

The new Application Firmware R&S®FS-K40 for the Analyzers R&S®FSP/FSU/FSQ measures the phase noise of signal sources. Being an integral part of the instrument software, it can make full use of the dynamic range, speed and remote control capabilities of the measuring instrument. In conjunction with the low phase noise of the high-end Analyzers R&S®FSU and R&S®FSQ, which has now been even further reduced, the R&S®FS-K40 yields testers of uniquely low phase noise.

Spectrum Analyzers R&S®FSP/FSU/FSQ Phase noise testers of unparalleled quality

R&S®FS-K40 – integral part of instrument software

Low phase noise of transmitter and receiver oscillators is crucial for the quality of transmit signals and therefore a key parameter in designing radiocommunications applications. High phase noise not only impairs modulation quality but also increases the power level in the neighboring channels, thus reducing transmission quality for other subscribers.

R&S®FS-K40 is the follow-up to the Phase Noise Measurement Software R&S®FS-K4 from Rohde & Schwarz. In contrast to R&S®FS-K4, which is installed on an external PC, the new firmware is integrated in the analyzer software. It can thus be started directly

from the analyzer's user interface and is completely remote-controllable via the IEC/IEEE bus or a LAN.

Settings and results with the accustomed high convenience

The basic parameters for phase noise measurements, e.g. carrier frequency and level, are entered in the GENERAL SETTINGS menu (FIG 1). The firmware automatically checks whether the amplitude and frequency of the incoming carrier are within predefined tolerances, and interrupts the measurement in the event of large deviations from set values. You can set the x- and y-axis display ranges, the residual FM and ϕ M measurement ranges and – as a special feature – the direction of measurement.

This means that measurements can also be started at maximum carrier offset – at large resolution bandwidths and thus short sweep times. This produces results quickly, and you can immediately change instrument settings if required.

When you press the MEAS SETTINGS softkey, R&S®FS-K40 displays a list of all sweep parameters relevant to the measurement (FIG 2). You can choose the sweep modes listed below for the selected measurement range (shown with a green background in FIG 2), depending on whether your application calls for short measurement time or high reproducibility:

- ◆ FAST (time-optimized measurement)
- ◆ NORMAL
- ◆ AVERAGED (over a high number of sweeps)
- ◆ MANUAL

You can also manually select all parameters such as the filter type, filter bandwidth and number of averaged sweeps for each carrier offset subrange or preset these parameters for the full measurement range.

In addition to the menus specifically for phase noise measurement, the firmware also provides further functions known from other spectrum analyzer applications. For example, you can perform pass / fail tests with the aid of user-definable limit lines. You can export data in ASCII format, store all parameter settings and display several traces simultaneously. Apart from the common trace functions such as averaging over several sweeps, trace smoothing is also performed.

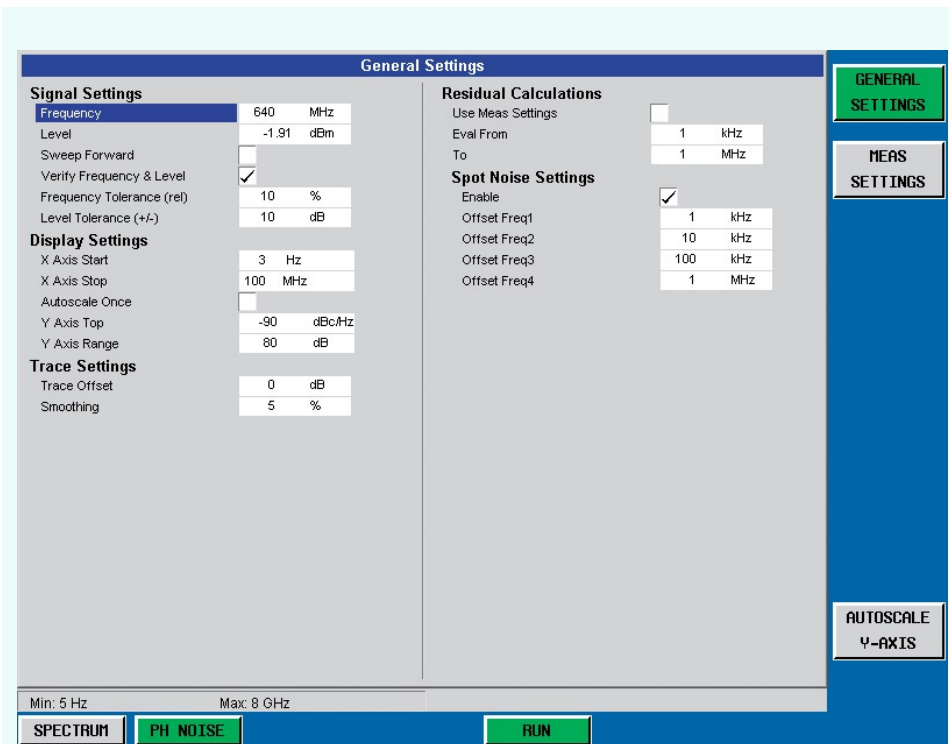


FIG 1 GENERAL SETTINGS menu for setting the global phase noise measurement parameters. The basic measurement parameters (carrier level and frequency, display ranges, etc), the residual FM and ϕ M measurement ranges as well as discrete offset frequencies are entered here.

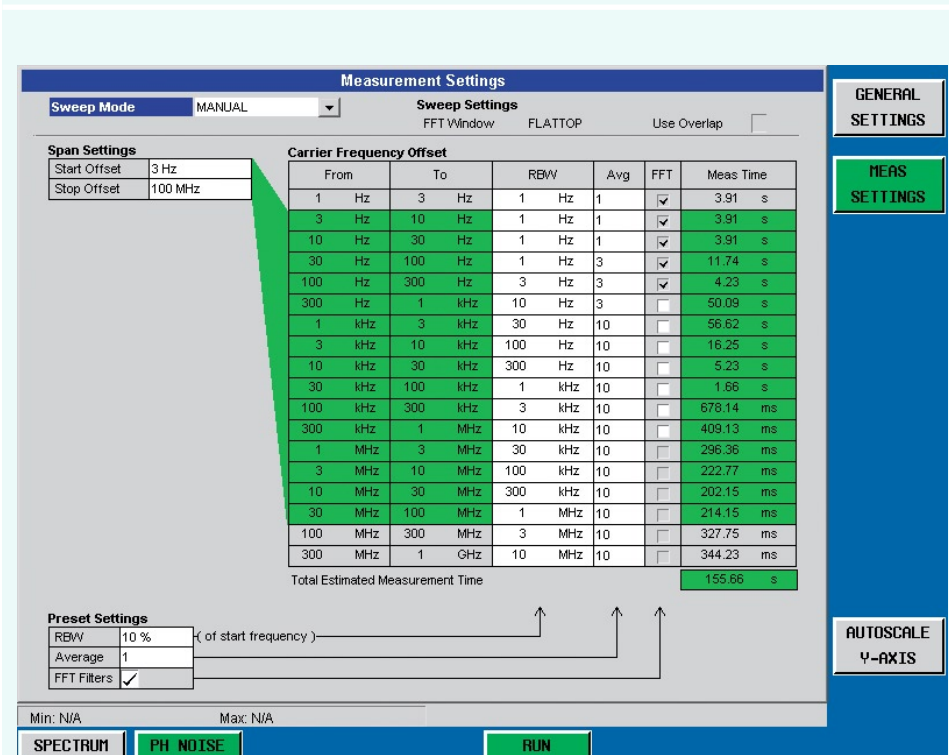


FIG 2 Overview and menu for setting the measurement range, filters and number of sweeps to be averaged. Setting of sweep parameters: The area on the left with a green background indicates the currently selected offset frequency measurement range. The fields with a white background can be edited.

► R&S®FSU and R&S®FSQ phase noise now even lower

The Spectrum Analyzers R&S®FSU and the Signal Analyzers R&S®FSQ of the newest generation (from serial No. 2xxxxx) feature significantly better

phase noise than their predecessors (FIG 3). The spectrum analyzer's inherent phase noise is the minimum limit of sensitivity in direct measurements of signal sources. To attain a measurement uncertainty below 1 dB, for example, the inherent phase noise of the instru-

ment must be at least 6 dB lower than the phase noise of the signal under test. In its Analyzers R&S®FSU and R&S®FSQ, Rohde & Schwarz now offers instruments of uniquely low phase noise. In conjunction with the R&S®FS-K40 firmware, this yields high-grade phase noise testers.

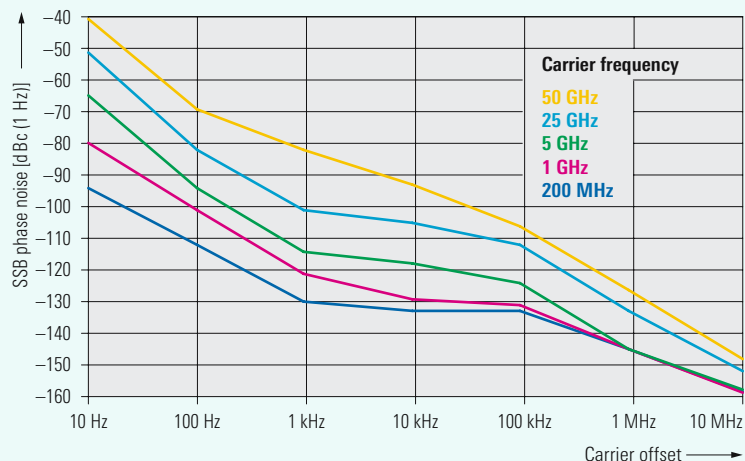


FIG 3 Typical phase noise values of the Spectrum Analyzers R&S®FSU and the Signal Analyzers R&S®FSQ at various input frequencies versus the carrier offset frequency.

Results at a glance

The R&S®FS-K40 firmware presents key results at a glance in a straightforward manner (FIG 4). In the default mode, the original trace and the smoothed trace are displayed together. A status bar at the lower edge of the screen indicates measurement progress and helps you to assess the remaining measurement time. If you start phase noise measurements at offset frequencies far from the carrier, results for the subranges of interest will be available very quickly due to the increased measurement speed at large bandwidths.

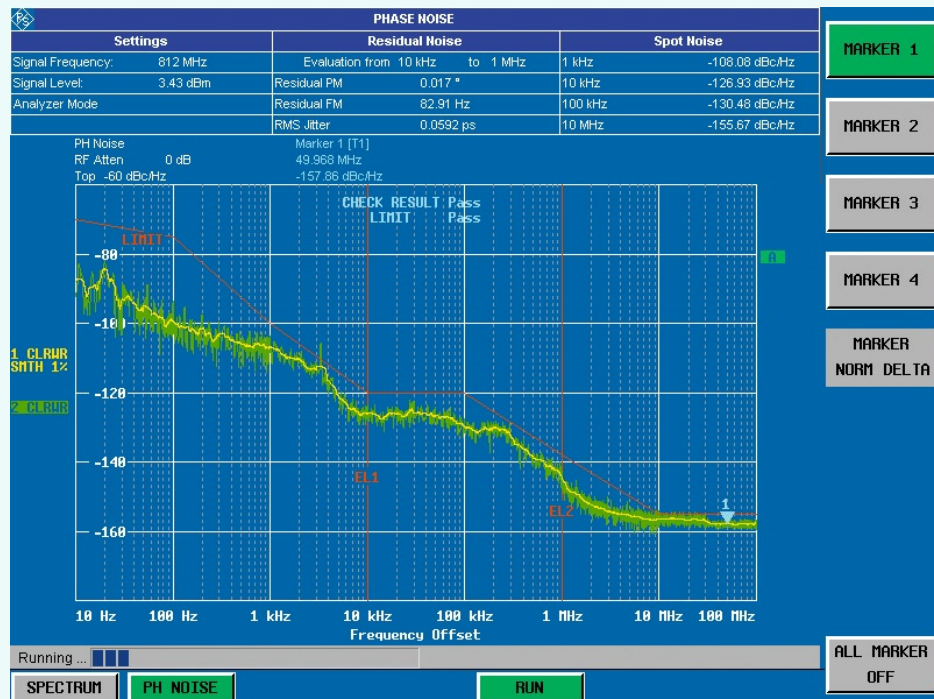


FIG 4 Typical result of a phase noise measurement at 10 Hz to 100 MHz offset from the carrier. The vertical red lines EL1 and EL2 mark the range limits for residual FM and ϕ M measurements. The red curve is the user-defined LIMIT. The measurement result (Pass in this example) is displayed at the top center of the diagram. A smoothed trace (yellow) is superimposed on the original trace (green). The blue bar (Running) at the lower edge of the screen indicates measurement progress and helps you to assess the remaining measurement time.

A comparison of results against limit lines also takes place after each subrange measurement. Traces are automatically scaled in the default mode. The main measurement parameters such as the signal frequency and amplitude are displayed in a table at the top of the screen. This table also shows the measured residual FM and ϕ M, RMS jitter and the phase noise values at specific offset frequencies.

Dr Wolfgang Wendler

More information, data sheet and manual at www.rohde-schwarz.com (search term: FS-K40)