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Acoustic hysteresis of varying cavity length of a bottle-shaped thermoacoustic prime mover with a neck to cavity ratio of 1:10 EMILY JENSEN, BONNIE ANDERSEN, Utah Valley University — A previous study showed hysteresis in transition regions to overtones of bottle-shaped thermoacoustic prime movers with a neck to cavity diameter ratio of 1:2.4 while varying the cavity length. Hysteresis regions were studied with a neck to cavity diameter ratio of 1:10. The device consisted of a neck (5.15 cm long, 0.75" ID) with a heating element around it and a cavity (ID 3.75") with a sliding piston, allowing the cavity length to be varied up to 38 cm long. Copper mesh was used for the heat exchangers and were located about 30% away from the top of the neck and 16 mg of steel wool served as the stack. A pressure sensor was connected to the center of the piston to measure acoustic pressure at the bottom of the cavity. Acoustic pressure, frequency, and hot and cold temperatures were recorded while both increasing and decreasing the cavity length from about 2 cm to 38 cm in increments of 0.2 cm over time intervals of 20 s with an input power of 10.5 W. Three transitions to overtones occurred at 6.8, 15.2, and 27.4 cm while pulling the piston out and at about 25.2, 15.6, and 6.0 cm while pushing the piston in. Frequencies and transition regions agreed with expected values. Both hot temperature and acoustic pressure increased during transition regions. This could be caused from multiple acoustic waves being produced.

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