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HARVESTING ENERGY FROM COUPLED PIEZOELECTRIC AND MULTIPLE ELECTROMAGNETIC HARVESTERS

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The need for smart cities and smart structures has necessitated the use of wireless sensors to monitor them. Piezoelectric (PE) and electromagnetic (EM) transductions based vibration energy harvester has received more attention for various applications. Single frequency based resonance harvesters give maximum power only at the resonance. Off resonance, the output power falls significantly. To overcome this issue, a hybrid piezo-electromagnetic energy harvesting technique is proposed. In the present work, a cantilever beam with an unimorphed macro fibre composite (MFC) is used to harvest PE energy due to direct piezoelectric effect and a spring-mass (magnet) system moving within a solenoid hung in two different places of the cantilever is used to harvest EM energy out of motion in a magnetic field. Both PE and EM energies are tapped in a single device making it a hybrid harvesting device. This study analyses power output of the hybrid harvester and compares it with that of the standalone PE and EM harvesters. The responses show that the hybrid harvester operates over a broad range of frequencies to harvest power as opposed to narrow operating frequency range in standalone devices.

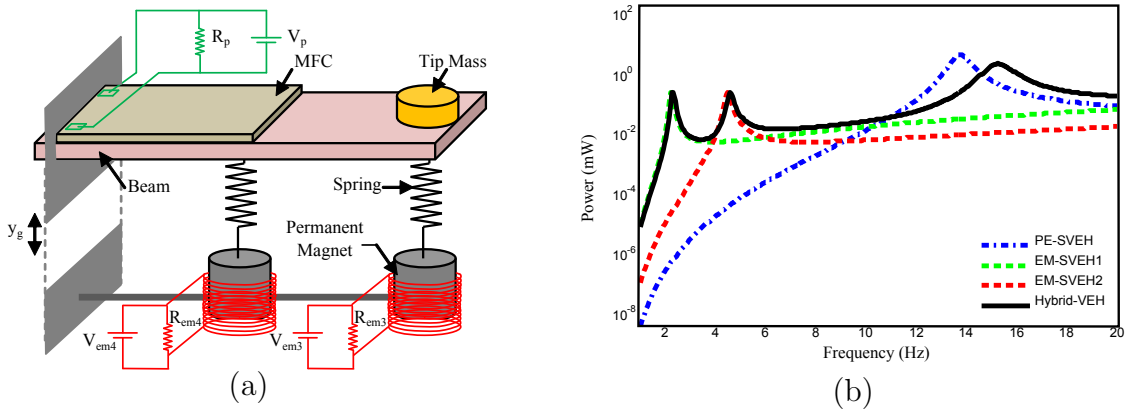

Figure 1: (a) Schematic diagram of the standalone piezoelectric energy harvester. (b) An equivalent model for the standalone piezoelectric energy harvester.

REFERENCES

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