

Jitter Measurement Tool Kit for Clock & Simple Clock-Data Analysis

LAB WM-787

February, 2011

Summary

Jitter Kit option makes it simple and easy to understand basic system jitter performance of clock signals and clock-data timing activity.

Evaluating system jitter performance can consume a great deal of an engineer's test and validation time. LeCroy's Jitter Kit (JitKit) option makes it simple and easy to understand basic system jitter performance of clock signals and clock-data timing activity.

JitKit features provide direct display of jitter measurement values, for both clock and clock-data timing signals. Jitter parameter readouts include maximum positive and negative deviations, worst case deviation, peak to peak, and standard deviation on more than 25 jitter related parameters. It provides plots which show the time, frequency and statistical domain views of jitter. Time correlated views of input signals and jitter track functions allow easy diagnosis of jitter sources, an overlay view provides an intuitive and accurate view of jitter and how it affects a signal. Figure 1 shows an example of the four jitter views for a 100 MHz clock.



Figure 1: Jitter Kit analysis of a 100 MHz clock signal including jitter measurements and views of jitter in the time, frequency, and statistical domains plus the jitter overlay

The QuickView button in the lower left hand corner of the Jitter Kit dialog box provides an instant setup. This includes the four views of jitter, and the key jitter parameters. Manual jitter measurement setup is guided by the simple flow diagram in the Jitter Kit dialog box.

In the example, measurement parameters for Period @ level, Time Interval Error @ level (TIE), and Cycle to cycle period jitter are being displayed along with the Duty cycle @ level, Width @ level, Rise@level, and Frequency @ level. The measurement table includes readout of the mean value, standard deviation (rms jitter), peak to peak jitter, maximum positive deviation from the mean, maximum negative deviation, and the maximum or worst case deviation. It also reports the number of measurements included in the statistics.

The jitter plots shown include the histogram of TIE, the JitterTrack of TIE which shows TIE as a function of time, the JitSpectrum (FFT) of the JitterTrack showing the frequency distribution of jitter values, and the JitterOverlay which is a persistence display of input waveform on a cycle by cycle basis. The Jitter Spectrum view shows two peaks, one at 9 kHz and its second harmonic at 18 kHz. The JitterTrack of TIE shows this in the form of a barely discernible periodicity. Using another feature of JitKit, the persistence trace mean, we have smoothed the JitterTrack to reveal the underlying periodic jitter component. Cursors, indicated by vertical dashed lines, mark the 110 μ s period. It is worthwhile to note that in order to see jitter with such a low frequency we have used 20 Mpoints of acquisition memory, despite the large amount of data being processed LeCroy's XStreamII fast analysis keeps the update rate quick and responsive.

Figure 2 shows the Jitter Kit Views for a 156.25 MHz clock with spread spectrum clocking enabled. The JitterTrack of TIE shows the variation of the phase of the signal as a function of time. The cursor on the JitSpectrum view marks the fundamental frequency of the modulation applied to the clock. The jitter histogram shows the distribution of phase values. Of the greatest interest is the JitOverlay which aligns multiple cycles of the clock waveform on a single display showing the variation of the waveform edges as the clock signal is modulated. This provides a very intuitive view of the modulation that is applied to the clock.

In Figure 3 the input components (clock and data) for the setup time measurement are shown along with the JitterTrack of the setup time measurement. The negative going peaks in the JitterTrack indicate setup times with lower values. Use the Zoom of Jitter Source 1 to center one of the negative peaks on the centerline of the display. Now press the zoom 'In' button to expand the display horizontally. Note that all three traces expand simultaneously.

Keep zooming in until you can see the clock/data pair having the low setup time value, shown in figure 5.

Using this technique you can observe the time correlation of any timing measurement between the Jittertrack and the actual time shift on the source waveforms. This not only illustrates the ability to time correlate source waveforms to jitter but also shows a dual channel jitter measurement.



Figure 2: The four Jitter Kit views for a spread spectrum clock and the Plot setup dialog box



Figure 3: Viewing the input clock and data sources for the setup time measurement along with the JitterTrace of Setup time

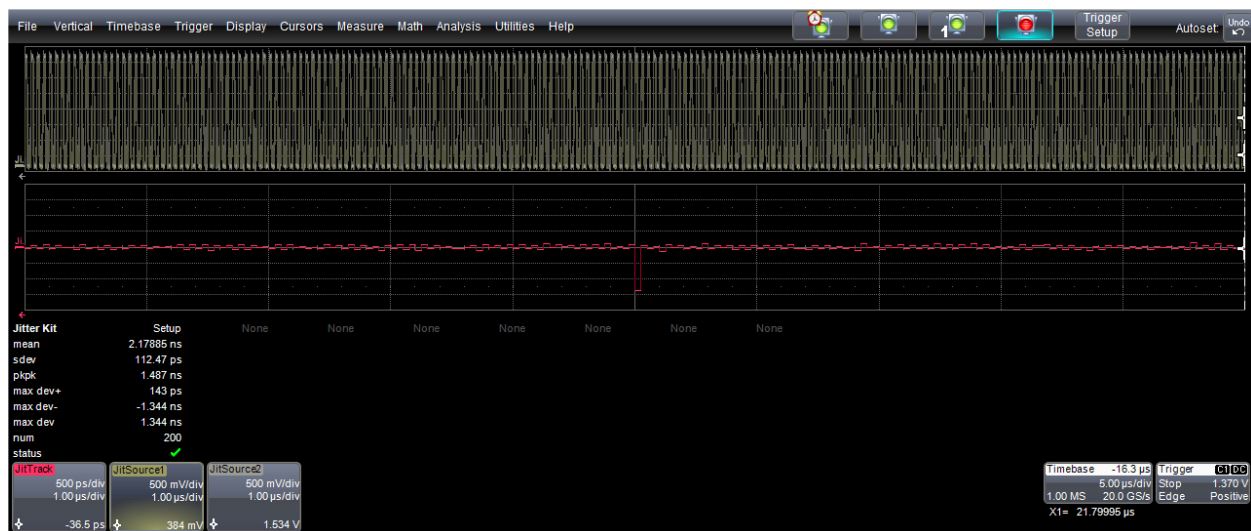


Figure 4: Pressing the Horizontal zoom “In” button expands all traces horizontally



Figure 5: At this point you can see the clock/data pair with the low setup time value

As you can see from these few examples the Jitter Kit option combines all the jitter analysis power of a LeCroy oscilloscope into one convenient place and provides measurements values most needed for clock and clock-data analysis.