FCC Test Report

Product Name	:	LGA module
Trade Name	:	WNC
Model No.	:	IMQ7
FCC ID	:	NKRIMQ7

Applicant	:	Wistron Neweb Corporation
Address	:	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C

Date of Receipt	:	Nov. 27, 2020
Issued Date	:	Dec. 17, 2020
Report No.	:	20B0952R-E3042110006
Report Version	:	V1.0

Test Report Certification

Issued Date : Dec. 17, 2020
Report No. : 20B0952R-E3042110006

Product Name	:	LGA module
Applicant	:	Wistron Neweb Corporation
Address	:	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C
Manufacturer	:	Wistron Neweb Corporation
Address	:	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C
Trade name	:	WNC
Model No.	:	IMQ7
FCC ID	:	NKRIMQ7
EUT Voltage	:	DC 3.8V
Testing Voltage	:	DC 3.8V
Applicable Standard	:	FCC CFR Title 47 Part 27 Subpart L FCC CFR Title 47 Part 27 Subpart F ANSI/TIA-603-E-2016 ANSI C63.26
Test Lab	:	Hsin Chu Laboratory
Address	:	No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C. TEL: +886-3-582-8001 / FAX: +886-3-582-8958
Test Result	:	Complied

Documented By : Lyla Yang

(Lyla Yang / Engineering Adm. Specialist)

Tested By : Max Chang

(Max Chang / Senior Engineer)

Approved By : Louis Hsu

(Louis Hsu / Deputy Manager)

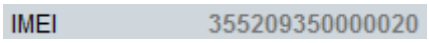
Revision History

Version	Description	Issued Date
V1.0	Initial issue of report	Dec. 17, 2020

TABLE OF CONTENTS

1. General Information

1.1. EUT Description

Product Name	LGA module
Trade Name	WNC
Model No.	IMQ7
Uplink Frequency Range (MHz)	LTE Band 4: 1710~1755 LTE Band 13: 777~787
Downlink Frequency Range (MHz)	LTE Band 4: 2110~2155 LTE Band 13: 746~756
Modulation	QPSK / 16QAM
HW Version	v1.0
SW Version	MPSS: IMQ7_v01.01 APSS: IMQ7_v00.01 CUSTAPP: 
IMEI No.	355209350000020 

Antenna Information	
MFR. / Model	WIESON TECHNOLOGIES CO., LTD / GY115HT0330-041
Antenna Type	Dipole Antenna
Antenna Gain	LTE Band 4: 1.62dBi LTE Band 13: 1.66dBi

Note:
1. This LGA module supports LTE Cat-M1 Band 4/13 function.
2. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
3. The EUT description is from the customer declaration.

1.2. Mode of Operation

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: LTE Band 4 Mode 2: LTE Band 13

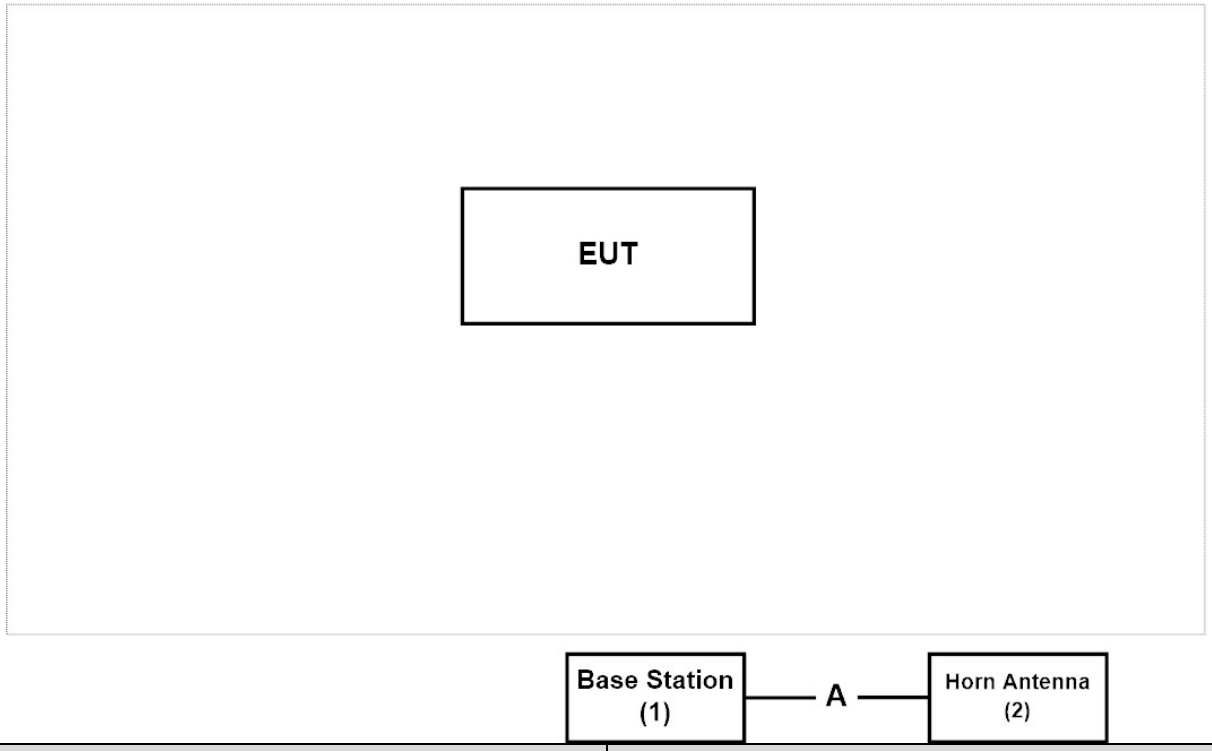
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1	Base Station	R&S	CMW500	157118	DoC	Non-Shielded, 6m
2	Horn Antenna	Schwarzbeck	BBHA 9120D	1640	DoC	--

1.4. Configuration of Tested System

Connection Diagram



Signal Cable Type		Signal cable Description
A	RF Cable	Shielded, 6m

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on 1.4.
2	Turn on the power of all equipment.
3	The EUT will continue to transmit the signal from Cat-M1 function.
4	Repeat the above procedure.

1.6. Comments and Remarks

The product specification and testing instructions for the EUT declared in the report are provided by the manufacturer who will take all responsibilities for the accuracy.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

Note: Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

B4

Uplink: 1710-1755MHz

Downlink: 2110-2155MHz

LTE B4			
FCC Part 27 Subpart L			
Test item	Reference section	Limit	Result
RF Output Power	§2.1033 §2.1046 §27.50	< 1 Watt	Pass
Occupied Bandwidth	§2.1049	N/A	Pass
Peak-to-average power ratio	§27.50	< 13 dB	Pass
Spurious Emissions	§2.1053 §27.53	< -13dBm	Pass
Spurious Emissions at Antenna Terminals	§27.53	< -13dBm	Pass
Frequency Stability	§2.1055 §27.54	< 2.5 ppm	Pass

Note: Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

B13

Uplink: 777-787MHz

Downlink: 746-756MHz

LTE B13			
FCC Part 27 Subpart F			
RF Output Power	Reference section	Limit	Result
RF Output Power	§2.1033 §2.1046 §27.50	< 3 Watts ERP	Pass
Occupied Bandwidth	§2.1049	N/A	Pass
Peak-to-average power ratio	§27.50	< 13 dB	Pass
Spurious Emissions	§2.1053 §27.53	< -13dBm	Pass
Spurious Emissions at Antenna Terminals	§27.53	< -13dBm	Pass
Frequency Stability	§2.1055 §27.54	< ±2.5 ppm	Pass

Note: Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.2. Test Environment

Items	Required	Test Site
Temperature (°C)	15-35	1
Humidity (%RH)	25-75	

Note: Test site information refers to Laboratory Information.

Laboratory Information

USA	**:**	**FCC Registration Number: TW3024**
Canada	**:**	**IC Registration Number: 22397-1 / 22397-2 / 22397-3**

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 2. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-582-8001 2. +886-3-582-8001
Fax number	1. +886-3-582-8958 2. +886-3-582-8958
Email address	info.tw@dekra.com
Website	http://www.dekra.com.tw

2.3. List of Test Equipment

RF Output Power / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Occupied Bandwidth / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Peak To Average Ratio / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Conducted Spurious Emissions / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Radiated Spurious Emissions / CB2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2020/06/04	2021/06/03
Bilog Antenna	Teseq	CBL6112D	23191	2020/06/12	2021/06/11
Signal Generator	Anritsu	MG3692B	051202	2020/02/10	2021/02/09
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Signal Analyzer	R&S	FSVA40	101455	2020/10/12	2021/10/11
Horn Antenna	Schwarzbeck	BBHA 9170	202	2019/12/27	2020/12/26
Pre-Amplifier	DEKRA	AP-400C	201801231	2020/11/16	2021/11/15
Pre-Amplifier	EMCI	EMC11830I	980366	2020/11/30	2021/11/29
Horn Antenna	Schwarzbeck	BBHA 9120D	01656	2020/10/14	2021/10/13
Pre-Amplifier	DEKRA	AP-025C	12183122	2020/09/03	2021/09/02
Signal Analyzer	R&S	FSV40	101435	2020/06/24	2021/06/23
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Coaxial Cable(13m)	Huber+Suhner	SF104	CB2-H	2020/07/25	2021/07/24
DEKRA Testing System	DEKRA	Version 1.2	CB2-H	NA	NA

Spurious Emissions at Antenna Terminals / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Frequency Stability / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
Temperature & Humidity Test Chamber	KSON	THS-B4T-150	A0401	2020/01/06	2021/01/06

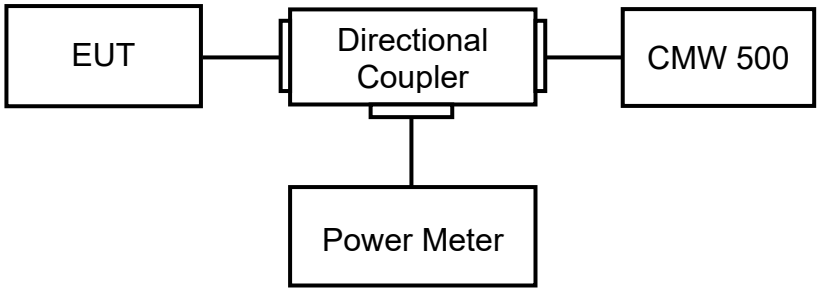
Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.4. Uncertainty

Test Item	Uncertainty
RF Output Power	±1.27 dB
Occupied Bandwidth	± 10 Hz
Peak To Average Ratio	Not exceed 13 dB
Spurious Emissions	± 1.27 dB for Conducted Measurement ± 3.2 dB for Radiated Measurement
Spurious Emissions at Antenna Terminals	± 3.2 dB
Frequency Stability	± 10 Hz

3. RF Output Power

3.1. Test Setup



3.2. Test Procedure

a) The RF output of the transmitter was connected to base station simulator.
b) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
c) Set EUT at maximum average power by base station simulator.
d) Measure lowest, middle, and highest channels for each bandwidth and different modulation.

Effective Isotropic Radiated Power = Conducted Power(dBm) + Antenna Gain(dBi)
Effective Radiated Power = Conducted Power(dBm) + Antenna Gain(dBi) - 2.15dB
The conversion of dBm to watts is given by the formula:

$$P_{(W)} = 1W \times \frac{10^{\left(\frac{P_{(dBm)}}{10}\right)}}{1000} = 10^{((P_{(dBm)}-30)/10)}$$

3.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.2.4
ANSI C63.26: 2015 Sub-clause 5.2.4.2

3.4. Test Result

Product	LGA module		
Test Item	RF Output Power		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/01	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	67.0

1.4M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) EIRP	Limit (W) EIRP
Band 4 1.4MHz	19957 1710.7	QPSK	1	0	Low	23.25	0.307	1
			6	0		21.08	0.186	1
		16-QAM	1	0		22.44	0.255	1
			5	0		21.10	0.187	1
	20175 1732.5	QPSK	1	0		23.23	0.305	1
			6	0		21.22	0.192	1
		16-QAM	1	0		22.50	0.258	1
			5	0		21.11	0.187	1
	20393 1754.3	QPSK	1	5	High	23.31	0.311	1
			6	0		21.18	0.191	1
		16-QAM	1	5		21.67	0.213	1
			5	1		21.35	0.198	1

3M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) EIRP	Limit (W) EIRP
Band 4 3MHz	19965 1711.5	QPSK	1	0	Low	23.17	0.301	1
			6	0		21.24	0.193	1
		16-QAM	1	0		22.41	0.253	1
			5	0		21.34	0.198	1
	20175 1732.5	QPSK	1	0		23.14	0.299	1
			6	0		21.26	0.194	1
		16-QAM	1	0		22.58	0.263	1
			5	0		21.25	0.194	1
	20385 1753.5	QPSK	1	5	High	23.35	0.314	1
			6	0		21.24	0.193	1
		16-QAM	1	5		21.94	0.227	1
			5	1		21.31	0.196	1

5M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) EIRP	Limit (W) EIRP
Band 4 5MHz	19975 1712.5	QPSK	1	0	Low	23.20	0.303	1
			6	0		22.36	0.250	1
		16-QAM	1	0		23.09	0.296	1
			5	0		21.32	0.197	1
	20175 1732.5	QPSK	1	0		23.18	0.302	1
			6	0		22.33	0.248	1
		16-QAM	1	0		23.11	0.297	1
			5	0		21.44	0.202	1
	20375 1752.5	QPSK	1	5	High	23.15	0.300	1
			6	0		22.28	0.245	1
		16-QAM	1	5		22.73	0.272	1
			5	1		21.40	0.200	1

10M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) EIRP	Limit (W) EIRP
Band 4 10MHz	20000 1715	QPSK	1	0	Low	23.23	0.305	1
			6	0		22.25	0.244	1
		16-QAM	1	0		23.04	0.292	1
			5	0		22.41	0.253	1
	20175 1732.5	QPSK	1	0		23.22	0.305	1
			6	0		22.30	0.247	1
		16-QAM	1	0		23.06	0.294	1
			5	0		22.45	0.255	1
	20350 1750	QPSK	1	5	High	23.17	0.301	1
			6	0		22.16	0.239	1
		16-QAM	1	5		22.82	0.278	1
			5	1		22.40	0.252	1

15M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) EIRP	Limit (W) EIRP
Band 4 15MHz	20025 1717.5	QPSK	1	0	Low	23.30	0.310	1
			6	0		23.15	0.300	1
		16-QAM	1	0		23.29	0.310	1
			5	0		23.36	0.315	1
	20175 1732.5	QPSK	1	0		23.21	0.304	1
			6	0		23.30	0.310	1
		16-QAM	1	0		23.15	0.300	1
			5	0		23.34	0.313	1
	20325 1747.5	QPSK	1	5	High	23.29	0.310	1
			6	0		23.20	0.303	1
		16-QAM	1	5		23.14	0.299	1
			5	1		23.31	0.311	1

20M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) EIRP	Limit (W) EIRP
Band 4 20MHz	20050 1720	QPSK	1	0	Low	23.40	0.318	1
			6	0		23.14	0.299	1
		16-QAM	1	0		23.04	0.292	1
			5	0		23.42	0.319	1
	20175 1732.5	QPSK	1	0		23.44	0.321	1
			6	0		23.20	0.303	1
		16-QAM	1	0		23.04	0.292	1
			5	0		23.39	0.317	1
	20300 1745	QPSK	1	5	High	23.40	0.318	1
			6	0		23.20	0.303	1
		16-QAM	1	5		22.85	0.280	1
			5	1		23.30	0.310	1

Product	LGA module		
Test Item	RF Output Power		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/01	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	67.0

5M

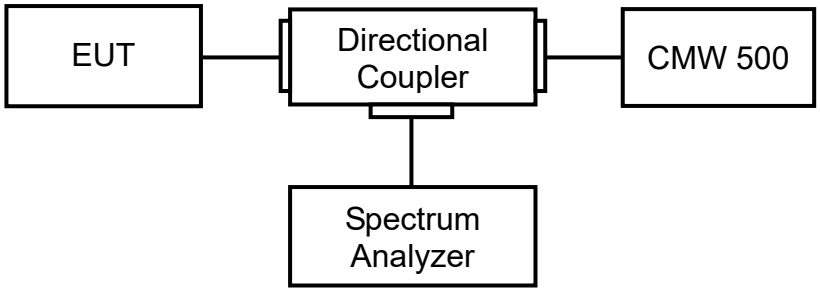
Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) ERP	Limit (W) ERP
Band 13 5MHz	23205 779.5	QPSK	1	0	Low	23.21	0.187	3
			6	0		22.56	0.161	3
		16-QAM	1	0		22.91	0.175	3
			5	0		21.67	0.131	3
	23230 782	QPSK	1	0		23.34	0.193	3
			6	0		22.53	0.160	3
		16-QAM	1	0		23.00	0.178	3
			5	0		21.56	0.128	3
	23255 784.5	QPSK	1	5	High	23.16	0.185	3
			6	0		22.67	0.165	3
		16-QAM	1	5		23.06	0.181	3
			5	1		21.70	0.132	3

10M

Band	Channel Freq. (MHz)	Modulation	RB No.	RB offset	NB Position	Conducted Output Power (dBm)	RF Output Power (W) ERP	Limit (W) ERP
Band 13 10MHz	23230 782	QPSK	1	0	Low	23.37	0.194	3
			6	0		22.59	0.162	3
		16-QAM	1	0		22.94	0.176	3
			5	0		22.82	0.171	3
		QPSK	1	5	High	23.15	0.185	3
			6	0		22.48	0.158	3
		16-QAM	1	5		22.95	0.176	3
			5	1		22.59	0.162	3

4. Occupied Bandwidth

4.1. Test Setup



4.2. Test Procedure

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 26 dB bandwidth and 99% occupied bandwidth of the low & middle & high channel for the highest RF powers were measured.

4.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 4.2 & 4.3
ANSI C63.26: 2015 Sub-clause 5.4.3 & 5.4.4

4.4. Test Result

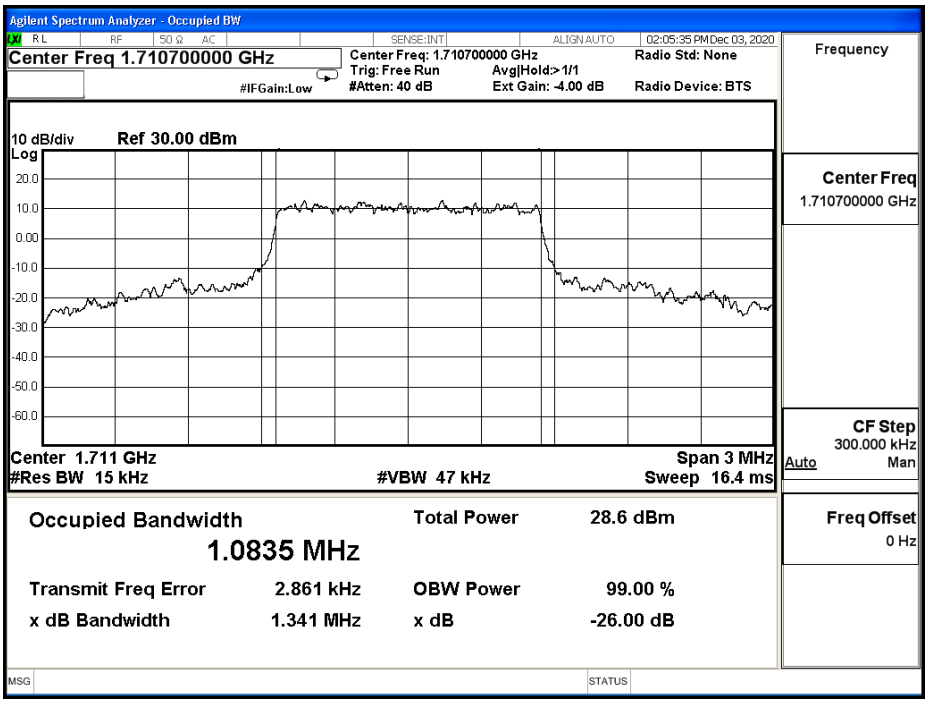
Product	LGA module		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/03	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	67.0

LTE Band 4

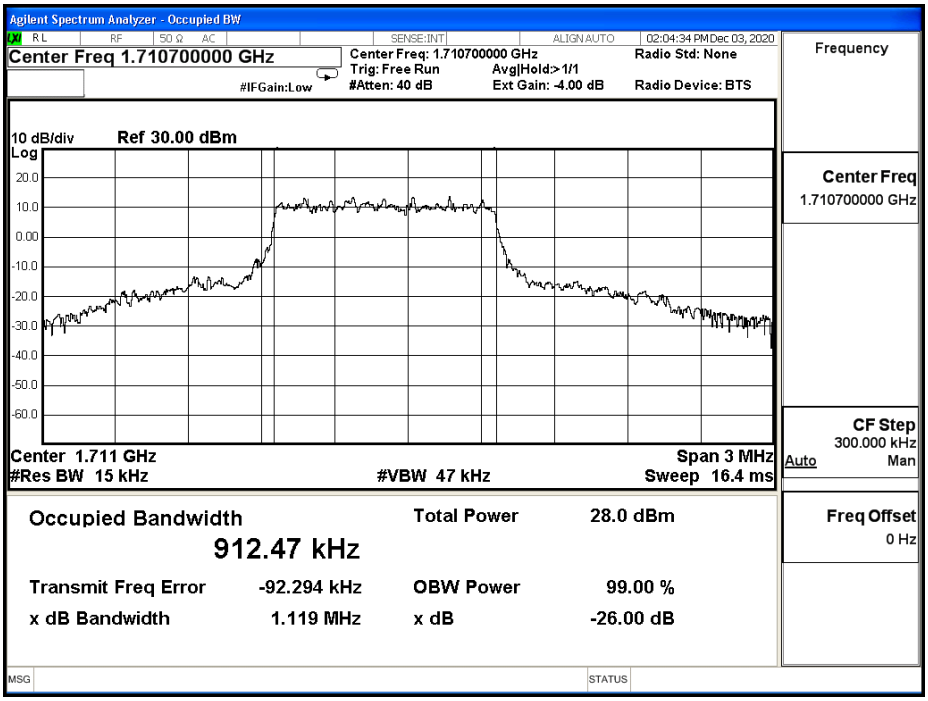
Bandwidth (MHz)	Modulation	Frequency (MHz)	Measure Level (MHz)		Limit (MHz)
			26dB BW	99% BW	
1.4M	QPSK	1710.7	1.341	1.083	N/A
		1732.5	1.634	1.084	N/A
		1754.3	1.261	1.081	N/A
	16-QAM	1710.7	1.119	0.912	N/A
		1732.5	1.120	0.913	N/A
		1754.3	1.314	0.907	N/A
3M	QPSK	1711.5	1.278	1.087	N/A
		1732.5	1.340	1.085	N/A
		1753.5	1.268	1.083	N/A
	16-QAM	1711.5	1.123	0.913	N/A
		1732.5	1.151	0.913	N/A
		1753.5	1.137	0.909	N/A
5M	QPSK	1712.5	1.323	1.093	N/A
		1732.5	1.327	1.094	N/A
		1752.5	1.266	1.079	N/A
	16-QAM	1712.5	1.089	0.913	N/A
		1732.5	1.094	0.915	N/A
		1752.5	1.105	0.912	N/A
10M	QPSK	1715.0	1.295	1.093	N/A
		1732.5	1.346	1.094	N/A
		1750.0	1.296	1.086	N/A
	16-QAM	1715.0	1.109	0.922	N/A
		1732.5	1.133	0.916	N/A
		1750.0	1.097	0.914	N/A

Bandwidth (MHz)	Modulation	Frequency (MHz)	Measure Level (MHz)		Limit (MHz)
			26dB BW	99% BW	
15M	QPSK	1717.5	1.359	1.106	N/A
		1732.5	1.357	1.112	N/A
		1747.5	1.290	1.111	N/A
	16-QAM	1717.5	1.108	0.916	N/A
		1732.5	1.149	0.922	N/A
		1747.5	1.108	0.934	N/A
20M	QPSK	1720.0	1.450	1.108	N/A
		1732.5	1.440	1.107	N/A
		1745.0	1.480	1.113	N/A
	16-QAM	1720.0	1.292	0.917	N/A
		1732.5	1.259	0.918	N/A
		1745.0	1.274	0.946	N/A

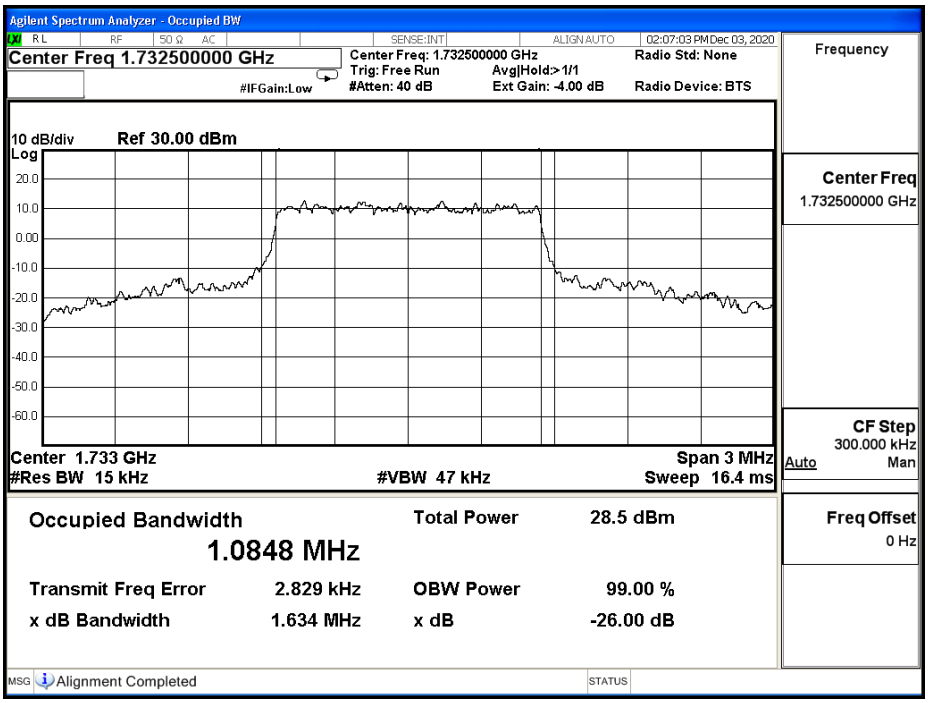
B4_CH19957_1.4M_QPSK_6RB0



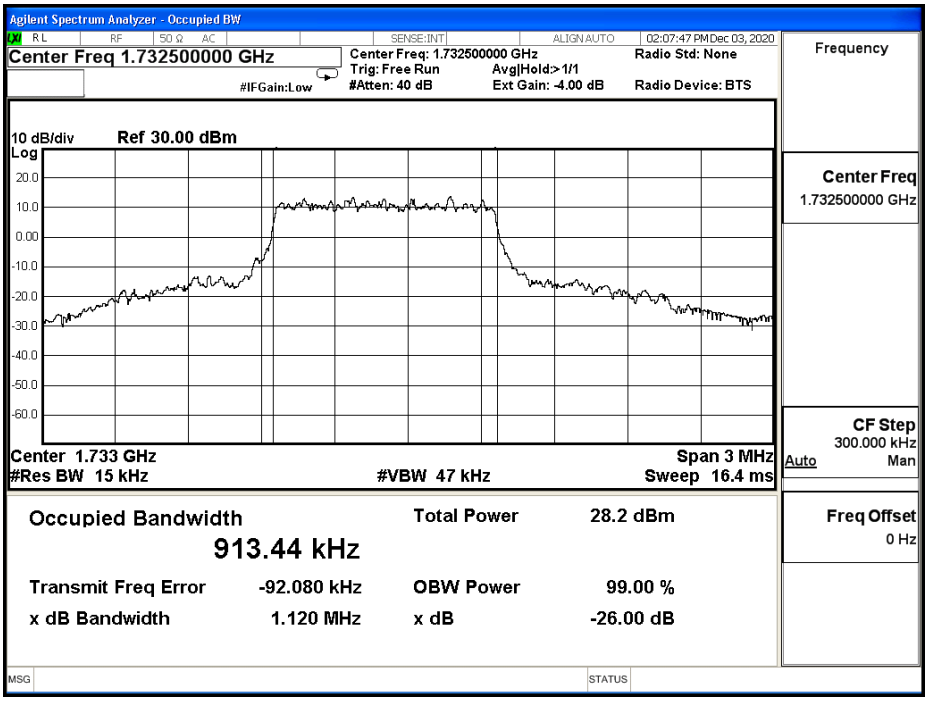
B4_CH19957_1.4M_16-QAM_5RB0



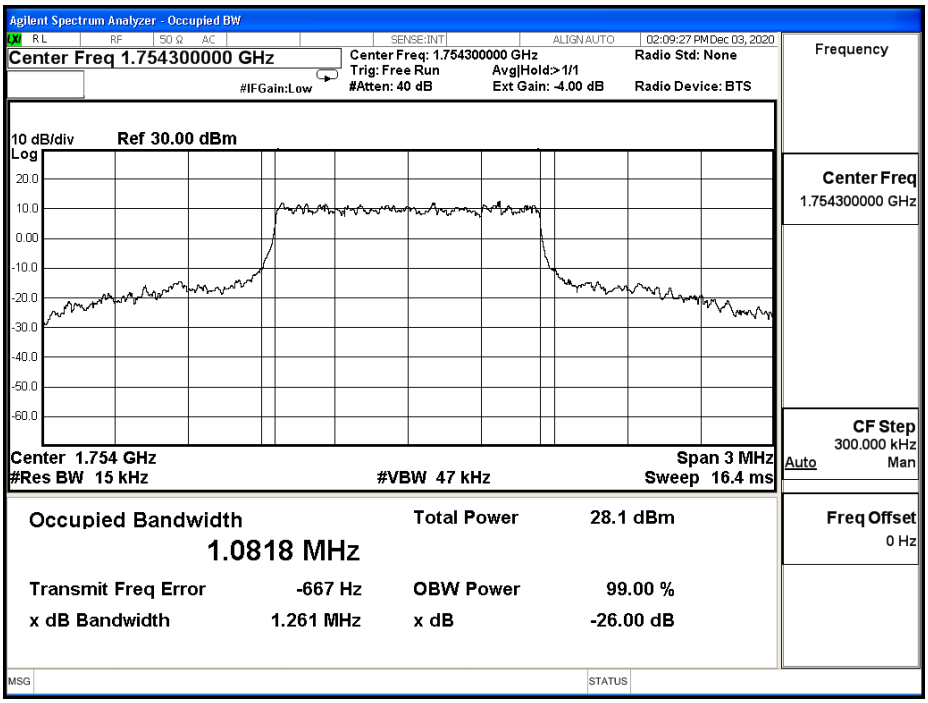
B4_CH20175_1.4M_QPSK_6RB0



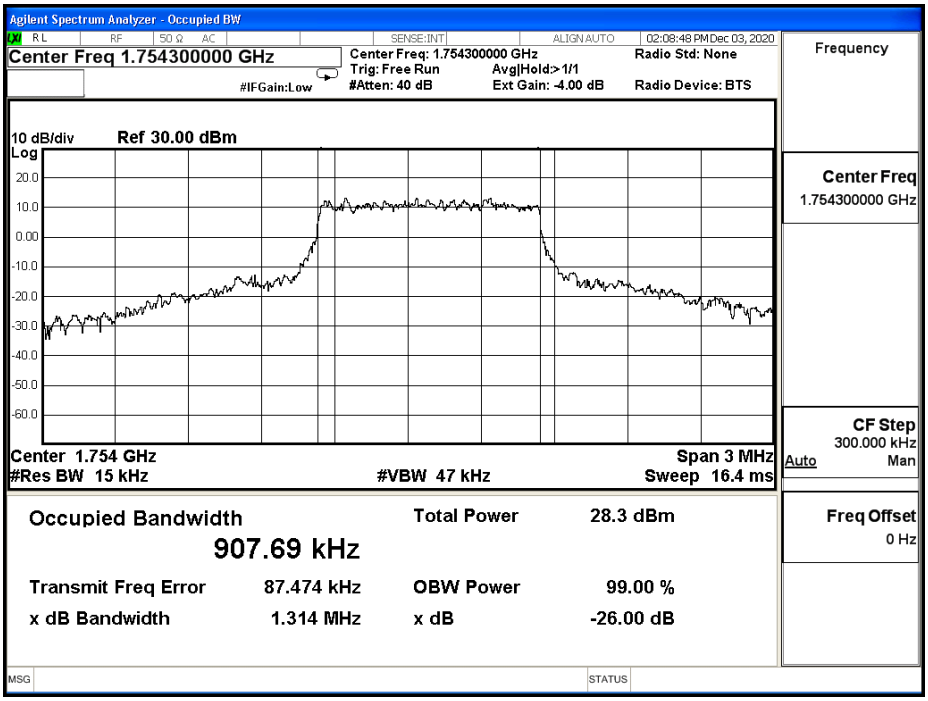
B4_CH20175_1.4M_16-QAM_5RB0



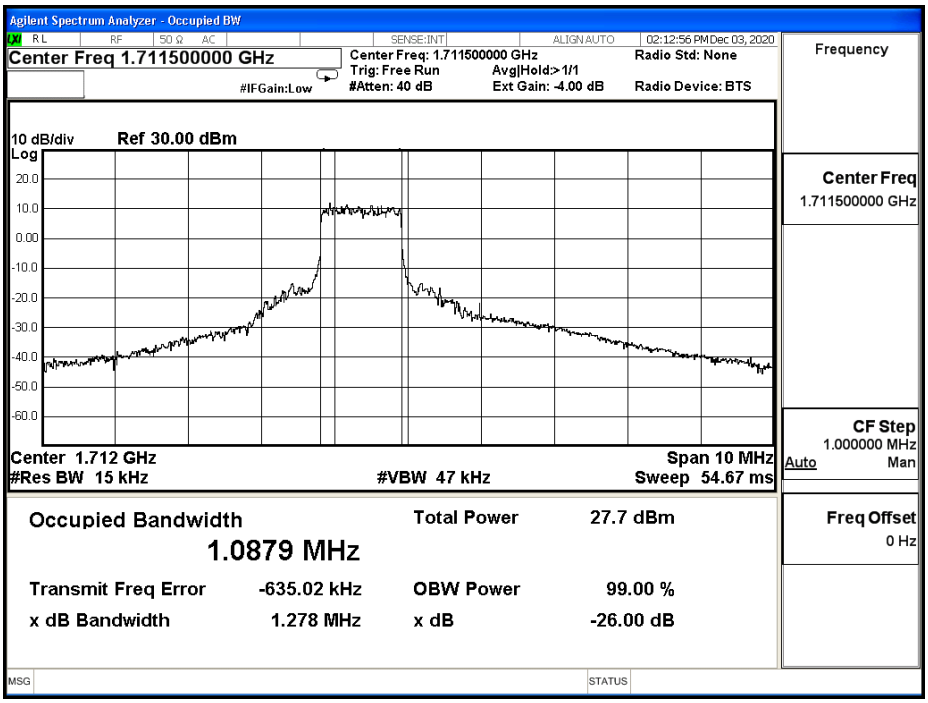
B4_CH20393_1.4M_QPSK_6RB0



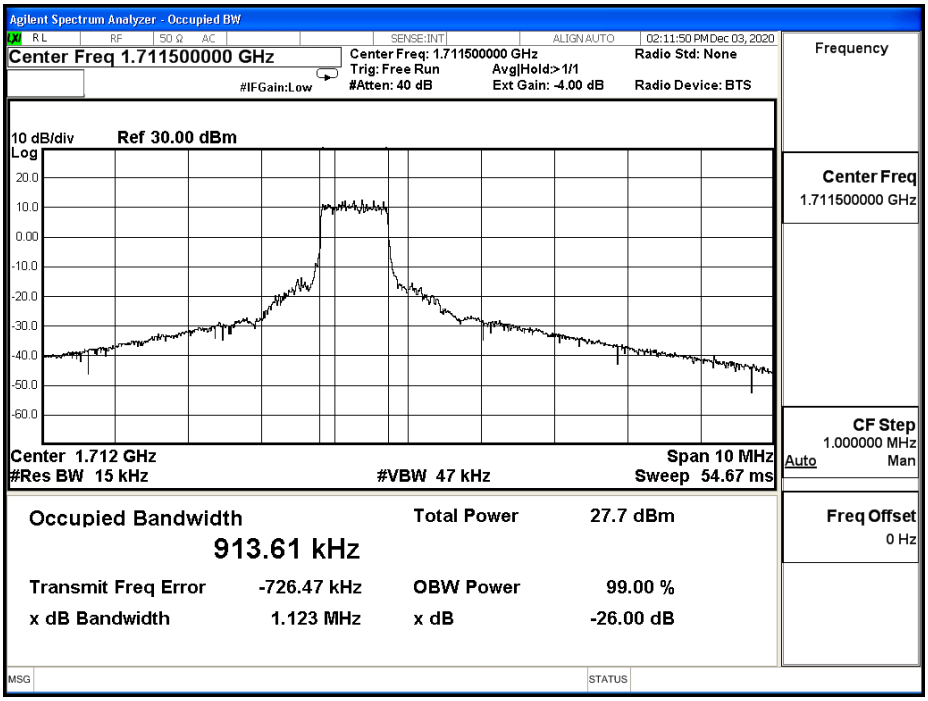
B4_CH20393_1.4M_16-QAM_5RB1



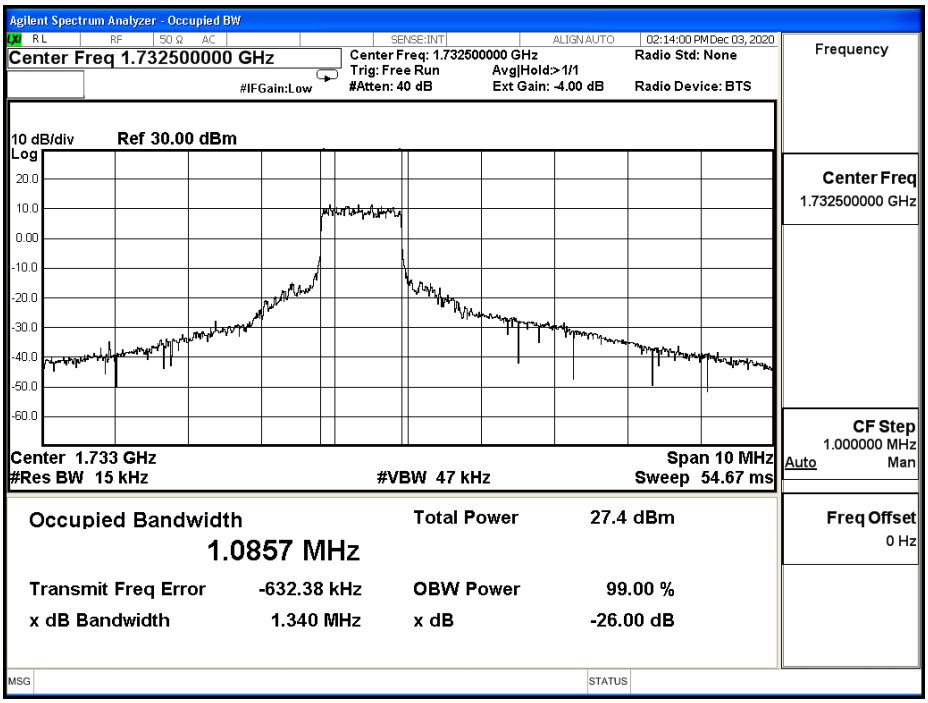
B4_CH19965_3M_QPSK_6RB0



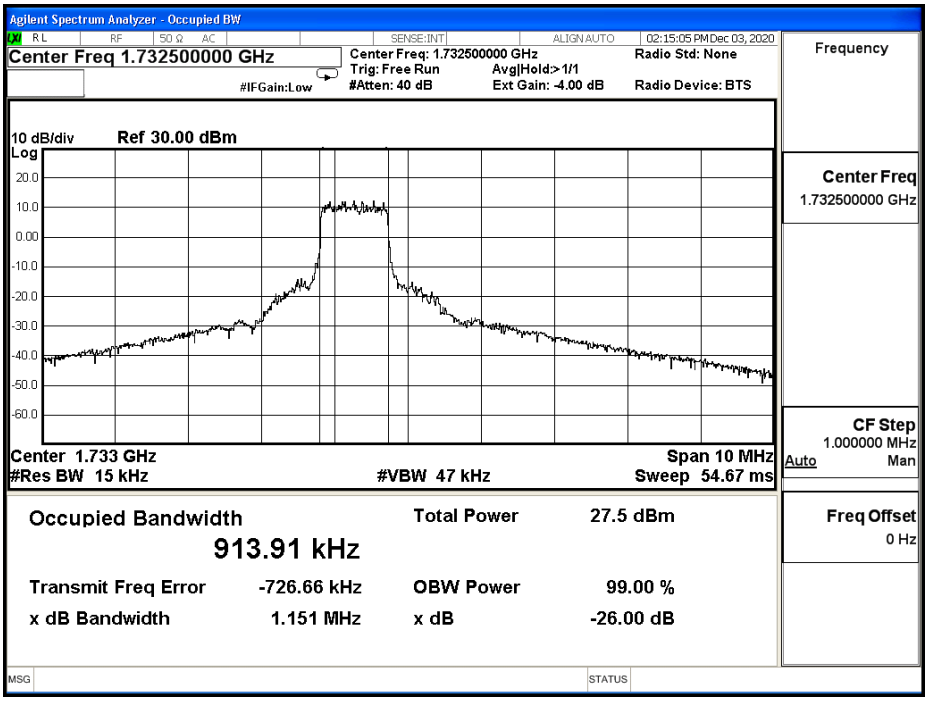
B4_CH19965_3M_16-QAM_5RB0



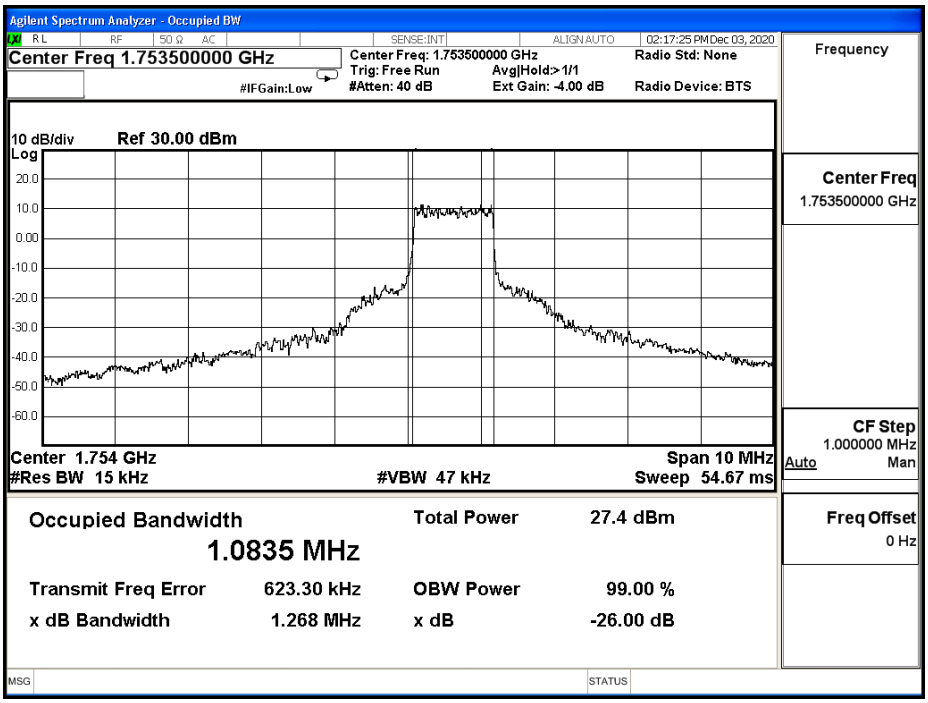
B4_CH20175_3M_QPSK_6RB0



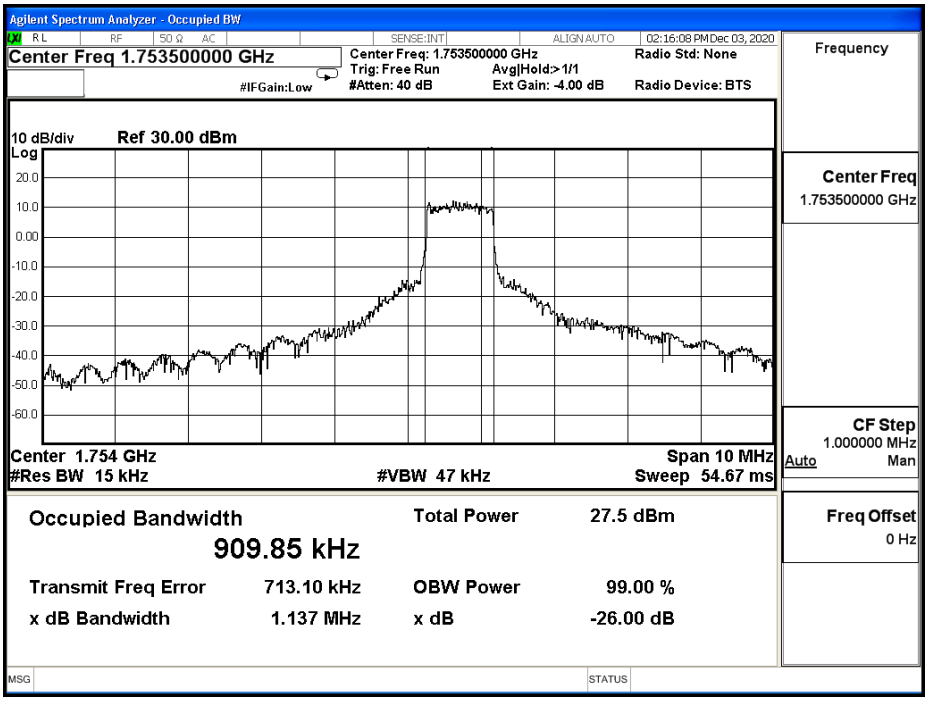
B4_CH20175_3M_16-QAM_5RB0



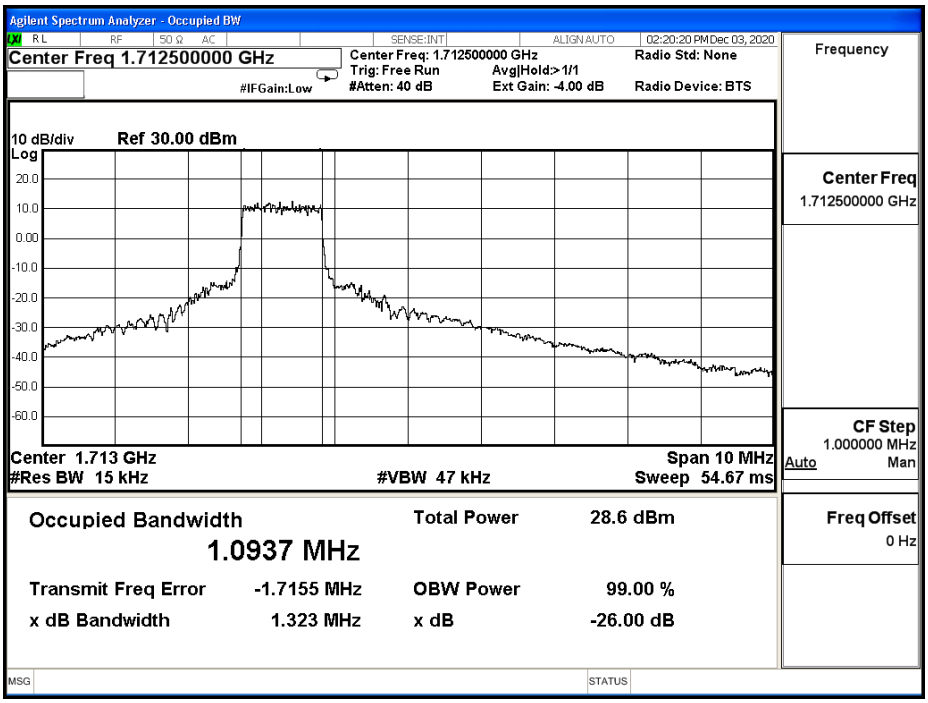
B4_CH20385_3M_QPSK_6RB0



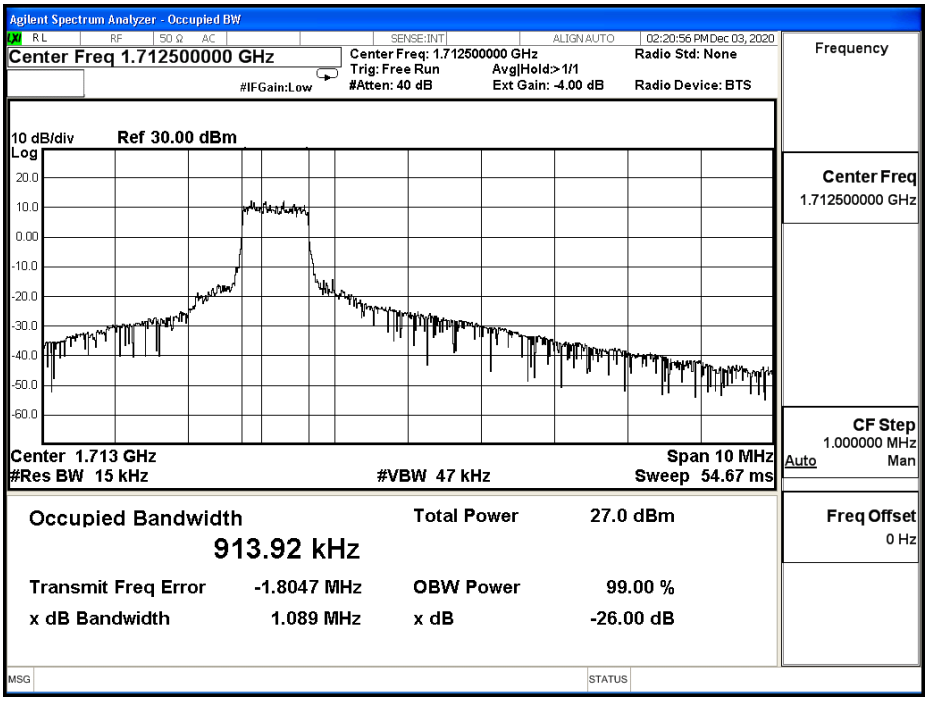
B4_CH20385_3M_16-QAM_5RB1



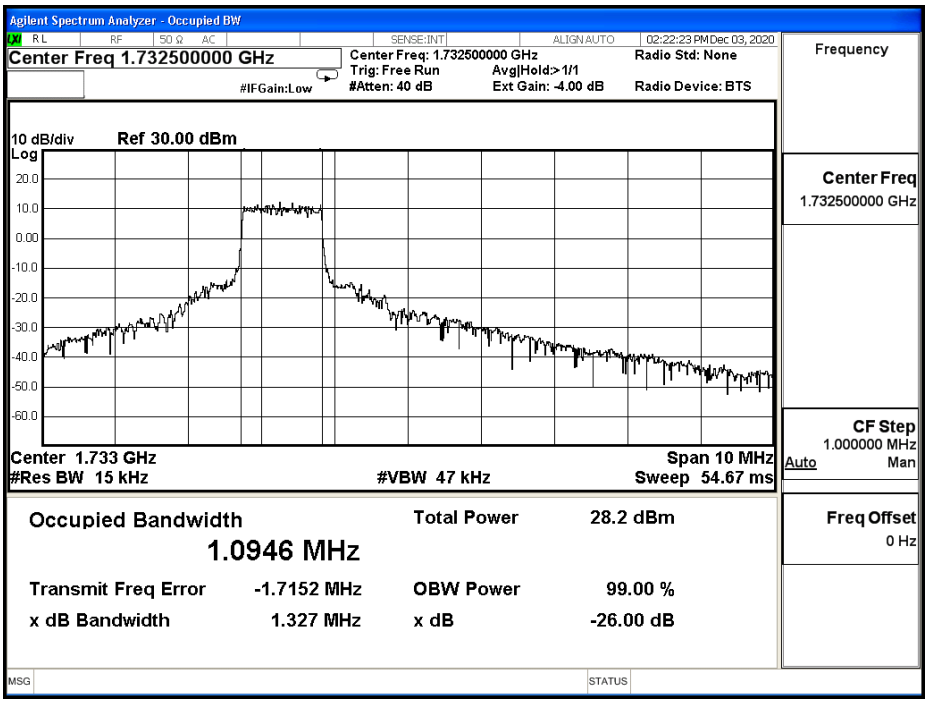
B4_CH19975_5M_QPSK_6RB0



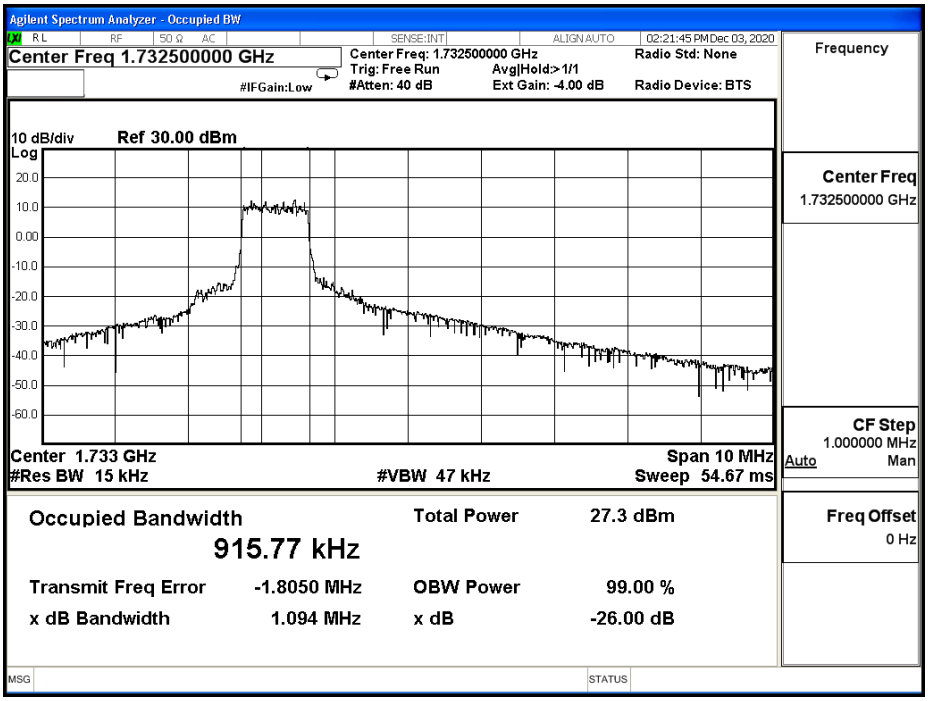
B4_CH19975_5M_16-QAM_5RB0



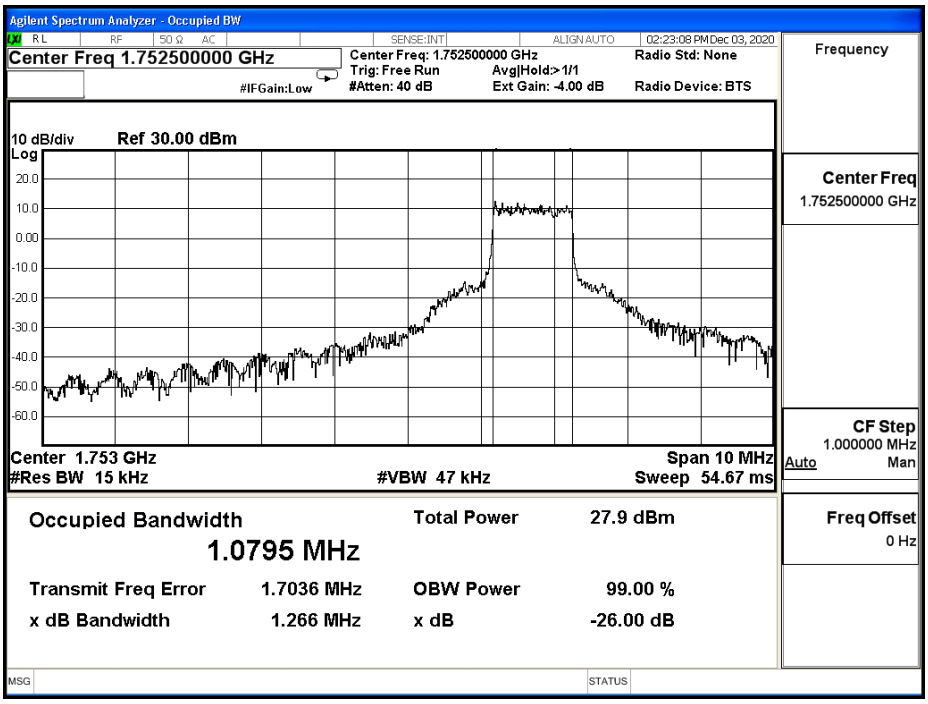
B4_CH20175_5M_QPSK_6RB0



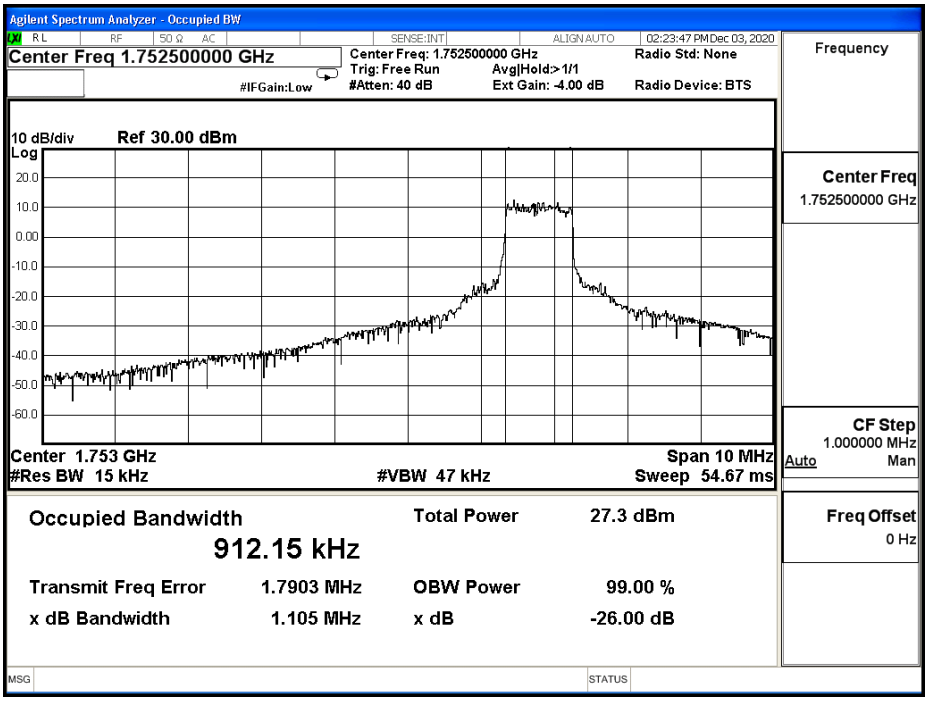
B4_CH20175_5M_16-QAM_5RB0



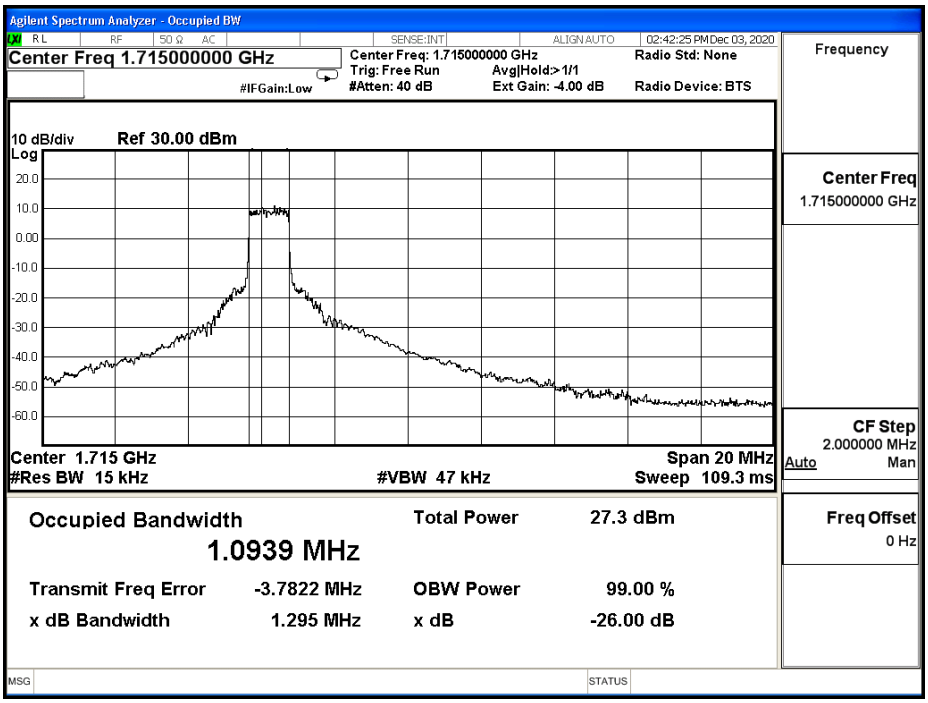
B4_CH20375_5M_QPSK_6RB0



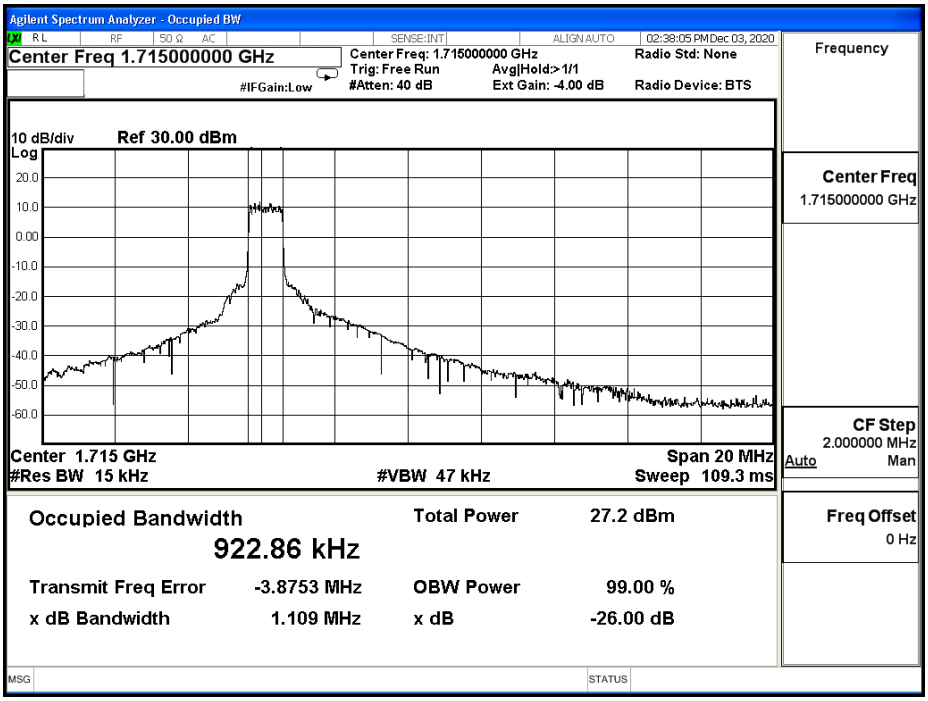
B4_CH20375_5M_16-QAM_5RB1



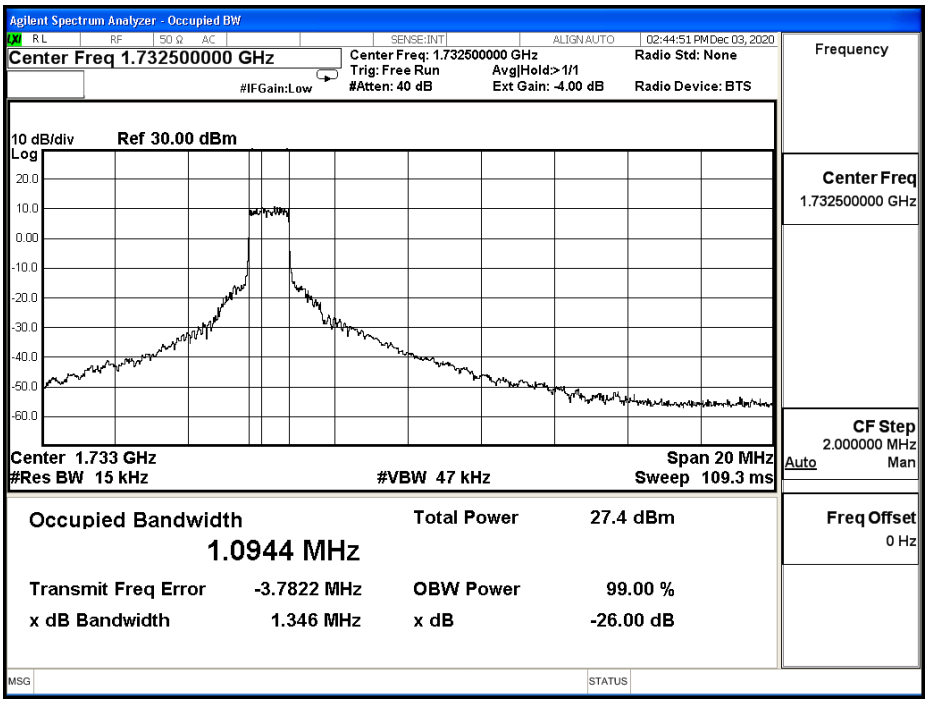
B4_CH20000_10M_QPSK_6RB0



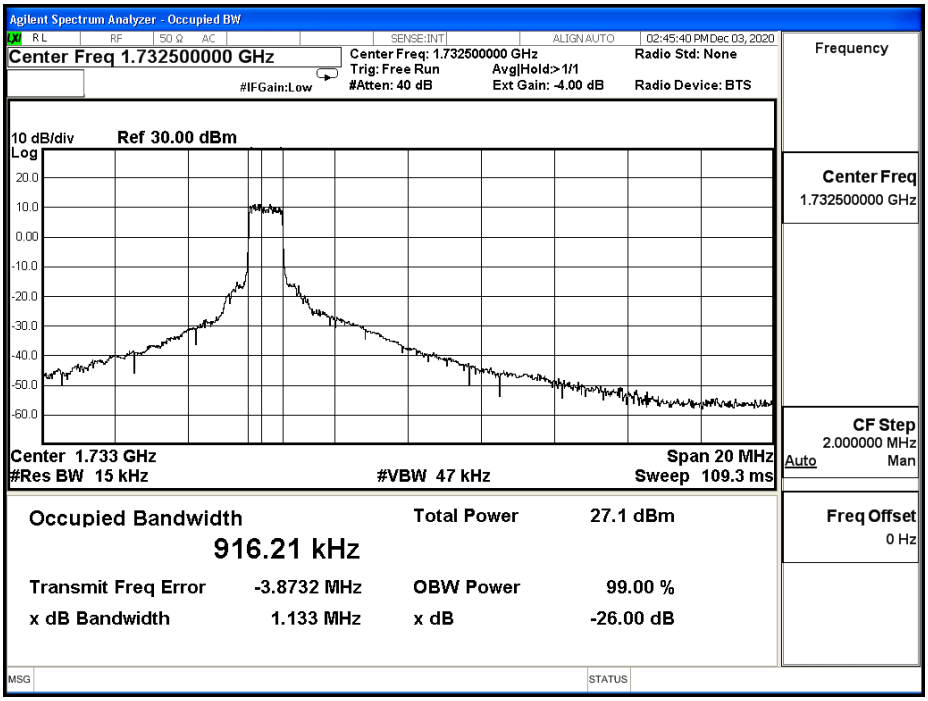
B4_CH20000_10M_16-QAM_5RB0



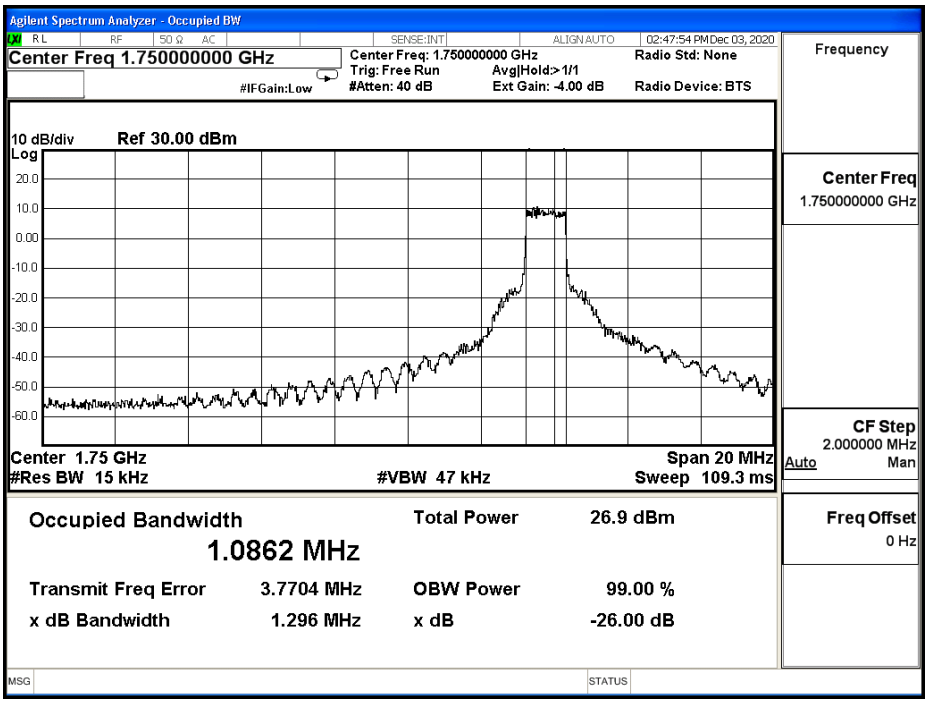
B4_CH20175_10M_QPSK_6RB0



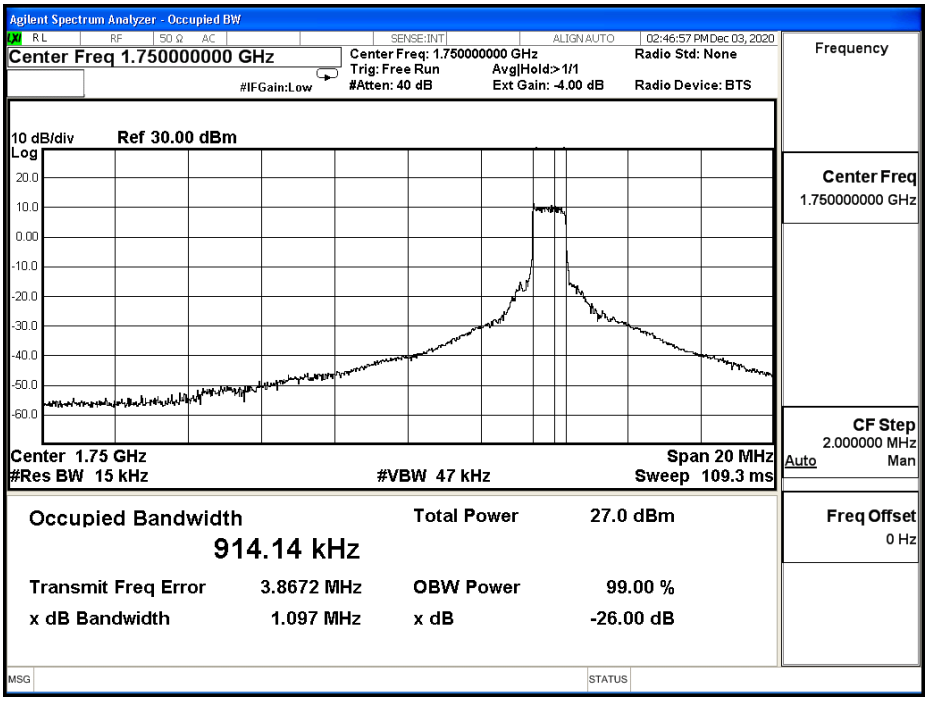
B4_CH20175_10M_16-QAM_5RB0



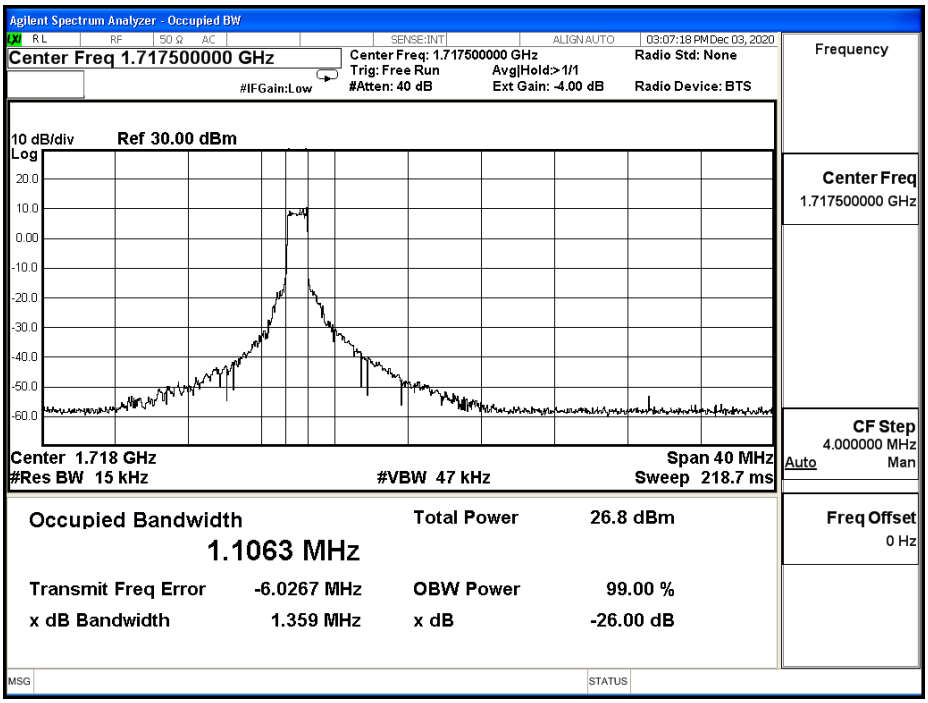
B4_CH20350_10M_QPSK_6RB0



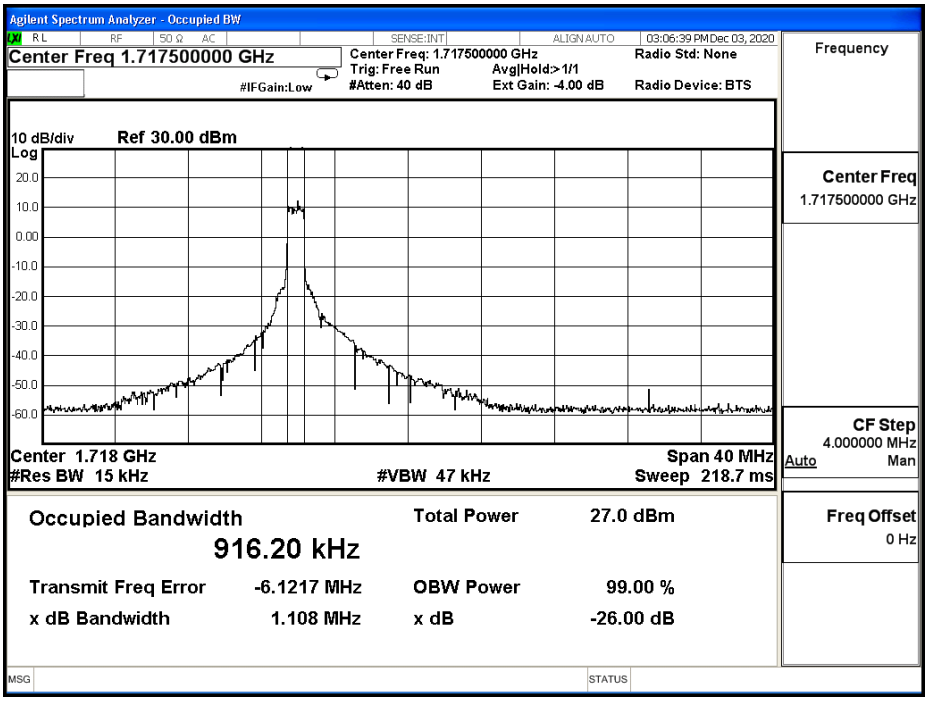
B4_CH20350_10M_16-QAM_5RB1



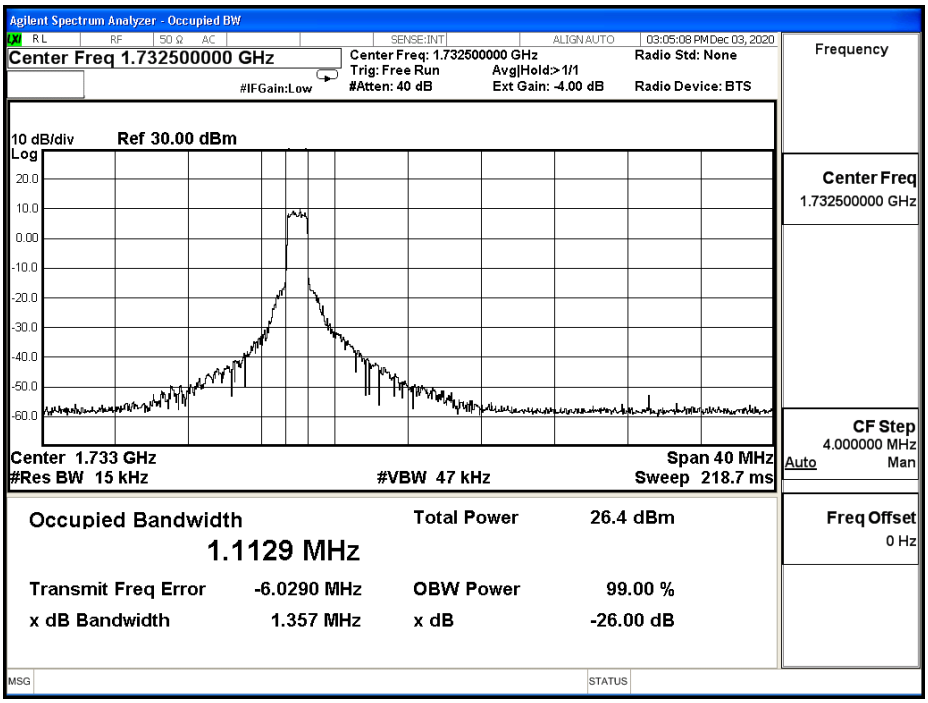
B4_CH20025_15M_QPSK_6RB0



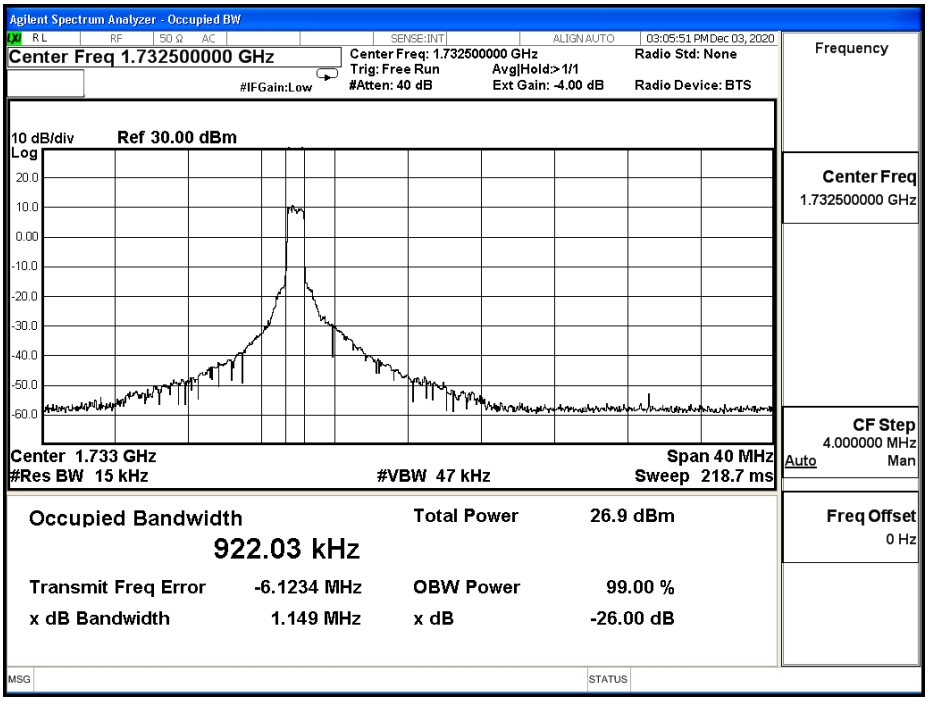
B4_CH20025_15M_16-QAM_5RB0



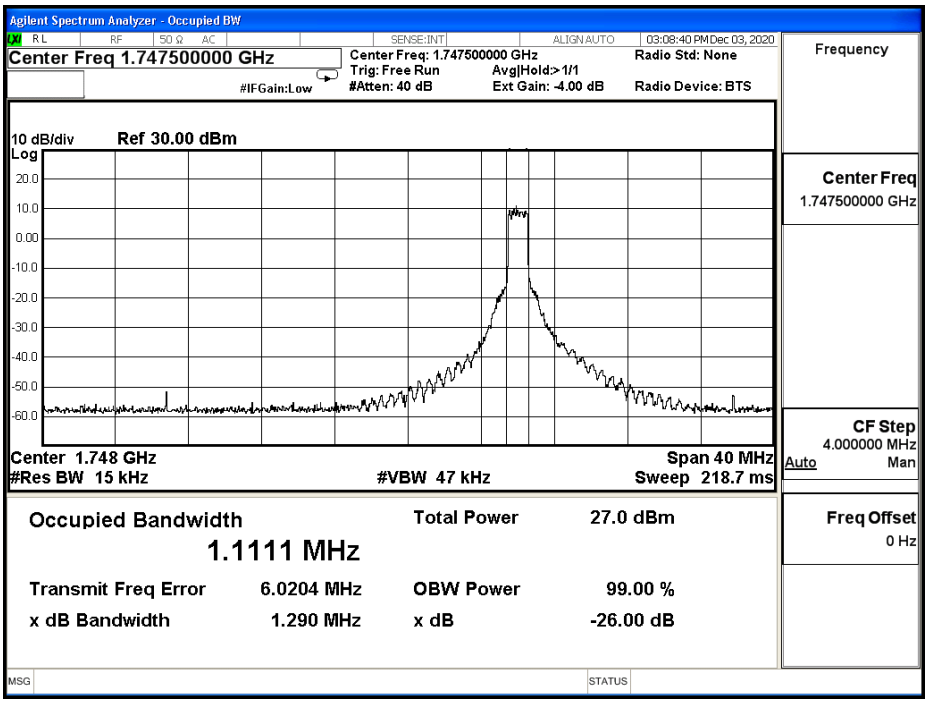
B4_CH20175_15M_QPSK_6RB0



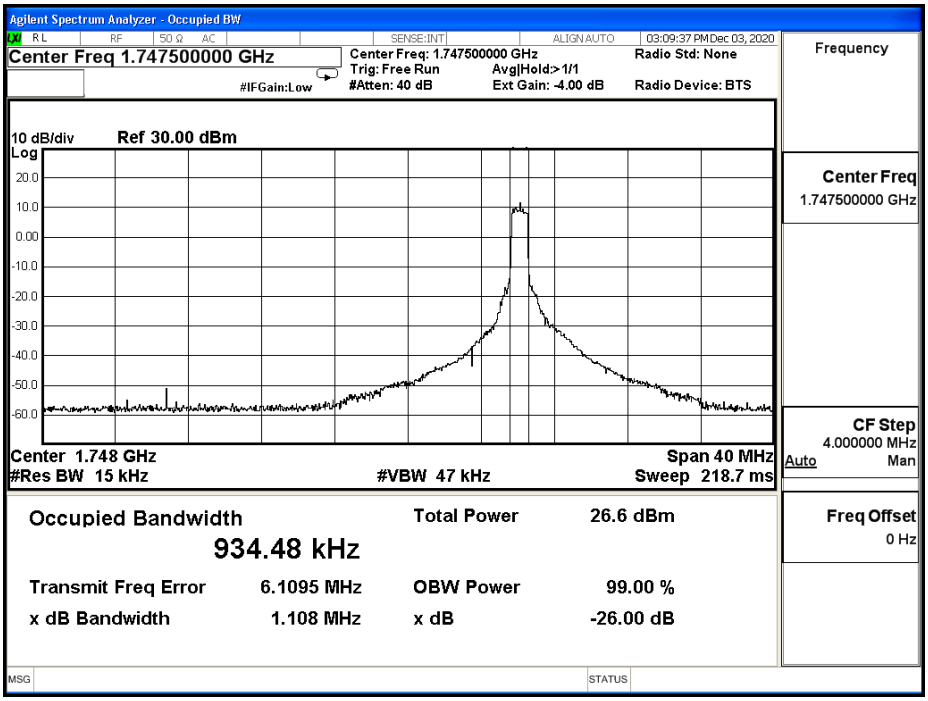
B4_CH20175_15M_16-QAM_5RB0



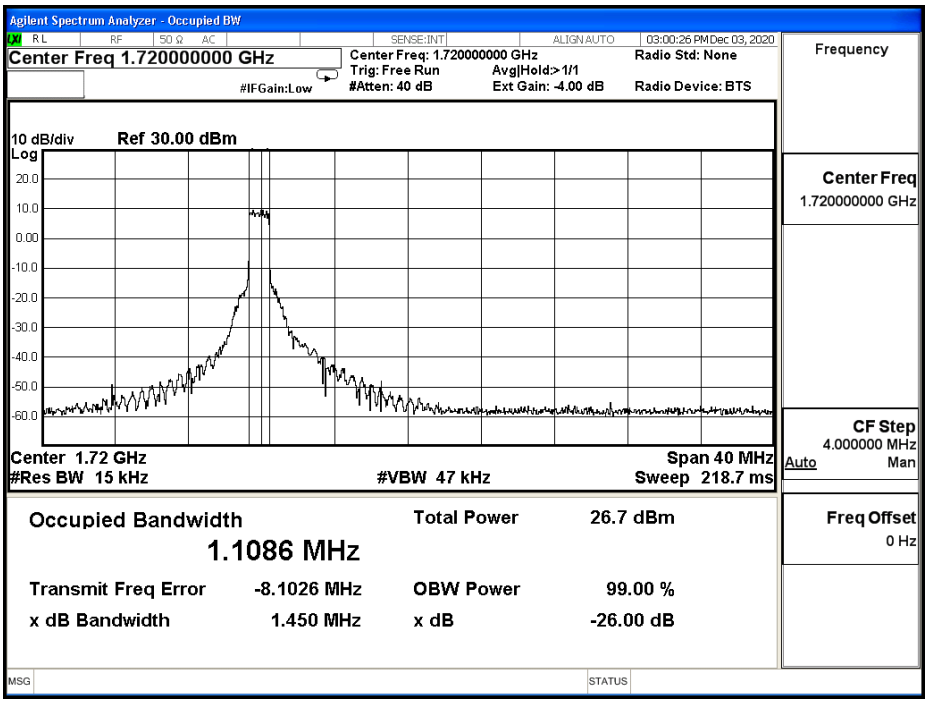
B4_CH20325_15M_QPSK_6RB0



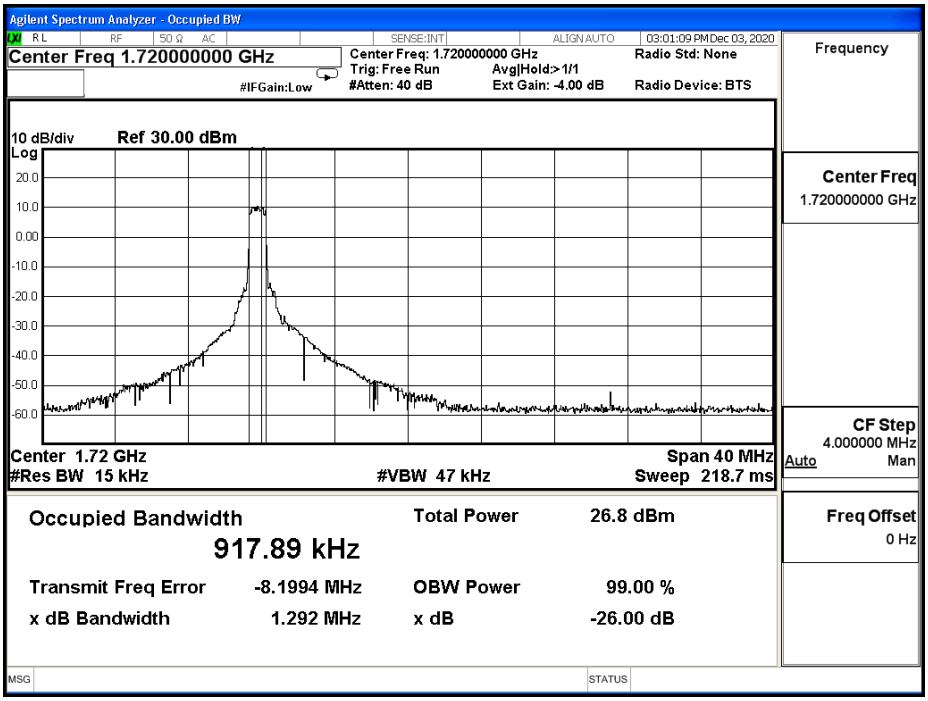
B4_CH20325_15M_16-QAM_5RB1



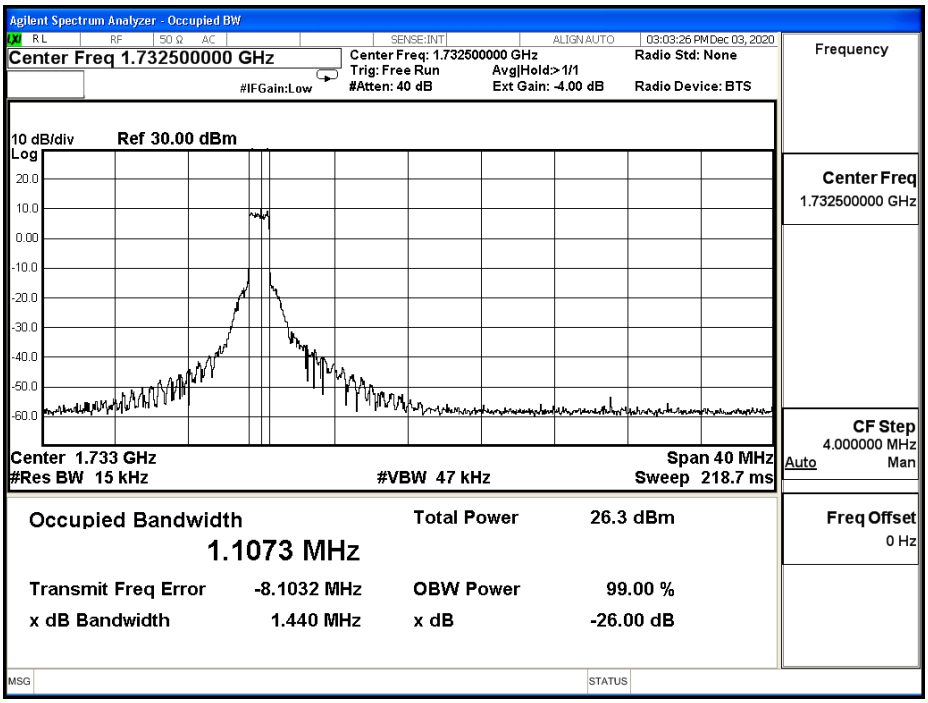
B4_CH20050_20M_QPSK_6RB0



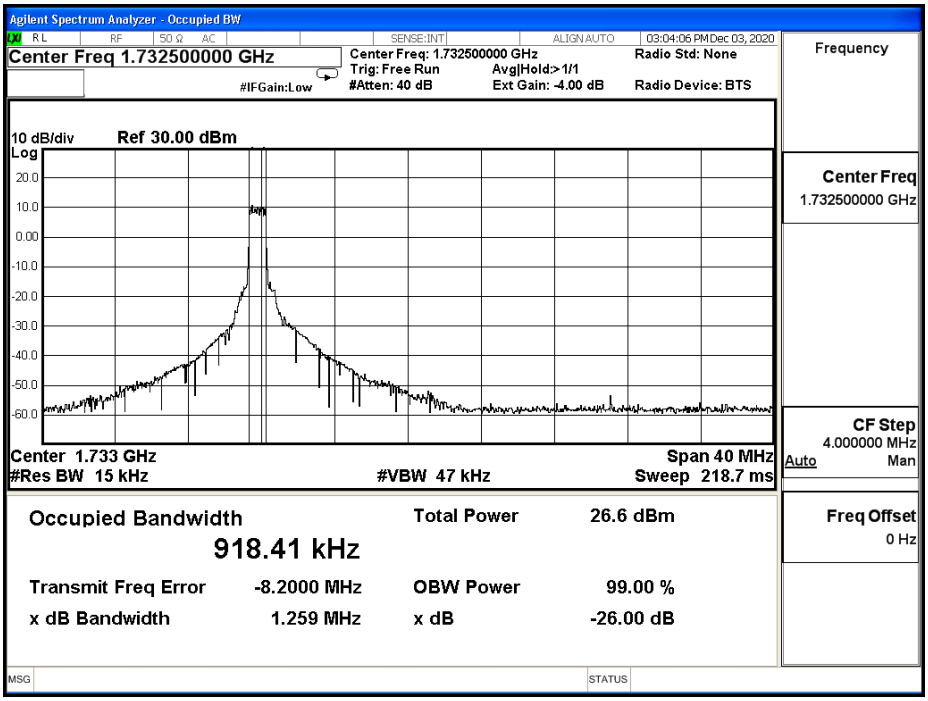
B4_CH20050_20M_16-QAM_5RB0



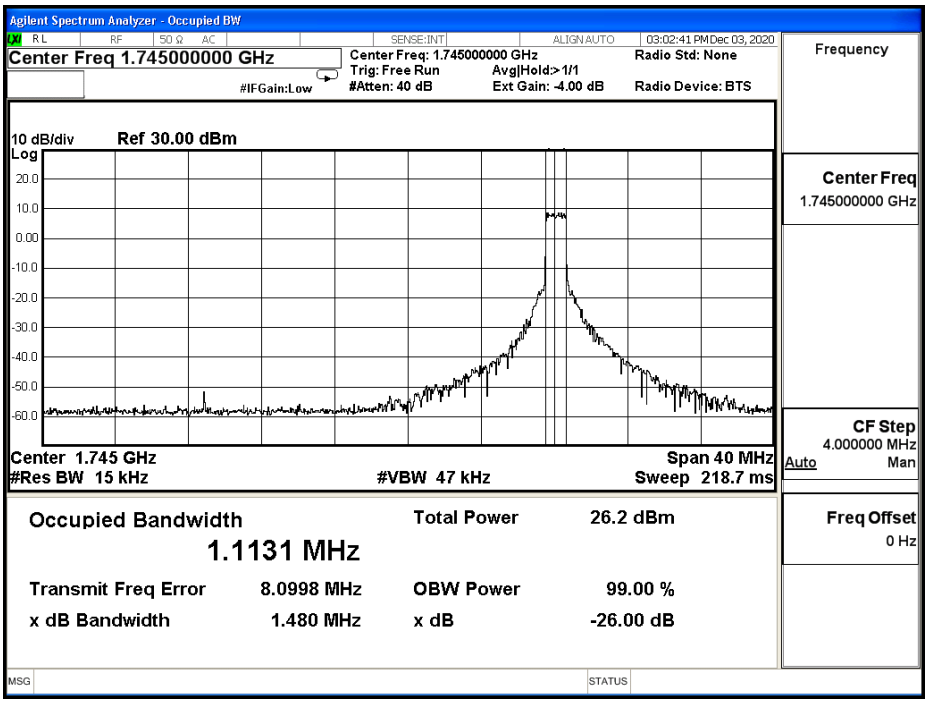
B4_CH20175_20M_QPSK_6RB0



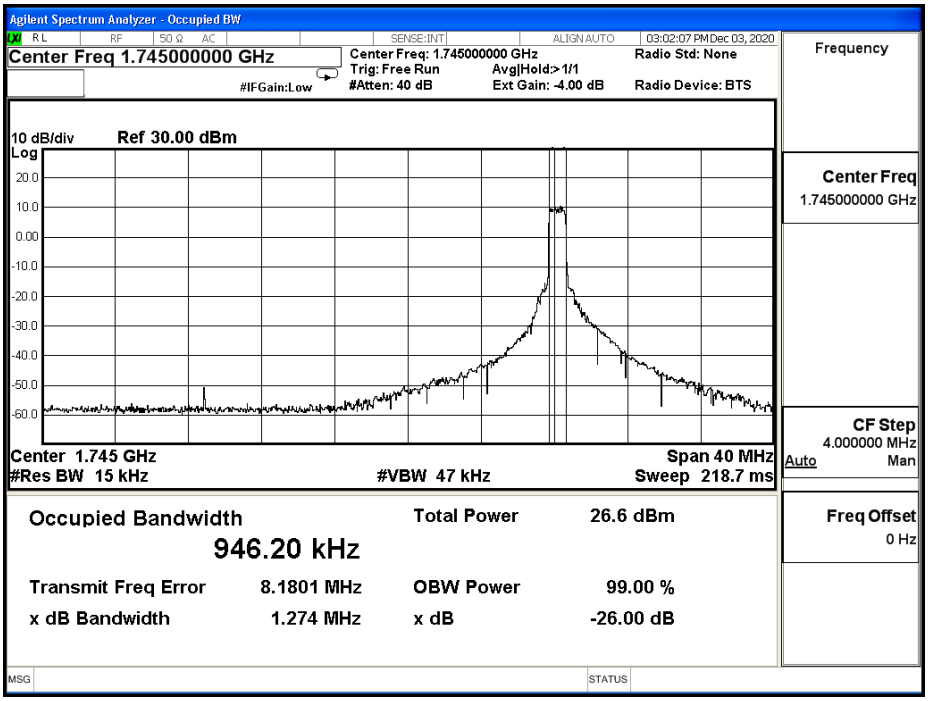
B4_CH20175_20M_16-QAM_5RB0



B4_CH20300_20M_QPSK_6RB0



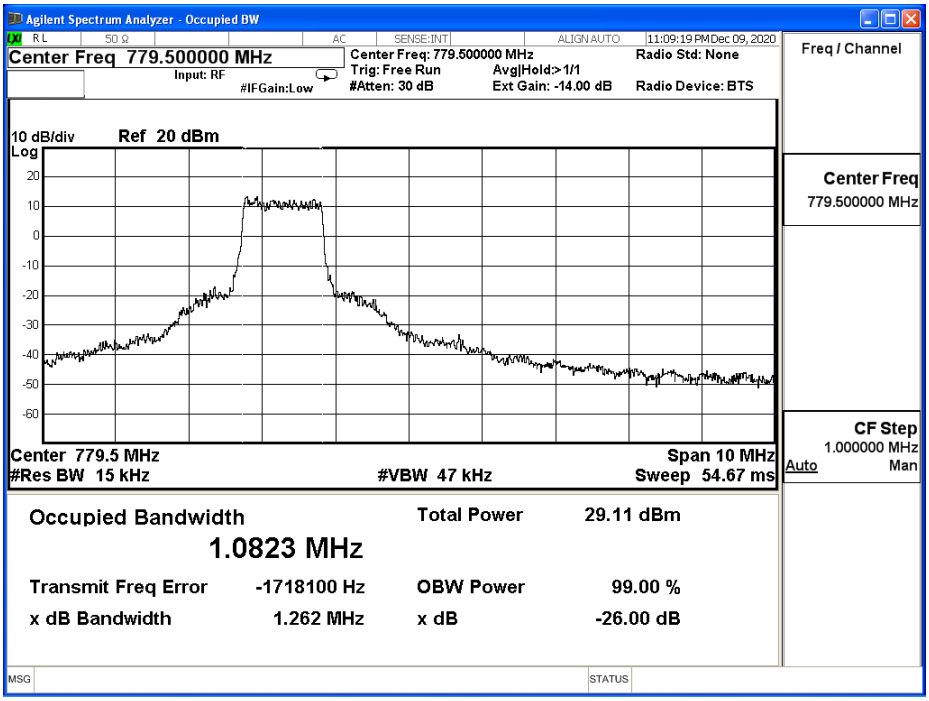
B4_CH20300_20M_16-QAM_5RB1



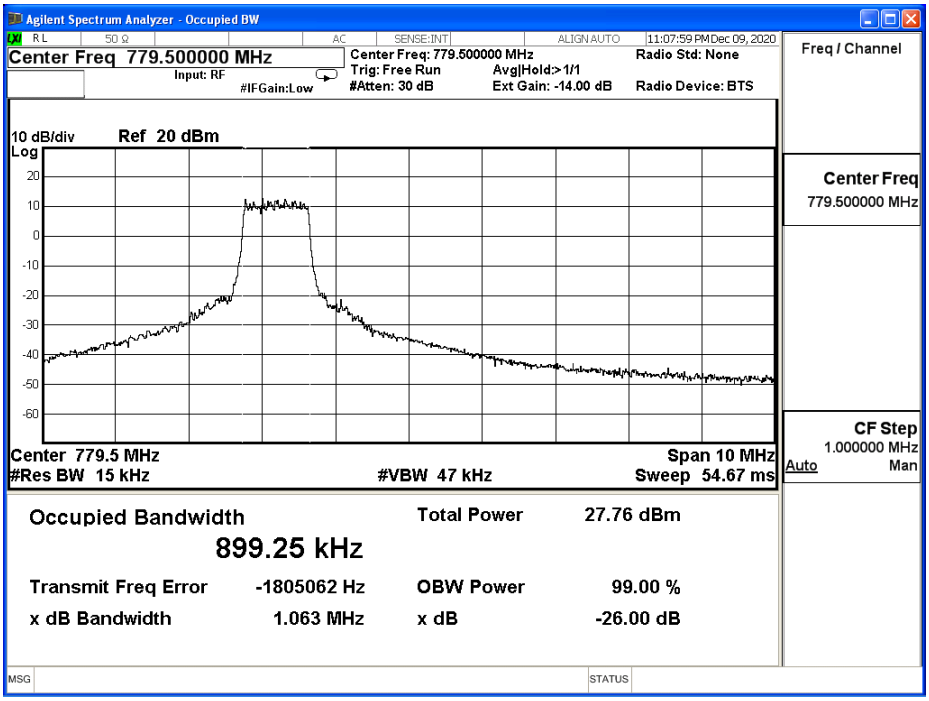
Product	LGA module		
Test Item	Occupied Bandwidth		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/09	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	67.0

Bandwidth (MHz)	Modulation	Frequency (MHz)	Measure Level (MHz)		Limit (MHz)
			26dB BW	99% BW	
5M	QPSK	779.5	1.262	1.082	N/A
		782.0	1.261	1.075	N/A
		784.5	1.270	1.087	N/A
	16-QAM	779.5	1.063	0.899	N/A
		782.0	1.076	0.905	N/A
		784.5	1.077	0.907	N/A
10M	QPSK	782 low	1.266	1.090	N/A
			1.271	1.090	N/A
	16-QAM	782 high	1.106	0.916	N/A
			1.089	0.912	N/A

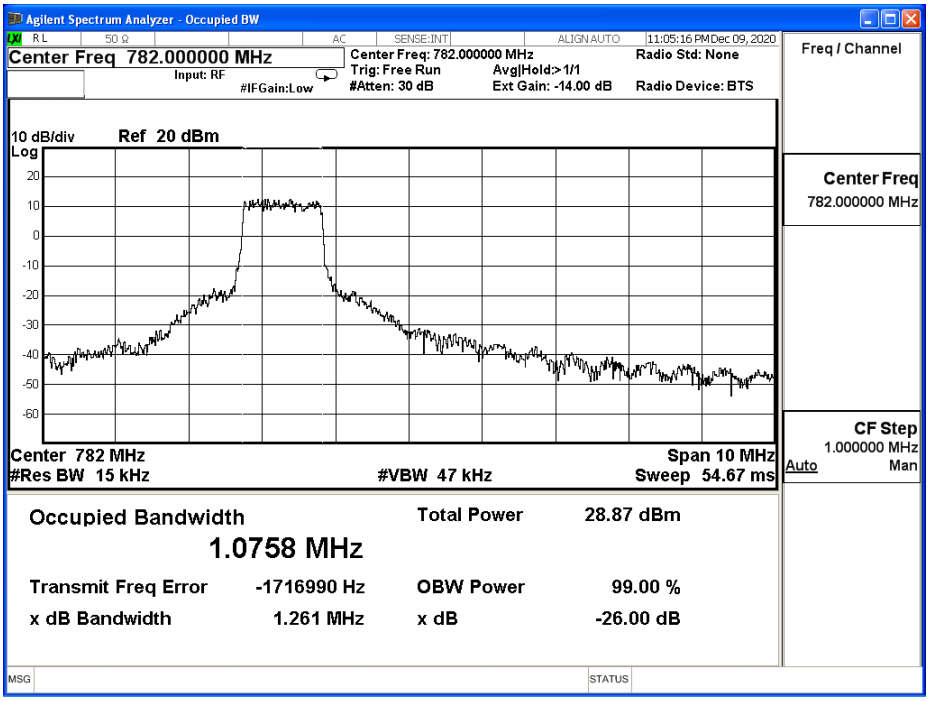
B13_CH23205_5M_QPSK_6RB0



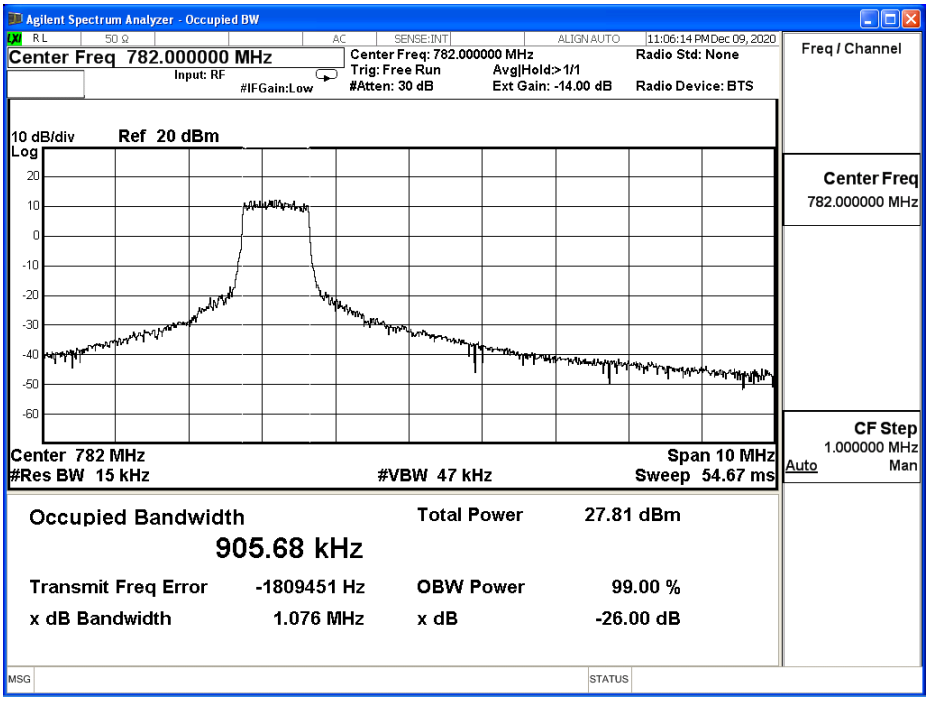
B13_CH23205_5M_16-QAM_5RB0



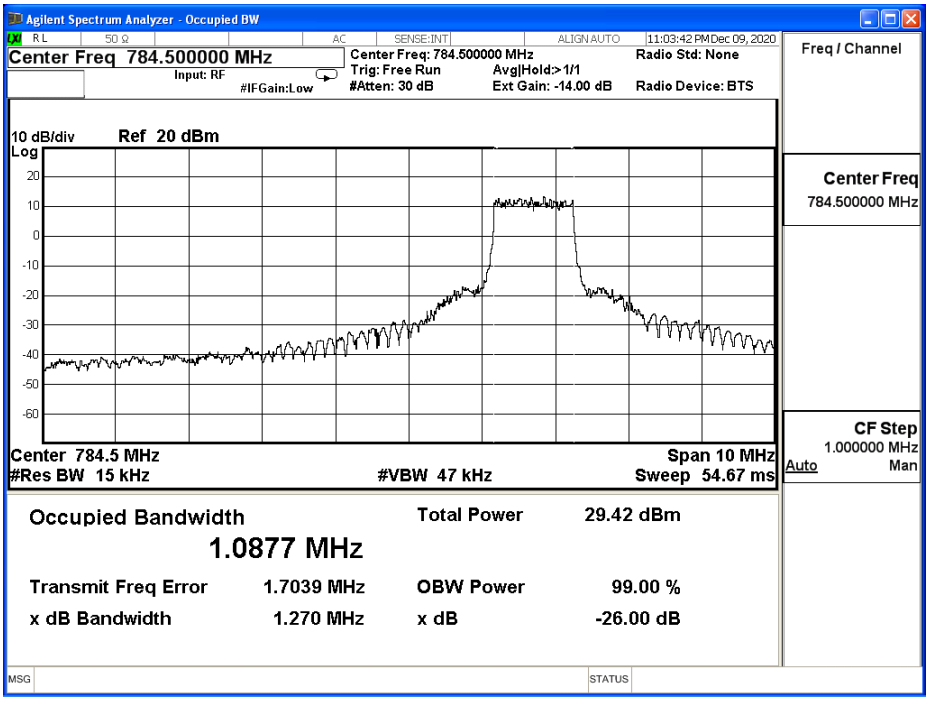
B13_CH23230_5M_QPSK_6RB0



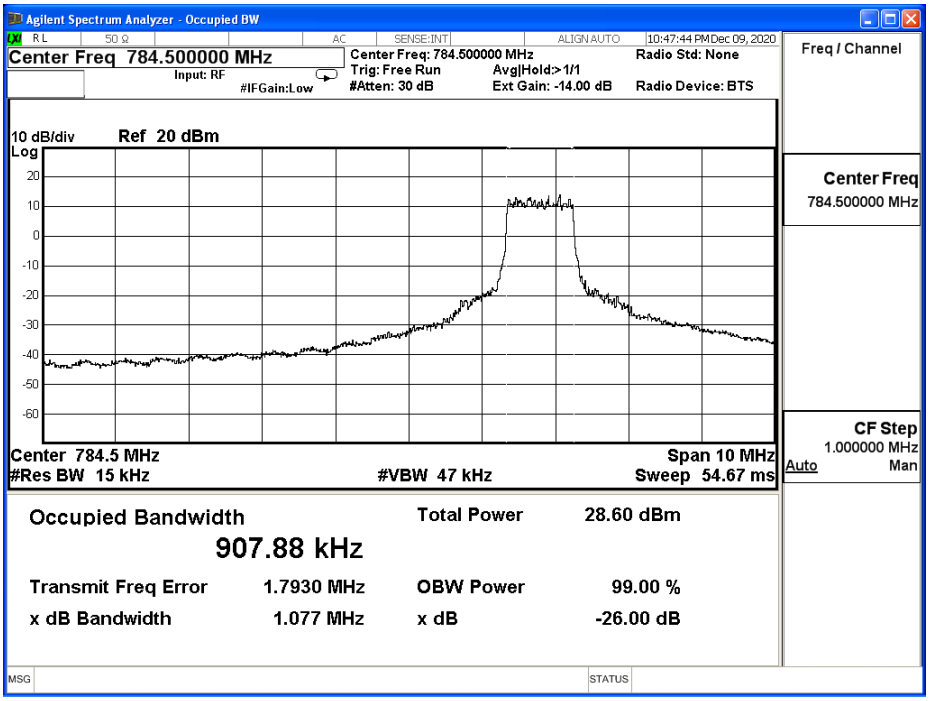
B13_CH23230_5M_16-QAM_5RB0



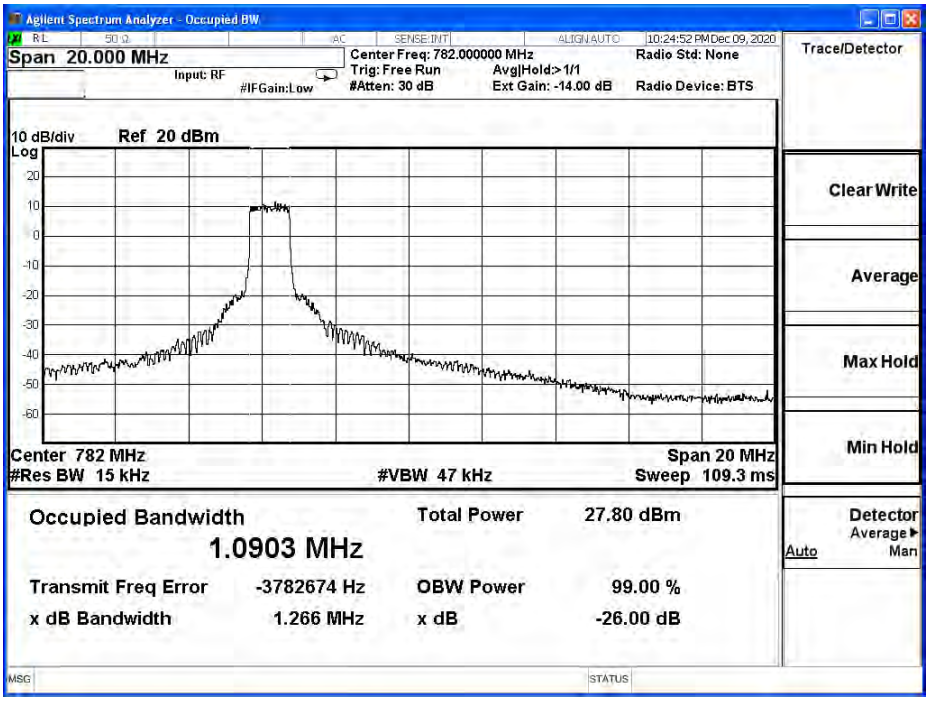
B13_CH23255_5M_QPSK_6RB0



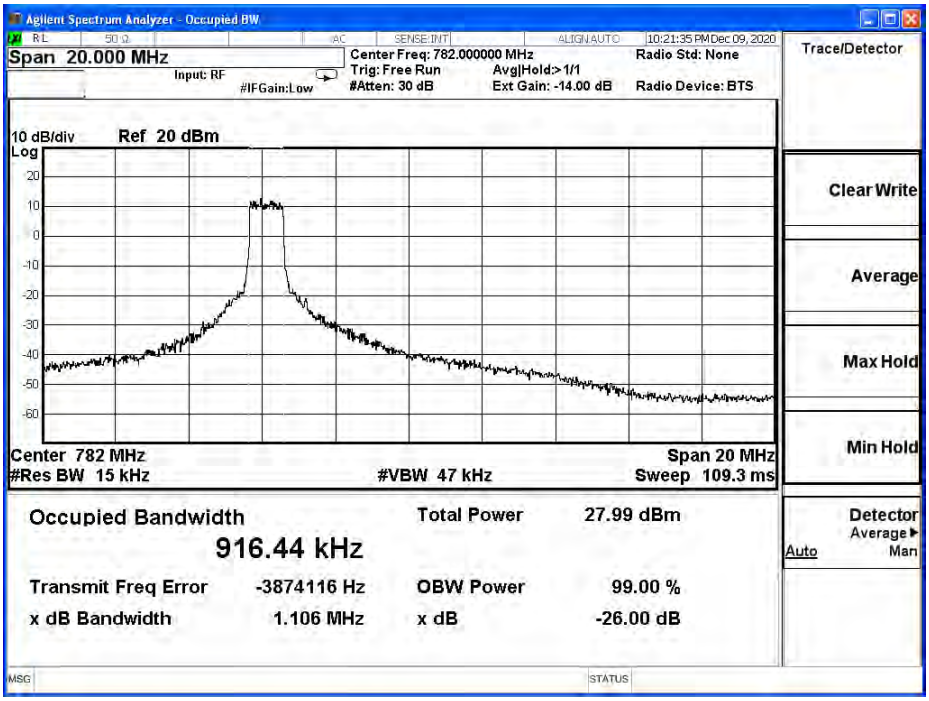
B13_CH23255_5M_16-QAM_5RB1



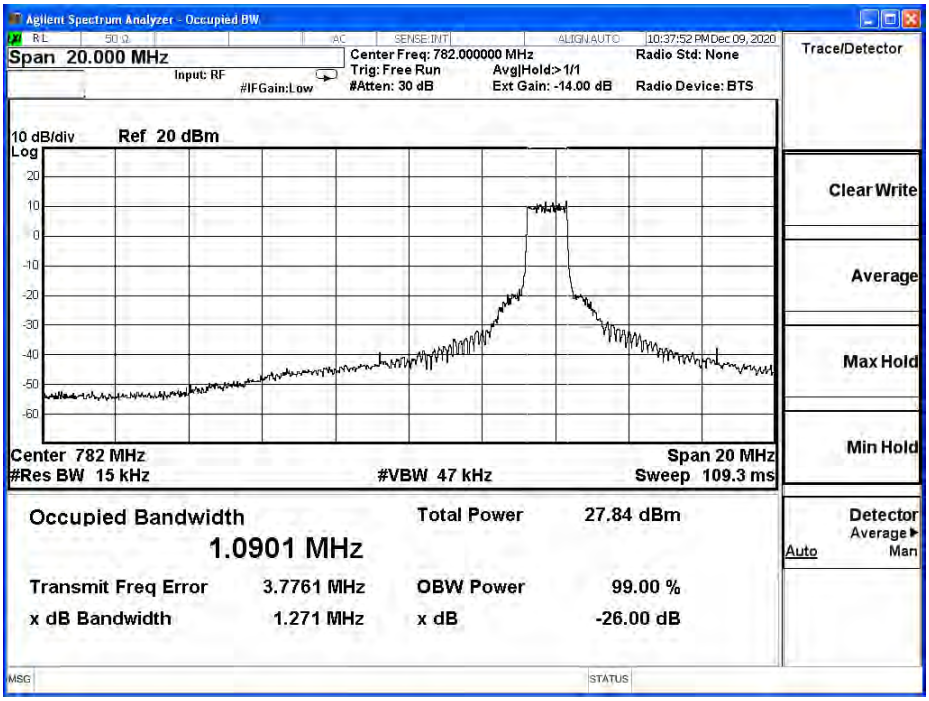
B13_CH23230_10M_QPSK_6RB0_low



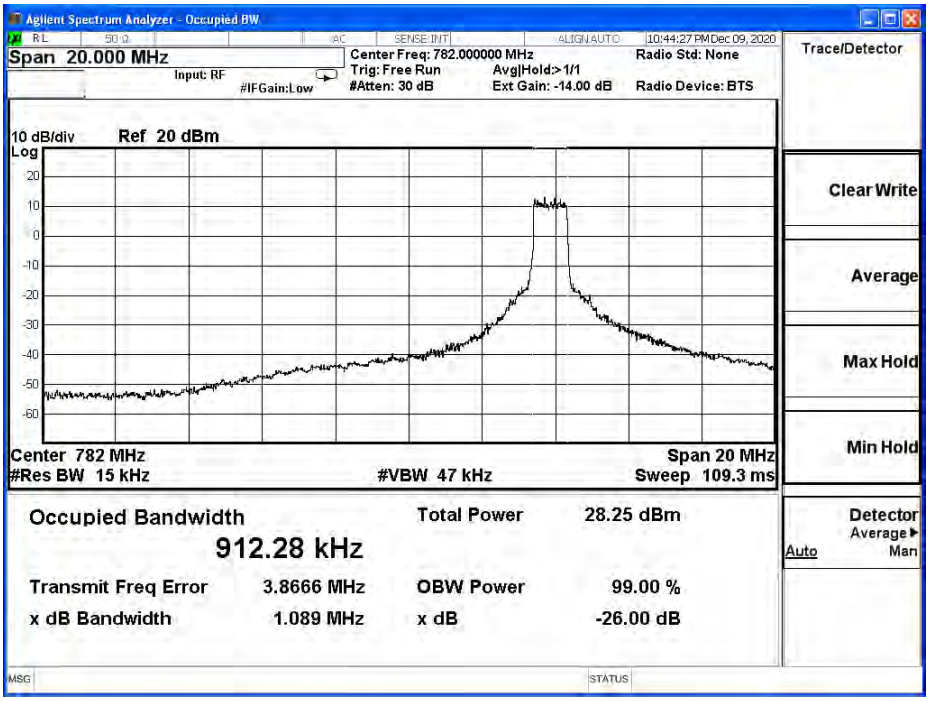
B13_CH23230_10M_16-QAM_5RB0_low



B13_CH23230_10M_QPSK_6RB0_high

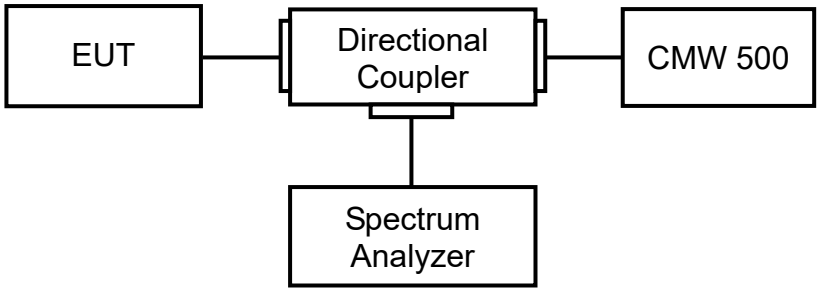


B13_CH23230_10M_16-QAM_5RB1_high



5. Peak To Average Ratio

5.1. Test Setup



5.2. Test Procedure

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Record the maximum PAPR level associated with a probability of 0.1 %.

5.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.7.2
ANSI C63.26: 2015 Sub-clause 5.2.3.4

5.4. Limit

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13dB.

5.5. Test Result

Product	LGA module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/02	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	65.0

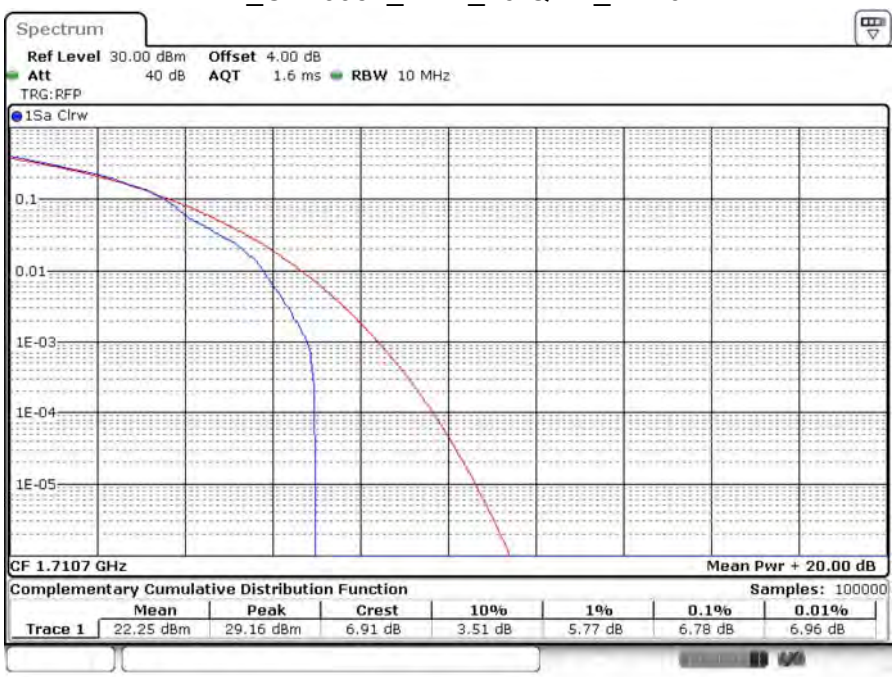
Band width (MHz)	Channel	Frequency (MHz)	Modulation	Peak (dBm)	Average (dBm)	PAPR (dB)
1.4M	19957	1710.7	QPSK	29.03	23.10	5.86
			16-QAM	29.16	22.25	6.78
	20175	1732.5	QPSK	29.05	23.14	5.86
			16-QAM	29.20	21.80	7.33
	20393	1754.3	QPSK	28.53	22.67	5.71
			16-QAM	28.68	21.90	6.55
3M	19965	1711.5	QPSK	28.97	23.06	5.83
			16-QAM	29.00	22.05	6.81
	20175	1732.5	QPSK	29.01	23.11	5.86
			16-QAM	28.98	22.09	6.78
	20385	1753.5	QPSK	28.51	22.83	5.62
			16-QAM	28.50	21.73	6.72
5M	19975	1712.5	QPSK	28.65	22.63	5.88
			16-QAM	29.27	22.49	6.72
	20175	1732.5	QPSK	28.75	22.83	5.83
			16-QAM	29.21	22.66	6.52
	20375	1752.5	QPSK	28.20	22.36	5.71
			16-QAM	28.75	22.24	6.46
10M	20000	1715	QPSK	27.16	21.14	5.88
			16-QAM	27.90	21.15	6.67
	20175	1732.5	QPSK	27.24	21.20	5.91
			16-QAM	27.85	21.12	6.67
	20350	1750	QPSK	26.62	20.87	5.68
			16-QAM	27.12	20.79	6.29

Band width (MHz)	Channel	Frequency (MHz)	Modulation	Peak (dBm)	Average (dBm)	PAPR (dB)
15M	20025	1717.5	QPSK	24.11	18.15	5.88
			16-QAM	24.82	18.14	6.64
	20175	1732.5	QPSK	24.22	18.27	5.88
			16-QAM	24.82	18.27	6.49
	20325	1747.5	QPSK	23.59	17.82	5.71
			16-QAM	24.22	17.76	6.43
20M	20050	1720	QPSK	20.35	14.32	5.91
			16-QAM	21.08	14.33	6.67
	20175	1732.5	QPSK	20.36	14.33	5.94
			16-QAM	20.95	14.28	6.61
	20300	1745	QPSK	20.14	14.33	5.68
			16-QAM	20.59	14.17	6.35

B4_CH19957_1.4M_QPSK_1RB0

Date: 2.DEC.2020 16:48:56

B4_CH19957_1.4M_16-QAM_1RB0

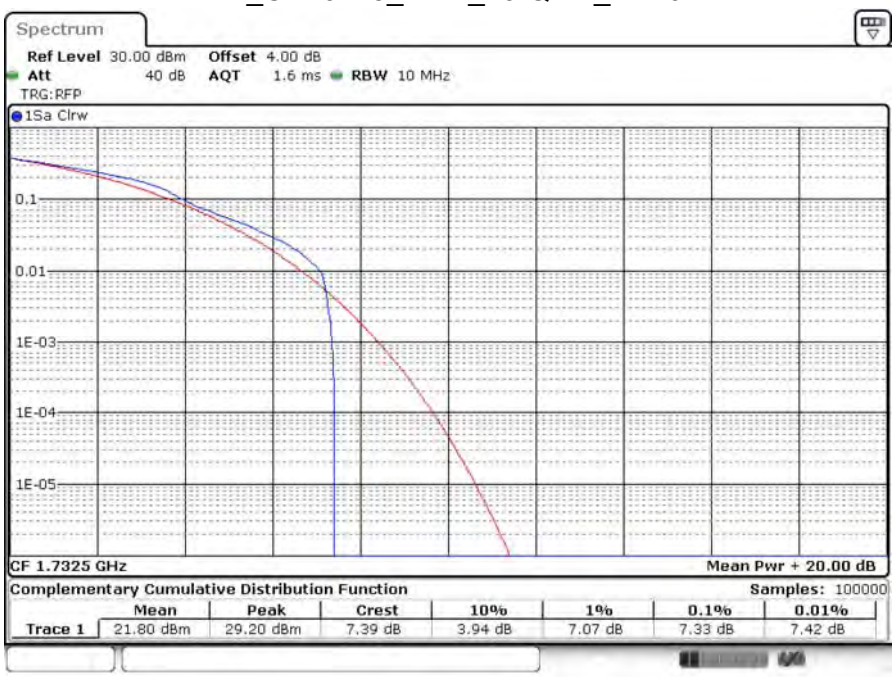


Date: 2.DEC.2020 16:50:53

B4_CH20175_1.4M_QPSK_1RB0

Date: 2.DEC.2020 16:51:33

B4_CH20175_1.4M_16-QAM_1RB0

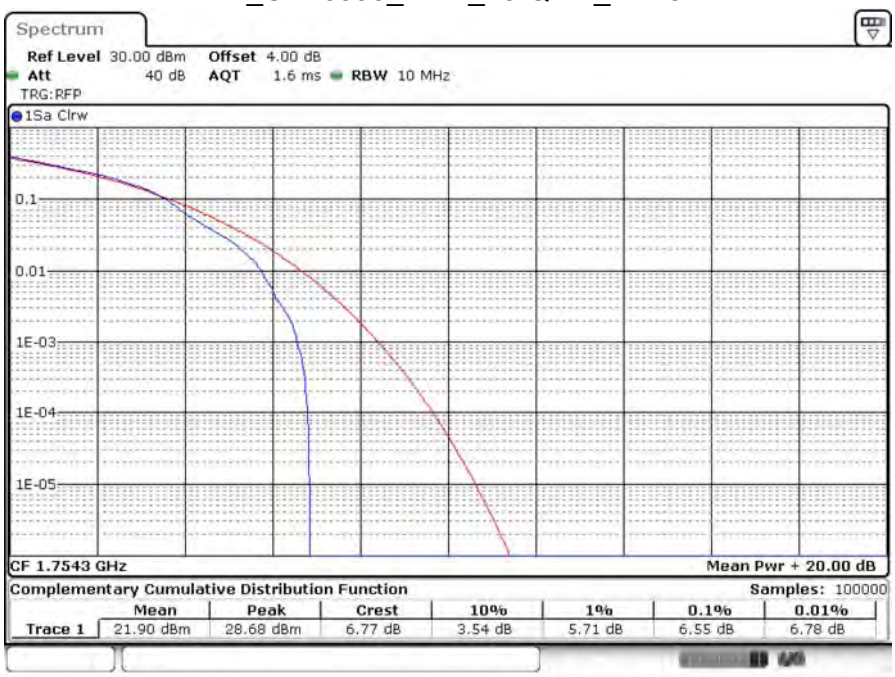


Date: 2.DEC.2020 16:51:15

B4_CH20393_1.4M_QPSK_1RB5

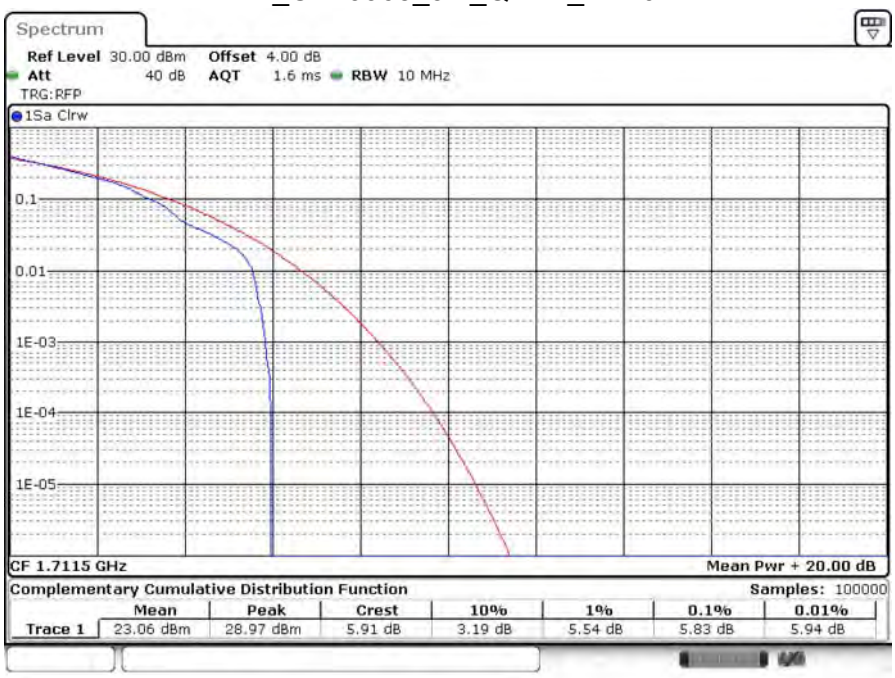
Date: 2.DEC.2020 16:52:51

B4_CH20393_1.4M_16-QAM_1RB5



Date: 2.DEC.2020 16:53:06

B4_CH19965_3M_QPSK_1RB0

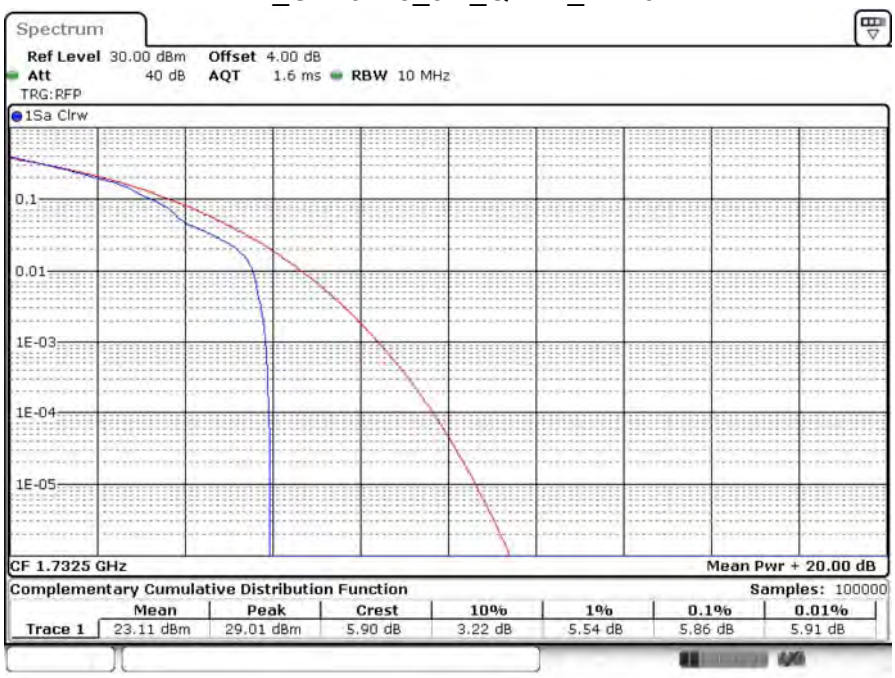


Date: 2.DEC.2020 16:54:24

B4_CH19965_3M_16-QAM_1RB0

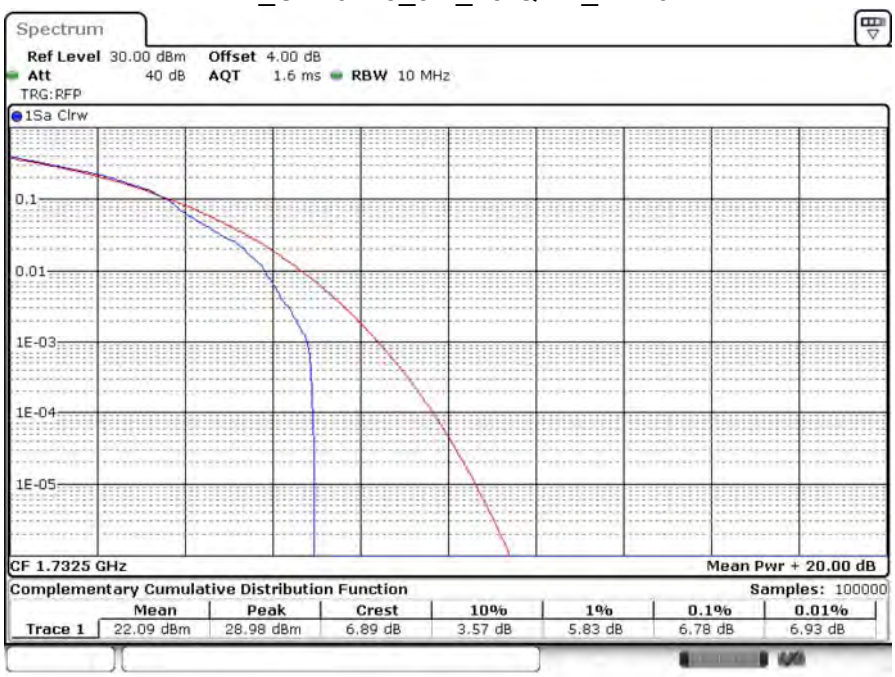
Date: 2.DEC.2020 16:54:51

B4_CH20175_3M_QPSK_1RB0



Date: 2.DEC.2020 16:55:40

B4_CH20175_3M_16-QAM_1RB0

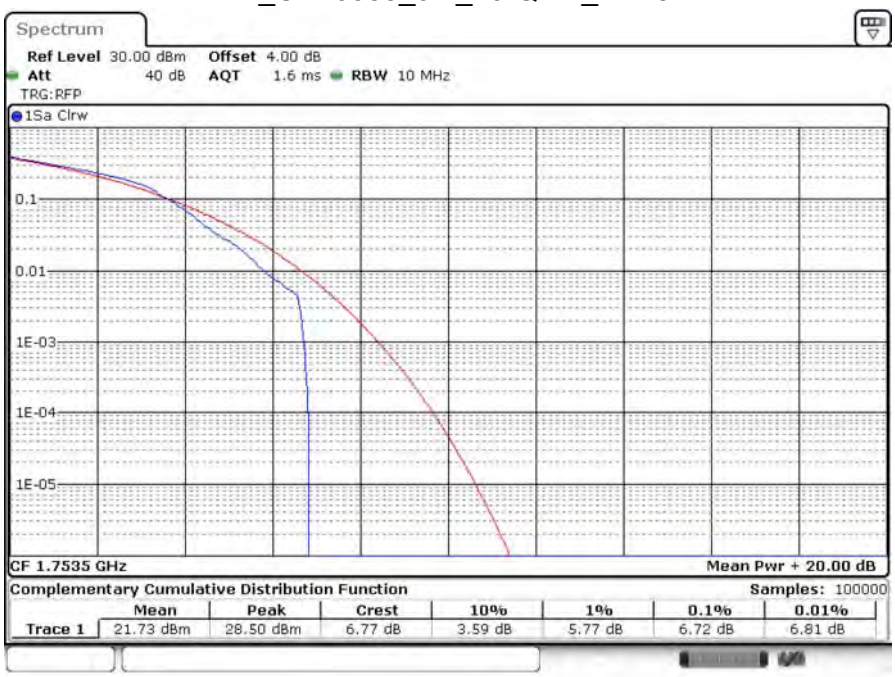


Date: 2.DEC.2020 16:55:27

B4_CH20385_3M_QPSK_1RB5

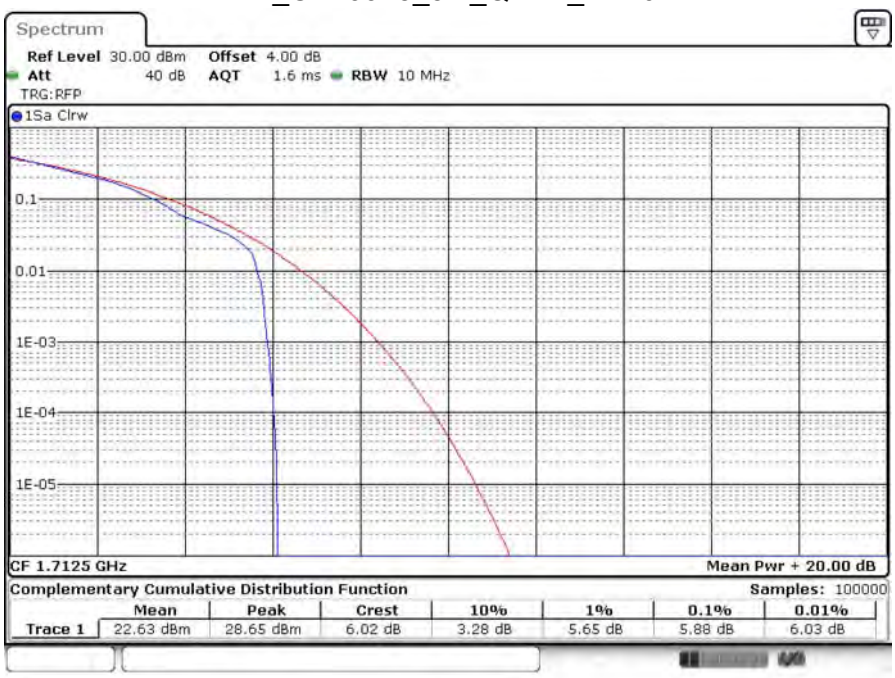
Date: 2.DEC.2020 16:56:18

B4_CH20385_3M_16-QAM_1RB5



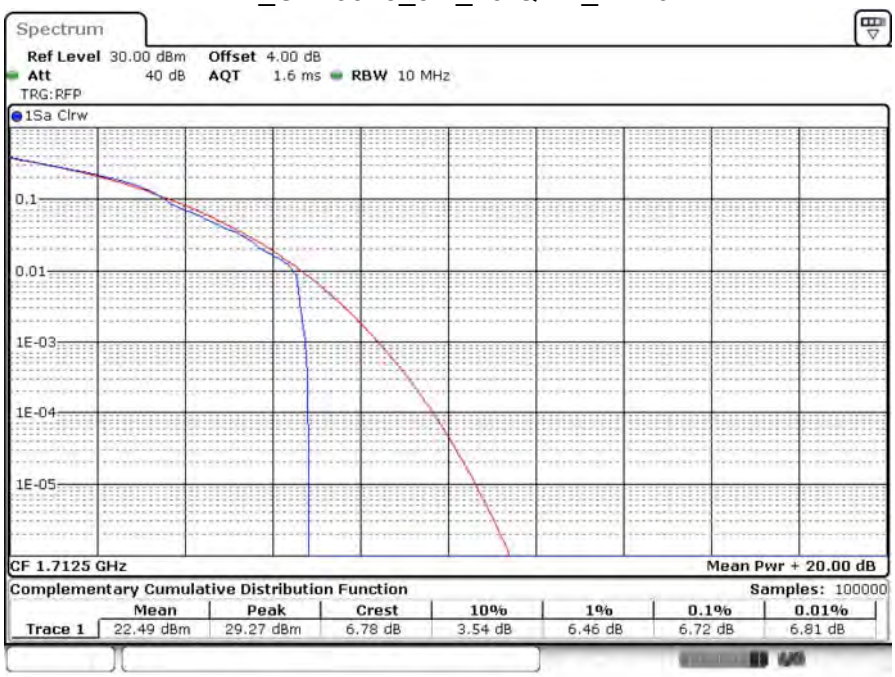
Date: 2.DEC.2020 16:56:38

B4_CH19975_5M_QPSK_1RB0



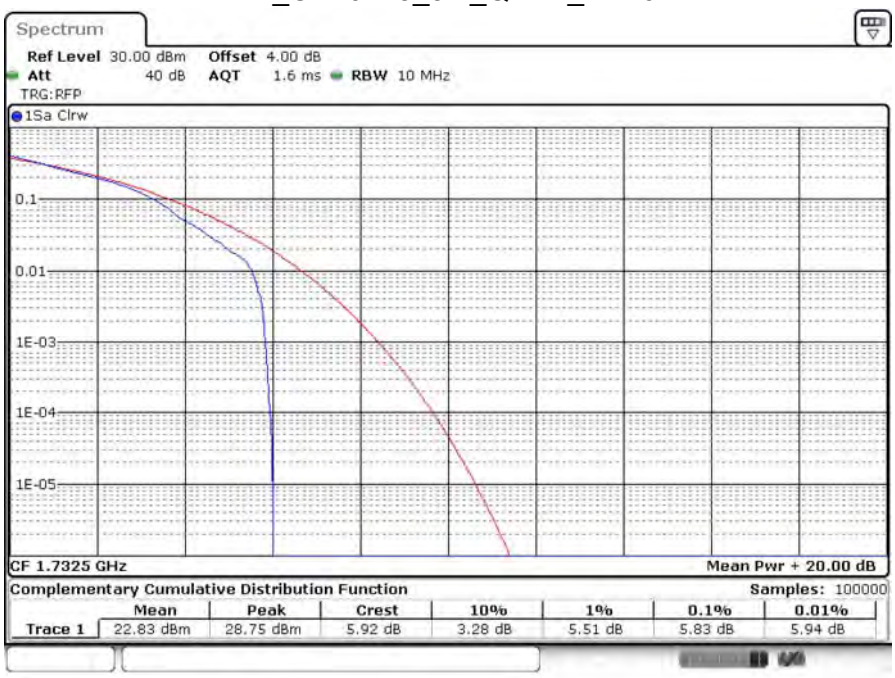
Date: 2.DEC.2020 17:01:46

B4_CH19975_5M_16-QAM_1RB0



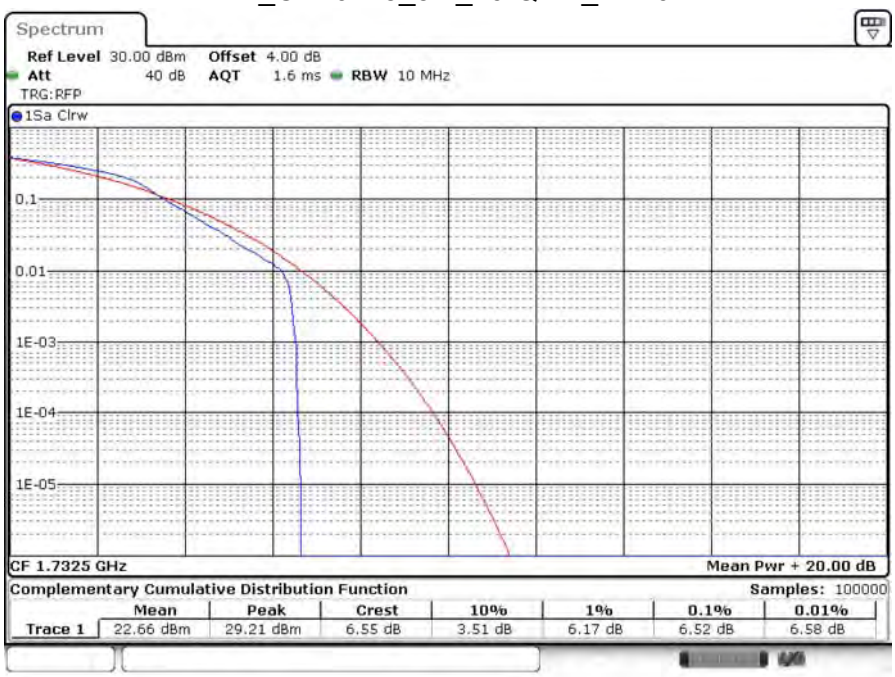
Date: 2.DEC.2020 16:58:10

B4_CH20175_5M_QPSK_1RB0



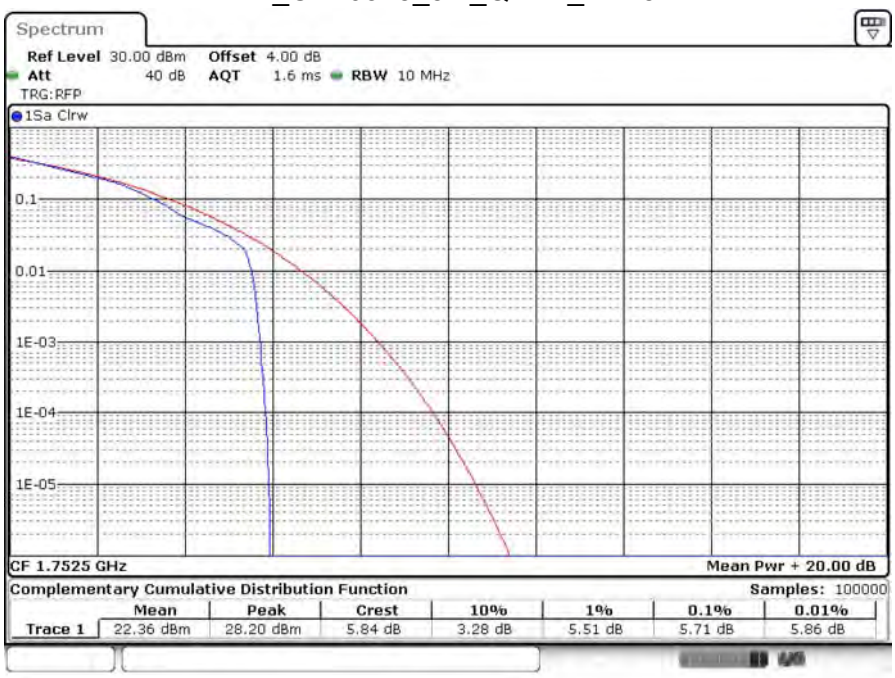
Date: 2.DEC.2020 16:58:51

B4_CH20175_5M_16-QAM_1RB0



Date: 2.DEC.2020 16:58:33

B4_CH20375_5M_QPSK_1RB5

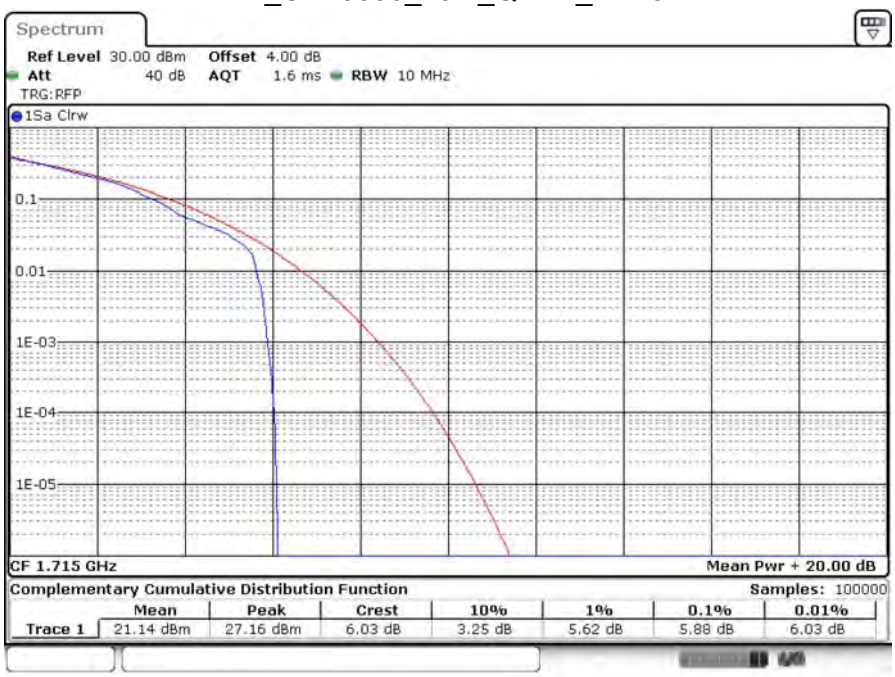


Date: 2.DEC.2020 16:59:22

B4_CH20375_5M_16-QAM_1RB5

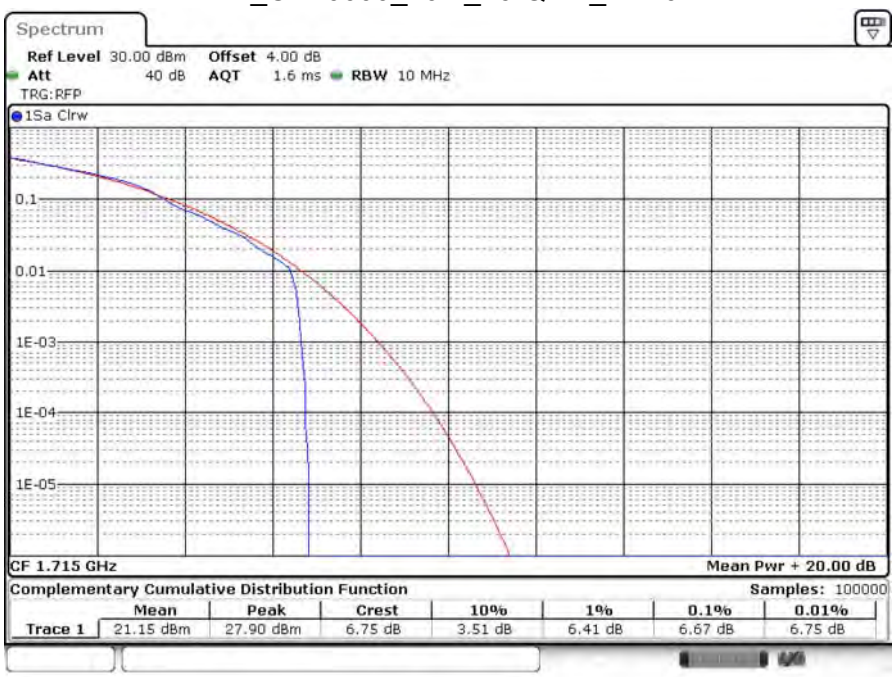
Date: 2.DEC.2020 16:59:38

B4_CH20000_10M_QPSK_1RB0



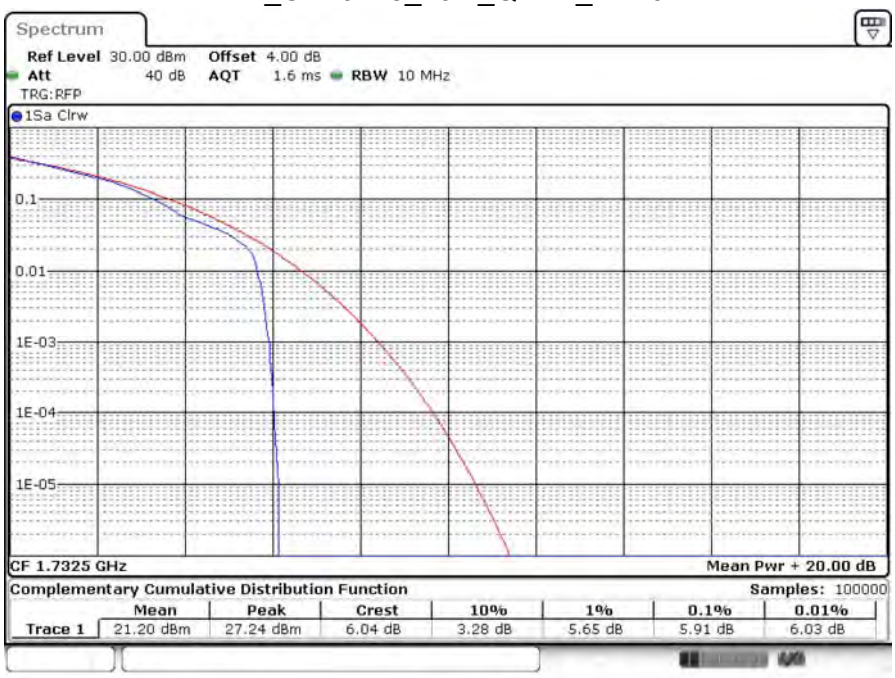
Date: 2.DEC.2020 17:02:26

B4_CH20000_10M_16-QAM_1RB0



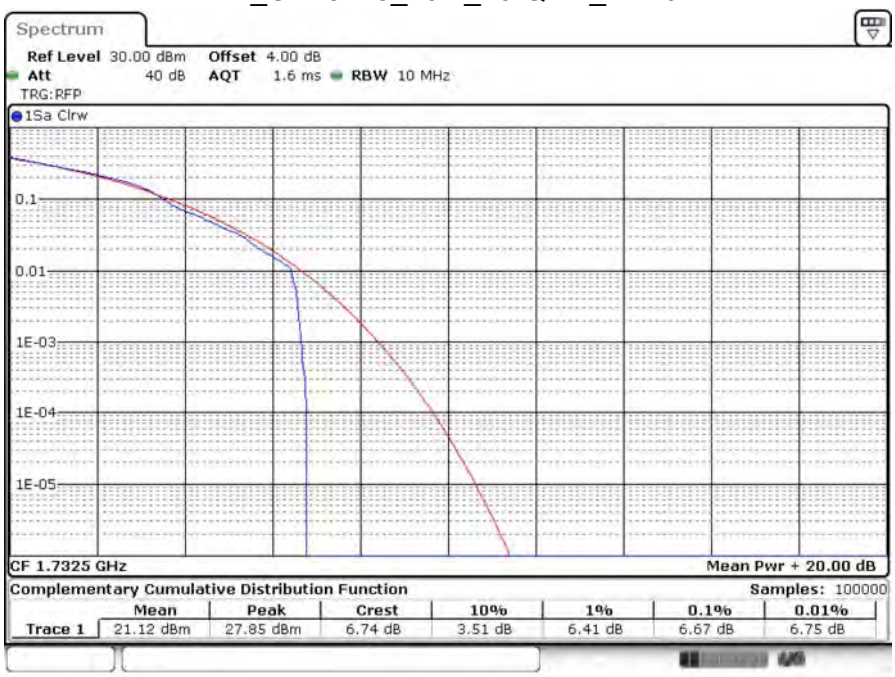
Date: 2.DEC.2020 17:02:39

B4_CH20175_10M_QPSK_1RB0



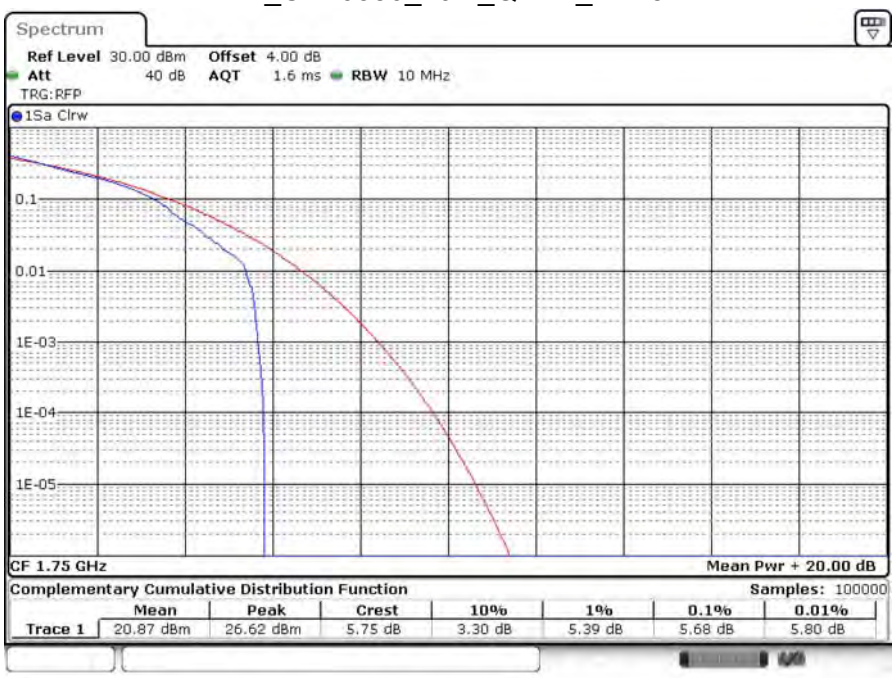
Date: 2.DEC.2020 17:03:10

B4_CH20175_10M_16-QAM_1RB0



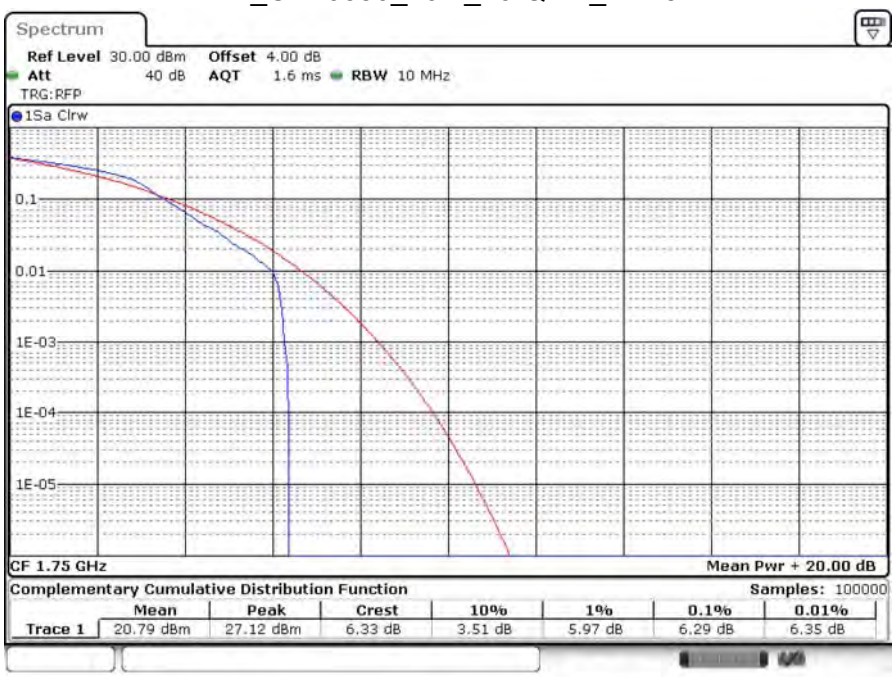
Date: 2.DEC.2020 17:02:59

B4_CH20350_10M_QPSK_1RB5



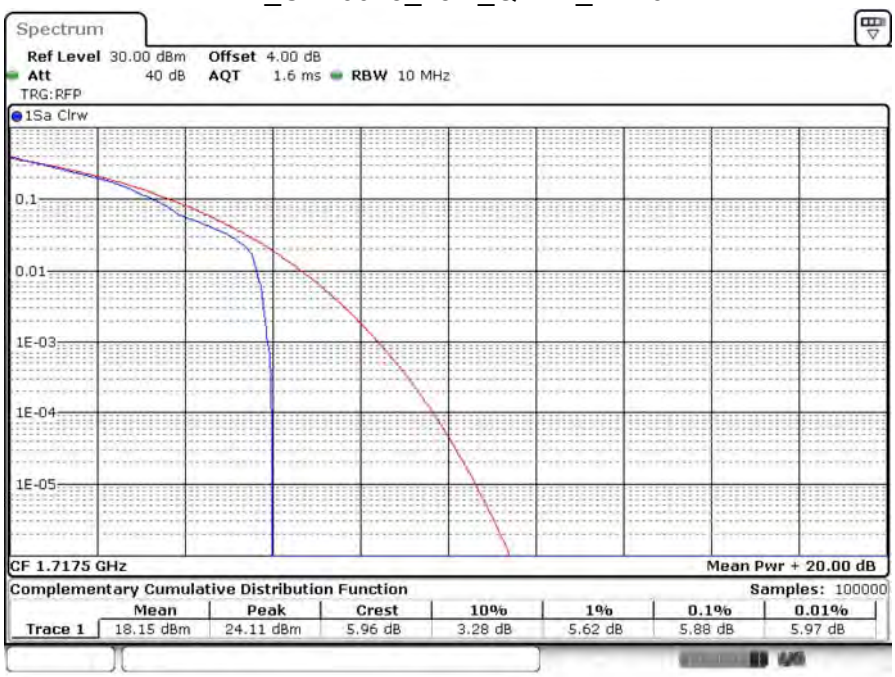
Date: 2.DEC.2020 17:04:58

B4_CH20350_10M_16-QAM_1RB5



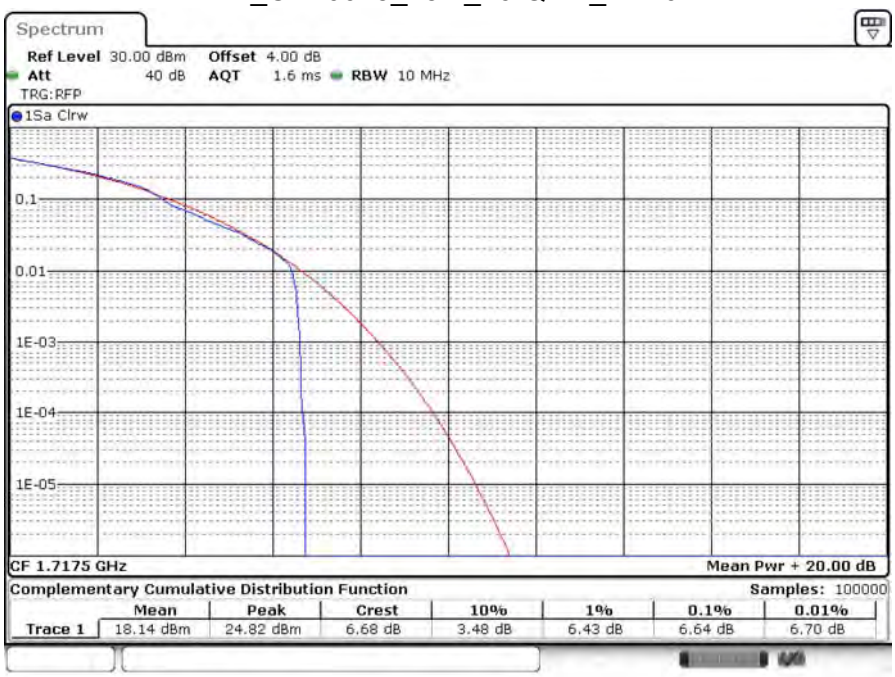
Date: 2.DEC.2020 17:05:09

B4_CH20025_15M_QPSK_1RB0



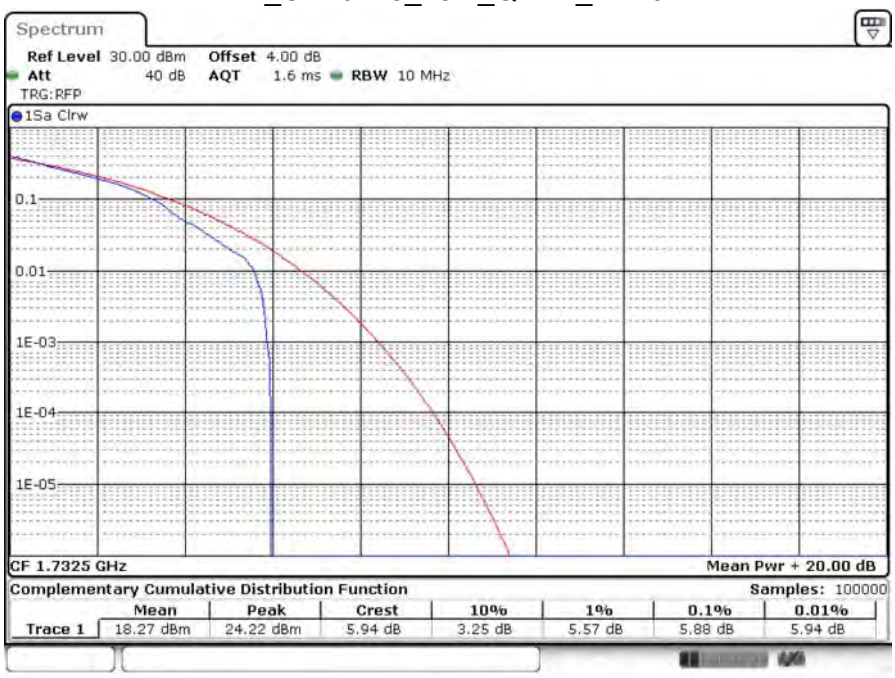
Date: 2.DEC.2020 17:16:09

B4_CH20025_15M_16-QAM_1RB0



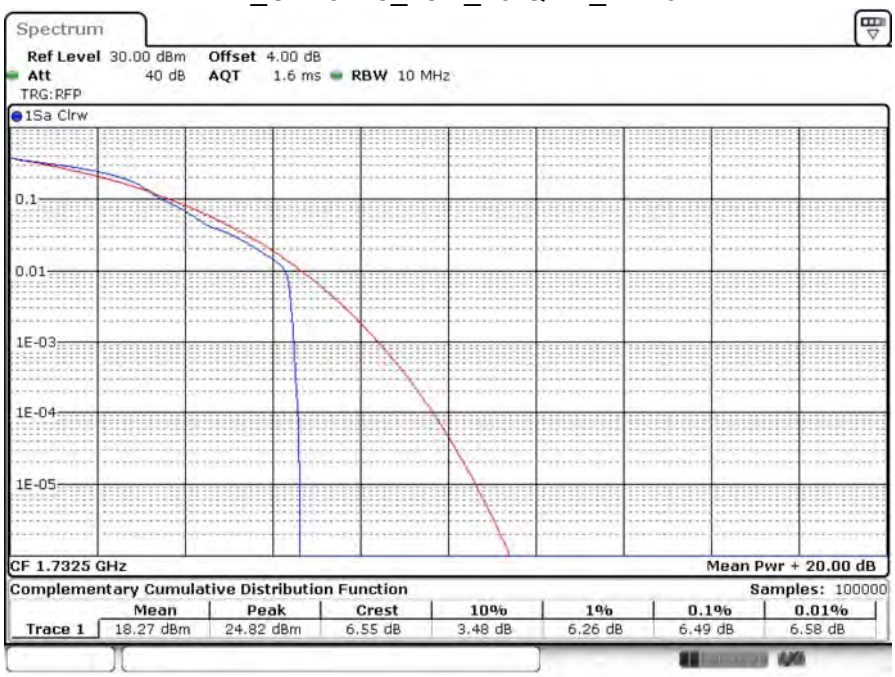
Date: 2.DEC.2020 17:16:29

B4_CH20175_15M_QPSK_1RB0



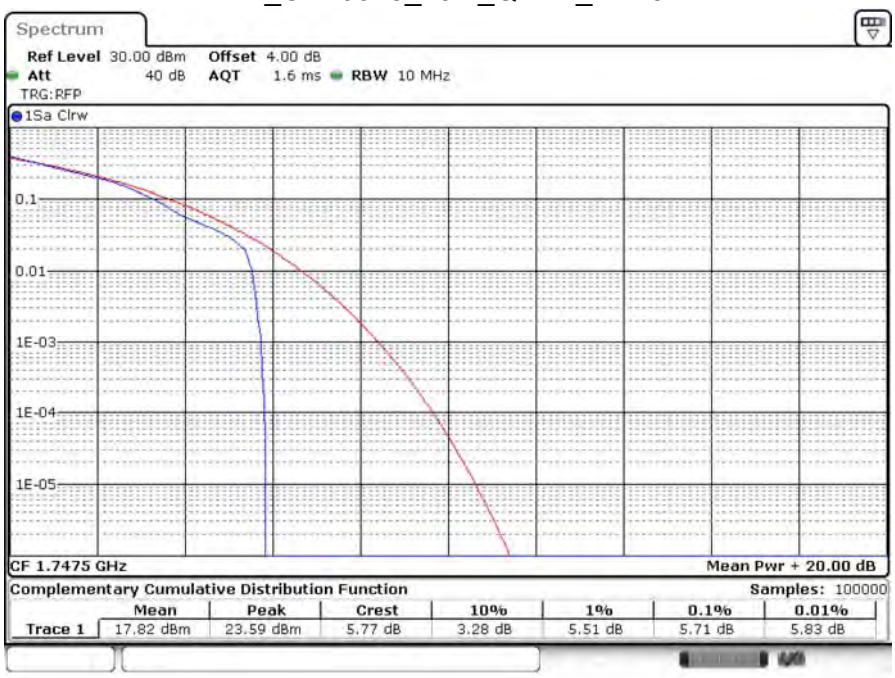
Date: 2.DEC.2020 17:16:56

B4_CH20175_15M_16-QAM_1RB0



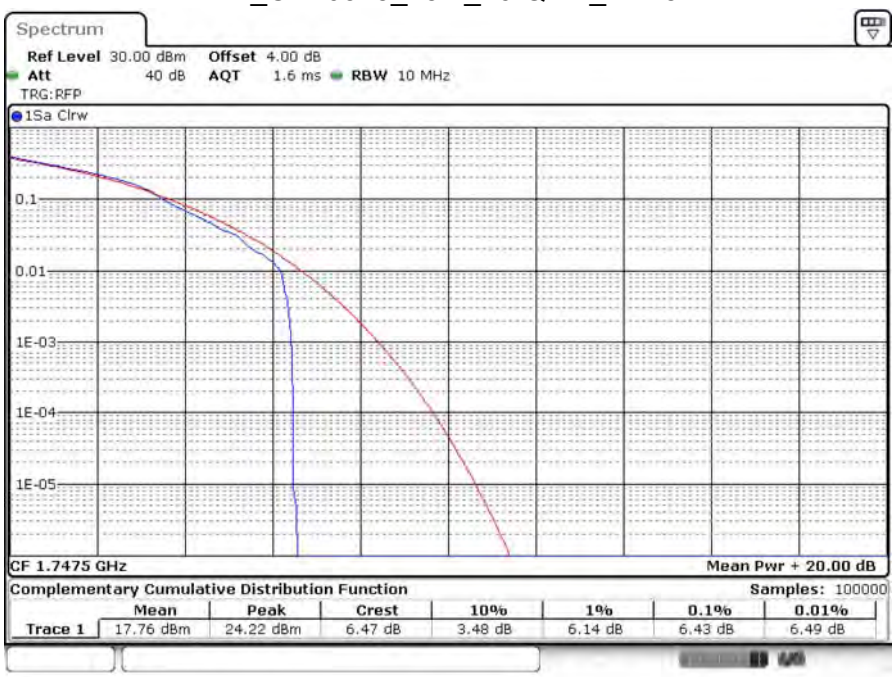
Date: 2.DEC.2020 17:16:48

B4_CH20325_15M_QPSK_1RB5



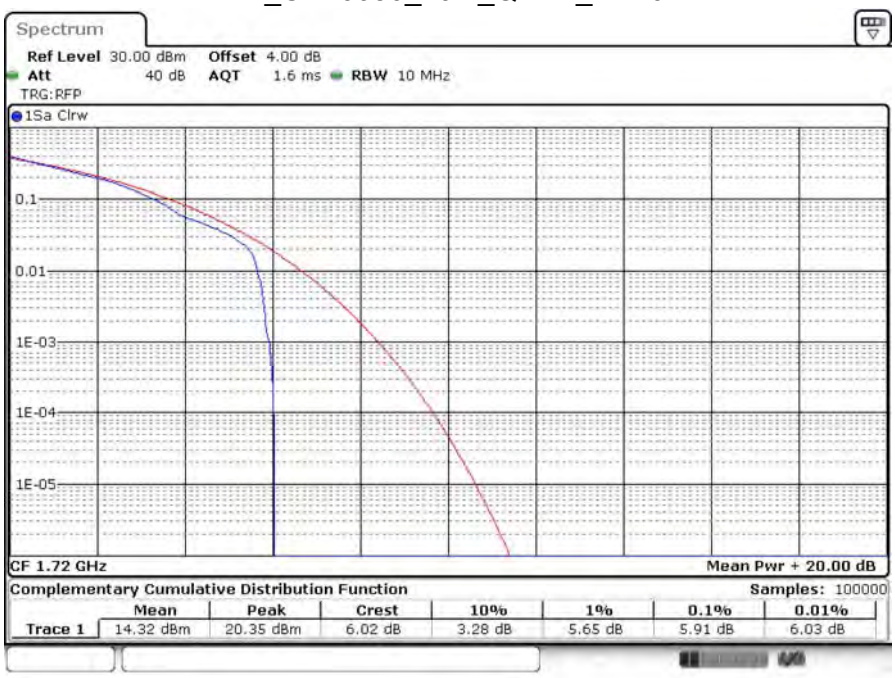
Date: 2.DEC.2020 17:17:25

B4_CH20325_15M_16-QAM_1RB5



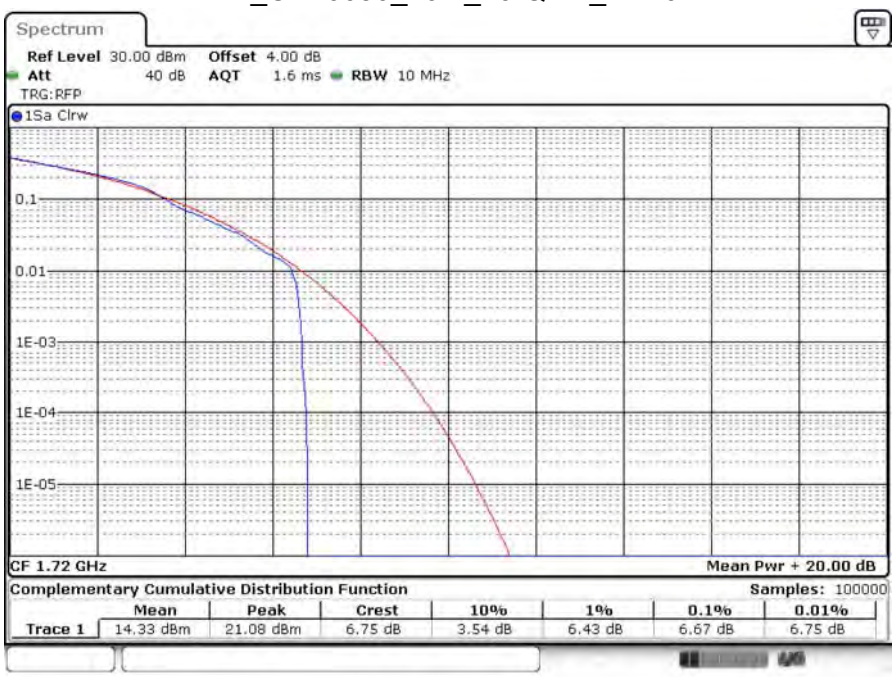
Date: 2.DEC.2020 17:17:37

B4_CH20050_20M_QPSK_1RB0



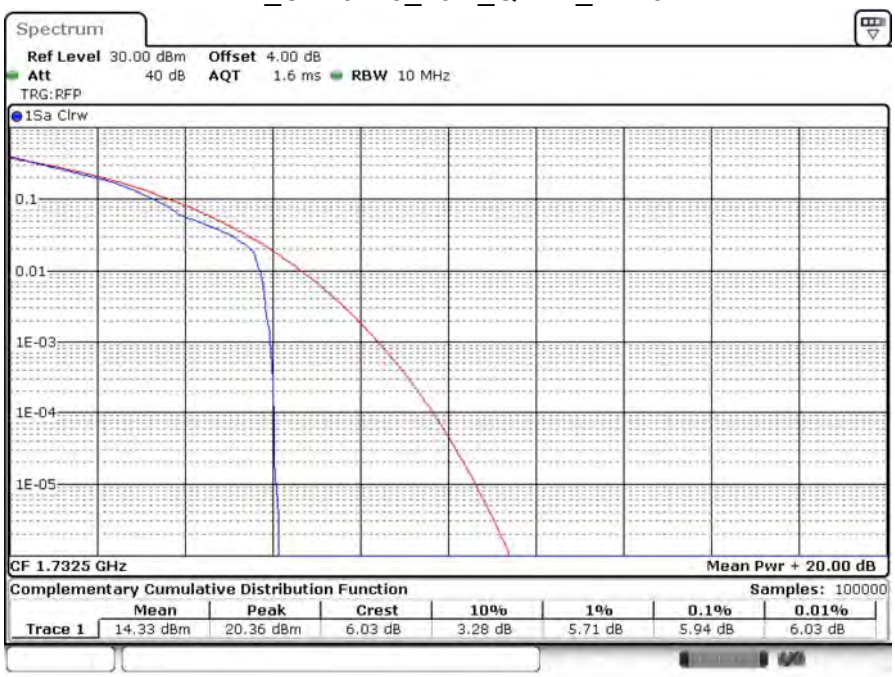
Date: 2.DEC.2020 17:18:16

B4_CH20050_20M_16-QAM_1RB0



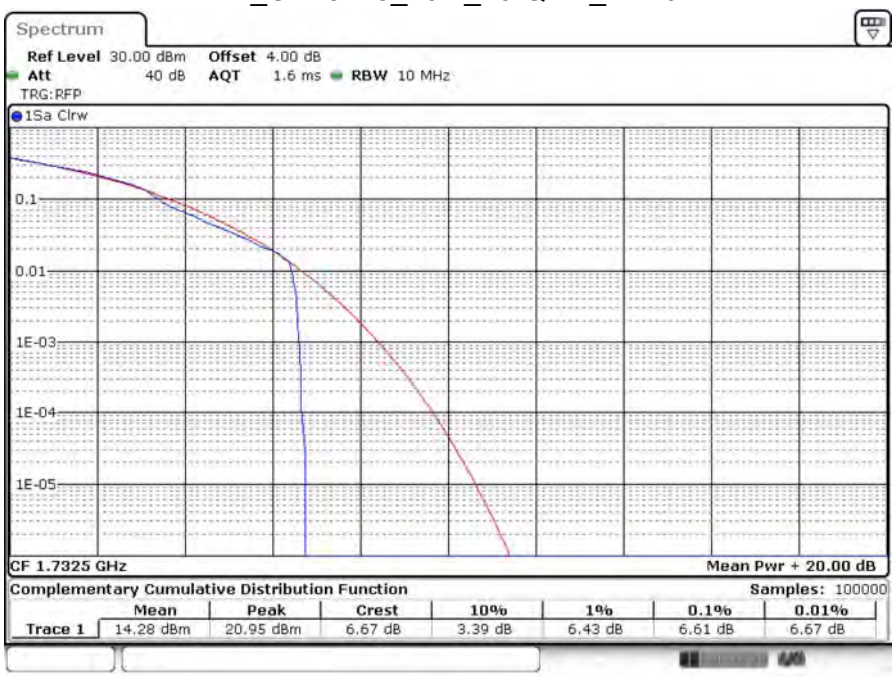
Date: 2.DEC.2020 17:18:26

B4_CH20175_20M_QPSK_1RB0



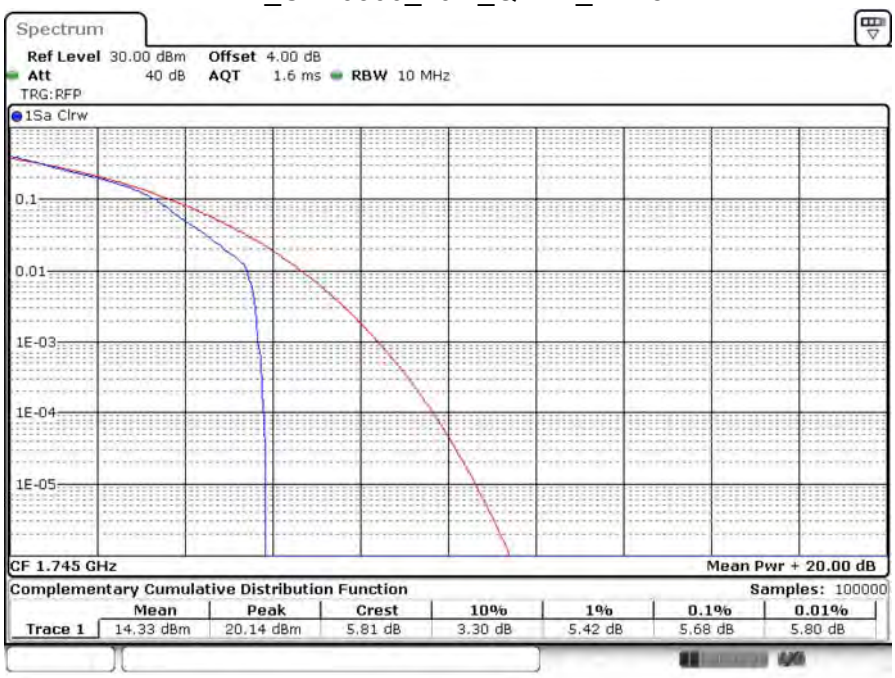
Date: 2.DEC.2020 17:19:00

B4_CH20175_20M_16-QAM_1RB0



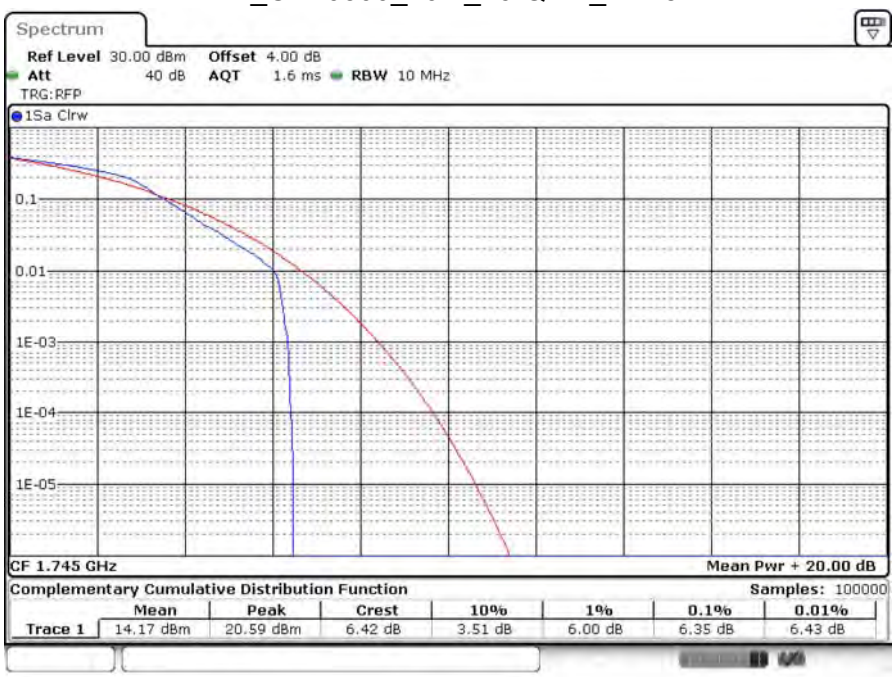
Date: 2.DEC.2020 17:18:50

B4_CH20300_20M_QPSK_1RB5



Date: 2.DEC.2020 17:19:48

B4_CH20300_20M_16-QAM_1RB5

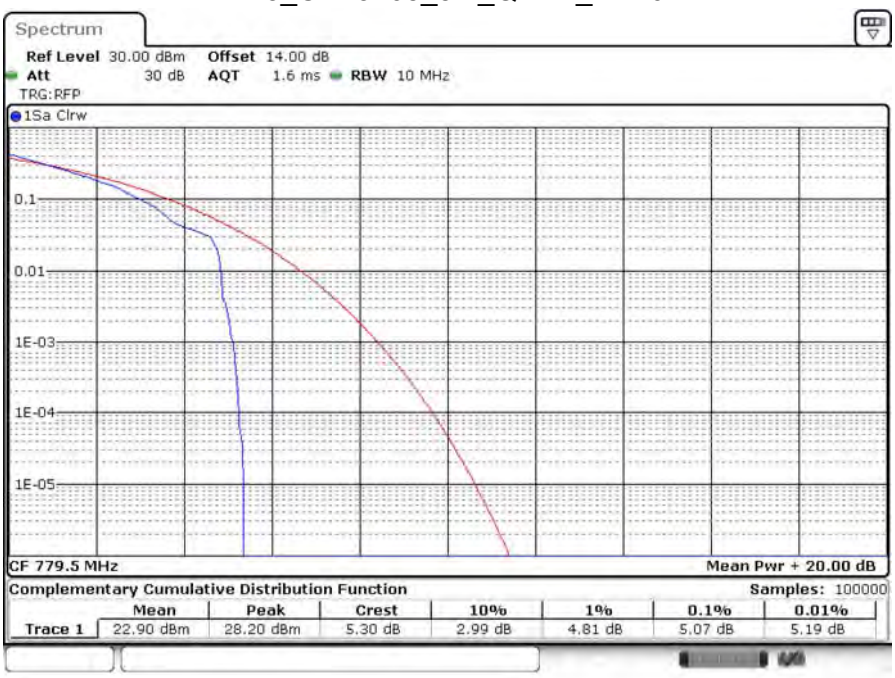


Date: 2.DEC.2020 17:20:08

Product	LGA module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/09	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	67.0

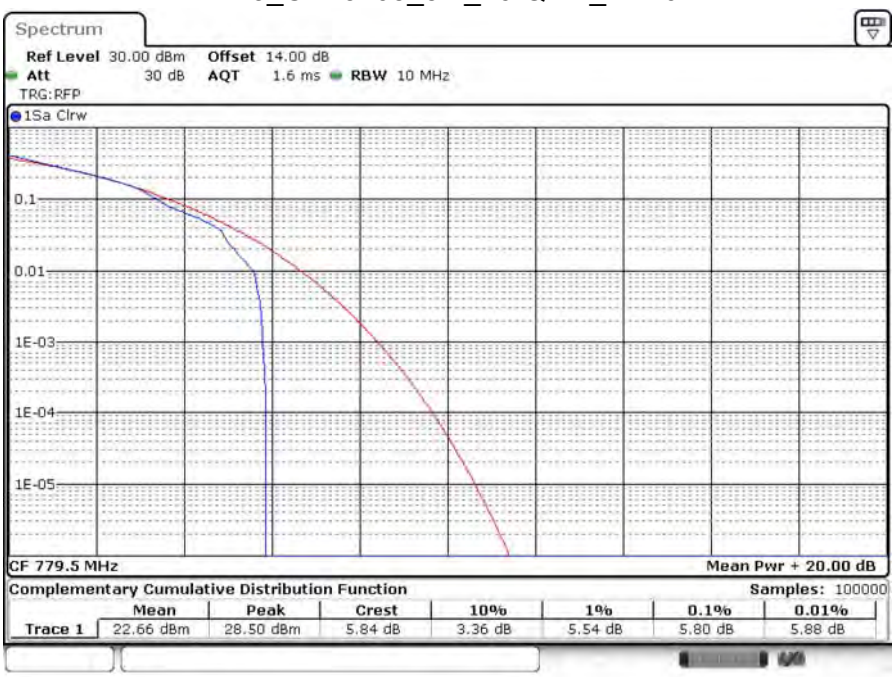
Band width (MHz)	Channel	Frequency (MHz)	Modulation	Peak (dBm)	Average (dBm)	PAPR (dB)
5M	23205	779.5	QPSK	28.20	22.90	5.07
			16-QAM	28.50	22.66	5.80
	23230	782	QPSK	28.20	22.90	5.22
			16-QAM	28.39	22.30	5.77
	23255	784.5	QPSK	28.37	22.79	5.54
			16-QAM	28.69	22.62	5.88
10M	23230	782 low	QPSK	26.58	21.39	5.04
			16-QAM	26.81	21.16	5.57
		782 high	QPSK	26.85	21.37	5.36
			16-QAM	27.12	21.21	5.68

B13_CH23205_5M_QPSK_1RB0



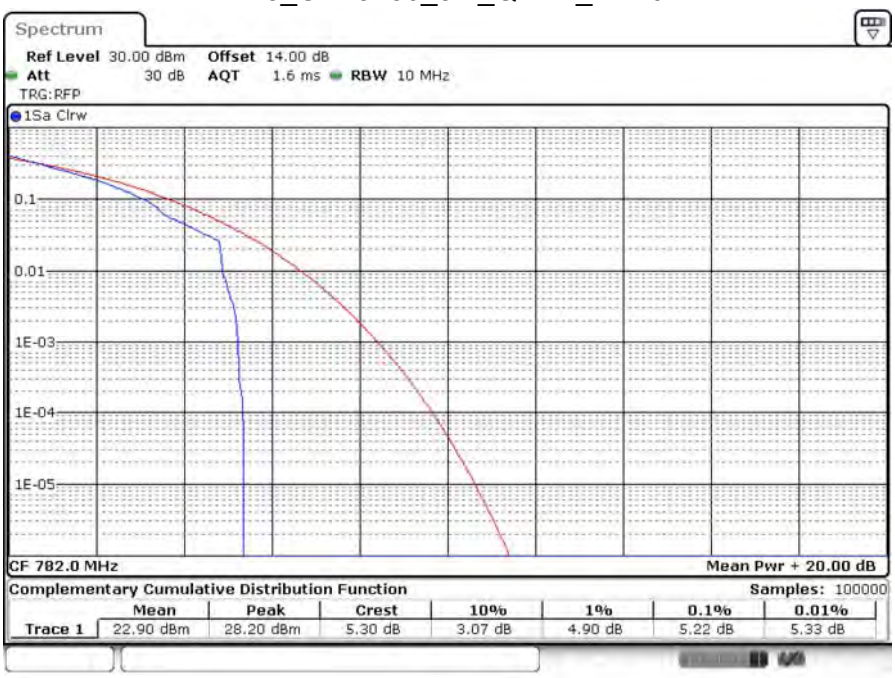
Date: 9.DEC.2020 17:21:22

B13_CH23205_5M_16-QAM_1RB0



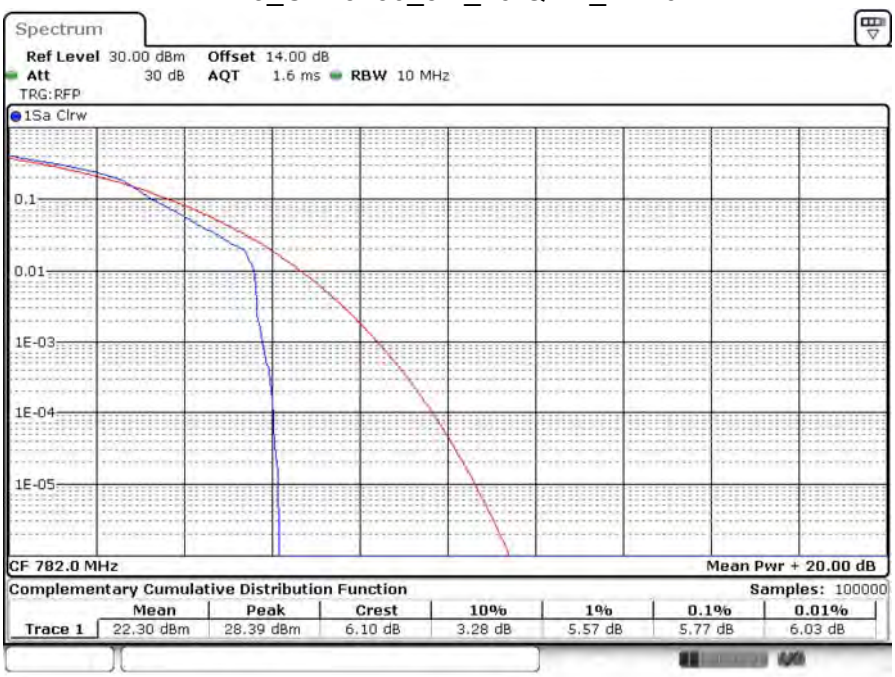
Date: 9.DEC.2020 17:21:34

B13_CH23230_5M_QPSK_1RB0



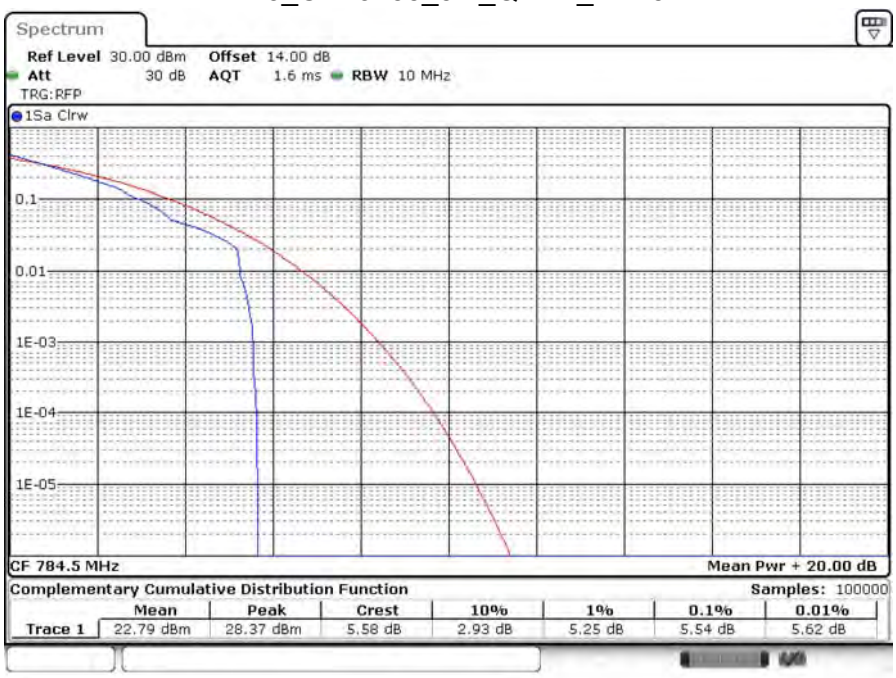
Date: 9.DEC.2020 17:25:21

B13_CH23230_5M_16-QAM_1RB0



Date: 9.DEC.2020 17:25:06

B13_CH23255_5M_QPSK_1RB5



Date: 9.DEC.2020 17:25:52

B13_CH23255_5M_16-QAM_1RB5

Date: 9.DEC.2020 17:26:05

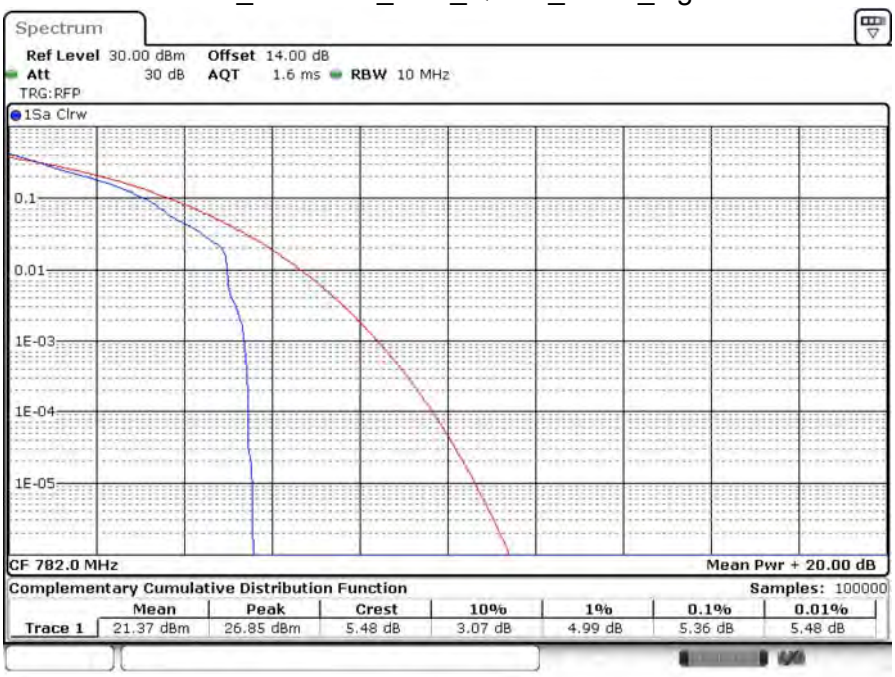
B13_CH23230_10M_QPSK_1RB0_low

Date: 9.DEC.2020 17:27:17

B13_CH23230_10M_16-QAM_1RB0_low

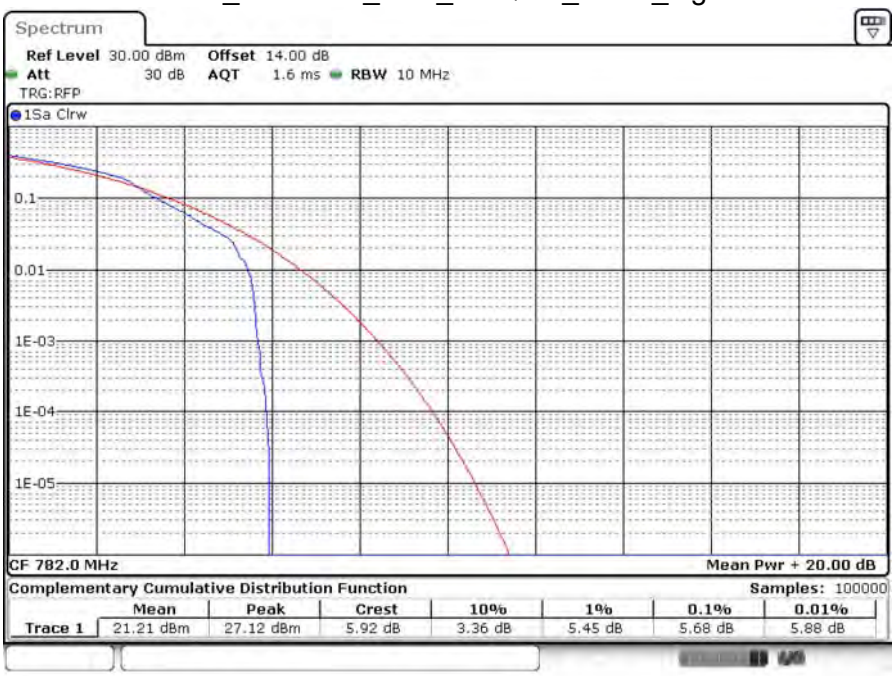
Date: 9.DEC.2020 17:27:27

B13_CH23230_10M_QPSK_1RB5_high



Date: 9.DEC.2020 17:27:05

B13_CH23230_10M_16-QAM_1RB5_high

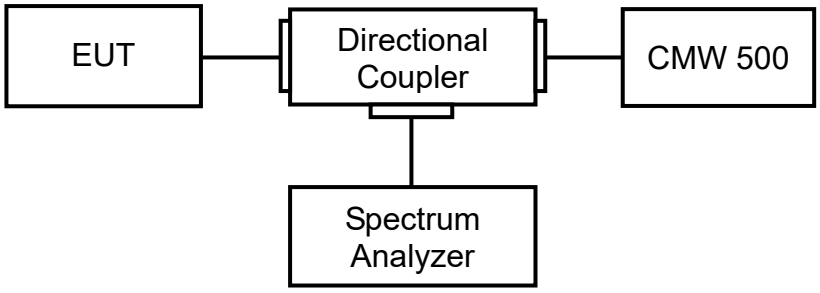


Date: 9.DEC.2020 17:26:53

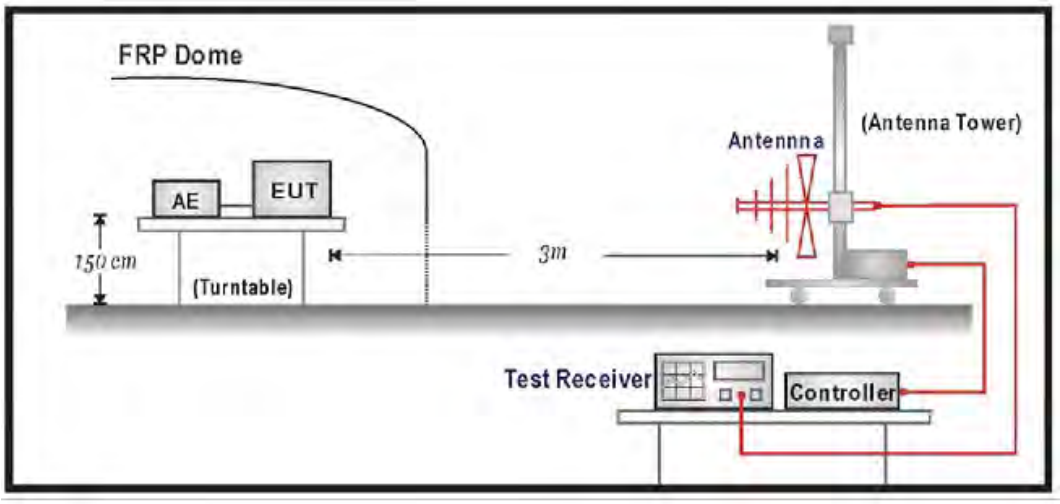
6. Spurious Emissions

6.1. Test Setup

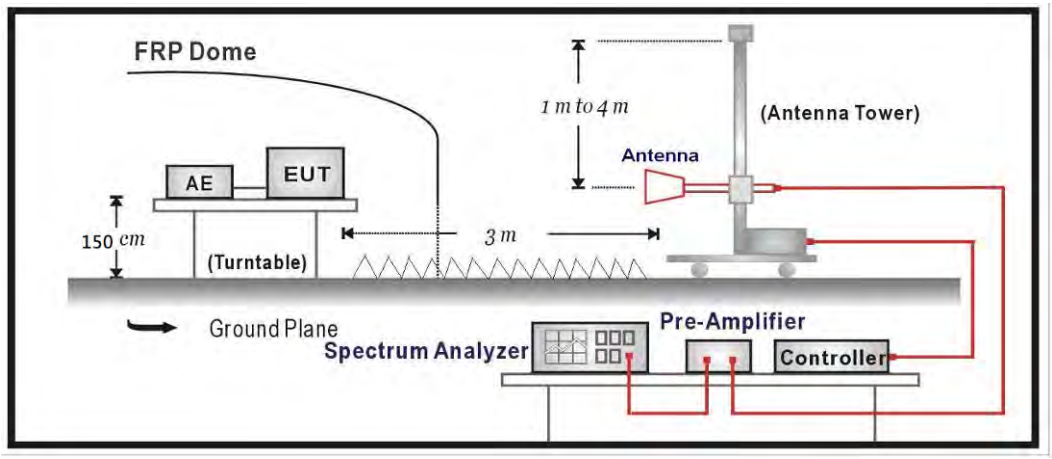
Conducted Spurious Measurement:



Radiated Spurious Measurement (below 1GHz)



Radiated Spurious Measurement (above 1GHz)



6.2. Test Procedure

Conducted Spurious Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c) EUT Communicate with CMW500, then select a channel for testing.
d) Add a correction factor to the display of spectrum, and then test.
e) The resolution bandwidth of the spectrum analyzer was set at 1 MHz, sufficient scans were taken to show the out of band Emission if any up to 10^{th} harmonic.

Radiated Spurious Measurement:

a) The EUT was placed on a rotatable wooden table with 1.5 meter above ground.
b) The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
c) The table was rotated 360 degrees to determine the position of the highest spurious emission.
d) The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
e) Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 1MHz, Sweep 500ms, Taking the record of maximum spurious emission.
f) A horn antenna was substituted in place of the EUT and was driven by a signal generator.
g) Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
h) Taking the record of output power at antenna port
i) Repeat step 7 to step 8 for another polarization.
j) EIRP = SG - Cable loss + Antenna Gain

6.3. Test Method

Conducted Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 6.1
ANSI C63.26: 2015 Sub-clause 5.7

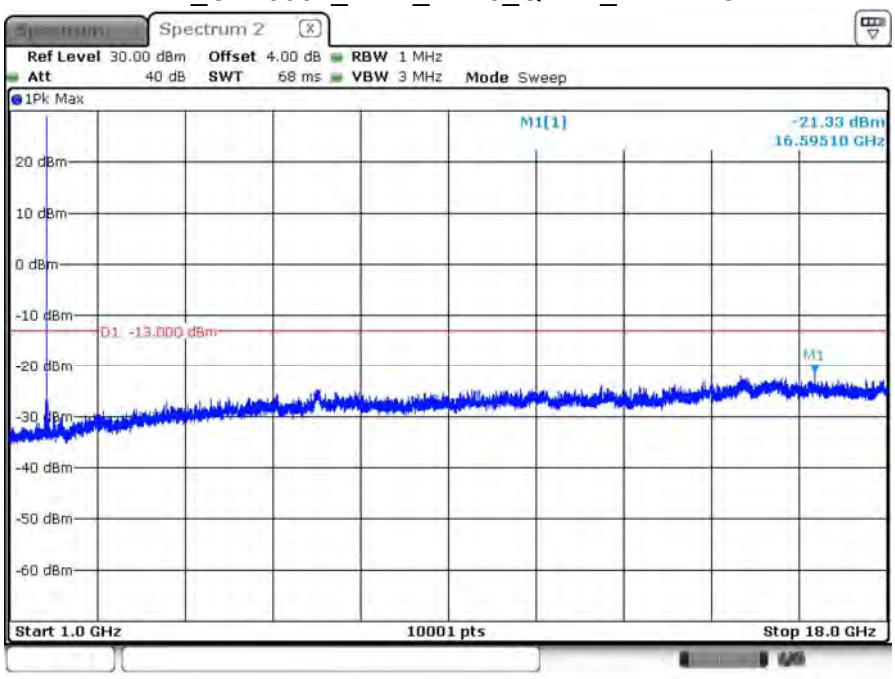
Radiated Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.8
ANSI C63.26: 2015 Sub-clause 5.5.3.2

6.4. Test Result

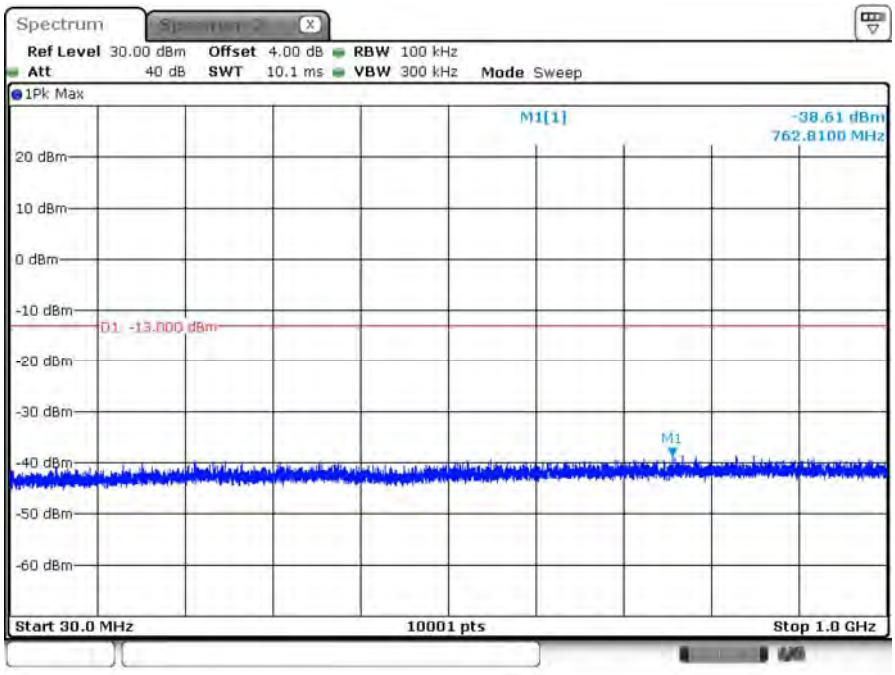
Product	LGA module		
Test Item	Conducted Spurious Emissions		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/04	Test Site	SR12-H
Temperature (°C)	25.0	Humidity (%RH)	60.0

B4_CH19957_1.4M_1RB0_QPSK_Above1G



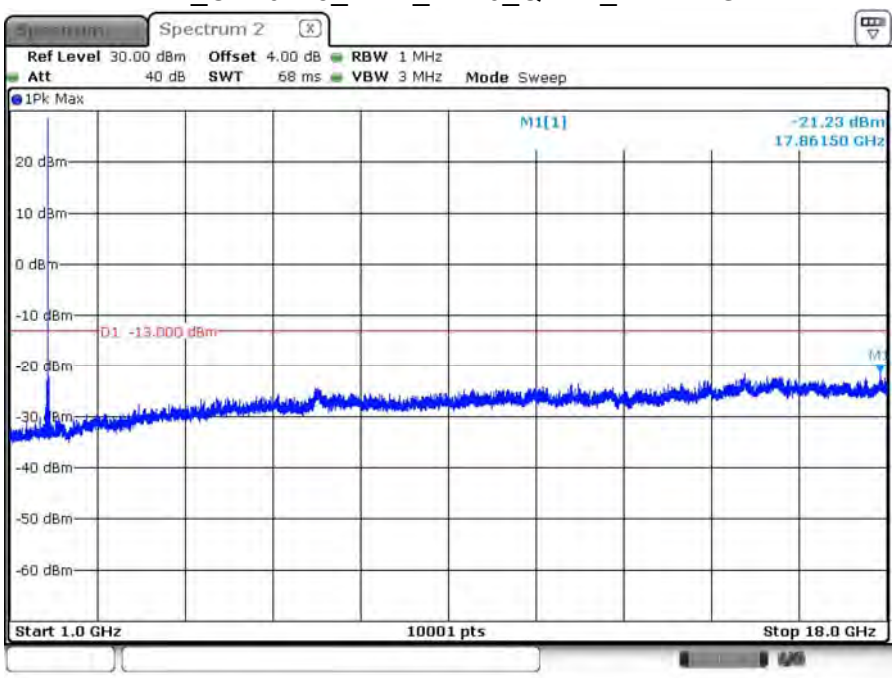
Date: 4.DEC.2020 10:17:24

B4_CH19957_1.4M_1RB0_QPSK_Below1G



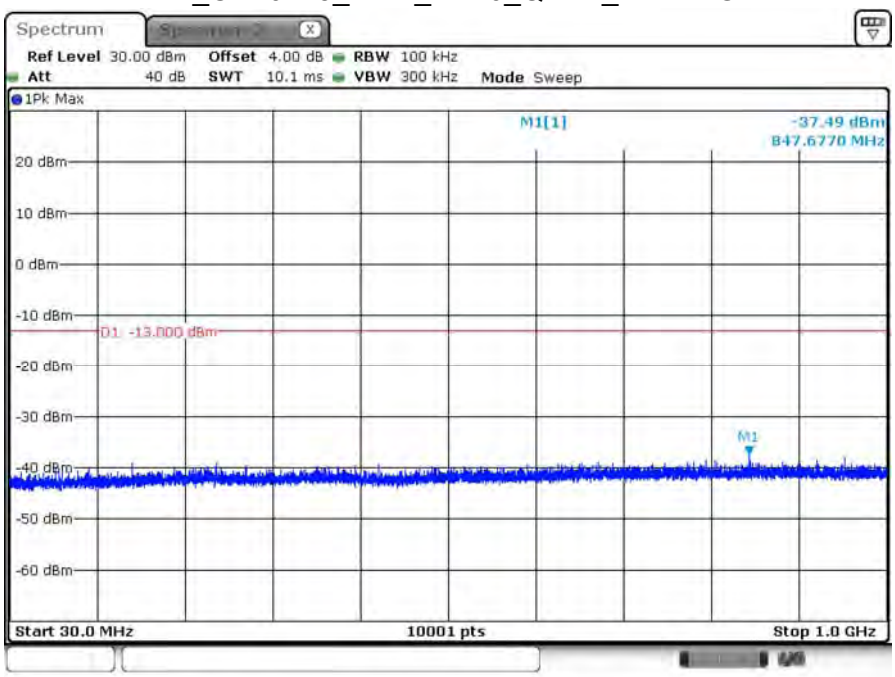
Date: 4.DEC.2020 10:16:35

B4_CH20175_1.4M_1RB0_QPSK_Above1G



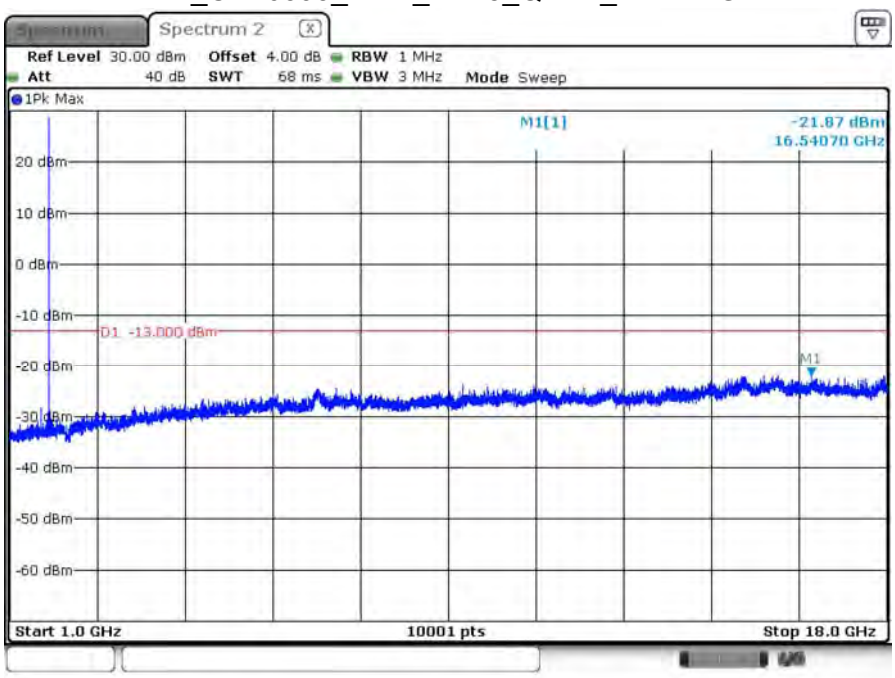
Date: 4.DEC.2020 10:18:19

B4_CH20175_1.4M_1RB0_QPSK_Below1G



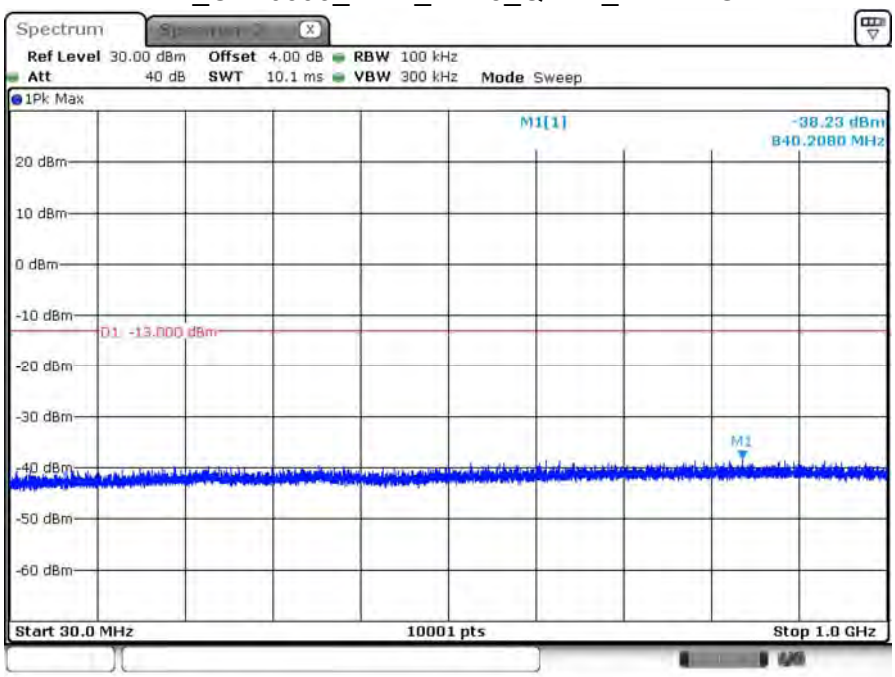
Date: 4.DEC.2020 10:19:17

B4_CH20393_1.4M_1RB5_QPSK_Above1G



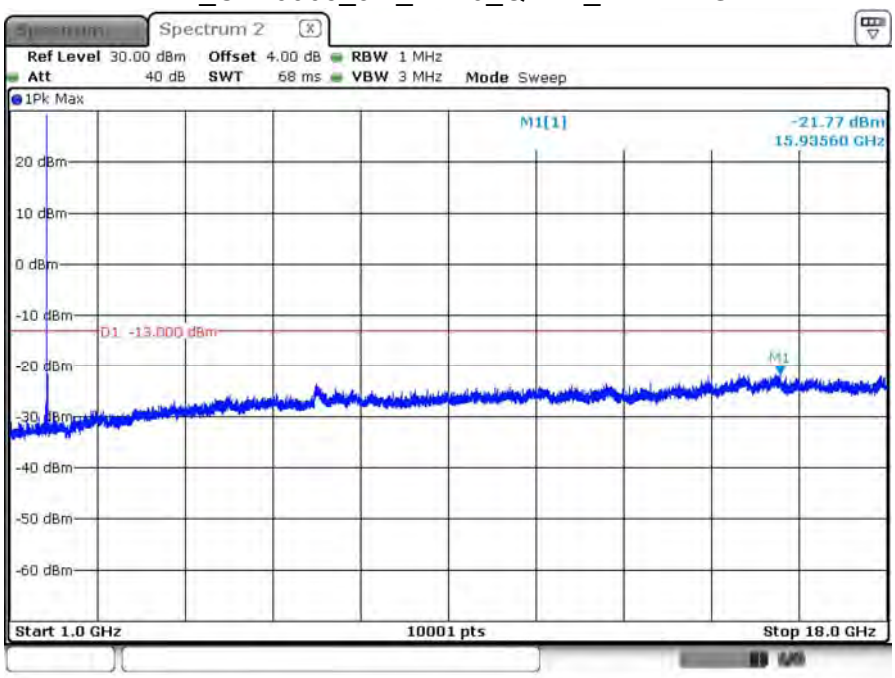
Date: 4.DEC.2020 10:21:13

B4_CH20393_1.4M_1RB5_QPSK_Below1G



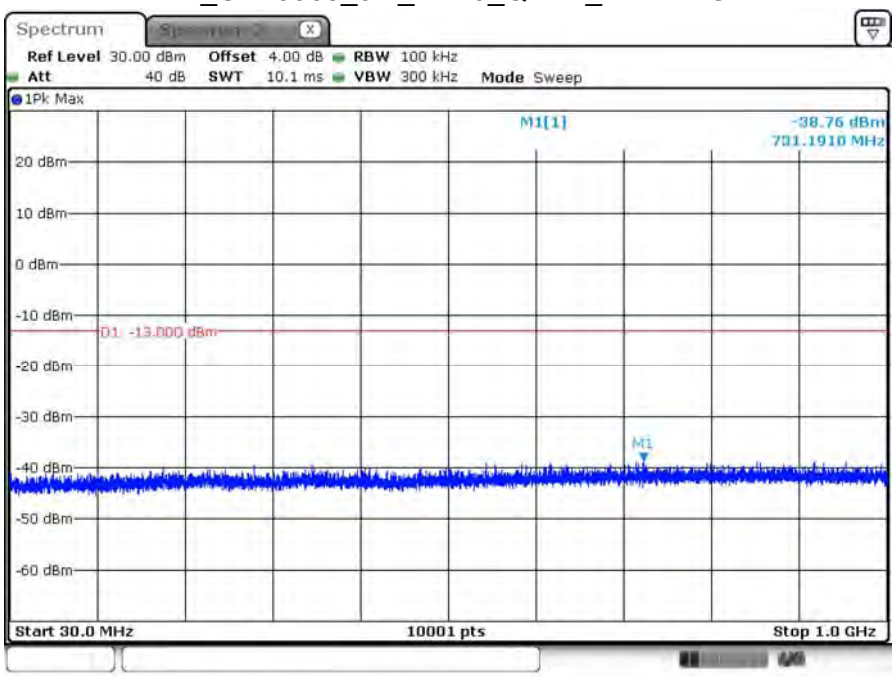
Date: 4.DEC.2020 10:20:26

B4_CH19965_3M_1RB0_QPSK_Above 1G



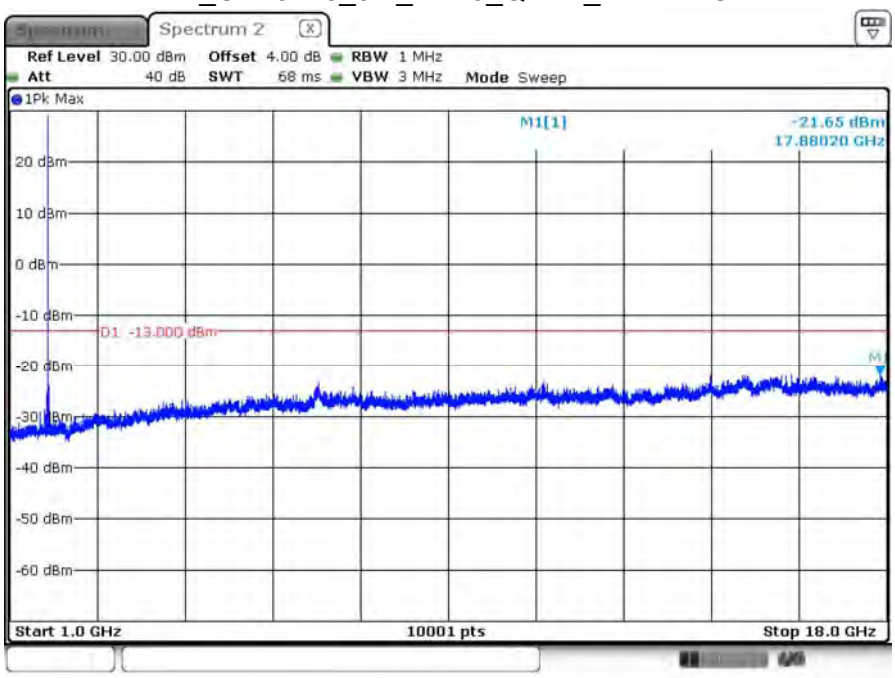
Date: 4.DEC.2020 10:23:33

B4_CH19965_3M_1RB0_QPSK_Below 1G



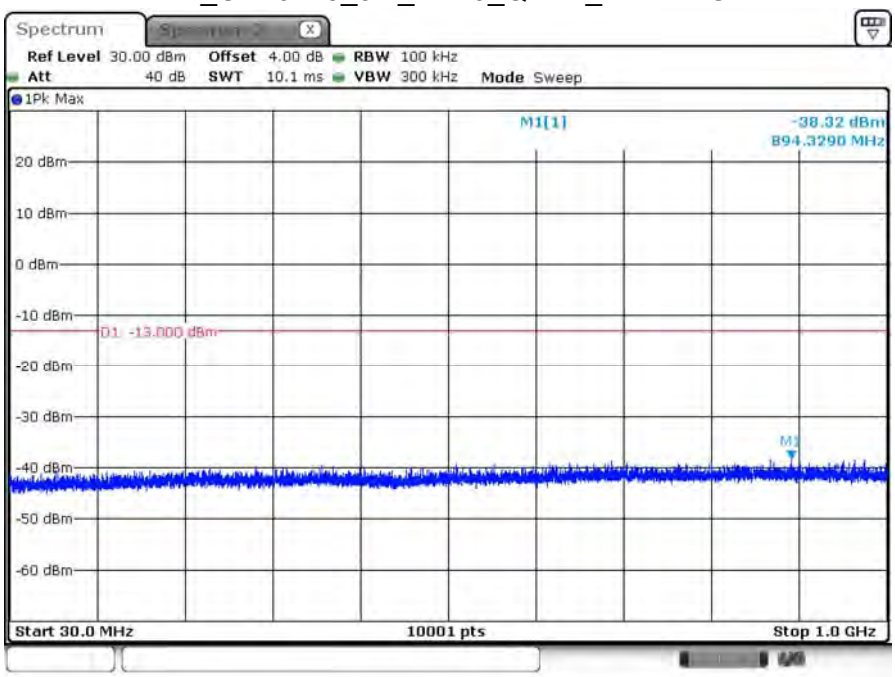
Date: 4.DEC.2020 10:24:15

B4_CH20175_3M_1RB0_QPSK_Above 1G



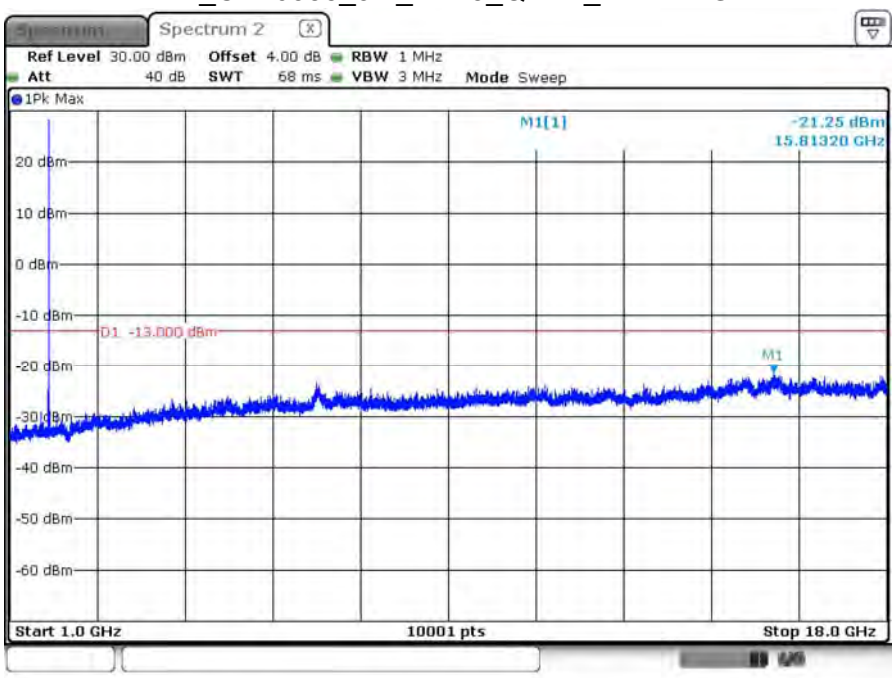
Date: 4.DEC.2020 10:26:01

B4_CH20175_3M_1RB0_QPSK_Below 1G



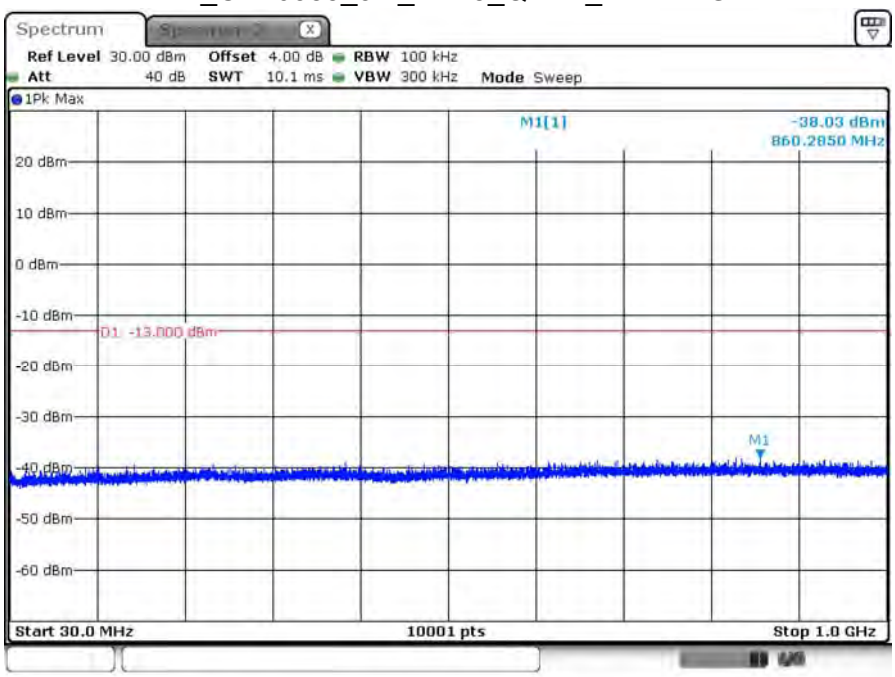
Date: 4.DEC.2020 10:24:54

B4_CH20385_3M_1RB5_QPSK_Above 1G



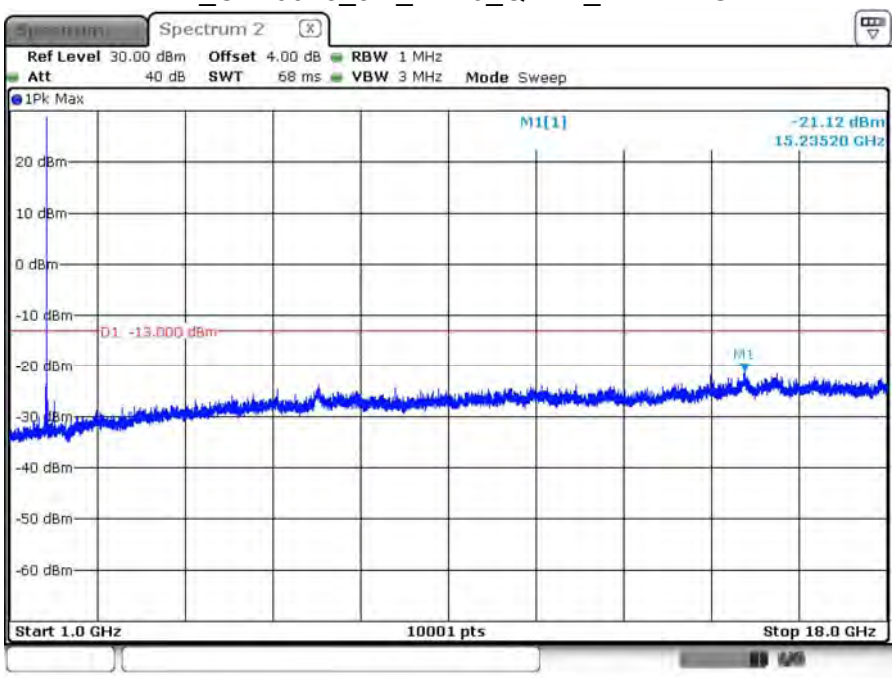
Date: 4.DEC.2020 10:26:59

B4_CH20385_3M_1RB5_QPSK_Below 1G

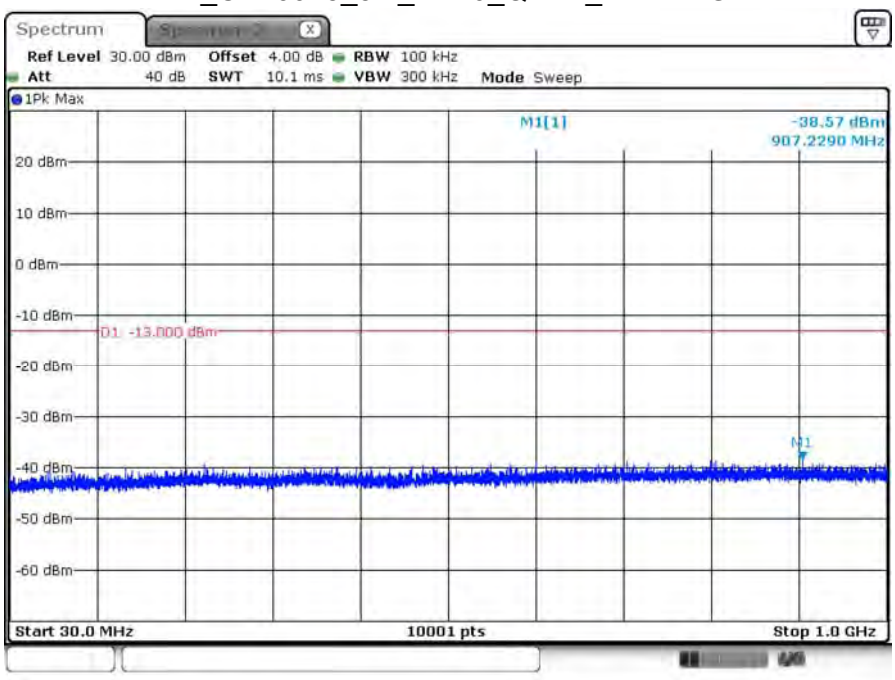


Date: 4.DEC.2020 10:29:30

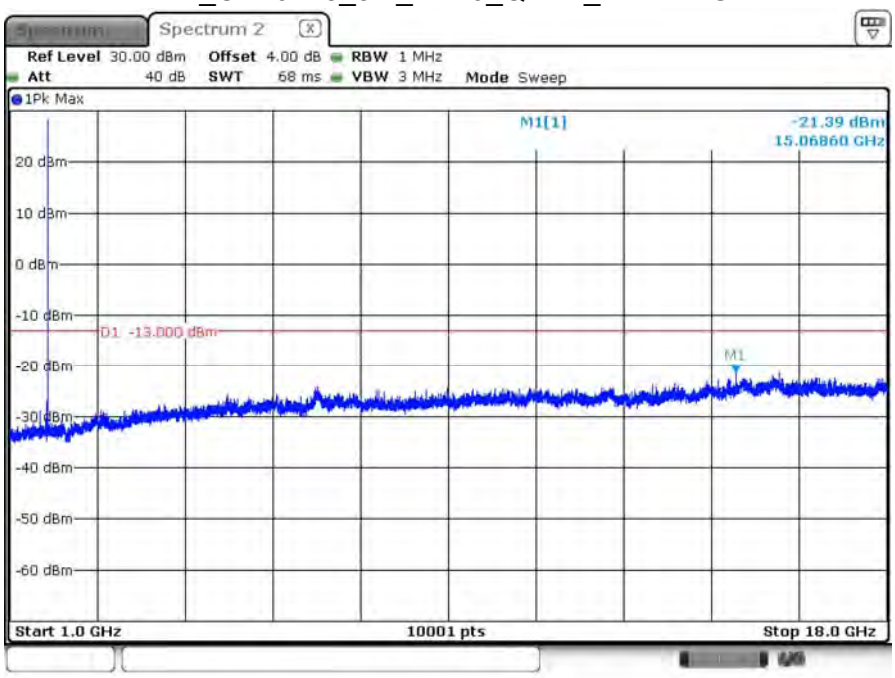
B4_CH19975_5M_1RB0_QPSK_Above 1G



B4_CH19975_5M_1RB0_QPSK_Below 1G

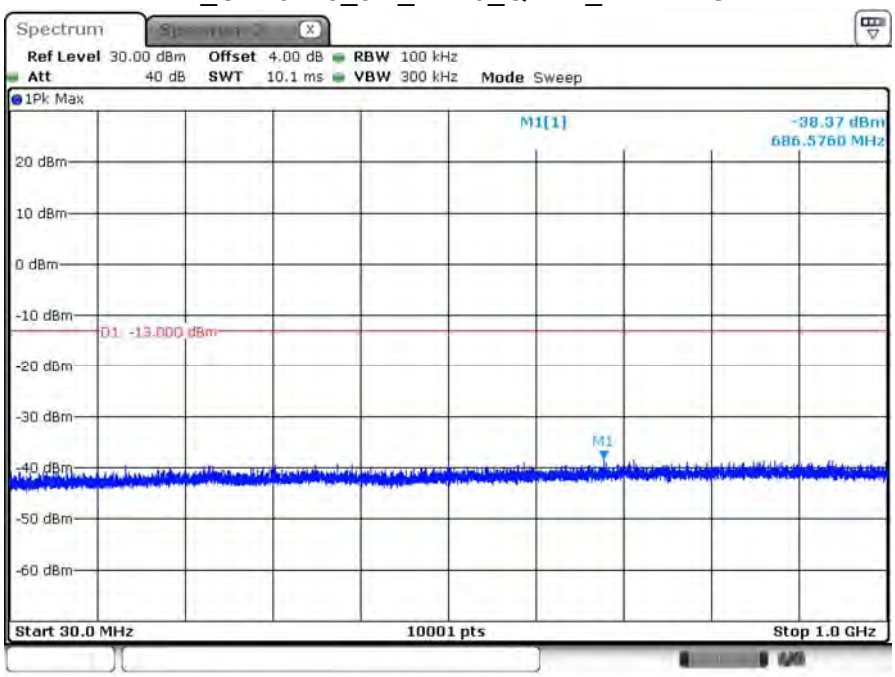


B4_CH20175_5M_1RB0_QPSK_Above 1G



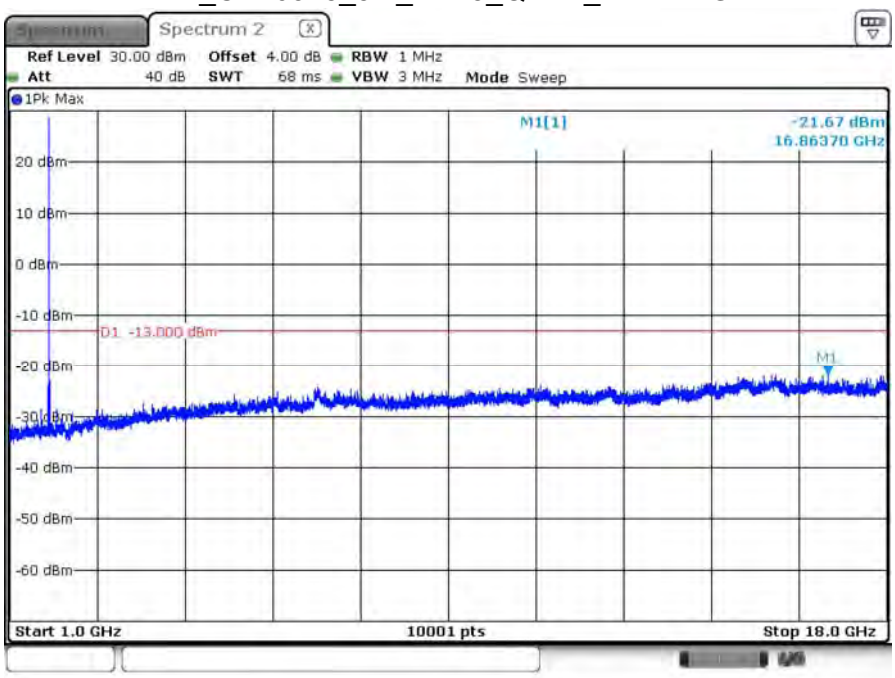
Date: 4.DEC.2020 13:28:25

B4_CH20175_5M_1RB0_QPSK_Below 1G



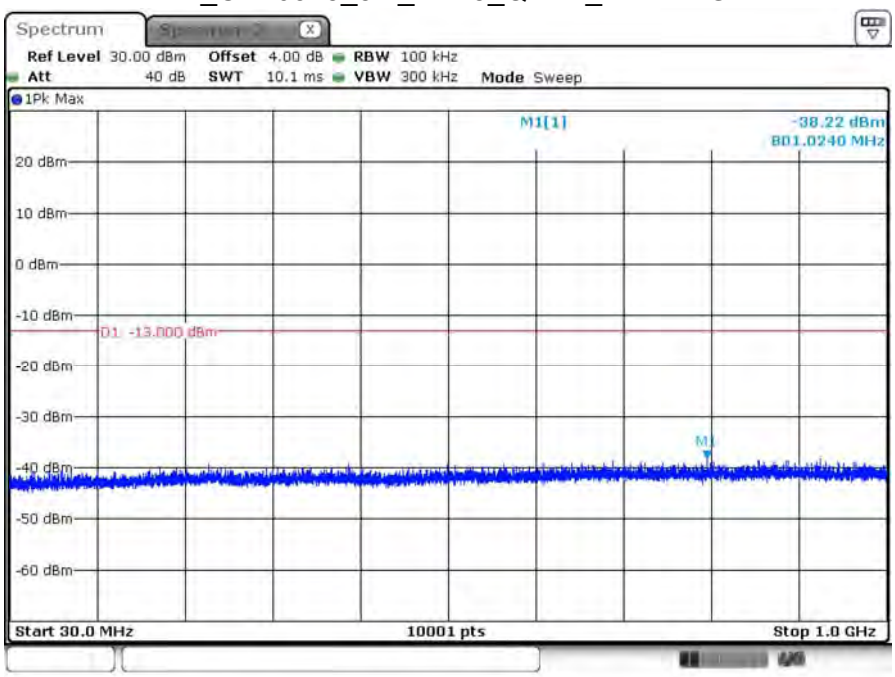
Date: 4.DEC.2020 13:30:45

B4_CH20375_5M_1RB5_QPSK_Above 1G



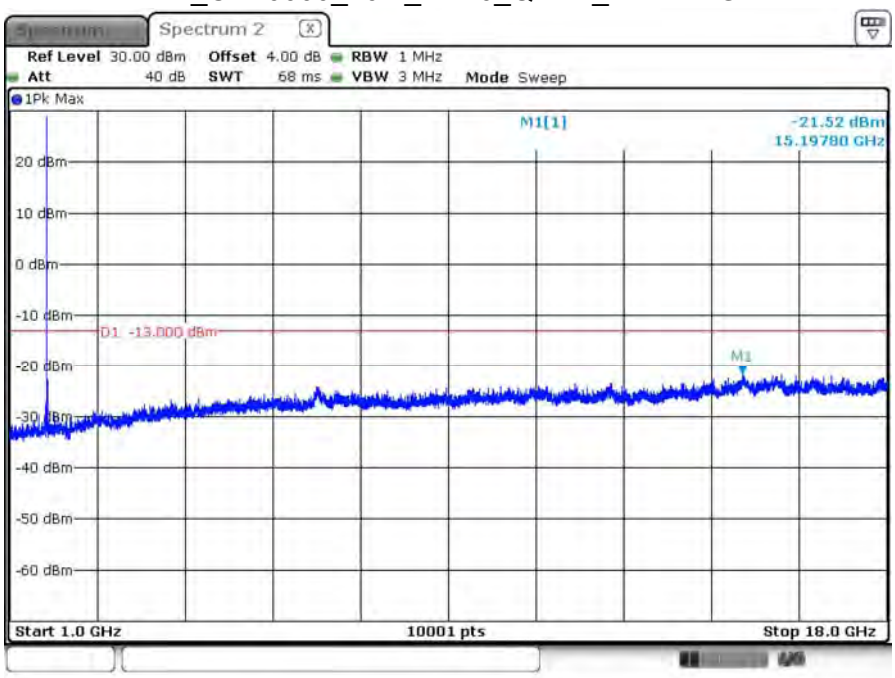
Date: 4.DEC.2020 13:32:50

B4_CH20375_5M_1RB5_QPSK_Below 1G



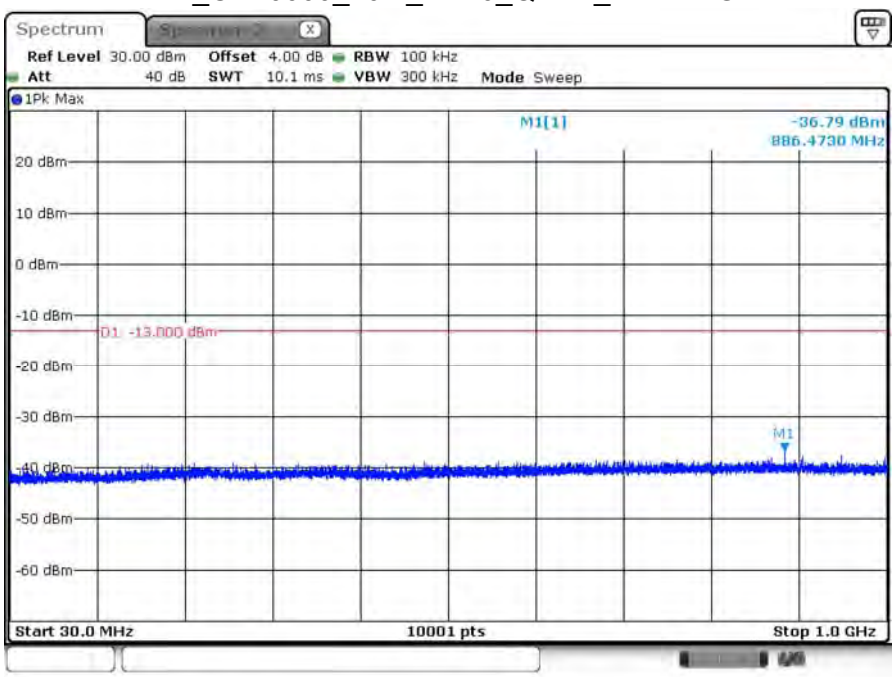
Date: 4.DEC.2020 13:31:50

B4_CH20000_10M_1RB0_QPSK_Above 1G



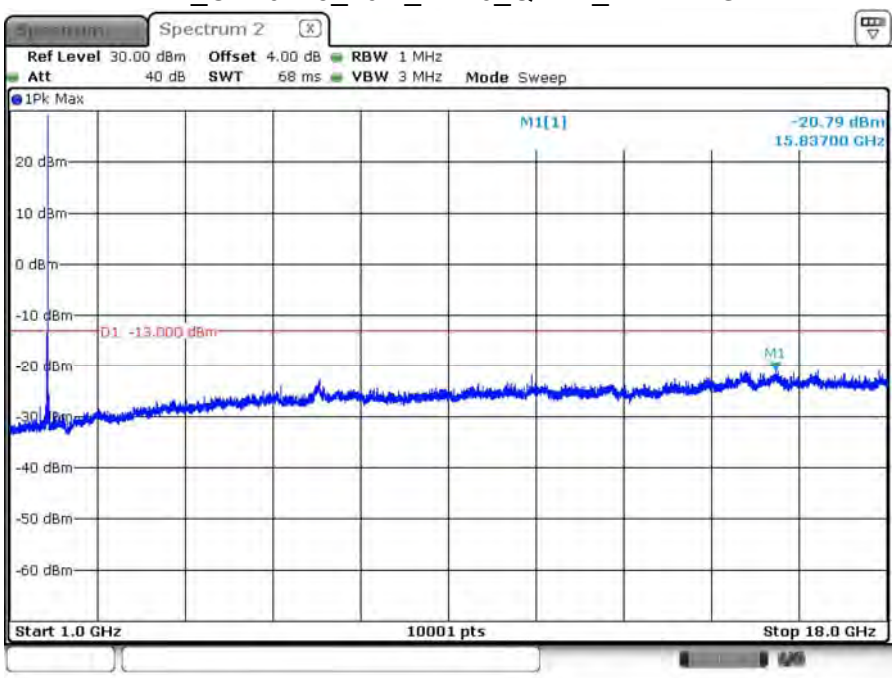
Date: 4.DEC.2020 13:34:44

B4_CH20000_10M_1RB0_QPSK_Below 1G



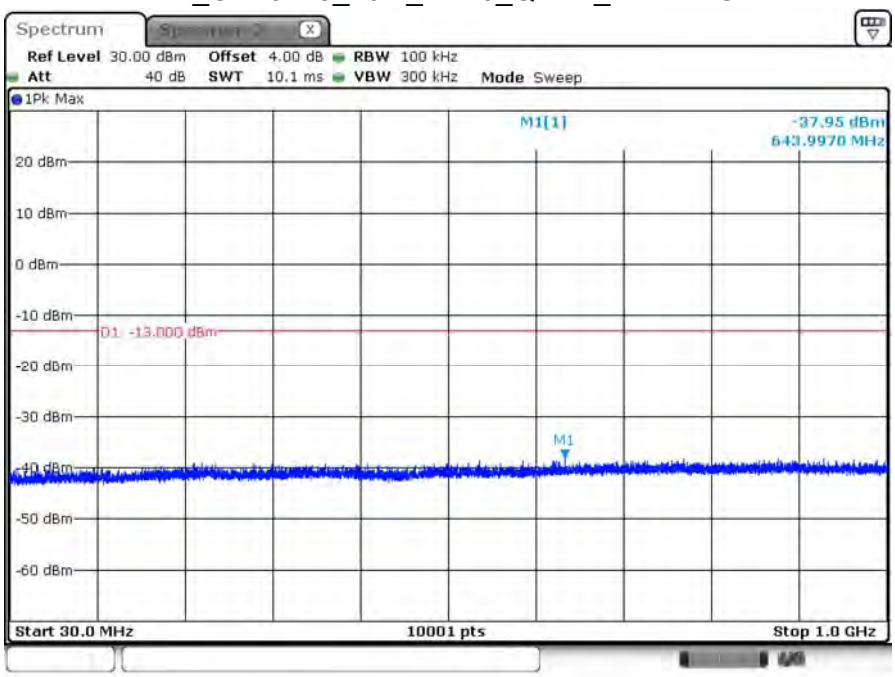
Date: 4.DEC.2020 13:40:13

B4_CH20175_10M_1RB0_QPSK_Above 1G



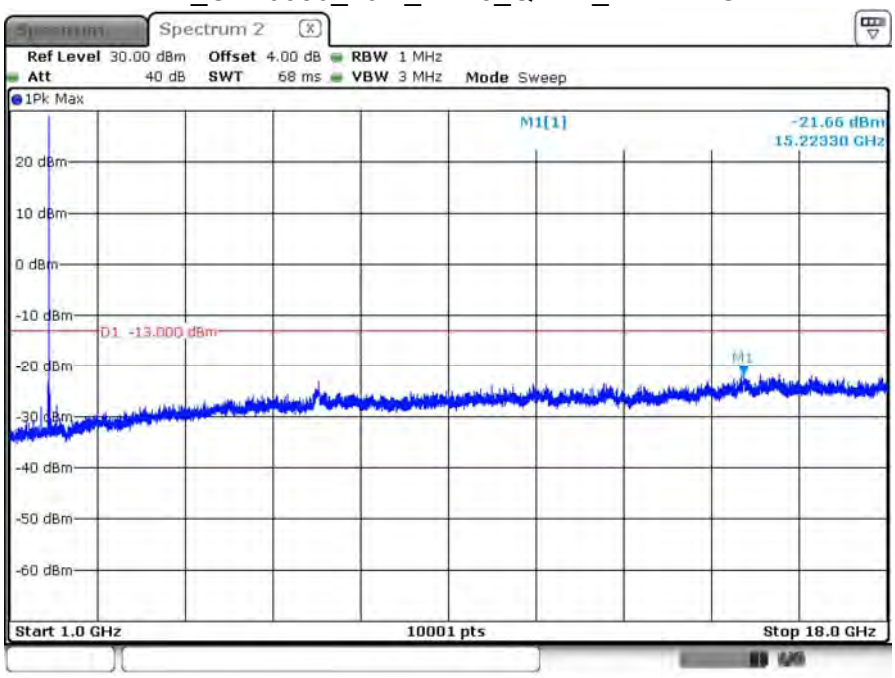
Date: 4.DEC.2020 13:53:08

B4_CH20175_10M_1RB0_QPSK_Below 1G



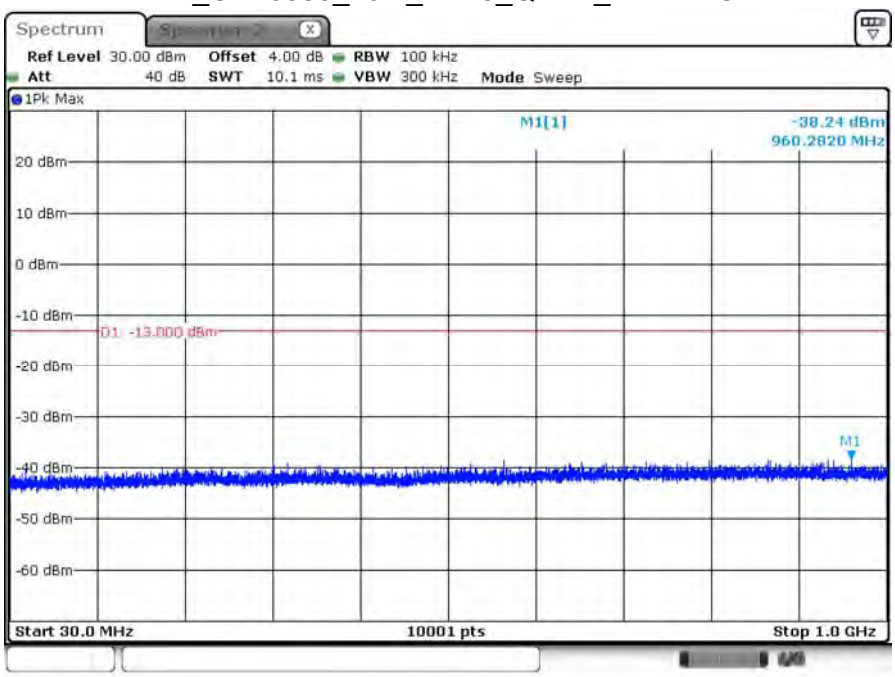
Date: 4.DEC.2020 13:45:01

B4_CH20350_10M_1RB5_QPSK_Above 1G



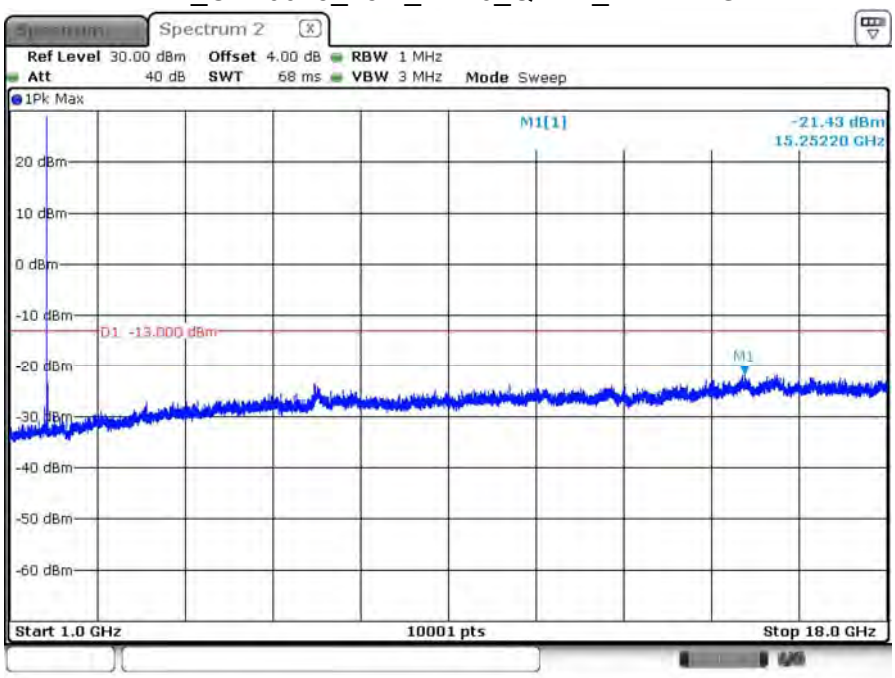
Date: 4.DEC.2020 13:54:06

B4_CH20350_10M_1RB5_QPSK_Below 1G



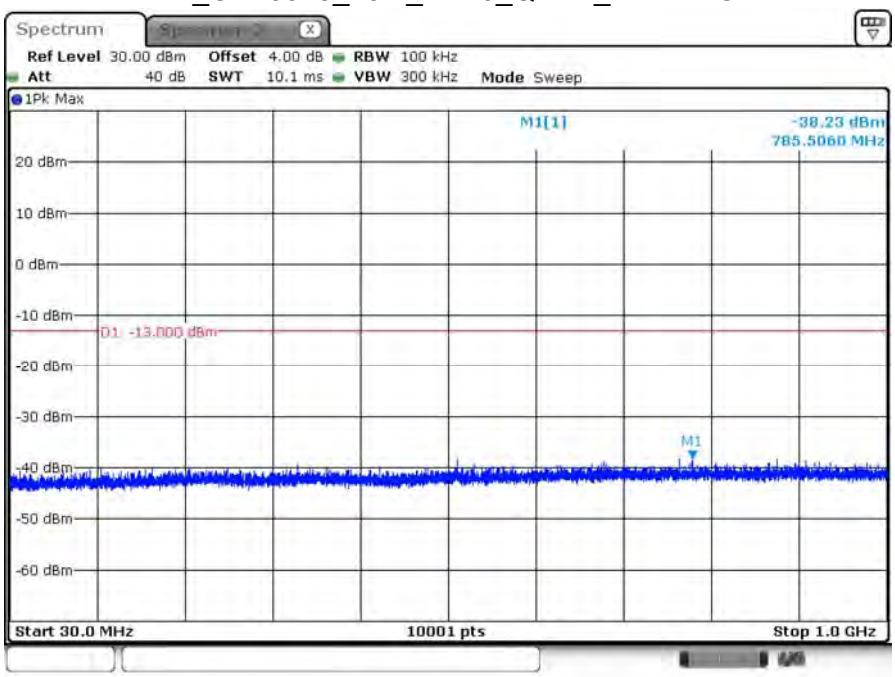
Date: 4.DEC.2020 13:54:54

B4_CH20025_15M_1RB0_QPSK_Above 1G



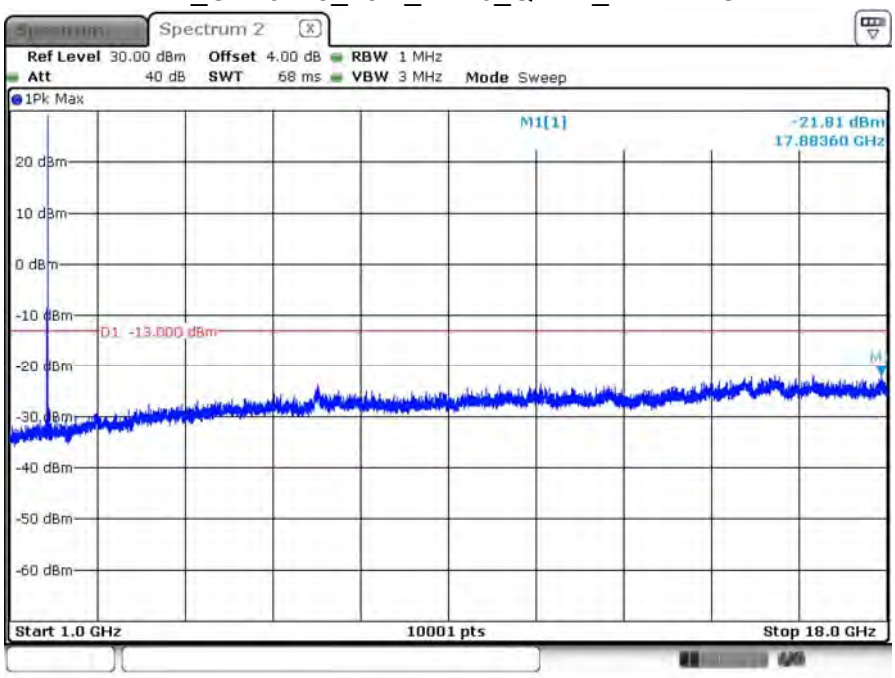
Date: 4.DEC.2020 13:56:58

B4_CH20025_15M_1RB0_QPSK_Below 1G



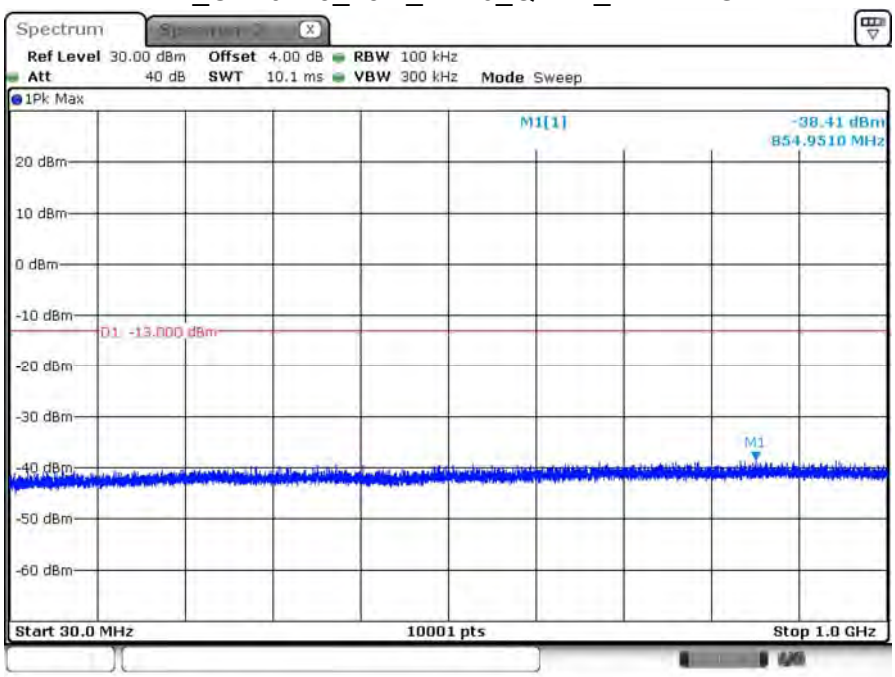
Date: 4.DEC.2020 13:56:03

B4_CH20175_15M_1RB0_QPSK_Above 1G



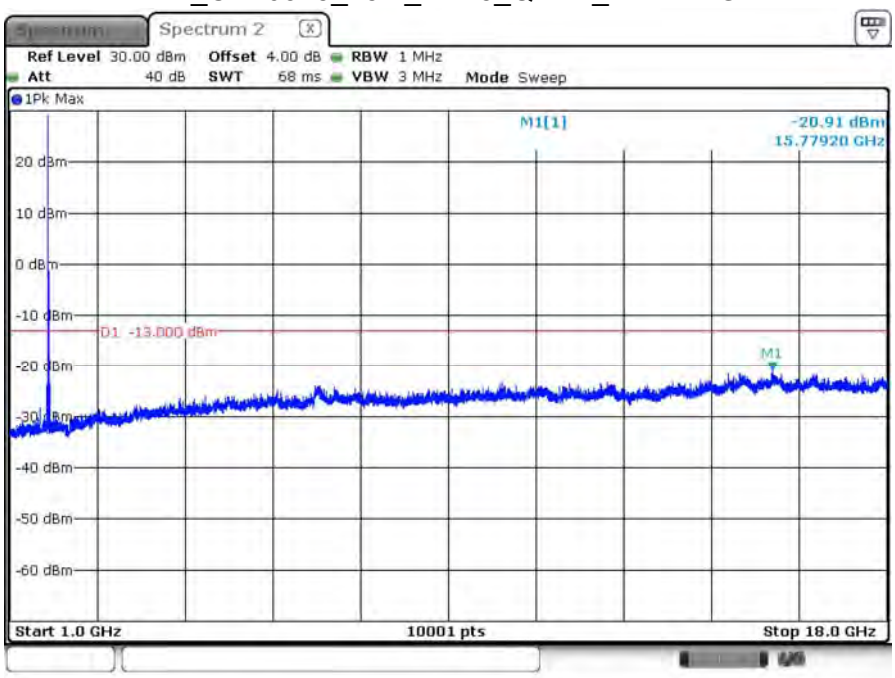
Date: 4.DEC.2020 13:57:37

B4_CH20175_15M_1RB0_QPSK_Below 1G



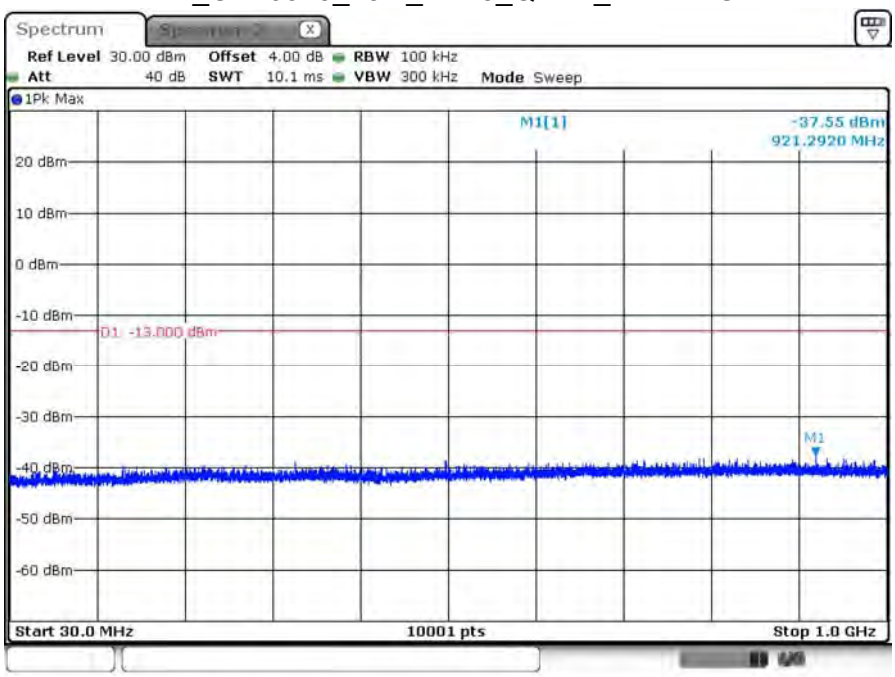
Date: 4.DEC.2020 13:58:39

B4_CH20325_15M_1RB5_QPSK_Above 1G



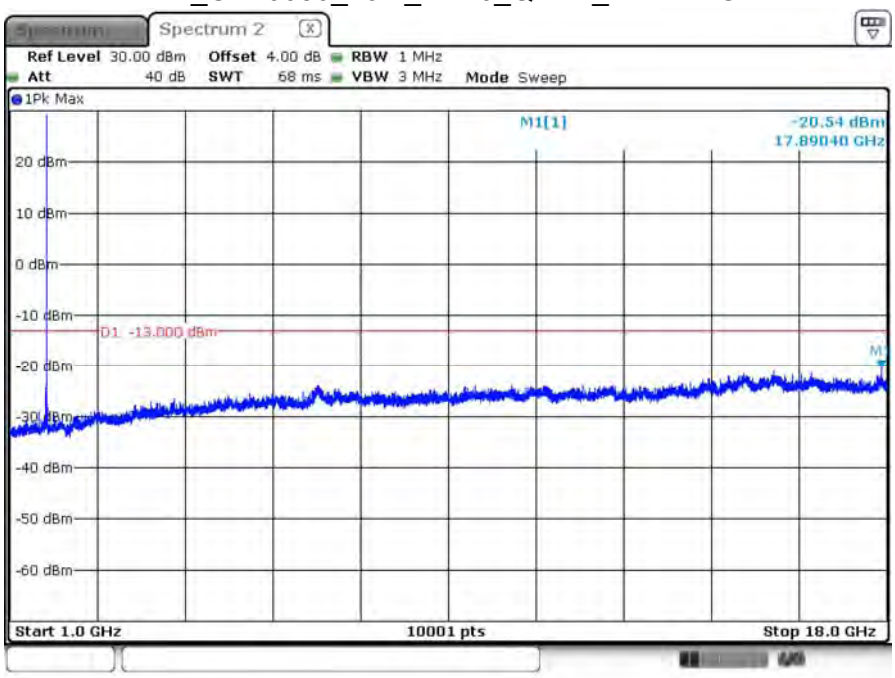
Date: 4.DEC.2020 14:03:43

B4_CH20325_15M_1RB5_QPSK_Below 1G



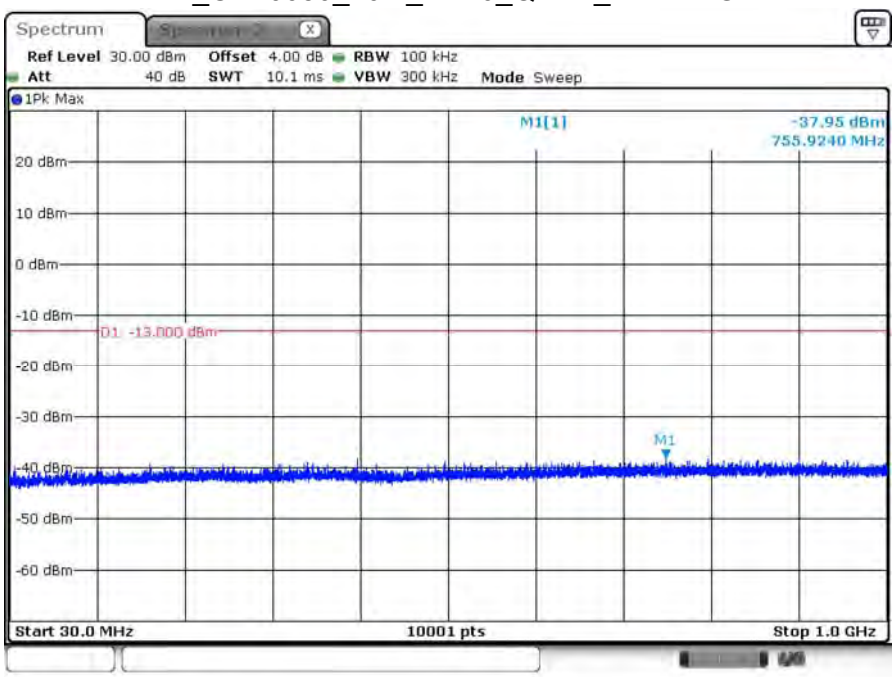
Date: 4.DEC.2020 14:00:55

B4_CH20050_20M_1RB0_QPSK_Above 1G



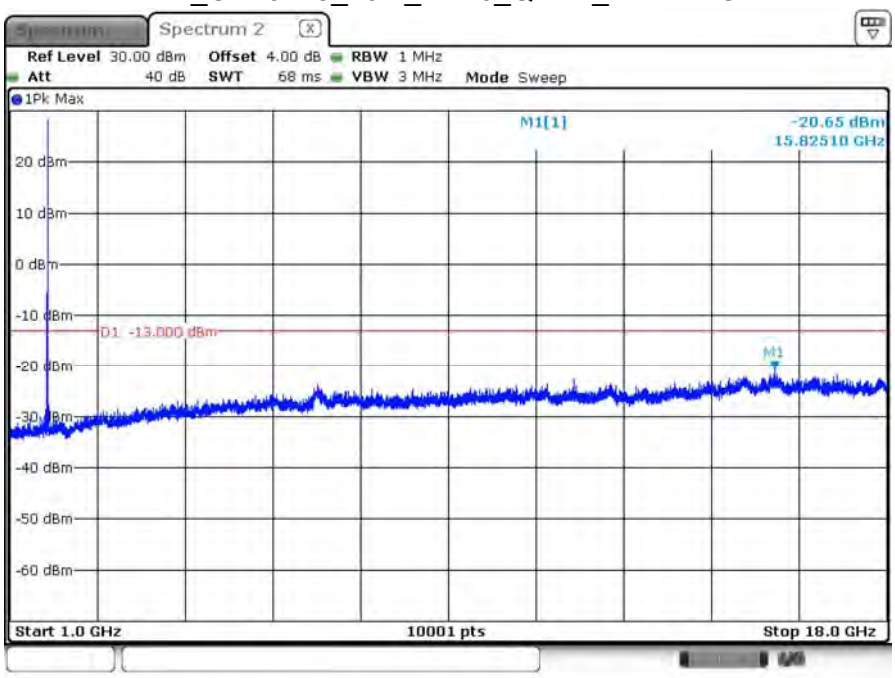
Date: 4.DEC.2020 14:07:22

B4_CH20050_20M_1RB0_QPSK_Below 1G



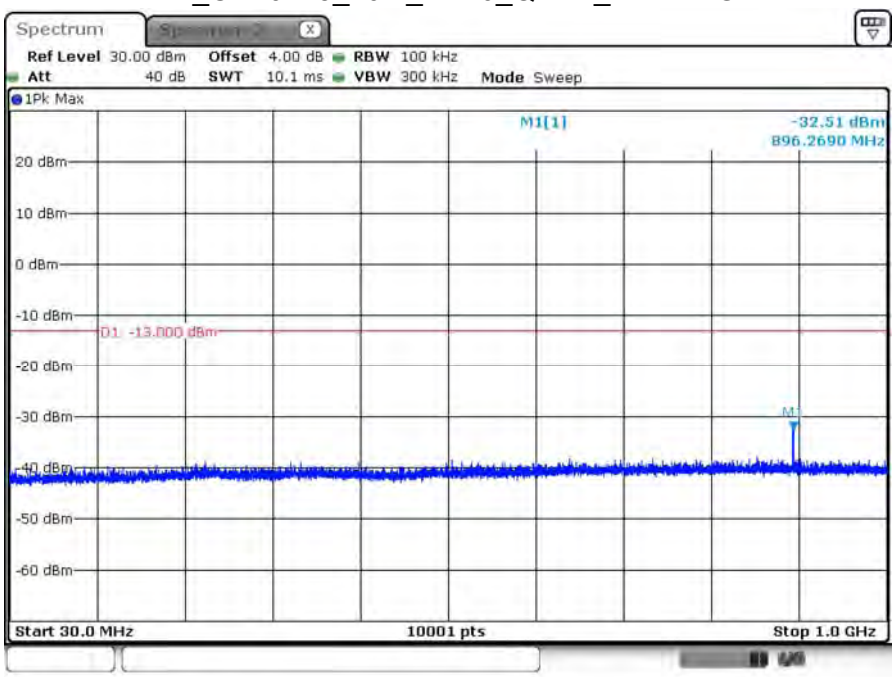
Date: 4.DEC.2020 14:09:36

B4_CH20175_20M_1RB0_QPSK_Above 1G



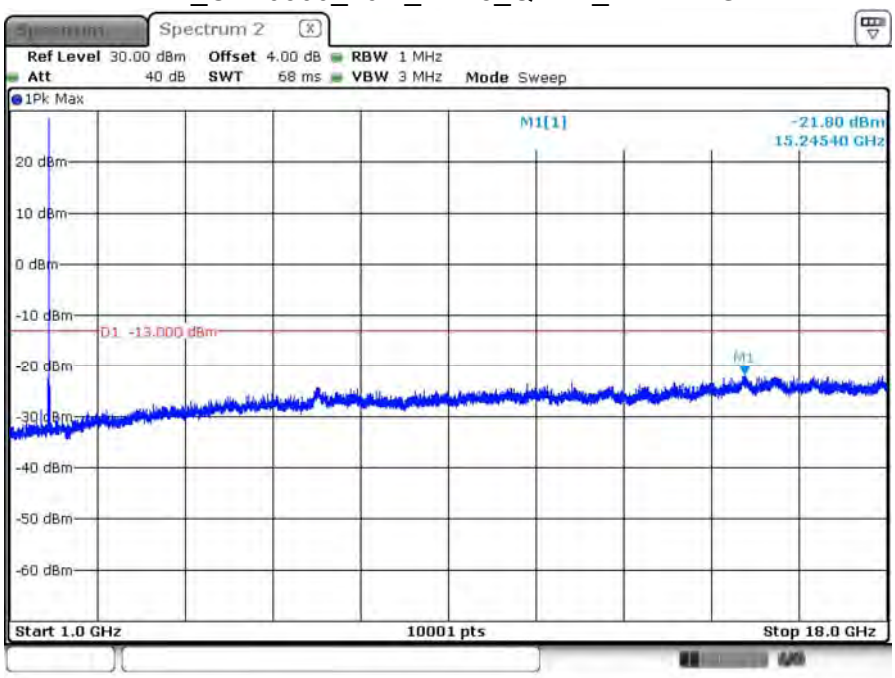
Date: 4.DEC.2020 14:15:17

B4_CH20175_20M_1RB0_QPSK_Below 1G



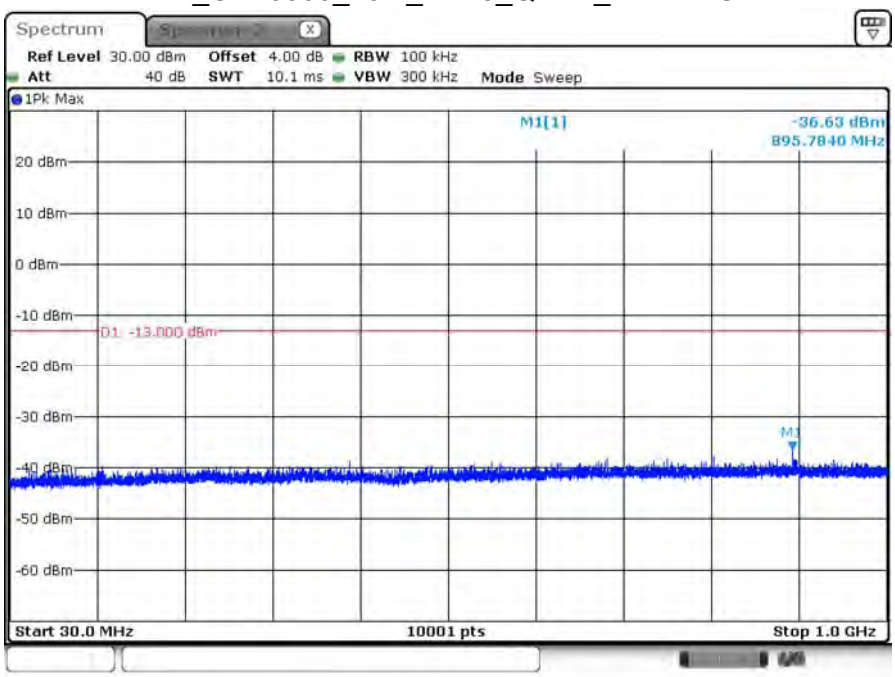
Date: 4.DEC.2020 14:13:59

B4_CH20300_20M_1RB5_QPSK_Above 1G



Date: 4.DEC.2020 14:16:55

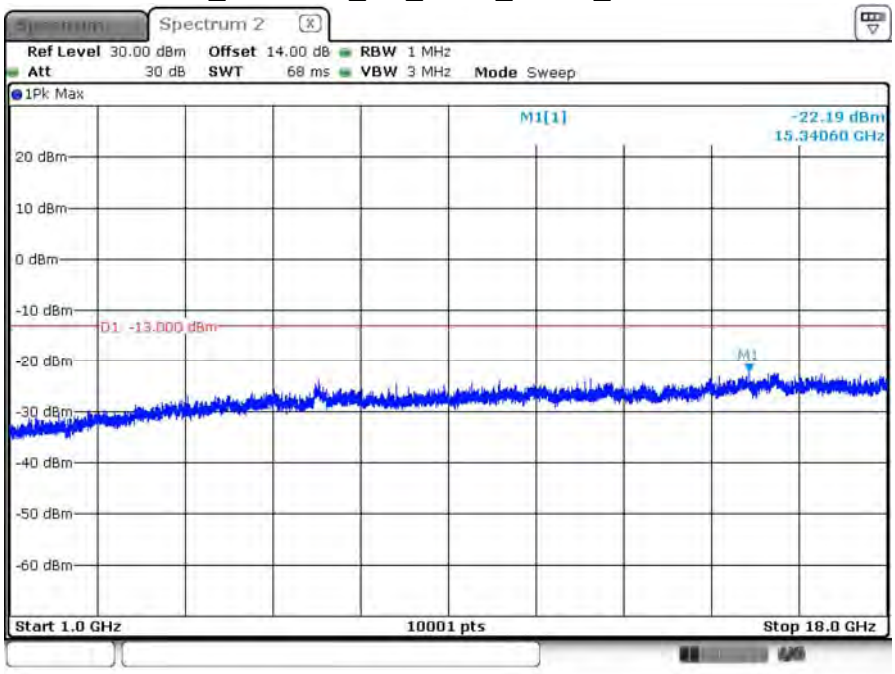
B4_CH20300_20M_1RB5_QPSK_Below 1G



Date: 4.DEC.2020 14:18:20

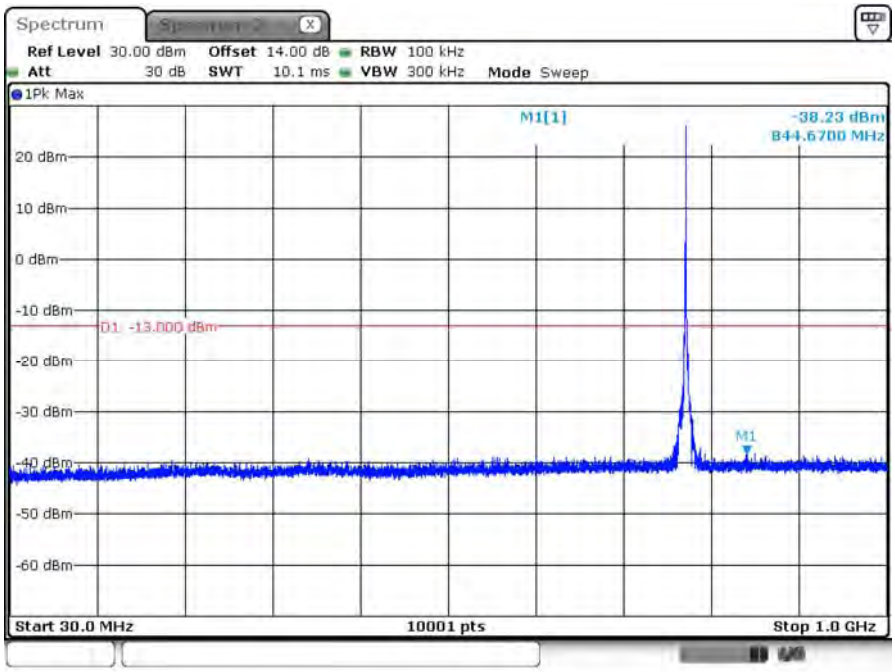
Product	LGA module		
Test Item	Conducted Spurious Emissions		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/09	Test Site	SR12-H
Temperature (°C)	25.0	Humidity (%RH)	60.0

B13_CH23205_5M_1RB0_QPSK_above 1G



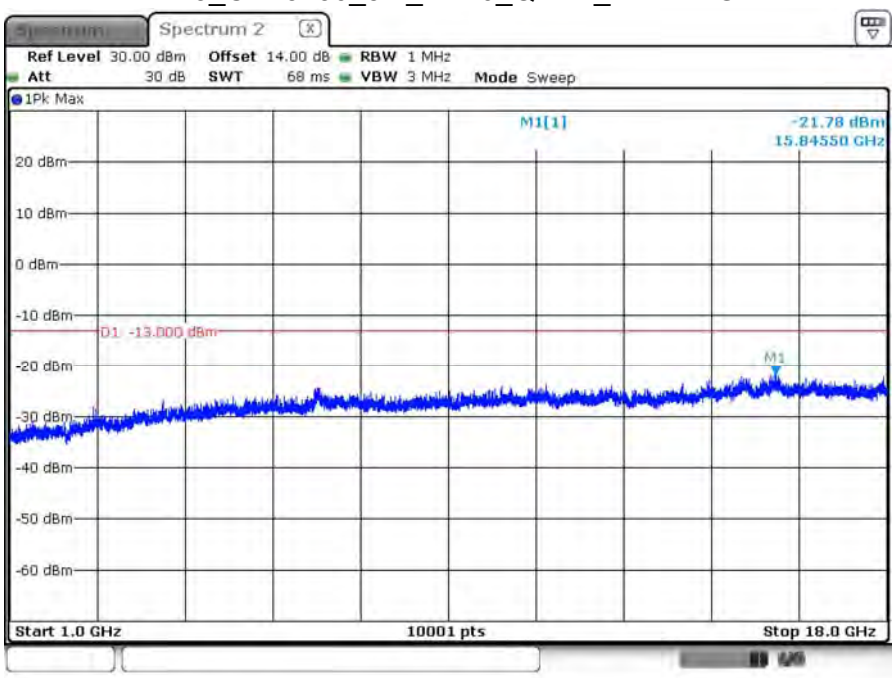
Date: 9.DEC.2020 11:03:21

B13_CH23205_5M_1RB0_QPSK_Below 1G



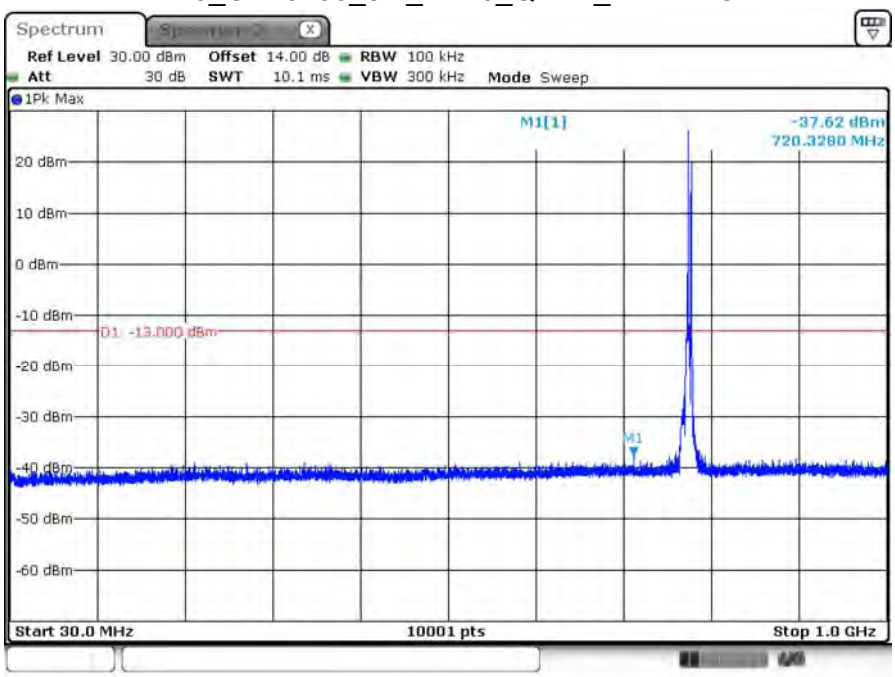
Date: 9.DEC.2020 11:05:31

B13_CH23230_5M_1RB0_QPSK_above 1G



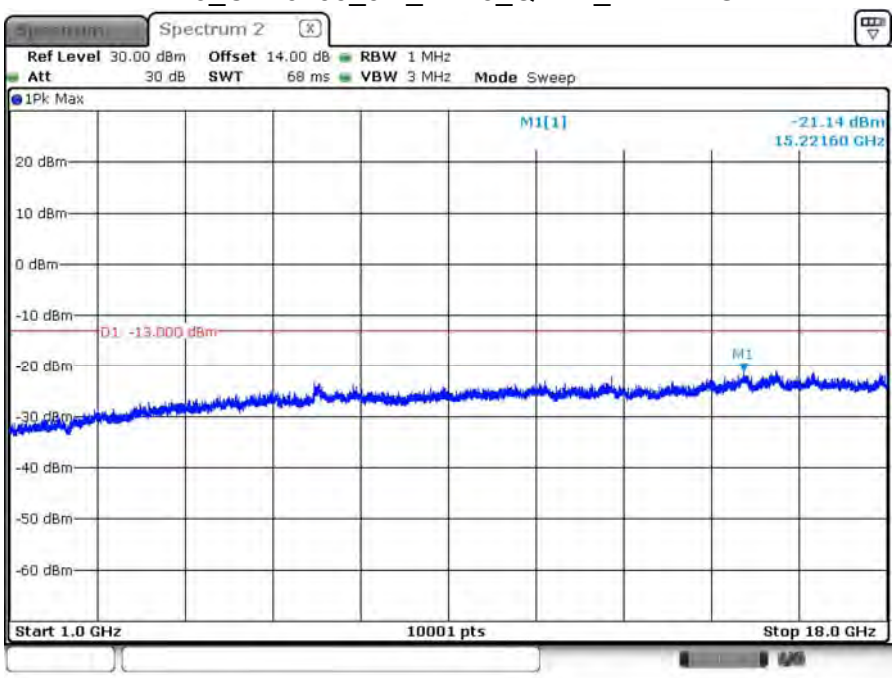
Date: 9.DEC.2020 11:01:28

B13_CH23230_5M_1RB0_QPSK_Below 1G



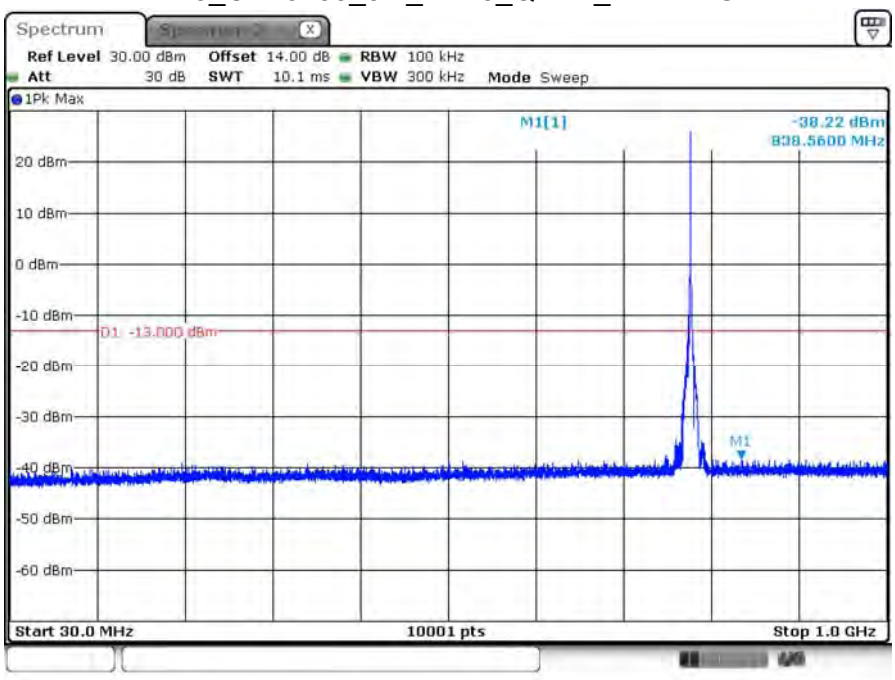
Date: 9.DEC.2020 11:00:30

B13_CH23255_5M_1RB5_QPSK_above 1G



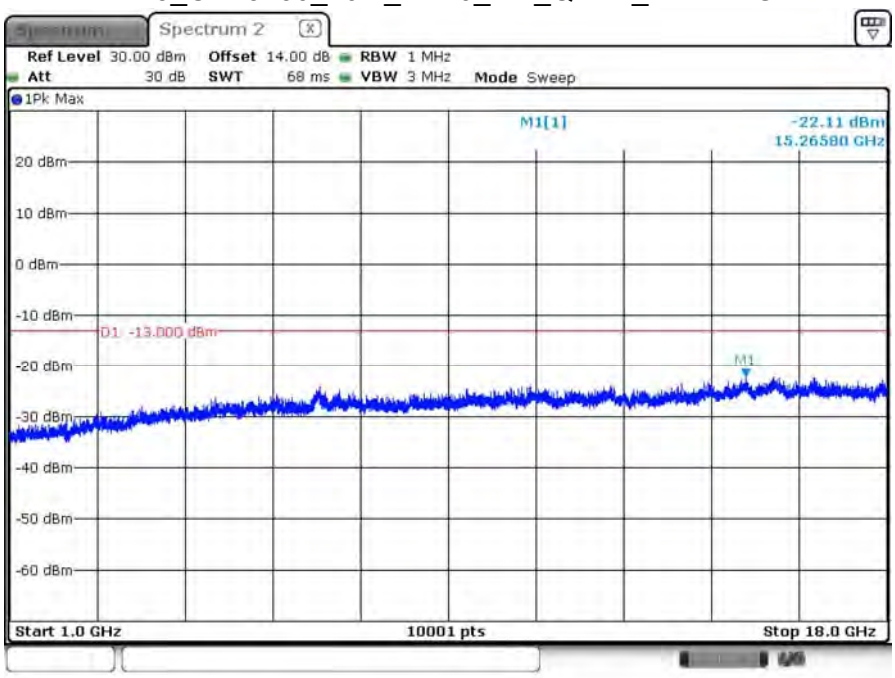
Date: 9.DEC.2020 11:15:33

B13_CH23255_5M_1RB5_QPSK_Below 1G



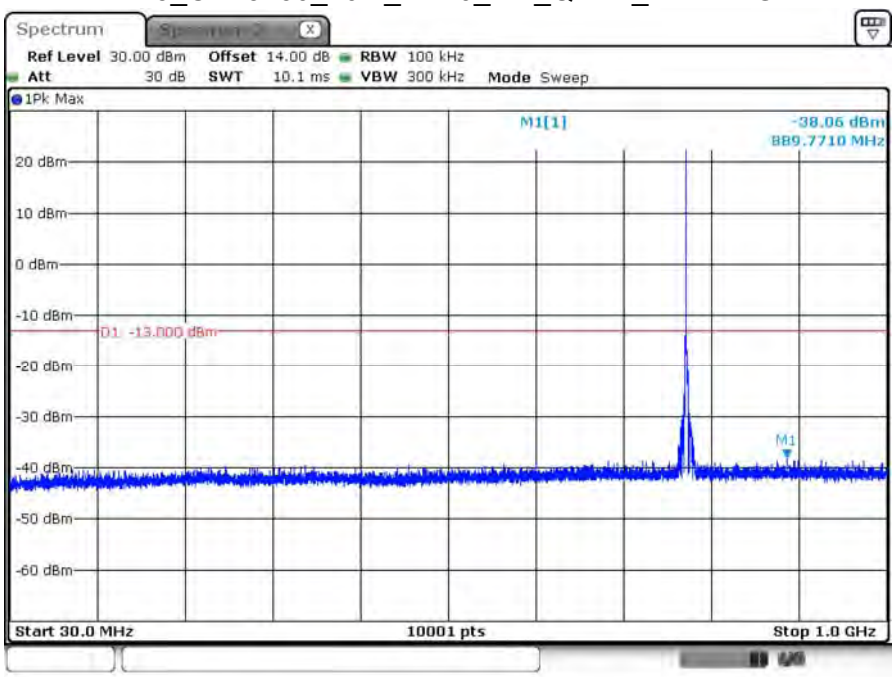
Date: 9.DEC.2020 11:08:16

B13_CH23230_10M_1RB0_low_QPSK_above 1G



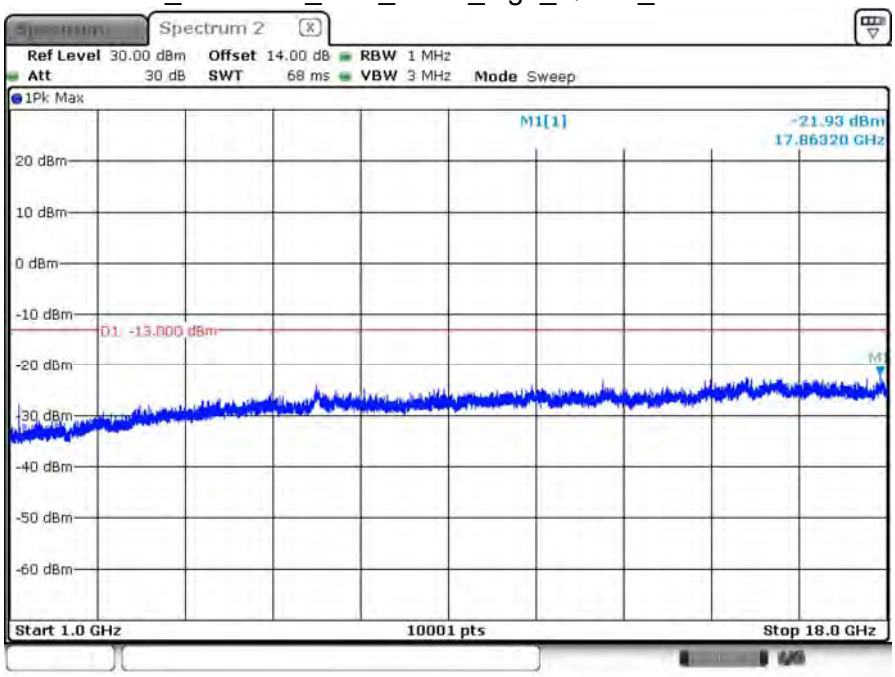
Date: 9.DEC.2020 13:39:27

B13_CH23230_10M_1RB0_low_QPSK_Below 1G



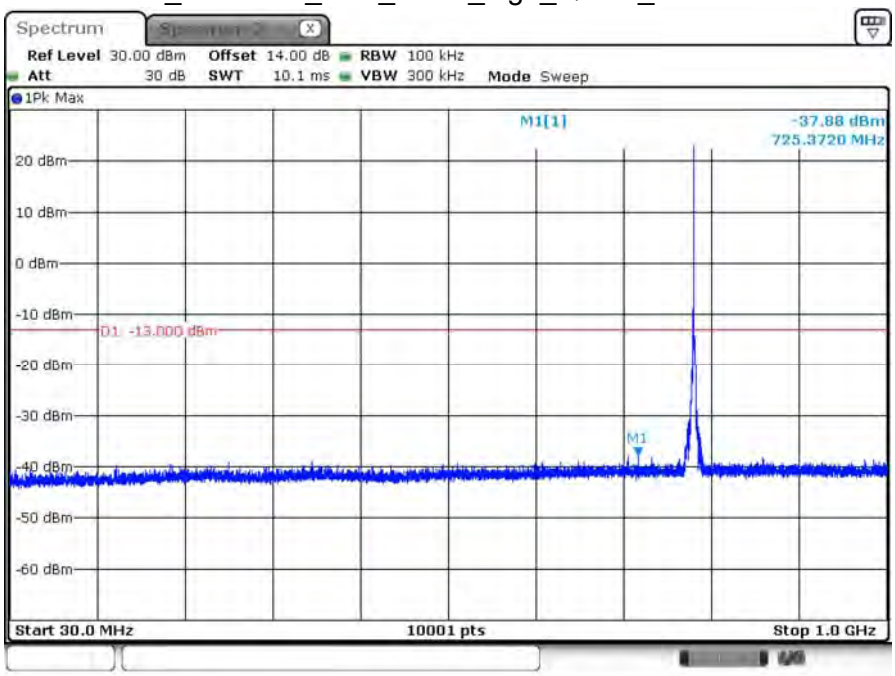
Date: 9.DEC.2020 13:38:41

B13_CH23230_10M_1RB5_high_QPSK_above 1G



Date: 9.DEC.2020 11:20:58

B13_CH23230_10M_1RB5_high_QPSK_Below 1G



Date: 9.DEC.2020 13:36:47

Product	LGA module		
Test Item	Radiated Spurious Emissions		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/10	Test Site	CB2-H
Temperature (°C)	24.1	Humidity (%RH)	58.0

20M_CH20050_QPSK_Band 4

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	3440.000	-45.10	-13	-32.10	-53.21	12.48	4.37
	5160.000	-43.27	-13	-30.27	-50.67	12.81	5.41
	6880.000	-36.64	-13	-23.64	-42.03	11.79	6.40
V	3440.000	-38.30	-13	-25.30	-46.41	12.48	4.37
	5160.000	-44.31	-13	-31.31	-51.71	12.81	5.41
	6880.000	-35.22	-13	-22.22	-40.61	11.79	6.40

20M_CH20175_QPSK_Band 4

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	3465.000	-44.25	-13	-31.25	-52.40	12.53	4.38
	5197.500	-44.26	-13	-31.26	-51.67	12.84	5.43
	6930.000	-35.69	-13	-22.69	-40.96	11.73	6.46
V	3465.000	-39.15	-13	-26.15	-47.30	12.53	4.38
	5197.500	-44.88	-13	-31.88	-52.29	12.84	5.43
	6930.000	-33.31	-13	-20.31	-38.58	11.73	6.46

20M_CH20300_QPSK_Band 4

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	3490.000	-46.39	-13	-33.39	-54.58	12.59	4.40
	5235.000	-44.26	-13	-31.26	-51.68	12.88	5.46
	6980.000	-32.58	-13	-19.58	-37.74	11.67	6.51
V	3490.000	-43.10	-13	-30.10	-51.29	12.59	4.40
	5235.000	-44.93	-13	-31.93	-52.35	12.88	5.46
	6980.000	-32.18	-13	-19.18	-37.34	11.67	6.51

Note:

1. Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.
2. Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier.
3. The spurious emission within 30-1000MHz were found more than 20 dBbelow the permissible value is not required to be report.

Product	LGA module		
Test Item	Radiated Spurious Emissions		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/10	Test Site	CB2-H
Temperature (°C)	24.1	Humidity (%RH)	58.0

10M_CH23230_low_Cat-M1_CAT-M1 Band13

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	1564.000	-48.93	-40	-8.93	-55.06	9.03	2.91
	2346.000	-52.85	-13	-39.85	-59.79	10.52	3.59
	3128.000	-51.68	-13	-38.68	-59.34	11.80	4.14
V	1564.000	-41.62	-40	-1.62	-47.75	9.03	2.91
	2346.000	-49.73	-13	-36.73	-56.67	10.52	3.59
	3128.000	-52.21	-13	-39.21	-59.87	11.80	4.14

10M_CH23230_high_Cat-M1_CAT-M1 Band13

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	1564.000	-51.41	-40	-11.41	-57.54	9.03	2.91
	2346.000	-52.98	-13	-39.98	-59.92	10.52	3.59
	3128.000	-51.47	-13	-38.47	-59.13	11.80	4.14
V	1564.000	-46.03	-40	-6.03	-52.16	9.03	2.91
	2346.000	-50.18	-13	-37.18	-57.12	10.52	3.59
	3128.000	-51.67	-13	-38.67	-59.33	11.80	4.14

Note:

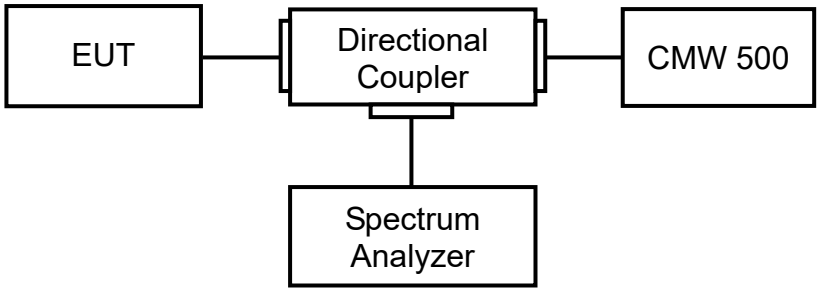
1. Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

2. Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier.

3. The spurious emission within 30-1000MHz were found more than 20 dBbelow the permissible value is not required to be report.

7. Spurious Emissions at Antenna Terminals

7.1. Test Setup



7.2. Test Procedure

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c) EUT Communicate with CMW500, then select a channel for testing.
d) Add a correction factor to the display of spectrum, and then test.
e) All measurements were done at low and high operational frequency range.
f) Record the max trace plot into the test report.

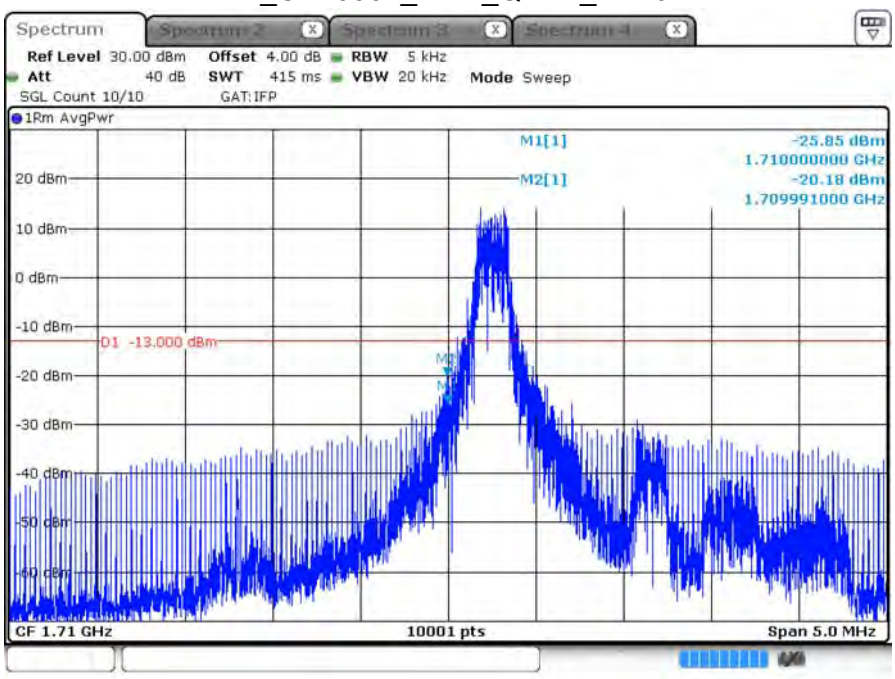
7.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 6.1
ANSI C63.26: 2015 Sub-clause 5.7

7.4. Test Result

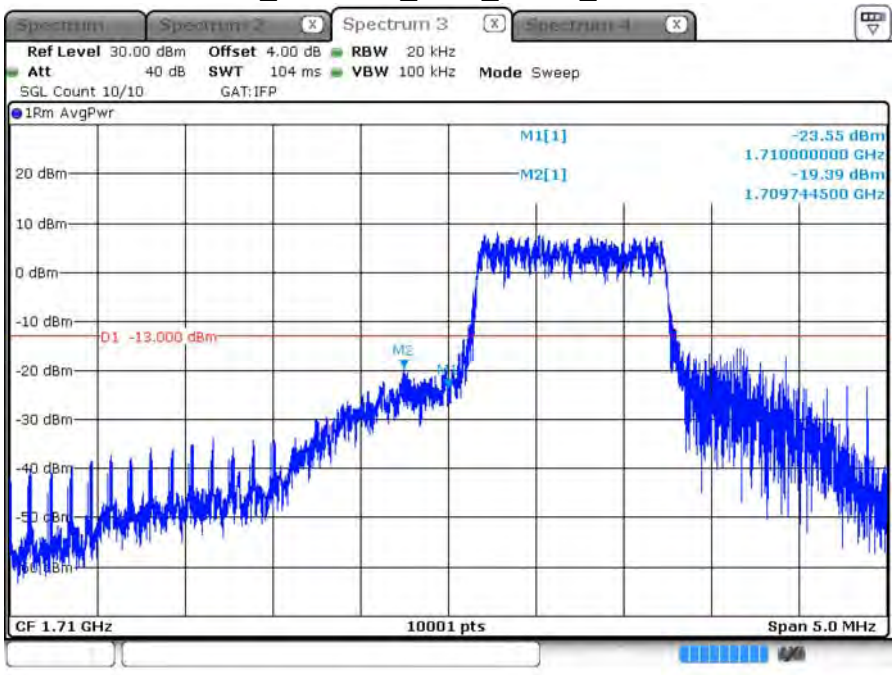
Product	LGA module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/02	Test Site	SR12-H
Temperature (°C)	25.0	Humidity (%RH)	61.0

B4_CH19957_1.4M_QPSK_1RB0



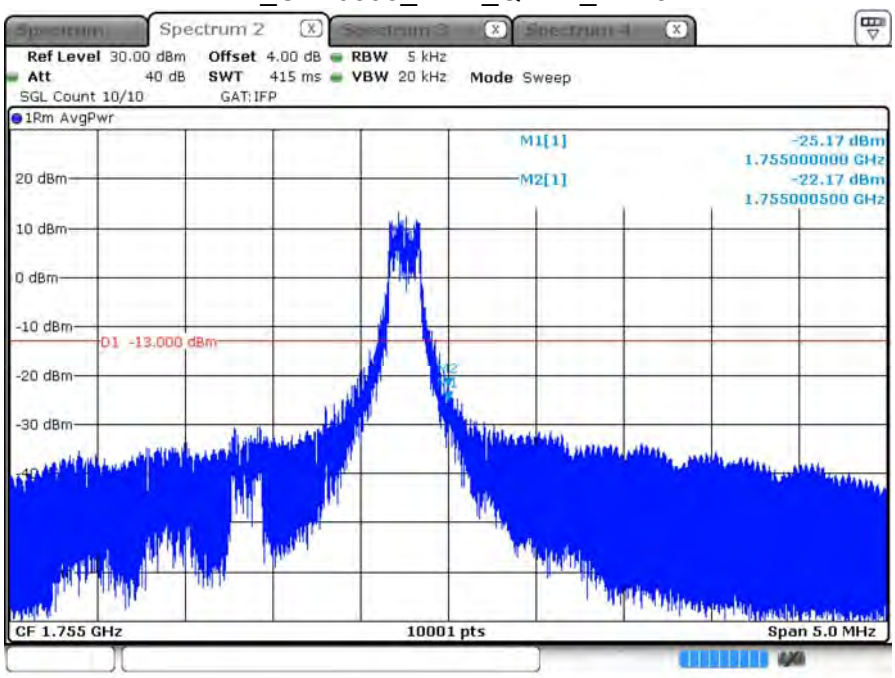
Date: 2.DEC.2020 14:23:22

B4_CH19957_1.4M_QPSK_6RB0



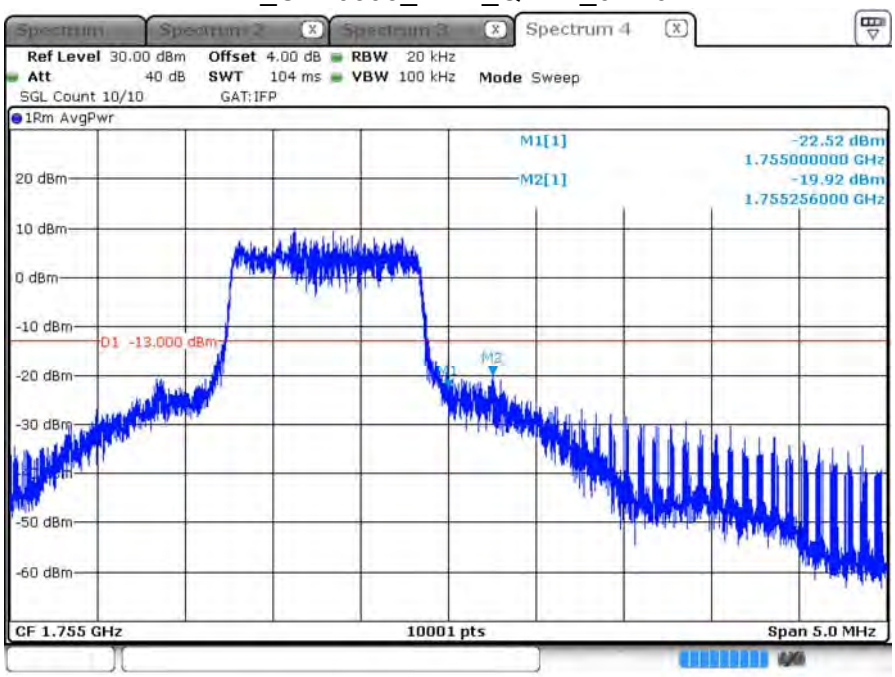
Date: 2.DEC.2020 14:24:46

B4_CH20393_1.4M_QPSK_1RB5



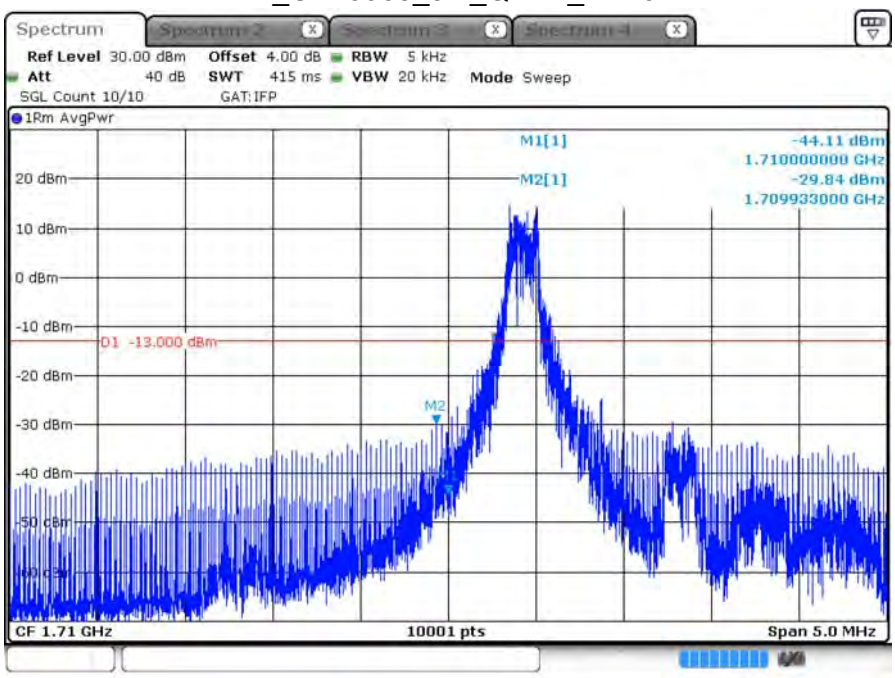
Date: 2.DEC.2020 14:28:19

B4_CH20393_1.4M_QPSK_6RB0



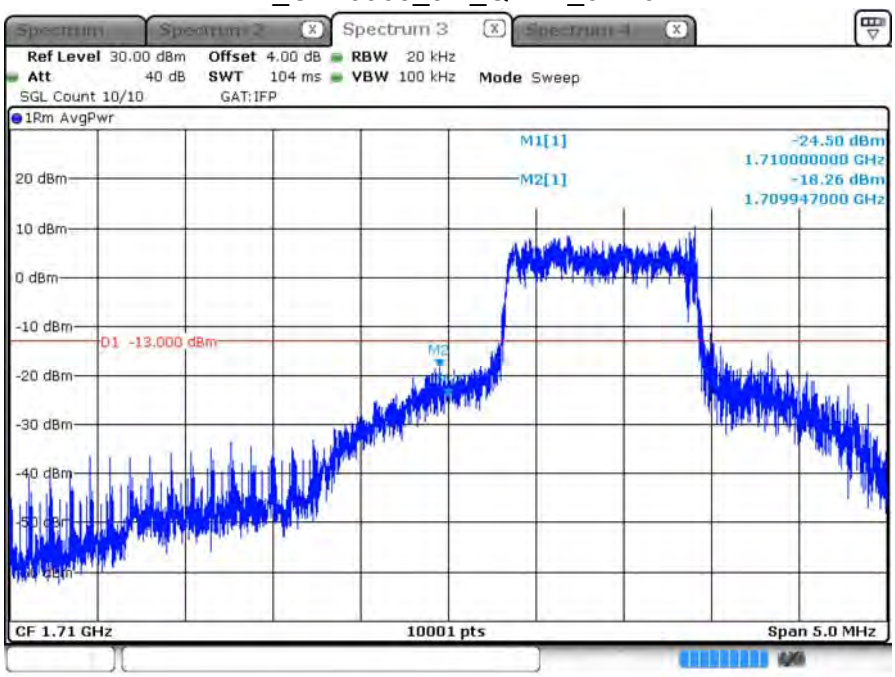
Date: 2.DEC.2020 14:26:04

B4_CH19965_3M_QPSK_1RB0



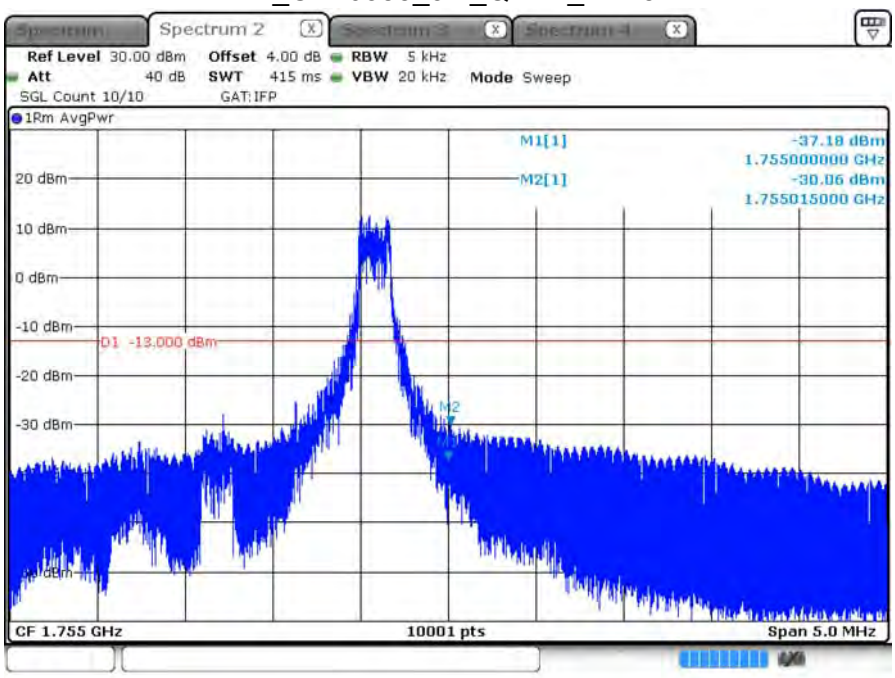
Date: 2.DEC.2020 14:32:12

B4_CH19965_3M_QPSK_6RB0



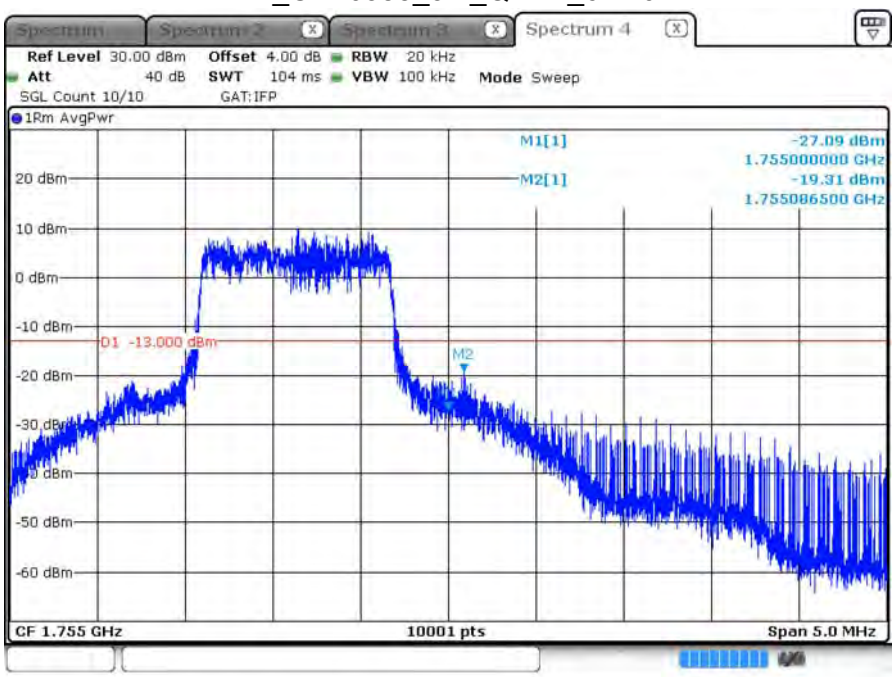
Date: 2.DEC.2020 14:32:52

B4_CH20385_3M_QPSK_1RB5



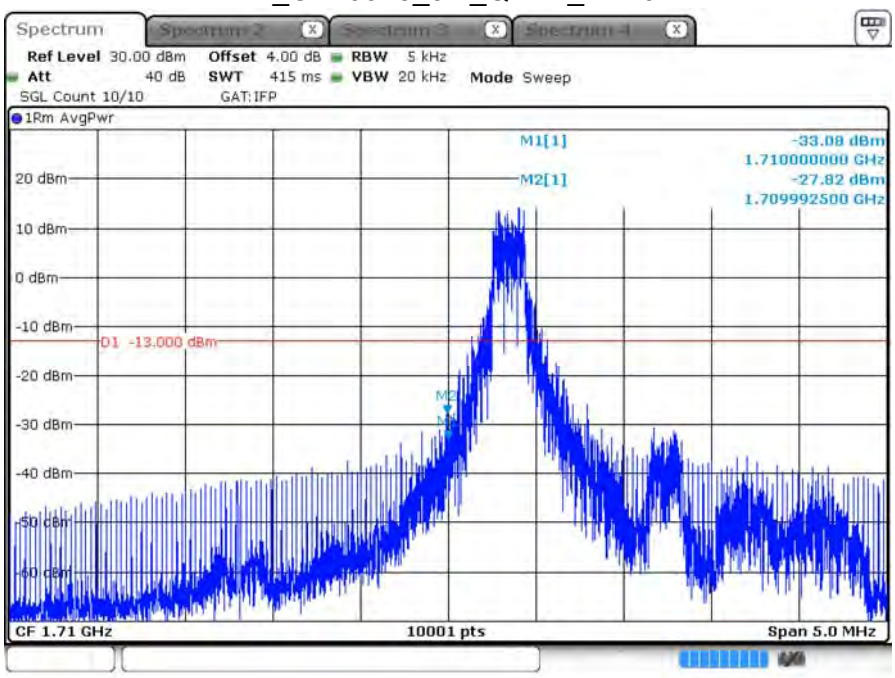
Date: 2.DEC.2020 14:31:15

B4_CH20385_3M_QPSK_6RB0



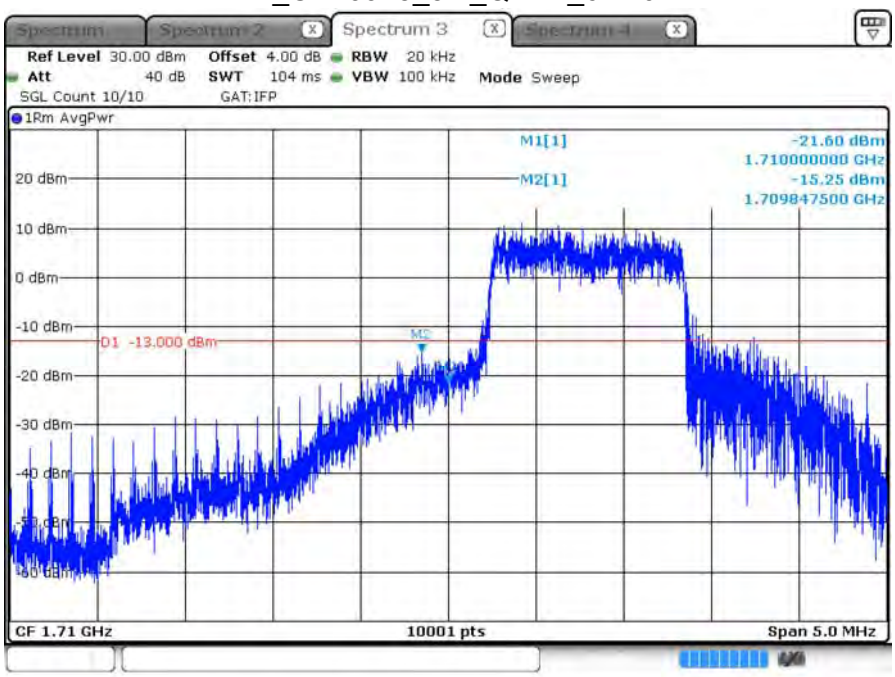
Date: 2.DEC.2020 14:29:33

B4_CH19975_5M_QPSK_1RB0



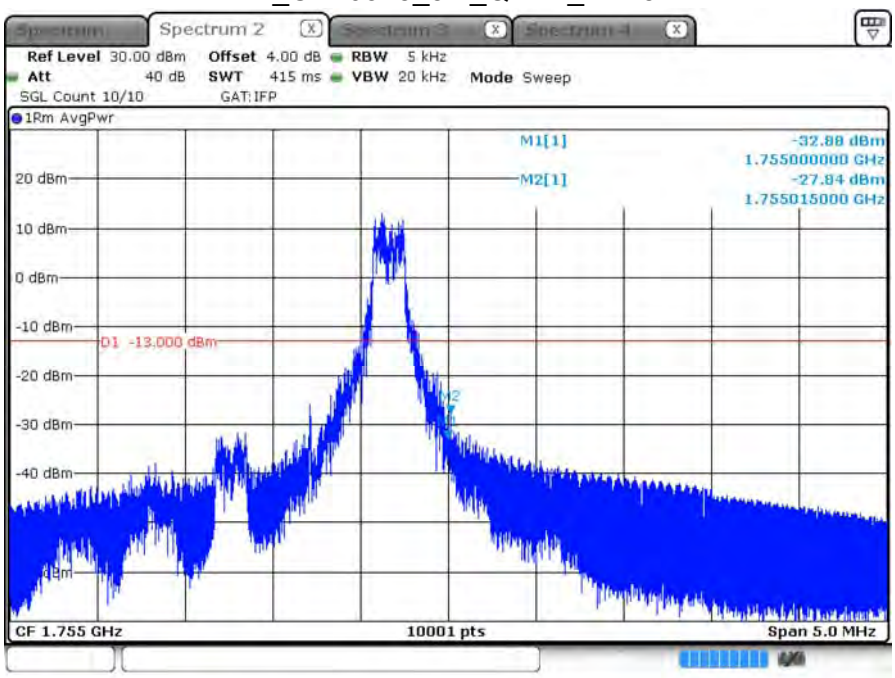
Date: 2.DEC.2020 14:34:54

B4_CH19975_5M_QPSK_6RB0



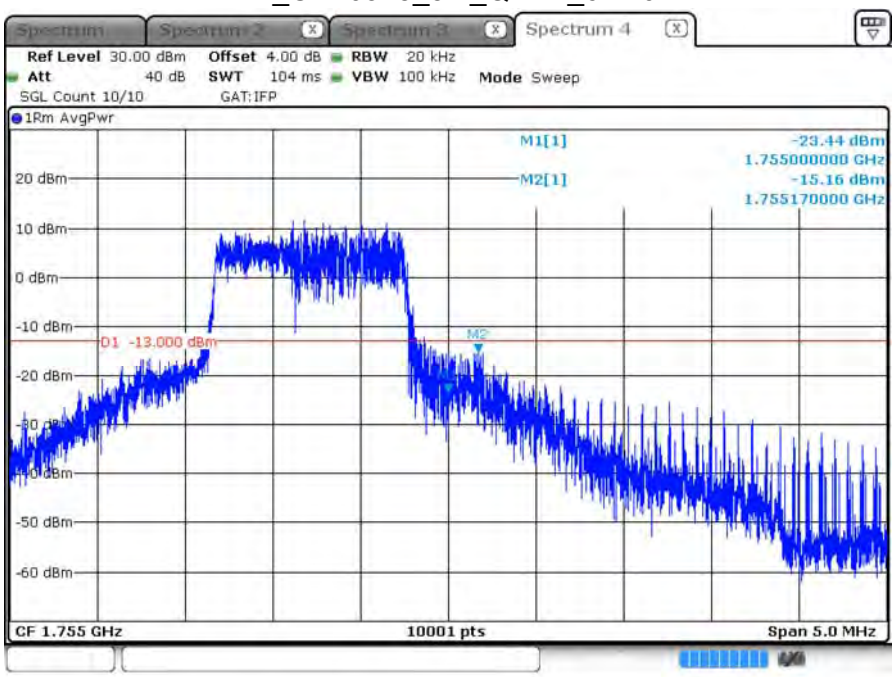
Date: 2.DEC.2020 14:33:52

B4_CH20375_5M_QPSK_1RB5



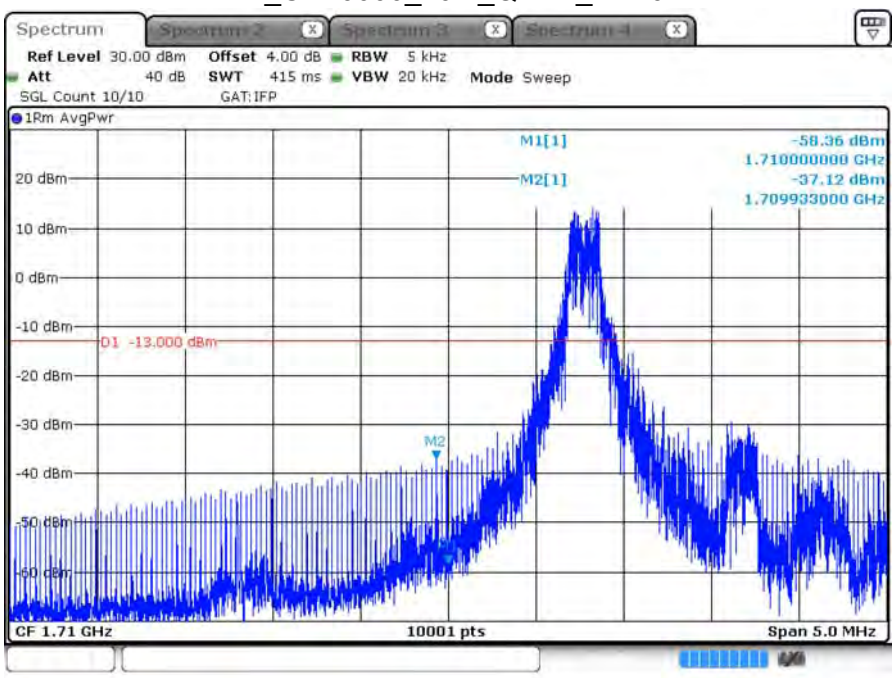
Date: 2.DEC.2020 14:36:47

B4_CH20375_5M_QPSK_6RB0



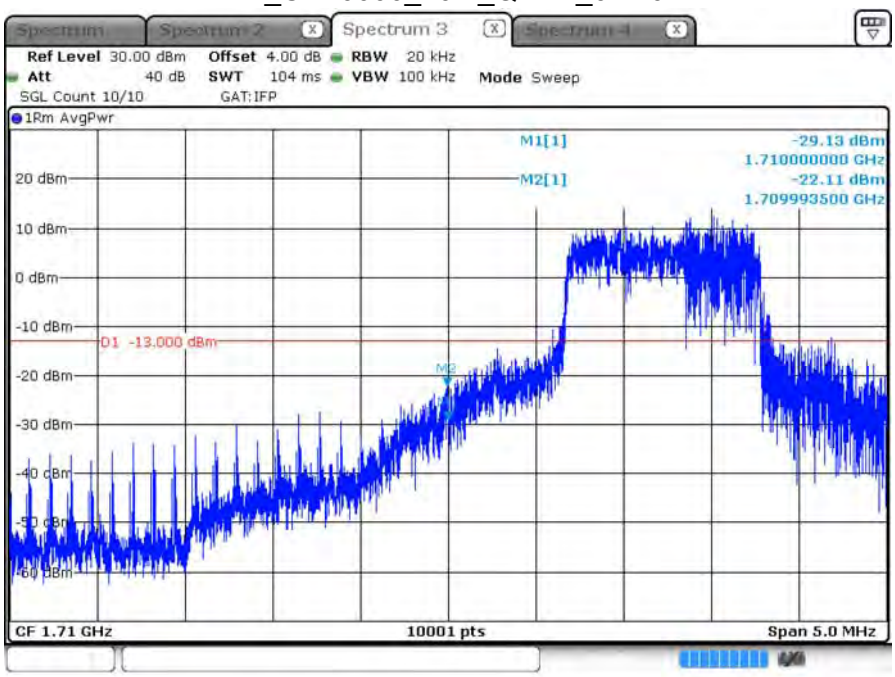
Date: 2.DEC.2020 14:37:21

B4_CH20000_10M_QPSK_1RB0



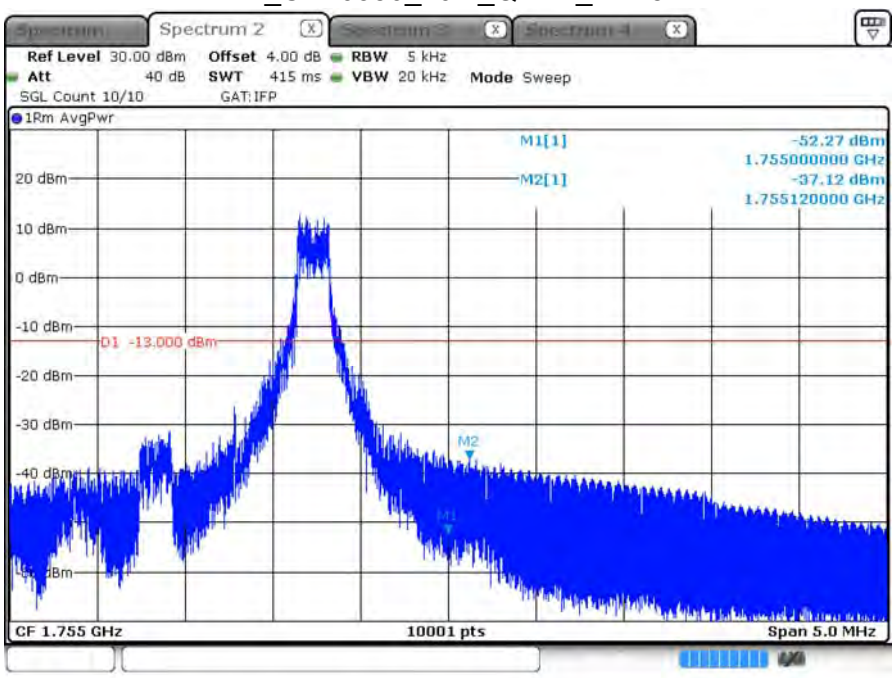
Date: 2.DEC.2020 14:42:26

B4_CH20000_10M_QPSK_6RB0



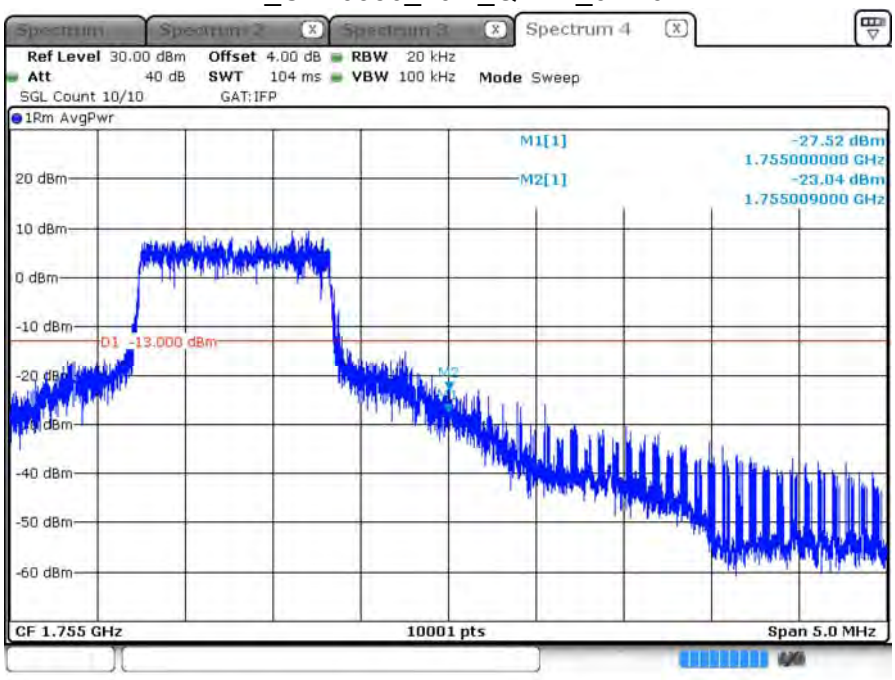
Date: 2.DEC.2020 14:41:42

B4_CH20350_10M_QPSK_1RB5



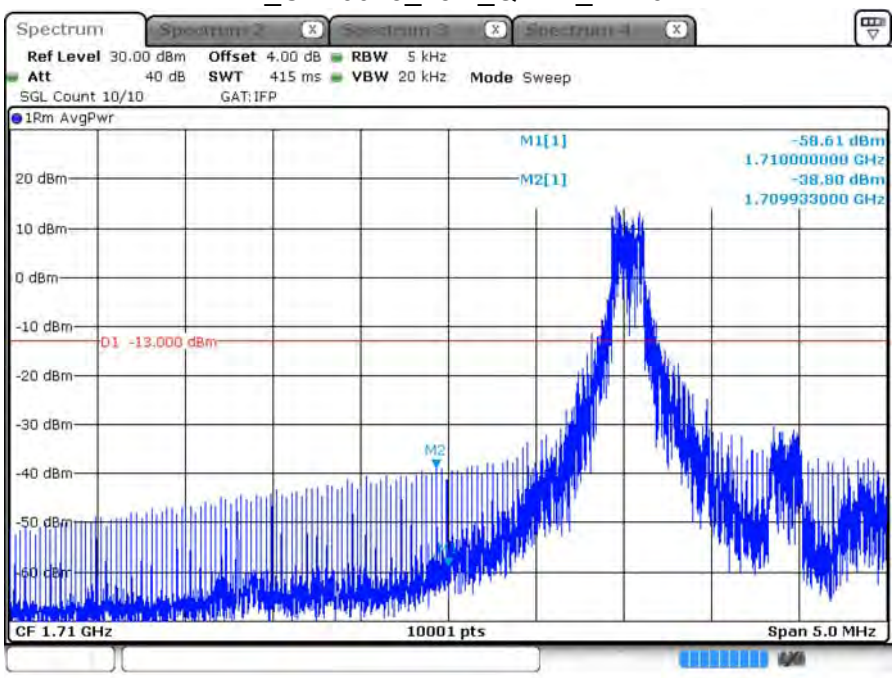
Date: 2.DEC.2020 14:40:11

B4_CH20350_10M_QPSK_6RB0



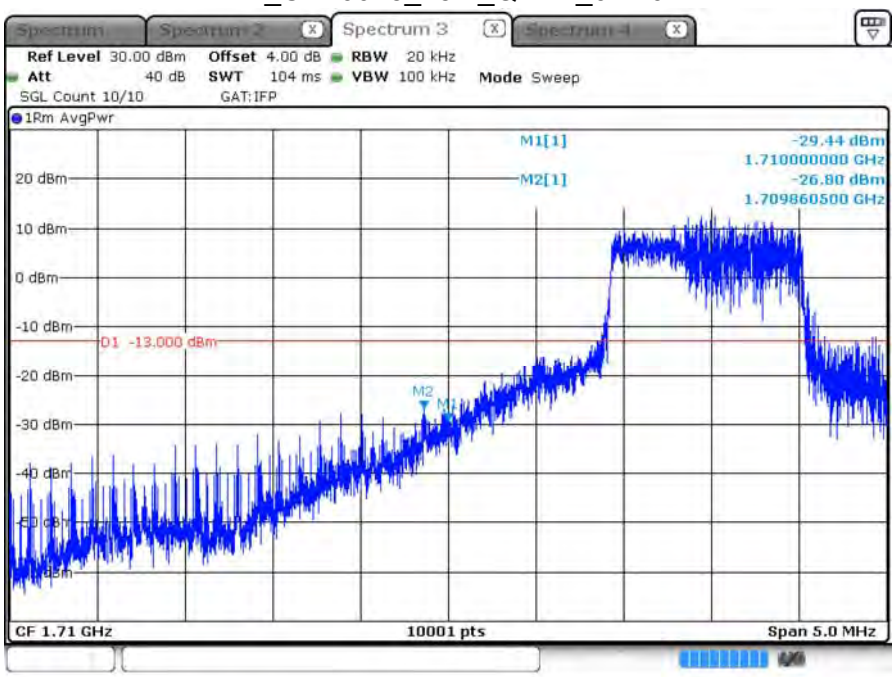
Date: 2.DEC.2020 14:40:53

B4_CH20025_15M_QPSK_1RB0



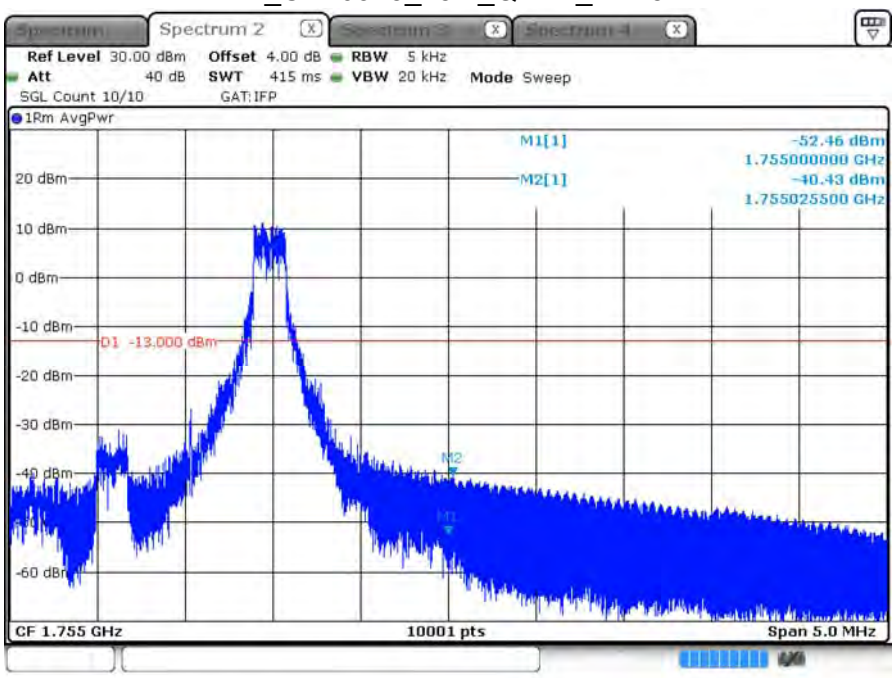
Date: 2.DEC.2020 14:51:51

B4_CH20025_15M_QPSK_6RB0



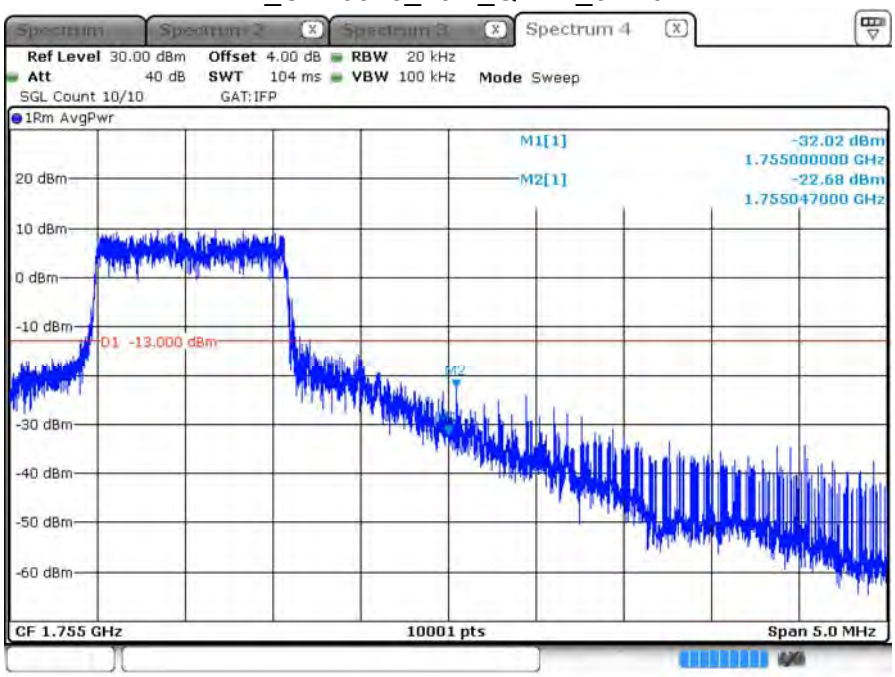
Date: 2.DEC.2020 14:52:16

B4_CH20325_15M_QPSK_1RB5



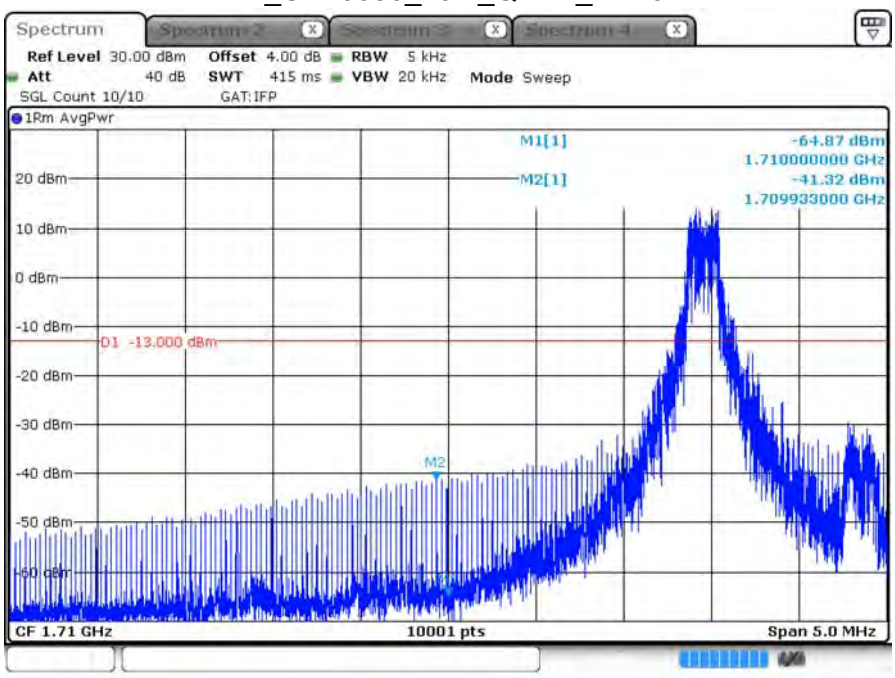
Date: 2.DEC.2020 14:55:30

B4_CH20325_15M_QPSK_6RB0



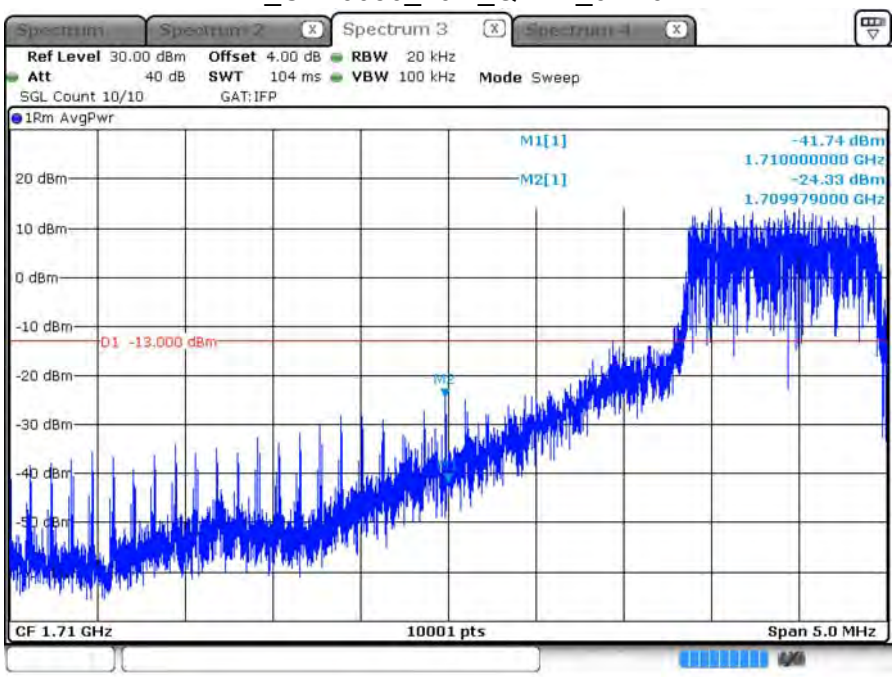
Date: 2.DEC.2020 14:53:46

B4_CH20050_20M_QPSK_1RB0



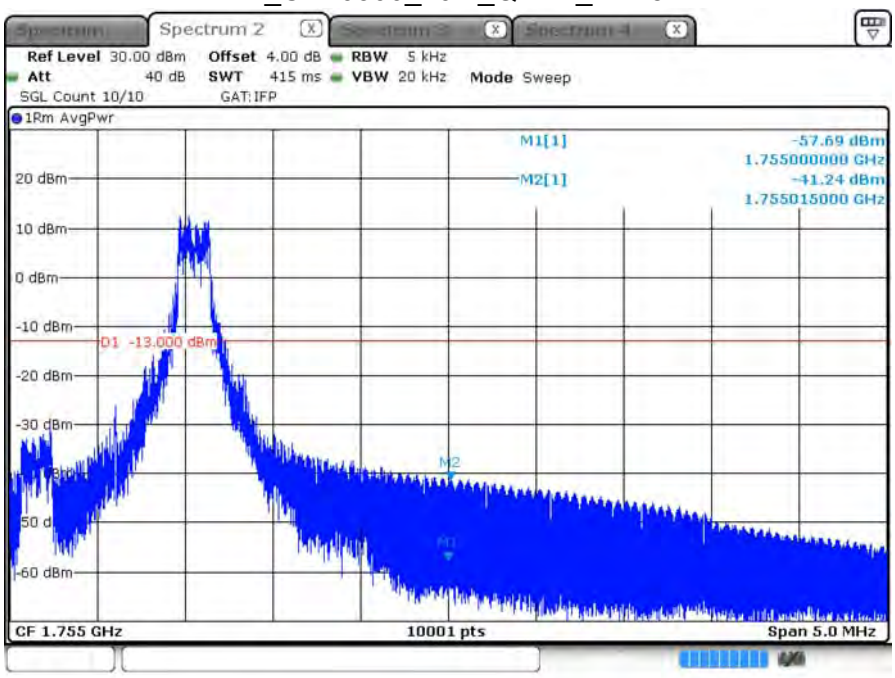
Date: 2.DEC.2020 15:04:35

B4_CH20050_20M_QPSK_6RB0



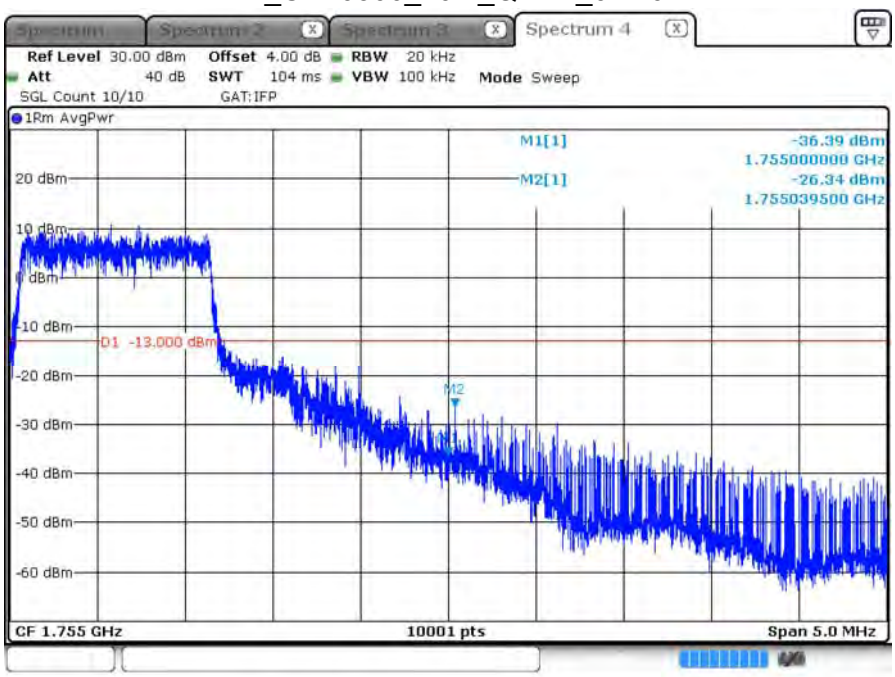
Date: 2.DEC.2020 15:04:57

B4_CH20300_20M_QPSK_1RB5



Date: 2.DEC.2020 15:03:52

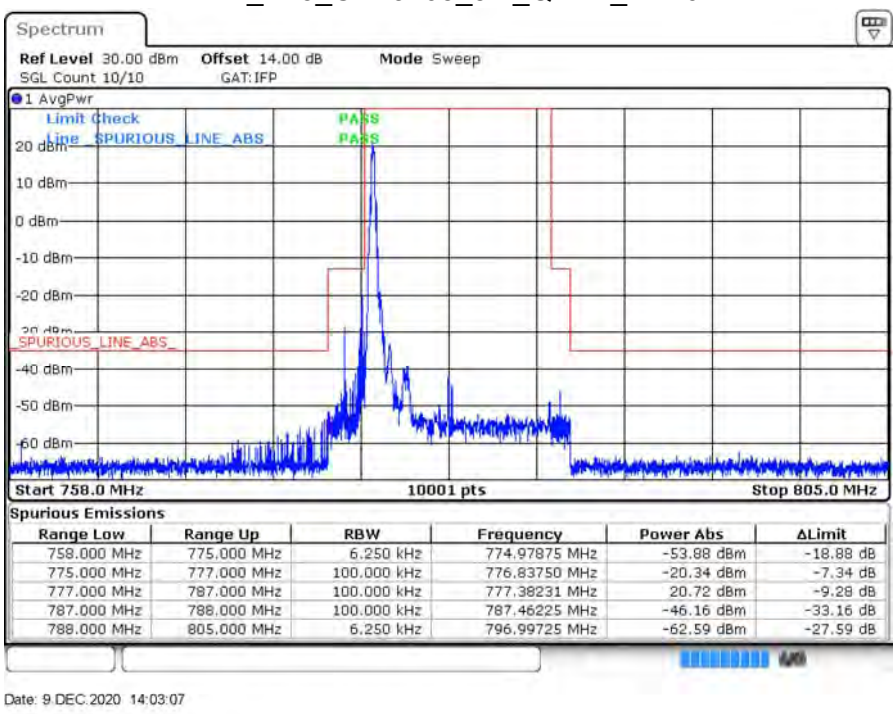
B4_CH20300_20M_QPSK_6RB0



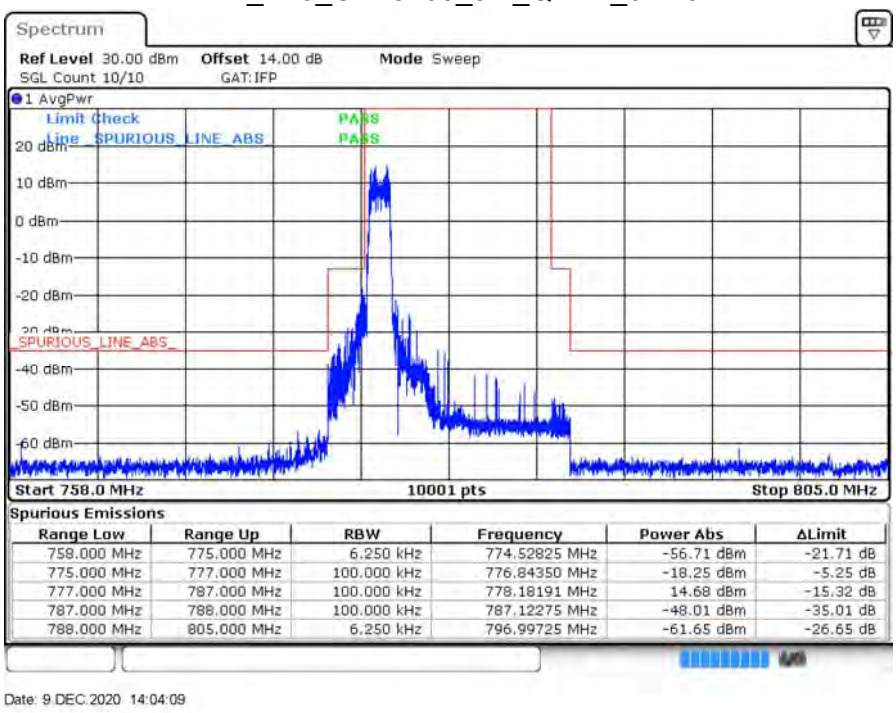
Date: 2.DEC.2020 14:57:01

Product	LGA module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/09	Test Site	SR12-H
Temperature (°C)	25.0	Humidity (%RH)	61.0

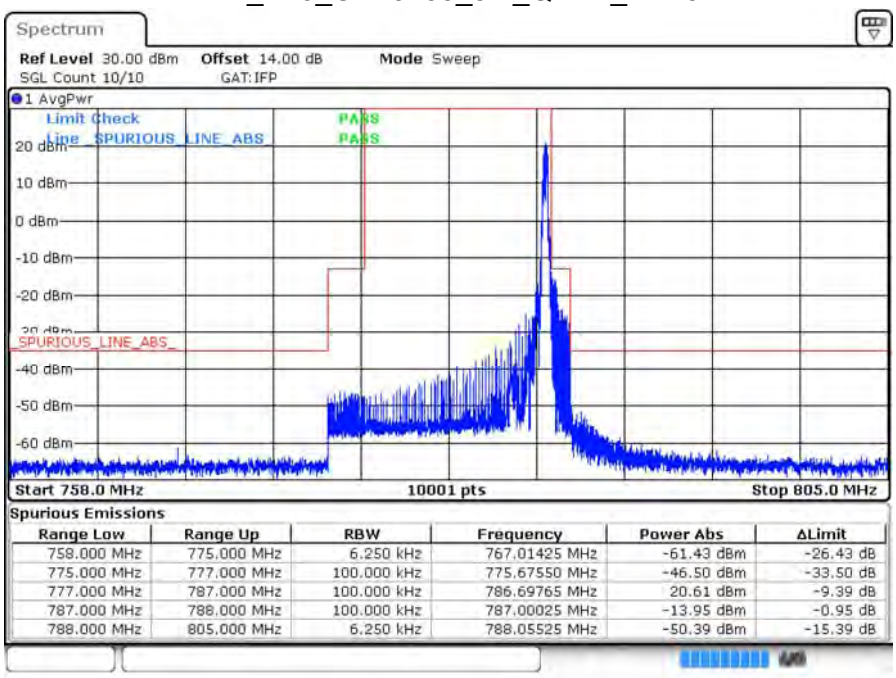
LTE_B13_CH23205_5M_QPSK_1RB0



LTE_B13_CH23205_5M_QPSK_6RB0



LTE_B13_CH23255_5M_QPSK_1RB5

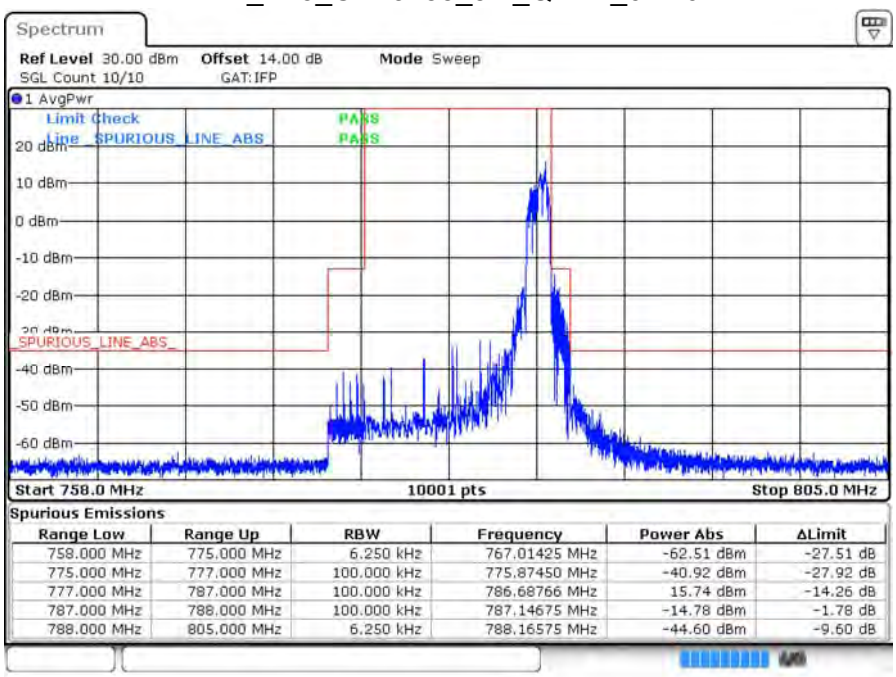


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
758.000 MHz	775.000 MHz	6.250 kHz	767.01425 MHz	-61.43 dBm	-26.43 dB
775.000 MHz	777.000 MHz	100.000 kHz	775.67550 MHz	-46.50 dBm	-33.50 dB
777.000 MHz	787.000 MHz	100.000 kHz	786.69765 MHz	20.61 dBm	-9.39 dB
787.000 MHz	788.000 MHz	100.000 kHz	787.00025 MHz	-13.95 dBm	-0.95 dB
788.000 MHz	805.000 MHz	6.250 kHz	788.05525 MHz	-50.39 dBm	-15.39 dB

Date: 9.DEC.2020 13:59:49

LTE_B13_CH23255_5M_QPSK_6RB0

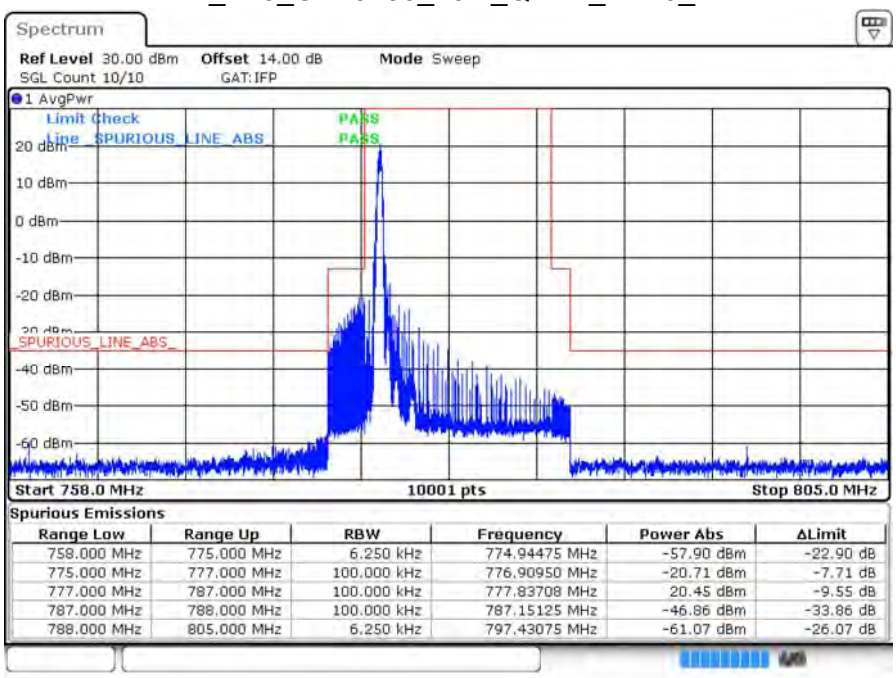


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
758.000 MHz	775.000 MHz	6.250 kHz	767.01425 MHz	-62.51 dBm	-27.51 dB
775.000 MHz	777.000 MHz	100.000 kHz	775.87450 MHz	-40.92 dBm	-27.92 dB
777.000 MHz	787.000 MHz	100.000 kHz	786.68766 MHz	15.74 dBm	-14.26 dB
787.000 MHz	788.000 MHz	100.000 kHz	787.14675 MHz	-14.78 dBm	-1.78 dB
788.000 MHz	805.000 MHz	6.250 kHz	788.16575 MHz	-44.60 dBm	-9.60 dB

Date: 9.DEC.2020 13:57:29

LTE_B13_CH23230_10M_QPSK_1RB0_low

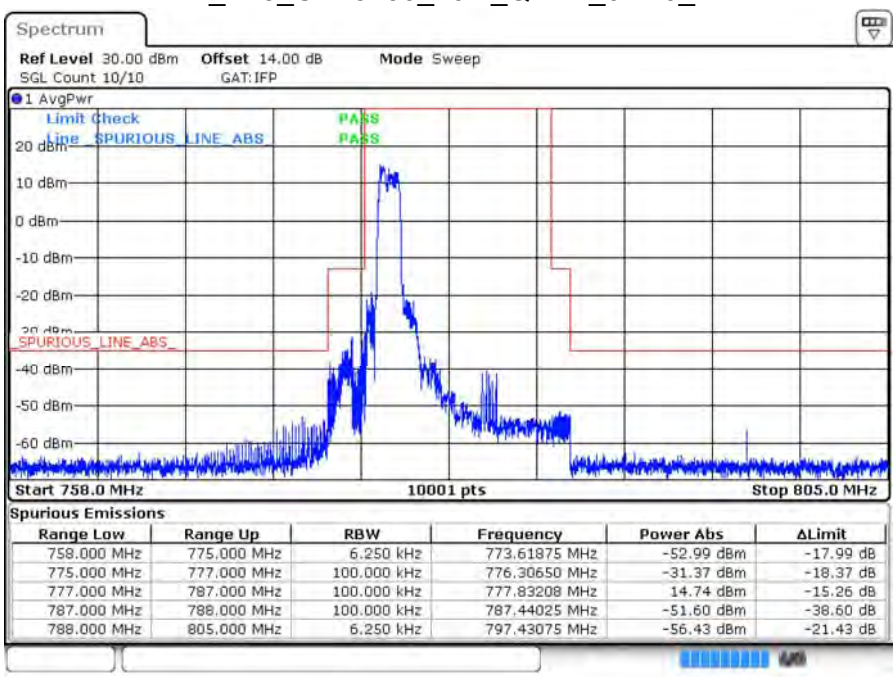


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
758.000 MHz	775.000 MHz	6.250 kHz	774.94475 MHz	-57.90 dBm	-22.90 dB
775.000 MHz	777.000 MHz	100.000 kHz	776.90950 MHz	-20.71 dBm	-7.71 dB
777.000 MHz	787.000 MHz	100.000 kHz	777.83708 MHz	20.45 dBm	-9.55 dB
787.000 MHz	788.000 MHz	100.000 kHz	787.15125 MHz	-46.86 dBm	-33.86 dB
788.000 MHz	805.000 MHz	6.250 kHz	797.43075 MHz	-61.07 dBm	-26.07 dB

Date: 9.DEC.2020 13:44:21

LTE_B13_CH23230_10M_QPSK_6RB0_low

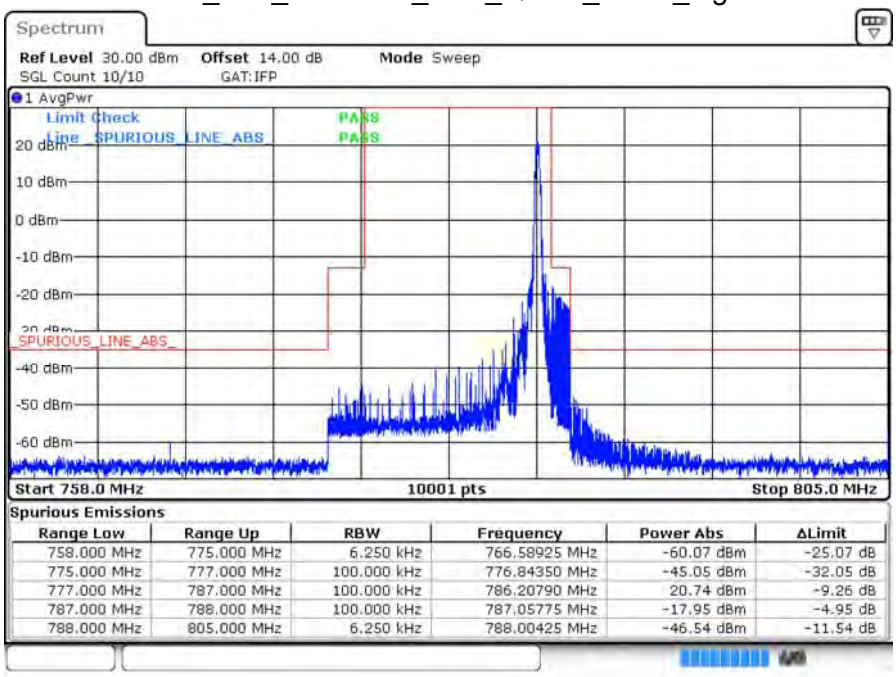


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
758.000 MHz	775.000 MHz	6.250 kHz	773.61875 MHz	-52.99 dBm	-17.99 dB
775.000 MHz	777.000 MHz	100.000 kHz	776.30650 MHz	-31.37 dBm	-18.37 dB
777.000 MHz	787.000 MHz	100.000 kHz	777.83208 MHz	14.74 dBm	-15.26 dB
787.000 MHz	788.000 MHz	100.000 kHz	787.44025 MHz	-51.60 dBm	-38.60 dB
788.000 MHz	805.000 MHz	6.250 kHz	797.43075 MHz	-56.43 dBm	-21.43 dB

Date: 9.DEC.2020 13:47:02

LTE_B13_CH23230_10M_QPSK_1RB5_high

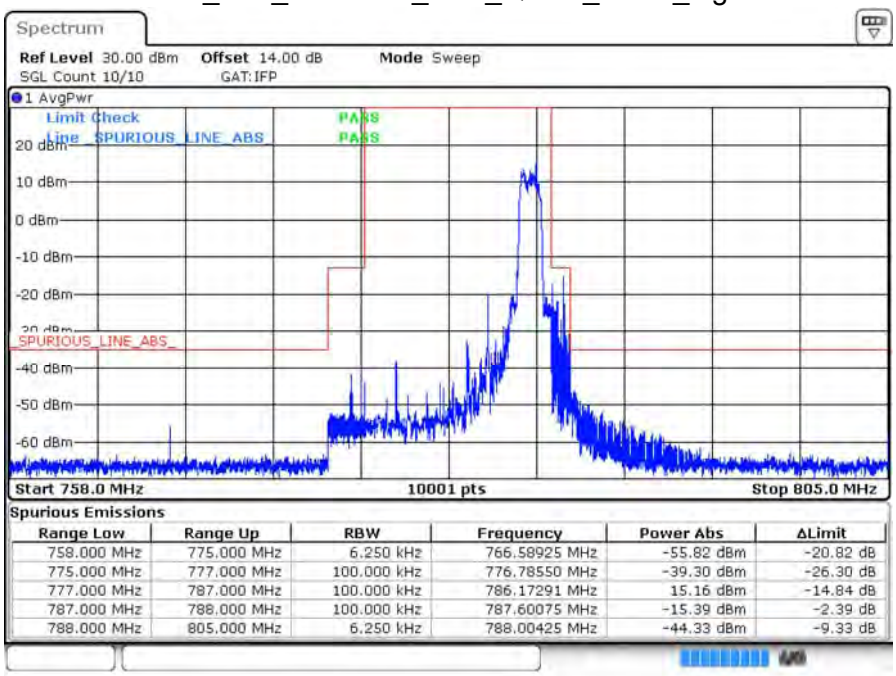


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
758.000 MHz	775.000 MHz	6.250 kHz	766.58925 MHz	-60.07 dBm	-25.07 dB
775.000 MHz	777.000 MHz	100.000 kHz	776.84350 MHz	-45.05 dBm	-32.05 dB
777.000 MHz	787.000 MHz	100.000 kHz	786.20790 MHz	20.74 dBm	-9.26 dB
787.000 MHz	788.000 MHz	100.000 kHz	787.05775 MHz	-17.95 dBm	-4.95 dB
788.000 MHz	805.000 MHz	6.250 kHz	788.00425 MHz	-46.54 dBm	-11.54 dB

Date: 9.DEC.2020 13:52:27

LTE_B13_CH23230_10M_QPSK_6RB0_high



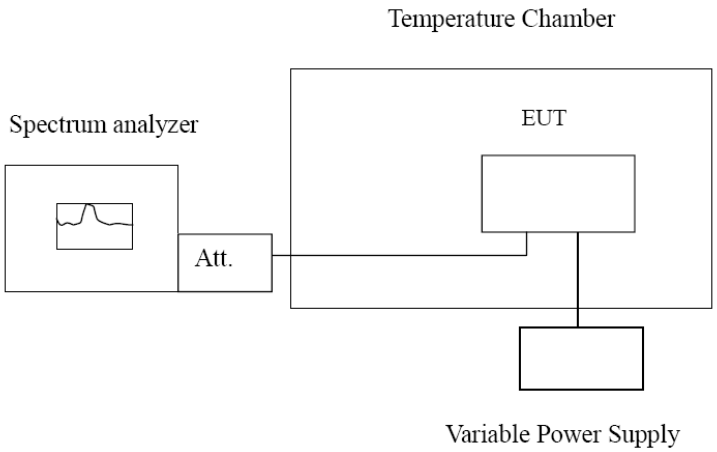
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
758.000 MHz	775.000 MHz	6.250 kHz	766.58925 MHz	-55.82 dBm	-20.82 dB
775.000 MHz	777.000 MHz	100.000 kHz	776.78550 MHz	-39.30 dBm	-26.30 dB
777.000 MHz	787.000 MHz	100.000 kHz	786.17291 MHz	15.16 dBm	-14.84 dB
787.000 MHz	788.000 MHz	100.000 kHz	787.60075 MHz	-15.39 dBm	-2.39 dB
788.000 MHz	805.000 MHz	6.250 kHz	788.00425 MHz	-44.33 dBm	-9.33 dB

Date: 9.DEC.2020 13:49:48

8. Frequency Stability

8.1. Test Setup



8.2. Test Procedure

Frequency Stability Under Temperature Variations:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

8.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 9
ANSI C63.26: 2015 Sub-clause 5.6

8.4. Test Result

Product	LGA module		
Test Item	Frequency Stability		
Test Mode	Mode 1: LTE Band 4		
Date of Test	2020/12/07	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	63.0

LTE Band 4_1710.7MHz_BW 1.4MHz
Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.34	0.0014
3.80	3.10	0.0018
2.85	2.66	0.0016

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.55	0.0015
-20	2.68	0.0016
-10	2.92	0.0017
0	3.82	0.0022
10	2.65	0.0015
20	1.58	0.0009
30	3.10	0.0018
40	2.26	0.0013
50	2.89	0.0017
60	2.73	0.0016

LTE Band 4_1754.3MHz_BW 1.4MHz
Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	3.00	0.0017
3.80	2.56	0.0015
2.85	3.11	0.0018

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.22	0.0013
-20	2.91	0.0017
-10	2.04	0.0012
0	3.09	0.0018
10	2.46	0.0014
20	3.06	0.0017
30	2.21	0.0013
40	2.68	0.0015
50	2.99	0.0017
60	1.70	0.0010

LTE Band 4_1711.5MHz_BW 3MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.16	0.0013
3.80	2.88	0.0017
2.85	2.82	0.0016

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.65	0.0015
-20	2.59	0.0015
-10	2.23	0.0013
0	2.84	0.0017
10	2.15	0.0013
20	2.41	0.0014
30	2.87	0.0017
40	1.73	0.0010
50	1.86	0.0011
60	3.12	0.0018

LTE Band 4_1753.5MHz_BW 3MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.83	0.0016
3.80	3.12	0.0018
2.85	1.99	0.0011

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.86	0.0016
-20	2.14	0.0012
-10	2.18	0.0012
0	1.64	0.0009
10	2.48	0.0014
20	1.76	0.0010
30	2.72	0.0016
40	1.94	0.0011
50	2.97	0.0017
60	2.62	0.0015

LTE Band 4_1712.5MHz_BW 5MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	1.83	0.0011
3.80	2.45	0.0014
2.85	2.22	0.0013

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	1.37	0.0008
-20	2.32	0.0014
-10	1.54	0.0009
0	1.97	0.0012
10	2.18	0.0013
20	1.49	0.0009
30	1.79	0.0010
40	1.71	0.0010
50	2.32	0.0014
60	2.30	0.0013

LTE Band 4_1752.5MHz_BW 5MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	1.68	0.0010
3.80	2.66	0.0015
2.85	1.38	0.0008

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.12	0.0012
-20	1.96	0.0011
-10	2.39	0.0014
0	2.04	0.0012
10	2.44	0.0014
20	2.27	0.0013
30	2.21	0.0013
40	2.42	0.0014
50	2.45	0.0014
60	2.16	0.0012

LTE Band 4_1715MHz_BW 10MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.12	0.0012
3.80	2.78	0.0016
2.85	2.26	0.0013

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.66	0.0016
-20	2.02	0.0012
-10	2.50	0.0015
0	2.39	0.0014
10	2.43	0.0014
20	1.63	0.0010
30	2.77	0.0016
40	2.29	0.0013
50	2.73	0.0016
60	2.62	0.0015

LTE Band 4_1750MHz_BW 10MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	3.10	0.0018
3.80	2.69	0.0015
2.85	1.61	0.0009

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.55	0.0015
-20	2.90	0.0017
-10	2.60	0.0015
0	1.41	0.0008
10	2.51	0.0014
20	1.96	0.0011
30	2.12	0.0012
40	2.64	0.0015
50	1.45	0.0008
60	1.60	0.0009

LTE Band 4_1717.5MHz_BW 15MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.40	0.0014
3.80	3.28	0.0019
2.85	2.56	0.0015

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.87	0.0017
-20	3.00	0.0017
-10	3.05	0.0018
0	2.54	0.0015
10	1.72	0.0010
20	2.38	0.0014
30	3.31	0.0019
40	2.45	0.0014
50	3.54	0.0021
60	3.29	0.0019

LTE Band 4_1747.5MHz_BW 15MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.5	3.23	0.0018
3.8	3.41	0.0020
2.9	3.01	0.0017

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.41	0.0014
-20	2.99	0.0017
-10	1.96	0.0011
0	2.87	0.0016
10	3.27	0.0019
20	2.59	0.0015
30	2.83	0.0016
40	1.98	0.0011
50	2.80	0.0016
60	3.15	0.0018

LTE Band 4_1720MHz_BW 20MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.16	0.0013
3.80	2.55	0.0015
2.85	3.26	0.0019

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	1.97	0.0011
-20	2.07	0.0012
-10	2.23	0.0013
0	1.23	0.0007
10	2.28	0.0013
20	2.86	0.0017
30	1.86	0.0011
40	2.41	0.0014
50	1.00	0.0006
60	1.97	0.0011

LTE Band 4_1745MHz_BW 20MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	3.46	0.0020
3.80	3.33	0.0019
2.85	2.47	0.0014

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.76	0.0016
-20	3.10	0.0018
-10	1.84	0.0011
0	2.60	0.0015
10	2.85	0.0016
20	2.65	0.0015
30	2.36	0.0014
40	3.08	0.0018
50	2.43	0.0014
60	2.71	0.0016

Product	LGA module		
Test Item	Frequency Stability		
Test Mode	Mode 2: LTE Band 13		
Date of Test	2020/12/07	Test Site	SR12-H
Temperature (°C)	24.0	Humidity (%RH)	63.0

LTE Band 13_779.5MHz_BW 5MHz
Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.54	0.0033
3.80	3.23	0.0041
2.85	3.17	0.0041

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.86	0.0037
-20	3.19	0.0041
-10	3.69	0.0047
0	2.68	0.0034
10	2.76	0.0035
20	3.87	0.0050
30	3.46	0.0044
40	3.78	0.0048
50	2.65	0.0034
60	1.99	0.0026

LTE Band 13_784.5MHz_BW 5MHz
Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.54	0.0032
3.80	2.99	0.0038
2.85	3.32	0.0042

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	1.89	0.0024
-20	2.09	0.0027
-10	2.70	0.0034
0	2.77	0.0035
10	2.44	0.0031
20	2.87	0.0037
30	2.20	0.0028
40	2.56	0.0033
50	2.64	0.0034
60	2.37	0.0030

LTE Band 13_782MHz_BW 10MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.50	2.99	0.0038
3.80	3.24	0.0041
2.85	3.50	0.0045

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	2.47	0.0032
-20	2.21	0.0028
-10	2.89	0.0037
0	2.18	0.0028
10	2.59	0.0033
20	3.16	0.0040
30	3.13	0.0040
40	2.84	0.0036
50	1.62	0.0021
60	3.65	0.0047