Application Bulletin

Comparing Vectron's Crystal-Based PECL Oscillator with a SAW-Based Equivalent

Jitter is a difficult parameter to clearly understand and compare by reviewing manufactures data sheets. Although largely unintentional, variations in jitter specifications include the method of test and equipment used as well as the number of samples acquired. In order to alleviate this, a side by side test was performed using the same test equipment, methods, fixturing and number of samples of Vectron's crystal-based 125.000 and 155.52MHz PECL oscillators, VCC6-QAB, versus an equivalent SAW-based oscillator.

The following jitter results were measured using a LeCroy 8600 acquiring 62K samples.

Period jitter compares the length of each cycle to the average period of an ideal clock using the long term averaged frequency.

	Period Jitter rms, ps	Period Jitter p/p, ps
Vectron 155MHz	2.86	22.70
SAW Based 155MHz	2.97	22.90
Vectron 125MHz	2.67	17.60
SAW Based 125MHz	2.72	16.00

Cycle to cycle jitter compares the difference in the cycle length of adjacent cycles.

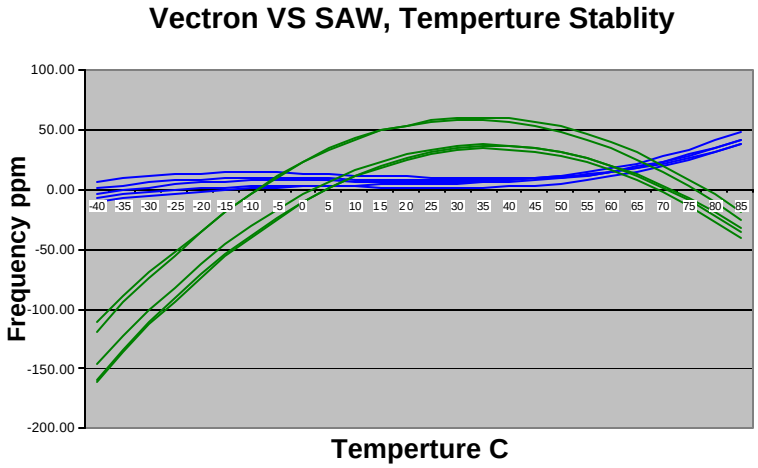
	Cycle to Cycle Jitter rms, ps	Cycle to Cycle Jitter p/p, ps
Vectron 155MHz	4.86	38.50
SAW Based 155MHz	5.14	39.60
Vectron 125MHz	4.64	38.56
SAW Based 125MHz	4.71	39.20

TIE or accumulated jitter is the variation in a clock's transition from its ideal position over many cycles.

	Accumulated Jitter rms, ps	Accumulated Jitter p/p, ps
Vectron 155MHz	2.25	17.60
SAW Based 155MHz	2.25	19.70
Vectron 125MHz	2.11	17.38
SAW Based 125MHz	2.13	18.10

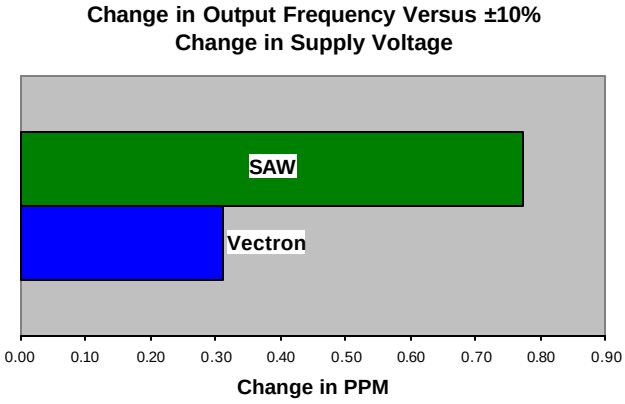
While data shows excellent results for both devices, the crystal based VCC6 series has an advantage in most of the three measurements; period, cycle to cycle and TIE jitter.

Another key parameter for reference clocks is temperature stability. The graph below shows relatively good stability in the -20 to 70°C range, and while the SAW based device meets rated specification, performance quickly degrades below -25°C.



Compare this to the crystal-based VCC6 performance curve, which is the data in blue, and advantages over extended temperature become apparent. In fact even +/-20ppm – including aging – can be provided which is Vectron's VCC6-107 series.

The third critical characteristic which effects stability and jitter performance is power supply sensitivity. Measurements were made under DC conditions and the power supply was varied by +/-10% and then compared to measurements made at 3.3volts. The results are graphed below and the advantage of the crystal based VCC6 solution is at least 2 times better.



For tight stability/low cost/low jitter applications, a crystal based solution should be the preferred choice.

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