January 21, 2024

Frank Martino - Proof of Skills Day 2

Q2 Experimental Measurements and Personal Instrumentation

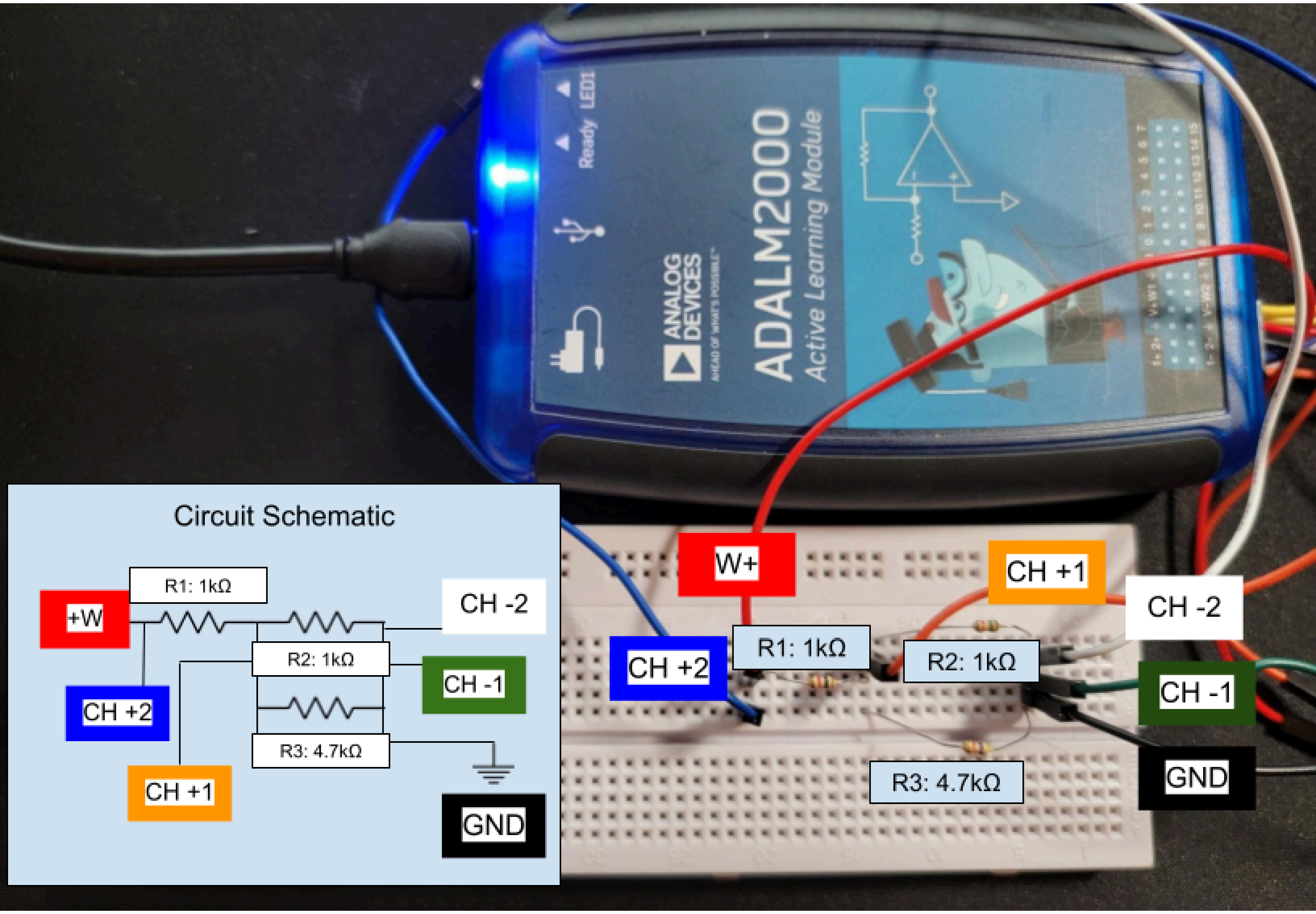
Prove your skill set using ONE of the following: M1K board, Analog Discovery Board, or M2K board.

Each of the **Experimental Measurements and Personal Instrumentation** Objectives above should reflect the following goals:
☑ ~~1. I can use consistent **color coding of wires when I build circuits on my breadboard** to aid in troubleshooting.~~ ☑ ~~2. I can "zoom in" to an oscilloscope output by **changing the time scale (x-axis)** to show important parameters (for example, a sinusoid with 25 cycles would be easier to see if only 3-5 cycles were shown instead!) when needed~~ ☑ ~~3. I can "zoom in" to an oscilloscope output by **changing the voltage scale (y-axis)** to show important parameters (for example, a sinusoid with 500mV amplitude would be difficult to see with 5V/div…) when needed~~ ☑ ~~4. I can **change the THICKNESS** of my trace lines for easy viewing.~~ ☑ ~~5. I **can change the background color of my oscilloscope output to white** and paste in an external document for easy viewing.~~ ☑ ~~6. I **can label the measurement output clearly** with the circuit schematic component names~~

Q2.4 Build a Resistive Circuit and Measure the DC voltage Resistive Circuit and Measure Voltage Across ONE Resistor Using A Sinusoidal Input Source

I can build a resistive circuit and measure voltage across ONE resistor using a sinusoidal input source (Must be two or more resistors, hint: try to make a sinusoidal source with amplitude 0 to 5V centered at 2.5 V and another from -5 to +5V centered at 0 then document whether your board can accomplish both or only one of these)

To prove my skills in building a resistive circuit and measuring the voltage across a resistor using a sinusoidal source. I made a circuit with a 1kΩ resistor in series with a parallel set of two resistors 1.5kΩ and 4.7kΩ (shown in the diagram below). I then supplied a sinusoidal wave with an amplitude of 5 volts with no offset, a frequency of 5KHz, and no phase shift using chanel W+ which leads to the ground channel. I could then measure the voltage that R2 was using up from that sinusoidal wave by inserting channels +1 and -1 on either side of the resistor. After adjusting the settings of the sinusoidal wave to be -5 volts to 5 volts again with a frequency of 5 MHz and no offset or phase shift. I then remeasured the voltage that R2 was using up on the oscilloscope. After viewing the output on the oscilloscope I found it was helpful to compare the voltage used by R2 with the input voltage so I used channels +2 and -2 on either side of the circuit which will be displayed in purple on later graphs.



Below shows the two generated signals from the ADALM2000, on each of the graphs the purple wave shows the voltage source output the orange is the voltage R2 is consuming when that voltage source is supplied.

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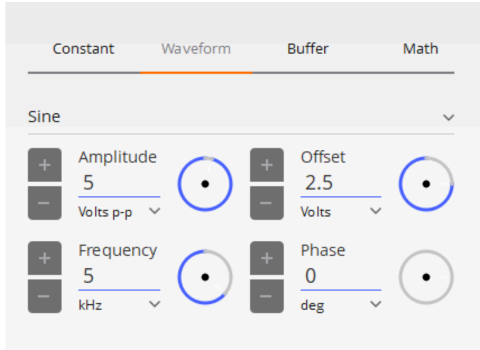
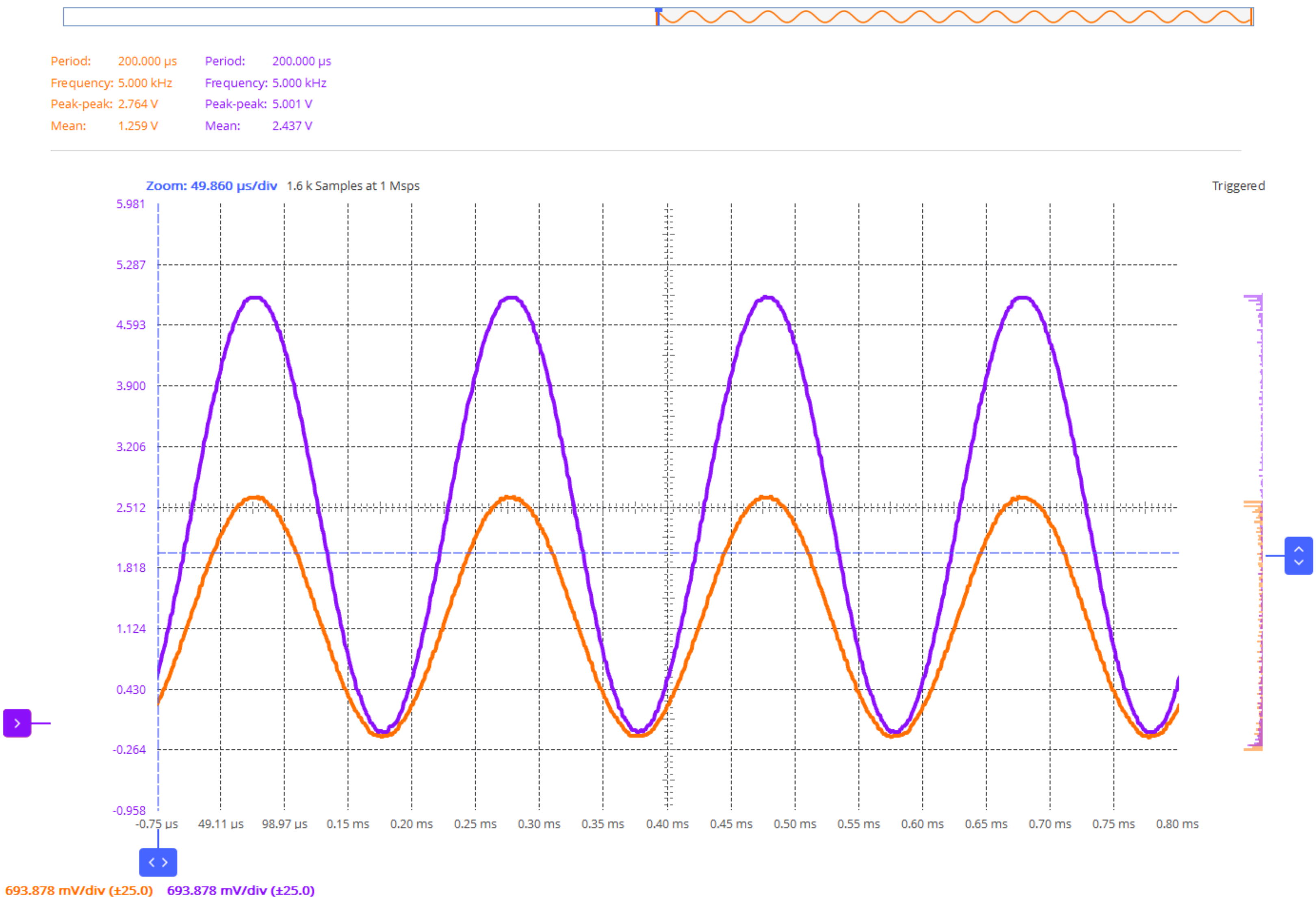
ADALM2000 Generated Signal 1:



Scopy Oscilloscope:
Voltage across R2(1kΩ):



After supplying the sinusoidal source (the purple wave) across the resistive circuit we find that the voltage ranges from 2.612 volts to -0.121 (the orange wave) volts across resistor 2.

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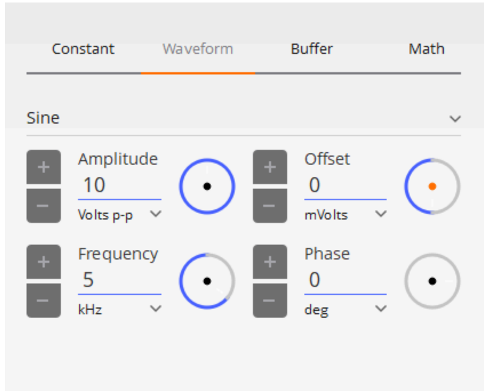
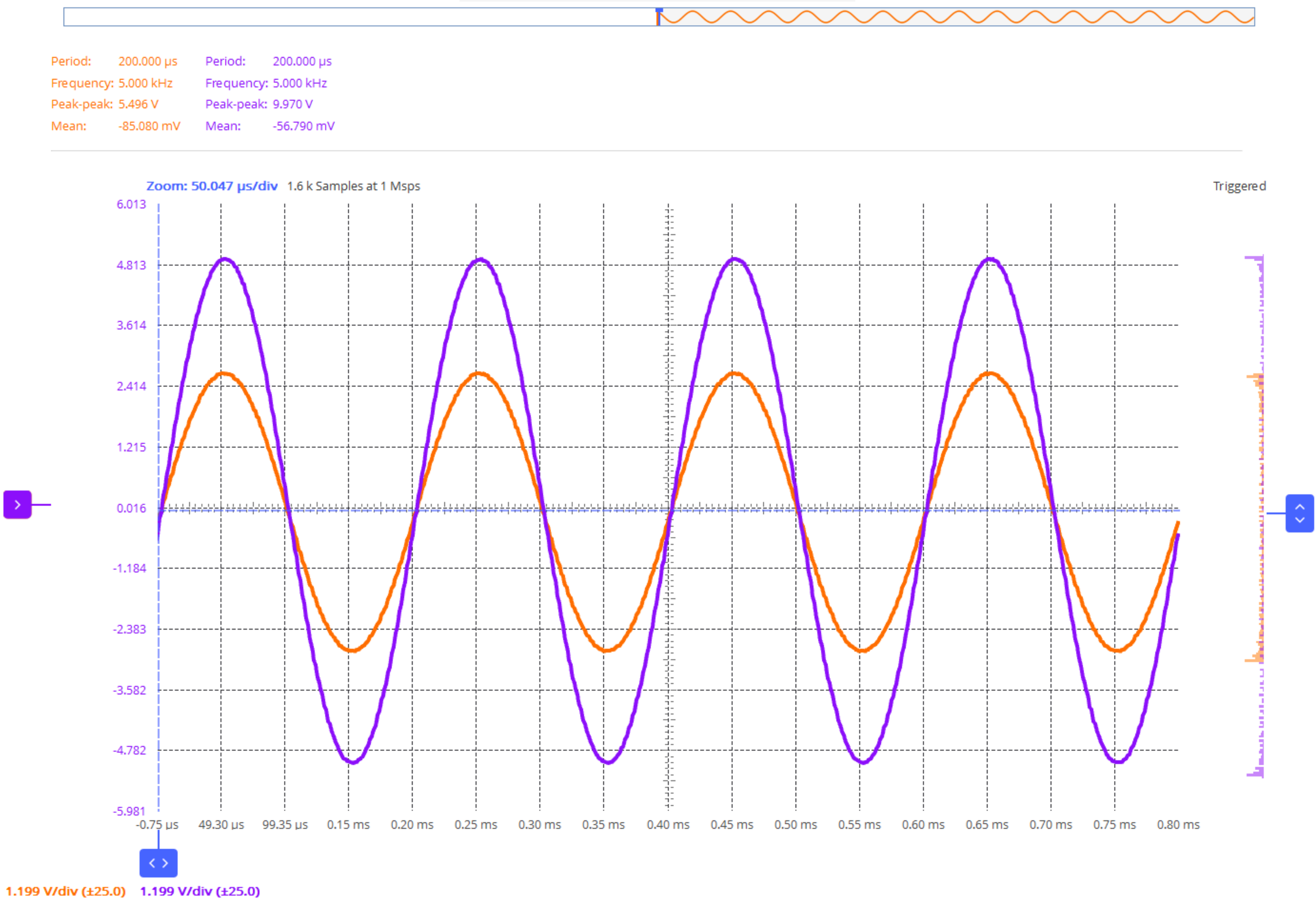
ADALM2000 Generated Signal 2:



Scopy Oscilloscope:
Voltage across R2(1kΩ):



After supplying the sinusoidal source (the purple wave) across the resistive circuit we find that the voltage ranges from 2.652 volts to -2.826 (the orange wave) volts across resistor 2.