Application Firmware for Bluetooth™ Measurements R&S FS-K8

Bluetooth transmitter measurements with Spectrum Analyzers R&S FSP and R&S FSU

◆ Enhanced measurement functionality for the spectrum analyzers of the R&S FSP and R&S FSU families in line with *Bluetooth* RF Test Specification (*Bluetooth* SIG) Rev. 0.91

◆ Measurement functions
  – Output power
  – Adjacent channel power (ACP)
  – Modulation characteristics
  – Initial carrier frequency tolerance (ICTF)
  – Carrier frequency drift

◆ Simultaneous display of traces and all numerical measurement results
◆ Automatic limit value monitoring
◆ Ideal for use in development and production of *Bluetooth* modules

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Application Firmware R&S FS-K8 enhances the range of applications of the Spectrum Analyzers R&S FSP and R&S FSU to include measurements on *Bluetooth* transmitters. All measurements are carried out in line with the *Bluetooth* RF Test Specification (*Bluetooth* SIG) Rev. 0.91. Integrated limit value monitoring is provided for all measurements and allows analysis of the results in the development and production of *Bluetooth* modules.

Output power (Fig. 1)

This measurement is provided for determining the maximum and average output power of the device under test during a burst. A complete packet is recorded in the time domain. The peak power is determined from the total trace contents, whereas the average power is derived from at least 20% to 80% of the burst. Triggering is effected to the sync word.

Adjacent channel power (ACP, Fig. 2)

This measurement is provided for determining the power of all adjacent channels. The power of up to 79 channels in total can be measured (39 lower channels + TX channel + 39 upper channels).
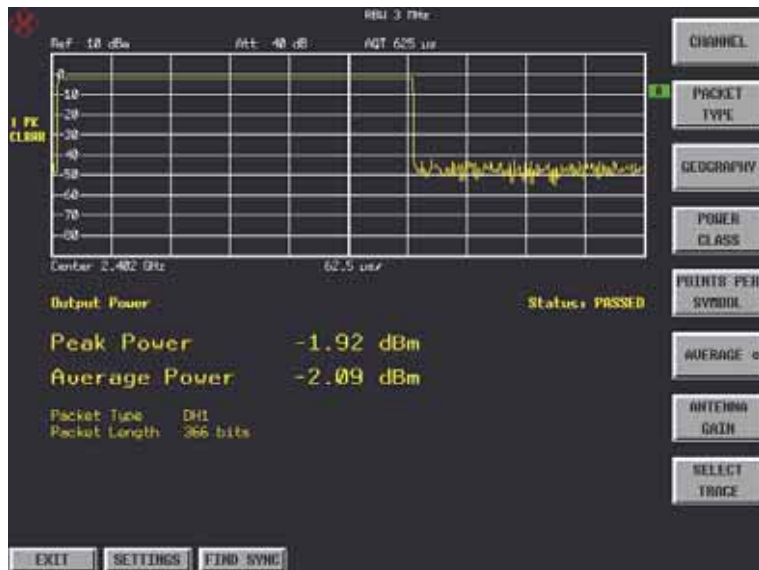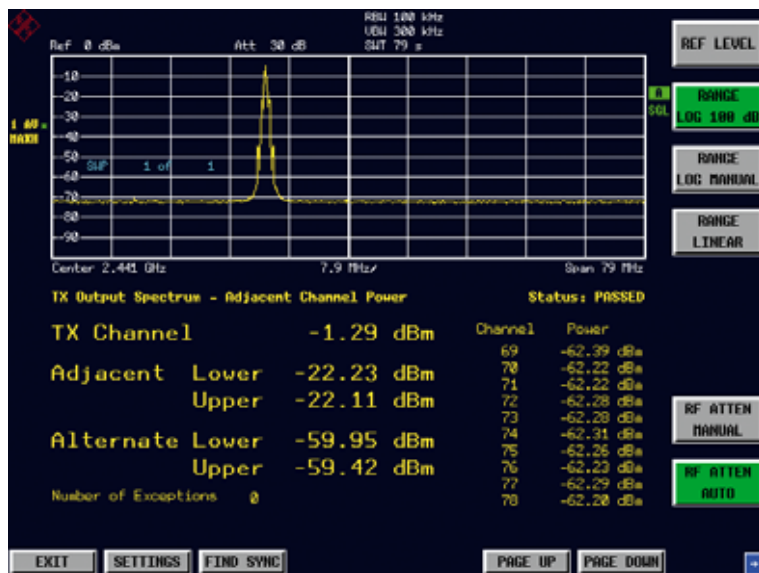

Fig. 1: Measurement of output power

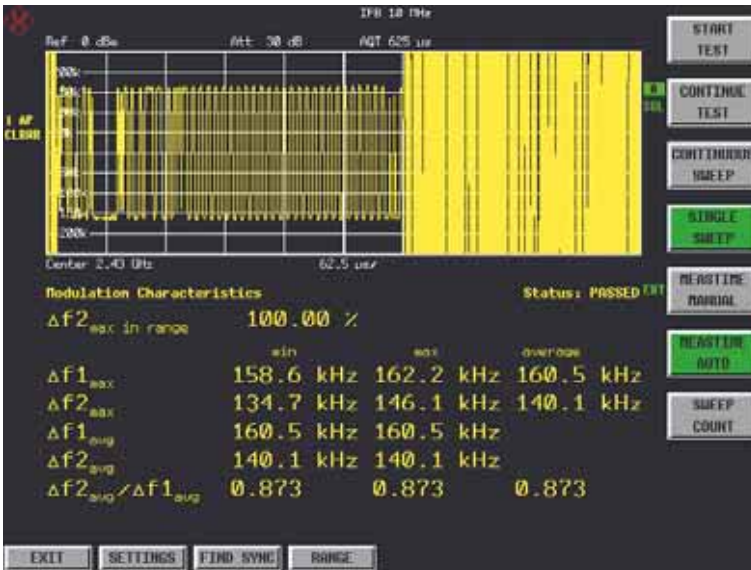*Fig. 2: Measurement of adjacent channel power (ACP)*

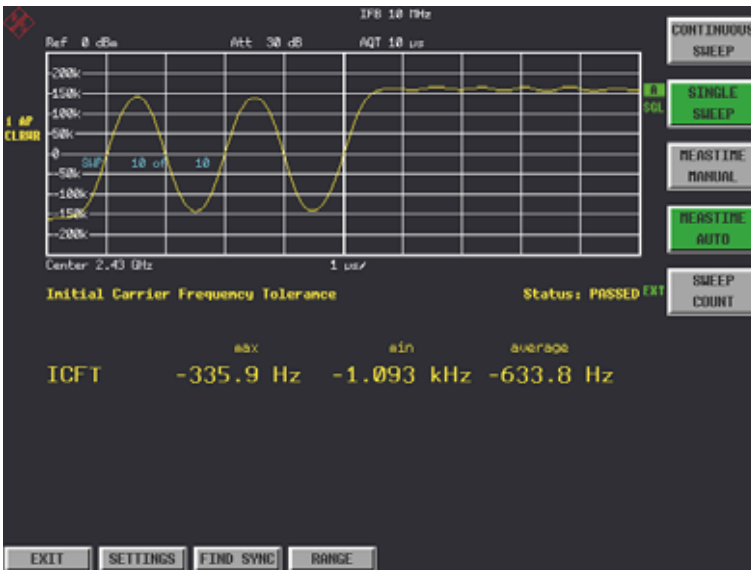Fig. 3: Measurement of modulation characteristics

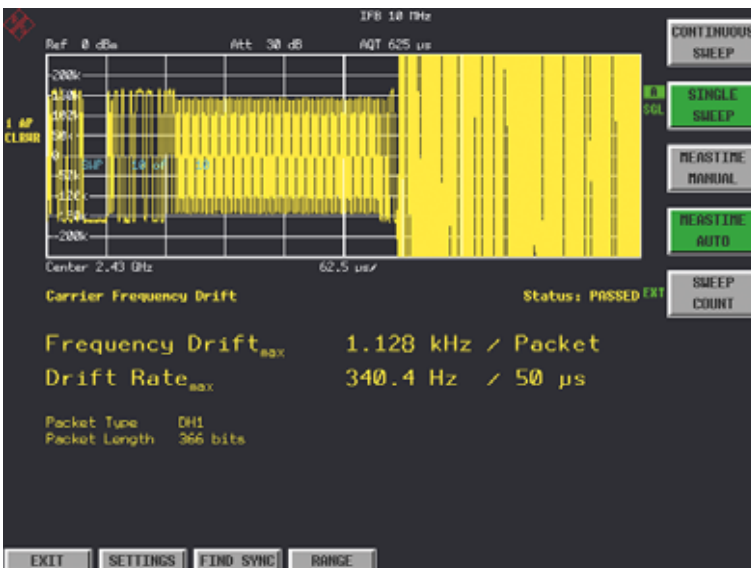

Fig. 4: Measurement of initial carrier frequency tolerance

Fig. 5: Measurement of carrier frequency drift

Modulation characteristics (Fig. 3)

This measurement is provided for determining the maximum frequency deviation of all 8-bit test sequences of the payload. In addition, the average value of the maximum frequency deviations per packet is calculated and displayed.

Initial carrier frequency tolerance (Fig. 4)

This measurement is provided for determining the carrier offset of the four preamble bits. In accordance with the RF test specification, the carrier offset is calculated from the midpoint of the first preamble bit to the midpoint of the bit following the preamble.

Carrier frequency drift (Fig. 5)

This measurement is provided for determining the maximum frequency drift between the average value of the preamble bits and an arbitrary 10-bit group of the payload. The maximum drift rate of the payload is determined in addition.

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Specifications

The specifications below are based on the data sheet specifications of the Spectrum Analyzer R&S FSP and have not been checked separately.
Specifications apply under the following conditions:
15 minutes warmup time at ambient temperature, specified environmental conditions met, calibration cycle adhered to and internal calibration performed.
Data with tolerances denotes measurement uncertainties with a confidence level of 95%.
Unless otherwise stated, specifications are quoted for an RF input level +30 dBm to –50 dBm within the *Bluetooth* band (ISM) 2400 MHz to 2483.5 MHz and default settings.

Output power	
Measurements	average and peak power to *Bluetooth* RF Test Specification
Level range	+30 dBm to –50 dBm
Level uncertainty	<0.7 dB (s = 0.25 dB)
Packet type	longest supported (DH1, DH3, DH5)
Payload	PRBS9
Synchronization	RF burst or preamble
Trigger	IF power, external, free run
Modulation characteristics	
Measurements	FM deviation according to *Bluetooth* RF Test Specification Δf1max, Δf2max, Δf1avg, Δf2avg and Δf2avg/Δf1avg
Deviation range	±250 kHz
Deviation uncertainty	<3 kHz (signal level >–25 dBm, 10 averages)
Packet type	longest supported (DH1, DH3, DH5)
Payload	10101010 and 11110000, auto detect
Synchronization	preamble
Trigger	IF power, external, free run
Initial carrier frequency tolerance (ICFT)	
Measurements	ICFT to *Bluetooth* RF Test Specification
Measurement range	±250 kHz
Uncertainty	<2 kHz + carrier frequency x reference error (signal level >–30 dBm)
Packet type	DH1
Payload	PRBS9
Synchronization	preamble
Trigger	IF power, external, free run
Carrier frequency drift	
Measurements	carrier frequency drift to *Bluetooth* RF Test Specification drift / packet and drift / 50 µs
Measurement range	±250 kHz
Uncertainty	<2 kHz (signal level > –30 dBm)
Packet type	all supported (DH1, DH3, DH5)
Payload	10101010
Synchronization	preamble
Trigger	IF power, external, free run

Adjacent channel power (ACP)	
Measurements	adjacent channel power according to *Bluetooth* RF Test Specification
Level range	max. +20 dBm
Packet type	DH1
Payload	PRBS9
Synchronization	none
Trigger	external, free run

Ordering information

Order designation	Type	Order No.
Application Firmware for Bluetooth™ Measurements with R&S FSP and R&S FSU	R&S FS-K8	1157.2568.02
Spectrum Analyzer 9 kHz to 3 GHz	R&S FSP3	1093.4495.03
Spectrum Analyzer 9 kHz to 7 GHz	R&S FSP7	1093.4495.07
Spectrum Analyzer 9 kHz to 13.6 GHz	R&S FSP13	1093.4495.13
Spectrum Analyzer 9 kHz to 30 GHz	R&S FSP30	1093.4495.30
Spectrum Analyzer 9 kHz to 40 GHz	R&S FSP40	1093.4495.40
Spectrum Analyzer 20 Hz to 3.6 GHz	R&S FSU3	1129.9003.03
Spectrum Analyzer 20 Hz to 8 GHz	R&S FSU8	1129.9003.08
Spectrum Analyzer 20 Hz to 26.5 GHz	R&S FSU26	1129.9003.26

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