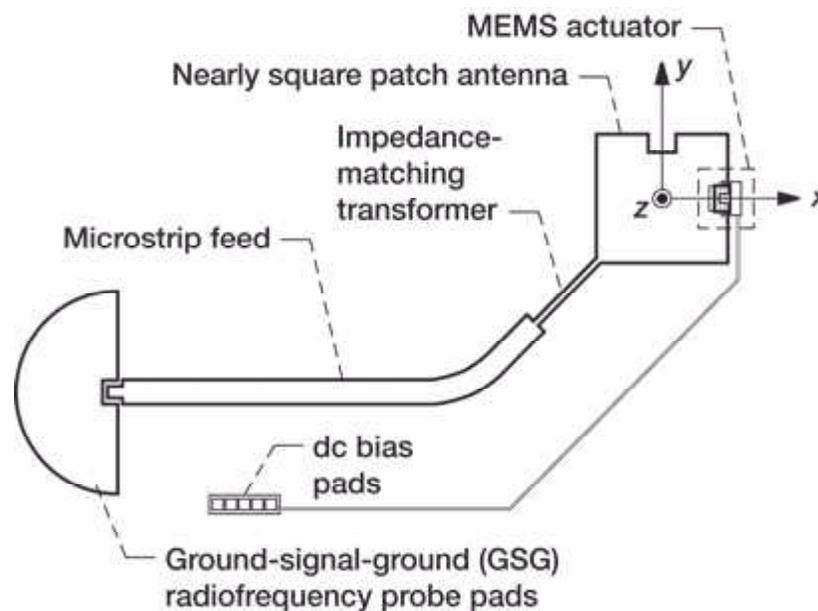


Microelectromechanical Systems (MEMS) Actuator-Based, Polarization Reconfigurable Patch Antenna Demonstrated

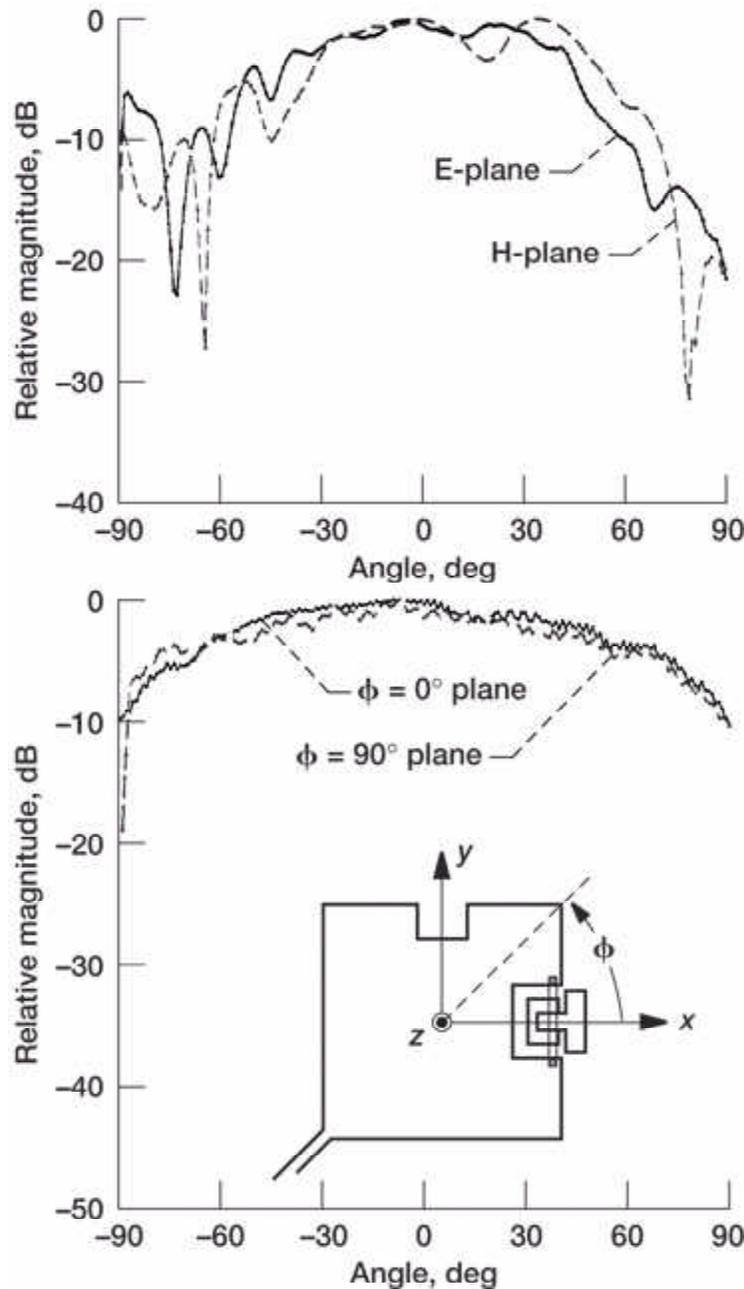
A nearly square patch antenna with a contact actuator along a radiating edge for polarization reconfiguration was demonstrated at Ka-band frequencies at the NASA Glenn Research Center. The layout of the antenna is shown in the following sketch. This antenna has the following advantages:



Nearly square patch antenna with integrated MEMS actuator for polarization reconfiguration. The impedance-matching transformer, feed line, and dc bias line/pads are also shown.

1. It can be dynamically reconfigured to receive and transmit a linearly polarized signal or a circularly polarized signal. This feature allows the substitution of multiple antennas on a satellite by a single antenna, thereby resulting in significant cost savings.
2. In our approach, the polarization is switched between the two states without affecting the frequency of operation; thus, valuable frequency spectrum is conserved.
3. The ability to switch polarization also helps mitigate propagation effects due to adverse weather on the performance of a satellite-to-ground link. Hence, polarization reconfigurability enhances link reliability.

The design and fabrication of the MEMS actuator is described in detail in reference 1. The operation of the antenna is as follows: when the MEMS actuator is turned on, the patch antenna radiates a linearly polarized signal. The measured E- and H-plane radiation patterns for this case are shown in the graph on the left. When the MEMS actuator is turned off, the patch antenna radiates a circularly polarized signal. The measured radiation patterns in the two orthogonal planes are shown in the graph on the right. These results demonstrate that the polarization of a nearly square patch antenna can be dynamically reconfigured.



Left: Measured linearly polarized radiation patterns that result when the MEMS actuator is turned on by applying a potential at the bias pads. Right: Measured circularly

polarized radiation patterns when the MEMS actuator is turned off.

Reference

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(NASA/CR-2001-210612), IEEE, Piscataway, NJ, 2001.

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