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HIGH-PRECISION MICROGRAVITY MEASURING TECHNIQUE FOR SPACECRAFT

Abstract

High-precision microgravity measuring is applied to obtain acceleration values of spacecraft during the flight, and thus to provide data for flight control. With size and weight limitations in spacecraft, microgravity measuring is primarily achieved by quartzes flexible accelerometer. This essay analyzes error sources of microgravity measuring by quartzes flexible accelerometer. Temperature compensation and installation error compensation are achieved by thermal-magnetic compensation and cross-coupling model, and are verified by temperature test, multi-position rolling test and cross-coupling test. With the advantages of high-precision and wide measuring range, a microgravity measuring device for spacecraft is presented with parameters as follows: resolution < 10 μg, nonlinearity $< 0.02\%$, bias temperature coefficient < 20 μg per degree Celsius, temperature coefficient of calibration factor $<$ 30ppm per degree Celsius, second-order nonlinear coefficient $< 3{*}10^{-5}g/g^2, and 10 g measuring range.$