Absorptionsgrad größer 1 - Blatt 1

Sound absorption coefficient greater than 1.00

Siehe auch Absorptionsgrad größer 1 - Blatt 2 mit Abbildungen:
http://www.sengpielaudio.com/AbsorptionsgradGroesserEinsBild.pdf

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Text

Sound absorption coefficient = Schallabsorptionsgrad - absorptivity = Absorptionsvermögen oder äquivalente Absorptionsfläche

Definition: a metric sabin per square meter, often omitted or treated as dimensionless. Of a surface with a given plan area and aspect ratio, the ratio of Sabine absorption of a surface to the plan area of the surface, $\alpha \times l = Ai / Si$.
Note that the absorption footprint of the surface is not obliged to be smaller than its plan area, resulting at times in **sound absorption coefficients greater than** 1.00. This diffraction effect is most noticeable for small plan areas, where strong sound absorption and long wavelength occur. The sound absorption coefficient increases generally with increasing absorber thickness and with increasing frequency.

Data Interpretation for Values Greater than 1.00

For some test specimens the method reports **sound absorption coefficients greater than** 1.00. This seems at first counter-intuitive because it is impossible for a surface to absorb more than 100 % of the sound energy striking it. To properly interpret this result, note the units of the sound absorption coefficient: metric sabins per square meter. In cases where the absorption footprint is larger than the area of the specimen, the **sound absorption coefficient is greater than** 1.00. This is called the edge effect or diffraction effect because it results from wave diffraction at the edges of the specimen. The specimen appears to be larger than its plan area by a perimeter stripe with width proportional to λ where α is the sound absorption coefficient that results from testing an infinite area. The effect increases with decreasing frequency, decreasing specimen size, increasing aspect ratio, and increasing sound absorption coefficient. Although the effect is most noticeable when values exceed 1.00, most low-frequency results for highly absorptive specimens are affected to some degree.

You should note that this calculation of the sound absorption is correct for the object in that configuration, that is, in the given size, aspect ratio and mounting, in a diffuse sound field. The corresponding sound absorption coefficient is correct in that configuration for the area used in the computation. Although it is common practice to do so, multiplying the sound absorption coefficient of a plane absorber by an area much larger than the specimen size may substantially overstate the sound absorption. (D. Nelson, “On quantifying and using the Diffraction Effect for cost- and performance optimization of sound absorbing treatments”, Proceedings of Noise-Con 90, Institute of Noise Control Engineering, 1990). The test standard controls for this to some degree by limiting the size of test specimens to no less than 60 square feet, and discouraging high aspect ratios.

"Diffraction Effect" in Sound Absorption Tests

Why is the **sound absorption coefficient greater than** 1.00? - Proceedings of Noise Con 90. Laboratory measurement of sound absorption is based on the effect of a patch of material on a diffuse sound field in a reverberation chamber. The mathematics used in the analysis presumes that sound travels with equal probability in all directions. This is more or less true throughout the room, except over the sample. For a highly absorptive sample sound travels into the specimen, but very little is reflected back. The discontinuity in the wave field at the edge of the specimen creates a diffraction effect that warps the sound field to make the specimen appear as much as a quarter-wavelength larger in each direction. This increases the sound absorption coefficient to such a degree that it often exceeds the theoretical limit of 1.00. Does this mean the data is invalid? No. The sound absorption coefficients reported are for a specimen of the given size in a diffuse sound field: application of these numbers to continuous surfaces may substantially overstate actual performance.

http://www.iperf.org/IPRF_ACAPPS.pdf

A **sound absorption coefficient greater than** 1.00 cannot occur in theory but can be measured for materials that are highly sound absorptive. However, the sound absorption coefficient should always be rounded to 1.00 when calculating sabins of absorption - Industrial Noise Control, 1987.

Find more on "Measurement of Sound Absorption".
http://www.ramsete.com/Public/Papers/094-AES97.PDF
http://afmg-network.com/viewtopic.php?p=2516&sid=676de8f5a5301669f43a6d321959b563