

## Description

With the fast spread of IP networks, Voice over IP (VoIP) has become the norm for providing telephony service. The unique characteristics of IP networks such as packet loss, delay etc. pose new challenges for real-time speech transmission. Modern VoIP terminals often apply advanced signal processing to maintain and/or improve speech quality. To assess the properties of VoIP telephony terminals, corresponding test methods and specifications are necessary.

ETSI specified appropriate performance requirements for narrowband VoIP terminals in two standards: ES 202 737 focuses on handsets and headsets, ES 202 738 on loudspeaking and hands-free devices. Both standards also incorporate wireless devices and softphones. In addition to basic testing procedures, these standards also describe advanced testing from a Quality-of-Service (QoS) perspective as perceived by the user.

HEAD acoustics combined the tests laid out in both standards in the test suite ES 202 737/38 for the advanced communication quality analysis system ACQUA. An exemplary test configuration is illustrated and described on the last page of this document.

If desired, measurements in the test suite can be modified or extended for additional tests as well as combined to create individual test sequences. However, testing for compliance with the ETSI standards requires unaltered measurements.

With its predefined measurement descriptors and automated measurement sequences, the test suite ES 202 737/38 allows fast and easy acquisition, analysis and documentation of measurement data.

## DATA SHEET

### ES 202 737 / 38 (Code 6795)

### ETSI ES 202 737 / ES 202 738, Narrowband IP Phones

#### Overview

The ETSI standards ES 202 737 and ES 202 738 provide speech transmission performance requirements for all types of narrowband VoIP terminals.

In contrast to standards only defining minimum performance requirements, ES 202 737 and ES 202 738 also specify advanced tests to accomplish good end-to-end speech quality as perceived by the user.

HEAD acoustics combined all measurements laid out in both standards in the automated test suite ES 202 737/38 for ACQUA.

The test suite allows manufacturers of VoIP terminals and VoIP service providers to ensure best narrowband speech quality by meeting the requirements specified in the ETSI standards.

#### Key Features

- Automated test suite to test narrowband VoIP terminals according to ETSI ES 202 737 and ES 202 738
- Includes basic tests as well as advanced testing from a QoS perspective as perceived by the user
- Supports all types of VoIP terminals:
  - Handsets
  - Headsets
  - Desktop-operated hands-free
  - Handheld hands-free
  - Softphones
  - Group audio terminals

#### Applications

- Automated speech quality analysis, experimental development and optimization as well as conformance testing of narrowband VoIP terminals according to ETSI ES 202 737 and ES 202 738

Overview of database revisions and specification versions		
Database revision	Based on specification version	Min. ACQUA version
5	ES 202 737 V1.8.1 (2020-03) ES 202 738 V1.8.1 (2020-03)	4.0.200 with Update 2

(Older releases are available upon request)

## Overview of SMDs in ES 202 737/38

● = SMD – = no SMD	Handset	Headset	Desktop-operated hands-free	Handheld hands-free	Softphone	Group audio terminal
SMD title						
Activation Sensitivity SND	●	●	●	●	●	●
Attenuation Range DT in SND /RCV	●	●	●	●	●	●
Attenuation Range DT in SND /RCV with Variable Echo Path	–	–	●	–	●	–
BGNT with far end Speech	●	●	●	●	●	●
Clock Accuracy SND / RCV	●	●	●	●	●	●
Clock Drift PPM SND / RCV	●	●	●	●	●	●
Codec specific Tests - Objective Listening Speech Quality SND / RCV POLQA <sup>1</sup>	●	●	●	●	●	●
Codec specific Tests - Objective Listening Speech Quality SND / RCV TOSQA	●	●	●	●	●	●
Codec specific Tests - Terminal Signal Processing Delay SND / RCV	●	●	●	●	●	●
Comfort Noise Level/Spectral Adj.	●	●	●	●	●	●
Distortion SND / RCV	●	●	●	●	●	●
Echo Attenuation during DT	●	●	●	●	●	●
Frequency Response SND / RCV	●	●	●	●	●	●
Idle Channel Noise SND / RCV	●	●	●	●	●	●
Idle Channel Noise - Peak SND / RCV	●	●	●	●	●	●
Loudness Rating SND / RCV	●	●	●	●	●	●
Out-of-Band Signals SND / RCV	●	●	●	●	●	●
Positional Robustness - Frequency Response	●	–	–	–	–	–
Positional Robustness - Loudness Rating	●	–	–	–	–	–
Positional Robustness - Speech Quality in the Presence of BGN	●	–	–	–	–	–
Quality of Jitter Buffer Adjustment (Delay and POLQA <sup>1</sup> )	●	●	●	●	●	●
Round Trip Delay, DUT Speech Proc.	●	●	●	●	●	●
Send Delay Variation	●	●	●	●	●	●
Send Loudness Rating Mic Mute	●	●	●	●	●	●
Sidetone Delay	●	●	–	–	–	–
Sidetone Masking Rating STMR	●	●	–	–	–	–
Spectral Echo Attenuation	●	●	●	●	●	●
Speech Quality in the Presence of BGN	●	●	●	●	●	●
Stability Loss	●	●	●	●	●	●
Temporal Echo Effects	●	●	●	●	●	●
Terminal Coupling Loss weighted	●	●	●	●	●	●
Variable Echo Path	●	●	●	–	●	–
Variation of Loudness Rating SLR	●	●	–	–	–	–

## General requirements

### Software

- **ACQUA (Code 6810 etc.)**, Advanced Communication Analysis System
- **ACOPT 10 (Code 6820)**, Option TOSQA, Telecommunications Objective Speech Quality Assessment
- **ACOPT 21 (Code 6844)**, Option 3QUEST, 3-fold Quality Evaluation of Speech in Telecommunications
- **ACOPT 30 (Code 6857)**, Option POLQA<sup>1</sup>
- **3PASS lab (Code 6990)**, Advanced background noise simulation system with automated equalization - lab version

### Hardware

- **labCORE (Code 7700)**, Modular multi-channel hardware platform with
  - **coreBUS (Code 7710)**, I/O bus mainboard
  - **coreOUT-Amp2 (Code 7720)**, Power amplifier board, for sending direction

- **coreIN-Mic4 (Code 7730)**, Microphone input board, for receiving direction
- **coreBEQ (Code 7740)**, labCORE binaural equalization, incl. filter set for one artificial head
- **coreIP (Code 7770)**, labCORE I/O module, Voice over IP reference gateway
- **coreIP-IMP (Code 7771)**, labCORE VoIP impairment option

### One of the following HEAD Measurement Systems:

- **HMS II.3-33 (Code 1230.1)**, HEAD Measurement System, basic version with 3.3 Pinna, right ear simulator & artificial mouth
- or
- **HMS II.3-LN (Code 1230.3)**, HEAD Measurement System, low-noise version with 3.3 Pinna, right ear simulator & artificial mouth (based on IEC 60318-4, low-noise, high dynamics)

### For handset measurements

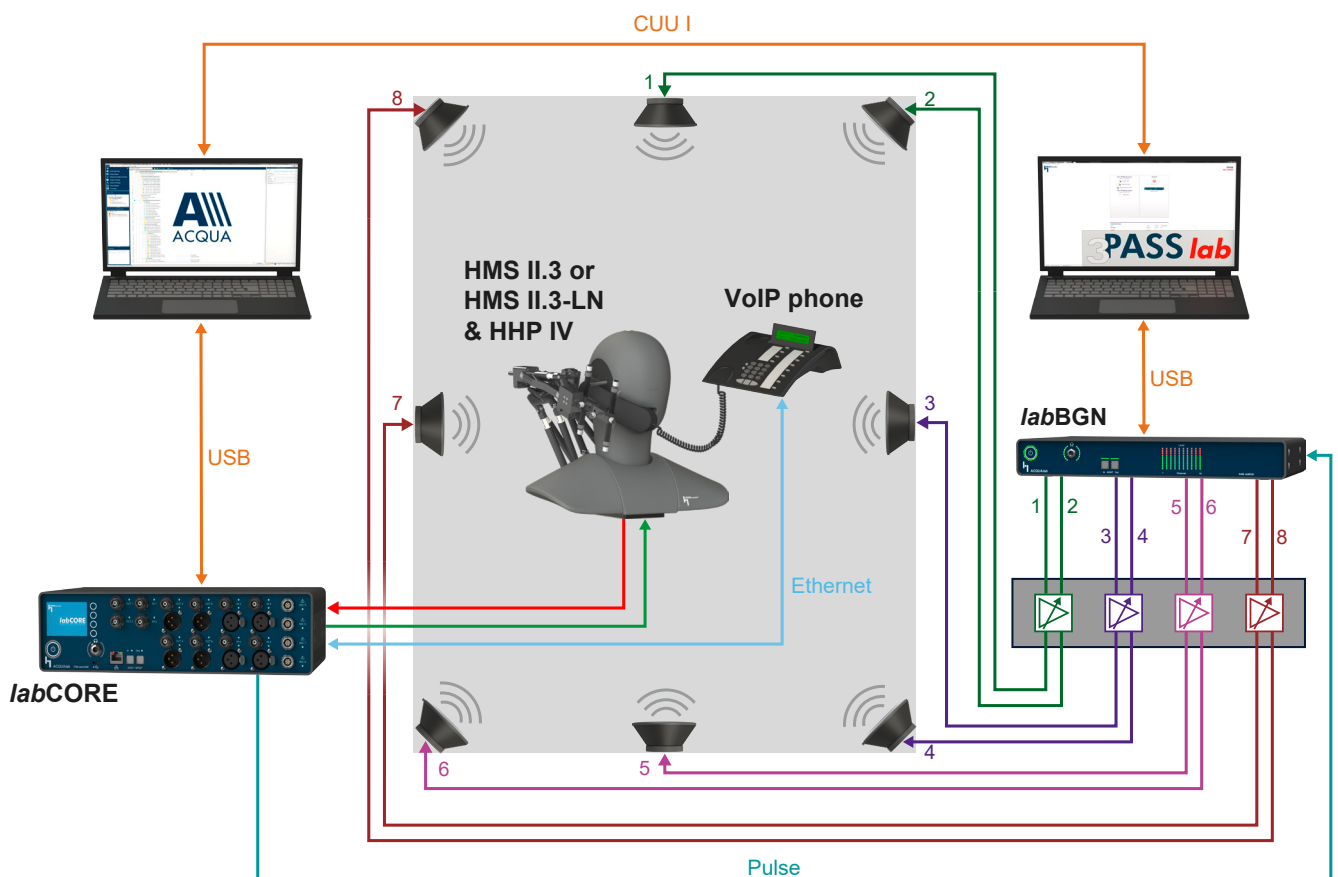
- **HHP IV<sup>2</sup> (Code 1406)**, motorized handset positioner

### For headset measurements

- **HIS L (Code 1231)**, HEAD impedance simulator, left (for HMS II.3)
- or
- **HIS L-LN (Code 1231.3)**, HEAD impedance simulator, left, low-noise version (for HMS II.3-LN)

### Delivery items

- **ES 202 737/38 (Code 6795)**, delivered as ACQUA database
- **V2C file**
- **Documentation** as PDF



Exemplary test configuration for handset testing with ES 202 737/38. The device under test is a VoIP phone in handset mode. HMS II.3 (or its low-noise variant HMS II.3-LN) simulates its user, the motorized handset positioner HHP IV<sup>2</sup> guarantees a repeatable position and contact pressure of the handset relative to the artificial ear and mouth.

Background noise is simulated via 3PASS lab. In collaboration, labCORE and ACQUA generate, send and receive signals and automatically trigger background noise playback for precise synchronization with measurements.

1) POLQA version 3 is required.

2) Alternatively, HHP III.1 (Code 1403) can be used.