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# Modeling the Reduction of Amplitude-to-Phase (AM-to-PM) Conversion in Charge-Compensated Modified Uni-traveling (CC-MUTC) Carrier Photodiodes

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Microwave signals are used in a wide variety of applications, including radio communications, radar, and astrophysics. The lowest-noise microwave sources to date have been produced using optical frequency combs. An optical frequency comb is an array of equally-space frequencies, separated by a microwave frequency and can be used to generate an ultra-low noise microwave signals using a photodetector. The photodetector converts the optical frequency comb into an array of equally spaced microwave frequencies. Noise is the critical limiting factor in many applications. A primary source of noise in the generation of an ultralow-noise microwave signal with stabilized optical frequency combs is amplitude-to-phase (AM-to-PM) conversion in photodetectors. We developed a model of a 16-layer CC-MUTC (charge-compensated modified uni-traveling carrier) photodetector by modifying the model of a 17-layer MUTC photodetector that was developed by Jamali Mahabadi et al. [ref]. CC-MUTC photodetectors are designed to reduce the AM-to-PM conversion. The objective of this project is to analyze a recently-designed 16-layer CC-MUTC structure to determine the reduction of the AM-to-PM conversion and thus to aid in the generation of ultra-low-noise microwave signals.