ANTENNAS - Feb 10, 2016

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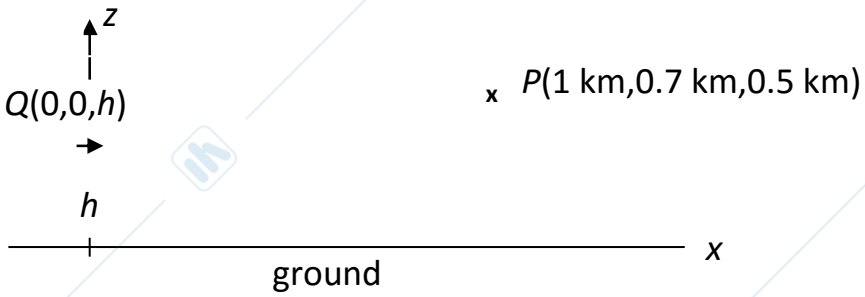
Problem 1

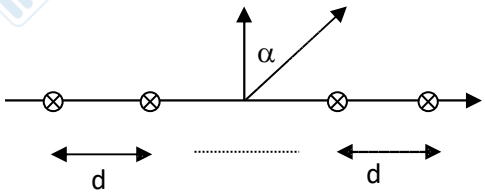
A x-directed hertzian dipole (l=λ/10, f=400 MHz) radiating 5 mW is placed at a height h with respect to a perfect conductor ground plane (placed at z=0). A receiving dipole, identical to the former and directed along y, is placed at P(1 km, 0.7 km, 0.5 km). Find

a) the optimal height, h to place the transmitting dipole (in order to maximize the received power);
b) the power received in these optimal conditions.



Problem 2

Design an array of dipoles at 1.9 GHz such that it is capable to follow a radiating source (target) appearing in the range of angles $-20° < \alpha < 60°$. The beam width must be not more than 7°. Find the number N of radiating elements, the distance between them (the same for all) and the relative phase shift as a function of α.



Problem 3

Consider a large rectangular aperture in a ground plane, having a=50 cm, b=35 cm and radiating an electromagnetic field at the frequency of 10 GHz. The aperture radiates a power of 1 W. Find the electric field, assumed uniform

- at the aperture;
- at 500 m from the aperture along the maximum radiation direction;
- at 500 m from the aperture on the maximum of the first sidelobe of both planes. (for what angles do we see the maximum of the sidelobe?)

Hint: use the Fourier transform…