ScopemaX CTA Phase Noise
Measurement comparison to Agilent E5052B

The following plots show both the E5052B and CTA measuring the same signals. Three signals with different phase noise curve profiles are shown to demonstrate how well the CTA results compare with those from the E5052B.

RMS and curve shapes compare well

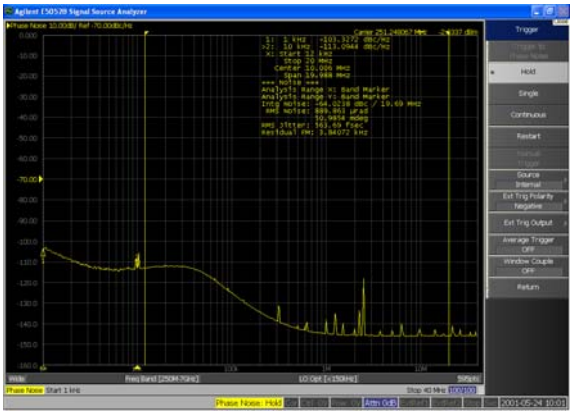

Figure 1
563fs RMS 12k-20MHz from E5052

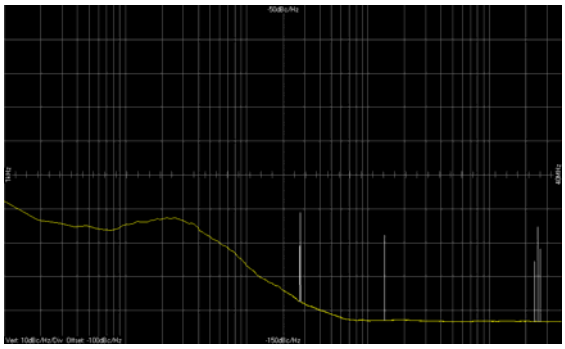

Figure 2
560fs RMS 12k-20MHz from CTA

Both Figure 1 and 2 are measurements of the same 251MHz signal. Both plots are 10Db per vertical division. The curves are very similar as are the RMS values from 12kHz to 20MHz. Horizontal span is 1kHz to 40MHz.

Notice how the spurs are sharper and better defined in the CTA plot. ScopemaX CTA identifies spurs prior to smoothing the curve. This maintains the true amplitude of periodic components. The fine, constant resolution throughout the plot reveals closely adjacent spurs which may need to be analyzed.

CTA provides additional information

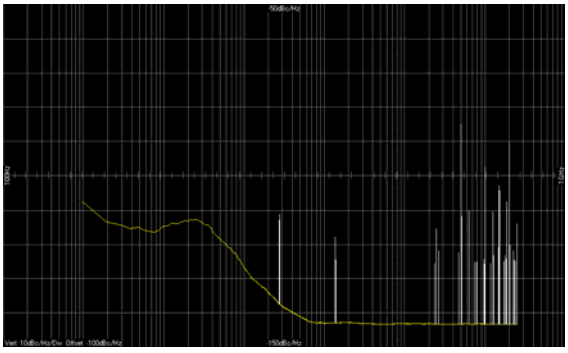

Figure 3 from CTA

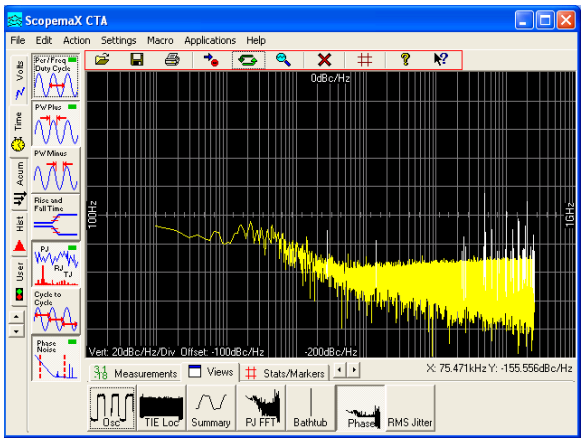

Figure 4 from CTA

Figure 3 shows the same CTA result full width which clearly displays an additional decade of useful information. Horizontal span of trace is 900Hz to 251MHz. The plot automatically adjusts to show a complete decade on each end regardless of where the actual result ended. Settings allow the user to reset the span to any desired width. The same trace is shown un-smoothed in Figure 4.

ScopemaX CTA handles noisy signals

Figure 5 10dB/div

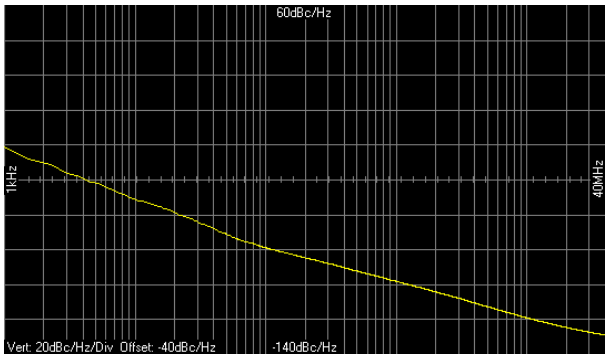

Figure 6 20dB/div

Figure 5 and 6 show the results of measuring an HP8131 square wave generator set to 400MHz. This noisy signal shows how the CTA follows the same trend as the E5052. Vertical scale on Figure 6 is 20dB per division. Both plots have a 100dB drop across the plot. In this example the spur threshold was set to 15dB which ignores any anomaly which is less than 15dB above the smoothed line so the CTA trend appears much smoother than the E5052 at the lowest frequencies.

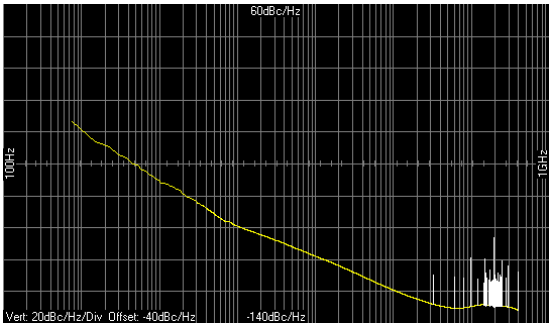

Figure 7

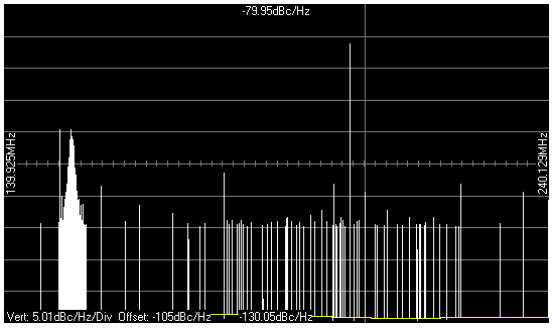

Figure 8

Figure 7 shows the same 400MHz signal full width of 1kHz to 400MHz. You can see the rightmost decade has many more spurs than all of the decades to the left. Figure 8 is a zoomed in view of the higher frequencies from 140MHz to 240MHz. Notice there is a tight grouping of spurs around 150MHz. further zooming will reveal even more detail. These waveform components cannot be seen on the E5052.

CTA and 10Gs scope measure down to -156dBc

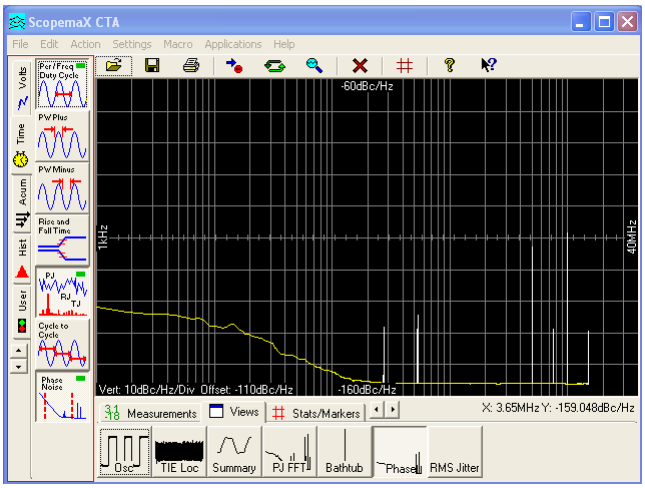

Figure 9

The signal in Figure 9 is a 15MHz clock which above 100kHz is at -156dBc/Hz. This shows the system is capable of measuring below -150dBc.

The oscilloscope which is used with ScopemaX CTA does effect the noisefloor the system is capable of showing. The scope used in these examples was a Rohde & Schwarz RTO1024 2GHz with 10Gs/sec sample rate. Using a ScopemaX CTA with a higher sample rate scope may produce results lower than -160dBc/Hz.

Some features of the CTA phase noise:

- **Smoothing of curve**
  - **Maintains amplitude of spurs**
- **Remove spurs from the smoothed curve**
- **User selectable spur threshold in Db**
- **Much wider plot**
  - **Stop frequency limited only by input signal frequency**
    - **Not limited to only 40 or 100MHz**
    - **User settable plot limits**
- **Constant resolution throughout plot**
  - **Identify closely spaced spurs**
- **Spurs do not alias around 250MHz (as in E5052B)**
  - **Will alias around upper frequency of plot**
    - **Easier to determine true frequency**
- **Calculate RMS between markers**
  - **Easy to set exact spans such as 12kHz to 20MHz**