

## Information on this document

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This document is the third of four application notes on performing jury tests. It contains information on suitable test environments and provides guidance on the selection of test signals and participants.

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### Target group

The following text has been created for readers who would like to perform jury tests and need basic information on the test setup.

### Questions?

Do you have questions? Your feedback is appreciated!

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## Performing Jury Tests – Part 3

### 1. Test environment

#### Design of the test room

The test environment should be designed in a way that the participants feel comfortable. Thus, the room should be well ventilated and have a pleasant temperature. Participants should not be shoved into a „storage room“ and should not be surrounded by too much technology in the test room. Depending on the individual persons, an excess of technology will either discourage or distract participants. Ambient noise in the test room should be as low as possible. If very quiet sounds are to be tested, the jury test needs to be performed in a soundproof room.



#### Interference by other test participants

If the jury test is performed in a group, this needs to be taken into account. Participants should not be influenced and/or disturbed by each other. This can be achieved, for example by setting up partition walls. Furthermore, crosstalk from one to the other participant should be avoided during playback of the test signals. In case of signal crosstalk, participants will not only hear the sounds intended for them from their own headphones, but also those from the headphones of other neighboring participants. This can be very disturbing under certain circumstances and distract participants or even influence their final rating. The influence of crosstalk can be minimized by playing back the sounds in group mode in which all participants hear the sounds to be evaluated at the same

time. If individual playback is required, crosstalk can be avoided or minimized by using closed-back headphones.

## 2. Test signals

The validity of the jury test results is largely influenced by the quality of the test signals. For this reason, the test signals for a jury test must be of high and consistent quality in order to obtain reliable ratings from the participants.

### *Choosing the recording conditions*

The sounds are to be recorded in such a way that they correspond to the normal use of the product under investigation. The easiest way to compare and evaluate sounds is to record them in the same environment and under the same conditions of use. Sounds recorded under different conditions should only be evaluated in a jury test if the different conditions are representative for the use of the product and these differences are to be specifically investigated.

As a rule, all sounds for a jury test should be recorded with the same recording equipment. This ensures that the participants evaluate the actual sounds during the jury test and not any differences relating to the recording equipment. Ensure that the recording is made without any disturbing, unrelated noise. If this is not possible, it may be useful to edit the recordings and remove the disturbing noise. In addition, all noise should have the same length. If the sounds differ in several aspects (e.g., different vehicles, different test tracks and different background noise), it is not easy to determine in retrospect which aspect had the greatest effect on the rating. It is much easier to determine the effect of one aspect on the rating if each aspect is varied and examined individually in a jury test.



### *Binaural test signals*

Using artificial head recordings is a good way to convey a spatial sound impression to the participants. Artificial head measurement in conjunction with suitable playback equipment allow participants to perceive the sounds during playback as if they were present during the original signal recordings. When playing back artificial head recordings, the use of correct equalization must be ensured. With SQala, this can be done automatically.



### *Loudness adaptation*

Under certain circumstances, it may be helpful to adjust the levels of the sounds so that they are all perceived as being equally loud. This is useful, for example, if the sound quality of the sounds is to be evaluated independently of the loudness. Untrained evaluators might be distracted by differing loudness from other noise aspects that are independent of loudness.

### *Signal length*

The lengths of the recordings should not be too short. For stationary signals, a length between 3 and 5 seconds is usually sufficient. For non-stationary signals, the signals may need to be longer. It should be noted, however, that the longer and more variable a signal is, the more difficult it becomes for participants to summarize their perceptions in just one rating. Also, in this case, it is more difficult for the test supervisor to identify the most influential aspect of the evaluation. It may therefore be more advisable to divide the sound into several shorter sections for jury evaluation.

### *Group playback or individual playback*

There are two options for the playback of test signals. One is to give participants the option of controlling the sound playback themselves. In this way, they can individually define when and how often the signals are played back (individual mode). The second option is to play back the sounds simultaneously for all participants according to a pre-defined playlist (group mode). Group mode is particularly useful if several participants are to perform the jury test at the same time and open headphones are used. In this case, participants might interfere with each other due to non-time-synchronous playback. Group mode is not available for all test types, though. For example, the ranking test cannot be performed in group mode. Individual mode is particularly advantageous for sounds that are very short (e.g., the slamming of a door) or very quiet. If such a sound is played back at a time when the participants are distracted or unfocused, they will not be able to perform the evaluation. In individual mode, each participant can start the playback at a time that suits them and repeat it if necessary.

### *Playback via loudspeakers*

In addition, it must be decided whether the playback is to be done via loudspeakers or via headphones. In the case of playback via loudspeakers, both the quality of the loudspeakers used and the room acoustics of the listening room will influence the participants' evaluation. For this reason, the loudspeakers and the room acoustics need to be matched to each other. Individual control of the test is not possible with loudspeaker playback in the group.



*High Precision Loudspeaker HPL*

### *Playback via headphones*

Playback via headphones is a simple way to ensure that all participants hear the same calibrated signal. Untrained participants who are not experienced listening to artificial head recordings via headphones may need a short familiarization period to get their bearings. If the room characteristics in the recording room significantly differ from those in the playback room, the difference between visual and auditory stimulus may cause the untrained listener to judge the sound as too loud, for example. This can be avoided by using suitable instructions. The test supervisor may ask the participants to close their eyes and put themselves in the corresponding room. With a little practice and instructor guidance, participants will be able to put themselves in the different acoustic environment very well. If the jury test is performed in a room with similar acoustic properties as the recording room, the problem will not occur.



### *Playback via headphones and subwoofer*

Sometimes, use of subwoofer during playback can be helpful when using headphones. For sounds with high levels in the low-frequency range, which are crucial for sound evaluation, the subwoofer can be used to generate additional low frequencies that would be missing with pure headphone playback. However, additional subwoofer playback limits the evaluation to group mode when listening with several people. As with playback via loudspeakers, the playback must be synchronous for all participants, so that individual control of the jury test is no longer possible. Importantly when using a subwoofer, the room and subwoofer need to be equalized so that the low frequency sounds arrive at each participant appropriately as well as not be influenced by any room acoustics.

Finally, the decision about the type of playback will certainly also depend on the room conditions and the available hardware.

### 3. Participants

Even the number and selection of participants is subject to external conditions. The pool from which participants can be recruited is usually finite, as is the time allotted for performing the jury test. However, as the selection and the number of participants influence the later outcome of the jury test, they should be carefully selected.

#### *Selection of participants*

Before selecting the participants, the objectives and tasks of the jury test must be clearly defined. In general, the knowledge level of the participants regarding the product to be tested and the demographic composition of the evaluation group are important factors when choosing listeners. Please refer to the following examples for a more detailed explanation. Trained participants, i.e., experts, will have no difficulty in mastering even complicated „listening tasks“. Because of their trained hearing, such experts find it easier to focus on a particular aspect of a sound and evaluate just that aspect. Untrained participants cannot do this. On the other hand, experts might overestimate some aspects of the sound and thus evaluate a sound somewhat worse than untrained persons. In addition to the general experience of participating in jury tests, the product experience should be examined as well. For example, sports car drivers or sports car enthusiasts may accept or even prefer the sporty, loud sound of



such a vehicle compared to other participants. This must be taken into account by the test supervisor when selecting participants and during the subsequent evaluation.

#### *Number of participants*

Also, the number of participants is an important factor influencing the measurement results. The more participants take part in the jury test, the more robust the database and the greater the understanding of the data collected. This allows better identification of outliers and balancing personal preferences of the participants. However, it may not be easy to find a large number of participants for extensive, time-consuming jury tests. There are various statistical tests that can be performed to determine whether enough people have participated in a jury test. For example, statistical formulas can be used to calculate the likelihood of a change in mean values with a larger number of participants. In this way, the test supervisor can statistically validate their test results. However, even a large number of participants cannot compensate for errors in the test design or an inappropriate selection of participants. For example, if care is not taken to ensure that the selected participants are representative of the target group, this may mean that the sound evaluations are not

automatically transferable to the target group. This may significantly reduce the validity of the jury test.

➔ Proceed to the [fourth application note on jury tests](#) providing an introduction into the evaluation of jury tests