TECHNOLOGY, TEST PROCESSES & ENGINEERING SERVICES

# BSR SUITE

## *New algorithm for objective Squeak & Rattle testing*

### Designed for

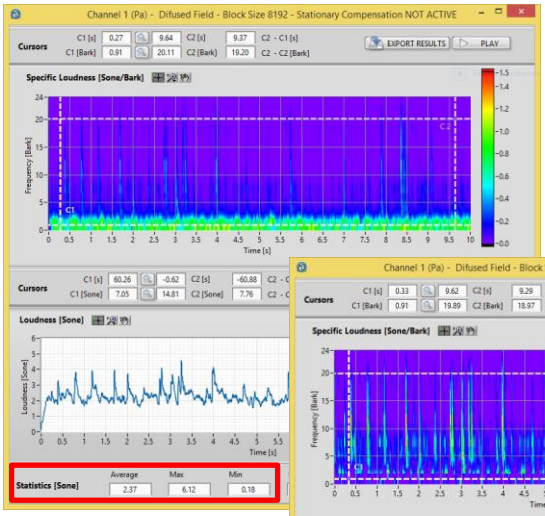
- Improved Squeak & Rattle tests of components & full vehicles
- Repeatable & Comparable production verfication Squeak & Rattle tests

### Features

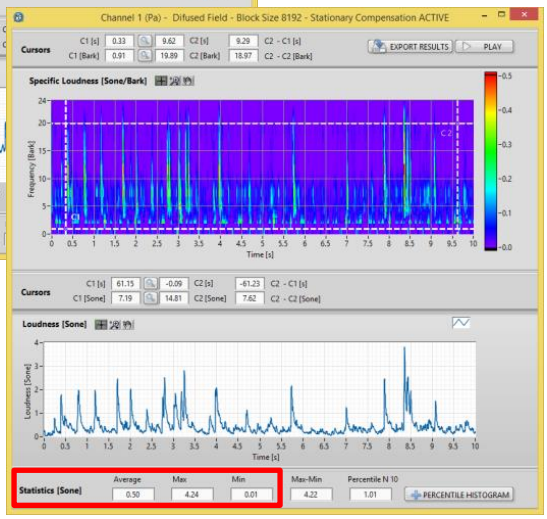
- Time Varying Loudness according to DIN45631/A1
- Switchable ***Adaptive Background Noise Compensation***
- Nx percentile levels
- Loudness spectra over time (sonogram)
- Time synchronized play-back & analysis
- Real-Time Analysis & Testing
- Import of Audio data (WAV)

### Key Differentiators

- Improves repeatability and comparability of objective Squeak & Rattle tests in different environments
- Reduces the influence of room acoustics
- Improves distinctiveness of good and noisy test item
- Adaptive Background Noise Compensation automatically adapts to changes in the excitation signal
- Easy & save: Works with different road profiles and test items without any adjustments
- Can be used for SINE, RANDOM & TIME HISTORY tests




**Loudness spectra over time without *Adaptive Background Noise Compensation*.**
**Deep frequency background noise is significantly influencing the time varying loudness level.**




***Adaptive Background Noise compensation* eliminates the stationary deep frequency background noise.**
**Time Varying Loudness is now determined by Squeak & Rattle noises.**

## Adaptive Background Noise Compensation

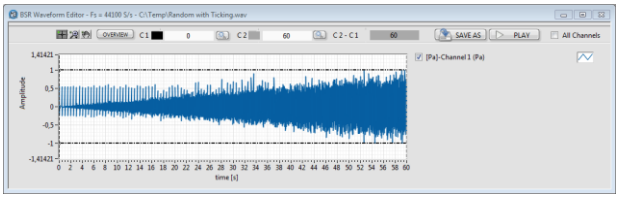
MB Dynamics GmbH has currently released a new algorithm for objective Squeak & Rattle testing. The algorithm is based on Time Varying Loudness according to DIN 45631/A1 and allows applying *Adaptive Background Noise Compensation* to audio measurements. *Adaptive Background Noise Compensation* removes stationary or slow changing environmental background noise like hum- or hiss-noise, room resonances and operating background noise radiated from the floor, fixture and test item. The influence of stationary background noise gets minimized while Squeak & Rattle noises can be detected more clearly. Differences in between test items with no BSR issues and noisy test items with overlaid Buzzes, Squeaks & Rattles become visible immediately.

By reducing the influence of environmental background noise, room acoustics and operating background noise the repeatability and comparability of objective Squeak & Rattle tests performed in different environments and on different test systems gets clearly improved. *Adaptive Background Noise Compensation* works with totally different excitation profiles (SINE-, RANDOM- or TIME HISTORY) without any adjustments to the algorithm. Objective Squeak & Rattle testing becomes repeatable, comparable, easy and save.

# *Background Noise Compensation is the decisive advantage*

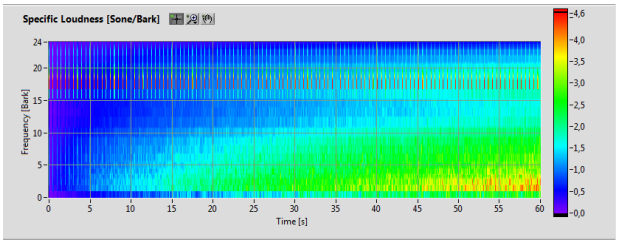
***Background noise has a major impact on all acoustic measurements.*** The use of quiet shaker systems is the basic requirement for BSR testing. Buzzes, Squeaks & Rattles must be clearly audible and must not be masked by the operating noise of the test system. MB Squeak & Rattle test systems meet the strict requirements on low operating background noise of different test procedures such as GMW14011, FORD CETP-L-413, BMW PR311-2 and others. However it should be noted that the resulting operating background noise inside the test room depends on a variety of additional factors such as environmental background noise, room acoustics and floor conditions inside the test room, fixture design and noise radiation from the fixture and test item. Typical Squeak & Rattle metrics such as N10 Time Varying Loudness, 1/3 octave band spectra or OCIAN are strongly influenced by the overall background noise. Differences in the operating background noise lead to larger deviations in the measurement results.

***Fixed HP-Filter is a work around but no solution.*** A fixed High-Pass filter at 300Hz as it is often used to filter out the operating background noise does not help to reduce the impact of high frequency noises like hiss or hum noise. Another major downside is that the total energy of deep frequency rattles gets reduced. As a result objective Squeak & Rattle measures of deep frequency impacts and rattles are not correlating to the subjective perceived loudness.

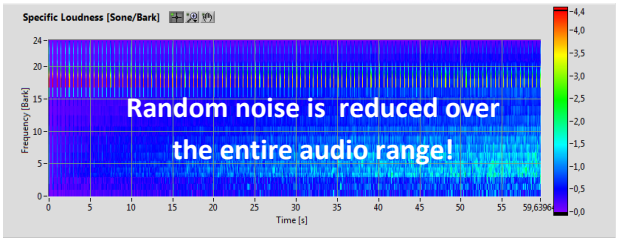


**Ticking noise with overlaid increasing random noise**

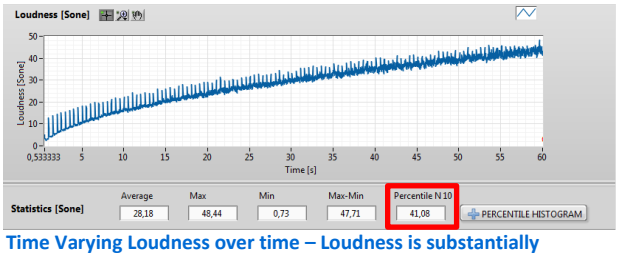
***Adaptive Background Noise Compensation (ABNC) over the entire audio range*** eliminates the influence of stationary or slow changing background noise without influencing the Loudness measures of overlaid Squeaks & Rattles. Test results are determined by the appearance of Squeaks & Rattles and not by background noise!



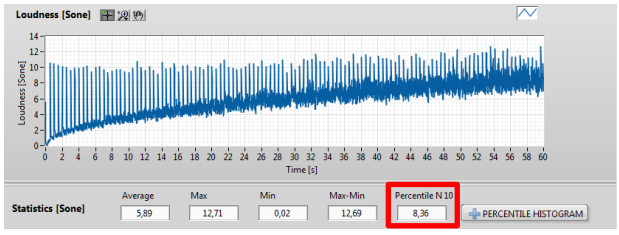

**Loudness spectra (2ms) over time – without compensation**




**Loudness spectra (2ms) over time – Background noise compensated**




**Time Varying Loudness over time – Loudness is substantially determined by the increasing random noise! (N10=41,08 Sone)**




**Time Varying Loudness over time, Loudness is determined by constant Loudness of ticking noise! (N10=8,36 Sone)**

***Real-time analysis enables production verification tests.*** BSR Suite enables Squeak & Rattle testing including *Adaptive Background Noise Compensation* in real-time. Testing against user definable thresholds, predefined test setups and a simple user interface makes objective Squeak & Rattle testing repeatable, safe and easy.

## *BSR SUITE*

### *Designed to Optimize Squeak & Rattle Testing*

| **BSR Suite - Analysis functions for objective Squeak & Rattle Testing** | |
|---|---|
| Filter | Low-Pass, High-Pass, Band-Pass & Band-Stop |
| Analysis | Time-Varying Loudness [Sone] & Specific Loudness spectra in compliance with DIN45631/A1 |
| Background Noise Compensation | Adaptive Background Noise Compensation over the entire audio frequency range |
| Level statistics | Average, Max, Min, Max-Min, Nx percentile levels |
| Testing | Real-time or offline testing against user definable thresholds, threshold curves or reference spectra |
| Data Import/Export | WAV-, TXT/CSV, RPCIII |