

Switchable and Tunable Ferroelectric Devices for Adaptive and Reconfigurable RF Circuits

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The exponential increase in the number of wireless devices as well as the limited wireless spectrum, poses significant challenges in the design of future wireless communication systems. Adaptive and reconfigurable radios that can change their frequency and mode of operation based on the unused/available wireless spectrum as well as their surrounding environmental conditions have been proposed to address such challenges. However, currently available RF and microwave circuit components cannot meet the performance requirements, and cost constraints necessary for the commercialization of such systems.

This presentation is on the applications of ferroelectric thin film barium strontium titanate (BST), a low loss, high dielectric constant field dependent multifunctional material. The electric field dependence of BST has been employed to design tunable RF and microwave devices and components. Another important characteristic of BST is its DC electric field induced piezoelectric and electrostrictive effect. These properties are utilized to design intrinsically switchable film bulk acoustic wave resonators (FBARs) and FBAR filters. Switchable ferroelectric based filter banks can significantly reduce size and power consumption of conventional filter banks employed in multi-standard and frequency agile radios. Properties and performance of several BST based adaptive and reconfigurable RF circuits will be presented.



Amir Mortazawi received the Ph.D. degree in electrical engineering from The University of Texas at Austin, in 1990. He is currently a Professor of electrical engineering with The University of Michigan at Ann Arbor. His research interests include millimeter-wave circuits, phased arrays, power amplifiers, ferroelectric thin film based devices and frequency-agile microwave circuits.

Mortazawi was the Editor-in-Chief for the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES from 2006-2010. He served on the IEEE Microwave Theory and Techniques Society (IEEE MTT-S) Administrative Committee (AdCom) for eight years. He also served as the Associate Editor for the IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION (1998–2001) and IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES (2005). Mortazawi is a Fellow of IEEE.