

Description

For the hearing impaired, everyday tasks like a telephone call can be a hurdle difficult to overcome. A viable solution is magnetic coupling of a telephone handset's earpiece into the person's hearing aid. Through this coupling, the conversation partner's voice is transmitted directly into the hearing aid. Obviously, intelligibility strongly depends on the quality of this transmission route. Over time, several standards have been created describing how to measure and evaluate the magnetic and acoustic output of telephone handsets in regards to hearing aid compatibility. HEAD acoustics gathered the methods laid out in the standards in this easy-to-use test suite – HAC-Suite.

The magnetic tests in HAC-Suite examine the coupling ability of handsets with the help of the HEAD acoustics handset positioners HAC II or HAC III. Both contain a coil probing the magnetic output of the handset under test. HAC III offers more space for large handsets and more versatile options for DUTs difficult to mount due to their size or shape.

Acoustic tests are performed with the help of a suitable HEAD acoustics HMS artificial head system and the motorized handset positioner HHP IV. They comprise of typical telecommunication handset tests such as frequency response, harmonic distortion, signal-to-noise ratio and more.

Test Signals

HAC-Suite applies several different types of signals to analyze the DUT like artificial voice according to Recommendation ITU-T P.50, stepped sine sweeps and 1000 Hz sine tones. The standards TIA-5050 and TIA-4965 laid out by the Telecommunications Industry Association add conversational gain to the list of acoustic measurements in HAC-Suite. This value aims at evaluating how well the DUT in a hands-free call scenario can replicate the volume of a real talker at a distance of 1 meter. This test is conducted with real speech as laid out in IEEE 269.

Overview of database revisions and specification versions		
Database Revision	Based on Specification Versions	Min. ACQUA Version
3	ETSI ES 200 381-1 V1.2.1 (2012-10)	4.2.100
	FCC 68.316/317 ¹ (2018-02)	
	ANSI C63.19 (2019)	
	TIA-1083-B (2015-10)	
	ITU-T P.370 (1996-08)	
	TIA-5050 (2018-01)	
TIA-4965 (2012-10)		

(Older releases are available upon request)

DATA SHEET

HAC-Suite (Code 60021)

Hearing Aid Compatibility Test Suite

Overview

HAC-Suite is a measurement suite for the HEAD acoustics analysis software ACQUA. The tests contained in the suite verify fixed and mobile telephone handsets for compliance with major hearing aid compatibility standards (see table below).

HAC-Suite contains two types of tests – probing the DUT's magnetic coupling ability with the handset positioners HAC II or HAC III as well as acoustic measurements with an artificial head.

HAC-Suite is ideally suited for manufacturers of fixed and mobile telephone handsets to easily test, qualify and optimize the hearing aid compatibility of their devices for compliance with the respective standards.

Key Features

- Easily applicable all-in-one solution for hearing aid compatibility testing
- Supports numerous standards
- Contains magnetic as well as acoustic measurements

Applications

- Testing telecommunication devices for compliance with hearing aid compatibility standards:
 - ETSI ES 200 381-1 V1.2.1
 - FCC 68.316/317¹
 - ANSI C63.19
 - TIA-1083-B
 - ITU-T P.370
 - TIA-5050
 - TIA-4965
- Experimental optimization of magnetic coil coupling in fixed and mobile telephone handsets

General Requirements

In addition to the following software and hardware, further components are required. They are determined based on use-case with the adjacent decision tree.

Software

- **ACQUA (Code 6810 etc.)**, Advanced Communication Analysis System
- **Further software components** (determined via decision tree)

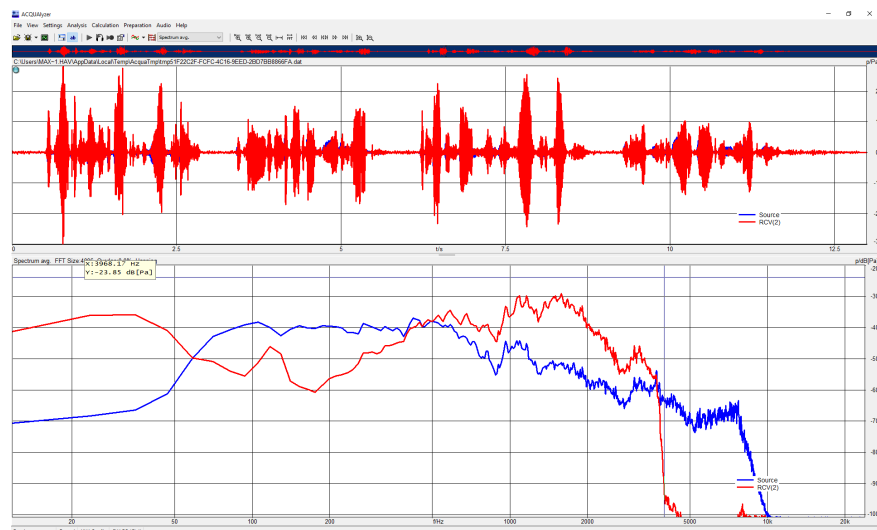
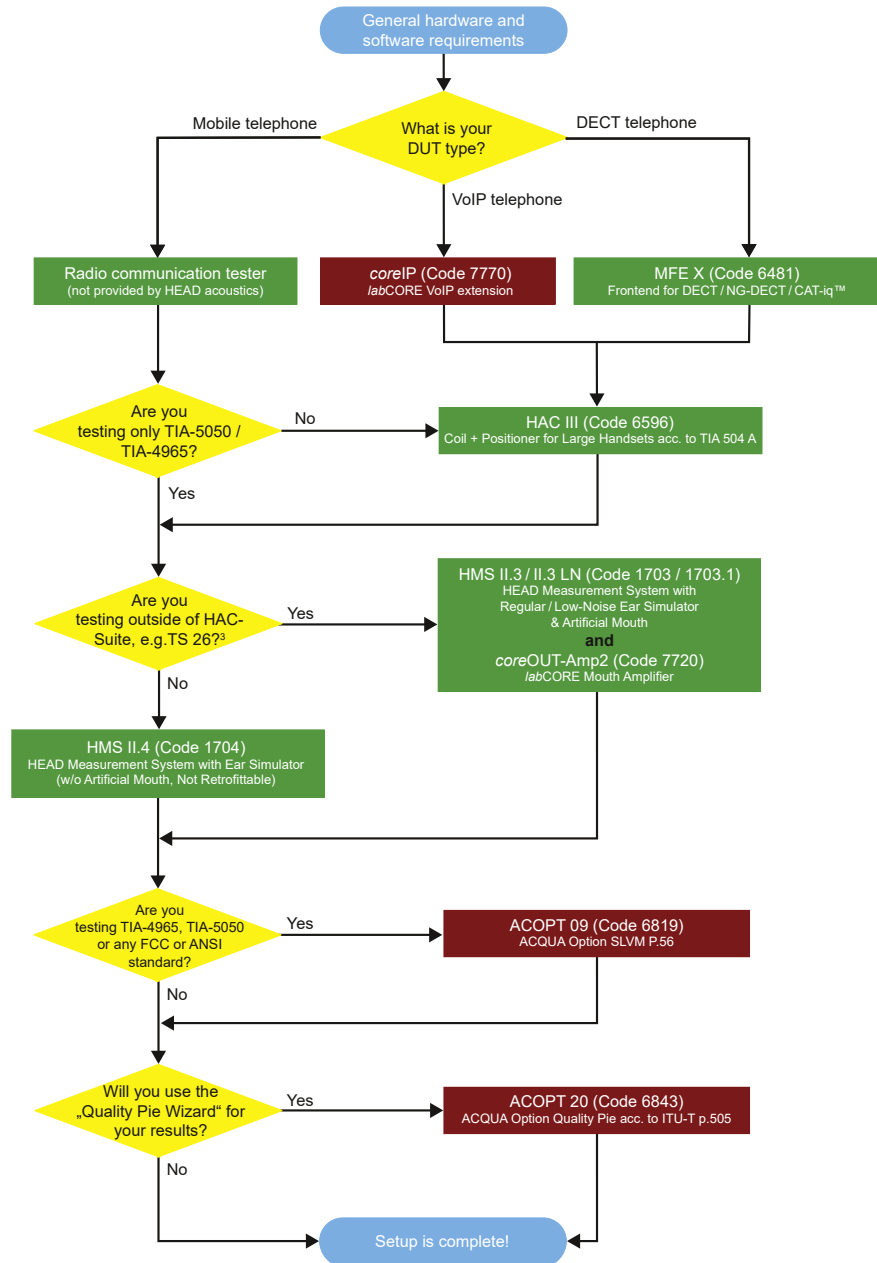
Hardware

- **labCORE (Code 7700)**, Modular multi-channel hardware platform **with**
 - **coreBUS (Code 7710)**, I/O bus mainboard
 - **coreIN-Mic4 (Code 7730)**, Microphone input board, for receiving direction
- **HHP IV (Code 1406)**, HEAD Handset Positioner for HMS II.3, MotoMount (Hexapod) Version
- **Further hardware components** (determined via decision tree)

Delivery Items

- **HAC-Suite (Code 60021)**, delivered as ACQUA database
- **V2C file**
- **Documentation** as PDF

Decision Tree for HAC-Suite



Exemplary measurement result of HAC Suite in ACQUAlyzer

Measurements in HAC-Suite							
	ETSI ES 200 381-1 V1.2.1 (2012-10)	FCC 68.316/317 ¹ (2018-02)	ANSI C63.19 (2019)	TIA-1083-B (2015-10)	ITU-T P.370 (1996-08)	TIA-5050 (2018-01)	TIA-4965 (2012-10)
<ul style="list-style-type: none"> ● included - not available ○ implicitly required^{1,2} 							
Magnetic Measurements with HAC II/HAC III							
Magnetic Field Strength/Intensity	●	●	●	●	●	-	-
Linearity of Magnetic Field Strength/Intensity	●	●	-	-	●	-	-
Receive Objective Loudness Rating (ROLR)	-	●	-	-	-	-	-
Calibration of Acoustic Receive Level	●	●	-	-	●	-	-
Acoustic Measurements with HMS system and HHP IV							
Frequency Response	●	-	●	●	●	●	-
Total Harmonic Distortion (THD)	●	-	○	●	-	●	-
Idle Noise	-	-	-	●	-	-	-
Signal-to-Noise Ratio	●	-	●	●	-	●	-
Conversational Gain	-	○	○	-	-	●	●

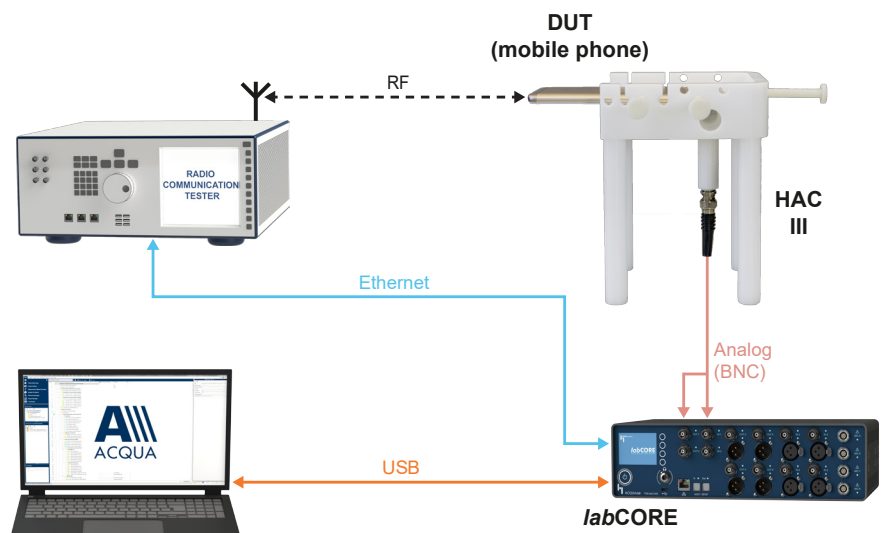


HAC III handset positioner with mounted smartphone

1) To fulfill FCC 68.316/317 (2018-02), the standard explicitly requires to also fulfill TIA-4965 (2012-10). Therefore, even if FCC 68.316/317 does not explicitly include acoustic measurements, it implicitly includes the acoustic measurements laid out in TIA-4965 and needs the associated additional hardware and software.

2) To fulfill ANSI C63.19 (2019), the standard explicitly requires to also fulfill TIA-5050 (2018-01). Therefore, even if ANSI C63.19 does not explicitly include acoustic measurements, it implicitly includes the acoustic measurements laid out in TIA-5050 and needs the associated additional hardware and software.

3) An artificial mouth is not required for testing with HAC-Suite. However, it is not possible for technical reasons to retrofit a HMS II.4 with an artificial mouth. Thus, for any current or future use outside of HAC-Suite, we recommend to choose a HMS with an artificial mouth such as HMS II.3 or HMS II.3 LN. To power an artificial mouth, labCORE should be equipped with the power amplifier hardware extension board coreOUT-Amp2.



Exemplary measurement configuration for HAC-Suite: magnetic measurements on a mobile phone with HAC III