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Modular VNA Extenders for Terahertz Frequencies

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***Abstract*—One of the major challenges of creating terahertz systems for radio astronomy and other applications is the lack of suitable test and measurement equipment. Over the past several decades researchers have developed and demonstrated broadband mixers and multipliers based on Schottky diodes that have been used primarily for scientific applications throughout this frequency band. As the performance of these basic components has improved and particularly as their tuning bandwidth has increased, it becomes possible to develop effective frequency extenders for standard test equipment, such as Vector Network Analyzers (VNAs) and Spectrum Analyzers (SAs). VDI's first effort in this area was in collaboration with ESA for the development of a VNA extender for their antenna test range in Noordwijk (see paper presented at the AMTA conference in St. Louis, Nov. 2007). For that effort VDI developed transmitter and receiver extenders to the WR6.5 and WR4.3 waveguide bands for a Rohde & Schwarz ZVA 40. These systems achieved transmit powers of ~0-5dBm and dynamic range in the range of 80-100dB across the waveguide bands.**

VDI is now developing a modular VNA extender system that will allow measurements across the frequency range from about 140 GHz through 1 THz, and eventually higher. The modular nature of the system allows the same lower frequency components, such as the LO and transmitter W-Band drivers, to be reused as additional frequency multipliers are added to move to higher frequency bands. Through the gradual improvement of the individual components, as well as the system design, VDI has recently demonstrated excellent performance (DR ~80dB) in the WR1.5 waveguide band. This talk will review the development of the modular VNA frequency extender system and present recent results for frequencies in the range from 500GHz through 1.5 THz.