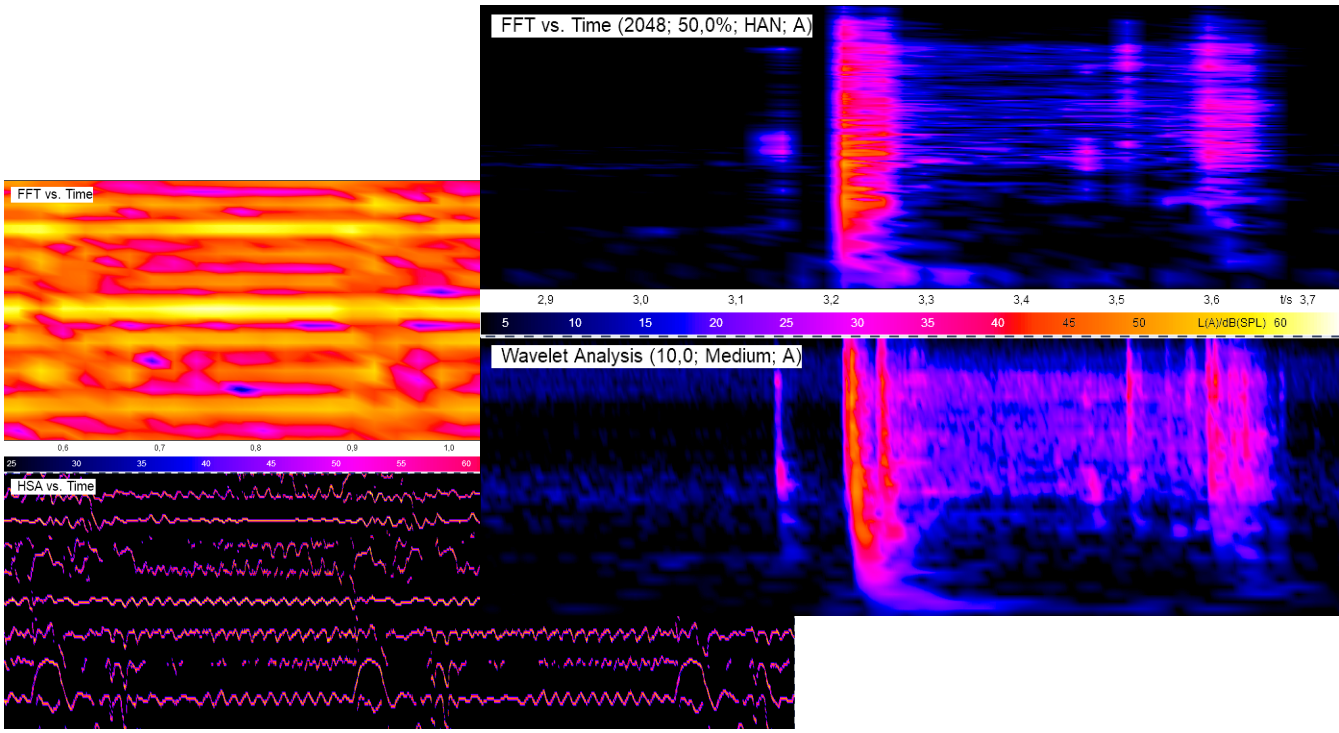
HEAD acoustics

DATA SHEET



ArtemiS SUITE
Signal Processing

Code 51003

ASP 003 Advanced Analysis

Advanced Analysis of ArtemiS SUITE provides sophisticated analyses, such as spectral analyses with a high or variable frequency resolution for examining short, transient signals, for using in Pool Projects, Automation Projects, Standardized Test Projects, and Metric Projects.

OVERVIEW

ASP 003 Advanced Analysis

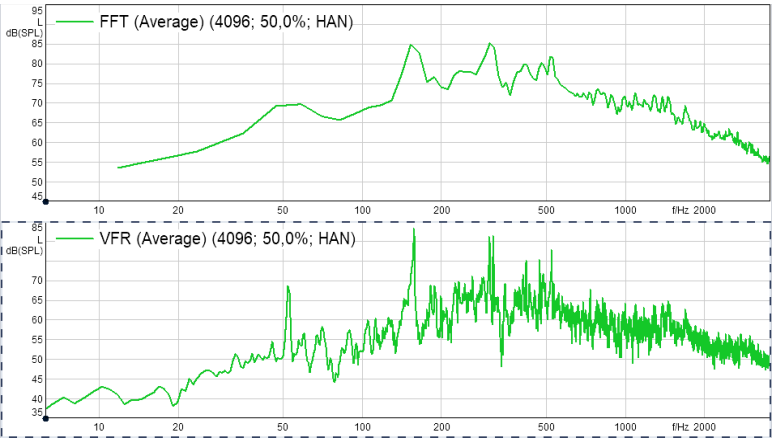
Code 51003

Advanced Analysis enables the use of advanced, highly sophisticated examination analysis methods that go beyond the normal analysis such as FFT analyses, for example.

The High-Resolution Spectral Analysis (HSA) is better suited than for an analysis of tonal components in nonstationary signals than the FFT, because it reduces the blurring effect of the window spectrum on the analysis result. Furthermore, it offers a many times higher time and frequency resolution than the FFT at the same time.

The VFR can be used as ear-related analysis and it is similar to human hearing optimized for the analysis of the low-frequency spectral components of an audio signal. The Wavelet analysis has proven to be especially suitable for examining short, transient signals, such as cycles of a combustion engine.

In addition, other analyses for special applications are available.



KEY FEATURES

Advanced Analysis includes several advanced analyses:

- Spectral analyses
  - HSA vs. Time
  - HSA (average)
  - VFR vs. Time
  - VFR (average)
  - Wavelet
- Other analyses
  - Gated DFT vs. Time
  - Gated DFT (average)
  - Cepstrum
  - Cepstrum vs. Time
  - Kurtosis vs. Time
- Usage
  - The Wavelet and VFR analyses can be used especially when a spectrum includes short, transient or tonal sound components
  - The HSA analysis can be used especially to examine low-frequency tonal sound components

The analyses can be used in Pool Projects (require APR 010), Automation Projects (require APR 050), Standardized Test Projects (require APR 220), and Metric Projects (require APR 570)

APPLICATIONS

- Examination of imbalances
- Analysis of cycle-synchronous data (combustion engines)
- Troubleshooting
- Sound-Engineering

DETAILS

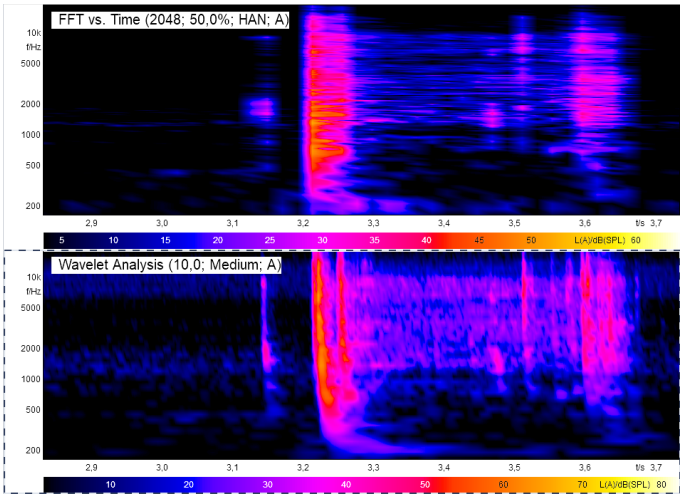
The provided advanced analyzes facilitate the sophisticated examination of input signals.

HSA vs. Time, HSA (average)

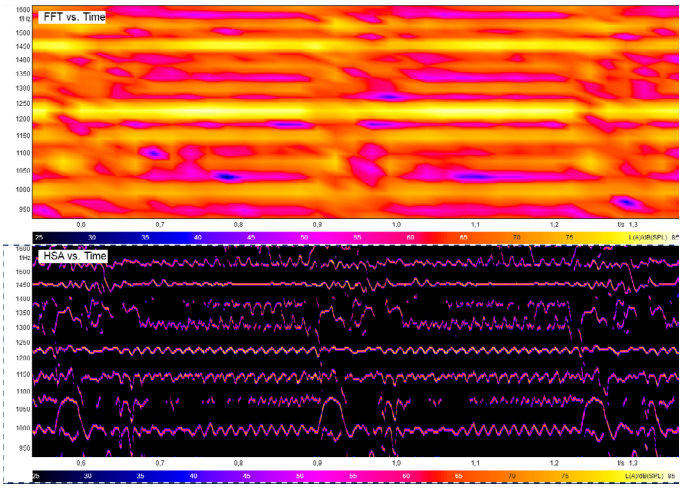
The HSA (High-resolution Spectral Analysis) method is a special signal estimation algorithm, which improves the analysis of tonal components in a signal. This applies especially to short signal sections, where HSA has great advantages compared to the conventional FFT analysis. Frequency and level can be seen more accurately and the „smearing" due to windowing is removed.

VFR vs. Time, VFR (average)

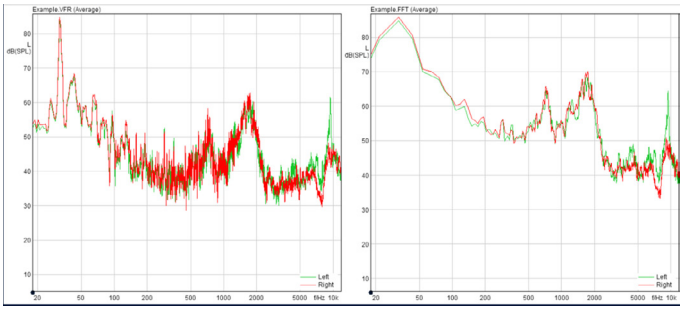
The VFR (Variable Frequency Resolution) analysis is based on the FFT analysis, but features a variable frequency resolution, which is better suited for analyzing low-frequency spectral components of a time-domain signal than the FFT. While the FFT delivers a spectral representation with a constant frequency resolution across the entire frequency range covered, the VFR is more similar to human hearing in that it has a higher frequency resolution at low frequencies than at higher ones.



Comparison: FFT vs. Time, Wavelet



Comparison: HSA vs. Time, FFT vs. Time



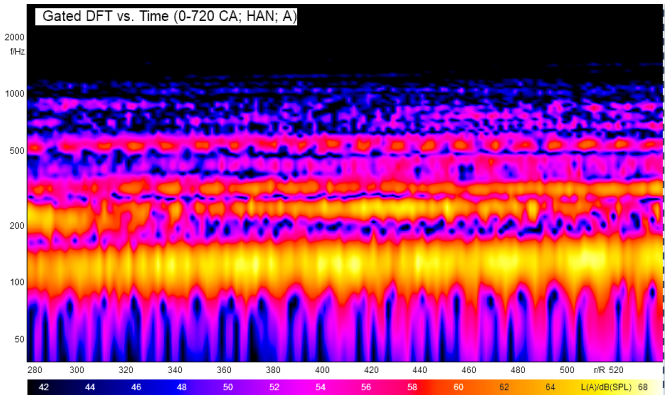
VFR (average), FFT (Average)

Wavelet

The wavelet analysis is particularly suited for examining short, transient signals, such as cycles of a combustion engine. Transient means that the sound is characterized by rapid, non-periodic changes. The wavelet analysis (as compared to the FFT analysis) is characterized by a high frequency resolution at low frequencies and, at the same time, a high time resolution at high frequencies.

Gated DFT vs. Time, Gated DFT (average)

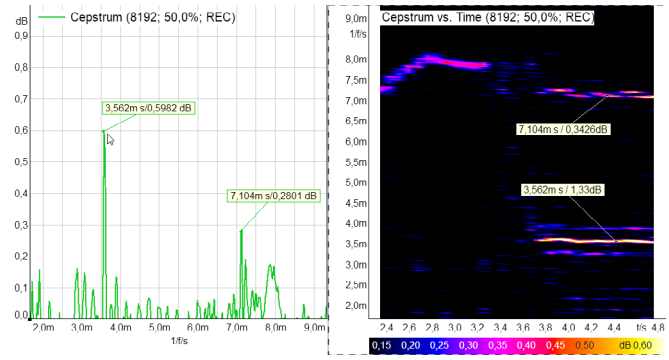
The Gated DFT analyses calculate the (averaged) gated DFT of an input signal. The continuous time signal is separated into short time segments and stored in a 3D HDF file. This way it is possible to even represent time signals as spectrogram or waterfall diagram.



Gated DFT vs. Time

Cepstrum, Cepstrum vs. Time

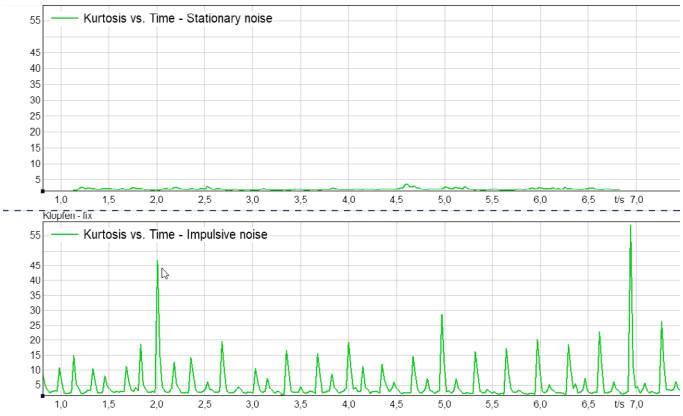
The Cepstrum analyses calculate the "real cepstrum" of an input signal. Therefore, the absolute value of the logarithm of the spectrum is transformed resulting in a symmetric real signal vs. time. Of that signal the positive half is displayed. For example, echoes and other periodicities can be identified in the signal this way.



Cepstrum, Cepstrum vs. Time

Kurtosis vs. Time

The Kurtosis analysis can be used as a measure for the impulsiveness of a signal. If a sufficiently large set of reference signals has shown a corresponding correlation, Kurtosis can be used very well as quick determination criterion of the form "good"/"bad" or "OK"/"not OK".



Kurtosis vs. Time

Required: APR Framework (Code 50000)

and/or: HEAD System Integration and Extension (ASX) programming interfaces

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