Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Invisibility Using Perfect Absorption CNT Carpet at Visible Frequency and Beyond L. JAY GUO, HAOFEI SHI, JONG OK, HYOUNGWON BAAC, Center for Nanophotonics and Spintronics, University of Michigan — The concept of invisibility cloak based on transformation optics and metamaterials has tantalized the scientific community. Cloaking of wavelength-size objects were realized at microwave and NIR frequencies. However, the complexity of metamaterials based on the previous principles limits the object to several wavelengths in size. Moreover, cloaking of 3-D objects at visible band demands challenging inhomogeneous 3D nanostructured metamaterials and still unattainable. We propose a perfect absorption ground plane cloak that works at visible range and for large area arbitrarily shaped 3D objects. Such homogeneous perfect absorption carpet is demonstrated by low density carbon nanotube (CNT) forest, which can visually compress arbitrary 3D objects to appear as a 2D perfect absorption sheet. Invisibility was observed by naked eyes for unpolarized light at entire visible band with cloaking area of 10^5 larger than a wavelength. Such a cloaking approach based on perfect absorption is not restricted to CNT carpet, and can be applied to a broader frequency range from UV to THz and acts as a universal cloak for arbitrarily large objects. In this scheme the deep space is a natural and perfect "ground plane". It would only take a "cloak" consisting of low density and broadband absorbing particles to render matters and objects totally "dark" to our current instruments.

L. Jay Guo
Center for Nanophotonics and Spintronics, University of Michigan

Date submitted: 27 Dec 2010 Electronic form version 1.4