

硅基微带天线损耗机理分析

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摘要：

硅基微带天线存在损耗大、效率低、增益不足等问题。其成因在于以下五种损耗：1.金属贴片及匹配微带线的导体损耗。2.介质的介电损耗。3.表面波损耗。4.半导体基底的电阻性损耗。5.由基底与绝缘层交界面上的载流子运动导致的界面损耗。在深入分析各种损耗的形成机理的基础上，研究了相应损耗的计算模型及其在总损耗中所占的地位，并提出了降低损耗的有效途径。实验结果显示，采用微机械（MEMS）工艺，在高阻硅与低介电常数介质的混合衬底上，生长一层多晶硅薄膜的方法，可有效降低损耗，使硅基微带天线单元的效率达到87%，增益达到8dB。

关键词：微带天线；MEMS天线；硅基天线；损耗

Attenuation Mechanisms of Microstrip Antenna on Silicon

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Abstract:

Microstrip antennas based on silicon exist the problems of high-loss, low efficiency, and low gain. Five main parts contribute to the results: 1.The conductor losses of the antenna patch and matching microstrip; 2.Medium dielectric loss; 3.Surface wave loss; 4.Resistive loss of the semiconductor substrate; 5.Interface loss caused by carrier movement at the interface of substrate and insulating layer. Based on the analysis of the attenuation mechanism of each kind of loss, the corresponding loss calculation model and it's proportion in the total loss are studied. And proposed effective ways to reduce losses.The experimental results show that the method of growth a layer of polycrystalline silicon thin-film on the substrate can effectively reduce the losses. The substrate is high-resistance silicon mixed with low dielectric constant substrate. All these can be done by micro-mechanical (MEMS) technology. This silicon based microstrip antenna element efficiency can reach 87%, gain up to 8dB.

Keywords: Microstrip Antenna; MEMS Antenna; Silicon substrate Antenna; Attenuation

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