

# NS5 ENVIRONMENTAL NOISE module

## Data processing software for noise sources evaluation

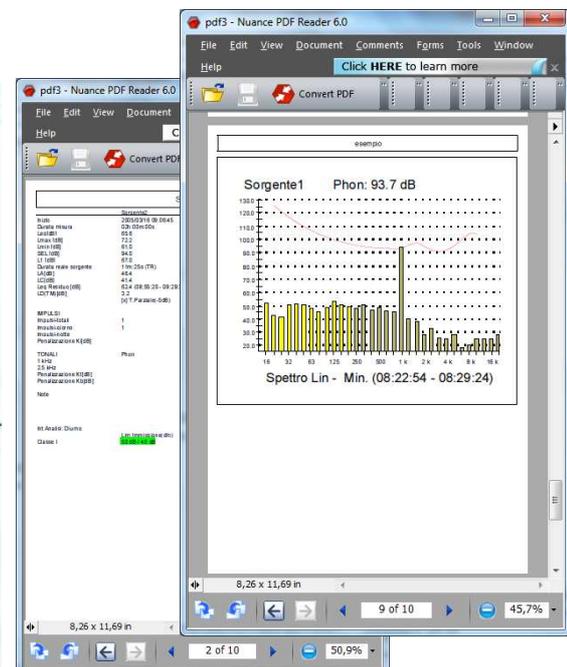
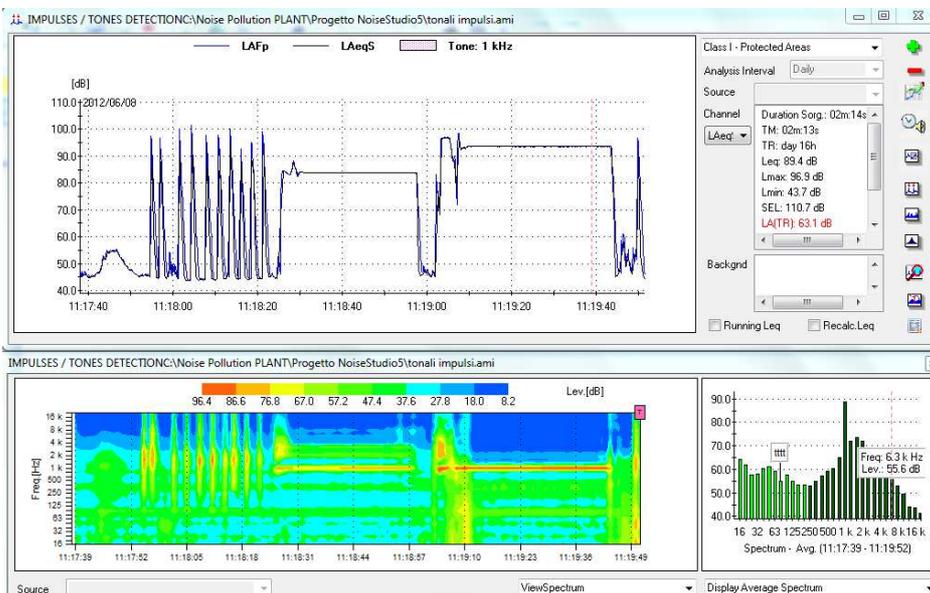
### Tonal and Impulsive noise components assessment

**ENVIRONMENTAL NOISE** module of Noise Studio allows to evaluate **emission**, **immission** and **background** (differential) noise level produced by annoying sound sources. Calculations are made according to national and international technical standards. An advanced processing function provides automatic search and identification of tonal and impulsive noise components. **Unwanted noise events** can be excluded from calculation; specific sources of noise can be identified in the data file using coloured markers, enabling to recalculate their **specific levels**.

**Reference standards:** ISO226-1987 - ISO226-2003 - D.M.16/03/1998

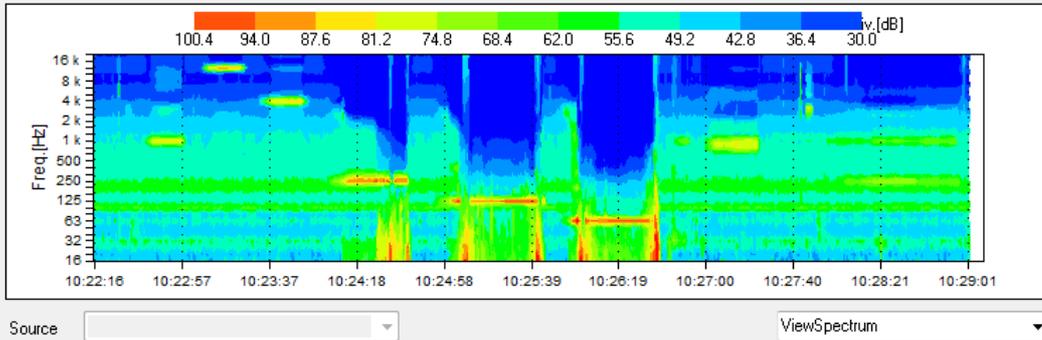
- ◆ Immission levels
- ◆ Emission levels
- ◆ Background levels (differential source - background)
- ◆ Direct comparison of noise levels to area of destination use
- ◆ Partial Leq referred to TM (Measurement time), TR (Reference time period) or TUser (selectable)
- ◆ Background noise time period calculation customizable
- ◆ Running Leq
- ◆ Leq and Lp *per period* recalculation; AVG, MAX and MIN values
- ◆ Tonal and Impulsive components calculation parameters user editable
- ◆ Automatic report of numerical and graphic data in Word and PDF format
- ◆ Sound level meter setup customizable using Noise Studio
- ◆ Calculation and representation of tonal components using *persistence* graphs
- ◆ Calculation and display of MIN spectrum for selected source
- ◆ Calculation and display of AVG spectrum for selected source
- ◆ Display of instantaneous spectrum
- ◆ Multi-spectral display (time history of frequency bands)
- ◆ Sonogram display

- ◆ Environmental Noise assessment
- ◆ Noise nuisance
- ◆ Tonal Components
- ◆ Impulsive Components
- ◆ Penalty for LAeq,TR
- ◆ Bonus for short duration noises (partial time).
- ◆ Statutory limits comparison
- ◆ Sources levels
- ◆ Anomalous events masking
- ◆ Automatic Word or Pdf reports
- ◆ Export pdf, Excel, txt
- ◆ Export chart



## TONAL COMPONENTS

- ◆ Real Time modifications display
- ◆ Tonal components automatic detection
- ◆ ISO226 curves
- ◆ Persistence graph
- ◆  $L_{Aeq,TR}$  penalty
- ◆ Comparison of spectra with isophonic curves for frequency audibility check



**TONAL COMPONENTS IDENTIFICATION:** Noise Studio NS5 starting from multi-spectrum noise acquisitions, allows to perform automatic detection for the presence of tonal components into the measurement data. Search for tonal components can be made both on the entire measurement duration or for specific sources, as soon as they have been marked using source identification function. The time period for tonal components scanning (sliding window) and the level difference between adjacent bands can be modified by the user. Also the MIN spectrum calculation can be customized by inserting the starting and ending time for analysis. Tonal components can alternatively be analyzed using special 1/3 octave filters having the center frequencies shifted by 1/2 band (only for HD2110L sound level meter with option HD2110.O1); such "shifted" spectrum allows to detect noise tones crossing two third octave standard filters.

Tone detection may need spectrum of minimum level. Calculate minimum spectrum from spectral data?

Interval Spectr. Minimum: 5 sec

Yes  No  Cancel

Tone detection parameters

Difference level from adjacent bands: 5.0

Difference from E.L levels and spectrum: 0.0

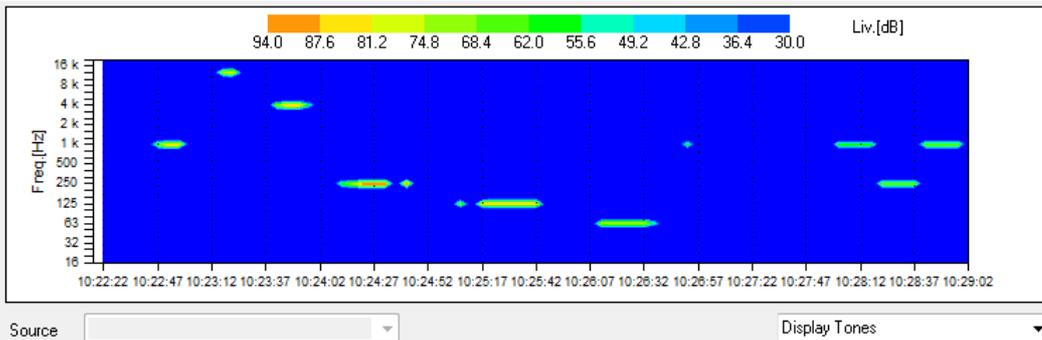
OK  Cancel

Min spectrum search interval

X axis

Start: 08/06/2012 11:19:19

Stop: 08/06/2012 11:19:34



**PERSISTENCY GRAPH:** when detected, tonal components are displayed on a color chart where all other noise components without **tonality**, **audibility** and sufficient **persistence** are hidden. Are highlighted only specific frequency components of interest, having attributes of annoyance and tonality. Persistence of each tonal component, expressed as a time percentage, is synthesized in a chart frequency/amplitude. The components detected are listed in a table from which you can select one or more than one for additional calculation. On selected components can be extracted the MIN, INST or AVG spectrum; obtained spectrum is compared to **ISO 226** equal-loudness contours to check audibility of tonal component under investigation. If a tonal component is found, a penalty of 3 or 6 dB (for components below 200Hz) is applied to global noise level  $L_{Aeq,TR}$  (Leq on Reference Time)

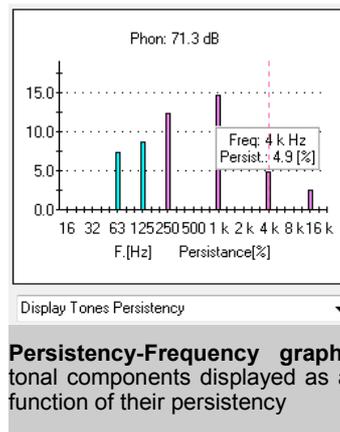
| TONAL [Hz]   | Phon[dB] | PERSIST | Sel.                                |
|--------------|----------|---------|-------------------------------------|
| Freq: 63     | 73.5     | 7.4%    | <input type="checkbox"/>            |
| Freq: 125    | 86.0     | 8.6%    | <input type="checkbox"/>            |
| Freq: 250    | 71.3     | 12.3%   | <input checked="" type="checkbox"/> |
| Freq: 1 k    | 83.0     | 14.7%   | <input checked="" type="checkbox"/> |
| Freq: 4 k    | 85.1     | 4.9%    | <input type="checkbox"/>            |
| Freq: 12.5 k | 81.7     | 2.5%    | <input type="checkbox"/>            |

PENALTY

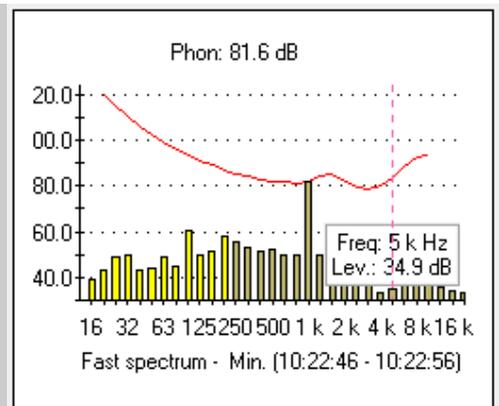
LF Tone: No

Tone: 3dB

Display Penalties

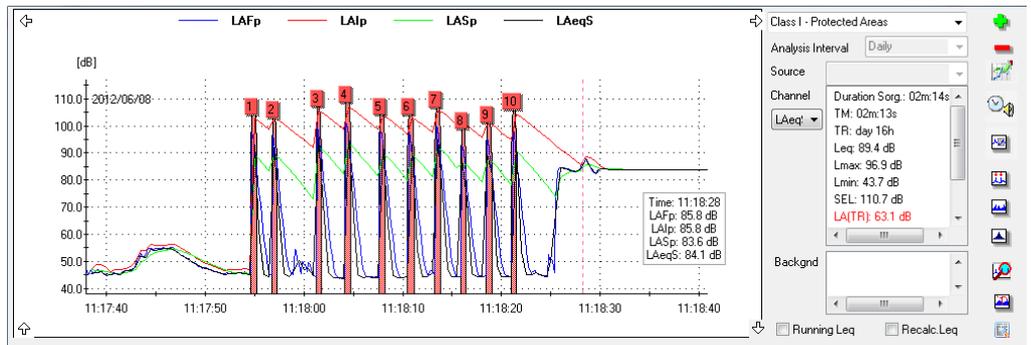


**Equal-Loudness CONTOURS:** minimum spectrum of one or more components found, is compared to equal-loudness contours. Only the band "touching" the higher isophonic curve is taken into account for calculation to apply penalty.

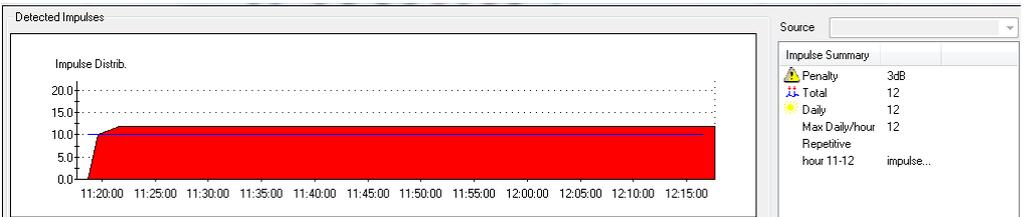


# IMPULSIVE COMPONENTS

- ◆ Real Time modifications display
- ◆ Impulses automatic detection
- ◆ Impulses count (day and night)
- ◆ Hourly impulses distribution
- ◆ LAeq,TR (reference time) penalty for impulses detection
- ◆ Impulses details
- ◆ Editable calculation parameters



**IMPULSES DETECTION:** identification of individual impulses during Day and Night periods. Count associated to specific source or to the full measurement. Detected impulses are identified using markers and numbers on the time history and even in detailed tables. If the allowed number of impulses is exceeded, the LAeq,TR (Reference Period) will be added a 3dB penalty. Possibility to customize detection parameters.



**IMPULSES HOURLY DISTRIBUTION:** distribution of detected impulses on 1h periods with indication of exceeding number of impulses both for day and night period. Detailed indication of time for each impulse. Possibility to insert user defined start time for detection.

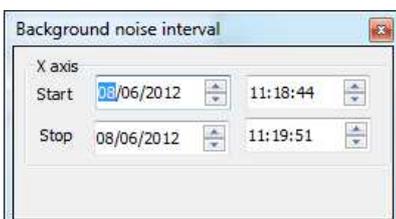
| Imp. | Start               | LAFmax -10dB [s] dura... | LAFmax [dB] | LAImax - LASmax [dB] |
|------|---------------------|--------------------------|-------------|----------------------|
| 1    | 2012/06/08 11:17:54 | 0.625                    | 97.5        | 13.5                 |
| 2    | 2012/06/08 11:17:56 | 0.500                    | 96.7        | 13.5                 |
| 3    | 2012/06/08 11:18:01 | 0.500                    | 100.1       | 13.4                 |
| 4    | 2012/06/08 11:18:04 | 0.625                    | 101.5       | 13.4                 |
| 5    | 2012/06/08 11:18:07 | 0.625                    | 97.7        | 14.2                 |
| 6    | 2012/06/08 11:18:10 | 0.625                    | 97.6        | 13.7                 |
| 7    | 2012/06/08 11:18:13 | 0.625                    | 100.0       | 13.7                 |
| 8    | 2012/06/08 11:18:15 | 0.500                    | 92.8        | 14.4                 |
| 9    | 2012/06/08 11:18:18 | 0.625                    | 95.0        | 14.0                 |

**IMPULSES TABULAR LIST:** detected impulses are displayed in tabular format. For each event are listed the exact time, LAI<sub>max</sub>-LAS<sub>max</sub> level, LAF<sub>max</sub> and duration. Selecting the impulse will accordingly synchronize and zoom the time history on wanted event.

**SHORT PERIOD NOISES:** the presence of disturbing noises having a limited duration compared to the daily reference period duration (for example a disturbing noise having only 15' emission duration) is automatically detected for each source or combination of sources. A bonus is automatically applied to overall level LAeq,TR (3dB or 5dB); if not applicable it can be disabled by the user.

**DIFFERENTIAL LEVEL:** differential level is calculated as the difference between source emission level and background noise level. Time period chosen for background level calculation can be selected and modified by the user.

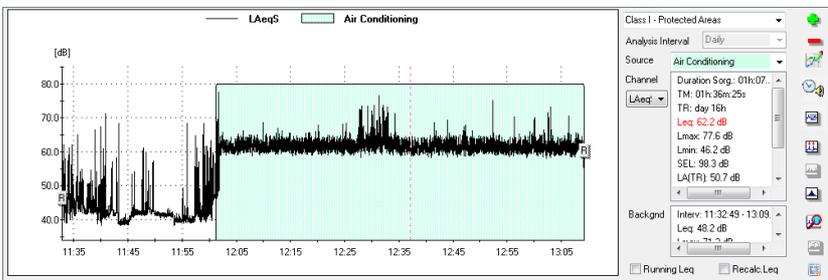
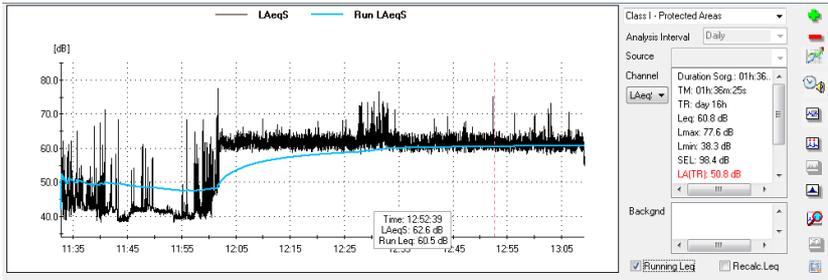
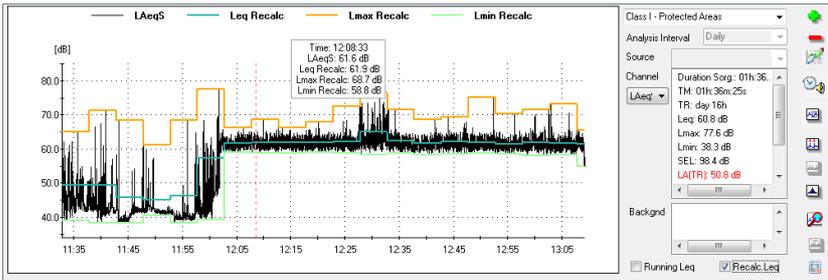
**BACKGROUND NOISE TIME PERIOD:** it's possible to select precisely the time period for Background noise calculation. Background noise will be used for differential limit check (Lsource - Lbgnd) and evaluation of annoying source compared to environmental noise.



|                      | FAN                                         | TRAFFIC NOISE                               |
|----------------------|---------------------------------------------|---------------------------------------------|
| Start                | 2012/06/08 12:44:11                         | 2012/06/08 12:44:26                         |
| Meas. Duration       | 01m:31s                                     | 01m:31s                                     |
| Leq[dB]              | 92.2                                        | 73.8                                        |
| Lmax [dB]            | 93.9                                        | 81.3                                        |
| Lmin [dB]            | 83.4                                        | 46.4                                        |
| SEL [dB]             | 108.0                                       | 82.8                                        |
| L1 [dB]              | 117.0                                       | 117.0                                       |
| Source Real duration | 00m:30s(TR)                                 | 00m:38s(TR)                                 |
| LA[dB]               | 60.4                                        | 35.2                                        |
| LC[dB]               | 60.4                                        | 25.2                                        |
| Leq Bgnd [dB]        | 47.7 (12:43:49 - 12:44:10)                  | 47.7 (12:43:49 - 12:44:10)                  |
| LD(TM)[dB]           | 44.5                                        | 26.1                                        |
|                      | <input type="checkbox"/> Partial Time(-5dB) | <input type="checkbox"/> Partial Time(-5dB) |
| <b>IMPULSES</b>      |                                             |                                             |
| Impulses-TOT         | 0                                           | 5                                           |
| Impulses-DAY         | 0                                           | 5                                           |
| Impulses-NIGHT       |                                             |                                             |
| Penalty Ki[dB]       |                                             |                                             |
| <b>TONES</b>         |                                             |                                             |
| Penalty Kt[dB]       | Phon                                        | Phon                                        |
| Penalty Kb[dB]       |                                             |                                             |

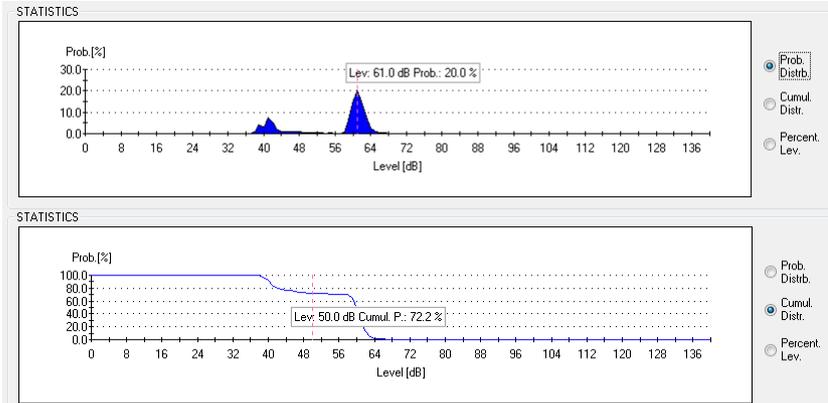
Two markers on the sound pressure level time history, indicate the starting and ending time of the period chosen for evaluation. Exceeded differential limits are displayed with the value in red.

The limits are specific for night and day.



**NOISE SOURCES IDENTIFICATION:** different noise sources can be entered and identified with customizable names. Individual source levels are then calculated and inserted in the measurement report. Different types of sources can be combined and overall level recalculated. Sources noise levels can be referred to presence time, to statutory periods or to custom time periods. Sections of the time history can be eliminated by the insertion of masks; masked data will not be taken into account in the calculations. The selection of the sources working periods can be done with the mouse or with a direct input of beginning and ending times.

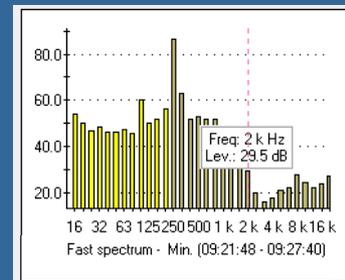
**SPECTRA CALCULATIONS:** processing and display of MINIMUM, AVERAGE and INSTANTANEOUS spectra within a temporal interval.



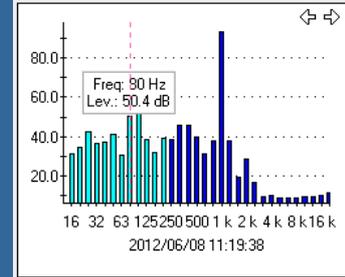
**STATISTICS:** from the measurement data it's possible to produce statistics as cumulative distribution, probability distribution and percentile levels. Statistical levels calculations are available as numerical and graphic format. Statistics can be processed also by individual sources.

## GRAPHIC REPRESENTATIONS STATISTICAL CALCULATIONS

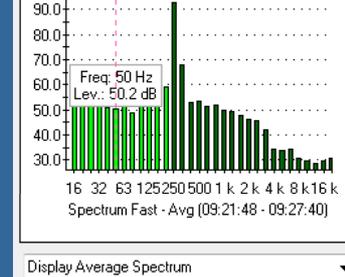
- ◆ Leq, Lmax, Lmin calculation on user-defined time periods and user-defined beginning time
- ◆ Running Leq calculation
- ◆ Input of multiple sources and masks
- ◆ Spectra calculations
- ◆ Overall and source statistics



Display Minimum Spectrum



Display Average Spectrum



Display Average Spectrum

Distributor

Languages: English, Italian

Software compatibility: Win98, 2000, Vista, XP, Win7 (32-64), Win8