

Tunable SIW cavity backed active antenna with circular polarization

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The Active Integrated Antenna (AIA) is defined as a radiator (antenna) integrated with active circuits such as oscillators. At first, AIAs have attracted a great deal of attentions in spatial power combining due to solid state circuit's power handling limitation in 90's [J. A. Navarro, Yong-Hui Shu and Kai Chang, "Broadband electronically tunable planar active radiating elements and spatial power combiners using notch antennas," *IEEE Transactions on Microwave Theory and Techniques*, vol. 40, no. 2, pp. 323-328, Feb 1992]. Low profile transmitters and Doppler transceiver modules are among other AIAs applications. The AIAs are also used in antenna array as a retrodirective array or to scan the array beam without phase shifters.

In this presentation, an AIA is proposed to use as an electromagnetic source of energy for low profile and low power circuits such as sensors and RFID tags in the 2.45 GHz frequency band (ISM). The proposed AIA consists of a Substrate Integrated Waveguide (SIW) cavity back antenna (as the radiator) and a transistor-based oscillator.

The SIW cavity back antenna is designed to have circular polarization to maximize the received power in distributed sensors and RFID tags with random direction placement. Using the SIW cavity back antenna improves the radiation pattern directivity and reduces the surface wave, which makes it ideal for integration with active RF circuits due to the minimized surface interference signals.

The oscillation is realized by means of Hetero-Junction Ga-As FET transistor at 2.45 GHz. A varactor diode is used in the oscillator configuration to obtain a frequency tunable oscillation, simply by changing the DC bias voltage of varactor diode. It should be noted that the proposed active antenna can also be implemented in an array configuration to increase the available output power.