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Beam Flutter and Energy Harvesting in Internal Flow[1] LUIS PHILLIPE TOSI, TIM COLONIUS, Caltech, STEWART SHERRIT, HYEONG JAE LEE, Jet Propulsion Laboratory, California Institute of Technology — Aeroelastic flutter, largely studied for causing engineering failures, has more recently been used as a means of extracting energy from the flow. Particularly, flutter of a cantilever or an elastically mounted plate in a converging-diverging flow passage has shown promise as an energy harvesting concept for internal flow applications. The instability onset is observed as a function of throat velocity, internal wall geometry, fluid and structure material properties. To enable these devices, our work explores features of the fluid-structure coupled dynamics as a function of relevant nondimensional parameters. The flutter boundary is examined through stability analysis of a reduced order model, and corroborated with numerical simulations at low Reynolds number. Experiments for an energy harvester design are qualitatively compared to results from analytical and numerical work, suggesting a robust limit cycle ensues due to a subcritical Hopf bifurcation.

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