FCC/IC Test Report

FOR:

InHand Electronics

Model Name: CTC-IS IPU

Product Description: Tracking Device (Government/Military)

FCC ID: 24C4A-CTCISIPU

47 CFR Part 2, 22, 24, 27 for LTE bands

TEST REPORT #: EMC_ CONNE_034_14001_FCC22_24_27_LTE_WWAN
DATE: 2015-1-21

FCC:
A2LA Accredited

IC recognized #
3462E-1

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Table of Contents

1 Assessment 3
2 Administrative Data 4
2.1 Identification of the Testing Laboratory Issuing the Test Report 4
2.2 Identification of the Client 4
2.3 Identification of the Manufacturer 4
3 Equipment under Test (EUT) 5
3.1 Specification of the Equipment under Test 5
3.2 Identification of the Equipment under Test (EUT) 6
3.3 Environmental conditions during Test 6
3.4 Dates of Testing 6
4 Subject of Investigation 7
5 Summary of Measurement Results 8
5.1 LTE Band 17 (700 MHz): 8
5.2 LTE Band 2 (1900 MHz): 9
5.3 LTE Band 4 (1700 MHz): 10
5.4 LTE Band 5 (850 MHz): 11
5.5 LTE Band 13 (700 MHz): 12
6 Measurements 13
6.1 RF Power Output 13
6.1.1 References *13*
6.1.2 Measurement Requirements: *13*
6.1.3 Limits: *13*
6.1.4 Measurement Procedure: *14*
6.1.5 Test Results *16*
6.1.6 Test Verdict *43*
6.1.7 RF Output Power Verification: *44*
6.2 TX Radiated Spurious Emissions 47
6.2.1 References *47*
6.2.2 Limits *47*
6.2.3 Measurement requirements: *48*
6.2.4 Radiated out of band measurement procedure: *49*
6.2.5 Sample Calculations for Radiated Measurements *50*
6.2.6 Measurement Survey: *50*
6.2.7 Test Conditions: *50*
6.2.8 Test Results: *51*
7 Test Equipment and Ancillaries used for tests 135
8 Test Setup Diagrams 136
9 Revision History 137

1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules parts 2, 22, 24 and 27 of Title 47 of the Code of Federal Regulations. No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
In Hand Electronics	Tracking device(Government/Military)	CTC-IS IPU

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2015-1-21	Compliance	Milton Ponce Deleon (Test Lab Manager)	Milton Ponce de Leon Digitally signed by Milton Ponce de Leon DN: cn=Milton Ponce de Leon, c=US, o=Cetecom Inc., ou=OTA, email=milton.deleon@cetecom.com Date: 2015.01.22 11:05:51 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2015-1-21	Compliance	Muhammad Umair Anees (EMC Engineer)	Muhammad Umair Anees Digitally signed by Muhammad Umair Anees DN: cn=Muhammad Umair Anees, c=US, o=EMC, ou=Compliance, email=Muhammad.Anees@cetecom.com Date: 2015.01.22 11:02:16 -08'00'

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	6370 Nancy Ridge Drive, Suite 101 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362 2400
Fax:	+1 (858) 587 4809
Test Lab Manager:	Milton Deleon

2.2 Identification of the Client

Applicant's Name:	InHand Electronics, Inc.
Street Address:	30 West Gude Drive Suite 550
City/Zip Code	Rockville, MD 20850
Country	United States
Contact Person:	Mark Price
Phone No.	(240) 558-2014
e-mail:	mprice@inhandelectronics.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	CTC-IS IPU
FCC-ID :	24C4A-CTCISIPU
Product Description:	Tracking device(Government/Military)
Technology / Type(s) of Modulation:	Sierra Wireless Integrated Radio Module: MC 7354 features: LTE,HSPA (tested in separate test report) LTE: QPSK, 16 QAM and 64 QAM
Operating Frequency Ranges (MHz) / Channels	LTE Band 17 (700 MHz): 710 -716 MHz LTE Band 13 (700MHz): 777 MHz – 787 MHz LTE Band 5 (850 MHz): 824.2-848.8 MHz LTE Band 4 (1700 MHz): 1712.4 -1752.5 MHz LTE Band 2 (1900 MHz): 1850.2-1909.8 MHz
Antenna Information as declared:	External Antenna: Penta-band dipole antenna by Pulse 2dBi gain across all bands mentioned above.
Power Supply/ Rated Operating Voltage Range:	External Battery pack with a 15VDC output
Rated Operating Temperature Range:	-18°C ~ +49°C
Test Sample Status:	Prototype
Other Radios included in the device:	802.15.4 Radio module MRF24J40MA by Microchip 2.4GHz operation

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	DEF0000104	Radiated/Conducted	001/002

3.3 Environmental conditions during Test

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 20-25°C
Relative Humidity: 40-60%

3.4 Dates of Testing

09/09/2014 – 10/01/2014

4 Subject of Investigation

The objective of the measurements applied by CETECOM Inc. was to establish compliance of the EUT as described under Ch. 3 of this Test Report, with the applicable criteria specified in

47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services
47 CFR Part 27: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 27-Miscellaneous wireless communication services

This test report is to support a request for new equipment authorization under the FCC ID: **24C4A-CTCISIPU**.

All testing was performed on the product referred to in Section 3 as EUT.

This product integrates the precertified WWAN module : Sierra Wireless **MC7354**

Taking into account, guidance from FCC KDB 996369 (modular approval) and where relevant test procedures did not change, conducted test results are leveraged from the test report for Sierra Wireless modem **MC7355** with FCC ID **N7NMC7355** issued by Sierra Wireless on August 16, 2012 for FCC/IC certification of LTE bands.

5 Summary of Measurement Results

5.1 LTE Band 17 (700 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4)	RF Output Power	Nominal	QPSK 16 QAM	■	☐	☐	☐	Complies
§27.50(d)(5)	Peak-to-average Ratio	Nominal	QPSK 16 QAM	☐	☐	☐	■	Note 1
§2.1055 §27.54	Frequency Stability	Extreme	QPSK 16 QAM	☐	☐	☐	■	Note 1
§2.1049 §27.53(h)	Occupied Bandwidth	Nominal	QPSK 16 QAM	☐	☐	☐	■	Note 1
§2.1051 §27.53(h)	Band Edge Compliance	Nominal	QPSK 16 QAM	☐	☐	☐	■	Note 1
§2.1053 §27.53(h)	Unwanted Emissions	Nominal	QPSK 16 QAM	■	☐	☐	☐	Complies

NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module data.

5.2 LTE Band 2 (1900 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a)	RF Output Power	Nominal	QPSK	■	☐	☐	☐	Complies
			16 QAM					
§24.232 (d)	Peak-to-average Ratio	Nominal	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1055 §24.235	Frequency Stability	Extreme	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1049	Occupied Bandwidth	Nominal	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1051 §24.238	Band Edge Compliance	Nominal	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1053 §24.238	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies
			16 QAM					

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module data.

5.3 LTE Band 4 (1700 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4)	RF Output Power	Nominal	QPSK 16 QAM	■	□	□	□	Complies
§27.50(d)(5)	Peak-to-average Ratio	Nominal	QPSK 16 QAM	□	□	□	■	Note 1
§2.1055 §27.54	Frequency Stability	Extreme	QPSK 16 QAM	□	□	□	■	Note 1
§2.1049 §27.53(h)	Occupied Bandwidth	Nominal	QPSK 16 QAM	□	□	□	■	Note 1
§2.1051 §27.53(h)	Band Edge Compliance	Nominal	QPSK 16 QAM	□	□	□	■	Note 1
§2.1053 §27.53(h)	Unwanted Emissions	Nominal	QPSK 16 QAM	■	□	□	□	Complies

NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module data.

5.4 LTE Band 5 (850 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a)	RF Output Power	Nominal	QPSK	■	☐	☐	☐	Complies
			16 QAM					
			16 QAM					
§2.1055 §22.355	Frequency Stability	Extreme	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1049 §22.917(b)	Occupied Bandwidth	Nominal	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1051 §22.917	Band Edge Compliance	Nominal	QPSK	☐	☐	☐	■	Note 1
			16 QAM					
§2.1053 §22.917	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies
			16 QAM					

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module data.

5.5 LTE Band 13 (700 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(h)(2)	RF Output Power	Nominal	QPSK 16 QAM	■	□	□	□	Complies
27.50(d)(5)	Peak-to-average Ratio	Nominal	QPSK 16 QAM	□	□	□	■	Note 1
§2.1055 §27.54	Frequency Stability	Extreme	QPSK 16 QAM	□	□	□	■	Note 1
§2.1049 §27.53(h)	Occupied Bandwidth	Nominal	QPSK 16 QAM	□	□	□	■	Note 1
§2.1051 §27.53(h)	Band Edge Compliance	Nominal	QPSK 16 QAM	□	□	□	■	Note 1
§2.1053 §27.53(h)	Unwanted Emissions	Nominal	QPSK 16 QAM	■	□	□	□	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module data.

6 Measurements

6.1 RF Power Output

6.1.1 References

- FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50
- FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

6.1.2 Measurement Requirements:

6.1.2.1 FCC 2.1046: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

6.1.3 Limits:

6.1.3.1 Band5 (850MHz)

FCC Part 22.913 (a)

FCC: Average ERP < 38.45 dBm (7W)

6.1.3.2 Band2 (1900 MHz)

FCC Part 24.232 (c) (e)

FCC: Average EIRP < 33 dBm (2W)

6.1.3.3 Band4 1700 MHz

FCC Part 27.50 (d) (4) (6)

FCC: Average EIRP < 30 dBm (1W)

6.1.3.4 Band17 (704-716 MHz)

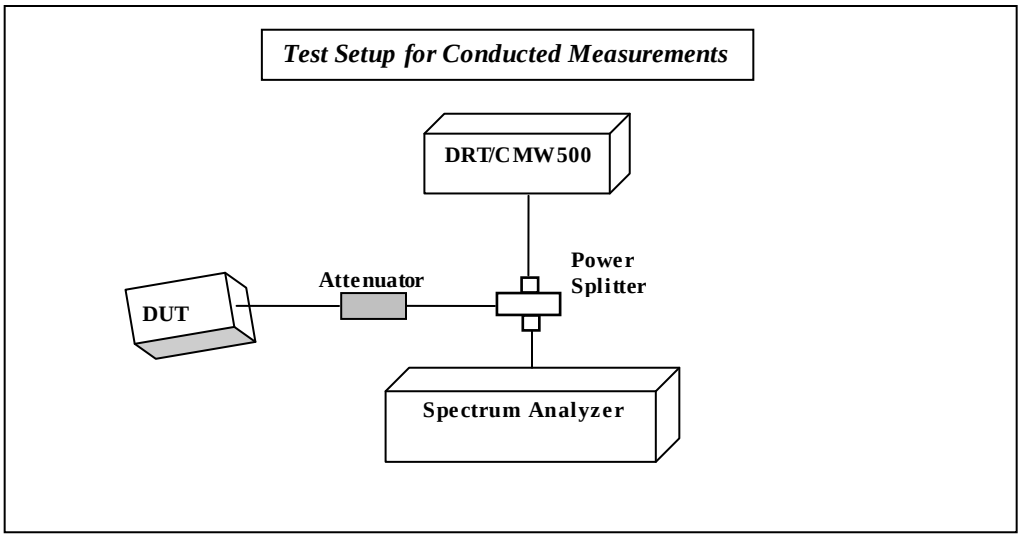
FCC Part 27.50 (c) (10)
FCC: Average ERP < 34.8 dBm (3W)

6.1.3.5 Band13 (777-787 MHz)

FCC Part 27.50 (b) (10)

FCC: Average ERP < 34.8 dBm (3W)

6.1.4 Measurement Procedure:



The DUT is using as much total output power as permissible according to the standards independent of physical bandwidth used. In order to achieve this goal the amplifier gain or baseband signal level inside the DUT is dynamically adjusted when the bandwidth changes. To verify the capability of the DUT to perform this dynamic adjustment it was tested with one single RB and with the full RB configuration for each supported channel bandwidth for each band under test.

Different modulations have different peak to average ratios so 16QAM and QPSK have been tested.

Testing for Low, Mid and High channel is the basic procedure from all radio base standards to catch frequency response over the band.

The power measurements were carried out with the CMW500. It returns peak and average results. Internally it uses a time domain power measurement function for Peak and RMS power. The measurements are including a range of at least 25LTE frames to ensure stable and reproduceable results for peak and average. A spot check has been carried out comparing this method with the frequency domain methods described in 971168 D01 Power Meas License Digital Systems v02 DR2-41372 - yielding results within 0.2dB.

The gains have been taken from the customer documentation.

The following attenuations between the DUT conducted port and input port of CMU have been determined for the bands under test. They have been entered in the RF config menu of the CMW500 to be able to take the final corrected reading. An additional attenuation or loss of the path between the U.FL connector on the Sierra Wireless module to the external SMA connector is added to the results. That loss is 1.2 dB for low bands and 2 dB for high bands.

LTE Band	Frequency at center	Attenuation
Band 17	710MHz	11.5
Band 2	1880MHz	11.5
Band 4	1732MHz	11.5
Band 5	835MHz	11.5
Band 7	2535MHz	11.5

6.1.4.1 Test Conditions:

Tnom: 22°C; Vnom: 15 V

6.1.4.2 Measurement Uncertainty

+/- 0.5 dB

6.1.5 Test Results

6.1.5.1 Conducted Output Power LTE Band 17:

LTE Band 17 (704 MHz – 716 MHz)							
RB Size = 1		**RB Offset** = Low/Mid/High				**BW (MHz)** = 5	
Modulation: QPSK							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23755/706.5/Low	27.66	23.01	4.65	2	22.86	34.8	Pass
23790/710/Mid	27.43	23.24	4.19	2	23.09	34.8	Pass
23825/711/High	26.93	22.99	3.94	2	22.84	34.8	Pass

LTE Band 17 (704 MHz – 716 MHz)							
RB Size = 25		**RB Offset** = Low				**BW (MHz)** = 5.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23755/706.5	28.18	22.21	5.97	2	22.06	34.8	Pass
23790/710	28.01	22.18	5.83	2	22.03	34.8	Pass
23825/713.5	28.46	22.07	6.39	2	21.92	34.8	Pass

LTE Band 17 (704 MHz – 716 MHz)							
RB Size = 50		**RB Offset** = Low				**BW (MHz)** = 10	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23780/709	28.16	22.07	6.09	2	21.92	34.8	Pass
23790/710	27.95	22.14	5.81	2	21.99	34.8	Pass
23800/711	28.2	22.15	6.05	2	22	34.8	Pass

LTE Band 17 (704 MHz – 716 MHz)							
Resource Block Size = 1		**Resource Block Offset** = Low/Mid/High				**BW (MHz)** = 5	
Modulation: 16 QAM							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23755/706.5/Low	27.17	21.7	5.47	2	21.55	34.8	Pass
23790/710/Mid	27.48	22.11	5.37	2	21.96	34.8	Pass
23825/711/High	27.16	22.28	4.88	2	22.13	34.8	Pass

LTE Band 17 (704 MHz – 716 MHz)							
Resource Block Size = 25		**Resource Block Offset** = Low				**BW (MHz)** = 5.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23755/706.5	27.98	21.2	6.78	2	21.05	34.8	Pass
23790/710	28.14	21.16	6.98	2	21.01	34.8	Pass
23825/713.5	28.58	21.05	7.53	2	20.9	34.8	Pass

LTE Band 17 (704 MHz – 716 MHz)							
Resource Block Size = 50		**Resource Block Offset** = Low				**BW (MHz)** = 10	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23780/709	28.41	21.09	7.32	2	20.94	34.8	Pass
23790/710	28.45	21.16	7.29	2	21.01	34.8	Pass
23800/711	28.05	21.14	6.91	2	20.99	34.8	Pass

6.1.5.2 Conducted Output Power LTE Band 2:

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 1		**RB Offset** = Low/Mid/High				**BW (MHz)** = 1.4	
Modulation: QPSK							
Ch/Center Frequency(MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18607/1850.7/Low	25.94	21.61	4.33	2	23.61	33	Pass
18900/1880/Mid	26.71	21.53	5.18	2	23.53	33	Pass
19193/1909.3/High	26.11	21.65	4.46	2	23.65	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 6		**RB Offset** = Low				**BW (MHz)** = 1.4	
Modulation: QPSK							
Ch/Center Frequency(MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18607/1850.7	27.24	21.37	5.87	2	23.37	33	Pass
18900/1880	28.03	21.4	6.63	2	23.4	33	Pass
19193/1909.3	27.53	21.64	5.89	2	23.64	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 15		**RB Offset** = Low				**BW (MHz)** = 3.0	
Modulation: QPSK							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18615/1851.5	27.46	21.25	6.21	2	23.25	33	Pass
18900/1880	28.46	21.34	7.12	2	23.34	33	Pass
19185/1908.5	27.71	21.62	6.09	2	23.62	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 25		**RB Offset** = Low				**BW (MHz)** = 5.0	
Modulation: QPSK							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18625/1852.5	28.09	21.23	6.86	2	23.23	33	Pass
18900/1880	27.54	21.21	6.33	2	23.21	33	Pass
19175/1907.5	27.9	21.5	6.4	2	23.5	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 50		**RB Offset** = Low				**BW (MHz)** = 10.0	
Modulation: QPSK							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18650/1855	27.47	21.01	6.46	2	23.01	33	Pass
18900/1880	27.62	21.14	6.48	2	23.14	33	Pass
19150/1905	27.91	21.37	6.54	2	23.37	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 75		**RB Offset** = Low				**BW (MHz)** = 15.0	
Modulation: QPSK							
Ch/Center Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18675/1857.5	27.25	21.15	6.1	2	23.15	33	Pass
18900/1880	27.6	21.1	6.5	2	23.1	33	Pass
19125/1902.5	27.86	21.3	6.56	2	23.3	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 100		**RB Offset** = Low				**BW (MHz)** = 20	
Modulation: QPSK							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18700/1860	26.91	21.09	5.82	2	23.09	33	Pass
18900/1880	27.37	21.12	6.25	2	23.12	33	Pass
19100/1900	27.67	21.19	6.48	2	23.19	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 1		**RB Offset** = Low/Mid/High				**BW (MHz)** = 1.4	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18607/1850.7/Low	25.69	21.16	4.53	2	23.16	33	Pass
18900/1880/Mid	27.09	21.17	5.92	2	23.17	33	Pass
19193/1909.3/High	26.41	21.13	5.28	2	23.13	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 6		**RB Offset** = Low				**BW (MHz)** = 1.4	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18607/1850.7	27.44	20.21	7.23	2	22.21	33	Pass
18900/1880	28.02	20.39	7.63	2	22.39	33	Pass
19193/1909.3	27.54	20.59	6.95	2	22.59	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 15			**RB Offset** = Low			**BW (MHz)** = 3.0	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18615/1851.5	27.66	20.46	7.2	2	22.46	33	Pass
18900/1880	27.79	20.39	7.4	2	22.39	33	Pass
19185/1908.5	27.98	20.61	7.37	2	22.61	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 25			**RB Offset** = Low			**BW (MHz)** = 5.0	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18625/1852.5	27.88	20.31	7.57	2	22.31	33	Pass
18900/1880	27.9	20.35	7.55	2	22.35	33	Pass
19175/1907.5	28.22	20.47	7.75	2	22.47	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 50			**RB Offset** = Low			**BW (MHz)** = 10.0	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18650/1855	27.7	20.08	7.62	2	22.08	33	Pass
18900/1880	28.07	20.12	7.95	2	22.12	33	Pass
19150/1905	27.77	20.36	7.41	2	22.36	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 75			**RB Offset** = Low			**BW (MHz)** = 15.0	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18675/1857.5	27.42	20.13	7.29	2	22.13	33	Pass
18900/1880	27.93	20.15	7.78	2	22.15	33	Pass
19125/1902.5	27.75	20.32	7.43	2	22.32	33	Pass

LTE Band 2 (1850 MHz – 1910 MHz)							
RB Size = 100			**RB Offset** = Low			**BW (MHz)** = 20	
Modulation: 16 QAM							
Ch/Center Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
18700/1860	27.29	20.35	6.94	2	22.35	33	Pass
18900/1880	27.84	20.05	7.79	2	22.05	33	Pass
19100/1900	27.59	20.2	7.39	2	22.2	33	Pass

6.1.5.3 Conducted Output Power LTE Band 4:

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 1		**RB Offset** = Low/Mid/High				**BW (MHz)** = 1.4	
Modulation: QPSK							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19957/1710.7/Low	28.03	23.37	4.66	2	25.37	30	Pass
20175/1732.5/Mid	27.05	22.8	4.25	2	24.8	30	Pass
20393/1754.3/High	27.55	22.67	4.88	2	24.67	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 6		**RB Offset** = Low				**BW (MHz)** = 1.4	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19957/1710.7	28.36	22.11	6.25	2	24.11	30	Pass
20175/1732.5	27.27	21.83	5.44	2	23.83	30	Pass
20393/1754.3	27.73	21.45	6.28	2	23.45	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 15			**RB Offset** = Low			**BW (MHz)** = 3.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19965/1711.5	29.07	21.96	7.11	2	23.96	30	Pass
20175/1732.5	27.6	21.86	5.74	2	23.86	30	Pass
20385/1753.5	27.45	21.51	5.94	2	23.51	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 25			**RB Offset** = Low			**BW (MHz)** = 5.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19975/1712.5	28.6	21.89	6.71	2	23.89	30	Pass
20175/1732.5	27.96	21.72	6.24	2	23.72	30	Pass
20375/1752.5	27.82	21.39	6.43	2	23.39	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 50			**RB Offset** = Low			**BW (MHz)** = 10.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
20000/1715	28.6	21.89	6.71	2	23.89	30	Pass
20175/1732.5	27.96	21.72	6.24	2	23.72	30	Pass
20350/1750	27.82	21.39	6.43	2	23.39	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 75			**RB Offset** = Low			**BW (MHz)** = 15.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
20025/1717.5	28.05	21.83	6.22	2	23.83	30	Pass
20175/1732.5	27.52	21.66	5.86	2	23.66	30	Pass
20325/1747.5	27.85	21.21	6.64	2	23.21	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 100			**RB Offset** = Low			**BW (MHz)** = 20	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
20050/1720	28.39	21.67	6.72	2	23.67	30	Pass
20175/1732.5	27.87	21.61	6.26	2	23.61	30	Pass
20300/1745	28.18	21.28	6.9	2	23.28	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 1			**RB Offset** = Low/Mid/High			**BW (MHz)** = 1.4	
Modulation: 16 QAM							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19957/1710.7/Low	27.74	21.87	5.87	2	23.87	30	Pass
20175/1732.5/Mid	26.64	21.6	5.04	2	23.6	30	Pass
20393/1754.3/High	26.82	21.1	5.72	2	23.1	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 6			**RB Offset** = Low			**BW (MHz)** = 1.4	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19957/1710.7	28.43	21.03	7.4	2	23.03	30	Pass
20175/1732.5	27.31	20.81	6.5	2	22.81	30	Pass
20393/1754.3	27.75	20.46	7.29	2	22.46	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 15			**RB Offset** = Low			**BW (MHz)** = 3.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19965/1711.5	28.62	21.09	7.53	2	23.09	30	Pass
20175/1732.5	27.73	20.92	6.81	2	22.92	30	Pass
20385/1753.5	27.53	20.67	6.86	2	22.67	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 25			**RB Offset** = Low			**BW (MHz)** = 5.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
19975/1712.5	28.4	21	7.4	2	23	30	Pass
20175/1732.5	27.79	20.82	6.97	2	22.82	30	Pass
20375/1752.5	28.16	20.38	7.78	2	22.38	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 50			**RB Offset** = Low			**BW (MHz)** = 10.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
20000/1715	28.22	20.8	7.42	2	22.8	30	Pass
20175/1732.5	27.61	20.65	6.96	2	22.65	30	Pass
20350/1750	27.82	20.28	7.54	2	22.28	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 75			**RB Offset** = Low			**BW (MHz)** = 15.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
20025/1717.5	27.91	20.62	7.29	2	22.62	30	Pass
20175/1732.5	27.33	20.56	6.77	2	22.56	30	Pass
20325/1747.5	27.79	20.37	7.42	2	22.37	30	Pass

LTE Band 4 (1710 MHz – 1755 MHz)							
RB Size = 100			**RB Offset** = Low			**BW (MHz)** = 20	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBd)**	**EIRP Average (dBm)**	**EIRP Average Limit (dBm) FCC**	**Results**
20050/1720	28.06	20.7	7.36	2	22.7	30	Pass
20175/1732.5	27.64	20.62	7.02	2	22.62	30	Pass
20300/1745	27.97	20.56	7.41	2	22.56	30	Pass

6.1.5.4 Conducted Output Power LTE Band 5:

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 1			**RB Offset** = Low/Mid/High			**BW (MHz)** = 1.4	
Modulation: QPSK							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20407/824.7/Low	27.83	23.25	4.58	2	23.1	34.8	Pass
20525/836.5/Mid	28.02	23.23	4.79	2	23.08	34.8	Pass
20643/848.3/High	27.54	23.13	4.41	2	22.98	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 6			**RB Offset** = Low			**BW (MHz)** = 1.4	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20407/824.7	28.25	22.33	5.92	2	22.18	34.8	Pass
20525/836.5	28.2	22.3	5.9	2	22.15	34.8	Pass
20643/848.3	28.49	22.24	6.25	2	22.09	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 15			**RB Offset** = Low			**BW (MHz)** = 3.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20415/825.5	28.5	22.3	6.2	2	22.15	34.8	Pass
20525/836.5	28.95	22.18	6.77	2	22.03	34.8	Pass
20635/847.5	28.43	22.29	6.14	2	22.14	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 25			**RB Offset** = Low			**BW (MHz)** = 5.0	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20425/826.5	29.15	22.29	6.86	2	22.14	34.8	Pass
20525/836.5	28.38	22.16	6.22	2	22.01	34.8	Pass
20625/846.5	28.88	21.34	7.54	2	21.19	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 50			**RB Offset** = Low			**BW (MHz)** = 10	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20450/829	28.71	22.26	6.45	2	22.11	34.8	Pass
20525/836.5	28.56	22.1	6.46	2	21.95	34.8	Pass
20600/844	27.95	22.06	5.89	2	21.91	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 1			**RB Offset** = Low/Mid/High			**BW (MHz)** = 1.4	
Modulation: 16 QAM							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20407/824.7/Low	27.26	21.99	5.27	2	21.84	34.8	Pass
20525/836.5/Mid	27.22	22.22	5	2	22.07	34.8	Pass
20643/848.3/High	27.36	22.07	5.29	2	21.92	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 6			**RB Offset** = Low			**BW (MHz)** = 1.4	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20407/824.7	28.38	21.3	7.08	2	21.15	34.8	Pass
20525/836.5	28.38	21.19	7.19	2	21.04	34.8	Pass
20643/848.3	28.22	21.24	6.98	2	21.09	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 15			**RB Offset** = Low			**BW (MHz)** = 3.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20415/825.5	28.13	21.45	6.68	2	21.3	34.8	Pass
20525/836.5	28.31	21.24	7.07	2	21.09	34.8	Pass
20635/847.5	28.63	21.23	7.4	2	21.08	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 25			**RB Offset** = Low			**BW (MHz)** = 5.0	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20425/826.5	28.48	21.33	7.15	2	21.18	34.8	Pass
20525/836.5	28.53	21.24	7.29	2	21.09	34.8	Pass
20625/846.5	28.36	21.34	7.02	2	21.19	34.8	Pass

LTE Band 5 (824 MHz – 849 MHz)							
RB Size = 50			**RB Offset** = Low			**BW (MHz)** = 10	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
20450/829	29.16	21.22	7.94	2	21.07	34.8	Pass
20525/836.5	28.91	21.23	7.68	2	21.08	34.8	Pass
20600/844	28.74	21.18	7.56	2	21.03	34.8	Pass

6.1.5.5 Conducted Output Power LTE Band 13:

LTE Band 13 (777 MHz – 787 MHz)							
RB Size = 1		**RB Offset** = Low/Mid/High				**BW (MHz)** = 5	
Modulation: QPSK							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23205/779.5/Low	27.88	23.81	4.07	2	23.66	34.8	Pass
23230/782/Mid	27.92	23.54	4.38	2	23.39	34.8	Pass
23255/784.5/High	27.9	23.46	4.44	2	23.31	34.8	Pass

LTE Band 13 (777 MHz – 787 MHz)							
RB Size = 1		**RB Offset** = Low/Mid/High				**BW (MHz)** = 5	
Modulation: 16 QAM							
Ch/Frequency (MHz)/RB	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23205/779.5/Low	27.32	22.08	5.24	2	21.93	34.8	Pass
23230/782/Mid	28.1	22.49	5.61	2	22.34	34.8	Pass
23255/784.5/High	28.28	22.82	5.46	2	22.67	34.8	Pass

LTE Band 13 (777 MHz – 787 MHz)							
RB Size = 25		**RB Offset** = Low/Mid/High				**BW (MHz)** = 5	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23205/779.5	28.83	22.34	6.49	2	22.19	34.8	Pass
23230/782	28.54	22.38	6.16	2	22.23	34.8	Pass
23255/784.5	28.26	22.42	5.84	2	22.27	34.8	Pass

LTE Band 13 (777 MHz – 787 MHz)							
RB Size = 25		**RB Offset** = Low/Mid/High				**BW (MHz)** = 5	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23205/779.5	29.02	21.33	7.69	2	21.18	34.8	Pass
23230/782	28.63	21.46	7.17	2	21.31	34.8	Pass
23255/784.5	28.2	21.37	6.83	2	21.22	34.8	Pass

LTE Band 13 (777 MHz – 787 MHz)							
RB Size = 50		**RB Offset** = Low/Mid/High				**BW (MHz)** = 10	
Modulation: QPSK							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23230/710	28.31	22.24	6.07	2	22.09	34.8	Pass

LTE Band 13 (777 MHz – 787 MHz)							
RB Size = 50		**RB Offset** = Low/Mid/High				**BW (MHz)** = 10	
Modulation: 16 QAM							
Ch/Frequency (MHz)	**Conducted Output Power Peak(dBm)**	**Conducted Output Power Average(dBm)**	**PAR (limit 13dB)**	**Antenna Gain (dBi)**	**ERP Average (dBm)**	**ERP Average Limit (dBm) FCC**	**Results**
23230/710	28.57	21.49	7.08	2	21.34	34.8	Pass

6.1.6 Test Verdict

Pass

6.1.7 RF Output Power Verification:

In this section, RF output power measured in this report is compared to the powers declared in the module's original filing report. This check will determine if the conducted test results from the module filing can be reused for this report. Particularly the power values measured should be less than what is declared in the module filing report.

For the sake of simplicity, only 5MHz and 10MHz BW results are shown, while all supported bandwidths are checked and verified.

LTE Band 2

			Max Power (RMS)		Max Power (PK)		Delta	
BW	Channel/Freq	Modulation	Module	Measured	Module	Measured	RMS	Peak
5	18625 (1852.5 MHz)	QPSK	22.09	21.23	28.54	28.09	0.86	0.45
		16QAM	21.24	20.31	28.32	27.88	0.93	0.44
	18900 (1880 MHz)	QPSK	22.3	21.21	28.27	27.54	1.09	0.73
		16QAM	21.41	20.35	28.48	27.9	1.06	0.58
	19175 (1907.5 MHz)	QPSK	22.36	21.5	28.04	27.9	0.86	0.14
		16QAM	21.35	20.47	27.81	28.22	0.88	-0.41
10	18650 (1855 MHz)	QPSK	22.18	21.01	28.71	27.47	1.17	1.24
		16QAM	21.13	20.08	28.87	27.7	1.05	1.17
	18900 (1880 MHz)	QPSK	22.26	21.14	28.94	27.62	1.12	1.32
		16QAM	21.23	20.12	28.77	28.07	1.11	0.7
	19150 (1905 MHz)	QPSK	22.26	21.37	28.32	27.91	0.89	0.41
		16QAM	21.08	20.36	28.4	27.77	0.72	0.63

LTE Band 4

			Max Power (RMS)		Max Power (PK)		Delta	
BW	Channel/Freq	Modulation	Module	Measured	Module	Measured	RMS	Peak
5	19975 (1712.5 MHz)	QPSK	22.21	21.89	28.87	28.6	0.32	0.27
		16QAM	21.15	21	28.83	28.4	0.15	0.43
	20175 (1732.5 MHz)	QPSK	22.24	21.72	28.14	27.96	0.52	0.18
		16QAM	21.22	20.82	27.95	27.79	0.4	0.16
	20375 (1752.5 MHz)	QPSK	22.16	21.39	28.52	27.82	0.77	0.7
		16QAM	21.15	20.38	28.51	28.16	0.77	0.35
10	20000 (1715 MHz)	QPSK	22.08	21.89	28.04	28.6	0.19	-0.56
		16QAM	21.08	20.8	28.13	28.22	0.28	-0.09
	18900 (1880 MHz)	QPSK	22.17	21.72	28.09	27.96	0.45	0.13
		16QAM	21.15	20.65	28.06	27.61	0.5	0.45
	20350 (1750 MHz)	QPSK	22.07	21.39	28.52	27.82	0.68	0.7
		16QAM	21.04	20.28	28.35	27.82	0.76	0.53

LTE Band 5

			Max Power (RMS)		Max Power (PK)		Delta	
BW	Channel/Freq	Modulation	Module	Measured	Module	Measured	RMS	Peak
5	20425 (826.5 MHz)	QPSK	22.41	22.29	28.37	29.15	0.12	-0.78
		16QAM	21.31	21.33	28.55	28.48	-0.02	0.07
	20525 (836.5.5 MHz)	QPSK	22.21	22.16	28.36	28.38	0.05	-0.02
		16QAM	21.28	21.24	28.26	28.53	0.04	-0.27
	20625 (846.5 MHz)	QPSK	22.23	21.34	28.24	28.88	0.89	-0.64
		16QAM	21.15	21.34	27.93	28.36	-0.19	-0.43
10	20450 (829 MHz)	QPSK	22.28	22.26	28.29	28.71	0.02	-0.42
		16QAM	21.35	21.22	28.47	29.16	0.13	-0.69
	20525 (836.5 MHz)	QPSK	22.21	22.1	28.25	28.56	0.11	-0.31
		16QAM	21.31	21.23	28.41	28.91	0.08	-0.5
	20600 (844 MHz)	QPSK	22.2	22.06	28.1	27.95	0.14	0.15
		16QAM	21.23	21.18	27.81	28.74	0.05	-0.93

LTE Band 13

			Max Power (RMS)		Max Power (PK)		Delta	
BW	Channel/Freq	Modulation	Module	Measured	Module	Measured	RMS	Peak
5	23205 (779.5 MHz)	QPSK	22.19	22.34	28.62	28.83	-0.15	-0.21
		16QAM	21.1	21.33	28.56	29.02	-0.23	-0.46
	23230 (782 MHz)	QPSK	22.16	22.38	28.14	28.54	-0.22	-0.4
		16QAM	21.05	21.46	27.98	28.63	-0.41	-0.65
	23255 (784.5 MHz)	QPSK	22.35	22.42	28.27	28.26	-0.07	0.01
		16QAM	21.22	21.37	28.06	28.2	-0.15	-0.14
10	23230 (782 MHz)	QPSK	22.15	22.24	28.2	28.31	-0.09	-0.11
		16QAM	21.25	21.49	28.13	28.57	-0.24	-0.44

LTE Band 17

			Max Power (RMS)		Max Power (PK)		Delta	
BW	Channel/Freq	Modulation	Module	Measured	Module	Measured	RMS	Peak
5	23755 (706.5 MHz)	QPSK	22.12	22.21	28.76	28.18	-0.09	0.58
		16QAM	21.05	21.2	28.7	27.98	-0.15	0.72
	23790 (710 MHz)	QPSK	22.16	22.18	28.42	28.01	-0.02	0.41
		16QAM	21.11	21.16	28.47	28.14	-0.05	0.33
	23825 (713.5 MHz)	QPSK	22.14	22.07	28.67	28.46	0.07	0.21
		16QAM	21.14	21.05	28.44	28.58	0.09	-0.14
	23790 (710 MHz)	QPSK	22.07	22.07	28.6	28.16	0	0.44
		16QAM	21	21.16	28.23	28.45	-0.16	-0.22

6.1.7.1 Verification Result:

All powers measured are within measurement tolerance and uncertainty. Hence all conducted test results will be re-used for this report per guidelines from FCC KDB 996369.

6.2 TX Radiated Spurious Emissions

6.2.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53
FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

6.2.2 Limits

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.
(b) *Measurement procedure*. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC 27.53 Emission limitations for AWS

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.
(h) 3) Measurement procedure. i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power

6.2.3 Measurement requirements:

6.2.3.1 FCC §2.1057 Frequency spectrum to be investigated.

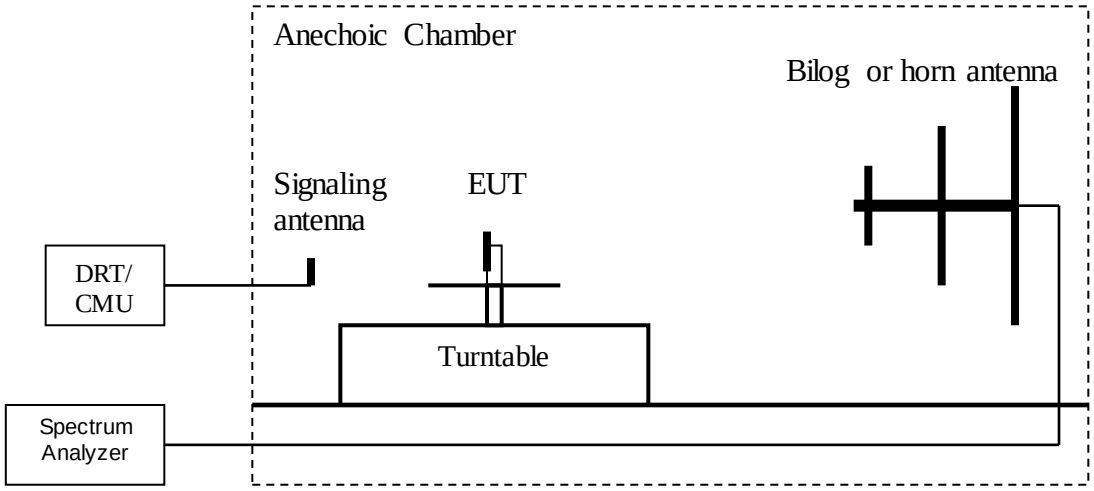
(a) In all of the measurements set forth in §§2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:
(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(2) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.
(b) Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.
(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

6.2.3.2 FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

6.2.4 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.

Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.

Set the spectrum analyzer to measure peak hold with the required settings.

Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.

Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.

Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Repeat steps 4, 5 and 6 with all antennas vertically polarized.

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

(N**ote:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

Radiated Measurement Uncertainty: ±3dB

6.2.5 Sample Calculations for Radiated Measurements

6.2.5.1 Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure.
The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)

Example:

Frequency (MHz)	Measured SA (dBµV)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

6.2.6 Measurement Survey:

The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 9kHz to the 10th harmonic of the highest frequency generated by the EUT.

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of all supported LTE bands.

The configuration with 1 Resource Block has been chosen as a worst case configuration because 1RB represents the highest power density and thus the highest peak powers of all supported bandwidth configurations. Additionally, configuration with full resource block for each band is also being tested as worst case since greater the physical bandwidth results in larger modulation spectrum residuals. Both QPSK and 16QAM modulations have been tested but only mid channel plots of 16QAM are shown in the report for brevity purposes. It's been observed that both modulations show near identical results.

For low channel the lowest resource block has been chosen and for high channel the highest to represent the worst case in terms of band edge proximity.

For 9kHz-30MHz and 18GHz-26GHz(if applicable) measurement ranges, only mid channel with QPSK modulation is tested. This is because at these extreme frequency ranges, there is a very low probability to have spurious emissions from TX signal, so mid channel is good enough representation to comply at these ranges.

For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.

Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier.

6.2.7 Test Conditions:

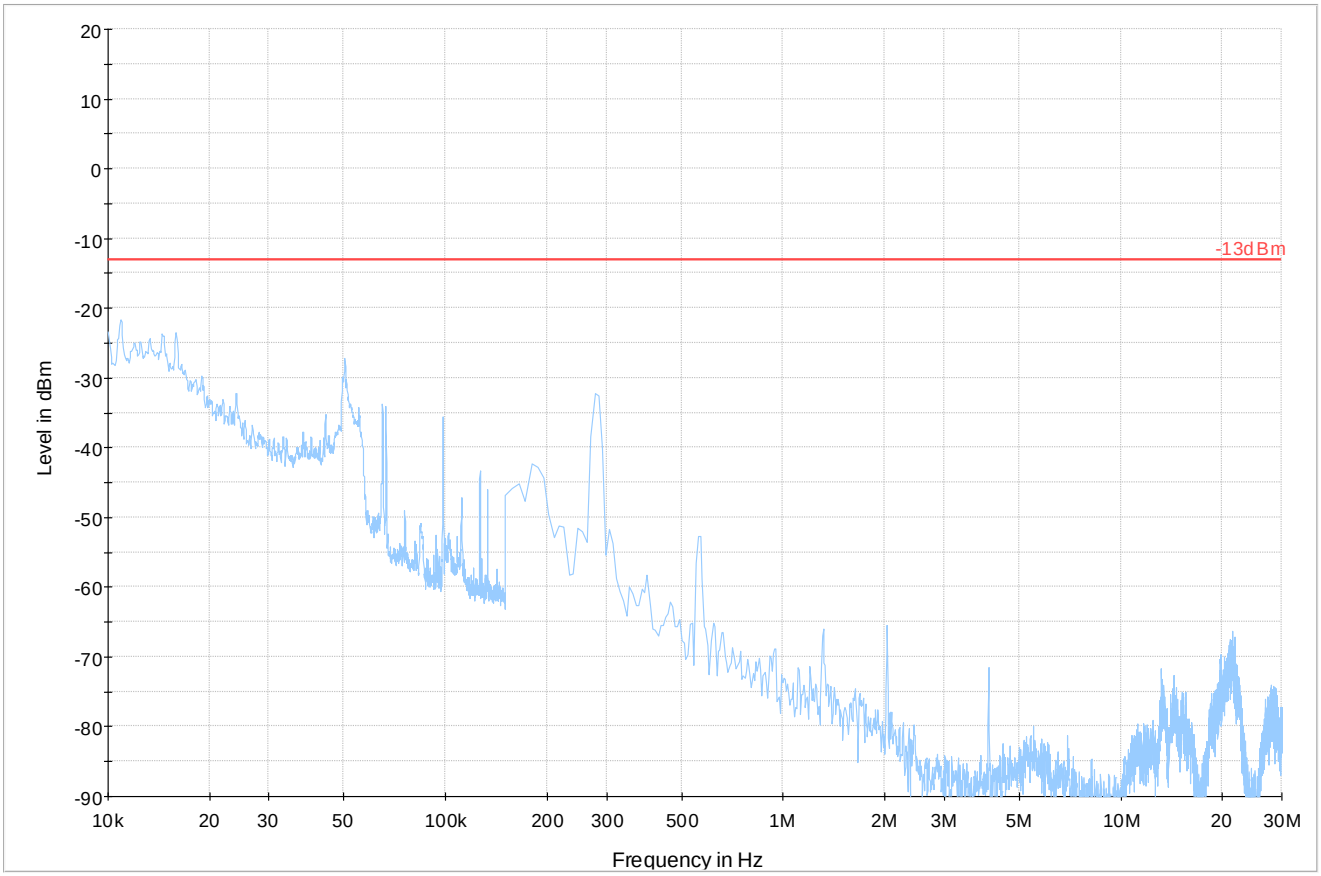
Tnom: 20°C; Vnom: 3.6 V

6.2.8 Test Results:

6.2.8.1 Spurious Emission LTE FDD 2:

6.2.8.1.1 QPSK/ 1.4MHz/ Low Channel/ 10kHz to 30MHz:

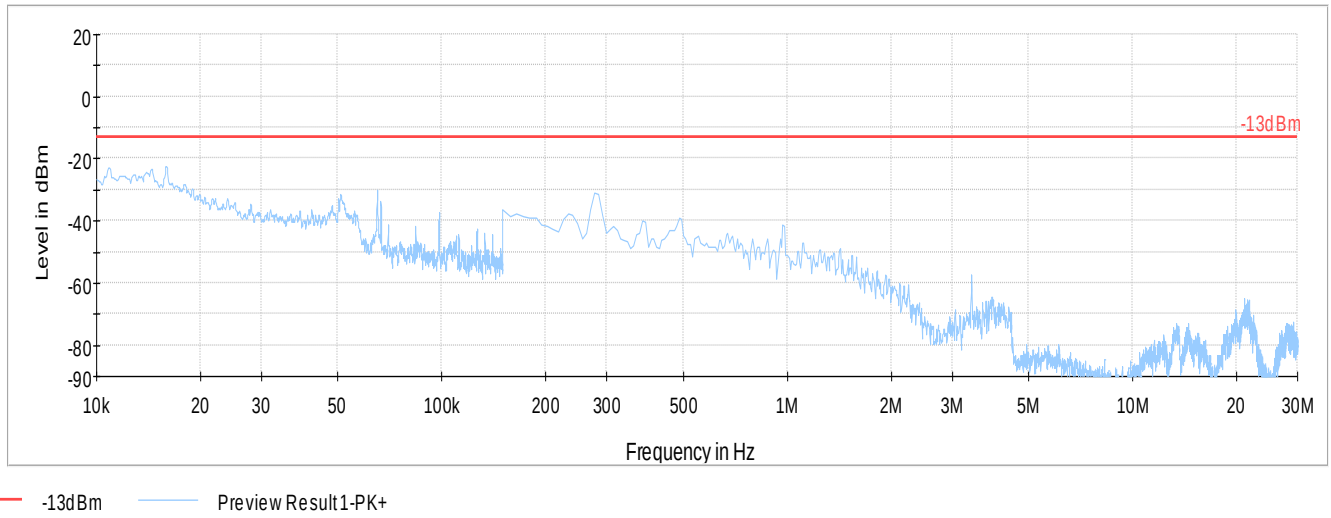
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30MHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

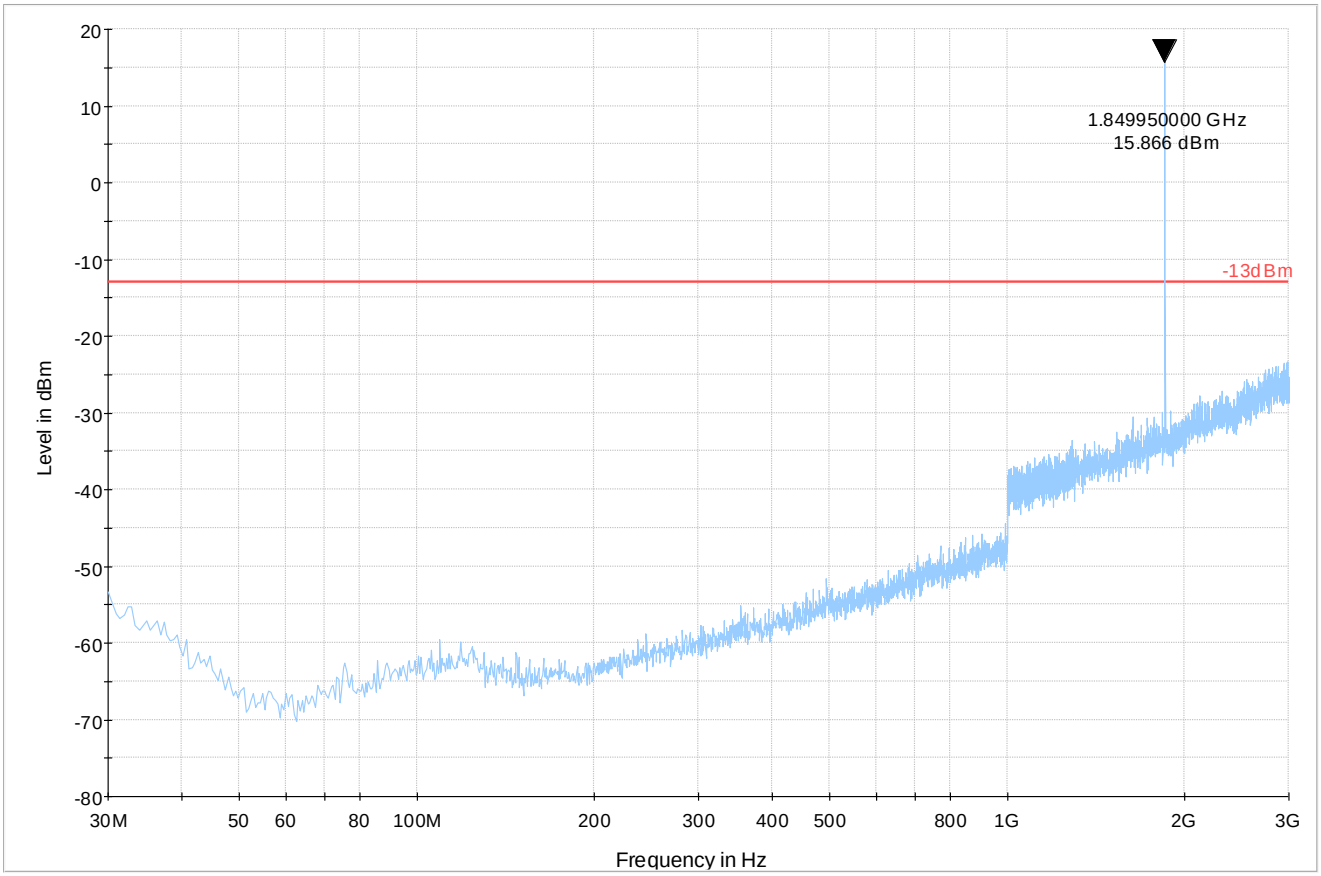
6.2.8.1.2 QPSK/ 20MHz/ Low Channel/ 10kHz to 30MHz:

LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30MHz -Mid Channel		
RB Size = Full	**RB Offset** = 0	**BW (MHz)** = 20



6.2.8.1.3 QPSK/ 1.4MHz/ Low Channel/ 30MHz to 3GHz:

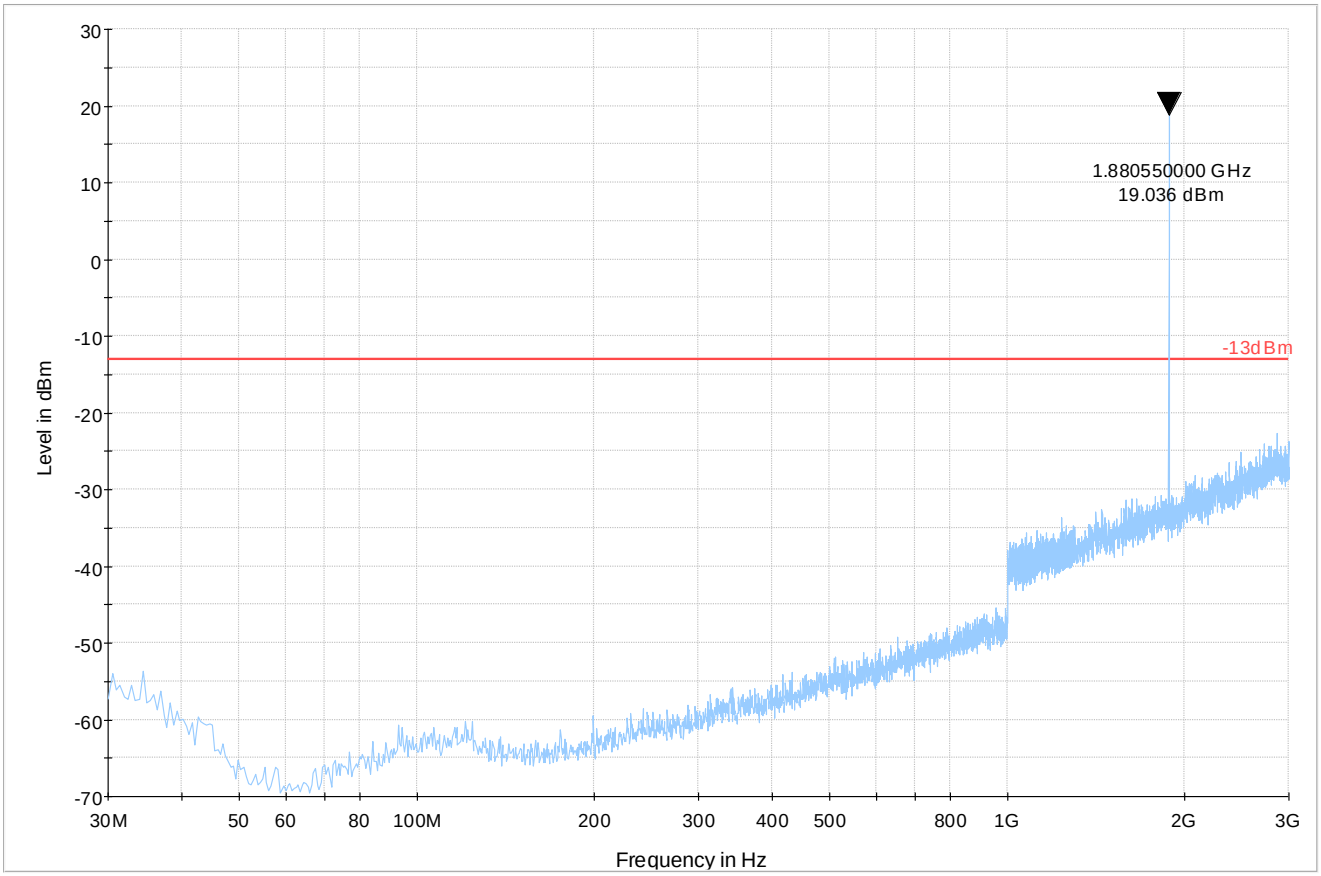
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.4 QPSK/ 1.4MHz/ Mid Channel/ 30MHz to 3GHz:

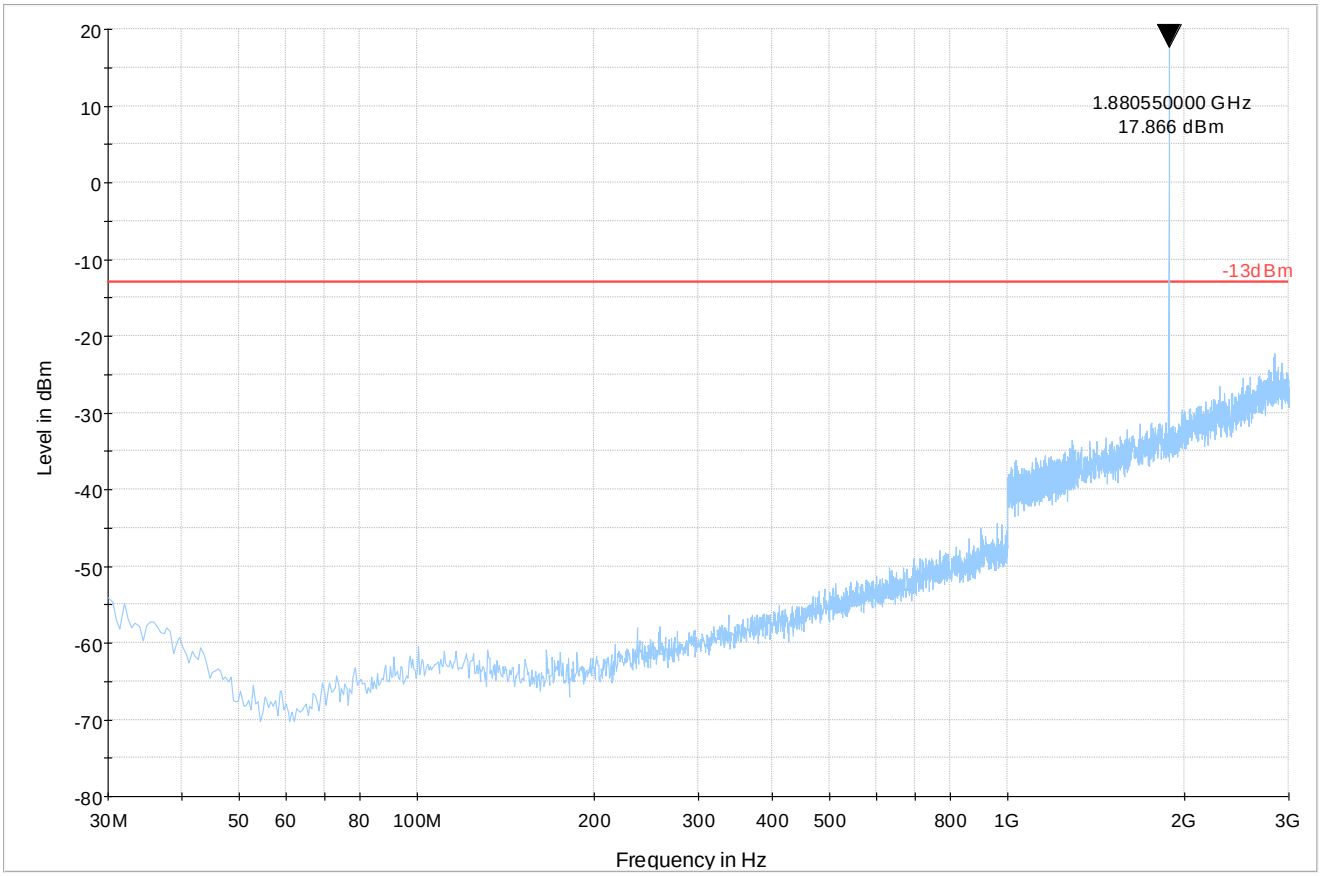
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.5 16QAM/ 1.4MHz/ Mid Channel/ 30MHz to 3GHz:

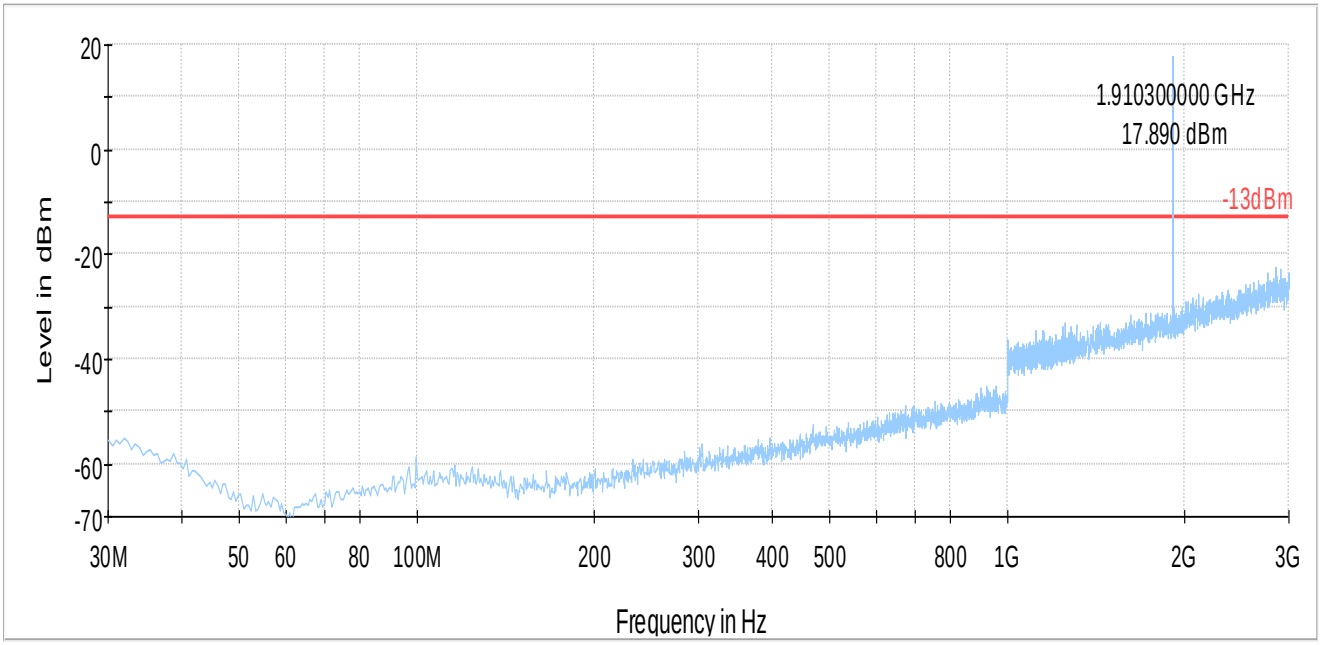
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: 16QAM		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.6 QPSK/ 1.4MHz/ High Channel/ 30MHz to 3GHz:

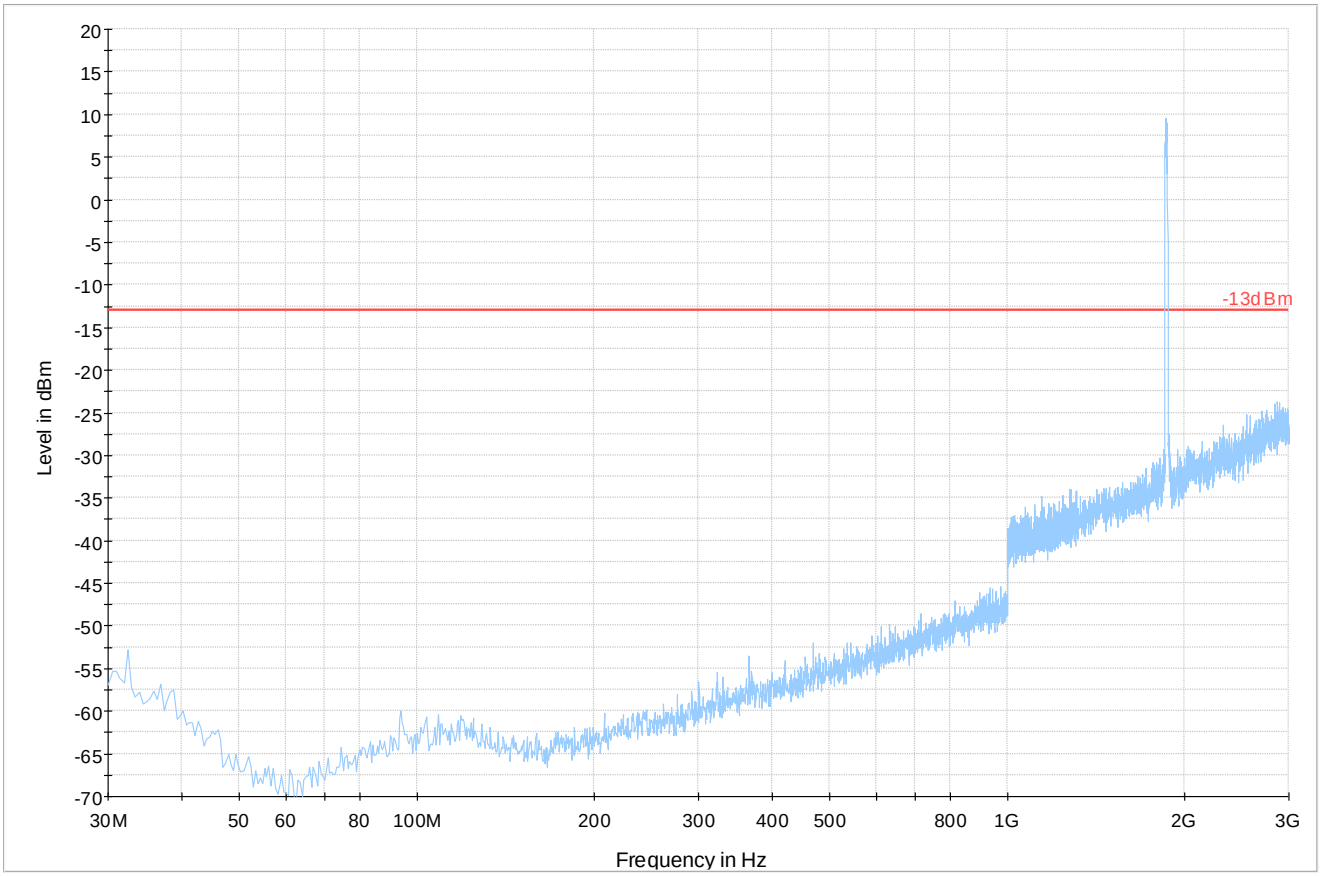
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.7 QPSK/ 20MHz/ Low Channel/ 30MHz to 3GHz:

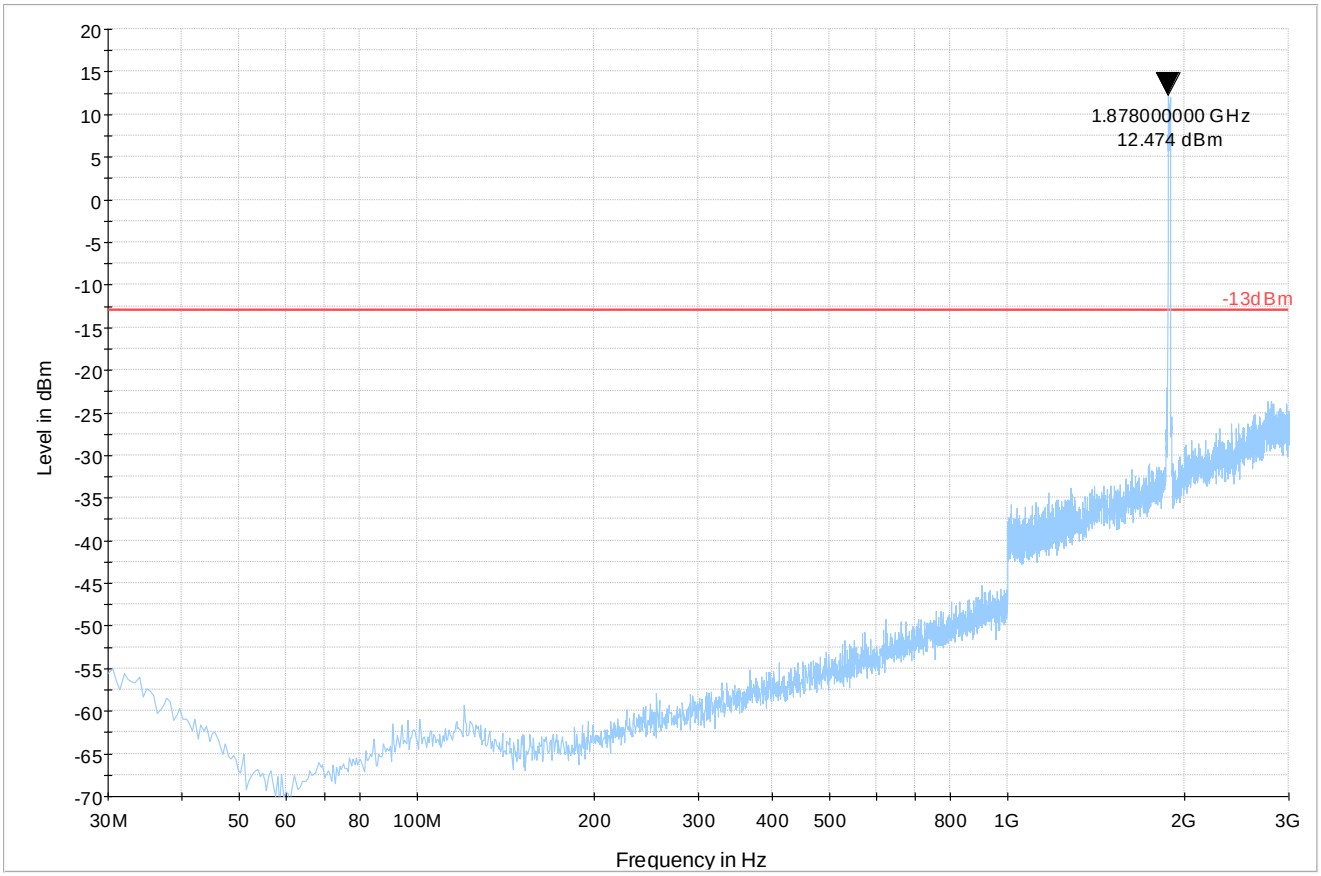
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz –Low Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.1.8 QPSK/ 20MHz/ Mid Channel/ 30MHz to 3GHz:

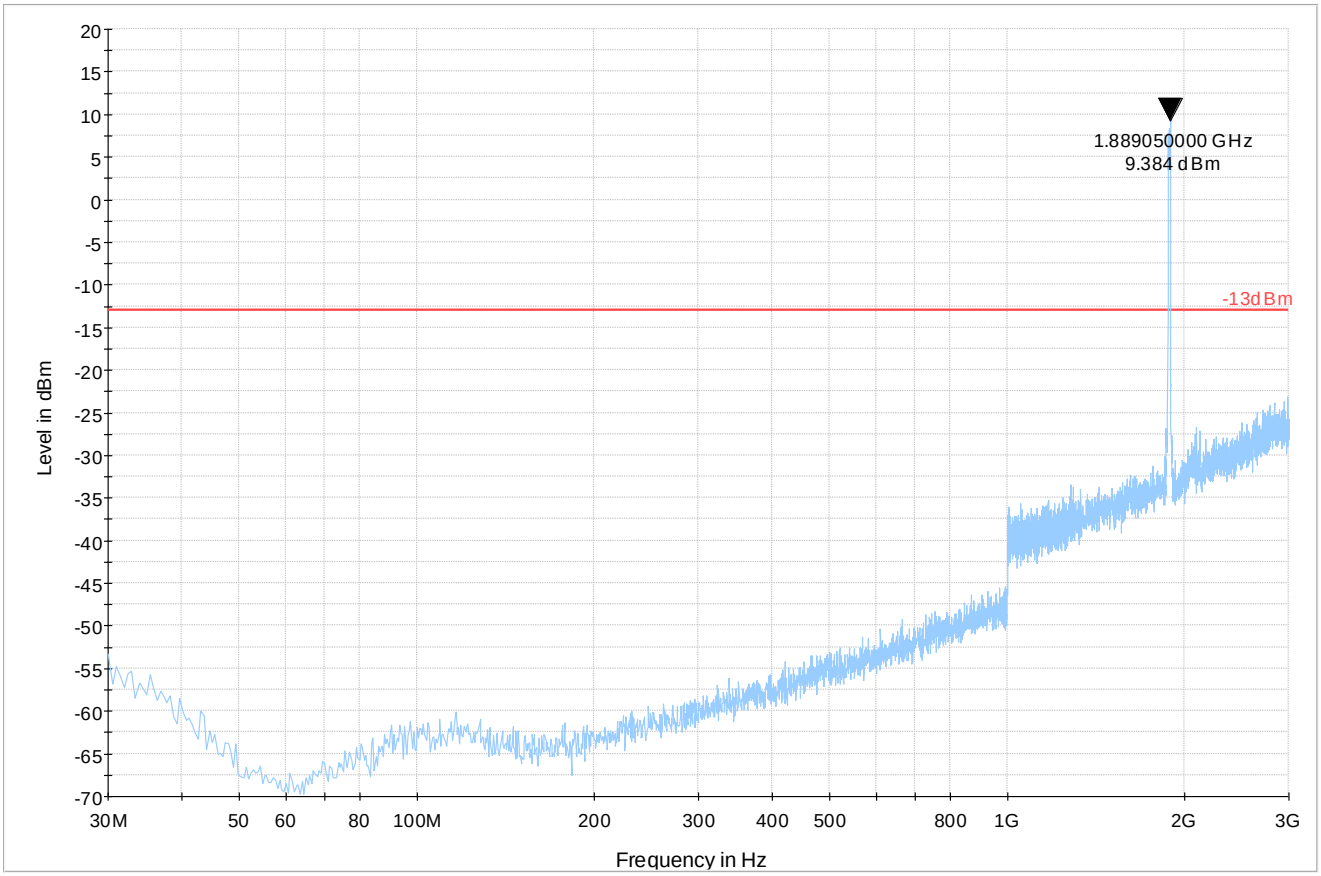
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.1.9 16 QAM/ 20MHz/ Mid Channel/ 30MHz to 3GHz:

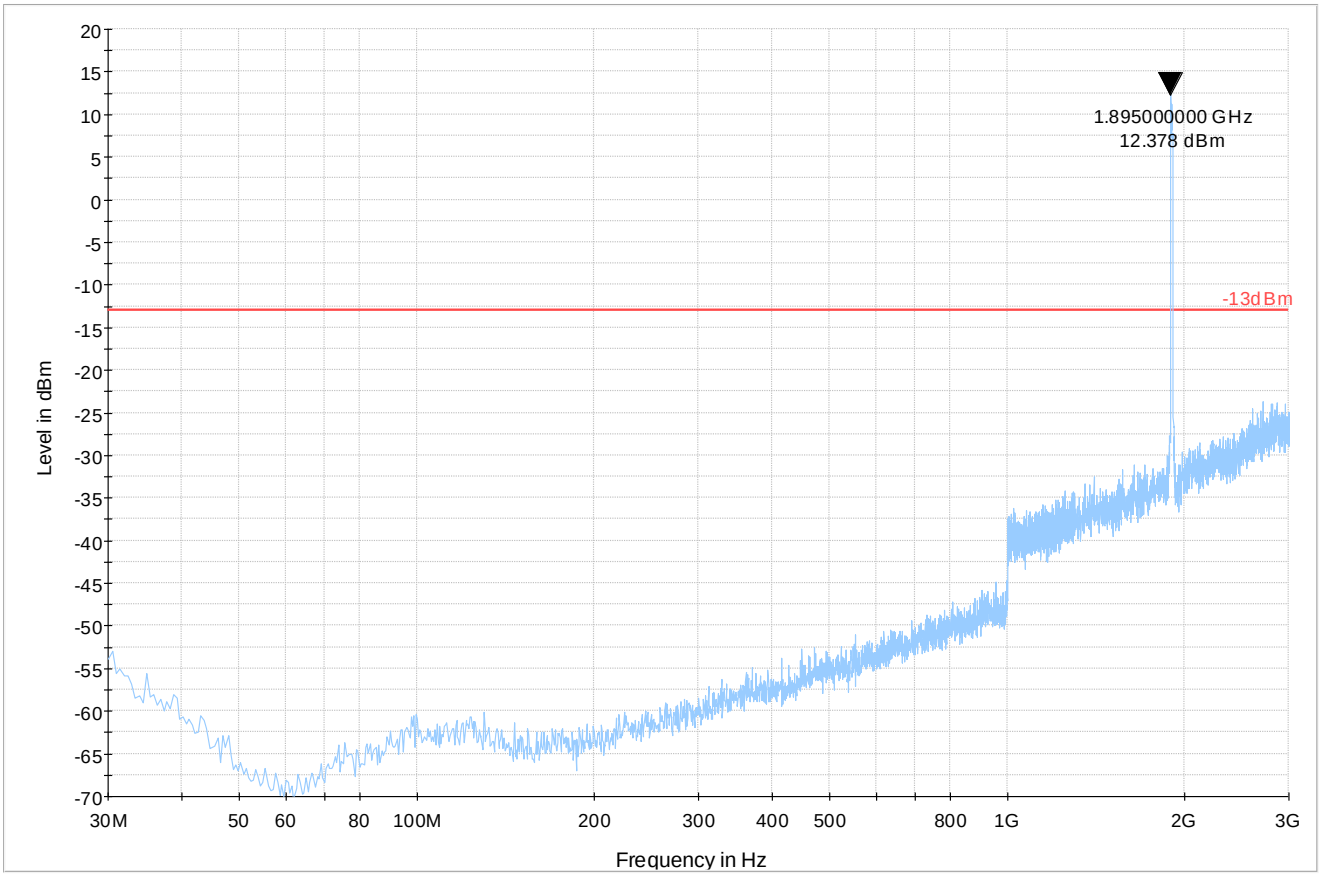
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: 16 QAM		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

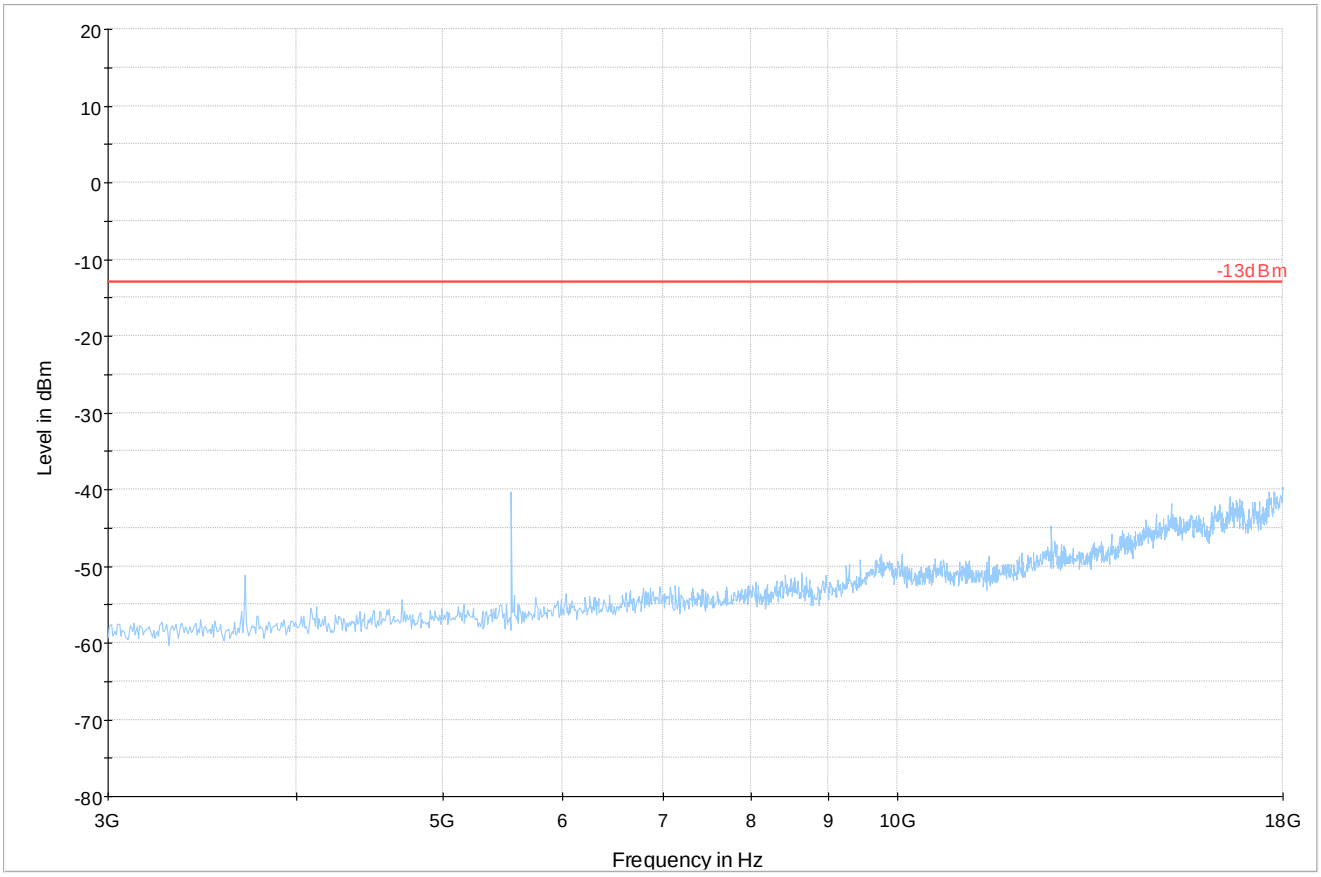
6.2.8.1.10 QPSK/ 20MHz/ High Channel/ 30MHz to 3GHz:

LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -High Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



6.2.8.1.11 QPSK/ 1.4MHz/ Low Channel/ 3GHz to 18GHz:

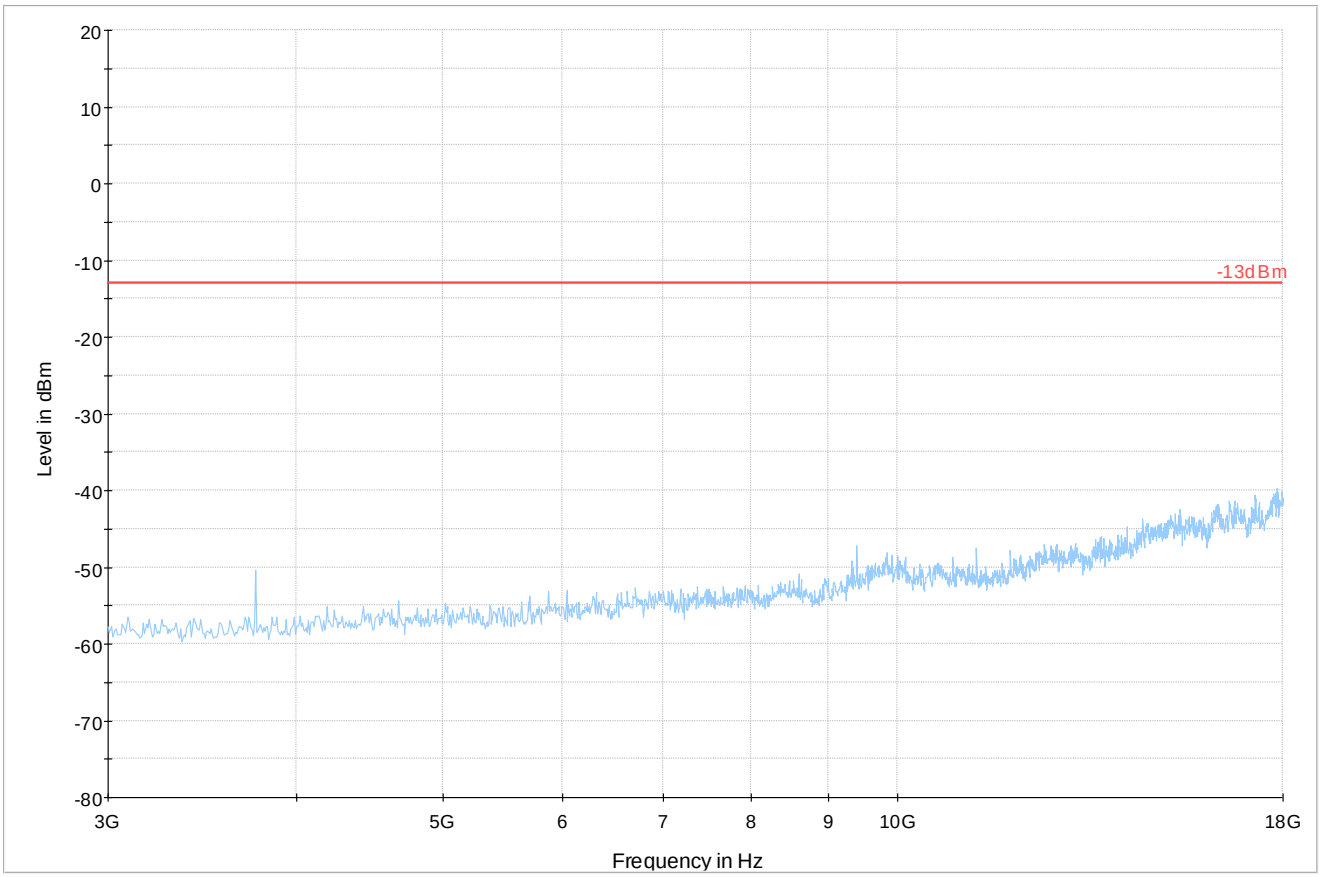
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.12 QPSK/ 1.4MHz/ Mid Channel/ 3GHz to 18GHz:

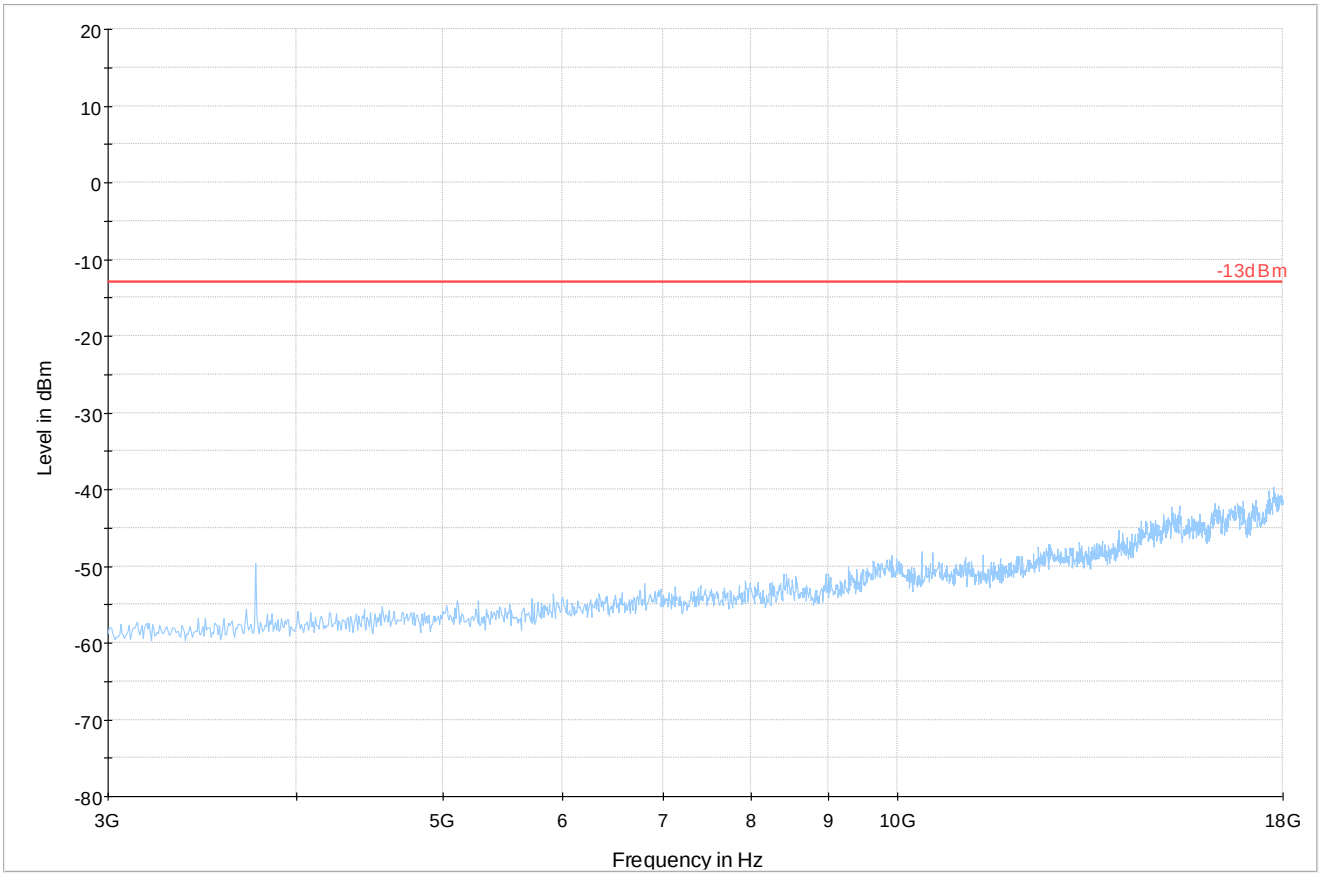
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.13 16QAM/ 1RB Mid/ Mid Channel/ 3GHz to 18GHz:

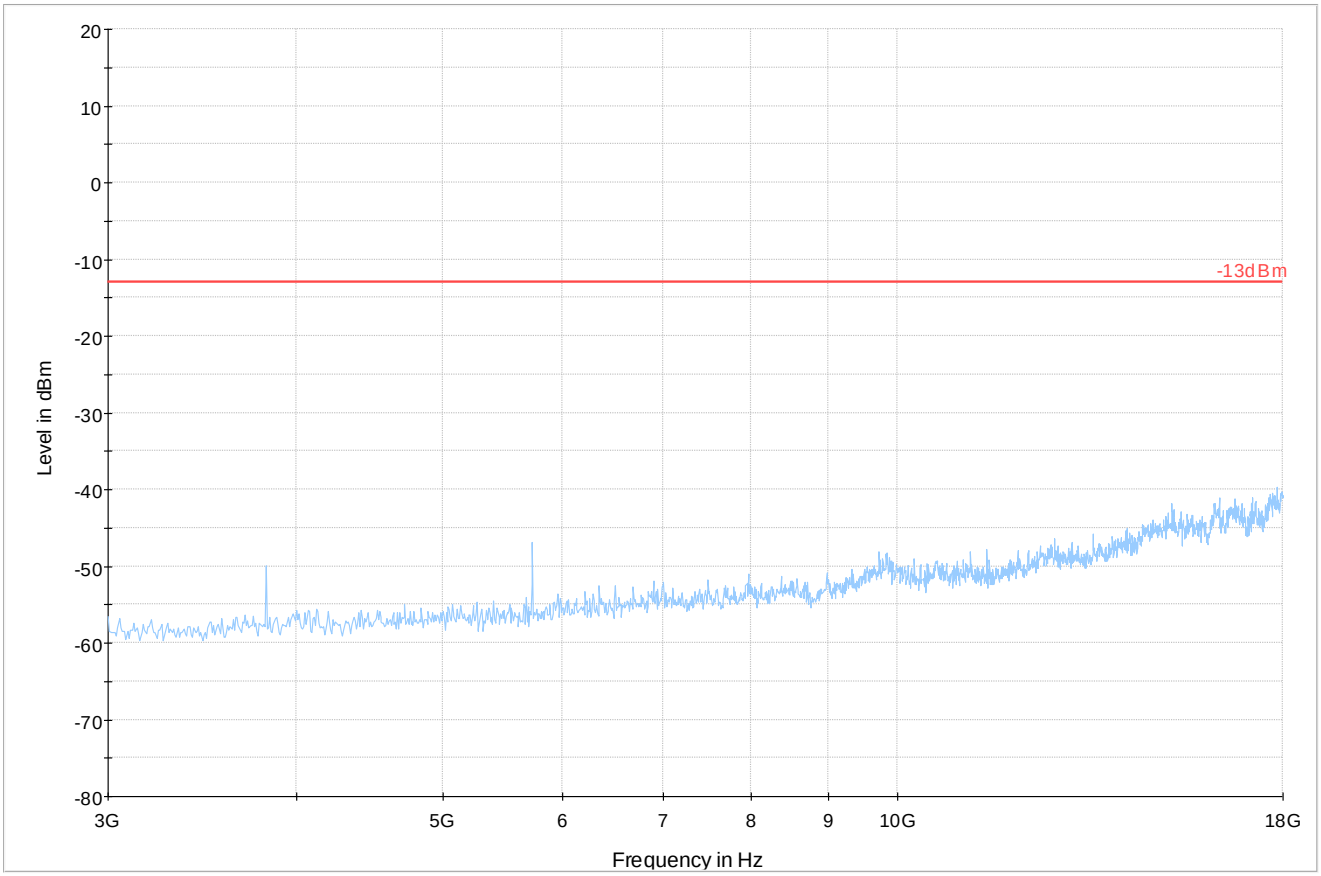
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: 16QAM		
Measurement results - 3 GHz – 18 GHz –Mid Channel		
RB Size = 1	**RB Offset** = Mid	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.14 QPSK/ 1.4MHz/ High Channel/ 3GHz to 18GHz:

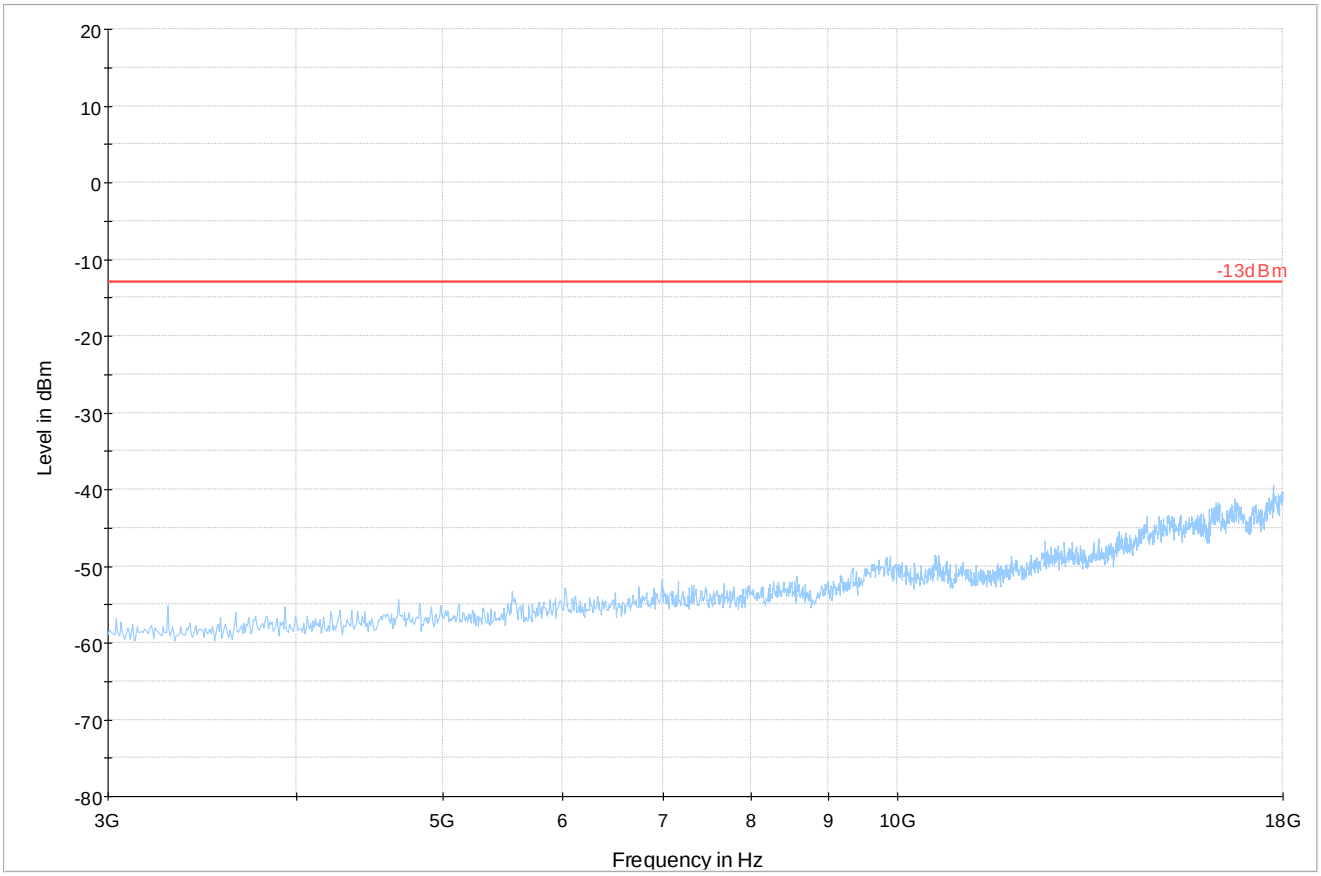
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.15 QPSK/ 20MHz/ Low Channel/ 3GHz to 18GHz:

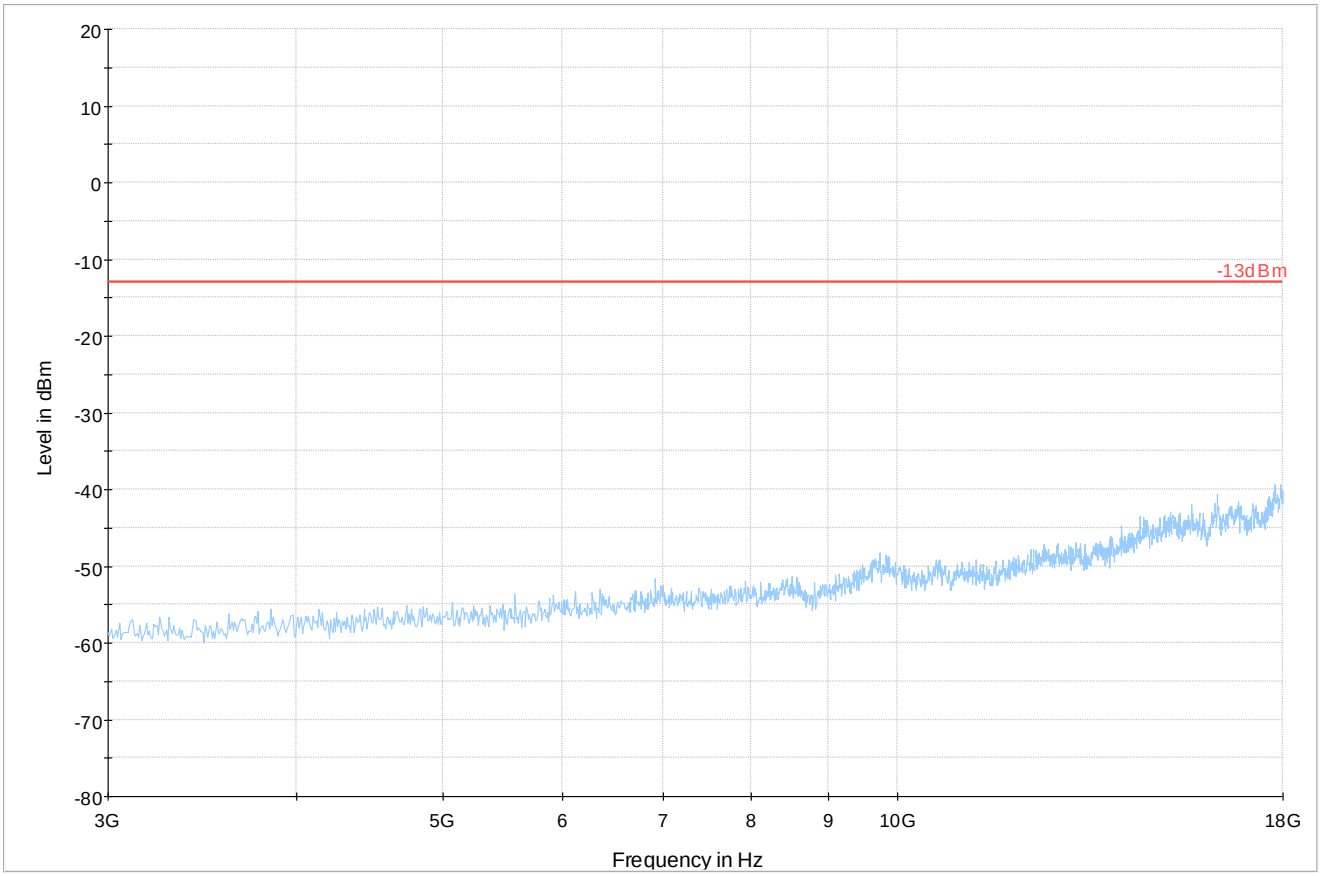
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Low Channel		
RB Size =100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.1.16 QPSK/ 20MHz/ Mid Channel/ 3GHz to 18GHz:

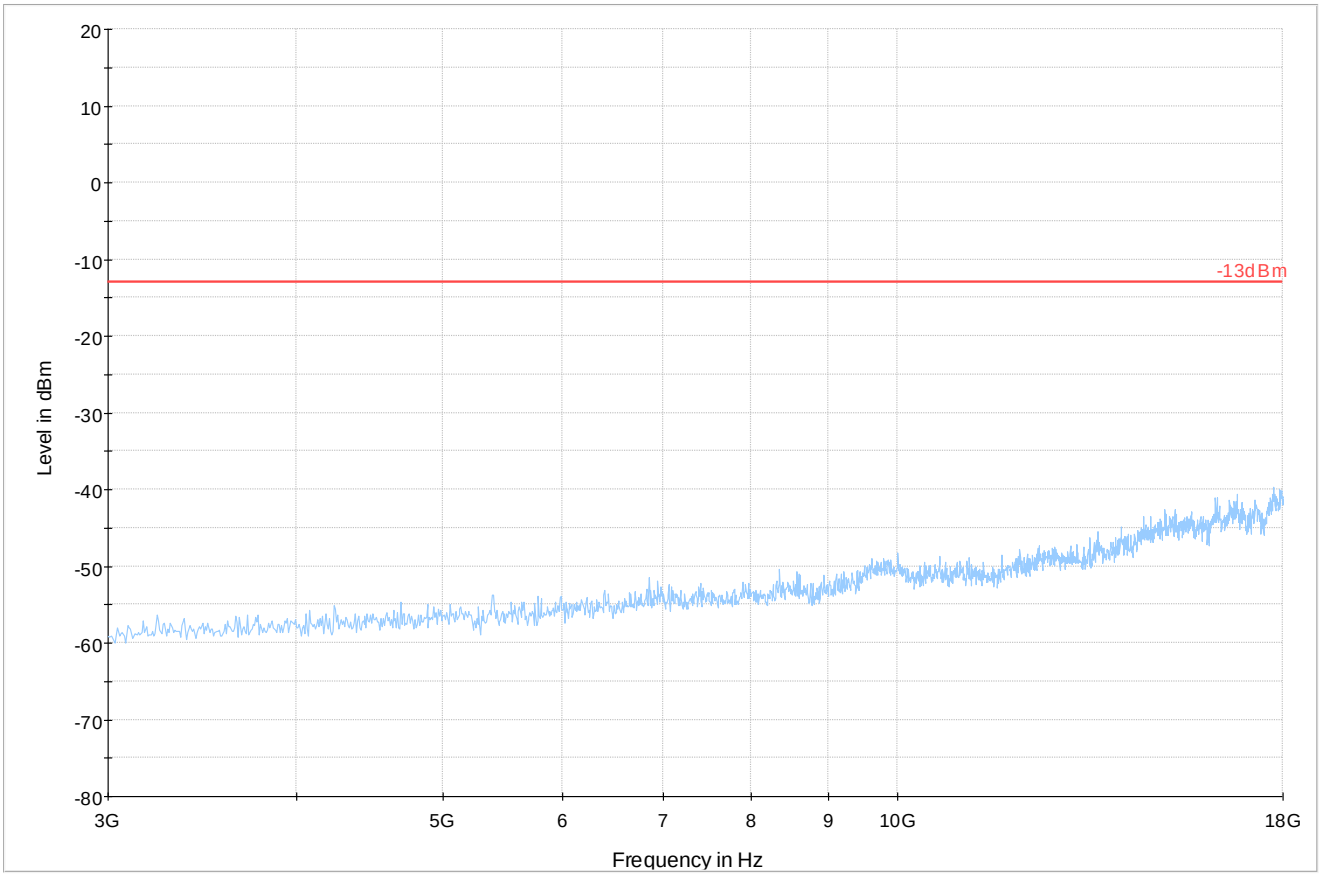
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.1.17 16QAM/ Full RB Mid/ Mid Channel/ 3GHz to 18GHz:

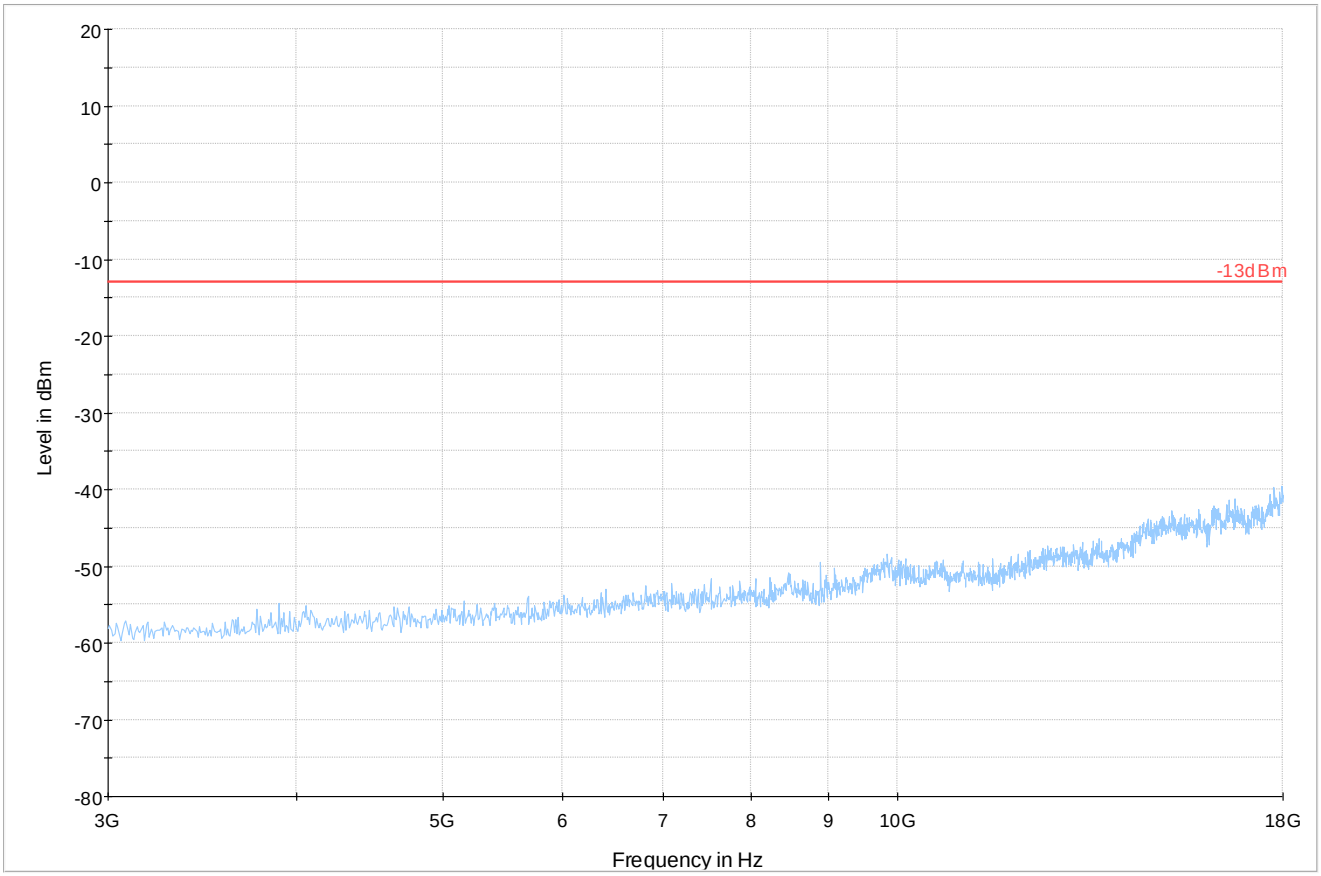
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: 16QAM		
Measurement results - 3 GHz – 18 GHz –Mid Channel		
RB Size = 100	**RB Offset** = Mid	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.1.18 QPSK/ 20MHz/ High Channel/ 3GHz to 18GHz:

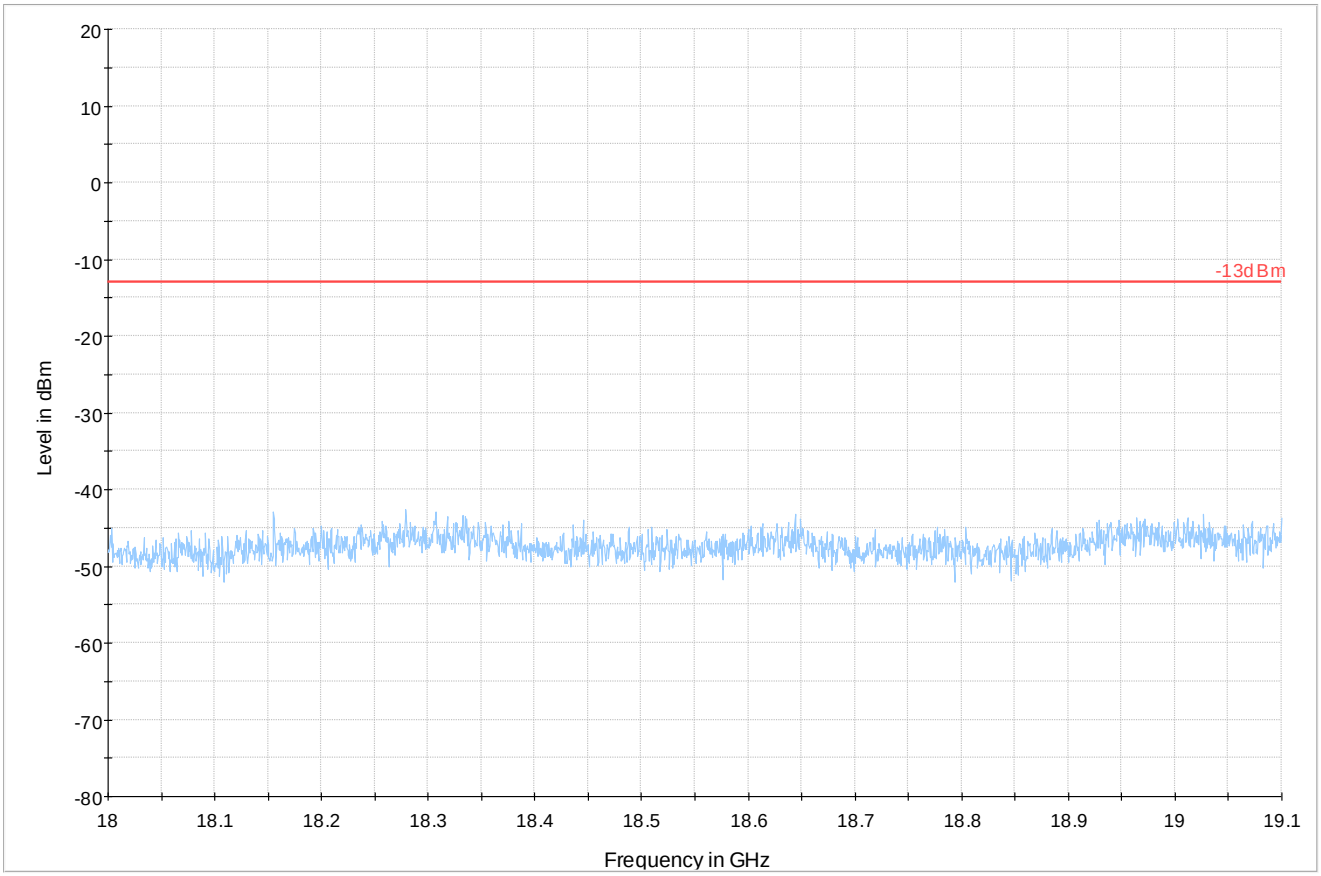
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -High Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.1.19 QPSK/ 1RB Mid/ Mid Channel/ 18GHz to 19.1GHz:

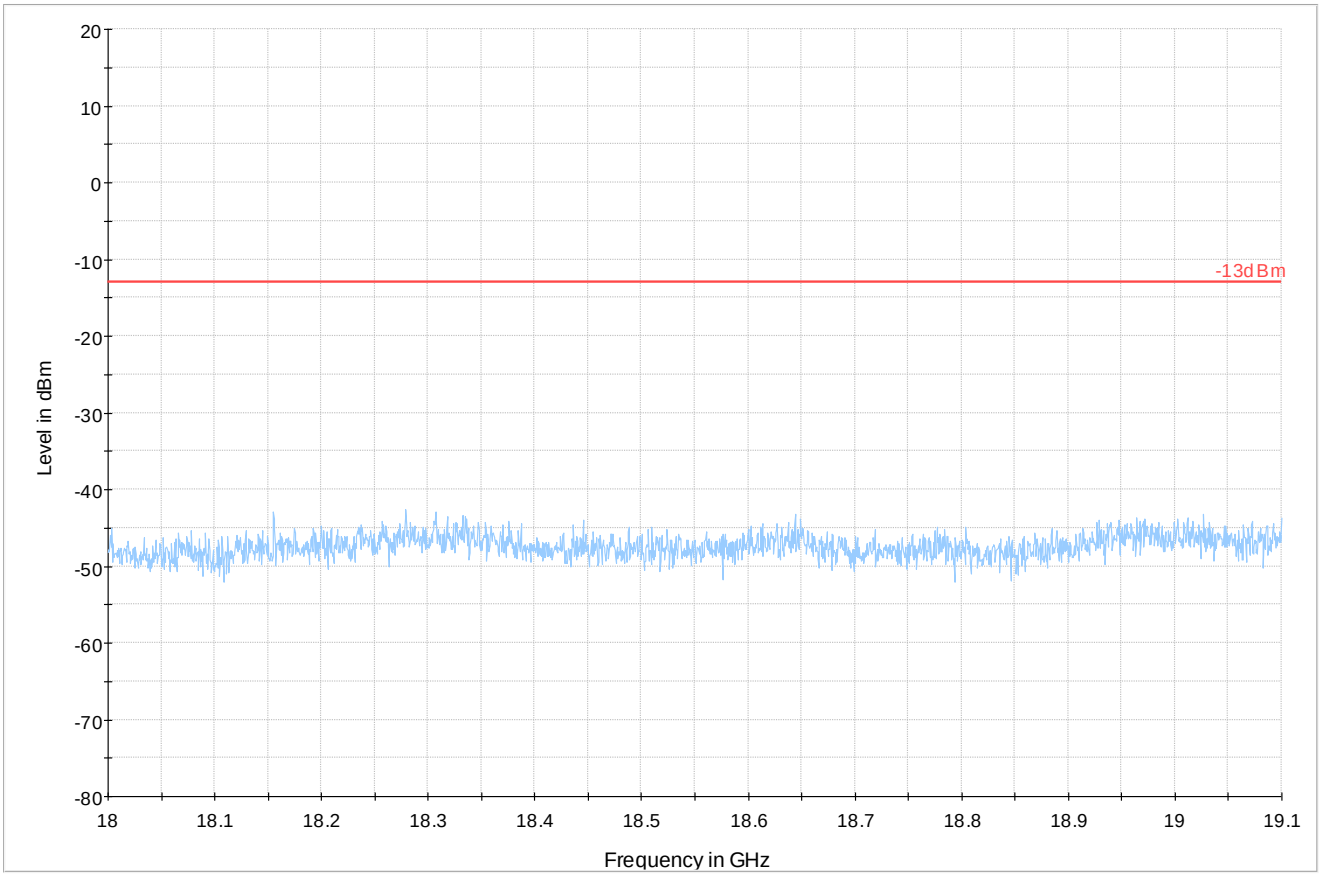
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 18 GHz – 19.1 GHz –Mid Channel		
RB Size = 1	**RB Offset** = Mid	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.1.20 QPSK/ Full RB Mid/ Mid Channel/ 18GHz to 19.1GHz:

LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: QPSK		
Measurement results - 18 GHz – 19.1 GHz –Mid Channel		
RB Size = Full	**RB Offset** = Mid	**BW (MHz)** = 20

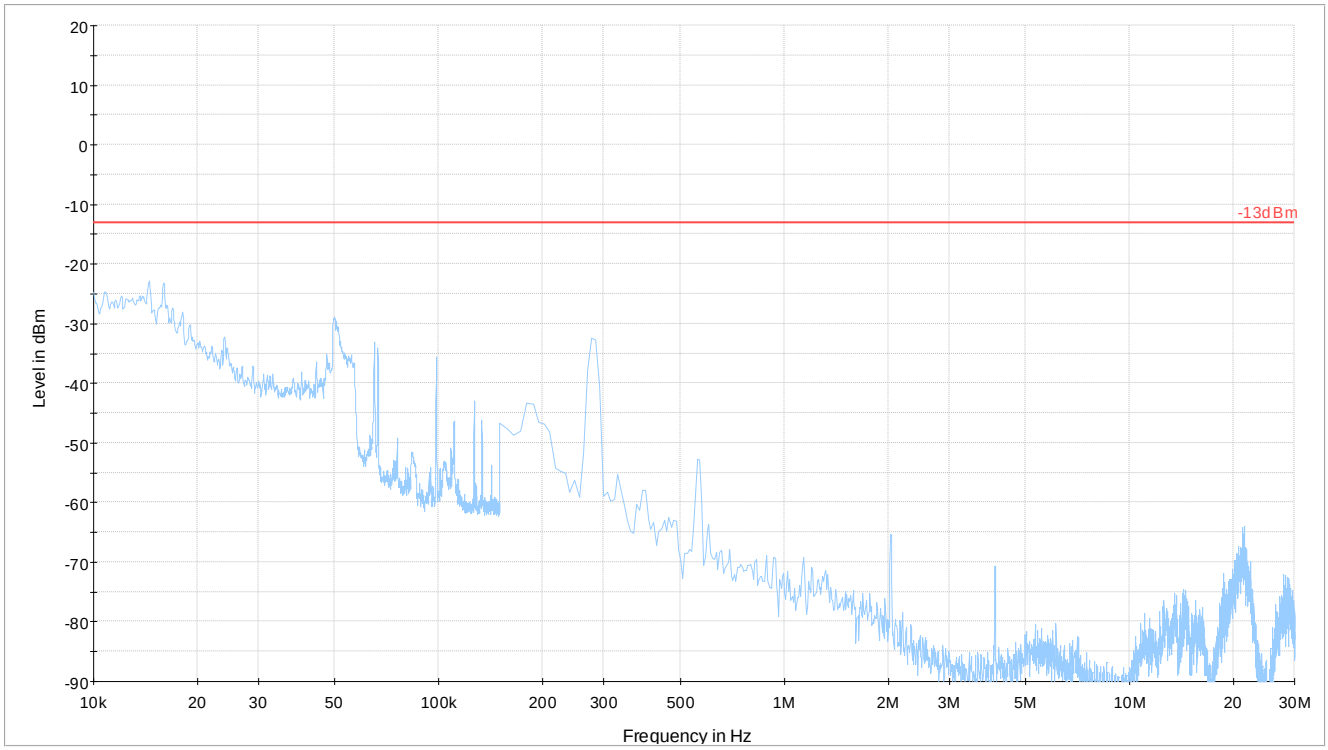


-13dBm Preview Result 1-PK+

6.2.8.2 Spurious Emission LTE FDD 4:

6.2.8.2.1 QPSK/ 1.4MHz/ Mid Channel/ 10kHz to 30MHz

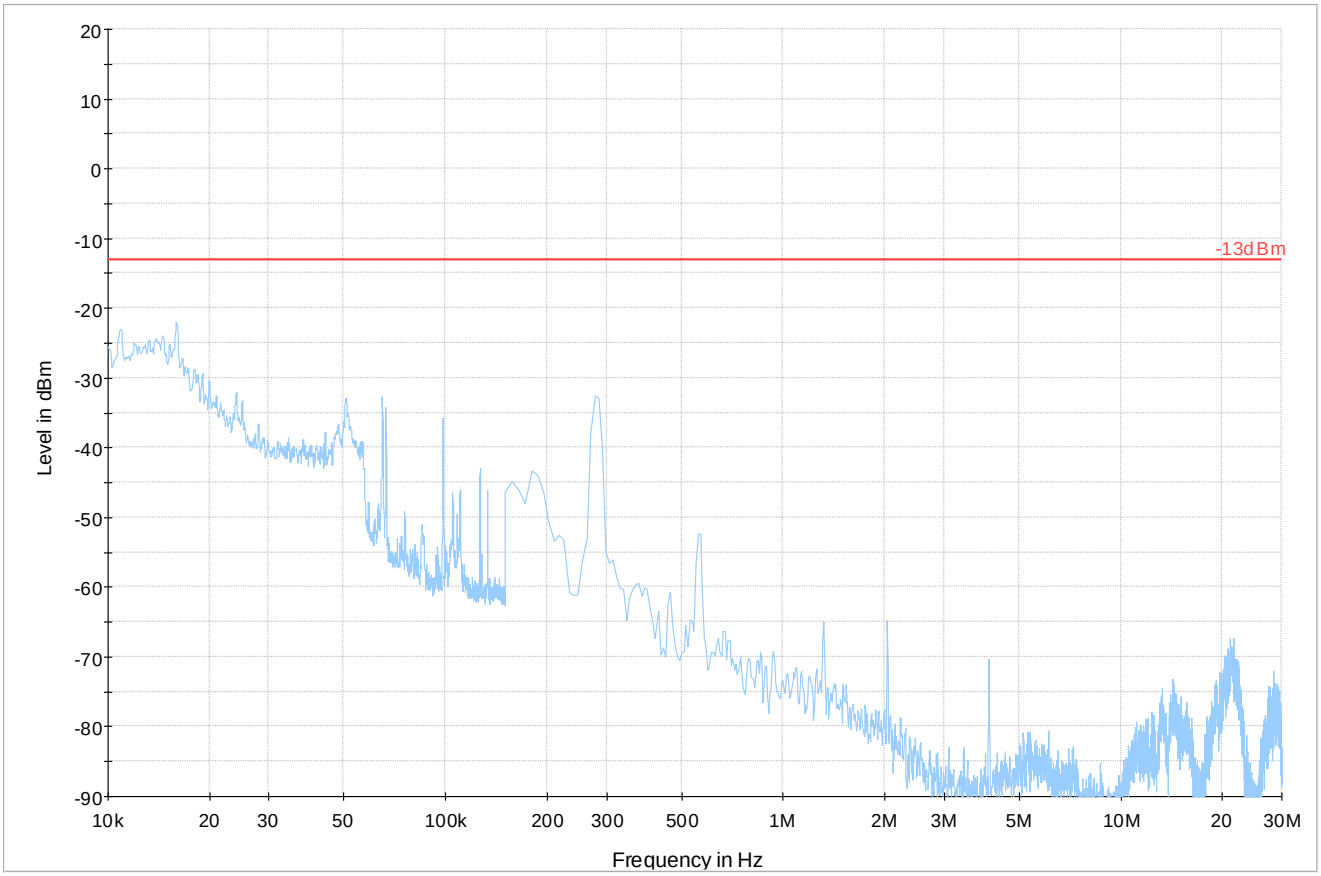
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

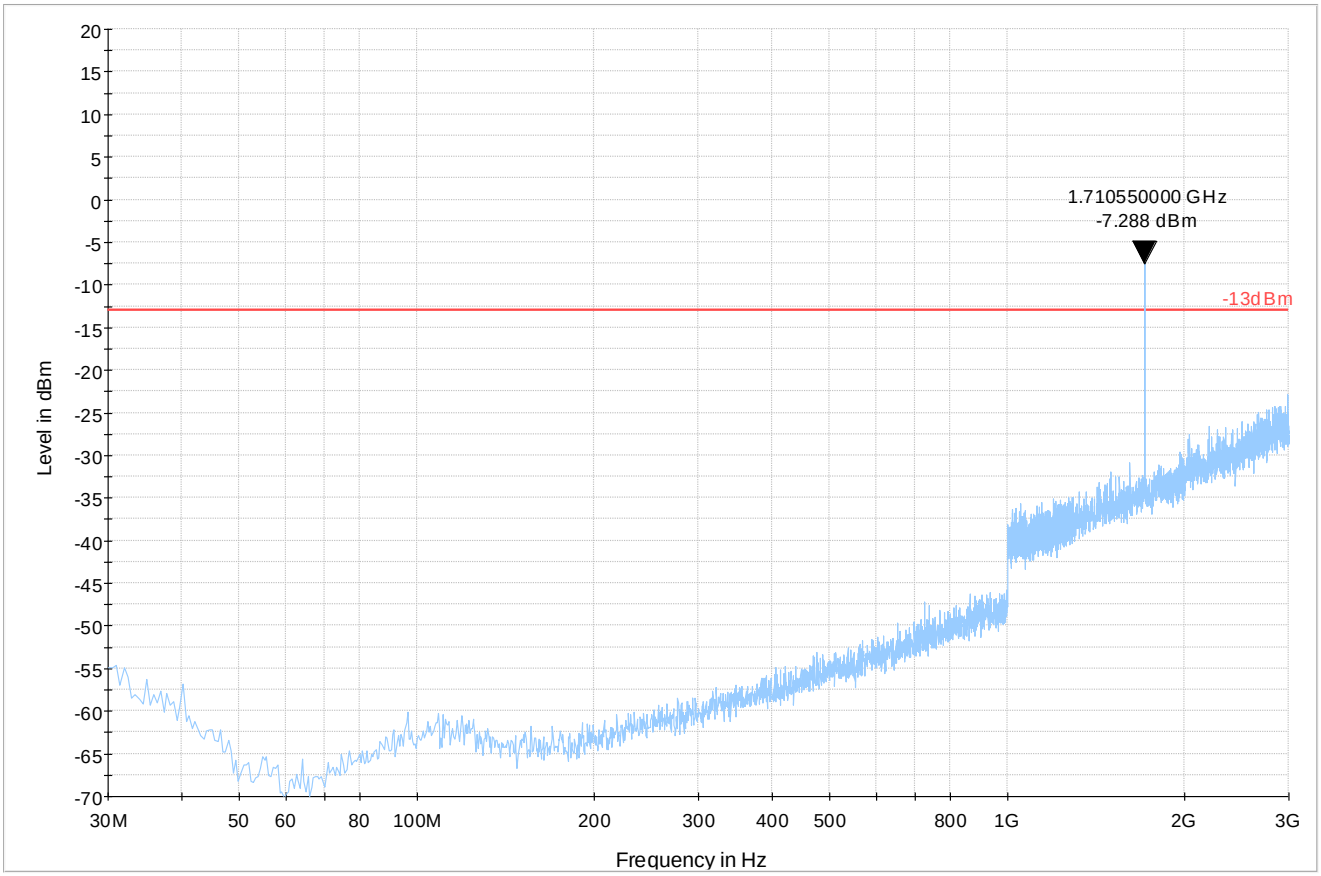
6.2.8.2.2 QPSK/ 20MHz/ Mid Channel/ 10kHz to 30MHz

LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 10 kHz – 30MHz -Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



6.2.8.2.3 QPSK/ 1.4MHz/ Low Channel/ 30MHz to 3GHz

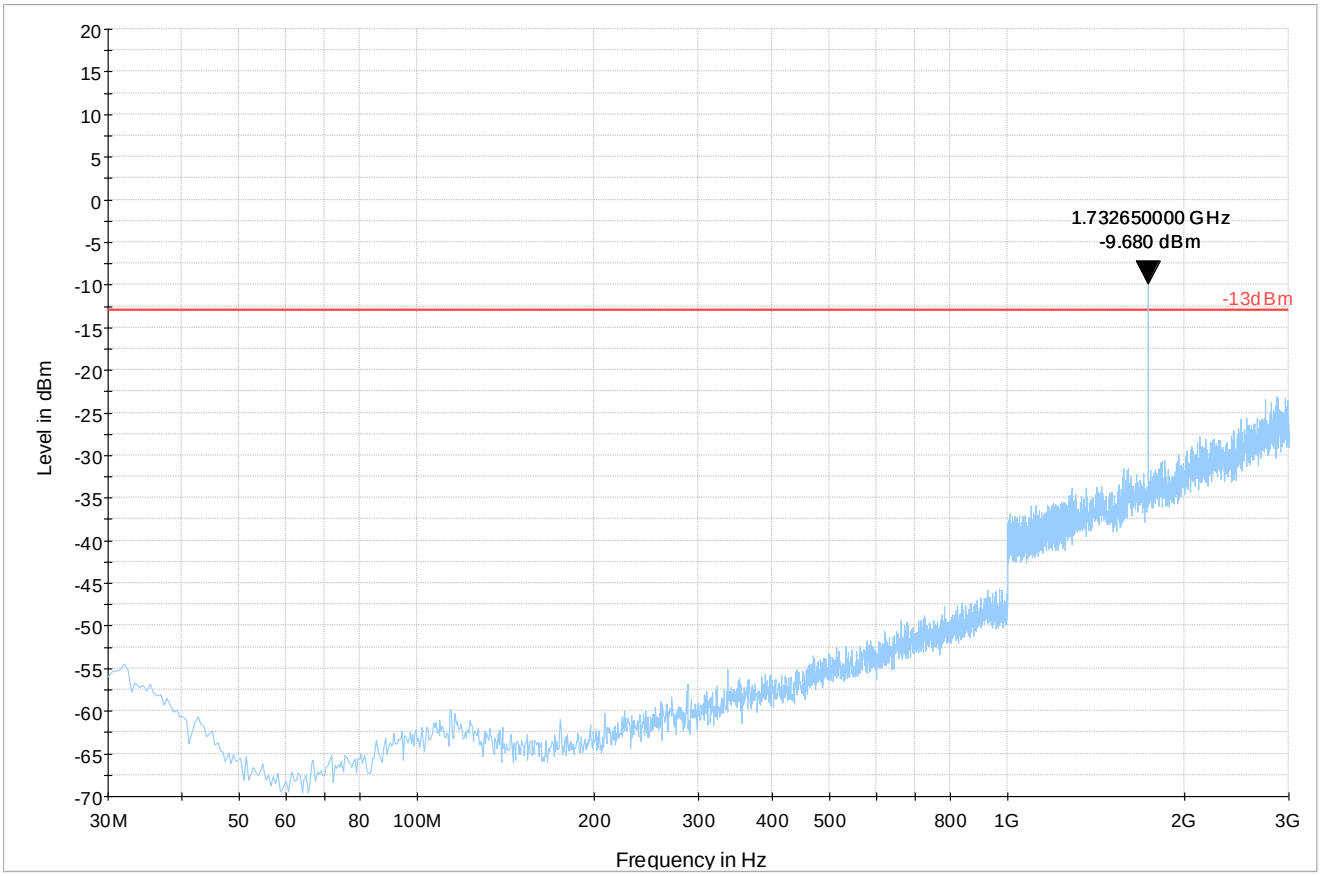
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Low Channel		
RB Size = 1	**RB Offset** = Low	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.4 QPSK/ 1.4MHz/ Mid Channel/ 30MHz to 3GHz

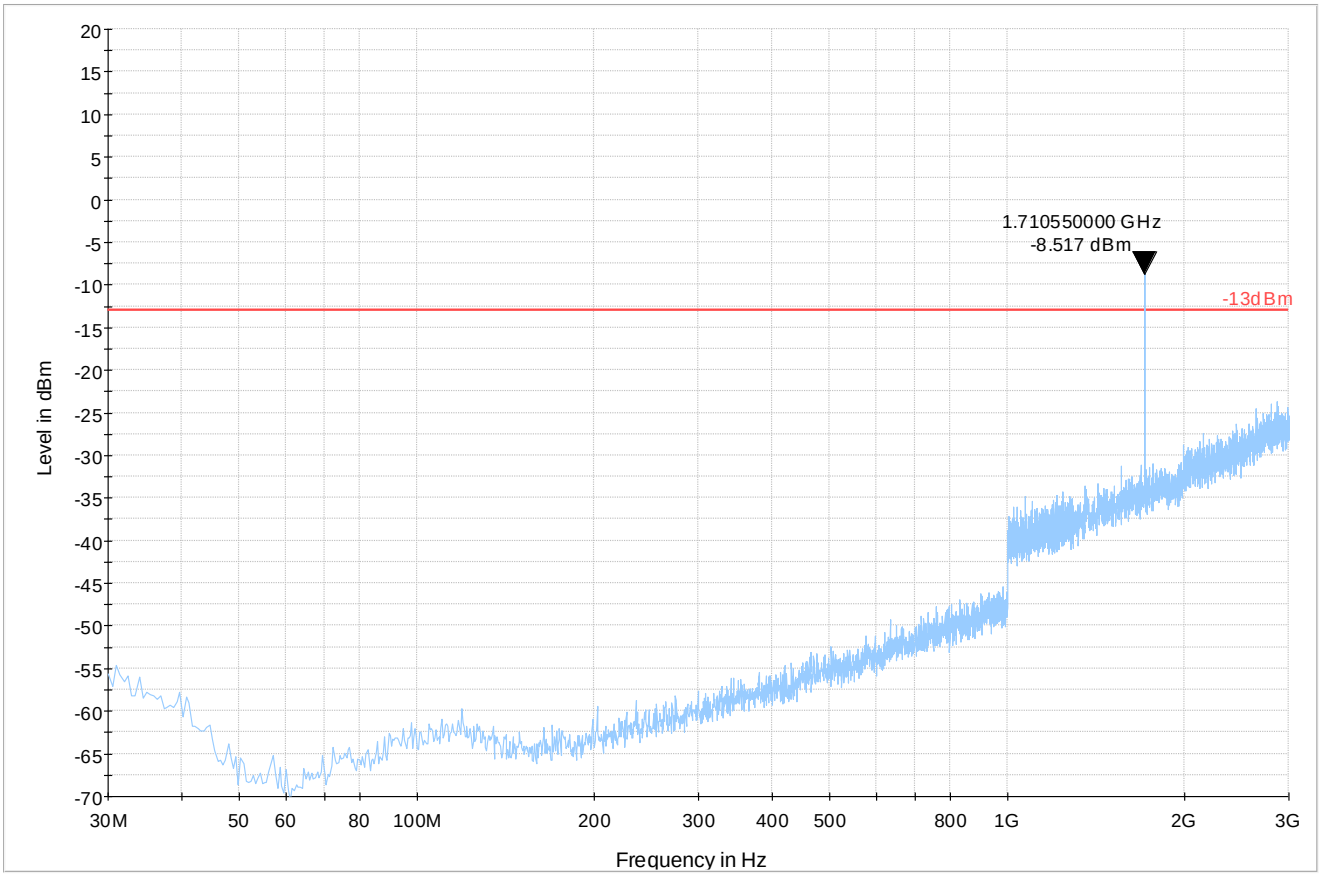
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 1	**RB Offset** = Mid	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.5 16QAM/ 1.4MHz/ Mid Channel/ 30MHz to 3GHz

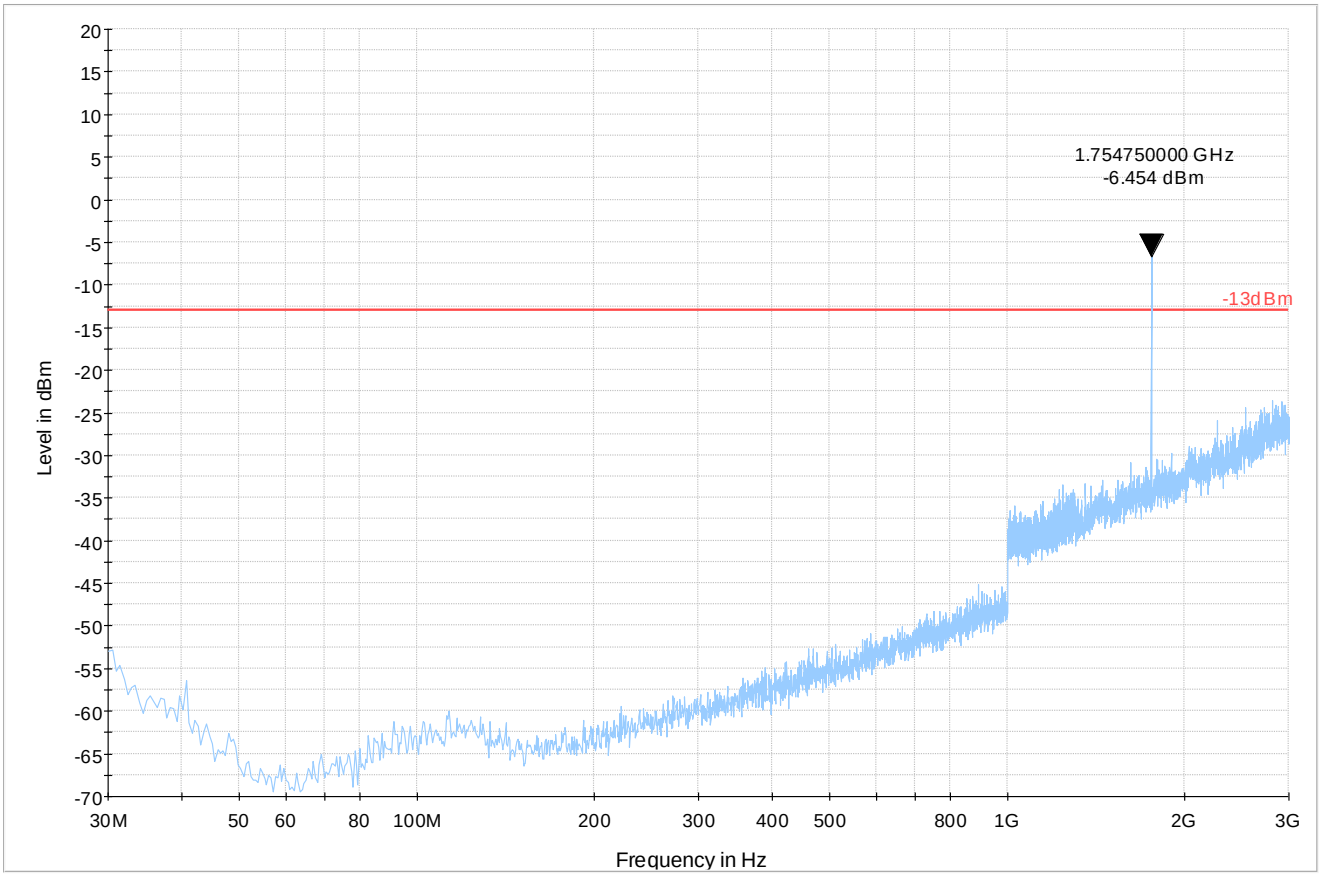
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: 16QAM		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 1	**RB Offset** = Mid	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.6 QPSK/ 1.4MHz/ High Channel/ 30MHz to 3GHz

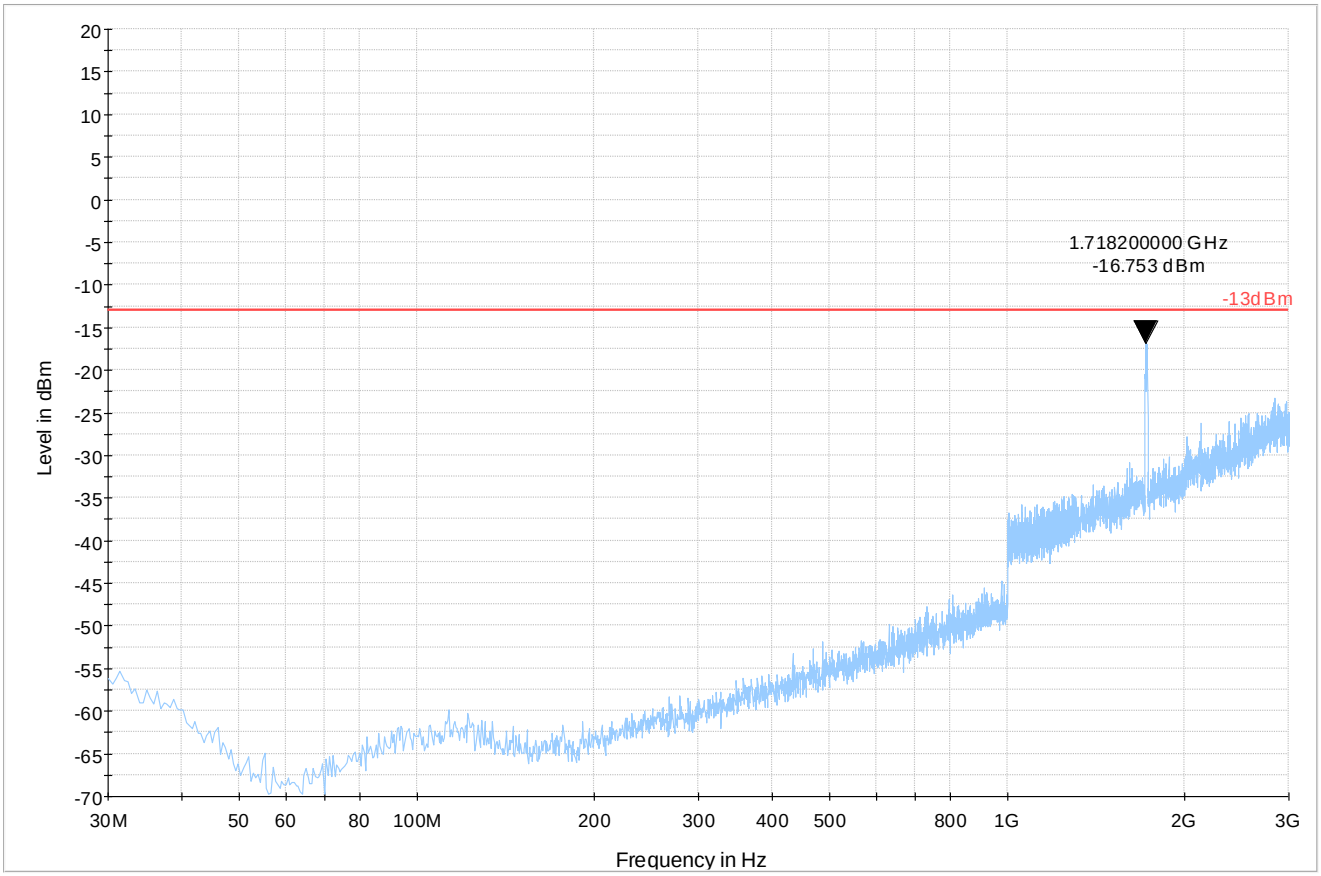
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -High Channel		
RB Size = 1	**RB Offset** = High	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.7 QPSK/ 20MHz/ Low Channel/ 30MHz to 3GHz

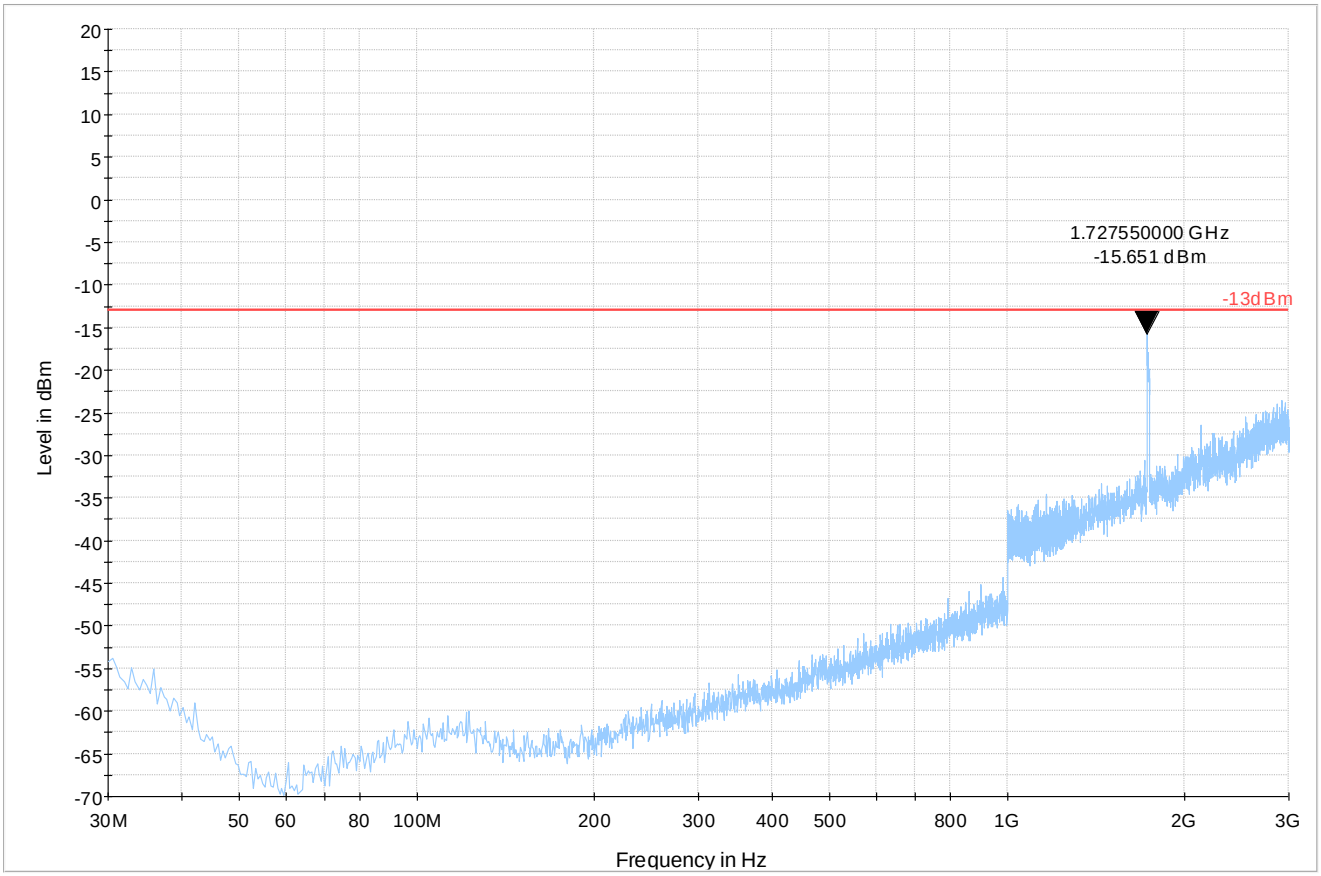
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Low Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.8 QPSK/ 20MHz/ Mid Channel/ 30MHz to 3GHz

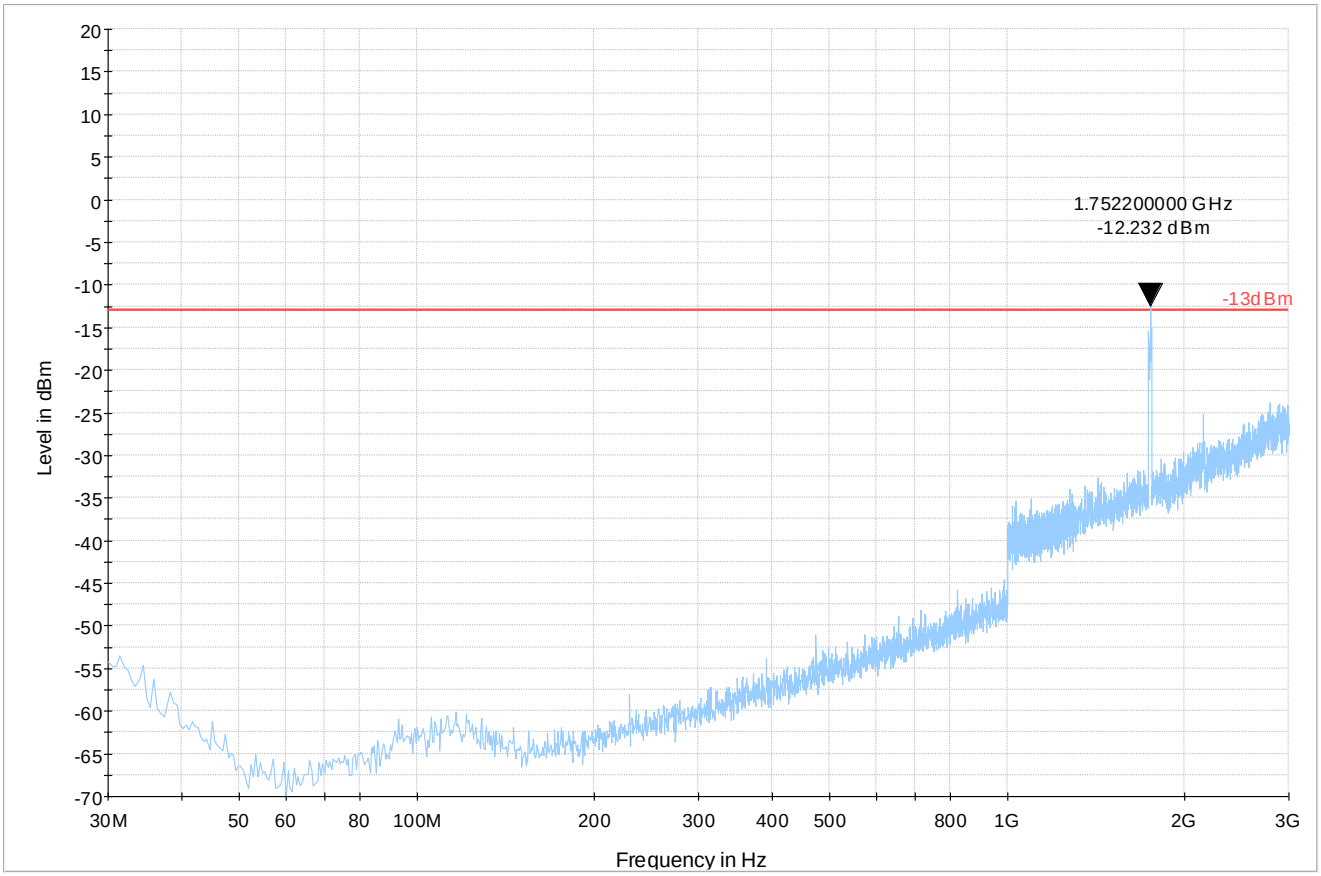
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz –Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.9 16QAM/ 20MHz/ Mid Channel/ 30MHz to 3GHz

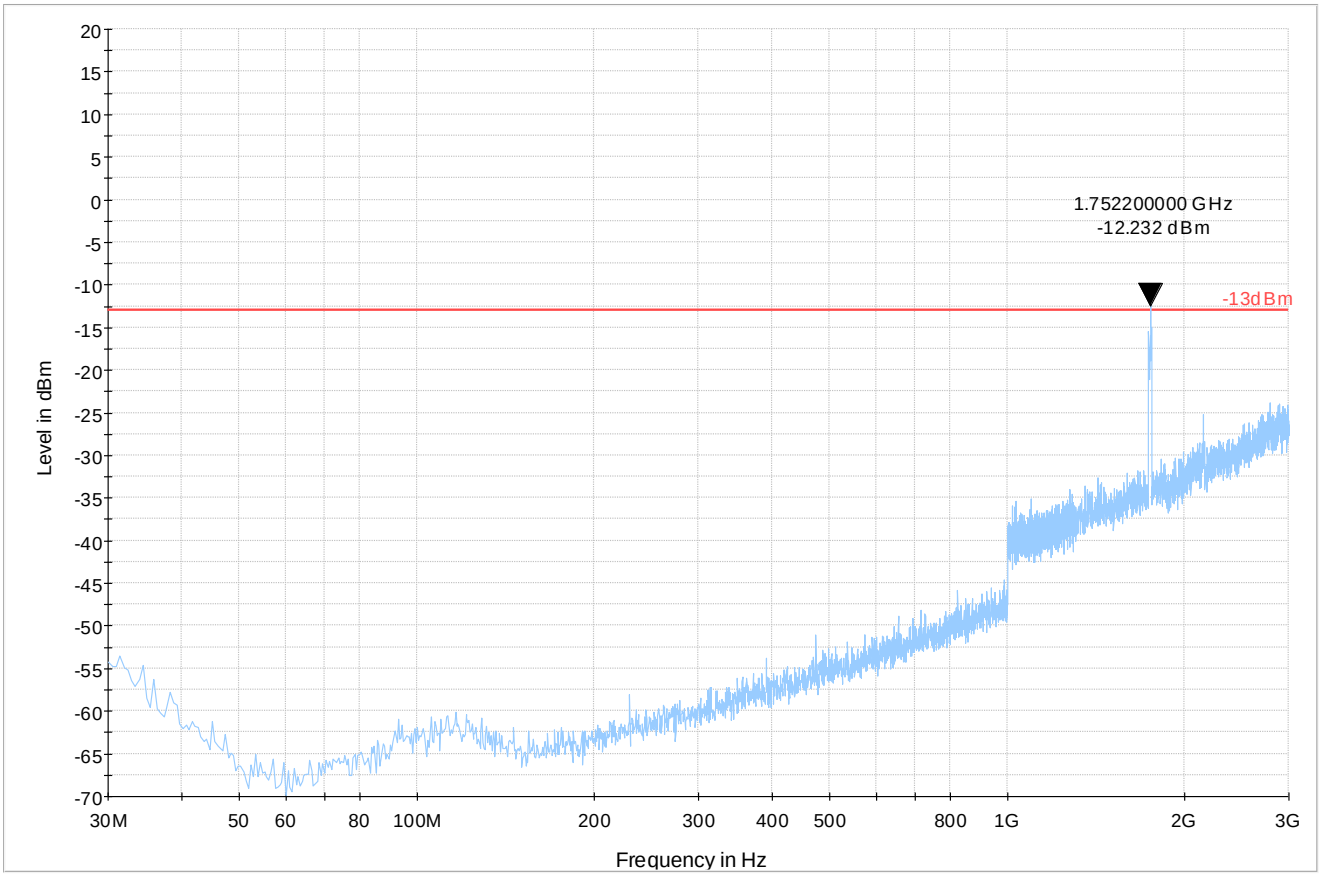
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: 16QAM		
Measurement results - 30 MHz – 3GHz –Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.10 QPSK/ 20MHz/ High Channel/ 30MHz to 3GHz

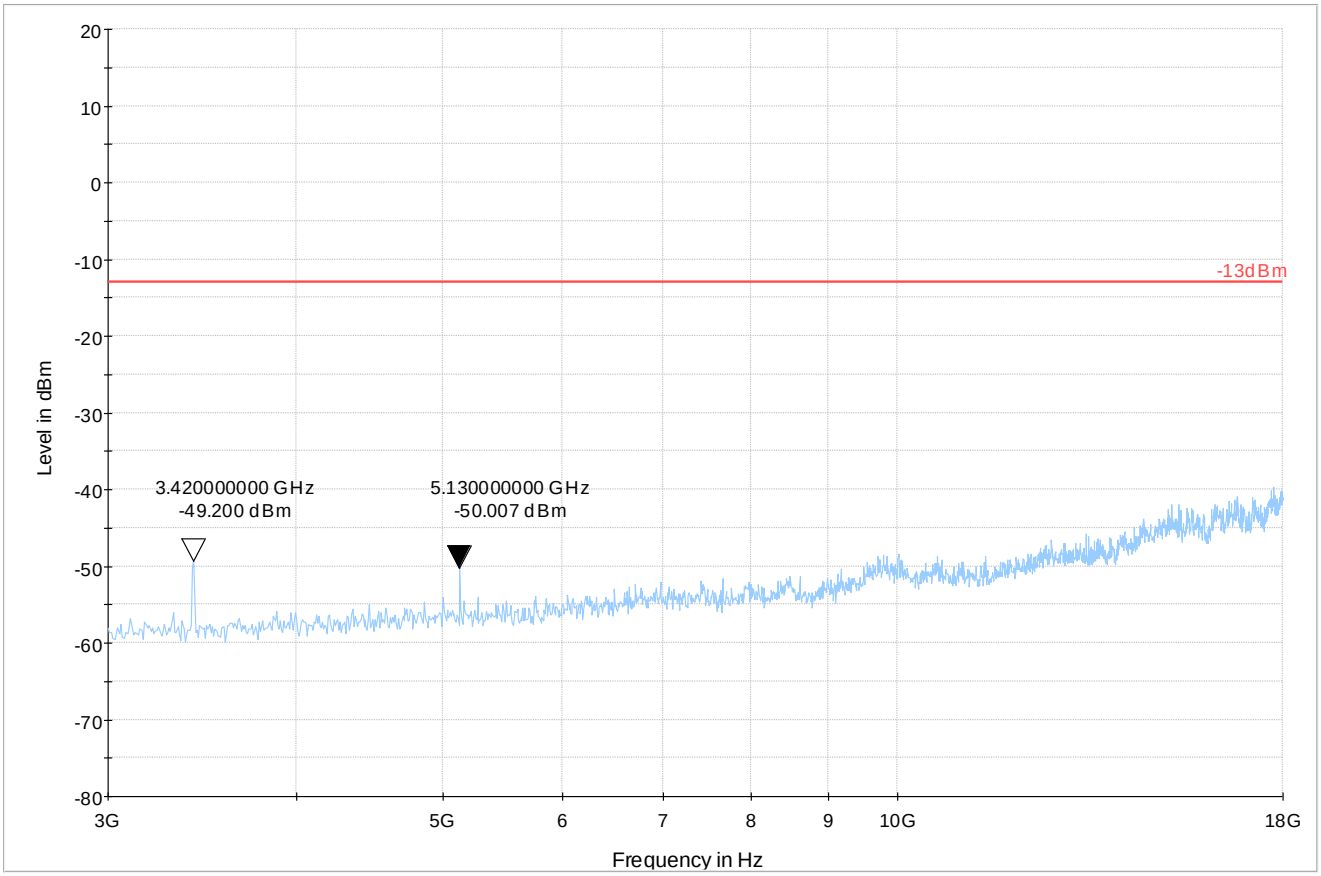
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -High Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.11 QPSK/ 1.4MHz/ Low Channel/ 3GHz to 18GHz

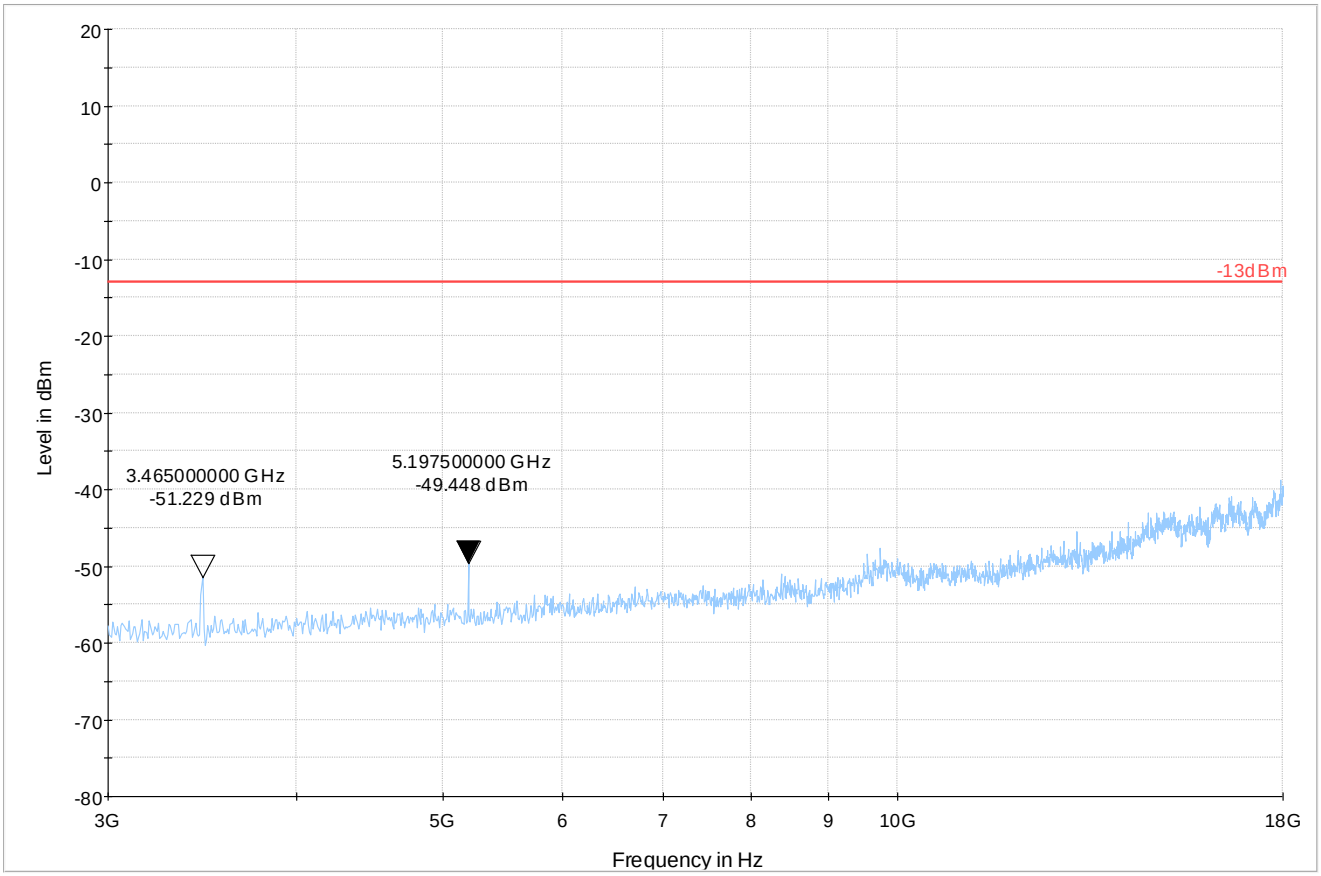
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.12 QPSK/ 1.4MHz/ Mid Channel/ 3GHz to 18GHz

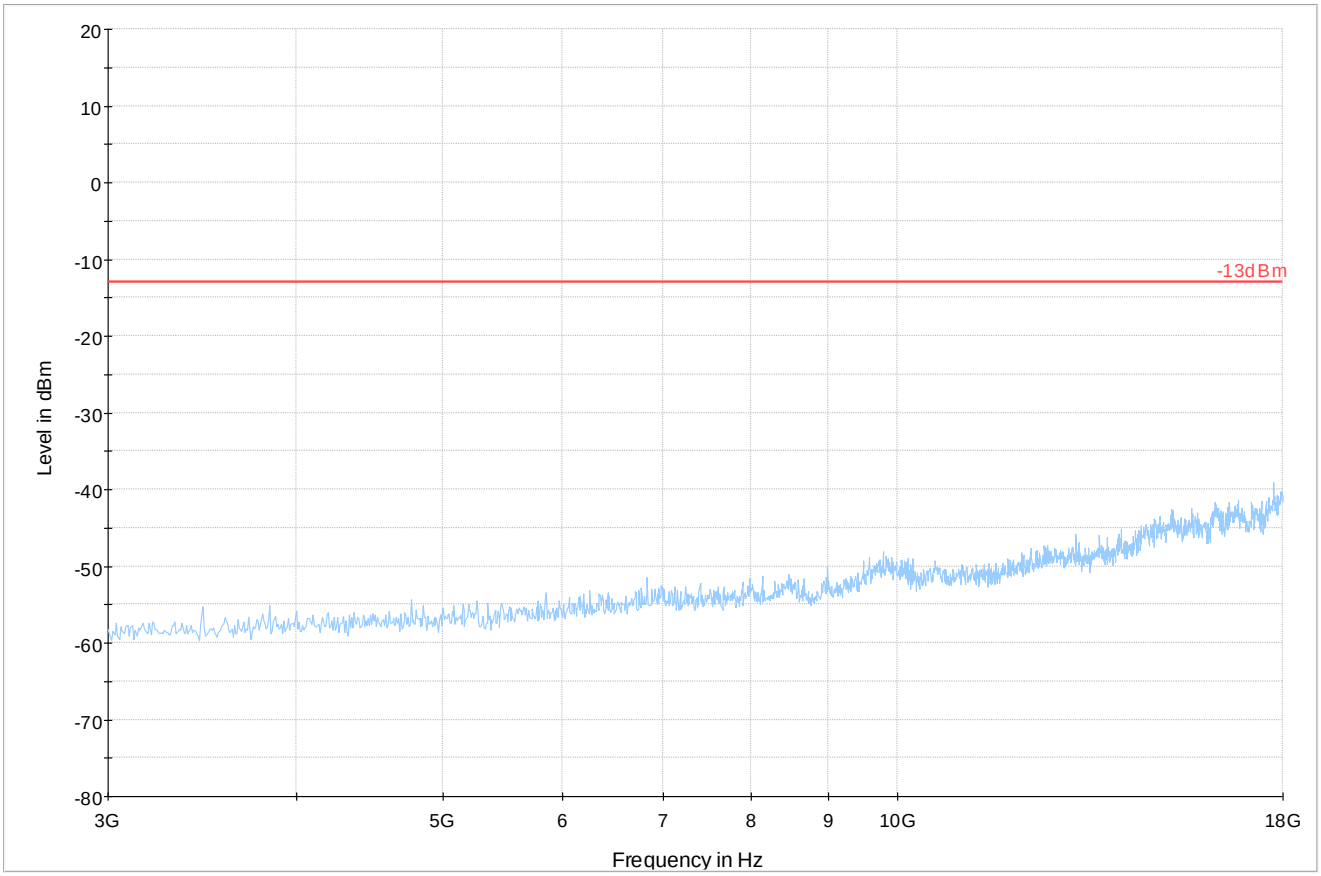
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.13 16QAM/ 1.4MHz/ Mid Channel/ 3GHz to 18GHz

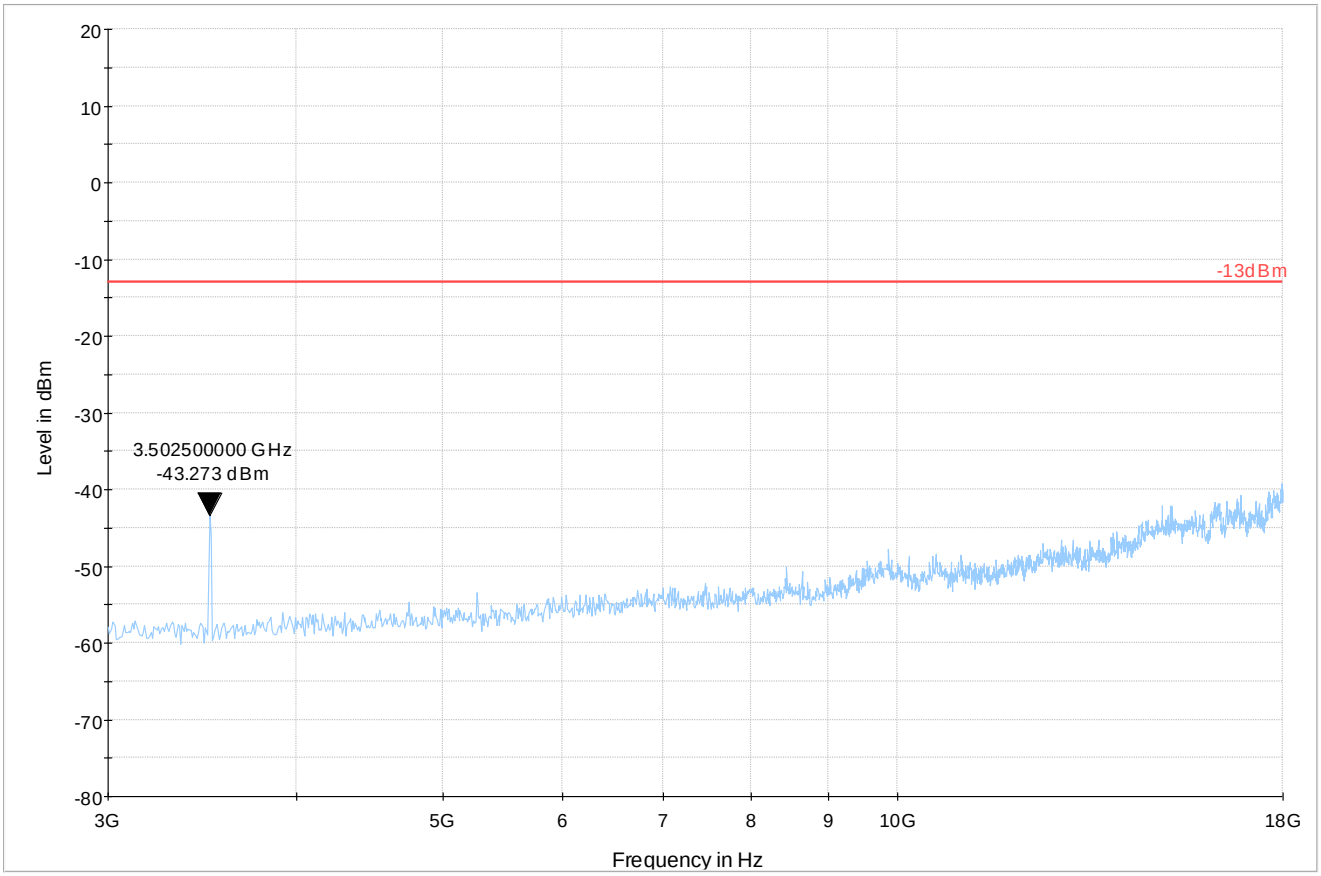
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: 16QAM		
Measurement results - 3 GHz – 18 GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.14 QPSK/ 1.4MHz/ High Channel/ 3GHz to 18GHz

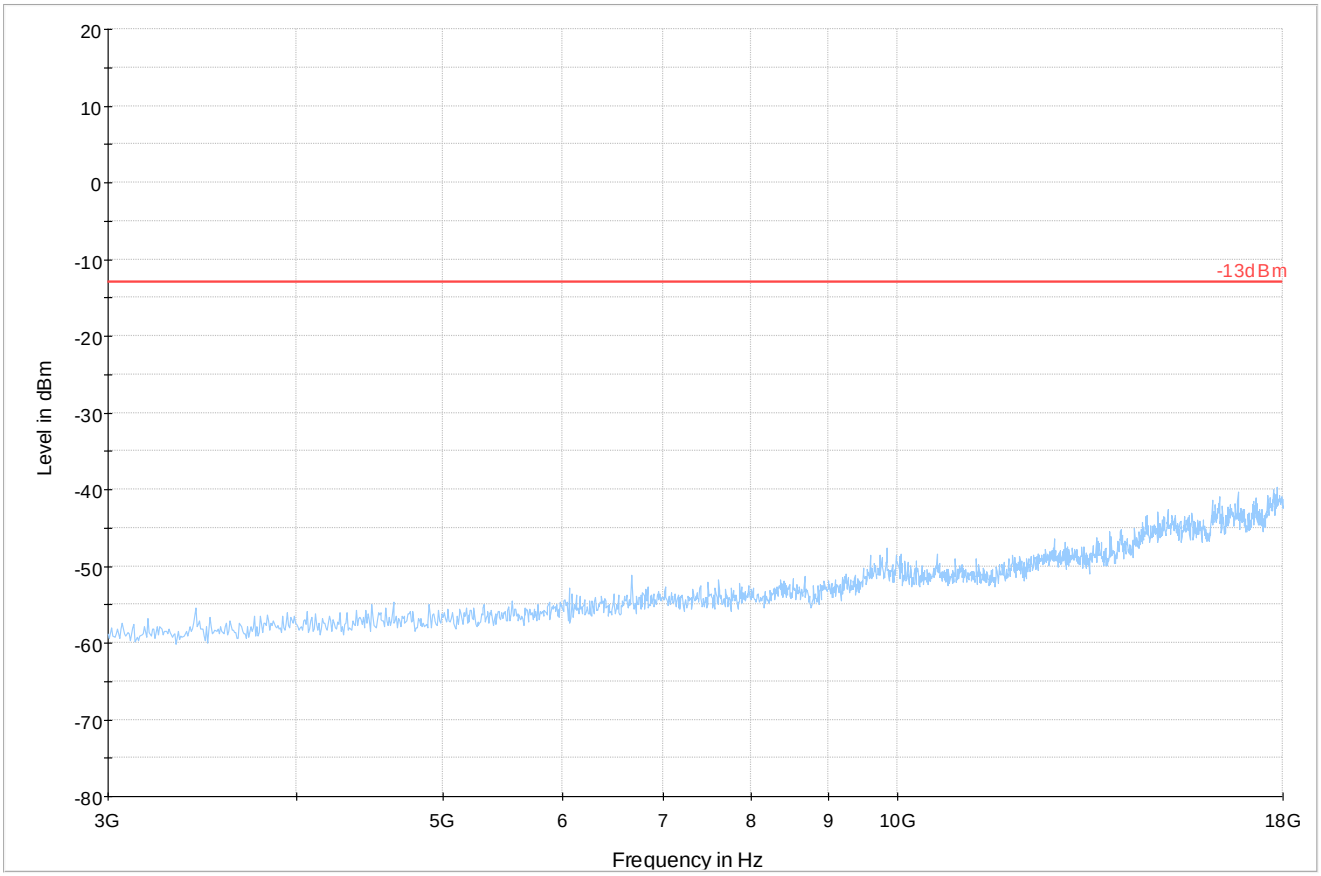
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.2.15 QPSK/ 20MHz/ Low Channel/ 3GHz to 18GHz

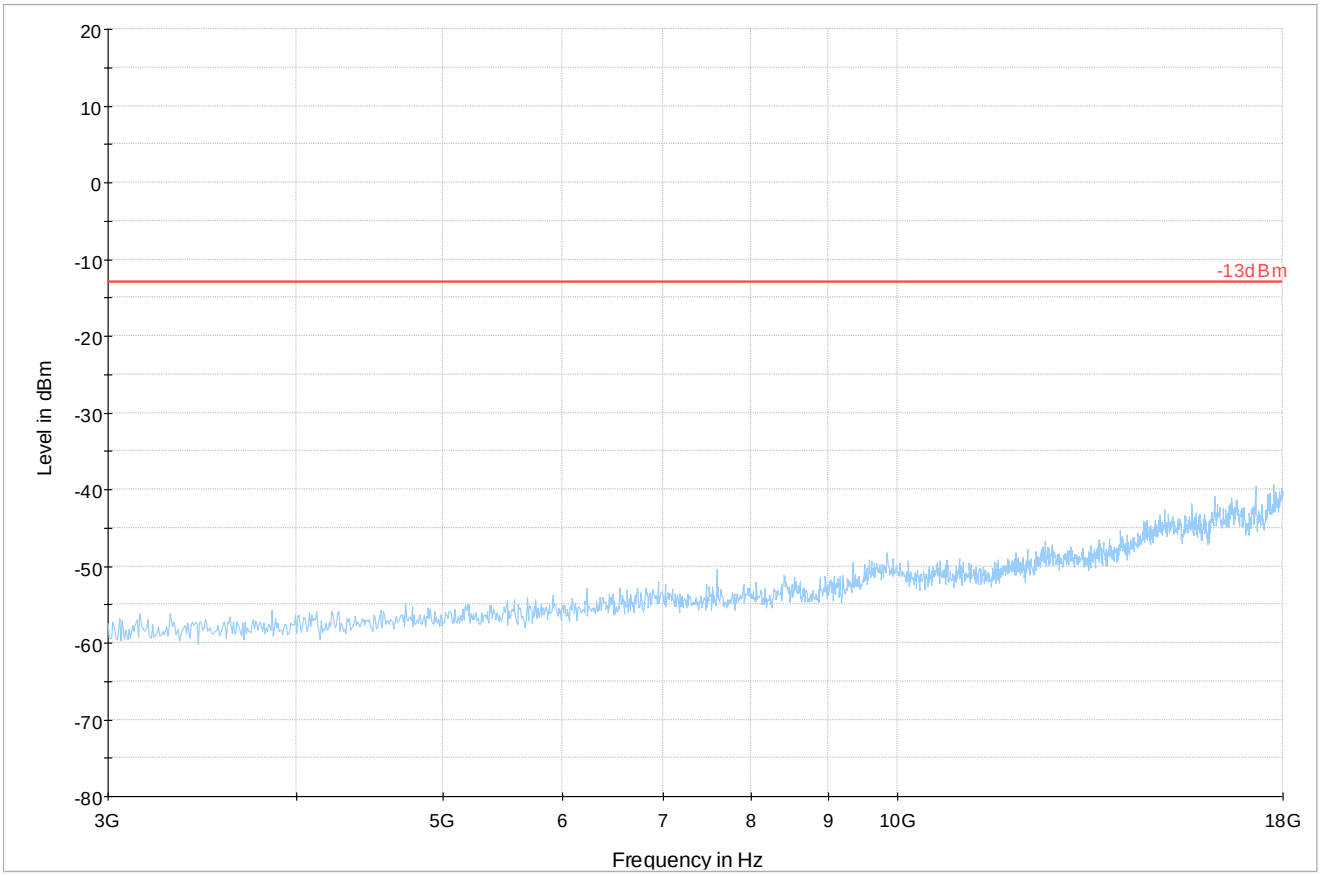
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Low Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.16 QPSK/ 20MHz/ Mid Channel/ 3GHz to 18GHz

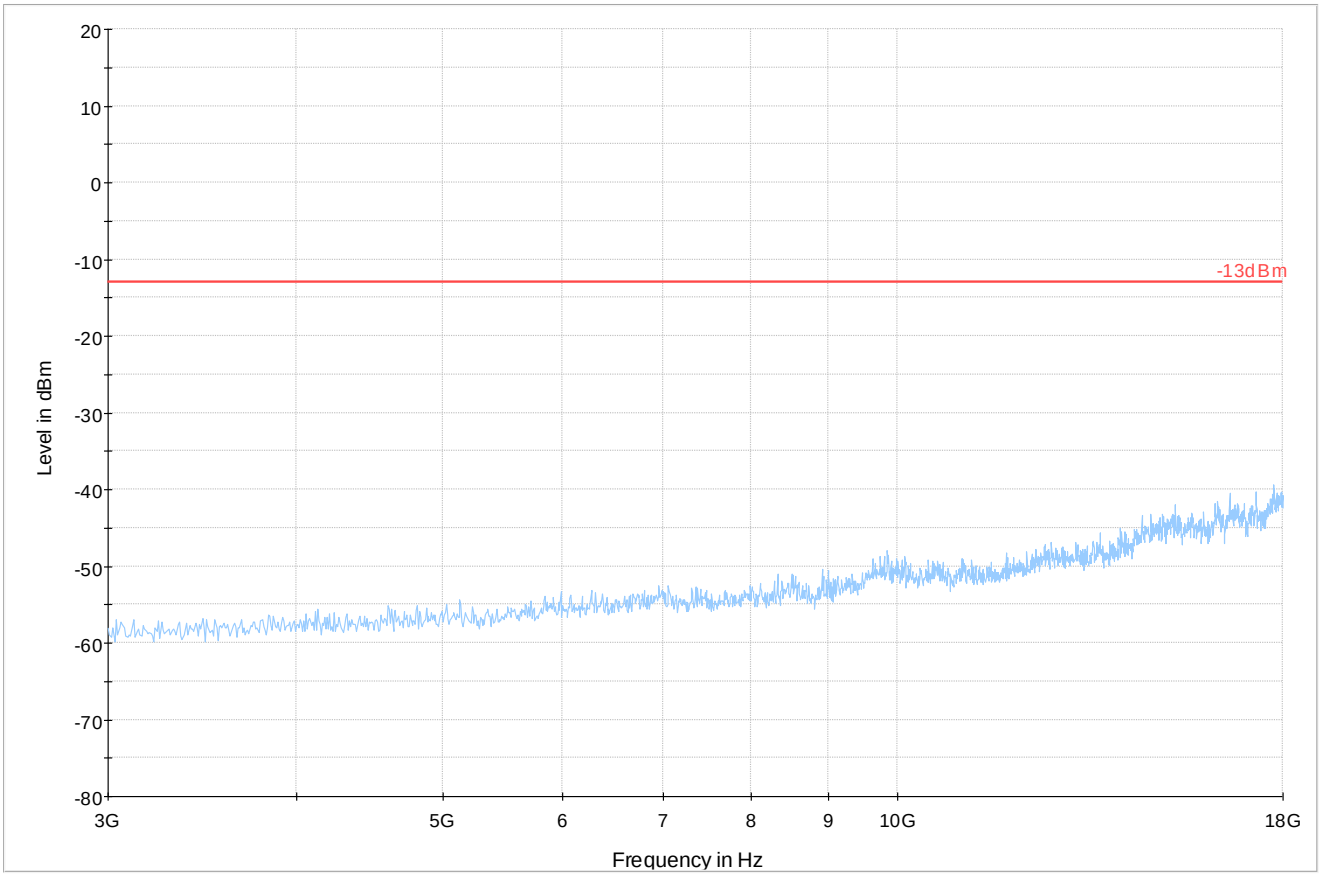
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.17 16QAM 20MHz/ Mid Channel/ 3GHz to 18GHz

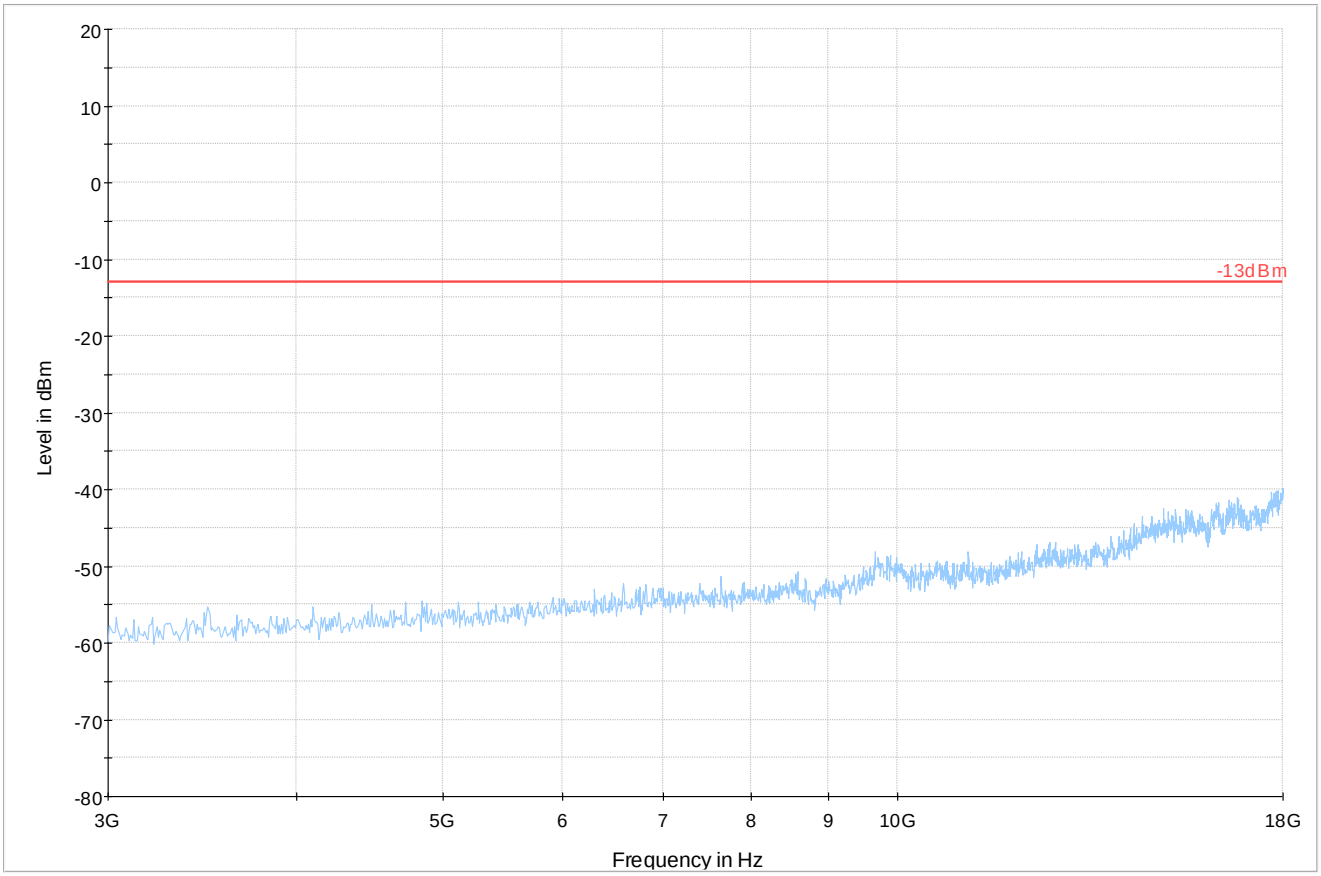
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: 16QAM		
Measurement results - 3 GHz – 18 GHz -Mid Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20



-13dBm Preview Result 1-PK+

6.2.8.2.18 QPSK/ 20MHz/ High Channel/ 3GHz to 18GHz

LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz -High Channel		
RB Size = 100	**RB Offset** = 0	**BW (MHz)** = 20

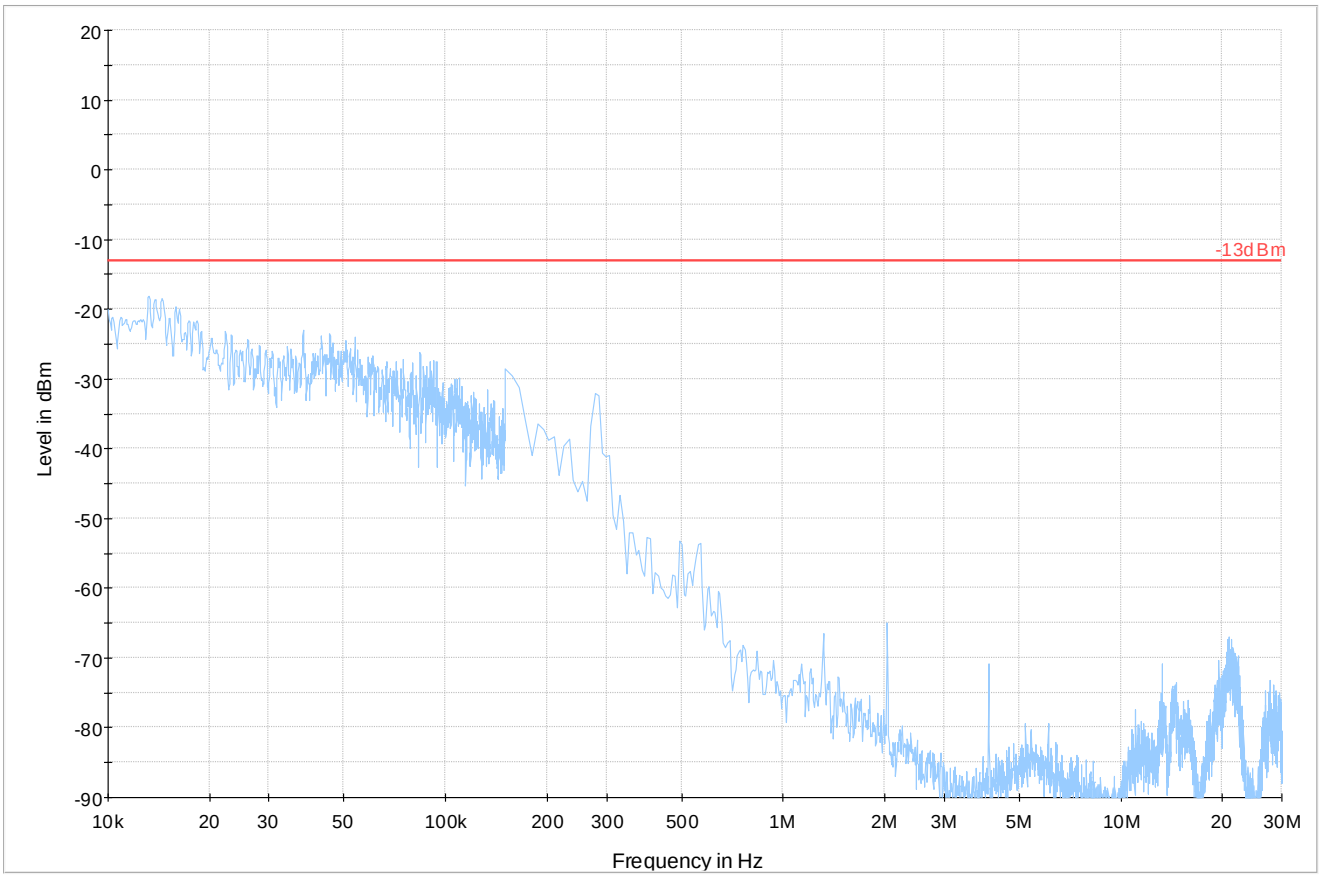


-13dBm Preview Result 1-PK+

6.2.8.3 Spurious Emission LTE FDD 5:

6.2.8.3.1 QPSK/ 1.4MHz/ Low Channel/ 10kHz to 30MHz

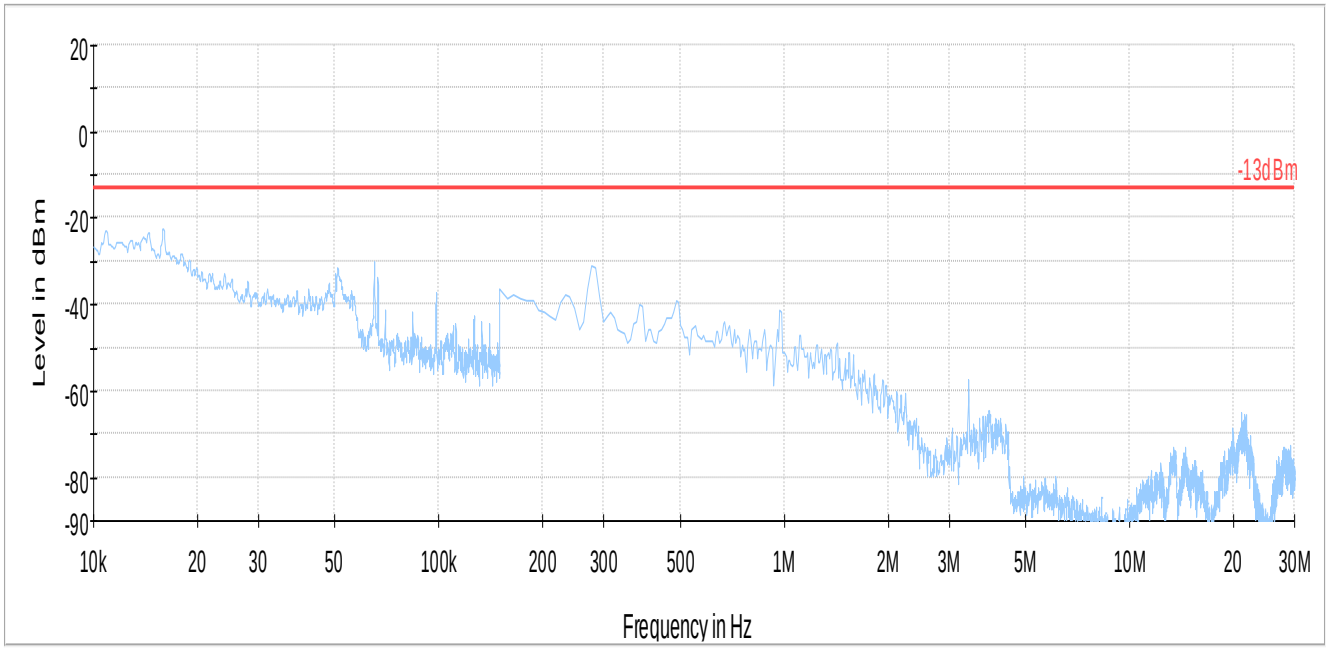
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz -Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.2 QPSK/ 10MHz/ Low Channel/ 10kHz to 30MHz

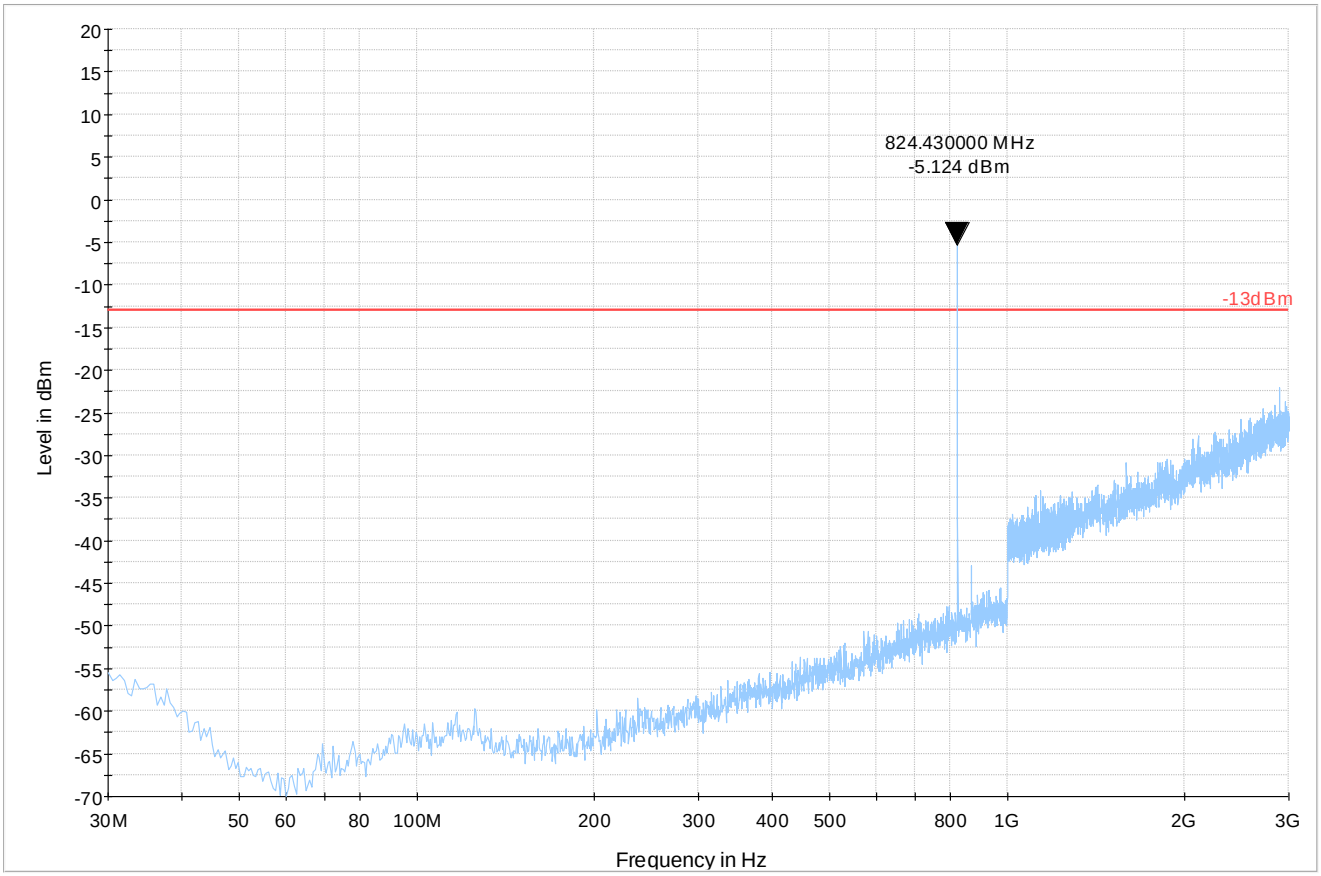
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz -Low Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result1-PK+

6.2.8.3.3 QPSK/ 1.4MHz/ Low Channel/ 30MHz to 3GHz

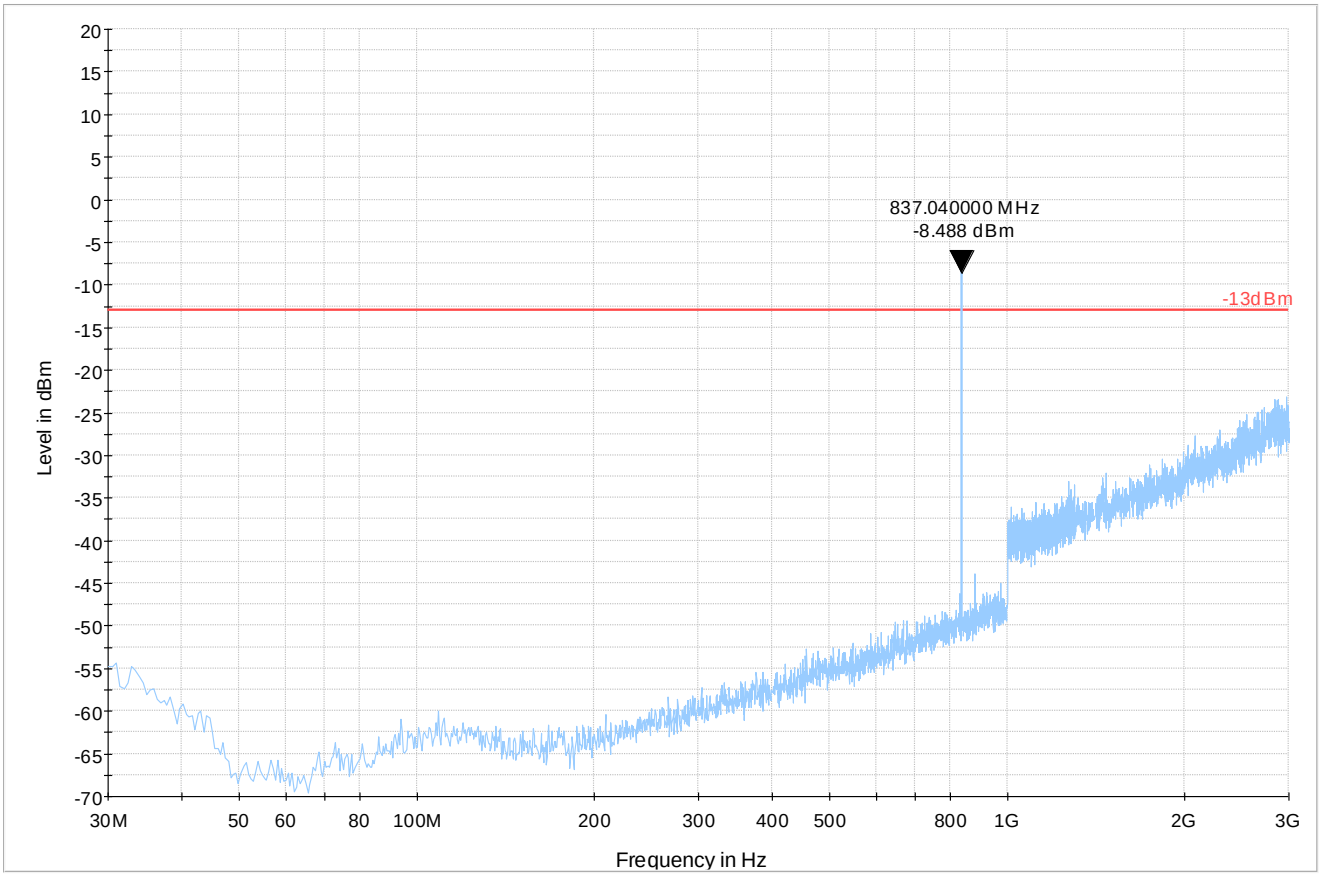
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.4 QPSK/ 1.4MHz/ Mid Channel/ 30MHz to 3GHz

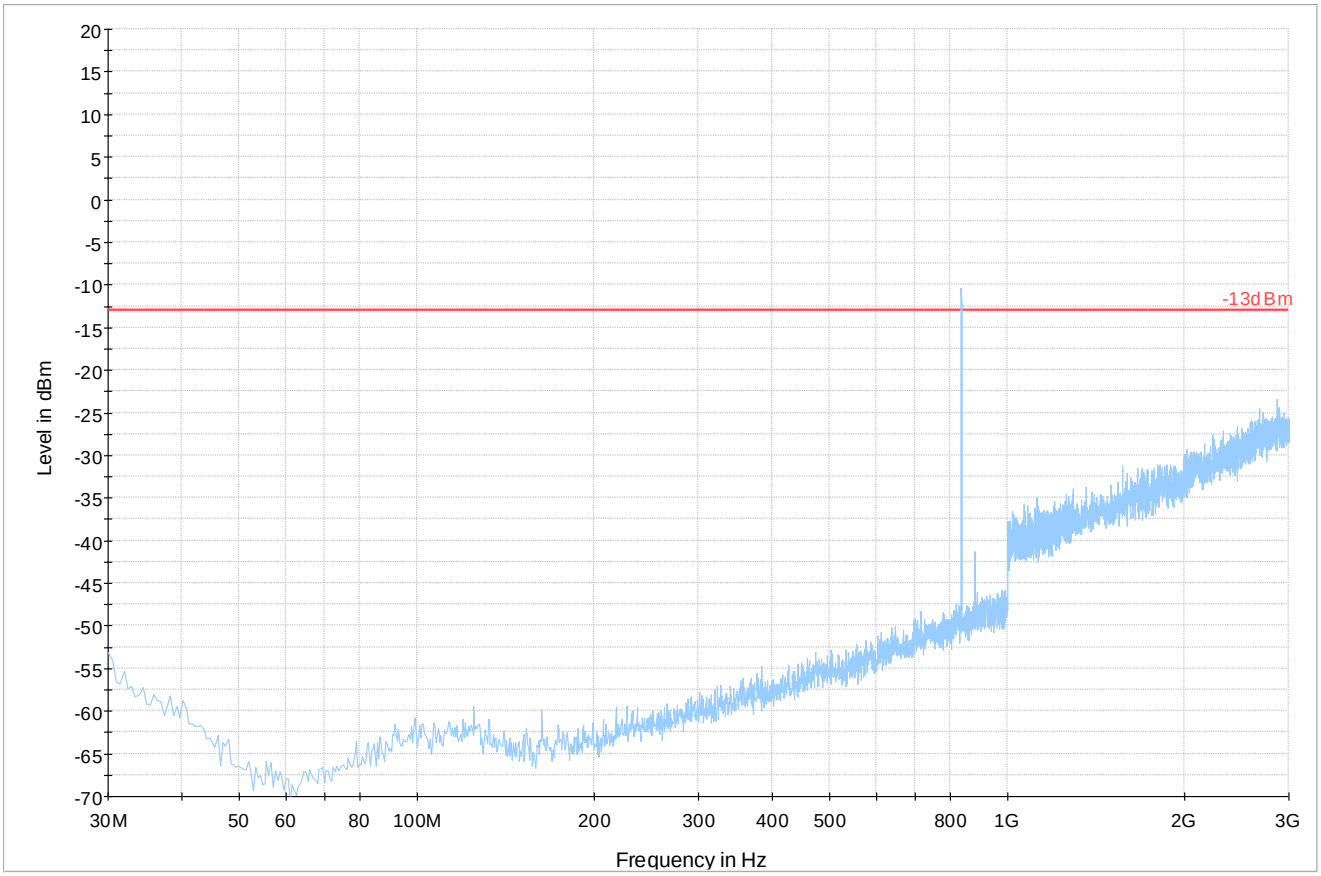
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.5 16 QAM/ 1.4MHz/ Mid Channel/ 30MHz to 3GHz

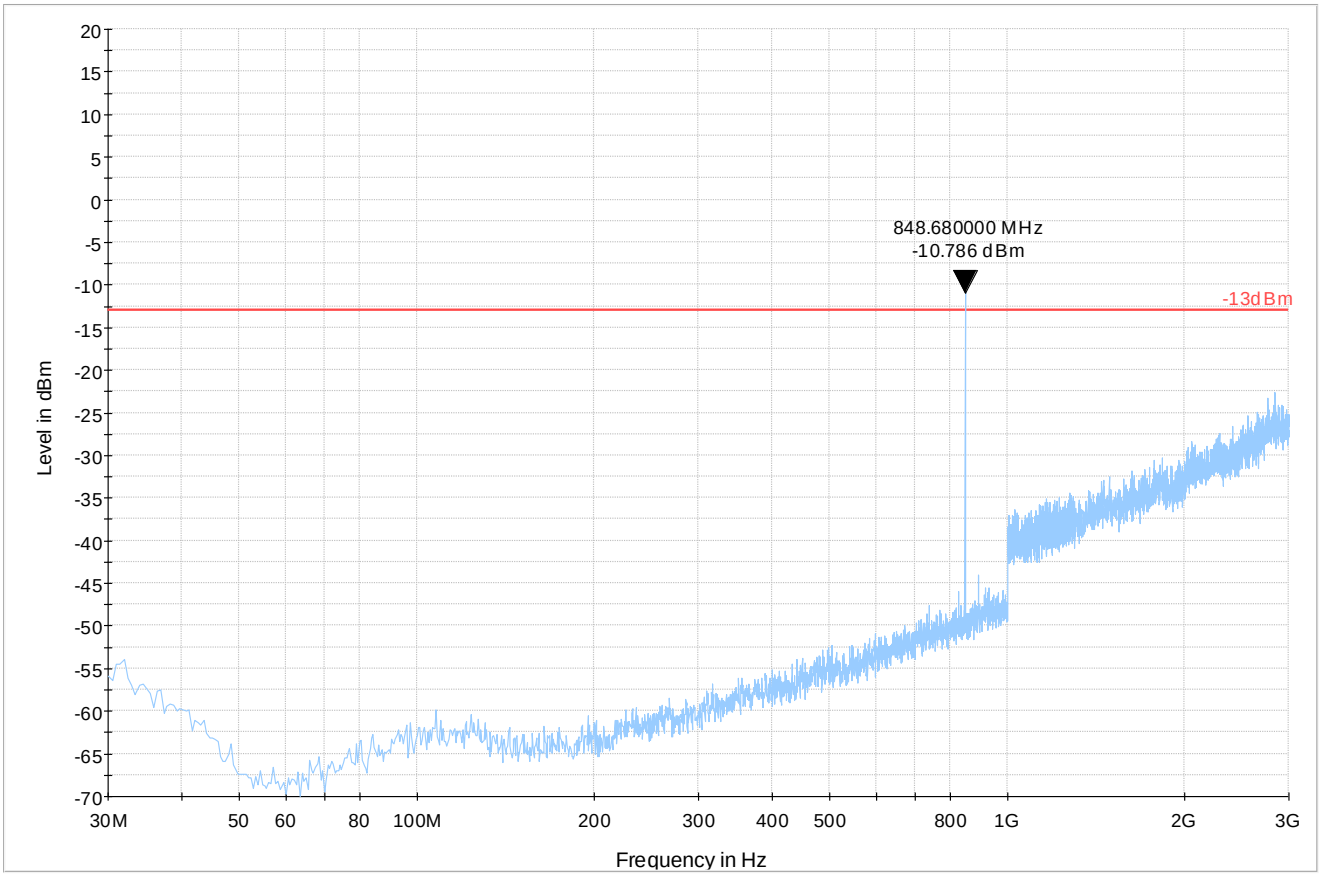
LTE Band 5 (824 MHz – 849 MHz) -Modulation: 16 QAM		
Measurement results – 30 MHz – 3GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.6 QPSK/ 1.4MHz/ High Channel/ 30MHz to 3GHz

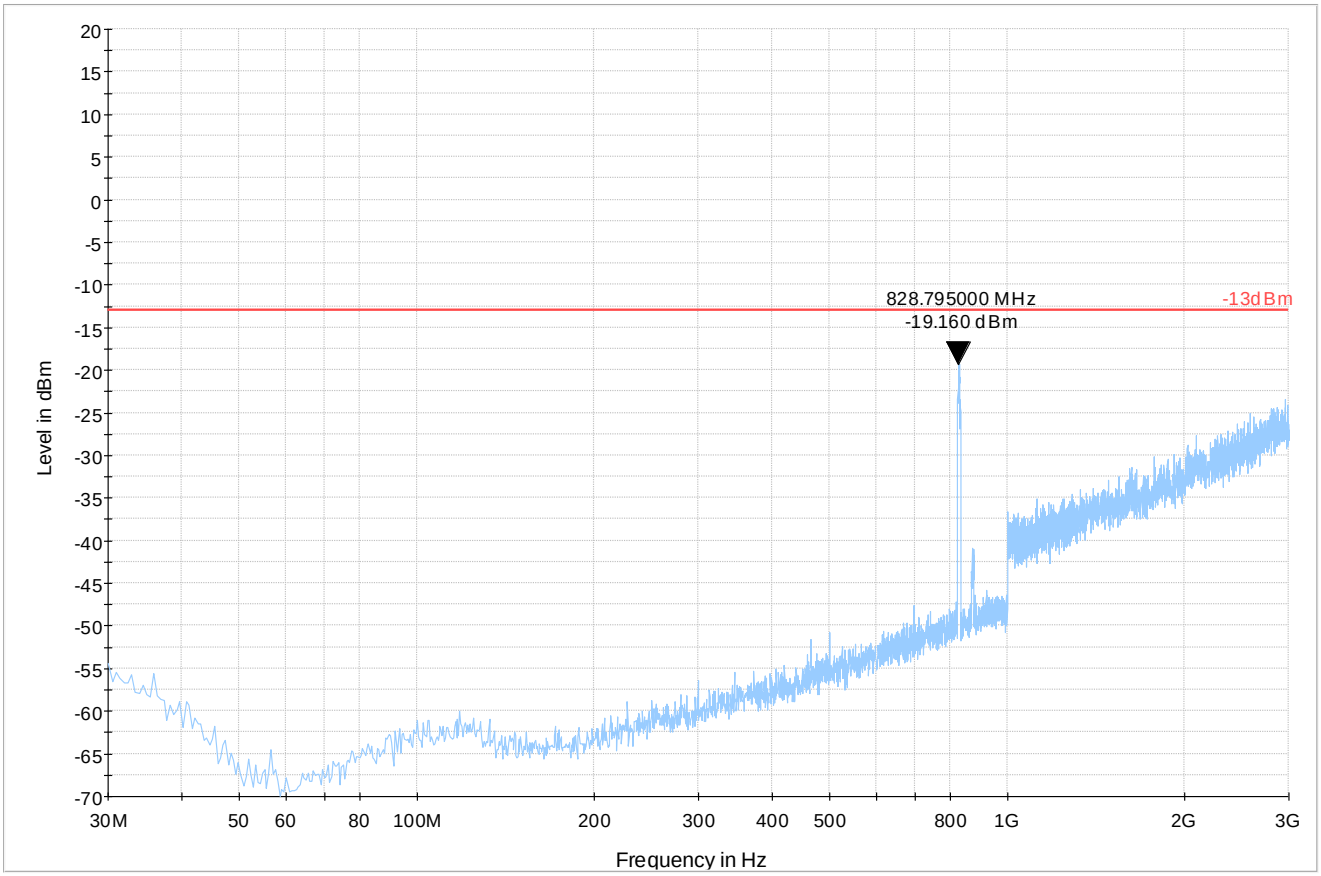
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -High Channel		
RB Size = 1	RB Offset = 0	BW (MHz) = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.7 QPSK/ 10MHz/ Low Channel/ 30MHz to 3GHz

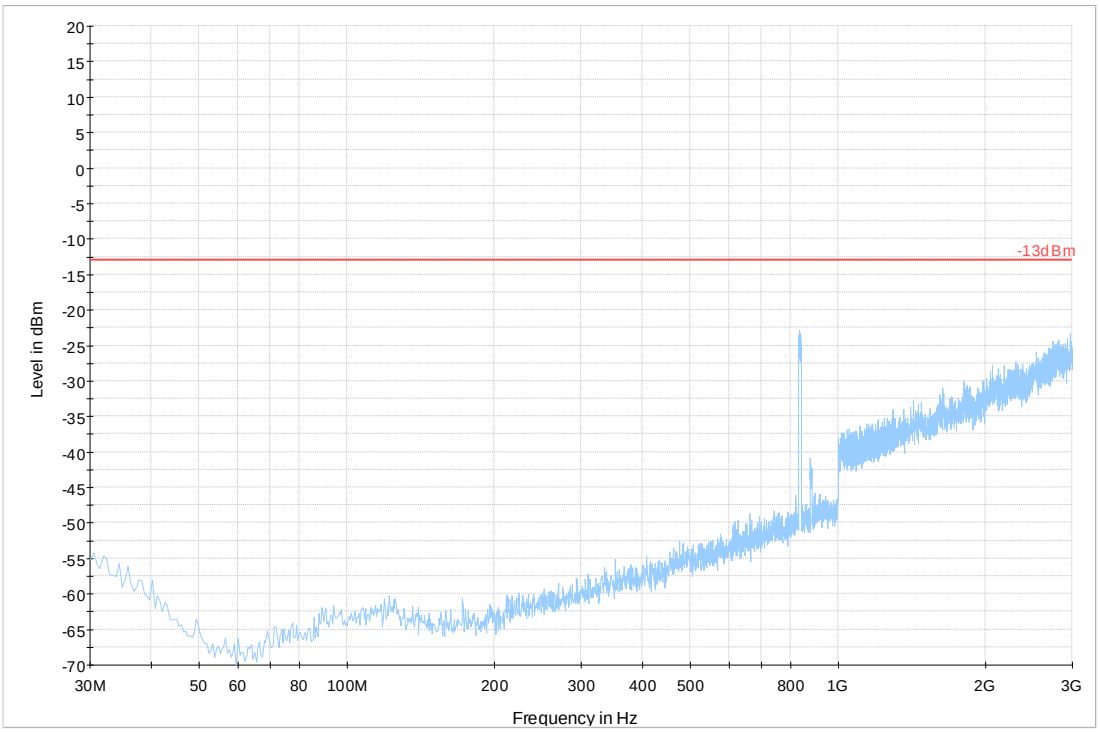
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Low Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.3.8 QPSK/ 10MHz/ Mid Channel/ 30MHz to 3GHz

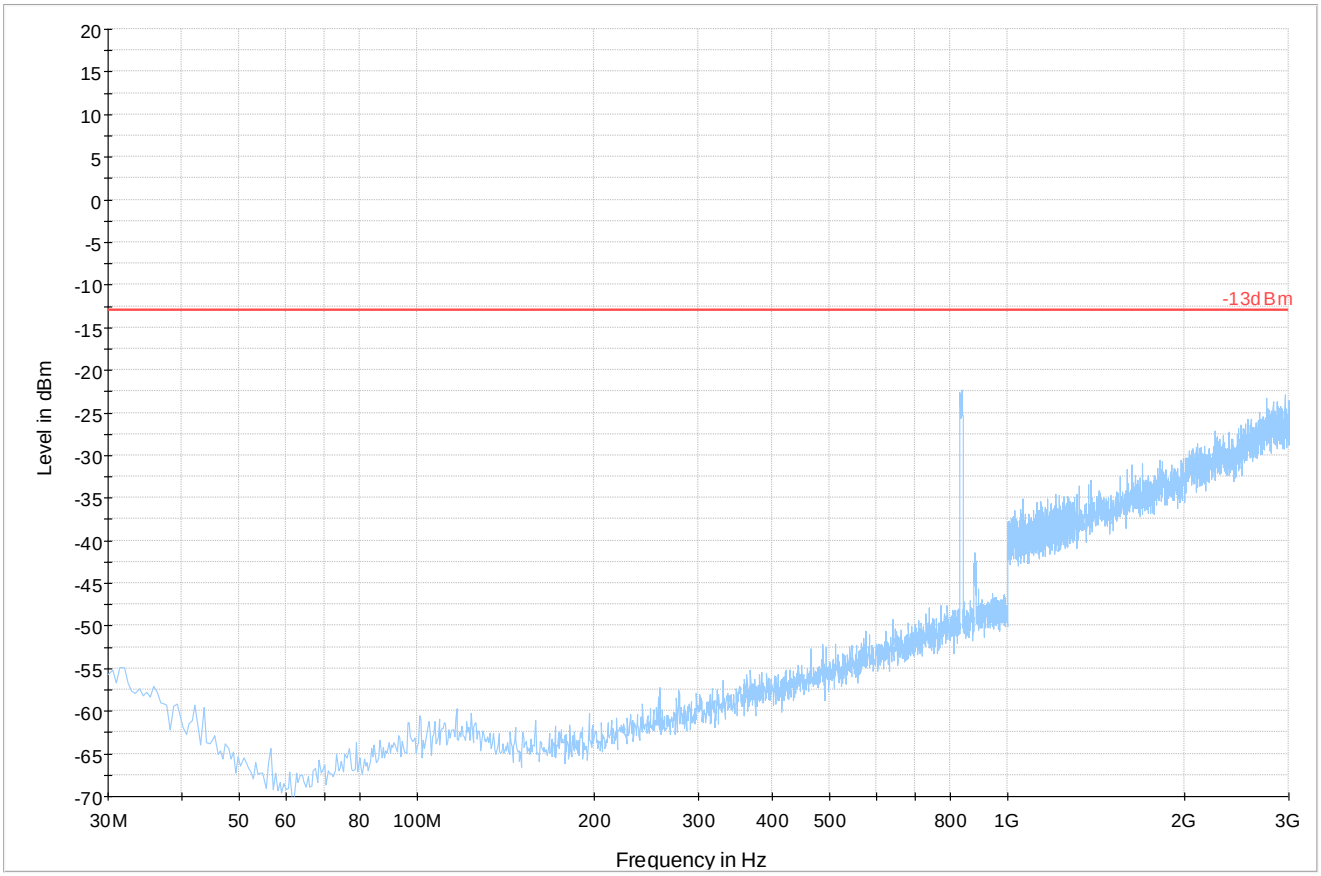
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -Mid Channel		
RB Size = 50	RB Offset = 0	BW (MHz) = 10



-13dBm Preview Result 1-PK+

6.2.8.3.9 16 QAM/ 10MHz/ Mid Channel/ 30MHz to 3GHz

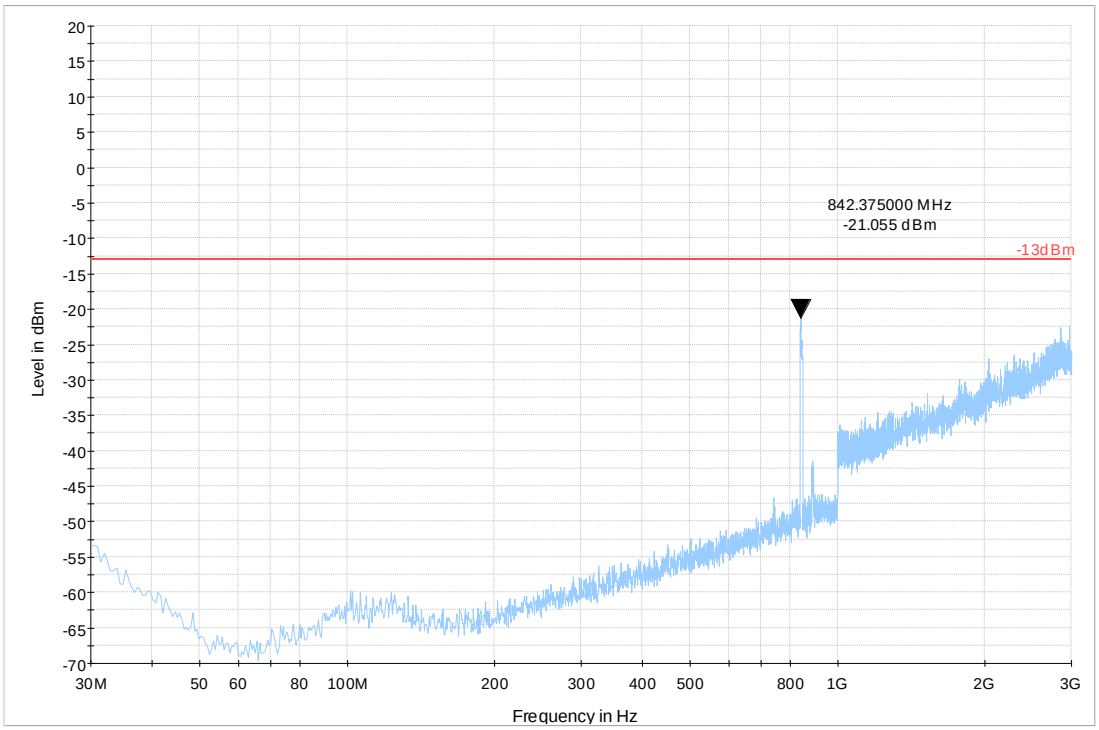
LTE Band 5 (824 MHz – 849 MHz) -Modulation: 16 QAM		
Measurement results – 30 MHz – 3 GHz -Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.3.10 QPSK/ 10MHz/ High Channel/ 30MHz to 3GHz

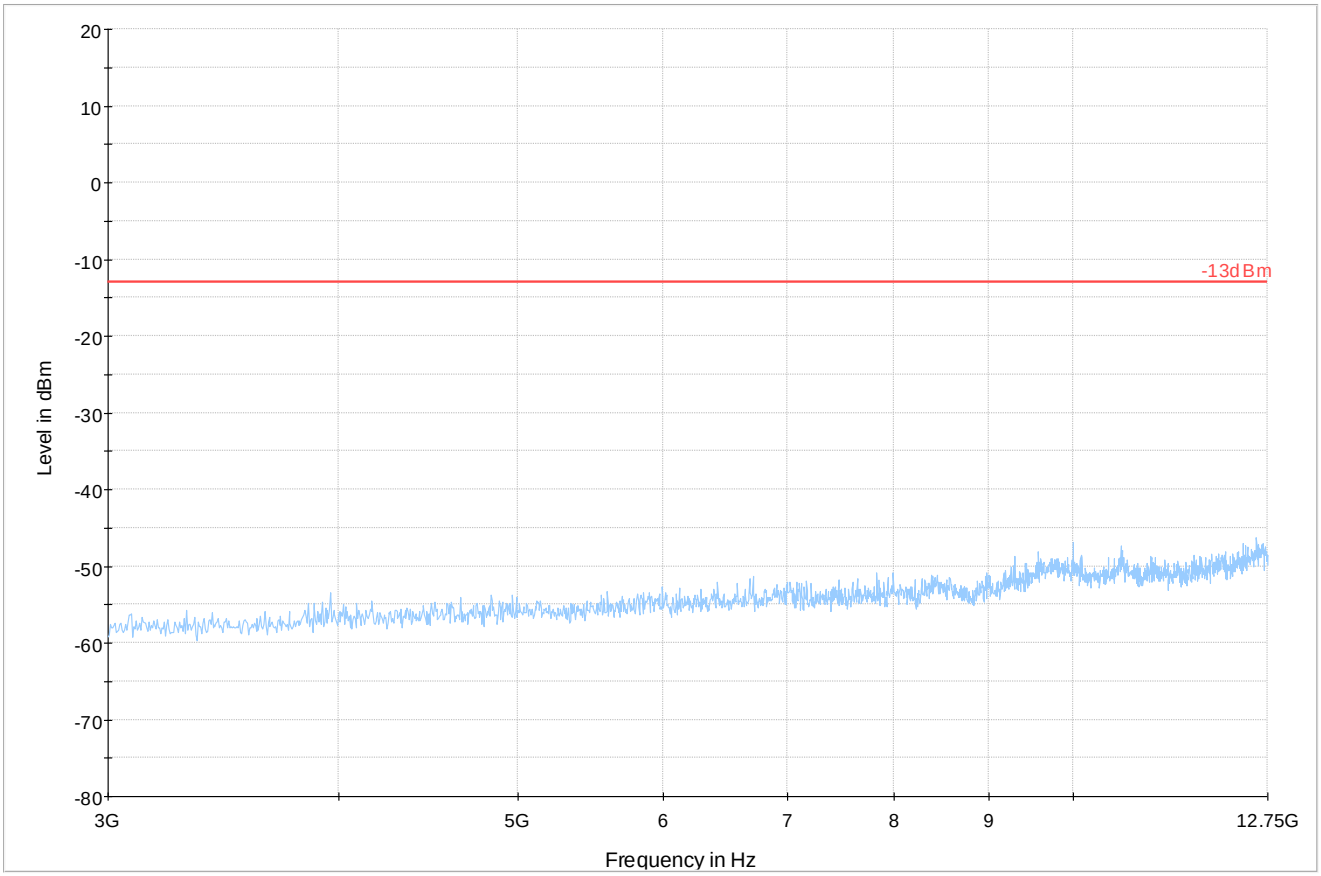
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3GHz -High Channel		
RB Size = 50	RB Offset = 0	BW (MHz) = 10



-13dBm Preview Result 1-PK+

6.2.8.3.11 QPSK/ 1.4MHz/ Low Channel/ 3GHz to 12.75GHz

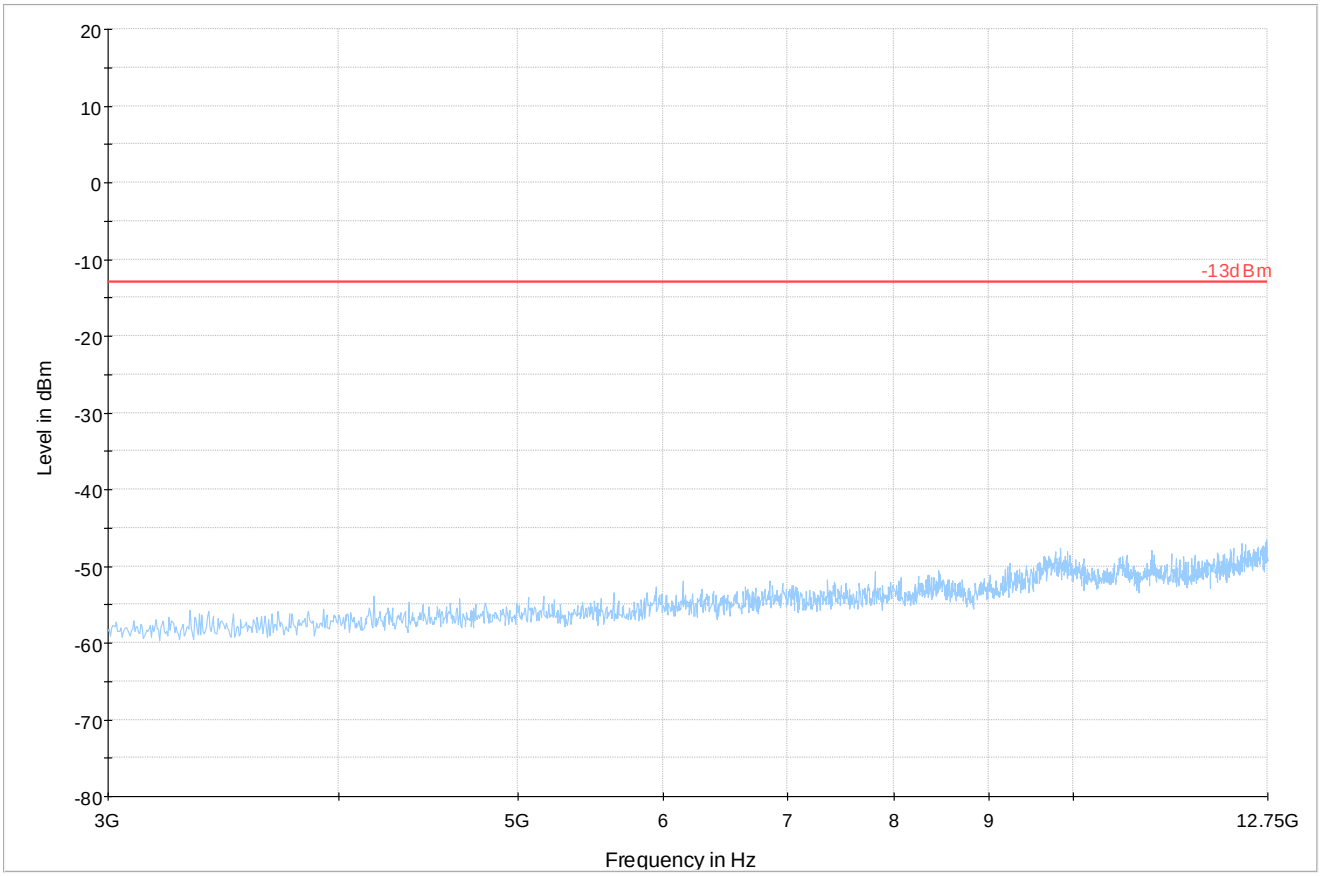
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results -3 GHz – 12.75 GHz -Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.12 QPSK/ 1.4MHz/ Mid Channel/ 3GHz to 12.75GHz

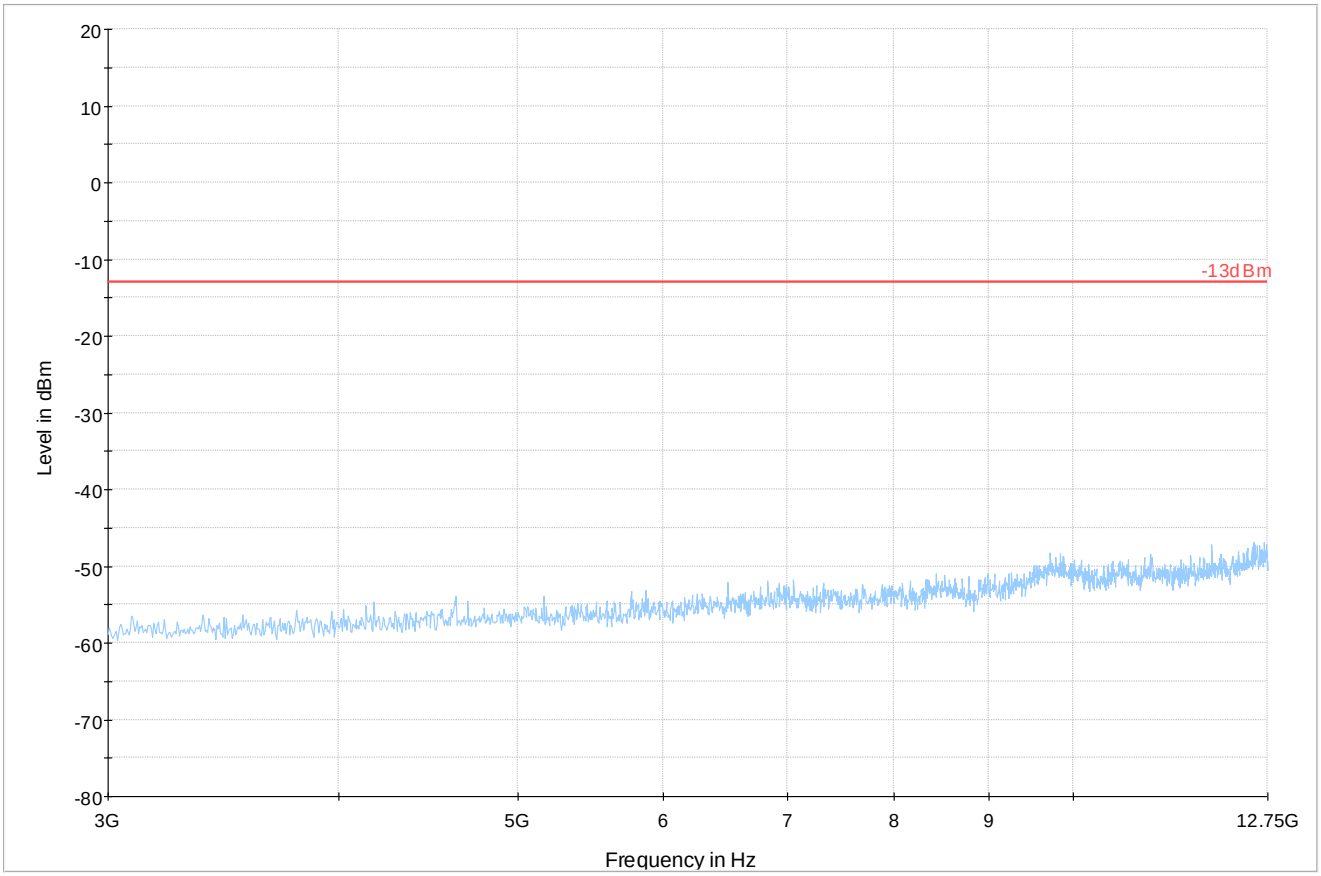
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results - 1 GHz – 12.75 GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.13 16 QAM/ 1.4MHz/ Mid Channel/ 3GHz to 12.75GHz

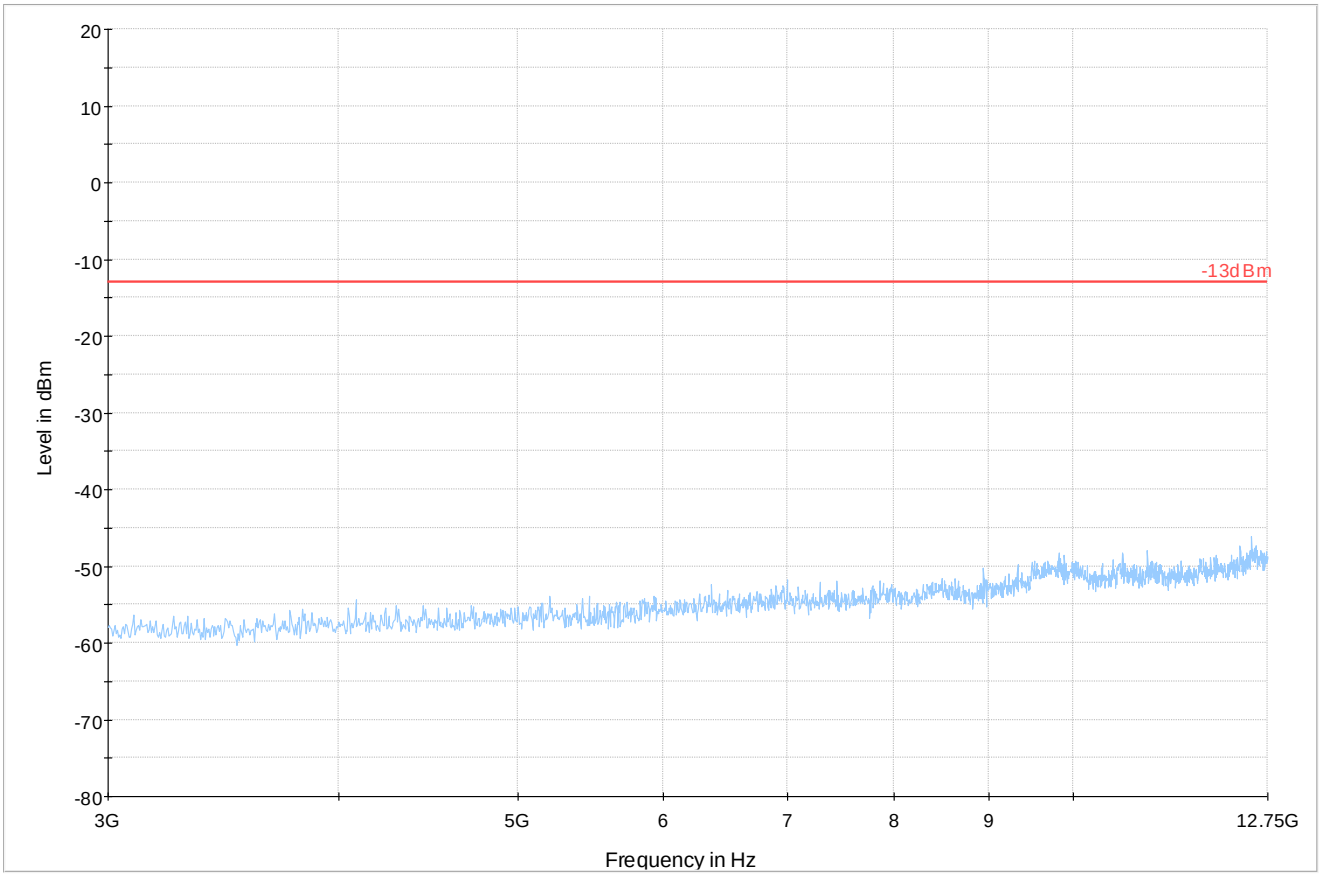
LTE Band 5 (824 MHz – 849 MHz) -Modulation: 16 QAM		
Measurement results – 3 GHz – 12.75 GHz -Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.14 QPSK/ 1.4MHz/ High Channel/ 3GHz to 12.75GHz

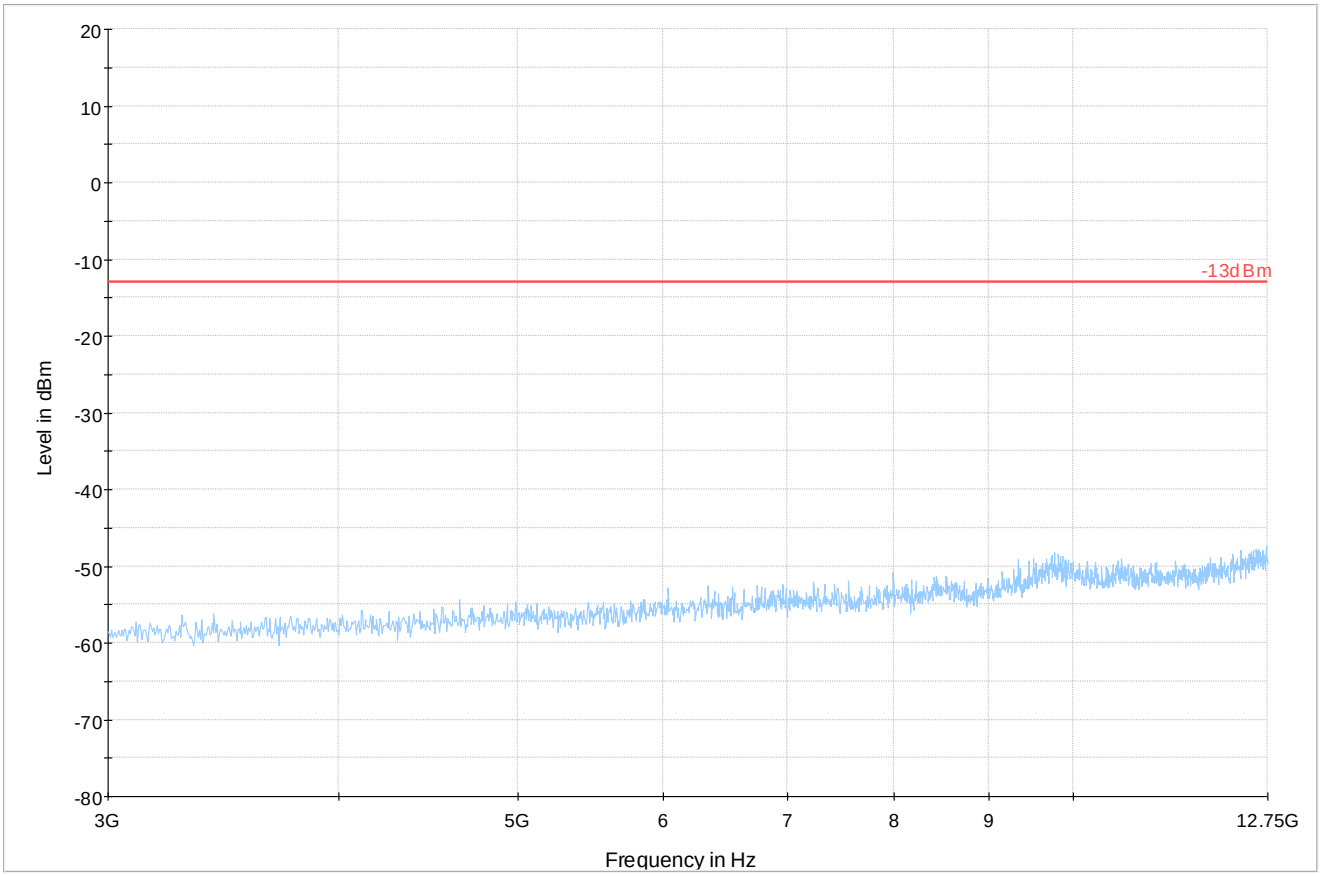
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results – 3 GHz – 12.75 GHz -High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 1.4



-13dBm Preview Result 1-PK+

6.2.8.3.15 QPSK/ 10MHz/ Low Channel/ 3GHz to 12.75GHz

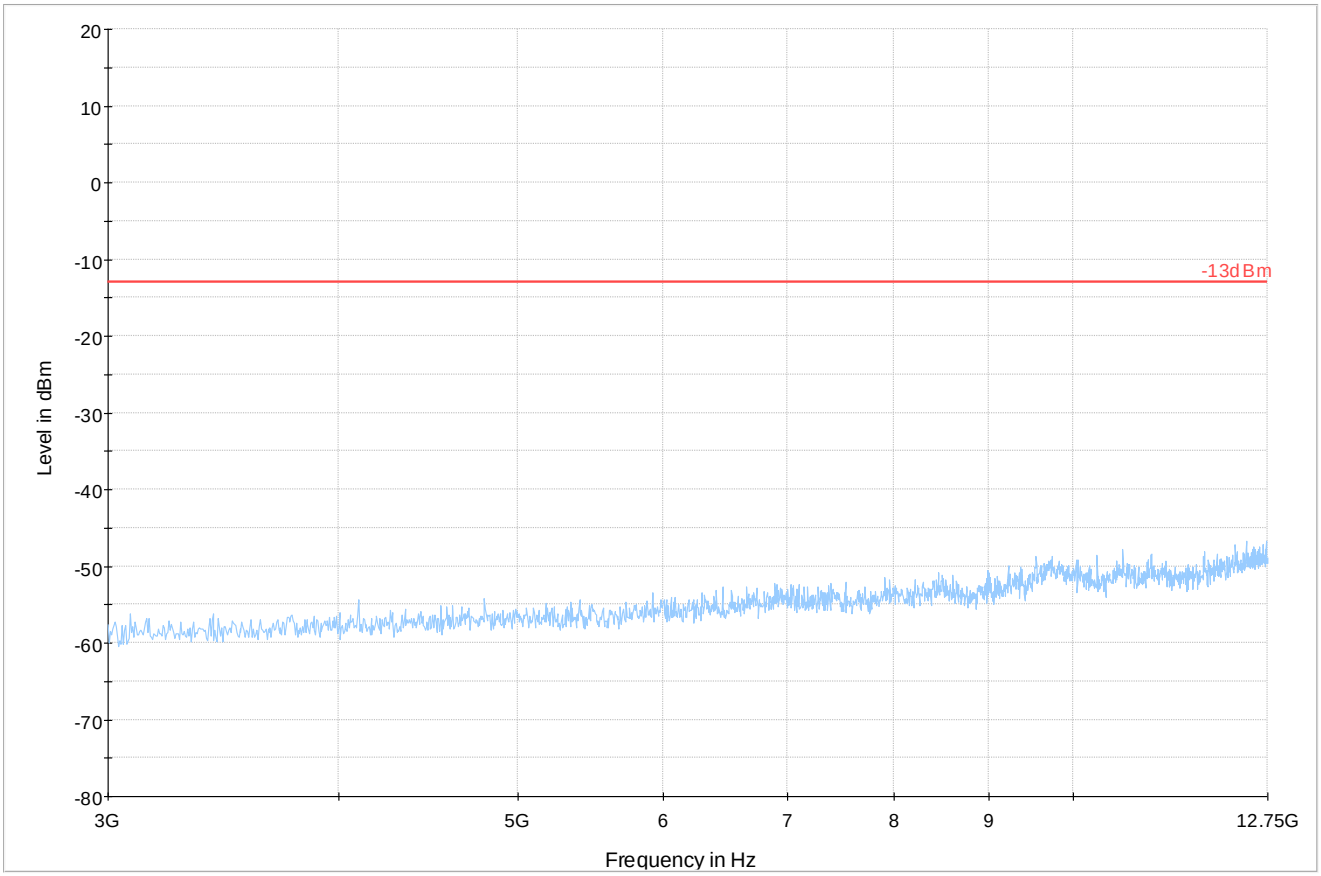
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results – 3 GHz – 12.75 GHz -Low Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.3.16 QPSK/ 10MHz/ Mid Channel/ 3GHz to 12.75GHz

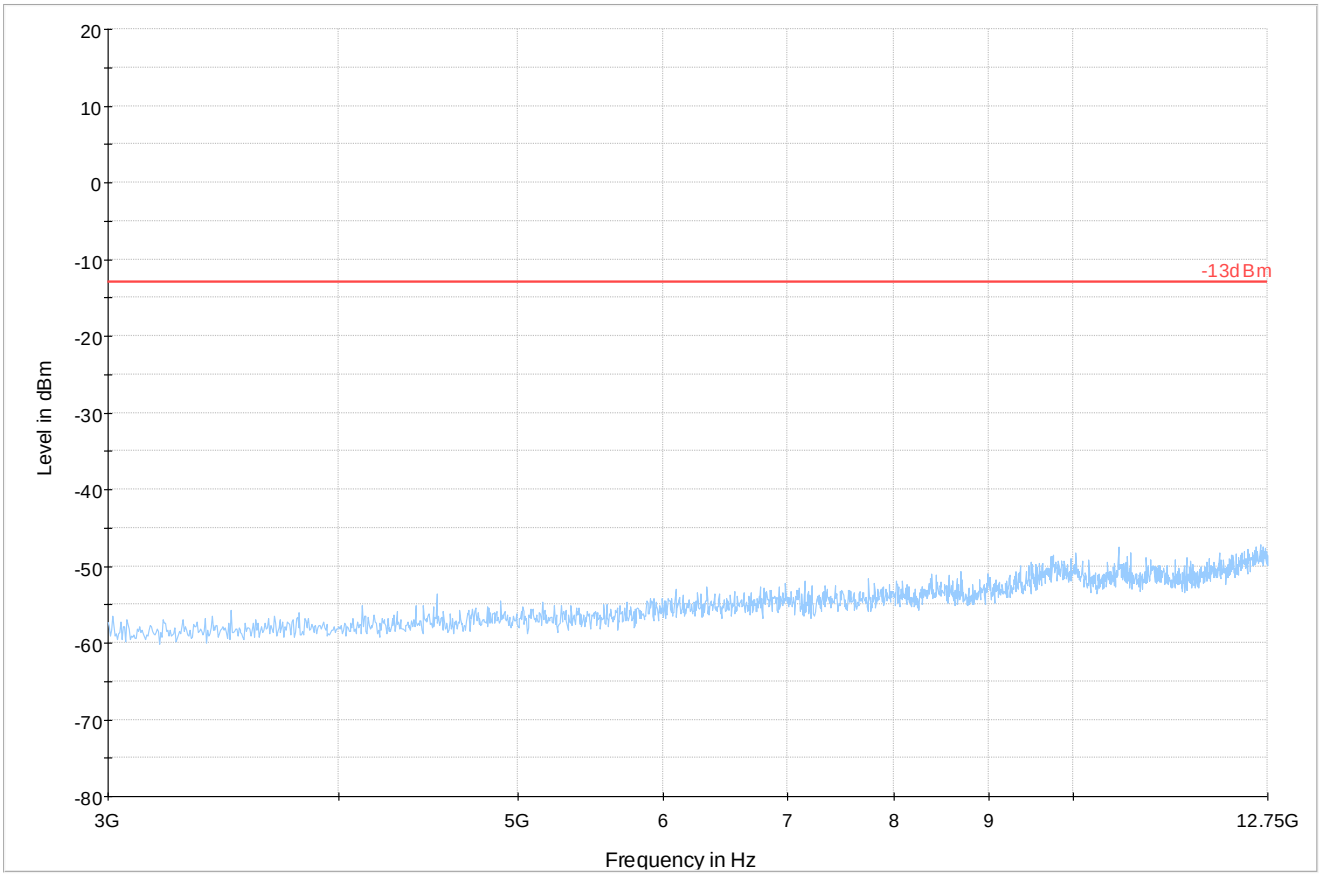
LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results – 3 GHz – 12.75 GHz -Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.3.17 16 QAM/ 10MHz/ Mid Channel/ 3GHz to 12.75GHz

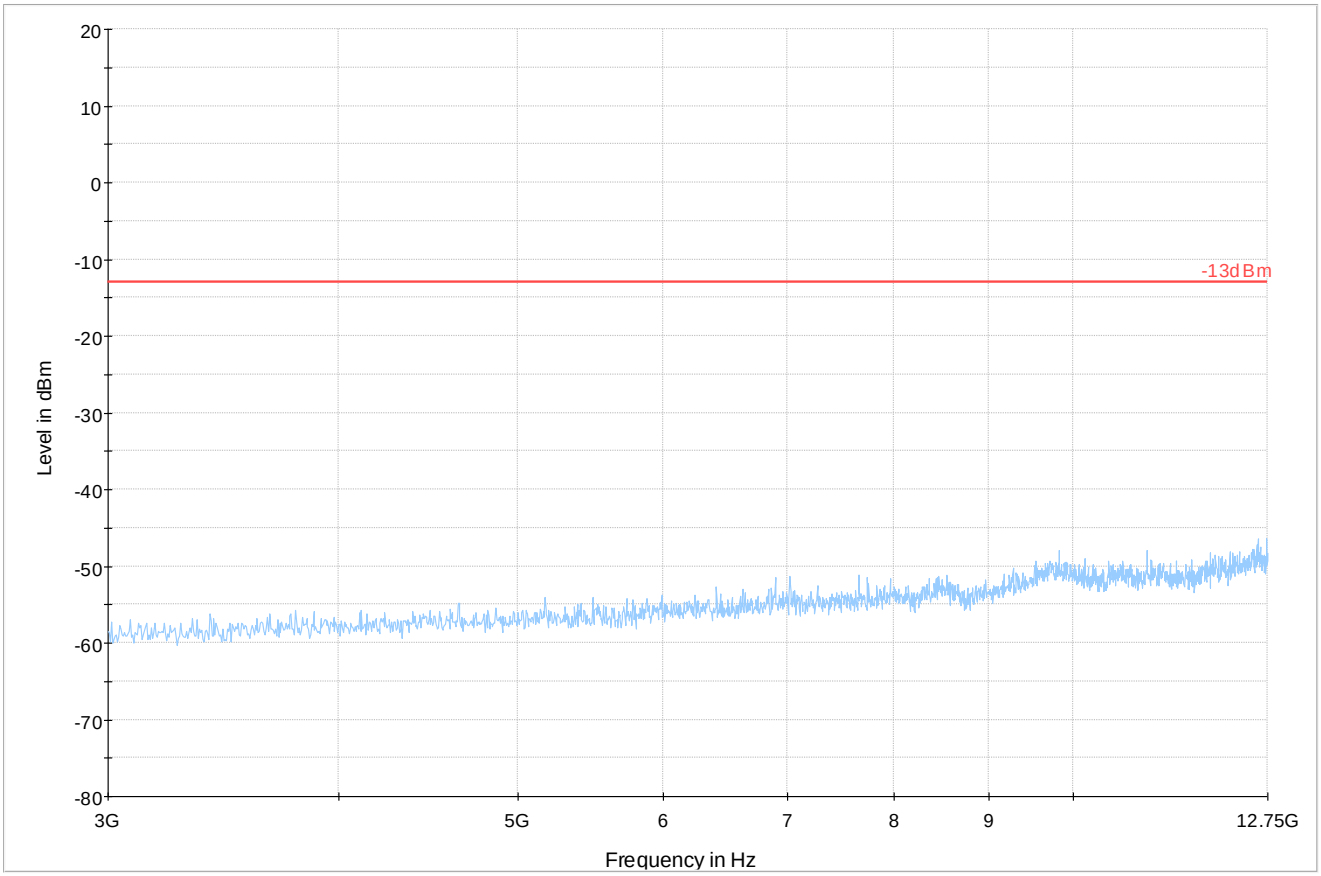
LTE Band 5 (824 MHz – 849 MHz) -Modulation: 16 QAM		
Measurement results – 3 GHz – 12.75 GHz -Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.3.18 QPSK/ 10MHz/ High Channel/ 3GHz to 12.75GHz

LTE Band 5 (824 MHz – 849 MHz) -Modulation: QPSK		
Measurement results – 3 GHz – 12.75 GHz -High Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10

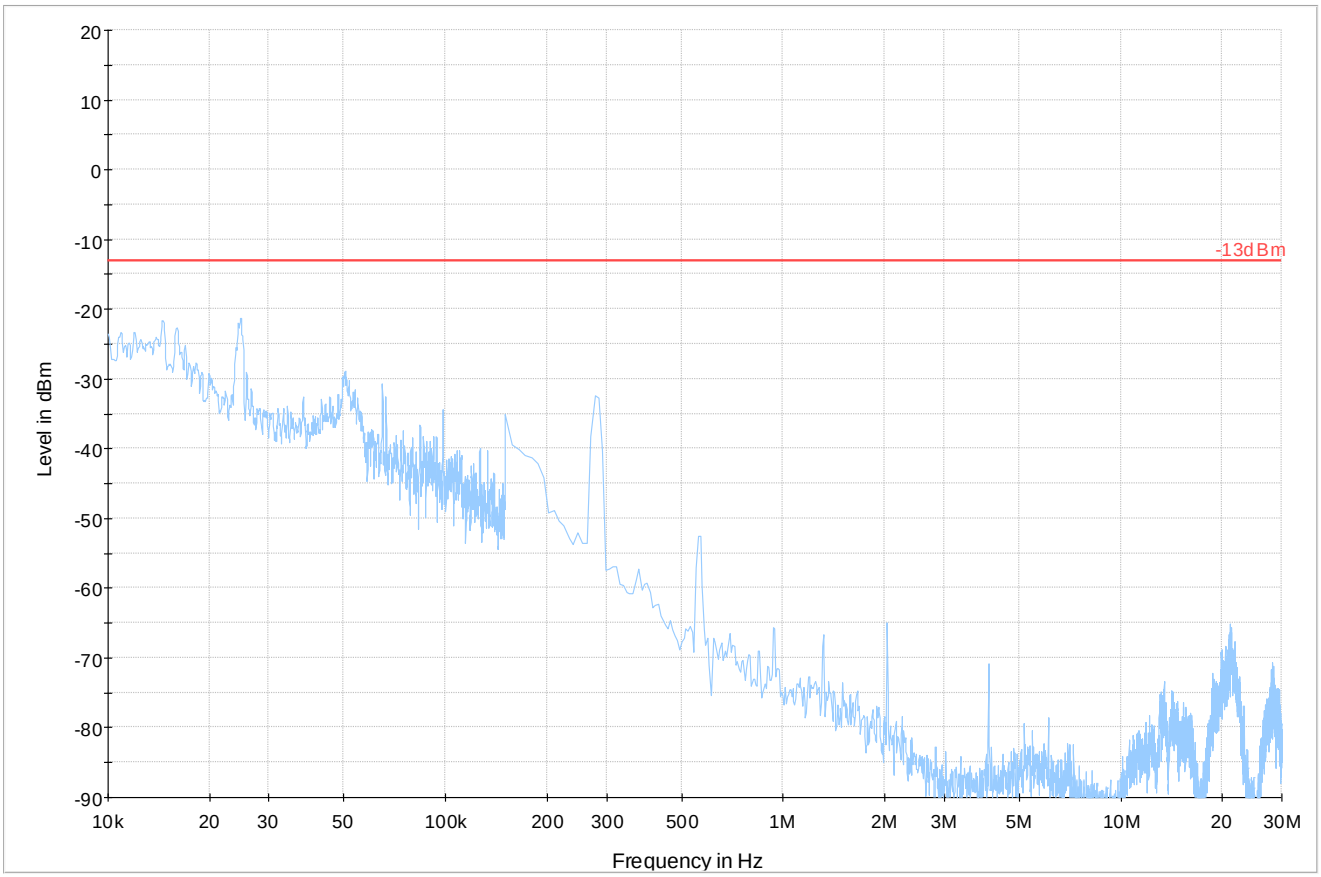


-13dBm Preview Result 1-PK+

6.2.8.4 Spurious Emissions LTE FDD 17:

6.2.8.4.1 QPSK/ 5 MHz/ Mid Channel/ 10kHz to 30MHz:

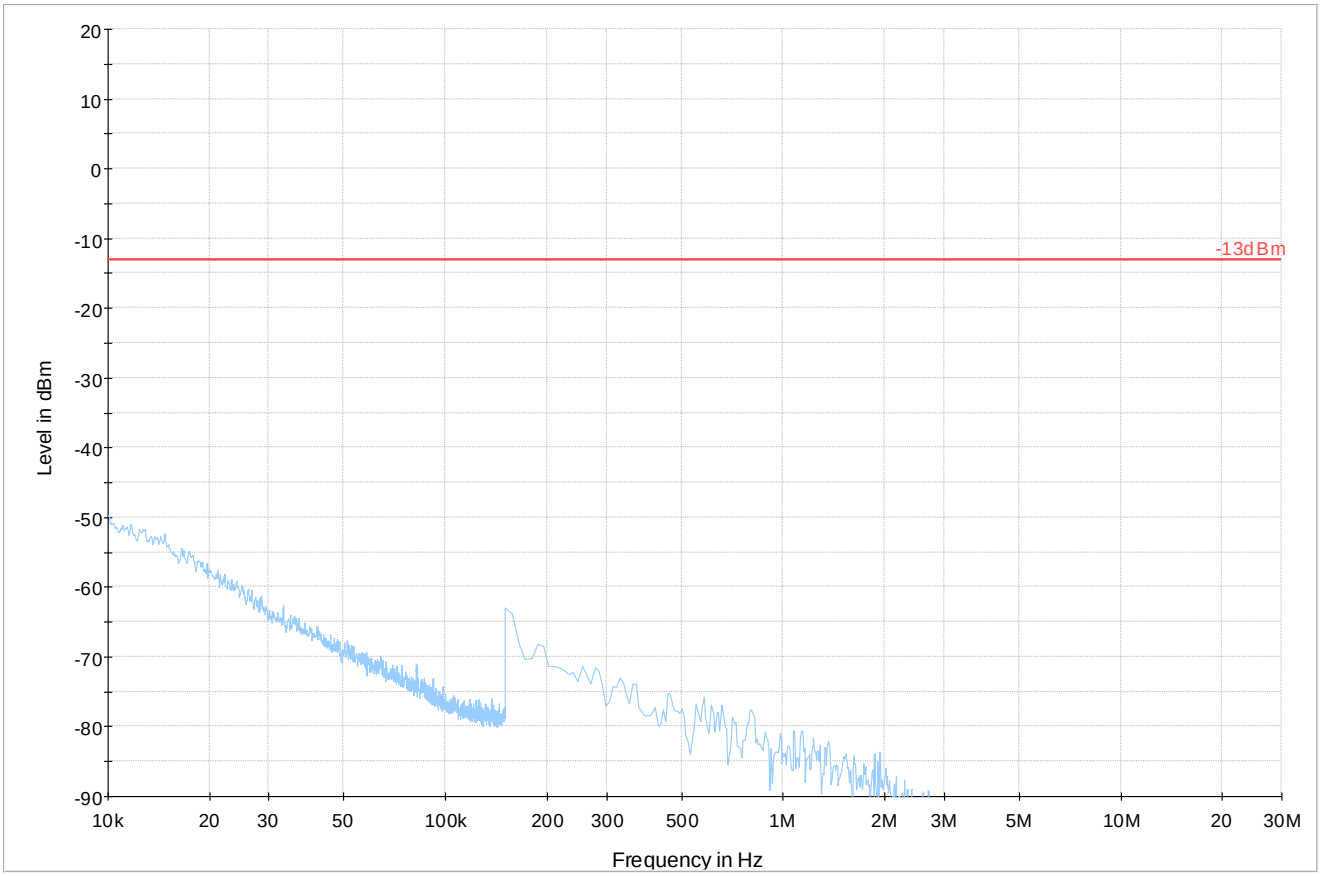
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.2 QPSK/ 10 MHz/ Mid Channel/ 10kHz to 30MHz:

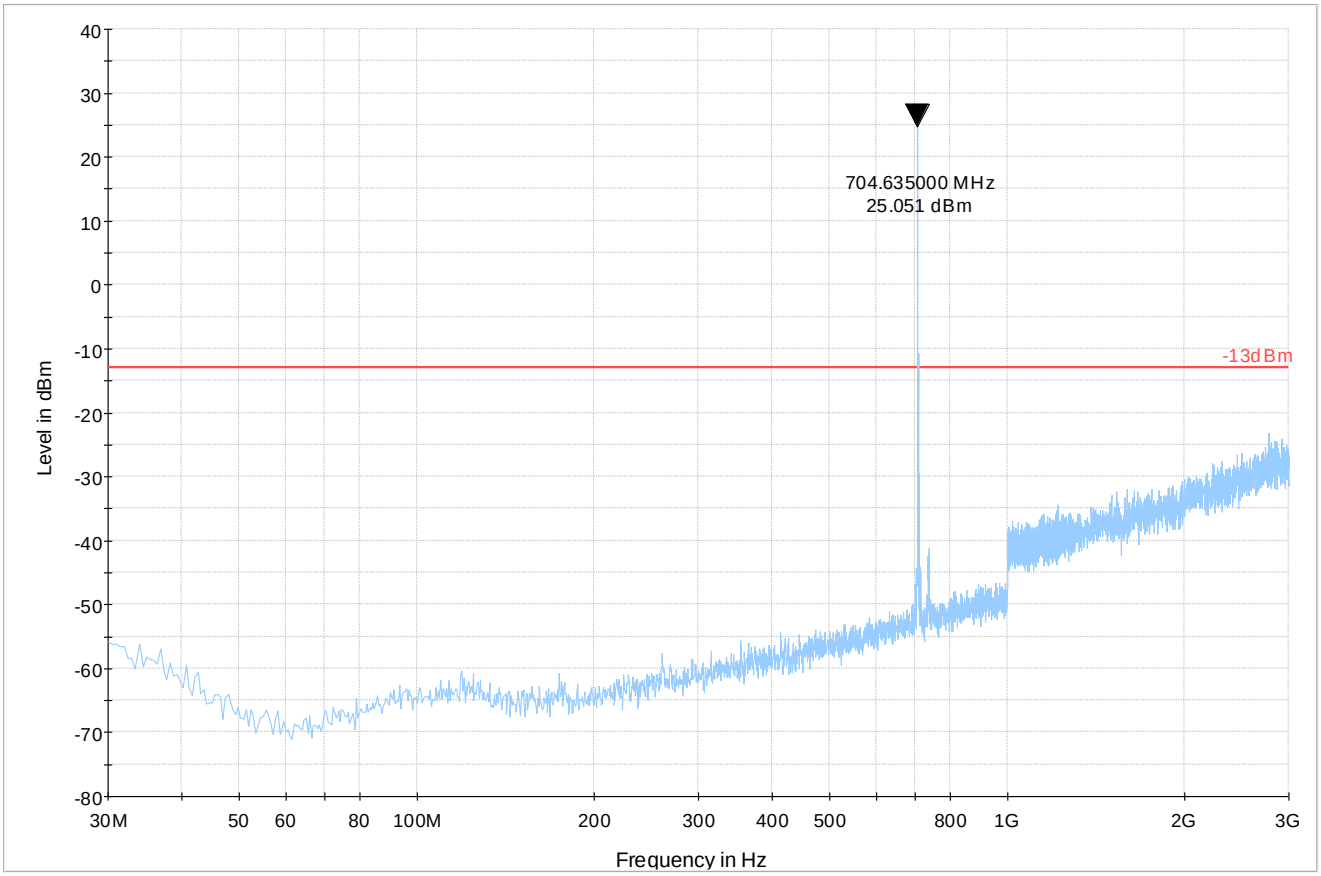
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.4.3 QPSK/ 5 MHz/ Low Channel/ 30MHz to 3GHz:

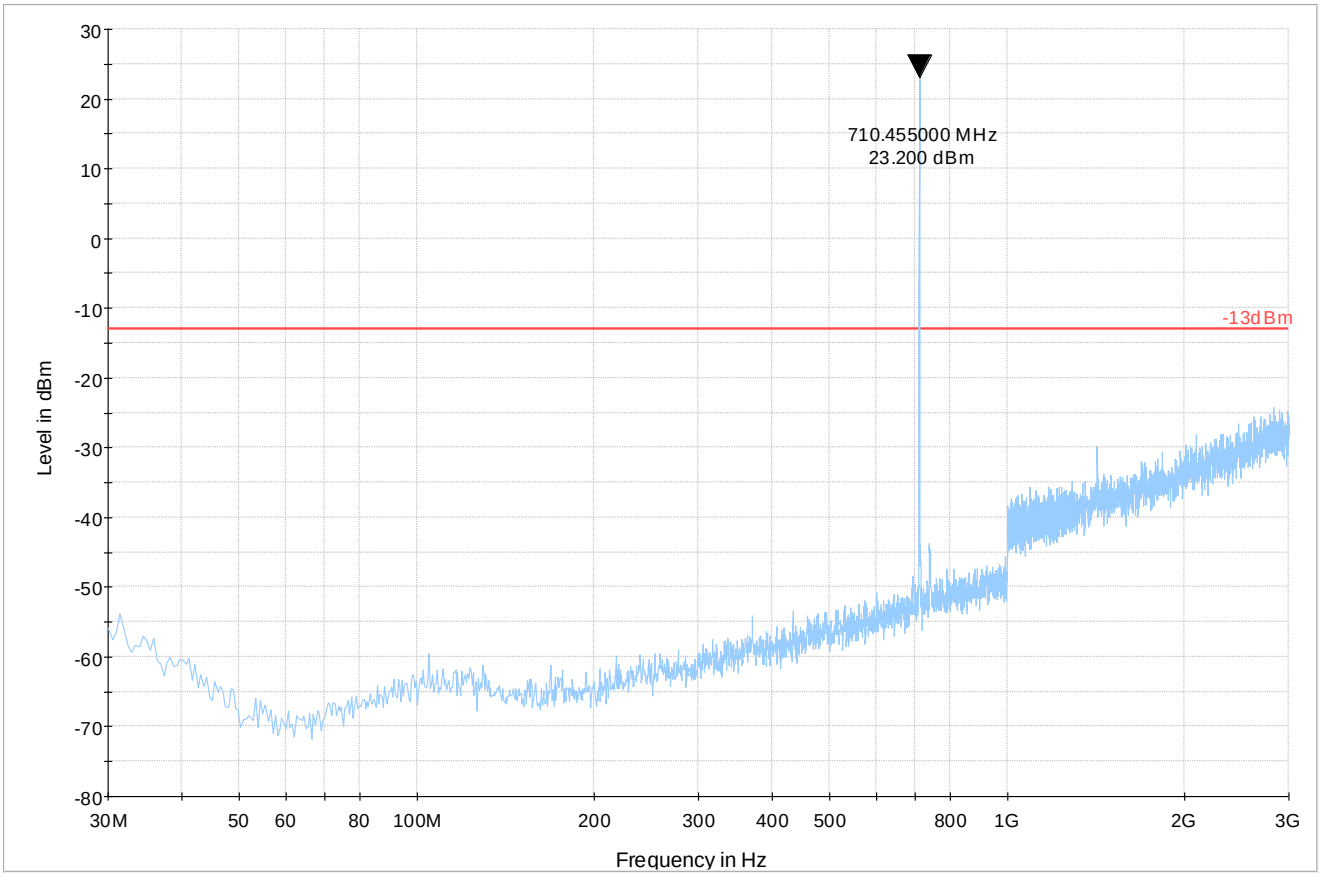
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – Low Channel 23755		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.4 QPSK/ 5 MHz/ Mid Channel/ 30MHz to 3GHz:

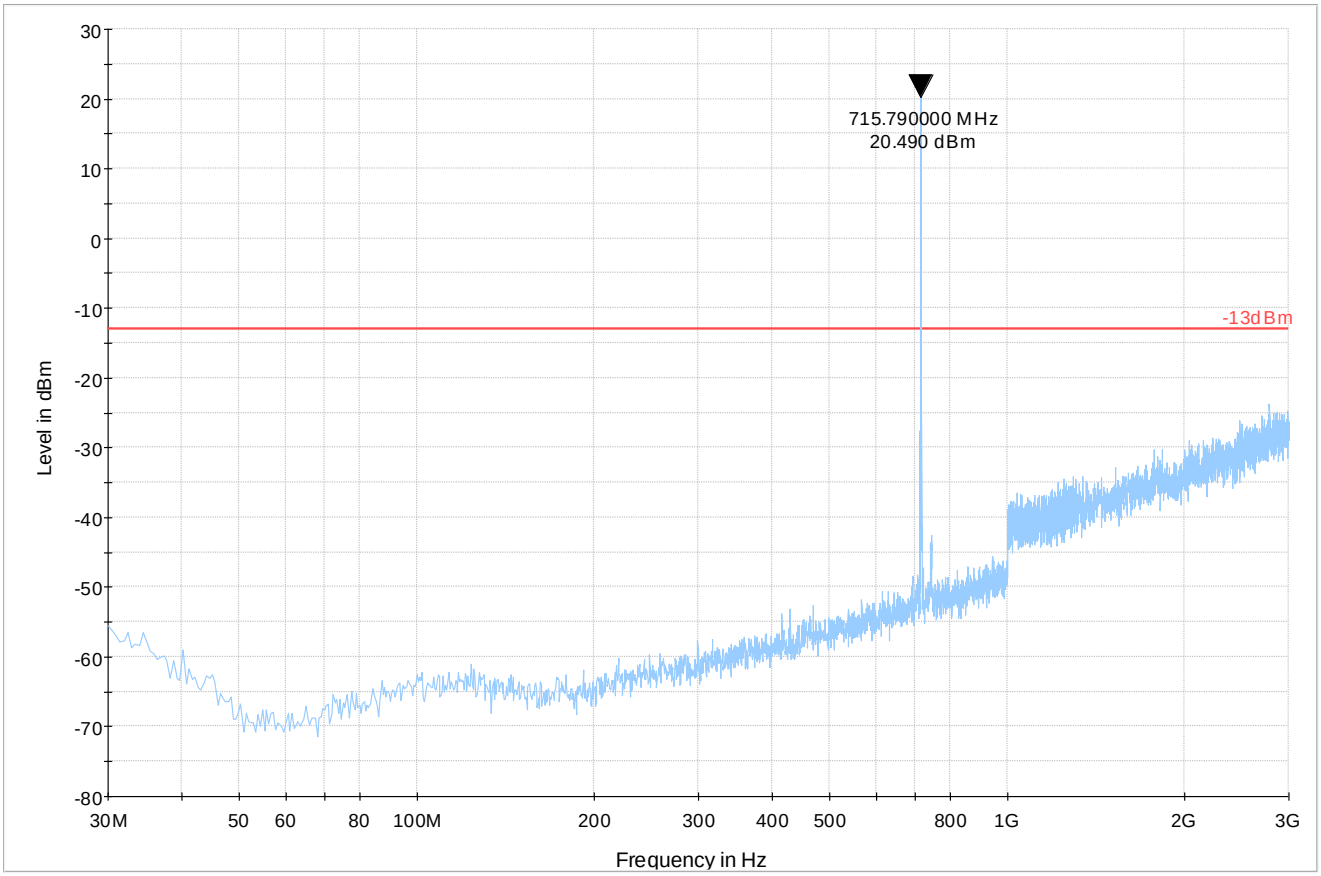
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.5 QPSK/ 5MHz/ High Channel/ 30MHz to 3GHz:

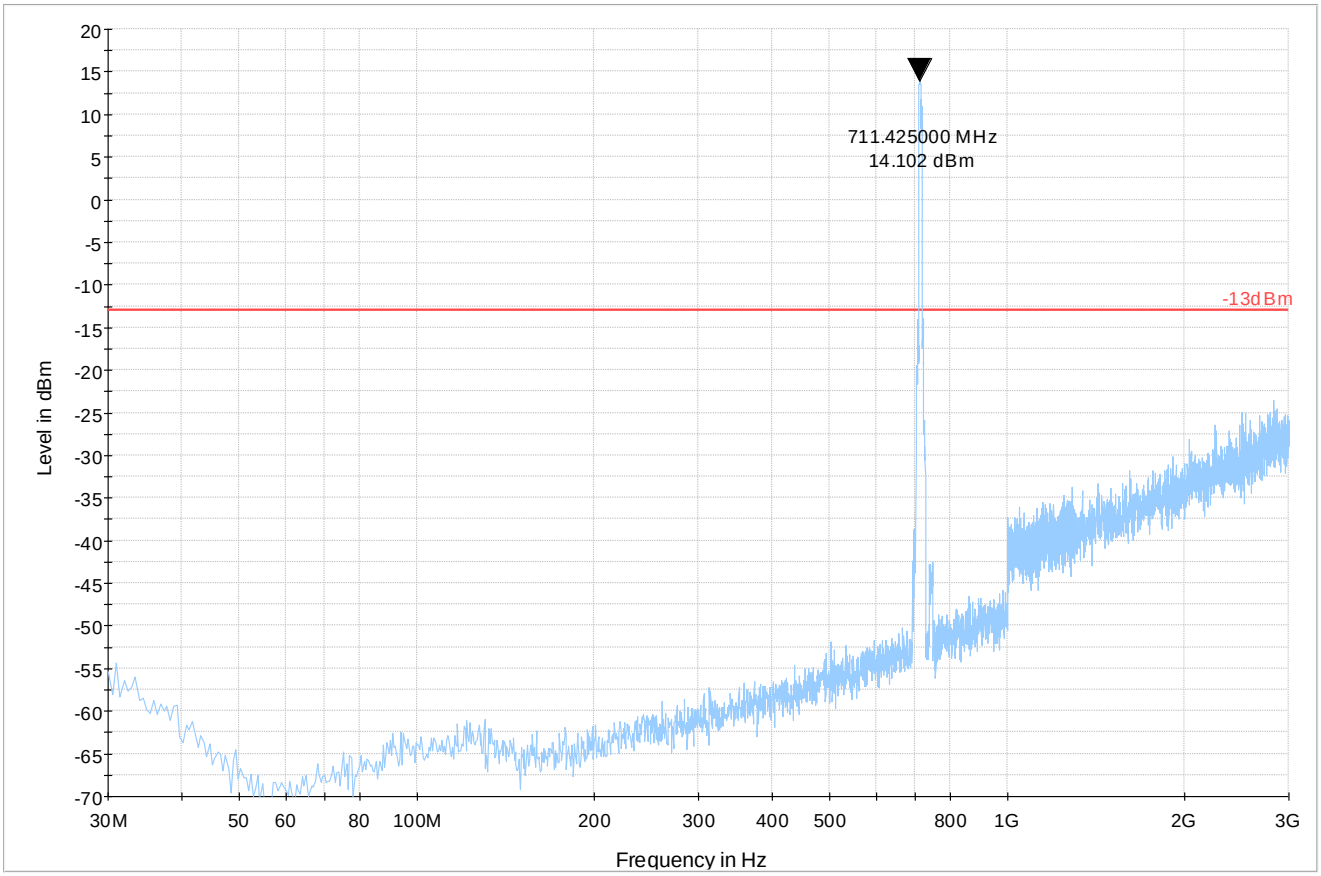
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.6 QPSK/10 MHz/ Mid Channel/ 30MHz to 3GHz:

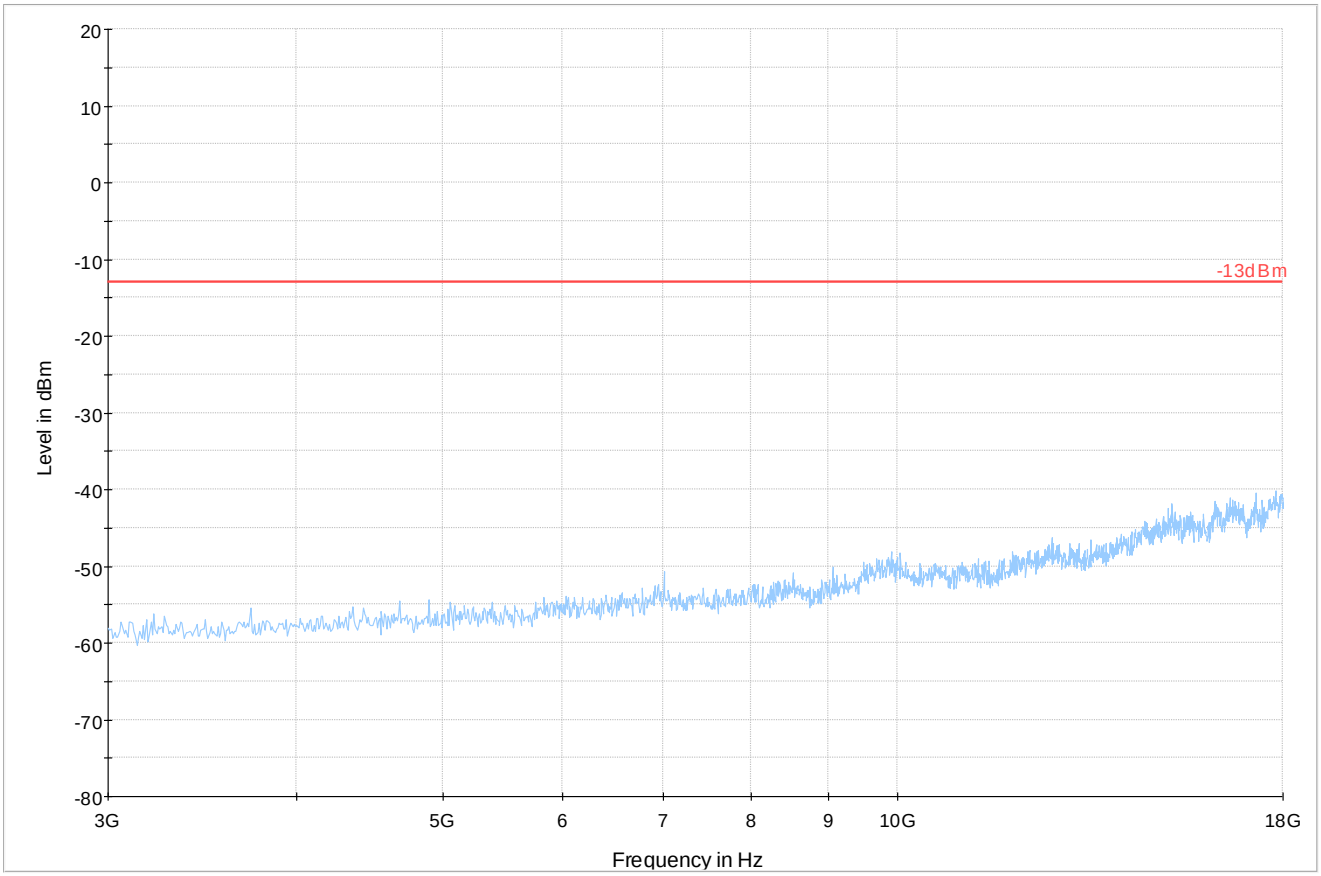
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.4.7 QPSK/ 5MHz/ Low Channel/ 3GHz to 18GHz:

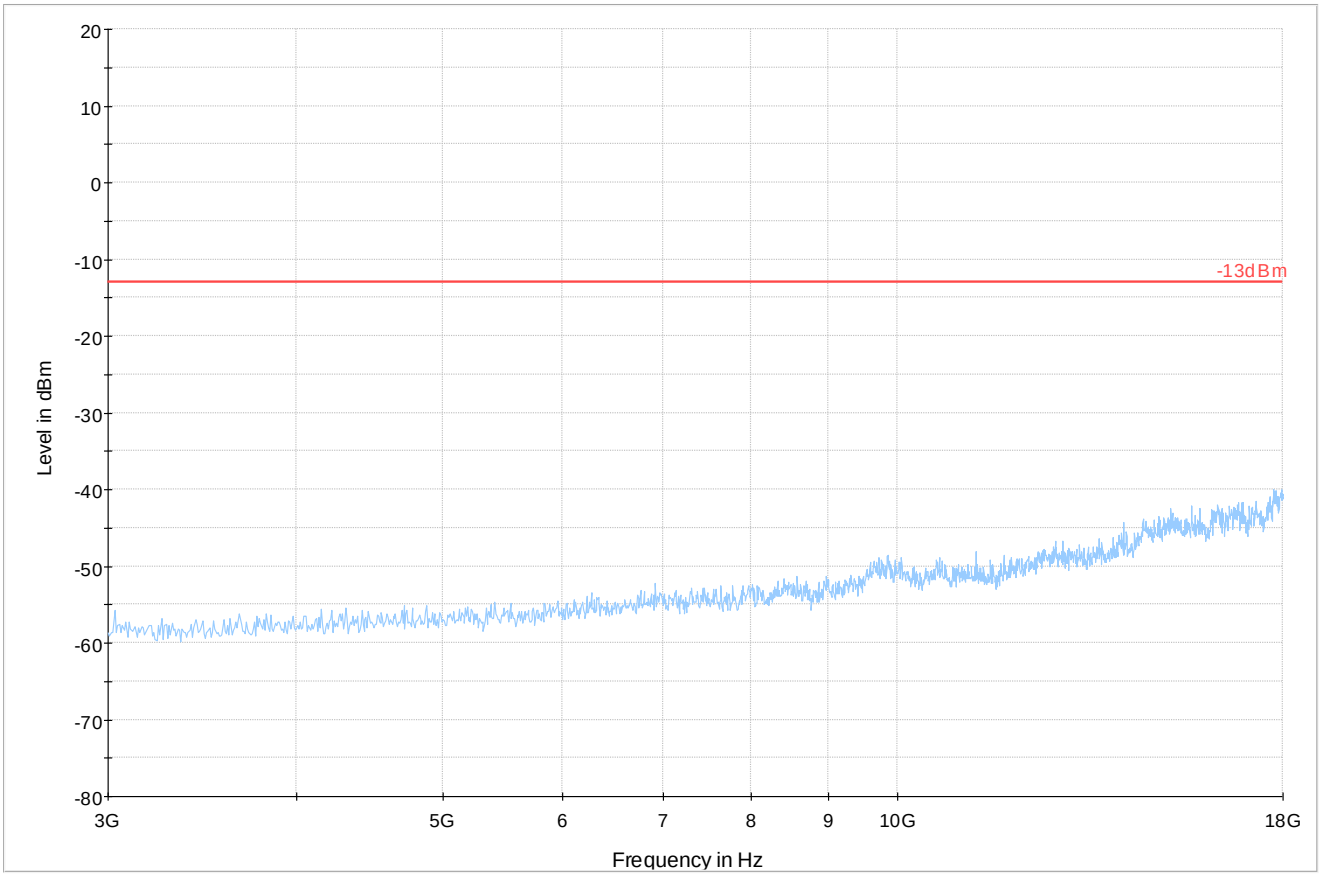
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz – Low Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.8 QPSK/ 5 MHz/ Mid Channel/ 3GHz to 18GHz:

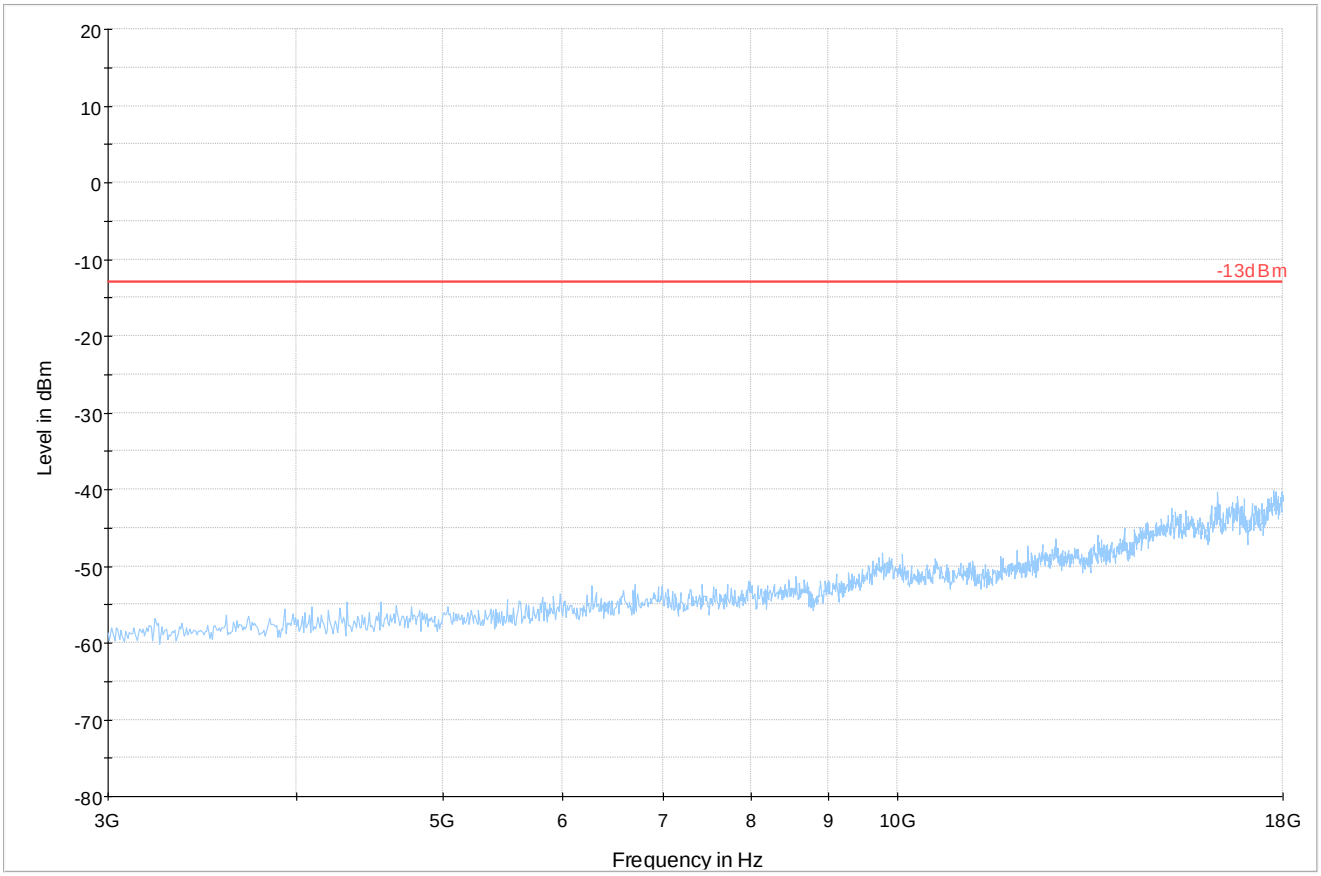
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.9 QPSK/ 5MHz/ High Channel/ 3GHz to 18GHz:

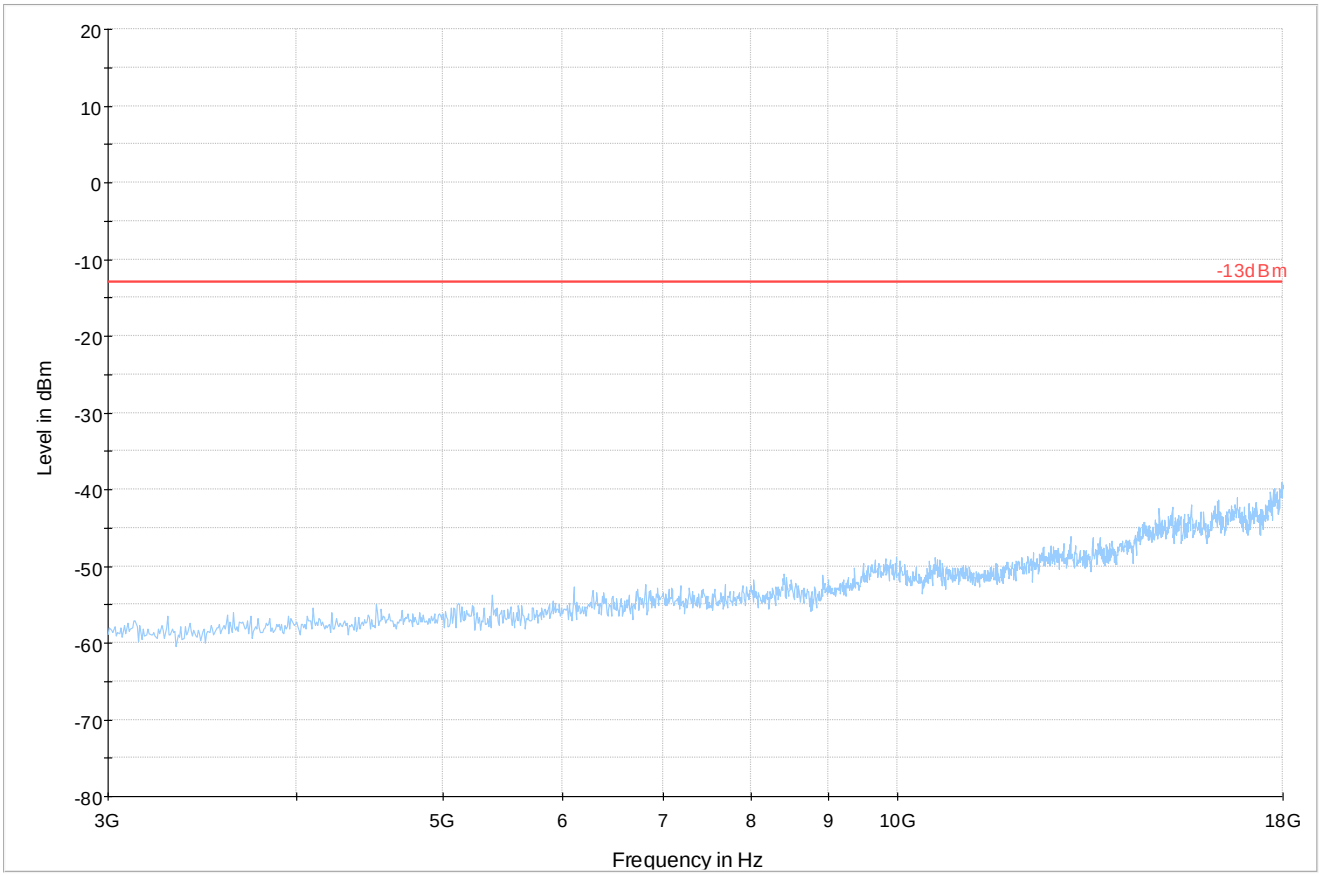
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz – High Channel		
RB Size = 1	RB Offset = 0	BW (MHz) = 5



-13dBm Preview Result 1-PK+

6.2.8.4.10 QPSK/10 MHz/ Mid Channel/ 3GHz to 18GHz:

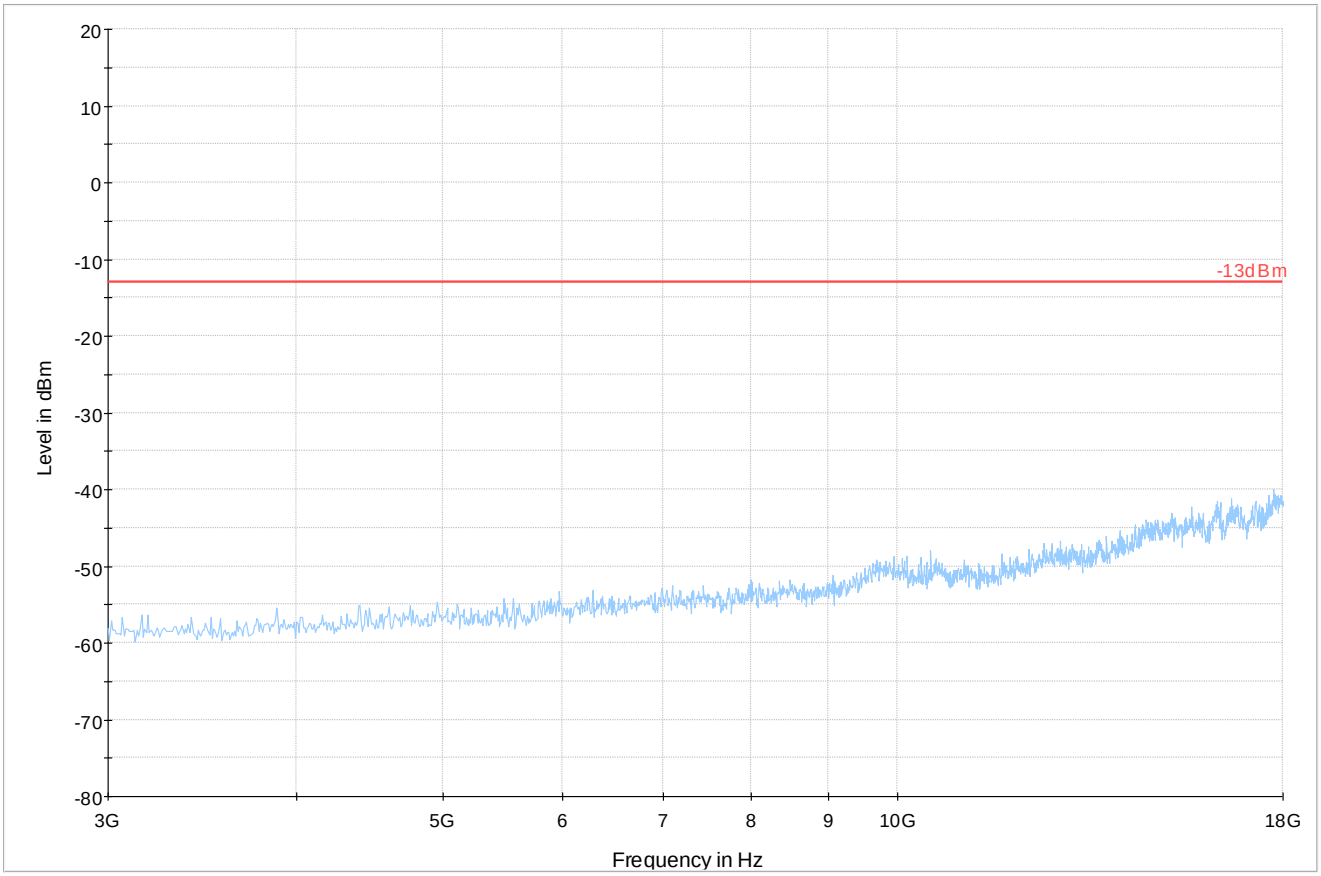
LTE Band 17 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results – 3 GHz – 18 GHz – Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.4.11 16 QAM/ 5MHz/ Mid Channel/ 30MHz to 3GHz:

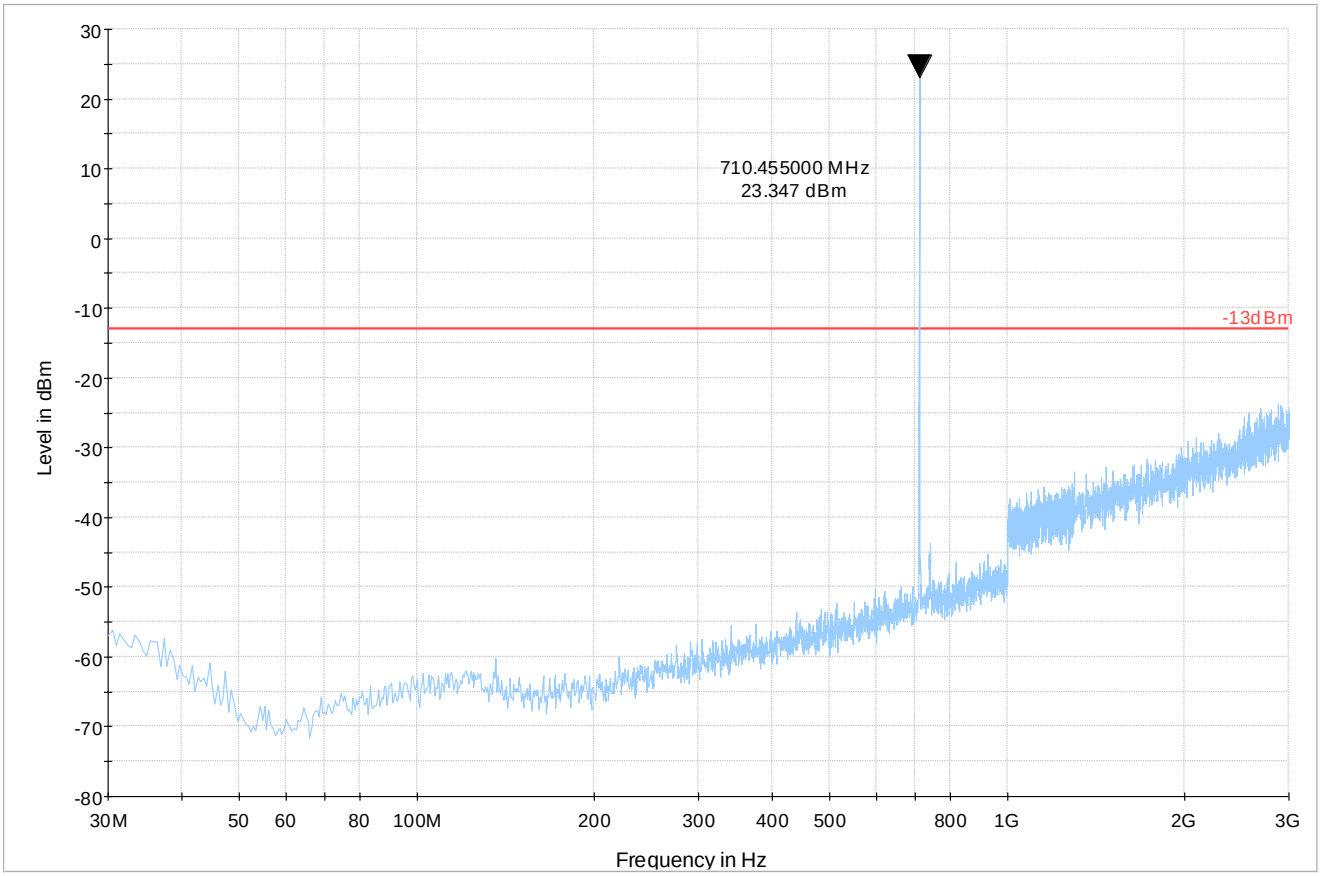
LTE Band 17 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Measurement results - 30 MHz – 3 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.12 16 QAM/ 10MHz/ Mid Channel/ 30MHz to 3GHz:

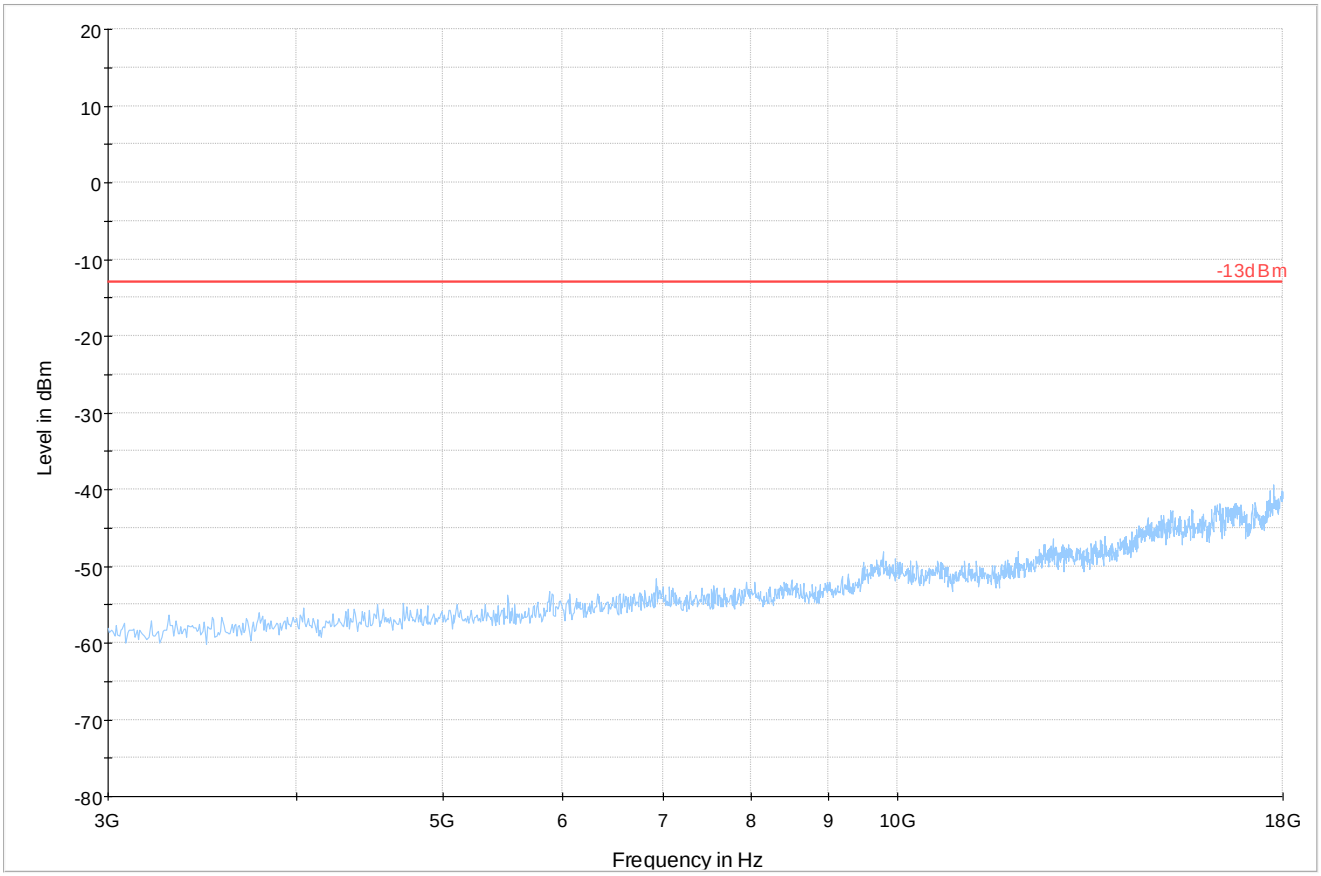
LTE Band 17 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Test results - 30 MHz – 3GHz -Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.4.13 16 QAM/ 5MHz/ Mid Channel/ 3GHz to 18GHz:

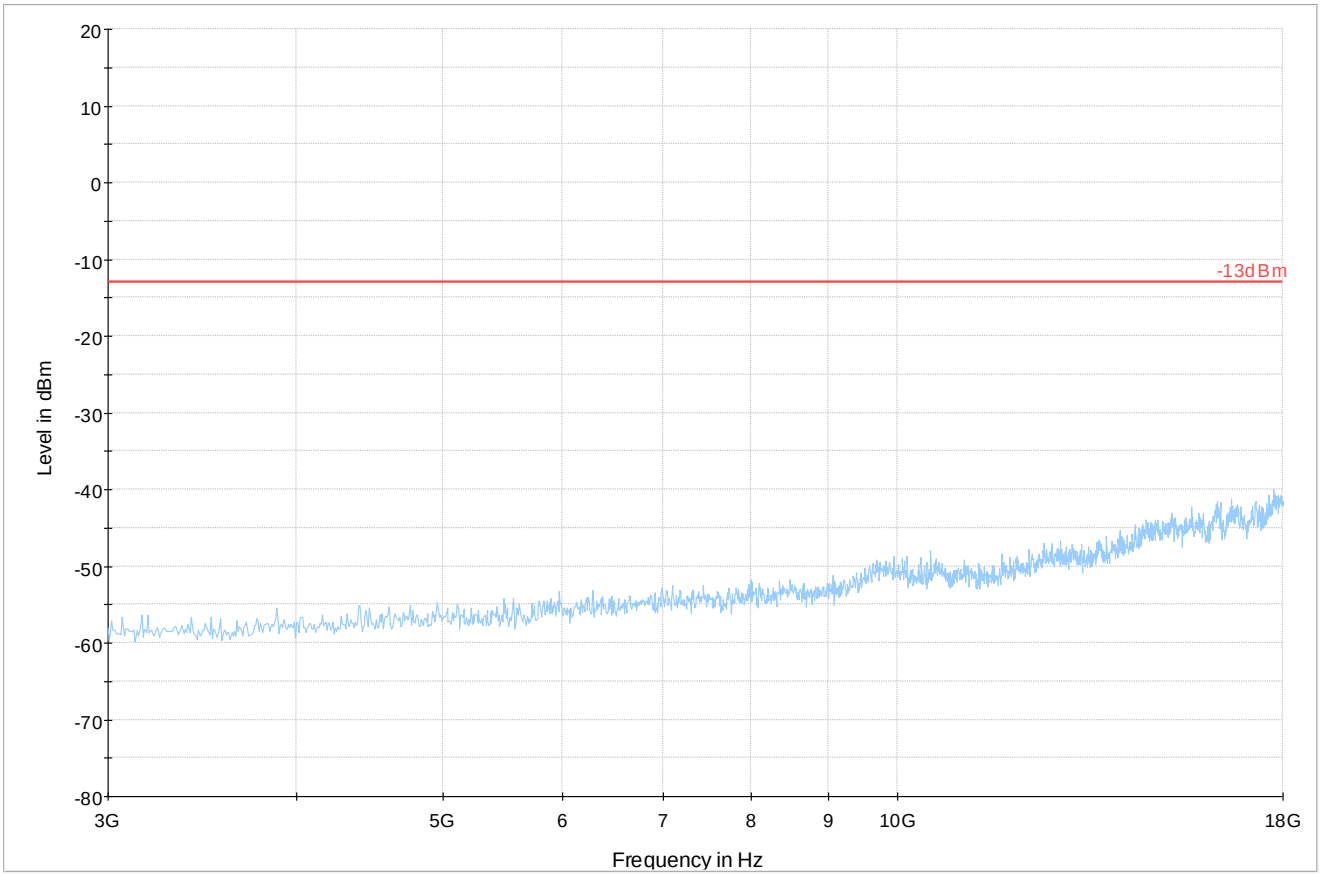
LTE Band 17 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Measurement results - 3 GHz – 18 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.4.14 16 QAM/ 10MHz/ Mid Channel/ 3GHz to 18GHz:

LTE Band 17 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Measurement results - 3 GHz – 18 GHz – Low Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10

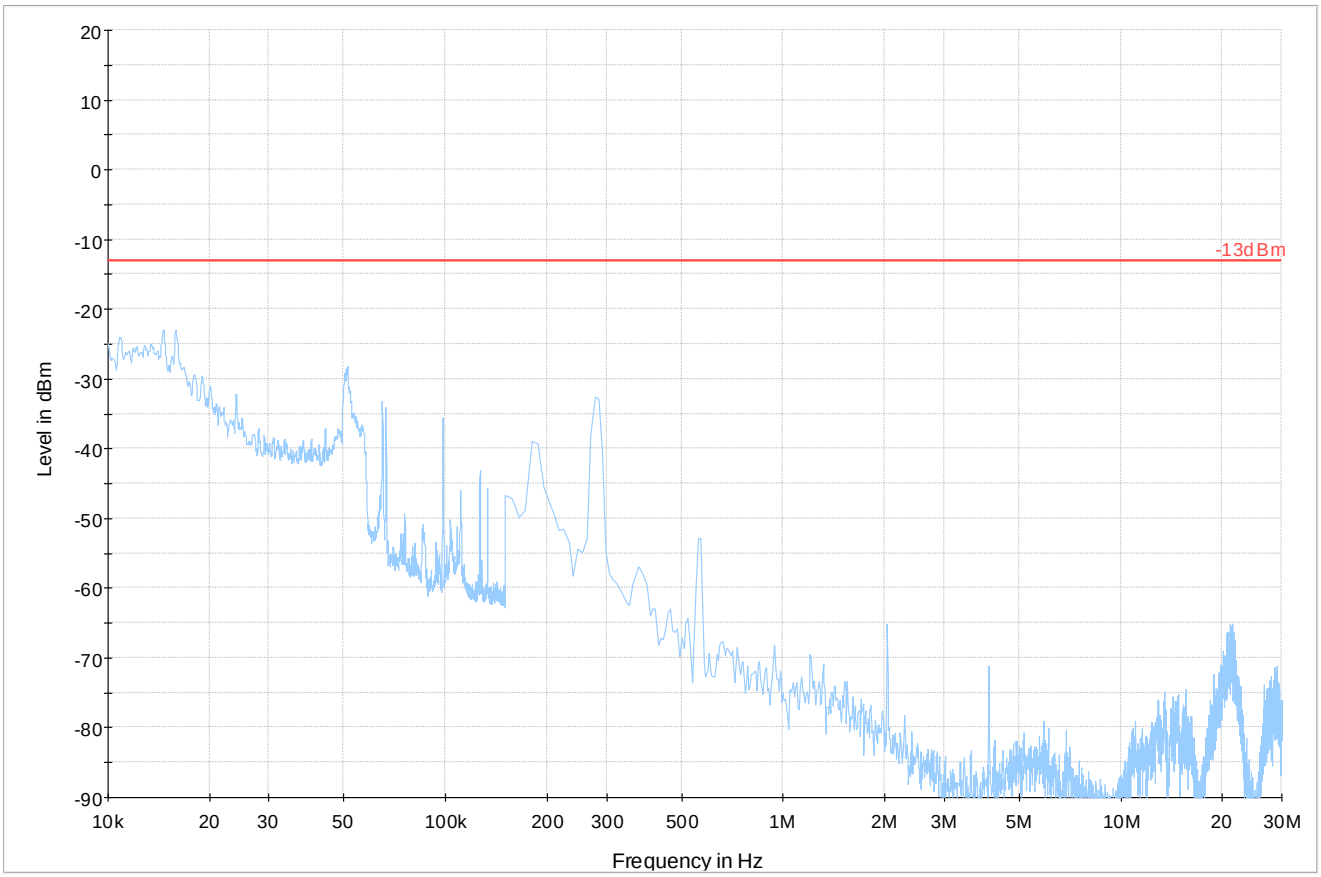


-13dBm Preview Result 1-PK+

6.2.8.5 Spurious Emissions LTE FDD 13:

6.2.8.5.1 QPSK/ 5 MHz/ Mid Channel/ 10kHz to 30MHz:

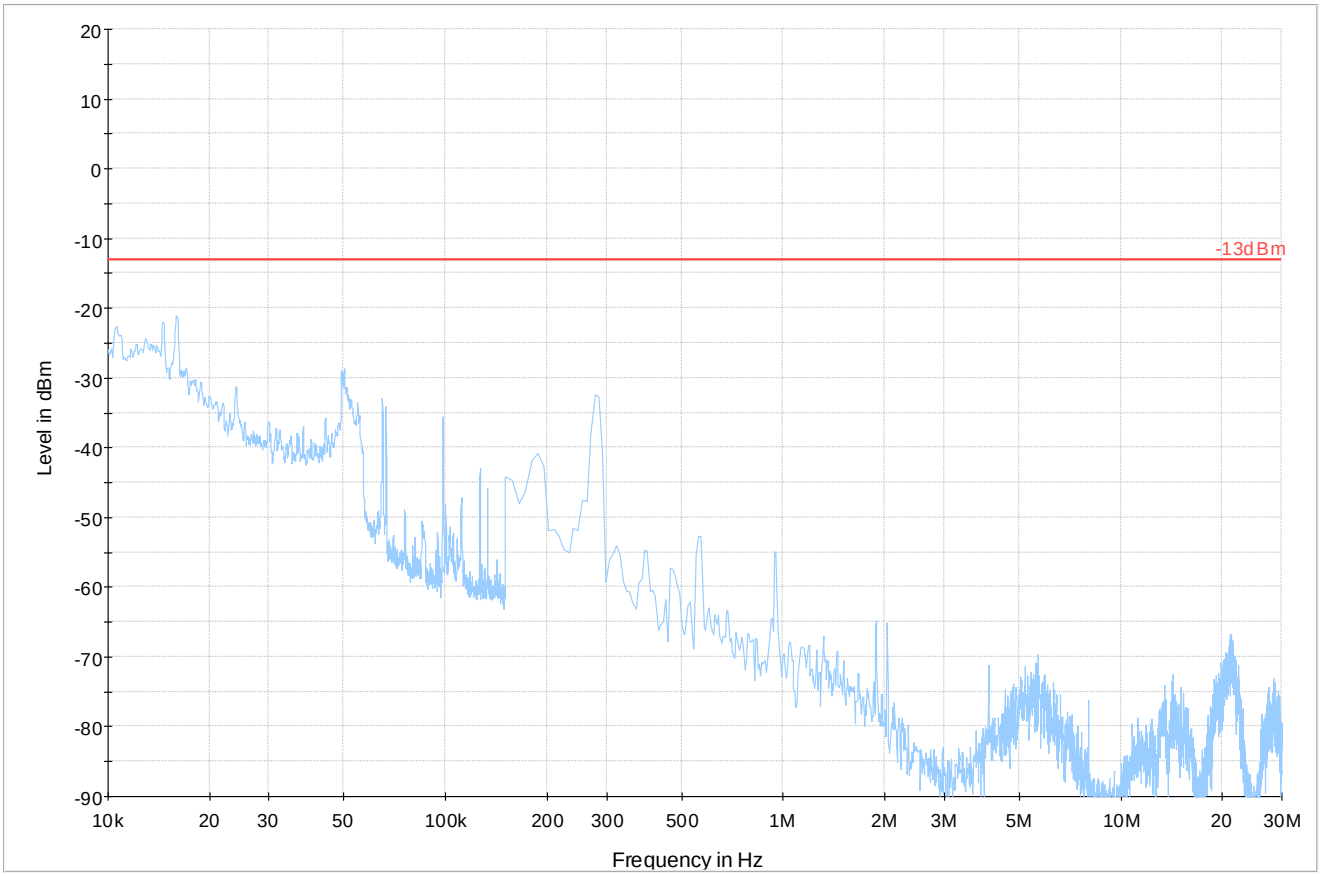
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.5.2 QPSK/ 10 MHz/ Mid Channel/ 10kHz to 30MHz:

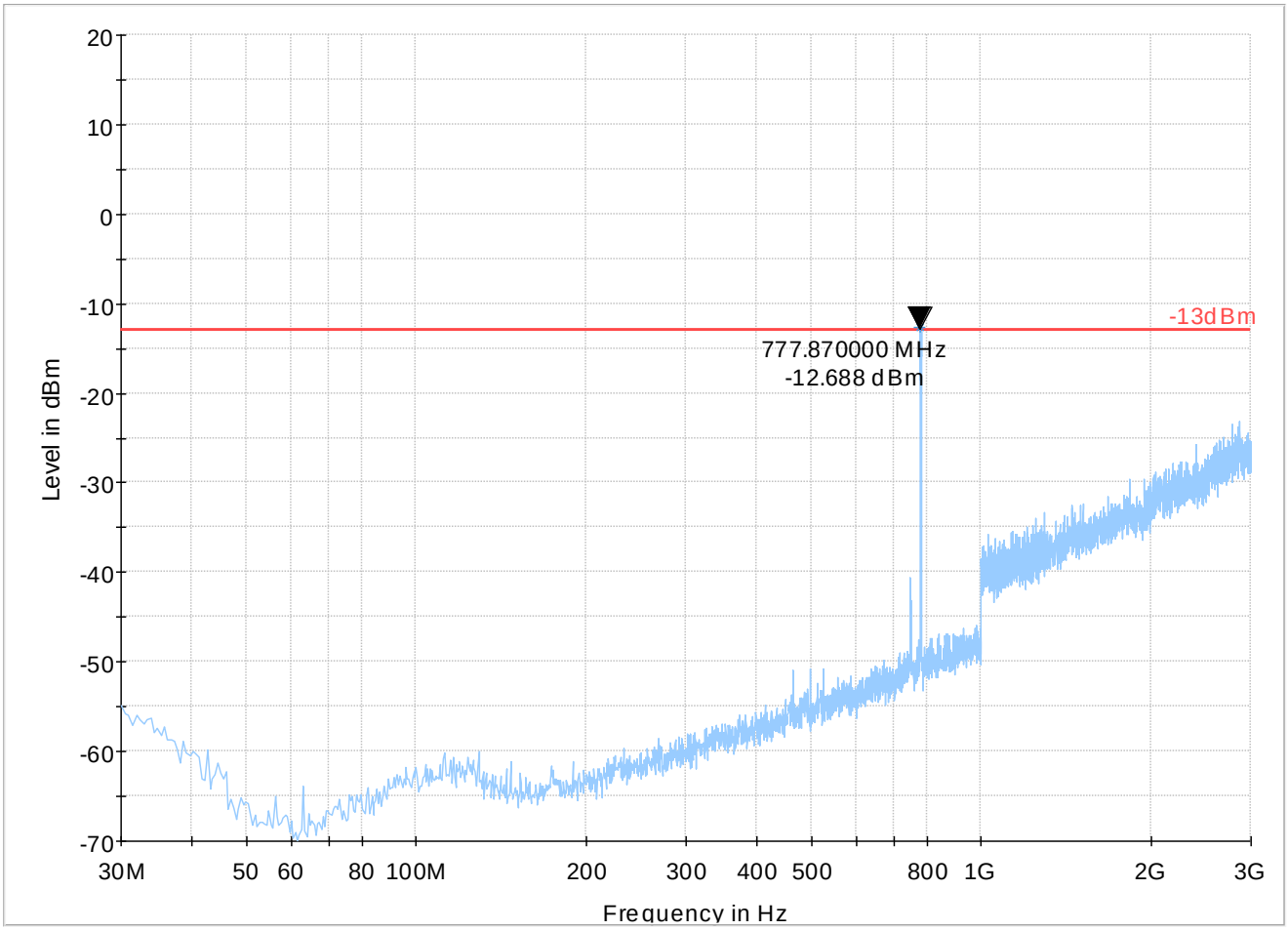
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results – 10 kHz – 30 MHz – Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.5.3 QPSK/ 5 MHz/ Low Channel/ 30MHz to 3GHz:

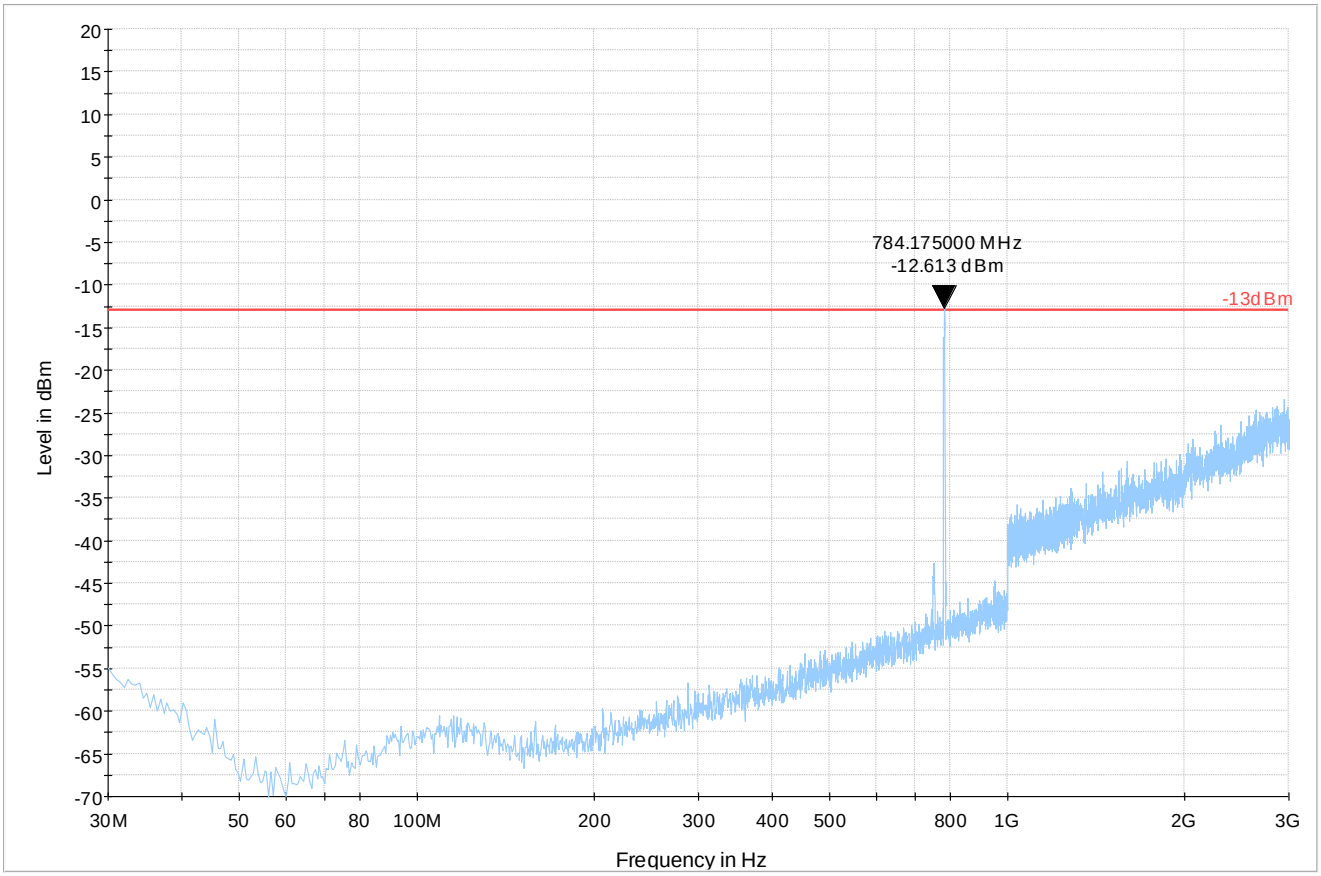
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – Low Channel 23755		
RB Size = 1	RB Offset = 0	BW (MHz) = 5



-13dBm Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

6.2.8.5.4 QPSK/ 5 MHz/ Mid Channel/ 30MHz to 3GHz:

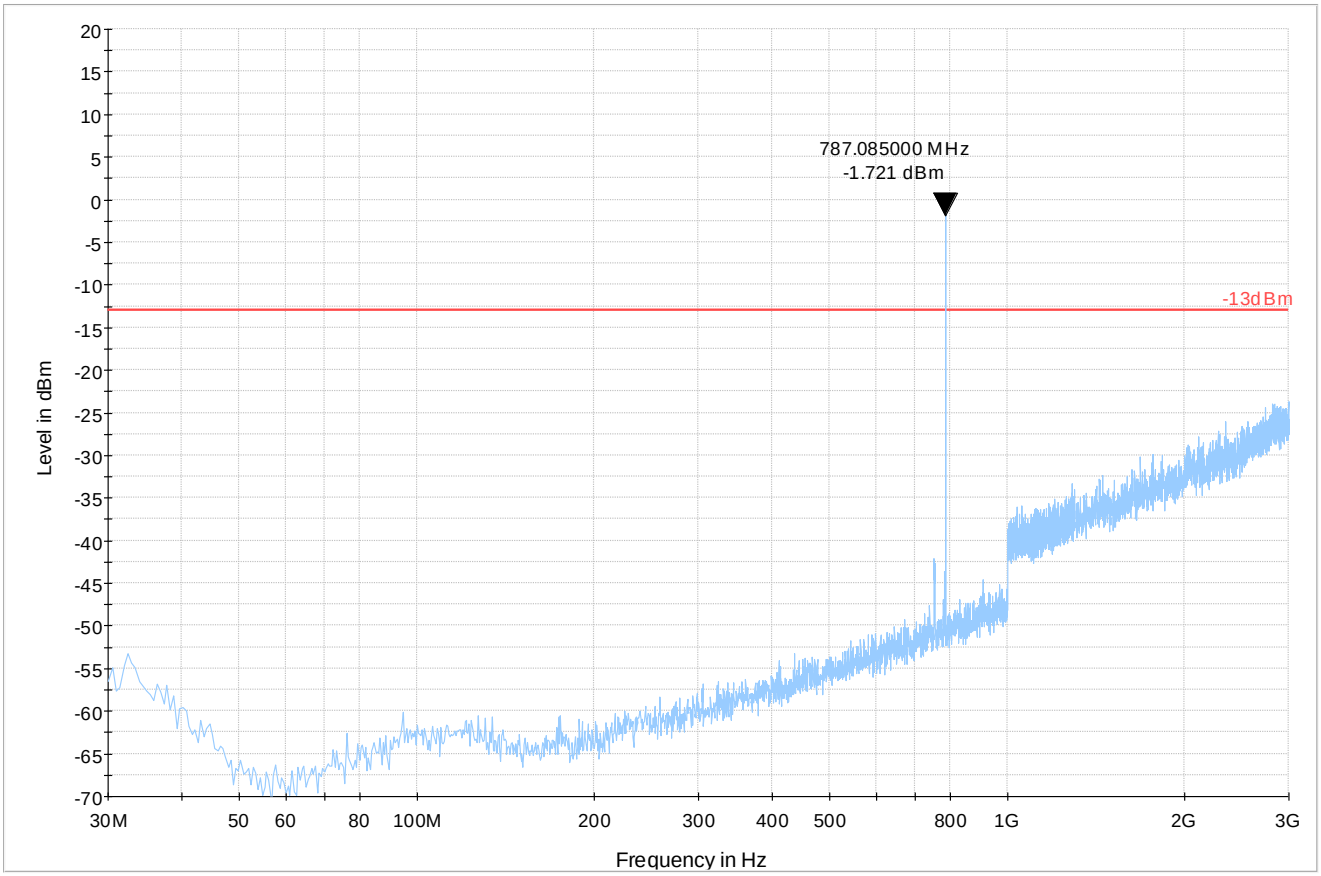
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.5.5 QPSK/ 5MHz/ High Channel/ 30MHz to 3GHz:

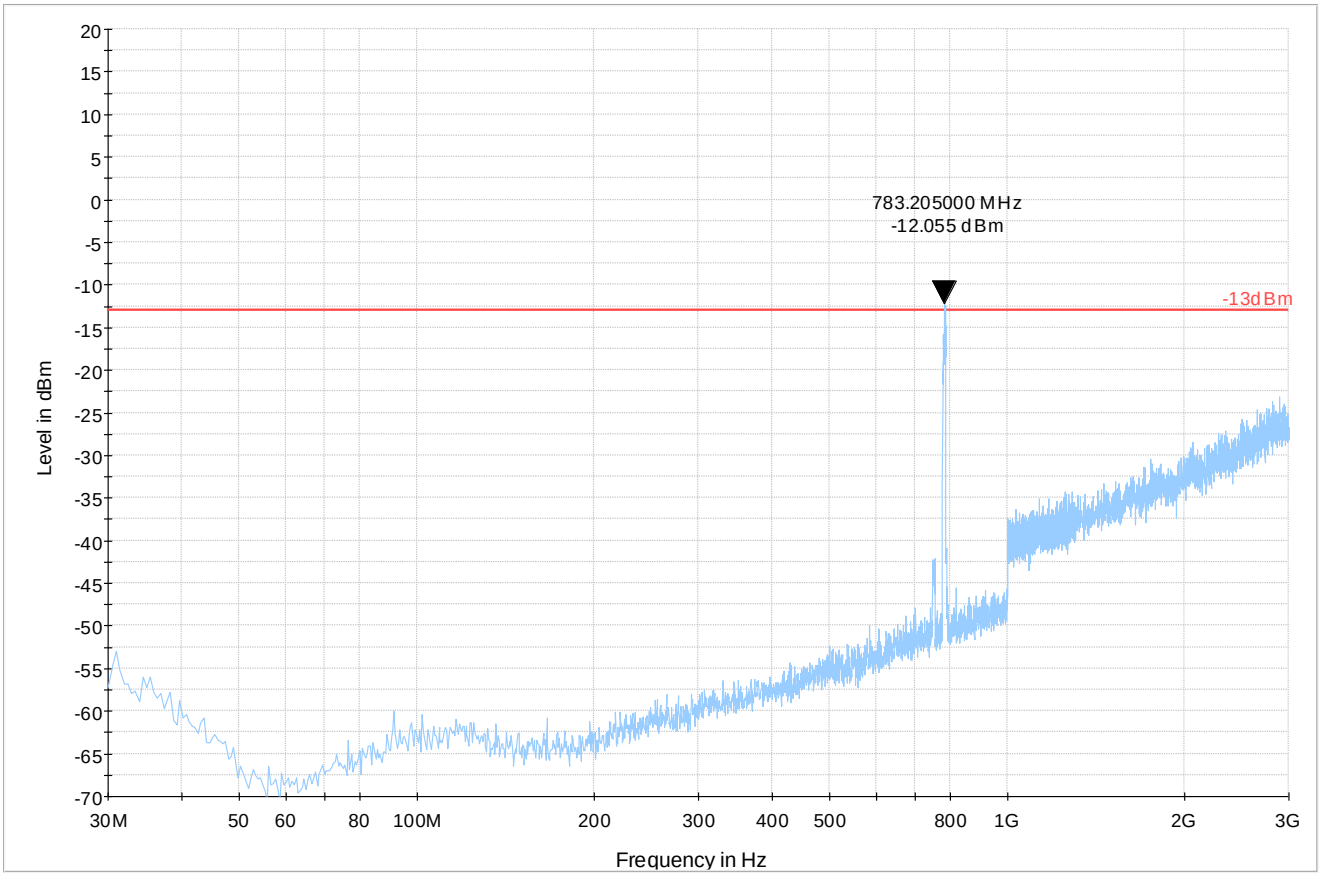
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.5.6 QPSK/10 MHz/ Mid Channel/ 30MHz to 3GHz:

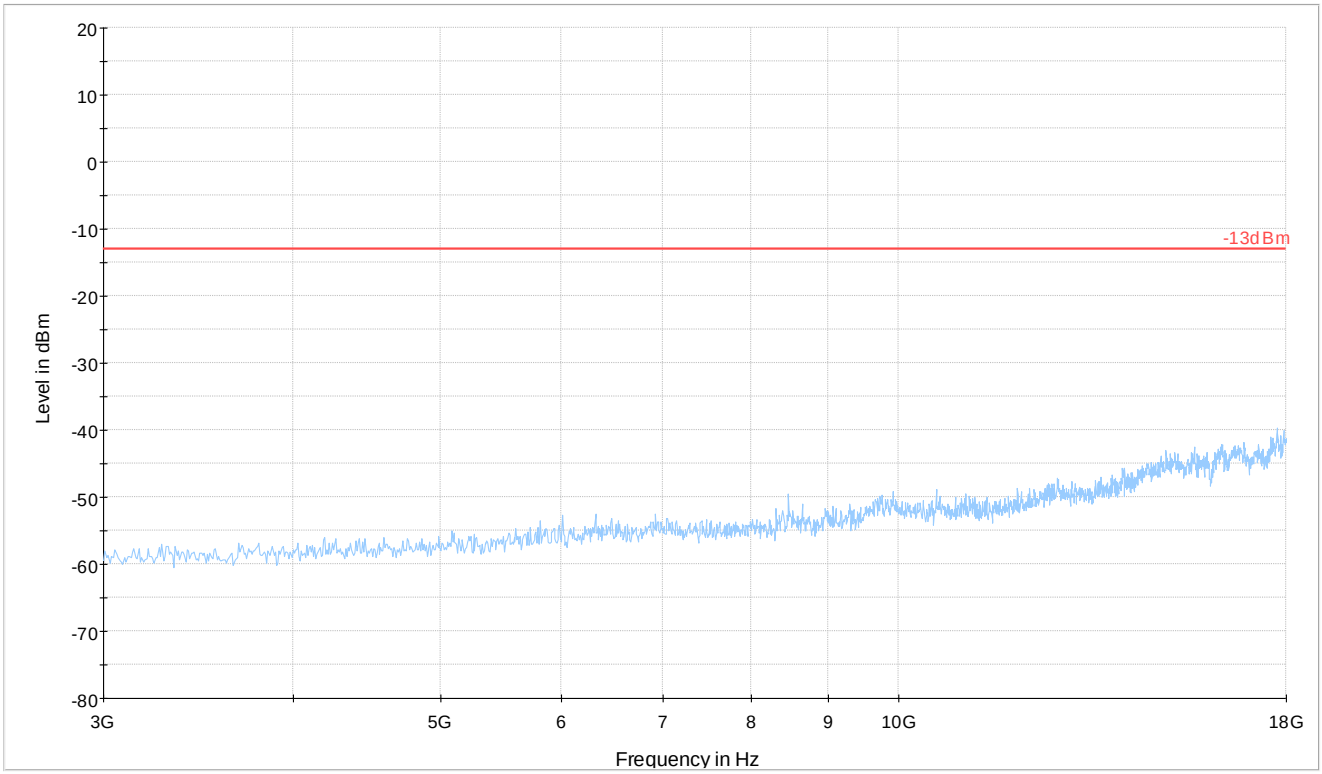
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 30 MHz – 3 GHz – Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.5.7 QPSK/ 5MHz/ Low Channel/ 3GHz to 18GHz:

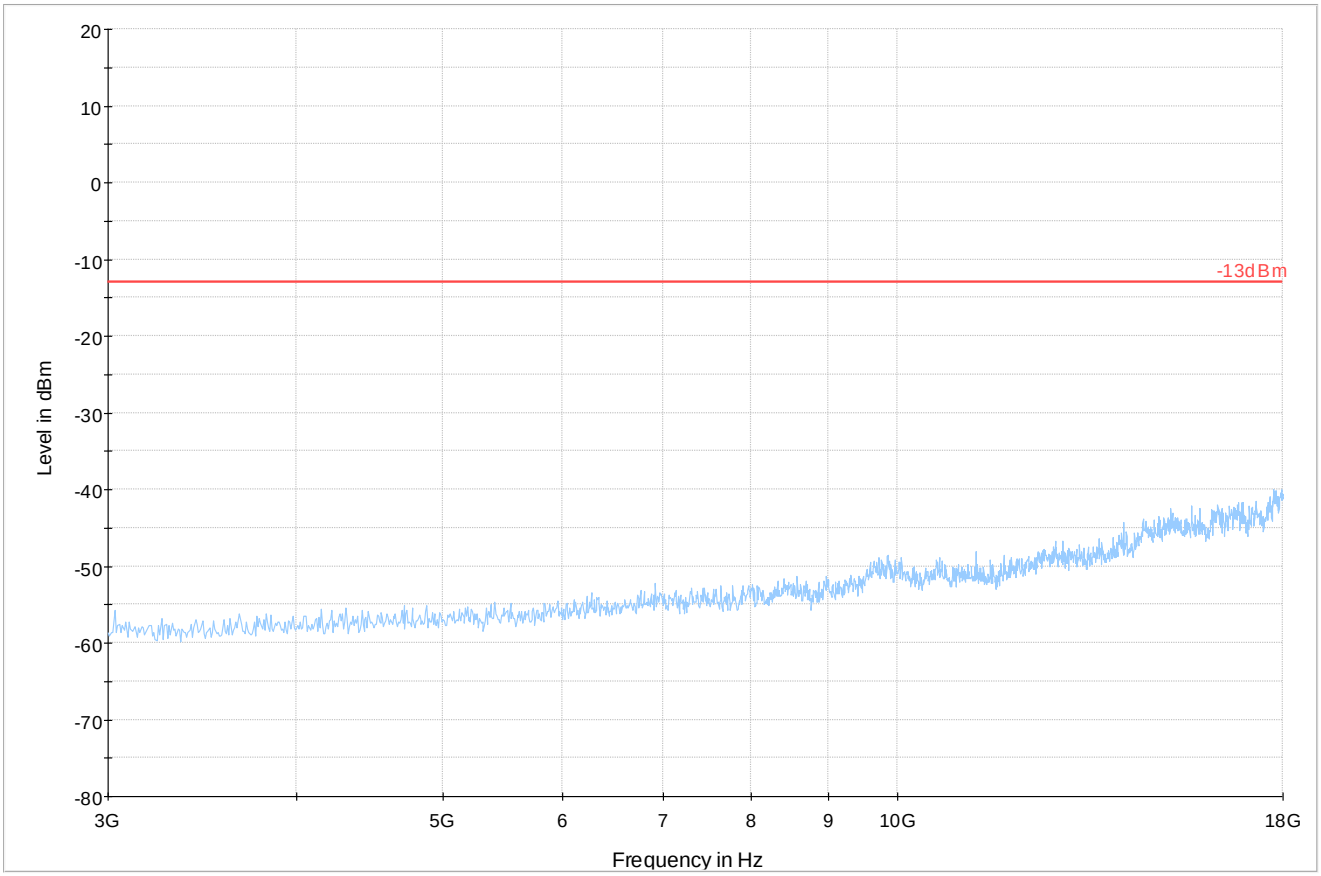
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz – Low Channel		
RB Size = 1	RB Offset = 0	BW (MHz) = 5



-13dBm Preview Result 1-PK+

6.2.8.5.8 QPSK/ 5 MHz/ Mid Channel/ 3GHz to 18GHz:

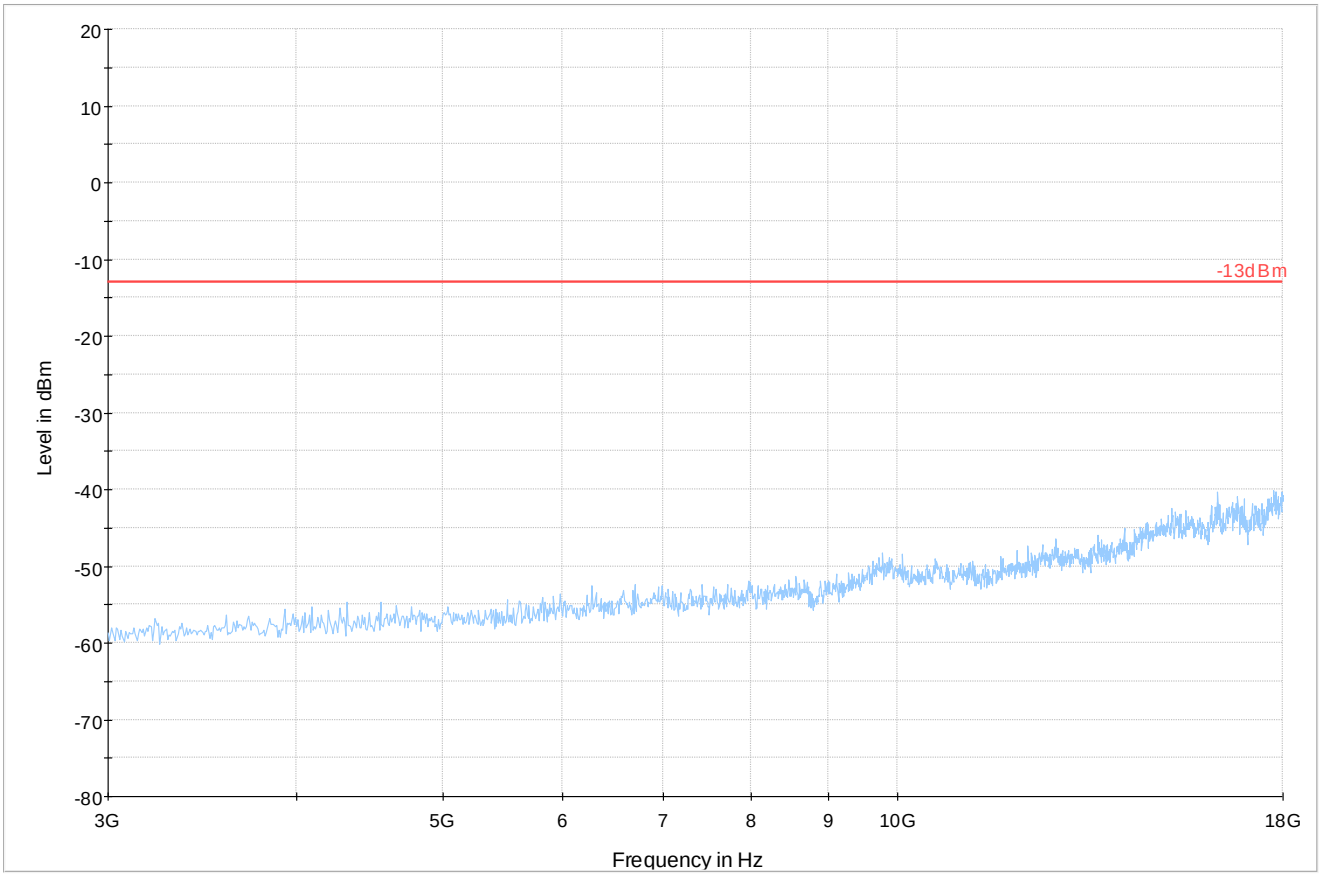
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.5.9 QPSK/ 5MHz/ High Channel/ 3GHz to 18GHz:

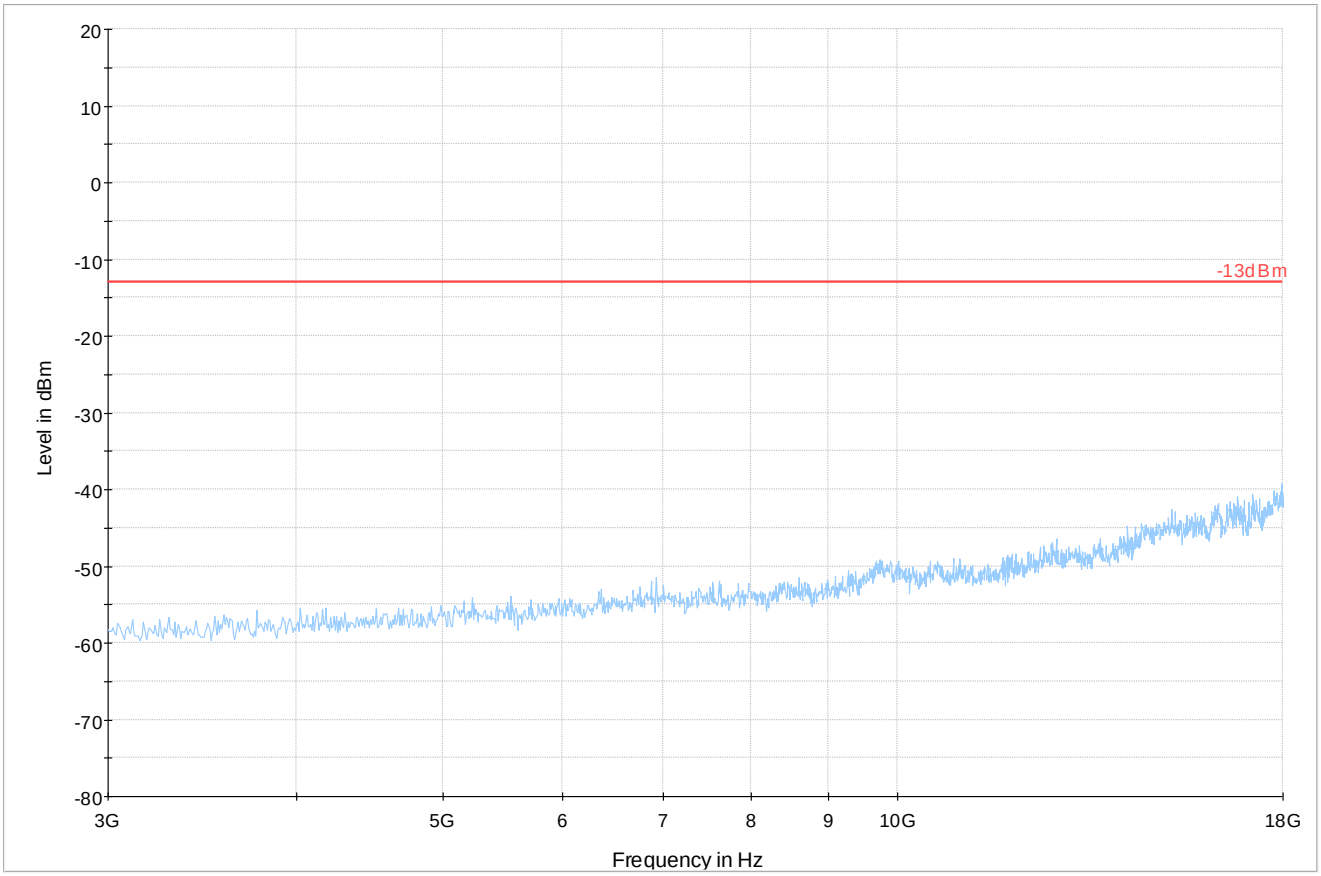
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results - 3 GHz – 18 GHz – High Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.5.10 QPSK/10 MHz/ Mid Channel/ 3GHz to 18GHz:

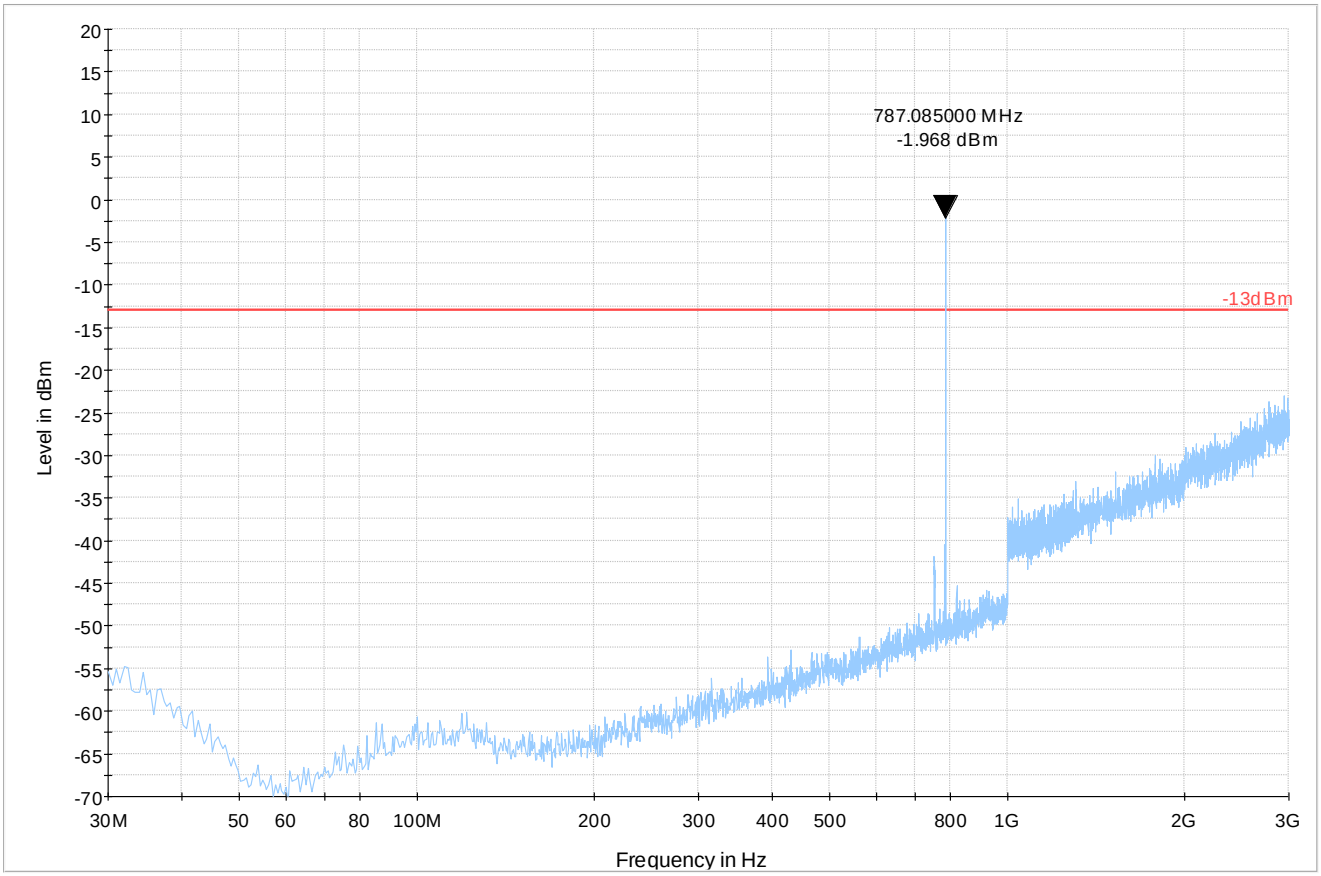
LTE Band 13 (704 MHz – 716 MHz) -Modulation: QPSK		
Measurement results – 3 GHz – 18 GHz – Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.5.11 16 QAM/ 5MHz/ Mid Channel/ 30MHz to 3GHz:

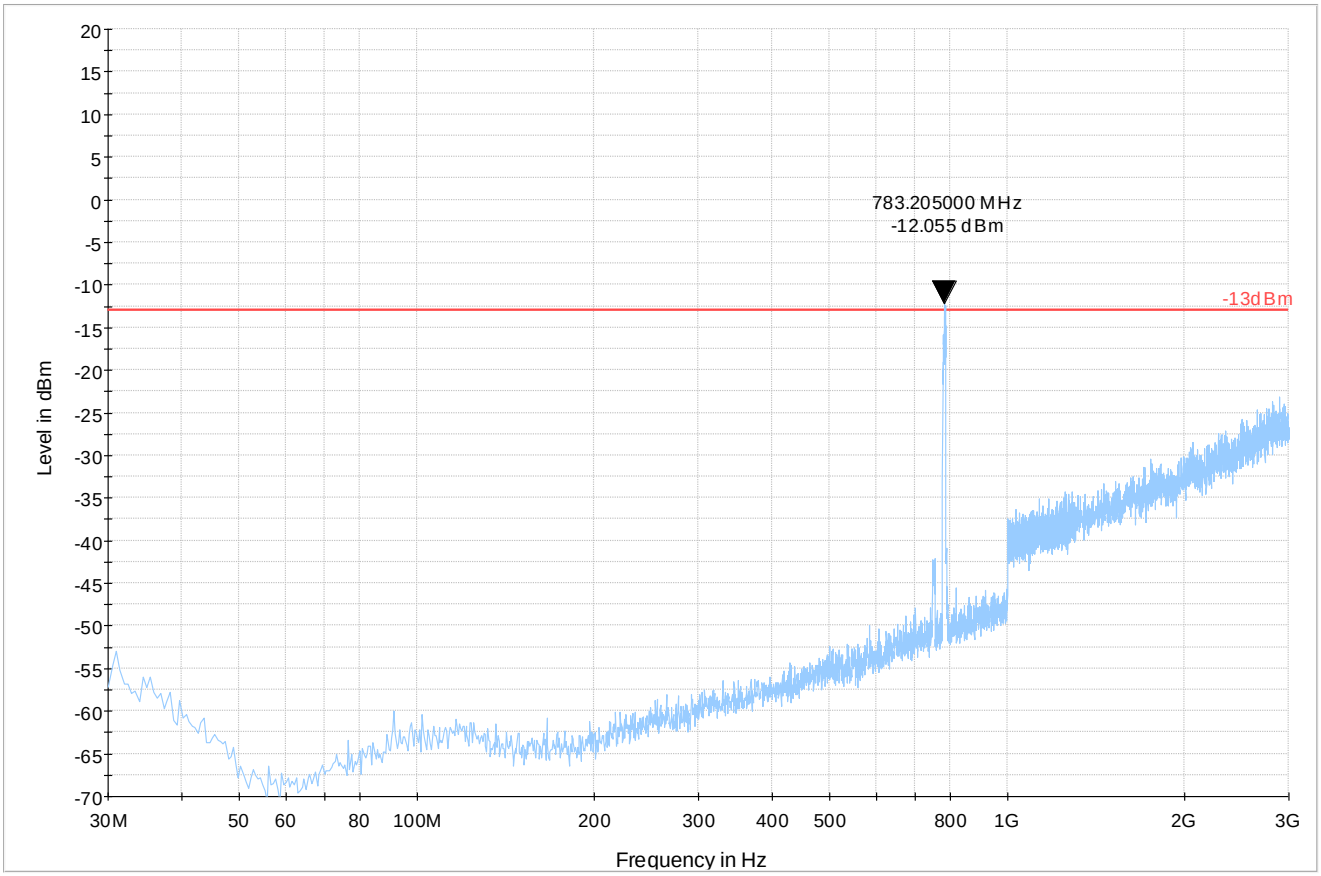
LTE Band 13 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Measurement results - 30 MHz – 3 GHz – Mid Channel		
RB Size = 25	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

16 QAM/ 10MHz/ Mid Channel/ 30MHz to 3GHz:

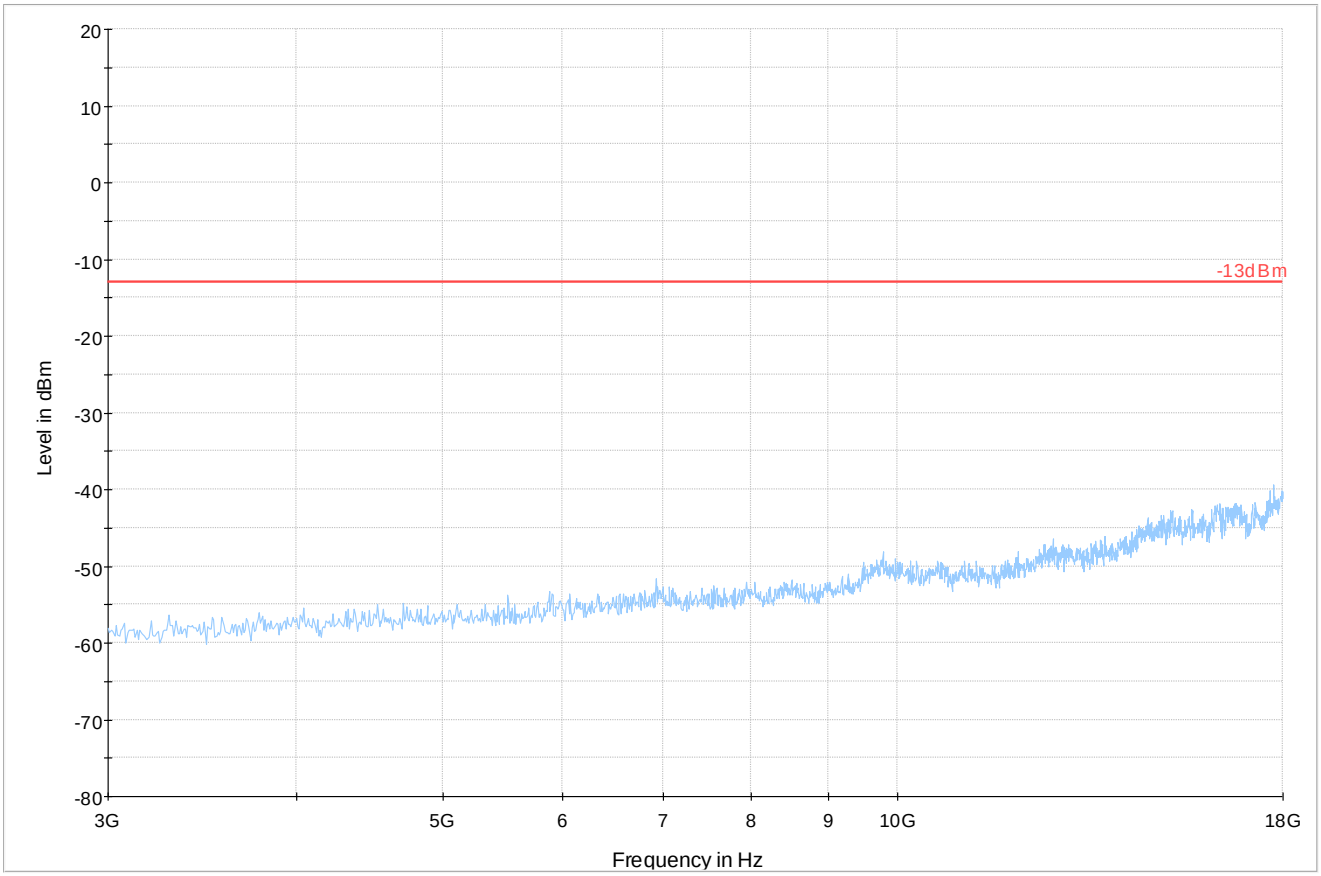
LTE Band 13 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Test results - 30 MHz – 3GHz -Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



-13dBm Preview Result 1-PK+

6.2.8.5.12 16 QAM/ 5MHz/ Mid Channel/ 3GHz to 18GHz:

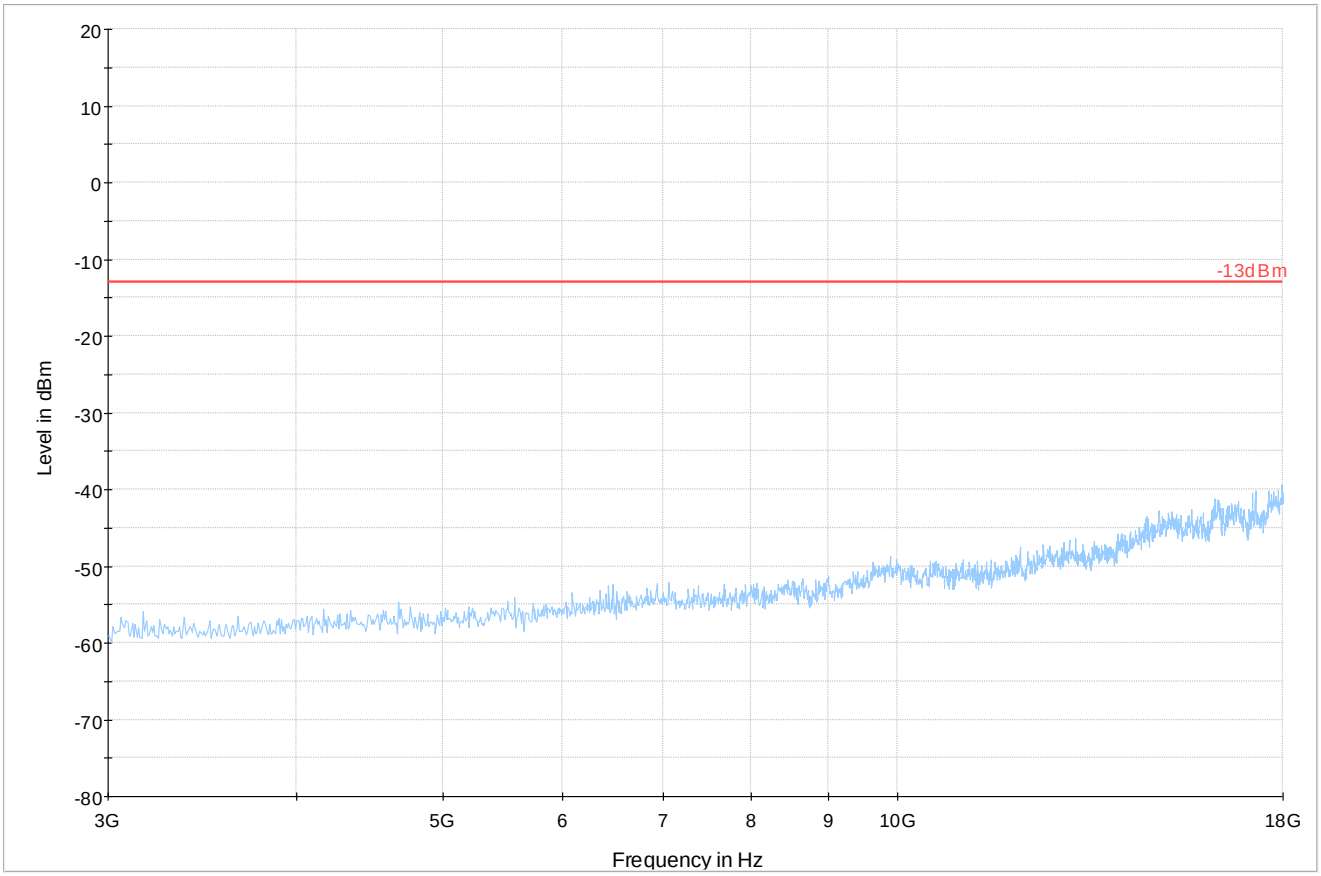
LTE Band 13 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Measurement results - 3 GHz – 18 GHz – Mid Channel		
RB Size = 1	**RB Offset** = 0	**BW (MHz)** = 5



-13dBm Preview Result 1-PK+

6.2.8.5.13 16 QAM/ 10MHz/ Mid Channel/ 3GHz to 18GHz:

LTE Band 13 (704 MHz – 716 MHz) -Modulation: 16 QAM		
Measurement results - 3 GHz – 18 GHz – Mid Channel		
RB Size = 50	**RB Offset** = 0	**BW (MHz)** = 10



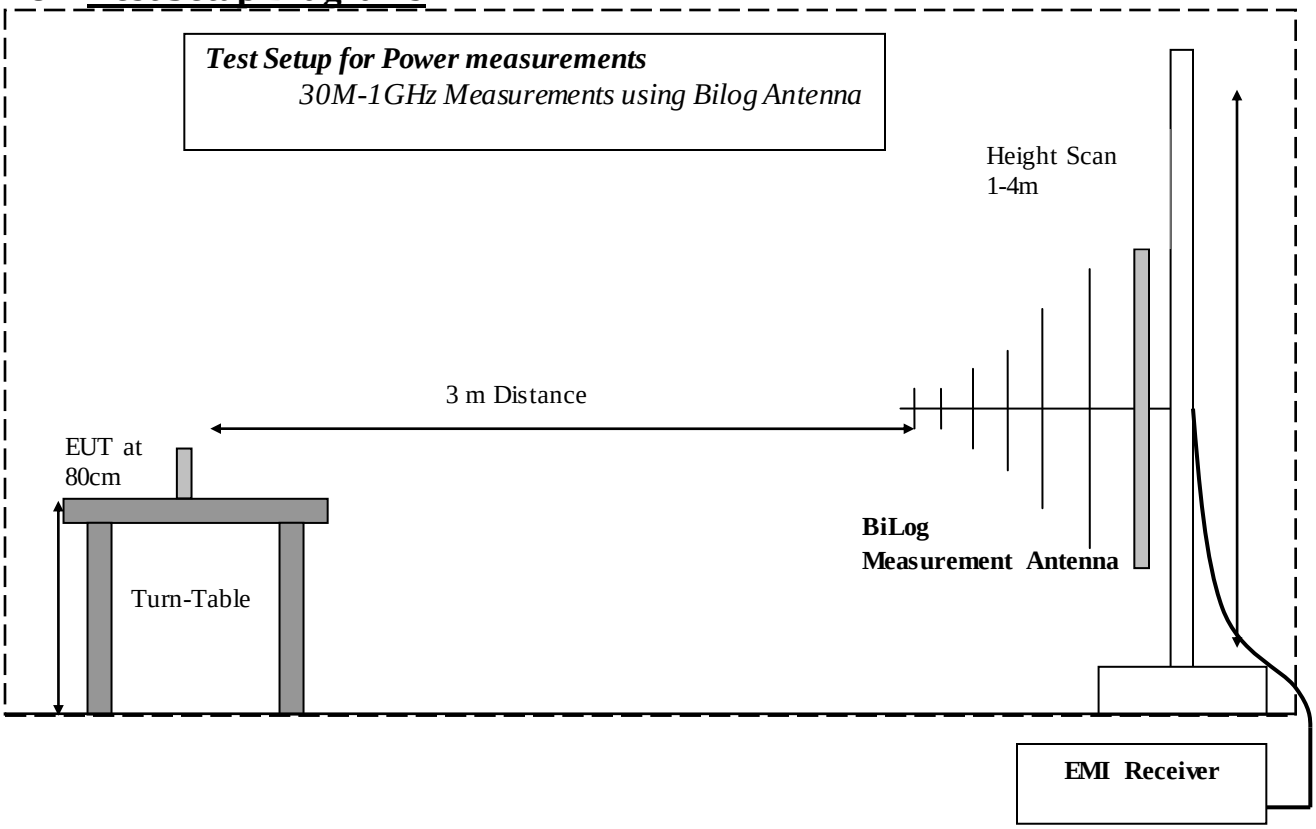
-13dBm Preview Result 1-PK+

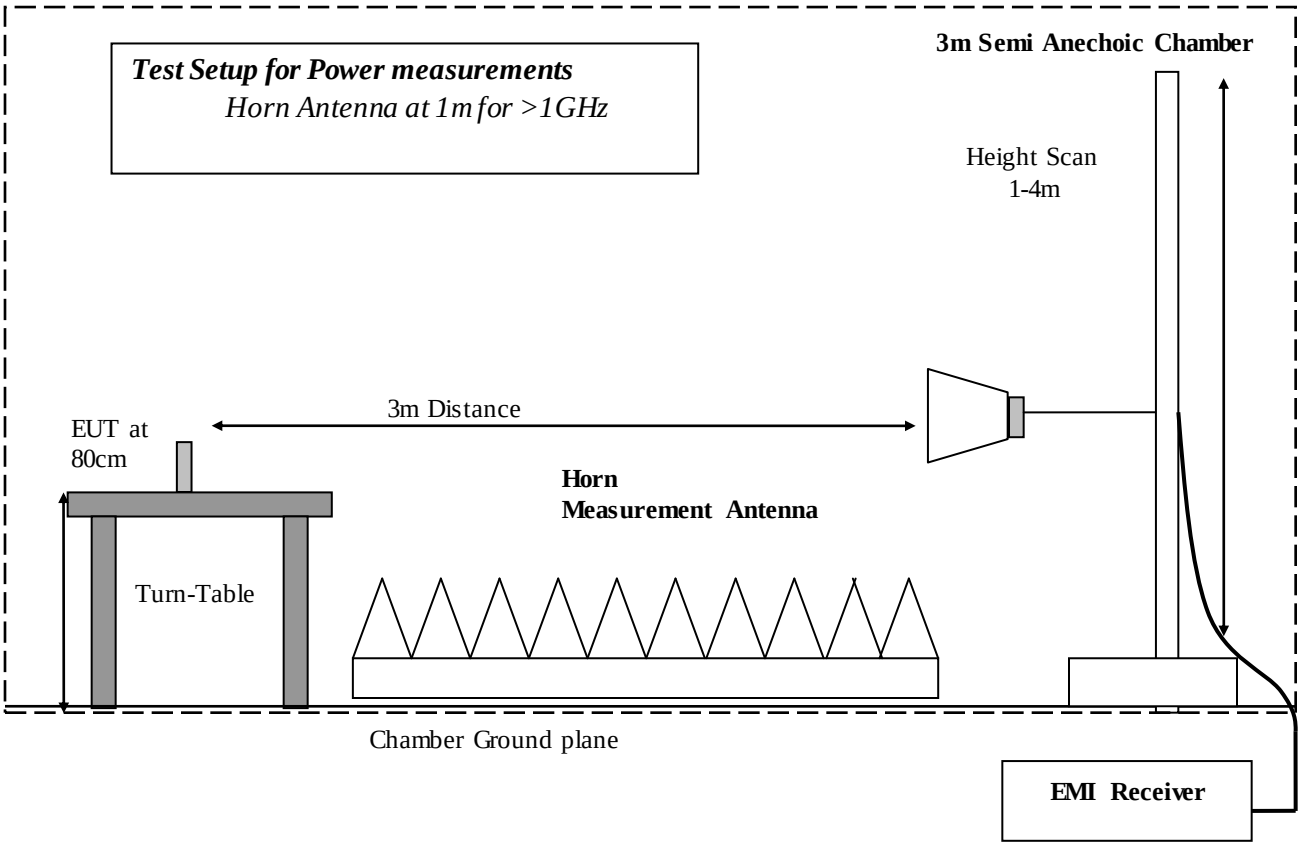
7 Test Equipment and Ancillaries used for tests

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSU 26	200302	6/2013	2 years	6/2015
Receiver	Rohde und Schwarz	ESR3	101663	2/2013	2 years	2/2015
LISN	Rohde und Schwarz	ESV 216	101129	1/2013	2 years	1/2015
Radiocommunication Tester	Rohde and Schwarz	CMU 200	121672	7/2013	2 years	7/2015
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	2/2012	3 year	2/2015
Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a		
Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a		
Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/60709 10	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		
High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224			
High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109			

Calibration status valid at the time of testing.
Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month.
Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2014-10-26	EMC_INTEL_INTEL_054_14001_FCC22_24_27_LTE_WWAN	First Version	M.Umair Anees
2015-1-21	EMC_INTEL_INTEL_054_14001_FCC22_24_27_LTE_WWAN_rev1	Revised section 6	M.Umair Anees