Abstracts

The Generation and Propagation of Acoustic Surface Waves at Microwave Frequencies

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The generation and propagation of acoustic surface waves is reviewed with particular emphasis on the microwave-frequency range. Theoretical work on optimizing the generation efficiency and the bandwidth of interdigital transducers is compared with recent experimental results. The minimum linewidth of 0.9 μm which can be produced by optical photolithographic techniques places an upper limit of about 1 GHz on the maximum frequency that can be generated at the fundamental mode. Overtone operation has been used to generate 3 GHz surface waves on LiNbO/sub 3/ but this method has the disadvantage of reduced efficiency plus the complication of volume-wave generation. A better solution for generation above 1 GHz is the fabrication of interdigital transducers by means of electron beam exposure of the photoresist. The surface-wave propagation loss gives a significant contribution to the total insertion loss of delay lines operating at microwave frequencies. Losses of 1.1 dB/μs and 3.8 dB/μs at 0.9 GHz and 2 GHz, respectively, have been measured for propagation along the Z-direction of Y-cut LiNbO/sub 3/ by means of a laser deflection method. Larger losses have been observed for quartz. The additional complexities for surface-wave propagation due to the anisotropic single-crystal substrates which are necessary at microwave frequencies are also described.

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