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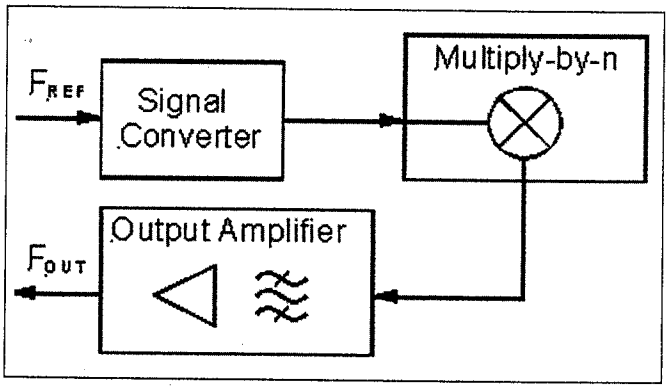
PRODUCTS & TECHNOLOGIES

GUEST EDITORIAL

DEPARTMENTS

Oscillators Use Parametric Multiplication Method

Fordahl has introduced three new series of oscillators developed using a new parametric multiplication method. This analog method of multiplication uses a hardware implementation of a multiplying function based on the transfer of parameters between semiconductors. This method, shown in Figure 1, offers an alternative to Fourier and PLL methods. It gives at the output a selectable coefficient of multiplication with a rejection of sub-harmonics. In addition, an output bandpass filter is added to improve the rejection of these sub-harmonics. Because of the analog type of multiplication, the spectral purity of the frequency (n * Fref) is improved and the phase noise and jitter reduced.



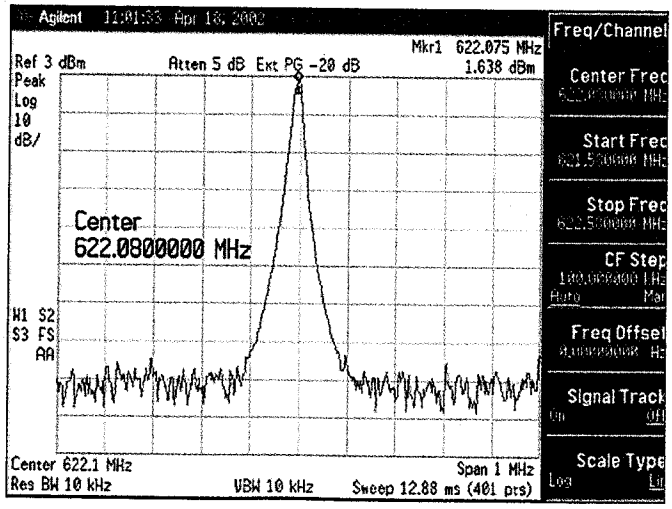
▲ **Figure 1. Parametric multiplication method.**

The output spectrum for the parametric method is shown in Figure 2. Figure 3 shows the phase noise comparison of the PLL versus parametric multiplication of the oscillator at 622.08 MHz. A comparison of the Fourier, PLL and parametric methods is given in Table 1.

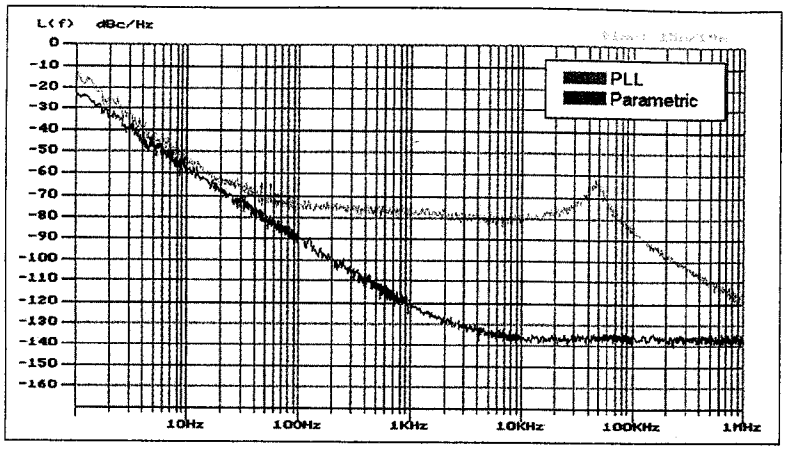
All three of the new oscillator series are targeted for use in telecommunications, gigabit Ethernet and high-frequency applications.

Two low-jitter oscillators

The DFN S1-MLECPI and DFN S8-MLECPI series of surface-mount device (SMD) precision oscillators each offer tight stability, 3.3-volt operation and low-jitter performance. These devices are available at frequencies from 622.08 to 800 MHz. Speci-fications include ±20 ppm per 15 years overall frequency stability with an operating temperature range of 0 to 70 degrees Celsius, as well as complementary output and enable/disable.



▲ **Figure 2. Spectral purity of the output frequency on a 622.08 MHz PECL oscillator developed using the parametric multiplication method.**



▲ **Figure 3. Phase noise comparison of PLL versus parametric multiplication at 622.08 MHz.**

The DFN S1-MLECPI series of oscillators deliver very low phase jitter characteristics of less than 1 picosecond at 50 kHz to 80 MHz. The crystal is housed in a 9 × 14 × 6 mm metal package. The DFN S8-MLECPI series offers very low phase jitter characteristics of less than 0.4 picosecond (typical) at 50 kHz to 80 MHz. The crystal is housed in a 20 × 12.8 × 7.8 mm metal package.

VXCOs

The DFV S8-MLECP series of SMD voltage-controlled crystal oscillators are available at frequencies from 622.08 to 800 MHz. These devices offer tight stability, 3.3-volt operation and low-jitter performance of less than 0.32 ps (typical) at 50 kHz to 80 MHz. Specifications include ±15 ppm temperature stability, with an operating temperature range of 0 to 70 degrees Celsius, complementary output, ±100 ppm pulling and enable/disable. The crystal is housed in a 20 × 12.8 × 7.8 mm metal package. ■

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	Fourier	PLL	Parametric
Frequency Range	Low frequencies (limited by the too-small values of the components for the high frequencies)	Low and high frequencies	Low and high frequencies
Spectral purity	Good	Poor	Good
Jitter	Good	Poor (except newer kinds of PLLs where jitter is acceptable)	Good
Phase Noise	Good	Poor (except newer kinds of PLLs where phase noise is acceptable)	Good
Spurious	Good	More spurious than with other methods	Good
Supply Current	Low current	High current	Low current
Supply Voltage Range	Higher voltage	Low voltages	Low voltages

▲ **Table 1. Comparison of Fourier, PLL and parametric multiplication methods.**