

Laboratory Session: Week 4: NI MyDAQ Week

Calpe_Khyle

Kuo_Calvin

DMM

1 kHz	Cyclic RMS	Meter Voltage		% Difference (vs Scope)	
Wave (5 V _{pp})	Key Scope Voltage	DMM	myDAQ/DMM	DMM	myDAQ
Sine	5 V	3.53 V	3.56 V	29.4 %	28.8 %
Triangle	5 V	2.79 V	2.79 V	44.2 %	44.2 %
Square	5 V	4.81 V	5.54 V	3.8 %	10.8 %

Question:

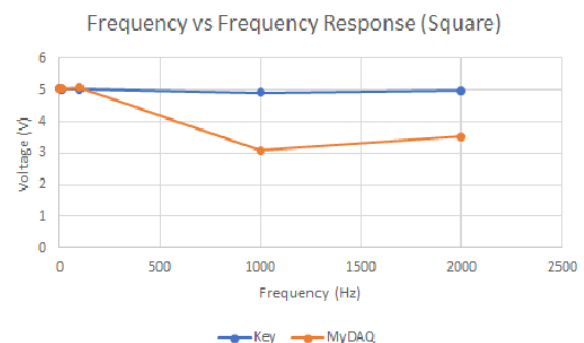
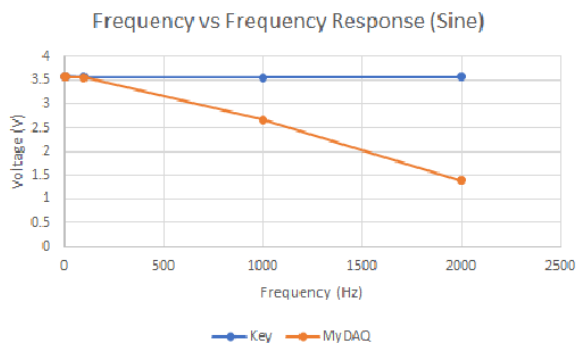
In particular, does the MyDAQ measurement of sine, square waves and triangular waves behave the same or differently than the digital multi-meter? Why?

Answer:

Apart from the square waves, the MyDAQ's measurements compare similarly to the digital multi-meter's measurements. Since the same inputs are passing through both devices, the first two values are expected. However, measurements for the square wave differ by approximately 20 percent. The discrepancy most likely occurred due to the difference in the components of each device and their accuracy in measurement.

Oscilloscope

Frequency	Oscilloscope RMS Voltages			
kHz	Sine (Key)	Square (Key)	Sine (myDAQ)	Square (myDAQ)
1	3.576 V	5.034 V	3.568 V	5.037 V
10	3.576 V	5.024 V	3.561 V	5.034 V
99	3.565 V	5.018 V	3.559 V	5.075 V
999	3.557 V	4.92 V	2.664 V	3.077 V
1999	3.57 V	4.98 V	1.392 V	3.532 V



Question:

We define the upper frequency response of a system to be the point at which the amplitude decreases to 70.7% (-3 dB). Using this criterion, can you estimate the frequency response of the myDAQ and the Keysight oscilloscopes? Discuss.

Answer:

As far as the measured data goes, you cannot estimate the frequency response of the myDAQ this way because the voltage stays constant. However, you can estimate the frequency response of the myDAQ because voltage drops as frequency increases (which is ~1000Hz for Sine waves and 750Hz for Square waves).

Dynamic Signal Analyzer (AKA Spectrum Analyzer)

Harmonic	Ratio in dB (n-th / 1st)	Theory
1	0	0
2	9.5	-6.02
3	13.8	-9.54
4	16.53	-12.04
5	18.42	-13.98
6	19.8	-15.56
7	20.8	-16.90
8	21.51	-18.06
9	21.94	-19.08
10	22.17	-20.00

Bode Analyzer

The theoretical cutoff frequency (-3 dB point) of the filter is 750 Hz.

The cutoff frequency as measured by the Bode Analyzer 400 Hz.

The % difference, using theoretical as the reference: 46.6 %

For the potential cause of the difference, perhaps, the MyDAQ could not accurately handle frequency response measurements of high frequencies.

