Time & Location: June 25, 2018 at 2:00 PM in HEC 450

Title: CUSTOMIZABLE ANTENNA ARRAY USING RECONFIGURABLE ANTENNA ELEMENTS

A shared aperture reconfigurable dual-polarized slot-ring antenna array switching between different frequency bands is presented for phased array applications. PIN diode switches are incorporated into the slots of the antenna to change the state of the reconfigurable slot-ring antenna array. Each frequency band has its own feeding lines which allows for the use of high-performance narrow-band transmit/receive (T/R) modules instead of Low-performance ultra wideband (UWB) T/R modules. Furthermore, the spacing between the elements in each frequency band is less than half free-space wavelength (λ₀) over the frequency band of operation which enables grating-lobe-free beam scanning. This is the first shared-aperture reconfigurable dual-polarized antenna array with separate feeding which is scalable to a larger array with element spacing of less than 0.5λ₀ in all frequency bands.

First, a switchable-band reconfigurable antenna array switching between L and C bands is presented. This antenna operates at 1.76/5.71 GHz with a fractional bandwidth (FBW) of 8.6%/11.5%, realized gain of 0.1/4.2 dBi and radiation efficiency of 66.6%/80.7% in the L/C band operating states, respectively. Second, a reconfigurable dual-polarized slot-ring antenna element switching between S and C bands with wide bandwidth in each operating state is presented. Fractal shapes are incorporated into the slot-ring antenna structure to significantly enhance bandwidth. In the S/C-band operating state, this antenna shows 69.1%/58.3% FBW with a measured maximum realized gain of 2.4/3.1 dBi. Third, a reconfigurable dual-polarized antenna array which is able to switch between S/C and C-band operating states with full-band coverage is developed. A 2×2 S-band antenna array can be reconfigured to a 4×4 C-band antenna array by activating/deactivating PIN diode switches. This antenna array shows 64.3%/66.7% FBW with 8.4/14.3 dBi maximum realized gain in the S/C-band operating states, respectively.

Major: Electrical Engineering

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Bachelor’s of Electrical Engineering, BS, 2009, Shiraz University
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Approved for distribution by Xun Gong, Committee Chair, on June 18, 2018.

The public is welcome to attend.