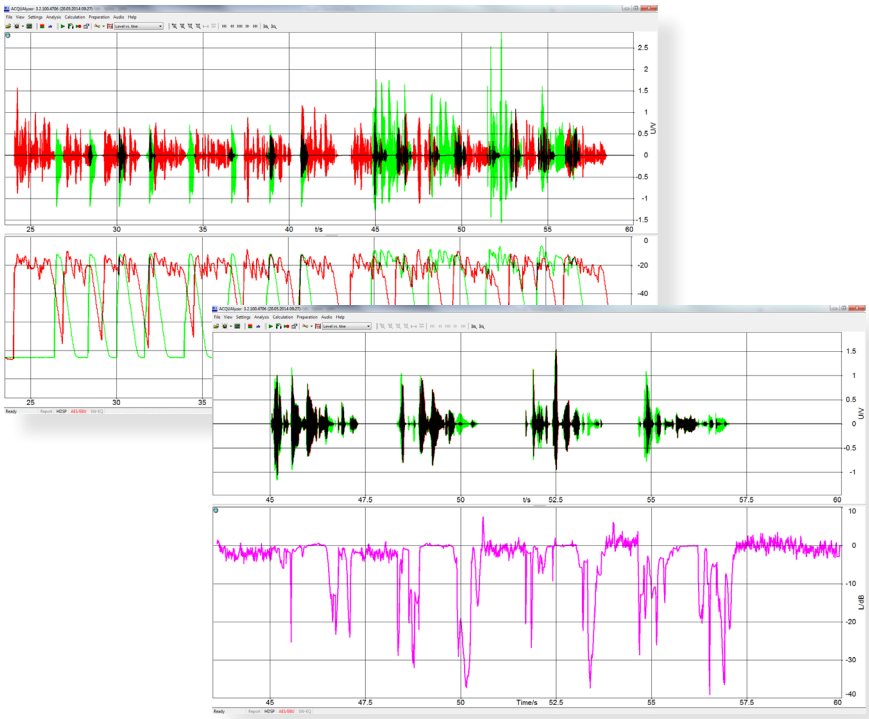
HEAD acoustics GmbH
Ebertstraße 30a
52134 Herzogenrath, Germany
Tel: +49 (0)2407 577-0
Fax: +49 (0)2407 577-99
E-mail: telecom@head-acoustics.de
WEB: www.head-acoustics.de

**DATA SHEET**

# ACOPT 32 (Code 6859)

## Speech-based Double Talk



*ACOPT 32: Representation of a measurement signal (left) and a measurement result*

## OVERVIEW

Double talk is a critical conversational situation and can impact echo cancellation and thus speech quality considerably. ACOPT 32, option Speech-based Double Talk, for the advanced communication quality analysis system ACQUA provides two speech-based methods for the measurement and analysis of double talk and classifies the performance of echo cancellers.

The first method is the Automated Double Talk Analysis according to **ITU-T recommendation P.502**. In contrast to the previous analysis with Composite Source Signals (CSS), now also speech sequences according to ITU-T recommendation P.501 are applied. Also for the second analysis method, the Speech-based Double Talk Analysis according to **3GPP standard TS 26.132**, real speech according to P.501 is used.

These standards specify test methods to assess the acoustic characteristics of narrowband, wideband, superwideband and fullband terminals and the corresponding minimum performance requirements.

HEAD acoustics has implemented the analysis for double talk performance based on these standards.

## DESCRIPTION

The ACQUA option Speech-based Double Talk (ACOPT 32) is suitable to measure and to assess the acoustic characteristics of narrowband, wideband, superwideband and fullband handsets, headsets and hands-free terminals (Device Under Test, DUT) regarding double talk performance.

This option for the communication analysis system ACQUA provides two speech-based test methods. Both methods are used with real speech according to ITU-T recommendation P.501: (1) Automated Double Talk Analysis according to **ITU-T recommendation P.502** based on histograms as well as (2) Speech-based Double Talk Analysis according to **3GPP standard TS 26.132**.

With these speech-based test methods ACOPT 32 allows detailed assessment of echo and attenuation performance during double talk. Parameters that can cause impairments are e.g. signal loss (temporal clipping) caused by non-linear signal processing as well as echo disturbances.

### (1) Automated Double Talk Analysis with real speech

The previous Automated Double Talk Analysis according to ITU-T P.502 has been extended to speech. In contrast to previous Composite Source Signals (CSS), now real speech sequences according to P.502 are used ("Amendment 2: Updated Appendix III – Automated double talk analysis procedure", section III.3).

The behavior of the DUT during an automated double talk test is classified by the Double Talk Type based on ITU-T P.340. Five categories are defined for the Double Talk Type (1, 2a, 2b, 2c, 3), which associates the attenuation range. In sending direction it ranges from ≤ 3 dB (category 1) to ≤ 9 dB (category 2b) to >12 dB (category 3). According to this categorization, the performance of the DUT is assessed.

### (2) Speech-based Double Talk Analysis

For this analysis method, which is according to 3GPP standard TS 26.132, real speech is used as measurement signal, according to ITU-T recommendation P.501. At the far end the test method measures duration and intensity of the level difference between the sending signal during double and single talk. In both runs, the same sequence at the near end is used for playback. Here, the echo canceller of the device under test is exposed to simultaneous echo and near-end speech. This can lead to the above-mentioned artifacts (signal loss and/or echo disturbances) in sending direction.

The histogram on the two dimensions duration and intensity of level difference is divided into eight categories (A1, A2, B, C, D, E, F, G). These categories characterize double talk performance and echo performance. The valuation ranges from "full-duplex and full transparency" (A1) to "clipping resulting in loss of words" (double talk, D) or "continuous echo" (G). The performance of the DUT is assessed according to this classification.

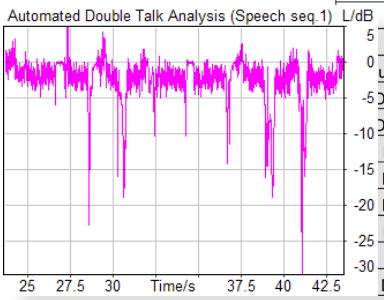
Via SMD "Double Talk Analysis", the user can easily choose between the two speech-based analysis methods (ACOPT 32) as well as the CSS-based algorithm (included in ACQUA). The Setup is the same for all analysis methods.

## APPLICATIONS

- **Automated analysis** of double talk performance of narrowband, wideband, superwideband and fullband handsets, headsets and hands-free terminals
- Necessary to perform the **measurement of echo control characteristics according to TS 26.132** (informative part)
- Necessary to perform the **measurement of attenuation range during double talk in sending and receiving direction according to ITU-T P.502** (required for ITU-T standards P.1100 & P.1110)

*The results of ACOPT 32 are represented in tabular form (cf. right, an example for measurements acc. to TS 26.132) and as a graph (cf. below, an example for measurements acc. to ITU-T P.502).*

| | | | |
|---|---|---|---|
| Delay ST vs DT | 0,010 s | Delay SND vs Source | 0,065 s |
| DT Class A1 | 42,47 % | ST Class A1 | 93,63 % |
| DT Class A2 | 47,41 % | ST Class A2 | 5,61 % |
| DT Class B | 0,25 % | ST Class B | 0,19 % |
| DT Class C | 9,88 % | ST Class C | 0,00 % |
| DT Class D | 0,00 % | ST Class D | 0,00 % |
| DT Class E | 0,00 % | ST Class E | 0,04 % |
| DT Class F | 0,00 % | ST Class F | 0,53 % |
| DT Class G | 0,00 % | ST Class G | 0,00 % |
| uble Talk Activity | 10,18 % | Single Talk Activity | 66,26 % |
| DT Avg. Level A1 | -1,3 dB | ST Avg. Level A1 | -0,9 dB |
| DT Avg. Level A2 | -7,6 dB | ST Avg. Level A2 | -6,9 dB |
| DT Avg. Level B | -22,8 dB | ST Avg. Level B | -15,2 dB |
| DT Avg. Level C | -17,3 dB | ST Avg. Level C | 0,0 dB |
| DT Avg. Level D | 0,0 dB | ST Avg. Level D | 0,0 dB |
| DT Avg. Level E | 0,0 dB | ST Avg. Level E | 7,3 dB |
| DT Avg. Level F | 0,0 dB | ST Avg. Level F | 5,6 dB |
| DT Avg. Level G | 0,0 dB | ST Avg. Level G | 0,0 dB |



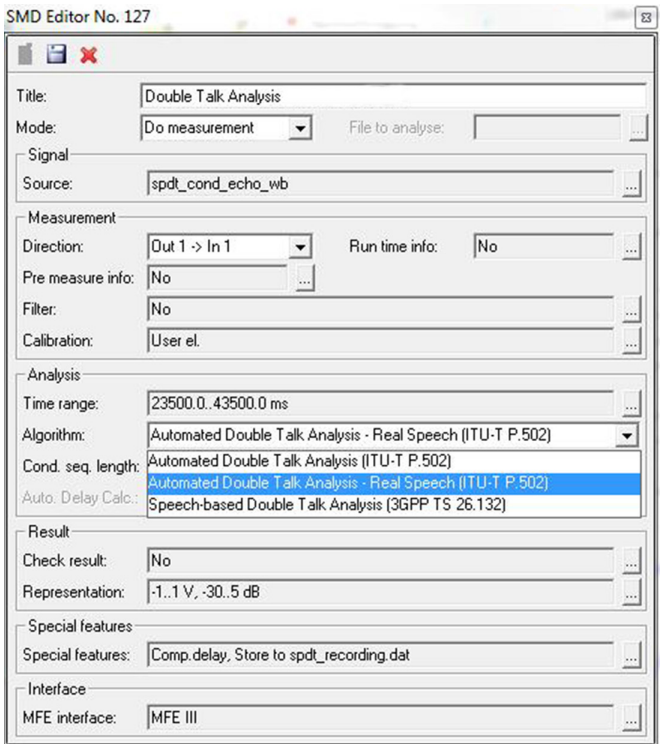

## SYSTEM REQUIREMENTS

ACOPT 32 (Option Speech-based Double Talk) requires the following products:

- **ACQUA (Code 6810 etc.)**, Advanced Communication Quality Analysis System, Version 3.3.100 or later
  *Note: existing customers need a valid software maintenance agreement (SMA)*

## DELIVERY ITEMS

- **ACOPT 32 (Code 6859)**, Option Speech-based Double Talk, delivered as V2C file for ACQUA
- Demo SMDs provided on ACQUA DVD, including Real Speech Sequence acc. to TS 26.132, also suitable for ITU-T P.502 analysis method




*Via the SMD "Double Talk Analysis" the user can easily chose between three analysis methods, as long as he owns ACOPT 32.*

represented by