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Momentum transferred to the environment by a Helmholtz resonator[1] JOSE FEDERICO HERNANDEZ-SANCHEZ, FELIPE ORDUA-BUSTAMANTE, ROBERTO VELASCO-SEGURA, National Autonomous University of Mexico — The momentum transferred from a Helmholtz resonator driven at high amplitudes is investigated experimentally and numerically for frequencies around resonance and higher. As visualized, the outward flow consists of a vortex-ring discharged every positive cycle. Momentum transfer in the outward cycle is estimated experimentally from the velocity and size of the vortex. Numerically, the momentum transfer is estimated from a Lumped Element Model (LEM) of the flow in the neck of the resonator. Results from the LEM are in good agreement with the experimental measurements. Under most conditions considered, the motion of air through the neck is dominated by the aerodynamic damping accounted for by the Bernoulli effect, and driven by the sound pressure within the resonator. A dimensionless scaling derived from the LEM, suggests that momentum transfer in the outward cycle scales as the ratio of the Reynolds and the Strouhal numbers. Such scaling is in good agreement with the experimental and numerical results, collapsing graphically into a common curve.

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