Acoustic modem project

# Session 1: Audio playback, recording and analysis

## Exercise 1-2: Time-frequency analysis of recorded signals

1. (C) Barlett’s Method: No overlapping.  
    Welch’s Method: Overlapping segments, these segments are windowed ( in time domain  
    PSD is not averaged out.
2. ? There are other frequencies due to harmonics. The frequencies are a multiplication of the original frequency.
3. A large DFT size gives us a more detailed frequency spectrum.
4. There is noise recorded. You can see this contribution on other frequencies
5. ?
6. ?
7. ?
8. In the spectrum, we recognize the frequencies: 1500Hz, 2000Hz, 4000Hz and 6000Hz. In the PSD, more frequencies are recognizable, but the higher ones are more dominant. The recorded signals contain less the low frequencies and have also some noise, which you can see in the other frequencies.
9. We can see which frequency bands are well recorded. Some frequency bands are less visible in the spectrogram which means that or the speakers don’t play these properly, or the microphone can’t record this sound very well.
10. In time, it is just a random distribution of frequencies. It’s changing in time but there is not a pattern. It’s completely random.
11. ?

## Exercise 1-3: Your best friend Shannon

1. The useful frequency range of the mic is : 50 Hz - 16 kHz. However we don’t know of this is a flat frequency response. The laptop speakers will have an equivalent range. But also not a flat range. The low frequencies are most of the time poorly represented.
2. The signal and the noise do not correlate, because these are powers. We can add or subtract these.