# EAE 298 Aeroacoustics
# Fall Quarter 2016
# Homework #1

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## Problem 1. [50 pts]

The values in the wav file are in volts. B&K measurement microphones invert the pressure a negative voltage from the microphone corresponds to a positive pressure. When you apply the calibration constant, account for this sign reversal. For this problem, the pre-calculated constant calibration factor is 116 pascals/volt. Convert the time series in voltage to pascals. (Assume that all of the power in the boom waveform is within the range of flat response of the microphone).

### Part (a)

[10 pts] Plot the waveform in pascals as a function of time. What is the peak pressure in the time domain? Notice the shape of the first arrival it has the classic N wave shape of a sonic boom. Notice the duration in time from the positive-pressure peak to the negative-pressure peak.

### Solution

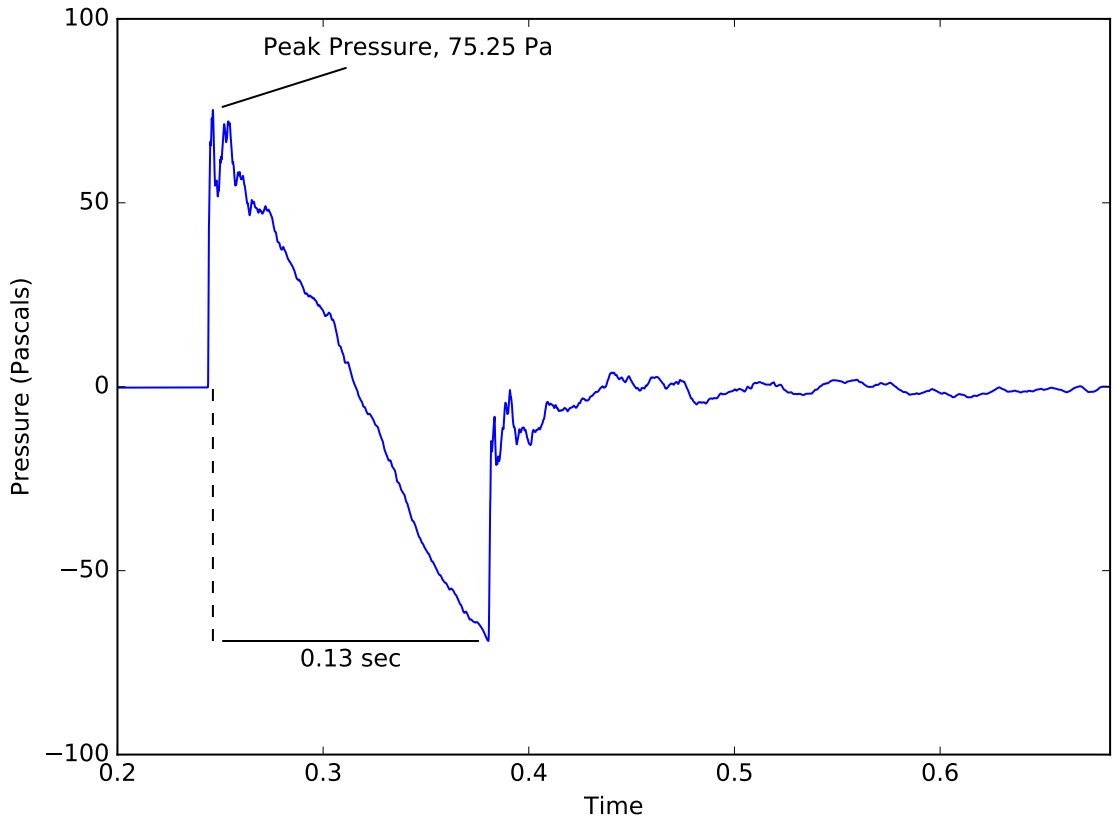
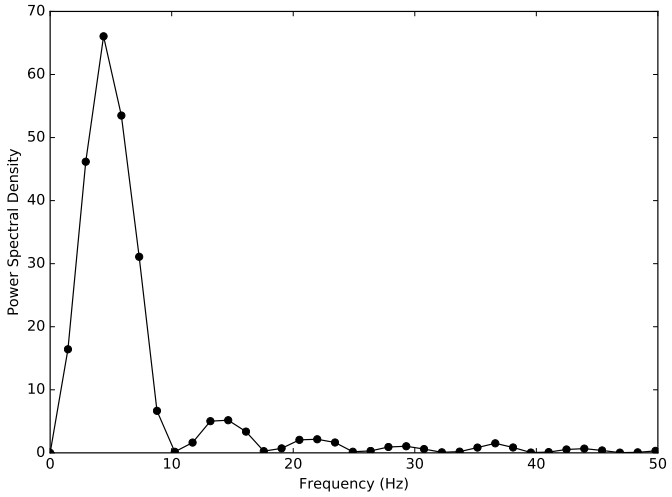



Figure 1: The waveform in pascals as a function of time. Peak pressure is noted at 75.25 Pa, and the duration in time from the positive-pressure peak to the negative-pressure peak is noted at 0.13 sec.

## Part (b)

[30 pts] Calculate and plot the single-sided power spectral density function ($G_{xx}$).

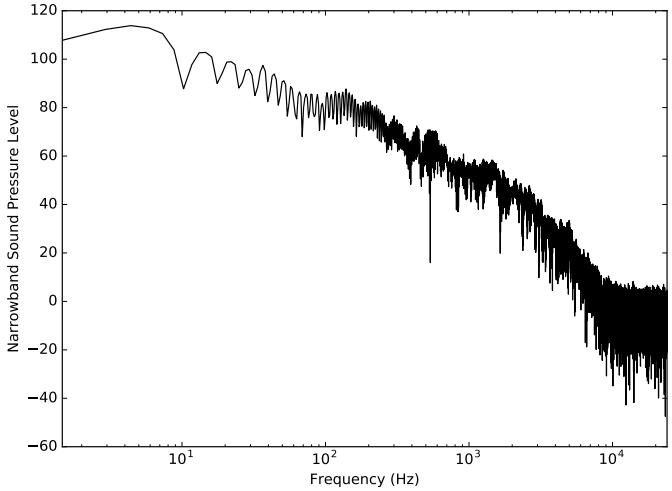
## Solution




## Part (c)

[10 pts] Convert and plot the standard narrowband sound pressure level with the reference pressure of 20 micro-Pascal.

## Solution



## Problem 2. [50 Pts]

Write a computer program to convert the narrow band spectra to one-third octave and octave band spectra.

### Part (a)

[20 pts] Convert the narrowband spectrum to one-third octave band spectrum and make a plot

#### Solution

You only get to YOLOSWAG once.

### Part (b)

[20 pts] Convert the one-third octave band spectrum to octave band spectrum and make a plot

#### Solution

You only get to YOLOSWAG once.

### Part (c)

[10 pts] Convert the octave band spectrum to the overall sound pressure level

#### Solution

You only get to YOLOSWAG once.