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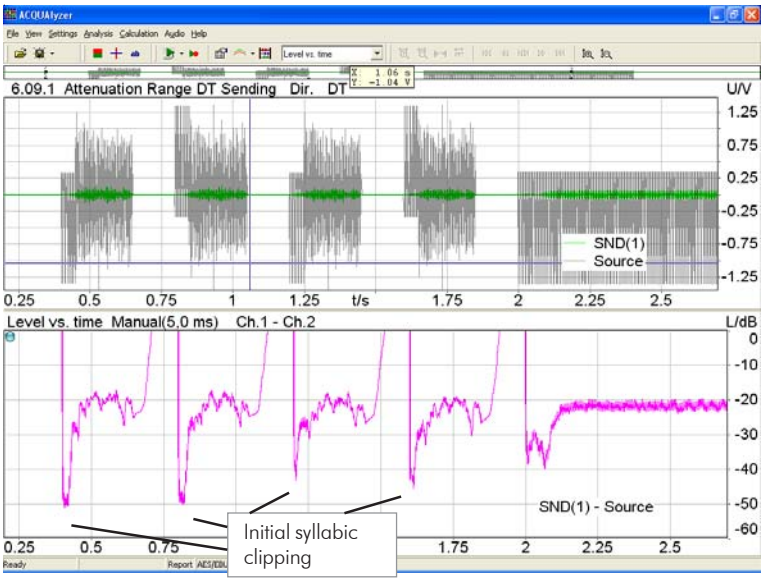
DATA SHEET

P.1110 (Code 6798)

Measurement Standard

Speech Quality Assessment of Wideband Car Hands-free Terminals According to ITU-T P.1110



Example of measurement result „Attenuation range during double talk" in ACQUA analysis module ACQUAlyzer. Upper window: Time sequence of measured signal (green) and source signal (gray). Lower window: Level vs. time analysis of the measured signal referred to the source signal.

DESCRIPTION

The International Telecommunications Union (ITU) has established a recommendation regarding the speech quality of wideband hands-free communication in vehicles. The requirements and test methods described in this specification have been co-developed by HEAD acoustics and are available for use with the communication analysis system ACQUA as measurement standard P.1110.

In combination with ACQUA and the artificial head measurement system HMS II.3, P.1110 allows the automated analysis and experimental optimization of complete systems and subsystems for hands-free communication in vehicles.

P.1110 comprises numerous standard values such as loudness rating, transfer function, idle channel noise in sending and receiving direction, suppression of out-of-band signals, echo attenuation and minimum activation levels. In addition, P.1110 takes into account several other important aspects:

- Consideration of car type specific conditions by measuring the hands-free terminal in its original mounting state. For retrofit solutions: use of a car cabin with typical acoustic characteristics.
- Tests under silent conditions as well as with realistic background noise, acoustic driving simulation equalized to target car, consideration of different speeds, engines and car body styles.
- Artificial head measurement system as "user" of the hands-free terminal.
- Primary focus on conversation parameters such as double talk performance and quality of background noise transmission.

Some of the measurements are based on current standards for third generation mobile phones such as 3GPP (3rd Generation Partnership Project), others on the results of auditory tests (another quality aspect of P.1110 compared to commonly used standards).

APPLICATIONS

- **Automated speech quality analysis** of car hands-free terminals
- **Experimental development and optimization** of car hands-free terminals with objective evaluation of sound quality
- **Optimized positioning** of hands-free microphones and loudspeakers in cars

TEST SIGNALS

- Composite source signals (CSS)
- Artificial voice
- Activation sequences
- Special noise sequences
- Speech sequences
- CSS combinations for double talk simulation
- AM/FM modulated sine signals for echo measurements
- Background noise

Overview

The integration of hands-free systems in cars is a challenging topic. The arrangement of microphones and loudspeakers, the variety of background noise situations and additional artifacts due to RF problems significantly influence speech quality.

P.1110 is a test suite which implements the wideband test cases specified by ITU-T P.1110. Some methods described in P.1110 are based on other ITU recommendations and have been successfully adapted to the car environment. The test methods focus on

- ***Standard telephonometric requirements such as frequency responses and loudness ratings in single talk situations***
- ***Echo performance and level variation in single and double talk situations***
- ***Quality of background noise transmission***

P.1110 can be used by manufacturers and suppliers of the automotive industry to qualify and optimize complete hands-free systems as well as the subsystems of microphone, speakerphone/headset and telephone with short-range wireless transmission link used to interconnect to the mobile network, e.g.:

- ***Built-in hands-free systems***
- ***After-market hands-free car kits***
- ***Corded headsets***
- ***Wireless headsets***

Furthermore, the compatibility between narrowband and wideband implementations is addressed.

MEASUREMENTS

The following list gives a summary of the measurements included in P.1110:

Microphone Measurements

- Microphone Sensitivity
- Microphone Frequency Response
- Microphone Front to Back Ratio
- Microphone Distortion
- Microphone Max. Sound Pressure Level
- Microphone Self Noise
- Microphone Overload Point
- Microphone Output Level in the Car
- Microphone Freq. Response P.50/CSS
- Microphone Idle Channel Noise
- SNR Improvement

Speakerphone & Headset Measurements

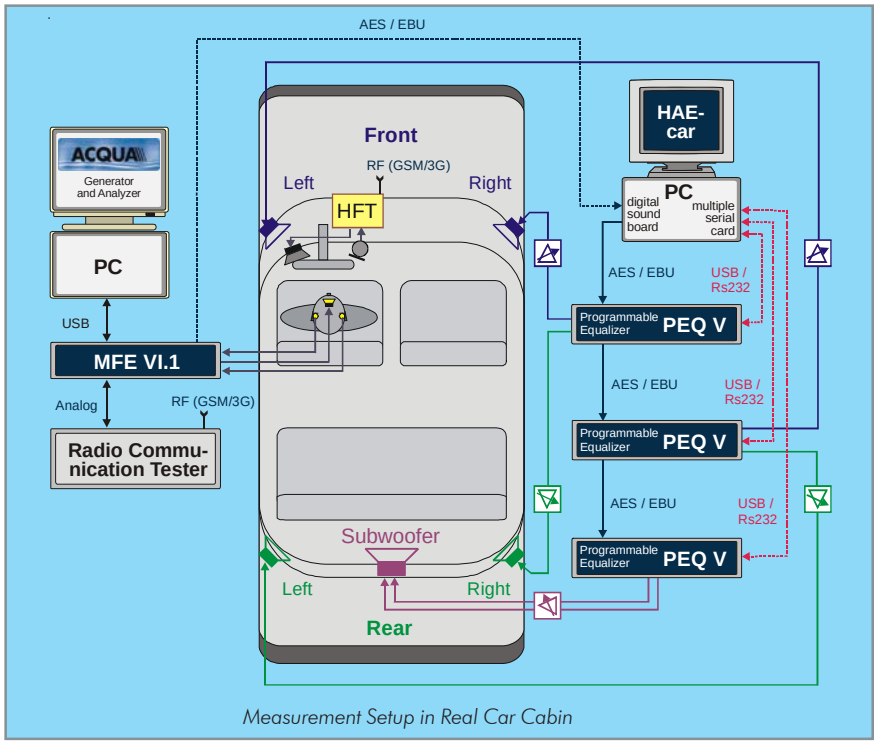
- Delay in SND/RCV Direction
- Loudness Ratings RCV Nom./Max.
- Loudness Ratings SND
- Variation of Loudness Ratings SND/RCV
- Frequency Response SND
- Frequency Response RCV

  Note: *Headset measurements for right ear only!*

- Out-of-Band SND/RCV
- Idle Channel Noise SND/RCV
- Activation SND/RCV
- Attenuation Range SND/RCV
- Attenuation Range SND/RCV during Double Talk
- One Way Speech Quality (TMOS) SND/RCV
- Listening Speech Quality Stability SND/RCV
- Distortion SND
- Distortion RCV S/N dB, Max. Volume
- Detection of Sent Speech Attenuation under DT, with Different Levels
- Terminal Coupling Loss (TCLw), Nominal / Max. Volume
- Echo Level vs. Time, CSS/P.50
- Spectral Echo Attenuation
- Echo Performance vs. Time CSS/P.50
- Echo Attenuation during Double Talk
- Initial Convergence with / without Background Noise, CSS/P.50

Under different BGN Scenarios:

- Background Noise Transmission after Call Set-up
- Speech Quality in the Presence of Background noise Eng/Fr (3QUEST)
- Quality of Background Noise Transmission (with Far-end Speech)
- Quality of Background Noise Transmission (with Near-end Speech)
- "Comfort Noise" Injection



Measurement Setup in Real Car Cabin

Short Range Wireless (SRW)

Note: these test cases require a wideband capable SRW interface, which is currently not available, because current Bluetooth® specifications do not cover wideband. HEAD acoustics MFE XI allows Bluetooth® narrowband measurements only.

Mandatory SRW Measurements

- Delay SND/RCV
- Junction Loudness Rating SND/RCV
- One Way Speech Quality PESQ SND/RCV
- Linearity SND/RCV
- Sensitivity Freq. Response SND/RCV
- Noise Cancellation Test in Sending
- Variation of SRW Echo Loss

Informative SRW Measurements (Optional)

- Junction Loudness Rating - P.50 SND/RCV
- One Way Speech Quality TOSQA SND/RCV
- AGC Test SND/RCV
- Switched Level SND/RCV
- Variation of SRW Echo Loss P.50
- ITU-T P.340 Attenuation - Double Talk SND/RCV
- SRW Quality Pie

SYSTEM REQUIREMENTS

P.1110 requires the following system components:

- **ACQUA** Communication Analysis System as one of the following versions (version 2.5.100 or later):
  - Full-license (Code 6810)
  - Workplace (Code 6830, for post-analysis and documentation only)
  - Compact Systems (Code 6860.xx)
- **ACOPT 10:** TOSQA2001, Telecommunications Objective Speech Quality Assessment (Code 6820)
- **ACOPT 16:** PESQ, Perceptual Evaluation of Speech Quality (Code 6836). *Note: only required for SRW measurements (e.g. Bluetooth®).*
- **ACOPT 17:** Relative Approach (Code 6839)
- **ACOPT 21:** 3QUEST, 3-fold Quality Evaluation of Speech in Telecommunications (Code 6844)
- **HMS II.3** HEAD Measurement System (Code 1230). *Note: depending on DUT headset type, pinna type 3.3 or 3.4 required*
- **HIS L** HEAD Impedance Simulator, Left, for HMS II.3 (Code 1231).
- **MFE VI.1** Measurement Frontend (Code 6462) with Option **MFEVI-BEQ** (Code 6461)
- **Background Noise Simulation System**, e.g. **HAE-car** (Code 6970)
- **GSM/3G Radio Communication Tester** with appropriate wideband speech codec (not provided by HEAD acoustics)
- **Rotating reflecting surface** according to ITU-T P.1110 (not provided by HEAD acoustics)

Note: short range wireless test cases (e.g. Bluetooth®) require a wideband capable SRW interface, which is currently not available, because current Bluetooth® specifications do not cover wideband. HEAD acoustics MFE XI allows Bluetooth® narrowband measurements only.

OPTIONS

- **ACOPT 20:** Quality Pie (Code 6843)

DELIVERY ITEMS

- **P.1110** Measurement standard, delivered as ACQUA database on CD (Code 6798)
- **Keyfile** (for ACQUA 2.5.100) or **V2C file** (for ACQUA 3.0.100 or later) on CD
- **Manual** as PDF on CD

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