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Periodic material-based vibration isolation for satellites

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The vibration environment of a satellite is very severe during launch. Isolating the satellite vibrations during launch will significantly enhance reliability and life-span, and reduce the weight of satellite structure and manufacturing cost. Guided by the recent advances in solid-state physics research, a new type of satellite vibration isolator is proposed by using periodic material that is hence called periodic isolator. The periodic isolator possesses a unique dynamic property, i.e., frequency band gaps. External vibrations with frequencies falling in the frequency band gaps of the periodic material-based satellite system were to be mitigated. Using the elastodynamics and the Bloch-Floquet theorem, the frequency band gaps of periodic isolators were determined. A parametric study was conducted to provide guidelines for the design of periodic isolators. Based on these analytical results, a finite element model of a micro-satellite with a set of designed periodic isolators was built to show the feasibility of vibration isolation. The periodic isolator was found to be a multi-directional isolator that provides vibration isolation in the three directions.

Biography

Yi Lung Mo is a PhD and PE holder. He is a Professor of Civil Engineering and Director of Thomas TC Hsu Structural Laboratory at the University of Houston, Houston. He has done his PhD in Structural Engineering from University of Hannover, Germany. He has 5 awards and 2 pending patents and has written eight books and book chapters and has had 149 technical papers published in international journals, also 152 conference papers and 51 technical reports. Based on his research performance, he has received the Alexander von Humboldt Research Fellow Award from Germany, the Distinguished Research Award from the National Science Council of Taiwan.

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