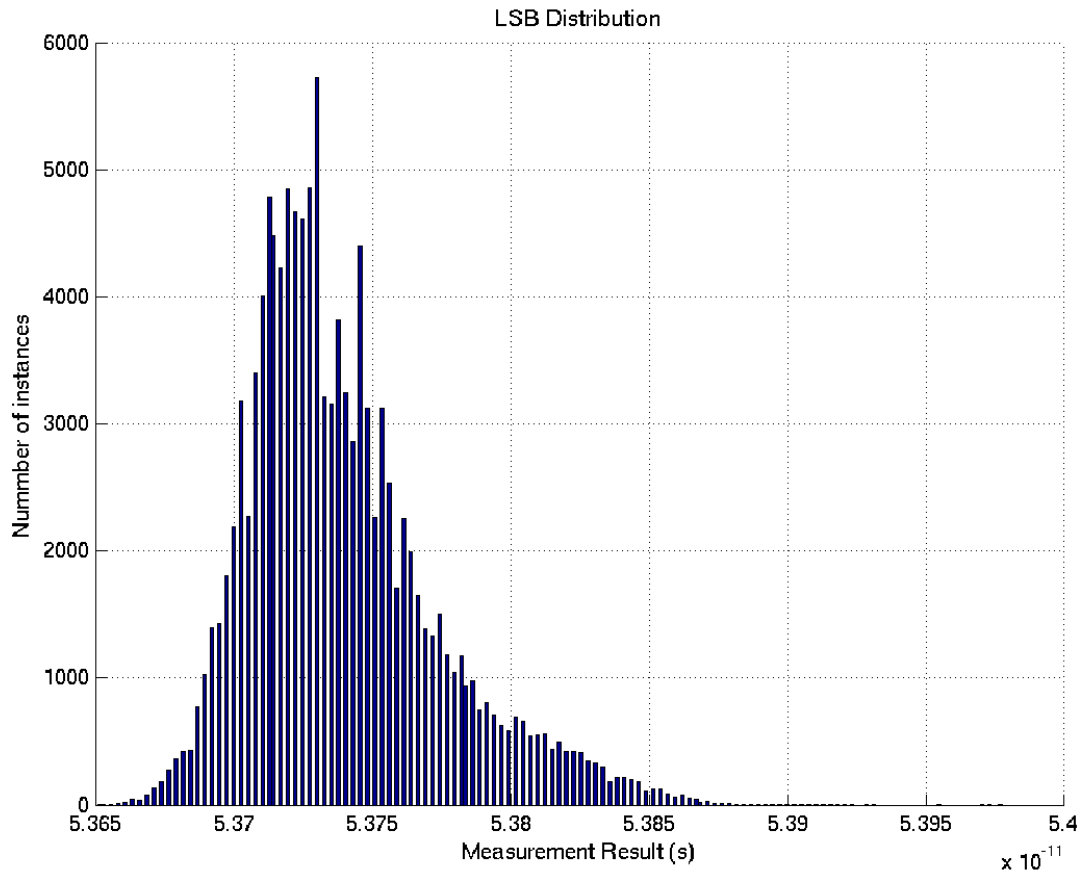


Both questions are related to the LSB changing over temperature. If the temperature changes, even slightly, the internal ring oscillator changes frequency, which affects the normalized LSB distribution, as shown below. This effect translates directly to the measurement results. If the temperature can be maintained more constantly, the distribution should be more normal. Alternatively, using only a single calculated LSB result will show a more normal distribution but the effect of temperature on the measured time will no longer be calibrated.

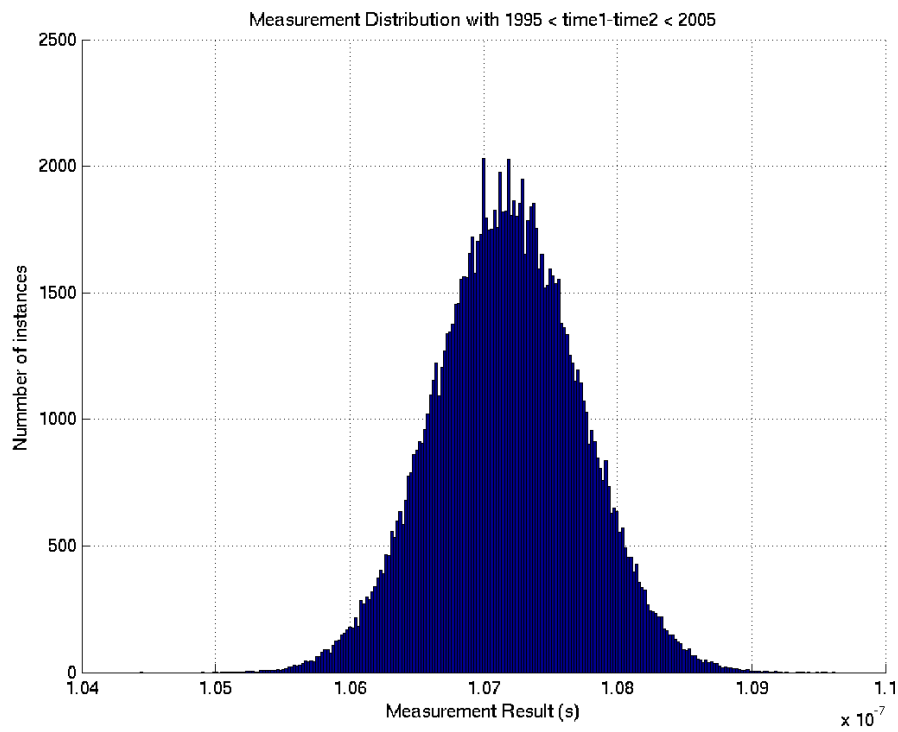
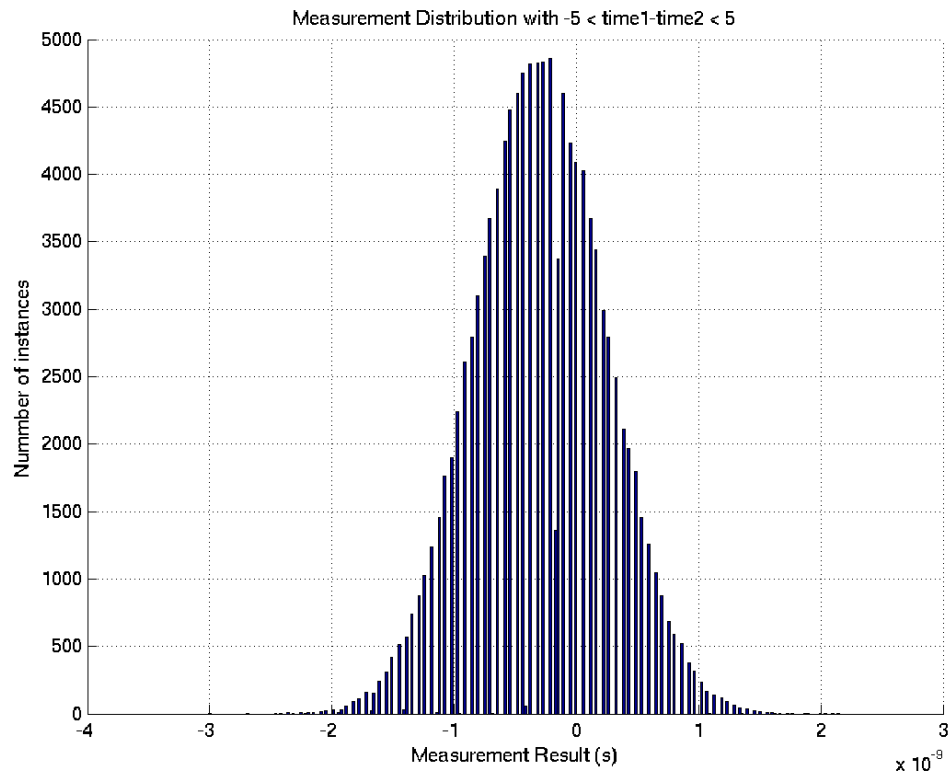


The reason for this “leaning” effect on the measured is due to the normLSB variation on the calculation:

$$\text{TOFn} = \text{normLSB}(\text{TIME1} - \text{TIME2}) + (\text{CLOCK_COUNTN})(\text{CLOCKperiod}).$$

If $\text{TIME1} - \text{TIME2}$ is large, this amplifies the effect of the variation in LSB. If $\text{TIME1} - \text{TIME2}$ is small, as in the case where measurements are integer multiples of the clock period, the bins of the LSBs are less merged.

Take two examples, in the first case, $\text{TIME1} - \text{TIME2}$ is in the range -5 to +5. In the second case, $\text{TIME1} - \text{TIME2}$ is 1995 to 2005. The variation in the ranges is exactly the same.

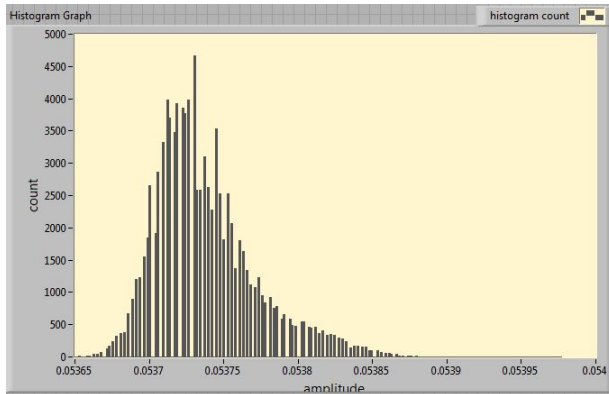


Some TDC7200EVM based measurements summarized below

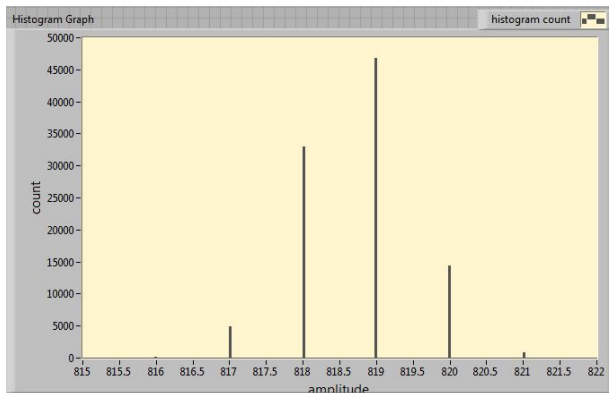
Tektronix AFG3102 (1GS/s, 100MHz, 200ps rms jitter) used as the source for Start/Stop inputs

Example 1: Mode 2, TOF = 544.2ns, Cal Cycles = 10, 8MHz onboard clock

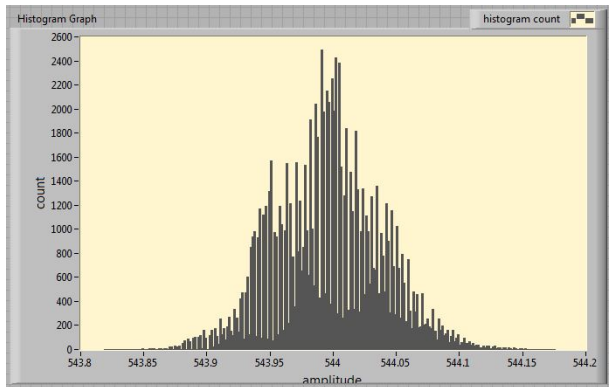
LSB Distribution



Time1-Time2 Distribution

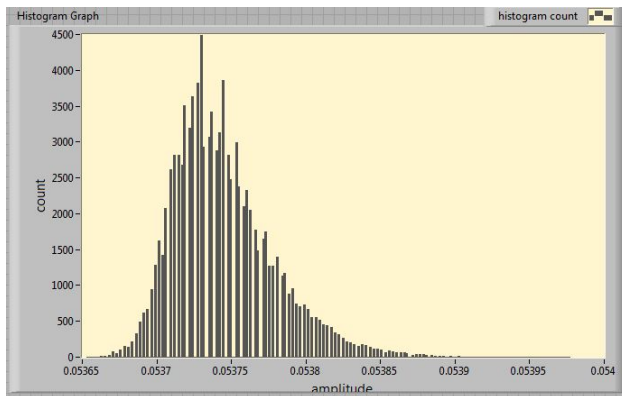


TOF Distribution

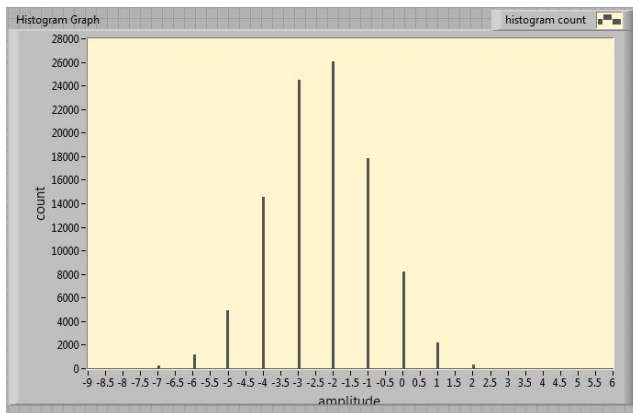


Example 2: Mode 2, TOF = 5us, Cal Cycles = 10, 8MHz onboard clock

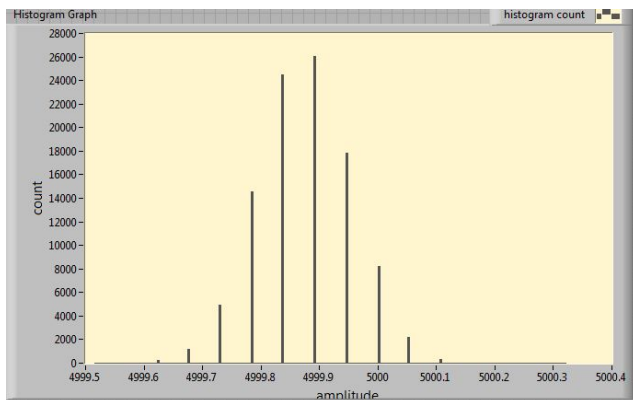
LSB Distribution



Time1-Time2 Distribution

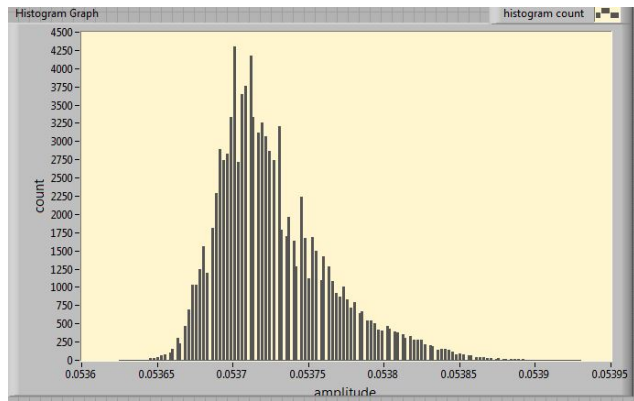


TOF Distribution

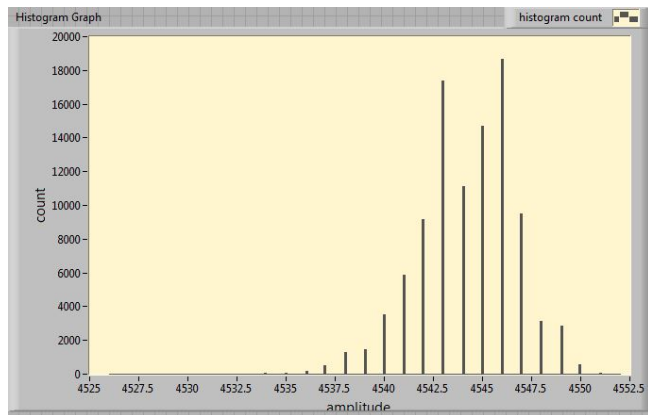


Example 3: Mode 1, TOF = 244.2ns, Cal Cycles = 10, 8MHz onboard clock

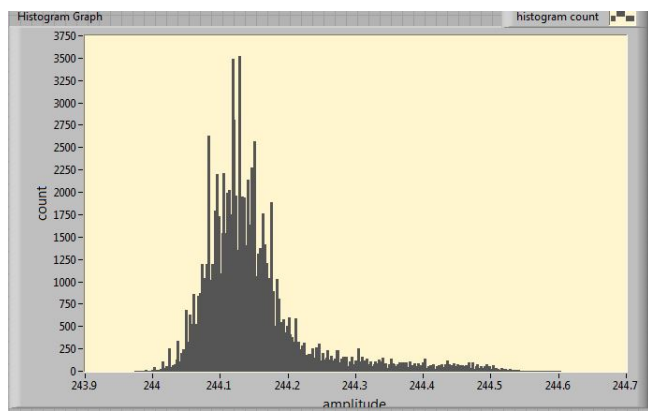
LSB Distribution



Time1 Distribution

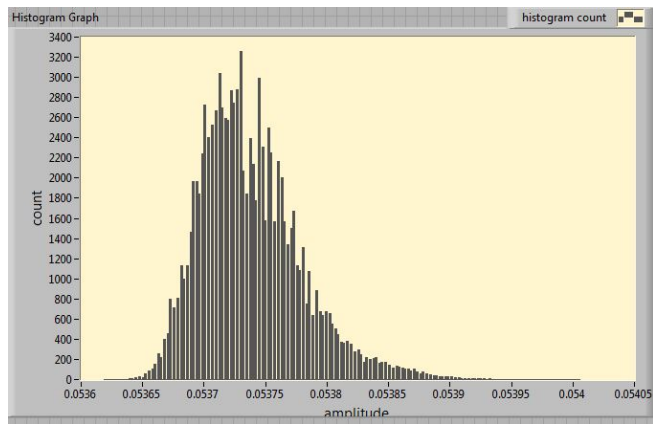


TOF Distribution

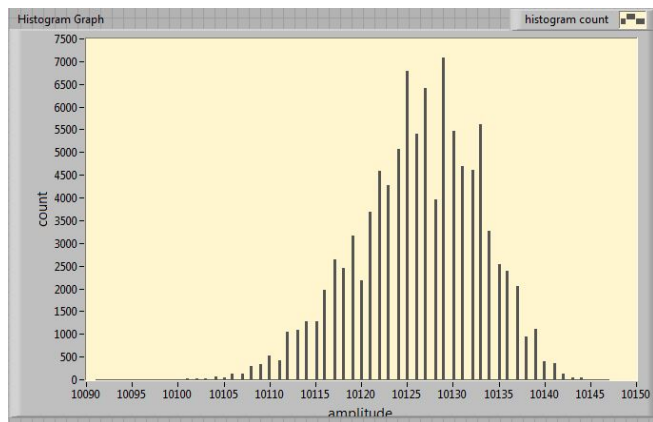


Example 4: Mode 1, TOF = 544.2ns, Cal Cycles = 10, 8MHz onboard clock

LSB Distribution



Time1 Distribution



TOF Distribution

