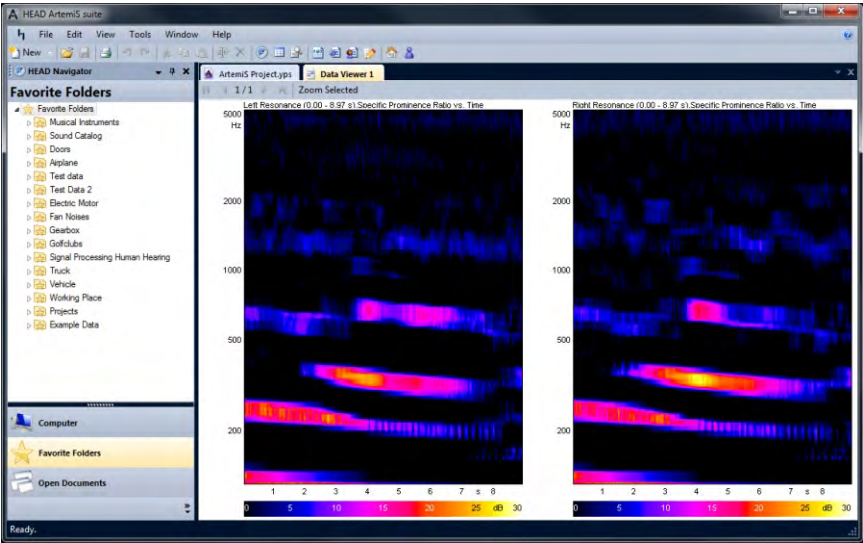


**ArtemiS SUITE Psychoacoustics  
 Module (Code 5012)**

Expansion module for the evaluation of sound measurements based on psychoacoustic parameters



**Overview**

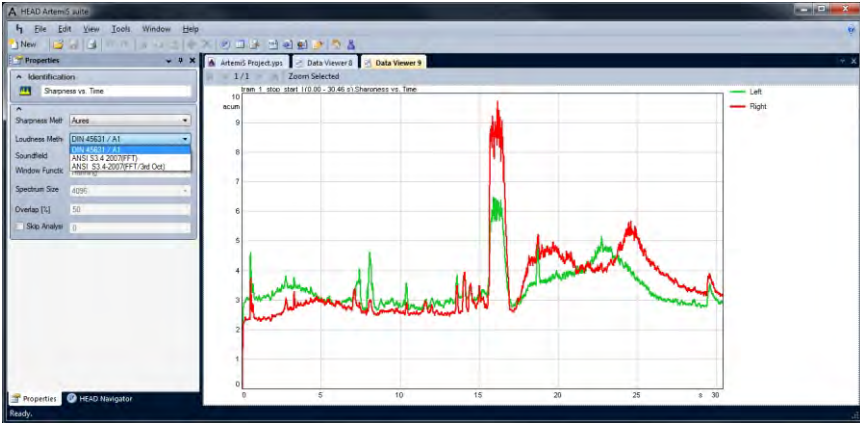
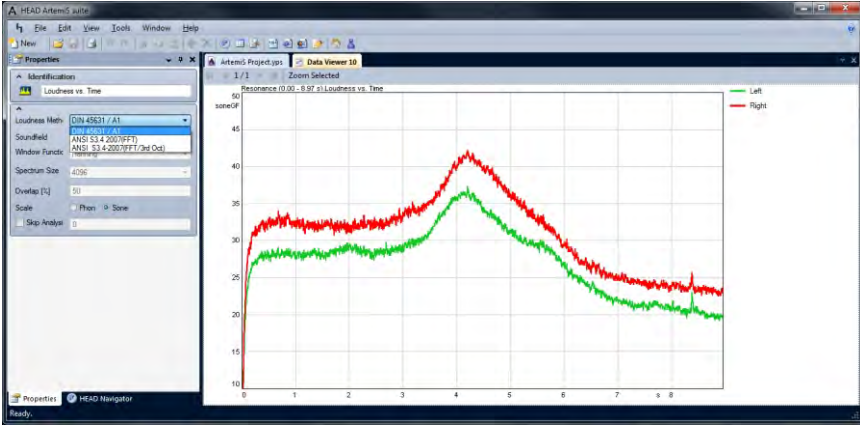
The psychoacoustics module provides various functions and parameters for the objective description of subjective sound experiences. Particularly the analyses loudness vs. time (DIN 45631/A1, ANSI S 3.4-2007) and sharpness vs. time (according to DIN 45692, Aures and von Bismarck) make the analysis of sound files possible under consideration of the specifics of the human hearing.

**Features**

- Expansion module of the ArtemiS SUITE with psychoacoustic analyses
- Loudness vs. time / Spec. Loudness vs. time according to DIN 45631/A1 / ANSI S 3.4-2007 (FFT/FFT 3rd Octave)
- Indication of the N5-percentile value in the legend at the calculation of loudness according to DIN
- Sharpness vs. time according to DIN 45692 / Aures / von Bismarck
- Spec. Prominence Ratio / Spec. Prominence Ratio vs. time
- In addition to the analyses included in the Psychoacoustics Module of the ArtemiS SUITE, ArtemiS 12 provides the analyses of the Psychoacoustics Module ATP 02

**Requirements**

- ArtemiS SUITE Basic Framework (Code 5000)
- ArtemiS SUITE Basic Analysis Module (Code 5001)



Analysis results and properties of the analyses Loudness vs. time (upper diagram) and Sharpness vs. time (lower diagram)

## Analysis Pool

### Loudness vs. time / Spec. Loudness vs. time

Calculation method:	DIN 45631/A1 / ANSI S3.4-2007 (FFT / FFT/3rd Octave)
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectrum Size:	16 - 2 <sup>23</sup>
Soundfield:	Free / Diffuse
Overlap:	1 - 99 %
Frequency Scale:	Hz / ERB
Scale:	Phon / Sone, Hz / Bark
Max. Nbr of Time Values:	Adjustable
DIN 45631/A1:	Transient oscillation effects (display in diagram) can be suppressed
Cuts:	Extracting of 2D curves from the three dimensional spectrum (Cut Mode: First Abscissa / Second Abscissa / Free selectable cuts)

### Sharpness vs. time

Sharpness method:	Aures / von Bismarck / DIN 45692
Soundfield:	Free / Diffuse
Loudness Algorithm:	DIN 45631/A1 / ANSI S3.4-2007 (FFT / FFT/3rd Octave)
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8, 16, 32
Spectrum Size:	16 - 2 <sup>23</sup>
Overlap:	1 - 99 %
DIN 45631/A1:	Transient oscillation effects (display in diagram) can be suppressed

### Spec. Prominence Ratio / Spec. Prominence Ratio vs. time

Bands:	Critical Bands / Third Octave Bands
Overlap:	1 - 99 %
Spectrum Size:	2 <sup>12</sup> - 2 <sup>16</sup>
Resolution:	24th Octave / 48th Octave / DFT
Critical Band Calculation:	Geometric Extrapolation / ECMA-74 8th edition / ECMA-74 9th edition
Reduction of the Spectrum on Tones	
Compensate Threshold of Hearing	
Tolerance:	User-specific
Cuts:	Extracting of 2D curves from the three dimensional spectrum (Cut Mode: First Abscissa / Second Abscissa / Free selectable cuts)

The Signature Analysis Module of the ArtemiS SUITE (ASM 13) extends the functionality of other modules. The following analysis types are only available with the combination of the Psychoacoustics Module and the Signature Analysis Module:

### Loudness vs. RPM

### Spec. Loudness vs. RPM

### Octave Spectrum vs. RPM

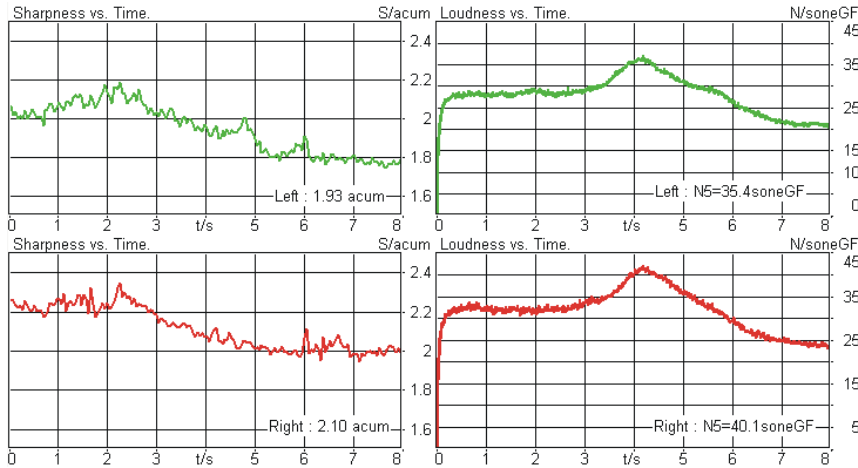
**ATP 02 (Code 5012)**

**ArtemiS Psychoacoustics Module**

for the evaluation of sound measurements based on psychoacoustic parameters  
 ASM 12 (Code 5012) of the ArtemiS SUITE includes ATP 02.

**Overview**

The psychoacoustics module provides various functions and parameters for the objective description of subjective sound experiences. Particularly the analyses loudness vs. time (according to DIN 45631/A1, ANSI S 3.4-2007, ISO 532 B and HEAD algorithm) and sharpness vs. time (according to DIN 45692, Aures and von Bismarck) make the analysis of sound files possible under consideration of the specifics of the human hearing. Loudness Adaptation is a separate application which can be started from ArtemiS. It allows the adaptation of 2-channel soundfiles e.g. for listening tests or synthesis of target sounds.

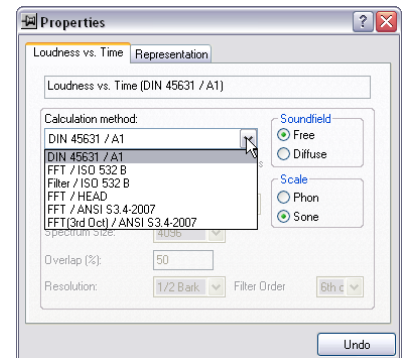


**Features**

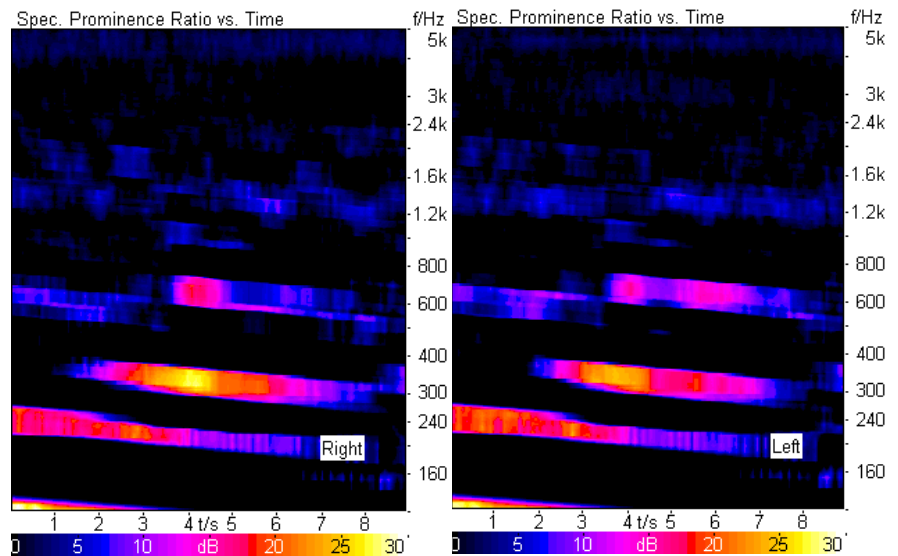
- Loudness vs. time / Spec. Loudness vs. time
- Calculation methods: DIN 45631/A1 / ANSI S 3.4-2007 / ISO 532 B / HEAD Algorithmus
- Indication of the  $N_5$ -percentile value in the legend at the calculation of loudness according to DIN
- Roughness vs. time / Spec. Roughness / Spec. Roughness vs. time
- Fluctuation Strength vs. time / Spec. Fluctuation Strength / Spec. Fluctuation Strength vs. time
- Sharpness vs. time (according to DIN 45692 / Aures / von Bismarck)
- Tonality vs. time
- Articulation Index vs. time
- Speech Intelligibility Index vs. time
- Speech Interference Level vs. time
- Spec. Prominence / Spec. Prominence Ratio vs. time
- Loudness Adaptation

**Applications**

- Objectivation of subjective judgements of sound events
- Classification of sound events based on psychoacoustic parameters
- Correlation of sound event vs. hearing event using objective parameters
- Evaluation of speech intelligibility and transmission quality



Configuration options: Loudness vs. time



Analysis results (Spec Prominence vs. time)

## Technical data

### **Loudness vs. time / Spec. Loudness vs. time**

Soundfield:	free / diffuse
Scale:	phon / sone
Calculation method:	DIN 45631/A1 ANSI S3.4-2007 (FFT/FFT 3rd Octave) ISO 532 B (filter/FFT) HEAD algorithm
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8 - 32
Spectrum Size:	$16 - 2^{20}$
Resolution (HEAD):	$\frac{1}{2}$ Bark - Bark
Overlap:	0 - 99.9 %
Filter / ISO 532 B	
Filter Order:	4th Ord. / 6th Ord.
Loudness vs. time	
Filter / ISO 532 B:	transient oscillation effects (display in diagram) can be suppressed

### **Roughness vs. time / Spec. Roughness / Spec. Roughness vs. time**

Frequency scale:	Hz / Bark
Roughness vs. time:	transient oscillation effects (display in diagram) can be suppressed

### **Sharpness vs. time**

Sharpness method:	Aures / von Bismarck / DIN 45692
Sound field:	free / diffuse
Loudness algorithm:	DIN 45631/A1 ANSI S3.4-2007 (FFT/FFT 3rd Octave) ISO 532 B (filter/FFT) HEAD algorithm
Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8 - 32
Spectrum Size:	$16 - 2^{20}$
Overlap:	0 - 99.9 %
Resolution (HEAD):	Bark - Bark
Filter / ISO 532	
Filter Order:	4th Ord. / 6th Ord.
DIN 45631 / filter/ISO 532 B:	transient oscillation effects (display in diagram) can be suppressed

### **Fluctuation Strength vs. time / Spec. Fluctuation Strength / Spec. Fluctuation Strength vs. time**

Frequency scale:	Hz / Bark
Resolution:	Bark - Bark
Fluctuation Strength vs. time:	transient oscillation effects (display in diagram) can be suppressed

### **Spec. Prominence Ratio / Spec. Prominence Ratio vs. time**

Bands:	3rd octave / critical bands
Overlap:	0 - 99.9 %
Spectrum size:	$2^{12} - 2^{16}$
Resolution:	$\frac{1}{24} - \frac{1}{48}$ octave / DFT
Critical bands calculation:	Geom. extrapolation / ECMA-74 8th Edition / ECMA-74 9th Edition
Reduction of the spectrum on tones	
Compensation threshold of hearing	
Spec. Prominence Ratio	
Tolerance:	user-specific

### **Articulation Index vs. time**

Filter	
Filter Order:	4th / 6th order
Time Weighting: (0 - 10000 ms)	Fast / slow / impulse / manual

### **DFT**

Window Function:	Rectangle / Hanning / Hamming / Blackman / Bartlet / Kaiser-Bessel 8 - 16 / Flat-top / Gauss 8 - 32
Spectrum Size:	$16 - 2^{20}$
Overlap:	0 - 99.9 %
Band border freq.:	Nominal / Octave / Decade

### **Speech Intelligibility Index vs. time**

Method:	octave / 3rd octave / critical bands
Speech spectrum:	standard / idealized / user- defined
Vocal effort:	normal / raised / loud / shout
Time Weight:	fast / slow / impulse / manual
Distance (m):	1 - n

### **Tonality vs. time**

Overlap:	0 - 99.9 %
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### **Speech Interference Level vs. time**

SIL Type:	SIL 3 (1 kHz - 4 kHz), SIL 4 (500 Hz - 4 kHz), PSIL (500 Hz - 2 kHz)
Time weight: (0 - 10000 ms)	fast / slow / impulse / manual

### **Loudness Adaptation**

Loudness methods:	time dependend time independend
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The functionality of the ArtemiS Psychoacoustics Module (ATP 02) is extended by the ArtemiS Signature Analysis Module (ATP 03). Further information you will find in the data sheet of ATP 03.