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Influences of Wind on Automotive Interior Sound Quality

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ABSTRACT

The effects of noise on human health (both mental and physical) are well known, and motivation to decrease noise in daily life is prevalent. Wind noise within automotive interior cabins could be detrimental to human health and comfort because of the negative impact on speech intelligibility and fatigue overall. There is little information on human perception of wind noise in automobile interiors though Loudness and Articulation Index have been examined as predictors of human response. They have been found to predict well in some circumstances, but not in others. A predictor with a higher correlation to human response is needed as criterion for car designers. In this research a variety of sound quality metrics are being examined to better define how people perceive wind noise. Ford collected sounds in cars in a wind tunnel using four artificial Aachen heads, varying the wind speed and direction. A variety of cars were tested, including midsize and compact SUVs. A database was created in order to easily compare a variety of characteristics for each sound and test configurations. Metrics for the front passenger and driver measurements were compared for symmetry and several unexpected asymmetries were found. High correlation ($R^2 > .9$) was found between several metrics: roughness, Articulation Index, A-weighted sound pressure level, and Zwicker Loudness. Subjective testing is still needed to be done to confirm which metrics provide the best predictions of people's responses.

KEYWORDS

Sound Quality, Automotive, Wind, Noise, Comfort