NS2A NOISE POLLUTION *module*

Post processing software module for long-term measurement data (daily, weekly, annual monitoring). Assessment of industrial, road traffic, railway and airport noise sources. Calculations according with 2002/49/CE European Directive

NOISE POLLUTION module of Noise Studio allows to evaluate the noise nuisance to the people due to specific sound sources like **industrial facilities, roads, highways, railways** and **airports**. Acoustic climate analysis for the purpose of noise mapping is carried out on a daily, weekly and annual basis in accordance 2002/49/CE European Directive. The module also allows to perform the calculation of railway and airport noise levels based on the identification of single noise events. Calculations as far as graphical representations, include not only global noise levels but also spectral and statistical analysis .

Reference standards: European Directive 2002/49/CE

- Noise level profiles acquired with Delta Ohm sound level meters both directly and using PC based acquisition NS4 Monitor module
- Flexibility and efficiency in time trace composition starting from measurement data. Possibility to exclude events using mask function
- Descriptors calculation **Lday**, **Levening**, **Lnight**, **Lden**
- Global, partial and by frequency intervals statistic calculations
- Noise events identification and calculation of specific parameters (duration, SEL, LAeq, LF max, statistics)
- Multi-spectral display (time profile of each frequency band)

Daily analysis: the analysis is based on measurements of 24 hours with a resolution equal to 1s. Are processed sound level profiles or spectra from 1/8s to 1s resolutions.
In general analysis includes detection of events and calculation of statistical levels. The program calculates each descriptor taking into account noise masks.

Weekly analysis: the analysis is based on measurements of seven days duration from Monday to Sunday with a resolution of 1 minute and 1 hour.
It's possible to analyze profiles of sound levels or spectra with 1 second resolution of developed with daily analysis or measured directly. The analysis includes detection of sound events and calculation of statistical levels.

Yearly analysis: analysis is based on measurements (or processed data) of **365 days** duration, starting from January and **1 hour** resolution. They can be used profiles processed in the weekly analysis phase.
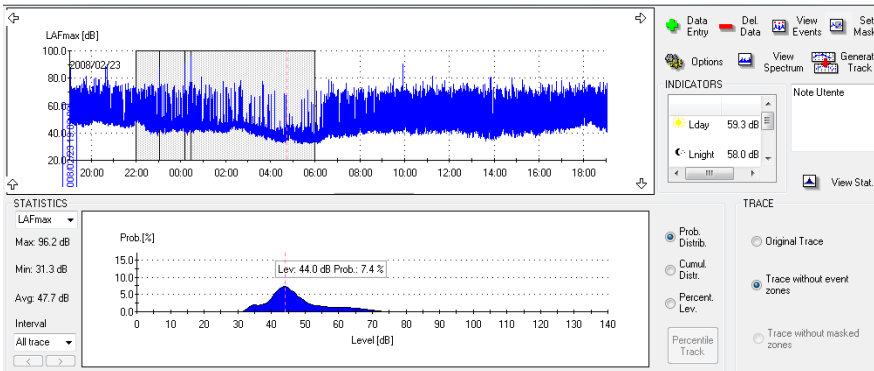
Environmental Noise Assessment

- **Directive 2002/49/CE**
- **D.Lgs 194/05**
- **DM 16/03/98**
- **Analysis periods:**
    - *Daily*
    - *Weekly*
    - *Yearly*
- **Road traffic noise**
- **Industrial noise**
- **Railway noise**
- **Airport noise**
- **Masking function**
- **Automatic report Word / Pdf**
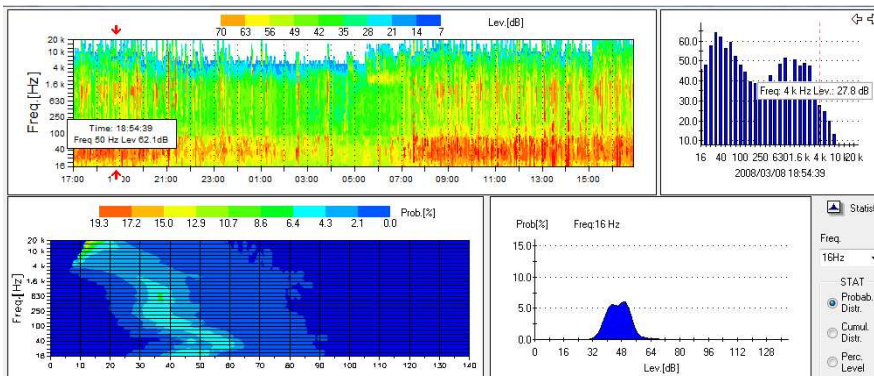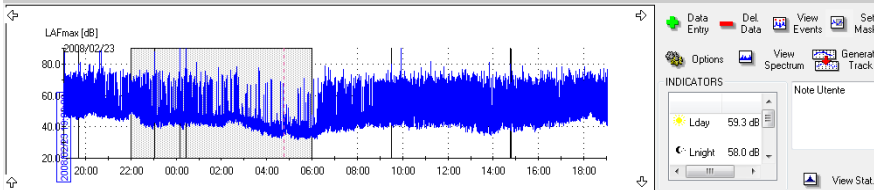- **Export pdf, excel, txt**
- **Graphic export**
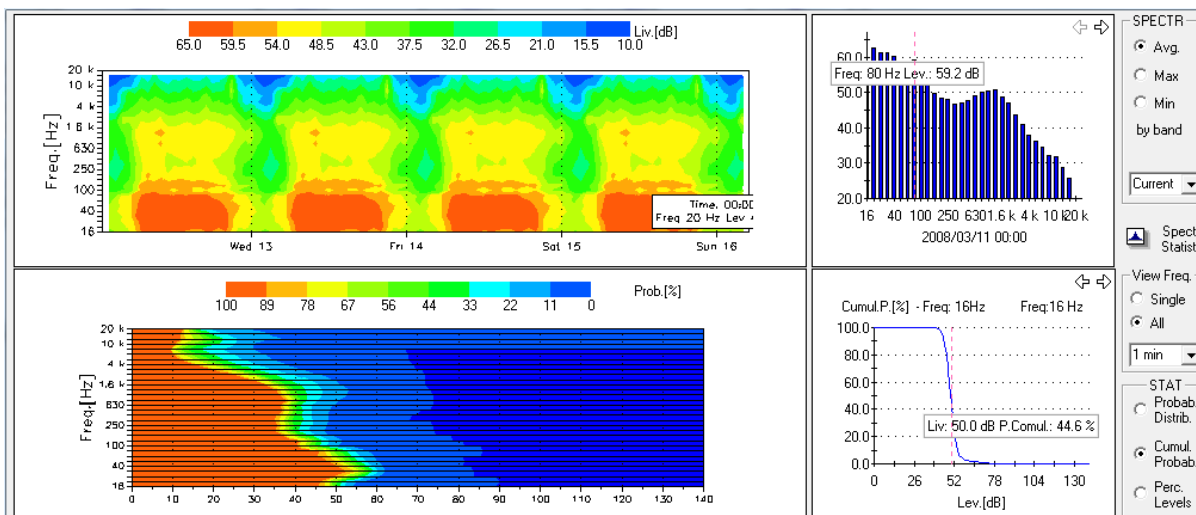
DAILY ANALYSIS

- ♦ Calculation and display of noise profile divided by **day**, **(evening)** and **night** periods
- ♦ Calculation of L_{day}, $L_{evening}$, L_{night} descriptors and overall Leq 24h
- ♦ Global statistics, partial (day, evening and night periods), hourly statistics or on user defined time period
- ♦ Automatic detection of noisy events with estraction of levels LAE, Leq, Lmax, percentiles L5, L10, L90, L95 and full statistics.
- ♦ Automatic detection of impulses based on LIp and LCpk time profiles
- ♦ In case of profiles having associated audio recordings (Monitor Module), it's possible to playback them sinchronized with noise profile
- ♦ Sonogram representation of frequency spectra (multi-spectral profiles)
- ♦ Statistics profile associated to frequency spectrum, calculated on predefined intervals, on a color-map graph.

Daily charts and events table: daily processing allows to detect events on threshold conditions and to divide them over reference periods in a tabular format. Events detection function allows to serch for *impulses* in the time profiles. Statistic is available both in graphic and numerical format as probability distribution, cumulative distribution

For each detected event are calculated LAE, LAeq, LAmax and four percentiles. Are shown date, hour and event duration. In the summary table in addition to events per period, are given overall duration, percentage with and without masks.

Daily graph*:*

Levels representation on a daily basis with table representation of overall levels for each reference period Lday, Lnight, LAeq (24h). Probability distribution, cumulative distribution and percentile levels for selected period.

Mask input:

It's possible to mask one or more periods of time trace and calculate levels with and without masked events.

Events identification: it's possible to identify events on the basis of level and duration thresholds different for each reference period. Research channel can be user selected.

Statistical graphs: on the basis of frequency time histories (daily or night period basis) it is possible to display *probability distribution*, *cumulative distribution* and *percentiles levels* time histories for each 1/3 oct. frequency band. A "*sonogram like*" coloured graph allows to easily evaluate statistical leves as a function of the frequency. Noise assessment for long time period measurements will be then very intuitive, easy and explicative.

NOISE Studio

WEEKLY/YEARLY ANALYSIS

♦ **Hourly levels graph**

♦ **Day, Evening, Night overall levels**

♦ **Daily levels graph**

Time history graph with selectable resolution in minute, hour, day.

LAeq, Lday, Lnight, running Leq time histories are displayed.

Weekly statistics graph able to display in a color chart the probability, cumulative distribution and percentile levels .

2D graph of statistical informations related to specific time periods (hour, full period, day, evening, night, custom).

Cumulative graph*:*

Coloured representation of cumulative distribution of noise levels. Distribution related to a specific time (for example the one linked to the cursor time position): from the graph on the right can be seen that, for selected time interval (hour interval 4 PM), 62dB level is exceeded the 31.7% of the time

Hour levels: chart with hourly resolution for the whole week
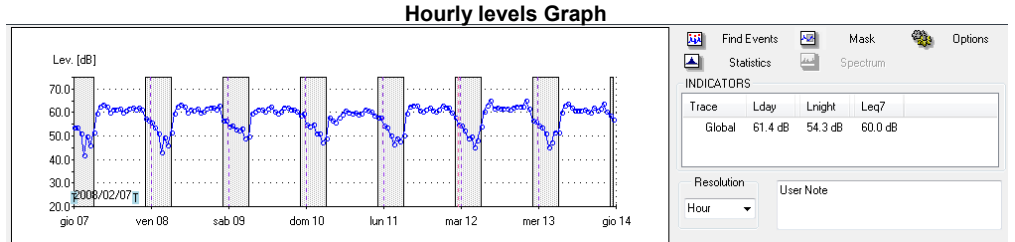**Daily levels**: day, evening, night, custom
Weekly levels LAeq,w

Tabular report for hour, day, night, evening levels.

Customizable resolution graph for LAeq, Lday, Lnight levels.

Multi-profile graph with the possibility to select traces to display. Possibility to display traces for 6 custom *statistical levels* or *frequency bands* also overlapped to global LAeq level.
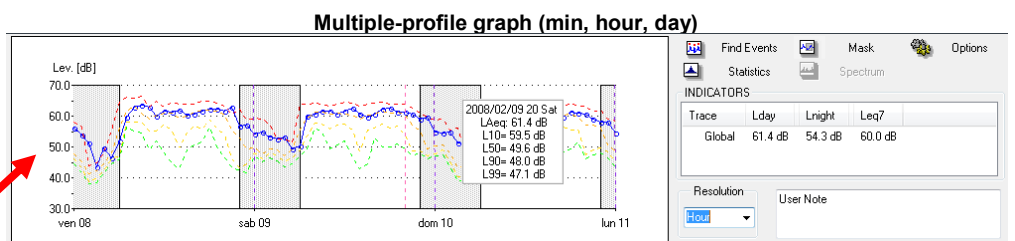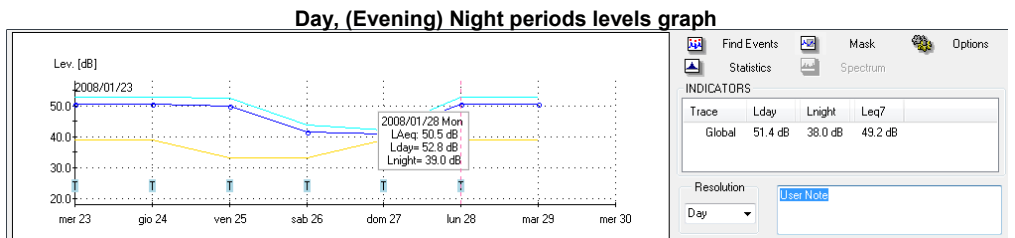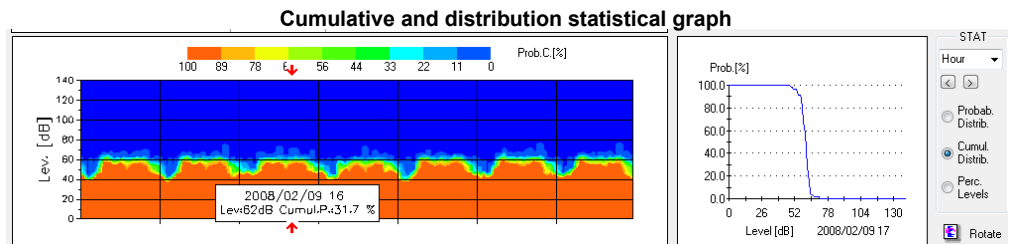
WEEKLY ANALYSIS: road traffic noise

♦ Weekly profile graph divided by day (evening) and night periods

♦ Equivalent levels by day, evening and night periods (and weekly equivalent level).

♦ Statistics: global, partial (day, evening and night periods) and by minute or by user defined interval.

♦ On the profile it's possible to display Lmax, running Leq, Lday, Levening, Lnight parameters and the time history of 6 user defined percentiles.

Hourly levels Graph

Hourly and daily tabular reports

Cumulative and distribution statistical graph

Day, (Evening) Night periods levels graph

Multiple-profile graph (min, hour, day)

Customizable reference periods

Analysis time interval for overall levels calculation customizable in two or three daily periods. Period starting and ending time customizable by the user.

Customizable impulses detection

Impulses detection function can be adapted to specific needs by adjusting amplitude and duration for event recognition.


NOISE Studio

RAILWAY/AIRPORT NOISE

Railway traffic noise analysis according to European Directive 2002/49/CE, DM 16/03/98, D.P.C.M. 459 - 18/11/98, D.Lgs.194 - 19/08/2005 .

Sound level profiles acquired with Delta Ohm sound level meters are analyzed.

Identification of events on the time history is made automatically. For each identified event are calculated the following parameters: duration, SEL, LAeq, LAFmax.

Are also calculated global descriptors $Leq_{,TR}$ day, $Leq_{,TR}$ evening, $Leq_{,TR}$ night, $Leq_{,TR}$ den

Multi-spectral analysis: in order to verify that identified event can be surely attributed to a train passby, it can be useful the spectral analysis performed in multi-spectral mode. If are stored, together with LAF sound level time history, the third octave bands profiles, the program will display, in addition to sound level profile also the color sonogram.
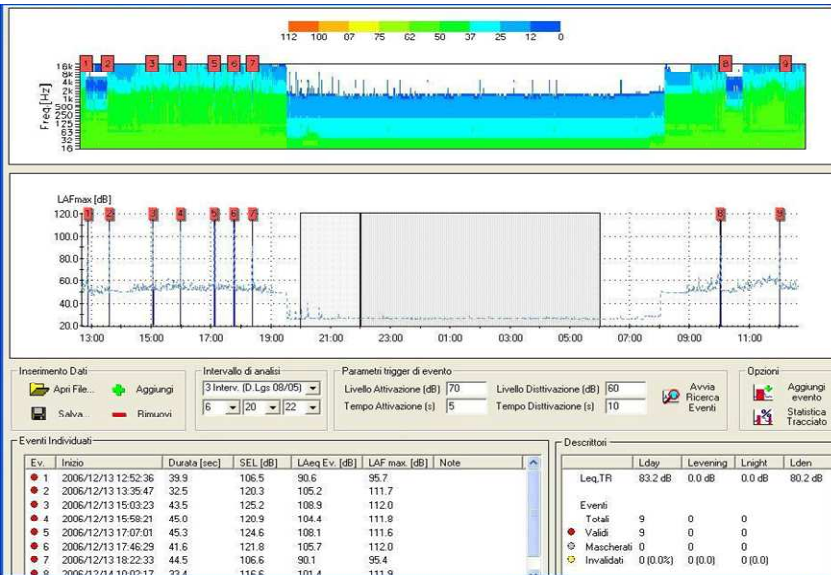

Automatic detection of railway noise events on threshold condition

Railway noise events can be identified using custom threshold conditions on Fast time profile. It's possible to define: *activation level* and *deactivation level* in order to recognize the event when a predefined value in dB is exceeded; *activation and deactivation time* in order to detect only events having a minimum duration (train transits for example normally have different duration than other events as aircraft flyovers or cars or trucks transits).

Identification of OK or NOK events for each reference period performing a background noise check close to the event itself (user customizable time interval for background noise check). It's possible to manually insert markers to identify railway noise and airport noise events. Probability distribution, cumulative distribution and percentiles for *noise sources* and *background noise* are differenziated. (v. chart above).
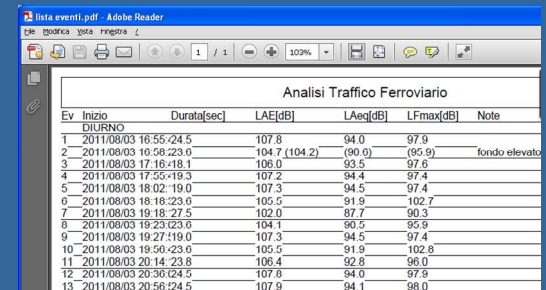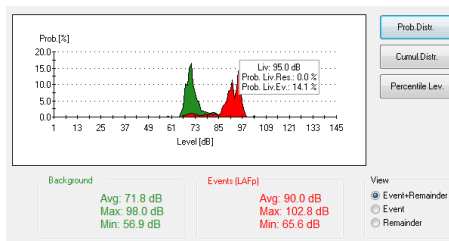

Custom time interval for event detection (EU Dir.2002/49/CE, D.Lgs.03/98, D.Lgs 08/05, D.M.31/11/97 - airport events)
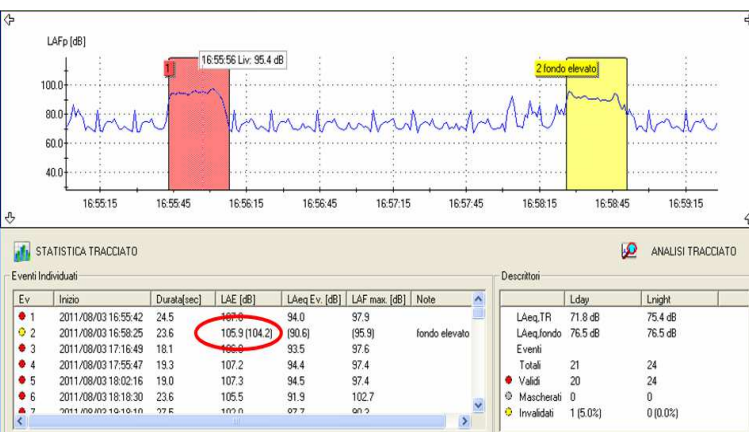
DATA PROCESSING AND GRAPHIC REPRESENTATION

♦ **EU Directive 2002/49/CE**

♦ **Event identification on threshold condition**

♦ **Manual event input**

♦ **Prob.Distr. events/backgnd**

♦ **Cum.Distr. events/backgnd**

♦ **Perc. levels events/backgnd**

♦ **Automatic report**

♦ **pdf and Word printout**

♦ **Copy/paste function**

♦ **Export txt and image**

Language: English, Italian

Distributor

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