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ECE 231 Lab 3
PWM and Timestamping on BeagleBone Black

PART I: Jitter Distribution Plots

Figure 1b. Jitter Distribution at 1Hz & 50% Duty Cycles

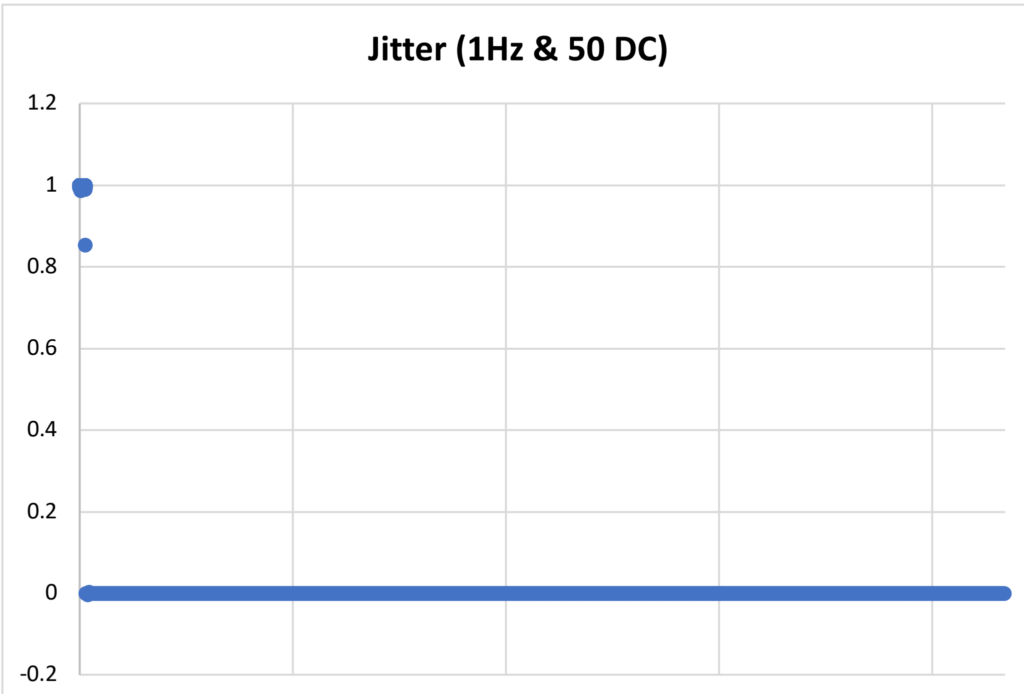


Figure 1b. Jitter Distribution at 1Hz & 50% Duty Cycles between -0.0003 and 0.0003

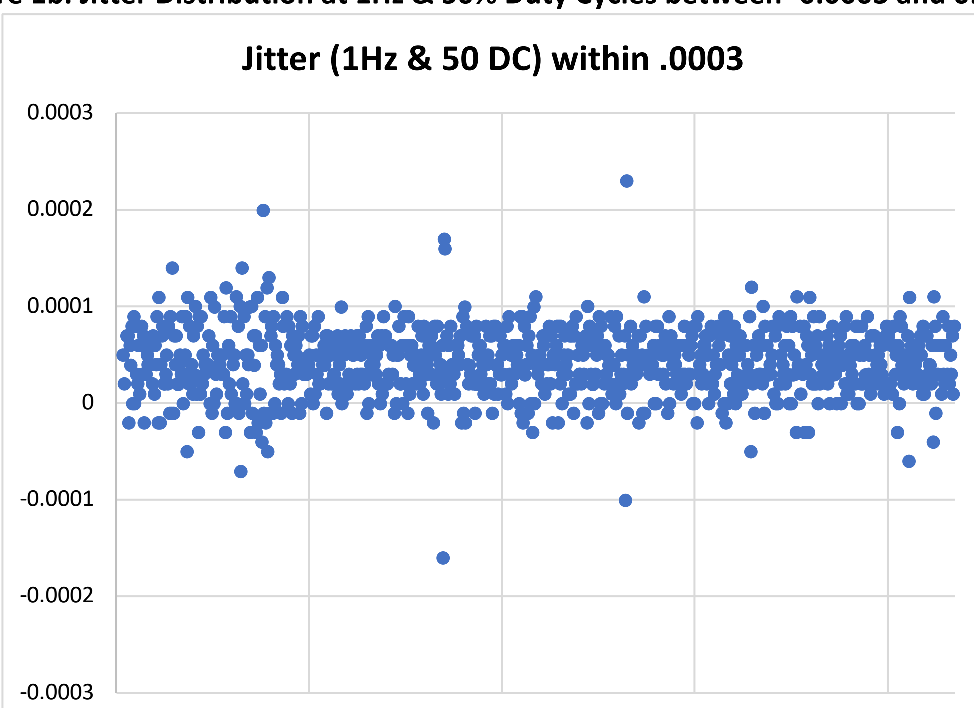


Figure 2a. Jitter Distribution at 100Hz & 50% Duty Cycles

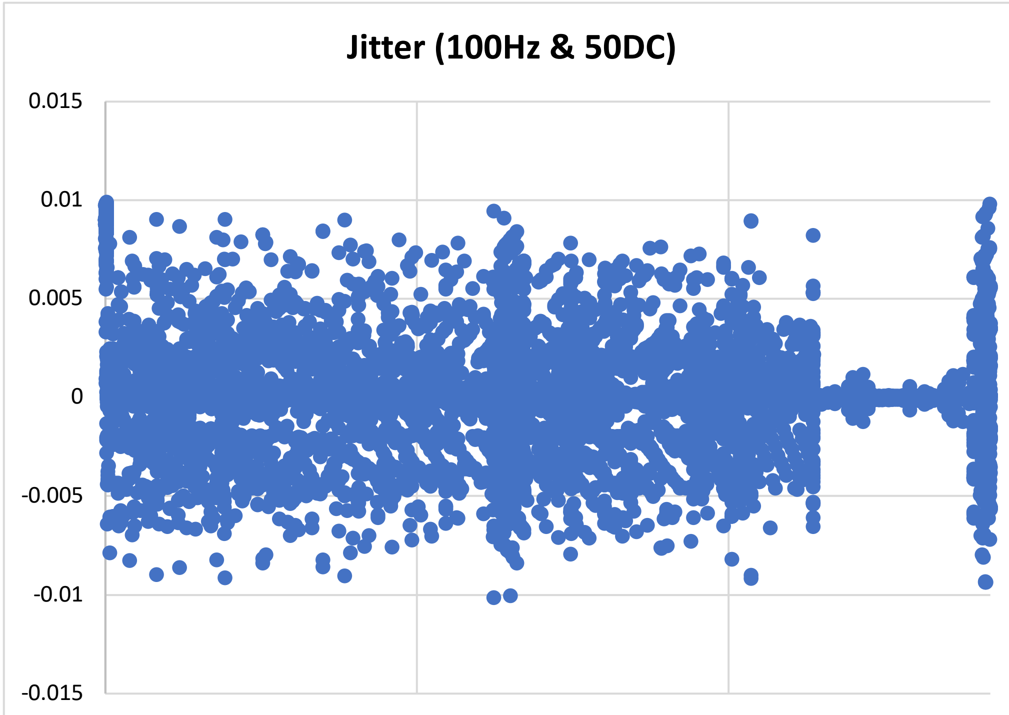


Figure 2b. Jitter Distribution at 100Hz & 50% Duty Cycles between -0.01 and 0.01

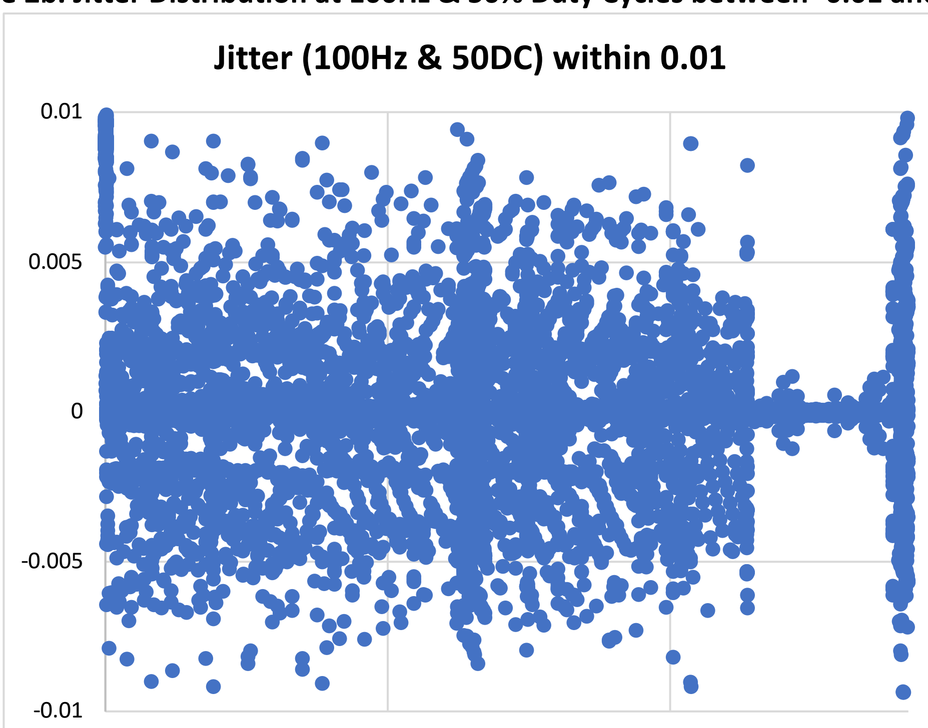
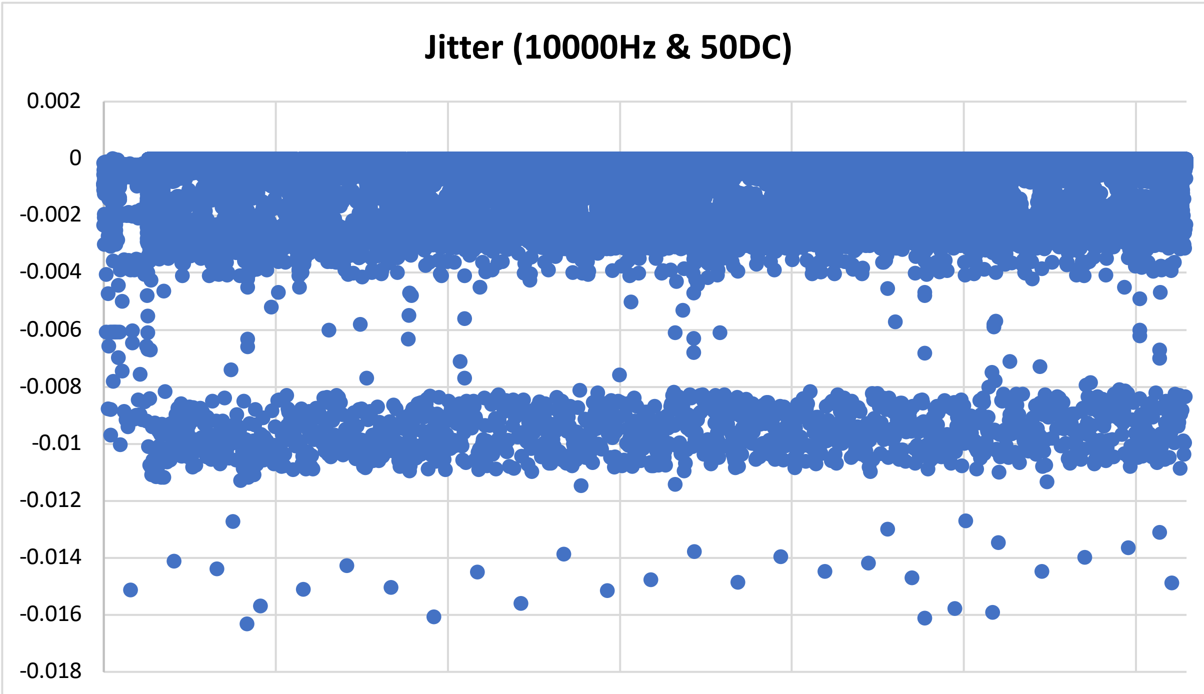


Figure 3. Jitter Distribution at 10000Hz & 50% Duty Cycles



Part II: Jitter Distribution Mean and Standard Deviation

Frequency:	**1 Hz**
Mean	0.933750646
Standard Deviation	0.247678329

Frequency:	**100 Hz**
Mean	0.000166095
Standard Deviation	0.001488139

Frequency:	**10000 Hz**
Mean	-0.000120099
Standard Deviation	-0.000120099

Part III: Quantitative Analysis

Jitter is the variation in delay, and in this case, we are testing the jitter of the timestamp function. Propagation is a factor that effects jitter. However slightly, the length of the wire may increase the jitter if it is a poor conductor or if the wire is exceedingly lengthy. Jitter may also be caused by an embedded system having a poor crystal, or a crystal in poor operating conditions. If the crystal is unstable and unreliable, it's oscillation frequency will be off thereby throwing off the clock and creating jitter. Fast clocks are also not as reliable as slow clocks, which I learned last lab when I had to do extra clock divides to get the timer working properly. Code efficiency is also another way to reduce jitter in our case. The system can only do what it's told as fast as its being told to do so, and that heavily relies on how long it takes to run any given code. An example of this would be a getSize() method, where you can implement it using a size variable that get incremented and decremented and so is stored, or you could traverse a whole data structure to get the size.

Changes that can be made to reduce jitter include minimizing distance of propagation and increasing quality of wires. Having a good stable crystal and clock source is also important as our trigger code checked for a clock edge. Having efficient code is the last element to reducing jitter as computers are only as fast as their brains.