GOAL- To measure the loop to loop cross talk between two loops and get an understanding of the principles of mutual inductance and what design features will reduce the common source of noise.

Measurement set up-

Firstly, the function generator was set up where the frequency was set as 10 kHz and the peak to peak voltage as 10v along with high impedance. We anticipated seeing the square waveform with the peak to peak 10 volts.

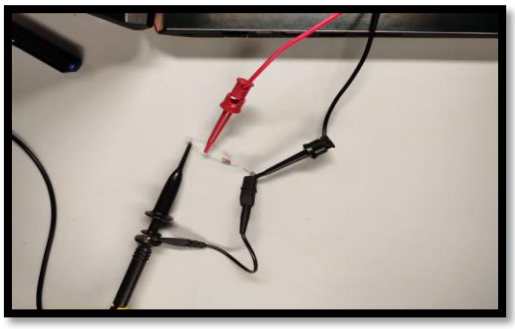
Now coming to the Thevenin's resistance measurement as being the 1st order system there will be a drop in voltage when there is some load which was not the case in ideal solutions where Vth= VL; hence the thevenin's resistance in the first order system will be -:

RL*((Vth-VL)/VL)

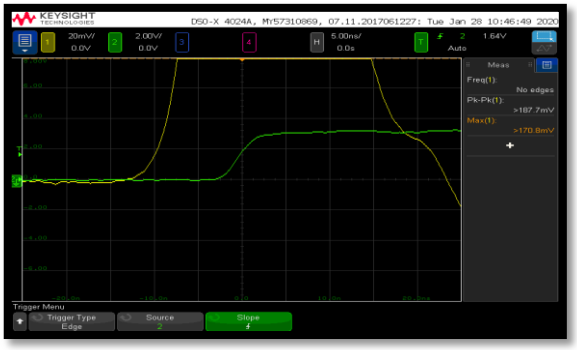
Hence to provide some load we can have the power consumption P<0.2 watt where P= V^2/R; so in my case the voltage was around 4.957 volts and taking R = 220 ohms with a voltage drop of 4 volts. The minigrabber cable was connected from the function generator and 10 x probe was connected with the scope along with the desired resistors to get the thevenin's resistance.

So Rth = 220*(4.957-4.0/ (4.0)) -> 52.6 ohm

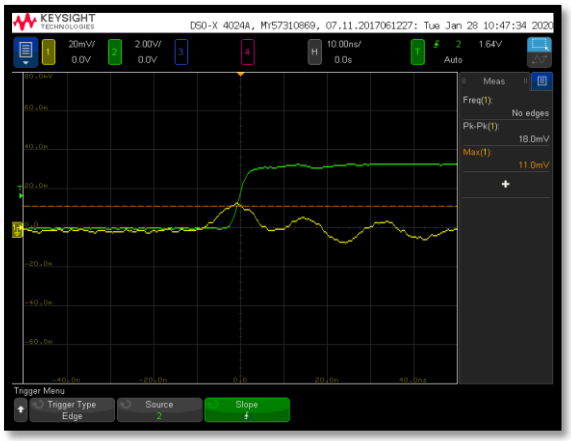
And further taking another value of R= 100 ohm, the thevenin's resistance was 52.5 ohms where the voltage drop across load was 3.25volts. Here the values are close to the output values of the thevenin's resistance of the function generator at high impedance state.



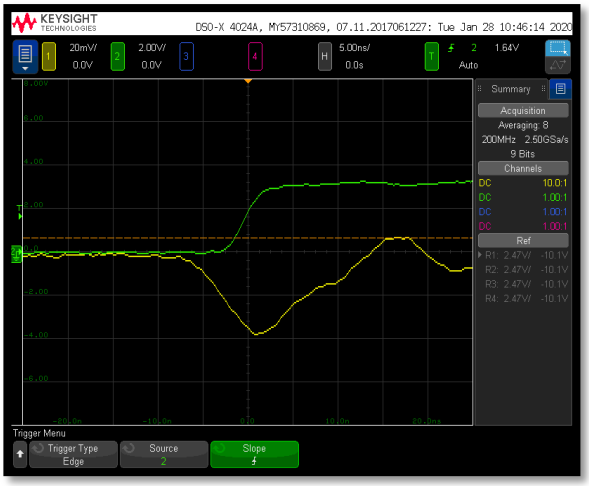
Moreover, to measure the loop to loop cross talk in our measurement setup, the function generator has been set up correctly with the required parameters of 10 KHz frequency and 10 volts peak to peak. Then with the help of the minigrabber cable the function generator was set as the aggressive loop and in case of the scope the 10x probe was set as the victim loop by shorting the ground ends. The sync signal was connected to channel 2 of the scope to find the signal and both the signals were synchronized. Lastly performance of different loops variations are done to find different signatures due to mutual inductance.

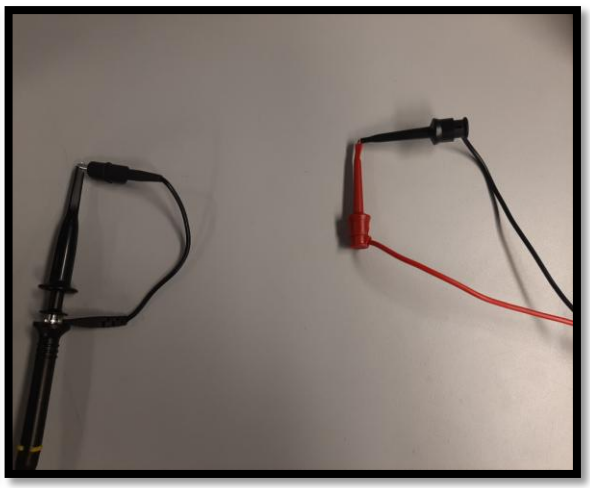


Loops overlapping



Small loops





Large loops apart

The reason behind the signature in case of large loops apart is because some amount of current is flowing in both the circuits which is producing magnetic field induction in both the circuits and finally leading to the signatures. The signatures can also go other side if the polarity of the loops is reversed. Similarly in case of overlapping loops there is an inductive effect between two loops which is providing that deviation on overlapping. Apart from that if we place the loops very far apart or reduce the cross-section of both the loops with our hands then there will no such big deviation or the noise will be reduced in the signatures as well.