HEAD acoustics

DATA SHEET

Code 60074

HQS-Car-Audio

HEAD acoustics Quality Standard, Car Audio Systems

OVERVIEW

HQS-Car-Audio

Code 60074

HEAD acoustics Quality Standard,
Car Audio Systems

HQS-Car-Audio is a test suite for testing and analyzing the performance of car audio systems with ACQUA. The application of the test suite targets both common car audio systems and sophisticated car audio systems. The measurements require applying the supported multi-point recording technologies for the most comprehensive results.

The playback of signals for recording is possible either via the *lab*CORE hardware platform which connects to the car audio system, or via customized devices since the test signals for playback are available as common audio formats (*.wav, *.mp3).

Some measurements within the test suite effectively use the move°S technology which enables turning the artificial head (HMS II Series) and therefore extends the analysis range. Furthermore, the versatility of the test suite also allows the application of microphone arrays for recording the necessary audio data for analysis.

KEY FEATURES

Database with comprehensive measurements analyses for assessing car audio systems

Focus on the audio system of the car as a whole

Includes, among others, measurements from the whitepaper *In-Car Acoustic Measurements* by the AES Technical Committee on Automotive Audio

Well-structured database for quick and easy operation of the testing procedure, storing results, and easy comparison between test runs/audio systems

Support of move°S technology

Various options for recording test signals

Playback of test signals via *lab*CORE interfaces such as A²B®, Bluetooth®, or high-definition analog output (closed loop measurements)

Playback of test signals via external devices (open loop measurements)

APPLICATIONS

Audio quality assessment of car audio systems

Tuning of car audio systems

DETAILS

DESCRIPTION

The HQS-Car-Audio test suite is a database which is applied in ACQUA. Among others, the test suite includes measurements from the whitepaper *In-Car Acoustic Measurements* by the AES Technical Committee on Automotive Audio, too. These measurements and analyses are intended for assessing the quality of car audio systems. HQS-Car-Audio is a toolbox containing different approaches for testing and assessing the car audio system. Measurements do not have to be executed in a default order. The scope ranges from quality assessment of basic audio system parameters to sophisticated analyses such as, e.g., stereo panning assessment.

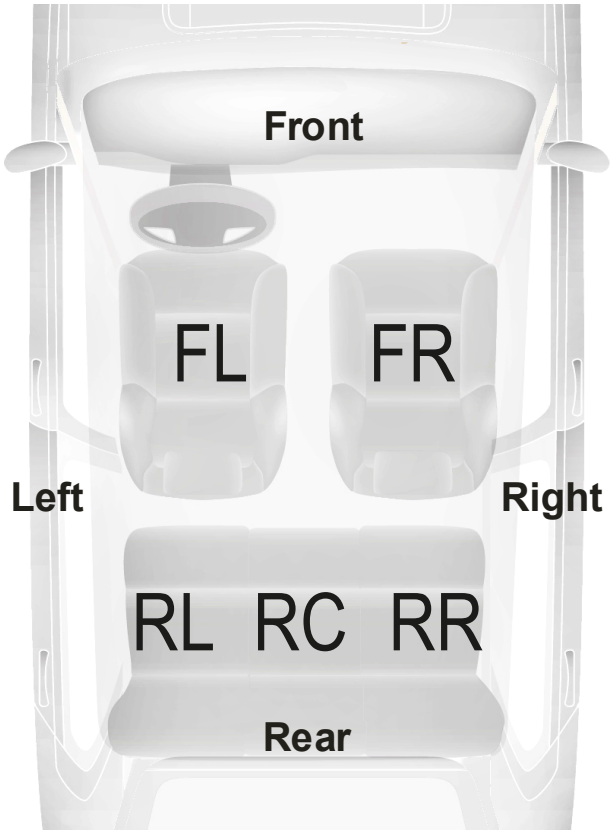
For this purpose, there are five recording positions which comprise the standard positions of a five-seater car (front left [FL], front right [FR], rear left [RL], rear right [RR], rear center [RC]). Recordings in the car are executable as closed loop measurements or open loop measurements.

Closed loop measurements require *lab*CORE for generating playback signals and transmitting them to the car audio system (via Analog interface, Bluetooth, A²B®). Further, *lab*CORE is used for recording the acoustic playback signal via artificial head(s) and/or a microphone array.

Open loop measurements require third-party equipment for inserting the provided audio files for playback into the car audio system. This also includes playback of on-board acoustic warning signals ('Chimes'), e.g., for seatbelt, headlights, doors. Nevertheless, *lab*CORE is applied as well for recording the acoustic playback signals via artificial head(s) and/or a microphone array.

The application of the HMS II Series enables the usage of the move°S technology which rotates the head to desired angles. Therefore, measurements with various head rotation angles and/or sequences are feasible for a wider range of assessment.

The test suite delivers comprehensive and significant results about the car audio system. It takes advanced knowledge of technical acoustics and audio systems for interpreting the results and drawing the right conclusions to improve the car audio system.



SCOPE OF DELIVERY

HQS-Car-Audio (Code 60074)
› delivered as ACQUA database backup
V2C file
› License file for ACQUA dongle
Test signal files for open loop measurements
› Zip file
Revision history
› PDF file

DATABASE CONTENTS

Structure

The database includes one ACQUA project. It comprises of two parts. The first part consists of all acoustic recordings while the second part includes the analyses of the recordings. Hence, the recordings shall be executed before executing the allocated analyses. Executing all desired recordings in advance provides the advantage for analyzing them without requiring the measurement configuration on stand by. Further, the database provides the advantage that all measurement data of every assessed car audio system is distinctively stored and accessible afterwards.

Recordings

Recordings are available as closed loop measurements or open loop measurements. An input box requests the recording positions beforehand for allocating them to the appropriate analyses afterwards.

- Tonal balance
- Delay/Time alignment (only for closed loop measurements)
- Distortion
- Reproduction of moving source (HATS only)
- MDAQS
- User-defined source files for subjective listening
- Chimes (only for open loop measurements)

Analyses

The analyses are executable for each recording position individually.

- Impulse response
  - Correlation and impulse response
- Sound pressure level
  - Level
- Frequency response
- Distortion
  - Relative Approach, impulsive distortion
  - Distortion (Farina)
- Binaural evaluation
  - Interaural level difference (ILD)
  - Interaural time difference (ITD) and IACC
  - Interaural level difference (move°S only)
  - MDAQS
  - Subjective listening (Level vs. time)
- Chimes
  - Frequency response
  - Level vs. time

GENERAL REQUIREMENTS

Hardware Platform

*lab*CORE (Code 7700)

- Modular multi-channel hardware platform

*core*BUS (Code 7710)

- *lab*CORE I/O bus mainboard

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

Audio Playback

One of the following playback interfaces for closed loop measurements:

*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

Analog

- *core*OUT-A2 (Code 7750)
  - *lab*CORE analog output board (2 × BNC + 2 × XLR)
- CJB II (Code 6090)
  - Adapter 3.5 mm jack 4-pin <> BNC

Audio Recording

Recordings can be executed with one/multiple artificial head(s) and/or microphone array(s).

Microphone Array

The number of applied microphone arrays and microphones is customizable.

Microphone holder (third-party equipment)
Measurement microphones (third-party equipment)

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OPTIONS

UG HMS/HSU move°S
› Upgrade HMS/HSU to move°S, Motorized head turning version

*core*BEQ-Add (Code 7741)
› *lab*CORE binaural equalization, Additional set of filters (core BEQ required)

HSM V (Code 1520)
› HEAD Seat Mount adapter for HMS/HSU

RELEASE NOTES

Database information	
Database revision	**ACQUA version**
Revision 01	at least 6.2.100

GENERAL REQUIREMENTS

One or multiple *lab*CORE input interfaces, depending on connection type and number of the microphones:

*core*IN-ICP4 (Code 7735)
› *lab*CORE ICP® sensor input board (4 × BNC)
*core*IN-A2 (Code 7760)
› *lab*CORE Analog input board (2 × BNC + 2 × XLR)
*core*IN-Mic4 (Code 7730)
› *lab*CORE microphone input board (4 × LEMO 7-pin)

Head and Torso Simulator (HATS)

*lab*CORE extensions for operation of HATS:

The number of applied HATS (max. five) is customizable. Each HATS requires its own set of BEQ filters. Many HATS (except HMS II.7) require two LEMO inputs of *core*IN-Mic4. HMS II.7 exclusively requires two IEPE/ICP inputs of *core*IN-ICP4.

*core*IN-Mic4 (Code 7730)
› *lab*CORE microphone input board (4 × LEMO 7-pin)
*core*BEQ (Code 7740)
› *lab*CORE binaural equalization, incl. filter set for one artificial head (delivered with *lab*CORE)
*core*IN-ICP4 (Code 7735)
› *lab*CORE ICP sensor input board, instead of *core*IN-Mic4

One or multiple 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

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GENERAL REQUIREMENTS

› 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 human-like ear canal simulator right and artificial mouth
› HIS L LN HEC (Code 1701.2)
  » Head Impedance Simulator, left, low noise, human-like ear canal version

HMS II.4

› HMS II.4 (Code 1704)
  » Head Measurement System, with right ear simulator
› 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)

ACQUA Options

ACOPT 17 (Code 6839)

› Option Relative Approach

ACOPT 36 (Code 6867)

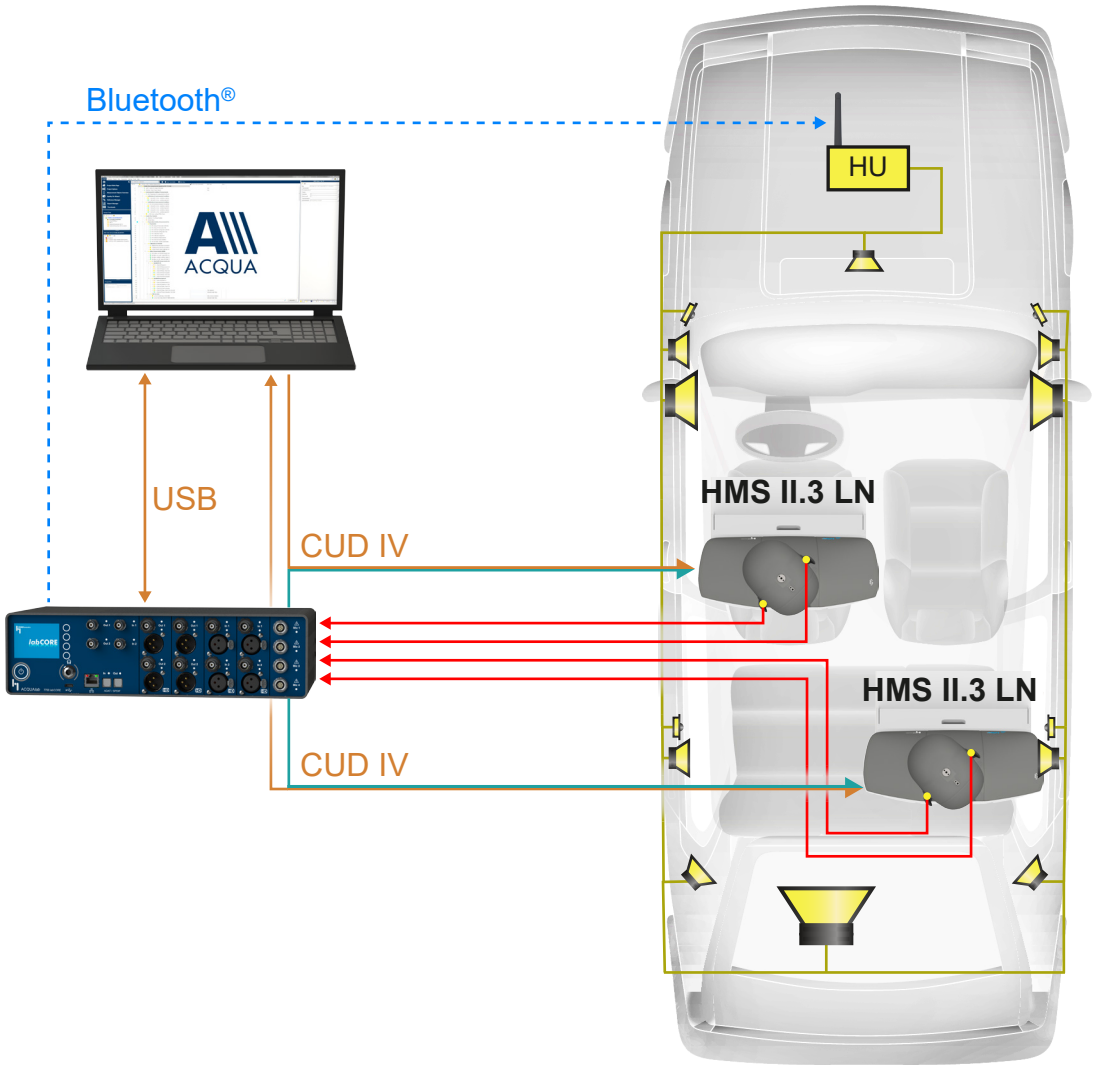
› Option MDAQS

IN PRACTICE

APPLICATION EXAMPLES

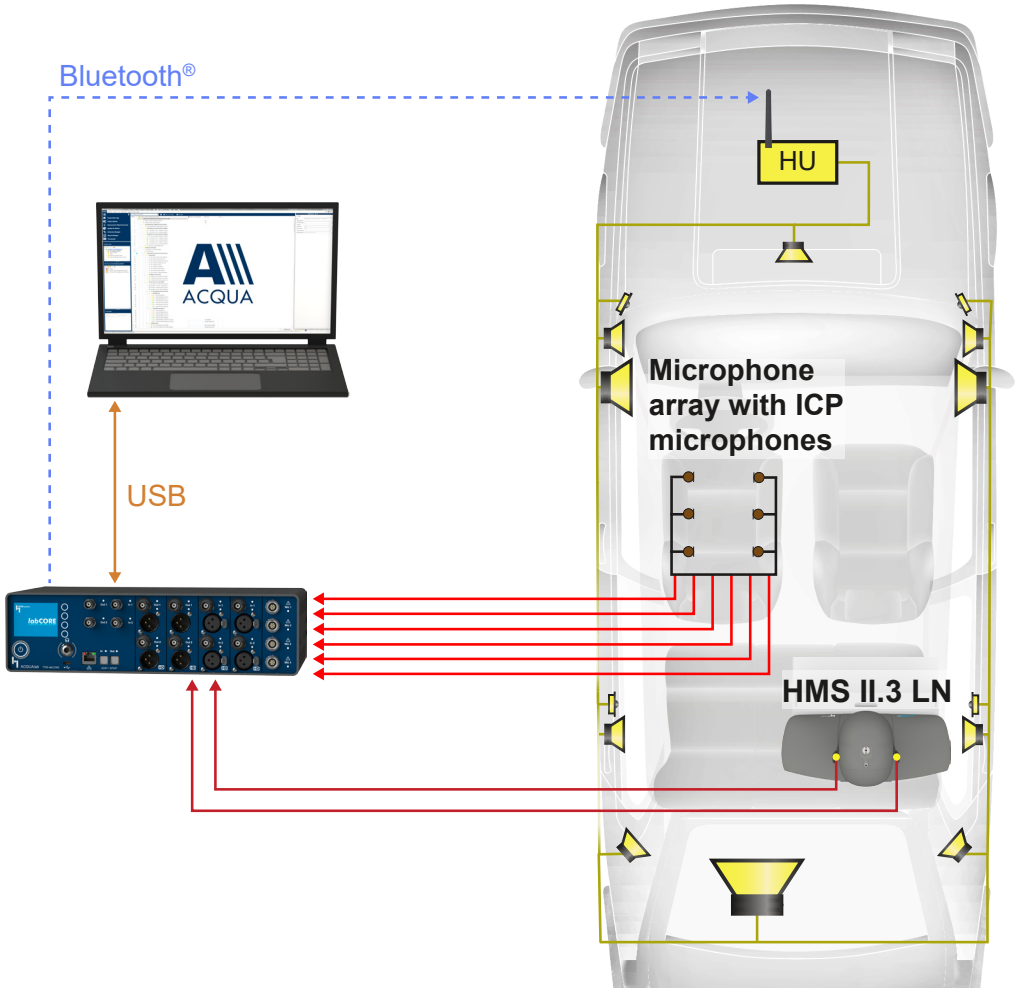
Recording Configuration with Two HATS Including move°S Technology

HQS-Car-Audio runs on an SQL server in ACQUA and plays back test signals. The test signals are transmitted via Bluetooth to the car audio system. Two HMS II.3 LN are positioned in the car and record the playback from the car audio system with their ear simulators. Furthermore, the artificial heads include the move°S technology and turn their heads to determined angles before and during the recordings. The recorded signals are transmitted via *lab*CORE to ACQUA for analysis.



Recording Configuration with a Microphone Array

HQS-Car-Audio runs on an SQL server in ACQUA and plays back test signals. The test signals are transmitted via Bluetooth to the car audio system. A microphone array with six microphones is positioned in the car and records the playback from the car audio system. The ICP microphones are connected to two *core*IN-ICP4 boards which are installed to *lab*CORE. One HMS II.3 LN is positioned in the car and records the playback from the car audio system with its ear simulators. The recorded signals are transmitted via *lab*CORE to ACQUA for analysis.



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