

Product Information

Voice Testing System for Hands-free Equipment

USES AND FEATURES

- Audio measurements on microphones for hands-free equipment
- Characterisation of the complete audio path of a mobile phone during send and receive
- Acoustical performance during switching and echo conditions
- Behaviour of hands-free equipment in the presence of ambient noise
- Easy-to-operate user interface with detailed information and instruction for the operator
- Automatic report generation in Microsoft® Word for full documentation of all measurements
- Scalable system that can be configured depending on test required. Configurations ranging from test of microphone in the car and under anechoic conditions, to configurations covering testing of the complete hands-free device including the mobile phone. All configurations are based on the PULSE™ analyzer platform
- Advanced test signals such as Composite Source Signal are used for switching and echo measurements

Testing Hands-free Equipment

The major challenge in the development of hands-free equipment is to ensure that the hands-free device is able to provide good communication at moderate speech levels and in the presence of ambient noise.

This is especially challenging when communicating inside a car, where compensation for the effect of the noisy environment is extremely important. Furthermore, the delay introduced by speech coders and digital processing increases the likelihood of the two connected parties interrupting each other and further reducing the intelligibility of the conversation.

Measurements on hands-free equipment as well as its individual components can easily be performed using the PULSE data acquisition and analyzer platform equipped with the proper hardware and software options.



Fig. 1
The Head and Torso Simulator (HATS) and the PULSE analyzer platform from Brüel & Kjær constitute a solid foundation for testing hands-free equipment in-car. Both VDA specific tests and other relevant electroacoustic tests on separate microphones or loudspeakers can be performed

System Description

Dedicated system configurations are available for acoustical measurements according to the VDA standard. These configurations all support the use of HATS as well as a measurement microphone and mouth simulator. This flexibility accommodates a solution that can be scaled according to the needs of the specific application, regardless of whether it is for the testing of microphones and loudspeakers in cars, adaptors for mobile phones, or complete, built-in, hands-free systems.

When testing involves a mobile phone, the system will also require an air interface that handles the radio link of the mobile phone, and enables the audio path to be accessed. For easy establishment of the radio link and proper setup of the audio path, the system software will remotely control the air interface and guide the operator through the process.

Recording Ambient Noise

Determining the behaviour of hands-free equipment in the presence of ambient noise requires that the equipment be exposed to the noise experienced when driving. This implies that the environmental noise must be recorded in the car prior to the actual measurement. The recording can be performed using HATS, a measurement microphone or a binaural recording headset together with a suitable PULSE front-end.

Fig. 2

Microphones that have been specially designed for integration in the safety belt are easily tested during the complete development cycle. The microphones can be tested either under anechoic conditions or in-car



Replaying Ambient Noise

To ensure realistic reproduction of the recorded ambient noise, the noise must be equalised. The digital equalisation performed by the system fully compensates for the influence of the loudspeakers being used to replay the ambient noise. Up to five loudspeakers can be used to replay the ambient noise.

Test Case Overview

The test cases that are outlined in the VDA deal with microphone performance under anechoic conditions, general

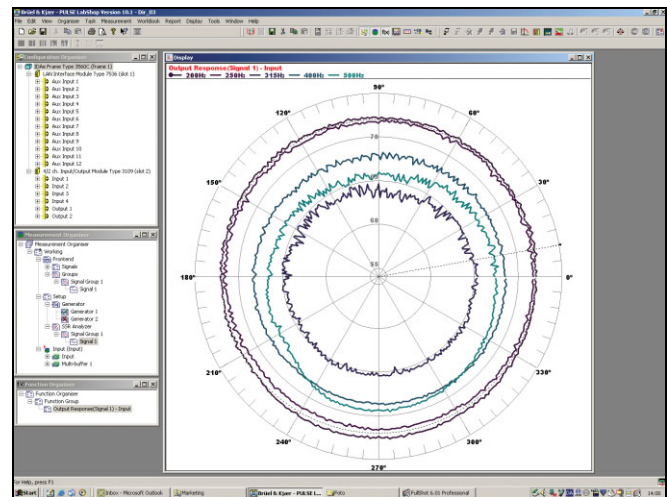
in-car performance of the mobile phone, switching and echo performance, and performance under the influence of ambient noise.

Traditional Electroacoustic Tests

To ensure the optimal acoustical design of any hands-free system, the individual components such as the microphone and loudspeaker must fulfil some basic acoustical properties. These properties can be determined using traditional electroacoustic measurements such as frequency response and harmonic distortion, and directivity. For loudspeakers the determination of intermodulation distortion, difference frequency distortion, and Thiele Small parameters should also be included.

Fig. 3

The PULSE analyzer platform also supports measurements of the directional response of loudspeakers and microphones. This parameter is especially important when evaluating the directionality of microphones towards noise



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