



SQuare 2

Sound Quality Representation and
Evaluation Studio



Sound Quality

- The purchase decision and the **satisfaction of customers** substantially depends on subjective impressions.
- The challenge for the responsible acoustics engineer is to design a **sound that is appropriate for the product**.
- Simply reducing the acoustic level is often not enough to meet the increased expectations of NVH customers.
- A sound must meet the expectations of the user, or, in the worst case, the customer will refuse to buy the product or associate the negative sound impression with a malfunction of the product.
- ***But - what is the appropriate sound?***

Sound Impressions of test persons

- **Listening tests form the basis** for answering the question of customer satisfaction.
There are various possibilities:
 - **Benchmark test:** In a listening test, competitive products are compared with respect to one or more attributes.
 - **Testing various alternatives:** Various designs for the sound of a product are evaluated to determine the best solution.
 - **Target sound:** The results from the listening test are used to determine the target sounds for products.



SQuare

- With the **Sound Quality Studio SQuare** test designs can be carried out in a quick and comfortable manner.
- In addition to the classic **listening tests**, SQuare offers the “**interactive mode**” for group discussion of presented sounds during brainstorming.
- SQuare consists of **hard- and software components** that can be configured according to the test requirement.
- The hardware can be configured as a Single-PC or a Multi-PC solution.
- The modular designed software offers various test types:
 - Group tests
 - Individual tests
 - Interactive demonstration of sound examples



Group Listening ↔ Individual Listening

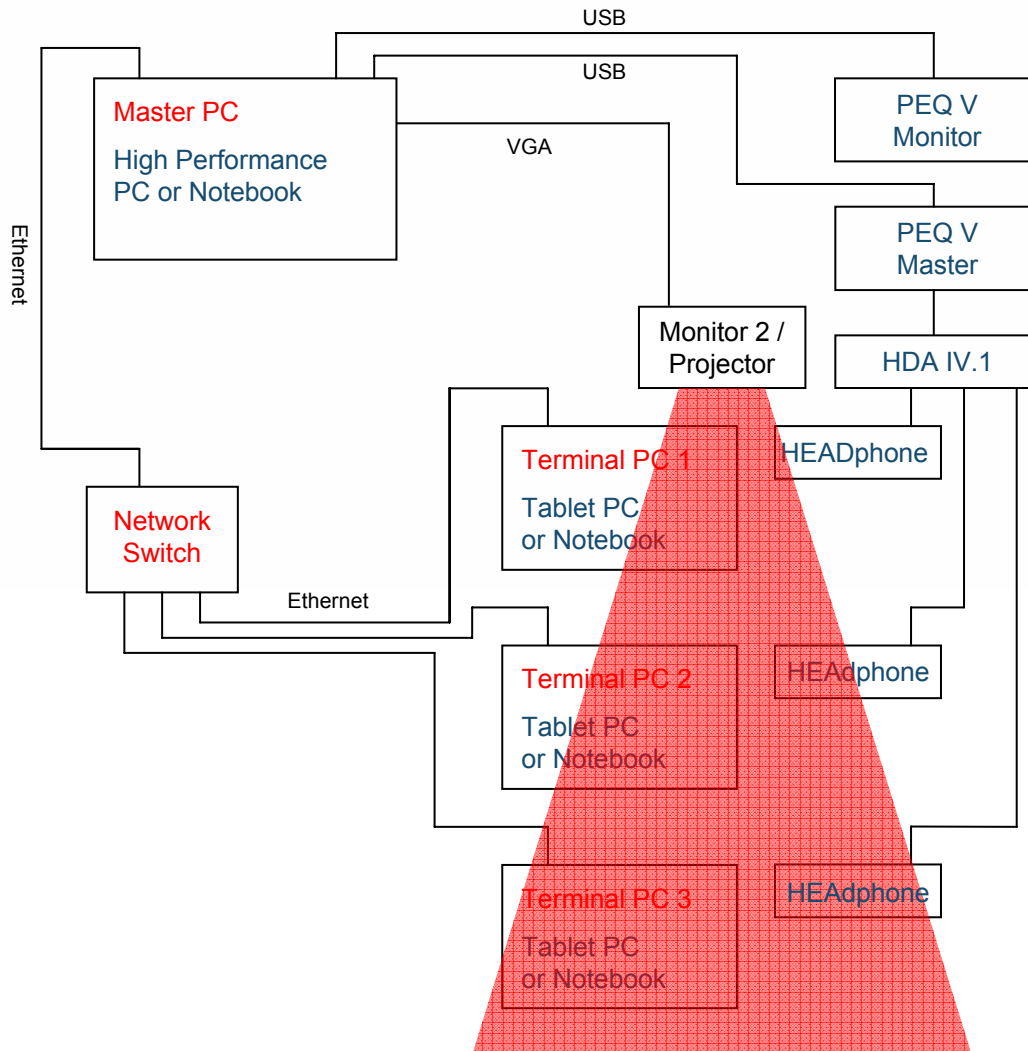
- Group Listening Mode
 - The test procedure is specified in the playlist on the Master PC, i.e. all test participants listen to the same sound at the same time. This test design can be used for the Single-PC solution as well as for the Multi-PC solution.
- Individual Listening Mode
 - The test procedure is specified in the playlist, however the test person can individually decide how often and when a sound is to be played back. This test design is only offered by the Multi-PC solution.
- The “interactive mode” for a binaural demonstration of sound examples is available in both solutions.



Group Listening solution

- A Master PC with the software SQuare is used. On this Master PC, the playlist are designed, the tests conducted and the results saved.
- Corresponding with the number of test places, handheld terminals or tablet-PCs are connected to the Master PC which guide the test persons through the test and which are also used for entering the sound evaluation data.
- There are different possibilities for the sound playback:
 - Playback via headphones (add. subwoofer optional)
 - Playback via loudspeakers (add. subwoofer optional)
 - Playback via SoundSeat or SoundCar (only airborne)
- For the Group Listening solution the user needs the SQuare Basic Software and SQuare Tool Pack 01 for the “Group Listening Mode“. In addition, with STP 03 the “interactive mode“ is available.

Standard Hardware for Group Listening



The evaluations are entered via mouse click, or, when using tablet-PCs, directly via touch screen. Connection to the Master PC is via LAN or wireless via W-LAN.

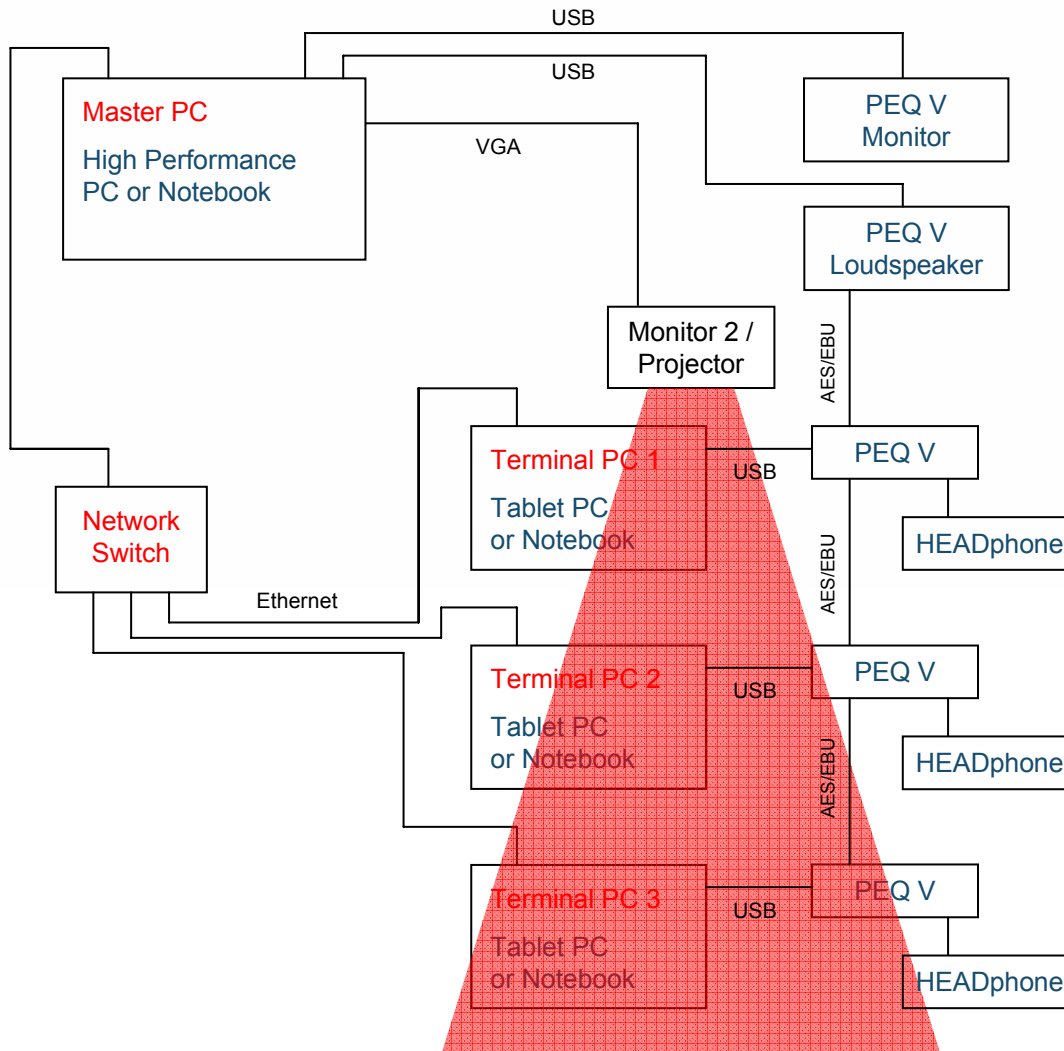
With the Master PC a second monitor or a projector can be controlled, which may be used, for example, to display the instructions to the test persons.

Individual Listening Solution

- The Individual Listening Solution consists of a Master PC and a number of terminal PCs that correspond with the number of available test places. On the Master PC, the playlists are designed, the tests conducted and the results saved.
- Group test and individual test are available. During the individual test the test person can decide independently when a noise is played back, repeated and evaluated.
- Semantic differential tests are only available with the Individual Listening solution.
- The playback is done via headphones.
- The evaluations are entered via touchscreen or via keyboard and mouse.
- For the Individual Listening solution the user needs the SQuare Basic Software and SQuare Tool Pack 01 + 02 for group and individual tests. In addition, with STP 03 the “interactive mode“ is available.



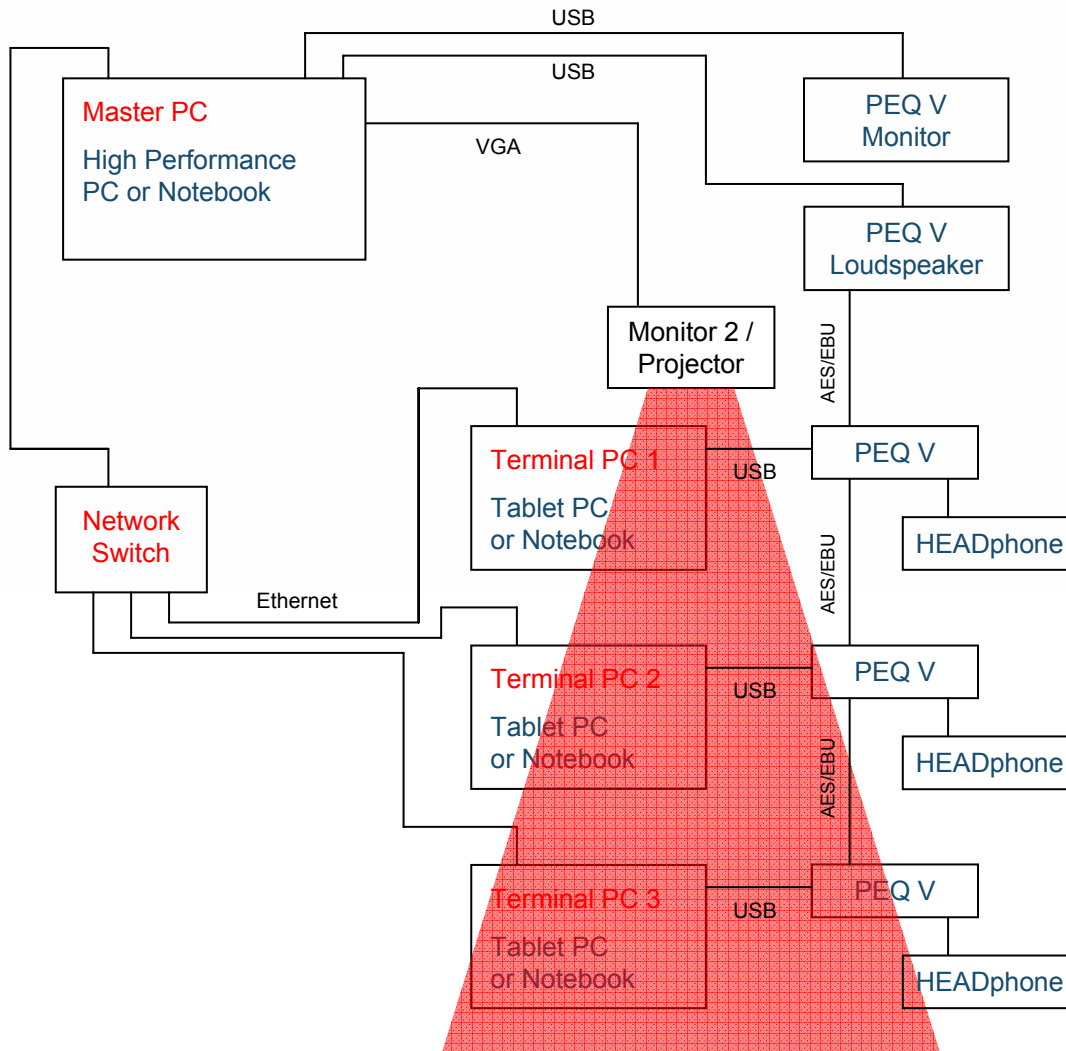
Standard Hardware for Individual Listening



Each test place is equipped with a PEQ V, with which sounds can be played back in an individual order at each terminal PC.

In addition, it is possible to play back the sounds to all test persons simultaneously via the Master PC.

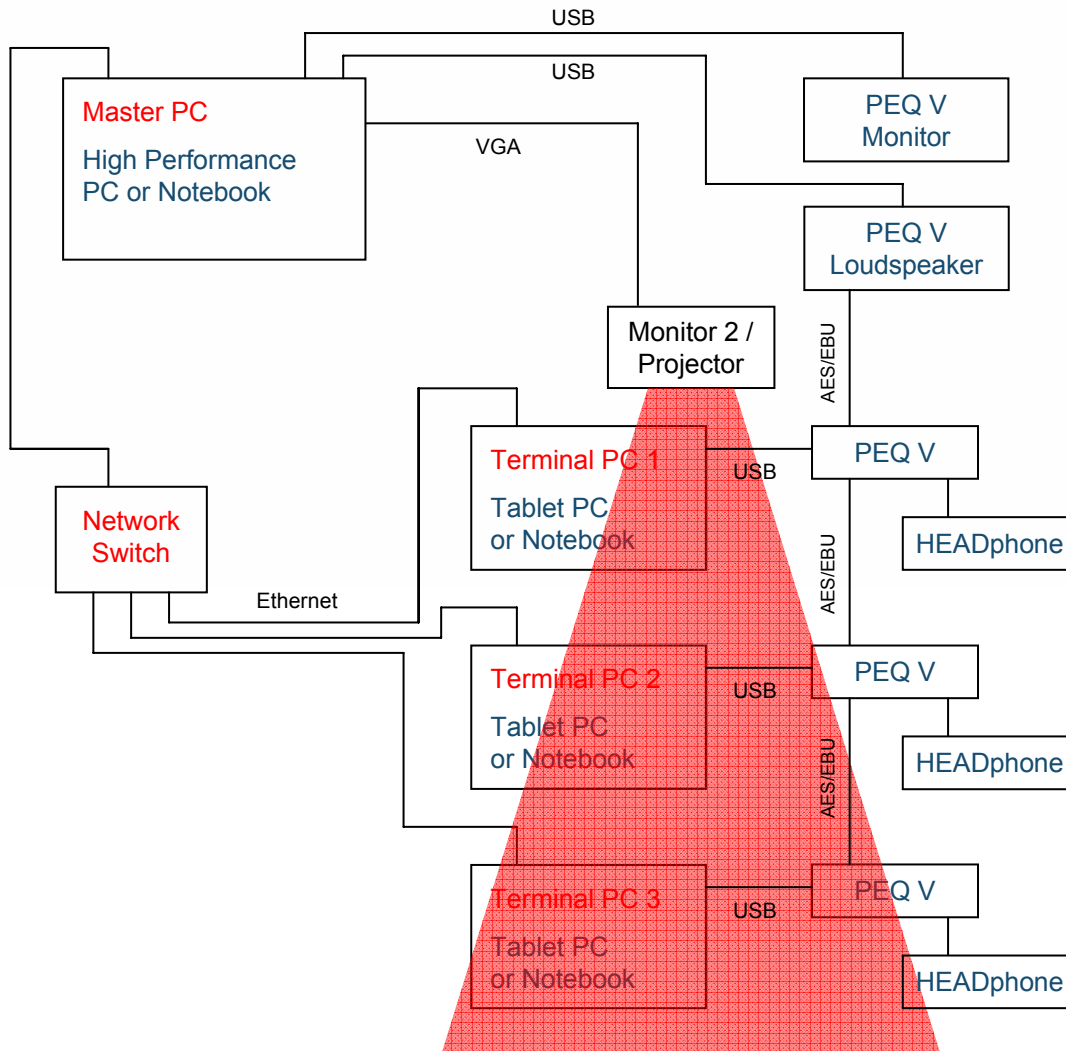
Standard Hardware for Individual Listening



The evaluations are entered via mouse click, or, when using tablet-PCs, directly via touch screen. Connection to the Master PC is via LAN or wireless via W-LAN.



Standard Hardware for Individual Listening



With the Master PC a second monitor or a projector can be controlled, which may be used, for example, to display the instructions to the test persons.



Playback Options

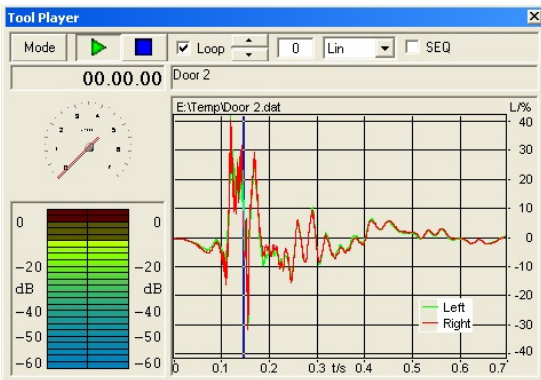
The following possibilities are available for playback with the Individual Listening configuration:

- Dynamic Headphones HD IV.1 with PEQ IV or PEQ IV.1
- Electrostatic Headphones HA III with PEQ IV and PVA IV.3

Playback with the Master PC:

With either the Group Listening or the Individual Listening solution a playback system can be optionally connected to the Master PC for the

test operator. This feature is very useful because a listening check should always be possible for creating a good test design.



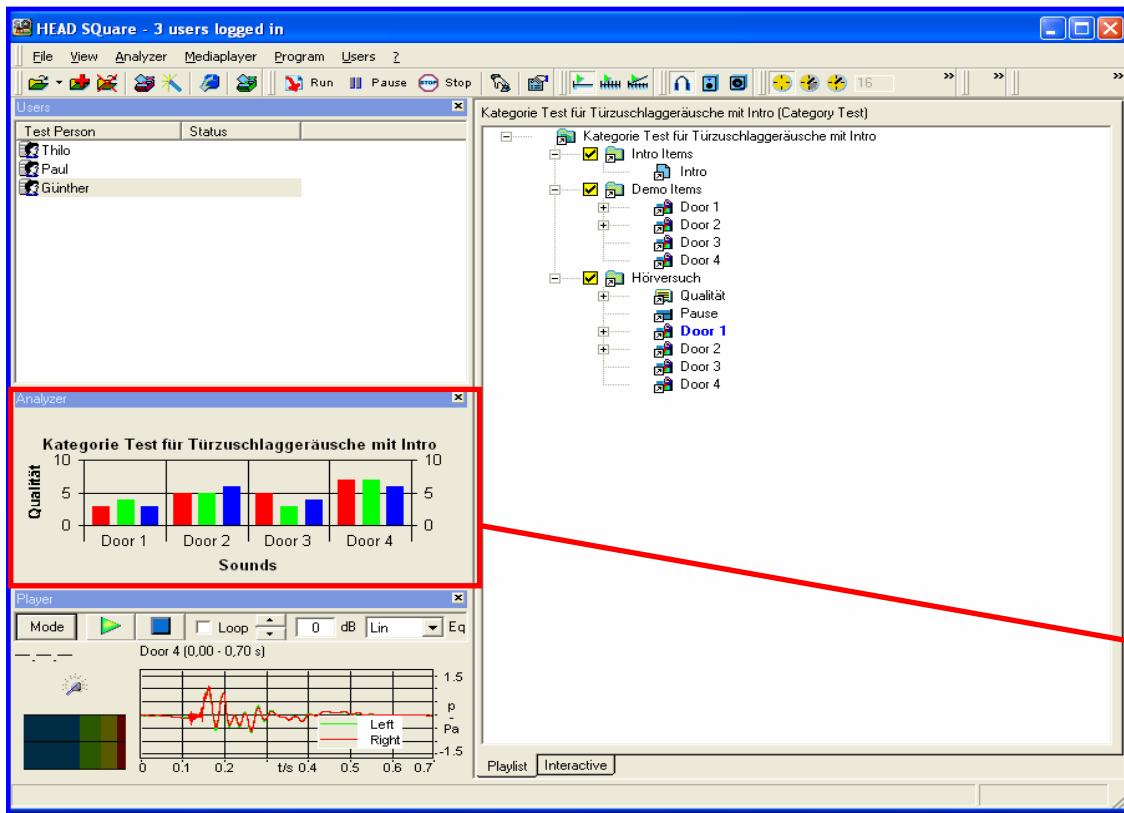
The Software SQuare

The concept

- Central operation of all components via the Master PC.
- Generating of specifically configured, individual playlists on the Master PC.
- Saving of time signals, playlists and result data in a SQL data file.
- Evaluation of the results with common statistics software (Excel, SPSS, STATISTICA, ...)



SQuare Master Application



Using the SQuare Master Application:

All hardware components are easily controlled.

Tests are generated and conducted.

Results are administered and corresponding reports generated.

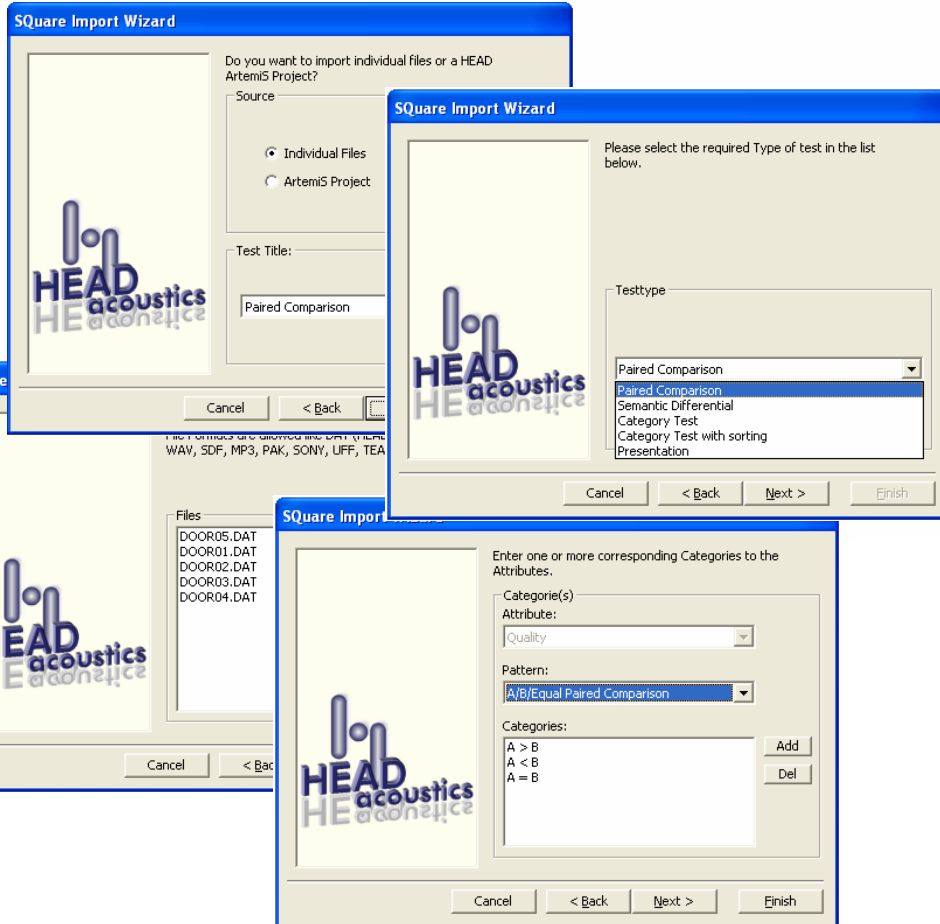
During the test, the test administrator gets a online display of the test subjects' responses.

Available test types

There are 5 different test types that can be quickly and conveniently assembled.

Next to the data formats of HEAD acoustics (DAT, HDF) many universal and third party formats can be imported into Square.

For binaural recordings that contain information about range and equalization, the hardware automatically configures itself to the proper setting for playback.

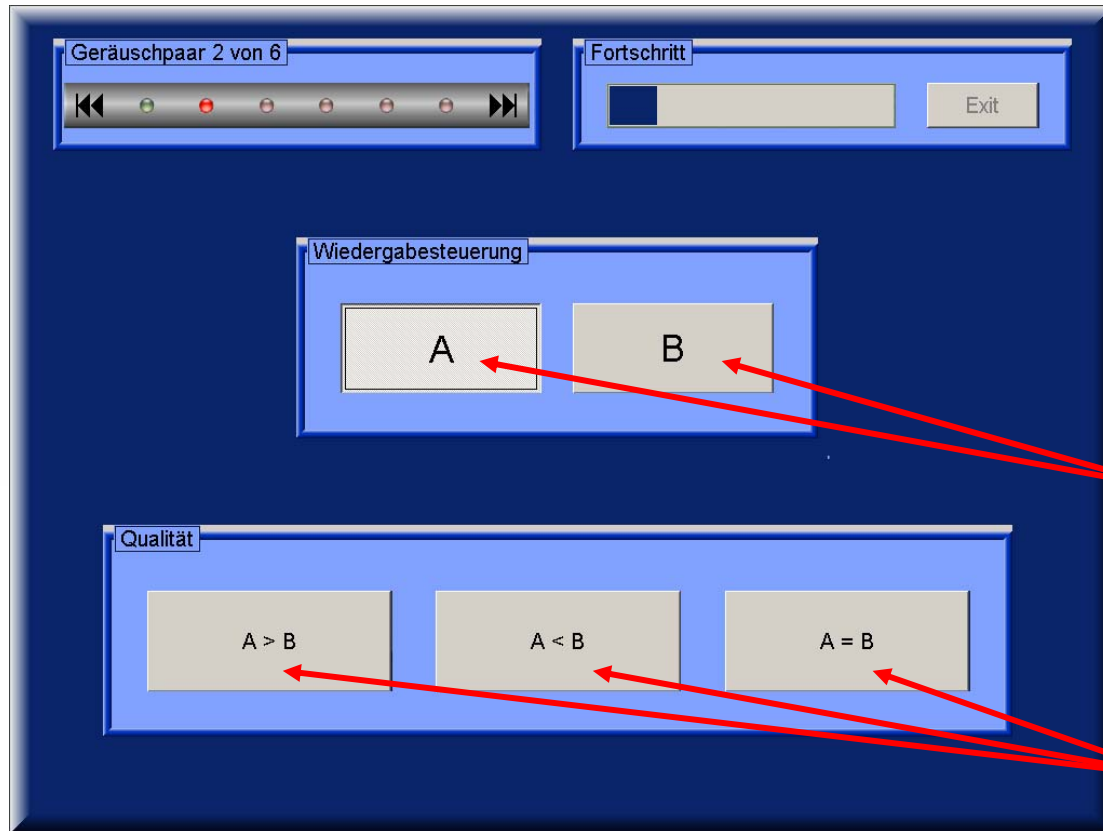


Preference test

In the preference test, sound pairs are presented to the test persons who have to compare and evaluate them with respect to one feature e.g. sharpness.

In the individual test the test person has the possibility to listen to a sound repeatedly. This is convenient for the evaluation of very similar sounds.

The labeling of the answer keys can be defined by the test administrator.



Category test

Steuerung




2 von 4



Ausgewähltes Geräusch...

Door 2 (0,00 - 0,70 s)

Starten Sie die Wiedergabe oder wählen Sie ein anderes Geräusch aus.



Exit

Lautheit

sehr
ziemlich
mittelmäßig
ein wenig
nicht

In the category test the test person is listening to a sound that has to be evaluated on a defined scale with respect to one attribute.

The labeling of the answer keys can be individually configured. However, a pre-defined labeling is also available.



Semantic Differential

- In a listening test with semantic differentials a sound that is to be evaluated based on several attributes is played back. The scale of these attributes is bi-polar and consists of antonym pairs, e.g. loud – soft or cheap – expensive.
- Such a test makes a detailed analysis, characterization and evaluation of sounds possible.
- This test is only available in the Group Listening configuration when using Notebooks/tablet PCs, and in the Individual Listening solution.

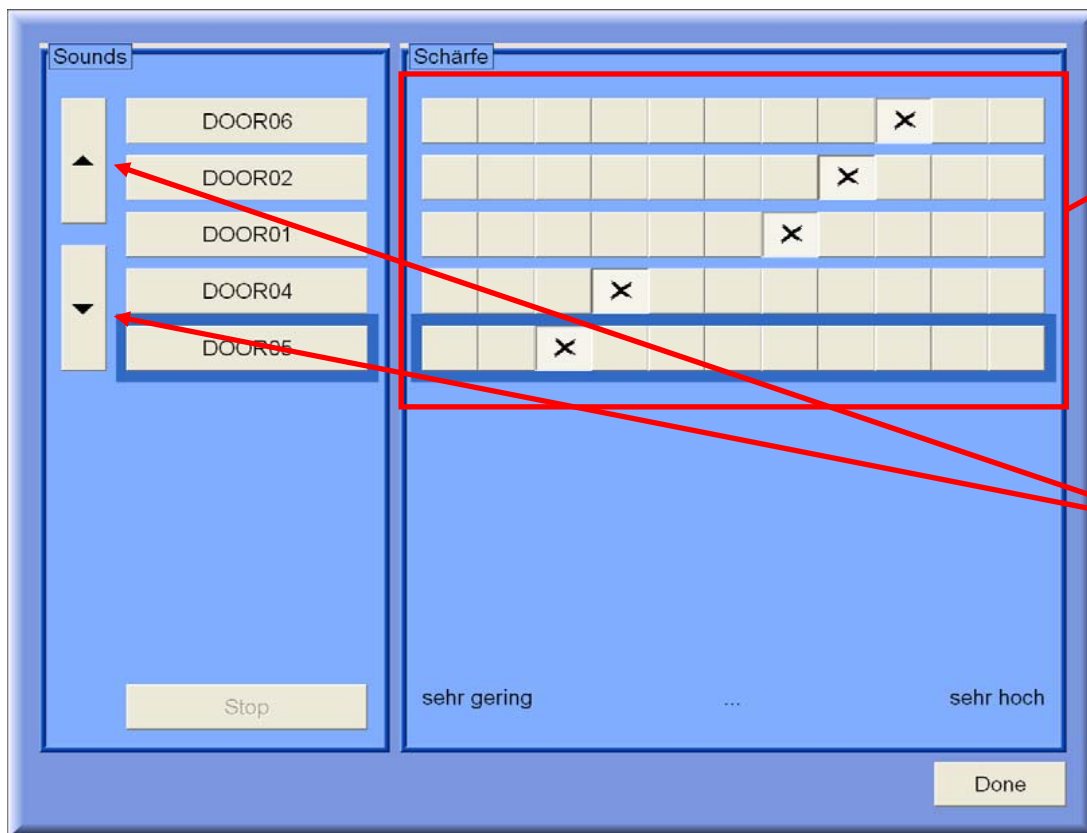


Category test with grading

- The category test with grading is a combination of an absolute evaluation of the presented sound examples (as with the classical category test) and a relative evaluation (as it is used with the A/B comparison, for example).
- The result is a ranking of the sound examples based on a selected criterion and the additional information about the absolute classification.
- This test is only available with the Individual Listening solution because each test person must be able to start the playback of the sound files individually and, if necessary, play them back repeatedly.



Category test with grading



The ranking of the sound examples adapts to the absolute evaluation of the sounds automatically.

With the cursors the ranking can be further adjusted or configured.



Interactive Mode

- The “interactive mode” is used for presenting sounds as part of a discussion.
- In the “interactive mode” the sounds of the demo folder of a playlist can be played back.
- The “interactive mode” can be operated in the group or individual mode. In the group mode, the test administrator selects a sound that is to be played back to all participants. In the individual mode, all sounds of the demo folder are available to each participant. The test administrator can switch between the two modes at all times.



Interactive Mode (Group Listening)

The screenshot displays the HEAD Square software interface in Group Listening mode. The window title is "HEAD Square - 3 users logged in". The interface is divided into several sections:

- Users Panel:** Located on the left, it lists three users: Thilo, Paul, and Günther, each with a status indicator.
- Control Panel:** At the top, it includes buttons for "Save", "Reload", "SEQ", and "Show All". Below these are volume and EQ settings (94 dB, 34 Lin) and a "Group" button.
- Audio Player:** The bottom-left section shows a waveform for "Door 1 (0.00 - 0.70 s)" with a frequency spectrum plot below it. The plot shows amplitude in dB (from -60 to 1.5) over time in seconds (0 to 0.7). The legend indicates "Left" (green) and "Right" (red) channels.
- Grid:** The main area is a 3x3 grid of audio player controls. The columns are labeled "Thilo", "Paul", and "Günther". The rows are labeled "Door 1", "Door 2", and "Door 3". Each cell contains a volume knob, a play button, and a stop button. A red arrow points from the "Group" button to the "Group" column header, and another red arrow points from the "Group" column header to the play buttons in the "Door 1" row, indicating that a single sound can be played back to all participants.

In the group mode of the interactive mode the test administrator can select and play back one sound to all participants. This kind of playback is available in the Group Listening as well as in the Individual Listening solution.

Interactive Mode (Individual Listening)

Geräusche

Door 1 (0,00 - 0,70 s)

Door 2 (0,00 - 0,70 s)

Door 3 (0,00 - 0,70 s)

Door 4 (0,00 - 0,70 s)

STOP



In the individual mode each participant can select and play back the desired sound independently. (This option is only available in the Individual Listening solution.)

For sounds with rpm information this rpm value can be read off the tachometer.

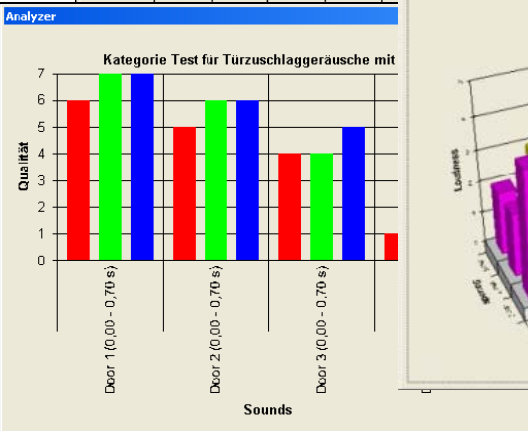
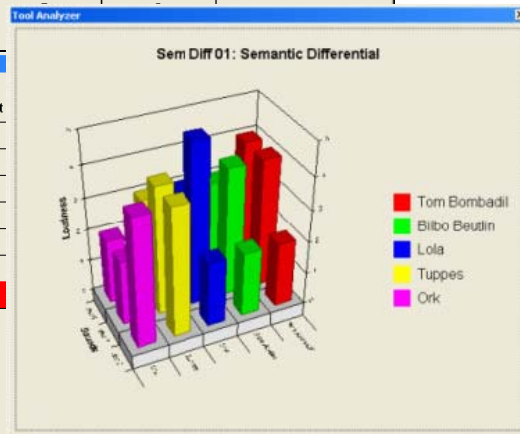
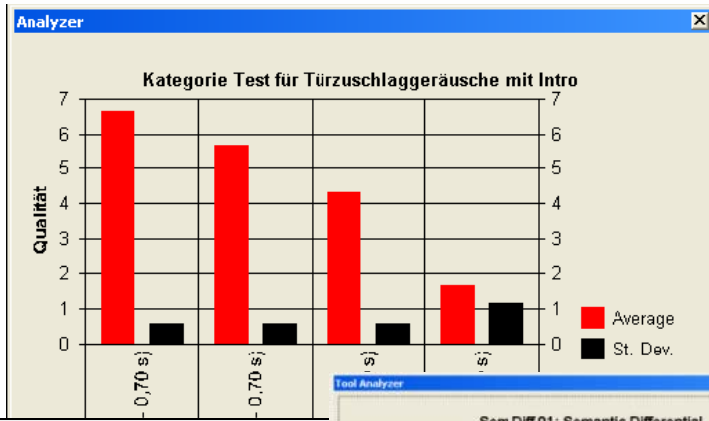


Test results

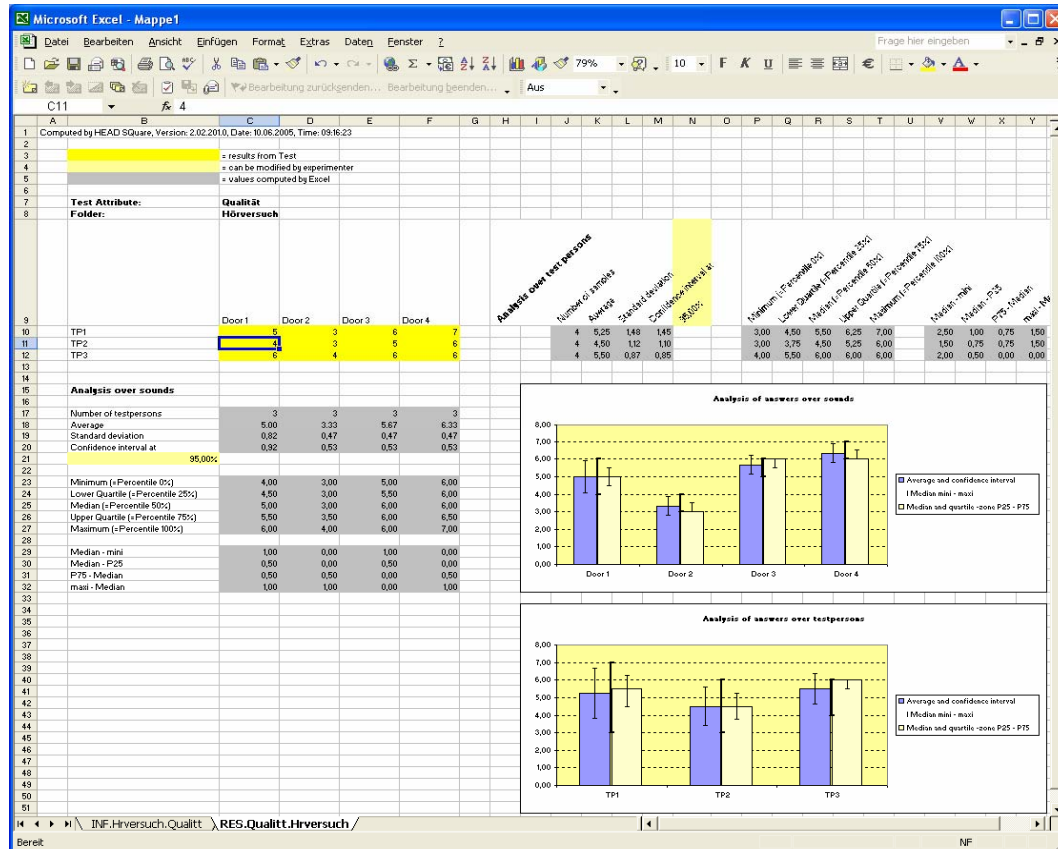
The test administrator can follow the evaluation of sounds during a test on the online display.

Different designs of the 2D- and 3D-presentation of the evaluations are offered.

The evaluations can be displayed to individual test persons as well as to the entire group.



Test results

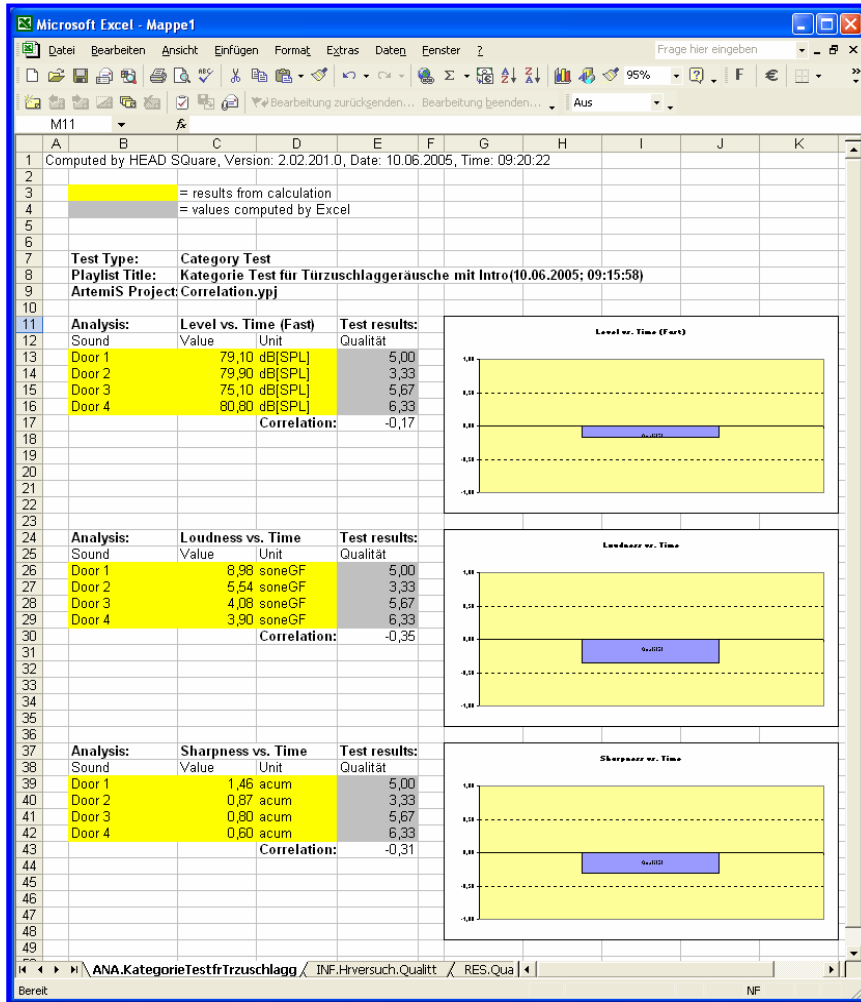


The test results from the listening tests can be exported into result reports in Excel.

With cell formatting the reports can easily be edited in Excel.

Furthermore, the data that are available in Excel can be imported into any other common statistics program - SPSS, STATISTICA, SAS - for further processing.

Test results



Besides the subjective evaluations also objective analysis results from ArtemiS can be integrated into the result reports.

The single values obtained from the analyses (e.g. level, loudness or sharpness) can be correlated with the subjective results of the listening test.

The results of the correlation analysis are presented numerically as well as graphically in the Excel report.

More Features of SQuare

- The text of the scales and attributes is defined in the playlist. It is also possible to modify all other texts that are displayed in the evaluation mask. The language of the displayed texts can be selected and switched on the Master PC.
- The sound examples can be played back in randomized sequence to avoid context effects.
- The PEQs of the listening places can be configured via the Master PC.
- The Switch Mode: In the Individual Listening solution one can switch between sounds. The switching can be done time-synchronous or rpm-synchronous or the playback can be set to “Always from beginning” which means that the playback always starts at the beginning of the sound.

