## Evanescent-Mode Cavity-Backed Tunable Slot Antenna

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Modern multifunctional wireless systems require either wideband or tunable antennas. Among these two, narrowband tunable antennas are often preferred due to their selectivity. Tunable antennas can be realized by either electric or magnetic tuning through various technologies. Among different tunable antennas, slot antenna became popular due to its low profile, high efficiency, and easy integrability with printed circuit boards. While resonant slot antennas are attractive because of their simple tunability, the cavity-backed ones have another important advantage: single-sided radiation since the cavity performs as a reflecting structure. Different types of cavity-backed slot antennas have been investigated, so far, using various tuning technologies such as varactors, pin diodes, MEMS and magnetic materials.

In this presentation, an evanescent-mode (EVA) cavity-backed slot antenna is introduced which provides wide tuning range, high-power handling and excellent linearity, as well. Although such an antenna can be employed individually in different applications, this is specifically an ideal element for high-power antenna arrays. An evanescent-mode cavity resonator is composed of a simple cavity loaded with a metallic post at its center. This capacitive loading not only shrinks the resonator size but also makes it easily tunable by concentrating most of the electric field in the gap between the post and the resonator top ceiling. Any changes in this gap size resulting change in the effective capacitance and consequently resonance frequency of the resonator.

A proof-of-concept cavity-backed slot antenna was designed, fabricated and experimentally investigated. The antenna is composed of a piezo-based tunable EVA cavity resonator with a wideband radiating slot on its back wall. Considering minimum return loss of 10 dB, the prototype fabricated antenna was successfully tuned over the frequency range of 1.8 - 2.6 GHz (gap size in the range of 15 - 170  $\mu$ m), representing about 36% tunability. The measured antenna gain was in the range of 5-6 dBi for this frequency range while the antenna could handle high powers up to 100 W.