

Exercises for the lecture

Collaborative transmission in wireless sensor networks

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Stephan Sigg (sigg@ibr.cs.tu-bs.de)

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2 Communication in wireless networks

2.1 Pathloss for 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

- a) 10cm
- b) 1m
- c) 1km

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)

2.2 Doppler Shift

- a) Assume a car heading directly towards a base station at a speed of 50 km/h. What is the amount of the Doppler frequency for a signal at 950 MHz?
- b) Of what amount is the Doppler frequency if the car is circling around the base station at a speed of 70 km/h and with a radius of 20m?