

# Digital Lab

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## Abstract

For this lab, we covered a wide range of topics relevant to digital radio. I don't know what the hell they were yet though.

## 1 Introduction

The foremost, most fundamental piece of physics relevant to digital signal sampling is the Nyquist criterion. A signal is a continuously-varying quantity, but a computer can only read its value a finite number of times. The Nyquist criterion states that in order to get sample data that approximates the actual shape of the signal, one must sample at at least twice the frequency of the signal.

Digital shit is pretty sweet!!

## 2 Experiments, Observations, Analysis and Interpretation

### 2.1 The Nyquist Frequency

The first thing we did in this lab was try to understand and visualize the Nyquist criterion. To do this, we sampled a signal at frequencies ranging from 0.1 times the Nyquist frequency to 3 times the Nyquist frequency and compared how effectively they seemed to illustrate the underlying sinusoid. Graphs of our results appear in figure 1. As you can see, the samples at less than the Nyquist frequency are periodic, but it is not easy to see that the underlying signal is a sinusoid or determine its amplitude or frequency. At the Nyquist frequency, the signal is clearly sinusoidal, and its amplitude and frequency can be easily determined. Finally, at triple the Nyquist frequency, the picture smooths out even further and looks almost like a continuous waveform.

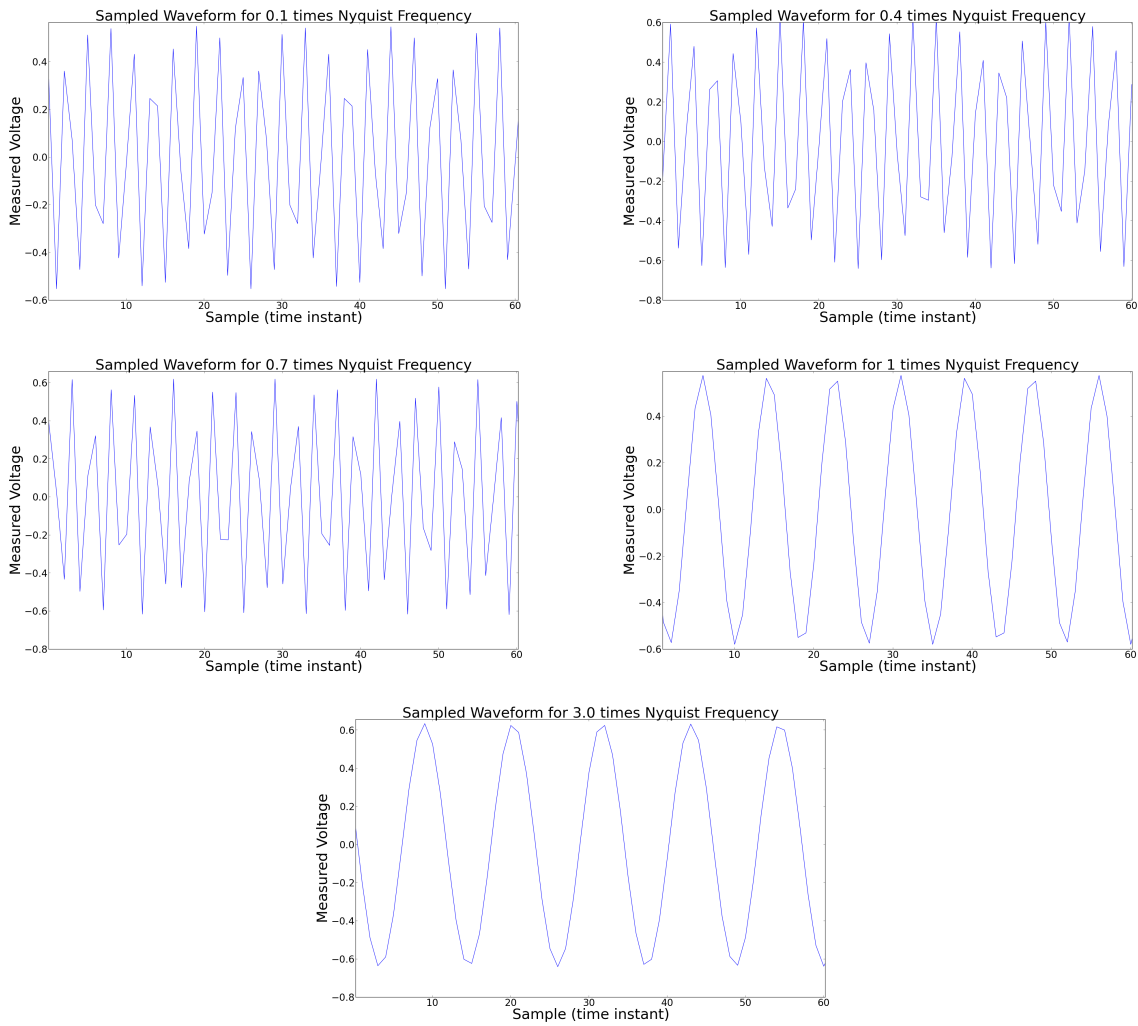


Figure 1: Sinusoidal signal sampled at 0.1, 0.4, 0.7, 1, and 3 times Nyquist frequency.