



## Description

Evaluating the speech quality of voice over IP (VoIP) systems and devices is a challenge. Various types of signal processing work in the background to maintain good speech quality. Typical signal processing of VoIP systems and devices involves:

- Speech codecs
- Jitter buffer adjustment
- Packet loss concealment (PLC)
- Automatic gain control (AGC) (plus digital gain control (DCG) in Teams)
- Acoustic echo cancellation
- Noise suppression (NS)
- Comfort noise generation (CNG)
- Voice activity detection (VAD)

In addition to dealing with acoustic factors like poor SNR and typical workplace background noise, the system is expected to respect network constraints by keeping the bitrate low and handling data transfer issues discretely (jitter, packet loss etc.).

Communication devices for Microsoft Teams (formerly Microsoft Skype for Business) use VoIP and thus the same signal processing methods. To guarantee best possible conversational quality in professional work environments,

Microsoft set standards in the 'Microsoft Teams Audio Test Specification V4.0'. It defines exact requirements for Teams personal and conferencing devices and accessories and how to test them for compliance. These requirements are implemented in the HEAD acoustics measurement standard MS Teams for ACQUA.

MS Teams includes two projects, each for typical Teams devices:

- Handsets and headsets
- Personal speakerphones (mouth-to-microphone distance  $\leq 1.0$  m) and conferencing devices (mouth-to-microphone distance  $> 1.0$  m)

MS Teams covers all relevant speech quality aspects in sending and receiving direction, echo performance as well as speech quality in presence of background noise and during double talk. For this purpose, the standard uses the analysis methods 3QUEST, EQUEST, POLQA as well as Speech-based Double Talk and Echo Analysis according to 3GPP TS 26.131/132.

### Overview of database revisions and specification versions

Database Revision	Based on Specification Version	Min. ACQUA Version
4	Microsoft Teams Audio Test Specification V4.0 (01/2019)	4.0.200

(Older releases are available upon request)

## DATA SHEET

### MS Teams (Code 60026)

#### Measurements according to Microsoft Teams Audio Test Specification V4.0

#### Overview

Microsoft Teams (formerly Microsoft Skype for Business) is a versatile platform for workplace collaboration and communication via VoIP. To ensure optimal speech quality in conversations held on Teams systems, Microsoft defines performance requirements for respective communication devices and accessories in the 'Microsoft Teams Audio Test Specification V4.0'. Focus is on usability-oriented characteristics such as speech quality, signal-to-noise ratio, echo and delay.

Based on these requirements, the HEAD acoustics measurement standard MS Teams allows efficient, automated testing of VoIP conferencing devices for compliance with the 'Microsoft Teams Audio Test Specification V4.0'.

Certified for

Microsoft Teams

Certified for

Skype for Business

#### Key Features

- Convenient automated testing of VoIP devices and accessories for compliance with 'Microsoft Teams Audio Test Specification V4.0'

#### Applications

- Automated analysis of handsets, headsets, personal / conferencing speakerphone devices and other accessories for Microsoft Teams
- Compliance testing according to 'Microsoft Teams Audio Test Specification V4.0'

#### General Requirements

- **ACQUA (Code 6810)**, Advanced Communication Quality Analysis System.
- 1 PC for ACQUA (as specified by corresponding data sheets)
- 1 PC for Reference Client (Windows)
- **ACOPT 21 (Code 6844)**, Option 3QUEST

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## PSMM Skype (Code 6595)

Several measurements in 'Microsoft Teams Audio Test Specification V4.0' include a free field microphone and artificial mouth placed at precisely defined positions in respect to the DUT. The optionally available, solid positioning stand PSMM Skype allows quick and convenient placement of mouth and microphone in any room. The enclosed laser pointer allows accurate alignment.

PSMM Skype can be used for measurement setups laid out in 'Microsoft Teams Audio Test Specification V4.0' as well as the preceding 'Microsoft Skype for Business Audio Test Specification V3.0'. The position markings on the mounting bar of PSMM Skype are according to specification 3.0 and can be disregarded for MS Teams measurements.

- **ACOPT 29 (Code 6856)**, Option EQUEST
- **ACOPT 30 (Code 6857)**, Option POLQA
- **ACOPT 32 (Code 6859)**, Option Speech-based double talk
- One of the following **HEAD measurement systems**
  - **HMS II.3 (Code 1230)**, HEAD measurement system with ear simulator, pinna type 3.3 or 3.4 with
  - **HIS L (Code 1231)**, HEAD impedance simulator, left ear (only for HAE-BGN)
- or
- **HMS II.3-LN (Code 1230.3)**, HEAD Measurement System, Low-Noise Version with 3.3 Pinna, Right Ear Simulator & Artificial Mouth with
- **HIS L-LN (Code 1231.3)**, HEAD impedance simulator, left ear, low-noise version (only for HAE-BGN)
- **labCORE (Code 7700)**, Modular Multi-channel Hardware Platform with
  - **coreBUS (Code 7710)**, labCORE I/O Bus Mainboard
  - **coreOUT-Amp2 (Code 7720)**, labCORE Power Amplifier Board
  - **coreBEQ (Code 7740)**, labCORE Binaural Equalization Software Extension
  - **coreIN-Mic4 (Code 7730)**, Microphone input board
- One of the following **soundboards**:
  - **DSB II (Code 2406)**, (internal, PCI) or
  - **DSB III (Code 2407)**, (internal, PCIe) or
  - **DSB IV (Code 2408)**, (external, USB)
- One of the following **background noise simulation systems**:
  - **HAE-BGN (Code 6971)** or
  - **3PASS lab (Code 6990)** or
  - **3PASS flex (Code 6995)**

SMDs in ACQUA database		
	Handset/ headset	Personal speakerphone & conferencing devices
Delay		SND, RCV
Total Quality Loss		SND, RCV
Frequency Response		SND, RCV
Signal Level (loud/normal/quiet speech)		SND, RCV
Single Frequency Interference		SND, RCV
Idle channel SNR		SND, RCV
Active channel SpNR		SND
EQUEST (Echo MOS) nominal/maximum volume		•
Distortion and Noise		SND, RCV
TCLw		•
Speech-based Double Talk (TS 26.131/132)		•
3QUEST S-/N-/G-MOS (various background noise types)		•
Maximum Output Level		RCV
Frequency Response, different angles	-	SND, RCV
Sidetone Masking Rate	•	-
Open office headset distractor attenuation	•	-
EQUEST in reverberant room with two near-end talkers	-	•
Test-specific hardware/software requirements		
HHP IV (Code 1406) or HHP III.1 (Code 1403)	• <sup>1</sup>	-
HMT III (Code 1961)	•	-
Free-field microphone	-	•
Artificial mouth according to ITU-T P.51	• <sup>2</sup>	•
Options		
ACOPT 02 Signal Analysis (Code 6812)	• <sup>3</sup>	• <sup>3</sup>
HRT I (Code 6498) + TEP-100 (Code 6499)	•	•
PSMM Skype (Code 6595)	• <sup>4</sup>	•

### Options

- Please see table

### Delivery Items

- **MS Teams Rev. 04 (Code 60026)**, as ACQUA database
- **V2C File** (for ACQUA)
- **2 Dongles** (for Teams Ref/DUT editor)

1) Only for handsets

2) As second talker (distractor) if second HATS is not available

3) Only if desired, not required by the specification

4) For positioning an artificial mouth as second talker (distractor) if second HATS is not available

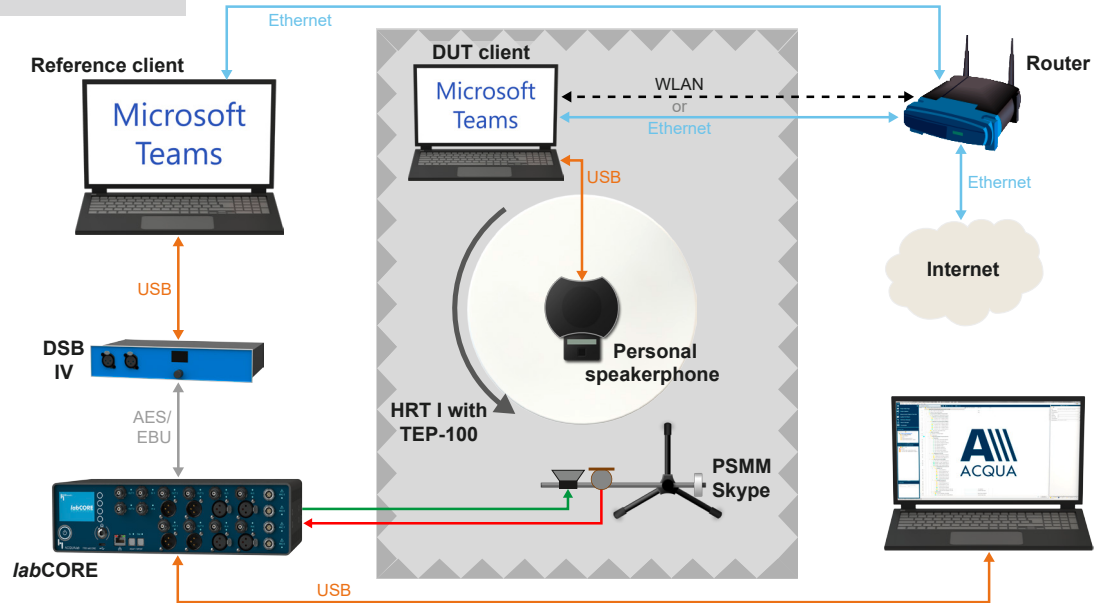
## MS Teams configuration examples

The following illustrations show two examples of measurement setups for Teams devices to be tested. Please note that both examples are test-specific, other tests according to the 'Microsoft Teams Audio Test Specification' may require different hardware and setups.

### Example 1: Personal speakerphone

In this example, the DUT is a personal speakerphone. It is tested in an anechoic room in central position on the remote-operated turntable HRT I with the extension plate TEP-100 ( $\varnothing$  100 cm). The speakerphone has no embedded client and

thus relies on a USB-connected computer as the client for Teams. The simulated conversation is held via an artificial mouth and free-field microphone attached to PSMM Skype.



### Example 2: USB headset

In the second example, the DUT is a USB headset connecting to a computer acting as the client for Teams. The simulated conversation is held via a HMS system simulating a person wearing the headset.

Testing is performed in a reverberant room. Background noise is simulated with the help of 3PASS lab, labBGN and eight large loudspeakers (no subwoofer required).

Playback of background noise is synchronized with measurements via the 'Pulse' connection to ensure perfect repeatability and thus conclusive test results.

