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Acoustoelectric Real Time Correlator*

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Abstract

It has been demonstrated experimentally that surface acoustic wave correlation of two signals can be performed by using space charge nonlinearity in a structure consisting of a thin semiconductor layer inserted between two different piezoelectric substrates; LiNbO_3 -Si-BGO. The two surface waves are collinear and propagate in the same direction. Both the theoretical analysis and computer results are presented here. In the analysis, 1) the diffusion effect is included and 2) neither thin film nor thick semiconductor layer approximation is used, since $d < \lambda_a$, $d > \lambda_D$, where d , λ_a and λ_D are the respective semiconductor thickness, acoustic wave length and Debye length. The charge distribution and the nonlinear interaction strength as a function of semiconductor thickness (this film case included) and resistivity will also be discussed.

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