APPLIED MATHEMATICS COLLOQUIUM

NOVEL ELECTRO-MAGNETIC PHENOMENA: ONE-WAY-WAVEGUIDES AND WIRELESS POWER TRANSFER

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ABSTRACT:

This talk will describe unusual mechanisms for the transport of electromagnetic energy, focusing on two recent developments:

ONE-WAY WAVEGUIDES: An ordinary waveguide transports waves going both forwards and backwards. A one-way waveguide supports only waves propagating in a single direction. Obstacles and disorder can no longer reflect waves, which exhibit 100% transmission in numerical simulations even across seemingly impassible perfectly-conducting barriers introduced into the waveguide. We will explain how such a phenomena, analogous to quantum-Hall edge states, can arise from gyromagnetic materials (such as lattices of Yttrium-Iron-Garnet rods). Generalizing earlier predictions by Raghu and Haldane, we show that the key requirement is related to a topological invariant of the eigenvalue bands known as their Chern number.

NONRADIATIVE WIRELESS POWER TRANSFER: For over a century, technologists have been intrigued by the feasibility of wireless electromagnetic power delivery - for example, to charge your laptop or your cell phone simply by being in the same room as the power source, without plugs or cables. We describe a wireless power transfer technique ("WiTricity") that explores long-lived electromagnetic resonances. Both the power source and the device receiving the power would be designed to resonate at the same frequency. Instead of irradiating the environment with electromagnetic waves, the source fills the space around it with a "non-radiative" field. This turns out to have the crucial advantage that power does not leak into the environment (such as the person carrying the cell phone).

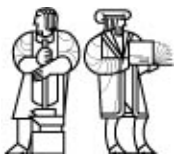
MONDAY DECEMBER 1ST 2008

4:30 PM

Building 4, Room 231

Refreshments at 4:00 PM in Building 2, Room 349
(Applied Math Common Room)

Applied Math Colloquium: http://www-math.mit.edu/amc/fall08
Math Department: http://www-math.mit.edu



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