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復旦大學　　学术报告

BST-Inspired Smart Flexible Electronics

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Title: **BST-Inspired Smart Flexible Electronics**

Abstract: The advances in modern communication systems have brought about devices with more functionality, better performance, smaller size, lighter weight and lower cost. Meanwhile, the requirement for newer devices has become more demanding than ever. Tunability and flexibility are both long-desired features. Tunable devices are ‘smart’ in the sense that they can adapt to the dynamic environment or varying user demand as well as correct the minor deviations due to manufacturing fluctuations, therefore making it possible to reduce system complexity and overall cost. It is also desired that electronics be flexible to provide conformability and portability. Previously, tunable devices on flexible substrates have been realized mainly by dicing and assembling. This approach is straightforward and easy to carry out. However, it will become a “mission impossible” when it comes to assembling a large amount of rigid devices on a flexible substrate. Moreover, the operating frequency is often limited by the parasitic effect of the interconnection between the diced device and the rest of the circuit on the flexible substrate. A new transfer technique is proposed and studied in this research. Tunable Barium Strontium Titanate (BST) inter-digital capacitors (IDCs) are first fabricated on a silicon substrate. The devices are then transferred onto a flexible liquid crystalline polymer (LCP) substrate using wafer bonding of the silicon substrate to the LCP substrate, followed by silicon etching. This approach allows for monolithic fabrication so that the transferred devices can operate in millimeter wave frequency. The tunability, capacitance, Q factor and equivalent circuit are studied. BST capacitors on LCP substrates are also compared with those on sapphire substrates to prove that this transfer process does not impair the performance. A study of a reflectarray antenna unit cell is also conducted for loss and phase swing performance. The BST thin film layout and bias line positions are studied in order to reduce the total loss.

Biography: Xun Gong received his B.S. and M.S. degrees in Electrical Engineering from FuDan University in 1997 and 2000, respectively, and the Ph.D. degree in Electrical Engineering from the University of Michigan, Ann Arbor in 2005. He is currently an associate professor in the Department of Electrical Engineering and Computer Science at University of Central Florida (UCF). He was with the Birck Nanotechnology Center at Purdue University, West Lafayette, IN, as a post-doctoral research associate. He served as the General Chair of the 2012 IEEE Wireless and Microwave Technology Conference (WAMICON), the Operations Chair of 2014 IEEE MTT-S International Microwave Symposium (IMS) and the TPC Chair for 2013 IEEE AP-S/URSI International Symposium on Antennas and Propagation. He served as the IEEE AP/MTT Chapter Chair in Orlando, FL during 2007-2010. He is the associate editor of IEEE Wireless and Microwave Component Letters (MWCL). He has been the recipient of the NSF Faculty Early CAREER Award for 2009-2014. He has published 69 referred Journal articles and conference papers. His current research interests include microwave filters and passive components, wireless passive sensors for harsh environment applications, antennas, phased arrays, and reflectarrays, flexible electronics, micromachining, advanced packaging, ceramic materials, polymer materials, ferroelectric materials, metamaterials, and material characterization.