

ELEC9721: Digital Signal Processing Theory and Applications

Lab 1A Simple sampling and spectra

When you complete each step, show a demonstrator so

1. (2.5 marks)

Create a signal of length 1 second in Matlab representing a sinusoid at 1kHz, sampled at 5kHz. Plot that signal against the correct time base so that it is clear that your signal is correct.

2. (2.5 marks)

Draw on paper the spectrum you expect to see for this sampled signal. Take the FFT of this signal and plot it against a properly labeled frequency axis, with 0Hz in the middle. What is the frequency resolution of this plot?

3. (2.5 marks)

Create a new sinusoid with magnitude 1.0, still sampled at 5kHz but having frequency 2.25kHz. Clip this signal to a maximum absolute value of 0.3, i.e. any value above 0.3 should become 0.3 and any below -0.3 should become -0.3. Plot that signal against the correct time base so that it is clear that your signal is correct.

4. (2.5 marks)

Draw on paper the spectrum you expect to see for this type of clipping in the continuous time (i.e. not sampled) domain. Then draw the version you expect for this sampling example. Take the FFT of this signal and plot it against a properly labeled frequency axis, with 0Hz in the middle. What do you expect to see in this plot? Is that what you see?

If you are unable to complete the laboratory in the assigned time, complete it in your own time as it is the starting point for Lab 1B.