

VisualTR™

The Waveform Analysis Acceleration Tool

Modern AE equipment captures waveforms in high speed and resolution! But how long does it take to get the meaningful information from the waveforms? A tool for efficient AE waveform analysis was urgently needed. It's now available: VisualTR.

VisualTR offers TR-Diagrams, TR-Pages and TR-Windows. The TR-Diagram shows one waveform in time and/or frequency domain. Several diagrams can be grouped into a TR-Page. Several pages can be grouped into a TR-Window. Several TR-Windows can be simultaneously active.

This hierarchy lets the user conveniently compare waveforms of, e.g.:

- different hits of the same event
- first-hits of different events
- hits of different tests (stored on different files)
- different kind of displays of the same hit

TR-Diagrams let the user conveniently see

- any waveform of a file, selected by set number, by TR-index or by next/previous set commands
- the time or frequency domain of the currently selected waveform

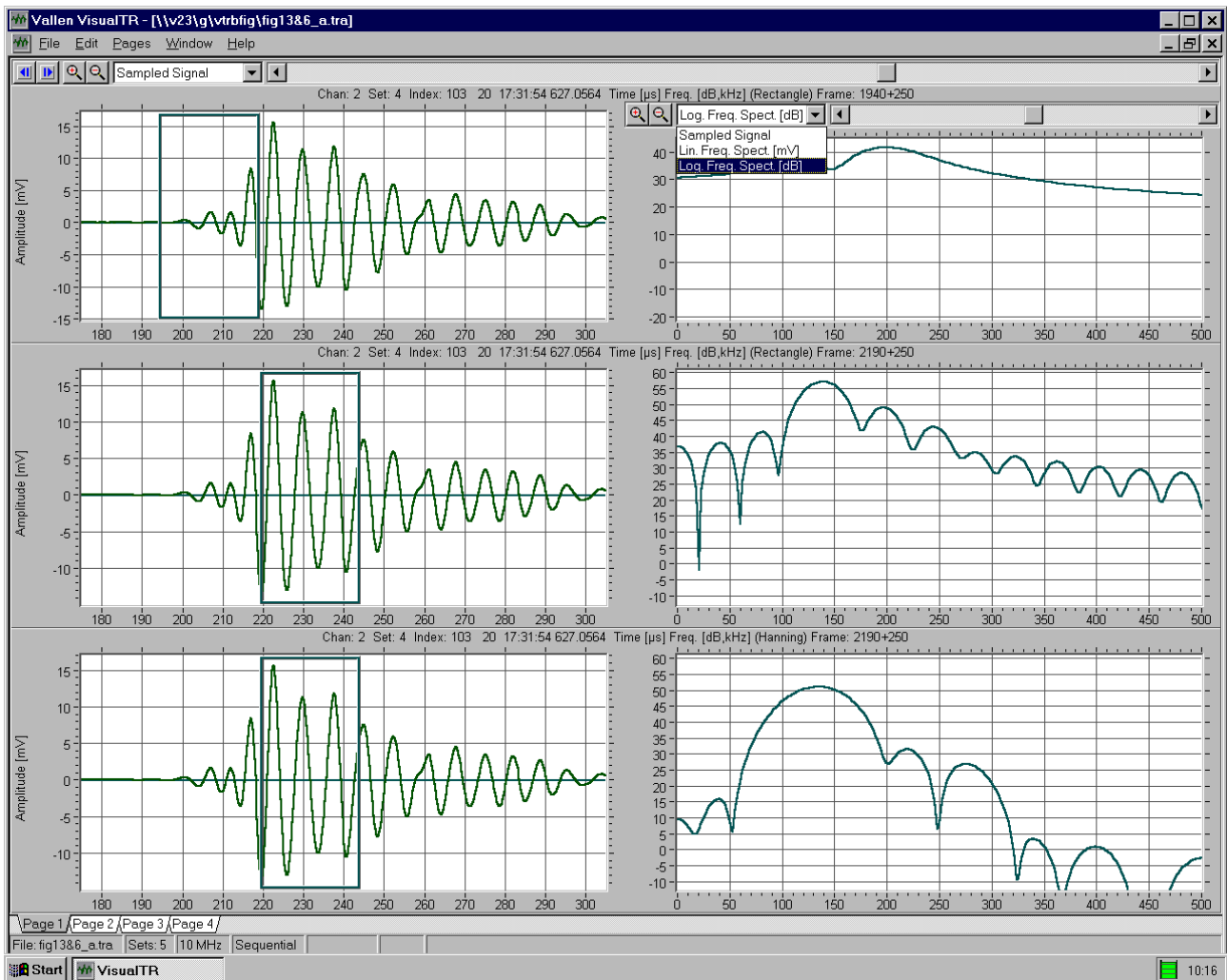


Fig.1: Waveforms (left) with FFT (right), the frames in the waveforms show the area from which the FFT is calculated. Calculating FFTs from different parts of the signal can cause remarkable differences in the spectra. The lower two FFTs differ because different windowing functions - middle: Rectangle, bottom: Hanning - are used.

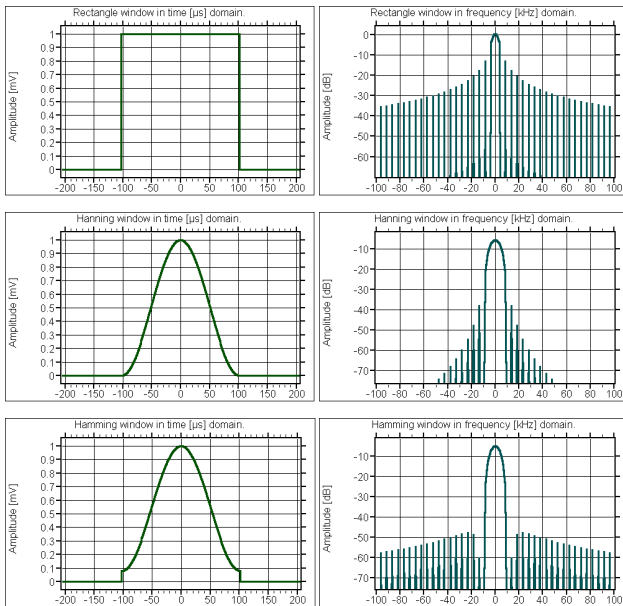


Fig.2: This figure shows a selection of three types of FFT-windows. Top down: Rectangle, Hanning, Hamming, left: time domain, right: frequency domain (logarithmic scale).

- an additional TR-client graph (on the right) showing user-selected details of the master graph - in time or frequency domain
- the spectrum in linear or logarithmic scaling, frequency scaling also selectable
- the smoothing effect on the spectrum by optional zero-extension of the waveform

- the effect of the following FFT-window functions: Rectangle, Hamming, Hanning, Welch, Bartlett, Trapezium (Fig.2)
- the effect of digital frequency filtering with user-defined cut-off frequencies and steepness (Fig.3)
- the envelopes of different frequencies obtained from Gaussian cross-correlations (plate mode analysis, Fig.3 upper graph).

Any data set of the selected TR-file can be shown in any TR-Diagram. Each diagram can independently scale, scroll, zoom, split into a time and a frequency graph, be copied (ASCII or graphical bitmap format) to any other Windows application via clipboard, and more.

TR-Pages are groups of TR-diagrams (like e.g. Fig.1), ideal for arranging signals for contrast, presentation and/or printout. For each page a header and a bottom text can be edited and printed. Several pages can be set-up. Tabs are provided for the easy selection of a page by a single mouse click.

TR-Windows contain one or several pages showing waveforms of the same file. To compare waveforms from different files, more than one TR-Window can be opened in **VisualTR**.

Fig.1 shows a **VisualTR** window with four TR-pages, the TR-page in the foreground shows three TR-diagrams. At the bottom, you can see the Tabs to select the other TR-pages.

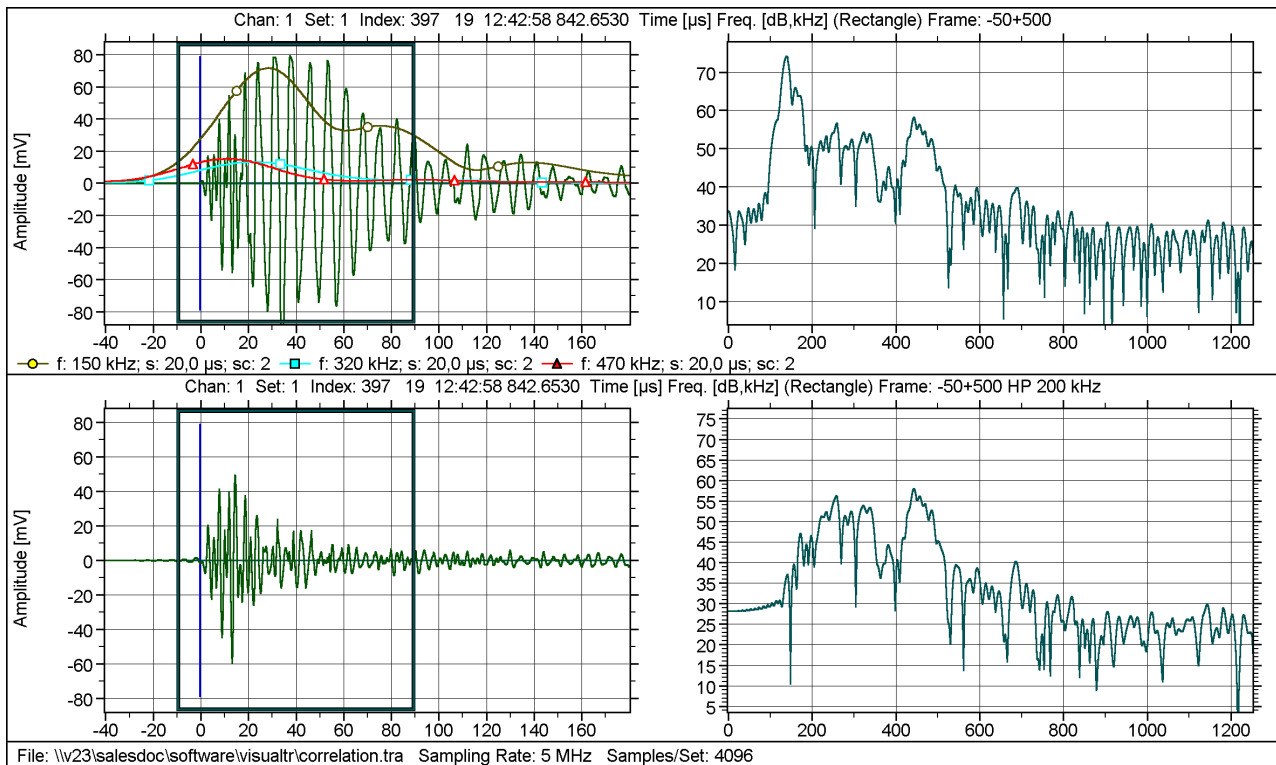


Fig.3: The left graphs show one signal in time domain, the lower one is digitally filtered (highpass 200kHz, 80dB/octave). The right diagrams show the FFT of the areas indicated by blue frames in time domain. The three lines (yellow, blue, red) in the upper left diagram show the narrow band frequency evolution over time (150, 320, 470 kHz).

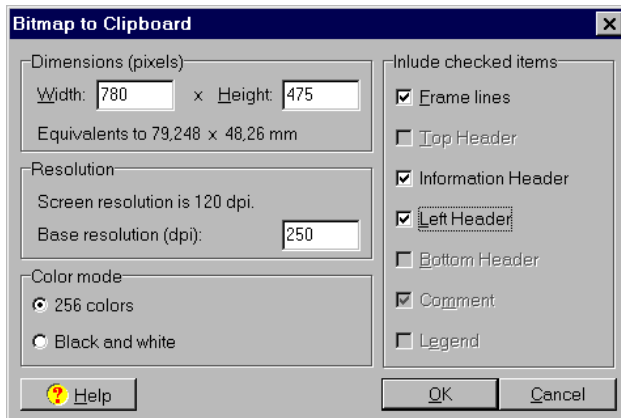


Fig.4: Bitmap to Clipboard window, showing the adjustable details.

Implemented in **VisualTR** is a powerful printing functionality. From anywhere in the software you can access it by simply pressing F2. Then you may select details such as the orientation (portrait/landscape), position and/or size on the printer page.

VisualTR also has a powerful copy to clipboard tool. It provides easy export of a complete page or only one selected TR-diagram in any desired pixel resolution, with or without header/legend texts to the windows clipboard. This makes import of graphs to your reports quick and easy. In a similar manner any waveform can be exported in ASCII format, e.g. for user-programmed signal processing.

Like the other Vallen Visual Family programs, **VisualTR** is a 32-windows program that takes full benefit of today's 32-bit PC-technology: No memory restriction, any Windows supported printer and graphic display can be used in full resolution, network supported (data file can reside anywhere in the network), just to mention a few.

During data acquisition, **VisualTR** is connected to the acquisition program via the Vallen-Systeme Scheduler which allows an immediate application of all the powerful tools to online-data.

Example: A closer look at thresholds

The first threshold crossing is commonly used as definition for the signal's arrival time at the sensor. This point of time together with the material's appropriate speed of sound is used for calculating the location of an event. The threshold should be selected carefully by the operator. As shown in Fig.5 an increase of the threshold from 50 to 65µV would cause a change in the arrival time of approximately 35µsec (@18cm difference in location!). **VisualTR** is a helpful tool e.g. in explaining why location results sometimes differ from expectations.

VisualTR is easy to learn and comes with an extensive online help text. There is also an introductory exercise with AE data for fast learning of the program's features.

VisualTR visualizes TR-data in an organized fashion - through windows, pages and diagrams.

VisualTR provides fast and efficient Acoustic Emission Waveform Analysis.

VisualTR is included in the software option SWTRU. **TR-View**, a version of **VisualTR** with reduced functionality is included in the basic software package SWB.

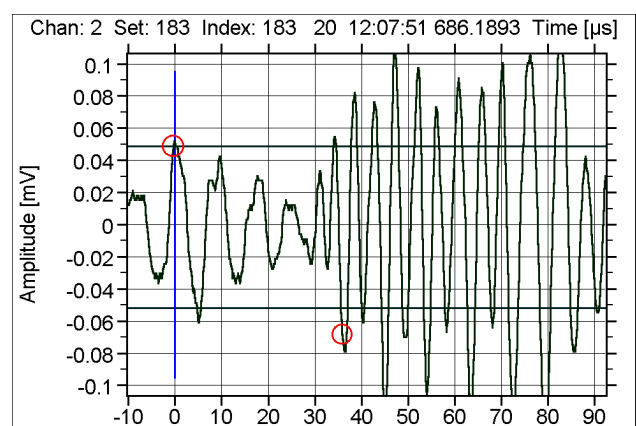


Fig.5: The transient data of a signal in the region of the first threshold crossing. VisualTR helps to find out why location results sometimes differ from expectations.

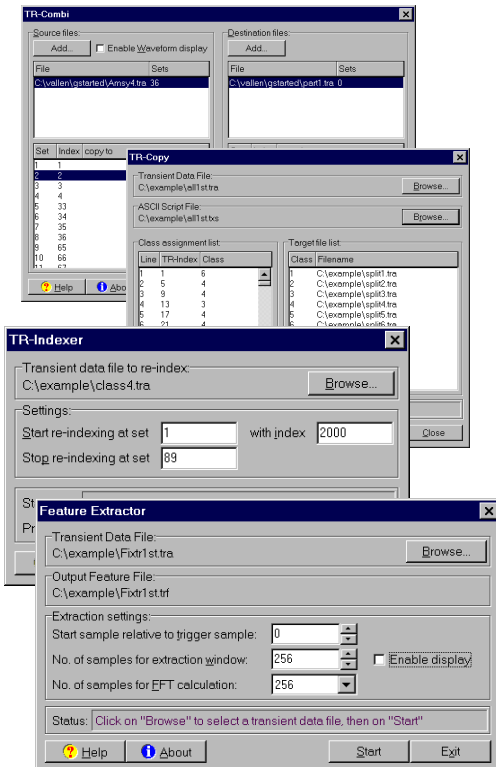
VisualClass

To evaluate high numbers of waveforms by looking at each single waveform, searching for similarities or differences is hard and time consuming. **VisualClass** finds similarities and differences in large numbers of waveforms quickly and automatically. Using this classification tool you will be able to evaluate any amount of transient data through use of only a few mouseclicks.

If you are interested in automatized waveform analysis request the **VisualClass** data sheet, the most powerful pattern recognition software for the classification of AE signals.

Speed up your analysis!

Tools included in VisualTR:



TR-Combi

eases the selection of learning data from multiple input files to one output file per class for the efficient building of a data base for the training of a classifier.

TR-Copy

copies the waveforms from one input file to one output file per class according to a list (CLASS vs TRAI) that can be generated e.g. automatically by the AE-multi-plot program or manually by the user. Helps to establish a learning data base for the training of a classifier.

TR-Indexer

Re-numbers the TR indices in a TR-file before combining TR data of different input files. Eases to keep track which waveforms came from which test.

Feature Extractor

extracts features from waveforms, (e.g. spectrum center of gravity) for listing, plotting or filtering in the SWB multi-plot program

VisualTR Highlights

- highly developed, full 32bit software for waveform analysis
- ability to organize your data acquired by AMS3 or AMSY4 using windows, pages and diagrams for comparison and presentation
- developed for online-analysis without affecting the data-acquisition
- intuitive graphic interface and full compatibility with all Windows software, extensive online-help
- powerful printing and copy to clipboard functions
- digital frequency filtering
- selectable FFT window functions
- and many more

Vallen - Systeme GmbH

Schäftlarnar Weg 26
 D - 82057 Icking (Munich)
 Germany
 Tel: +49 8178 9674-400
 Fax: +49 8178 9674-444
 email: info@vallen.de
 internet: http://www.vallen.de

Represented by:

Specifications are subject to change as product developments are made.