# CHARGE COLLECTION MECHANISMS IN A SUB-MICRON GRATED MSM PHOTODETECTOR: FIELD ANALYSIS

Suresh Kranthi Nakka

Dr. Naz E. Islam, Thesis Supervisor

## ABSTRACT

Enhanced charge collection mechanisms due to sub-micron wall-like silicon structures on the active surface of a metal-semiconductor-metal (MSM) photodetector were studied through the analysis of transmitted electromagnetic energy with and without the structural changes. Analysis shows that rearranging the walls to a square lattice (cubic or rectangular shaped structures) could improve the charge collection efficiency further. Further studies were done to show that there exists a certain critical percentage of the area covered by the gratings over the detector after which the charge collection efficiency starts to decrease.

It is shown that there is less possibility for the incident wave to leak away from the surface for the case of square shaped gratings than the cone gratings. For higher power transmission into the detector active region, the square silicon gratings were doped with a material having a refractive index less than that of silicon, so that most of the incident wave is reflected towards the active region.