Design of an Additively Manufactured Filtenna with Enhanced Spectrum Sensing and Noise Mitigation Capabilities

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This work aims to develop an efficient filtering antenna or filtenna design for proactively avoiding interference in the Citizens Broadband Radio Service (CBRS) band from 3.55-3.7 GHz. The proposed filtenna will be used as the Environmental sensing capability (ESC+) sensor to make the spectrum sensing more sensitive to signals of interest in the CBRS band, like the naval ship-borne radar signals, while insensitive to interfering signals like LTE/5G signals.

The building blocks of the filtenna structure will consist of (i) a dual-polarized choked, corrugated horn antenna for suppressing reception outside the main beam and (ii) a multi-order cavity filter with low-loss performance within the frequency band of interest and high rejection at other frequencies. The filtenna co-design approach, using coupled-resonator theory for bandpass filter synthesis, will be used to integrate the horn antenna and the cavity filter in a single unit. A dual-coaxial feed orthogonal-mode cavity filter will be designed to couple into the vertical and horizontal polarizations of the pyramidal horn. The filtenna structure will be constructed using additive manufacturing techniques and electroplating processes for lower fabrication complexity.