

# Proposal for a Master Project

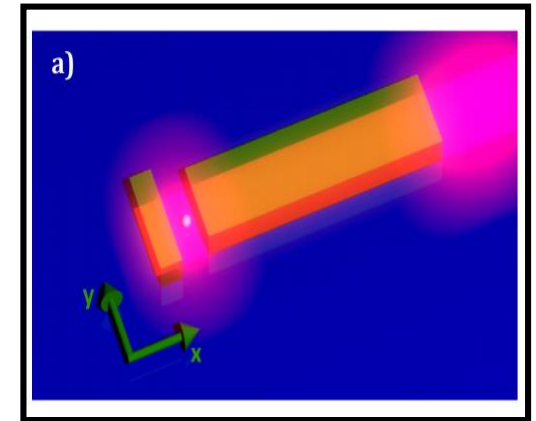
## Title:

Characterizing the Optical Properties of a Dielectric Nanoantenna Array

## Description:

Metal nanoantennas tend to exhibit high losses in the optical regime. Their resonance properties also demand a strong control over the geometry of the structure [1]. These problems can be overcome by replacing metals with low loss dielectric materials. In [2] and [3] we proposed a hybrid dielectric leaky-wave nanoantenna which corresponds to a weakly guiding waveguide in the optical regime. It offers a great improvement in the directivity and is more robust to the fabrication imperfections. Figure (a) depicts the Hafnium-dioxide nanoantenna deposited on a glass substrate which can be excited using an appropriate light source.

In this work, more than one of these antenna elements is to be considered to construct an nanoantenna-array for studying the resulting radiation patterns in near-field and farfield. The study would be done in comparison to an isolated nanoantenna to understand the contribution of the array effect to the corresponding radiation patterns. The task is to be implemented using CST Microwave Studio and MATLAB.



## Literature:

[1] P. Bharadwaj, B. Deutsch, and L. Novotny, "Optical Antennas," *Adv. Opt. Photon.* 1, 438-483 (2009).

[2] A. Hildebrandt, *Design and Fundamentals of Optical Nanoantennas for High Intensity Enhancement or High Directivity* (Doctoral dissertation, Universität Paderborn, 2017).

[3] M. Peter, A. Hildebrandt, C. Schlickriede, K. Gharib, T. Zentgraf, J. Förstner and S. Linden, , "Directional Emission from Dielectric Leaky-Wave Nanoantennas", *Nano Letters* 17 (7), 4178-4183 (2017).