ASSIGNMENT 8

(due Thursday November 24, 2022)

1. (50 points) Build a *FEKO* project of a very short wire dipole of length $L=0.02\lambda$, where λ is the free-space wavelength at $f=30$ MHz. You can use your previous top-hat project and simply delete the capacitive plates. **NOTE:** Work with double-precision (default *FEKO* precision is single).

a) What is the input impedance Z_{in} of the short dipole? How does the radiation resistance $\mathrm{Re}Z_{in}$ compare with the radiation resistance of the short top-hat antenna? Explain theoretically the difference between the two resistances. How does the radiation resistance of the simulated short wire dipole compare with the theoretical calculation for a short dipole with triangular current-magnitude distribution?

b) What is the polarization of the dipole (provide plots)? How does it compare with the theoretical prediction?

c) What is the maximum gain of the wire dipole? How does it compare with the theoretical value? How does it compare with the maximum gain of the top-hat antenna?

d) What is the current distribution (magnitude) on the short wire dipole (provide plot)? How does it compare with the current distribution on the wire of the top-hat antenna?

2. (50 points) Build a *FEKO* project of a half-wavelength wire dipole at $f=30$ MHz. Set wire radius at $a=0.001\lambda$. How does the simulated radiation resistance compare with the theoretical value? Adjust the dipole length, so that the antenna reactance is below 3 Ω. You can do this manually or use the built-in optimization algorithms. What is now the antenna resistance? What is its maximum gain G_0? How does it compare with the theoretical gain of a half-wavelength dipole?