

Research Of Dependence PCMF's With The Slots In The Ground Plane Impedances On The Microstrip Line Thickness

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Abstract – The synthesis of the band-pass filters on the coupled microstrip lines of different thickness with the slots in the ground plane has been accomplished. Influence of microstrip line thickness on impedances has been analysed. The nomogram was built by calculation results which simplifies a design process of the band-pass filters with slots in the ground plane.

Keywords – Synthesis of the band-pass filters, coupled microstrip lines, slot in the ground plane, nomogram of dependence of filters impedances on thickness strip.

I. INTRODUCTION

Parallel coupled-line microstrip filters (PCMFs) are common components in microwave integrated circuits owing to their simple design and versatility. However, when implemented in their traditional form on a single-layer substrate in microstrip technology, these filters present two serious drawbacks: the existence of a spurious passband at $2fo$ (where fo is the central frequency of the filter) and weak lateral coupling between the lines in the conventional structure [1].

Proposal in [2] is to use the modified structure, which simply incorporates in the well-known microstrip line a centered slot at the ground plane. The slot width can be adjusted so as to tune the even/odd phase velocities in order to suppress the spurious band. Besides, this structure provides tight coupling (in comparison with conventional microstrip lines), thus, relaxing the requirements on physical dimensions width and thickness in those cases where tight coupling is necessary.

The synthesis of the band-pass PCMFs with the slots in the ground plane is accomplished in [3] and comparison of synthesized filters with electrodynamic simulation results and specifications of filters without slots in the ground plane are performed. However microstrip line thickness had not take into account in calculation of parameters of coupled-line microstrip filters with the slots in the ground plane.

This paper's goal is analysis of influence of microstrip line thickness on bandpass filter parameters and achievement of nomogram which reflects dependence of impedances of filters with the slots in the ground plane on thickness strip of microstrip line and simplify a planning process of this kind of filters.

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II. TOPOLOGY SYNTHESIS UNDER GIVEN IMPEDANCES

On the basis of results [3] in this paper simulation of bandpass PCMFs with microstrip line thickness equal 5, 10, 18, 35 i 50 mkm has been worked out. For simulation and analysis of bandpass PCMFs with the slots in the ground plane commercial program *AWR Microwave Office* has been used. As a result new filters' structures has been built and frequency response has been obtained.

III. RESEARCH RESULTS

Research is performed for 4 bandpass PCMFs with Butterworth approximation with the slots in the ground plane.

On results calculations a nomogram has been built. As we can see on nomogram, introduction of slots to the filter ground plane topology changes its parameters. By the got nomogram it is possible to simplify the design process of this kind of filter after the set initial descriptions. For this purpose it is necessary to find on a nomogram a point corresponding with the set value of impedances, synthesized on condition of a zero strip thickness, next to find proper point-on-wave, which conform the necessary microstrip thickness, and to define an amendment on impedances.

IV. CONCLUSIONS

The synthesis of the band-pass PCMF's of different thickness with the slots in the ground plane had been accomplished. Influence of microstrip line thickness on impedances has been analyzed. Using results of calculations a nomogram has been built which simplifies a design process of the band-pass filters with the holes in screen. Presented nomogram evidently reflects dependence of impedances of filters with the slots in the ground plane on strip thickness.

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