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Séminaire du LVA

Mesure psychophysique de la gêne de bruits d'onduleurs photovoltaïques

Psychophysical Scaling of the Annoyance Produced by Photovoltaic Inverters

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Photovoltaic inverters used in solar power systems produce noise across the entire audible spectrum. To assess the annoyance generated by such noise, listening tests were performed on binaural recordings made from different brands of inverters in various operating conditions. 42 participants judged how unpleasant each of 40 sound samples appeared when compared to a reference using the method of magnitude estimation. In addition, they performed all possible paired comparisons on a subset of the sounds. The latter is particularly telling, since it may reveal inconsistencies (intransitivities) in the judgments that direct rating methods cannot detect. It turned out that the paired-comparison data largely conformed with the Bradley-Terry-Luce model implying that auditory unpleasantness of these sounds is in fact ratio-scalable. The magnitude estimates were highly reliable, showed systematic dependencies on the type of solar inverter, and increased monotonically with the power converted. They further indicated that the noise components due to cooling ventilation emerging in the mid-frequency range have a greater impact on perceived unpleasantness than the high-frequency peaks near 16–18 kHz. When trying to predict mean unpleasantness scale values on the basis of psychoacoustical metrics, a linear combination of (binaural) loudness, roughness, and sharpness accounted for over 90% of the variance in the subjective data. By contrast, a-weighted sound pressure level and other purely acoustical measures performed poorly in this respect. This indicates that it may be advantageous to include psychoacoustical parameters in the evaluation of noise generated by solar inverters.