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Constructive interference in arrays of energy harvesters in fluid flows[1] VAHID AZADEH RANJBAR, OLEG GOUSHCHA, NIELL ELVIN, YIANNIS ANDREOPOULOS, CUNY-CCNY — In the present work we demonstrate some unique opportunities which exist to increase the power harvested with fluidic piezoelectric generators by almost two orders of magnitude higher than existing methods by exploiting dynamic non-linearities and deploying multi-element arrays in carefully selected positions in a fluid flow field. These ac-coupled generators convert fluid kinetic energy, which otherwise would be wasted, into electrical energy. The available power in a flowing fluid is proportional to the cube of its velocity and if it is properly harvested can be used for continuously powering very small electronic devices or can be rectified and stored for intermittent use. Additional experimental work has shown that non-linear arrays of such energy harvesters can produce high output voltages in a very broadband range of frequencies. In our work, we investigate the effect of geometric parameters such as spatial arrangement and the mutual interference between the elements of a non-linear array on their overall performance and efficiency characteristics. Analytical tools based on the non-linear van der Pol oscillator have been also developed and verified with experimental data.

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