

Microwaves

Series 1

Problem 1

A RADAR emits a 400kW signal at 8.5 GHz towards Ganymed, one of Jupiter's satellites. Its antenna has a gain of 72 dB. The reflected signals reaches the Earth 1 hour and 7 minutes after emission. Ganymed's diameter is of 2635 km and it reflects 12% of the power that a metallic sphere would reflect. What is the reflected power received by the RADAR ?

Problem 2

A doppler RADAR emits a signal at 35GHz. Which is the doppler frequency produced by a car circulating with a speed of 140 km/h towards the RADAR ?

Problem 3

At which maximum latitude can we receive the signal of a geostationary satellite having a

- a) grazing incidence (signals comes from the horizon and is parallel to the ground)
- b) an elevation angle of 10° (signals comes from an elevation of 10° over the horizon)

The curvature effect of the atmosphere is neglected

Hint: make a drawing of the geometry of the problem

Problem 4

Can this expression represent an induction field ? Why ?

$$\mathbf{B} = \frac{B_0}{a^2} (\mathbf{e}_x xz + \mathbf{e}_y yz + \mathbf{e}_z xy)$$