

Thesis Topic

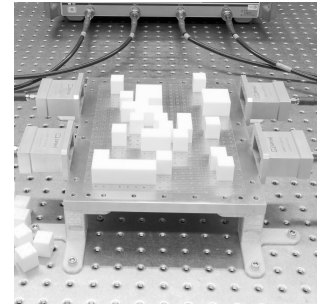
The CEM team offers the following topic

"Automated Design of Analog (Wave) Computers"

to be chosen by a student and elaborated as the final thesis.

DESCRIPTION

Explore the tools used to evaluate the field in the presence of dielectric bricks within a parallel plate setup. Establish a connection between the existing tools for the analysis, such as the 2D method of moments, and topology optimization, to design 4-port microwave devices capable of performing arbitrary linear mathematical operations. For instance, consider the rat-race coupler, which combines and subtracts input signals. However, for arbitrary operation, the design is typically unknown and has to be found. Synthesized devices will be physically constructed and measured.



CONTEXT

The topic will be solved within the prestigious Junior Start project of the Czech Science Foundation.

Collaboration with the members of the CEM group is expected.

PREREQUISITIES

Knowledge of programming, algebra, and basic knowledge of electromagnetism is expected.


REWARD

There is a monthly financial reward of ~8.000 CZK (before tax) associated with the topic elaboration.

LITERATURE

- [1] Tzarouchis, *et al.*: Mathematical Operations and Equation Solving With Reconfigurable Metadevices, *Light: Science & Applications*, 11:263, 2022.
- [2] Capmany and Pérez: *Programmable Integrated Photonics*, Oxford University Press, 2020.

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Surface current density on two plates, $ka = 0.5$.
The 2nd mode of $\mathbf{X}_0 \mathbf{I}_n = \lambda_n \mathbf{R}_0 \mathbf{I}_n$ decomposition is depicted.