lines. These products can be configured with several high-performance, dual-frequency 5/10-MHz oscillators. The Low Phase Noise Output Module works with these disciplined oscillators to provide individually buffered, spectrally pure, sinewave outputs. The levels of the contributors to spectral impurity have been carefully controlled by the design of the oscillators and the design of the module and its integration into the rackmount chassis. Very good channel-to-channel isolation has also been achieved.

Spectral Purity

Spectral purity refers to the power spectral density (PSD) of a waveform relative to that of an ideal, pure sinewave having frequency f_0. Such a perfect waveform would have a PSD consisting of two delta functions located at +/- f_0 on the Fourier frequency axis. Real world waveforms do not attain this level of purity and exhibit a power spectrum that contains additional periodic and random PSD components. Spectral purity is important in a frequency standard when it is used as the reference for synthesizing a carrier signal for the purpose of broadcasting or receiving information. Any impurities in the spectrum will to some degree mask the information that is intentionally modulated onto the carrier prior to broadcast.

Periodic Impurities

The periodic impurity components are further sub-classified as harmonic and non-harmonic. The harmonic components reside at Fourier frequencies that are integer multiples of f_0. Their levels are generally minimized by using passive bandpass filtering and ultra-linear output drivers.

Non-harmonic components are also commonly called spurious components, or óspursô. They can appear at any Fourier frequency

Phase Noise

Random noise sources within a precision crystal oscillator circuit effectively modulate the signal. The modulation due to random noise is divided between amplitude modulation (AM) and phase modulation (PM). In most applications, the PM component, or phase noise, is of greatest importance. This is due to the multiplicative effect on phase noise that occurs when we multiply the frequency of a precision source in order to synthesize a carrier wave. For example, one milliradian of phase noise at the f_0 = 10 MHz source is multiplied to one radian of phase noise at the 10 GHz carrier frequency.

The oscillators manufactured at EndRun Technologies exhibit extremely low close-in phase noise. This close-in phase noise is

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