Laboratory: SSB and AM demodulation

1 Objective

Objectives of the lab:

- To get familiar at a high level of how to implement the various AM demodulation algorithms.
- To get familiar with an IQ-demodulator.
- To analyse AM demodulation.

2 Requirements

Note: This lab requires some preparation, in terms of theoretical background as well as the use of the tools (Matlab/Octave, the m-files, etc.). Students who are unable to do the lab because they have not prepared will be asked to leave.

Instructions, source material and preparation required:

- You are required to present block diagrams of the AM demodulators before you are allowed to enter the lab.
- Lab partners must operate in groups of three (and no larger) and may help each other during the lab but each should use his/her own examples in all the exercises and write his/her own lab report.

Report: The report will take the form of the following group of files which should all be attached to a single email:

- An answer sheet (in PDF format) with your name and your lab partners' names and student numbers, the date and experiment name, and your results.
- All the m files used in the lab.
- Your report should include an introduction, as well as a conclusion section, briefly explaining all important results.

3 Outcomes

1. AM DSB FC demodulation

1.a. Sketch a block diagram of how AM DSB FC can be demodulated. Show the necessary equations.

1.b. Use the code from Lab 1 to generate an AM DSB FC signal modulated with a single tone of 1 kHz. Demodulate this signal and compare the output with your input signal. Verify that the demodulator is working by noting the change in amplitude and frequency when the amplitude and frequency of the input signal is changed. Call the demonstrator to verify the results (The demonstrator has to sign your name off on a list).

2. AM DSB FC demodulation using an IQ structure

2.a. Sketch a block diagram of how AM DSB FC can be demodulated. Show the necessary equations.

2.b. Use the code from Lab 1 to generate an AM DSB FC signal modulated with a single tone of 1 kHz. Demodulate this signal and compare the output with your input signal. Verify that the demodulator is working by noting the change in amplitude and frequency when the amplitude and frequency of the input signal is changed. Call the demonstrator to verify the results (The demonstrator has to sign your name off on a list).

2.c. Compare the output of the IQ demodulation with the output obtained in Question 1.

3. AM DSB SC demodulation using an IQ structure

3.a. Sketch a block diagram of how AM DSB SC can be demodulated. Show the necessary equations.

3.b. Use the code from Lab 1 to generate an AM DSB SC signal modulated with a single tone of 1 kHz. Demodulate this signal and compare the output with your input signal. Verify that the demodulator is working by noting the change in amplitude and frequency when the amplitude and frequency of the input signal is changed. Call the demonstrator to verify the results (The demonstrator has to sign your name off on a list).

4. AM SSB demodulation using an IQ structure

4.a. Sketch a block diagram of how AM SSB can be demodulated using the USRP. Show the necessary equations.

4.b. Generate an AM SSB signal modulated with a single tone of 1 kHz. Demodulate this signal and compare the output with your input signal. Verify that the demodulator is working by noting the change in amplitude and frequency when the amplitude and frequency of the input signal is changed. Call the demonstrator to verify the results (The demonstrator has to sign your name off on a list).