



LAB 8 – Terrestrial And Satellite Path Loss

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Purpose:

To implement computer based programs to model terrestrial and satellite path loss.

Equipment:

- A PC
- Software listed below:
 - The following exercises require the use of programs on the computers in L-19A called RFprop and FRIIS.BAS .
 - FRIIS.bas is found through COMMUNIC in the subdirectory ANTENNAS. Note: you must have GWBASIC loaded in the directory to run FRIIS. Use Windows Explorer to navigate to FRIIS.bas. RFprop has an icon on the computer screen.
 - **NOTE TO OTHER USERS:** Rfprop can be acquired on line. The DOS based program used in Part B was found as shareware on the internet.

PART A: Terrestrial Propagation

Open Rfprop from the icon and enter the appropriate values based on the following information.

A 15-watt transmitter operates into the following conditions:

- TX antenna gain – 15 dBi
- RX antenna gain – 8dBi
- Carrier frequency 800 MHz
- TX and RX antenna height of 12 meters
- Nominal range of 10 km with the obstruction at midpoint
- Building loss – 0 dB
- Fading margin 15 dB
- Obstruction radius 50 meters
- Obstruction height 100 meters
- RX noise figure 3 dB
- Signal bandwidth 75 KHz
- RX detector S/N 30 dB
- Temp 290K
- Input intercept (dBm) 5
- Propagation law 2

Set the topology to a smooth hill with diffraction losses included. (bottom right) The following two values will be referred to as value A and value B with subsequent changes. You will record the changes to value A and B each time there is a change. Return to original setting for the next steps.

Value A – What is the Maximum range including diffraction loss? _____

Value B – What is the marginal range including diffraction? _____



a) Change the carrier frequency to 400 MHz.

Value A _____

Value B _____

Reset frequency to original value.

b) Change signal bandwidth to 25 KHz.

Value A _____

Value B _____

Explain the result. Reset to 75 KHz.

c) Change obstruction height to 50 meters.

Value A _____

Value B _____

Reset to original height. Explain briefly.

d) Change propagation from square law to fourth law.

Value A _____

Value B _____

Reset to square law.

What power in WATTS (adjust TX power) will give a maximum range close to 10 km?

Show calculation for wattage.

PART B:

2. A geostationary satellite at a distance of 40,000 km transmits at 12 GHz with an antenna gain of 50 dBi. The transmitter power in watts will be given by the last two digits of your student number. The transmission line has negligible loss and an SWR of 1.2 .

The receiving station on earth uses an antenna with a gain of 35 dBi. The feedline from antenna to receiver has negligible loss and an SWR of 1.5 . The polarization of both antennas is the same, so use 0 dB when asked for the polarity mismatch.



- a.) Use the basic program FRIIS, as described above, to find the power input to the receiver.
- b.) Use the program to find the effect of each of the following:
 - i.) Doubling the power on the satellite.
 - ii.) Changing the SWR at the receiver to 2.
 - iii.) Increasing the distance by 1000 km.