Design and Fabrication of a MEMS Steerable Broadband Antenna Capable of Dual Polarization

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In this work we will present the fabrication process and experimental results of a MEMS steerable broadband antenna. Reconfigurable MEMS antennas can alter radiation, polarization and frequency characteristics by some change in the physical structure. While many reconfigurable antennas focus on changing the operating frequency while maintaining the same radiation characteristics, researchers have noted the need for systems that can manipulate the radiation characteristics without changing the operating frequencies. It is this problem that the proposed MEMS rotatable antenna platform seeks to address.

Our previous work utilized a modified Fourpoint antenna while the current work utilizes two separated bowtie elements with independent feed lines. The antenna is designed to fit on a 9mm × 9mm silicon platform, operates between 15-18GHz and is matched to a 50Ω coplanar waveguide. The structure is simulated using ANSOFT High Frequency Structure Simulator (HFSS) and fabricated in the High Density Electronics Center (HiDEC) at the University of Arkansas. Preliminary measurements show good agreement between the simulated and measured scattering parameters.

This work will detail the fabrication processes used along with the experimentally measured results. The amount of deformation allowed by the hinges will be measured for various hinge configurations using mechanical and electrostatic actuation methods. Many factors including the thickness and shape of the hinges, the position of the bias and the amount of bias induced will control the mechanical movement. The degree of rotation possible is directly related to the overall size of the platform. Through COMSOL simulations estimates that the maximum rotation angle will be on the order of 3-4° which is confirmed through our preliminary measurements.