

**IN12-113**

**ANALYSIS OF POTENTIAL SOLUTIONS TO AUDIBLE TIRE CAVITY AND RIM  
COUPLING RESONANCE NOISE**

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**ABSTRACT**

The coupling of the tire cavity and tire rim resonance imparts a force upon the wheel spindle which is transmitted to the vehicle interior to produce undesirable noise levels. Modifications to the tire rim or tire cavity can decouple these resonances by shifting the natural frequency outside of the 200 – 250 Hz range to reduce the audible noise levels. Through experiment and analysis several potential solutions have been compared for their commercial viability. Modifications of the rim included the Kühl wheel design and the implementation of a Helmholtz resonator, whilst tire cavity modifications included the extrusion of rubber from the tire into the cavity, the introduction of a sound absorption material and an elastic ring with separator fins which extends into the cavity due to centrifugal forces. Through QFD analysis the elastic ring design was found to be most commercially viable in terms of performance, cost, safety, versatility, durability and manufacturing readiness.