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Title

Panel positioning error and support mechanism for a 30-m Thz radio telescope

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Abstract

A 30-m TeraHertz (THz) radio telescope is proposed to operate at 200 μm with an active primary surface. This paper presents sensitivity analysis of active surface panel positioning errors with optical performance in terms of the Strehl ratio. Based on Ruze's surface error theory and using a Monte Carlo simulation, the effects of six rigid panel positioning errors, such as piston, tip, tilt, radial, azimuthal and twist displacements, were directly derived. The optical performance of the telescope was then evaluated using the standard Strehl ratio. We graphically illustrated the various panel error effects by presenting simulations of complete ensembles of full reflector surface errors for the six different rigid panel positioning errors. Study of the panel error sensitivity analysis revealed that the piston error and tilt/tip errors are dominant while the other rigid errors are much less important. Furthermore, as indicated by the results, we conceived of an alternative Master-Slave Concept-based (MSC-based) active surface by implementing a special Series-Parallel Concept-based (SPC-based) hexapod as the active panel support mechanism. A new 30-m active reflector based on the two concepts was demonstrated to achieve correction for all the six rigid panel positioning errors in an economically feasible way. (8 References).