Physics 4050H: Project 1

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Abstract

Blah Blah

Reference... figures w... they're d...

1 Introduction

Normal intro stuff. Discuss why we think the datasheet plot is sketchy (i.e. real world examples of high quality mics). Also consider units of the datasheet, dbU, dbV? Can we compare it to the freq. corr. curve from Dayton Audio??

2 Theory??

Idk, maybe talk about how electret mics work?? Not super relevant other than making it more evident that the datasheet is dodgy.

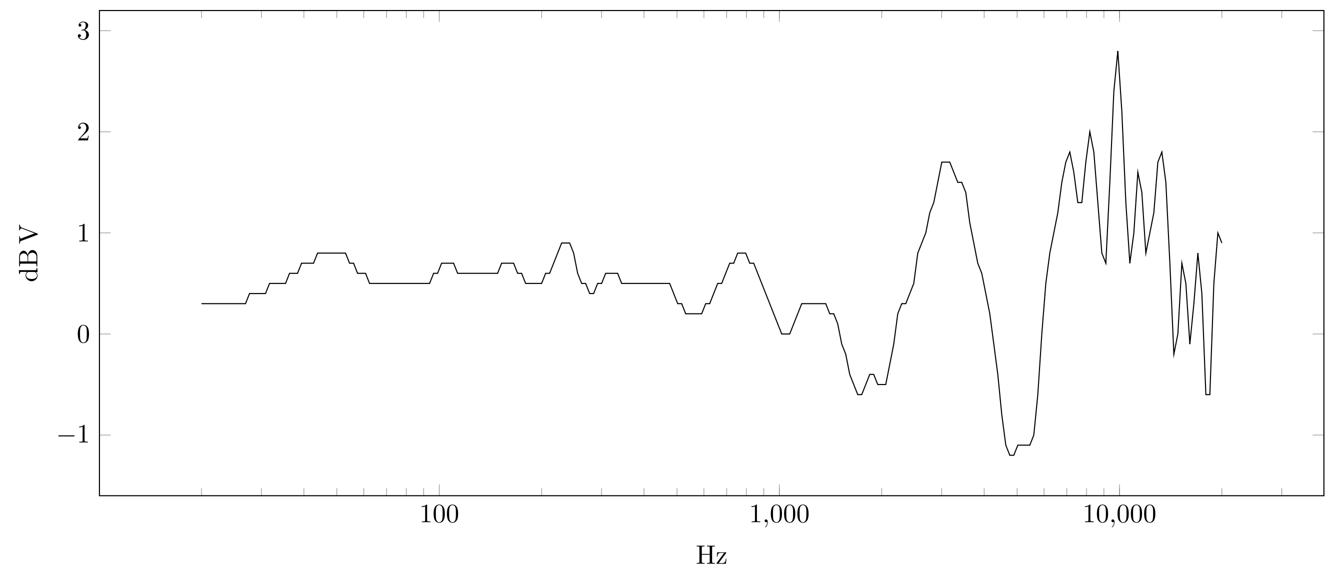

Figure 1: Manufacturer provided correction curve for the reference microphone

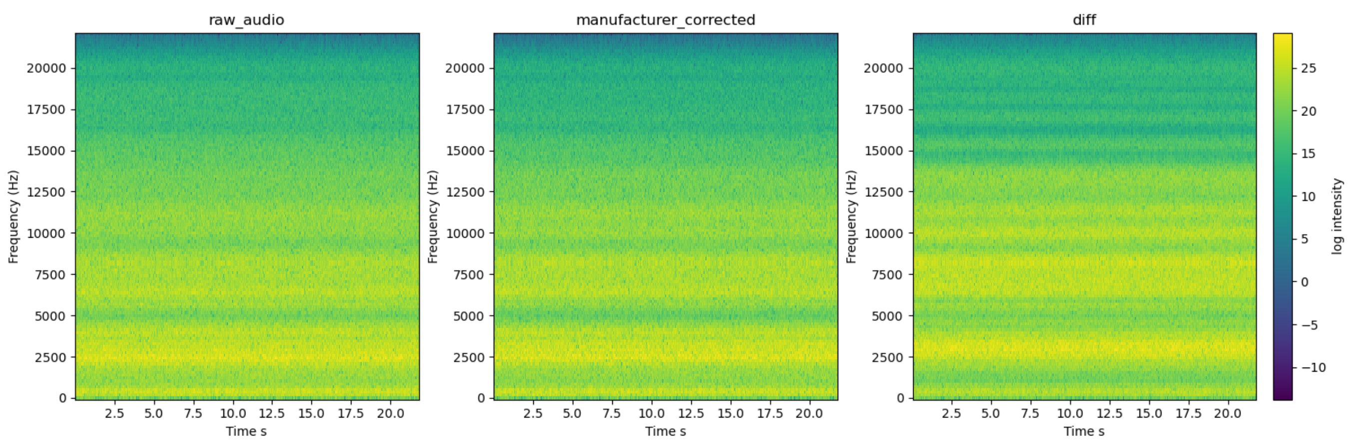

Figure 2: White noise captured on the reference microphone at various processing stages. The final plot is the difference between the raw and corrected signals, created by phase inversion.

3 Methods

Give a general flowchart of the process

3.1 Noise Generation

3.2 Constructing a Correction Profile

In order to determine the response of the unknown (untrusted) microphone a known sound source and receiver are required. Here a fairly trustworthy reference microphone was used in combination with a low quality speaker. The reference microphone, a Dayton Audio iMM-6, included a calibration file which mapped frequencies to dBV ($V = 10^{dBV/20}$) correction values. Values were given with respect to a reference value of 39.9 dB V at 1 kHz. Without a known accurate calibrated microphone it is difficult to proceed and so it was assumed that audio recorded within the range of the calibration curve was, after applying the calibration curve, ideal. With the recording microphone now assumed to be ideal any deviation from a signal with equal contribution from all frequencies over the chosen range should be in majority caused by the speaker with some environmental effects that remain effectively constant regardless of the recording device used . From here the audio recording/processing software Audacity was used to analyze the recorded audio and create a frequency contribution plot and dataset. The dataset contains frequencies mapped to decibel values representing the amount of a specific frequency present in the signal. In an ideal system

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Talk abo the harm ics :(

with a perfect emitter perfectly coupled to a perfect receiver the recorded signal would contain equal amounts of every frequency emitted by the sound source. This is not the case here but all frequencies are present in some amount. This allows the construction of another correction curve. By selecting a desired intensity we can add the difference between the recorded signal strength and the desired signal strength at each frequency. This generates a correction curve which equalizes the signal across a desired frequency range. As, at this point, the only major influence on the signal is the quality of the speaker, this correction curve will eliminate these effects and can therefore be used to eliminate the effects of the speaker when testing non-ideal receivers.

4 Confounding Factors

4.1