King Saud University
College of Engineering
Electrical Engineering department

Final Exam EE423 9/2/1418

Estimate the electric field strength at a distance 40 Km from a short vertical monopole radiating 10 Kw at frequency 1 MHz over ground with mean conductivity = 10 mS/m.

What is the probable range of good reception from a 900 KHz radio broad casting transmitter with E_1=1500 mV/m over surrounding land with mean conductivity = 10 mS/m? assume that the minimum level of signal for good reception is 1 mV/m.

two transmitters 1500 Km apart, transmit different programs at the same frequency f= 1 MHz and with the same radiated powers. What is the difference between the day time and night time coverage if each transmitter if a protection ratio of 200:1 is required for 95% of the time with E_{min}=0.1 mV/m? assume 4500 mV/m and uniform ground conductivity of 10mS/m.

Estimate the path loss power received, field strength at the receiver and signal-to-noise ratio for an HF radio link with the following parameters:

transmitter power=30dBw
working frequency- 10MHz
Ground range=2000Km
virtual height of the ionosphere=300Km
sunspot number R_{12}=110
Gyrometric frequency f_h=1.25 MHz
Latitude, $=50^o$
Zenith angle, $=77^o$
transmitter antenna gain =receiver antenna gain =10 dB
receiver bandwidth =3.4 KHz
atmospheric noise factor=33dB

if a target of s= is illuminated by A radar with transmitted power of Pt= , and gain Gt= 200 Km away. What is the power density of the return signal from the target midway between the target and the radar.

What are the magnitudes of the maximum usable frequency MUF and the optimum Working Frequency OWF associated with an HF radio link extending over 2500 Km via reflection from the F2 layer for the summer and winter seasons at noon time and for the maximum and minimum sunspots.

Determine the path length P, the spatial loss L(s) at each of the four OWF found in (a) and at a height of 300 Km.

Estimate the path loss for the cases in (a), assuming R_{12}=100 F_H=1.25 MHz, latitude =50 and x=65^o .

for a minimum signal-to-noise ratio of 25 dB at 3.4 KHz bandwidth, calculate the required transmitted power for this link assuming antenna gain G(t) = G(r) = 10 dB and the atmospheric noise factor is assumed constant at 35 dB.

What part of wave parameters defines its polarization. Describe a simple method of generating or Receiving a circularly polarized wave.

What is the effect of the complex dielectric constant on the wave passing through the ionosphere.

Define the skip distance, illustrate by a sketch define clearly the regions associated with this phenomena.

Define the skip distance

Define the critical frequency in sky wave propagation and drive its expression.

Define MUF and OUF

p1.6

Determine the electric field strength at distance d=10 Km over 2a land with conductivity of 1 mS/m and relative permitivity of 7. At F=3MHz and E_1= 1500mV/m.

State the steps needed to be taken in order to calculate signal level over a land sea path.

Suggest the steps for land-sea-land path.

If you have a radar transmitter of peak power of 300KW, the unambiguous range is 500Km, the transmitter BW=1MHz what is the average power, what is the range resolution

consider a radar system wit the following parameters. Gt= , F=3Ghz noisefigure=6dB, if the required range is 200Km the minimum target cross section is = 20 m2 , find the required peak power in this situation if the available peak power is only one forth of that required, suggest a way to over com that detailed description.

Explain how a radar system can be used to detect moving targets over a large clutter.

Derive the mathematical relation between the Doppler frequency and target speed.

An air plane uses a radar to monitor its speed and height. The radar is in the air plane front, its beam make 45^{o} with the horizon fnd an equation relating the Doppler frequency to the airplane speed

if the max. height for such airplane is 5Km find the max. repetition frequency that can be used in this case

drive an expression for the beamwidth of an N element uniform linear array

describe a method that can be used to prevent nulls from appearing on the radiation pattern of leaner array. What is a practical example for that

Two half wave dipoles in broad =side array, separated by d=02L are each supplied with 4W when $V_1=V_2$ What current is supplied to each dipole?

What is the field strength at distance r=1 Km in direction th=45 from the array broad side direction.

What should be the distance d between two element broadside array in order to get a null at 30^{o} from broadside.