

Deployable Ultra Wideband Antenna for CubeSats

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Low profile and low frequency wideband antennas are typically used for long distance (*viz.* satellite) communications. However, low frequency antennas are known for their large dimensions. Therefore, there is strong interest to reduce their size, particularly for airborne applications. Notably at 40 MHz, a standard quarter-wave long monopole ($\lambda/4$) is 1.875m long with only 10% bandwidth. The goal of this paper is to introduce size reduction techniques and wideband realizations of low frequency antennas to reduce the need for multiple structures within the same platform. A challenge is to also achieve consistent high gain pattern across the frequency band of operation.

This paper introduces a novel low-profile ultra wideband body-of-revolution (BoR) monopole antenna with specified radiation objectives and size constraints. This ultra-wideband (UWB) monopole antenna is targeting an operation from 40-160 MHz with emphasis on constant high gain in a low volume. Key to achieving this bandwidth is the feed design and the introduction of parasitic loading to enable minimal reflections across the bandwidth while still maintaining a small structure in reference to wavelength. Capacitive top loading was also added to further improve matching and pattern stability. The introduced optimum monopole design achieves 4:1 (40-160MHz) bandwidth with a VSWR < 3 and a omnidirectional gain of 5 dBi. This optimized aperture delivers a higher and more stable gain pattern when compared to previous inverted-hat antennas. Packable and retractable versions of the antenna will be also discussed for use in CubeSats using various origami type concepts. For validation, the antenna is fabricated and tested to collect gain, pattern and VSWR data. Measurements will be provided at the conference and compared to simulations.