Fundamentals of Electromagnetic Fields and Waves: I

Fall 2005, EE 30348, Electrical Engineering, University of Notre Dame

Assignment 9

Due date: **Wednesday, November 8th**.
Please attach this sheet on top of your solutions. Sketch figures wherever necessary.

1) **Gauss's law and Boundary Conditions**:

Iskander: Problem 3.23.

2) **Electric and Magnetic Fields in Materials**:

Iskander: Problem 3.20, Problem 3.21.

3) **Electromagnetic wave propagation in non-conductive media**:

Iskander: Problem 3.11, Problem 3.19.

4) **Electromagnetic wave propagation in conductive media, deep-sea communication**:

Iskander: Problem 3.14, Problem 3.15, Problem 3.18, Problem 3.24.

5) **Shielding Electric & Magnetic Fields**

I need a region in space (say volume V_0) to be *completely free* of all electric and magnetic fields. Describe how you will achieve such a volume if -

a) The **E** and **H** fields are time-dependent (for example, in an electromagnetic wave), and

b) The **E** and **H** fields are static (for example, you have two electrodes with a DC voltage for **E**, and a solenoid with a DC current for **H**).

Use the boundary conditions arguments, and the penetration of **E** and **H** fields into material media in your design. What is the difference between such electromagnetic 'shielding', and the idea of 'invisibility' as described in the paper posted on the class website?