



# dBTRAIT SOFTWARE

## User Manual





## dBTRAIT Software User Manual

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## **Welcome to the world of 01dB**

ACOEM thanks you for the purchase of your 01dB software and invites you to consult this user manual. For more information about our products, please visit our website at [www.01db.com](http://www.01db.com).

### **On receipt of the software**

This software has been thoroughly tested and documented before being published. The installer and documentation are either provided on physical media (CD-ROM, USB flash drive) or made available for download from our customer portal at <http://support.01db.acoem.com>. On receipt, please install the software in accordance with the recommendations set out in the documentation.

### **Conditions of use and warranty**

Details of the conditions of use of the software and its warranty are set out in the End-User Licence Agreement (EULA), the terms of which must be accepted during the installation process.

### **Further information**

#### *For further information*

- Visit our website: [www.01db.com](http://www.01db.com)
- Follow us on Twitter: [http://twitter.com/01dB\\_acoem](http://twitter.com/01dB_acoem)
- Follow us on Facebook: <https://www.facebook.com/01dB-542024152626414/?fref=ts>
- Follow us on LinkedIn: [https://www.linkedin.com/company/01db-prevention-of-noise-&-vibration-pollution?trk=biz-brand-tree-co-name](https://www.linkedin.com/company/01db-prevention-of-noise-amp-vibration-pollution?trk=biz-brand-tree-co-name)
- Contact our customer service department by email: [01db.support@acoem.com](mailto:01db.support@acoem.com)

# CHAPTER 1

## GENERAL PRESENTATION

---

### 1.1 INTRODUCTION

The software package **dBTrait** has been developed for the processing of **environmental noise & vibration measurement data**; as well as for the analysis of **human body exposure to vibrations**. It is the fundamental tool for working on measurement data in these fields of application. It is capable of processing the recorded data:

- from the new generation of **01dB** instruments (**DUO, FUSION, CUBE, ORION**),
- from the data-logging sound level meters of previous generations (SIP95, **Blue Solo & Solo Black Edition**),
- from the dosimeters exposimeters (**WED** for noise, **VIB** for vibration),
- and from all **01dB** PC-based acquisition systems (**SYMPHONIE, HARMONIE, dB12, dB4**).

Standardised results (such as time history of a given quantity, levels and statistical over selectable periods, etc.) are available. In addition, **dBTrait** offers powerful processing functionalities: time history of a selected spectrum frequency band and associated statistical calculations, playback of audio recordings from within the data plot, frequency analysis, identification and evaluation of noise sources with intelligent coding techniques, coupled noise/weather analysis... As well as time history of dominant frequencies for vibrations in the environment, comparison to normative thresholds and Limit Curves, reporting of measurements, etc.

**dBTrait** meets the normative and regulatory needs of French and International legislation and follows its evolution.

The **dBTrait** application software is the ideal investigation tool, which makes data processing easy and helps the user to analyse any given nuisance problem. The user-friendly interface ensures that the inexperienced user quickly becomes familiar with the system and results can easily be exported to word processors or spreadsheets, for documentation or further calculation. **dBTrait** is the tool for consultants, control offices, and experts in acoustics and vibrations.

### 1.2 COMPATIBILITY

**dBTrait 6.3** (and higher versions) runs under Windows 10 (32 & 64 bits).

Following the end of support from Microsoft, Windows 7 is no longer supported for dBTrait.

Some features of dBTrait 6 are based on an Internet Explorer Active X (Dominant frequency history). For proper operation, Internet Explorer version 11 (or its successor Microsoft Edge) must be installed on the computer.

The video visualization feature (new feature of version 6.3) requires the K-Lite Codec Pack (freeware), installed with the global setup.

#### Minimum screen resolution:

dBTrait: no minimum screen resolution

dBFileManager: minimum screen resolution: >1100 x 810 pixels

## 1.3 MAIN FUNCTIONS

We give below a list of the main functions of the **dB Trait** software package.

To get detailed explanations on how to use these functions, please refer to the appropriate section of this manual.

-  **dB Trait** is licence protected. The accessible functions from the above list depend on your licence profile.
-  The accessible functions also depend on the type of measuring instrument used, and of the type of measurement carried out.
-  The main evolutions of the **dB Trait** software based on the versions released on the market are described in the corresponding Release Note. These evolutions consist of corrections of errors or of new functionalities.

### 1.3.1 Interface

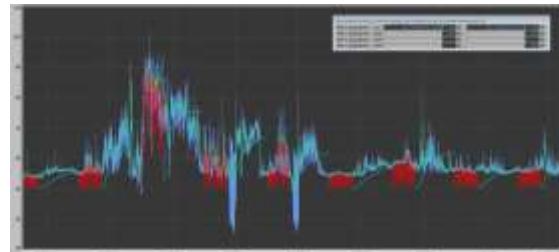
The dB Trait software is based on the following principles:

- Functions accessible through menus and submenus.
- Main functions also available through icons for quick access.
- Automatic adaptation of available icons based on function used.
- Window display, multiple-window display, very easy switch from one window to another.
- Multi-curve graphic functions with cursor-based zoom and adjustable scales, etc.

### 1.3.2 Temporal Analysis Of Acoustical & Vibration Quantities

Time history displayed on any time basis and over user-defined periods:

- Acoustics:  
Short Leq, Peak, Slow, Fast, etc.
- Environmental Vibrations:  
PPV (x,y,z), PCPV, PVS, Short Leq, weighted levels, VDV (x,y,z), Lp (x,y,z : estimated groundborne noise level from low frequency vibration velocity measurements), etc.
- Human body vibrations:  
Peak levels, weighted levels, VDV, etc.
- Audio signal playback (wave, or mp3) from within the time history plot.



#### New in dB Trait 6.3:

- Webcam video or pictures visualization from within the time history plot.

### 1.3.3 Frequency Analysis Of Time Signals (Audio and Vibration)

Calculations of averaged spectra or multispectra:

- in 1/n octaves (octaves, third octaves, ..., up to 1/48 octaves)
- and/or FFT from audio or vibration signal recordings.

Calculations of global levels, averaged or in time history, with acoustics or vibration weightings, time weightings, ..., Peak levels, etc..

Automatic calculations possibilities with "opening script", allowing getting right after the measurement session's opening the wished indicators (at user's choice): LEQ, weighted LEQ, multispectral, etc.

- from vibration signals recorded by the WLS wireless sensor (using FUSION or DUO),
- from acceleration signals recorded using ORION
- with possibilities to use pre-processings

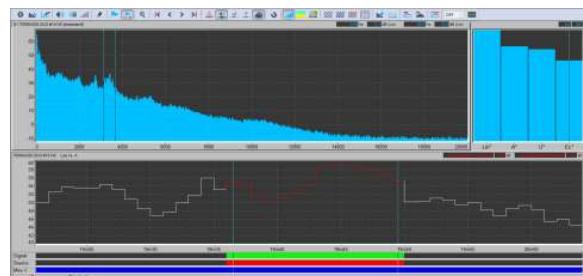
#### **New in dBTrait 6.1:**

Pre-processing possibilities on time signals (filterings, integration, derivation, weighting ...) allowing for example to integrate an acceleration signal into a vibration velocity signal.

### 1.3.4 Multispectrum Analysis

Time history of a spectrum (1/n octaves, FFT) over the whole measurement or from time signals recordings.

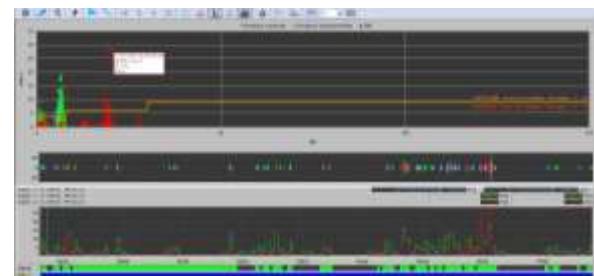
Representation as instantaneous or average/min/max spectrum, or sonogram, over the user-selected time period, with or without time/frequency sections. Possible display of spectra with or without frequency weighting, and one or more associated global levels.



### 1.3.5 Dominant Frequency Analysis

History of dominant frequencies associated with PPV or PCPV, over user-selected periods:

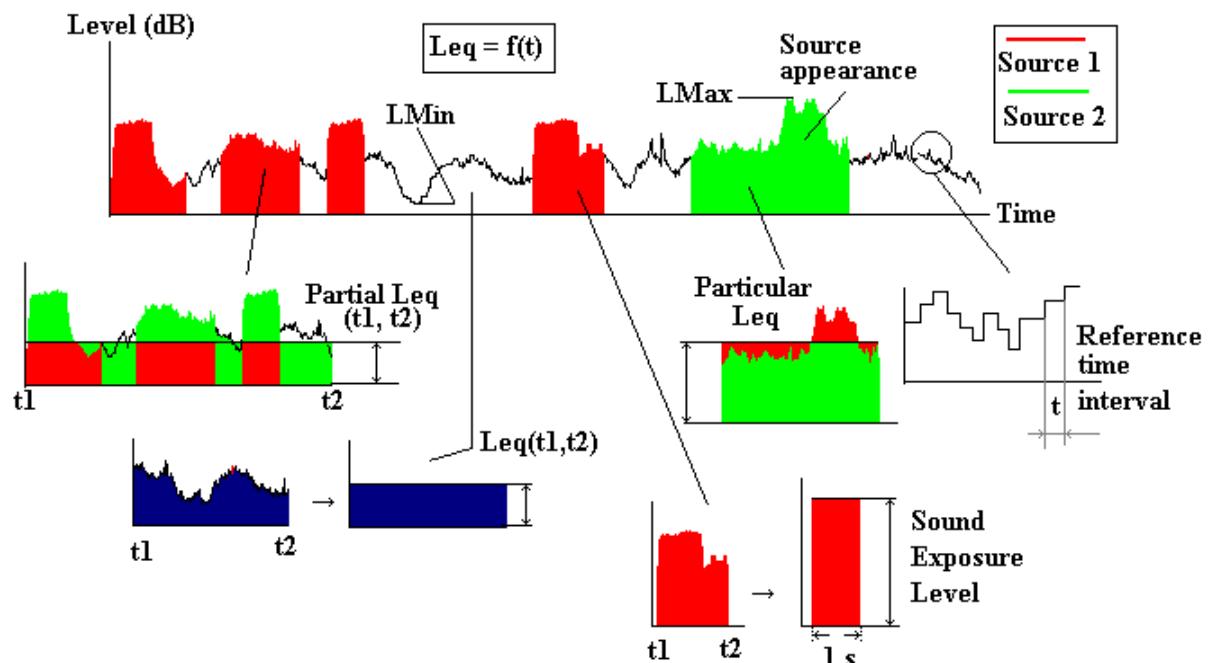
Representation as a scatter chart with display of reference standardized templates. Visual display of time signals from triaxial transducers for recorded events.



### 1.3.6 Data recomposition

Based on the different types of analyses available (see § 1.3.2 to 1.3.5 above), there are many possibilities of data recomposition.

The scheme below (based on an example with acoustics data) describes some of the noise indicators recomposed from the original short Leq data (time data):



See CHAPTER 22 for the definitions of the indicators listed on the above diagram.

### 1.3.7 Analysis of Vibrations on the Work Place

Processing of data relative to vibrations on the work place (data measured using VIB)

- Hand-arm
- Whole body
- Multiple exposure

Specific calculations such as SEAT or VDV.

### 1.3.8 Result Processing

Results shown as tables or colour graphics for direct printing, or export to standard office software to generate measurement reports.

- Overall Leq and statistical indices over selected time periods.
- Leq by noise source or vibration source and occurrence.
- Cumulative and probability distributions.
- Peak, Lmin, Lmax, Slow, Fast, Impulse, SEL, etc. levels.
- Loudest and quietest periods.day.
- Calculation of the Lden by day, week, month.
- Editing of statutory analysis reports.

### 1.3.9 Noise Source & Vibration Source Identification (Coding)

- Coding techniques available to classify noise or vibration events, including audio playback.
- Automatic (using threshold or time window conditions) or manual coding.
- Elimination of unwanted noise / vibration events during processing.
- Listing of noise or vibration events present with Leq and SEL levels, time of occurrence, partial Leq, etc.

### 1.3.10 Standards and Regulations

#### Noise in the Environment

- Occupational noise: noise exposure, sound exposure and OSHA indices.
- (France) Instructions des plaintes contre le bruit : bruits de voisinage (décrets correspondants et NFS31-010).
- (France) Bruit émis par les installations classées (arrêtés et décrets correspondants).
- (France) Bruit au poste de travail (NFS31-084 multiples réglementations).
- (France) Norme NFS31-010 (20/12/1996) : niveaux et émergences, tonalités marquées, impulsionalité, etc.
- (France) Norme NFS31-085 : tableaux de résultats selon les périodes réglementaires définies par l'utilisateur.
- (Italy) Decreto 16 marzo 1998

#### Vibrations in the Environment

- (France) Circulaire du 23 juillet 1986
- (France) Arrêté du 22 septembre 1994 – Carrières
- (Germany) DIN4150-3
- (UK) BS5228-4
- (UK) BS7385-2

#### Human body exposure to vibrations

- European Directive 2002/44/CE
- (Brasil) NH09-NR15
- (Italy) Decreto legislativo 9 aprile 2008, n. 81

The software also relies on the following standards:

- ISO 2631-1: Mechanical vibration and shock – Evaluation of human exposure to Whole-body vibration.

- ISO 5349-1: Mechanical vibration – Measurement and evaluation of human exposure to handtransmitted vibration.
- NF EN 14253: Mechanical vibration – Measurement and calculation of the effect on health of occupational exposure due to Whole-body vibration.

### **1.3.11 Automatic processing**

Automatic processing of a set of measurement files with user defined scripts: automatic result printing on screen, on printer, or storage in files for easy graphics / tables inserting into a Word report.

## 1.4 EXAMPLE OF ANALYSIS PROCESS

The analysis principle of acoustical or vibration quantities in the **dBTrait** software package is very simple. In this paragraph, we present a typical procedure for noise data processing. The same principle can easily be adapted to issues related to vibration measurement analysis. Most of the following points are optional, either because you will not be able to access to that particular function, either because such analysis is not required.

- **Step 1:** Open one (several) CMG datafile(s).

Once the **dBTrait** software is launched, use the command **File / Open** to open a CMG measurement session file that is stored on the computer hard disk.

Several CMG datafiles may be joined together to create a single measurement file. Use the command **File / Import/Concatenate**.

- **Step 2:** GRAPHICS : Display of a noise or vibrations quantity time history or a statistical distribution.

Once a CMG datafile is open, the analysis process may be started, for example, with a time history display of any acoustical quantity contained in the measurement file (command **Visualization / Time history**). See **CHAPTER 4**.

It is possible to display the time history of acoustical quantities together with the associated instantaneous octave spectrum or third octave spectrum. To do so, use the command **Visualization / Spectral time history**. See **CHAPTER 5**.

A probability distribution of the noise levels may be displayed with the command **Visualization / Histogram**. Similarly, use the command **Visualization / Cumulative distribution** to display a cumulative distribution (cumulative histogram) of the noise levels. See **CHAPTER 10**.

- **Step 3:** Playback and frequency analysis of audio and vibration records.

It is possible to directly playback audio records from a time history plot, by a single mouse click. Using the commands of the **Post-processing** menu will allow the user to perform frequency analysis of the time signal audio recordings. See **sections 4.12, 4.13 and CHAPTER 14**.

- **Step 4:** Nuisance source coding.

Depending on the Leq pattern of the noise data, and with help of user's comments and audio records, noise source identification is an easy operation to perform. When a noise event has been identified, the commands of the menu **Source** allow the operator to code these noise events in the data stream, for later analysis. See **§ 4.14 and CHAPTER 9**.

When sources have already been coded at the time of the measurement, it is possible to validate or invalidate the effectiveness of the identified events.

- **Step 5:** TABLES : Results listings.

Use the commands of the **Results** menu to calculate, for example, the overall Leq and statistical indices for the whole duration of the datafile or for user-defined time periods. Other calculations give result tables such as Leq by noise source and occurrence, the Peak, Lmin, Lmax levels, etc. the loudest and quietest periods, etc. See **CHAPTER 11**.

Regulatory calculations of French and international regulations are also available through the command **Statutory Analysis**. See **CHAPTER 13**.

- **Step 6:** Printing the results / Edition of a test report.

Use the commands **File / Print** and the commands of the **Edit** menu to respectively print a time history plot or a table of results and to export the results into word and spreadsheet processors for further calculations and presentation. See **CHAPTER 16**.

- **Step 7:** Save the measurement session datafiles.

Use the command **File / Save**, to save any modification made to the current datafile. See **sections 3.1.7 and 19.9**.

# CHAPTER 2

## DBTRAIT INSTALLATION

---

### 2.1 SOFTWARE INSTALLATION

The dBTrait software is installed by executing the Setup file.

Example: for software version 6.1: execute the “setupdBTrait6.1.exe” file

- ❑ *The utility software **dBFileManager** can be installed in addition, via the provided setup file.*
- ❑ *Please uninstall dBFileManager 5.5 before installing dBTrait 6.0. This will not remove the instruments catalog previously created using dBFileManager 5.5.*
- ❑ *For software compatibility information, see §1.2.*

**Note:**

The installation process requires administrator rights. In case needed, please contact your network administrator.

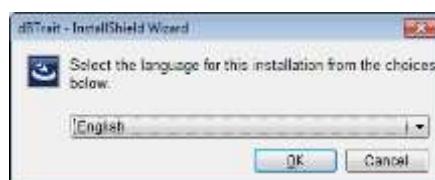
**Note:**

It may be necessary to turn your anti-virus off before launching the installation setup.

Once the dBTrait installer has been launched, a series of windows intuitively guides the user through the software installation process.

Example of installation process under Windows Seven:

Screen 1:  
Language selection



- ❑ *Note: Selecting the language at this point will affect the language of the installation wizard only, as well as the language of the User Manual (the User Manual will be in English if the user chooses French during the installation, the user manual will be in English for all other choices). The language of the dBTrait software will be automatically defined (see § 19.1 for more details on how to select the software language).*

Screen 2:  
Preparing the installation



Screen 3:  
Installation wizard welcome screen



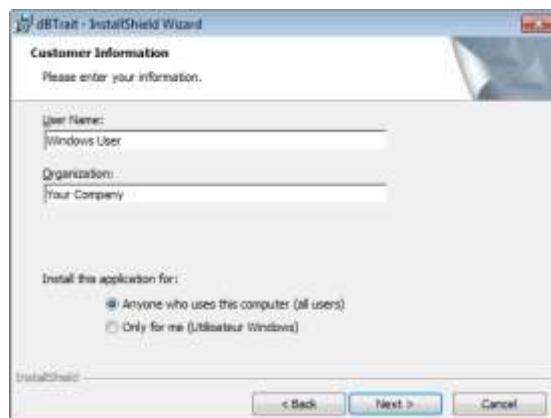
Screen 4:  
License agreement screen

(End User License Agreement – EULA)



Printing the EULA text is not possible if software MS Word is open.

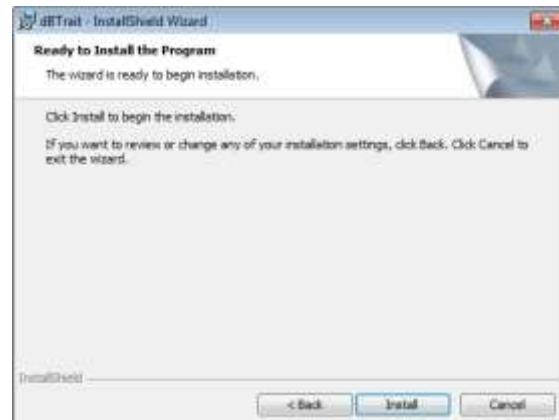
Screen 5:  
Customer information screen



*Screen 6:  
Installation folder selection  
screen*



*Screen 7: Installation launch screen*



*Screen 8: Installation completion screen*



Once the installation has been completed, the **dBTrait** software may be launched from the menu Start → All Programs → 01dB → dBTrait 6

 A message about a missing file « api-ms-win-crt-runtime-l1-1-0.dll » may appear in certain cases after software installation, when launching it.

Solution 1: update Windows.

Solution 2: install a patch or Windows add-on: download “VC redist” and install it:

For Windows 64bits : [http://download.microsoft.com/download/8/c/b/8cb4af84-165e-4b36-978d-e867e07fc707/vc\\_redist.x64.exe](http://download.microsoft.com/download/8/c/b/8cb4af84-165e-4b36-978d-e867e07fc707/vc_redist.x64.exe)

For Windows 32bits : [http://download.microsoft.com/download/9/b/3/9b3d2920-49f7-4e76-a55c-d72b51e44537/vc\\_redist.x86.exe](http://download.microsoft.com/download/9/b/3/9b3d2920-49f7-4e76-a55c-d72b51e44537/vc_redist.x86.exe)

Solution 3: install this Windows update: <https://www.microsoft.com/en-us/download/details.aspx?id=49081>

## 2.2 LICENCE

When the software is started for the first time, the user is requested to enter the licence provided:

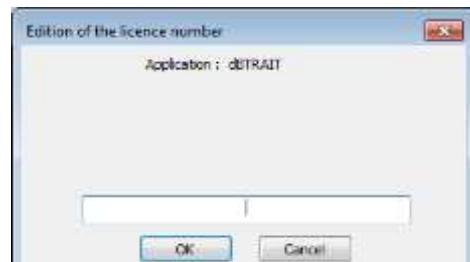
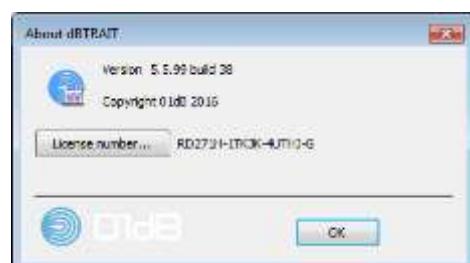
It is possible to enter a temporary licence.

In this case, dB Trait indicates the licence expiry when the expiry date approaches (with pop-up message at software startup):

To change or enter the licence number (to replace a temporary licence with a permanent licence, for example), open menu “?”, select **About**, and then click on the **License number** button.

Type the provided license number, (or copy/paste it), then validate.

A message requests then to restart the software



Without license, it is possible to use the software in Viewer mode (limited functionnalities).

## 2.3 dBTRAIT.INI

Modifying the file **dBTrait.ini** is mentioned several times in this manual. This file is located under [X:\ProgramData\01dB\Trait](#), where X represents the volume where **dB Trait** software is installed.

The software must be closed before proceeding to modifications in the **dBTrait.ini** file.

# CHAPTER 3

## GENERAL NOTIONS & DATAFILE MANAGEMENT

---

### 3.1 CMG MEASUREMENT SESSION

The **dBTrait** software package processes noise & vibration data saved in a measurement session data file with extension **CMG**. A **CMG** data file is a specific data format developed by **01dB** to store the time histories of any type of noise / vibration quantities and the time signals recordings. It can be constituted of several **channels**, each one corresponding to a different type of data, coming from one or several measurement **physical channels**.

There are several ways to create **CMG** documents:

- Either directly with measuring instruments or acquisition software:
  - **DUO, FUSION, CUBE, ORION**
  - Software **dBTrig** (with **Symphonie, Harmonie, dB12, dB4** acquisition software programs, etc.).
- Or through importation: a module of the dBTrait program achieves this function:
  - Data transfer to a PC from the memory content of data-logging sound level meters like Solo or Blue Solo or Solo Black Edition or SIP95, etc.

In both cases, multiple measurements can be open or imported in a single operation. See **§3.2** and the associated sub-sections regarding the different cases.

Any measurement made with a **01dB** measurement system is stored in a unique data file type: the measurement session with extension **CMG**.

The **CMG** files can include:

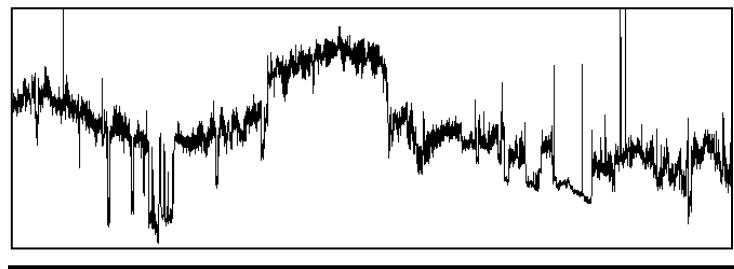
- |   |                       |
|---|-----------------------|
| <ul style="list-style-type: none"> <li>▪ data at “main” elementary base period</li> </ul>   | <b>Main data</b>      |
| <ul style="list-style-type: none"> <li>▪ data at “fine” or “large” elementary base period (parallel measurements)</li> <li>▪ Meteorological data (at “main” elementary base period or other)</li> <li>▪ Time signal recordings</li> <li>▪ Codings</li> <li>▪ “System codings” (overloads, under-loads, sensor default)</li> <li>▪ written comments</li> <li>▪ vocal comments</li> <li>▪ Global items (see detailed description at <b>CHAPTER 15</b>)</li> </ul> | <b>Auxiliary data</b> |

Data types other than data at elementary base period, are considered as **Auxiliary data**.

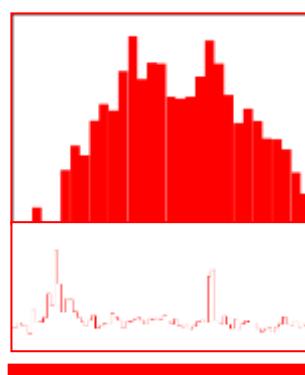
They can be viewed directly from the time history plot, into information bars. In a more general manner, the auxiliary data can be displayed by the commands of the **Aux.** menu.

It is possible to access directly to any parallel measurement by using the navigation data flow list in the main toolbar. The measurement session information window is refreshed each time a different dataflow is selected.

The drawing shown below is an example of the results obtained for the main dataflow (time history), over the complete duration of the measurement session and a complementary data flow, that is a parallel measurement, over the duration of an event.



**Main data flow**  
(over the complete duration of the measurement)



**Parallel measurement n°1**  
(over the duration of an event)

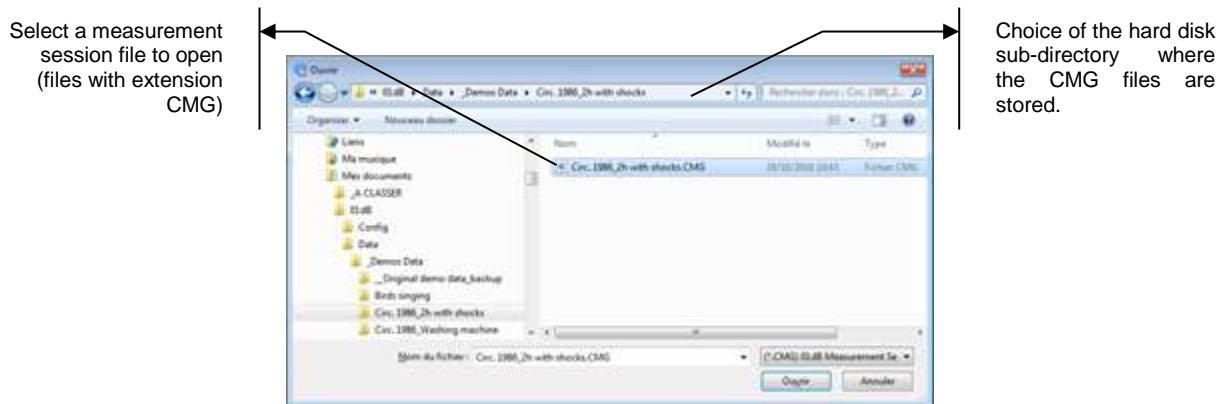
← Total duration of the CMG measurement session file →

- ─  See § 22.1.1 for more details on channels and physical channels.
- ─  See § 22.1.2 for more details on data flows.
- ─  All these data can be available or not, depending on the type of instrument used for measurement and on the use thereof. Refer to your measuring instrument user manual for further information on its own capabilities.

A measurement session data file, with the CMG extension, may represent several megabytes of data and **dBTrait** may work simultaneously on several data files.

### 3.1.1 Open a CMG datafile

To open a CMG measurement session file stored on the computer hard disk, click on the icon  or use the command **File / Open**. The following dialog box appears on screen.



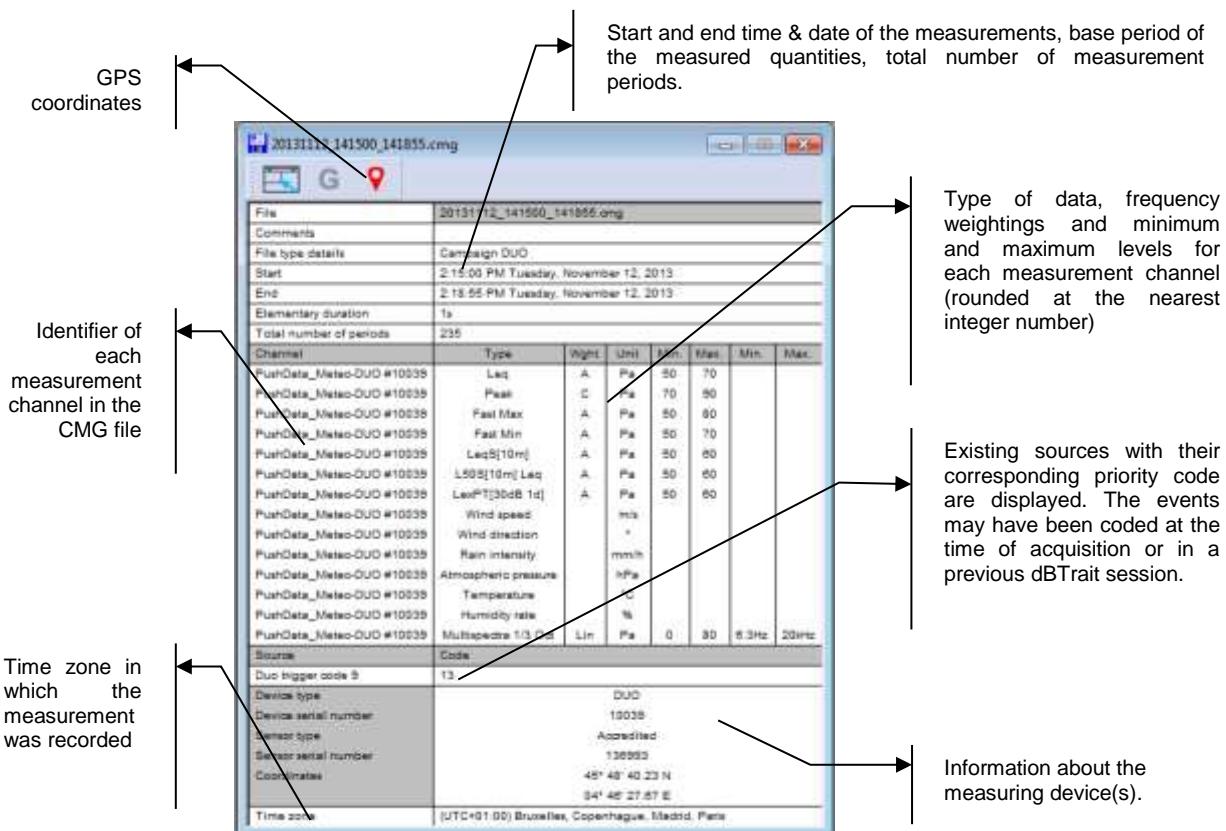
Once a file has been selected, click on the **Open** button to open the datafile and proceed with its analysis.

- ─  **Important Notice:** specific case of measurement sessions containing recordings of vibration signals obtained with the WLS sensor (used with DUO FUSION):  
From version 5.5, dBTrait allows automatic processing of signals during the opening phase, to obtain the desired indicators immediately (LEQ, weighted LEQ, multispectra, etc.) on vibration data.  
For more details, see § 14.5.

- ─ **New in dBTrait 6.3:** possibility to open a measurement session by drag & dropping the CMG file on dBTrait

### 3.1.2 Information window of a CMG file

Once a CMG datafile is open, the following window (**main window**) is displayed on screen:



The beginning and end times given in this window correspond to the acquisition date and time references.

From the **Channel** field are listed the quantities per physical measurement channel (in the example above, there is one acoustic measurement channel for which there are 8 noise quantities: overall A weighted Leq, C weighted Peak, A weighted time constants Fast Max and Fast Min, Sliding Leq, Sliding statistics, Noise Exposure level, and Multispectrum).

For each channel, the data **type** (Leq, Peak, Slow, Fast, Impulse, multispectrum, PPV,etc.), the frequency **weightings** (A, B, C, Lin, Wb, Wbc, etc.) and the **minimum** and **maximum** values in dB or Physical Units are given.



An information window (or its icon when minimised) is displayed for each open CMG datafile. Closing down this window will close the datafile.

### 3.1.3 Visualize the GPS position

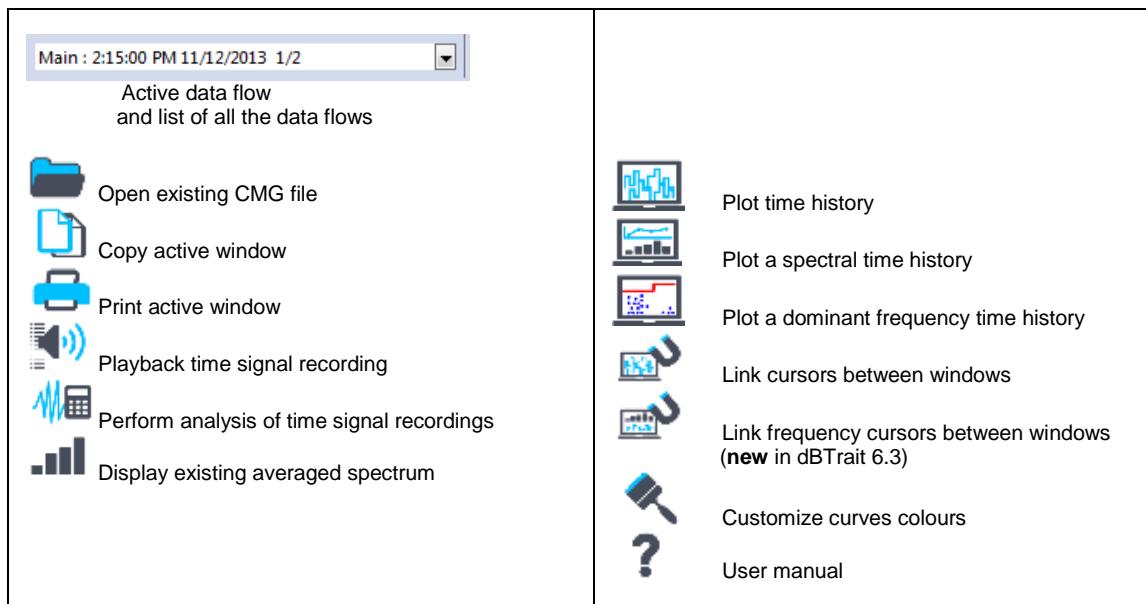
Using button  , one can display the GPS coordinates of the measurement point in Google Maps:



-  This function is accessible only for instruments **DUO**, **FUSION**, **CUBE** and **ORION**, and when the GPS coordinates could be determined during the measurements.
-  Google Maps is launched in the default web browser.
-  When several measurement points coexist in the measurement session, each point is displayed in separated tabs in the web browser.

### 3.1.4 Main Toolbar

The main horizontal toolbar allows the user to access the following dB Trait functions



### 3.1.5 Edit the CMG datafile header

It is possible to modify the header of CMG datafiles by using the commands **Edit / File Header / General parameters** and **Channels**.

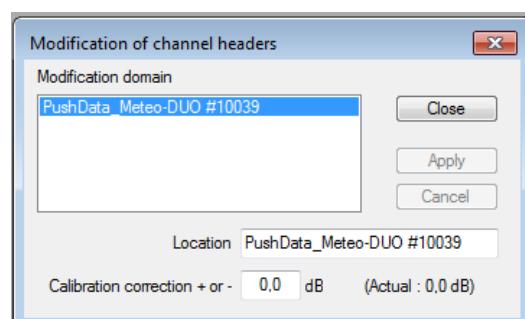
The dialog box **File Header Modification** allows the user to modify the following general parameters:



- Comments
- The start date and time of the datafile
- The Time Zone

The dialog box **Channel Header Modification** allows the user to modify the following parameters:

- The **location** of a measurement channel
- The **calibration correction** factor to apply to the data of the selected measurement channel. This correction applies to all data acquired on this channel and included in the measurement session. The correction will be stored in the file header.



After editing these parameters, use the key **Apply** to validate the modifications without exiting the dialog box.

### 3.1.6 Close a CMG datafile

To close a measurement session file of type CMG, use the command **File / Close**. Closing down the information window of the datafile will also result in closing the CMG datafile. All others windows (results' listings, time history plots, etc.) will be closed as well.

**dBTrait** will also prompt the user to save this CMG datafile if any modifications have been made to it before closing.

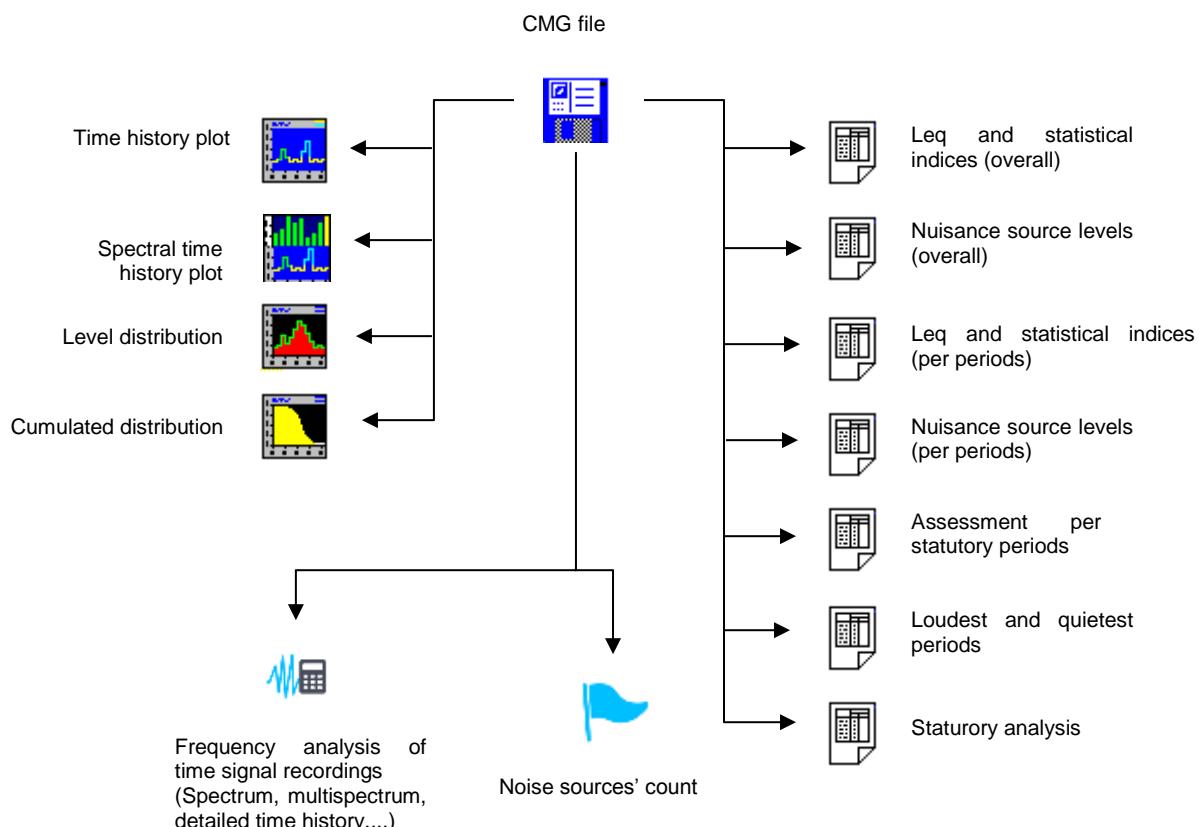
### 3.1.7 Save a CMG datafile

To save the modifications made to a datafile in **dBTrait**, it is required to use the command **File / Save** or **File / Save As** to save the measurement session on the computer hard disk.

Several storage modes are proposed by the software. See § 19.9 for more details.

### 3.1.8 Document dependencies in a CMG file

**dBTrait** allows the user to work in different measurement session files at the same time. For each file, several windows may be displayed: time history plots, result tables, etc. The drawing shown below describes the hierarchy of all the documents that can be created from a CMG file:

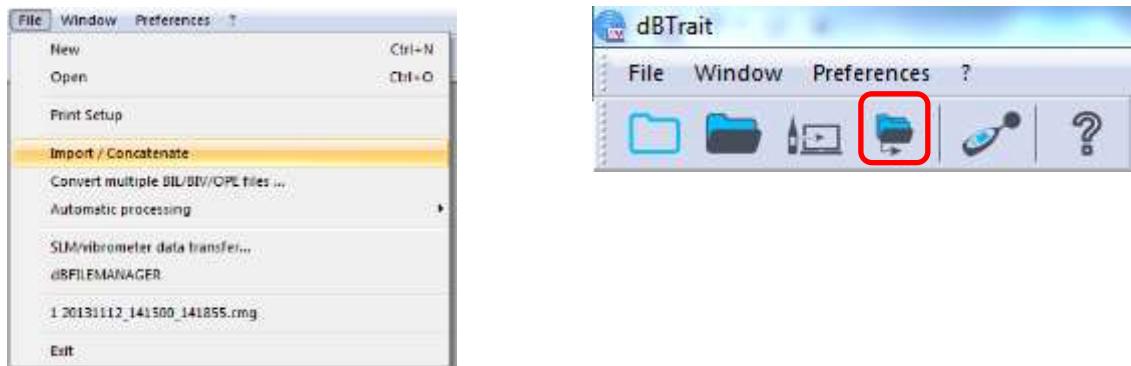


The **main window** is the **file information window** to which any other views are related. When closing the main window, all dependant windows are closed. However, any dependant windows may be closed separately.



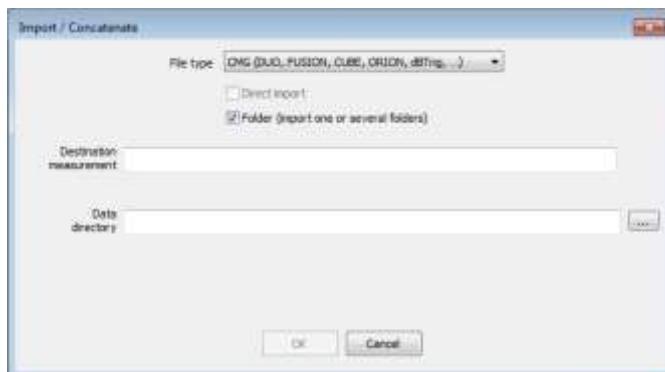
## 3.2 IMPORT / CONCATENATE DATAFILES

File import is achieved using option **Import / Concatenate** in the **File** menu, or through the **Import / Concatenate** icon in the Main Toolbar:



4 types of files can be imported into **dB Trait**:

- **CMG** files
- **BIL** files, from WED or Blue Solo or Solo Black Edition
- **BIV** files, from VIB
- **OPE** files, from Oper@ monitoring stations



A window opens up, which lets you select:

- The **File type** among the 4 types listed above.
- Whether **files** or **folders** are to be imported.
- The **data** to import.

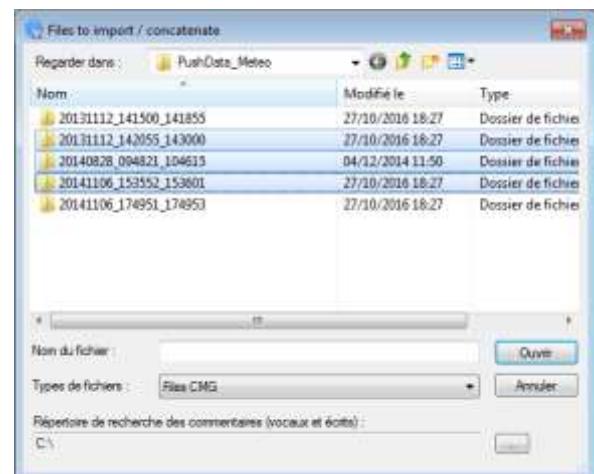
### ▪ **Folder** option (import one or several folders)

When the option is enabled, all measurement sessions included in a **folder selection** can be imported, which allows, for instance, importing a selection of measurement sessions recorded by new generation instruments **DUO**, **FUSION**, **CUBE**, **ORION** (for these instruments, measurements are stored in folders).

If the option is disabled, a **selection of files** of the selected type can be imported.

Click on button to access the data selection window (see opposite).

**Multi-selection** of files or folders is achieved by left clicking on the mouse and holding down keys **Shift** or **Ctrl** on the keyboard.



After completing the selection, click on **Open** to confirm.

The **Destination measurement session** field is automatically populated if data are imported from a session that is already open.

- **Concatenation**

If several files or folders are selected, they will be automatically concatenated into a single session file, according to concatenation rules.

This new measurement session file groups together all the records on the same channel, if:

- the records to concatenate **do not overlap temporally**
- the records to concatenate have the **same base period** (e.g. 1s)
- the records to concatenate have the **same measurement location**

Otherwise, the campaign presents the records in various ways:

- Identical base periods, but different location names: in the same data flow, but with different channels
- Different base periods: in different data flows.

If recordings that need to be concatenated show a time overlap and that the measurement location is the same, then there is a function called "Management of measurement overlap" (enabled by default). See § 20.4.

The names of all chosen files are displayed on the "Name" line.

The length of this line is limited to 4,096 characters. This length can be insufficient for treatments of monitoring files where the number of files to take is high:

Add the following line in the section [Settings] of the dB Trait.INI file, in order to increase the size of the input line.

[Settings]

...

MultFileBufSize=16384

*Number 16384 is an example.*

 With dB Trait 6.0, you no longer need to create a new empty file (File / New) before the import.

 With dB Trait 6.0, importing comments and/or files is possible only using the "multiple file conversion" function.

### 3.2.1 Import / Concatenate CMG files (DUO, FUSION, CUBE, ORION, dBTrig, ...)

Using command **Import / Concatenate** in the **File** menu or icon :

Select **File type** **CMG (DUO, FUSION, CUBE, ORION, dBTrig, ...)** ▾



Then:

- For DUO, FUSION, CUBE, ORION measurement sessions
  - Select option **Folder (import one or several folders)** to import a selection of several measurements.
  - To import a single measurement, just use command **File / Open**.
- For dBTrig measurement sessions
  - Unselect option **Folder (import one or several folders)** to import one or several measurement sessions located in a single folder.
  - Select option **Folder (import one or several folders)** to import all measurement sessions located in the selected folder(s).

 *Concatenation of measurement sessions originating from different instruments: for a successful operation, the “location” names in the measurement sessions to be merged should be different.*

### 3.2.2 Import / Concatenate BIL files (WED, BlueSolo, BlackSolo)

Measurement files are stored in BIL format on the **WED** dosimeter, as well as on the **BlueSolo** and **Solo Black Edition** soundlevelmeters.

This paragraph describes data import from the moment BIL files are present on the PC.  
For more details on the different procedures to transfer BIL files to the PC, see:

- For WED: § 18.4.
- For pour Blue Solo & Solo Black Edition: **§ 18.2**.

Using command **Import / Concatenate** in the **File** menu or icon :

Select **File type** **BIL (dosimeter WED, BlueSolo, BlackSolo)** ▾



and then:

- Unselect option **Folder (import one or several folders)** to import one or several BIL files located in the same folder.
- Select option **Folder (import one or several folders)** to import all BIL files located in the selected folder(s).

### 3.2.3 Import / Concatenate BIV files (VIB)

Measurement files are stored in BIV format on the **VIB** vibration dosimeter.

This paragraph describes data import from the moment the BIV files are present on the PC.  
For more information on the different procedures used to import BIV files to the PC, see § 18.3.



Using command **Import / Concatenate** in the **File** menu or icon :

Select **File type** **BIV (vibromètre VIB)** .

And then:

- Unselect option **Folder (import one or several folders)** to import one of several BIV files located in the same folder.
- Select option **Folder (import one or several folders)** to import all BIV files in the selected folder(s).

### 3.2.4 Import / Concatenate OPE datafiles (Oper@)



Using command **Import / Concatenate** in the **File** menu or icon :

Select **File type** **OPE (Oper@)** .

And then:

- Unselect option **Folder (import one or several folders)** to import one or several OPE files located in the same folder.
- Select option **Folder (import one or several folders)** to import all OPE files located in the selected folder(s).

*Sources coding are kept during importation.*

### 3.2.5 Import LEQ datafiles

The LEQ datafiles are from old 01dB measurement systems in 16-bit versions.

To the LEQ datafiles are linked various auxiliary data (WAV files, LEQ files, NOC files resulting from an audio record analysis, etc.).

**In dBTrait v6.0, the LEQ datafile import is not supported anymore.** For any need of LEQ datafile import, please contact [01db.support@acoemgroup.com](mailto:01db.support@acoemgroup.com).

### 3.3 IMPORT COMMENTS...

It is possible to import comments in the form of TXT, Wave, or specific files.

#### 3.3.1 Import Text or Wave comments (dB Solo)

See § 18.2.1.

#### 3.3.2 Import specific comments

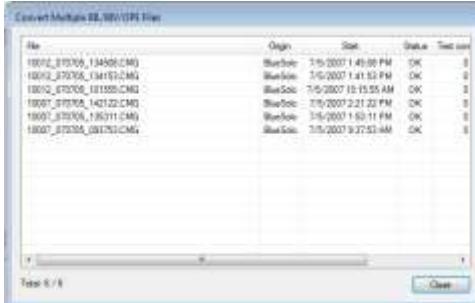
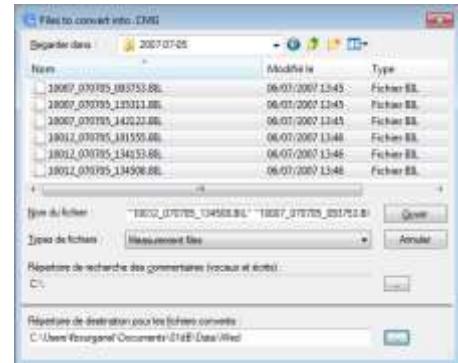
Importing radar informations as comments is possible. See in dB Trait's User Manual in French version.

### 3.4 CONVERSION OF MULTIPLE FILES

Several BIL or OPE files can be converted in a single operation into a CMG session file using the **File / Convert multiple files** command.

To do so:

- Select the files to convert
- Specify the path to comments associated to the measurements to convert
- Specify where the converted files will be stored.



Click on “Open” to launch the conversion process.

Once the conversion is finished, a summary table listing all processed operations is displayed.

### 3.5 MANAGEMENT OF ANOMALIES AND MISSING DATA IDENTIFICATION

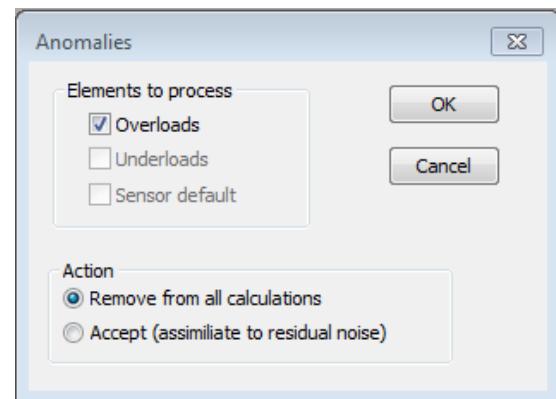
In addition to data import/concatenation functions, dB Trait allows managing potential anomalies in the measurements, as well as identifying possible missing data.

#### 3.5.1 Anomalies

Command **Misc / Anomalies** is used to manage possible anomalies in the measurement: overloads, underloads, transducer defect.

The type of anomaly to process can be selected. Two different actions can then be performed on the data of interest:

- Remove from all calculations
- Accept (assimilate to residual noise).



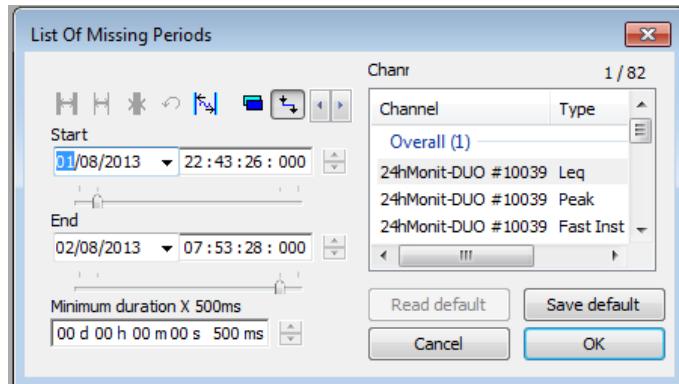
See § 9.2.3 for more details on **Eliminated** and **Residual codings**.

### 3.5.2 List of missing periods

Command **Misc / List of missing periods** is used to list time periods for which there are no data.

Search can be performed as follows:

- Over a time period defined by the user,
- Over one or several processing channels,
- By defining a minimum threshold to consider that data are missing.



*Most of the time, if data are missing for a processing channel, they will also be missing for another processing channel originating from the same measuring device.*

After validation of the parameters, a window opens up showing a table listing the periods for which there are no data:

Missing periods Construction site_Night_20130801_2013080...			
File	Construction site_Night_20130801_2013080...		
Start	8/1/2013 10:43:26 PM:000		
End	8/2/2013 7:53:28 AM:000		
Minimum duration	0:00:00:500		
24hMonit-DUO #10039 (Leq)			
Period start	End	Duration	Type
8/2/2013 12:00:00 AM:000	8/2/2013 12:00:19 AM:000	0:00:19:000	Missing periods
8/2/2013 6:00:00 AM:000	8/2/2013 6:00:19 AM:000	0:00:19:000	Missing periods
Total		0:00:38:000	

*This function does not handle the cases of "invalid" values, only the cases of absence of data.*

# CHAPTER 4

## TIME HISTORY PLOT

The time history plot is one of the main plots available in **dBTrait**. It represents a plot of sound levels or vibration levels (calculated according to a user-defined time base) vs. time. The measurement data is taken from a CMG datafile. Such plot gives not only an overview of a noise climate or a vibration climate for a given environment, but also an in-depth description of particular events.

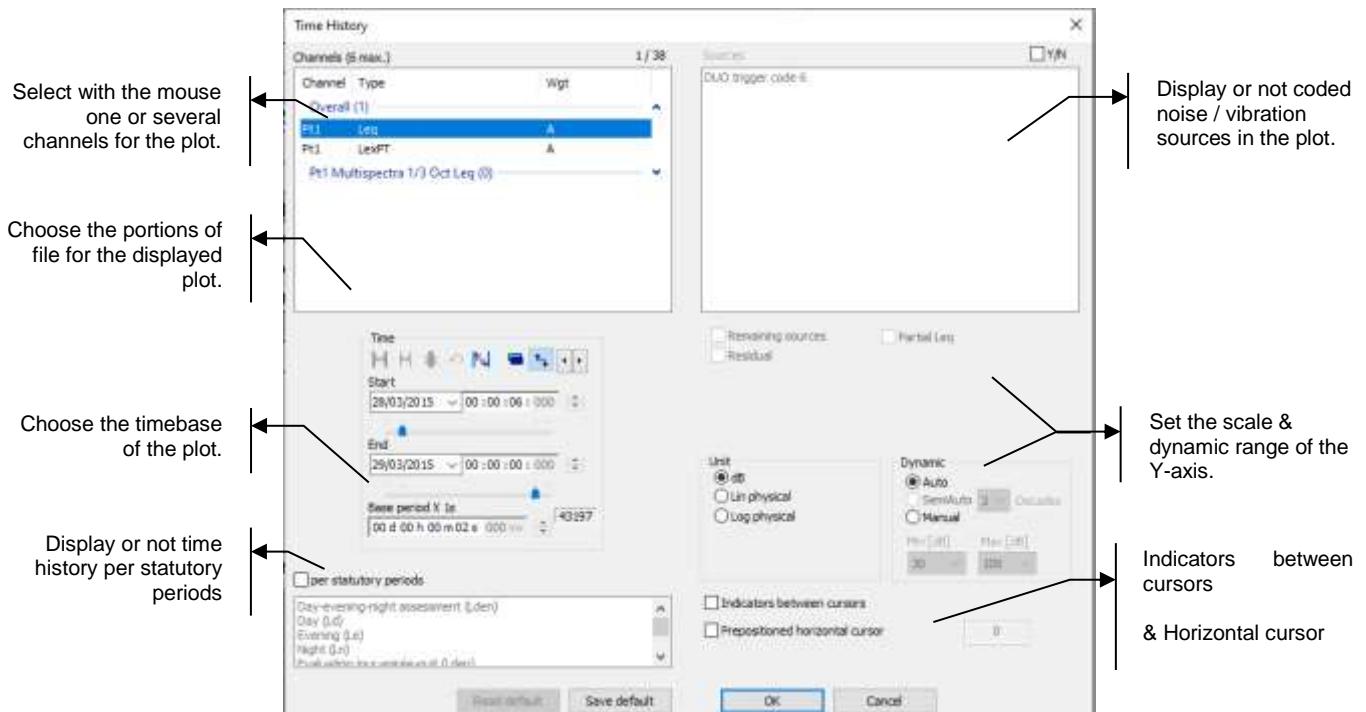
The time history plot may or may not display existing noise or vibration events. In this case, the sources will be displayed with different colours on the plot.

Audio or Vibration records can be played back through the sound system of the computer directly from the time history plot. Further analysis of recorded time signals can also be launched from this plot.

### 4.1 CONFIGURATION PARAMETERS OF THE PLOT



Once a measurement datafile is open, click on the icon or use the command **Visualization / Time History** to plot a time history of any measured quantity present in the CMG datafile. The following dialog box is displayed on screen. Define the parameters of the plot. On validation of this dialog box, the time history plot will be displayed in a new window.



Right clicking on a selection zone enlarges it (for instance: right click on the Channels selection zone). To recover the standard display, right click again.

The following parameters may be defined:

- **Channels**

The acquired quantities stored in a CMG datafile that can be plotted (see definition at **CHAPTER 22**). For each physical channel (measurement channel), different types of noise data can be available. A maximum of six channels can be displayed simultaneously on a time history plot. To select several channels, use the Ctrl or Shift keys on the keyboard.

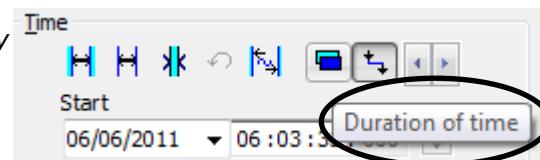
- **Timetable**

Specify the beginning and ending time of the file section to plot (the format of this selection is **dd/mm/yy hh:mm:ss:ms**) or the beginning time and the length of the section to take into account.

Icons  are used to:

-  Select the **entire file** (i.e., data over the total length of the file)
-  Select the **entire channel** (i.e., data over the total time length of the channel)
-  Select data **between cursors** placed on the plot
-  Go back to original times
-  **Round up times** (rounding calculation depends on the total duration of display)
-  Select whether to display **ending time or duration**
-  **Link** starting and ending cursors.

 Hover the mouse over the button to display tooltip describing the associated function.



- **Base plot step (base period)**

The plot may be displayed using the default time base of the measured quantities in the datafile or a greater time base. The base period is the time period over which the indicators will be displayed (possibly recalculated if the base period is not the elementary timebase).

 The terms “*integration time*” (IT) or “*logging interval*” are commonly used to describe the time base. One usually talks about elementary IT or recomposed IT.

During acquisition, an elementary time base has been used to store the data (usually 125ms or 1s for noise or human body vibration, 5s for environmental vibration). It is possible to recalculate/display noise or vibration levels according to a greater time base (for example 15-min) that is a multiple of the main elementary timebase. **dBTrait** adjusts automatically the base plot step (base period) to the nearest value that matches an elementary timebase multiple.

Similarly, it is not possible to recalculate/display noise/vibration indicators according to a step that is smaller than the main elementary timebase.

- **Partial Leq**

The **Partial Leq** is an equivalent sound pressure level of a specific noise source over a selected time portion. The partial Leq is related to the duration of each period and is calculated regardless of sources' duration.

-  *The option **Partial Leq** is activated only when a time history plot is displayed according to a base plot step greater than the acquisition time base.*

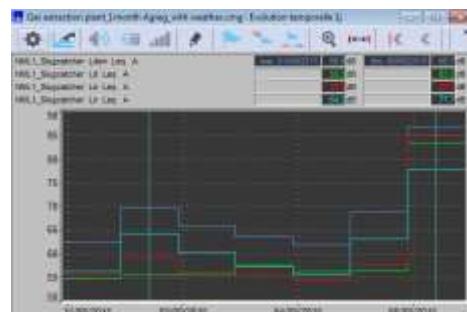
- **Per statutory periods** (for acoustic data only)

- 

Displays the chosen values according to the statutory periods defined in the command Preferences - Statutory periods.

The plot displays then **one value per statutory period** in the studied period.

Example: If studying the LAeq indicator over one week and selecting "Night (Ln)" as statutory period, the plot displays only 7 values per channel (see dialog aside).



Now, if "Day-evening-night assessment (Lden)", "Day (Ld)", "Evening (Le)" and finally "Night (Ln)" are selected as statutory periods, the plot shows 4 curves with 7 values each (see opposite).

This function is useful for long term monitoring measurements as the Concatenation function in the measurement session.

- **Sources / Remaining sources / Residual (Not coded)**

Select in a list the nuisance sources to consider (or not) for the plot. If one wish to display nuisance sources (box **Y/N** ticked) on the plot, they will be shown in different colours in order to differentiate them from the rest of the data.

If several sources are referenced, use the mouse to select the sources to display.

The option **Remaining sources** allows the user to plot all sources that have not been selected, except the Residual, as a single source named "Other sources". This option may be useful to estimate the contribution of a source compared to all the other sources, for instance. The selection will be recalled as default value next time such a command is used.

-  *This option is not active when no source is identified or when all the sources have been selected in the list.*

The option **Residual** allows the user to represent all the data in the file that have not been coded as a specific source. Any data not being linked to a source is considered as being part of the "Residual level". The selection will be recalled as default value next time such a command is used.

-  When more than one channel are selected for the plot, the identified nuisance sources cannot be displayed on it.

▪ **Graphic scales: Units and Dynamic options**

Select the units and the type of dynamic range (Auto, SemiAuto, Manual) for the scale of the ordinate axis of the plot. After validation, these settings will be applied to the plot. For automatic adjustment of the values of the ordinate axis, tick box **Auto**.

The following combinations can be selected:

dB unit	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> <li>▪ Manual dynamic range: Min and Max settings available</li> </ul>
Lin Physical Units	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> </ul>
Log Physical Units	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> <li>▪ SemiAuto dynamic range:           <ul style="list-style-type: none"> <li>○ Max level set automatically,</li> <li>○ and dynamic range set with drop-down menu:               <ul style="list-style-type: none"> <li>▪ from 2 to 6 decades</li> <li>▪ The Min levels automatically depend on the dynamic settings.</li> </ul> </li> </ul> </li> <li>▪ Manual: Min and Max settings available.</li> </ul>

-  By toggling between “dB” and “Physiques Lin” or “Physical Log”, Min and Max settings revert to default values.

▪ **Indicators between cursors**

This option allows the user to calculate the equivalent level corresponding to the time portion in between the cursors of the time history plot. This value is displayed on the time history plot.

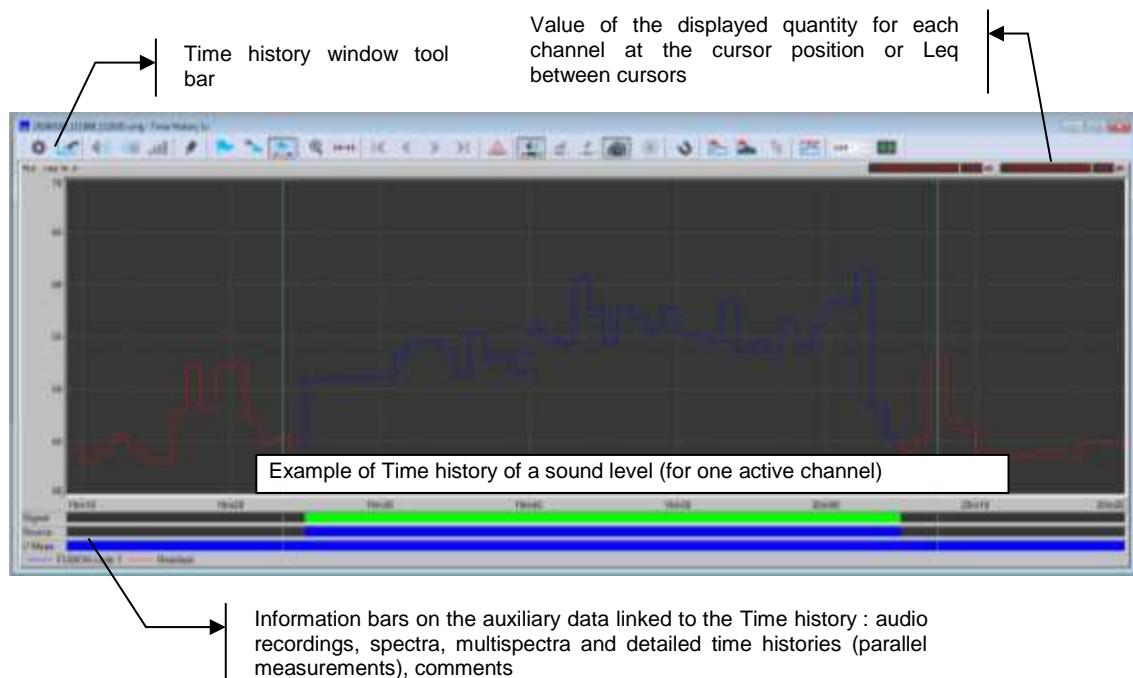
- If this value is not checked, the value is given for each cursor position on the time history plot.
- If this value is checked, the following default parameters will be displayed:
  - Date for left cursor
  - Average level between cursors for Leq type data
  - Maximum level between the 2 cursors for Peak type data
  - Time length between cursors
  - SEL value between cursors (SEL calculated over the entire section between cursors does not take Max – 10 into account).



-  SEL is calculated for certain types of compatibles data only.

-  To display the date for the 2<sup>nd</sup> cursor, one needs to modify the dB Trait.ini file and set ShowDuration to 0 in the [Settings] section.

## 4.2 TIME HISTORY PLOT DISPLAY



The time history plot window features a tool bar that gives access to functions such as coding a noise source between cursors, analysing in frequency and /or time domains, audio records playback, editing comments, etc.

**dBTrait** can display up to five information bars, which represent auxiliary data associated with the time history plot:

- Possible anomalies: overloads, underloads, transducer defect (**Anomalies** bar)
- Comments relative to the measurement (**Comm.** bar)
- Recordings of time signals (**Signal** bar, formerly Audio bar)
- When data based on fine elementary timebase are available: 1/N octave or FFT **multispectrum**, and/or fine history of an indicator (**// Mes** bar)
- When analyses based on averaged calculations are available: averaged spectra in 1/Nth octaves (**Spect** bar)

A **double click** with the mouse on these events allows the user to display in another window the auxiliary data (playback of an audio record, display an averaged spectrum, a multispectrum, a detailed time history or a comment, switch to a “fine” dataflow in the data flow navigation bar).

All actions dealing with **auxiliary** data are accessible through the commands of the **Aux.** menu. It allows the user to manage these events (edit, delete, export...).

The **Parallel measurements** bar corresponds to the analysis of time signals that vary with time, such as a **multispectrum** or a detailed time history. Access directly to such measurements by using the data flow navigation bar in the main toolbar of **dBTRAIT**

*Loading a graph with a large volume of data can be long. This process can be interrupted using the Esc key on the keyboard.*

### 4.3 TIME HISTORY PLOT TOOLBAR

	Set plot parameters		Display first section of the file
	Set display parameters		Display previous section of the file
	Listen to the audio record corresponding to the cursor position		Display next section of the file
	Display Videos/Pictures corresponding to the cursor position		Display last section of the file
	Analysis of the audio record corresponding to the cursor position		Show / Hide Anomalies bar
	Display the spectrum corresponding to the cursor position		Show / Hide Audio bar
	Edit a comment between the cursors positions		Show / Hide Spectrum bar
	Identify a source (code) for the time portion between the cursors' positions		Show / Hide Comment bar
	Search the next occurrence of a source		Show / Hide parallel measurement bar (auxiliary data that varies with time)
	Select the source occurrence at the cursor position		Show / Hide Webcam bar
	Show / Hide the Source bar		Shows the weather data
	Zoom on the time history section between cursors		Link the 2 cursors together
	Plot section between cursors in another window		Search Max level on current view
			Search Max level on entire file
			Enables horizontal cursor
			Enables display of Vibration time signals (dropdown menu)
			Enables display of Acoustic time signals

These commands are also accessible by clicking on the time history with the right mouse button.

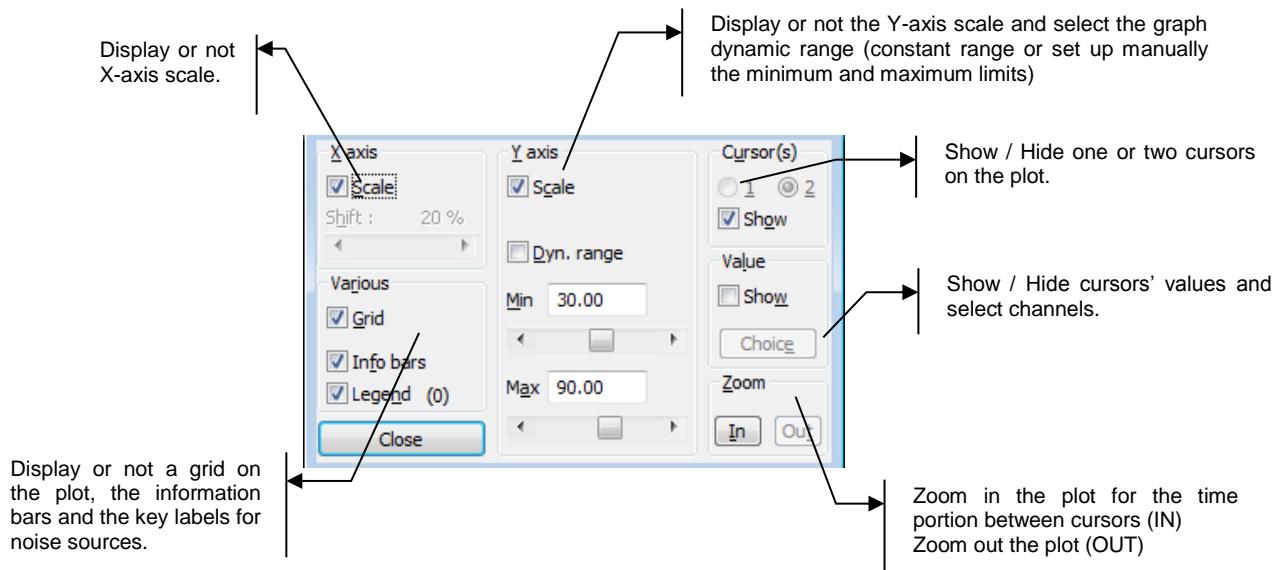
- The icon bar is automatically truncated when the screen size does not allow for its full display. A double arrow is then displayed at the right end of the icon bar, which allows accessing a menu listing the functions whose icons could not be shown (in this particular case, the selection of Vibration signals will be detached).



## 4.4 SET-UP GRAPHICAL DISPLAY PARAMETERS

Set-up the graphical display parameters by clicking on the icon .

The plot is updated immediately when a modification is made. Each plot has its own settings' dialog box: a modification on one plot does not affect the settings of another plot.



## 4.5 CURSORS AND DISPLAYS

Two cursors can be used to show the values on the time history. They can be displaced using the mouse, or the keyboard for a step-by-step displacement:

- Left and right arrows on the keyboard are used to move the active cursor.
- To change the active cursor using the keyboard, press the space bar.
- If you lose control of the cursor from the keyboard, click on the Time History graphic area to regain control.

The two cursors can be linked by clicking on  in the secondary toolbar.

In this mode, the left cursor will displace the right cursor, keeping the time difference between the two of them. This difference is adjusted by the right cursor.

- ❖ When several plots are open (in several windows), all cursors in all windows can be synchronized by activating icon **Linked cursors** in the **main toolbar** (i.e., the upper bar).
- ❖ In case of synchronization failure, move the cursor to the secondary window and then back to the first window.

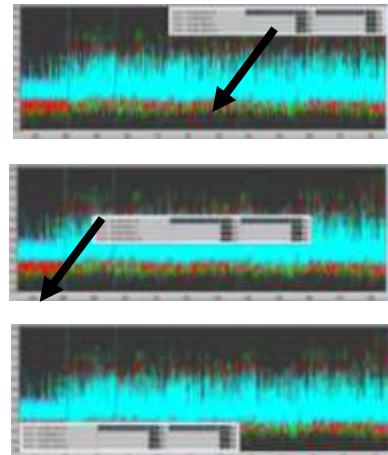
Cursor values are read in displays that appear right above the curves (up to 3 curves displayed: "linked" display mode) or over them (beyond 3 curves: "detached" display mode). In all cases, displays can be linked or unlinked by double-clicking on them.

Once they are unlinked (detached), the displays have the following properties:

- They can progressively be made transparent by acting on the mouse wheel.



- They can be manually or semi-manually displaced in the graph by double-clicking:
- Drag & drop the displays to place them anywhere.
- Click on the top right corner of the displays to place them on the top right corner of the graph.
- Click on the bottom right corner of the displays to place them on the bottom right corner of the graph.
- Click on the middle of the displays to place them in the middle of the graph.
- Click on the top left corner of the displays to place them on the top left corner of the graph.
- Click on the bottom left corner of the displays to place them on the bottom left corner of the graph.



- They can be resized using the mouse.
- They can be linked (re-attached) by double-clicking on their title bar.

One can get a horizontal cursor by clicking on icon . This cursor can be displaced using the mouse, or the keyboard for a step-by-step displacement with the up/down arrows. The cursor value corresponding to its position on the ordinate axis is displayed along with the cursor.

*The representation of a window or a graph automatically adjusts to the screen and/or window size. Displays in "linked" mode are then automatically hidden when the graph size is too small.*

## 4.6 ZOOM-IN BETWEEN CURSORS

The **Zoom-in between cursors** button, , is used to zoom in on a time history section. Disabling the button allows zooming out.

-  *Specific case: if an audio file is started while in zoom-in mode (by double-clicking on the audio bar...), the Zoom button is disabled. To zoom out, just zoom in again and zoom out.*
-  **IF THE USER ZOOMS IN, AND THEN RETURNS TO THE CONFIGURATION WINDOW: UPON EXIT OF THE CONFIGURATION WINDOW, ZOOM WILL BE RESET. HOWEVER, PREVIOUSLY DEFINED TIME SCHEDULES WILL BE RE-APPLIED.**

## 4.7 DISPLAY DATA BY TIME PORTIONS

It is possible to navigate from a time section of the data file to another by using the icons 

 or via right click **File start**; **Previous section** ; **Next section** ; **File end** if the time history plot display does not cover the complete duration of the datafile.

-  *If the complete file is displayed on the plot, the time portion icons cannot be accessed (greyed).*

**Example:** For a 24-hour measurement file (starting at 08:00am and ending at 08:00am the next day), the operator display a time history plot for the time portion starting at 16:00 and ending at 17:00:

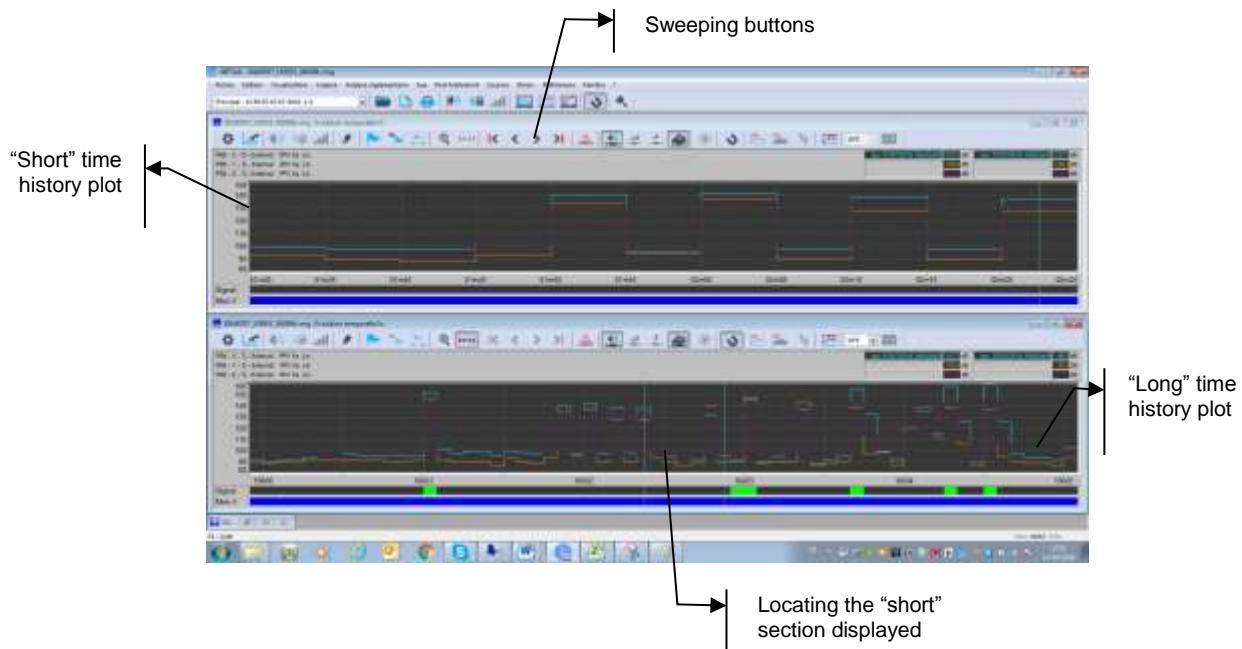
- Click on the icon  to display the next time portion of the plot 17:00 – 18:00, then
- Click on the icon  to display the last time portion of the plot 07:00 – 08:00, then
- Click on the icon  to display the previous time portion of the plot 06:00 – 07:00, then
- Click on the icon  to display the first time portion of the plot 08:00 – 09:00.

## 4.8 PLOT OF HISTORY BETWEEN CURSORS IN A SEPARATED VIEW

With function  **Plot of history between cursors in a separated view**, the time history between cursors can be displayed in another window.

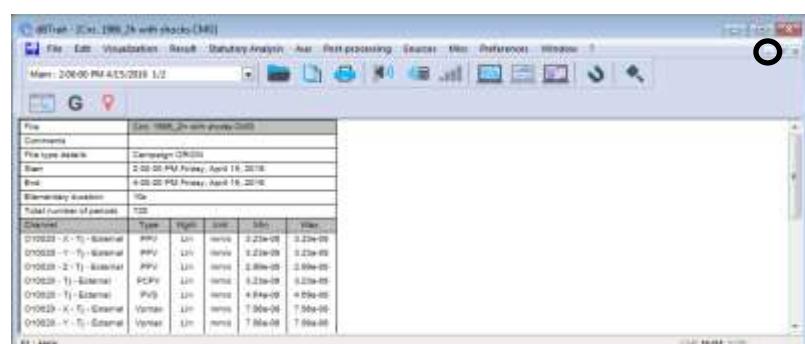
Thus, a “long” time history (e.g., 1 day) and a “short” time history (e.g., 5 minutes) can be displayed simultaneously and the “short” time history can be swept section by section from the “long” time history using the sweeping button.

The sections displayed on the “short” history are labelled on the “long” history by the position of the cursors, which move in a synchronous way between these two views.



### Procedure to follow:

- ❶ Minimize the main window
- ❷ Display a time history
- ❸ Enable function 
- ❹ Use buttons   from the “short” time history.



 With dB Trait 6.0, the following functions are automatically activated using function .



(main toolbar) **Link cursors between windows**

and  (secondary toolbar) **Linked cursors**.

## 4.9 DISPLAY INFORMATION BARS



With the icons or via **Right Click / Bars / ...**, it is possible to display or hide information bars of auxiliary data associated to the main data.

Also, the bar indicating the possible **Anomalies** (Overload, Under-load, Sensor Default, ...) (icon ) can be displayed.

*The information bars are only accessible if events occurred. If, for example, no Audio or Vibration signal was recorded at the time of acquisition, the Audio bar icon is greyed.*

## 4.10 EDIT AND DISPLAY COMMENTS

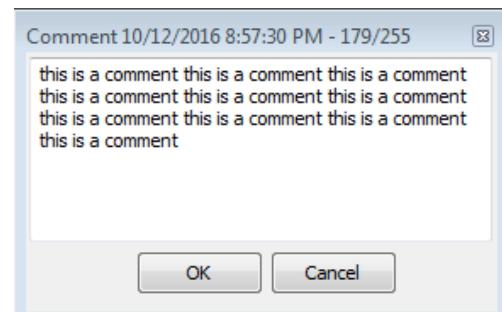
Comments added during a measurement through the Web interface of **DUO**, **FUSION**, **CUBE** or **ORION** can be viewed in the **Comm** bar if it is enabled (button ).

Furthermore, it is possible to insert comments in the time history plot with the icon (or via Right Click on the plot). The comments are dated (between cursors) and may be used for example to enrich information associated to the measurement.

The comments are used as a notepad and are stored within the datafile. This is useful when the user wishes to exploit again old measurement results, and if the hand notes made at the time are lost.

To edit an existing comment:

- Use the mouse to double click on a comment in the comment bar or use command **Aux / Comments / Display**.
- Type in your edits in the Comments dialog box.

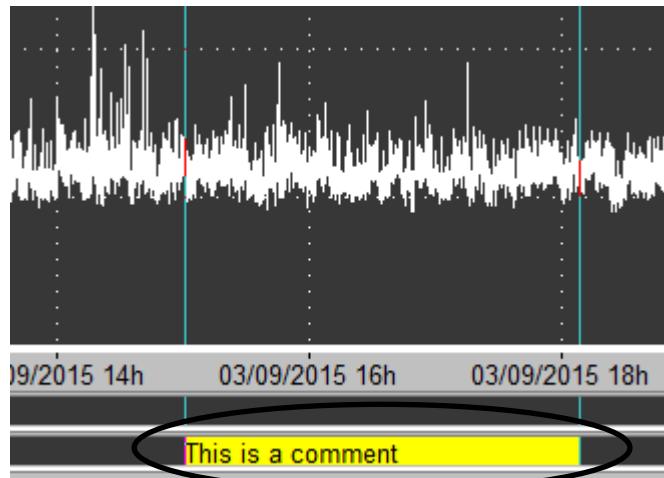


To insert a comment:

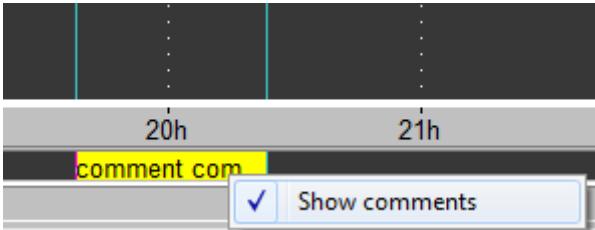
- Place both cursors of the plot on the considered time portion
- Click on the icon
- Input text in the comment dialog box

Display the comments on screen by double clicking on the event in the comment information bar or use the command **Aux / Comment**.

Comments are displayed directly in the **Comm** bar (see opposite).

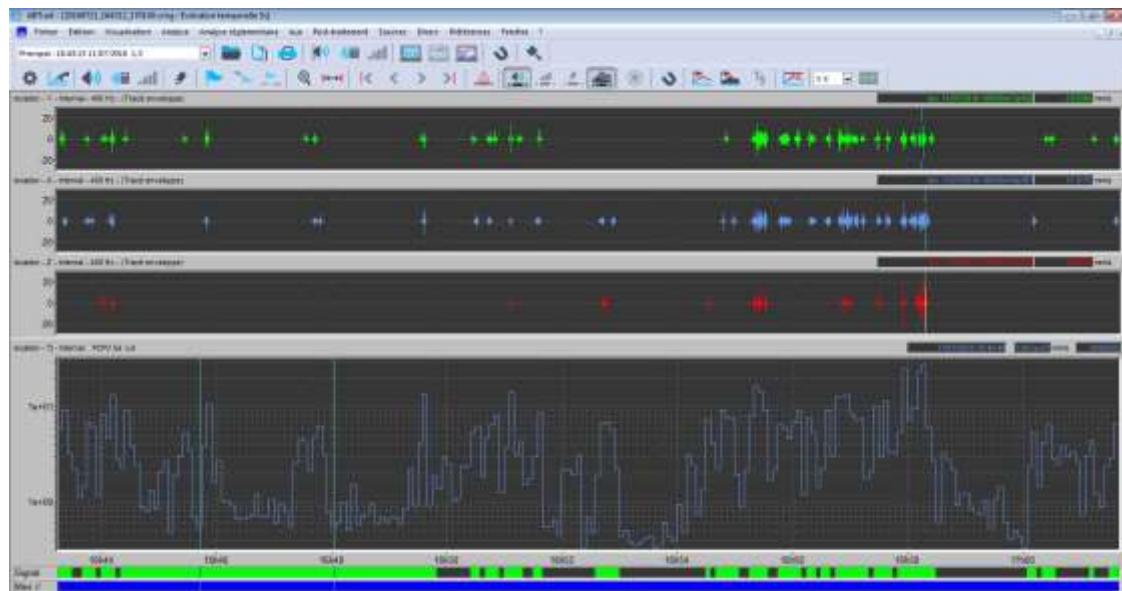


If you do not want the comments to be displayed in the **Comm** bar, right click on a comment to disable the **Display comments** option.



## 4.11 DISPLAY OF TIME SIGNALS

dB Trait 6.0 allows for the visual display of the **time signals** of a measurement session.



This feature is available depending on the indicators displayed on the Time History plot. If time signals are associated with the indicators on display, they can be viewed.

- █ *Time signals are associated with indicators if they belong to the same physical channel. See § 22.1.1 for more details on the concept of physical channel.*

### ▪ Activation of time signal display

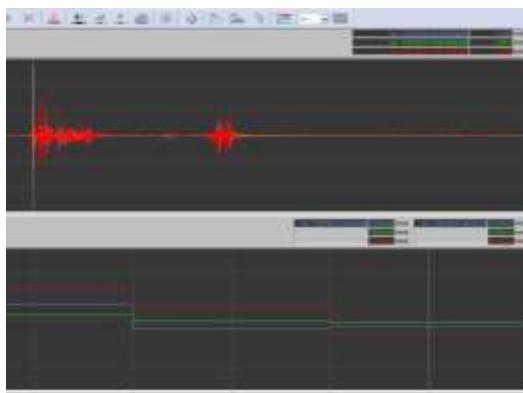
Using dedicating menus and icons in the secondary toolbar, one can display the time signals that may be present in the file section on display.

- **Drop-down menu** : display of vibration signals (acceleration or velocity)
- **Icon** : acoustic signal

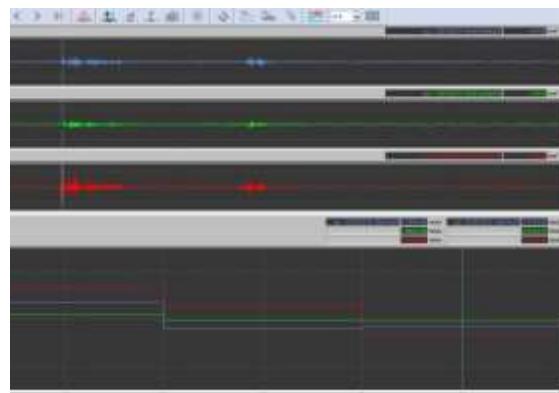
- █ *Noise and/or vibration signals can be displayed independently.*

### ▪ Display modes for Vibration time signals:

- **Compact mode** or : X,Y,Z vibration signals (acceleration or velocity) are superimposed..
- **Side-by-side mode** or : X,Y,Z vibration signals (acceleration or velocity) are displayed side by side (split).
- **No display of Vibration signals:**



*Example of acceleration signals in compact mode*

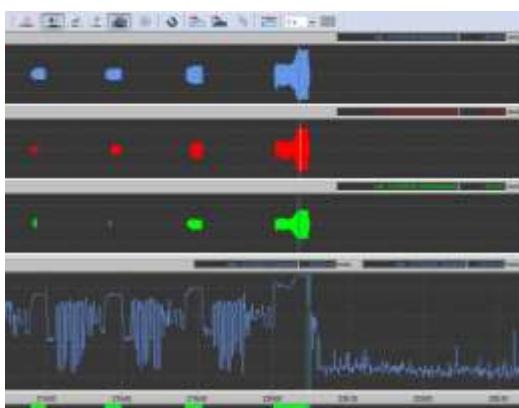


*Same example in side-by-side mode*

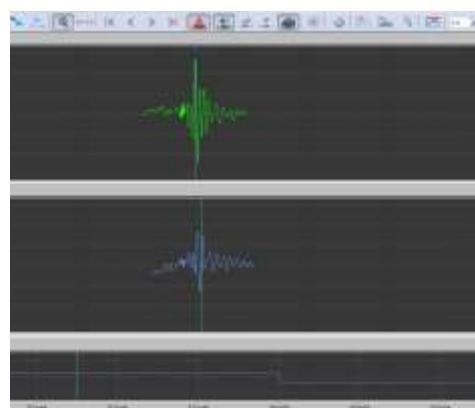
- ─ Recordings of time signals associated with several physical channels (e.g., originating from several measuring instruments, the measurement sessions of which have been merged) can be displayed.
- ─ Specific case of vibration measurements carried out with ORION: for PCPV and PVS indicators, three signals are linked to the (X,Y,Z) magnitude. See example below.

#### ▪ Plot in Envelope plot or True plot

Time signal plots are displayed in **True plot** mode if the number of samples to display (per channel) is lower than 4,000. Beyond this limit, plots are displayed as **Envelope plots**. The Envelope plot does not represent all the samples of the time signal, but shows their envelope. The plot automatically adjusts between these two modes.



*Example of a plot in Envelope plot*



*Example of a True plot*

#### ▪ Scales

The time signal graphs have their own ordinate scales (automatic scales).

- For Vibration signals, scales are the same for all axes (for comparison purposes), including when different transducer triplets are displayed (e.g., internal transducer/external transducer originating from the same ORION instrument, or data originating from two different ORION instruments).
- For Acoustic signals, scales are specific to each graph.

The x-axis (time scale) is similar to that of the Time history plot.

#### ▪ Cursors

A cursor is available for each time signal graph. By default, it is placed on the peak values of the signal section on display. Like the time history cursors, this cursor can be displaced using the mouse, or the keyboard for a step-by-step displacement:

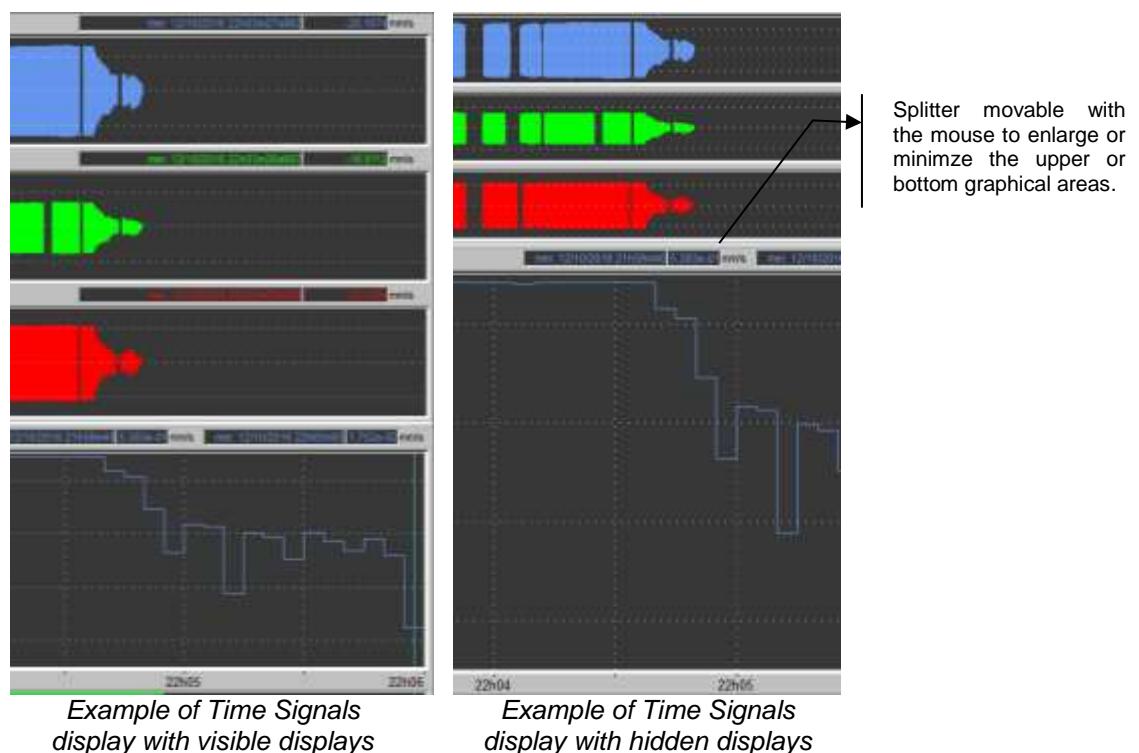
- Left and right arrows of the keyboard are used to move the cursor.
- If the cursor control is lost from the keyboard, click on the Time signal graphical area to regain control.

The cursors of all time signal graphs are independent one from another.

#### ▪ Splitter: enlarge or minimize graphical areas

The area devoted to signal display can be enlarged or minimized using a “splitter” that can be slid with the mouse.

Time signal displays are automatically hidden when the graph size is too small.



- Colour scheme

Time signals are represented using the following colour scheme:

- Vibration signals: colours for **Signal 1** to **Signal 6**

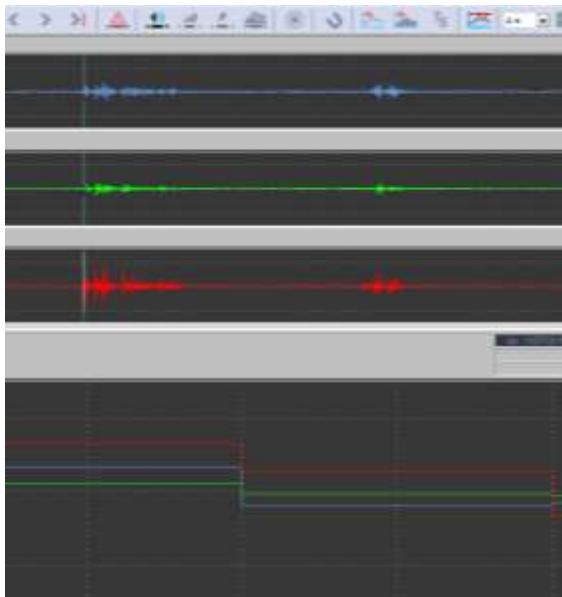
<i>Example with ORION :</i>	
Colour for Signal 1 ( <b>Blue</b> by default)	X - Internal
Colour for Signal 2 ( <b>Light green</b> by default)	Y – Internal
Colour for Signal 3 ( <b>Red</b> by default)	Z – Internal
Colour for Signal 4 ( <b>Cyan</b> by default)	X - External
Colour for Signal 5 ( <b>Orange</b> by default)	Y – External
Colour for Signal 6 ( <b>Purple</b> by default)	Z – External

- Acoustic signals: the colour depends on the number of the physical channel
  - DUO, FUSION, CUBE: channel 0, **Signal 1** (**Blue** by default)
  - ORION: channel 6, **Signal 7** (**Dark green** by default)

For more details on colour customization, see §19.4.

- **Enlargement of a time signal graph**

A time signal graph can be enlarged (full screen) by double-clicking on it.



*Example of a normal plot*



*Example of a plot with a full-screen time signal*

- “Time signals” graphs are automatically inserted if data come from an Orion station (and, of course, if measurements include time signal recordings): in this case, “Velocity signals for DF calc.” signals are automatically displayed in mode V = (X,Y,Z axes).
- Specific case: velocity signals originating from an ORION device fitted with an external transducer like a velocimeter or a geophone. In this case, 2 types of velocity signals may exist in the measurement session: signal with a sampling frequency of 3,200 Hz and signals with a sampling frequency of 400 Hz = “Velocity signals for DF calc.”. In the specific case, dBTrait favors the display of the signals with the higher sampling frequency.
- Specific case: vibration time signals recorded with dBTrig cannot be viewed.
- If the velocity signal is not available over the complete duration of the measurement session, the drop-down menu for the Vibration signal plot may be available, but not effective.
- In the case of ORION data, the order for displaying the signals from the 3 axes does not always follow the (X,Y,Z) order. However, the dedicated colours are always followed.

## 4.12 PLAYBACK AN AUDIO RECORD / AUX. MENU

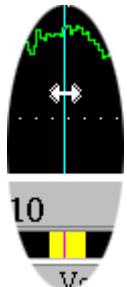
When audio signals (or, in a more general way, recordings of time signals) have been recorded at the time of acquisition, it is possible to play them back through the computer sound system. Audio replay can be achieved in various ways:

Directly from the time history plot display.



To do so, display the audio bar by clicking on the icon . It is then displayed below the plot. Double click with the mouse on an audio event. The audio record is then replayed through the sound system of the computer.

Directly from the time history plot display, with a cursor



To do so, display the audio bar by clicking on the icon . It is then displayed below the plot. Move the cursor on the audio event to playback as shown.

Click on the icon or **Right Click / Replay**. The audio record is then replayed through the sound system of the computer (multimedia sound card).

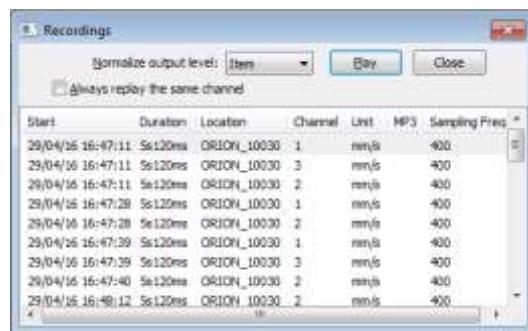
- If the active cursor is not placed on an audio event, the replay button cannot be accessed.
- If audio recordings are available for several physical channels, audio replay « between cursors » is not possible all the times (in certain case, the audio may be played back from its beginning, and not from the cursor position).

### From the Aux. menu of dB Trait.

Audio records can also be played back as soon as a CMG datafile has been open.



To do so, click on the icon or use the command **Aux. / Audio / Replay**. If more than one audio files have been recorded, a dialog box is displayed (see below) that allows the user to choose which audio records should be played back. After selecting the audio signal in the list, click on **Play** to listen to it on the computer sound system (multimedia sound card).



- The listening of an audio file can be stopped by clicking on the Stop button or by pressing the Escape key on the keyboard.

The **Normalize output level** option is used to optimize the listening level (through “gain optimization”). Several choices are available:

- **Item:** standardization applied to the signal recording to be played back.  
The standardization of the playback level is independent from one recording to the other (this choice corresponds to the existing option in versions dB Trait 5.3 / 5.4).
- **Channel:** standardization over all signals of the same physical channel, for the entire measurement session.  
The standardization of the playback level is applied in the same way to all the recordings of a physical channel. This allows for “relative” comparative listening.
- **No:** playback of an audio recording with no optimization of the playback level.

The **Always replay the same channel** option is useful when several physical channels are present in the measurement session. This option allows defining the playback channel by double-clicking on the Audio bar.

When this option is selected, the playback channel is memorized as soon as the playback is launched.

- ❖ *Specific case: the **Always replay the same channel** option is not available for cases where signals are not fully synchronous (same start date, same duration).*
- ❖ *The cursor of a time history plot is synchronised with the playback of an audio recording over the part of the audio file visible on screen:*
  - If a spectrum view is associated, the spectrum changes simultaneously.
  - If cursors are synchronised for all views, they all move at the same time.
- ❖ *Specific case: when the magnifier mode (zoom) is active, the replay cursor for an audio recording is desynchronized if the complete audio file is played back through the Audio button of the main icon bar (or through the **Aux / Audio** menu).*

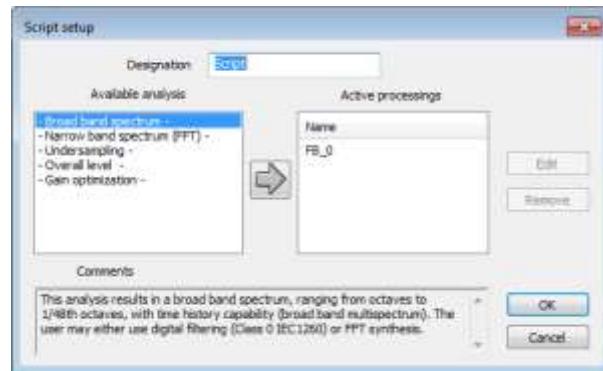
## 4.13 POST-PROCESSING OF A TIME SIGNAL RECORDING

The user may analyse audio or vibration records in both time and frequency domains, according to user defined parameters, directly from a time history plot.

### 4.13.1 Analysis configuration

Use the command **Post-processing / Configure - signal processing** to define the parameters of the time signals recordings analyses. The script configuration dialog box is displayed on screen.

You can also directly use the icon  Then **Configure** button.



 The configuration and operating process of time signals records analyses are dealt with in **CHAPTER 14**.

### 4.13.2 Run analyses

Time signals records analyses can be run in dBTrait by different means:

- Directly from the time history plot display, with a cursor

To do so, display the audio bar by clicking on the icon  . It is then displayed below the plot. Move the cursor on the audio event to analyse as shown.

Click on the icon .

Signals can then be analyzed... See **CHAPTER 14** for more details.



 When several physical channels are present, the window **Recordings to process** opens and allows for selecting which channels to process.

 If the active cursor is not placed on a audio event, the processing button cannot be accessed.

When a fine analysis has been processed, an event corresponding to the type of analysis is created in the corresponding information bar.

If, for example, audio records' analyses result in a third octave averaged spectrum and a third octave **multispectrum**, the corresponding events are shown in the information bars, below the audio event that was analysed.



When an **analysis "at IT timebase"** is processed, it will be then available among the data of the main data flow.

- From the Post-processing menu of dB Trait.

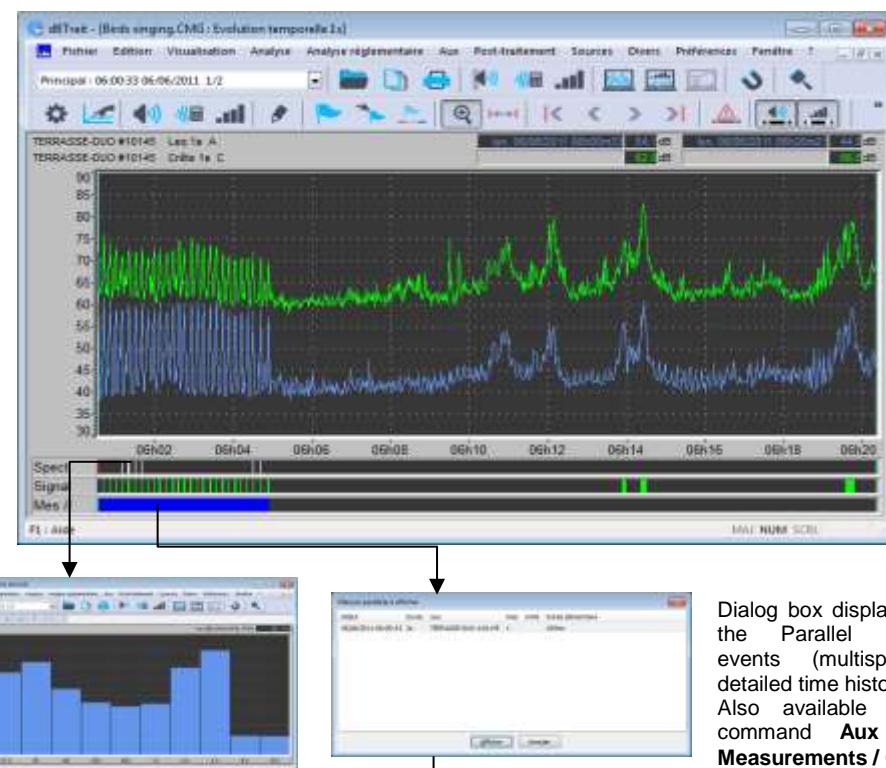
Time signals can also be processed as follows:

Click on the icon  in the main dB Trait toolbar or use the command **Post-processing / Execute – signal processing...**

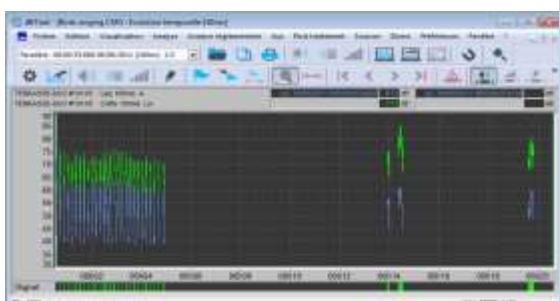
 *The configuration and operating process of time signals records analyses are dealt with in CHAPTER 14.*

### 4.13.3 Display time signals analysis results

The results of the time signal records' analyses can be directly accessed, for most of them, on the time history plot by a double click on the corresponding event. These results are otherwise accessible through the commands of the **Aux.** menu.



A double click on a **Spectrum** event displays an averaged spectrum in 1/N octave bands.



Display of a detailed time history



Display of a time history per frequency band (multispectrum)

In a general way, the display of auxiliary events is accessible as follows:

- **Fine analyses:**
  - Through the command **Aux / Parallel Measurements**.
  - or by switching from the main data stream to the parallel data stream (selector in the general toolbar)
- **Averaged spectra:**
  - Through the command **Aux / Spectra**
  - or using the Spec. bar
- **Averaged analyses** (spectra and overall levels):
  - By the Global items view (see CHAPTER 15)

 For the particular case of averaged FFT spectra: following the computation, the spectrum is not listed in the list of spectra in Aux / Spectra (only listed in the Global items view)

## 4.14 CODING A NUISANCE SOURCE

It is possible to identify nuisance events by coding data on the time history plot by using the

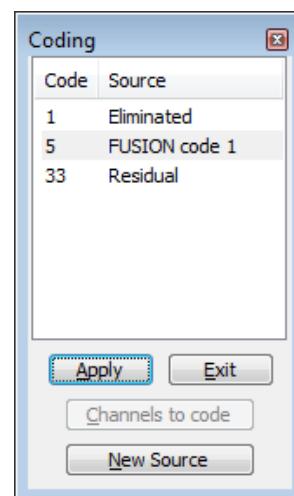
command  or Right Click / Source between cursors.

To do so, click on the icon . The dialog box shown aside appears on screen. There are two possibilities:

- **The noise data / vibration data to code corresponds to an existing source, already defined in the software.**

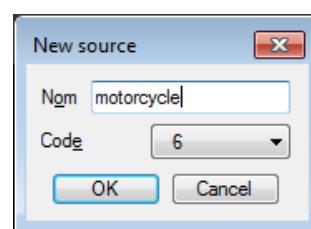
Place the cursors on a time portion of the plot then select in the **source** list a given source type and press the **Apply** button. The data in between the cursors on the time history plot is then coded.

Proceed similarly to code other noise sources.



- **The noise data to code corresponds to a new nuisance source, not yet defined in the software.**

Click on the **New source** button. The dialog box shown opposite appears on-screen. Give a **name** and a **code** number to the new source and validate (**OK**).

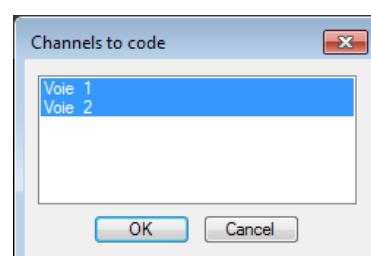


Then place the cursors on a time portion of the plot then select in the **source** list a given source type and press the **Apply** button. The data in between the cursors on the time history plot is then coded.

 The code with the lowest number has priority to the others. Select a lower number, in order to code a source "over" the existing source (the code column shows the existing codes).

Noise source coding can be applied to one or several measurement channels.

Click on the **Channel(s) to code** button. The dialog box shown opposite appears on-screen. Select the appropriate channels and validate (**OK**).



Once the source coding between cursors is completed, click on the **Exit** button in the main dialog box.



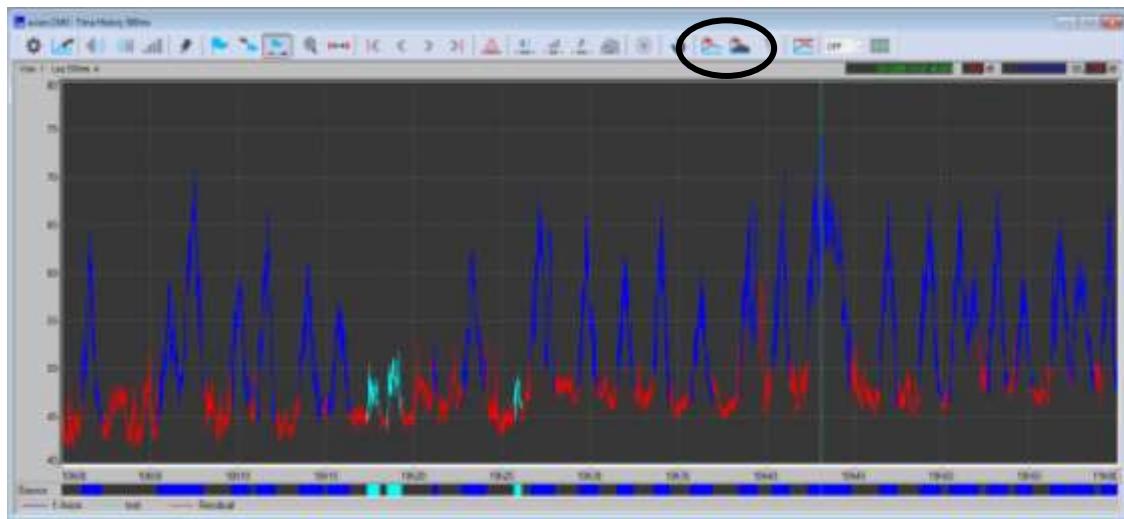
The command  or **Right Click / Next appearance** can be used to find the next appearance of the same type of source on the time history plot. Two possibilities may occur:

- If a cursor is located on an existing source (nuisance event), **dBTrait** then place the 2 cursors at the start and end of the next appearance of the source.
- If the cursor is not located on a nuisance event, a dialog box is displayed for the operator to choose which type of noise source should be searched for.



*More information on coding noise events in dBTrait can be found in **CHAPTER 9***

## 4.15 SEARCH FOR MAX LEVEL



The Max level can be searched for the measured quantity displayed in the time history plot:

- **Max search on the display area** 

Search rules are as follows:

- Max search is performed on the type of magnitude displayed in the time history plot (**icon is disabled if two indicators are displayed**)
- Search for the maximum value(s) (0.1 dB tolerance)
- Circular displacement on all values. Search is always carried out starting from the left cursor (which may eventually become the right cursor)
- In case of a spectrum view, spectrum at the cursor will be displayed.

- **Max search on the entire file** 

The same rules apply, except that the display will automatically move to the max area.

-  *Max calculation can only be performed on a **basic period view**. If a recomposed Leq is displayed, then Max search buttons will be disabled (to change the display time basis, see § 4.1).*

# CHAPTER 5

## TIME HISTORY DIFFERENCE

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On the same site, measuring with several synchronized measuring instruments allows the use of an additional function in **dBTrait**: "time history difference".

This graph represents the time history of differences between the levels on the two channels, as a function of time. This function allows the disturbance nuisance sources to be characterized more accurately.

Just like time history, the "time history difference" graph can display the identified nuisance sources. The sources will be traced in a specific color to clearly distinguish them from the rest of the data.

The proper use of this function requires the use of at least two time-synchronized instruments. An instrument such as **DUO**, **FUSION** or **CUBE** facilitates this synchronization via the use of the integrated GPS chip.

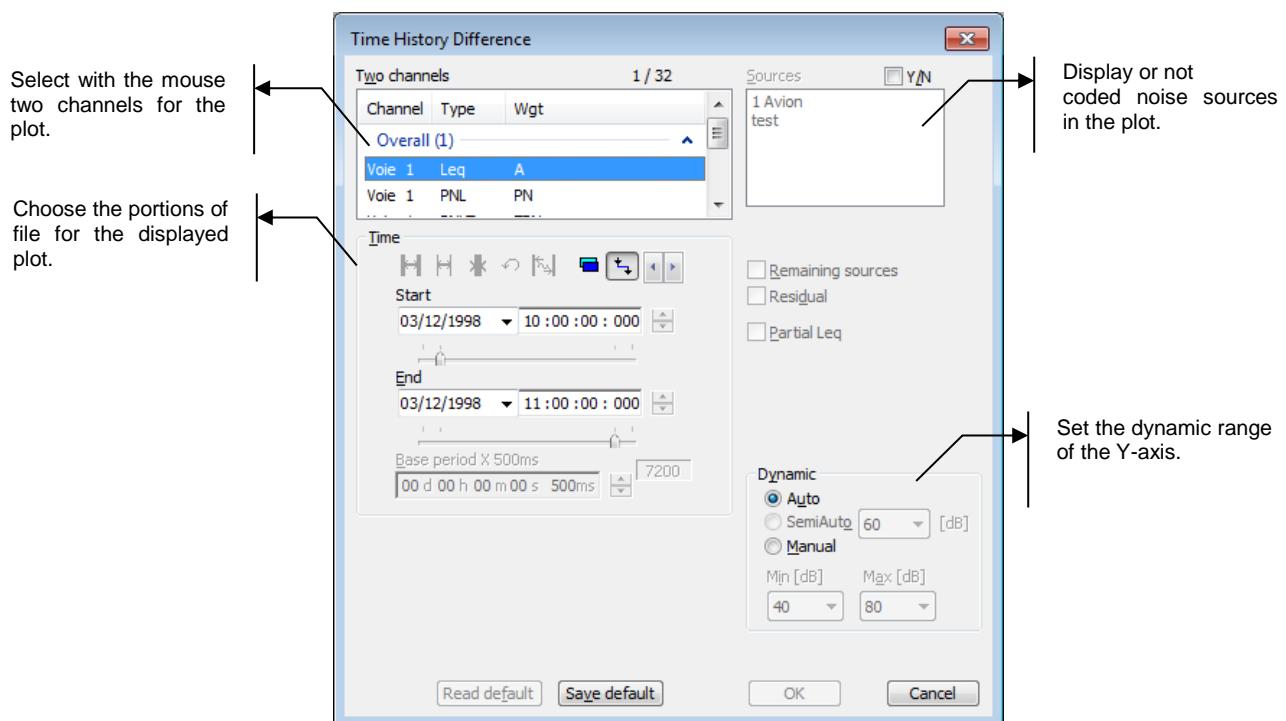
The time history graph is in general preceded by a concatenation of measurement campaigns gathered through two instruments. See **section 3.2** for further details on concatenation.



*This function is not relevant for some types of quantities (e.g. VDV x,y,z), for which it is rendered inoperative.*

## 5.1 CONFIGURATION PARAMETERS OF THE PLOT

Once a measurement datafile is open, use the command **Visualization / Time History difference** to plot the time history of the level differences between any quantities present in the CMG datafile. The following dialog box is displayed on screen. Define the parameters of the plot. On validation of this dialog box, the time history difference plot will be displayed in a new window.



To facilitate channel selection, right clicking in the list toggles the display to extended mode. Right click again to switch back to the normal display mode.

The following parameters may be defined:

- **Two Channels**

Two channels are needed to obtain a time history difference graph. The calculation is performed in the **order of appearance in the list**:

Channel 1 – Channel 2

Known limitation: the sorting of the channel list does not allow moving channel 2 before channel 1.

- **Timetable**

Specify the beginning and ending time of the file section to plot (the format of this selection is **hh:mm:ss:ms dd/mm/yy**) or the beginning time and the length of the section to take into account.

Icons are used to, respectively:

- Select the **entire file** (i.e., data over the total length of the file)
- Select the **entire channel** (i.e., data over the total time length of the channel)

- Select data **between cursors** placed on the plot
- Go back to **original times**
- **Round up times** (rounding calculation depends on the total duration of display)
- Select whether to display **ending time or duration**
- **Link** starting and ending cursors.

**▪ Base plot step**

The base plot step is not accessible because the time history difference can only be plotted with the elementary integration period.

**▪ Sources / Remaining sources / Not coded**

Select in a list the nuisance sources to consider (or not) for the plot. If one wishes to display sources (box **Y/N** ticked) on the plot, they will be shown in different colours in order to differentiate them from the rest of the data.

The option **Remaining sources** allows the user to plot all sources that have not been selected, except the background noise, as a single source named "Other sources". This option may be useful to estimate the contribution of a source compared to all the other sources, for instance. The selection will be recalled as default value next time such a command is used.

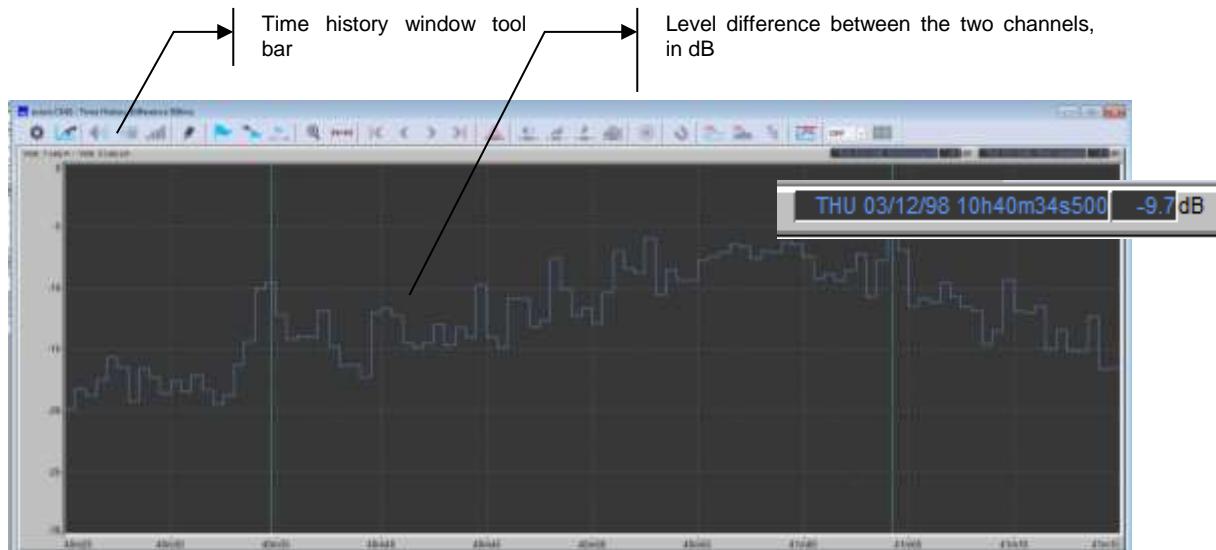
*This option is not active when no source is identified or when all the sources have been selected in the list.*

The option **Residual** (background noise) allows the user to represent all the data in the file that have not been coded as a specific source called "background". The selection will be recalled as default value next time such a command is used.

**▪ Dynamic range**

Select the minimum and maximum values of the Y-axis in dB for the plot. On validation, these parameters will be applied to the plot. To automatically adjust these values, tick the box **Auto**.

## 5.2 TIME HISTORY DIFFERENCE PLOT DISPLAY



*Only noise sources codes of the first channel are displayed!*

### 5.3 TIME HISTORY PLOT TOOLBAR

	Set plot parameters		Display first section of the file
	Set display parameters		Display previous section of the file
	Listen to the audio record corresponding to the cursor position		Display next section of the file
	Display Videos/Pictures corresponding to the cursor position		Display last section of the file
	Analysis of the audio record corresponding to the cursor position		Show / Hide Anomalies bar
	Display the spectrum corresponding to the cursor position		Show / Hide Audio bar
	Edit a comment between the cursors positions		Show / Hide Spectrum bar
	Identify a noise source (code) for the time portion between the cursors' positions		Show / Hide Comment bar
	Search the next occurrence of a noise source		Show / Hide Parallel measurement bar (auxiliary data that varies with time)
	Select the source occurrence at the cursor position		Show / Hide Webcam bar
	Show / Hide Sources bar		Shows the weather data
	Zoom on the time history section between cursors		Link the 2 cursors together
	Plot section between cursors in another window		Search Max level on current view
			Search Max level on entire file
			Enables horizontal cursor
			Enables display of Vibration time signals (drop-down menu)
			Enables display of Acoustic time signals

These commands are also accessible by clicking on the time history with the right mouse button.

## 5.4 FUNCTIONS COMMON TO THE TIME HISTORY PLOT

Many functions of the **Time History Difference** are common to the **Time History**. Refer to sub-sections of **CHAPTER 4** for a detailed description of the following functions:

- **Set-up of graphical and display parameters**

See principles described in §4.4.

- **Cursors and Displays**

See principles described in § 4.5.

- **Zoom-in between cursors**

See principles described in § 4.6.

- **Display noise data by time portions**

See principles described in § 4.7.

- **Plot of history between cursors in a separated view**

See principles described in § 4.8.

- **Display of information bars**

See principles described in § 4.9.

- **Edit and display comments**

See principles described in § 4.10.

- **Display of time signals**

See principles described in § 4.11.

- **Playback an audio record / Aux. menu**

See principles described in § 4.12.

- **Post-processing of a time signal recording**

See principles described in § 4.13.

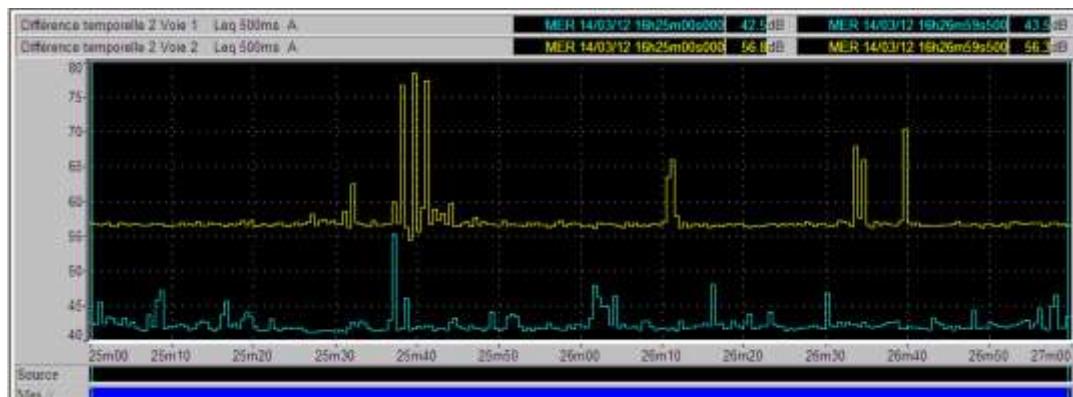
- **Coding of a noise source**

See principles described in § 4.14.

## 5.5 EXAMPLE

In the case of a complaint due to noisy neighbors, two measurements were performed:

- Channel 1: at the plaintiff's
- Channel 2: adjacent to the incriminated source



*Time history of the two channels*

The use of time history difference will allow the discrimination of unwanted noise so as not to be taken into account in the analysis in relation to the neighbor-generated noise.



The above graph represents the time history difference between the overall levels for each elementary period:

### L<sub>Aeq</sub>(t) Channel 1 – L<sub>Aeq</sub>(t) Channel 2

The time history difference values are **relative**; they can be positive or negative. Visualization in the form of **vectors** allows a better mental representation of the case.

The average value of time history difference is about -15 dB, which means that the noise level is on average higher than at measurement point 2. In effect, measurement point 1 is farther from the disturbance source.

The **fluctuations around this average** allow the **discrimination of the unwanted sources**:

- If a peak is above this average:
- The noise level is higher at point 1
- This noise has not been generated by a disturbance source but an unwanted noise source
- **This part of the measurement must therefore be eliminated so that it is not taken into account**

The elimination of unwanted noise can be automated via the function **Coding on the threshold difference**. See § 9.3.5 for further information.

# CHAPTER 6

## SPECTRAL TIME HISTORY PLOT (MULTISPECTRUM)

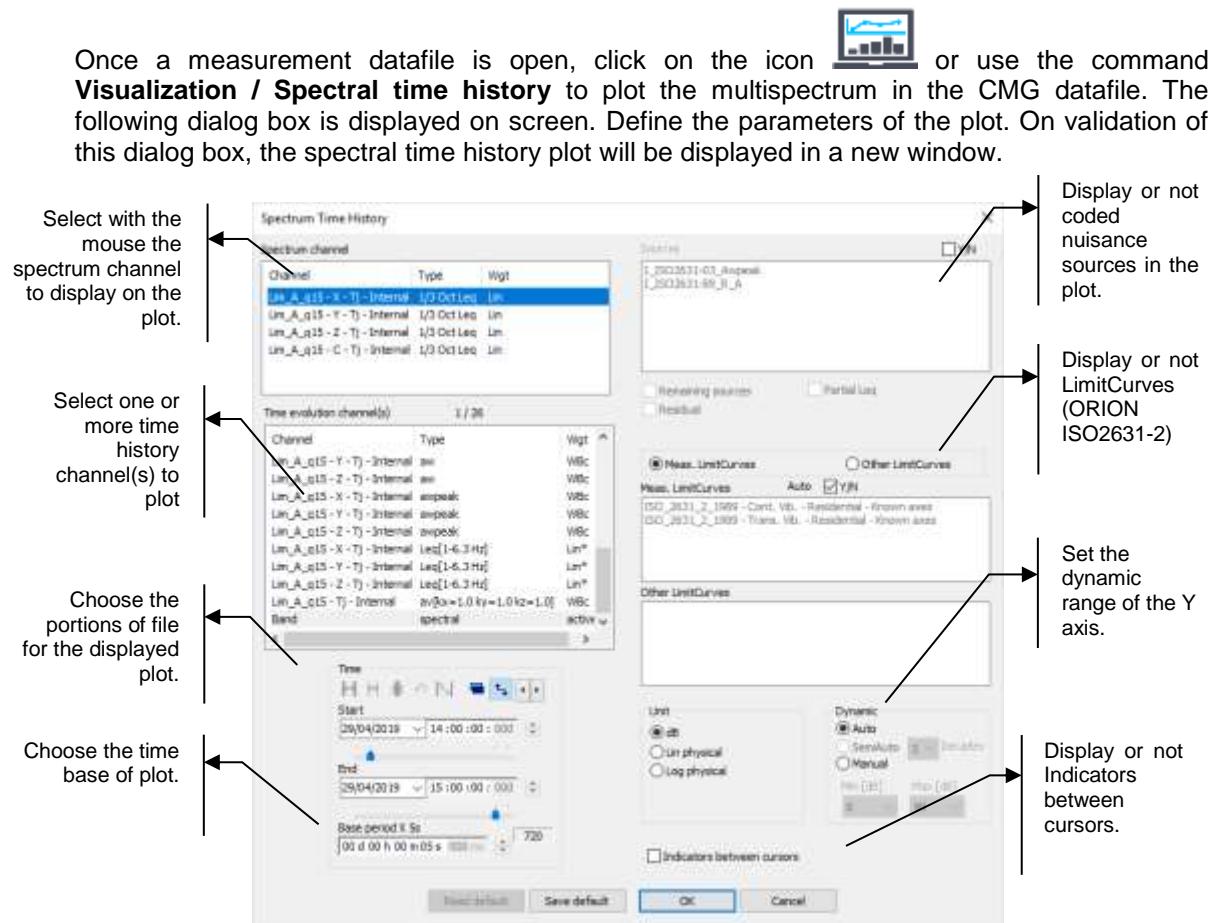
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The spectral time history plot is one of the main plots available in **dBTrait**. It shows the history of the spectrum in **1/n octaves** or in **narrow bands (FFT)** versus time, as an instantaneous spectrum or a sonogram. The spectrum representation is associated with the time history of the other data, to which the time history of a specific frequency band can be added. This type of plot allows for a “climate view”, as well as a detailed analysis of any noise or vibration environment, from a **frequency standpoint**.

The spectral time history plot may or may not display existing events. In this case, the nuisance sources will be displayed with different colours on the plot.

The **multispectrum** plot also allows for direct playback of the signals, calculation of average, minimum and maximum spectra between cursors, application of A, B or C or vibration weightings directly on the spectrum plot, display of one or several overall levels calculated from the spectrum (Lin, weighted, between cursors, in a predefined band), as well as capture of comments.

## 6.1 CONFIGURATION PARAMETERS OF THE PLOT



Right clicking on a selection zone enlarges it (for instance: right click on the Channels selection zone). To recover the standard display, right click again.

The following parameters may be defined:

### ▪ Spectral channel

Select a spectral channel to plot, among the available channels corresponding to **multispectrum** type data.

### ▪ Time history channel(s)

Select time channel(s) to plot. Together with measurement channels, the user can also display the time history plot of the current band. It is used to compare the time history for a frequency band (selected on the spectrum history) with the global time history.

There is the possibility to draw 6 time histories simultaneously (or 5, if the current band has been chosen). To select several channels, use the Ctrl or Shift keys on the keyboard.

### ▪ Timetable

Specify the beginning and ending time of the file section to plot (the format of this selection is **dd/mm/yy hh:mm:ss:ms**) or the beginning time and the length of the section to take into account.

Icons

are used to, respectively:

- Select the **entire file** (i.e., data over the total length of the file)

-  Select the **entire channel** (i.e., data over the total time length of the channel)
-  Select data **between cursors** placed on the plot
-  Go back to original times
-  **Round up times** (rounding calculation depends on the total duration of display)
-  Select whether to display **ending time or duration**
-  **Link** starting and ending cursors.

▪ **Base plot step (base period)**

The plot may be displayed using the default time base of the measured quantities in the datafile or a greater time base. The base period is the time period over which the indicators will be displayed (possibly recalculated if the base period is not the elementary timebase)

During acquisition, an elementary time base has been used to store the data (usually 125ms or 1s in Acoustics or Human Body vibrations). It is possible to recalculate/display noise or vibration levels according to a greater time base (for example 15-min) that is a multiple of the main elementary timebase. **dB Trait** adjusts automatically the base plot step (base period) to the nearest value that matches an elementary time base multiple.

Similarly, it is not possible to recalculate/display noise/vibration indicators according to a step that is smaller than the main elementary timebase.

▪ **Sources / Remaining sources / Residual (Not coded)**

Select in a list the nuisance sources to consider (or not) for the plot. If one wishes to display nuisance sources (box **Y/N** ticked) on the plot, they will be shown in different colours in order to differentiate them from the rest of the data.

If several sources are referenced, use the mouse to select the sources to display.

The option **Remaining sources** allows the user to plot all sources that have not been selected, except the Residual, as a single source named "Other sources". This option may be useful to estimate the contribution of a source compared to all the other sources, for instance. The selection will be recalled as default value next time such a command is used.

 *This option is not active when no source is identified or when all the sources have been selected in the list.*

The option **Residual** allows the user to represent all the data in the file that have not been coded as a specific source. Any data not being linked to a source is considered as being part of the "Residual level". The selection will be recalled as default value next time such a command is used.

▪ **New in dB Trait 6.2: Meas. LimitCurves / Other LimitCurves**

Select the templates (LimitCurves) to display (**ORION ISO2631-2 measurements**). By default, the Meas. LimitCurves option is selected, and all relevant Limit Curves set on ORION for the measurement will be automatically displayed (they are stored in the measurement session). To

display only one portion of the templates set for the measurement, untick box   and manually select the Meas. LimitCurves to display.

 *In case standardized Limit Curves modified during the measurement set-up are displayed, the word "(modified)" is added to the Limit Curve name.*

To display Limit Curves other than those set for the measurement, select option **Other LimitCurves**. The available user-defined Limit Curves can then be selected (to be defined in the file **ToleranceCurves\_Spectra.xml** available in <C:\ProgramData\01dB\dB Trait>).

- **Plot active frequency band**

Select this option to automatically plot the time history of the frequency band selected with the cursor on the spectrum plot. If this option is not ticked, the plotted time history will not be adjusted when a different frequency band is selected on the plot.

- **Graphic scales: Units and Dynamic options**

Select the units and the type of dynamic range (Auto, SemiAuto, Manual) for the scale of the ordinate axis of the plot. After validation, these settings will be applied to the plot. For automatic adjustment of the values of the ordinate axis, tick box **Auto**.

The following combinations can be selected:

dB unit	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> <li>▪ Manual dynamic range: Min and Max settings available</li> </ul>
Lin Physical Units	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> </ul>
Log Physical Units	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> <li>▪ SemiAuto dynamic range: <ul style="list-style-type: none"> <li>○ Max level set automatically,</li> <li>○ and dynamic range set with drop-down menu: from 2 to 6 decades</li> <li>○ The Min levels automatically depend on the dynamic settings.</li> </ul> </li> <li>▪ Manual: Min and Max settings available.</li> </ul>

- ❖ By toggling between “dB” and “Physiques Lin” or “Physical Log”, Min and Max settings revert to default values.
- ❖ The scales settings (dB, Lin, Log) apply to the time history plot (lower graph) as well as to the spectrum plot (upper graph). On the other hand, the dynamic settings apply to the time history only. To refine the dynamic for the spectrum, see § 6.6.

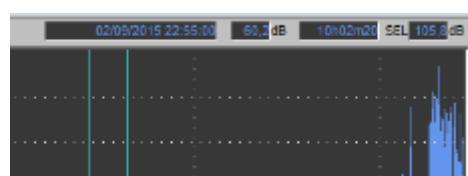
- **Indicators between cursors**

This option allows the user to calculate the equivalent sound pressure level corresponding to the time portion in between the cursors of the time history plot. This value is displayed on the time history plot.

If this value is not checked, the dB value of the acoustic magnitude is given for each cursor position on the time history plot.

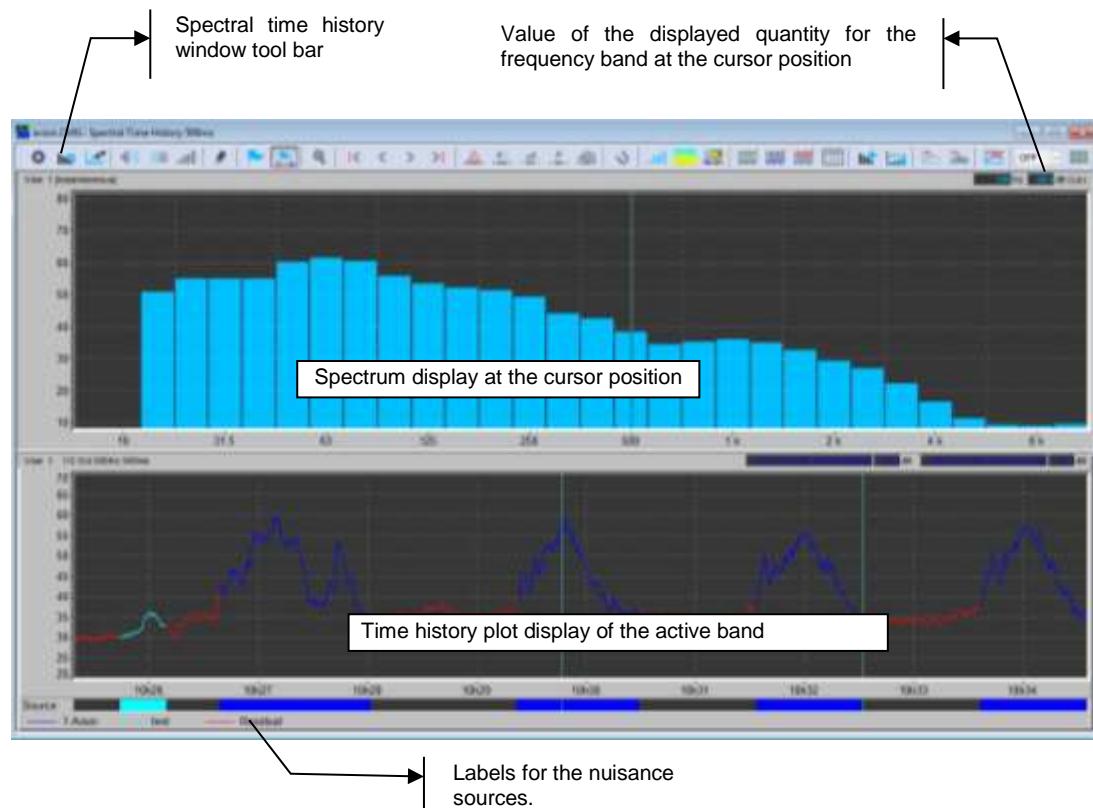
If this value is checked, the following default parameters will be displayed:

- Date for left cursor
- Average level between cursors for Leq data type
- Maximum level between cursors for Peak data type
- Time length between cursors
- SEL value between cursors (SEL calculated over the entire section between cursors does not take Max – 10 into account).



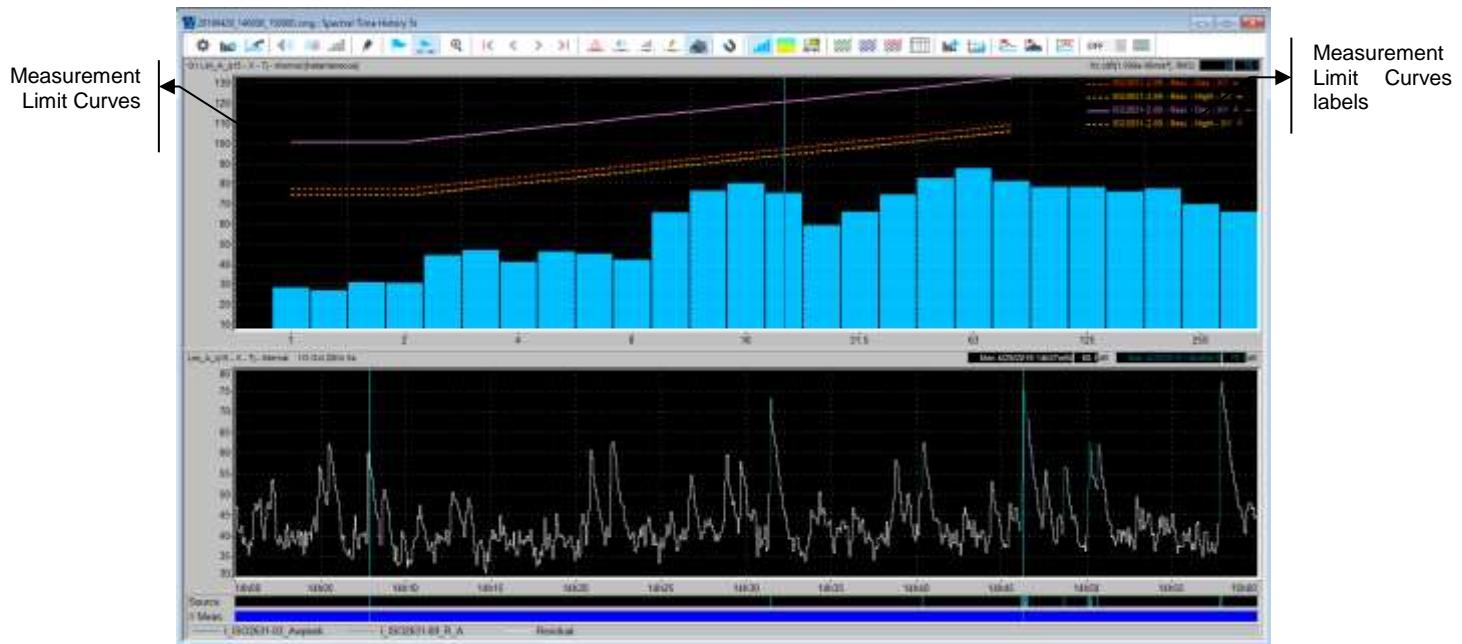
- ❖ The SEL value is computed only for certain types of compatible data.
- ❖ To display the date for the 2nd cursor, one needs to modify the dB Trait.ini file and set ShowDuration to 0 in the [Settings] section.

## 6.2 SPECTRAL TIME HISTORY PLOT DISPLAY



The spectral time history plot window features a tool bar that gives access to functions such as coding a nuisance source between cursors, choosing the spectrum mode between instantaneous, spectrogram, and averaged / minimum / maximum between cursors, display of associated time signals, etc.

**New in dB Trait 6.2:** case of spectrum displayed with Limit Curves  
**(ORION ISO 2631-2 measurements):**



#### ▪ Limit Curves

The Limit Curves selected in the set-up of the plot are displayed, with their name at the upper right corner. A symbol indicates whether this is a Limit Curve for continuous vibrations (symbol  $=$ ) or transient vibrations (symbol  $\perp$ ).

In the case of "modified" standardized Limit Curve, the name includes the word "modified".

— ISO2631-2.89 - Crit. - XY = —  
- - - ISO2631-2.89 - Crit. - XY (modified) - - -

A colour is automatically assigned to each Limit Curve. This colour can be modified (see Detailed description in § 19.4)

#### ▪ Notification of the applicable Limit Curve

In ORION different Limit Curves apply to the cases of "transient" and "continuous" signals, as well as to Day and Night periods. And the automatic detection of the type of signal results in an Limit Curve that can change from one elementary duration to another.

For that reason, the user is informed of the reference Limit Curve applied to the instantaneous spectrum (i.e. applied to the  $T_j$  elementary duration): it is displayed in solid line rather than dashed line.

### 6.3 SPECTRAL TIME HISTORY PLOT TOOLBAR

	Set plot parameters		Show / Hide overload bar
	Set display parameters for the time history		Show / Hide audio bar
	Set display parameters for spectrum		Show / Hide spectrum bar
	Listen to the audio record corresponding to the cursor position		Show / Hide comment bar
	Display Videos/Pictures corresponding to the cursor position		Show / Hide parallel measurement bar (auxiliary data that varies with time)
	Analysis of the audio record corresponding to the cursor position		Show / Hide Webcam bar
	Display of an averaged spectrum corresponding to the cursor position		Link the two cursors together
	Edit a comment between the cursors positions		Display in instantaneous mode
	Identify a noise source (code) for the time portion between the cursors' positions		Display in sonogram mode
	Search the next occurrence of a source		Display the sonogram between cursors (with slices)
	Select the source occurrence at the cursor position		Calculate and display average spectrum between cursor (central plot in yellow)
	Show / Hide Sources bar		Calculate and display minimum spectrum between cursors (bottom plot in yellow)
	Zoom on the time history section between cursors		Calculate and display maximum spectrum between cursors (bottom plot in yellow)
	Display first section of the file		List values for spectrum on display (Leq and statistics values)
	Display previous section of the file		Add displayed spectrum to list of global items
	Display next section of the file		Convert displayed spectrum into octave spectrum
	Display last section of the file		Search Max level on current view
			Search Max level on entire file
			Enables horizontal cursor
			Enables display of Vibration time signals (drop-down menu)
			Enables display of Acoustic time signals

These commands are also accessible by clicking on the spectral time history with the right mouse button.

## 6.4 DISPLAY MODES

 The display modes described below are exclusive one over the other.

### 6.4.1 Instantaneous spectrum

The **Instantaneous spectrum** mode is displayed by clicking on icon .

- **Interactions between time history plot and spectrum**

The displayed spectrum corresponds to the spectrum at the cursor position on the time history plot.

- **Interactions between spectrum and time history plot**

If the option **Plot active frequency band** has been selected in the display parameters, when moving the cursor on the instantaneous spectrum plot (upper part of the window), the time history of the corresponding frequency band is automatically displayed in the lower part of the window.

- **Full screen**

The instantaneous spectrum can be displayed in full-screen mode by double-clicking on it. Double click again on the spectrum to go back to the normal display.

### 6.4.2 Min/Max/Averaged spectra

With icons ,  and  (corresponding to **commands Right click / Averaged spectrum**, **Minimum spectrum**, **Maximum spectrum**, respectively), the instantaneous spectrum can be replaced by the averaged, minimum and maximum spectra, respectively calculated over the period between the two cursors of the time history.

The **averaged spectrum** corresponds to the average of all instantaneous spectra between the cursors.

The **minimum spectrum** corresponds to the minimum values of the short Leqs for the considered time periods (between cursors). For each frequency band, the minimum value is calculated. The minimum spectrum therefore corresponds to the minima of the frequency bands.

The **maximum spectrum** corresponds to the maximum values of the short Leqs for the considered time periods (between cursors). For each frequency band, the maximum value is calculated. The maximum spectrum therefore corresponds to the maxima of the frequency bands.

Min/Max/Averaged graphs can be superimposed.

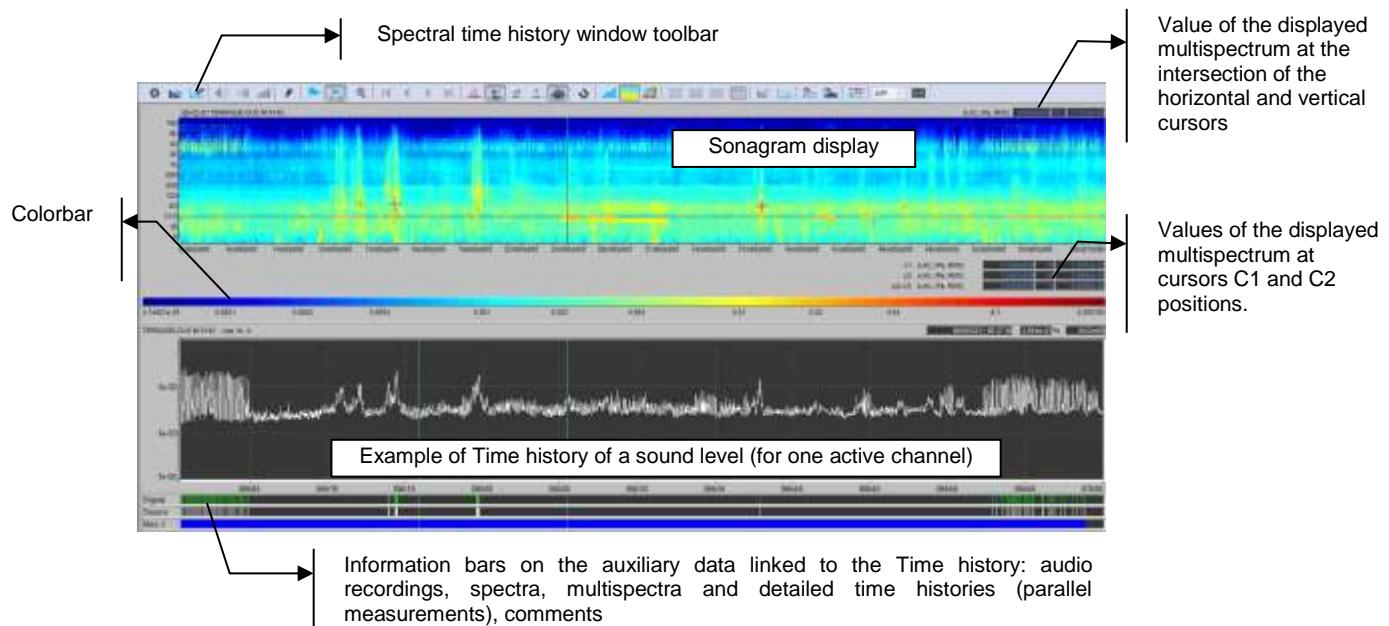
 Activating one the **Min**, **Max** or **Averaged** button disabled the display of the instantaneous spectrum, which is then not visible simultaneously with **Min** and/or **Max** and/or **Averaged** spectra.

- **Full screen**

Min/Max/Averaged spectra can be displayed in full-screen mode by double-clicking on them. Double click again to go back to standard display.

### 6.4.3 Sonagram

The **Sonogram** mode is available by clicking on icon .



- **Interactions between time history and spectrum**

The time cursor (vertical) on the sonogram corresponds to the active cursor on the time history plot, and vice versa.

- **Time and frequency cursors**

A time cursor (vertical) and a frequency cursor (horizontal) provide the spectrum value at their intersection.

By default, these cursors are positioned at the extreme left and extreme bottom of the sonogram.

- **Differential cursors (time/frequency cross)**

Two differential cursors (crosses C1 and C2) indicate the spectrum value at a frequency and at precise instants t1 and t2.

The difference between the C1 and C2 values is displayed.

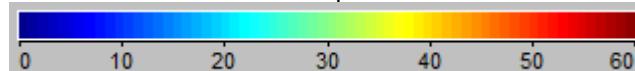
Initially, these cursors are positioned in the bottom left corner of the sonogram.

The values of these two points are displayed at the bottom right of the sonogram, as well as algebraic differences between the values of each axis (see opposite).

c1	0m00s000	6.3	8.3278e-04
c2	1m42s000	20k	6.4943e-05
c2-c1	1m42s000	20k	7.6784e-04

- **Colour bar**

The colour scale versus amplitude is shown at the bottom of the sonogram.



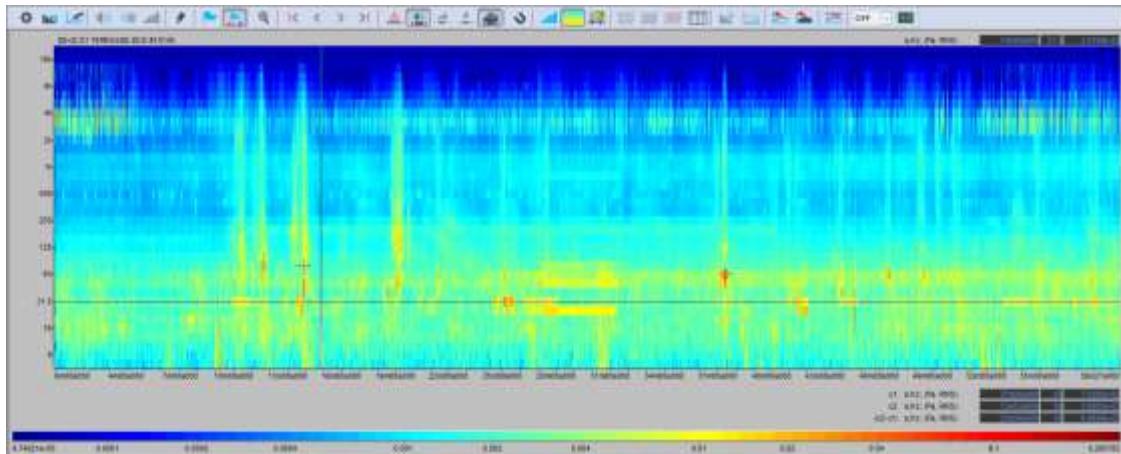
The colour scheme can be changed in the Plot settings window .

- **Plot settings**

The plot settings can be defined using button  . See § 6.6 for more details.

- **Full screen**

The sonogram can be displayed in full-screen mode by double-clicking on it.



In full-screen display mode, double click on the sonogram to go back to normal display.

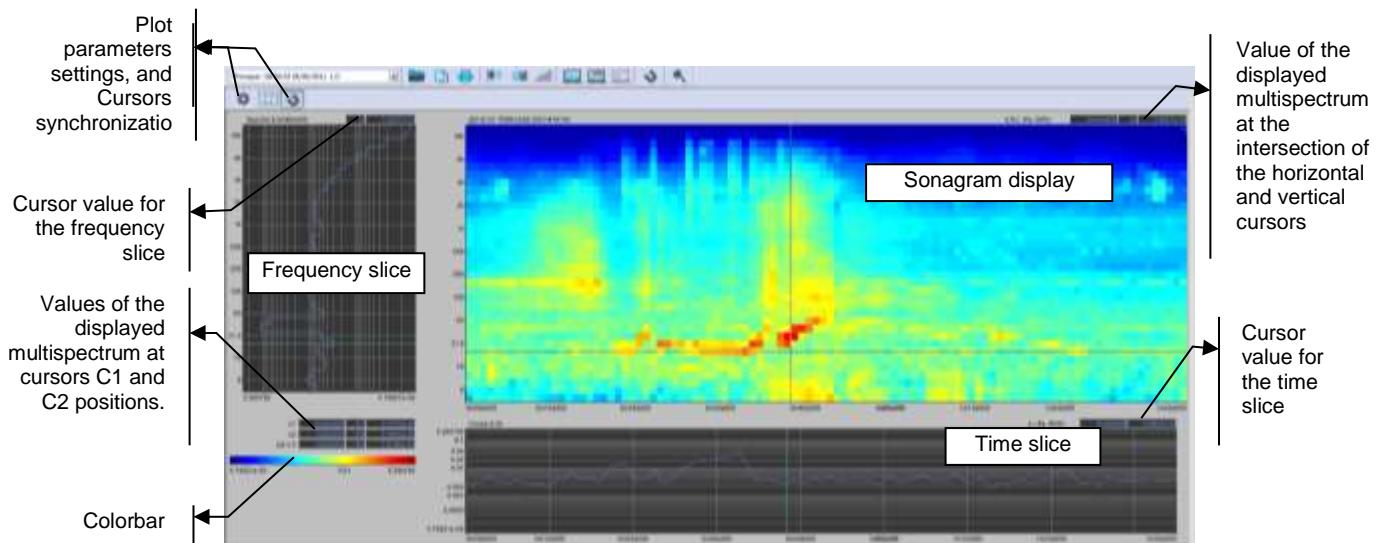
- ☐ In **Sonagram** mode, displayed data are not recomposed.
- ☐ Limitation: the **Sonagram** displays one value less than the time history (at the right end of the sonogram) because the cursor is positioned to the left of a value, the plot of which is on the right of the cursor. Thus, for the last point, the cursor stops at the right end of the **Sonagram**, so that the value plot is not visible.  
This appears like shift with respect to the **Time history** plot for which the cursor is centered on the value and the last value is fully represented.
- ☐ It can take long to load a **Sonagram** containing a large volume of data.
- ☐ The representation of a window or graph automatically adjusts to the screen size and/or the window size. The colour bar and the cursors of the **Sonagram** are then automatically hidden when the graph size is too small.
- ☐ The scale of the **Sonagram** x-axis is expressed in relative time. It cannot be displayed in absolute time.
- ☐ Limitation: in **Instantaneous spectrum** mode, the spectrum cursor drives the **active band**, which can be plotted in the time history (view from the bottom). In **Sonagram** mode, the **active band** is not driven by the frequency cursor position (horizontal cursor).

#### 6.4.4 Sonagram between cursors (with slices)



Click on icon to display the **Sonagram between cursors (with slices)**.

A **new window** opens up, which shows the sonagram for the file portion defined by the position of the two cursors:



- Toolbar

Plot settings Positions cross cursors in the corners of the sonagram (bottom left and top right)	Synchronizes cursors in the 3 views
---	-------------------------------------

- **Time cursor and frequency cursor**

A time cursor (vertical) and a frequency cursor (horizontal) indicate the spectrum value at their intersection.  
By default, these cursors are positioned at the extreme left and extreme bottom of the sonogram.

- **Slices**

The position of the time cursor (vertical) and frequency cursor (horizontal) is used to get the following respective slices:

- Frequency slice: display of the spectrum at the vertical cursor position
- Time slice: display of the time history at the horizontal cursor position

- **Cursor synchronization**

By default, button is active, and cursors are synchronized in the 3 views (sonagram and slices). If this button is deactivated, the cursors on the slices become independent. Displacing them on the sonagram will however still synchronize the cursors on the slices.

#### ▪ Differential cursors

Two differential cursors (crosses C1 and C2) indicate the spectrum value at a frequency and at precise instants t1 and t2.

The difference between the C1 and C2 values is displayed.

Initially, these cursors are positioned in the bottom left corner of the sonogram with slices.

The values of these two points are displayed at the bottom left of the sonogram, as well as algebraic differences between the values of each axis (see opposite).

c1	0m00s000	6.3	8.3278e-04
c2	1m42s000	20k	6.4943e-05
c2-c1	1m42s000	20k	7.6784e-04

#### ▪ Reset of the differential cursor position



Pressing button will position differential cursors C1 and C2 in the corners of the sonogram (bottom left and top right corners).

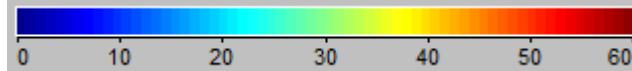
#### ▪ Zoom

Details of a specific area of the sonogram can be displayed by enlarging the area to the full view. Hold down the SHIFT key on the keyboard and define the rectangle to enlarge using the mouse pointer and pressing the mouse button.

The use of this type of zoom function should be restricted to the **Sonogram between cursors**.

#### ▪ Colour scale

The colour scale versus amplitude is shown at the bottom left of the sonogram.



The colour scheme can be changed in the Plot settings window



#### ▪ Plot settings

The plot settings can be defined using button . See § 6.6 for more details.



After closing the **Sonogram between cursors** window, the user returns to the **Spectrum history** window.

## 6.5 FUNCTIONS COMMON TO THE TIME HISTORY PLOT

Many functions of the **Spectral time history** are common to the **Time History**.

Refer to sub-sections of **CHAPTER 4** for a detailed description of the following functions:

- **Set-up of graphical and display parameters**

See principles described in § 4.4.

- **Cursors and displays**

See principles described in § 4.5.

- **Zoom-in between cursors**

See principles described in § 4.6.

- **Display data by time portions**

See principles described in § 4.7.

- **Display of information bars**

See principles described in § 4.9.

- **Edit and display comments**

See principles described in § 4.10.

- **Display of time signals**

See principles described in § 4.11.

- **Playback an audio record / Aux. menu**

See principles described in § 4.12.

- **Post-processing of a time signal recording**

See principles described in § 4.13.

- **Coding of a noise source**

See principles described in § 4.14.

## 6.6 CONFIGURATION OF SPECTRUM DISPLAY SETTINGS

### 6.6.1 Instantaneous spectrum and Sonagram

Spectrum display settings are available using command  or Right click / Spectrum parameters.

A dialog box including several tabs is displayed on screen. These tabs are used to define **Frequencies**, **Data**, **Overall levels**, **Graphics** parameters.

To define default settings, tick box  Fixed by default, and then click on OK, Apply or Apply at all.

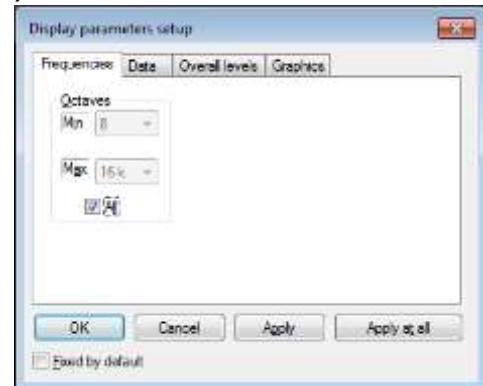
 *Option **Fixed by default** does not apply to the Dynamic range (amplitude) of the spectrum history.*

 *Regarding the setting of the Dynamic range (amplitude) of the spectra:*

- Case of a display with elementary duration: spectra are displayed with a dynamic range corresponding to min/max values on the selected time portion.
- Case of a display with recomposed duration: spectra are displayed with an automatic dynamic range that is always optimized (autoscale).

#### ▪ Frequencies tab (case of 1/n octave spectra)

In this tab, select the minimum and maximum frequency bands that will be displayed on the graphical view.

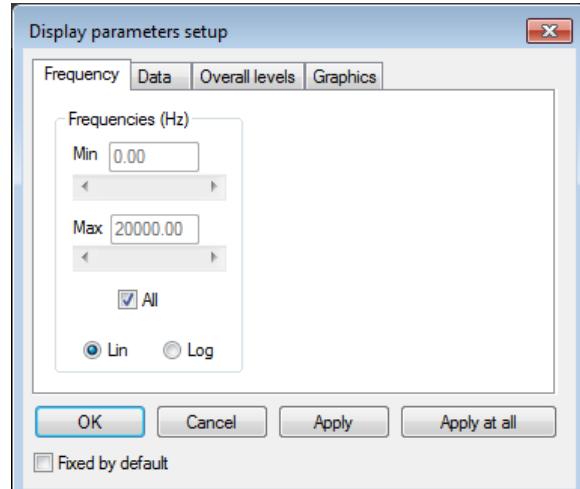


#### ▪ Frequencies tab (case of FFT – narrow band spectra)

In this tab, select the minimum and maximum frequencies that will be displayed on the graphical view.

Check box **All** to display the data over the full frequency range of the spectrum.

Select a linear scale (Lin) or a logarithmic scale (Log) to represent the frequencies.

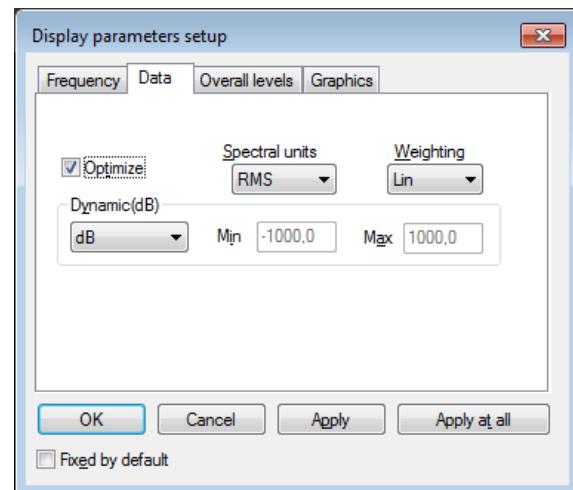


#### ▪ Data tab

In this tab, use the **Dynamic(dB)** menu to select the data display type: physical units (Dynamic : Lin or Log) or decibels (dB).

Then, select the desired **Spectral unit** (RMS or PWR), as well as the **Weighting** to apply to all spectral data.

If the **Optimize** box is not checked, the user can define minimum and maximum values for the display dynamic range.



Refer to **sections 6.6.2 and 6.6.3** for a detailed list of frequency weightings and types of spectral units available in **dBTrait**.

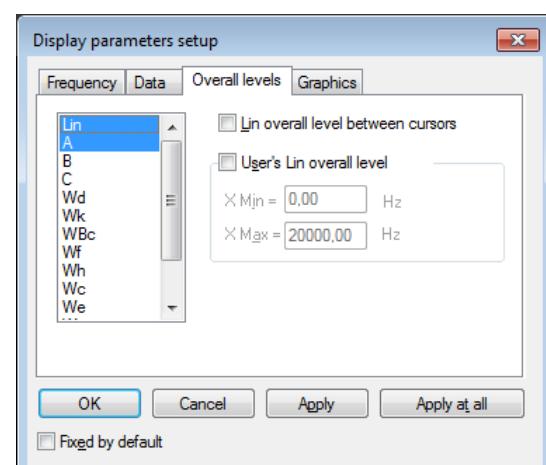
#### ▪ Overall levels tab

This tab is not available for the Sonogram and Sonogram between cursors modes.

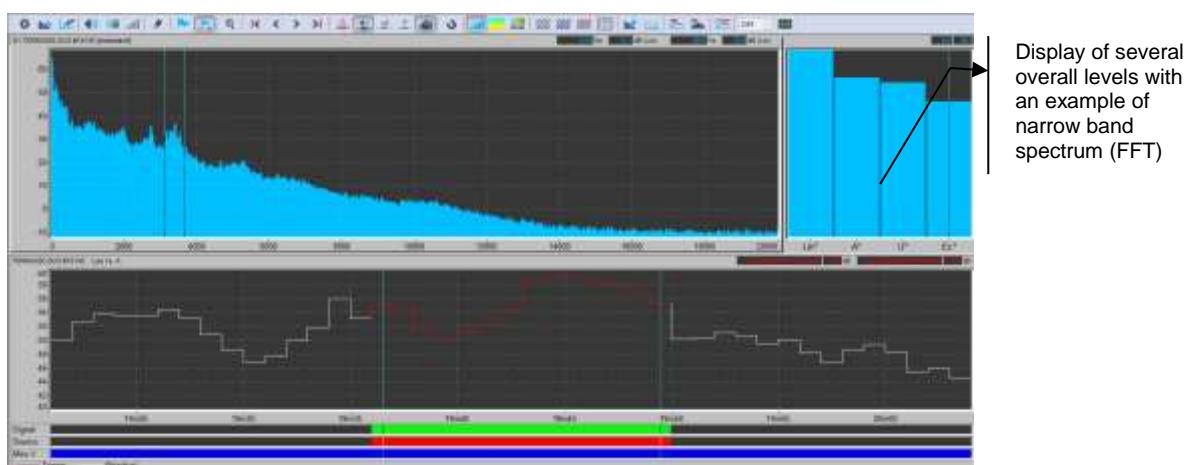
In this tab, select the overall levels (weighted or not) to calculate and display with the spectrum.

It is also possible to calculate the **Lin overall level between cursors** (labelled "Ec" on the graph).

Specific case of **Narrow band (FFT)** spectra and multispectra: a **User's Lin overall level** can be calculated for with Min and Max frequencies are to be defined.



After validation of window **Display parameters setup**, the overall levels are displayed on the right side of the spectra:

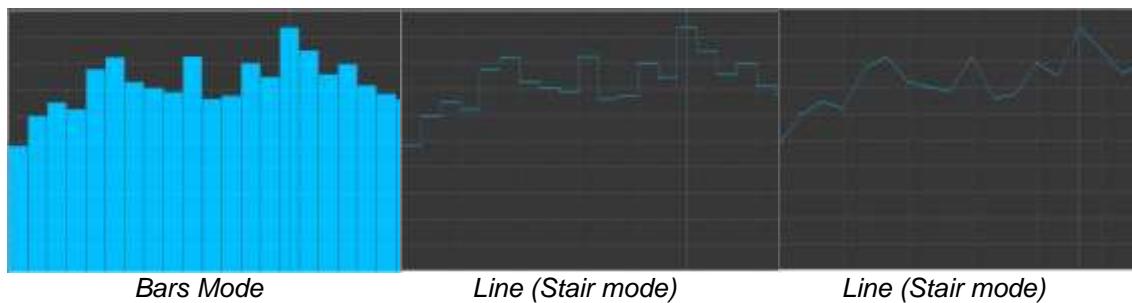
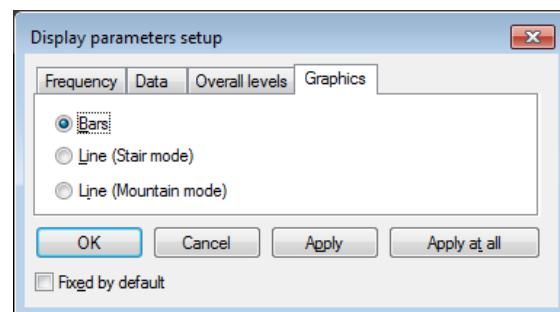


- └ In **dBTrait**, a recomposed overall level (from spectral band levels) is labelled with a star “\*” (e.g., **A\*** or **Wm\***).
- └ **Note:** The calculation of the "User's Lin overall level" (noted  $U^*$ ) is different from the calculation of the "Lin overall level between cursors" (noted  $Ec^*$ , meaning "Entre Curseurs" in French). For  $Ec^*$ , we make the sum of all the bands between the cursors. For  $U^*$ , it is the same thing, except for the extreme bands, for which only the energy between "Fu-" and "Fband+" is taken into account ( $Fu^- = X \text{ min user AND } F\text{band}+ = \text{upper bound of the frequency band in which } Fu^- \text{ is located}$ ). Example: spectrum with  $\Delta f=10\text{Hz}$  and  $X_{\min}(\text{user})=20$  and  $X_{\max}(\text{user})=50 \Rightarrow$  the energy of the 30 and 40 Hz bands will be summed, and only half of the energy of the extreme bands will be taken into account because we consider that the 10Hz band starts at 5Hz and ends at 15Hz....

#### ▪ Graphics tab

The type of spectrum plot can be selected in this tab: bars or lines (2 modes).

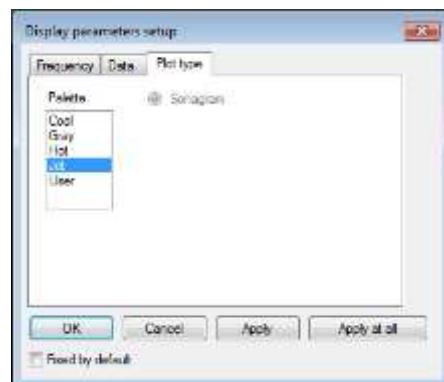
Examples of the different types of displays are provided below.



#### ▪ Plot type tab (case of sonogram or sonogram between cursors)

The type of colour **Palette** used to plot the sonogram can be selected in this tab.

The Jet palette is selected by default.



## 6.6.2 List of frequency weightings for spectra

The following acoustic frequency weightings can be selected:

- **A weighting:** Sensitivity of the human ear at low levels
- **Lin weighting:** No weighting (linear)
- **B weighting:** Sensitivity of the human ear at medium levels
- **C weighting:** Sensitivity of the human ear at high levels
- **G weighting:** Infrasound weighting

The following vibration frequency weightings can be selected:

ISO2631 part 1

- **Principal weightings Wd** (horizontal vibrations) and **Wk** (vertical vibrations) to evaluate the adverse effects of vibrations on human beings relative to health, comfort and perception issues.
- **Additional weighting Wc** (seat back vibration measurement), **We** (rotation vibration measurement) and **Wj** (vibration measurement under head of recumbent person) related to comfort issues, in specific cases.
- **Principal weighting Wf** to evaluate the adverse effects of vibrations on human beings relative to motion sickness.
- **Principal weighting Wb** to evaluate the adverse effects of vibrations on human beings relative to comfort issues in given environments (vehicles on rails, for example).

**ISO8041 (and ISO2631 part 2)**

- **Principal weighting WBc / Wm** (all directions combined) to evaluate the adverse effects of continuous and shock-induced (1Hz to 80Hz) vibrations in buildings.

**ISO8041 (and ISO5349)**

- **Hand-arm weighting Wh** (all directions) to evaluate hand-transmitted vibrations.

## 6.6.3 Spectral units

For spectra (type autospectra), it is possible to select the following display units:

- **dB** : Level in decibels of the considered quantity (Leq, Slow, Fast, Impulse, etc.)
- **RMS** (Root Mean Square): Average quadrature value for all the instantaneous squared values, expressed in physical units.
- **PWR (POWER):** The power represents the average of a squared value. It is the unit used to determine the power at a given frequency for a determined (sinusoidal) signal. It is expressed in squared units.

## 6.7 LISTING MIN/MAX/AVERAGED SPECTRA VALUES BETWEEN CURSORS



With the command or **Right Click / list spectra**, it is possible to list the values of the displayed spectrum in a results table or as graphics.

*For further information on this type of listing, see the sections 11.1 and 11.3.*

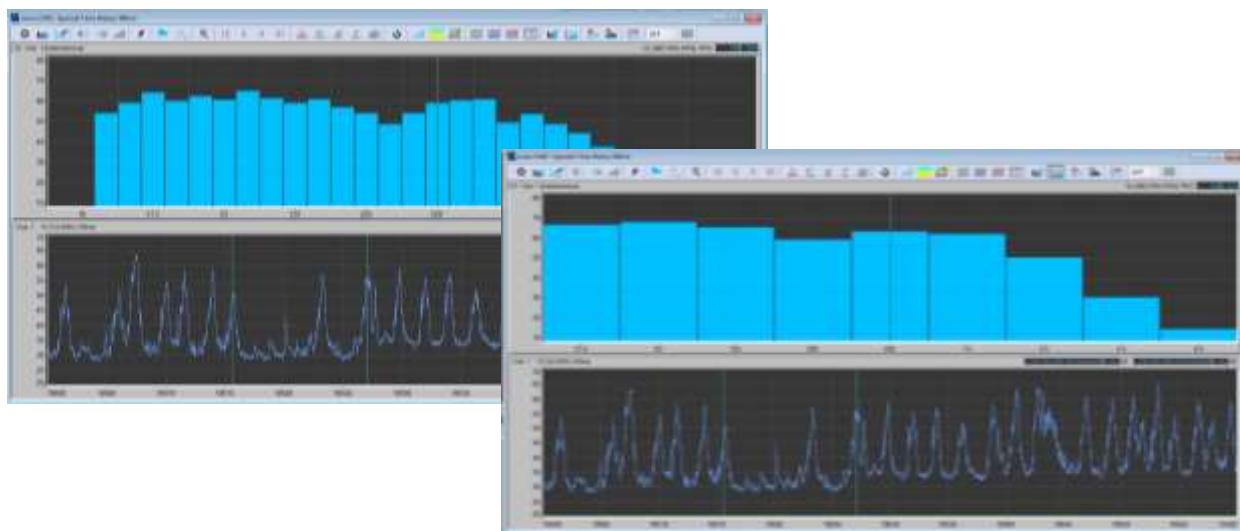
## 6.8 ADDING A SPECTRUM

 Button is used to add the displayed spectrum to the list of global items. From this view then, various calculations can be performed on spectra (see **CHAPTER 15** for more details on this function).

## 6.9 OCTAVE BAND CONVERSION

### 6.9.1 Spectrum conversion

 Click on to convert the current spectrum into an octave spectrum. This function performs a temporary conversion only of the current spectrum.

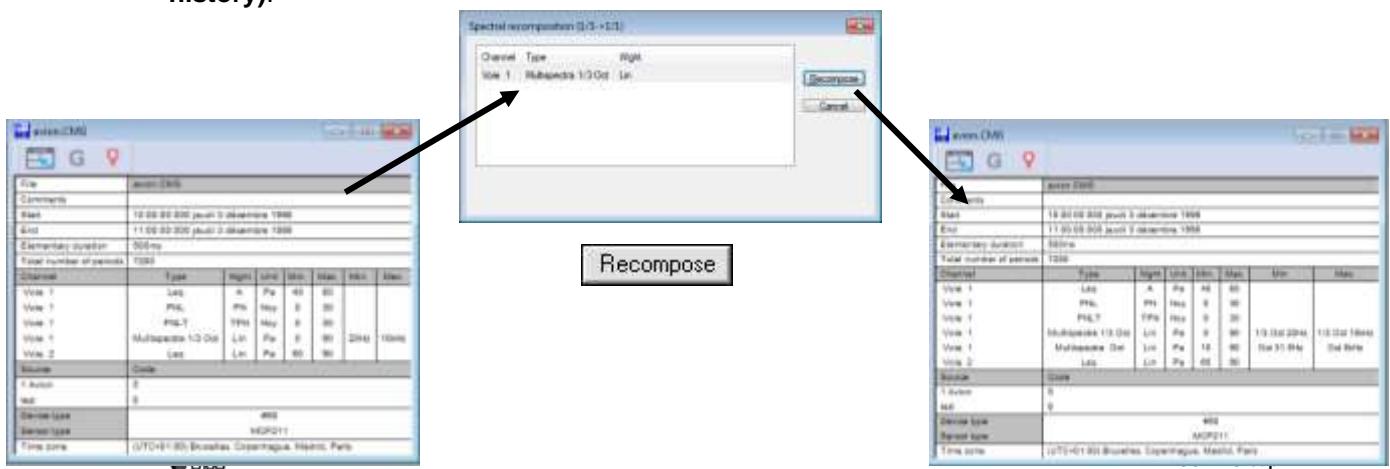


 The corresponding spectrum can be added to the list of global items and the conversion into octave spectrum can be launched from this specific view in order to keep the save the converted spectrum.

### 6.9.2 Multispectra conversion

It's possible to convert a multispectra 1/3 octave in a multispectra 1/1 octave with the help of the menu **Post-Processing / Spectral recomposition (1/3→1/1)**.

A specific window appears in order to choose multispectra to convert. Click on **Recompose** for multispectra calculation; this multispectra is added to the information window of the measurement session, and can be displayed using the command **Visualization / Spectral time history**.



# CHAPTER 7

## DOMINANT FREQUENCY HISTORY PLOT

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The **Dominant frequency history** plot is dedicated to data measured with the Smart Vibration Monitoring Terminal **ORION** device (environmental vibration measurements).

The plot represents the time history of the dominant frequencies associated with PPV or PCPV values. It provides a detailed representation of the environmental vibration situation (construction or destruction site, vibrations generated by a rail infrastructure, etc.). The user can display reference templates (reference limit curves) used during the measurement or other standardized templates.

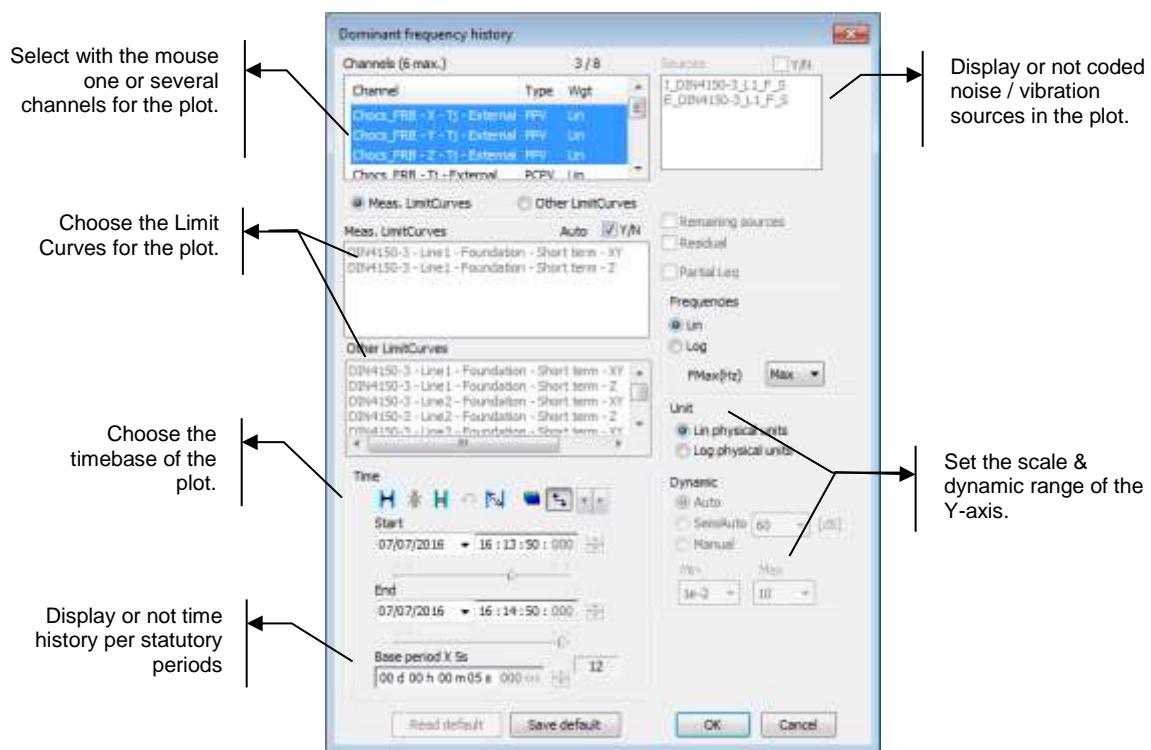
Based on the user's selection, the Dominant frequency history plot can display or not the identified sources of nuisances. In this case, sources will be plotted using a specific colour so as to stand out from the other data.



*To this date, the visual display of data with sources is limited to a single selected magnitude. To view the X,Y,Z data from a triaxial transducer with sources, a solution would be to display the PCPV value rather than the PPV value of the three axes.*

## 7.1 CONFIGURATION PARAMETERS OF THE PLOT

Open the measurement file and click on icon or use command **Visualization / Dominant frequency history** to plot the dominant frequency history associated with the **PPV** or **PCPV** indicators. This dialog box allows setting the parameters used for the plot. When the dialog box is confirmed, the dominant frequency history is displayed in a new window.



- Right click on a selection area (e.g., channel selection area) to enlarge it. To go back to the normal view, right click on the area again.

The following parameters can be defined:

### ▪ Channels

Select the time channel(s) to plot. Up to 6 time history plots can be generated simultaneously. Only **PPV/DF** or **PCPV/DF**-type data present in the measurement session can be selected. To make multiple selections, use the **CTRL** or **SHIFT** keys on the keyboard. To select several channels, use the **Ctrl** or **Shift** keys on the keyboard

### ▪ Meas. LimitCurves / Other LimitCurves

Select the templates (LimitCurves) to display. By default, the **Meas. LimitCurves** option is selected, and all Limit Curves set on ORION for the measurement will be automatically displayed (they are stored in the measurement session). To display only one portion of the templates set for the measurement, untick box  **O/N** and manually select the **Meas. LimitCurves** to display.

- In case standardized Limit Curves modified during the measurement set-up are displayed, the word "(modified)" is added to the Limit Curve name.

To display Limit Curves other than those set for the measurement, select option **Other LimitCurves**. A full list of templates is available for selection. These are standardized Limit

Curves corresponding to the different possible configurations on ORION. Up to 6 can be selected. Specific templates can be added to this list (see § 7.6).

- **Specific case of Standard DIN4150-3 “Pipe Network”:** templates of this category have very low levels. When selected for display, they are not very visible, unless using a Log scale.
- Automatic detection is carried out regarding possible duplicate templates between the Internal and External transducers; if both templates are identical, only one will be listed.
- When data originating from several ORION devices (concatenation of measurement sessions) are superimposed, with different measurement configurations (hence different templates), all templates available in the measurement session can be selected (up to 6 templates can be selected).

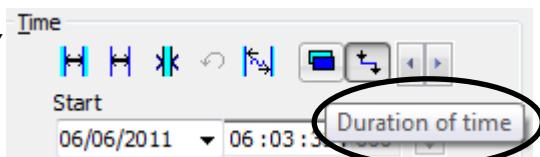
#### ■ Timetable

Specify the beginning and ending time of the file section to plot (the format of this selection is dd/mm/yy hh:mm:ss:ms) or the beginning time and the length of the section to take into account.

Icons  are used to:

-  Select the entire file (i.e., data over the total length of the file)
-  Select the entire channel (i.e., data over the total time length of the channel)
-  Select data between cursors placed on the plot
-  Go back to original times
-  Round up times (rounding calculation depends on the total duration of display)
-  Select whether to display ending time or duration
-  Link starting and ending cursors.

- Hover the mouse over the button to display tooltip describing the associated function.



- **Base plot step (base period)**

The plot may be displayed using the default time base of the measured quantities in the datafile or a greater time base. The base period is the time period over which the indicators will be displayed (possibly recalculated if the base period is not the elementary timebase).

During acquisition, an elementary timebase is used to store data (usually 5s, 10s or 30s for PPVjk/DFjk or PCPVjk/DFjk data measured with ORION). It is possible to recalculate/display vibration levels according to a greater time base (for example 15-min) that is a multiple of the main elementary timebase. **dB Trait** adjusts automatically the base plot step (base period) to the nearest value that matches an elementary timebase multiple.

Similarly, it is not possible to recalculate/display noise indicators according to a step that is smaller than the main elementary timebase.

- **Sources / Remaining sources / Residual (Not coded)**

Select in a list the nuisance sources to consider (or not) for the plot. If one wishes to display nuisance sources (box **Y/N** ticked) on the plot, they will be shown in different colours in order to differentiate them from the rest of the data.

If several sources are referenced, use the mouse to select the sources to display.

The option **Remaining sources** allows the user to plot all sources that have not been selected, except the Residual, as a single source named "Other sources". This option may be useful to estimate the contribution of a source compared to all the other sources, for instance. The selection will be recalled as default value next time such a command is used.

 *This option is not active when no source is identified or when all the sources have been selected in the list.*

The option **Residual** allows the user to represent all the data in the file that have not been coded as a specific source. Any data not being linked to a source is considered as being part of the "Residual level". The selection will be recalled as default value next time such a command is used.

 *When more than one channel are selected for the plot, the identified nuisance sources cannot be displayed on it.*

- **Frequencies**

The frequency scale can be defined in Lin or Log units.

The minimum frequency for the x-axis scale can be set in the **Fmin** field:

- 0 (except in Log scale), 0.1, 1, 10
- Min

Setting "Min": the x-axis scale is set according to the Min frequency among displayed data.

The maximum frequency for the x-axis scale can be set in the **Fmax** field:

- 20,50,100,150
- Max

Setting "Max": the maximum value of the x-axis scale will be the Max frequency among displayed data (+10% or 20%).

- Units and Dynamic range (Plot scales)
- By default**, the amplitude scale is **linear**.

Select the type of scale (Lin physical units or Log physical units) and the type of dynamic range (Auto, SemiAuto, Manual) for the plot. Confirm to apply these settings to the plot.

The following combinations can be selected:

Lin Physical Units	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> </ul>
Log Physical Units	<ul style="list-style-type: none"> <li>▪ Auto dynamic range</li> <li>▪ SemiAuto dynamic range: <ul style="list-style-type: none"> <li>○ Max level set automatically,</li> <li>○ Dynamic range set with drop-down menu: from 2 to 6 decades</li> <li>○ The Min levels automatically depend on the dynamic settings.</li> </ul> </li> <li>▪ Manual: Min and Max settings available (values in decades from 1e-6 to 1e+6).</li> </ul>

## 7.2 DOMINANT FREQUENCY HISTORY PLOT DISPLAY



### ▪ Toolbar

The Dominant frequency history plot window includes a toolbar providing access to functions relative to this plot, for instance source coding between cursors, activation of time signal display, etc.

### ▪ Colour convention

Indicators on display are automatically represented using a colour convention.

- Case 1:

A colour is dedicated to each measurement axis (X,Y,Z): colours 1 to 6 defined in the software Preferences will be used.

Example: For the selection of PPVx,PPVy,PPVz, the following colours are automatically assigned: blue, green, red (and cyan, orange, purple in case the PPVx, PPVy and PPVz indicators of a second transducer are selected).

- Case 2:

Colours are no longer correlated to the measurement axes: colours 1 to 6 defined in the software Preferences are applied to the indicators based on their order of display.

Example: for a selection of several PCPV//FD indicators, colours 1 to 6 are assigned to the different PCPV/DF indicators depending on their position in the selection list.

Other example: for a display of PPVx, PPVy, PPVz, PCPV, PVS, colours 1 to 5 are assigned to the different indicators based on their position in the selection list.

#### ▪ **Caption**

A caption above the Dominant frequencies plot indicates the meaning of the symbols used in the plot:

• Continuous vibrations   x Transient vibrations   ■ DIN

#### ▪ **Limit Curves**

The Limit Curves selected in the set-up of the plot are displayed, with their name at the right end of the Limit Curves. A symbol indicates whether this is a Limit Curve for continuous vibrations (symbol  $=$ ) or transient vibrations (symbol  $\perp$ ).

In the case of “modified” standardized Limit Curve, the name includes the word “(modified)”.



A colour is automatically assigned to each Limit Curve. This colour can be modified (see Detailed description in § 19.4)

#### ▪ **Time signals**

The user can choose whether or not to display **time signals**. A detailed description of this feature is available in §4.11.

-   *The zoom-in between cursors button allows zooming in on a portion of the time history. However, the PPV/DF or PCPV/DF pairs of points are not “filtered” according to the zoom: all pairs of points defined by the previously defined observation period remain on display.*
  
-  *After changing the window size (minimization of the window, etc.), the dominant frequency plot (upper part) may no longer be visible. In this case, just place the cursor in the time history (lower part) to go back to the standard view.*

### 7.3 DOMINANT FREQUENCY HISTORY PLOT TOOLBAR

	Set plot parameters		Show / Hide the Source bar
	Set display parameters		Show / Hide Anomalies bar
	Zoom on the time history section between cursors		Show / Hide Audio bar
	Edit a comment between the cursors positions		Show / Hide Comment bar
	Identify a source (code) for the time portion between the cursors' positions		Show / Hide parallel measurement bar (auxiliary data that varies with time)
	Search the next occurrence of a source		Link the 2 cursors together
	Select the source occurrence at the cursor position		Search Max level on current view
	Display first section of the file		Search Max level on entire file
	Display previous section of the file		Enables horizontal cursor
	Display next section of the file		Enables display of Vibration time signals (dropdown menu)
	Display last section of the file		Enables display of Acoustic time signals

Most of the commands available from the toolbar described here above are also accessible by clicking on the time history with the right mouse button.

## 7.4 FUNCTIONS COMMON TO THE TIME HISTORY PLOT

Many functions of the **Dominant frequency history** are common to the **Time History**. Refer to sub-sections of **CHAPTER 4** for a detailed description of the following functions:

- **Set-up of graphical and display parameters**

See principles described in §4.4.

- **Display data by time portions**

See principles described in § 4.7.

- **Display of information bars**

See principles described in § 4.9.

- **Edit and display comments**

See principles described in § 4.10.

- **Display of time signals**

See principles described in § 4.11.

- **Coding of a noise source**

See principles described in § 4.14.

## 7.5 CURSORS AND DISPLAYS

- **Zoom-in between cursors**

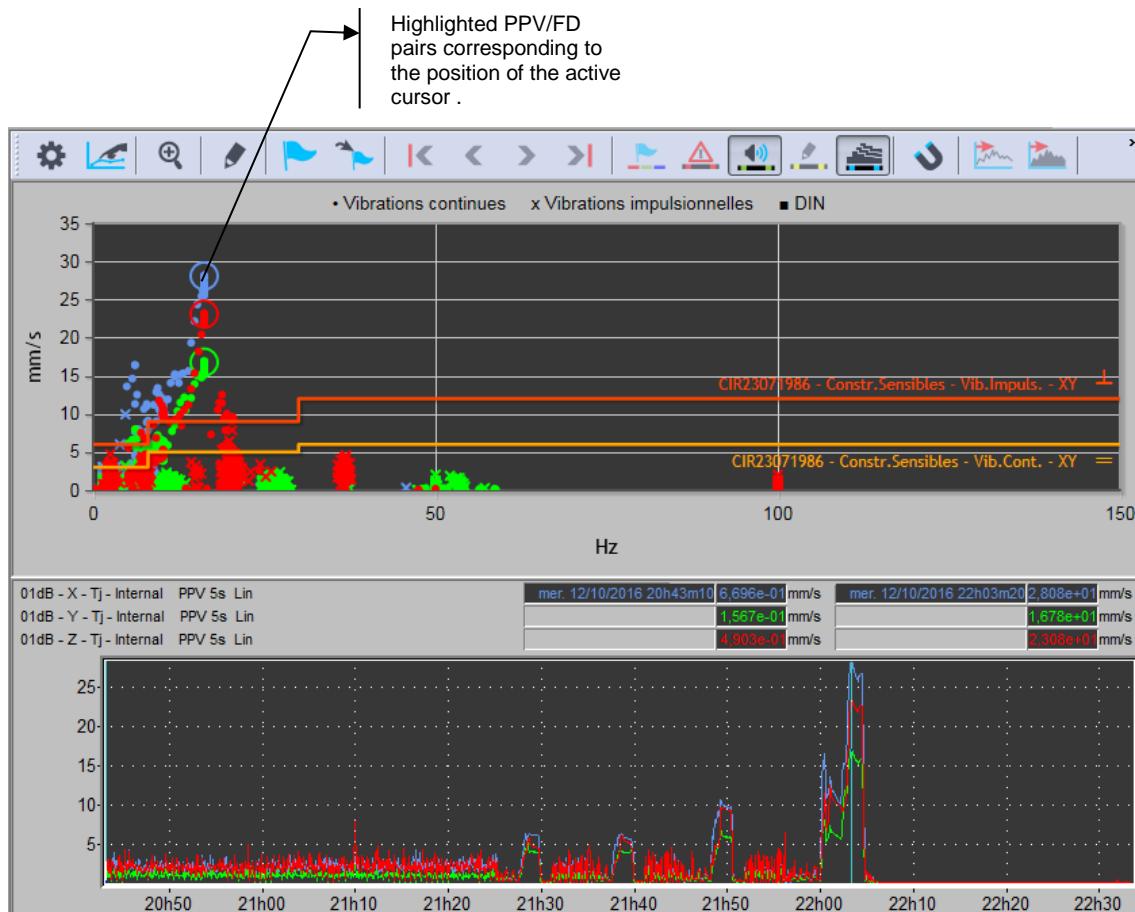
This feature is common with that of the Time history plot. See the principles described in § 4.6.

- **Specifics of the Dominant frequency time history plot:**

On the Time history part, two cursors are available. Displacement of the active cursor highlights the corresponding PPV/DF pair(s) on the dominant frequency plot (upper plot): PPV/FD pairs are circled.

**New in dB Trait 6.2:**

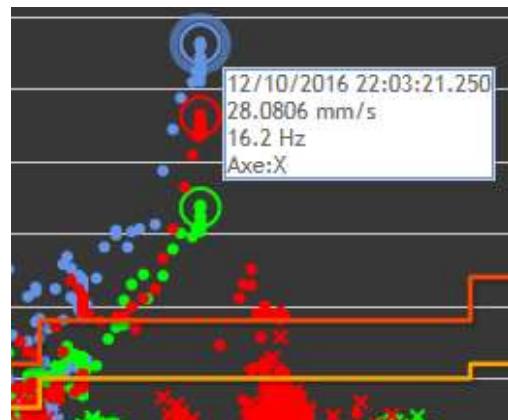
The reverse is now possible: a double click on a point of the PPV/DF plot moves the cursor on the time history at the corresponding position.



#### ▪ Tooltip with value details

Details of a PPV/FD pair displayed in the dominant frequency plot (upper plot) are available by hovering the mouse over the point:

- dd/mm/yy hh:mm:ss:ms: point date
- PPV or PCPV value
- value of associated dominant frequency
- Axis (for PCPV only)



## 7.6 ADDING/EDITING TEMPLATES

Standardized templates corresponding to the different configurations possible on ORION are also available by default in dBTrait (**Other LimitCurves**, see § 7.1).

They are defined and stored in file **ToleranceCurves.xml** available in C:\ProgramData\01dB\dB Trait.

The templates contained in this file can be modified and specific templates can also be added. To do so, the file must be edited (using a simple text editor like Notepad, Notepad++, etc.) and a template added according to the structure of the file.

As soon as a new template is added to the file, it can immediately be displayed through selection in the Other LimitCurves section of the Dominant frequency history plot parameters.

When editing a template in the ToleranceCurves.xml file, the user can label this template as a “modified template” as follows:

- Edit the corresponding ModifiedXY/ ModifiedZ/ Modified field by changing “0” to “1”.
- Set this field back to “0” if the user reverts to original values.

### Examples:

#### **Editing a DIN4160-3 template, "InferiorXY" value for the 1<sup>st</sup> frequency: from 20 to 25**

```
<Limits Value="PPVj_DFj" Standard="DIN4150-3" ActiveOnInternal="0" ActiveOnExternal="0"
BuildingType="FOUNDATION" DurationType="SHORT_TERM" LineType="LINE_1">
<Limit ModifiedXY="1" ModifiedZ="0">
<Frequency Value="1" InferiorXY="25" SuperiorXY="20" InferiorZ="20" SuperiorZ="20"/>
<Frequency Value="10" InferiorXY="20" SuperiorXY="20" InferiorZ="20" SuperiorZ="20"/>
<Frequency Value="50" InferiorXY="40" SuperiorXY="40" InferiorZ="40" SuperiorZ="40"/>
<Frequency Value="100" InferiorXY="50" SuperiorXY="50" InferiorZ="50" SuperiorZ="50"/>
</Limit>
</Limits>
```

#### **Editing a BS 7385-2 template, 4<sup>th</sup> frequency value: from 15 to 20**

```
<Limits Value="PCPVj_DFj" Standard="BS_7385_2" ActiveOnInternal="0" ActiveOnExternal="0" LineType="LINE_2"
DetectionType="AUTOMATIC" >
<Limit Type="IMPULSIVE" Modified="1">
<Frequency Value="1" Inferior="3.75" Superior="3.75"/>
<Frequency Value="4" Inferior="15" Superior="15"/>
<Frequency Value="20" Inferior="20" Superior="20"/>
<Frequency Value="40" Inferior="50" Superior="50"/>
</Limit>
</Limits>
```

# CHAPTER 8

## WEATHER DATA ANALYSIS

---

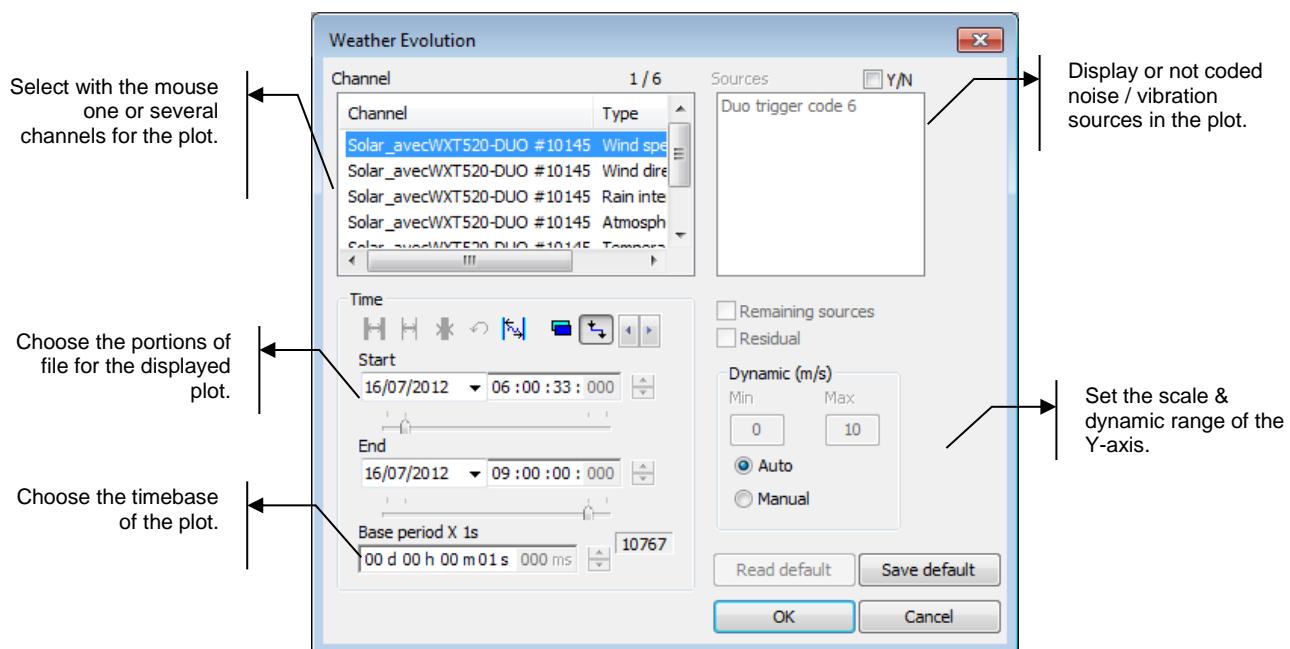
A weather station can be connected to the DUO / FUSION / CUBE sound level meters and thus record weather data in addition to the usual acoustic indicators.

Weather data that are stored at a multiple of the acoustic logging interval (set-up in the instrument) are:

- Wind speed,
- Wind direction,
- Rain intensity,
- Atmospheric pressure,
- Air temperature,
- Relative humidity.

### 8.1 TIME HISTORY OF WEATHER DATA

To view the time history of these parameters, go to **Visualization / Weather Evolution**. A window opens up:



The following parameters may be defined:

- **Channels**

The acquired Weather data stored in a CMG datafile that can be plotted.

Different types of Weather data can be available. Only one channel can be displayed at a time (because scales are very different from one Weather data to another, displaying several on the same scale would not be relevant). To display several Weather data channels, It is recommended to open several Weather Evolution windows, then arrange them using the

command **Window / Arrange vertically**, and then activate the function **between windows** from the main toolbar.



**Link cursors**

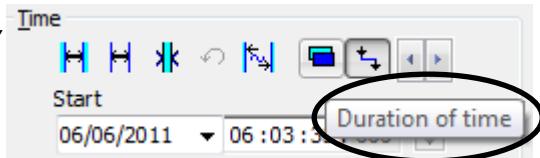
#### ▪ **Timetable**

Specify the beginning and ending time of the file section to plot (the format of this selection is **dd/mm/yy hh:mm:ss:ms**) or the beginning time and the length of the section to take into account.

Icons  are used to:

-  Select the **entire file** (i.e., data over the total length of the file)
-  Select the **entire channel** (i.e., data over the total time length of the channel)
-  Select data **between cursors** placed on the plot
-  Go back to original times
-  **Round up times** (rounding calculation depends on the total duration of display)
-  Select whether to display **ending time or duration**
-  **Link** starting and ending cursors.

 *Hover the mouse over the button to display tooltip describing the associated function.*



#### ▪ **Base plot step (base period)**

The plot may be displayed using the default time base of the measured quantities in the datafile or a greater time base. The base period is the time period over which the indicators will be displayed (possibly recalculated if the base period is not the elementary timebase).

 *The terms "integration time" (IT) or "logging interval" are commonly used to describe the time base. One usually talks about elementary IT or recomposed IT.*

During acquisition, an elementary time base has been used to store the Weather data (multiple of the noise or vibration data IT). It is possible to recalculate/display Weather indicators according to a greater time base (for example 15-min) that is a multiple of the main elementary timebase. **dB Trait** adjusts automatically the base plot step (base period) to the nearest value that matches an elementary timebase multiple.

Similarly, it is not possible to recalculate/display Weather indicators according to a step that is smaller than the main elementary timebase.

 *When data are displayed over a timebase different of the elementary duration, the weather data are recomposed as follow:*

- All weather data, except for wind direction: arithmetic average
- Wind direction: vectorial average.

#### ▪ **Sources / Remaining sources / Residual (Not coded)**

Select in a list the nuisance sources to consider (or not) for the plot. If one wishes to display nuisance sources (box **Y/N** ticked) on the plot, they will be shown in different colours in order to differentiate them from the rest of the data.

If several sources are referenced, use the mouse to select the sources to display.

The option **Remaining sources** allows the user to plot all sources that have not been selected, except the Residual, as a single source named “Other sources”. This option may be useful to estimate the contribution of a source compared to all the other sources, for instance. The selection will be recalled as default value next time such a command is used.

 *This option is not active when no source is identified or when all the sources have been selected in the list.*

The option **Residual** allows the user to represent all the data in the file that have not been coded as a specific source. Any data not being linked to a source is considered as being part of the “Residual level”. The selection will be recalled as default value next time such a command is used.

 *When more than one channel are selected for the plot, the identified nuisance sources cannot be displayed on it.*

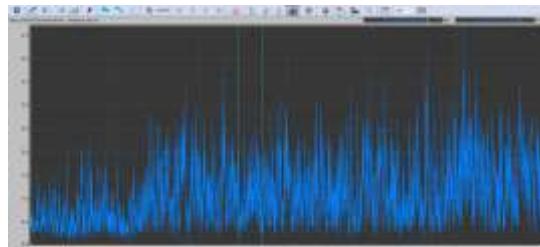
#### ▪ Graphic dynamic

Select the type of dynamic (Auto or Manual) for the scale of the ordinate axis of the plot. After validation, these settings will be applied to the plot.

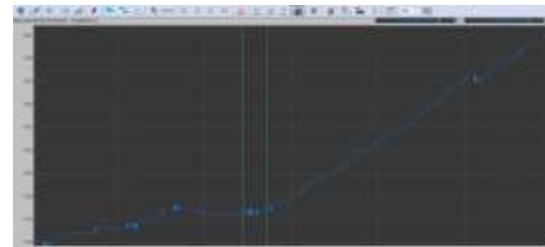
To automatically adjust the Y-axis values, select the **Auto** option.

To manually adjust the Y-axis values, select the **Manual** option.

After validation of the configuration parameters, the **Weather Evolution** window opens up. It includes a toolbar containing the same buttons as for the Time History window.



*Example of a wind speed time history plot*



*Example of an atmospheric pressure time history plot*

#### ▪ Wind rose and summary of Weather data

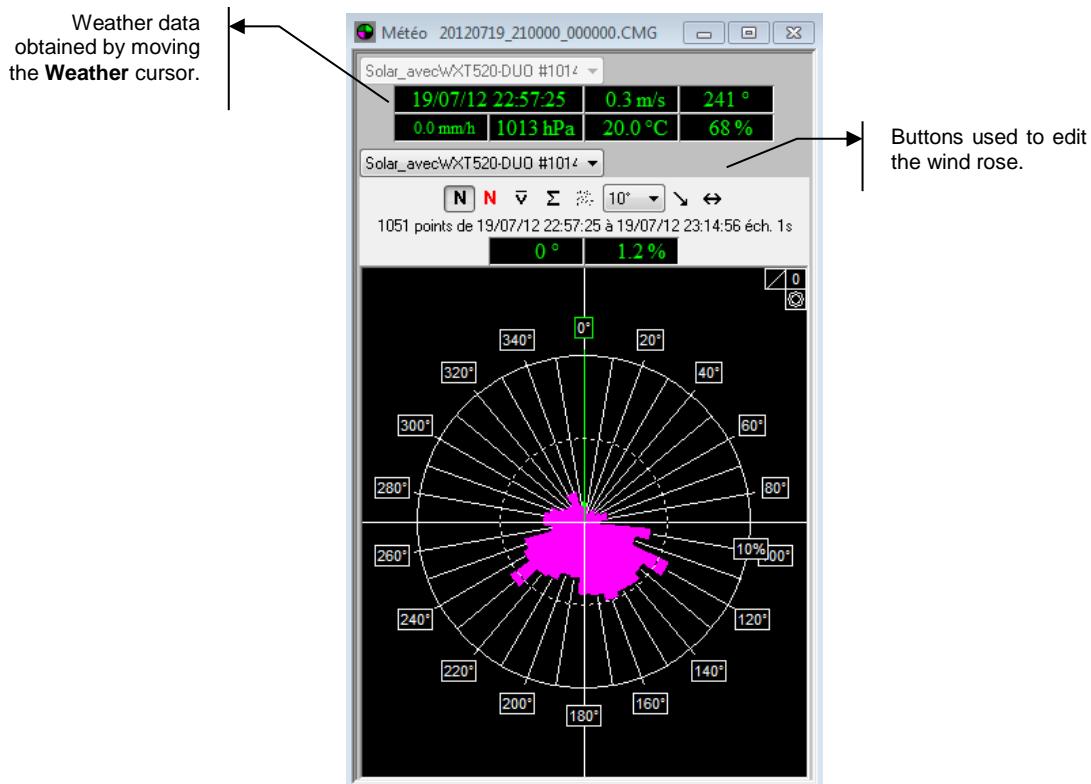
Time History and Weather Evolution windows include button  , which can be activated when weather data are available.

 Click on  to display a window that summarizes the weather data associated with the measurement.

A yellow **Weather** cursor is displayed on the time history plot: move this cursor to view the weather data at a specific moment.

The following weather data are displayed in the summary window:

- Date and time,
- Wind speed in m/s,
- Wind direction in °,
- Pluviometry in mm/h,
- Atmospheric pressure in hPa,
- Temperature in °C
- Moisture content in %.



Several buttons can be used to edit the wind rose:

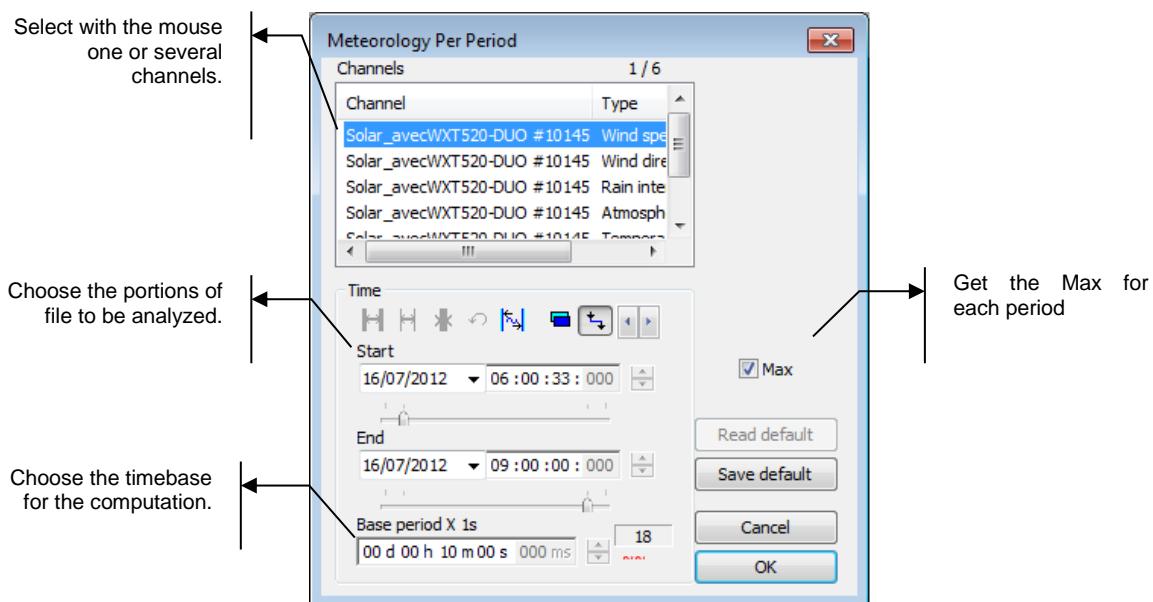
- Button for counting.
- Button for counting per wind speed.
- Button to get the average wind speed.
- Button to get the cumulative wind speed.
- Button to get a scatter plot.
- Drop-down list to edit the wind rose step.
- Button to show/hide the wind speed vector.
- Button to display all data.

- When data are displayed over a timebase that is different of the elementary duration, weather values are recomposed as follows:
- Wind rose: association of wind direction and speed data and display of fully recomposed V vector.

## 8.2 ANALYSIS OF WEATHER DATA PER PERIOD

The weather data of a measurement can be listed per period.

To do so, go to **Result / Meteorology per period**. The following window opens up:



The result obtained is a table of values:

File	DUO_with Weather Data_6parameters.CMG	
Periods	10m	
Start	7/16/2012 6:00:33 AM	
End	7/16/2012 9:00:33 AM	
Location	Solar_avecWXT520-DUO #10145	
Data type	Wind speed	
Unit	dB	
Period start	Mean	Max
7/16/2012 6:00:33 AM	0,6	1,5
7/16/2012 6:10:33 AM	0,6	2,1
7/16/2012 6:20:33 AM	0,7	2,3
7/16/2012 6:30:33 AM	0,6	2,1
7/16/2012 6:40:33 AM	1,1	2,8
7/16/2012 6:50:33 AM	1,3	3,4
7/16/2012 7:00:33 AM	1,2	4,1
7/16/2012 7:10:33 AM	1,1	2,6
7/16/2012 7:20:33 AM	1,2	3,2
7/16/2012 7:30:33 AM	1,1	2,7
7/16/2012 7:40:33 AM	1,2	3,2
7/16/2012 7:50:33 AM	1,2	3,5
7/16/2012 8:00:33 AM	1,1	3,5
7/16/2012 8:10:33 AM	1,1	4,3
7/16/2012 8:20:33 AM	1,2	3,4
7/16/2012 8:30:33 AM	1,6	4,7
7/16/2012 8:40:33 AM	1,2	3,1
7/16/2012 8:50:33 AM	1,6	3,4
Overall	1,1	4,7

*Weather data are recomposed as follow:*

- All weather data, except for wind direction: arithmetic average
- Wind direction: vectorial average.

# CHAPTER 9

## IDENTIFICATION OF SOURCES

---

**dBTrait** can be used to identify noise sources / vibration sources in order to calculate their contribution to the overall noise level and to perform analysis according to various regulations. The identification process is achieved by coding techniques specific to the software. On top of coding at the acquisition stage, **dBTrait** features three different type of coding techniques:

- **Coding using cursors (from a time history plot)**

A time condition is used to code a source on a time portion of the data. This command is activated only for time history plot display. The time section to code is the one in between the cursors on the time history plot.

- **Coding within known time limits (Source menu)**

A time condition is defined to code a noise source on a time portion of the data.

- **Coding using a threshold (Source menu)**

A threshold condition, with or without an additional time condition, is applied to identify data as a specific noise source.

Use these commands to define nuisance events and identify a portion of the data as a specific source. A name and a code number designate a nuisance source.

### 9.1 ADVANTAGES OF CODING

The source identification commands are powerful tools of **dBTrait** and **dBTrig**, as well as in measuring instruments (**DUO**, **FUSION**, **CUBE**, **ORION**, **Solo**). The source identification (on-line and/or off-line) allows the user to define very precisely the time portions of the measurement where nuisance events appear.

When processing measurement results, the source identification process allows the user to calculate indicators specific to a nuisance event, and compare it to overall levels.

- **Coding during acquisition (on-line)**

On-line source identification is possible during acquisition.

 *Coding with dBTrig: the function keys F4 to F9 can be used respectively for codes 4 to 9.*

Note that for **DUO**, **FUSION**, **CUBE**, **ORION**, **Solo**, as well as for the expert module of **dBTrig**, it is possible to perform simultaneous coding of nuisance sources.

- **Coding during processing (off-line)**

The first step of the off-line source identification process is to define a nuisance source. A source is defined by its identifier (a string of characters) and an internal identifier (its code number). The code number is a unique number between 1 and 15. Some of these codes are pre-set and cannot be modified (see more details below).

After defining the source, select a time portion of the measurement and code it as a specific nuisance source. The identification itself follows precise rules and may be performed using various methods (cursors, known time limits, threshold, etc.).

When sources are identified, the following indicators may be calculated for each nuisance source:

Tables	Graphics
Particular Leq Partial Leq SEL, LMIN, LMAX Counting sources' appearances Contribution of sources to overall level	Time history Statistical distribution

## 9.2 SOURCE IDENTIFICATION TECHNIQUES

We describe in this paragraph the principles and the techniques used in 01dB programs to identify a noise source.

### 9.2.1 Time condition

The noise source is defined by time limits (start and end).

This may be used to identify a source whose appearances are known (**Source / Identifying using time condition**) or from a time history display (**Time history or Graph / source between cursors**). In the latter case the start and end times read automatically at cursors' positions.



The "Identify" icon of the time history plot toolbar provides direct access to source identification using a time condition between cursors.

### 9.2.2 Threshold condition

The threshold condition provides **automatic** identification of the multiple appearances of a given noise source / vibration source. The data to code (Short Leqs of the overall noise level or a frequency band, time weighted levels, Peak levels, etc.) corresponds to noise levels between minimum and maximum user-defined thresholds. Two criteria that are more sophisticated may also help to make the threshold coding more precise. Firstly, use a condition that set the duration of each source appearance. Secondly, an extension before and after the threshold may be required, usually for moving sources (getting closer and going away).

- 📘 Example 1: a car is usually defined by a minimum threshold of 60 dB, a maximum threshold of 80 dB, a minimum event duration of 1 second and a maximum event duration of 10 seconds.
- 📘 Example 2: a plane may fly over the site where the car noise from the previous example is measured. It may happen that the noise level of the plane is similar to the average level of cars' passing by, and the same minimum threshold of 60-dB and maximum threshold of 80 dB should be used for source identification. Different duration limits may be set to distinguish the two sources (minimum event duration of 30 second for planes can be used for example).

Source appearances can be "extended" by defining durations (in seconds) before and after that will be considered as belonging to the defined sources. This option, which is very useful, allows coding file portions that do not fulfill the level criteria.

Coding using a threshold condition is the most performing source identification technique as the user defines the Leq pattern (minimum and maximum levels and duration) of a source but it requires a good knowledge of the coding principles. We recommend this method for advanced users.

Once the source identification criteria have been defined, noise data that fulfils the conditions are affected to a given noise source, according to a priority rule based on the code number.

### 9.2.3 Definitions of code numbers

The code number of a source is the unique internal identifier of a defined nuisance event. It varies between 1 and 15. Each elemental time period, of each measurement channel independently, may have a different associated code number. The following list describes the code numbers:

- **Code 1 : Eliminated**

Any data coded with code 1 will not be taken into account for post-processing functions, and data plots. This code eliminates external annoyances, which have nothing to do with the noise environment to study (for example, ones can eliminate from a measurement the noise made by the operator or a third party).

-  *During acquisition using dBTrig, the software associates code 1 to the measured short Leq data in pause mode. The corresponding time portion will be coded as eliminated in the datafile, and will therefore be ignored for any subsequent post-processing operations.*

- **Code 2 : Overload**

This code is generated automatically during measurement or data transfer. All values coded 2 should usually not be taken into account in calculations (assimilated to code 1), as the recorded values were not within the linearity range of the instrument, at the time of acquisition.

- **Code 3 : Underload**

This code is generated automatically during measurement. All values coded 3 should usually not be taken into account in calculations (assimilated to code 1) as the recorded values were out of the linearity range of the instrument, at the time of acquisition.

- **Code 4 : Calibration**

Specific to Oper@ Noise Monitoring Station. This code is generated automatically during measurement.

- **Codes 5 to 24 : Noise sources / Vibration sources**

These codes are available to code up to 20 different noise events. At the time of acquisition, on-line coding may be performed from code 5 to code 9 for manual coding, and higher range of code numbers for automatic coding.

- **Code 32 : Sensor Default**

Specific to ORION Vibration Monitoring Terminal. This code is generated automatically during measurement.

- **Code 33 :Background (before dBTrait 6 : code 15)**

When no source is specified, the Residual (code number 33) is applied. This is the default code for the measured data.

-  **Warning:** *The priority rule may be transgressed for explicit coding with this number.*

-  *The codes 1 (Eliminated), 2 (Overload), 3 (Underload) and 33 (Background) are pre-set and the values are automatically coded when creating the CMG data file if necessary.*

-  *The codes 4 « calibration » and 32 « sensor default » are systematically eliminated from calculations and recombinations. Except if explicitly requested, by selecting them.*

-  *The code 32 « sensor default » can be visualized in the **Anomalies** bar and in the **Source** bar at the same time.*

-  *The code 33 « Background » can be renamed. To proceed, close dBTrait and open the dBTrait.ini file. Add **NotCodedName=other name** in the [Settings] section.*

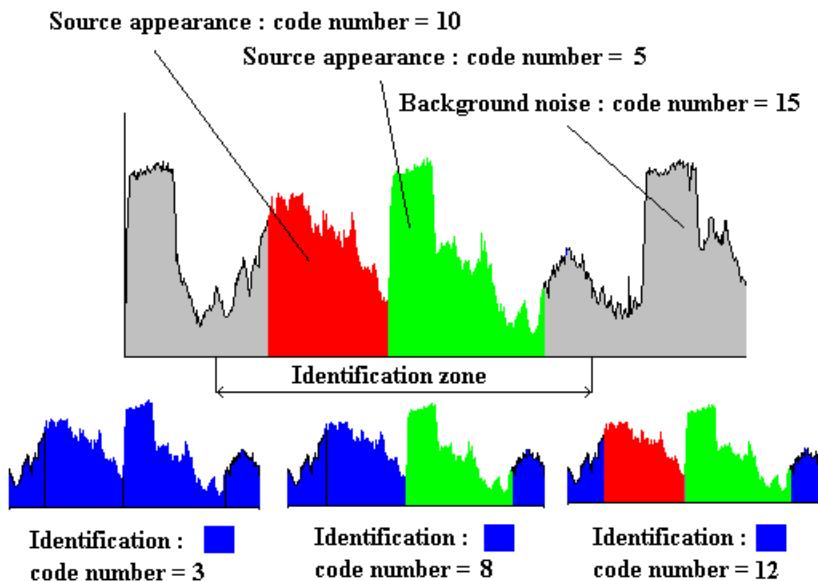
### 9.2.4 Code number priority rule

In Acoustics, the short Leq method assigns a source code to each elemental time period. Each source is identified by its code (a number between 1 and 15). If there is no source identified, the data is considered as a source type 'background'. Only one source may be associated with each time portion. The priority rule has been introduced to manage complex nuisance situations when two or more sources are active at the same time.

This rule is based on the postulate that a unique code is associated with a source. The code number is defined either automatically or by the user. When a coding operation is running, **dBTrait** may face a particular situation when the user is requested to code a new source and that a previously existing source had already been associated to the same time portion. The priority rule solves the ambiguity: **the source with a lower code number has priority over a source with a higher code**. If the old source has priority (lower code), no coding will be done at this time moment. If the new source has priority, it will replace the old one at this time moment.

Some code numbers are reserved. The code 15 (highest possible) is reserved for background noise. Any new source will have a lower code, and thus have priority over background noise. The code 1 is reserved for the eliminated periods. A time period coded with code 1 is eliminated from all subsequent operations (plots, listings, and calculations). The code 2 is often used for overload, and the code 3 for underload coding.

**Example:** Consider a time portion of a source appearance (code 8) that the user wishes to assign to another source. It will only be possible if the current source code number is lower (less than 8). In this case, the previous source appearance will be split into 2 noise events separated by the new source appearance. Otherwise (code greater than 8), the previous source



appearance will remain unchanged.

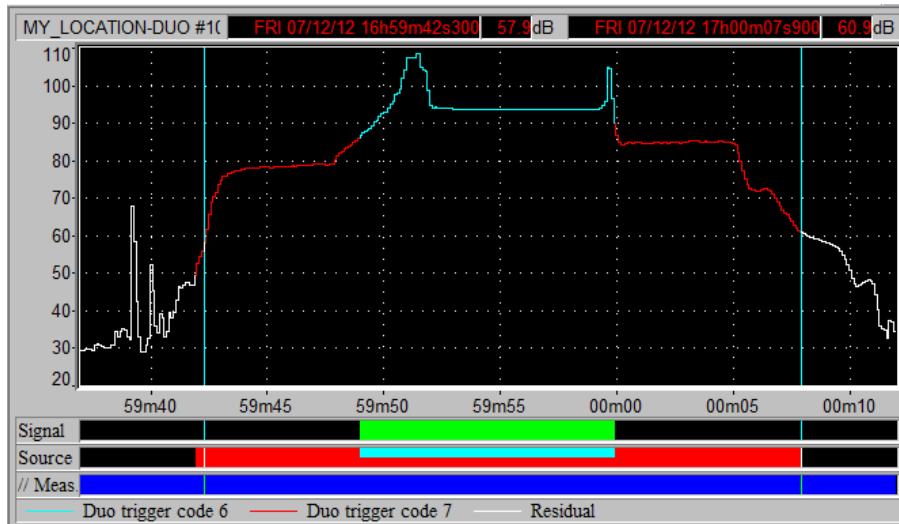
The example above shows the importance of the source code number when identifying a noise source. Depending upon the source code number, the result of identification may change and lead to different calculation results.

- ❖ At the time of processing, when deleting a noise source, all data attached to the current source are assigned to the background noise, as it is not possible to restore the previous source identification. **Therefore, we recommend being very careful when coding sources, as this operation is irreversible.**
- ❖ The priority rule is not respected when the operator re-code part of the data with the source "background" (code 15). In this case only, existing codes will be deleted and overwritten.

With **dBTRIG32 expert module**, it is possible to code simultaneously noise data. In this case, the priority rule is still valid but the data coded with a higher code number will be overwritten.

If, for example, the data that lies within the identification zone in the above example are coded with the numbers 10 and 5 simultaneously, and that the user delete the code 5, the noise data will still be coded with the code 10.

**Example:** measurement performed with DUO: code 6 corresponding to levels higher than 90 dBA; code 7 corresponding to levels higher than 60 dBA.



Code 6 has priority over code 7 (on the time history plot, blue “hides” red). However the different detected codes are shown in the source bar.

- 📖 Note the code correspondence between DUO and dBTrait:  
Trigger DUO code 6 → corresponds to dBTrait code 10  
Trigger DUO code 7 → corresponds to dBTrait code 11



When all nuisance sources have been coded, one can revert to the “residual” code (code 15) by deleting the desired sources. We recommend that you be extremely cautious as this operation is irreversible.

Using the **expert module** of **dBTrig** software, as well as **DUO**, **FUSION**, **CUBE**, **Solo**, **ORION**, one can perform multiple coding of the data. In this case, the priority rule still applies. However, data coded with a higher code number are not overwritten. If, for instance, data included on the above identification area are coded with code numbers 10 and 5 simultaneously, and if the user deletes code 5, data will still be identified with code 10.

- 📖 The priority rule does not apply if the operator recodes part of the data with the “residual” source, in which case existing codes are deleted.
- 📖 Note: in practice, the code does not appear in the Source bar if the end of the event is outside the displayed period.

### 9.3 CODING COMMANDS IN dBTRAIT

Let us now describe each coding commands of **dBTrait**.

#### 9.3.1 Source between cursors

It is possible to identify noise events by coding data on a time history plot by using the

command  or **right Click / Source between cursors** for a time history plot or a spectral time history plot.

The command  or **Right Click / Next appearance** can be used to find the next appearance of the same type of source on the time history plot.

##### New in dBTrait 6.3:

Using the **Next appearance** feature, dBTrait now places the 2 cursors at the start and end of the next appearance of the source

##### New in dBTrait 6.3:



The command  or **Right Click / Adjust cursors to the source** (or double click on an occurrence in the Source bar) can be used to select an occurrence at the cursor position.

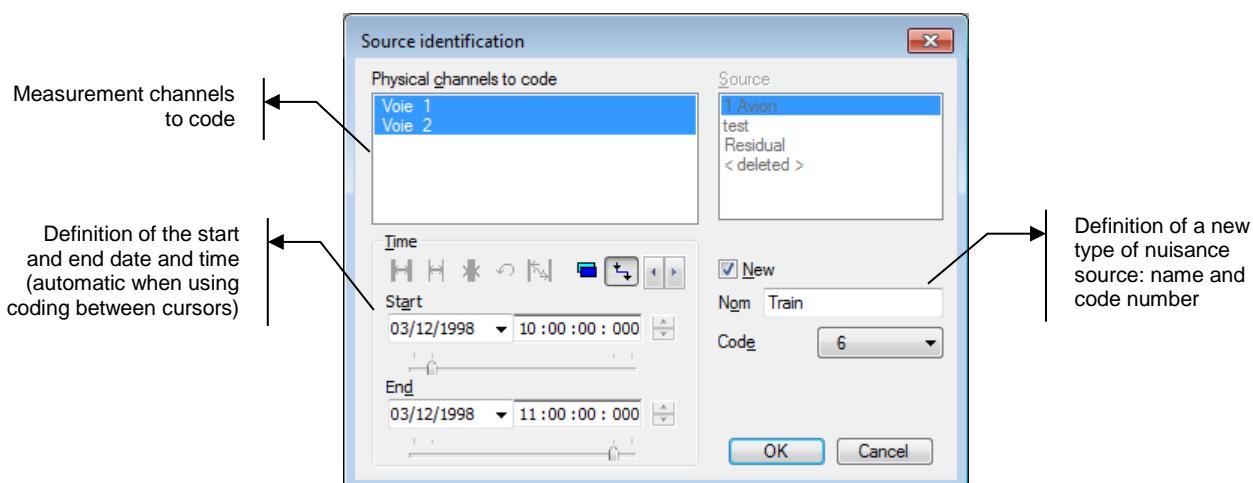
 For further information on coding sources from a plot, consult the §4.14.

#### 9.3.2 Identifying using time condition / Source menu

Use the command **Source / Identifying using time condition** to define the parameters of the source identification process using a time condition. The only difference with the 'source between cursors' command is that the time parameters (start and end) are not defined by the cursors' position on the plot.

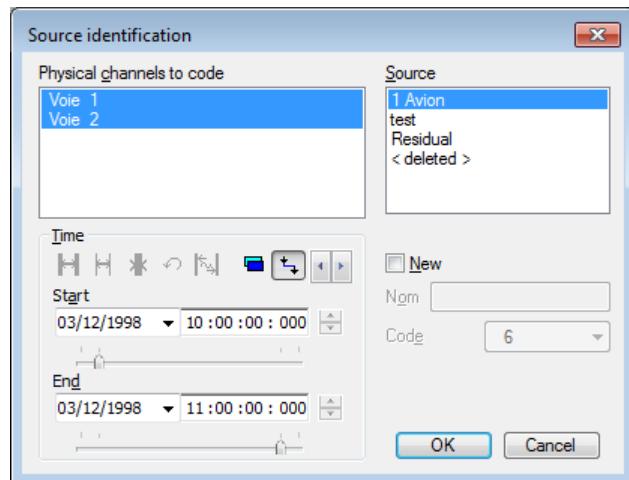
There are two possibilities:

- The nuisance data to code corresponds to a new noise source / vibration source, not yet defined in the software. Tick the **New** box and give a **name** and a **code** number to the source.



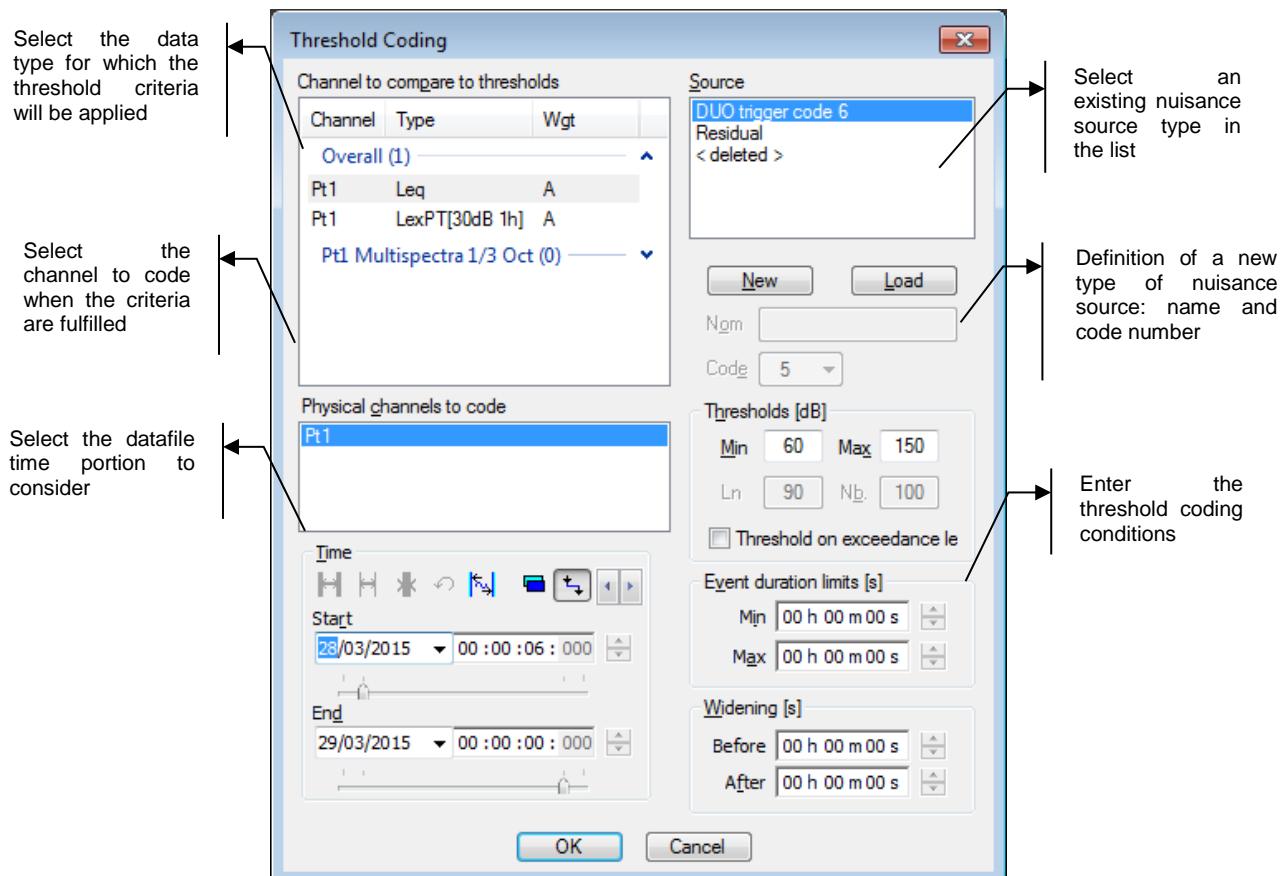
- The nuisance data to code corresponds to an existing noise source / vibration source, already defined in the software. Uncheck the **New** box and select in the **source** list a source type.

Noise source coding can be applied to one or several measurement channels. In the field **Channel(s) to code**, select the appropriate channels.



### 9.3.3 Identifying using threshold condition

Use the command **Source / Identifying using threshold condition** to define the parameters of the source identification process using a threshold condition. To illustrate threshold coding, let consider the example of a car. A minimum threshold of 60 dB, a maximum threshold of 80 dB, minimum event duration of 1 second and maximum event duration of 10 seconds usually defines a car pattern.



First, select the **channel to compare to the threshold** conditions. The software will scan through the data contained in this channel and look for a time portion that fulfils the threshold criteria. In the field **Coding domain**, select all the measurement channels for which the data will be coded when the threshold conditions are fulfilled. It is possible to define a **new** type of nuisance source or to select an existing type of **source** in a list as before. It is also possible to **load** nuisance sources that have been previously defined in a different file (sources' information in the file **sources.ini**)

The threshold coding technique of **dBTrait** obeys to three criteria (or conditions):

- **Threshold conditions (Threshold field)**

Define the minimum and maximum levels in dB for the type of source to identify. In our example, select 60dB as minimum and 80 dB as maximum levels. All measured levels in the datafile that are contained in the range 60dB to 80dB will meet this first requirement.

- **Option Threshold on exceedance level (statistical level)**

Coding is carried out on the basis of a sliding statistical level ( $L_n$ ) (i.e. the histogram on which the  $L_n$  calculation is done is updated every elementary timebase).

- **Duration conditions (Event duration field)**

Define the minimum and maximum event duration in seconds for the type of source to identify. In our example, select 1s as minimum duration and 10s as maximum duration All measured levels in the datafile that fits in the range 60dB to 80dB and that lasts for 1s at least and 10s at most will meet the requirements.

- **Enhancement conditions (Enhancement field)**

In order to extend the measured data coded according to the above conditions; define the enhancement duration before and after the coded event. In our example, for a car passing-by, the time portion of acoustic data coded, as a Car noise source will be extended by 1s before and after the actual identified event.

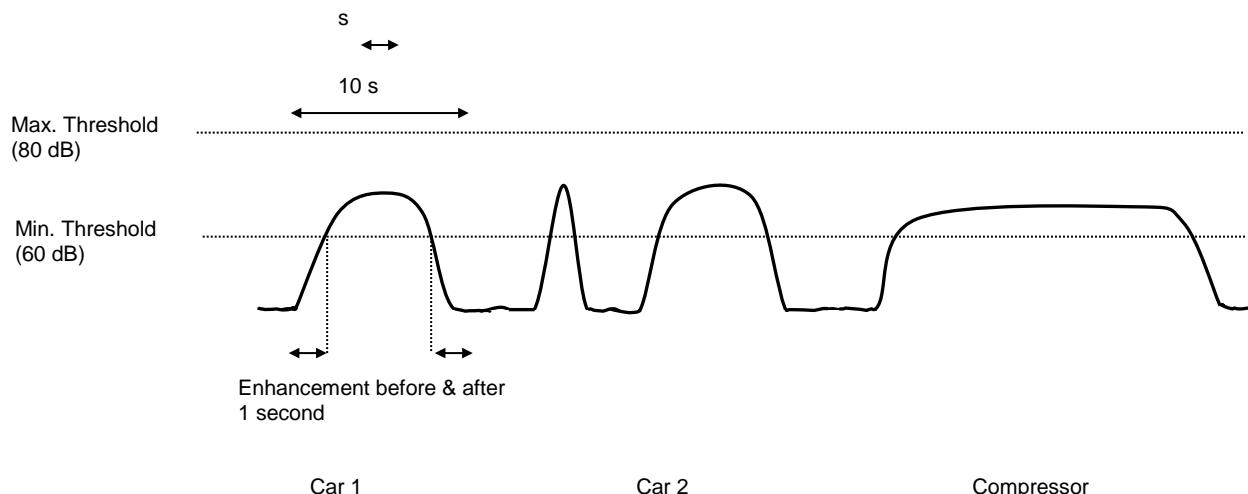


**Warning: for measured data to be coded with this command, the levels, duration and enhancements criteria must be fulfilled at the same time.**

### 9.3.4 Example of threshold coding

In this (theoretical) example, the threshold conditions have been defined

- Minimum threshold = 60 dB / Maximum threshold = 80 dB
- Minimum event duration = 1 second / Maximum event duration = 10 seconds.
- Enhancement duration before and after the event = 1 second



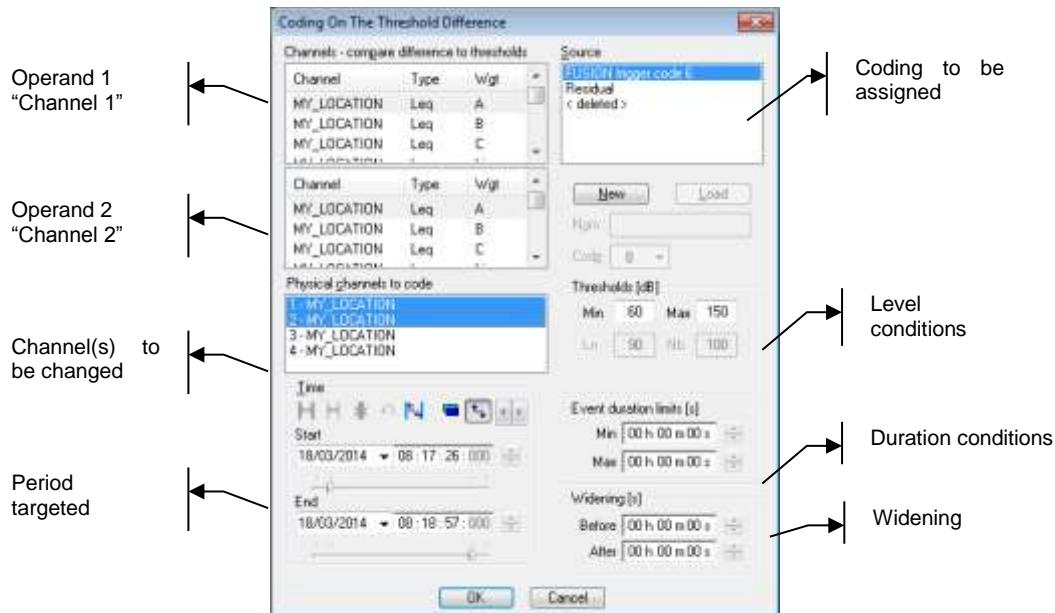
**dBTrait** will automatically code car no 1 and car no 2 but will not code the gunshot event (because this event duration is less than 1 second), nor the compressor event (because this event duration is more than 10 seconds).

The enhancement duration before and after the coded event allows the program to code as well data that is obviously part of the event, but for which their values are below the minimum threshold.

### 9.3.5 Coding on the threshold difference

Use the command **Source / Coding on the Threshold Difference** to define the parameters used for coding on the threshold difference. The principle of this function is similar to the standard Threshold coding, but applies to the time history difference.

The target for this coding is the only difference to standard threshold coding: the coding is applied to a level difference.



The use of Coding on the Threshold Difference allows the automation of the discrimination of unwanted noise. By coding unwanted noise as “eliminated”, it is not taken into account in the calculation of neighbor noise.

Firstly, the measurement channels that make up the time history difference must be chosen. Operation format is as follows:

Channel in first list – Channel in second list

- **Physical channels to be coded**

Select all measurement channels to be coded as a function of thresholds.

Physical channels correspond to an instrument's measurement channels.

- **Time**

This option allows the application of the coding on the threshold difference to a part of the total measurement, if desired.

- **Source**

It is possible, as for coding within time limits, to define a new noise source / vibration source or use an existing source. It is also possible to **load** source definitions performed in other analyses (in the file **SOURCES.INI**).

By default, the creation of a new source is proposed. Click on the **New** button to select existing sources.

Coding on the threshold difference in **dBTrait** is governed by three conditions:

- **Level condition (“Threshold” field)**

Define the minimum and maximum levels in dB for the type of noise source to be identified. Thresholds may be negative for time history differences.

- **Event duration condition (“Event duration limits” field)**

Define the minimum and maximum event duration limits in seconds for the type of noise source to be identified.

- **Widening condition (“Widening” field)**

To take into account data that do not fulfil the level and event duration conditions, define widening durations before and after in seconds for the type of nuisance source to be identified.

For any source event fulfilling the level conditions, the data corresponding to the widening duration specified before and after will also be considered as belonging to the source.

 **Warning, to be threshold coded, the data must simultaneously fulfil the level, event duration and widening conditions.**

### 9.3.6 Example of Coding on the threshold difference

In the case of a complaint due to noisy neighbors, two measurements were performed:

- Channel 1: at the plaintiff's
- Channel 2: adjacent to the incriminated source



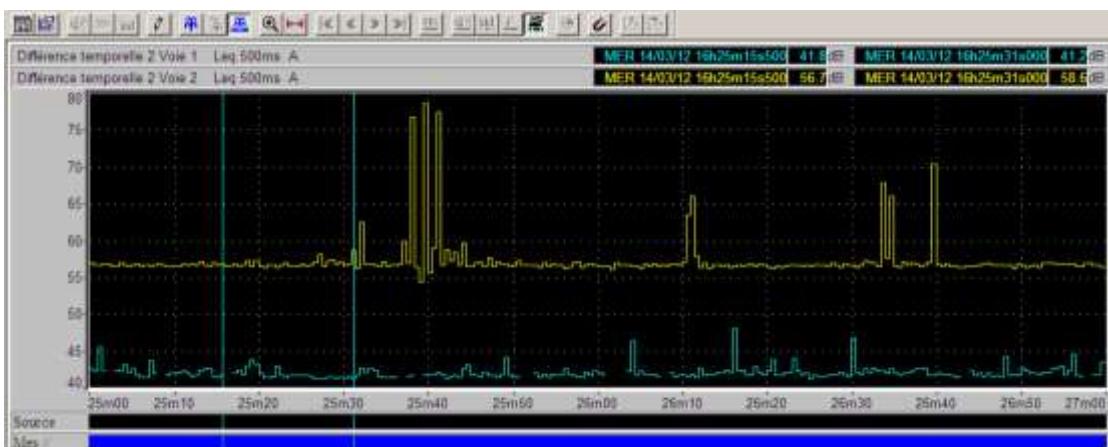
*Time history difference between Channels 1 and 2 (average value of ~ -15 dB)*

In the previous time history difference, any peak greater than -15 dB represents a noise level that is greatest at measurement point 1.

These noises could not have been generated by the incriminated source (at point 2) and must not be taken into account in the calculation of neighbor noise. Coding on the threshold difference in “elimination” mode allows the removal of these peaks.

**Settings:**

- To be applied to Channel 1 only
- “Elimination” coding
- Minimum threshold: -14 dB
- Maximum threshold: 0 dB (no level exceeds this value)
- Minimum duration: 1 second
- “Elimination” coding

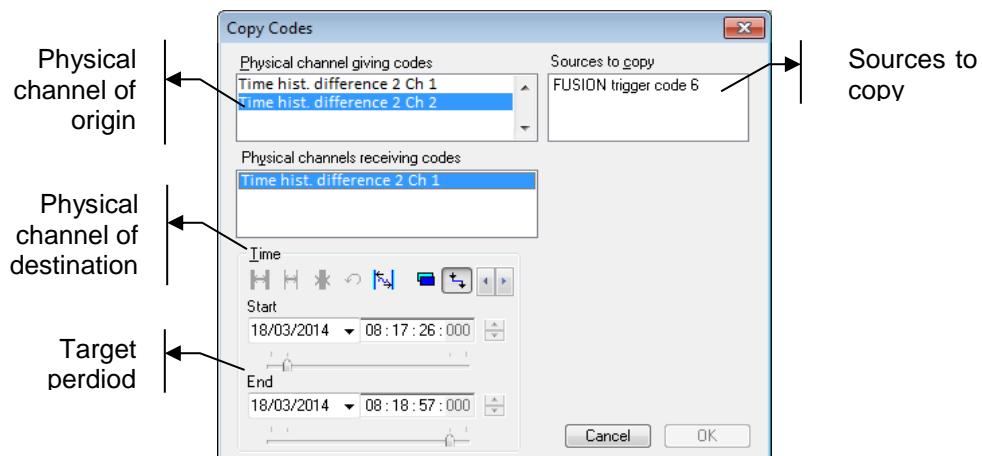


Time histories for the two channels after coding on the threshold difference on channel 1 (blue)

The data fulfilling the previous conditions have effectively been eliminated and are no longer visible in the time history.

### 9.3.7 Copy codes

Use the command **Source / Copy codes** to duplicate one or more sources between the campaign's physical channels. This function is very useful for synchronous physical channels.



- **Physical channel giving code, and Physical channels receiving codes**

The original physical **channel** comprises the sources to be copied. It is possible to copy codes to one or more target **channels**.

- **Sources to copy**

After selecting the original physical channel, the list of corresponding sources is displayed. It is possible to copy one or more sources to the target channels.

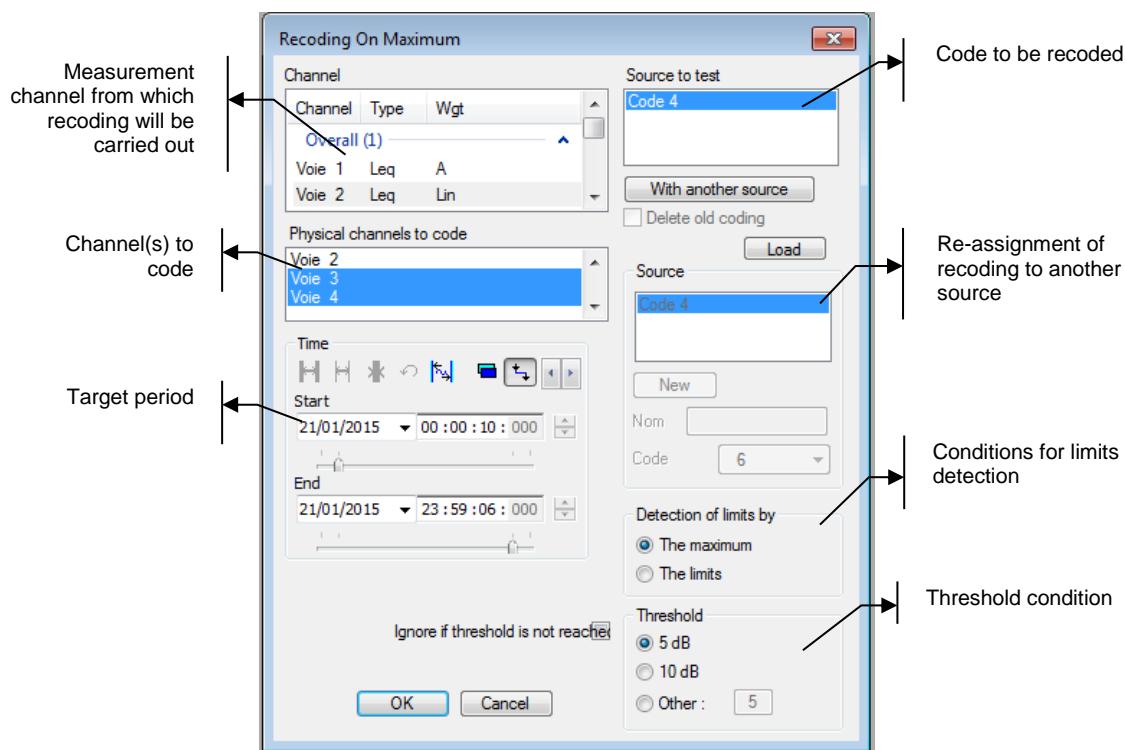
- **Time**

The user may choose, via this part, to copy only part of the measurement originating from the original physical channel.

 **The command *Copy Codes* is not available if no source is present in the measurement campaign.**

### 9.3.8 Recoding on maximum

Use the command **Source / Recoding on maximum** for recoding a source “around his max”.



#### ▪ Channel

Select the measurement channel from which recoding will be carried out.

#### ▪ Physical channels to be coded

Select all measurement channels to be recoded.

*Physical channels correspond to an instrument's measurement channels.*

#### ▪ Time

This option allows applying the recoding to a part of the total measurement, if desired.

#### ▪ Source to test

Select the source to be recoded. Alternately, it is possible to select/define a new noise source / vibration source or use an existing source.

#### ▪ With another source

Using this button allows for applying recoding from the **Source to test** to another source

- Either an existing source from the measurement session
- Or a new source (in such case, a name and code number must be assigned to the new source).
- It is also possible to **load** source definitions performed in other analyses (in the file **SOURCES.INI**).

#### ▪ Source

Re-assignment of recoding (if activated).

#### ▪ Detection of the new limits from

Allows for choosing the recoding method: either by the maximum, or by the limits (i.e. by the ends).

#### ▪ Ignore if threshold is not reached

Allows for defining what to do in the case where the **threshold levels** are not reached.

**Principle of the recoding on maximum function:**

The **Recoding on maximum** function allows for redefining time limits of a segment of existing code, based on the observed maximum in the corresponding time interval, and by keeping the segments within +/- XdB.

For each coded segment of **Source to test**, within the defined period:

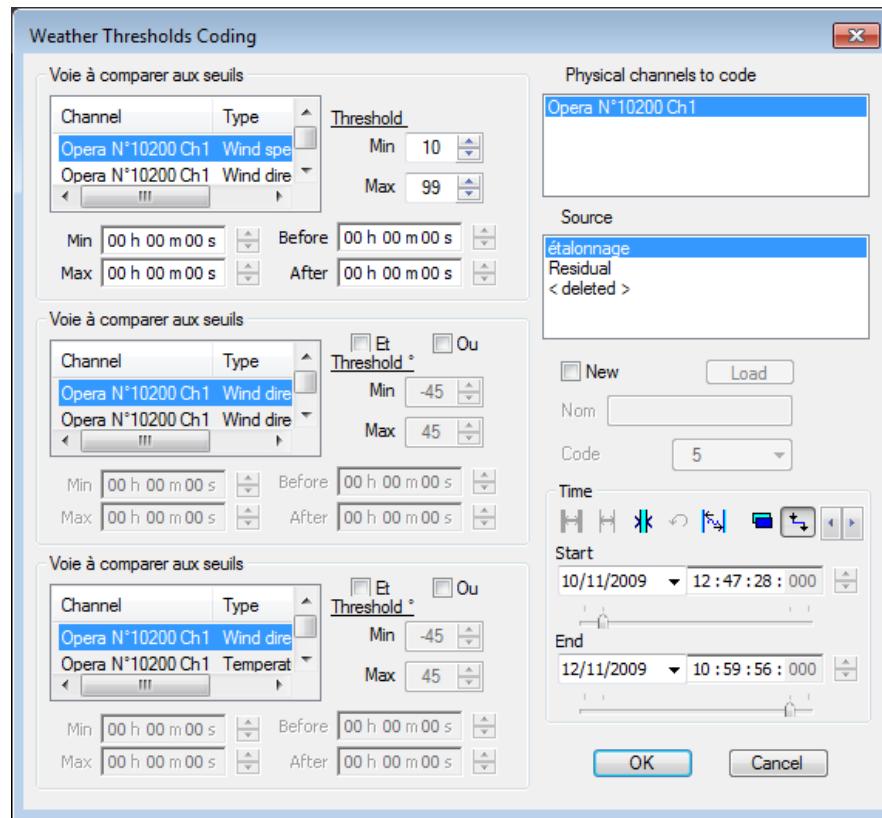
1. The segment is identified, with its reference beginning and ending dates
2. The maximum in this time interval is spotted
3. From this maximum, the detection threshold ("DT") are defined (at -5 dB, or -10 dB, or -x dB)
  - a. Case of **Detection of the new limits from the Maximum**: the limits detection goes to the left and to the right of the maximum and stops when the level passes under the DT level.
  - b. Case of **Detection of the new limits from the Endings**: the limit detection start from the reference endings (beginning and end) towards the maximum, and stops when the level passes over SD.
4. If the DT is not crossed from the left or right (or both):
  - a. If option **Ignore if threshold is not reached** is ticked: no recoding is applied. The software proceeds to the next segment.
  - b. If option **Ignore if threshold is not reached** is unticked: the undetected limits remain unchanged (reference beginning, reference ending, or both). Then recoding is applied, on the original source or on the previously defined new source. Of course, if nothing has changed, neither left ending nor right ending, neither Source to test, nor physical channel to code: no recoding is applied.



*If there is no maximum within the time interval of a code (for instance: upward slope), the recoding function does nothing, and skips to the next code time interval to be recoded.*

### 9.3.9 Coding on Weather Thresholds

Use the command **Source / Weather thresholds coding** in order to code a nuisance source on the basis of meteorological conditions.



This function is not described in this User Manual. If needed, please ask for some help to 01dB Technical Support.

### 9.3.10 Undo coding / Redo coding

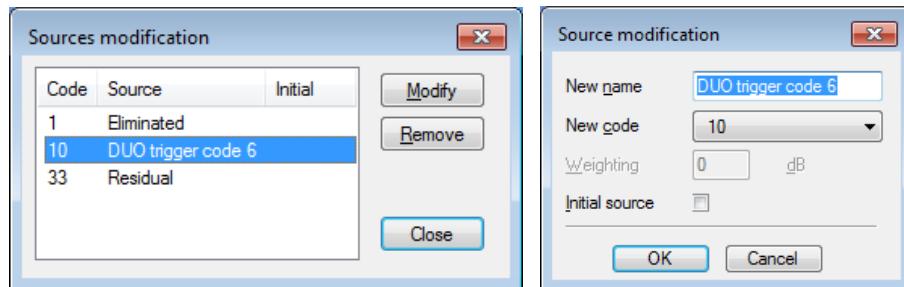
Use the command **Source / Undo or Redo coding** to cancel or repeat coding-related actions. Undo coding & Redo coding applies to the following coding functions:

- Coding within the known time limits
- Threshold coding
- Coding on the threshold difference
- Copy codes
- Recoding on maximum
- Weather threshold coding

### 9.3.11 Modifications of existing sources

Use the command **Source / Modify** to change or remove the different types of existing sources in **dB Trait**. The following dialog box is displayed on screen:

Select a source type in the list and click on **Modify** to edit the name and the priority code number of the source or click on **Delete** to completely remove this type of source from the datafile



The data of a nuisance source can also be fully deleted by clicking on **Remove**.

The **Weighting** field in dB corresponds to a correction factor that will be applied to all data coded with this type of noise source. It can be used, for example, to simulate how overall levels would be affected if the given noise event was reduced by N dB.

To activate this option, please contact 01dB Technical Support.

### 9.3.12 Convert time signal records into sources

By using the command **Aux / Audio / Convert to source**, it is possible to code the measured data time portion corresponding to a time signal record duration.

The user select the time signal records to convert (giving the start and end times for the coding operation) as well as an existing or a new source.

### 9.3.13 Convert comments into sources

By using the command **Aux / Comment / Convert to source**, it is possible to code the measured data time portion corresponding to a comment duration.

The user select the comments to convert (giving the start and end times for the coding operation) as well as an existing or a new source.

### 9.3.14 Definition of Sources available by default

It is possible to define default available sources when opening **dB Trait**.

To do this, you must modify the **dB Trait.ini** file (the software must be closed). Look for the section **[CommonSources]** and add it if it does not exist. Then under the section **[CommonSources]** add the desired code(s) as follows:

```
[CommonSources]
n5=NomCode5
```

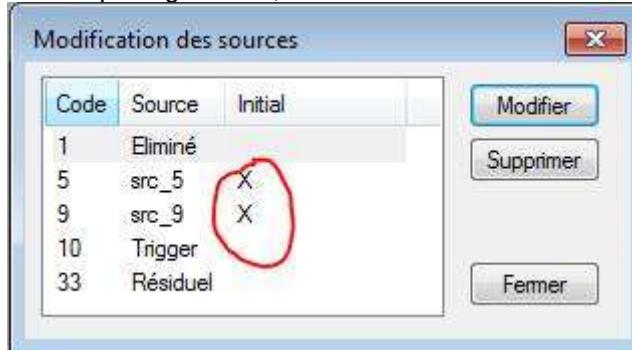
n9=NomCode9

After saving dBTrait.ini and restarting the software, the content of the [CommonSources] section is automatically completed by adding a "w" parameter for source weighting (default weighting to 0, i.e. no weighting).

Example :

```
[CommonSources]
n5=NomCode5
w5=0
n9=NomCode9
w9=0
```

When opening dBTrait, the sources thus defined are available by default:



Note : the sources available by default are marked « Initial ».

If, however, at the start of a campaign, codes with identical N° to the N° of the sources available by default are present, they have priority and the sources available by default are not made available.

Note: Optionally, the "Weight" option can be defined by the user from the beginning in dBTrait.ini (the value is in 1/10th of dB). This specific parameter is used by the Takt (German regulation), if the SourceWgt parameter is set to 1 (under the section [Settings]).

### 9.3.15 ELVIRA coding (specific feature)

**Principle of the ELVIRA coding:** each flight recorded in .PTR files is transformed into an Airplane event (= Source coding)

See details in dBTrait's User Manual in French version.

# CHAPTER 10

## STATISTICAL DISTRIBUTION PLOTS

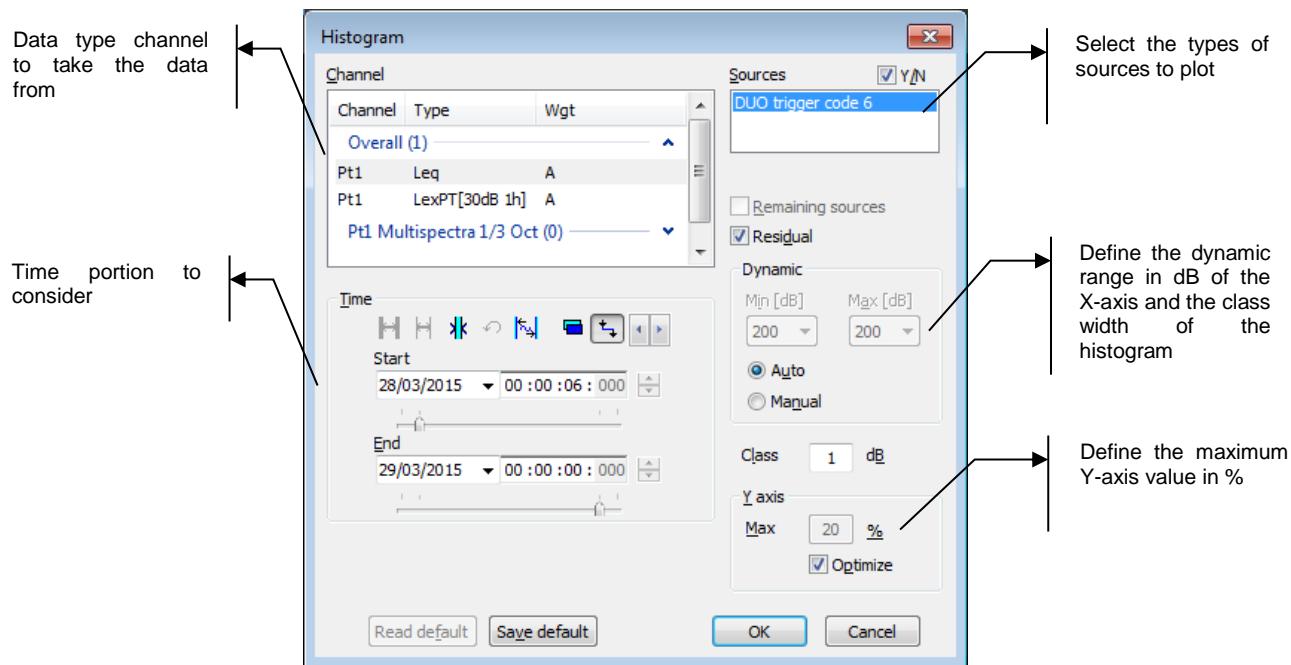
**dBTrait** allows the user to calculate level distribution and cumulated distribution plots.

- ❖ *Histograms are not available for L<sub>p</sub> x,y,z (estimated groundborne noise level, measured by ORION version Firmware 1.5 or higher).*

### 10.1 HISTOGRAM - AMPLITUDE DISTRIBUTION PLOT

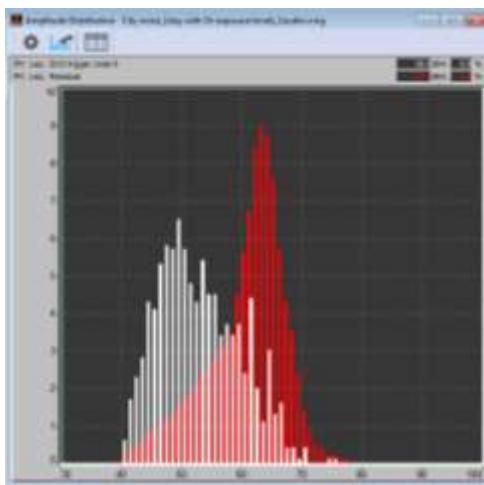
The amplitude distribution plot is an interesting tool to compare the level distribution of various noise or vibration sources in percent (including the comparison of level distribution of various nuisance sources). **dBTrait** allows the amplitude distribution to be plotted with or without existing sources and the background noise on the same graph.

Use the command **Visualization / Histogram** to plot the amplitude distribution of noise levels. The following dialog box appears on screen:



In the field **X-axis**, it is possible to set automatically the dynamic range of the X-axis corresponding to the noise or vibration levels' distribution by ticking the **Auto** box. The width of each **class** is defined in dB. This value can vary from 0.1 dB to 20 dB in 0.1dB steps.

It is sometimes interesting to compare the level distributions of one of the main sources and the residual levels (data not coded in the datafile). In the below example, we will compare the amplitude distributions of data coded as **Train** to the **Residual**. The resulting distribution plot is shown below:



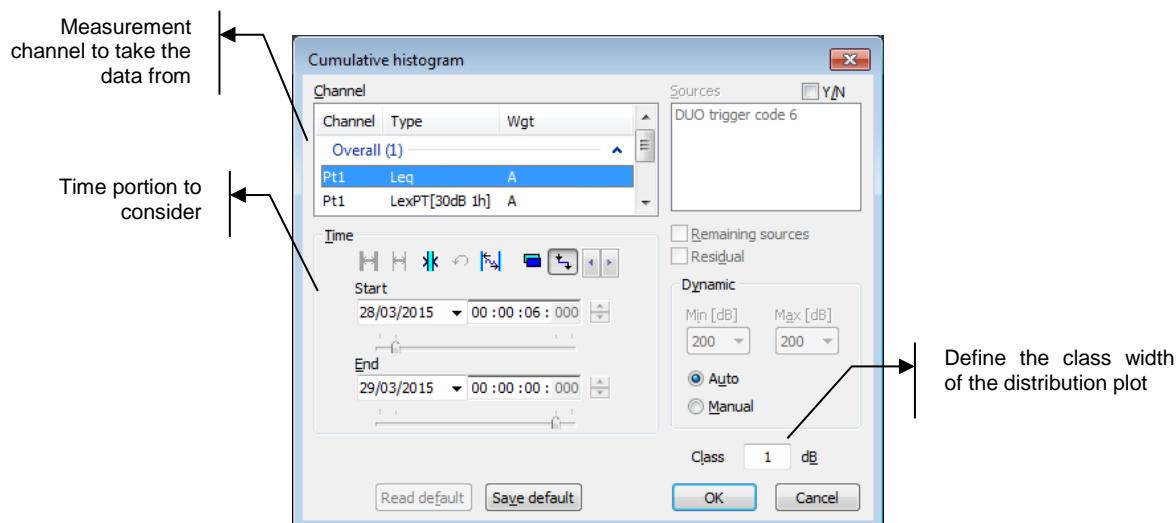
This plot represents the percentage of noise data contained in 1dB level classes for the data coded as "Duo Trigger code 6" and the rest of the data.

If the option **Remaining Sources** was ticked, a third distribution would have been plotted, that would represent the amplitude distribution of the rest of remaining sources (other source-coded data in the datafile).

## 10.2 CUMULATIVE HISTOGRAM

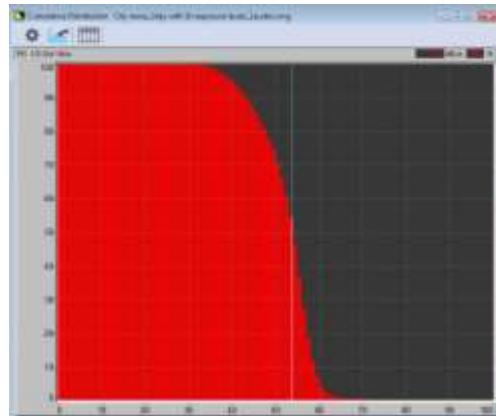
The cumulative distribution plot is used to display statistical indices (or percentiles) graphically. The percentiles may be calculated with a narrow integration step (0.1 dB), which allows particularly accurate study of the level distribution. The cumulative distribution is displayed regardless of the existing sources (overall result).

Use the command **Visualization / Cumulative distribution** to plot the statistical distribution. The following dialog box appears on screen:



The width of each **class** is defined in dB. This value can vary from 0.1 dB to 20 dB in 0.1dB steps.

Below is a typical cumulative distribution plot (statistical indices in classes of constant width as a function of level in dB):



In the above example, the statistical index **L64.5 = 48 dB(A)**. It means that the noise levels in the datafile are equal to or greater than 48 dB(A) during 64.5% of the time.

Similarly, the statistical index Lmin, corresponding to the minimum short Leq value of the considered time portion is equal to 40 dB(A) in our example. It corresponds to the index L100, the noise level that is exceeded during 100% of the time.

The statistical index Lmax, corresponding to the maximum short Leq value of the considered time portion is equal to 72 dB(A) in our example. It corresponds to the index L0, the noise level that is exceeded during 0% of the time.

# CHAPTER 11

## TABLE OF RESULTS (RESULTS MENU)

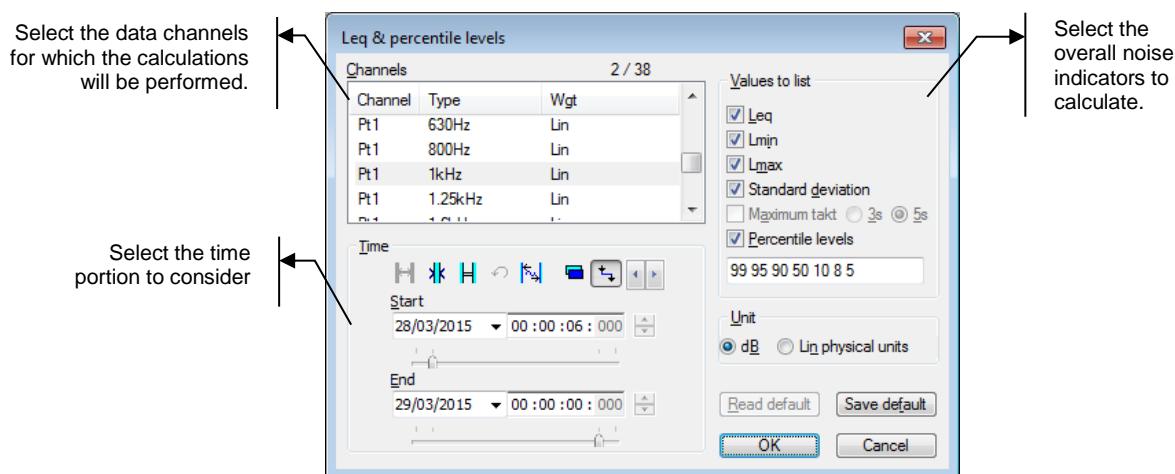
The dBTrait software can list many results as tables or charts. All commands described hereafter are available in the **Results** menu. Most of the indicators described in this chapter are defined in **CHAPTER 22**.

### 11.1 LISTING OF OVERALL QUANTITIES

The following functions allow the user to calculate overall noise indicators or overall vibration indicators without taking into account the different nuisance sources defined.

#### 11.1.1 Levels and Statistics (overall)

Use the command **Result / Levels and statistics** to calculate Leq, Lmin, Lmax values and statistical indices over a portion or the complete measurement file. The following dialog box appears on screen:



The software may calculate the following overall noise indicators:

- Leq
- Standard deviation (only if Unit = dB)
- Lmin
- Percentile levels (statistical indices) (user-defined) (only if Unit = dB)
- Lmax
- Takt Maximal (average – available only when LAmax data type is selected)

The resulting table of results is displayed in a new window on validation by **OK**. An example is given below:

Overall Leq and Ln Table City noise_1day with 1h exposure levels_1audio.cmg														
File	City noise_1day with 1h exposure levels_...													
Start	28/03/15 00:00:06													
End	29/03/15 00:00:00													
Channel	Type	Wght	Unit	Leq	Lmin	Lmax	StdDev	L99	L95	L90	L50	L10	L8	L5
Pt1	Leq	A	dB	64.8	39.5	90.6	6.4	43.7	48.1	51.4	62.3	67.9	68.4	69.4
Pt1	1/3 Oct 1kHz	Lin	dB	55.6	29.3	84.7	6.1	34.4	39.4	42.7	53.5	58.3	58.7	59.6

The table of results features a toolbar with icons that allows the user to modify the calculations' parameters for example. The icons of listing window toolbar allow the user to perform the following operations:



Change the listing parameters



Display as a graphical plot the results in the frequency bands (spectrum data)



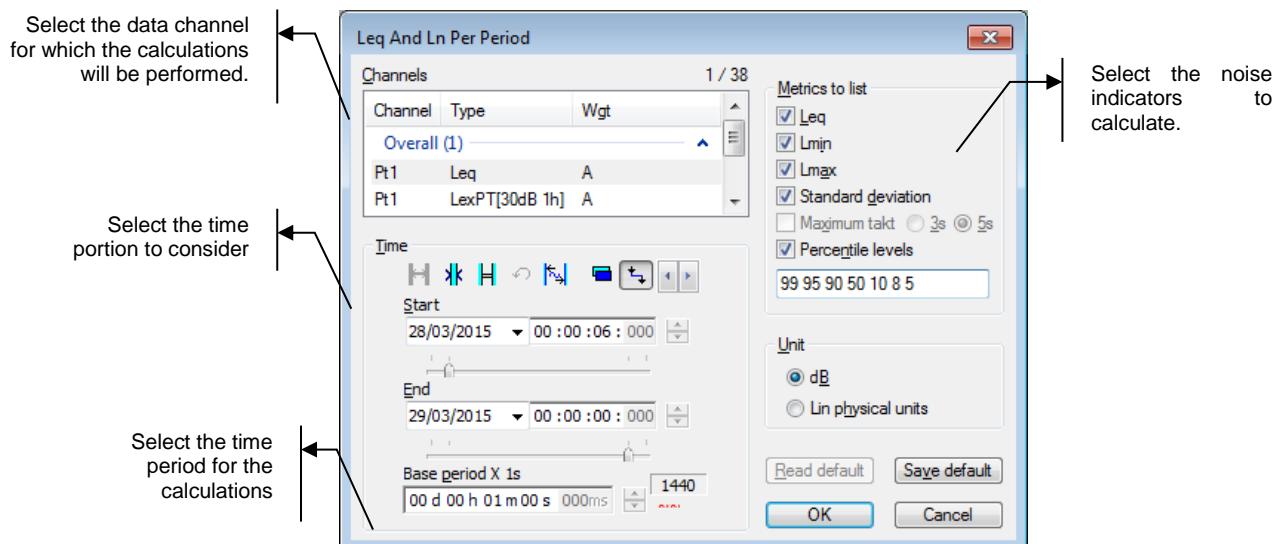
Activate (or not) the automatic window resizing operation when the contents have changed.

*For more information on how to display noise indicators graphically, see § 11.3.*

*These calculations are made without taking into account existing noise sources. For more information on the calculations of noise indicators with sources' information, see § 11.2.*

### 11.1.2 Levels and statistics (per period)

Use the command **Result / Levels and statistics per period** to calculate Leq values and statistical indices over a portion or the complete measurement file for user-defined time periods. The following dialog box appears on screen:



The software may calculate the following indicators for each period:

- Leq
- Standard deviation (only if Unit = dB)
- Lmin
- Percentile levels (statistical indices)
- Lmax
- (user-defined) (only if Unit = dB)
- Takt Maximal (average – available only when LAFmax data type is selected)

The resulting table of results is displayed in a new window on validation by **OK**. An example is given below:

File	City noise_1day with TH exposure levels_1audio.c...									
Periods	30m									
Start	28/03/15 00:00:00									
End	28/03/15 04:00:00									
Location	Pt1									
Weighting	A.									
Data type	Leq									
Unit	dB									
Period start	LME	LMIN	LMAX	SDCEN	L90	L80	L50	L10	L2	LR
28/03/15 00:30:00	83.8	81.4	81.2	4.8	82.4	83.5	84.0	80.5	88.4	88.3
28/03/15 00:30:00	88.2	85.1	85.8	8.2	81.1	82.4	83.3	88.3	88.1	87.4
28/03/15 01:00:00	81.1	87.0	78.5	8.2	48.8	49.8	50.8	87.0	84.8	85.2
28/03/15 01:30:00	89.8	87.9	78.5	4.8	49.1	50.0	50.8	88.4	83.8	84.4
28/03/15 02:00:00	80.1	86.7	78.3	8.8	47.8	48.5	50.5	88.8	83.9	84.5
28/03/15 02:00:00	88.7	84.0	73.6	5.7	44.8	46.2	47.4	83.2	82.6	83.3
28/03/15 02:30:00	87.6	82.5	74.0	8.7	41.5	43.5	44.0	88.9	81.8	82.5
28/03/15 03:00:00	80.8	89.5	83.5	7.4	41.4	42.6	43.8	81.9	83.1	84.2
Overall	81.8	88.5	85.8	8.3	42.5	48.5	47.8	88.0	84.3	85.2

The table of results features a toolbar with icons that allows the user to modify the calculations' parameters for example. The icons of listing window toolbar allow the user to perform the following operations:



Change the listing parameters



Activate (or not) automatic window resizing operation when the contents have changed.

### 11.1.3 Levels and statistics indices by statutory periods (Assessment indicators)

The statutory period's options are used to make calculations of various parameters (acoustic parameters in particular) within fixed daily or weekly periods. These calculations are intended for use with long term CMG datafiles.

Let consider a weeklong measurement file. They are enough data in it to calculate the global day noise level (say from 8 am until 8 pm) over the whole week, or only during working days, or day by day. To do so, it is sufficient to limit the calculations to the appropriate time slices of the measurement slices.

Such an operation can be done manually, using the command **Levels and statistics** of the **Results** menu for each required time period and then calculating the overall level. The **Statutory periods** option allows the user to perform automatically these fastidious calculations.

The term "statutory periods" does not only apply to standardized time periods but also to user defined time periods. One can define for example the period between 18h and 19h corresponding to the time people come back from the office. Even if such a period does not apply to any regulation, **dBTrait** will accurately calculate noise levels.

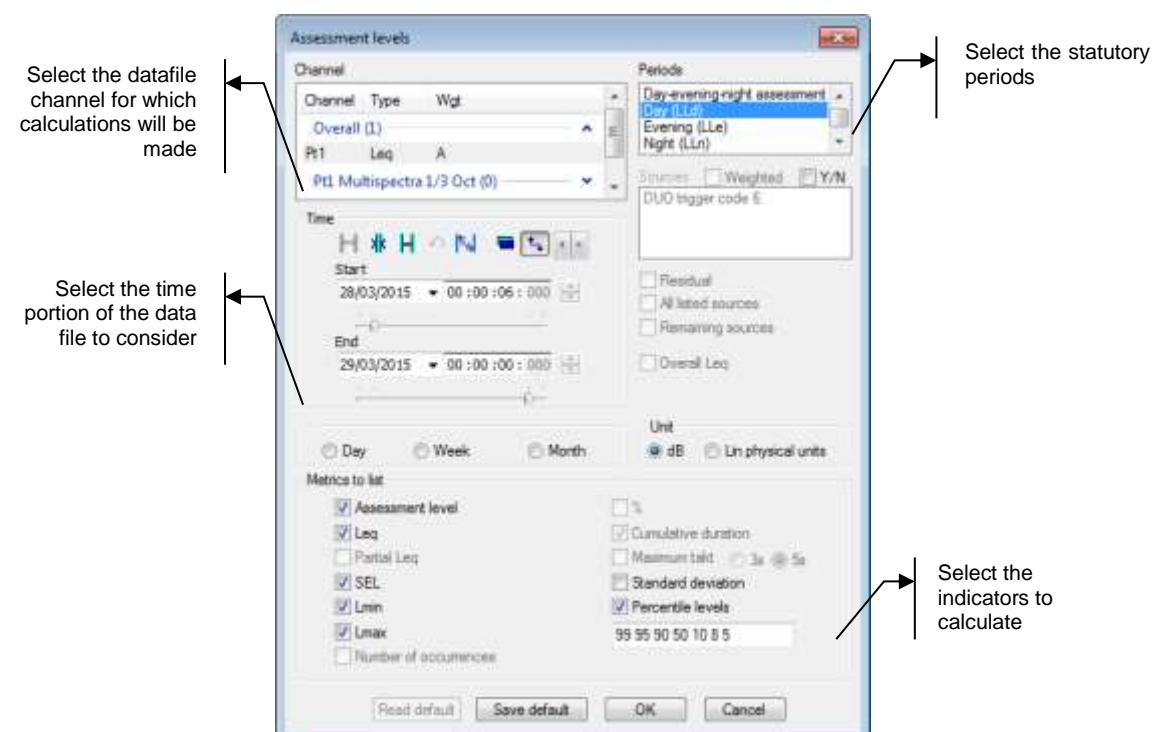
 *The command described here is independent of the **Neighborhood noise** and **Classified installations** options. These options deal with specific regulations and the statutory periods that are taken into account are fixed and cannot be subjected to any change.*

Two operations are necessary to obtain noise levels during specific periods:

- Definition (& edition) of the time periods.
- Definition of the calculation parameters and results' display.

To define statutory periods, use the command **Preferences / Statutory periods**. This issue is dealt with in § 12.2.

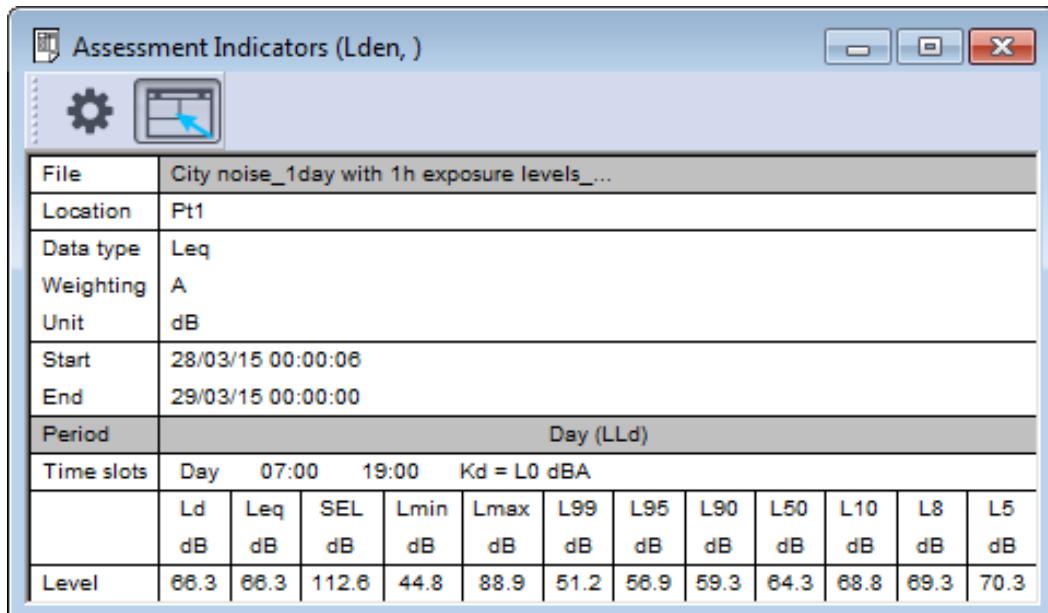
Use the command **Result / Assessment indicators (Lden,...)** for calculations of the acoustical indicators corresponding to the statutory periods defined by the user. The following dialog box appears on screen:



The option **Daily** means that the acoustical parameters will be calculated day by day. In other words, one can obtain the daily results for measurement datafiles that last over several days.

This option is greyed if calculations apply to weekly periods. It has another limitation: **It can only be applied when a single daily 24-hour period is selected**. The option will therefore also be greyed if two 24-hour cycles are selected in the above dialog box. This limitation is due to the complexity of such listing.

The window shown below shows a sample statutory periods listing:



The screenshot shows a software window titled "Assessment Indicators (Lden, )". The window contains a table with the following data:

File	City noise_1day with 1h exposure levels_...											
Location	Pt1											
Data type	Leq											
Weighting	A											
Unit	dB											
Start	28/03/15 00:00:06											
End	29/03/15 00:00:00											
Period	Day (LLd)											
Time slots	Day	07:00	19:00	Kd = L0 dBA								
	Ld dB	Leq dB	SEL dB	Lmin dB	Lmax dB	L99 dB	L95 dB	L90 dB	L50 dB	L10 dB	L8 dB	L5 dB
Level	66.3	66.3	112.6	44.8	88.9	51.2	56.9	59.3	64.3	68.8	69.3	70.3

The table of results features a toolbar with icons that allows the user to modify the calculations' parameters for example. The icons of listing window toolbar allows the user to perform the following operations:



Change the listing parameters



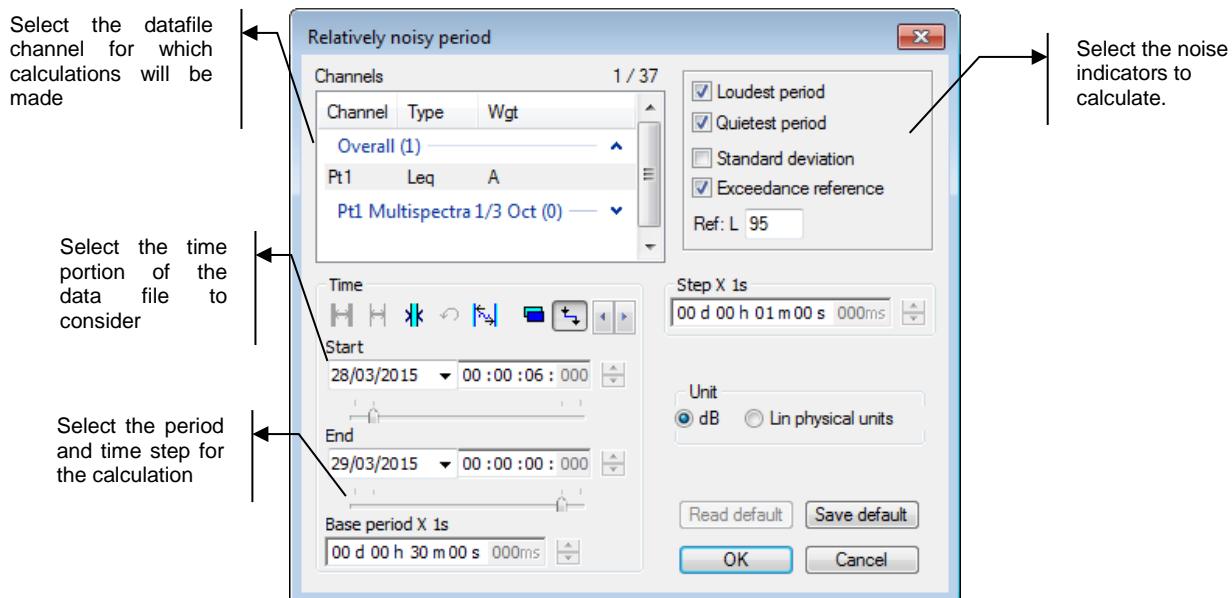
Activate (or not) automatic window resizing operation when the contents have changed.

### 11.1.4 Max/Min periods (Loudest and quietest periods)

Use the command **Result / Max/Min periods** to calculate the loudest and/or quietest time period of the measurement datafile.

This function is not available for  $L_p$  x,y,z (estimated groundborne noise level, measured by ORION version Firmware 1.5 or higher).

The following dialog box appears on screen:



In the fields **Period** and **Step**, define respectively the cumulated duration for the calculation of the loudest and/or quietest periods and the time step for intermediate calculations. In our example, with a step of 1 minute and a period of 30 minutes, the software will calculate the Leq minute by minute, and, by comparison of these intermediate calculations, will calculate the loudest and quietest 30 minutes of the datafile.

Select **Standard deviation** to display the deviation between minimum and maximum values of the noise levels over the cumulated duration of the period (only for certain types of quantities).

Select **Compare to a percentile** and type in the **Ln** index to compare the equivalent sound pressure levels and the defined percentile over the cumulated duration of the period.

On validation of these parameters, **dBTrait** calculates the loudest and/or the quietest periods for the selected time portion of the datafile. The resulting table is displayed in another window (such as shown below)

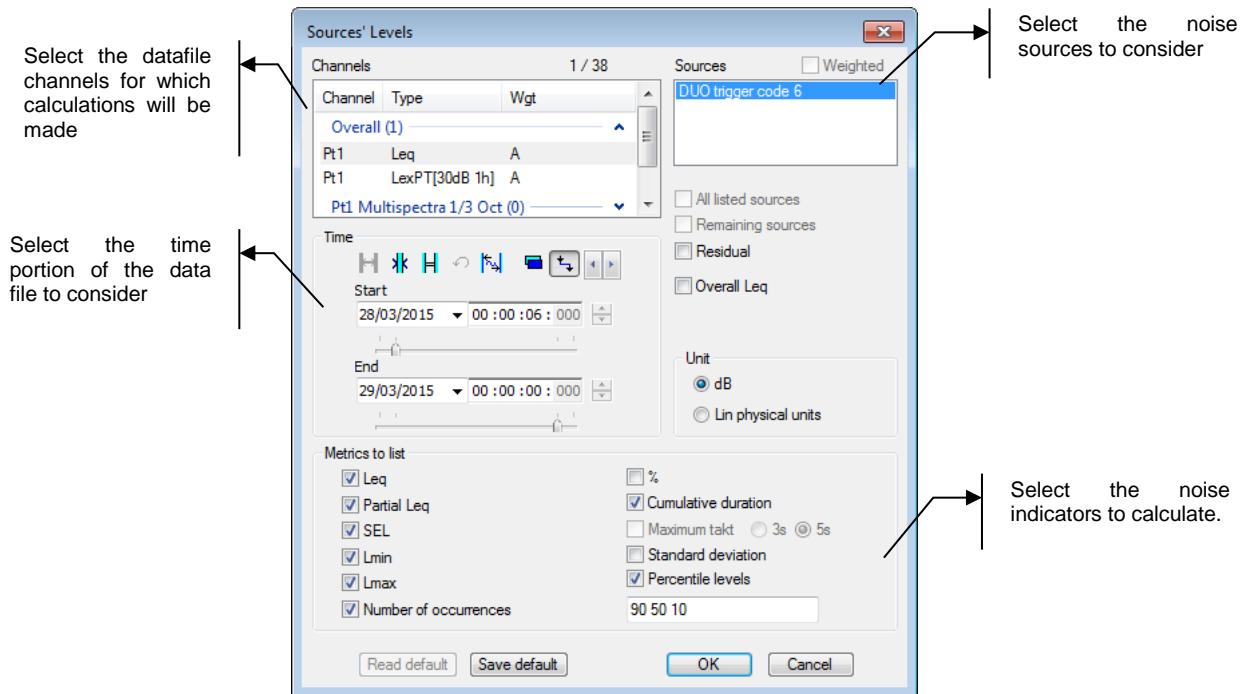
Relatively noisy period	
File	City noise_1day with 1h exposure levels...
Start	28/03/15 00:00:06
End	29/03/15 00:00:00
Location	Pt1
Weighting	A
Data type	Leq
Unit	dB
Quietest period (L30m)	
Start	28/03/15 08:16:06
End	28/03/15 08:46:06
Level	67.1 dBA
L95	63.9 dBA
Level-L95	3.2 dBA
Relatively noisy period (L30m)	
Start	28/03/15 04:16:06
End	28/03/15 04:46:06
Level	62.3 dBA
L95	42.2 dBA
Level-L95	20.1 dBA

## 11.2 LISTING OF NUISANCE SOURCES' QUANTITIES

The following functions allow the user to calculate noise indicators taking into account noise sources.

### 11.2.1 Levels of defined sources (overall)

Use the command **Result / Sources' levels** to calculate nuisance indicators of the defined nuisance sources over a portion or the complete measurement datafile. The following dialog box appears on screen:



The software may calculate the following indicators:

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>▪ Particular Leq</li> <li>▪ Partial Leq</li> <li>▪ SEL</li> <li>▪ Lmin</li> <li>▪ Lmax</li> </ul> | <ul style="list-style-type: none"> <li>▪ Number of appearances of the source</li> <li>▪ % of the file containing the code</li> <li>▪ Cumulated duration of the source</li> <li>▪ Takt Maximal (average – available only when LAFmax data type is selected)</li> <li>▪ Standard deviation</li> <li>▪ Percentile levels (Ln)</li> </ul> |
|--|---|

These indicators are calculated for each noise sources selected in the list, as well as for the **remaining sources** (the sources that are not selected considered as a single source). If the option **Listed sources together** is ticked, the calculations will also be performed for all the sources selected in the list. If the option **Background noise** is ticked, the calculations will be performed for the rest of data. The option **Overall Leq** allows the user to calculate the indicators for coded and uncoded data, for each measurement channel.

The option **Weighted** can be used to calculate the indicators with weighted sources. A source weighting (or attenuation by a user-defined factor) can be defined by the command **Source / Modify**. See § 9.3.5. This option is greyed when no attenuation coefficient is defined.

The resulting table of results is displayed in a new window on validation by **OK**.

Source Levels City noise_1day with 1h exposure levels_1audio.cmg									
File	City noise_1day with 1h exposure levels_1audio.cmg								
Start	28/03/15 00:00:06								
End	29/03/15 00:00:00								
Source	DUO trigger code 6								
Location	Leq specific dB	Leq (partial) dB	SEL dB	Lmin dB	Lmax dB	Count	L90 dB	L50 dB	Duration cumulated h:min:s
Pt1 [ Leq A ]	58.7	37.8	87.1	40.9	75.4	1	44.6	52.1	62.3 00:11:44
Pt1 [ 1/3 Oct 1kHz ]	49.5	28.6	78.0	31.7	62.6	1	35.5	43.5	54.2 00:11:44

The table of results features a toolbar with icons that allows the user to modify the calculations' parameters for example. The icons of listing window toolbar allows the user to perform the following operations:



Change the listing parameters



Display as a graphical plot the results in the frequency bands (spectrum data)



Activate (or not) the automatic window resizing operation when the contents have changed.

Data display of listed spectra is dealt with in § 11.3.

If several channels are selected, it is not possible to display the results in physical units.

### 11.2.2 Levels of defined sources (per periods)

Use the command **Result / Sources per periods** to calculate noise indicators of the defined noise sources over a portion or the complete measurement datafile for user-defined time periods. The following dialog box appears on screen:

Select the datafile channel for which calculations will be made

Select the noise sources to consider

Select the time portion of the data file to consider

Select the time period for the calculations

Select the noise indicators to calculate.

Channel	Type	Wgt
Overall (1)		
Pt1	Leq	A
Pt1	LexPT[30dB 1h]	A
Pt1	Multispectra 1/3 Oct	(0)

Time

Start: 28/03/2015 00:00:06:000

End: 29/03/2015 00:00:00:000

Base period X 1s: 00 d 00 h 15 m 00 s 000ms

Sources: DUO trigger code 6

Metrics to list:

- Leq
- Partial Leq
- SEL
- Lmin
- Lmax
- Number of occurrences
- %
- Cumulative duration
- Maximum takt

Unit: dB (radio button selected)

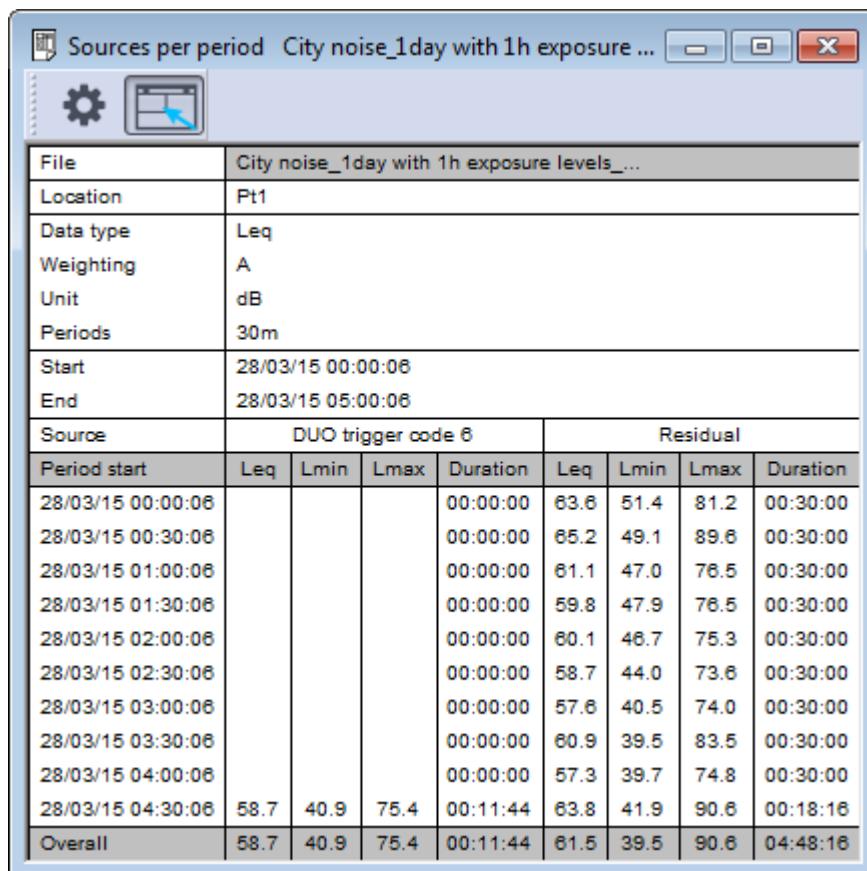
OK Cancel

The software may calculate the following indicators, for each period:

- Particular Leq
- Number of appearances of the source
- Partial Leq
- % of the file containing the code
- SEL
- Cumulated duration of the source
- Lmin
- Takt Maximal (average – available only when LAFmax data type is selected)
- Lmax

These indicators are calculated for each noise sources selected in the list, as well as for the **remaining sources** (the sources that are not selected considered as a single source). If the option **Listed sources together** is ticked, the calculations will also be performed for all the sources selected in the list. If the option **Background noise** is ticked, the calculations will be performed for the rest of data.

The resulting table of results is displayed in a new window on validation by **OK**.



The screenshot shows a software window titled "Sources per period" with the subtitle "City noise\_1day with 1h exposure ...". The window contains a toolbar with two icons: a gear (parameters) and a window (listing parameters). Below the toolbar is a table with the following data:

File	City noise_1day with 1h exposure levels...							
Location	Pt1							
Data type	Leq							
Weighting	A							
Unit	dB							
Periods	30m							
Start	28/03/15 00:00:06							
End	28/03/15 05:00:06							
Source	DUO trigger code 6				Residual			
Period start	Leq	Lmin	Lmax	Duration	Leq	Lmin	Lmax	Duration
28/03/15 00:00:06				00:00:00	63.6	51.4	81.2	00:30:00
28/03/15 00:30:06				00:00:00	65.2	49.1	89.6	00:30:00
28/03/15 01:00:06				00:00:00	61.1	47.0	76.5	00:30:00
28/03/15 01:30:06				00:00:00	59.8	47.9	76.5	00:30:00
28/03/15 02:00:06				00:00:00	60.1	46.7	75.3	00:30:00
28/03/15 02:30:06				00:00:00	58.7	44.0	73.6	00:30:00
28/03/15 03:00:06				00:00:00	57.6	40.5	74.0	00:30:00
28/03/15 03:30:06				00:00:00	60.9	39.5	83.5	00:30:00
28/03/15 04:00:06				00:00:00	57.3	39.7	74.8	00:30:00
28/03/15 04:30:06	58.7	40.9	75.4	00:11:44	63.8	41.9	90.6	00:18:16
Overall	58.7	40.9	75.4	00:11:44	61.5	39.5	90.6	04:48:16

The table of results features a toolbar with icons that allows the user to modify the calculations' parameters for example. The icons of listing window toolbar allows the user to perform the following information:



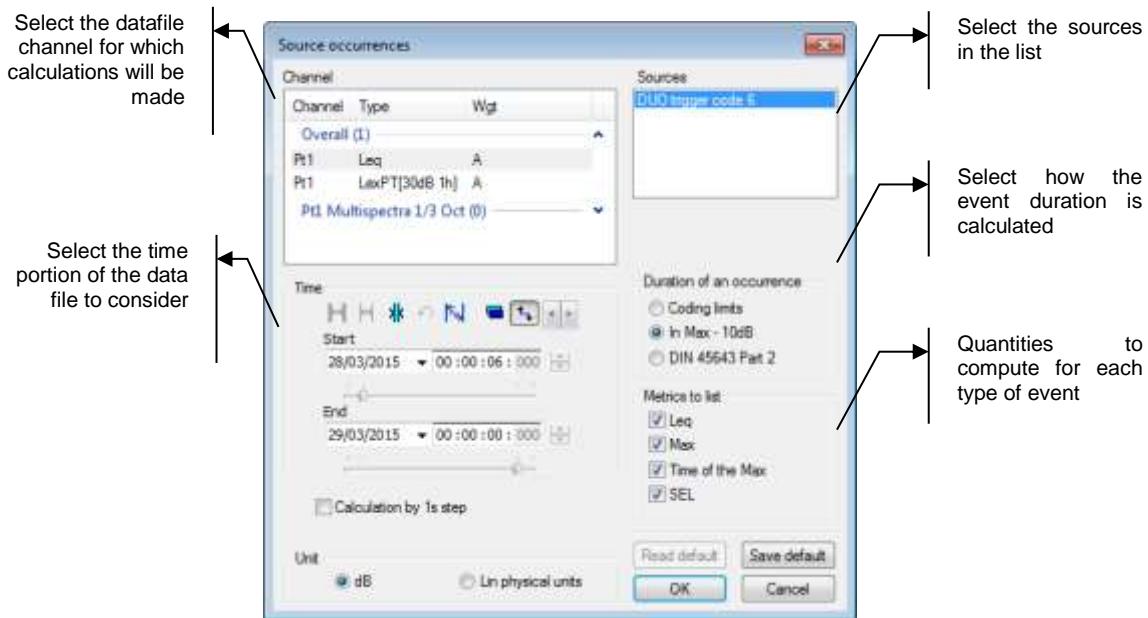
Change the listing parameters



Activate (or not) the automatic window resizing operation when the contents have changed.

### 11.2.3 Counting sources

Use the command **Result / Counting** to count the number of times sources appears in the measurement datafile. The following dialog box appears on screen:



The duration of any particular event can be considered in two ways: either the duration of the coded event (coding limits) or the duration corresponding to the Max level - 10dB. This max level is either the maximum level it self or the Leq(1s) corresponding value (If possible).

On validation of this dialog box, the following table of results is displayed on screen in another window:

List of source appearances City noise_1d...	
File	City noise_1day with 1h exposure levels...
Location	Pt1
Source	DUO trigger code 6
Data type	Leq
Weighting	A
Unit	dB
Start	28/03/15 00:00:06
End	29/03/15 00:00:00
Appearance	Duration Leq Lmax Time Lmax SEL
28/03/15 04:50:34	0:08:48 59.1 75.4 28/03/15 04:59:19 86.3
Total: 1	0:08:48 59.1 75.4 86.3

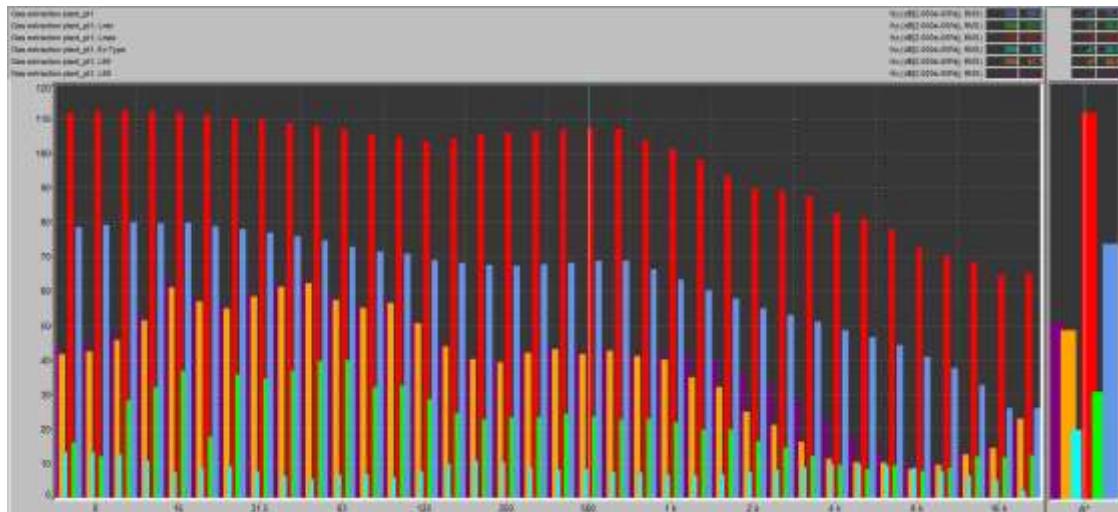
The counting operation allows the user to obtain the following results for each source's appearance:

- Time and date of the appearance
- Duration of each source appearance
- Particular Leq, Lmax, time of appearance of Lmax and SEL for each source appearance
- Total number of appearances for each type of source
- Total duration for each type of source
- Overall Leq, Lmax and SEL for each type of source

### 11.3 DISPLAY LISTED SPECTRA AS GRAPHICS

When calculating overall quantities (see § 11.1.1) and/or levels for noise sources or vibration sources (see § 11.2.1) the resulting indicators may be displayed in a graphical manner **if the measurement channels selected for the calculations correspond to the frequency bands of a spectrum.**

This type of graphic may be accessed by the icon  of the table of results.



*A maximum of 6 curves can be plotted simultaneously on the same graphic.*

# CHAPTER 12

## LDEN AND OTHER ASSESSMENT LEVELS

---

### 12.1 LDEN DEFINITION

$L_{den}$ : day-evening-night assessment sound level

$L_{den}$  is a noise assessment indicator that represents the sound level corrected according to the period of the day.

**L** stands for “level”, **d** for “day”, **e** for “evening”, and **n** for “night”.

It is based on the following principle:

- The day Leq is not corrected, except for a possible penalty of 5 dB on Saturdays and Sundays.
- The evening Leq is corrected by a 5 dB penalty.
- The night Leq is corrected by a 10 dB penalty.

The  $L_{den}$  day-evening-night level is expressed in decibels (dB) and defined by the following formula:

The 2002 European directive has imposed the use of Lden and defined its time periods as follows:

- day: from 7:00 am to 7:00 pm
- evening: from 7:00 pm to 11:00 pm
- night: from 11:00pm to 7:00 am

These periods can be slightly changed for a better match with the living habits of the different countries.

For instance, in France, day, evening and night periods are defined as 6:00am-6:00pm, 6:00pm-10:00pm, 10:00pm-6:00am, respectively.

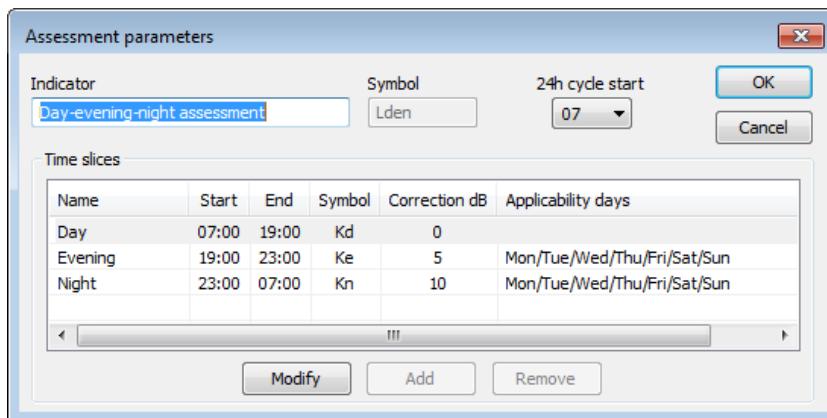
Other levels can be defined, covering the 24-hour period with different penalties depending on the time. An additional level,  $L_{dn}$  (day-night 7:00am-10:00pm; 10:00pm-7:00am) is also mentioned in the directive.

### 12.2 PARAMETER INPUT FOR AN ASSESSMENT LEVEL

Parameters of statutory periods are set up from the “Preferences” / “Statutory periods...” menu.

#### 12.2.1 Default Lden

The “day-evening-night assessment (Lden)” period is always present. It is automatically loaded each time the program is started even if the user deletes it or changes it.

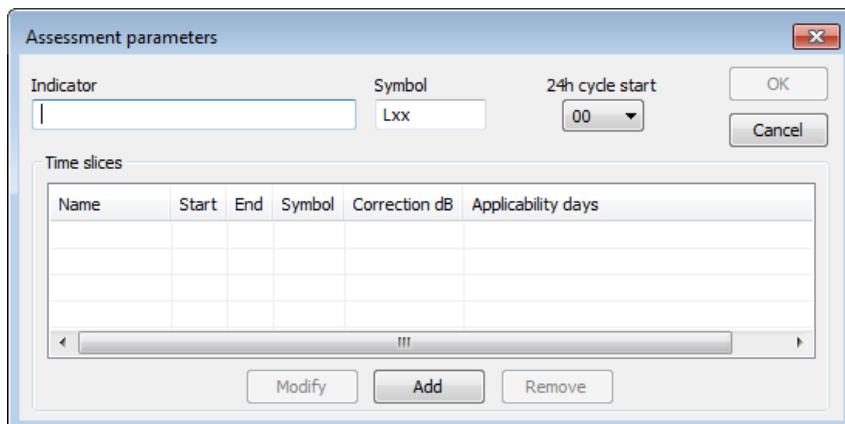


The definition of Lden can be changed. Changing its name will result in a new Lden period being loaded next time the program is open. This new period will have the characteristics of the aforementioned directive (possibly adapted to the country).

All periods are saved in the program configuration file (dBTrait.ini) and can be used from one time to another.

## 12.2.2 Creating or changing a period

The “Add” button is used to open the next dialogue box and define a new period:



The same window is displayed if option “Modify” is selected. In this case, however, the input fields already contain the data of the selected period.

### 12.2.2.1 Period name

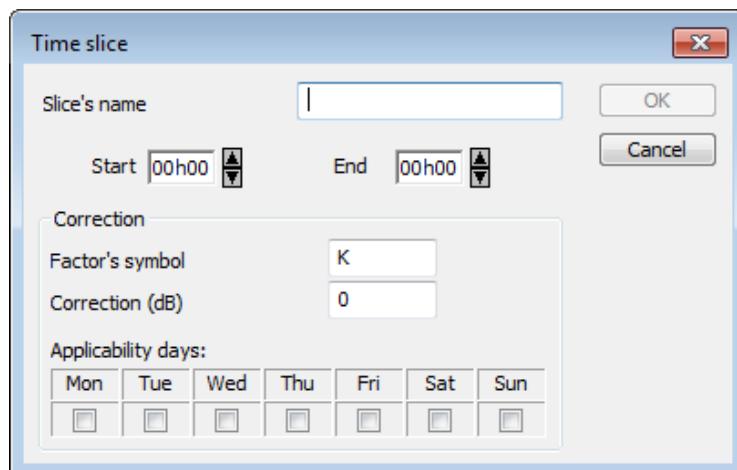
This is a descriptive text characteristic of the period, which will be the identifier of the period in the results definition dialogue boxes (menu “Results”, options “Assessment by statutory periods” and “Time history”). It will appear in the headers of the lists.

### 12.2.2.2 Symbol

This text replaces the symbol (or the abbreviation) used to express the indicator resulting from the calculation. For instance, "Lden" is the replacement text for  $L_{den}$ .

### 12.2.2.3 Time periods

Buttons "Add" and "Change" are used to open the next dialogue box and define time periods:



Each period is defined by its name (e.g., "Day" for Lden).

The time period must not cover more than 24 hours. A period can go beyond midnight (e.g., the "Night" period going from 11:00 pm to 07:00 am, according to the directive).

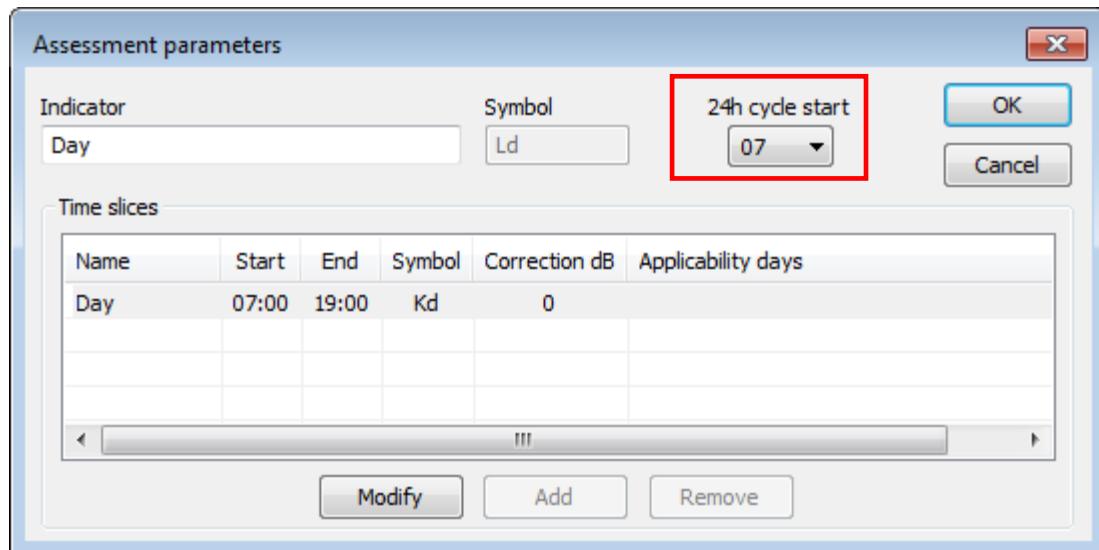
### 12.2.2.4 Penalties

A penalty (or correction) expressed in dB can be applied to the noise in each period. It is expressed by its correction factor, the name and value of which are defined in the table shown above (this name will appear in all lists, e.g., "Kd" for the correction factor of the "daytime" period).

### 12.2.2.5 Days for the application of penalties

In most cases, the penalty is applied every day: just check the box for every day of the week. Otherwise, and for instance, in the case of a daytime penalty for Saturdays and Sundays, just check these days for the penalty to be applied selectively.

#### 12.2.2.6 Start of the 24-hour period calculation



One must define the starting time for the 24-hour statutory period. By default, the calculation starting time is the time corresponding to the start of the “day” time period.

The user can however change this time, if he/she wants to express  $L_{den}$  based on another reference.

In the case of the  $L_{den}$  calculation, as defined in the European directive, the recomposition period lasts 24 hours and ranges from 7:00 am on day X to 7:00 am on day X+1. This means that the “night” period is defined, in part, over day X, from 11:00 pm to midnight, and in part over day X+1, from midnight to 7:00 am.

#### 12.2.2.7 Precautions

We recommend “filling in” completely the 24-hour period with adjacent time periods that do not overlap. The European  $L_{den}$  is a good example, since the sum of the day/evening/night periods (12+4+8) amounts to 24 hours and the periods follow each other.

One can define a period made up of intervals that do not fully cover the 24-hour period. However, it is not possible to define superimposed periods. Some logic is then required when setting up the periods and changing a time.

## 12.3 CALCULATION OF ASSESSMENT LEVELS

In the **Results** Menu, select **Assessments Indicators**. A new box is now available in the listing parameters: **Assessment levels**. By default, this box is checked and cannot be unselected. All other parameters (Leq, maxima and minima, SEL, etc.) remain the same.

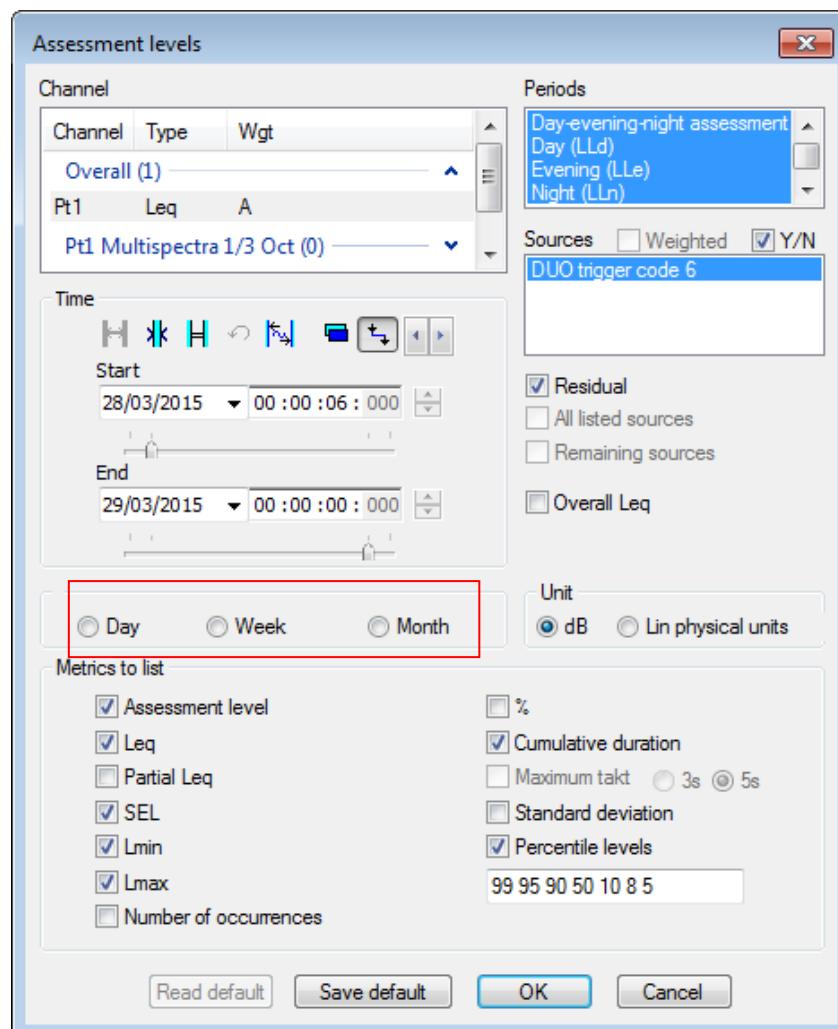
This function resumes the same possibilities of calculation as that of the **Sources' levels**, where the user can hold indicators Leq, maxima and minima, SEL,... by choosing the periods which the calculations concern. These periods were defined before, in the **Preferences** menu.

Selected magnitudes can be listed globally in the total period, or day by day, or week by week, or month by month.

In case of a recomposition over a long period ("Start" and "End" defined in the "Time periods" section of the window), the calculation is performed according to Formula 4.4 of Standard ISO 1996 part 2 (according to the 1987 version; the 1996 version does not include any calculation rule for the assessment of the level average).

$$L_{Ar,LT} = 10 \log \left[ \frac{1}{N} \sum_{i=1}^N 10^{0,1(L_{Ar,T})i} \right]$$

The choice of the period of calculations for the results display in the daytime a day, week a week or month a month is realized by marking Day / Week or Month, in the window below.



### 12.3.1 Global results

In the absence of period Day / Week / Month selected, results appear globally for all the measurement duration.

Assessment Indicators (Lden, )	
File	Gas extraction plant_1month Agreg_with w...
Location	NML1_Slugcatcher
Data type	Leq
Weighting	A
Unit	dB
Start	31/08/15 00:00:00
End	08/10/15 09:00:00
Period	Day-evening-night assessment (LLden)
Time slots	Day 07:00 19:00 Kd = L0 dBA Evening 19:00 23:00 Ke = L5 dBA Mon Tue Wed Thu Fri Sat Sun Night 23:00 07:00 Kn = L10 dBA Mon Tue Wed Thu Fri Sat Sun
	Lden dB Leq dB Lmin dB Lmax dB
Level	74.3 68.5 32.9 110.3

### 12.3.2 Day-by-day results

#### 12.3.2.1 Day by day results table

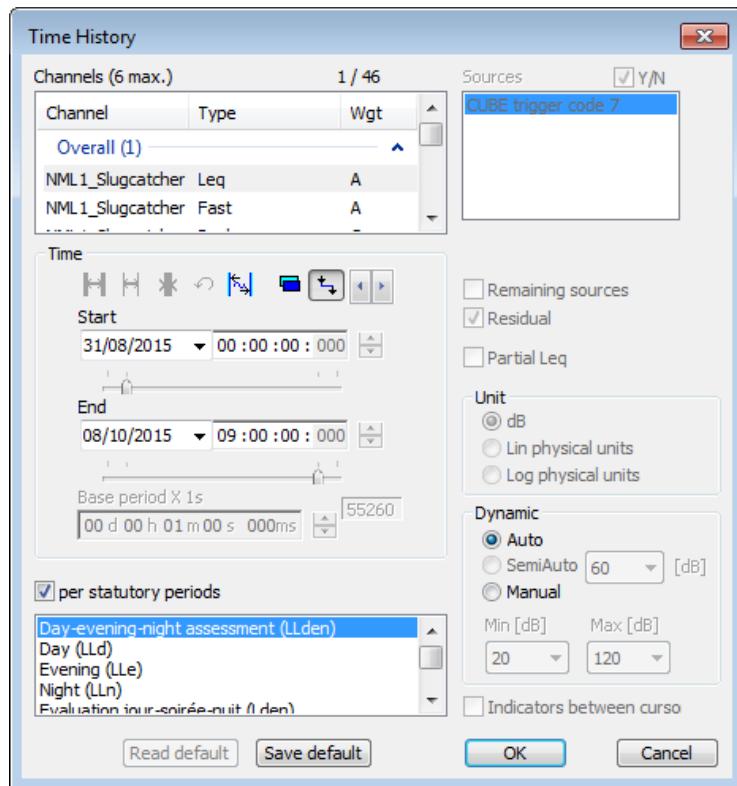
Example of results table in the daytime a day, by statutory period, on the completeness of the duration of measure The day is identified by the day name ( first 3 letters) and the date in the daytime (day/month/year).

Assessment Indicators (Lden, )				
File	Gas extraction plant_1month Agreg_with w...			
Location	NML1_Slugcatcher			
Data type	Leq			
Weighting	A			
Unit	dB			
Start	31/08/15 00:00:00			
End	12/09/15 00:00:00			
Period	Day-evening-night assessment (LLden)			
Time slots	Day 07:00 19:00 Kd = L0 dBA Evening 19:00 23:00 Ke = L5 dBA Mon Tue Wed Thu Fri Sat Sun Night 23:00 07:00 Kn = L10 dBA Mon Tue Wed Thu Fri Sat Sun			
	Lden dB Leq dB Lmin dB Lmax dB			
Day	Day			
Mon 31/08/2015	62.2	55.3	51.9	74.7
Tue 01/09/2015	69.6	60.8	51.8	82.6
Wed 02/09/2015	66.3	58.0	53.4	86.0
Thu 03/09/2015	64.0	56.9	53.2	76.0
Fri 04/09/2015	61.9	55.3	52.6	79.4
Sat 05/09/2015	70.3	61.3	52.7	86.0
Sun 06/09/2015	86.2	82.5	36.2	110.3
Mon 07/09/2015	73.1	68.6	32.9	97.6
Tue 08/09/2015	69.2	64.2	34.2	98.6
Wed 09/09/2015	63.3	58.0	52.5	79.8
Thu 10/09/2015	69.0	60.8	53.1	92.5
Fri 11/09/2015	63.2	56.9	53.3	76.9

- Result of the evaluation for period appears on white bottom only if data were measured during the completeness of this period. If data miss, results are shown on grey bottom. Furthermore, it is normal that the results appear on grey bottom during periodic added measurements because that a short cut of measure is compulsory between two consecutive periods.

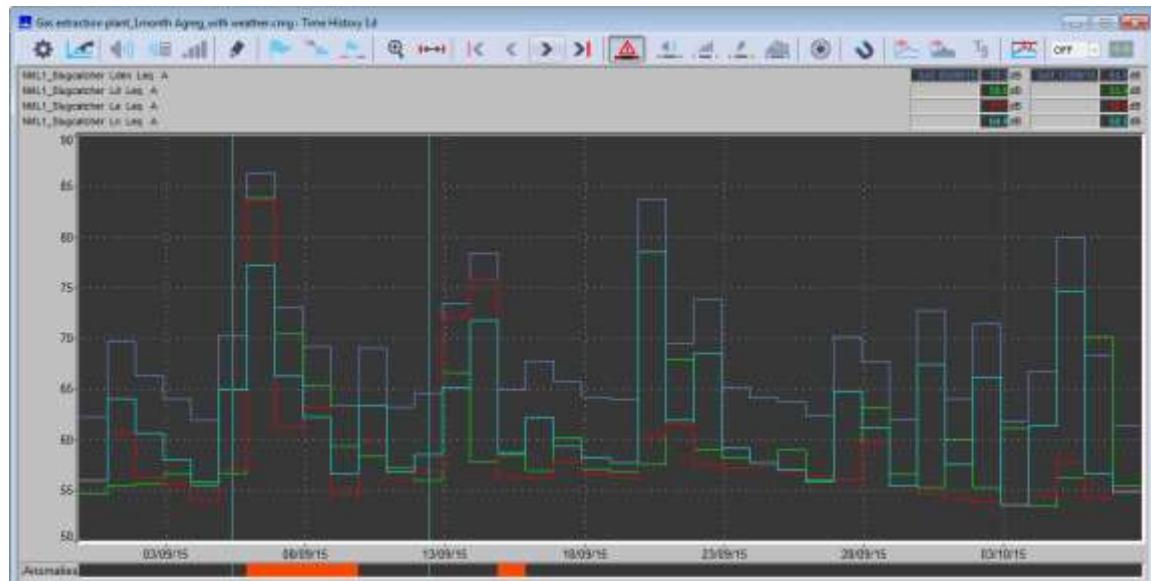
### 12.3.2.2 Day by day plot

Option “Results” / “Time history” is used to plot time history charts for statutory periods, especially Lden, as well as other “day by day” levels.



For the Lden statutory period defined over 24 hours, the plot represents the day-by-day history of Lden statutory levels, and the cursor shows the Lden single value for the selected day.

For periods shorter than 24 hours, such as Ld, Le and Ln, the time history plot represents, for the day shown by the cursor, the value of the index calculated over the defined period. That is, the requested display will show three curves, Ld, Le and Ln, each one with a single value per selected day. For day D, the cursor will show the Ld value for the daytime period (7:00am-7:00pm), the Le value for the evening period (7:00pm-11:00pm) and the Ln value for the night period for day D, calculated from 11:00pm on day D to 7:00am on day D+1.



### 12.3.3 Week by Week Results

Only a results table can be published.

Example of results table Week by Week, by statutory period, on the completeness of the measurement duration. The week is identified by year and the week number in the year.

Assessment Indicators (Lden, )											
File	Gas extraction plant_1month Agreg_with w...										
Location	NML1_Slugcatcher										
Data type	Leq										
Weighting	A										
Unit	dB										
Start	31/08/15 00:00:00										
End	12/10/15 00:00:00										
Period	Day-evening-night assessment (LLden)										
Time slots	Day	07:00	19:00	Kd = L0 dBA	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	Evening	19:00	23:00	Ke = L5 dBA	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	Night	23:00	07:00	Kn = L10 dBA	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Week	Lden dB		Leq dB		Lmin dB		Lmax dB				
2015-W36	78.1		74.1		36.2		110.3				
2015-W37	69.7		64.3		32.9		98.6				
2015-W38	76.6		67.4		35.9		104.0				
2015-W39	68.8		61.6		53.0		97.8				
2015-W40	68.4		60.4		48.9		87.0				
2015-W41	73.1		64.8		48.2		94.7				

-  Result of the evaluation for period appears on white bottom only if data were measured during the completeness of this period. If data miss, results are shown on grey bottom. Furthermore, it is normal that the results appear on grey bottom during periodic added measurements because that a short cut of measure is compulsory between two consecutive periods.

### 12.3.4 Month by Month Results

Only a results table can be published.

Example of results table Month by Month, by statutory period, on the completeness of the measurement duration. The month is identified by the month name in the year.

The screenshot shows a software window titled "Assessment Indicators (Lden, )". The window contains a table with the following data:

File	Gas extraction plant_1month Agreg_with w...									
Location	NML1_Slugcatcher									
Data type	Leq									
Weighting	A									
Unit	dB									
Start	01/08/15 00:00:00									
End	01/11/15 00:00:00									
Period	Day-evening-night assessment (Lden)									
Time slots	Day Evening Night	07:00 19:00 23:00	19:00 Ke = L5 dBA 23:00	Kd = L0 dBA Mon Mon	Tue Tue	Wed Wed	Thu Thu	Fri Fri	Sat Sat	Sun Sun
Month		Lden dB	Leq dB	Lmin dB			Lmax dB			
August		62.9	55.2	51.9			75.9			
September		74.8	69.2	32.9			110.3			
October		68.7	60.5	48.2			94.7			

*Result of the evaluation for period appears on white bottom only if data were measured during the completeness of this period. If data miss, results are shown on grey bottom. Furthermore, it is normal that the results appear on grey bottom during periodic added measurements because that a short cut of measure is compulsory between two consecutive periods.*

## 12.4 DAYLIGHT SAVING TIME

Assessment levels such as Lden and similar levels are essentially intended for the characterisation of long periods, from one month to one year. Switches to daylight saving time can occur during these periods.

Time changes are now integrated in the calculation of elementary periods.

Here is an example to illustrate this point: in France, the time change occurs twice a year: the last Sunday of March is one hour shorter, and the last Sunday of October is one hour longer. dB Trait no longer calculates indicators over the requested period, but between requested limits. If standard Lden is requested, the night will always start at 11:00 pm and end at 7:00 am, and the time of 11:00 pm will be defined based on the evening time, and 7:00 am based on the morning time, even if a time change has occurred in the meantime.

Example: the night of the time change in March lasts 7 hours, and that in October 9 hours (both between 11:00 pm and 7:00 am). The calculation will then be performed accordingly.

# CHAPTER 13

## STATUTORY ANALYSIS MODULES

---

The dB Trait software makes it possible to apply all the recommendations or to carry out calculations specific to various regulations thanks to several optional modules. Each of these options is described in this chapter.

### 13.1 NOISE IN THE ENVIRONMENT

#### 13.1.1 Bruits de voisinage (décret du 31 Août 2006)

See in dB Trait's User Manual in French version.

#### 13.1.2 Bruits de voisinage (décret du 18 Avril 1995)

See in dB Trait's User Manual in French version.

#### 13.1.3 Installations classées (Arrêté du 20 Août 1985 et du 1er Mars 1993)

See in dB Trait's User Manual in French version.

#### 13.1.4 Installations classées (Arrêté du 23 Janvier 1997)

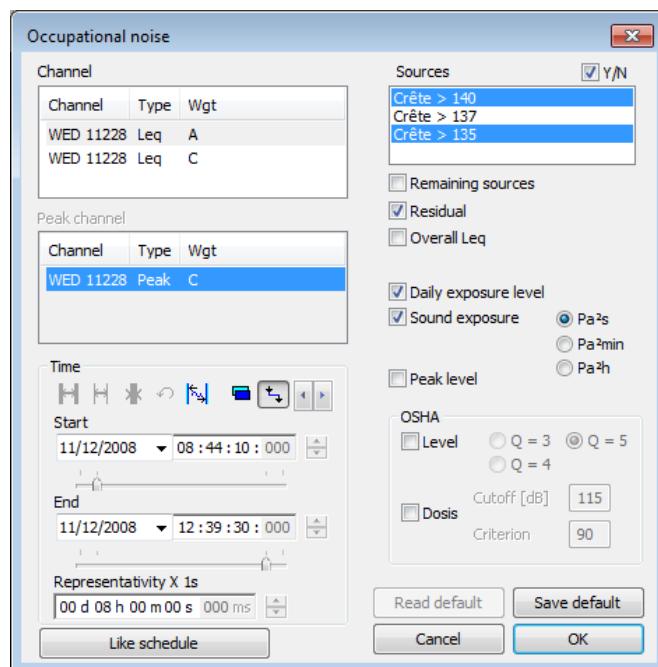
See in dB Trait's User Manual in French version.

### 13.1.5 Noise at work (multiple regulations)

Use the command **Statutory Analysis / Occupational noise (or Work Station...)** to calculate acoustical indicators related to various regulations of noise at work. The following indicators may be calculated globally or for each selected noise sources:

- Noise Exposure Level ( 8 h Day)
- Sound Exposure (in Pa<sup>2</sup>s, Pa<sup>2</sup>min or Pa<sup>2</sup>h)
- Peak level
- OSHA level
- OSHA dose

The occupational noise dialog box will be displayed in order to define the parameters of the calculation. The listing of the occupational noise indicators is therefore displayed:



#### ▪ Channel

Select one measurement channel, between those available, to calculate for.

#### ▪ Peak Channel

Select here the peak channel to be scanned for Peak related indicators. The list of existing peak channels for the current file is displayed. Its identifier identifies each channel corresponding to a certain type of data stored during measurement. When only one peak channel is present, this field is disabled and the peak channel is displayed and selected by default.

#### ▪ Timetable

Select the file portion to be used for calculations.

#### ▪ Representativeness (hh:mm:ss)

Define here the duration to take into account as the representative duration for the computation. Let us consider a measurement between 10:00am and 10:15am, fifteen minutes only. The factory operation measured lasts 4 hours per day, same level. The representativity of the measurement done is then 4 hours.

Select 8 hours if you have measured noise levels constant over the whole working day.

If you have measured a full factory operation (i.e. the duration of the measurement corresponds to the duration of the factory operation), click on **Like schedule** to set the representativity to the duration of the selected time section.

- **Sources / Remaining sources / Background noise**

Select the noise sources to consider (or not) for the calculations. Before proceeding with the calculation, it may be required to code events as specific noise sources. See **CHAPTER 9** for coding noise events.

The option **Remaining sources** allows the user to calculate the specified noise indicators for all sources that have not been selected. These sources, except the background noise, are put together as a single source named "remaining sources". This option may be useful to estimate the contribution of a source compared to all the other sources, for instance.

The option **Residual** allows the user to calculate the specified indicators for the source named "Residual". This source represents all the noise data in the file that have not been coded as a specific noise source.

The option **Overall Leq** allows the user to calculate the equivalent sound pressure level for each selected source over the considered time portion. This value will be display at the bottom of the listing window.

- **Noise exposure level (8h day)**

Click this option in order to include the computation of the Noise Exposure Level called LEX,d. It is calculated as follows:

$$L_{EX,d} = 10 * \log \left[ \frac{1}{T_0} \int_0^T \left( \frac{P_A(t)}{P_0} \right)^2 dt \right]$$

Where:

$T_0$  is the reference duration  $T_0 = 28800$  s = 8 hours

$T_d$  is the representative duration (defined as "representativity" in the dialog box)

$P_A(t)$  is the A weighted sound pressure level

$P_0$  is the reference sound pressure level  $P_0 = 2^{-5}$  Pa

- **Sound exposure**

Click this option in order to include the computation of the Sound Exposure called  $E_{A,T}$ . Once enabled, this option allows to select the units to express the Sound Exposure ( Pa2s, Pa2min or Pa2h ). It is calculated as follows:

$$E_{A,T} = \int_{t_i}^t p_A^2(t) dt$$

Where:

$P_A(t)$  is the A weighted sound pressure level

- **Peak level**

Click this option in order to include the computation of the Peak Level, called Lpc. This option is only available if a Peak Channel exists. It is calculated as follows:

$$L_{pc} = 10 \log \left( \frac{P_c}{P_0} \right)^2$$

Where:

$P_c$  is the maximum instantaneous sound pressure level over the considered time interval

$P_0$  is the reference sound pressure level  $P_0 = 2^{-5}$  Pa

▪ **OSHA (level)**

Click this option in order to include the computation of the OSHA Level, called  $Lav(Q)$ . Once enabled, this option allows to select the OSHA Factor Q ( 3, 4 or 5 ) and the cut-off Level in dB. It is calculated as follows:

$$L_{av}(Q) = q * \log \left[ \frac{1}{T} \int_0^T 10^{L_{AS}/q} dt \right]$$

Where:

$L_{AS}$  is the A weighted sound pressure level, usually exponentially averaged with the SLOW time constant

Q is the exchange rate selected in the dialog box

$q = Q / \log(2)$

T is the considered time period

The **cut-off level** is the limit below, which the level are not taken into account for the OSHA calculation.

▪ **OSHA (Dose)**

Click this option in order to include the computation of the OSHA Dose, called D. Once enabled, this option allows to select the Criterion Level. It is calculated as follows:

$$D = \frac{100}{T_c} \int_0^{T_c} (L_{AS} - L_c) / q dt$$

Where:

$L_{AS}$  is the A weighted sound pressure level, usually exponentially averaged with the SLOW time constant

Q is the exchange rate selected in the dialog box

$q = Q / \log(2)$

$L_c$  is the criterion level selected in the dialog box

$T_c = 8$  hours

T is the considered time period

The **cut-off level** is the limit below which the levels are not taken into account for the OSHA calculation. Define also the criterion level in dB. This level establishes the crossing point between the curve of slope 5 (Q exchange rate) and the energy curve.

If, for example, we have a constant level of 95 dBA, measurement with Q=5 will give a dose of 200% for a criterion level of 90dB, and 100% for a criterion level of 95dB, and 50% for 100 dB. The OSHA dose is expressed in time percentile of the acceptable dose.

Here is an example of results of occupational noise calculation. It may be done with or without the existing sources over a section of the considered file. The term "source" may be in this case applied to a particular industrial operation. The operator can calculate the contribution of different operations on the global daily noise.

 Copy this result listing (command Edit / Copy) as values or graphics for further exploitation and result presentation in spreadsheet or word processors

Exposure USINE.CMG				
File	USINE.CMG			
Location	Cascales			
Weighting	A			
Data type	Leq			
Start	20/04/98 10:02:31:000			
End	20/04/98 16:42:54:000			
Source	LEXd dBA	EAD Pa²s	OSHA Q=5 dBA	Dose Q=5 %
Presses	36,4	0	-2,7	0,0
fenwik	41,6	0	17,0	0,1
compressor	30,1	0	-24,3	0,0
Background	57,7	6	40,5	1,7
Overall	57,9	7	41,4	1,9

### 13.1.6 Bruits dans l'environnement (NFS31-010 du 31 Décembre 1996)

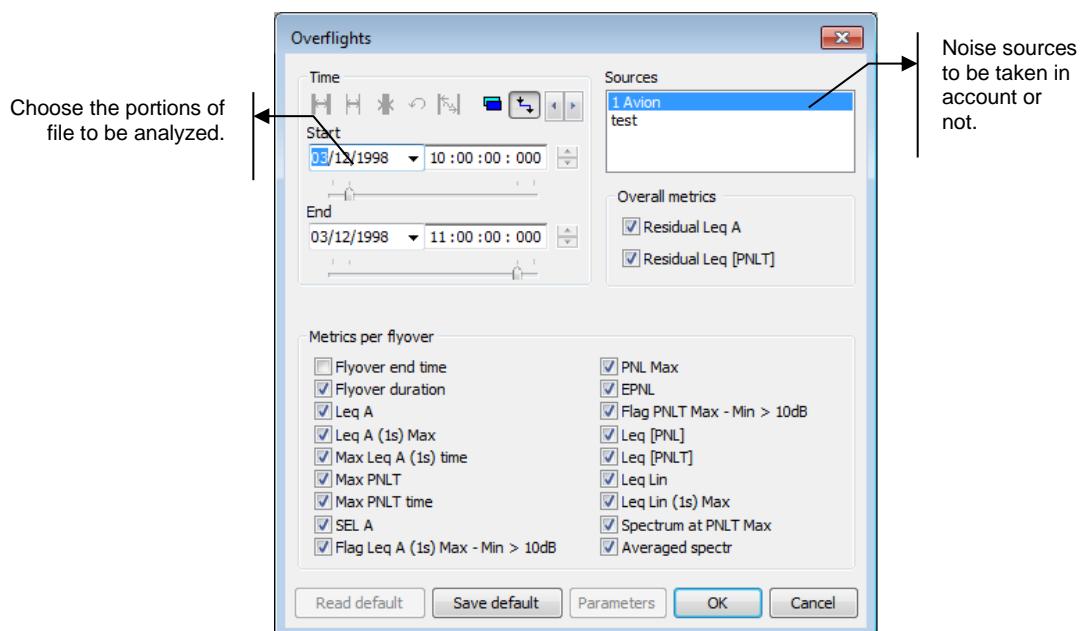
See in dB Trait's User Manual in French version.

### 13.1.7 Airplane flyovers

The **Airplane flyovers** analysis is available with an Acoustic Expert licence, if the following conditions are met:

- The measurement session includes acoustic data of type LAeq **or** Leq Lin **or** 1/3 Octave Slow **or** PNL **or** PNLT.
- **and** the measurement session includes codes.

Use the command **Statutory Analysis / Airplane flyovers** to open the following window:



- **Timetable**

Specify the beginning and ending time of the file section to plot (the format of this selection is **dd/mm/yy hh:mm:ss:ms**) or the beginning time and the length of the section to take into account.

Icons are used to:

- Select the **entire file** (i.e., data over the total length of the file)
- Select the **entire channel** (i.e., data over the total time length of the channel)
- Select data **between cursors** placed on the plot
- Go back to original times
- **Round up times** (rounding calculation depends on the total duration of display)
- Select whether to display **ending time or duration**
- **Link** starting and ending cursors.

- Several indicators can be obtained:
- Flyover end time: gives the time corresponding to the end of each coding associated to an airplane flyover.
- Flyover duration: gives the duration of each appearance.
- Leq A: gives the A-weighted average level for each appearance.
- Leq A(1s) Max: gives the highest Leq A value.
- Max Leq A(1s) Time: gives the time of the Leq A(1s) Max.
- Max PNLT
- Max PNLT time
- SEL A: gives the A-weighted SEL
- Flag Leq A (1s) Max – Min > 10dB: gives Yes or No
- PNL Max
- EPNL
- Flag PNLT Max – Min > 10dB: gives Yes or No
- Leq [PNL]
- Leq [PNLT]
- Leq Lin
- Leq Lin (1s) Max
- Spectrum at PNLT Max
- Averaged spectr

Here is an example of results:

File	20160817_151556_151616.cmg								
Location	airbus3								
Start	8/17/2016 3:15:56 PM:000								
End	8/17/2016 3:16:16 PM:000								
Overall A	54,6								
Overall PNLT	113,6								
Source	Appearance	Duration	End	Leq A	PNLT Max	Time PNLT Max	EPNL	PNLT Max - Min >10	PNL Max
CUBE trigger code 8	8/17/2016 3:15:56 PM	0:00:17	8/17/2016 3:16:13 PM	98,6	124,6	8/17/2016 3:16:11 PM:000	115,1	No	123,1

### 13.1.8 Aeronautical event according to NF S 31-190

See details in dBTrait's User Manual in French version.

## 13.2 VIBRATIONS IN THE ENVIRONMENT

### 13.2.1 DIN 4150-3

The **Statutory analysis / Reporting according DIN4150-3** command is used to assess environmental vibrations according to Standard **DIN4150-3** and easily generate a report.

 Its execution requires having Measurement templates (**Meas. LimitCurves**) of type **DIN4150-3** in the measurement session.

 This feature is not accessible for **Ti** data, but only for **Tj** data. See § 22.1.2 for more details about **Tj** and **Ti** data.

This function used the Counting command, complemented with several functionalities.

The dialog box shown opposite is used to define the parameters required for this assessment:

#### ▪ Channel

The metrics used as reference for the calculations. Only PPV/FDj data can be selected, as triplets (complete triaxial transducers and not axis by axis).

Multi-selection is not allowed.

#### ▪ Sources

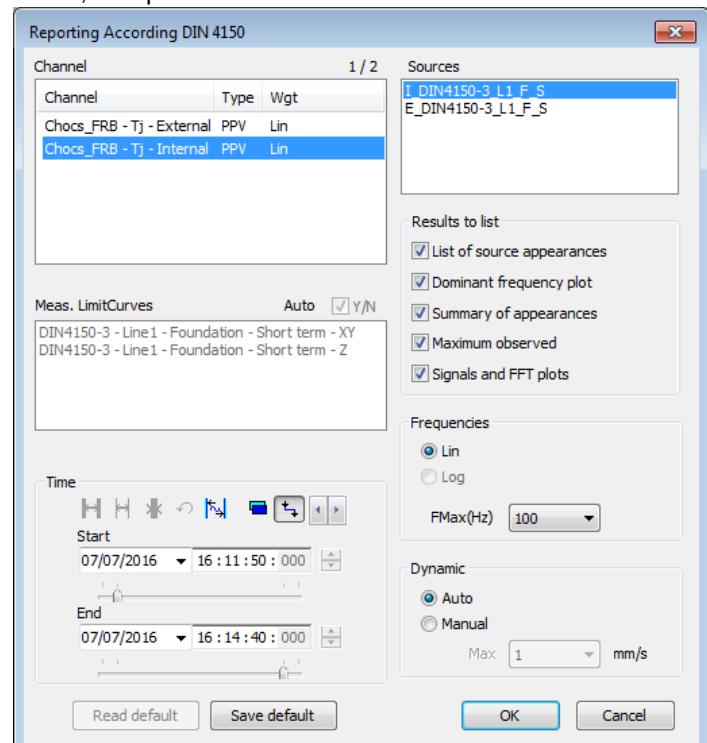
Sources of nuisance to take into account. All sources of the measurement sessions of type **DIN4150-3** (i.e., containing the “DIN4150-3” character string) are selected by default. The user can manually unselect one or several sources of type **DIN4150-3**.

#### ▪ Meas. LimitCurves

The Measurement templates, Meas. LimitCurves, set on ORION and stored in the measurement session are automatically selected.

#### ▪ Time

The file portion to take into account for the statutory analysis.

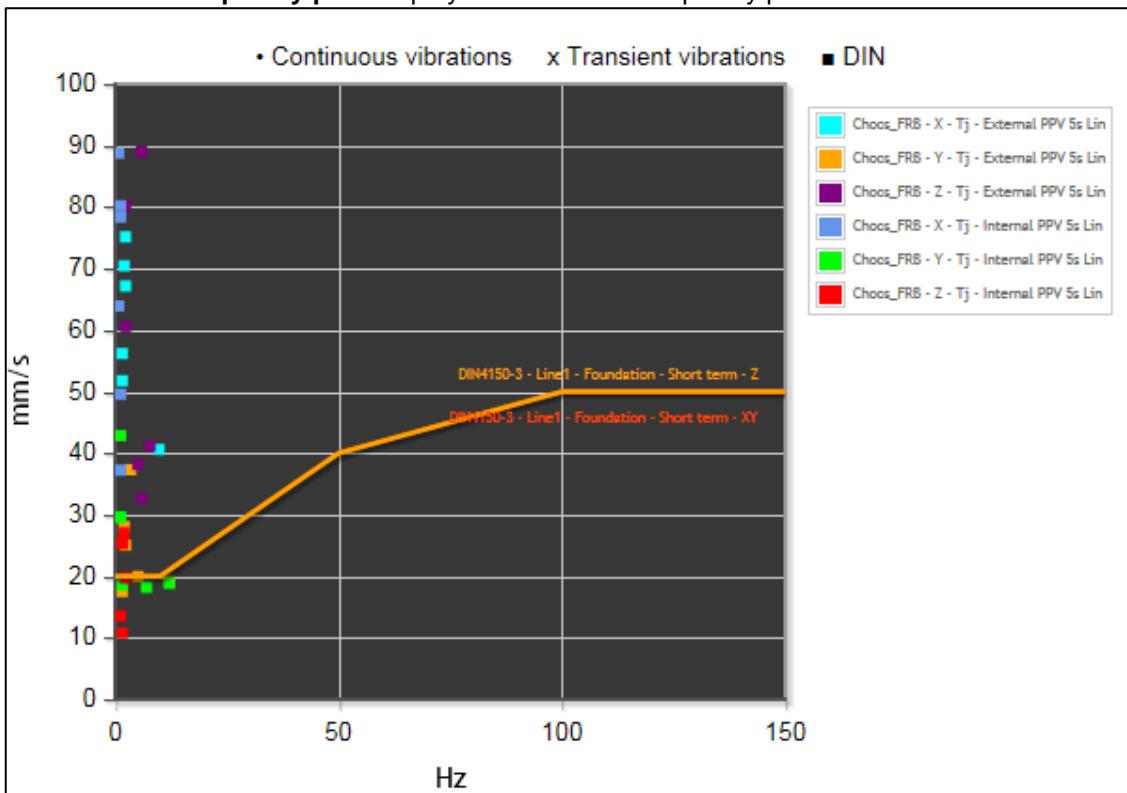


Select the desired types of results (by default, all types of results are selected).

- List of source appearances:** lists source appearances along with details of associated characteristic values:

List of source appearances												
Source	Appearance	Duration	Max.	Heure Max	PPVx	FDx	PPVy	FDy	PPVz	FDz		
I_DIN4150-3_L1_F_S	7/7/2016 4:12:00 PM	0:00:05	80.22	4:12:02 PM:913	80.22	1.17	29.64	1.17	27.05	1.95		
E_DIN4150-3_L1_F_S	7/7/2016 4:12:00 PM	0:00:05	80.16	4:12:02 PM:878	70.44	1.95	28.04	1.95	80.16	2.34		
I_DIN4150-3_L1_F_S	7/7/2016 4:12:40 PM	0:00:05	88.77	4:12:42 PM:950	88.77	0.78	29.55	0.78	19.73	2.34		
E_DIN4150-3_L1_F_S	7/7/2016 4:12:40 PM	0:00:05	75.16	4:12:42 PM:949	75.16	2.34	25.03	2.34	80.57	2.34		
I_DIN4150-3_L1_F_S	7/7/2016 4:12:50 PM	0:00:05	63.93	4:12:50 PM:815	63.93	0.78	18.21	7.03	13.56	1.17		
E_DIN4150-3_L1_F_S	7/7/2016 4:12:50 PM	0:00:05	67.16	4:12:50 PM:811	67.16	2.34	19.94	5.08	38.15	5.08		
I_DIN4150-3_L1_F_S	7/7/2016 4:13:10 PM	0:00:05	49.58	4:13:12 PM:449	49.58	1.17	18.55	1.56	25.45	1.56		
E_DIN4150-3_L1_F_S	7/7/2016 4:13:10 PM	0:00:05	56.19	4:13:12 PM:445	56.19	1.56	17.51	1.56	41.11	7.81		
I_DIN4150-3_L1_F_S	7/7/2016 4:13:30 PM	0:00:05	37.22	4:13:31 PM:865	37.22	1.17	18.85	12.11	10.78	1.56		
E_DIN4150-3_L1_F_S	7/7/2016 4:13:30 PM	0:00:05	40.60	4:13:31 PM:862	40.60	9.77	19.06	12.11	32.59	5.86		
I_DIN4150-3_L1_F_S	7/7/2016 4:14:10 PM	0:00:05	78.35	4:14:13 PM:203	78.35	1.17	42.85	1.17	25.28	1.56		
E_DIN4150-3_L1_F_S	7/7/2016 4:14:10 PM	0:00:05	88.98	4:14:13 PM:232	51.76	1.56	37.32	3.52	88.98	5.86		

- Dominant frequency plot:** displays the dominant frequency plot



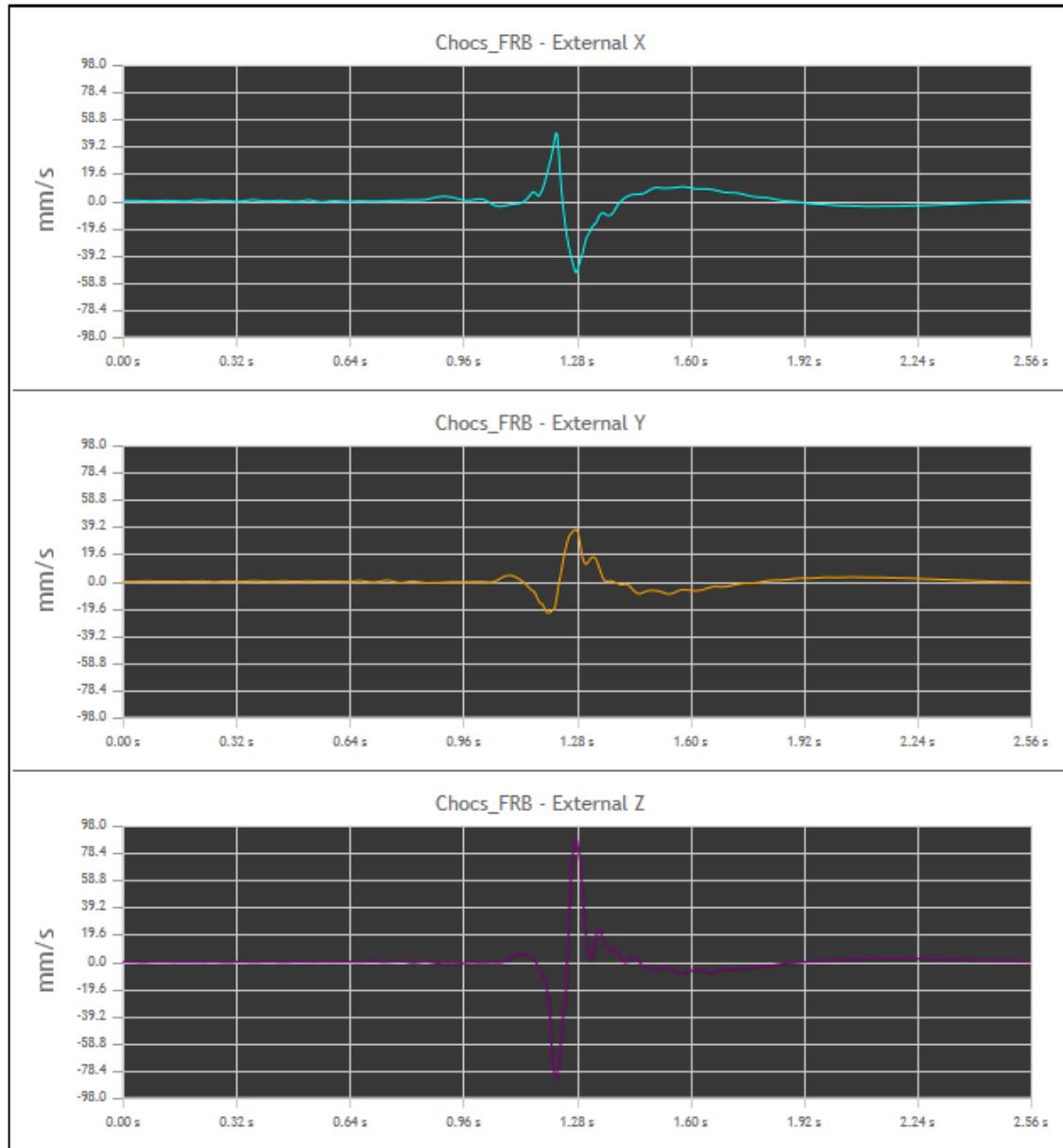
- Summary of appearances:** displays the summary of appearances for each selected source:
  - Source name
  - Number of appearances
  - Total duration

Summary of appearances					
Source	Appearance	Duration			
E_DIN4150-3_L1_F_S	Total:6	0:00:30	I_DIN4150-3_L1_F_S	Total:6	0:00:30

- **Maximum observed / Selected appearance:** displays in a synthetic form the strongest event (occurrence of the strongest source) and the details for the associated values.

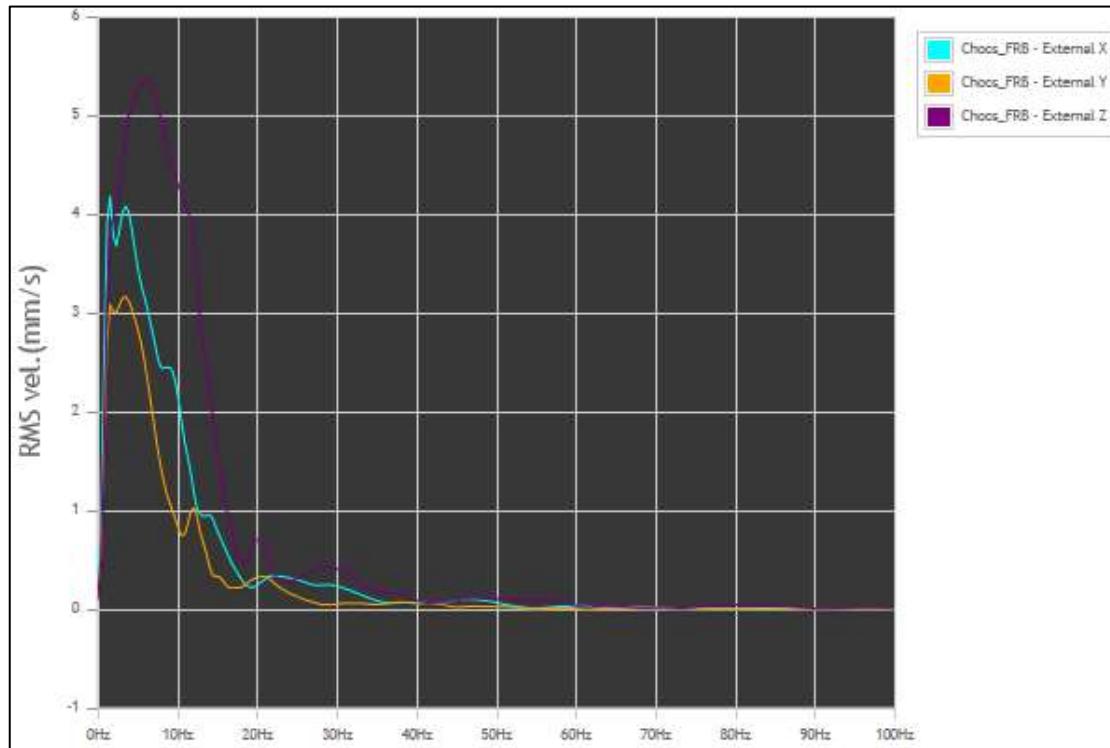
Maximum observed											
Source	Appearance	Duration	Max.	Heure Max	PPVx	FDx	PPVy	FDy	PPVz	FDz	
E_DIN4150-3_L1_F_S	7/7/2016 4:14:10 PM	0:00:05	88.98	4:14:13 PM:232	51.76	1.56	37.32	3.52	88.98	5.86	

**Signals and FFT plots:** displays the plots of time signals and the corresponding FFT spectra for the **Maximum observed** or **Selected appearance**:  
**X,Y,Z signals:**



**FFT spectra:**

- BOOK *Automatically calculated, on the fly, with calculation settings similar to those of ORION. See **ORION** user manual for more details.*



- BOOK *Signals and FFT spectra are represented using the same colour convention as that described in § 4.11.*
- BOOK *Amplitude scales are the same for plots X, Y, Z.*

- **Dynamic**

Select the type of dynamic range (Auto or Manual) for the ordinate scale of the plots.

After validation of the set-up window, all **Results to list** activated by the user are displayed on screen along with an information cartouche (see opposite).

Conformity analysis - DIN 4150					
File	Shocks_3min_Internal and External.cmg				
Location	Choos_FRB - Tj				
Start	7/7/2016 4:11:50 PM				
End	7/7/2016 4:14:40 PM				
Source	E_DIN4150-3_L1_F_S, I_DIN4150-3_L1_F_S				
Data type	PPVx	FDx	PPVy	FDy	PPVz
Units	mm/s	Hz	mm/s	Hz	mm/s
Device type	ORION Device serial number: 10051				
Sensor type	InternalAccelerometer	Sensor serial number: 000000			
Sensor type	ExternalVelocimeter	Sensor serial number: 000000			

If no source appearance is present in the analyzed file portion, the corresponding list stays empty and indicates “**No events were observed**”:

List of source appearances
No events were observed

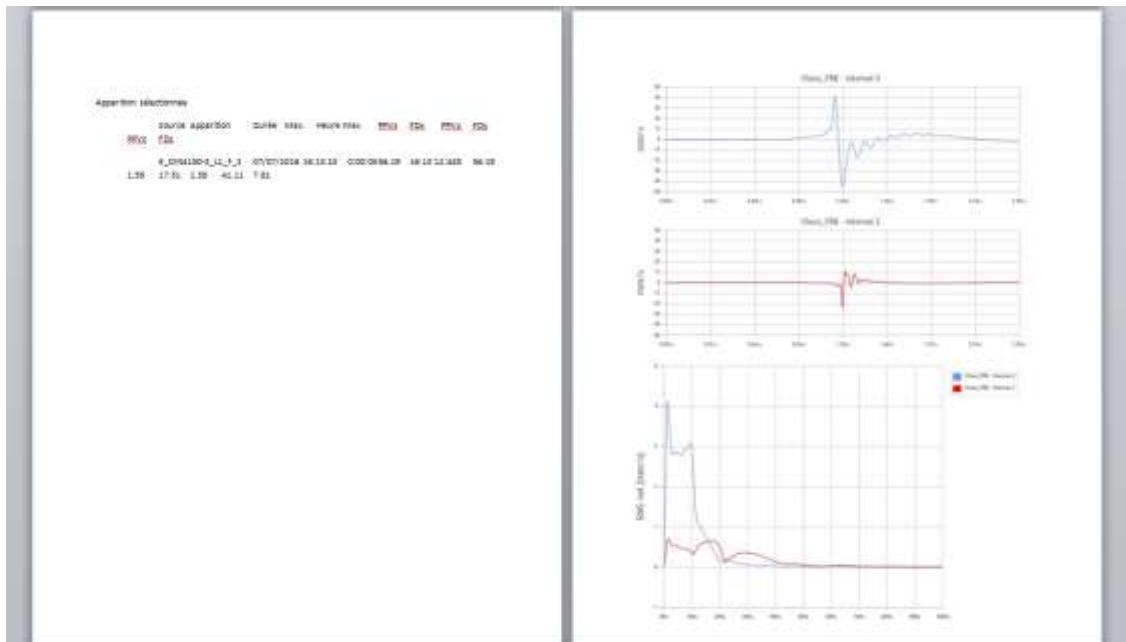
If sources are present in the analyzed file portion, the corresponding **Results to list** will be displayed.

#### **New in dB Trait 6.3:**

Possibility to select/unselect events by clicking on the left column (Shift+click to select/unselect all).

Several possibilities are offered to export these elements for reporting purpose:

- The **Edit / Copy** command or keyboard shortcut **Ctrl+c** or icon  allows exporting the table elements to Clipboard
- The **Edit / Export Word** command or keyboard shortcut **Ctrl+w** or icon  : allows exporting all the selected events to Word, with the header information first (dates, serial number, ...) and listing of events, and then a detailed page for each event, including the graphics.
- The **Edit / Export Excel** command or icon  : allows exporting all the selected events to Excel, with the header information first (dates, serial number, ...) and listing of events, and then one tab per event, including the graphics.



- ❖ In case of troubles with the Word export, please give it another try.
- ❖ In case of troubles with the Excel export, please set the "Visible" parameter to 1 in the [Excel] section of the [dB Trait.ini](#) file.

By default, the event on display is the strongest event (**Maximum observed**).

Another event can be selected in the list of appearances. The **Maximum observed** inset then becomes **Selected appearance**, and the associated characteristic values are replaced:

Selected appearance											
Source	Appearance	Duration	Max.	Heure Max	PPVx	FDx	PPVy	FDy	PPVz	FDz	
E_DIN4150-3_L1_F_S	7/7/2016 4:12:50 PM	0:00:05	67.16	4:12:50 PM-811	67.16	2.34	19.94	5.08	38.15	5.08	

Signal and FFT plots are also updated and display elements relevant to the **Selected appearance**.

This allows the user checking, for any source appearance, the aspect of the velocity time signals (“velocity signals for DF calc.”) for axes X,Y,Z, as well as the corresponding FFT. It is thus possible to check for the possible existence of high frequency peaks, in addition to the frequency peak selected as dominant frequency.

- (book) *For more details on “velocity signals for DF calc.” and on the calculation of dominant frequencies, see the **ORION** user manual.*
- (book) *For each source appearance, “velocity signals for DF calc.” can be present or not in the measurement session: the storage of X,Y,Z signals in **ORION** is independent, by axis, and depends on threshold violations occurring on the respective axes.*  
Therefore, signals and FFT will not be systematically displayed for all X,Y,Z axes.
- (book) *In case the measurement sessions of several **ORION** devices are merged with different templates (concatenation of measurement sessions), the template selected for the merged measurement session will be that of the first item of the channel.*
- (book) *In case of an error of the user when configuring the measurement (selection of a wrong standard), this function cannot be immediately used. The solution consists in redoing the measurements using one of the options of Standard DIN 4150-3 (with the same base period  $T_j$  and the same location name) in an intermediate measurement session, manually redoing the codes in the session containing the actual measurements and merging the two sessions.*

### 13.2.2 Circulaire du 23 juillet 1986

Command **Statutory analysis / Reporting according Circ July 23, 1986** is used to analyze environmental vibrations according to the aforementioned French decree and to easily generate a report.

(full name of decree in French: **circulaire du 23 juillet 1986** relative aux vibrations mécaniques émises dans l'environnement par les installations classées pour la protection de l'environnement).

This function takes exactly the principle of the the command **Statutory analysis / Reporting according DIN4150-3**. See § 13.2.1 for more details.

- (book) *This feature is not accessible for  $T_i$  data, but only for  $T_j$  data. See § 22.1.2 for more details about  $T_j$  and  $T_i$  data.*

### 13.2.3 Arrêté du 22 septembre 1994

Arrêté du 22 septembre 1994 relatif aux exploitations de carrières et aux installations de premier traitement des matériaux de carrières.

To assess environmental vibrations according to this order, use command **Analysis / Counting**.

#### 13.2.4 BS 5228-4

Command **Statutory analysis / Reporting according 5228-4** is used to analyze environmental vibrations according to the aforementioned English standard and to easily generate a report. (full name of the **BS 5228-4** standard: Noise and vibration control on construction and open sites. Code of practice for noise and vibration control applicable to piling operations).

This function takes exactly the principle of the the command **Statutory analysis / Reporting according DIN4150-3**. See § 13.2.1 for more details.



*This feature is not accessible for **Ti** data, but only for **Tj** data. See § 22.1.2 for more details about **Tj** and **Ti** data.*

### 13.2.5 BS 5228-2 (BS 7385-2)

Command **Statutory analysis / Reporting according 5228-2 (7385-2)** is used to analyze environmental vibrations according to the aforementioned English standards and to easily generate a report.

(full name of the **BS 7385-2** standard: Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration).

(full name of the **BS 5228-2** standard: Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration).

This function takes exactly the principle of the the command **Statutory analysis / Reporting according DIN4150-3**. See § 13.2.1 for more details.

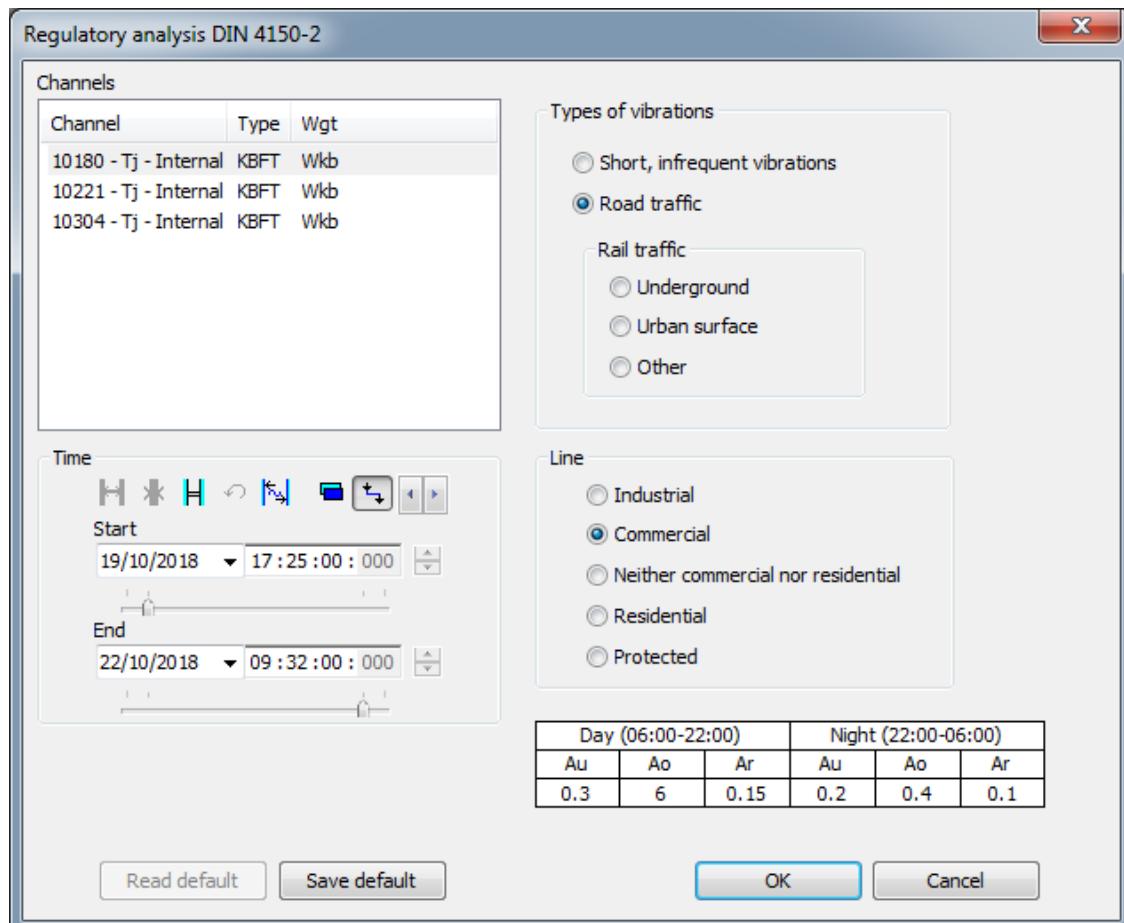
 *This feature is not accessible for **Ti** data, but only for **Tj** data. See § 22.1.2 for more details about **Tj** and **Ti** data.*

#### 13.2.1 DIN 4150-2

The **Statutory analysis / Analyze according DIN4150-2** command is used to assess environmental vibrations according to Standard **DIN4150-2** and easily generate a report.

 *Its execution requires having KBFT type data in the measurement session.*

The configuration window below allows defining the parameters necessary for this evaluation:



- **Channel**

The metrics used as reference for the calculations. Only KBFT data can be selected, as triplets (complete triaxial transducers and not axis by axis).

Multi-selection is not allowed.

- **Time**

The file portion to take into account for the statutory analysis.

- **Types of vibrations**

Selection of the type of vibration concerned by the measurement to be analyzed, according to the list from the standard.

- **Line**

Selection of the type of location of the Building in which the measurement was performed.

- **Reference values table**

Table showing the reference values used for the statutory assessment, depending on the « Types of vibrations » / « Line » user's choice.

By validating the configuration window, a result window is displayed, in which the compliance analysis is given day by day, for the regulatory periods Day and Night.

This table is preceded by an information cartouche:

The screenshot shows a software interface for a regulatory analysis. At the top, there is a title bar with the text "Regulatory analysis DIN 4150-2 WeekEnd\_20-21-Oct2018\_3 app..." and standard window controls (minimize, maximize, close). Below the title bar is a toolbar with two icons: a gear (settings) and a grid (view). The main area consists of two tables. The first table is a summary of parameters:

File	WeekEnd_20-21-Oct2018_3 appareils.CMG					
Location	10180 - Tj - Internal					
Start	10/19/2018 5:25:00 PM					
End	10/22/2018 9:32:00 AM					
Types of vibrations	Road traffic					
Line	Commercial					
Values used for evaluation	Highest values among X,Y,Z					

The second table is a detailed compliance analysis table:

Reference indicator	KBFmax		KBFT <sub>r</sub>		KBFmax		KBFT <sub>r</sub>	
	Au	Ao	Ar	Au	Ao	Ar	Au	Ao
Reference values	0.3	6	0.15	0.2	0.4	0.1		
Period	Day 6-22h				Night 22-6h			
	KBFmax	KBFT <sub>r</sub>	Conformity	KBFmax	KBFT <sub>r</sub>	Conformity		
10/19/2018	3.818	0.162	NOK	0.017	0.000	OK		
10/20/2018	0.016	0.000	OK	0.023	0.000	OK		
10/21/2018	0.021	0.000	OK	0.024	0.000	OK		
10/22/2018	0.857	0.022	OK			Not determined		

The command **Edit / Copy** or shortcut **Ctrl+c** allows copying the result window content: as image, or as values.

- For each date, the reference indicators are compared with the reference values  $A_u$ ,  $A_0$  and  $A_r$ , for Day and Night period.
- Particular case: analysis performed on " $T_i$ " values, e. g. 1s (instead of 30s " $T_j$ " values): in this case the data include KBFT but never KBFTr. The conformity analysis cannot therefore be done in some cases, and the conformity result is then "Not determined".
- If a measurement session includes **KBFTr rest and KBFTr no rest** (e.g. if the user has stopped the measurement, changed the measurement configuration, and then restarted the measurement): the DIN 4150-2 analysis module takes into account the first of the 2 indicators encountered (either KBFTr rest, or KBFTr no rest) and ignores the second. Therefore, for such cases, it is recommended to process separately the measurements including exclusively KBFTr rest or exclusively KBFTr no rest. To do so, care must be taken to ensure that only homogeneous measurements are concatenated.

### 13.3 HUMAN BODY EXPOSURE TO VIBRATIONS

#### 13.3.1 Hand-Arm study

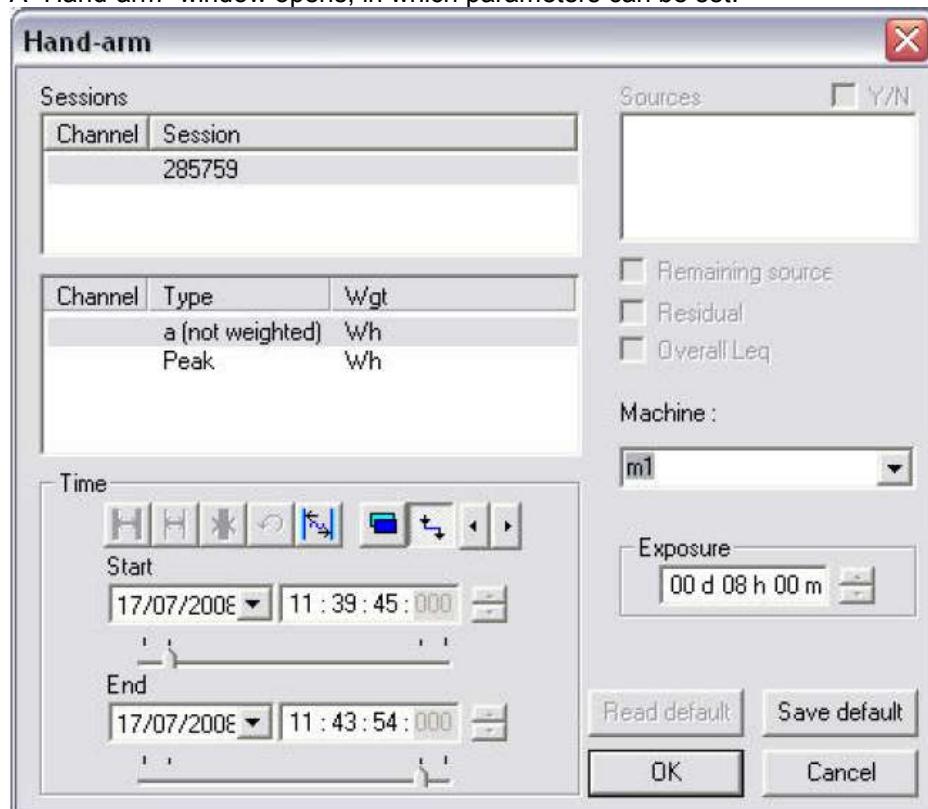
##### 13.3.1.1 Selection of Hand-Arm parameters

This paragraph deals with the study of Hand-arm vibration. **dBTrait** can be used to process data collected by **Maestro** and **VIB** vibration dosimeters and give results compliant with **Directive 2002/44/CE** regarding the Hand-arm study.

These results are available from the following procedure:

- Transfer a VIB measurement of the Hand-Arm type (storage of ahw on the three axes) or open a .CMG file (this file must result from a Hand-arm measurement).
- Click on Statutory Analysis / Hand-arm

A "Hand-arm" window opens, in which parameters can be set.



### 13.3.1.2 Processing Hand-Arm results

After selection of the parameters, **dB Trait** displays, in a table, the results for the Hand-arm study.

Hand-arm results 010026_080717_113945000_1.CMG						
	$\Sigma$	$\Sigma$	$\Sigma$			
File	010026_080717_113945000_1.CMG					
Location						
Start	17/07/08 11:39:45					
End	17/07/08 11:43:54					
Hand arm						
Operator	2					
Measurement location	room					
Type	ahw (weighted HA)					
Machine	m1					
Axis	X	Y	Z	Level Overall	Overall	Exposure
Weighting	VWh	VWh	VWh	Hand arm (ahw)	A(8)	
Level (m/s <sup>2</sup> )	0,49	0,60	1,04	1,30	1,30	8h
Warning level (m/s <sup>2</sup> )					2,50	29h43m
Maximum level (m/s <sup>2</sup> )					5,00	118h51m
Exposure level A(8) is below warning level						

This table summarises:

- The  $a_{hw}$  level in m/s<sup>2</sup> for each axis;
- The A(8) level resulting from the  $a_{hw}$  level and from the exposure time;
- The result compared to two thresholds listed in the Directive;
- Exposure times corresponding to the violation of the first and second thresholds;
- The overall Hand-arm  $a_{hw}$  level resulting from the three  $a_{hw}$  values.

### 13.3.2 Whole-Body study

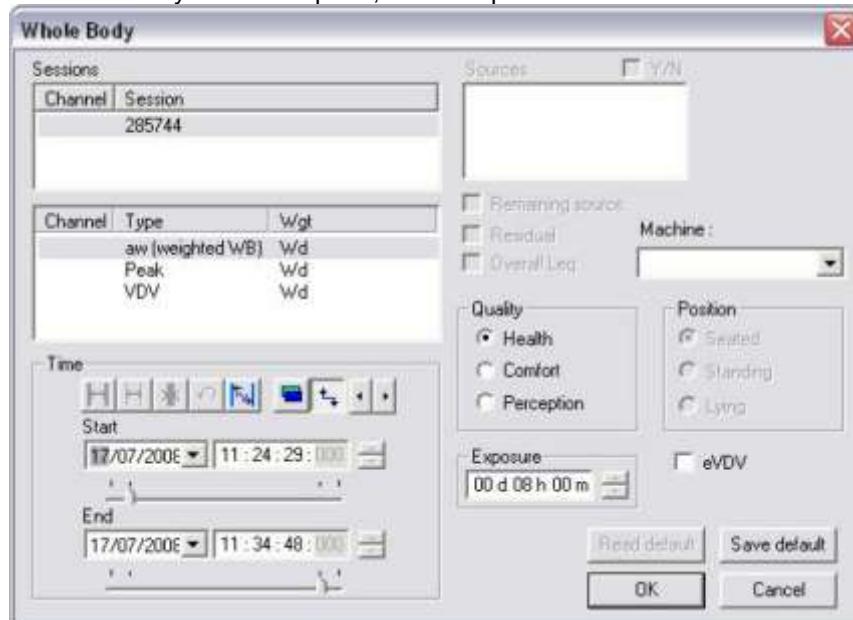
#### 13.3.2.1 Selection of Whole-Body parameters

**dB Trait** can also be used for the study of **Whole-body** vibration. Like for the Hand-arm study, results are compliant with **Directive 2002/44/CE**.

These results are available as follows:

- Transfer a **VIB** measurement of the Whole-body type (storage of aw on the three axes) or open a .CMG file (this file must result from a Whole-body measurement).
- Click on Statutory Analysis / Whole body

A "Whole-body" window opens, in which parameters can be set.



### 13.3.2.2 Processing Whole-Body results

Like for the Hand-arm parts, Whole-body results are displayed in a table. In this paragraph, we will deal with the "health" domain. The other two domains will be addressed further down.

#### 13.3.2.2.1 Results in the "Health" domain

Whole body results 010026_080717_112429000.CMG						
File	010026_080717_112429000.CMG					
Location						
Start	17/07/08 11:24:29					
End	17/07/08 11:34:48					
Whole body						
Quality	Health					
Body position	Seated					
Measurement location	Seat					
Operator	andrew					
Measurement location	room					
Type	aw (weighted WB)					
Machine						
Axis	X	Y	Z	Level Overall Whole body (aw)	Overall A(8)	Exposure
Weighting	Wd	Wd	Wk			
Coefficient	1,4	1,4	1			
Level (m/s <sup>2</sup> )	0,81	0,97	1,26			
Corrected (m/s <sup>2</sup> )	1,13	1,36	1,26	2,17	1,35	8h
Warning level (m/s <sup>2</sup> )					0,50	1h 5m16s
Maximum level (m/s <sup>2</sup> )					1,15	5h45m17s
Exposure level A(8) is above maximum level						

This table lists the following results (for our example):

- the aw level in m/s<sup>2</sup> for each axis;
- the A(8) level resulting from the aw levels and the exposure time;
- the result compared with the two European thresholds;
- exposure times corresponding to the violation of the first and second thresholds.

We shall now see the summary tables for the other two quality criteria (comfort and perception), see § 13.3.2.1.

### 13.3.2.2.2 Results regarding "Comfort"

For the comfort criterion, the following table is computed for our example:

Whole body results 010026_080717_112...				
File	010026_080717_112429000.CMG			
Location				
Start	17/07/08 11:24:29			
End	17/07/08 11:34:48			
<b>Whole body</b>				
Quality	Comfort			
Body position	Seated			
Measurement location	Seat			
Operator	andrew			
Measurement location	room			
Type	aw (weighted WB)			
Machine				
Axis	X	Y	Z	Level Overall
Weighting	Wd	Wd	Wk	Whole body (av)
Level (m/s <sup>2</sup> )	0,81	0,97	1,26	1,78
1,25 m/s <sup>2</sup> <= Aeq <= 2,50 m/s <sup>2</sup> : very uncomfortable				

This table includes the following information:

- the file used for the measurements
- the beginning and the end of the measurements (format: dd:mm:yy hh:mm:ss)
- the “quality” domain under study (comfort)
- the body position during measurement (seated)
- the location of the transducer during measurement (seat)
- the weighting used for the calculation
- the comfort level with respect to the calculated A(8) value and to that recommended by the European Directive (extremely uncomfortable)

### 13.3.2.2.3 Results regarding "Perception"

For the perception criterion, the following table is obtained:

Whole body results 010026_080717_112...				
File	010026_080717_112429000.CMG			
Location				
Start	17/07/08 11:24:29			
End	17/07/08 11:34:48			
<b>Whole body</b>				
Quality	Perception			
Body position	Seated			
Measurement location	Seat			
Operator	andrew			
Measurement location	room			
Type	aw (weighted WB)			
Machine				
Axis	X	Y	Z	Level Overall
Weighting	Wd	Wd	Wk	Whole body (av)
Level (m/s <sup>2</sup> )	0,81	0,97	1,26	1,78
Above perception threshold (0,015 m/s <sup>2</sup> )				

This table lists the same data as the previous table. The only changes are:

- the “quality” domain under study (perception)
- the perception level (above or under the perception threshold set to 0.015 m/s<sup>2</sup>).

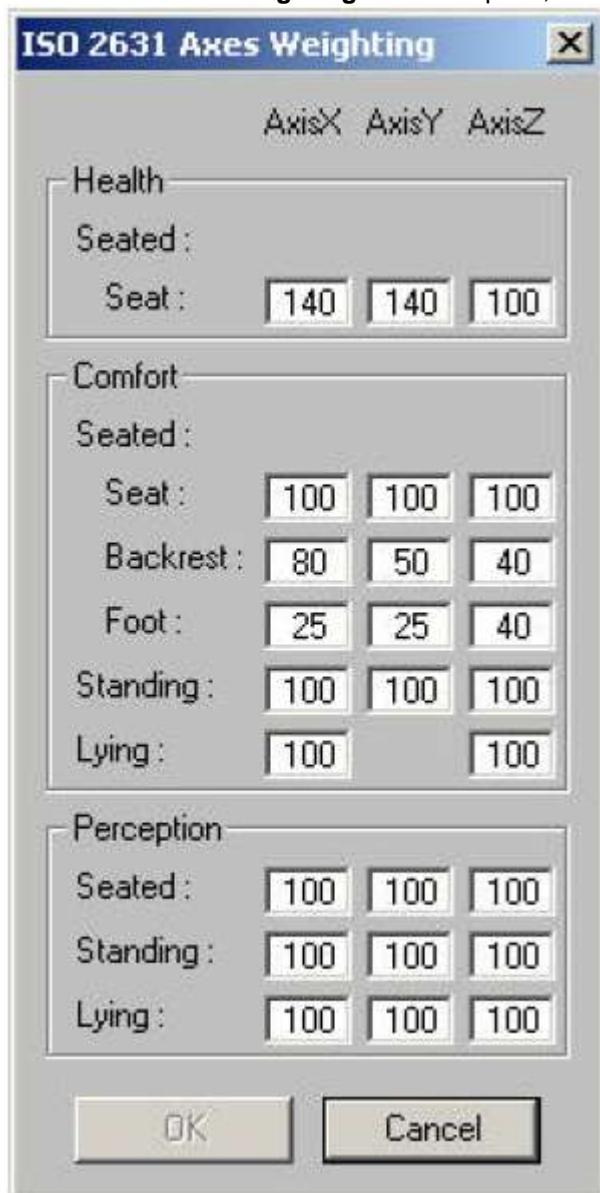
### 13.3.2.3 Changing axis weighting

Weighting values can be changed for X, Y and Z axes, and this for the following criteria: health, comfort and perception. Default values are those recommended in Standard ISO 2361.

To change these parameters, which will then be taken into account for the calculation of Whole-body results and will be displayed in the results window:

- Click on **Aux / ISO 2361** axis weighting.

An “**ISO 2361 axis weighting**” window opens, in which weighting values can be changed.



### 13.3.3 SEAT time history

The experiment presented here is a **SEAT** measurement. All data will then be processed by **dBTrait**. This experiment was done in the conditions recommended in Standard **ISO 2631**.

The experiment took place on a power lift truck.

The monoaxial accelerometer was fixed on the frame of the truck, while the rigid plate containing the triaxial accelerometer was set on the seat, the operator being seated on it.

The measurements were performed while the power lift truck moved on a natural testing track at a constant speed.

The minimum integration time for the measurements was 180 seconds.

The results presented here pertain to one of the measurements.

#### 13.3.3.1 Selecting SEAT parameters

During Whole-body measurements, an accelerometer can be added to the Whole-body device in order to calculate the **SEAT** indicator (the transmission factor for the seat RMS amplitudes).

The **SEAT** function is available only when the measurements were performed with a secondary accelerometer.

#### Conditions:

At opening stage of a measurement session, a SEAT channel is associated to a Z channel and a Z2 channel if the following conditions are met:

- Same session number
- Same dates
- Whole body
- Aw

When these conditions are met, dBTrait then recomposes the **SEAT** indicator from Z and Z2.

This recomposition is used in plots

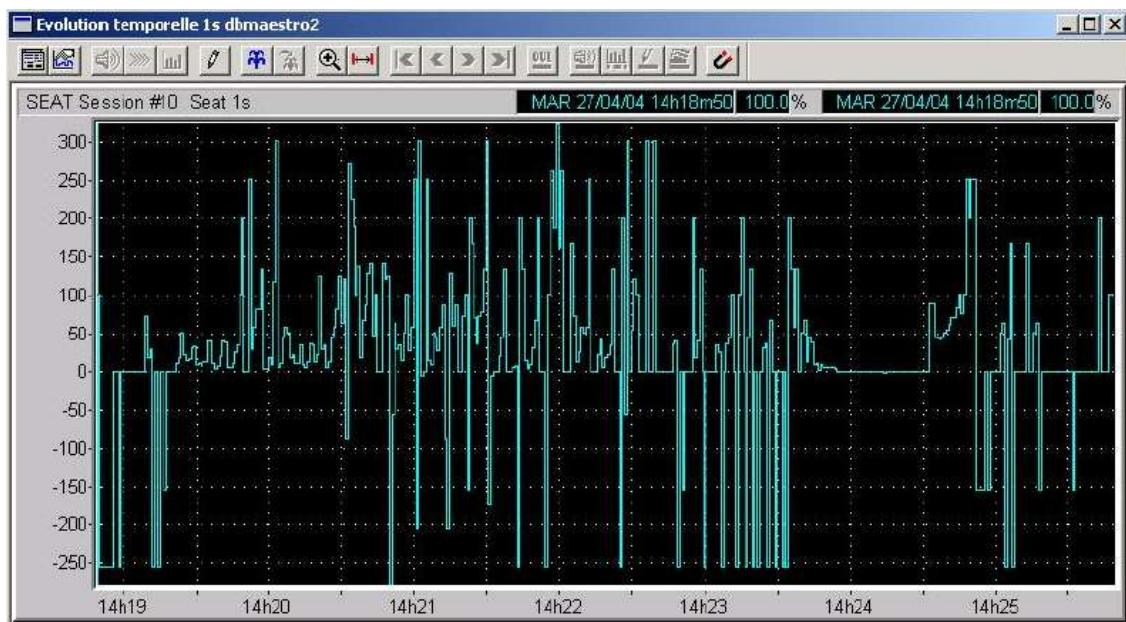
- with a recomposed Integration Time
- when the “indicator between cursors” is activated

To use this function:

- Open a .CMG file in **dBTrait** (this file must be a Whole-body measurement)
- Click on Visualisation / time history
- A configuration window opens, which will allow changing the parameters. Among the list of channels, select SEAT.

### 13.3.3.2 Graph analysis

The **SEAT** plot is similar to the time history plot. It is a curve that represents **SEAT** versus time. The curve below shows the **SEAT** measured on the power lift truck. Using the cursors, one can determine the **SEAT** value for a given time T.



### 13.3.4 Multiple exposure

Standard NF EN 14253 is used to assess statutory A(8) resulting from the daily exposure to several types of vibration generated, for instance, by several machines.  
**dBTrait** allows for this type of calculation.

The recombination is calculated differently for each domain (**Hand-arm** and **Whole-body**), however the path to the result is the same.

The coding method for the different exposures (different machines) is to be used they were measured in the same measurement file. Measurements need then to be done in a row, one after the other.

Otherwise, measurements can be concatenated in order to be gathered in a single measurement file (.CMG file). The concatenation procedure is described elsewhere in this document.

This method allows for faster processing and easier comparison of the different results on the same time history.

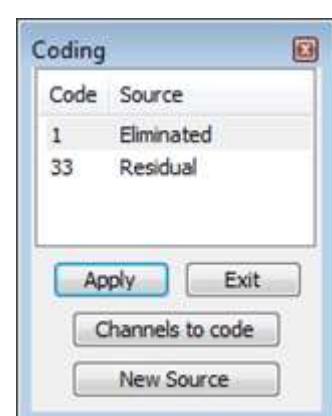
Here is the procedure to follow:

- Transfer a **Hand-arm** or **Whole-body** measurement from VIB or open a .CMG file (the current example deals with a Hand-arm measurement)
- Open the time history from the Visualization / Time history menu

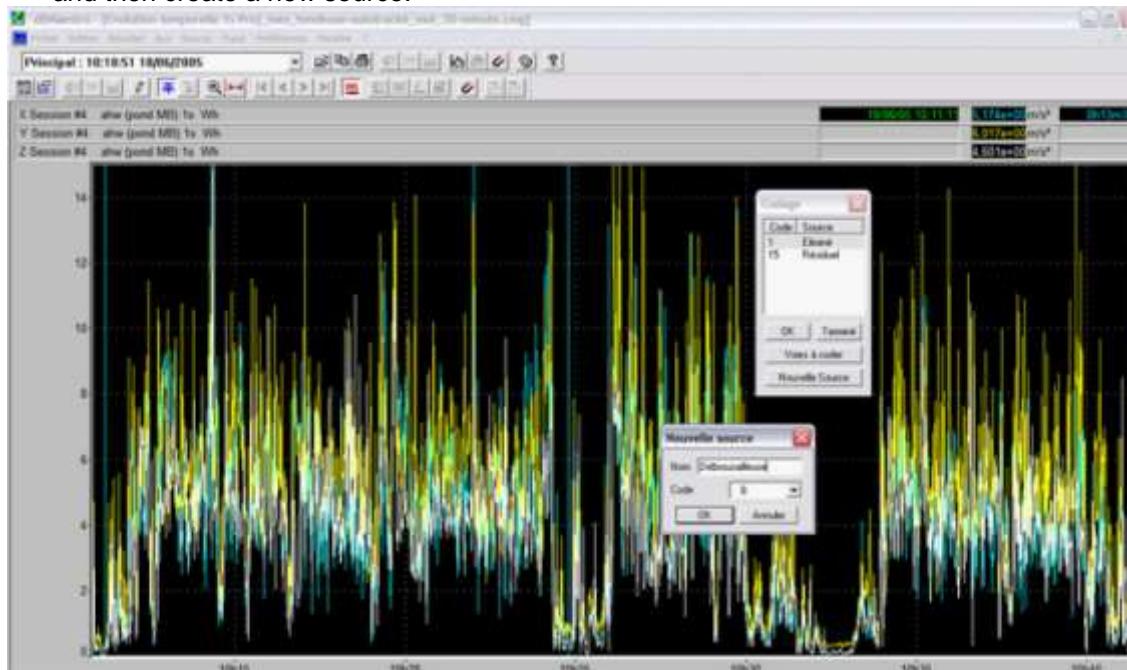


- Open the coding window by clicking on the source icon

The coding window is displayed.

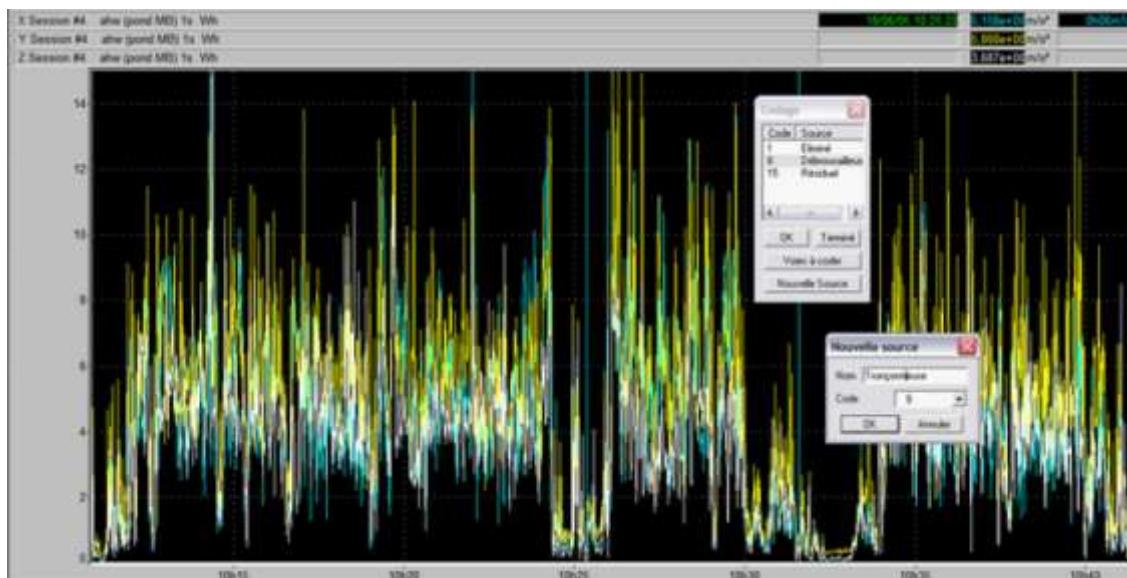


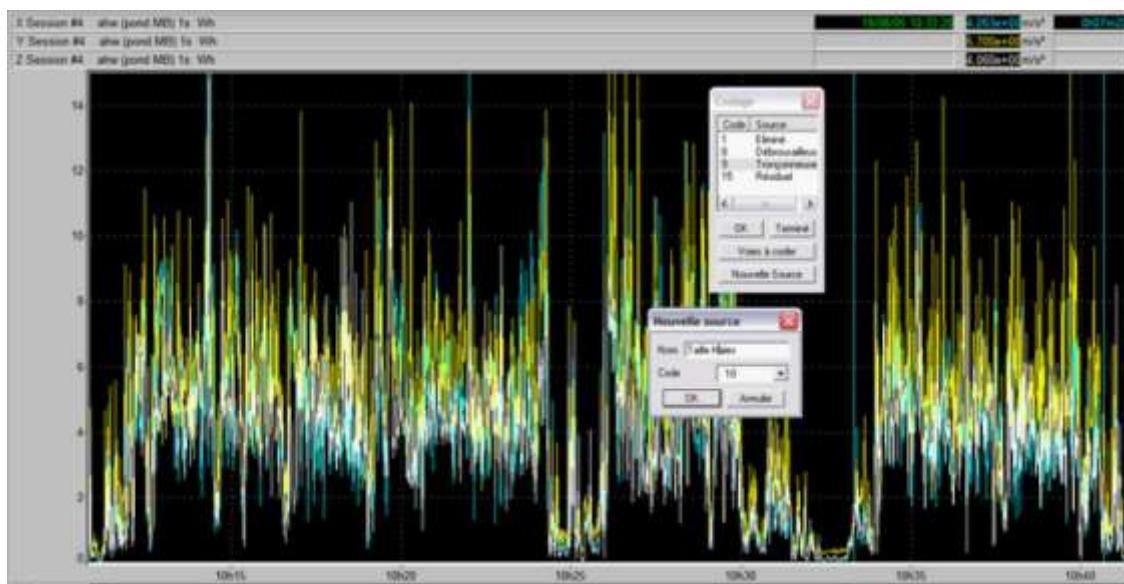
- Place the cursors on both sides of the section representing the exposure to the first machine and then create a new source.



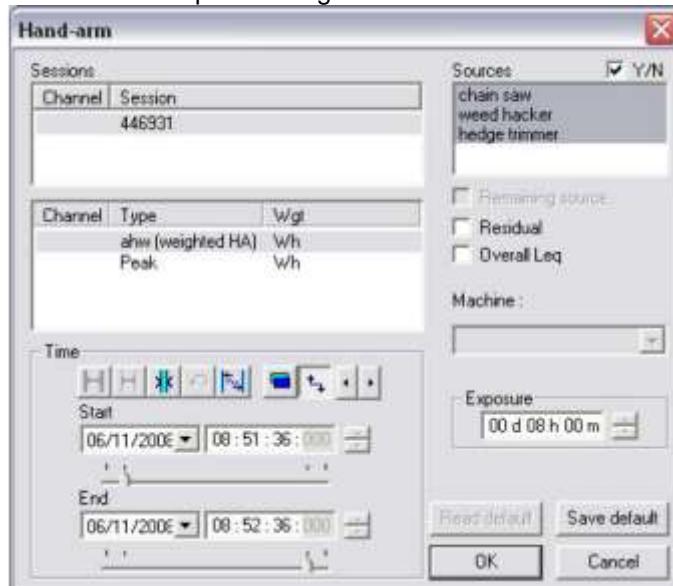
Once the new source is validated, the part between cursors belongs to this source

- Repeat this operation for all other exposures (in the example below, a “weed hacker” source and a “hedge trimmer” source are created next).





- Once all sources are created, click on Exit and then open the results' set-up window using the **Statutory Analysis / Hand-arm or Whole-body** menu.
- Check the option taking into account the sources in order to get a result for each source.



Hand-arm results 010021_081106_085136000.CMG						
File	010021_081106_085136000.CMG					
Location						
Start	06/11/08 08:51:36					
End	06/11/08 08:52:36					
Hand arm						
Operator	andrew					
Measurement location	room					
Type	ahw (weighted HA)					
Machine	chain saw					
Axis	X	Y	Z	Level Hand arm (ahw)	Overall A(8)	Exposure
Weighting	Wh	Wh	Wh			
Level (m/s <sup>2</sup> )	0,10	0,12	0,10	0,19	0,19	8h
Warning level (m/s <sup>2</sup> )					2,50	1441h48m
Maximum level (m/s <sup>2</sup> )					5,00	5767h12m
Exposure level A(8) is below warning level						
Machine	weed hacker					
Axis	X	Y	Z	Level Hand arm (ahw)	Overall A(8)	Exposure
Weighting	Wh	Wh	Wh			
Level (m/s <sup>2</sup> )	0,10	0,12	0,10	0,18	0,18	8h
Warning level (m/s <sup>2</sup> )					2,50	1481h57m
Maximum level (m/s <sup>2</sup> )					5,00	5927h46m
Exposure level A(8) is below warning level						
Machine	hedge trimmer					
Axis	X	Y	Z	Level Hand arm (ahw)	Overall A(8)	Exposure
Weighting	Wh	Wh	Wh			
Level (m/s <sup>2</sup> )	0,10	0,12	0,10	0,19	0,19	8h
Warning level (m/s <sup>2</sup> )					2,50	1423h56m
Maximum level (m/s <sup>2</sup> )					5,00	5695h42m
Exposure level A(8) is below warning level						

All these sources can now be cumulated to obtain a single result.



To do so, click on the icon to send the results to the “multiple machine” calculation table.

Multiple machines - 010021_081106_085136000.CMG						
Hand arm		Vibration m/s <sup>2</sup>			Partial exposure	
		X	Y	Z		
Machine 1	chain saw	0,100	0,124	0,097	08 h 00 m 00 s	0,19
Machine 2	weed hacker	0,098	0,121	0,098	08 h 00 m 00 s	0,18
Machine 3	hedge trimmer	0,098	0,125	0,100	08 h 00 m 00 s	0,19
					00 h 00 m 00 s	
Daily vibration exposure A(8) 0,32 m/s <sup>2</sup>						
<input type="button" value="OK"/>		<input type="button" value="Cancel"/>	<input type="button" value="Add"/>	<input type="button" value="Delete"/>	<input type="button" value="Delete all"/>	

The exposure time can then be set for each machine or another machine can be added manually. Global A(8) is recalculated in real time.

Multiple machines - 010021\_081106\_085136000.CMG

Machine	Name	Vibration m/s <sup>2</sup>			Partial exposure	Daily vibration exposure A(8)
		X	Y	Z		
Machine 1	chain saw	0,100	0,124	0,097	04 h 00 m 00 s	0,13
Machine 2	weed hacker	0,098	0,121	0,098	02 h 00 m 00 s	0,09
Machine 3	hedge trimmer	0,098	0,125	0,100	02 h 00 m 00 s	0,09
					08 h 00 m 00 s	
						0,19 m/s <sup>2</sup>

**OK**   **Cancel**   **Add**   **Delete 3**   **Delete all**

Once all exposure times are defined, click on OK to view the results table

Multiple machines 010021\_081106\_085...

File	010021_081106_085136000.CMG				
Start	06/11/08 08:51:36				
End	06/11/08 08:52:36				
Hand arm					
Machine	Level m/s <sup>2</sup>			Duration h:min:s	Exposure m/s <sup>2</sup>
	ahwx	ahwy	ahwy		
chain saw	0,10	0,12	0,10	4:00:00	0,13
weed hacker	0,10	0,12	0,10	2:00:00	0,09
hedge trimmer	0,10	0,13	0,10	2:00:00	0,09
Daily vibration exposure A(8) : 0,19 m/s <sup>2</sup>					

# CHAPTER 14

## PROCESSING OF TIME SIGNALS

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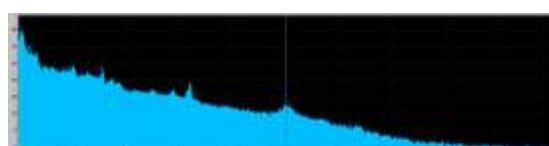
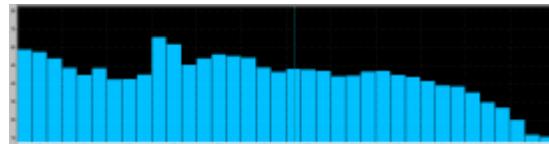
### 14.1 INTRODUCTION TO POST-PROCESSING POSSIBILITIES

dB Trait offers the possibility of **post-processing time signals**, sometimes also called "audio recordings".

These can be acoustic or vibration signals.

The main processing possibilities are as follows:

- **Broad band spectra** in 1/n octaves (octaves, 1/3 octaves, ..., up to 1/48 octaves), averaged or multispectra
- **Narrow band spectra (FFT)**, averaged or multispectra
- **Detailed time history** of global levels: LEQ, Peak, with or without frequency weighting (A, C, Lin..., vibration weightings), with or without time weighting (Fast, Slow, Impulse, etc.)



The following processings are also possible:

- **Undersampling** of time signals records.
- **Gain optimization**

#### New in dB Trait 6.1:

All processing can be preceded by **Pre-processing**: filtering, integration, derivation, weighting, etc., allowing for example to integrate an acceleration signal into a vibration velocity signal, and then to calculate an FFT multispectrum, etc.

#### New in dB Trait 6.1 :

Now it is possible to define and execute **several scripts**.

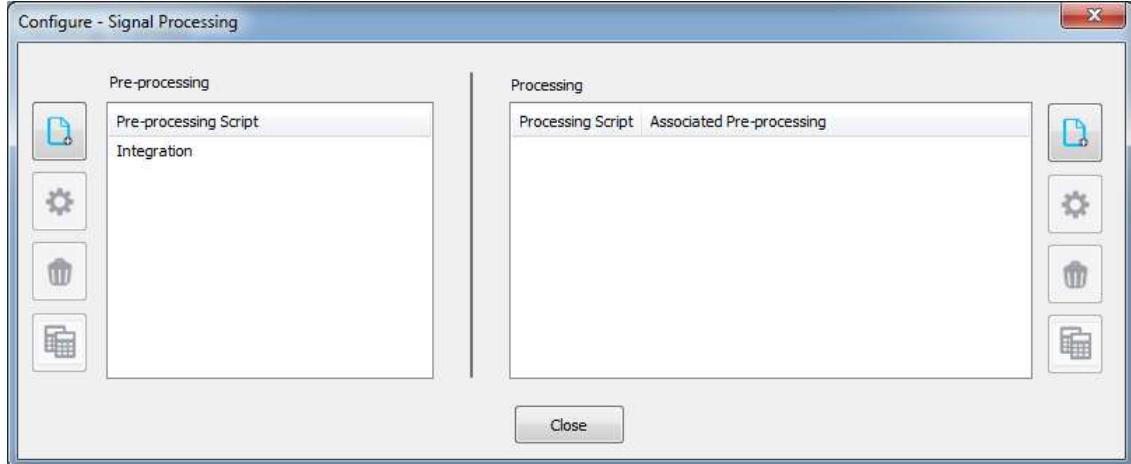
#### New in dB Trait 6.1 :

With ORION data, post-processing of velocity signals with sampling frequency of 400Hz (**Velocity signals for DF calc.**) is now possible.

All processings are available through the command **Post-processing / Configure –Signal processing**

or through the command **Post-procesing / Execute – Signal processing**

and then icon 



The user then defines an **analysis script** that consists of a list of processings.

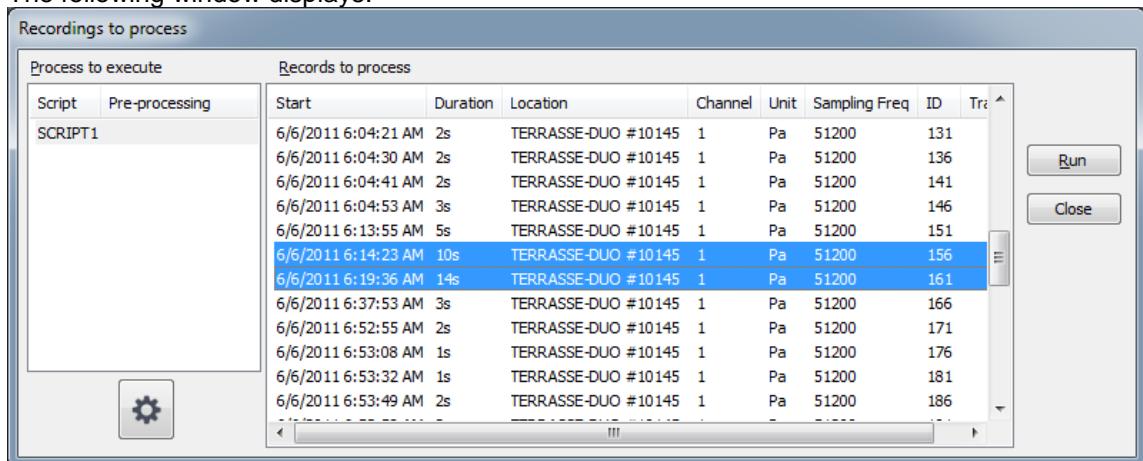
For each type of processing, the user sets various parameters.

Once the processing configuration is done, the time signals data analysis may be started in **dBTrait** by different commands:

- **Multiple processing from the Post-processing menu**

Use the command **Post-processing / Execute – Signal processing**.

The following window displays:



Simply select the signal recordings to process in the given list, and the process to execute. Then use the Run button...

- **Single processing from the time history plot**

Use the commands described in §4.13.2.

To summarize, it is possible to process various analysis in parallel, which can be categorized as follows:

- **Fine analysis:** carried out on a smaller time base than the main data flow's one.
- **« at IT timebase » analysis:** carried out on the main data flow's time base.  
New in dB Trait 6.1: processings are configured by default on this time base.
- **Averaged analysis:** average computations from the whole signal length.

This module will offer you on the one hand a significant time saving thanks to its ease of use and its speed of calculation; and on the other hand a complete evaluation of the studied nuisance.

 *If the option cannot be accessed, it means that the CMG datafile does not contain any signal recordings.*

## 14.2 OPERATING PRINCIPLE OF THE PRE-PROCESSING SCRIPT SERVER

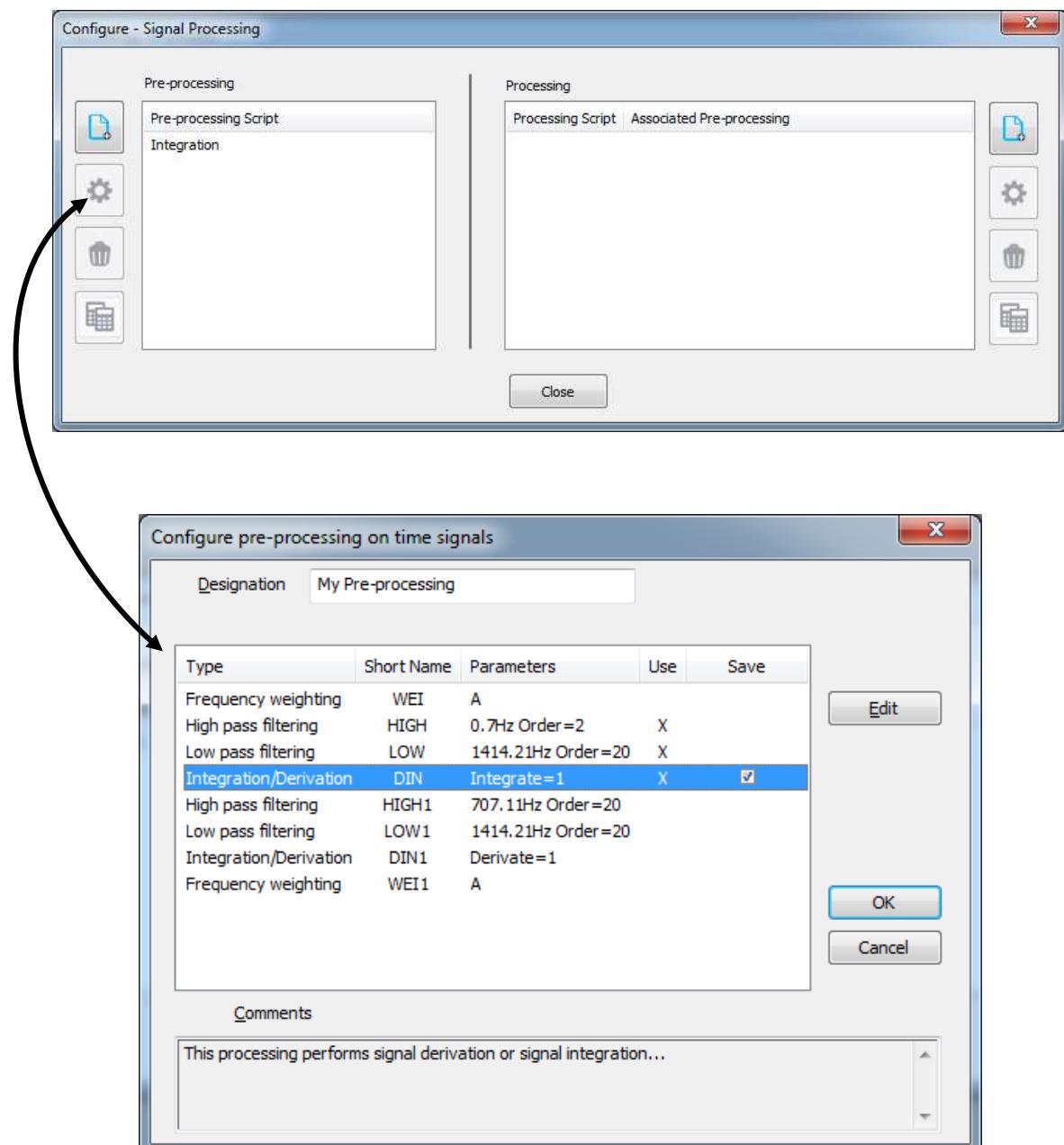
In the **Configure – Signal processing** window, the **Pre-processings** can be configured via the left panel.

By default, an **Integration** pre-processing is always available.

The buttons on the left allows for:

- **Create** a new pre-processing
- **Edit** a pre-processing
- **Delete** a pre-processing
- **Duplicate** a pre-processing

When **editing** a pre-processing script, the list of pre-processings is displayed:



The list of available pre-processings is fixed.

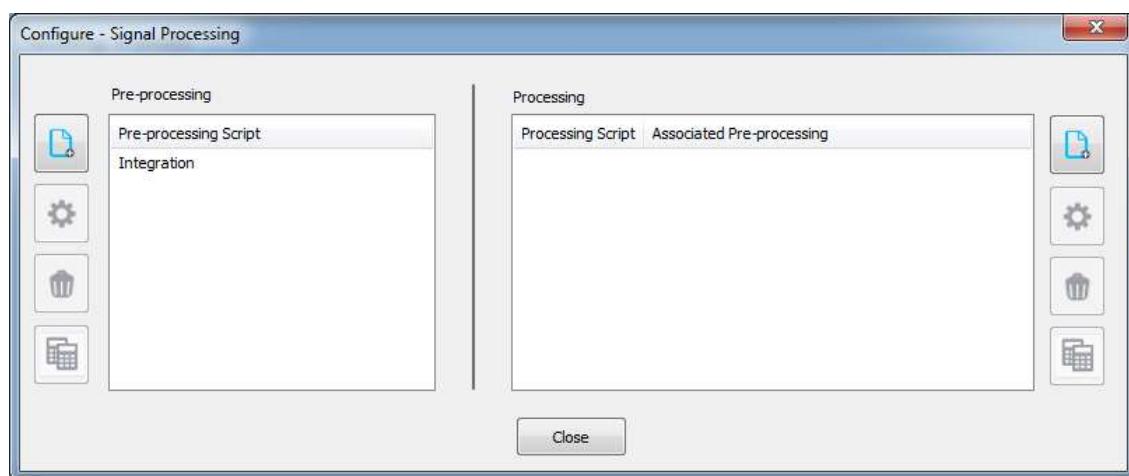
The user activates among this list the wished pre-processing(s) by clicking in the **Use** column. It is even possible to save the corresponding intermediate time signal by clicking in the **Save** column.

The Designation field allows giving a name to the Pre-processing script.

Once the **pre-procesing** validated, it can be **selected in a processing script**.

## 14.3 OPERATING PRINCIPLE OF THE PROCESSING SCRIPT SERVER

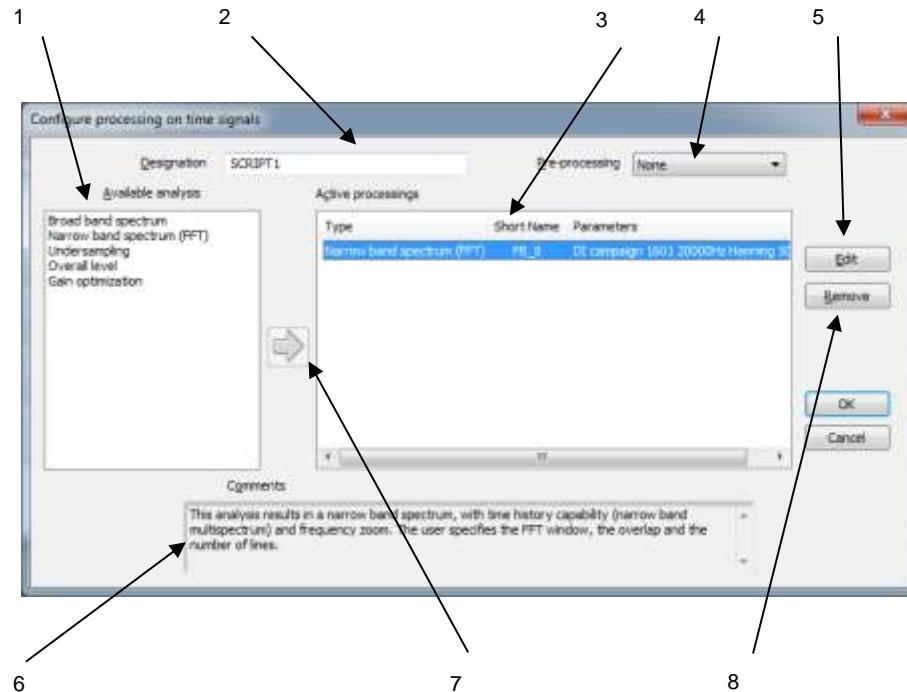
In the **Configure – Signal processing** window, the **Processing scripts** can be configured via the right panel.



The buttons on the right allows for:

- **Create** a new processing
- **Edit** a processing
- **Delete** a processing
- **Duplicate** a processing

When editing a **Processing script**, the following window displays:



1. List of **available processings**: it shows all the types of processings available in **dB Trait**. All these operators can process the same recordings independently. The same operator can be used several times with different parameters to process the same time signal recording.
2. **Designation**: give a name to the script.
3. Set of **active processings** currently part of the script. These operators will be activated to analyse independently a set of time signal events.
4. **Pre-processing**: allows for selecting (or not) a pre-processing
5. **Edit** the parameters of the selected operator (in the list of available processings). Each operator shows his/her own configuration dialog box.
6. Comments describing the operator selected in the available processings' list. If an operator from the active processings' list is selected, the comment field shows the type of the operator.
7. **Key >>** that allows to add an operator into the active processings' list. Different operators of the same type may be added (the user may for example define a multispectrum analysis in third octave band with different time steps). A generic name for each operator is given by default.
8. The key **remove** allows the user to remove an operator from the list of the active processings.

Once the list of active processings has been defined, edit each one of them to define the calculation parameters.

## 14.4 CONFIGURATION OF EACH ACTIVE PROCESSING.

Once the list of active processings has been defined in the script configuration dialog box, define the calculation parameters of each operator.

To do so, select an operator in the list and click on the **Edit** button.

An operator applies a given processing on a quantity or a set of quantities (time signals records in the present case). Each type of operator has its own name and a set of analysis parameters. Furthermore, the progress of each calculation is shown to the user at user-defined intervals.

Select the wished analysis to get information on its configuration parameters.

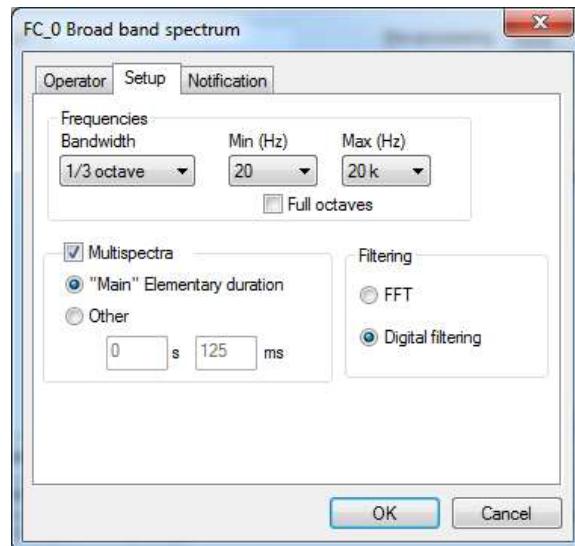
### 14.4.1 Broad band analysis (averaged spectra and multispectra)

In the script configuration dialog box, select an operator of type – **Broad band spectrum** - in the list of available processings and place it in the list of active processings. An operator of name FC is then created.

Select this operator and click on the **Edit** key. The dialog box shown below is displayed on screen. The tab **Operator** gives a detailed description of the operator and allows the user to define a more specific name for it.

In the tab **Setup**, the following analysis parameters may be defined:

- **Bandwidth** to define the spectrum bandwidth for the analysis: Octaves and 1/3 octaves by default, 1/1, 1/3, 1/6, 1/12, 1/24 and 1/48<sup>th</sup> octaves in option.
- **Min** : Minimum centre frequency of analysis
- **Max** : Maximum centre frequency of analysis
- **Full octaves**: If this option is activated, the software will set the minimum and maximum frequency limits so that only full octaves are calculated.
- **Analysis**: Select the method used to perform frequency analysis: FFT or digital filtering.



- **Multispectra**: If this option is activated, the user obtains the time history of the spectrum over the signal duration.
- **“Main” elementary duration** (selected by default): allows for calculating multispectra on the “main” elementary duration (or time base) of the measurement session
- **Other**: allows for calculating multispectra on another elementary duration. The time step may vary from 1ms to x seconds.

 The choice of maximum frequency for the analysis will depend upon the measurement pass band of the signal to be processed: if a pass band of 10 kHz was defined for time signal records (or a sampling frequency of 25.6 kHz), frequency bands greater than this pass band cannot be obtained.

#### 14.4.2 Narrow band analysis (FFT) (averaged spectra and multispectra)

In the script configuration dialog box, select an operator of type - **Narrow band spectrum (FFT)** - in the list of available processings and place it in the list of active processings. An operator of name FB is then created.

Select this operator and click on the **Edit** button. The dialog box shown below is displayed on screen. The tab **Operator** gives a detailed description of the operator and allows the user to define a more specific name for it.

In the tab **Setup**, the following analysis parameters may be defined:

- **Window:** Choose the FFT window for the analysis. The following windows are available: Rectangular, Hanning, Hamming, Kaiser-Bessel, and Flat Top
- **Overlap:** (not available if Multispectra option is ticked) choose the overlap factor for the analysis amongst the following quantities: 0, 25%, 50% and 75%.
- **Band:** Select the maximum frequency (in Hz) of the analysis.
- **Lines:** Select the number of lines for the FFT analysis amongst the values displayed in the list: 101, 201, 401, 801, 1601 or 3201, 6401, 12801. The higher the number of lines the higher the frequency resolution (and the higher the time block duration as well).
- **Multispectra:** if this option is activated, the user obtains the time history of the spectrum over the item duration.
- **“Main” elementary duration** (selected by default): allows for calculating multispectra on the “main” elementary duration (or time base) of the measurement session.
- **Other:** allows for calculating multispectra on another elementary duration. The time step may vary from 1ms to x seconds.



##### **▪ Zoom: This option is reserved for advanced use.**

This option allows the user to compute a FFT spectrum with a shift of the central frequency Fc and a zoom factor. This allows the user to reduce the frequency range of analysis around a centre frequency and thereby increase the frequency resolution. When the option is ticked, choose the centre frequency and the zoom factor from the right part of the dialog box. Or use the curve on the left-hand side: it informs the user about the chosen parameters. The green information bar (lower part) indicates the analysis frequency range while the spectrum's shape indicates the chosen frequency resolution (showing a fake spectrum). Modifying the centre frequency or the minimum frequency can be done by moving the cursors respectively to the right and to the left on the curve.

*The minimum and maximum frequencies, the Resolution (in Hz) and the Duration (in seconds) of the analysis are indicated in the summary table.*

*The choice of maximum frequency for the analysis will depend upon the measurement pass band of the signal to be processed: if a pass band of 10 kHz was defined for time signal records (or a sampling frequency of 25.6 kHz), frequency bands greater than this pass band cannot be obtained.*

*Restriction: the length of a time block must be smaller than that of a signal.*

#### 14.4.3 Overall level analysis (detailed time history)

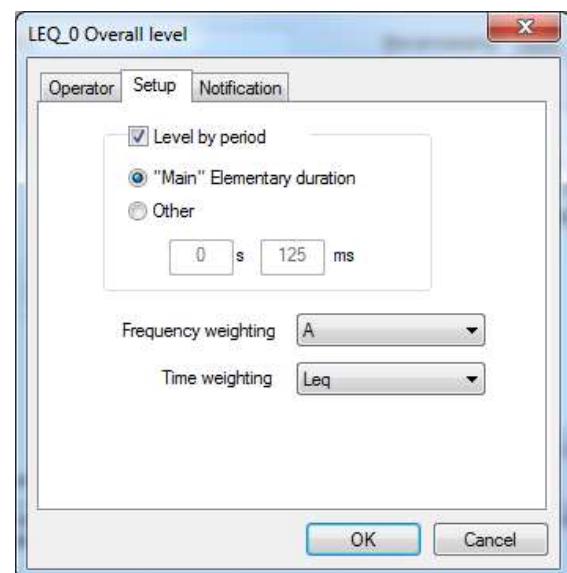
A detailed time history analysis offers a zoom facility for the time history data over the duration of the event.

In the script configuration dialog box, select an operator of type - **Overall level** - in the list of available processings and place it in the list of active processings. On operator of name LEQ is then created.

Select this operator and click on the **Edit** key. The dialog box shown below is displayed on screen. The tab **Operator** gives a detailed description of the operator and allows the user to define a more specific name for it.

In the tab **Configuration**, the following analysis parameters may be defined:

- **Level by period**: if activated, the overall level is calculated with a time step. If not ticked, the overall level is calculated as a single value over the whole signal length.
- **"Main" elementary duration** (selected by default): allows for calculating the overall level time history on the "main" elementary duration (or time base) of the measurement session
- **Other**: allows for setting another elementary duration. It may vary between 1 ms and x seconds.
- **Frequency weighting** : select a frequency weighting to calculate the overall level (A, B, C, Lin, as well as vibration weightings Wm, Wk..., German Wkb,...)
- **Time weighting** : select the overall noise quantity to calculate (Leq, Peak, Slow, Fast, Impulse)



If, for example, a time step of 1 s is chosen for a 2 s long time signal recording, only two values will be calculated (one value per second). The result will therefore be useless. It is recommended to specify as small a step as possible without increasing calculation time too much.

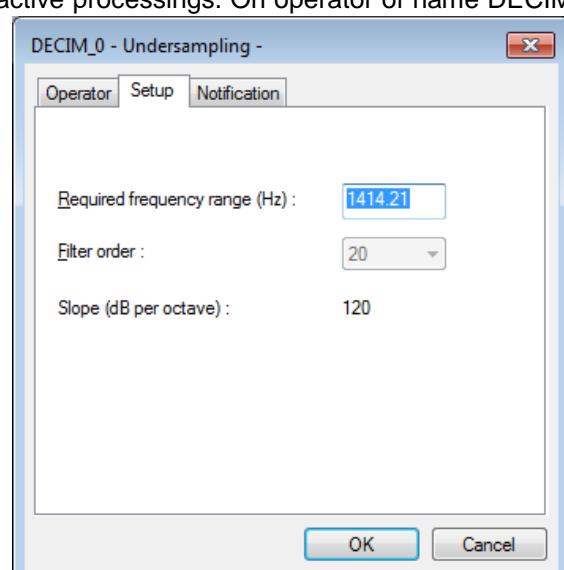
*Time weighting: the Slow, Fast and Impulse calculations are actually based on short Leqs of 5ms, averaged then exponentially..*

#### 14.4.4 Undersampling

In the script configuration dialog box, select an operator of type - **Undersampling** - in the list of available processings and place it in the list of active processings. On operator of name DECIM is then created.

Select this operator and click on the **Edit** key. The dialog box shown below is displayed on screen. The tab **Operator** gives a detailed description of the operator and allows the user to define a more specific name for it.

In the tab **Configuration**, the following analysis parameters may be defined:



- **Required frequency range:** define the maximum frequency of the audio event after undersampling.

It is recommended not to undersample audio files below 2000 Hz unless source recognition, by playing back the file, is unimportant.

The size of time signal recordings, in term of memory space, depends on the pass band declared in the configuration box. A table shows the size in kilobytes of time signal records as a function of the pass band.

Even if time signals files have been analysed at the time of acquisition, you may process them again, with different parameters, in **dB Trait**. It is therefore recommended not to undersample the audio files at acquisition stage since the sampling rate becomes the upper band limit for a further analysis.

The audio file decimation factor is equal to the ratio of measurement frequency and undersampling rate. Be aware that only whole integers multiples of 2 or 5 are taken into account. The following results are valid for audio records of 10 s long with a passband of 20 kHz.

Frequency pass band (Hz)	decimation factor	decimated file sizes (kilobytes)
De 20000 à 10001	0	1001*
De 10000 à 5001	2	501
De 5000 à 4001	4	251
De 4000 à 2001	5	201
De 2001 à 1001	10	101
< 1000	-	63 **

\* original size of the file

\*\* minimum size

- ❖ Most of modern sound cards now automatically manage the questions of sampling frequency for playback of audio recordings.
- ❖ Typically, a 2 kHz frequency pass band is the minimum required to accurately identify events during playback of environmental noise.

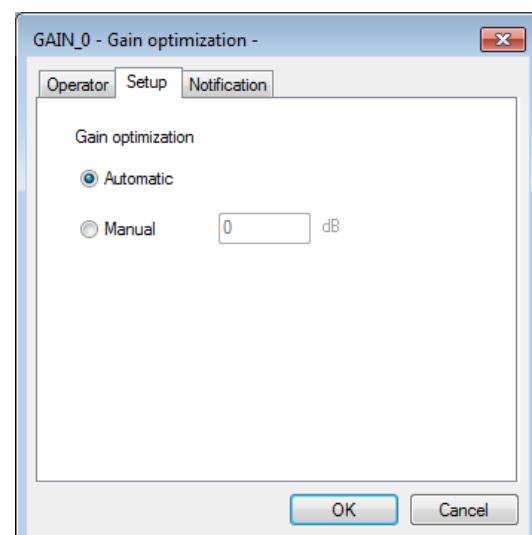
#### 14.4.5 Gain optimization

The gain of audio signals can be changed to make their playback easier.

- ❖ The **Gain Optimization** function is maintained operational, but simpler possibilities are offered to the user since versions 5.4 and 5.5 de **dB Trait**. See § 4.12 for more details.

In the script configuration dialog box, select an operator of type – **Gain optimization** – in the list of possible processings and place it in the list of active processings. A GAIN operator is then created. Select this operator and click on the **Edit** button to display the dialog box shown opposite. The **Operator** tab provides a detailed description of the operating of this type of processing and can be used to edit its name.

In the **Configuration** tab, the following analysis parameters can be defined:



- **Gain optimization:** select either automatic or manual optimization. In the latter case, set the gain to be applied to the signal.

#### 14.4.6 Export audio records at the WAV file format

It is possible to export audio records at the WAV file format by using the command **Aux / Audio / Export in WAV file format**. The following dialog box is displayed on screen.

In the list of audio records attached to the measurement session, select one or more audio records to export.



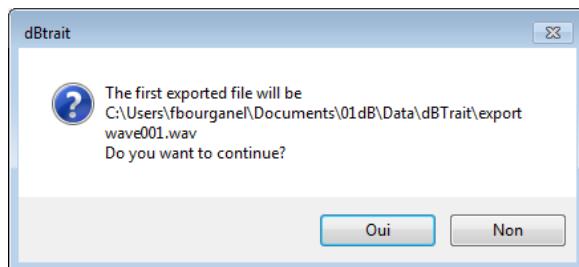
In order to identify the audio records to export, different information is available (date, time, duration, location, sampling frequency).

Once the audio records have been selected, click on the **Export** button.

The **individual channels** option allows the user to export dual channel audio records into two single channel WAV files.

The software then displays a dialog box in which the user gives a generic filename for exporting the audio records. Select a directory on the hard disk and enter a filename, then click on the **Open** button.

A warning message is then displayed to give the complete filename of the first audio record to export. If this name is acceptable, click on the **Yes** button.



The following records to export are then incremented. For example, the first record could be named DEMO001.WAV while the fourth exported recorded will be named DEMO004.WAV. The WAV files may then be replayed with the standard multimedia tools of the Windows environment.



*The 01dB WAV format is compatible with the standard WAV format. It additionally integrates metrological information.*

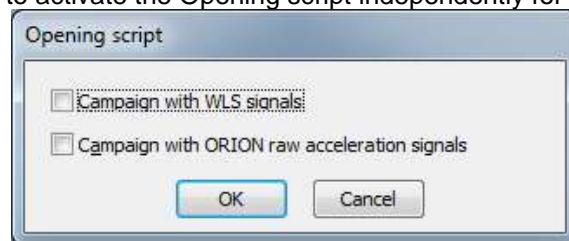
## 14.5 OPENING SCRIPT (SPECIFIC TO VIBRATION RECORDINGS MADE WITH WLS)

The opening script is a specific feature for measurement sessions including vibration signals recordings, obtained with the wireless sensor **WLS** (used with DUO or FUSION) **or with ORION**.

It allows automatic processing of vibration signals during the opening phase of the measurement session in order to obtain immediately the desired indicators (chosen by the user: LEQ, weighted LEQ, multispectra, etc.) on vibration data.

The opening script configuration can be accessed via **Post-processing / Configure – Opening script**.

The activation of the Opening script is done via the **Preferences / Opening script** menu.  
It is possible to choose to activate the Opening script independently for WLS or ORION signals:



The configuration principle is similar to the Signal script configuration (see §14.3), except some particularities described here below.

### 14.5.1 Broad brand analysis (averaged spectra and multispectra)

#### Opening script particularities:

- **Filtering:** This choice is not operational. The computation is performed always using the Digital filtering method.
- **Multispectra:** This choice is not operational. The computation always gives Multispectra.
- **Time step:** This choice is not operational. The calculation is performed always on the time basis (time step) identical to the acoustic data. The calculation is also made on the time basis corresponding to the "coding time", if acoustic data of this type exist in the measurement session.

Furthermore, the choice of maximum frequency for the analysis will depend upon the vibration signals sampling frequency. For signals obtained with the WLS wireless sensor, the sampling frequency is 12,8kHz.

Thus the bandwidth is limited to 5kHz. Frequency bands greater than this cannot be obtained.

### 14.5.2 Narrow brand analysis (FFT) (averaged spectra and multispectra)

#### Opening script particularities:

- **Multispectra:** This choice is not operational. The computation always gives Multispectra.
- **Time step:** This choice is not operational. The calculation is performed always on the time basis (time step) identical to the acoustic data. The calculation is also made on the time basis corresponding to the "coding time", if acoustic data of this type exist in the measurement session.

Furthermore, the choice of maximum frequency for the analysis will depend upon the vibration signals sampling frequency. For signals obtained with the WLS wireless sensor, the sampling frequency is 12,8kHz.

Thus the bandwidth is limited to 5kHz. Frequency bands greater than this cannot be obtained.

#### 14.5.3 Overall level analysis (detailed time history)

##### Opening script particularities:

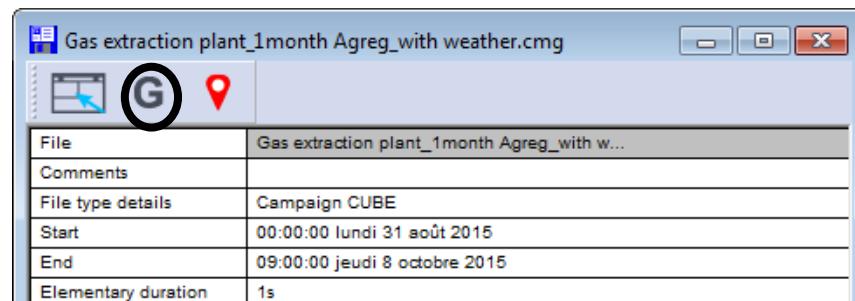
- **Global level for the whole signal:** This choice is not operational.
- **Time step:** This choice is not operational. The calculation is performed always on the time basis (time step) identical to the acoustic data. The calculation is also made on the time basis corresponding to the "coding time", if acoustic data of this type exist in the measurement session.

# CHAPTER 15

## GLOBAL ITEMS VIEW

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As of version 4.7, global items (overall values, overall spectra) are managed in a separate view that can be accessed from the “**Window – Global items view**” menu or with « **G** » button of the information window.



S	I..	Family	Data type	W..	Date	I..	D..	Avera...	Y...	X...	X...	X...	X...	C...	Application
0	Leq	Results table			03/06/05 11:26:46	#7	15		Pa					1	01dB-MetraVib Solo
1	Autospectrum	Leq	Lin		03/06/05 11:26:46	#7	15	Average	Pa	1/3	50	5 k	Hz	1	01dB-MetraVib Solo

This view allows for the management of global items in a simple way, especially tables of overall values transferred from sound level meters **BLUE SOLO & SOLO BLACK EDITION**, as well as from **DUO, FUSION, CUBE** of version 2.40 or higher.

Also, some operations can be performed on spectra from this display.

### 15.1 GENERAL FUNCTIONS

#### 15.1.1 Operations on items in a Global items view

This window lists all **global items** measured by sound level meters or added from the spectrum history plot or computed (averaged spectra).

Double-click on any item to open it.

This view is accessible only if some global items exist in the measurement session.  
Furthermore, it is automatically open when adding a global item from the Spectrum history view.

Use these buttons to, respectively:

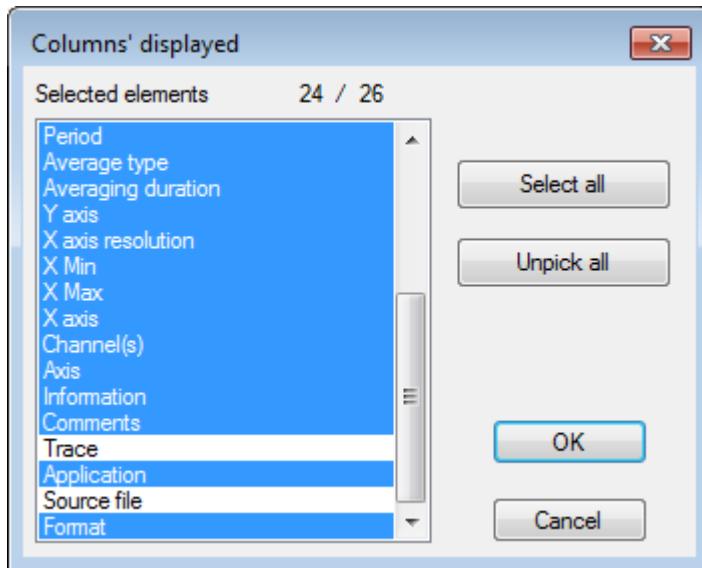


- Display spectrum or table for selected item (several items can be selected in order to superimpose spectra)
- List values for the selected spectrum(a)
- Remove one or more spectra from the view
- Change some parameters relative to selected items
- Create a new spectrum
- Add selected spectra
- Subtract selected spectra
- Average selected spectra
- Correct a spectrum
- Convert a spectrum into an octave spectrum
- Display NR/NC curves (option)

*Items of the list can be sorted by clicking on column headers.*

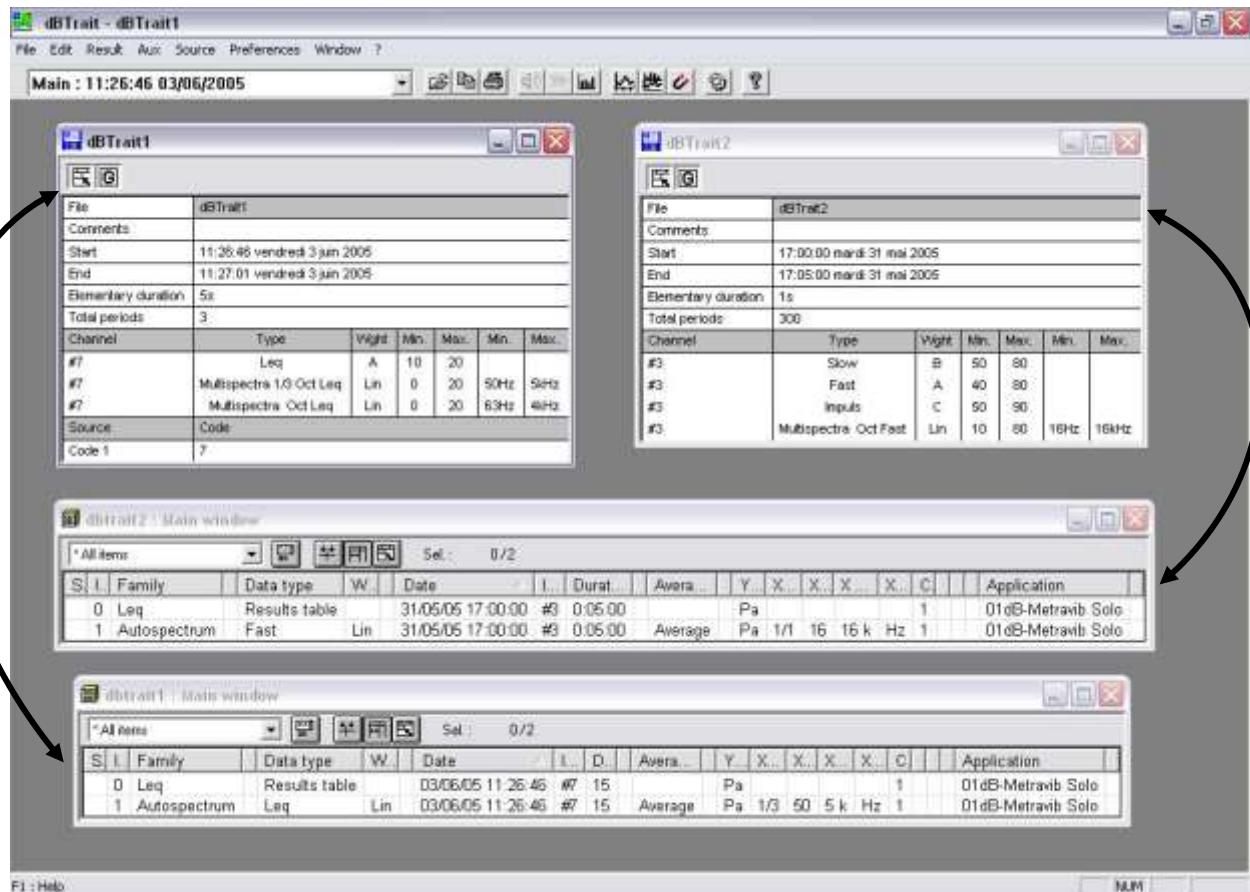
Use the additional following buttons to:

- |  |                                   |
|--|-----------------------------------|
|  | automatically resize column width |
|  | automatically resize window       |
|  | select column to display:         |

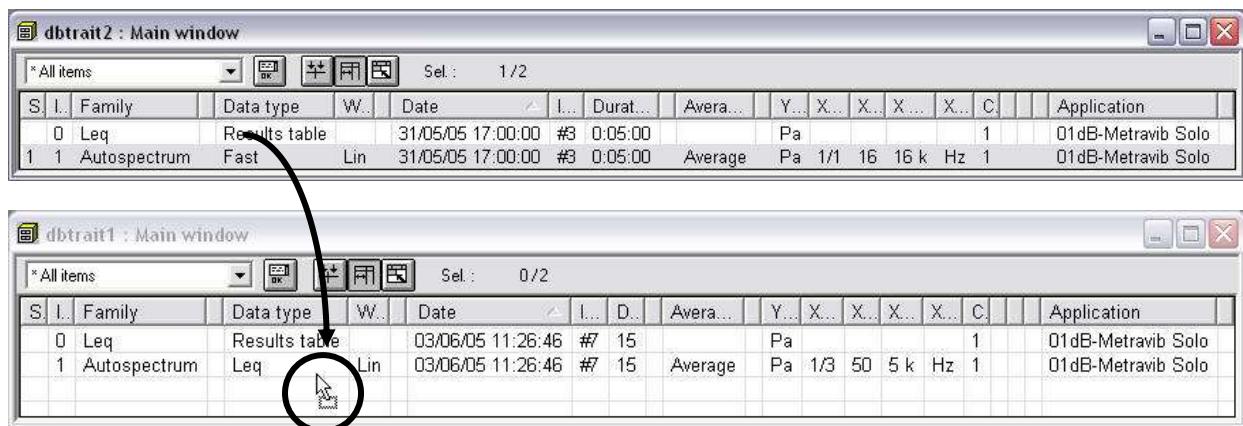


### 15.1.2 Management of the different global item views

Each measurement session has an associated global item view:



Items can be **dragged and dropped** between different windows of overall levels for calculation and/or comparison purposes. To do so, click on the item to displace, and then move the mouse to the destination window while holding down the mouse button:



## 15.2 OVERALL VALUES

During data transfer, overall values (spectra and tables) are transferred directly into the global items view.

ID	Family	Data type	Weighting	location	Start	End	Duration	Value	Unit
14	Leq	Leq	A	#17	24/05/04 14:41:22	24/05/04 14:41:45	23	50,7	dB[2.000e-05 Pa]
14	Leq	Max	A	#17	24/05/04 14:41:22	24/05/04 14:41:45	23	59,5	dB[2.000e-05 Pa]
14	Leq	Min	A	#17	24/05/04 14:41:22	24/05/04 14:41:45	23	42,4	dB[2.000e-05 Pa]
14	Leq	Sel	A	#17	24/05/04 14:41:22	24/05/04 14:41:45	23	64,3	dB[2.000e-05 Pa]

Double click to display the overall values of a transferred measurement session.

## 15.3 SPECTRA ADDED FROM THE SPECTRUM HISTORY PLOT

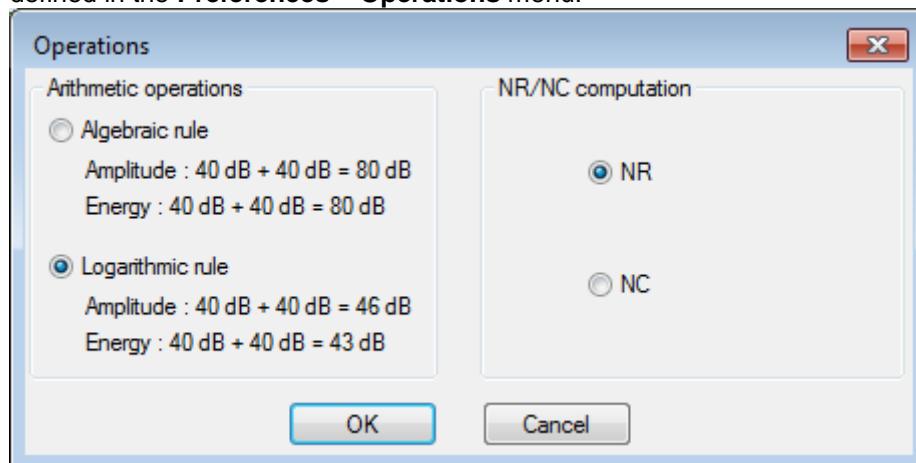


Click on the icon to add the spectrum currently displayed in the time history view to the list of global items. Calculations can then be performed on this spectrum.

## 15.4 CALCULATIONS ON SPECTRA

### 15.4.1 General preferences

Prior to any calculation, one should specify the type of operation to perform: algebraic or logarithmic. One should also specify whether NR or NC curves are expected. These settings are defined in the **Preferences – Operations** menu.



### 15.4.2 Sum, difference, average

To add, subtract or average spectra, just select them in the list and click on the corresponding button. Spectra of the same type should however be selected to perform calculations. The resulting spectrum is added to the list.

### 15.4.3 Spectrum correction

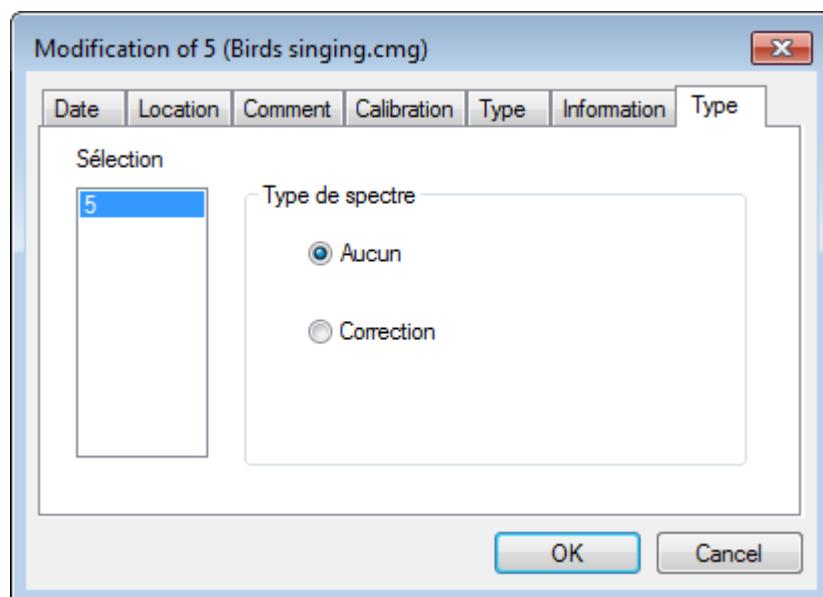
To correct a spectrum, a correction **spectrum** is required. There are two possible methods:

- either use an existing spectrum
- or create a spectrum

In both cases, this spectrum must be of the same type as the spectra to correct.

The spectrum that is going to be used to correct other spectra must be labelled as a correction

spectrum. To do so, select the spectrum, click on the Modify button , and in the “Type” tab select “correction”. The type of the spectrum is listed as “Correction” in item view.



Select the spectra to correct, as well as the correction spectrum:

S.	ID	Famille	Type	Grandeur	P. N.	Lieu	Durée	P. M.	O.	A.	R.	X.	X.	A.	Vb.	A. L.	C.	T.
0	Global		Tableau de résultats			05/06/2011 06:00:33	0:59:28			Pa					10146			
1	1	Autospectre	Leq		Lin	06/06/2011 06:00:33	0:59:28			Pa	1/3	6.3	20 k	Hz	10146			
2	2	Autospectre	Correction	Leq		06/06/2011 06:00:33	Max	0:59:28		Pa	1/3	6.3	20 k	Hz	10146			
3	3	Autospectre	Leq		Lin	06/06/2011 06:00:33	Min	0:59:28		Pa	1/3	6.3	20 k	Hz	10146			
4	Global	L0	Tableau de résultats			06/06/2011 06:00:33	L1	0:59:28	Stat	0,5	Pa				10146			

Click on the button  to start the calculation.

Corrected spectrum (a) will be added to the list in the main window.

#### 15.4.4 Spectrum recombination

A spectrum can be recomposed in octave bands by clicking on .

The resulting spectrum will then be added to the list in the main window.

#### 15.4.5 NR/NC curves

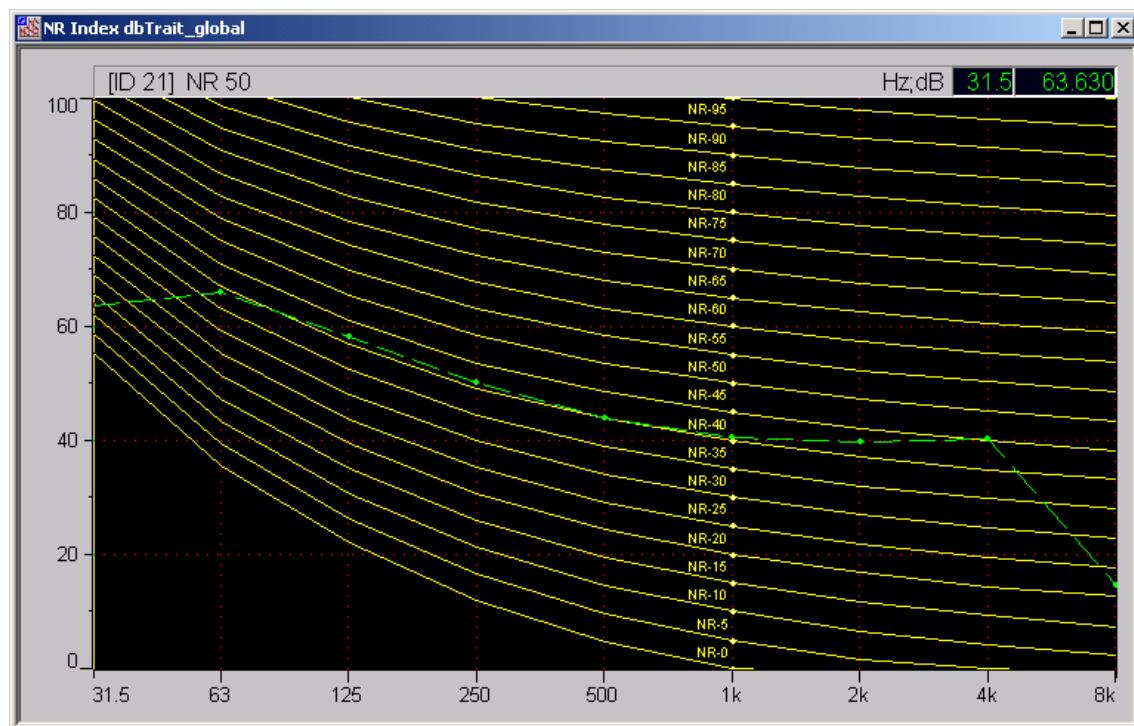
To calculate NR or NC curves, the calculation must be performed on an **octave spectrum**.



Click on the corresponding button:



The result is displayed in the general window. Double click on the item or on the  button to plot the result:



# CHAPTER 16

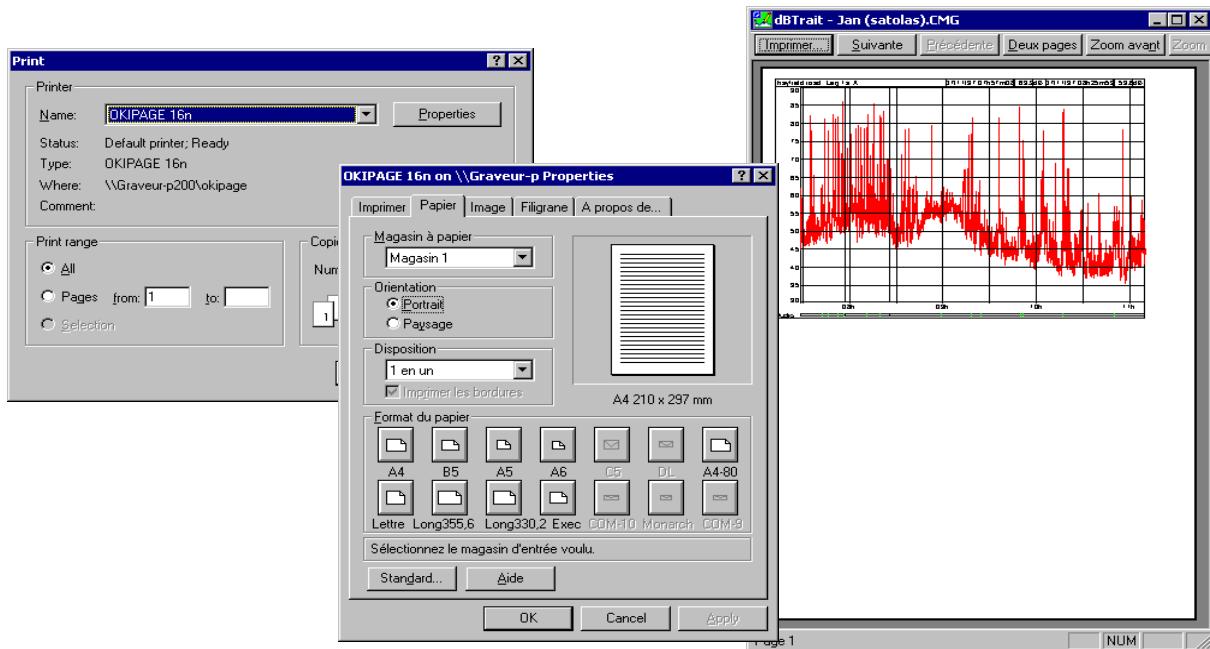
## RESULT EXPLOITATION

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It is possible in **dBTrait** to print directly a time history plot and/or a result listing and to export the results as graphics or values in standard office spreadsheet and word processor software, for further processing and result presentation. The user can also customise the way the data is displayed in the software.

### 16.1 PRINTING RESULTS

Using the commands of the **File** menu, results can be directly printed by **dBTrait**, if a printer is connected to the computer, of course. Use the command **File / Print** to display the Print dialog box. Specify which pages should be printed, the number of copies, and the printer driver to use as well as other parameters (print quality, etc.)



Access directly to the printer configuration dialog box by the command **File / Print Setup** and to a preview of the document to print by the command **File / Print Preview**. The toolbar of the print preview window allows the user, for example, to zoom in the preview document.

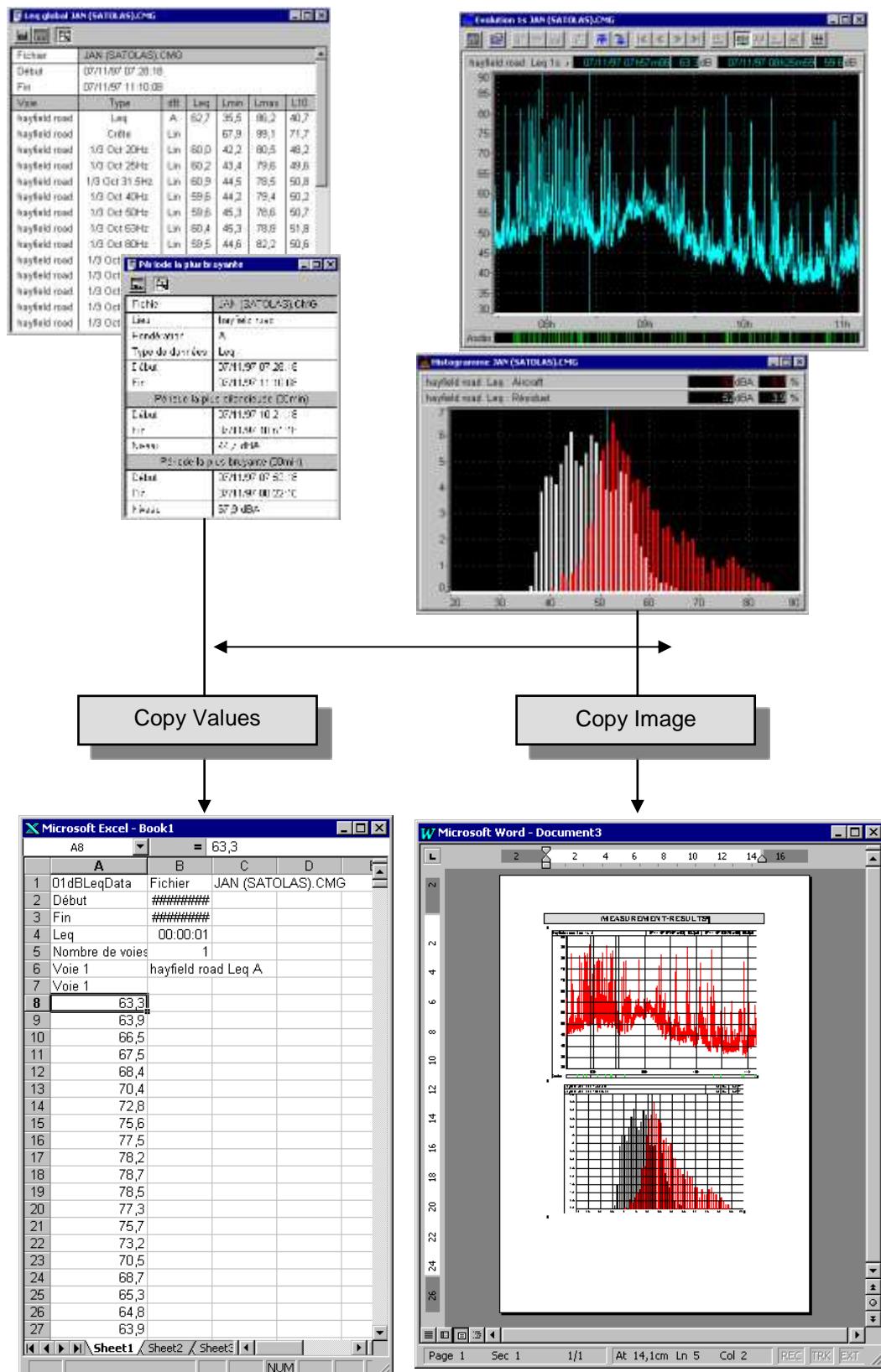
When printing graphics, the user can set a few additional parameters by the **commands Preferences / Graphic printout / Time history** and **Histograms**.

The user can set the margins of the graphic printout frame and, when printing a time history plot, the dimensions (in mm) for the time scale (X-axis) and the level scale (Y-axis). See § 19.5 for more details.

It is also possible to define the colours of each curves of the printout by using the command **Preferences/ Colours / Printer**. See § 19.1 19.4.

## **16.2 EXPORTING DATA TO A SPREADSHEET AND WORD PROCESSORS**

The user may either export results as graphics (time history plots, results listings, comments listings) by the command **Edit / copy / Image** or export the results as values by the command **Edit / Copy / Values**. After the copy command of **dBTrait**, simply paste (Edit / Paste) the data in a word processor or a spreadsheet processor as shown below:

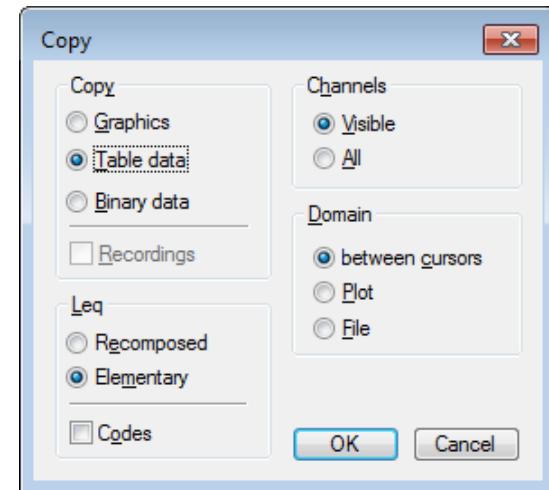


### 16.3 PRINCIPLE OF THE COPY / PASTE OPERATION OF A TIME HISTORY PLOT

The configuration dialog box for copying time history plots (command **Edit / Copy**) when the active window is a time history plot offers three different possibilities for the operation:

- **Copy graphics**

This function directly copies the graph as shown on screen (except for the curve colours, depending on the user-defined preferences, see § 19.4). It then can be paste in a word processor.



- This function copies as well the cursors if they are shown on screen and if the displays are "linked".
- Known limitation connue: the time signals displays (Acoustics and/or Vibrations) are not copy/pasted. Except for the Dominant frequency history plot.
- The « graphics » copy for the Dominant frequency plot is based on a different principle from the rest: the MS Word software is open, and the graphics are pasted in it.

- **Copy values**

This function copies the values of the noise / vibration data into a spreadsheet processor. The user may copy the original data values (**base period values**) or the recomposed values according to a greater time base, if used in the time history plot (**time base values as displayed**).

The user may also copy the codes' information (tick the box **Include Codes**), all the measurement channels contained in the CMG file (**Channels / All**) or only the ones displayed on the plot (**Channels / As displayed**).

- The code box will be disabled if **elementary values** are not used.
- Particular case for measurement sessions including acoustics or vibration data together with weather data:  
*In such case, Dans ce cas, it is needed to export the data by "Copy / Table Data" in 2 passes: one pass for data "in dB", and one pass for weather data in physical units.*

- **Copy binary data**

It is the same principle as for copying tabulated values but this command is used to paste the values in a new or an existing CMG file.

This option is mainly used to keep only part of the CMG file (only one measurement channel for example) or to recompose the elemental values (Leqs, Peaks, ...) according to a greater time base.

## 16.4 PRINCIPLE OF THE COPY / PASTE OPERATION OF A SPECTRUM TIME HISTORY PLOT

The principle is the same as for the Time history plot.

In addition, the copy of values applies to either the time history values (when the time history part – lower part of the graph – is clicked), or to the spectrum values (when the spectrum part – upper part of the graph – is clicked).

-  *Export a weighted spectrum is possible: for this, it is just necessary to have the spectrum displayed with a frequency weighting.*

## 16.5 PRINCIPLE OF THE COPY / PASTE OPERATION OF A DOMINANT FREQUENCY HISTORY PLOT

The principle is the same as for the Time history plot.

In addition, the copy of values applies to either the time history values (when the time history part – lower part of the graph – is clicked), or to the Dominant frequency values (when the dominant frequency part – upper part of the graph – is clicked).

Exporting the dominant frequency values allow to get access to extended information associated to each value of dominant frequency:

Value	Date max	Kurtosis	FreqMax	OverThreshold	Impulse	Axis
-------	----------	----------	---------	---------------	---------	------

Where:

- Value: peak value (PPV or PCPV)
- Date max: accurate dating of the peak value, within the corresponding elementary period ( $T_j$ ), in relative time.
- Kurtosis: Kurtosis value of the signal portion surrounding the peak.
- FreqMax: dominant frequency value
- OverThreshold: Boolean indicating whether the value is over the threshold or not.
- Impulse: Boolean indicating whether the value is categorized as impulsive signal or not.
- Axis: indicates the origin of the highest value among X or Y or Z axes (only for PCPV values).

# CHAPTER 17

## AUTOMATIC PROCESSING

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In **dB Trait**, several measurement session datafiles can be analysed **automatically**. The analysis consists of the simultaneous execution of a number of operations defined by the user in a script.

The results of the processing can be displayed on the screen (**Display Simulation**), printed (**Printer**), or sent to a set of files (**Files**). The files containing the results can then be resumed in a word or spreadsheet processor.

The software allows the user to define and save these scripts in files, for later use. A script contains a list of operations to carry out on the CMG files. All the options of the **Results** menu can therefore be assimilated to a single operation and can form part of a script.

An operation of the same type can be part of the script several times with different parameters (e.g. Plot on the time history over a period of one hour and another plot over a period of 10 minutes).

**All the operations are completely carried out for the duration of each file.** A script is saved in a file whose extension is FAS (File Automatic Script) by default.

- *Automatic processing with dB Trait v6.0 does not allow the use of Spectrum history nor Dominant frequency history.*
- *Automatic processing with dB Trait v6.0 does allow the use of the ORION-dedicated Statutory Analysis "DIN4150-3" or "Circulaire de 1986" or "BS 5228-4" or "BS 5228-2". When doing so, it is necessary to restrict the use to "simulation on display".*

### 17.1 SCRIPT CAPTURE

The capture only allows the definition of a **new** script. It is not possible to modify an existing one. Each step necessary to define a new script is shown below.

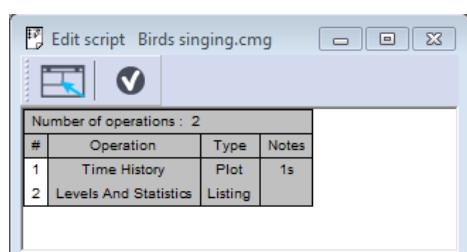
- **Opening a CMG data file**

The definition of a new script is based on the analysis of a CMG file. This file should be representative of the set of files to analyse. The first operation of a script capture is therefore opening a CMG file.

- **Activating the script capture mode.**

Selecting the command **Automatic Processing Script** in the **Misc** menu does it. The **Editing Script** window is then displayed onto the screen. At first, it indicates that the number of script operations is zero.

- **Defining the script operations**



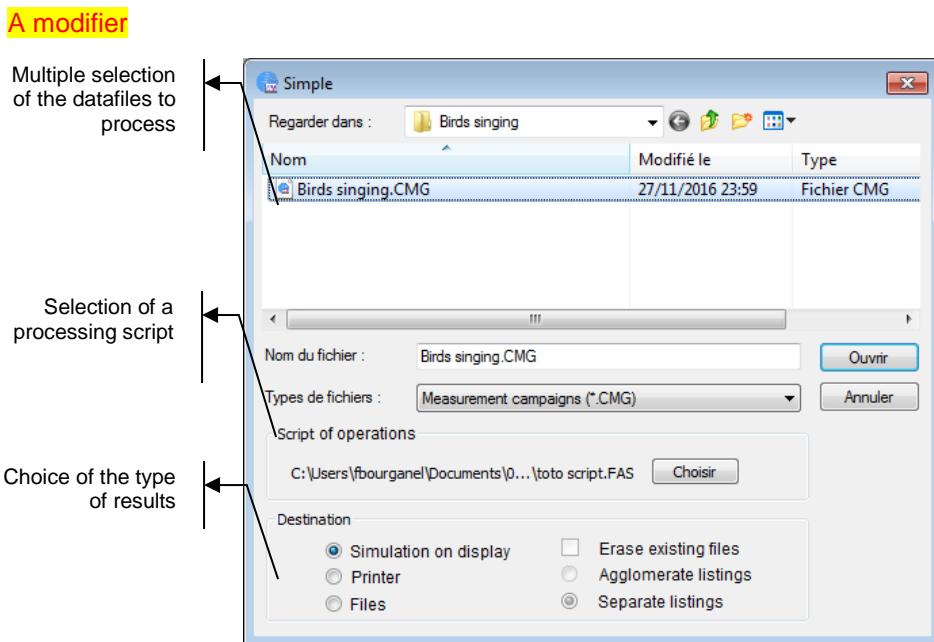
The definition of the script contents is made as the current CMG file is processed. All of the operation parameters are memorised, and a new line is added to the window after each operation. For example, after a spectral time history plot and overall Leq table listing, the window displays the following information.

- **Ending the capture procedure and Saving the script**

Clicking the window  button ends the script capture. The operator can then save the script in a file with FAS extension. The script is then saved and ready to use.

## 17.2 LAUNCHING OF AUTOMATIC PROCESSING

The **Automatic Processing** command in the **File** section launches the processing. Opening a CMG file beforehand is not necessary. The dialogue box to select the analysis parameters is shown below:



**A modifier**

The file list allows a multiple selection of CMG files from a specified directory (by clicking on each file and holding the CTRL key down). The selected files are marked in the list and displayed in the capture window (in the visible length limit). The chosen script filename is displayed in the middle of the dialogue box. The **Choose** button allows the user to select another script. A similar dialog box is displayed for selection of the script file.

Only one script can be selected at a time. Three destinations are possible for the results:

### 17.2.1 Simulation on display (on the screen)

It is advised to choose this option first. It allows the user to see on the screen each processing step, file by file and operation by operation. Errors, incompatibilities, incorrect formats can be therefore detected before launching the 'true' processing.

### 17.2.2 Printing results

Each obtained result will be printed. Usually, a result (table or graph) takes up one page. Some listings, such as **level per period** and **counts**, can take up several pages.

### 17.2.3 Set of files' results

The results are sent to two types of file:

- Listings to text files (ASCII)
- and graphics to metafiles (Window formats).

Due to their simplicity, the text files can be grouped in **agglomerate listings**. This option allows the user to dispose of the same information to a number of lower files.

For **separate listings**, one file will be created for each listing, which can be used for macro commands in spreadsheets or text processors.

The rules for the filenames are shown below:

- A new sub-directory is created in the data directory. It carries the name of the script file. For example, if the file to be processed is located in the directory C:\01DB\CMG and the selected script is ALPHA.FAS, the results will be stored in the new directory C:\01DB\CMG\ALPHA.

- **The files containing graphical results carry the CMG filename with the incremental extensions from T00 (T for Trace) followed by two digits starting from 00.**

For example, if a time history and an amplitude distribution make part of the ALPHA.FAS script applied to the files TOTO.CMG and TATO.CMG of the C:\01DB\CMG directory, the files:

- C:\01DB\CMG\ALPHA\TOTO.T000 will contain the time history of the TOTO.CMG file
- C:\01DB\CMG\ALPHA\TOTO.T01 its amplitude distribution
- C:\01DB\CMG\ALPHA\TATO.T00 the time history of the TATO.CMG file
- C:\01DB\CMG\ALPHA\TATO.T01 the amplitude distribution of the TATO.CMG file.

The result filenames are in this case independent of the script filename.

(actually the files may be written in the script file folder).

- **If the agglomerate listings option is chosen, the program creates a file by listing operation, with a unique name depending on the type of operation:**

Leq and Ln	LEVELS
Sources	LSOURCES
Leq and Ln per period	LEVELPER
Sources per period	SOURCEPER
Statutory periods	USERPER
Loudest period	LOUDEST
Count	COUNT
Occupational noise	WORKPLAC

- **The extension is .000 for the first operation of a given type in the script, .001 for the second one, etc.**

For example, the grouped listing of the type 'Leq and statistical indices' of a CMG file assembly in the C:\01DB\CMG index, treated by the script ALPHA.FAS will be placed in the file C:\01DB\CMG\ALPHA\LEVELS.000. If the script contains a second listing of this type (with different indices, for example), the results of the operation will be found in the file C:\01DB\CMG\ALPHA\LEVELS.001. The names of the result files are in this case independent of the names of the acoustic data files. As it has been mentioned earlier, no grouping of graphics files is possible.

 **Important: The files are sorted chronologically if the 'agglomerate listings' option is chosen, to allow for an easier exploitation of results.**

- If the '*Individual listings*' option is chosen, the names of the result files obey the same procedure as for graphical result files: a listing file by CMG data file and by script operation. The only difference is the first letter of the extension: an L (for Listing) replaces the T (for Trace). The names of the result files are in this case independent of the name of the script file.

For example, if the listings '**Leq and Statistical indices**' and '**Statutory periods**' make part of an ALPHA.FAS script applied to files TOTO.CMG and TATO.CMG in the directory C:\01DB\CMG, the files:

- C:\01DB\CMG\ALPHA\TOTO.L00 will contain Leq and Ln indices of the TOTO.CMG file,
- C:\01DB\CMG\ALPHA\TOTO.L01 'Statutory periods' of the TOT.CMG file,
- C:\01DB\CMG\ALPHA\TATO.L00 'Leq and Ln indices' of the TATO.CMG file and
- C:\01DB\CMG\ALPHA\TATO.L01 'Leq by regulated periods' of the TATO.CMG file.

## 17.3 PROCESSING PROGRESS

Once the processing parameters have been defined, **dBTrait** opens, one by one, the files of the selected set and applies, one by one, the script operations. A special window follows the processing.

File demo6.FAS				
Origin	Destination	Operation	OK?	Informations
BAL9.CMG	Display	Time history	OK	Operation OK
BAL9.CMG	Display	Leq and Ln	OK	Operation OK
BAL10.CMG	Display	Time history	OK	Operation OK
BAL10.CMG	Display	Leq and Ln	OK	Operation OK
BAL2.CMG	Display	Time history	OK	Operation OK
BAL2.CMG	Display	Leq and Ln	OK	Operation OK

One line is added after each operation. This window remains displayed after the end of the processing as it constitutes the processing report.



Each operation is first executed on-screen, independently of the result destination. The results are then transferred to a printer or a file.

If the destination is the screen, it first stops, with the results displayed and a message for the user to continue

This logic allows a review of all the operations before printing or saving in exit files. The **Next** button continues with the next operation. The **All** button execute all the other script operations on all the selected files. The **Cancel** button interrupts the script. After the last operation, the current file is closed (and the on-screen results erased) except if this file was open before the processing launch.

At the end of the processing (after the last operation on the last file) the window entitled '**Summary**' can be consulted to check the script process. This window can be printed or transferred into another application via the copy/paste function.

## 17.4 LEVELS & STATISTICAL INDICES : PRIVILEGED OPERATION

The listing of the type **Levels and statistics** is the basis of all data file analysis. It is particularly important for the analysis of files obtained from long on-site measurements.

To make the results more easy to use, the listing format **Levels and statistics** changes for the automatic processing. It is presented under the form of a line per file channel. In particular, for the treatment of a single channel, each data file is listed in a single line. The choice of agglomerate listings allows the piling up of lines in the same text file.

Let us take the example of a 9-day noise measurement, split into 24-hour files. The script contains the "Leq and Ln" operation, with a day by day (file by file) listing option:

File	Start	End	Channel	Type	dB	Leq	Lmin	Lmax
BAL9.CMG	11/11/94 07:00:00	12/11/94 07:00:00		Leq	A	72,5	51,9	94,4
BAL10.CMG	12/11/94 07:00:00	13/11/94 07:00:00		Leq	A	58,8	48,6	69,8
BAL2.CMG	04/11/94 07:00:00	05/11/94 07:00:00		Leq	A	59,6	48,2	70,3
BAL3.CMG	05/11/94 07:00:00	06/11/94 07:00:00		Leq	A	57,4	46,6	70,3
BAL4.CMG	06/11/94 07:00:00	07/11/94 07:00:00		Leq	A	63,6	54,8	73,5
BAL5.CMG	07/11/94 07:00:00	08/11/94 07:00:00		Leq	A	67,8	62,5	72,5
BAL6.CMG	08/11/94 07:00:00	09/11/94 07:00:00		Leq	A	62,1	53,2	70,8
BAL7.CMG	09/11/94 07:00:00	10/11/94 07:00:00		Leq	A	58,2	53,1	70,7
BAL8.CMG	10/11/94 07:00:00	11/11/94 07:00:00		Leq	A	54,9	51,0	71,8
BAL1.CMG	03/11/94 07:00:00	04/11/94 07:00:00		Leq	A	68,5	56,8	106,4

We talked about the format of results sent to the agglomerate file. The listing of type **Levels and statistics** benefits from a complimentary privilege: the agglomerate listing is presented entirely formatted on the screen independently of the choice of exit destination. In other words, even after a simulation on the screen, the results of this type are displayed (data as for preceding example):

This is a standard list of **dB Trait**: it can be printed or transferred by a simple copy/paste action to another application without recourse to particular importation of text or table processors.

Summary: Overall Leq and Ln Table															
File	Start	End	Channel	Type	dB	Leq	Lmin	Lmax	L99,8	L95	L90	L50	L10	L8	L5
BAL9.CMG	11/11/94 07:00:00	12/11/94 07:00:00		Leq	A	72,5	51,9	94,4	52,3	53,4	54,0	55,8	57,6	57,7	58,1
BAL10.CMG	12/11/94 07:00:00	13/11/94 07:00:00		Leq	A	58,8	48,6	69,8	49,3	52,2	53,1	56,3	61,3	62,8	65,2
BAL2.CMG	04/11/94 07:00:00	05/11/94 07:00:00		Leq	A	59,6	48,2	70,3	48,5	50,7	56,0	59,3	61,5	61,7	62,1
BAL3.CMG	05/11/94 07:00:00	06/11/94 07:00:00		Leq	A	57,4	46,6	70,3	46,8	48,6	49,2	57,6	59,7	60,0	60,4
BAL4.CMG	06/11/94 07:00:00	07/11/94 07:00:00		Leq	A	63,6	54,8	73,5	55,8	57,5	58,2	61,4	66,6	66,8	67,1
BAL5.CMG	07/11/94 07:00:00	08/11/94 07:00:00		Leq	A	67,8	62,5	72,5	63,2	65,5	66,0	67,5	69,0	69,2	69,4
BAL6.CMG	08/11/94 07:00:00	09/11/94 07:00:00		Leq	A	62,1	53,2	70,8	53,7	55,6	56,4	59,3	66,6	66,8	67,2
BAL7.CMG	09/11/94 07:00:00	10/11/94 07:00:00		Leq	A	58,2	53,1	70,7	53,3	54,2	55,7	57,8	59,8	60,0	60,3
BAL8.CMG	10/11/94 07:00:00	11/11/94 07:00:00		Leq	A	54,9	51,0	71,8	51,1	51,6	52,0	53,4	57,4	57,7	58,1
BAL1.CMG	03/11/94 07:00:00	04/11/94 07:00:00		Leq	A	68,5	56,8	106,4	57,7	60,5	61,1	62,5	64,2	64,5	64,8

 There will be as many summary windows as listing operations 'Levels and Statistics in the script.'

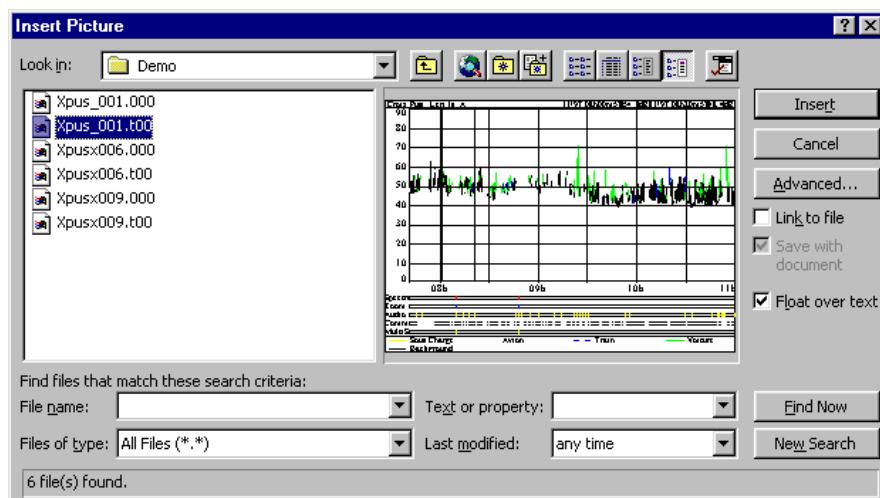
## 17.5 RESUMPTION BY SPREADSHEET OR WORD PROCESSORS

### 17.5.1 Resumption of graphical results

**Reminder:** The graphical results are stored in the files having the name of the acoustical data file with the extensions T00, T01 etc., and they are found in the sub-directory of the data index carrying the script file name.

These files are in the Windows metafile format. Usually, Windows attaches the extension .WMF to files of this type. The complexity of the automatic analysis file manager leads us to choose non-standard extensions. Nevertheless, the WMF format is respected and the resumption does not present any difficulties, it is sufficient to explicitly state the file extension.

For example, here is a spectral time history resulting from the automatic processing progress. Use the command **Insert / Picture** in Word to insert it in a report:



### 17.5.2 List-type results

These types of results are provided as text files that can be read by a word processor. Selection and copy/paste operations allow for a rapid transfer of all or part of the list to another document. In a spreadsheet program, the cells of the spreadsheet will be automatically populated by the values of the list file: results are ready for analysis.

## 17.6 HELPFUL ADVICE

An erroneous definition can lead to parameter changes of an operation, or even to the impossibility of its execution. To minimise the possibility of errors it is advised:

- **To make a preliminary simulation.** Errors can be detected one by one, and the script can therefore be redefined.
- **To define the script using a file as close as possible to the file assembly to be processed.** *Simple example:* an operation designed for channel 2 of a file to multiple files (Leq, Fast, Peak, and frequency data...) will produce an error if the script is applied to a mono channel file.
- **To pay particular attention to sources:** the numbers of the codes must be identical for a correct processing.
- **To not change the dB Trait environment.** For example, the listing ‘Leq by statutory periods’ can lead to an error if the periods concerned have been erased between the moment of the script definition and the moment of analysis.

## 17.7 ERRORS AND WARNINGS

Information concerning errors (operation impossible) and warnings (operation done with modified parameters) appear in the ‘info’ rubric of the ‘summary’ window at the end of the processing. They also appear in the confirmation dialogue box after each operation, in the case of screen simulation. The errors are marked as **ERR** and the warnings as ‘!’.

The list of errors and warnings are shown below:

**Message: Operation OK      Type: OK**

No comments.

**Message: Not Enough Memory      Type: ERR**

Fatal error. Close any application not necessary or define the script with fewer operations.

**Message: Error access destination file Type: ERR**

The disk is full or protected. Erase files not necessary, change the disk or remove the protection.

**Message: Incorrect Parameters      Type: ERR**

The script cannot load the parameters of the current operation. Define the script again. Check that the file has not been modified to avoid the same problem in the future.

**Message: Unknown Operation      Type: ERR**

The script continues with an operation that is not recognised by **dB Trait**. There are two possible reasons: the operation in question is not available in your configuration (are you using the script of a colleague?) or the script was modified.

**Message: Erroneous Sources      Type: ERR**

None of the requested sources could be found in the open file. This error appears in operations whose development ‘without sources’ is impossible (ex: particular source levels)

**Message: Erroneous Periods      Type: ERR**

None of the regulated periods specified in the script could be supplied by **dB Trait**. This error will appear for the listing by statutory periods for all the selected files. It is due to a change of period definition between the moment where the script was defined and the present analysis. Capture the periods and redefine the script.

**Message: Erroneous Channels      Type: ERR**

The operation concerns channels that do not exist in the file. The script has been defined on the basis of a file having more channels than the file currently been processed. Redefine the script on the representative base file.

**Message: Execution Impossible      Type: ERR**

An error appeared during the execution. This could be due to an interruption by the operator during a long operation, or an incompatibility of a calculated result (e.g.: no valid data)

**Message: Modified Parameters      Type: !**

Reserved for future use

**Message: Modified Sources      Type: !**

The requested operation could not be applied with the requested source assembly. Only the available sources were taken. In the case of operations able to be developed without sources (e.g.: Time history) this message appears even if no sources were found. Redefine the script for the representative base file, having the same sources as the treated file.

**Message: Modified Period Duration      Type: !**

The requested operation could not be developed with the requested period. This is due to an incompatibility of period duration. For example, the plot by 5-second periods is not possible in the case of a file having an elementary period of 10 seconds, nor 3 seconds. The duration is adjusted.

# CHAPTER 18

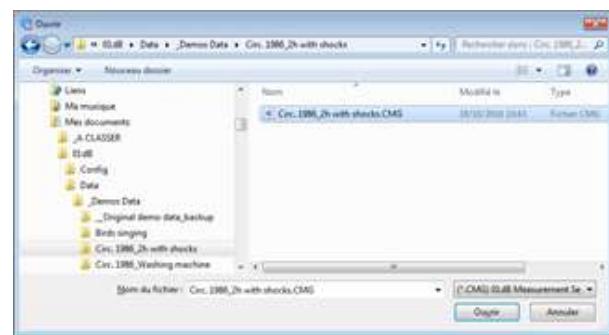
## DATA TRANSFER PROCEDURES

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### 18.1 DATA TRANSFER FROM DUO / FUSION / CUBE / ORION

#### 18.1.1 Direct reading – SD card and USB transfer

- Turn on your measuring instrument.
- Connect it to the PC using the USB cable (or insert the SD card in the PC card drive).
- Open dBTrait
- To read a single file, click on **File** and then on **Open**.
  
- Browse My Computer to locate the Removable disk.
- Each folder corresponds then to the measurement's "Location" name defined in the Info. tab of the instrument (by default: MY\_LOC).
- Open the folder containing the measurement to read.
- The "Location name" folder contains a subfolder by measurement period, the name of which is Date\_Start time\_End time.
- Example: 20101222\_111204\_111330 for the measurement started on December 22, 2010 at 11hr12min04sec and ended at 11hr13min30sec.
- Open the subfolder containing the measurement to read.
- Subfoldfer Date\_Start time\_End time contains file Date\_Start time\_End time.CMG
- Select the file and click on **Open**.
- The main window of the measurement session is displayed. The file contained in the SD card is open for reading. Before processing its data, it is advised that a copy be saved on the computer hard disk.
- Click on **File**, and then on **Save as...**
- Select the storage location on the hard drive, as well as the name of the .CMG file, and click on **Save**.
- Processing can then be performed, and
- Changes saved on the hard disk.



### 18.1.2 Multiple import and concatenation

The **DUO / FUSION / CUBE / ORION** instruments automatically split the measurement in consecutive sessions (24-hour to the maximum). The **import / concatenate** function is used to concatenate these sessions into a single continuous measurement session.

- Turn on your instrument.
- Connect it to the PC using the USB cable (or insert the SD card in the PC card drive).
- Open **dBTrait** (higher version).

The rest of the procedure is described in § 3.2.1.

### 18.1.3 Remote transfer using dBFileManager

The **DUO / FUSION / CUBE / ORION** instruments include an FTP server that allows for the remote transfer of measured data.

**01dB** has developed a specific application **dBFileManager**, dedicated to these instruments, allowing for a simplified connection for downloading measurements, as well as various other operations.

The connection to instruments may be established by any communication mode: Ethernet connections, Wi-Fi and 3G.



**dBFileManager** can be launched from the **File** menu in **dBTrait** or icon .

 **dBFileManager** is the standard data collection software, manually operated. The **dBDataCollector** software is offered in complement. It is characterised by its autonomous functions and automation.

#### 18.1.3.1 Main functions of dBFileManager

The main functions of **dBFileManager** are as follows:

- Management of **DUO / FUSION / CUBE / ORION** equipment catalog (installed base)
- Measurement data downloading (closed / unclosed campaigns), with possible selection of the types of data to download
- Download and Dispatching of measurement configurations and/or systems configurations
- Dispatching of.czip files (Firmware update files)

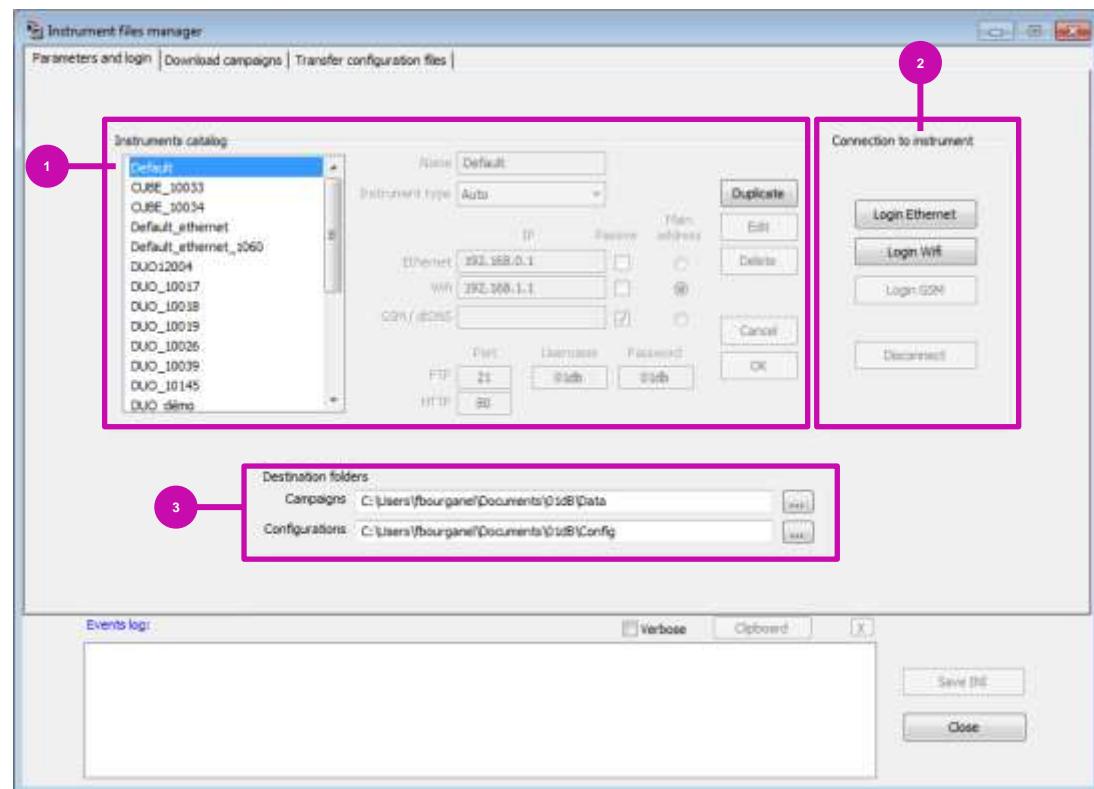
 For a detailed description of the two last functionnalities, see in **DUO / FUSION / CUBE User Manual**.

The **dBFileManager** user interface is composed of 3 tabs, plus a lower area for Events log.

### 18.1.3.2 Parameters and login

The Parameters and login tab includes:

- ① The catalog management
- ② The connection to instruments
- ③ The choice for destination folders:
  - For measurement data
  - For configuration files.

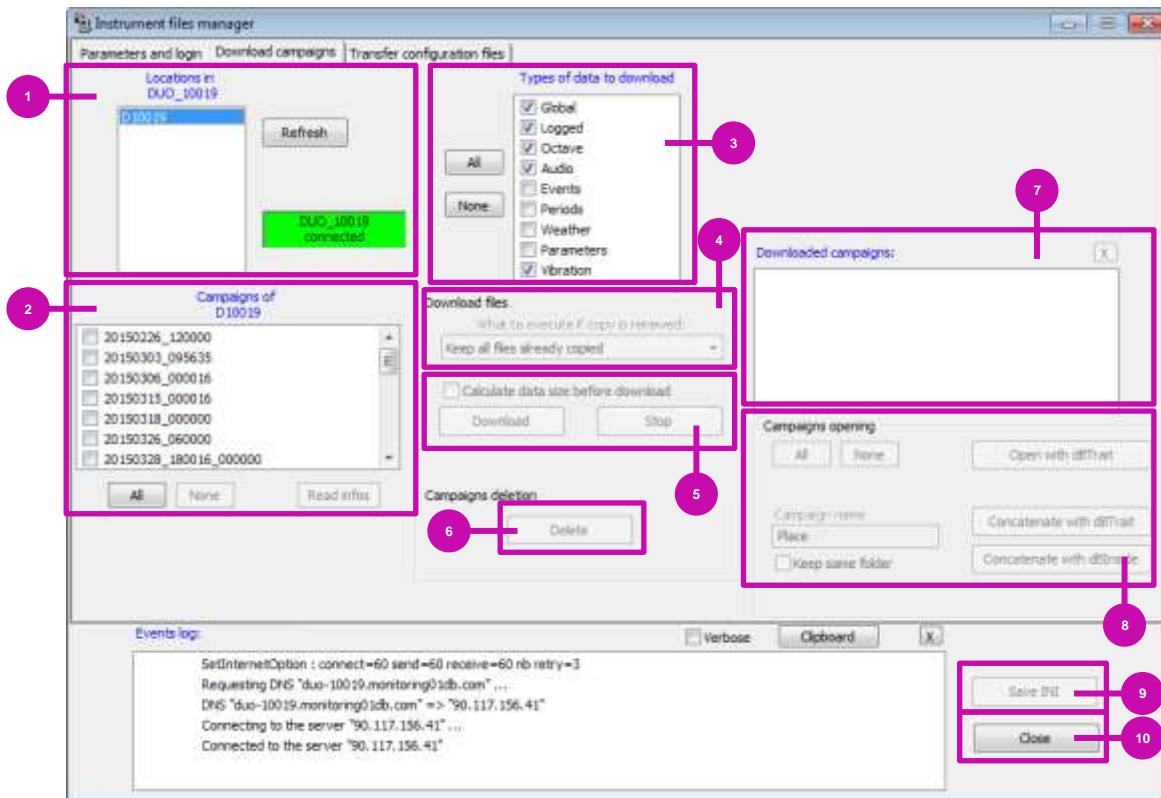


- A “default” instrument is available in the catalog, allowing an easy and quick connection to a brand new instrument with its factory settings. When connecting to “default”, the instrument type is automatically determined (whatever the type is: DUO, FUSION CUBE, or ORION).

### 18.1.3.3 Download campaigns

The Download campaigns tab applies to the current connected instrument, and includes:

- ❶ The selection of a measurement location for which data are to be downloaded
  - ❷ The selection of measurement campaigns to be downloaded
  - ❸ The selection of the data types to be downloaded (choices are different between **DUO/FUSION/CUBE** and **ORION**).
  - ❹ The copying mode (in case of copy renewal)
  - ❺ Two buttons for launching / stopping the download process
- The option « Calculate data size before download » to get an estimated data size amount, allowing the user to carry on or cancel the download process.
- ❻ The deletion of selected campaigns (deletion on the remote instrument)
  - ❼ The list of downloaded campaigns (during the current software session) (Downloaded campaigns area)
  - ❽ Quick open buttons, for the selected campaigns (in the Downloaded campaigns area):
    - **Open with dB Trait**: launches dB Trait and open one or several campaigns in the standard mode (campaigns to be analyzed separately)
    - **Concatenate with dB Trait**: launches dB Trait and opens several campaigns in Concatenated mode (for « Environmental » measurements only).
    - **Concatenate with dB Inside**: launches dB Inside and opens several campaigns in Concatenated mode (for « Building » measurements only).



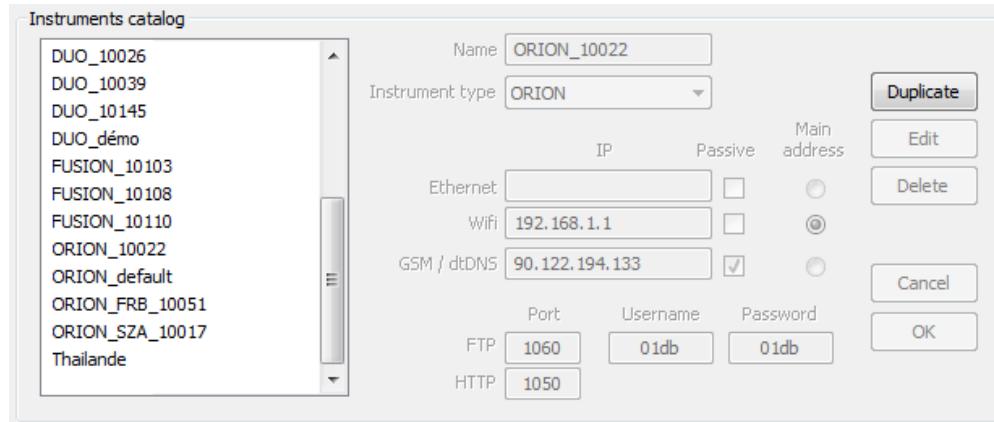
- ❽ Save INI button: for saving manually the global software configuration (the global software configuration is also systematically saved during exit).
- ❾ Close button: for exiting the software.

**Book icon:** As of version 6.0.0.13, it is also possible to download a user selection of signals (audio or vibration signals) from a measurement session (previously, all the signal files of the same campaign were downloadable without distinction).

#### 18.1.3.4 Catalog management

The **dBFileManager Instruments catalog** is a directory allowing the user to list all **DUO**, **FUSION**, **CUBE** and **ORION** instruments for which the user may want to transfer data.

 Note: The **dBFileManager Instruments catalog** is shared with the **dBDataCollector** automatic transfers application. Therefore, all instruments already entered in the **dBFileManager Instruments catalog** will be automatically accessible in **dBDataCollector**, and vice-versa.



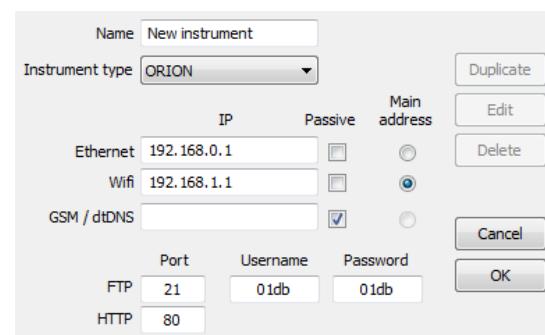
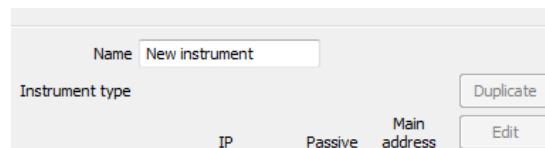
#### 18.1.3.5 Addition/Editing of equipment in the Instruments catalog

The Duplicate button allows the addition of a new instrument of type DUO, CUBE, FUSION or ORION into the catalog. The addition is carried out by duplicating the selected instrument from the catalog.

A default Name will be attributed to the created instrument

The user then sets the Instrument type from the Dropdown menu,

and completes the fields necessary for communicating with the instrument and its identification:



Once all information concerning the new instrument has been entered, the user confirms by pressing the OK button.

The new instrument then appears in the catalog listing on the left:



Description of the fields available for each instrument:

- **Name:** instrument identification
- Instrument type
- **Ethernet:** Instrument Ethernet IP address
- **Wi-Fi:** Instrument Wi-Fi IP address
- **GSM/dtDNS:** GSM/3G IP address, or name of dtDNS host if this parameter has been configured on the unit
- **FTP Port:** FTP port No. as configured on the unit
- **HTTP Port:** HTTP port No. as configured on the unit
- **Username:** FTP username as configured on the unit
- **Password:** FTP password as configured on the unit
- **Passive Mode:** option to be independently selected for each connection mode possible.
- **Main address:** address (or connection mode) which will effectively be used for communication with this instrument for configuration files transfers.  
Only one main address may be selected.

At least one IP address must be entered for an instrument, but not necessarily for all three.

The Instruments catalog is not limited in number and thus allows the simple management of an installed base of several tens of units, for example.

An instrument present in the catalog may be modified. Simply select in the list to the left then click on the **Edit** button.

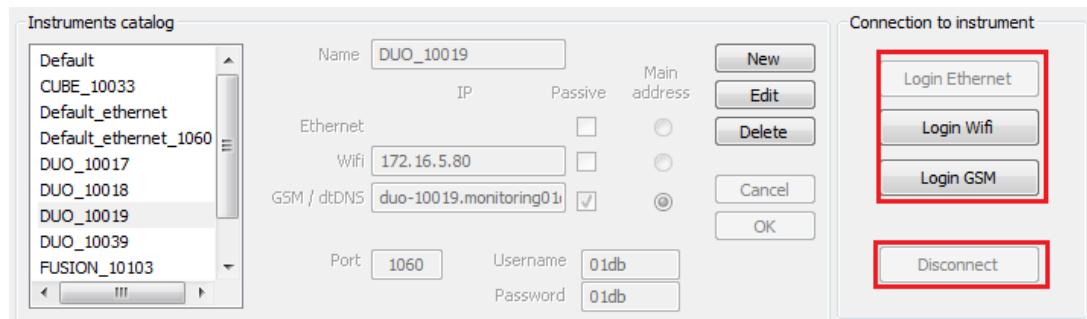
Lastly, the **Delete** button allows the deletion of an instrument from the Catalog. A confirmation message allows the operation to be confirmed / cancelled.

-  *For an instrument used in DHCP mode, its machine name can be entered in the Ethernet field, e.g.: DUO\_xxxxx, where xxxx is the unit's serial No.*
-  *Passive Mode: this mode is recommended for communication with an instrument in GSM (3G) mode. In general, the other communication modes (Ethernet and Wi-Fi) do not require enabling this option.*
-  *In the event of connecting to DUO using its dtDNS host name, a name resolution phase precedes the connection. This phase is visible in the Events log. In this case, the DNS "cache" is worked around (or "shunted") to avoid dBFileManager trying to connect to an address that is no longer valid (which is the case after 24 hours maximum, for example, for a 3G DUO connection via the Orange operator in France).*
  - *Resolution of the DNS name: search for correspondence between the dtDNS name and the IP connection address.*
  - *DNS cache: keeps the last IP address corresponding to the dtDNS name; this information is stored on the PC that hosts dBDataCollector.*
-  *In case of connection issues: check the Windows firewall settings on your computer. There, it can be necessary sometimes to set the network options of dBFileManager to both "public" **and** "private" for a proper communication authorizing.*

### 18.1.3.6 Browsing the Instruments catalog and Connections

The Instruments catalog can be browsed by selecting the instruments that appear in the list on the left of the Catalog window.

When an instrument is selected, it is possible to start a connection using the buttons to the right of the Catalog window:



The connection is possible for all types of non-empty addresses for the selected instrument.

In the example below, the selected DUO has two addresses: a WiFi address, and a GSM/dtDNS address (defined as the main address).



*Note: connection steps are visible in the Event log.*

## 18.2 DATA TRANSFER FROM BLUESOLO & SOLO BLACK EDITION

Regarding the sound level meters type **Blue Solo & Solo Black Edition**:

They embed a removable SD-Card memory card to store measured data and recorded audio files. On a Pocket PC, software **dBSolo** can be used to record oral or written comments. Leq, spectra, audio recordings, written and oral notes can then be transferred to **dBTrait**.

### 18.2.1 Importing notes from the Pocket PC

 With **dBTrait 6.0**, importing written comments and/or vocal comments is only possible using the function **Convert multiples files** as well as the function **Import comments** accessible when a measurement session is open.

By default, files containing written or oral comments recorded during the measurement session are stored in folder **\My Documents\Comments dBSolo\** in the Pocket PC memory.

**dBSolo** generates two types of comments or notes: oral comments (\*.**WAV**) and written comments (\*.**TXT**).

Each filename is unique and consists of prefix **NOTE\_BlueSolo** serial number (6 characters), followed by the file starting date in format **yymmdd**, and time in format **hhmmss** followed by milliseconds.

Example 1: **NOTE\_656565\_060823\_170856000.TXT** is written comment file recorded on August 23, 2006 at 17h08m56s000 during a measurement performed with sound level meter 656565.

Example 2: **NOTE\_656565\_060823\_170903000.WAV** is an oral comment file recorded on August 23, 2006 at 17h09m03s000 during a measurement performed with sound level meter 656565.

#### Importing files stored in the Pocket PC memory requires **two steps**:

- Transferring the Pocket PC to the computer hard disk using Microsoft ActiveSync.
- Importing files into the measurement session using **dBTrait**

**Configuration of ActiveSync for the automatic transfer of comment files to the computer**  
(to be performed when connecting the Pocket PC to the computer for the first time):

- Install ActiveSync from the CD-ROM provided with the Pocket PC.
- Place the Pocket PC on its base and connect it to the USB port of the computer.
- ActiveSync detects a new Pocket PC. Select Standard Partnership, then Synchronise with this office computer.
- Select **Files** in the list of synchronisation parameters.
- Click on **Next**, then **Finish**.

Each time the Pocket PC is connected to the computer, ActiveSync will automatically copy the files contained in folder **My Documents** of the Pocket PC memory to folder **\My Documents\XXXXXX My documents\** of the computer (where XXXXXX is the name assigned to your Pocket PC by ActiveSync when setting up the partnership. The default name is "Pocket\_PC").

Comment files are imported in the measurement session during transfer protocol of associated measurement session.

If the name of a comment file does not comply with the naming rule used by dBSolo, the program will define the comment date based on the file creation date displayed in Windows Explorer. This allows importing text comments originating from sources other than dBSolo.

For files that do not include any information on time length, it will be set to 0.4 times the total number of characters, in seconds.

### 18.2.2 Transferring data stored in the SD memory

When stored on the SD memory card, binary data are preformatted into files that can be imported directly into dB Trait.

BlueSolo & Solo Black Edition generate two types of measurement files: time history files (\*.BIL) and recorded signals files (\*.WAV).

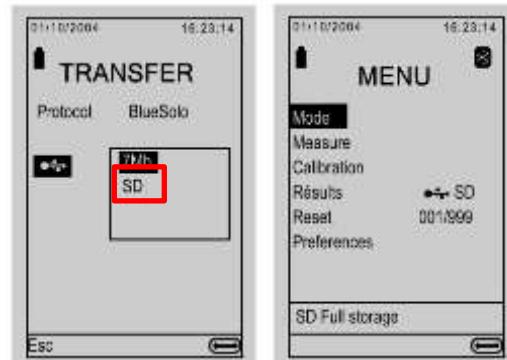
Each filename is unique and consists of the BlueSolo & Solo Black Edition serial number (6 characters), followed by the file starting date in format **yymmdd**, and time in format **hhmmss** followed by milliseconds.

Example 1: 656565\_060823\_170652000.BIL is a time history file originating from sound level meter 656565 started on August 23, 2006 at 17h06m52s000.

Example 2: 656565\_060823\_170738000.WAV is an audio signal file originating from sound level meter 656565 started on August 23, 2006 at 17h07m38s000.

The following procedure should be adhered to:

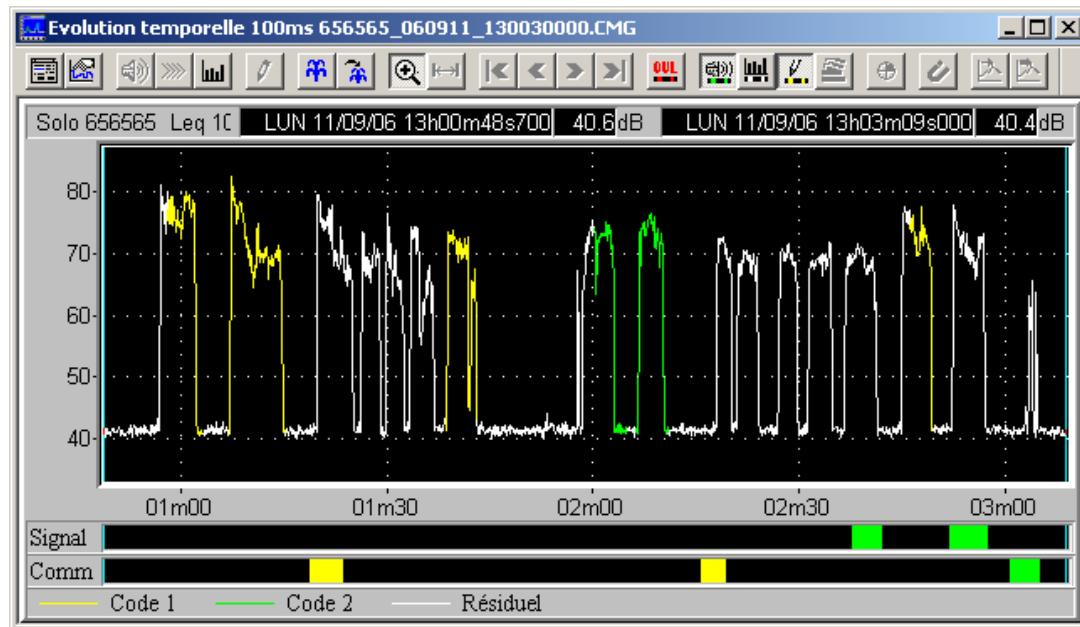
- Start BlueSolo or Solo Black Edition.
- Go to the **Preferences** menu, then **Transfer**.
- Select mode **SD** next to the **USB** field. Validate.
- In the **Main menu** screen, go to **Results**.
- Turn the computer on, if not already done, and wait for the full start of Windows.
- Connect BlueSolo to the USB port on the computer.
- Windows detects a new peripheral device. Follow the automatic installation procedure (only for the first-time connection).
- Start dB Trait or higher version.
- Click on **File** then **New**. A new – blank – file is created until data are exported.
- Click on **File**, then **Import / Concatenate**
- Browse through removable disk **BLUE SOLO or SOLO BLACK EDITION 60XXX**, then folder **DATA**.
- Select the time history file (\*.BIL). The program will automatically determine which \*.WAV files are associated. Validate by clicking on **Open**.
- In menu **File / Save as**, select a location for storage on the computer hard disk.
- \*.BIL and \*.WAV files contained in the BlueSolo / Solo Black Edition memory can then be deleted using Windows File Explorer.
- Select the location for the previously imported comment files.
- dB Trait automatically imports the associated wv files and associated comments into a single measurement session.
- Go to **File, Save as** to select a location to store the measurement session on the computer hard disk.
- It is then possible to delete the .BIL and .WAV files contained in the memory of Blue Solo & Solo Black Edition from Windows' File Explorer. The comment files can also be deleted from the Pocket PC memory (They will then be automatically deleted from the computer on the next synchronization).
- BlueSolo & Solo Black Edition can then be disconnected from the PC and turned off.



 The “Sound level meter transfer” function of dB Trait is not to be used.

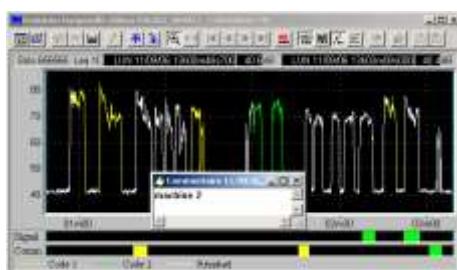
### 18.2.3 Reading data in dB Trait

The time history plot is displayed with **Visualization / Time history**. Four types of data transferred and stored in the measurement session file are displayed:

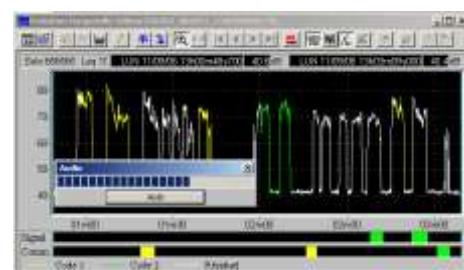


- \* **Equivalent levels measured by BlueSolo (Leq, Lp, Spectrum)** : Plot of the time history (in white in the figure) with sources identified by Code 1 (yellow) and Code 2 (green).
- \* Recordings of the metrological audio signal by BlueSolo : Green parts on the Signal bar under the graph.
- \* Written comments saved in dB Solo : Green parts of the Comm bar under the graph.
- \* Oral comments recorded in dB Solo : Green parts of the Comm bar under the graph.

Double click on an event in the **Comm** bar to:



*Written comments can be edited and saved*



*No processing can be applied to comments*

## 18.3 DATA TRANSFER FROM VIB

**dB Trait** allows transferring all data (time data) stored in the **VIB** measuring instrument, as well as (oral or written) comments stored in the VIB remote control.

Two types of data can be imported:

- Comments stored during the measurement (\*.txt, \*.wav files)
- Measurement files (\*.BIL, \*.WAV files)

We recommend transferring first the comments, next the measurement files on the PC.

### 18.3.1 Transfer of comments

Audio and text comments are stored on the system that operates dBA(8) (PPC, PC or Tablet PC).

If comments are already stored on the PC, go directly to step 2, otherwise follow the procedure described below:

By default, written and oral comment files recorded during the measurement with dBA(8) are stored in folder **\My Documents** of the Pocket PC memory.

Each file has a unique name made up of prefix **NOTE**\_serial number of VIB (6 characters), followed by the date in format **yymmdd**, and the starting time of the comment file in format **hhmmss** followed by milliseconds.

Example 1: **NOTE\_656565\_060823\_170856000.TXT** is a comment file recorded on August 23, 2006 at 17h08m56s000 during a measurement performed by VIB number 656565.

Example 2: **NOTE\_656565\_060823\_170903000.WAV** is a comment file recorded on August 23, 2006 at 17h09m03s000 during a measurement performed with VIB number 656565.

**Importing** files stored in the Pocket PC memory requires **two steps**:

- **Transfer** from the Pocket PC to the hard disk of the computer with software Microsoft ActiveSync.
- **Import** of measurement files by **dB Trait**.

**Configuration of ActiveSync for the automatic transfer of comment files to the computer**  
(to be performed when connecting the Pocket PC to the computer for the first time):

- Install ActiveSync from the CD-ROM provided with the Pocket PC.
- Place the Pocket PC on its base and connect it to the USB port of the computer.
- ActiveSync detects a new Pocket PC. Select Standard Partnership, then Synchronise with this office computer.
- Select **Files** in the list of synchronisation parameters.
- Click on **Next**, then **Finish**.

Each time the Pocket PC is connected to the computer, ActiveSync automatically copies the files contained in folder **My Documents** of the Pocket PC memory to folder **\My Documents\XXXXXX My documents\** of the computer (where XXXXXX is the name given to the Pocket PC by ActiveSync when setting up the partnership, by default: "Pocket PC").

### 18.3.2 Transfer of measurement data originating from VIB

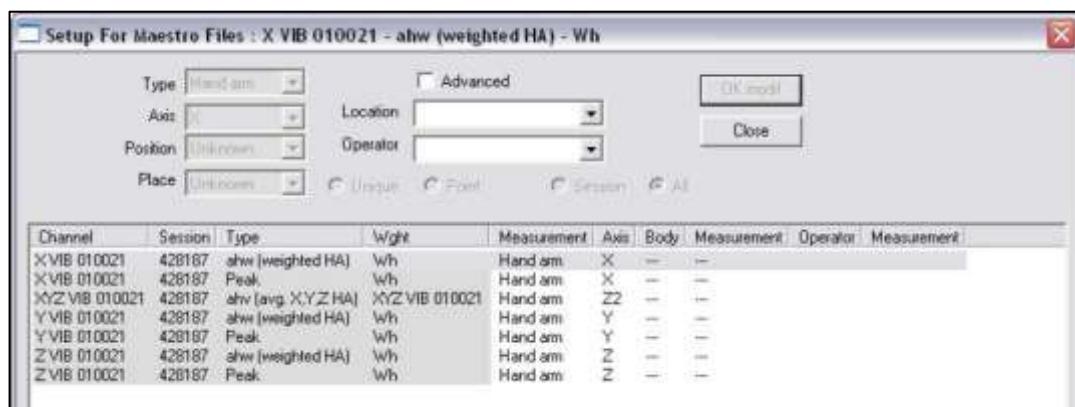
Follow the procedure described below:

- Connect the A-type male-female USB cable to a USB port on the computer;
- Connect VIB to the PC using the USB cable;
- Turn **VIB** on.
- VIB is recognised and accessible in Windows Explorer as a removable device.
- Start **dB Trait**, and then select **File / Import/Concatenate** to open an exploration window:

The rest of the procedure is described in § 3.2.3.

A new window **Set-up of Maestro files**, opens up, allowing for the definition of the following parameters:

- Type of measurement (hand arm, Whole body or unknown).
- Axis (x, y or z).
- Position of the operator during the measurement (in case of Whole body only).
- Location of the accelerometer (in case of Whole body only).



Note: In this example: Hand-arm mode, unknown position, unknown transducer place.

These parameters can be changed later by clicking on **Aux / Setup for Maestro files** in order to correct, e.g., an error that occurred during parameter input.

When all settings are defined, click on **OK** and the **main window** of the measurement session is displayed.

## 18.4 DATA TRANSFER FROM WED

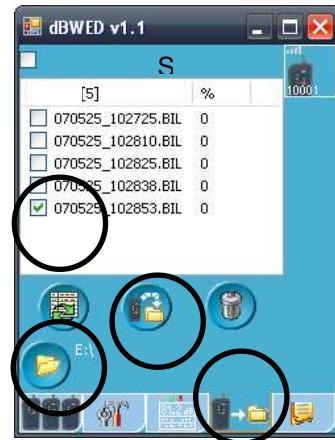
Regarding the noise dosimeter **WED**, there are two different ways to import files, using software dBWed either on a PC, or on a Pocket PC.

### 18.4.1 Software on PC

Start dBWed on the PC, then:

- Go to the file transfer tab
- Check the files to transfer
- Select the location where files must be transferred
- Click on the button to start file transfer

Transferred files are of the following type:  
*WEDserialnumber\_date\_time.BIL*



Example: file 10001\_070418\_180012.BIL is a measurement file originating from WED 10001, containing a measurement achieved on April 18, 2007 at 18:00:12.

### 18.4.2 Software on Pocket PC (PPC)

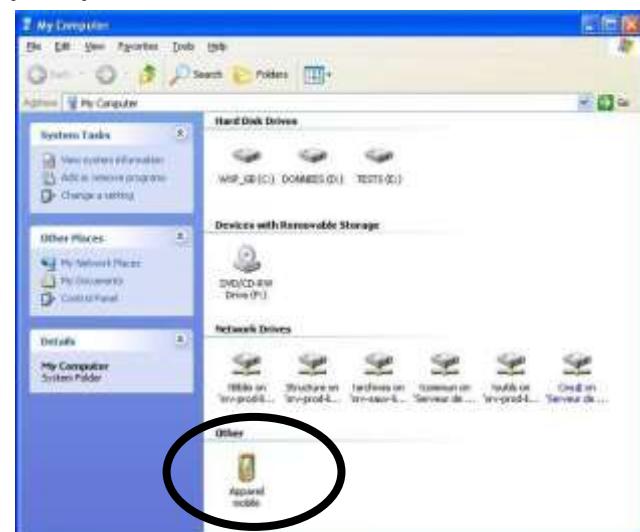
Reading BIL files in dBTrait consists of three steps:

- 1) Transferring measurement files from the WED to the PPC.

The procedure is the same as that described in the previous paragraph, starting the software on the PPC.

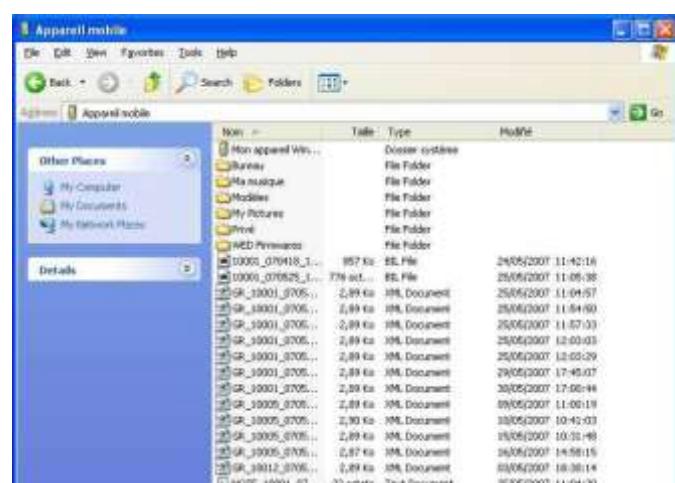
- 2) Transferring measurement and comment files on the PC.

Connect the PPC to the computer.  
 Double-click on the PC workstation to start browsing through the mobile instrument.



Documents stored in the PPC in the "My documents" folder are displayed directly. If files have been stored elsewhere, one needs to click again on "My mobile Windows instrument" to browse through the PPC.

Select the files to transfer, then copy / paste them on to the PC.



There are four types of files created by dBWED:

- XML files: their names begin with GR; these are overall results table files.
- TXT files: their names begin with NOTE; these are written comment files.
- WAV files: their names begin with NOTE; these are audio comment files.
- BIL files: their names begin with the WED number; these are measurement files.

3) Importing BIL files in **dBTrait**.

The rest of the procedure is described in § 3.2.2.

## 18.5 DATA TRANSFER FOR OLD TYPES OF DEVICES

Use the command **File / SLM/vibrometer data transfer**.

This allows transferring data by:

- Serial communication
- USB communication (Solo, storage on internal memory)

With **dBTrait** 6.0:

- The COM ports can now be selected from COM1 to COM16
- Transfer rates: 38400 / 57600 / 115200 / 230400.

# CHAPTER 19

## CUSTOMIZATION OF dBTRAIT (PREFERENCES MENU)

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**dBTrait** customization options are available in the **Preferences** menu.

Some options of the **Preferences** menu are not described hereafter, but in the chapters dedicated to specific functions.

### 19.1 LANGUAGE & DATE FORMAT

The **Preferences / Language and Date format** menu is available when no measurement session is open.

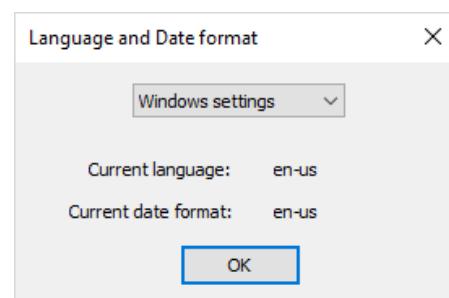
#### Available choices:

- Windows settings

This is the default selection when the software is installed.

It allows applying the Windows settings language to **dBTrait**.

When the language defined in Windows settings is not available in **dBTrait**, English is set.



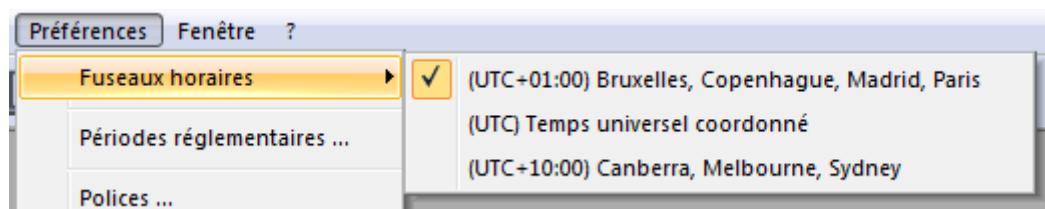
- Manual selection of the language

The software language can also be selected manually among the available languages.

In both cases, the current language and current date format are listed.

### 19.2 TIME ZONES

The **Preferences / Time Zones** menu is available when a measurement session is open.



It can be used to select the time zone in which the user wants to view the measurement data. By default, two to three choices are available:

- The user's computer time zone
- The UTC time zone (UTC 00)
- The time zone of the measurement session (which may be the same as the PC time zone, in which case only two choices are offered).

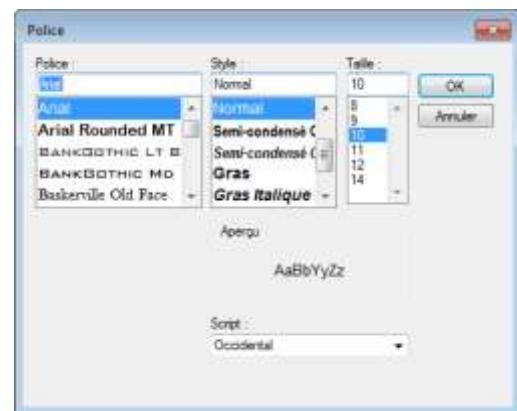
To set a time zone as the default time zone (including a time zone not offered by **dBTrait**), see the description of parameters TZIMode and TZIdefault in § 20.4.

### 19.3 FONTS

The command **Preferences / Font** allows the user to choose which computer font will be used to display text in **dBTrait** (except for graphics where the font cannot be modified).

Select the font type, style (regular, Italic, Bold, etc.) and size in this dialog box.

Click on **OK** when all the modifications have been carried out.



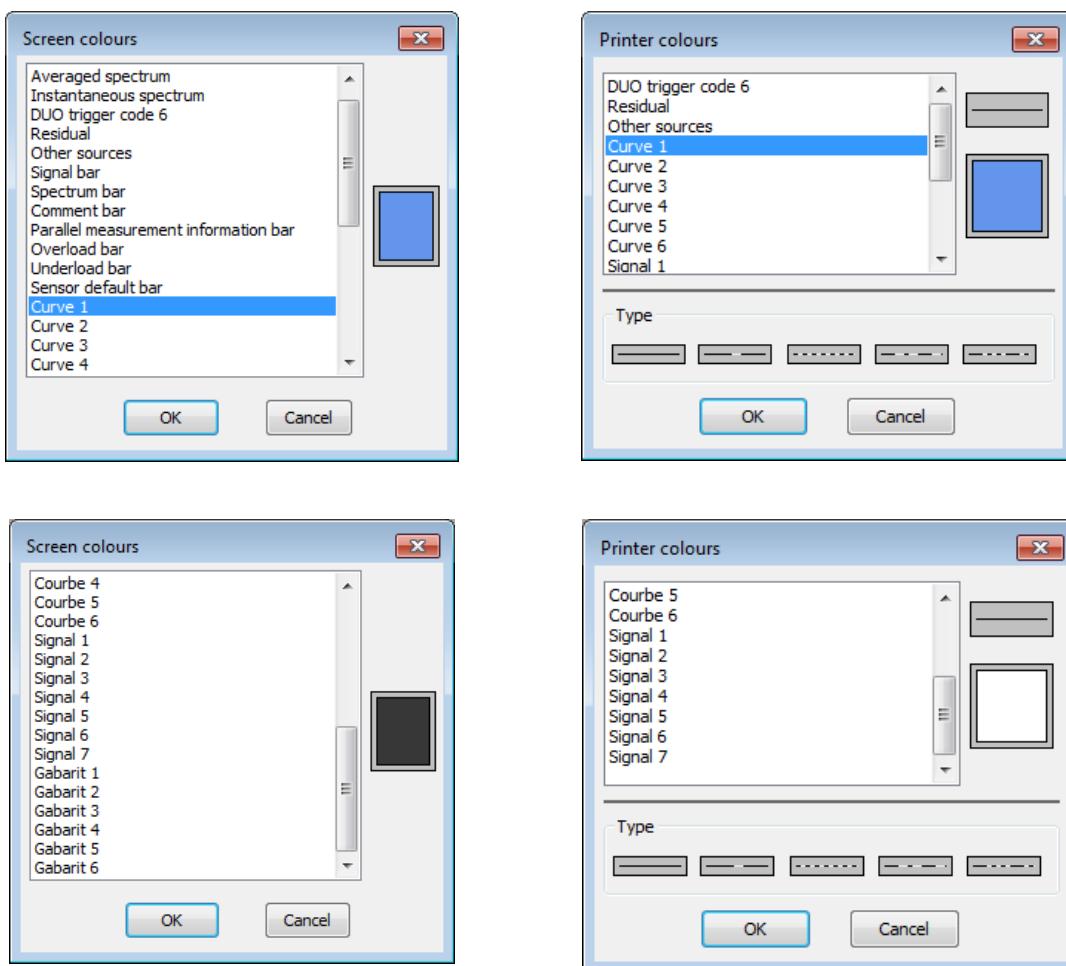
## 19.4 COLOURS

The software allows the user to customise various parameters for displaying the data.

The commands **Preferences / Colours / Screen** (or icon ) and **Preferences / Colours / Printer** allows the user to respectively set the colours of the different types of data displayed on screen or on the printer.

Select in this list the type of data for which you want to modify the colour. The actual colour associated to this type of data is displayed on the right. Then, select with the mouse the new colour.

For the printer colours, the user can also select the **type** of line used for printing a noise quantity.



Click on **OK** when all the modifications have been carried out.

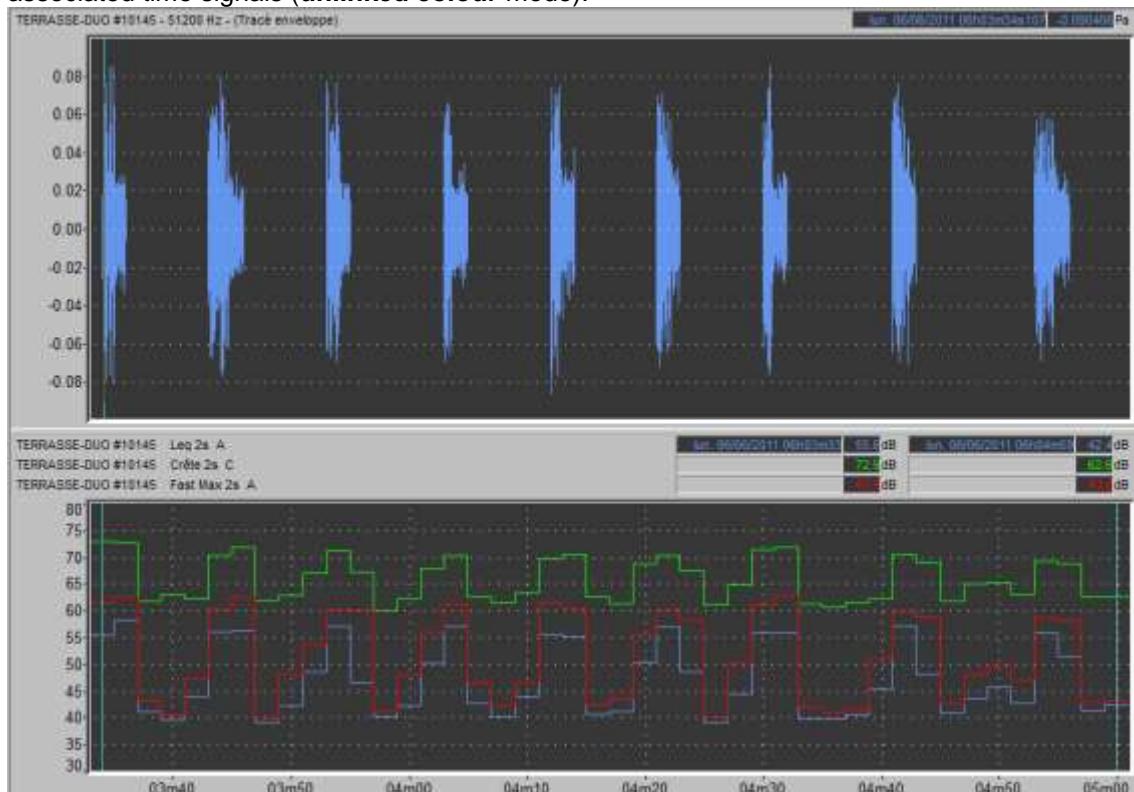
One of the new features of **dBTrait** 6.0 is the automatic assignment of a **colour** based on the **physical channel**.

This colour assignment is systematically applied to time signals. Colour configuration is achieved by selecting **Signal 1** and **Signal 7** in the **Preferences / Colours / Screen** window. It also applies to processing channels (e.g., LAeq or axis PPV, etc.) provided only one **processing channel** is displayed per physical channel. In this case, the colours will be automatically matched between the processing channel display and the associated signals (**linked colour** mode). This is particularly useful for an easier display of the vibration measurements carried out by triaxial transducers.

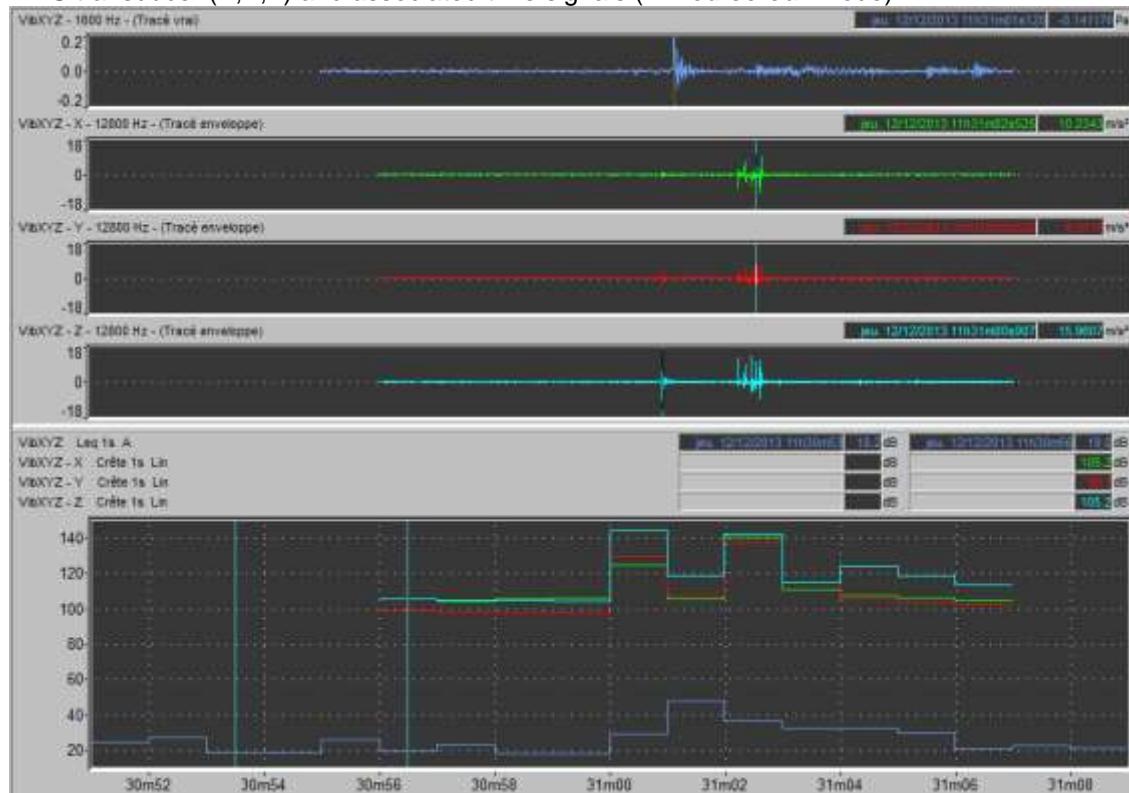
In the opposite case, when several processing channels are displayed for a single physical channel, colour assignment is not linked because the processing channels/signals association is not guaranteed. Signals are then displayed with a different colour for each physical channel. The processing channels are displayed using colours 1 to 6 randomly (**unlinked colour** mode).

The examples below show the automatic **colour** assignment based on the **physical channel**:

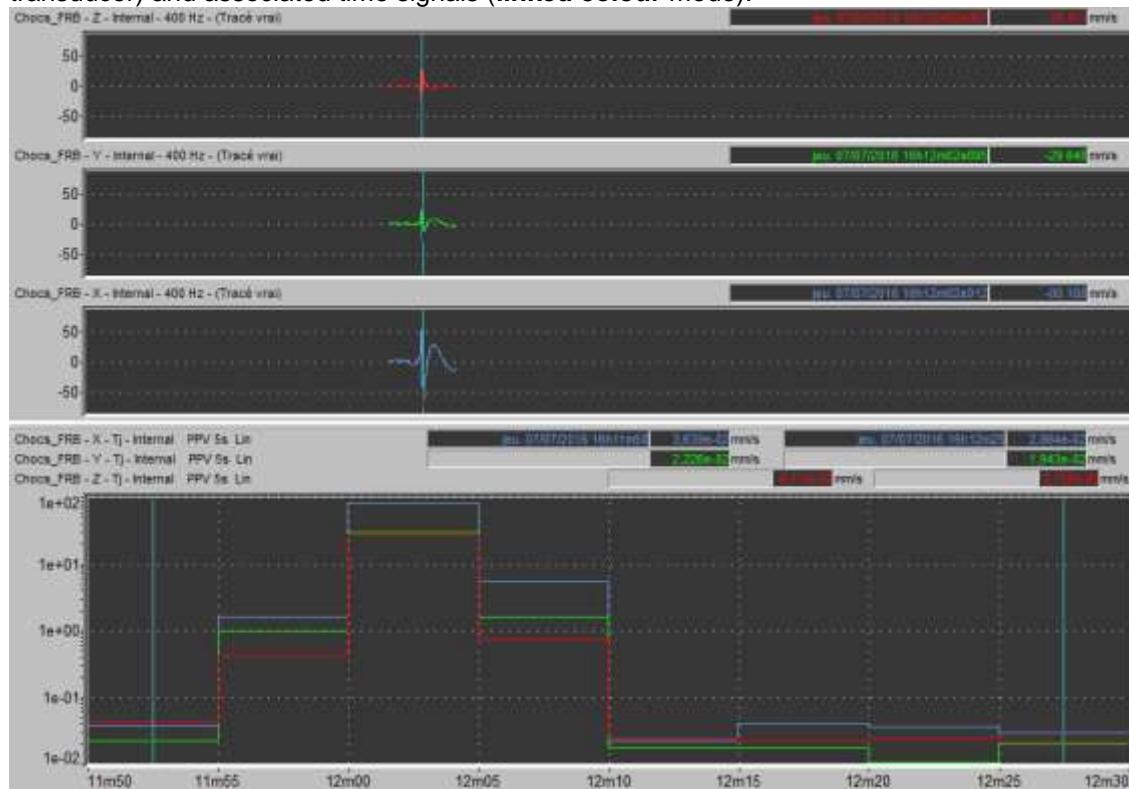
Case 1: display of 3 processing channels from a DUO device (Leq, Peak, Fast Max) and of associated time signals (**unlinked colour** mode):



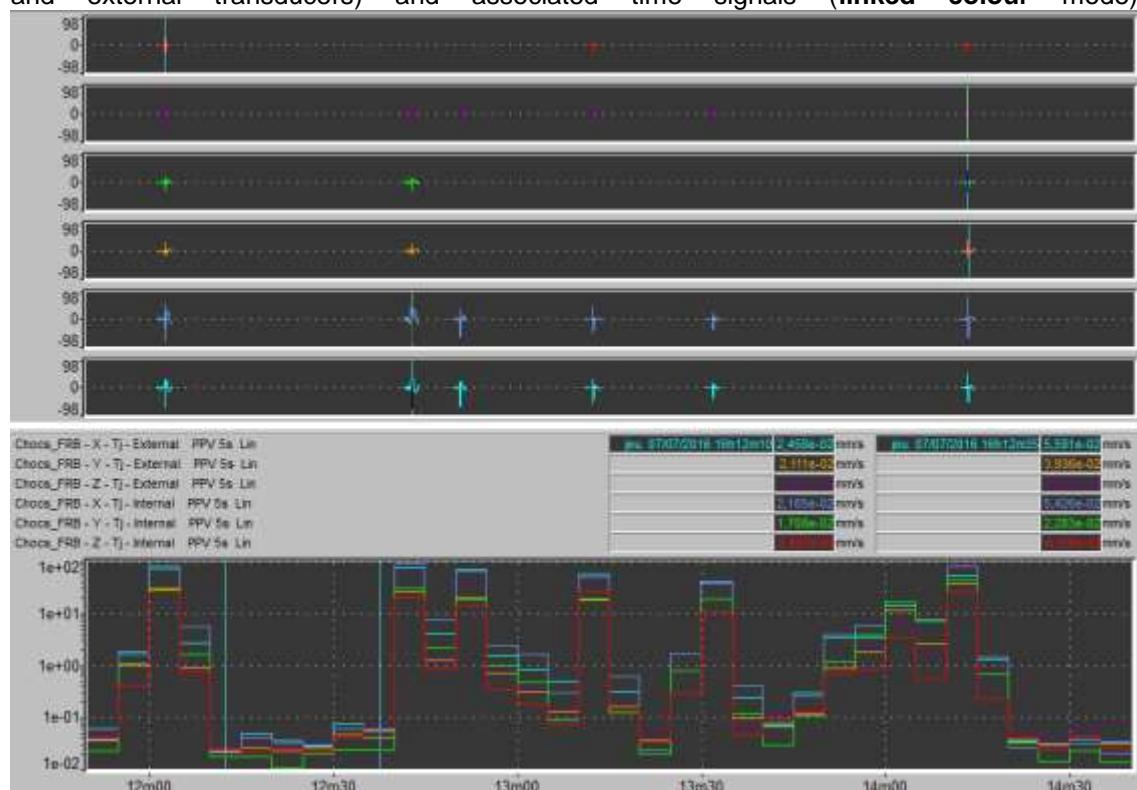
Case 2: display of a channel originating from a DUO device (Leq), 3 channels from a wireless WLS transducer (X,Y,Z) and associated time signals (**linked colour mode**):



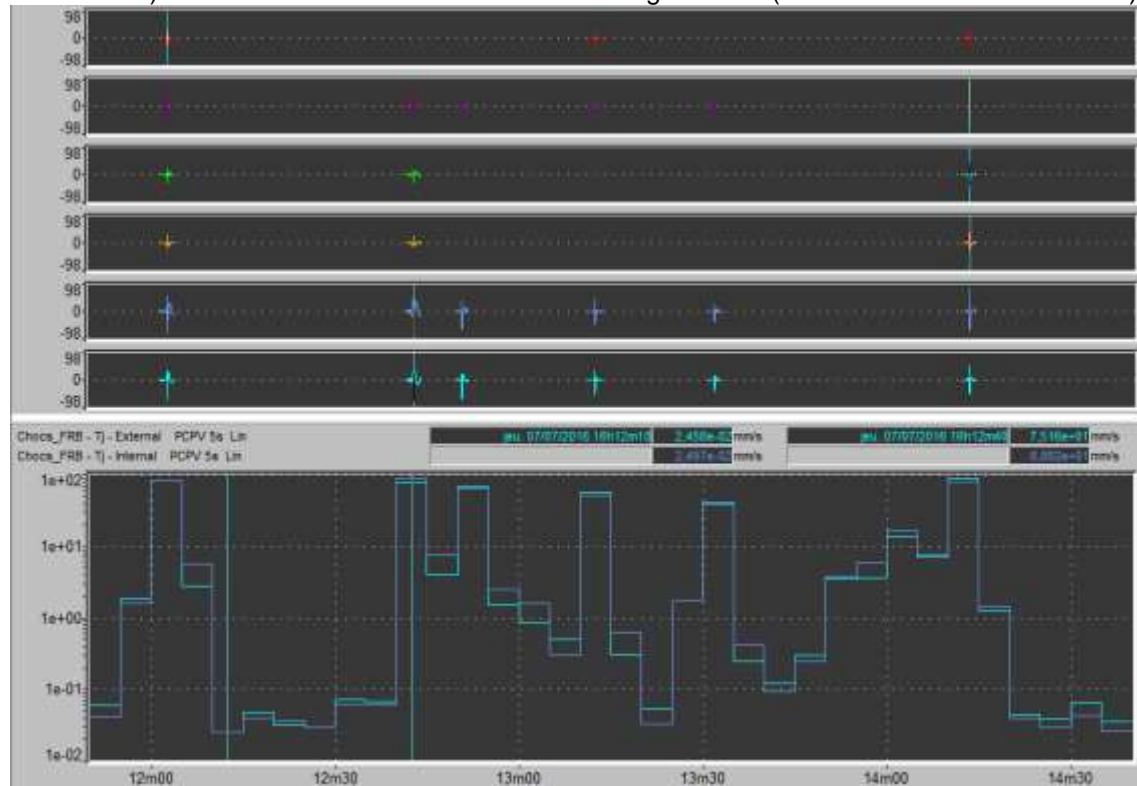
Case 3: display of 3 channels from an ORION device (PPV of the X,Y,Z channels of the internal transducer) and associated time signals (**linked colour mode**):



Case 4: display of 6 channels from an ORION device (PPV of X,Y,Z channels of the internal and external transducers) and associated time signals (**linked colour mode**):



Case 5: display of 2 channels from an ORION device (PCPV of the internal and external transducers) and associated time signals (**linked colour mode**):

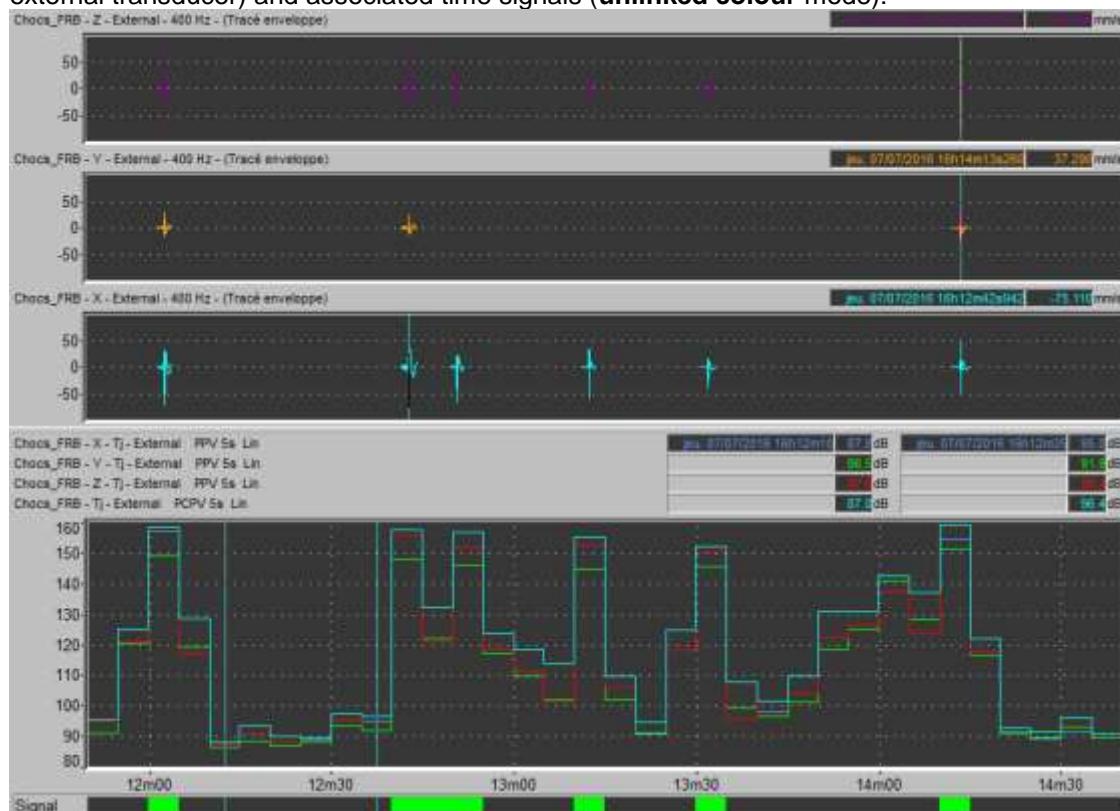


PCPV, like PVS, is an indicator summarizing axes X,Y,Z.

**Case 6:** display of 2 channels from an ORION device corresponding to the same physical channel (PPV for channel Z and Vpmax for channel Z, internal transducer) and associated time signals (**unlinked colour mode**):



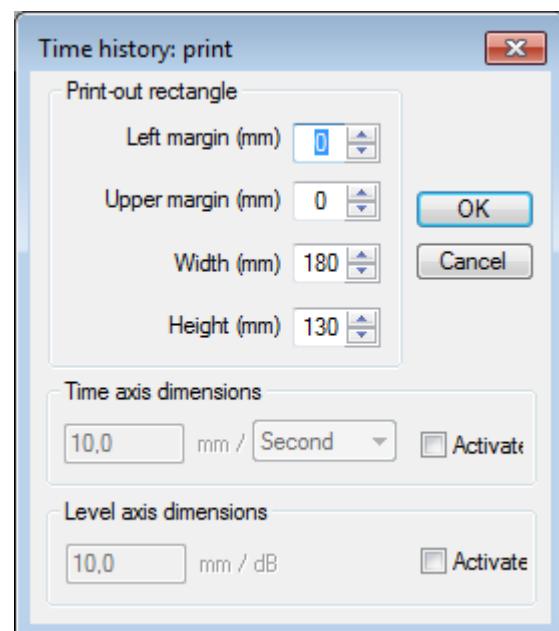
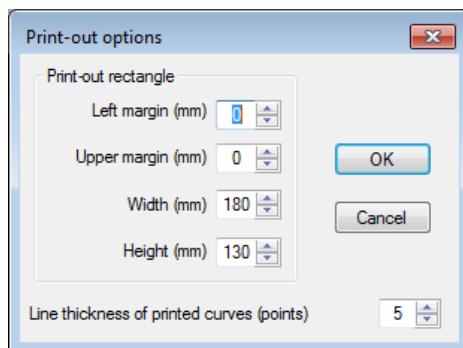
**Case 7:** display of 4 channels from an ORION device (PPV for channels X,Y,Z and PCPV, external transducer) and associated time signals (**unlinked colour mode**):



- ⓘ See § 22.1.1 and 22.1.2 for more details on the channel and physical channel concepts.
- ⓘ For your information, numbering of the physical channel by type of device:
  - DUO, FUSION, CUBE: single-channel instruments, channel 0
  - ORION:
    - Internal X,Y,Z channels: channels 0,1,2
    - Internal X,Y,Z channels: channels 3,4,5
    - Acoustic pressure external channel: channel 6
  - dB4:
    - Input channels 1,2,3,4: channels 0,1,2,3
- ⓘ The dBTrait 6.0 colours are defined in the dBTrait.ini file in a [Colors2] section, which allows for the possible coexistence of versions 6.0 and 5.0 of dBTrait.
- ⓘ If colour changes have been made by the user, it is possible to revert to the default colours: when dBTrait is closed, open the dBTrait.ini file and then delete all or part of the [Colors2] section in order to fully or partially reset it.

## 19.5 PRINTING OPTIONS

When printing graphics, the user can set a few additional parameters by the commands **Preferences / Graphic printout / Time history** or **Histograms** or **Table** or **Windrose**.

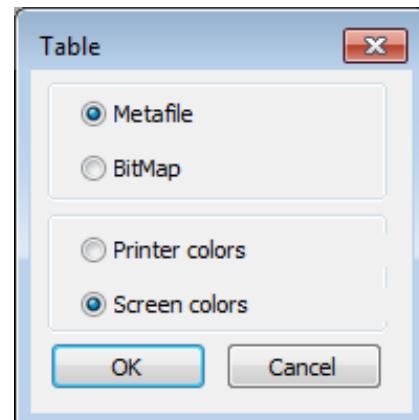


The user can set the margins of the graphic printout frame and, when printing a time history plot, the dimensions (in mm) for the time scale (X-axis) and the level scale (Y-axis).

## 19.6 COPY OPTIONS

It is possible to customize the options for copying images. The following choices are available to the user:

- Format
  - Metafile (by default)
  - BitMap
- Colors
  - Printer colors
  - Screen colors



## 19.7 DISPLACEMENTS AND CURSORS

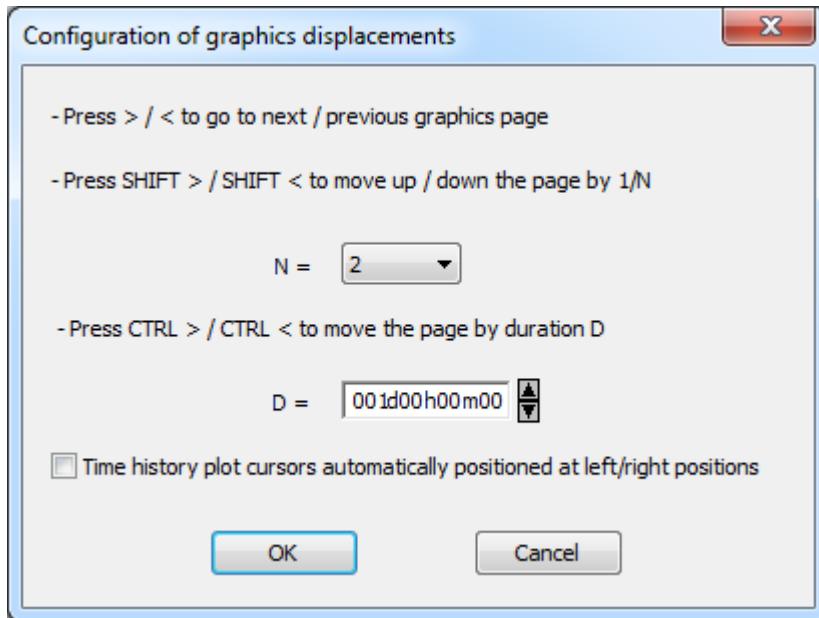
Displacements on time history plots and on spectra can be customised.

Reminders on classic displacements:

- move to the next page
- | go to last page
- < go to previous page
- |< go back to first page

Move by Nth of a page or by a defined length of time using keyboard shortcuts.

These parameters are set in the **Preferences / Displacements** menu:



Press SHIFT + ➤ to move by an N<sup>th</sup> of a screen, according to the predefined settings.

Press CTRL + ➤ to move by a defined length of time.

#### New in dB Trait 6.1:

The option **Time history plot cursors automatically positioned at left/right positions** allows a default positioning of the cursors at the very left and very right positions of the graph.

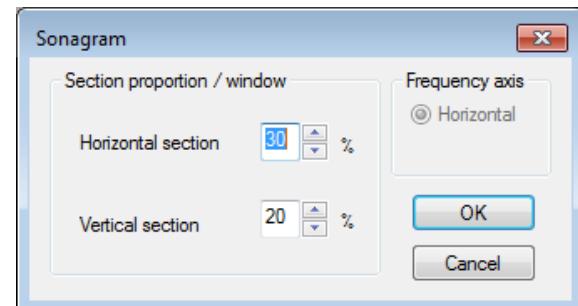
## 19.8 SONAGRAM

The **Preferences / Sonogram window** menu is used to access additional settings for the display of sonograms.

### ▪ Section proportion / window

The proportion used in the display of sections with respect to the display of the sonogram itself can be set in percent.

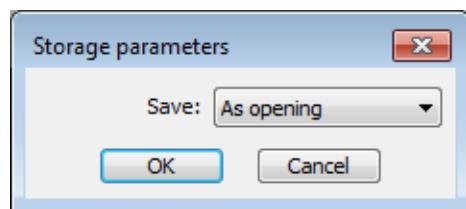
After validation of the changes, these will be dynamically applied to the sonogram windows currently open.



## 19.9 STORAGE MODES FOR CMG FILES

The command **Preferences / Storage** allows the user to select the type of data storage of the auxiliary/additional data in a measurement session file CMG.

The different choices are available via a dropdown menu.



- **As opening:** data are stored with the same format as opening. This choice is particularly convenient for data measured by **DUO / FUSION / CUBE / ORION**, in order to keep the original data structure (folders and sub-folders).
- **One file:** all the auxiliary/additional data would be saved into the measurement session file itself (in one single .CMG file).
- **Separate files:** the auxiliary/additional data would be stored into binary files (\*.BID).

 When measurement sessions include pictures or videos (DUO/FUSION/CUBE option Webcam), the saving mode must be “As opening”.

Summary table:

Various modes for the data before saving ↓	Storage mode →		
	One file	Separate files	As opening
<b>As opening</b> (Folder, CMG file, and sub-folders with BID files)	<p>1 single CMG file:            - all the items are concatenated into the CMG            - the folders and the names of the BID files are lost.            - if new items are created (post-processings, etc.), see the rule here below.</p>	<p>1 CMG file + BID files            - the names and folders for BID files are kept            - if new items are created (post-processings, etc.), see the rule here below.</p>	Same as for the separate files mode
<b>One file</b> (single CMG)	<p>1 single CMG file:            - all the items are concatenated into the CMG            - if new items are created (post-processings, etc.), they will be incorporated into the CMG</p>	<p>1 CMG file + BID files            - The items are extracted from the CMG and stored into separated files. See the rule here below.</p>	Same as for the One file mode.
<b>Separated files</b> (CMG + BID files)	<p>1 single CMG file:            - all the items are concatenated into the CMG</p>	<p>1 CMG file + BID files            - the names for BID files are kept            - If new items are created (post-processings, etc.), see the rule here below.</p>	Same as for the Separated files mode

#### Rule for items creation by dB Trait (and dB Fa):

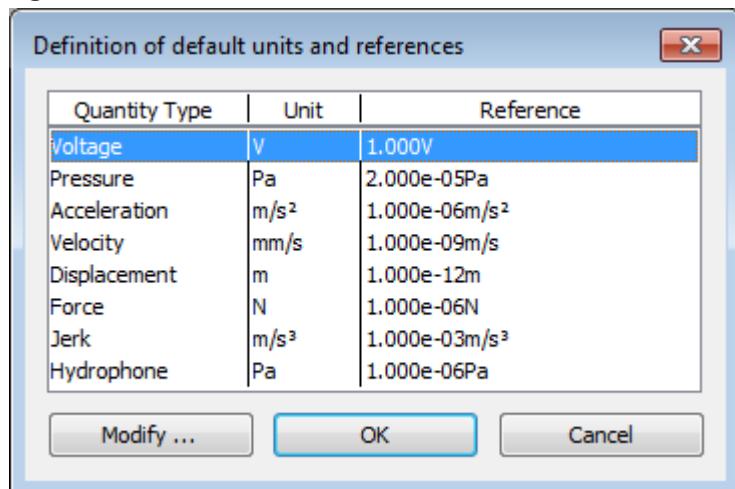
In the Separated files mode, when new BID files are created, they are given the name of the CMG file followed by a number. The files are created in the same folder as the CMG.

- ❑ The original saving mode is lost once a measurement session has been saved in another mode.
- ❑ In all modes the parameters of the items remain in the CMG file. The BID files contain only the pure data (data at IT timebase, spectra, time signals, codes, comments).

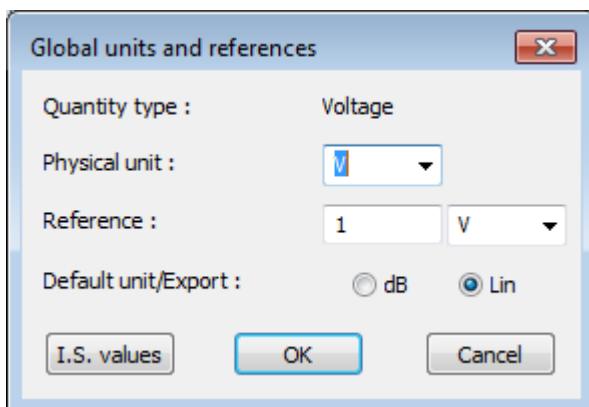
## 19.10 UNITS MANAGEMENT

The **Preferences / Units management** command is used to define the default units and references used for each type of indicator. One can also define export units applied when copying/pasting spectra or overall levels from the global item view: either physical units, or dB.

Click on **Modify** to redefine the physical unit and/or the reference value for the selected indicator, as well as the export unit.



Click on the **I.S. values** button to get the international system default value for the selected indicator.



## 19.11 SYNCHRONIZED CURSORS

The **Preferences / Synchronized cursors** command is used to activate **Link cursors between windows** function (equivalent to icon on the main toolbar).

# CHAPTER 20

## HIDDEN FUNCTIONS AND SPECIFIC PARAMETERS

---

In **dBTrait**, there are some 'hidden' functions, for which parameters can only be set in the **[Settings]** section of the **dBTrait.INI** file. They cannot be accessed directly by a software command.

### 20.1 STATISTICAL INDICES' RESOLUTION

The statistical indices in **dBTrait** are calculated with a resolution of 0.5 dB by default. One may have noticed that in some listings, the Lmax value was inferior to the L0 value. This is due to calculus limits in the base class of the indices (L0 is rounded to the nearest approximate value), Lmax being calculated with the 'true' values of the data file.

The 0.5dB resolution limit was originally defined to save computer memory. For a file between 20 and 100 dB, a histogram (the basis of any statistical calculus) with a resolution of 0.1dB will take up to 3204 bytes of computer memory (801 data values per measurement channel). If this calculus has to repeat for many consecutive periods, the memory requirements will be even larger.

A 0.5 dB resolution reduces the memory needs by a factor 5. Experience shows that this limit is never a problem, as statistical results can take another approximation.

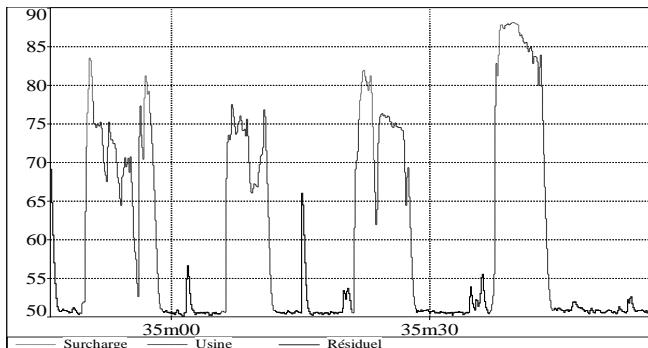
However, it is possible to have a better resolution, down to 0.1dB, for the storage of LEQ files. It can be defined under the line "**LnResolution**" of the **[Settings]** section of the **dBTrait.INI** file. For example, to obtain the smallest resolution 0.1 dB, this section will be:

```
[Settings]
...
...
LnResolution=1
...
...
```

The contrary (resolution superior to 0.5 dB) is also possible. If your computer shows problems when calculating statistical indices (example: indices every minute for one week of data), the result accuracy can be decreased to reduce the memory needs of the computer. For a 2-dB resolution, the **[Settings]** section will be written as follows:

```
...
...
LnResolution=20
...
```

## 20.2 SOURCES' COUNT



Consider a measurement where sources are coded but with overload risks. The events we are interested in may be affected by overload events.

From the graph, we can see that the "Usine" event appears 4 times in the period represented. The event count gives the following result:

Ten appearances instead of four? The result is compliant with the calculation algorithm: a source occurrence is detected when the current code changes from another code to that of the source that is searched for. Thus, each time an overload occurs, the program detects a new "Usine" event.

The counting configuration can be set to avoid this problem. Any event with a code value of 2 (overload) should not be considered as discontinuity of the source considered. A line "**ContinuousSource**" should therefore be added into the [Settings] section of the dBTrait.INI file:

```
[Settings]
...
...
ContinuousSource=2
...
...
```

Fichier	GLOK_001.CMG			
Source	Usine Mein Büro Fast			
Lieu	LIN			
Début	11:34:46:000 15/04/96			
Fin	11:35:56:000 15/04/96			
Apparition	Durée	Leq	Lmax	SEL
11:34:49:375 15/04/96	0:00:00:875	64.3	72.0	63.8
11:34:51:000 15/04/96	0:00:05:875	71.7	77.3	79.4
11:34:57:625 15/04/96	0:00:01:500	67.3	74.8	69.1
11:35:05:750 15/04/96	0:00:06:375	72.1	77.5	80.1
11:35:21:000 15/04/96	0:00:00:875	70.0	75.5	69.5
11:35:22:625 15/04/96	0:00:00:250	80.2	80.5	74.3
11:35:23:625 15/04/96	0:00:04:875	73.4	76.3	80.3
11:35:37:000 15/04/96	0:00:00:875	75.4	82.8	74.9
11:35:38:625 15/04/96	0:00:01:000	87.8	88.0	87.8
11:35:40:500 15/04/96	0:00:04:000	82.7	86.5	88.7
Total: 10	0:00:26:500	78.1	88.0	92.3

The listing will then be:

Fichier	GLOK_001.LEQ			
Source	Usine			
Lieu	Mein Büro Fast			
Pondération	LIN			
Début	11:34:46:000 15/04/96			
Fin	11:35:56:000 15/04/96			
Apparition	Durée	Leq	Lmax	SEL
11:34:49:375 15/04/96	0:00:08:250	70.7	77.3	79.9
11:35:05:750 15/04/96	0:00:06:375	72.1	77.5	80.1
11:35:21:000 15/04/96	0:00:06:000	73.7	80.5	81.5
11:35:37:000 15/04/96	0:00:05:875	83.7	88.0	91.4
Total: 4	0:00:26:500	78.1	88.0	92.3

The code 1 (eliminate) may be specified above so that the count of sources events is not affected by possible residual sources.

## 20.3 TIME HISTORY OF PERCENTILES

It is possible in **dB Trait** to access to the time history of percentiles (statistical levels) using the binary cut and paste function of the software.

To do so, follow the procedure shown below.



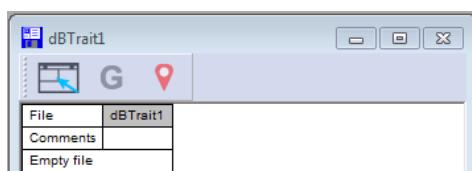
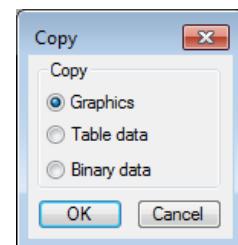
- 1** After opening the datafile of interest, use the command **Result / Levels and Statistics per period**, as explained in the § 11.1.2, and select the statistical indices to calculate.

These percentiles will be the ones that will be plotted as a time history later on.

Select the period carefully as well because it will represent the time basis of the plot.

- 2** On validation of the previous dialog box, the calculations are made and a table of results is displayed. Then, use the command **Edit / Copy**. The opposite dialog box is displayed.

Select Binary data in the field Object to copy.



- 3** Create a new CMG datafile by the command **File / New** and give a name to this file. An empty datafile is created and its information window is shown on screen.

It is also possible to paste the binary data in an existing datafile.

Channel	Type	Wght	Unit	Min.	Max.
NML1_Slugcatcher	Leq	A	Pa	50	100
NML1_Slugcatcher	Leq Min.	A	Pa	30	60
NML1_Slugcatcher	Leq Min.	A	Pa	50	120
NML1_Slugcatcher	Leq	A	Pa	0	20
NML1_Slugcatcher	L99 Leq	A	Pa	30	70
NML1_Slugcatcher	L95 Leq	A	Pa	30	70
NML1_Slugcatcher	L90 Leq	A	Pa	30	70
NML1_Slugcatcher	L50 Leq	A	Pa	30	80
NML1_Slugcatcher	L10 Leq	A	Pa	40	100
NML1_Slugcatcher	L8 Leq	A	Pa	40	100
NML1_Slugcatcher	L5 Leq	A	Pa	40	100

The information window then looks like this:

- ⑤ When the operation is completed, the information of the CMG file features the channels containing the time history of the paste statistical indices.

Save this file by the command **File / Save**.

The user can now display the time history plot of any channels contained in the datafile.



- ⑥ The user can then copy this plot into a word processor or copy the values into a spreadsheet processor or print directly the results as explained in **CHAPTER 16**.

## 20.4 OTHER SPECIFIC PARAMETERS

Some specific parameters of dB Trait can be refined through selections that are not directly accessible in the program, but can be edited in the **dB Trait.ini** file.

Close the dB Trait software before making any change in the **dB Trait.ini** file.

### Definition of Sources available by default

See details at [§9.3.14](#).

### Renaming the code 33 “Background” or “Residual”

See details at [§9.2.3](#).

### Leq between cursors

This option is used to calculate the equivalent sound level between cursors on the time history plot. This value is displayed in the time history window.

If this option is not selected, the dB value of the acoustic indicator is given for each position of the cursor on the time history plot.

If this value is selected, the following elements are displayed by default:

- The date at the left cursor.
- Average Leq between the 2 cursors.
- The duration between the 2 cursors.
- The SEL value between the 2 cursors (SEL calculated over the entire area between the 2 cursors without taking account Max – 10).

-  To display the date on the 2<sup>nd</sup> cursor, you need to edit the **dBTrait.ini** file and set *ShowDuration* to 0 in paragraph [Settings].

#### Management of measurement overlap (import/concatenation)

In section [Settings]:

- Parameter **WithDriftTime** (default value = 1, active): allows managing cases where data to import overlap (usually further to a clock update at midnight): allows for the forced storage in the same channel of two measurements slightly overlapping in time.
- Parameter **DriftTimeRate** (default value = 6944): authorized overlap value in ppm (the default value corresponds to 10 min for a 24-hour measurement session).
- Parameter **DriftTimeAuto** (default value = 0): if value = 1, measurement overlap is managed directly with no warning to the user.

#### Display of Underloads for DUO / FUSION / CUBE

- Parameter **DisplayUnderload** (default value = 0, disabled): if value = 1, allows displaying the list of Underload values contained in **DUO / FUSION / CUBE** measurement sessions.

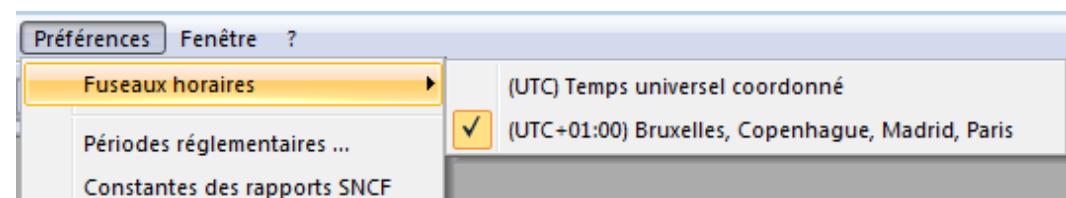
#### Default TimeZone (TZI = Time Zone)

In section [Settings]:

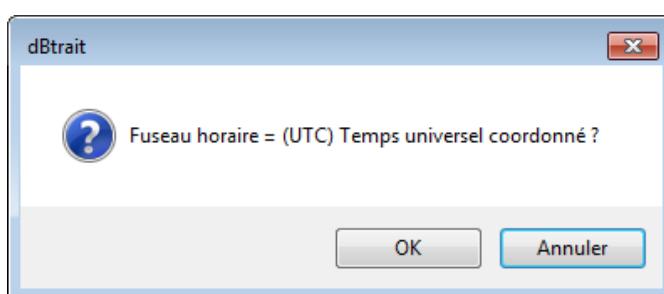
- Parameter **TZIMode** (default value = 0):
- TZIMode = 0: opening of measurement sessions in the PC TZI
- TZIMode = 1: possible opening of the measurement session in a default TZI
- TZIMode = 2: opening of measurement sessions in the TZI of the measurement session open last
- Parameter **TZIDefault** (no default value): allows setting up the default TZI.

TZIDefault is set as follows:

- ① With dBTrait closed, open the **dBTrait.ini** file, and change parameter **TZIMode=1**. Save and close the file.
- ② Open dBTrait, open a measurement session (if possible, a session measured in the time zone that will be defined as the default), go to the **Preferences | Time zones** menu:



- ③ Hold the Shift key down on the keyboard and click on the time zone to define as the default time zone.
- ④ A confirmation message is displayed. Click on **OK** to confirm or Cancel.



### **SaveUnicode**

In section [Campaign]:

- Parameter **SaveUNICODE** (default value = 0, disabled): if value = 1, allows saving comments in non Roman characters (Chinese, Korean, Thai, etc.). If the option stays set to 0, comments typed in non Roman characters will not be saved.

### **GoogleMap**

In section [Settings]:

- Parameter **VersionGoogleMap2** (default value = 0, calls the current version of GoogleMap): allows selecting a specific version of GoogleMap called by dBTrait.

### **Internet Explorer**

As of dBTrait version 6.0.0.1 (and higher): the version of the Internet Explorer Active X called by dBTrait for displaying web pages (GPS coordinates visualization, Dominant frequency history) is notified to Windows. This is done by means of the following registry key, automatically added by the installation setup of dBTrait:

```
[HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Internet
Explorer\MAIN\FeatureControl\FEATURE_BROWSER_EMULATION]
"dbtrait.exe"=dword:00002af8
```

### **Import Direct**

Not described (unofficial feature).

### **Locking of measurement sessions**

From dBTrait version 5.5.0.6 there is a locking principle on measurement sessions:

When opening a measurement session using dBTrait, a file is created besides the .cmg file (named xxxx.cmg.lock). The presence of this file is detected by dBTrait at opening stage, and prevents opening the measurement session twice at the same time.

This is to prevent potential conflicts of simultaneous use by two applications.

About the .lock file: it is created with a "file delete on close" flag activated, managed by the Windows system itself. So that, even in the event of a software crash, the file is deleted anyway after the CMG file "handle" is closed.

The locking principle can be deactivated:

In section [Campaign]:

- Parameter **LockCampaign** (default value = 1): set the value to 0 to deactivate the locking principle.

### **Format of GPS coordinates**

By default, the GPS coordinates are displayed with the following classic format:

45° 48' 39.29 N

04° 46' 26.67 E

They can also be displayed in fractional form:

45.810914° N

4.774076° E

In section [Settings]:

- Parameter **DecimalDegree** (default value = 0): set the value to 1 to display the coordinates in fractional form.

### **FixHoles**

See details in dBTrait's User Manual in French version.

## 20.5 SPECIFIC PARAMETERS FOR DBFILEMANAGER

For dBTrait 6.0.1.6 specific version only: specific mode « ReadCatalogFromdBSurv ».

See in dBTrait's User Manual in French version.

# CHAPTER 21

## TROUBLESHOOTING

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💡 When printing graphics, some noise time histories are not shown

The colours that are displayed on screen and on the printer are defined by different commands.  
If a curve is not displayed correctly, check:

- The background colour of the graph
- The Y axis dynamic range

💡 The CMG files are not associated with the dB Trait application

Under Windows7, open the registry (« regedit » command), then find the registry key for dB Trait for its association with CMG files:

HKEY\_CLASSES\_ROOT\Applications\dBTrait.exe\shell\open\command\

Check if the .exe path is right. If not, then change the path to the correct one

After doing this, you can now go to the file you wish to associate and use the standard way Open With (by right clicking on a CMG file), then chose dB Trait and tick “Always use the selected program to open this kind of file”.

# CHAPTER 22

## GLOSSARY

---

This chapter presents the definition of the indicators and magnitudes mentioned in this manual.

### 22.1 GENERAL DESIGNATIONS

#### 22.1.1 Physical channel and processed channel (channel)

A **physical channel** is a **measurement channel** from the **sensor** to the **digitization** of the signal, through a conditioning stage; this for a **given measurement location**.

For the **DUO**, **FUSION**, **CUBE**, **SOLO** devices, that are single-channel devices, there is only one physical channel per device and per measurement location.

For a **dB4** acquisition unit (with 4 input channels), there are 4 physical channels per measurement location.

The notion of a **physical channel** is used by **dBTrait** during measurement sessions concatenation: each item of the measurement sessions to be concatenated is then tested against the others, and the items are grouped together on the same **processed channel** if they meet the following conditions:

- They do not overlap in time,
- They are of the same type, weighting, etc.
- They are of same labels,
- They are of the same period,
- They are of same Channel number (example 0, 1, 2, 3 ...).

In **dBTrait**, the serial number does not intervene in the notion of **physical channel**, nor the type of device. This makes it possible to concatenate measurements made with different devices over a long period of time, but corresponding to a same location in reality and to the same purpose.

From one single **physical channel** can result different **processed channels**.

- Example for a DUO, FUSION, CUBE, SOLO sound level meter:  
LAeq, LCpk, SLOW, FAST, Spectra in Octaves or 1/3 Octaves, etc.
- Example for ORION:  
PPV, Vpmax, etc.
- Example for VIB:  
aw, MTVV, etc.

A processed channel (or channel) is associated to one single physical channel; and a physical channel is associated to N processed channels.

In addition, when a coding is applied in **dBTrait**, it is associated to the physical channel and its N processed channels.

### 22.1.2 Data flow

During an acquisition or a post-processing calculation, an elementary timebase is used to store the data (usually 1/8s or 1s in acoustics or human body vibrations, and 5s in environmental vibrations).

The expression **Logging interval** is also commonly used to describe the timebase. Expressions **elementary logging interval**, **fast logging interval** or **recomposed logging interval** are also used.

**Logging interval (T):** Logging interval = storage rate: calculation time for the indicators and time between 2 successive storages in the internal memory of the instrument.

**T<sub>j</sub>:**

Equivalent of the logging interval for ORION measurements.

**Fast logging interval (CT):** Logging interval during coding.

**T<sub>i</sub>:**

Equivalent of the fast logging interval for ORION measurements.

**Main data flow**

Data with "main" elementary logging interval (typically 1s).

**Parallel data flow**

Data with "thin" or "large" elementary logging interval.

## 22.2 OVERALL ACOUSTICAL QUANTITIES

### 22.2.1 Lden

L<sub>den</sub>: day-evening-night assessment sound level

L<sub>den</sub> is a noise assessment indicator that represents the sound level corrected according to the period of the day. L stands for "level" , d for "day" , e for "evening" , and n for "night" .

It is based on the following principle:

- The day Leq is not corrected, except for a possible penalty of 5 dB on Saturdays and Sundays.
- The evening Leq is corrected by a 5 dB penalty.
- The night Leq is corrected by a 10 dB penalty.

The L<sub>den</sub> day-evening-night level is expressed in decibels (dB) and defined by the following formula:

The 2002 European directive has imposed the use of Lden and defined its time periods as follows:

- day: from 7:00 am to 7:00 pm
- evening: from 7:00 pm to 11:00 pm
- night: from 11:00pm to 7:00 am

These periods can be slightly changed for a better match with the living habits of the different countries.

For instance, in France, day, evening and night periods are defined as 6:00am-6:00pm, 6:00pm-10:00pm, 10:00pm-6:00am, respectively.

Other levels can be defined, covering the 24-hour period with different penalties depending on the time. An additional level,  $L_{dn}$  (day-night 7:00am-10:00pm; 10:00pm-7:00am) is also mentioned in the directive.

## 22.2.2 Sound pressure level $L_p$

It is given by the formula:

$$L_p = 10 \log \left( \frac{P^2(t)}{P_{ref}^2} \right)$$

Where:

- P is the root mean square sound pressure level, in Pascal
- $P_{ref}$  is the reference sound pressure level (20  $\mu$  Pa )

## 22.2.3 Equivalent sound pressure level $L_{eq}$

The LEQ is the equivalent continuous sound pressure level (in decibels) within a time interval. This is the value of the sound pressure level of a continuous, steady sound that, within a specified time interval  $t_2-t_1$  has the same root mean square value as the sound under consideration whose level varies with time.

The calculation of the Leq from the sound pressure level is given by the formula:

$$L_{eq} = 10 \log \left[ \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{P^2(t)}{P_{ref}^2} dt \right]$$

Where:

- $L_{eq,T}$  is the equivalent continuous sound pressure level, in decibels, determined over a reference time interval T starting at  $t_1$  and ending at  $t_2$
- $P_{ref}$  is the reference sound pressure level (20  $\mu$  Pa)
- $P(t)$  is the instantaneous sound pressure of the sound signal

As a function of the considered time portion, we define a complementary term short LEQ for time intervals that vary from a few milliseconds to a few seconds.

01dB software packages uses the **short Leq** principle. As for the LEQ, the short Leq conserves the energy and a LEQ over a time interval T can be recomposed from short Leqs values, over the considered time portion.

The value of the recomposed Leq for N short Leqs over N elementary periods is given by the formula:

$$L_{eq} = 10 \log \left[ \frac{1}{N} \sum_{i=1}^N 10^{(Leq_i)/10} \right]$$

Where:

- N is the number of elemental periods
- $Leq_i$  is the short Leq corresponding to the ith sample, expressed in dB.

Each short Leq sample can be associated with a noise source (using the coding technique). Therefore, each time portion of a measurement can be assigned to a specific noise event, allowing us to calculate specific indicators related to noise events.

The value of the recomposed Leq for N short Leqs (for a specific noise event) over N elementary periods is given by the same formula.

### 22.2.4 Peak level

The Peak level is the maximum absolute value of instantaneous sound pressure within a time interval. It is expressed in dB (ref 2e-5 Pa).

### 22.2.5 Percentiles (Statistical indices)

The percentile  $L_n$  is the sound pressure level that is exceeded  $N\%$  of the time interval considered.

#### Symbols

- $L_{N,T}$  for example,  $L_{95,1H}$  is the level exceeded for 95% of 1h
- $L_{100}$  (value exceeded during 100% of the time interval) value is also called LMIN
- $L_0$  (value exceeded during 0% of the time interval) value is called LMAX

### 22.2.6 LMIN

It is the minimum short term LEQ value for the considered time period. For a defined time interval, a certain number of short term LEQ are to be considered. The LMIN value is the lowest value for each time interval (Period). It is equivalent to the L100 value.

### 22.2.7 LMAX

It is the maximum short term LEQ value for the considered time period. For a defined time interval, a certain number of short term LEQ are to be considered. The LMAX value is the highest value for each time interval (Period). It is equivalent to the L0 value.

## 22.3 ACOUSTICAL QUANTITIES RELATIVE TO NOISE SOURCES

A **noise source** is a specific type of noise, which appeared during the measurement. A noise source is usually composed of several noise events (appearances). Each source is defined by its name and a **unique** code number.

Noise sources are defined by coding certain parts of a measurement as being associated to the noise source. To do so, a special information (source code) may be assigned to each elemental time period.

 Coding noise data is described in **CHAPTER 9**.

Once noise events have been coded, the following indicators may be calculated.

### 22.3.1 Particular Leq

Equivalent sound pressure level, in decibels, corresponding to a specific source and related to its duration of action. The formula is given below:

$$L_{eq,particular} = \frac{1}{\sum \Delta t} \int_{\Delta t} \frac{P^2(t)}{P_0^2} dt$$

Where:

Delta T sum is the cumulated duration of action of the considered noise source

$P_0$  is the reference sound pressure level (20  $\mu$  Pa)

$P(t)$  is the instantaneous sound pressure of the sound signal

- ❖ It is also possible to relate the energy of the source to the complete time period by calculating the partial LEQ.

### 22.3.2 Partial Leq

The equivalent sound pressure level, in decibels, corresponding to a specific source and related to the whole considered time interval. It is given by the formula:

$$L_{eq,partial} = \frac{1}{T} \int_{\sum t} \frac{P^2(t)}{P_0^2} dt$$

Where:

$\Delta T$  sum is the cumulated duration of action of the considered noise source

$P_0$  is the reference sound pressure level (20  $\mu$  Pa)

$P(t)$  is the instantaneous sound pressure of the sound signal

- ❖ It is also possible to relate the energy of the source to its own duration of action by calculating the particular LEQ.

### 22.3.3 Sound Exposure Level (SEL)

Averaged energy of a discrete noise event of a source over the selected time period related to a 1 second time interval. It is usually called: SEL. It is given by the formula:

$$SEL = 10 \log \frac{1}{t_0} \int_{t_1}^{t_2} \frac{p^2(t)}{P_{ref}^2} dt$$

Where:

$P(t)$  is the instantaneous sound pressure

$t_2 - t_1$  is a stated time interval long enough to encompass all significant sound of a stated event

$P_0$  is the reference sound pressure level (20  $\mu$  Pa)

$t_0$  is the reference duration 1 s

### 22.3.4 Standard Deviation

The standard deviation is given by the formula:

$$\sqrt{\frac{1}{n-1} \sum_{i=1}^n (e_i - \bar{e})^2}$$

Where:

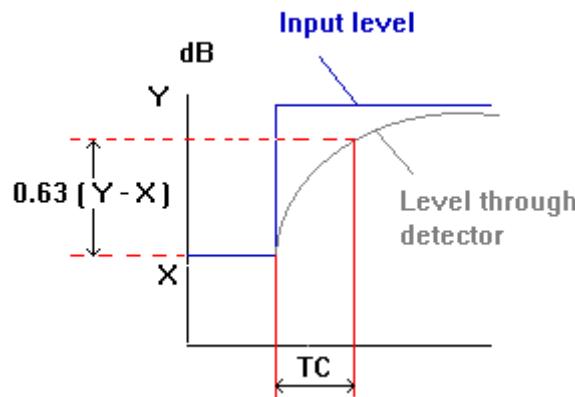
$n$  = number of samples considered

$e_i$  =  $i$  th sample

$\bar{e}$  = mean value.

## 22.4 TIME WEIGHTINGS

This is the result of an RC type integration with a specific time constant. As the input level varies from X to Y and remains at Y, the time constant is the time requested by the detector to reach 63 % of the distance between X and Y



### 22.4.1 SLOW time weighting

This is the result of an RC type integration with 1-second time constant. As the input level varies from X to Y and remains at Y, the time constant is the time requested by the detector to reach 63 % of the distance between X and Y.

For the Slow time weighting:  $TC = 1000$  milliseconds.

### 22.4.2 FAST time weighting

This is the result of an RC type integration with 125 milliseconds time constant. As the input level varies from X to Y and remains at Y, the time constant is the time requested by the detector to reach 63 % of the distance between X and Y.

For the Fast time weighting:  $TC = 125$  milliseconds.

### 22.4.3 IMPULSE time weighting

This weighting is a combined result of an RC type integration with 35 milliseconds time constant for increasing slope followed by an RC type integration with 35 milliseconds time constant for decreasing slope.

For the Impulse time weighting:  $TC = 35$  milliseconds (increasing level) and  $TC = 3000$  milliseconds (decreasing level).

### 22.4.4 User defined time weighting RC

This is the result of an RC type integration with A milliseconds time constant. As the input level varies from X to Y and remains at Y, the time constant is the time requested by the detector to reach 63 % of the distance between X and Y.

For the user-defined time weighting:  $TC = A$  milliseconds (A defined by the user).

## 22.5 FREQUENCY WEIGHTING NETWORKS

The weighting networks used in acoustics have been defined from the basic research of Fletcher and Munson in 1933. The goal of the study was to determine the influence of the human ear as a function of frequency and level. From these studies, the Equal Loudness contours have been defined. They were the basis of the weighting networks definition. The aim of the weighting networks is to provide a level as close as possible to subjective perception (as they integrate the human ear attenuation and hence describe the subjective impression of a noise).

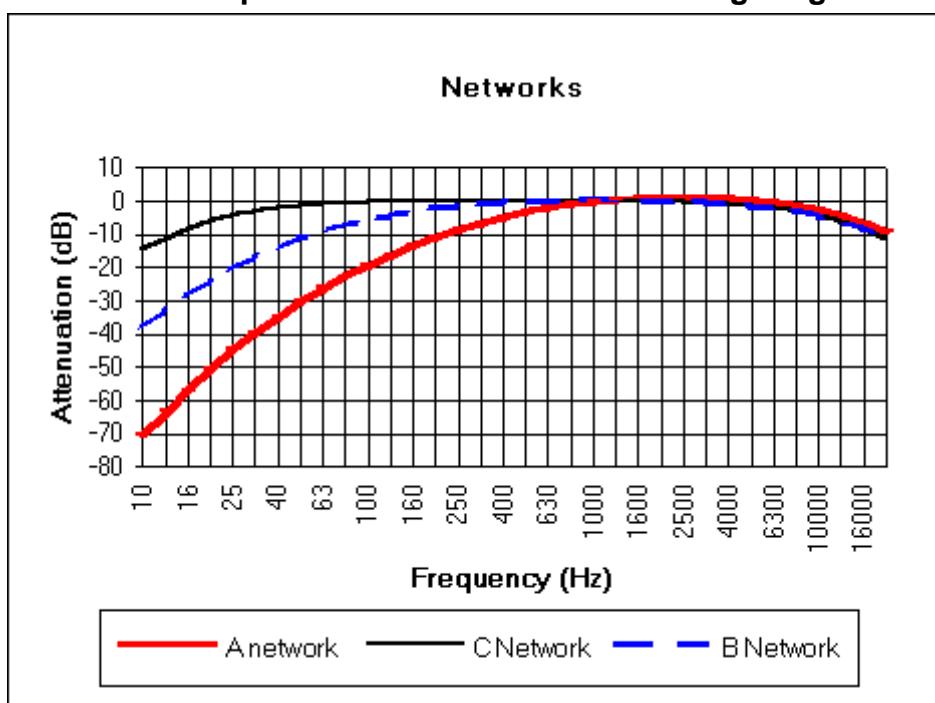
The A network corresponds to the sensitivity of the human ear at low levels, the B network to medium levels and the C network to high levels. In the field of environmental noise, for instance, most measurements are performed using the A network.

The A weighting is the network which correlates the best with the human ear. It attenuates both low and high frequencies and magnifies the frequencies around 2 kHz (the frequency range where the human ear is the most sensitive).

The C weighting looks much like the A weighting at high frequencies and is flat in frequencies below 1kHz.

The table and curves below describe the various networks.

### 22.5.1 Comparative curves of the usual Weighting Networks



### 22.5.2 Correction table of the Weighting Networks versus frequency

Nominal frequency (Hz)	Exact frequency (Hz)	Nominal frequency (Hz)	Exact frequency (Hz)
10	10	500	501.2
12.5	12.59	630	631.0
16	15.85	800	794.3
20	19.95	1000	1000
25	25.12	1250	1259
31.5	31.62	1600	1585
40	39.81	2000	1995
50	50.12	2500	2512
63	63.10	3150	3162
80	79.43	4000	3981
100	100.0	5000	5012
125	125.9	6300	6310
160	158.5	8000	7943
200	199.5	10000	10000
250	251.2	12500	12590
315	316.2	16000	15850
400	398.1	20000	19950

### 22.5.3 Transfer function of the corresponding filters

- A weighting network:

$$H(p) = \frac{4\pi^2 \cdot 12200^2 \cdot P^4}{(P + 2\pi \cdot 20.6)^2 (P + 2\pi \cdot 12200)^2 (P + 2\pi \cdot 107.7)(P + 2\pi \cdot 737.9)}$$

- B weighting network

$$H(p) = \frac{4\pi^2 \cdot 12200^2 \cdot P^3}{(P + 2\pi \cdot 20.6)^2 (P + 2\pi \cdot 12200)^2 (P + 2\pi \cdot 158.5)}$$

- C weighting network

$$H(p) = \frac{4\pi^2 \cdot 12200^2 \cdot P^2}{(P + 2\pi \cdot 20.6)^2 (P + 2\pi \cdot 12200)^2}$$

## 22.6 SPECTRA

It is a representation of the frequency components of a signal. A spectrum of a signal is obtained via frequency analysis. It is usually displayed in one of the following forms: narrow bands (FFT), octave bands, third octave bands.

Spectra can be:

- **Averaged spectra:** one single spectrum is calculated and averaged on a given time interval.
- **Multispectra:** a series of spectra is calculated on a given time interval, on a regular elementary timebase. Thus the multispectrum term designates a time history of spectra.

### 22.6.1 Octave and third octave bands

An **octave band** is a frequency band whose pass-band limit follows a ratio of 2 (between a given frequency and the double of it). An octave is determined by its central frequency. A **third octave band** is frequency band whose pass-band limits follows a ratio of  $2^{1/3}$ .

The usual octave and third octaves bands are centred on preferred frequencies as described in IEC 1260.

## 22.6.2 Octave and third octave: standardised bandwidth and centre frequencies

Designation	Third octave pass band	Width	Octave Passband	Width
20 KHz	17.8-22.4 kHz	4600 Hz	11.2-22.4 kHz	11200 Hz
16 kHz	14.1-17.8 kHz	3700 Hz		
12.5 kHz	11.2-14.1 kHz	2900 Hz		
10 kHz	8910-11200 Hz	2290 Hz	5620-11200 Hz	5600 Hz
8 000hz	7080-8910 Hz	1830 Hz		
6 300 Hz	5620-7080 Hz	1460 Hz		
5 000 Hz	4470-5620 Hz	1150 Hz	2820-5620 Hz	2820 Hz
4 000 Hz	3550-4470 Hz	920 Hz		
3 150 Hz	2820-3550 Hz	730 Hz		
2 500 Hz	2240-2820 Hz	580 Hz	1410-2820 Hz	1410 Hz
2 000 Hz	1780-2240 Hz	460 Hz		
1 600 Hz	1410-1780 Hz	370 Hz		
1 250 Hz	1120-1410 Hz	290 Hz	708-1410 Hz	708 Hz
1 000 Hz	891-1120 Hz	229 Hz		
800 Hz	708-891 Hz	183 Hz		
630 Hz	562-708 Hz	146 Hz	355-708 Hz	355 Hz
500 Hz	447-562 Hz	115 Hz		
400 Hz	355-447 Hz	92 Hz		
315 Hz	282-355 Hz	73 Hz	178-355 Hz	178 Hz
250 Hz	224-282 Hz	58 Hz		
200 Hz	178-224 Hz	46 Hz		
160 Hz	141-178 Hz	37 Hz	89.1-178 Hz	89.1 Hz
125 Hz	112-141 Hz	29 Hz		
100 Hz	89.1-112 Hz	22.9 Hz		
80 Hz	70.8-89.1 Hz	18.3 Hz	44.7-89.1 Hz	44.7 Hz
63 Hz	56.2-70.8 Hz	14.6 Hz		
50 Hz	44.7-56.2 Hz	11.5 Hz		
40 Hz	35.5-44.7 Hz	9.2 Hz	22.4-44.7 Hz	22.4 Hz
31.5 Hz	28.2-35.5 Hz	7.3 Hz		
25 Hz	22.4-28.2 Hz	5.8 Hz		
20 Hz	17.8-22.4 Hz	4.6 Hz	11.2-22.4 Hz	11.2 Hz
16 Hz	14.1-17.8 Hz	3.7 Hz		
12.5 Hz	11.2-14.1 Hz	2.9 Hz		
10 Hz	8.91-11.2 Hz	2.29 Hz	5.62-11.2 Hz	5.62 Hz
8 Hz	7.08-8.91 Hz	1.83 Hz		
6.3 Hz	5.62-7.08 Hz	1.46 Hz		
5 Hz	4.47-5.62 Hz	1.15 Hz	2.82-5.62 Hz	2.82 Hz
4 Hz	3.55-4.47 Hz	0.92 Hz		
3.15 Hz	2.82-3.55 Hz	0.73 Hz		
2.5 Hz	2.24-2.82 Hz	0.58 Hz	1.41-2.82 Hz	1.41 Hz
2 Hz H	1.78-2.24 Hz	0.46 Hz		
1.6 Hz	1.41-1.78 Hz	0.37 Hz		
1.25 Hz	1.12-1.41 Hz	0.29 Hz	0.708-1.41 Hz	0.708 Hz
1 Hz	0.891-1.12 Hz	0.229 Hz		
0.8 Hz	0.705-0.891 Hz	0.183 Hz		

## 22.7 INDICATORS USED FOR ENVIRONMENTAL VIBRATIONS

With the ORION instrument:

Data are measured and stored according to 2 different base periods Tt

- Ti and Tj, see definitions in § 22.1.2.

And simultaneously on 3 axes:

- k: axes X, Y and Z.

### 22.7.1 PPV

**PPV<sub>tk</sub>**: Peak Particle Velocity: greatest instantaneous Particle Velocity on k axis during a given time interval t.

### 22.7.2 PCPV

**PCPV<sub>t</sub>**: Peak Component Particle Velocity: greatest instantaneous Particle Velocity on all axes during a given time interval t

### 22.7.3 DF (dominant frequency)

**DF<sub>j</sub>**: Dominant Frequency: frequency corresponding to the maximum of an FFT spectrum centred at the particle velocity time of the max

### 22.7.4 PVS

**PVSt**: Peak Vector Sum (or Peak True Resultant Velocity): maximum of the true resultant particle velocity (vector magnitude) obtained by vectorily summing the three orthogonal components coincident with time

### 22.7.5 V<sub>max</sub>

**V<sub>maxtk</sub>**: specific PPV according to "Arrêté du 2/09/1994" corresponding to the PPV calculated on frequency weighted signal on axis k during a given time interval t:

Frequency	1 Hz	5 Hz	30 Hz	80 Hz
Weighting	5	1	1	0.375

### 22.7.6 VDV

**VDV<sub>tk</sub>** : Vibration Dose Value on k axis, updated each time interval t from the beginning of the period (or from the beginning of the measurement).

Vibration Dose Value: fourth root of the time integral of the fourth power of the acceleration after it has been frequency-weighted.

$$VDV = \left[ \int_0^{T_m} a_w^4(t) \right]^{1/4}$$

Where:

- $a_w$  is the frequency-weighted acceleration
  - $W_d$  or  $W_b$  weighting for BS 6472-1 standard
  - $W_m$  weighting for ISO 2631-2 2003 standard

### 22.7.7 L<sub>p</sub> and L<sub>pmax</sub>

L<sub>p</sub> and L<sub>pmax</sub> are groundborne noise levels estimated from low frequency vibration velocity measurements.

Groundborne noise level is re-radiated noise caused by underground vibrations, generated e.g. by trains, tunneling, etc.

$$Lp = Lv - C(dB)$$

Where:

**Lv = LvTik:** vibration particle velocity RMS level, A-weighted, in dB, measured each T<sub>i</sub> interval, band-filtered 16 Hz-250 Hz (see ISO 14837 § 4.1): this indicator is not stored by ORION.

**C(dB):** correction factor in dB

**L<sub>p</sub> = LpTik:** « ground borne noise » RMS in dB(A) on k axis during a given time interval T<sub>i</sub> (deducted from LvTik)

**L<sub>pmaxTjk</sub>:** « ground borne noise » max in dB(A) on k axis from LpTik values during a given time interval T<sub>j</sub>.

### 22.7.8 KBFT, KBFTm, KBFTr

**KBFTk:** maximum weighted vibration severity on k axis

**KBFTmk:** RMS weighted vibration severity on k axis

$$KBFTmk = \sqrt{\frac{1}{N} * \sum_{j=1}^N KBFTjk^2}$$

Where N = number of T<sub>j</sub> cycles since the beginning of the day or night period

KBFTjk is replaced by 0 if the measured value KBFTjk ≤ 0.1

**KBFTrk no rest:** evaluation vibration severity on k axis, without particularly taking into account rest periods.

**KBFTrk rest:** evaluation vibration severity on k axis, with particularly taking into account rest periods.

 See ORION User Manual for more details on these indicators.

**KBFmax:** maximum weighted vibration severity

Maximum value among all KBFTk values during a complete evaluation period.

### 22.7.9 aw, awpeak

**aw k:** weighted RMS acceleration on the k axis

**awpeak k:** weighted peak acceleration on the k axis

- With frequency weighting:
  - W<sub>Bc</sub> weighting for ISO 2631-2 1989 standard (W.B. combined)
  - W<sub>m</sub> weighting for ISO 2631-2 2003 standard

### 22.7.10 MTVV

**MTVVTjk:** maximum transient vibration values actualized every T<sub>j</sub> since the beginning of the measurement session on the k axis.

### 22.7.11 av, Multispectra x,y,z & C, Leq[Fmin-Fmax Hz]

**av:** combined acceleration with:

$$Av = \sqrt{(kx^2 * Awx^2 + ky^2 * Awy^2 + kz^2 * Awz^2)}$$

kx, ky and kz can be user defined

- With frequency weighting:
  - W<sub>Bc</sub> weighting for ISO 2631-2 1989 standard (W.B. combined)

**Multispectra 1/3 Octave Leq “x,y,z”:**

RMS acceleration 1/3 Oct spectra on x,y,z axis

**Multispectra 1/3 Octave Leq “C” (AnTj in ORION):**

RMS combined acceleration 1/3 Oct spectra:

$$AnTj = \sqrt{(kx^2 * AnTjx^2 + ky^2 * AnTjy^2 + kz^2 * AnTjz^2)}$$

**Leq[Fmin-Fmax Hz] “x,y,z” (A\*Tjk in ORION):**

RMS recomposed acceleration, recomposed between 1/3 Oct F1 and 1/3 Oct F2



## About ACOEM

### ACOEM Group

Reduce your environmental impact

In today's fast-moving world, the environment is increasingly impacted. The ACOEM Group is committed to sustainable development and help companies and public authorities limit their environmental impact by offering products and services that:

- Prevent and control air, noise and vibration pollution
- Increase the productivity and reliability of industrial machinery
- Contribute to the development of effective, robust & noiseless products
- Protect soldiers, sites and vehicles in military theaters of operation

Across the world, ACOEM's 670 employees innovate in the measurement, analysis and control of all environmental parameters through the 01dB, ECOTECH, ONEPROD, FIXTURLASER, MEAX and METRAVIB brands.

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