

WLAN 802.11a Application Firmware R&S[®] FSQ-K90

Transmitter measurements on WLAN 802.11a OFDM signals with the Signal Analyzer R&S FSQ

- Enhances the signal analyzers of the R&S FSQ family by transmitter measurements in accordance with the IEEE 802.11a standard
- Frequency range from 20 MHz to 3/8/26 GHz, depending on base unit
- Very low residual EVM of below -44 dB/-46 dB
- Automatic or manual setting of modulation format
- Analysis at the RF or in the baseband (optional)
- All measurement functions remotecontrollable via IEC/IEEE bus or LAN
- High measurement rate of >2 measurements/s (54 Mbps, 16 payload symbols)
- Supports 802.11g OFDM



General

Application Firmware R&S FSQ-K90 expands the application range of the Signal Analyzers R&S FSQ by spectrum and modulation measurements on OFDM signals in accordance with the WLAN standard IEEE 802.11a. The measurements specified by this standard can thus be performed at a keystroke, for example:

- Output power (burst power)
- Spectrum mask with limit lines and PASS/FAIL display (FIG 1a +b)

- Spectrum flatness (including display of group delay, FIG 4)
- Constellation error (FIG 2)
- RF carrier leakage (FIG 2)
- Carrier frequency and symbol clock error
- Adjacent channel power

Further analysis and evaluation facilities are often required in the development and verification phase:

- Constellation diagram for all carriers or a single carrier
- Constellation overview of all carriers (FIG 6)
- EVM of single carriers
- EVM versus symbols or time
- Group delay
- Time-gated spectrum (FFT)
- Time-gated CCDF and crest factor
- Bit stream
- Analysis at the RF, IF, inverted IF or in the baseband (option R&S FSQ-B71)
- Selectable tracking (phase, timing, level)

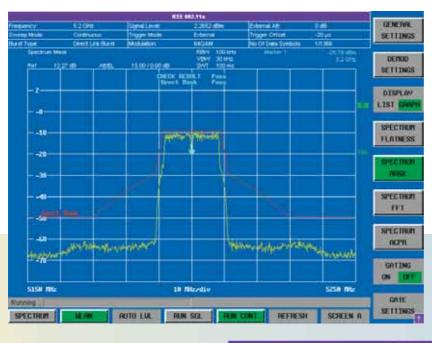


FIG 1a: Spectrum mask with standard-compliant limit lines

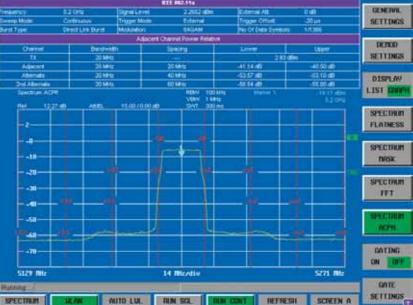


FIG 1b: ACP measurement

The usual spectrum analysis functions of the base unit further expand measurement functionality, making the instrument even more versatile.

Other typical development tasks can be performed with the following measurement functions:

- Channel and user-configurable adjacent channel power measurement
- Multicarrier adjacent channel power measurement
- TOI marker for automatic determination of third-order intercept
- Noise measurements (with R&S FS-K3) or phase noise measurement (with R&S FS-K4)

The Signal Analyzer R&S FS026 covers the entire frequency range to be measured for spurious emissions.

			IEEE 802.11a					
Frequency:	2 OHz	Signal Level	3.19 dBn		idemai Att	0.08		GENERAL
Sweep Mode:	Single	Trigger Mode:	Free Run		rigger Offset	0 s		SETTINGS
Burst Type:	Direct Link B	urst Modulation:	64QAM	!	io Of Data Symbols:	1/1366		
								DEMOD
			sult Summar	У				SETTINGS
No. of Bursts	5	1000 of 1000						
		Min	Mean	Lim	it Max	: Limit	Unit	DISPLAY
EVM All Carr	iers	0.30	0.47	5.6	2 0.66	5.62	%	LIST GRAPH
		-50.49	-46.47	-25.0	0 -43.67	-25.00	dB	
EVM Data Ca	arriers	0.30	0.48	5.6	2 0.67	5.62	%	PUT 0
		-50.40	-46.37	-25.0	0 -43.54	-25.00	dB	
EVM Pilot Ca	arriers	0.22	0.40	39.8	1 0.58	39.81	%	EUH 0
		-53.00	-47.91	-8.0	0 -44.66	-8.00	dB	
IQ Offset		-50.60	-48.00	-15.0	0 -48.17	-15.00	dB	
Gain Imbalar		-0.07	-0.01		0.04		%	SPECTRUM ©
		-0.01	-0.00		0.00		dB	
Quadrature (Offset	-0.10	-0.04		0.00		•	CONSTELL 0
Center Frequ	Jency Error	101.59	117.59	± 4000	0 131.78	± 40000	Hz	
Symbol Clock	k Error	-1.46	-0.09	± 2	0 1.40	± 20	ppm	
Burst Power		0.89	0.95		1.19		dBm	STATISTICS®
Crest Factor		8.03	9.09		10.36		dB	
Measurement C	omplete							
SPECTRUM	HLAN	AUTO LUL	RUN SOL	RUN CON	IT REFRESH	SCREE	NB	

FIG 2: Display of the main modulation parameters in the Result Summary: The measurement covering 20 bursts shows an EVM of -46.7 dB for the best burst (min. peak) and -45.09 dB for the worst burst (max. peak) as well as an average EVM of -46.09 dB for all bursts. Output power (with regard to burst) and crest factor are also displayed. Quick and easy determination, for example, of the EVM dependence on the output power of an amplifier is thus possible. Owing to its auto level function, the analyzer follows these level changes without requiring any manual settings.

Carrier Selection		IEI I	E 802.11a			
Carrier Selection	All Carriers	Signal Level	4.4059 dDn	External Att.	0:00	GENERAL
	Al Carriers	Trigger Mode:	External	Trigger Offset	-20 µs	SETTINGS
MEAN FYERE	Plicts Only	Modulation	64QAM	No Of Data Symbols:	1/1366	
Capture Memor	7 .26	anples 20000				
Ref 14,485	-25	a Time 1 mg	Gate Off B Burst 1(1)			DEMOD
A 404 10	-24	nale finitizendelated				SETTINGS
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H-₩-¶						LIST GRAPH
-26						
-34						
-42				M		CONSTELL
58						
58						
0.0000 ms		0.1	888 mszdiv		1.0000 ws	CONSTELL
						US CARRIER
Constellation v	s Symbol					V3 CHITTEN
9.84918						
			+ + + + +			
			4 4 4 4 4			
		+++	4 4 4 4 4			
						CARRIER
						SELECTION
			+ + + + +			GATING
			+ + + + +			0011120100
-9.84918						ON OFF
-38,9036					38,9036	
Running						GATE
					-	SETTINGS
SPECTRUM	HLAN	AUTO LUL RI	IN SGL RUN	CONT REFRESH	SCREEN (A TIMOU

FIG 3: Constellation diagram of all or (selectable) single carriers

			IEF ##2.11#				
sumer:	52012	SanwLever	4.4850 (Em.	External Alt	0.68		DENERIE
weigt Mildler	Continuous	Trigger Milde	Esterniel	Trager Other	-20 µm		SETTING
est Type:	Depict Line Durit	MOBUIER	EEGAM.	No Of Data Synders	171366		Bhiskhister
Spectrum Fi	eness (ABSAB) Georg	Delay Ref. (ODItys)					-
1 1		1 1	1 1 1				DEMOD
							SETTING
2.4					-	-	
							DISPLA
1.0						100	LIST ON
							Mileon I
							C. CONTRACTOR
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- 10.6		_			_	-	SPECINE
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-26 Garr	ier-	??*	CORT PERSONNEL OF		10000	10 F 2	A A STORE
-26 Garr	ier.	10712					GATE

FIG 4: Group delay and spectrum flatness are determined via the channel estimation of the preamble or (user-selectable) for the entire burst including payload. Frequency responses of filters, distortions due to time offsets or different I and Q signal delays (skew) are clearly visible.

General Settings					
Signal Characteristics					
Standard	IEEE 802.11a				
Frequency	5.2 GHz				
Channel No	40				
Auto Level	\checkmark				
Ext Att	0 dB				
Signal Level (RF)	-30 dBm				
Signal Level (Baseband)	1 V				
Data Capture Settings					
Capture Time	1 ms				
Overall Burst Count					
No of Bursts to Analyze	1				
Trigger Settings					
Trigger Mode	Free Run				
Trigger Offset	Free Run				
Power Level (RF)	External				
Power Level (Baseband)	Power				
Auto Power Trigger Level					
IQ Settings					
Swap IQ					
Input Settings					
Baseband Input					
IQ Input	50 Ohm				
Balanced	\checkmark				
Low Pass	\checkmark				
Dither					

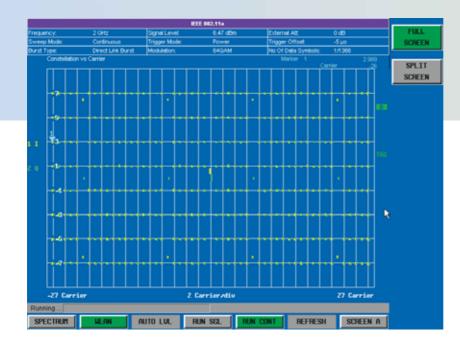
Demod Settings				
Burst To Analyze Use Signal Field Content Burst Type Demodulator Equal Burst Length Min No of Data Symbols Max No of Data Symbols	Direct Link Burst 64QAM BPSK QPSK 16QAM 64QAM			
Improved Channel Estimation Tracking Phase Timing Level	~			

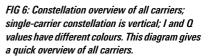
FIGs 5a + b: Setup; tables permit a quick overview of the selected settings and immediate access to the setting parameters

The optional Vector Signal Analyzer R&S FSQ-K70 enhances the R&S FSQ by universal demodulation and analysis functions for digitally modulated signals up to a symbol rate of 25 Msps. Thus, the AM/AM and AM/φM distortion curves of an amplifier, for example, can be determined directly from a digitally modulated signal, i.e. very realistically. For analysis down to the chip layer, the option R&S FSQ-B71 has selectable balanced or unbalanced I and Q baseband inputs.

Measurements in the 2.4 GHz range already support 802.11g OFDM.

Specifications for R&S FSQ-K90 see PD 0758.0200.





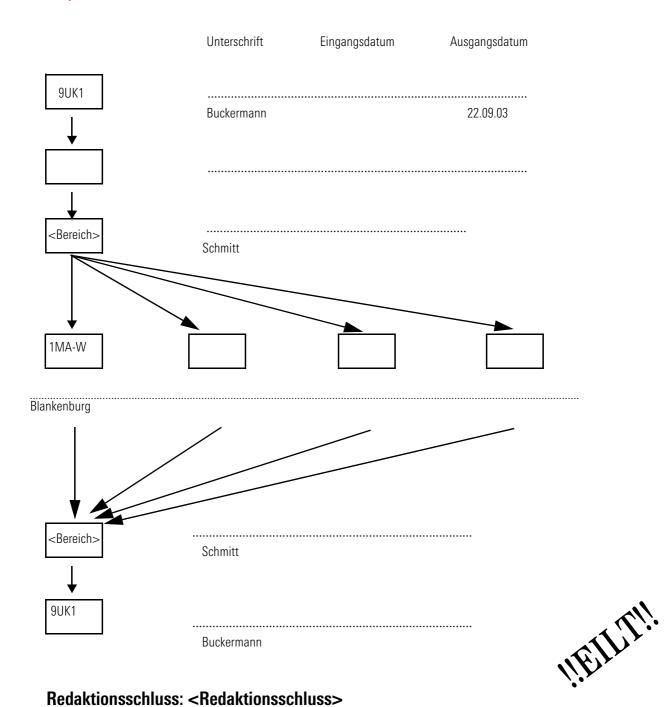




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Datenblatt-Umlauf WLAN 802.11a Application Firmware R&S $^{\!\!\circ}\,\Phi\Sigma\Theta{-}K90$

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Bemerkungen: