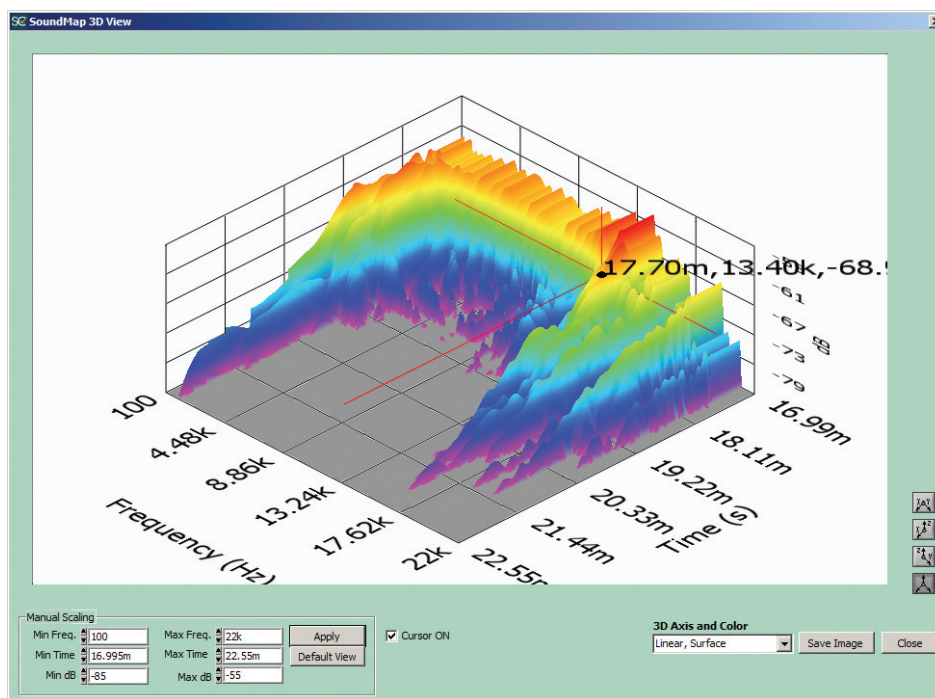




Time Frequency Analysis

The SoundMap Module / Software



3D Waterfall plot (CSD) showing impulse response of a loudspeaker

Introduction

The SoundMap™ Time Frequency Analysis module enables detailed analysis of signals simultaneously in both the time and frequency domain. It is ideal for impulse response analysis and detection of loose particles and Rub & Buzz in loudspeakers. It is also valuable for identification of transient effects such as drop out in digital devices including VoIP and Bluetooth headsets.

It offers four different analysis options:

- Cumulative Spectral Decay (CSD) – also known as waterfall plots
- Short Time Fourier Transform (STFT)
- Wavelet
- Wigner-Ville

SoundMap offers far more flexibility than conventional 'waterfall plot' software, and more accurate and psychoacoustically significant analysis options. A variety of display options include 3D waterfall plot, intensity map with time and frequency slices, instantaneous spectrum, frequency time curve, time envelope and others. A "slice" can be viewed in either the time or frequency domain for in-depth examination of any result.

In addition to analyzing data collected in SoundCheck, SoundMap can read data from any WAV file, ASCII text file or even a MLSSA TIM file, therefore can be used to analyze data collected on other instrumentation.

Analyses

Cumulative Spectral Decay (CSD) – also known as Waterfall Plots

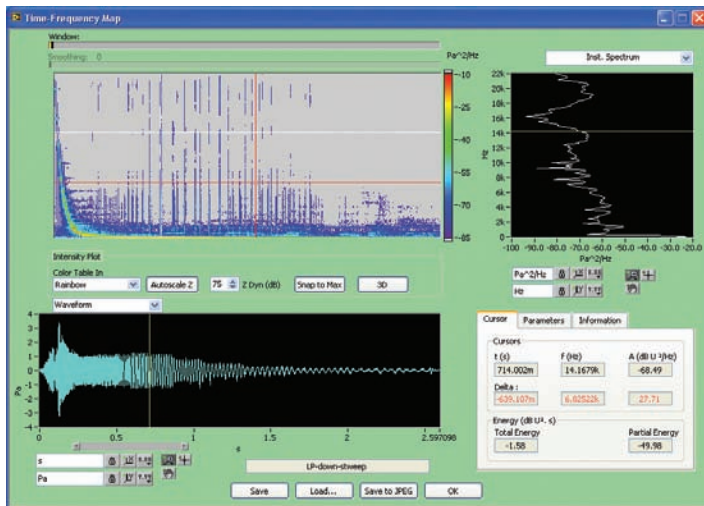
Cumulative Spectral Decay is the traditional tool for impulse response analysis of loudspeakers. It calculates the "ringing" of the loudspeaker for each frequency using the impulse response. Data can be output in a variety of formats including the widely-used three-dimensional 'waterfall plots'.

Short Time Fourier Transform (STFT)

The Short Time Fourier Transform is a general purpose algorithm which enables observation of the spectral changes of a signal over time. This method is ideal for the detection of manufacturing defects such as loose particles and Rub & Buzz in loudspeakers, measurement of settling time and ringing in devices including loudspeakers and telephones, and analysis of dropouts, discontinuities and instabilities in digital devices.



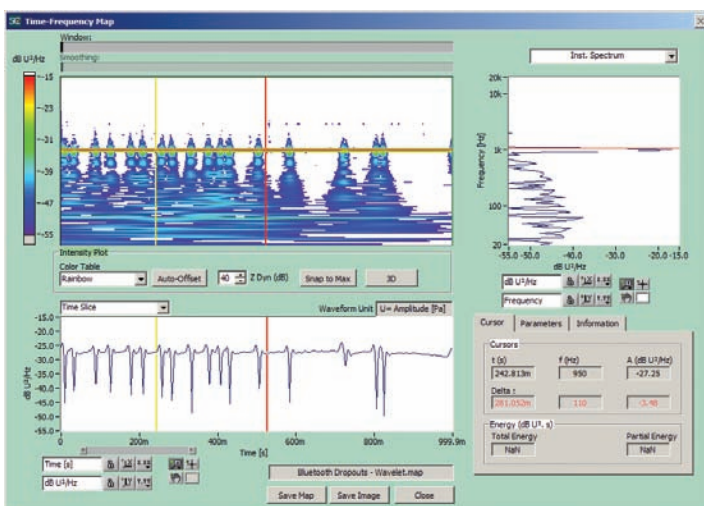
Time Frequency Analysis (cont.)



STFT Analysis showing loose particles in a loudspeaker

Wavelet

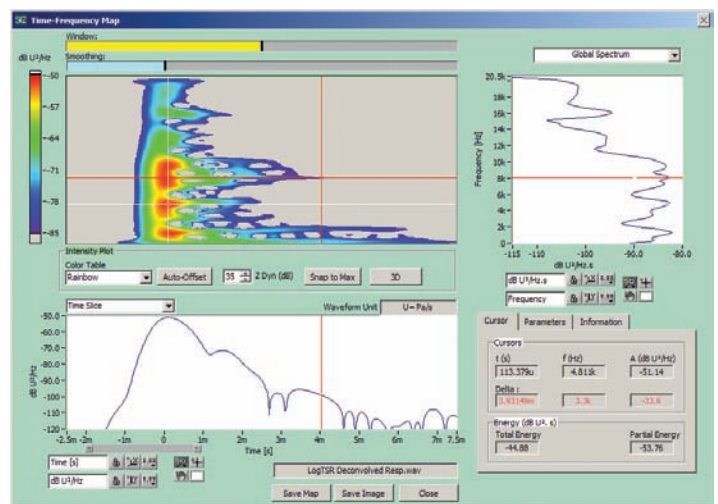
Wavelet analysis differs from CSD and STFT analysis in that it uses constant percentage bandwidth rather than constant frequency bandwidth. This offers better time resolution at high frequencies and better frequency resolution at the lower end of the spectrum. This is advantageous as it is more psychoacoustically significant and it is easy to see the entire 20Hz – 20kHz spectrum in one picture. Applications for wavelet analysis are generally the same as for STFT analysis described above; the algorithm selected depends on whether constant frequency or constant percentage bandwidth is preferred.



Wavelet analysis presented as a time-frequency map to show Bluetooth dropout

Wigner-Ville

Wigner-Ville is the ultimate algorithm for detailed analysis of very short events, for example fine analysis of transients or in-depth observation of rapidly evolving signals. Offering an output resolution of one spectrum per sample, it is the maximum achievable precision. It complements the more commonly used analysis methods discussed above.



Wigner-Ville analysis of the Impulse response of a loudspeaker showing a time-slice at 3.69 kHz and the global spectrum.

Please see Listen website for full technical specifications.

Ordering Information

There are 2 SoundMap versions.

Part# 1300 SoundMap Time Frequency Analysis Full version (CSD, Short Time Fourier, Wigner-Ville, Wavelet)

Part# 1301 SoundMap CSD (Cumulative Spectral Decay) analysis only

SoundMap is available as a module for your Sound-Check system, or as a stand-alone product. Please specify at time of ordering.