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Effect of Varying Resonator Length for Thermoacoustic Prime Movers CORY HEWARD, BONNIE ANDERSEN, Utah Valley University — Improvement of performance of thermoacoustic engines is critical to advancing the technology. Bottle-shaped themoacoustic prime movers have a quarter-wave resonator neck and a large cavity. The cylindrical neck region consists of a cold side and a hot side with the heat exchangers and the "stack" between the two. The geometric parameters of these parts determine the resonant frequency and affect the acoustic pressure of the device. To achieve an optimum of acoustic power, the stack should be positioned at the center of the neck where contributions of the pressure and velocity waves are a maximu,, giving an ideal ratio of hot to cold side length of 50%. However, radiation loss is directly proportional to the length of the hot side. Thus, the optimum ratio will be less than 50%. Studies show that increasing the length of the neck decreases the resonant frequency according to a transcendental equation that is independent of this ratio. Results confirm that decreasing the ratio increases the acoustic pressure within the device. Three cold side lengths were tested with up to eight hot side lengths. For the longest cold side tested, the ratio of 36% is optimum.

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