

Bachelor 's Thesis in the NanoEngineering Program

Topic: Optimization and Electromagnetic Simulation of Integrated THz Lens Antennas for High-Frequency RTDs

Summary:

Terahertz (THz) technology offers promising opportunities for high-resolution sensing and imaging in scientific and industrial applications. Resonant Tunneling Diodes (RTDs) are compact semiconductor devices capable of functioning both as THz oscillators and detectors. To enhance their radiation characteristics—such as directivity, gain, and beam shaping—the integration of RTDs with dielectric lenses (e.g., made of silicon or aluminum oxide) is essential.

This work focuses on the design and electromagnetic (EM) simulation of RTD emitter-based antenna systems integrated with dielectric lenses. While single-element antennas are investigated, the study also extends to RTD arrays configured as oscillators. Particular emphasis is placed on optimizing lens geometries, including unconventional shapes such as ellipsoidal lenses, using aluminum oxide as the dielectric material to improve high-frequency performance and compatibility with 3D printing technologies.