

ASSIGNMENT 9

(due Thursday December 1, 2022)

1. (50 points) A $\lambda/20$ -dipole (triangular current distribution) is placed vertically at a height of $h = 2\lambda$ above an infinite electric ground plane. Determine analytically the angles (between zero and $\pi/2$ radians) where all nulls of its pattern occur.

Explore the pattern of this arrangement with *FEKO* using a perfect infinite ground plane. Use thin wire segments and an operating frequency of $f_0 = 300$ MHz. Provide plots with the *FEKO* output. Comment if differences exist between the *FEKO* model and the analytical solution.

NOTE: To observe the pattern nulls well, increase the number of samples in the elevation pattern when requesting the far field from *FEKO*.

2. (50 points) A horizontal $\lambda/20$ -dipole (triangular current distribution) is placed parallel to the x -axis a distance $h = \lambda/\sqrt{2}$ above an infinite electric ground plane. Determine:

- (a) the radiation resistance,
- (b) the direction of maximum radiation (θ_m, ϕ_m) ,
- (c) the maximum directivity,
- (d) the nulls of the pattern in the $\phi = 0$ plane.

Confirm all calculations above with *FEKO* simulations and summarize the observed discrepancies.