

RPG FS-Z60, FS-Z140, FZ-Z170, FS-  
Z220, FS-Z325, FS-Z500

Harmonic Mixer

Specifications



**Radiometer Physics**

A Rohde & Schwarz Company

# Definitions

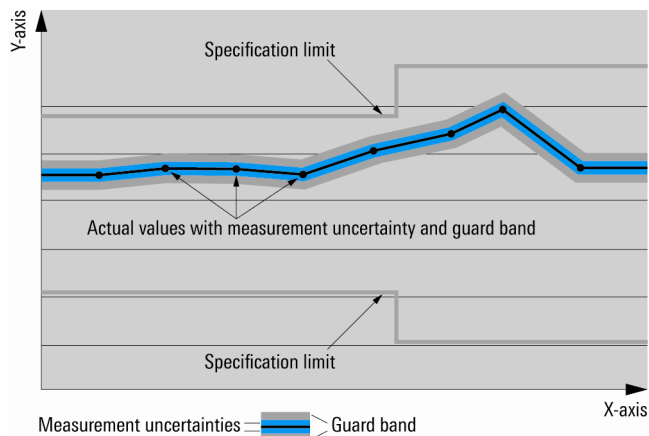
## General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

## Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



## Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

## Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with  $<$ ,  $>$  or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

## Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

## Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

## Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

# Specifications

RF frequency range	RPG FS-Z 60	40 GHz to 60 GHz
	RPG FS-Z 140	90 GHz to 140 GHz
	RPG FS-Z 170	110 GHz to 170 GHz
	RPG FS-Z 220	170 GHz to 220 GHz
	RPG FS-Z 325	220 GHz to 325 GHz
	RPG FS-Z 500	325 GHz to 500 GHz
Maximum CW RF input level	RPG FS-Z 60	+10 dBm
	RPG FS-Z 140	+10 dBm
	RPG FS-Z 170	+10 dBm
	RPG FS-Z 220	+10 dBm
	RPG FS-Z 325	+10 dBm
	RPG FS-Z 500	+10 dBm
1 dB compression <sup>1</sup>	RPG FS-Z 60	0 dBm (nom.)
	RPG FS-Z 140	-3dBm (nom.)
	RPG FS-Z 170	-3dBm (nom.)
	RPG FS-Z 220	-5dBm (nom.)
	RPG FS-Z 325	-5dBm (nom.)
	RPG FS-Z 500	-3dBm (nom.)
Conversion loss with the R&S®FSU/FSV/FSVR/FSUP/FSQ/FSW (LO level between +14 dBm and +17 dBm at the LO input port)	RPG FS-Z 60	
	4 <sup>th</sup> LO harmonic selected, 40 GHz ≤ f <sub>RF</sub> ≤ 60 GHz	≤ 20 dB, 15 dB (typ.)
	RPG FS-Z 140	
	10 <sup>th</sup> LO harmonic selected, 90 GHz ≤ f <sub>RF</sub> ≤ 140 GHz	typ. 28
	RPG FS-Z 170	
	12 <sup>th</sup> LO harmonic selected, 110 GHz ≤ f <sub>RF</sub> ≤ 170 GHz	typ. 30
	RPG FS-Z 220	
	16 <sup>th</sup> LO harmonic selected, 140 GHz ≤ f <sub>RF</sub> ≤ 220 GHz	max. 48, typ. 32
	RPG FS-Z 325	
22 <sup>th</sup> LO harmonic selected, 220 GHz ≤ f <sub>RF</sub> ≤ 325 GHz	typ. 40	
RPG FS-Z 500		
36 <sup>th</sup> LO harmonic selected, 325 GHz ≤ f <sub>RF</sub> ≤ 500 GHz	max. 65; typ. 58	
Level uncertainty with the R&S®FSU/FSV/FSVR/FSUP/FSQ/FSW at calibrated frequency points	95 % confidence level, LO level between +14 dBm and +17 dBm and +25 °C	< 3.0 dB
	+5 °C to +40 °C	< 4.5 dB
	Frequency response	within any 1 GHz band, LO level between +14 dBm and +17 dBm at the LO input port, conversion loss equalized using the supplied conversion loss table
Temperature drift	0 °C to +55 °C	< 1 dB (typ.)
<b>RF input</b>		
Waveguide designator	RPG FS-Z 60	WR19
	RPG FS-Z 140	WM-2032 (WR8)
	RPG FS-Z 170	WM-1651 (WR6.5)
	RPG FS-Z 220	WM-1295 (WR5.1)
	RPG FS-Z 325	WM-864 (WR3.4)
	RPG FS-Z 500	WM-570 (WR2.2)
Connector type (anti cocking flange)	RPG FS-Zxxx	precision waveguide flange compatible with flange types UG-387/U-M and IEEE 1785.2a
VSWR	RPG FS-Z 60	1.3 : 1 (typ.)
	RPG FS-Z 140	1.5 : 1 (typ.)
	RPG FS-Z 170	1.6 : 1 (typ.)
	RPG FS-Z 220	1.7 : 1 (typ.)
	RPG FS-Z 325	1.4 : 1 (typ.)
	RPG FS-Z 500	2.7 : 1 (typ.)
<b>Local oscillator input (LO IN)</b>		
Connector		SMA connector (female)
LO frequency range	RPG FS-Z 60	8.6 GHz to 15.4 GHz
	RPG FS-Z 140	9.0 GHz to 14.0 GHz
	RPG FS-Z 170	9.13 GHz to 14.13 GHz
	RPG FS-Z 220	8.72 GHz to 13.72 GHz
	RPG FS-Z 325	10.0 GHz to 14.77 GHz
	RPG FS-Z 500	9.02 GHz to 13.88 GHz
Maximum rated LO level (RF input level < max. permissible CW)	RPG FS-Z 60	+18.0 dBm
	RPG FS-Z 140	+18.0 dBm

<sup>1</sup> The specified value represents the 1 dB compression point of the mixer itself. The 1 dB compression point in combination with a Rohde & Schwarz spectrum analyzer with B21 option can be lower, if the RF input level minus conversion loss exceeds the full scale level of the B21 option.

RF input level)	RPG FS-Z 170	+18.0 dBm
	RPG FS-Z 220	+18.0 dBm
	RPG FS-Z 325	+17.0 dBm
	RPG FS-Z 500	+17.0 dBm
<b>(IF OUT)</b>		
Connector		SMA connector (female)
Frequency range		5 MHz to 6.0 GHz <sup>2</sup>

## General data

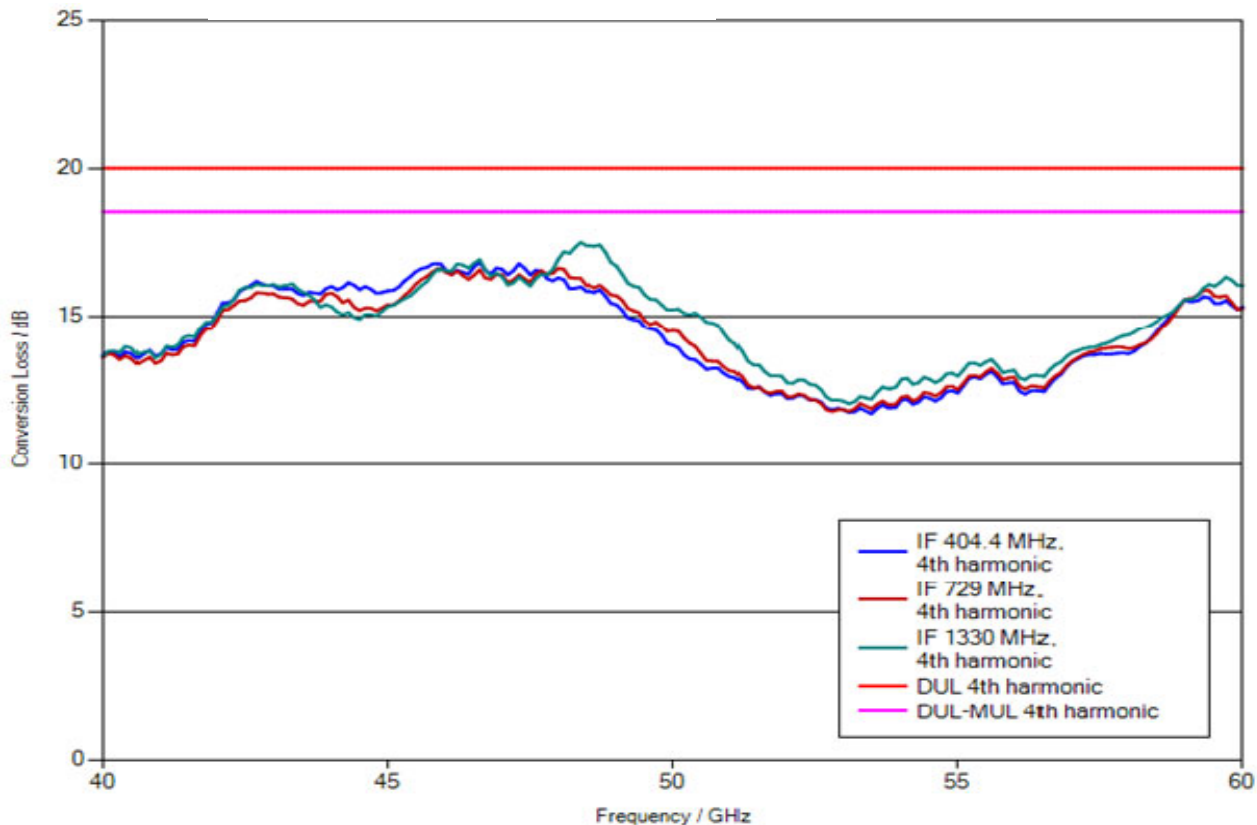
Operating temperature range		0 °C to +55 °C
Permissible temperature range		0 °C to +55 °C
Storage temperature range		-40 °C to +70 °C
Climatic loading		+40 °C at 95 % relative humidity (non condensing) (DIN EN 60068-2-30: 2000-02)
Dimensions	FS-Z 60 (W × H × D) FS-Z 140 (W × H × D) FS-Z 170 (W × H × D) FS-Z 220 (W × H × D) FS-Z 325 (W × H × D) FS-Z 500 (W × H × D)	27.0 mm × 24.15 mm × ~64 mm (1.06 in × 0,95 in × 2.51 in) 27.0 mm × 24.15 mm × ~94 mm (1.06 in × 0,95 in × 3.70 in) 27.0 mm × 24.15 mm × ~85 mm (1.06 in × 0,95 in × 3.34 in) 27.0 mm × 24.15 mm × ~84 mm (1.06 in × 0,95 in × 3.30 in) 27.0 mm × 24.15 mm × ~73 mm (1.06 in × 0,95 in × 2.87 in)
Weight		(typ.) 190 g (nom.) (typ.) 0.45 lb (nom.)

## Ordering information

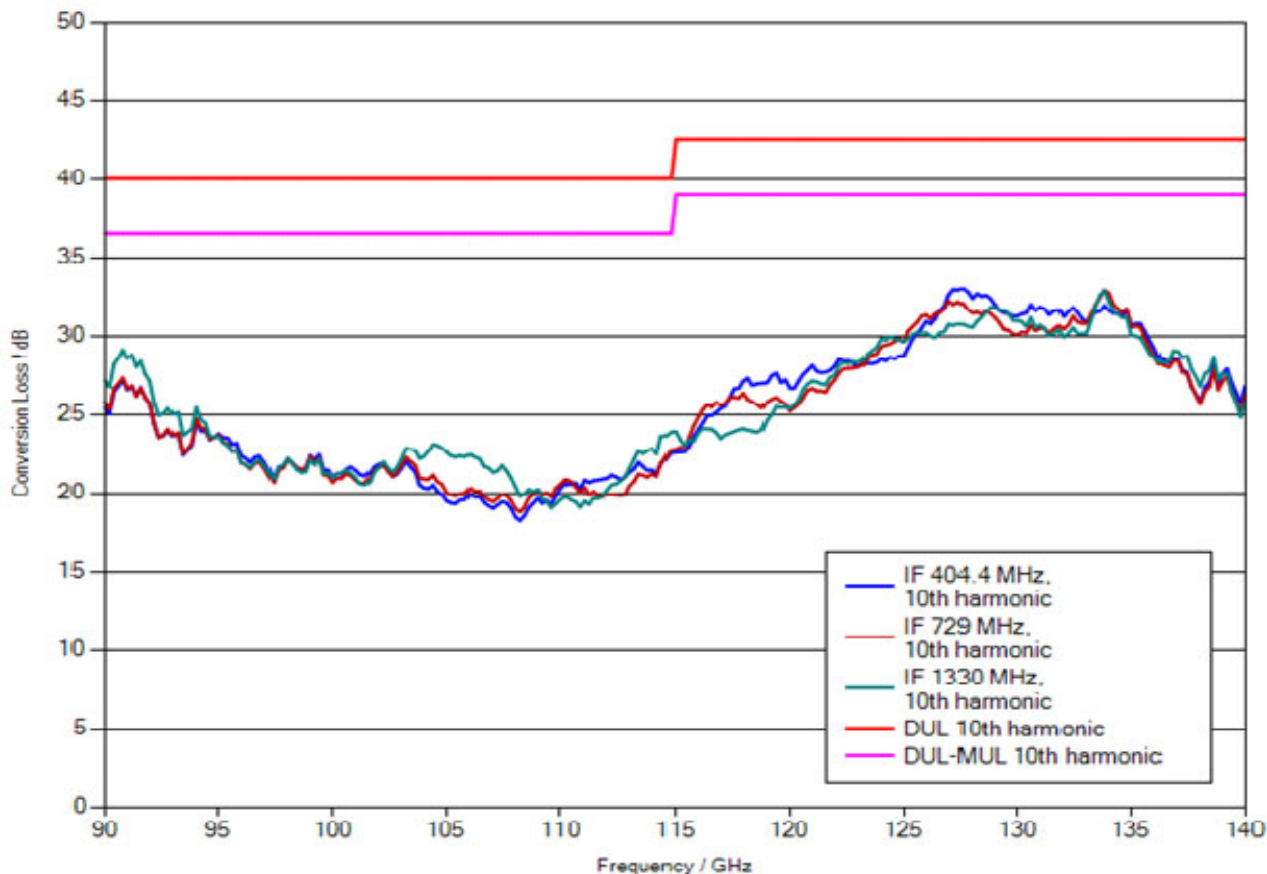
Designation	Type	R&S Order No.
Harmonic Mixer, 40 GHz to 70 GHz	RPG FS-Z 60	1048.0171.02
Harmonic Mixer, 90 GHz to 140 GHz	RPG FS-Z 140	3622.0708.02
Harmonic Mixer, 110 GHz to 170 GHz	RPG FS-Z 170	3622.0714.02
Harmonic Mixer, 140 GHz to 220 GHz	RPG FS-Z 220	3593.3250.02
Harmonic Mixer, 220 GHz to 325 GHz	RPG FS-Z 325	3593.3267.02
Harmonic Mixer, 325 GHz to 500 GHz	RPG FS-Z 500	3593.3273.02
<b>Accessories supplied</b>	USB stick with calibrated conversion loss data, carrying case	
Compatible with spectrum analyzers from Rohde & Schwarz; LO/IF ports (-B21 option) required		

<sup>2</sup> The actual IF frequency depends on the type of spectrum analyzer. Conversion loss tables are supplied with the separately provided USB stick.

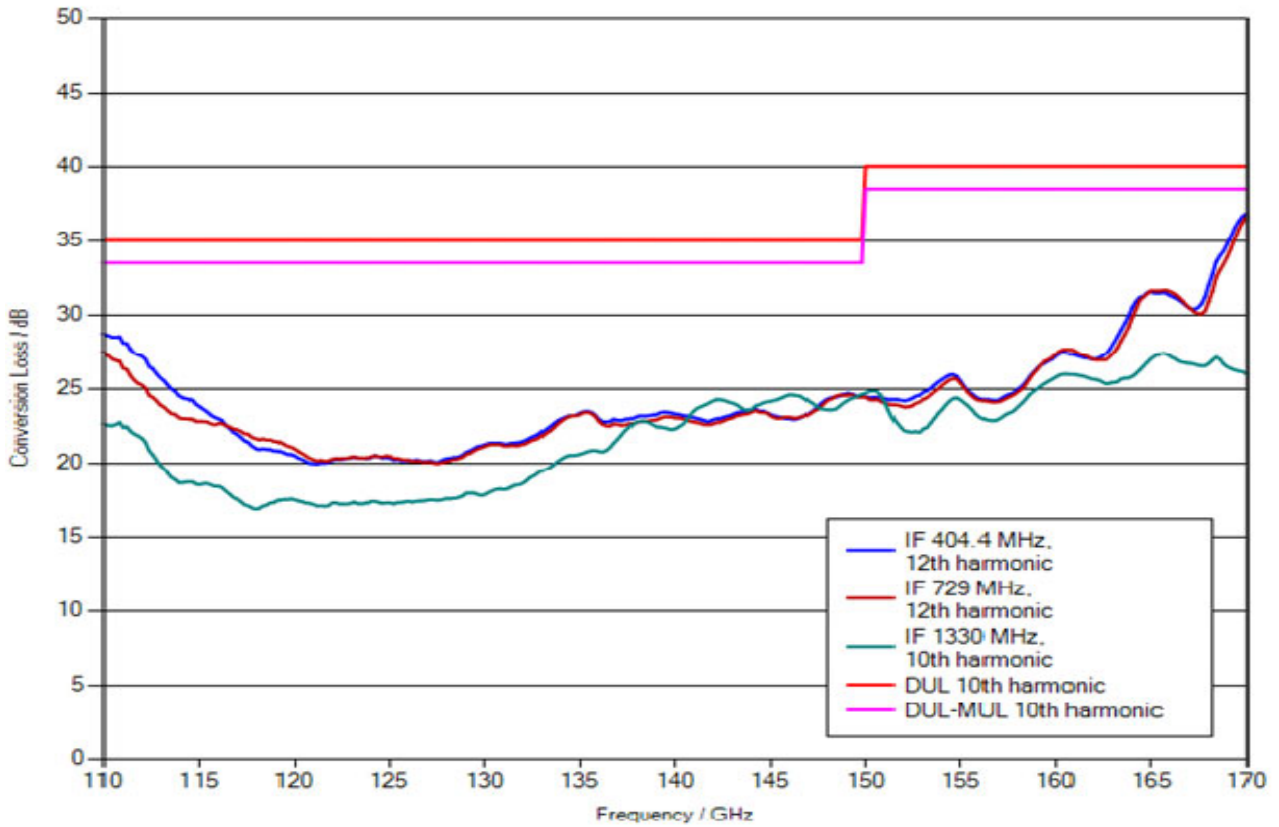
FS-Z60 1048.0171.02



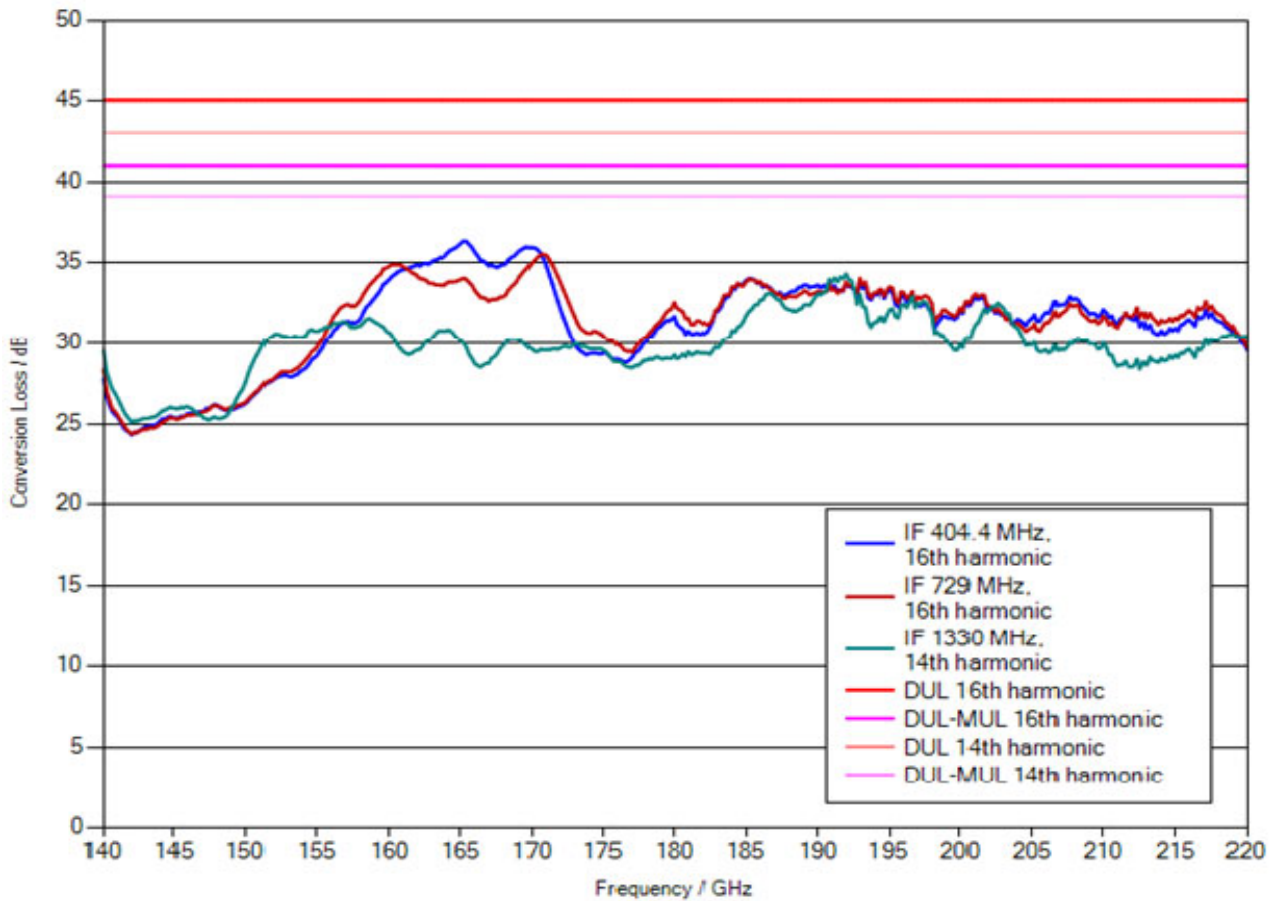
FS-Z140 3622.0708.02



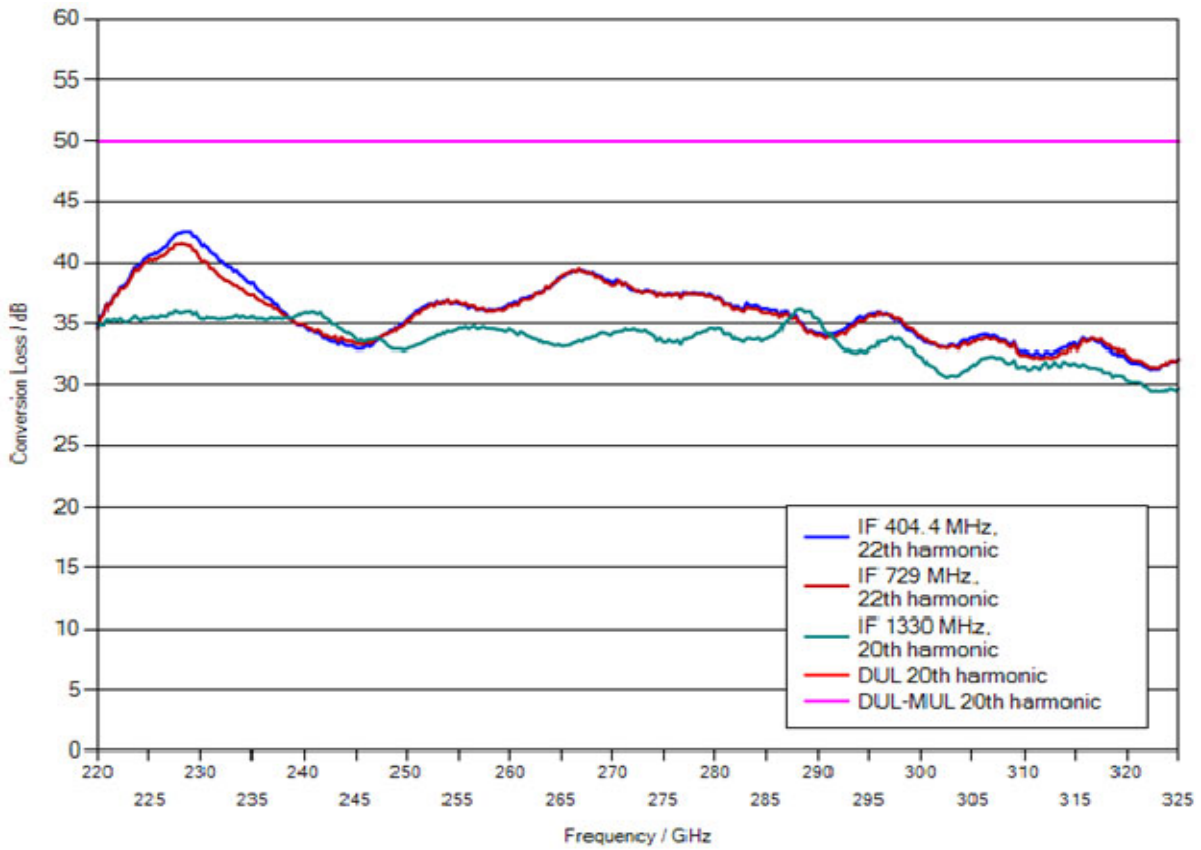
FS-Z170 3622.0714.02



FS-Z220 3593.3250.02



FS-Z325 3593.3267.02



FS-Z500 3593.3273.02

