# DNA Software

## Acoustic and Vibration Measurement Software!

### Applications

- Research and Development
  - Building Acoustics
  - Sound Power Determination
  - Vibration Measurements
  - Statistics
  - Pass-by
  - Sound Intensity
  - Simple Point and Shoot
  - Transient Capture

- Environmental
  - Aircraft Noise
  - Industrial Noise
  - General Surveys
  - Transportation Noise
  - Community Noise
  - Events and Tone

- Worker Safety
  - Work Place Surveys
  - Machinery Noise
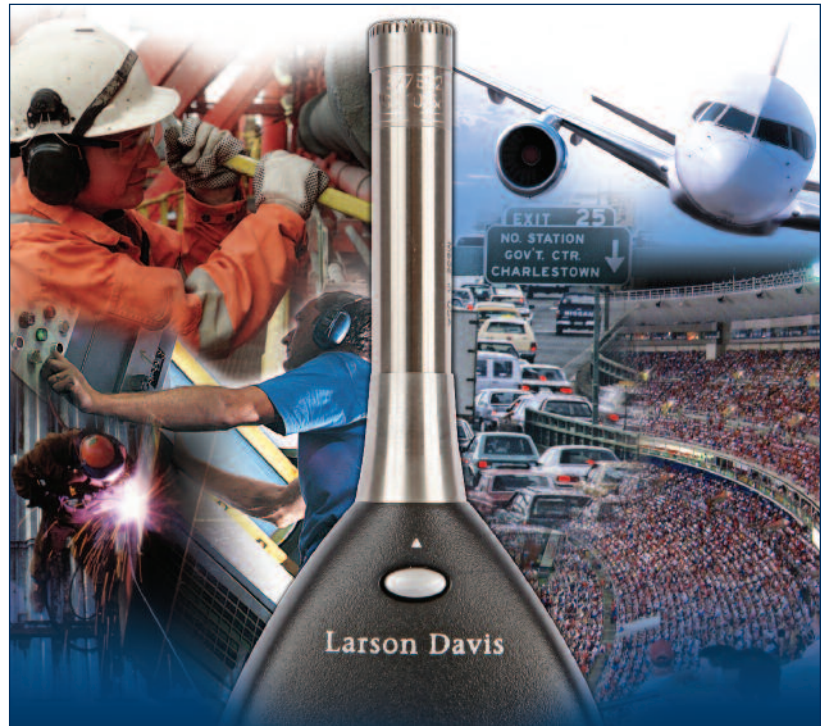
Analyzing noise and vibration data can be difficult. Its not often easy to see the patterns or recognize the nuances of complex data sets. Furthermore, presenting data in a way that is meaningful can be challenging, yet perhaps our most important task.

DNA (Data, Navigation, and Analysis) makes maneuvering through extensive data a simple operation and putting together meaningful reports has never been easier. Some of DNAs many features include:

### FEATURES AND BENEFITS

- Control of Larson Davis Models 831, SoundTrack LxT, HVM100, 720, 812, 820, 824, 2900B, & 3000+.
- Multiple live data displays on the PC screen.
- Stream data directly from analyzer to PC hard drive, including sound files.
- Read stored data files from analyzer or disk.
- Create report templates for easy graphing and printing.
- Organize templates, graphics, and measurements for easy recall.
- Reports can integrate text, graphics, pictures, or embedded objects (OLE 2.0) such as MS Word, MS Excel and .WAV files.
- Graph 1/1, 1/3, 1/12, 1/24 octave, FFT and zoom FFT, SLM parameters; statistical distribution and more!
- Cursor synchronization between different types of graphics with drag and drop functionality for use in a wide variety of applications.
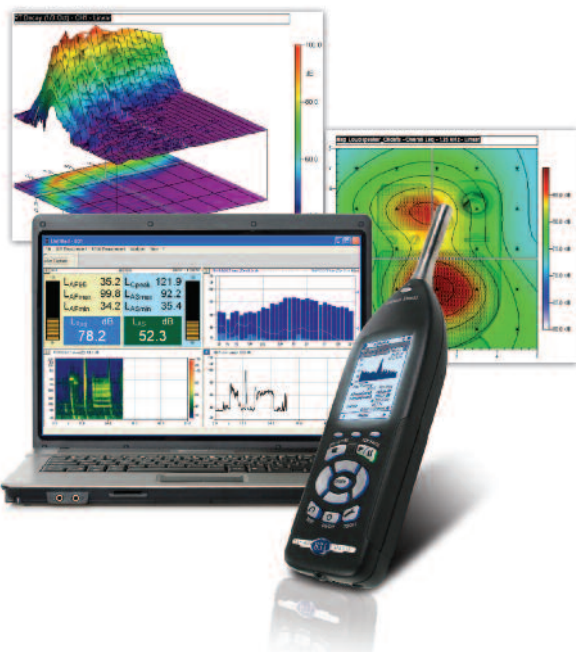
## One Software Package for Unlimited Needs

DNA integrates and fully supports all types of measurements made with Larson Davis noise and vibration instrumentation. It replaces the need for several different software applications to achieve what you really want for display, analysis, and reporting of all project measurement data. DNA quickly produces high quality charts, reports, and presentations.

## Real-time Display Mode DUAL MODE

DNA displays and controls measurement data on a PC in real-time, while maintaining access to all of the instruments measurement and analysis functions.

Unique to DNA is its capability to use the LD instrument as data acquisition front-end while at the same time and in parallel the instrument can store data locally.

## WYSIWYG

DNA is What You See Is What You Get software. You place, resize, and manipulate graphical objects, images, graphs, text, and other types of objects on a page. What you see displayed on the screen remains unchanged on the printed report. (NOTE: Refer to the MS Word: Print Layout View. )

## Instruments Supported

DNA software interfaces with following Larson Davis instruments:

| LD Instrument | DNA Driver | USB | Serial | TCP/IP |
|---|---|---|---|---|
| Models 831 | SWW-DNA-831 | ✓ | ✓ | |
| SoundTrack LxT | SWW-DNA-LXT | ✓ | | |
| HVM100 | SWW-DNA-HVM | ✓ | ✓ | |
| Model 812, 820, 870 | SWW-DNA-SLM | ✓ | ✓ | |
| Model 712, 720 | SWW-DNA-720 | ✓ | ✓ | |
| Series 824 | SWW-DNA-824 | ✓ | ✓ | |
| 2-ch: 2800, 2900, 3000 & 3200 | SWW-DNA-2800 | ✓ | ✓ | ✓ |

It provides instrument setup and direct conversion and display of data files.

- Import data via USB, RS-232, RS-422, and modem.
- Easy management of the various instrument setup parameters.
- Real-time control of all measurement and analysis functions of the instrument.
- Configure the instrument
- Read the datafiles stored on the instrument
- Connect one or more instruments to the live real-time display
- Direct or remote connection
- User defined display layout with time history, digital display, instantaneous octave with min / max indication, and spectrogram.
- Layout and setup can be saved and retrieved.

Model 831 has extra functions

- For Model 831 also a real-time reverberation time mode.
- Analog and Edge modem support as well as TCP/IP broadband support
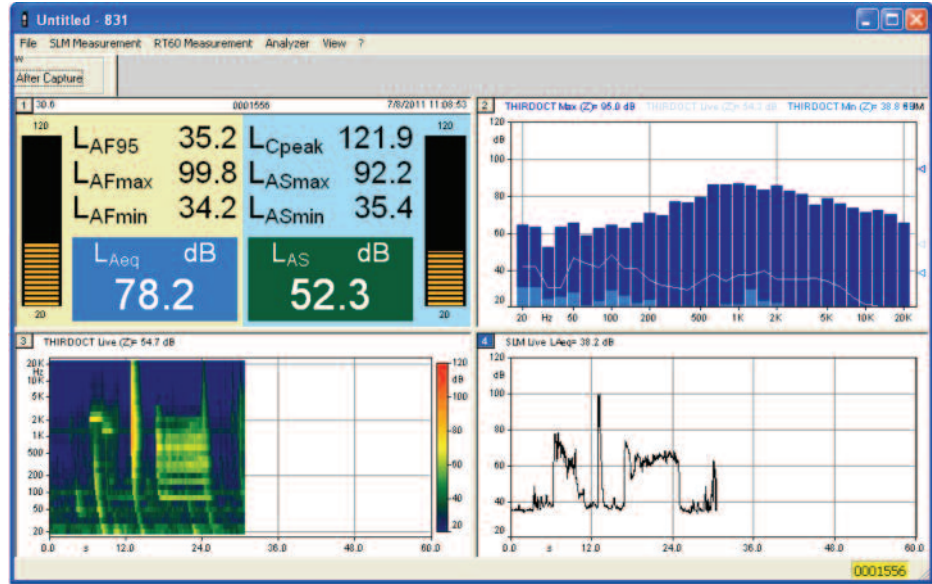
## Measurement Organization

DNA saves all measurement-related files as elements of a project file. Project files can contain measurement data, page descriptions, images, audio files, etc. All data are organized in a tree structure (like Windows Explorer). In addition, DNA allows you to drag & drop any object onto project reports.

The dual view of the data allows for an immediate flip from graphical view to tabular view of the measurement or processing data. Using the F2 (graphical) or F4 (tabular) toggle, you can verify your measurement values or export them to MS Excel for example.

## Graphics

Core to the concept of DNA it the active graph with direct access to the data.

2 modes of operation in Page Layer mode:
- Graph – control the contents of the graph
- Object – control the location and size of the graph on the page

Note: this is similar to the AutoCad layers.

This is complemented by the Global layer – defines the back ground common to all pages. Cfr Header & Footer in MS Word or master slide in MS Powerpoint.

The major benefit of this working principle is the direct access to data visualization without having to check the print preview.

For each graph, you can control the plot size, scaling of each axis, grid lines, bar graphs, overlaying, linear and log scales, EU, integration / differentiation and unit conversion (eg dB to physical units).

Cursors can be synchronized over different graphs.

Dual cursors can zoom or make a local evaluation of the data.

Any combination of graphs and objects (even an entire document) can be saved as a template.

In addition, you can perform cumulative distribution versus time and for each frequency band, percentile Ln versus time and frequency; frequency versus time, speed, distance or rpm; order analysis, RT-60, etc.
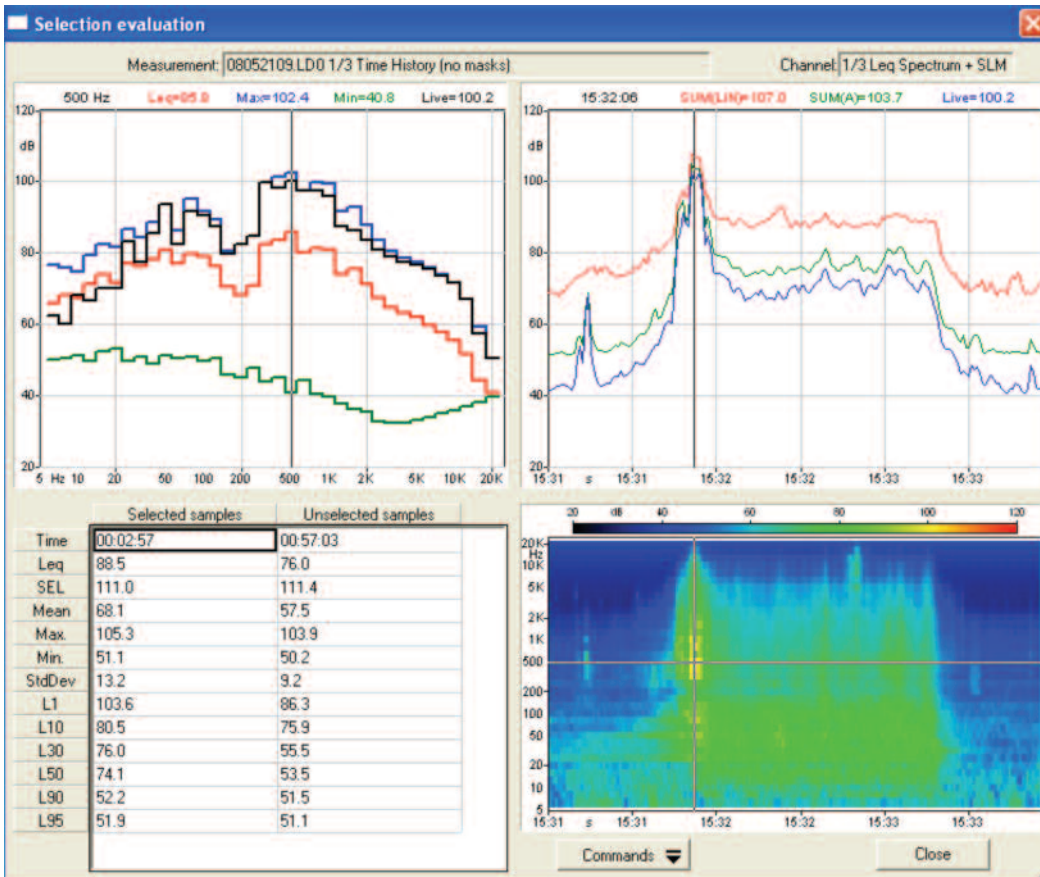
Available graphic formats are

- XY Graphs
- Time history
- Spectrogram
- Maps
- Open-GL 3D
- Numeric tables
- Marker tables
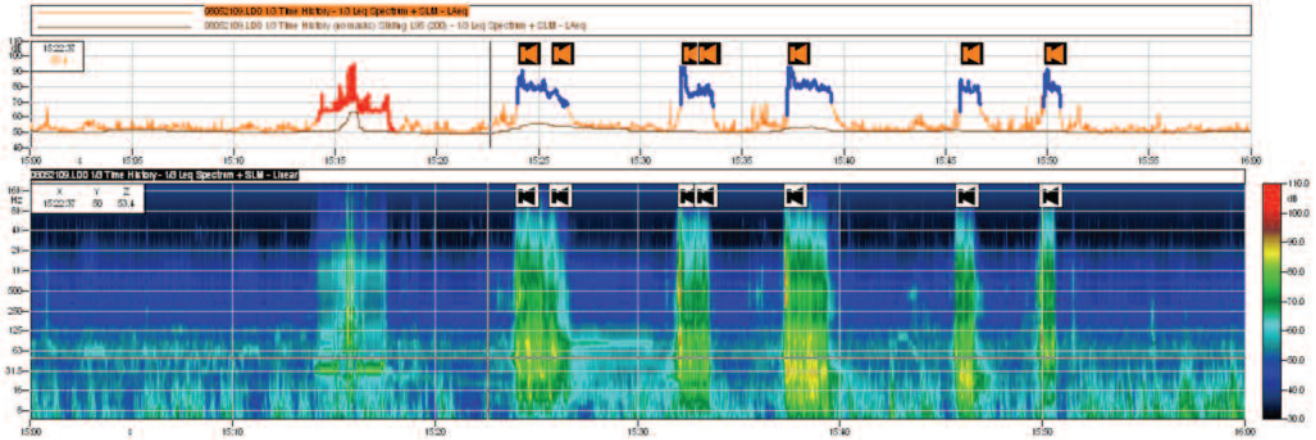


**Time history with WAV sound recordings and related spectrogram – notice the linked cursors.**



**Cursor Evaluate – positioning the cursor around a time history section allows to scrutinize a detail. In the graph we see**

- **Top left: the spectra:Leq, Max, Min and instantaneous at cursor position in top right grap)**
- **Top right: time history as Z-wt and A-wt as well as the spectrum at cursor frequency set at top left graph**
- **Bottom left: tabular values of selected portion**
- **Bottom right: spectrogram with cursors**
- **Commands allows to zoom in and out, export the data**
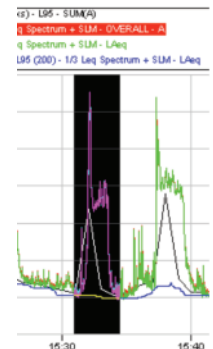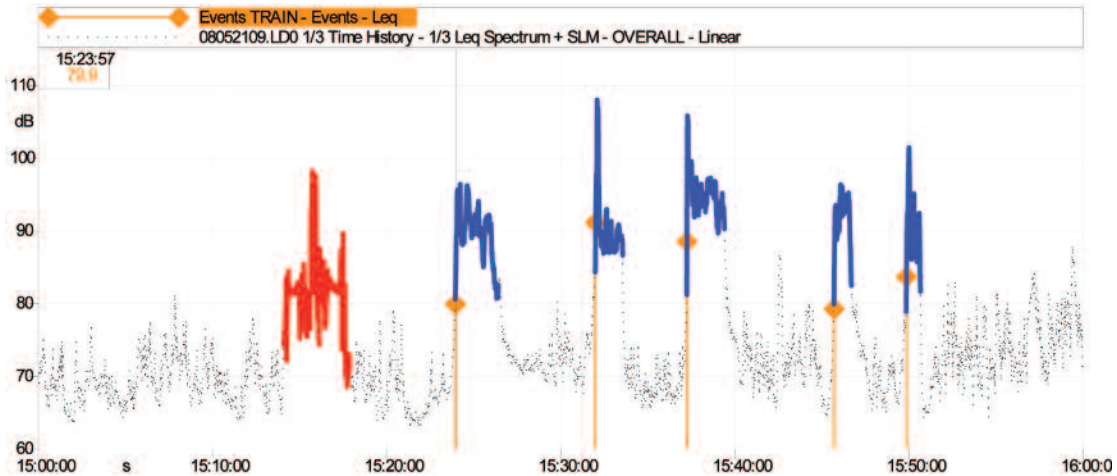
The graph shows the time history in dotted line overlaid with the "train" events in blue and the garbage truck in red.
The start of each train event is marked as well.

### 08052109.LD0 1/3 Time History
### 1/3 Leq Spectrum + SLM - OVERALL
### Linear

| Name | Start | Duration | Leq | Lmax |
|---|---|---|---|---|
| Total | 15:00:01 | 01:00:00 | 85.8 | 108.0 |
| Unmasked | 15:00:01 | 00:48:17 | 73.9 | 90.3 |
| Masked | 15:14:06 | 00:11:43 | 92.6 | 108.0 |
| | | | | |
| Garbage Truck | 15:14:06 | 00:03:46 | 84.7 | 98.3 |
| Train 1 | 15:23:57 | 00:02:27 | 91.0 | 96.4 |
| Train 2 | 15:31:59 | 00:01:34 | 95.4 | 108.0 |
| Train 3 | 15:37:15 | 00:02:09 | 96.0 | 105.8 |
| Train 4 | 15:45:42 | 00:00:59 | 92.6 | 96.4 |
| Train 5 | 15:49:51 | 00:00:48 | 92.7 | 101.5 |

The Marker table shows all marked sections with time of occurrence and specific values.

### Events TRAIN
### Events - Leq

| s | dB | Duration | LMax | SEL |
|---|---|---|---|---|
| 15:23:57 | 79.93 | 147.00 | 90.83 | 101.60 |
| 15:31:59 | 91.15 | 94.00 | 105.25 | 110.88 |
| 15:37:15 | 88.53 | 129.00 | 103.99 | 109.64 |
| 15:45:42 | 79.28 | 59.00 | 84.85 | 96.99 |
| 15:49:51 | 83.71 | 48.00 | 91.67 | 100.52 |

The event table shows the consecutive events with time of occurrence,
duration and specific values.

### Graphics

- Management of graphics, numerical tables, comments, dynamic markers, digital photos, and video clips.
- Direct import of image files as metafile WMF and EMF or bitmap as DIB or BMP.
- X, Y, and Z axis definable as linear or logarithmic with selectable values, or using autoscale.
- Single or multiple cursors synchronized among the displayed graphs.
- Alignment of graphics and objects.

## Data Post-Processing

DNA calculates functions including all mathematical operations from data blocks, spectra, multi-spectra, levels versus time, engine revolution or speed, and more. Levels of selected spectral bands can be modified or canceled, both in frequency and in time domain, for data matrix or multi-spectra. Several weighting curves are included with the software.
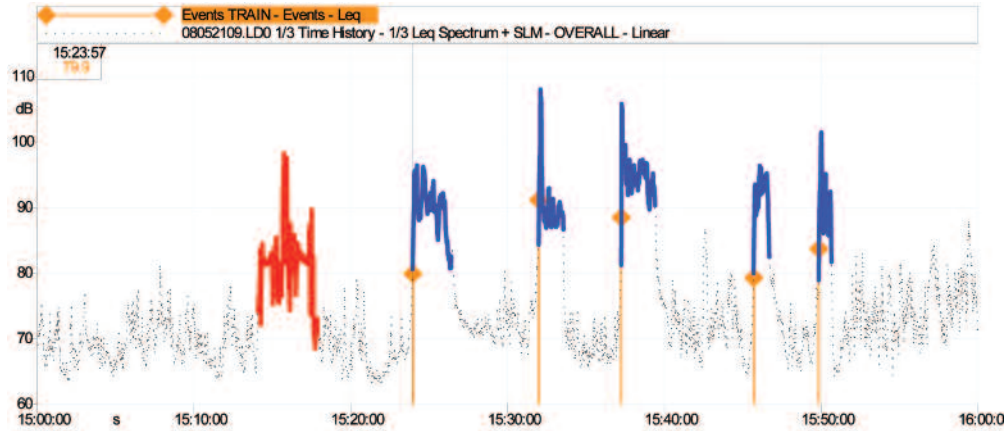
- Cut & paste between sequences acquired in the time domain.
- Measurement recalibration and level modification in frequency and time domain.
- Search function for events, pure tones and impulses
- Spectrograms and 3D graphics (waterfall).
- Mathematical functions, masks in time and frequency domain, automatic identification of the events, tonal components, etc.
- Creation of the curve family as ISO-NR, ISO-2633, Isophonics ISO-226, etc.
- Weighting curves.
- Statistics on the overall value and per frequency band, also in FFT
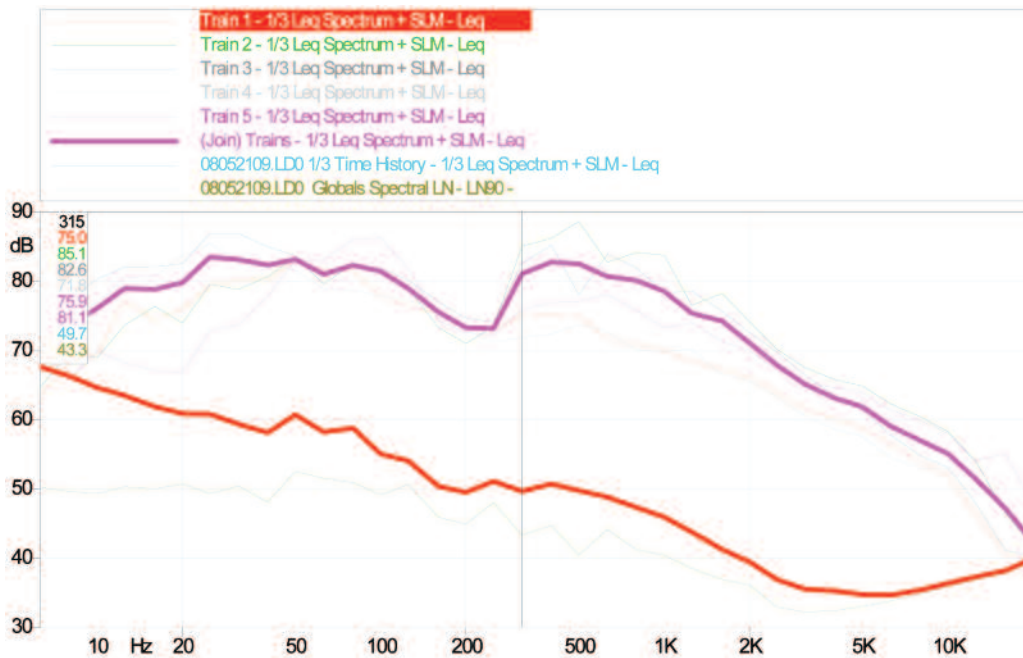


The spectra for each train events are plotted next to the average train event and overlaid with the residual noise (after removal of the garbage truck) and the L90 spectrum of the hour.
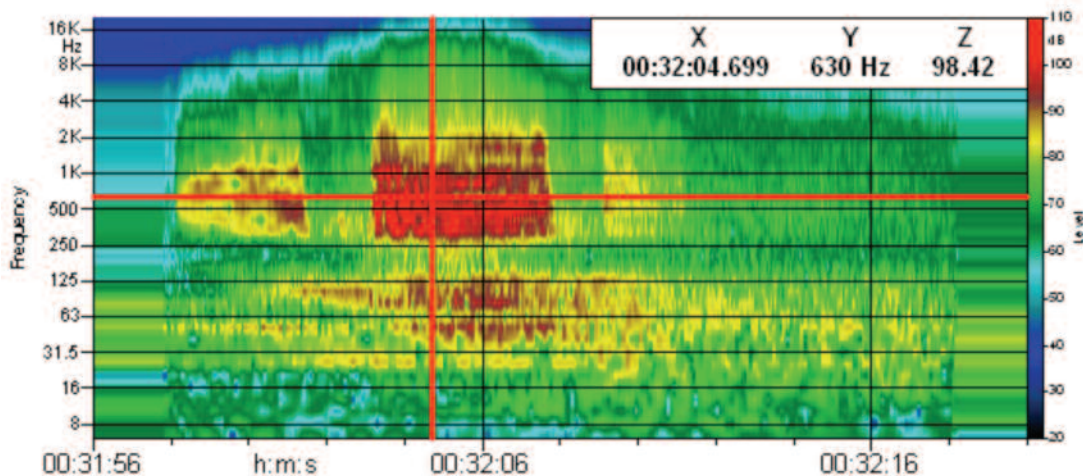


Using the Model 831 event spectrum at 20msec the spectrogram shows distinctly the horn being blown twice (higher frequencies [250 ~ 2 kHz]) and the rail/wheel interaction in the lower frequency octave bands [20 ~ 125Hz].

**Events TRAIN - Events - Leq**
**08052109.LD0 1/3 Time History - 1/3 Leq Spectrum + SLM - OVERALL - Linear**

**The event search is used to detect the exceedances then mark them blue and extract the data from the time history for further detail processing.**

## Other

- OLE 2.0 (client) with all Microsoft applications
- Copy and paste through clipboard both for graphics and numerical tables
- Undo
- Email documents
- On-line help
- Print preview with multiple pages of a document

## Data Input

- Search function for
  - Events including marker positioning, multi-marker.
  - Pure tone
  - Impulses
- Arithmetic operations on measurements and data management
- Marker for data exclusion or modification including related spectra
- Data files for waveforms, statistics, frequency analysis in 1/1, 1/3, 1/12, 1/24 octave and FFT with any kind of spectral resolution, crosspectra, module, phase, real and imaginary part, spectrum, multispectra, harmonic orders, meteorological signals, voltage, current, etc.
- Measurement file with icons (Measurements Organizer) with Drag and Drop functions for quick selection.
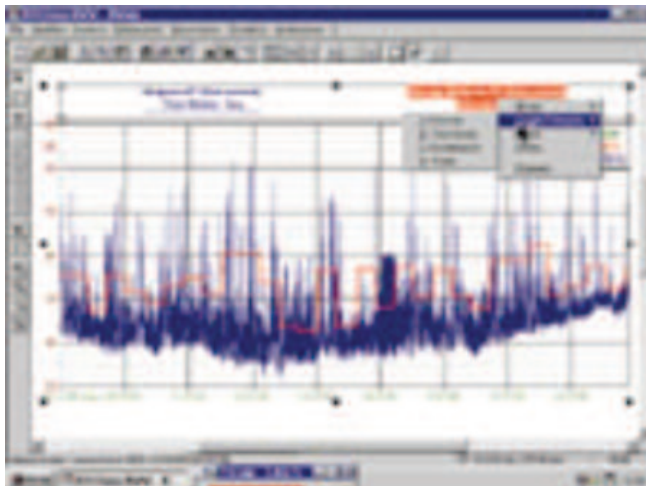


**The statistical calculation is made on the temporal sequence of levels, or spectra in 1/3, 1/12, 1/24 octave or FFT.**

## DNA Reader

DNA files use a proprietary format, recognizable with their .DNA extension. To allow collegeagues or customers to read, view, plot and print DNA results, the DNA reader is the ideal complement.

- Open any DNA file
- Read cursor value
- Change scaling
- Export to MS Office
- Print to PDF or printer

## DNA Remote

While using remote noise monitoring stations, you want to have your regular data download for each station. DAN Remote organizes this for you in an fully automated way. The instrument files are transferred from the remote station to the server where they are kept for analysis.

- Organisation of remote calling per connection (allows simultaneous data retrieval).
- Multiple instruments per connection for sequential access
- Selectable frequency for retrieval: once / day to once / hour.
- Analog, wireless, or direct connection as well as 831 TCP/IP supported.
- Support for 820, 870, 824, 831 and LXT instruments
- Automatically deletes files on the instrument upon successful transfer

**The statistical calculation is made on the temporal sequence of levels, or spectra in 1/3, 1/12, 1/24 octave or FFT.**

## Optional Modules

DNA can be expanded to meet your measurement needs with the following modules:

- Events tracking: PNL and PNLT event time history and EPNL event, TRAIN 6-22 and 22-6 processing
- 3D color mapping
- Optimized mapping using OpenGL, requires DNA Mapping
- Industrial Hygiene
- Building Acoustics, allows calculation of transmission loss and sound insulation calculations.
- Direct Store and File Audio option storing directly on a computer bypassing instrument memory
- Order tracking capabilities

## Event tracking

This modules focuses on traffic sectors like airplanes and trains. For airplanes it calculates the Perceived Noise Level (PNL), Perceived noise level corrected for tone (PNLT) and the Effective Perceived Noise Level with a correction for tone and duration (EPNL)

PNL    $L_{PN}$    Perceived Noise Level
PNLT    $L_{PNT}$    Tone Corrected Perceived Noise Level
EPNL    $L_{EPN}$    Effective Perceived Noise Level with a correction for tone and duration
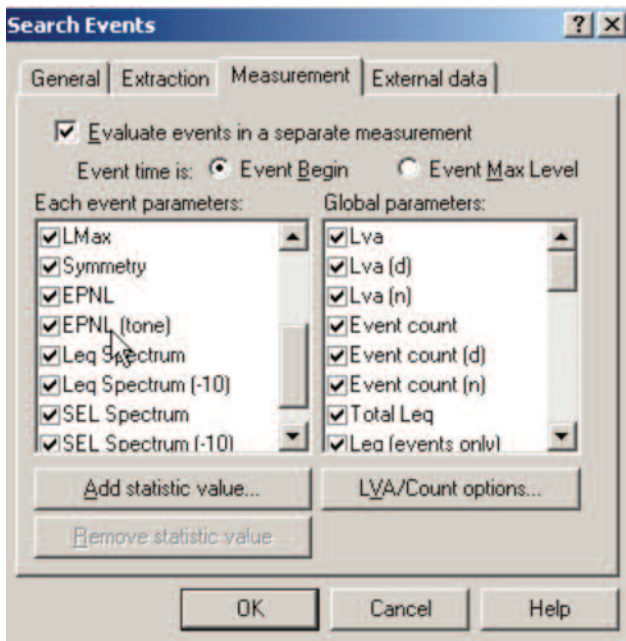
$L_{EPN}$ = $L_{PNmax}$ + 10 log (t10/20) + F(dB)

     $L_{PNmax}$ = maximum LPN during flyover
     $t_{10}$ = duration in seconds during which LPN > LPNmax − 10 dB
     F    = pure tone correction, usually + 3dB

For trains it distributes the train event SPL in the 6-22 or 22-6 daily periods giving the Leq contribution of the train noise to the overall noise.
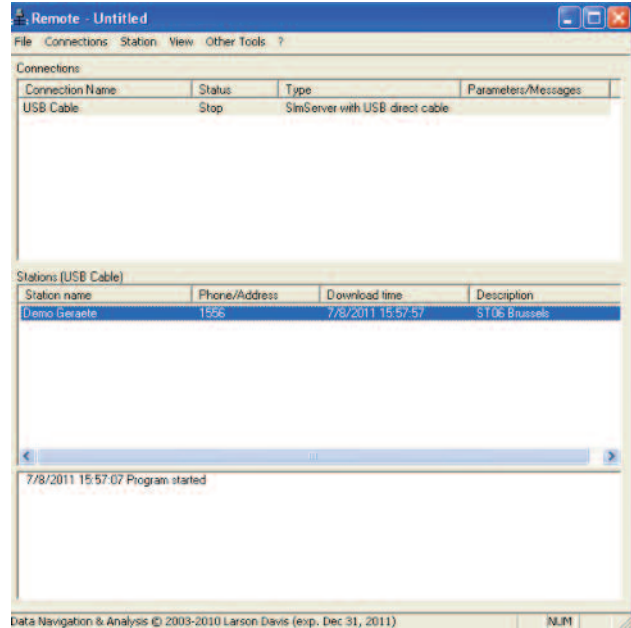


**The search event window will allow to select the extra parameters for PNL and TR functions.**

## Architectural Acoustics

The Architectural Acoustics module of DNA focuses on the sound transmission loss calculation according to ISO and ASTM standards.

- Reverberation Time (RT-60) data can be imported or tuned if the original decays per octave are available, including support for the backward Schroeder Integration method). Typical standards are ISO 3382-2, ISO 354
- Absorption Coefficient calculation based on ISO 354, 11654 or ASTM E2235
- ISO 140 & ISO 717 for adjacent rooms, building façade and floor transmission loss.
- ASTM Standards E90,E336, E966, E492, E1007 and classification standards E413, E1332 and E989.

Leveraging the powerful DNA Graph Template concept, DNA allows you to plug your measured data directly in the appropriate template to go to the recommended graphical representation of the results.
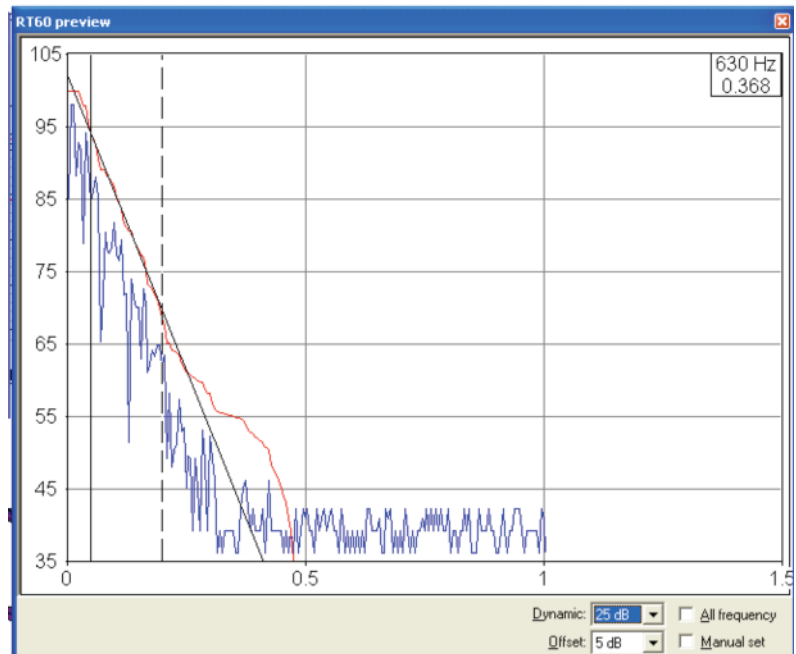
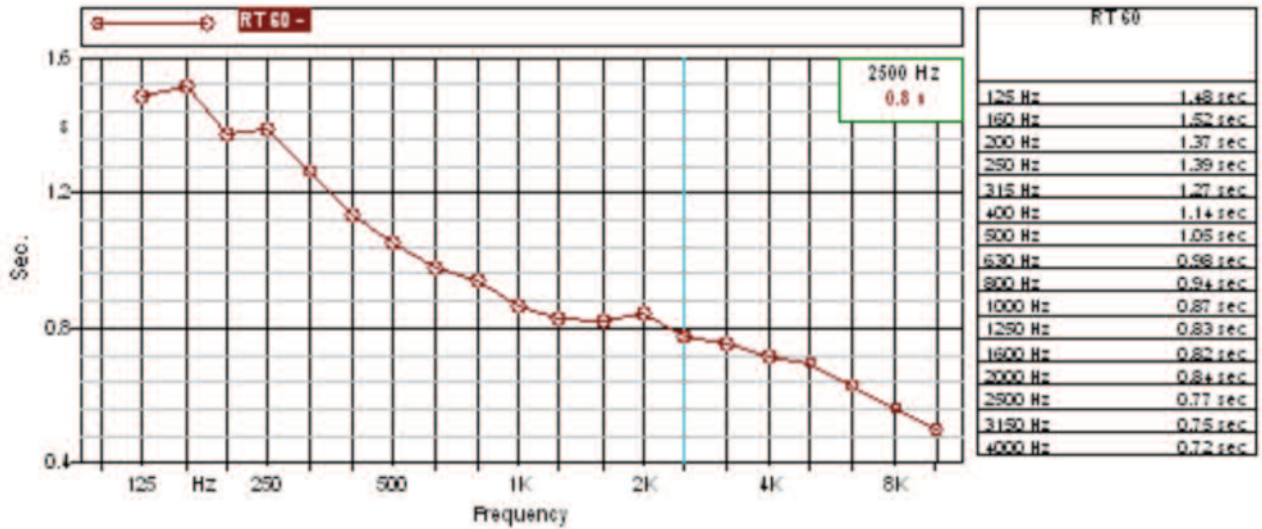DNA will also average the transmitting, receiving or background levels.
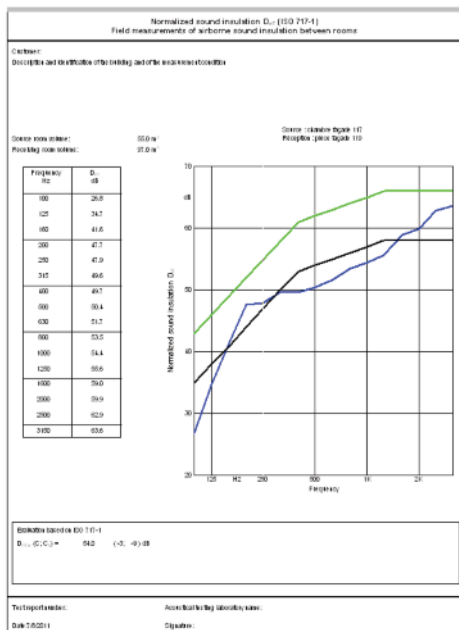
**Normalized sound insulation Dnw plotted to ISO 717-1.
(The green line shows the next quality level to be achieved**
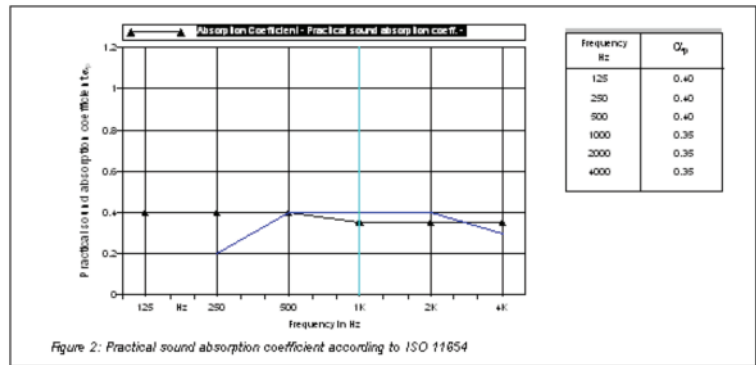
**Absorption coefficient calculation referring to ISO 354 and ISO 11654 methods.**

**Visual validuation and optional manual tuning of RT60 estimation**

**Reveberation time spectrum and tabular list.**

## Mapping

The mapping function serves to plot equal level contour data, usually called iso-lines. For a better graphical representation, you can add the (faded) picture of the object or the room.
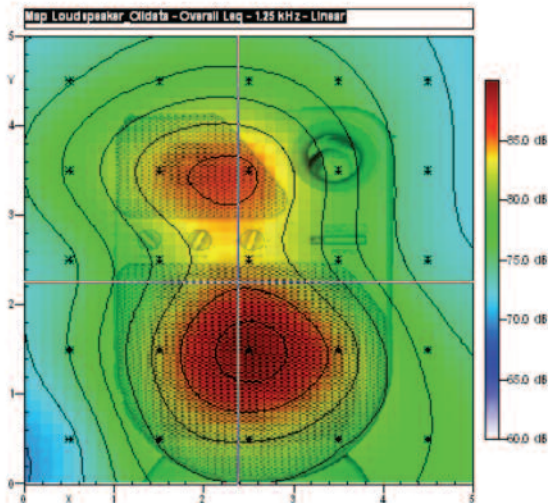
- A factory floor survey combined with mapping gives an acoustic floor plan.
- Combine with acoustic intensity measurements.
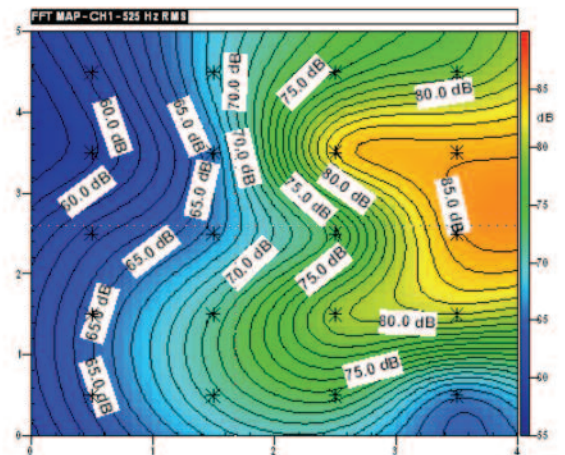- Use with overall, octave or FFT data.
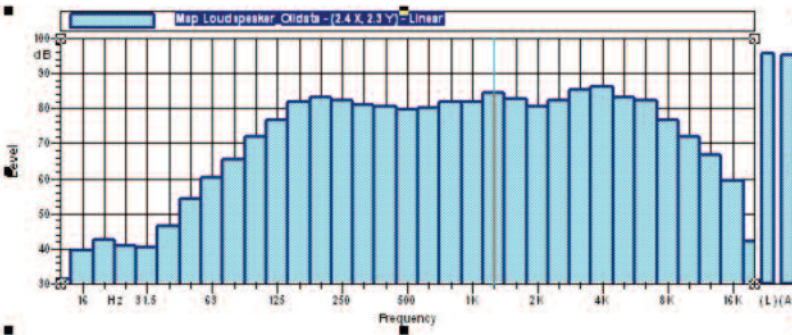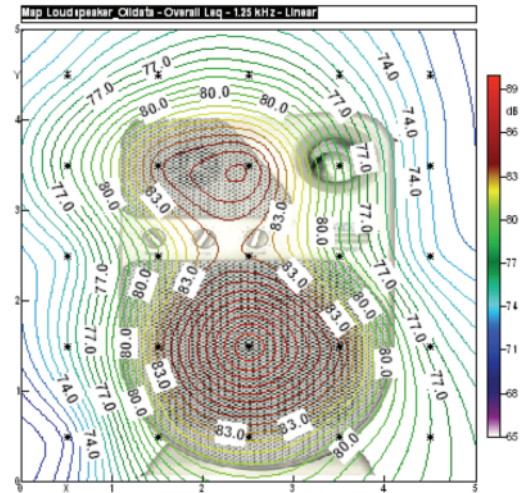


**Overlay of the speaker and the iso-loudness curves at 12.5 kHz**



## frequency : 1250 Hz



**Overall spectrum with cursor linked to the iso loudness map at 1250 Hz**
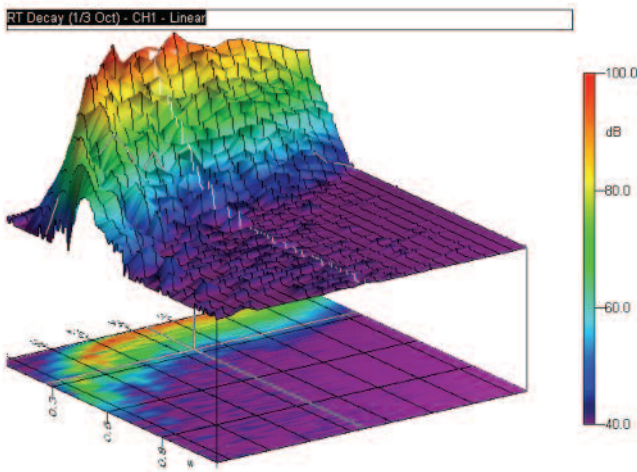


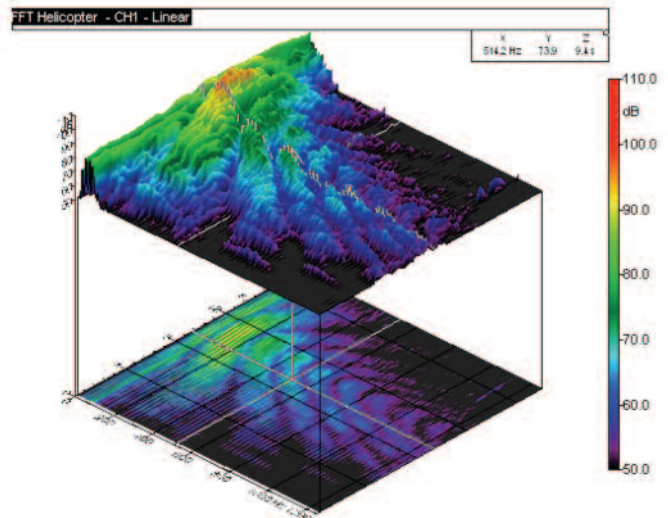**Using FFT analysis we can refine the map.**

### Open-GL 3D Mapping

The Open-GL library will give more depth and light to the 3D graphs.



**1/3rd octave decays shown in a 3D diagram**



**Helicopter fly-over data analyzed with FFT spectra**

### Industrial Hygiene

Noise and vibration exposure data are gathered per task and daily exposure projections and verifications can be made easily.

- For Noise the tool takes for personal hearing protection into account
- For noise a weekly overview can be made
- List of tasks per person leads to a total exposure as well as the A(8) extrapolated value.



| Job description | Measure | te (min) | X | Y | Z | SUM | A(8) |
|---|---|---|---|---|---|---|---|
| | Hand-Arm Drill | 180.00 | 0.04 | 0.15 | 0.19 | 0.25 | |
| Ken Cox | Hand-Arm Grinder | 120.00 | 0.26 | 0.20 | 0.61 | 0.69 | 6.05 |
| | Hand-Arm Makita HR50 | 120.00 | 6.10 | 7.33 | 7.41 | 12.08 | |

### PC Direct Store

- Stores data directly to a PCs hard drive
- Intended for applications where instrument memory is not sufficient, e.g. environmental monitoring, passbys, and long run-up

### File Audio

- Stores time domain signal from the instrument to the PC sound card, and then to the hard drive
- Sound file can be attached to a graph or page
- Creates .WAV files

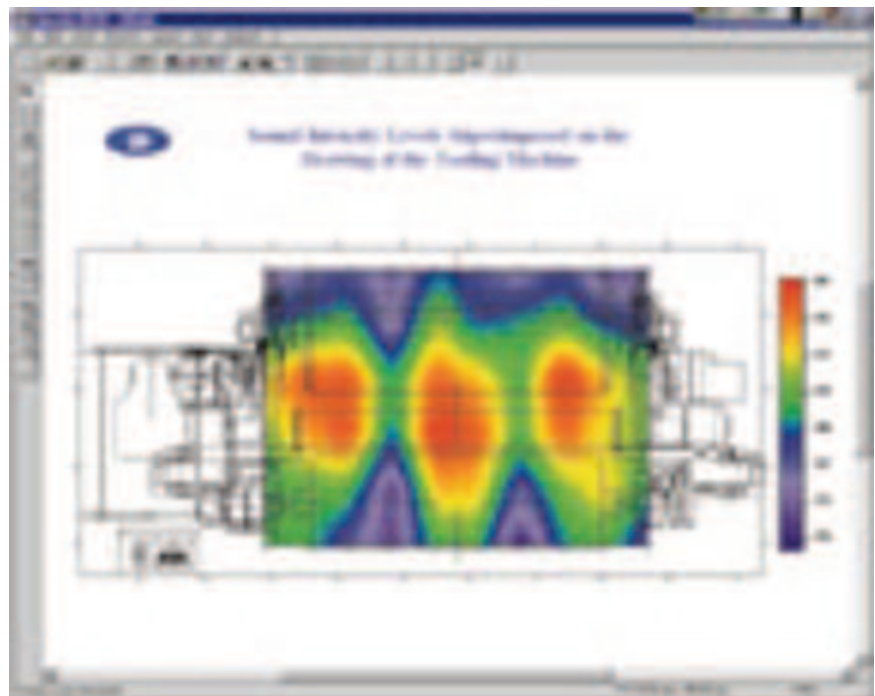### Order Tracking Analysis

- Order extraction from autostore by-Tach
- Graphics template for order analysis
- Spectrum vs RPM or Speed for frequency or order
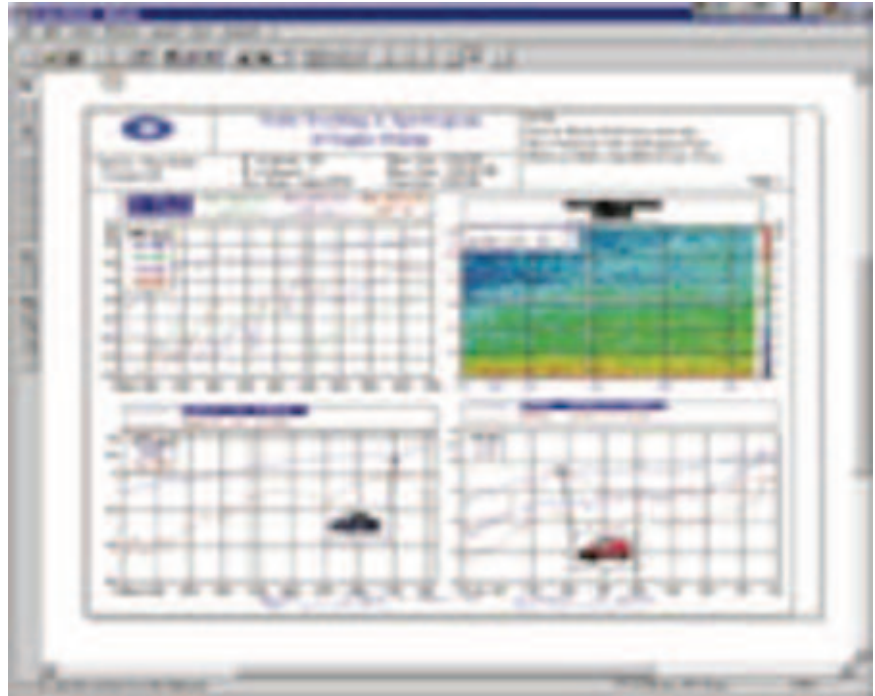


**Automotive - Order Tracking with spectrogram**

### Acoustic Intensity

- Support for ISO 9614
- Contour plotting (planar only)
- Overlay on DXF Autocad file of the measurement surface



**Acoustic Intensity superimposed on a drawing**

## Core DNA

| | |
|---|---|
| SWW-DNA | Core DNA Software and dongle (USB) for evaluation and reporting of data downloaded from the Larson Davis instruments, requires an instrument driver. |

### Real-Time Instrument Control, Acquisition and Data Download (instrument driver)

| | |
|---|---|
| SWW-DNA-SLM | Instrument driver provides instrument control, setup, live display, data translation, and data download for the Larson Davis Models 812, 820, 870 sound level meters. |
| SWW-DNA-2800 | Instrument driver for instrument control, setup, live display, data translation, and data download for the Larson Davis Models 2800, 2900, 3000+, 3200. |
| SWW-DNA-720 | Instrument driver for instrument control, setup, live display, data translation, and data download for the Larson Davis Models 712 & 720. |
| SWW-DNA-824 | Instrument driver for instrument control, setup, live display, data translation, and data download for the Larson Davis system 824 sound level meter. |
| SWW-DNA-831 | Instrument driver for instrument control, setup, live display, data translation, and data download for Model 831 sound level meter. |
| SWW-DNA-LXT | Instrument driver for instrument control, setup, live display, data translation, and data download for the SoundTrack LxT sound level meter. |
| SWW-DNA-HVM | Instrument driver provides instrument control, setup, live display, data translation, and data download for the Model HVM100. |

### ADVANCED PROCESSING

| | |
|---|---|
| SWW-DNA-REMOTE | DNA software for monitoring a remote location when using 820, 824, 870, 831, LXT. Uses modem connection for communication and data download. |

### ADVANCED PROCESSING

| | |
|---|---|
| SWW-DNA-EV | DNA option for events tracking: PNL and PNLT event time history and EPNL event, TRAIN 6-22 and 22-6 processing |
| SWW-DNA-MAP | DNA option for 3D color mapping |
| SWW-DNA-MOG | DNA option for optimized mapping using OpenGL, requires DNA Mapping |
| SWW-DNA-IY | DNA option for Industrial Hygiene |
| SWW-DNA-BA | DNA software Building Acoustics, allows calculation of transmission loss and sound insulation calculations. |
| SWW-DNA-DS-FA | Direct Store and File Audio option storing directly on a computer bypassing instrument memory. Includes CBL134 for downloading audio files. |
| SWW-DNA-TRK | Adds order tracking capabilities to the DNA software. |

### Multi User

| | |
|---|---|
| SWW-DNA-D-RTA1 | Extra Dongle for Multi User of 2800, 2900, 3000+ (USB ). |
| SWW-DNA-D-RTA2 | Extra Dongle for Multi User of SLM 824 / 831 (USB). |
| SWW-DNA-D-RTA3 | Extra Dongle for Multi User of SLM 824, 2800, 2900, 3000+ (USB). |
| SWW-DNA-D-SLM | Extra Dongle for Multi User of SLM 812, 820, 870 and HVM (USB). |

## Specifications

| | |
|---|---|
| Operating System Requirements | MS Windows® : XP Pro SP3, Vista Business Sp1 and Win 7 in 32-bit version and Win 7 in 64-bit. |

### Graphic Modules

| | |
|---|---|
| Graph models | XY-Graph, Time History, Spectrogram, Ln distribution |
| Tables | Numeric table, marker table, event table, exposure table (IH) |
| Axis control | Autorange, units (SI and user units), scale factors, log and lin |

### Graphic Objects

| | |
|---|---|
| Types | DNA Graphs and tables, text, drawing objects, pictures, mediafiles |
| Size | Manual, snap to grid |
| Location | Manual, snap to grid |
| Alignment | Horizontal, vertical and distribution |
| Copy & Paste | For all graphic objects |
| Export | As bitmap, as metafile |

## LARSON DAVIS
### A PCB PIEZOTRONICS DIV.

3425 Walden Avenue, Depew, NY 14043-2495 USA
**Phone** 716-926-8243
**Toll-Free in USA** 888-258-3222
**Fax** 716-926-8215   **E-mail** sales@larsondavis.com
**Web Site** www.larsondavis.com
ISO 9001 CERTIFIED

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For environmental noise monitoring and building acoustics, **Larson Davis** offers a full line of instruments, accessories and software. For personal noise and vibration exposure monitoring, Larson Davis complements this with sound level meters, personal noise dosimeters, human vibration meters, audiometric calibration systems and hearing conservation programs.

*Visit* **www.larsondavis.com** *to locate your nearest sales office*