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Magnet Position Variation of the Electromagnetic Actuation System in a Torsional Scanner

Authors : Loke Kean Koay, Mani Maran Ratnam

Abstract : A mechanically-resonant torsional spring scanner was developed in a recent study. Various methods were developed to improve the angular displacement of the scanner while maintaining the scanner frequency. However, the effects of rotor magnet radial position on scanner characteristics were not well investigated. In this study, the relationships between the magnet position and the scanner characteristics such as natural frequency, angular displacement and stress level were studied. A finite element model was created and an average deviation of 3.18% was found between the simulation and experimental results, qualifying the simulation results as a guide for further investigations. Three magnet positions on the transverse oscillating suspended plate were investigated by finite element analysis (FEA) and one of the positions were selected as the design position. The magnet position with the longest distance from the twist axis of the mirror was selected since it attains minimum stress level while exceeding the minimum critical flicker frequency and delivering the targeted angular displacement to the scanner.

Keywords : torsional scanner, design optimization, computer-aided design, magnet position variation
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