J98E.2—Rotating Charged Rod

Problem

A thin uniform rod of length l and mass M has constant linear charge density λ. Its endpoint is rigidly attached to a vertical axis at right angles. The rod is given angular velocity $\omega \ll c/l$ about the axis at $t = 0$. You may assume that the electrostatic energy stored in the rod is much smaller than the kinetic energy of the rod. No external torques are applied for $t \geq 0$.

a) What is the power radiated at $t = 0$ due to the electric dipole emission?

b) Estimate, up to a dimensionless constant of proportionality, the power radiated at $t = 0$ due to the magnetic dipole emission.