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Magnetic field effect on nonlocal resonance frequencies of structure-based filter with periodic square holes network

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Abstract: In this paper, we investigate the magnetic field, thermal loads and small scale effects on the dynamics vibration of a nanobeam structure composed of a rectangular configuration perforated with periodic square holes network and subjected to axial magnetic field based on Euler–Bernoulli beam model (EBM) and Timoshenko beam model (TBM). The developed resonance frequencies expressions are derived by modifying the standard equations of dynamics beam vibration. The small scale effect is adopted via the Eringen's nonlocal theory while the coupled governing equations are obtained and solved using analytical solution method in order to determine the resonance frequency of perforated nanobeam. It is found that the resonance frequency change, the magnetic field intensity, the thermal loads and small scale effects are in dependence with geometrical parameters such as size and number of holes. Therefore, these results are discussed for the investigation of the structure dynamic deformation and compared with literature results where new remarks are deduced and presented with detail for a proper design of M/NEMS structures.

Key words: Magnetic field ; Vibration of a nanobeam ; periodic square holes network

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