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***Abstract*—**

I. Introduction

II. Results & Discussion

A. Analysis of Amplitude Modulation

A message, $m(t)$, with a bandwidth, $B = 2$[kHz] modulates a cosine carrier with a frequency of 10[kHz]. The combined signal is $s(t) = m(t)\cos(20000\pi t)$. Using a Fourier transform on $s(t)$ reveals a maximum frequency at 12[kHz]. In fact, as seen in figure 1, by filling the band that $m(t)$ occupies with white noise, the Fourier transform of $s(t)$ contains white noise centered on the carrier frequency with twice the bandwidth of the original signal. The spike that occurs at 10[kHz] is the result of the original signal having a DC term and the carrier frequency having a value of 10[kHz].

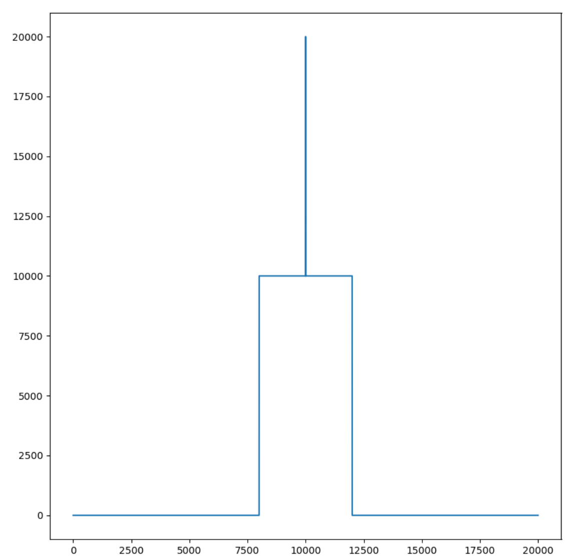

Fig. 1. The Fourier transform of a white noise signal carried at 10[kHz]

If instead, $m(t)$ had a triangular spectrum of amplitude 1, the spectrum of $s(t)$ will be two triangles touching at the base at 10[kHz] as seen in figure 2.

B. Periodicity and Sampling Frequency

Consider the signal $x(t) = \cos(2\pi t/7)$. Given the standard forms, $\cos(2\pi f t)$ and $\cos(\omega t)$, where f is linear frequency and ω is angular frequency, $f = \frac{1}{7}$ and $\omega = \frac{2\pi}{7}$. Given a sampling frequency of 1[Hz], the sampling theorem is satisfied. To determine if a sampled signal is periodic, the condition $\omega N = 2\pi r$, where r is the smallest integer such that N is an integer, must be satisfied.

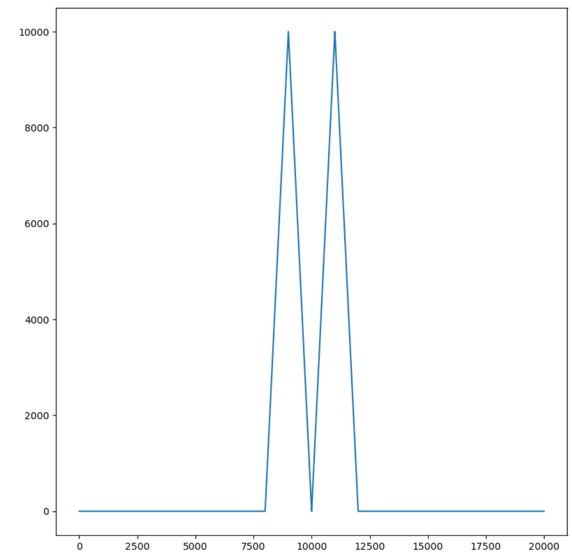

Fig. 2. The Fourier transform of a signal with a triangular spectrum carried at 10[kHz]

III. Conclusions