HEAD acoustics®

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HEADlines

| Editorial |

The changing face of mobility

Day by day, we all experience the far-reaching social and technological changes in the areas of mobility, transportation and communications. HEAD acoustics is observing these changes with great interest. These developments offer exciting opportunities and new challenges, but also risks. This is why we incorporate our ideas and visions for the future into the products and services of today, and why we actively participate in national and international research projects.

Prof. Dr.-Ing. Klaus Genuit
Managing Director

Besides the products and services from HEAD acoustics, which we continuously adapt to the wishes and requirements of our customers, our company is actively addressing the effects of a changing mobility. The transition from combustion-engine to electric vehicles poses many challenges to our researchers and developers. We focus not only on the acoustic and vibration-related comfort of the vehicle, but also, for example, on the possibility of establishing quiet urban areas with the advent of electric vehicles. We are helping to design the future and actively participate in many research projects. At our symposium in September 2011, internationally renowned experts met for a discussion and exchanged their opinions and perspectives regarding the changes and the future of mobility and communications.

As the world is turning
The symposium

Expert opinions on the future of mobility and communications

How will the need for mobility change in the coming decades? How will transportation change in the face of increasing needs for mobility and tougher environmental demands? How will people communicate in 25 years? Such questions regarding the future of mobility and communications were at the center of a symposium held on the occasion of HEAD acoustics' 25th anniversary. On September 23, 2011 in Herzogenrath, Germany, renowned experts from the areas of energy technology, architecture, economics, sociology and acoustics discussed the future of mobility, transportation and communications from the point of view of their respective fields.

At the symposium "Society's mobility and communication in 25 years", internationally renowned experts presented their visions of the future, which they had developed in a preceding workshop over several days. At the symposium, the speakers then put up for discussion their scenarios about future individual and public transportation and about the changing needs for mobility and communications considering the demographic shift and society's increasing urbanization.

A major subject of the discussion were the experts' very different forecasts regarding the success of electric vehicles in the coming decades with a view to customer preferences, price development, infrastructure and the law. The resulting consequences for the automotive industry in general and vehicle acoustics in particular were the subject of controversial discussion. Another question was which technical innovations will prevail and which should be regarded as stop-gap technologies, and the changes resulting from this. One thing seems to be sure: Several different mobility solutions will exist in parallel. Individual users will thus make their mobility decisions based on lifestyle and resources.

An important core subject revolved about today's and tomorrow's communications technologies and the cultural aspects associated with them. Small mobile communications devices will widely replace conventional personal computers and allow unlimited access to information at any time and place. Opinion was clear on how closely mobility and communications are intertwined already and that they will coalesce even more in the future.

The symposium proved to be an ideal platform for exchanges on many fascinating topics. Despite controversial expert opinions, it became obvious that it is worthwhile discussing the technical and social changes and paradigm shifts at an early stage in order to adequately react to such changes. For HEAD acoustics, too, it is – and will always be – indispensable to be concerned with trend-setting social changes at an early stage. Learn more about the symposium and the speakers at www.head-acoustics.de/eng/symposium.htm.

From left to right: Dr. Harry Witchel, James Rosenstein, Prof. Luigi Maffei, Prof. Dr. Werner Rammert, Prof. Dr. Brigitte Schulte-Fortkamp, Prof. Dr. Winfried Pohlmeier, Dr.-Ing. Hans-Wilhelm Gierlich

Brake*OBSERVER*

Mobile test system for brake noise

Brake noise can be extremely unpleasant and lead to high warranty costs. The system solution Brake*OBSERVER* allows our customers to optimize the acoustic quality of their brake systems.

A now firmly established method for detecting brake noise is the unique Relative Approach algorithm developed by HEAD acoustics. Based on the pattern recognition function of human hearing, the system excels with smart data management and its flexible, yet easy and intuitive software operation.

Following an update, the Brake*OBSERVER* now consists of new, compact hardware components. An all-purpose computer solution is integrated in the form of the Panasonic ToughBook CF31. High quality and ruggedness are just some of the requirements for the measurement system, which records brake noise reliably even under difficult conditions, including high ambient temperatures.

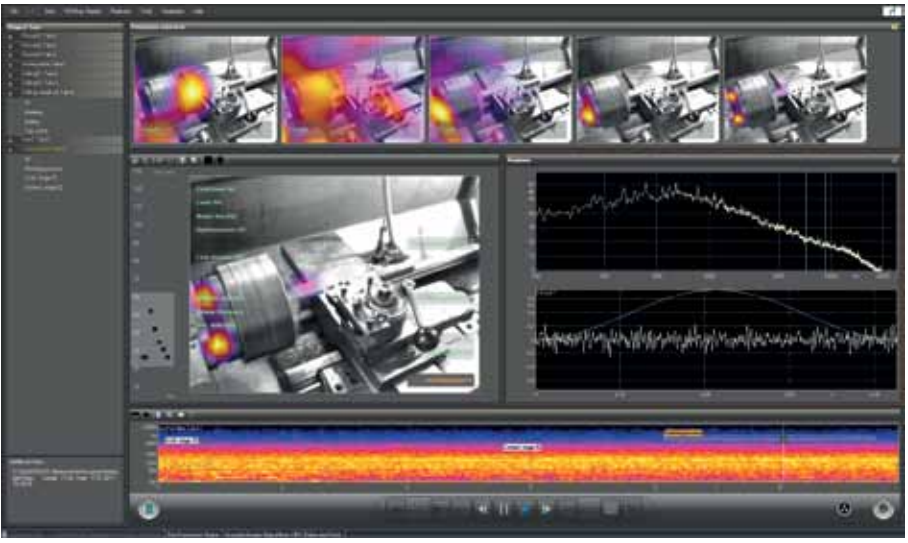
If your interests encompass not only the detection and recording of brake noise close to the driver's position in the vehicle cabin, but also the exterior noise, you will benefit from a new software update available now. It facilitates the analysis of signal levels from all audio channels. Furthermore, it offers the possibility to perform brake-noise detection with audio sensors located directly in the wheel well.

For more information, please visit www.head-acoustics.de/eng/nvh_brakeobserver.htm.

HEAD VISOR core

Advanced beam-forming

New functions have been incorporated into the HEAD VISOR software, which allow the highest quality recording, evaluation and presentation of acoustic measurements: Thanks to numerous trigger functions, a systematic acquisition of measurement data is as effortless as can be. For example, when engine speeds exceed or fall below certain threshold values, when certain tones occur, or when a predefined time has elapsed, the system starts and stops the measurements automatically and sorts the results accordingly.



The recordings can then be evaluated in a consistent manner according to a custom test standard. This allows, for example, the acoustic emissions of a machine during an operation cycle to be summarized in a single image for direct comparison with other measurements from the series.

The built-in Screen Recorder allows the entire user interface of the software to be "filmed" during your evaluation. That way, you can directly compile all results audio-visually in a movie, which you can then embed in your presentation. Never before has it been so fast and easy to create such impressive presentations.

HEAD VISOR – the second generation of beam-forming

Channel extension made easy

Flexible, custom extension of possibilities with HEAD*lab* and SQuadriga II

Four new modules are available for HEAD*lab*, the mobile 24-bit multi-channel front-end system. The signal module *lab*V12, the microphone module *lab*M6, the digital module *lab*DX and the HMS module *lab*HMS offer you even more flexibility with multi-channel recordings, troubleshooting, sound engineering or quality control. It is quick and easy to recombine the modules, so you can adapt to changing tasks in an optimal manner.

The 6-channel microphone module *lab*M6 is ideally suited for measurements with several condenser microphones. Up to six microphones can be plugged into a single module. Together with the control module *lab*CTRL I.1 and the power module *lab*PWR I.2, up to ten *lab*M6 modules can be combined, extending the system to a total of 60 channels. The 12-channel module *lab*V12, which allows systems to be built with up to 120 channels, is particularly attractive due to the phase-accuracy of the 24-bit data and a signal-to-noise ratio of typically 107 dB(A). Furthermore, it features optional high-pass filters for each individual channel. The *lab*DX module equipped with two pulse inputs and two CAN or FlexRay inputs features an interface for connecting and controlling an HMS III or HMS IV artificial head. The *lab*HMS module allows simultaneous recordings of up to three artificial heads of the HMS III or HMS IV generation. In connection with the control unit *lab*CTRL I.1, it is even possible to use four artificial heads.

By additionally operating the mobile recording and playback front-end SQuadriga II, a HEAD*lab* system can be upgraded with additional channels. Used as a HEAD*lab* module, SQuadriga II extends your system with additional connection options. Vice versa, the HEAD*lab* module *lab*V6 can also be connected to your SQuadriga II to extend its channel count. Or you can connect two SQuadriga II front-ends to each other, thus doubling your possibilities.

To learn more about our front-ends, please visit www.head-acoustics.de/eng/nvh_recording_systems.htm.

HEAD Video Camera I.0

Noise-source visualization synchronous with measurement signals

The HVC I.0 is a high-quality USB video camera from HEAD acoustics, which visualizes and documents sound sources by means of video recordings. Using the HEAD Recorder software, these recordings are synchronized with sound and pulse measurements.

The straightforward display and the combination rotary knob and push button located on top allow for intuitive menu-based operation. Several trigger modes with an adjustable frame rate between 0 and 150 fps (frames per second) provide a wide range of application possibilities.

With the ArtemiS SUITE analysis software, the audio recordings can be analyzed and played back synchronously to the video recordings. That way, individual video frames can be precisely aligned to the corresponding sound events.

Its compact size, low weight and rugged design make the HVC 1.0 a versatile recording device for a wide range of applications.

Sound and vibration analysis
ArtemiS SUITE 4.0.100

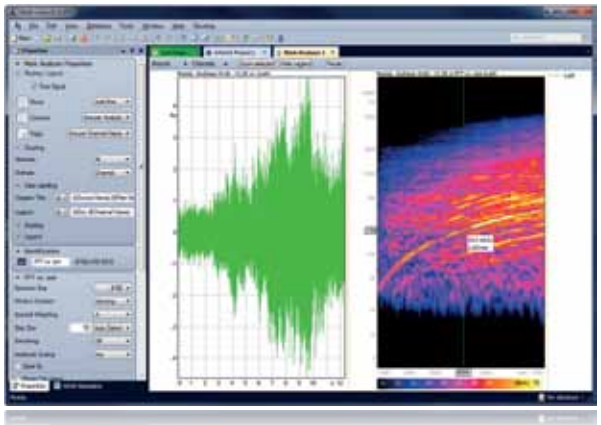
The wait will soon be over – version 4.0.100 of the ArtemiS SUITE is due for release this summer. Further refinements to the familiar modules such as the Pools, the Reporting module, and the documentation functions have now been supplemented with new modules to facilitate your daily work.

Prior to the actual analysis, relevant sections of the measurements – called "marks" – must be defined. For this purpose, we entirely redeveloped the Mark Editor. Besides a clearer layout of the channel display, the new Mark Editor supports easy management of marks and a direct connection to the Pools via drag & drop.

Particularly where large amounts of measurement data must be managed, documentation becomes an increasingly important issue. Feedback we collected during customer workshops has been incorporated into the revised documentation module. It is now much easier to create custom templates, to populate them with your subject-specific information and to use it for documenting your data. Once documented, you can access this information via a database search and reuse it in your reports.

The interactive features of the Mark Analyzer found in ArtemiS 12 are now implemented in ArtemiS SUITE. Marks, filters and analyses can be easily exchanged via drag & drop.

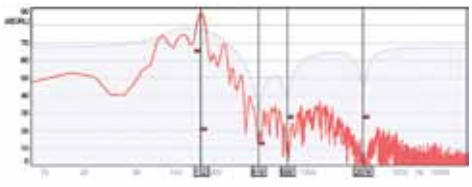
Another new feature of version 4.0.100 is real-time filtering. By means of newly developed morphing technology, you can immediately see – and hear, of course – the effect of your selected filters and changes to their parameters in the Mark Analyzer. The filter parameters can be configured either directly via the new filter cursors or via a dedicated control panel.



Interactive Mark Analyzer

Special cursors for the diagrams have been newly developed for other applications. For example, the read cursor displays individual values from a curve on the axis. Differences can be easily calculated by switching this cursor.

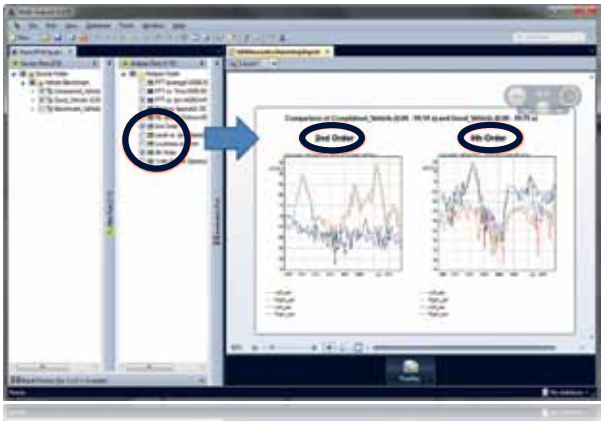
Another cursor variant, the harmonics cursor, helps you to identify harmonic frequencies – the respective series of harmonics can be interactively adapted to your data set.



New interactive filter cursors

The creation of reports has been further simplified. With version 4.0.100, it is now possible to populate predefined reports directly from within the Pools. Where formerly a lot of manual work was involved, the ArtemiS SUITE now comes to your aid: Start the calculation, view the data, and export the report to PowerPoint® – never before has reporting been so easy!

Besides the modules already mentioned, version 4.0.100 provides you with additional functions indispensable for your daily work, such as configurable display properties for analyses, basic statistic calculations in the Pools, and extended document management for a custom layout of windows within the ArtemiS SUITE.



Report generation from within the Pools

To learn more about the ArtemiS SUITE, please visit our web site at www.head-acoustics.de/eng/nvh_artemis_suite.htm.

Quiet urban areas
CityHush

Road traffic noise of the future

Electric vehicles will increasingly replace vehicles with combustion engines in the coming years. The associated reduction of traffic noise in urban areas makes this innovation attractive and can boost the success of electric cars even further. The European research project CityHush has been dealing with solutions for reducing noise in cities for two years already.

HEAD acoustics has been commissioned to establish the degree to which road noise can be reduced by means of electric engines and different types of tires, since engines and tires are the main sources of road traffic noise. The associated examination of hybrid and electric vehicles focused on two main aspects:

First, the HEAD VISOR technology for the localization of sound sources was further developed and modified. A large-area VISOR array equipped with microphones detects and selects the noise sources of passing vehicles. This makes it possible to analyze the exterior noise of hybrid and electric cars in direct comparison to cars with combustion engines.

The second focus was on the development of simulation technology for traffic noise, which allows the acoustic effects of simulated road traffic situations to be calculated and auralized. Based on extensive measurement data, psychoacoustic noise maps can be created. It is even possible to auralize traffic noise at any chosen location on the noise map. Furthermore, various road traffic scenarios were examined in order to answer questions, such as whether access to potential noise protection areas should be restricted to motorcycles and cars with electric engines.

The CityHush project (SPC8-GA-2009-233655) is funded by the European Commission via its Seventh Framework Programme. To learn more about the European research project, please visit www.cityhush.eu.

ZIM project TiNA – Tire Noise Auralization

Particularly in the case of electric vehicles with very low engine noise, tire noise becomes the loudest noise component in the interior of the vehicle. The importance of optimizing the sound and vibration comfort regarding tire noise is consequently much increased. The Institute of Automotive Engineering at the Cologne University of Applied Sciences and HEAD acoustics are cooperating on a project addressing this subject, as funded by the Central Innovation Programme for SMEs (ZIM) of the German Federal Ministry of Economics and Technology.

The first part of the project saw the development of a tool for the auralization of the contributions that individual tires make to the total interior noise under dynamic driving conditions. The tool allows, for example, tire noise during a full-throttle acceleration to be determined without audible engine noise.

The second part will focus on the analysis of chassis sensitivity. Measurement data are combined with simulation models in order to calculate the dynamic force transmission in the chassis, allowing for a detailed insight into the transmission paths. Furthermore, the sensitivity of individual components regarding interior noise will be examined by varying the model parameters. This allows, for example, a simulation of the effects of production tolerances.

Supported by:

Federal Ministry of Economics and Technology

on the basis of a decision by the German Bundestag

ISO 532 – loudness

Finding a loudness standard for stationary and non-stationary sound

Loudness is one of the most familiar psychoacoustic quantities and has therefore been the subject of various standardization efforts for quite some time. As early as 1975, the German DIN 45631 standard for determining the loudness of stationary sound was adopted. It was revised in 1991 and extended by the annex A1 for time-variant signals in 2007. On the international level, the ISO 532 standard has existed for many decades; part A describes the method according to Stevens, part B is based on DIN 45631 from 1975. In 2007, the American standard ANSI S 3.4.-2007 was created, which additionally describes loudness calculation for stationary sound. However, it is based on a model by Glasberg and Moore, whose main difference is the spectral subdivision into at least 40 ERBs (Equivalent Rectangular Bands), as opposed to the 24 critical bands suggested by the Zwicker method.

ISO 532 on the international level

There was a desire to revise the ISO 532 standard on the international level. The suggestion was to replace the former Stevens loudness of 532 A, which had no practical application, by the American ANSI S 3.4.-2007 standard and to adapt part B of ISO 532 to the German DIN 45631 standard from 1991.

It was also initially suggested to define a loudness standard for stationary sound and to add a second part (ISO 532 Part II) for defining the loudness of non-stationary sound. These considerations lead to the first CD draft (CD 1 532), which suggested both methods as equivalent standards in part A and B. However, the ISO preferred not to define two different methods in one standard, if possible. With regard to continuity, the suggestion was to choose one method as the reference method and to mention the other one as additional information.

The second CD draft

If this were to be deemed unacceptable, then tolerance criteria were to be defined that both methods should be able to fulfill. Based on these recommendations, the second CD draft (CD 2 532) was created, which suggested a modified Moore & Glasberg loudness including a binaural loudness as the standard and mentioned the Zwicker loudness merely as additional information. This draft triggered controversial discussion worldwide.

New research was initiated, leading to the conclusion that neither of the methods yielded sufficient accuracy for real-life sounds. The advocates of Moore & Glasberg loudness argued that this method matches the curves of constant loudness according to ISO 226 (2003) better than Zwicker loudness, which is closer to the curves of constant loudness according to the 1987 version of ISO 226. The changes to ISO 226 mainly affect the low-frequency range. The revised ISO 226 from 2003 contains a significantly (up to 10 dB) lower sensitivity for low-frequency signals than the former version from 1987. This result is also currently being discussed internationally on a scientific level. In addition, even the weighting curve of the A-weighted sound pressure level does not comply with the ISO 226 curve for 40 phon.

DIS 532 fails

In spite of the unclear scientific situation, a new draft DIS 532 for loudness was finally released, which is solely based on Moore & Glasberg loudness, which is not identical to the American ANSI S 3.4-2007 standard, and which does not mention the German DIN 45631. An international vote was held on this DIS 532. The results show that only seven countries voted in favor of the draft, whereas twelve were against it, which means that DIS 532 is a failure so far.

It is worth mentioning that the worldwide protests by manufacturers of psychoacoustic software solutions and users of psychoacoustic parameters, who unambiguously spoke in favor of maintaining DIN 45631 loudness, were ignored by a narrow majority within the ISO working group.

Conclusion: Currently, DIN 45631 A1 is still the only official standard defining loudness for both stationary and non-stationary signals.

HEAD acoustics events

Getting in touch with our customers is very important for us. Therefore, our NVH division holds a number of events each year, which focus on the exchange of experience and the dialog with our customers. Come visit us and participate in our events.

Girls´ Day

In April 2012, HEAD acoustics GmbH will open its doors for the nation-wide Girls' Day. On this day, 25 girls will experience an exciting program in the acoustics field.

Location: HEAD acoustics GmbH headquarters
Date: April 26, 2012

Acoustics Day

In September we will present focal topics of the acoustics field in our traditional "Acoustics Day" workshop. With informative lectures and practical demonstrations, we will present our latest product developments in a pleasant surrounding. There will be enough time and opportunity to exchange opinions and experience with other participants and the acoustics engineers of HEAD acoustics. There are four dates you can choose from:

Location: Castrop-Rauxel
Date: September 11, 2012
Location: Dahlenburg
Date: September 13, 2012
Location: Forchheim
Date: September 25, 2012
Location: Ludwigsburg
Date: September 27, 2012

Tradeshows and conferences

- DAGA 2012 – 38th annual conference for acoustics; Darmstadt, Germany; March 19-22, 2012
- Acoustics 2012; Nantes, France; April 23-27, 2012
- KSNVE 2012 Annual Spring Conference; Jeju Island, Korea; April 26-27, 2012
- The Acoustics 2012 Hong Kong; Hong Kong, China; May 13-18, 2012
  Abstracts:
  The complexity of sound quality engineering – only a technical issue? (Author: Prof. Dr. Klaus Genuit)
  (R)Evolution in vehicle acoustics – Sound design, warning signals and quiet cities (Author: Prof. Dr. Klaus Genuit)
  The link between soundscape perception and attention processes (Author: André Fiebig)
- EuroNoise 2012; Prague, Czech Republic; June 10-13, 2012
- 7th International Styrian Noise, Vibration & Harshness Congress; Graz, Austria; June 13-15, 2012
  Abstracts:
  Tire-road noise analysis of on-road measurements under dynamic driving conditions
  (Authors: Dr. Roland Sottek, Bernd Philippen)
- inter.noise 2012; New York City, USA; August 19-22, 2012

Did you know that ...

... version 12 of NoiseBook in connection with SQuadriga II allows you to record not only the eight inputs (BHS I + 6 x Line/ICP/DC), but also CAN bus/ OBD-2 data?