## Introduction

The Oscilloscope tool featured in Copley's CME software can be used to tune the amplifier, monitor performance, and perform diagnostics. When saved, the scope will generate a .CSV (Excel) file containing the scope data which can be analyzed by other third-party software. The following App Note will show how to perform a fast Fourier transform (FFT) on scope data gathered in CME using MATLAB software.

Example

The following trace is a recording of the Limited Position (Ch 1) and Actual Current (Ch 2) while the Function Generator creates a Square Wave applied to the Current Loop.
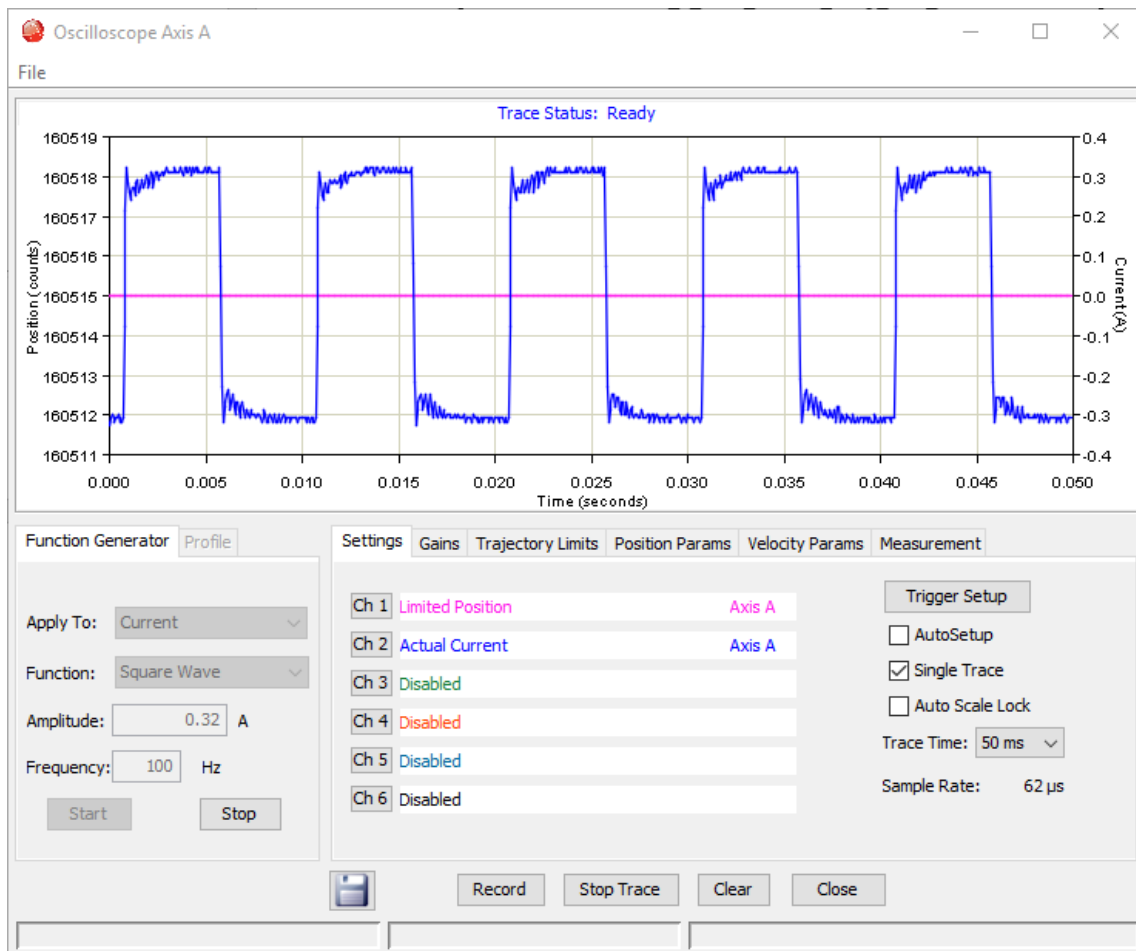
First select the save button to the left of the Record button in the Oscilloscope to save the data to a .CSV file. The above scope trace was saved as "4_2_2019_Current_Loop_Square_Wave.csv". Be sure to also save the .CSV file in the MATLAB directory. Next open the MATLAB software.

Example MATLAB Code:

```
% This script demonstrates how to import data from a .CSV
% and perform an FFT with the corresponding plot.
% This script was made with MATLAB R2019a

% If the .CSV file was not saved in the MATLAB directory
% then the following line of code would also contain the file path.
filename = '4_2_2019_Current_Loop_Square_Wave.csv';

% Get the data from the file as a matrix.
T = readmatrix(filename);
[rows, columns] = size(T);

% Split the matrix into column vectors.
Time = T(1:rows, 1);
Position = T(1:rows, 2);
Current = T(1:rows, 3);

% Convert from seconds to hertz
Frequency = 1./(Time);

% Take the FFT of the important data.
FFTcurrent = fft(Current);

% Plot the data against frequency.
% Note that plotting like this will only plot the real
% parts of the FFT.
figure(1)
plot(Frequency, abs(FFTcurrent));
% Comment out the previous line and
% comment in the following line to plot real vs. imaginary.
%plot(FFTcurrent)
title('FFT Vs. Frequency');
xlabel('Frequency (Hz)');
ylabel('Amplitude');
```
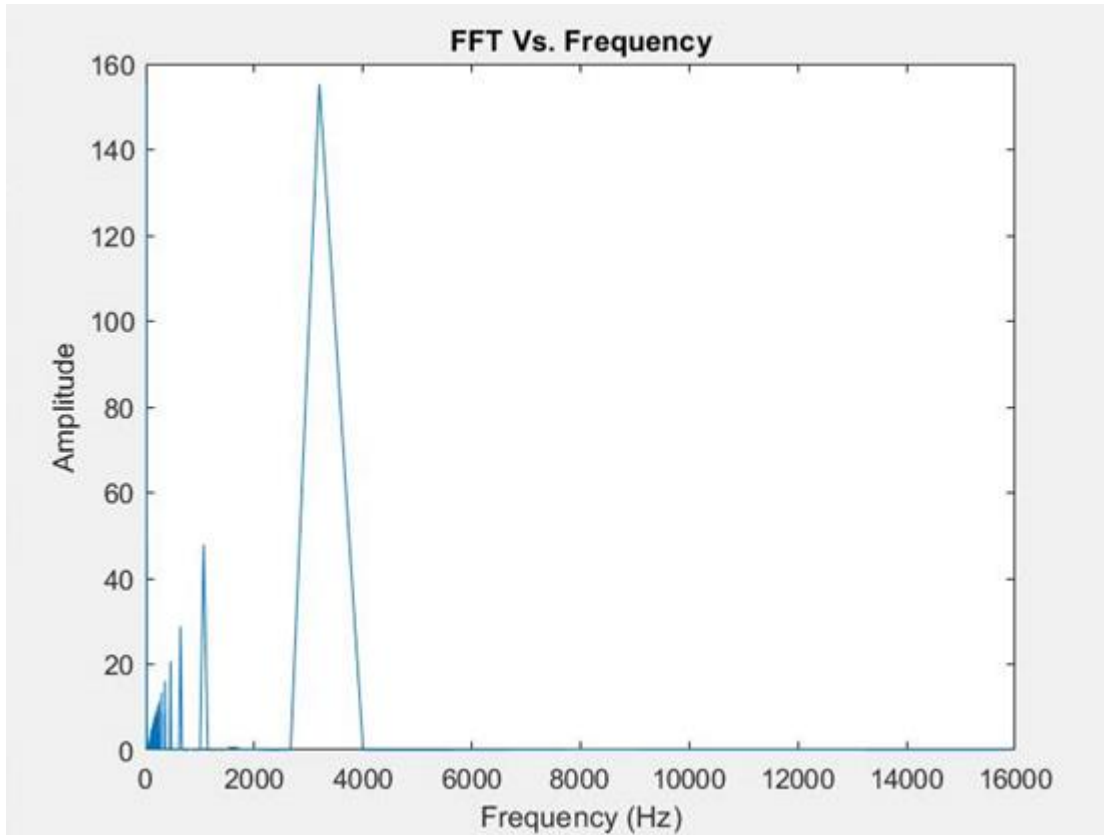
The example MATLAB code generates the following plot of the amplitude of the FFT of the amplifier's current versus the frequency of the amplifier's current.

For details on how to use the Oscilloscope please refer to the CME User Guide.

Revision History

Date	Revision	Revision
04/05/2019	00	Initial release