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Topic of Research: Designing of Meta-Material Based Reconfigurable Array Antenna for Wireless Communication

FINDINGS

The findings from this PhD thesis on ‘Designing of Meta-Material Based Reconfigurable Array Antenna for Wireless Communication’ emphasize the designing of the antenna array with effective and potential techniques for accomplishing better communications with improved capacity, better coverage, high transmission quality. In this way, an antenna array designed with ability to reconfigure the antenna arrays’ performance key features, such as ‘the operating frequency’, ‘radiation-pattern’, and ‘polarization sense’. Frequency and polarization reconfigurability of the designed antennas array is accomplished from the fact of redistribution of the antenna current which is accomplished by employing switching elements such as RF-MEMS, PIN-Diodes, varactors.

The research also introduced a monopole concept-based idea to improve the impedance BW and the metamaterial artificial structures for miniaturization of antenna physical dimensions as well as improvement of antenna performance parameters. A notch filtering concept incorporated to achieve frequency reconfigurability feature of designed antenna. The phase-shifters based feed network are competent to switch the mode of polarization between LHCP and RHCP whereas spur-line filters are adopted to reconfigure the operational frequency bands 3-4 GHz and 5-6 GHz.

The research also focused on designing a smart feed network that included three Wilkinson power dividers and six phase shifters in order to accomplish polarization diversity and the phase shifter used in feed network act as unit cell of meta-material.

Collectively, these findings contribute to design a coplanar MSPA array with compact radiating patches which incorporated to switch among Left-Hand Circular Polarization (LHCP), Right-Hand Circular Polarization (RHPC), and Linear Polarization (LP) and worked in ISM band, WLAN and WiMAX band. The design is based on meta-materials and smart feed network as well. The simultaneous use of met-materials and smart feed network makes the design more compact.

Keywords: Microstrip Patch Antenna; Frequency Reconfiguration, Polarization Reconfiguration Solid State Switch - PIN Diode, Meta-Materials, Antenna Array