

# FCC PART 22H, PART 24E, PART 27 TEST REPORT

For

**Quanzhou Tesunho Electronics Co., Ltd**

2#, 5F E-19# Phase 2 Xunmei, Quanzhou, Fujian, China

**FCC ID: 2AKS9TM991**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Mobile PoC Radio
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**GENERAL INFORMATION****Product Description for Equipment under Test (EUT)**

Applicant	Quanzhou Tesunho Electronics Co., Ltd
Tested Model	TM991
Series Model	TM993, TM995
Product Type	Mobile PoC Radio
Power Supply	DC 13.8V
RF Function	WCDMA, LTE
Operating Band/Frequency	WCDMA Band II: 1850-1910 MHz(TX), 1930-1990MHz(RX) WCDMA Band V: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 2: 1850-1910 MHz(TX), 1930-1990MHz(RX) LTE Band 4: 1710-1755 MHz(TX), 2110-2155MHz(RX) LTE Band 5: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 12: 699-716 MHz(TX), 729-746 MHz(RX) LTE Band 17: 704-716 MHz(TX), 734-746 MHz(RX)
Power Class	WCDMA/LTE: Class 3
Modulation Type	WCDMA/LTE: QPSK,16QAM
Antenna Type	WCDMA/LTE: Monopole Antenna
Maximum Antenna Gain	WCDMA Band II: 0.0dBi WCDMA Band V: 0.0dBi LTE Band2: 0.0dBi LTE Band4: 0.0dBi LTE Band5: 0.0dBi LTE Band12: 0.0dBi LTE Band17: 0.0dBi

*\*All measurement and test data in this report was gathered from production sample serial number: 20191125050.  
(Assigned by the BACL. The EUT supplied by the applicant was received on 2019-11-25)*

**Objective**

This type approval report is prepared on behalf of *Quanzhou Tesunho Electronics Co., Ltd* in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E and Part 27 of the Federal Communication Commissions' 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).

## 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℃
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 and CAB identifier CN0004 under the ISED requirement. 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 5	1.4M	Low	20407	824.7
		Middle	20525	836.5
		High	20643	848.3
	3M	Low	20415	825.5
		Middle	20525	836.5
		High	20635	847.5
	5M	Low	20425	826.5
		Middle	20525	836.5
		High	20625	846.5
	10M	Low	20450	829.0
		Middle	20525	836.5
		High	20600	844.0
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

Mode		Channel		Frequency (MHz)
LTE Band 17	5M	Low	23755	706.5
		Middle	23790	710.0
		High	23825	713.5
	10M	Low	23780	709.0
		Middle	23790	710.0
		High	23800	711.0

**Equipment Modifications**

No modifications were made to the EUT.

**Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Universal Radio Communication Test	CMU200	100184
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478
ZHAOXIN	DC Power Supply	RXN-605D	DC002
Aihuaxin technology	Antenna	/	/

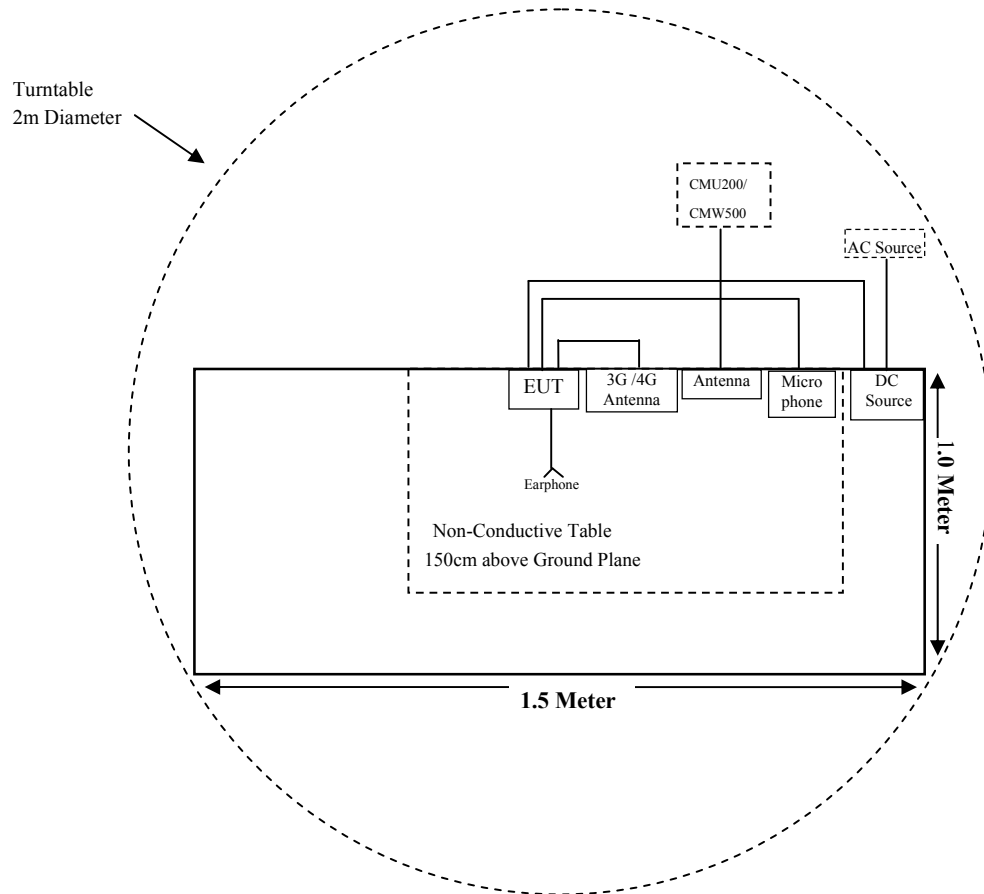
**External I/O Cable**

Cable Description	Length (m)	From Port	To
Data Cable	1.5	EUT	DC Source
Power Cable	1.0	DC Source	AC Source



## Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz & Above 1GHz):



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	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	2019-11-30	2020-11-29
HP	Signal Generator	HP 8341B	2624A00116	2019-11-30	2020-11-29
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	2019-08-14	2020-08-13
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 Test	CMU200	110605	2019-11-30	2020-11-29
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2019-08-05	2020-08-04
<b>Radiated Emission Test (Chamber 2#)</b>					
HP	Signal Generator	HP 8341B	2624A00116	2019-11-30	2020-11-29
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-05-30	2020-05-29
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3115	6229	2019-12-12	2020-12-11
ETS-LINDGREN	Horn Antenna	3116	00084159	2019-12-12	2020-12-11
ETS-LINDGREN	Horn Antenna	3116	2516	2019-12-12	2020-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
SELECTOR	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 Test	CMU200	110605	2019-11-30	2020-11-29
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2019-08-05	2020-08-04

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2019-11-30	2020-11-29
Rohde & Schwarz	Universal Radio Communication Test	CMU200	110605	2019-11-30	2020-11-29
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2019-08-05	2020-08-04
Mini-Circuits	Power Splitter	ZFRSC-14-S+	SF019411452	2019-11-10	2020-11-09
BACL	Temperature & Humidity Chamber	BTH-150	30023	2019-12-20	2020-12-19
Quanzhou Tesunho	RF Cable	Quanzhou Tesunho 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).

## **FCC §1.1310 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

### **Applicable Standard**

According to subpart 1.1310 and 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density

### **Calculated Formulary:**

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

### **Calculated Data (worst case):**

Mode	Frequency Range (MHz)	Antenna Gain		Target Output Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
WCDMA Band II	1850.0-1910.0	0.0	1.00	22.00	158.49	20	0.0315	1.00
WCDMA Band V	824.0-849.0	0.0	1.00	23.00	199.53	20	0.0397	0.55
FDD (Band 2)	1850.0-1910.0	0.0	1.00	22.00	158.49	20	0.0315	1.00
FDD (Band 4)	1710.0-1755.0	0.0	1.00	22.50	177.83	20	0.0354	1.00
FDD (Band 5)	824.0-849.0	0.0	1.00	23.00	199.53	20	0.0397	0.55
FDD (Band 12)	699.0-716.0	0.0	1.00	23.50	223.87	20	0.0445	0.47
FDD (Band 17)	704.0-716.0	0.0	1.00	23.50	223.87	20	0.0445	0.47

**Note1:** The target output power was declared by the manufacturer.

**Note2:** Conclusion: The device meets MPE at distance 20cm.

## **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.

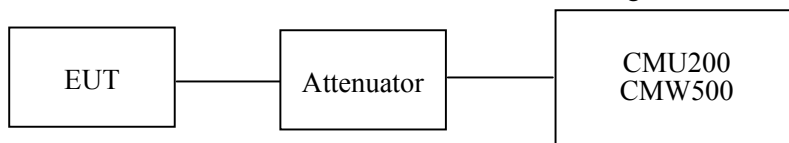
According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

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:	101.3 kPa

The testing was performed by Winnie Yang on 2019-12-24.

### 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	22.63	22.35	22.51
		HSDPA	1	22.02	21.70	21.84
			2	21.87	21.71	21.89
			3	21.47	21.25	21.28
			4	21.00	20.88	20.95
		HSUPA	1	21.62	21.28	21.38
			2	21.38	21.17	21.40
			3	21.29	21.11	21.34
			4	20.89	20.73	20.99
			5	20.37	20.42	20.48
		HSPA+	1	21.94	21.91	21.90



**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	21.68	21.86	21.52
		HSDPA	1	21.25	21.21	20.86
			2	20.94	21.09	21.01
			3	20.89	20.76	20.37
			4	20.45	20.28	19.85
		HSUPA	1	20.93	20.72	20.37
			2	20.63	20.71	20.26
			3	20.28	20.38	20.38
			4	20.28	20.37	19.91
			5	20.12	20.26	19.80
		HSPA+	1	21.14	21.39	20.99

**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	21.21	21.34	21.41
		1#3	20.52	20.53	20.79
		1#5	21.13	20.62	20.45
		3#0	20.63	21.05	20.68
		3#1	21.11	20.65	21.30
		3#3	20.77	20.90	21.48
		6#0	20.27	21.26	20.45
	16-QAM	1#0	20.23	20.90	21.49
		1#3	20.65	21.13	20.59
		1#5	20.79	21.12	21.54
		3#0	20.83	21.32	20.91
		3#1	20.66	20.83	21.33
		3#3	20.73	20.70	20.92
		6#0	21.05	21.11	21.39
3M	QPSK	1#0	21.15	21.09	21.26
		1#7	20.92	20.60	20.95
		1#14	20.78	20.51	21.12
		8#0	20.18	20.45	20.37
		8#4	21.10	20.67	20.64
		8#7	20.35	20.12	20.40
		15#0	20.49	20.77	21.20
	16-QAM	1#0	20.21	20.52	20.59
		1#7	20.95	20.98	20.28
		1#14	20.37	20.29	20.97
		8#0	20.42	20.35	21.11
		8#4	20.44	20.99	20.78
		8#7	20.60	20.21	20.92
		15#0	20.70	20.45	20.56

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	21.22	21.06	21.19
		1#12	20.46	20.94	21.09
		1#24	21.18	20.90	21.07
		12#0	21.22	20.20	20.57
		12#6	20.54	20.99	20.74
		12#11	20.91	20.29	20.99
		25#0	20.86	20.95	20.32
	16-QAM	1#0	21.05	21.03	20.89
		1#12	20.47	20.55	20.85
		1#24	20.98	20.60	20.95
		12#0	20.56	20.80	20.66
		12#6	20.77	20.75	20.21
		12#11	21.22	20.44	21.16
		25#0	20.40	20.48	20.54
10M	QPSK	1#0	21.35	21.27	21.46
		1#24	21.17	20.73	21.42
		1#49	20.61	20.33	20.62
		25#0	20.62	20.72	21.22
		25#12	20.45	20.71	20.94
		25#24	21.12	20.85	20.86
		50#0	20.70	20.96	21.33
	16-QAM	1#0	20.69	20.44	21.01
		1#24	20.41	20.80	20.49
		1#49	20.97	20.66	20.91
		25#0	21.27	20.67	21.28
		25#12	21.20	20.97	21.22
		25#24	20.84	21.17	20.86
		50#0	21.14	20.33	20.95

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	21.17	21.24	21.08
		1#37	20.27	20.95	20.93
		1#74	20.76	20.56	20.57
		36#0	21.06	20.63	20.39
		36#17	20.73	20.89	20.49
		36#35	21.16	21.24	20.94
		75#0	21.05	21.07	20.28
	16-QAM	1#0	20.26	21.24	20.42
		1#37	20.93	20.97	21.02
		1#74	20.21	21.13	20.20
		36#0	20.46	21.22	21.02
		36#17	21.13	21.16	21.01
		36#35	21.08	20.64	20.25
		75#0	20.83	20.85	20.62
20M	QPSK	1#0	21.29	21.34	21.18
		1#49	20.86	20.73	20.48
		1#99	20.31	20.35	20.39
		50#0	20.72	20.72	20.96
		50#24	21.06	20.82	20.22
		50#49	20.85	20.77	20.35
		100#0	20.42	20.53	20.39
	16-QAM	1#0	20.72	20.93	20.86
		1#49	21.17	21.11	20.63
		1#99	20.34	20.86	20.85
		50#0	21.21	20.49	20.39
		50#24	21.17	20.79	21.14
		50#49	20.61	21.29	21.14
		100#0	21.03	20.49	20.84

**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	21.52	21.43	21.36
		1#3	21.12	20.43	20.70
		1#5	21.36	20.50	21.30
		3#0	21.36	20.86	21.29
		3#1	20.77	20.84	21.35
		3#3	21.10	20.67	20.78
		6#0	21.07	20.72	20.89
	16-QAM	1#0	20.66	20.87	20.76
		1#3	21.17	20.73	21.08
		1#5	21.32	21.22	20.97
		3#0	21.22	21.07	20.55
		3#1	21.50	21.31	20.88
		3#3	20.58	20.44	21.05
		6#0	21.41	20.55	20.81
3M	QPSK	1#0	21.14	21.07	21.18
		1#7	20.31	20.10	20.27
		1#14	20.46	20.78	20.59
		8#0	20.84	20.70	20.85
		8#4	20.89	21.02	20.63
		8#7	20.21	20.46	20.39
		15#0	20.36	21.05	20.90
	16-QAM	1#0	21.08	20.56	20.24
		1#7	20.63	21.05	20.47
		1#14	21.11	20.42	21.10
		8#0	21.06	20.31	21.07
		8#4	20.67	20.34	20.79
		8#7	20.67	20.25	20.30
		15#0	20.67	21.03	20.49

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	21.85	21.76	21.51
		1#12	21.50	21.46	20.81
		1#24	20.98	20.91	21.49
		12#0	21.18	20.94	21.29
		12#6	21.37	21.33	21.27
		12#11	21.15	21.29	21.28
		25#0	21.66	20.81	21.51
	16-QAM	1#0	21.27	21.71	20.75
		1#12	21.05	20.91	21.38
		1#24	21.48	20.92	20.68
		12#0	21.20	21.74	21.46
		12#6	21.62	21.38	20.76
		12#11	21.55	21.42	21.01
		25#0	21.09	21.42	20.97
10M	QPSK	1#0	21.96	21.68	21.38
		1#24	21.45	21.55	20.86
		1#49	21.72	21.02	20.86
		25#0	21.89	21.52	21.11
		25#12	21.73	20.77	20.44
		25#24	21.53	21.09	21.20
		50#0	21.86	21.17	20.62
	16-QAM	1#0	21.44	21.05	21.23
		1#24	21.12	21.01	20.79
		1#49	21.28	21.57	21.28
		25#0	21.04	21.42	21.10
		25#12	21.91	20.74	21.26
		25#24	21.50	21.05	20.95
		50#0	21.71	21.44	21.05

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	21.74	22.06	22.13
		1#37	21.33	21.51	21.48
		1#74	21.35	21.65	21.36
		36#0	21.59	21.25	21.85
		36#17	21.26	21.31	21.53
		36#35	21.39	21.68	21.28
		75#0	21.69	21.88	21.96
	16-QAM	1#0	21.11	21.37	21.90
		1#37	20.82	21.41	21.61
		1#74	21.24	22.00	22.11
		36#0	21.73	21.22	22.11
		36#17	21.14	21.41	21.88
		36#35	21.64	21.35	21.13
		75#0	21.28	21.12	21.26
20M	QPSK	1#0	21.86	21.91	21.81
		1#49	21.56	21.44	21.27
		1#99	21.29	21.16	21.08
		50#0	21.68	21.50	21.32
		50#24	21.78	21.76	20.99
		50#49	21.04	21.64	21.23
		100#0	21.21	21.50	20.96
	16-QAM	1#0	20.88	21.83	21.11
		1#49	21.02	21.08	21.69
		1#99	21.38	21.40	21.19
		50#0	21.38	21.43	21.71
		50#24	21.27	21.84	21.40
		50#49	21.84	21.06	21.49
		100#0	21.08	21.76	21.01

**LTE Band 5**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	1#0	22.25	22.36	22.41
		1#3	22.05	22.35	21.79
		1#5	21.56	21.64	21.53
		3#0	21.41	22.11	21.92
		3#1	21.89	22.21	22.40
		3#3	22.09	22.05	22.20
		6#0	21.29	21.64	21.93
	16-QAM	1#0	21.71	22.16	21.95
		1#3	22.17	21.80	21.59
		1#5	22.06	22.28	21.60
		3#0	21.54	21.99	21.57
		3#1	22.02	22.25	21.52
		3#3	21.72	22.19	22.24
		6#0	22.17	21.64	22.40
3M	QPSK	1#0	21.32	21.44	21.52
		1#7	20.64	20.67	20.91
		1#14	21.07	20.87	20.64
		8#0	20.53	21.28	21.18
		8#4	20.46	21.39	21.47
		8#7	20.89	20.48	20.91
		15#0	21.16	20.99	20.89
	16-QAM	1#0	21.20	20.63	21.25
		1#7	21.18	21.43	21.46
		1#14	21.16	21.04	21.23
		8#0	20.85	21.36	21.03
		8#4	20.85	20.60	20.66
		8#7	20.60	20.65	20.82
		15#0	20.45	21.34	20.93



Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	22.15	21.98	21.67
		1#12	21.98	21.33	21.28
		1#24	21.20	21.48	21.01
		12#0	21.86	21.63	20.71
		12#6	21.96	21.38	21.14
		12#11	21.48	21.39	21.04
		25#0	21.47	21.16	20.76
	16-QAM	1#0	21.28	21.23	21.61
		1#12	21.21	21.49	21.64
		1#24	21.49	21.31	20.72
		12#0	21.54	21.09	20.84
		12#6	21.72	21.56	20.95
		12#11	21.47	21.37	21.12
		25#0	21.36	21.53	20.76
10M	QPSK	1#0	22.43	22.23	22.16
		1#24	22.31	21.47	21.19
		1#49	21.97	21.47	21.82
		25#0	21.58	22.11	21.65
		25#12	21.76	22.11	21.97
		25#24	21.90	21.98	22.14
		50#0	21.87	21.35	22.01
	16-QAM	1#0	22.08	21.33	21.33
		1#24	22.34	21.34	21.38
		1#49	21.58	21.47	21.94
		25#0	22.33	21.68	21.76
		25#12	21.62	22.10	21.44
		25#24	21.79	21.35	21.62
		50#0	21.43	22.14	21.74

**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	23.41	23.36	23.19
		1#3	23.18	22.98	22.94
		1#5	23.14	23.01	22.91
		3#0	22.92	22.96	22.89
		3#1	23.17	23.18	22.96
		3#3	23.09	23.25	22.95
		6#0	22.81	22.98	22.67
	16-QAM	1#0	22.47	22.68	22.32
		1#3	22.08	22.28	22.11
		1#5	22.23	22.37	22.02
		3#0	22.23	22.29	22.01
		3#1	22.34	22.48	22.09
		3#3	22.28	22.56	21.92
		6#0	22.05	22.36	21.71
3M	QPSK	1#0	23.16	23.27	22.96
		1#7	22.92	22.91	22.74
		1#14	22.89	22.99	22.75
		8#0	22.88	22.81	22.57
		8#4	22.89	22.91	22.66
		8#7	23.00	23.15	22.60
		15#0	22.80	22.89	22.38
	16-QAM	1#0	22.48	22.60	22.03
		1#7	22.11	22.33	21.66
		1#14	22.16	22.37	21.64
		8#0	22.16	22.37	21.68
		8#4	22.16	22.30	21.71
		8#7	22.33	22.49	21.70
		15#0	22.01	22.29	21.31

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	22.76	23.11	23.02
		1#12	22.38	22.73	22.73
		1#24	22.37	22.88	22.79
		12#0	22.51	22.75	22.79
		12#6	22.53	22.94	22.78
		12#11	22.50	22.74	22.64
		25#0	22.18	22.38	22.41
	16-QAM	1#0	22.35	22.93	22.56
		1#12	22.01	22.73	22.25
		1#24	22.03	22.58	22.22
		12#0	21.95	22.59	22.16
		12#6	22.07	22.57	22.22
		12#11	21.97	22.56	22.35
		25#0	21.76	22.20	21.97
10M	QPSK	1#0	23.03	23.15	23.36
		1#24	22.67	22.79	23.09
		1#49	22.69	22.75	23.07
		25#0	22.53	22.67	23.01
		25#12	22.72	23.01	23.22
		25#24	22.67	22.85	23.08
		50#0	22.35	22.50	22.87
	16-QAM	1#0	22.59	22.76	22.90
		1#24	22.19	22.51	22.67
		1#49	22.21	22.36	22.58
		25#0	22.13	22.49	22.42
		25#12	22.37	22.52	22.61
		25#24	22.30	22.51	22.58
		50#0	21.97	22.15	22.19

**LTE Band 17**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	22.41	22.62	23.14
		1#12	22.04	22.23	22.86
		1#24	22.16	22.26	22.89
		12#0	22.04	22.19	22.86
		12#6	22.25	22.40	22.77
		12#11	22.29	22.29	23.04
		25#0	22.08	21.99	22.79
	16-QAM	1#0	22.35	22.93	22.56
		1#12	22.13	22.71	22.23
		1#24	21.96	22.65	22.21
		12#0	21.97	22.43	22.28
		12#6	22.11	22.80	22.38
		12#11	22.13	22.80	22.24
		25#0	21.86	22.49	21.97
10M	QPSK	1#0	22.26	22.13	21.95
		1#24	22.01	21.87	21.65
		1#49	21.91	21.88	21.65
		25#0	21.99	21.66	21.67
		25#12	22.10	22.00	21.69
		25#24	22.07	21.97	21.67
		50#0	21.72	21.77	21.40
	16-QAM	1#0	22.59	22.76	22.90
		1#24	22.32	22.53	22.68
		1#49	22.28	22.47	22.60
		25#0	22.34	22.43	22.56
		25#12	22.26	22.44	22.80
		25#24	22.46	22.50	22.79
		50#0	22.08	22.21	22.52

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

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA (Rel 99)	Low	3.31	$\leq 13$
	Middle	3.40	$\leq 13$
	High	3.35	$\leq 13$
WCDMA (HSDPA)	Low	2.73	$\leq 13$
	Middle	2.76	$\leq 13$
	High	2.70	$\leq 13$
WCDMA (HSUPA)	Low	2.83	$\leq 13$
	Middle	2.73	$\leq 13$
	High	2.83	$\leq 13$
WCDMA (HSPA+)	Low	2.59	$\leq 13$
	Middle	2.51	$\leq 13$
	High	2.61	$\leq 13$

**WCDMA Band II**

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA (Rel 99)	Low	2.72	$\leq 13$
	Middle	2.75	$\leq 13$
	High	2.84	$\leq 13$
WCDMA (HSDPA)	Low	2.57	$\leq 13$
	Middle	2.51	$\leq 13$
	High	2.51	$\leq 13$
WCDMA (HSUPA)	Low	2.61	$\leq 13$
	Middle	2.54	$\leq 13$
	High	2.46	$\leq 13$
WCDMA (HSPA+)	Low	2.52	$\leq 13$
	Middle	2.44	$\leq 13$
	High	2.52	$\leq 13$

**LTE Band 2**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit (dB)
QPSK	1 RB	20M	3.57	3.73	3.62	13
	100 RB		5.60	5.77	5.64	13
16-QAM	1 RB	20M	4.43	4.61	4.53	13
	100 RB		6.46	6.58	6.59	13

**LTE Band 4**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	20M	3.52	3.63	3.41	13
	100 RB		5.58	5.61	5.41	13
16-QAM	1 RB	20M	4.27	4.51	4.37	13
	100 RB		6.29	6.51	6.30	13

**LTE Band 5**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	10M	3.37	3.64	3.62	13
	50 RB		5.35	5.71	5.58	13
16-QAM	1 RB	10M	4.61	4.73	4.66	13
	50 RB		6.53	6.71	6.60	13

**LTE Band 12**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	10M	3.34	3.67	3.62	13
	50 RB		5.38	5.62	5.54	13
16-QAM	1 RB	10M	4.41	4.73	4.62	13
	50 RB		6.47	6.72	6.67	13

**LTE Band 17**

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	10M	3.32	3.51	3.54	13
	50 RB		5.42	5.45	5.61	13
16-QAM	1 RB	10M	4.26	4.71	4.57	13
	50 RB		6.28	6.80	6.50	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								
836.60	H	88.68	23.22	0.63	-1.14	21.45	38.45	17.00
836.60	V	91.27	22.35	0.63	-1.14	20.58	38.45	17.87
WCDMA Band II, Middle Channel								
1880.00	H	88.92	15.88	0.85	8.81	23.84	33.00	9.16
1880.00	V	86.12	13.30	0.85	8.81	21.26	33.00	11.74

**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								
1880.00	H	90.91	17.87	0.85	8.81	25.83	33.00	7.17
1880.00	V	88.02	15.20	0.85	8.81	23.16	33.00	9.84
16-QAM 1.4M BW Middle Channel								
1880.00	H	90.75	17.71	0.85	8.81	25.67	33.00	7.33
1880.00	V	87.89	15.07	0.85	8.81	23.03	33.00	9.97
QPSK 3M BW Middle Channel								
1880.00	H	90.78	17.74	0.85	8.81	25.70	33.00	7.30
1880.00	V	87.92	15.10	0.85	8.81	23.06	33.00	9.94
16-QAM 3M BW Middle Channel								
1880.00	H	90.62	17.58	0.85	8.81	25.54	33.00	7.46
1880.00	V	87.61	14.79	0.85	8.81	22.75	33.00	10.25
QPSK 5M BW Middle Channel								
1880.00	H	90.71	17.67	0.85	8.81	25.63	33.00	7.37
1880.00	V	87.58	14.76	0.85	8.81	22.72	33.00	10.28
16-QAM 5M BW Middle Channel								
1880.00	H	90.53	17.49	0.85	8.81	25.45	33.00	7.55
1880.00	V	87.43	14.61	0.85	8.81	22.57	33.00	10.43

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								
1880.00	H	90.58	17.54	0.85	8.81	25.50	33.00	7.50
1880.00	V	87.39	14.57	0.85	8.81	22.53	33.00	10.47
16-QAM 10M BW Middle Channel								
1880.00	H	90.41	17.37	0.85	8.81	25.33	33.00	7.67
1880.00	V	87.29	14.47	0.85	8.81	22.43	33.00	10.57
QPSK 15M BW Middle Channel								
1880.00	H	90.36	17.32	0.85	8.81	25.28	33.00	7.72
1880.00	V	87.12	14.30	0.85	8.81	22.26	33.00	10.74
16-QAM 15M BW Middle Channel								
1880.00	H	90.27	17.23	0.85	8.81	25.19	33.00	7.81
1880.00	V	87.06	14.24	0.85	8.81	22.20	33.00	10.80
QPSK 20M BW Middle Channel								
1880.00	H	90.17	17.13	0.85	8.81	25.09	33.00	7.91
1880.00	V	86.92	14.10	0.85	8.81	22.06	33.00	10.94
16-QAM 20M BW Middle Channel								
1880.00	H	90.03	16.99	0.85	8.81	24.95	33.00	8.05
1880.00	V	86.89	14.07	0.85	8.81	22.03	33.00	10.97

**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								
1732.50	H	89.93	15.87	0.84	8.57	23.60	30.00	6.40
1732.50	V	87.01	13.37	0.84	8.57	21.10	30.00	8.90
16-QAM 1.4M BW Middle Channel								
1732.50	H	89.73	15.67	0.84	8.57	23.40	30.00	6.60
1732.50	V	86.87	13.23	0.84	8.57	20.96	30.00	9.04
QPSK 3M BW Middle Channel								
1732.50	H	89.64	15.58	0.84	8.57	23.31	30.00	6.69
1732.50	V	86.89	13.25	0.84	8.57	20.98	30.00	9.02
16-QAM 3M BW Middle Channel								
1732.50	H	89.61	15.55	0.84	8.57	23.28	30.00	6.72
1732.50	V	86.70	13.06	0.84	8.57	20.79	30.00	9.21
QPSK 5M BW Middle Channel								
1732.50	H	89.51	15.45	0.84	8.57	23.18	30.00	6.82
1732.50	V	86.59	12.95	0.84	8.57	20.68	30.00	9.32
16-QAM 5M BW Middle Channel								
1732.50	H	89.49	15.43	0.84	8.57	23.16	30.00	6.84
1732.50	V	86.58	12.94	0.84	8.57	20.67	30.00	9.33

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								
1732.50	H	89.43	15.37	0.84	8.57	23.10	30.00	6.90
1732.50	V	86.42	12.78	0.84	8.57	20.51	30.00	9.49
16-QAM 10M BW Middle Channel								
1732.50	H	89.36	15.30	0.84	8.57	23.03	30.00	6.97
1732.50	V	86.44	12.80	0.84	8.57	20.53	30.00	9.47
QPSK 15M BW Middle Channel								
1732.50	H	89.33	15.27	0.84	8.57	23.00	30.00	7.00
1732.50	V	86.31	12.67	0.84	8.57	20.40	30.00	9.60
16-QAM 15M BW Middle Channel								
1732.50	H	89.17	15.11	0.84	8.57	22.84	30.00	7.16
1732.50	V	86.27	12.63	0.84	8.57	20.36	30.00	9.64
QPSK 20M BW Middle Channel								
1732.50	H	89.18	15.12	0.84	8.57	22.85	30.00	7.15
1732.50	V	86.14	12.50	0.84	8.57	20.23	30.00	9.77
16-QAM 20M BW Middle Channel								
1732.50	H	89.03	14.97	0.84	8.57	22.70	30.00	7.30
1732.50	V	86.07	12.43	0.84	8.57	20.16	30.00	9.84

**LTE Band 5**

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								
836.50	H	88.87	23.40	0.63	-1.14	21.63	38.45	16.82
836.50	V	91.75	22.83	0.63	-1.14	21.06	38.45	17.39
16-QAM 1.4M BW Middle Channel								
836.50	H	88.76	23.29	0.63	-1.14	21.52	38.45	16.93
836.50	V	91.66	22.74	0.63	-1.14	20.97	38.45	17.48
QPSK 3M BW Middle Channel								
836.50	H	88.63	23.16	0.63	-1.14	21.39	38.45	17.06
836.50	V	91.53	22.61	0.63	-1.14	20.84	38.45	17.61
16-QAM 3M BW Middle Channel								
836.50	H	88.64	23.17	0.63	-1.14	21.40	38.45	17.05
836.50	V	91.39	22.47	0.63	-1.14	20.70	38.45	17.75
QPSK 5M BW Middle Channel								
836.50	H	88.52	23.05	0.63	-1.14	21.28	38.45	17.17
836.50	V	91.22	22.30	0.63	-1.14	20.53	38.45	17.92
16-QAM 5M BW Middle Channel								
836.50	H	88.53	23.06	0.63	-1.14	21.29	38.45	17.16
836.50	V	91.09	22.17	0.63	-1.14	20.40	38.45	18.05
QPSK 10M BW Middle Channel								
836.50	H	88.37	22.90	0.63	-1.14	21.13	38.45	17.32
836.50	V	90.96	22.04	0.63	-1.14	20.27	38.45	18.18
16-QAM 10M BW Middle Channel								
836.50	H	88.25	22.78	0.63	-1.14	21.01	38.45	17.32
836.50	V	90.83	21.91	0.63	-1.14	20.14	38.45	18.18

**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								
707.50	H	90.11	25.98	0.62	-1.71	23.65	34.77	11.12
707.50	V	87.07	24.33	0.62	-1.71	22.00	34.77	12.77
16-QAM 1.4M BW Middle Channel								
707.50	H	90.02	25.89	0.62	-1.71	23.56	34.77	11.21
707.50	V	86.96	24.22	0.62	-1.71	21.89	34.77	12.88
QPSK 3M BW Middle Channel								
707.50	H	89.93	25.80	0.62	-1.71	23.47	34.77	11.30
707.50	V	86.83	24.09	0.62	-1.71	21.76	34.77	13.01
16-QAM 3M BW Middle Channel								
707.50	H	89.82	25.69	0.62	-1.71	23.36	34.77	11.41
707.50	V	86.72	23.98	0.62	-1.71	21.65	34.77	13.12
QPSK 5M BW Middle Channel								
707.50	H	89.78	25.65	0.62	-1.71	23.32	34.77	11.45
707.50	V	86.73	23.99	0.62	-1.71	21.66	34.77	13.11
16-QAM 5M BW Middle Channel								
707.50	H	89.71	25.58	0.62	-1.71	23.25	34.77	11.52
707.50	V	86.54	23.80	0.62	-1.71	21.47	34.77	13.30
QPSK 10M BW Middle Channel								
707.50	H	89.63	25.50	0.62	-1.71	23.17	34.77	11.60
707.50	V	86.59	23.85	0.62	-1.71	21.52	34.77	13.25
16-QAM 10M BW Middle Channel								
707.50	H	89.62	25.49	0.62	-1.71	23.16	34.77	11.61
707.50	V	86.37	23.63	0.62	-1.71	21.30	34.77	13.47

**LTE Band 17**

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 5M BW Middle Channel								
710.00	H	89.72	25.55	0.62	-1.7	23.23	34.77	11.54
710.00	V	86.64	24.03	0.62	-1.7	21.71	34.77	13.06
16-QAM 5M BW Middle Channel								
710.00	H	89.63	25.46	0.62	-1.7	23.14	34.77	11.63
710.00	V	86.51	23.90	0.62	-1.7	21.58	34.77	13.19
QPSK 10M BW Middle Channel								
710.00	H	89.6	25.43	0.62	-1.7	23.11	34.77	11.66
710.00	V	86.33	23.72	0.62	-1.7	21.40	34.77	13.37
16-QAM 10M BW Middle Channel								
710.00	H	89.48	25.31	0.62	-1.7	22.99	34.77	11.78
710.00	V	86.15	23.54	0.62	-1.7	21.22	34.77	13.55

**Note:**

All above data were tested with no amplifier

Absolute Level = Submitted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

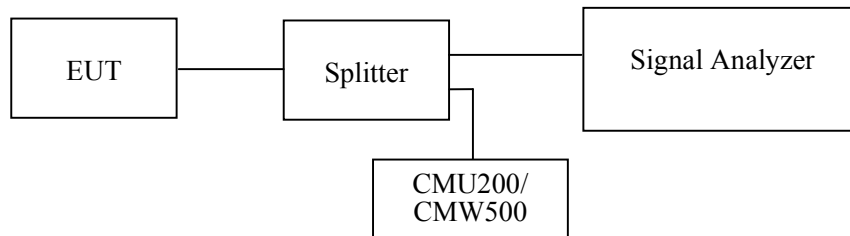
**FCC §2.1049, §22.917, §22.905 & §24.238; §27.53- OCCUPIED BANDWIDTH****Applicable Standards**

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 100 kHz (WCDMA), 20kHz for LTE 1.4 MHz, 100 kHz for LTE & 3 MHz 5 MHz & 10 MHz, 200 kHz for LTE 15 MHz & 20 MHz, and the 26 dB & 99% bandwidth was recorded.

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

<b>Temperature:</b>	23.5~24.9 °C
<b>Relative Humidity:</b>	50~53 %
<b>ATM Pressure:</b>	101.6~103.7 kPa

*The testing was performed by Winnie Yang from 2019-12-11 to 2019-12-18.*

*EUT operation mode: Transmitting*

*Test Result: Compliant.*

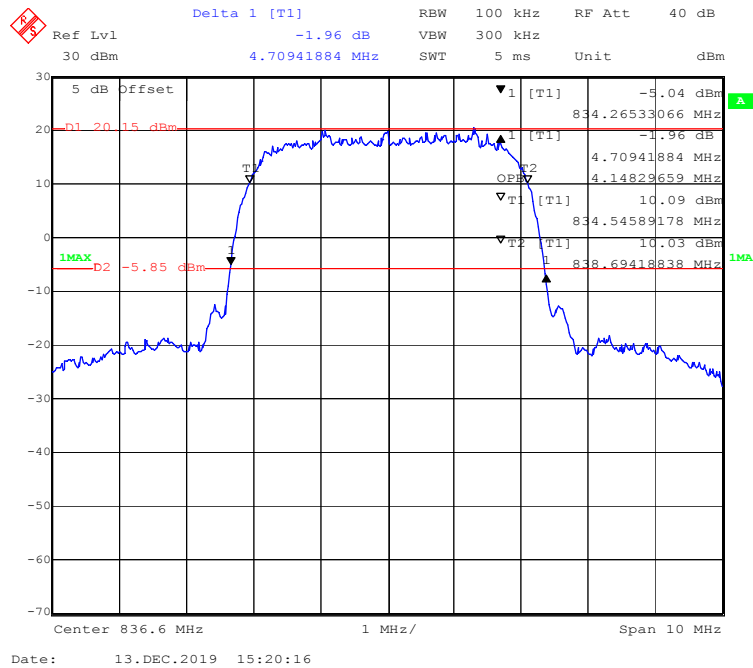
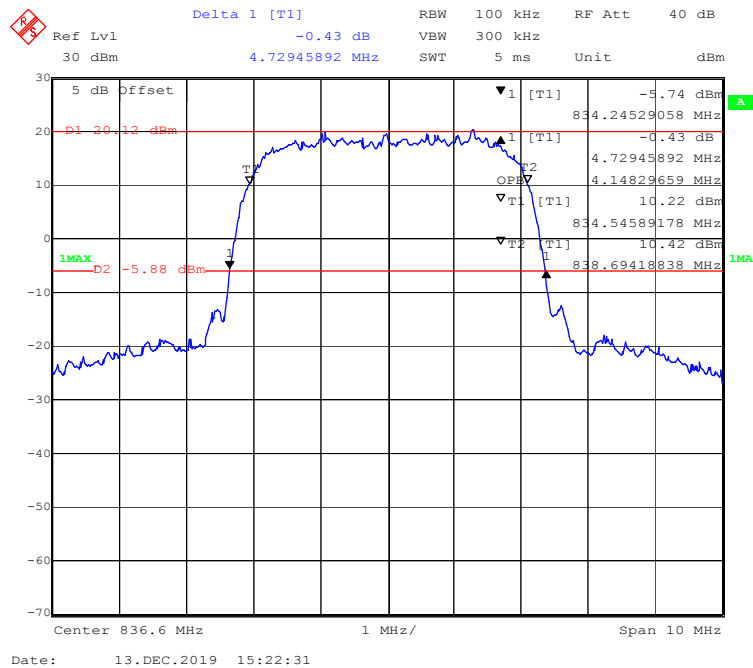


**WCDMA Band V**

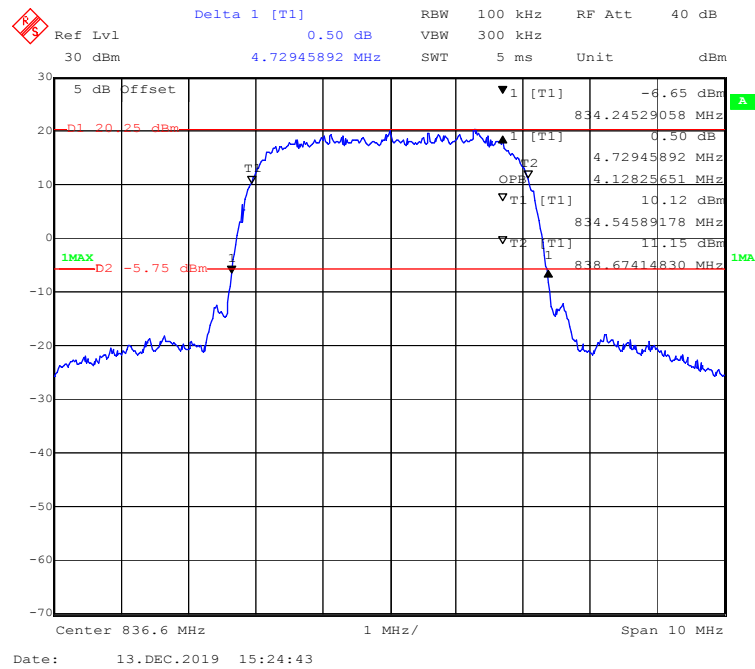
<b>Mode</b>	<b>Frequency (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>	<b>99% Occupied Bandwidth (MHz)</b>
WCDMA (Rel 99)	836.6	4.709	4.148
WCDMA (HSDPA)	836.6	4.729	4.148
WCDMA (HSUPA)	836.6	4.729	4.128
WCDMA (HSPA+)	836.6	4.729	4.148

**WCDMA Band II**

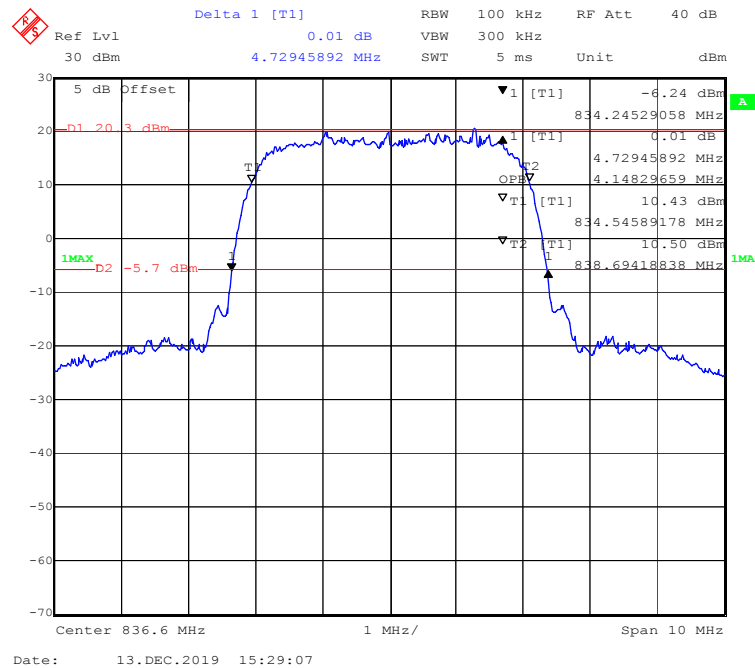
<b>Mode</b>	<b>Frequency (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>	<b>99% Occupied Bandwidth (MHz)</b>
WCDMA (Rel 99)	1880	4.729	4.128
WCDMA (HSDPA)	1880	4.729	4.148
WCDMA (HSUPA)	1880	4.729	4.148
WCDMA (HSPA+)	1880	4.709	4.148

**WCDMA Band V****99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode****99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode**

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



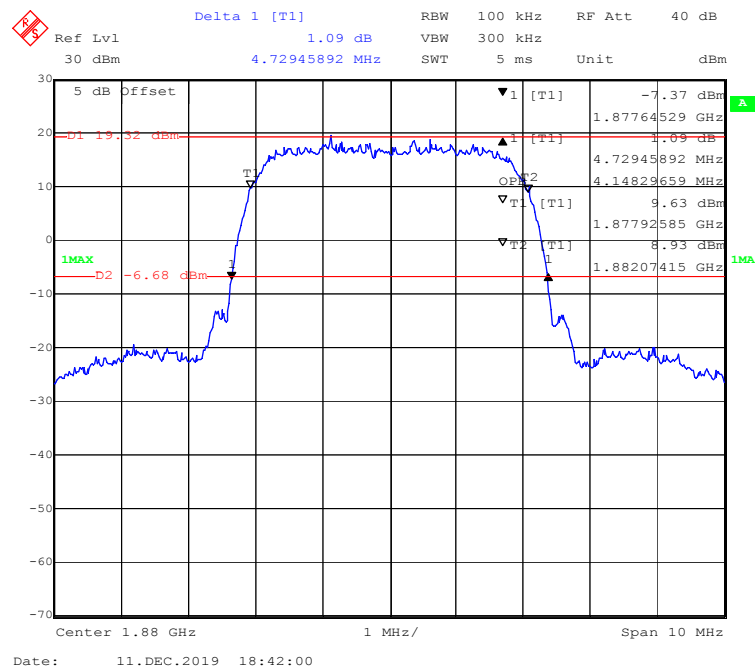
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode



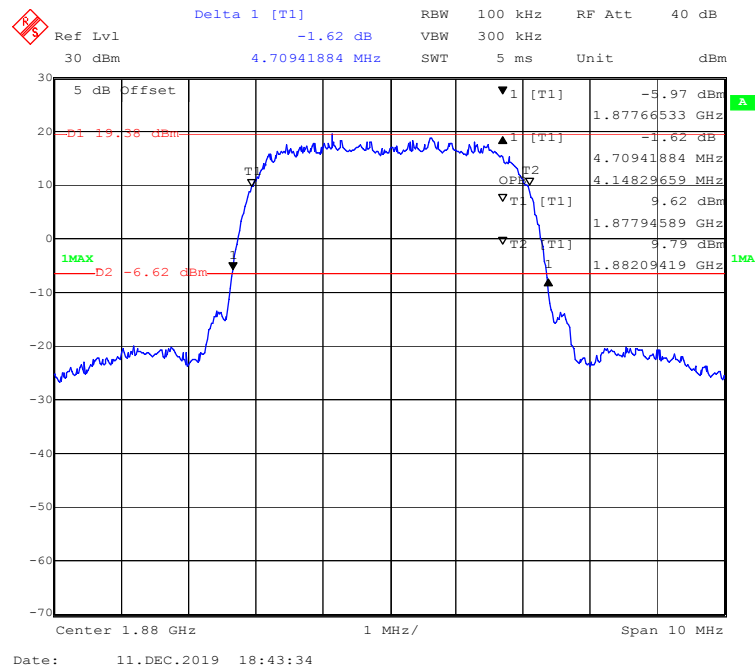
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



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

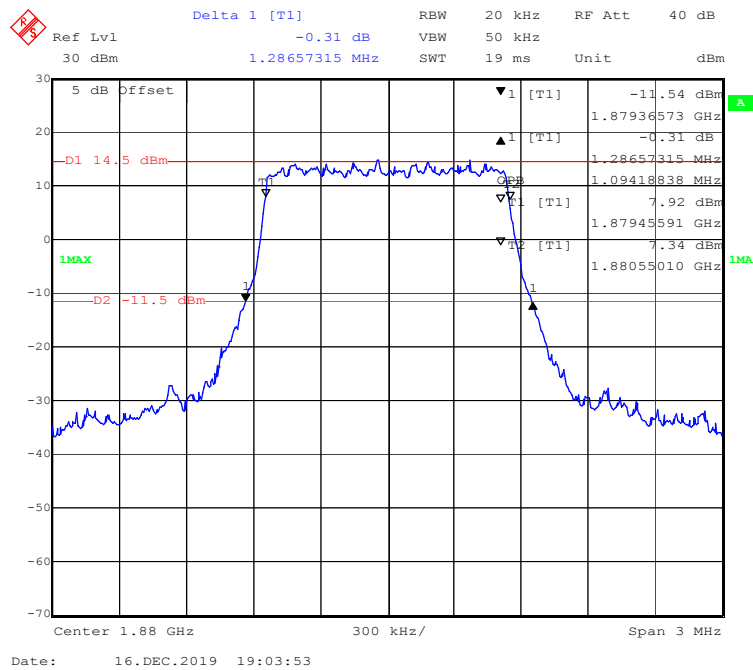
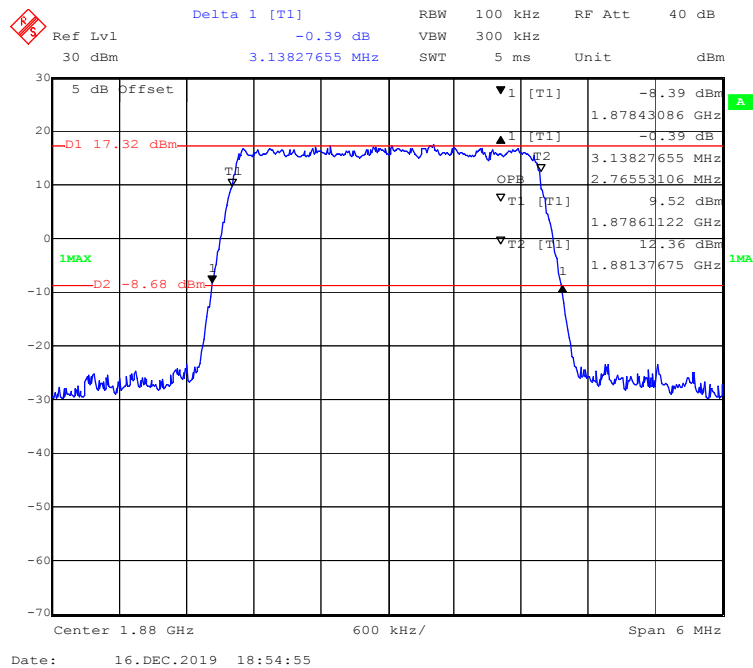


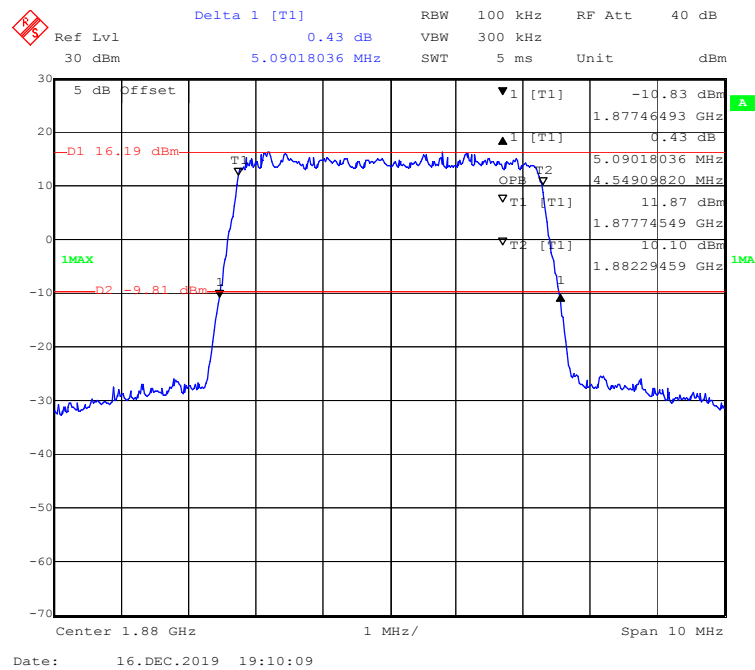
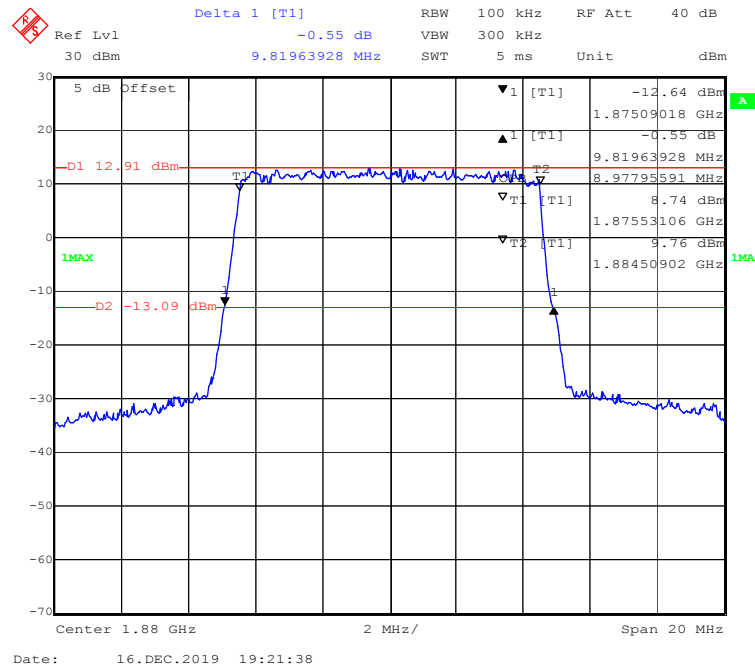
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode



**LTE Band 2:**

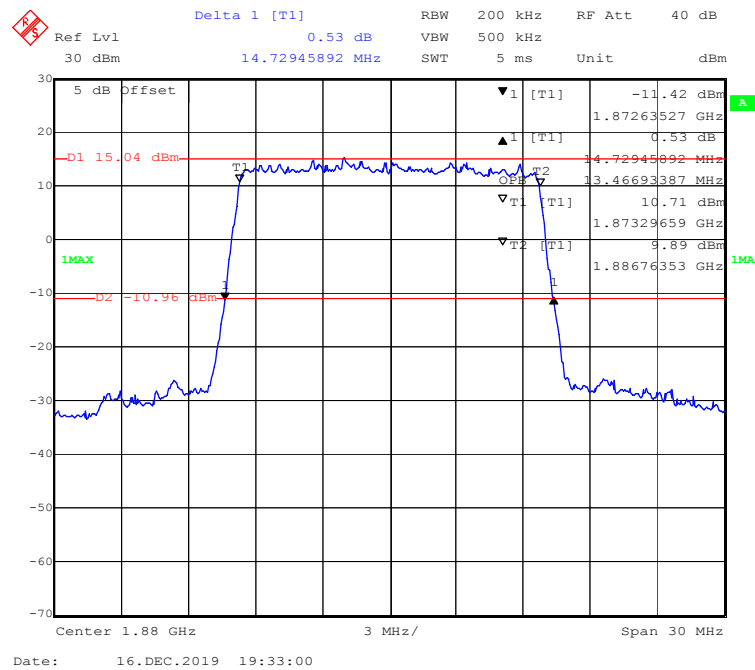
Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.287	1.094
	3M		3.138	2.766
	5M		5.090	4.549
	10M		9.820	8.978
	15M		14.729	13.467
	20M		19.238	17.956
16-QAM	1.4M	Middle	1.305	1.100
	3M		3.126	2.766
	5M		5.090	4.549
	10M		9.860	8.978
	15M		14.729	13.527
	20M		19.238	17.960

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

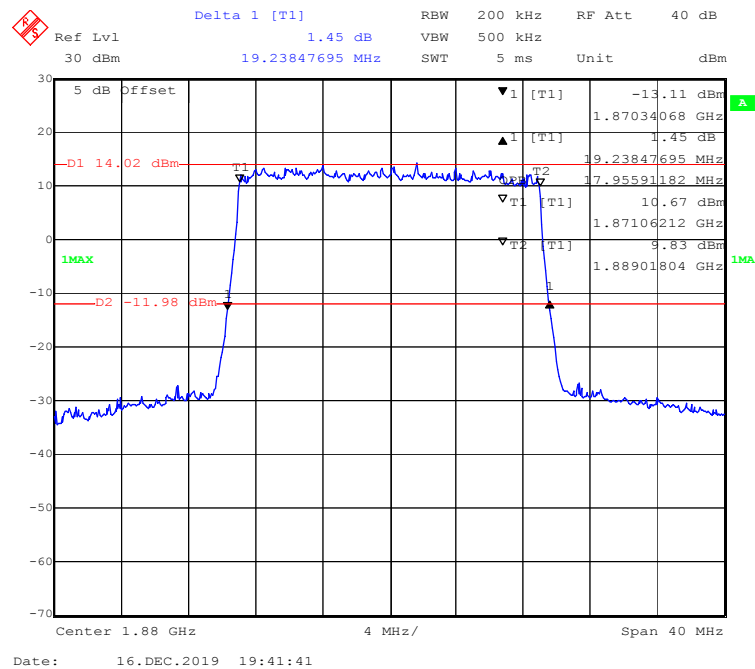
**QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (10MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

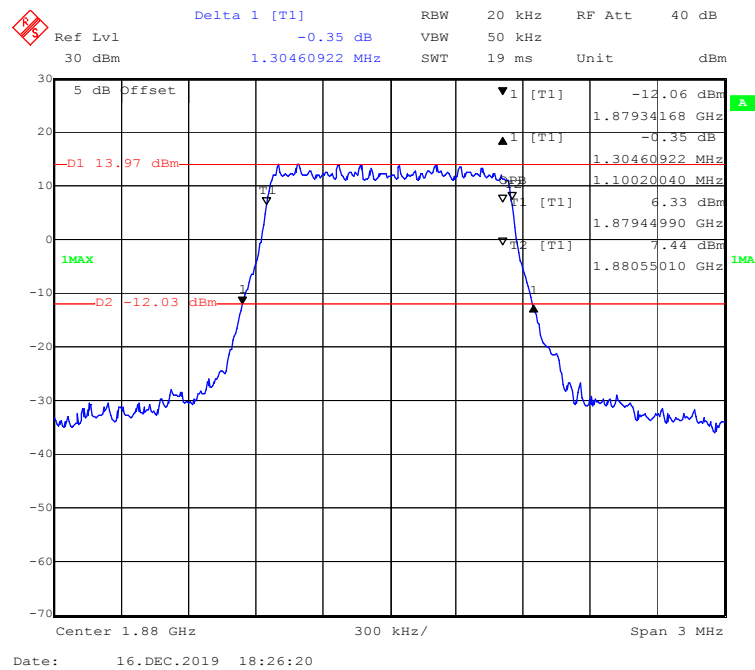
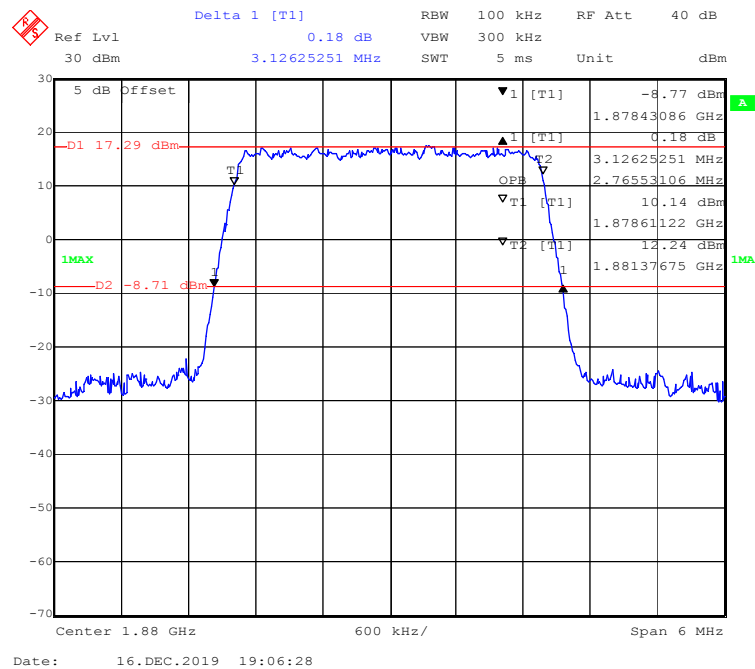


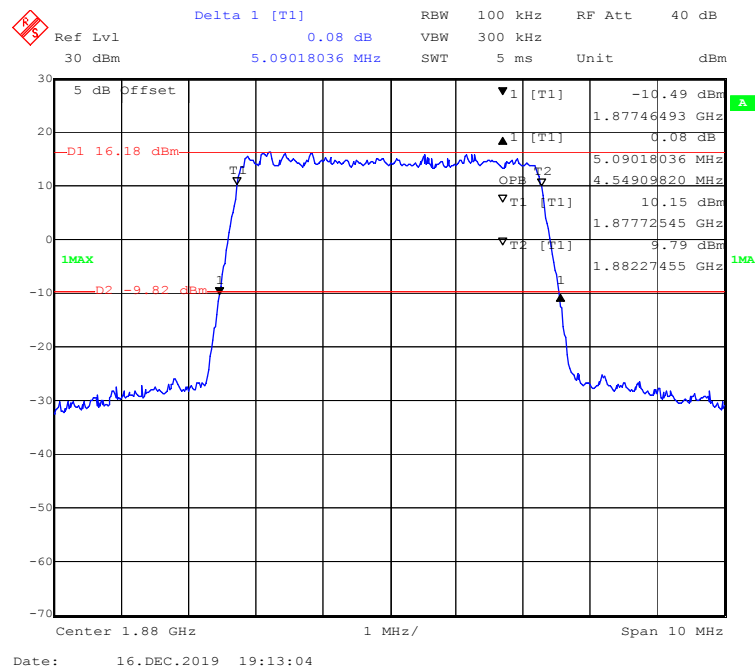
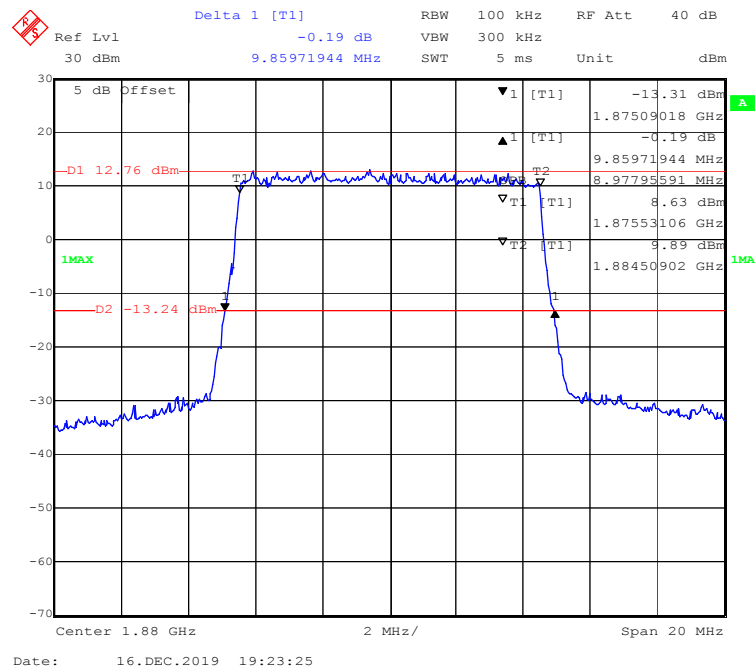
### QPSK (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel

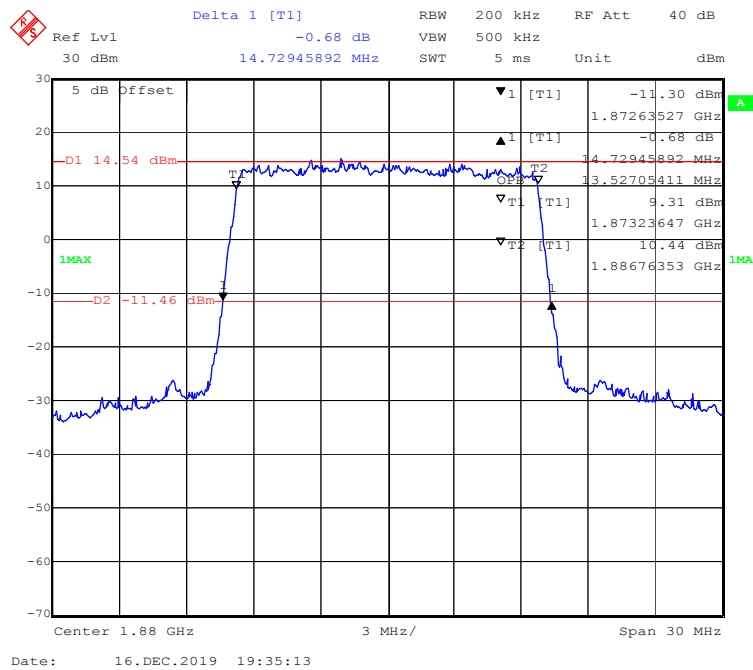
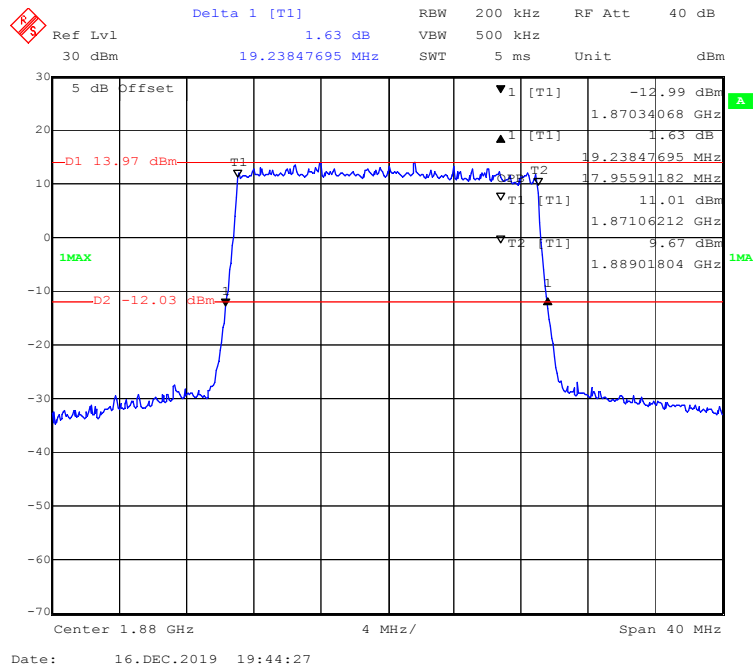


### QPSK (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



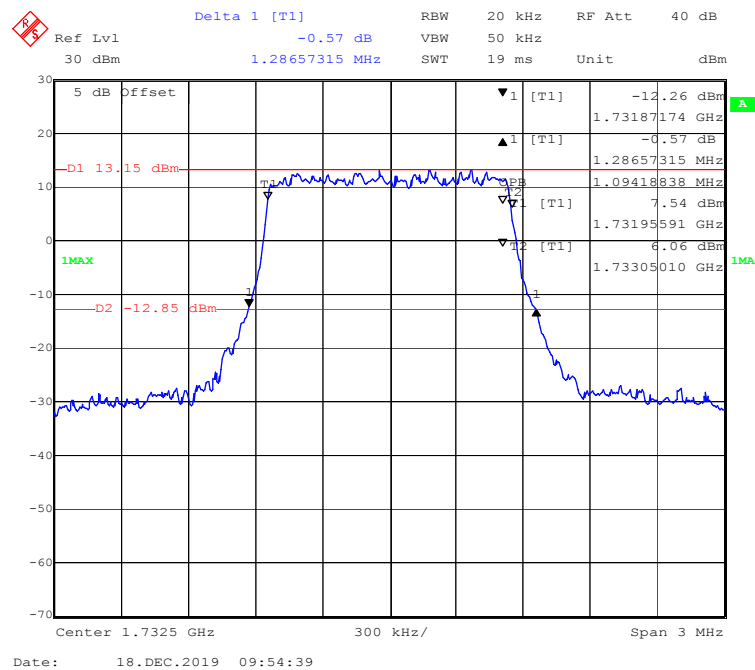
**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

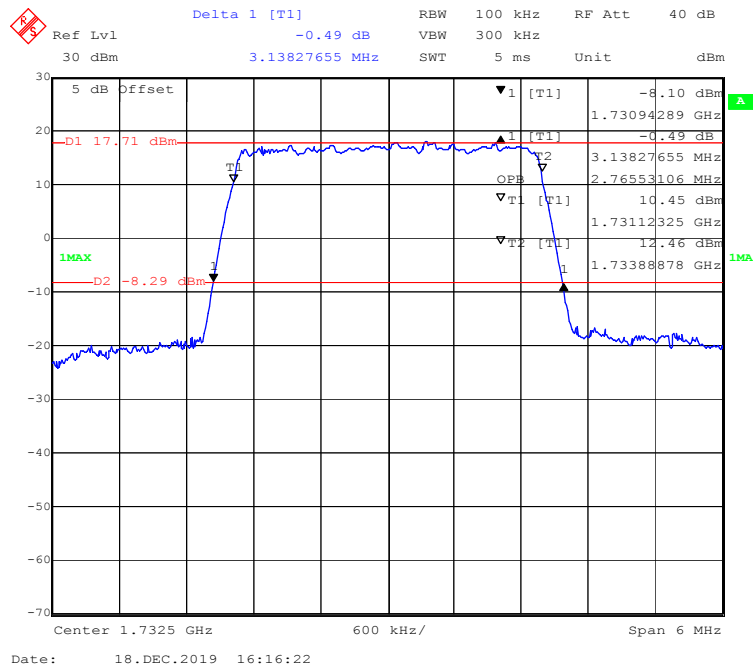
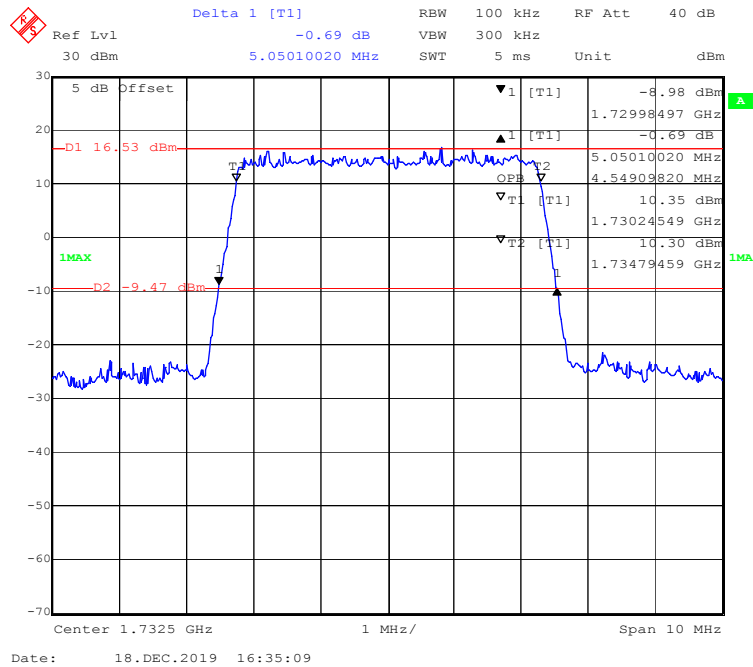
**16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

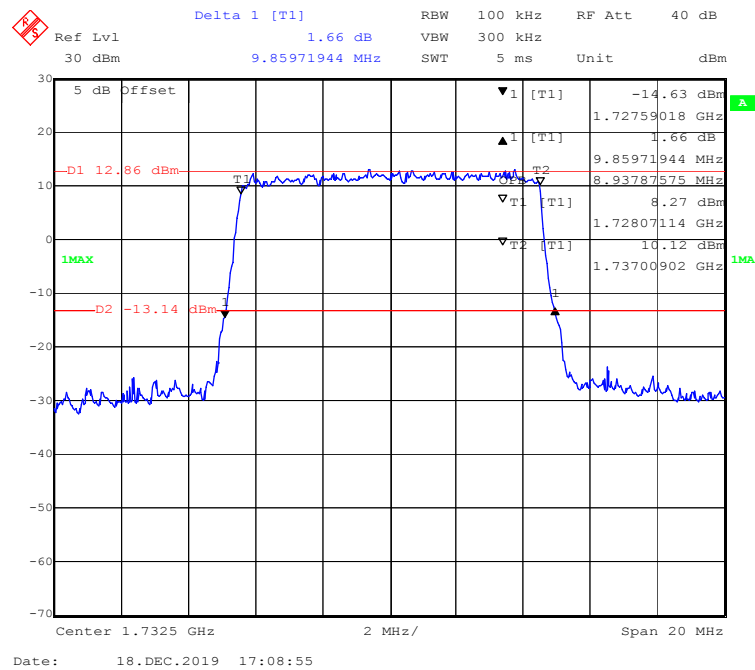
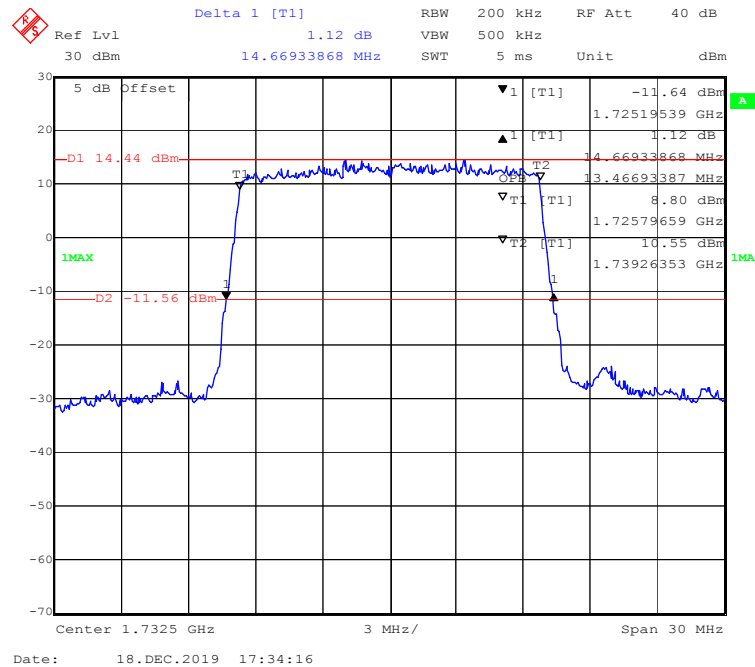
**16-QAM (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

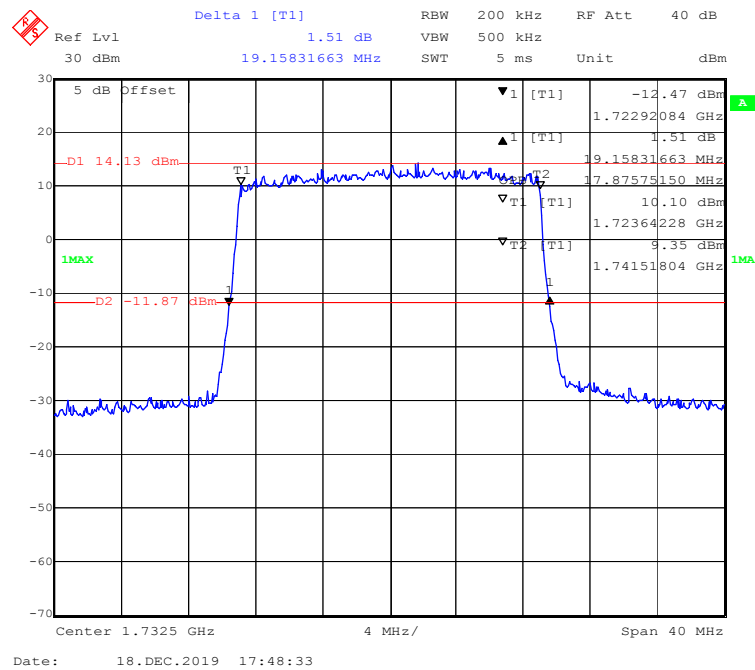
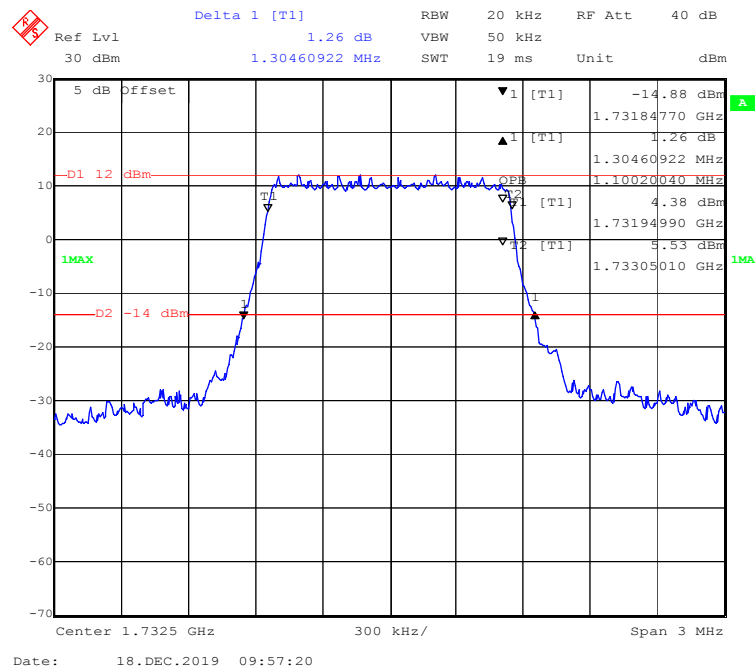
**LTE Band 4:**

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.287	1.094
	3M		3.138	2.766
	5M		5.050	4.549
	10M		9.860	8.938
	15M		14.669	13.467
	20M		19.158	17.876
16-QAM	1.4M	Middle	1.305	1.100
	3M		3.138	2.766
	5M		5.050	4.549
	10M		9.780	8.938
	15M		14.790	13.467
	20M		19.078	17.876

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

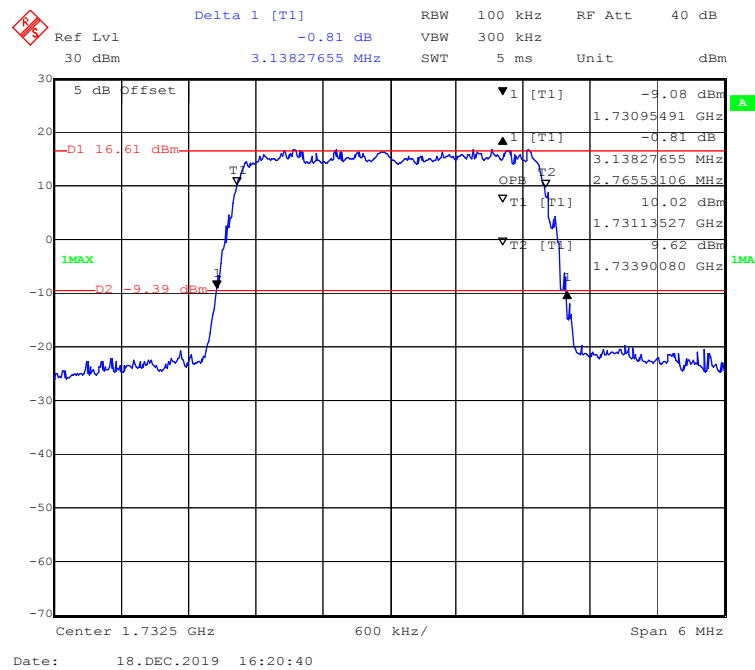
**QPSK (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (5MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

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

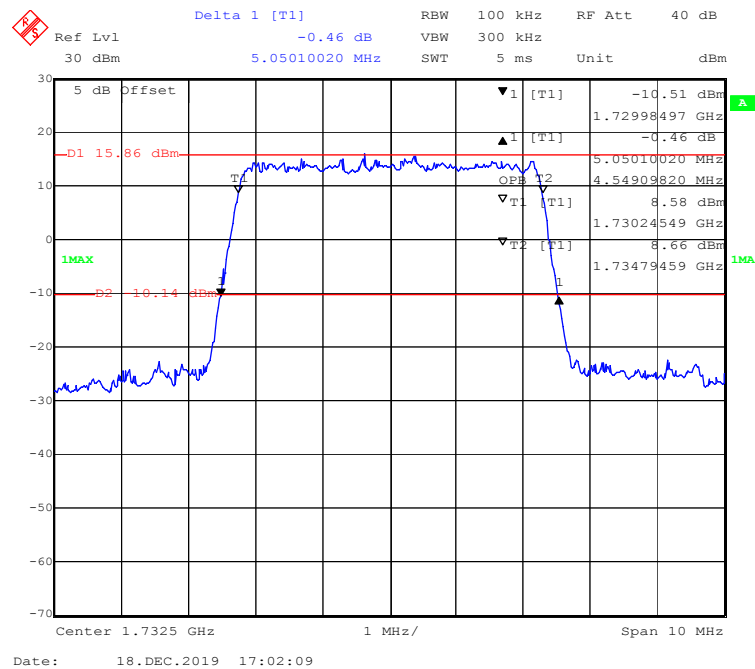
**QPSK (20 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

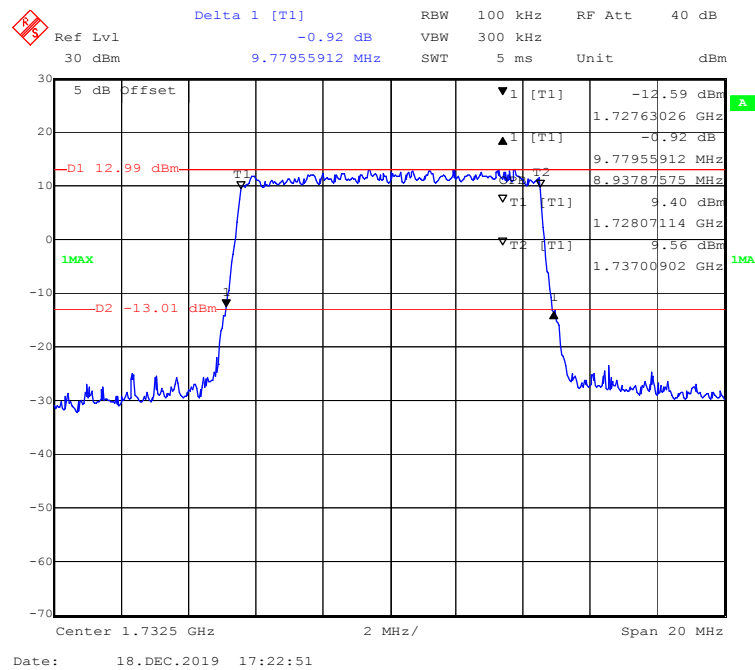
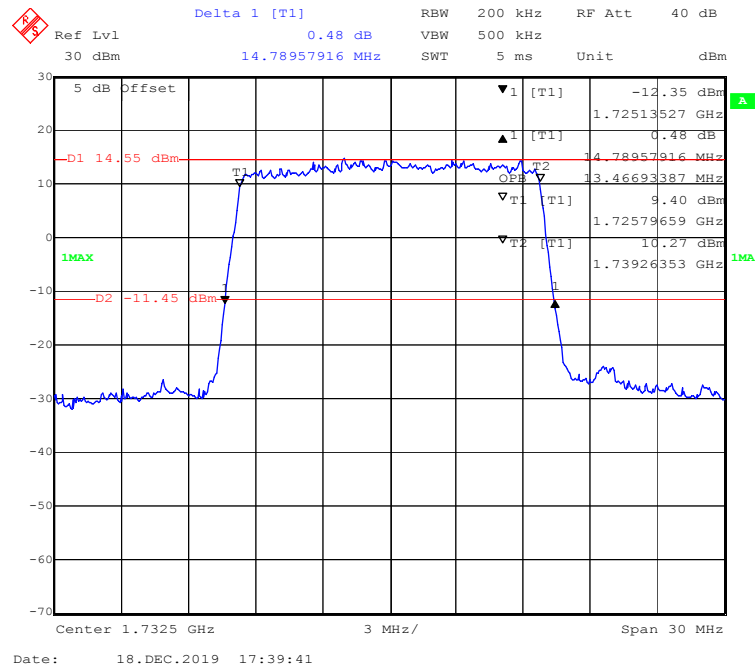


### 16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel

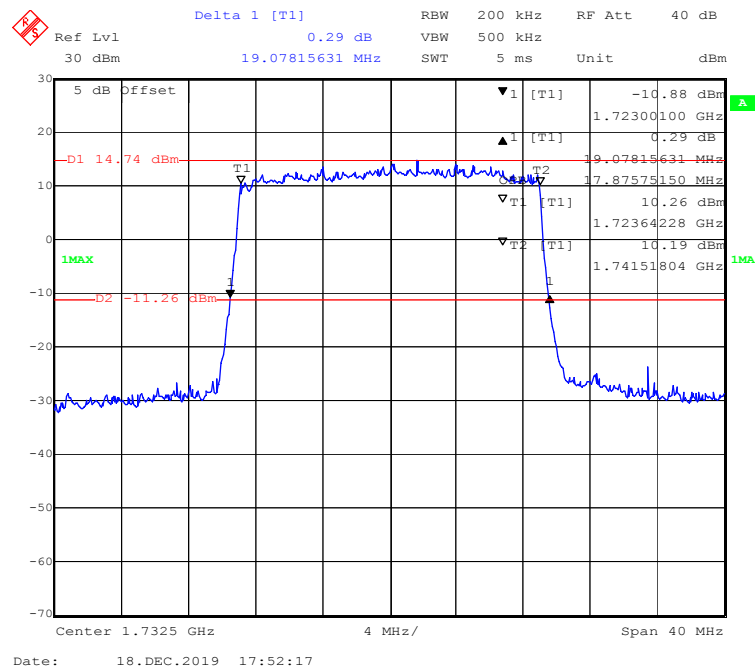


### 16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



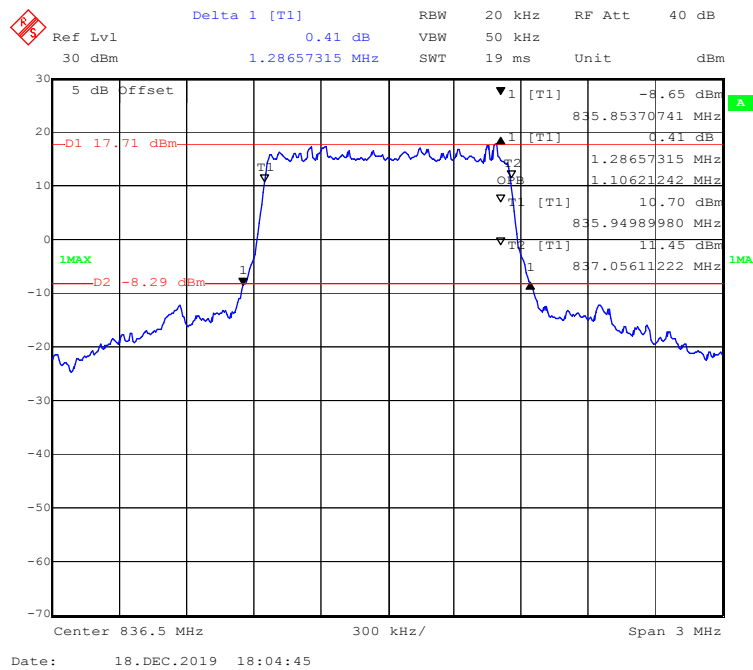
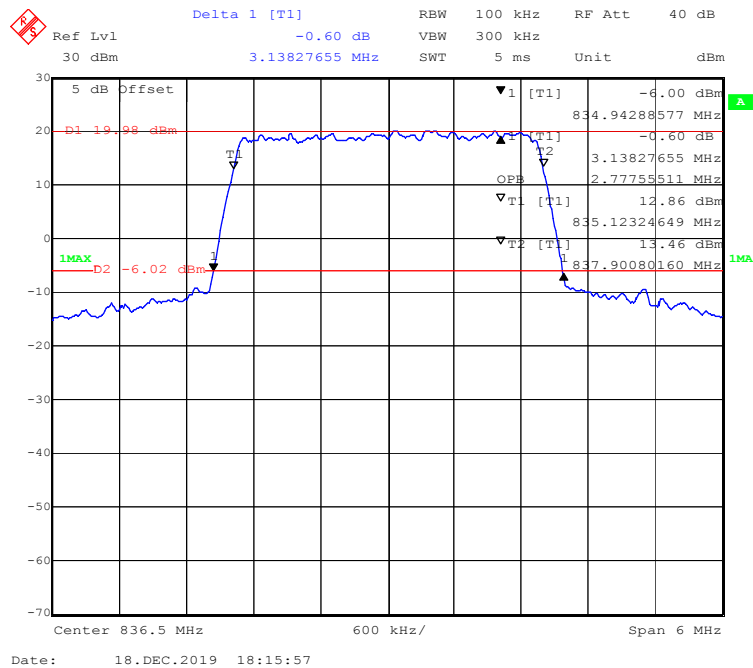
**16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (15 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

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



**LTE Band 5:**

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.287	1.106
	3M		3.138	2.778
	5M		5.090	4.549
	10M		9.900	9.018
16-QAM	1.4M	Middle	1.293	1.094
	3M		3.126	2.778
	5M		5.070	4.549
	10M		9.820	9.018

**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] 0.95 dB

Ref Lvl 30 dBm

RBW 100 kHz

VBW 300 kHz

SWT 5 ms

RF Att 40 dB

Unit dBm

5 dB Offset

D1 19.24 dBm

1MAX -6.76 dBm

1 [T1] -7.44 dBm

833.96492986 MHz

0.95 dB

5.09018036 MHz

OPB 4.54909820 MHz

T1 [T1] 13.07 dBm

834.24549098 MHz

T2 [T1] 13.29 dBm

838.79458918 MHz

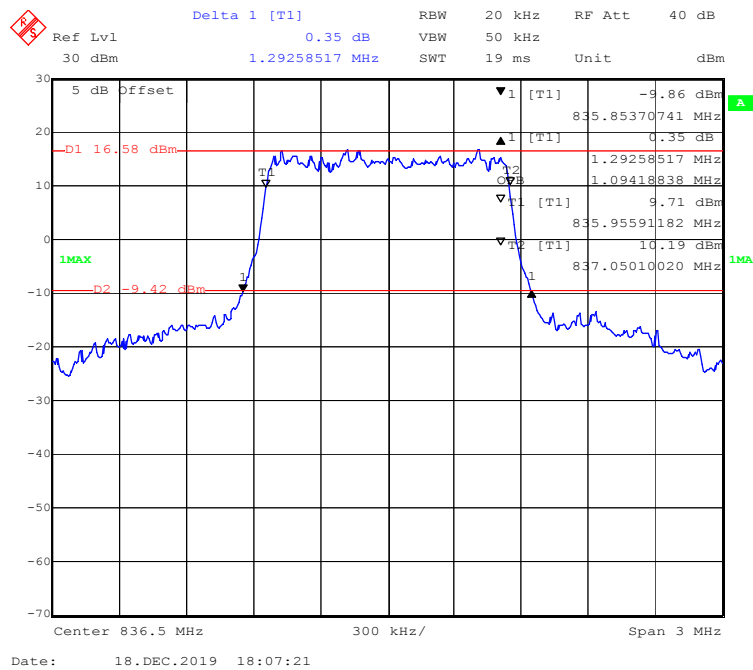
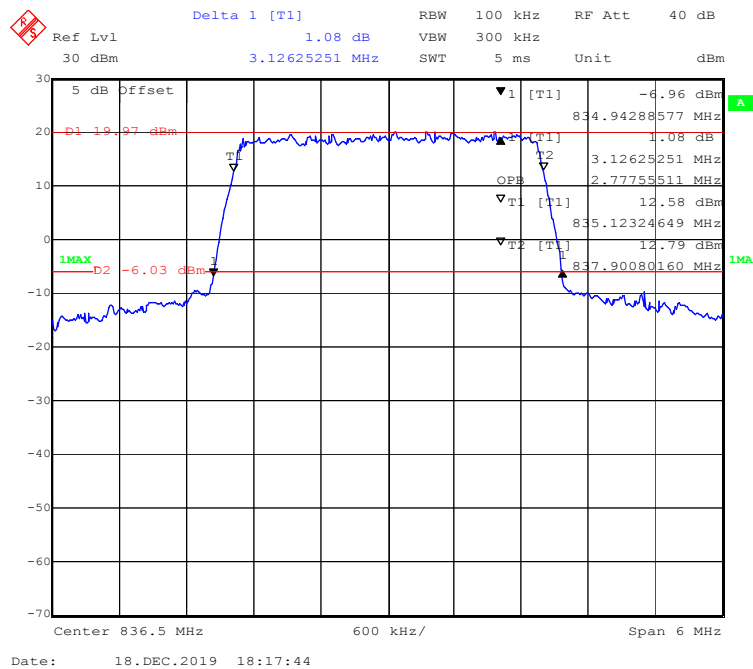
Center 836.5 MHz

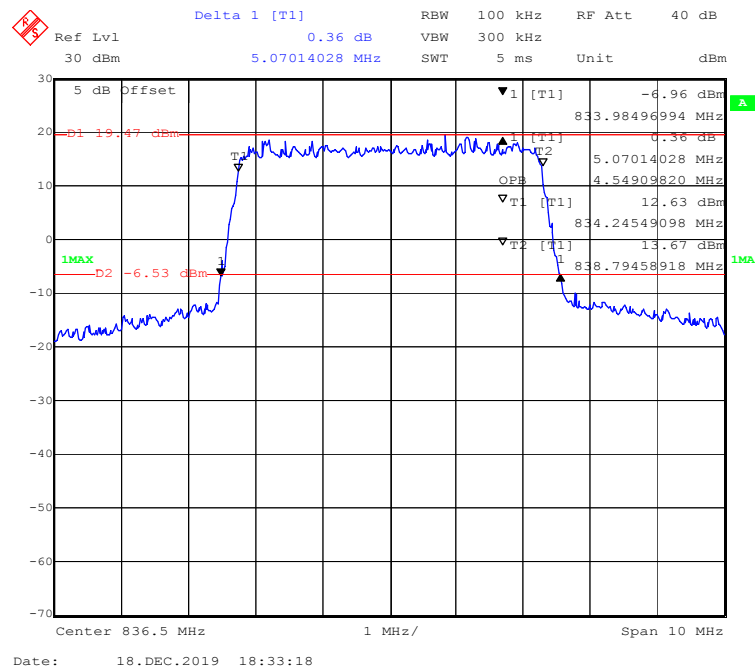
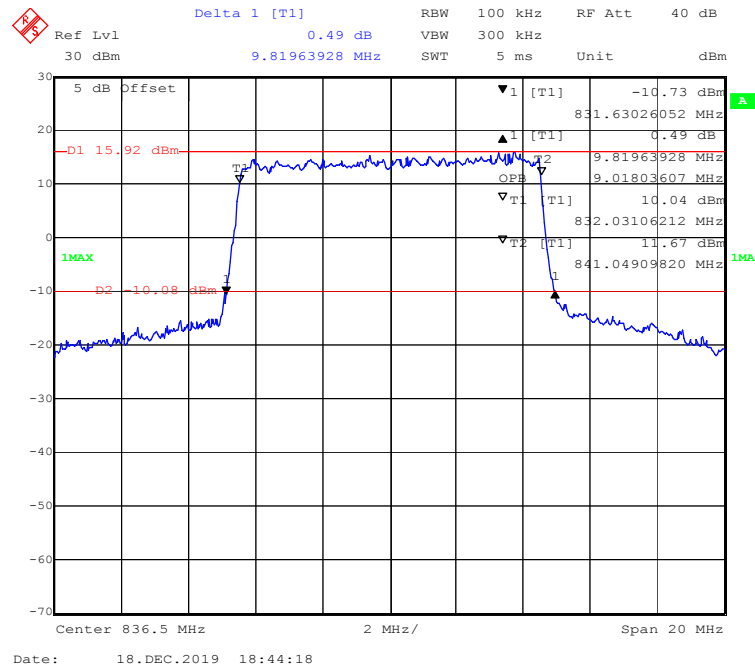
1 MHz/

Span 10 MHz

Date: 18.DEC.2019 18:22:16

[illegible]

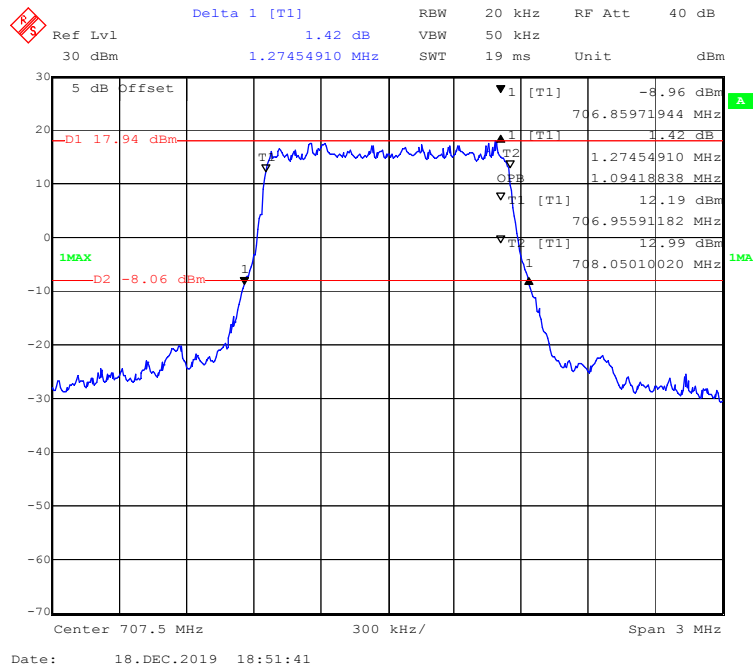
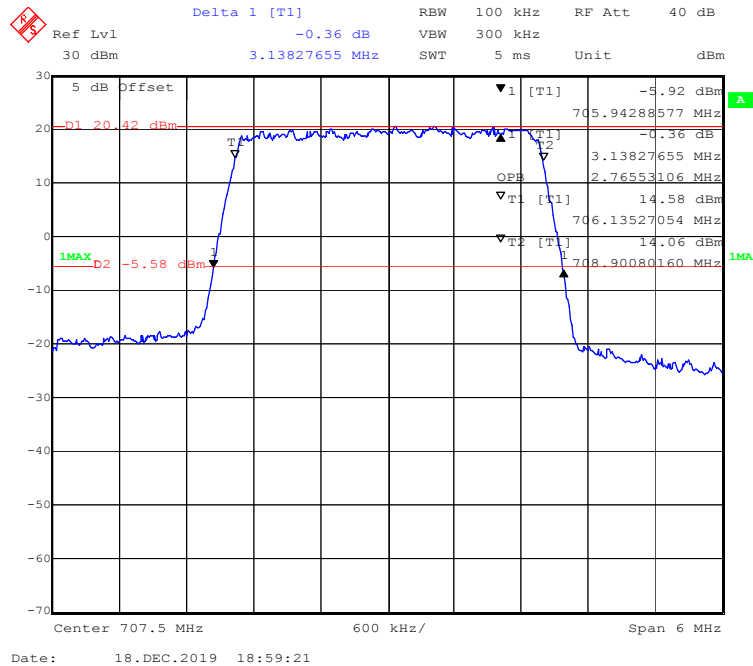
**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

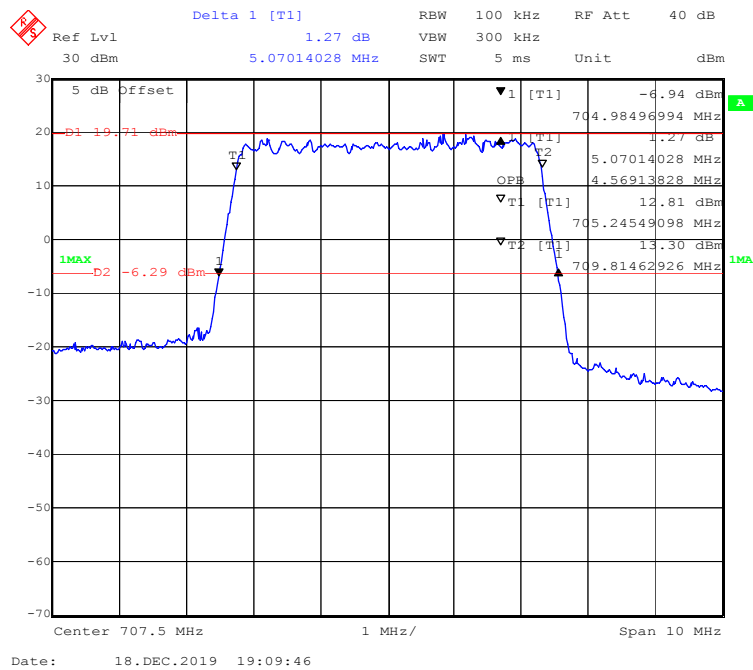
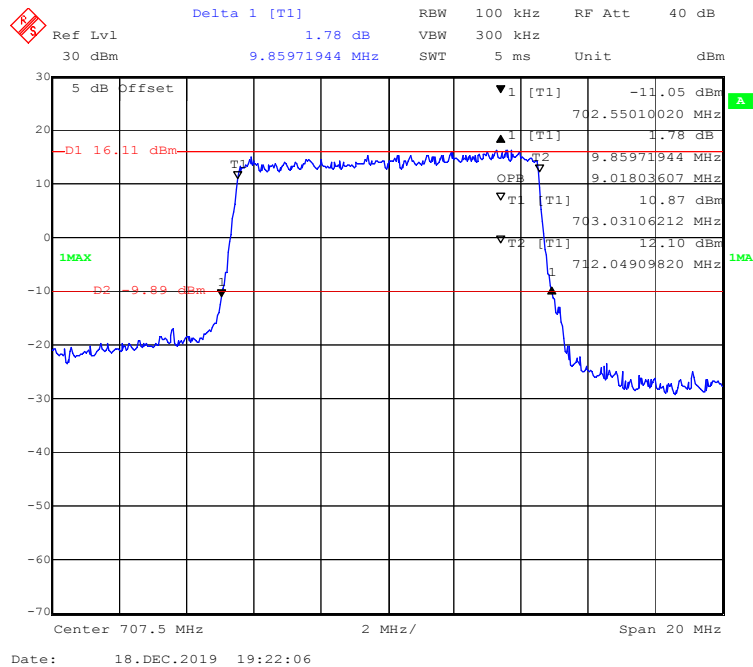
**16-QAM (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

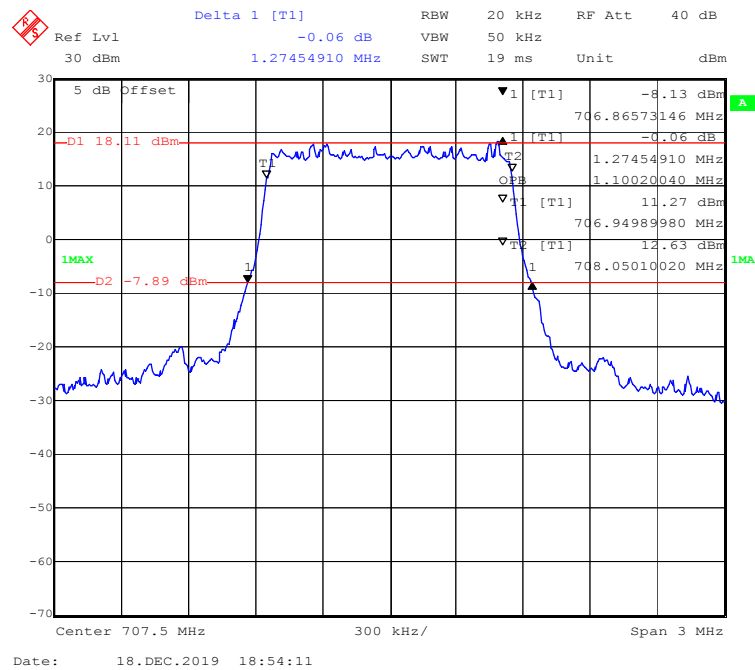
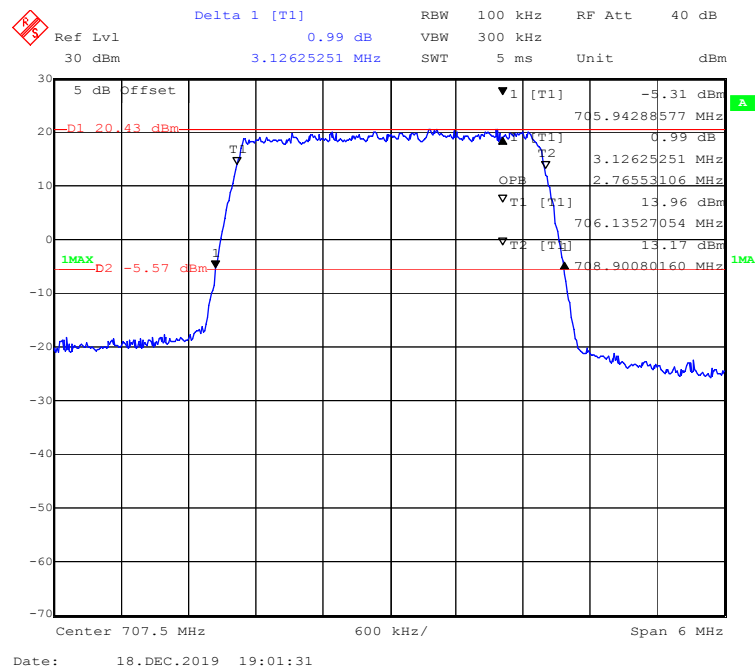


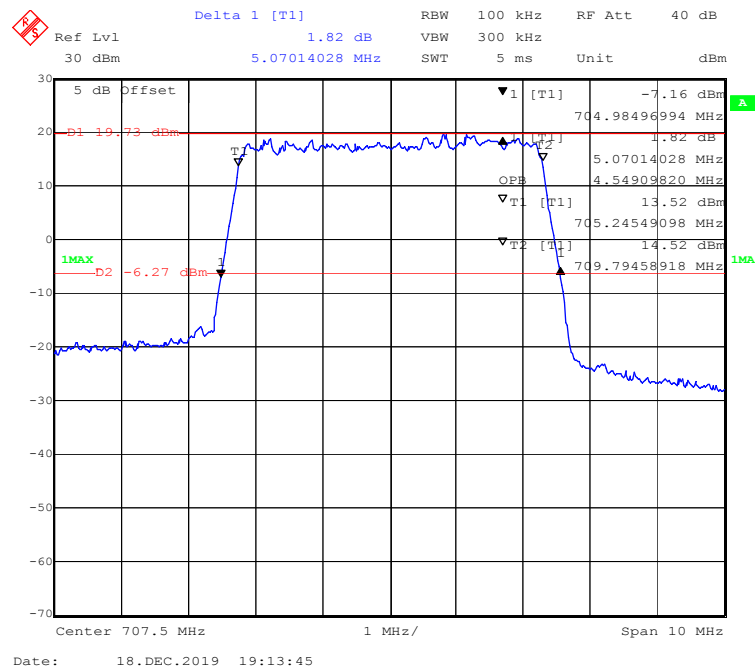
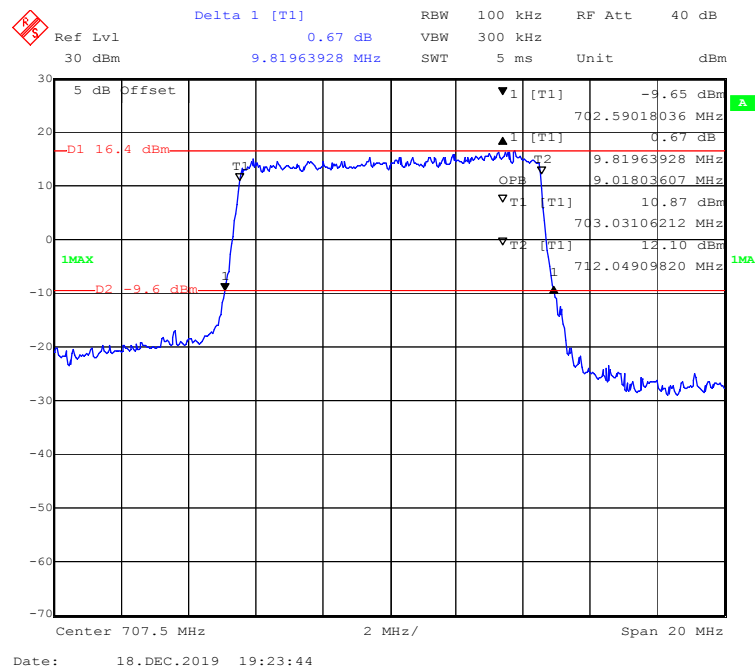
**LTE Band 12:**

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.275	1.094
	3M		3.138	2.766
	5M		5.070	4.569
	10M		9.860	9.018
16-QAM	1.4M	Middle	1.275	1.100
	3M		3.126	2.766
	5M		5.070	4.549
	10M		9.820	9.018

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

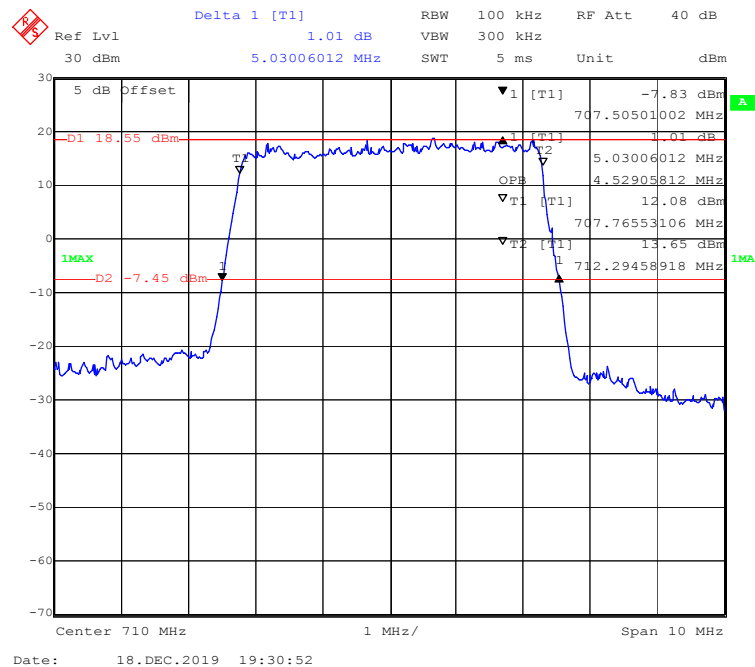
**QPSK (5 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (10MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

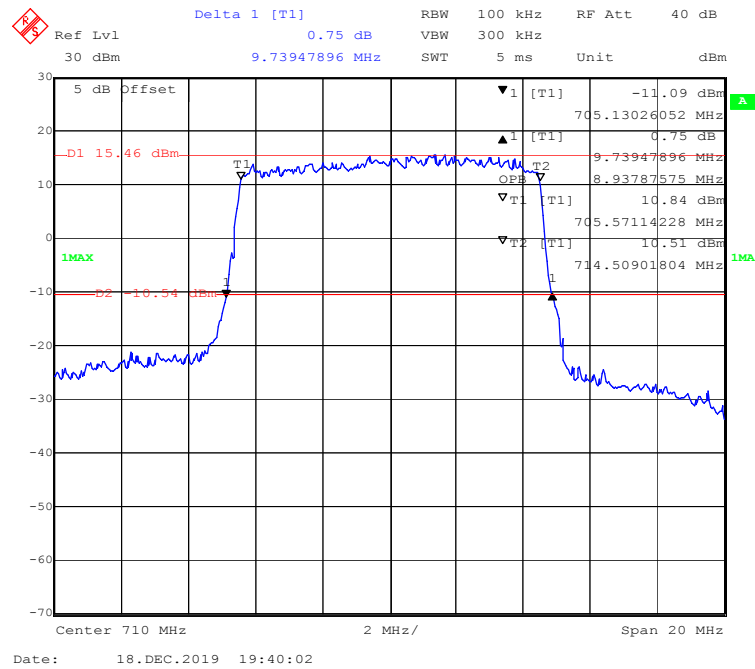
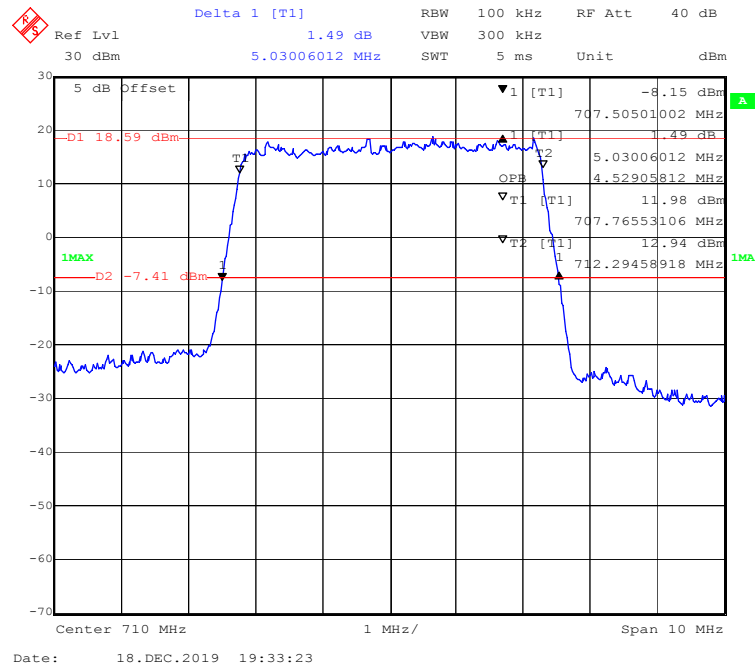
**16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****16-QAM (3 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

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

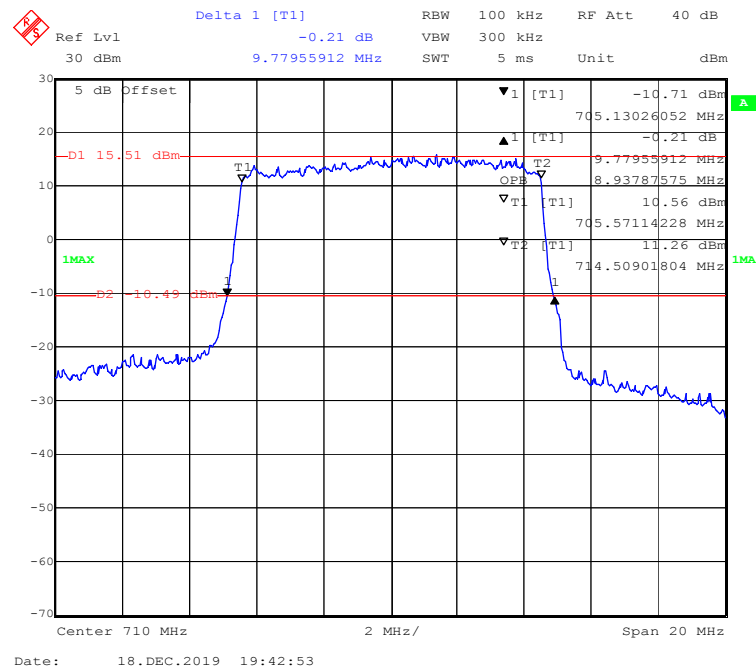
**LTE Band 17:**

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	5M	Middle	5.030	4.529
	10M		9.739	8.938
16-QAM	5M	Middle	5.030	4.529
	10M		9.780	8.938

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

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

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





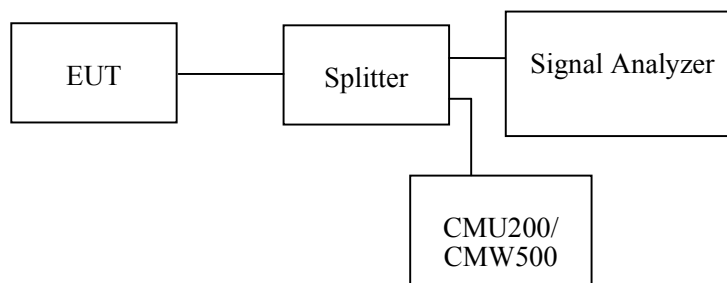
**FCC § 2.1051; § 22.917 (a); § 24.238 (a); §27.53(g) (h) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS****Applicable Standards**

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>	23.2-23.5 °C
<b>Relative Humidity:</b>	51-53 %
<b>ATM Pressure:</b>	101.1-103. 3 kPa

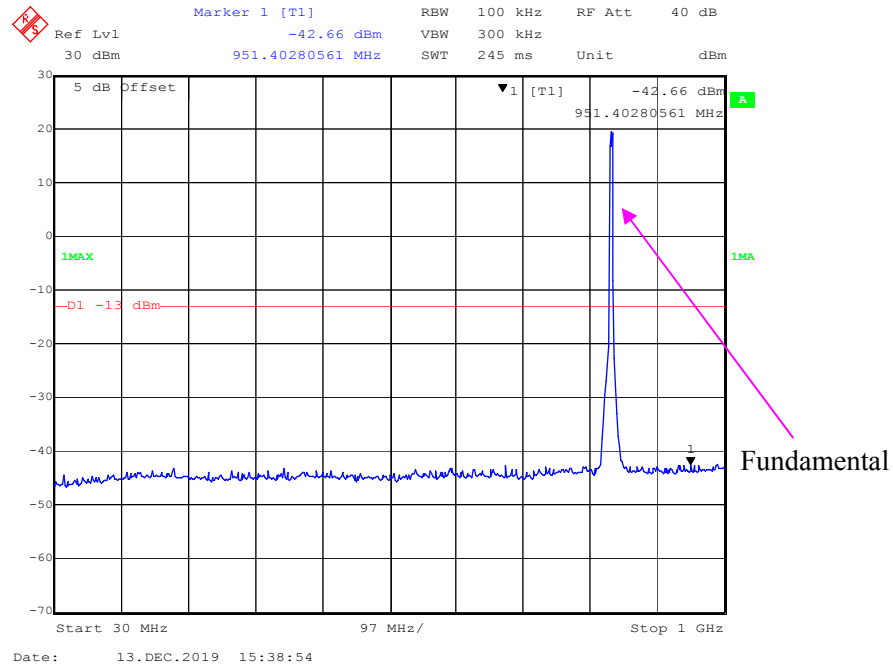
*The testing was performed by Winnie Yang from 2019-12-11 to 2019-12-26.*

*EUT operation mode: Transmitting*

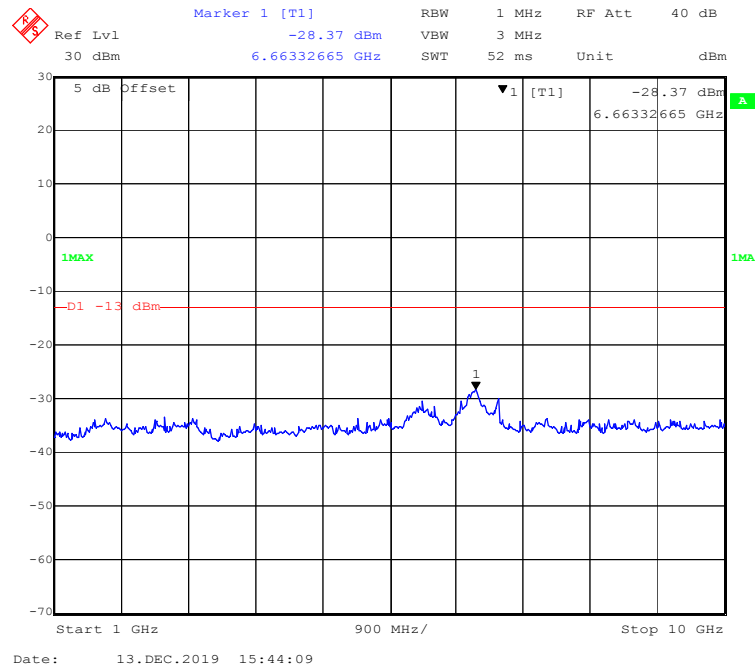
*Test Result: Compliant.*

# WCDMA Band V:

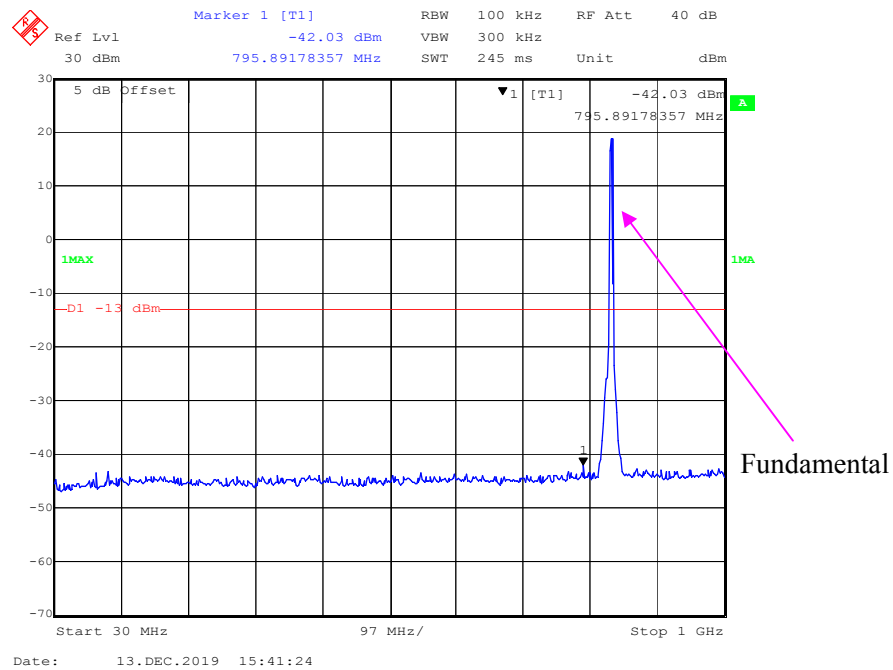
## 30 MHz – 1GHz WCDMA (Rel 99) Mode, Middle channel



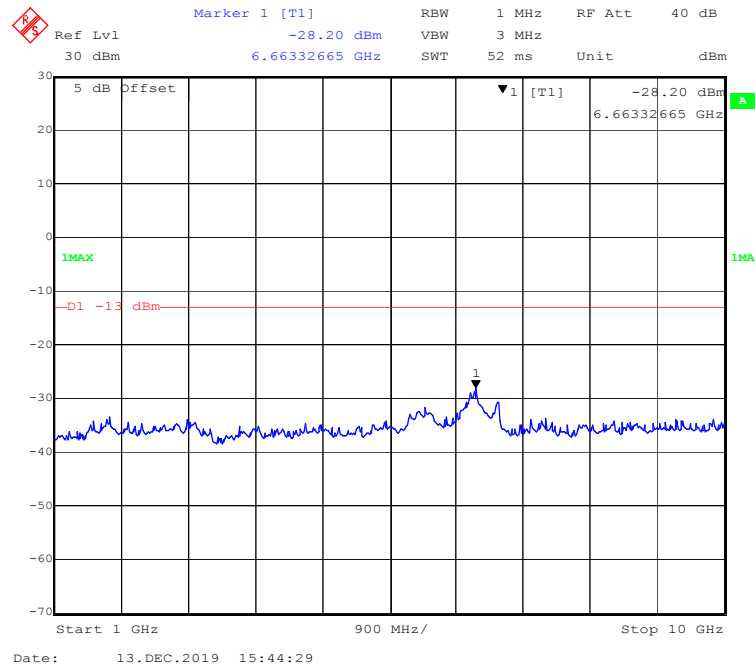
## 1 GHz – 10 GHz WCDMA (Rel 99) Mode, Middle channel



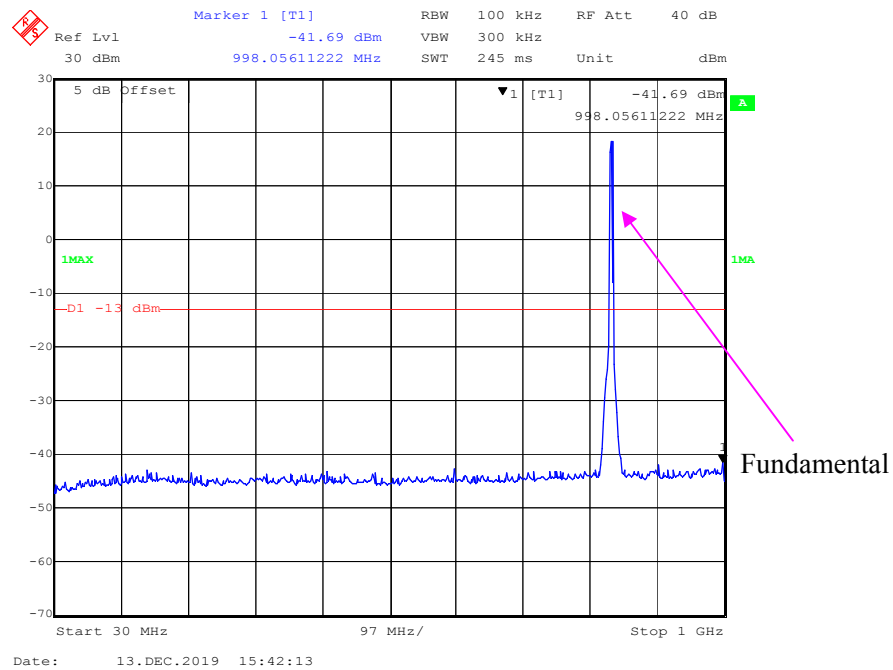
### 30 MHz – 1GHz WCDMA (HSDPA) Mode, Middle channel



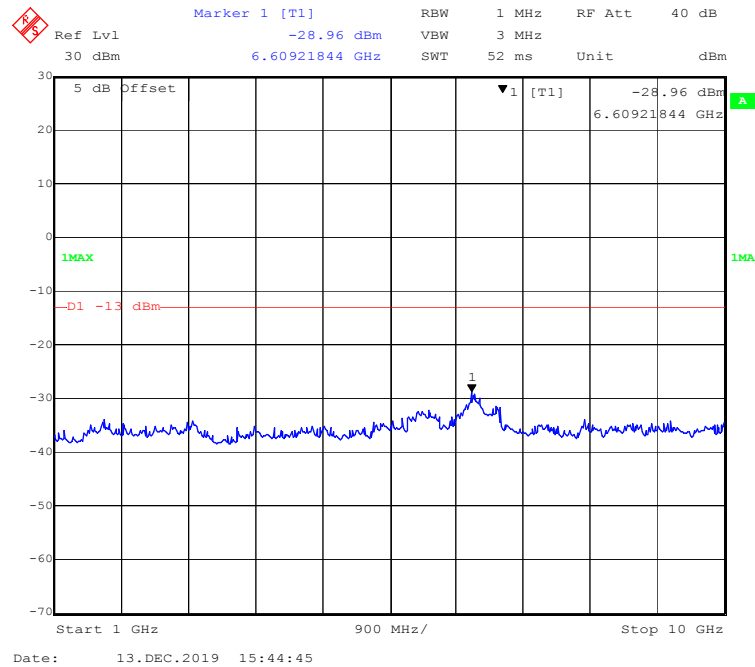
### 1 GHz – 10 GHz WCDMA (HSDPA) Mode, Middle channel



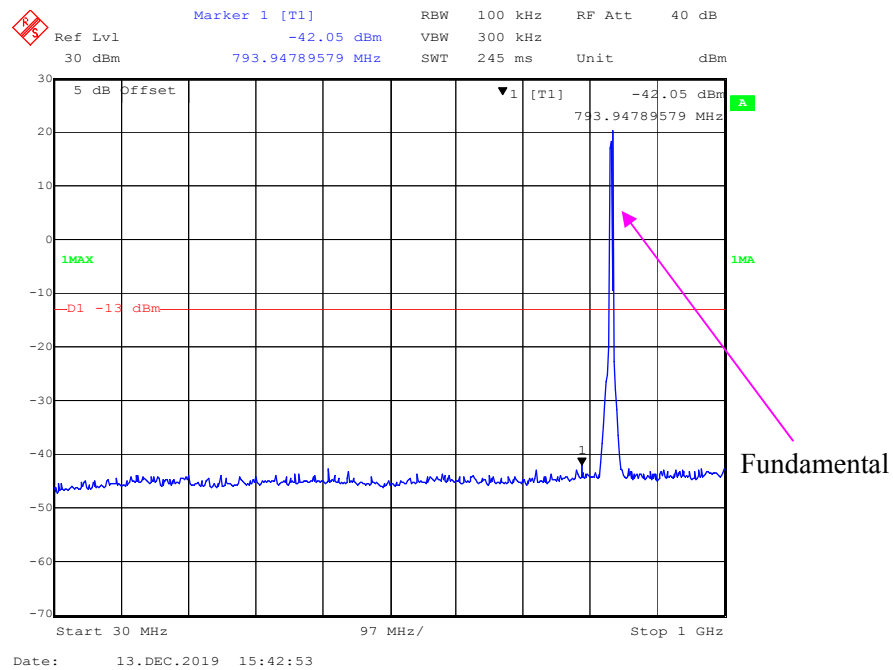
### 30 MHz – 1GHz WCDMA (HSUPA) Mode, Middle channel



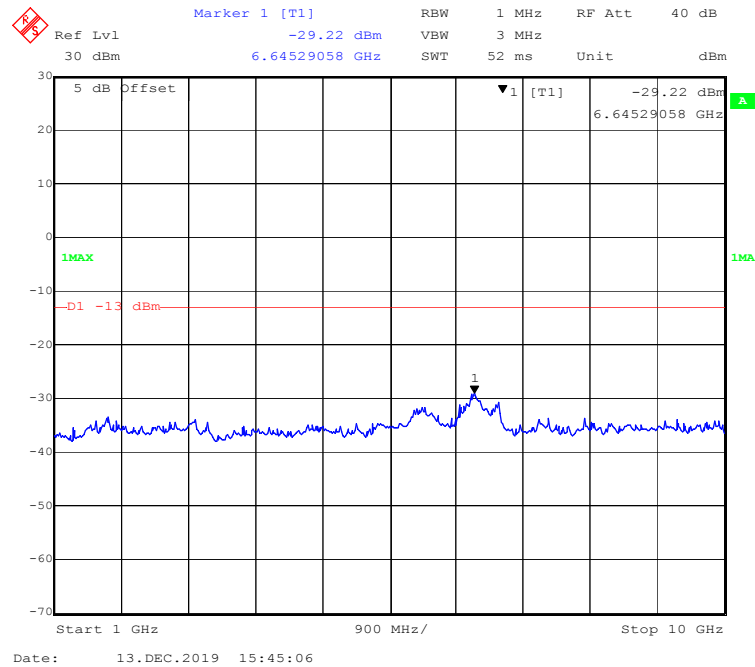
### 1 GHz – 10 GHz WCDMA (HSUPA) Mode, Middle channel



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

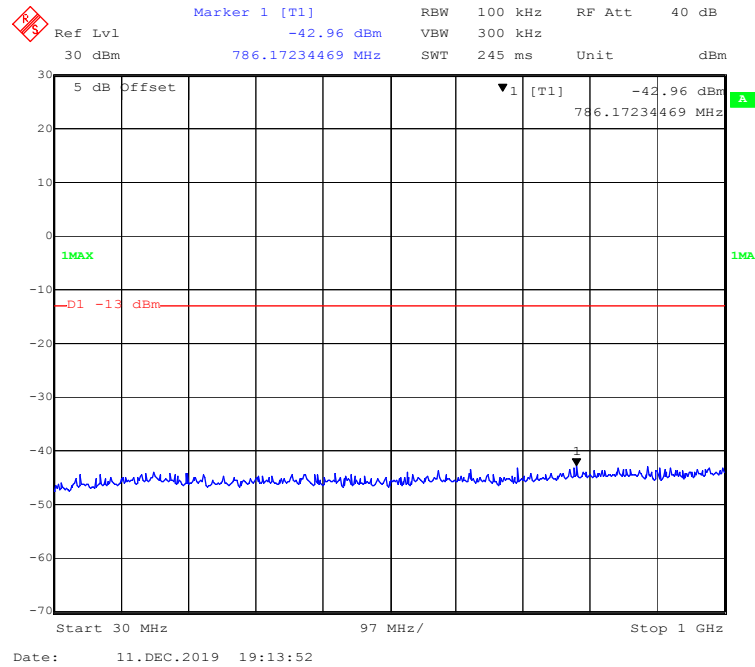


### 1 GHz – 10 GHz WCDMA (HSPA+) Mode, Middle channel

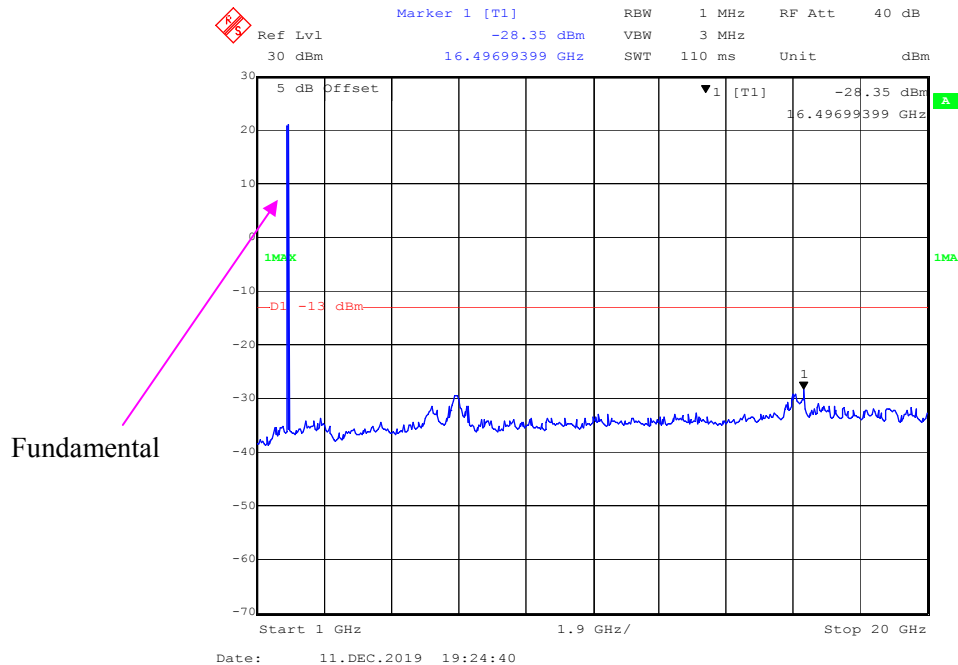


## WCDMA Band II:

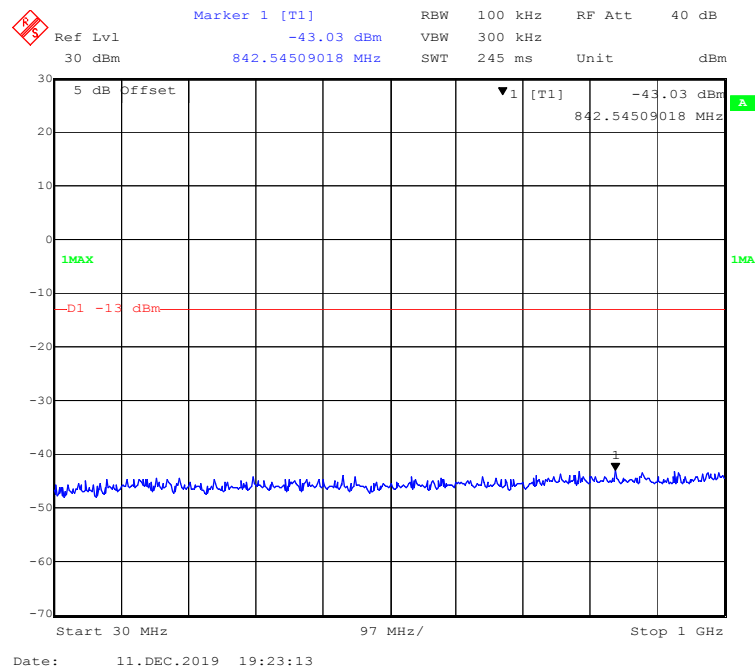
### 30 MHz – 1GHz WCDMA (Rel 99) Mode, Middle channel



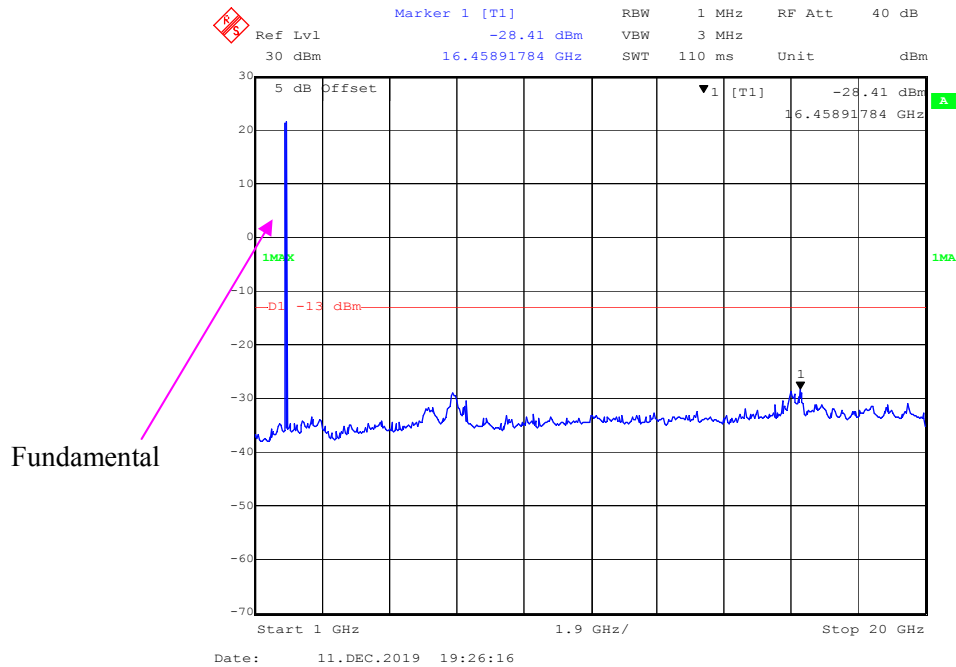
### 1 GHz – 20 GHz WCDMA (Rel 99) Mode, Middle channel



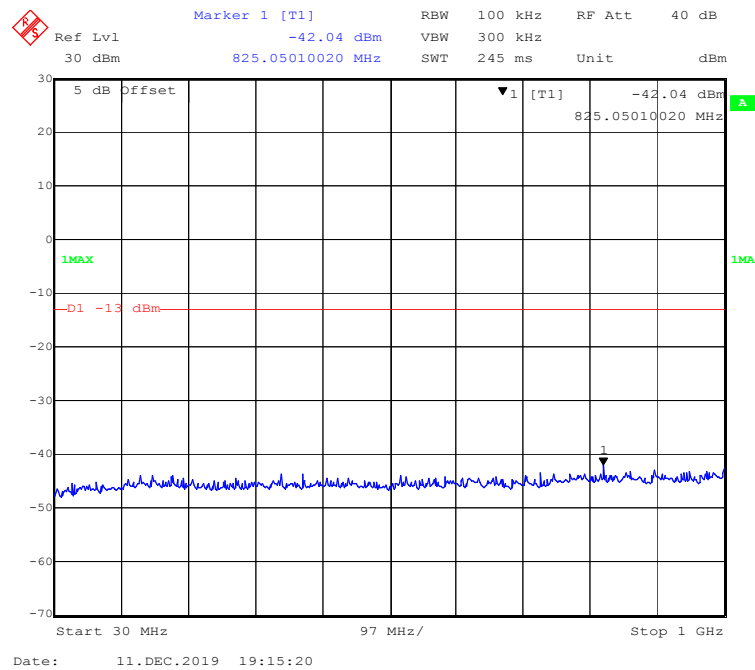
### 30 MHz – 1GHz WCDMA (HSDPA) Mode, Middle channel



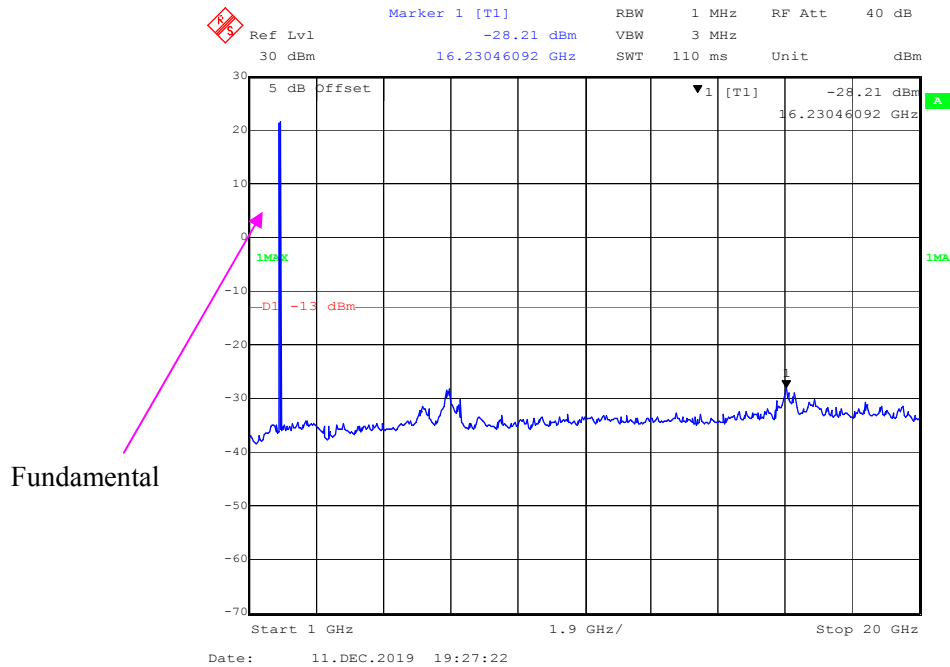
### 1 GHz – 20 GHz WCDMA (HSDPA) Mode, Middle channel



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

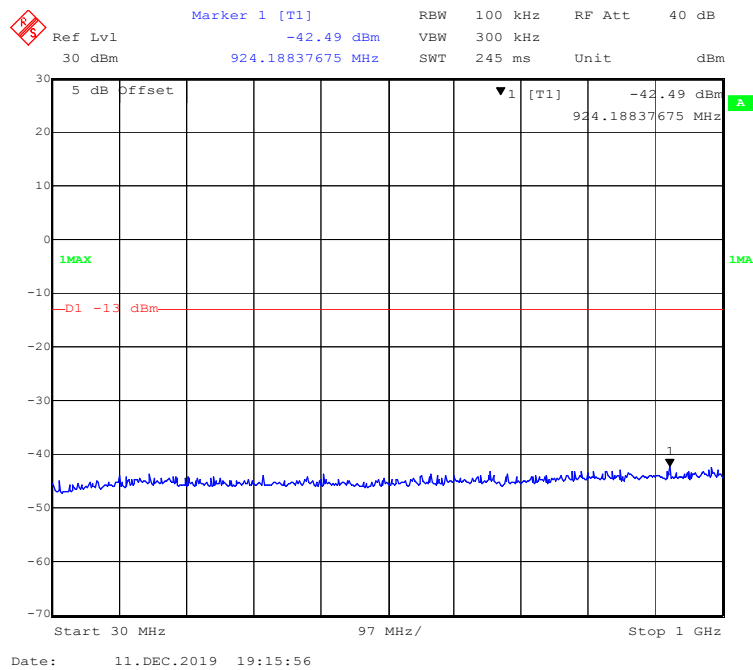


### 1 GHz – 20 GHz WCDMA (HSUPA) Mode, Middle channel

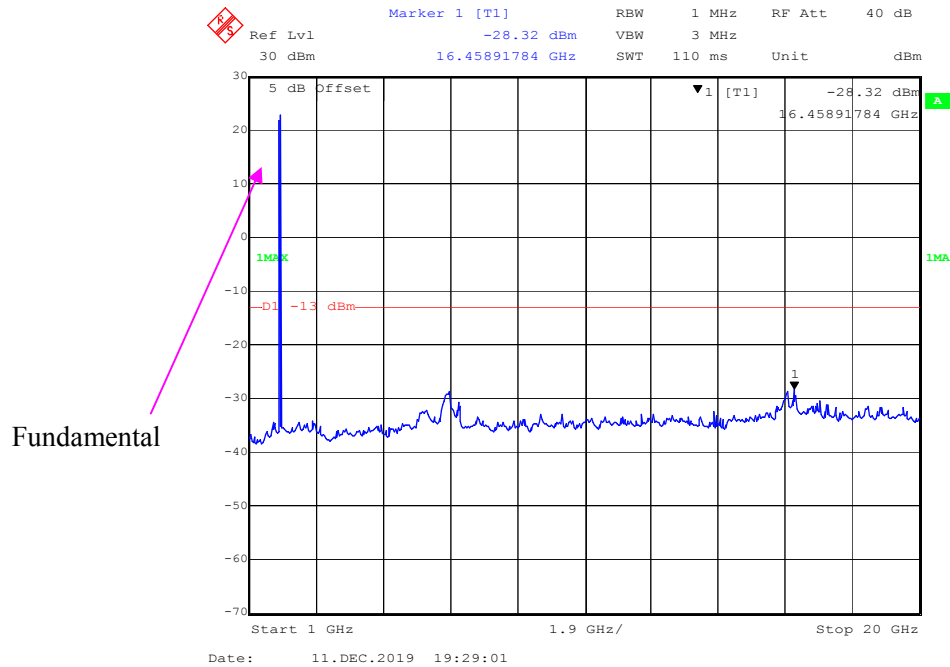




### 30 MHz – 1GHz WCDMA (HSPA+) Mode, Middle channel

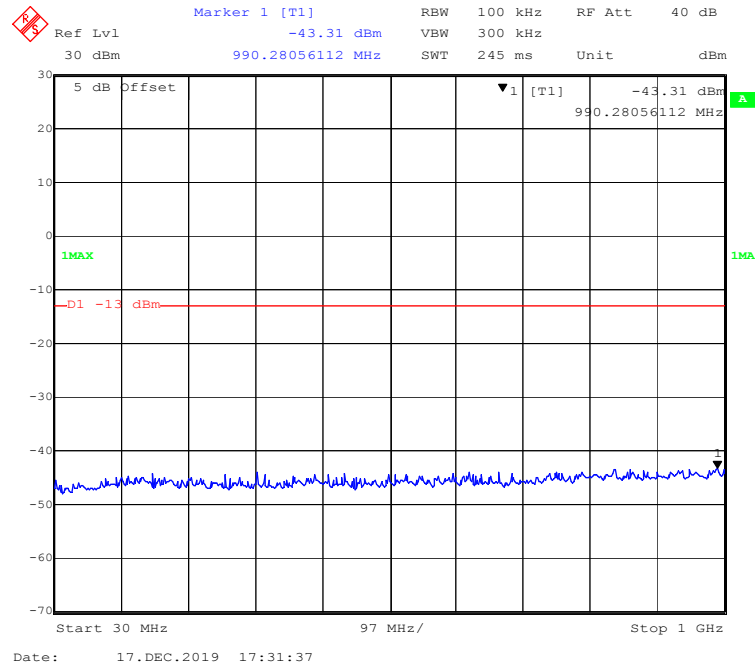


### 1 GHz – 20 GHz WCDMA (HSPA+) Mode, Middle channel

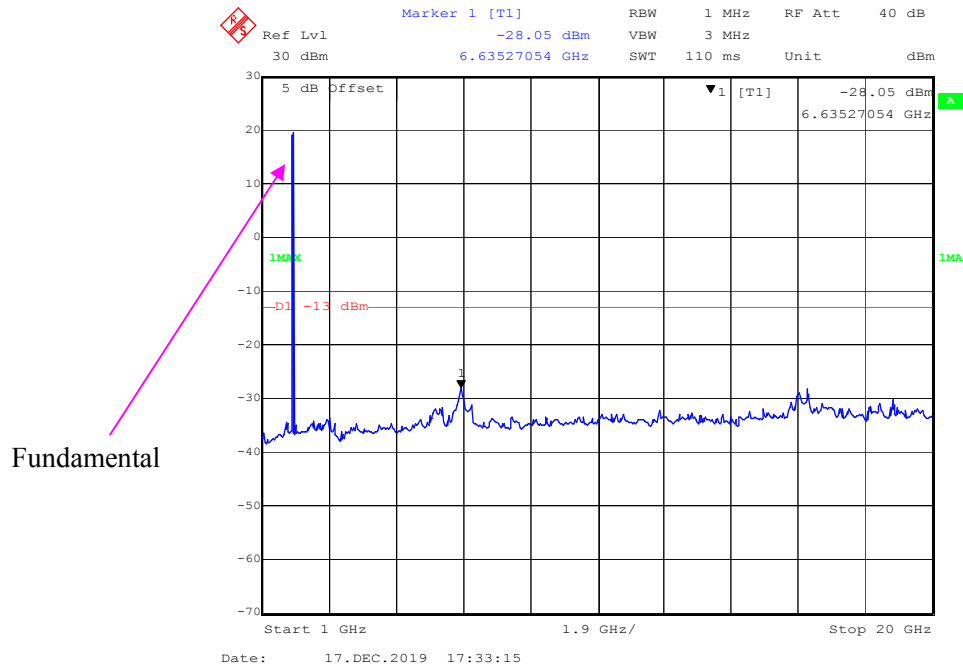


## LTE Band 2:

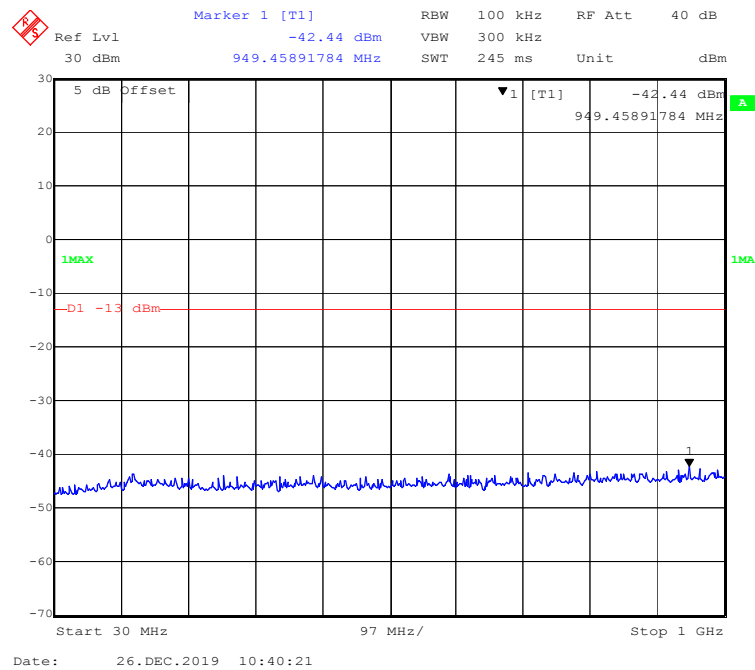
### 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)



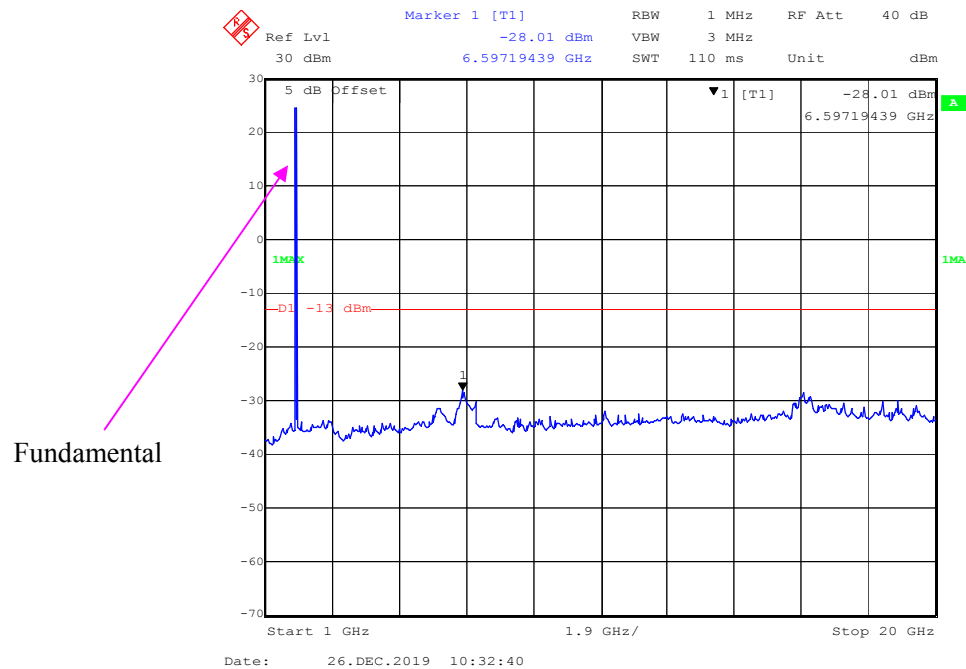
### 1 GHz – 20 GHz (1.4 MHz, QPSK, Middle Channel)



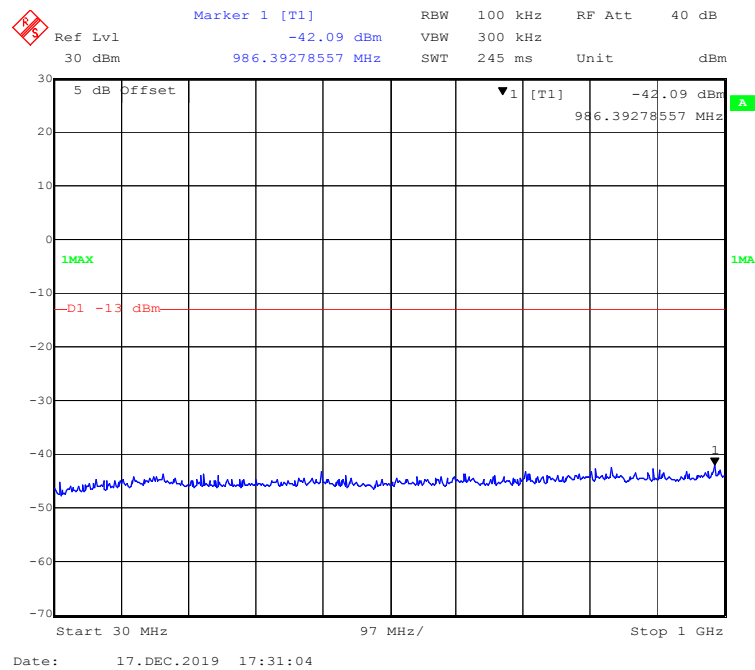
### 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



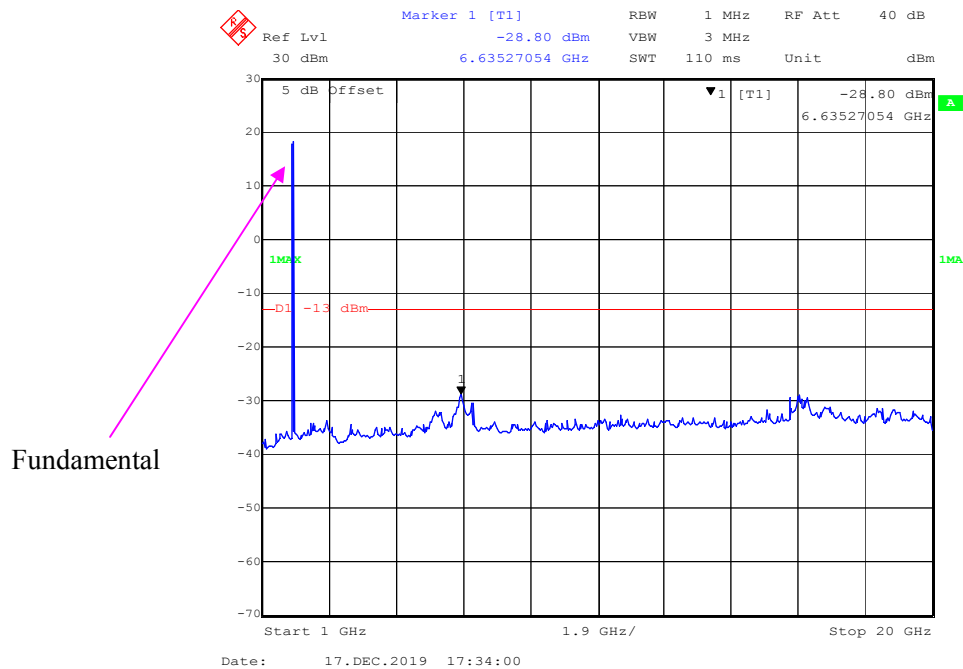
### 1 GHz – 20 GHz (1.4 MHz, 16-QAM, Middle Channel)



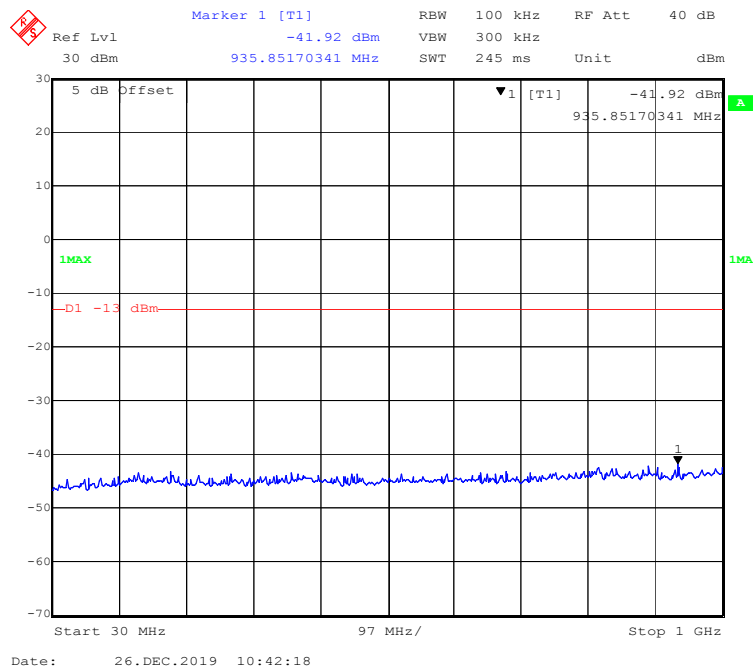
### 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)



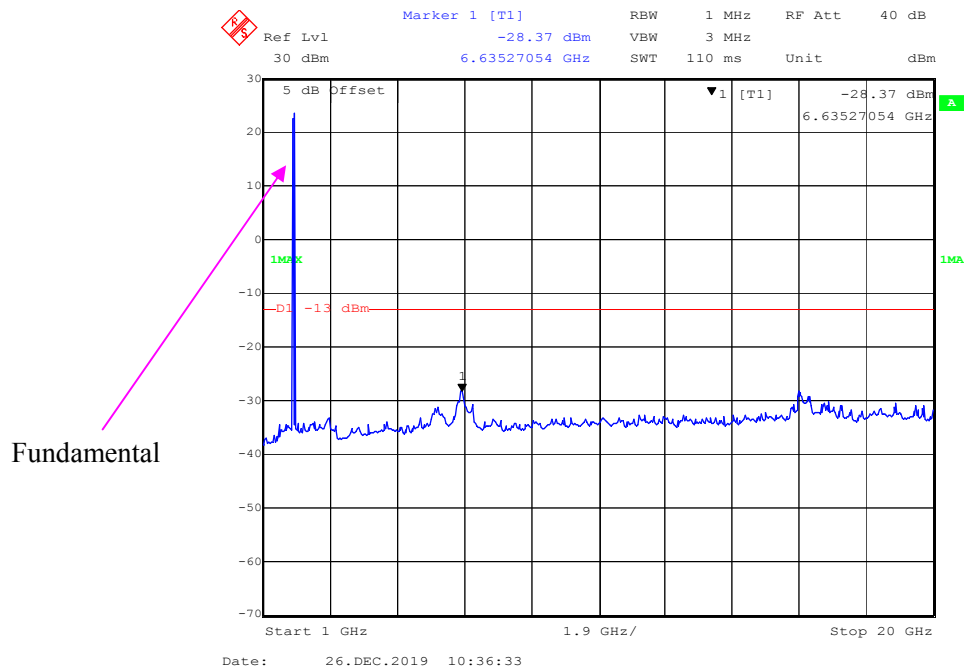
### 1 GHz – 20 GHz (3 MHz, QPSK, Middle Channel)



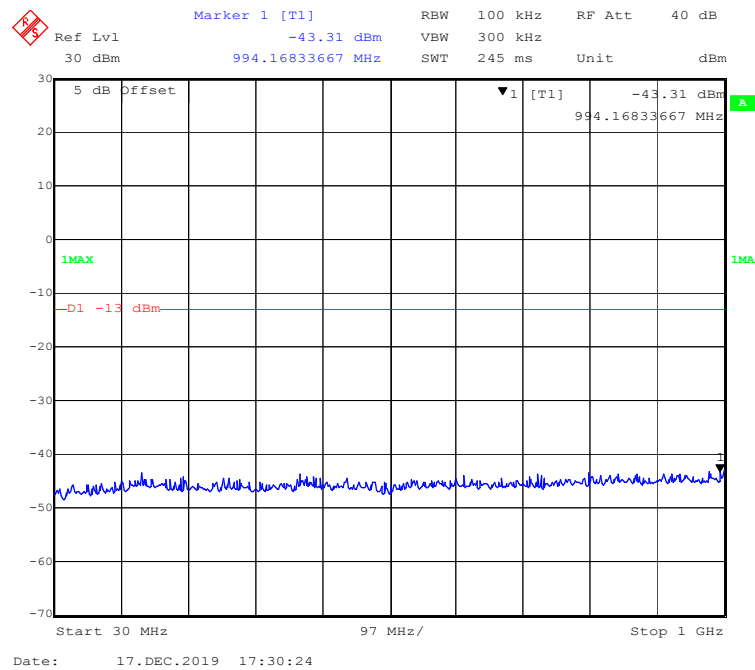
### 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



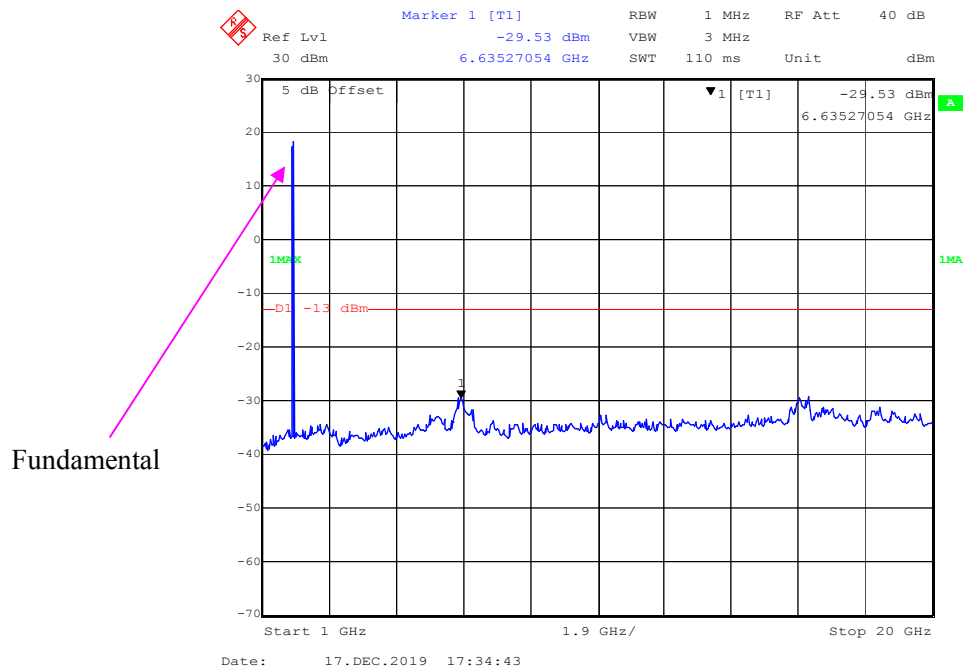
### 1 GHz – 20 GHz (3 MHz, 16-QAM, Middle Channel)



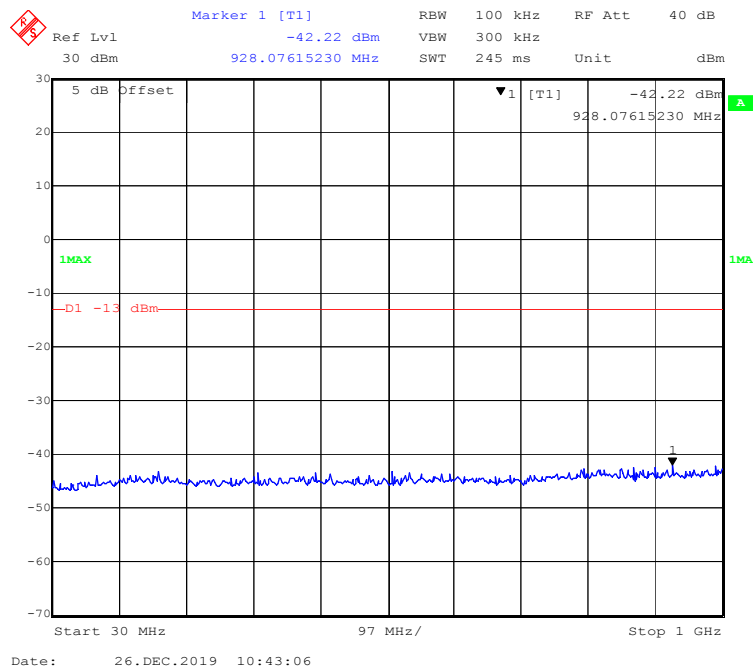
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



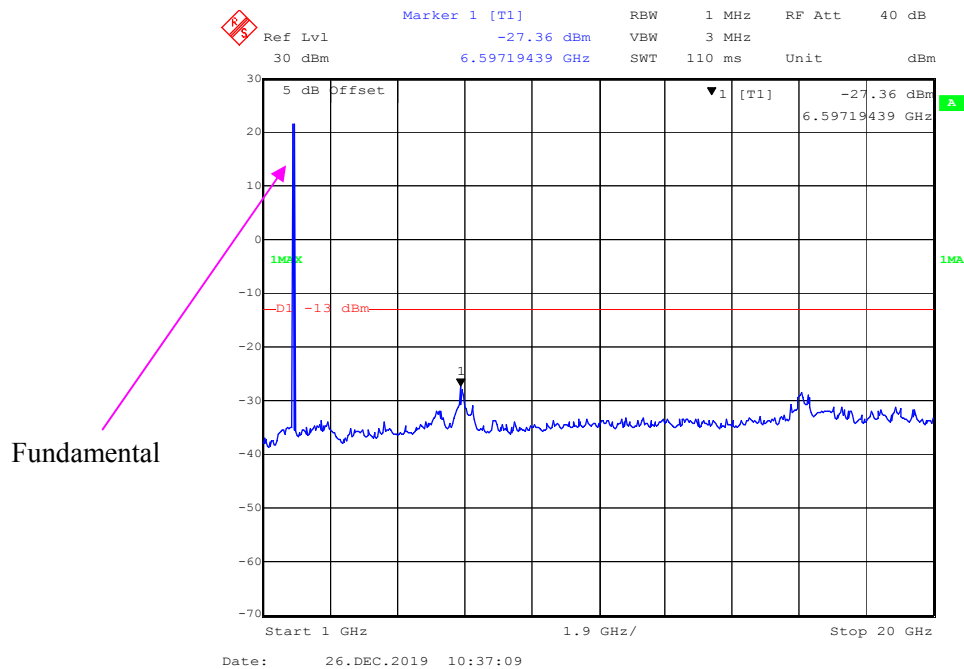
### 1 GHz – 20 GHz (5 MHz, QPSK, Middle Channel)



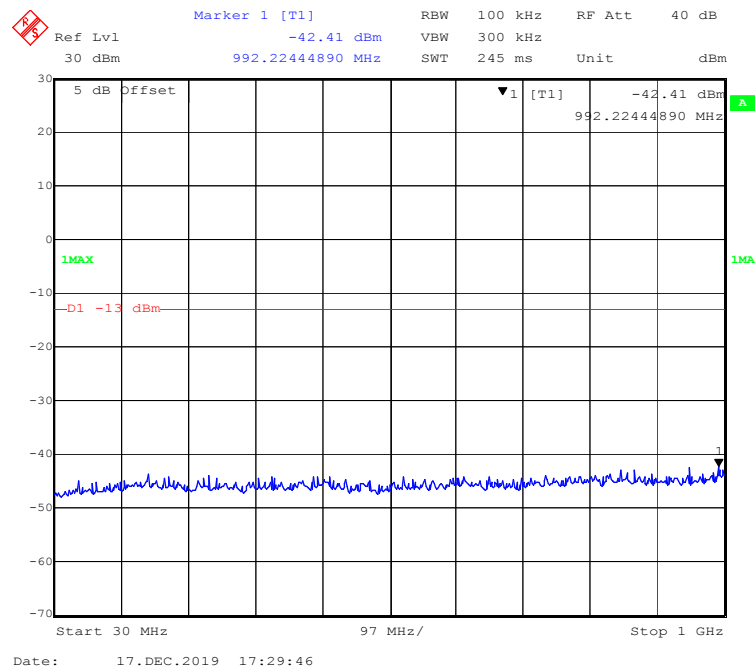
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



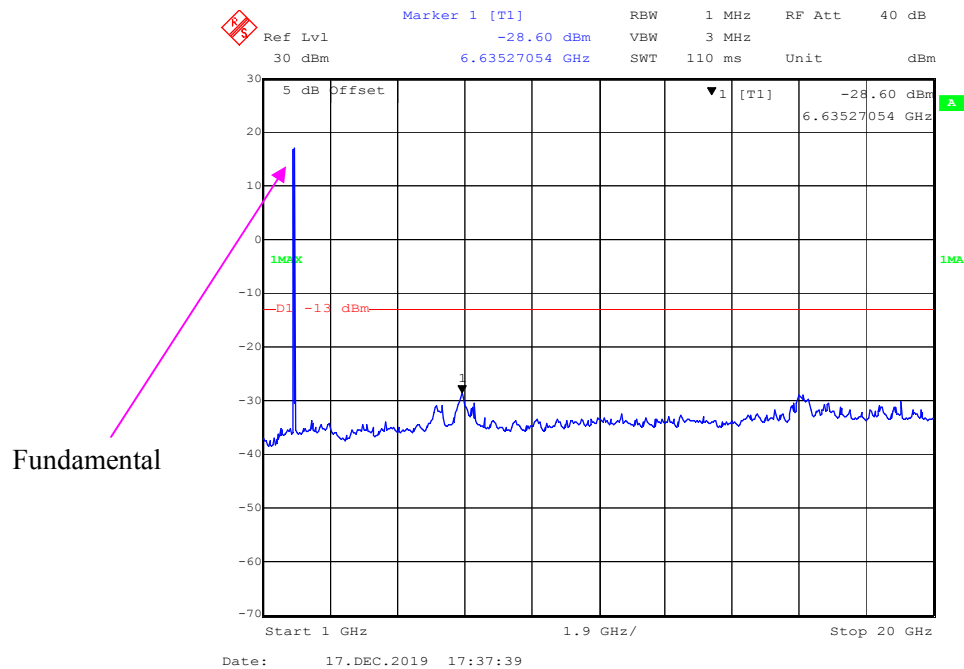
### 1 GHz – 20 GHz (5 MHz, 16-QAM, Middle Channel)



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

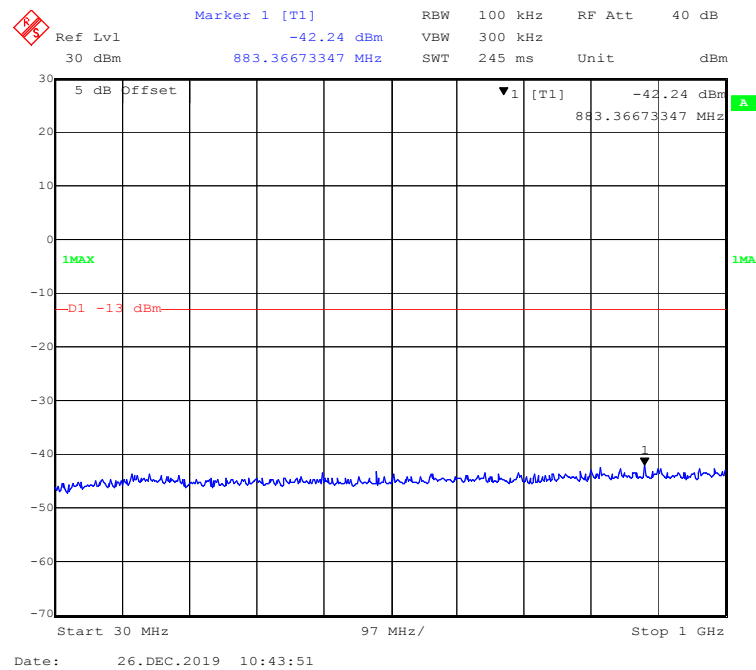


### 1 GHz – 20 GHz (10 MHz, QPSK, Middle Channel)

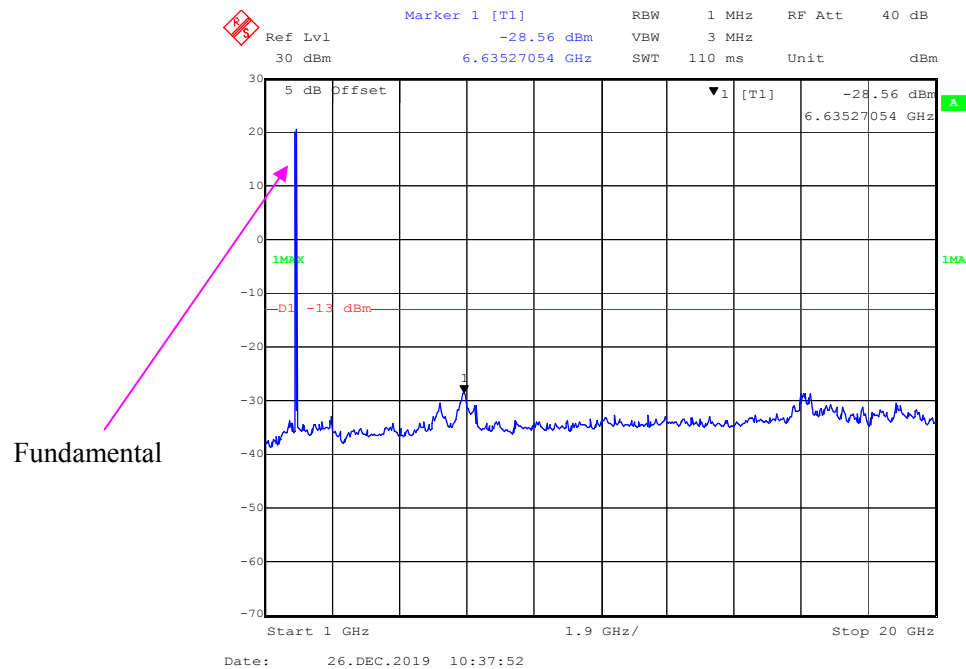




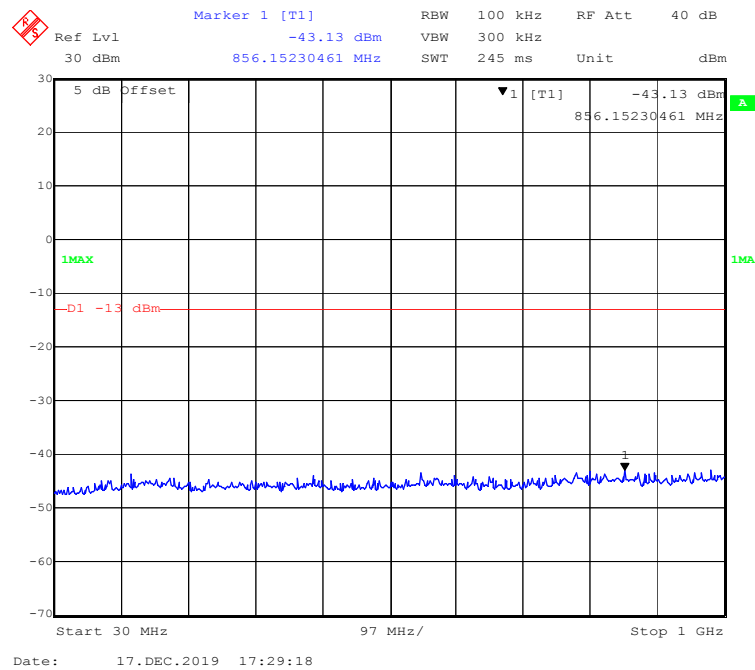
### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



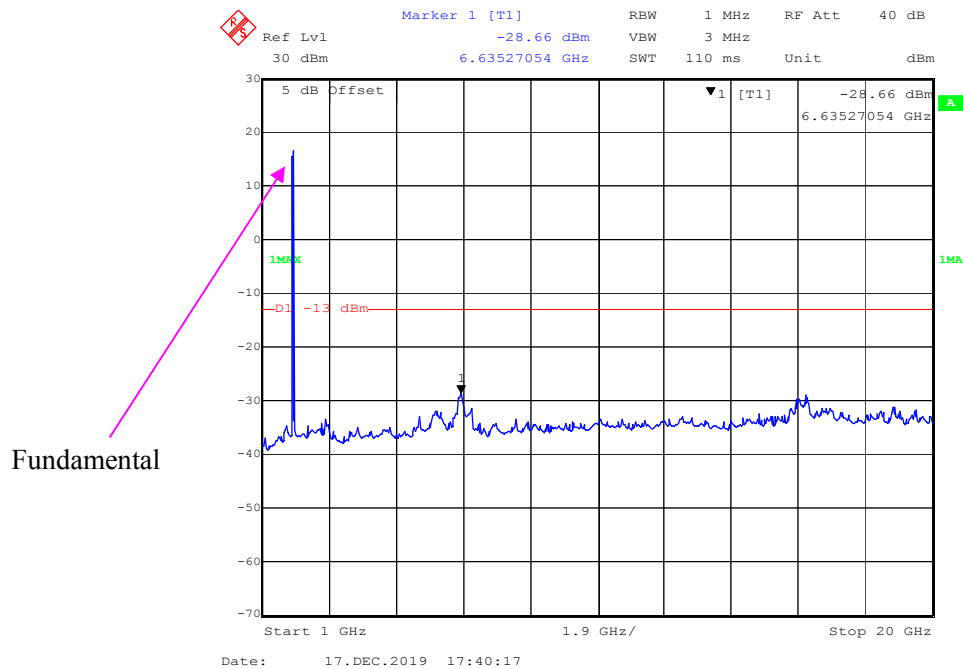
### 1 GHz – 20 GHz (10 MHz, 16-QAM, Middle Channel)



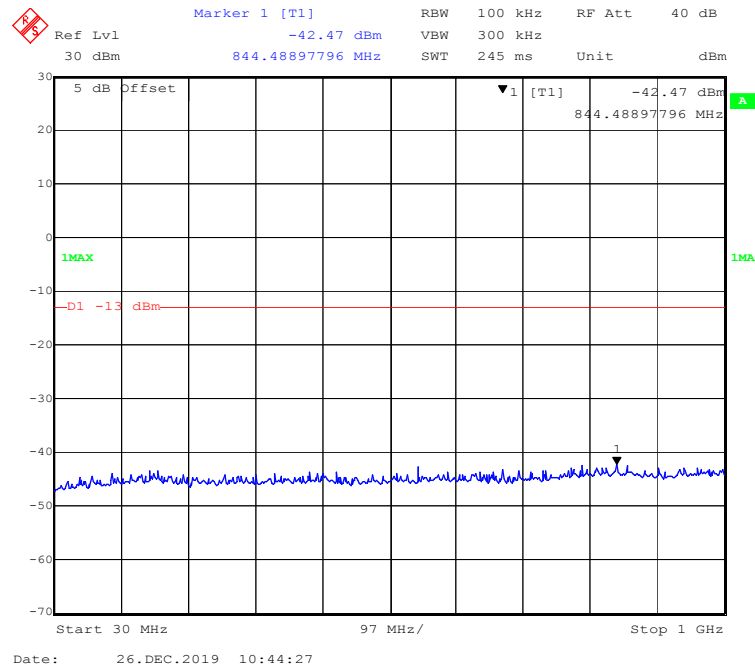
### 30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)



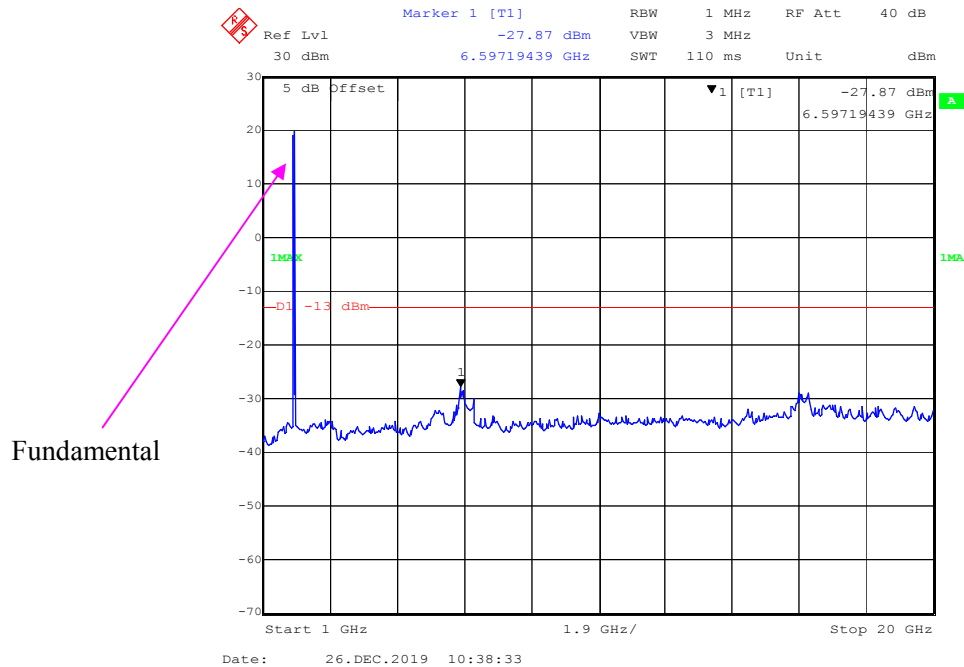
### 1 GHz – 20 GHz (15 MHz, QPSK, Middle Channel)



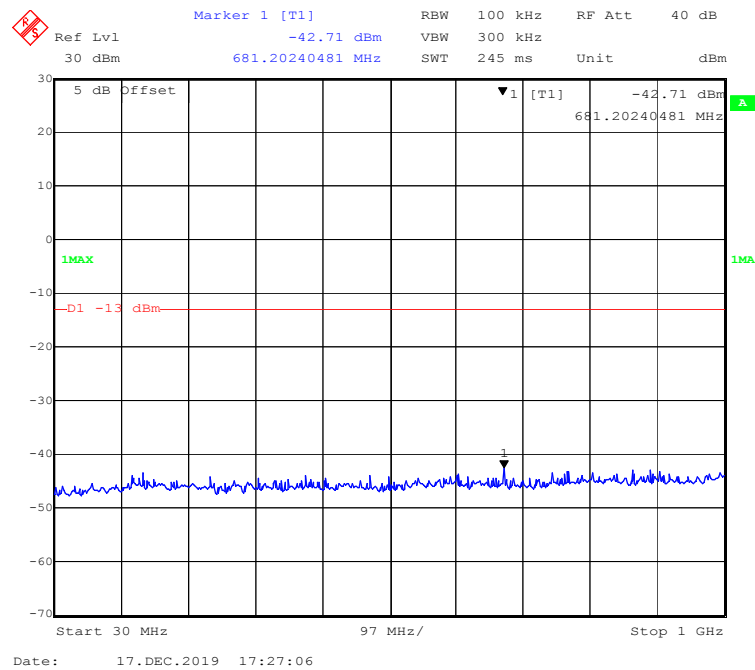
### 30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)



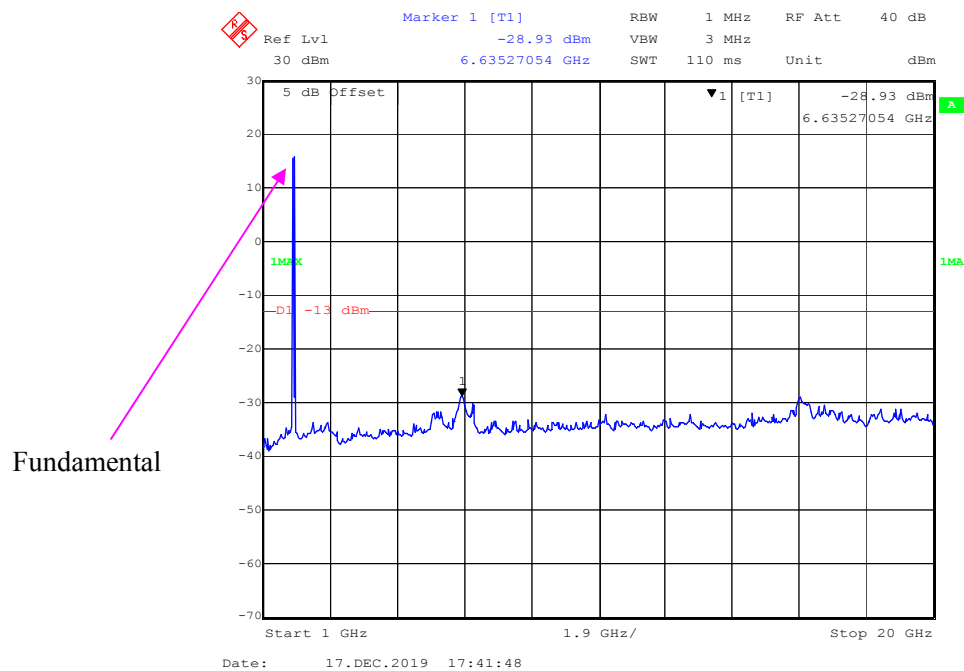
### 1 GHz – 20 GHz (15 MHz, 16-QAM, Middle Channel)



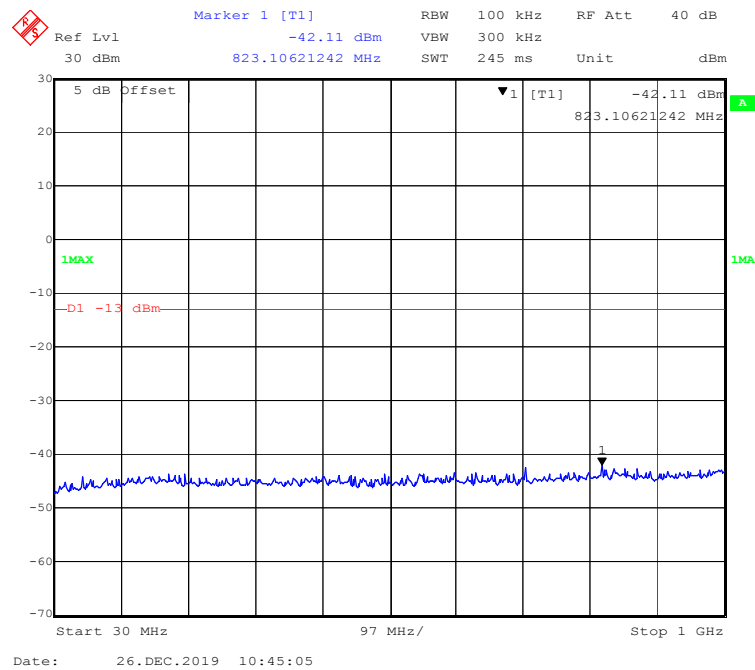
### 30 MHz - 1 GHz (20 MHz, QPSK, Middle Channel)



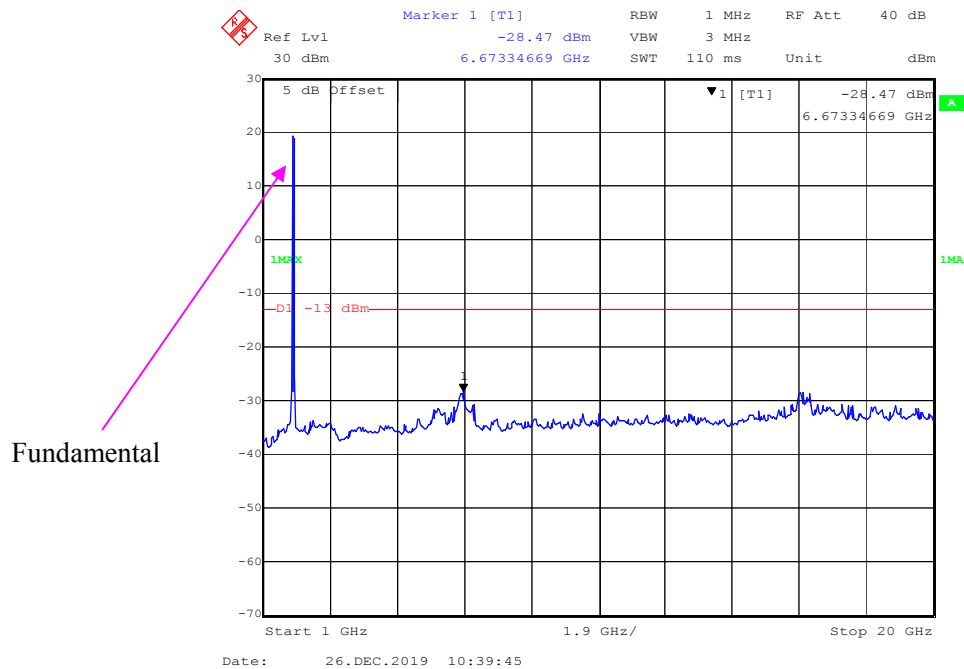
### 1 GHz – 20 GHz (20 MHz, QPSK, Middle Channel)



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

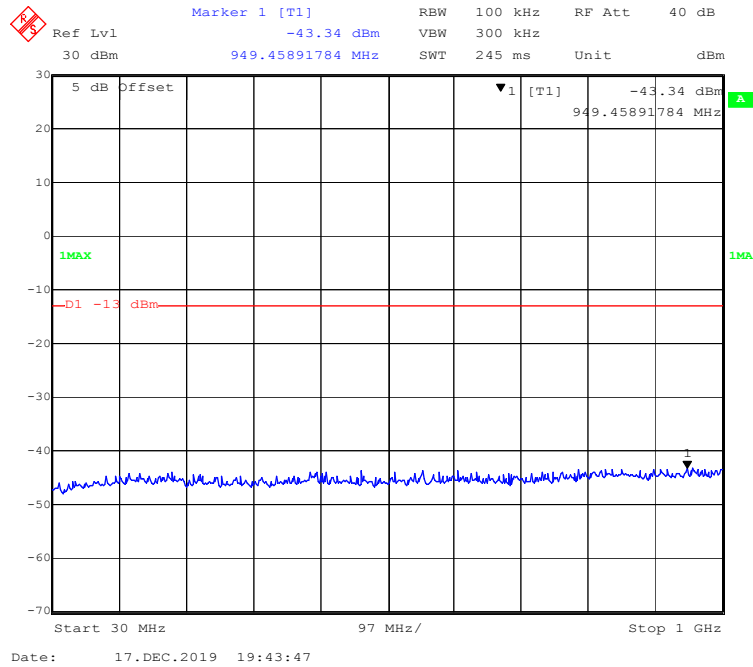


### 1 GHz – 20 GHz (20 MHz, 16-QAM, Middle Channel)

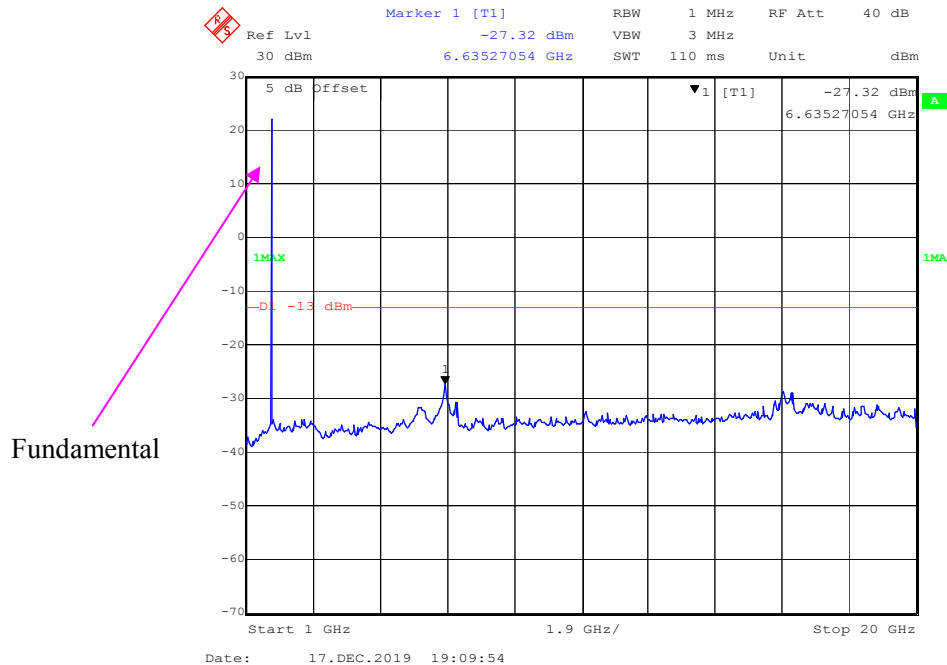


# LTE Band 4:

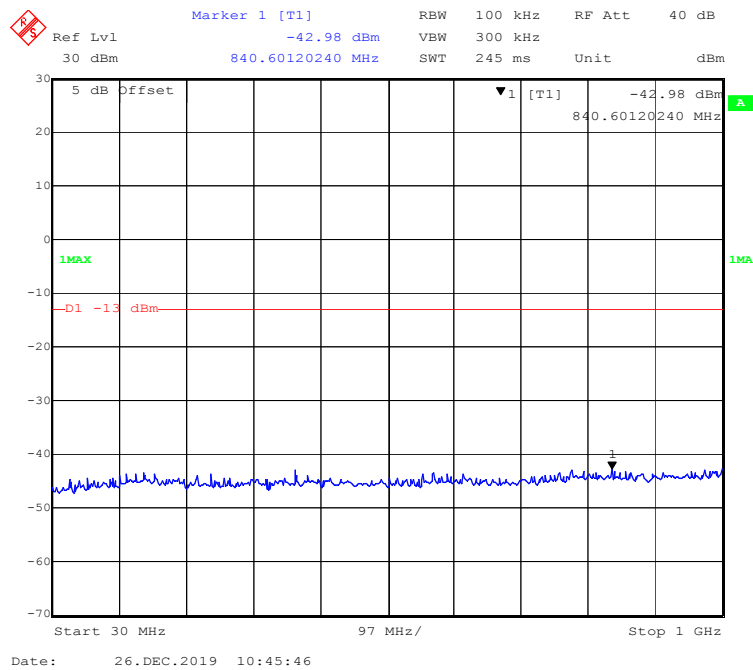
## 30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)



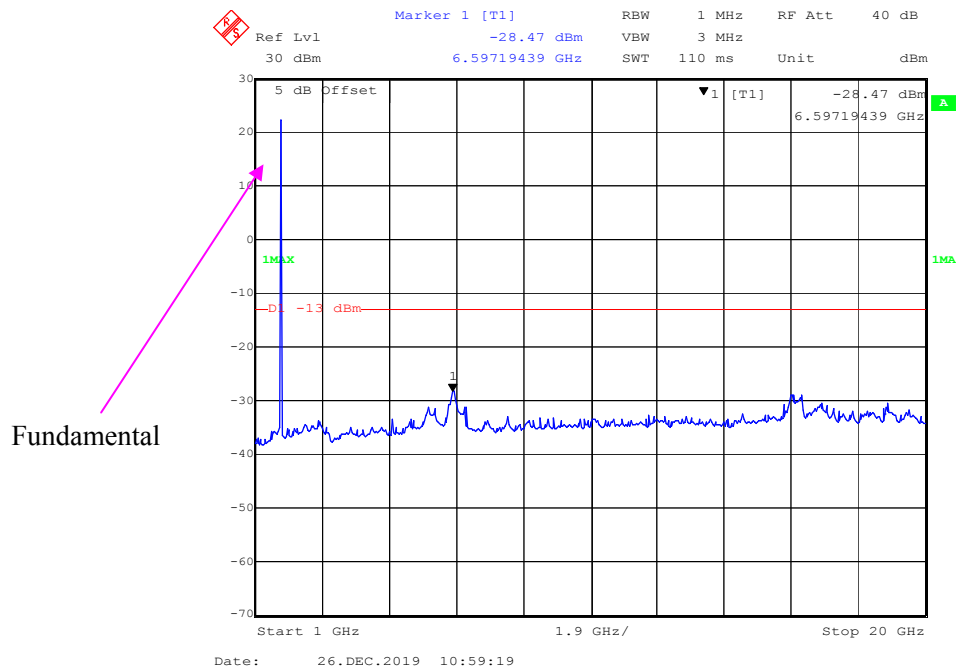
## 1 GHz – 20 GHz (1.4 MHz, QPSK, Middle Channel)



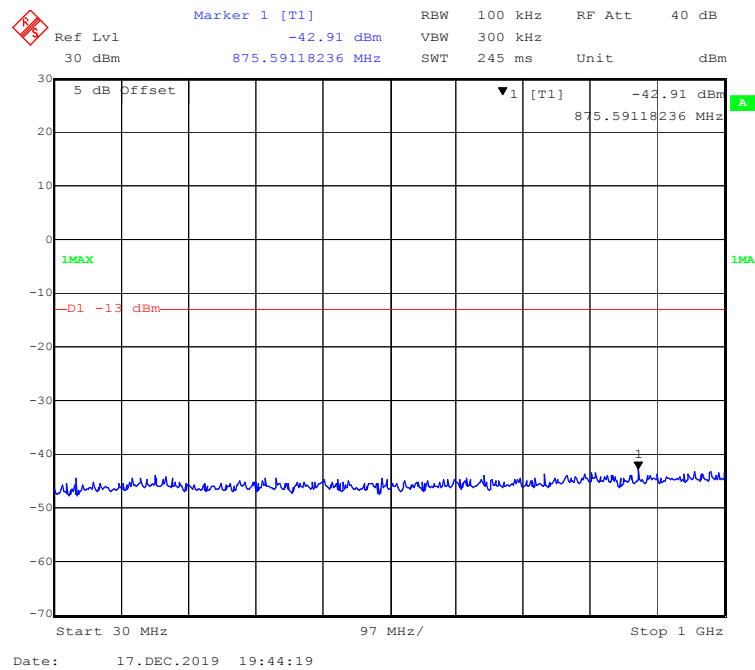
### 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



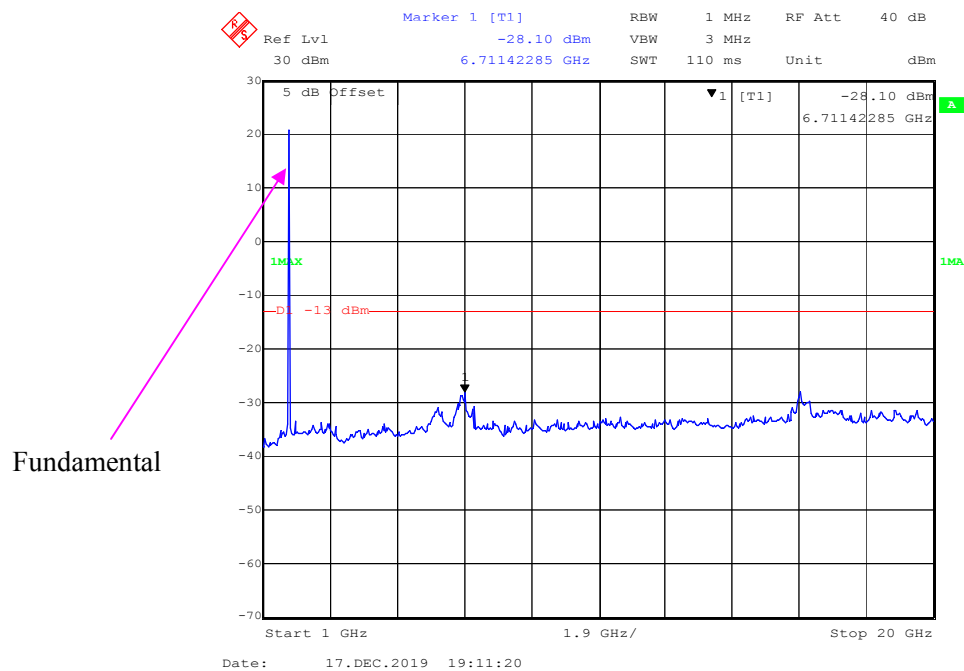
### 1 GHz – 20 GHz (1.4 MHz, 16-QAM, Middle Channel)



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

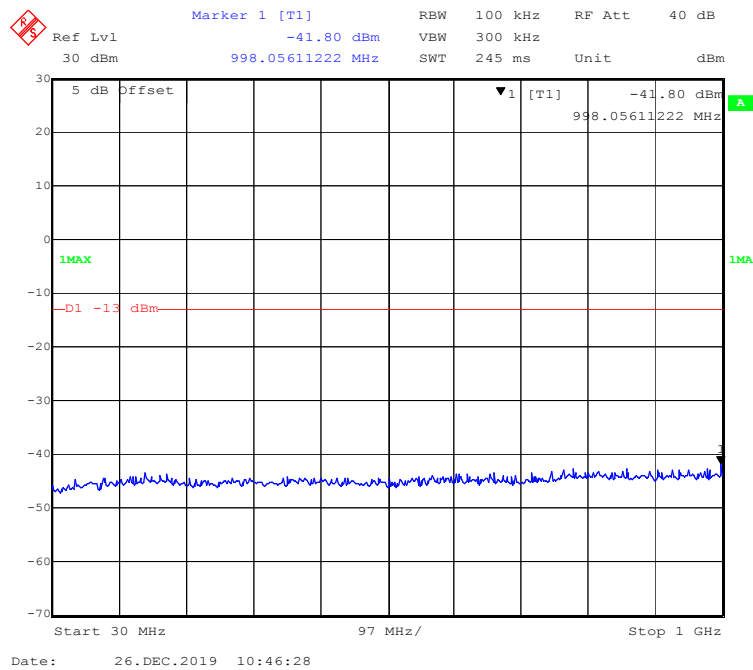


### 1 GHz – 20 GHz (3 MHz, QPSK, Middle Channel)

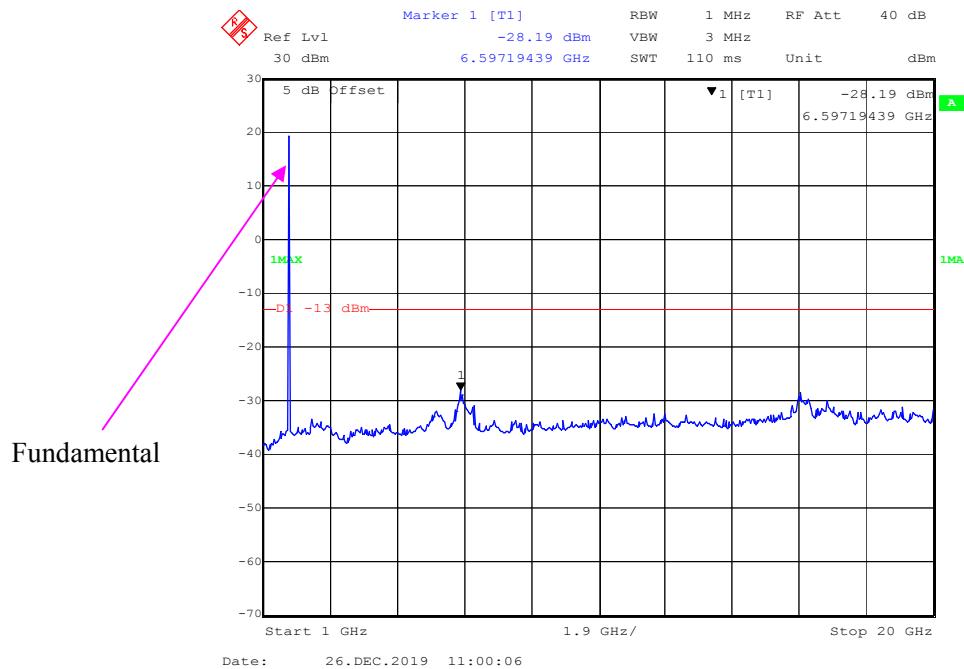




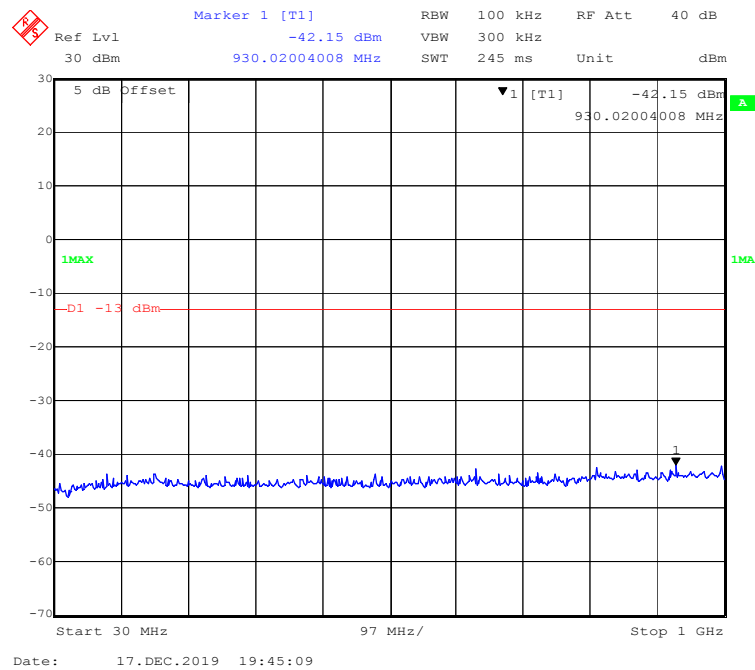
### 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



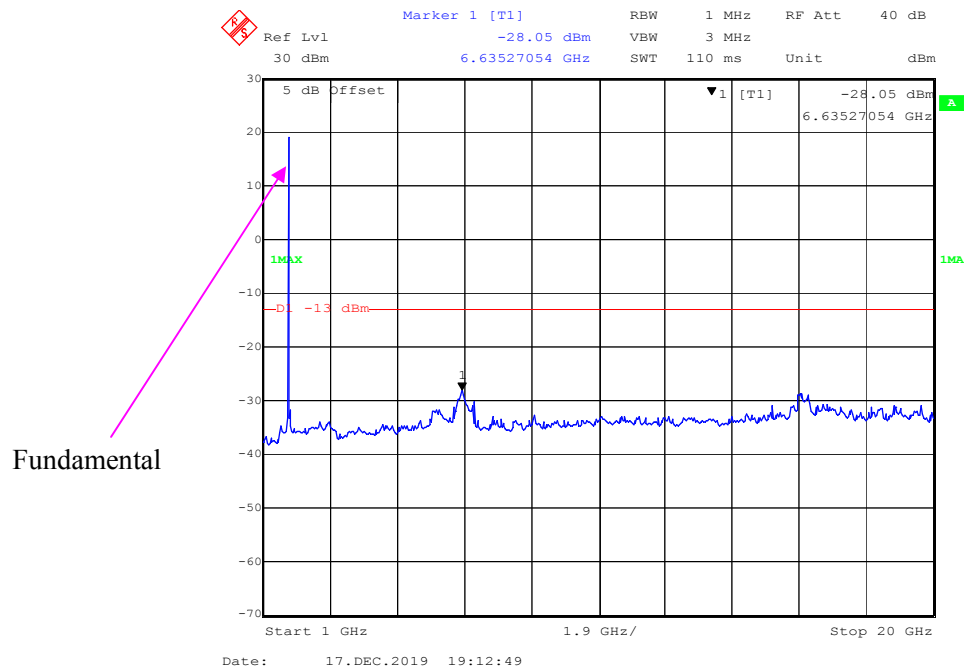
### 1 GHz – 20 GHz (3 MHz, 16-QAM, Middle Channel)



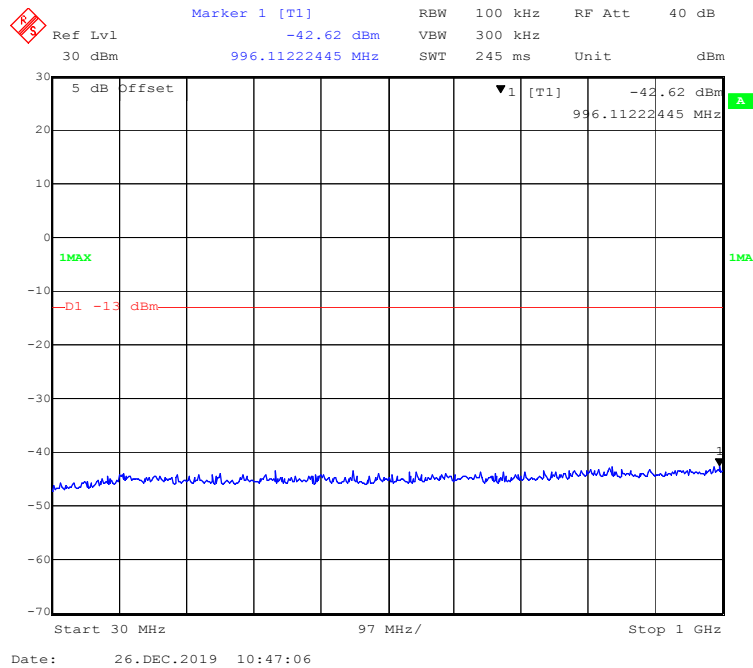
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



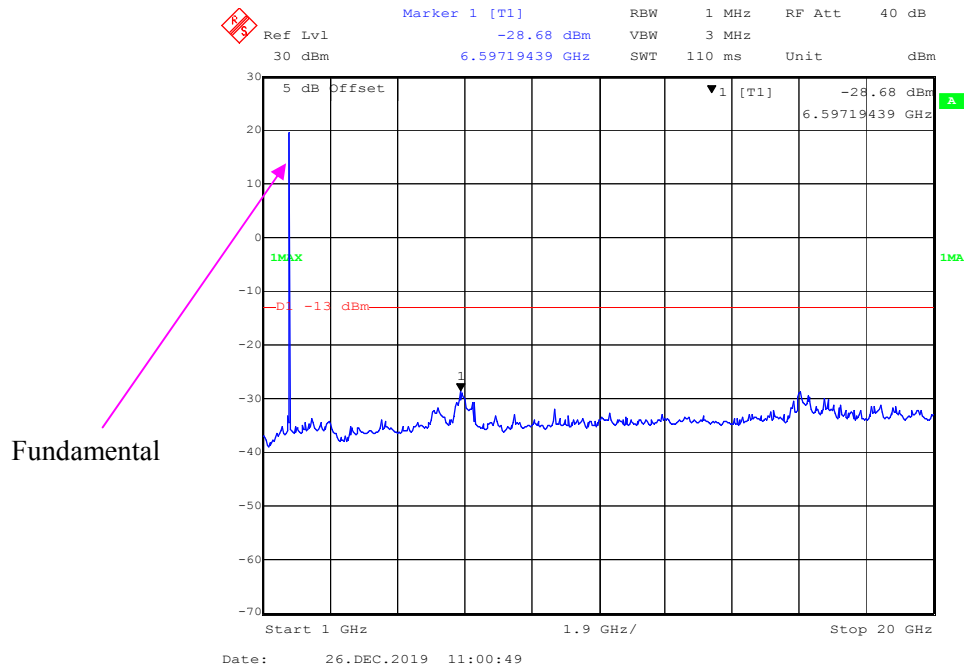
### 1 GHz – 20 GHz (5 MHz, QPSK, Middle Channel)



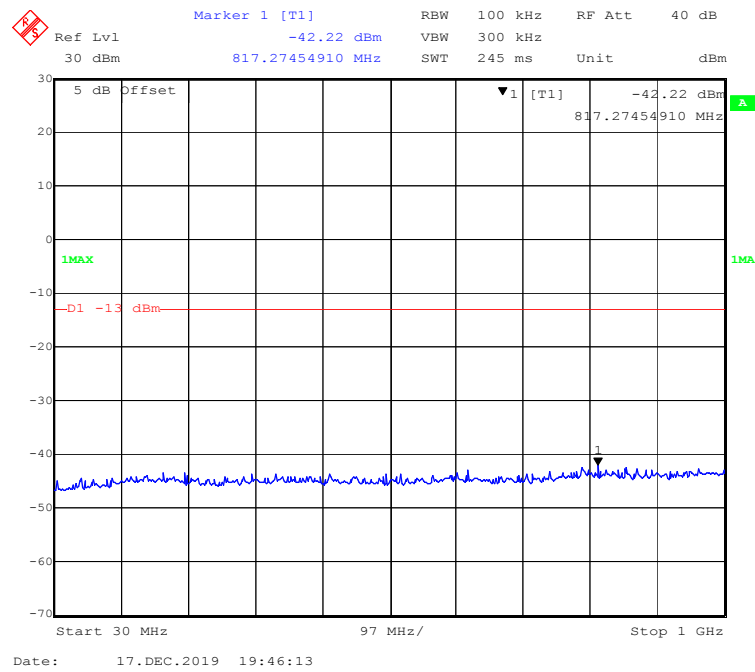
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



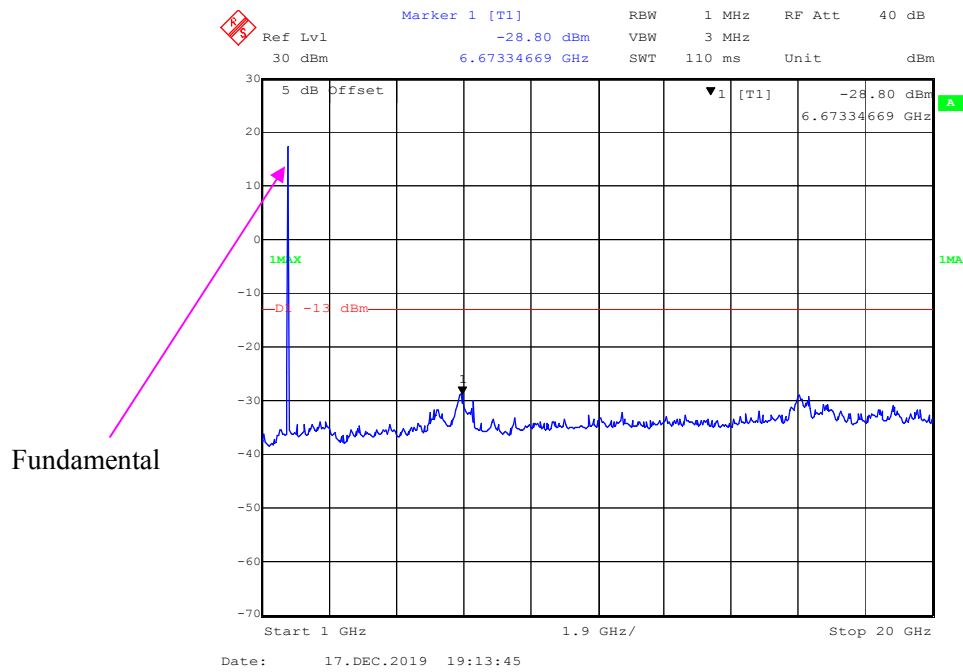
### 1 GHz – 20 GHz (5 MHz, 16-QAM, Middle Channel)



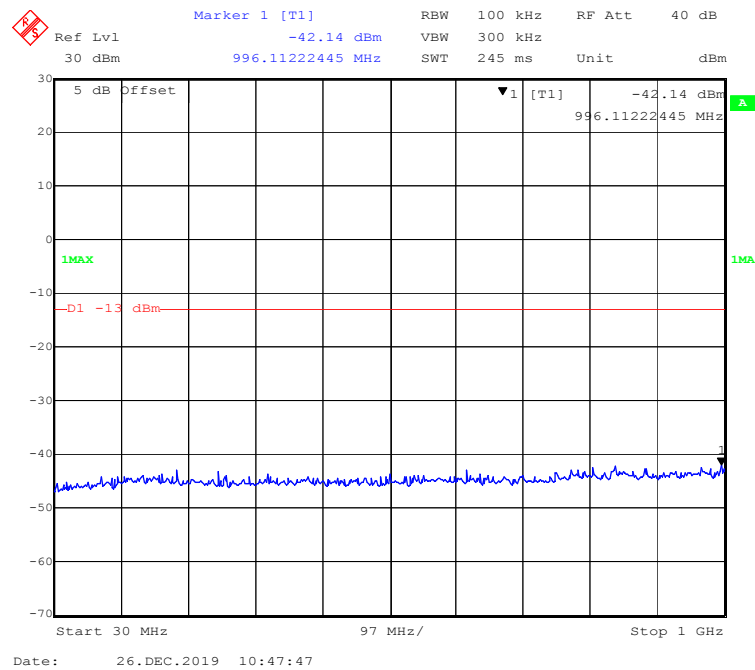
### 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)



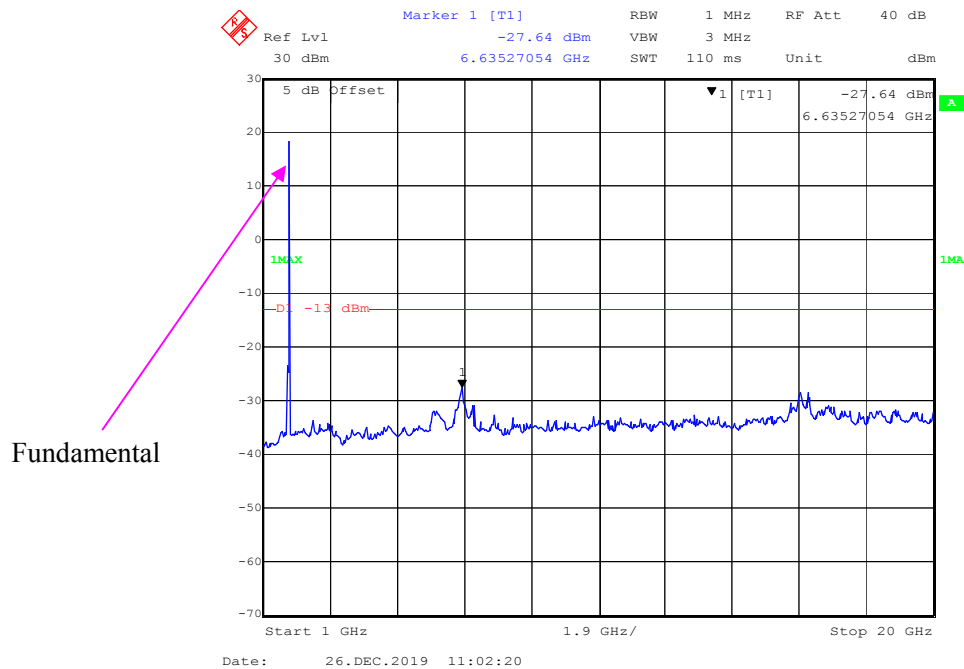
### 1 GHz – 20 GHz (10 MHz, QPSK, Middle Channel)



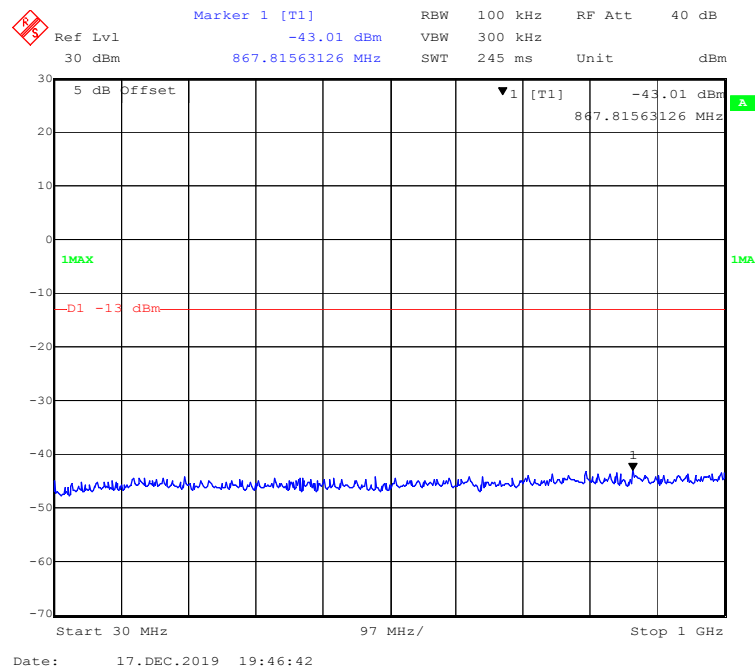
### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



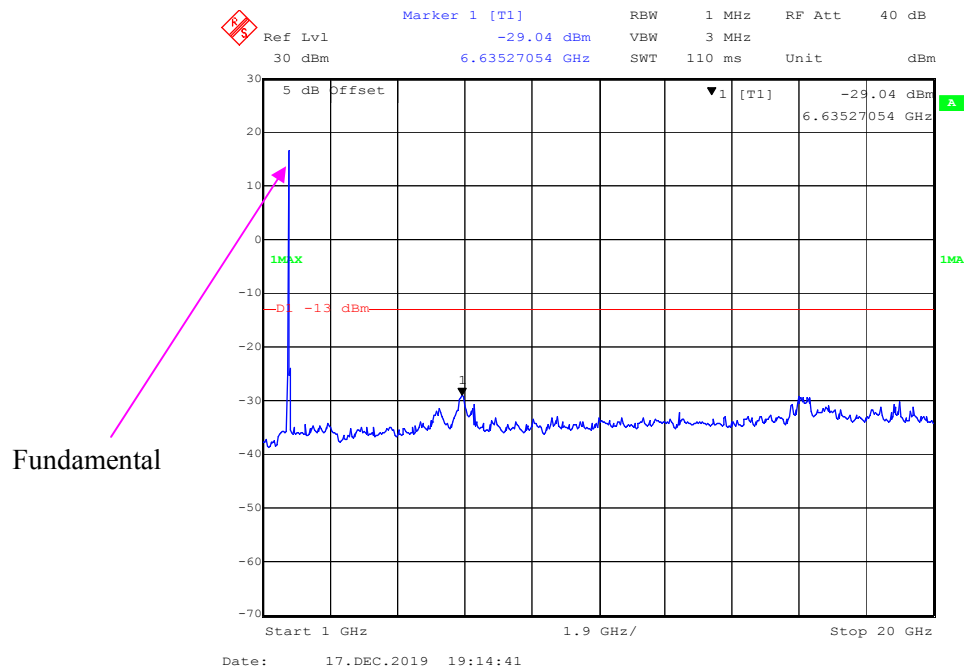
### 1 GHz – 20 GHz (10 MHz, 16-QAM, Middle Channel)



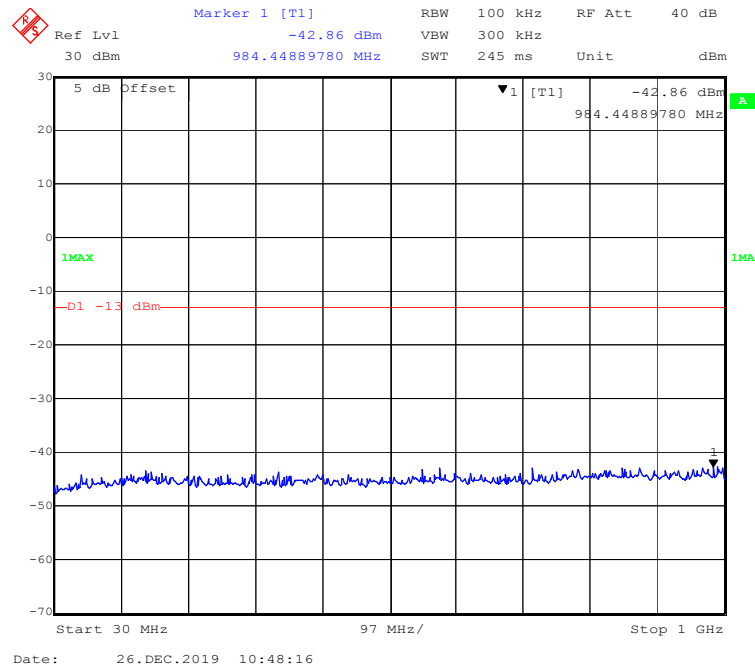
### 30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)



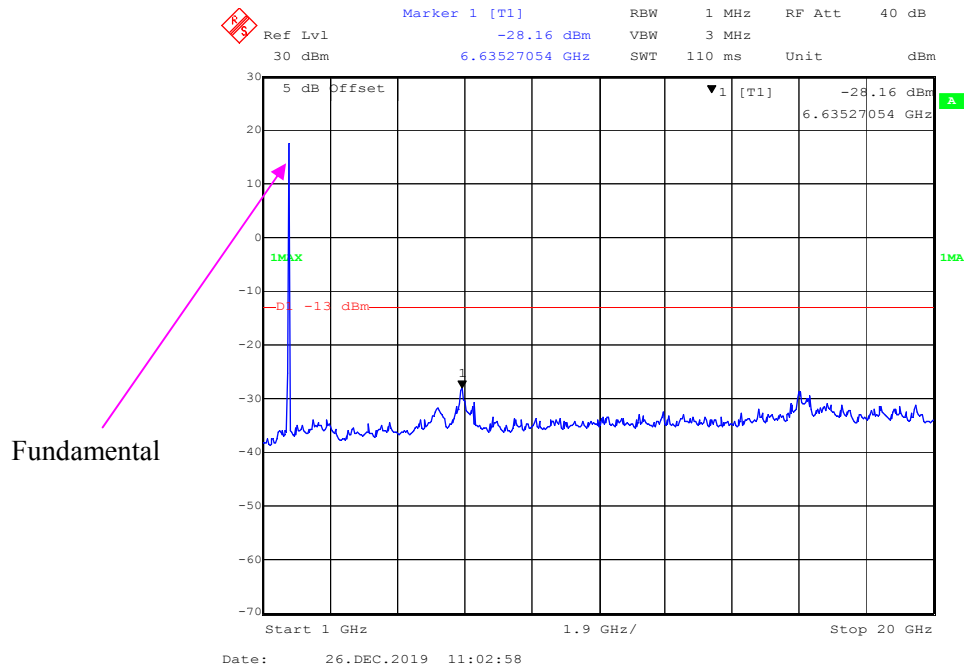
### 1 GHz – 20 GHz (15 MHz, QPSK, Middle Channel)



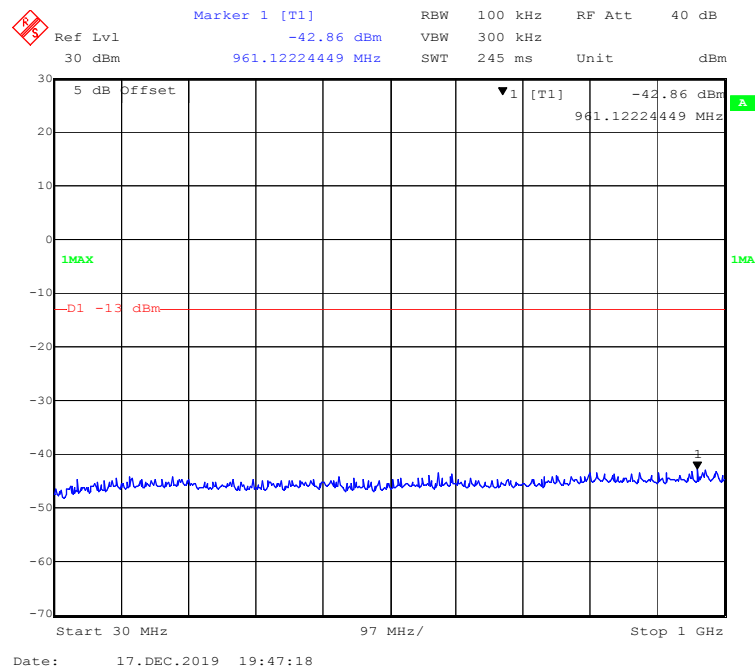
### 30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)



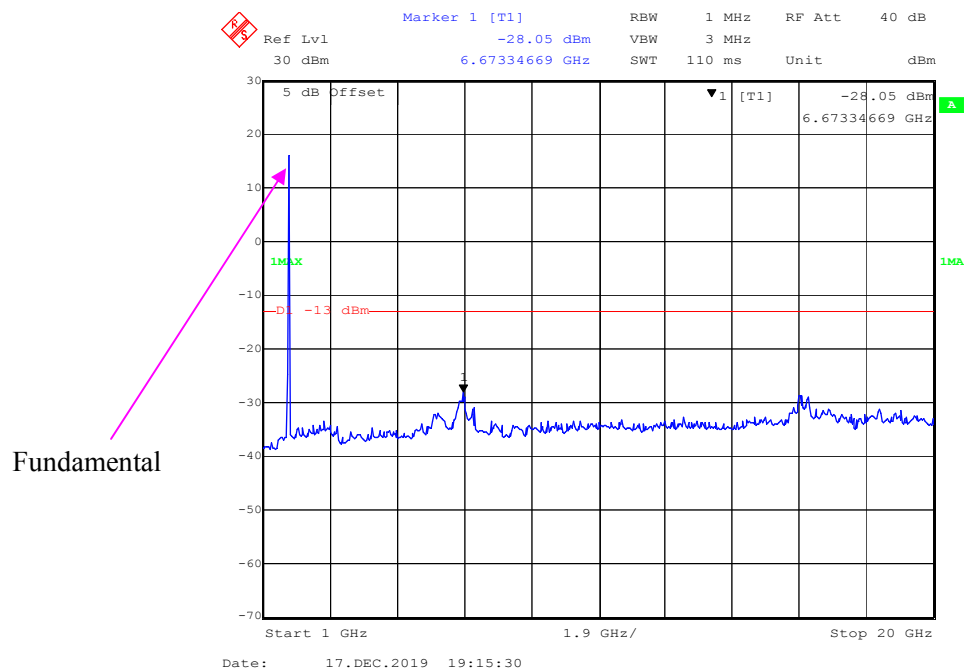
### 1 GHz – 20 GHz (15 MHz, 16-QAM, Middle Channel)



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

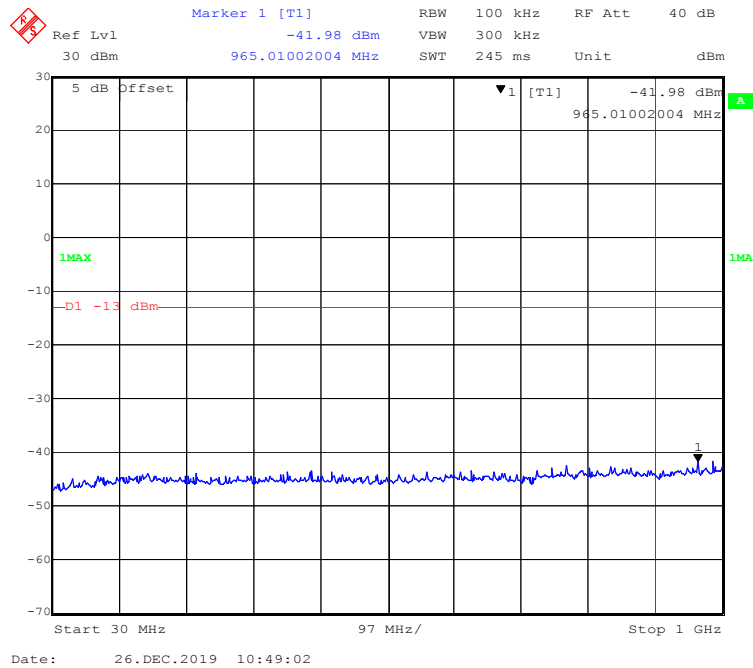


### 1 GHz – 20 GHz (20 MHz, QPSK, Middle Channel)

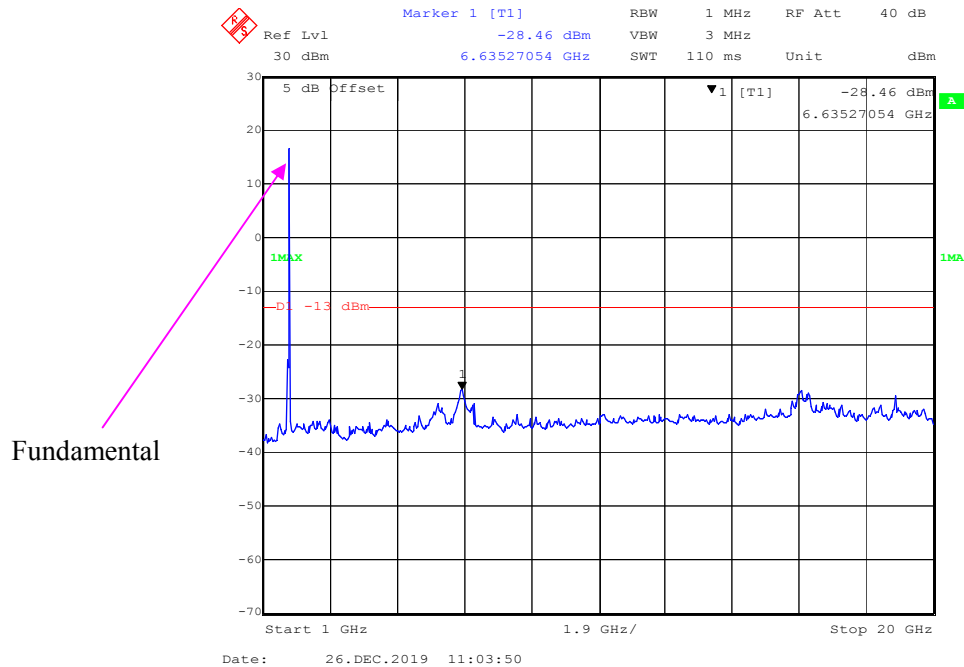


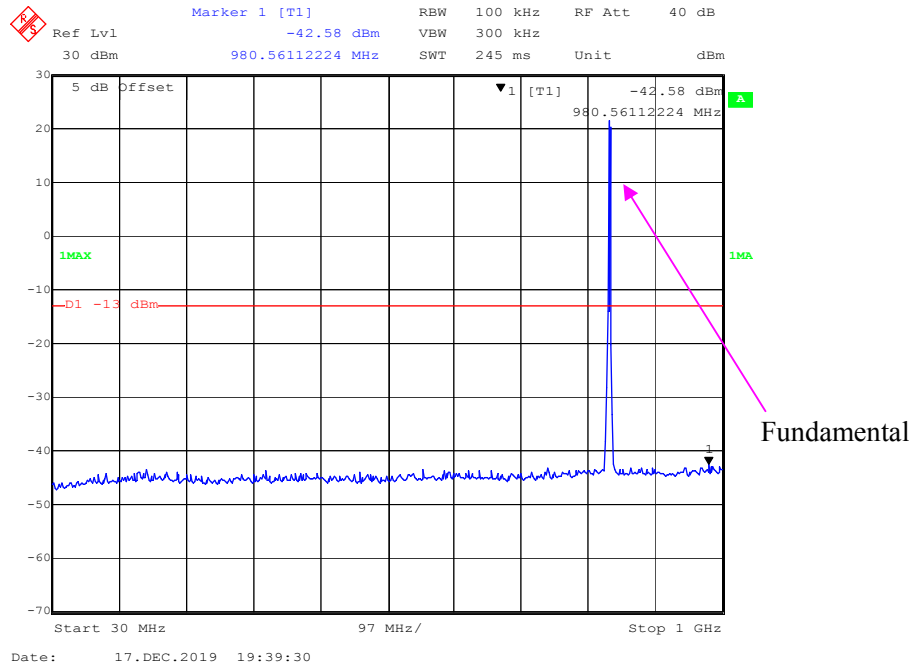
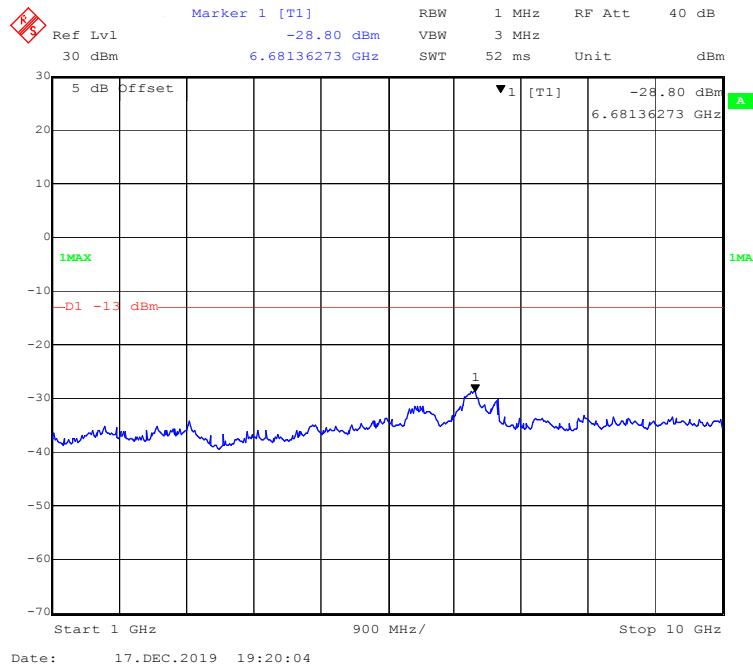


### 30 MHz - 1 GHz (20 MHz, 16-QAM, Middle Channel)

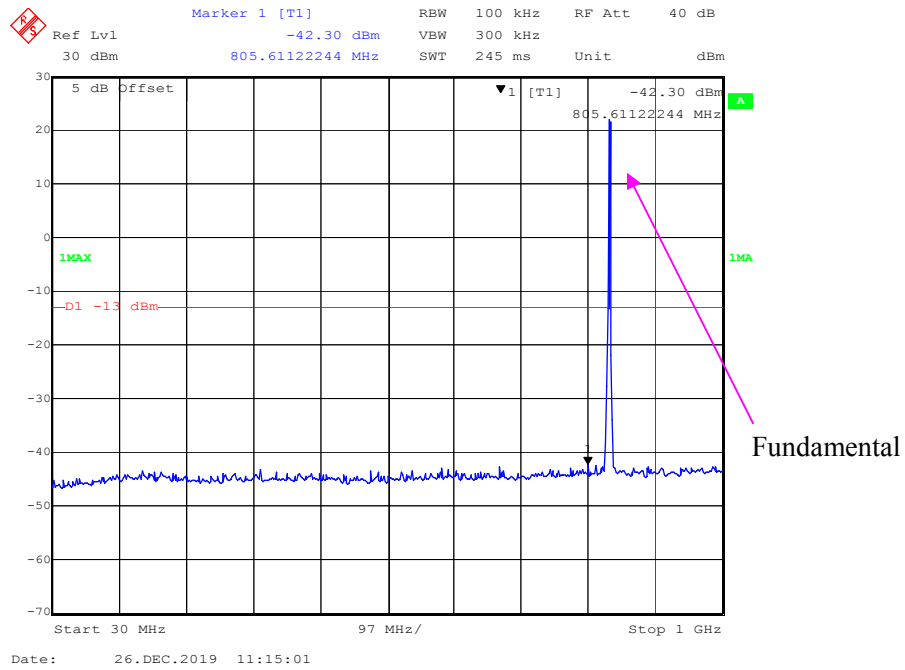


### 1 GHz – 20 GHz (20 MHz, 16-QAM, Middle Channel)

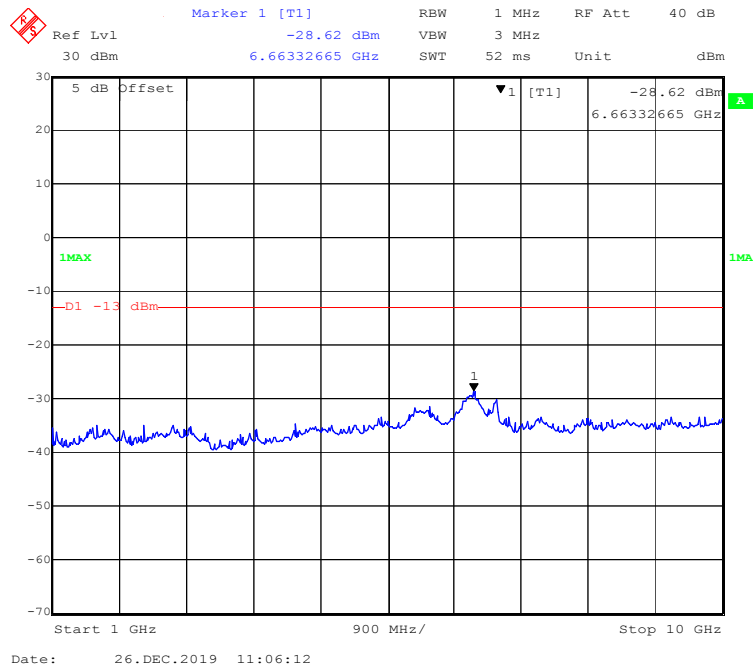


**LTE Band 5:****30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)****1 GHz – 10 GHz (1.4 MHz, QPSK, Middle Channel)**

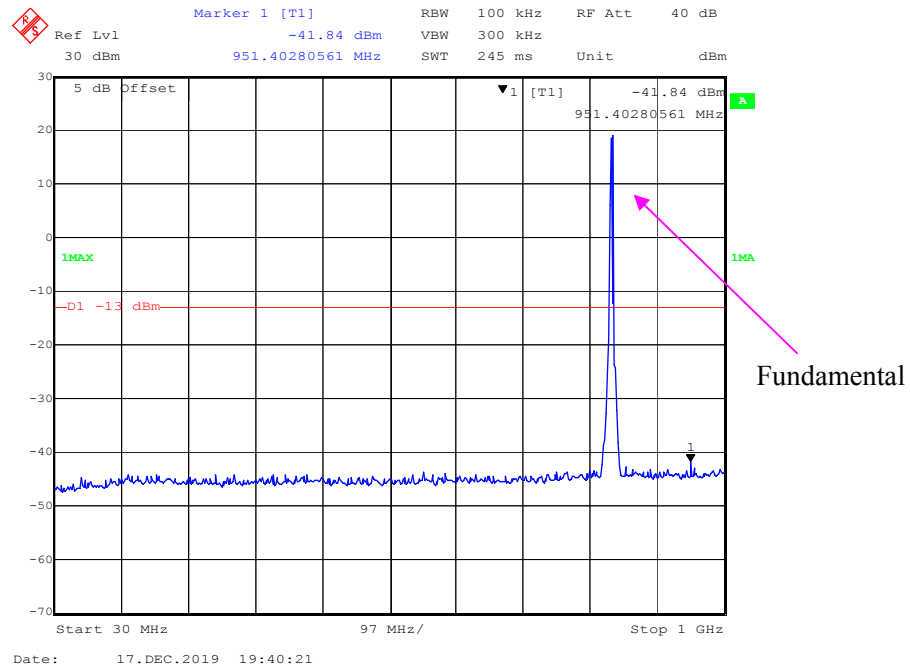
### 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



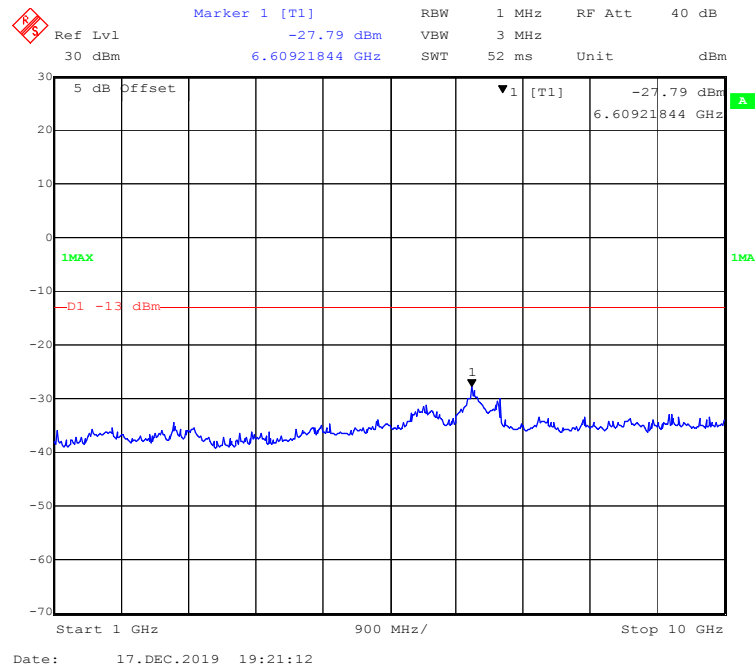
### 1 GHz – 10 GHz (1.4 MHz, 16-QAM, Middle Channel)



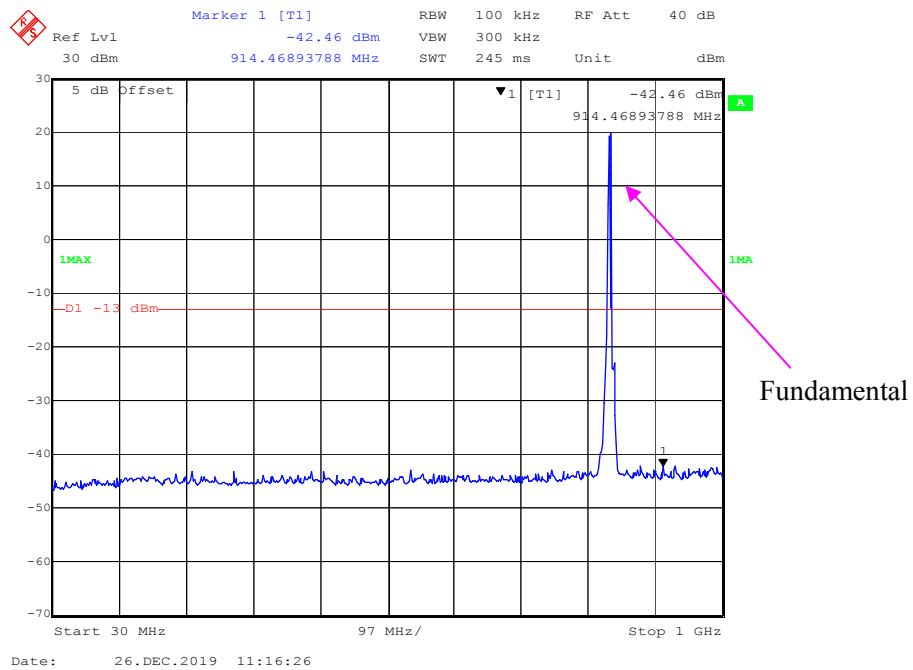
### 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)



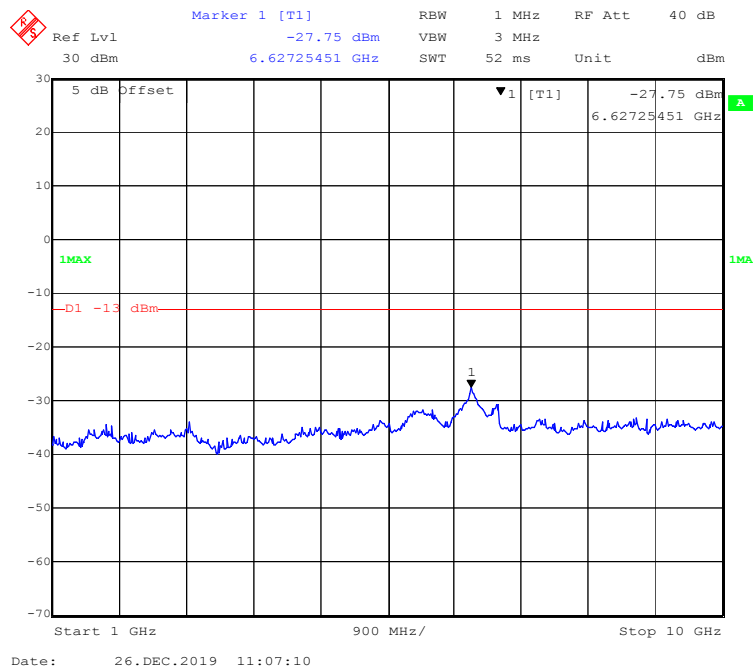
### 1 GHz – 10 GHz (3 MHz, QPSK, Middle Channel)



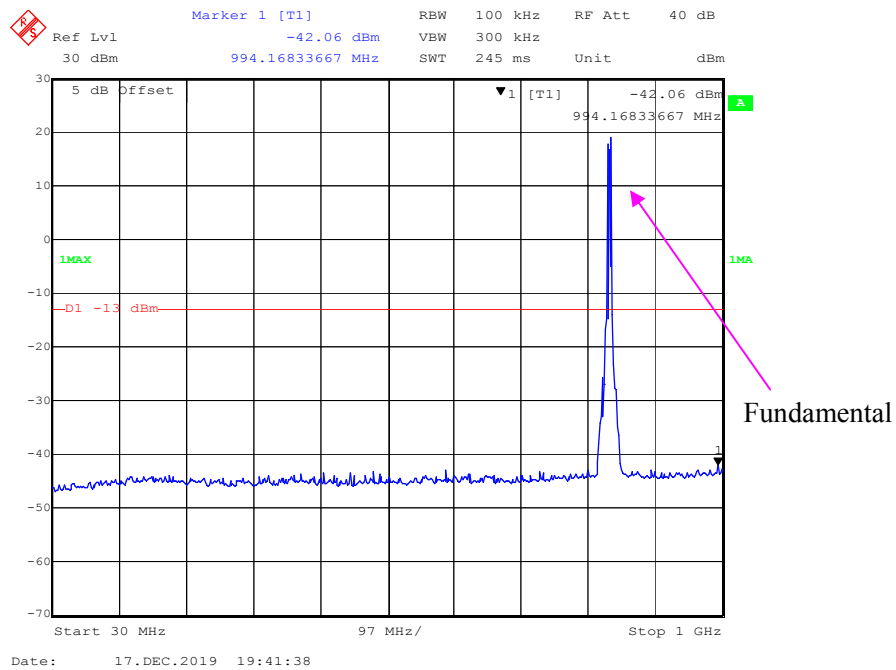
### 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



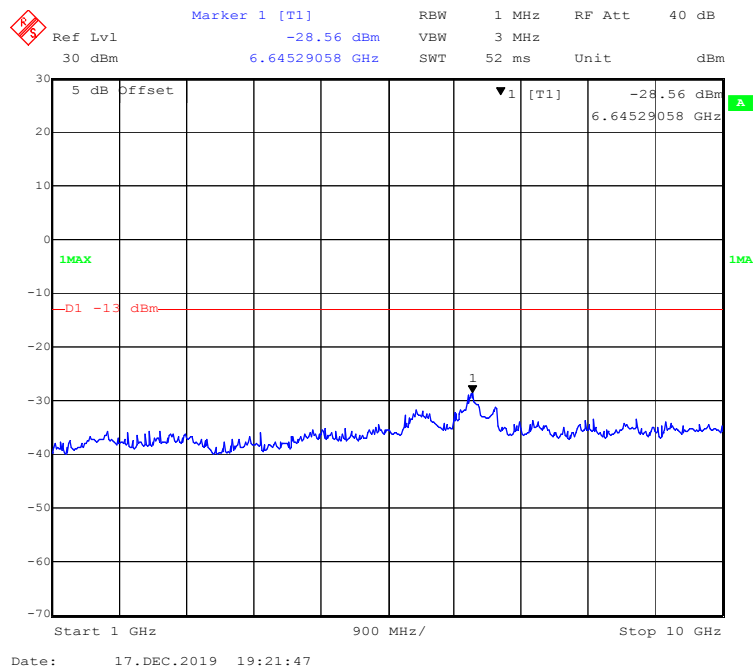
### 1 GHz – 10 GHz (3 MHz, 16-QAM, Middle Channel)



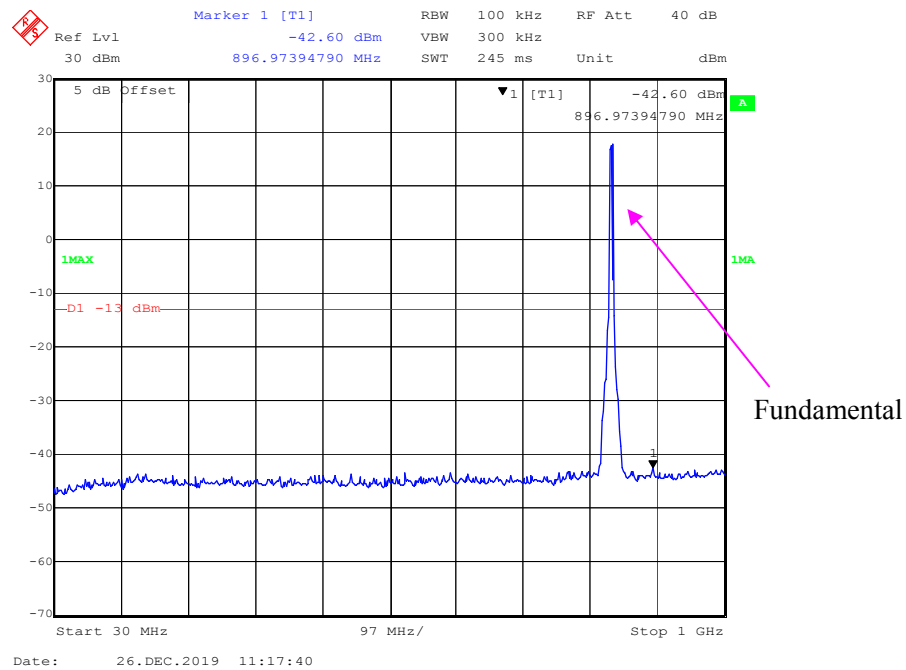
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



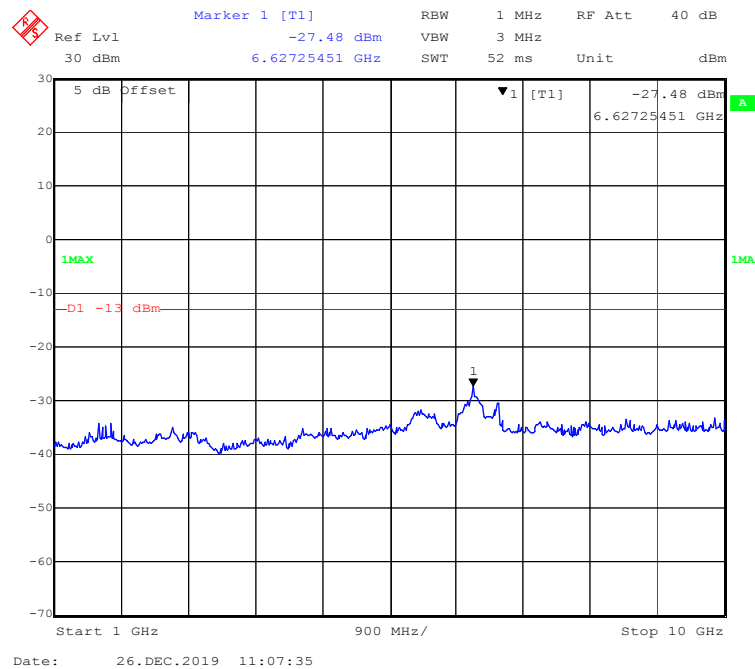
### 1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)



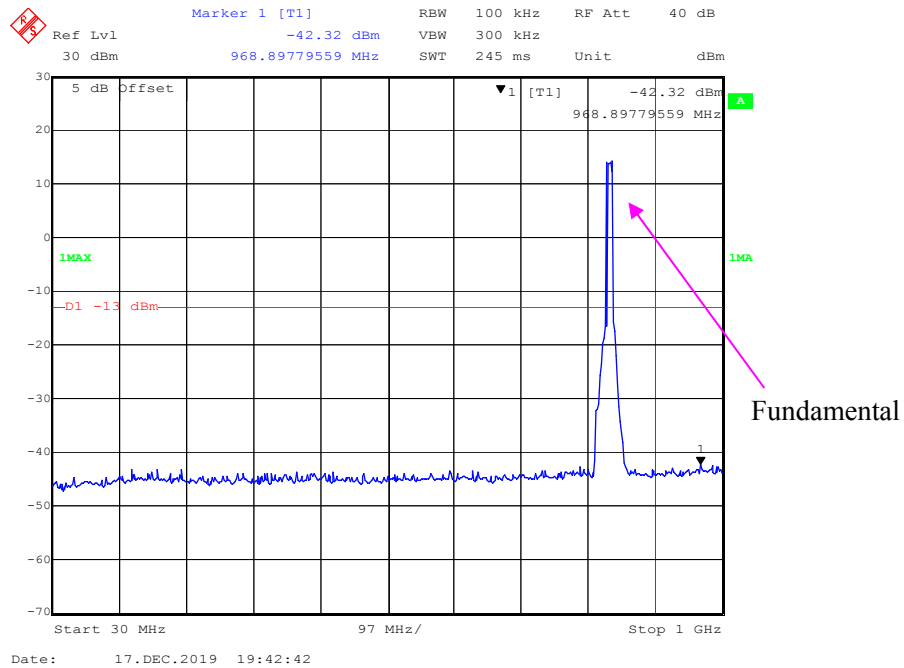
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



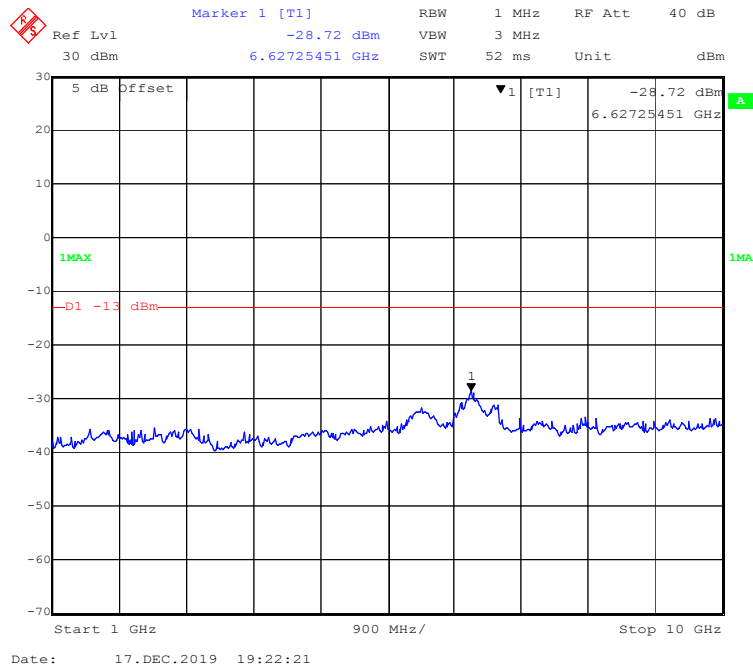
### 1 GHz – 10 GHz (5 MHz, 16-QAM, Middle Channel)



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

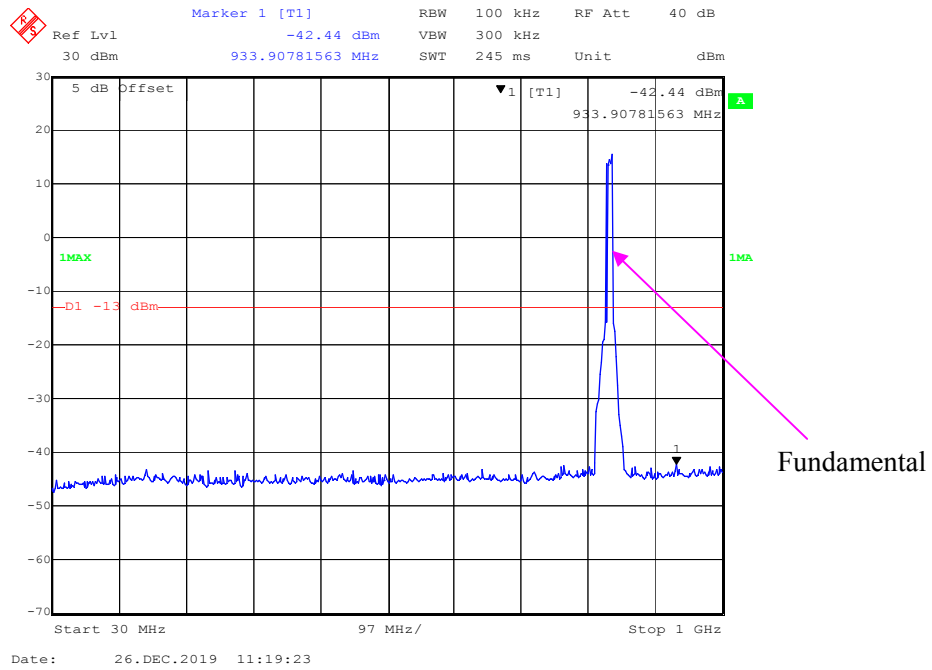


### 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)

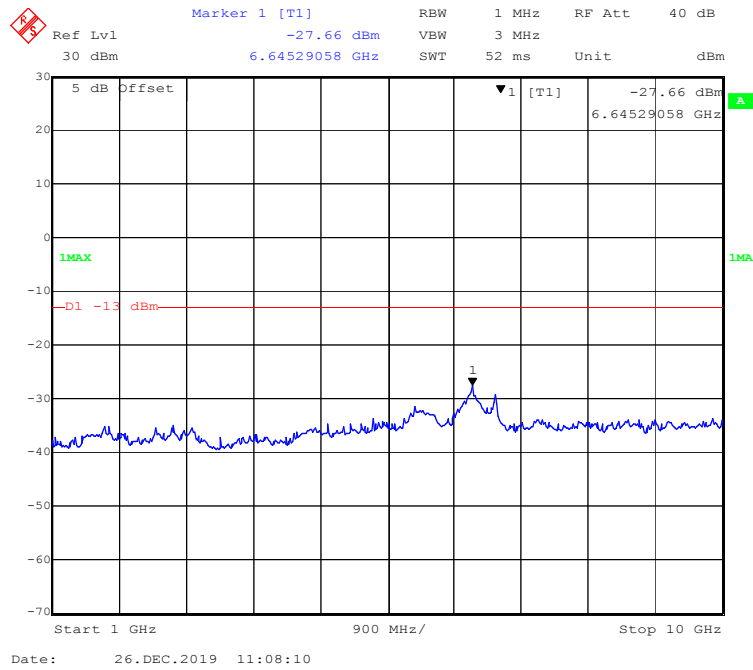


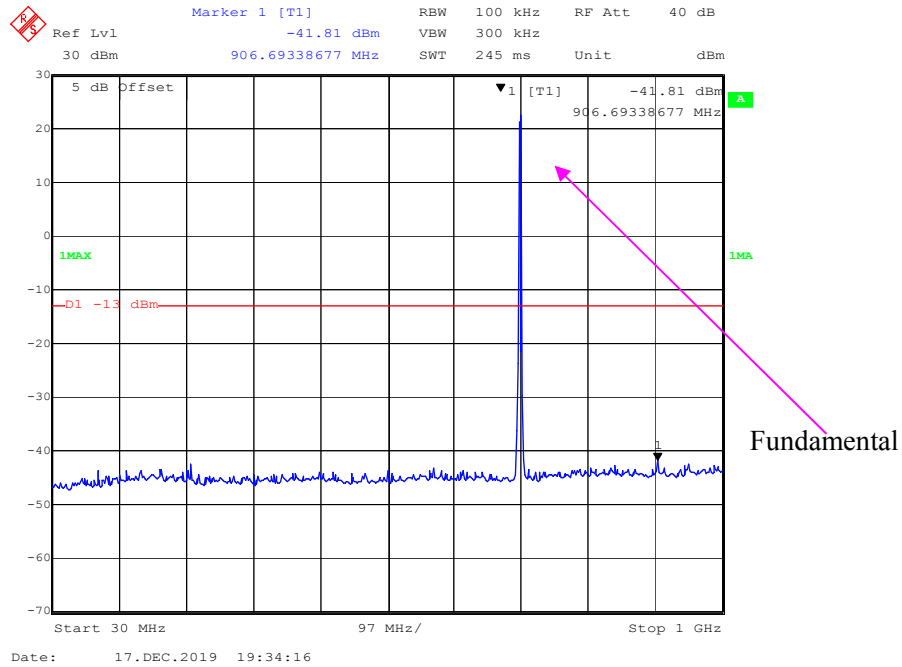
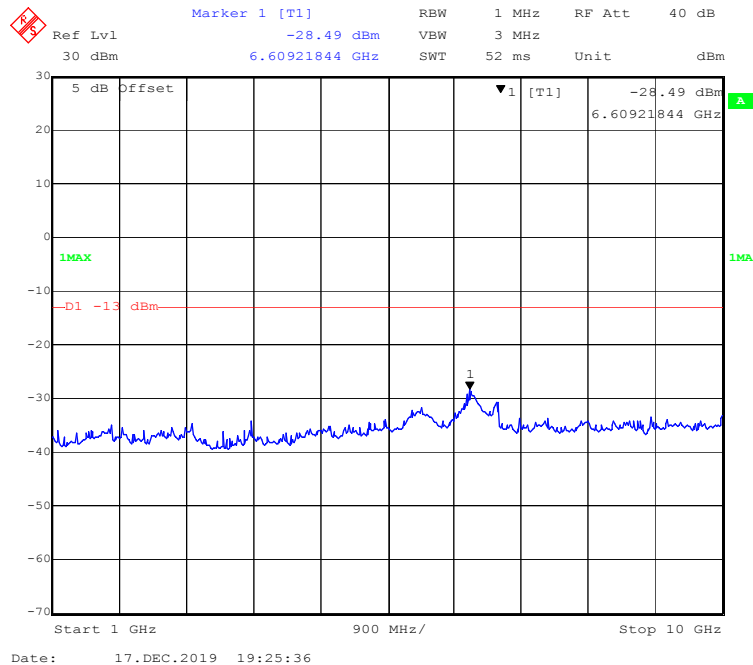


### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)

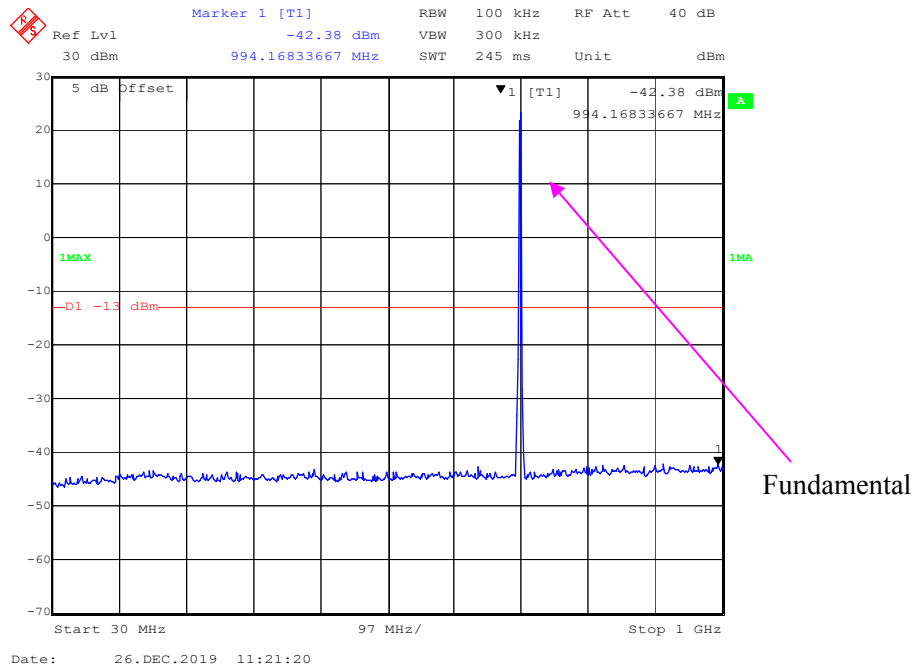


### 1 GHz – 10 GHz (10 MHz, 16-QAM, Middle Channel)

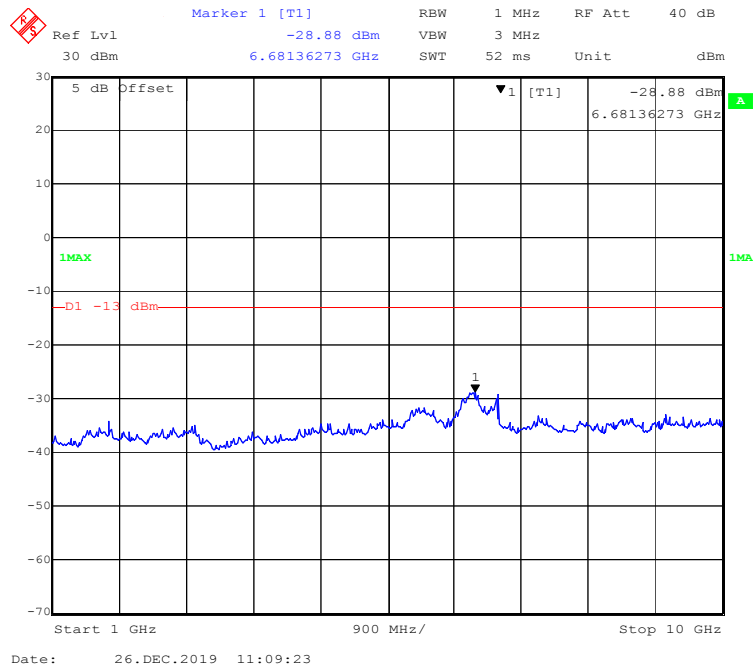


**LTE Band 12:****30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)****1 GHz - 10 GHz (1.4 MHz, QPSK, Middle Channel)**

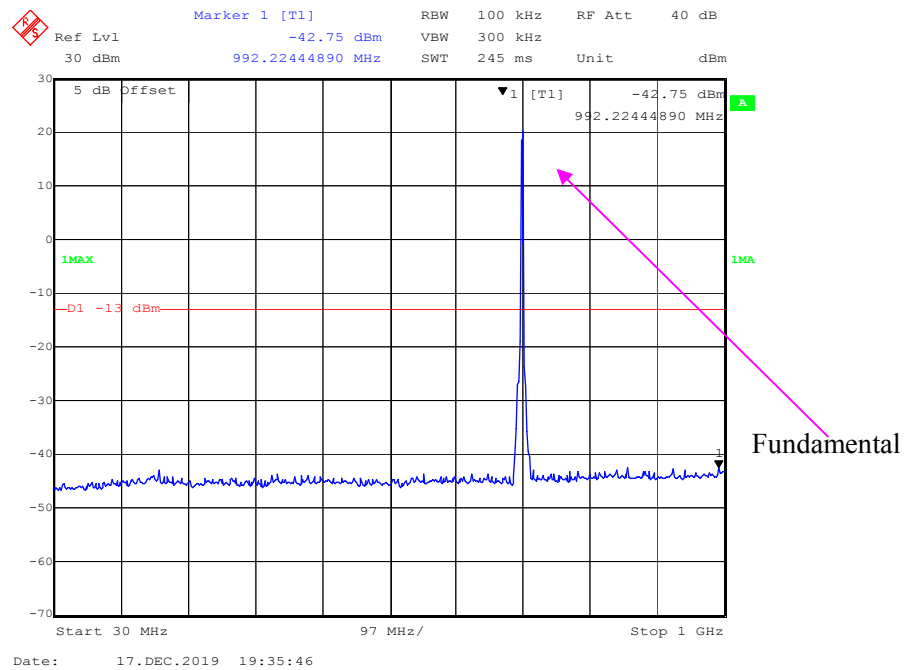
### 30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



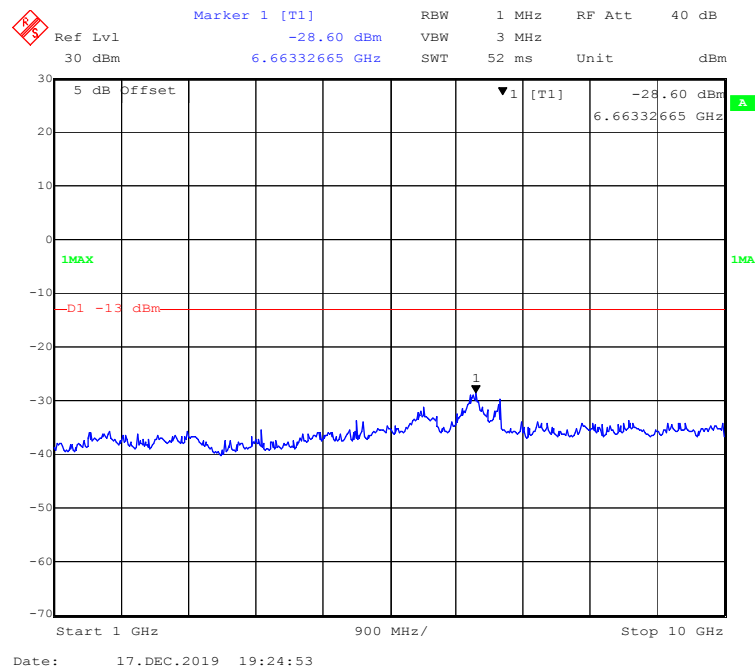
### 1 GHz – 10 GHz (1.4 MHz, 16-QAM, Middle Channel)



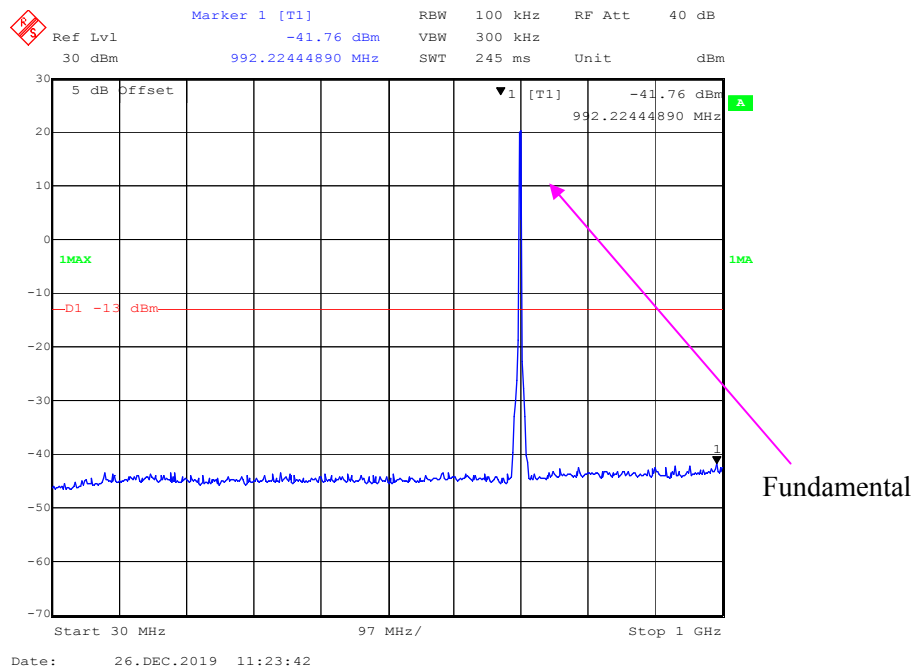
### 30 MHz - 1 GHz (3 MHz, QPSK, Middle Channel)



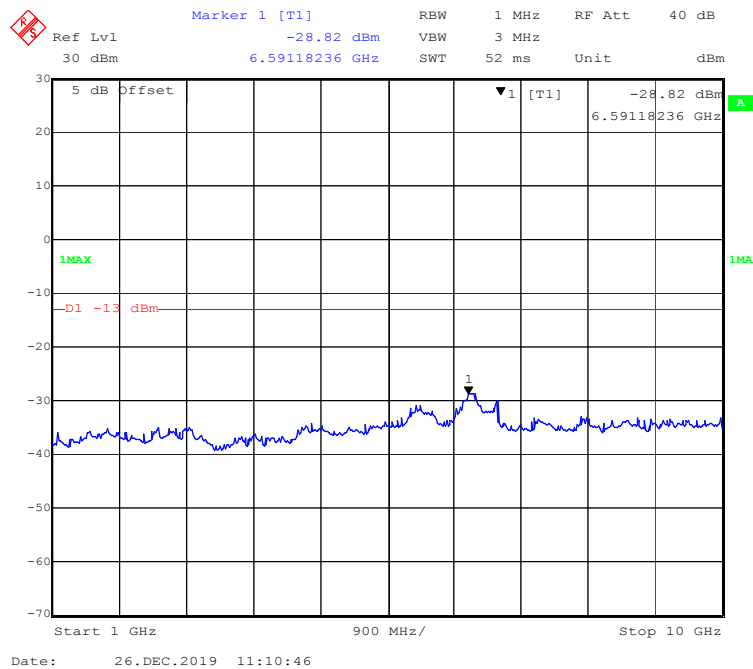
### 1 GHz – 10 GHz (3 MHz, QPSK, Middle Channel)



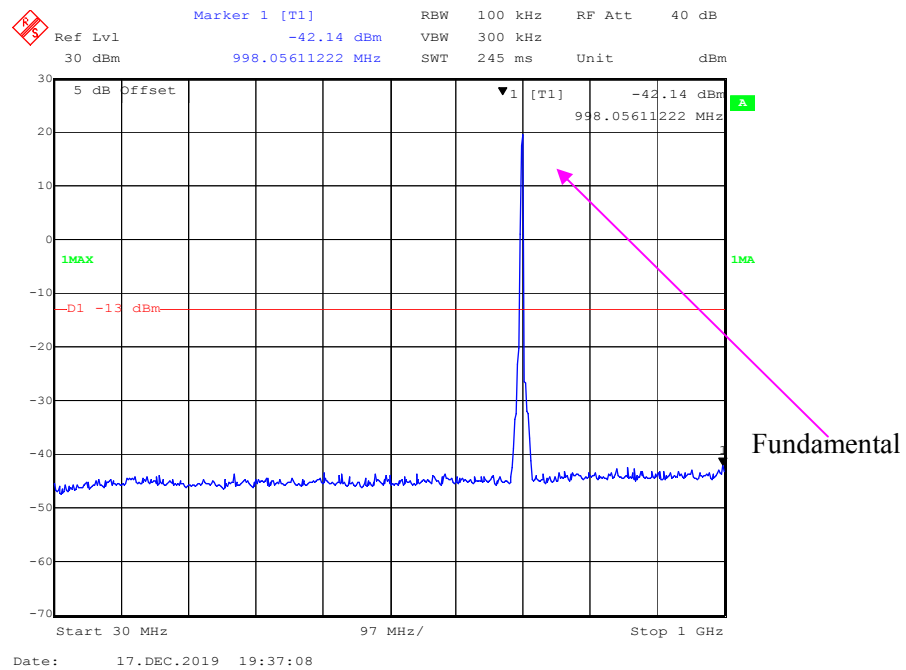
### 30 MHz - 1 GHz (3 MHz, 16-QAM, Middle Channel)



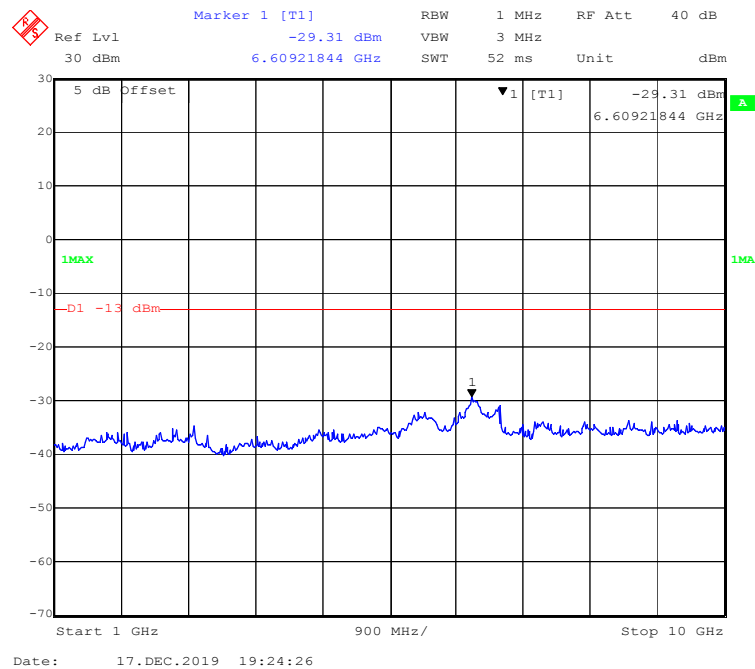
### 1 GHz – 10 GHz (3 MHz, 16-QAM, Middle Channel)



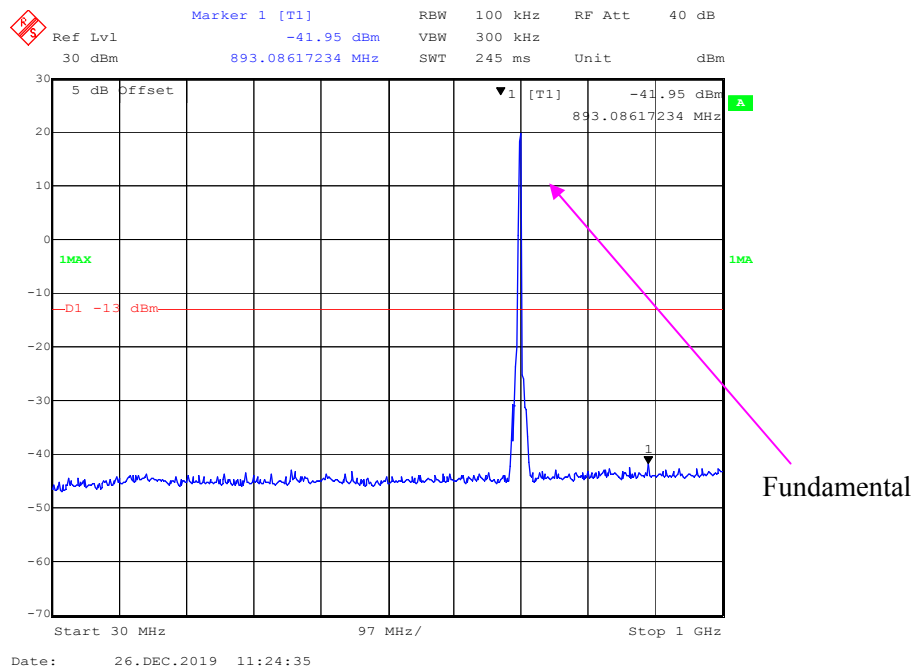
### 30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)



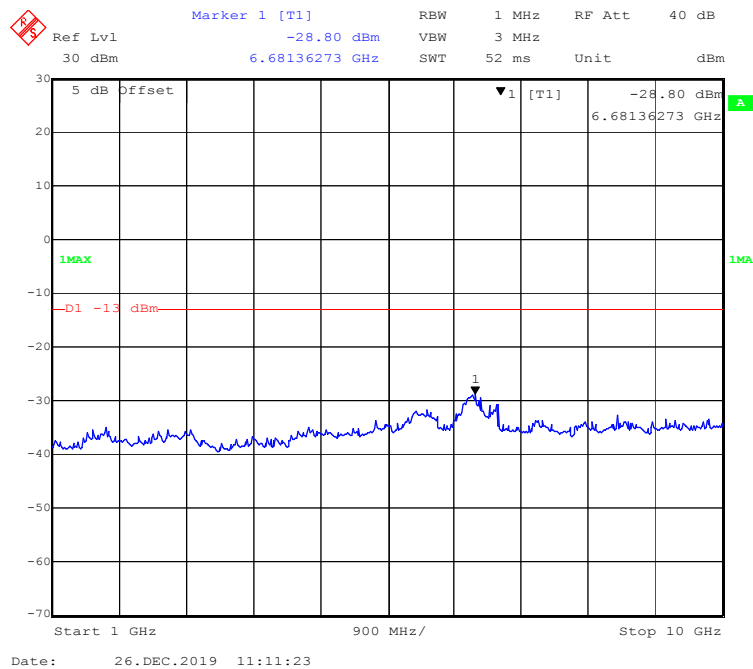
### 1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)



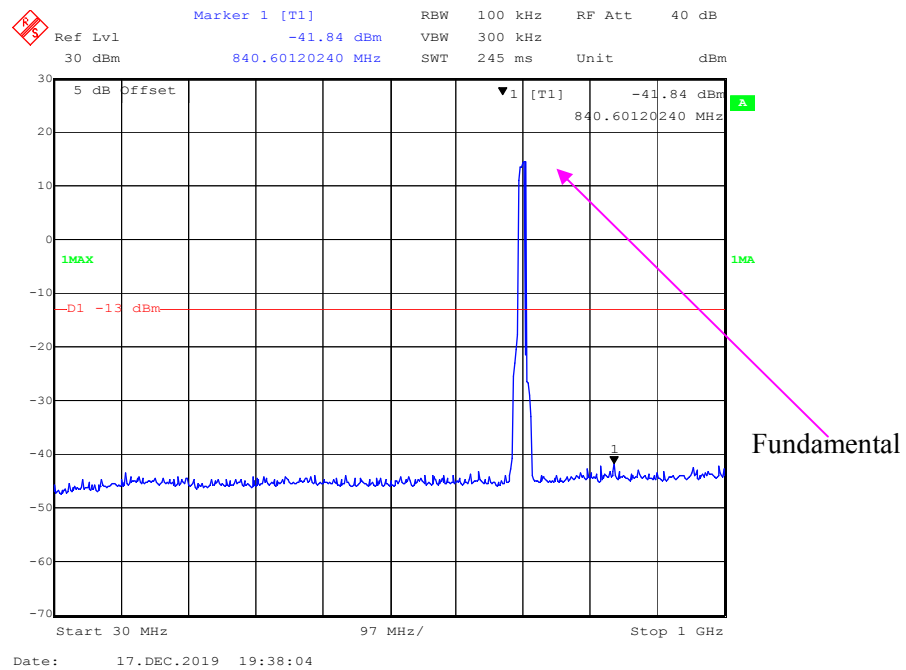
### 30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



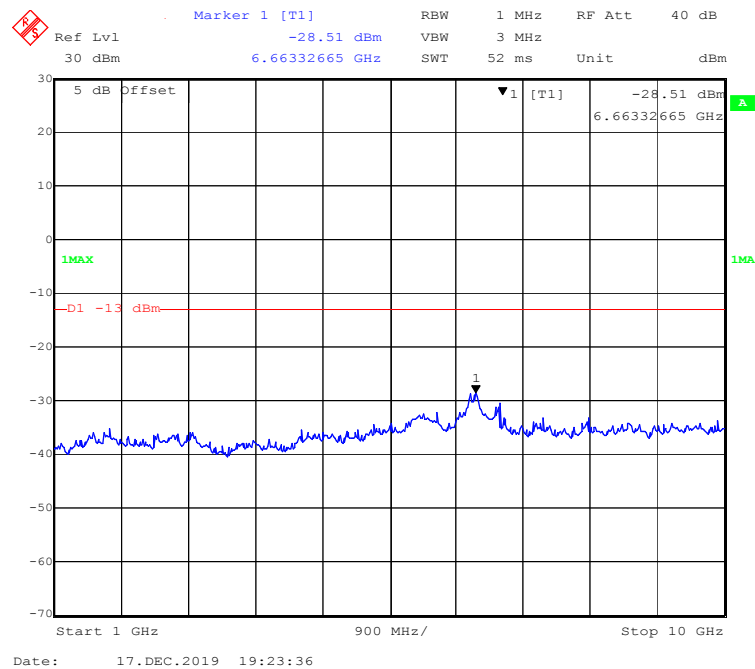
### 1 GHz – 10 GHz (5 MHz, 16-QAM, Middle Channel)



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

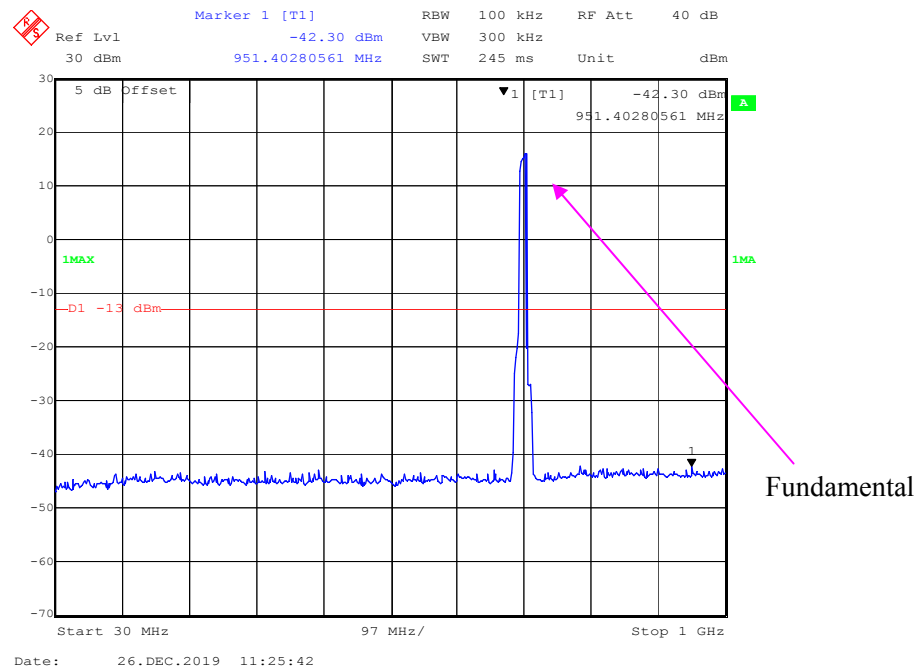


### 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)

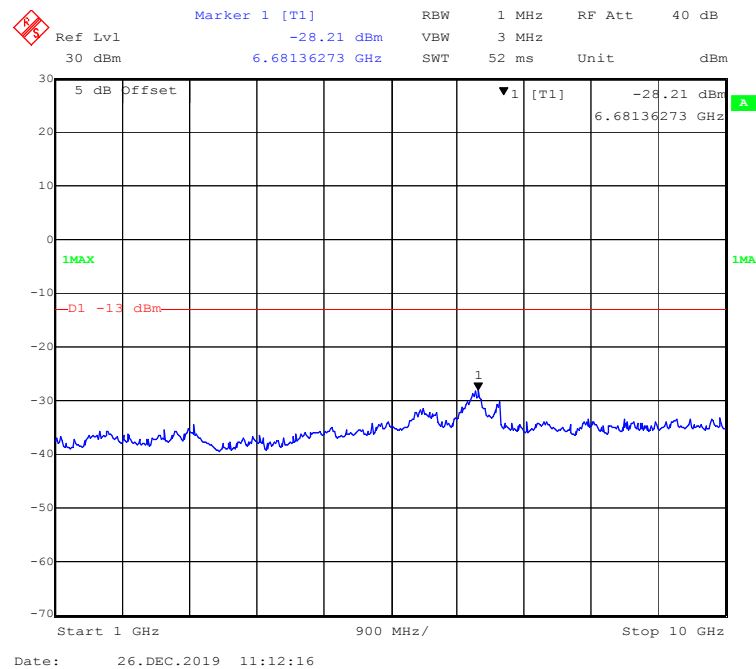


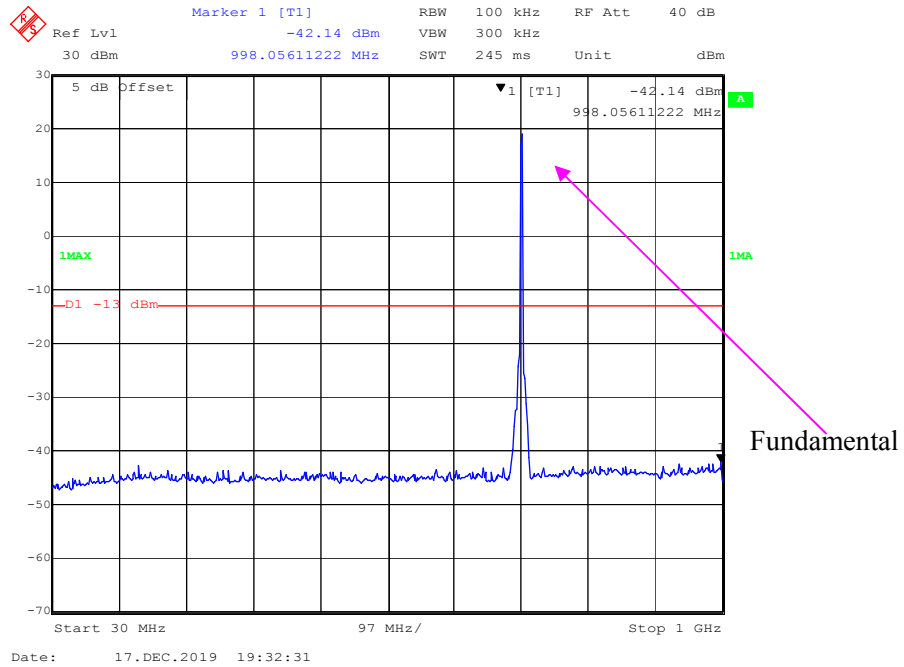
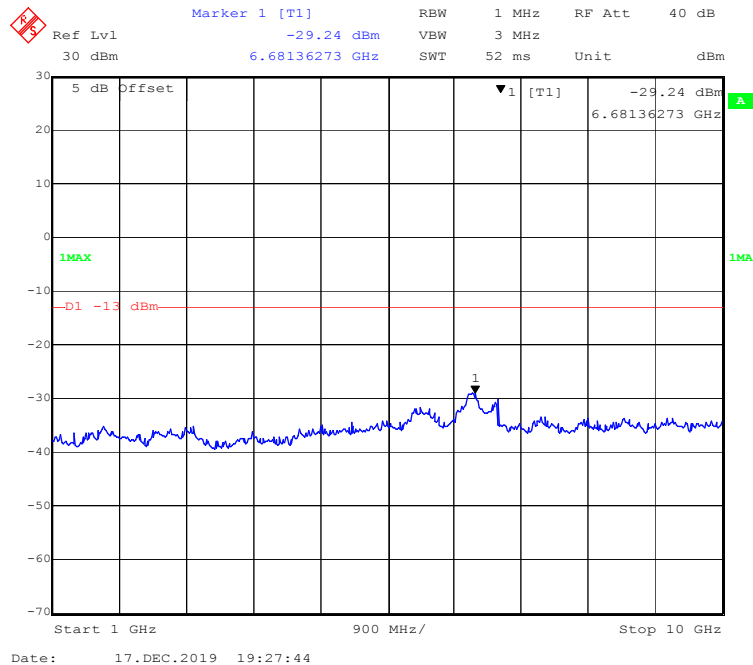


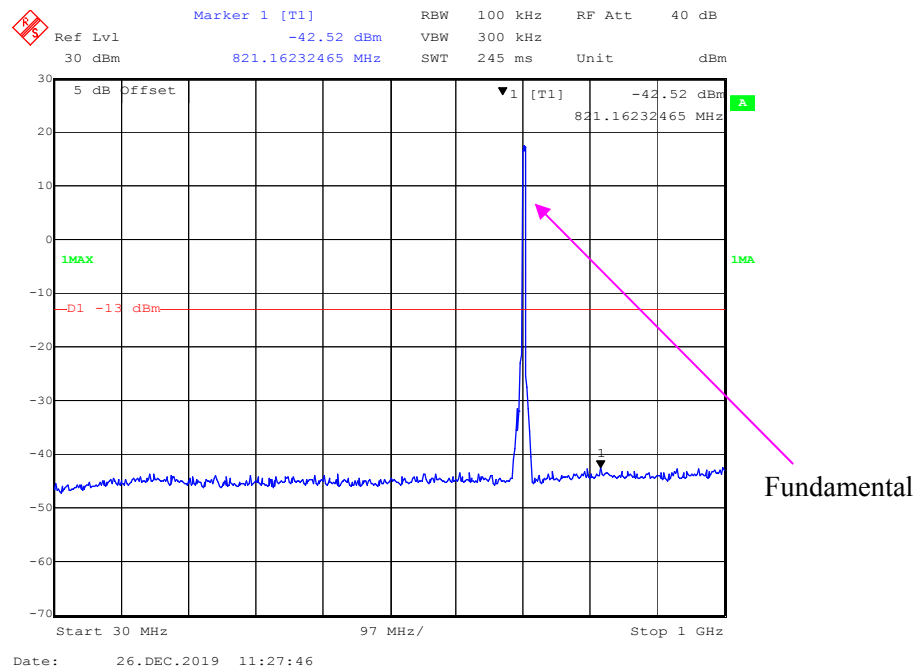
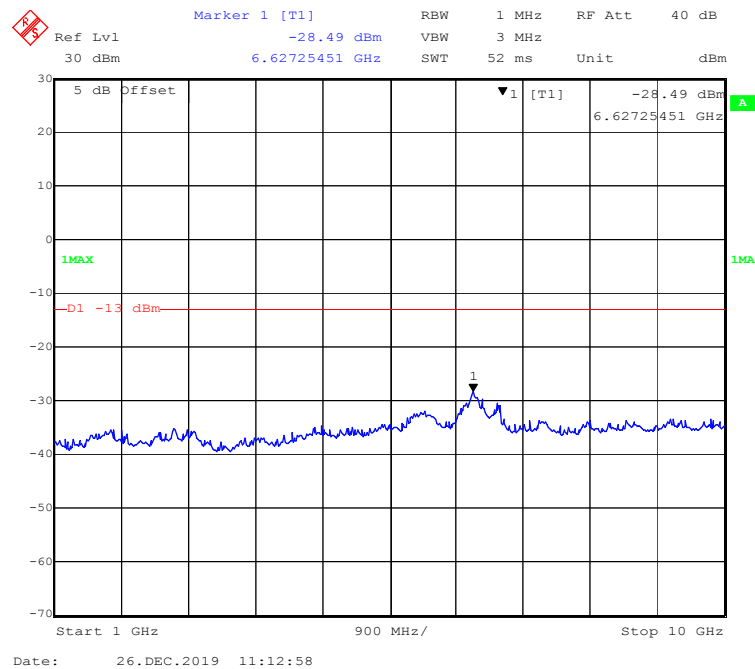
### 30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



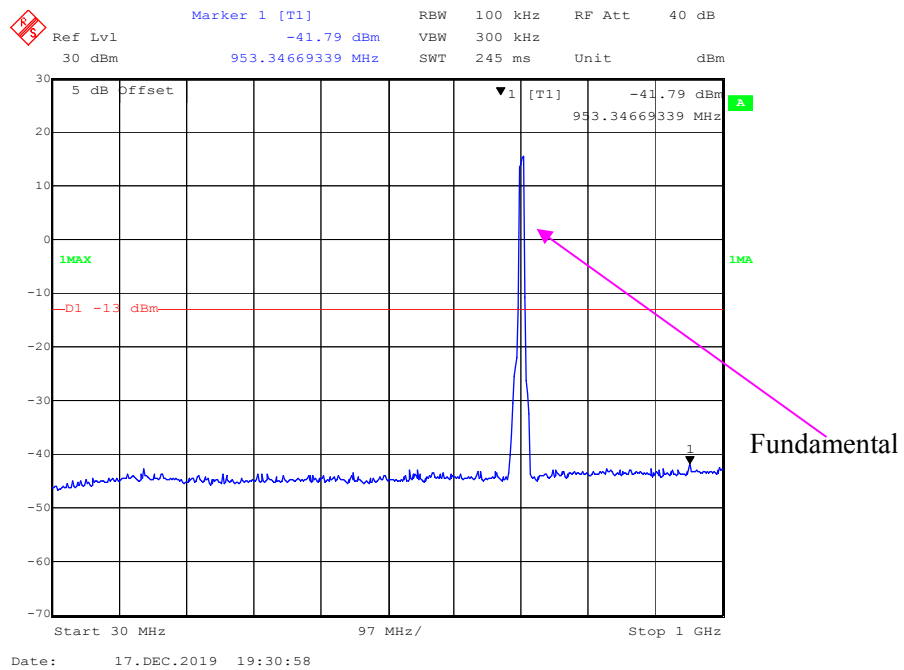
### 1 GHz – 10 GHz (10 MHz, 16-QAM, Middle Channel)



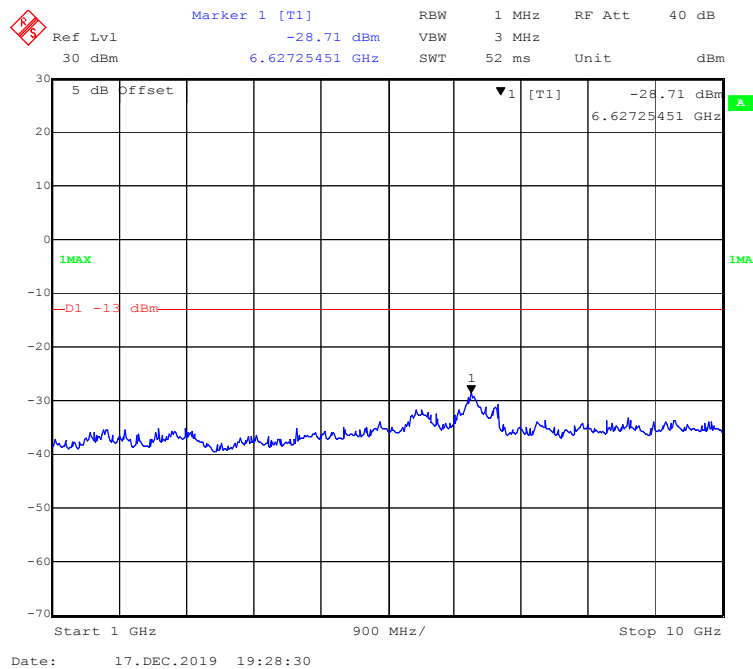
**LTE Band 17:****30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)****1 GHz – 10 GHz (5 MHz, QPSK, Middle Channel)**

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

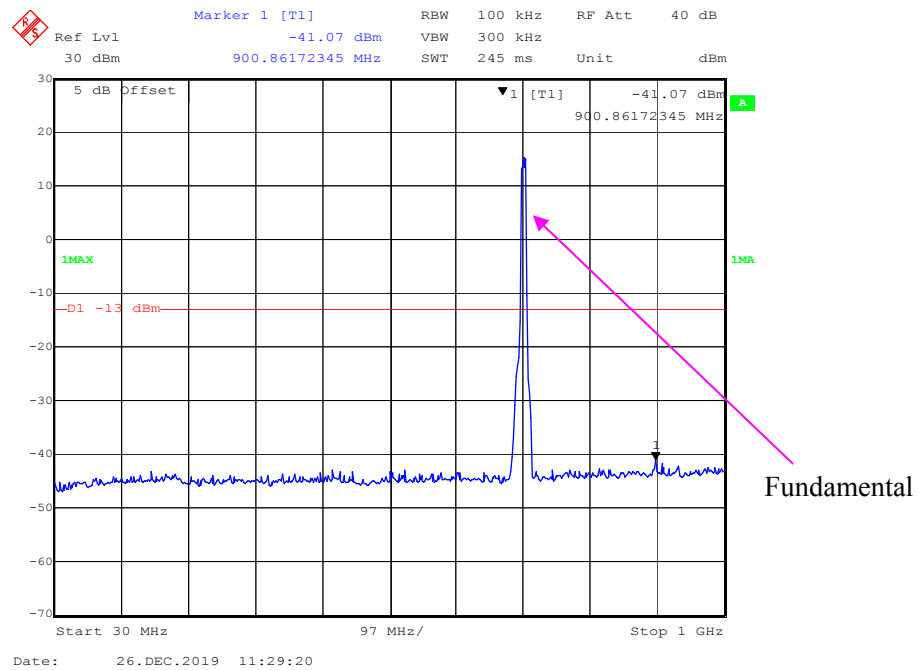
### 30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)



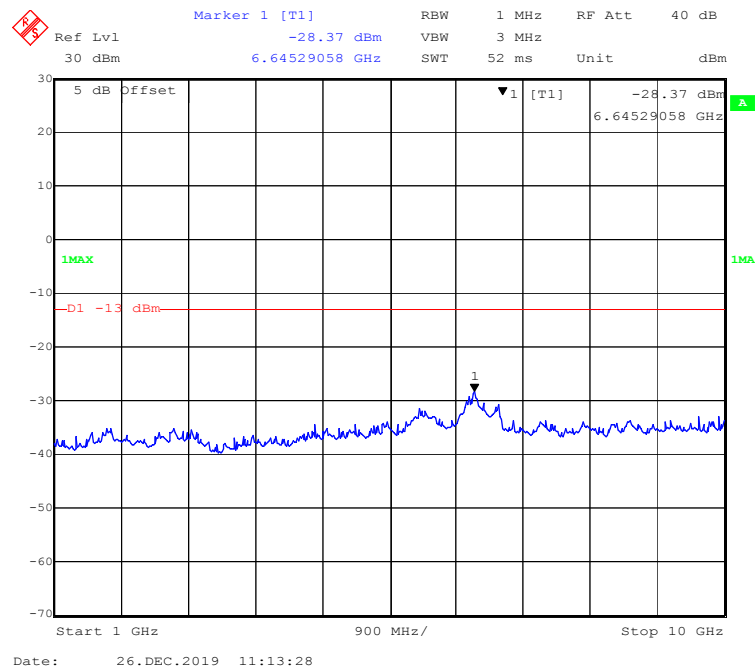
### 1 GHz – 10 GHz (10 MHz, QPSK, Middle Channel)



### 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 (g) (h) - SPURIOUS RADIATED EMISSIONS**

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### **Applicable Standards**

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

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.

(g) For operations in the 600 MHz band and the 698-746 MHz band, 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 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

### **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 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.3 kPa

The testing was performed by Winnie Yang on 2019-12-24.

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										
128.11	58.12	234	200	H	-54.33	0.35	-6.11	-60.79	-13.00	47.79
128.11	44.16	217	100	V	-61.95	0.35	-6.11	-68.41	-13.00	55.41
1673.20	25.90	174	100	H	-79.63	0.84	8.48	-71.99	-13.00	58.99
1673.20	26.97	21	200	V	-78.56	0.84	8.48	-70.92	-13.00	57.92
2509.80	25.92	319	100	H	-76.03	0.89	10.09	-66.83	-13.00	53.83
2509.80	28.52	27	200	V	-73.43	0.89	10.09	-64.23	-13.00	51.23

**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										
127.66	58.33	11	200	H	-54.15	0.35	-6.11	-60.61	-13.00	47.61
127.66	44.58	292	200	V	-61.51	0.35	-6.11	-67.97	-13.00	54.97
3760.00	27.06	175	100	H	-70.92	0.95	9.74	-62.13	-13.00	49.13
3760.00	25.91	78	100	V	-72.07	0.95	9.74	-63.28	-13.00	50.28
5640.00	25.12	139	200	H	-68.73	1.15	10.47	-59.41	-13.00	46.41
5640.00	26.57	128	200	V	-67.28	1.15	10.47	-57.96	-13.00	44.96

**Note:**

- 1) Antenna gain is dBd for frequency below 1GHz and dBi for frequency above 1GHz
- 2) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
- 3) 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										
128.56	61.18	324	200	H	-51.25	0.35	-6.11	-57.71	-13.00	44.71
128.56	47.27	133	100	V	-58.86	0.35	-6.11	-65.32	-13.00	52.32
3760.00	27.78	268	200	H	-70.20	0.95	9.74	-61.41	-13.00	48.41
3760.00	26.83	349	200	V	-71.15	0.95	9.74	-62.36	-13.00	49.36
5640.00	25.74	204	100	H	-68.11	1.15	10.47	-58.79	-13.00	45.79
5640.00	26.26	221	200	V	-67.59	1.15	10.47	-58.27	-13.00	45.27
16-QAM 1.4MHz Bandwidth Middle Channel										
128.11	61.29	272	100	H	-51.16	0.35	-6.11	-57.62	-13.00	44.62
128.11	46.56	76	200	V	-59.55	0.35	-6.11	-66.01	-13.00	53.01
3760.00	26.98	51	100	H	-71.00	0.95	9.74	-62.21	-13.00	49.21
3760.00	27.55	106	100	V	-70.43	0.95	9.74	-61.64	-13.00	48.64
5640.00	24.86	113	100	H	-68.99	1.15	10.47	-59.67	-13.00	46.67
5640.00	25.66	102	200	V	-68.19	1.15	10.47	-58.87	-13.00	45.87

**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										
128.11	60.00	323	100	H	-52.45	0.35	-6.11	-58.91	-13.00	45.91
128.11	46.33	226	200	V	-59.78	0.35	-6.11	-66.24	-13.00	53.24
3465.00	25.66	228	100	H	-73.15	0.93	9.87	-64.21	-13.00	51.21
3465.00	26.58	226	200	V	-72.23	0.93	9.87	-63.29	-13.00	50.29
5197.50	26.22	270	100	H	-69.51	1.10	10.30	-60.31	-13.00	47.31
5197.50	27.14	287	100	V	-68.59	1.10	10.30	-59.39	-13.00	46.39
16-QAM 1.4MHz Bandwidth Middle Channel										
127.67	60.92	250	100	H	-51.56	0.35	-6.11	-58.02	-13.00	45.02
127.67	46.56	196	100	V	-59.53	0.35	-6.11	-65.99	-13.00	52.99
3465.00	25.34	275	200	H	-73.47	0.93	9.87	-64.53	-13.00	51.53
3465.00	26.26	287	200	V	-72.55	0.93	9.87	-63.61	-13.00	50.61
5197.50	26.81	152	100	H	-68.92	1.10	10.30	-59.72	-13.00	46.72
5197.50	26.57	216	100	V	-69.16	1.10	10.30	-59.96	-13.00	46.96



**30 MHz ~ 10 GHz:****LTE Band 5:**

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										
150.54	62.32	209	200	H	-48.92	0.37	-6.15	-55.44	-13.00	42.44
150.54	51.67	63	100	V	-55.54	0.37	-6.15	-62.06	-13.00	49.06
1673.00	26.46	31	200	H	-79.07	0.84	8.48	-71.43	-13.00	58.43
1673.00	27.78	163	100	V	-77.75	0.84	8.48	-70.11	-13.00	57.11
2509.50	26.46	218	100	H	-75.49	0.89	10.09	-66.29	-13.00	53.29
2509.50	28.89	124	200	V	-73.06	0.89	10.09	-63.86	-13.00	50.86
16-QAM 1.4MHz Bandwidth Middle Channel										
150.54	61.90	144	100	H	-49.34	0.37	-6.15	-55.86	-13.00	42.86
150.54	51.14	177	200	V	-56.07	0.37	-6.15	-62.59	-13.00	49.59
1673.00	27.07	30	100	H	-78.46	0.84	8.48	-70.82	-13.00	57.82
1673.00	28.63	99	200	V	-76.90	0.84	8.48	-69.26	-13.00	56.26
2509.50	26.98	303	200	H	-74.97	0.89	10.09	-65.77	-13.00	52.77
2509.50	28.78	78	100	V	-73.17	0.89	10.09	-63.97	-13.00	50.97

**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										
150.54	61.49	183	100	H	-49.75	0.37	-6.15	-56.27	-13.00	43.27
150.54	51.53	5	100	V	-55.68	0.37	-6.15	-62.20	-13.00	49.2
1415.00	27.63	13	100	H	-79.43	0.82	7.96	-72.29	-13.00	59.29
1415.00	27.99	157	100	V	-79.07	0.82	7.96	-71.93	-13.00	58.93
2122.50	26.64	349	100	H	-75.92	0.86	9.27	-67.51	-13.00	54.51
2122.50	27.79	354	200	V	-74.77	0.86	9.27	-66.36	-13.00	53.36
16-QAM 1.4MHz Bandwidth Middle Channel										
150.54	62.04	212	100	H	-49.20	0.37	-6.15	-55.72	-13.00	42.72
150.54	50.82	268	100	V	-56.39	0.37	-6.15	-62.91	-13.00	49.91
1415.00	26.89	142	200	H	-80.17	0.82	7.96	-73.03	-13.00	60.03
1415.00	27.36	123	200	V	-79.70	0.82	7.96	-72.56	-13.00	59.56
2122.50	27.56	127	200	H	-75.00	0.86	9.27	-66.59	-13.00	53.59
2122.50	28.22	69	200	V	-74.34	0.86	9.27	-65.93	-13.00	52.93

**30 MHz ~ 10 GHz:****LTE Band 17:**

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 5MHz Bandwidth Middle Channel										
151.07	62.14	62	200	H	-49.07	0.37	-6.15	-55.59	-13.00	42.59
151.07	48.90	4	200	V	-58.33	0.37	-6.15	-64.85	-13.00	51.85
1420.00	26.22	301	100	H	-80.84	0.82	7.98	-73.68	-13.00	60.68
1420.00	26.99	132	200	V	-80.07	0.82	7.98	-72.91	-13.00	59.91
2130.00	26.60	175	100	H	-75.95	0.86	9.29	-67.52	-13.00	54.52
2130.00	27.94	347	200	V	-74.61	0.86	9.29	-66.18	-13.00	53.18
16-QAM 5MHz Bandwidth Middle Channel										
151.07	62.38	112	100	H	-48.83	0.37	-6.15	-55.35	-13.00	42.35
151.07	52.39	311	200	V	-54.84	0.37	-6.15	-61.36	-13.00	48.36
1420.00	26.05	134	100	H	-81.01	0.82	7.98	-73.85	-13.00	60.85
1420.00	26.94	111	200	V	-80.12	0.82	7.98	-72.96	-13.00	59.96
2130.00	27.71	94	200	H	-74.84	0.86	9.29	-66.41	-13.00	53.41
2130.00	28.09	129	100	V	-74.46	0.86	9.29	-66.03	-13.00	53.03

**Note:**

- 1) Antenna gain is dBd for frequency below 1GHz and dBi for frequency above 1GHz
- 2) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
- 3) 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 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.

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

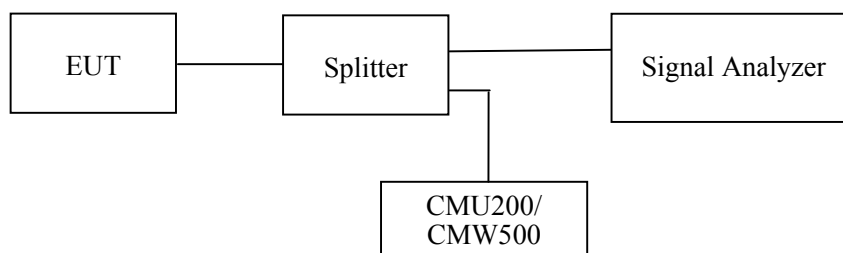
shall not be less than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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

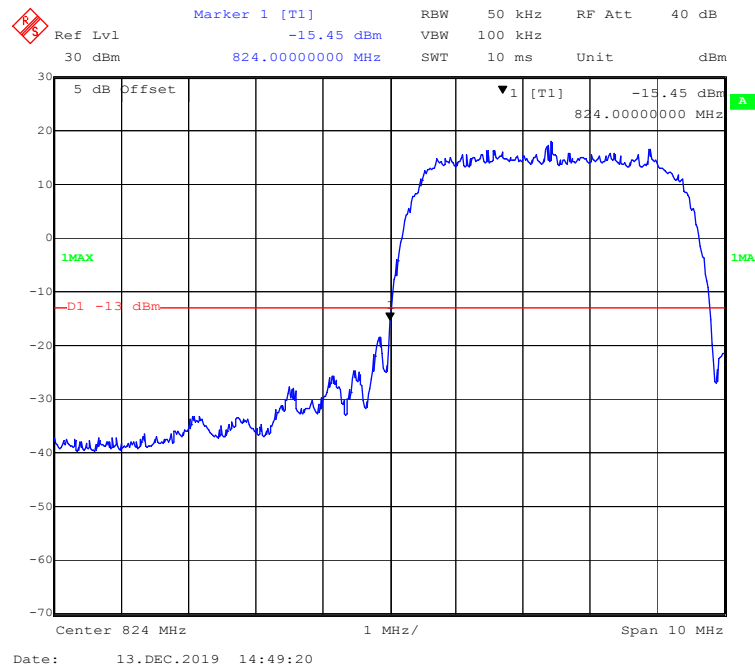
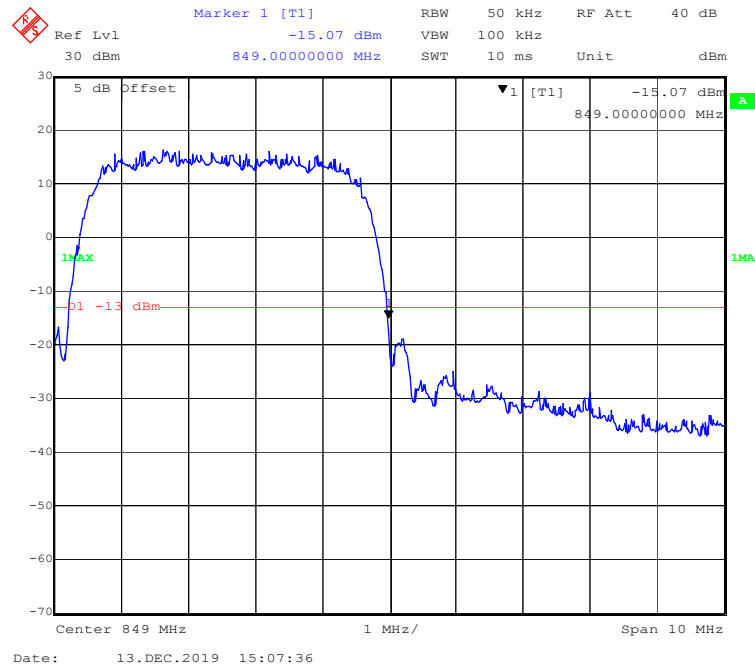
#### Environmental Conditions

Temperature:	23.5~25.3 °C
Relative Humidity:	50~53 %
ATM Pressure:	102.7~103.3 kPa

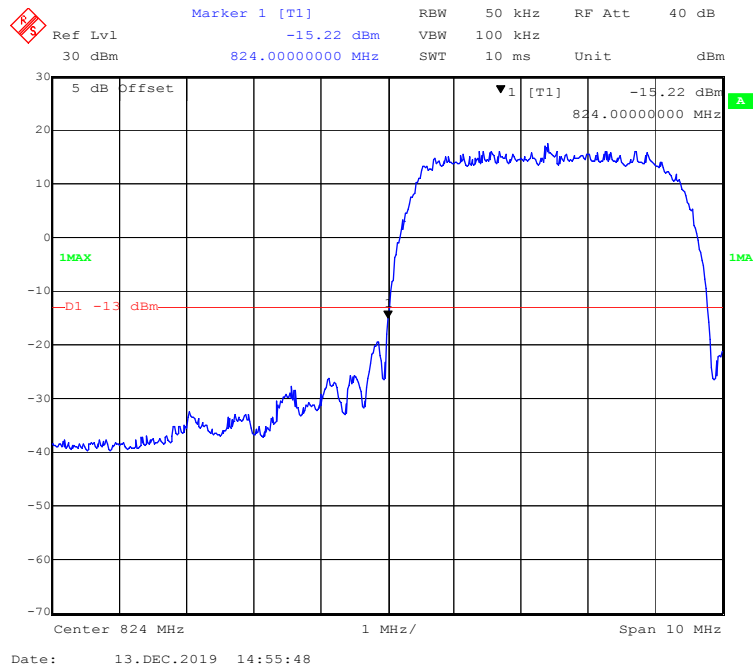
The testing was performed by Winnie Yang from 2019-12-11 to 2019-12-22.

EUT operation mode: Transmitting

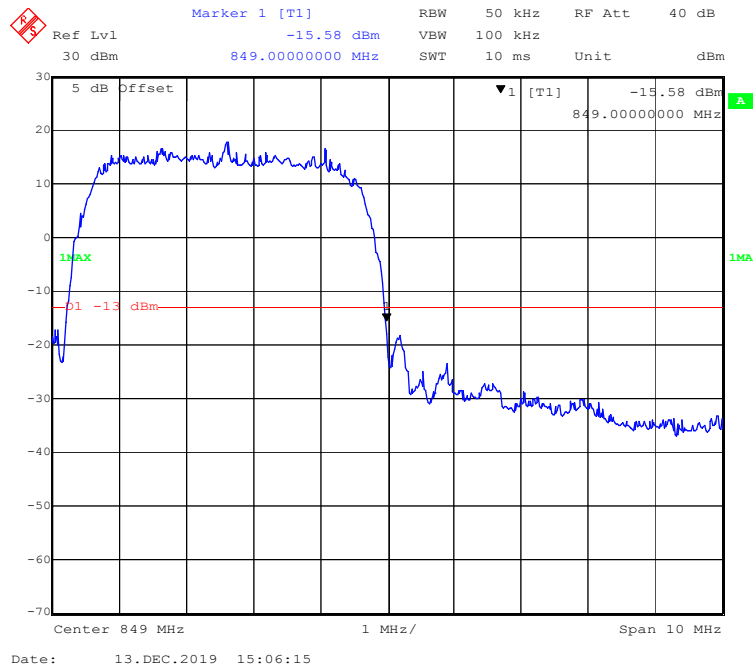
Test Result: Compliant.

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

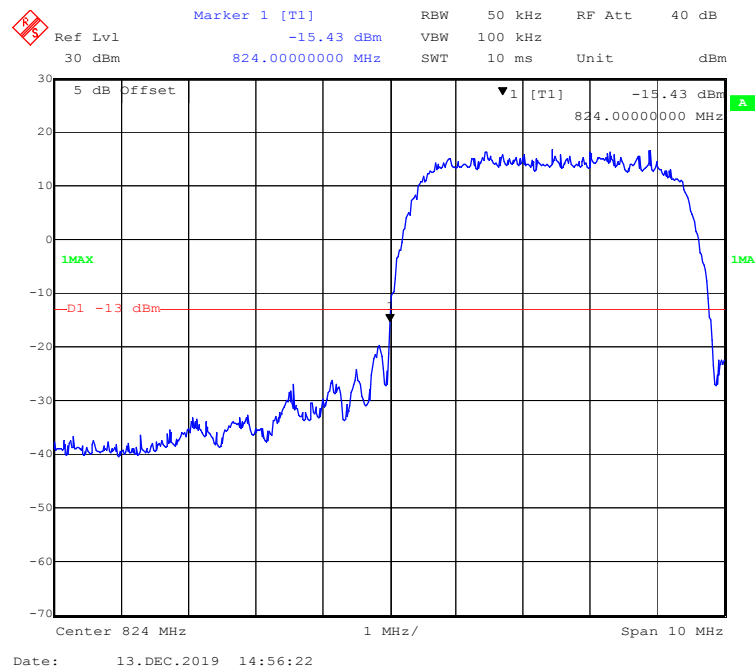
### WCDMA (HSDPA) Mode, Left Band Edge



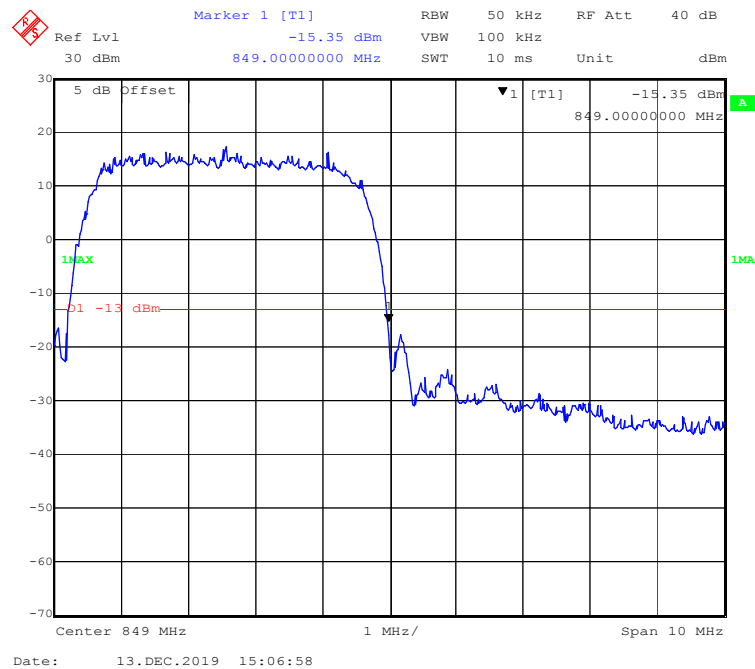
### WCDMA (HSDPA) Mode, Right Band Edge



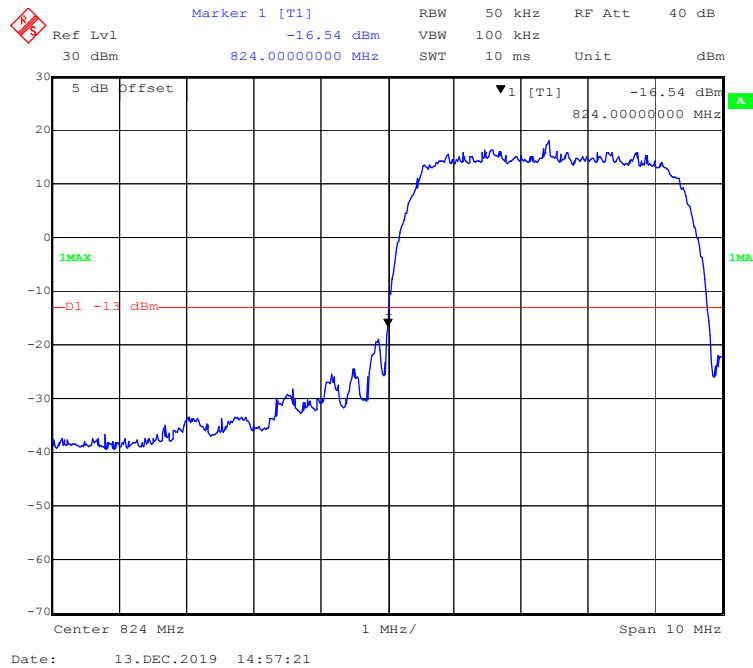
### WCDMA (HSUPA) Mode, Left Band Edge



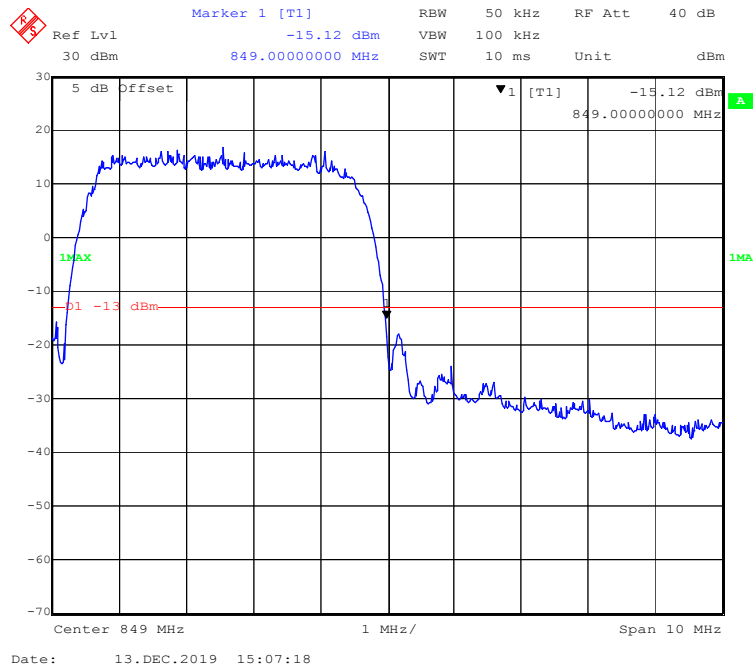
### WCDMA (HSUPA) Mode, Right Band Edge



### WCDMA (HSPA+) Mode, Left Band Edge

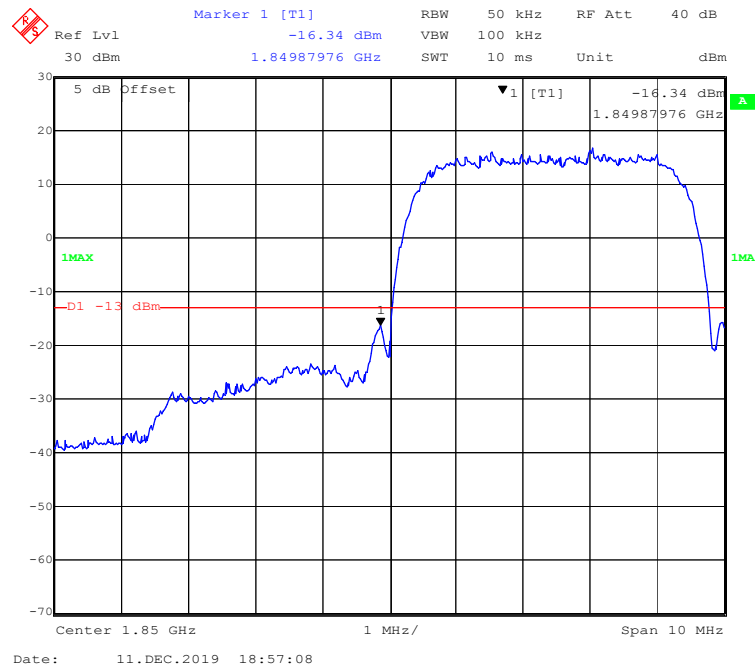


### WCDMA (HSPA+) Mode, Right Band Edge

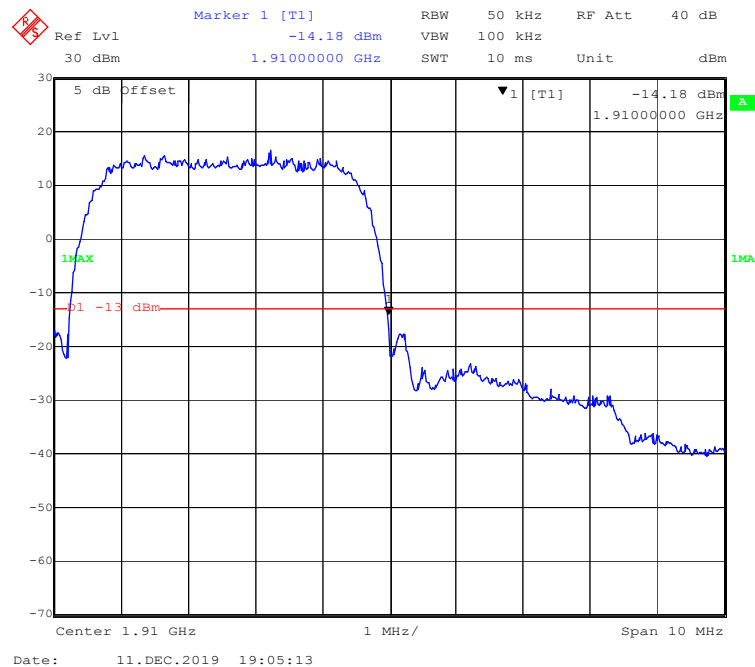


## WCDMA Band II

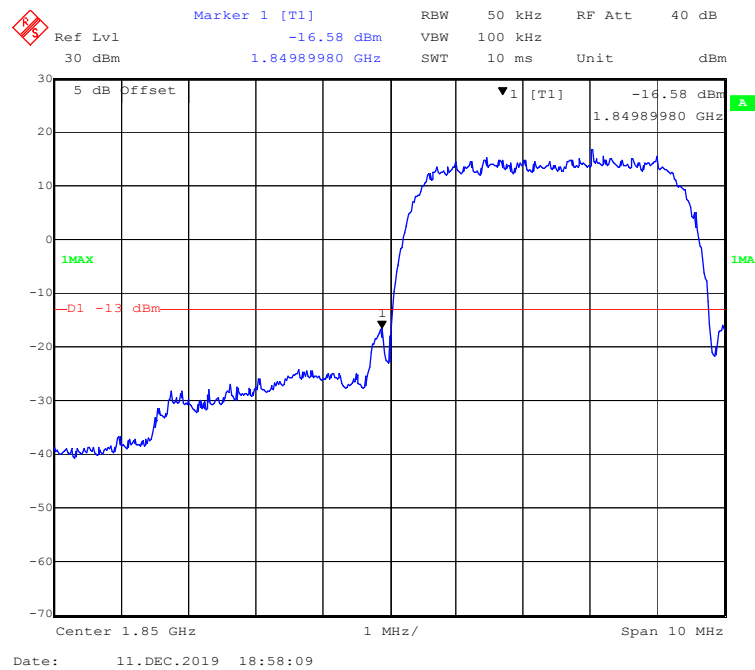
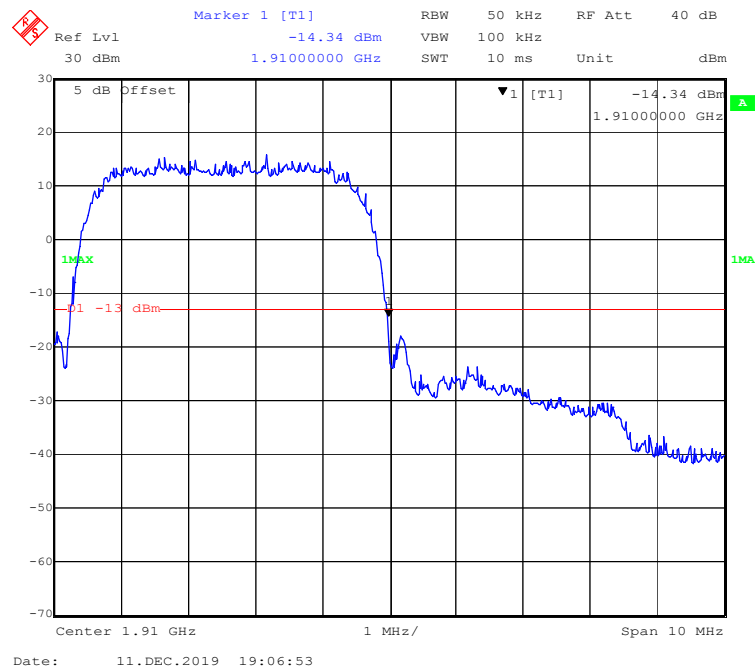
### WCDMA (Rel 99) Mode, Left Band Edge



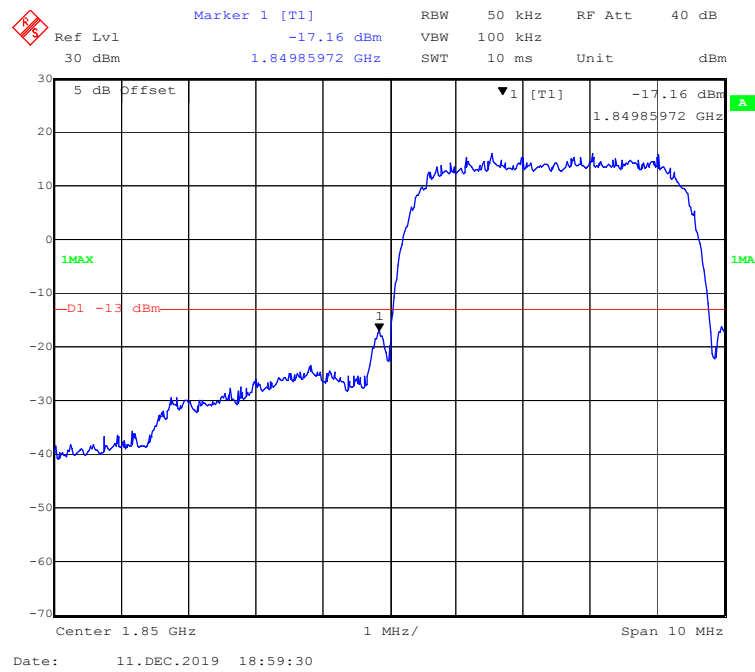
### WCDMA (Rel 99) Mode, Right Band Edge



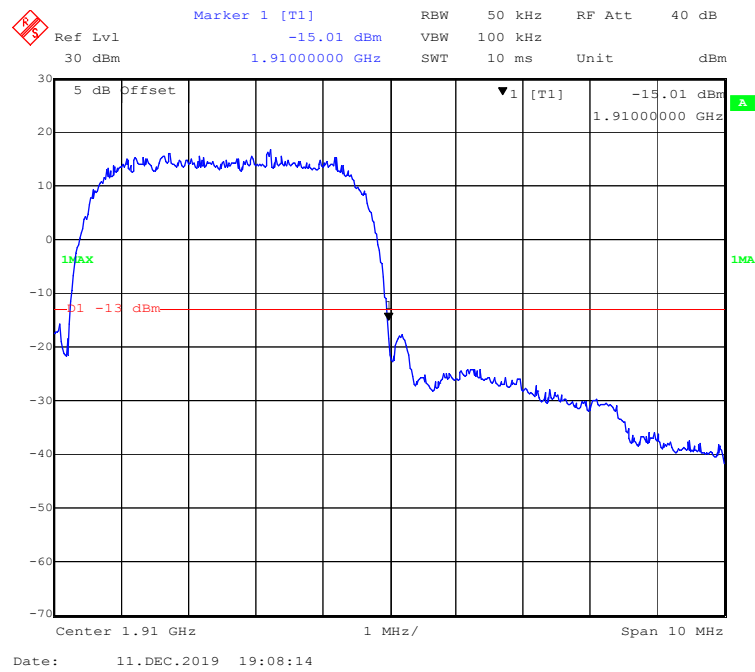


**WCDMA (HSDPA) Mode, Left Band Edge****WCDMA (HSDPA) Mode, Right Band Edge**

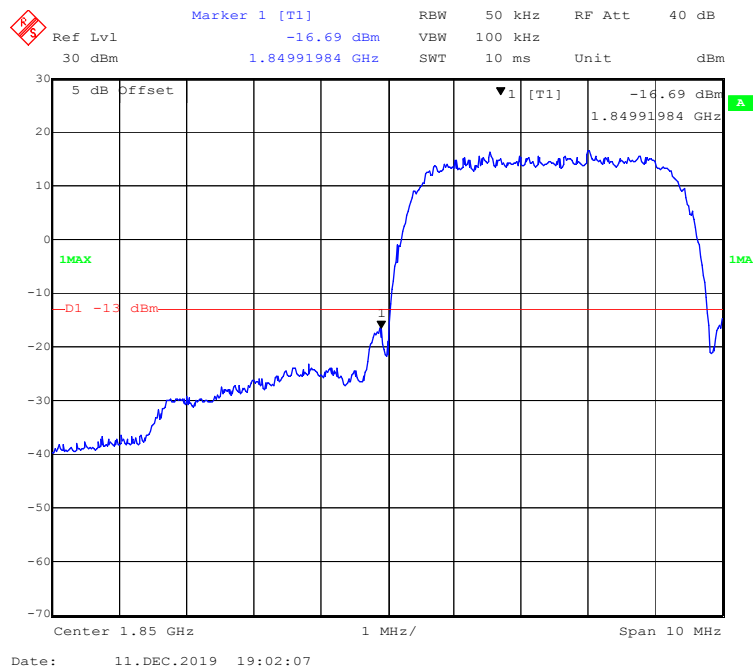
### WCDMA (HSUPA) Mode, Left Band Edge



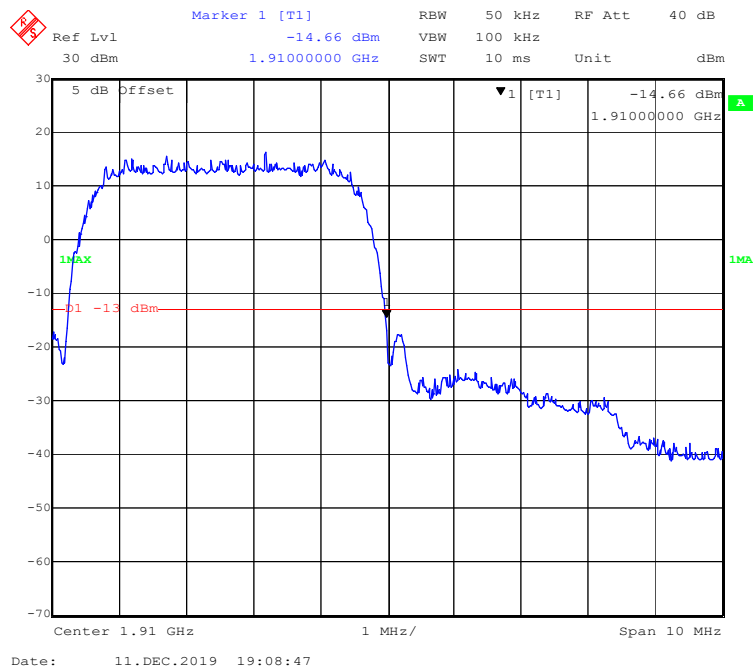
### WCDMA (HSUPA) Mode, Right Band Edge

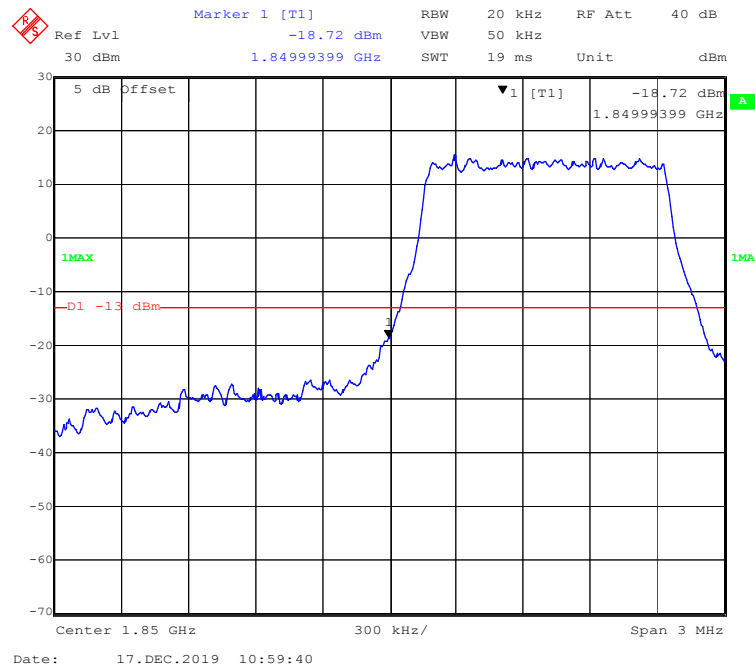
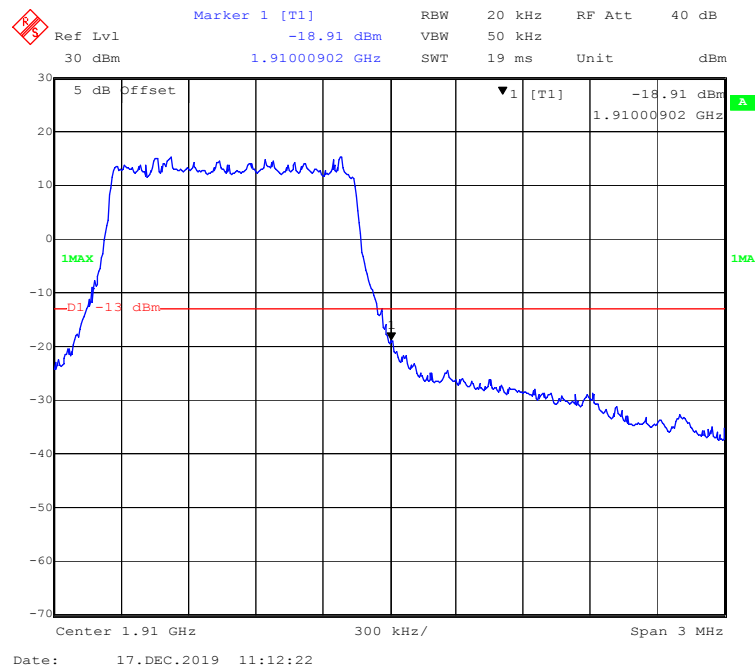


### WCDMA (HSPA+) Mode, Left Band Edge

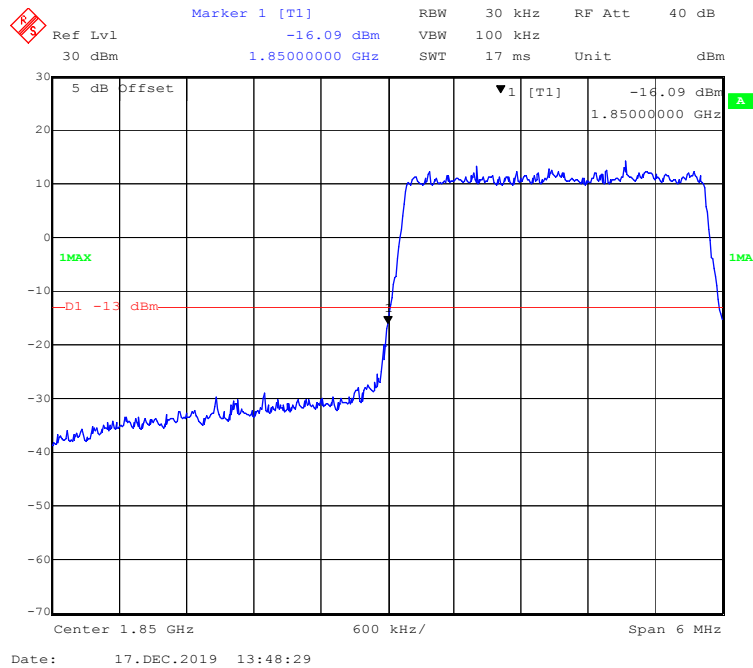


### WCDMA (HSPA+) Mode, Right Band Edge

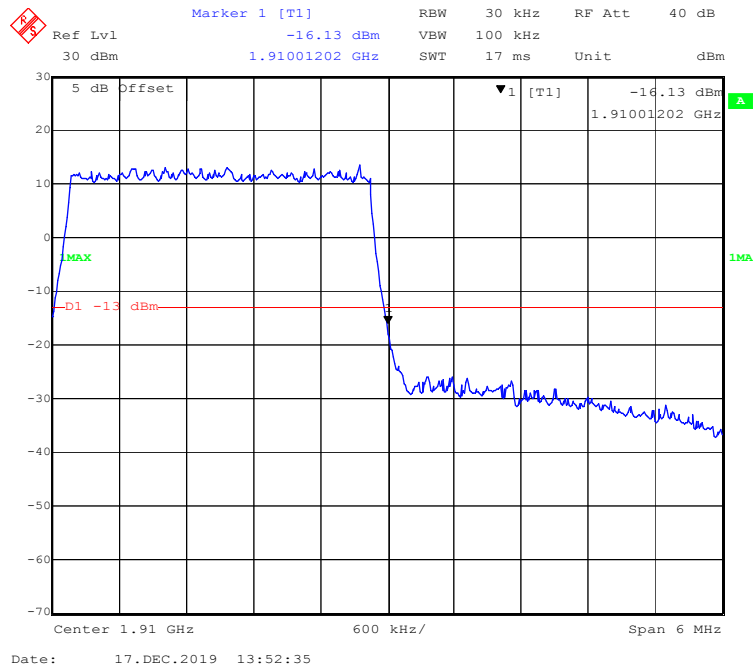


**LTE Band 2:****QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

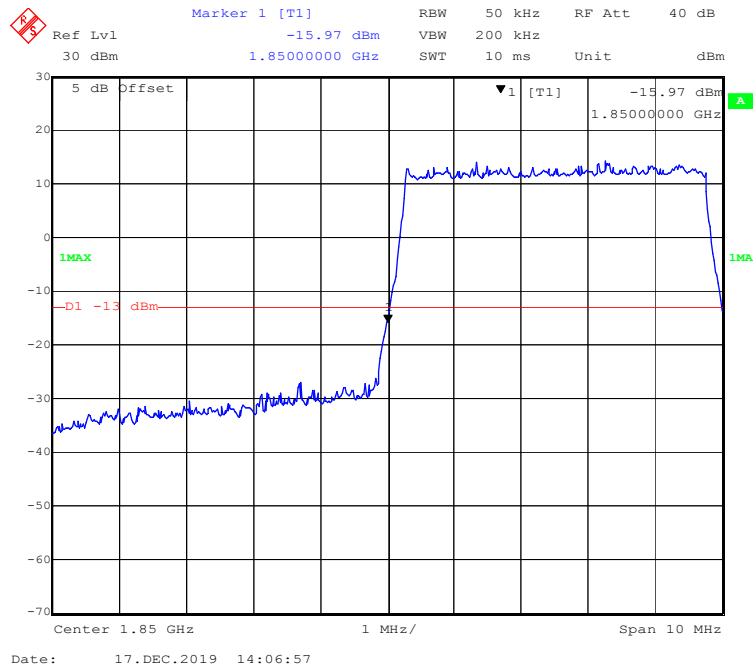
### QPSK (3 MHz, FULL RB) - Left Band Edge



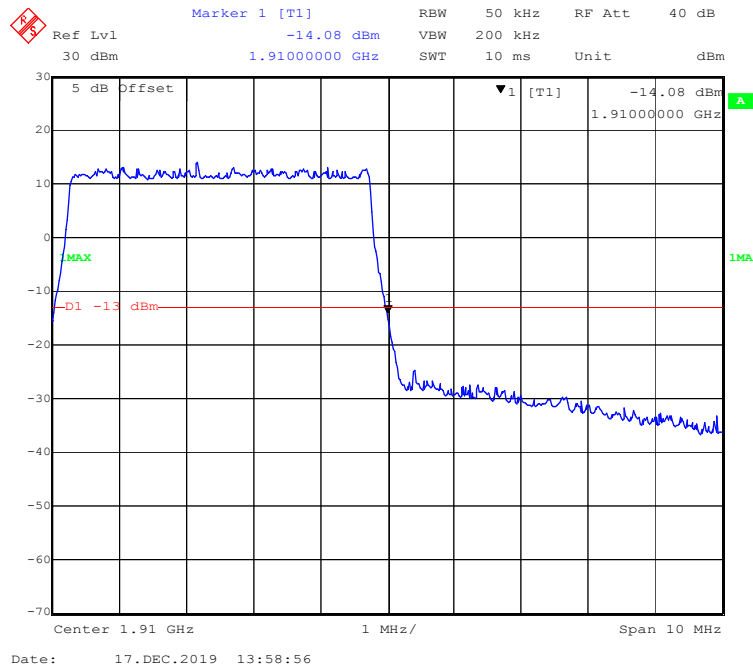
### QPSK (3 MHz, FULL RB) - Right Band Edge



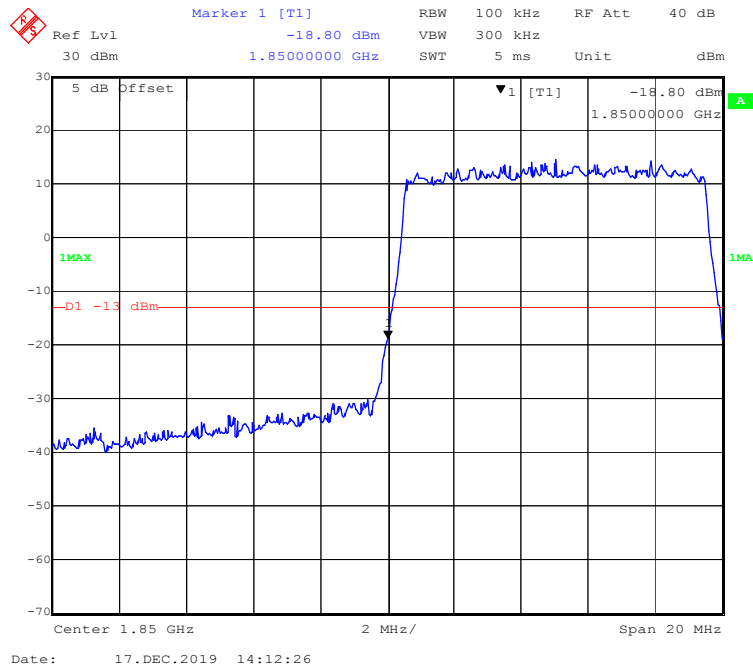
### QPSK (5 MHz, FULL RB) - Left Band Edge



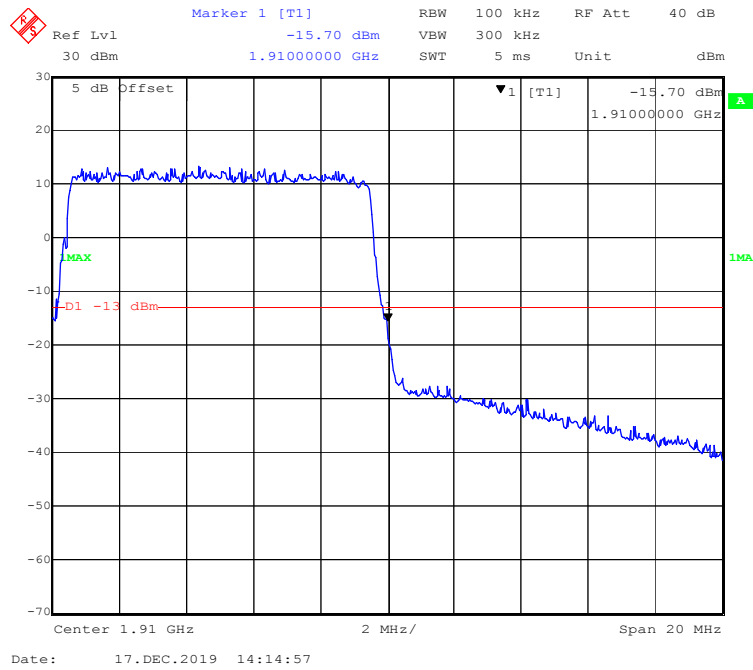
### QPSK (5 MHz, FULL RB) - Right Band Edge



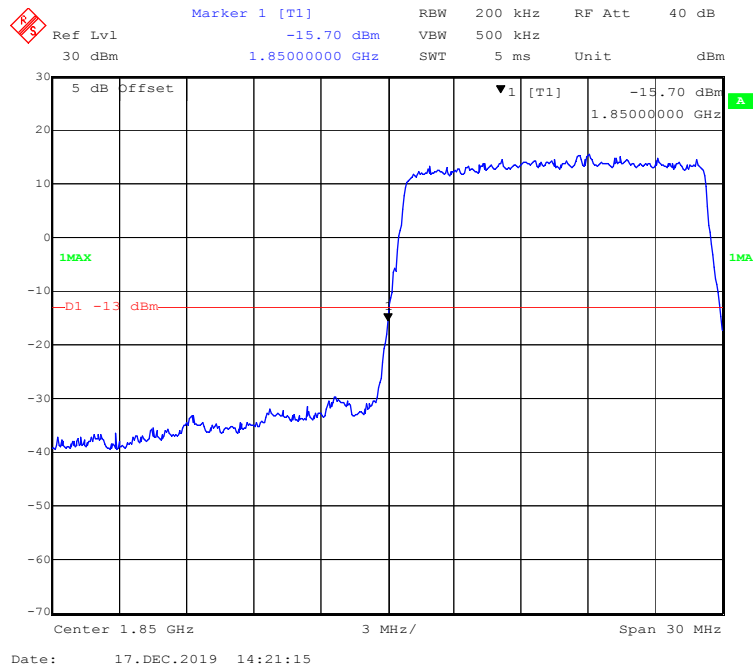
### QPSK (10 MHz, FULL RB) - Left Band Edge



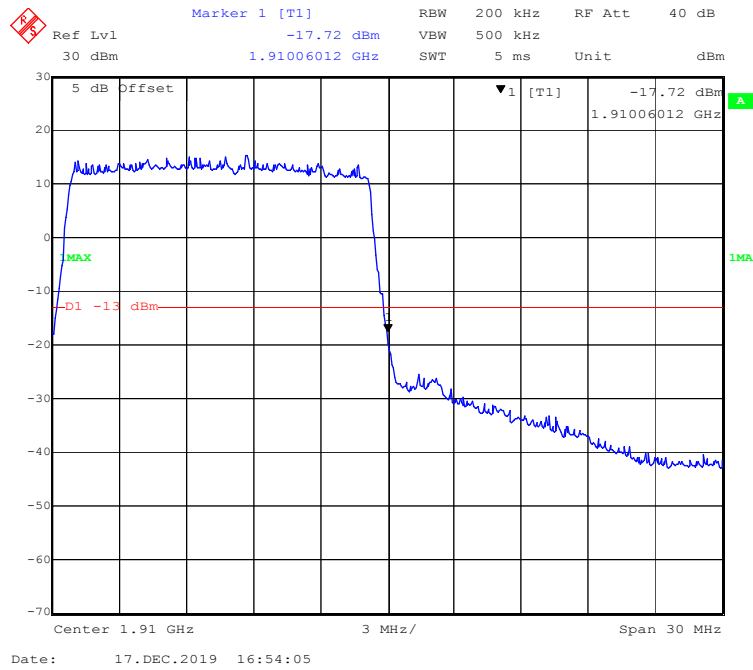
### QPSK (10 MHz, FULL RB) - Right Band Edge



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

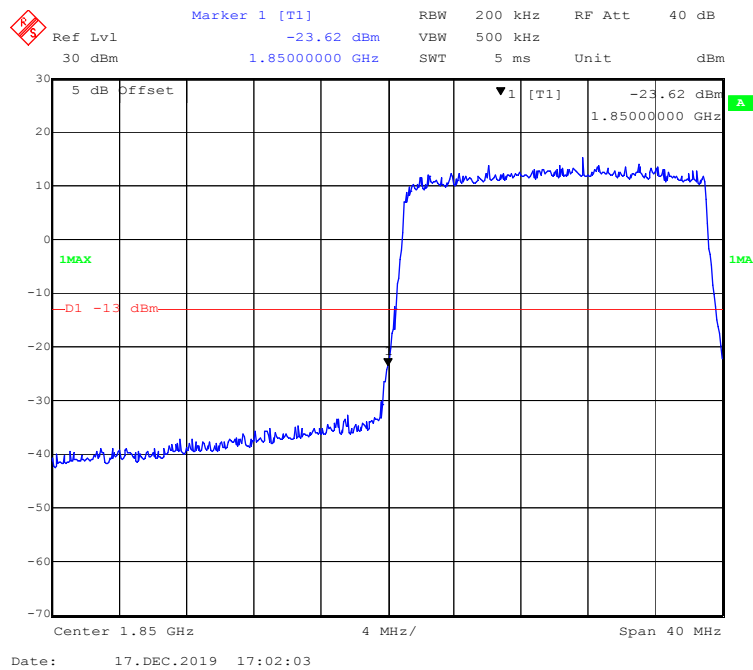


### QPSK (15 MHz, FULL RB) - Right Band Edge

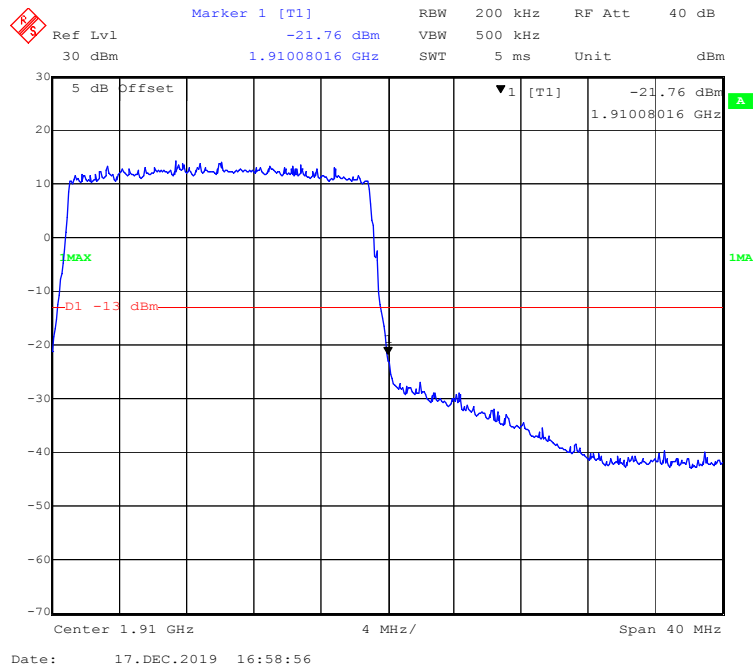




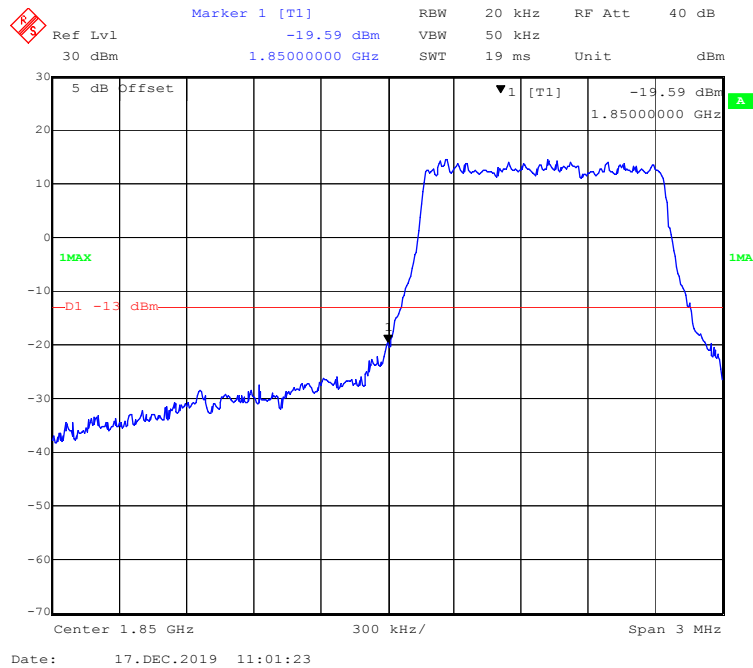
### QPSK (20 MHz, FULL RB) - Left Band Edge



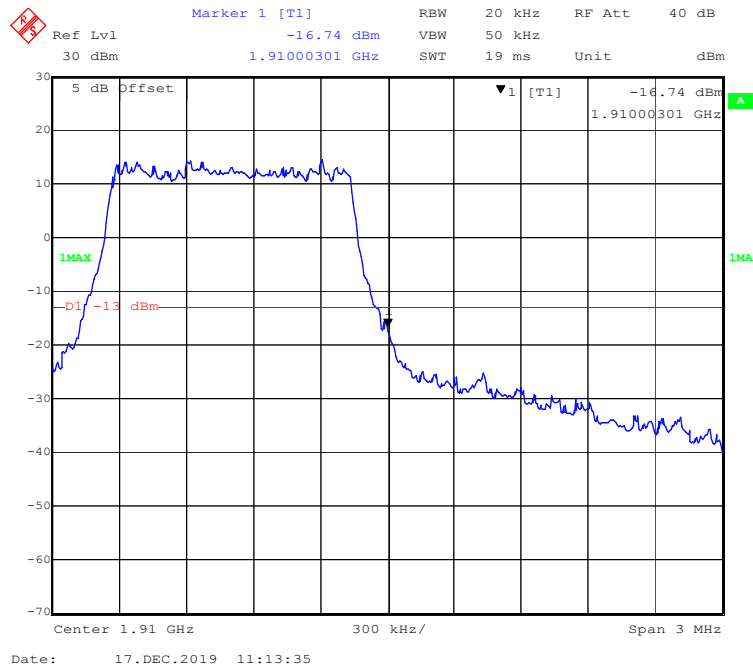
### QPSK (20 MHz, FULL RB) - Right Band Edge



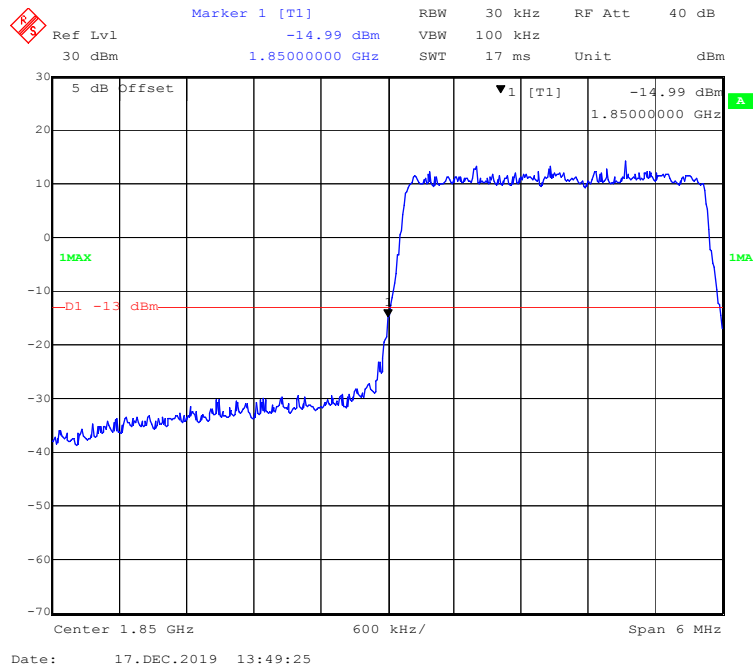
### 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



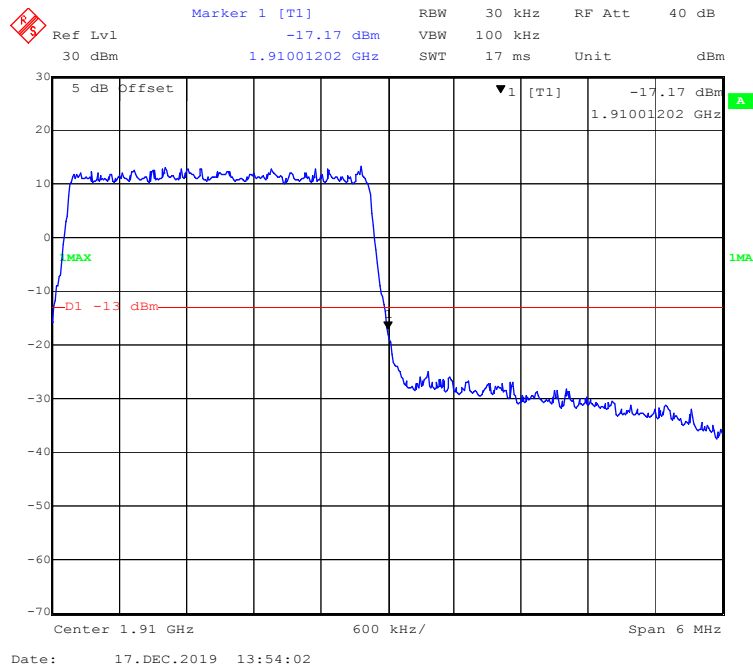
### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



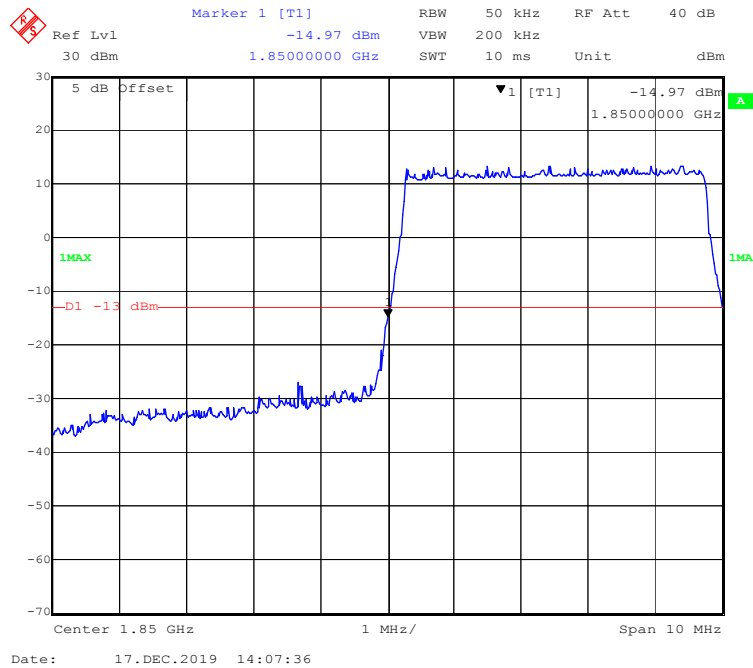
### 16-QAM (3 MHz, FULL RB) - Left Band Edge



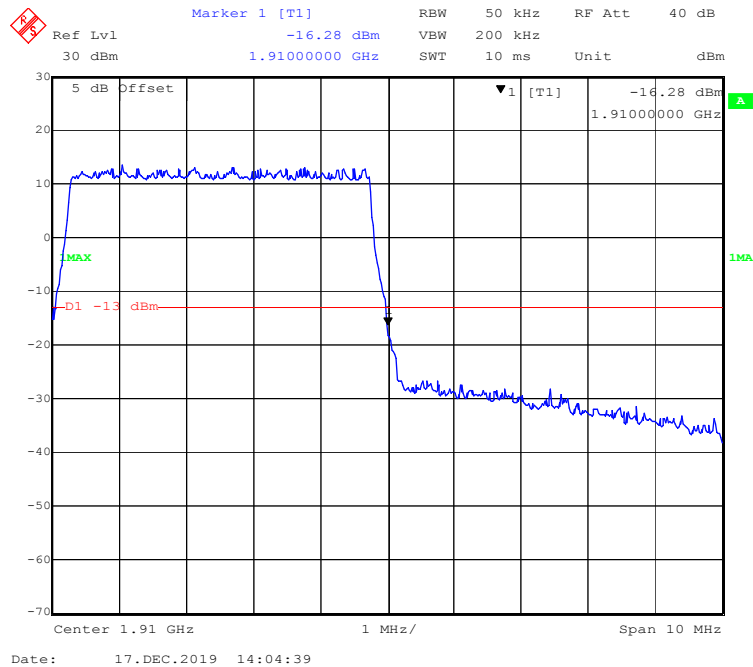
### 16-QAM (3 MHz, FULL RB) - Right Band Edge

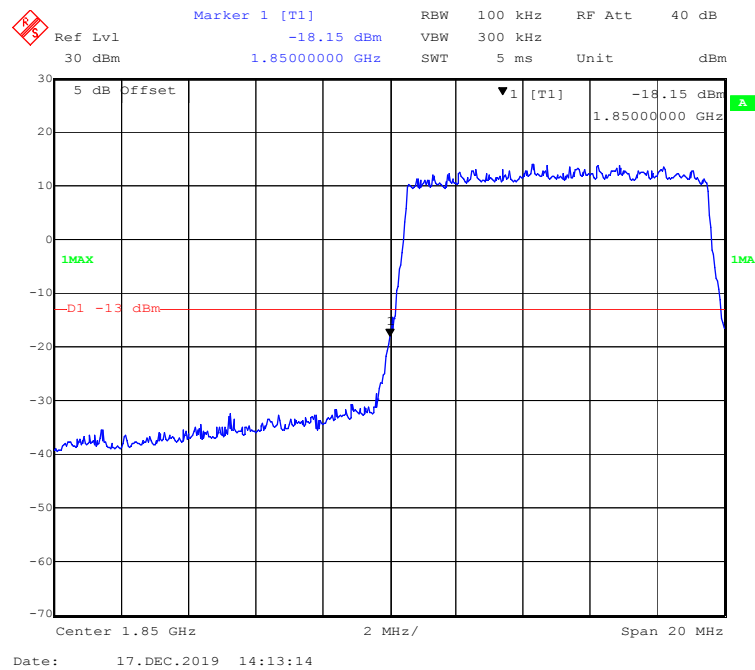
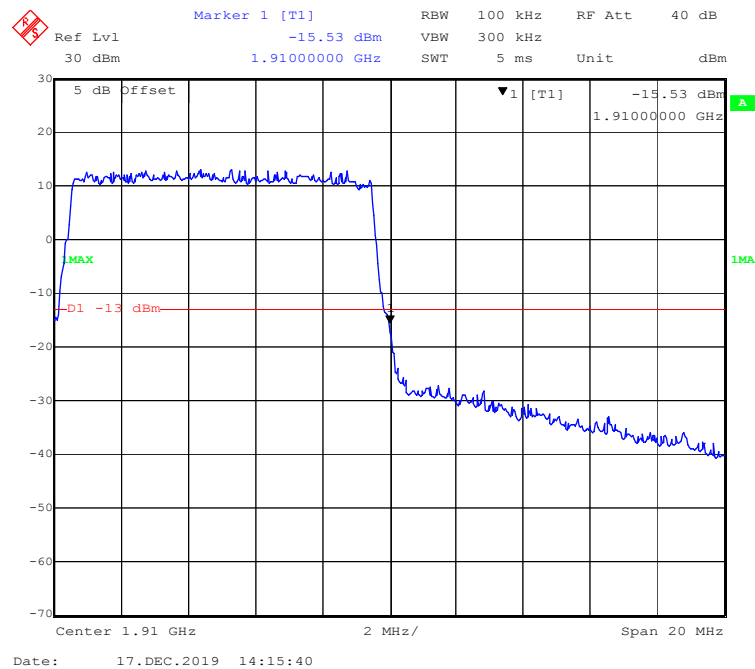


### 16-QAM (5 MHz, FULL RB) - Left Band Edge

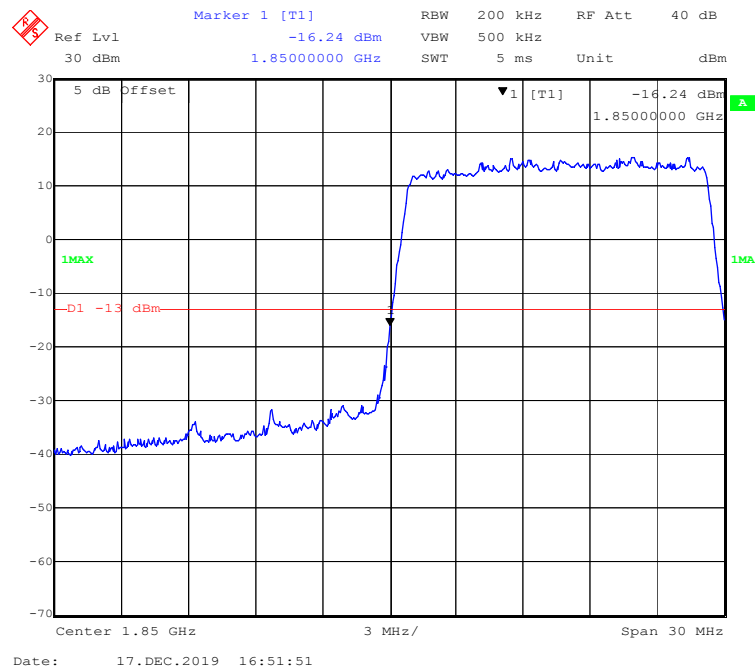


### 16-QAM (5 MHz, FULL RB) - Right Band Edge

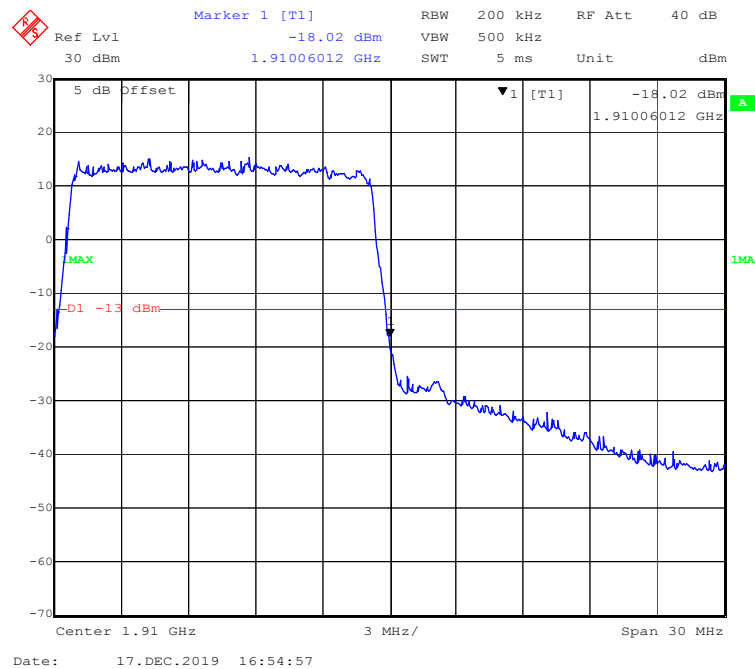


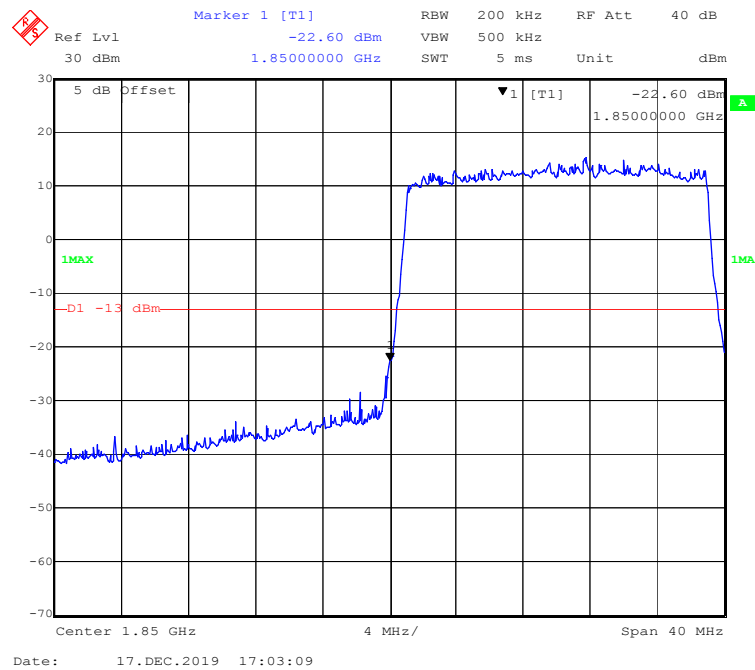
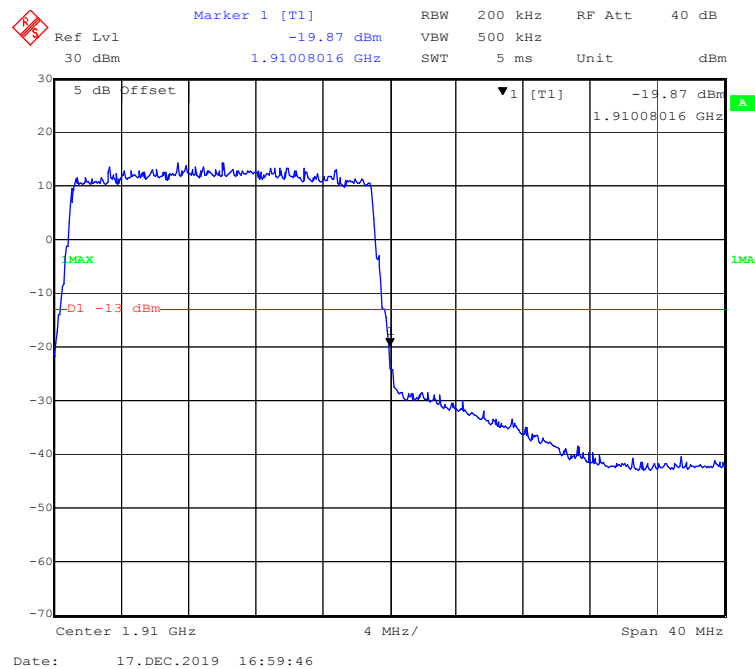
**16-QAM (10 MHz, FULL RB) - Left Band Edge****16-QAM (10 MHz, FULL RB) - Right Band Edge**

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



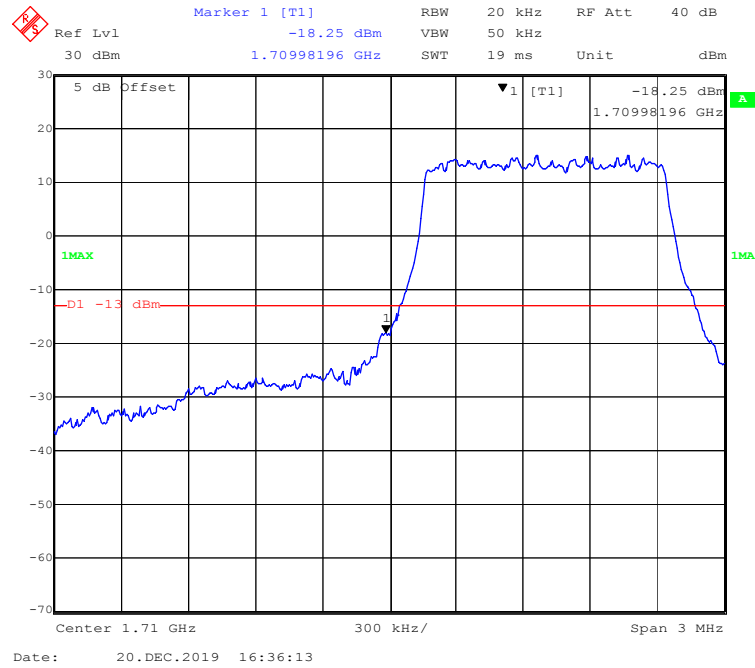
### 16-QAM (15 MHz, FULL RB) - Right Band Edge



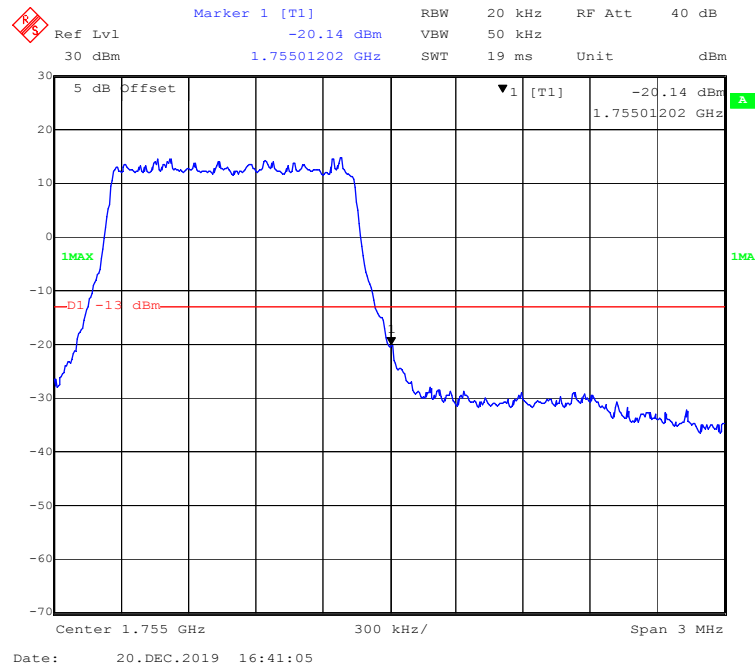
**16-QAM (20 MHz, FULL RB) - Left Band Edge****16-QAM (20 MHz, FULL RB) - Right Band Edge**

# LTE Band 4:

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

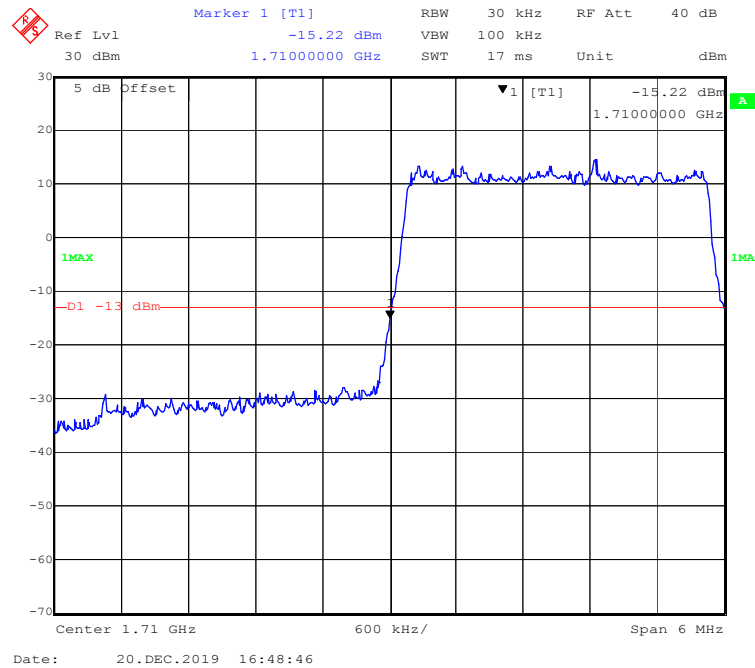


## QPSK (1.4 MHz, FULL RB) - Right Band Edge

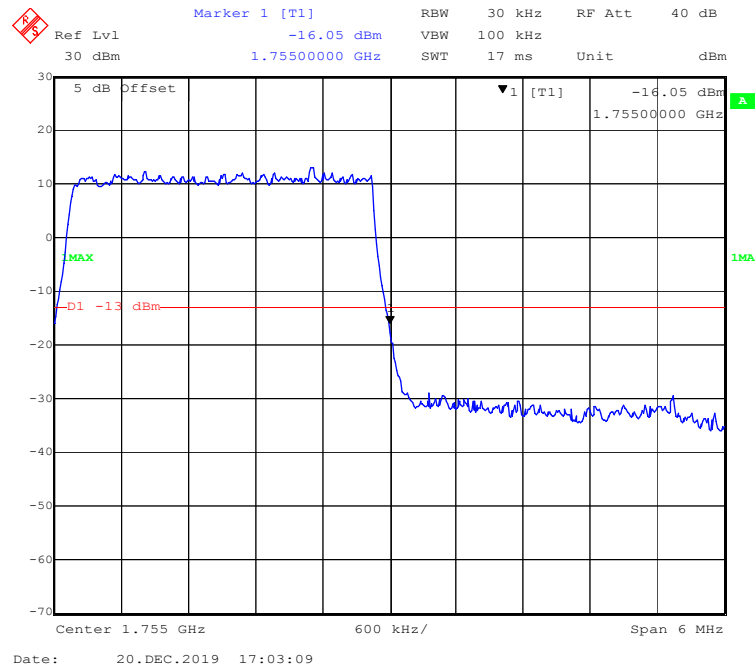




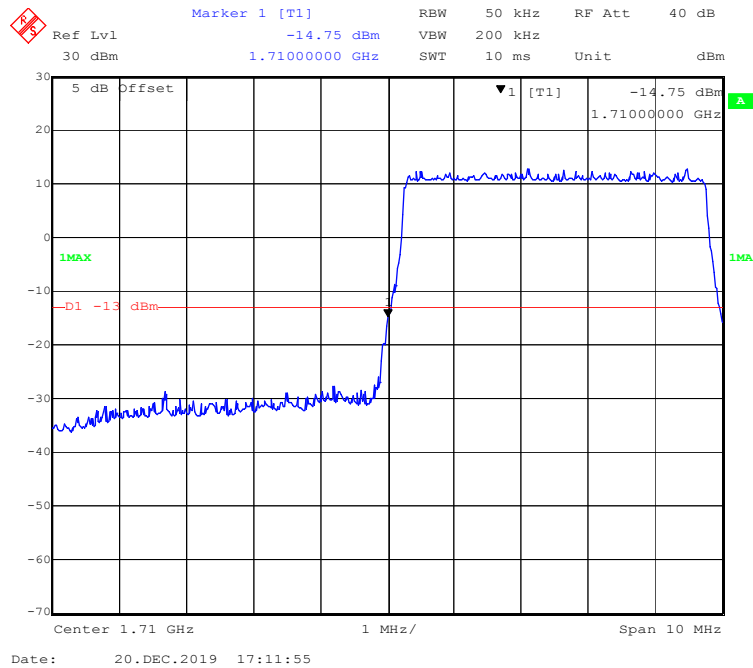
### QPSK (3 MHz, FULL RB) - Left Band Edge



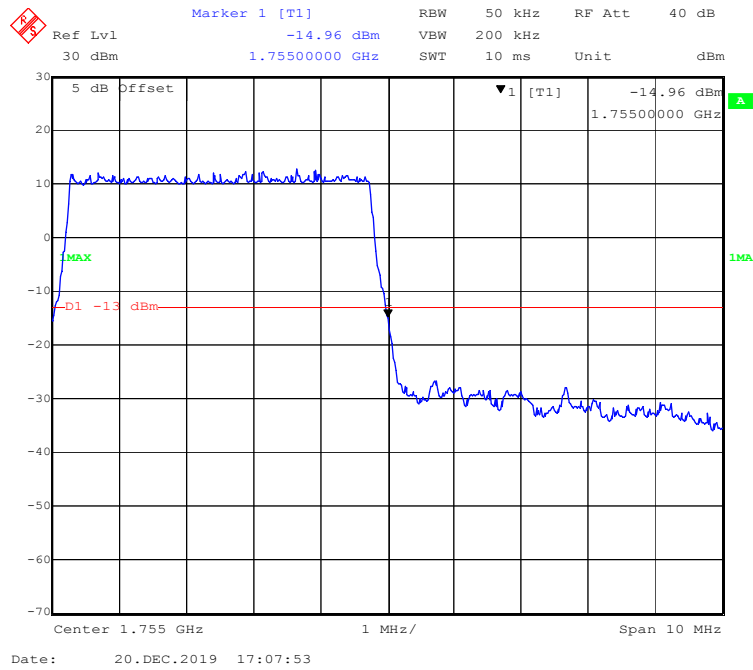
### QPSK (3 MHz, FULL RB) - Right Band Edge



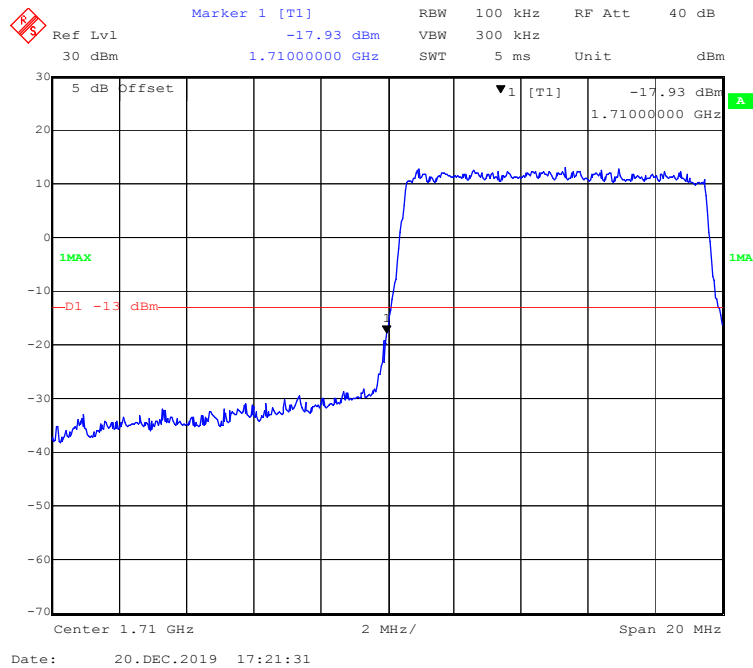
### QPSK (5 MHz, FULL RB) - Left Band Edge



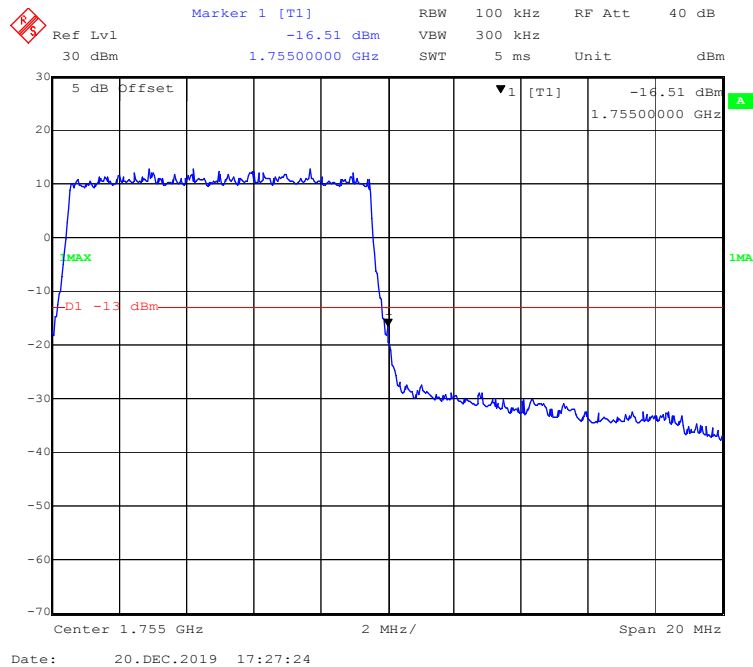
### QPSK (5 MHz, FULL RB) - Right Band Edge



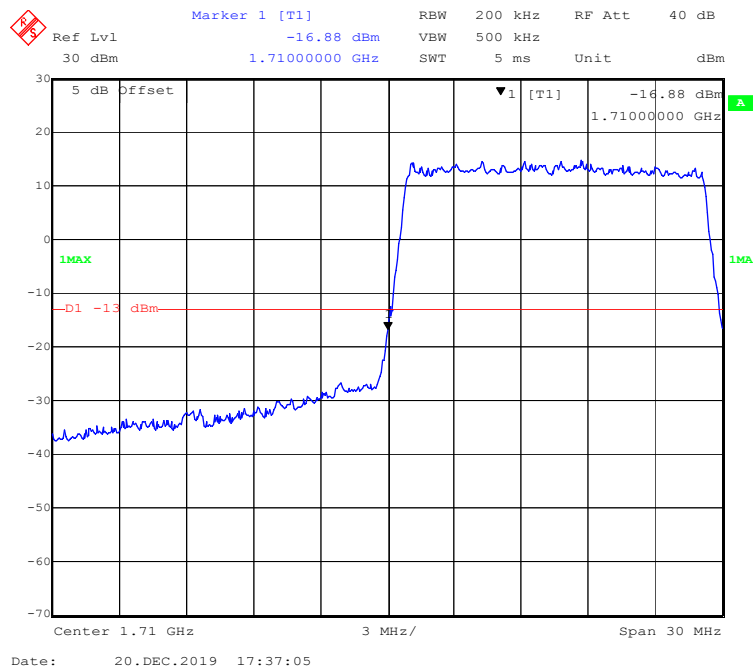
### QPSK (10 MHz, FULL RB) - Left Band Edge



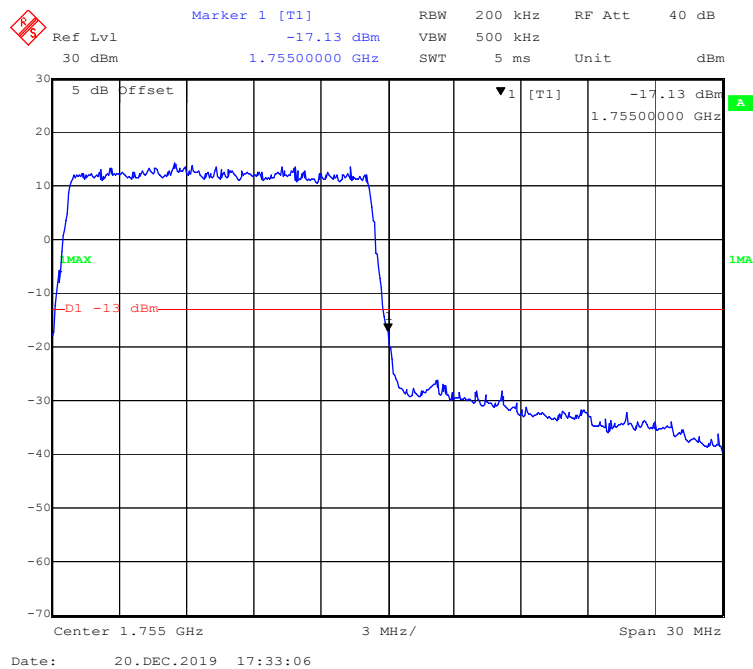
### QPSK (10 MHz, FULL RB) - Right Band Edge



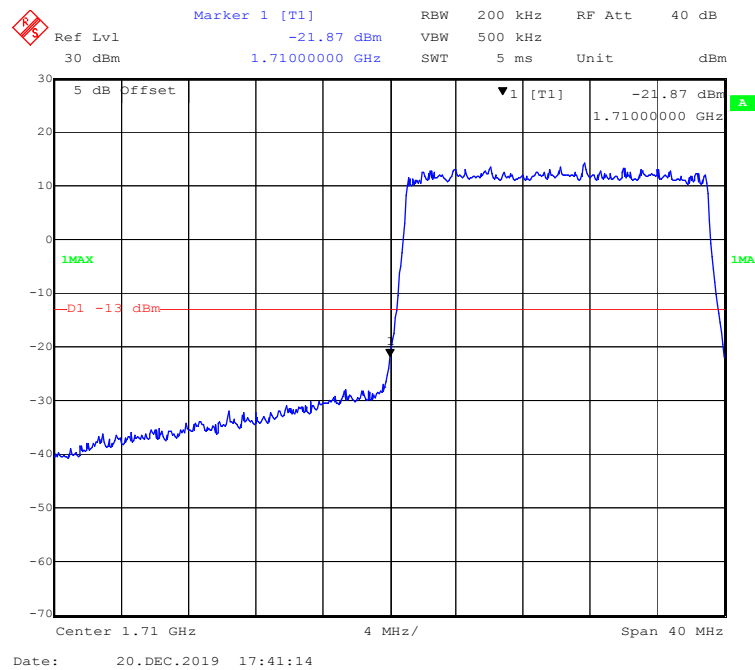
### QPSK (15 MHz, FULL RB) - Left Band Edge



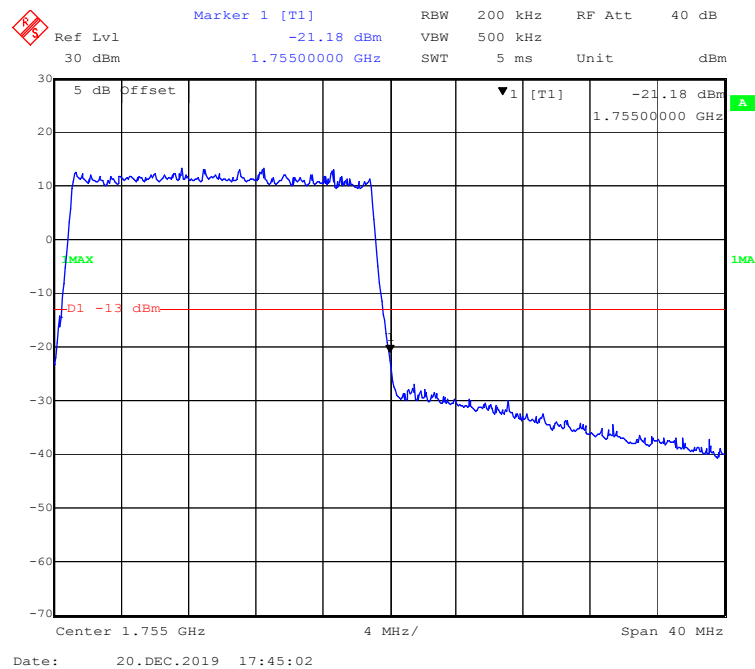
### QPSK (15 MHz, FULL RB) - Right Band Edge



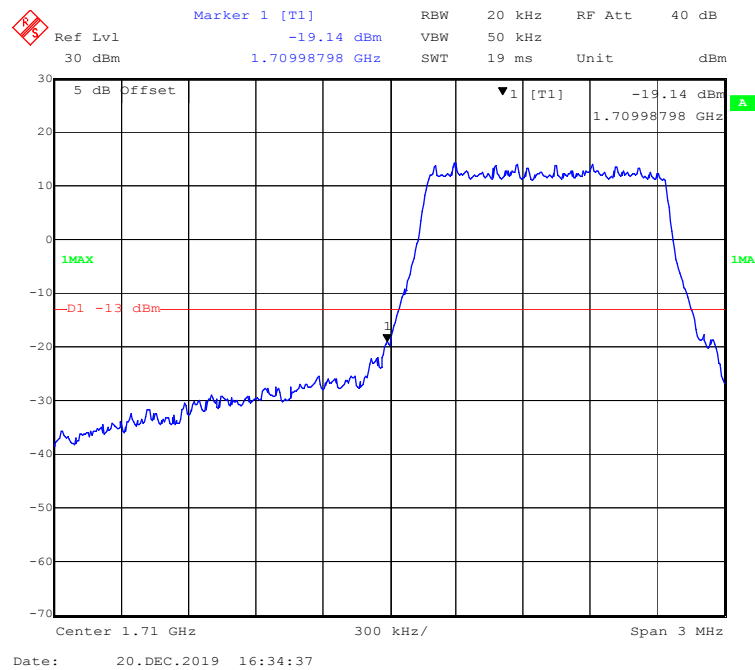
### QPSK (20 MHz, FULL RB) - Left Band Edge



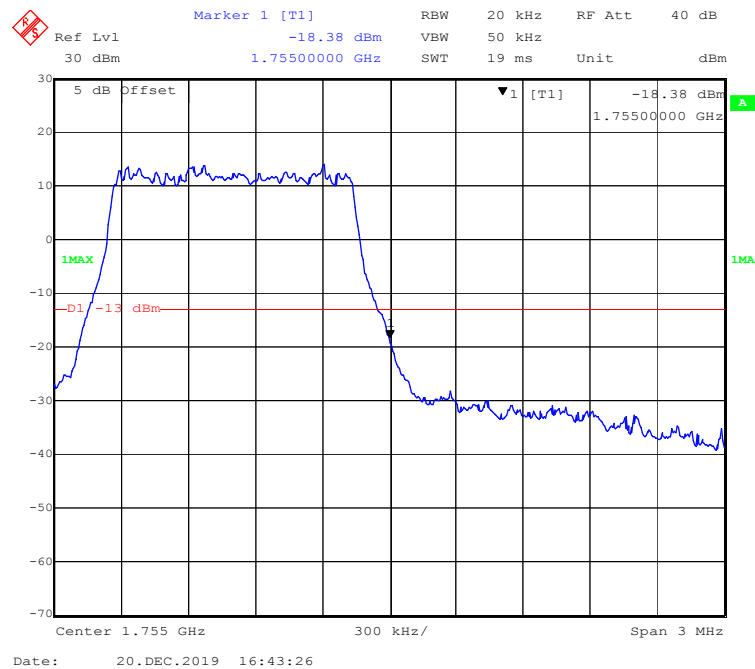
### QPSK (20 MHz, FULL RB) - Right Band Edge

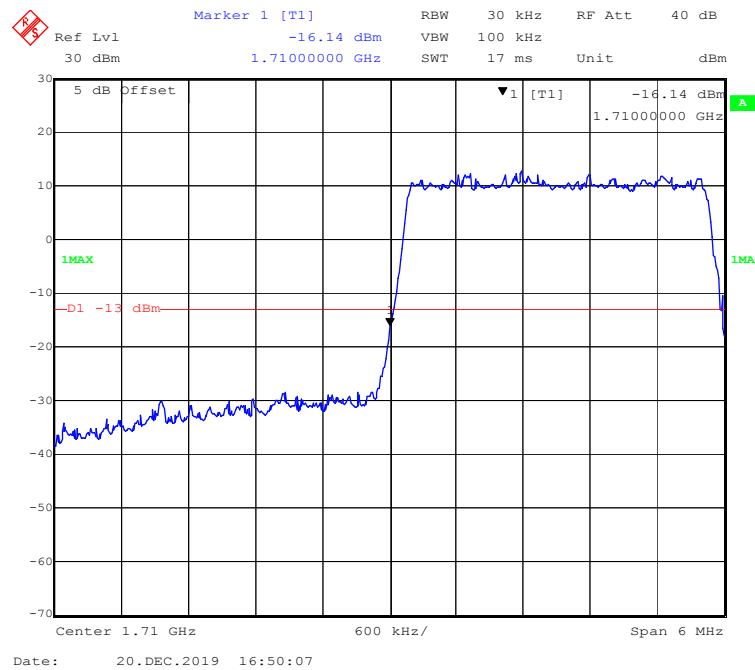
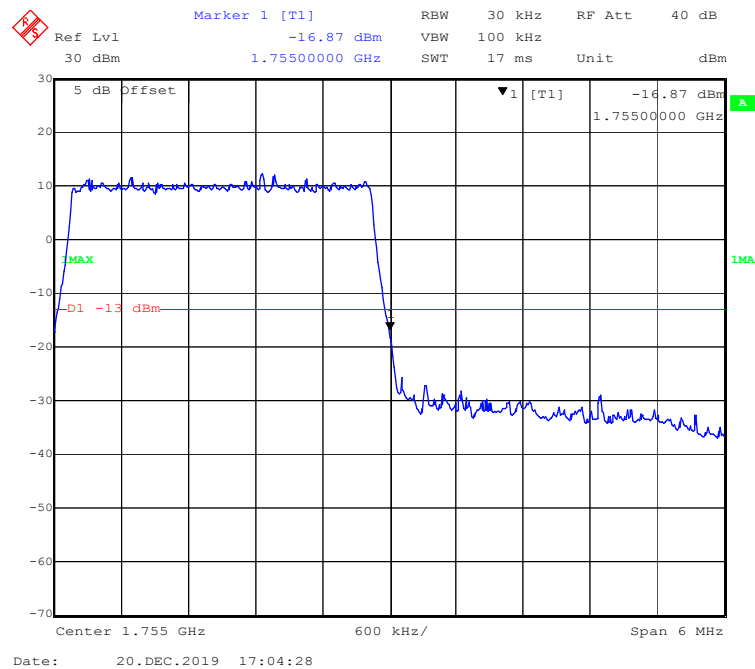


### 16-QAM (1.4 MHz, FULL RB) - Left Band Edge

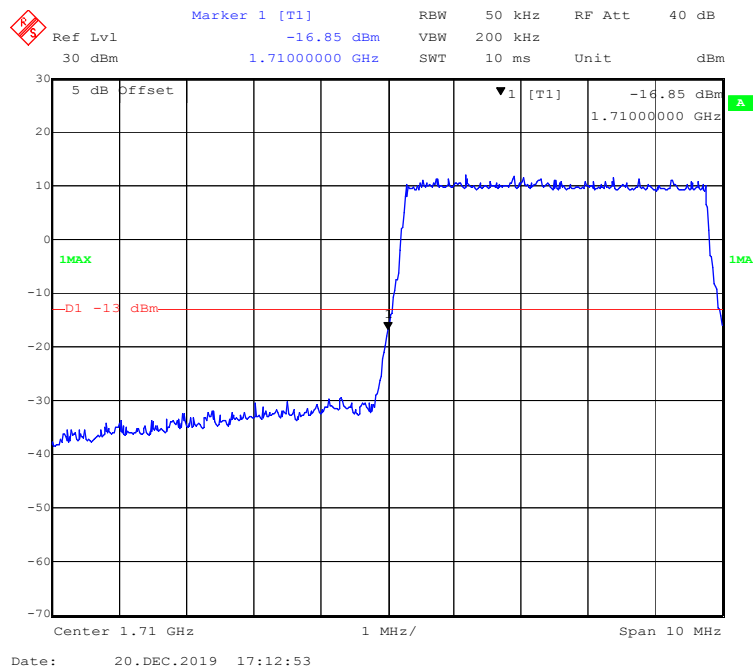


### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge

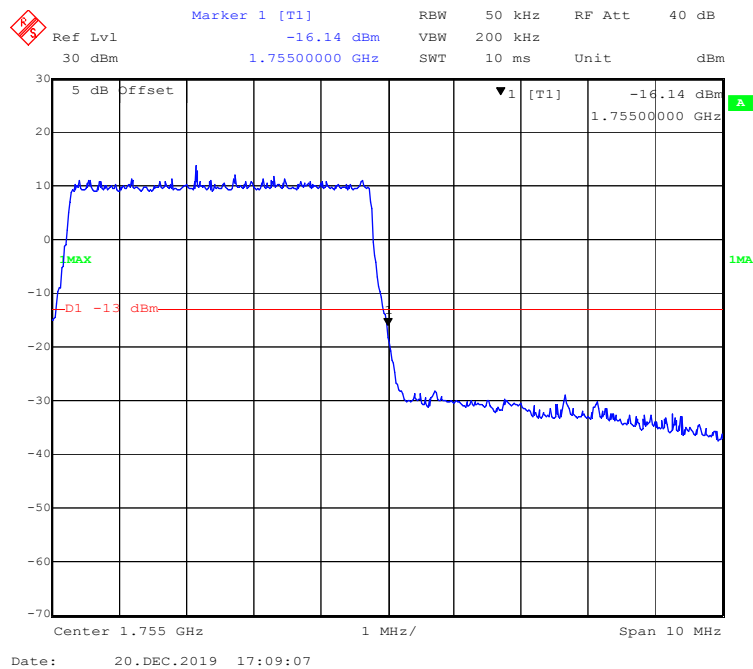


**16-QAM (3 MHz, FULL RB) - Left Band Edge****16-QAM (3 MHz, FULL RB) - Right Band Edge**

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

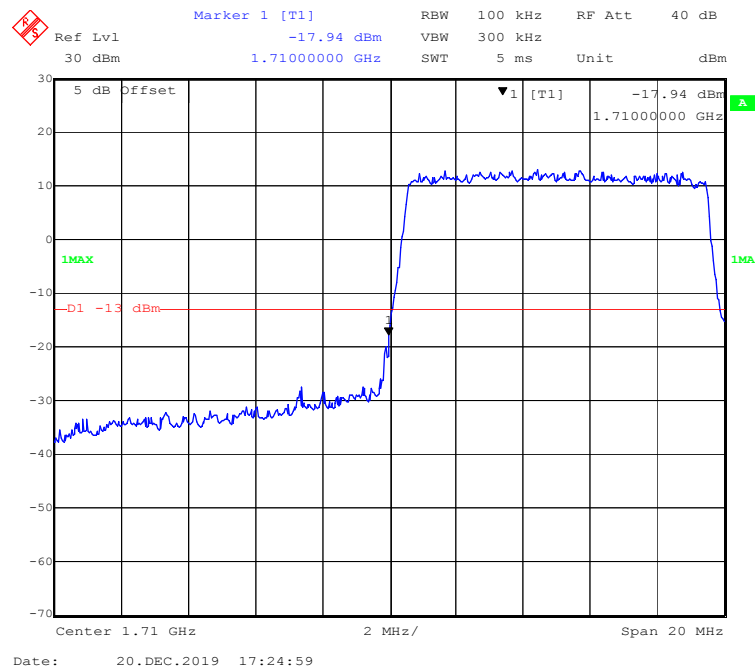


### 16-QAM (5 MHz, FULL RB) - Right Band Edge

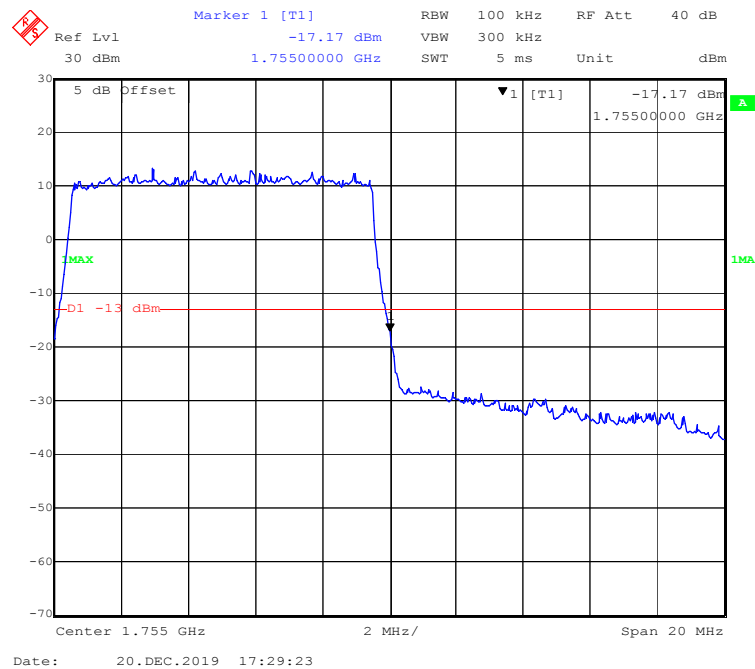


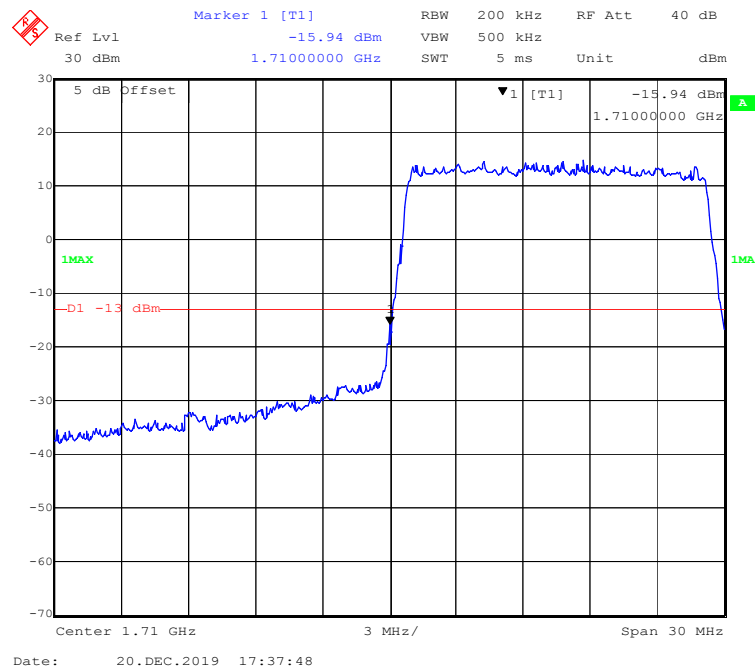
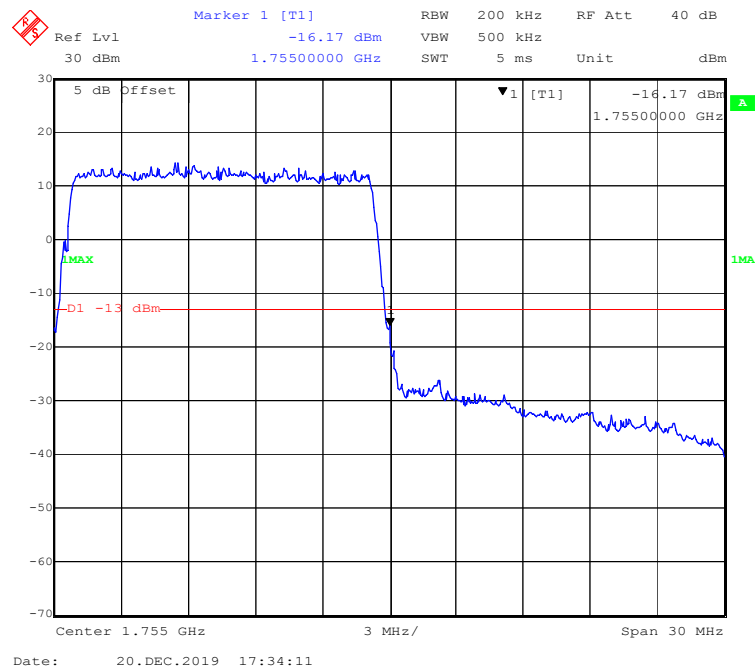


### 16-QAM (10 MHz, FULL RB) - Left Band Edge

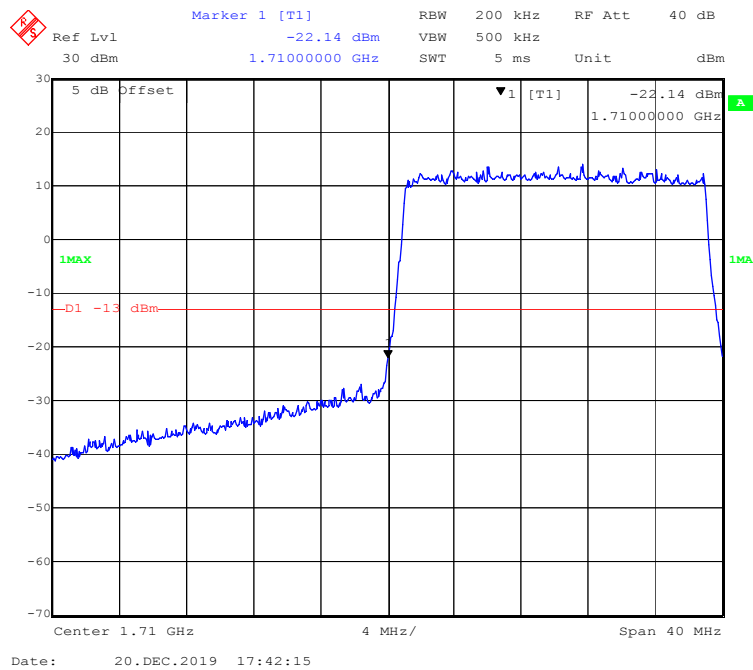


### 16-QAM (10 MHz, FULL RB) - Right Band Edge

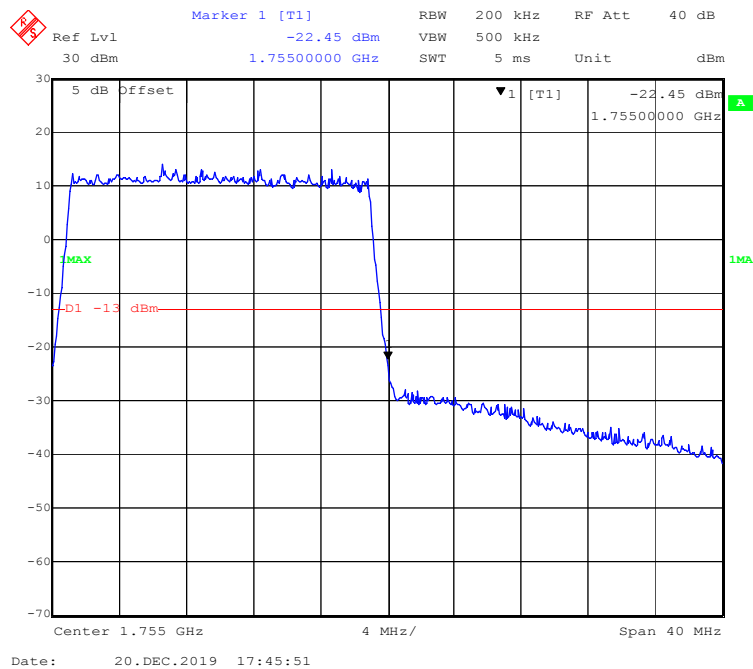


**16-QAM (15 MHz, FULL RB) - Left Band Edge****16-QAM (15 MHz, FULL RB) - Right Band Edge**

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

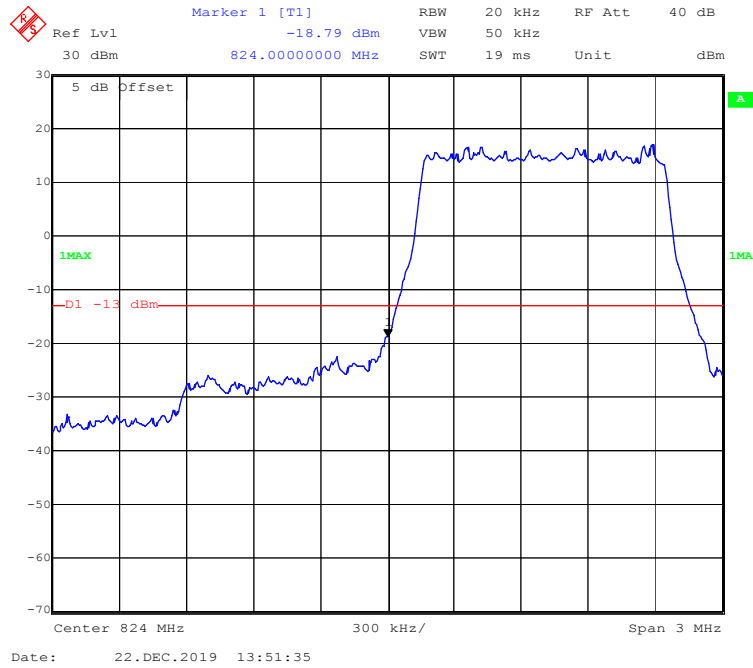


### 16-QAM (20 MHz, FULL RB) - Right Band Edge

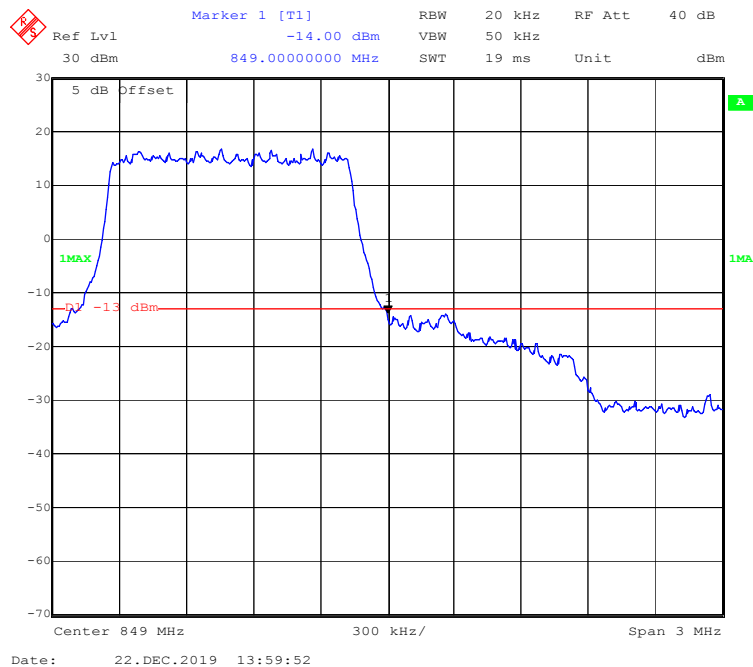


# LTE Band 5:

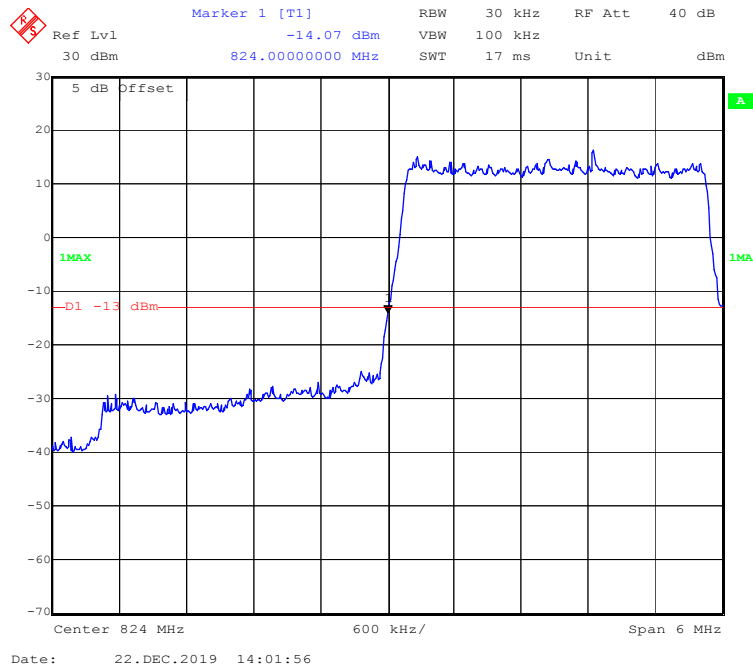
## QPSK (1.4 MHz, FULL RB) - Left Band Edge



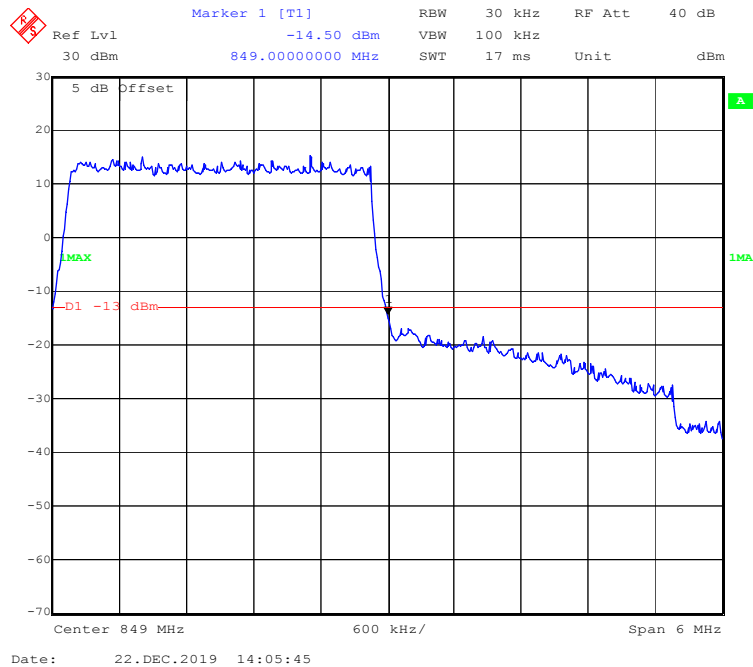
## QPSK (1.4 MHz, FULL RB) - Right Band Edge



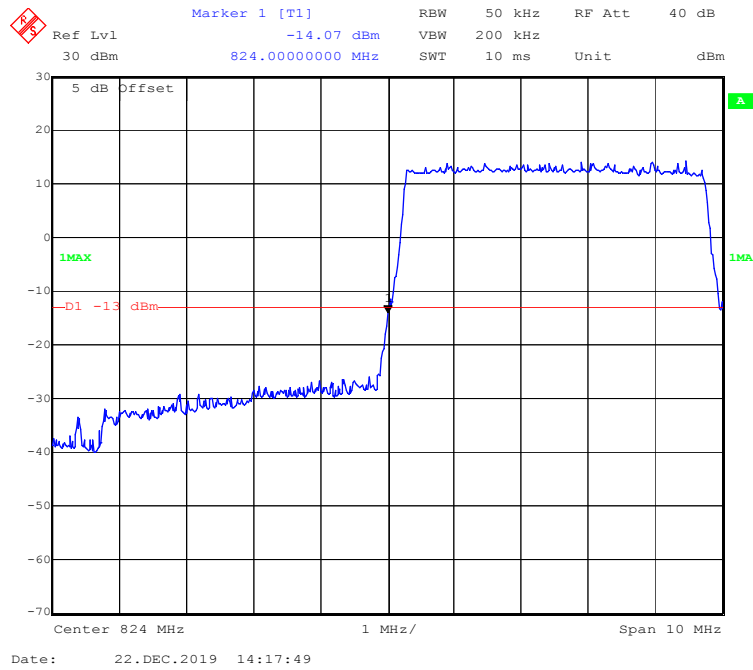
### QPSK (3 MHz, FULL RB) - Left Band Edge



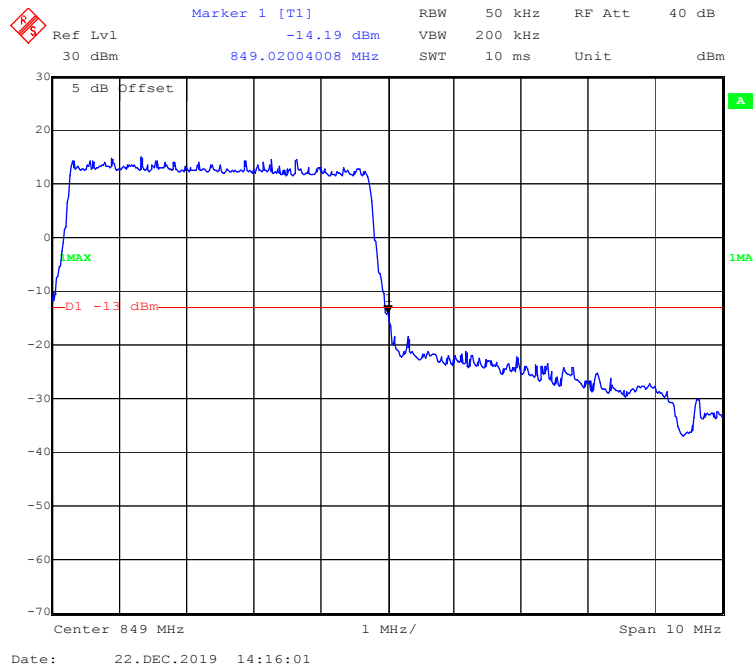
### QPSK (3 MHz, FULL RB) - Right Band Edge



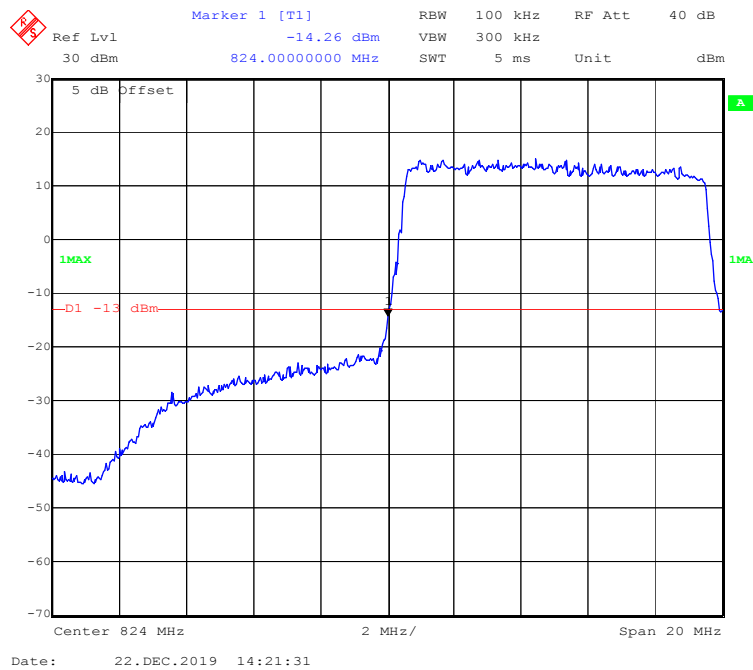
### QPSK (5 MHz, FULL RB) - Left Band Edge



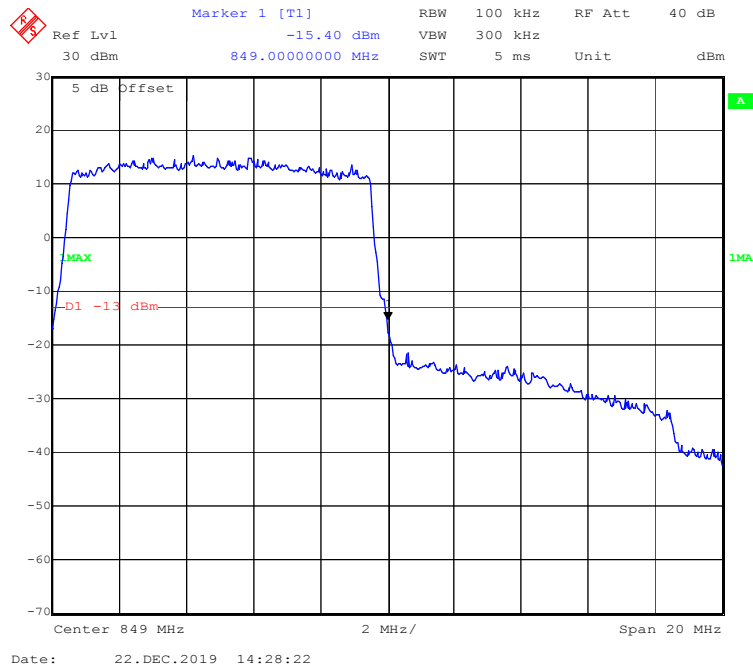
### QPSK (5 MHz, FULL RB) - Right Band Edge



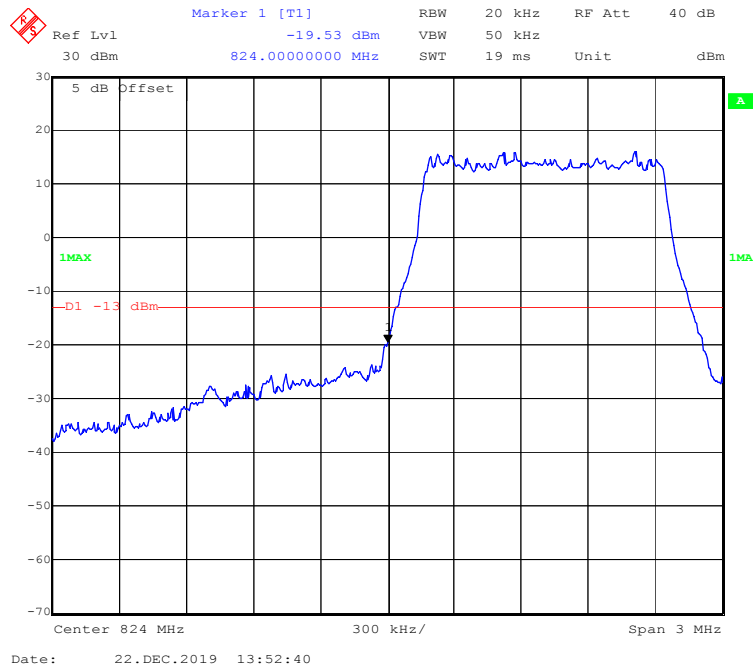
### QPSK (10 MHz, FULL RB) - Left Band Edge



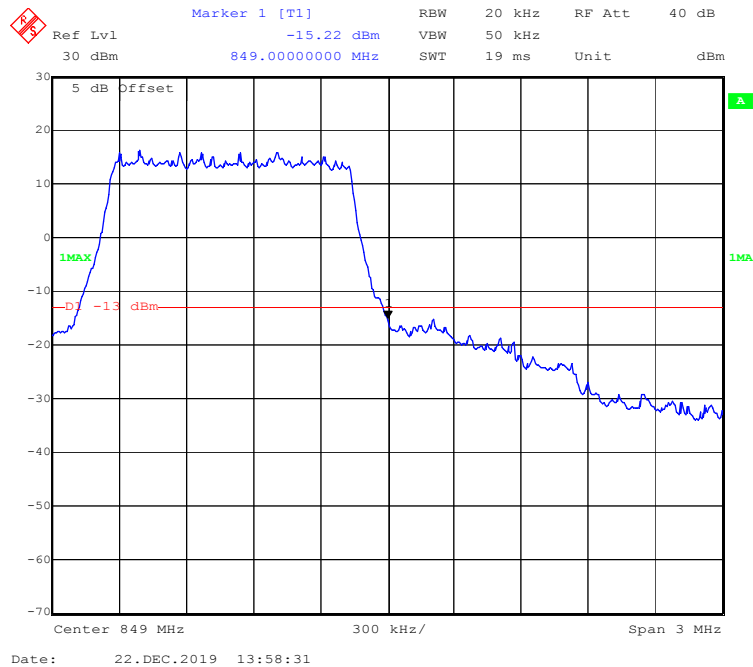
### QPSK (10 MHz, FULL RB) - Right Band Edge



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

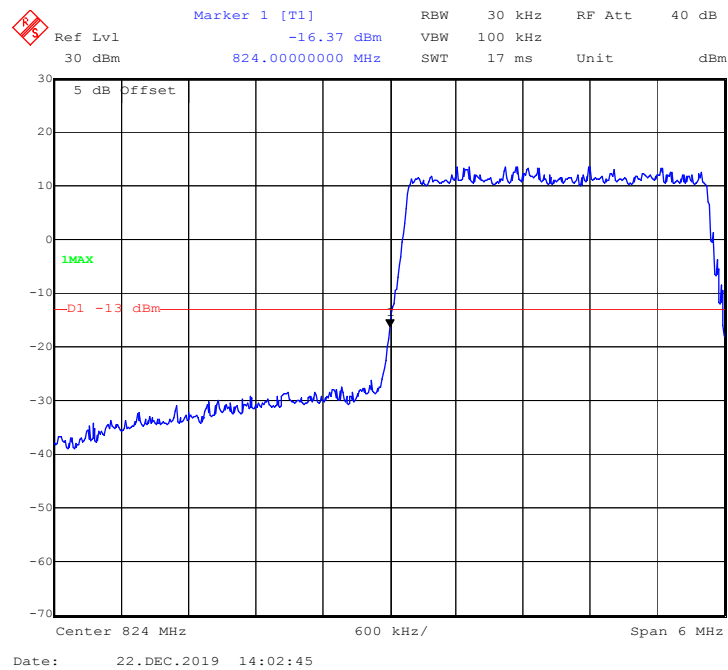


### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge

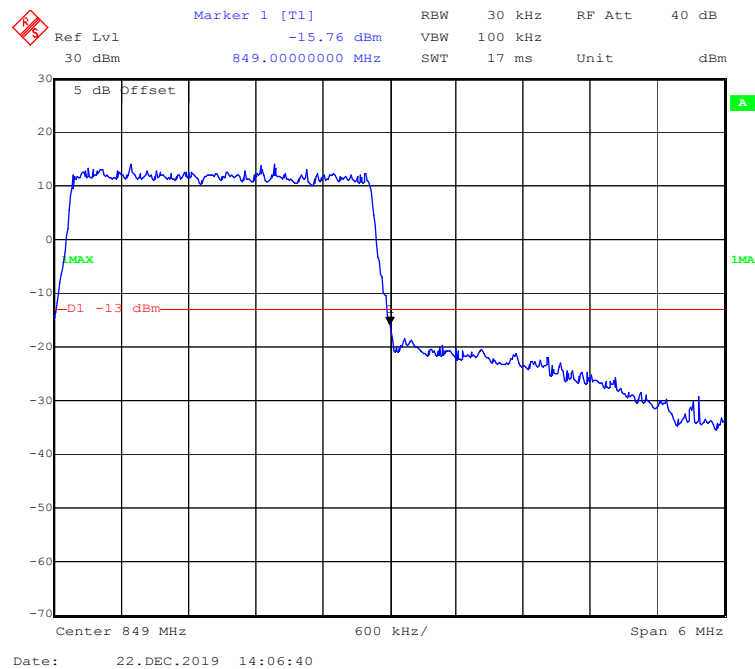




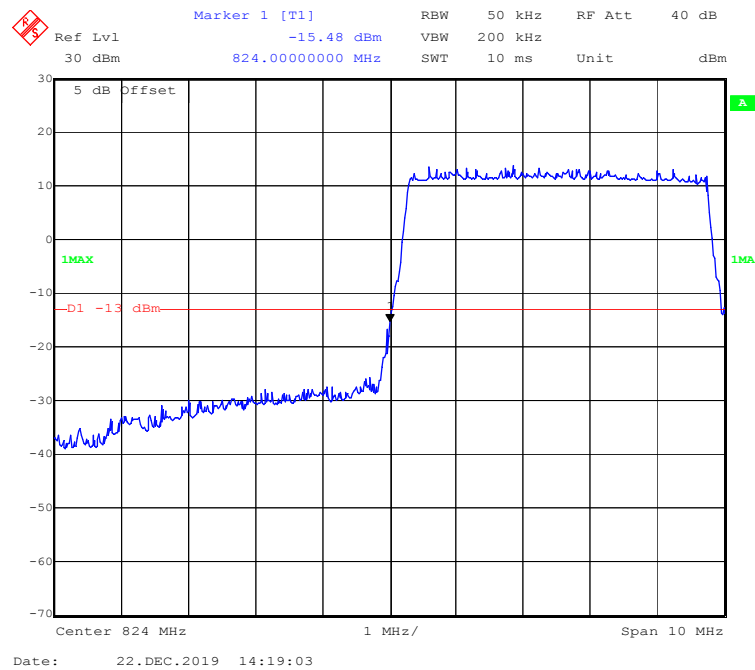
### 16-QAM (3 MHz, FULL RB) - Left Band Edge



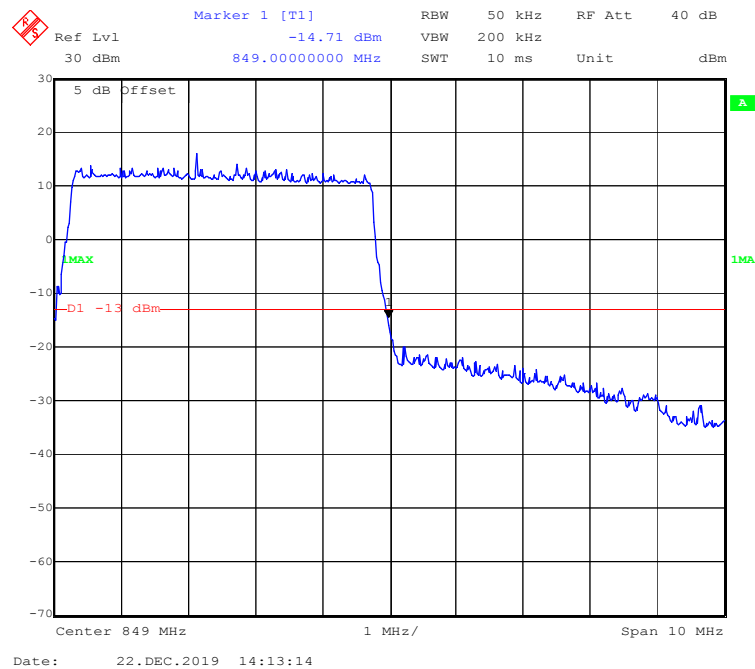
### 16-QAM (3 MHz, FULL RB) - Right Band Edge



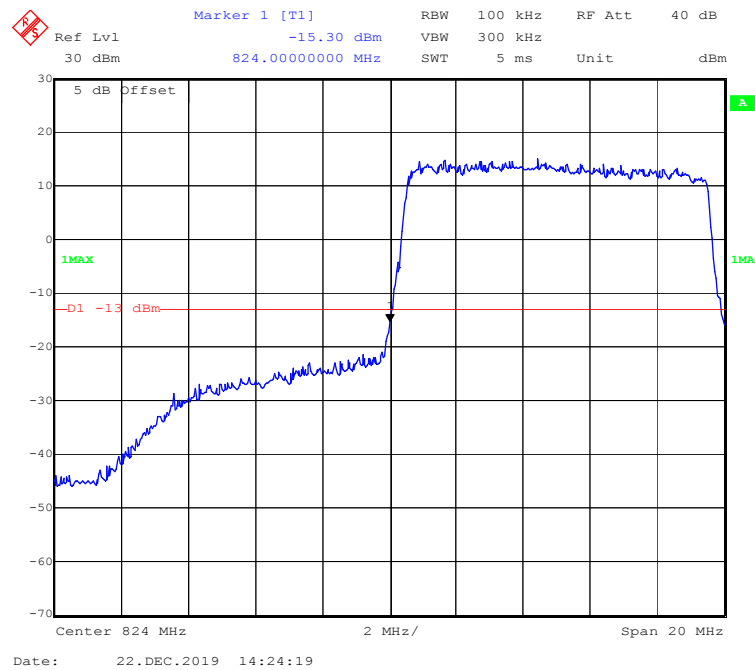
### 16-QAM (5 MHz, FULL RB) - Left Band Edge



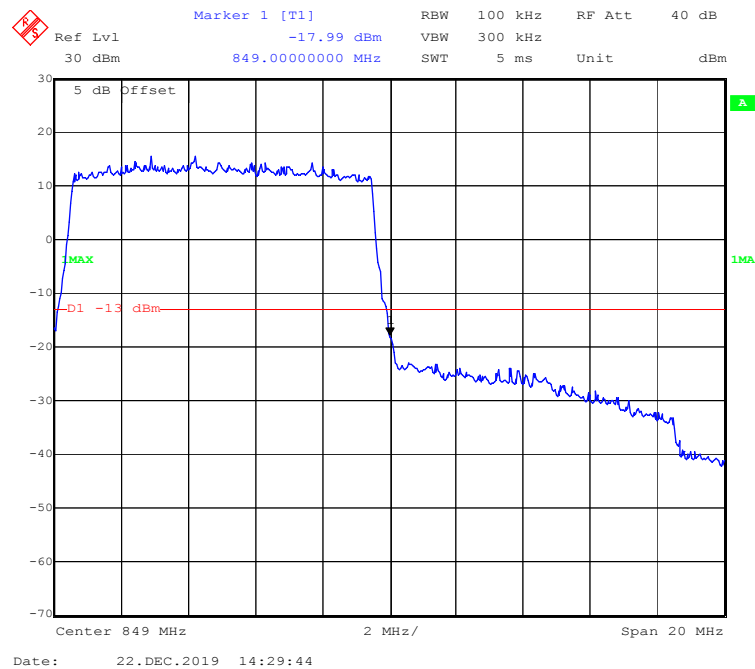
### 16-QAM (5 MHz, FULL RB) - Right Band Edge



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

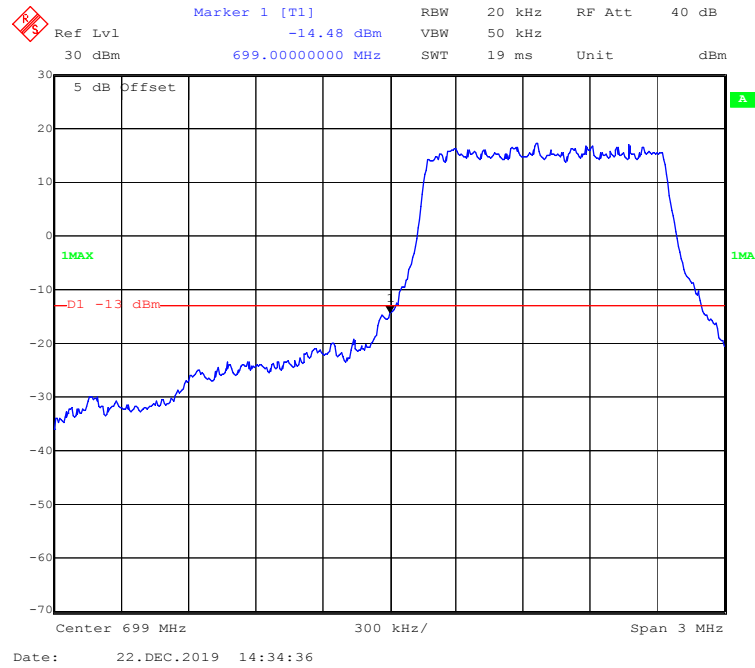


### 16-QAM (10 MHz, FULL RB) - Right Band Edge

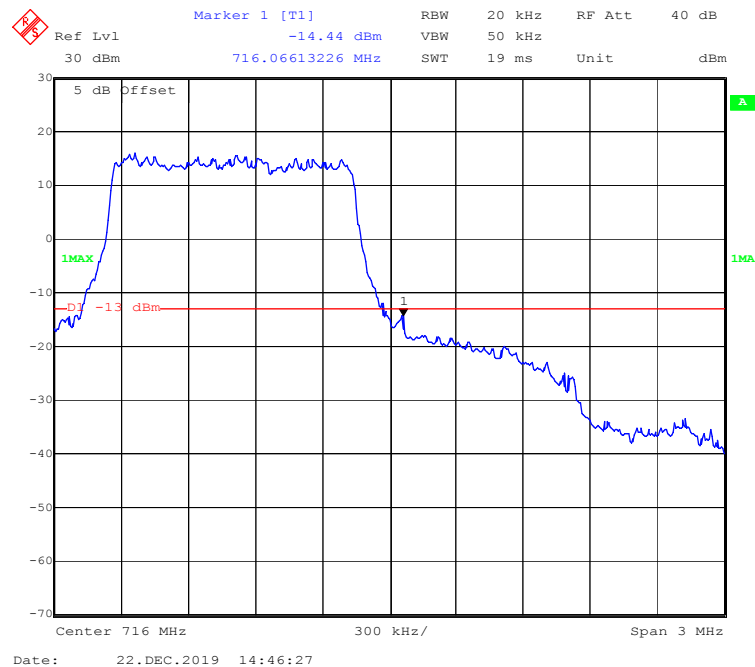


# LTE Band 12:

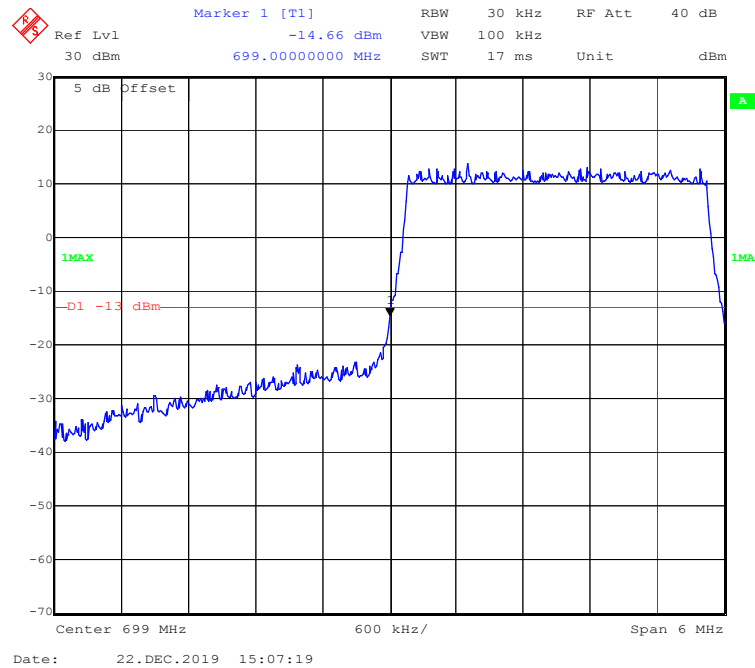
## QPSK (1.4 MHz, FULL RB) - Left Band Edge



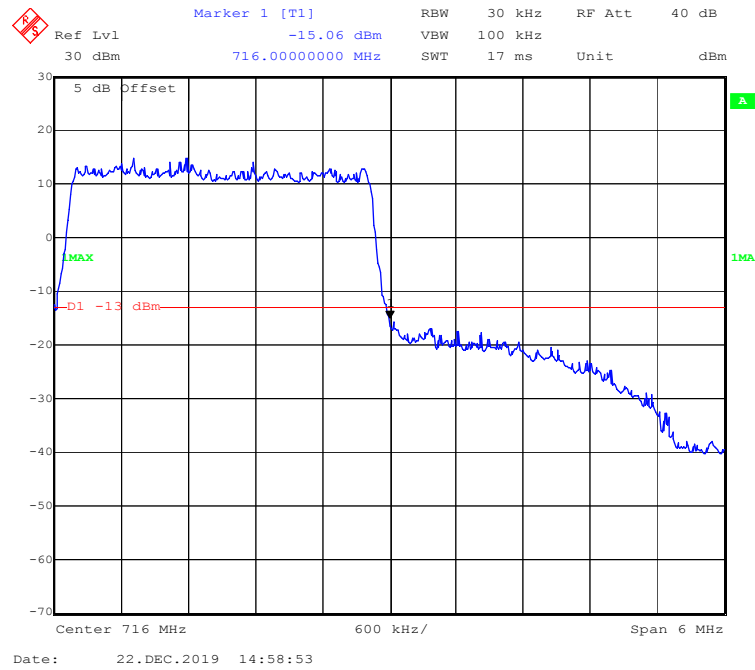
## QPSK (1.4 MHz, FULL RB) - Right Band Edge



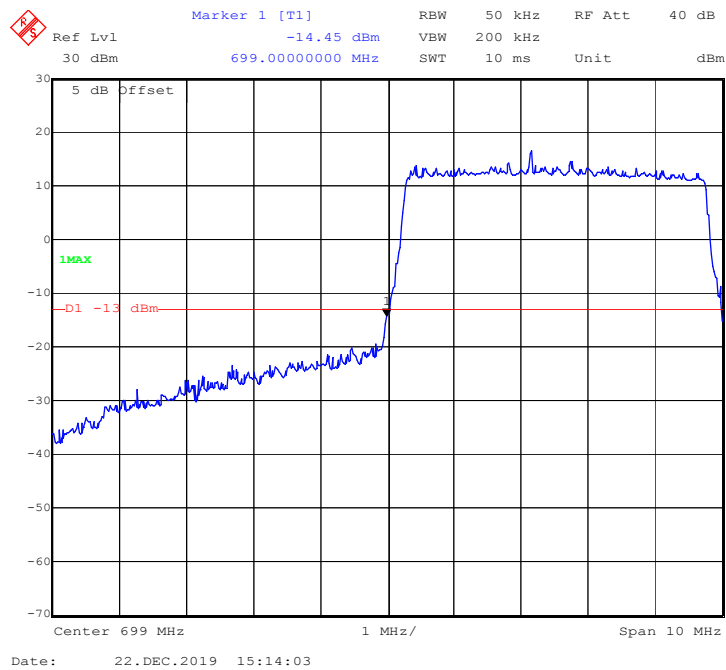
### QPSK (3 MHz, FULL RB) - Left Band Edge



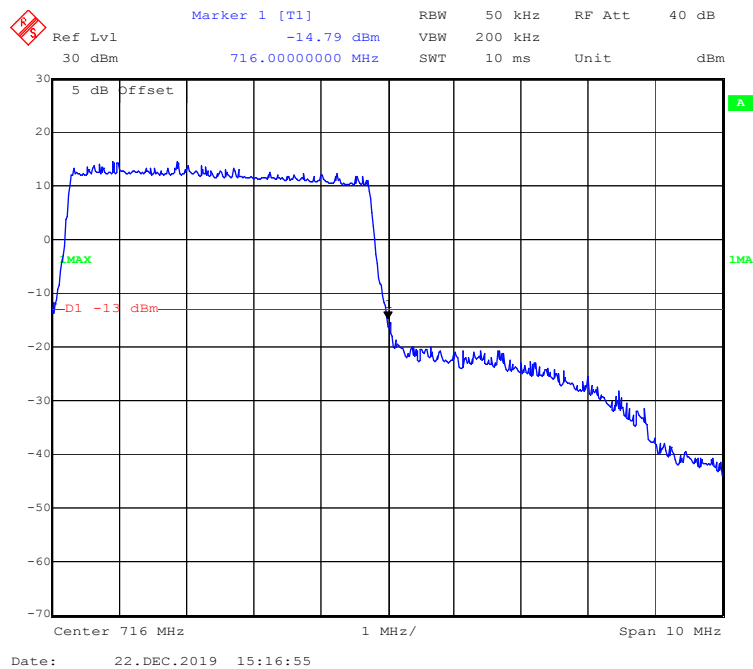
### QPSK (3 MHz, FULL RB) - Right Band Edge



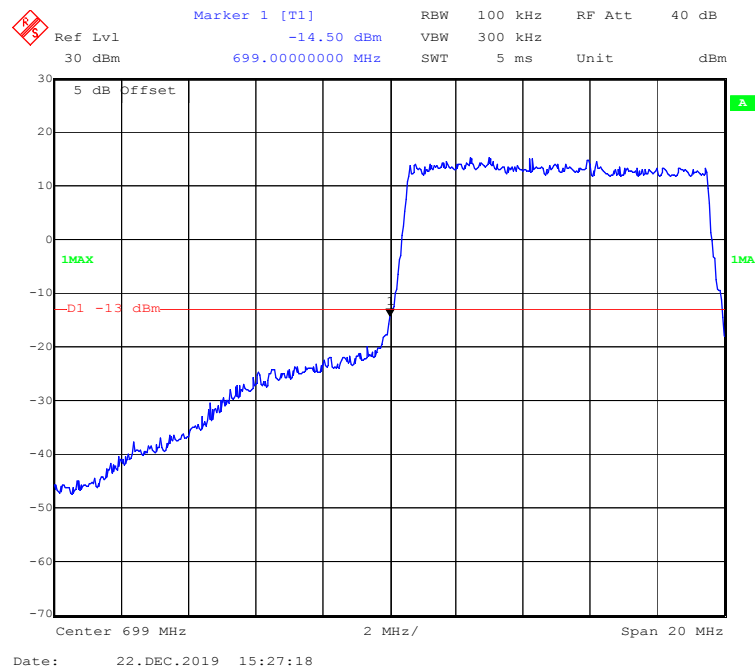
### QPSK (5 MHz, FULL RB) - Left Band Edge



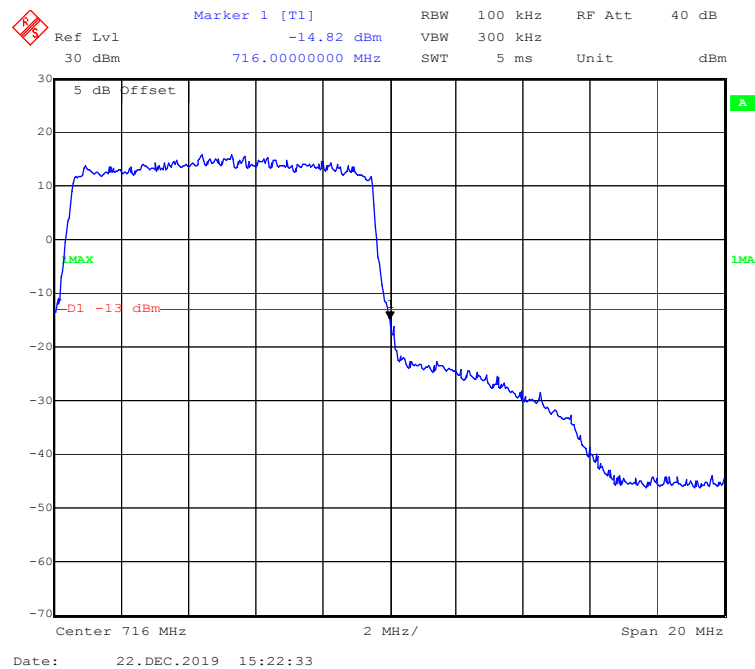
### QPSK (5 MHz, FULL RB) - Right Band Edge



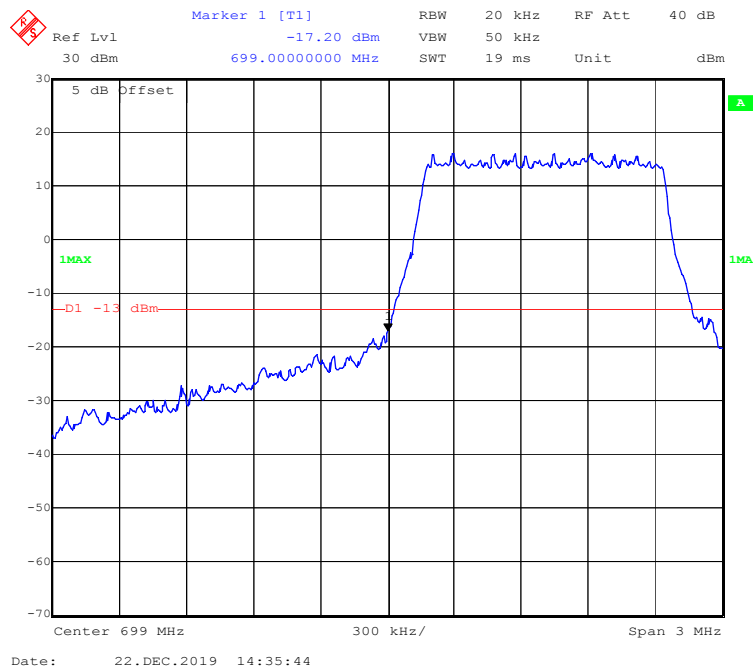
### QPSK (10 MHz, FULL RB) - Left Band Edge



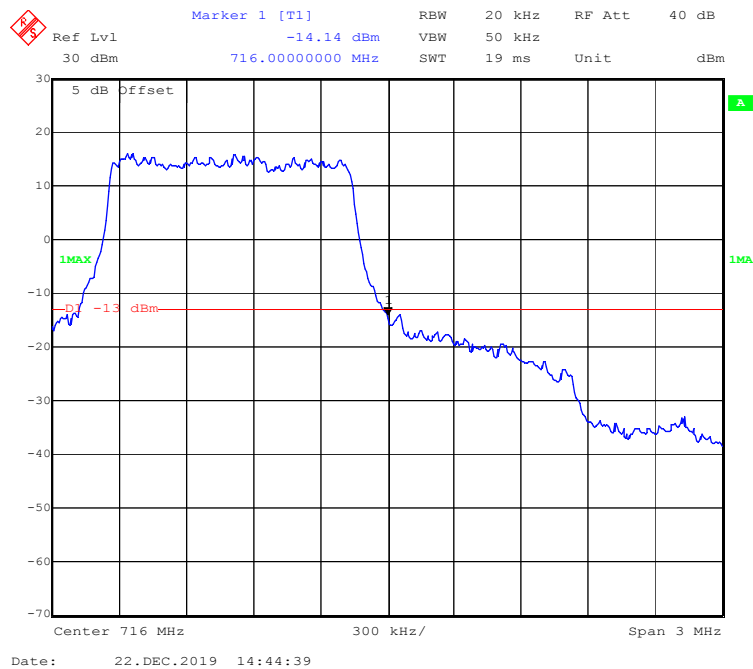
### QPSK (10 MHz, FULL RB) - Right Band Edge



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

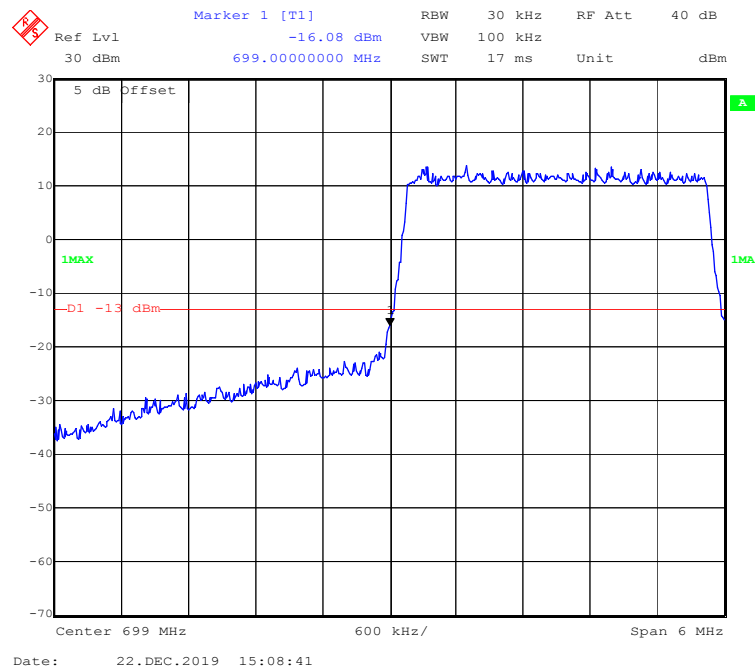


### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge

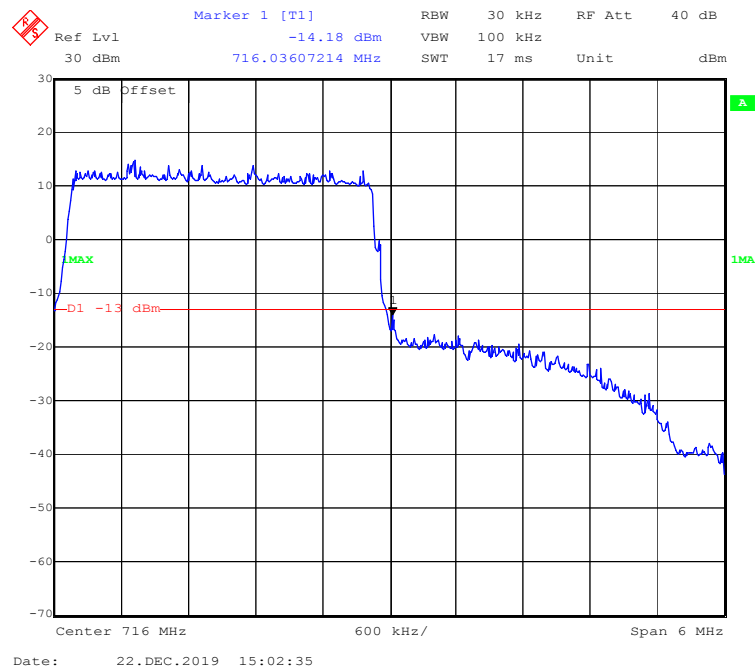




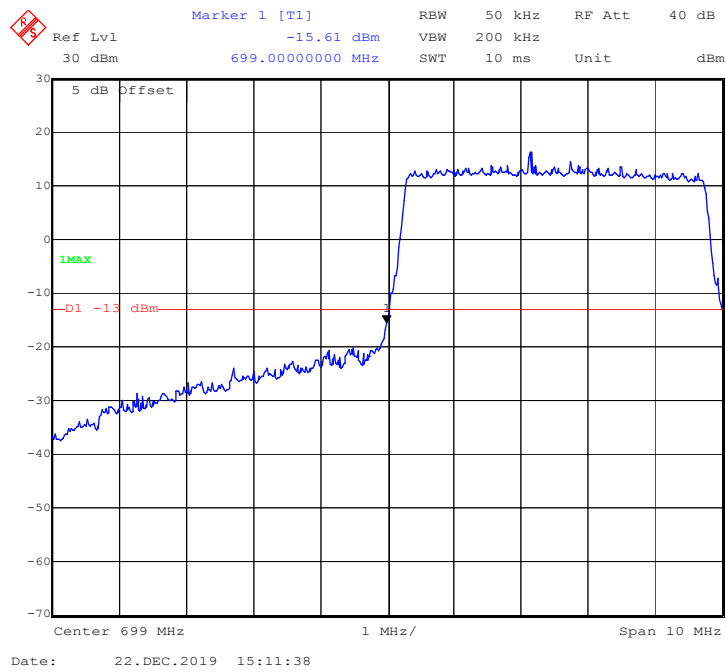
### 16-QAM (3 MHz, FULL RB) - Left Band Edge



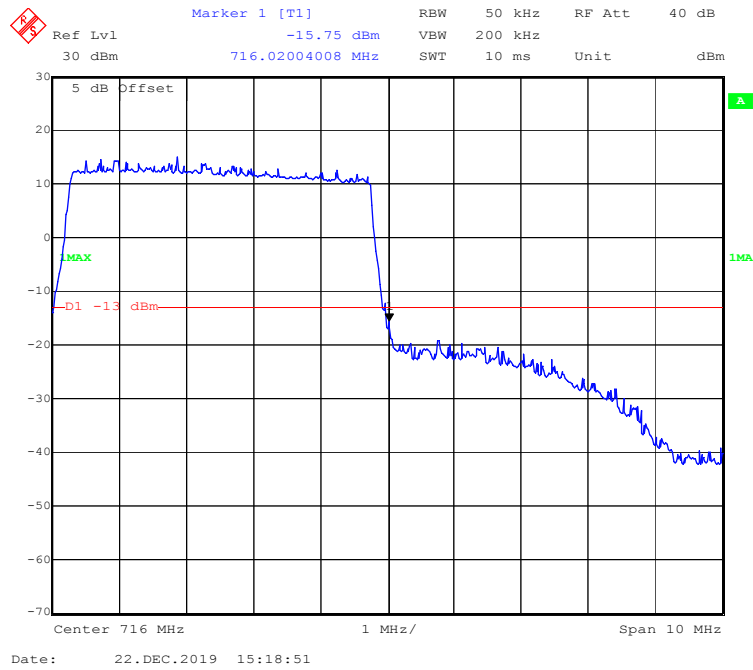
### 16-QAM (3 MHz, FULL RB) - Right Band Edge



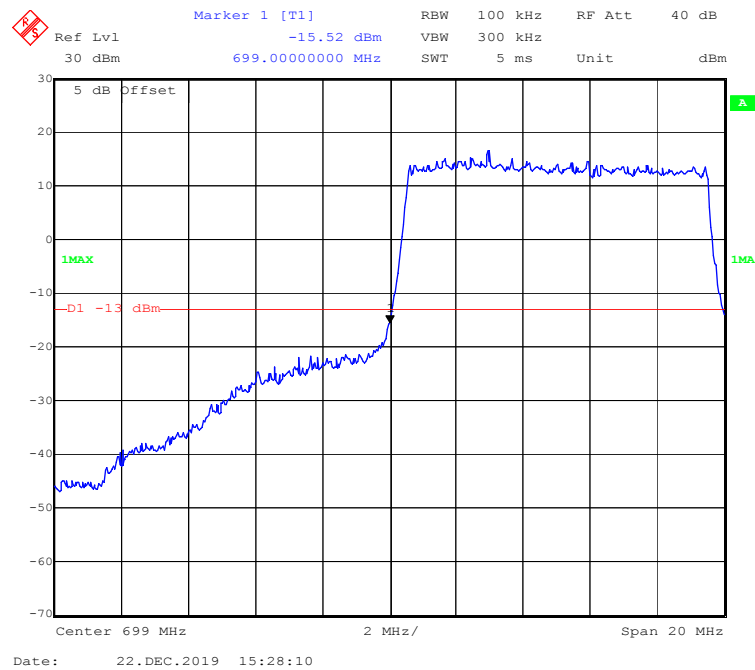
### 16-QAM (5 MHz, FULL RB) - Left Band Edge



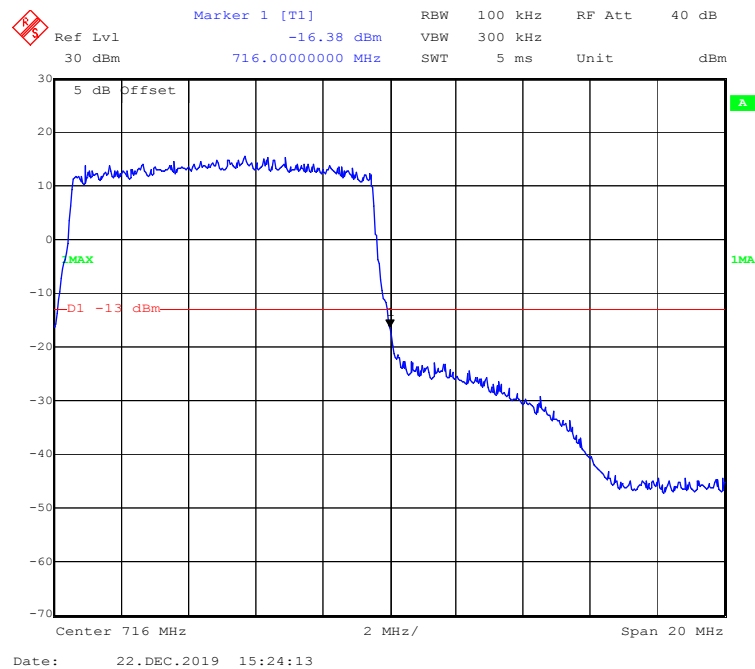
### 16-QAM (5 MHz, FULL RB) - Right Band Edge



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

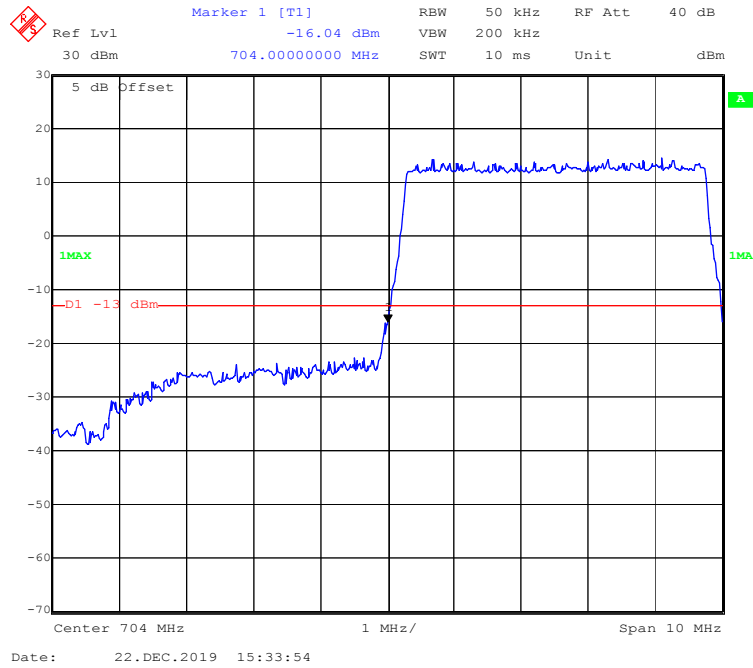


### 16-QAM (10 MHz, FULL RB) - Right Band Edge

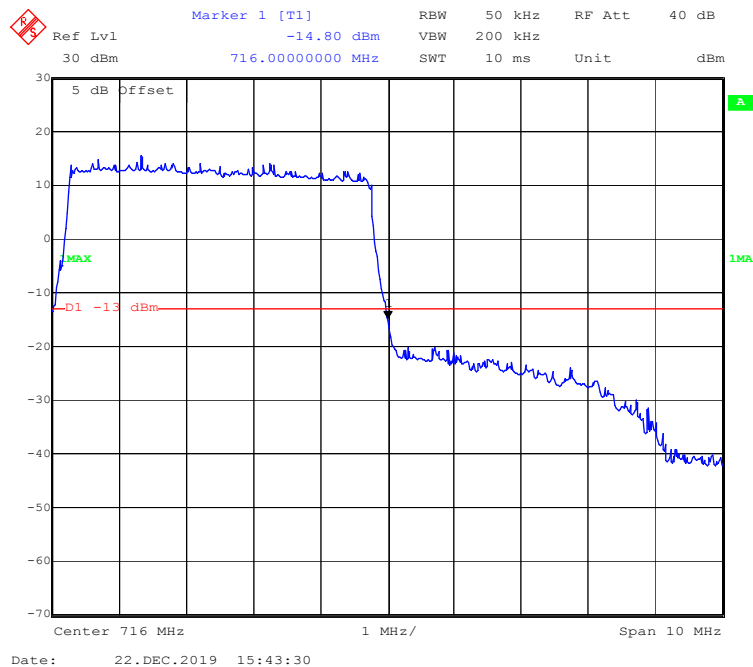


# LTE Band 17:

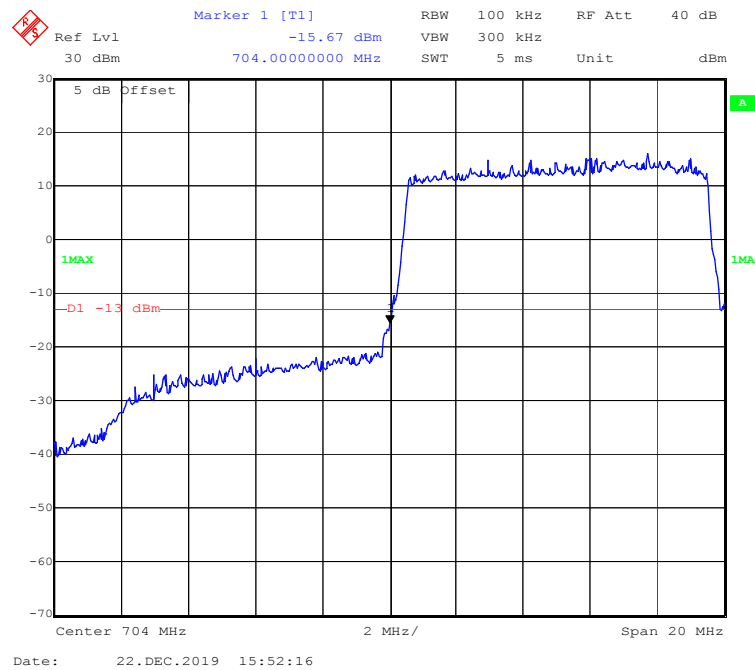
## QPSK (5 MHz, FULL RB) - Left Band Edge



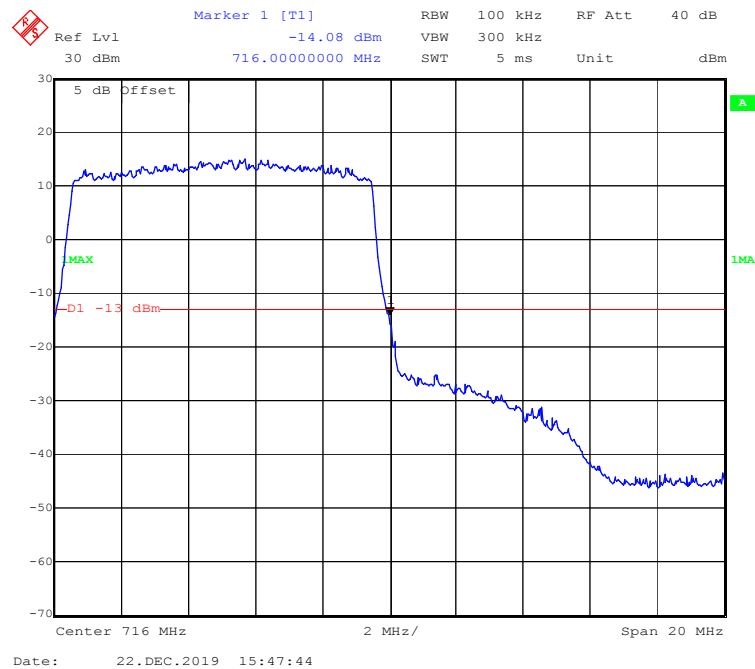
## QPSK (5 MHz, FULL RB) - Right Band Edge



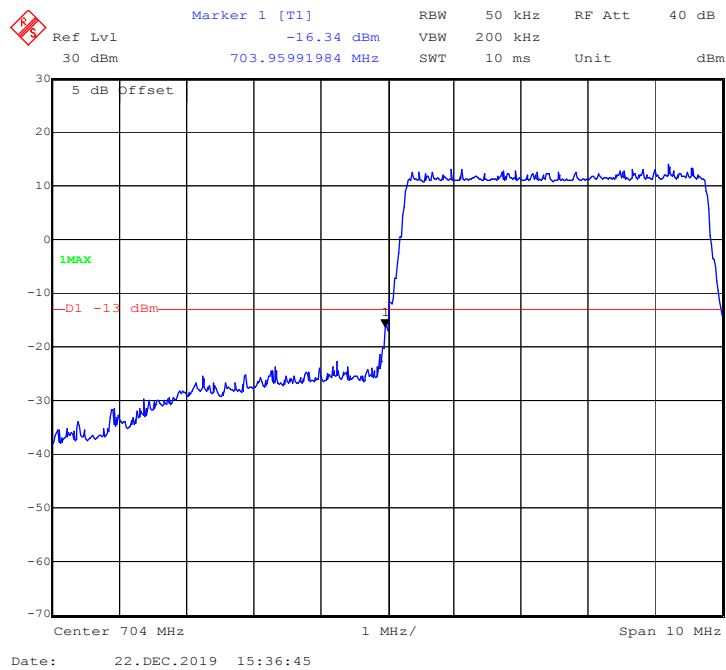
### QPSK (10 MHz, FULL RB) - Left Band Edge



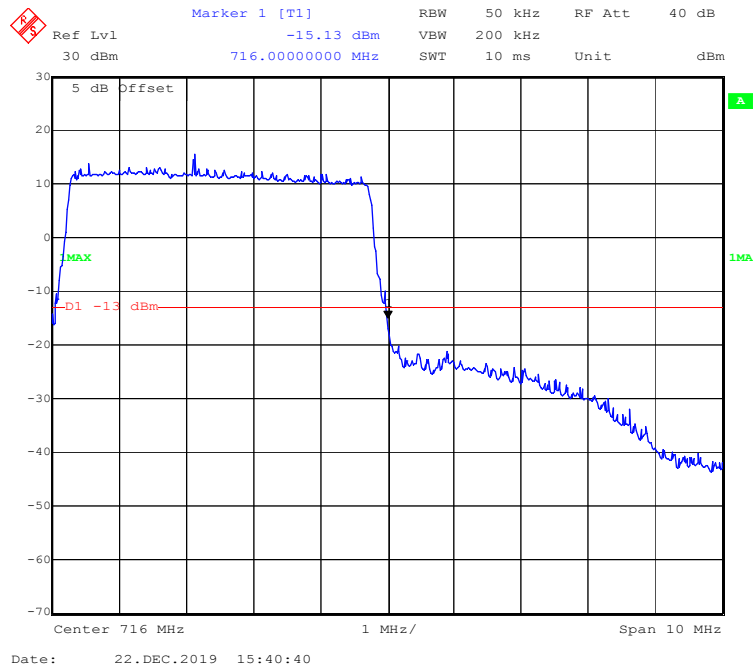
### QPSK (10 MHz, FULL RB) - Right Band Edge



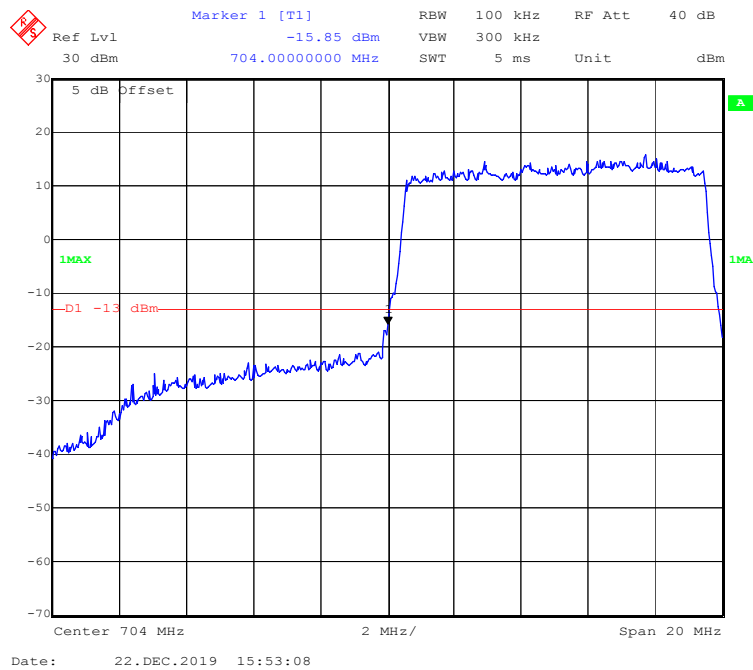
### 16-QAM (5 MHz, FULL RB) - Left Band Edge



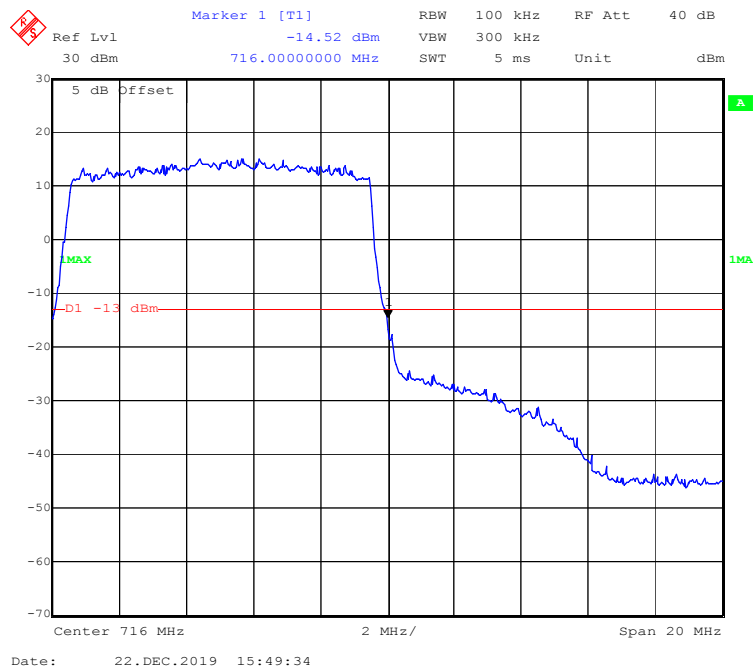
### 16-QAM (5 MHz, FULL RB) - Right Band Edge



### 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

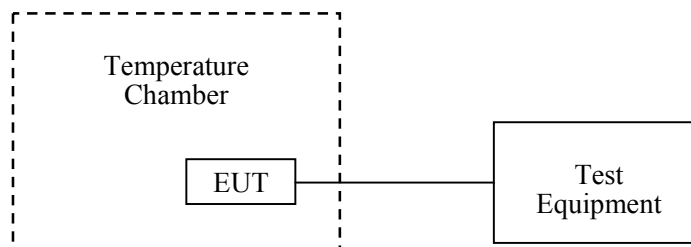
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

**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 Winnie Yang on 2019-12-26.

EUT operation mode: Transmitting

Test Result: Compliant.

**WCDMA Band V:**

Middle Channel, $f_o = 836.6$ MHz				
Temperature (°C)	Power Supplied ( $V_{DC}$ )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	12	0.0143	2.5
-20		11	0.0131	2.5
-10		11	0.0131	2.5
0		10	0.0120	2.5
10		9	0.0108	2.5
20		8	0.0096	2.5
30		8	0.0096	2.5
40		10	0.0120	2.5
50		12	0.0143	2.5
25	V min.= 12.4	8	0.0096	2.5
25	V max.= 15.2	9	0.0108	2.5

**WCDMA Band II:**

Middle Channel, $f_o=1880.0$ MHz				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	13.8	12	0.0064	Pass
-20		11	0.0059	Pass
-10		10	0.0053	Pass
0		9	0.0048	Pass
10		8	0.0043	Pass
20		7	0.0037	Pass
30		7	0.0037	Pass
40		9	0.0048	Pass
50		11	0.0059	Pass
25	V min.= 12.4	8	0.0043	Pass
25	V max.= 15.2	7	0.0037	Pass

**LTE Band 2:**

<b>f<sub>0</sub> =1880.0 MHz (QPSK)</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	13.8	12	0.0064	Pass
-20		11	0.0059	Pass
-10		10	0.0053	Pass
0		9	0.0048	Pass
10		9	0.0048	Pass
20		8	0.0043	Pass
30		7	0.0037	Pass
40		9	0.0048	Pass
50		11	0.0059	Pass
25	V min.= 12.4	9	0.0048	Pass
25	V max.= 15.2	11	0.0059	Pass

<b>f<sub>0</sub> =1880.0 MHz (16-QAM)</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	13.8	12	0.0064	Pass
-20		11	0.0059	Pass
-10		10	0.0053	Pass
0		10	0.0053	Pass
10		9	0.0048	Pass
20		8	0.0043	Pass
30		7	0.0037	Pass
40		9	0.0048	Pass
50		11	0.0059	Pass
25	V min.= 12.4	7	0.0037	Pass
25	V max.= 15.2	8	0.0043	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	13.8	1710.0473	1754.9486	1710	1755
-20		1710.0484	1754.9455	1710	1755
-10		1710.0495	1754.9480	1710	1755
0		1710.0410	1754.9417	1710	1755
10		1710.0472	1754.9495	1710	1755
20		1710.0409	1754.9428	1710	1755
30		1710.0449	1754.9441	1710	1755
40		1710.0480	1754.9429	1710	1755
50		1710.0494	1754.9444	1710	1755
25	V min.= 12.4	1710.0404	1754.9428	1710	1755
25	V max.= 15.2	1710.0435	1754.9425	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	13.8	1710.0451	1754.9405	1710	1755
-20		1710.0413	1754.9423	1710	1755
-10		1710.0444	1754.9497	1710	1755
0		1710.0490	1754.9439	1710	1755
10		1710.0454	1754.9479	1710	1755
20		1710.0471	1754.9403	1710	1755
30		1710.0436	1754.9427	1710	1755
40		1710.0478	1754.9450	1710	1755
50		1710.0419	1754.9470	1710	1755
25	V min.= 12.4	1710.0443	1754.9448	1710	1755
25	V max.= 15.2	1710.0447	1754.9409	1710	1755

**LTE Band 5:**

Middle Channel, $f_0$ =836.5 MHz (QPSK)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	12	0.0143	2.5
-20		11	0.0132	2.5
-10		10	0.0120	2.5
0		10	0.0120	2.5
10		9	0.0108	2.5
20		8	0.0096	2.5
30		8	0.0096	2.5
40		9	0.0108	2.5
50		11	0.0132	2.5
25	V min.=12.4	10	0.0120	2.5
25	V max.= 15.2	9	0.0108	2.5

Middle Channel, $f_0$ =836.5 MHz(16-QAM)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	11	0.0132	2.5
-20		11	0.0132	2.5
-10		10	0.0120	2.5
0		9	0.0108	2.5
10		8	0.0096	2.5
20		7	0.0084	2.5
30		7	0.0084	2.5
40		8	0.0096	2.5
50		10	0.0120	2.5
25	V min.= 12.4	9	0.0108	2.5
25	V max.= 15.2	10	0.0120	2.5

**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	13.8	699.0154	715.9784	699	716
-20		699.0146	715.9865	699	716
-10		699.0197	715.9762	699	716
0		699.0219	715.9744	699	716
10		699.0129	715.9701	699	716
20		699.0120	715.9718	699	716
30		699.0221	715.9701	699	716
40		699.0138	715.9762	699	716
50		699.0195	715.9722	699	716
25	V min.= 12.4	699.0195	715.9886	699	716
25	V max.= 15.2	699.0110	715.9754	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	13.8	699.0200	715.9713	699	716
-20		699.0188	715.9885	699	716
-10		699.0233	715.9745	699	716
0		699.0117	715.9801	699	716
10		699.0190	715.9769	699	716
20		699.0146	715.9742	699	716
30		699.0193	715.9868	699	716
40		699.0253	715.9716	699	716
50		699.0253	715.9780	699	716
25	V min.= 12.4	699.0150	715.9769	699	716
25	V max.= 15.2	699.0131	715.9709	699	716

**LTE Band 17:**

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	13.8	704.0121	715.9791	704	716
-20		704.0190	715.9877	704	716
-10		704.0153	715.9765	704	716
0		704.0152	715.9709	704	716
10		704.0187	715.9725	704	716
20		704.0200	715.9723	704	716
30		704.0115	715.9717	704	716
40		704.0130	715.9751	704	716
50		704.0154	715.9736	704	716
25	V min.= 12.4	704.0195	715.9816	704	716
25	V max.= 15.2	704.0180	715.9758	704	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	13.8	704.0102	715.9757	704	716
-20		704.0196	715.9826	704	716
-10		704.0163	715.9731	704	716
0		704.0179	715.9872	704	716
10		704.0154	715.9755	704	716
20		704.0197	715.9773	704	716
30		704.0160	715.9826	704	716
40		704.0133	715.9762	704	716
50		704.0145	715.9722	704	716
25	V min.= 12.4	704.0113	715.9712	704	716
25	V max.= 15.2	704.0181	715.9714	704	716

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