EDITORIAL

Help Wanted Now

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A widely used metric, the Zwicker loudness calculation method, is currently being deleted from ISO standardization to be replaced with a new method. This issue is very important; there is a possibility of a significant shift in the use and industrial usefulness of psychoacoustic metrics.

We have found that few in the principal user base, industry, were or are aware of this situation. ISO Draft International Standard (DIS) 532-1, London, April 2011 by ISO TC43/WG9, deletes both Zwicker and Stevens loudness and replaces them with a single new method by Moore & Glasberg similar to but not identical to ANSI S3.4-2007. ISO TC43/WG9 stands for Technical Committee 43 (Acoustics), Working Group 9 (method for calculating loudness level).

The April 2011 DIS 532-1 is now before the 40 ISO member nations for voting that will conclude in December 2011 and determine the final outcome, five months after the July release of the DIS.

A window of opportunity exists to express your opinion. If users wish that the Zwicker method *not* be deleted, and so communicate to their national standards organizations (the only official avenue for communication), the outcome may yet be influenced.

Background. The first psychoacoustic metric to be developed, loudness, has been in widespread use worldwide in industry, the largest user base for many years. There are two normative methods under the ISO 532:1975 standard (which still stands until the December 2011 voting decision). The loudness version in widest use was standardized as ISO 532B (Zwicker method, based on critical bands, frequently called "Zwicker loudness"). ISO 532:1975 includes another normative method, ISO 532A (Stevens method, based on octave bands, which has seen little use since the advent of the Zwicker procedure).

Going into the recent round of WG9 meetings regarding revising the ISO 532 standard, the intention was to edit the existing ISO 532 "Stationary Loudness" by replacing Part A, the former Stevens Loudness, which was rarely used, by the ANSI S3.4-2007 loudness and updating Part B, basically an English translation of DIN 45631-1975, by the revised DIN 45631-1991.

The current DIS 532-1 from the April 2011 London meeting of WG9 is totally different. A new loudness model by Moore & Glasberg shall be standardized, which even considers binaural loudness and differs from the Moore & Glasberg method of ANSI S3.4-2007. Furthermore, the Zwicker method is completely deleted without even informative status and without a grace period. In other words, the Zwicker loudness model, in worldwide use for decades, shall no longer be a standard, while a new loudness model shall be the sole standard, which up to now is little known, rarely used (mainly at universities), and furthermore deviates from the American ANSI S3.4-2007 standard.

The new method is very complex, not easily comprehensible, and very time-consuming in calculation. In addition, it requires a certain previous knowledge from the user. All manufacturers of software packages that contain a calculation of loudness refer to Zwicker methodology (either DIN 45631 or ISO 532B), so users of psychoacoustic parameters worldwide, mainly the automotive industry, computer industry and manufacturers of home appliances and office equipment, have measured, compared and collected data for more than 30 years based on Zwicker loudness.

Before the April 2011 London meeting of ISO TC43/WG9, software suppliers Müller-BBM, HEAD acoustics, Brüel & Kjær and LMS allied in support of the ISO 532 Zwicker retention.

Concerns Expressed by Industrial Users. Continuity is critically important to acceptance and use of standards. Psychoacoustics (particularly Zwicker loudness) has a large, active industrial user base with historic records, compared values and trust. Zwicker loudness measurements serve as a medium of communication.

Continuity is economically important to the industrial user base. No one has objected to the new method (it is welcomed). Nearly all who have written have objected to *replacing* the established method rather than adding while retaining. Continuity and reliance would be damaged.

The proposed new method has advantages, so does the older method. There is general agreement about imperfection of the Zwicker method as well as other methods; that there is no perfect loudness method, yet the Zwicker method has proven reliable over many years.

None of these respondents sees any reason to delete the Zwicker method. Concerns are expressed that psychoacoustics would become less accepted. Most industrial users contacted in North America expressed astonishment at not knowing; they thought that a standards committee would query known users prior to making changes or removing in-use tools.

Discussion. If a new method is to be brought before the user community of a standardized method, it should first be introduced as an informative part of the standard so it can be tried for several years, after which a decision about whether the established method should be replaced can reliably be made. To ensure the necessary continuity, it is absolutely inappropriate to completely remove a well-introduced, widely used method.

None of the concerns in the comments of the second ISO Committee Draft 532-1 (ISO/CD 532-1) presented both by users of loudness calculations and by manufacturers of loudness calculation software were considered in arriving at the current DIS.

The argument that Zwicker loudness is not in accordance with ISO 226:2003, the stated reason for its deletion, is unacceptable. For example, even the well-known A-weighted sound level differs from ISO 226:2003.

There are no serious doubts regarding the application of Zwicker loudness in practice. On the other hand, no scientifically proven advantages exist that the Moore & Glasberg method contains a remarkable improvement regarding the loudness calculation of real signals compared to Zwicker loudness.

If only one loudness calculation method is to be approved as a standard in a revised ISO 532, it can only be recommended to standardize the Zwicker loudness and to include other calculation models only as informative. This will avoid confusion and irritation of users due to the history, existing data libraries and international use of the existing method.

Action Avenue for Interested or Concerned Parties. In the United States, the Acoustical Society of America (ASA) is a member of the U.S. Technical Advisory Group (USTAG) to ISO TC43. This TAG prepares the U.S. position on draft ISO standards. The ASA position on draft standards is prepared by the ASA primary voting representative (PVR) and, in his or her absence, by the ASA alternate voting representative (AVR).

The ASA primary voting representative to the USTAG for ISO TC43 is Paul Schomer (he is also Chair of the USTAG for ISO TC43). The ASA alternate voting representative to the USTAG for ISO TC43 is Bob Hellweg.

If you wish to comment on the DIS ISO 532, you should send comments to: ASA PVR to the USTAG for ISO TC43; Paul D. Schomer; 2117 Robert Drive; Champaign, IL 61821; e-mail: schomer@schomerandassociates.com. Also to: ASA AVR to the USTAG for ISO TC43; Robert Hellweg; e-mail: hellweg@helwegacoustics.com.

If you are an ASA member, please so indicate when communicating. If you can locate an ASA member in your company, it would be preferable for that person to transmit the communication under his or her signature. The structure for commenting to the voting authority for other countries is

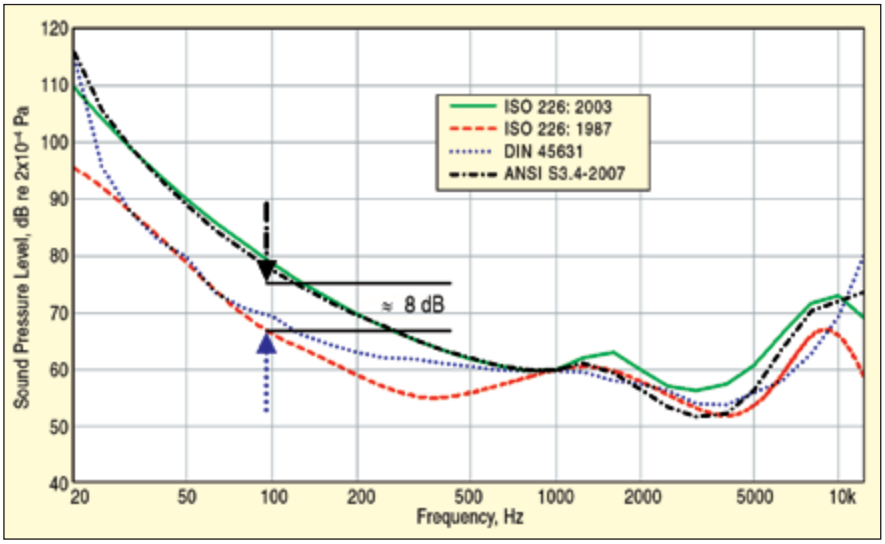

Figure 1. Equal-loudness contours (courtesy Roland Sottek, Noise-Con 2010): ANSI S3.4-2007 has a low-frequency correction factor to match ISO 226:2003; DIN 45631 (Zwicker method) has a correction factor to approximate ISO 226:1987. Tones, especially below 500 Hz are judged significantly less loud by ANSI S3.4-2007 than by DIN 45631. This figure illustrates the response to tones.

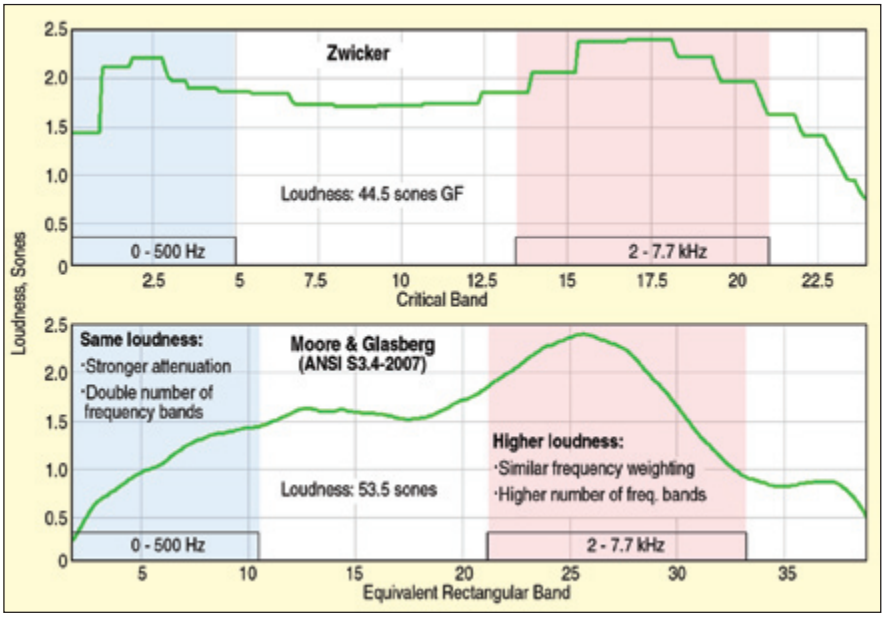

Figure 2. Broadband noise loudness in sones (from Sottek, Noise-Con 2010). In contrast to DIN, the results achieved by ANSI show increasing loudness with increasing bandwidth. For this 80 dB, 20-16,000 Hz pink noise, the ANSI S3.4-2007 overall result (bottom) is more than 20% higher than the DIN result (top).

similar and typically involves the national standards organization.

A number of readers may already have written to the Secretariat of TC43 – thank you; those communications were made known to TC43. However, in the current critical voting phase, the only way to influence the outcome is to write to your national technical advisory group representative to ISO TC43, which will inform and potentially influence your country's voting position. Previous letters redirected, if you wrote earlier to the TC 43 secretariat, will suffice and in fact are essential. For all readers with concerns, it is very important to express them without delay.

Comparison of Loudness Results with Methods ISO 532B (DIN 45631-1991) and ANSI S3.4-2007. In addition to the different behaviors of the Zwicker and Moore & Glasberg methods shown in Figures 1 and 2 for loudness values from pure tones and from broadband noise, a significant "education factor" would be needed for users observing the lower-frequency part of specific loudness plots (such as that shown in Figure 2). The lower plot of Figure 2 would suggest to a viewer familiar with Zwicker specific loudness that the low-frequency content is much less with the Moore & Glasberg method. This is due to the bandwidth-related density level of the narrower equivalent rectangular bands (ERBs) of the proposed new method – lower level per narrower band but more bands with similar total magnitude – and also due to the stronger low-frequency attenuation of the Moore & Glasberg method relative to the Zwicker method. It is our view that the overall spectral shape of Moore & Glasberg specific loudness under-represents the perception of broadband noise below about 500 Hz.

Conclusions. The Zwicker and Moore & Glasberg methods behave differently with different signal bandwidths. No "translation formula" may be applied universally to a result calculated with one method to make it equivalent to a result from the other method. This bandwidth-related behavior difference and the amount of difference in loudness values seen with technical sounds suggest that the continuity and comparability of archived results needed by industrial users would be disrupted by suddenly eliminating the widely used method.

Please evaluate the importance of this issue to your work and in your industry. If concerned, please communicate as soon as possible your recommendation of your country's vote to the appropriate contacts. As noted earlier, the issue is extremely important. There has never been the possibility for so significant a shift in the use and industrial usefulness of psychoacoustic metrics.

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