

Verifying the clock source

The signal purity of clock sources has a direct impact on system performance. To ensure proper operation, it is necessary to verify that the purity meets the design requirements.

Your task

As a designer of analog and digital circuits, you use and rely on the clock signal used in the target system. Since the clock directly influences overall system performance, it is essential that its performance be good enough to meet the needed requirements. In order to select or develop a clock generator to use in your design or to ensure that the supplied system clock has the proper performance once it reaches your section, you need to verify its performance to make sure it meets your needs. Phase noise, jitter, wideband noise and spurs are typical performance indicators.

T&M solution

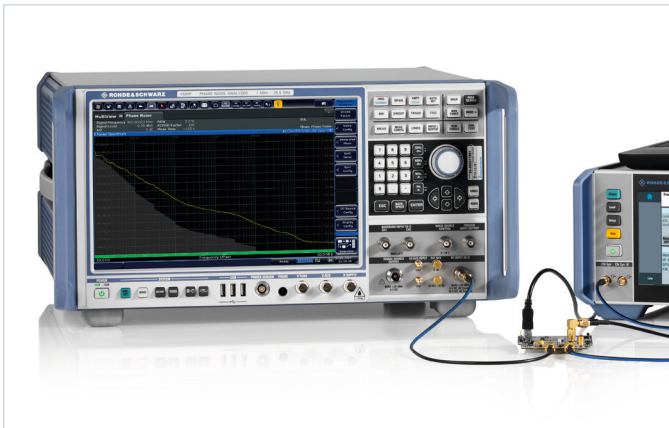
The R&S®FSWP phase noise analyzer and VCO tester is the right tool for verifying clock sources. Clock jitter is typically measured in the time domain. For superior sensitivity,

users switch to the frequency domain to measure the clock jitter based on a phase noise measurement. The frequency domain approach also makes it easy to separate random jitter from periodic jitter, which can be easily determined by the spur level. Easily changeable integration ranges and weighting filters make it an even more powerful tool for jitter characterization with highest sensitivity.

For measuring clocks with very low jitter, the R&S®FSWP can be equipped with a second internal local oscillator to allow cross-correlation and improve the phase noise sensitivity. To know how many correlations are useful, the instrument displays the achievable level of sensitivity with grey color-coding for a given setting. If the grey area is clearly below the trace, you know that the measurements are correct. Thanks to the extremely low-noise internal sources, only a small number of cross-correlations are needed to achieve a large sensitivity range. This speeds up measurement of clean signals dramatically.

The R&S®FSWP features:

- Frequency range from 1 MHz to 8/26.5/50 GHz
- Up to 500 GHz with external mixers
- High sensitivity for phase noise measurements thanks to cross-correlation and extremely low-noise internal reference sources
 - typ. -172 dBc (1 Hz) at 1 GHz carrier frequency and 10 kHz offset
 - typ. -158 dBc (1 Hz) at 10 GHz carrier frequency and 10 kHz offset



Measuring the phase noise and jitter of the clock source with the R&S®FSWP.



The R&S®FSWP displays the achievable level of sensitivity with grey color-coding.

A spectrum analyzer is typically used for spur searches. The R&S®FSWP includes a high-end spectrum and signal analyzer covering the full frequency range of the phase noise tester. You can search for spurs in the spectrum analyzer mode without any other instruments. Thanks to the large screen, you can configure multiple result windows in parallel on the display – and see the result of the phase noise measurements and the spectrum side by side.

The R&S®FSWP features:

- Signal and spectrum analyzer and phase noise analyzer in a single box
- High-end signal and spectrum analyzer, 10 Hz to 8/26.5/50 GHz
- Wide dynamic range thanks to low displayed average noise level (DANL) of -156 dBm (1 Hz) (without noise cancellation) and high TOI of typ. 25 dBm
- 80 MHz signal analysis bandwidth
- Total measurement uncertainty: < 0.2 dB up to 3.6 GHz, < 0.3 dB up to 8 GHz

The R&S®FSWP includes a useful add-on as standard: low-noise internal DC sources for VCO characterization. It includes a power supply up to 16 V and a tuning voltage supply up to 28 V. Therefore, the power supply for the clock source module comes free. If the clock source is frequency tunable and based on a VCO design, tests over supply and tuning voltages are easily performed.

In short, the R&S®FSWP is the right tool for verifying the performance of the cleanest clock sources to ensure that the clock does not affect overall system performance.

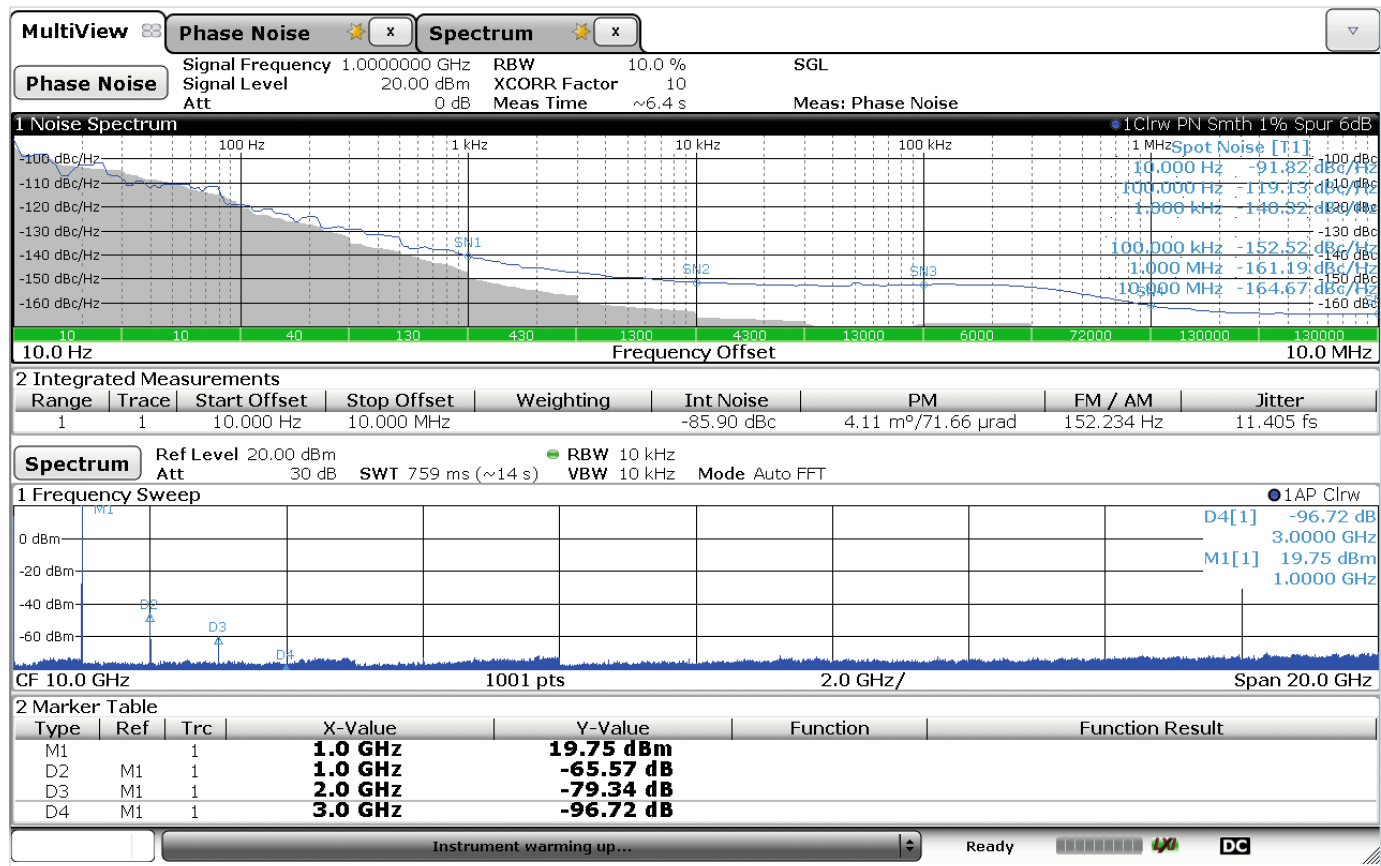
See also

www.rohde-schwarz.com/product/fswp

Application Notes

- A 1 MHz to 50 GHz Direct Down-Conversion Phase Noise Analyzer with Cross-Correlation
- Measurement Uncertainty Analysis and Traceability for Phase Noise

Phase noise measurement and spur/harmonic search in the spectrum domain in parallel.



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