

## MODEL OF LOSSY LAYERED SYSTEMS

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### I. INTRODUCTION

The analysis of energy relations in layered dielectric systems (LDS) with losses is important for many applications, mainly because it enables comparison of the obtained formulas with their counterparts for lossless systems.

### II. RESULTS

It turned out that for effective study of energy relations and their implications, it is necessary to refine significantly the conceptual and mathematical apparatus for solving the direct problem of the propagation of plane waves in lossy LDS. Under minimal assumptions, universal analytical expressions are derived for the elements of the transfer matrix  $T$ . This matrix describes all possible in such systems relations between plane electromagnetic fields to the left and to the right of the LDS in the form of functionals on the physical characteristics of the LDS and the field frequency, which allow understanding the spectral laws. A description of the spectral characteristics of an arbitrary LDS with losses is proposed and substantiated based on significantly expanded interpretation of the formulas found by P.G. Kard [1], refined in [2] and widely used for lossless LDS in [3] and [4].

This rises the theory of the direct problem to the level that provides the necessary data for the further development of the mathematical apparatus for the formulation and solution of optimization and inverse problems.

### III. CONCLUSIONS

Proof of the possibility of an extended interpretation of expressions derived by P.G. Kard will enable carrying out detailed analytical studies of the spectral properties of arbitrary LDS with losses, as well as estimation of their energy coefficients of reflection, transmission and losses. These are also necessary for the formulation and solution of problems of analysis and synthesis of dielectric filters for various purposes.

### REFERENCES

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