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Author: Mr. Shigeru Shimose
Japan Aerospace Exploration Agency (JAXA), Japan

Prof. Onoda Junjiro
Japan Aerospace Exploration Agency (JAXA), Japan
Prof. Kenji Minesugi
Japan Aerospace Exploration Agency (JAXA), Japan

OPTIMAL PARALLEL/SERIES CONNECTION OF MULTIPLE PIEZOELECTRIC PATCHES AND
INDUCTORS FOR SSDI VIBRATION SUPPRESSION

Abstract

Many works have been reported on the semi-active vibration suppression technique so called synchronized switch damping on inductor (SSDI). The technique uses a piezoelectric transducer attached to a vibration structure and a switched inductive shunt circuit. At each extremum of the voltage across the piezo-transducer, SSDI technique turns on the switch of the shunt circuit such that the voltage inverts. When the inversion is completed, the switch is immediately turned off. It is well known that this technique effectively suppresses the vibration of the structure. Previously, the authors have experimentally demonstrated that this method can reduce the vibration amplitude of 140kg satellite by 50% by using 80g piezoelectric patches. In that demonstration, it revealed that multiple piezoelectric patches needed to be attached to the actual satellite structure because of the practical limitation of space where the piezoelectric patches can be attached. It was also shown that the performance in suppressing the vibration heavily depends on the configuration of parallel/series electrical connection of these patches. Therefore, we have studied and shown the optimal parallel/series connection of the patches. This paper shows the optimal configuration of parallel/series connection of not only the piezoelectric patches but also multiple inductors.