Abstracts

True Time-Delay Fiber-Optic Control of an Ultrawideband Array Transmitter/Receiver with Multibeam Capability

M.Y. Frankel and R.D. Esman. "True Time-Delay Fiber-Optic Control of an Ultrawideband Array Transmitter/Receiver with Multibeam Capability." 1995 Transactions on Microwave Theory and Techniques 43.9 (Sep. 1995, Part II [T-MTT] (Special Issue on Microwave and Millimeter Wave Photonics)): 2387-2394.

A true time-delay beamformer based on a fiber-optic dispersive prism is developed and characterized. The beam-former is used to control an ultrawideband time-steered array antenna, which is a significant improvement over inherently narrowband phased-array antennas. The time-steered transmitter antenna consists of eight broadband spiral elements in a sparsely-populated array. In transmit mode the bandwidth is microwave-component limited to 2-18 GHz. The transmitter shows an unprecedented performance with >100° azimuth steering and no observed squint over the full frequency range. We also extend the beamformer functionality and demonstrate, we believe for the first time, fully-independent duall-beam dual-frequency ultrawideband antenna transmitter operation. Furthermore, the beamformer is shown to be capable of controlling the transmitter under pulsed operation with microwave pulse-widths as short as 75 ps. In the phase-steered receive mode, the antenna is component-limited to two elements and a frequency range of 6-16 GHz. However, we can still demonstrate squint-free receiver steering over >70° azimuth over the full available frequency range.

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