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Low loss millimeter-wave switches based on the Vanadium Dioxide Metal - Insulator - Transition MARK FIELD, CHRISTOPHER HILLMAN, PHILIP STUPAR, ZACHARY GRIFFITH, Teledyne Scientific & Imaging, MARK RODWELL, University of California Santa Barbara — A new ultra-low-loss and broad band millimeter wave switch technology based on the reversible metal / insulator phase transition of vanadium dioxide has been developed. We report having fabricated series configured, single-pole single-throw (SPST) switches having measured S-parameters from DC to 110 GHz. The on-state insertion loss is 0.2 dB and off-state isolation is 21 dB at 50 GHz. The resulting impedance contrast ratio, *ZOFF / ZON*, is greater than 500:1 at 50 GHz (i.e. cut-off frequency $fc \sim 40$ THz). As a demonstration of the technology's utility, we also present the results of a 2-bit real time delay phase shifter incorporating a pair of VO2 SP4T switches. This switch technology's high impedance contrast ratio combined with its compactness, ease of integration, and low voltage operation make it an enabler of previously unachievable high-performance millimeter wave FPGAs.

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