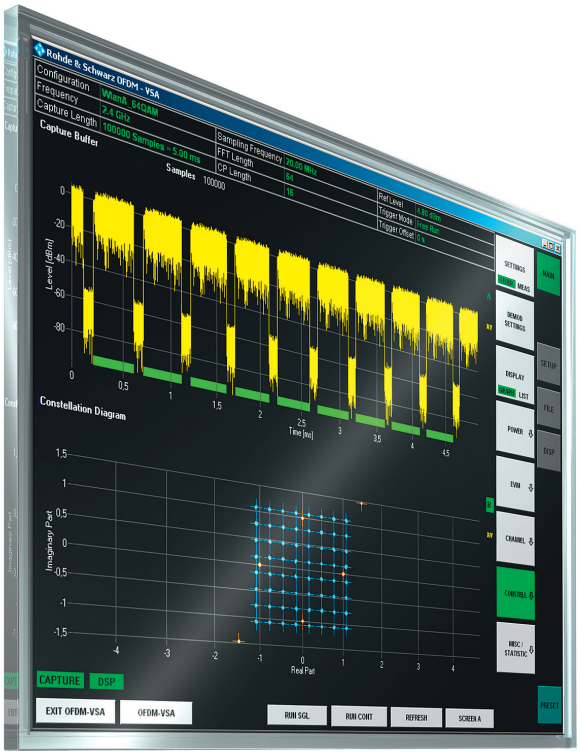
R&S®FSQ-K96 OFDM Vector Signal Analysis with the R&S®FSQ Signal Analyzer



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Test & Measurement

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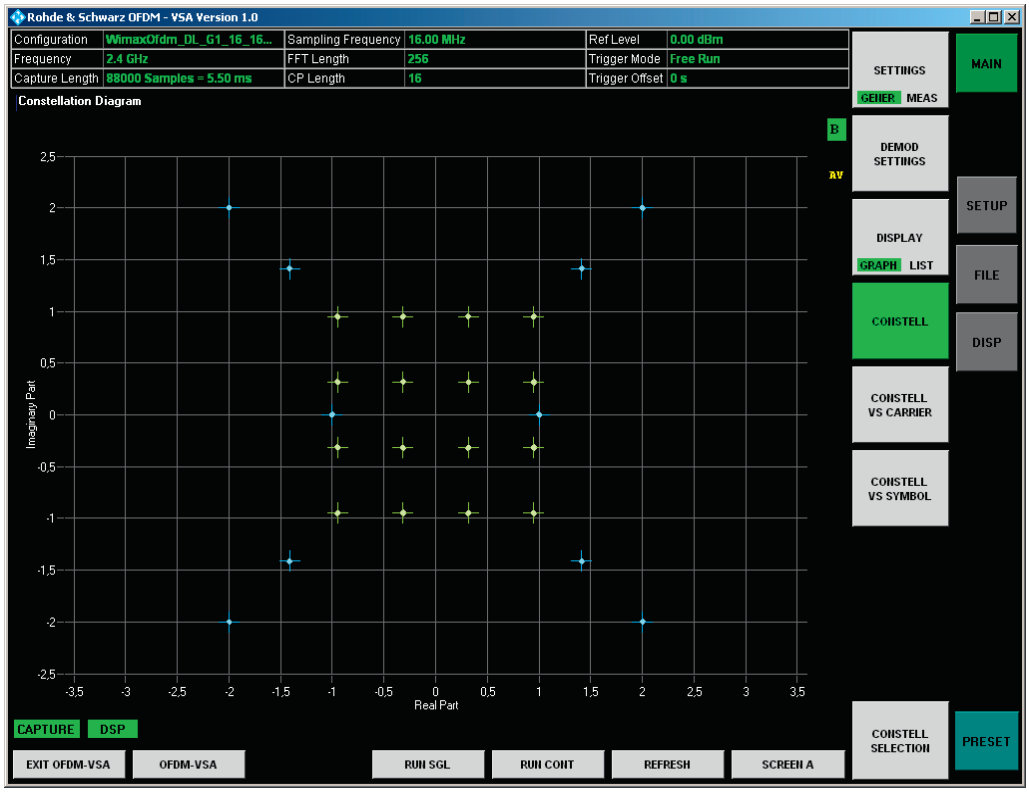
R&S®FSQ-K96 OFDM Vector Signal Analysis

At a glance

The R&S®FSQ-K96 PC software expands the R&S®FSQ signal analyzer to feature modulation measurements on general OFDM signals. The OFDM demodulator is user-configurable and standard-independent.

The software analyzes OFDM signals that are either user-defined or compliant with standards such as IEEE 802.16 (WiMAX), IEEE 802.11a/g/n (WLAN), or DVB-T. Moreover, it supports development engineers in the analysis of proprietary signals in the initial phases of forthcoming OFDM standards.

- Expansion of the R&S®FSQ signal analyzer to feature transmitter measurements on general OFDM signals
- User-definable and standard-independent OFDM demodulator
- Support of OFDM and OFDMA
- Support of any PSK or QAM modulation format
- Frequency range 50 MHz to 3/8/26.5/40 GHz, depending on the R&S®FSQ model
- Very low residual EVM of below –51 dB for DVB-T, 2k mode
- RF measurement or I/Q baseband measurement (optional)



The constellation diagram shows the in-phase and quadrature components over the entire area of the measured input data. It can be displayed either for all carriers or for selected carriers. Color coding makes identification of the different modulation formats easy.

R&S®FSQ-K96 OFDM Vector Signal Analysis

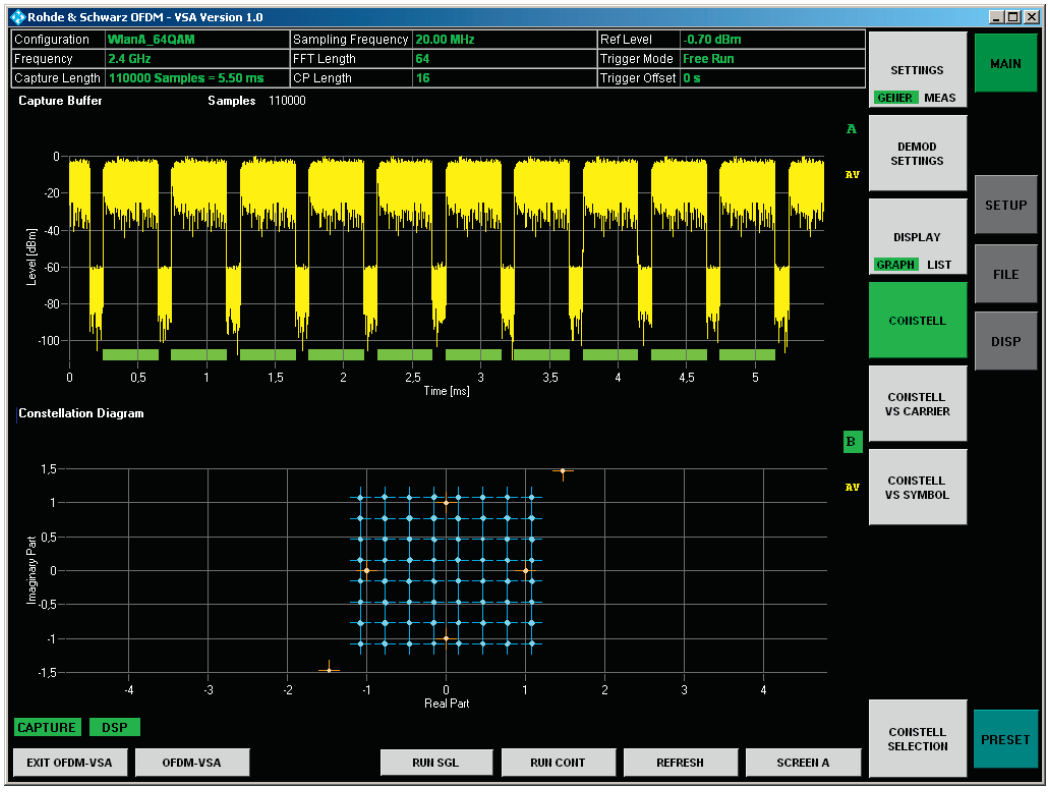
Benefits and key features

User-configurable and standard-independent

- The software offers a high degree of freedom in the selection of measurement parameters. In addition to the user-definable OFDM demodulator, general parameters such as trigger, synchronization and tracking can be set manually.

Numerous measurements for the analysis of OFDM signals

- In addition to a numeric table that lists information such as EVM results or the I/Q offset, the R&S®FSQ-K96 software provides numerous graphical results that make error analysis easy.



The upper part of the display shows the recorded signal in the time domain. The lower part shows the constellation diagram.

Settings and configuration of the OFDM demodulator

The R&S®FSQ-K96 PC software offers maximum flexibility for adapting the analyzer to the signal requirements. Thanks to this flexibility, you can define frequency, bandwidths, sample rate and guard interval length for the corresponding OFDM signal. Many other parameters can be modified as needed, e.g. memory depth or trigger settings.

The following OFDM parameters are user-definable:

- General OFDM parameters such as signal bandwidth, sample rate, FFT length, cyclic prefix length
- Preamble structure
- Position of the pilots and data carriers
- Modulation format of the data carriers

The OFDM parameters listed above can be set in the "demodulation settings". The general parameters can be entered directly in the R&S®FSQ-K96 application. A configuration file is available for the additional OFDM parameters. You can define the OFDM demodulator in detail by using this file.

The diagram shows the power of each carrier and symbol of the received frames in dBm for each carrier. The values are color-coded in accordance with a table of colors that is displayed in the upper area of the measurement window.

Basic settings

The basic OFDM parameters such as bandwidth, sample rate, FFT length, and cycle prefix length are directly definable. Thus, you can also verify these parameters without a configuration file. Moreover, you can obtain measurement results for CCDF and various power measurements (power spectrum, power vs. symbol, power vs. carrier, power vs. symbol and carrier).

Expanded settings by means of a configuration file

The configuration file defines all parameters of an OFDM signal in detail, which thus permits the software to perform demodulation and the further analysis of OFDM signals configured in almost any manner. This file lets you enter all parameters that the software requires in order to carry out frame synchronization and demodulation. Available results include the various EVM or channel measurements such as EVM for each carrier, group delay, or impulse response.

Configuration file features

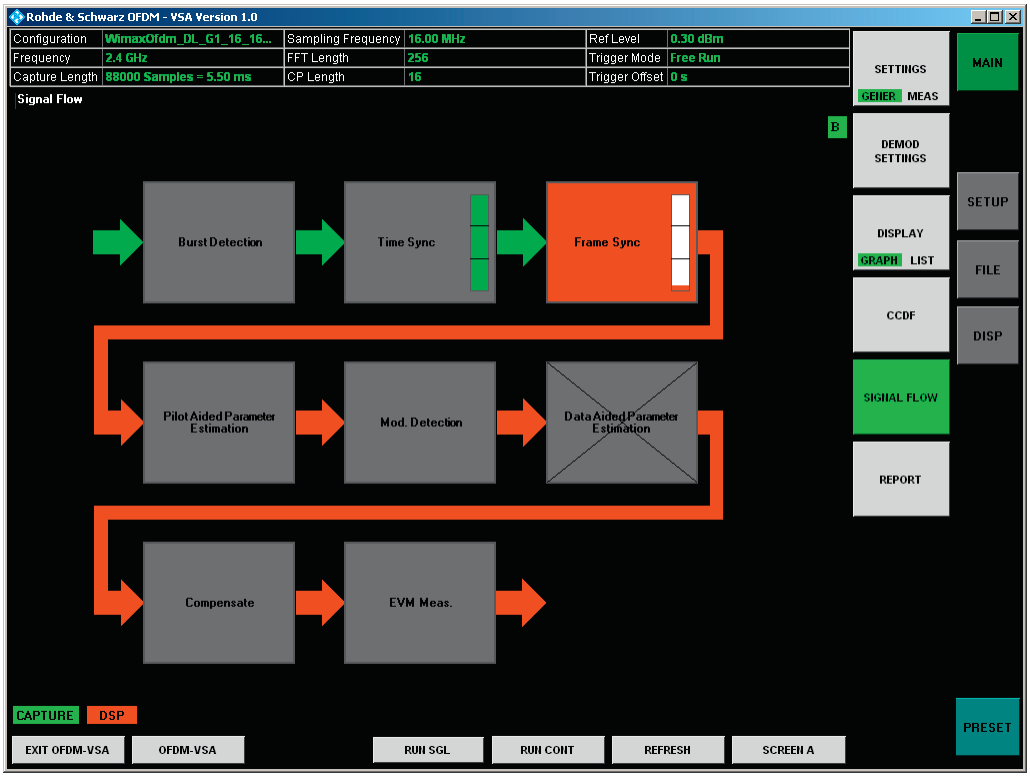
- User-defined information on the following can be entered:
  - Position and value of the pilot carriers
  - Position and modulation format of the data carriers
  - Preamble structure
- File can be created using higher-level programming languages such as MATLAB® or C
- File easy to create with special MATLAB® class
- Detailed instructions provided on how to create configuration files
- Sample system configuration files provided for the following
  - WLAN 802.11a, 802.11g OFDM
  - WiMAX 802.16 OFDM
  - DVB-T, DVB-H

Expanded settings in the software

In addition to the parameters in the configuration file, parameters such as synchronization and tracking can also be set manually. These setting capabilities make error analysis easy. Plus, you can for example compensate for the frequency error of the measurement signal in the measurement results by using the phase tracking feature.

The software also offers the following functions:

- Frequency synchronization (based on pilots or data)
- Time synchronization (to cyclic prefix or preamble)
- Automatic modulation detection
- Burst search support (accelerates the detection of burst signals)
- Tracking of phase, timing, and level



The signal flow diagram describes the current measurement status in detail. It also offers information about the area in which the signal to be analyzed is faulty or deviates from the settings. The signal flow diagram is thus a powerful tool for troubleshooting problems in the modulation of the signal. In this example, the pilot cells of the signal do not match the configurations. Unused blocks are crossed out.

Measurements

The R&S®FSQ-K96 PC software offers numerous measurements for the analysis of OFDM signals.

A numeric table lists the main parameters and results of the measurements

EVM results (averaged)
- EVM of all carriers
- EVM of data carriers only
- EVM of pilot carriers only

I/Q constellation
- Frequency error
- Symbol clock error

I/Q offset
- Gain imbalance
- Quadrature offset

Power measurement
- Frame power
- Crest factor

The software displays the following measurement results as graphs

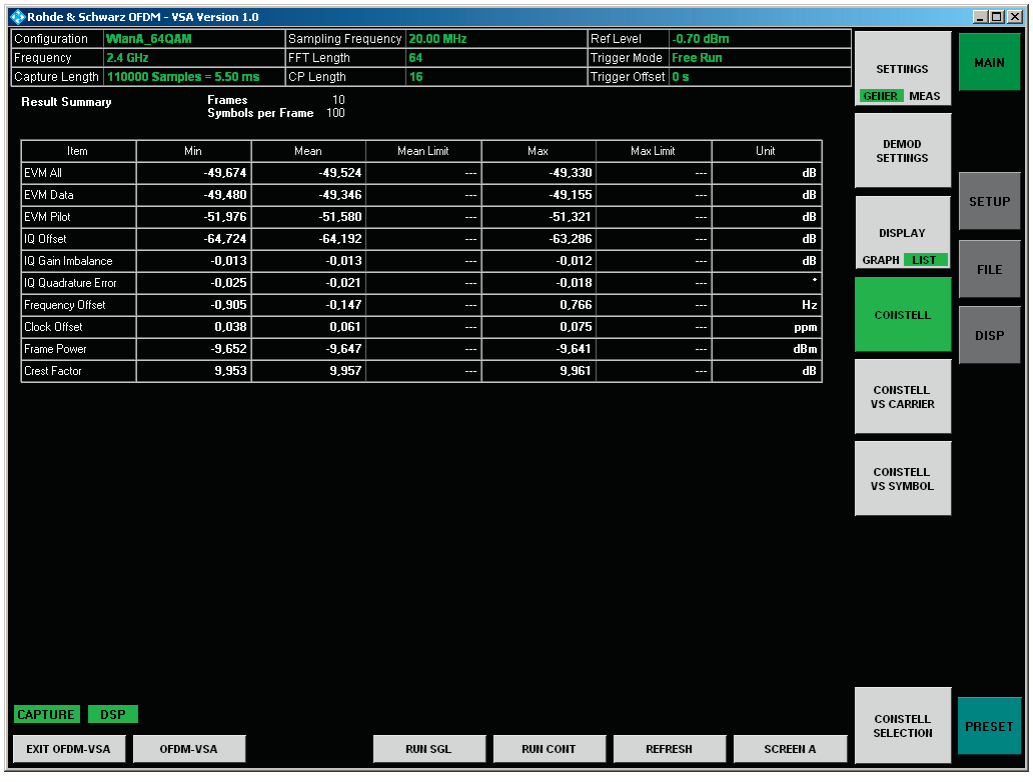
Power measurement
- Power vs. symbol and carrier
- Power vs. carrier
- Power vs. symbol
- Capture buffer
- Power spectrum

Error vector magnitude (EVM measurements)
- EVM vs. symbol and carrier
- EVM vs. carrier
- EVM vs. symbol
- Frequency and phase error

Channel measurements
- Spectrum flatness
- Group delay
- Impulse response

Constellation measurements
- Constellation diagram (color-coded by modulation mode)
- Constellation vs. carrier
- Constellation vs. symbols

Other measurements
- CCDF
- Signal flow diagram (detailed description of the current measurement status)
- Report (detailed list of demodulation steps)



The summary of results offers a quick overview of the most important numeric measurement results. The calculation includes all analyzed frames in the capture buffer.

Ordering information

Designation	Type	Order No.
OFDM Vector Signal Analysis	R&S®FSQ-K96	1308.9570.02
R&S®FSQ Signal Analyzer		
20 Hz to 3.6 GHz	R&S®FSQ3	1155.5001.03
20 Hz to 8 GHz	R&S®FSQ8	1155.5001.08
20 Hz to 26 GHz	R&S®FSQ26	1155.5001.26
20 Hz to 40 GHz	R&S®FSQ40	1155.5001.40
Expansion for the R&S®FSQ		
I/Q Baseband Input	R&S®FSQ-B71	1157.0113.02

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For data sheet, see
PD 5214.0282.22
and www.rohde-schwarz.com
(search term: FSQ-K96)

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*0.14 €/min within German wireline network; rates may vary in other networks (wireline and mobile) and countries.