Design and Development of Flat Panel Phased Array Antennas for Wireless and Satellite Communication Applications

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Abstract

There is a great demand for high data throughput, innovative beam steering antenna solutions for wireless and satellite communication applications. In the last decade, beam steering antennas have seen tremendous progress, primarily due to the maturity of silicon beamforming chipsets, multilayer printed circuit boards, and 3D printing technologies. This talk will focus on the emerging flat panel phased array antennas used in wireless and satellite communications. The presentation will delve into electronic beam steering through beam forming networks and commercially available beam forming integrated circuit (BFIC) chips. Examples of X-/Ku-/Ka-band flat panel phased array antennas featuring dual linear, dual circular, and polarization reconfigurable designs will be showcased. The challenges and roles of silicon BFICs, multilayered printed circuit board (PCB) fabrication, RF component assembly, beam forming algorithms, and 3D dielectric and metal printing in antenna array designs will be explored during these discussions. The talk will emphasize the importance of data throughput testing of Ka-band flat panel phased array antennas in a laboratory environment and over-the-air (OTA) testing across a 1 km link between two San Diego State University buildings. It will also cover data throughput testing of a dual circular polarized Ka-band flat panel phased array on a payload over a 100,000 ft Aerostar balloon. The speaker will conclude with insights on the future evolution of beam steering technology.