The Gravity Effect of Optomechanical Design on the Remote Sensing Instrument

Yu-Chuan Lin[1], Shenq-Tsong Chang[2], Long-Jeng Lee[3] and Ting-Ming Huang[4]

[1]*Instrument Technology Research Center, National Applied Research Laboratories*

20, R&D Rd. VI, Hsinchu Science Park,Hsinchu, 30076, Taiwan

[1]*yclin@itrc.narl.org.tw*, [2]*stc@itrc.narl.org.tw*, [3]*ljlee@itrc.narl.org.tw*, [4]*tmw@itrc.narl.org.tw*

Abstract. The remote sensing instrument (RSI) is an optical instrument for earth observation satellite. The Cassegrain optical system was widely used in space-borne or astronomical telescope configuration with a primary mirror, a secondary mirror and correct lenses. The space-based telescope will experience ground test, launch and space orbit operation, where the impact of various environmental loads of each stage must be considered in the related design phases. The ground assembly and test phases are majorly subjected to earth gravity disturbance. As a result, inapplicable optomechanical design or configuration induce optical aberration and lead to degraded image quality. In order to predict and identify the relationship between optomechanical structure's optical aberration and gravity effect, a detailed structural analysis of optomechanical design using finite element model (FEM) combined with optical image qualities interpretation of Zernike polynomials fitting are presented in this article. This report tries to simulate the various optical performances as rotating the optomechanical structure as the different orientation gravity by FEM and optical software. Actually, the RSI system environment tests are processed under 1G earth gravity. The -1G can be considered as the whole RSI system upside down. Since the optomechanical assembly and ground-based optical tests are time consuming, the simulation result will give the better ways for RSI system alignment and environment test to reduce the unnecessary test and approach the better RSI system optomechanical design. The relationship between mirror optical aberration and gravity effect (+/-1G) are discussed and identified.

Keywords: Optomechanical Analysis, Finite Element Analysis, Optical Aberration

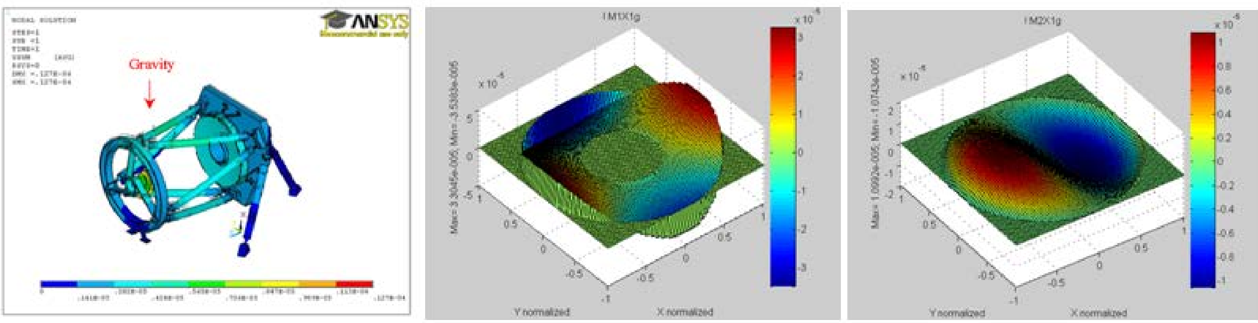

Figure 1. Optomechanical analysis by FEM under gravity acting perpendicular to the optical axis