

FCC PART 27  
FCC PART 22H, PART 24E  
MEASUREMENT AND TEST REPORT

For

**Sam Radios Ltd.**

No.18 Daxiamei Industrial Park, Nan'an, Quanzhou, Fujian, 362300, China

**FCC ID: 2AGPQ-POC580S**

<b>Report Type:</b> Original Report	<b>Product Type:</b> 4G LTE PoC Radio
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<b>Report Number:</b> RXM190827059-00A	
<b>Report Date:</b> 2019-09-29	
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Applicant	Sam Radios Ltd.
Tested Model	NP-580
Series Model	NM-588, NP-590, NM-598
Model Difference	Model names and housing color
Product Type	4G LTE PoC Radio
Dimension	115mm(L)*55mm(W)*35mm(H)
Power Supply	DC 3.7V from battery and DC 5V charging by adapter

#### Adapter Information:

Model: NLA100050W1A6

Input: AC100-240 V 50/60Hz 0.2A Max

Output: 5.0V, 1A

*\*All measurement and test data in this report was gathered from production sample serial number: 20190827059.  
(Assigned by the BACL. The EUT supplied by the applicant was received on 2019-08-27)*

### Objective

This type approval report is prepared on behalf of *Sam Radios Ltd.* in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E and Part 27 of the Federal Communication Commission's rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

### Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s)

## Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services  
Part 24 Subpart E - Personal Communication Services  
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	5.91dB
	1GHz~6GHz	4.68dB
	6GHz~18GHz	4.92dB
	18GHz~40GHz	5.21dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

## Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

## SYSTEM TEST CONFIGURATION

### Justification

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

### Channel List

Mode		Channel		Frequency (MHz)
WCDMA Band II		Low	9262	1852.4
		Middle	9400	1880.0
		High	9538	1907.6
WCDMA Band V		Low	4132	826.4
		Middle	4183	836.6
		High	4233	846.6
LTE Band 2	1.4M	Low	18607	1850.7
		Middle	18900	1880.0
		High	19193	1909.3
	3M	Low	18615	1851.5
		Middle	18900	1880.0
		High	19185	1908.5
	5M	Low	18625	1852.5
		Middle	18900	1880.0
		High	19175	1907.5
	10M	Low	18650	1855.0
		Middle	18900	1880.0
		High	19150	1905.0
	15M	Low	18675	1857.5
		Middle	18900	1880.0
		High	19125	1902.5
	20M	Low	18700	1860.0
		Middle	18900	1880.0
		High	19100	1900.0

Mode		Channel		Frequency (MHz)
LTE Band 4	1.4M	Low	19957	1710.7
		Middle	20175	1732.5
		High	20393	1754.3
	3M	Low	19965	1711.5
		Middle	20175	1732.5
		High	20385	1753.5
	5M	Low	19975	1712.5
		Middle	20175	1732.5
		High	20375	1752.5
	10M	Low	20000	1715.0
		Middle	20175	1732.5
		High	20350	1750.0
	15M	Low	20025	1717.5
		Middle	20175	1732.5
		High	20325	1747.5
	20M	Low	20050	1720.0
		Middle	20175	1732.5
		High	20300	1745.0
LTE Band 12	1.4M	Low	23017	699.7
		Middle	23095	707.5
		High	23173	715.3
	3M	Low	23025	700.5
		Middle	23095	707.5
		High	23165	714.5
	5M	Low	23035	701.5
		Middle	23095	707.5
		High	23155	713.5
	10M	Low	23060	704.0
		Middle	23095	707.5
		High	23130	711.0

## Equipment Modifications

No modifications were made to the EUT.

## Support Equipment List and Details

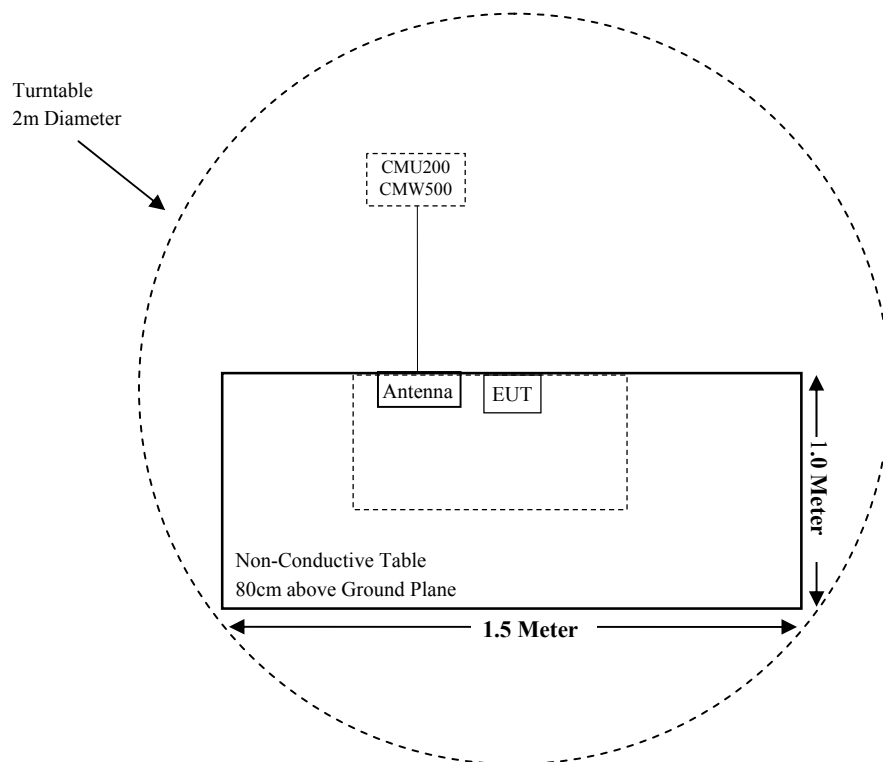
Manufacturer	Description	Model	Serial Number
R & S	Wideband Radio Communication Tester	CMW500	104478
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605
/	Antenna	/	/

## External I/O Cable

Cable Description	Length (m)	From Port	To
Antenna Cable	3.0	Antenna	CMW500

## Block Diagram of Test Setup

For Radiated Emissions (Below & Above 1GHz):



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§1.1307(b) & §2.1093	RF EXPOSURE INFORMATION	Compliant
§2.1046; § 22.913 (a);§ 24.232 (c); § 27.50 (c)(d);	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53;	Occupied Bandwidth	Compliant
§ 2.1051; § 22.917 (a); § 24.238 (a); §27.53;	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (g) (h);	Spurious Radiated Emissions	Compliant
§ 22.917 (a); § 24.238 (a); §27.53 (g) (h);	Band Edge	Compliant
§ 2.1055; § 22.355; § 24.235; §27.54;	Frequency stability	Compliant



**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test (Chamber 1#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-12	2019-11-11
HP	Signal Generator	HP 8341B	2624A00116	2019-08-29	2020-08-28
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2019-01-09	2022-01-08
Sonoma Instrunent	Pre-amplifier	310N	171205	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2018-11-12	2019-11-11
R & S	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20
<b>Radiated Emission Test (Chamber 2#)</b>					
HP	Signal Generator	HP 8341B	2624A00116	2019-08-29	2020-08-28
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-08-27	2020-08-26
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2019-01-11	2022-01-10
ETS-LINDGREN	Horn Antenna	3115	6229	2019-01-11	2022-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
ETS-LINDGREN	Horn Antenna	3116	2516	2016-12-12	2019-12-12
A.H.Systems, inc	Amplifier	2641-1	466	2019-09-11	2020-09-10
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-16	016	2019-08-15	2020-08-14
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2018-11-12	2019-11-11
R & S	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2018-09-21	2019-09-20
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2019-09-21	2020-09-20
Narda	Attenuator	2dB	002	2019-01-10	2020-01-09
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2018-11-12	2019-11-11
R & S	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20
Mini-Circuits	Power splitter	ZFRSC-14-S+	SF019411452	2018-11-10	2019-11-09
BACL	Temperature & Humidity Chamber	BTH-150	30023	2018-10-10	2019-10-09
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2018-10-10	2019-10-09
Quanzhou Sam	RF Cable	Quanzhou Sam C01	C01	Each Time	/

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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## **FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION**

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### **Applicable Standard**

FCC§1.1307(b),§2.1093.

### **Measurement Result**

Please refer to the SAR report: RXM190827058-20

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## **FCC §2.1047 - MODULATION CHARACTERISTIC**

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According to FCC § 2.1047(d), Part 22H & 24E, Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

**FCC §2.1046; § 22.913 (a); § 24.232 (c); §27.50 (c) (d); - RF OUTPUT POWER****Applicable Standards**

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts (38.45dBm).

According to FCC §2.1046 and §24.232 (c), mobile and portable stations are limited to 2 watts (33dBm) EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

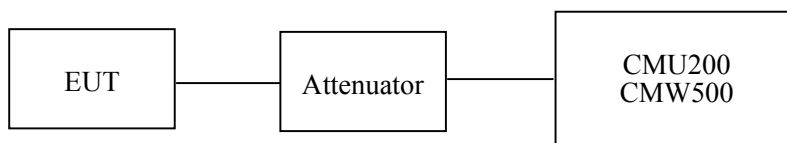
According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

According to §27.50(c), Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP..

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

**Test Procedure*****Conducted method:***

The RF output of the transmitter was connected to the CMU200 through sufficient attenuation.

***Radiated Output Power:***

The measurements procedures specified in ANSI/TIA-603-D were applied.

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.

b) Key the transmitter, then rotate the EUT 360o azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).

c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.  
 $\text{LOSS} = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:

$$\text{ERP (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$$

f) The maximum ERP is the maximum value determined in the preceding step.

(Note: Effective Isotropic Radiated Power (EIRP) can be computed using the following:

$$\text{EIRP (dBm)} = \text{ERP (dBm)} + 2.15 \text{ (dB)}$$

## Test Data

### Environmental Conditions

Temperature:	23.2°C
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Jack Jiao on 2019-09-11.

### Conducted Power:

#### WCDMA Band V

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band V)	Normal	Rel 99	1	23.11	23.31	22.99
		HSDPA	1	22.86	22.94	22.73
			2	22.53	22.61	22.41
			3	22.31	22.46	22.16
			4	22.12	22.31	22.04
		HSUPA	1	21.89	22.11	21.76
			2	21.76	21.99	21.43
			3	21.37	21.61	21.21
			4	21.15	21.29	21.07
			5	20.97	21.16	20.83
		HSPA+	1	22.97	23.15	22.91

**WCDMA Band II**

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band II)	Normal	Rel 99	1	22.55	22.71	22.59
		HSDPA	1	22.36	22.51	22.39
			2	22.21	22.36	22.25
			3	22.05	22.13	22.06
			4	21.91	21.99	21.96
		HSUPA	1	21.73	21.83	21.76
			2	21.51	21.62	21.56
			3	22.33	22.42	22.36
			4	21.15	21.22	21.17
			5	20.83	20.91	20.88
		HSPA+	1	22.61	22.73	22.64

**Maximum Output Power:****LTE Band 2**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	1#0	21.68	22.36	21.85
		1#3	21.78	22.27	21.95
		1#5	21.70	22.28	21.97
		3#0	21.69	22.41	22.01
		3#1	21.68	22.29	22.01
		3#3	21.63	22.34	21.91
		6#0	21.68	22.43	21.90
	16-QAM	1#0	21.79	22.41	21.88
		1#3	21.74	22.39	21.98
		1#5	21.71	22.43	22.11
		3#0	21.79	22.41	22.19
		3#1	21.70	22.45	22.05
		3#3	21.68	22.36	22.04
		6#0	21.72	22.40	22.04
3M	QPSK	1#0	21.61	22.39	22.03
		1#7	21.69	22.51	22.11
		1#14	21.61	22.47	22.18
		8#0	21.68	22.51	22.17
		8#4	21.70	22.53	22.22
		8#7	21.78	22.59	22.21
		15#0	21.64	22.56	22.12
	16-QAM	1#0	21.65	22.63	22.12
		1#7	21.63	22.64	22.05
		1#14	21.59	22.70	22.03
		8#0	21.59	22.70	22.00
		8#4	21.61	22.66	22.00
		8#7	21.57	22.57	22.02
		15#0	21.58	22.59	21.96



Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	21.52	22.67	21.87
		1#12	21.43	22.68	21.88
		1#24	21.55	22.68	21.98
		12#0	21.54	22.73	21.99
		12#6	21.54	22.63	21.91
		12#11	21.61	22.67	21.87
		25#0	21.62	22.70	21.79
	16-QAM	1#0	21.54	22.66	21.84
		1#12	21.56	22.72	21.93
		1#24	21.55	22.83	21.91
		12#0	21.63	22.92	21.88
		12#6	21.55	23.01	21.89
		12#11	21.57	23.02	21.86
		25#0	21.61	23.04	21.86
10M	QPSK	1#0	21.49	23.01	21.94
		1#24	21.41	22.94	21.96
		1#49	21.28	22.86	22.02
		25#0	21.30	22.85	22.13
		25#12	21.30	22.89	22.07
		25#24	21.25	22.93	22.00
		50#0	21.21	22.93	22.13
	16-QAM	1#0	21.11	22.99	22.11
		1#24	21.09	22.88	22.21
		1#49	20.95	22.79	22.22
		25#0	20.96	22.71	22.22
		25#12	20.89	22.74	22.29
		25#24	20.83	22.79	22.24
		50#0	20.79	22.71	22.19

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	20.76	22.71	22.23
		1#37	20.67	22.85	22.22
		1#74	20.58	22.85	22.30
		36#0	20.52	22.79	22.39
		36#17	20.55	22.76	22.39
		36#35	20.58	22.73	22.33
		75#0	20.58	22.79	22.25
	16-QAM	1#0	20.52	22.81	22.35
		1#37	20.61	22.88	22.28
		1#74	20.58	22.81	22.31
		36#0	20.65	22.75	22.40
		36#17	20.61	22.85	22.27
		36#35	20.60	22.90	22.30
		75#0	20.60	22.96	22.37
20M	QPSK	1#0	20.55	23.03	22.42
		1#49	20.65	23.04	22.38
		1#99	20.53	23.12	22.40
		50#0	20.50	23.05	22.35
		50#24	20.47	23.07	22.39
		50#49	20.48	23.11	22.47
		100#0	20.39	23.00	22.53
	16-QAM	1#0	20.38	23.01	22.45
		1#49	20.38	22.94	22.42
		1#99	20.38	23.06	22.45
		50#0	20.29	22.98	22.45
		50#24	20.42	22.89	22.44
		50#49	20.33	22.87	22.39
		100#0	20.30	22.91	22.43

**LTE Band 4**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	1#0	21.68	21.98	21.85
		1#3	21.72	21.97	21.93
		1#5	21.65	21.95	21.92
		3#0	21.66	22.02	21.87
		3#1	21.73	22.03	21.88
		3#3	21.78	22.05	21.90
		6#0	21.85	22.03	21.84
	16-QAM	1#0	21.75	22.02	21.82
		1#3	21.68	21.98	21.77
		1#5	21.70	21.98	21.68
		3#0	21.83	22.08	21.71
		3#1	21.76	21.95	21.74
		3#3	21.69	22.00	21.77
		6#0	21.69	21.89	21.71
3M	QPSK	1#0	21.79	21.93	21.69
		1#7	21.79	22.06	21.64
		1#14	21.79	22.04	21.67
		8#0	21.87	22.17	21.61
		8#4	22.00	22.16	21.57
		8#7	21.93	22.17	21.71
		15#0	21.85	22.19	21.79
	16-QAM	1#0	21.92	22.14	21.78
		1#7	21.90	22.05	21.85
		1#14	21.99	22.14	21.83
		8#0	22.01	22.12	21.95
		8#4	22.10	22.09	21.97
		8#7	22.12	22.20	22.00
		15#0	22.14	22.27	22.01

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	22.16	22.18	21.91
		1#12	22.17	22.23	21.89
		1#24	22.16	22.17	21.98
		12#0	22.09	22.23	21.97
		12#6	22.06	22.23	22.00
		12#11	22.08	22.31	21.98
		25#0	22.16	22.26	21.99
	16-QAM	1#0	22.23	22.23	21.96
		1#12	22.23	22.30	22.01
		1#24	22.14	22.26	22.02
		12#0	22.15	22.31	22.09
		12#6	22.18	22.23	22.08
		12#11	22.15	22.17	22.13
		25#0	22.18	22.21	22.16
10M	QPSK	1#0	22.21	22.17	22.22
		1#24	22.22	22.18	22.15
		1#49	22.26	22.30	22.10
		25#0	22.20	22.37	22.11
		25#12	22.16	22.39	22.01
		25#24	22.18	22.44	22.11
		50#0	22.14	22.52	22.08
	16-QAM	1#0	22.23	22.50	22.01
		1#24	22.32	22.47	21.93
		1#49	22.35	22.40	21.81
		25#0	22.48	22.48	21.80
		25#12	22.43	22.49	21.80
		25#24	22.47	22.50	21.80
		50#0	22.40	22.50	21.80

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	22.41	22.50	21.73
		1#37	22.41	22.49	21.71
		1#74	22.44	22.54	21.76
		36#0	22.40	22.47	21.83
		36#17	22.50	22.49	21.84
		36#35	22.60	22.48	21.86
		75#0	22.62	22.45	21.91
	16-QAM	1#0	22.64	22.46	21.97
		1#37	22.59	22.43	21.98
		1#74	22.51	22.53	22.03
		36#0	22.55	22.45	22.03
		36#17	22.57	22.52	22.05
		36#35	22.52	22.44	22.08
		75#0	22.62	22.43	22.19
20M	QPSK	1#0	22.58	22.51	22.29
		1#49	22.59	22.58	22.33
		1#99	22.59	22.62	22.41
		50#0	22.54	22.52	22.30
		50#24	22.58	22.45	22.17
		50#49	22.65	22.41	22.07
		100#0	22.56	22.46	22.07
	16-QAM	1#0	22.59	22.47	22.05
		1#49	22.64	22.47	22.04
		1#99	22.66	22.45	22.13
		50#0	22.58	22.44	22.26
		50#24	22.69	22.36	22.34
		50#49	22.66	22.35	22.31
		100#0	22.62	22.40	22.33

**LTE Band 12**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	1#0	21.68	22.05	21.85
		1#3	21.62	22.00	21.71
		1#5	21.63	22.08	21.75
		3#0	21.66	22.20	21.66
		3#1	21.68	22.21	21.60
		3#3	21.71	22.31	21.51
		6#0	21.69	22.31	21.36
	16-QAM	1#0	21.63	22.29	21.37
		1#3	21.75	22.25	21.43
		1#5	21.76	22.26	21.42
		3#0	21.85	22.20	21.31
		3#1	21.87	22.29	21.31
		3#3	21.86	22.20	21.41
		6#0	21.86	22.24	21.34
3M	QPSK	1#0	21.93	22.34	21.25
		1#7	21.90	22.33	21.32
		1#14	21.84	22.35	21.34
		8#0	21.78	22.38	21.39
		8#4	21.70	22.33	21.42
		8#7	21.75	22.29	21.37
		15#0	21.79	22.27	21.34
	16-QAM	1#0	21.79	22.24	21.29
		1#7	21.73	22.16	21.29
		1#14	21.81	22.08	21.39
		8#0	21.80	22.03	21.49
		8#4	21.78	22.12	21.39
		8#7	21.85	22.14	21.31
		15#0	21.85	22.16	21.40

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	21.80	22.21	21.51
		1#12	21.83	22.32	21.50
		1#24	21.73	22.35	21.47
		12#0	21.81	22.39	21.44
		12#6	21.77	22.39	21.47
		12#11	21.73	22.46	21.55
		25#0	21.65	22.46	21.66
	16-QAM	1#0	21.53	22.49	21.55
		1#12	21.59	22.53	21.56
		1#24	21.57	22.56	21.57
		12#0	21.59	22.58	21.50
		12#6	21.63	22.65	21.39
		12#11	21.64	22.68	21.33
		25#0	21.62	22.64	21.25
10M	QPSK	1#0	21.53	22.61	21.23
		1#24	21.54	22.60	21.14
		1#49	21.63	22.59	21.14
		25#0	21.59	22.55	21.05
		25#12	21.60	22.61	20.96
		25#24	21.54	22.57	21.04
		50#0	21.52	22.65	21.03
	16-QAM	1#0	21.52	22.74	21.07
		1#24	21.48	22.75	21.10
		1#49	21.53	22.82	21.11
		25#0	21.63	22.81	21.05
		25#12	21.65	22.85	21.10
		25#24	21.54	22.87	21.04
		50#0	21.55	22.99	21.07

**Peak-to-average ratio (PAR):****WCDMA Band V:**

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA (Rel99)	Low	3.23	≤ 13
	Middle	3.29	≤ 13
	High	3.21	≤ 13
WCDMA (HSDPA)	Low	2.79	≤ 13
	Middle	2.75	≤ 13
	High	2.73	≤ 13
WCDMA (HSUPA)	Low	2.72	≤ 13
	Middle	2.77	≤ 13
	High	2.59	≤ 13
WCDMA (HSPA+)	Low	2.62	≤ 13
	Middle	2.54	≤ 13
	High	2.48	≤ 13

**WCDMA Band II**

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA (Rel99)	Low	2.68	≤ 13
	Middle	2.62	≤ 13
	High	2.68	≤ 13
WCDMA (HSDPA)	Low	2.28	≤ 13
	Middle	2.34	≤ 13
	High	2.25	≤ 13
WCDMA (HSUPA)	Low	2.33	≤ 13
	Middle	2.43	≤ 13
	High	2.40	≤ 13
WCDMA (HSPA+)	Low	2.26	≤ 13
	Middle	2.28	≤ 13
	High	2.24	≤ 13



**LTE Band 2**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit (dB)
QPSK	1 RB	20M	3.03	3.12	3.24	13
	100 RB		4.67	4.75	4.62	13
16-QAM	1 RB	20M	4.13	4.29	4.25	13
	100 RB		5.86	5.57	5.84	13

**LTE Band 4**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	20M	3.08	3.16	3.26	13
	100 RB		4.54	4.86	4.73	13
16-QAM	1 RB	20M	4.23	4.26	4.33	13
	100 RB		5.75	5.42	5.95	13

**LTE Band 12**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	10M	3.10	3.14	3.21	13
	50 RB		4.62	4.73	4.65	13
16-QAM	1 RB	10M	4.16	4.35	4.32	13
	50 RB		5.84	5.54	5.68	13

**ERP & EIRP****WCDMA Mode**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd/dBi)			
WCDMA Band V, Middle Channel								
836.6	H	89.14	25.45	0.63	-1.14	23.68	38.45	14.77
836.6	V	92.45	25.30	0.63	-1.14	23.53	38.45	14.92
WCDMA Band II, Middle Channel								
1880.0	H	82.92	11.88	0.85	8.81	19.84	33.00	13.16
1880.0	V	86.73	15.38	0.85	8.81	23.34	33.00	9.66

**Note:**

All above data were tested with no amplifier

Absolute Level = Submitted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

**LTE Band 2**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4M BW Middle Channel								
1880.0	H	82.56	11.52	0.85	8.81	19.48	33.00	13.52
1880.0	V	86.54	15.19	0.85	8.81	23.15	33.00	9.85
16-QAM 1.4M BW Middle Channel								
1880.0	H	82.58	11.54	0.85	8.81	19.50	33.00	13.50
1880.0	V	86.55	15.2	0.85	8.81	23.16	33.00	9.84
QPSK 3M BW Middle Channel								
1880.0	H	82.18	11.14	0.85	8.81	19.10	33.00	13.90
1880.0	V	86.68	15.33	0.85	8.81	23.29	33.00	9.71
16-QAM 3M BW Middle Channel								
1880.0	H	82.71	11.67	0.85	8.81	19.63	33.00	13.37
1880.0	V	86.32	14.97	0.85	8.81	22.93	33.00	10.07
QPSK 5M BW Middle Channel								
1880.0	H	82.72	11.68	0.85	8.81	19.64	33.00	13.36
1880.0	V	86.87	15.52	0.85	8.81	23.48	33.00	9.52
16-QAM 5M BW Middle Channel								
1880.0	H	82.39	11.35	0.85	8.81	19.31	33.00	13.69
1880.0	V	86.82	15.47	0.85	8.81	23.43	33.00	9.57

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 10M BW Middle Channel								
1880.0	H	81.12	10.08	0.85	8.81	18.04	33.00	14.96
1880.0	V	86.41	15.06	0.85	8.81	23.02	33.00	9.98
16-QAM 10M BW Middle Channel								
1880.0	H	81.68	10.64	0.85	8.81	18.60	33.00	14.40
1880.0	V	85.84	14.49	0.85	8.81	22.45	33.00	10.55
QPSK 15M BW Middle Channel								
1880.0	H	82.03	10.99	0.85	8.81	18.95	33.00	14.05
1880.0	V	86.38	15.03	0.85	8.81	22.99	33.00	10.01
16-QAM 15M BW Middle Channel								
1880.0	H	81.80	10.76	0.85	8.81	18.72	33.00	14.28
1880.0	V	86.00	14.65	0.85	8.81	22.61	33.00	10.39
QPSK 20M BW Middle Channel								
1880.0	H	81.42	10.38	0.85	8.81	18.34	33.00	14.66
1880.0	V	86.41	15.06	0.85	8.81	23.02	33.00	9.98
16-QAM 20M BW Middle Channel								
1880.0	H	81.76	10.72	0.85	8.81	18.68	33.00	14.32
1880.0	V	85.91	14.56	0.85	8.81	22.52	33.00	10.48

**LTE Band 4**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4M BW Middle Channel								
1732.5	H	85.01	10.25	0.85	8.81	18.21	30.00	11.79
1732.5	V	88.11	13.73	0.85	8.81	21.69	30.00	8.31
16-QAM 1.4M BW Middle Channel								
1732.5	H	84.36	9.6	0.85	8.81	17.56	30.00	12.44
1732.5	V	88.00	13.62	0.85	8.81	21.58	30.00	8.42
QPSK 3M BW Middle Channel								
1732.5	H	84.56	9.8	0.85	8.81	17.76	30.00	12.24
1732.5	V	87.76	13.38	0.85	8.81	21.34	30.00	8.66
16-QAM 3M BW Middle Channel								
1732.5	H	85.09	10.33	0.85	8.81	18.29	30.00	11.71
1732.5	V	88.15	13.77	0.85	8.81	21.73	30.00	8.27
QPSK 5M BW Middle Channel								
1732.5	H	84.90	10.14	0.85	8.81	18.10	30.00	11.90
1732.5	V	88.41	14.03	0.85	8.81	21.99	30.00	8.01
16-QAM 5M BW Middle Channel								
1732.5	H	84.22	9.46	0.85	8.81	17.42	30.00	12.58
1732.5	V	88.23	13.85	0.85	8.81	21.81	30.00	8.19

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 10M BW Middle Channel								
1732.5	H	84.34	9.58	0.85	8.81	17.54	30.00	12.46
1732.5	V	88.31	13.93	0.85	8.81	21.89	30.00	8.11
16-QAM 10M BW Middle Channel								
1732.5	H	84.17	9.41	0.85	8.81	17.37	30.00	12.63
1732.5	V	88.49	14.11	0.85	8.81	22.07	30.00	7.93
QPSK 15M BW Middle Channel								
1732.5	H	84.99	10.23	0.85	8.81	18.19	30.00	11.81
1732.5	V	87.64	13.26	0.85	8.81	21.22	30.00	8.78
16-QAM 15M BW Middle Channel								
1732.5	H	84.59	9.83	0.85	8.81	17.79	30.00	12.21
1732.5	V	88.45	14.07	0.85	8.81	22.03	30.00	7.97
QPSK 20M BW Middle Channel								
1732.5	H	85.00	10.24	0.85	8.81	18.20	30.00	11.80
1732.5	V	88.37	13.99	0.85	8.81	21.95	30.00	8.05
16-QAM 20M BW Middle Channel								
1732.5	H	84.53	9.77	0.85	8.81	17.73	30.00	12.27
1732.5	V	88.05	13.67	0.85	8.81	21.63	30.00	8.37

**LTE Band 12**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4M BW Middle Channel								
707.5	H	87.69	7.99	0.62	-1.71	15.66	33.77	18.11
707.5	V	90.16	11.85	0.62	-1.71	19.52	33.77	14.25
16-QAM 1.4M BW Middle Channel								
707.5	H	87.46	11.93	0.62	-1.71	21.09	33.77	12.68
707.5	V	90.08	8.26	0.62	-1.71	17.42	33.77	16.35
QPSK 3M BW Middle Channel								
707.5	H	87.37	12.03	0.62	-1.71	21.19	33.77	12.58
707.5	V	89.96	8.21	0.62	-1.71	17.37	33.77	16.40
16-QAM 3M BW Middle Channel								
707.5	H	87.20	11.60	0.62	-1.71	20.76	33.77	13.01
707.5	V	89.74	7.99	0.62	-1.71	17.15	33.77	16.62
QPSK 5M BW Middle Channel								
707.5	H	89.14	9.44	0.62	-1.71	17.11	33.77	16.66
707.5	V	91.47	13.16	0.62	-1.71	20.83	33.77	12.94
16-QAM 5M BW Middle Channel								
707.5	H	88.98	11.93	0.62	-1.71	21.09	33.77	12.68
707.5	V	91.30	8.26	0.62	-1.71	17.42	33.77	16.35
QPSK 10M BW Middle Channel								
707.5	H	88.87	12.03	0.62	-1.71	21.19	33.77	12.58
707.5	V	91.23	8.21	0.62	-1.71	17.37	33.77	16.40
16-QAM 10M BW Middle Channel								
707.5	H	88.67	11.6	0.62	-1.71	20.76	33.77	13.01
707.5	V	91.10	7.99	0.62	-1.71	17.15	33.77	16.62

**Note:**

All above data were tested with no amplifier

Absolute Level = Submitted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

**FCC §2.1049, §22.917, §22.905 & §24.238; §27.53- OCCUPIED BANDWIDTH****Applicable Standards**

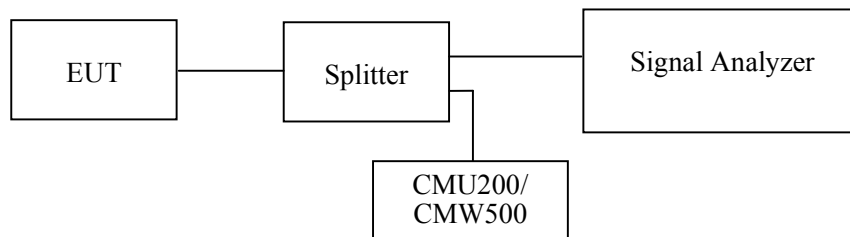
FCC 47 §2.1049, §22.917, §22.905 & §24.238 and §27.53.

**Test Procedure**

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) & 100 kHz (WCDMA), and the 26 dB & 99% bandwidth was recorded.

The resolution bandwidth of the spectrum analyzer was set at 1% to 5% of the anticipated emission bandwidth and the 26 dB & 99% bandwidth was recorded.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	23.2°C-23.5°C
<b>Relative Humidity:</b>	51 %-53%
<b>ATM Pressure:</b>	101.1kPa-103.3kPa

*The testing was performed by Jack Jiao from 2019-09-19 to 2019-09-29.*

*EUT operation mode: Transmitting*

*Test Result: Compliant.*



**WCDMA Band V**

<b>Mode</b>	<b>Frequency (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>	<b>99% Occupied Bandwidth (MHz)</b>
WCDMA (Rel 99)	836.6	4.749	4.128
WCDMA (HSDPA)	836.6	4.770	4.128
WCDMA (HSUPA)	836.6	4.729	4.128
WCDMA (HSPA+)	836.6	4.749	4.128

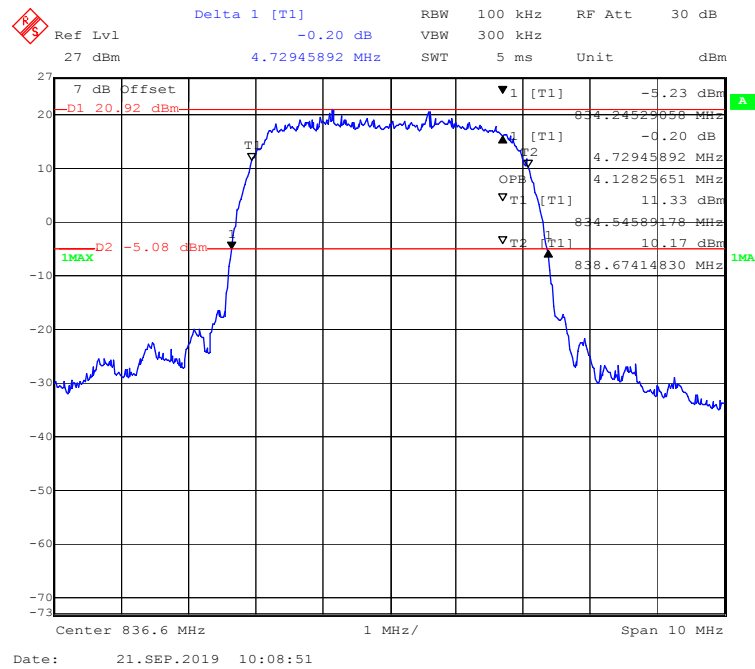
**WCDMA Band II**

<b>Mode</b>	<b>Frequency (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>	<b>99% Occupied Bandwidth (MHz)</b>
WCDMA (Rel 99)	1880	4.749	4.148
WCDMA (HSDPA)	1880	4.749	4.148
WCDMA (HSUPA)	1880	4.749	4.148
WCDMA (HSPA+)	1880	4.709	4.148

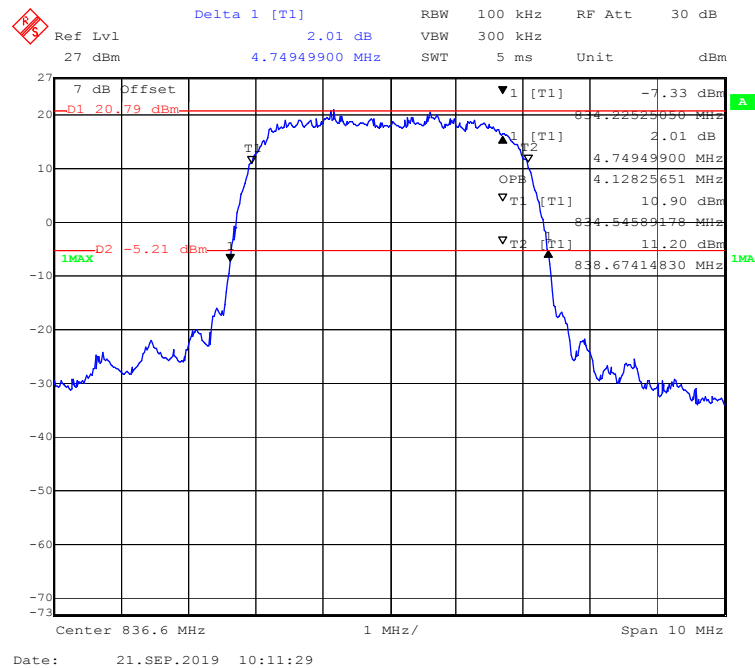
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSUPA) Mode

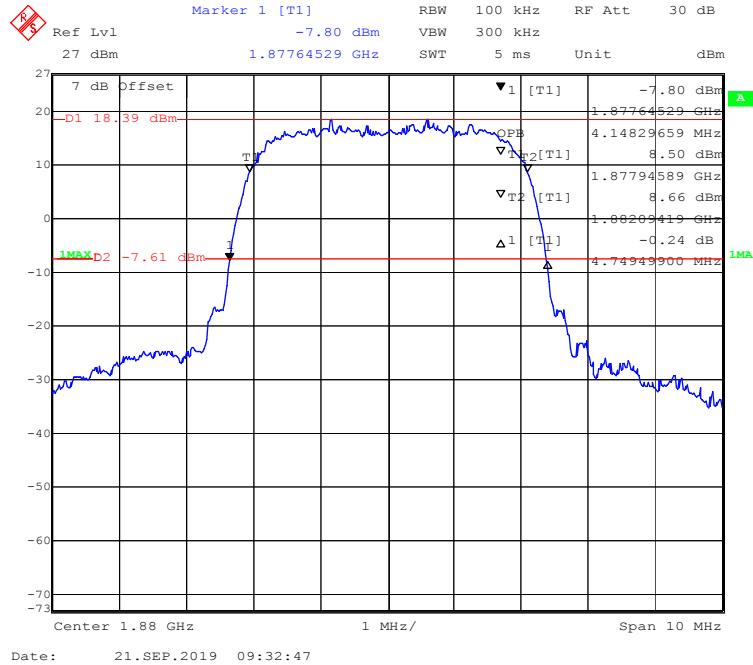


### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode

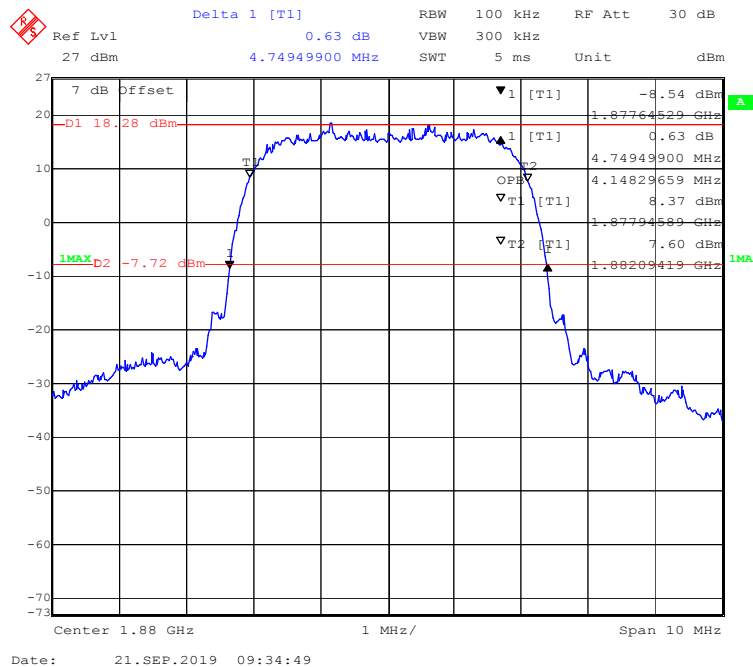


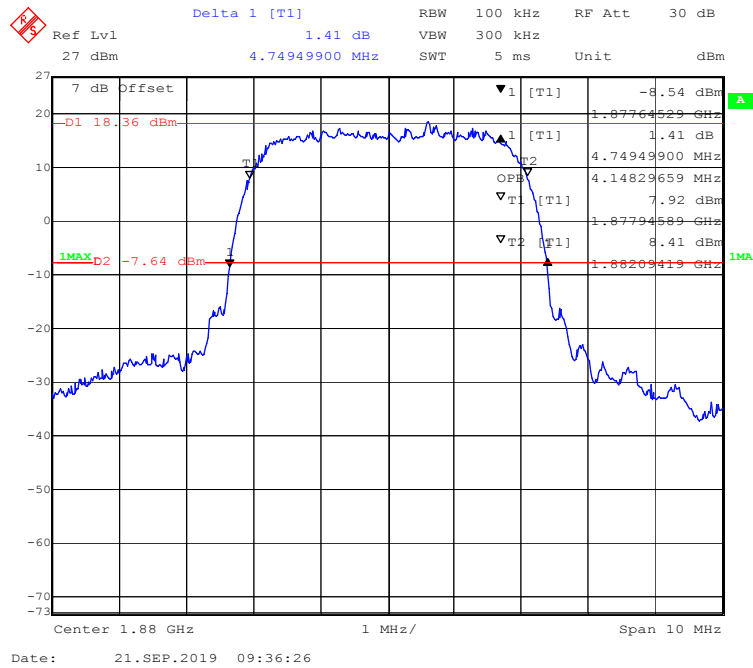
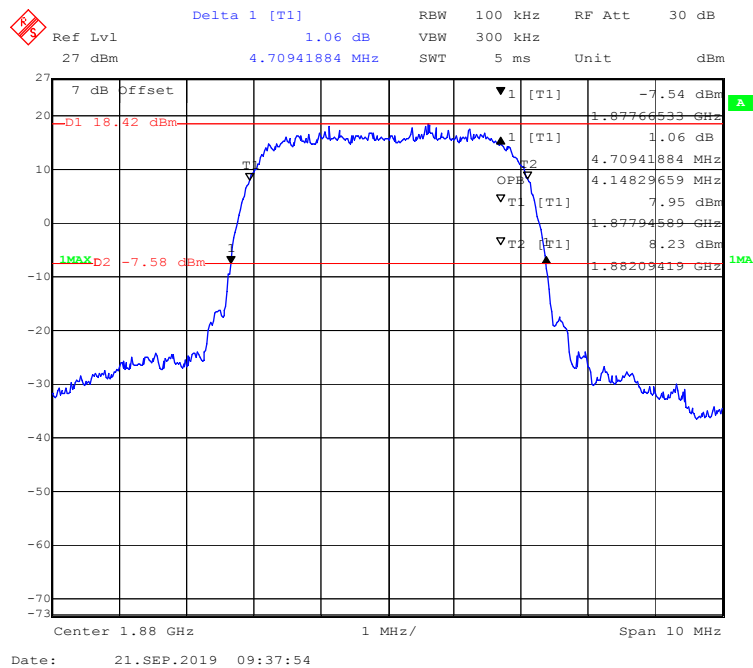
## WCDMA Band II

## 99% Occupied &amp; 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



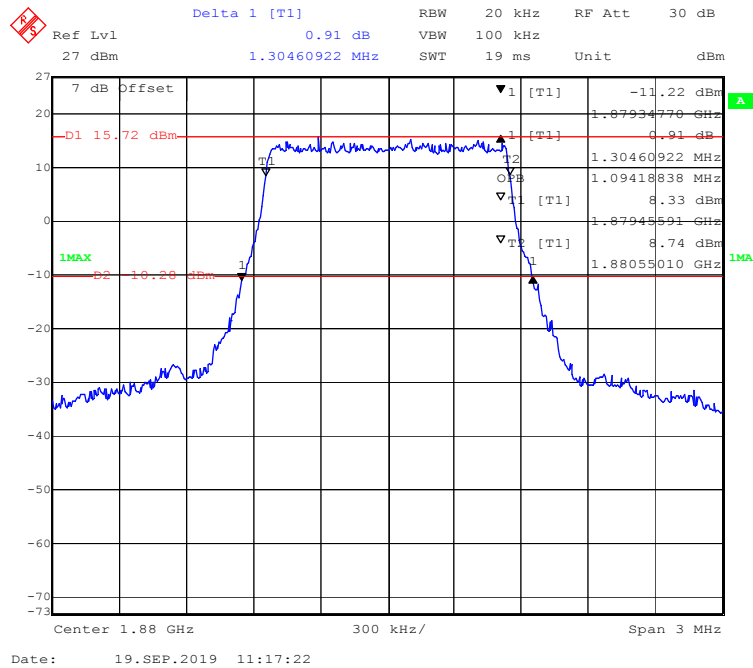
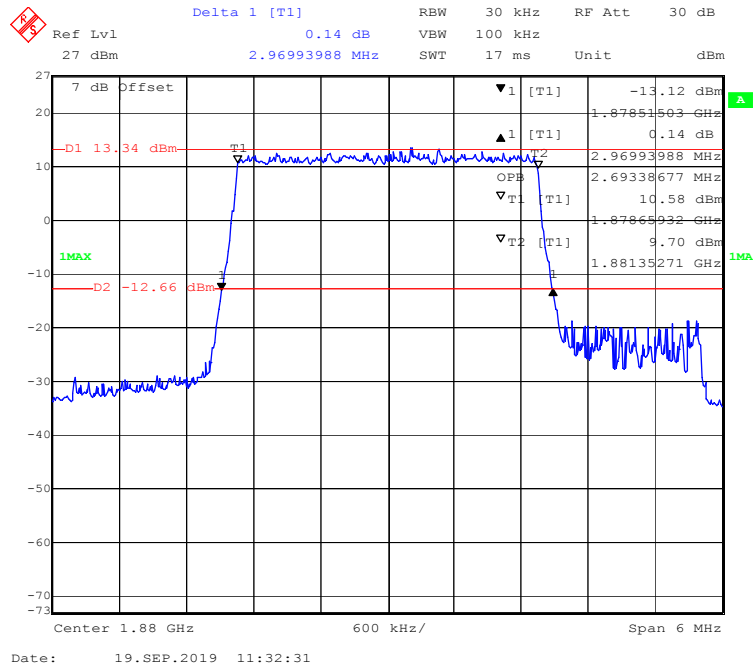
## 99% Occupied &amp; 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode

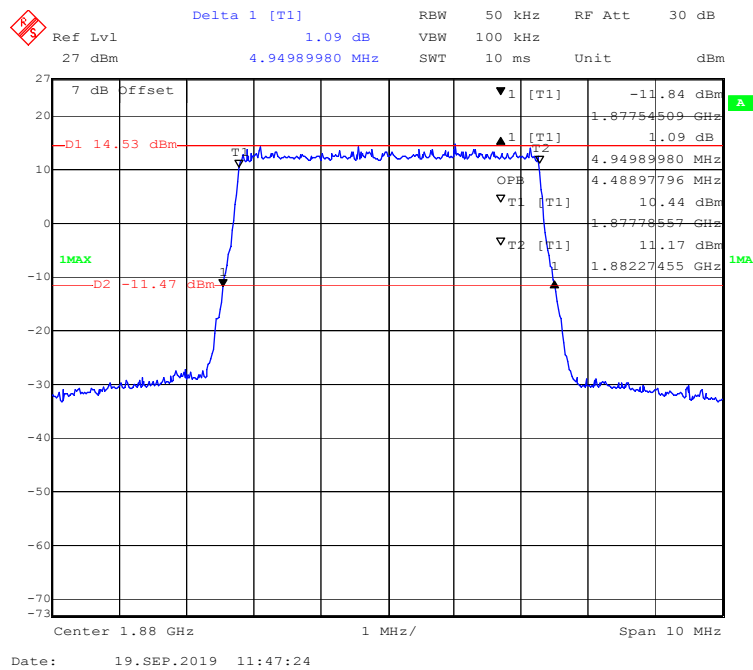
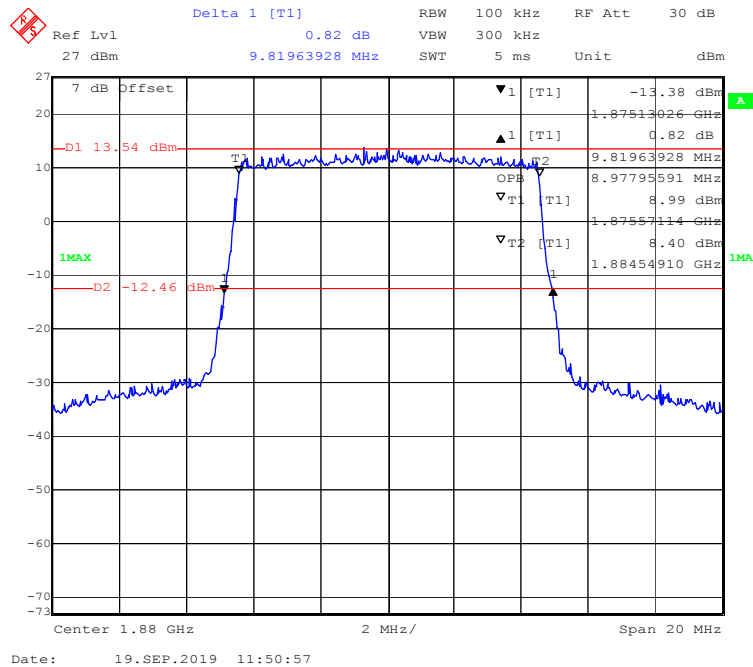


**99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSUPA) Mode****99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode**

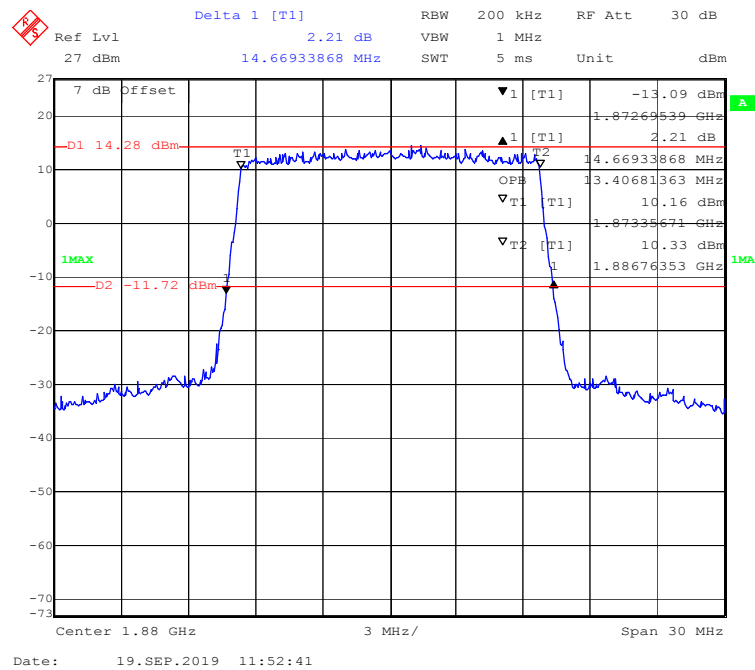
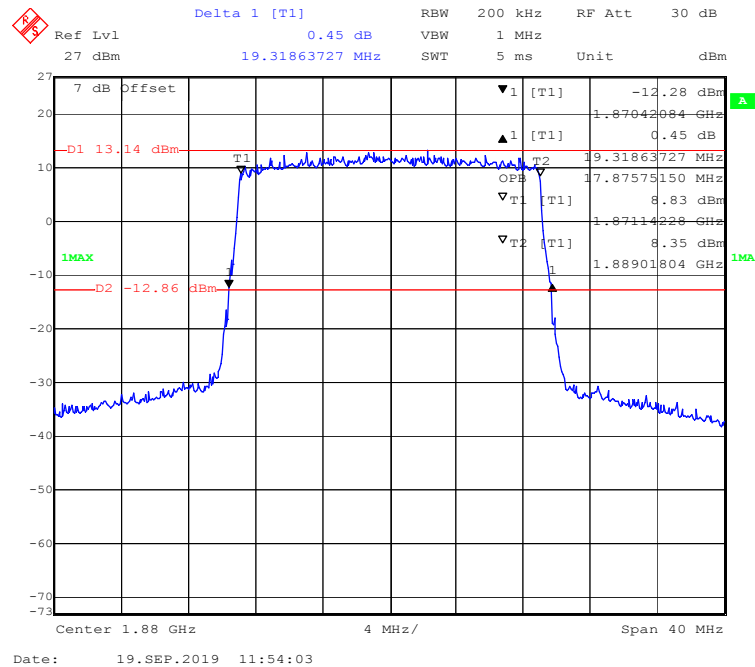
**LTE Band 2:**

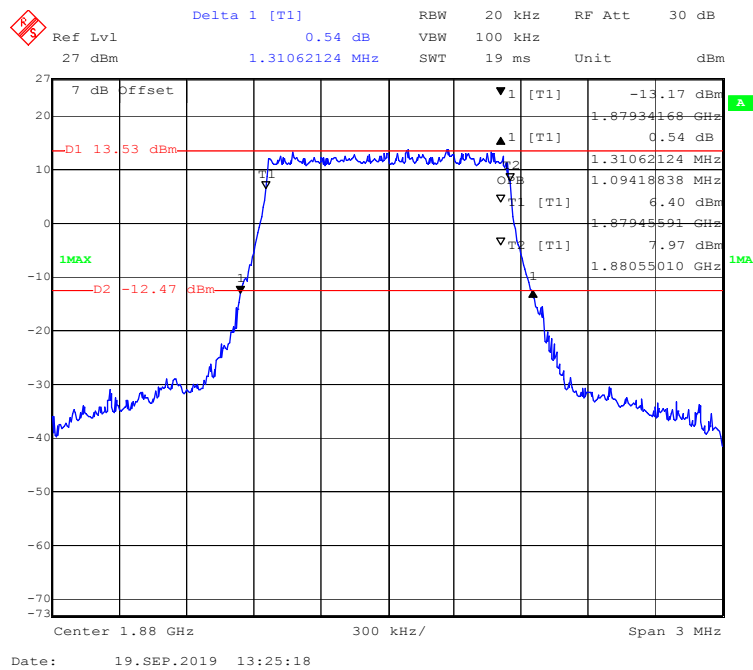
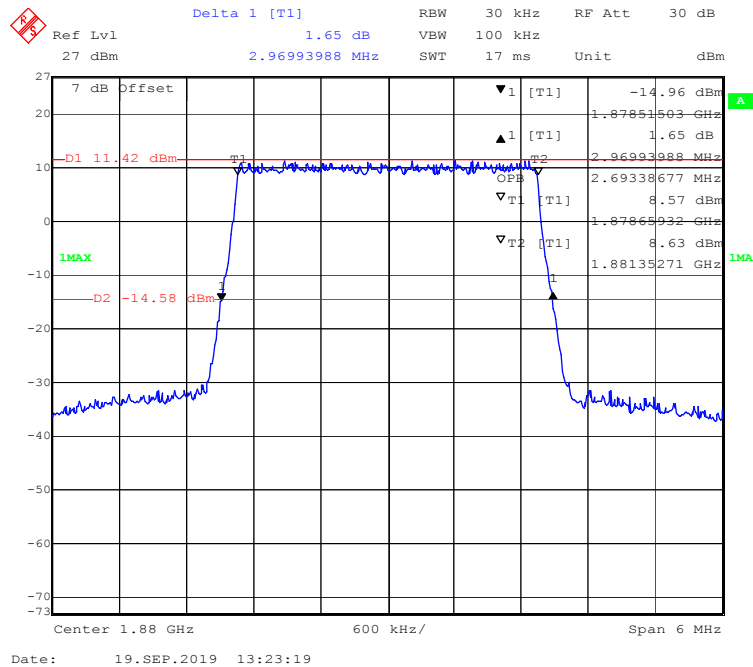
Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.305	1.094
	3M		2.970	2.693
	5M		4.950	4.489
	10M		9.820	8.978
	15M		14.669	13.407
	20M		19.319	17.876
16-QAM	1.4M	Middle	1.311	1.094
	3M		2.970	2.693
	5M		4.930	4.509
	10M		9.820	8.938
	15M		14.669	13.407
	20M		19.319	17.876

**QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

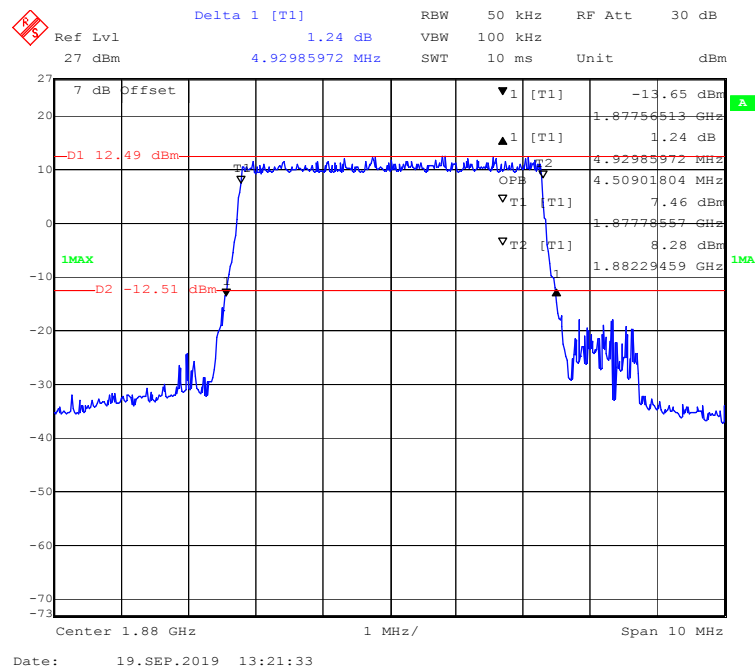
**QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (10MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



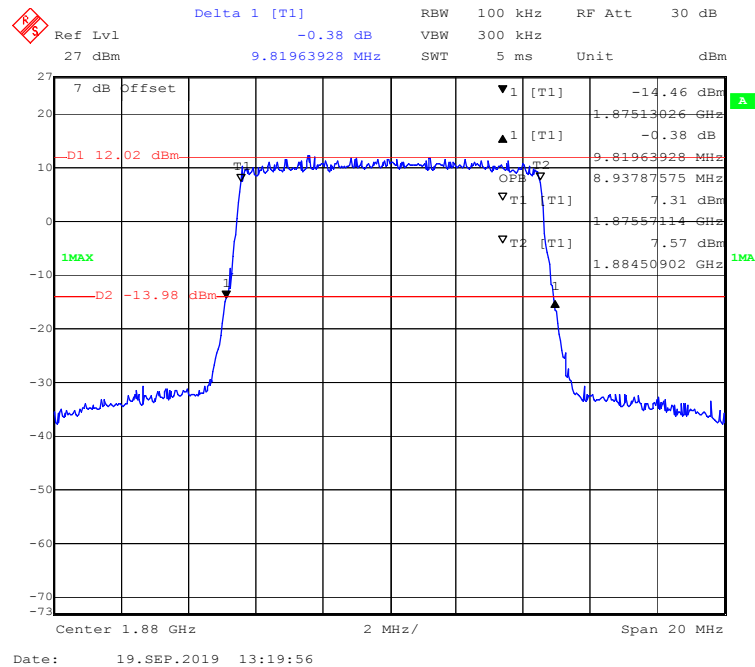
**QPSK (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

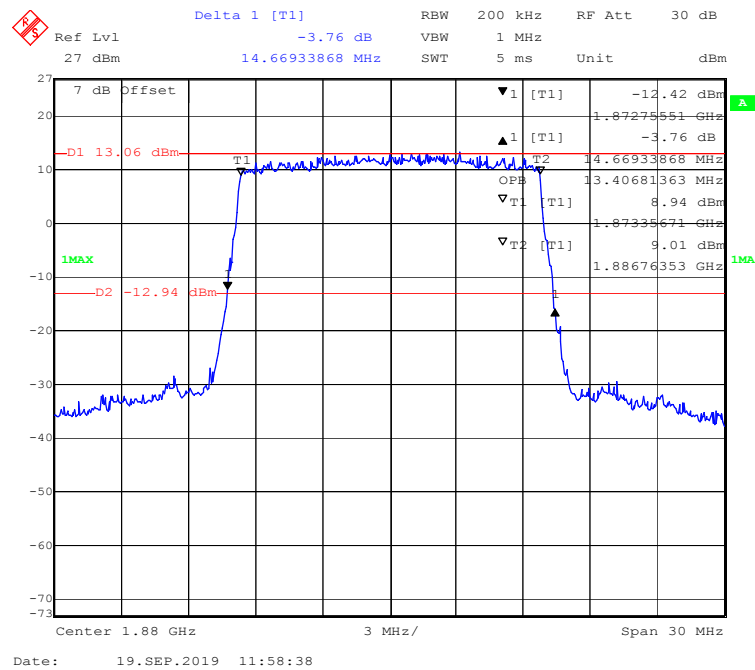
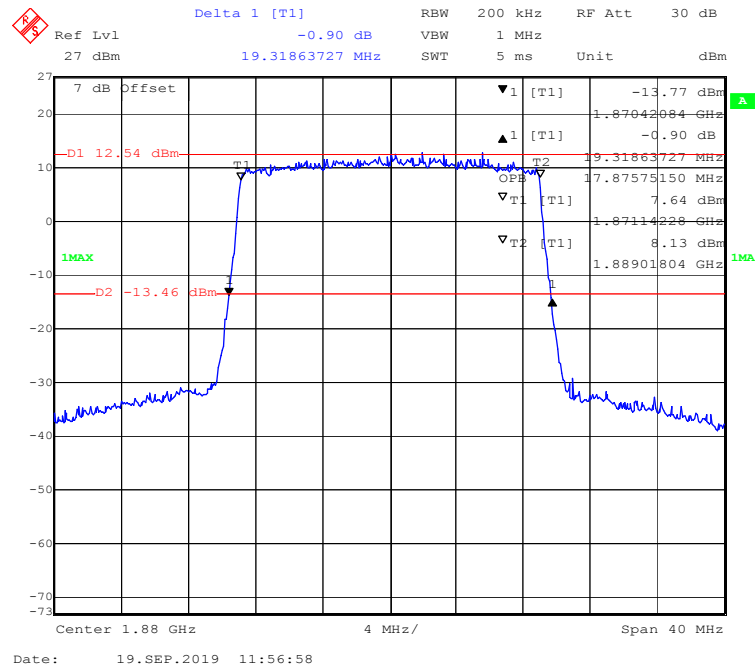
**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

### 16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



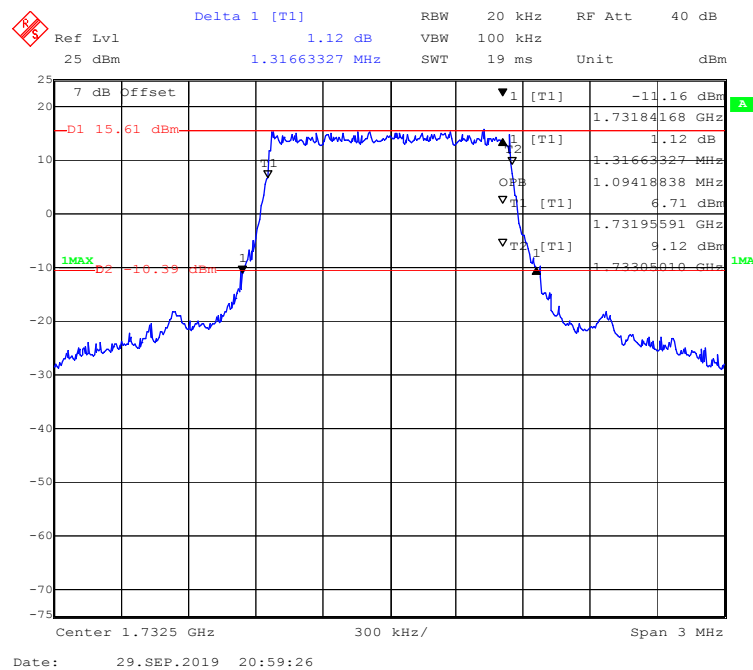
### 16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel

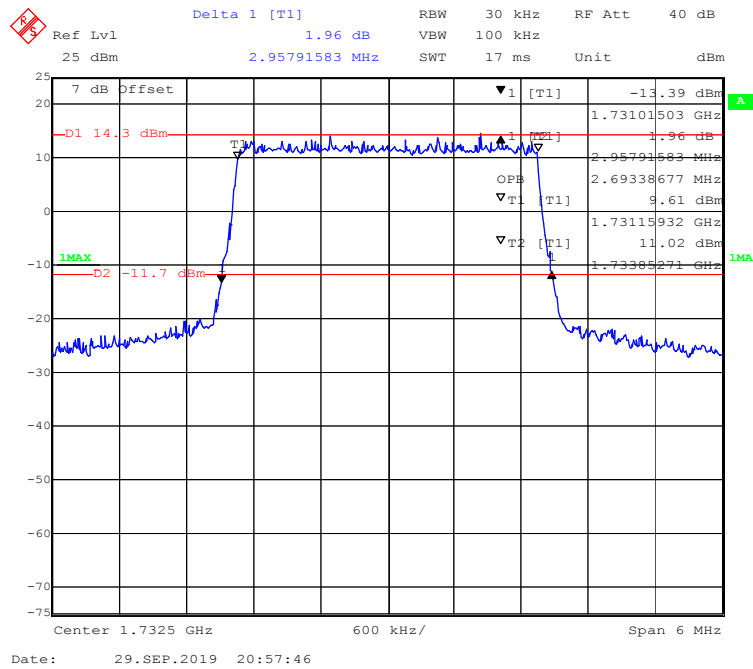
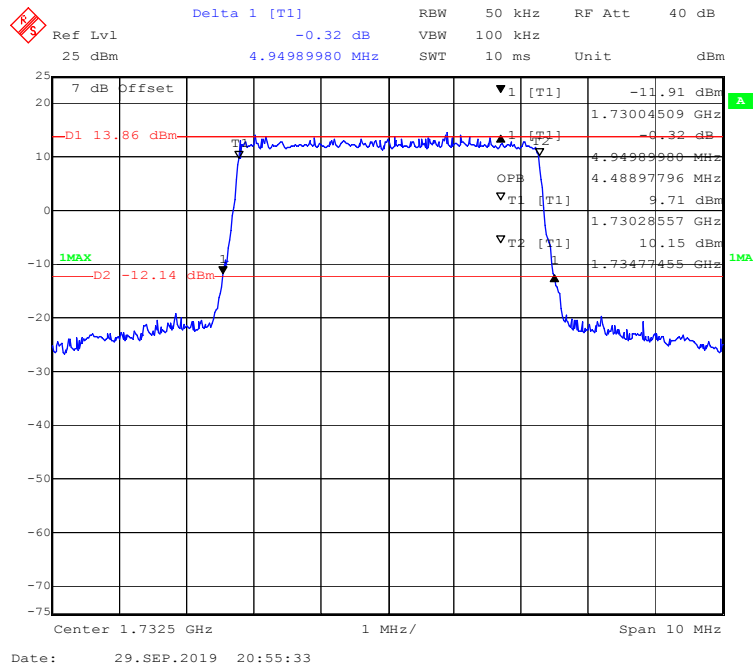


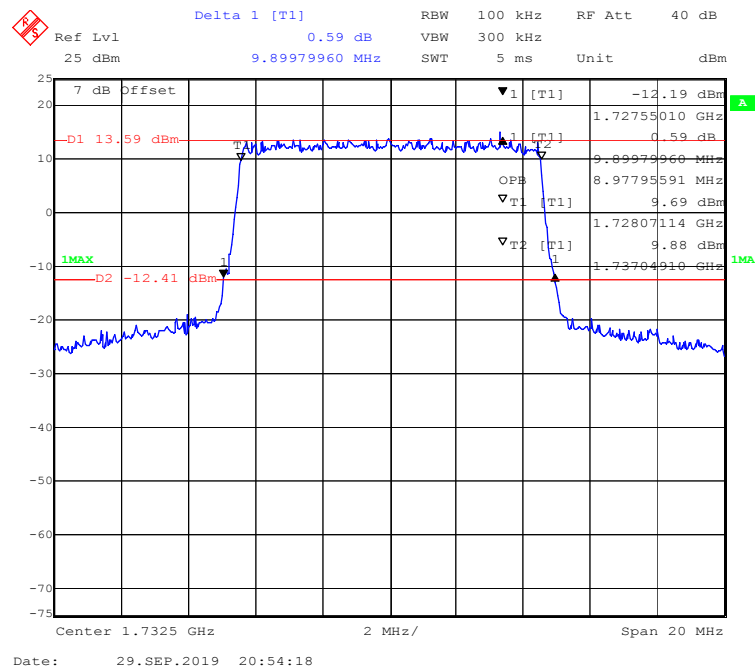
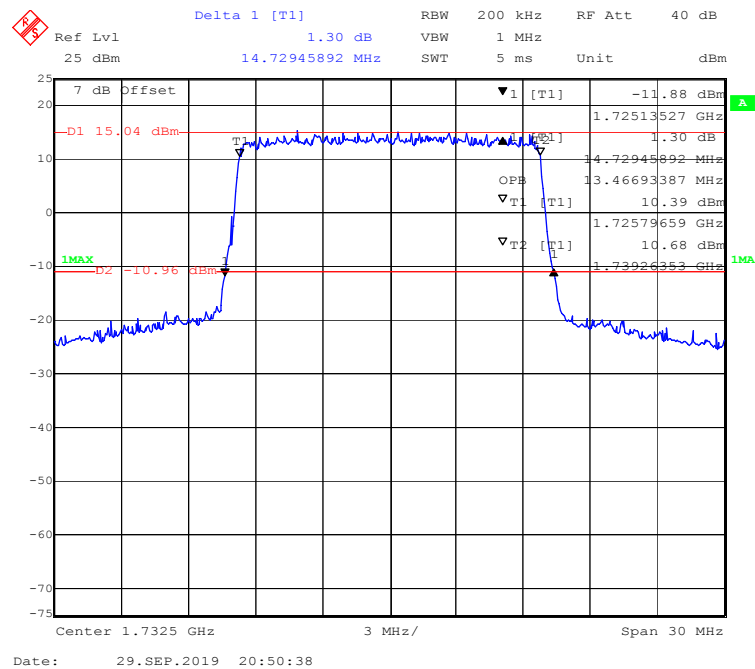
**16-QAM (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

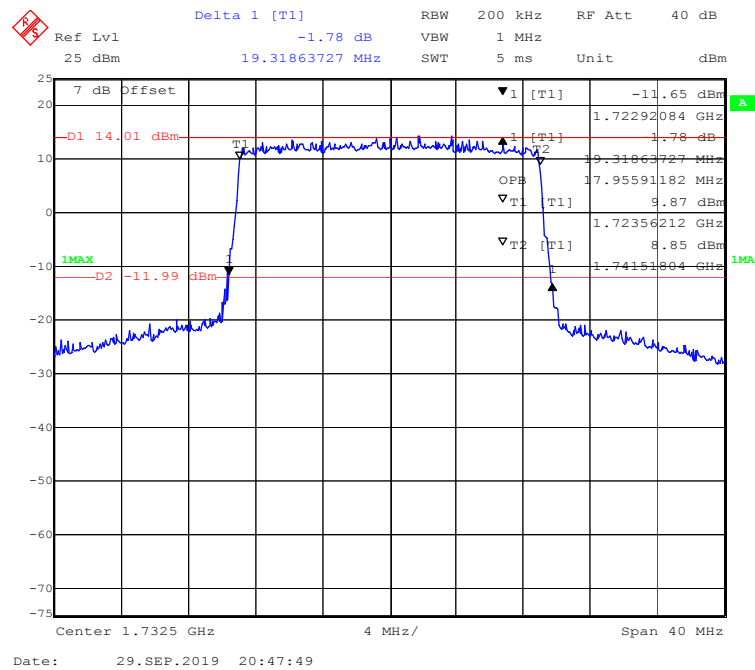
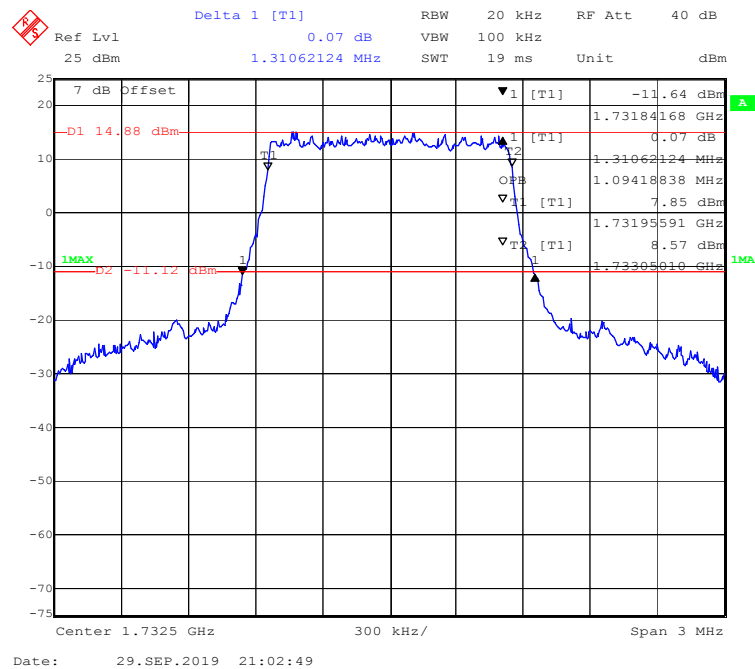
**LTE Band 4:**

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.317	1.094
	3M		2.958	2.693
	5M		4.950	4.489
	10M		9.900	8.978
	15M		14.729	13.467
	20M		19.319	17.956
16-QAM	1.4M	Middle	1.311	1.094
	3M		2.982	2.693
	5M		4.949	4.489
	10M		9.860	8.938
	15M		14.669	13.467
	20M		19.319	17.956

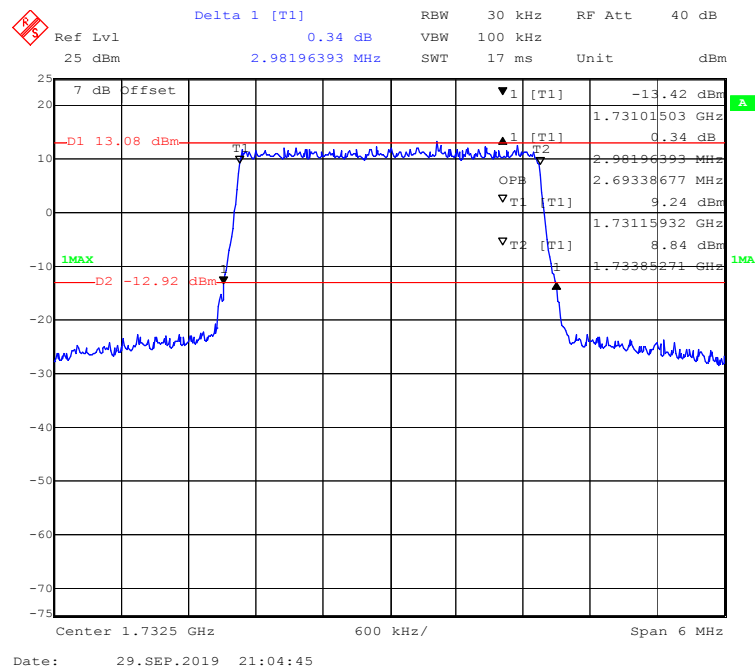
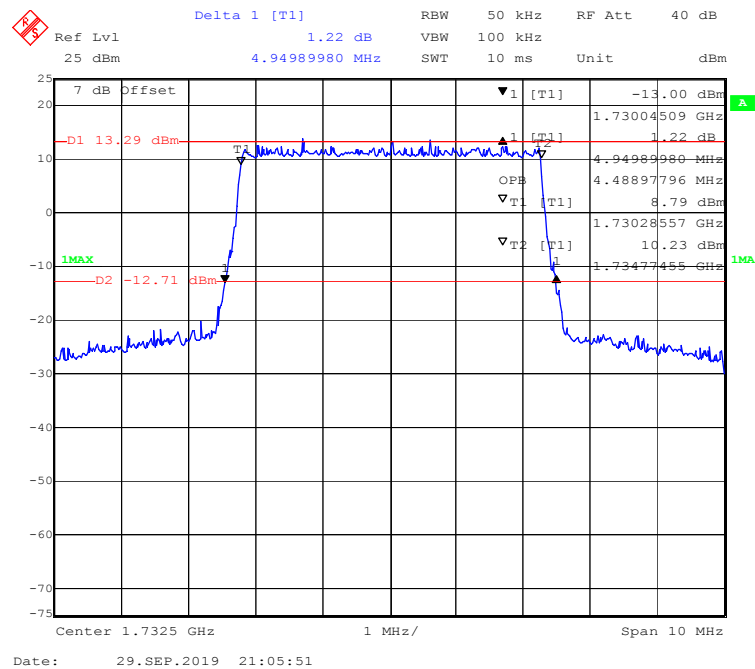
**QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

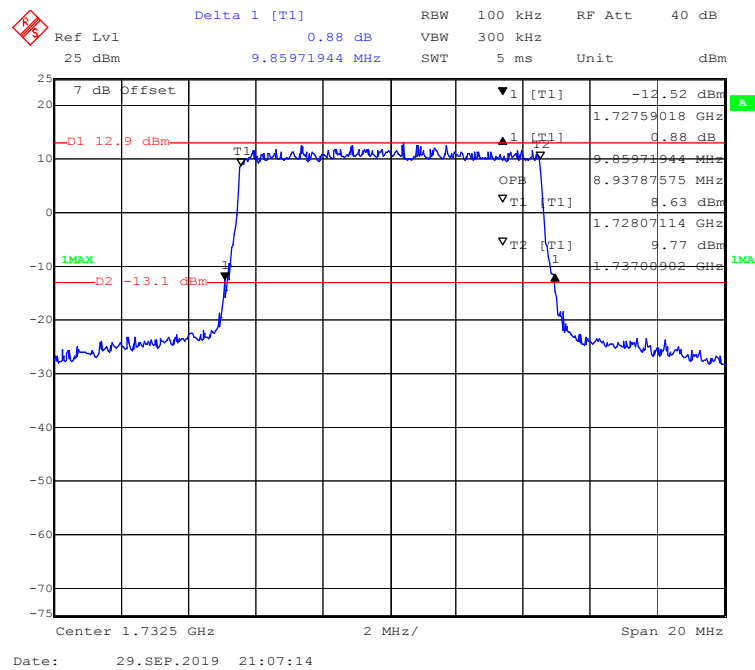
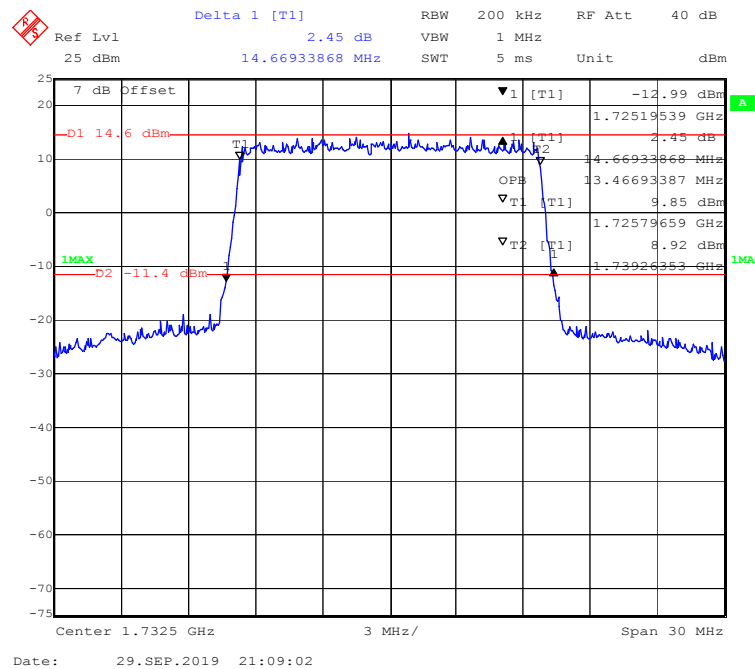
**QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (5MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

**QPSK (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

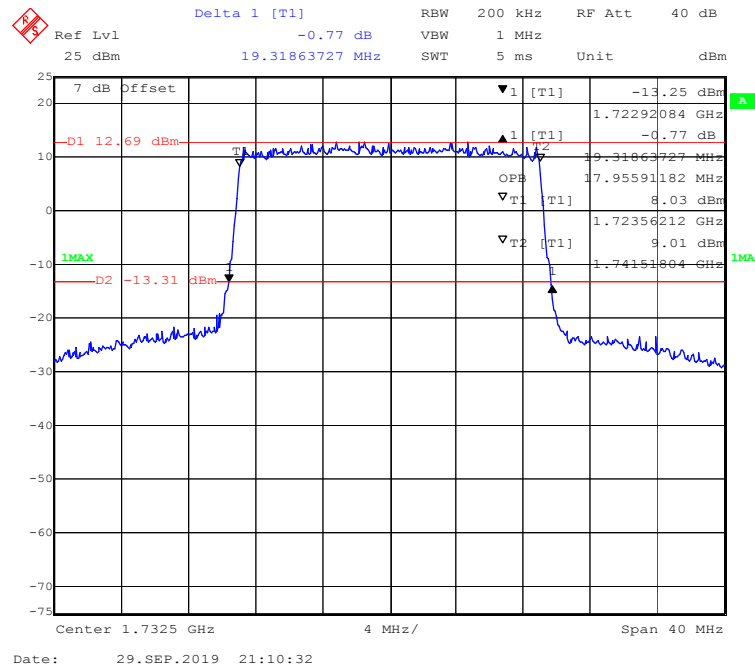
**QPSK (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



**16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

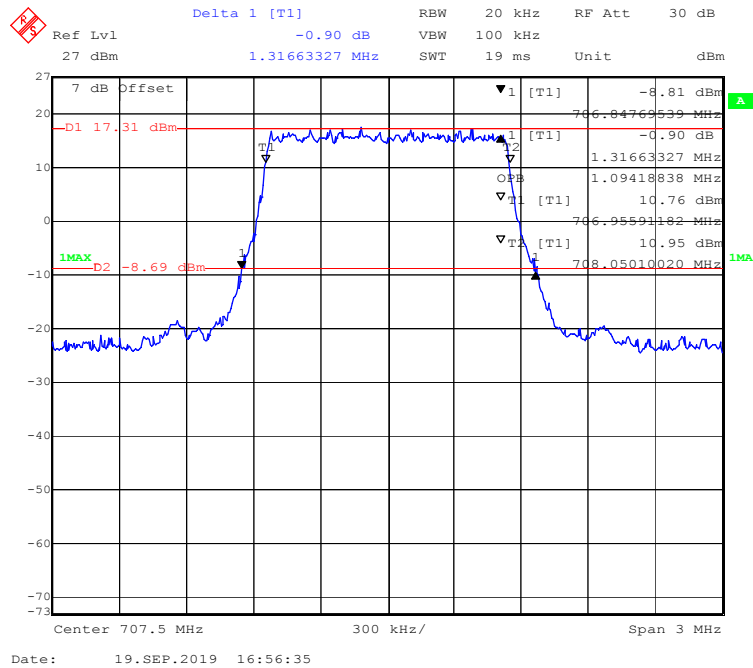
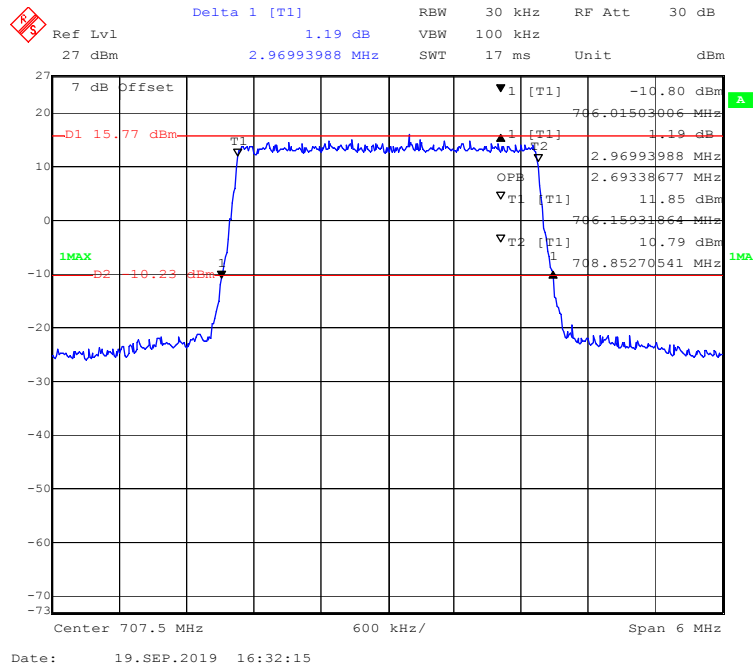
**16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

16-QAM (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



**LTE Band 12:**

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.317	1.094
	3M		2.970	2.693
	5M		4.990	4.489
	10M		9.780	8.938
16-QAM	1.4M	Middle	1.305	1.094
	3M		2.970	2.693
	5M		4.950	4.509
	10M		9.820	8.938

**QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

Delta 1 [T1]

RBW 50 kHz RF Att 30 dB

Ref Lvl 1.52 dB VBW 100 kHz

27 dBm 4.98997996 MHz SWT 10 ms Unit dBm

7 dB Offset

D1 16.49 dBm

1MAX

D2 -9.51 dBm

▼1 [T1] -10.54 dBm

705.02505010 MHz

4.98997996 MHz

4.48897796 MHz

▼T1 [T1] 12.49 dBm

705.28557114 MHz

▼T2 [T1] 12.75 dBm

709.7745910 MHz

Center 707.5 MHz 1 MHz/ Span 10 MHz

Date: 19.SEP.2019 16:48:02

Delta 1 [T1]

Ref Lvl 2.39 dB

27 dBm

9.77955912 MHz

RBW 100 kHz

VBW 300 kHz

SWT 5 ms

RF Att 30 dB

Unit dBm

7 dB Offset

D1 16.22 dBm

T1

1 [T1]

2.39 dB

9.77955912 MHz

OPB

8.93787575 MHz

T1 [T1]

12.15 dBm

703.07114228 MHz

T2 [T1]

11.60 dBm

712.00901804 MHz

1MAX

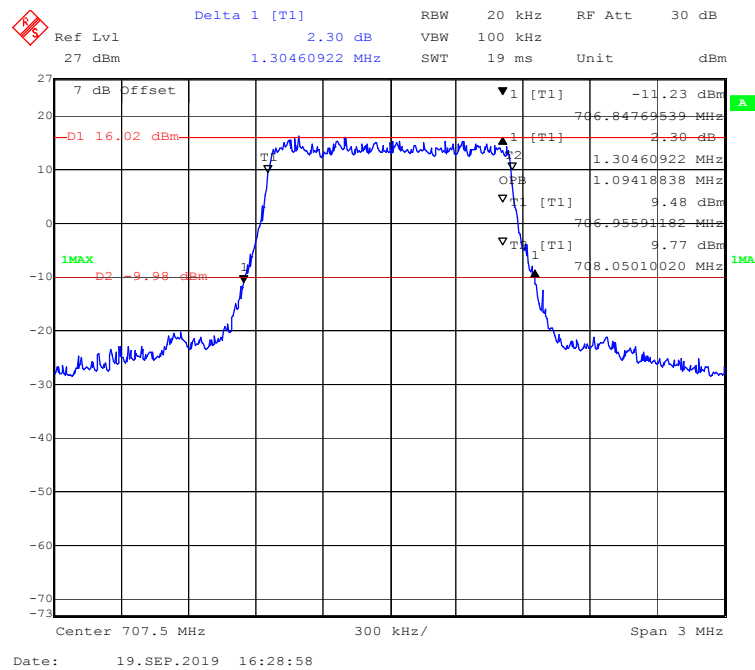
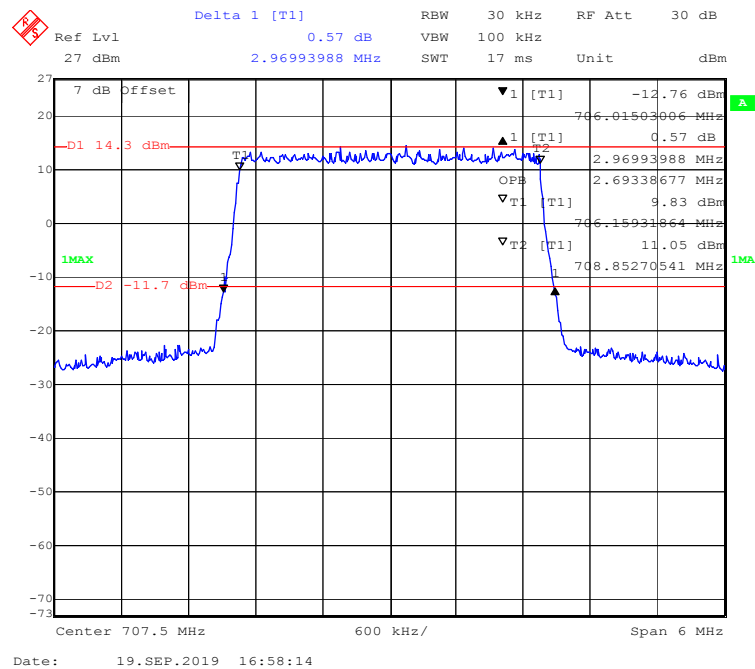
D2 -9.78 dBm

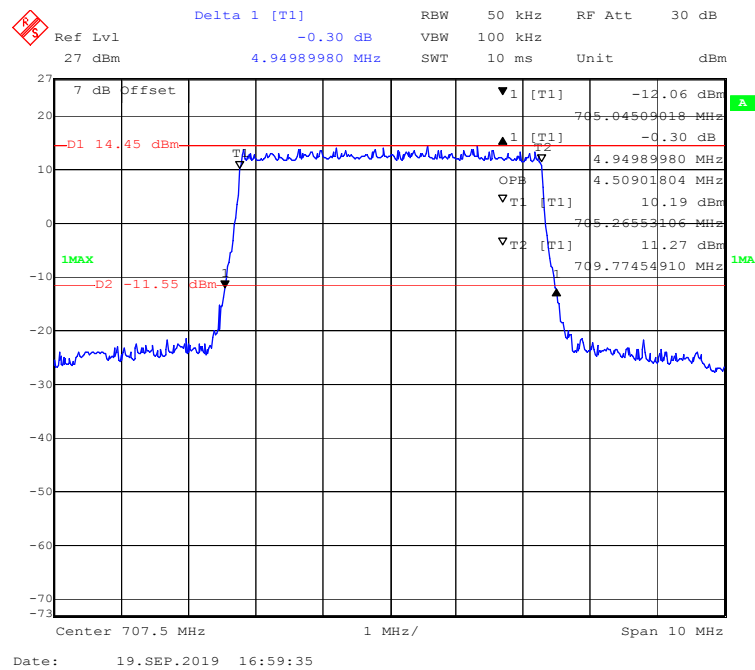
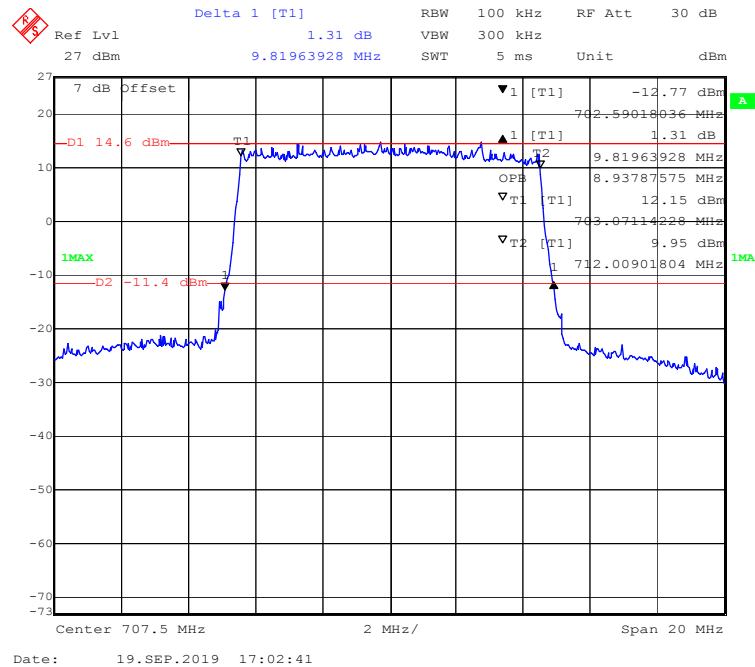
Center 707.5 MHz

2 MHz/

Span 20 MHz

Date: 19.SEP.2019 16:50:02

**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

**16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**



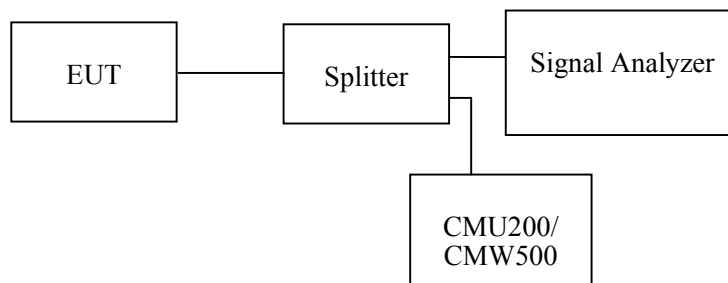
**FCC § 2.1051; § 22.917 (a); § 24.238 (a) § 27.53 (g) (h); - SPURIOUS EMISSIONS AT ANTENNA TERMINALS****Applicable Standards**

FCC §2.1051, §22.917(a) and §24.238(a) and §27.53 (g) (h).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

**Test Procedure**

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz & 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	23.5°C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.1kPa

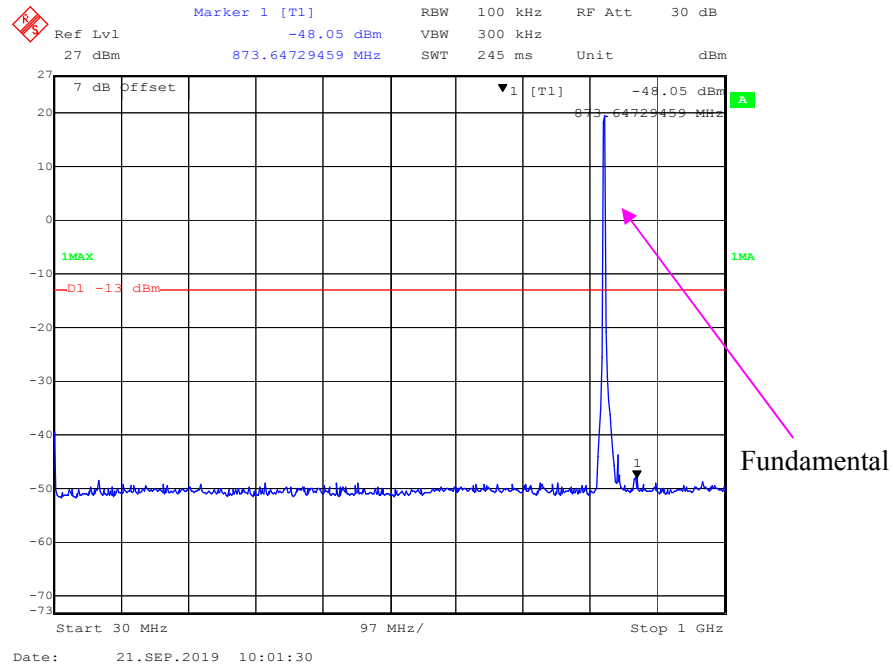
*The testing was performed by Jack Jiao on 2019-09-21.*

*EUT operation mode: Transmitting*

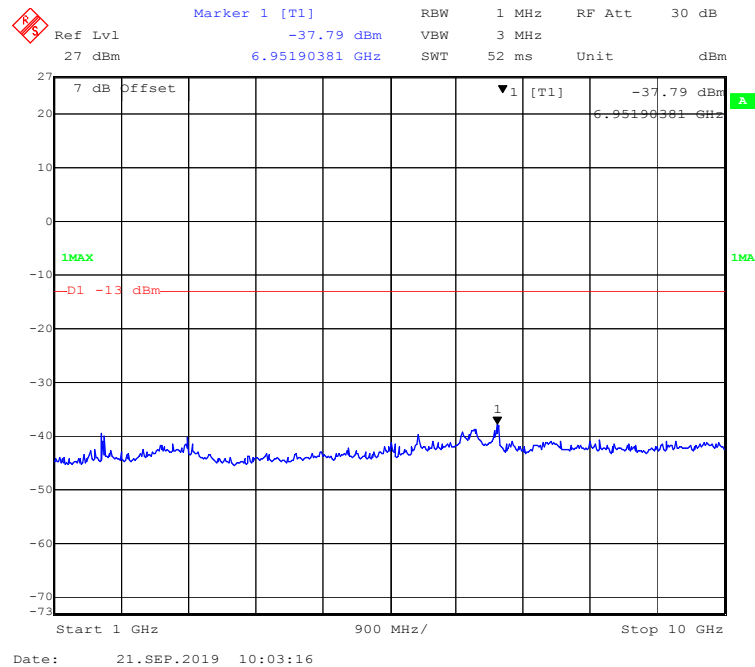
*Test Result: Compliant.*

# WCDMA Band V:

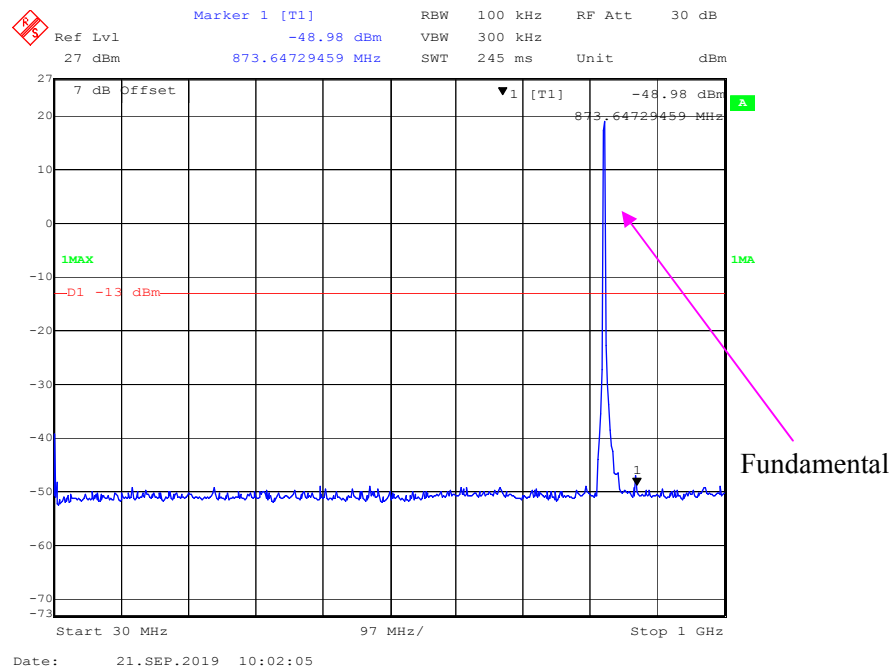
## 30 MHz – 1GHz WCDMA (Rel 99) Mode, Middle channel



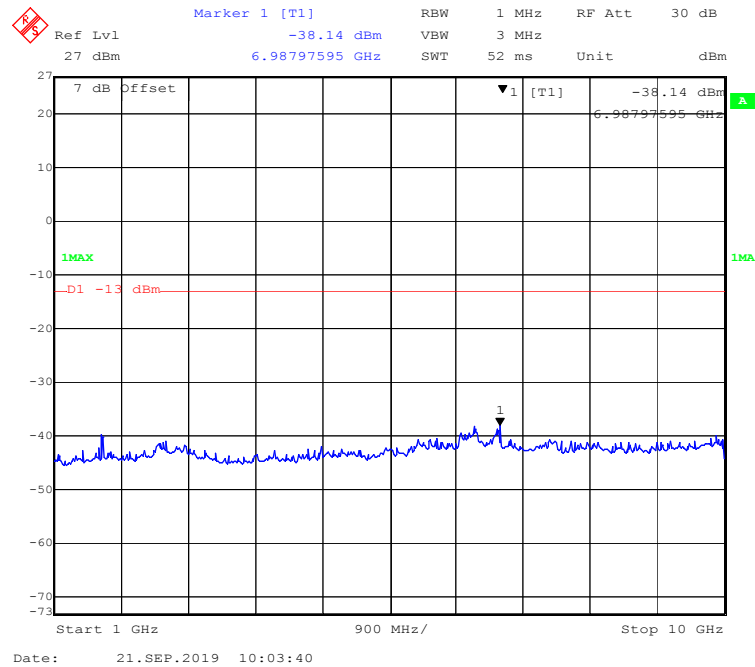
## 1 GHz – 10 GHz WCDMA (Rel 99) Mode, Middle channel



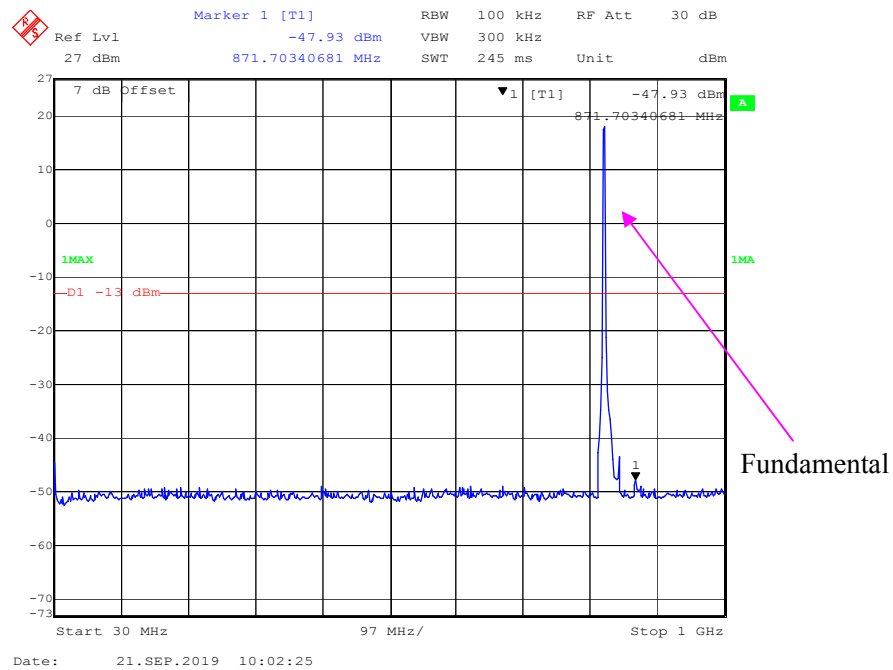
### 30 MHz – 1GHz WCDMA (HSDPA) Mode, Middle channel



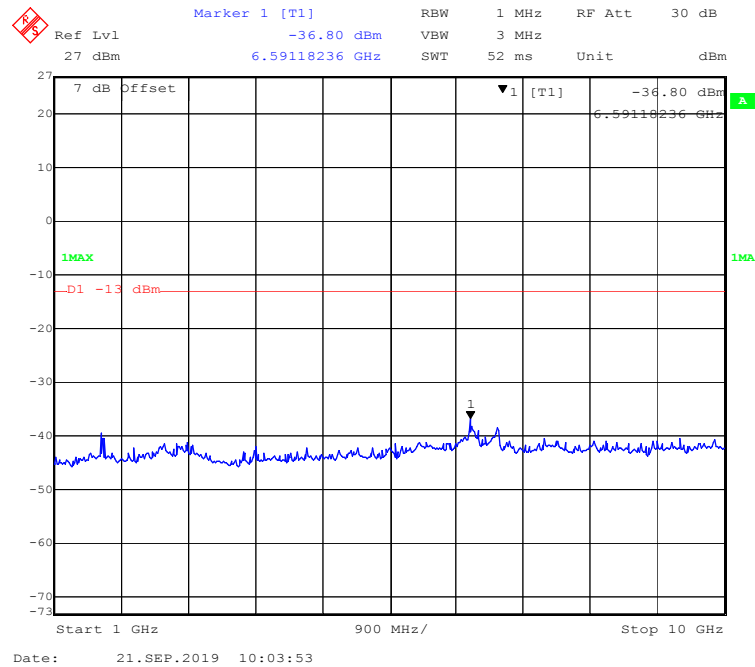
### 1 GHz – 10 GHz WCDMA (HSDPA) Mode, Middle channel



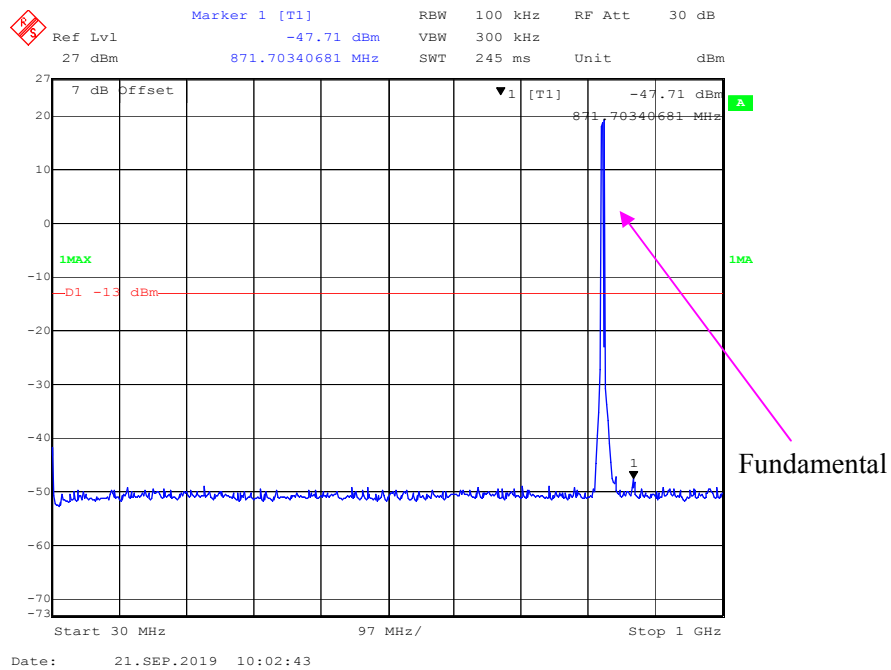
### 30 MHz – 1GHz WCDMA (HSUPA) Mode, Middle channel



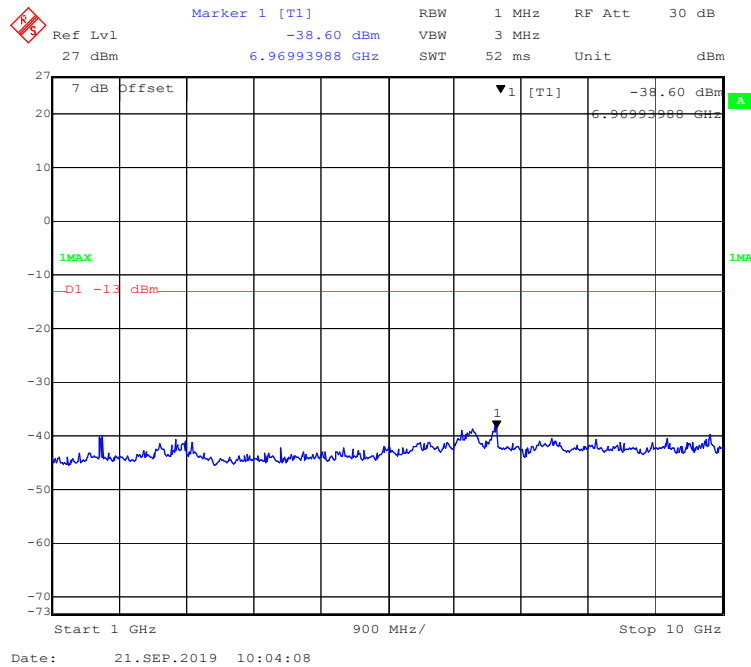
### 1 GHz – 10 GHz WCDMA (HSUPA) Mode, Middle channel



### 30 MHz – 1GHz WCDMA (HSPA+) Mode, Middle channel

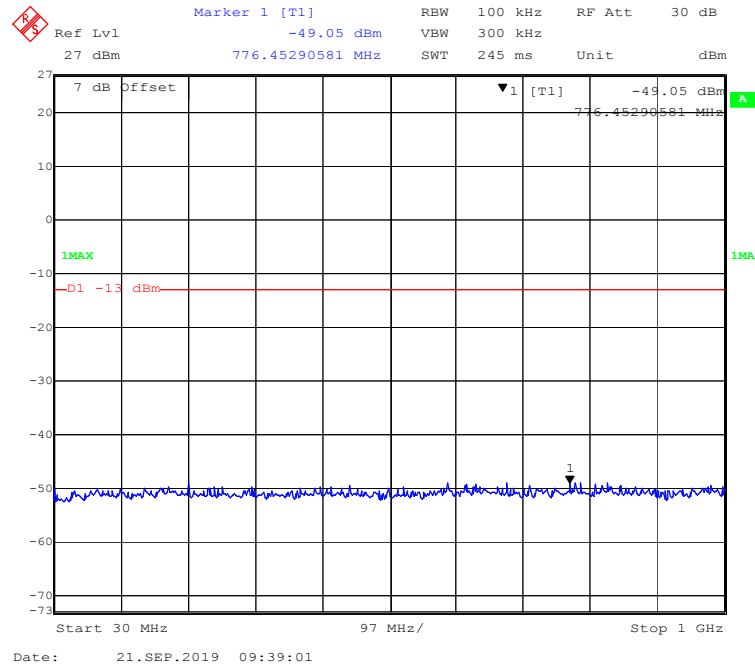


### 1 GHz – 10 GHz WCDMA (HSPA+) Mode, Middle channel

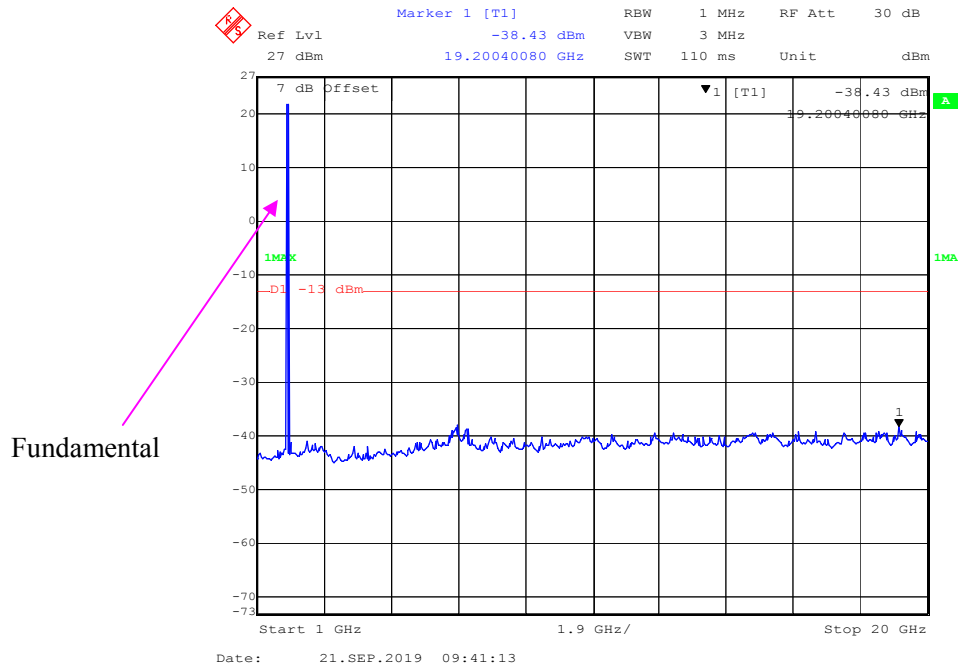


## WCDMA Band II:

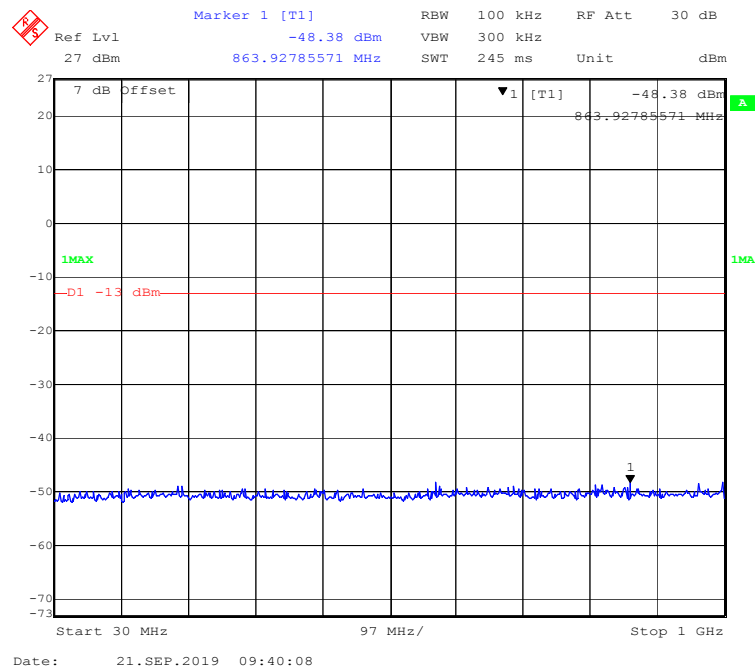
### 30 MHz – 1GHz WCDMA (Rel 99) Mode, Middle channel



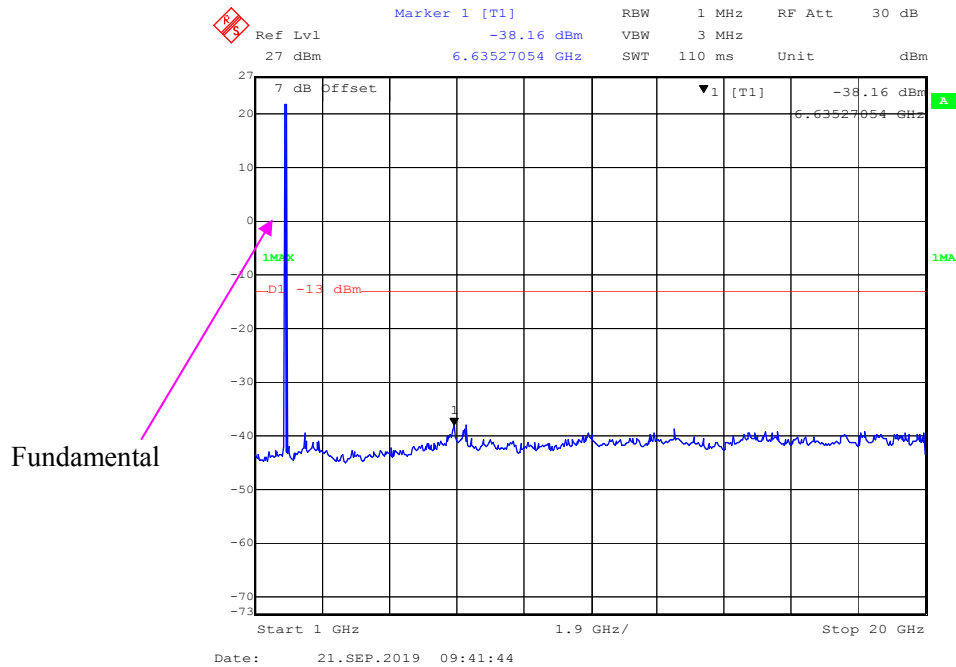
### 1 GHz – 20 GHz WCDMA (Rel 99) Mode, Middle channel



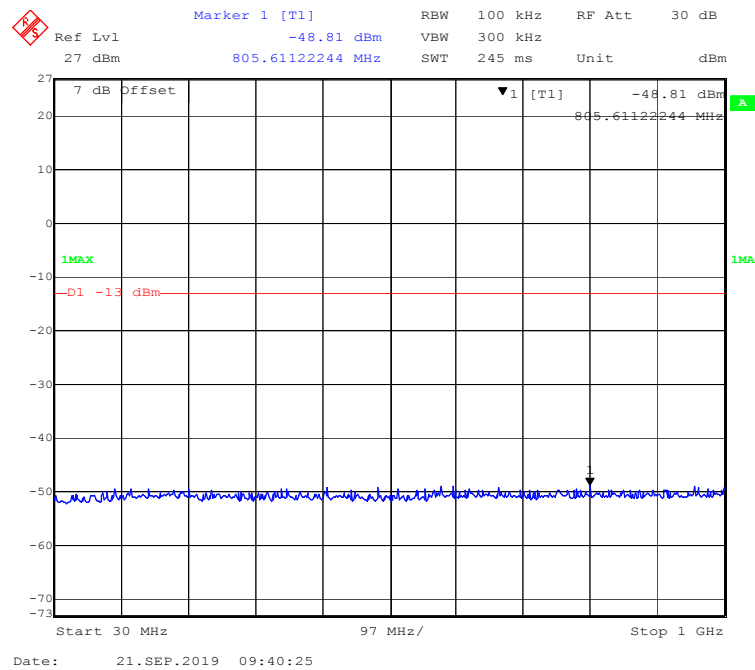
### 30 MHz – 1GHz WCDMA (HSDPA) Mode, Middle channel



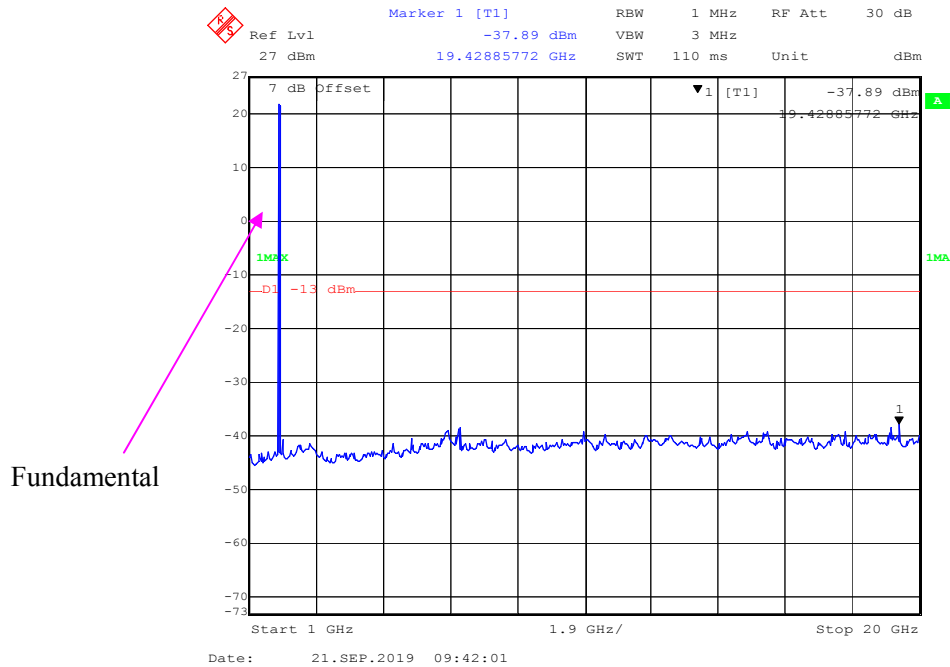
### 1 GHz – 20 GHz WCDMA (HSDPA) Mode, Middle channel



### 30 MHz – 1GHz WCDMA (HSUPA) Mode, Middle channel

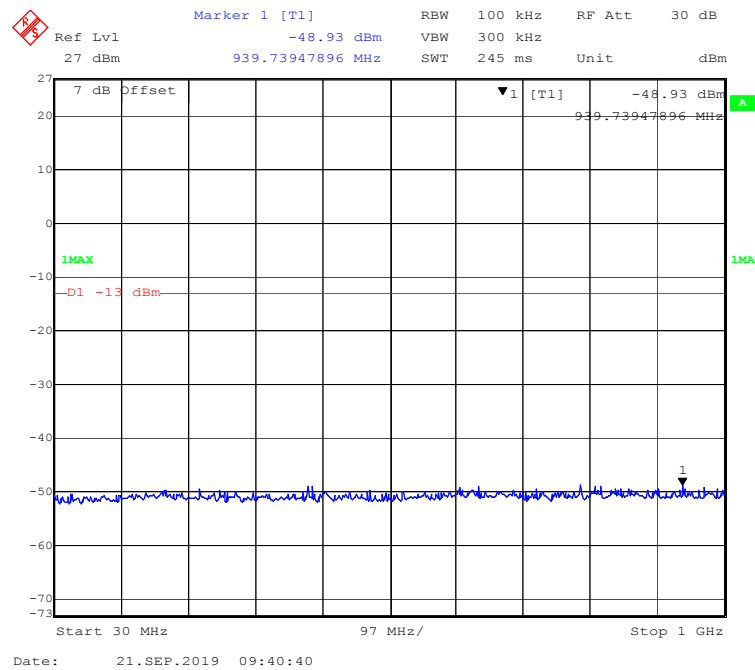


### 1 GHz – 20 GHz WCDMA (HSUPA) Mode, Middle channel

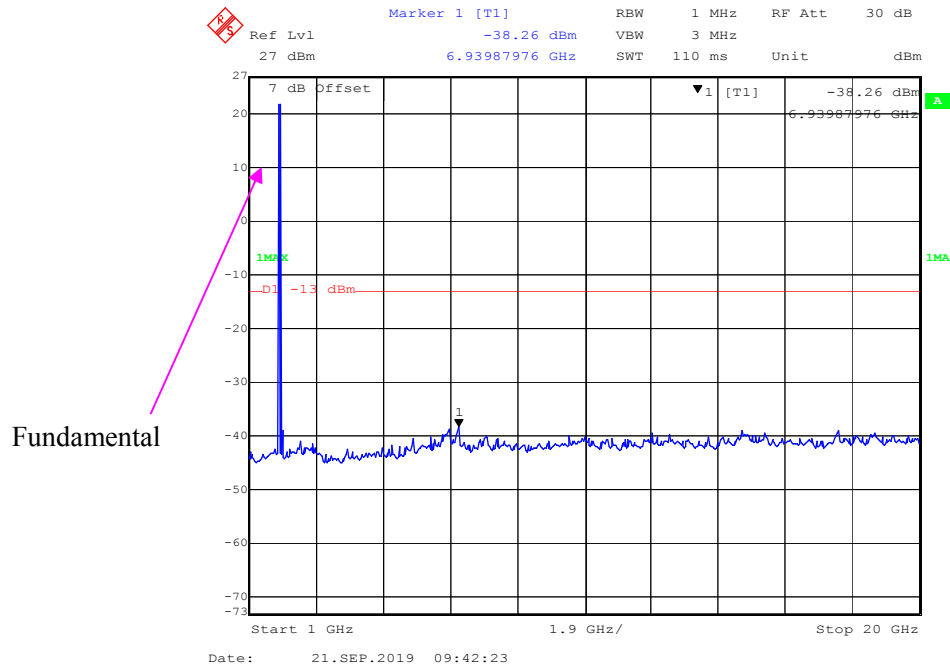




### 30 MHz – 1GHz WCDMA (HSPA+) Mode, Middle channel

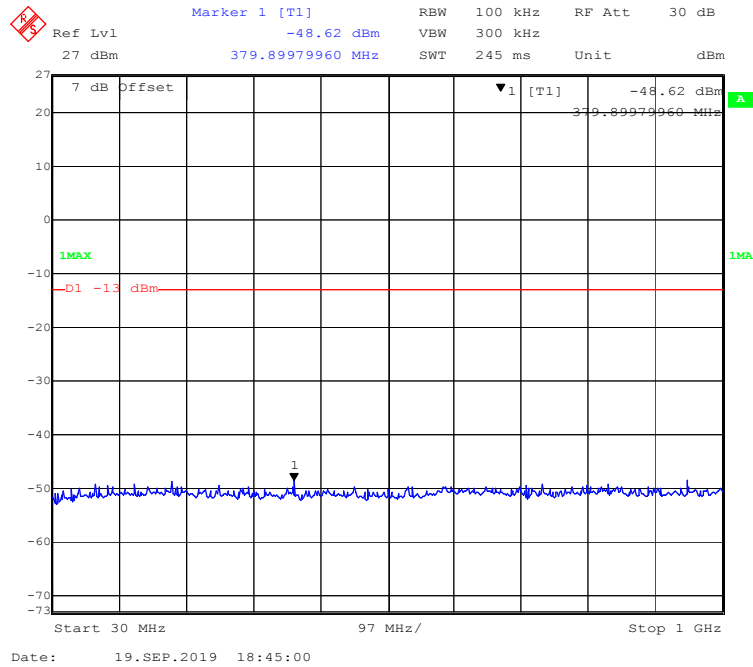


### 1 GHz – 20 GHz WCDMA (HSPA+) Mode, Middle channel

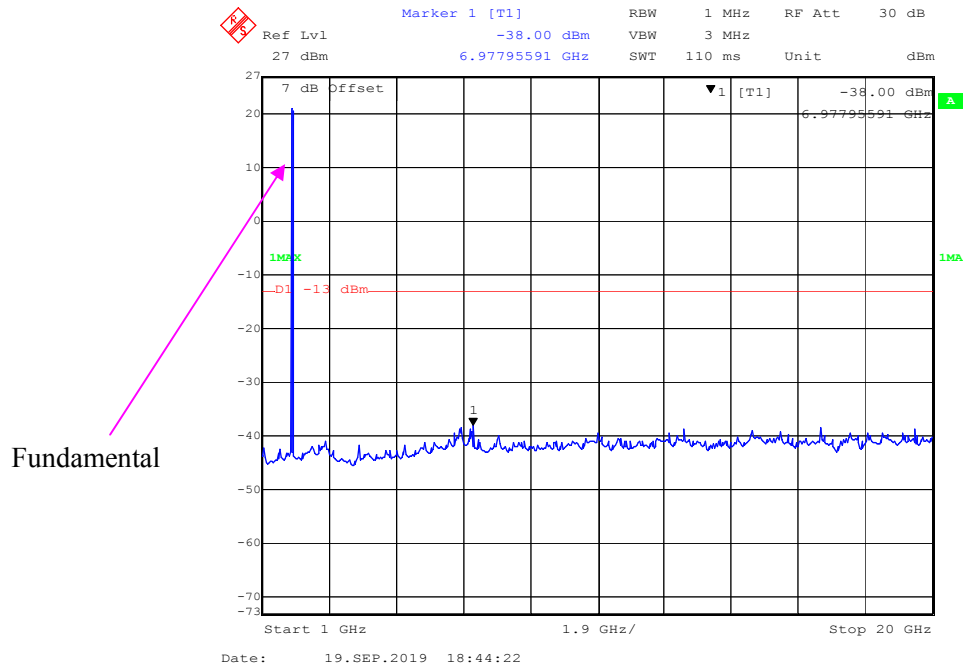


## LTE Band 2:

### 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)



### 1 GHz – 20 GHz (1.4 MHz, QPSK, Middle Channel)



Marker 1 [T1] -48.60 dBm

Ref Lvl 27 dBm

88.31663327 MHz

RBW 100 kHz RF Att 30 dB

VBW 300 kHz

SWT 245 ms

Unit dBm

7 dB Offset

▼ 1 [T1] -48.60 dBm

88.31663327 MHz

1MAX

-D1 -13 dBm

1

Start 30 MHz 97 MHz/ Stop 1 GHz

Date: 19.SEP.2019 18:45:50

Ref Lvl 27 dBm Marker 1 [T1] -38.67 dBm RBW 1 MHz RF Att 30 dB  
 VBW 3 MHz  
 SWT 110 ms Unit dBm

7 dB Offset ▼1 [T1] -38.67 dBm  
 6.97795591 GHz

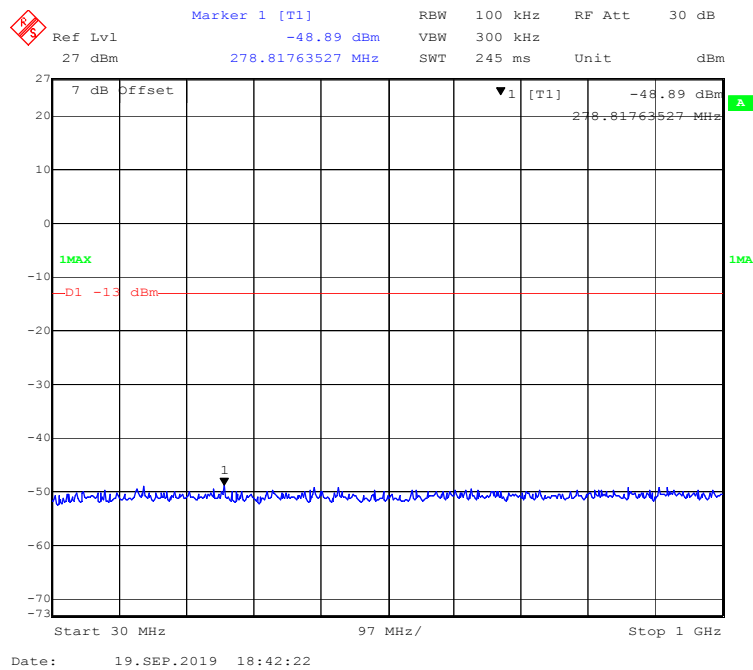
1MAX  
 -13 dBm

1

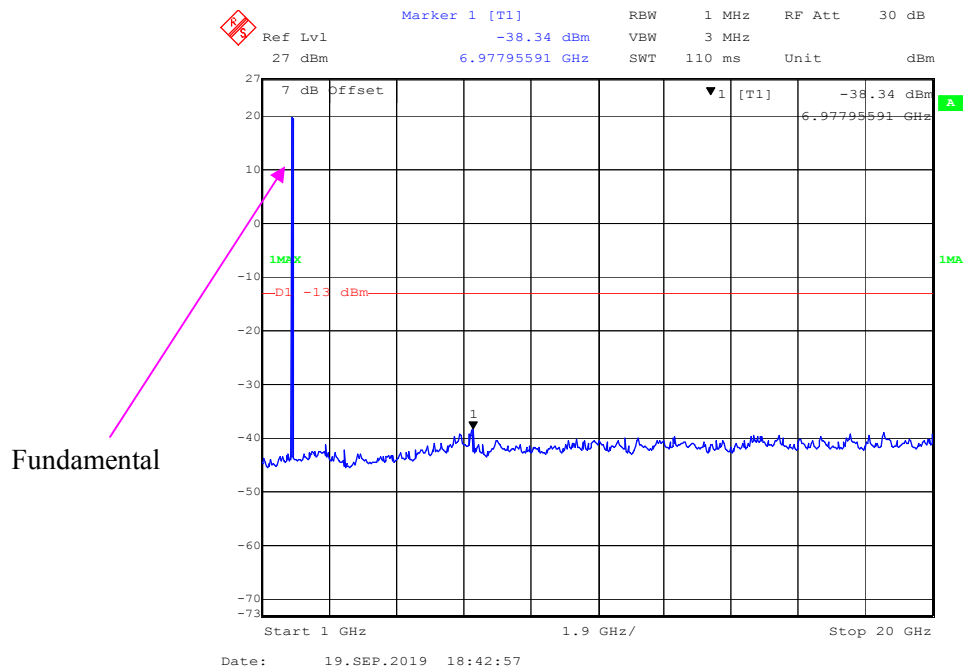
Start 1 GHz 1.9 GHz/ Stop 20 GHz

Date: 19.SEP.2019 18:43:50

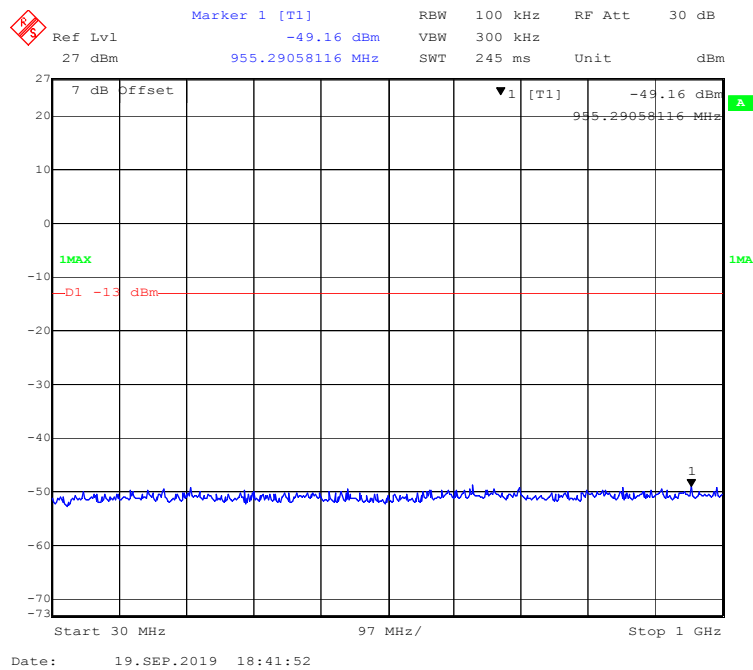
### 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)



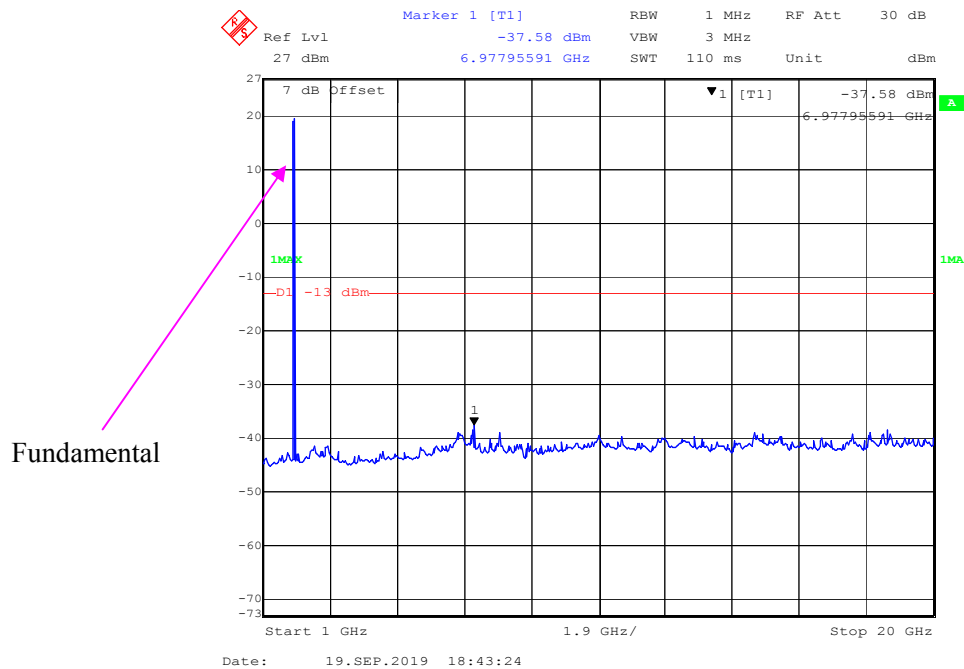
### 1 GHz – 20 GHz (3 MHz, QPSK, Middle Channel)



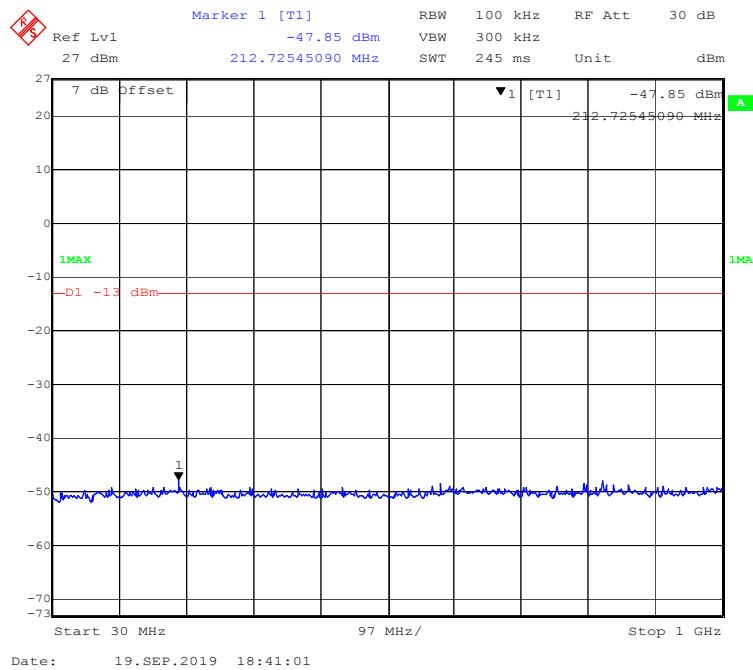
### 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



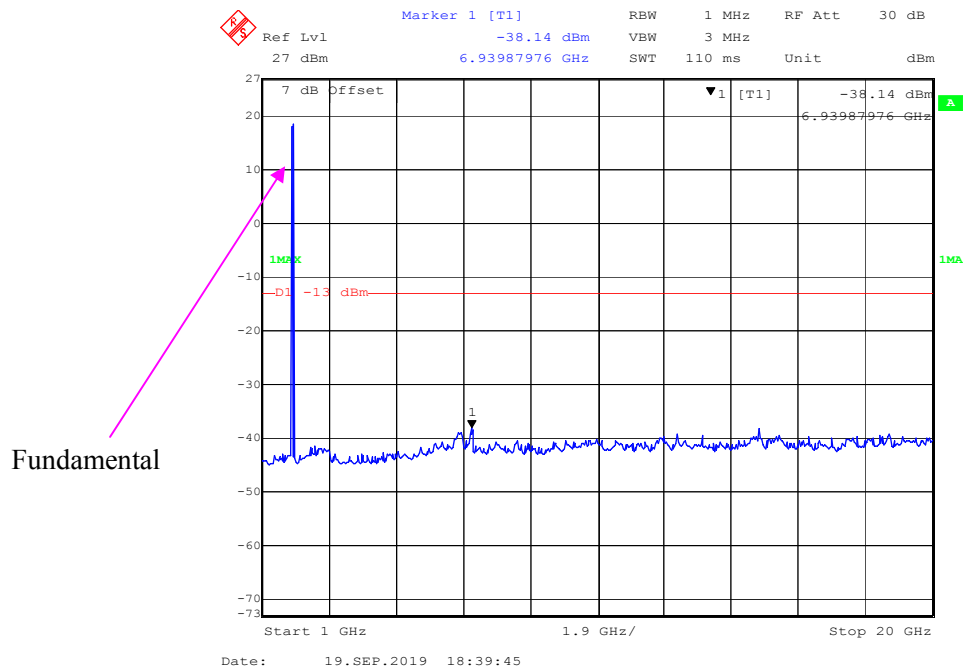
### 1 GHz – 20 GHz (3 MHz, 16-QAM, Middle Channel)



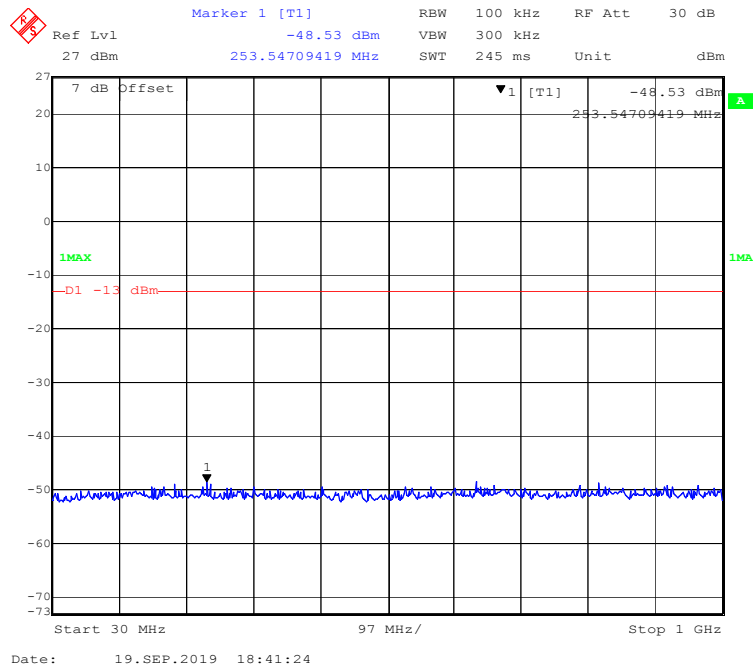
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



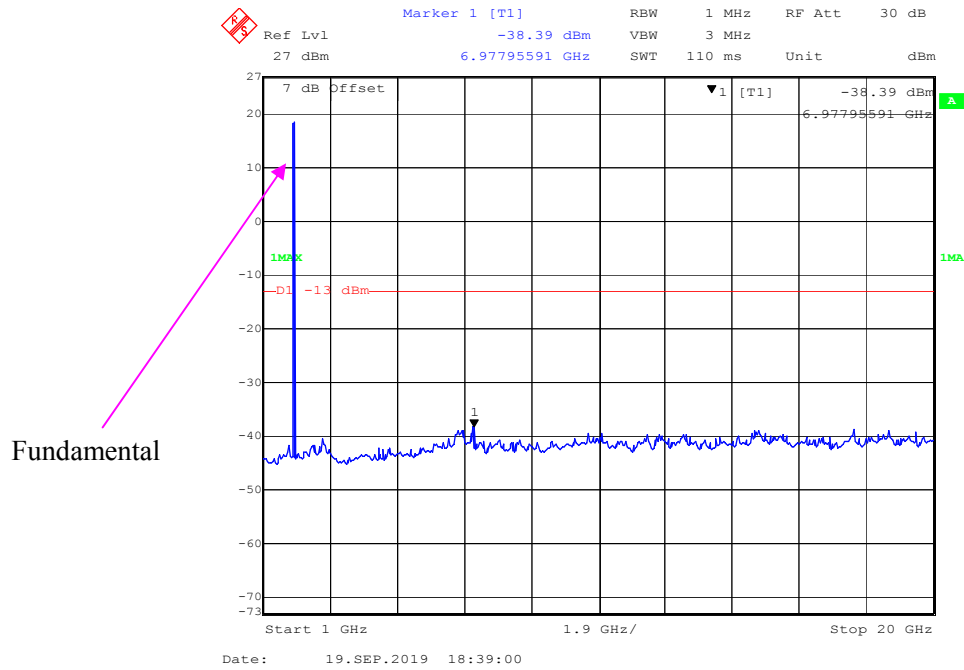
### 1 GHz – 20 GHz (5 MHz, QPSK, Middle Channel)



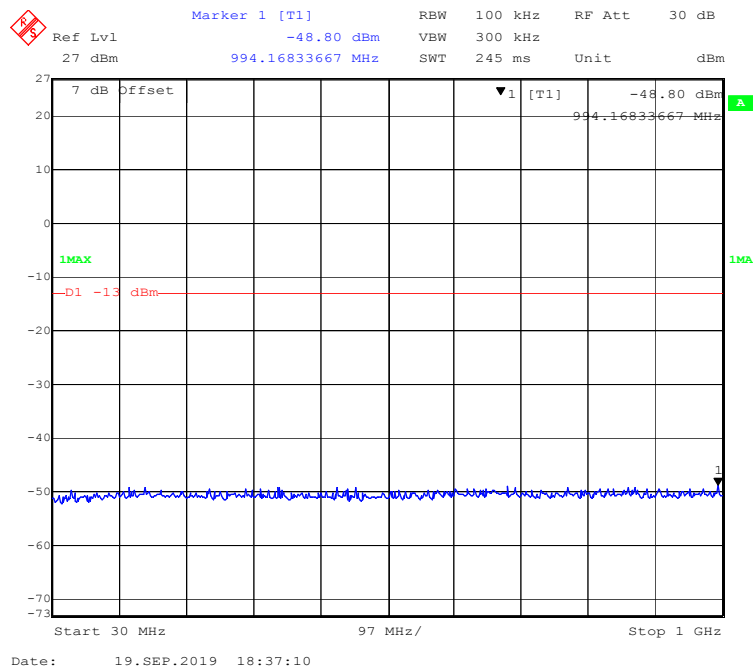
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



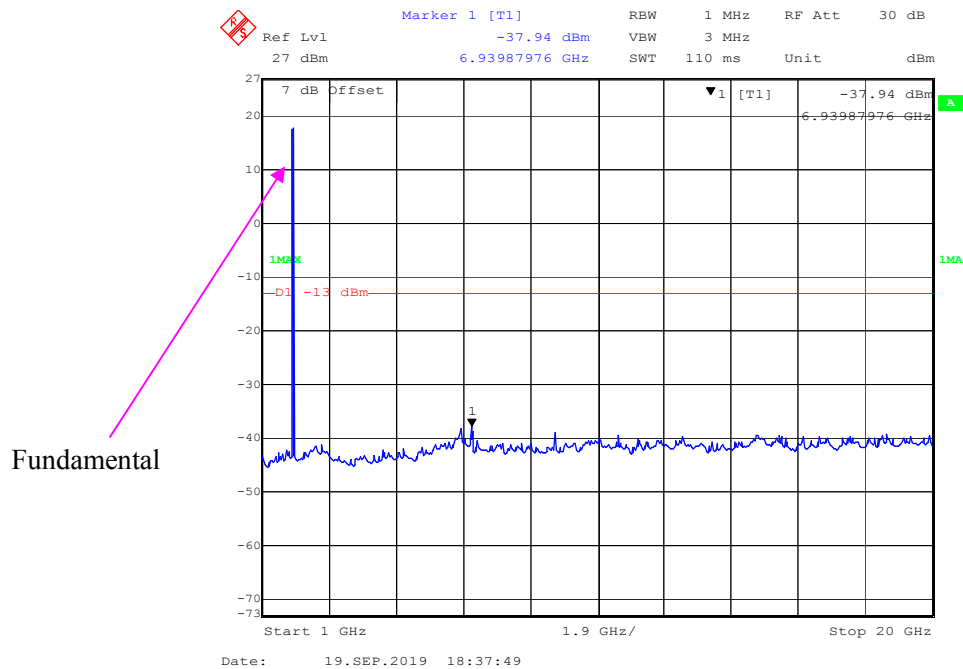
### 1 GHz – 20 GHz (5 MHz, 16-QAM, Middle Channel)



### 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)

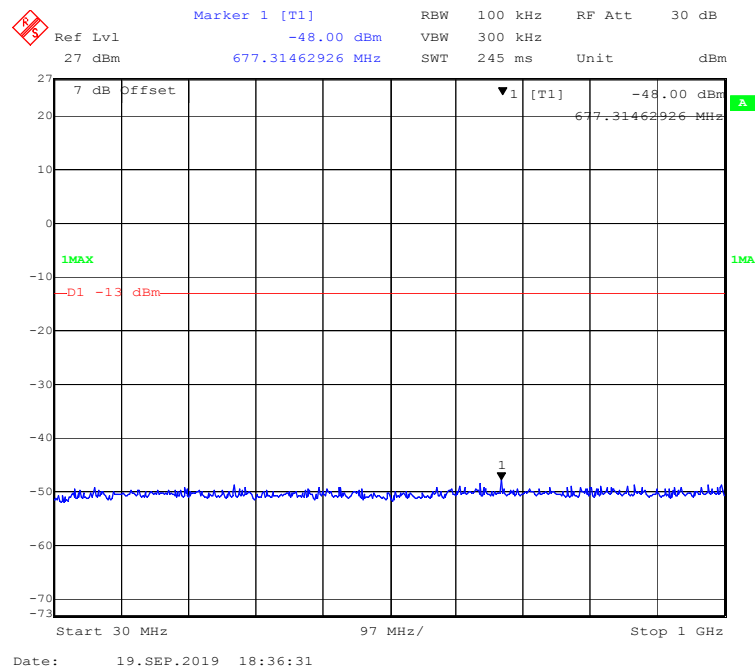


### 1 GHz – 20 GHz (10 MHz, QPSK, Middle Channel)

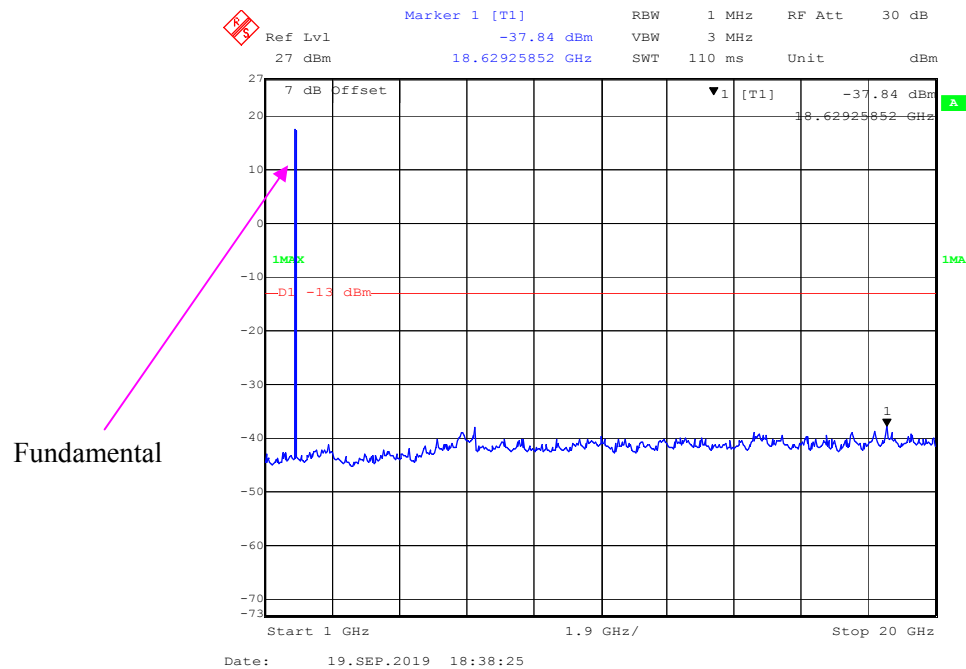




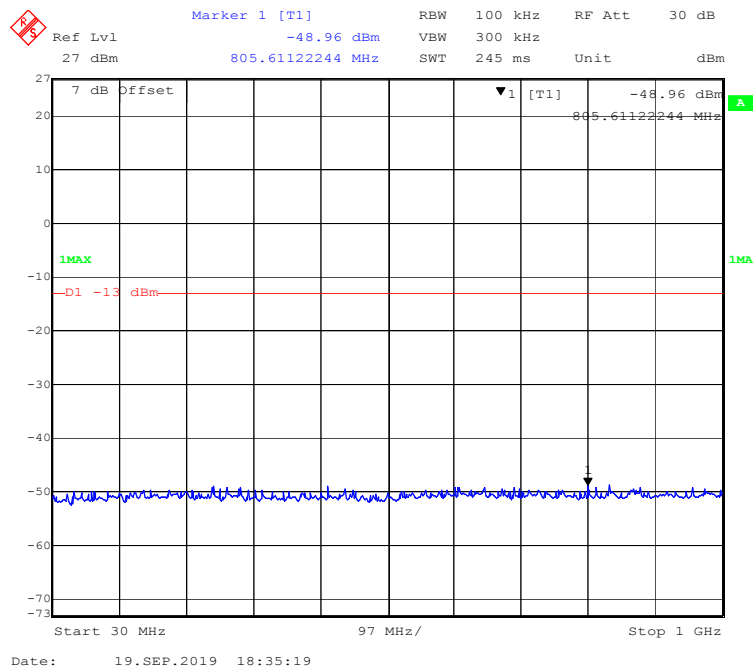
### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



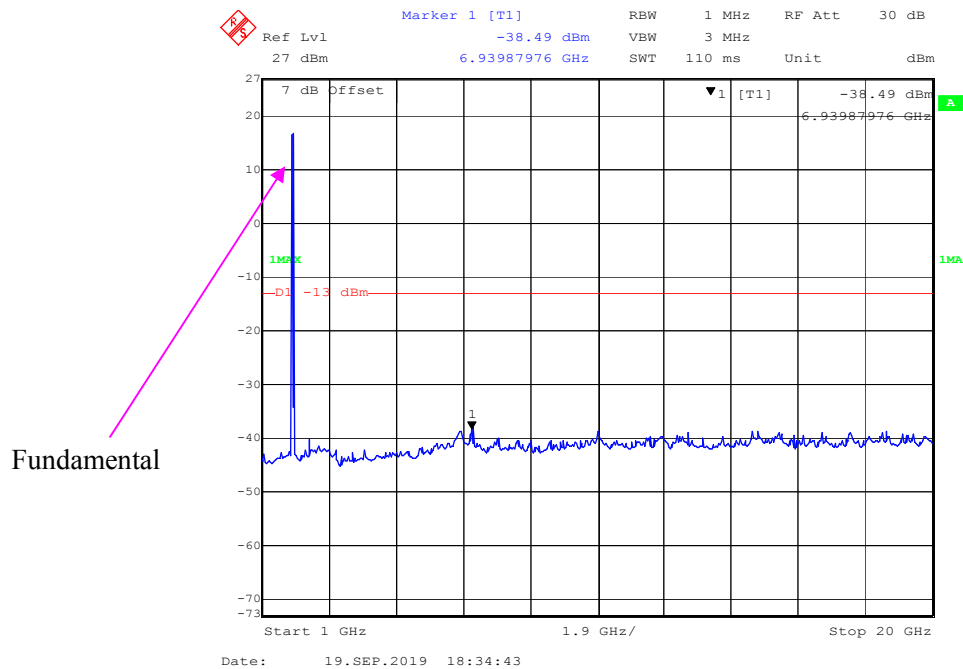
### 1 GHz – 20 GHz (10 MHz, 16-QAM, Middle Channel)



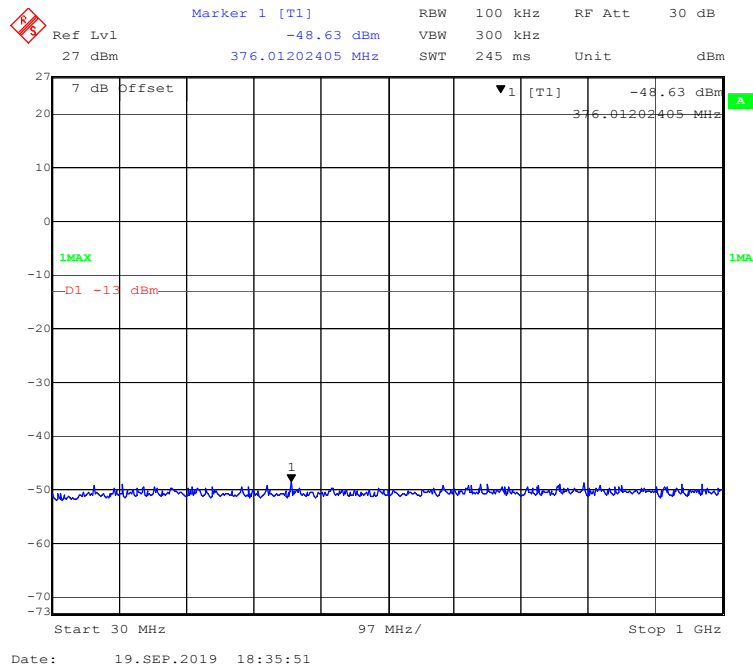
### 30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)



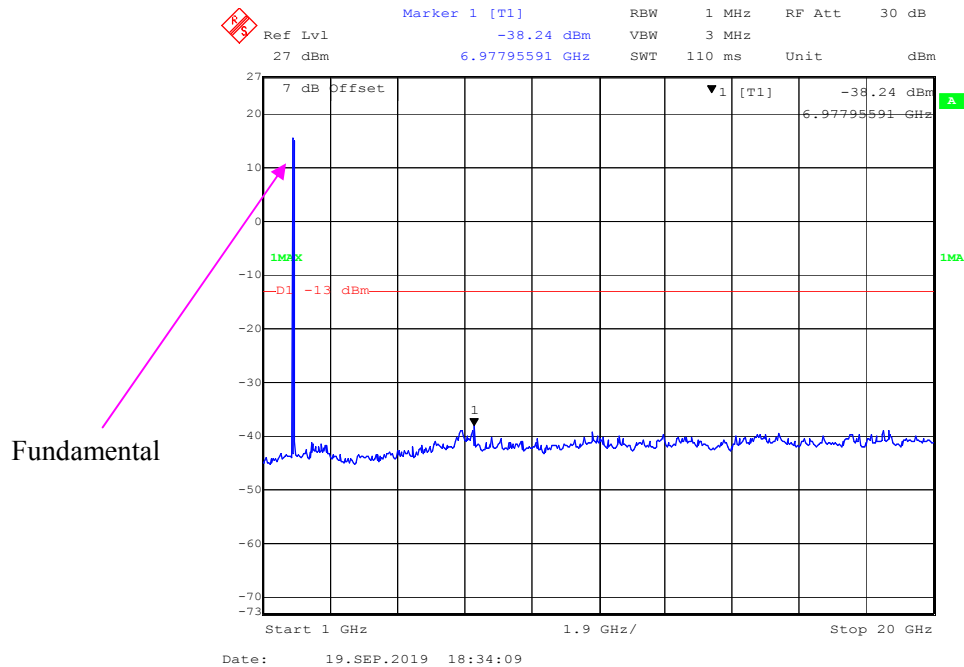
### 1 GHz – 20 GHz (15 MHz, QPSK, Middle Channel)



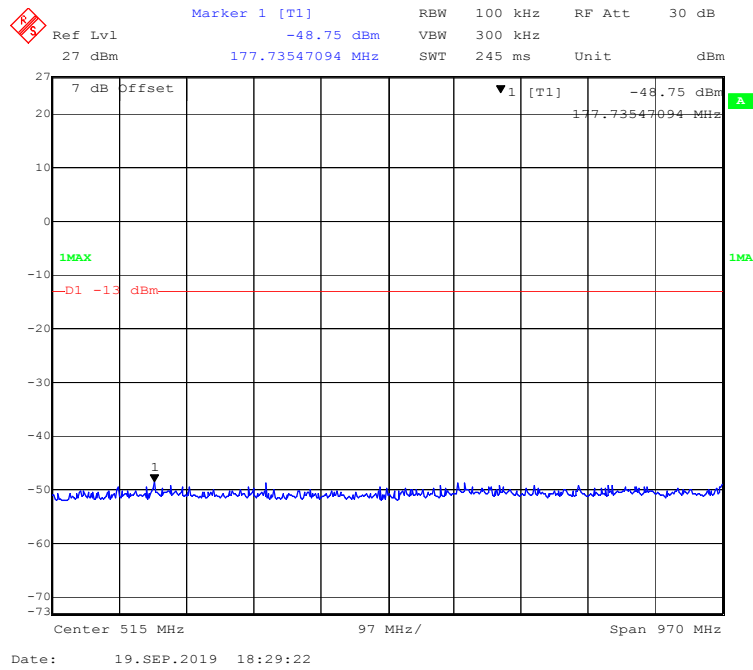
### 30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)



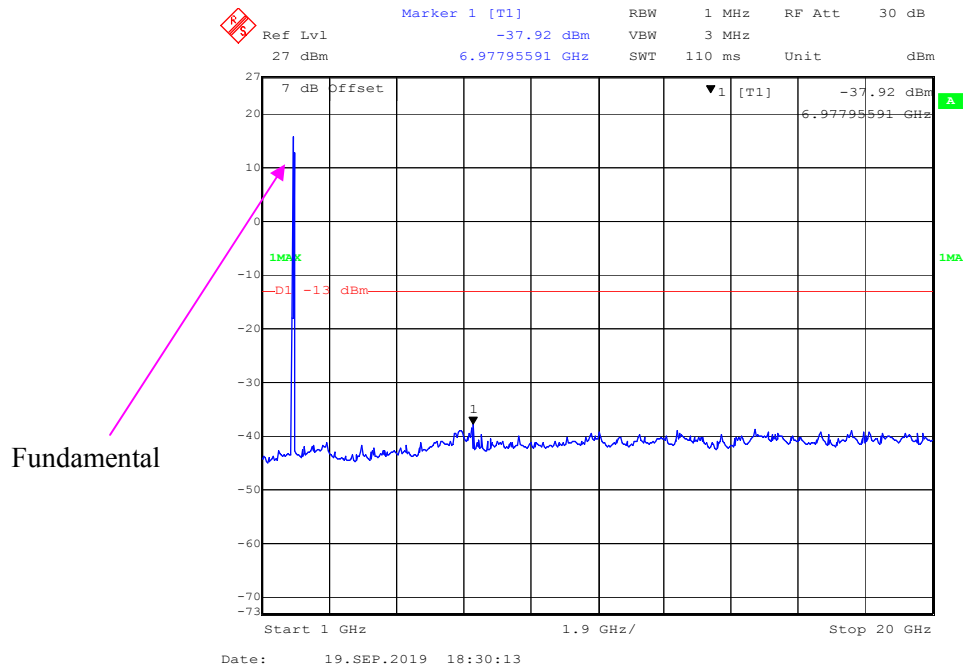
### 1 GHz – 20 GHz (15 MHz, 16-QAM, Middle Channel)



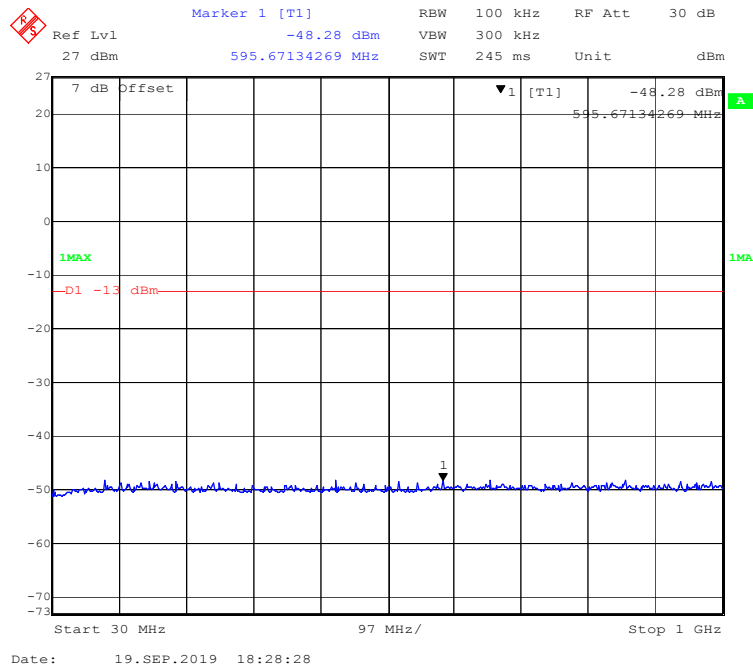
### 30 MHz - 1 GHz (20 MHz, QPSK, Middle Channel)



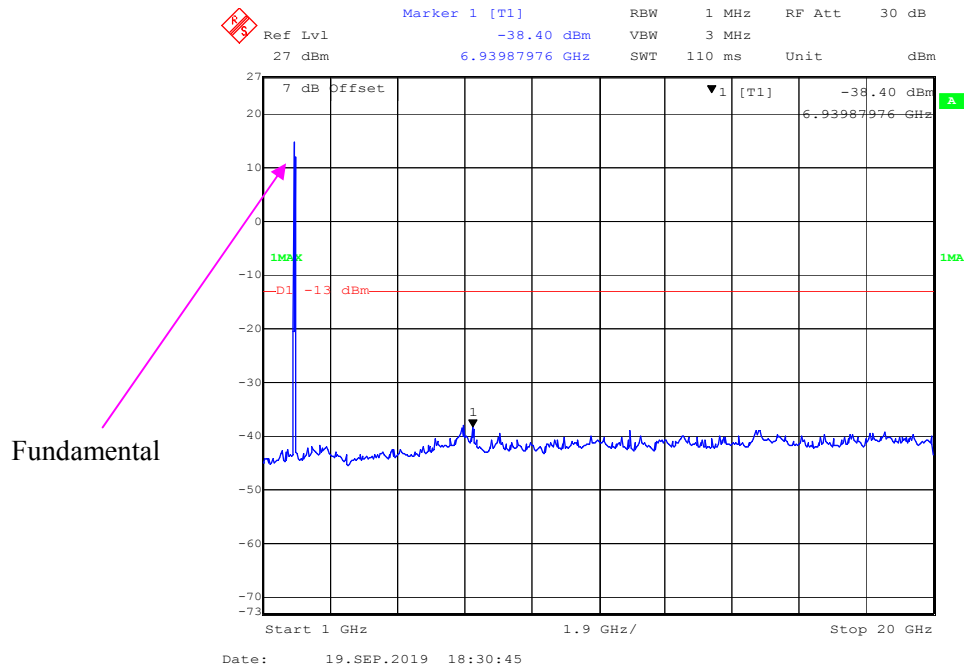
### 1 GHz – 20 GHz (20 MHz, QPSK, Middle Channel)

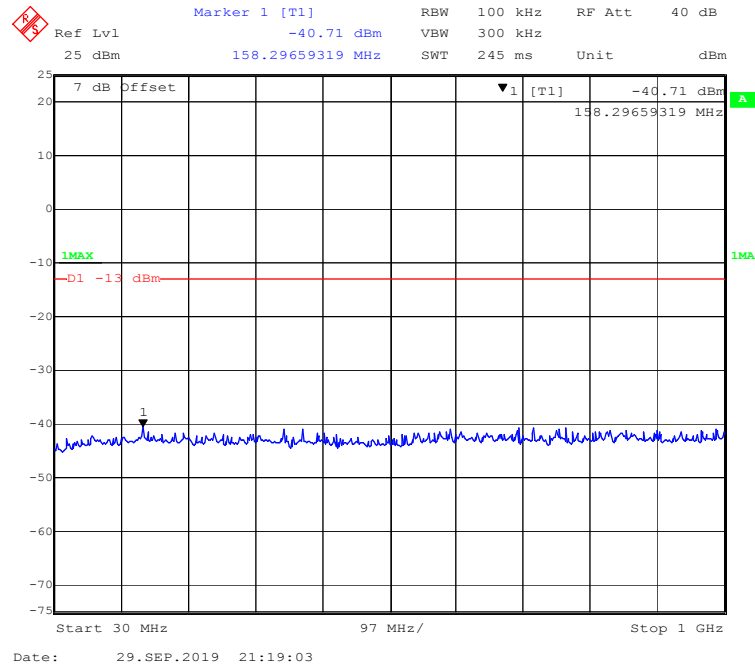
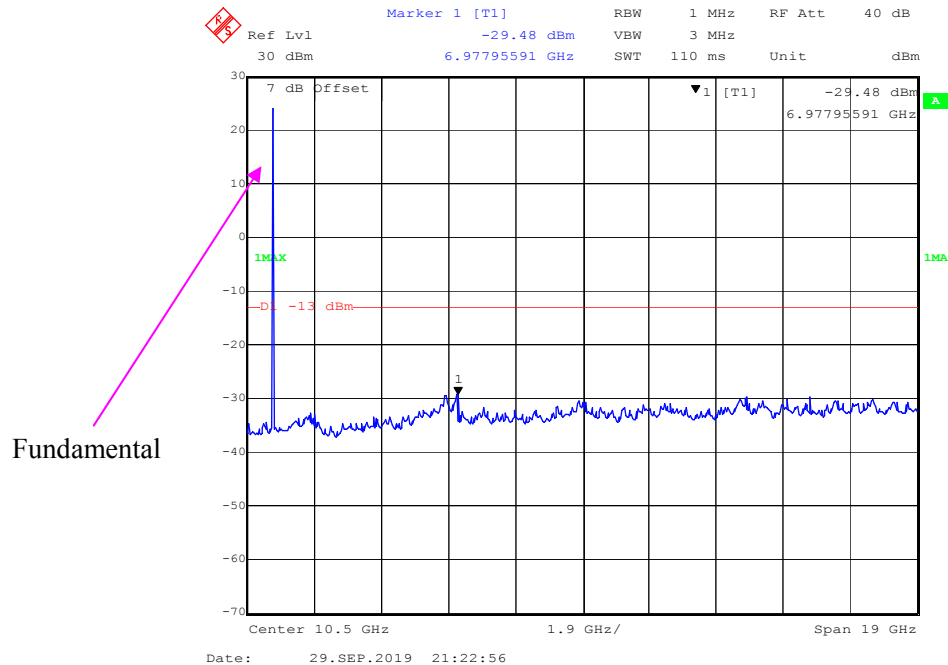


### 30 MHz - 1 GHz (20 MHz, 16-QAM, Middle Channel)

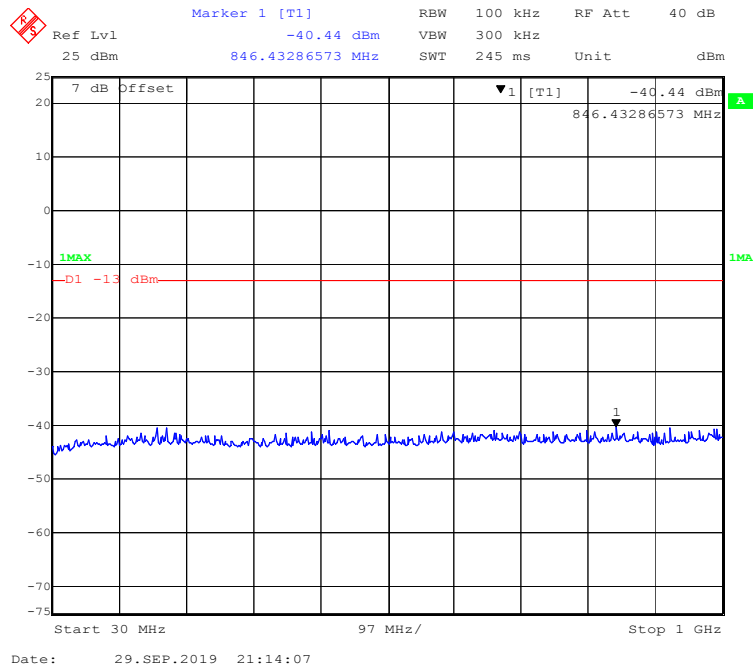


### 1 GHz – 20 GHz (20 MHz, 16-QAM, Middle Channel)

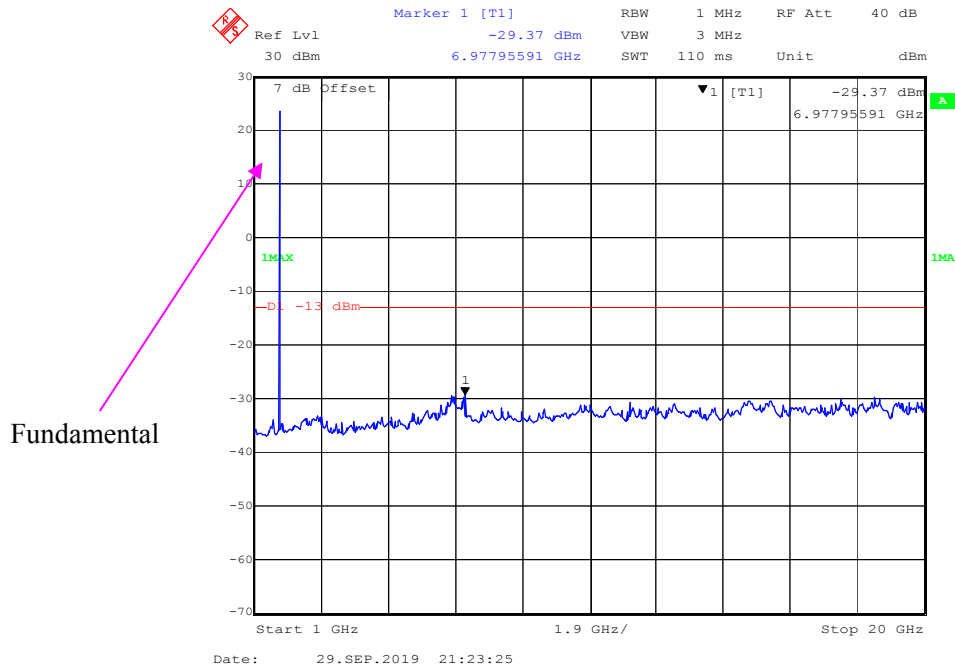


**LTE Band 4:****30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)****1 GHz - 20 GHz (1.4 MHz, QPSK, Middle Channel)**

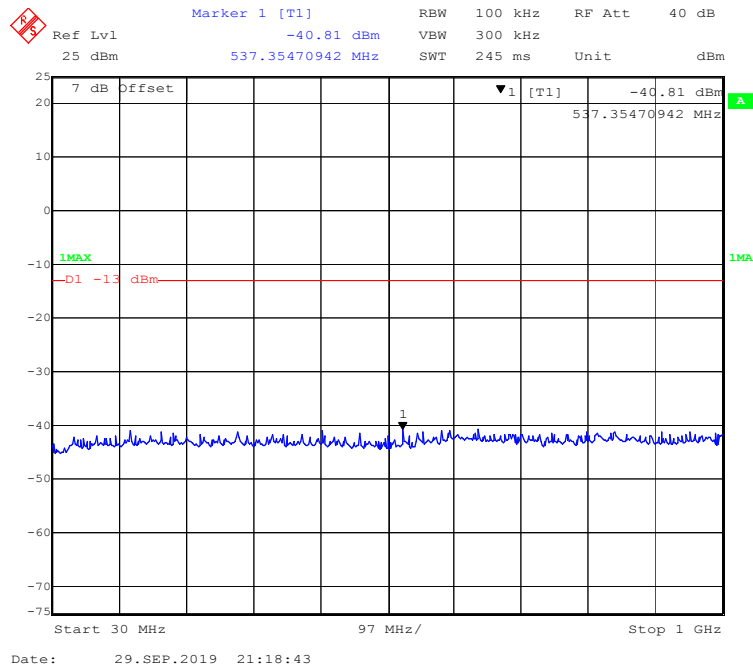
### 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



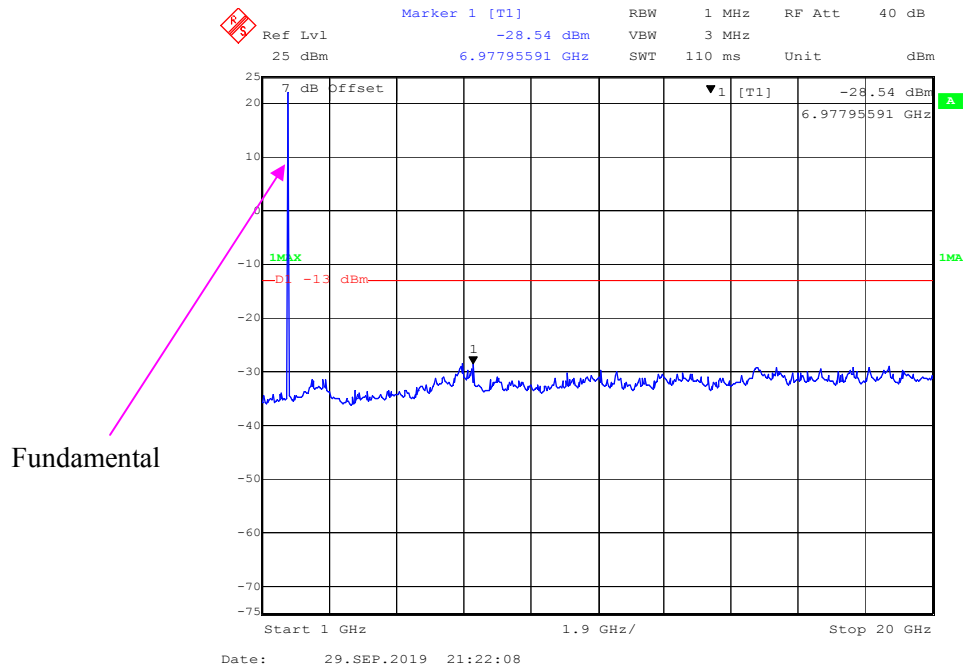
### 1 GHz – 20 GHz (1.4 MHz, 16-QAM, Middle Channel)



### 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)

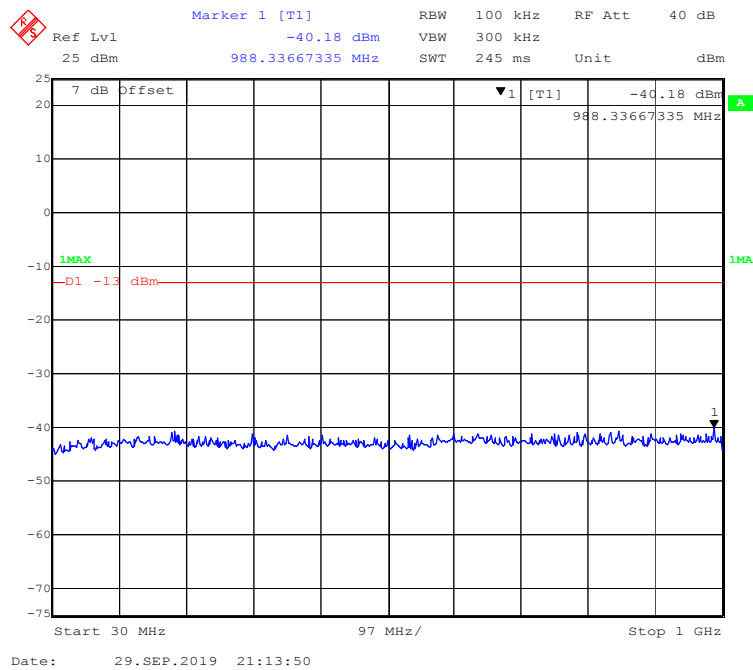


### 1 GHz – 20 GHz (3 MHz, QPSK, Middle Channel)

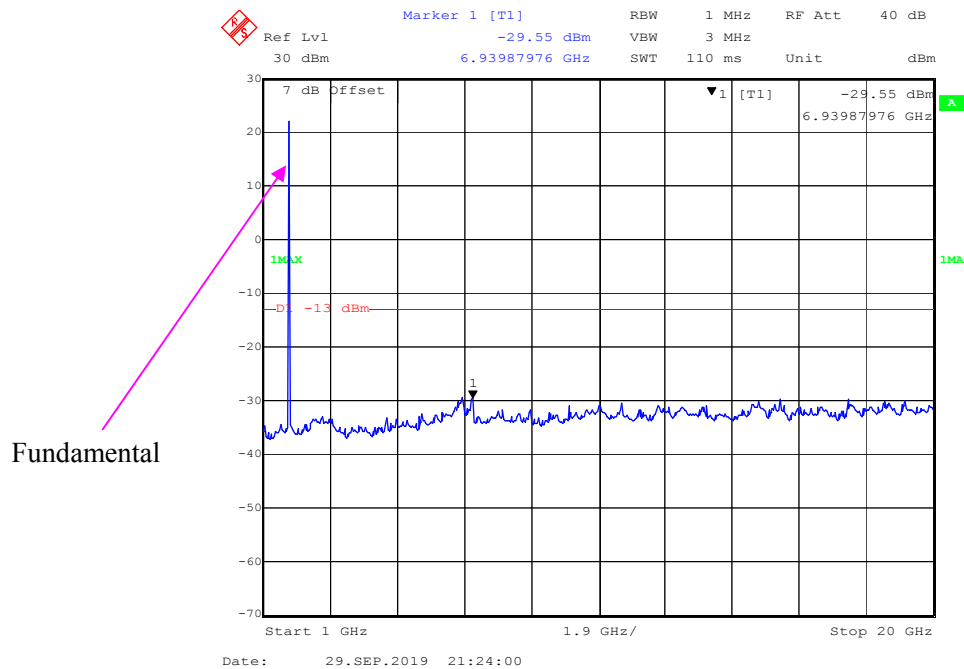




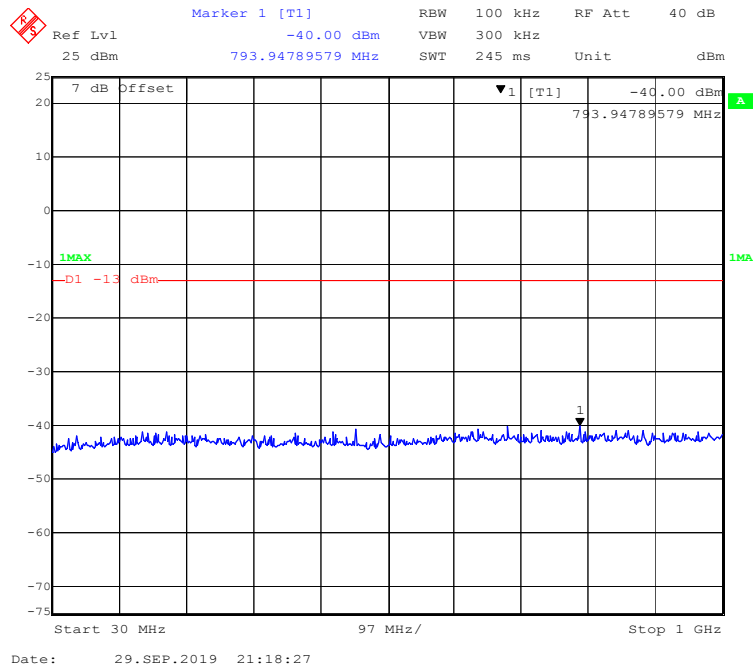
### 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



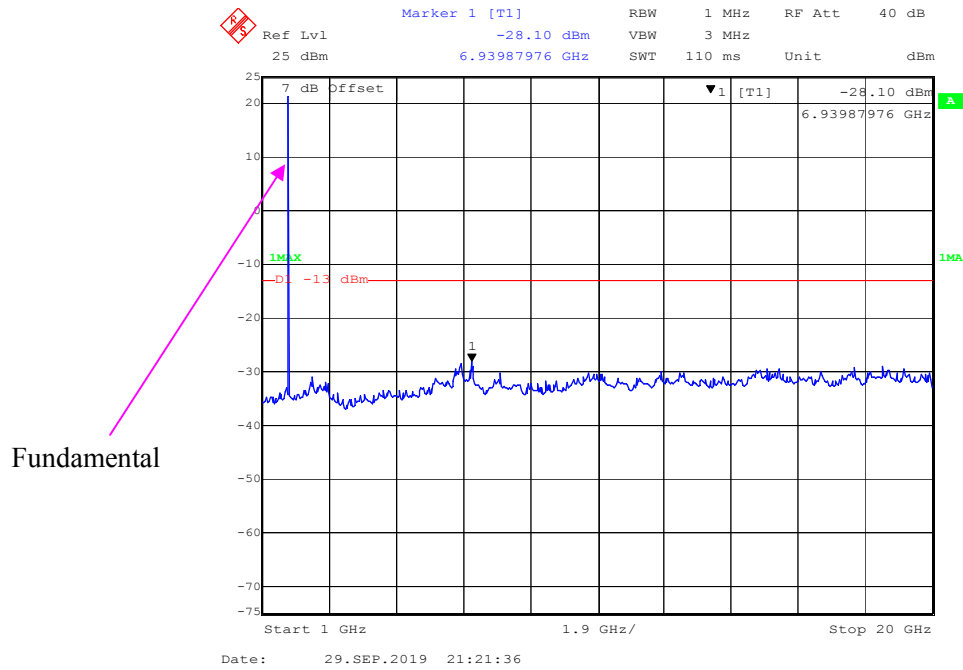
### 1 GHz – 20 GHz (3 MHz, 16-QAM, Middle Channel)



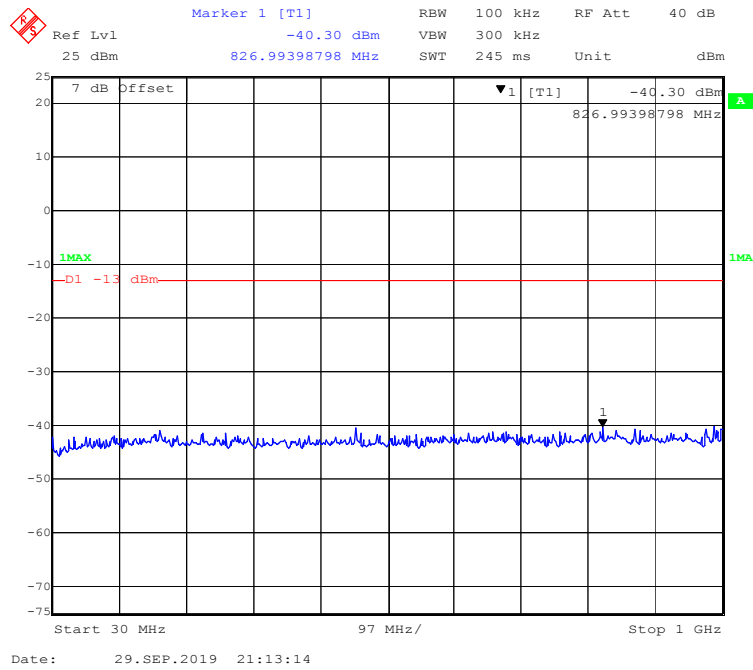
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



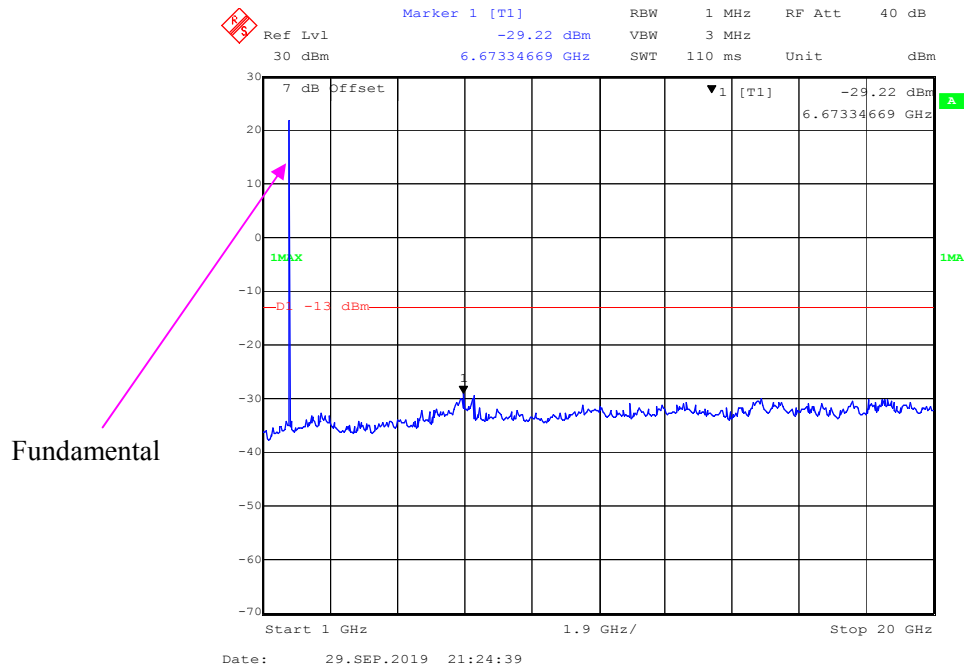
### 1 GHz – 20 GHz (5 MHz, QPSK, Middle Channel)



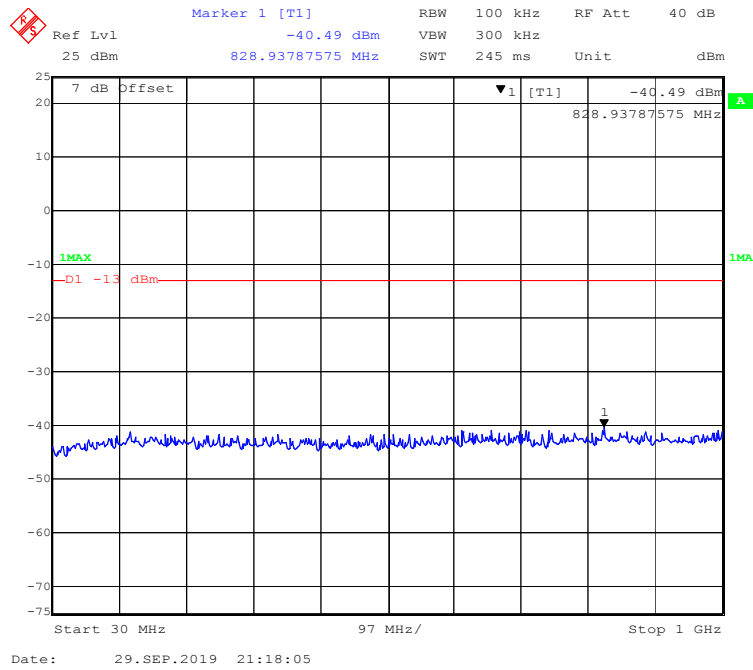
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



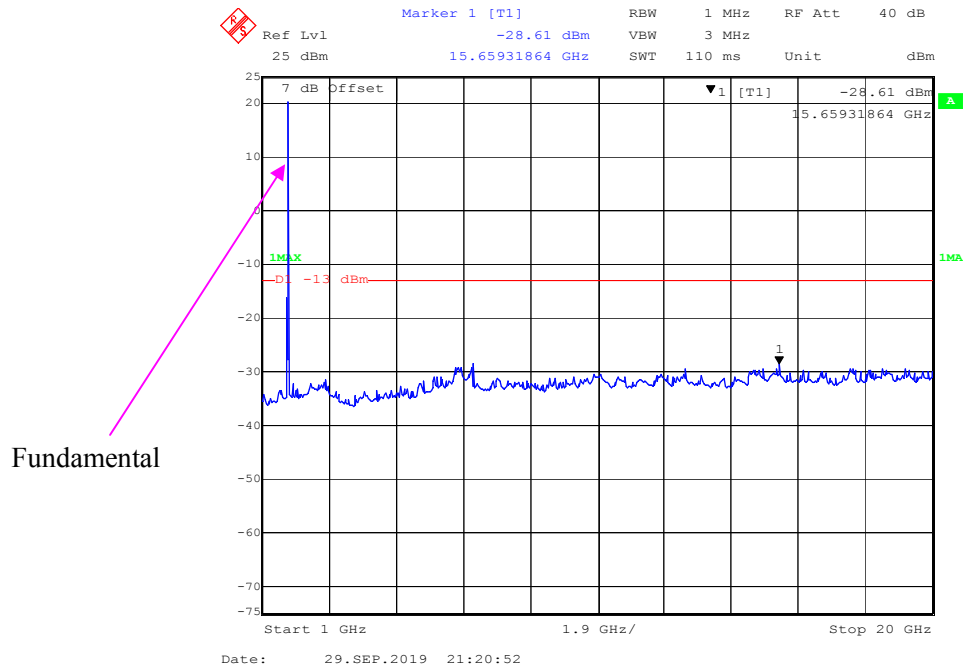
### 1 GHz – 20 GHz (5 MHz, 16-QAM, Middle Channel)



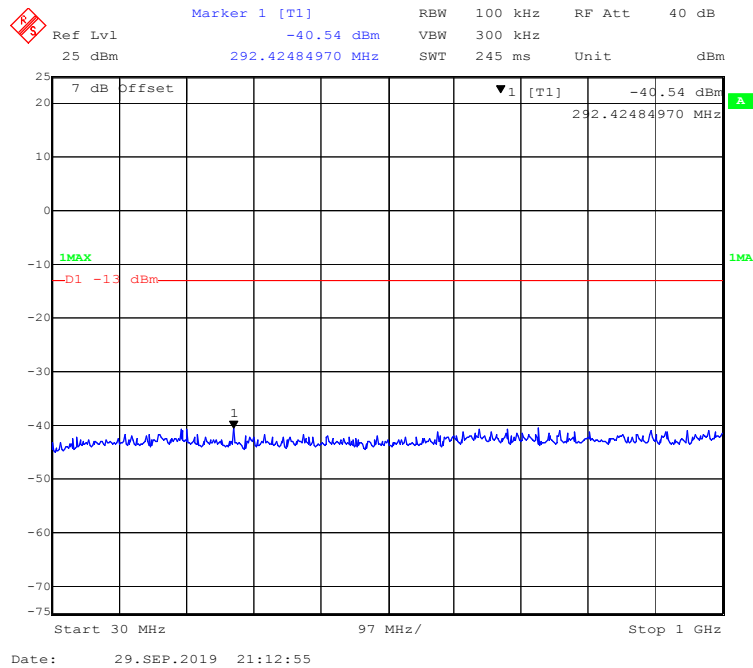
### 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)



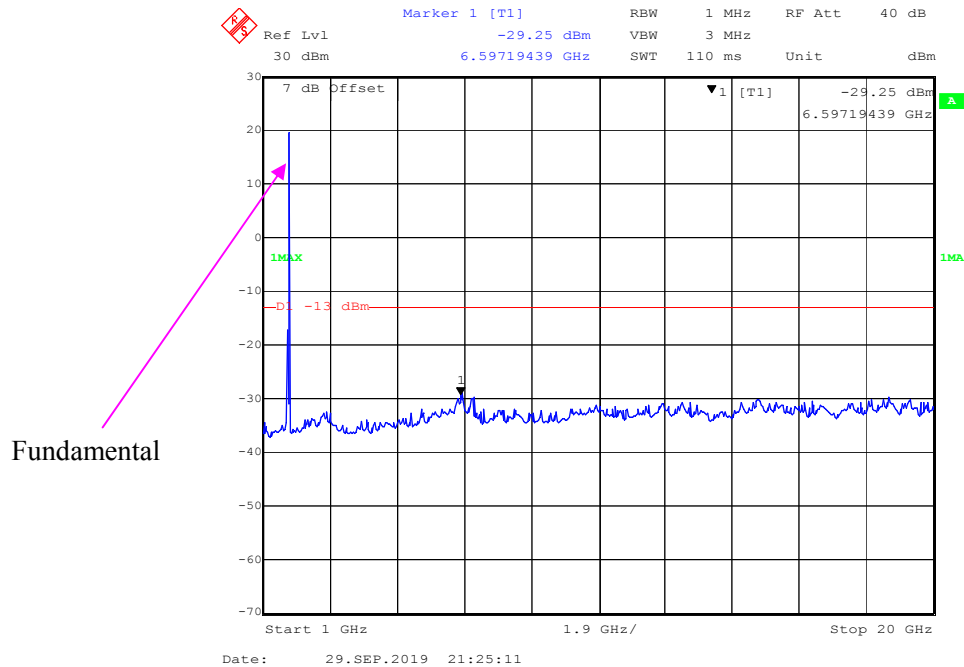
### 1 GHz – 20 GHz (10 MHz, QPSK, Middle Channel)



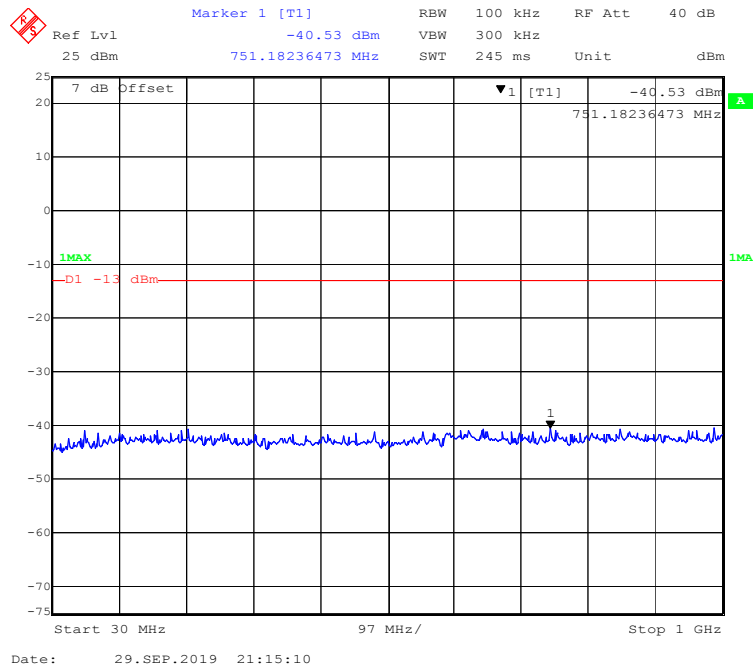
### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



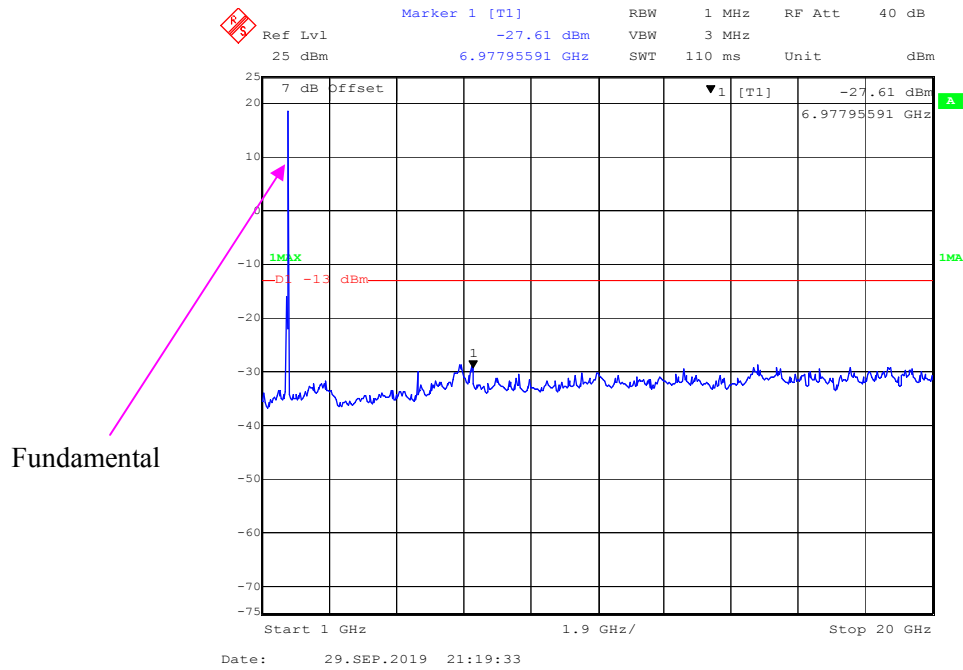
### 1 GHz – 20 GHz (10 MHz, 16-QAM, Middle Channel)



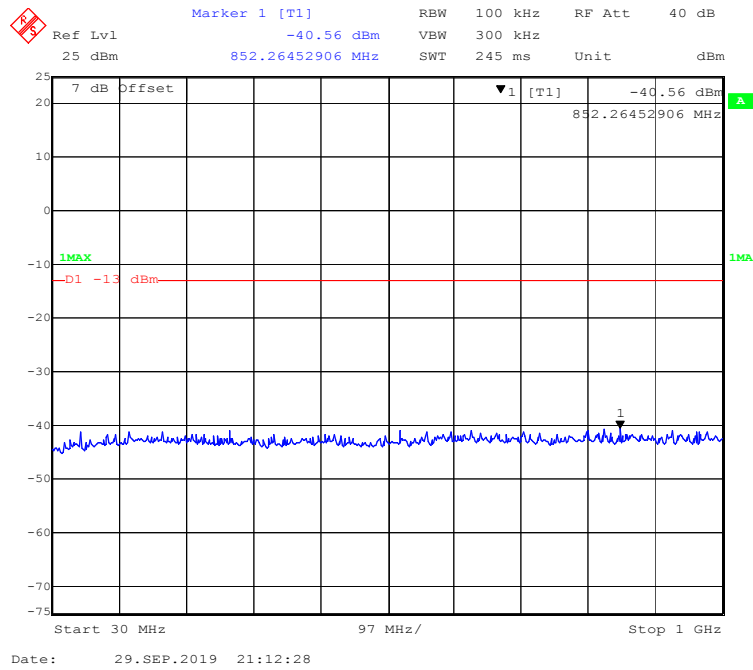
### 30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)



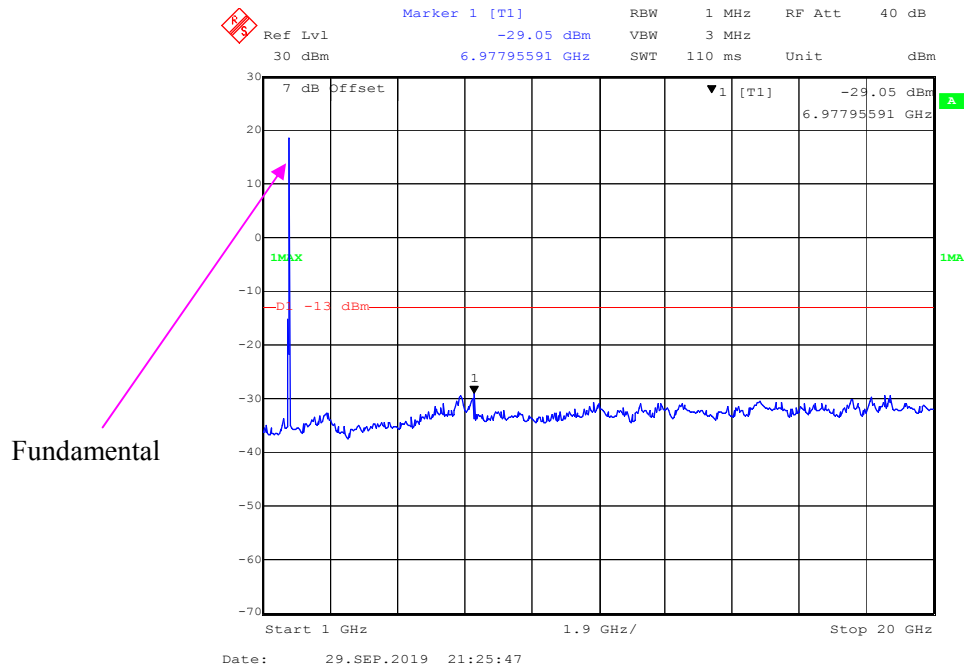
### 1 GHz – 20 GHz (15 MHz, QPSK, Middle Channel)



### 30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)



### 1 GHz – 20 GHz (15 MHz, 16-QAM, Middle Channel)



Marker 1 [T1] RBW 100 kHz RF Att 40 dB  
 Ref Lvl -40.50 dBm VBW 300 kHz  
 25 dBm 519.85971944 MHz SWT 245 ms Unit dBm

7 dB Offset  
 1 [T1] -40.50 dBm  
 519.85971944 MHz

1MAX  
 D1 -13 dBm

Start 30 MHz 97 MHz/ Stop 1 GHz

Date: 29.SEP.2019 21:16:12

Ref Lvl 25 dBm -28.50 dBm RBW 1 MHz VBW 3 MHz RF Att 40 dB Unit dBm

Marker 1 [T1] 6.97795591 GHz

7 dB Offset

▼1 [T1] -28.50 dBm 6.97795591 GHz

1Max

-13 dBm

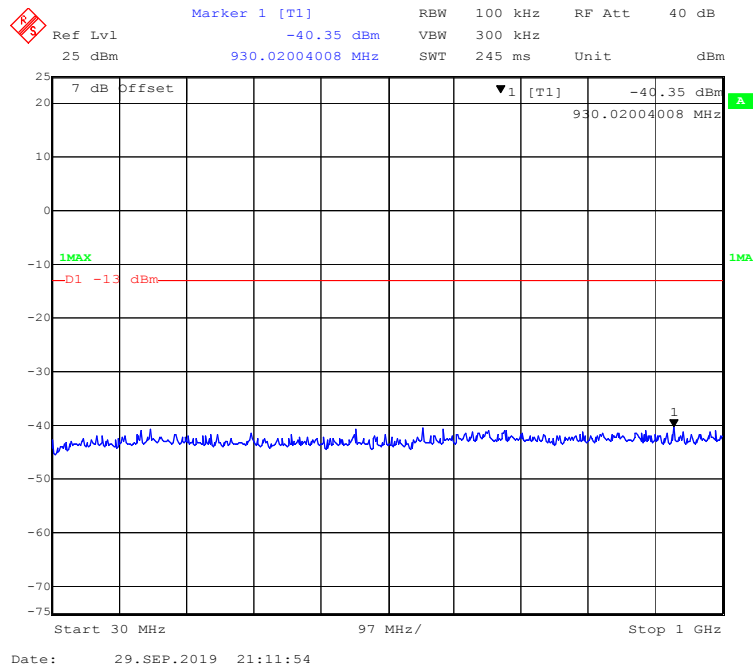
1

Start 1 GHz 1.9 GHz/ Stop 20 GHz

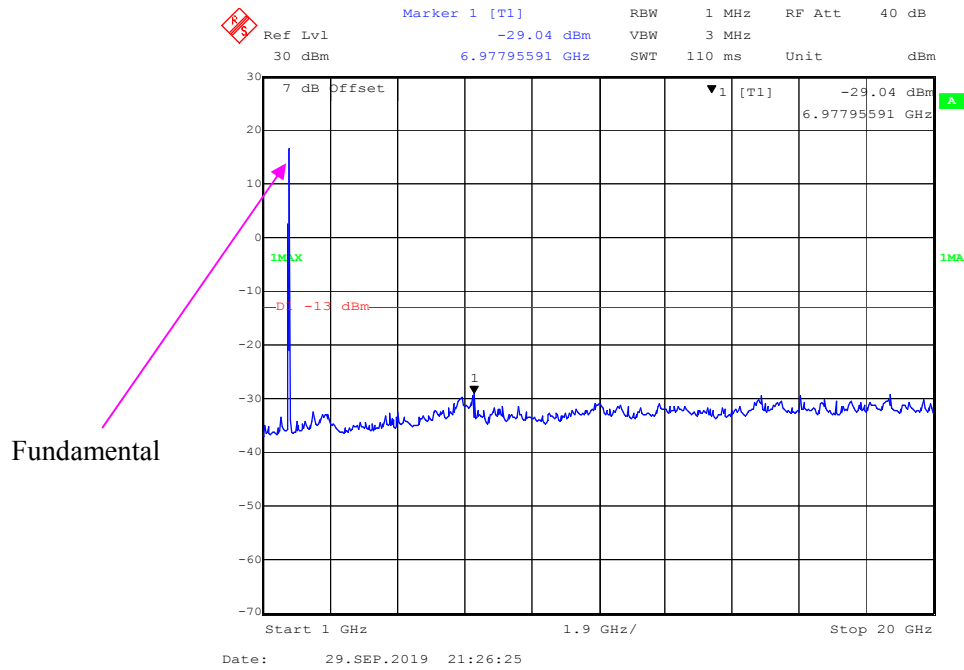
Date: 29.SEP.2019 21:20:19



### 30 MHz - 1 GHz (20 MHz, 16-QAM, Middle Channel)

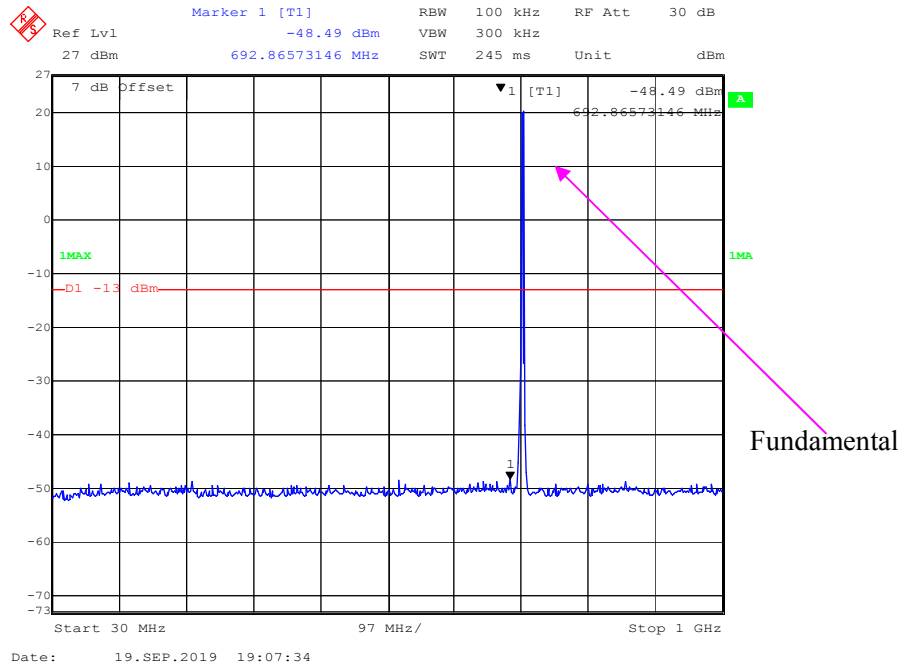


### 1 GHz – 20 GHz (20 MHz, 16-QAM, Middle Channel)

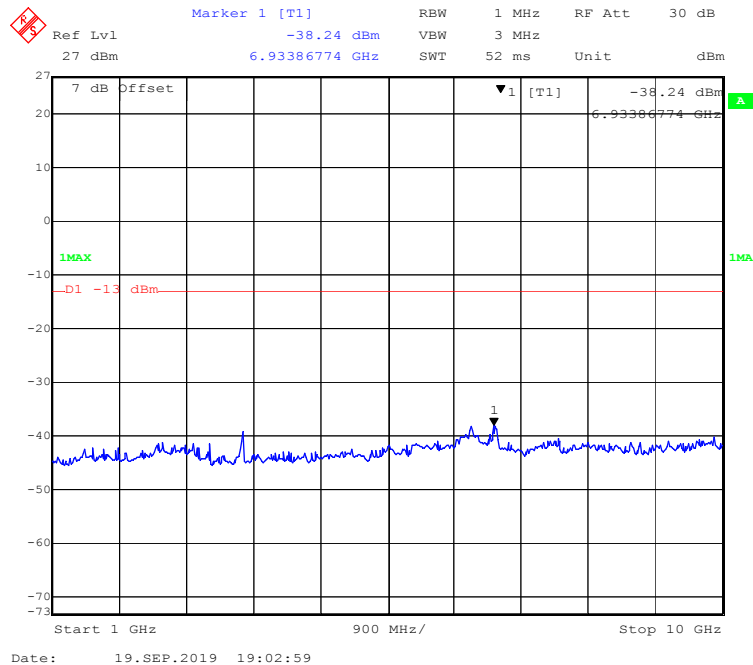


# LTE Band 12:

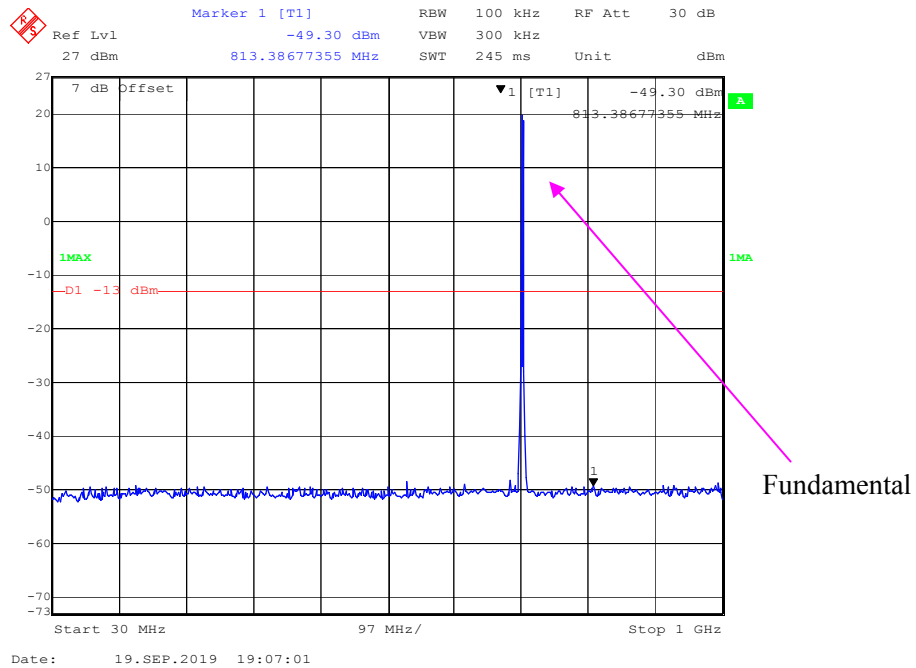
## 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)



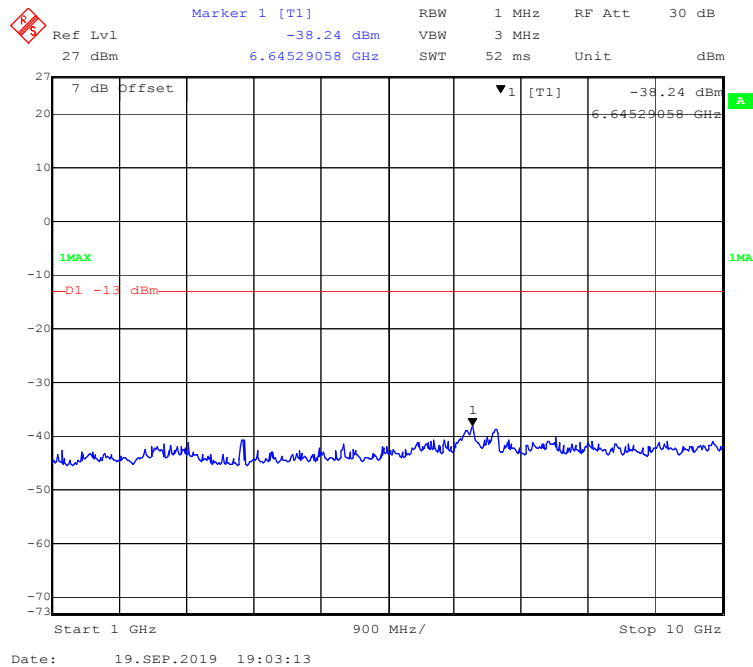
## 1 GHz – 10 GHz (1.4 MHz, QPSK, Middle Channel)



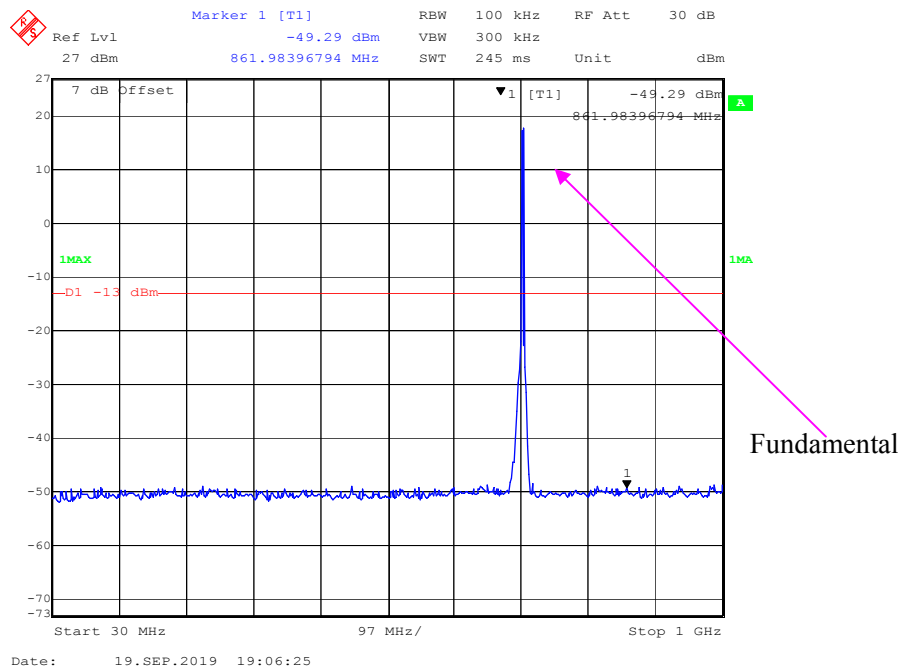
### 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



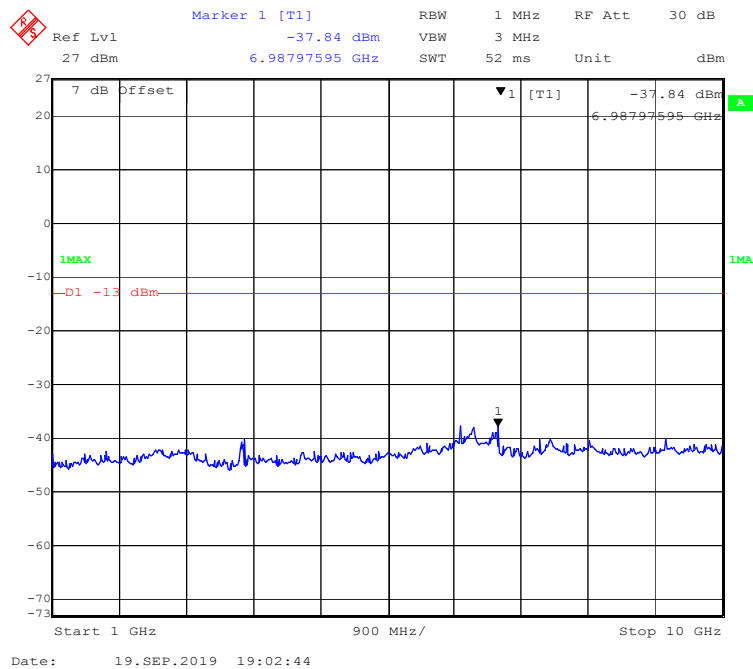
### 1 GHz – 10 GHz (1.4 MHz, 16-QAM, Middle Channel)

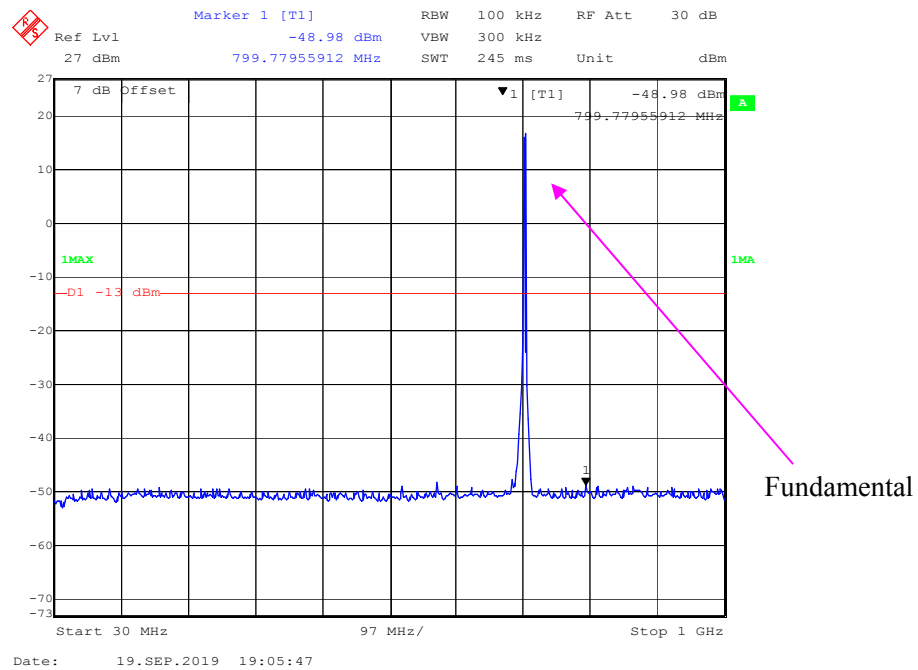
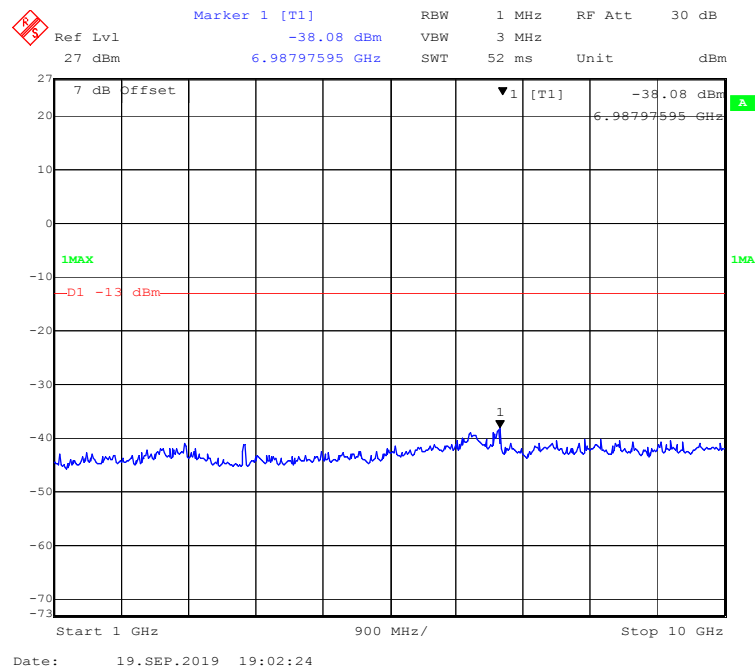


### 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)

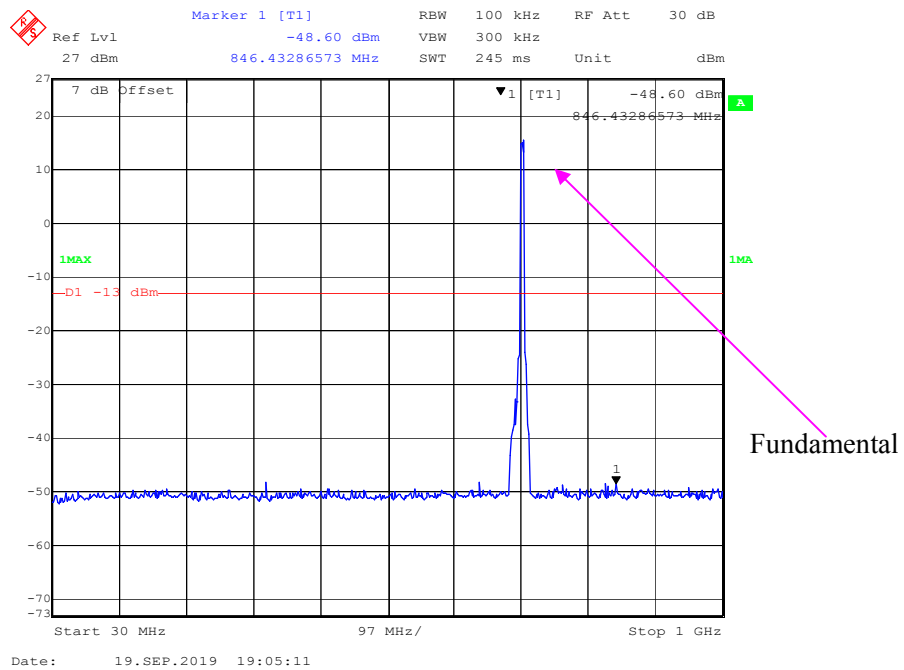


### 1 GHz – 10 GHz (3 MHz, QPSK, Middle Channel)

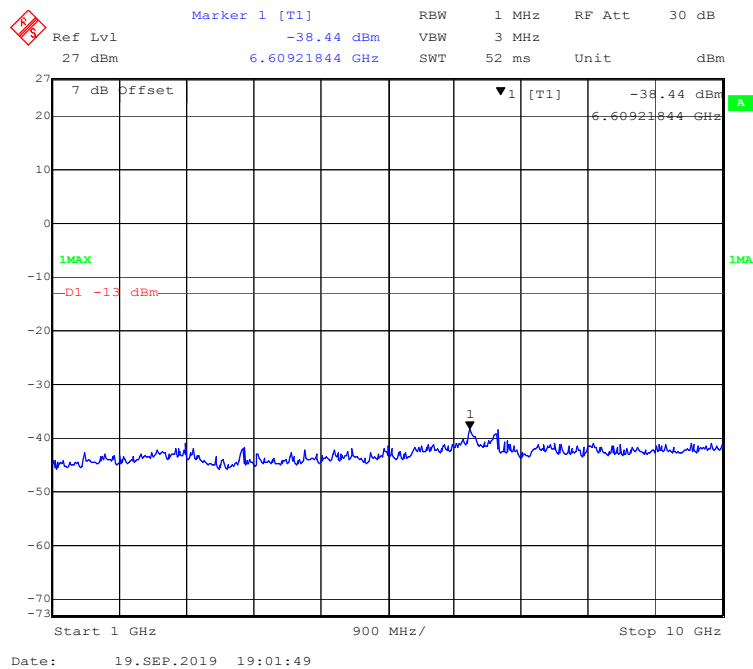


**30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)****1 GHz – 10 GHz (3 MHz, 16-QAM, Middle Channel)**

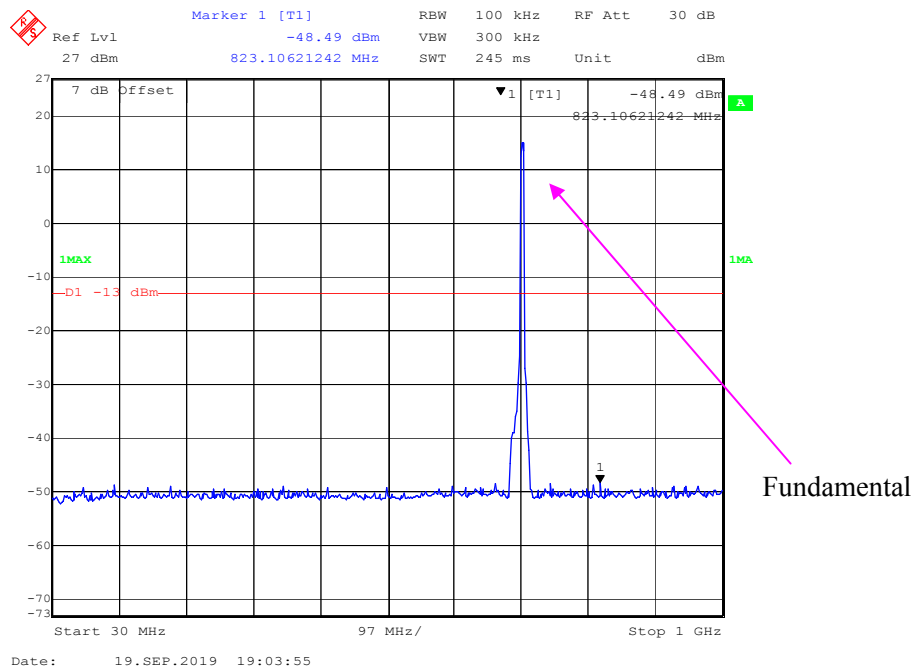
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



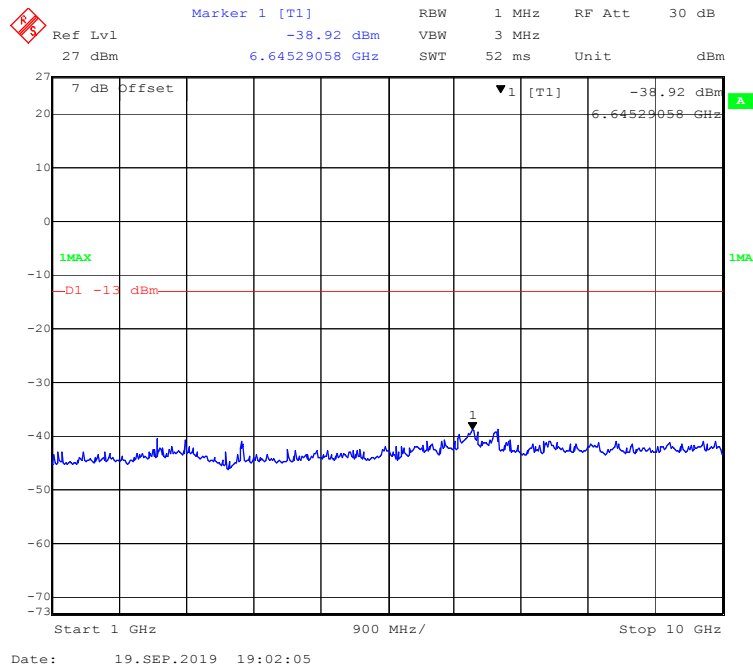
### 1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)



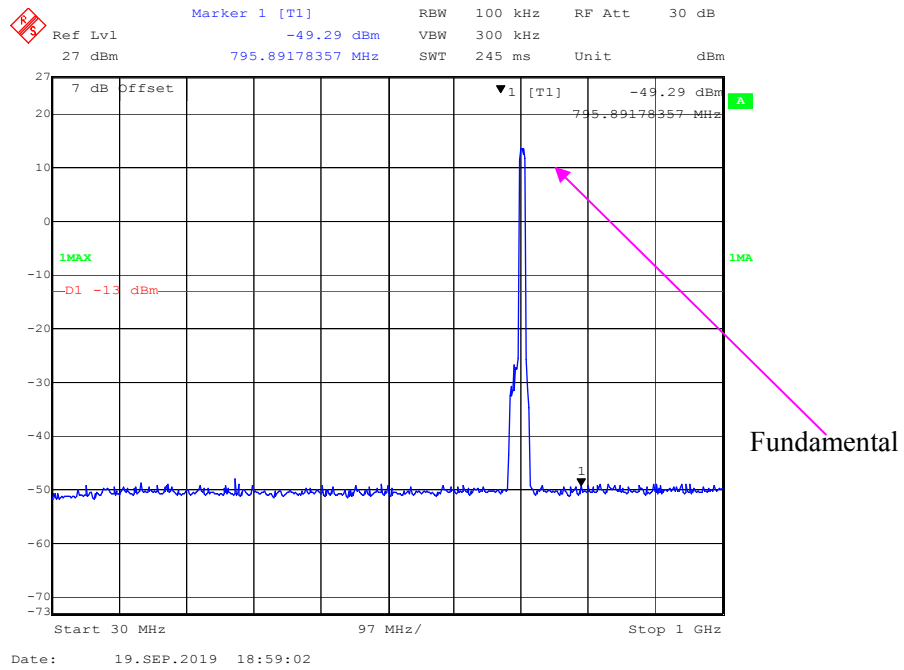
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



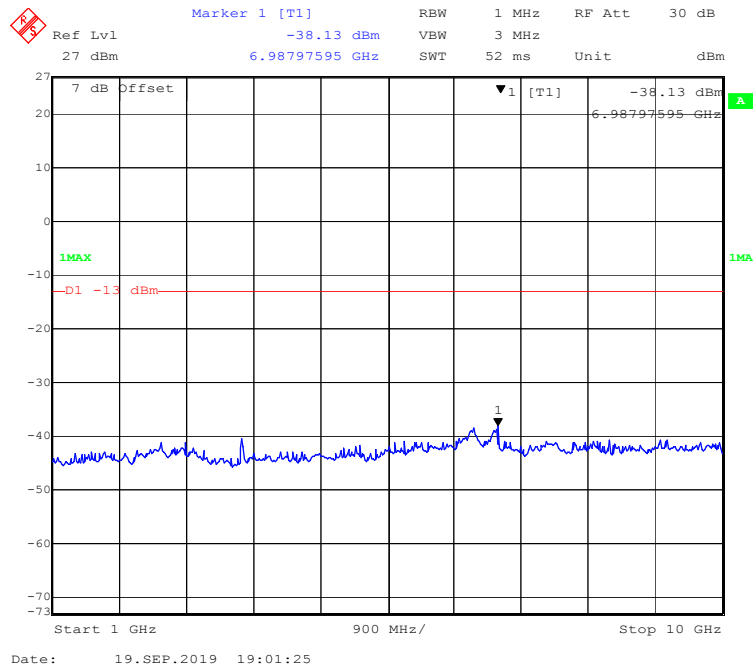
### 1 GHz – 10 GHz (5 MHz, 16-QAM, Middle Channel)



### 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)

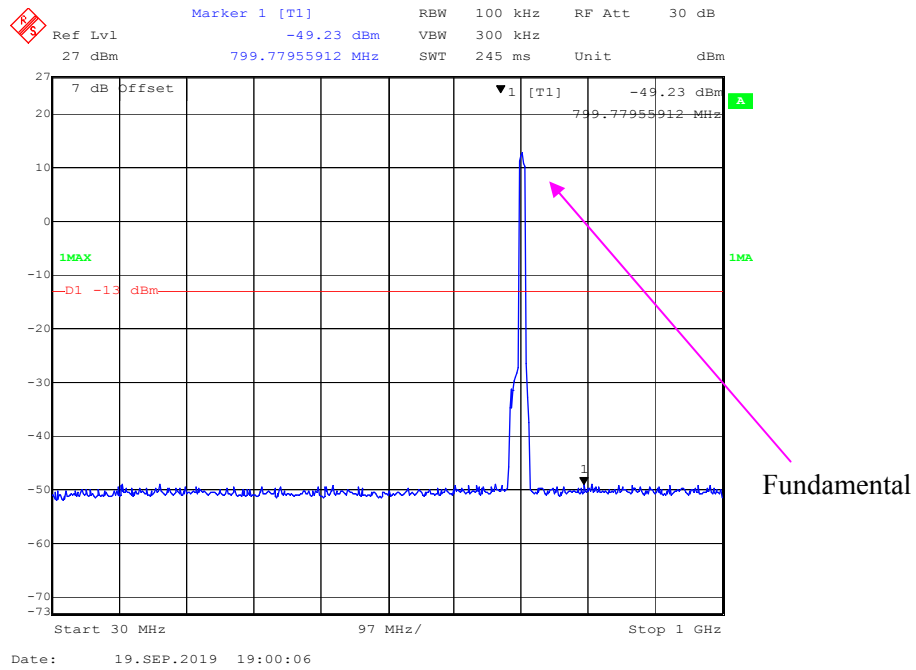


### 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)

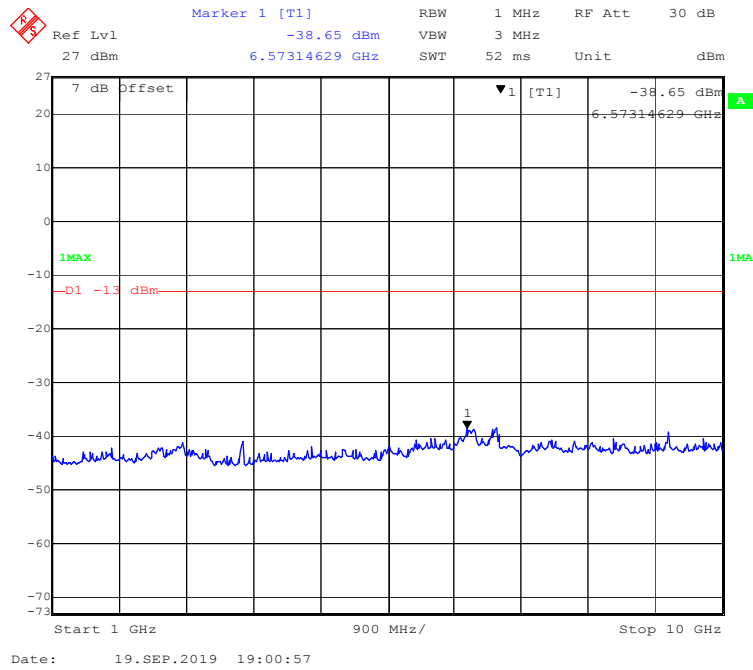




### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



### 1 GHz – 10 GHz (10 MHz, 16-QAM, Middle Channel)



## **FCC § 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (h) (m) - SPURIOUS RADIATED EMISSIONS**

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### **Applicable Standards**

FCC § 2.1053, §22.917(a) and § 24.238(a) and § 27.53(h) (m)

22.917 (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.

24.238 (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.

27.53(h) (m), for mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

### **Test Procedure**

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg (\text{TX pwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$

**Test Data****Environmental Conditions**

<b>Temperature:</b>	23.2℃
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.3kPa

The testing was performed by Jack Jiao on 2019-09-19.

Test mode: Transmitting (Pre-scan with low, middle and high channels, and the worse case data as below)

**30 MHz ~ 10 GHz:****WCDMA Band V**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
WCDMA Mode, Middle channel										
250.30	32.71	254	1.0	H	-68.74	0.44	-2.25	-71.43	-13.00	58.43
250.30	42.92	218	2.0	V	-66.76	0.44	-2.25	-69.45	-13.00	56.45
1673.20	69.47	72	1.0	H	-41.48	0.84	8.48	-33.84	-13.00	20.84
1673.20	71.67	310	2.0	V	-39.53	0.84	8.48	-31.89	-13.00	18.89
2509.80	67.69	187	1.0	H	-40.93	0.89	10.09	-31.73	-13.00	18.73
2509.80	69.04	291	1.0	V	-39.65	0.89	10.09	-30.45	-13.00	17.45

**30 MHz ~ 20 GHz:****WCDMA Band II**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
WCDMA Mode, Middle channel										
250.30	34.36	22	1.0	H	-67.09	0.44	-2.25	-69.78	-13.00	56.78
250.30	45.22	13	2.0	V	-64.46	0.44	-2.25	-67.15	-13.00	54.15
3760.00	48.83	237	2.0	H	-54.86	0.95	9.74	-46.07	-13.00	33.07
3760.00	51.53	55	2.0	V	-52.48	0.95	9.74	-43.69	-13.00	30.69
5640.00	47.74	167	1.0	H	-52.77	1.15	10.47	-43.45	-13.00	30.45
5640.00	50.33	124	1.0	V	-50.48	1.15	10.47	-41.16	-13.00	28.16

**Note:**

1) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)

2) Margin (dB) = Limit (dBm) - Absolute Level (dBm)

Test mode: Transmitting (Pre-scan with all the bandwidth, and worse case as below)

**30 MHz ~ 20 GHz:**

**LTE Band 2:**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4MHz Bandwidth Middle Channel										
250.30	35.70	188	1.0	H	-65.75	0.38	-6.17	-72.30	-13.00	59.30
250.30	46.93	187	1.0	V	-62.75	0.38	-6.17	-69.30	-13.00	56.30
3760.00	43.54	225	2.0	H	-60.15	0.95	9.74	-51.36	-13.00	38.36
3760.00	44.96	66	1.0	V	-59.05	0.95	9.74	-50.26	-13.00	37.26
5640.00	43.95	11	1.0	H	-56.56	1.15	10.47	-47.24	-13.00	34.24
5640.00	46.35	167	1.0	V	-54.46	1.15	10.47	-45.14	-13.00	32.14
16-QAM 1.4MHz Bandwidth Middle Channel										
250.30	34.64	136	1.0	H	-66.81	0.38	-6.17	-73.36	-13.00	60.36
250.30	45.77	85	2.0	V	-63.91	0.38	-6.17	-70.46	-13.00	57.46
3760.00	40.91	14	1.0	H	-62.78	0.95	9.74	-53.99	-13.00	40.99
3760.00	43.58	2	1.0	V	-60.43	0.95	9.74	-51.64	-13.00	38.64
5640.00	41.63	95	2.0	H	-58.88	1.15	10.47	-49.56	-13.00	36.56
5640.00	45.07	40	1.0	V	-55.74	1.15	10.47	-46.42	-13.00	33.42

**30 MHz ~ 20 GHz:**

**LTE Band 4:**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4MHz Bandwidth Middle Channel										
250.30	35.11	173	1.0	H	-66.34	0.38	-6.17	-72.89	-13.00	59.89
250.30	48.09	112	1.0	V	-61.59	0.38	-6.17	-68.14	-13.00	55.14
3465.00	41.43	228	1.0	H	-63.36	0.93	9.87	-54.42	-13.00	41.42
3465.00	43.92	150	1.0	V	-61.30	0.93	9.87	-52.36	-13.00	39.36
5197.50	46.37	300	2.0	H	-55.71	1.10	10.30	-46.51	-13.00	33.51
5197.50	48.40	139	1.0	V	-53.89	1.10	10.30	-44.69	-13.00	31.69
16-QAM 1.4MHz Bandwidth Middle Channel										
250.30	34.44	218	2.0	H	-67.01	0.38	-6.17	-73.56	-13.00	60.56
250.30	44.59	119	1.0	V	-65.09	0.38	-6.17	-71.64	-13.00	58.64
3465.00	39.60	26	2.0	H	-65.19	0.93	9.87	-56.25	-13.00	43.25
3465.00	41.14	57	2.0	V	-64.08	0.93	9.87	-55.14	-13.00	42.14
5197.50	33.72	129	2.0	H	-68.36	1.10	10.30	-59.16	-13.00	46.16
5197.50	35.67	163	2.0	V	-66.62	1.10	10.30	-57.42	-13.00	44.42

**30 MHz ~ 10 GHz:****LTE Band 12:**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 1.4MHz Bandwidth Middle Channel										
250.30	39.86	334	2.0	H	-61.59	0.38	-6.17	-68.14	-13.00	55.14
250.30	49.75	310	1.0	V	-59.93	0.38	-6.17	-66.48	-13.00	53.48
1415.00	38.57	113	2.0	H	-66.18	0.82	7.69	-59.31	-13.00	46.31
1415.00	41.13	197	1.0	V	-64.02	0.82	7.69	-57.15	-13.00	44.15
2122.50	36.74	218	1.0	H	-64.52	0.86	9.27	-56.11	-13.00	43.11
2122.50	38.61	275	2.0	V	-62.93	0.86	9.27	-54.52	-13.00	41.52
16-QAM 1.4MHz Bandwidth Middle Channel										
250.30	37.75	18	2.0	H	-63.70	0.38	-6.17	-70.25	-13.00	57.25
250.30	48.87	249	1.0	V	-60.81	0.38	-6.17	-67.36	-13.00	54.36
1415.00	35.52	60	2.0	H	-69.23	0.82	7.69	-62.36	-13.00	49.36
1415.00	38.50	236	1.0	V	-66.65	0.82	7.69	-59.78	-13.00	46.78
2122.50	33.39	110	1.0	H	-67.87	0.86	9.27	-59.46	-13.00	46.46
2122.50	36.66	19	2.0	V	-64.88	0.86	9.27	-56.47	-13.00	43.47

**Note:**

- 1) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
- 2) Margin (dB) = Limit (dBm) - Absolute Level (dBm)

**FCC § 22.917 (a); § 24.238 (a); §27.53 (g) (h) - BAND EDGES****Applicable Standards**

According to § 22.917(a), the power of any emissions 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.

According to §24.238(a), the power of any emissions 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.

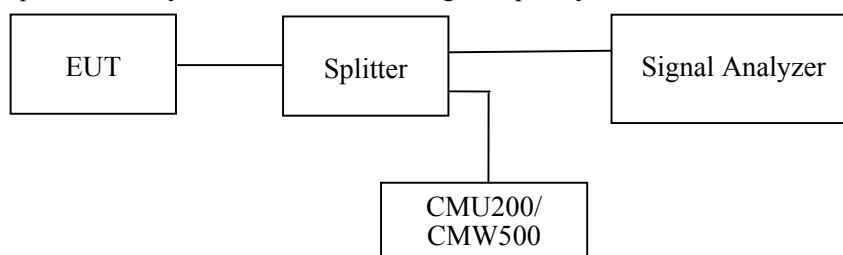
According to FCC §27.53 (g) (h), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

FCC §2.1051. The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

**Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.

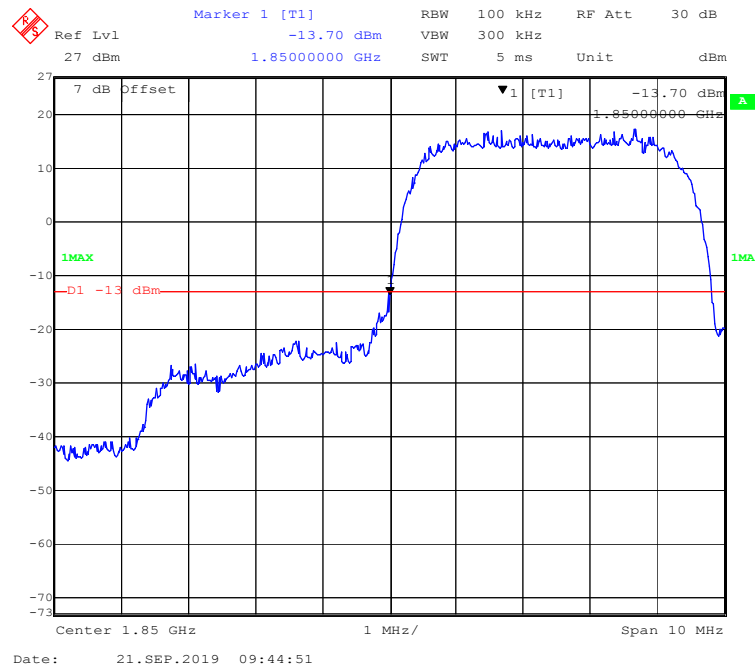
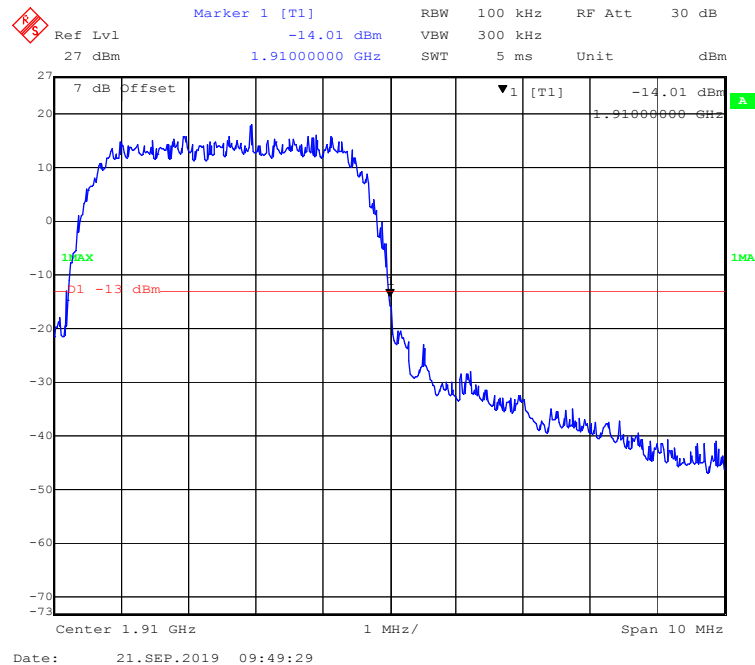
**Test Data****Environmental Conditions**

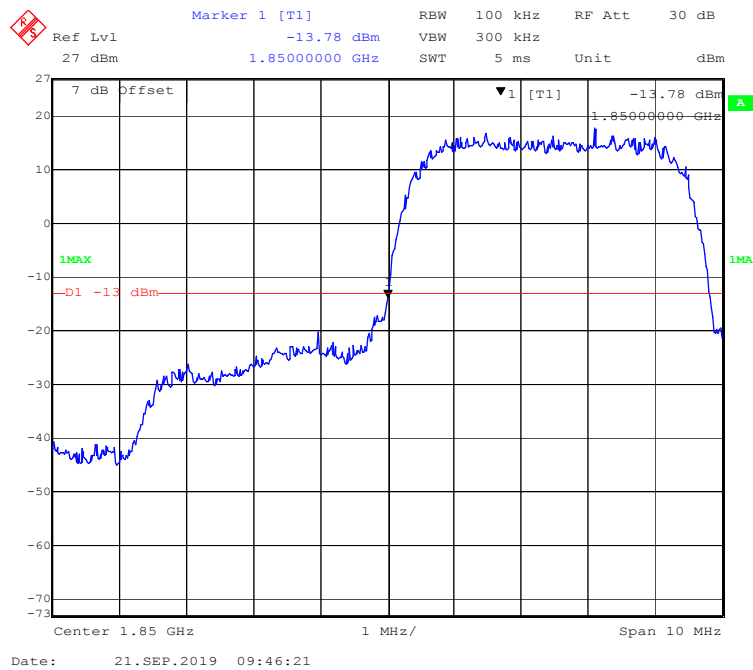
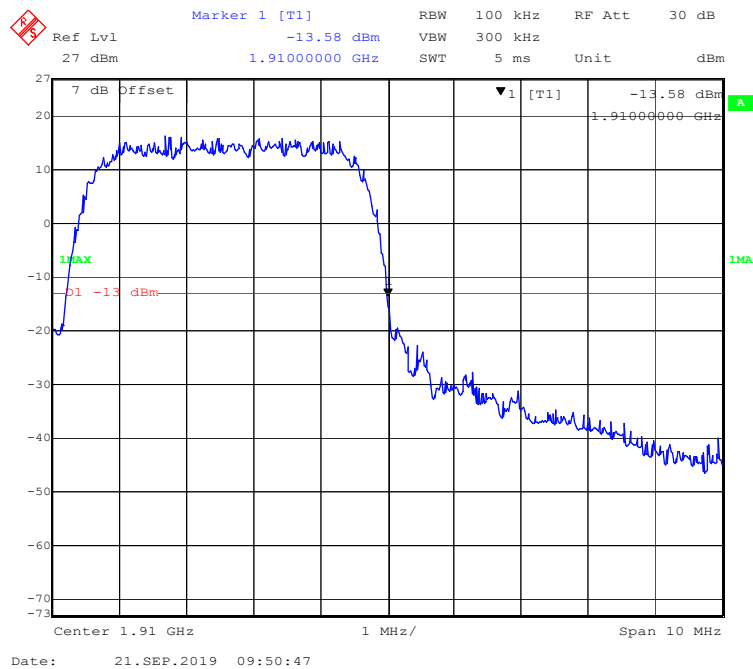
Temperature:	23.2°C-23.5°C
Relative Humidity:	51 %-53%
ATM Pressure:	101.1kPa-103.3kPa

The testing was performed by Jack Jiao from 2019-09-19 to 2019-09-29.

EUT operation mode: Transmitting

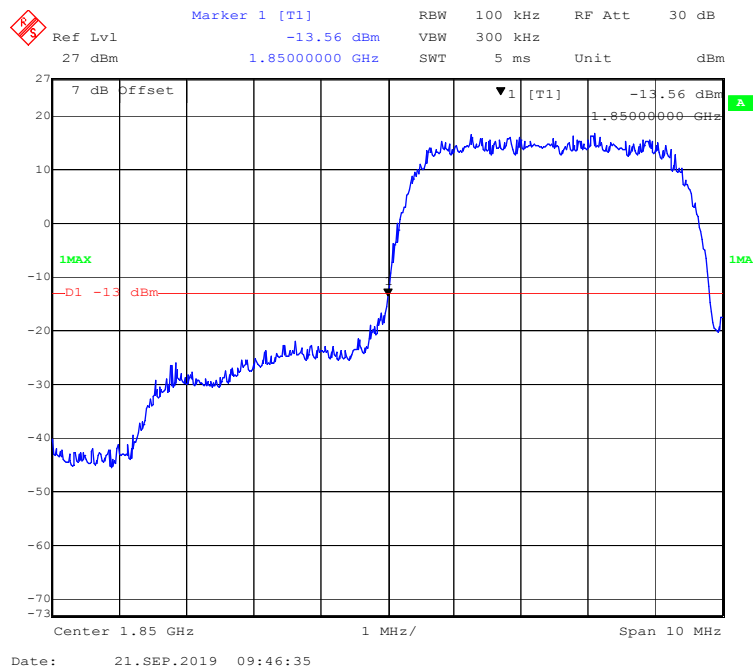
Test Result: Compliant.

**WCDMA Band II****WCDMA (Rel 99) Mode, Left Band Edge****WCDMA (Rel 99) Mode, Right Band Edge**

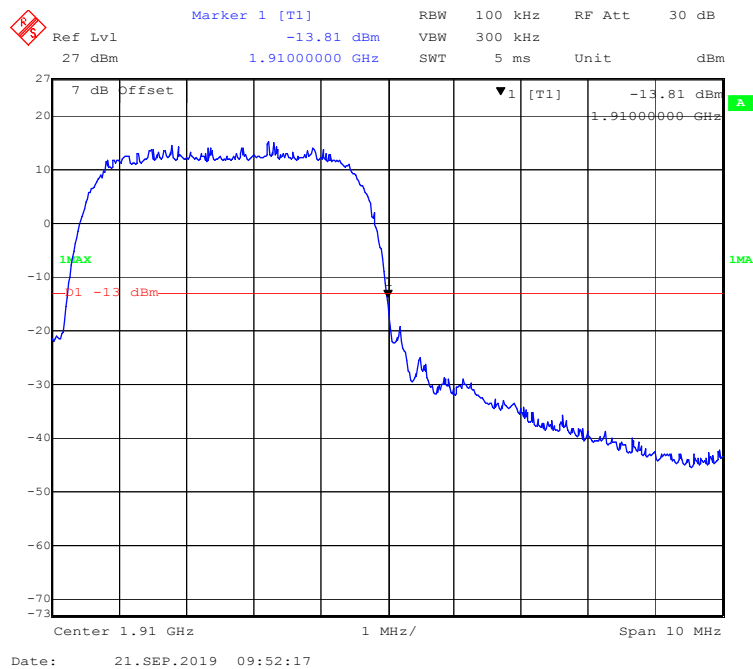
**WCDMA (HSDPA) Mode, Left Band Edge****WCDMA (HSDPA) Mode, Right Band Edge**

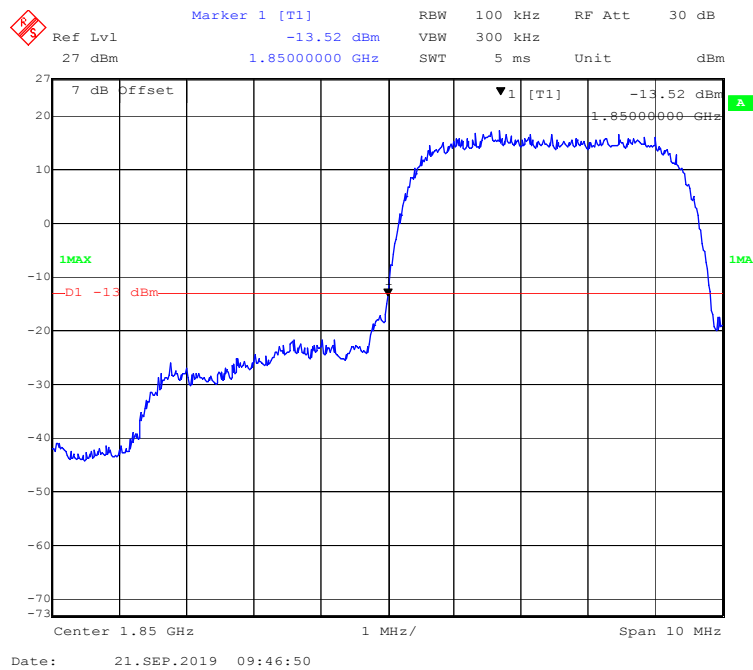
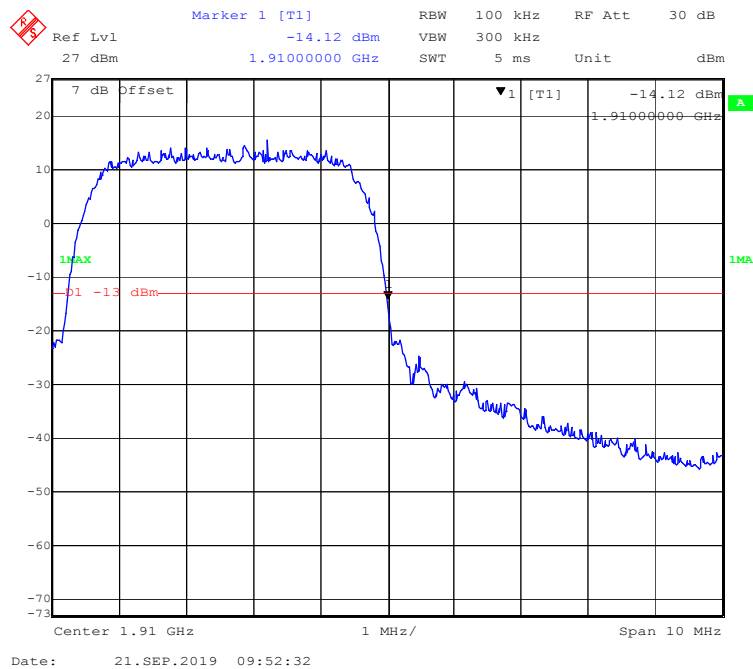


### WCDMA (HSUPA) Mode, Left Band Edge



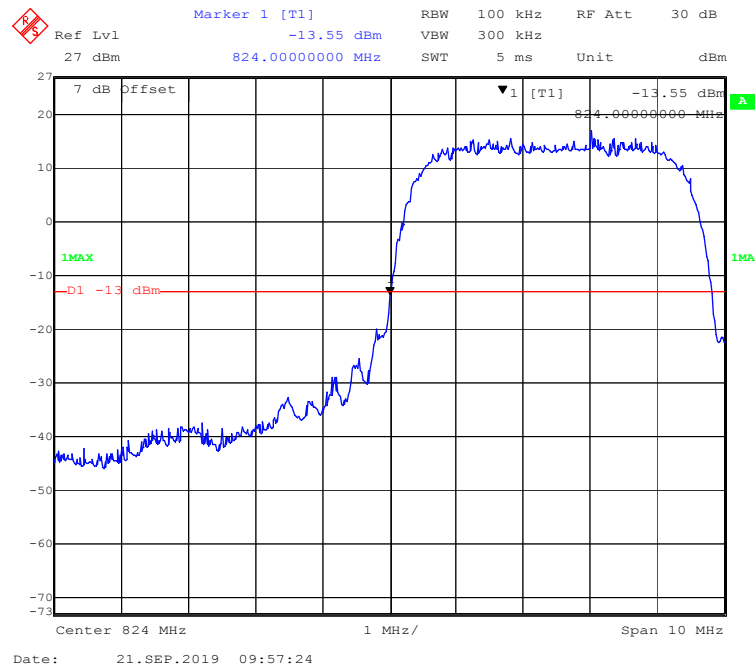
### WCDMA (HSUPA) Mode, Right Band Edge



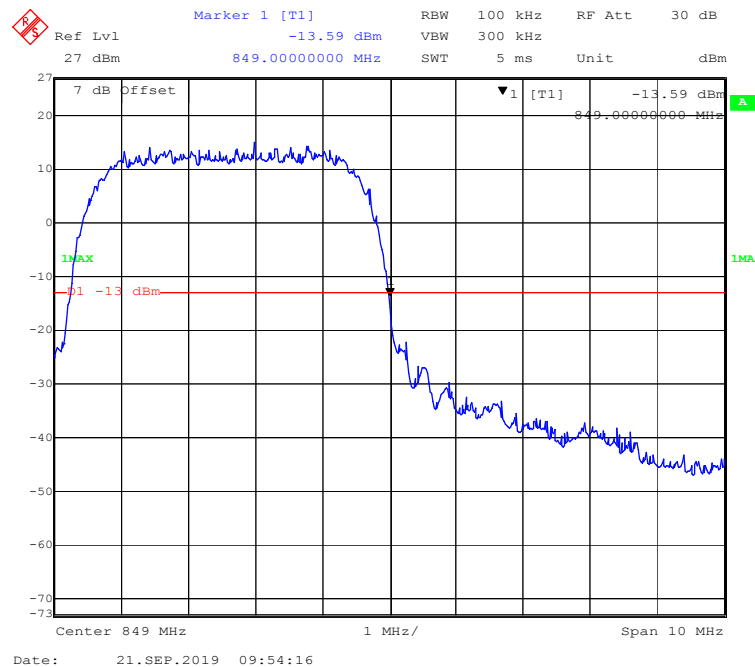
**WCDMA (HSPA+) Mode, Left Band Edge****WCDMA (HSPA+) Mode, Right Band Edge**

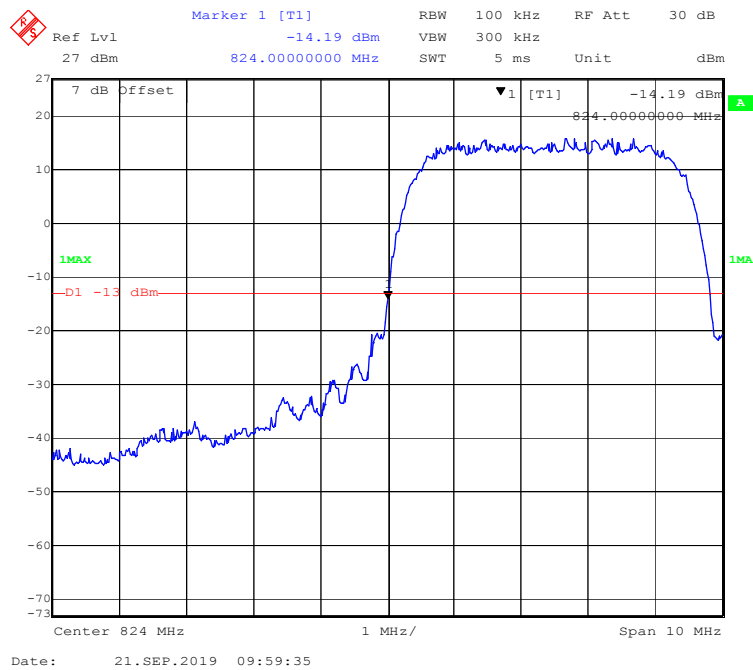
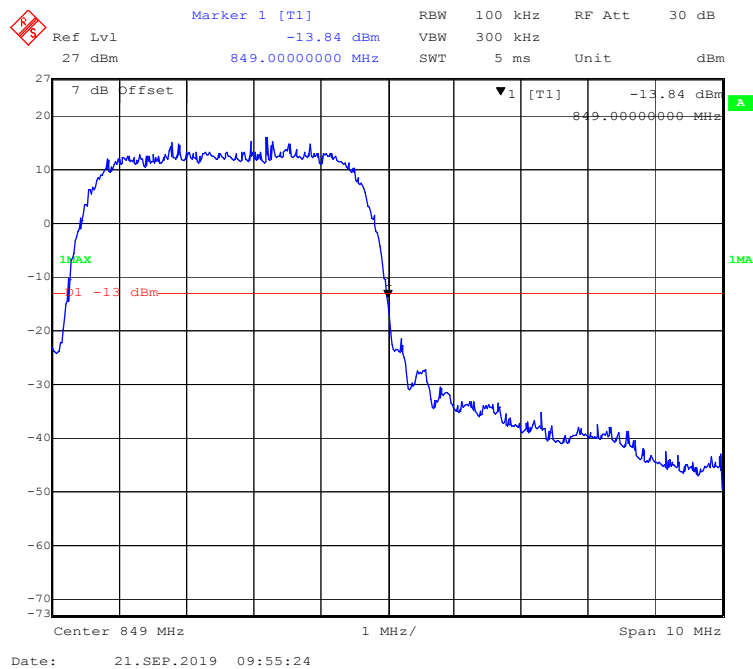
# WCDMA Band V

## WCDMA (Rel99) Mode, Left Band Edge

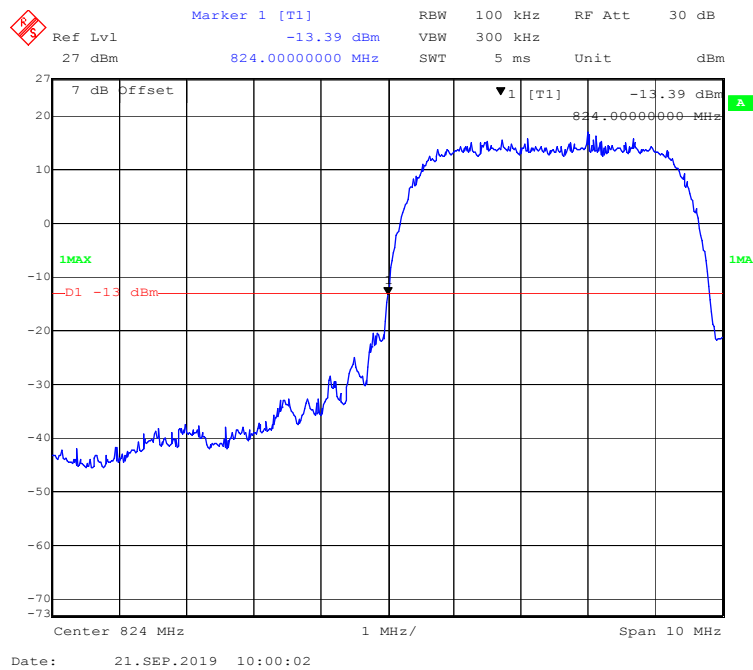


## WCDMA (Rel99) Mode, Right Band Edge

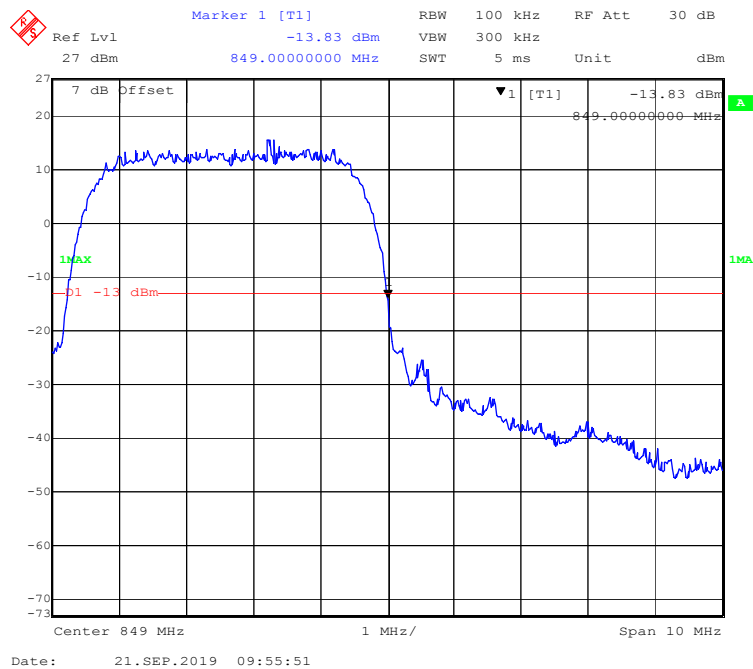


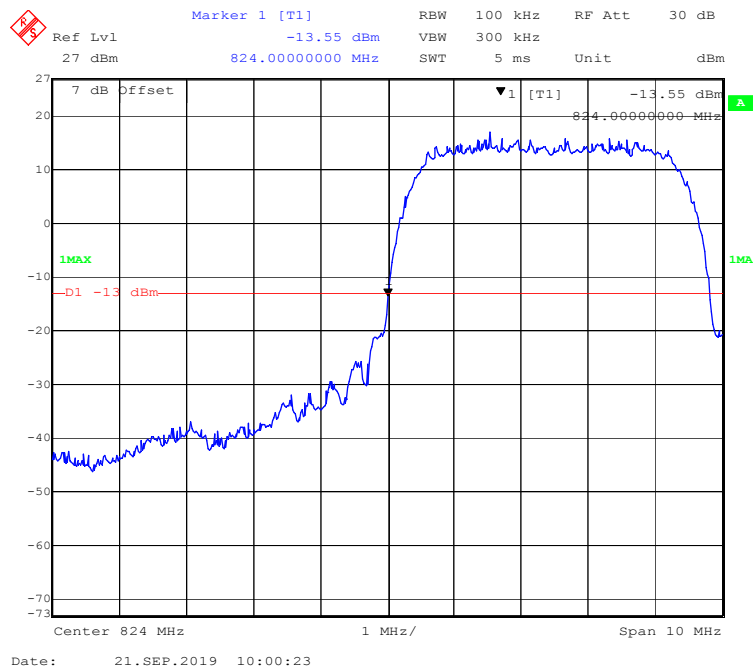
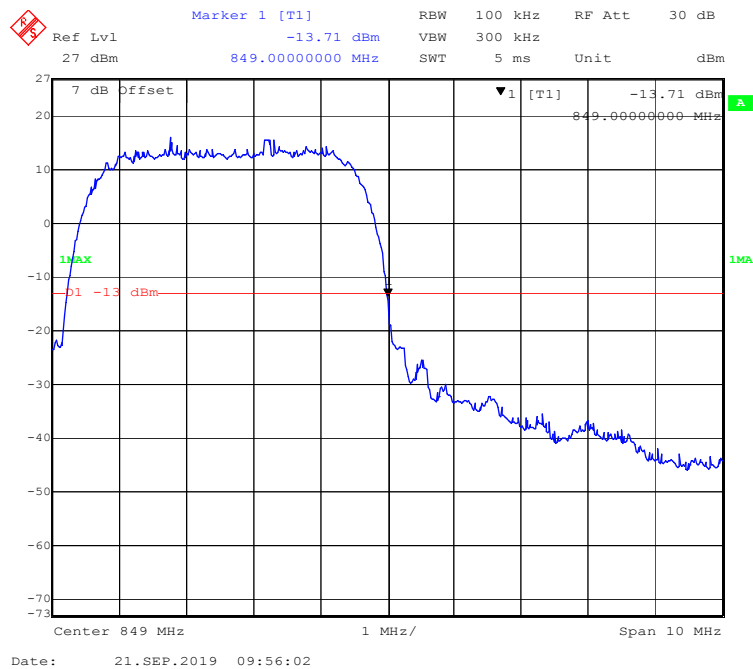
**WCDMA (HSDPA) Mode, Left Band Edge****WCDMA (HSDPA) Mode, Right Band Edge**

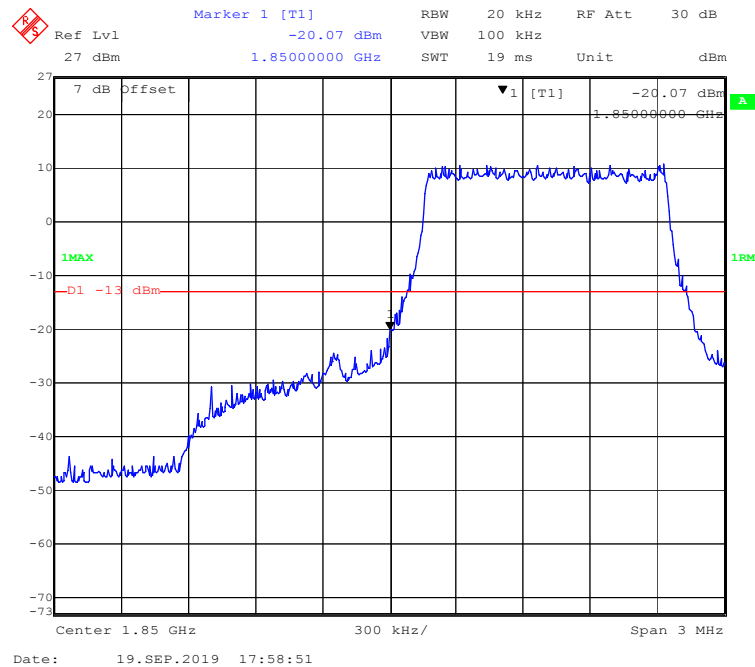
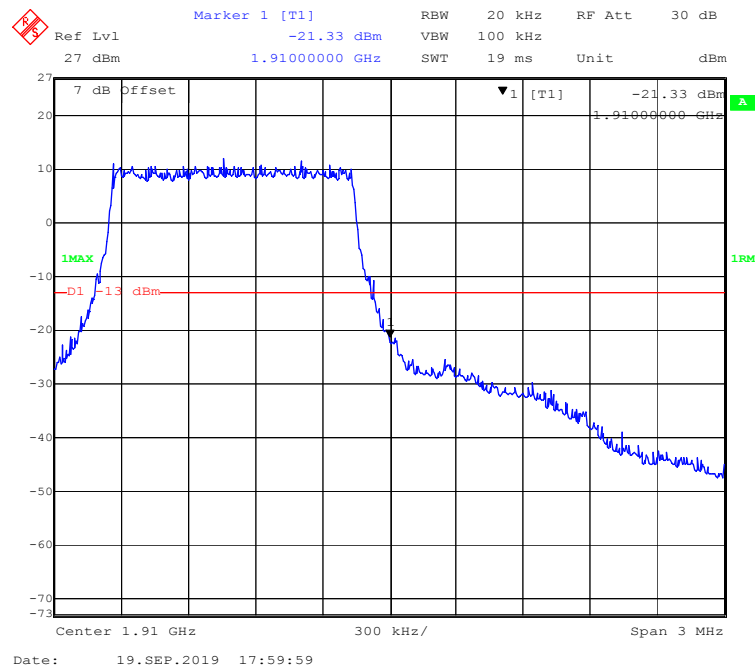
### WCDMA (HSUPA) Mode, Left Band Edge



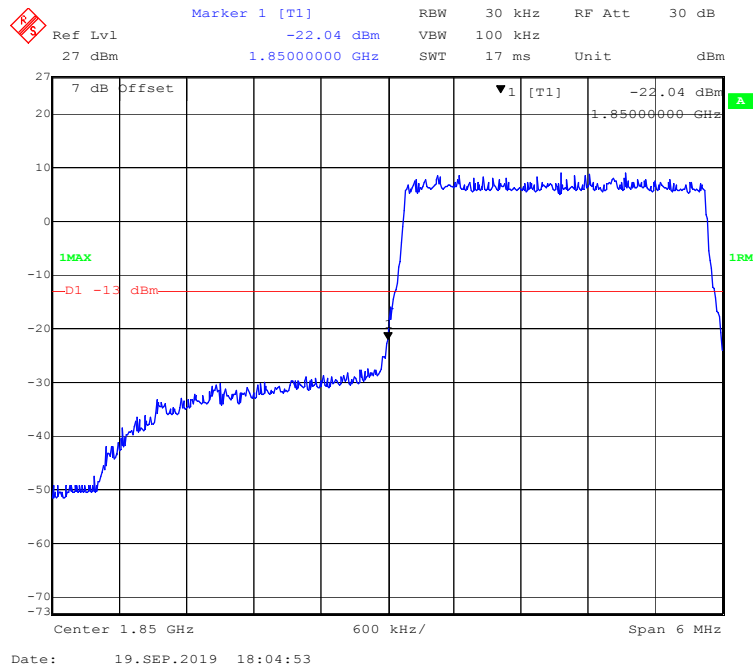
### WCDMA (HSUPA) Mode, Right Band Edge



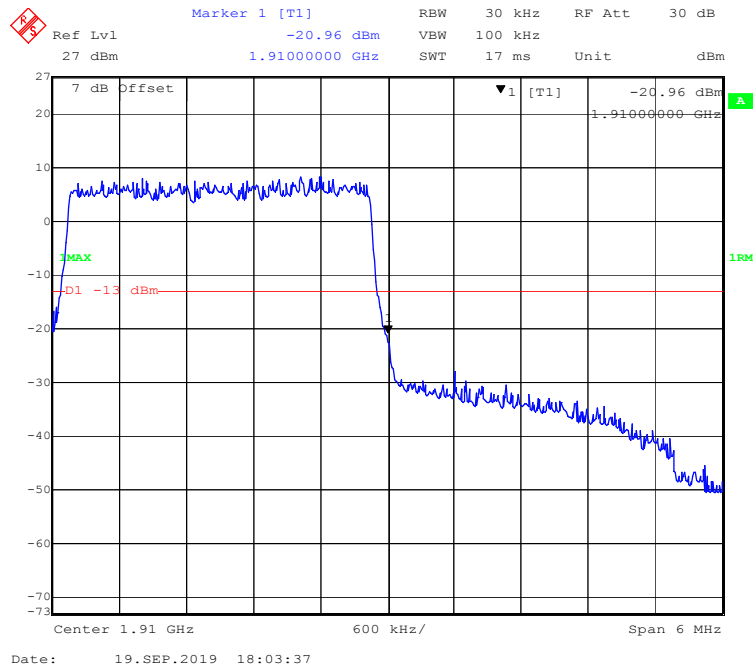
**WCDMA (HSPA+) Mode, Left Band Edge****WCDMA (HSPA+) Mode, Right Band Edge**

**LTE Band 2:****QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

### QPSK (3 MHz, FULL RB) - Left Band Edge

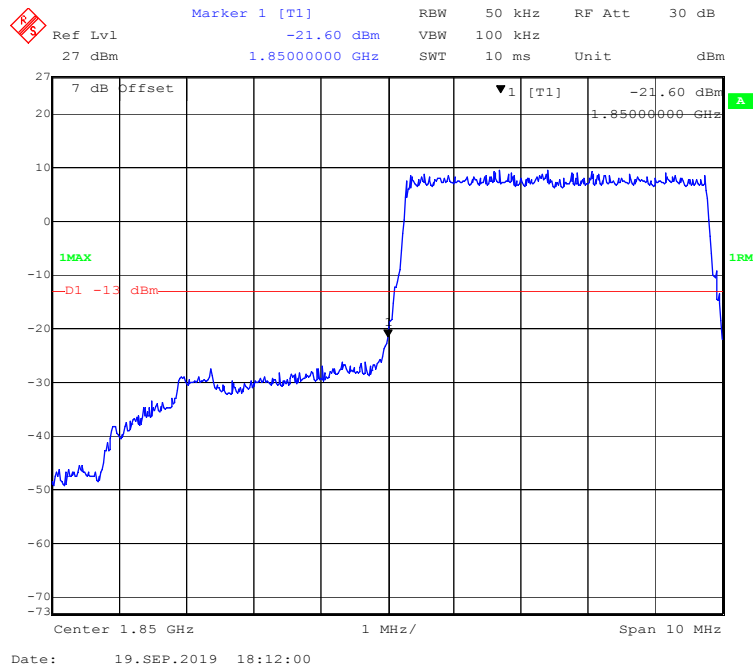


### QPSK (3 MHz, FULL RB) - Right Band Edge

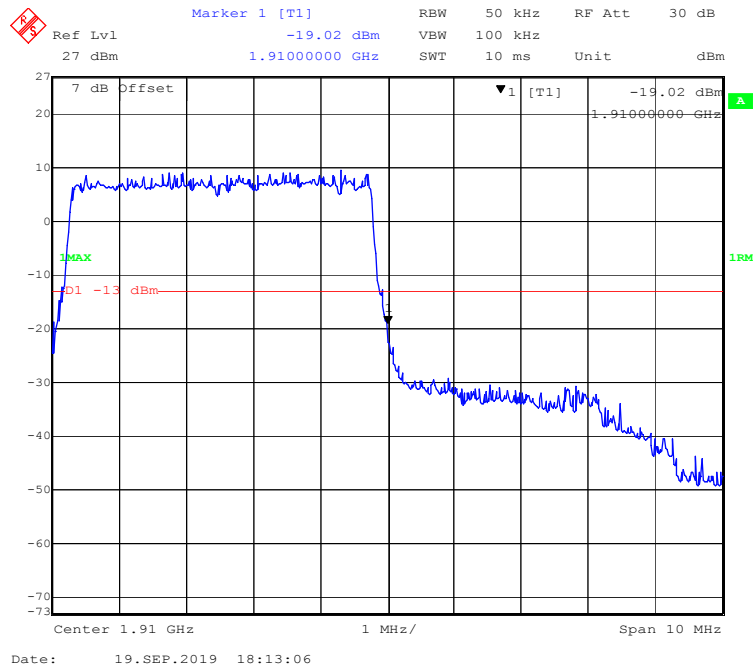




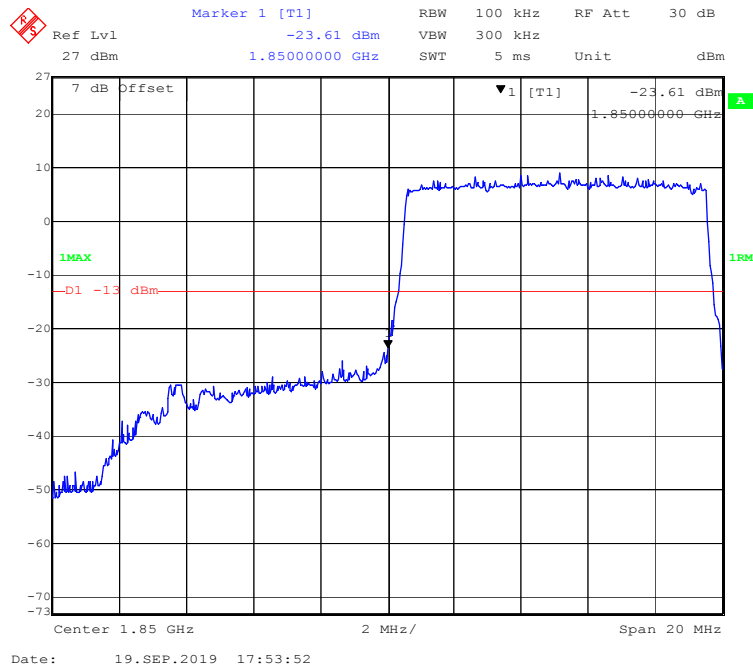
### QPSK (5 MHz, FULL RB) - Left Band Edge



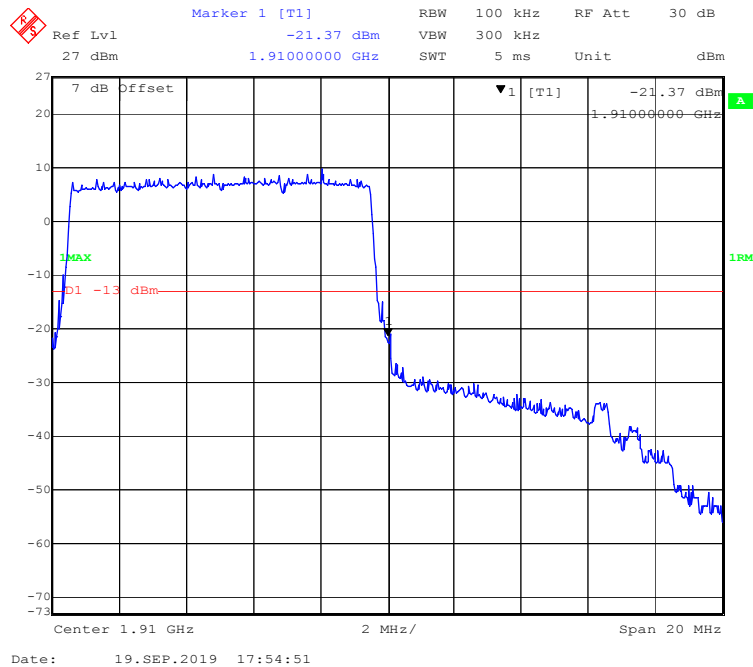
### QPSK (5 MHz, FULL RB) - Right Band Edge



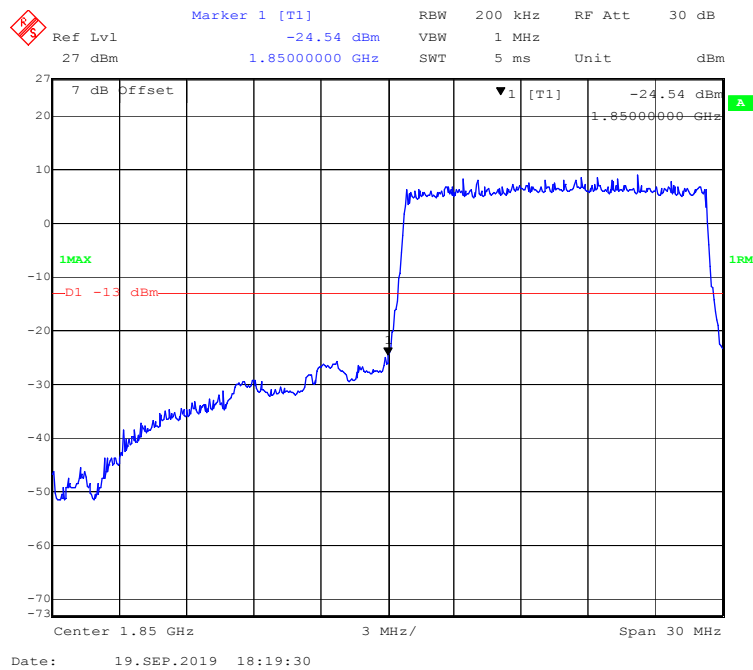
### QPSK (10 MHz, FULL RB) - Left Band Edge



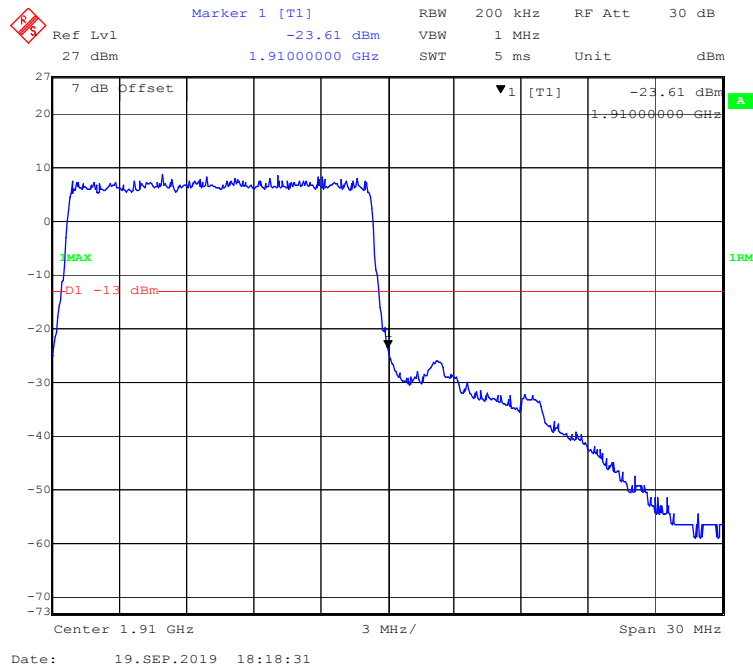
### QPSK (10 MHz, FULL RB) - Right Band Edge



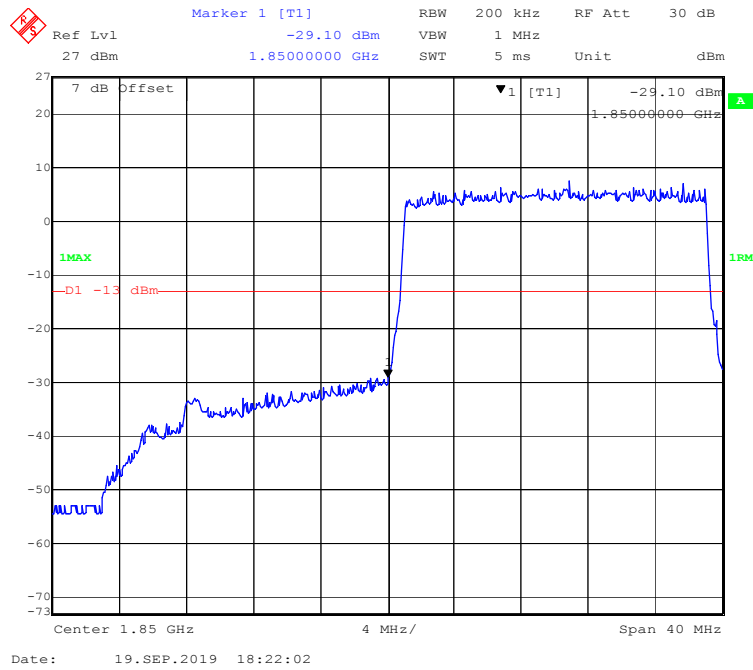
### QPSK (15 MHz, FULL RB) - Left Band Edge



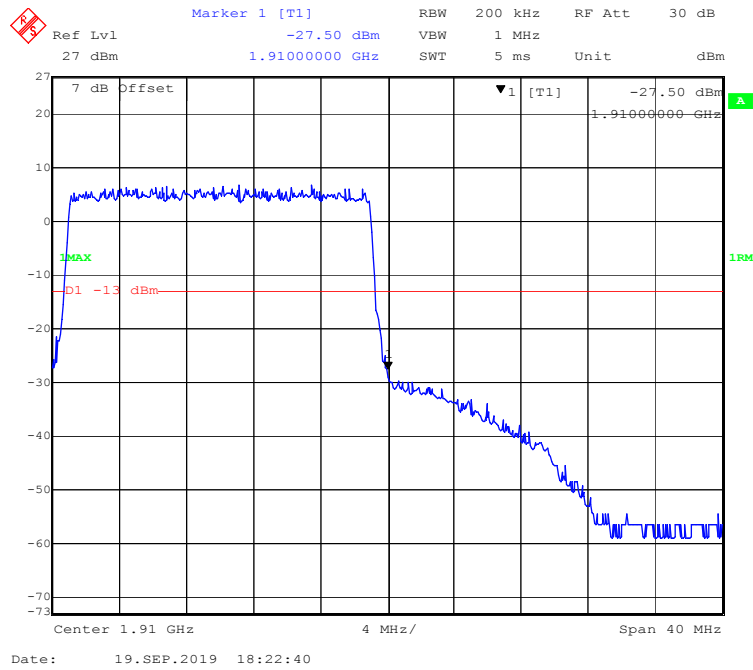
### QPSK (15 MHz, FULL RB) - Right Band Edge



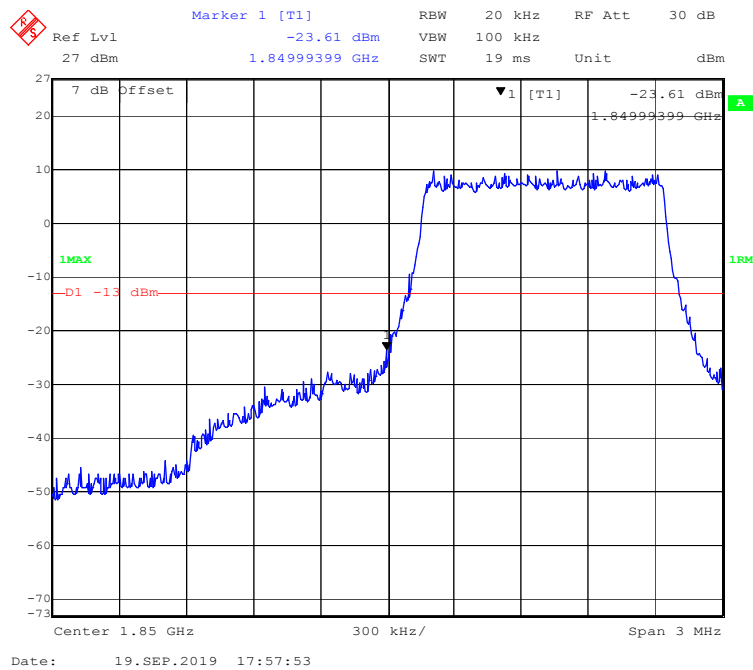
### QPSK (20 MHz, FULL RB) - Left Band Edge



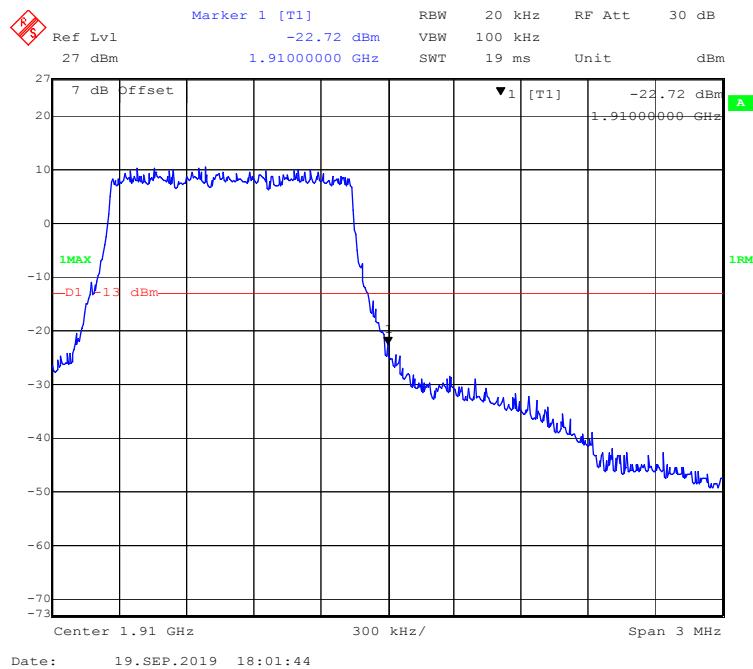
### QPSK (20 MHz, FULL RB) - Right Band Edge



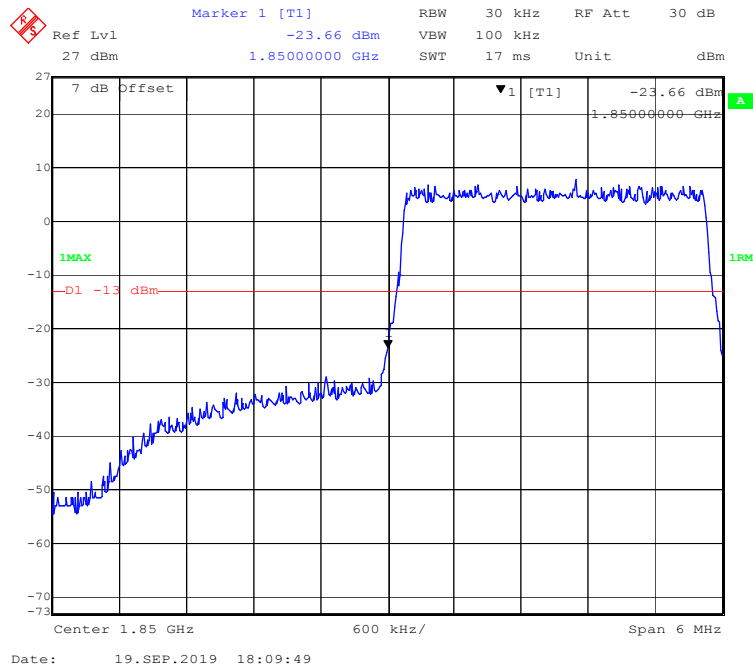
### 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



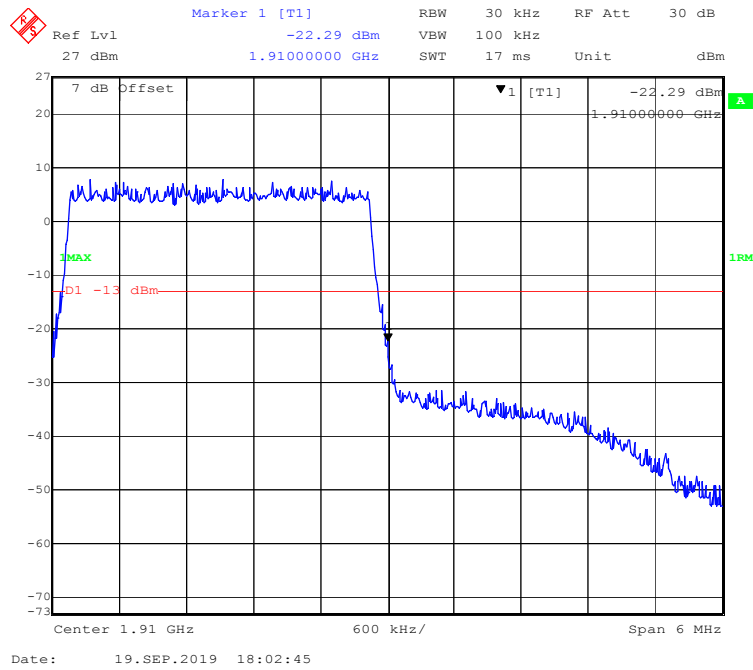
### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



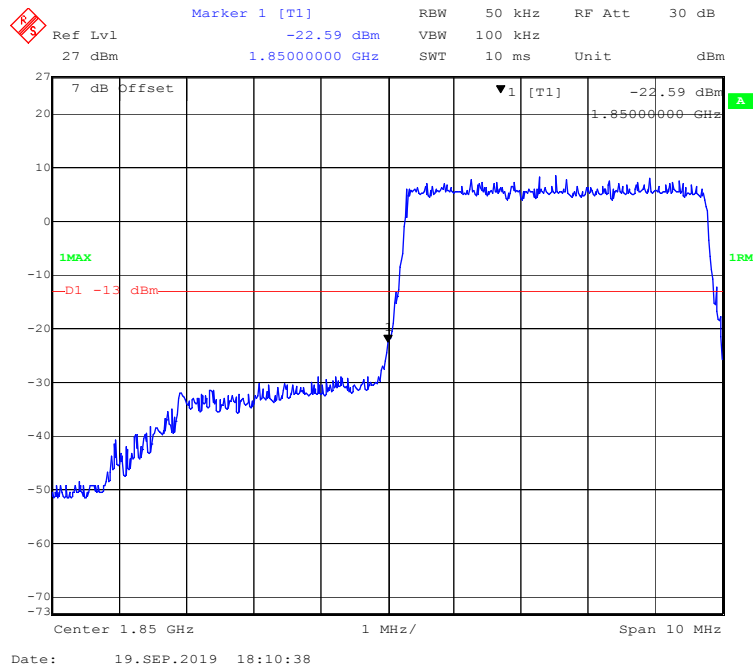
### 16-QAM (3 MHz, FULL RB) - Left Band Edge



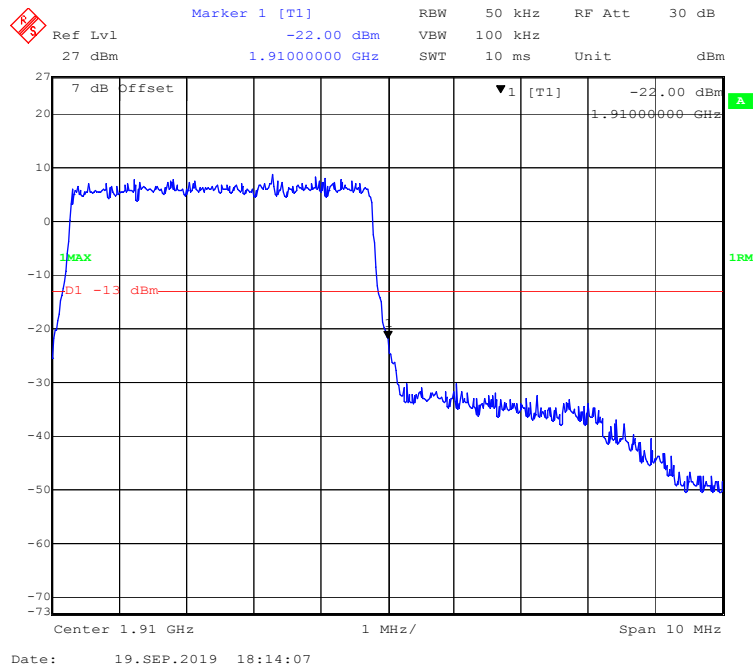
### 16-QAM (3 MHz, FULL RB) - Right Band Edge



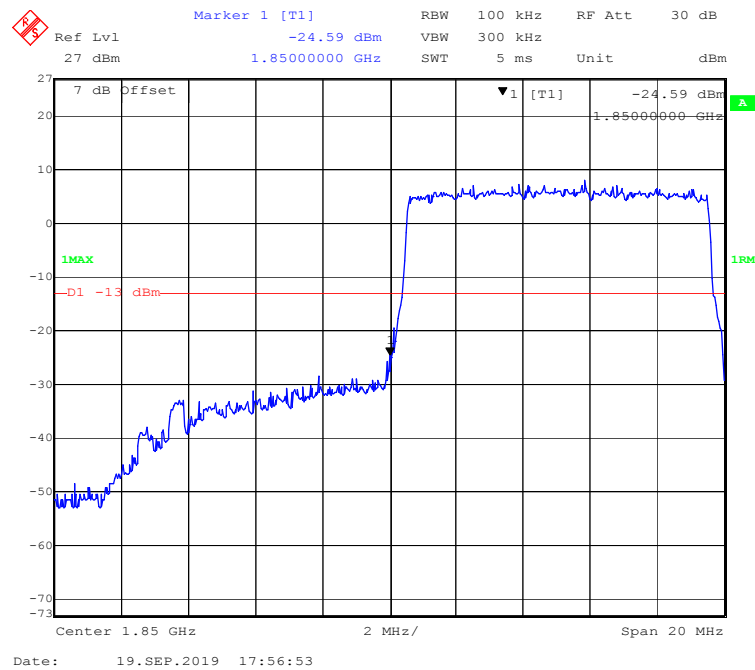
### 16-QAM (5 MHz, FULL RB) - Left Band Edge



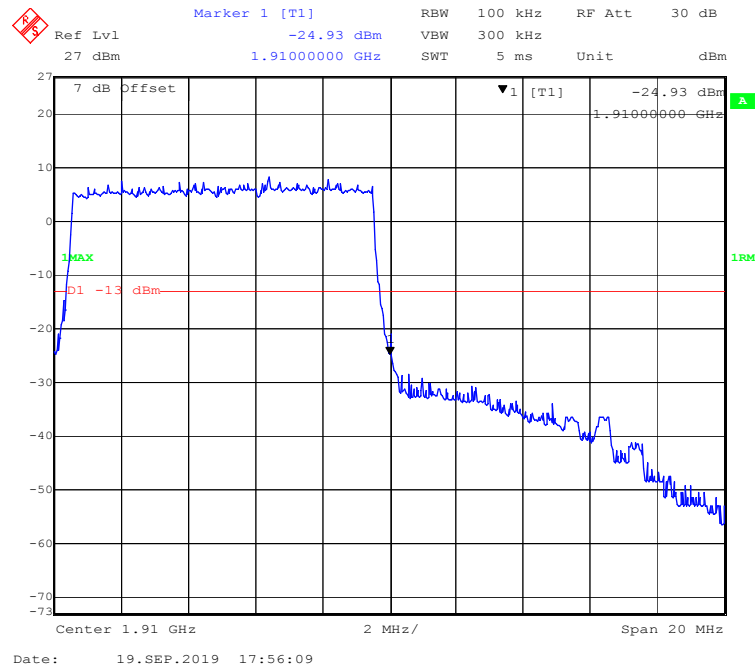
### 16-QAM (5 MHz, FULL RB) - Right Band Edge



### 16-QAM (10 MHz, FULL RB) - Left Band Edge

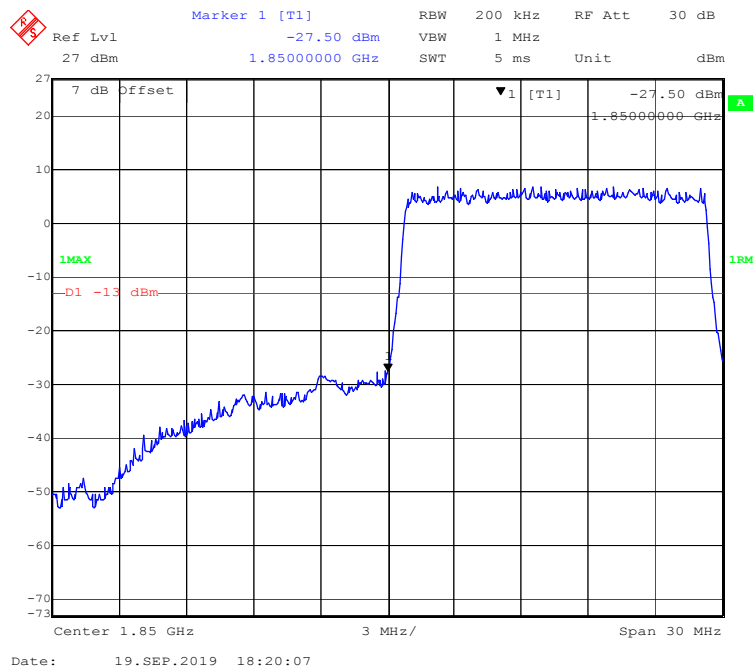


### 16-QAM (10 MHz, FULL RB) - Right Band Edge

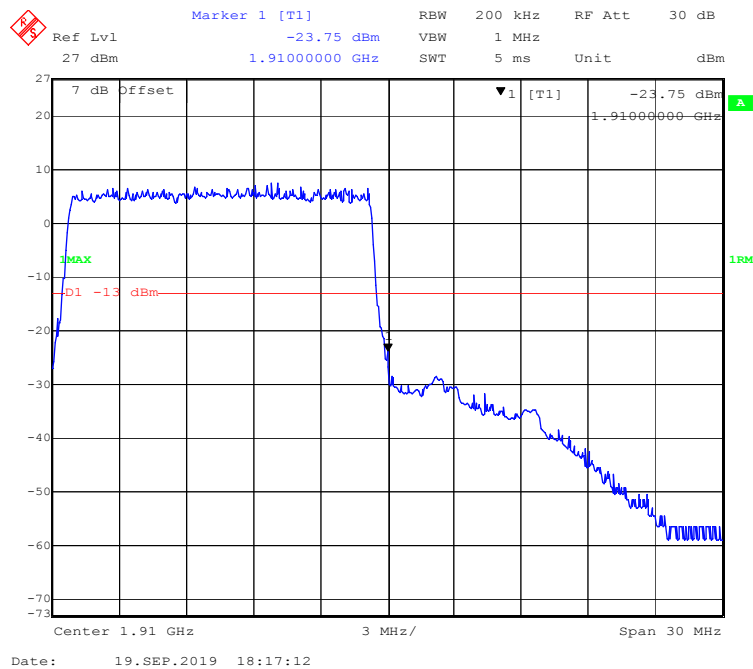




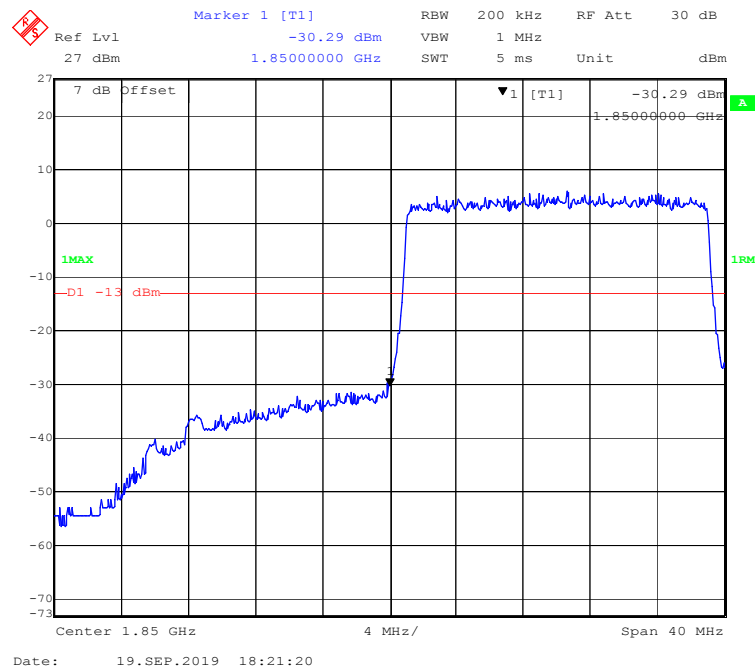
### 16-QAM (15 MHz, FULL RB) - Left Band Edge



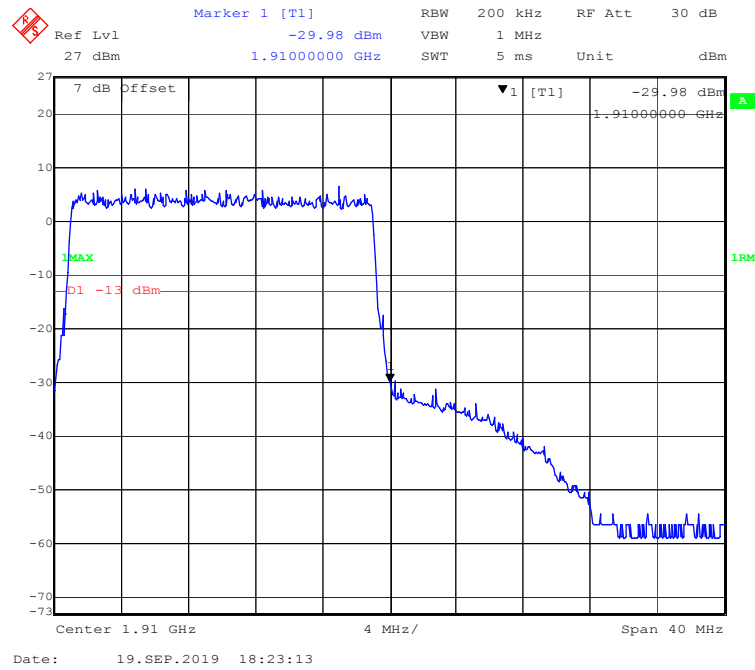
### 16-QAM (15 MHz, FULL RB) - Right Band Edge



### 16-QAM (20 MHz, FULL RB) - Left Band Edge

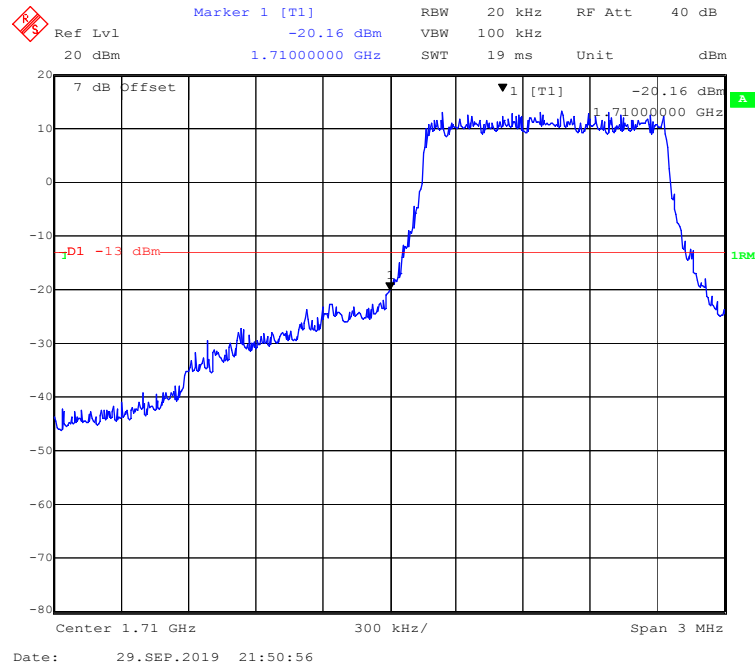


### 16-QAM (20 MHz, FULL RB) - Right Band Edge

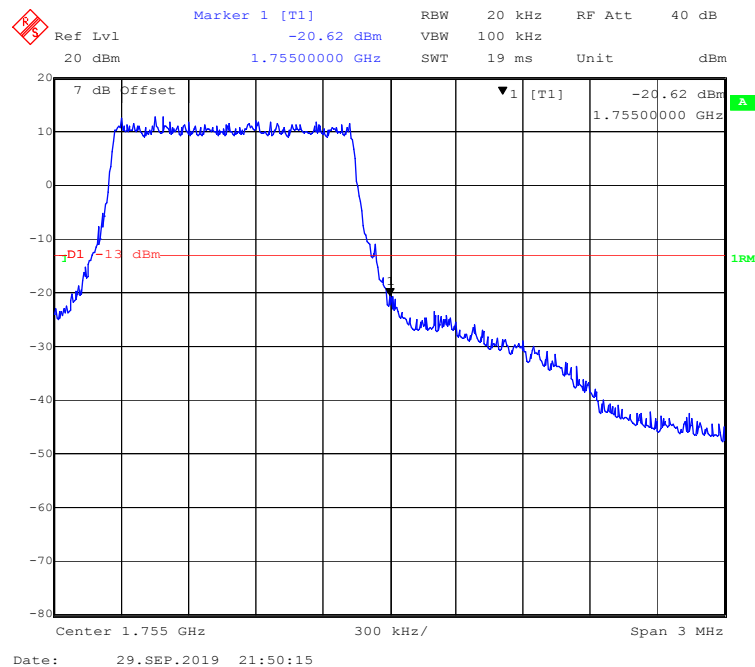


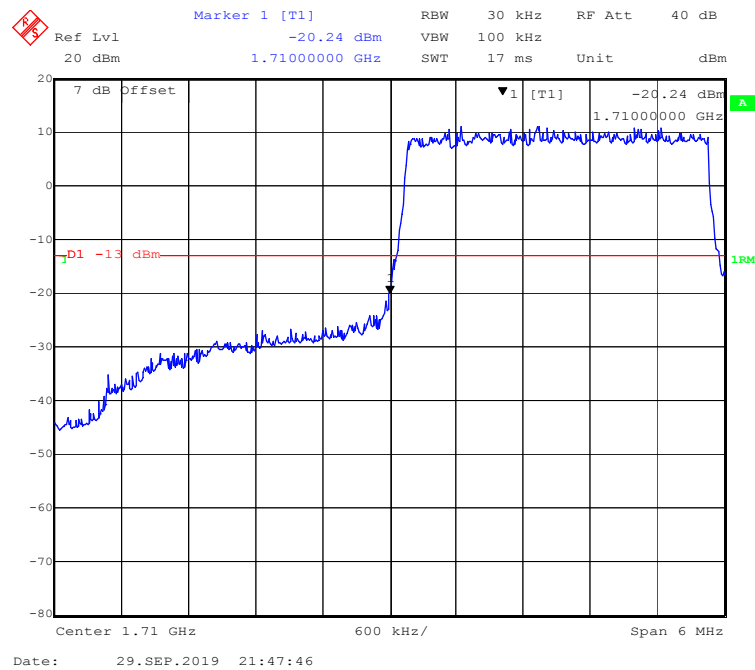
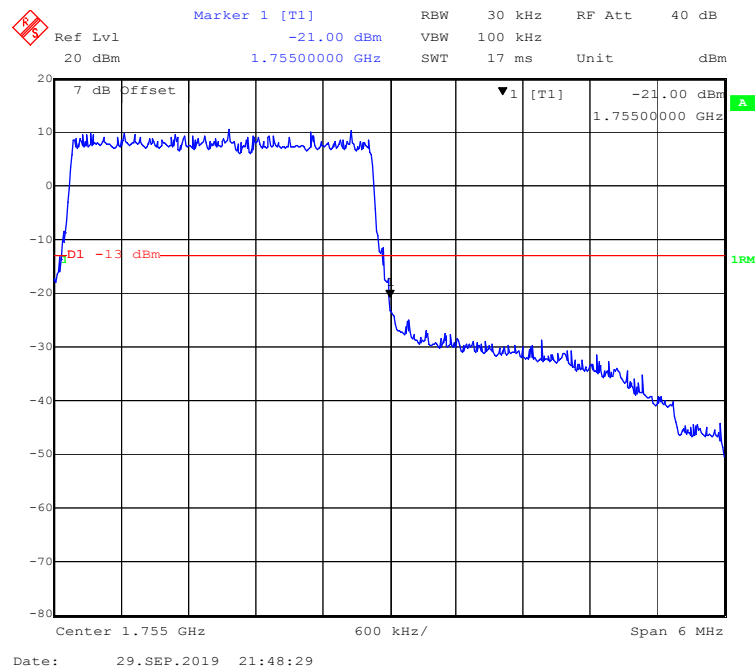
# LTE Band 4:

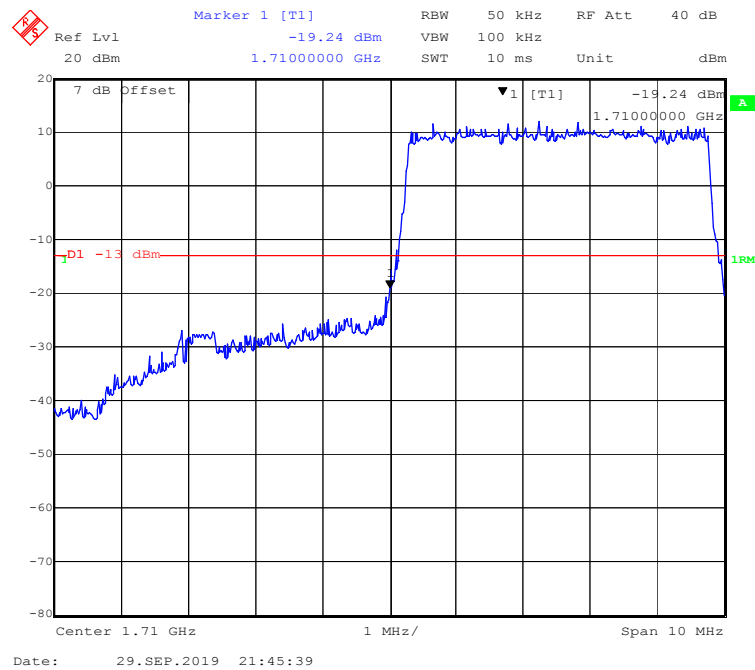
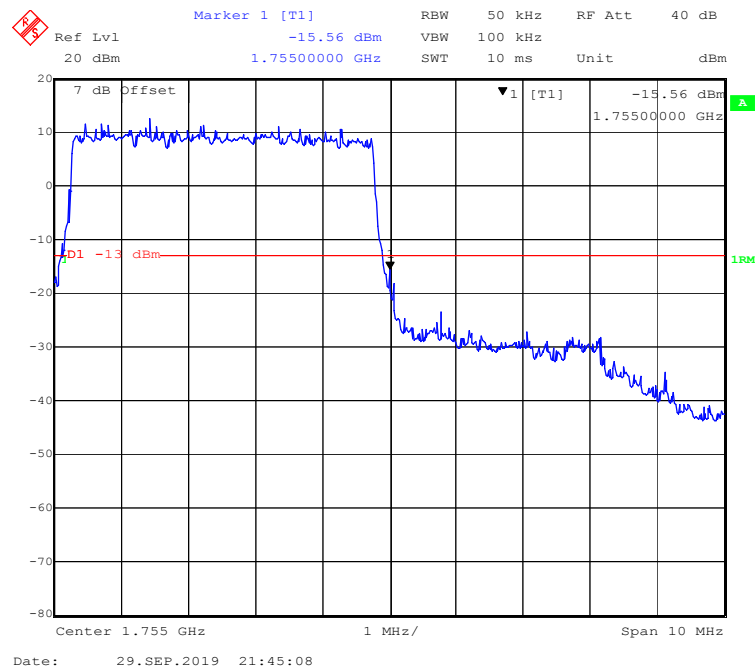
## QPSK (1.4 MHz, FULL RB) - Left Band Edge



## QPSK (1.4 MHz, FULL RB) - Right Band Edge



**QPSK (3 MHz, FULL RB) - Left Band Edge****QPSK (3 MHz, FULL RB) - Right Band Edge**

**QPSK (5 MHz, FULL RB) - Left Band Edge****QPSK (5 MHz, FULL RB) - Right Band Edge**

Marker 1 [T1]  
 Ref Lvl -20.43 dBm  
 20 dBm 1.7100000 GHz  
 RBW 100 kHz RF Att 40 dB  
 SWT 5 ms Unit dBm

7 dB Offset  
 ▼1 [T1]  
 -20.43 dBm  
 1.7100000 GHz  
 D1 -13 dBm  
 1RM

Center 1.71 GHz  
 2 MHz/  
 Span 20 MHz

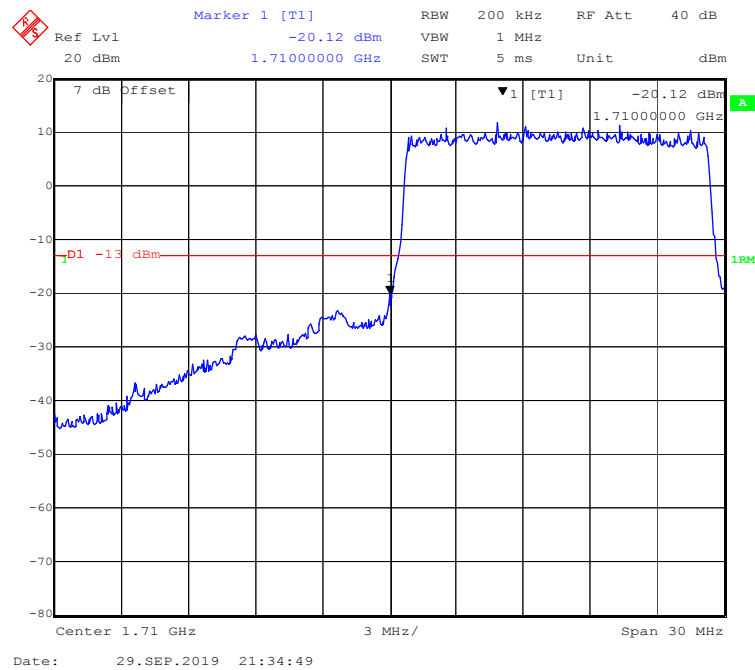
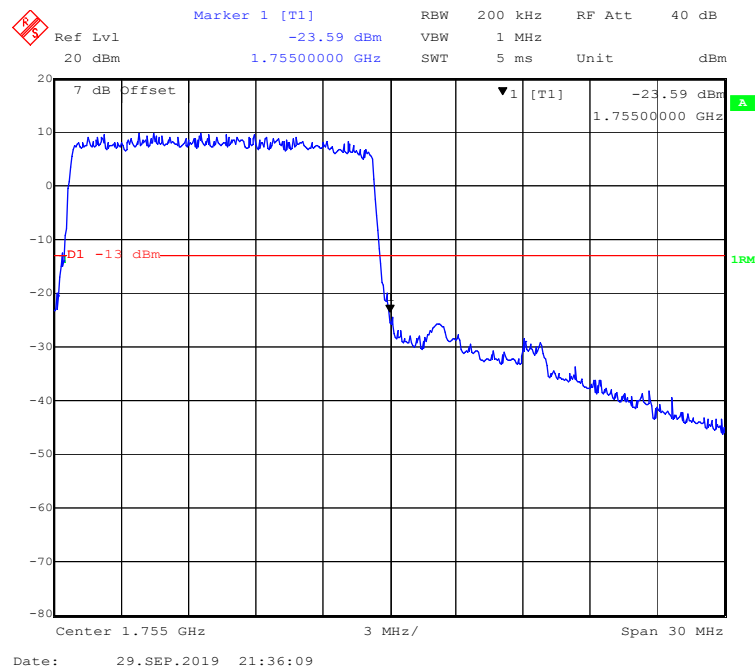
Date: 29.SEP.2019 21:42:14

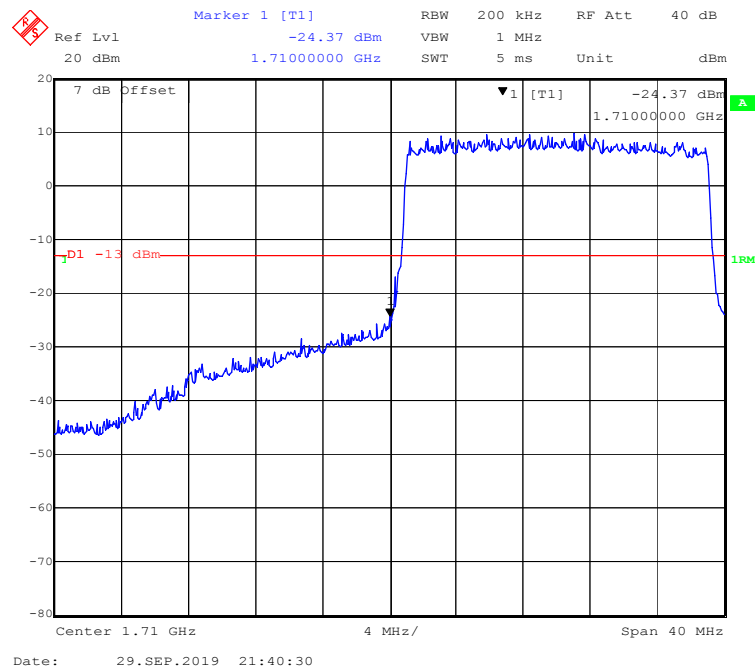
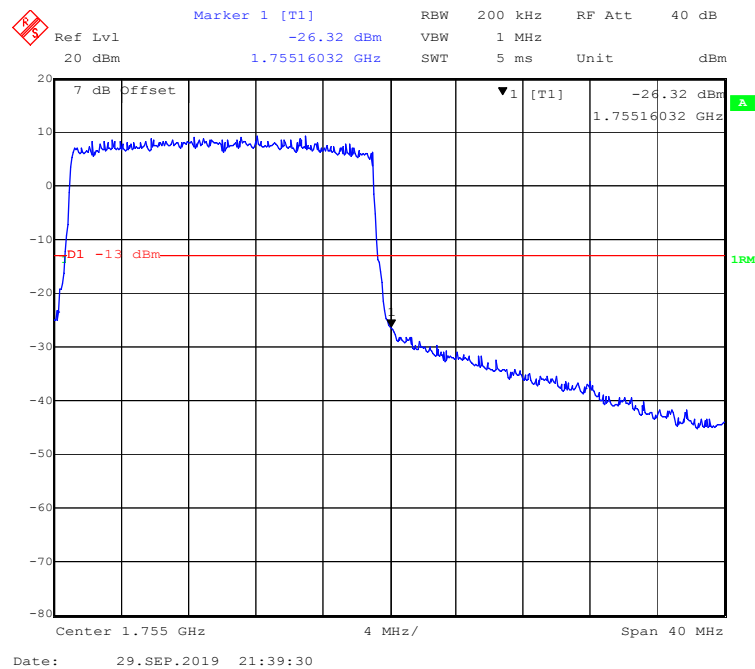
A spectrum analyzer screenshot showing a signal at 1.755 GHz. The plot displays a signal that drops sharply at the center frequency. The interface includes various settings and a date/time stamp.

Parameter	Value
Ref Lvl	20 dBm
Marker 1 [T1]	-21.21 dBm
RBW	100 kHz
VBW	300 kHz
SWT	5 ms
RF Att	40 dB
Unit	dBm

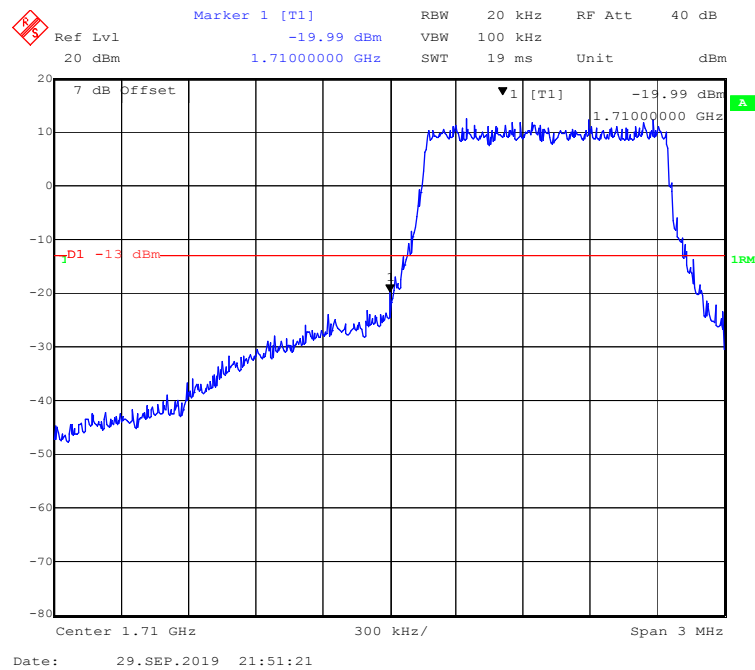
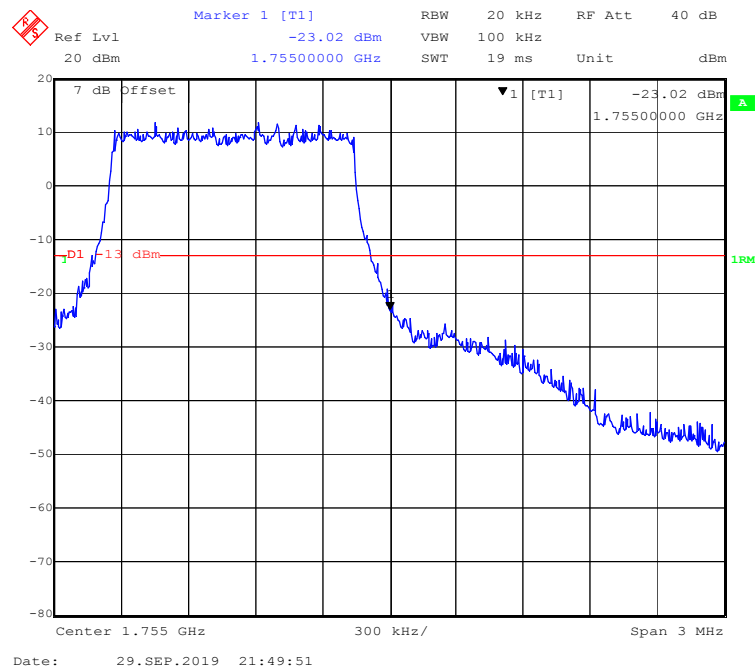
Center 1.755 GHz  
 2 MHz/  
 Span 20 MHz

Date: 29.SEP.2019 21:42:59

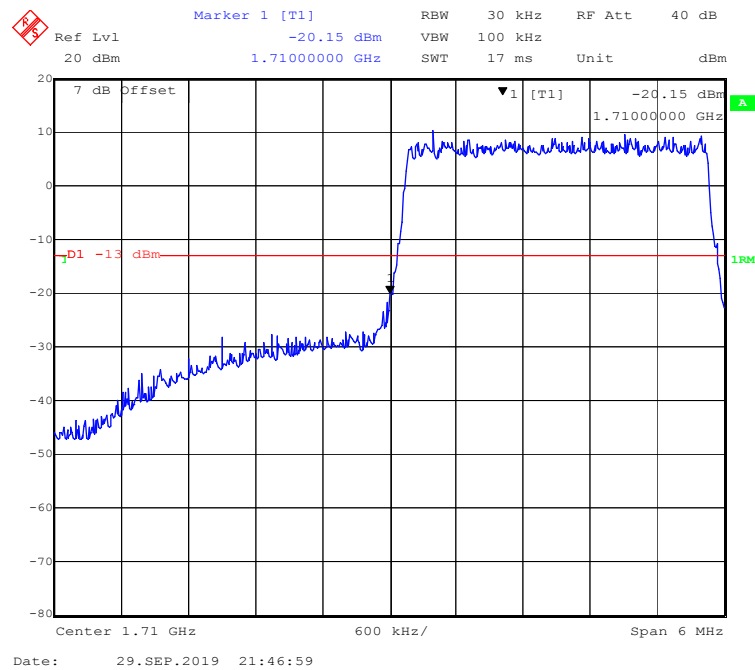
**QPSK (15 MHz, FULL RB) - Left Band Edge****QPSK (15 MHz, FULL RB) - Right Band Edge**

**QPSK (20 MHz, FULL RB) - Left Band Edge****QPSK (20 MHz, FULL RB) - Right Band Edge**

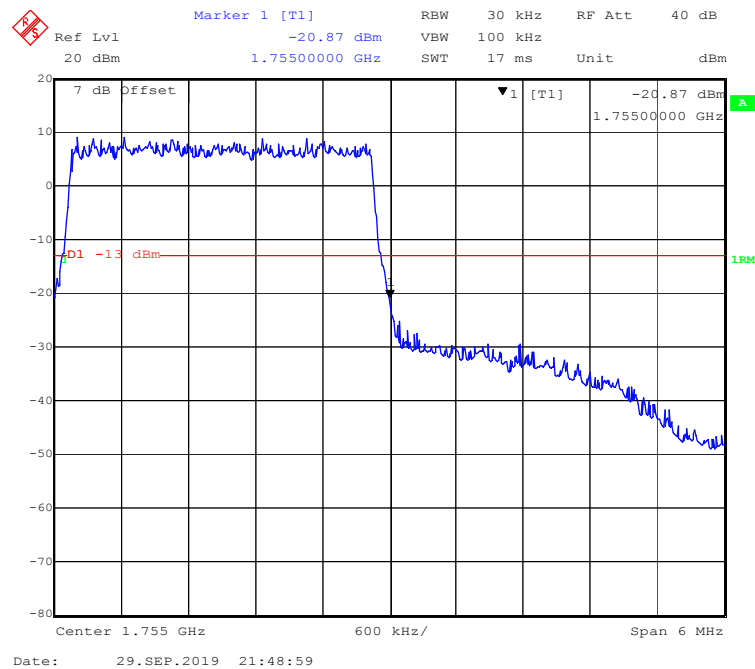


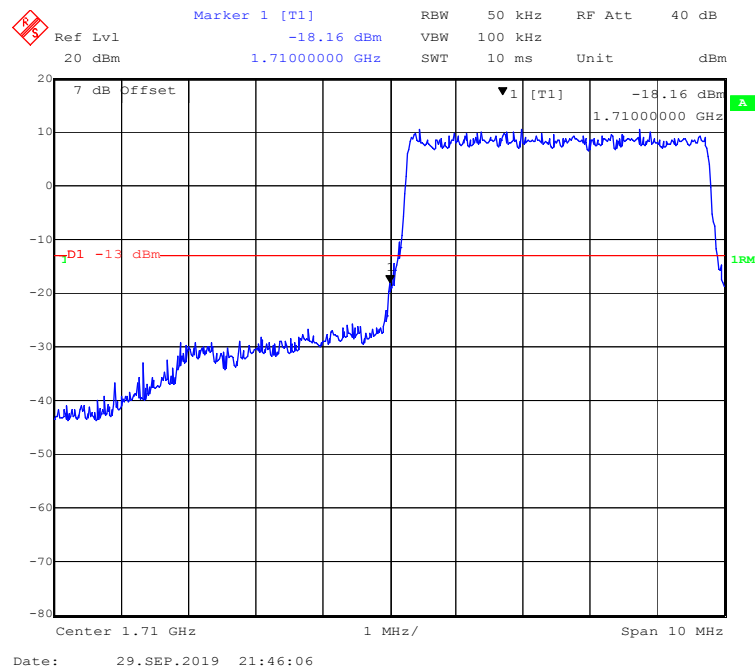
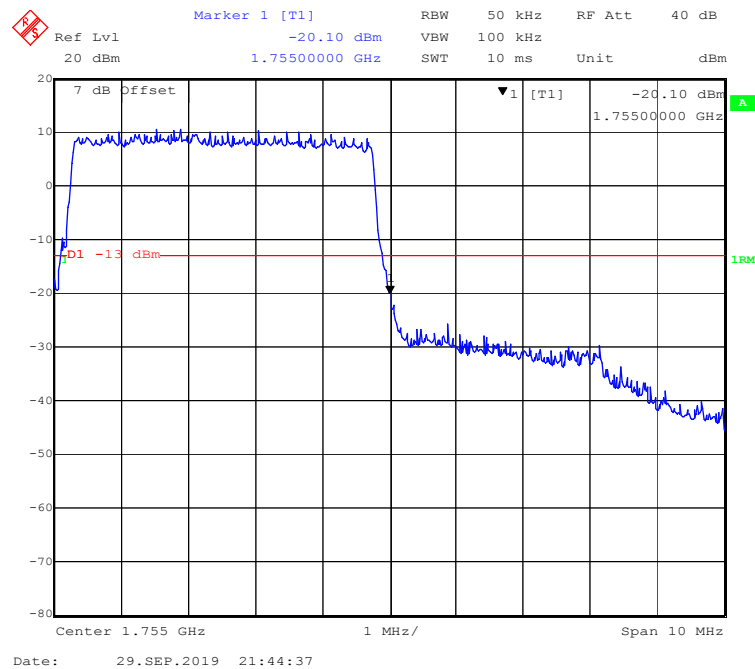
**16-QAM (1.4 MHz, FULL RB) - Left Band Edge****16-QAM (1.4 MHz, FULL RB) - Right Band Edge**

### 16-QAM (3 MHz, FULL RB) - Left Band Edge

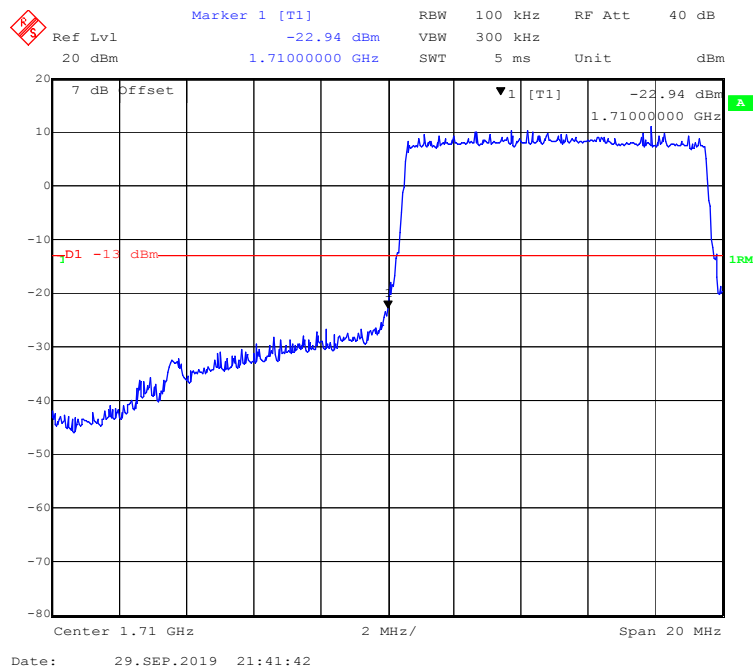


### 16-QAM (3 MHz, FULL RB) - Right Band Edge

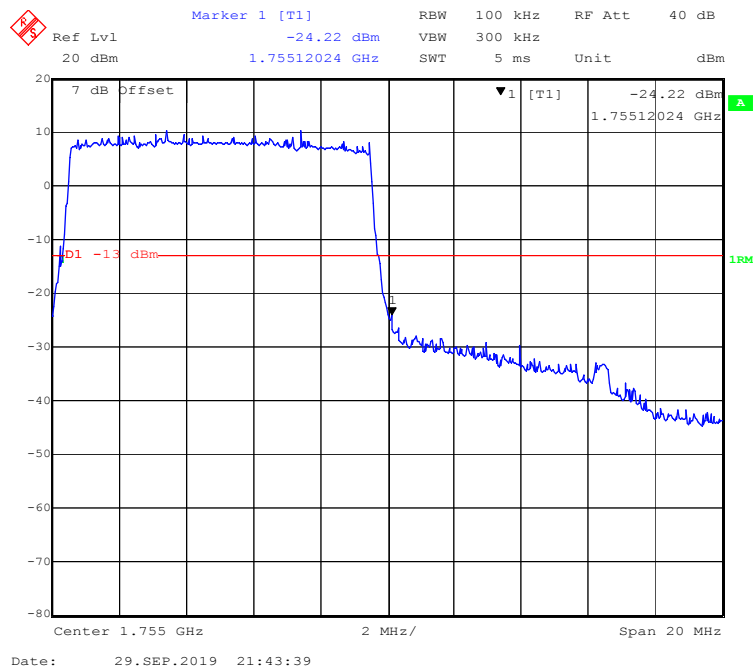


**16-QAM (5 MHz, FULL RB) - Left Band Edge****16-QAM (5 MHz, FULL RB) - Right Band Edge**

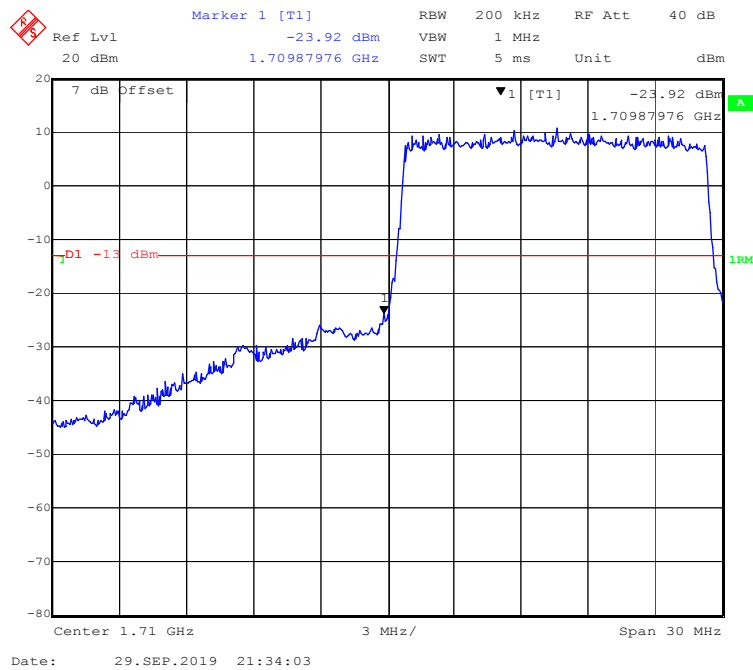
### 16-QAM (10 MHz, FULL RB) - Left Band Edge



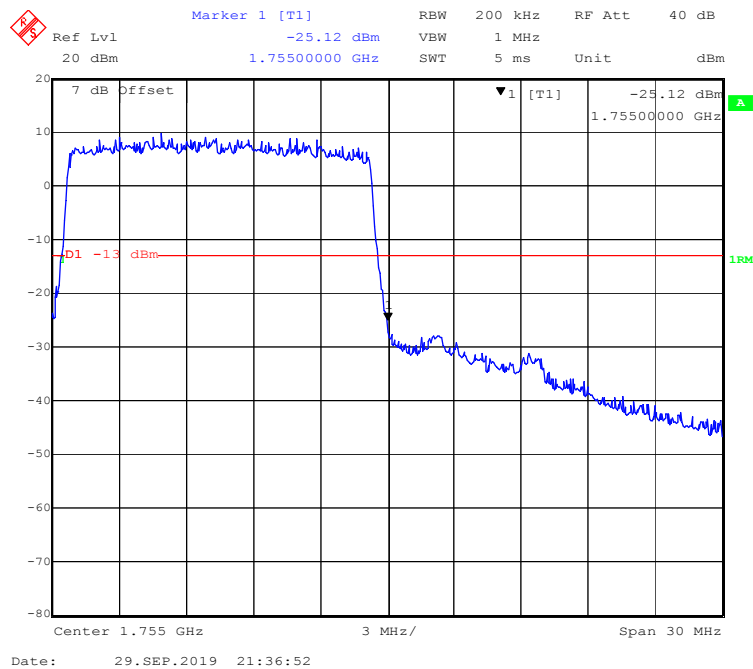
### 16-QAM (10 MHz, FULL RB) - Right Band Edge



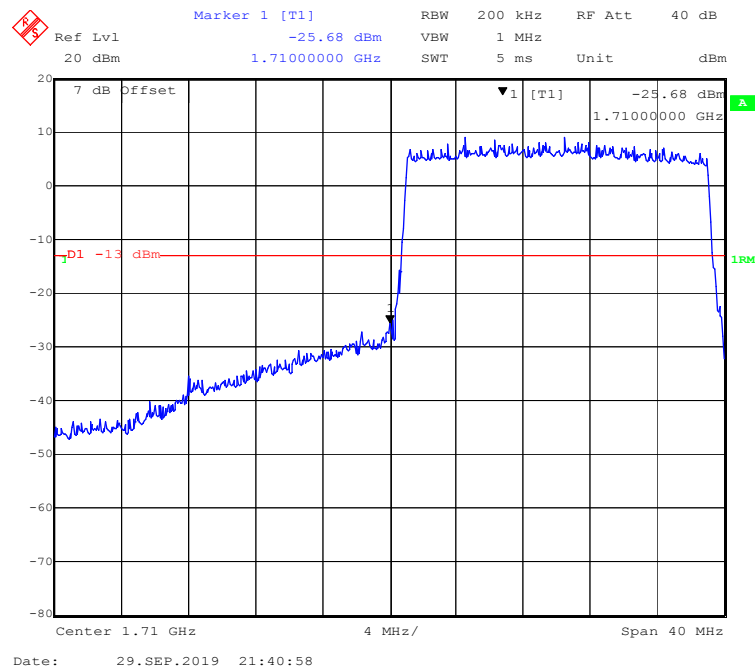
### 16-QAM (15 MHz, FULL RB) - Left Band Edge



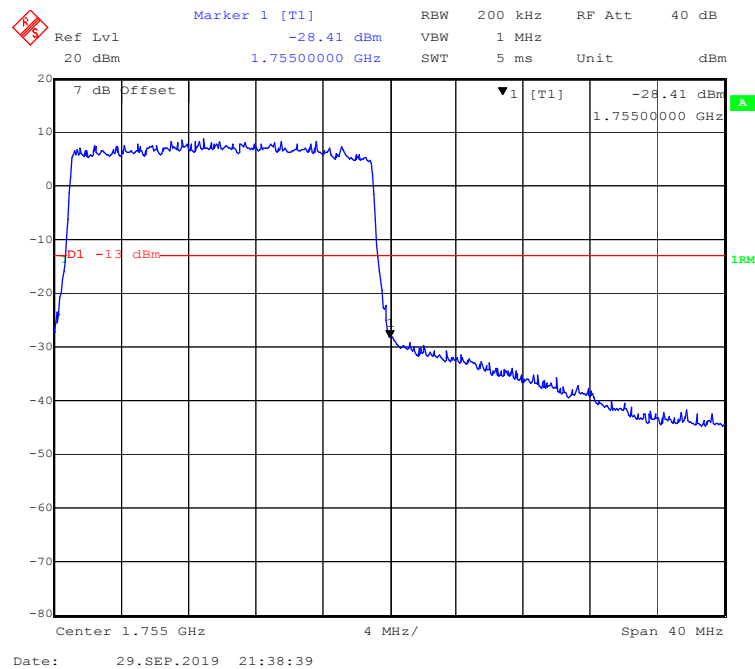
### 16-QAM (15 MHz, FULL RB) - Right Band Edge

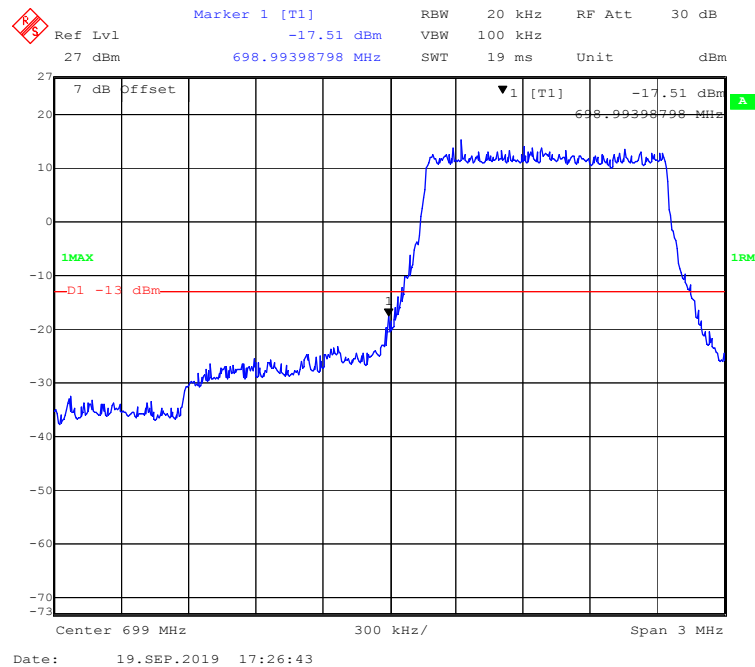
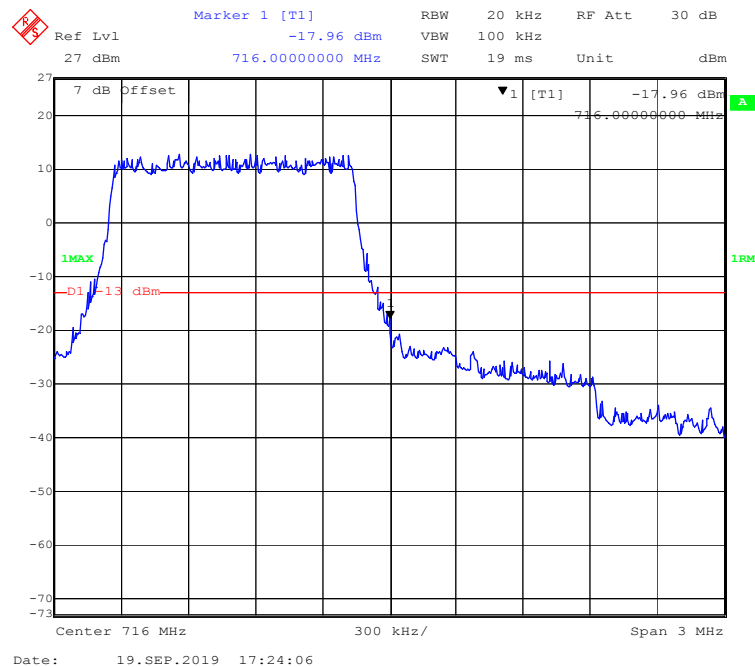


### 16-QAM (20 MHz, FULL RB) - Left Band Edge

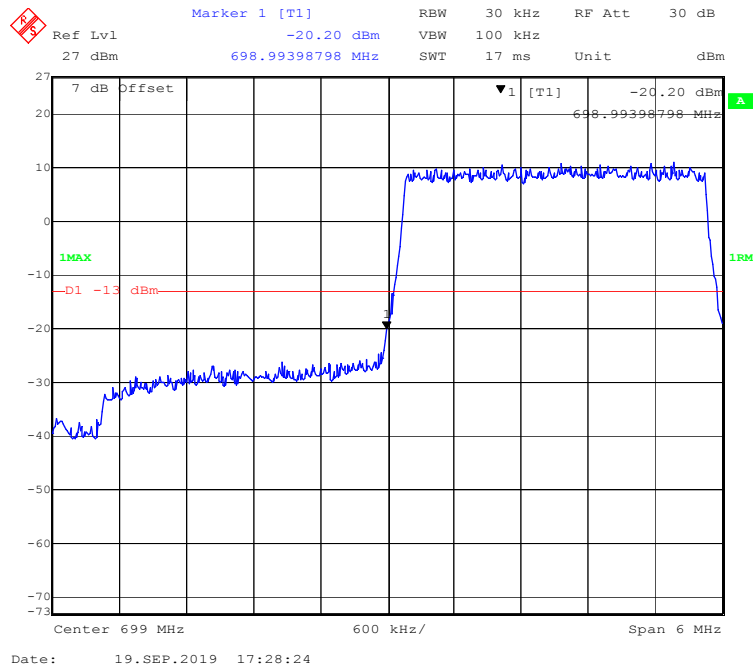


### 16-QAM (20 MHz, FULL RB) - Right Band Edge

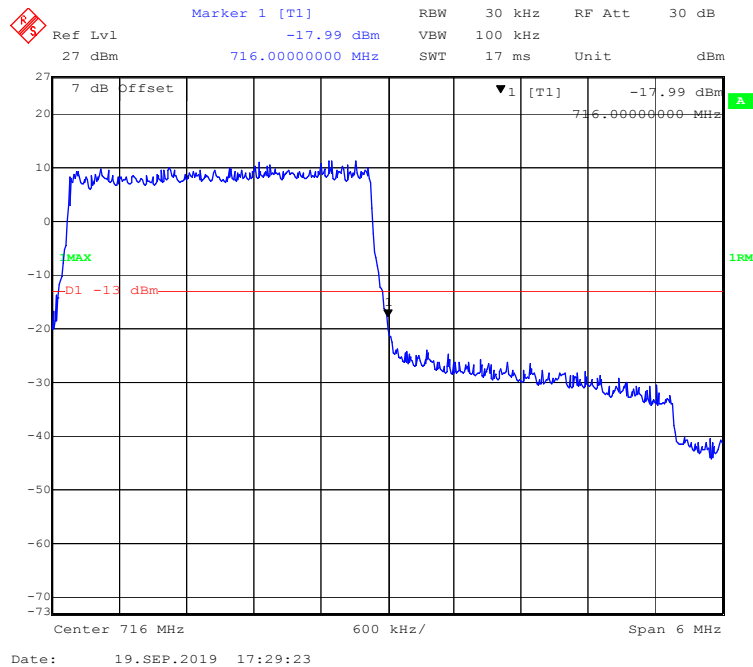


**LTE Band 12:****QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

### QPSK (3 MHz, FULL RB) - Left Band Edge

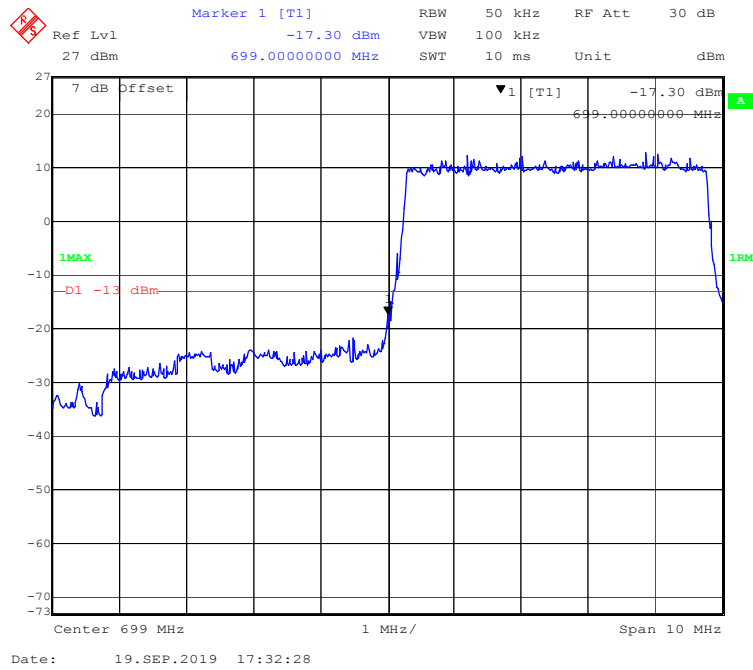


### QPSK (3 MHz, FULL RB) - Right Band Edge

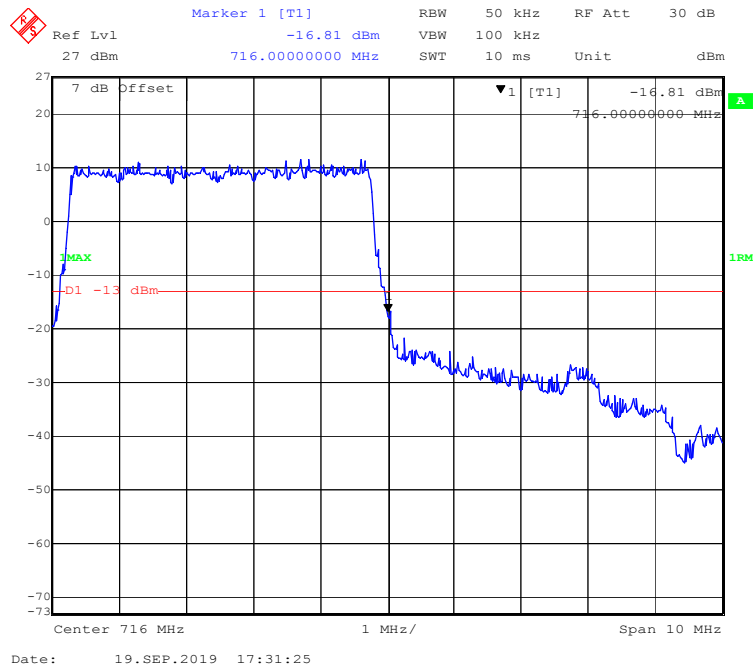




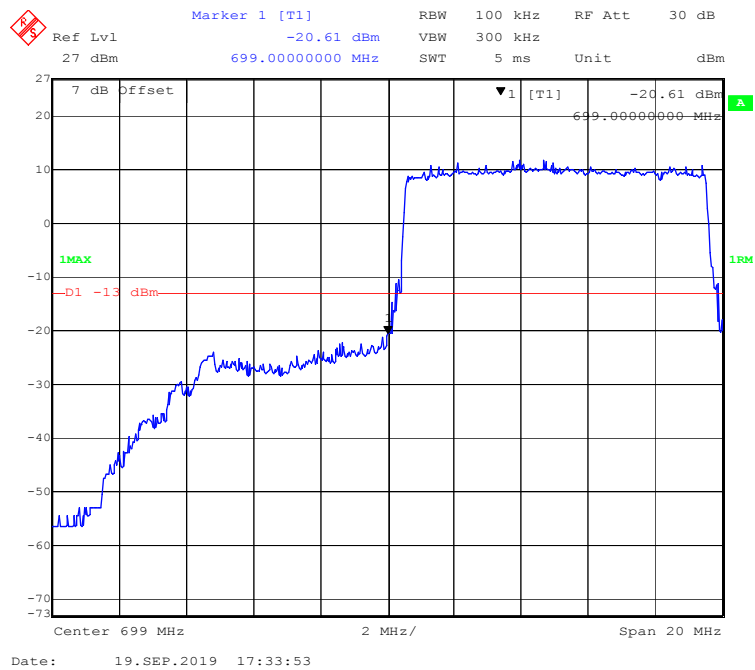
### QPSK (5 MHz, FULL RB) - Left Band Edge



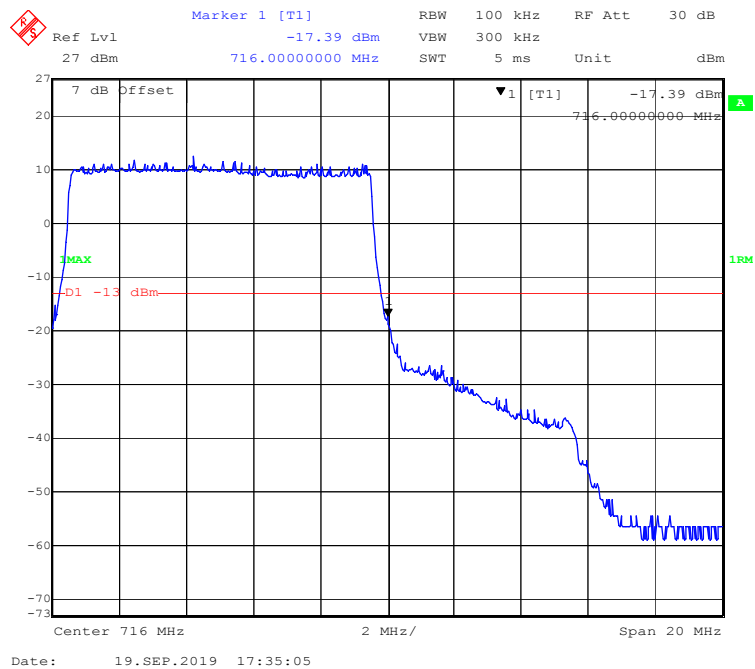
### QPSK (5 MHz, FULL RB) - Right Band Edge



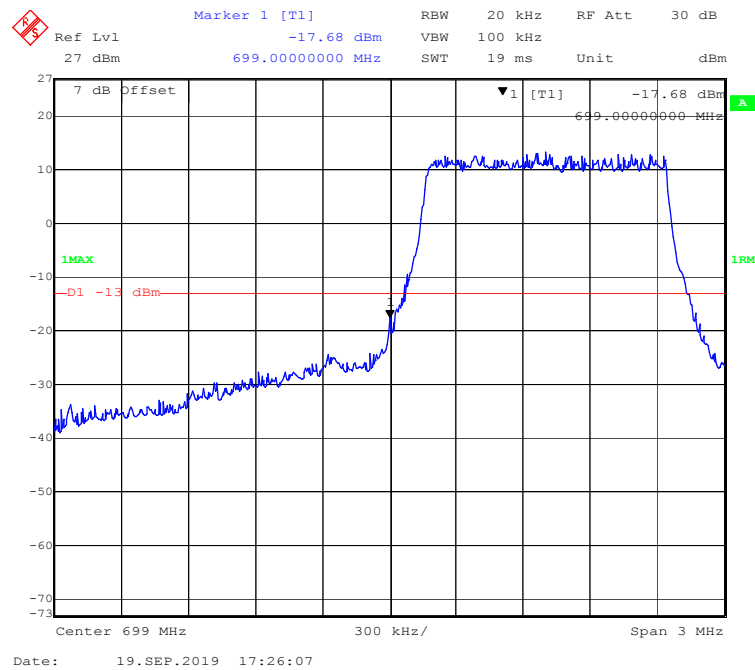
### QPSK (10 MHz, FULL RB) - Left Band Edge



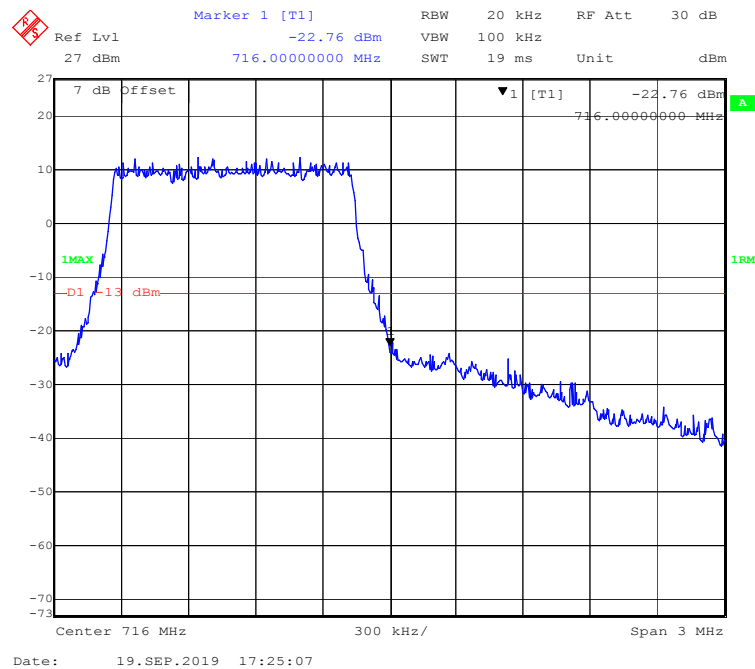
### QPSK (10 MHz, FULL RB) - Right Band Edge



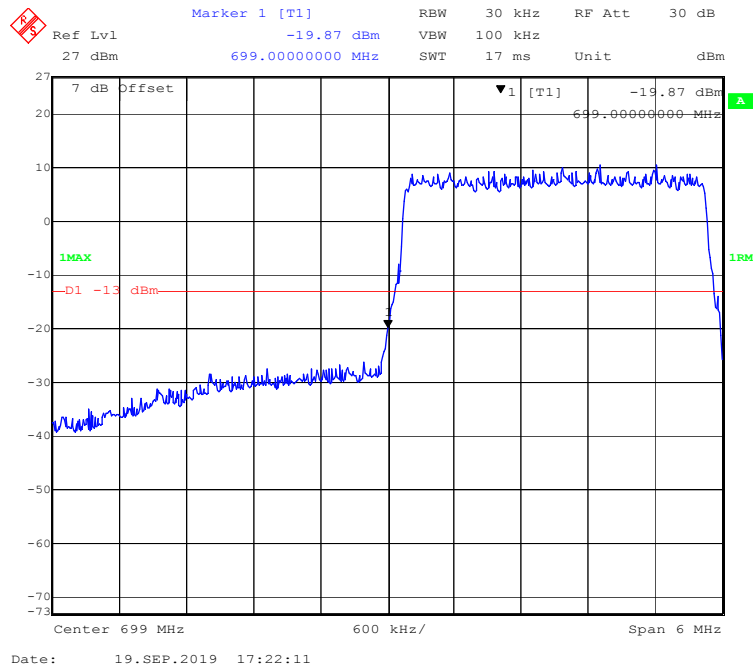
### 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



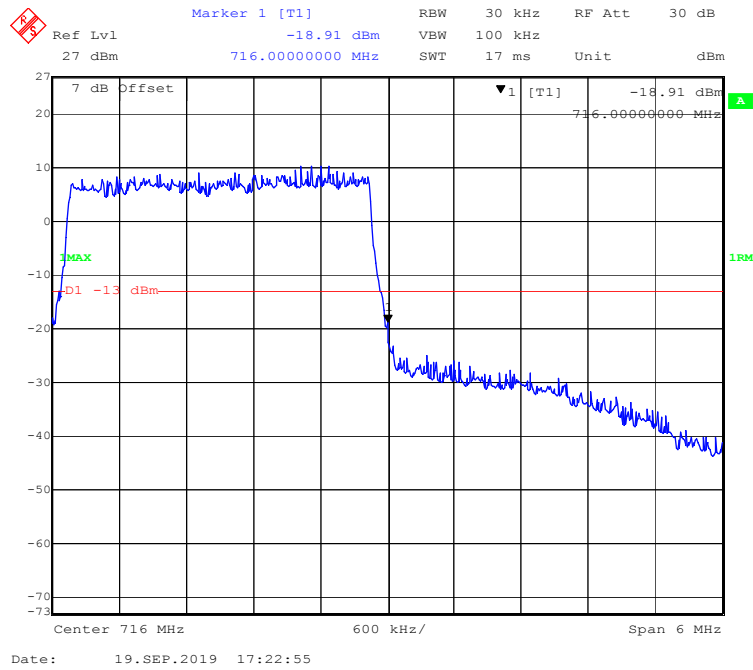
### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge

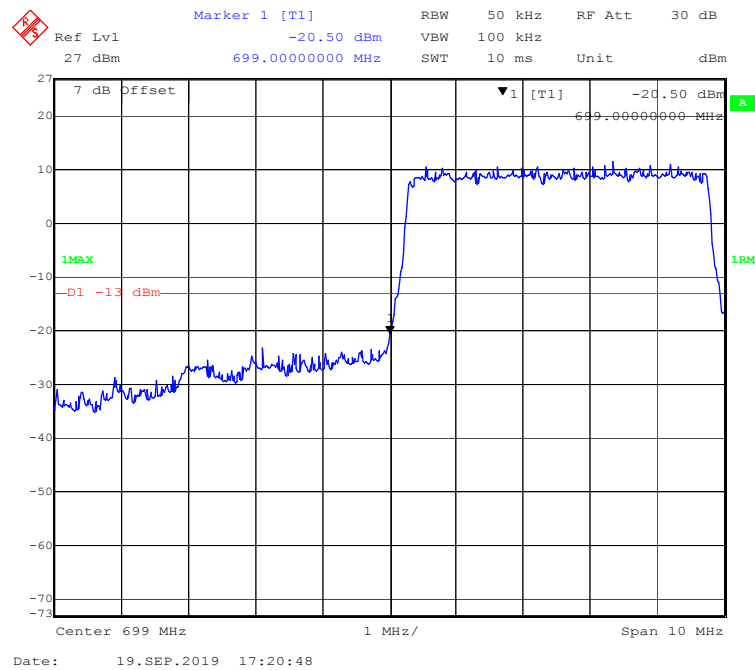
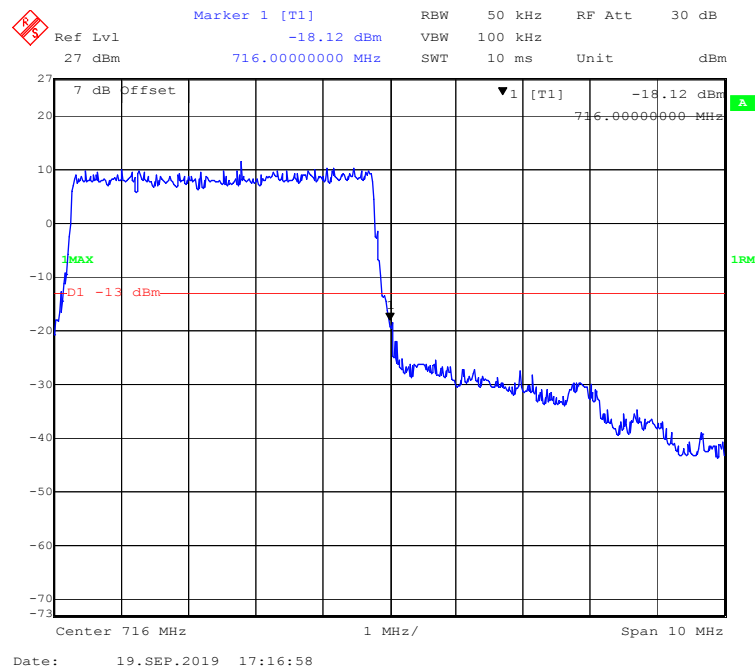


### 16-QAM (3 MHz, FULL RB) - Left Band Edge

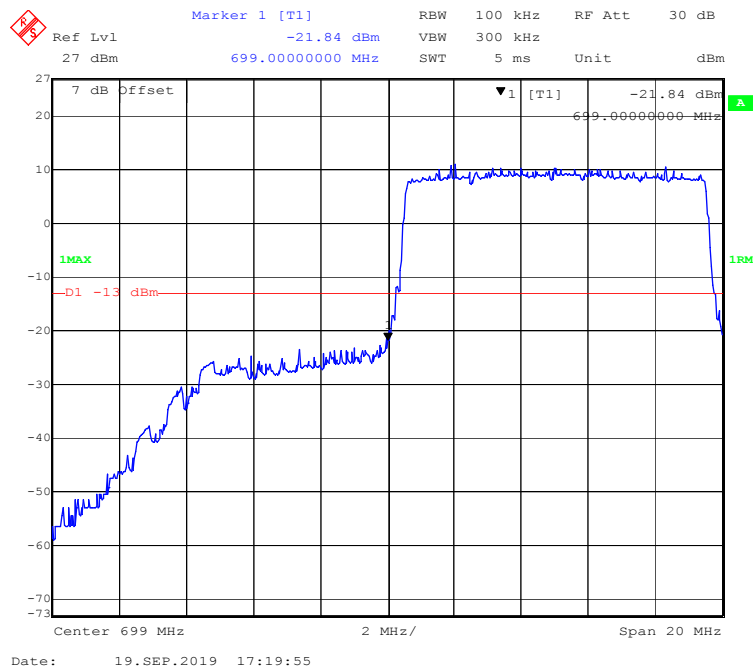


### 16-QAM (3 MHz, FULL RB) - Right Band Edge

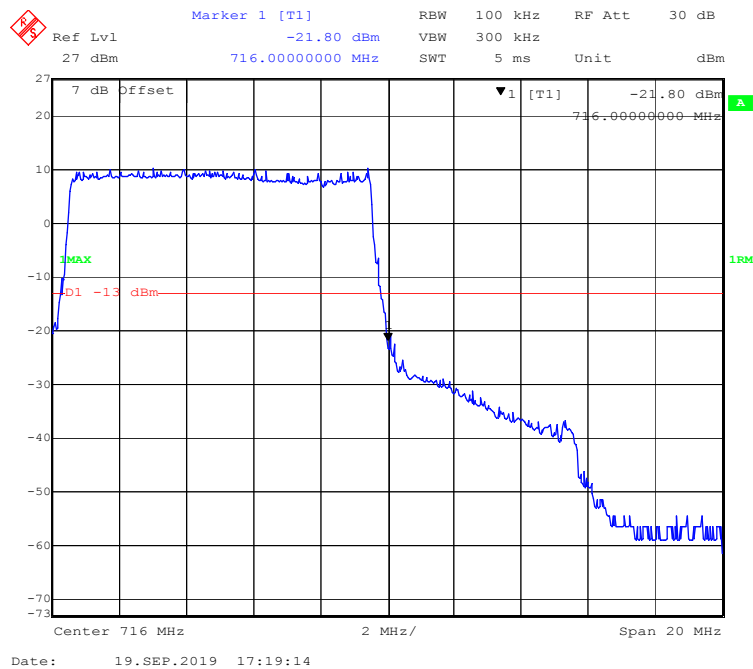


**16-QAM (5 MHz, FULL RB) - Left Band Edge****16-QAM (5 MHz, FULL RB) - Right Band Edge**

### 16-QAM (10 MHz, FULL RB) - Left Band Edge



### 16-QAM (10 MHz, FULL RB) - Right Band Edge



**FCC § 2.1055; § 22.355; § 24.235; §27.54- FREQUENCY STABILITY****Applicable Standards**

FCC § 2.1055, §22.355, §24.235 and §27.54.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

**Frequency Tolerance for Transmitters in the Public Mobile Services**

Frequency Range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

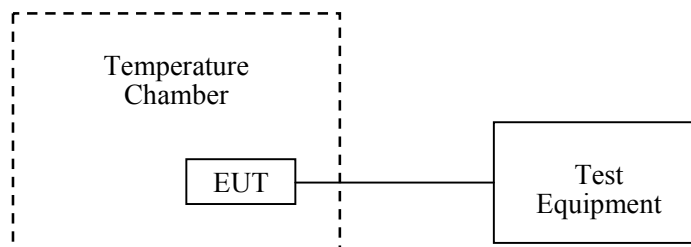
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

**Test Procedure**

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



**Test Data****Environmental Conditions**

<b>Temperature:</b>	23.2 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.3 kPa

The testing was performed by Jack Jiao on 2019-09-19.

EUT operation mode: Transmitting

Test Result: Compliant.

**WCDMA Band V:**

Middle Channel, $f_o = 836.6$ MHz				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	4	0.0048	2.5
-20		5	0.0060	2.5
-10		5	0.0060	2.5
0		3	0.0036	2.5
10		4	0.0048	2.5
20		2	0.0024	2.5
30		3	0.0036	2.5
40		7	0.0084	2.5
50		6	0.0072	2.5
25	V min.= 3.5	4	0.0048	2.5
25	V max.= 4.2	7	0.0084	2.5



**WCDMA Band II:**

<b>WCDMA Mode, Middle Channel, <math>f_o=1880.0</math> MHz</b>				
<b>Temperature (°C)</b>	<b>Power Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Result</b>
-30	3.7	7	0.0037	Pass
-20		3	0.0016	
-10		6	0.0032	Pass
0		5	0.0027	Pass
10		7	0.0037	Pass
20		10	0.0053	Pass
30		10	0.0053	Pass
40		9	0.0048	Pass
50		6	0.0032	Pass
25	V min.= 3.5	6	0.0032	Pass
25	V max.= 4.2	9	0.0048	Pass

**LTE Band 2:**

Middle Channel, $f_o=1880.0$ MHz (QPSK)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	11	0.0059	Pass
-20		10	0.0053	Pass
-10		8	0.0043	Pass
0		9	0.0048	Pass
10		-4	-0.0021	Pass
20		2	0.0011	Pass
30		4	0.0021	Pass
40		5	0.0027	Pass
50		6	0.0032	Pass
25	V min.= 3.5	8	0.0043	Pass
25	V max.= 4.2	7	0.0037	Pass

Middle Channel, $f_o=1880.0$ MHz (16-QAM)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	12	0.0064	Pass
-20		10	0.0053	Pass
-10		7	0.0037	Pass
0		9	0.0048	Pass
10		-4	-0.0021	Pass
20		2	0.0011	Pass
30		3	0.0016	Pass
40		6	0.0032	Pass
50		7	0.0037	Pass
25	V min.= 3.5	8	0.0043	Pass
25	V max.= 4.2	5	0.0027	Pass

**LTE Band 4:**

Low Channel & High Channel (QPSK)					
Temperature	Power Supplied	F <sub>L</sub>	F <sub>H</sub>	F <sub>L</sub> Limit	F <sub>H</sub> Limit
(°C)	(V <sub>DC</sub> )	(MHz)	(MHz)	(MHz)	(MHz)
-30	3.7	1710.0456	1754.9492	1710	1755
-20		1710.0547	1754.9495	1710	1755
-10		1710.0512	1754.9512	1710	1755
0		1710.0492	1754.9491	1710	1755
10		1710.0514	1754.9492	1710	1755
20		1710.0487	1754.9494	1710	1755
30		1710.0485	1754.9497	1710	1755
40		1710.0491	1754.9494	1710	1755
50		1710.0512	1754.9512	1710	1755
25	V min.= 3.5	1710.0495	1754.9497	1710	1755
25	V max.= 4.2	1710.0504	1754.9523	1710	1755

Low Channel & High Channel (16-QAM)					
Temperature	Power Supplied	F <sub>L</sub>	F <sub>H</sub>	F <sub>L</sub> Limit	F <sub>H</sub> Limit
(°C)	(V <sub>DC</sub> )	(MHz)	(MHz)	(MHz)	(MHz)
-30	3.7	1710.0452	1754.9495	1710	1755
-20		1710.0541	1754.9494	1710	1755
-10		1710.0515	1754.9516	1710	1755
0		1710.0493	1754.9492	1710	1755
10		1710.0515	1754.9493	1710	1755
20		1710.0485	1754.9494	1710	1755
30		1710.0486	1754.9496	1710	1755
40		1710.0493	1754.9495	1710	1755
50		1710.0514	1754.9519	1710	1755
25	V min.= 3.5	1710.0498	1754.9494	1710	1755
25	V max.= 4.2	1710.0503	1754.9524	1710	1755

**LTE Band 12:**

Low Channel & High Channel (QPSK)					
Temperature	Power Supplied	F <sub>L</sub>	F <sub>H</sub>	F <sub>L</sub> Limit	F <sub>H</sub> Limit
(°C)	(V <sub>DC</sub> )	(MHz)	(MHz)	(MHz)	(MHz)
-30	3.7	699.0195	715.9794	699	716
-20		699.0197	715.9805	699	716
-10		699.0209	715.9796	699	716
0		699.0193	715.9791	699	716
10		699.0209	715.9785	699	716
20		699.0207	715.9806	699	716
30		699.0198	715.9797	699	716
40		699.0215	715.9815	699	716
50		699.0206	715.9817	699	716
25	V min.= 3.5	699.0217	715.9812	699	716
25	V max.= 4.2	699.0215	715.9803	699	716

Low Channel & High Channel (16-QAM)					
Temperature	Power Supplied	F <sub>L</sub>	F <sub>H</sub>	F <sub>L</sub> Limit	F <sub>H</sub> Limit
(°C)	(V <sub>DC</sub> )	(MHz)	(MHz)	(MHz)	(MHz)
-30	3.7	699.0196	715.9798	699	716
-20		699.0197	715.9807	699	716
-10		699.0204	715.9796	699	716
0		699.0195	715.9794	699	716
10		699.0206	715.9788	699	716
20		699.0205	715.9805	699	716
30		699.0195	715.9792	699	716
40		699.0217	715.9813	699	716
50		699.0208	715.9818	699	716
25	V min.= 3.5	699.0216	715.9809	699	716
25	V max.= 4.2	699.0214	715.9808	699	716

\*\*\*\*\* END OF REPORT \*\*\*\*\*