

Evaluation, measurement, and prediction of global loudness of noise immissions

By Ingeborg Stemplinger

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Evaluations, measurements and predictions of noise immissions usually are based on A-weighted energy-equivalent level, which represents a physical magnitude. However, in her thesis, Ingeborg Stemplinger elucidates the psychoacoustic background of subjective evaluations of noise immissions. The concept of "global loudness", i.e. perceived loudness averaged over longer periods of time (minutes, hours) is elaborated.

In extended psycho acoustic studies, global loudness of noise immissions from steady state noise (e.g. industrial noise) as well as noise with distinct temporal structure is assessed. In particular, traffic noise immissions for different means of transportation (road, rail, air) are described, and combinations of different noise sources (e.g. traffic noise plus industrial noise) are treated. Moreover, highly impulsive noise like noise from tennis courts is evaluated.

In addition to the subjective evaluations, noise immissions are described by physical measurements. In many cases, values of physically measured percentile loudness are in line with the subjective evaluations. While for noise immissions from steady state sounds, traditional magnitudes like Leq also can describe the ranking of sounds, the magnitude of differences in loudness can be assessed only by psychoacoustically based procedures as described in DIN 45 631. For impulsive sounds like tennis noise, for example, traditional physical measurements like LTm can not describe the influence of the number of events on the subjective evaluation.

In conclusion, Ingeborg Stemplinger proposes to use for physical measurements of noise immissions percentile loudness. The accuracy of measurements of percentile loudness is challenged by statistical tests, and practical hints for the tradeoff between measurement time and accuracy of the data are given.

Finally, predictions of global loudness are compared to physically measured values. In particular for noise sources with a regular schedule like railways, predictions are within 5% of the measured values.

In summary, the thesis of Ingeborg Stemplinger can serve as a reference for psychoacoustically based methods to evaluate noise immissions.

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