



Test Receiver R&S FSET7, R&S FSET22, RF Preselector R&S FSET-Z2, R&S FSET-Z22

Measurement and evaluation of compromising emissions

Test Receiver R&S FSET7, R&S FSET22

- ◆ Frequency range
100 Hz to 7 GHz/22 GHz
- ◆ IF bandwidths (RBW)
10 Hz to 500 MHz in steps of 1/2/5
- ◆ Full-featured test receiver or spectrum analyzer operating modes selectable
- ◆ Noise figure <3 dB typ. (up to 2 GHz, with R&S FSET-Z2 or R&S FSET-Z22)
- ◆ Result memory for 500 000 samples (analyzer mode) or 250 000 measurement values (receiver mode, one trace)
- ◆ Built-in controller with operating system WindowsNT

RF Preselector R&S FSET-Z2, R&S FSET-Z22

- ◆ Versatile filters:
 - 11 highpass and 7 lowpass filters freely combinable up to 40 MHz
 - 9 bandpass filters from 40 MHz to 2 GHz
 - 4 highpass filters from 2 GHz to 22 GHz (R&S FSET-Z22 only)
- ◆ Switchable 10/20/30 dB preamplifiers for maximum sensitivity
- ◆ Balanced input (0.3 kHz to 50 kHz) with selectable impedance
- ◆ Built-in comb generator up to 2 GHz



ROHDE & SCHWARZ

Technology at its ultimate limit

Test Receiver R&S FSET7, R&S FSET22¹⁾

The Spectrum Analyzers R&S FSE have set standards for innovative and highly dynamic spectrum analysis. The R&S FSET 7, R&S FSET22 are based on the hardware platform of this analyzer family and combine the flexibility and speed of a spectrum analyzer with the benefits of a high-end test receiver. The two models are characterized by:

- ◆ Measurement results are easily readable on the high-contrast 24 cm colour screen (shielded LC display)
- ◆ Test receiver display with level bargraph and scan result buffer with up to 250 000 measurement values

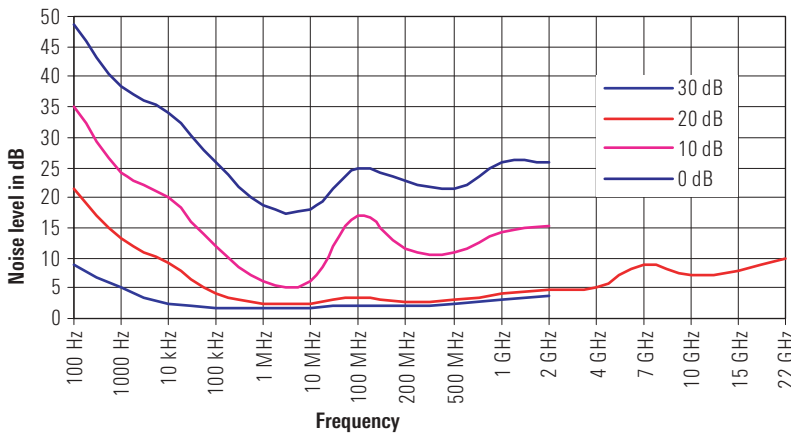
- ◆ Split-screen display, combining fast spectrum analysis with detailed scan spectrum, allows easy evaluation of critical frequencies
- ◆ A great number of evaluation aids such as frequency, level and threshold lines, markers and freely definable limit lines simplify signal measurements in the time and frequency domain
- ◆ Parallel measurements with up to 4 traces or split-screen display with completely different settings allow signals to be investigated under various aspects in a single measurement

- ◆ Modulation analysis of analog or digital signals
- ◆ The integrated Pentium controller permits application programs to be used under WindowsNT without an additional PC being required and simplifies documentation by using universal PC formats for output on a printer or as a file

¹⁾ The designation R&S FSET 7, R&S FSET22 or R&S FSET-Z2, R&S FSET-Z22 indicates that the information provided is valid for both test receivers or both RF preselectors.



Improved data security and structuring for different user groups by means of a removable hard disk containing measurement results, limit lines, operational system, instrument firmware, etc.



Test equipment with very low inherent noise is required for measuring very small signals. Here R&S FSET7, R&S FSET22 with the RF Preselector R&S FSET-Z2, R&S FSET-Z22 set the standard. With a typical noise figure of <3 dB in the frequency range up to 2 GHz the limits of the technically feasible are reached.

With preselector and switchable preamplifiers, the R&S FSET7, R&S FSET22 are optimally equipped for all kinds of measurements.

In addition, the R&S FSET7, R&S FSET22 offer an extra wideband RF signal path and evaluation capabilities making them first choice for exacting emission measurements and measurements on pulsed signals:

- ◆ IF bandwidths (−6 dB) from 10 Hz to 500 MHz; low group-delay distortions reduce overshoots in the case of pulsed signals, the high selectivity (60/6 dB <4.5) ensures excellent separation of even very close signals
- ◆ The pulse stretcher allows detection and display of short pulses at bandwidths up to 500 MHz
- ◆ A memory for 500 000 samples allows fine discrimination of the spectra or time domain signals for more detailed measurements by zooming of captured data (analyzer mode)
- ◆ The wide dynamic range of the linear AM detector permits evaluation of signals of greatly differing level at the video output
- ◆ An undistorted envelope signal is available at the video output even at the largest bandwidth or when a pulse stretcher is used
- ◆ Analog demodulators for AM, FM and φM and digital demodulators for PSK, FSK, QAM and MSK are available for signal modulation measurements

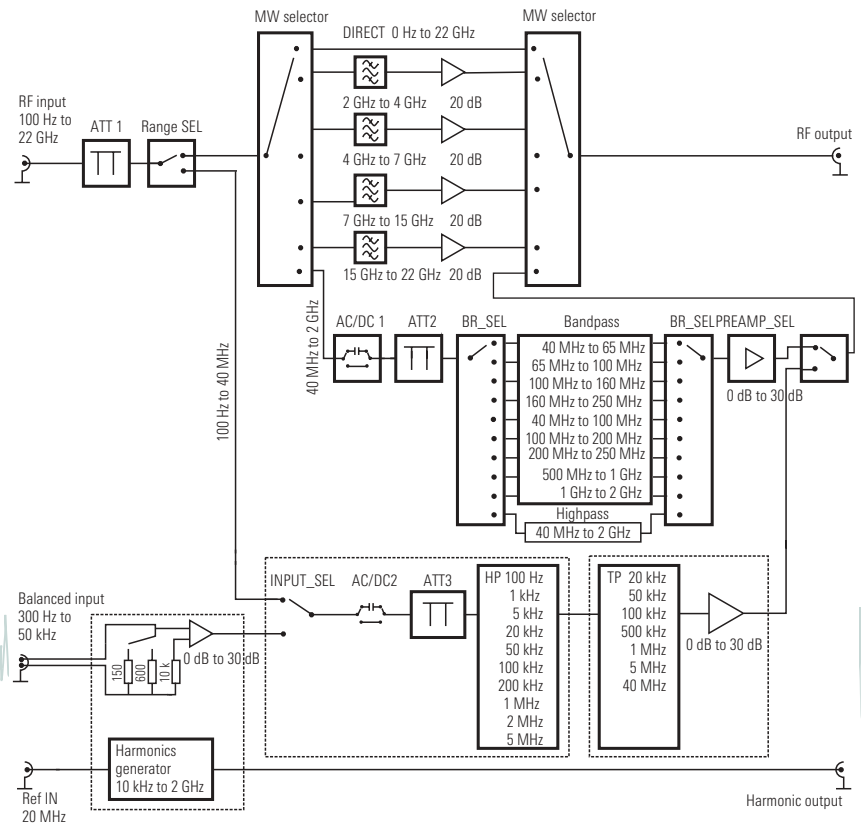
RF Preselector R&S FSET-Z2, R&S FSET-Z22

The RF Preselectors R&S FSET-Z2, R&S FSET-Z22 are controlled by the R&S FSET basic unit. Numerous highpass, lowpass and bandpass filters of extremely low insertion loss suppress strong signals without influencing the sensitivity. Switchable preamplifiers match the receiver input to the signal to be measured. With a 30 dB preamplifier and

noise figure of 3 dB up to 2 GHz even very weak signals can be measured. With 0 dB gain, an intermodulation-free dynamic range of more than 100 dB of the receiver ensures that the inherent interference is negligible. This allows optimum measurements to be performed on signals of any strength.

The balanced input makes low-hum measurements at low frequencies possible.

Block diagram of RF Preselector R&S FSET-Z22



Applications at a glance

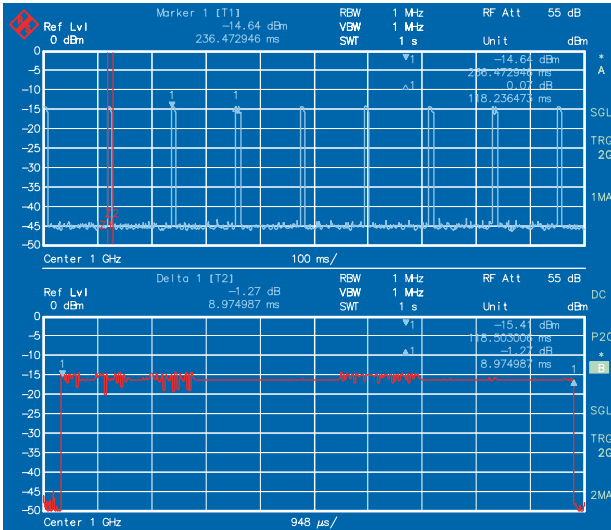


FIG 1 The 500 000 sample memory of the R&S FSET7, R&S FSET22 in conjunction with a maximum sweep time of 16 000 seconds offers a high resolution for off-line analysis and thus speeds up highly sensitive measurements with the use of a wide span and narrow IF bandwidth. A typical application is the zooming of long sweeps in the time or frequency domain. The upper trace shows 1 s of a received pulse on a logarithmic scale, the lower trace a signal expanded by the factor 105.

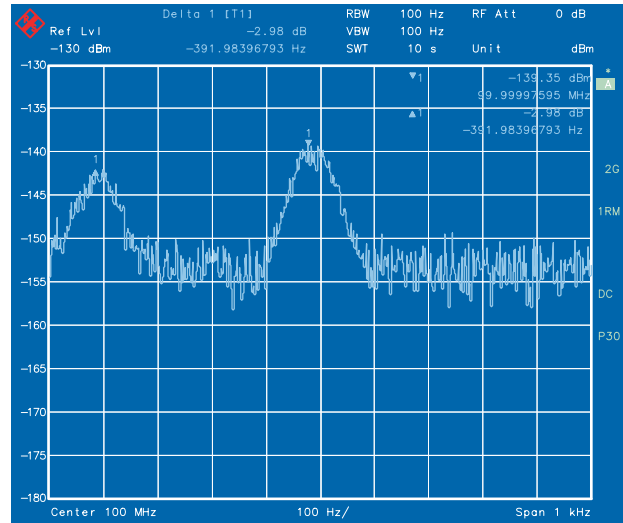


FIG 2 The nonharmonics of a 100 MHz signal of -140 dBm can be exactly measured at a bandwidth of 100 Hz and a signal/noise ratio of >20 dB. At a 10 dB higher noise figure of the measuring instrument, the bandwidth would have to be reduced to 10 Hz and the sweep time extended by the factor 100 to obtain a similar display.

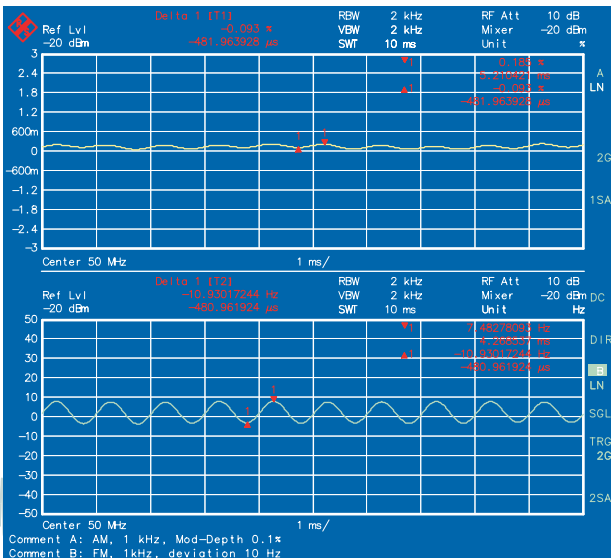


FIG 3 High-precision demodulators for AM, FM and ϕM signals are standard in the R&S FSET7, R&S FSET22. Digital demodulation of AM and FM signals permits accurate measurement down to very small modulation depths. The upper trace in the diagram shows a demodulated AM signal with a modulation depth of 0.1%. At the bottom a demodulated FM signal with 10 Hz deviation is displayed.

In addition to the narrowband digital demodulators, the R&S FSET7, R&S FSET22 comprise an analog broadband FM demodulator covering the deviation range from 50 kHz to 5 MHz.

- ◆ The wide IF range from 10 Hz to 500 MHz, the high measurement speed and the great variety of evaluation and display capabilities make the R&S FSET7, R&S FSET22 ideal for exacting measurements.
- ◆ Even **weak signals approaching the physical limit** can be accurately measured with the aid of narrowband filters. Filter bandwidths of up to 1 kHz are implemented in the R&S FSET7, R&S FSET22 with digital FIR filters. These filters feature a completely aging- and temperature-independent characteristic, an ideal phase response and good selectivity. In contrast to FFT filters, digital FIR filters act like analog filters and can, therefore, also be used for pulsed signals.
- ◆ The IF and video bandwidths of up to 500 MHz ensure that broadband signals are fully detected and made available for further processing at the IF or video outputs. Internal signal processing is performed with a 20 MHz sampling frequency, 12 bit resolution and analog pulse stretcher. Because of the minimum sweep time of 1 μ s at zero span, accurate measurements can be carried out in the time domain without further measuring aids.

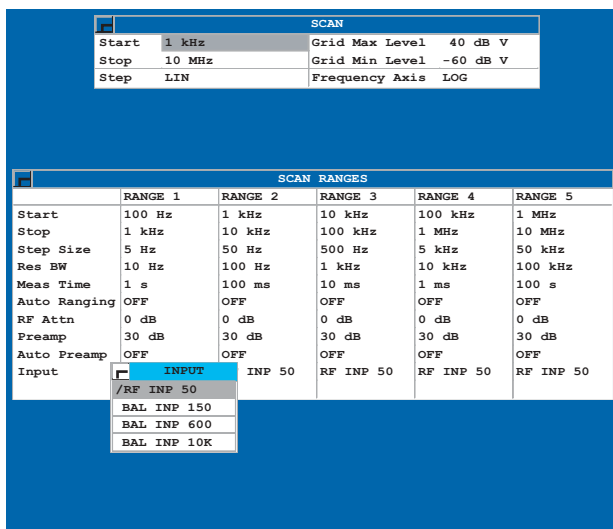


FIG 4 In RECEIVER mode, the R&S FSET measures in a predefined frequency range with selectable settings (step width, measurement time, IF bandwidth, preamp gain etc) for each frequency. Up to 10 subranges which need not be next to each other can be defined within one scan. The subranges are then scanned by the R&S FSET one after the other. The individual parameter settings for the measurement in each subrange can be selected independently. The maximal number of frequencies that can be measured depends on the number of the traces that are switched on (one trace: 250 000 samples; four traces: 80 000 samples per trace). They are stored for post-processing, e.g. zooming or data export in ASCII format.

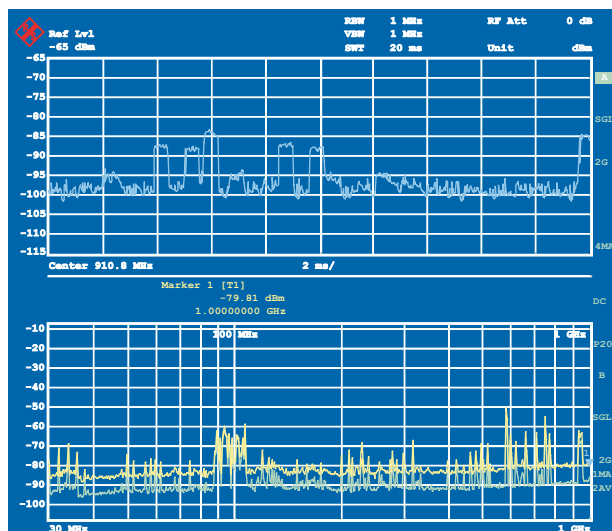


FIG 5 The measurement results are displayed on the screen either in a full-screen window or in two split-screen windows. In RECEIVER mode, a selection can be made in the upper half of the screen between bargraph display of receiver mode and spectrum analyzer mode. The lower half of the screen displays the trace(s) of the last frequency scan. The MARKER TRACK function couples the center frequency of the upper screen in analyzer mode to the marker frequency in the lower screen (receiver mode). As a result, a further evaluation at critical frequencies of the previous scan result either in the frequency or time domain is facilitated considerably.

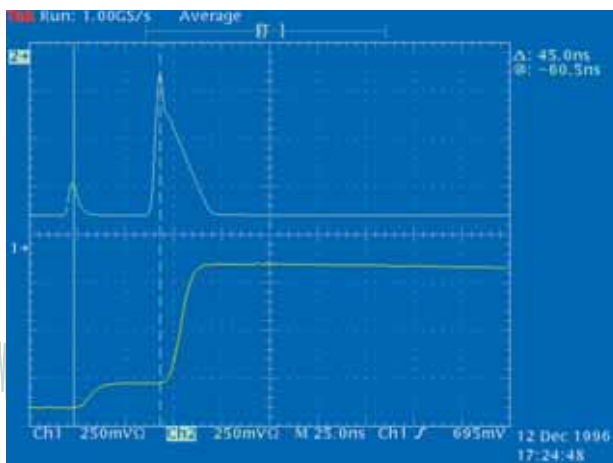


FIG 6 The integrated analog pulse stretcher is notable for its high level accuracy and excellent dynamic characteristics. It allows level-controlled measurements of short pulses with resolution bandwidths of up to 500 MHz to be performed. The upper trace of the diagram shows the input signal: two short pulses of different amplitude, spaced 45 ns. The displayed signal is available at the VIDEO UNSTRETCHED output. The extended pulse is due to band-limiting of the IF filter. The pulse stretcher accurately follows the input signal level and holds the signal with an inaccuracy of <1 dB for the subsequent 12 bit A/D conversion.

A rewarding investment

Outstanding sensitivity

The RF Preselectors R&S FSET-Z2, R&S FSET-Z22 add an outstanding sensitivity and versatile input filters to the R&S FSET7, R&S FSET22 basic unit, making them ideal instruments for measuring broadband and weak signals – particularly at the antenna. Thanks to the preselector and subsequent sensitive amplifiers, signal sources with an extremely wide dynamic range can be accurately detected.

Without the RF preselector unit, the R&S FSET7, R&S FSET22 can be used as a broadband spectrum analyzer.

Low cost of ownership

The careful design of the R&S FSE family for minimizing electrical and mechanical failures has also been applied to the R&S FSET7, R&S FSET22:

- ◆ Calibration interval 1 year
- ◆ Built-in selftest routines
- ◆ Extensive calibration routines
- ◆ Modular design
- ◆ Statistics function for all mechanical switches

Correctly calibrated at all times

Thanks to internal calibration routines, the R&S FSET7, R&S FSET22 are able to perform accurate measurements within specified tolerances. Manual starting of these calibration routines ensures that important measurements are not interrupted.

The calibration measurements results are made available in form of data tables on the R&S FSET display, i.e. drifts in module parameters are easily detected and the reliability of measurement results is enhanced.

Selftest – the built-in diagnostics

With the aid of the selftest, errors can be located down to module level. This results in fast identification and replacement of defective modules and considerably reduces repair costs and downtimes.

Further on a statistics function displays various tables listing the number of switching operations for all mechanical RF switching components (attenuators, relays, etc).



Interior of the RF Preselector R&S FSET-Z22: a glance into the unit shows the complexity of signal filtering. The solid and modular design ensures a long life and great service friendliness.

Rear of instruments with connections



Specifications

The specifications apply under the following conditions: 30 minutes warmup time at ambient temperature, specified environmental conditions and calibration cycle met. A self-calibration is carried out. Data marked nominal are design parameters and are not checked. The specifications apply to the R&S FSET7, R&S FSET22 stand-alone instruments and to the combined instruments R&S FSET7 + R&S FSET-Z2 or R&S FSET22 + R&S FSET-Z22 unless otherwise stated.

Frequency range	
DC coupling	
R&S FSET 7 + R&S FSET-Z2 ¹⁾	100 Hz to 7 GHz
R&S FSET 22 + R&S FSET-Z22 ¹⁾	100 Hz to 22 GHz
AC coupling	100 Hz to 2 GHz
Frequency resolution	0.1 Hz
Frequency tuning	rotary knob, up/down keys, numeric entry, frequency sweep
Frequency axis	linear or logarithmic
Internal reference frequency (nominal)	
Aging	1 x 10 ⁻⁹ /day, after 30 days of operation 2 x 10 ⁻⁷ /year
Temperature drift	5 x 10 ⁻⁸ (0 °C to +50 °C)
Total error	2.5 x 10 ⁻⁷ /year
Frequency display	
Display	numeric display, with markers
Resolution	0.1 Hz, 0.1 Hz to 10 kHz (depending on span)
Error limits	±(marker frequency x reference error + 0.5% x span + 20% x resolution BW + 10 Hz + ½ (last digit))
Frequency counter	measures frequency of marker
Resolution	0.1 Hz to 10 kHz (settable)
Counting accuracy (S/N >25 dB)	±(frequency x reference error + 10 Hz + ½ (last digit))
Display range of frequency axis	
	0 Hz, 10 Hz to 7 GHz (R&S FSET7) 0 Hz, 10 Hz to 22 GHz (R&S FSET22)
Resolution	0.1 Hz
Error limit	1%
Spectral purity	
SSB phase noise, RF frequency <500 MHz, span = (2 to 100) x carrier offset	
Carrier offset	
100 Hz	<-81 dBc (1 Hz)
1 kHz	<-100 dBc (1 Hz)
10 kHz	<-114 dBc (1 Hz)
100 kHz	<-111 dBc (1 Hz)
1 MHz	<-129 dBc (1 Hz)
Sweep (analyzer mode)	
Span 0 Hz (zero span)	1 µs to 16000 s
Span ≥10 Hz, RBW >1 kHz	5 ms to 16000 s
Accuracy	±1% (nominal)
Picture refresh rate/s (span ≤7 GHz)	>20 updates with 1 trace >15 updates/s with 2 traces at shortest sweep time
Sampling rate	50 ns (20 MHz, 12 bit A/D converter)
Number of pixels	500
Time measurement	with marker or display lines
Resolution	50 ns
Sweep trigger	free-running, single, line, video, gated, delayed, external

Zero span	additional pretrigger, posttrigger, trigger delay	
Frequency scan (receiver mode)		
Scan	scan with max. 10 subranges with different settings	
Measurement time per frequency	100 µs to 100 s, selectable	
RF input		
VSWR (RF attenuation >0 dB)		
f <3.5 GHz	<1.5:1	
f <7 GHz	<2.0:1	
f <22 GHz	<2.5:1 (R&S FSET22 only)	
	R&S FSET7, R&S FSET22	R&S FSET7 + R&S FSET-Z2, R&S FSET22 + R&S FSET-Z22
Input attenuator		
DC to 2 GHz	0 dB to 70 dB, 10 dB steps	0 dB to 80 dB, 1 dB steps
f <2 GHz	0 dB to 70 dB, 10 dB steps	0 dB to 70 dB, 10 dB steps
Maximum input level (RF attenuation ≥10 dB, preamp off)		
AC	30 dBm (137 dBµV)	
Pulse voltage	150 V	
Pulse energy	0.5 mWs	
DC		
DC coupling	0 V	
AC coupling	80 V (R&S FSET-Z2, R&S FSET-Z22 only)	
1 dB compression at RF input (0 dB RF attenuation, RF preamp off)		
f <7 GHz	+10 dBm	
7 GHz to 22 GHz	0 dBm (R&S FSET22 only)	
Filters in RF Preselector R&S FSET-Z2, R&S FSET-Z22		
100 Hz to 40 MHz	highpass and lowpass filters can be combined	
Highpass filters	100 Hz/1/5/20/50/100/200/500 kHz/ 1/2/5 MHz	
Lowpass filters	20/50/100/500 kHz/1/5/40 MHz	
40 MHz to 2 GHz	highpass or fixed bandpass filters	
Highpass filter	40 MHz	
Suboctave filters	40 MHz to 65 MHz 65 MHz to 100 MHz 100 MHz to 160 MHz 160 MHz to 250 MHz	
Octave bandfilters	40 MHz to 100 MHz 100 MHz to 200 MHz 200 MHz to 500 MHz 500 MHz to 1000 MHz 1 GHz to 2 GHz	
2 GHz to 22 GHz (R&S FSET-Z22 only)	highpass filters 2/4/7/15 GHz	
Preamplifier (after preselector) gain (nominal)		
100 Hz to 40 MHz	0/10/20/30 dB, switchable	
40 MHz to 2 GHz	0/10/20/30 dB, switchable	
2 GHz to 22 GHz (R&S FSET-Z22 only)	20 dB	
IF bandwidths (-6 dB, -0/+20%) ²⁾		
Digital filters	10 Hz to 1 kHz, steps 1/2/5	
Selectivity, -60 dB/-6 dB	<4.5	
Analog filters	2 kHz to 500 MHz, steps 1/2/5	
Selectivity, -60 dB/-6 dB	<4.5	
Video bandwidth	1 Hz to 500 MHz, steps 1/2/5	
Pulse stretcher	analog peak detector, suitable for measuring the pulse response up to 500 MHz resolution bandwidth	
Display range	displayed noise floor up to +30 dBm	

Displayed average noise level

(0 dB RF attenuation, RBW = 10 Hz, VBW = 1 Hz, trace average, 20 averages, span 0 Hz, 50 Ω termination)

100 Hz	<-110 dBm
1 kHz	<-120 dBm
10 kHz	<-125 dBm
100 kHz	<-130 dBm
1 MHz	<-142 dBm

Noise figure³⁾ (total noise figure including noise figure of basic unit R&S FSET7, R&S FSET22)

Frequency	R&S FSET7, R&S FSET22	R&S FSET7 + R&S FSET-Z2, R&S FSET22 + R&S FSET-Z2Z, preamplifier gain			
		0 dB	10 dB	20 dB	30 dB
100 Hz to 1 kHz					<20 dB
1 kHz to 10 kHz					<15 dB
10 kHz to 100 kHz					<8 dB
100 kHz to 1 MHz					<6 dB
1 MHz to 40 MHz	<26 dB	<27 dB	<14 dB	<4 dB	<4 dB
40 MHz to 2 GHz	<29 dB	<29 dB	<17 dB	<7 dB	<5 dB
2 GHz to 4 GHz	<29 dB	<30 dB ⁴⁾	–	<8 dB ⁴⁾	–
4 GHz to 7 GHz	<31 dB	<33 dB ⁴⁾	–	<10 dB ⁴⁾	–
7 GHz to 15 GHz ⁴⁾	<29 dB	<33 dB	–	<10 dB	–
15 GHz to 22 GHz ⁴⁾	<31 dB	<35 dB	–	<12 dB	–

Spurious

Max. harmonics suppression, f >500 MHz

90 dB

Intermodulation-free dynamic range

>100 dB

Intermodulation

3rd-order intercept (TOI), Δf >10 x resolution bandwidth or >10 kHz

500 MHz to 7 GHz

>12 dBm

7 GHz to 22 GHz (R&S FSET22 only)

>10 dBm

2nd harmonic intercept (SHI)

>25 dBm for f <500 MHz

>40 dBm for f >500 MHz

Immunity to interference

Image frequency

>80 dB

Intermediate frequency

>70 dB

Residual responses (f >1 MHz, without input signal, 0 dB RF attenuation)

Span <30 MHz

<-110 dBm

Span ≥30 MHz

<-100 dBm

f_m = 5717.2 / 25.175/60 MHz

<-100 dBm

Other responses, mixer level <-10 dBm

<-75 dB

Linear dynamic range

RBW = 1 MHz, RF attenuation = 0 dB, VBW << RBW, logarithmic display (1 dB compression – MDS (minimum detectable signal))

Frequency	Preamplifier gain			
	0 dB	10 dB	20 dB	30 dB
40 MHz	90 dB	85 dB	80 dB	70 dB
100 MHz	85 dB	80 dB	78 dB	68 dB
1 GHz	82 dB	80 dB	78 dB	70 dB

Level display

Digital

numeric, 0.1 dB resolution

Quasi-analog

bargraph display, separate for each detector

Result display

500 x 400 pixels (one diagram displayed)

Logarithmic level range

1 dB, 10 dB to 200 dB in 10 dB steps

Linear level range

10% of reference level per level division, 10 divisions

Setting range of reference level (analyzer mode)

Logarithmic level display

-130 dBm to 30 dBm in 0.1 dB steps

Linear level display

7 nV to 7.07 V in 1% steps

Unit of level axis

Logarithmic level display

dBμV, dBm, dBμA, dBpW, dBpT, dB(μV/m), dB(μA/m), dB⁵⁾/MHz

Linear level display

mV, μV, mA, μA, pW, nW

Traces

max. four traces

Trace detectors

min. peak, max. peak, auto peak, sample, average, rms, AC video

Trace functions

clearwrite, min. hold, max. hold, average

Types of averaging

– running over 10 traces in display memory
– number of averages selectable (1 to 1024)
– averaging of all samples in capture memory
– averaging of maximum and minimum peak values

Capture memory

500 000 measurement values (analyzer mode only)

Number of diagrams displayed

max. two with independent settings

Level measurement

with markers and display lines

Level resolution

0.01 dB

Number of markers

4 markers and 4 delta markers

Time measurement

with markers and display lines

Time resolution

50 ns

Transducers

transducer factors with unit/transducer sets can be defined (frequency-dependent)

Interpolation between points

Stineman method (spline), linear or log. frequency axis

Number of points

max. 50

Limit lines

input via table, with 50 data points each

Interpolation between points

linear or logarithmic

	R&S FSET7, R&S FSET22	R&S FSET7 + R&S FSET-Z2, R&S FSET22 + R&S FSET-Z2Z
Level measurement error limits (30 dB RF attenuation, RBW=5 kHz, span 15 kHz, reference level -15 dBm, input level -20 dBm, preamp off)		
At 120 MHz	<0.3 dB	<0.5 dB
Frequency response (10 dB RF attenuation)		
100 Hz to 1 GHz	<1 dB	
1 GHz to 7 GHz	<2 dB	
Attenuator	<0.4 dB	
IF gain switching	<0.2 dB	
RF preamp switching		<0.5 dB ⁶⁾

Linearity error limits

Logarithmic level display (S/N >15 dB)

RBW 10 Hz to 1 kHz

0 dB to -50 dB

<0.3 dB

-50 dB to -70 dB

<1 dB

RBW 5 kHz to 10 MHz

0 dB to -50 dB

<0.3 dB

-50 dB to -70 dB

<0.5 dB

-70 dB to -95 dB

<1 dB

RBW 20 MHz to 200 MHz

0 dB to -40 dB

<1 dB

-40 dB to -60 dB

<2 dB

Linear level display

5% of reference level

Resolution bandwidth switching error	
≤10 MHz	<0.3 dB
20 MHz to 500 MHz	<2 dB (>100 MHz: measurement in filter center)
Additional amplitude error with pulse signals (pulse stretcher switched on)	
RBW ≤1 MHz	<1 dB
RBW 2 MHz to 5 MHz	<2 dB
RBW 10 MHz	<3 dB
LIN	
RBW 20 MHz to 500 MHz	<2 dB
LOG	
RBW 20 MHz to 100 MHz	<3 dB
RBW 200 MHz	<4 dB

Modulation measurement

Analog modulated signals	AM modulation depth FM frequency deviation phase deviation
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FM demodulation	
2 kHz ≤ RBW ≤ 100 kHz	
Measurement ranges	50 Hz to 50 kHz, steps 5/15/50
Error of deviation display ($f_{mod} \leq 0.1 \times$ RBW, deviation $\leq 0.1 \times$ RBW)	<5% of measured value + residual FM
Frequency offset	<5% of measurement range
Residual FM RMS weighted (RBW 10 kHz, AF lowpass AUTO, reference level -10 dBm, input level -20 dBm)	<4 Hz ⁷⁾

100 kHz < RBW ≤ 10 MHz	
Measurement ranges	50 kHz to 5 MHz, steps 5/15/50
Error of deviation display ($f_{mod} \leq 0.1 \times$ RBW, deviation $\leq 0.1 \times$ RBW)	<5% of measured value + residual FM
Frequency offset	<100 kHz + 5% of measurement range
Residual FM RMS weighted (RBW 500 kHz, AF lowpass AUTO, reference level -10 dBm, input level -20 dBm)	<100 Hz ⁸⁾

φM demodulation	
2 kHz ≤ RBW ≤ 100 kHz	
Measurement ranges	0.01 to 10 rad, steps 1/3/10
Error of deviation display (30 Hz $\leq f_{mod} \leq 0.1 \times$ RBW, phase deviation $\leq 0.1 \times$ RBW/ f_{mod})	<5% of measured value + residual PM
Residual FM RMS weighted (RBW 10 kHz, AF lowpass AUTO, reference level -10 dBm, input level -20 dBm)	<0.01 rad ⁹⁾

AM demodulation	
2 kHz ≤ RBW ≤ 100 kHz	
Measurement ranges	3%, 10%, 100%
Error of modulation depth display (30 Hz $\leq f_{mod} \leq 0.1 \times$ RBW, m < 99%, 0 dB to 30 dB below ref. level, S/N > 55 dB)	<5% of measured value + residual AM
Residual AM RMS weighted (RBW 10 kHz, AF lowpass AUTO 3 kHz, 0 dB to 10 dB below reference level, level > -20 dBm)	<0.03% ⁸⁾

Digital modulated signals	BPSK, QPSK, O-QPSK, DQPSK, $\pi/4$ -DQPSK, 8PSK, 16QAM, MSK, FSK
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Trigger functions

Trigger	free-running, line frequency, video, external
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Delayed sweep	
Trigger source	free-running, line, video, external
Delay time	100 ns to 10 s, resolution 1 μ s or 1% of delay time
Error of delay time	$\pm(1 \mu\text{s} + (0.1\% \times \text{delay time}))$
Delayed sweep time	2 μ s to 1000 s

Gated sweep	
Trigger source	external
Gate delay	1 μ s to 100 s
Gate length	1 μ s to 100 s, resolution 1 μ s or 1% of gate length
Error of gate length	$\pm(1 \mu\text{s} + (0.05\% \times \text{gate length}))$
Gap sweep	
Trigger source	free-running, line frequency, video, external
Pretrigger	1 μ s to 100 s, 50 ns resolution, depending on sweep time
Time between trigger and gap	1 μ s to 100 s, 50 ns resolution, depending on sweep time
Gap length	1 μ s to 100 s, 50 ns resolution

Inputs and outputs (R&S FSET7, R&S FSET22 front panel)

RF input	
R&S FSET7	N female, 50 Ω
R&S FSET22	adapter system, 50 Ω , N male and female, 3.5 mm male and female
Probe power	+15 V DC, -12.6 V DC and ground, max. 150 mA
Antenna code	
Supply and coding connector for antennas etc	12-pin Tuchel socket
Supply voltage	± 10 V, max. 100 mA, ground
AF output	3.5 mm stereo jack plug, $Z_{out} = 10 \Omega$
Open-circuit voltage	max. 1.5 V, adjustable

Inputs and outputs (R&S FSET-Z2, R&S FSET-Z22 front panel)

RF input	
R&S FSET-Z2	N female, 50 Ω
R&S FSET-Z22	adapter system, 50 Ω , N male and female, 3.5 mm male and female
RF output (for connection to R&S FSET7, R&S FSET22 only)	
R&S FSET-Z2	N female, 50 Ω
R&S FSET-Z22	adapter system, 50 Ω
Balanced input (for R&S FSET7 + R&S FSET-Z2, R&S FSET22 + R&S FSET-Z22)	Twinax connector
Frequency range	300 Hz to 50 kHz
Input impedance, selectable	150 Ω , 600 Ω , 10 k Ω
Maximum input voltage	
DC	80 V
AC	4 V peak
Common-mode rejection ($R_{in} = 600 \Omega$)	
300 Hz to 3 kHz	70 dB
3 kHz to 50 kHz	40 dB
Harmonic generator output	N connector, 50 Ω
Output signal, harmonic generator	
10 kHz	comb spectrum 10 kHz to 40 MHz, 40 dB μ V at 10 MHz
100 kHz	comb spectrum 10 MHz to 2 GHz, 30 dB μ V at 120 MHz

Inputs and outputs (R&S FSET7, R&S FSET22 rear panel)

21.4 MHz output	BNC connector, 50 Ω
Bandwidth	≥ 2 kHz or RBW, max. 10 MHz
Level	0 dBm at reference level, mixer level > -60 dBm

741.4 MHz output	BNC connector, 50 Ω
Bandwidth	≥20 MHz or RBW, max. 500 MHz
Level	5 dBm at reference level, mixer level >−60 dBm
Video output	BNC connector, 50 Ω
Voltage	−0.1 V to 1 V full scale
Bandwidth	VBW, max. 0.5 x RBW
Video-unstretched output	BNC connector, 50 Ω
Voltage	−0.1 V to 1 V full scale
Bandwidth	
RBW 20 MHz to 500 MHz	VBW (20 MHz to 500 MHz), max. 0.5 x RBW
RBW ≤10 MHz	0.5 x RBW
External video filter output	BNC connector, 0 to 1 V full scale, 50 Ω
External video filter input	BNC connector, 0 to 1 V full scale, 50 Ω
Sweep start	BNC connector, 50 Ω
Voltage	TTL high on sweep
Reference frequency	
Output, switchable to input	BNC connector
Output frequency, level	10 MHz, 7 dBm
Input	10 MHz or n x 1 MHz, n = 1 to 16
Required level	>0 dBm from 50 Ω
Noise source	
Supply connector for noise source	BNC connector, 0 V and 28 V, switchable
External trigger/gate input	BNC connector, >10 kΩ
Voltage	−5 V to +5 V settable
IEC/IEEE-bus remote control	interface to IEC60625 (IEEE 488.2)
Command set	SCPI 1994.0
Connector	24-pin Amphenol female connector strips
Interface functions	SH1/AH1/T6/L4/SR1/RL1/PP1/DC1/DT1/C11
Serial interface	RS-232-C (COM1 and COM2), 9-pin connectors
Mouse interface	PS/2-mouse-compatible
Printer interface	parallel interface (Centronics-compatible) or serial interface (RS-232-C)
Keyboard connector	5-pin DIN connector for MF-2 keyboard
User interface	25-pin Cannon connector
External monitor (VGA)	15-pin connector
R&S FSET-Z2, R&S FSET-Z22 control interface	25-pin Cannon connector
Reference 20 MHz	BNC connector, 20 MHz clock for R&S FSET-Z2, R&S FSET-Z22
Inputs and outputs (R&S FSET-Z2, R&S FSET-Z22 rear panel)	
R&S FSET-Z2, R&S FSET-Z22 control interface	25-pin Cannon connector, control via R&S FSET7, R&S FSET22
Reference input 20 MHz	BNC connector, 20 MHz clock for R&S FSET-Z2, R&S FSET-Z22

- 1) The designation R&S FSET7 + R&S FSET-Z2 or R&S FSET22 + R&S FSET-Z22 indicates that the information provided is valid for the respective combination of test receiver and RF preselector.
- 2) RBW 500 MHz (−6 dB): −5/+20%.
- 3) Valid in temperature range +20°C to +35°C, otherwise additional error 2 dB.
- 4) R&S FSET22 + R&S FSET-Z22 only (marked in blue).
- 5) x = μV, μV/m, μA or μA/m.
- 6) Valid in temperature range 20°C to 35°C, otherwise additional error 2 dB.
- 7) The values are valid for <7 GHz. The values are double in the range 7 GHz to 15 GHz, and fourfold in the range 15 GHz to 22 GHz.
- 8) The values are valid for <7 GHz. The values are double in the range 7 GHz to 15 GHz, and fourfold in the range 15 GHz to 22 GHz (R&S FSET22 only).

General data

Display	24 cm (9.5") LC colour display, 640 x 480 pixels (VGA resolution)
Integrated controller	
Mass memory	3.5" disk drive, 1.44 Mbyte, removable hard disk
Processor	Pentium MMX: 233 MHz
Operating system	Windows NT, English version
RAM	64 Mbyte
Environmental	
Nominal temperature range	+5°C to +40°C
Limit temperature range	0°C to +50°C
Storage temperature range	−40°C to +70°C
Humidity	+40°C at 95% rel. humidity (IEC60068)
Mechanical resistance	
Sinusoidal vibration	5 Hz to 150 Hz, max. 2 g at 55 Hz, 0.5 g from 55 Hz to 150 Hz, in line with IEC60068, IEC61010, MIL-T-28800D, class 5
Random vibration	10 Hz to 300 Hz, acceleration 1.2 g rms
Shock	40 g shock spectrum, in line with MIL-STD-810C and MIL-T-28800D, classes 3 and 5
RFI suppression	corresponds to EMC regulation of EU (89/336/EEC) and to German EMC law
Power requirements	
R&S FSET7, R&S FSET22	100 V to 120 V ±10%, 50 Hz to 400 Hz 200 V to 240 V ±10%, 50 Hz to 60 Hz
R&S FSET-Z2, R&S FSET-Z22	100/120/230/240 V ±10%, 47 Hz to 440 Hz, class of protection I to VDE0411
Power consumption	
R&S FSET7, R&S FSET22	280 VA
R&S FSET-Z2, R&S FSET-Z22	50 VA
Safety	in line with EN61010
Dimensions (W x H x D)	
R&S FSET7, R&S FSET22	435 mm x 236 mm x 570 mm (17.1 x 9.3 x 22.45 inches)
R&S FSET-Z2, R&S FSET-Z22	435 mm x 192 mm x 570 mm (17.1 x 7.6 x 22.45 inches)
Weight	
R&S FSET7, R&S FSET22	approx. 32 kg (72 lb)
R&S FSET-Z2, R&S FSET-Z22	approx. 26 kg (58 lb)

Ordering information

Order designation	Type	Order No.
Test Receiver 100 Hz to 7 GHz	R&S FSET7	1080.3508.27
Test Receiver 100 Hz to 22 GHz	R&S FSET22	1080.3508.32
RF Preselector for R&S FSET7	R&S FSET-Z2	1070.2009.07
RF Preselector for R&S FSET22	R&S FSET-Z22	1070.2009.02
Accessories supplied for R&S FSET7, R&S FSET22		
Power cable, operating manual, spare fuses, MF-2 keyboard (US), PS/2 mouse Test-port adapter N and 3.5 mm connector (female) (for R&S FSET22 only)		
Accessories supplied for R&S FSET-Z2, R&S FSET-Z22		
Power cable, spare fuses, set of connecting cables to R&S FSET7, R&S FSET22 (length: 300 mm)		
Options		
2nd Hard Disk for R&S FSET7, R&S FSET22 incl. firmware, WindowsNT	R&S FSE-B19	1088.7248.22
Ethernet Interface with RJ45 connector	R&S FSE-B16	1073.5973.04

Order designation	Type	Order No.
Recommended extras		
Service Kit	R&S FSE-Z1	1066.3862.02
Headphones		0708.9010.00
IEC/IEEE-Bus Connecting Cable, 1 m	R&S PCK	0292.2013.10
IEC/IEEE-Bus Connecting Cable, 2 m	R&S PCK	0292.2013.20
Transit Case (for R&S FSET7, R&S FSET22)	R&S ZZK-955	1013.9395.00
Transit Case (for R&S FSET-Z2, R&S FSET-Z22)	R&S ZZK-945	1013.9372.00
19" Rack Adapter (for R&S FSET7, R&S FSET22)	R&S ZZA-95	0396.4911.00
19" Rack Adapter (for R&S FSET-Z2, R&S FSET-Z22)	R&S ZZK-94	0396.4905.00
H-Field Test Antenna (100 Hz to 30 MHz)	R&S HM525	4031.0508.02
Low-Noise Test Antenna System (100 Hz to 1 GHz)	R&S AM524	4015.7001.02





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