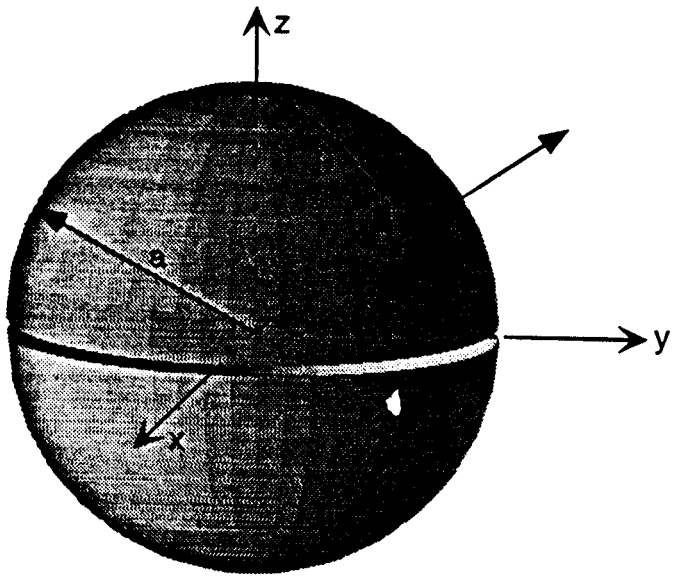
EM Fall 97A

Two perfectly conducting metallic hemispherical shells of radius a are separated by a very small insulating gap and form a sphere of radius a, as shown.



(a) Suppose the top hemisphere has static potential $+V_0$ and the lower hemisphere has static potential $-V_0$. Calculate the electric dipole moment, p_0.

Work parts (b) and (c) to lowest nonvanishing order in ω:

(b) Suppose the potentials oscillate at low frequency, so that the top shell has potential $+V_0 \cos(\omega t)$ and the bottom shell has potential $-V_0 \cos(\omega t)$. Sketch the pattern of the radiated power as a function of the polar angle, θ.

(c) Calculate the time averaged power radiated per unit solid angle as a function of a, ω, V_o, θ, and appropriate constants. If you have forgotten the formula for radiated power, a correct dimensional analysis will earn you nearly full credit.

(d) For what values of ω is it a good approximation to consider only the lowest nonvanishing order in ω?