Abstracts

Planar microwave integrated phase-shifter design with high purity ferroelectric material

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Ferroelectric materials (FEM's) are very attractive because their dielectric constant can be modulated under the effect of an externally applied electric field perpendicular to the direction of propagation of a microwave signal. FEM may be particularly useful for the development of a new family of planar phase shifters which operate up to X-band. The use of FEM in the microwave frequency range has been limited in the past due to the high losses of these materials; tan /spl delta/=0.3 at 3 GHz is typical for commercial BaTiO/sub 3/ (BTO) and due to the high electric field necessary to bias the structure in order to obtain substantial dielectric constant change. In this paper, a significant reduction in material losses is demonstrated. This is achieved by using a new sol-gel technique to produce barium modified strontium titanium oxide [Ba/sub 1-x/Sr/sub x/TiO/sub 3/ (BST)], which has ferroelectric properties at room temperature. Also demonstrated is how the use of thin ceramics reduces the required bias voltage below 250 V, with almost no power consumption required to induce a change in the dielectric constant. A phase shift of 165/spl deg/ was obtained at 2.4 GHz, with an insertion loss below 3 dB by using a bias voltage of 250 V. Due to the planar geometry and light weight of the device, it can be fully integrated in planar microwave structures.

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