Acoustic Energy Harvesting using Helmholtz Resonator with Tapered Neck
Minu A Pillai1, Dr. Ezhilarasi D2
National Institute of Technology Tiruchirappalli, Department of Instrumentation & Control Engineering, Tamilnadu- 620015

Introduction: The proposed acoustic energy harvester makes use of the increased amplification rate of a Helmholtz resonator due to the tapered nature of its neck.

Computational Methods: The pressure amplification factor, G of the resonator is

\[ G = \frac{p_c}{p_i} = 2\pi \sqrt{\frac{V}{S^3}} \]

The smoother area change from the neck towards the cavity will reduce the flow of resistance of the sound waves and will increase the sound absorption capacity of the Helmholtz resonator.

Results: A sound wave of 95dB fed directly to the Helmholtz resonator with tapered neck (tapering angle 21°) of resonant frequency 284 Hz produces an output voltage of 396 mV (Figure 6) which closely resembles the simulation results (Figure 5).

Conclusions: When the resonator was geometrically tuned with piezoelectric cantilever the ratio of voltage obtained from the resonator with tapered neck to that of the resonator without tapered neck was about 0.60. After a particular value of slope of the tapered section the output starts decreasing as the tapered region hinders the plane waves inside the resonator.

References: