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Performance of Piezoelectric Energy Harvesters in Isotropic Turbulence[1] AMIR DANESH-YAZDI, OLEG GOUSHCHA, NIELL ELVIN, YIANNIS ANDREOPOULOS, The City College of the City University of New York — A piezoelectric harvester beam is used to extract energy from the turbulence in a surrounding fluid. An experimental investigation is carried out in a large scale wind tunnel in which turbulence-generating grids of varying dimensions are used to excite a flexible cantilever beam with a piezoelectric patch. The beam is instrumented with a strain gauge and the strain and voltage generated by the piezoelectric material are recorded as a function of time at various distances from the grid. We observe that the presence of the beam breaks the flow isotropy in the near field but the pressure forcing content retains some of the isotropy features. The pertinent parameters that influence the voltage output and performance of the beam are identified as (1) the dimensionless distance of the beam from the grid with respect to the grid size and (2) the dimensionless length of the beam. The voltage output is also shown to obey an exponential decay law with respect to the dimensionless distance parameter. A theoretical solution to the voltage output and tip displacement is also suggested and the results are compared with experimental data.

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