METATUNE

DC12: Design, fabrication, and characterization of reconfigurable and time-varying optical metasurfaces

Doctoral position at Department of Electronics and Nanoengineering at Aalto University, in Espoo, Finland.

Main supervisor: Prof. Viktar Asadchy [AALTO]

Co-supervisors/mentors: Prof. Carsten Rockstuhl [KIT] and Prof. Ana Díaz-Rubio [UPV]

Aalto University

Objectives:

- To design **optical metasurfaces capable of complex reconfigurable functionalities** while restricting control to a single, or otherwise limited, discrete set of tuning parameters, enabling practical global actuation and robust device operation.
- To design **optical metasurfaces and material platforms exhibiting time-varying responses**. Using adjoint-based optimization and spatial structuring, to realize complex time-modulated medium dynamics with realistic material constraints and experimentally feasible excitation and driving schemes.
- To **fabricate and experimentally characterize** the designed prototypes, and to validate their reconfigurable and time-varying performance through quantitative comparison with analytical modeling and full-wave simulation results.

This position is part of the MetaTune Doctoral Network "Reconfigurability using inversely designed metasurfaces", which has been funded under the Horizon Europe Marie Skłodowska-Curie Actions (MSCA) program.

Acquire knowledge: During the thesis, the candidate will acquire a solid understanding of the theoretical and practical requirements for designing optical metasurfaces with complex reconfigurable and time-varying responses, with particular emphasis on achieving rich functionality under a single or otherwise limited set of discrete tuning parameters. In parallel, the candidate will gain in-depth knowledge of time-modulated photonic media, nonlinear optics, adjoint-based optimization strategies for high-dimensional inverse design, and realistic material and excitation constraints at optical frequencies. The candidate will also develop practical expertise in prototype fabrication, experimental characterization, and quantitative validation of measured performance against analytical models and full-wave simulations.

Design	Materials	Fabrication	Characterization
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→ Go to the project webpage for more information

What METATUNE Offers:

- Work contract at Aalto is for 36 months funded through the MSCA network, with the additional benefits for employees (public and universal health system, free schools, etc.).

- Three research stays, one 4-month at Karlsruher Institut fuer Technologie, one 3-month at Photonicsens SL in Valencia, Spain, and one 3-month at Polytechnic University of Valencia are foreseen in the research plan.

- Opportunity to pursue a PhD degree at a leading European university within a collaborative, international network.

- Training program including research-specific and transferable skills courses.

- Active participation in workshops, conferences, and network-wide events to build professional and scientific connections.

- Stimulating, multidisciplinary, and international research environment within a prestigious European training network.

Starting date: Now-December 2026; negotiable.

Deadline for online application: May 31, 2026 (but candidates are encouraged to apply as soon as possible).

Mandatory Requirements:

- You must have a finalised **master's degree** in fields related to the research topic: Electrical Engineering, Physics, Telecommunications Engineering, Applied Physics, Optics, Material Engineering, or similar.

- You should **not have a doctoral degree** at the time of recruitment.

- You must not have resided or carried out your main activity (work, studies, etc.) in Finland for more than **12 months in the 36 months** immediately before the recruitment (this is a requirement from the funding authority).

- You will apply for the study right in doctoral studies at Aalto University School of Electrical Engineering and must satisfy the eligibility conditions for this doctoral programme.

- Sufficient skills in the **English** language.

Additional Requirements:

- Strong background in electrodynamics and excellent mathematical skills.
- Basic knowledge of computational electromagnetics.

- High proficiency in Python, MATLAB, Wolfram Mathematica, or similar programming software.
- High motivation and creativity.
- Good written and verbal communication, including presentation skills.
- Good organizational skills, attention to details, and ability to meet deadlines.
- Willingness to learn and work collaboratively in a research environment.

Desired skills and knowledge:

- Proficiency in electromagnetic simulation software, such as COMSOL Multiphysics, ANSYS HFSS, or CST Studio Suite.
- Previous experience with the topic of time-varying materials or systems.
- Solid knowledge of computational electromagnetics.
- Previous experience in nanofabrication or design of metasurfaces.

→ **Apply Now!**