STUDIES ON MICROWAVE SLOT-LINE AND INTEGRATED FIN-LINE

By

RAINEE NAVIN SIMONS

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Dedicated to

my

parents, brothers and sisters

CERTIFICATE

(i) I am satisfied that the thesis presented by Rainee Navin Simons is worthy of consideration for the award of the degree of Doctor of Philosophy and is a record of the original bonafide research work carried out by him under my guidance and supervision and that the results contained in it have not been submitted in part or in full to any other university or institute for award of any degree/diploma.

(ii) I certify that:

(a) that he has pursued the prescribed course of research;

(b) that he is of good moral character.

P. S. Satsangi

(Prof. P.S. Satsangi)
Chairman,
Dept. Research Committee,
Dept. of Elect. Engg.,
Indian Institute of Technology,
Delhi.

Rajendra K Arora
17 August 1981

(Prof. R.K. Arora)
Supervisor,
Dept. of Elect. Engg.,
Indian Institute of Technology,
Delhi.

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ABSTRACT

The thesis presents a study of slot-line on a dielectric substrate and also integrated fin-line. Several new configurations of slot-line and integrated fin-line are presented. An unified analytical technique for determining the dispersion and characteristic impedance of these structures is proposed.

The study commences with an analysis of (a) suspended slot-line and also suspended coupled slot-line on double layer dielectric substrate, and (b) suspended sandwich slot-line and also suspended coupled slot-line sandwiched between two dielectric substrates. Besides, an analysis of suspended broadside coupled slot-line with overlay is also presented. The computed results graphically illustrate (a) the dispersion characteristics and also the characteristic impedance and, (b) the effect of shielding on the dispersion and characteristic impedance. Expressions for the electric field and the magnetic field components in the air and dielectric regions of the coupled slot-line structure for the even mode and also the odd mode of excitation are derived and presented. These expressions are computed; and the electric field and the magnetic field lines in the cross section and longitudinal section of the structure are illustrated.

The study also presents two new fin-line structures; namely, (a) fin-line with a variable characteristic and (b) fin-line with a double-slot. The computed results for the fin-line with a variable characteristic graphically illustrate the variation of the guide wavelength, characteristic impedance and effective dielectric constant with position and permittivity of the adjacent dielectric substrate. The computed results for the fin-line with a double-slot graphically illustrate the variation of the even mode and odd mode guide wavelength and also the characteristic impedance as a function of the frequency with the distance of separation between the slots as a parameter.

The analysis and the computed results presented are believed to be new and are not found in the open literature. These results should find extensive applications in the design and fabrication of slot-line and also integrated fin-line components, such as, directional couplers, power dividers and filters.

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