



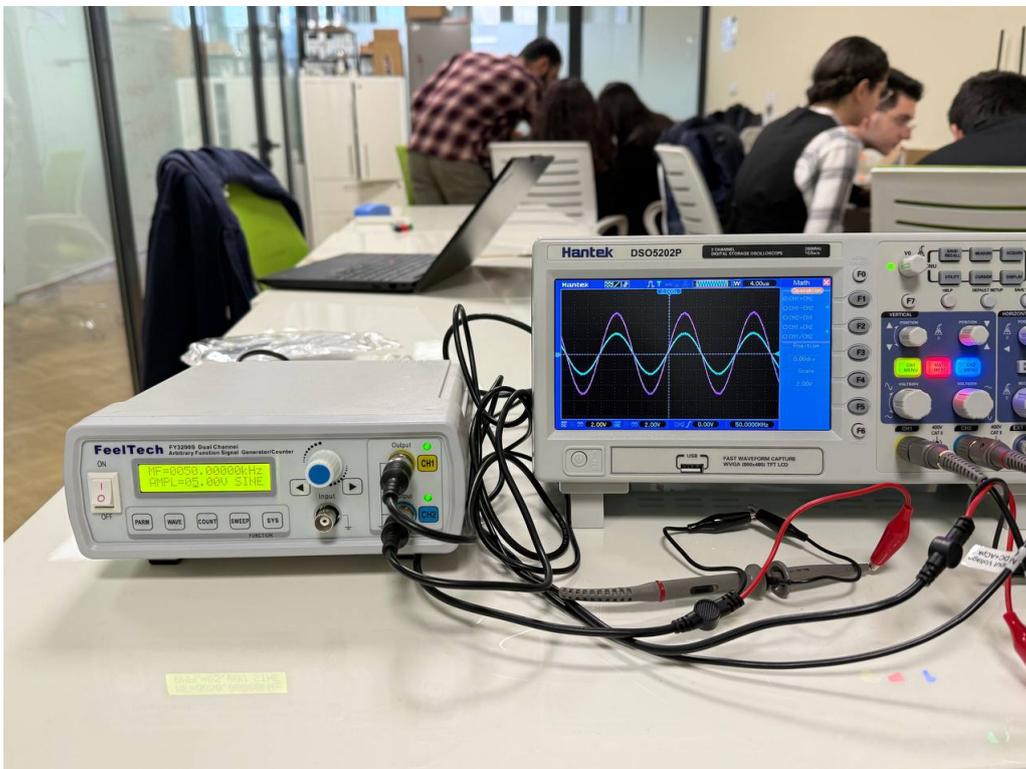
Digital version

Signal interference, Lissajous curve and propagation delay.

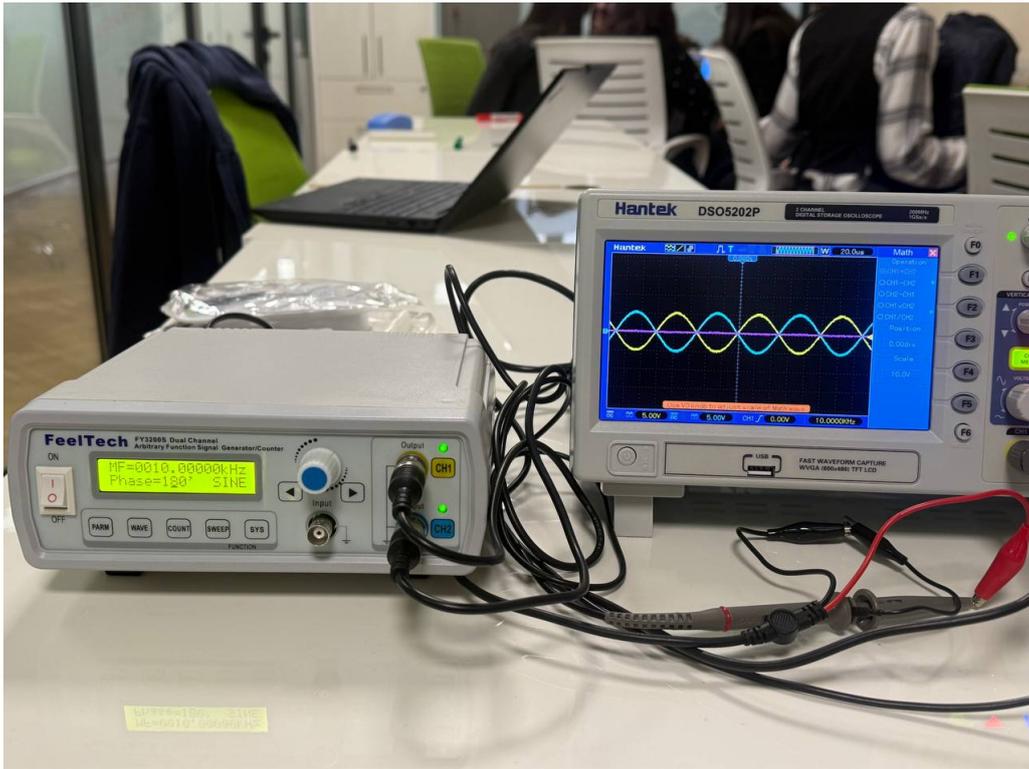
Mher Saribekyan A09210183

February 5, 2026

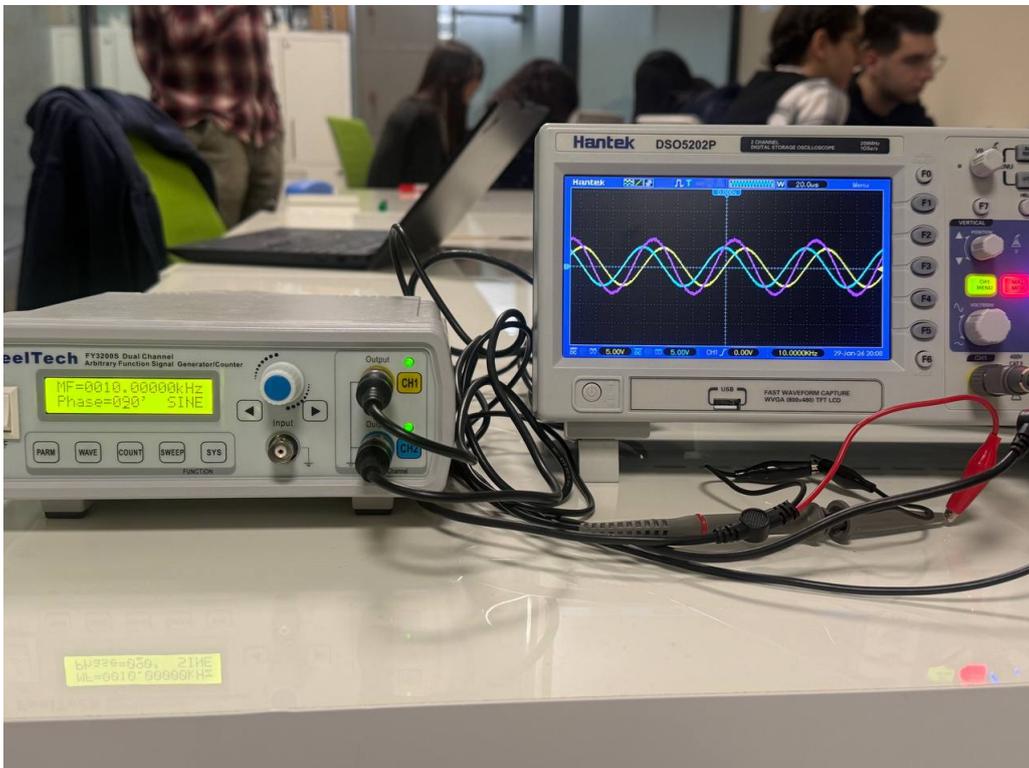
Math functions



Sum function of two identical $50kHz$ $5V$ pk-pk signals gives same frequency but twice the amplitude output.



Sum function of two identical $50kHz$ $5V$ pk-pk signals, phase of one is changed by 180 degrees, gives 0, as they cancel each other.

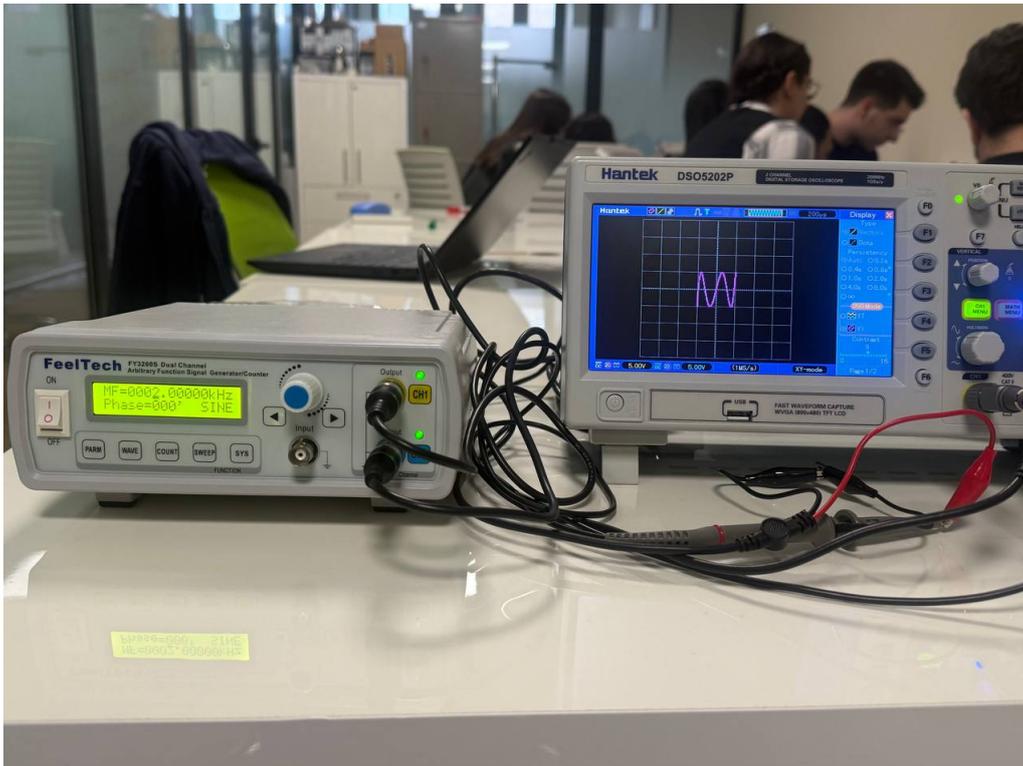


Sum function of two identical $50kHz$ $5V$ pk-pk signals, phase of one is changed by 90 degrees, gives a phased

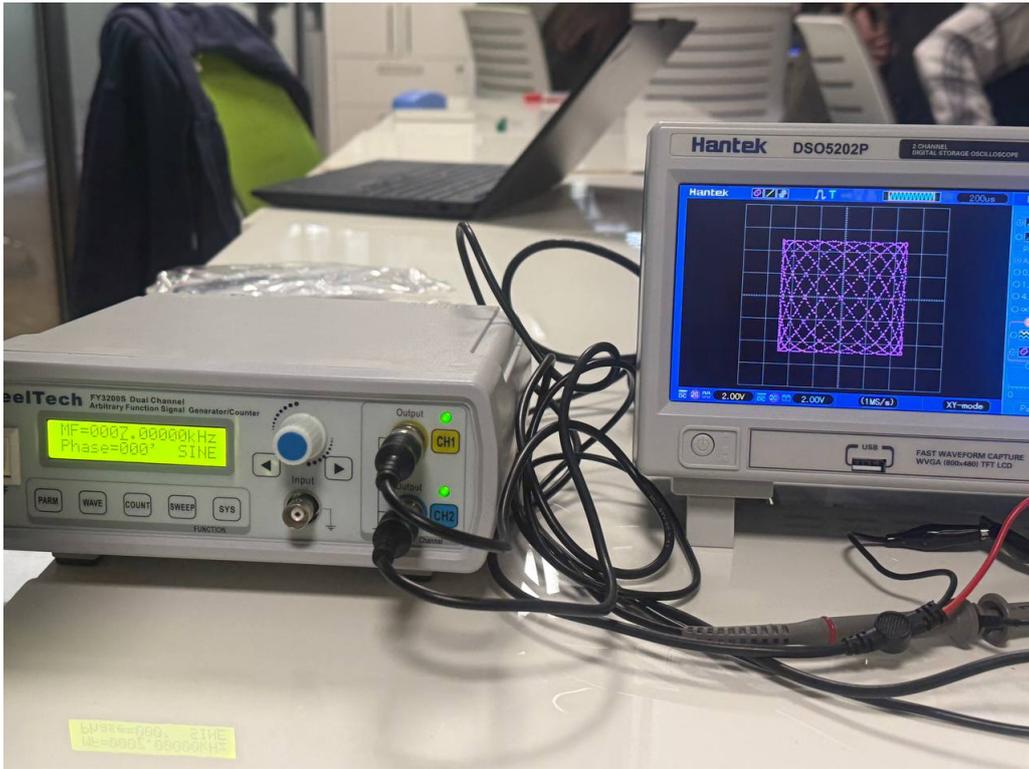
sine wave, which can be explained by the sum of cosine and sine formula. We get a larger amplitude sine, with a phase.

Lissajous curves

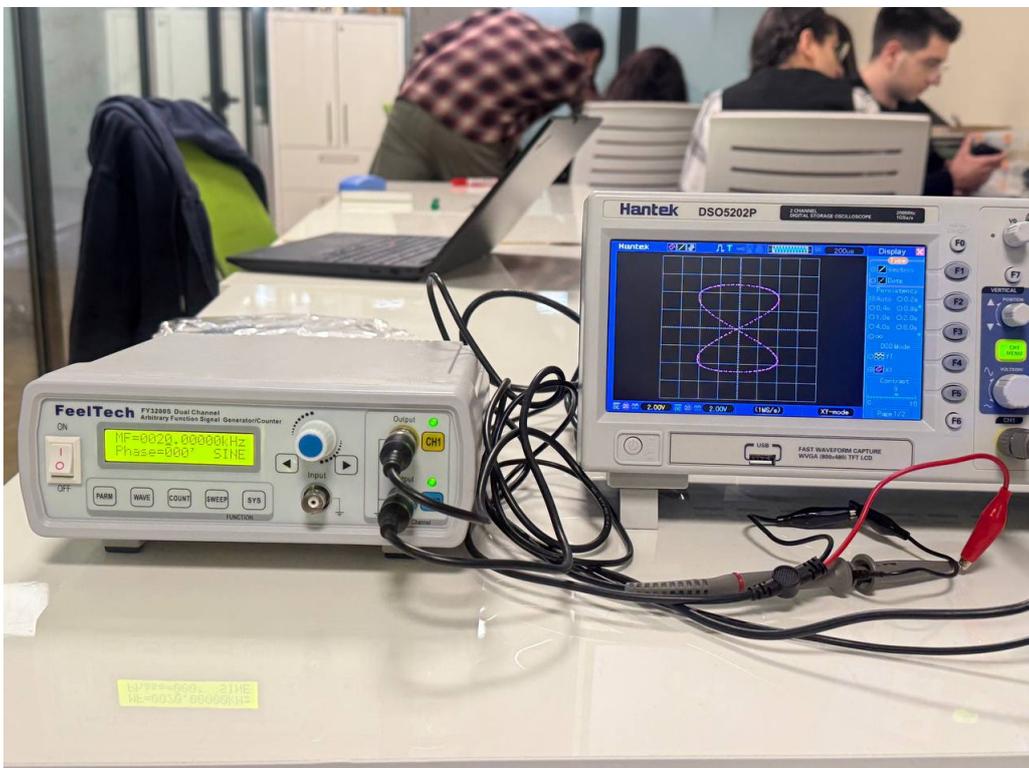
In these curves, the oscilloscope draws a curve in the x-y plane, where one coordinate is the voltage on one probe, and the other coordinate is the voltage on the other probe. The center is (0,0). It can be used for frequency and phase analysis.



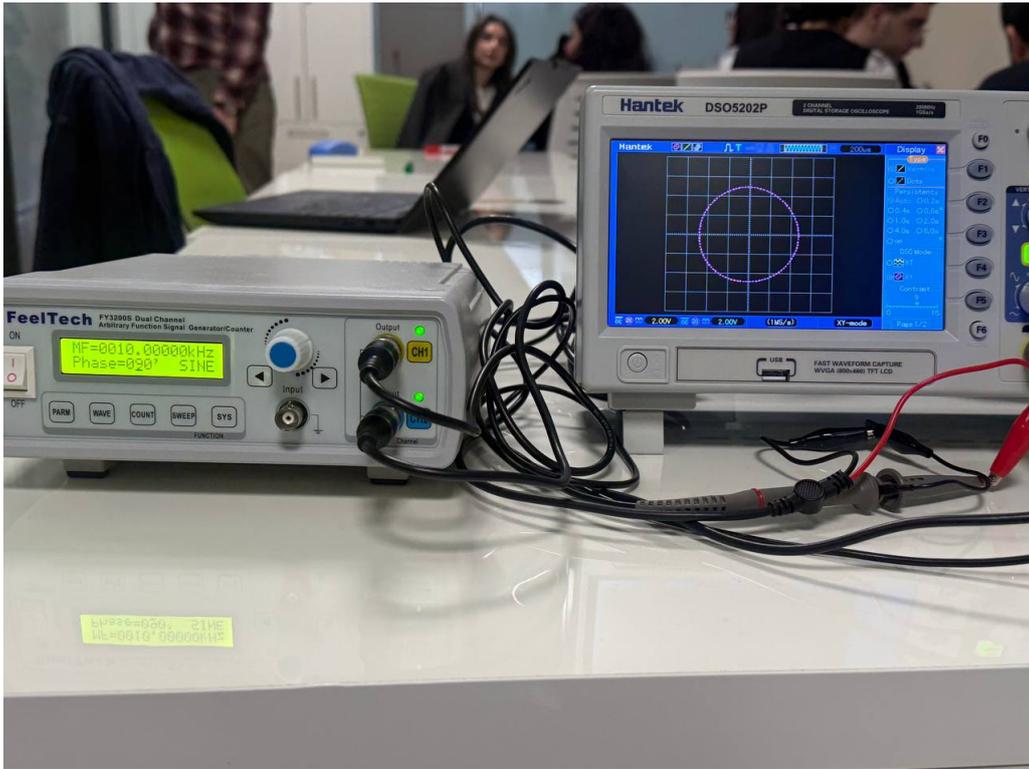
One signal is 10kHz , the other is 2kHz . While x goes from left to right, the y coordinate goes up and down five times, because one frequency is five times the other.



Frequencies are not multiples of each other, that's why the pattern has to repeat a few times (7 for one signal, 10 for the other) for the curve to close. Hence we have the above pattern.

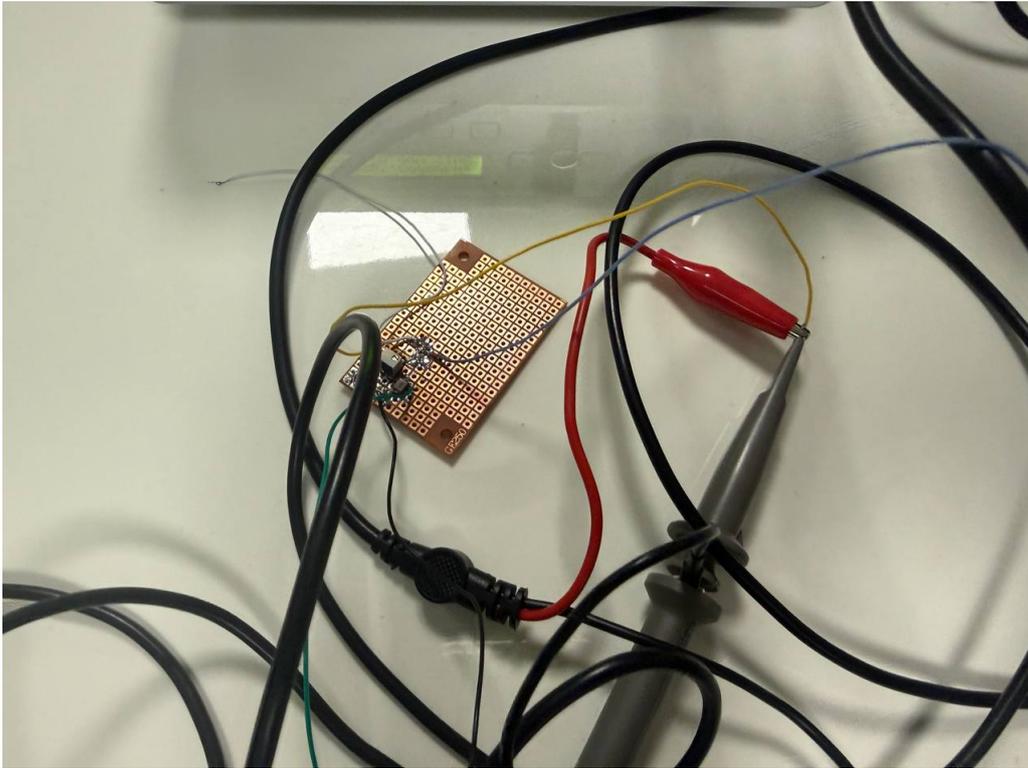


One frequency is twice the other frequency, that's why we get a closed curve and two "loops".

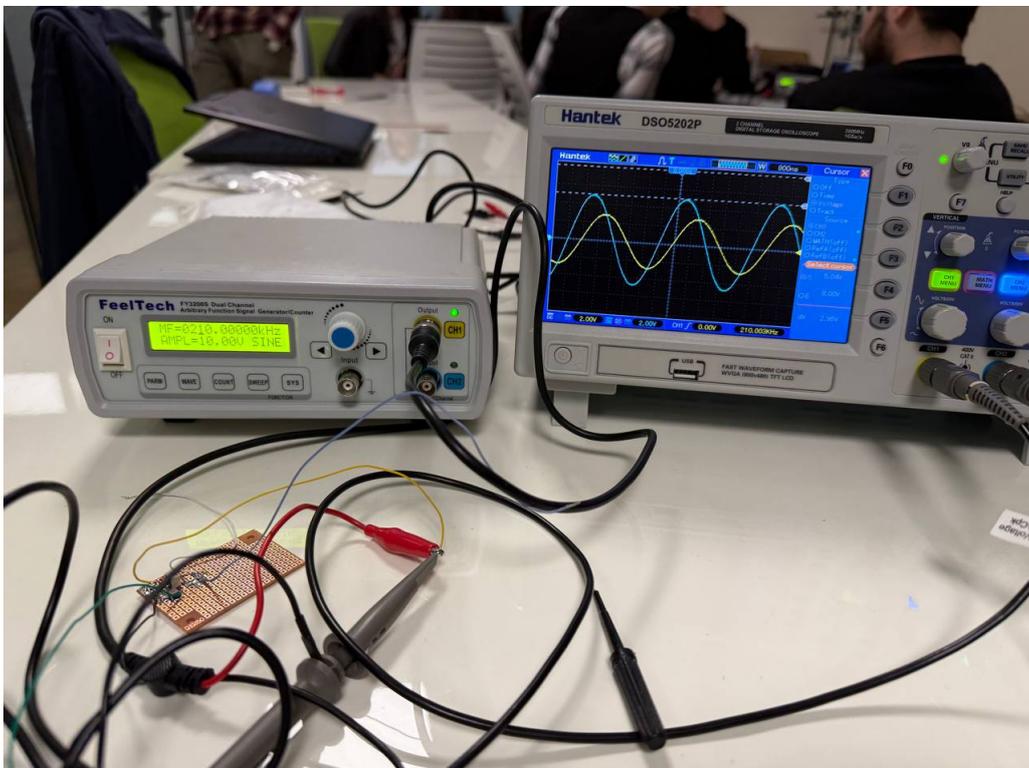


Identical input signal, with one signal phase shifted by 90 degrees. This gives sine wave on one probe and cosine on the other probe, which gives a circle, as the by the property of sines and cosines.

RC low pass filter



RC low pass filter was constructed with a series resistor and a capacitor connected to ground. The potentiometer was adjusted and the output was observed.



In this case, the input $210kHz$ is attenuated, the voltage is lower, however we also notice a phase shift (a delay) to the right.