Physics Colloquium

(continued)
Graduate Posters

Michigan Technological University
Thursday, April 17, 2014
1:00 to 3:00 pm
Aftermath Atrium in Fisher Hall

A Multi-band, Unidirectional, Phase-preserved Lensing Invisibility Cloak

Ran Duan
Advisors: Elena Semouchkina and Ravi Pandey

Abstract: The principles of geometric optics are used to develop an approach for multiband unidirectional transmission cloaking by using dielectric lenses/prisms at frequencies from microwaves to optics of objects with dimensions substantially exceeding the wavelength of radiation. Instead of accelerating waves in the cloak medium composed of resonant metamaterials to preserve the phases for waves travelling in free space and through the cloak, the proposed system provides the phase preservation by delay the phase of the waves travelling though the cloak by multiple of 2π. The cloaking effect is quantitatively confirmed by simulations of the total scattering cross-section of the cloaked objects in multiple bands.

Minimum Principle in Electromagnetic Scattering by Small Particles

Ajarii Mongkolsittisilp
Advisor: Dr. Alex Kostinski

Abstract: What is an optimal particle shape for scattering, e.g., shape causing minimal extinction among those of equal volume and randomly oriented? Guided by the isoperimetric property of a sphere, relevant in the geometrical optics limit of scattering by large particles, we examine an analogous question in the low frequency approximation, seeking to disentangle electric and geometric contributions. Sphere is shown to scatter and absorb least. So is a spherical configuration among coated confocal ellipsoids. Monotonic increase with asphericity for orientation-averaged induced dipole moments and scattering cross-sections is shown. We conjecture that low and high frequency regimes can be connected in a single "spherical minimum" when reasonable size distributions of randomly oriented aspherical particles wash out the resonances for intermediate size parameters.

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