Physics 7312 Professor Scalise
Homework Assignment #10 Spring 2023

1. Consider once again the case of a charge q undergoing simple harmonic motion in the z-direction

$$\vec{r}(t) = \hat{z} z_0 \cos \omega t$$

but this time use the multipole analysis with the first two non-vanishing terms. Find the differential power per unit solid angle $\frac{dP}{d\Omega}$ and compare your results with an expansion of the exact results from the last assignment. Do they agree? Comment.

2. A hollow sphere of radius a has uniform electric surface charge density σ and spins about an axis through its center with angular speed ω.

   (a) What is the current density $\vec{J}(\vec{r}, t)$?

   (b) What is the lowest multipole moment of the radiation (E1, E2/M1, E3/M2, etc.) and to what power of ω is the radiated power proportional ($P \propto \omega^n$)?

BONUS (due when the homework is due):

Explain Supplee's paradox and its resolution. My niece, who is in high school, will be grading this. If she can not understand what you wrote, she will not award any points.