Department of Electrical and Computer Engineering
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Senior Design Project

Optical pulling of multiple Rayleigh sized particles simultaneously using a Metasurface

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DECLARATION

This is to certify that this Thesis is our original work. No part of this work has been submitted elsewhere partially or fully for the award of any other degree or diploma. Any material reproduced in this thesis has been properly acknowledged.

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APPROVAL

The capstone project entitled "**Optical pulling of multiple Rayleigh sized particles simultaneously using a Metasurface**" by **Mridula Rodoshi (ID#1711517043), Mohammad Ahsanul Haque (ID#1831696643)** is approved in partial fulfillment of the requirement of the Degree of Bachelor of Science in Electrical and Electronic Engineering on July and has been accepted as satisfactory.

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ABSTRACT

Creating pulling force for several sorts of particles simultaneously on a single setup is very difficult and unusual in the literature. In this article, a single nanometer-sized metasurface was used to generate an optical pulling force for multiple particles simultaneously. Initially, three particles were the main focus, but this was eventually expanded to seven particles to strengthen the findings based on multiparticles. An incident beam (varying the wavelength from 640nm to 1200nm) is used to produce surface plasmon polariton waves, which were afterwards responsible for pulling the Rayleigh sized (50nm in our instance) particles. By generating a dual non-paraxial surface plasmon polariton (SPP) energized plasmonic complex field, which induces completely different behaviors in Rayleigh scatterers with dissimilar material properties, the proposed setup promotes effective on-chip material-based optical pulling of silica (a dielectric object), gold (a plasmonic object), and chiral nanospheres.