LeCroy Applications Brief No. L.A.B. 738

SSC Measurements

More Spread Spectrum Clock Measurements Using A DSO

Spread Spectrum Clocks (SSC) are becoming more evident in electronics systems. Frequency modulating the clock with a known modulation waveform spectrally spreads the frequency spectrum of the clock in order to reduce the peak spectral power. This reduction in peak power levels is required in order to meet more stringent electromagnetic interference standards. The correct operation of systems employing this SSC technology requires knowledge of the actual modulation characteristics.

LeCroys J-260 Jitter and Timing Analyzer makes it easy to quickly extract information from the SSC waveforms. In figure 1 the JitterTrack ™ of period (trace B) has been used to view the variation of the clock period with time. It is obvious that the modulation is nominally triangular in shape. However, high noise level in the resulting measurement makes it difficult to reliably determine the modulation frequency. By employing the JitterTrack of Time Interval Error (TIE) , it is easy to obtain a very clean view of the instantaneous phase variation of the signal. The instantaneous phase is also periodic at the modulation frequency and yields a reliable frequency measurement, shown in the parameter readout under the waveform display graticule.

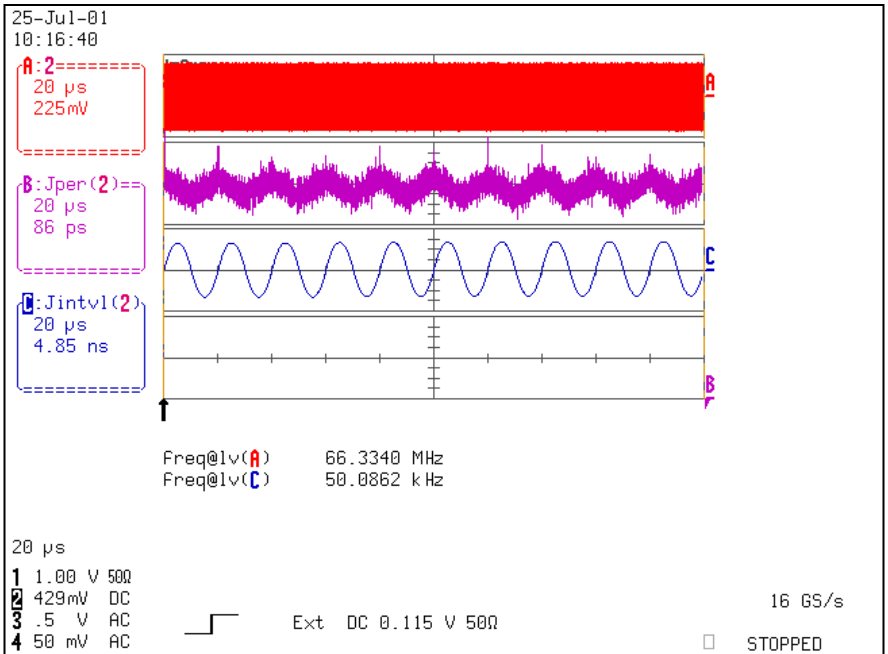

Figure 1 JitterTrack functions are used to investigate spread spectrum clock modulation characteristics. JitterTrack of Time Interval Error reads modulation frequency

Both the frequency of the clock and the modulation are being read out.

The TIE function, which measures the time difference between the edges of the acquired waveform relative to an ideal clock, can be though of as the integral of the instantaneous frequency of the clock signal. Since the clock is frequency modulated with a triangle waveform the phase change has a parabolic shape. The cumulative nature of the phase measurement results in a lower noise level.

The Fast Fourier Transform (FFT) can be applied to measure the effective reduction in the peak spectral power levels due to spectral spreading. Figure 2 shows the steps in setting up this measurement. Trace B is the FFT of the acquired signal (top trace). The FFT is averaged using the FFT average function (Trace C). This process is performed for both the normal clock at 66.67 MHz and the spread spectrum clock. The first measurement is stored in one of the scopes internal memories (trace D)and is compared with the second measurement (trace C).

In figure 3 the two spectra are overlapped on a single grid to show the reduction in peak power levels due to spectral spreading. The difference, in this case, is about -7 dB.

While these measurements can be made on any LeCroy scope equipped with the Jitter and Timing Analysis (JTA) option, the J-260 Jitter Analyzer makes them directly accessible from the front panel. This can result in significant setup and measurement time saving if you are engaged in critical timing measurements.

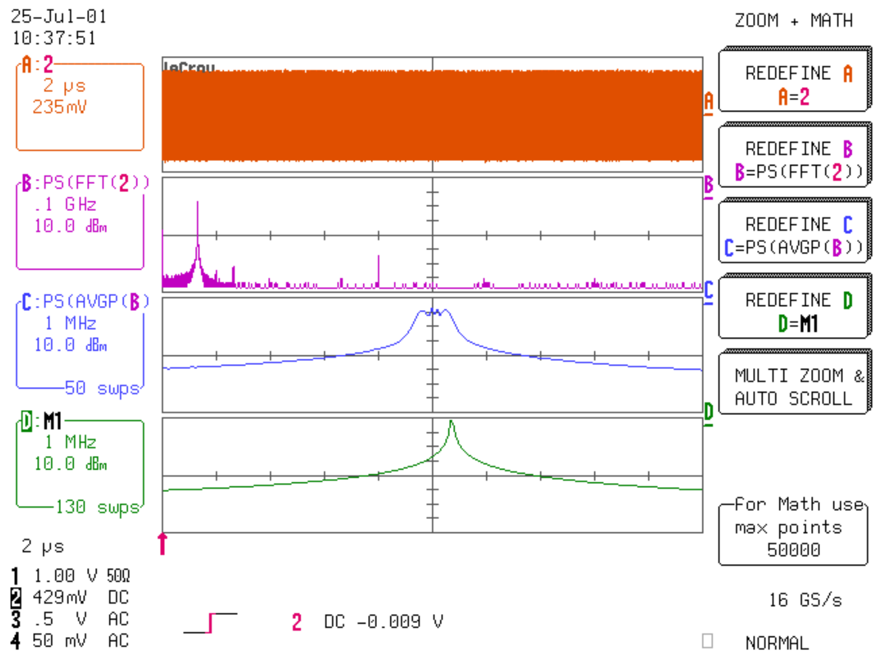

Figure 2 The setup for measuring the relative power difference between the normal and SSC.

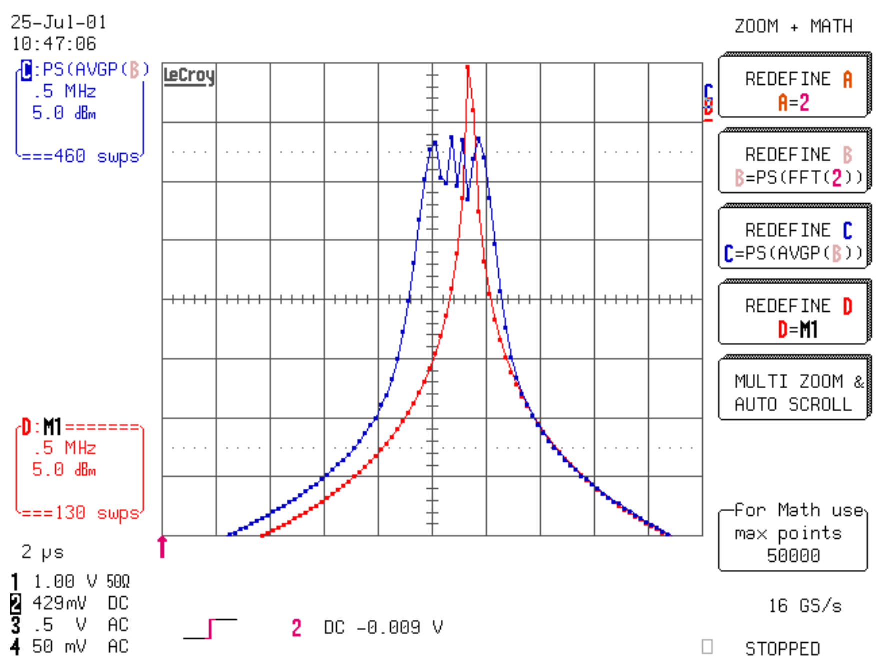

Figure 3 A comparison of the peak spectral levels of a normal and SS clock.