ABSTRACT

This research is devoted to study the design, simulation, fabrication, assembly, and characterization of planar spring as component of Electromagnetic Vibration Energy Harvesting (EVEH) device. This EVEH device is composed of symmetrical double planar spring, magnet, and coil. Double planar spring with four cantilever made of kapton, taken from pyralux material with Young's modulus of $3.1x10^9$ Pa and a density of 1300 kg/m^3. The magnet used in this research is NdFeB magnet (Neodymium Iron Boron) which has diameter and thick of 6 mm and 2 mm, respectively. Planar spring is simulated using Finite Element Analysis Comsol Multiphysics 4.3 software to obtain resonance frequency of the planar spring. EVEH devices are characterized to obtain the resonance frequency and voltage. From simulation of EVEH device with dimension of 25x25 mm^2, the resonance frequency is generated of about 72.5 Hz without any significant changes when acceleration variations are made. We also obtain the deviation of 5 mm, 5.5 mm, and 6.5 mm when 0.4 g, 0.5 g, and 0.6 g accelerations are varied (1 g = 9.8 m/s^2), respectively. The resonance frequency of about 178.2 Hz is produced when the EVEH device is simulated without any significant changes when acceleration variations are made. In this dimension, the deviation of 2 mm, 2.5 mm, and 3 mm are obtained when 0.4 g, 0.5 g, 0.6 g acceleration are varied (1 g = 9.8 m/s^2), respectively. Finally, EVEH devices are characterized by several variation of acceleration and cantilever width. It is obtained that the range of resonance frequency are around 92 – 107 Hz and 145 – 161 Hz for 25x25 mm^2 and 15x15 mm^2 planar spring design, respectively. The voltages are observed around 160 – 420 mV and 19.5 – 39.7 mV for 25x25 mm^2 and 15x15 mm^2 planar spring design, respectively.

***Keywords**: EVEH, kapton, pyralux, resonance frequency, flexible PCB*