DATA SHEET

APPLICATION EXAMPLES INCLUDED

Code 6990

3PASS *lab*

HEAD acoustics 3-dimensional Playback of Acoustic Sound Scenarios

OVERVIEW

3PASS *lab*

Code 6990

3-dimensional Playback of Acoustic Sound Scenarios

3PASS *lab* is an advanced playback and recording system capable of preserving and reproducing real-life background noise scenarios in different test rooms.

3PASS *lab* is especially suited for the evaluation of complex noise reduction algorithms as often found in smartphones as well as active noise cancellation systems. 3PASS *lab* complies with ETSI standard TS 103 224 and includes a background noise database containing files from the specification.

KEY FEATURES

Compliance with ETSI TS 103 224

Automated digital system equalization together with *lab*BGN and MSA I/MSA II

Handset, hands-free, desktop hands-free device testing

Testing binaural (ANC) headphones/headsets/hearing aids

Binaural equalization with artificial head according to 3GPP TS 26.132 and ETSI TS 103 224

Including background noise database

Remote control of 3PASS *lab* playback by ACQUA/ VoCAS via TCP/IP, REST, or adapter cable

APPLICATIONS

Sound field reproduction for device testing at one position in space according to ETSI TS 103 224

Handset testing configurations

Handset testing configuration with binaural equalization (according to 3GPP TS 26.132 and ETSI TS 103 224)

Hands-free testing configurations

Desktop hands-free testing configurations

Headset testing configurations (binaural)

DETAILS

Background noise impairs speech intelligibility during conversations via telecommunication terminals or the quality of voice recognition systems. For evaluating the behavior of corresponding devices in the presence of background noise, realistic and reproducible testing is required. Appropriate systems for simulating background noise consist of hardware components for recording, equalization, and playback as well as a main control software controlling the functionalities. 3PASS *lab* in conjunction with appropriate HEAD acoustics equipment is a convenient system providing all these functionalities.

DESCRIPTION

General

3PASS *lab* reproduces previously recorded background noise scenarios including their essential spatial characteristics. It is applicable for development and assessment of complex background noise reduction algorithms. Thus, it helps assessing the performance of modern smartphones, (ANC) headphones, (ANC) headsets, and hands-free communication devices such as smart speakers or conferencing devices under real life conditions.

3PASS *lab* allows automated digital system equalization via microphone surround arrays MSA I/MSA II or via a binaural HATS (e.g. HMS II.3). MSA I has an asymmetric arrangement of eight microphones (2 × left, 1 × front, 5 × right) for best equalization results at the typical microphone positions of, e.g. mobile phones. MSA II has a symmetrical build with 2 × 4 microphones for binaural applications.

Users of the legacy systems HAE-BGN or HAE-car using *lab*BGN can easily upgrade to 3PASS *lab* without requiring a new hardware platform.

Application setups

3PASS *lab* provides five setups for different applications. The application usually depends on the device under test (DUT) which ranges from near-field devices such as handsets and headsets to far-field devices such as conferencing devices or smart speakers.
  › Handset setup
    » Standard setup with eight loudspeakers and optional subwoofer for testing handsets. Equalization with MSA I mounted on a HEAD measurement system.
  › Handset binaural setup (acc. to 3GPP TS 26.132)
    » Setup with four loudspeakers and optional subwoofer for testing handsets. Equalization with ear microphones of the applied artificial head. More accurate and convenient method from ETSI TS 103 224 compared to ETSI ES 202 396-1.
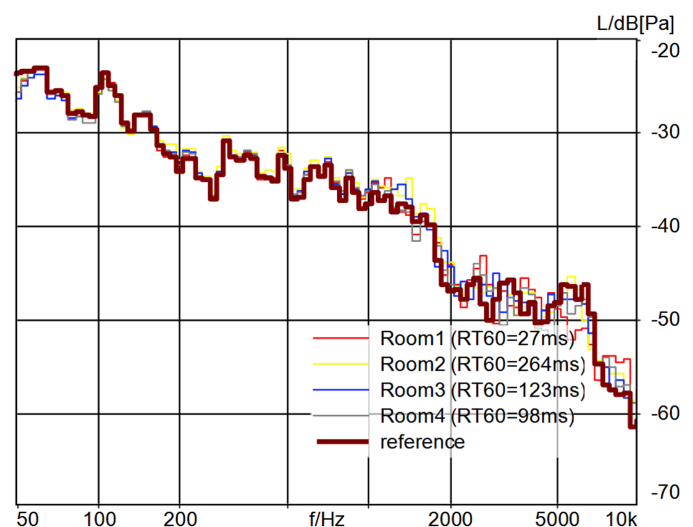
The reference is a recording via the microphone of the DUT in a typical test room. The other four graphs show the recreation of the reference signal by 3PASS lab in four different rooms with different reverberation times. The very high correlation with the reference signal demonstrates the accuracy of 3PASS lab and its automated digital equalization across different laboratories and test rooms.

- › Hands-free setup
  - » Standard setup with eight loudspeakers and optional subwoofer for testing hands-free terminals. Equalization with MSA I positioned close to the DUT microphone.
- › Desktop hands-free setup
  - » Standard setup with eight loudspeakers and optional subwoofer for testing desktop operated hands-free terminals. Equalization with MSA I positioned close to the DUT microphone.
- › Binaural application setup
  - » Standard setup with eight loudspeakers and optional subwoofer for testing binaural headsets. Equalization with MSA II mounted on a HEAD measurement system.

Equalization

There are different equalization procedures due to different microphone arrangements for each application setup:
- › Equalization with MSA I
- › Equalization with MSA II
- › Equalization with binaural artificial head

The software runs the appropriate equalization according to the applied setup. Most steps of the equalization procedures are similar but differ in detail. In general, all procedures require level adjustments for the loudspeakers in the setup. Then, 3PASS *lab* records sweeps from each loudspeaker with the applied microphones. Due to the asymmetrical design of MSA I, the sweep recording has to be executed at two different positions. Therefore, MSA I is rotatable by 10°. For binaural equalization according to 3GPP TS 26.132, the number of loudspeakers is different and there are additional microphone settings for *lab*CORE. Finally, 3PASS *lab* runs calculations for the equalization by using the recorded signal data.

Remote control

3PASS *lab* provides an interface for remote operation by other HEAD acoustics software (ACQUA, VoCAS). There are multiple ways for controlling 3PASS *lab* remotely:
- › TCP/IP
  - » Run 3PASS *lab* and ACQUA/VoCAS on the same computer or in the same network.
- › REST
  - » Run 3PASS *lab* and ACQUA/VoCAS on the same computer or in the same network.
- › HAE Remote
  - » Run 3PASS *lab* and ACQUA/VoCAS on different computers which are interconnected by an adapter cable.

GENERAL REQUIREMENTS

Hardware

Hardware platform

*lab*BGN (Code 6486)
- › ACQUA*lab* (8+2)-channel background noise hardware platform

Only for binaural equalization acc. to ETSI TS 103 224:

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

Recording equipment

One of the following microphone arrays:

For handset and hands-free application:
- › MSA I (Code 6487)
  - » 8-channel microphone surround array, asymmetrical, according to ETSI TS 103 224

For binaural and hands-free application:
- › MSA II (Code 6487.2)
  - » 8-channel microphone surround array, symmetrical, according to ETSI TS 103 224

Only for binaural equalization acc. to ETSI TS 103 224:

HMS II.3 (Code 1703)
- › HEAD measurement system, basic version with right ear simulator, 3.3 pinna & artificial mouth

HIS L (Code 1701)
- › HEAD impedance simulator, left

Playback equipment

The number of loudspeakers, power amplifiers, and cables depends on the applied 3PASS *lab* setup:
- › Eight loudspeakers (Handset setup, hands-free setup, desktop hands-free setup, and binaural applications)
- › Four loudspeakers (Handset binaural setup for measurements according to 3GPP TS 26.132)

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OPTIONS

Hardware

CUU I (Code 6085)
› Adapter USB <> USB for Remote control HAE

HSW II.1 (Code 2952)
› HEAD Subwoofer for 3PASS (incl. KMT DC 3 Power Amplifier)

HSW II.1-V1 (Code 2952-V1)
› HEAD Subwoofer for 3PASS (incl. LD Systems XS700 Power Amplifier)

HSW II.1-V2 (Code 2952-V2)
› HEAD Subwoofer for 3PASS (incl. QSC GX3 Power Amplifier)

Software

3PASS *reverb* (Code 6996)
› Option for 3PASS: Simulation of reverberation scenarios

UG 3PASS *lab* > 3PASS *flex* (Code 6993)
› Upgrade 3PASS *lab* > 3PASS *flex*

GENERAL REQUIREMENTS

HEAD acoustics provides a selection of appropriate third party loudspeakers and power amplifiers for 3PASS *lab* configurations.

CSO I.0 (Code 9822)
› Loudspeaker cable set for 3PASS (4 Speaker connections)

Operating equipment

PC
› Multi-core processor 1.6 GHz or faster, 4 GB RAM, 40 GB free disk space, 3 USB ports

Software

One of the following Windows® applications:

Microsoft Windows 10 Pro
› (English or German version)
Microsoft Windows 11 Pro
› (English or German version)

SCOPE OF DELIVERY

› Setup DVD 3PASS *lab* (incl. background noise database)
› Dongle (USB)

IN PRACTICE

APPLICATION EXAMPLES

Equalization: Handset setup

MSA I is mounted on HMS II.3 in the measurement cabin for recording. It connects to *lab*BGN via HEAD*link*. 3PASS *lab* runs on a computer which connects to *lab*BGN. *lab*BGN forwards signals via power amplifiers to eight loudspeakers in the measurement cabin. The equalization proceeds according to the procedure from ETSI TS 103 224.
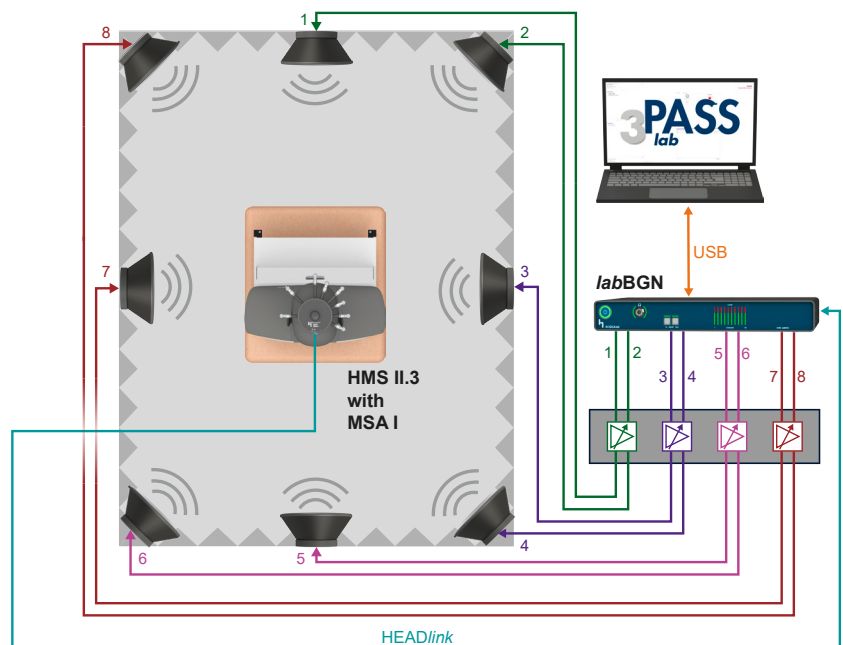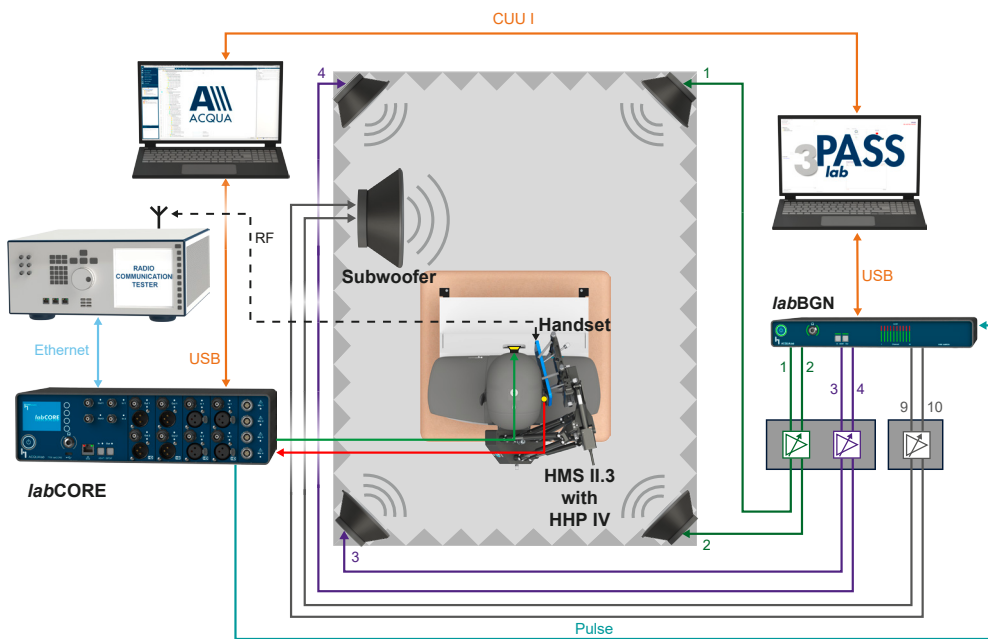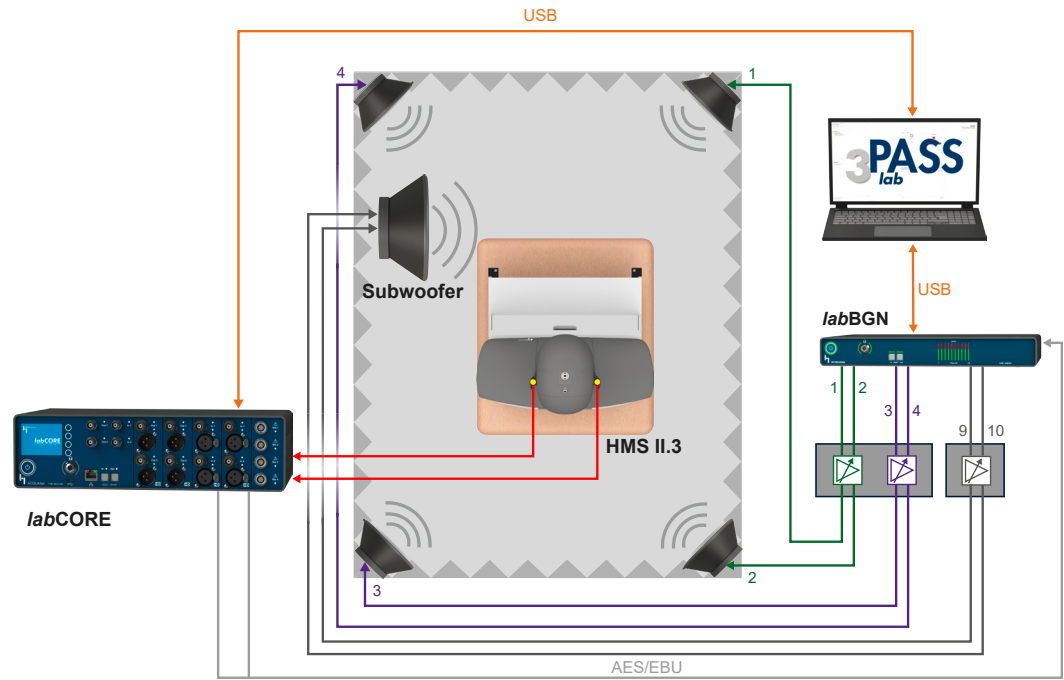

Measurement: Handset setup

The handset is clamped into HHP IV and connects via packet-switched network to a radio tester. *lab*CORE transmits signals to HMS II.3 and radio tester for playback and receives signals from HMS II.3 and radio tester for recording. ACQUA generates the signals for playback and records signals for analysis. 3PASS *lab* plays back background noises and ACQUA assesses speech signal processing of the smartphone under real-life conditions.
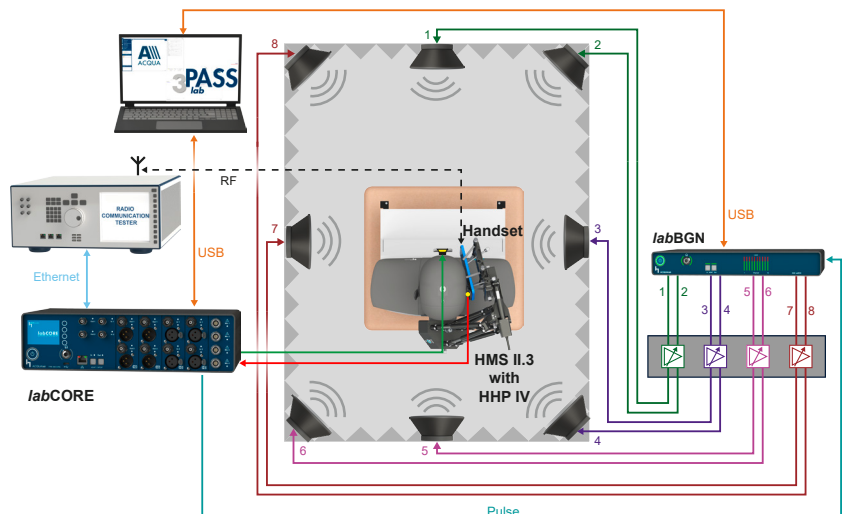
Equalization: Handset setup (3GPP TS 26.132)

Both ear microphones of the HMS II.3 artificial head connect to *lab*CORE for recoding. 3PASS *lab* controls settings for *lab*CORE in the equalization procedure. *lab*CORE forwards received signals from the ear microphones to *lab*BGN via AES/EBU. The playback signals from 3PASS *lab* run through *lab*BGN and power amplifiers to four loudspeakers and a (optional) subwoofer. The equalization proceeds according to the procedure from ETSI TS 103 224.


Measurement: Handset setup (3GPP TS 26.132)

The handset is clamped into HHP IV and connects via packet-switched network to a radio tester. *lab*CORE transmits signals to HMS II.3 and radio tester for playback and receives signals from HMS II.3 and radio tester for recording. ACQUA generates the signals for playback and records signals for analysis. 3PASS *lab* plays back background noises and ACQUA assesses speech signal processing of the smartphone under real-life conditions.

Equalization: Desktop hands-free setup

MSA I is mounted on a stand base positioned on a table in the measurement cabin for recording. It connects to *lab*BGN via HEAD*link*. 3PASS *lab* runs on a computer which connects to *lab*BGN. *lab*BGN forwards signals via power amplifiers to eight loudspeakers in the measurement cabin. The equalization proceeds according to the procedure from ETSI TS 103 224.
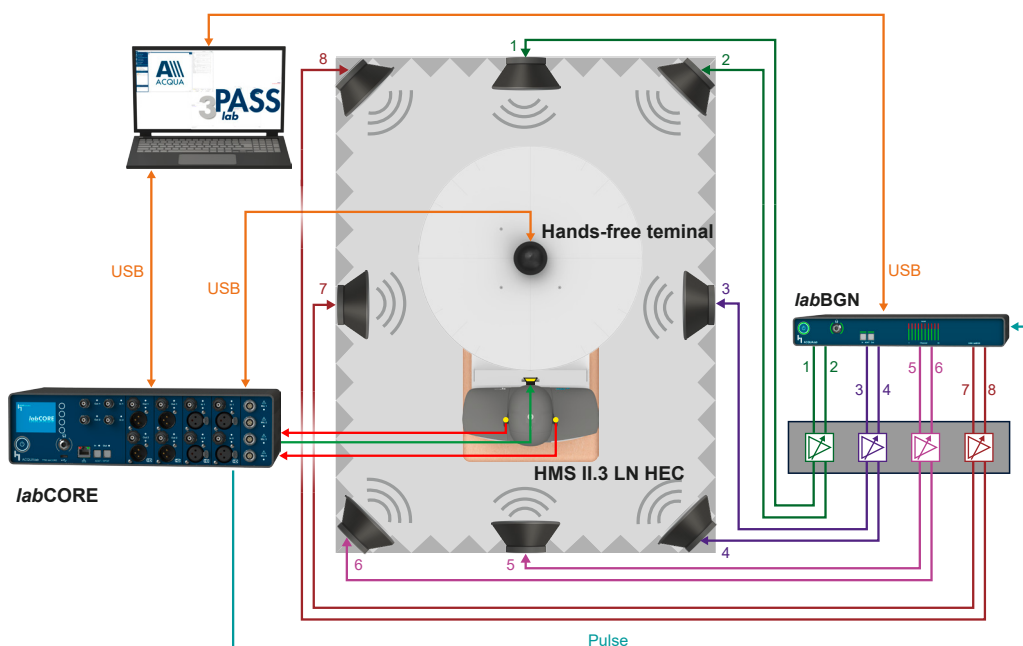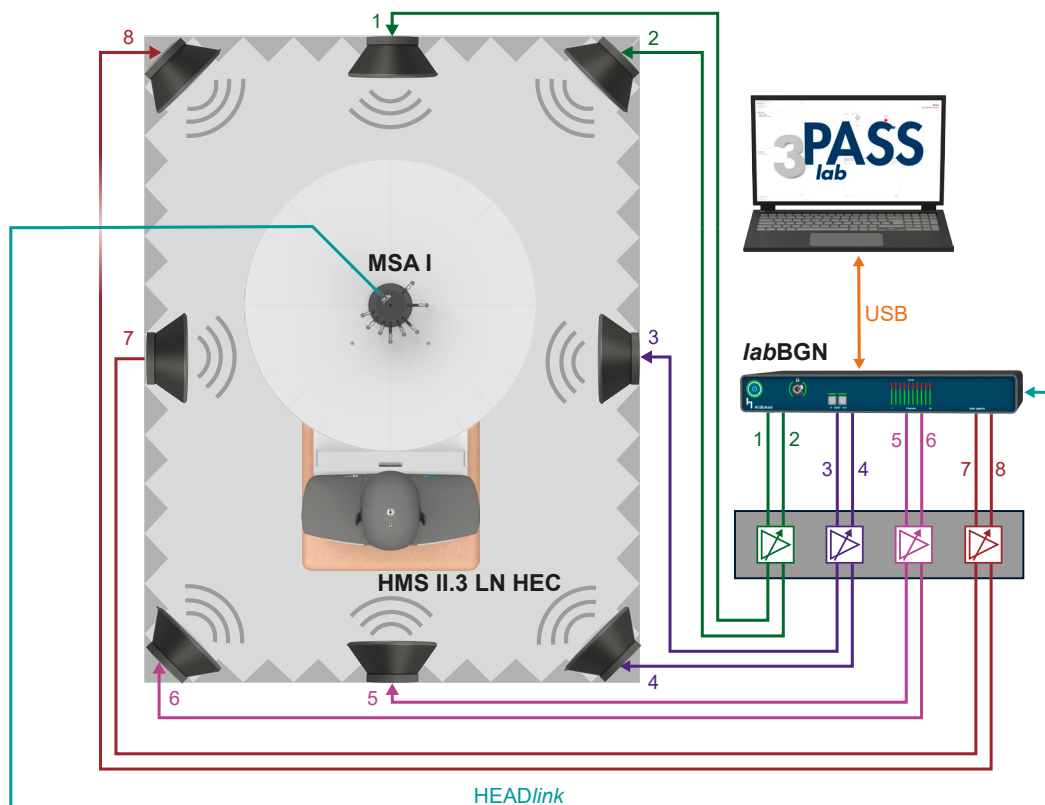

Measurement: Desktop hands-free setup

The hands-free terminal is positioned on the table in the measurement cabin. *lab*CORE transmits signals to HMS II.3 for playback and receives signals from HMS II.3 for recording. ACQUA generates the signals for playback and analyzes the recorded signals. 3PASS *lab* plays back background noises and ACQUA assesses speech signal processing of the hands-free terminal under real-life conditions.

Equalization: Binaural application setup

MSA II is mounted on HMS II.3 LN HEC in the measurement cabin for recording. It connects to *lab*BGN via HEAD*link*. 3PASS *lab* runs on a computer which connects to *lab*BGN. *lab*BGN connects via power amplifiers to eight loudspeakers in the measurement cabin. The equalization proceeds according to the procedure from ETSI TS 103 224.

HMS II.3 LN HEC with MSA II

*lab*BGN

HEAD*link*

USB
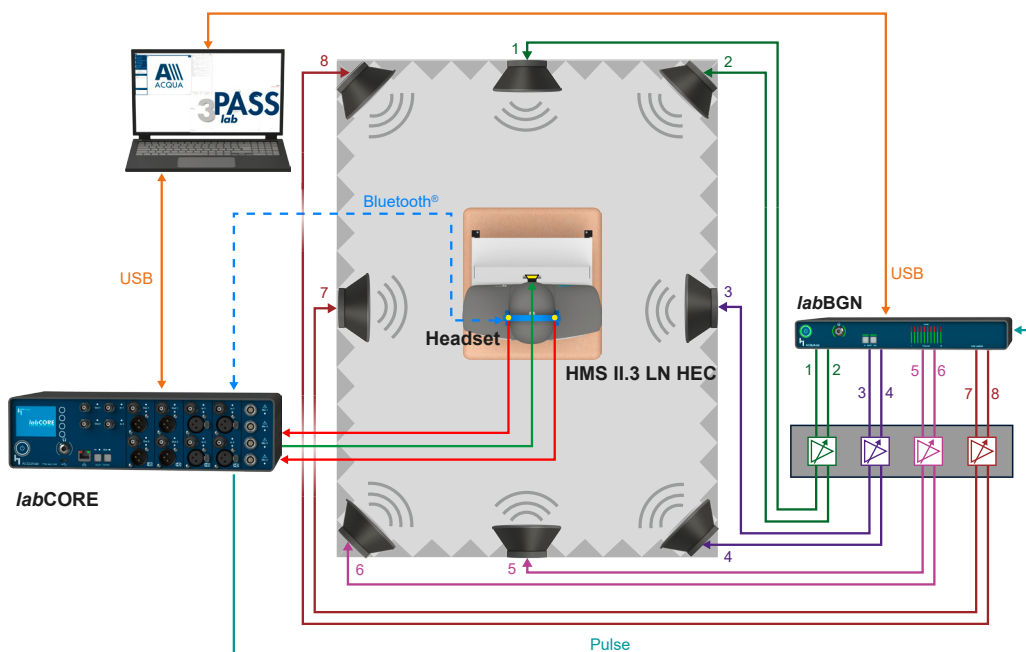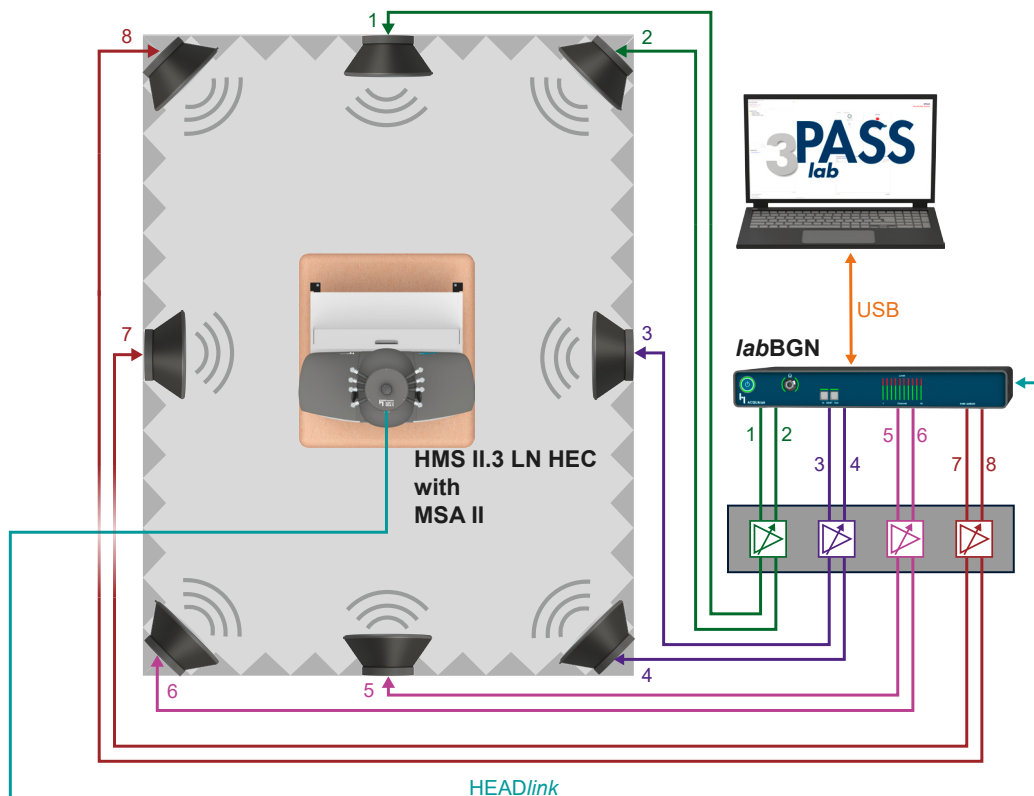
Measurement: Binaural application setup

HMS II.3 LN HEC is positioned in the measurement cabin wearing the headset. The headset exchanges audio data with *lab*CORE via Bluetooth®. *lab*CORE transmits audio signals to HMS II.3 LN HEC and headset for playback and receives audio signals from HMS II.3 LN HEC and headset for recording. ACQUA generates the signals for playback and records signals for analysis. 3PASS *lab* plays back background noises and ACQUA assesses speech signal processing of the headset under real-life conditions.

Headset

HMS II.3 LN HEC

*lab*BGN

*lab*CORE

Bluetooth®

USB

USB

Pulse

◀ASIO▶

COMPATIBLE

ASIO is a registered trademark of
Steinberg Media Technologies GmbH

VST

COMPATIBLE

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HEAD acoustics

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