## Abstract

**Title:** GTD Technique Based Analysis of Radiation Pattern Simulations of a Mechanically Active Parabolic Space Antenna Actuated Using SMA Actuators

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**Abstract Body:**

Shape morphing strategy of flexible parabolic antenna actuated with Shape Memory Alloy (SMA) actuators is discussed in this paper. A C-band reflector is made of Polycarbonate Lexan material and manufactured using vacuum forming and Pre-blow technique using perfectly machined Aluminium mould. The flexible reflector has centrally mounted Goose-neck shaped feed support structure. Metallisation of the reflector has been carried out on the hydrophobic concave surface using Vacuum deposition (VDP) approach. Major application of such flexible Antennas is for variable illumination or footprint generation for any given topology on earth. In addition, a novel self-locking device is also used. The locking is highly desirable in space where power is very critical issue of concern. Based upon the demand, the locking device can keep the structure in deformed configuration even after the power from SMA actuators is cut off. An eight bit absolute encoder is installed with locking device to control the shape of the Antenna in a closed loop system. Presently, we have experimentally validated four such actuation points on the Antenna , by making the wavefront or skin of the reflector active by using Austenite and Martensite state trained Strands of Shape Memory Alloy (NiTinol) wires at specific temperature range, which will be customized to elevated space temperatures in the design Validation model of the reflector coming up in light weight space qualified PEEK (Poly Ether Ether Ketone) material.

To predict the coupled deflection of structure from heated SMA wires, Finite Element (FE) analysis is carried out using Abaqus. Thereafter, Electro-Magnetic (EM) pattern prediction for the deformed shape is carried out. Two modes of EM pattern have been considered viz. Steering and Shaping. Three different cases of shaping are discussed (a) Undeformed Antenna structure, (b) Shaped Antenna with deformation at a Control point, (c) Steered antenna structure. The EM patterns corresponding to each mode are analysed using Geometric theory of diffraction (GTD) technique using Matlab. The presented study is envisaged to provide useful insights in the design of flexible antenna system for both space segment and in Ground segment as futuristic radome based smart DTH systems.

**Biography:**

S. Kalra has completed his PhD at the age of 29 years from Indian Institute of Technology Kanpur. During his Ph.D. he was working on a reconfigurable antenna system actuated using Shape Memory Alloy actuators. He is currently serving as faculty in the Department of Mechanical Engineering, IIT Jammu, India

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