Abstracts

Frequency Division Multiplexed Microwave and Baseband Digital Optical Fiber Link for Phased Array Antennas

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A frequency division multiplexed optical fiber link is described in which microwave (1 to 8 GHz) and baseband digital (1 to 10 Mb/s) signals are combined electrically and transmitted through a direct modulation microwave optical link. The microwave signal does not affect bit error rate (BER) performance of the Manchester-coded baseband digital data link. The baseband digital signal affects microwave signal quality by generating second-order intermodulation noise. The intermodulation noise power density is found to be proportional to both the microwave input power and the digital input power, enabling the system to be modeled as a mixer (AM modulator). The conversion loss for the digital signal is approximately 68 dB for a 1 GHz microwave signal and is highly dependent on the microwave frequency, reaching a minimum value of 41dB at 4.5 GHz, corresponding to the laser diode relaxation oscillation frequency. We show that Manchester coding on the digital link places the intermodulation noise peak away from the microwave signal, preventing degradation of close carrier phase noise (<1 kHz offset). A direct trade-off between intermodulation noise and digital link margin is developed to project system performance.

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