Abstracts

Rigorous Analysis of Mode Propagation and Field Scattering in Silicon-Based Coplanar MIS Slow Wave Structures with Abrupt Transitions to Transmission Lines on Normal Substrate

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This paper presents a rigorous field theoretical analysis of slow wave mode propagation in coplanar waveguide (CPW) metal-insulator-semiconductor (MIS) transmission lines with a laterally confined doping profile, Two types of transmission line structures are investigated--bulk silicon and semiconductor on-insulator (S01). In both cases a Gaussian profile of the doping depth is assumed. It was found that an optimum lateral width of the doping region exists for which both structures exhibit a much better slow wave factor at lower losses than traditional thin-film MIS transmission lines. The abrupt transition between MIS, CPW, and CPW on a normal insulating substrate was investigated as well. It was found that the reflection coefficient increases significantly with frequency and when the lateral width of the doping region is extended over the whole cross section of the CPW. The investigation was carried out using the frequency-domain transmission tine modeling (TLM) (FDTLM) method.

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