Computer Networks Group
University of Göttingen, Germany

Homework #3
(Due on 12:00am, Thursday, Nov. 19th, 2015)

1 Pathloss with different wireless technologies

Consider a Jennic sensor node with 3dBm transmission power (antenna gain 0dBi), a mobile station that transmits at 2W in GSM (antenna gain 0dBi), a GSM base station that transmits at 10W (antenna gain 3dBi), a DAB (digital audio broadcasting) transmitter with 1 kW EIRP (230 MHz), a DVB-T (digital video broadcast) transmitter with an EIRP of 10kW (800 MHz). Furthermore, consider a Bluetooth transmitter with 2.5 mW EIRP (2.4GHz) and a Wlan transmitter with 100mW EIRP (2.4GHz).

Calculate the signal strength at a receiver at a distance of

1. 10cm
2. 1m
3. 1km
4. 10km

Assume that the receiver has an antenna gain of 0dBi.

Note: Antenna gain of a DVB-T roof-mounted antenna with 800MHz: 12dB. Indoor antenna: -2 to 0 dB)

2 CDMA encoding and decoding

Consdier four senders A, B, C, and D. Which are assigned the following chip sequences:

A_{chip}= 11110000

B_{chip}= 11000011

C_{chip}= 10011001

D_{chip}= 10010110

The data sequences to transmit are

A_{data}= 00

B_{data}= 11

C_{data}= 10

D_{data}= 01

a) Please calculate the combined and encoded sequence obtained at a receiver
b) Demonstrate the decoding of the respective sequences at the four receive nodes

3 Thermal noise

Estimate the thermal noise in an indoor environment (assume a room temperature of 20°C) for a 1Mhz signal.

4 CSMA/CA

How does CSMA/CA tackle the problem of collisions (what steps are taken at the sender and receiver respectively)?