

CARLETON UNIVERSITY

Department of Systems and Computer Engineering

SYSC 4700 Telecommunications Engineering Winter 2008

Assignment 2

Posting date: Tuesday, February 5, 2008

Due date: 4:00 pm, Monday, February 11, 2008 (in box outside ME 4438)

Late submission: 4:00 pm, Tuesday, February 12, 2008

The assignment solutions will be posted at 5:00 pm on Feb 12

Question 1 [20 marks] Link Budget for WiMax

In this question we will analyze the coverage region of a Base Station (BS) in an upcoming WiMax network (search WiMax through Google). Here are the specifications of interest:

- BS transmit power: $P_{TX} = 33$ dBm
- Transmitter (BS) antenna gain: $G_{TX} = 12$ dB
- Receiver (terminal) antenna gain: $G_{RX} = 3$ dB
- High speed data rate: $R = 10$ Mbps
- Modulation: QPSK with synch pulses
- Quality requirement: $SNR > 7$ dB
- Carrier frequency: $f = 3.4$ GHz
- Receiver noise figure: $N_F = 8$ dB
- Ambient temperature: $T = 20^\circ\text{C}$
- Boltzmann constant: $k = 1.38 \times 10^{-23}$ joule/ $^\circ\text{K}$
- Path loss (PL): $(4\pi d/\lambda)^{3.5}$, where
 - Distance between BS and a terminal: d
 - Carrier wavelength: λ

(a) Find the radius of the coverage region of a WiMax BS.

(b) If this network were deployed only for voice communications at 10 Kbps, find the radius of the coverage region of a WiMax BS, assuming all other parameters are the same.

Note: Pay attention to the units!