Department of Electrical and Computer Engineering
North South University

Senior Project Design

Optical Pulling and Pushing Force for Dielectric, Chiral and Plasmonic nano particles

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Declaration

This is to declare that no part of this report or the project has been previously submitted elsewhere for the fulfillment of any other degree or program. Proper acknowledgement has been provided for any material that has been taken from previously published sources in the bibliography section of this report.

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Approval

The Senior Design Project entitle “Optical Pulling and Pushing Force for Dielectric, Chiral and Plasmonic nano particles” by Mustafizur Rahman Rana, Syeda Prioty Sultana and Fabiha Rahman Efa has been accepted as satisfactory and approved for partial fulfillment of the requirement of BS in EEE degree program.

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Abstract

Optical pulling has been demonstrated on dielectric, plasmonic and chiral nanostructures using dielectric substrate. On the plasmonic substrate, the optical pushing force is also visible. For a specific wavelength range, optical pulling force can be obtained on a dielectric substrate. For estimating optical pulling force on nanostructures, we devised a general framework based on the time averaged Minkowski stress tensor. There is also a demonstration of a failed attempt to locate pulling force on a plasmonic substrate. The pulling force in dielectric particles on dielectric substrate is caused by the interference of electric quadrupole and dipole. The recoil force in a chiral particle can be used to create pulling force. The pulling force in plasmonic particles is caused by the current density.