EE 483/583 Antennas for Wireless Communications (Spring 2025)
Homework 4
Friday, February 7, 2025

1) If the vector electric potential for an antenna is $\overline{F} = \hat{a}_z F_0 \dfrac{e^{-jkr}}{r}$, find $\overline{E} = \overline{E}_{FF}$ and $\overline{H} = \overline{H}_{FF}$ in the **far-field**. Give your answers in spherical coordinates. Assume $\overline{A} = 0$. Factor out common terms, e.g., $F_0 \dfrac{e^{-jkr}}{r}$.

2) Given that the vector magnetic potential for an antenna is $\overline{A} = \hat{a}_\theta A_0 \cos\theta \left[\dfrac{e^{-jkr}}{r} + \dfrac{jke^{-jkr}}{r^2} \right]$, find $\overline{E}$ and $\overline{H}$ **everywhere**. Give your answers in spherical coordinates. Assume $\overline{F} = 0$. Factor out common terms, e.g., $A_0 \dfrac{e^{-jkr}}{r}$.

3) Given that the vector magnetic potential for an antenna is $\overline{A} = \hat{a}_\theta A_0 \cos\theta \left[\dfrac{e^{-jkr}}{r} + \dfrac{jke^{-jkr}}{r^2} \right]$, find $\overline{E} = \overline{E}_{FF}$ and $\overline{H} = \overline{H}_{FF}$ in the **far-field**. Give your answers in spherical coordinates. Assume $\overline{F} = 0$. Factor out common terms, e.g., $A_0 \dfrac{e^{-jkr}}{r}$.

4) **EE 583 only**: If the vector electric potential for an antenna is $\overline{F} = \hat{a}_z F_0 \dfrac{e^{-jkr}}{r}$, find $\overline{E}$ and $\overline{H}$ **everywhere**. Give your answers in spherical coordinates. Assume $\overline{A} = 0$. Factor out common terms, e.g., $F_0 \dfrac{e^{-jkr}}{r}$.

Due Friday, February 14, 2025