

Lab #4

1. Using Arbitrary waveform generator (AWG) Ch. 1 and measuring them using Digitizer Ch. 1, generate:
  - a. A Square pulse with a width of 50 ns and an amplitude of 1 V
  - b. A gaussian pulse with a duration of 50 ns and an amplitude of 1 V
  - c. A pulse that rises like a gaussian for 10 ns, and plateaus for 40 ns, amplitude of 1 V
  - d. A 50 MHz sine wave which lasts for 50 ns.
  - e. Compare these to the ideal pulse shape
2. Now send separate drive and readout pulses. From AWG Ch.1 send a 50 ns, 1V square pulse (drive) to Digitizer Ch1. From AWG Ch. 2, send a 1 us, 1 V square pulse (readout) to Digitizer Ch2. Make sure the readout pulse starts after the drive pulse
  - a. **Rabi oscillations:** Vary the pulse width from 1 - 100 ns.
  - b. **T1 decay:** Vary the time delay between 0 - 100 ns for a fixed drive pulse width.
  - c. **Ramsey interference:** Send two drive pulses and vary the spacing between pulses from 0 - 100 ns.
3. Why would it be bad to use short pulses to drive a qubit? What are the Fourier components of a square pulse?