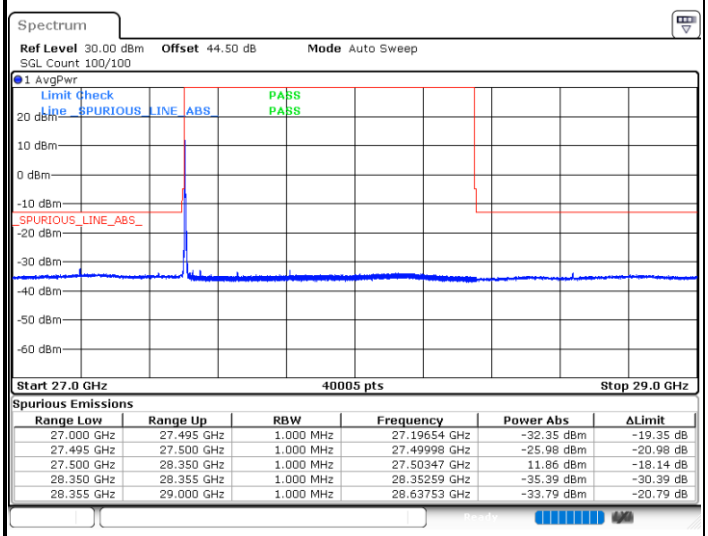
CP-OFDM Module 1

NR Band n261/ 50MHz / QPSK

Lowest Band Edge / 1 RB

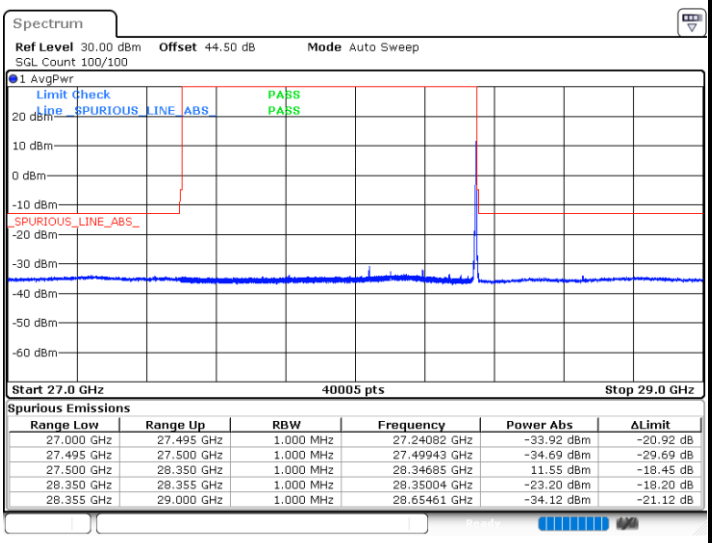


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.19654 GHz	-32.35 dBm	-19.35 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49998 GHz	-25.98 dBm	-20.98 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50347 GHz	11.86 dBm	-18.14 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35259 GHz	-35.39 dBm	-30.39 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.63753 GHz	-33.79 dBm	-20.79 dB

Date: 17.AUG.2020 23:11:52

Highest Band Edge / 1 RB



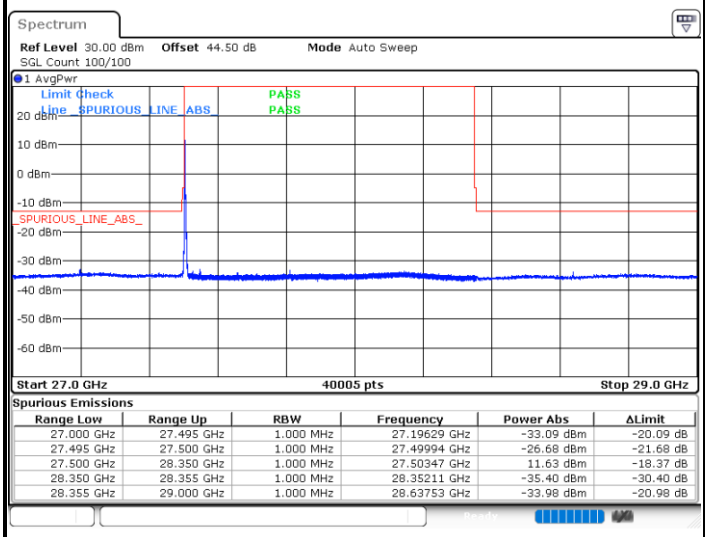
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.24082 GHz	-33.92 dBm	-20.92 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49943 GHz	-34.69 dBm	-29.69 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.34685 GHz	11.55 dBm	-18.45 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35004 GHz	-23.20 dBm	-18.20 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.65461 GHz	-34.12 dBm	-21.12 dB

Date: 18.AUG.2020 02:55:37

NR Band n261/ 50MHz / 16QAM

Lowest Band Edge / 1 RB

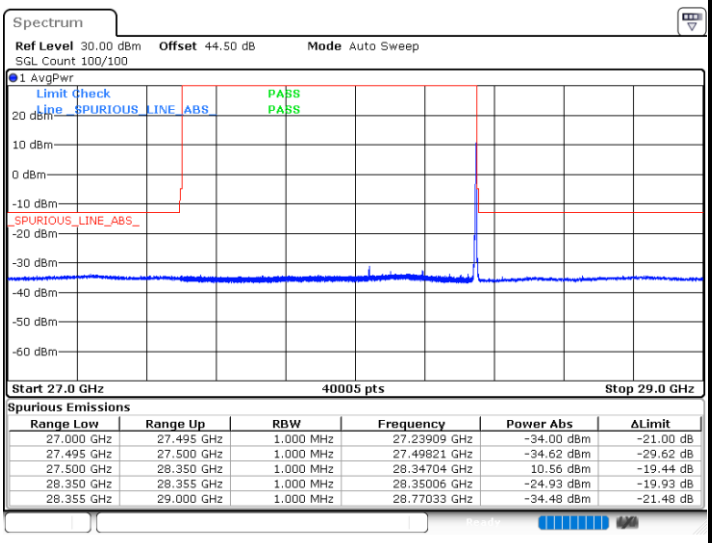


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.19629 GHz	-33.09 dBm	-20.09 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49994 GHz	-26.68 dBm	-21.68 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50347 GHz	11.63 dBm	-18.37 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35211 GHz	-35.40 dBm	-30.40 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.63753 GHz	-33.98 dBm	-20.98 dB

Date: 17.AUG.2020 23:09:52

Highest Band Edge / 1 RB



Spurious Emissions

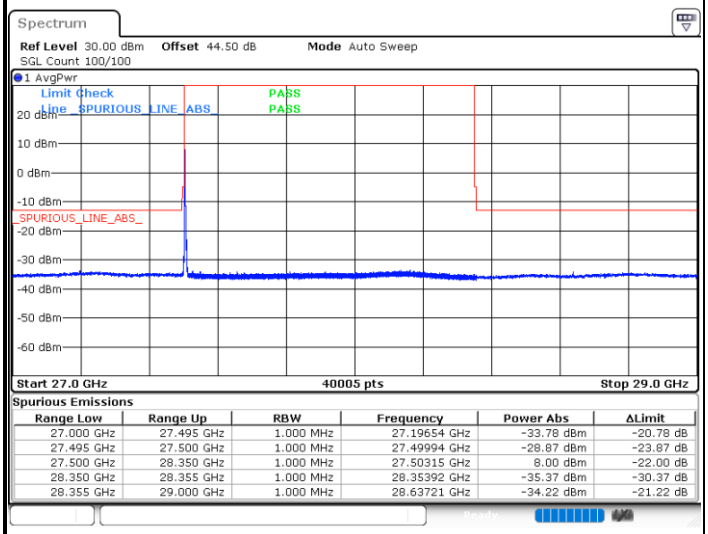
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.23909 GHz	-34.00 dBm	-21.00 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49821 GHz	-34.62 dBm	-29.62 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.34704 GHz	10.56 dBm	-19.44 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35006 GHz	-24.93 dBm	-19.93 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.77033 GHz	-34.48 dBm	-21.48 dB

Date: 18.AUG.2020 02:56:33

CP-OFDM Module 1

NR Band n261/ 50MHz / 64QAM

Lowest Band Edge / 1 RB

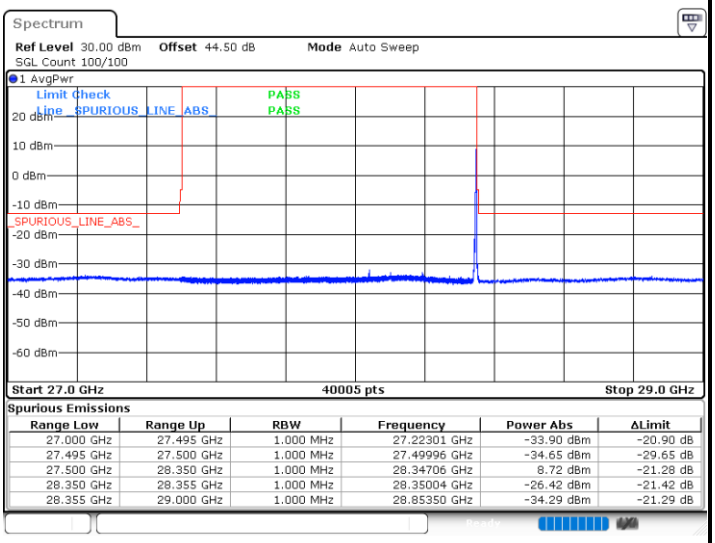


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.19654 GHz	-33.78 dBm	-20.78 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49994 GHz	-28.87 dBm	-23.87 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50315 GHz	8.00 dBm	-22.00 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35392 GHz	-35.37 dBm	-30.37 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.63721 GHz	-34.22 dBm	-21.22 dB

Date: 17.AUG.2020 23:10:38

Highest Band Edge / 1 RB



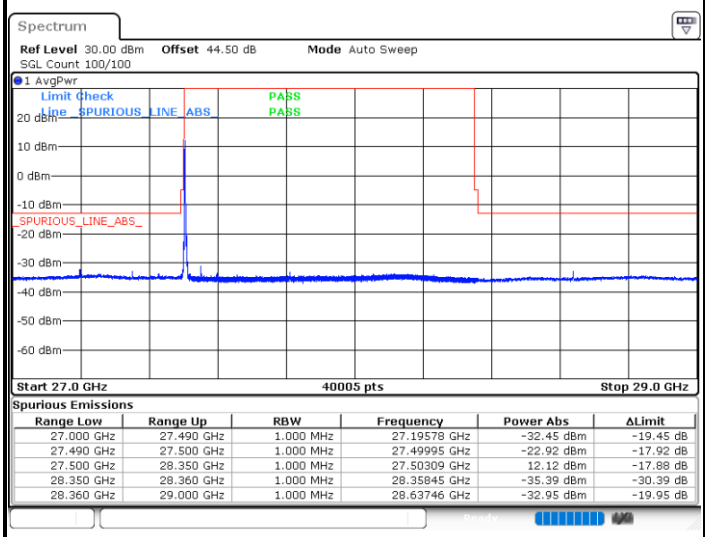
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.22301 GHz	-33.90 dBm	-20.90 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49996 GHz	-34.65 dBm	-29.65 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.34706 GHz	8.72 dBm	-21.28 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35004 GHz	-26.42 dBm	-21.42 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.85350 GHz	-34.29 dBm	-21.29 dB

Date: 18.AUG.2020 02:57:24

NR Band n261/ 100MHz / QPSK

Lowest Band Edge / 1 RB

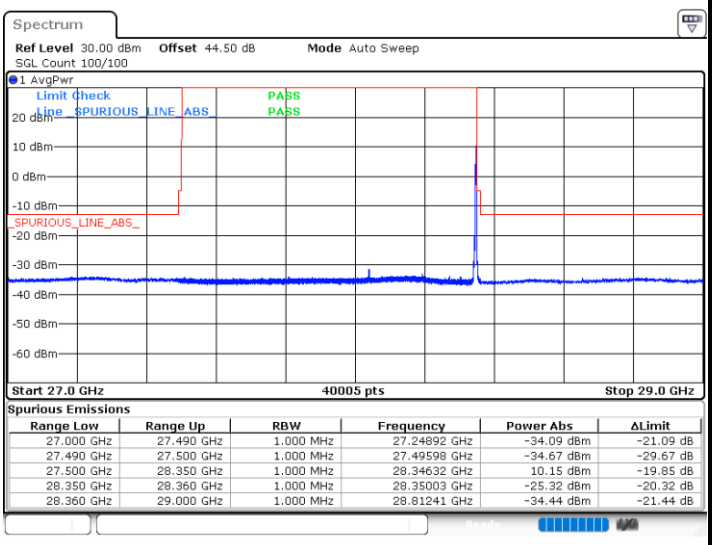


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.19578 GHz	-32.45 dBm	-19.45 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49995 GHz	-22.92 dBm	-17.92 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50309 GHz	12.12 dBm	-17.88 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35845 GHz	-35.39 dBm	-30.39 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.63746 GHz	-32.95 dBm	-19.95 dB

Date: 18.AUG.2020 00:19:59

Highest Band Edge / 1 RB



Spurious Emissions

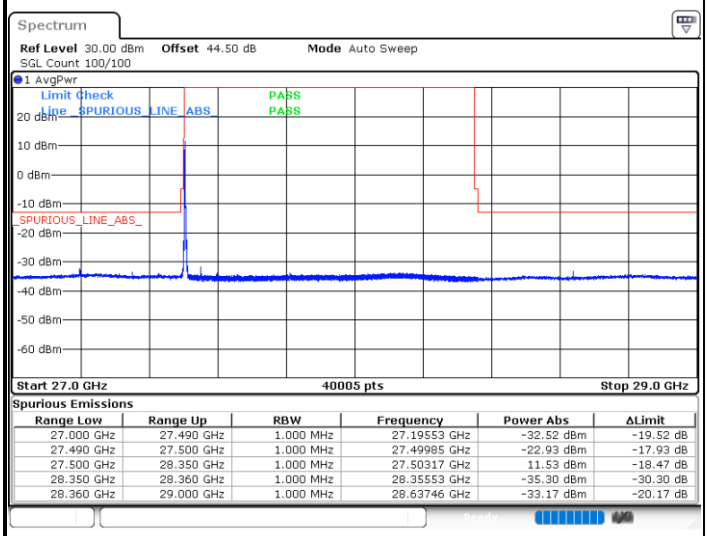
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.24892 GHz	-34.09 dBm	-21.09 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49598 GHz	-34.67 dBm	-29.67 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.34632 GHz	10.15 dBm	-19.85 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35003 GHz	-25.32 dBm	-20.32 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.81241 GHz	-34.44 dBm	-21.44 dB

Date: 18.AUG.2020 03:10:31

CP-OFDM Module 1

NR Band n261/ 100MHz / 16QAM

Lowest Band Edge / 1 RB

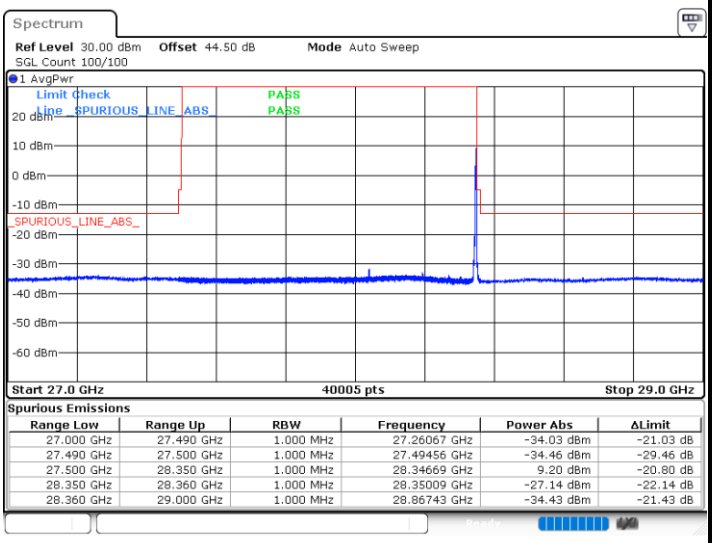


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.19553 GHz	-32.52 dBm	-19.52 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49985 GHz	-22.93 dBm	-17.93 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50317 GHz	11.53 dBm	-18.47 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35553 GHz	-35.30 dBm	-30.30 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.63746 GHz	-33.17 dBm	-20.17 dB

Date: 18.AUG.2020 00:18:57

Highest Band Edge / 1 RB



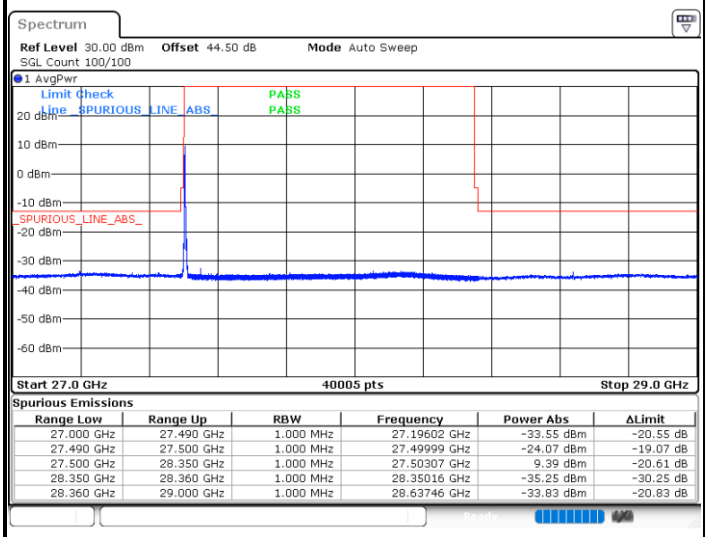
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.26067 GHz	-34.03 dBm	-21.03 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49456 GHz	-34.46 dBm	-29.46 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.34669 GHz	9.20 dBm	-20.80 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35009 GHz	-27.14 dBm	-22.14 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.86743 GHz	-34.43 dBm	-21.43 dB

Date: 18.AUG.2020 03:11:14

NR Band n261/ 100MHz / 64QAM

Lowest Band Edge / 1 RB

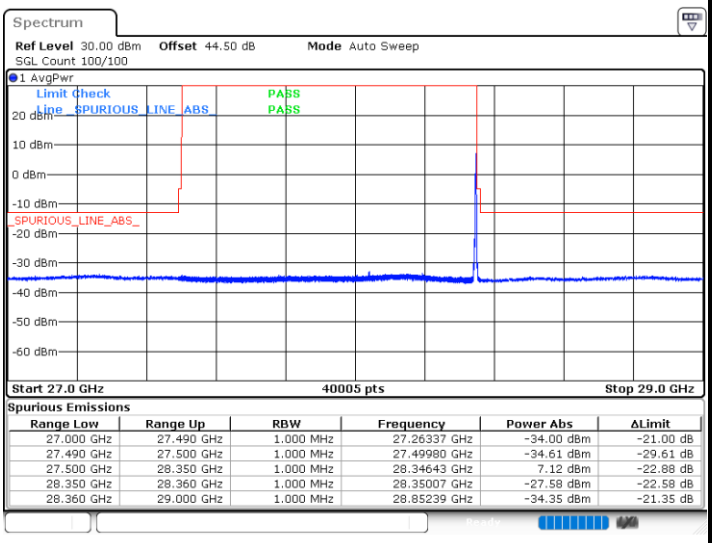


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.19602 GHz	-33.55 dBm	-20.55 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49999 GHz	-24.07 dBm	-19.07 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50307 GHz	9.39 dBm	-20.61 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35016 GHz	-35.25 dBm	-30.25 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.63746 GHz	-33.83 dBm	-20.83 dB

Date: 18.AUG.2020 00:17:48

Highest Band Edge / 1 RB



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.26337 GHz	-34.00 dBm	-21.00 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49980 GHz	-34.61 dBm	-29.61 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.34643 GHz	7.12 dBm	-22.88 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35007 GHz	-27.58 dBm	-22.58 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.85239 GHz	-34.35 dBm	-21.35 dB

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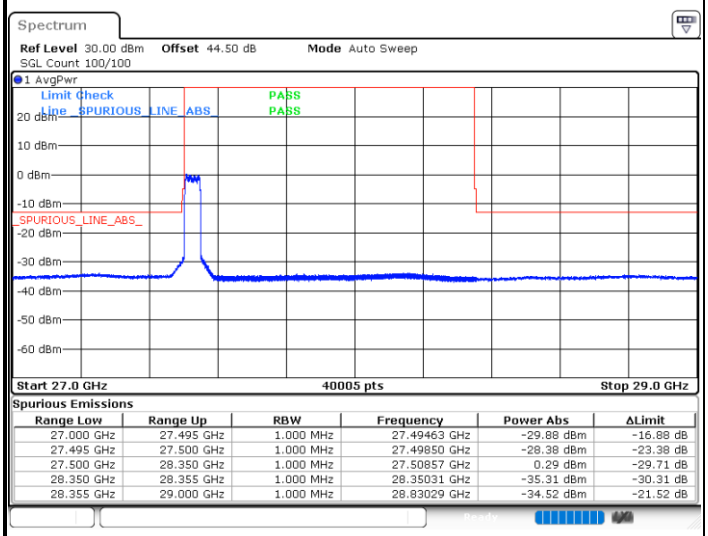
CP-OFDM Module 1

NR Band n261/ 50MHz / QPSK

Lowest Band Edge / Full RB

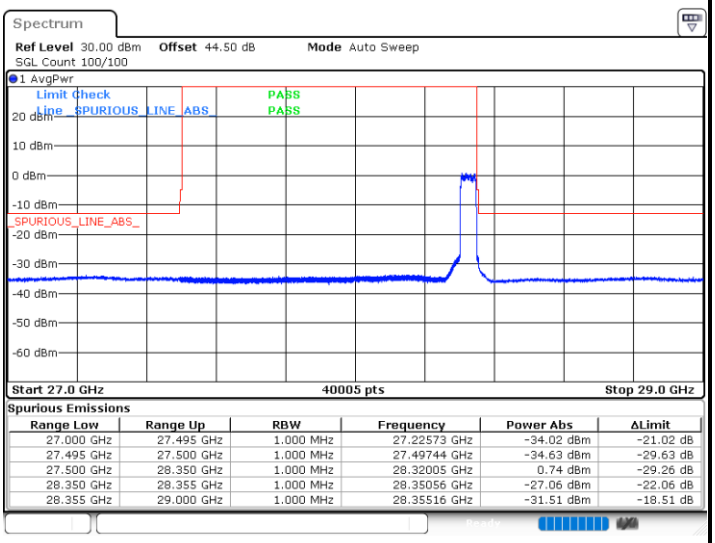


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.49463 GHz	-29.88 dBm	-16.88 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49850 GHz	-28.38 dBm	-23.38 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50857 GHz	0.29 dBm	-29.71 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35031 GHz	-35.31 dBm	-30.31 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.83029 GHz	-34.52 dBm	-21.52 dB

Date: 17.AUG.2020 23:16:57

Highest Band Edge / Full RB



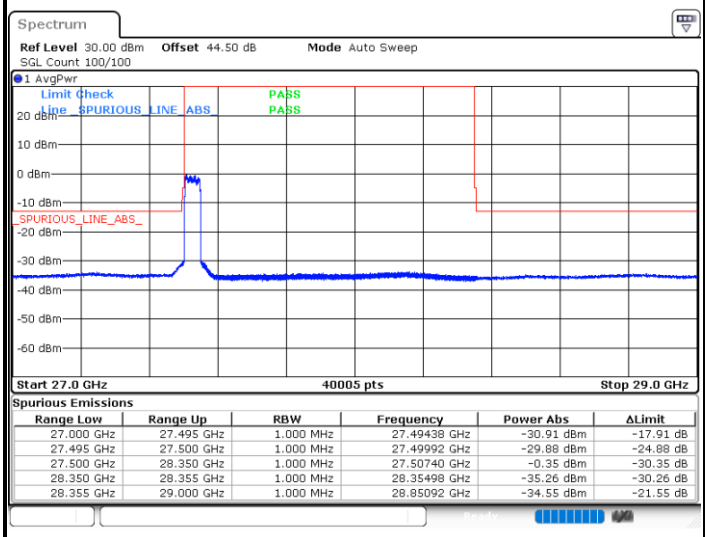
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.22573 GHz	-34.02 dBm	-21.02 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49744 GHz	-34.63 dBm	-29.63 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.32005 GHz	0.74 dBm	-29.26 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35056 GHz	-27.06 dBm	-22.06 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.35516 GHz	-31.51 dBm	-18.51 dB

Date: 18.AUG.2020 02:49:48

NR Band n261/ 50MHz / 16QAM

Lowest Band Edge / Full RB

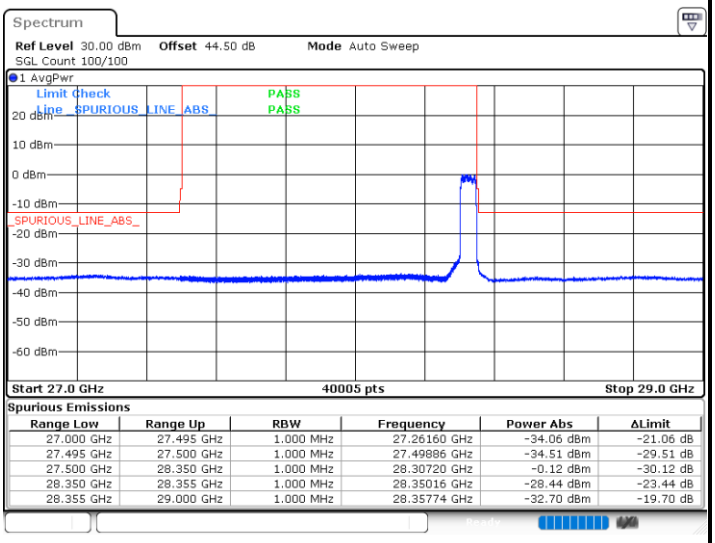


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.49438 GHz	-30.91 dBm	-17.91 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49992 GHz	-29.88 dBm	-24.88 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50740 GHz	-0.35 dBm	-30.35 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35498 GHz	-35.26 dBm	-30.26 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.85092 GHz	-34.55 dBm	-21.55 dB

Date: 17.AUG.2020 23:20:28

Highest Band Edge / Full RB



Spurious Emissions

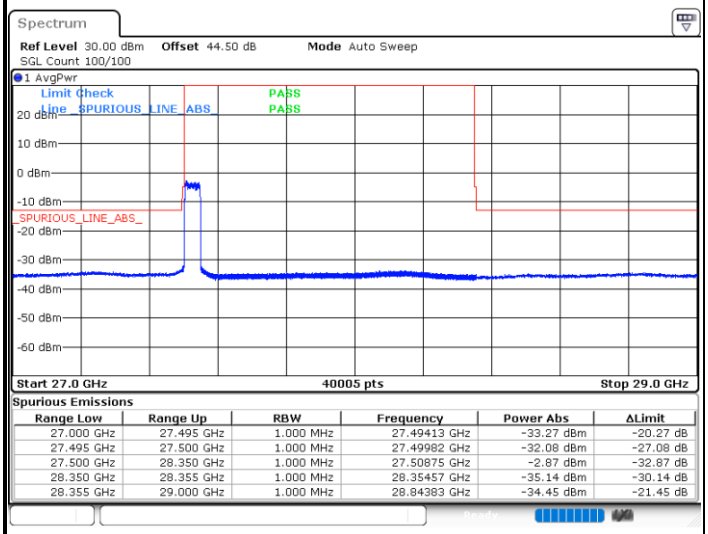
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.26160 GHz	-34.06 dBm	-21.06 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49886 GHz	-34.51 dBm	-29.51 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.30720 GHz	-0.12 dBm	-30.12 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35016 GHz	-28.44 dBm	-23.44 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.35774 GHz	-32.70 dBm	-19.70 dB

Date: 18.AUG.2020 02:50:53

CP-OFDM Module 1

NR Band n261/ 50MHz / 64QAM

Lowest Band Edge / Full RB

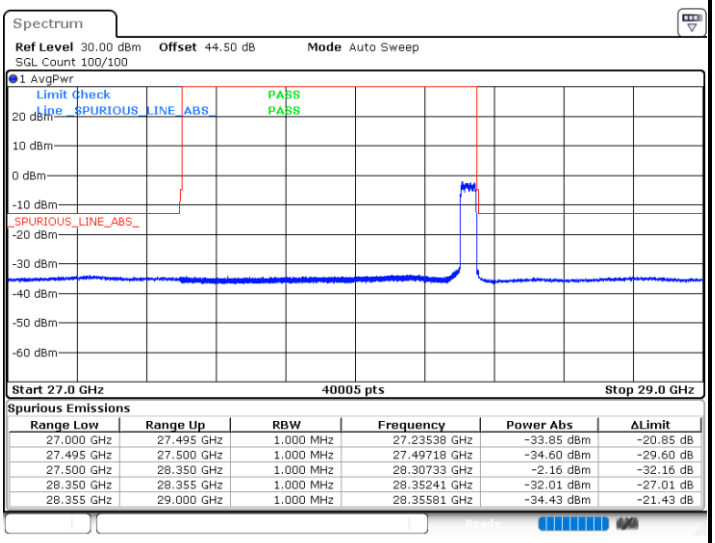


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.49413 GHz	-33.27 dBm	-20.27 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49982 GHz	-32.08 dBm	-27.08 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.50875 GHz	-2.87 dBm	-32.87 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35457 GHz	-35.14 dBm	-30.14 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.84383 GHz	-34.45 dBm	-21.45 dB

Date: 17.AUG.2020 23:22:29

Highest Band Edge / Full RB



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.495 GHz	1.000 MHz	27.23538 GHz	-33.85 dBm	-20.85 dB
27.495 GHz	27.500 GHz	1.000 MHz	27.49718 GHz	-34.60 dBm	-29.60 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.30733 GHz	-2.16 dBm	-32.16 dB
28.350 GHz	28.355 GHz	1.000 MHz	28.35241 GHz	-32.01 dBm	-27.01 dB
28.355 GHz	29.000 GHz	1.000 MHz	28.35581 GHz	-34.43 dBm	-21.43 dB

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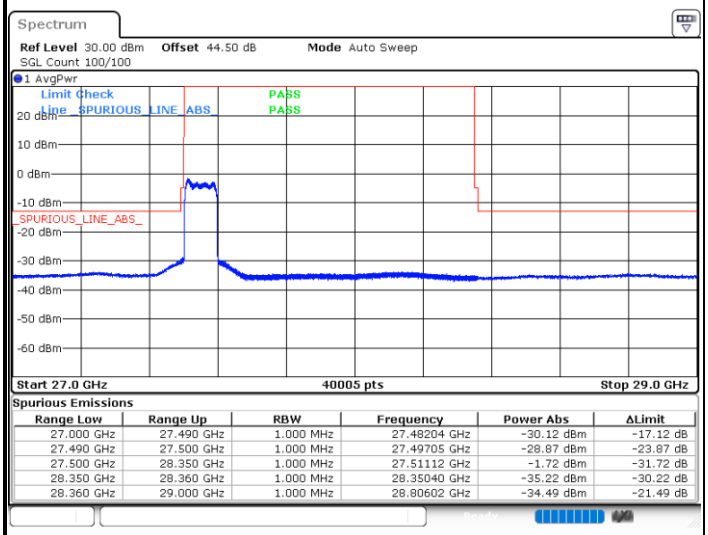
NR Band n261/ 100MHz / QPSK

Lowest Band Edge / Full RB

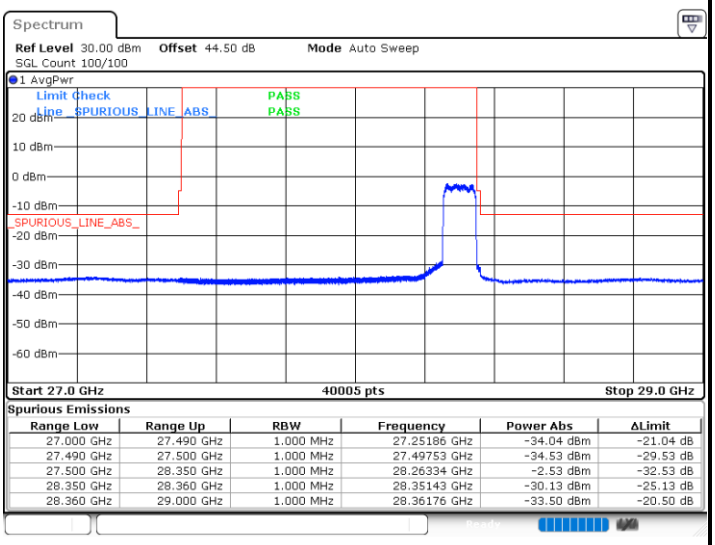


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.48204 GHz	-30.12 dBm	-17.12 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49705 GHz	-28.87 dBm	-23.87 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.51112 GHz	-1.72 dBm	-31.72 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35040 GHz	-35.22 dBm	-30.22 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.80602 GHz	-34.49 dBm	-21.49 dB

Date: 18.AUG.2020 00:24:07

Highest Band Edge / Full RB



Spurious Emissions

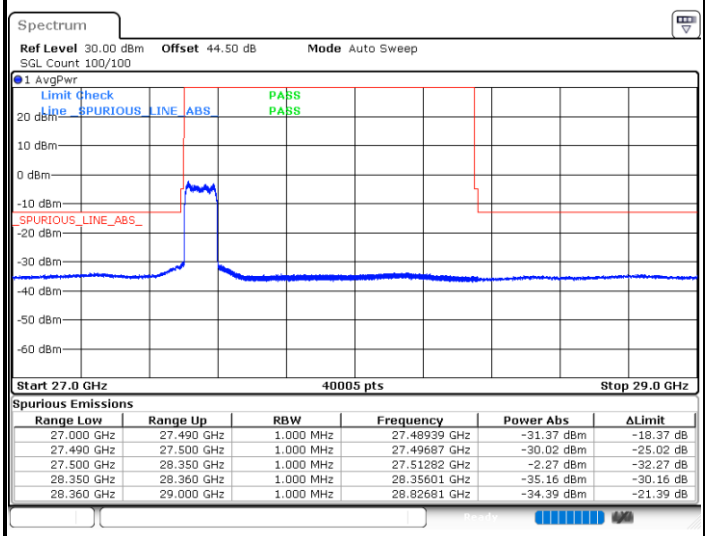
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.25186 GHz	-34.04 dBm	-21.04 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49753 GHz	-34.53 dBm	-29.53 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.26334 GHz	-2.53 dBm	-32.53 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35143 GHz	-30.13 dBm	-25.13 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.36176 GHz	-33.50 dBm	-20.50 dB

Date: 18.AUG.2020 03:04:57

CP-OFDM Module 1

NR Band n261/ 100MHz / 16QAM

Lowest Band Edge / Full RB



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.48939 GHz	-31.37 dBm	-18.37 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49687 GHz	-30.02 dBm	-25.02 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.51282 GHz	-2.27 dBm	-32.27 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35601 GHz	-35.16 dBm	-30.16 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.82681 GHz	-34.39 dBm	-21.39 dB

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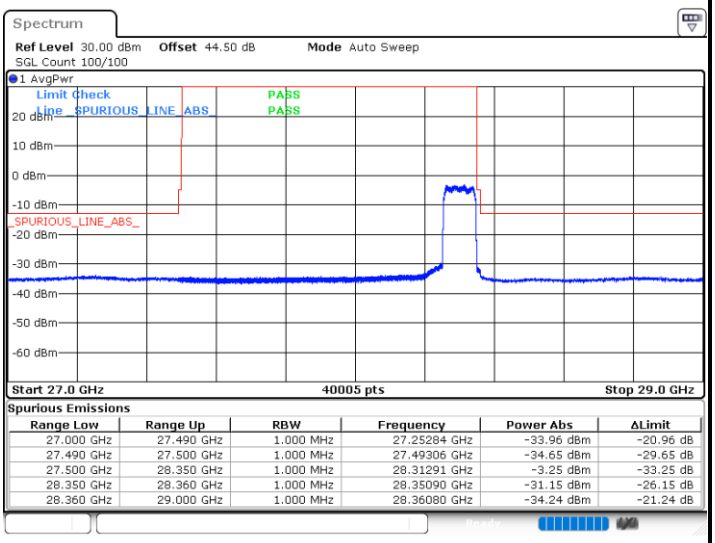
Highest Band Edge / Full RB



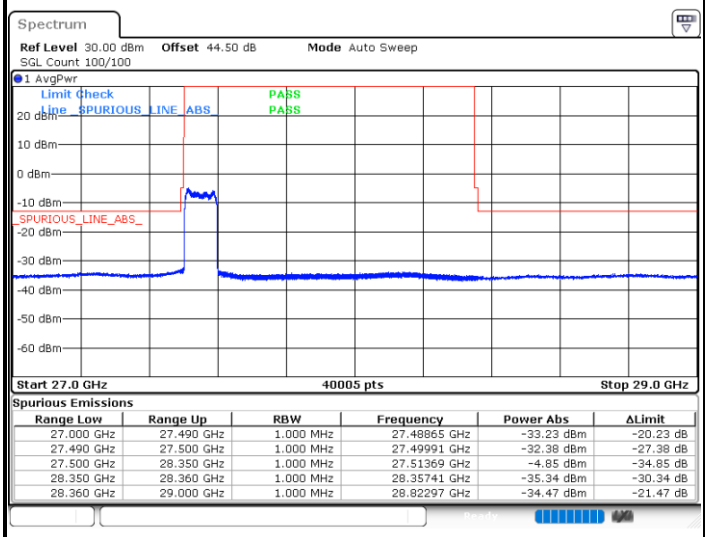
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.25284 GHz	-33.96 dBm	-20.96 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49306 GHz	-34.65 dBm	-29.65 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.31291 GHz	-3.25 dBm	-33.25 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35090 GHz	-31.15 dBm	-26.15 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.36080 GHz	-34.24 dBm	-21.24 dB

Date: 18.AUG.2020 03:06:09

NR Band n261/ 100MHz / 64QAM

Lowest Band Edge / Full RB

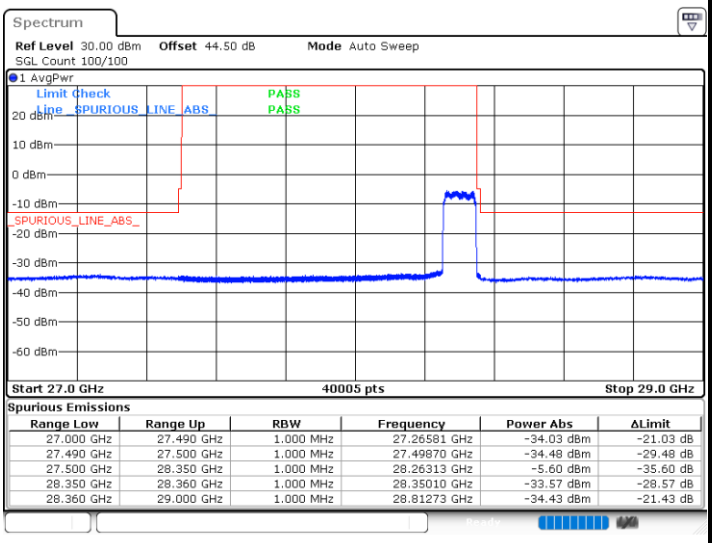


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.48865 GHz	-33.23 dBm	-20.23 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49991 GHz	-32.38 dBm	-27.38 dB
27.500 GHz	28.350 GHz	1.000 MHz	27.51369 GHz	-4.85 dBm	-34.85 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35741 GHz	-35.34 dBm	-30.34 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.82297 GHz	-34.47 dBm	-21.47 dB

Date: 18.AUG.2020 00:27:52

Highest Band Edge / Full RB



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
27.000 GHz	27.490 GHz	1.000 MHz	27.26581 GHz	-34.03 dBm	-21.03 dB
27.490 GHz	27.500 GHz	1.000 MHz	27.49870 GHz	-34.48 dBm	-29.48 dB
27.500 GHz	28.350 GHz	1.000 MHz	28.26313 GHz	-5.60 dBm	-35.60 dB
28.350 GHz	28.360 GHz	1.000 MHz	28.35010 GHz	-33.57 dBm	-28.57 dB
28.360 GHz	29.000 GHz	1.000 MHz	28.81273 GHz	-34.43 dBm	-21.43 dB

Date: 18.AUG.2020 03:07:23

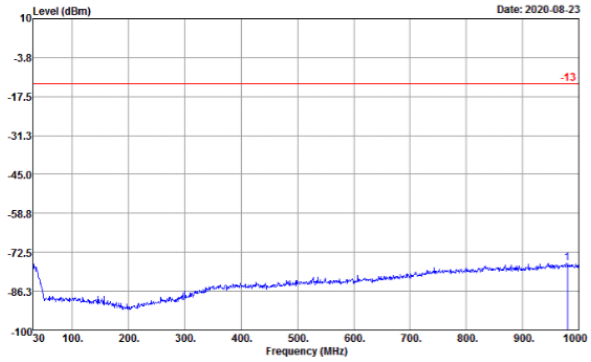
Spurious Emission

There is no significant spurious emission signal found for frequency started from 30MHz up to 18GHz.

Only the noise floor is reported.

NR Band n261 (30MHz-1GHz)

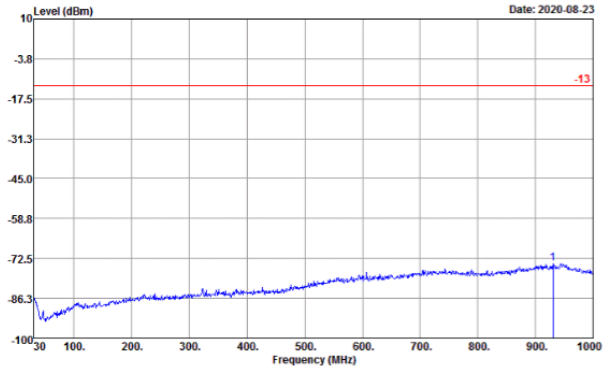
Horizontal



Site : 03CH10-HY
Condition : -13 EIRP_WO HORIZONTAL
Project : 041657-01
: n261 Module 1

	Freq	Level	Over Limit	Limit Line
	MHz	dBm	dB	dBm
1	979.63	-76.39	-63.39	-13.00

Vertical

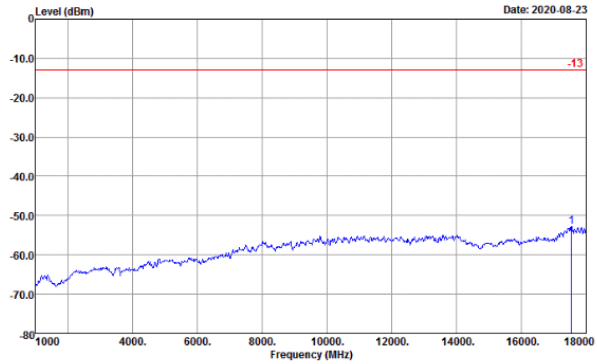


Site : 03CH10-HY
Condition : -13 EIRP_WO VERTICAL
Project : 041657-01
: n261 Module 1

	Freq	Level	Over Limit	Limit Line
	MHz	dBm	dB	dBm
1	930.16	-74.13	-61.13	-13.00

NR Band n261(1GHz-18GHz)

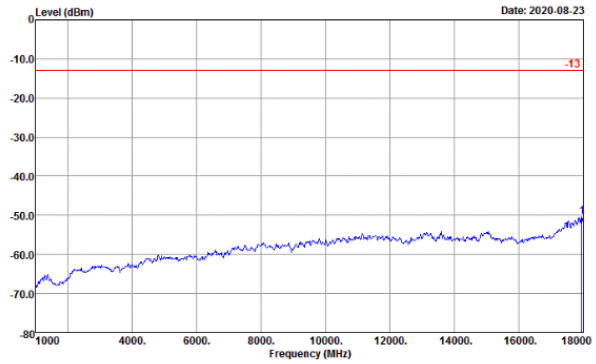
Horizontal



Site : 03CH10-HY
Condition : -13 EIRP_WO HORIZONTAL
Project : 041657-01
: n261 Module 1

	Freq	Level	Over Limit	Limit Line
	MHz	dBm	dB	dBm
1	17541.00	-52.75	-39.75	-13.00

Vertical



Site : 03CH10-HY
Condition : -13 EIRP_WO VERTICAL
Project : 041657-01
: n261 Module 1

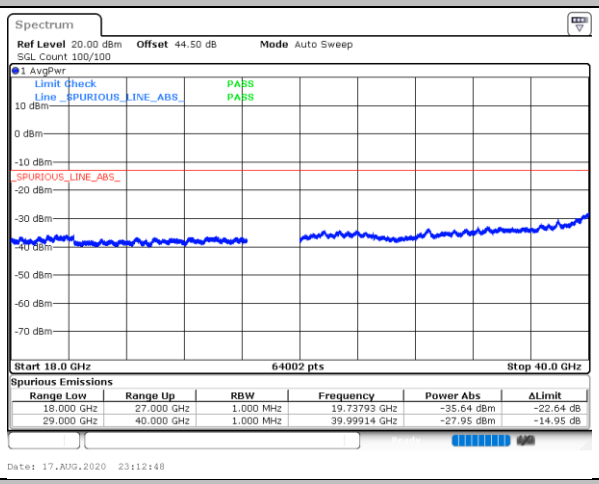
	Freq	Level	Over Limit	Limit Line
	MHz	dBm	dB	dBm
1	17949.00	-50.32	-37.32	-13.00

Spurious emission between 18GHz to 40GHz worst case plot is reported as following..

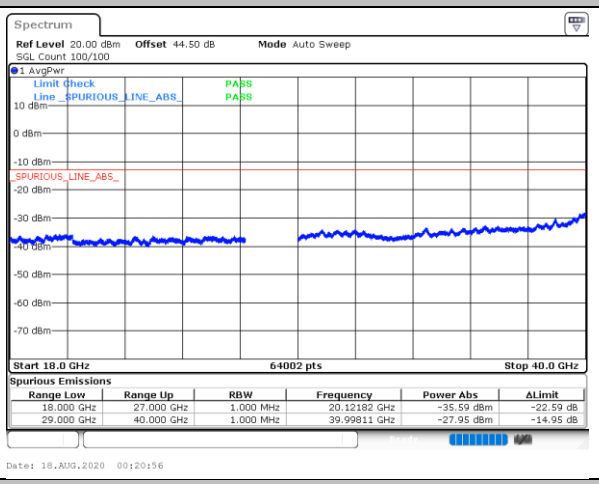
CP-OFDM Module 1

NR Band n261QPSK (18-40GHz)

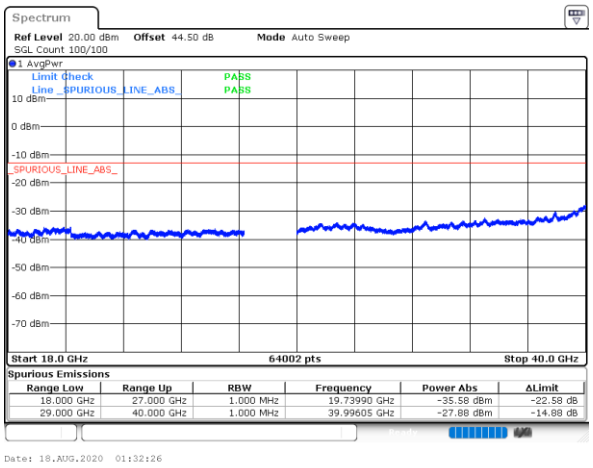
Lowest Channel / 50MHz



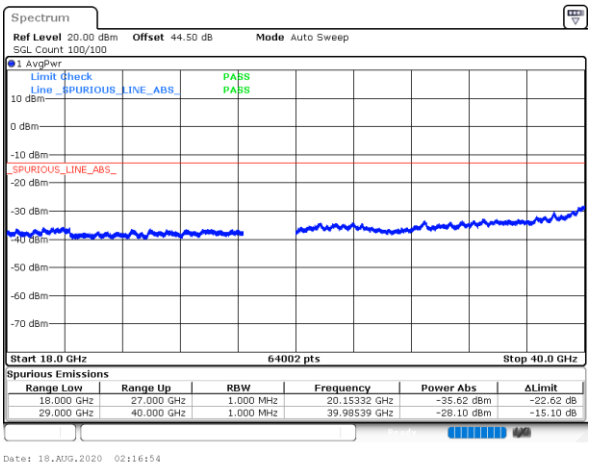
Lowest Channel / 100MHz



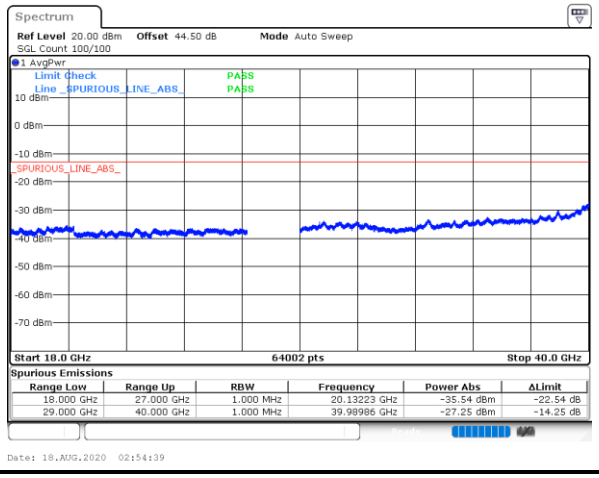
Middle Channel / 50MHz



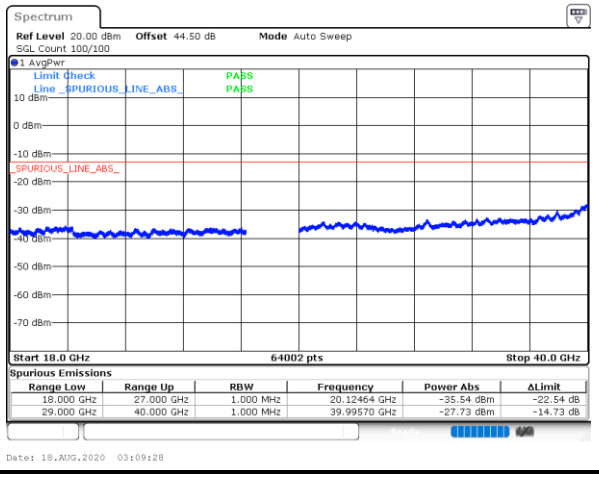
Middle Channel / 100MHz



Highest Channel / 50MHz



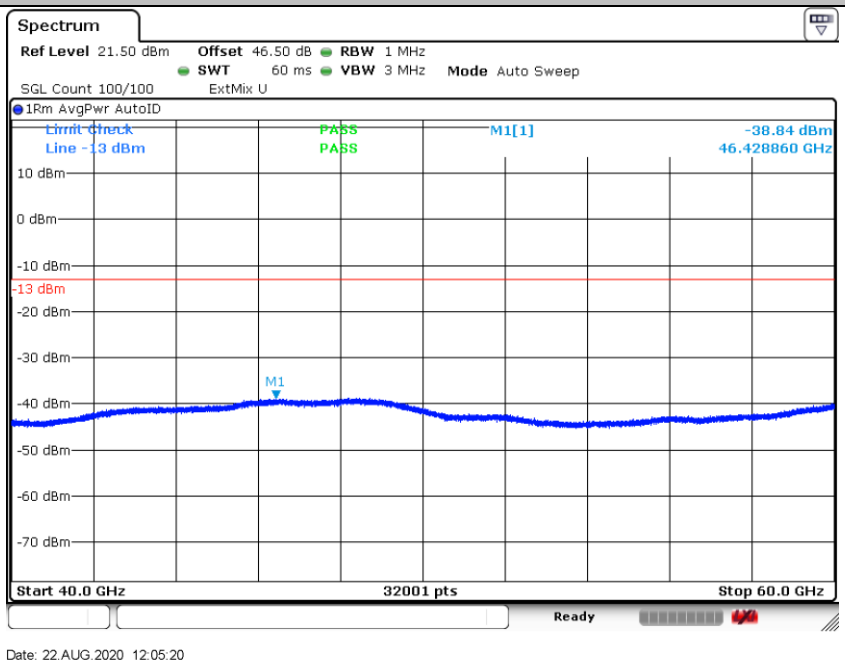
Highest Channel / 100MHz



There is no significant spurious emission signal found for frequency started from 40GHz up to 100GHz.

Only the noise floor is reported.

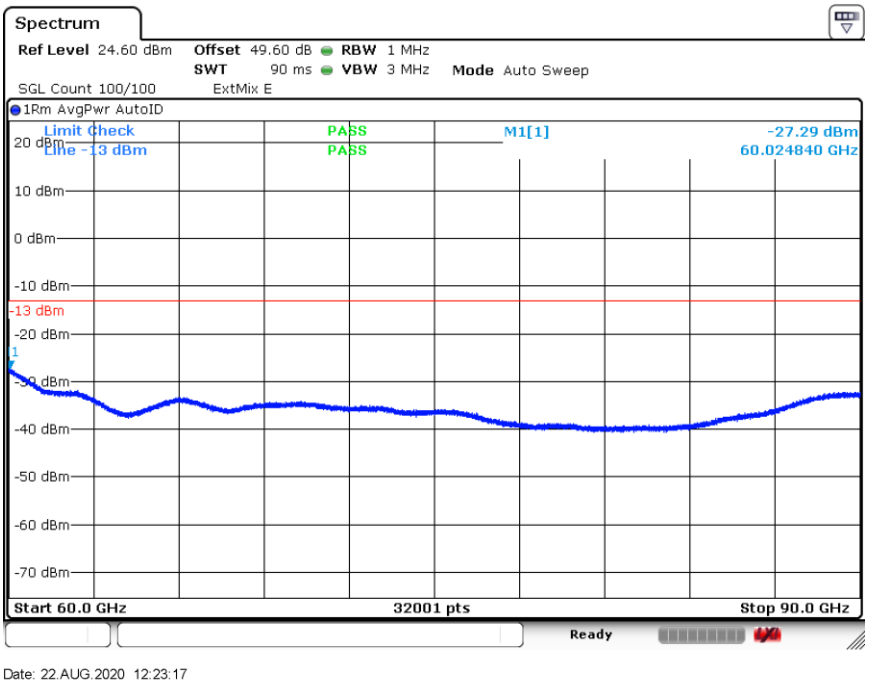
NR Band n261
(40GHz-60GHz)



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8

= 42.3 + 2 + 107 + 20log(1) – 104.8 = 46.5 (dB)

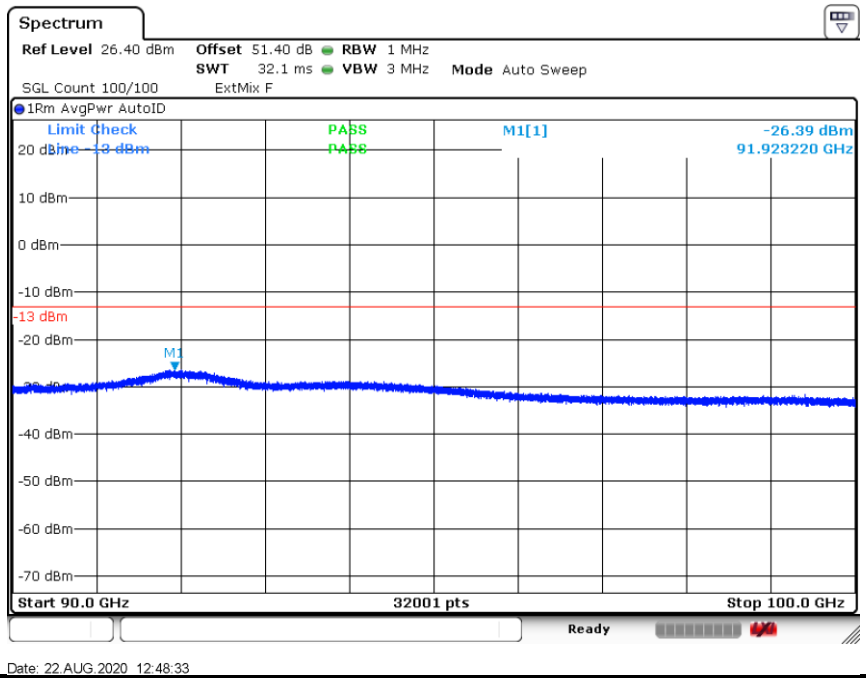
NR Band n261
(60GHz-90GHz)



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8

= 45.4 + 2 + 107 + 20log(1) – 104.8 = 49.6 (dB)

NR Band n261
(90GHz-100GHz)



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8

= 47.2 + 2 + 107 + 20log(1) – 104.8 = 51.4 (dB)

NR Band n261

Frequency Stability

Test Conditions		NR Band n261 / Middle Channel			Limit
Temperature (°C)	Voltage (Volt)	CW tone			Note 2.
		Frequency (GHz)	Deviation (kHz)	Deviation (ppm)	Result
50	Normal Voltage	27.9251758	-176.800	6.331	Pass
40	Normal Voltage	27.9251159	-116.900	4.186	
30	Normal Voltage	27.9250859	-86.900	3.112	
20(Ref.)	Normal Voltage	27.924999	0.000	0.000	
10	Normal Voltage	27.924976	23.000	0.824	
0	Normal Voltage	27.924956	43.000	1.540	
-10	Normal Voltage	27.9249361	62.900	2.252	
-20	Normal Voltage	27.9248961	102.900	3.685	
-30	Normal Voltage	27.9248561	142.900	5.117	
20	Maximum Voltage	27.925009	-10.000	0.358	
20	Normal Voltage	27.924999	0.000	0.000	
20	Battery End Point	27.924979	20.000	0.716	

Note:

1. Normal Voltage =3.85 V.；Battery End Point (BEP) =3.3 V.；Maximum Voltage =4.25 V.
2. The frequency fundamental emissions stay within the operation band.

Appendix C. R&S Mixer Certificate

Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate
Kalibrierschein

Certificate Number 24-0140-101128-01
Zertifikatsnummer

Unit Data

Item
Gegenstand
Harmonic Mixer, 90 GHz to 140 GHz

Manufacturer
Hersteller
RPG

Type
Typ
RPG FS-Z140

Material Number
Materialnummer
3622.0708.02

Serial Number
Seriennummer
101128

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber

Order Number
Bestellnummer

Date of Receipt
Eingangsdatum

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung
Meckenheim, 2018-09-03

Scope of Calibration
Umfang der Kalibrierung
Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)
New device

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung)
All measured values are <u>within the data sheet specifications.</u>

Extend of Calibration Documents
Umfang des Kalibrierdokuments
2 pages Calibration Certificate
5 pages Outgoing Results

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor k = 2). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit k = 2). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Radiometer Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum
2018-09-06

Head of Laboratory
Laborleitung
Schulze

Person Responsible
Bearbeiter
Dick

Radiometer Physics GmbH ● Werner-von-Siemens-Str. 4 ● 53340 Meckenheim ● Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 ● Managing Director: Achim Walber, Dr. Thomas Rose ● Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 ● VAT Identification No.: DE 123 377 395

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity **20 % - 80 %**
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23 $^{+7}_{-3}$) °C

Working standards used (having a significant effect on the accuracy)
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

Item Gegenstand	**Type** Typ	**Serial Number** Seriennummer	**Calibration Certificate Number** Kalibrierscheinnummer	**Cal. Due** Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17

UGB1 **A compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

UGB2 **A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

Notes
Anmerkungen

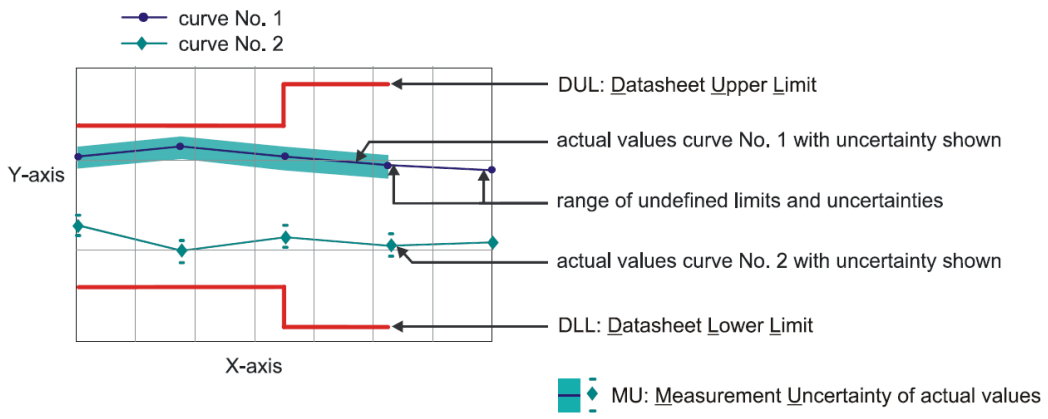
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

Outgoing Results

The following abbreviations may be used in this document

{a}	No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
{b}	The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
{c}	Functional test, therefore no measurement uncertainty is stated.
{d}	Typical value, refer to performance test.
{e}	The measurement uncertainty is taken into account when setting the measuring system.
DL or DT	Data Limit for symmetrical tolerance limits
DLL	Datasheet Lower Limit
DUL	Datasheet Upper Limit
MU	Measurement Uncertainty
MLL or MLV	Measurement Uncertainty Lower Value
MUL or MUV	Measurement Uncertainty Upper Value
Nom.	Nominal Value
Dev.	Deviation
MErr.	Measurement Error
Act.	Actual Value
UGB	Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
UGB1	Measurement results marked as UGB1 show conformity with a probability of >50 %and <95 %.
UGB2	Measurement results marked as UGB2 show non-conformity with a probability of >50 %and <95 %.
DU	Datasheet Uncertainty

Explanation of charts

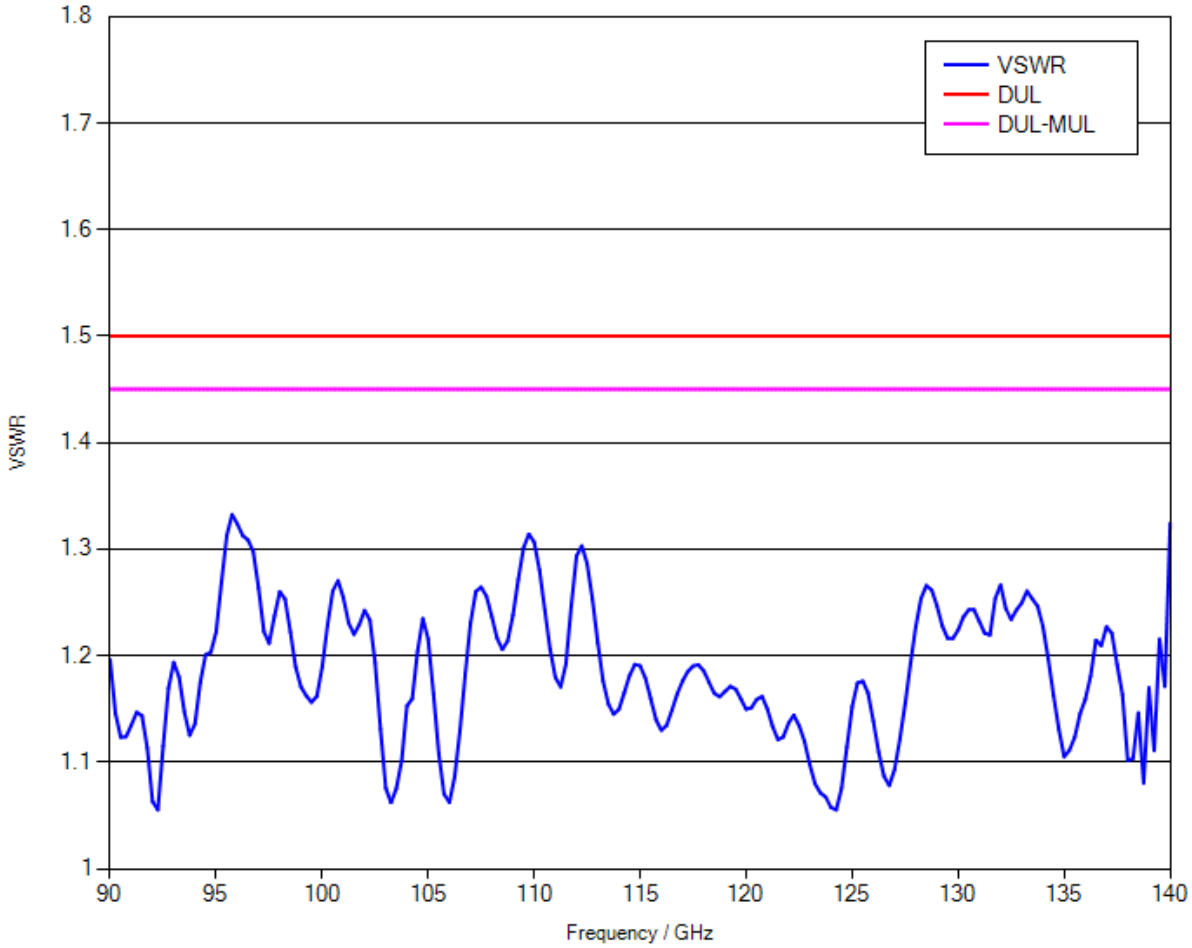


Software used for measurement

Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_09	

1.1 RF Input – VSWR

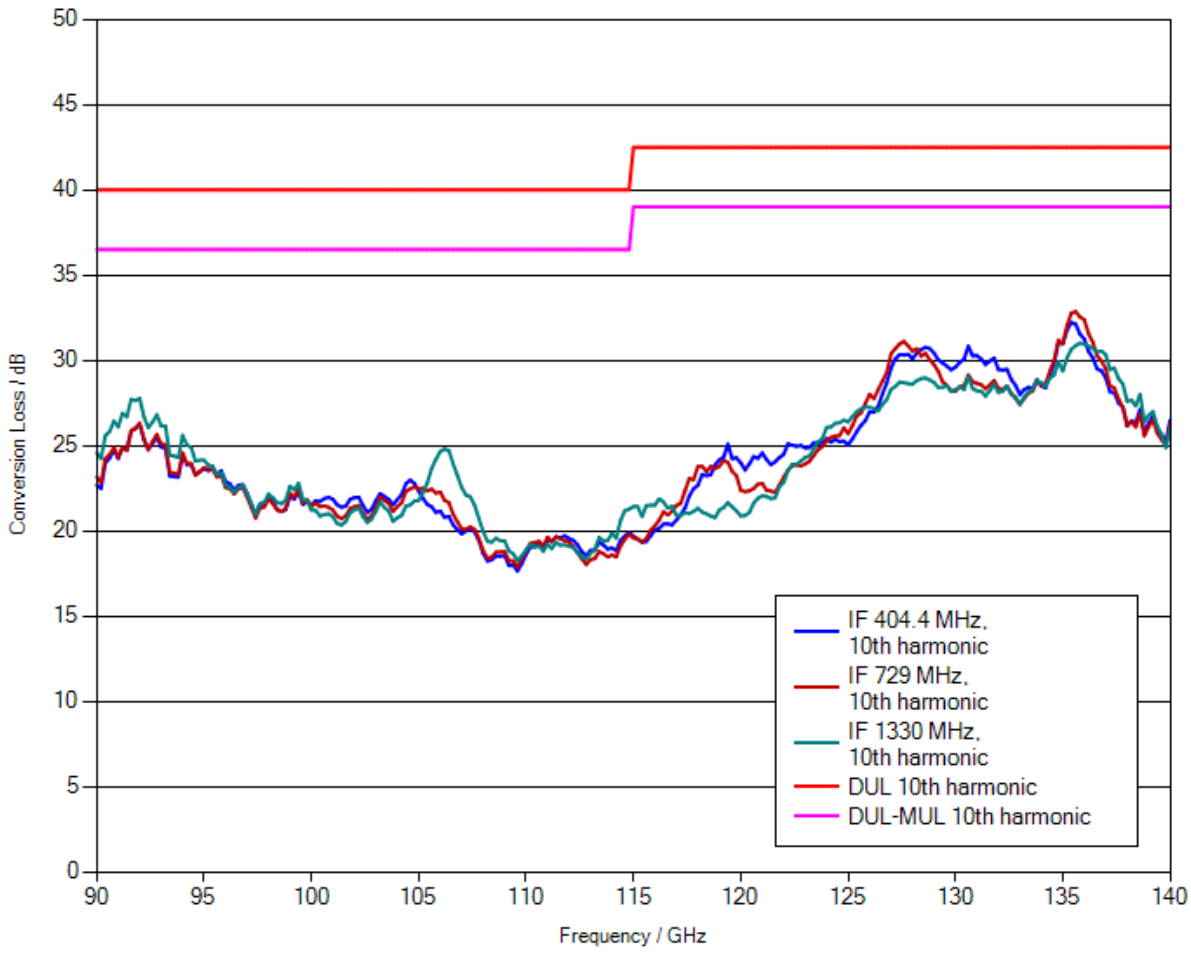
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +14 dBm nominal
Bias 0 A

Measurement uncertainty: 3.5 dB



Note: Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the "paper clip" symbol to display the file.

The file has been renamed for safety reasons.
When downloading the file onto your PC, please delete the ".file" extension and unzip the data.

1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 10th harmonic	6 dB	2.8 dB	PASS
IF = 729 MHz, 10th harmonic	6 dB	2.75 dB	PASS
IF = 1330 MHz, 10th harmonic	6 dB	2.62 dB	PASS

Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate
Kalibrierschein

Certificate Number 24-0060-100986-01
Zertifikatsnummer

Unit Data

Item
Gegenstand
Harmonic Mixer, 40 GHz to 60 GHz

Manufacturer
Hersteller
RPG

Type
Typ
RPG FS-Z60

Material Number
Materialnummer
1048.0171.02

Serial Number
Seriennummer
100986

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber

Order Number
Bestellnummer

Date of Receipt
Eingangsdatum

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung
Meckenheim, 2018-10-31

Scope of Calibration
Umfang der Kalibrierung
Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)
New device

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung)
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Radiometer Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum
2018-11-05

Head of Laboratory
Laborleitung
Schulze

Person Responsible
Bearbeiter
Heinze

Radiometer Physics GmbH ● Werner-von-Siemens-Str. 4 ● 53340 Meckenheim ● Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 ● Managing Director: Achim Walber, Dr. Thomas Rose ● Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 ● VAT Identification No.: DE 123 377 395

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RPG-PAQA-TN-2014-002

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Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17
Powersensor	R&S® NRP-Z57	101423	20-541799	2019-04-27
Calibration Kit	WR19	U10001	24-0060-U10001-01	2019-02-01

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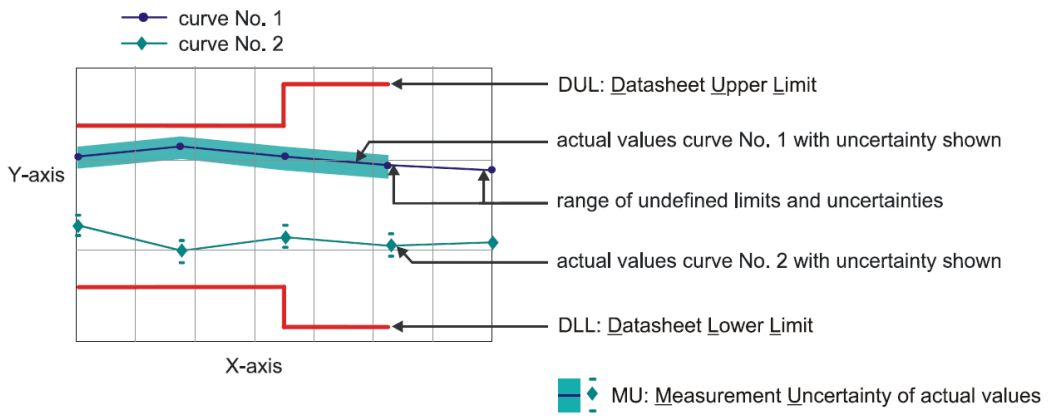
DU	Datasheet Uncertainty

Explanation of charts

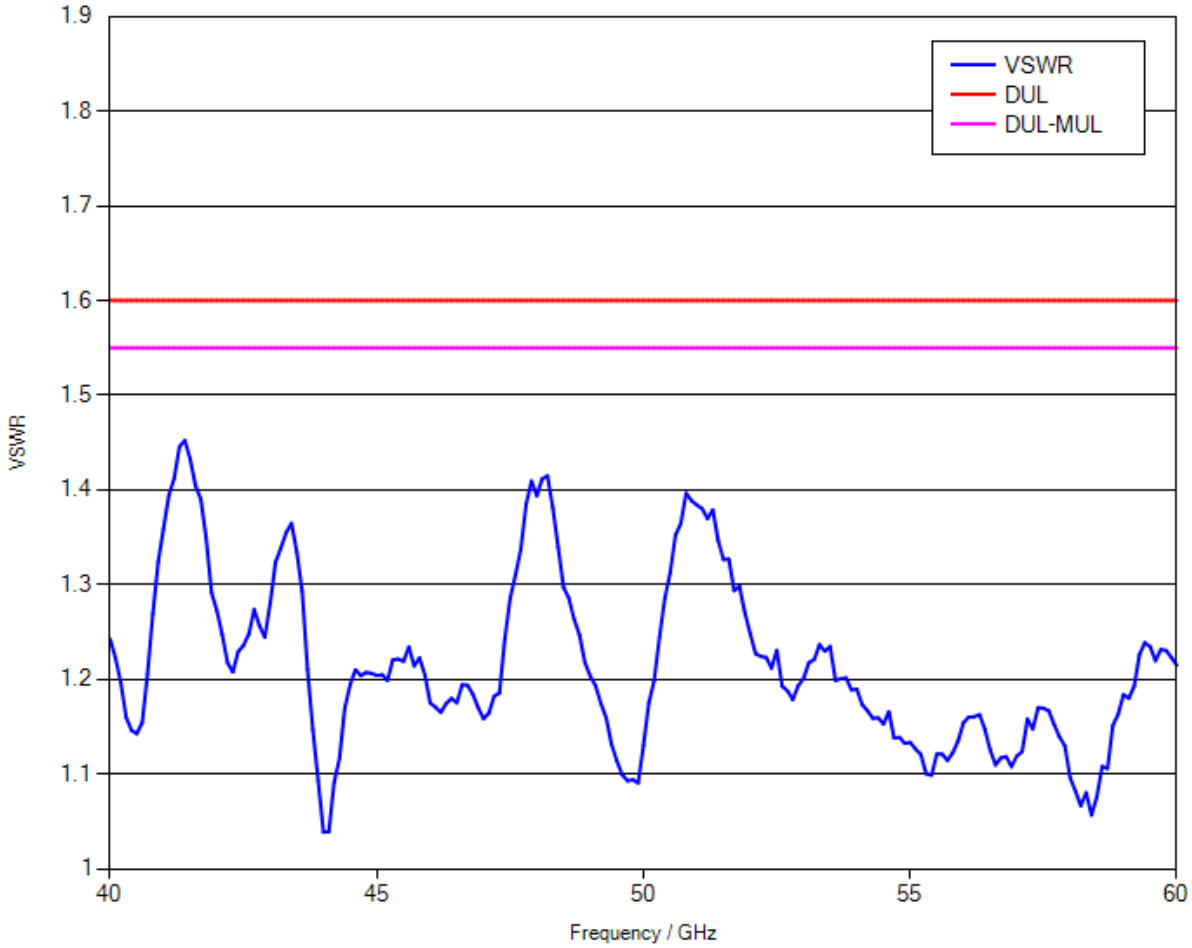


Software used for measurement

Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_09	

1.1 RF Input – VSWR

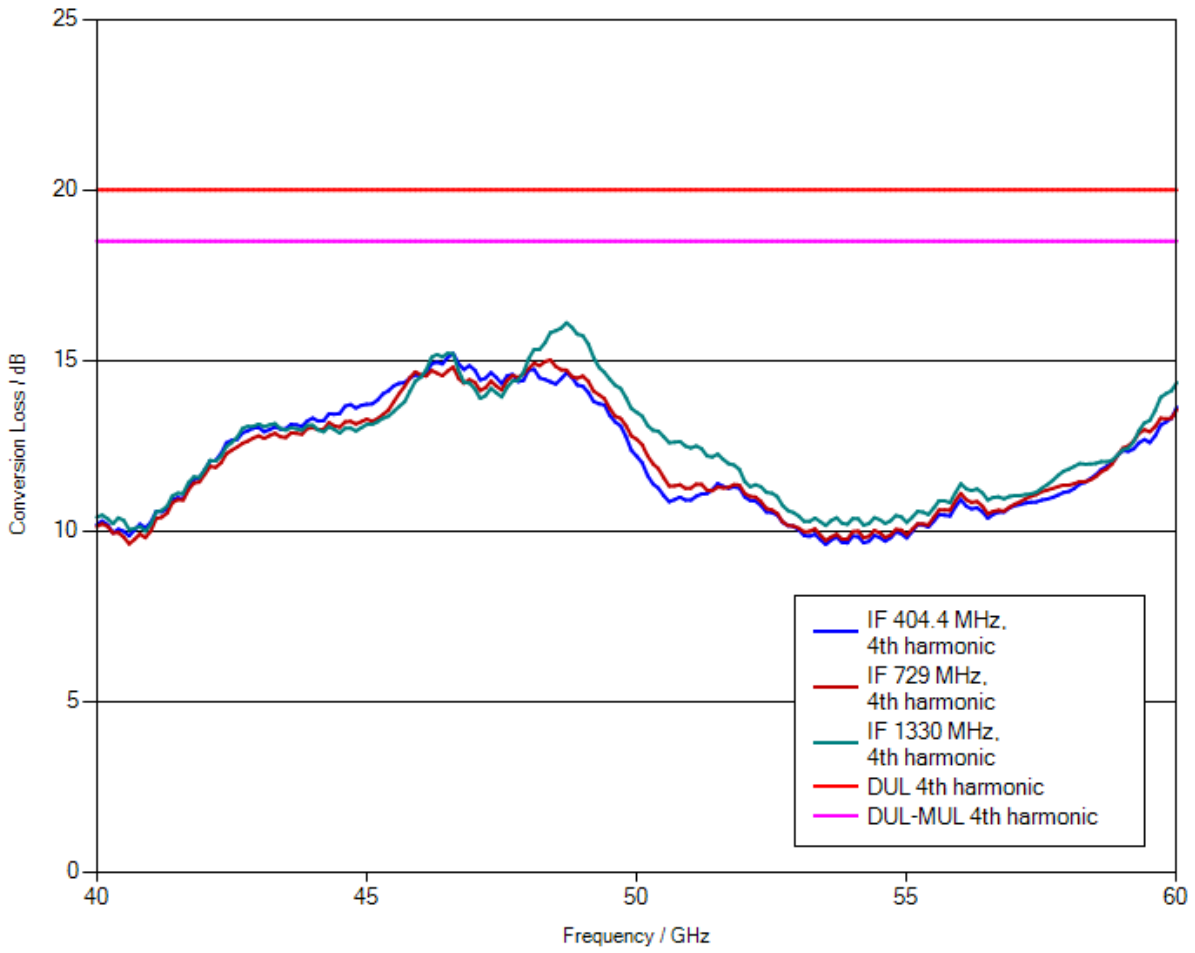
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +13 dBm nominal
Bias 0 A

Measurement uncertainty: 1.5 dB



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The file has been renamed for safety reasons.
When downloading the file onto your PC, please delete the ".file" extension and unzip the data.

1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 4th harmonic	4 dB	2.32 dB	PASS
IF = 729 MHz, 4th harmonic	4 dB	1.99 dB	PASS
IF = 1330 MHz, 4th harmonic	4 dB	2.14 dB	PASS

ROHDE&SCHWARZ

Calibration Certificate
Kalibrierschein

Certificate Number 24-0090-101811-01
Zertifikatsnummer

Unit Data

Item
Gegenstand: **Harmonic Mixer, 60 GHz to 90 GHz**

Manufacturer
Hersteller: **ROHDE & SCHWARZ**

Type
Typ: **R&S® FS-Z90**

Material Number
Materialnummer: **1048.0371.02**

Serial Number
Seriennummer: **101811**

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber

Order Number
Bestellnummer

Date of Receipt
Eingangsdatum

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung: **Meckenheim, 2018-07-16**

Scope of Calibration
Umfang der Kalibrierung: **Standard Calibration**

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung): **New device**

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung): **All measured values are within the data sheet specifications.**

Extend of Calibration Documents
Umfang des Kalibrierdokuments: **2 pages Calibration Certificate**
5 pages Outgoing Results

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor k = 2). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit k = 2). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Radiometer Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum: **2018-07-19**

Head of Laboratory
Laborleitung: Ceru

Person Responsible
Bearbeiter: Grossmindorf

Radiometer Physics GmbH • Werner-von-Siemens-Str. 4 • 53340 Meckenheim • Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 • Managing Director: Achim Walber, Dr. Thomas Rose • Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 • VAT Identification No.: DE 123 377 395

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

$(23\ ^{+7}_{-3})$ °C

Working standards used (having a significant effect on the accuracy)
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

Item Gegenstand	**Type** Typ	**Serial Number** Seriennummer	**Calibration Certificate Number** Kalibrierscheinnummer	**Cal. Due** Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17
Powersensor	R&S® NRP-Z58	101063	20-611482	2018-07-21
Calibration kit	WR12	E10001	RPG-PAQA-TN-2014-005	2019-02-01

UGB1 **A compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

UGB2 **A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

Notes
Anmerkungen

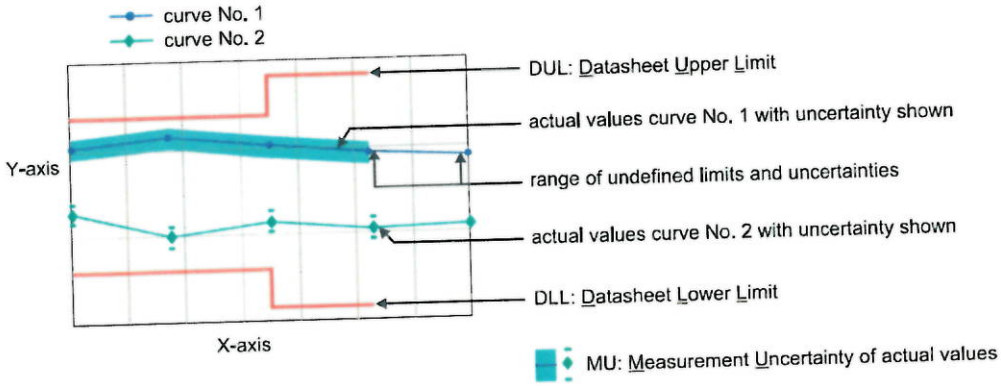
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

Outgoing Results

The following abbreviations may be used in this document

{a}	No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
{b}	The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
{c}	Functional test, therefore no measurement uncertainty is stated.
{d}	Typical value, refer to performance test.
{e}	The measurement uncertainty is taken into account when setting the measuring system.
DL or DT	Data Limit for symmetrical tolerance limits
DLL	Datasheet Lower Limit
DUL	Datasheet Upper Limit
MU	Measurement Uncertainty
MLL or MLV	Measurement Uncertainty Lower Value
MUL or MUV	Measurement Uncertainty Upper Value
Nom.	Nominal Value
Dev.	Deviation
MErr.	Measurement Error
Act.	Actual Value
UGB	Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
UGB1	Measurement results marked as UGB1 show conformity with a probability of >50 %and <95 %.
UGB2	Measurement results marked as UGB2 show non-conformity with a probability of >50 %and <95 %.
DU	Datasheet Uncertainty

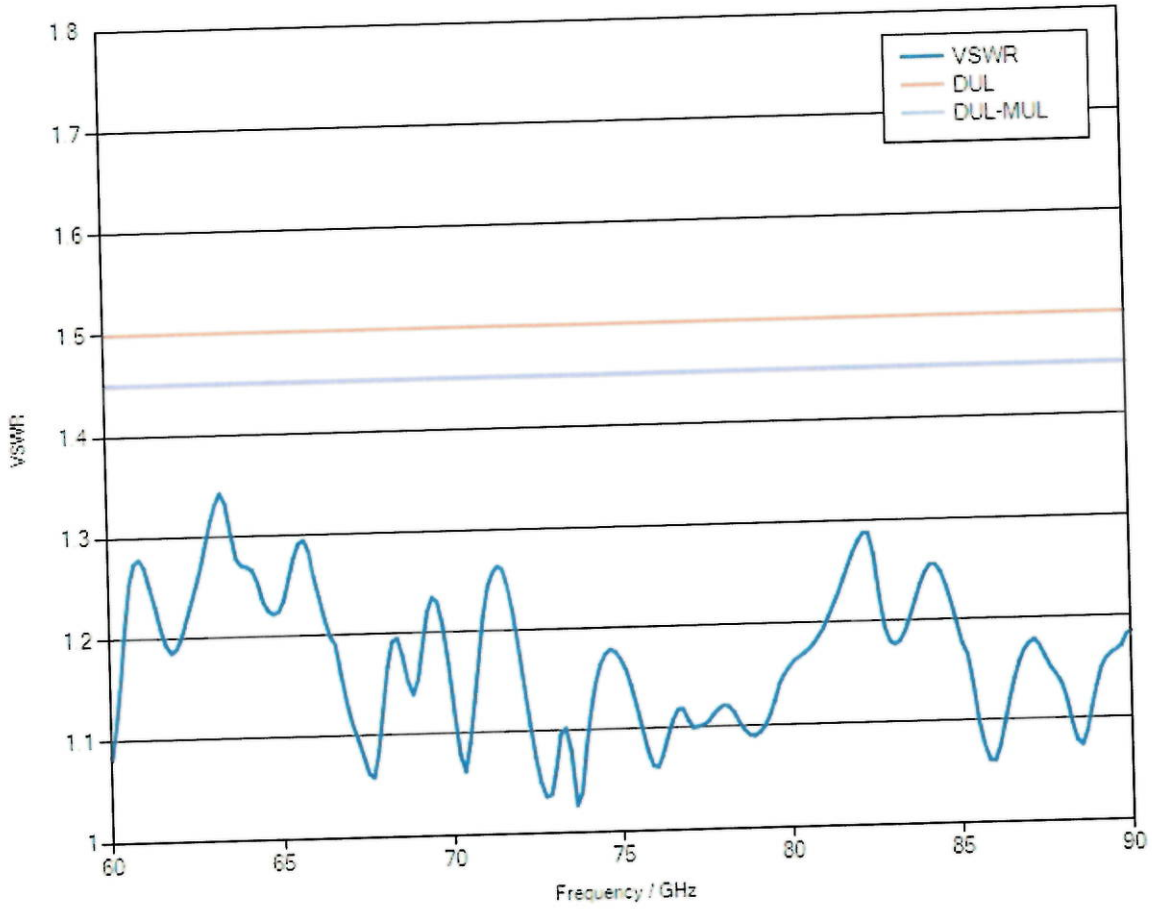
Explanation of charts



Software used for measurement Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_08	

1.1 RF Input – VSWR

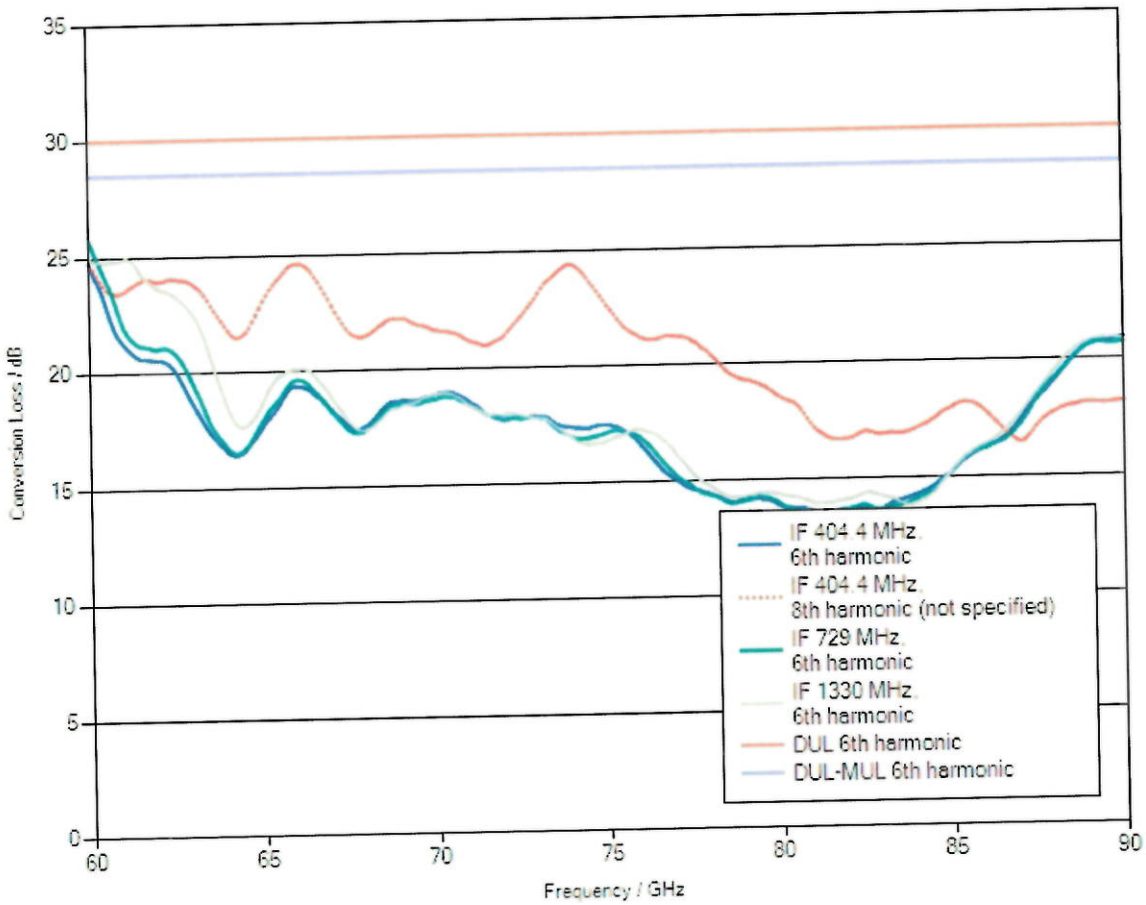
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +14 dBm nominal
Bias 0 A

Measurement uncertainty: 1.5 dB



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1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 6th harmonic	6 dB	3.29 dB	PASS
IF = 404.4 MHz, 8th harmonic	not specified	2.25 dB	not specified
IF = 729 MHz, 6th harmonic	6 dB	3.47 dB	PASS
IF = 1330 MHz, 6th harmonic	6 dB	3.84 dB	PASS

Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate
Kalibrierschein

Certificate Number 24-0220-101014-01
Zertifikatsnummer

Unit Data

Item
Gegenstand
Harmonic Mixer, 140 GHz to 220 GHz

Manufacturer
Hersteller
RPG

Type
Typ
RPG FS-Z220

Material Number
Materialnummer
3593.3250.02

Serial Number
Seriennummer
101014

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber

Order Number
Bestellnummer

Date of Receipt
Eingangsdatum

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung
Meckenheim, 2018-08-27

Scope of Calibration
Umfang der Kalibrierung
Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)
New device

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung)
All measured values are <u>within the data sheet specifications.</u>

Extend of Calibration Documents
Umfang des Kalibrierdokuments
2 pages Calibration Certificate
5 pages Outgoing Results

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Radiometer Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum
2018-08-28

Head of Laboratory
Laborleitung
Schulze

Person Responsible
Bearbeiter
Heinze

Radiometer Physics GmbH ● Werner-von-Siemens-Str. 4 ● 53340 Meckenheim ● Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 ● Managing Director: Achim Walber, Dr. Thomas Rose ● Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 ● VAT Identification No.: DE 123 377 395

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity **20 % - 80 %**
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23 $^{+7}_{-3}$) °C

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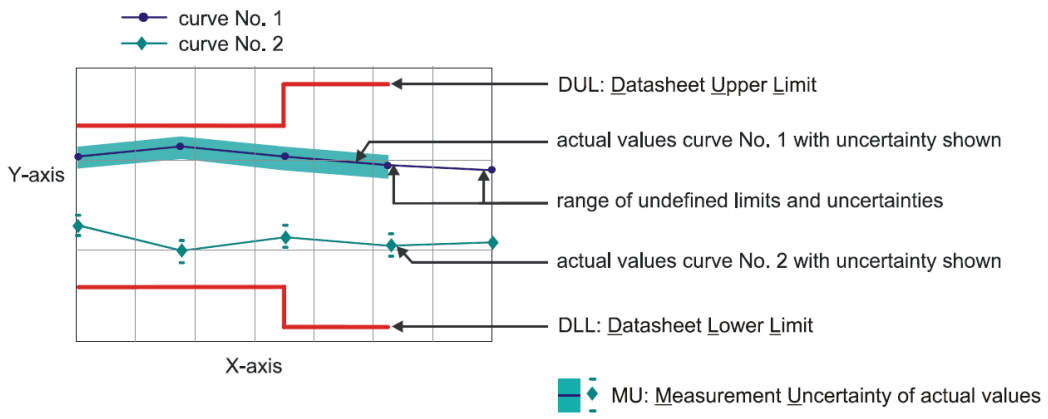

Software used for measurement

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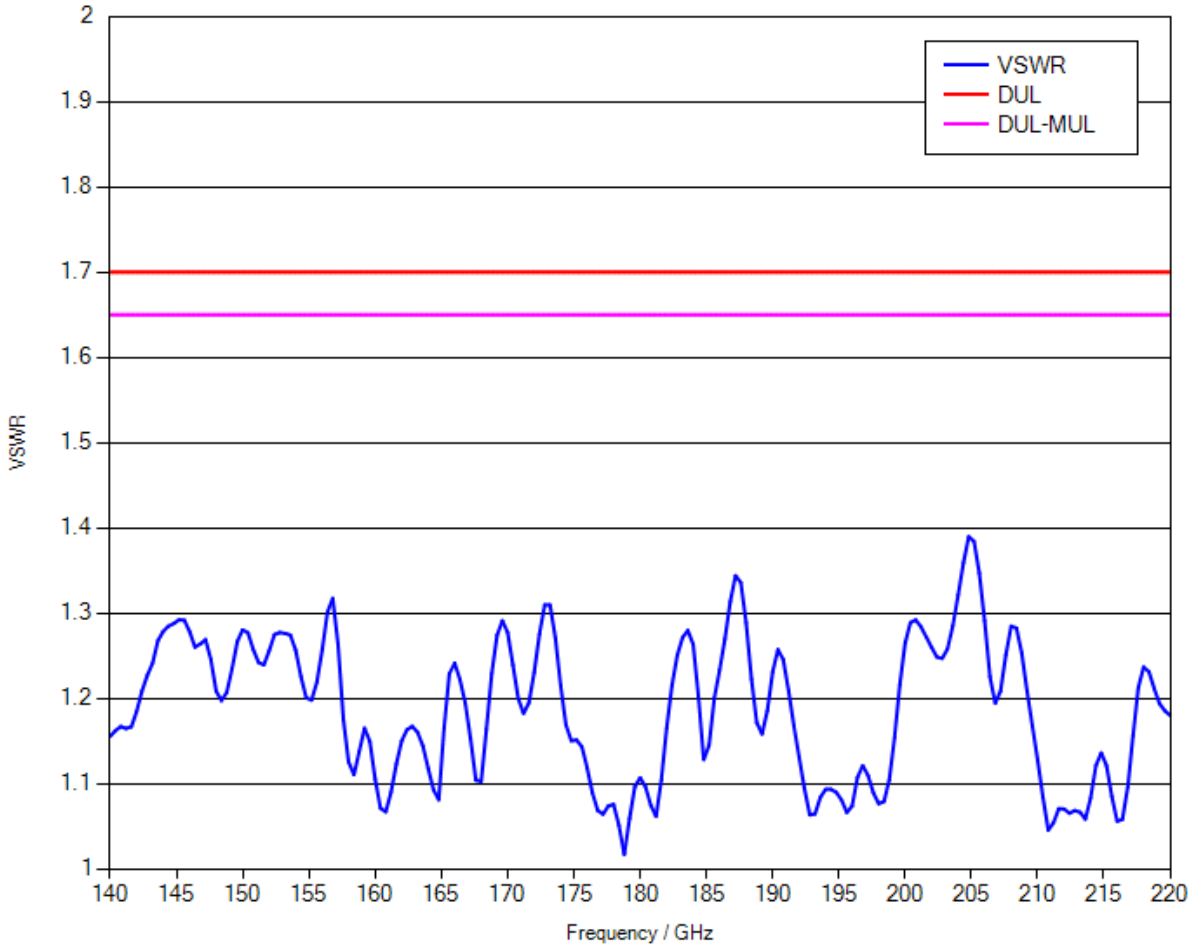
MixerCertification	7_09	

1.1 RF Input – VSWR

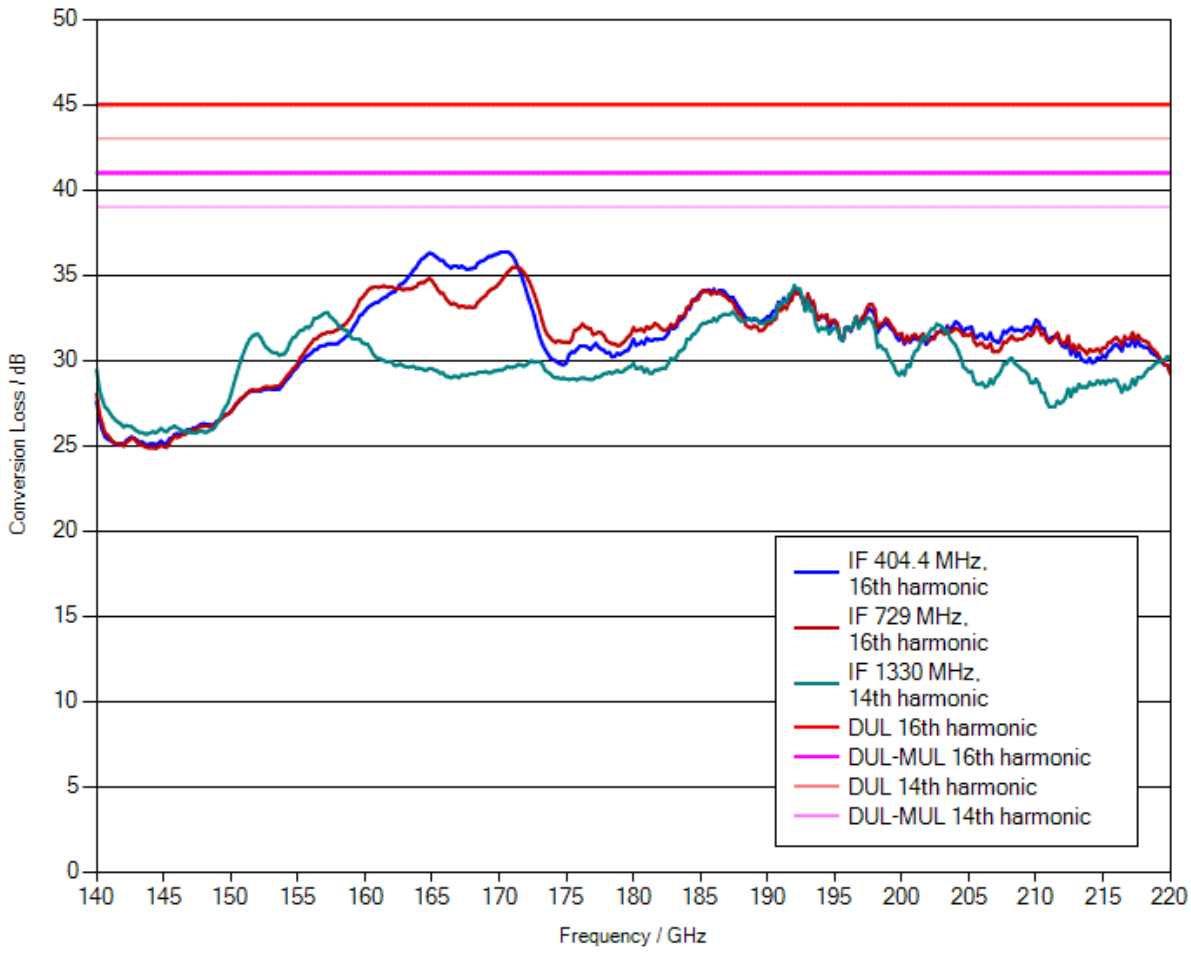
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +13 dBm nominal
Bias 0 A

Measurement uncertainty: 4 dB



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1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 16th harmonic	6 dB	2.71 dB	PASS
IF = 729 MHz, 16th harmonic	6 dB	2.61 dB	PASS
IF = 1330 MHz, 14th harmonic	6 dB	2.61 dB	PASS