Q: How do I test a PLL?

Phase Locked Loop

Use of the MX feature of the Titan and Griffin systems is one way to measure frequency. There is a "trick" that uses the digital part of the tester to accomplish this. Consider the following equation:

$$Fout = Fmax \pm Fs/N$$

Example: Fout known at 1%?
N = 100 points is enough.

Follow these basic steps to setup for frequency measurement. The illustration below helps to clarify the process.

1) Connect the PLL output to a tester system channel. Define this channel as DUT output with some nominal threshold level.
2) In the vectors window, define the expected output value as all L. Now when you click the RUN button, the Analysis window will show a number of H's followed by number of L's, followed by number of H's, then a number of L's, and so on. When you display the Analysis data as a Vector Graph you will see a square waveform coming from the PLL output.
3) Now for the tricky part: think of the system channel the PLL is connected to as a single bit digitizer, operating at the Test Rate frequency, named Fs in the drawing below. When you will pass trace data for this pin to the Fast Fourier Transform function, you will receive the frequency spectrum data. Search for the MAX value. This is the searched PLL frequency. You can also derive jitter (statistically) based on this frequency spectrum data.
4) What if the PLL freq is more than the Test Rate? Connect the PLL to 2, 3, or more sys channels and for each of them define a different compare strobe to have it distributed equally within time, thus effectively multiplying Fs.

The ACT/Asp C code for automating this will use the functions appearing on the next page.

measurement accuracy = spectrum resolution : $\Delta F = Fs/N$
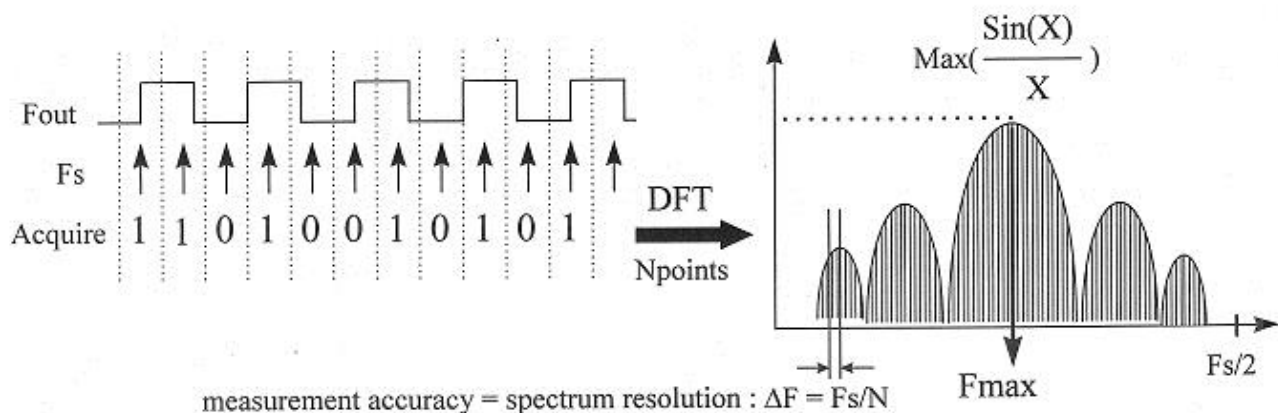
ACT/Asp C code functions for performing FFT frequency measurement:

AspFunFunctionalTest() - collect output data
AspReadTraceMemory() - transfer data into PC (or better AspReadSinglePebTraceMemory() - faster)
AspDecodeMemoryBit()-to read single channel data
AspFFTComplex() - convert into frequency domain
Eventually - int AspFFTComplexToMag() - get frequency magnitude data
Search the FFT result for max value - this is Fpll.

For detailed function descriptions, please see ACT Help.