Tuesday, January 19, 2016

Remember, you can volunteer to explain any of these at the board, for 50 points of credit maximum per problem. There will 25 points for the board presentation and 25 points for the written solution. You don't need to work them all out, these are the problems most closely related to the recent lectures.

Problems in Jackson's 3rd ed.:

9.1 rotating charges

9.2 rotating quadrupole

9.3 oscillating oppositely charged hemi-spheres

9.5 radiation derived using $\vec{A}$ and Φ

9.7 instantaneous radiated power

9.8 radiated electromagnetic momentum

9.16 antenna with a sine wave current distribution

Other Problems:

W1. A small circular loop antenna of radius a lies in the xy-plane, driven by a current varying as $\exp\{-i\omega t\}$. Analyze its magnetic dipole radiation fields and find the angular distribution of radiated power and the total radiated power (for $ka \ll 1$). Also determine the radiation resistance ($P_{\text{rad}} = I_{\text{rms}}^2 R_{\text{rad}}$).

W2. Many devices use a "monopole antenna", a single conductor driven by an oscillator, pointing upward from a horizontal grounded plane (i.e., the Earth). Discuss and analyze how its fields, angular distribution of radiated power, total radiated power, and radiation resistance differ from that of a center-fed dipole antenna.