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Non-Linear High Amplitude Oscillations in Wave-shaped Resonators[1] DION ANTAO, BAKHTIER FAROUK, Department of Mechanical Engineering and Mechanics, Drexel University — A numerical and experimental study of non-linear, high amplitude standing waves in "wave-shaped" resonators is reported here. These waves are shock-less and can generate peak acoustic overpressures that can exceed the ambient pressure by three/four times its nominal value. A high fidelity compressible axisymmetric computational fluid dynamic model is used to simulate the phenomena in cylindrical and arbitrarily shaped axisymmetric resonators. Working fluids (Helium, Nitrogen and R-134a) at various operating pressures are studied. The experiments are performed in a constant cross-section cylindrical resonator in atmospheric pressure nitrogen and helium to provide model validation. The high amplitude non-linear oscillations demonstrated can be used as a prime mover in a variety of applications including thermoacoustic cryocooling.

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