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Qualitative analysis of mode transitions in bottle-shaped resonators with waterfall plots[1] BONNIE ANDERSEN, JOSH DIMOND, CICELY POTTER, AARON HORIKAMI, Utah Valley University — A closed bottle-shaped resonator consists of a coupled acoustic system with the neck behaving as a quarter-wave resonator and the cavity as a half-wave resonator. Such a system gives rise to overtones that are not harmonic of the fundamental and could be used as a thermal sensor. A thermoacoustic stack subject to a temperature gradient can generate self-sustained oscillations within the bottle. Mode transitions were previously observed to occur at the same position within a few millimeters when a piston controlled with a translation stage was moved up or down with a manual control to adjust the cavity length. The dominant mode was recorded using a power spectrum of the signal measured with a pressure sensor. In this study, the piston motion is automated and eight neck/cavity combinations were tested at three different piston speeds and at various input powers. The input powers were adjusted to just above thermoacoustic onset and not to exceed thermal limits of the materials used. Waterfall plots allow the visualization of the time evolution of the power spectrum where intensity is plotted both as a function of time and frequency. Qualitatively, the transitions occur at the same place within the cavity after a threshold input power is reached.

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