Characterizing Gated Oscillators

Measuring Stability And Envelope Shape In Gated Oscillators

Gated or keyed oscillators are turned on and off rapidly. This type of operation often causes frequency changes or "chirps". Characterizing the keying characteristics and frequency stability of gated oscillators is an easy job for LeCroy oscilloscopes with the jitter and timing analysis package.

Figure 1 shows a typical measurement on a 315 MHz keyless entry system transmitter. This type of device uses a keyed continuous wave (cw) transmitter to send digital information to the receiver located in a vehicle. Data is encoded by controlling the width of the burst.

Of interest to the designer is the shape of the gated burst envelope and the frequency variation as the oscillator is keyed. The shape of the envelope affects the spurious content of the signal. Likewise, frequency or phase modulation of the carrier caused by the gating the oscillator affects signal purity. Either of these effects can result in out of band signal components and a potential for failure to meet emissions certification requirements.

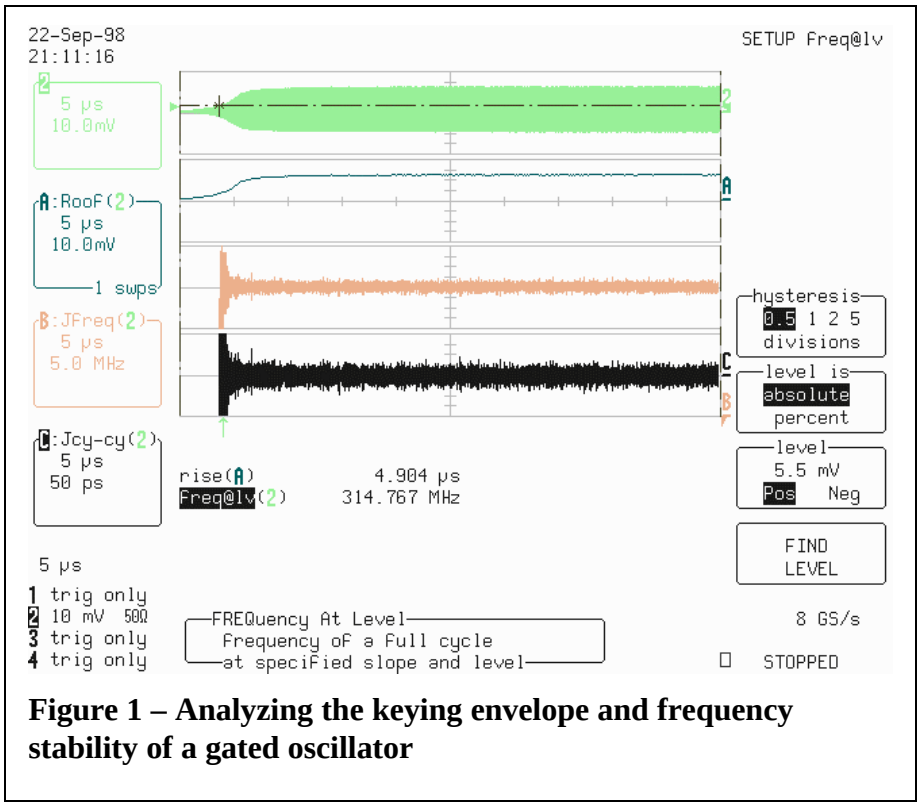

Figure 1 – Analyzing the keying envelope and frequency stability of a gated oscillator

In figure 1 the leading edge of the transmitted waveform is captured in channel 2 shown as the top trace. Trace A contains the extrema math function called roof, which extracts the peak values of each cycle of the transmitted signal. This trace is used to evaluate the risetime of the burst. The risetime parameter appears on the first line of the parameter readout located directly below the displayed traces.

Trace B, third from the top, contains the JitterTrack function of frequency and shows the variation in frequency as a function of time. Note that the frequency converges to the nominal 315 MHz in about 250 ns. The bottom trace contains the JitterTrack of cycle to cycle period variation. Both of these functions allow the user to specify the amplitude threshold and hysteresis level. This allows the user to start the measurement only after the signal has achieved a reasonable level. The threshold level appears as a dotted horizontal line of the source waveform(CH2). Note that the JitterTrack function do not start until the threshold level is achieved. This avoids errors caused by reading noise at the beginning of the waveform.