# Numerical Simulation of a Plasmonic Niobium Photocathode for SRF Gun Applications

TECHNISCHE UNIVERSITÄT DARMSTADT

**Proposal for a Bachelor's thesis | Master's thesis | HiWi job**
**Study field: Computational Engineering | Electrical Engineering**
**February 15, 2022**

## Description

Currently available linear accelerators are operated in pulsed mode to prevent a thermal overload of the entire system. Upcoming planned CW operations are possible using SRF photoinjectors with either warm or cold photocathodes. The use of warm cathodes in an otherwise cold cavity, which initially appears advantageous, unfortunately leads to a variety of difficulties. On the other side, a cold photocathode cannot be made from the efficient semiconducting materials such that metals with intrinsically lower quantum efficiencies have to be applied instead. Nanostructured surfaces can be used to increase the effective quantum efficiency by surface plasmon resonance enhancement. Optimized nanostructures enable the efficient application of a given laser with a specified wavelength and allow a promising operating regime for future photoinjectors.

## Task

Numerical simulations of the resulting electromagnetic fields of a nanoholed structure illuminated by a plane wave. In a first step a simplified nanohole based on a step profile can be used to reduce the modelling effort. The finite-sized array will then be approximated by an infinite expansion such that proper boundary conditions can be applied and only a single hole has to be considered.

## References


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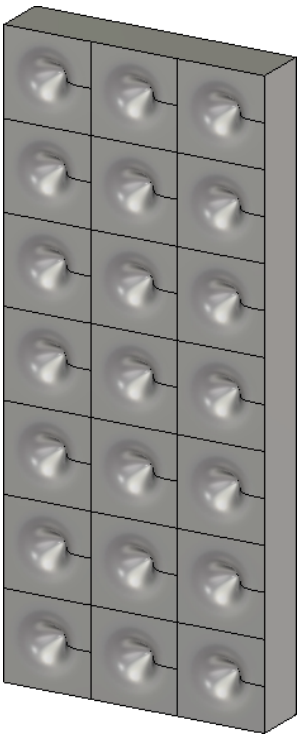

**Figure 1:** Section of a nanostructured surface.