HEAD acoustics

APPLICATION EXAMPLES INCLUDED

Code 60067

HQS-ViBRIDGE

ViBRIDGE Tests of Headsets

ViBRIDGE

OVERVIEW

HQS-ViBRIDGE

Code 60067

ViBRIDGE Tests of Headsets

HQS-ViBRIDGE is a quality standard developed by HEAD acoustics for application of the compatible HEAD measurement system HMS II.3 ViBRIDGE.

The test suite delivers data to build a comprehensive picture of the performance level by in-ear headsets utilizing bone conduction in signal processing. All included measurements can be executed with and without applying the structure-borne signal. Thus, the effect of the structure-borne signal on speech quality can be apparent. The results may be used for benchmarking as well as improving in-ear headsets during their development.

KEY FEATURES

State-of-the-art measurements and analyses for assessing in-ear headsets which utilize bone conduction in signal processing

Various measurements and analyses

Distinct test scenarios to get a comprehensive picture about the performance of the headsets under test

Full compatibility with HMS II.3 ViBRIDGE

APPLICATIONS

Comprehensive testing of in-ear headsets that utilize near-end bone conduction sound to improve:
› Speech quality in sending direction in the presence of background noise or concurrent talker
› Echo cancellation
› Double Talk performance in sending direction

DETAILS

The use of headsets in communication is ever-increasing and the demand for improving communication quality is ongoing. A new technology in the field is the use of human bone conduction in headset signal processing. It is well known that the human voice is transmitted by bone conduction in addition to the airborne sound into the ear canal. Bone conduction sensors can pick up the voice signal transmitted by bone conduction. HEAD acoustics provides the ViBRIDGE technology which simulates bone conduction for speech playback with HMS II.3 ViBRIDGE. For convenient and effective application of HMS II.3 ViBRIDGE, HQS-ViBRIDGE provides measurements and analyses in ACQUA to assess in-ear headsets which capture bone conduction.

DESCRIPTION

General

HQS-ViBRIDGE includes various measurements with subsequent analyses to assess in-ear headsets which capture bone conduction. The headsets are inserted into the artificial ears of HMS II.3 ViBRIDGE which contains actuators to simulate bone conduction. In general, the measurements are conducted in two conditions: Either the function for producing the structure-borne signal is activated or deactivated. Furthermore, the measurements are categorized by the assessment of different parameters such as:

› Frequency response
› Speech quality in the presence of background noise
› Double Talk
› Speech quality in the presence of a concurrent talker

Frequency response

Frequency response analysis of a loudness measurement with real speech. The loudness measurement is executed with activated or deactivated bone conduction functionality at HMS II.3 ViBRIDGE. Afterwards, ACQUA executes a FFT analysis for the measurements and presents both frequency response curves in one diagram for comparison.

Speech quality in the presence of background noise

ACQUA plays back and records real-speech in the presence of background noise with activated and deactivated structure-borne functionality at HMS II.3 ViBRIDGE. The recordings are afterwards analyzed by the 3QUEST algorithm according to ETSI TS 103 281 (Model A)[1] which presents the results as MOS values. There are three approaches to assess potential divergence of the noise canceler with 3QUEST:

› The speech signal starts first while background noise starts delayed. Thus, ACQUA assesses the performance of the noise canceler to separate speech and noise if the background noise suddenly interferes.
› The background noise starts first while the speech signal starts delayed and runs longer than the background noise. Thus, ACQUA assesses the performance of the noise canceler to separate speech and noise if background noise suddenly stops.
› The speech signal and the background noise start simultaneously. ACQUA assesses the performance of the noise canceler to separate speech and noise.

There is a fourth approach that calculates level variations in the time domain to detect potential noise reduction in the uplink signal with activated structure-borne functionality at HMS II.3 ViBRIDGE.

Double Talk measurements with and without the presence of background noise

HQS-ViBRIDGE includes Double Talk measurements (acc. to recommendation ITU-T P.502) and analysis with activated and deactivated bone conduction functionality at HMS II.3 ViBRIDGE. These measurements are available in silence and with background noise (experimental). The results provide information about the effect of adding a structure-borne signal to the speech signal on Double Talk behavior of appropriate in-ear headsets.

Speech quality in the presence of a concurrent talker

A concurrent talker (2nd artificial head or artificial mouth) is positioned in various positions around HMS II.3 ViBRIDGE. ACQUA plays back and records real-speech in the presence of a concurrent talker with activated and deactivated structure-borne functionality at HMS II.3 ViBRIDGE. The recordings are analyzed subsequently by the 3QUEST algorithm according to ETSI TS 103 281 (Model A)[1] which presents the results as MOS values. There are two approaches to assess potential divergence of the noise canceler with 3QUEST:

› The speech signal starts first while the concurrent talker starts delayed. Thus, ACQUA assesses the performance of the noise canceler to separate near-end signal and concurrent talker if the concurrent talker suddenly interferes.
› The concurrent talker starts first while the speech signal starts delayed and runs longer than the concurrent talker. Thus, ACQUA assesses the performance of the noise canceler to separate speech and concurrent talker if the concurrent talker suddenly stops.

OPTIONS

ACOPT 19 (Code 6842)
› Option Online analysis

GENERAL REQUIREMENTS

Hardware

ViBRIDGE application

HMS II.3 ViBRIDGE (Code 1703.3)
› HEAD measurement system, Low-Noise, with human-like ViBRIDGE ear simulators (left and right) and artificial mouth
*lab*CORE (Code 7700)
› Modular multi-channel hardware platform
*core*BUS (Code 7710)
› *lab*CORE I/O bus mainboard
*core*OUT-Amp2 (Code 7720)[2]
› *lab*CORE power amplifier board

Bluetooth® headset connectivity

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

Concurrent talker measurements

Equipment option 1
HMS II.5 (Code 1705)
› HEAD measurement system, with 3.3 pinna and artificial mouth (without ear simulators)
*core*OUT-Amp2 (Code 7720)[2]
› *lab*CORE power amplifier board

Equipment option 2
Standalone mouth simulator according to recommendation ITU-T P.51 with built-in power amplifier

Volume control and Double Talk measurements

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

RELEASE NOTES

Database revision and specification version	
Database revision	**ACQUA version**
01	at least 6.0.110

SCOPE OF DELIVERY

HQS-ViBRIDGE (Code 60067)
› delivered as ACQUA database backup
V2C file
› License file for ACQUA dongle
Revision history
› PDF file

GENERAL REQUIREMENTS

Software

Measurement and analysis software

One of the following applications:

ACQUA (Code 6810)
› Advanced Communication Quality Analysis Software, full license (version 6.0.110 or newer)
ACQUA Compact (Code 6860)
› Version 6.0.110 or newer

Background noise simulation software

3PASS *lab* (Code 6990)
› Advanced background noise simulation system with automated equalization – lab version

ACQUA options

ACOPT 09 (Code 6819)
› Option SLVM P.56
ACOPT 25 (Code 6852)
› Option Psychoacoustics
ACOPT 32 (Code 6859)
› Option Speech-based Double Talk analysis
ACOPT 35 (Code 6866)
› Option 3QUEST super-wideband/fullband according to ETSI TS 103 281, Model A

IN PRACTICE

APPLICATION EXAMPLES

Speech quality in the presence of background noise (exemplary)

The test scenario depicts testing in-ear headsets that utilize bone conduction to assess speech quality in sending direction. The in-ear headsets are inserted left and right in the ears of HMS II.3 ViBRIDGE. *lab*CORE powers the artificial mouth loudspeaker as well as the ViBRIDGE actuators with two amplified channels of *core*OUT-Amp2. Background noise is simulated with 3PASS *lab*. For full repeatability of measurements, background noise playback is synchronized by *lab*CORE through a pulse connection to the *lab*BGN hardware platform. ACQUA operates in conjunction with *lab*CORE to generate, receive, and analyze signals.
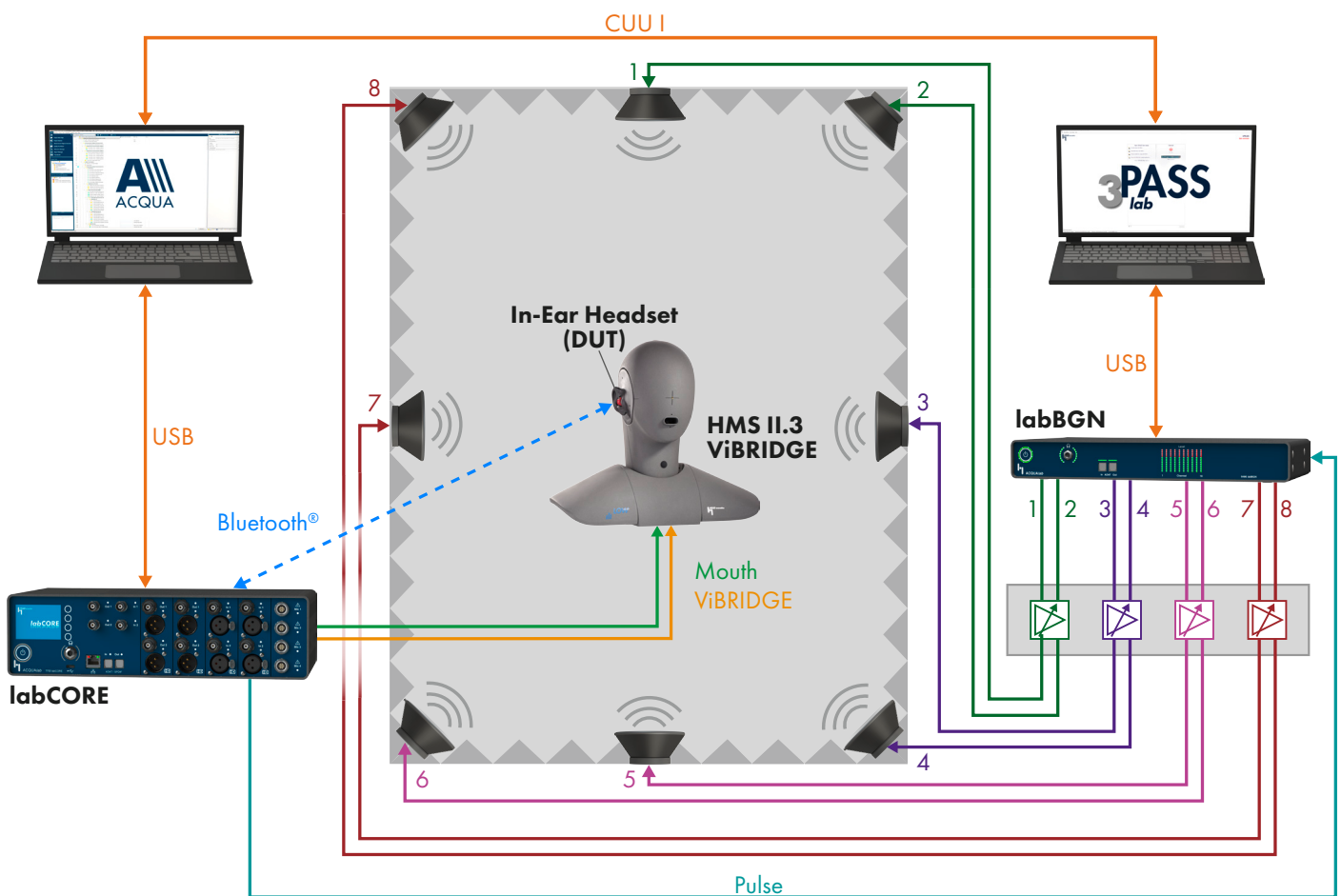
Speech quality in the presence of a concurrent talker (exemplary)

The test scenario depicts testing in-ear headsets that utilize bone conduction to assess speech quality in sending direction. The in-ear headsets are inserted left and right in the ears of HMS II.3 ViBRIDGE. *lab*CORE powers the artificial mouth loudspeaker as well as the ViBRIDGE actuators with two amplified channels of *core*OUT-Amp2. The concurrent talker mouth loudspeaker is powered by the second *core*OUT-Amp2. ACQUA operates in conjunction with *lab*CORE to generate, receive, and analyze signals.
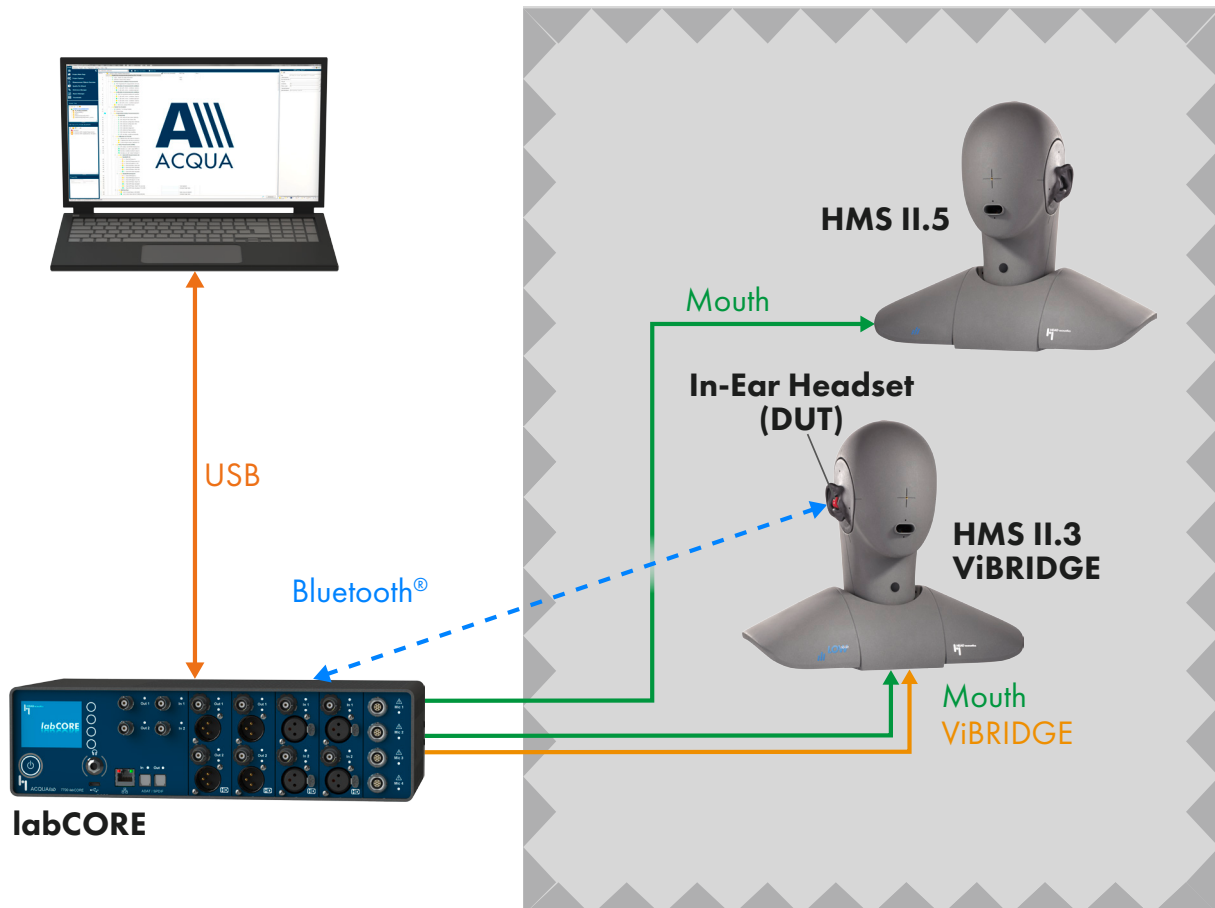
1. The test suite applies the 3QUEST algorithm of ETSI TS 103 281 (Model A) for wideband measurements, even though the algorithm is optimized for super-wideband and fullband devices. Other 3QUEST methods require a single reference microphone at the microphone of the device under test. Since both microphones (left & right) of in-ear headsets shall be considered equally in the measurements, only ETSI TS 103 281 (Model A) provides appropriate results.
2. The application of ViBRIDGE requires both channels of the *core*OUT-Amp2 board. Hence, a second *core*OUT-Amp2 board is required for the operation of HMS II.5 as concurrent talker.

HEAD acoustics

Contact Information

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