

HOW TO USE HARMONIC MIXERS WITH DIFFERENT R&S®FSW BANDWIDTH OPTIONS

The R&S®FSW offers a variety of different bandwidth options and makes it possible to combine these with external harmonic mixers to enlarge the analyzer's frequency range up to 325 GHz. This application card will give some guidance as to the possible combinations of bandwidth options and mixers in conjunction with the needed IF frequencies.



Your task

For testing automotive radar sensors, analyzing millimeter-wave radar/imaging applications, checking wideband communications applications or testing microwave links, it is often necessary to enlarge the frequency range of the signal and spectrum analyzer in place. One possibility is obviously to use external mixers (e.g. harmonic mixers).

Rohde & Schwarz solution

The analyzer simply has to be equipped with the R&S®FSW-B21 option. The following harmonic mixers are available:

Type (R&S®)	FS-Z60	FS-Z75	FS-Z90	FS-Z110	FS-Z140	FS-Z170	FS-Z220	FS-Z325
Order number	1048.0171.02	3638.2240.02	3638.2270.02	3638.2292.02	3622.0708.02	3622.0714.02	3593.3250.02	3593.3267.02
Frequency range	40 GHz to 60 GHz	50 GHz to 75 GHz	60 GHz to 90 GHz	75 GHz to 110 GHz	90 GHz to 140 GHz	110 GHz to 170 GHz	140 GHz to 220 GHz	220 GHz to 325 GHz
1 dB compression (typ.)	0 dBm	-5 dBm	-6 dBm	-6 dBm	-3 dBm	-3 dBm	-5 dBm	-5 dBm
Conversion loss	max. 20 dB, typ. 15 dB	max. 24 dB, typ. 18 dB	max. 25 dB, typ. 18 dB	max. 30 dB, typ. 23 dB	max. 43 dB	max. 40 dB	max. 48 dB, typ. 32 dB	max. 50 dB
RF port	WR19 (UG383/UM)	WR15 (UG385/U)	WR12 (UG387/UM)	WR10 (UG387/UM)	WR08 (UG387/UM)	WR06 (UG387/UM)	WR5.1 (UG387/UM)	WR3.4 (UG387/UM)
LO input frequency	8.6 GHz to 15.4 GHz	8 GHz to 12.84 GHz	7.44 GHz to 15.34 GHz	7.75 GHz to 13.99 GHz	9 GHz to 14 GHz	9.13 GHz to 14.13 GHz	8.72 GHz to 13.72 GHz	10 GHz to 14.77 GHz
LO harmonic number	4	6	6	8	10	12	16	18
LO power	+13.0 dBm	+14.0 dBm	+14.0 dBm	+15.5 dBm	+14.0 dBm	+15.5 dBm	+13.0 dBm	+16.0 dBm
VSWR (typ.)	1.6:1, 1.3:1	1.4:1	1.4:1	1.4:1	1.5:1	1.6:1	1.7:1	3:1

The table below lists the possible combinations of bandwidths and mixers, indicating the required IF frequencies (in MHz). Please also refer to the R&S®FSW data sheet (PD 5215.6749.22), section IF input – IF frequency (page 39).

Summary

Using the tables, you can easily determine what mixer/analyzer settings are needed to perform the desired measurement.

For more details concerning the mixers, go to:

<https://www.radiometer-physics.de/products/mmwave-and-terahertz-products/spectrum-analyzer-extendere/fs-z-mixers/>

You can find more information about the possible

R&S®FSW configurations at: https://www.rohde-schwarz.com/product/fsw-productstartpage_63493-11793.html

Mixers (R&S®)	FS-Z60	FS-Z75 ¹⁾	FS-Z90 ¹⁾	FS-Z110 ¹⁾	FS-Z140	FS-Z170	FS-Z220	FS-Z325	Bandwidth
Without option									
–	1310 MHz to 1330 MHz								≤80 MHz
With option									
R&S®FSW-B160/B320	1530 MHz								80 MHz to 160/320 MHz
R&S®FSW-B512/B512R/B1200/B2001/B800R	1580 MHz								80 MHz to 512 MHz
R&S®FSW-B1200/B2001/B800R	–	3290 MHz			–	–	–	–	>512 MHz
R&S®FSW-B4001	–	2660 MHz			–	–	–	–	80 MHz to 4400 MHz
R&S®FSW-B6001/B8001	–	2660 MHz			–	–	–	–	80 MHz to 4400 MHz
R&S®FSW-B6001/B8001	–	–	–	–	–	–	–	–	>4400 MHz ²⁾
R&S®FSW-B2000	2000 MHz								80 MHz to 2000 MHz
R&S®FSW-B5000	–	2800 MHz			–	–	–	–	80 MHz to 4400 MHz
R&S®FSW-B5000	–	3500 MHz			–	–	–	–	>4400 MHz

¹⁾ Correction tables for bandwidth options delivered on USB stick.

²⁾ For bandwidths above 4.4 GHz the R&S®FSW expects an IF frequency of 9.933 GHz (the R&S®FS-Zxx mixer family does not support this). The maximum IF frequencies for R&S®FS-Z75/90/110: maximum IF = 6 GHz; all other R&S®FS-Zxx mixers: maximum IF = 3 GHz.