HEAD acoustics

DATA SHEET

APPLICATION EXAMPLE INCLUDED

Code 6867

MDAQS

Option MDAQS – Multi-Dimensional Audio Quality Score

OVERVIEW

MDAQS

Code 6867

Option MDAQS – Multi-Dimensional Audio Quality Score

MDAQS is an AI-based method for instrumental evaluation of audio quality. It merges the key criteria for perceived audio playback quality – timbre, distortion, and immersiveness – into one single MOS value for quick assessment and good comparability.

HEAD acoustics developed MDAQS – the Multi-Dimensional Audio Quality Score – based on a tailor-made auditory test design. An algorithm trained with test results calculates a MOS value that reflects the audio quality of arbitrary playback systems or devices, e.g., loudspeakers, headphones and headsets, in-vehicle audio systems, mobile speakers, smart speakers, and more. Thus, it enables quick and convenient assessment of playback quality during and after development.

MDAQS is available for ACQUA as the ACQUA Option: ACOPT 36.

KEY FEATURES

Comprehensive automated test suite

Algorithm for professional assessment of perceived audio playback quality

Supports all types of audio systems and devices with audible playback

APPLICATIONS

Evaluation and experimental optimization of audio quality in systems and devices with audible playback

DETAILS

Customer expectations to audio playback quality are increasing continuously. Manufacturers of audio equipment meet these demands by different measures, e.g., increasing the number of amplifier channels and loudspeakers, active sound optimization (e.g., digital equalization), active noise cancellation, and other measures. This rising complexity is prevalent in virtually every modern application with audible playback:

- Multi-channel loudspeaker systems in vehicles and at home
- Earphones, headphones, and headsets
- Smart speakers
- Mobile loudspeakers
- One-piece multi-room loudspeakers
- Stereo audio systems

Developing and tuning such complex systems and devices towards a desired sound signature becomes increasingly difficult. Basic measurements (e.g., frequency response) do not reveal the system's quality in its entirety and thus do not suffice to predict human perception. This can be accomplished by conducting auditory tests. However, getting statistically meaningful results entail high personnel expenses and significant expenditure of time.

For meeting the demand for a quick and cost-effective solution to assess audio playback quality, HEAD acoustics developed MDAQS – the Multi-Dimensional Audio Quality Score. MDAQS is the first algorithm for instrumental assessment of audio quality of arbitrary systems and devices with audible playback.

DESCRIPTION

General

The basis for MDAQS is to describe human perception of sound quality with three main categories: timbre, distortions, and immersion. Trials with naïve listeners have proven test designs based on these criteria to be a very adequate method for assessing perceived audio quality. HEAD acoustics developed a sophisticated algorithm based on this method. Trained with the results of numerous sessions of auditory testing, the algorithm is able to accurately predict the audio quality of the device under test (DUT) as perceived by naïve listeners.

MDAQS can be used by manufacturers and suppliers of audio systems and devices for fast and convenient testing, comparison, and experimental optimization of audio playback quality.

Analysis with MDAQS is straightforward. The MDAQS database contains two-channel test signals as well as music excerpts representing a cross-section of genres. The test sequence is played back by the device under test. The playback is recorded with an artificial head from the HMS Series and subsequently analyzed with ACQUA.

Evaluating these recordings, the MDAQS algorithm calculates four MOS values for the DUT:

- MOS-T: Timbre
- MOS-D: Distortion
- MOS-I: Immersiveness
- MOS-O: A combined MOS for overall quality

These values determine audio quality, verify the success of fine-tuning, and allow benchmarking against similar devices. Additionally, they show strong suits as well as weaknesses in single categories, allowing to target specific areas to improve a device's performance.

The environment for testing with MDAQS depends on the type of DUT. For example, testing a closed headphone only requires a reasonably quiet environment, not necessarily a (semi-)anechoic room. A high signal-to-noise ratio (SNR) is the deciding factor. If there is a low SNR, the predictive accuracy of MDAQS decreases. Devices providing only low sound pressure levels at the ear despite an ideal environment – e.g., small mobile loudspeakers – benefit from choosing HSM II.3 LN or HMS II.3 LN HEC to increase SNR.

MDAQS 2.0

MDAQS 2.0 enables to select between different calculation versions. Two versions are tailor-made for specific devices. These device-oriented calculations are exclusively for either headphones or cars. The algorithms behind these calculations are specifically trained by focusing only on headphones respectively cars. A generic calculation version (MDAQS 2.0) supports assessing all other kinds of appropriate devices.

STRUCTURE

MDAQS (Code 6867) includes different calculation modes. There are three different versions for MDAQS 2.0 whose application depends on the device under test:

- MDAQS 2.0
- MDAQS 2.0 Car
- MDAQS 2.0 Headphones

The calculation for headphones can also be acquired exclusively with ACOPT 40 (Code 6873).

Furthermore, there are the legacy versions MDAQS 1.0 and MDAQS 1.1 which can be applied to assess any device under test.

GENERAL REQUIREMENTS

Hardware

Hardware Platform

*lab*CORE (Code 7700)
- Modular multi-channel hardware platform

*core*BUS (Code 7710)
- *lab*CORE I/O bus mainboard

*core*IN-Mic4 (Code 7730)
- *lab*CORE microphone input board

*core*BEQ (Code 7740)
- *lab*CORE binaural equalization, incl. filter set for one artificial head

Head and Torso Simulator

One of the following Head Measurement Systems:

HMS II.3
- HMS II.3 (Code 1703)
  - » Head Measurement System, basic version with right ear simulator, 3.3 pinna, and artificial mouth
- HIS L (Code 1701)
  - » Head Impedance Simulator, left

HMS II.3 LN
- HMS II.3 LN (Code 1703.1)
  - » Head Measurement System, low-noise version with right ear simulator, 3.3 pinna, and artificial mouth
- HIS L LN (Code 1701.1)
  - » Head Impedance Simulator, left, low-noise version

HMS II.3 LN HEC
- HMS II.3 LN HEC (Code 1703.2)
  - » Head Measurement System, low-noise version with right human-like ear canal simulator and artificial mouth
- HIS L LN HEC (Code 1701.2)
  - » Head Impedance Simulator, left, low noise, human-like ear canal version

Continued on next page

PLAYBACK INTERFACES

*core*BT2 (Code 7782)
- › *lab*CORE I/O module, Bluetooth reference access point, version 2

*core*A2B-Basic (Code 7791)
- › *lab*CORE I/O Module, A²B Interface (32 Channels), Hardware + Main/Sub-Node Mode

*core*OUT-A2 (Code 7750)
- › *lab*CORE Output Module, Analog Balanced/Unbalanced (2 Channels)

GENERAL REQUIREMENTS

HMS II.4
- › HMS II.4 (Code 1704)
  - » Head Measurement System, with right ear simulator and 3.3 pinna (w/o artificial mouth)
- › HIS L (Code 1701)
  - » Head Impedance Simulator, left

HMS II.6
- › HMS II.6 (Code 1706)
  - » Head Measurement System, with artificial mouth and free-field microphones (left and right)

HMS II.7
- › HMS II.7 (Code 1707)
  - » Head Measurement System, with artificial mouth and free-field ICP microphones (left and right)
- › *core*IN-ICP4 (Code 7735)
  - » *lab*CORE ICP microphone input board, instead of *core*IN-Mic4

Software

One of the following software applications:

ACQUA (Code 6810)
- › Advanced Communication Quality Analysis Software, full license version

ACQUA Compact (Code 6860)
- › Compact test system

SCOPE OF DELIVERY

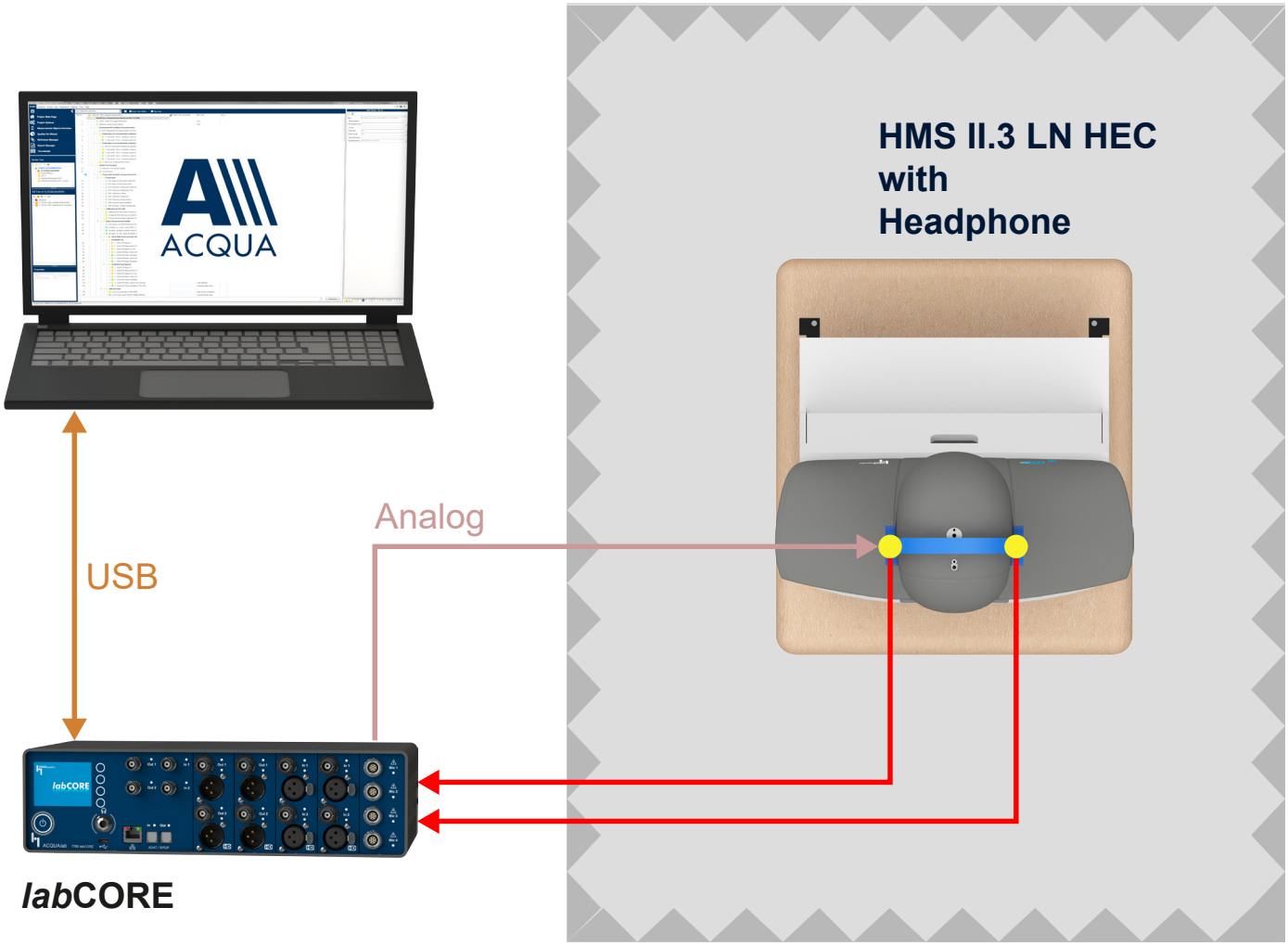
MDAQS (Code 6867)
- › Delivered as V2C file for ACQUA dongle

IN PRACTICE

APPLICATION EXAMPLES

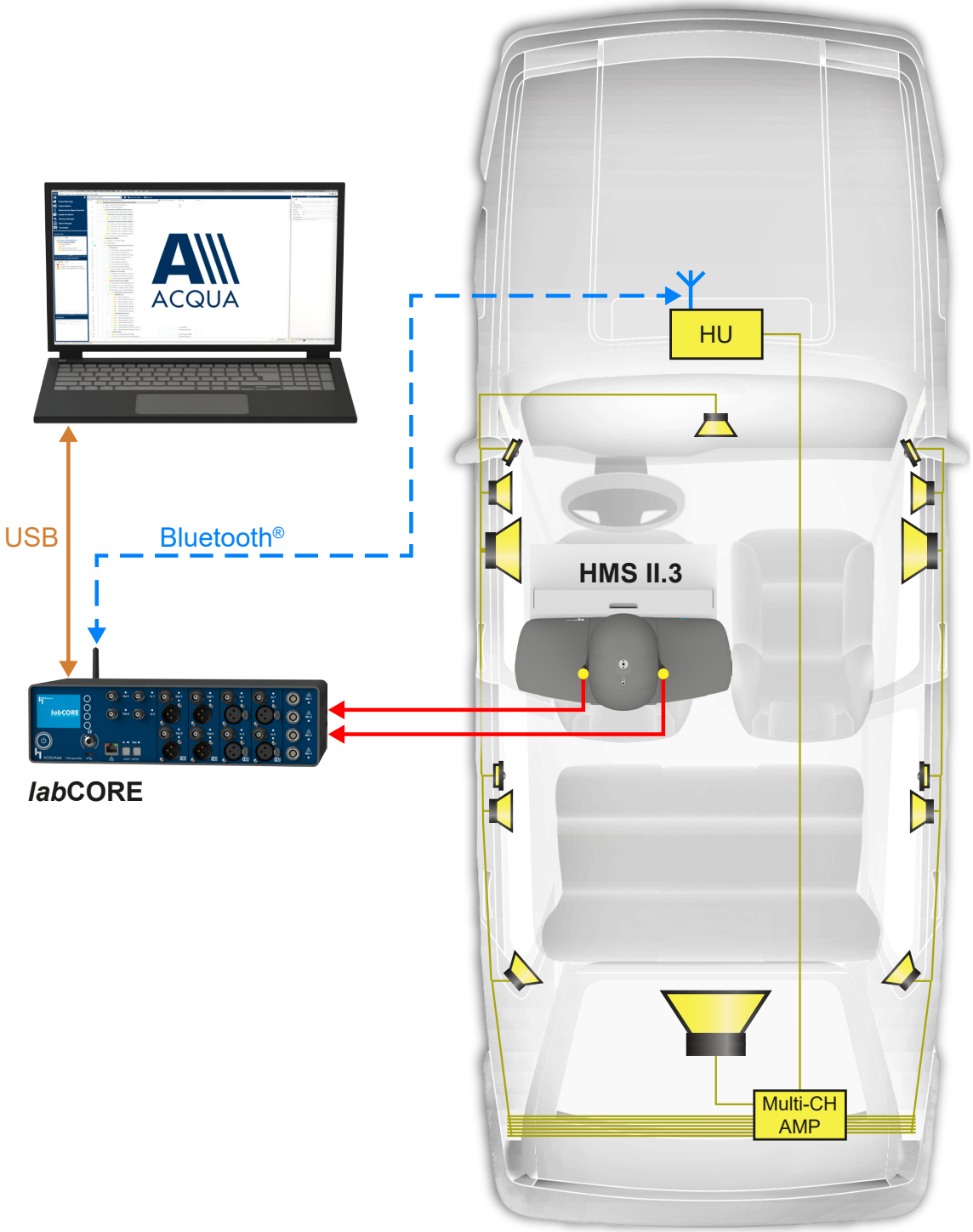
Measurement Setup for a High Quality Headphones

*lab*CORE sends the MDAQS test sequence via its 6.3 mm headphone output to the headphones worn by HMS II.3 LN HEC. The hardware platform receives binaural feedback from HMS II.3 LN HEC and passes it on to ACQUA. The software processes the recordings and calculates the MOS values for the headphone.



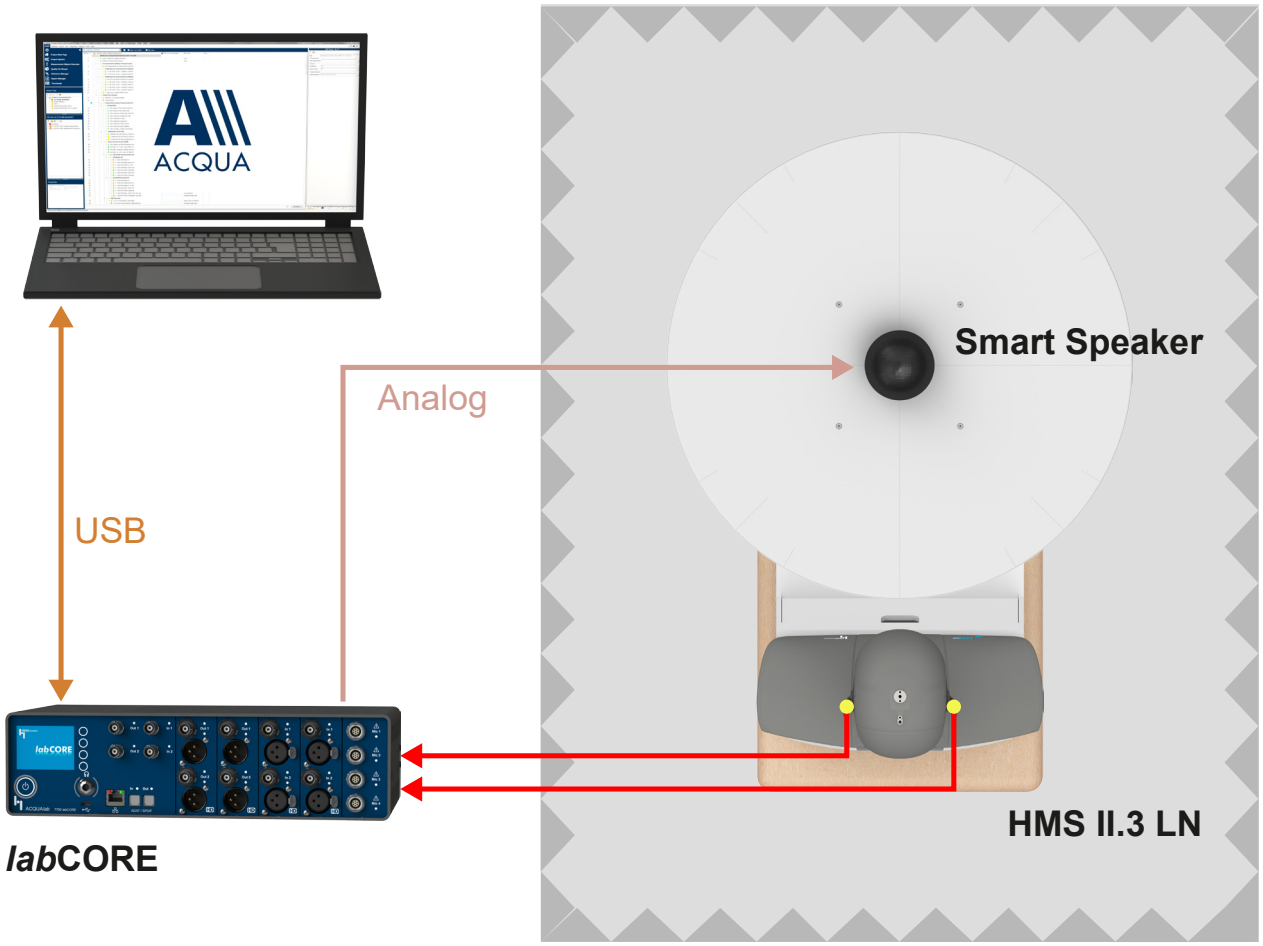
Measurement Setup for a Multi-Channel Loudspeaker System in a Vehicle

*lab*CORE connects via Bluetooth® to the vehicle's head unit and sends the MDAQS test sequence for playback. The hardware platform receives the recording from HMS II.3 and passes it on to ACQUA. The software processes the recording and calculates the MOS values for the loudspeaker system.



Measurement Setup for a Smart Speaker

For ensuring a good SNR, the measurement takes place in a semi-anechoic test chamber. *lab*CORE connects to the speaker via analog input to play back the MDAQS test sequence. The hardware platform receives the recording from HMS II.3 LN and passes it on to ACQUA. The software processes the recording and calculates the MOS values for the smart speaker.



HEAD acoustics

Contact Information

Ebertstraße 30a
52134 Herzogenrath, Germany
Phone: +49 2407 577-0
E-Mail: sales@head-acoustics.com
Website: www.head-acoustics.com