Abstracts

Principles and performance of traveling-wave photodetector arrays

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Analog fiber-optic links are used in a variety of microwave applications, including cable-TV and cellular-telephone distribution, as well as antenna remoting. The RF insertion loss and output power obtainable from externally modulated links is primarily limited by photodetector optical-power handling capabilities. Using traveling-wave concepts similar to those in microwave distributed amplifiers, we demonstrate the principle of traveling-wave detector arrays (TWDAs) in which discrete photodiodes are embedded within an artificial transmission line. By feeding these detectors with suitably time-delayed optical signals, this arrangement coherently combines multiple RF photocurrents into a single output. This paper presents the theory, construction details, and results of two- and four-element TWDA's operating up into the Ku-band. We demonstrate a two-element TWDA yielding a 6-dB improvement in insertion loss and RF output power with 12 GHz of operating bandwidth, and a four-element TWDA yielding 12-dB improvement up to 18 GHz.

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