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EGR 24L Introduction of Circuit Analysis Laboratory

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Lab#3
Introduction to Oscilloscope and Function Generator

Introduction:

This is the third lab this week we mainly focus on explored and practice using the oscilloscope including menu, cursor, adjusting waveform and how to operate using math functions. Moreover, we also observe how functions generator works including how to configuration DC offset, waveform, voltage, and sweep function.

Oscilloscope is one of the most important tools, the professional tool that allow engineering's to view voltage signals in real time. It is significant useful when we are dealing with time-varying signal and its help engineering to learn the waveform interacted to the voltage signal. On the other hand, the waveform function generator is also one of the most significant as well, engineer used it to assign AC voltage, generate waveform, VPP, DC offset, etc.

When Oscilloscope connected to function generator, the function generator will create all kinds of waveform depending on function generator configurated which will allow engineer to make a calculation and understand more about DC/AC voltage relationship to the waveform.

Procedure: Need to simplify the procedure/methods section

After we practice and play allow oscilloscope and function generator.

1) Part 1: we only do the exercise, no record the data but what we do was we learn how to operate the RIGOL DG1000 Function Generator, we learn how to configure waveform, output probe, frequencies, ect. It is the good foundation to learn all set up and configuration on the function generator.

2) Part1 continue: the second part of part one we aim to understand how to do calibration on Oscilloscope. We concentrate on learning what is amplitude and measurement of waveform, know how to set auto waveform display, how probe attenuation work, how to control horizontal and vertical control x and y axis on the graph, understand DC coupling and AC coupling, know the inversion function, triggering control and how to apply math function.

3) Part2-1: we configured own signal from function generator. This first calibration that we did was a simple Sine Waveform. We follow the spec sheet by try switch between 1X and 10X on probe setting and others setting until we got the same as the spec sheet shown which was square sine waveform. Then, we take a screen shot of image (d).

4) Part2-2: we are using scope to auto display AC waveform. We connect the scope ch-1 to function generator ch1 and disconnect Ch-2 probe for not make any interfere to the graph. Then we connect function generator probe cable ch1 to Oscilloscope ch1. Set out put ch1 to Oscilloscope. We follow each step on spec sheet. We obtain output the same as shown on spec sheet which was a simple sine waveform. Then, we take a screen shot of image (h).

5) Part2-3-5: Checking and matching probe attenuation and AC/DC coupling of the scope. This part of experiment we make sure that all probe cables set up correctly like way it should be. We follow each step on the spec sheet. We learn how to adjustment horizontal and vertical control to squeeze and stretch waveform on the display. We also learn how to bring everything back by pressing AUTO button. Next, we experiment with DC/AC coupling of the scope. Use the vertical scale knob to shrink the sine wave. Then push "Channel-1" button to bring up the Coupling setting. Set the Coupling to DC. We set function generator output on Ch-1 to Sine waveform, 1Khz, 4 Vpp, 0V dc offset and take a screen shot of image of (o).

6) Next, we set the Coupling to AC, and repeat the same procedure of changing the offset of the signal coming out of the function generator. We see the graph is shifting down when the 0 V dc and the graph is move up when we set Vdc to 1. (please see screenshot of image o below)

7) Next, in the part 2-6: inversion of waveform. We adjust the vertical scale knob to 1V/Div. and the horizontal scale knob to 2-3 periods of waves in the scope display. We also set Invert option from "OFF" to "ON." After that we set the function generator to 1Khz, 4Vpp, 0V dc offset signal. Next, we set function generator to 1Khz, 4Vpp, -2V dc. Then we compare we see the difference that Sinewave form is look identical except the position of them are different. We see slightly graph move down when the V dc is equal -2.

8) Next, we repeated the same process as previous task but without own. Two AC signals on our own choice. After that the question is asked to explain how you can obtain the DC offset voltage by looking at Vmax and Vmin on the scope display. So, the best way is counting the number of vertical divisions between the zero line on the oscilloscope and the center of the oscillatory signal. Multiply the number of vertical divisions by the volts/division setting in order to obtain the DC offset.

9) Next, in Part 2-8 we made an adjustment on trigger knob by turning knob around to see what the signal show on display is if we keep squeeze the waveform outer. We see that the wave form is start moving. (screenshot s) and (screenshot u)

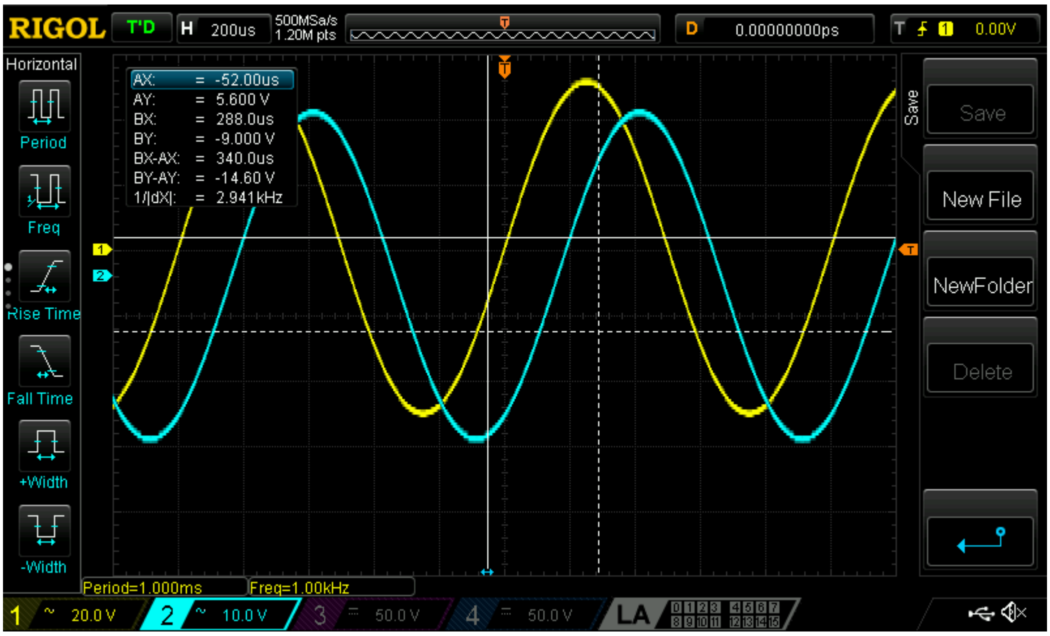
10) Lastly, in Part 2-9 applying a math function to process two signals. We connect the scope's Ch-1 and Ch-2 to the function generator's Ch-1 and Ch-2, respectively. We set the scope's Probe setting for both Ch-1 and Ch-2 were set to 1X (factory default setting is 10X). Output both Ch-1 and Ch-2 signals from the function generator to the scope. Ch-1 signal is 1kHz, 4Vpp, 2Vdc offset; Ch-2 signal is 2kHz, 5Vpp, 0Vdc offset. Then, we pressed "Auto" to get the standard look from the display show on display. After that, we stabilized both waveform by used vertical and horizontal knob adjustment. Then we pressed Math button. Selected A+B, set operation to "ON" we obtain the graph y. Then we move on the last part, we increase amplitude (Vpp) of the lower frequency ch1 signal from 4Vpp to 8Vpp.Then, we follow spec sheet by increase the higher frequency ch-02 to 8kHz. We obtain the result as screenshot in the picture (Z)

Conclusion:

This experiment helps us to understand more about relationship of voltage signal, graph, and waveform. I found this experiment to be very fun. We got to play around with the most important engineering tools, oscilloscope, and function generator. They both did help us to learn to understand the significant of idea of Sinewave form which interacted to DC/AC voltage. We also know more what would happen when the voltage does to the circuit in general. Therefore, this is also one of the most important labs.

Appendixes: Part 2:

a) images Calibration of the special scope problem using the scope's own signal generator.



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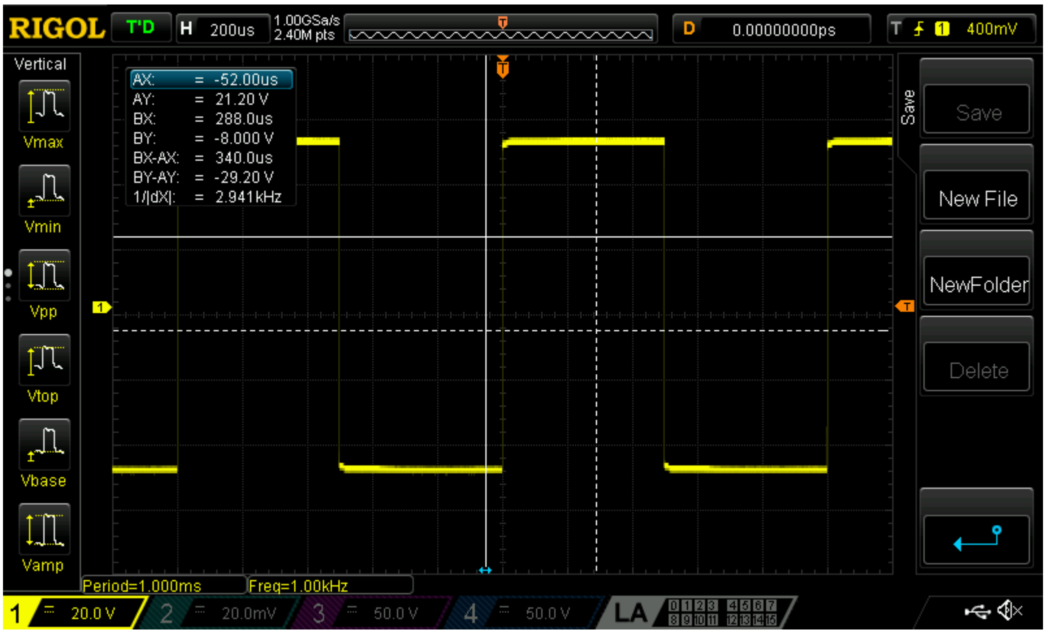
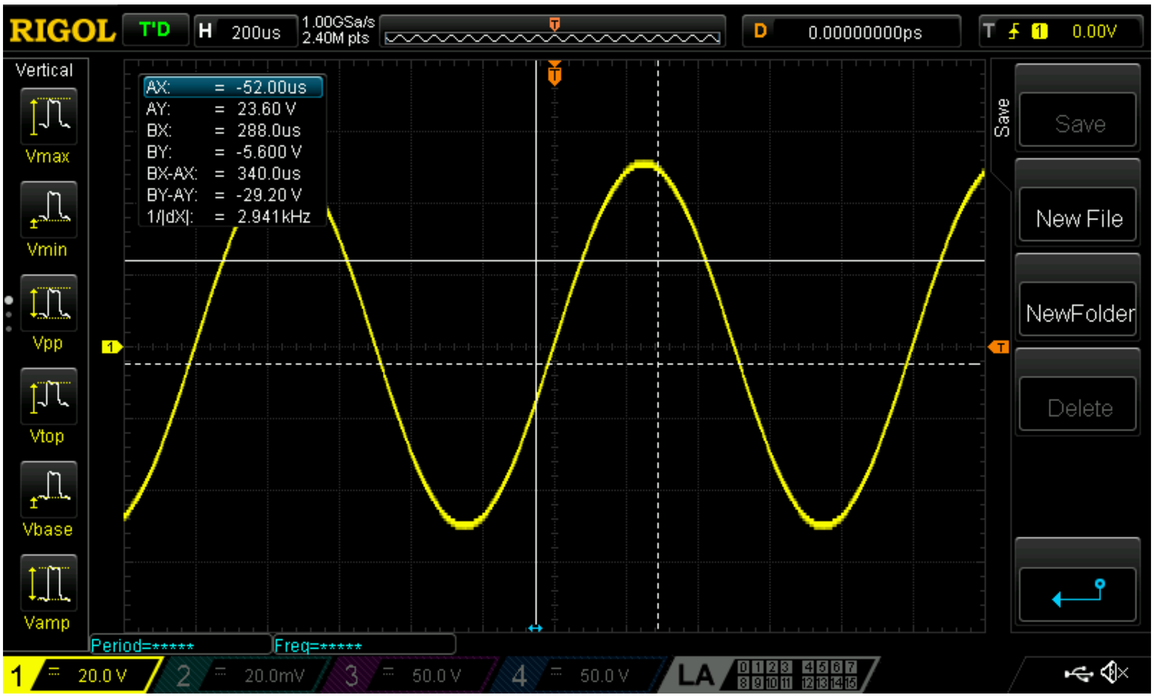
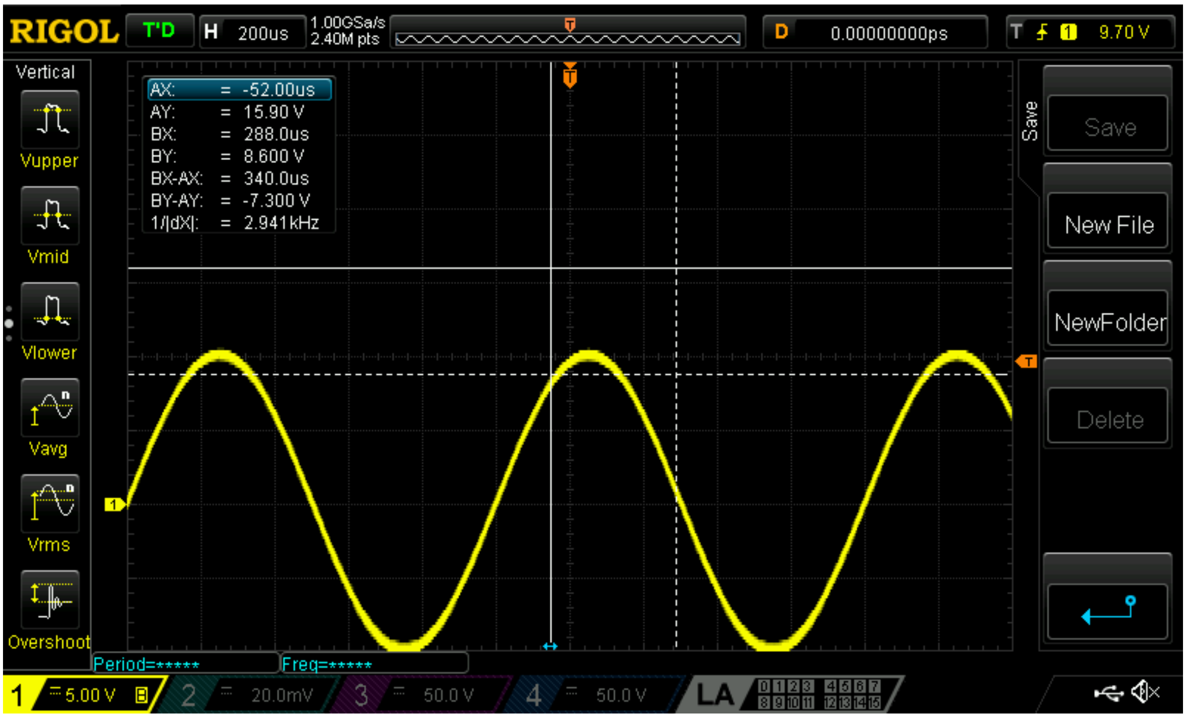
d) one image of square wave for probe calibration



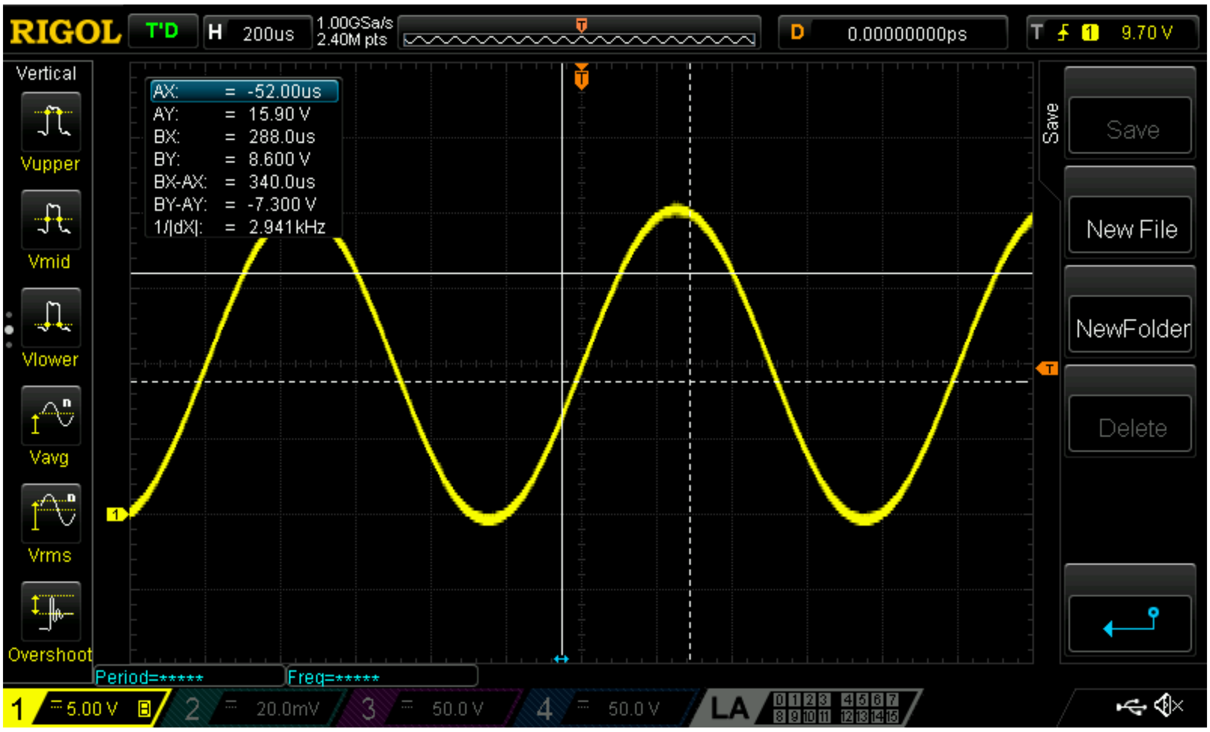
h) one image of regular sine wave



o) two images showing offset with scope's DC coupling

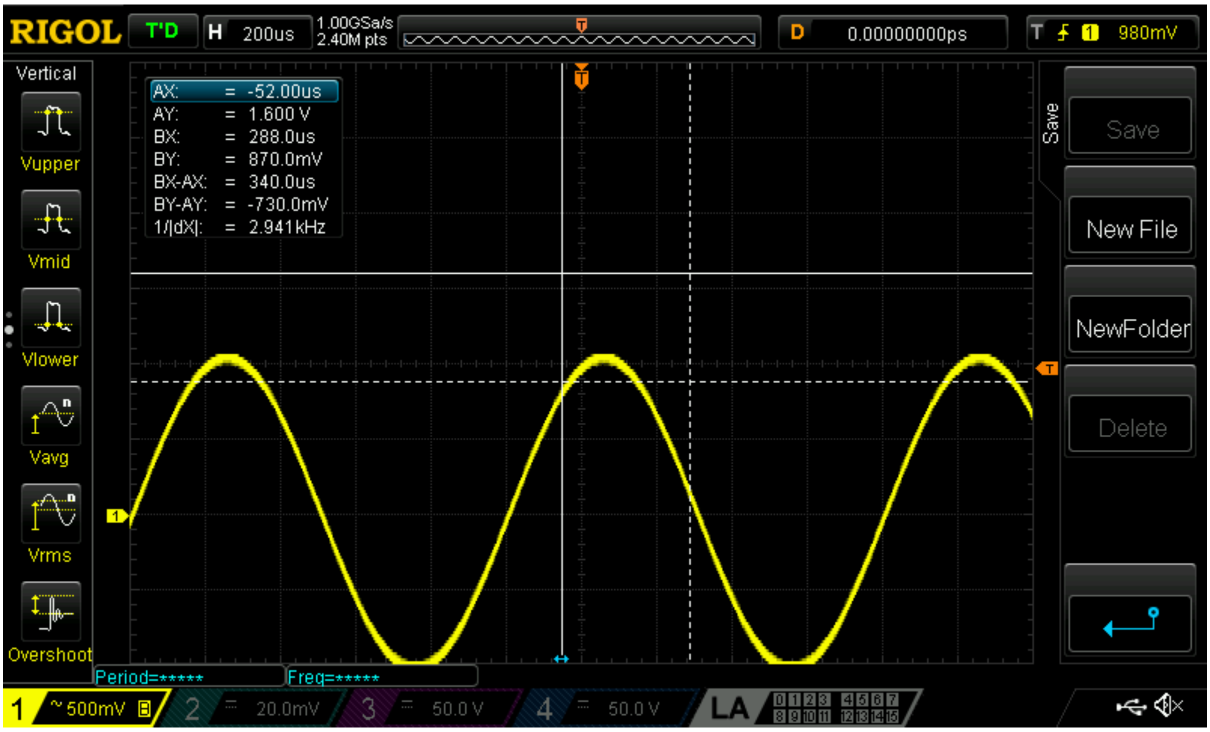


At 0 Vdc the graph is dropped down.



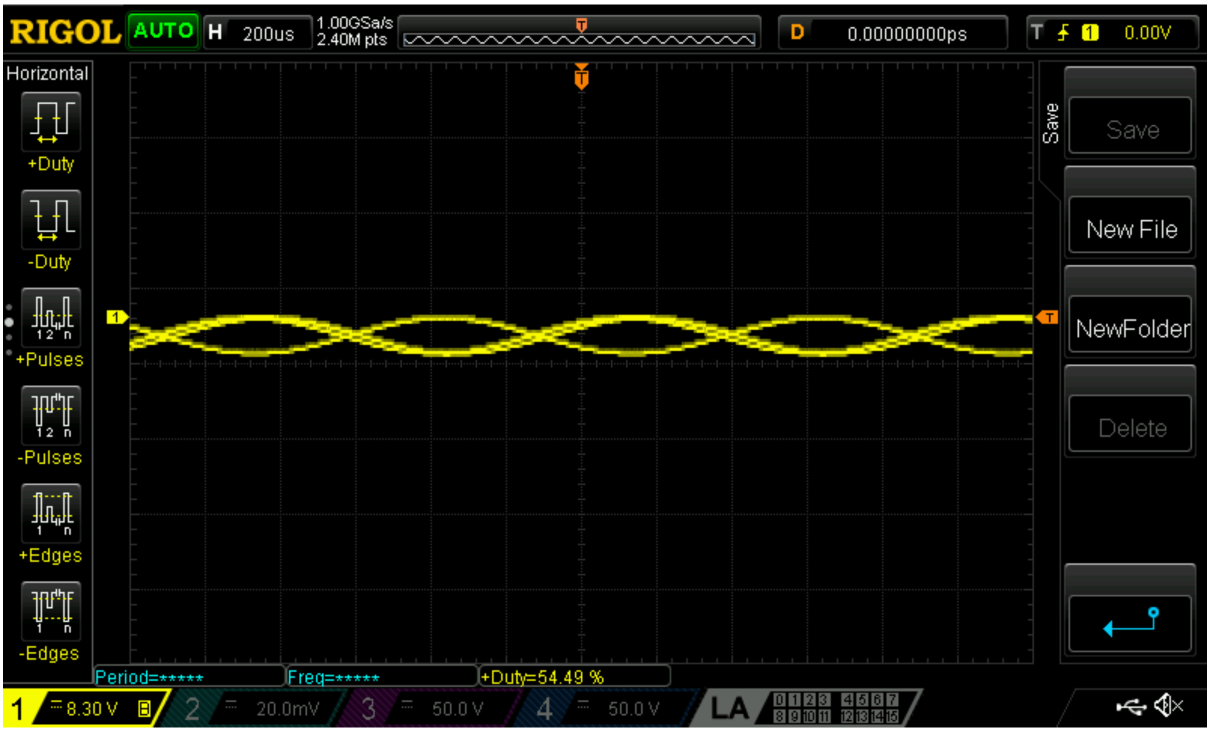
At 1 V dc the graph is moved up.

p) one image of an offset signal with scope's AC coupling (showing no offset)



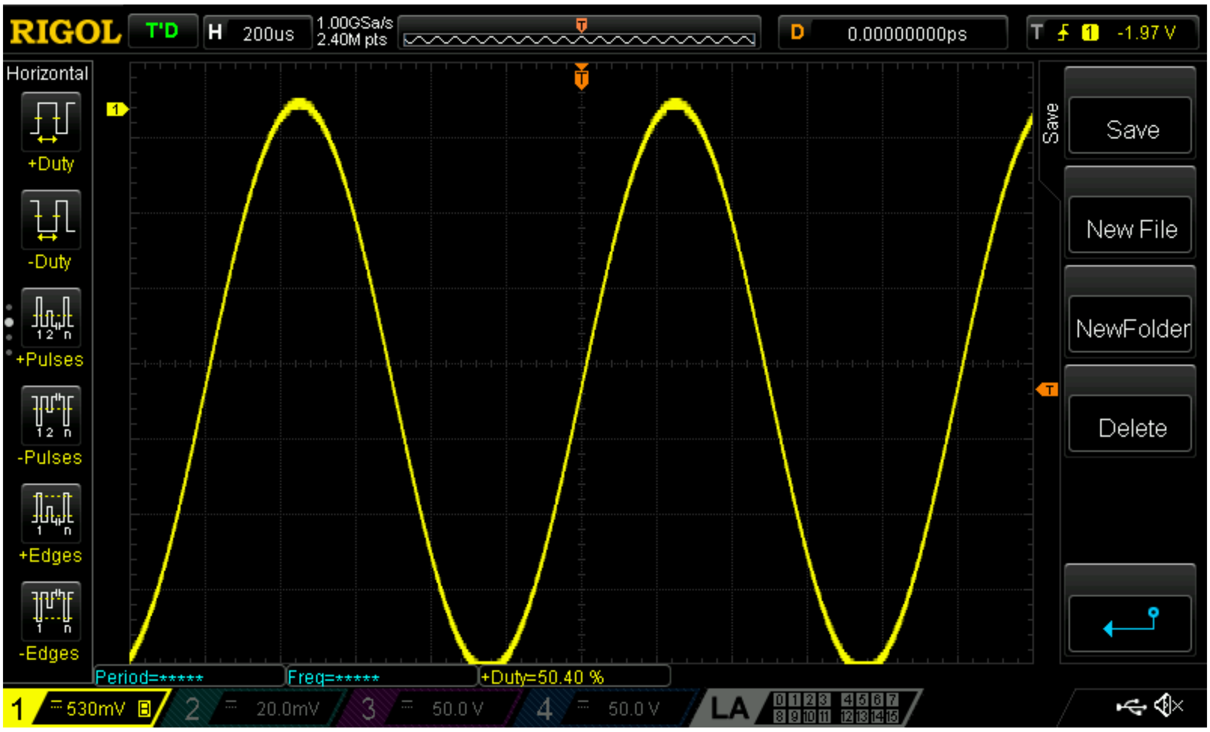
With the AC couple the graph position make a different

s) one image of a dancing wave without triggering

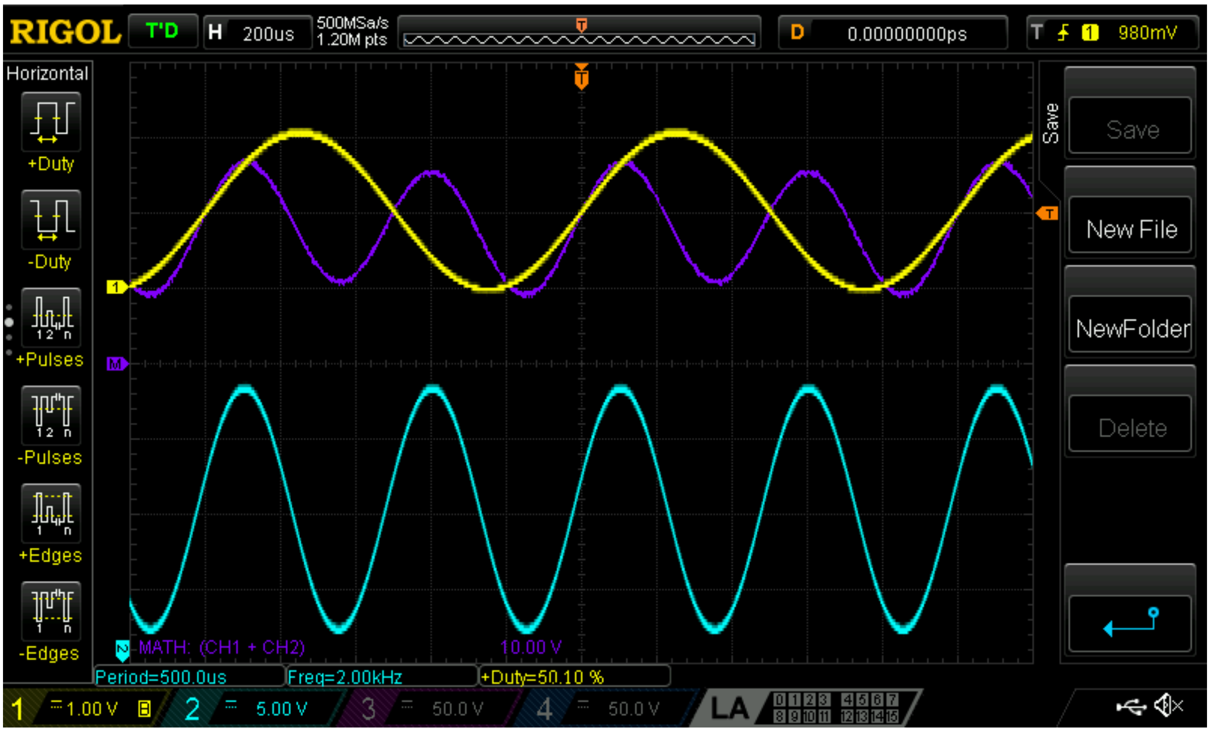


Without triggering we see the graphing moving spiral

u) one image of a stationary wave with proper triggering



y) one image of three waves under a MATH operation



z) one image of another three waves under a MATH operation