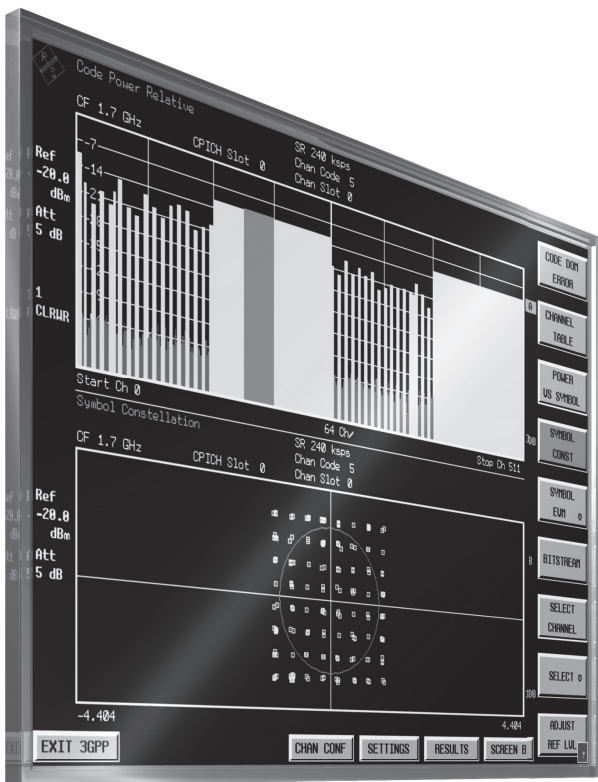


# R&S® FS-K72/-K73/-K73+ R&S® FS-K74/-K74+ WCDMA 3GPP Application Firmware Specifications



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The specifications of the R&S®FS-K72/-K73/-K73<sup>+</sup>/-K74/-K74<sup>+</sup> options are based on the data sheet specifications of the R&S®FSQ, R&S®FSU and R&S®FSP spectrum analyzers. Specifications apply under the following conditions: 30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal automatic adjustments performed.

Typical values are designated with the abbreviation *typ*. These values are verified during the final test but are not assured by Rohde & Schwarz.

Nominal values are design parameters that are not assured by Rohde & Schwarz. These values are verified during product development but are not specifically tested during production.

In line with the 3GPP standard, chip rates are specified in Mcps (million chips per second), whereas bit rates and symbol rates are specified in kbps (thousand bits per second) or ksps (thousand symbols per second). Mcps, kbps, and ksps are not SI units.

Data without tolerance limits is not binding.

# Specifications

## Frequency

R&S®FSQ	Range	R&S®FSU	Range	R&S®FSP	Range
R&S®FSQ3	20 Hz to 3.6 GHz	R&S®FSU3	20 Hz to 3.6 GHz	R&S®FSP3	20 Hz to 3 GHz
R&S®FSQ8	20 Hz to 8 GHz	R&S®FSU8	20 Hz to 8 GHz	R&S®FSP7	20 Hz to 8 GHz
R&S®FSQ26	20 Hz to 26.5 GHz	R&S®FSU26	20 Hz to 26.5 GHz	R&S®FSP13	20 Hz to 13 GHz
R&S®FSQ40	20 Hz to 40 GHz	R&S®FSU46	20 Hz to 46 GHz	R&S®FSP30	20 Hz to 30 GHz
–	–	R&S®FSU50	20 Hz to 50 GHz	R&S®FSP40	20 Hz to 40 GHz

## R&S®FS-K72 (3GPP FDD base station test)

The R&S®FSPx analyzer has to be equipped with the R&S®FSP-B15 and R&S®FSP-B70 options. Specifications apply at frequencies lower than 3.6 GHz (R&S®FSU/FSQ) or 3 GHz (R&S®FSP).

PMU = permissible measurement uncertainty in line with test specification 3GPP TS 25.141

### Base station output power

Base station output power	Test case 6.2.1	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Level range		-70 dBm to +30 dBm	-70 dBm to +30 dBm	-70 dBm to +30 dBm	
Level uncertainty	total power $P_{total} > -60$ dBm	< 0.3 dB	< 0.3 dB	< 0.5 dB	< 0.7 dB

CPICH power accuracy	Test case 6.2.2	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Level range of total power		-40 dBm to +30 dBm	-40 dBm to +30 dBm	-40 dBm to +30 dBm	
Level range of CPICH		-40 dB to 0 dB	-40 dB to 0 dB	-40 dB to 0 dB	
Level uncertainty (absolute power)	$P_{CPICH} \geq -10$ dB $P_{CPICH} \geq -20$ dB $P_{CPICH} \geq -30$ dB $P_{CPICH} \geq -40$ dB	< 0.31 dB ( $\sigma = 0.003$ ) < 0.32 dB ( $\sigma = 0.010$ ) < 0.37 dB ( $\sigma = 0.034$ ) < 0.54 dB ( $\sigma = 0.100$ )	< 0.31 dB ( $\sigma = 0.004$ ) < 0.32 dB ( $\sigma = 0.012$ ) < 0.37 dB ( $\sigma = 0.036$ ) < 0.54 dB ( $\sigma = 0.120$ )	< 0.51 dB ( $\sigma = 0.005$ ) < 0.53 dB ( $\sigma = 0.012$ ) < 0.57 dB ( $\sigma = 0.036$ ) < 0.74 dB ( $\sigma = 0.120$ )	< 0.8 dB
Level uncertainty (relative power)	$P_{CPICH} \geq -10$ dB $P_{CPICH} \geq -20$ dB $P_{CPICH} \geq -30$ dB $P_{CPICH} \geq -40$ dB	< 0.010 dB ( $\sigma = 0.003$ ) < 0.020 dB ( $\sigma = 0.010$ ) < 0.070 dB ( $\sigma = 0.034$ ) < 0.200 dB ( $\sigma = 0.100$ )	< 0.012 dB ( $\sigma = 0.004$ ) < 0.025 dB ( $\sigma = 0.012$ ) < 0.075 dB ( $\sigma = 0.036$ ) < 0.240 dB ( $\sigma = 0.10$ )	< 0.014 dB ( $\sigma = 0.005$ ) < 0.030 dB ( $\sigma = 0.012$ ) < 0.080 dB ( $\sigma = 0.036$ ) < 0.260 dB ( $\sigma = 0.120$ )	< 0.3 dB

### Frequency error

Frequency error	Test case 6.3	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range	CPICH synchronous SCH synchronous	$\pm 5$ kHz	$\pm 5$ kHz	$\pm 5$ kHz	$\pm 1$ kHz
Measurement uncertainty	SNR > 40 dB	< 5 Hz + $\Delta f_{ref}^1$ ( $\sigma = 2$ Hz)	< 5 Hz + $\Delta f_{ref}^1$ ( $\sigma = 2$ Hz)	< 5 Hz + $\Delta f_{ref}^1$ ( $\sigma = 2$ Hz)	< 12 Hz + $\Delta f_{ref}^1$

<sup>1</sup>  $\Delta f_{ref}$  = uncertainty of reference frequency.

## Output power dynamics

Power control steps	Test case 6.4.2 (test model 2)	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Level range		-40 dBm to +30 dBm	-40 dBm to +30 dBm	-40 dBm to +30 dBm	
Relative level uncertainty	power dynamic range $\leq 30$ dB				
	1 x 1 dB step	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.07 dB ( $\sigma = 0.02$ dB)	< 0.1 dB
	1 x 0.5 dB step	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.07 dB ( $\sigma = 0.02$ dB)	< 0.1 dB
	10 x 1 dB steps	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.07 dB ( $\sigma = 0.02$ dB)	< 0.1 dB
Number of frames		100	3	3	

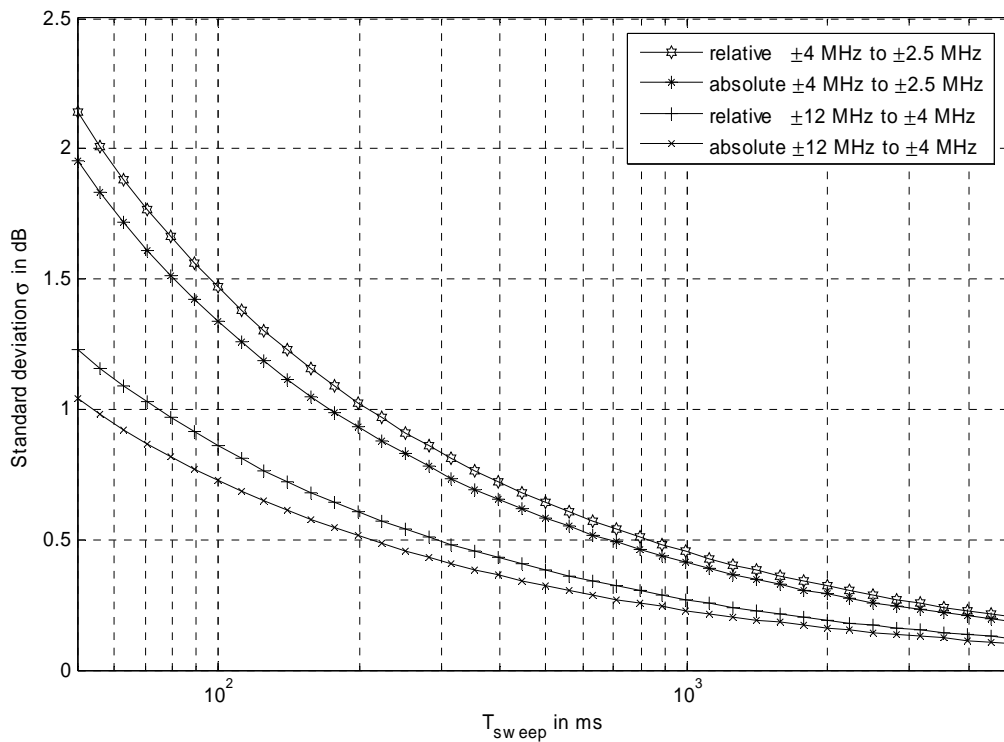
Power control dynamic range	Test case 6.4.3 (test model 2)	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Level range		-40 dBm to +30 dBm	-40 dBm to +30 dBm	-40 dBm to +30 dBm	
Absolute level uncertainty	total power $P_{\text{total}} > -40$ dBm, relative channel power $P_{\text{rel}} \geq -30$ dB	< 0.5 dB ( $\sigma = 0.07$ dB)	< 0.5 dB ( $\sigma = 0.07$ dB)	< 0.7 dB ( $\sigma = 0.10$ dB)	< 1.1 dB
Relative level uncertainty	total power $P_{\text{total}} > -40$ dBm, relative channel power $P_{\text{channel}} \geq -30$ dB	< 0.3 dB ( $\sigma = 0.07$ dB)	< 0.3 dB ( $\sigma = 0.07$ dB)	< 0.3 dB ( $\sigma = 0.10$ dB)	< 1.1 dB
Number of frames		100	3	3	

Total power dynamic range	Test case 6.4.4	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Level range		-70 dBm to +30 dBm	-70 dBm to +30 dBm	-70 dBm to +30 dBm	
Level uncertainty	total power $P_{\text{total}} < -70$ dBm, dynamic range $P_{\text{dyn}} < 30$ dB	< 0.07 dB ( $\sigma = 0.02$ dB)	< 0.10 dB ( $\sigma = 0.02$ dB)	< 0.2 dB ( $\sigma = 0.05$ dB)	< 0.3 dB

## Output RF spectrum emissions

Occupied bandwidth	Test case 6.5.1	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement uncertainty	$P > -40$ dBm span $\leq 10$ MHz	$< 38$ kHz ( $\sigma = 18$ kHz)	$< 38$ kHz ( $\sigma = 18$ kHz)	$< 38$ kHz ( $\sigma = 18$ kHz)	$< 100$ kHz

Spectrum emission mask	Test case 6.5.2.1	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Dynamic range	total power $P_{\text{total}} > -20$ dBm	69 dB	68 dB	65 dB	
Relative level uncertainty		$< 0.15$ dB + $2\sigma(T_{\text{sweep}})^2$	$< 0.15$ dB + $2\sigma(T_{\text{sweep}})^2$	$< 0.2$ dB + $2\sigma(T_{\text{sweep}})^2$	$< 1.5$ dB
Absolute level uncertainty		$< 0.45$ dB + $2\sigma(T_{\text{sweep}})^2$	$< 0.45$ dB + $2\sigma(T_{\text{sweep}})^2$	$< 0.7$ dB + $2\sigma(T_{\text{sweep}})^2$	$< 1.5$ dB

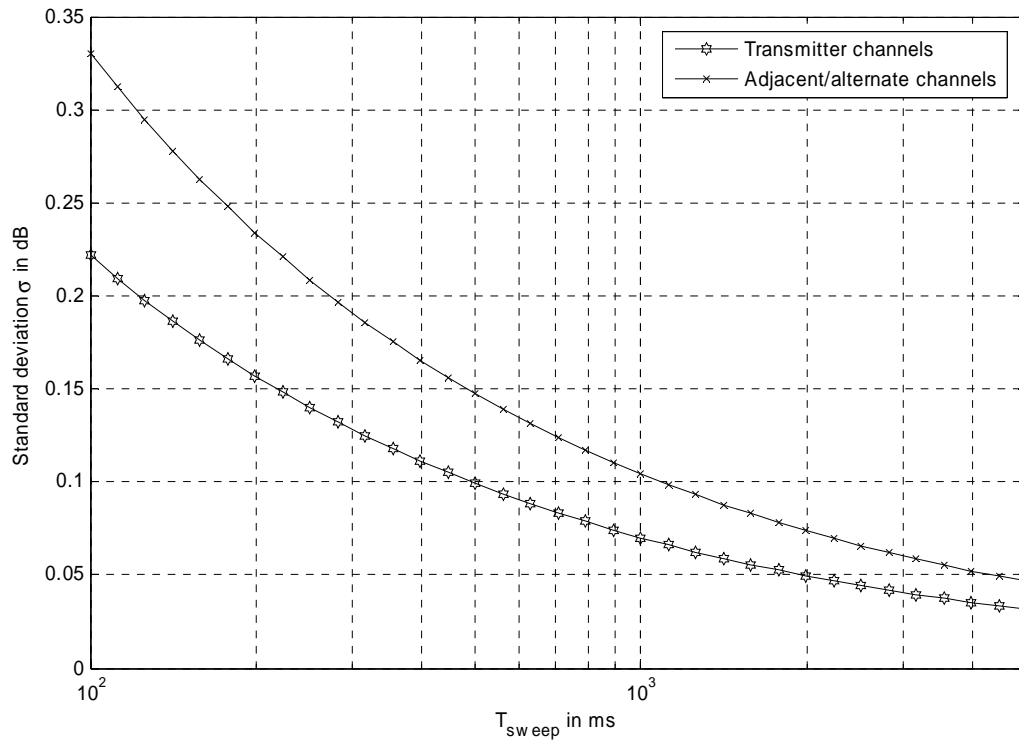


Standard deviation  $\sigma$  of spectrum emission mask measurement as a function of sweep time ( $T_{\text{sweep}}$ ).

<sup>2</sup> The standard deviation  $\sigma(T_{\text{sweep}})$  of Gaussian-distributed signals depends on the selected sweep time ( $T_{\text{sweep}}$ ). Increasing the sweep time decreases the standard deviation ( $\sigma$ ).

Adjacent channel leakage ratio	Test case 6.5.2.2	R&S® FSQ	R&S® FSU	R&S® FSP	PMU
<b>Single carrier</b>	<b>only 1 DPCH</b>	<b>carrier power &gt; -10 dBm</b>	<b>carrier power &gt; -10 dBm</b>	<b>carrier power &gt; -20 dBm</b>	
Dynamic range	noise correction off				
	1st adjacent	75.5 dB	75.5 dB	68 dB	
	2nd adjacent	81 dB	81 dB	69 dB	
	noise correction on				
<b>Single carrier</b>	<b>test model 1 with 64 DPCH</b>	<b>carrier power &gt; -10 dBm</b>	<b>carrier power &gt; -10 dBm</b>	<b>carrier power &gt; -20 dBm</b>	
	1st adjacent	83 dB	83 dB	72 dB	
	2nd adjacent	89 dB	89 dB	73 dB	
	noise correction on				
Dynamic range	noise correction off				
	1st adjacent	73 dB	73 dB	68 dB	
	2nd adjacent	76 dB	76 dB	69 dB	
	noise correction on				
Dynamic range	1st adjacent	83 dB	83 dB	72 dB	
	2nd adjacent	84 dB	84 dB	73 dB	
	noise correction on				
	1st adjacent	82 dB	82 dB	71 dB	
Dynamic range	2nd adjacent	84 dB	84 dB	72 dB	
	noise correction on				
	1st adjacent	73 dB	73 dB	67 dB	
	2nd adjacent	76 dB	76 dB	69 dB	
Dynamic range	noise correction on				
	1st adjacent	82 dB	82 dB	71 dB	
	2nd adjacent	84 dB	84 dB	72 dB	
	noise correction off				
Dynamic range	1st adjacent	68 dB	68 dB	63 dB	
	2nd adjacent	71 dB	71 dB	63 dB	
	noise correction on				
	1st adjacent	77 dB	77 dB	68 dB	
Measurement uncertainty	2nd adjacent	77 dB	77 dB	68 dB	
		$0.15 \text{ dB} + 2\sigma(T_{\text{sweep}})^3$	$0.15 \text{ dB} + 2\sigma(T_{\text{sweep}})^3$	$0.2 \text{ dB} + 2\sigma(T_{\text{sweep}})^3$	< 0.8 dB

<sup>3</sup> The standard deviation  $\sigma(T_{\text{sweep}})$  of Gaussian-distributed signals depends on the selected sweep time ( $T_{\text{sweep}}$ ). Increasing the sweep time decreases the standard deviation ( $\sigma$ ).



Standard deviation  $\sigma$  of adjacent channel leakage ratio measurement as a function of the selected sweep time ( $T_{\text{sweep}}$ ).

Spurious emissions	Test case 6.5.3	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement uncertainty	f < 10 MHz	< 0.5 dB ( $\sigma = 0.2$ dB)	< 0.5 dB ( $\sigma = 0.2$ dB)	–	< 1.5 dB
	10 MHz < f < 2.2 GHz	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.3 dB ( $\sigma = 0.1$ dB)	–	< 1.5 dB
	2.2 GHz < f < 3.6 GHz	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.3 dB ( $\sigma = 0.1$ dB)	–	< 2.0 dB
	3.6 GHz < f < 4 GHz	< 1.5 dB ( $\sigma = 0.5$ dB)	< 1.5 dB ( $\sigma = 0.5$ dB)	–	< 2.0 dB
	4 GHz < f < 8 GHz	< 1.5 dB ( $\sigma = 0.5$ dB)	< 1.5 dB ( $\sigma = 0.5$ dB)	–	< 4.0 dB
	8 GHz < f < 22 GHz	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.0 dB ( $\sigma = 0.7$ dB)	–	< 4.0 dB
Measurement uncertainty	f < 50 kHz	–	–	< 1.0 dB ( $\sigma = 0.3$ dB)	< 1.5 dB
	50 kHz < f < 2.2 GHz	–	–	< 0.5 dB ( $\sigma = 0.17$ dB)	< 1.5 dB
	2.2 GHz < f < 3.0 GHz	–	–	< 0.5 dB ( $\sigma = 0.17$ dB)	< 2.0 dB
	3.0 GHz < f < 4 GHz	–	–	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.0 dB
	4 GHz < f < 7 GHz	–	–	< 2.0 dB ( $\sigma = 0.7$ dB)	< 4.0 dB
	7 GHz < f < 13 GHz	–	–	< 2.5 dB	< 4.0 dB
	13 GHz < f < 30 GHz	–	–	< 3.0 dB	< 4.0 dB

### Transmit intermodulation

Transmit intermodulation	Test case 6.6	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Max. level	attenuator = 0 dB	+20 dBm	+20 dBm	+20 dBm	
	attenuator $\geq$ 10 dB	+30 dBm	+30 dBm	+30 dBm	
Third order intercept (TOI)	300 MHz < f < 3.6 GHz	20 dBm	20 dBm	7 dBm	
Level uncertainty	P > -120 dBm				
	2.0 GHz < f < 2.3 GHz	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.5 dB ( $\sigma = 0.17$ dB)	< 1.5 dB
	6.2 GHz < f < 6.6 GHz	< 1.5 dB ( $\sigma = 0.5$ dB)	< 1.5 dB ( $\sigma = 0.5$ dB)	< 2.0 dB ( $\sigma = 0.7$ dB)	< 4.0 dB
	10.4 GHz < f < 11.0 GHz	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.5 dB	< 4.0 dB
Measurements	adjacent channel leakage ratio				
	spectrum emission mask				
	spurious emissions				

### Transmit modulation

Composite EVM	Test case 6.7.1	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		0.5 % to 25 %	0.5 % to 25 %	1.0 % to 25 %	
Inherent EVM		< 0.7 %	< 1.0 %	< 1.5 %	
Measurement uncertainty	test models 1 to 4 P > -40 dBm	< 0.4 % ( $\sigma = 0.1$ %)	< 0.5 % ( $\sigma = 0.1$ %)	< 1 % ( $\sigma = 0.3$ %)	< 2.5 %

Peak code domain error power (PCDEP)	Test case 6.7.2	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range	-50 dB to 0 dB	0 dB to -60 dB	0 dB to -60 dB	0 dB to -50 dB	
Inherent PCDEP		< -60 dB ( $\sigma = 0.5$ dB)	< -60 dB ( $\sigma = 0.5$ dB)	< -50 dB ( $\sigma = 0.5$ dB)	
Measurement uncertainty	-30 dB < PCDEP	< 0.10 dB ( $\sigma = 0.02$ dB)	< 0.15 dB ( $\sigma = 0.05$ dB)	< 0.15 dB ( $\sigma = 0.05$ dB)	< 1.0 dB
	-40 dB < PCDEP < -30 dB	< 0.20 dB ( $\sigma = 0.05$ dB)	< 0.40 dB ( $\sigma = 0.15$ dB)	< 0.40 dB ( $\sigma = 0.15$ dB)	< 1.0 dB
	-50 dB < PCDEP < -40 dB	< 0.50 dB ( $\sigma = 0.15$ dB)	< 0.80 dB ( $\sigma = 0.30$ dB)	< 0.80 dB ( $\sigma = 0.30$ dB)	< 1.0 dB
	-60 dB < PCDEP < -50 dB	< 1.00 dB ( $\sigma = 0.35$ dB)	< 1.20 dB ( $\sigma = 0.60$ dB)		< 1.0 dB

Time Alignment Error	Test case 6.7.3	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range <sup>4</sup>		0.0 T <sub>c</sub> to 2.0 T <sub>c</sub>	0.0 T <sub>c</sub> to 2.0 T <sub>c</sub>	0.0 T <sub>c</sub> to 2.0 T <sub>c</sub>	
Inherent TAE		< 0.1 T <sub>c</sub>	< 0.1 T <sub>c</sub>	< 0.1 T <sub>c</sub>	
Measurement uncertainty	P > -40 dBm, External Reference				
	Tx Diversity and MIMO	< 0.1 T <sub>c</sub>	< 0.1 T <sub>c</sub>	< 0.1 T <sub>c</sub>	< 0.1 T <sub>c</sub>
	Multiple Cells	< 0.1 T <sub>c</sub>	–	–	–

<sup>4</sup> T<sub>c</sub> = chip duration.



## R&S® FS-K73 (3GPP FDD user equipment test)

The R&S® FSPx analyzer has to be equipped with the R&S® FSP-B15 option. To analyze more than one slot, the R&S® FSPx has to be equipped with the R&S® FSP-B70 option. Specifications apply at frequencies lower than 3.6 GHz (R&S® FSU/FSQ) or 3 GHz (R&S® FSP).

PMU = permissible measurement uncertainty in line with test specification 3GPP TS 34.121.

### Output power

Maximum output power	Test case 5.2	R&S® FSQ	R&S® FSU	R&S® FSP	PMU
Level range		-70 dBm to +30 dBm	-70 dBm to +30 dBm	-70 dBm to +30 dBm	
Level uncertainty	$P > -60$ dBm	< 0.3 dB	< 0.3 dB	< 0.5 dB	< 0.7 dB

### Frequency error

Frequency error	Test case 5.3	R&S® FSQ	R&S® FSU	R&S® FSP	PMU
Measurement range		±3 kHz	±3 kHz	±3 kHz	±1 kHz
Measurement uncertainty	SNR > 40 dB	< 5 Hz + $\Delta f_{ref}^5$ ( $\sigma = 2$ Hz)	< 5 Hz + $\Delta f_{ref}^5$ ( $\sigma = 2$ Hz)	< 5 Hz + $\Delta f_{ref}^5$ ( $\sigma = 2$ Hz)	< 10 Hz + $\Delta f_{ref}^5$

### Output power dynamics

Code power accuracy		R&S® FSQ	R&S® FSU	R&S® FSP	PMU
Level range of total power		-40 dBm to +30 dBm	-40 dBm to +30 dBm	-40 dBm to +30 dBm	
Level uncertainty (absolute power)	$P_{channel} \geq -10$ dB	< 0.33 dB ( $\sigma = 0.01$ )	< 0.33 dB ( $\sigma = 0.01$ )	< 0.53 dB ( $\sigma = 0.01$ )	
	$P_{channel} \geq -20$ dB	< 0.36 dB ( $\sigma = 0.02$ )	< 0.36 dB ( $\sigma = 0.02$ )	< 0.56 dB ( $\sigma = 0.02$ )	
	$P_{channel} \geq -30$ dB	< 0.40 dB ( $\sigma = 0.04$ )	< 0.40 dB ( $\sigma = 0.04$ )	< 0.60 dB ( $\sigma = 0.04$ )	
	$P_{channel} \geq -40$ dB	< 0.60 dB ( $\sigma = 0.10$ )	< 0.60 dB ( $\sigma = 0.10$ )	< 0.80 dB ( $\sigma = 0.10$ )	
Level uncertainty (relative power)	$P_{channel} \geq -10$ dB	< 0.03 dB ( $\sigma = 0.01$ )	< 0.03 dB ( $\sigma = 0.01$ )	< 0.04 dB ( $\sigma = 0.01$ )	
	$P_{channel} \geq -20$ dB	< 0.06 dB ( $\sigma = 0.02$ )	< 0.06 dB ( $\sigma = 0.02$ )	< 0.08 dB ( $\sigma = 0.03$ )	
	$P_{channel} \geq -30$ dB	< 0.10 dB ( $\sigma = 0.04$ )	< 0.10 dB ( $\sigma = 0.04$ )	< 0.20 dB ( $\sigma = 0.05$ )	
	$P_{channel} \geq -40$ dB	< 0.30 dB ( $\sigma = 0.10$ )	< 0.30 dB ( $\sigma = 0.10$ )	< 0.40 dB ( $\sigma = 0.15$ )	

Inner loop power control	Test case 5.4.2	R&S® FSQ	R&S® FSU	R&S® FSP	PMU
Level range		-40 dBm to +30 dBm	-40 dBm to +30 dBm	-40 dBm to +30 dBm	
Relative level uncertainty	$P_{dyn} \leq 30$ dB				
	1 x 1 dB step	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.04 dB ( $\sigma = 0.01$ dB)	< 0.10 dB
	1 x 2 dB step	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.03 dB ( $\sigma = 0.01$ dB)	< 0.04 dB ( $\sigma = 0.01$ dB)	< 0.15 dB
	1 x 3 dB step	< 0.04 dB ( $\sigma = 0.01$ dB)	< 0.04 dB ( $\sigma = 0.01$ dB)	< 0.05 dB ( $\sigma = 0.01$ dB)	< 0.20 dB
	10 x 1 dB steps	< 0.06 dB ( $\sigma = 0.02$ dB)	< 0.06 dB ( $\sigma = 0.02$ dB)	< 0.08 dB ( $\sigma = 0.02$ dB)	< 0.30 dB
10 x 2 dB steps	< 0.06 dB ( $\sigma = 0.02$ dB)	< 0.06 dB ( $\sigma = 0.02$ dB)	< 0.08 dB ( $\sigma = 0.02$ dB)	< 0.30 dB	
Number of frames		100	3	3 (1 slot without R&S® FSP-B70)	-

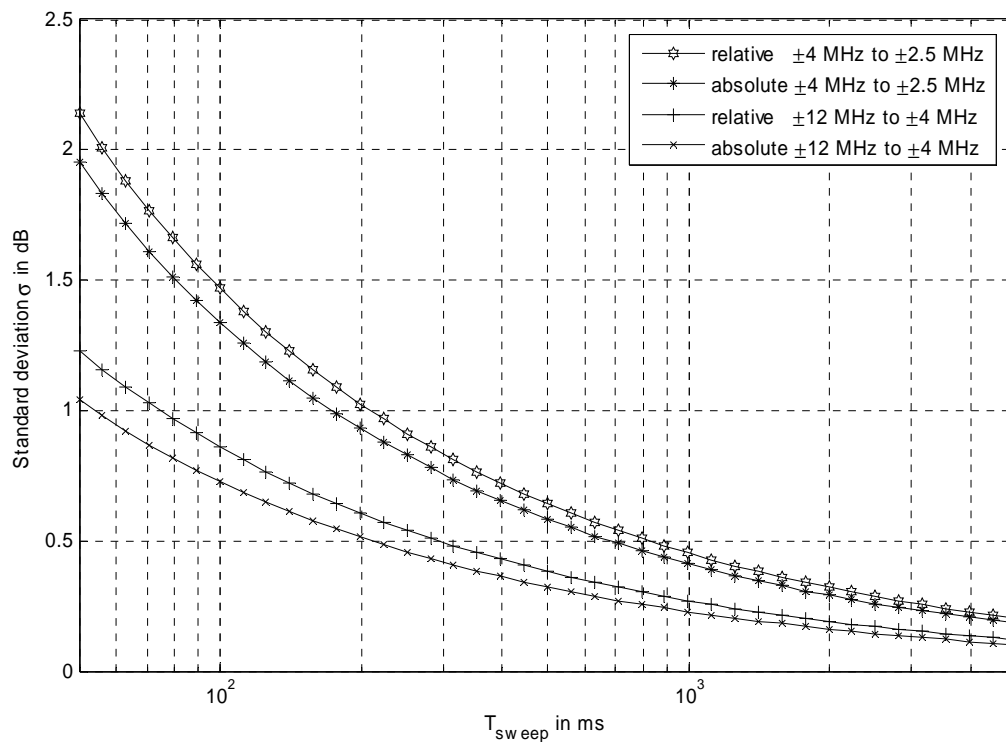
Minimum output power	Test case 5.4.3	R&S® FSQ	R&S® FSU	R&S® FSP	PMU
Level range		-70 dBm to +30 dBm	-70 dBm to +30 dBm	-70 dBm to +30 dBm	
Level uncertainty	$P_{total} > -40$ dBm	< 0.3 dB	< 0.3 dB	< 0.5 dB	< 1.0 dB

<sup>5</sup>  $\Delta f_{ref}$  = uncertainty of reference frequency.

### Output RF spectrum emissions

Occupied bandwidth	Test case 5.8	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement uncertainty	$P > -40$ dBm span $\leq 10$ MHz	$< 38$ kHz ( $\sigma = 18$ kHz)	$< 38$ kHz ( $\sigma = 18$ kHz)	$< 38$ kHz ( $\sigma = 18$ kHz)	$< 100$ kHz

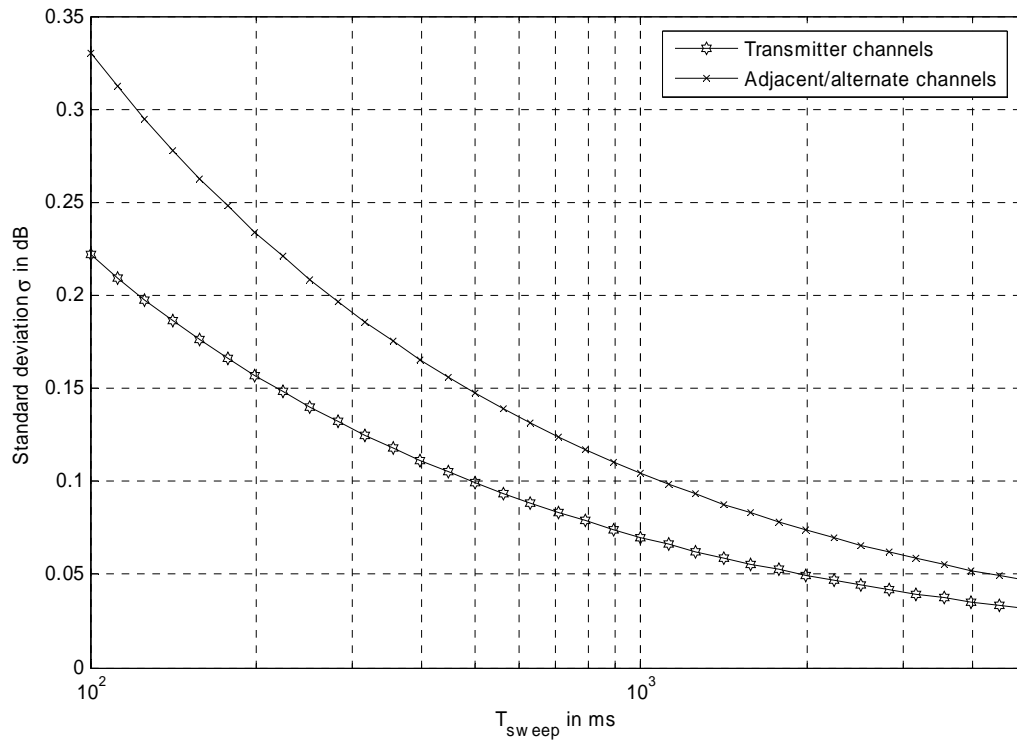
Spectrum emission mask	Test case 5.9	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Dynamic range	$P > -20$ dBm	69 dB	68 dB	65 dB	
Relative level uncertainty		$< 0.15$ dB + $2\sigma(T_{\text{sweep}})^6$	$< 0.15$ dB + $2\sigma(T_{\text{sweep}})^6$	$< 0.2$ dB + $2\sigma(T_{\text{sweep}})^6$	$< 1.5$ dB
Absolute level uncertainty		$< 0.45$ dB + $2\sigma(T_{\text{sweep}})^6$	$< 0.45$ dB + $2\sigma(T_{\text{sweep}})^6$	$< 0.7$ dB + $2\sigma(T_{\text{sweep}})^6$	$< 1.5$ dB



Standard deviation  $\sigma$  of spectrum emission mask measurement as a function of sweep time ( $T_{\text{sweep}}$ ).

<sup>6</sup> The standard deviation  $\sigma(T_{\text{sweep}})$  of Gaussian-distributed signals depends on the selected sweep time ( $T_{\text{sweep}}$ ). Increasing the sweep time decreases the standard deviation ( $\sigma$ ).

Adjacent channel leakage ratio	Test case 5.10	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Single carrier ACP	only 1 DPDCH	P > -10 dBm	P > -10 dBm	P > -20 dBm	
Dynamic range	noise correction off				
	1st adjacent	75.5 dB	75.5 dB	68 dB	
	2nd adjacent	81 dB	81 dB	69 dB	
	noise correction on				
	1st adjacent	83 dB	83 dB	72 dB	
	2nd adjacent	89 dB	89 dB	73 dB	
Single carrier ACP	as defined by the test case	P > -10 dBm	P > -10 dBm	P > -20 dBm	
Dynamic range	noise correction off				
	1st adjacent	73 dB	73 dB	68 dB	
	2nd adjacent	76 dB	76 dB	69 dB	
	noise correction on				
	1st adjacent	83 dB	83 dB	72 dB	
	2nd adjacent	84 dB	84 dB	73 dB	
Measurement uncertainty		$0.15 \text{ dB} + 2\sigma(T_{\text{sweep}})^6$	$0.15 \text{ dB} + 2\sigma(T_{\text{sweep}})^6$	$0.2 \text{ dB} + 2\sigma(T_{\text{sweep}})^6$	< 0.8 dB



Standard deviation  $\sigma$  of adjacent channel leakage ratio measurement as a function of the selected sweep time ( $T_{\text{sweep}}$ ).

Spurious emissions	Test case 5.11	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement uncertainty	f < 10 MHz	< 0.5 dB ( $\sigma = 0.2$ dB)	< 0.5 dB ( $\sigma = 0.2$ dB)	–	< 1.5 dB
	10 MHz < f < 2.2 GHz	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.3 dB ( $\sigma = 0.1$ dB)	–	< 1.5 dB
	2.2 GHz < f < 3.6 GHz	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.3 dB ( $\sigma = 0.1$ dB)	–	< 2.0 dB
	3.6 GHz < f < 4 GHz	< 1.5 dB ( $\sigma = 0.5$ dB)	< 1.5 dB ( $\sigma = 0.5$ dB)	–	< 2.0 dB
	4 GHz < f < 8 GHz	< 1.5 dB ( $\sigma = 0.5$ dB)	< 1.5 dB ( $\sigma = 0.5$ dB)	–	< 4.0 dB
Measurement uncertainty	8 GHz < f < 22 GHz	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.0 dB ( $\sigma = 0.7$ dB)	–	< 4.0 dB
	f < 50 kHz	–	–	< 1.0 dB ( $\sigma = 0.3$ dB)	< 1.5 dB
	50 kHz < f < 2.2 GHz	–	–	< 0.5 dB ( $\sigma = 0.17$ dB)	< 1.5 dB
	2.2 GHz < f < 3.0 GHz	–	–	< 0.5 dB ( $\sigma = 0.17$ dB)	< 2.0 dB
	3.0 GHz < f < 4 GHz	–	–	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.0 dB
	4 GHz < f < 7 GHz	–	–	< 2.0 dB ( $\sigma = 0.7$ dB)	< 4.0 dB
	7 GHz < f < 13 GHz	–	–	< 2.5 dB	< 4.0 dB
13 GHz < f < 30 GHz	–	–	< 3.0 dB	< 4.0 dB	

### Transmit intermodulation

Transmit inter-modulation	Test case 5.12	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Max. level	attenuator = 0 dB	+20 dBm	+20 dBm	+20 dBm	
	attenuator $\geq$ 10 dB	+30 dBm	+30 dBm	+30 dBm	
Third order intercept (TOI)	300 MHz < f < 3.6 GHz	20 dBm	20 dBm	7 dBm	
Level uncertainty	P > -120 dBm				
	1.8 GHz < f < 2.1 GHz	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.3 dB ( $\sigma = 0.1$ dB)	< 0.5 dB ( $\sigma = 0.17$ dB)	< 1.5 dB
	5.6 GHz < f < 6.1 GHz	< 1.5 dB ( $\sigma = 0.5$ dB)	< 1.5 dB ( $\sigma = 0.5$ dB)	< 2.0 dB ( $\sigma = 0.7$ dB)	< 4.0 dB
	9.5 GHz < f < 10.0 GHz	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.0 dB ( $\sigma = 0.7$ dB)	< 2.5 dB	< 4.0 dB
Measurement	adjacent channel leakage ratio				
	spectrum emission mask				
	spurious emissions				

### Transmit modulation

Composite EVM	Test case 5.13.1	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		0.5 % to 25 %	0.5 % to 25 %	1.0 % to 25 %	
Inherent EVM		< 0.7 %	< 1.0 %	< 1.5 %	
Measurement uncertainty	P > -40 dBm	< 0.4 % ( $\sigma = 0.1$ %)	< 0.5 % ( $\sigma = 0.1$ %)	< 1 % ( $\sigma = 0.3$ %)	< 2.5 %

Peak code domain error power (PCDEP)	Test case 5.13.2	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range	-50 dB to 0 dB	0 dB to -60 dB	0 dB to -60 dB	0 dB to -50 dB	
Inherent PCDEP		< -60 dB ( $\sigma = 0.5$ dB)	< -60 dB ( $\sigma = 0.5$ dB)	< -50 dB ( $\sigma = 0.5$ dB)	
Measurement uncertainty	-30 dB < PCDEP	< 0.10 dB ( $\sigma = 0.02$ dB)	< 0.15 dB ( $\sigma = 0.05$ dB)	< 0.15 dB ( $\sigma = 0.05$ dB)	< 1.0 dB
	-40 dB < PCDEP < -30 dB	< 0.20 dB ( $\sigma = 0.05$ dB)	< 0.40 dB ( $\sigma = 0.15$ dB)	< 0.40 dB ( $\sigma = 0.15$ dB)	< 1.0 dB
	-50 dB < PCDEP < -40 dB	< 0.50 dB ( $\sigma = 0.15$ dB)	< 0.80 dB ( $\sigma = 0.30$ dB)	< 0.80 dB ( $\sigma = 0.30$ dB)	< 1.0 dB
	-60 dB < PCDEP < -50 dB	< 1.00 dB ( $\sigma = 0.35$ dB)	< 1.20 dB ( $\sigma = 0.60$ dB)		< 1.0 dB

## R&S®FS-K73+ (3GPP HSPA+ UE transmitter test)

The R&S®FSQx, R&S®FSUx and R&S®FSPx have to be equipped with R&S®FS-K73+ 3GPP HSPA+ UE transmitter test. The R&S®FSPx has to be equipped with the R&S®FSP-B15 and the R&S®FSP-B70 option. All specifications of R&S®FS-K73 also apply to R&S®FS-K73+. In addition, all measurements are supported for E-DPDCH using BPSK or 4PAM modulation. Specifications apply at frequency lower than 3.6 GHz (R&S®FSU/FSQ) or 3 GHz (R&S®FSP), assuming signal distortions limited to additive white Gaussian noise.

PMU = permissible measurement uncertainty in line with test specification 3GPP TS 34.121.

### Transmit modulation

Relative code domain error (RCDE)	Test case 5.13.2A Test case 5.13.2B	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		< -15 dB	< -15 dB	< -15 dB	
Measurement uncertainty	P > -40 dBm	< 0.5 dB	< 0.5 dB	< 0.5 dB	< 0.5 dB

Phase discontinuity	Test case 5.13.1AA	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		< 60 degree	< 60 degree	< 60 degree	
Measurement uncertainty	P > -40 dBm	< 6 degree	< 6 degree	< 6 degree	< 6 degree

I/Q origin offset	Test case 5.13.1AAA	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		< 15 %	< 15 %	< 15 %	
Measurement uncertainty	P > -40 dBm	< 0.8 % (equiv. < 0.5 dB)	< 0.8 % (equiv. < 0.5 dB)	< 0.8 % (equiv. < 0.5 dB)	< 0.5 dB

## R&S®FS-K74 (HSDPA application firmware)

The R&S®FSQx, R&S®FSUx and R&S®FSPx have to be equipped with R&S®FS-K74 HSDPA application firmware. The R&S®FSPx has to be equipped with the R&S®FSP-B15 and R&S®FSP-B70 options. All specifications of R&S®FS-K72 also apply to the R&S®FS-K74. In addition, all measurements are supported for HS-SCCH and HS-PDSCH using QPSK or 16QAM modulation. Specifications apply at frequency lower than 3.6 GHz (R&S®FSU/FSQ) or 3 GHz (R&S®FSP).

PMU = permissible measurement uncertainty in line with test specification 3GPP TS 25.141.

### Transmit modulation

Composite EVM	Test case 6.7.1	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		0.5 % to 15 %	0.5 % to 15 %	1.0 % to 15 %	
Inherent EVM		< 0.7 %	< 1.0 %	< 1.5 %	
Measurement uncertainty	test model 5 <sup>7</sup> P > -40 dBm	< 0.4 % ( $\sigma = 0.1$ %)	< 0.5 % ( $\sigma = 0.1$ %)	< 1 % ( $\sigma = 0.3$ %)	< 2.5 %

## R&S®FS-K74+ (3GPP HSPA+ base station test)

The R&S®FSQx, R&S®FSUx and R&S®FSPx have to be equipped with R&S®FS-K74+ 3GPP HSPA+ base station test. The R&S®FSPx has to be equipped with the R&S®FSP-B15 and the R&S®FSP-B70 options. All specifications of the R&S®FS-K72 and the R&S®FS-K74 also apply to the R&S®FS-K74+. In addition, all measurements are supported for HS-PDSCH using QPSK, 16QAM or 64QAM modulation. Specifications apply at frequency lower than 3.6 GHz (R&S®FSU/FSQ) or 3 GHz (R&S®FSP), assuming signal distortions limited to additive white Gaussian noise.

PMU = permissible measurement uncertainty in line with test specification 3GPP TS 25.141.

### Transmit modulation

Relative Code Domain Error (RCDE)	Test case 6.7.4	R&S®FSQ	R&S®FSU	R&S®FSP	PMU
Measurement range		< -19 dB	< -19 dB	< -19 dB	
Measurement uncertainty	test model 6 <sup>8</sup> P > -40 dBm	< 1.0 dB	< 1.0 dB	< 1.0 dB	< 1.0 dB

<sup>7</sup> EVM for base stations supporting HS-SCCH and HS-PDSCH transmission using 16QAM or QPSK modulation.

<sup>8</sup> RCDE for base stations supporting HS-PDSCH transmission using 64QAM modulation.

## Configuration overview

Option	Base station			User equipment (UE)		
	R&S <sup>®</sup> FSQ	R&S <sup>®</sup> FSU	R&S <sup>®</sup> FSP	R&S <sup>®</sup> FSQ	R&S <sup>®</sup> FSU	R&S <sup>®</sup> FSP
R&S <sup>®</sup> FS-K72	•	•	•			
R&S <sup>®</sup> FS-K73				•	•	•
R&S <sup>®</sup> FS-K73 <sup>+</sup>				•	•	•
R&S <sup>®</sup> FS-K74	•	•	•			
R&S <sup>®</sup> FS-K74 <sup>+</sup>	•	•	•			
R&S <sup>®</sup> FSP-B15			•			•
R&S <sup>®</sup> FSP-B70			•			○ <sup>9</sup>

<sup>9</sup> Extends measurement range of R&S<sup>®</sup>FS-K73 application firmware from one slot to three frames.

# Ordering information

## R&S®FS-K72

The R&S®FS-K72 application firmware can be integrated into any member of the R&S®FSU and R&S®FSQ families. The R&S®FSP-B70 and the R&S®FSP-B15 options are prerequisites for operating the application firmware on any member of the R&S®FSP spectrum analyzer family.

Designation	Type	Order No.
WCDMA 3GPP Application Firmware	R&S®FS-K72	1154.7000.02
Pulse Calibrator for R&S®FSP	R&S®FS-B15	1155.1006.02
Demodulator Hardware for R&S®FSP	R&S®FS-B70	1157.0559.02

## R&S®FS-K73

The R&S®FS-K73 application firmware can be integrated into any member of the R&S®FSU and R&S®FSQ families. The R&S®FSP-B15 option is a prerequisite for operating the application firmware on any member of the R&S®FSP spectrum analyzer family.

Designation	Type	Order No.
WCDMA 3GPP Application Firmware	R&S®FS-K73	1154.7252.02
Pulse Calibrator for R&S®FSP	R&S®FS-B15	1155.1006.02

## R&S®FS-K73+

The R&S®FS-K73+ application firmware can be integrated into R&S®FSP with order number 1164.4391.xx or R&S®FSU with order number 1166.1660.xx or R&S®FSQ with the WindowsXP operating system. The R&S®FS-K73 option is a prerequisite for operating the application firmware on members of the R&S®FSU and R&S®FSQ families. The R&S®FS-K73 and the R&S®FSP-B15 option are prerequisites for operating the application firmware on members of the R&S®FSP spectrum analyzer family.

Designation	Type	Order No.
3GPP HSPA+ UE Transmitter Test	R&S®FS-K73+	1309.9274.02
WCDMA 3GPP Application Firmware	R&S®FS-K73	1154.7252.02
Pulse Calibrator for R&S®FSP	R&S®FS-B15	1155.1006.02

## R&S®FS-K74

The R&S®FS-K74 application firmware can be integrated into R&S®FSP with order number 1164.4391.xx or R&S®FSU with order number 1166.1660.xx or R&S®FSQ with WindowsXP operating system. The R&S®FS-K72 option is a prerequisite for operating the application firmware on members of the R&S®FSU and R&S®FSQ families. The R&S®FS-K72, the R&S®FSP-B70 and the R&S®FSP-B15 option are prerequisites for operating the application firmware on members of the R&S®FSP spectrum analyzer family.

Designation	Type	Order No.
HSDPA Application Firmware	R&S®FS-K74	1300.7156.02
WCDMA 3GPP Application Firmware	R&S®FS-K72	1154.7000.02
Pulse Calibrator for R&S®FSP	R&S®FS-B15	1155.1006.02
Demodulator Hardware for R&S®FSP	R&S®FS-B70	1157.0559.02

## R&S®FS-K74+

The R&S®FS-K74+ application firmware can be integrated into R&S®FSPs with order number 1164.4391.xx or R&S®FSU with order number 1166.1660.xx or R&S®FSQ with WindowsXP operating system. The R&S®FS-K72 and the R&S®FS-K74 options are prerequisites for operating the application firmware on members of the R&S®FSU and R&S®FSQ families. The R&S®FS-K72, the R&S®FS-K74, the R&S®FSP-B70 and the R&S®FSP-B15 option are prerequisites for operating the application firmware on members of the R&S®FSP spectrum analyzer family.

Designation	Type	Order No.
3GPP HSPA+ Base Station Test	R&S®FS-K74+	1309.9180.02
HSDPA Application Firmware	R&S®FS-K74	1300.7156.02
WCDMA 3GPP Application Firmware	R&S®FS-K72	1154.7000.02
Pulse Calibrator for R&S®FSP	R&S®FS-B15	1155.1006.02
Demodulator Hardware for R&S®FSP	R&S®FS-B70	1157.0559.02