

R&S®FSL / FSP / FSQ Spectrum / Signal Analyzers

Ready for virtually any broadband application

Rohde & Schwarz offers a complete product portfolio for generating and analyzing signals in WiMAX applications. The products cover virtually any requirement and excellently complement each other.

New standards – greater requirements

Ever higher data rates in wireless transmission methods also place more stringent requirements on the T&M equipment. The demodulation bandwidth is therefore an important parameter. For example, demodulation bandwidths of at least 5 MHz are necessary for measuring the modulation quality of 3GPP signals.

Development labs place the highest requirements on the equipment, where it is often not enough to analyze only a single signal. For realistic tests, it is also necessary to simulate multicarrier / multiband scenarios, which necessitates significantly wider demodulation bandwidths – a domain of high-end signal analyzers such as the R&S®FSQ.

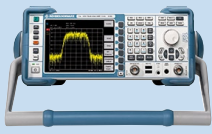


In the past, measurements performed in production only required the demodulation of a narrowband channel. However, the emergence of new broadband transmission standards such as WLAN (802.11) and stationary or mobile WiMAX (802.16-2004, 802.16e-2005) with bandwidths up to 28 MHz are now requiring the use of signal analyzers with wider bandwidths in production as well – a field the R&S®FSL spectrum analyzer specializes in.

High-end and cost-optimized solutions

Rohde & Schwarz offers the ideal T&M equipment for both development and production. A cost-efficient alternative for production now rounds out the company's product portfolio. When equipped with the R&S®FSL-K91 option for WLAN and the R&S®FSL-K93 option for WiMAX, the R&S®FSL is ideal for the analysis of these broadband signals. Owing to its demodulation bandwidth of up to 20 MHz, the R&S®FSL analyzes the modulation quality of all conventional broadband signals at unrivaled speed, accuracy, and cost-effectiveness. The measurement capabilities offered, the user interface, as well as the remote control commands are identical with the corresponding options of the high-end R&S®FSQ signal analyzer (R&S®FSQ-K91 [1], R&S®FSQ-K93 [2]), where only the technical parameters and the configuration may differ. Thus, another major advantage is offered: Measurement solutions developed in the lab can be quickly and easily transferred to production. Porting to different platforms is no longer necessary, and employees do not require special training for the various T&M solutions.

With regard to the production of WLAN and WiMAX equipment, the R&S®FSL is the instrument of choice when it comes to finding a compromise between price and technical capabilities. If the requirements placed on the dynamic range are between those of the R&S®FSL and the high-end R&S®FSQ, e. g. in the production of base stations, Rohde & Schwarz has developed a customized solution: the WiMAX option for the medium-class R&S®FSP spectrum analyzer. By offering

FIG 1 Typical values for EVM and ACLR of the R&S®FSL, R&S®FSP, and R&S®FSQ spectrum and signal analyzers in the case of a WiMAX signal with a bandwidth of 8.75 MHz at 3.5 GHz input frequency. The last row in the table shows the various demodulation bandwidths.

	R&S®FSL	R&S®FSP	R&S®FSQ
			
EVM	-37.5 dB	-46 dB	-54 dB
ACLR	59 dB	69 dB	81 dB
Demodulation bandwidth	20 MHz	9 MHz	120 MHz

the R&S®FSQ, R&S®FSP, and R&S®FSL spectrum and signal analyzers and the R&S®FSQ- / FSP- / FSL-K93 WiMAX options, Rohde & Schwarz provides cross-compatible T&M solutions for any application. Moreover, the solutions differ only in their technical parameters (FIG 1).

If you are performing measurements in the baseband, a further alternative is the R&S®FMU 36 baseband signal analyzer together with the R&S®FSQ-K93 option. With respect to signal processing, this solution is basically identical with the R&S®FSQ (the R&S®FMU 36 is presented on page 44).

Expanded scope of functions

The various measurement capabilities of the R&S®FSL- / FSP- / FSQ-K93 options as well as the display of the measurement results have already been discussed in previous articles on this topic ([2], [3]). However, the well-planned further development of the options includes not only optimized analysis algorithms that allow most notably higher measurement speed and greater flexibility in application, but also an expanded scope of functions. For example, you can now change the mask for spectral measurements and adapt it to the various requirements of the regulatory authorities of different countries. This makes it possible to easily check whether the products can be used in the various sales regions. Moreover, a new function has been added to the options that far exceeds the normal use of vector signal analyzers for testing modulation characteristics. The DL map can now be decoded and used for demodulation. This allows you to measure DL signals without knowing the DL map and without dealing with the difficulties of entering. As a result, the measurement of transmit signals is significantly simplified, development work becomes more effective, and the setup

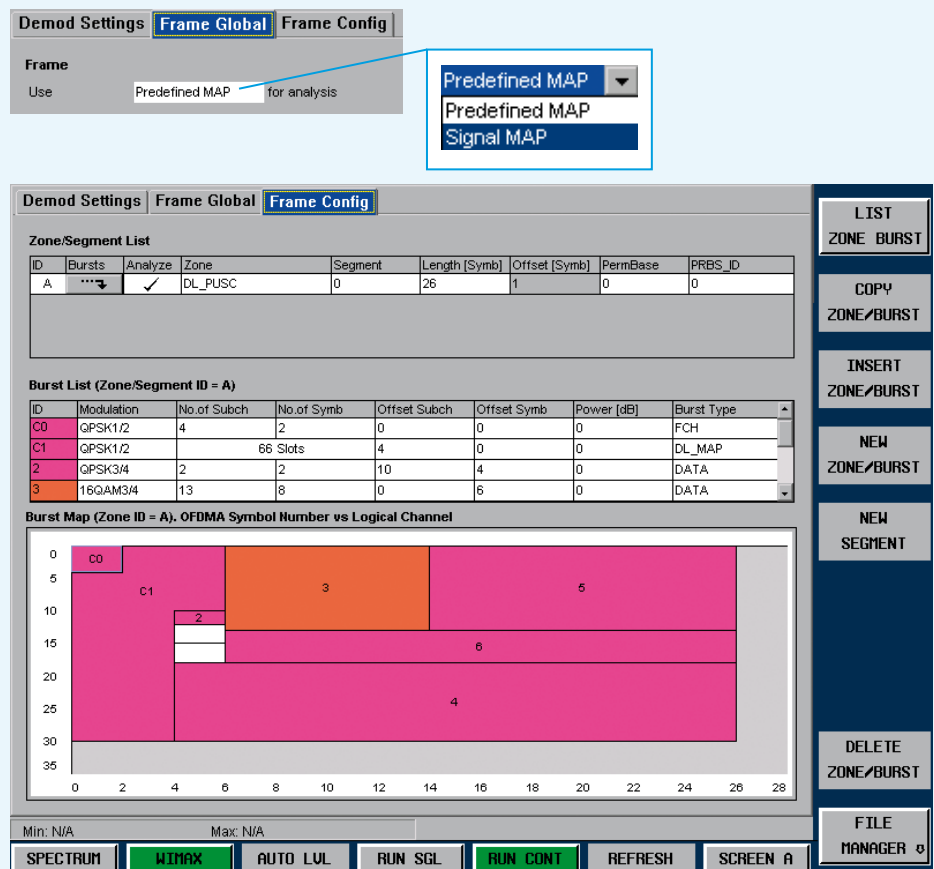
of T&M equipment in production takes less time. Furthermore, you can determine whether the DL map was generated correctly. This function, similar to a sniffer¹⁾, may help you avoid having to invest in a costly instrument for this purpose. FIG 2 shows the simple operation. By defining the demodulation settings, you can specify whether a predefined DL map or the one present in the signal is to be used. The DL map can then be read and graphically displayed. The burst assignment as well as the modulation type of each burst can also be easily read (FIG 3).

Generators as well

The characterization of WiMAX instruments also requires generators in addition to signal analyzers. Rohde & Schwarz offers scalable solutions for this purpose. For example, the R&S®SMJ100 A [4] together with the R&S®SMJ-K49 option is a cost-optimized instrument for generating signals in production. In this case as well, the setting capabilities, the user interface, and the remote

1) A sniffer is an instrument that analyzes and displays transmit signal data that is important for connection setup but without responding to it – as, for example, a full-fledged protocol tester or communications tester is able to do.

FIG 2 Automatic demodulation of a WiMAX signal. The burst assignment with the various modulation types can be displayed.



► control commands are identical to those of the high-end R&S®SMU200A generator. The R&S®SMU200A offers significantly more capabilities such as fading, which is indispensable in development labs. To further simplify measurements on WiMAX modules, the individual signal settings of Rohde & Schwarz signal generators can be transferred to the Rohde & Schwarz signal analyzers – either directly via LAN or via an external storage medium. You only have to define the signal once in the generator, i. e. you do not have to configure the analyzer after you transfer the settings. This eliminates effort and errors, which can be very time-consuming due to the large number of WiMAX parameters involved.

Summary

Rohde & Schwarz provides a complete product portfolio for WiMAX – both for generating and analyzing signals. Moreover, the individual products optimally complement each other. The combination of the R&S®FSL and R&S®SMJ100A is often used in production shops, while the R&S®FSQ together with the R&S®SMU200A is intended more for development labs.

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More information and data sheets at
www.rohde-schwarz.com
(search term: type designation)

REFERENCES

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- [3] Signal Generators R&S®SMx / Analyzers R&S®FSQ / R&S®FSL: WiMAX goes mobile – new T&M solutions are required. News from Rohde & Schwarz (2006), No. 190, pp 24–27
- [4] Vector Signal Generator R&S®SMJ100A: The all-purpose generator that redefines the medium segment. News from Rohde & Schwarz (2005), No. 186, pp 30–33

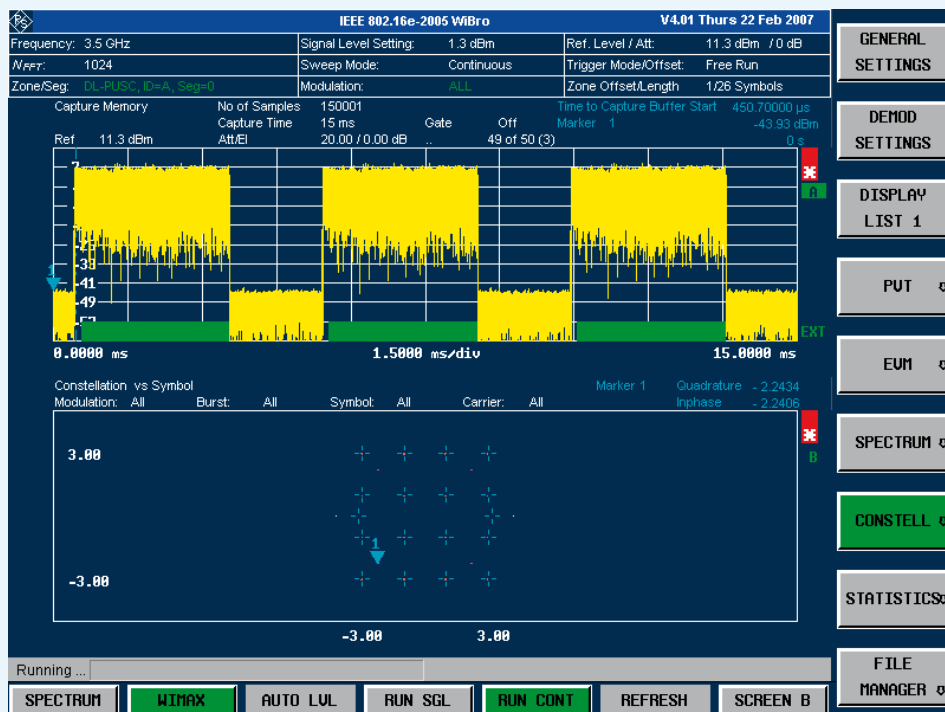


FIG 3

The green bar shows which parts of the signal have been analyzed and that the DL map has been detected. The constellation diagram shows the various modulation types.