

Lab 1

Total harmonic distortion (THD)

- What it means
- How to calculate it

Power-RMS-PSD

- Know what PSD means.
- Know how the PSD of noise is affected when the noise passes through a filter.
- Know how to convert from PSD to power to RMS voltage.

Signal-to-noise ratio (SNR)

dB unit conversions

- Know the formulas, and how to apply them.

Lab 2

LTI systems: Convolution, impulse response, frequency response, etc.

Two-tone test and inter-modulation distortion

- Know the purpose of the two-tone test.
- Derive the distortion terms arising from a two-tone test applied to a nonlinear system (Pre-Lab 2, Question 3).
- Know the in-band third-order inter-modulation terms.

Lab 3

AM (DSBLC) signals and modulation diagrams

- Know the block diagrams (how to draw them, and how to build them in lab).
- Know how the signals change during the modulation and demodulation processes.

Modulation index

- Calculate it from a time-domain waveform.
- Calculate it from a block diagram.
- Know the relationship between modulation index, message amplitude, and DC offset.

Envelope detector

- Know the circuit diagram.
- How the circuit works
- How to choose RC
- What happens if RC is too big, too small?

Frequency mixing and super-heterodyne receiver

- What is frequency mixing?
- What is the purpose of super-heterodyne receivers?
- How does a super-heterodyne receiver work?
- Justify (mathematically) the equations for the two choices of the local oscillator frequency.

Lab 4

DSBSC signals and modulation diagrams

- Know the block diagrams (how to draw them, and how to build them in lab).
- Know how the signals change during the modulation and demodulation processes.
- Know the differences between DSBSC and DSBLC, and the advantages and disadvantages of each.

Problems with envelope detector demodulation

- What is the result of demodulating a DSBSC signal using an envelope detector?
- How does this result compare to the original message?

Synchronous demodulation

- Why does receiver need to be at the same frequency as the incoming carrier? (Know what happens if the frequencies are different.)
- Why does receiver need to be in phase with incoming carrier? (Know what happens if the phases are different.)
- Know how to get synchronous demodulation (so that the modulating and demodulating carriers have the same phase). We've covered two methods:
 - o Stealing the carrier (Know how to do this.)
 - o Costas Loop (Know the block diagram, and why it works conceptually.)