Abstracts

An Electronically Variable Surface Acoustic Wave Phase Shifter

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A surface acoustic wave phase shifter has been realized by utilizing the interaction between the piezoelectric fields of a surface wave and an adjacent semiconductor. One important feature of this interaction is that the velocity of the surface wave depends on the electrical properties of materials placed in the vicinity of, but not mechanically touching, the piezoelectric. For example, Campbell and Jones have calculated the velocity of surface waves on the y-plane of LiNbO/sub 3/ for the case of a free surface (Fig. 1, omega h = /spl infin/) and the case where an infinitesimally thin perfect conductor is placed on the surface (omega h = 0). For waves propagating in the Z-direction (Theta = 90°) the velocity decreases by about 2. 5% when an electrical short is placed at the surface. This velocity change can be achieved by purely electrical means by varying the free carrier concentration at the semiconductor surface. The method we have used to accomplish this is to apply an electric field normal to the semiconductor surface as illustrated in the inset to Fig. 2. Here the semiconductor functions as one plate of a capacitor and the induced charge at the surface then varies with the applied voltage V.

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