Doctoraat Gert Poesen

Titel: Towards an adaptable Millimeter Wave Reflector: Development of an Antenna coupled Opto-Electronic Modulator Array

Abstract:

We present in this work the development of an adaptable reflector that can be integrated in an active millimetre wave imaging system to reduce typical noise artefacts appearing in coherent millimetre wave images. For the first time, low loss network components in a multi-layer thin film multi-chip module technology on a high-resistivity silicon substrate are characterized up to 110 GHz. The fundamental analysis of the interaction between a photo-induced plasma in the high resistivity silicon substrate and millimetre wave signals is presented. The static and time dependent characteristics of a basic opto electronic millimetre wave modulator are discussed. Full band electromagnetic models are developed which can be integrated into advanced software packages to simulate the optical modulation of millimetre waves. Optimization principles are discussed to improve the optical sensitivity and prevent cross talk artefacts. The design of an advanced opto electronic modulator is presented which can be integrated into a redirective antenna reflector. The implementation of a small scale optically modulated reflector is presented which is the first demonstrator of a dynamic diffuser required in active millimetre imaging systems.