# Computational Simulation of Gold Core/Shell Nanostructures for Near-Field Transducers in Heat-Assisted Magnetic Recording

J. Bennington[1]

[1]Queen's University Belfast, Belfast, Northern Ireland, UK

## Abstract

Since their introduction in 1955, the storage density of hard disks has doubled every three years [1], however with current perpendicular storage densities fast approaching the Tbit/in2 theoretical limit imposed by superparamagnetism, new methods of recording higher density data are becoming more urgent. Heat assisted magnetic recording (HAMR) aims to surpass this limit by introducing a new variable, write temperature, to the traditional trilemma of signal-to-noise ratio, writability and thermal stability [2]. This is accomplished by temporarily heating individual bits above the Curie temperature during the write process using laser light plasmonically coupled into a near field transducer (NFT). A recurring problem, however, is the build-up of thermal energy in the transducer itself which can lead to NFT deformation and the cessation of operation. A mechanism to dissipate this excess heat in the NFT without greatly effecting its' plasmonic response is therefore required.

This study uses the RF Module and COMSOL Multiphysics® software to investigate the plasmonic response of gold core/shell nanoparticles with varying shell materials and thicknesses. Plane wave radiation is incident on a PML bounded region containing the nanoparticles and extinction spectra taken using the scatter matrix are examined for plasmonic activity at the relevant wavelength. The thermal energy distribution in the structures are analysed to determine if the core/shell structures are appropriate for HAMR.

## Reference

[1] W. A. Challener et al. Heat-assisted magnetic recoring by a near-field transducer with efficient optical energy transfer, Nature Photonics, 3, 220-224, 2009.

[2] M. H. Kryder et al. Heat assisted magnetic recording, Proceedings of the IEEE, VOL 96, No. 11, 2008.