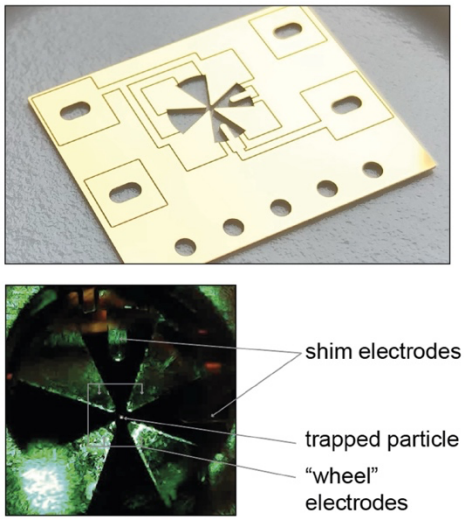
Simulation and Fabrication of a Tunable Electric "Wheel" Trap for Quantum Levitodynamics Experiments

Levitating solid objects in a vacuum offers a powerful platform for exploring quantum mechanical phenomena at macroscopic scales, especially in mass and motion. One promising method involves using a quadrupole RF electric field to create a rotating saddle potential for trapping charged particles. To enhance this technique, the electric trap can be combined with a high numerical aperture optical tweezer, requiring a compact design and precise alignment of both traps.

In this project, you will design a chip-scale trap that meets these requirements, offering both a small footprint and the ability to electrically adjust the center of the potential. The trap will be fabricated on-chip, and its trapping performance will be compared with simulated models.

Objectives:

- Understand the principles behind quadrupole electrical traps
- Simulate innovative wheel trap designs using COMSOL
- Fabricate and test the chip



Prior knowledge: Electromagnetism and electrical circuits. Experience with FEM simulations (COMSOL) and micro-fabrication techniques is a plus.

Are you interested? Please contact Massimiliano Rossi (m.rossi-1@tudelft.nl) or drop by my office (22.E105)!