Minor ES Connectivity

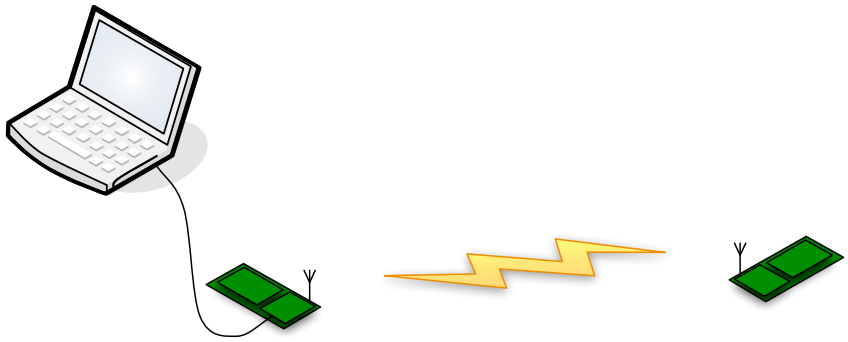
Assignment week 5

This assignment can be submitted separately or in pairs

Past weeks we've seen that wireless connectivity is based primarily on transmitting and receiving electromagnetic waves. We scratched on the surface of aspects that play a role in the path from transmitter to receiver.

Suppose we have two XBee Series 1 devices (A and B), communicating using OQPSK modulation and we want to see whether they will be able to to communicate wirelessly. I've put them some distance apart from another in an office environment, with some walls in between them and there's also some WiFi traffic. Summarizing, I've found the following characteristics:

- The transmitter output of the devices is 1mW.
- The receiver sensitivity of the devices is -92 dBm (1% PER). This is based on a noise floor of -120 dBm.
- The free space loss accounts for 60 dB
- Absorption (walls) and reflection (walls and mismatch) account for 22 dB loss
- Interference from other sources accounts for 15 dB loss
- I'm using standard (dipole) antenna with a gain of 2,1 dBi



XBEE CONNECTION SETUP

Question 1
Of course I want to know whether I will be able to communicate between these two devices. This means that you will have to draw a link budget showing the contribution of each of the effects on the signal power level. The result must be a conclusion whether or not I will be able to communicate in a sensible way between these two devices.

Question 2
And now some reasoning: Suppose I'm going to use directional antennas on these devices. What would be the probable effect of using these antennas? Would the communication link between the devices benefit from this? What would be the pros, and what would be possible cons? Provide me with a short explanation of your reasoning.

Question 3
Finally some discussion on jamming. Suppose somebody would want to jam the connection between the two devices, i.e. the information exchange between both XBee devices must be made impossible. How would you do this? This means: what do you have to keep in mind and how would you do it in the concrete case of these two XBee devices?

For all answers I want to see where you got the answers from. This means that I want reference (APA style) to your sources.