Microelectromechanical Systems (MEMS) Actuator for Reconfigurable Patch Antenna Demonstrated

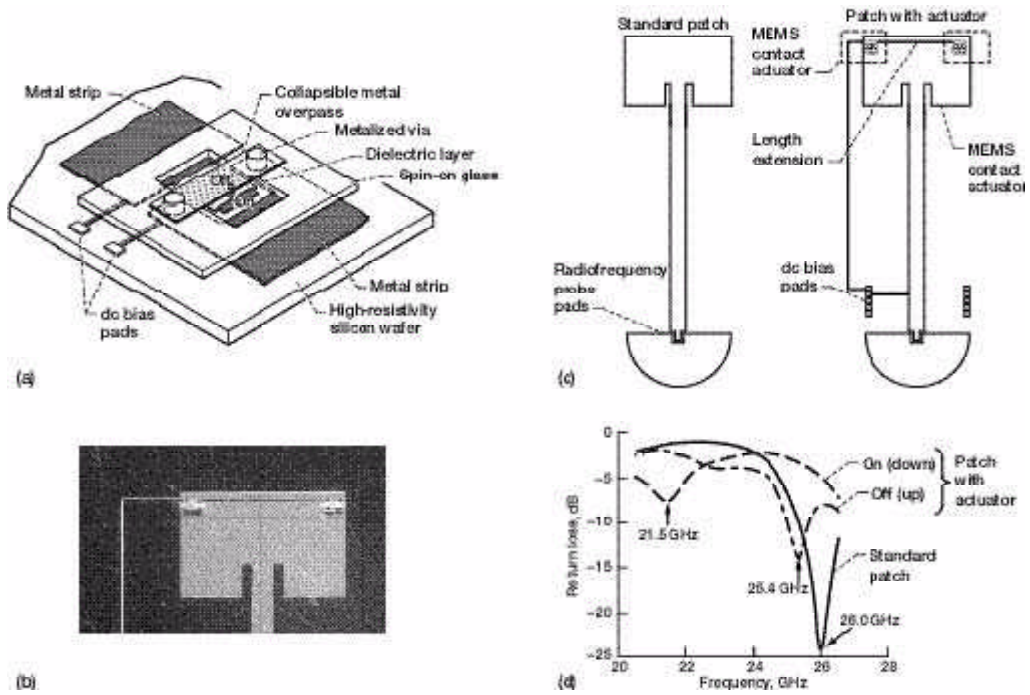
A microstrip patch antenna with two contact actuators along the radiating edges for frequency reconfiguration was demonstrated at K-band frequencies. The layout of the antenna is shown in the following figure. This antenna has the following advantages over conventional semiconductor varactor-diode-tuned patch antennas:

1. By eliminating the semiconductor diode and its nonlinear I-V characteristics, the antenna minimizes intermodulation signal distortion. This is particularly important in digital wireless systems, which are sensitive to intersymbol interference caused by intermodulation products.

2. Because the MEMS actuator is an electrostatic device, it does not draw any current during operation and, hence, requires a negligible amount of power for actuation. This is an important advantage for hand-held, battery-operated, portable wireless systems since the battery does not need to be charged frequently.

3. The MEMS actuator does not require any special epitaxial layers as in the case of diodes and, hence, is cost effective.

The measured return loss of the patch antenna with and without the actuator is shown in part (d). This figure shows that the antenna can be tuned over a frequency range of several gigahertz at K-band frequencies.



MEMS contact-actuator-based frequency-reconfigurable patch antenna. (a) MEMS contact actuator. (b) MEMS contact actuator integrated with patch antenna. (c) Standard patch and patch with actuator. (d) Reconfigurable patch antenna characteristics.

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