A reconfigurable antenna to facilitate spectrum management in AWS-3
USNC-URSI National Radio Science Meeting

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The ubiquity of today's wireless applications means that wireless devices and systems are operating in a variety of networks and in increasingly congested environments. Meanwhile proliferation of wireless devices and networks has simultaneously decreased the real estate available at RF access point sites for each device. These demands push the need for reconfigurable antennas that can operate, as needed, in different frequency bands, polarizations, and beam patterns. Likewise, spectrum management challenges can be eased by frequency reassignment and frequency reuse.

As published elsewhere, a pixel pattern of interconnected switches over a ground plane can yield a reconfigurable antenna structure that meets these demands. We report design and measurement of an antenna approximately 1λ square that can change switch states to operate in ~300 MHz wide bands within and around the recently auctioned AWS-3 spectrum. The simulated design shows the ability to produce configurable beam patterns with positive realized gain over: a frequency range of 1 GHz – 3 GHz, a variety of polarizations, and with main lobe steering up to +/-60 degrees from broadside of the antenna board. By implementing the antenna pixels with commercial GaAs switches having low power consumption and a fast switch time, the antenna can switch between states with quick, millisecond scale configuration times and low power consumption of about 1W.

Two versions of the antenna were built with different pixel sizes, and performances were compared over a small number of antenna characteristics. The antenna version with greater pixel density and better characteristics was measured over a large number of states to characterize the realized gain performance with configuration over polarization, frequency, and beam angle.

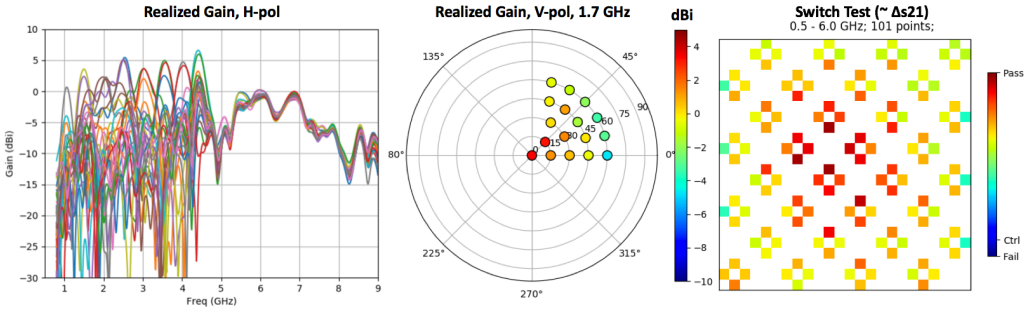

Figure 1. Optimized frequency responses (left), map of switched change of transmission coefficient summed over frequency range (left), set of optimized peak realized gains in the first octant of the hemisphere (right).