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Title

[A New Class of Improved Bandwidth Planar Ultrawideband Modular Antenna \(puma\) Arrays Scalable to mm-Waves](#)

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Document Type

Open Access

Degree Program

Electrical & Computer Engineering

Degree Type

Master of Science in Electrical and Computer Engineering (M.S.E.C.E.)

Year Degree Awarded

2013

Month Degree Awarded

May

Keywords

Antenna arrays, mm-wave array, Dipole, Planar arrays, Ultrawideband

Abstract

A new class of Planar Ultrawideband Modular Antenna (PUMA) arrays, termed PUMAv3, is introduced to offer improved performance and further meet demand needs for multifunctional systems. PUMAv3 extends the frequency scalability of PUMA arrays to mm-waves (approximately 50 GHz) and improves bandwidth by 50% without the use of a matching network or external baluns. The major enabling technical innovation is the advent of a new common-mode mitigation mechanism that relies upon capacitively-loaded shorting vias to push broadside catastrophic resonances below the operating band without inhibiting low-end bandwidth performance. Ridged waveguide models are employed to explain the operational principles and accurately predict the location of the common-mode frequency within the new array topology. Additionally, the superstrate loading scheme is split into two exclusive layers to enhance broadside and wide angle impedance levels while maintaining the highest frequency at 97% of the grating lobe frequency and reducing the overall array profile by up to 30%. The PUMAv3 also retains the attractive practical advantages inherent to the PUMA array family: aperture modularity, direct 50-ohm feeding, and low-cost planar multilayer PCB fabrication. Infinite array full-wave simulations of a dual-polarized PUMAv3 satisfying manufacture guidelines suggest 10.6-47.6 GHz (4.5:1) operation with strong VSWR levels out to 45 degrees, high port isolation and low cross-polarization.

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