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Numerical analysis of the characteristics of Helmholtz resonators with multiple necks[1] JINLIANG HENG, T DHANACHANDRAN THANAPAL, WAI LEE CHAN, BASMAN ELHADIDI, Nanyang Technological University — Helmholtz resonators are commonly used in combustion engines to reduce engine noise and tackle combustion instability issues. A resonator, typically consisting of a fixed volume cavity and a neck has a resonant frequency that is a function of the speed of sound, neck cross-sectional area, cavity volume, and neck length. For a resonator with multiple necks, the analytical expression is able to determine a single value for its resonant frequency. However, in this work involving a cavity with multiple necks, experiments have shown that multiple frequencies are present. Subsequent numerical simulations utilizing the Lattice Boltzmann method also yield reasonable agreement with experiments, suggesting that the multiple-frequency phenomenon may be attributed to interactions between different necks, and may be specific to the current experimental setup. Further simulations with sinusoidal and pulse acoustic source will be performed for further insights to the flow associated with a resonator with multiple necks, from which the multiple-frequency phenomenon may be explained.

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