

Sheet 1: Basic Concepts of Wireless Communication

✓ 1) Is it possible to transmit a digital signal, e.g., coded as square wave as used inside a computer, using radio transmission without any loss? Why?

✓ 2) What are the main problems of signal propagation? Why do radio waves not always follow a straight line? Why is reflection both useful and harmful?

✓ 3) How to counter fading?



✓ 4) What are the types of interference?

✓ 5) A wireless base station transmits at the unlicensed carrier frequency of $f_c = 5.775$ GHz. Its maximum transmit power is 1 W according to FCC rules. Assume that the base station and receiver antenna gains are 4. We use $\text{dBm} = 10 \log_{10}(\text{power})$, where power is represented in mW. Thus $1 \text{ W} = 30 \text{ dBm}$.

- What is the wavelength of the wireless channel?
- What is the received signal power in dBm, in the free space, of a signal from the base station to a receiver who is at a distance of 1 mile (1.6 km)? What is the transmission delay in ns?
- Assume that a receiver has a sensitivity level of -91 dBm, what is the maximum distance of the receiver, in the free space, from the base station?

