

F15 NET3900
Modules 10 Assignment

Instructions:

This assignment is for study purposes only.

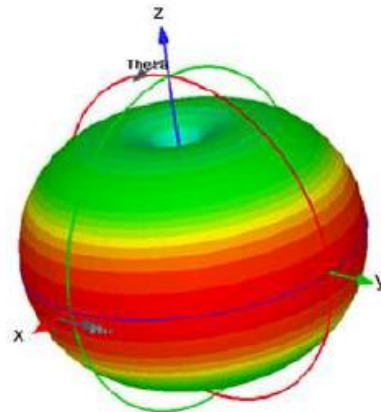
1. What is antenna polarization and why is it important?

Antenna polarization is an orientation and is defined to be in the same direction as the electric field. For example, the Aruba AP125, when ceiling mounted, is vertically polarized because the E-field is also vertical. For maximum energy transfer between the transmitting and receiving antennas, they should be mounted with matching polarization. Polarization is not an issue in for building use because of scatter. Polarization is an important issue for point-to-point Wi-Fi radio bridges.

2. Draw the shape of the horizontal and elevation radiation patterns for the following dipole antenna. The antenna is mounted to be vertically polarized.

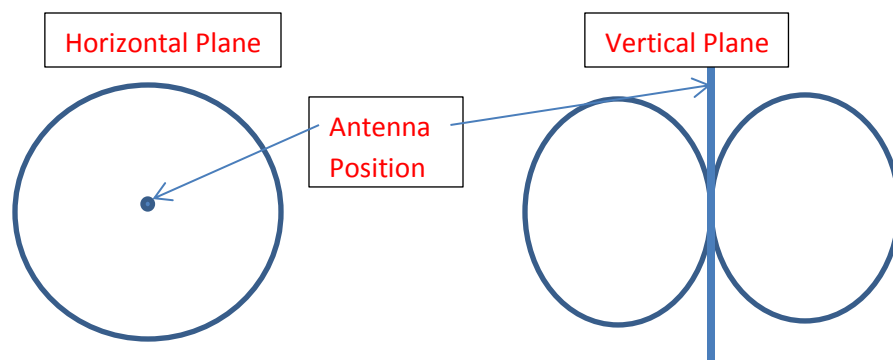


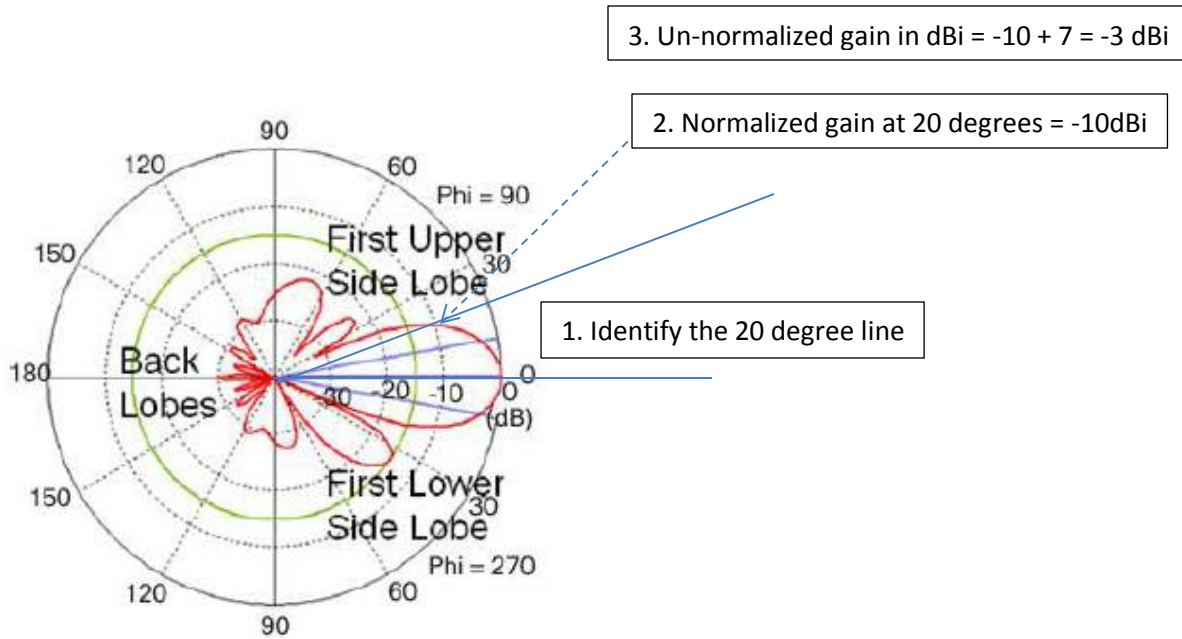
(a) Dipole Antenna Model



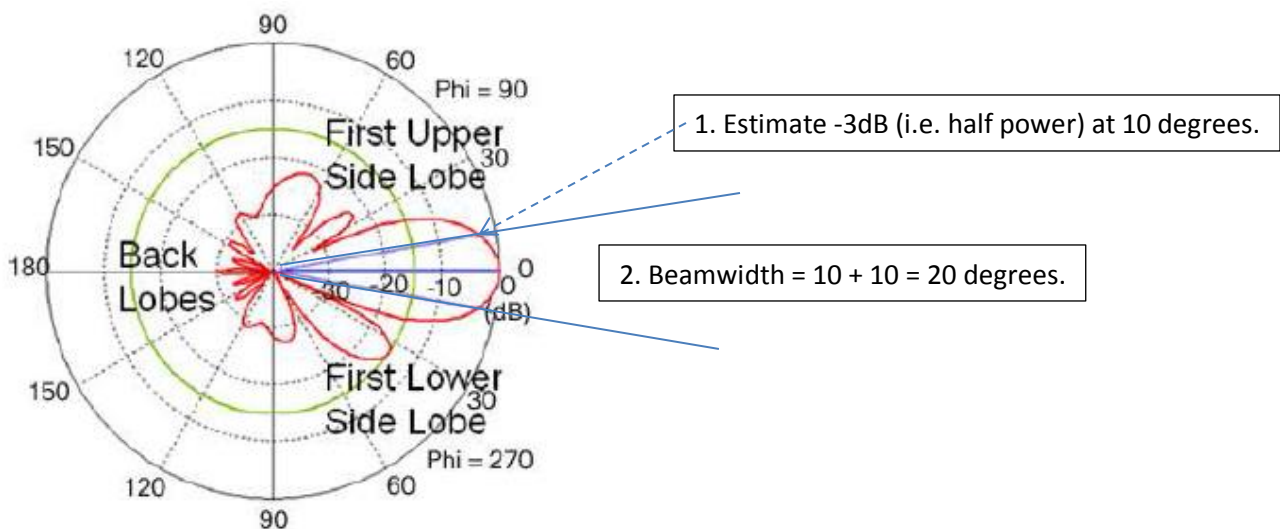
(b) Dipole 3D Radiation Pattern

The horizontal plane radiation is shown on the left. The dipole antennas are omnidirectional in this plane. The vertical plane radiation pattern is shown on the right.

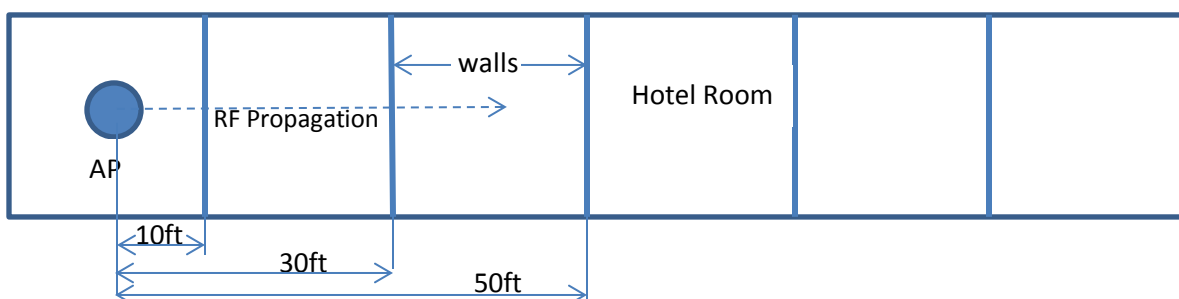




c) From the diagram below, the beamwidth is 20 degrees.



5. In an Access Point placement design, an AP is placed in the middle of a hotel room as shown in the diagram. The hotel rooms are 20 feet wide. The walls have a loss of 6 dB. The 5 GHz band radio power level is set to 14 dBm to match the client device power levels. The antenna gain in this band is 2 dBi. The design calls for a cell edge of -65 dBm. In order to determine the position of the next AP, calculate the distance to the cell edge in the 5 GHz band only. Show all your work.



Assume that the AP can propagate through n walls.

The power equation becomes:

$P_{rx} = P_{tx} + \text{Gain} - \text{Loss}_{\text{wall}} - \text{FSPL}(d)$; where d = distance

$$-65 = 14 + 2 - nx6 - \text{FSPL}(d)$$

$$81 = 6n - \text{FSPL}(d)$$

This equation is solved iteratively.

Let n = 2 walls then if d is between 30 and 50 feet, we have a solution.

$$81 = 12 - \text{FSPL}(d)$$

$\text{FSPL}(d) = -69$ ft using FSPL tables. (I will provide FSPL tables or formula at midterm)

d = 41 which is within wall limits.

Therefore the signal will propagate 41 feet.