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VFTST-Audio-NB (Code 60009)

Acoustical Quality Evaluation of Terminals, Narrowband Part

Measurement tree and result diagram for VFTST-Audio-NB in communication analysis system ACQUA

Overview

Speech quality assessment of mobile phones is quite a challenge due to the various kinds of signal processing involved (e.g. noise reduction algorithms, various kinds of speech processing and the transmission delay itself). All these aspects have a significant influence on conversational speech quality.

Therefore, Vodafone has developed the test specification Performance TST Audio Quality 3.0 which has been implemented by HEAD acoustics as measurement standard for the communication analysis system ACQUA. It provides **comprehensive tests** for the analysis of

- **Delay**
- **Speech transmission quality**
- **Echo**
- **Quality during double talk**
- **Quality of background noise transmission**
- **Bluetooth® interface**

Manufacturers need VFTST-Audio-NB to be able to prove conformance of their narrowband devices with the requirements of the latest Vodafone audio test specification.

DESCRIPTION

The tests implemented in VFTST-Audio-NB cover all requirements of the Vodafone specification with regard to **acoustical quality in the narrowband range** such as

- delay measurements in sending and receiving direction
- objective speech quality assessment under single talk conditions in sending and receiving direction
- echo tests
- detailed evaluation of quality during double talk
- quality of background noise transmission.

In addition, **electric headset interface measurements** based on ITU-T P.381 and measurements according to **VF Acoustic Safety Requirements Spec. Version 3.0** (based on EN 60950, EN 50332 and ETSI EG 202 518) have been implemented in the test suite.

Moreover, **recordings using real speech** under single talk, echo and double talk conditions are implemented. Apart from the measured parameters these recordings also provide listening examples which can be used for audio demonstrations.

For determination of the quality of background noise transmission a standardized arrangement consisting of four loudspeakers and one subwoofer is used in a separate test room setup. It allows a **close-to-reality noise playback** and can be used for all types of background noise.

APPLICATIONS

- **Conformance tests** of narrowband terminals, hands-free and headsets according to Vodafone Performance TST Audio Quality V3.0 and Vodafone Acoustic Safety Requirements Spec. Version 3.0

SYSTEM REQUIREMENTS

VFTST-Audio-NB requires the following system components:

- **ACQUA** Communication Analysis System as one of the following variants (version 3.2.100 or later):
  - Full-license (Code 6810)
  - Workplace (Code 6830, for post-analysis and documentation only)
  - Compact Systems (Code 6860.xx)
- **HMS II.3-33** (Code 1230.1) HEAD Measurement System with pinna type 3.3.
- **HHP III.1** Handset Positioner (Code 1403)
- **MFE VI.1** Measurement Front End (Code 6462) with option **MFEVI-BEQ** (Code 6461)
- **MFE XI** Universal Bluetooth® Access Point (Code 6482), for Bluetooth® measurements
- **HAE-BGN** Background Noise Simulation, version 2.1.300 or later (Code 6971)
- **ACOPT 10** TOSQA2001 Telecommunications Objective Speech Quality Assessment (Code 6820)
- **ACOPT 21** 3QUEST, 3-fold Quality Evaluation of Speech in Telecommunications (Code 6844)
- **ISDN Tester**, e.g. Aethra D2500 Pro
- **System Simulator** e.g. R&S CMU200 (not delivered by HEAD acoustics)
- **"Additional Single Talker"**, e.g second HATS mouth, additional Artificial Mouth or equalized speaker as simplified setup
- **Headset Interface Box** for coupling wired headsets to MFE VI.1

OPTIONS

- **ACOPT 17: Relative Approach** (Code 6839) for "additional noise reduction in RCV" tests (informative)
- **ACOPT 20: Quality Pie** (Code 6843), recommended for graphical result representation according to ITU-T P.505
- **ACOPT 29: EQUEST** (ACOPT 29, Code 6856), informative
- **ACOPT 30: POLQA** (Code 6857), informative for acoustic tests and as alternative to TOSQA for Bluetooth® tests
- **ACOPT 32: Speech Based Double Talk** (Code 6859), informative: Calculation of "Echo control characteristics" based on 3GPP TS 26.132 V12.0.0 (2013-06). Note: The requirements defined in this specification are still under study. The reference implementation published by 3GPP contains known work items which are currently under discussion. These work items are partly taken into consideration within ACOPT 32 already. ACOPT 32 is available since ACQUA 3.2 and will be continuously adapted to the ongoing development of the 3GPP specification.
- **UG VFTST-Audio-WB** Upgrade to wideband measurements (Code 60010)

DELIVERY ITEMS

- **VFTST-Audio-NB** measurement standard, delivered as ACQUA database (Code 60009)
- **V2C file**
- **Standard documentation** as PDF

MEASUREMENTS

The table below lists all measurement that can be performed with VFTST-Audio-NB.

| Handset, Handheld Hands-free and Headset Tests	HANB	HHNB	HENB
System Simulator Calibration	●	●	●
Delay in SND/ RCV/ Echo	●	●	●
DUT Delay in SND/RCV/ Round-Trip	●	●	●
Loopback Delay (Round-Trip)	●	●	●
Loudness Rating, Real Speech*	RCV/SND	RCV/SND	RCV/SND
Idle Channel Noise*	RCV/SND	RCV/SND	RCV/SND
Frequency Response, Real Speech*	RCV/SND	RCV/SND	RCV/SND
Speech Intelligibility Enhancement, with/without BGN	RCV	n/a	n/a
Artificial Bandwidth Extension*	RCV	n/a	n/a
TMOS Estimation by Frequency Response	RCV	n/a	n/a
Noise Reduction in RCV - Level vs. Time, Relative Approach	RCV	n/a	n/a
Distortion with/ without activation	RCV/SND	RCV/SND	RCV/SND
Listening Speech Quality TMOS*	RCV/SND	RCV/SND	RCV/SND
Listening Speech Quality P.863	RCV/SND	RCV/SND	RCV/SND
Activation Sensitivity RCV - Switch On	RCV	RCV/SND	RCV
Attenuation Range - Switch Over	RCV/SND	RCV/SND	RCV/SND
Automatic Gain Control (AGC) Test	RCV/SND	RCV/SND	RCV/SND
Activation in SND Direction	SND	SND	SND
Sidetone Delay	●	n/a	●
Sidetone Masking Rate (STMR)*	●	n/a	●
TCLw (compressed speech)*	●	●	●
Echo Control Characteristics - Informative	●	●	●
Echo Attenuation vs. Time*	●	●	●
Echo Level vs. Time*	●	●	●
Perceptual Based Echo Assessment (EQUEST)*	●	●	●
Spectral Echo Attenuation*	●	●	●
Echo vs. Time, Variant Echo Path*	●	n/a	n/a
Stability loss	●	●	●
Initial Convergence with Hoth Noise	●	●	●
Attenuation range during Double Talk (automatic DT, P.502)	RCV/SND	RCV/SND	RCV/SND
Echo Components during Double Talk	●	●	●
BGNT with Near End Speech (CSS), Mensa, Hoth	●	●	●
BGNT with Far End Speech (Real Speech), Mensa, Hoth	●	●	●
Comfort Noise: Level Adjustment, Mensa	●	●	●
Comfort Noise: Spectral Adjustment, Cafe	●	●	●
Speech and Noise Quality BGN - Mensa, Car, Train, Road, Callc	●	●	●
Speech and Noise Quality BGN (ETSI TS 103 106) S-/N-/G-MOS*	●	●	●
Speech and Noise Quality BGN – Positional Robustness	●	n/a	n/a
Speech and Noise Quality BGN – Including Additional Talker	●	●	●
Speech and Noise Quality BGN (EG 202 396-3) - Mensa, Car, Train, Road	●	●	●
Speech and Noise Quality BGN (EG 202 396-3) S-/N-/G-MOS*	●	●	●
Speech Qual. TMOS AMR-WB 12.2, 6.7, 4.75 kBit/s	RCV/SND	n/a	RCV/SND
Various Speech Recording Single Talk, Double Talk, Echo, BGN*	●	●	●

Media Playback functionality	
Headset Idle Channel Noise After Act., WB	●
Headset Distortion (sinusoidal)	●
Headset Wideband Speech Quality (TMOS)	●
Headset Wideband Frequency Response	●

Bluetooth Interface of Mobile Phones	BMNB
System Simulator Calibration	●
Delay in SND/ RCV/ Echo	●
DUT Delay in SND/RCV/ Round-Trip	●
Junction Loudness Rating	RCV/SND
Junction Loudness Rating - Volume Control	RCV
Sensitivity Frequency Response	RCV/SND
One Way Speech Quality - TMOS	RCV/SND
Switched Level, 5 dB, 10 dB, 15 dB	RCV/SND
One Way Speech Quality - P.863	RCV/SND
Noise Cancellation Test in SND (long burst)	SND
Noise Reduction, Part I & II (long burst)	SND
Idle Channel Noise SND Nom. Vol.	RCV/SND
Automatic Gain Control (AGC) Test	RCV/SND
Attenuation Range during Double Talk (Part I)	RCV/SND
Attenuation Range during Double Talk (Part II)	SND
Echo attenuation (Spectrum) 20dB - 20ms, 1ms	●
Echo attenuation 20dB - 20m, 1ms	●
Echo Loss 20 dB Att. Speech Part II BMNB	●

Electric Headset Interface of Mobile Phones	EINB
Delay in SND/ RCV/ Echo	●
DUT Delay in SND/RCV/ Round-Trip	●
Loopback Delay (Round-Trip)	●
Frequency Response Real Speech	RCV/SND
Level (RMS, ASL)*	RCV/SND
Automatic Gain Control (AGC) Test	RCV/SND
Idle Channel Noise	RCV/SND
Idle Channel Noise, SINR	RCV/SND
Listening Speech Quality - TMOS	RCV/SND
Listening Speech Quality - P.863	RCV/SND
Out-of-Band Signal	SND
Sidetone Delay	●
Sidetone Masking Rate (STMR)*	●
Attenuation Range during Double Talk	RCV/SND
Echo Components during Double Talk	●
BGNT with Far End Real Speech - Mensa	●
Speech and Noise Quality BGN - Mensa, Car, Train, Road	●
Speech and Noise Quality BGN (ETSI TS 103 106) S-/N-/G-MOS*	●
Speech and Noise Quality BGN (EG 202 396-3) - - Mensa, Car, Train, Road	●
Speech and Noise Quality BGN (EG 202 396-3) S-/N-/G-MOS*	●
TCLw compressed Speech*	●
Echo Level vs. Time Speech	●

VF Acoustic Safety Requirements	Ac.Shock
Maximum Acoustic Output Ringtone Test	RCV
Maximum Acoustic Output Network Test	RCV
Long Term Exposure Laeq according to EN50332-1	Left, Right
Long Term Exposure Maximum Output Voltage Vm EN50332-2	Left, Right
Long Term Exposure WBCV acc. to EN50332-2	Left, Right

*comprises several measurement variants, e.g. varying application forces

(HANB: Handset Narrowband; HHNB: Handheld Hands-free Narrowband; HENB: Headset Narrowband)
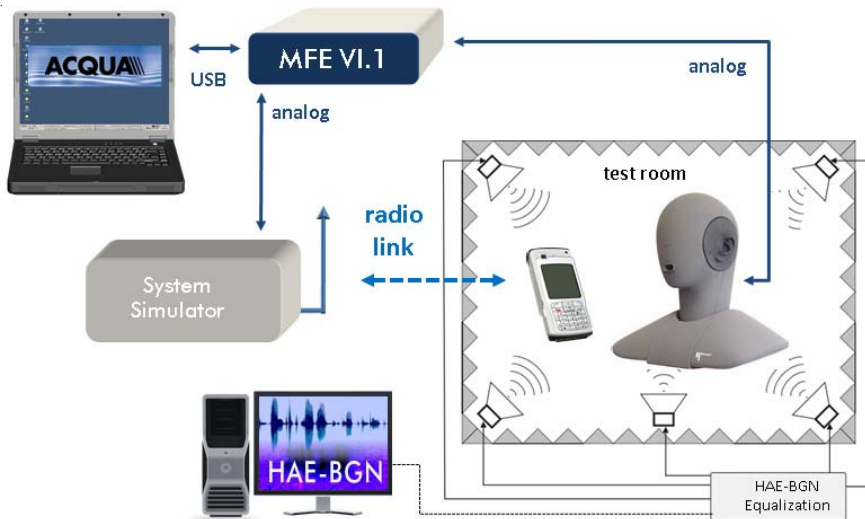
Typical test setup

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