Phase Noise and Phase Jitter

In the realm of modern communication and signal processing, two pivotal concepts continually emerge: phase noise and phase jitter. These two interconnected characteristics are indicators of signal stability and quality, especially in high-frequency and high-performance applications. Let's delve into a deeper understanding of what phase noise and phase jitter entail and why they matter in the world of technology and communications.

What are Phase Noise and Phase Jitter?

In signal processing, phase noise is the frequency domain representation of random fluctuations in the phase of a waveform, corresponding to time domain deviation from perfect periodicity (jitter). Phase noise is the instability of a frequency expressed in the frequency domain, while jitter is fluctuation of the signal waveform in the time domain.

Jitter can also be called time base error, which refers to the problem in the fields of electronics and telecommunications. The difference between the periodic signal and the true period is usually equivalent to the reference clock signal. Time base errors can affect the analog output of a digital-to-analog converter. In communication links (such as USB, FPGA, PCI-E, SATA, OC-48), especially during the restoration process of sampling signals, jitter is not expected to occur.

Current Requirements and Optimization

Improvements in current consumption and the waveform's fluctuation help optimize differential oscillators and improve performance. In order to satisfy these needs, AKER has been focusing on the performance of the differential oscillator product RMS jitter. As the size of the quartz crystal inside the reference oscillator gets smaller, maintaining better RMS jitter capability becomes more challenging.

In response to the current demand for overall system size and functionality, designers are looking for a way to provide the best jitter performance of a small size. Such characteristics are widely used in network, optical module, optical transceiver, high-speed communication, computational storage and RF applications that require low power consumption and low jitter performance.

AKER Product Performance

The RMS jitter curves of AKER's 3.2×2.5 LVPECL 156.25 MHz 3.3 V third overtone products have been compared to industry standards, demonstrating AKER's superior RMS jitter performance. The phase noise performance for the third overtone is remarkably stable (third overtone-mode crystals resonate at three times its fundamental frequency for faster and smoother data transmission).

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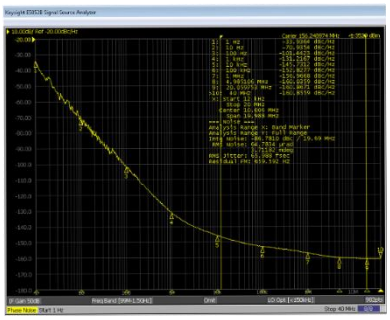
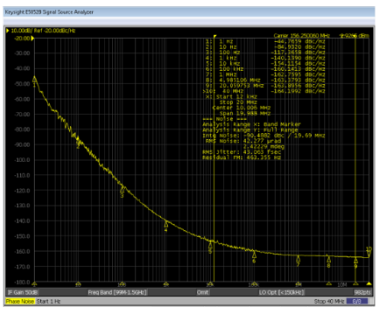
Please refer to the graphical illustration below for further details.



RMS Jitter(10Khz~20Mhz) 66fsec typ

10Hz	-66.1
100Hz	-100.3
1K	-127.1
10K	-142.1
100K	-147.5
1M	-152.7
5M	-158.3
20M	-158.3

RMS jitter stands at a remarkable 66 fs, while the current consumption remains below 40 mA.

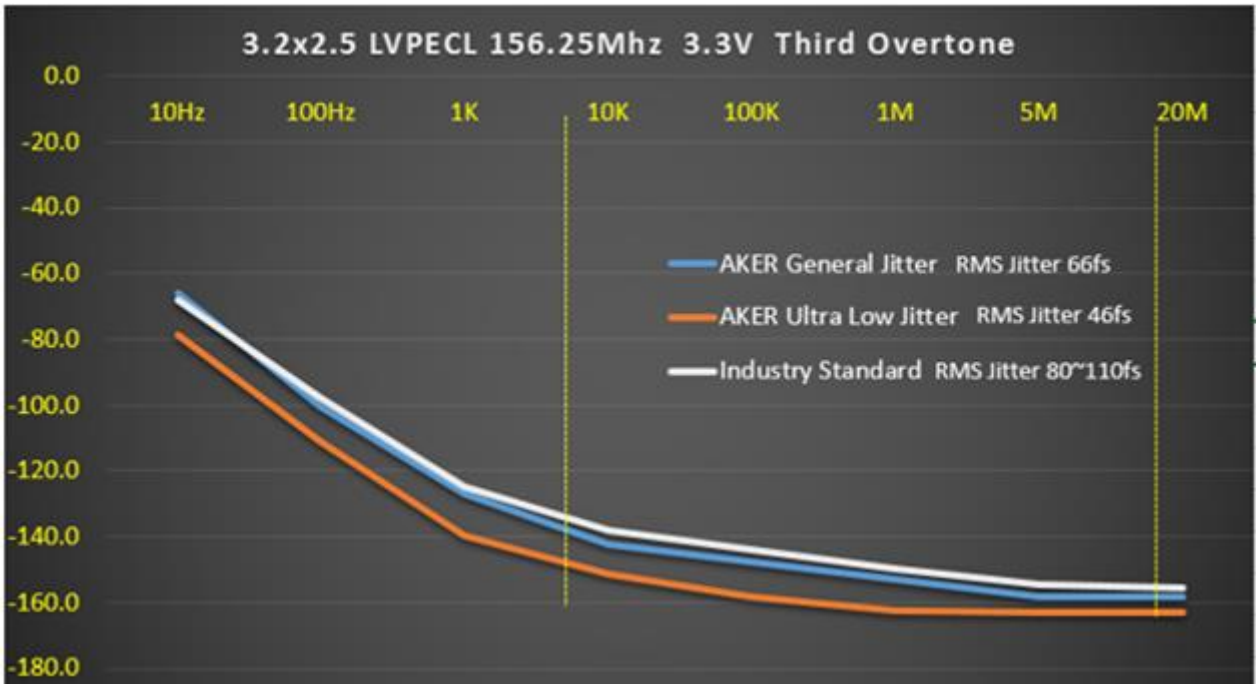


RMS Jitter(10Khz~20Mhz) 46fsec typ

10Hz	-77.0
100Hz	-112.7
1K	-138.9
10K	-151.3
100K	-158.6
1M	-162.6
5M	-163.3
20M	-163.9

AKER product stands out with an exceptional phase noise rating of 46 fs and an impressively low current consumption of under 40 mA.

Jitter Comparison: AKER vs. Industry Standard



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AKER Product Specifications and Performance:

Third Overtone Products

AKER Product	Frequency	Output	Supply Voltage	Max Current Consumption	Typical Phase Jitter (12 k to 20 MHz)
SMEN-321	156.25 MHz	LVPECL	3.3 V	50 mA	46 fs
SMDN-321	156.25 MHz	LVDS	3.3 V	20 mA	80 fs
SMLN-321	156.25 MHz	HCSL	3.3 V	30 mA	80 fs

Additional AKER Differential Oscillators

AKER Product	Description	Frequency	Application
SMEN-751	LVPECL 7.0x5.0	156.253 MHz	Ethernet Switches
SMDN-751	LVDS 7.0x5.0	100.000 MHz; 125.000 MHz; 156.250 MHz	Ethernet Switches, HDMI
SMDN-321	LVDS 3.2x2.5	100.000 MHz	Video Device
SMLN-751	HCSL 7.0x5.0	100.000 MHz	Intel FPGA
SMEN-321	LVPECL 3.2x2.5	156.250 MHz	Intel FPGA, Ethernet
SMEN-221	LVPECL 2.5x2.0	125.000 MHz	Ethernet