TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 22H

FCC PART 27

MEASUREMENT AND TEST REPORT

For

Shanghai Rising Digital Co.,Ltd.

No 318 ,Chuanda Road , Pudong New District Shanghai China

FCC ID: 2AJONSEED-10IA-01

Report Type:	**Product Type:**
Original Report	SEED-10IA-01 display screen

Test Engineer:	Hope Zhang
Report Number:	RSHA181207002-00B
Report Date:	2019-03-24
Reviewed By:	Oscar Ye RF Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Shanghai Rising Digital Co.,Ltd.
Tested Model	SEED-10IA-01
Series Model	SEED-10IA-01 (L)
Product Type	SEED-10IA-01 display screen
Dimension	274mm(L)*212mm(W)*47.9mm(H)
Power Supply	DC 12- 24V

**All measurement and test data in this report was gathered from production sample serial number: 20181207002. (Assigned by the BACL. The EUT supplied by the applicant was received on 2018-12-07)*

Objective

This type approval report is prepared on behalf of *Shanghai Rising Digital Co.,Ltd.* in accordance with Part 2, Part 22-Subpart H and Part 27 of the Federal Communication Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and Part 15.407 NII submissions with FCC ID: 2AJONSEED-10IA-01.

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 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
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.05dB
	1GHz~6GHz	4.48dB
	6GHz~18GHz	5.22dB
Occupied Bandwidth		0.5kHz
Frequency Stability		1Hz
Temperature		1.0℃
Humidity		6%

Test Facility

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

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

SYSTEM TEST CONFIGURATION

Justification

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

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

Channel List

Mode		Channel		Frequency (MHz)
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 41	5M	Low	40265	2518.5
		Middle	40740	2593.0
		High	41215	2667.5
	10M	Low	40290	2521.0
		Middle	40740	2593.0
		High	41190	2665.0
	15M	Low	40315	2523.5
		Middle	40740	2593.0
		High	41165	2662.5
	20M	Low	40340	2526.0
		Middle	40740	2593.0
		High	41140	2660.0

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

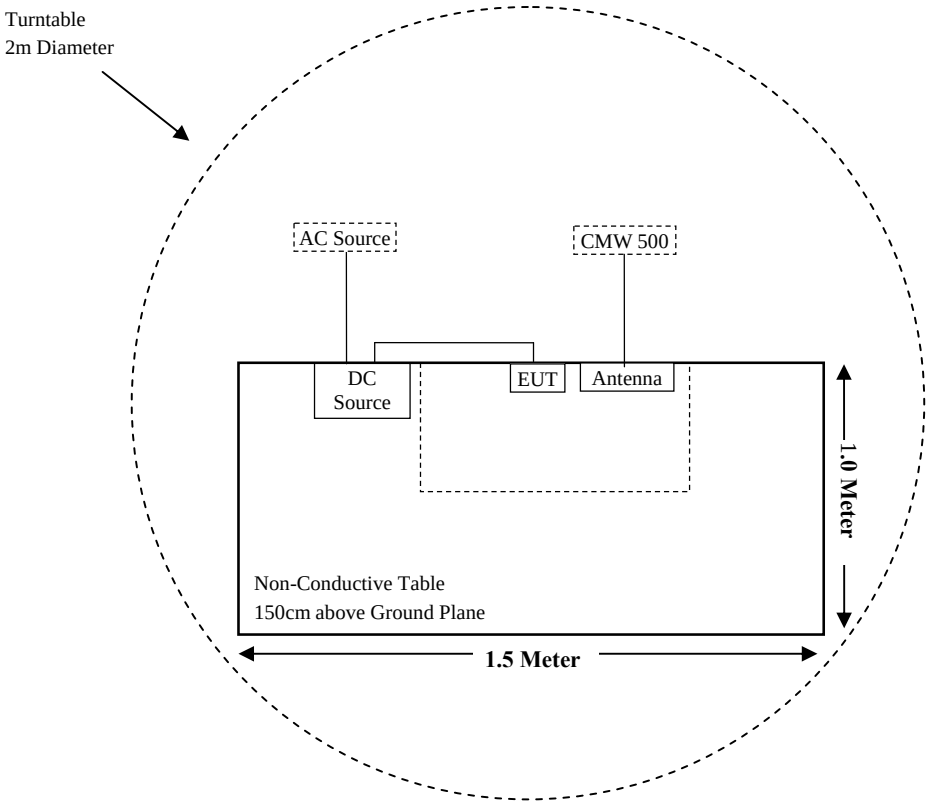
Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478
ZHAOXIN	DC Power Supply	RXN-605D	DC002
Aihuaxin Technology	Antenna	/	/

External Cable List and Details

Cable Description	Length (m)	From Port	To
DC Cable	1.0	EUT	DC Power Supply
Antenna Cable	1.8	Antenna	CMW500

Block Diagram of Test Setup

For Radiated Emissions



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310& §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliance
§2.1046; §22.913 (a); §27.50 (h)	RF Output Power	Compliance
§2.1047	Modulation Characteristics	Not Applicable
§2.1049; §22.905; §22.917; §27.53	Occupied Bandwidth	Compliance
§2.1051; §22.917 (a); §27.53 (m)	Spurious Emissions at Antenna Terminal	Compliance
§2.1053; §22.917 (a); §27.53 (m)	Spurious Radiated Emissions	Compliance
§22.917 (a); §27.53 (m)	Band Edge	Compliance
§2.1055; §22.355; §27.54;	Frequency stability	Compliance

TEST EQUIPMENT LIST

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2018-11-12	2019-11-11
R & S	Wideband Radio Communication Tester	CMW500	104478	2018-07-21	2019-07-20
BACL	Temperature & Humidity Chamber	BTH-150	30023	2018-10-10	2019-10-09
ZHAOXIN	DC Power Supply	RXN-605D	DC002	2018-10-10	2019-10-09
Rising	RF Cable	Rising01	C01	Each	/

*** 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 15.247 (i) and subpart 1.1310, 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^2)**	**Averaging Time (minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f^2)	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^2);
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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

For LTE mode:

Mode	Frequency Range (MHz)	Max Antenna Gain		Target Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
Band 5	824-849	2.70	1.86	22	158.49	20	0.0587	0.55
Band 41	2516-2670	3.70	2.34	23	199.53	20	0.0930	1.00

For Wi-Fi mode:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412-2462	2.20	1.66	17.00	50.12	20	0.0165	1.00
802.11g		2.20	1.66	16.00	39.81	20	0.0131	1.00
802.11n-HT20		2.20	1.66	15.00	31.62	20	0.0104	1.00
802.11n-HT40	2422-2452	2.20	1.66	15.00	31.62	20	0.0104	1.00

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11a	5150-5250	2.20	1.66	14.00	25.12	20	0.0083	1.00
802.11n-HT20		2.20	1.66	15.00	31.62	20	0.0104	1.00
802.11n-HT40		2.20	1.66	15.00	31.62	20	0.0104	1.00
802.11a	5725-5850	2.20	1.66	14.00	25.12	20	0.0083	1.00
802.11n-HT20		2.20	1.66	15.00	31.62	20	0.0104	1.00
802.11n-HT40		2.20	1.66	16.00	39.81	20	0.0131	1.00

Note:
(1) The target output power was declared by the Manufacturer.
(2) 2.4GWi-Fi and 5GWi-Fi cannot transmit simultaneously.
(3) Wi-Fi and LTE can transmit simultaneously, The worst condition is 802.11b of 2.4G Wi-Fi and LTE Band 5, as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0165/1.00+0.0587/0.55=0.0165+0.1067=0.1232 < 1.0$$

Result: The device meet FCC MPE at 20 cm distance.

FCC §2.1047 - MODULATION CHARACTERISTIC

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

§2.1046; § 22.913 (a); §27.50 (h) - RF OUTPUT POWER

Applicable Standards

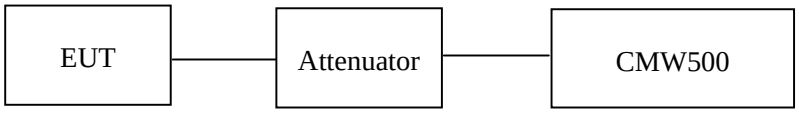
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to §27.50(h), the maximum transmitter output power not exceed 2Watts (33dBm)
The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMW500 through sufficient attenuation.



Test Data

Environmental Conditions

Temperature:	23.4℃
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Hope Zhang on 2019-01-22.

Conducted Power:

LTE Band 5

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
1.4M	QPSK	1#0	21.51	21.51	21.42	38.45
		1#3	21.64	21.54	21.48	
		1#5	21.56	21.67	21.40	
		3#0	21.69	21.66	21.54	
		3#1	21.67	21.56	21.54	
		3#3	21.47	21.40	21.47	
		6#0	21.07	21.43	21.58	
	16-QAM	1#0	21.48	21.25	21.56	
		1#3	21.59	21.49	21.48	
		1#5	21.53	21.24	21.65	
		3#0	21.51	21.44	21.17	
		3#1	21.48	21.83	21.65	
		3#3	21.67	21.23	21.50	
		6#0	21.09	21.58	21.22	
3M	QPSK	1#0	21.68	21.40	21.50	38.45
		1#7	21.47	21.62	21.62	
		1#14	21.47	21.47	21.55	
		8#0	21.56	21.35	21.49	
		8#4	21.68	21.30	21.75	
		8#7	21.61	21.18	21.49	
		15#0	21.11	21.37	21.66	
	16-QAM	1#0	21.53	21.52	21.43	
		1#7	21.48	21.39	21.70	
		1#14	21.58	21.30	21.56	
		8#0	21.07	21.58	21.70	
		8#4	21.72	21.88	21.32	
		8#7	21.42	21.36	21.35	
		15#0	21.32	21.51	21.36	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
5M	QPSK	1#0	21.15	21.13	21.34	38.45
		1#12	21.46	21.32	21.69	
		1#24	21.34	21.48	21.54	
		12#0	21.14	21.38	21.70	
		12#6	21.34	21.86	21.43	
		12#11	21.32	21.29	21.35	
		25#0	21.49	21.48	21.41	
	16-QAM	1#0	21.68	21.56	21.47	
		1#12	21.89	21.64	21.63	
		1#24	21.63	21.46	21.37	
		12#0	21.11	21.22	21.91	
		12#6	21.26	21.34	21.75	
		12#11	21.54	21.43	21.46	
		25#0	21.54	21.67	21.71	
10M	QPSK	1#0	21.33	21.44	21.71	38.45
		1#24	21.41	21.16	21.27	
		1#49	21.70	21.62	21.04	
		25#0	21.92	21.68	21.55	
		25#12	21.60	21.08	21.44	
		25#24	21.87	21.47	21.46	
		50#0	21.27	21.47	21.51	
	16-QAM	1#0	21.60	21.55	21.34	
		1#24	21.52	21.70	21.35	
		1#49	21.17	21.36	21.45	
		25#0	21.08	21.24	21.58	
		25#12	21.26	21.17	21.31	
		25#24	21.89	21.28	21.66	
		50#0	21.50	21.66	21.44	

LTE Band 41

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
5M	QPSK	1#0	21.84	21.63	22.04	33
		1#12	21.59	21.48	21.66	
		1#24	21.80	21.75	21.91	
		12#0	21.54	21.62	21.86	
		12#6	21.81	21.66	21.57	
		12#11	21.79	21.70	21.93	
		25#0	21.87	21.76	21.84	
	16-QAM	1#0	21.93	21.89	21.54	
		1#12	22.00	21.84	22.00	
		1#24	21.33	21.60	21.76	
		12#0	21.68	21.73	21.43	
		12#6	21.37	21.74	21.34	
		12#11	21.75	21.73	21.85	
		25#0	21.86	21.25	21.73	
10M	QPSK	1#0	21.69	21.56	21.64	33
		1#24	21.89	21.38	21.31	
		1#49	21.98	21.56	21.68	
		25#0	21.65	21.68	21.50	
		25#12	21.42	21.96	21.81	
		25#24	21.27	21.59	21.74	
		50#0	21.57	21.51	21.74	
	16-QAM	1#0	21.43	21.89	21.58	
		1#24	21.54	21.51	22.02	
		1#49	21.70	21.67	21.58	
		25#0	21.69	21.57	21.95	
		25#12	21.61	21.49	21.84	
		25#24	21.62	21.63	21.70	
		50#0	22.05	21.74	21.70	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
15M	QPSK	1#0	21.67	21.61	21.71	33
		1#37	21.56	22.02	22.14	
		1#74	21.92	21.89	21.84	
		36#0	21.85	21.82	21.73	
		36#17	21.48	21.63	21.86	
		36#35	21.90	21.75	21.82	
		75#0	21.72	22.01	21.43	
	16-QAM	1#0	21.85	21.96	21.88	
		1#37	21.97	21.46	21.81	
		1#74	21.67	21.82	21.48	
		36#0	21.52	21.68	21.77	
		36#17	21.59	21.71	21.39	
		36#35	21.56	21.52	21.65	
		75#0	21.60	21.79	21.89	
20M	QPSK	1#0	22.14	21.69	21.72	33
		1#49	21.81	21.60	21.68	
		1#99	21.69	21.87	21.38	
		50#0	21.39	21.89	21.70	
		50#24	21.97	21.59	21.58	
		50#49	21.70	21.62	22.00	
		100#0	21.51	21.40	21.92	
	16-QAM	1#0	21.75	21.88	21.36	
		1#49	22.07	21.70	22.02	
		1#99	21.26	21.93	21.79	
		50#0	21.93	21.36	21.73	
		50#24	21.87	21.45	21.68	
		50#49	21.98	21.74	21.56	
		100#0	21.70	21.98	21.82	

Radiated Power:

ERP:

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)			
QPSK 1.4M BW Middle Channel								
836.5	H	86.7	23.13	0.63	-1.14	21.36	38.45	17.09
836.5	V	90.34	23.31	0.63	-1.14	21.54	38.45	16.91
16-QAM 1.4M BW Middle Channel								
836.5	H	86.7	23.13	0.63	-1.14	21.36	38.45	17.09
836.5	V	90.35	23.32	0.63	-1.14	21.55	38.45	16.9
QPSK 3M BW Middle Channel								
836.5	H	86.97	23.4	0.63	-1.14	21.63	38.45	16.82
836.5	V	90.15	23.12	0.63	-1.14	21.35	38.45	17.1
16-QAM 3M BW Middle Channel								
836.5	H	86.9	23.33	0.63	-1.14	21.56	38.45	16.89
836.5	V	90.43	23.4	0.63	-1.14	21.63	38.45	16.82
QPSK 5M BW Middle Channel								
836.5	H	87	23.43	0.63	-1.14	21.66	38.45	16.79
836.5	V	90.25	23.22	0.63	-1.14	21.45	38.45	17
16-QAM 5M BW Middle Channel								
836.5	H	86.9	23.33	0.63	-1.14	21.56	38.45	16.89
836.5	V	90.43	23.4	0.63	-1.14	21.63	38.45	16.82
QPSK 10M BW Middle Channel								
836.5	H	86.86	23.29	0.63	-1.14	21.52	38.45	16.93
836.5	V	90.25	23.22	0.63	-1.14	21.45	38.45	17
16-QAM 10M BW Middle Channel								
836.5	H	86.8	23.23	0.63	-1.14	21.46	38.45	16.99
836.5	V	90.36	23.33	0.63	-1.14	21.56	38.45	16.89

LTE Band 41

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 (dBi)			
QPSK 5M BW Middle Channel								
2593	H	83.88	11.91	0.89	10.1	21.12	33	11.88
2593	V	83.86	11.9	0.89	10.1	21.11	33	11.89
16-QAM 5M BW Middle Channel								
2593	H	83.79	11.82	0.89	10.1	21.03	33	11.97
2593	V	83.81	11.85	0.89	10.1	21.06	33	11.94
QPSK 10M BW Middle Channel								
2593	H	83.92	11.95	0.89	10.1	21.16	33	11.84
2593	V	83.96	12	0.89	10.1	21.21	33	11.79
16-QAM 10M BW Middle Channel								
2593	H	83.88	11.91	0.89	10.1	21.12	33	11.88
2593	V	83.94	11.98	0.89	10.1	21.19	33	11.81
QPSK 15M BW Middle Channel								
2593	H	83.82	11.85	0.89	10.1	21.06	33	11.94
2593	V	83.83	11.87	0.89	10.1	21.08	33	11.92
16-QAM 15M BW Middle Channel								
2593	H	84.12	12.15	0.89	10.1	21.36	33	11.64
2593	V	83.96	12	0.89	10.1	21.21	33	11.79
QPSK 20M BW Middle Channel								
2593	H	84.04	12.07	0.89	10.1	21.28	33	11.72
2593	V	83.88	11.92	0.89	10.1	21.13	33	11.87
16-QAM 20M BW Middle Channel								
2593	H	83.97	12	0.89	10.1	21.21	33	11.79
2593	V	83.78	11.82	0.89	10.1	21.03	33	11.97

Note:
All above data were tested without amplifier.
Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
Margin (dB) = Limit (dBm) - Absolute Level (dBm)

FCC §2.1049 & §22.917, §22.905& §27.53 - OCCUPIED BANDWIDTH

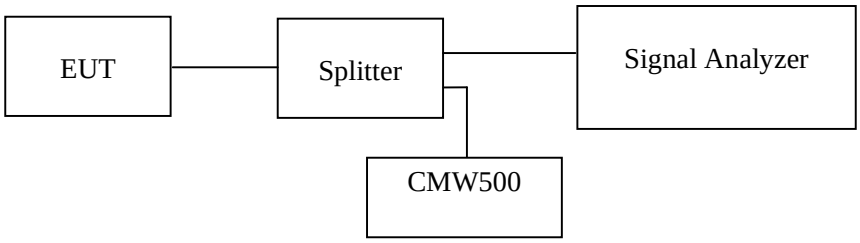
Applicable Standards

FCC 47 §2.1049, §22.917, §22.905 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 1% to 5% of the anticipated emission bandwidth and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0kPa

The testing was performed by Hope Zhang on 2019-01-21.

EUT operation mode: Transmitting

Test Result: Compliance.

LTE Band 5:

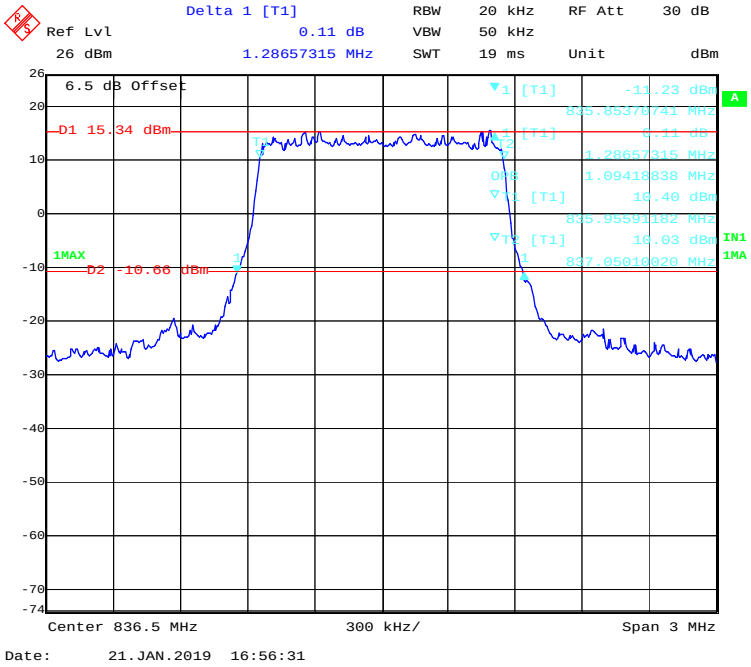
Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
QPSK	1.4M	Middle	1.29	1.09
	3M		2.96	2.71
	5M		4.93	4.49
	10M		9.86	8.98
16-QAM	1.4M	Middle	1.27	1.11
	3M		2.96	2.71
	5M		4.95	4.51
	10M		9.86	8.98

LTE Band 41:

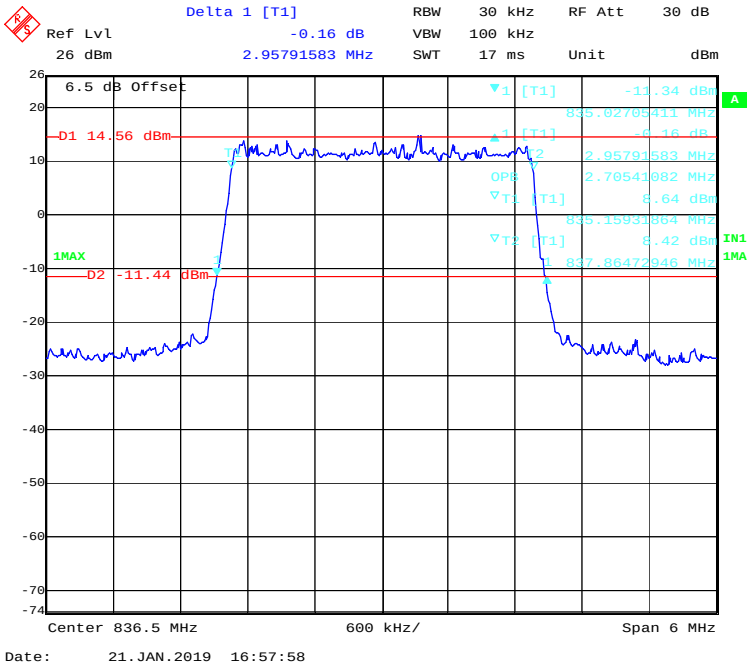
Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
QPSK	5M	Middle	4.93	4.47
	10M		10.10	8.98
	15M		16.35	13.47
	20M		19.08	17.96
16-QAM	5M	Middle	4.93	4.47
	10M		10.02	8.98
	15M		15.99	13.47
	20M		19.08	17.96

LTE Band 5:

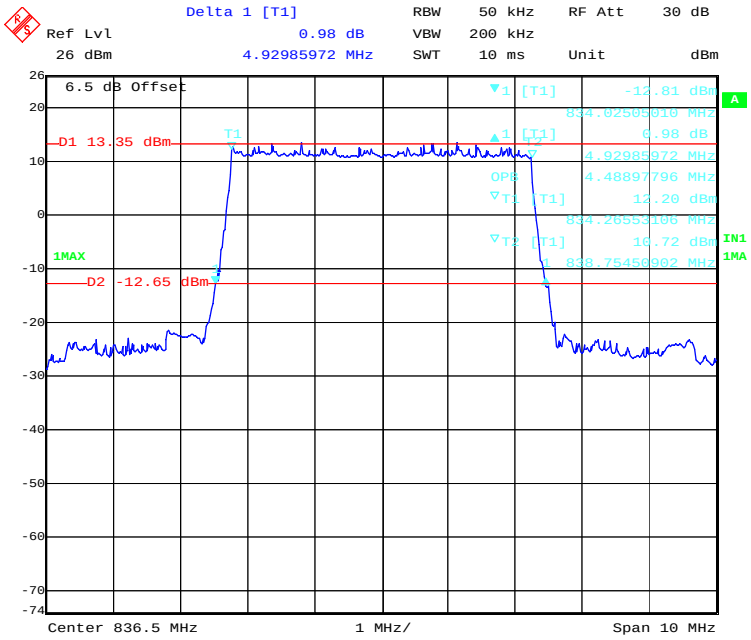
QPSK (1.4 MHz) - Middle channel



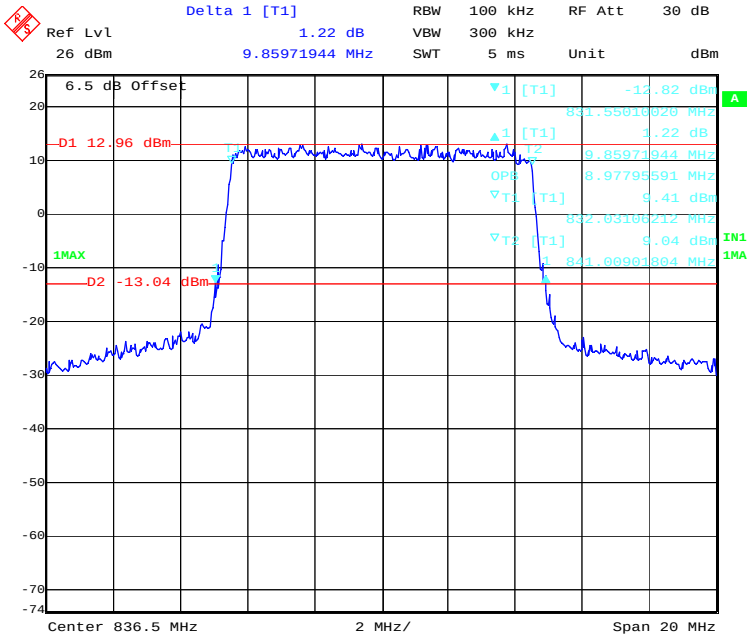
QPSK (3 MHz) - Middle channel



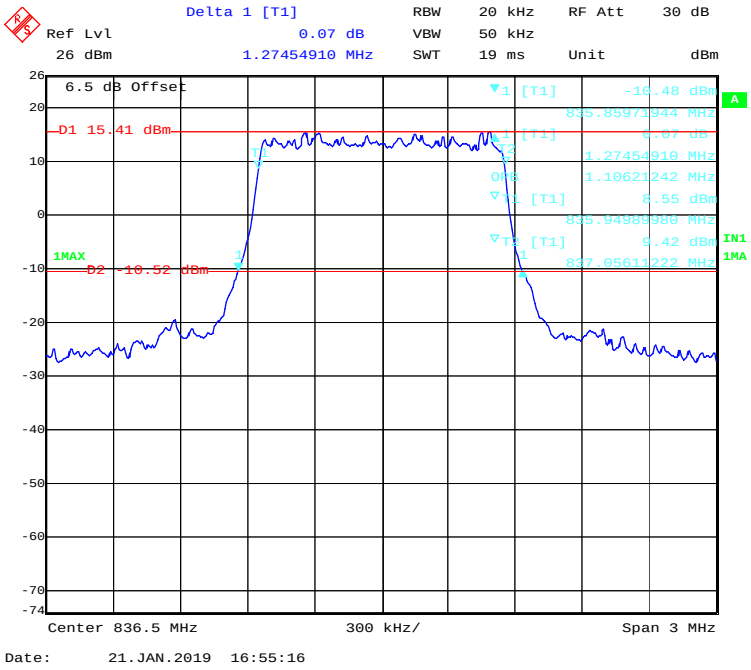
QPSK (5MHz) - Middle channel



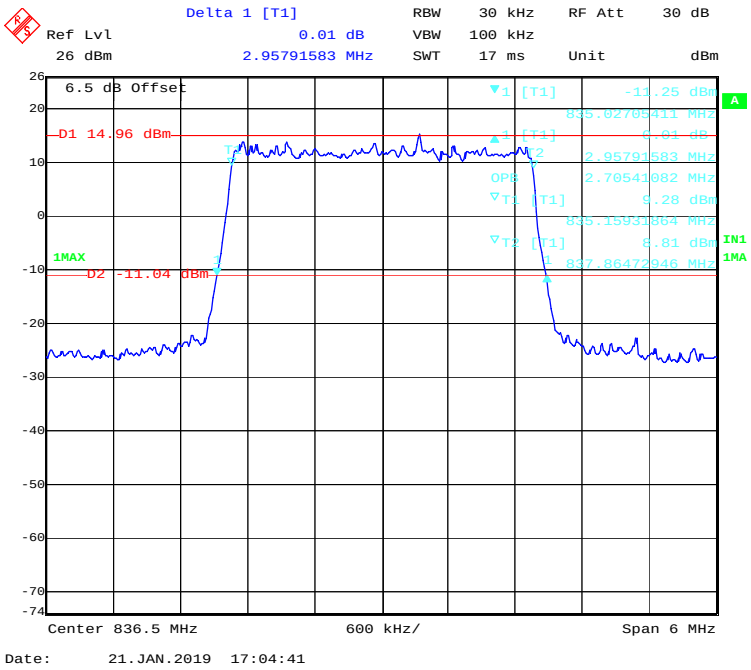
QPSK (10 MHz) - Middle channel



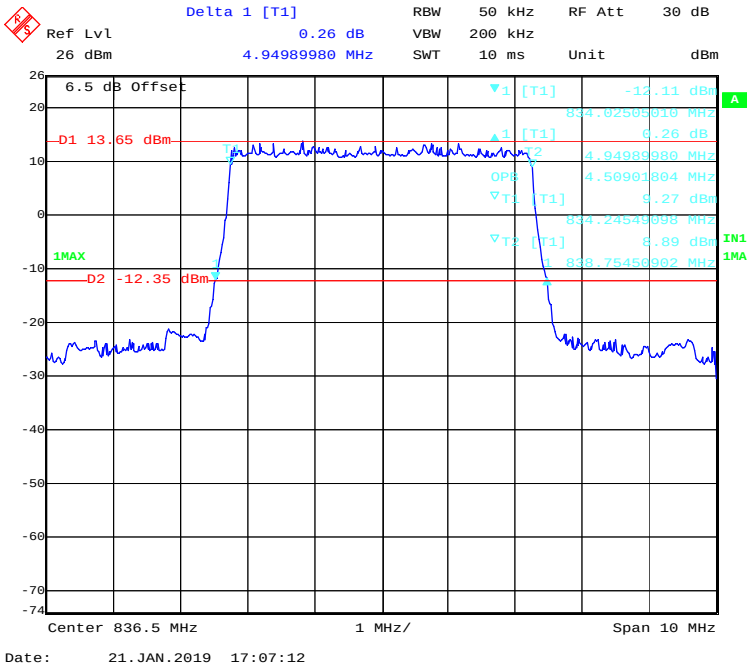
16-QAM (1.4 MHz) - Middle channel



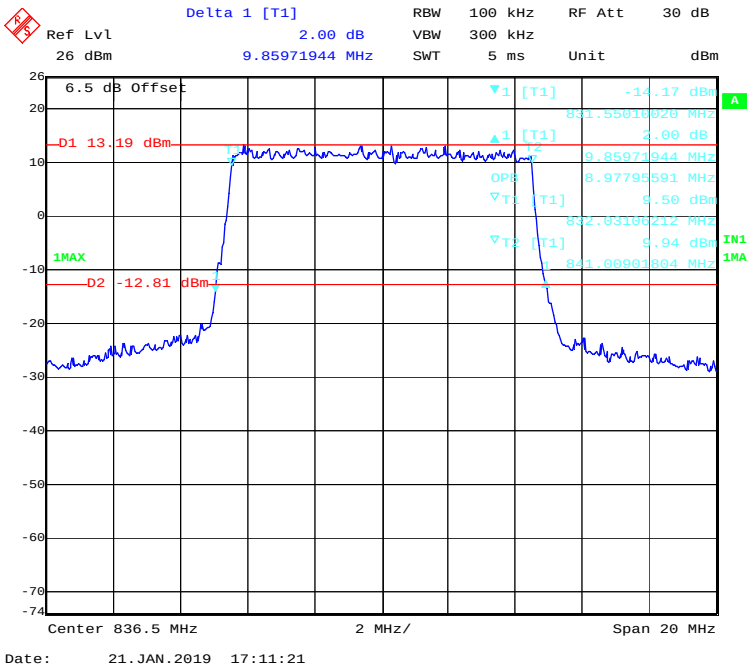
16-QAM (3 MHz) - Middle channel



16-QAM (5 MHz) - Middle channel

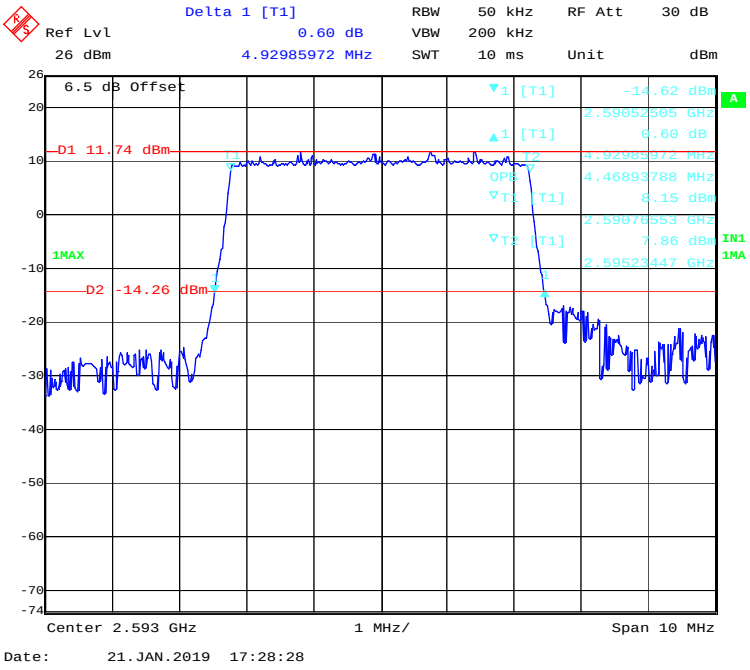


16-QAM (10 MHz) - Middle channel

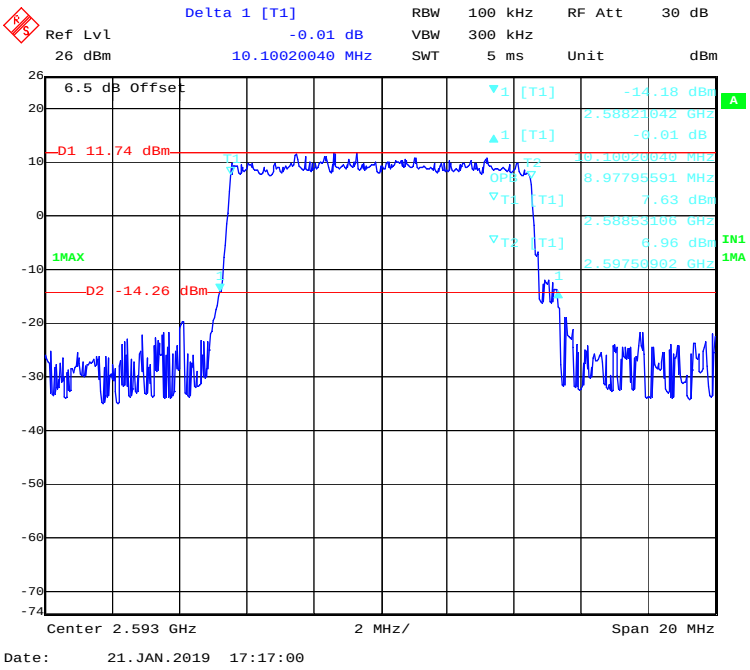


LTE Band 41

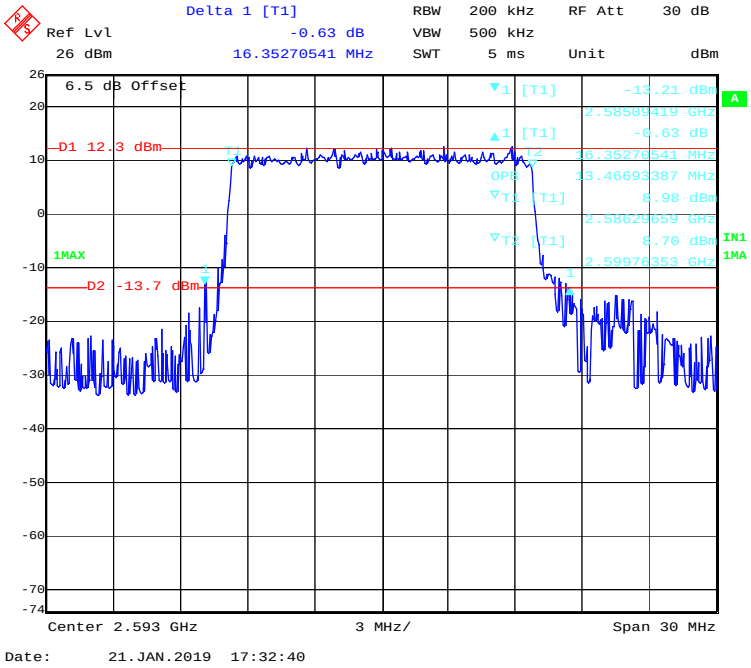
QPSK (5MHz) - Middle channel



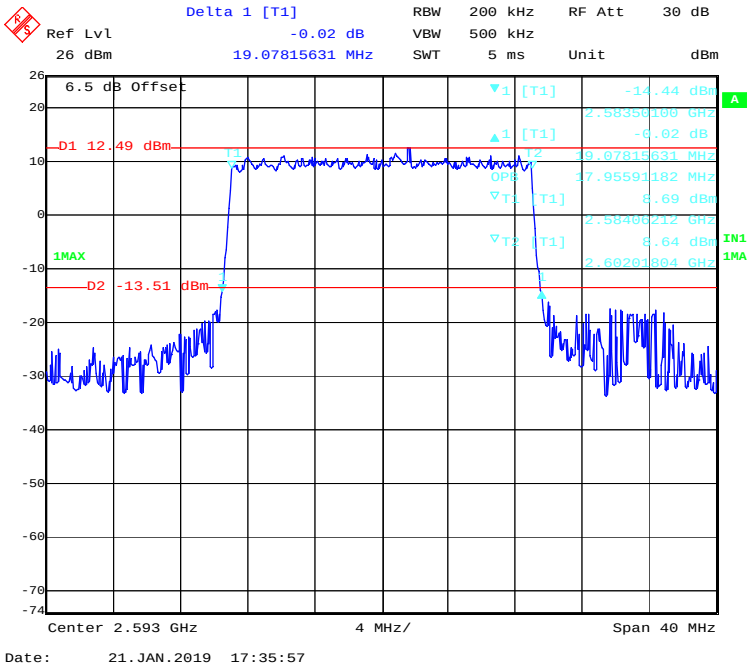
QPSK (10 MHz) - Middle channel



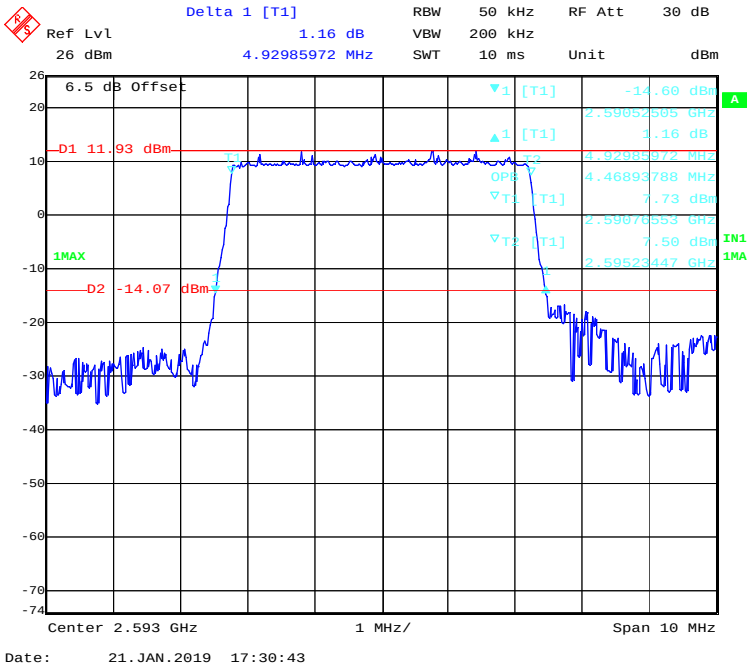
QPSK (15 MHz) - Middle channel



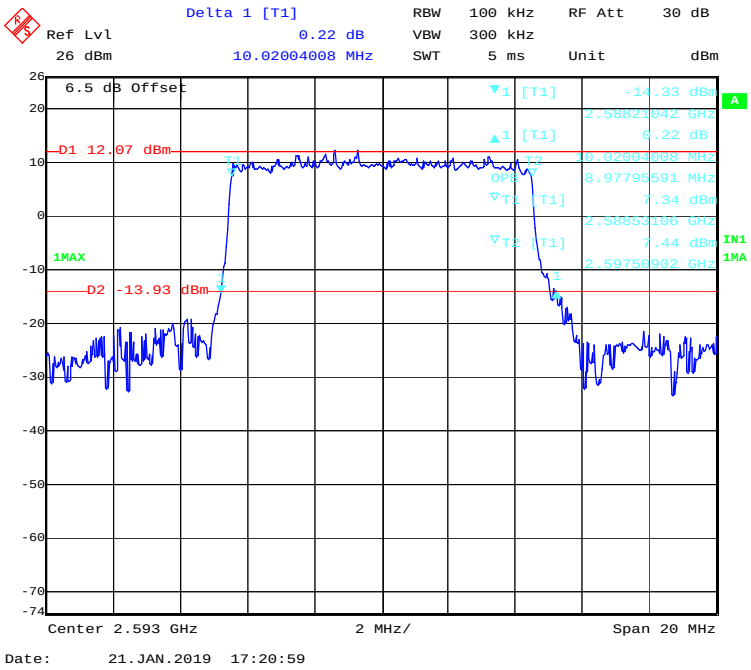
QPSK (20 MHz) - Middle channel



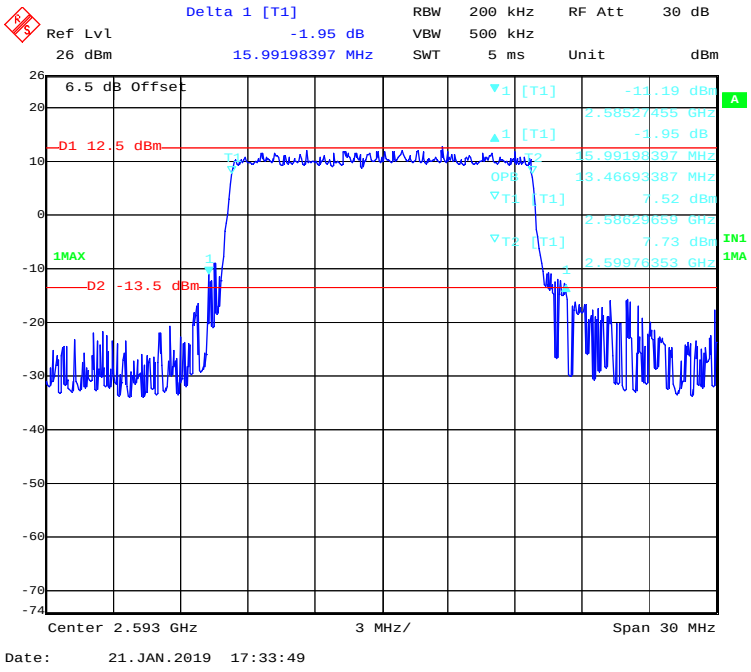
16-QAM (5 MHz) - Middle channel



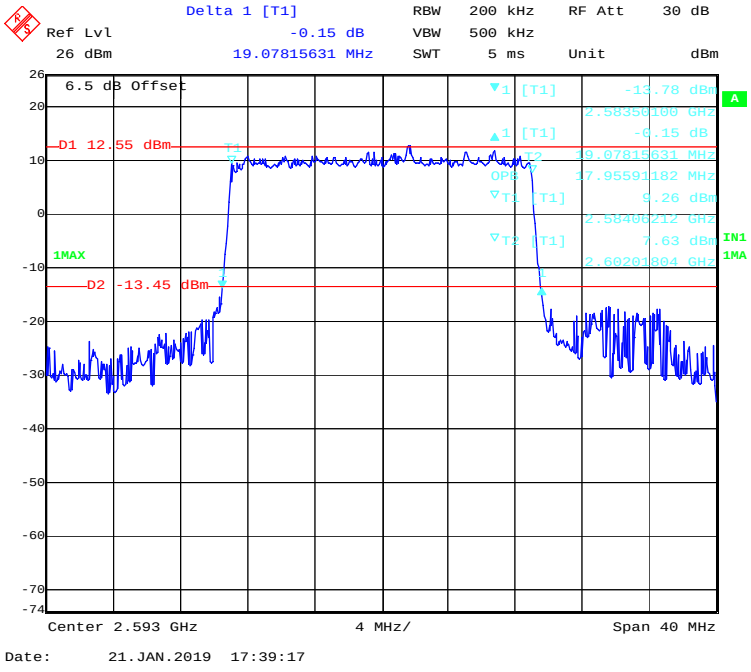
16-QAM (10 MHz) - Middle channel



16-QAM (15 MHz) - Middle channel



16-QAM (20 MHz) - Middle channel



§ 2.1051 & § 22.917 (a) & §27.53 (m) SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

FCC §2.1051, §22.917(a) and §27.53(m).

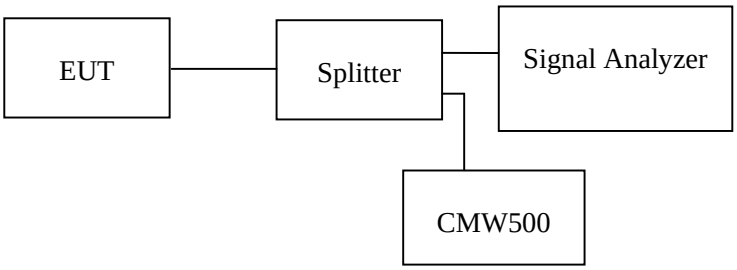
The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

According to §22.917(a),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.

According to §27.53(m),for mobile digital stations, any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 55 + 10 log(P) dB.

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 100kHz for below 1GHz & 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

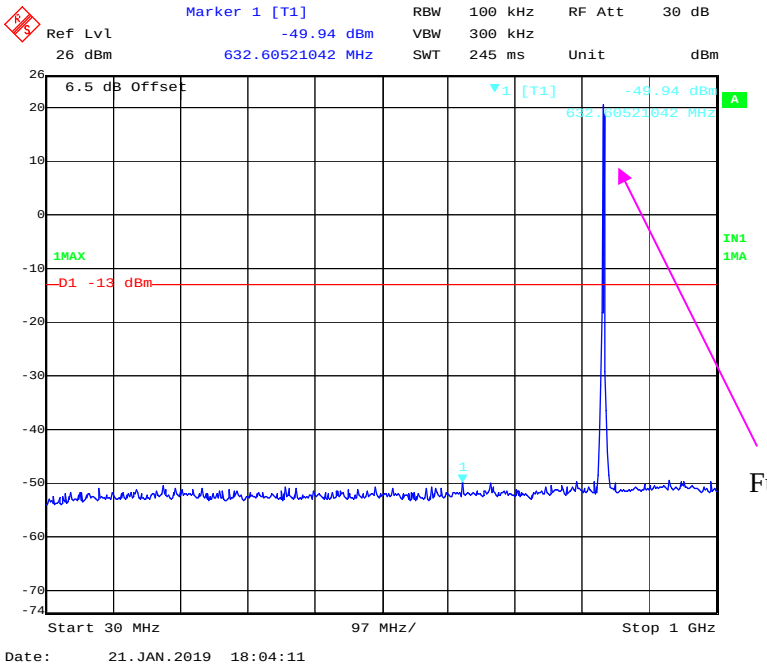
Temperature:	23.2 ℃~23.5 ℃
Relative Humidity:	50 %~52 %
ATM Pressure:	101.1kPa~101.2kPa

The testing was performed by Hope Zhang on 2019-01-21&2019-03-24

EUT operation mode: Transmitting

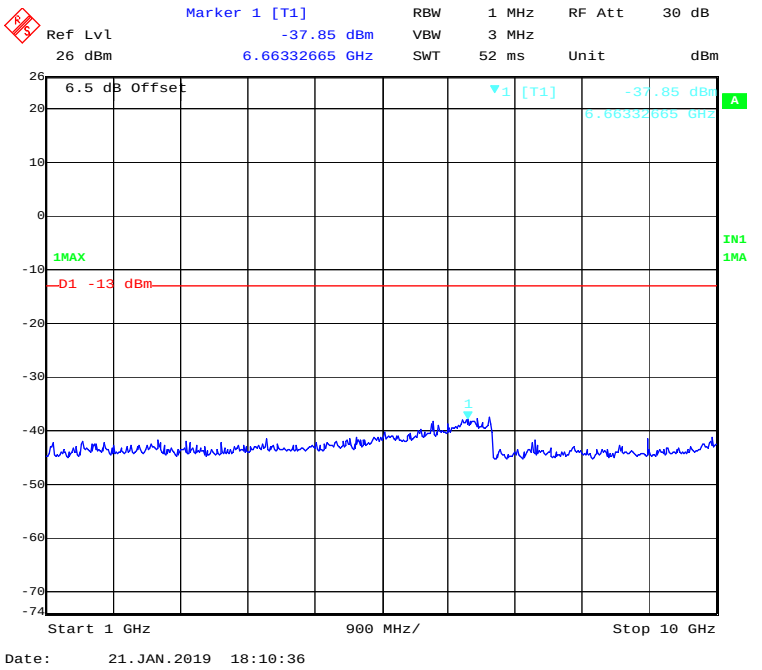
LTE Band 5:

30 MHz - 1 GHz 1.4 MHz, Middle Channel)

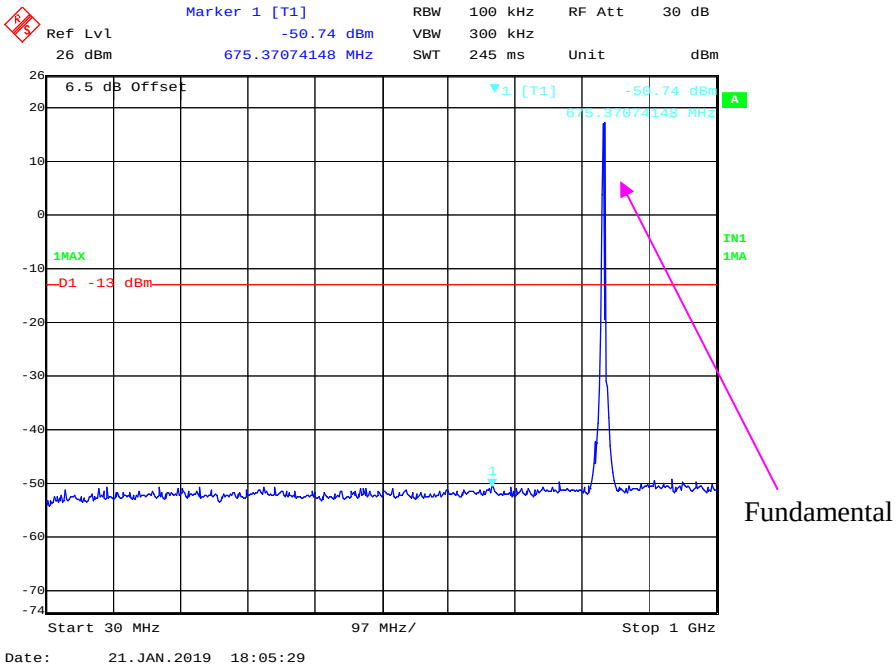


Fundamental

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

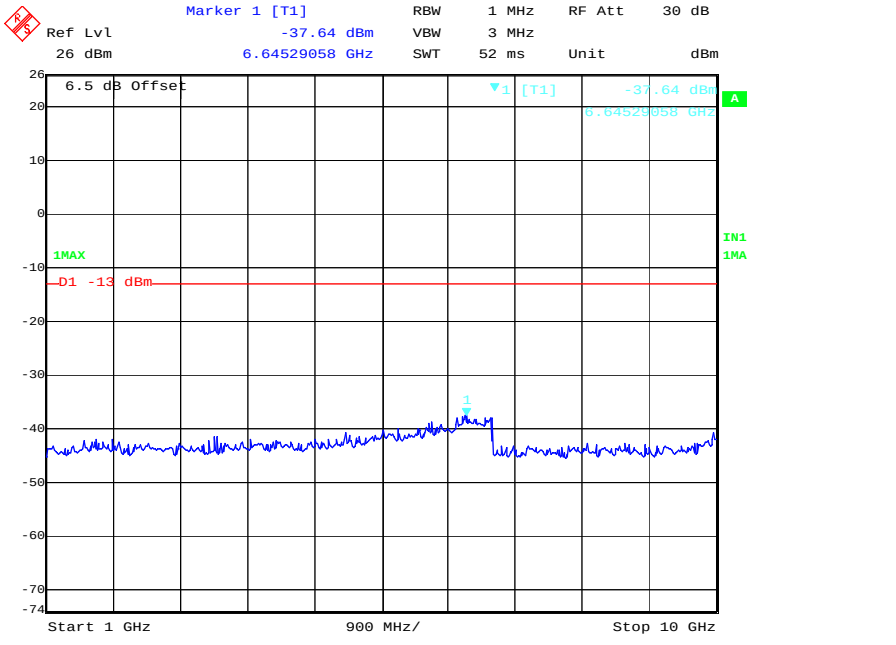


30 MHz - 1 GHz (3MHz, Middle Channel)



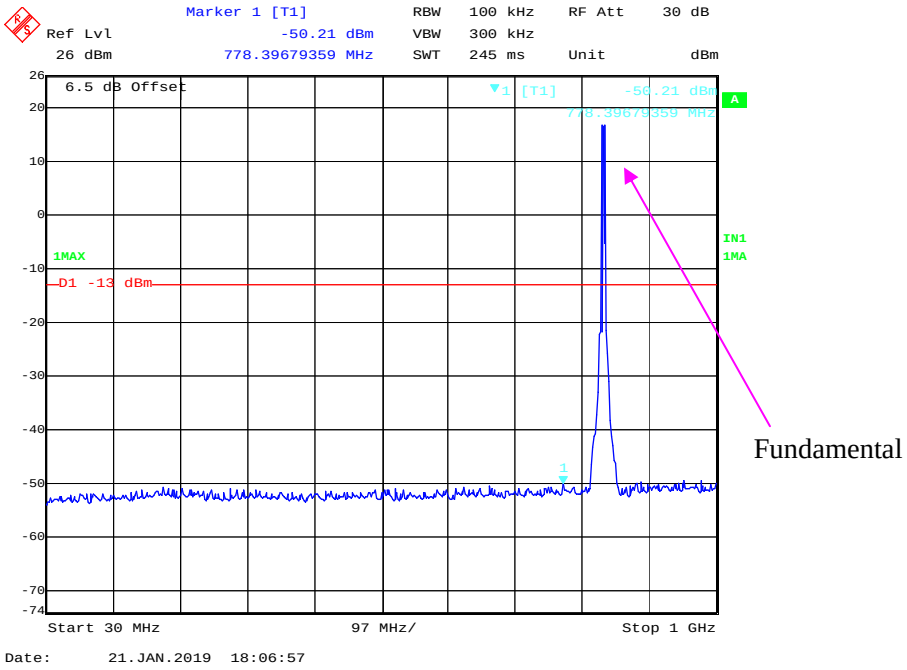
Date: 21.JAN.2019 18:05:29

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



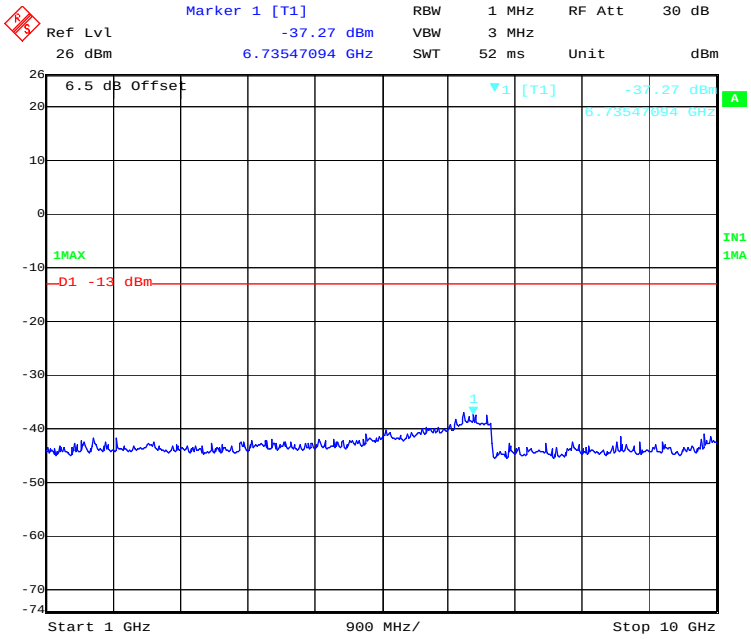
Date: 21.JAN.2019 18:10:15

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



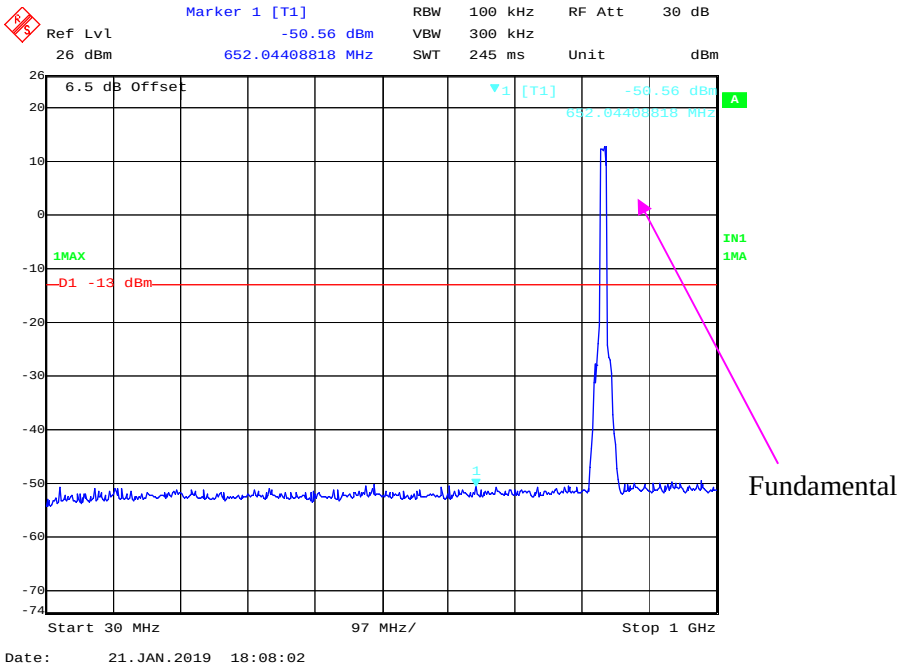
Date: 21.JAN.2019 18:06:57

1 GHz – 10 GHz (5MHz, Middle Channel)



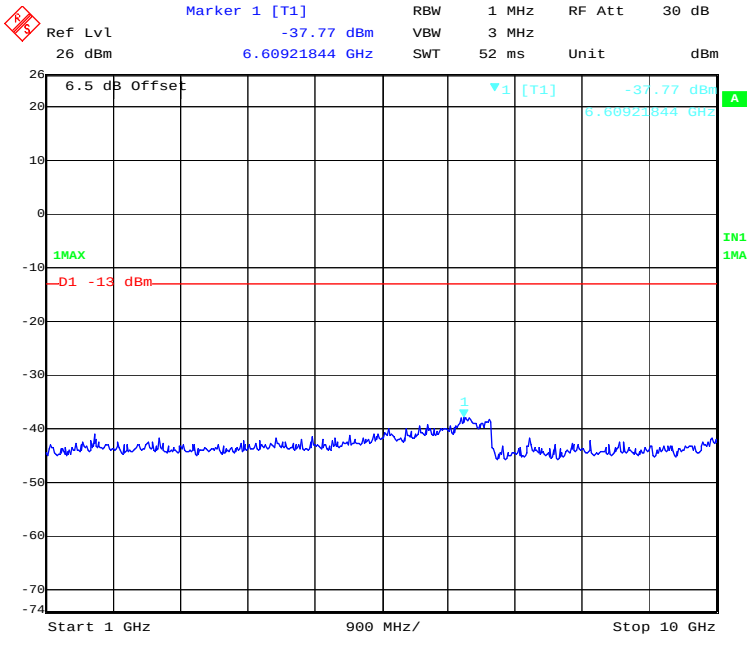
Date: 21.JAN.2019 18:09:52

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



Date: 21.JAN.2019 18:08:02

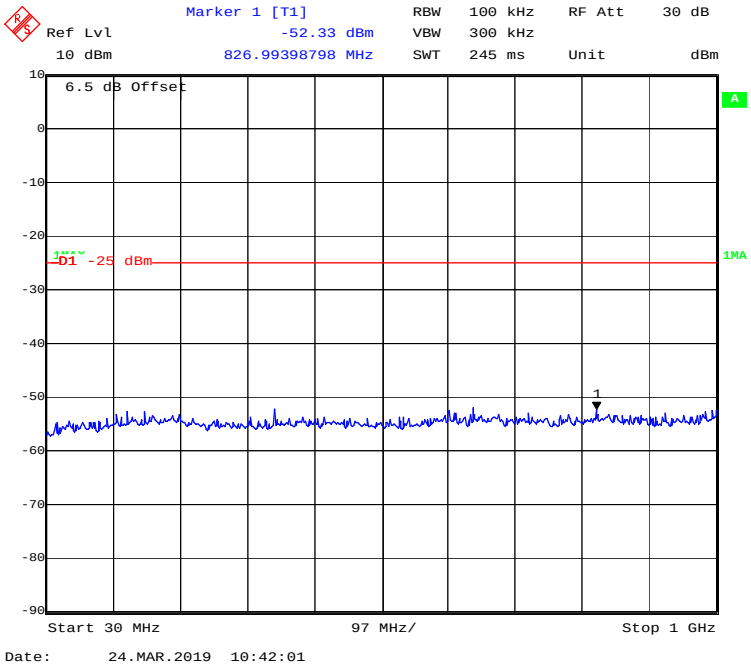
1 GHz – 10 GHz (10 MHz, Middle Channel)



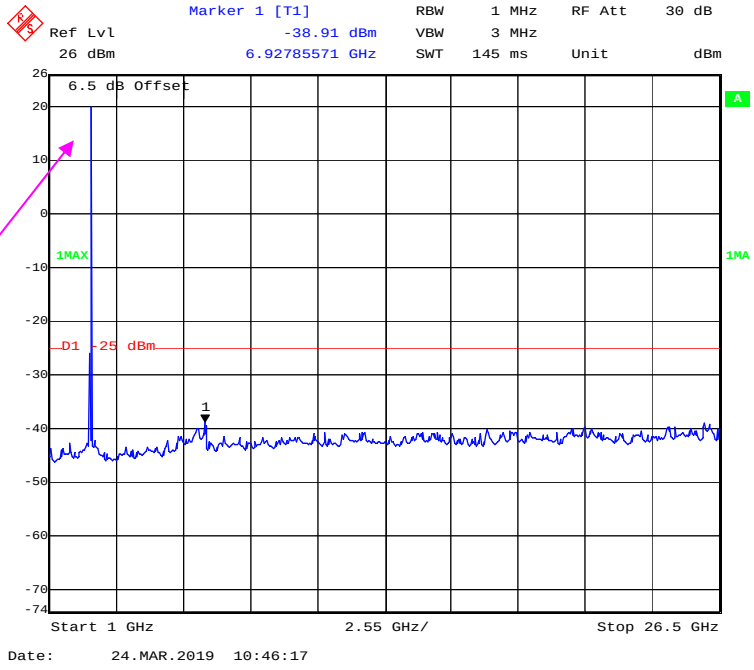
Date: 21.JAN.2019 18:08:51

LTE Band 41:

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

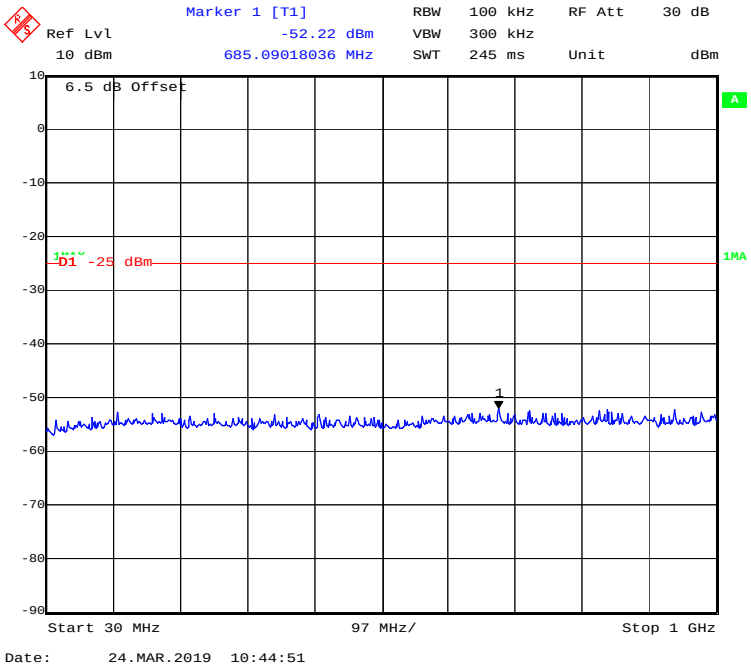


1 GHz – 26.5 GHz (5 MHz, Middle Channel)

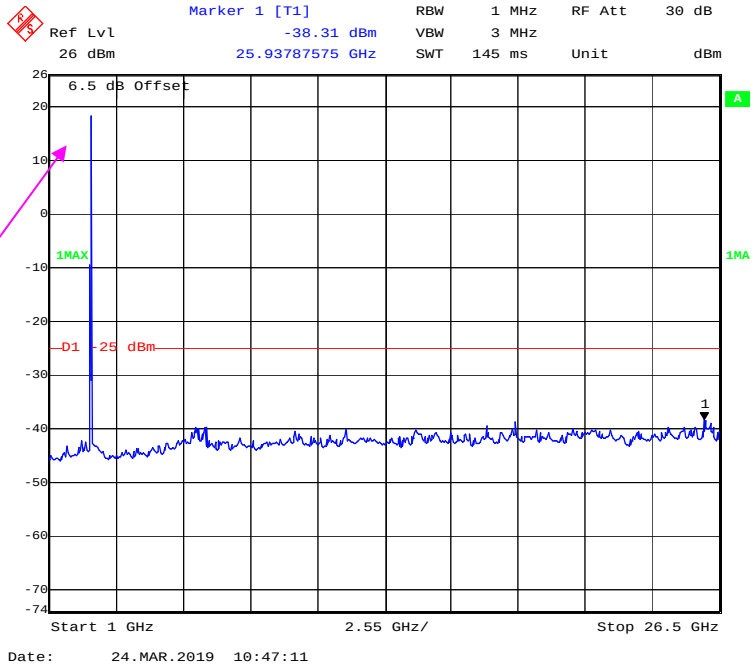


Fundamental

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

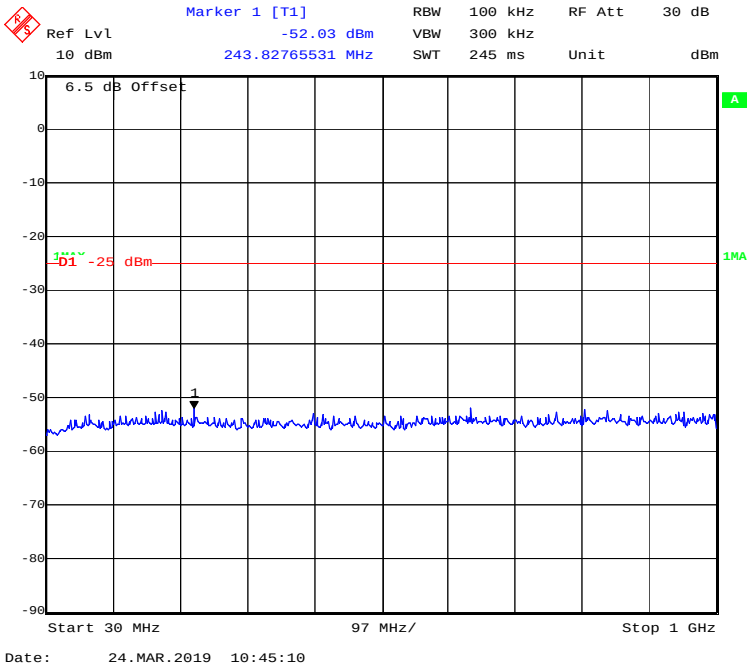


1 GHz –26.5 GHz (10 MHz, Middle Channel)

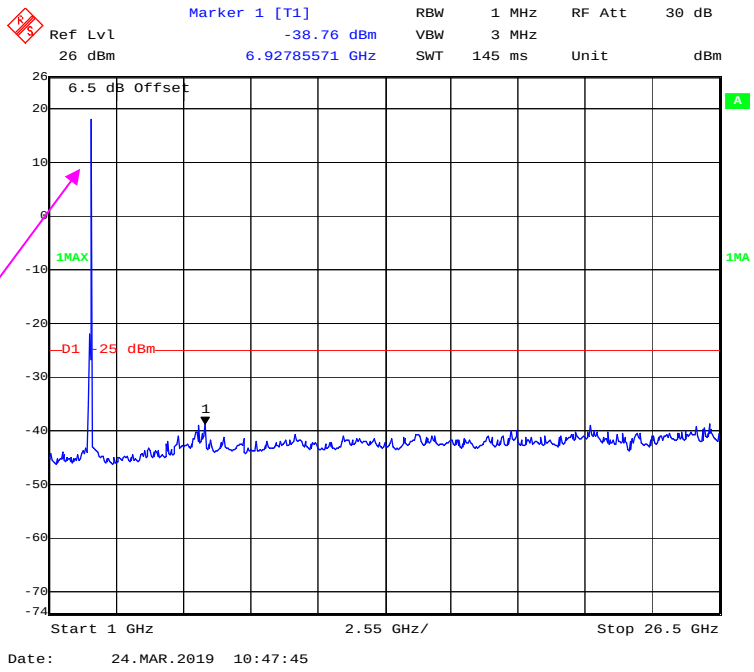


Fundamental

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

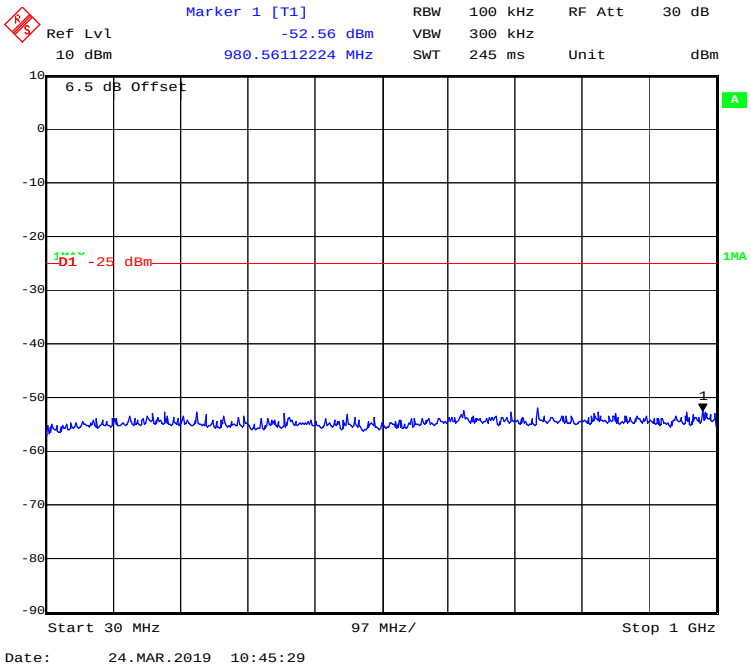


1 GHz – 26.5 GHz (15MHz, Middle Channel)

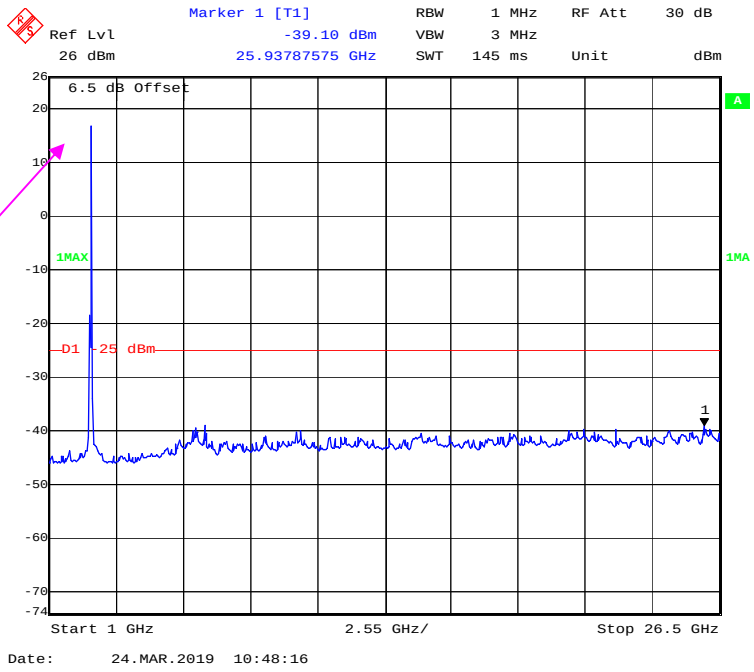


Fundamental

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



1 GHz – 26.5 GHz (20 MHz, Middle Channel)



Fundamental

FCC § 2.1053 & § 22.917 (a) & §27.53 (m) - SPURIOUS RADIATED EMISSIONS

Applicable Standards

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

For fixed user stations, 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.

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 (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

Test Data

Environmental Conditions

Temperature:	23.3 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Hope Zhang on 2019-01-21.

Test mode: Transmitting (Pre-scan with Low, Middle, High channel, and the worse case data as below)

LTE Band 5 (30 MHz ~ 10 GHz):

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										
715.0	58.58	246	232	H	-42.07	0.62	-1.67	-44.36	-13	31.36
715.0	58.80	137	120	V	-39.87	0.62	-1.67	-42.16	-13	29.16
1673.0	43.66	344	180	H	-59.98	0.84	8.41	-43.26	-13	30.26
1673.0	44.15	151	228	V	-60.86	0.84	8.41	-40.25	-13	27.25
2509.5	42.78	281	153	H	-58.16	0.89	10.09	-39.25	-13	26.25
2509.5	43.06	151	186	V	-57.89	0.89	10.09	-36.56	-13	23.56
16-QAM 5MHz Bandwidth Middle Channel										
715.0	58.68	63	233	H	-41.97	0.62	-1.67	-44.26	-13	31.26
715.0	58.80	327	239	V	-39.87	0.62	-1.67	-42.16	-13	29.16
1673.0	49.99	156	207	H	-53.65	0.84	8.41	-44.26	-13	31.26
1673.0	48.67	80	236	V	-56.34	0.84	8.41	-41.36	-13	28.36
2509.5	44.74	116	213	H	-56.20	0.89	10.09	-38.25	-13	25.25
2509.5	44.11	85	213	V	-56.84	0.89	10.09	-35.54	-13	22.54

Note:
The limit is base on EIRP.

LTE Band 41 (30 MHz ~ 26.5 GHz):

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										
716.52	60.37	246	232	H	-40.28	0.62	-1.67	-45.56	-25	20.56
716.52	61.29	137	120	V	-37.38	0.62	-1.67	-43.21	-25	18.21
5190.00	45.73	344	180	H	-49.16	1.10	10.30	-44.25	-25	19.25
5190.00	46.52	151	228	V	-48.67	1.10	10.30	-40.26	-25	15.26
7785.00	43.87	281	153	H	-45.63	1.85	10.04	-39.26	-25	14.26
7785.00	42.15	151	186	V	-47.45	1.85	10.04	-35.87	-25	10.87
16-QAM 5MHz Bandwidth Middle Channel										
716.52	62.03	63	233	H	-38.62	0.62	-1.67	-46.18	-25	21.18
716.52	61.72	327	239	V	-36.95	0.62	-1.67	-42.16	-25	17.16
5190.00	49.99	156	207	H	-44.90	1.10	10.30	-45.11	-25	20.11
5190.00	48.67	80	236	V	-46.52	1.10	10.30	-42.14	-25	17.14
7785.00	44.74	116	213	H	-44.76	1.85	10.04	-38.16	-25	13.16
7785.00	43.12	85	213	V	-46.48	1.85	10.04	-35.10	-25	10.10

Note:
The limit is base on EIRP.

FCC §22.917 (a) & §27.53 (m) - BAND EDGES

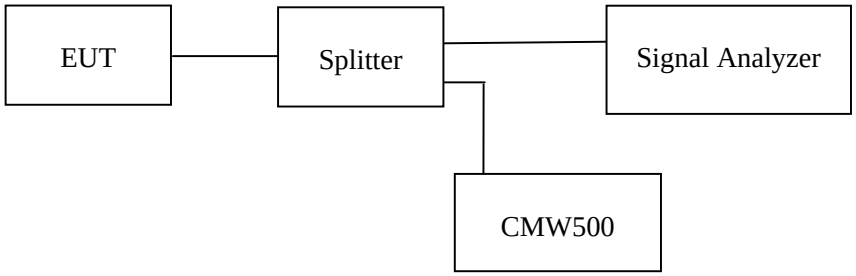
Applicable Standards

For fixed user stations, 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.

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

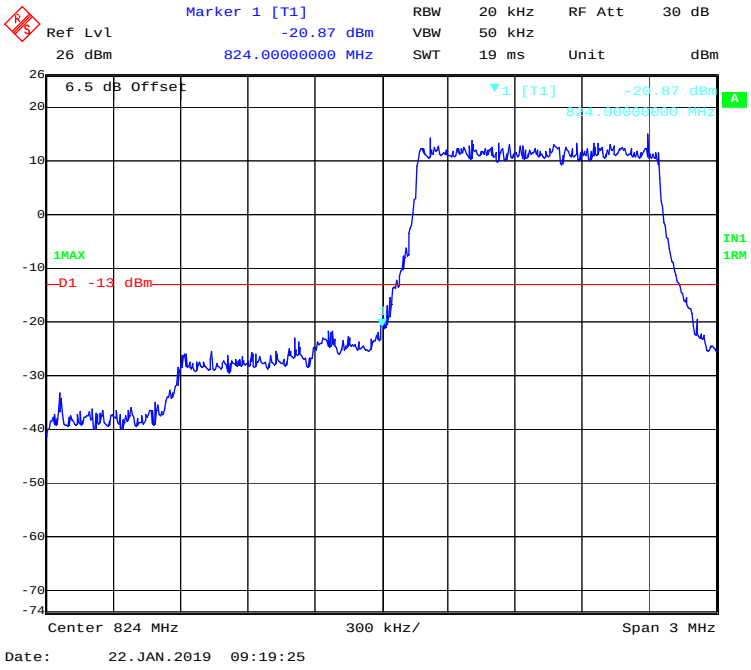
Temperature:	23.3 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Hope Zhang on 2019-01-22.

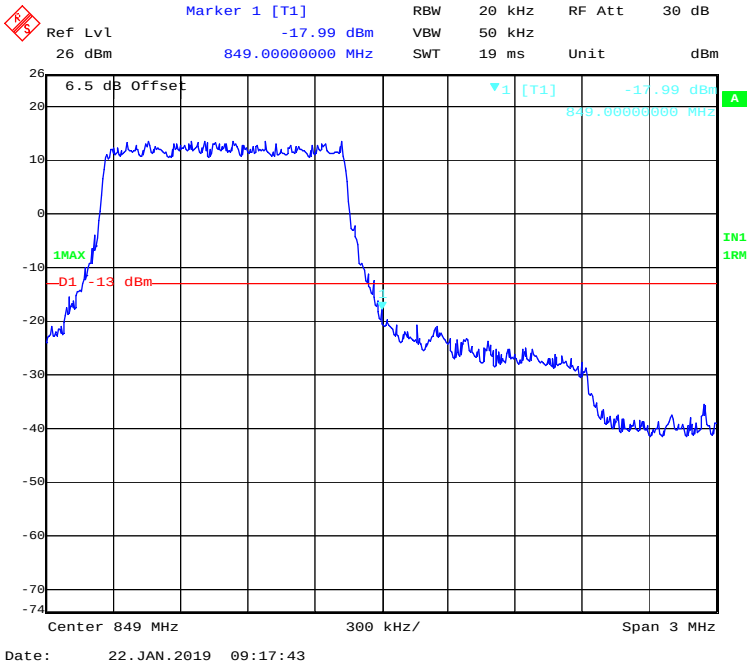
EUT operation mode: Transmitting

LTE Band 5:

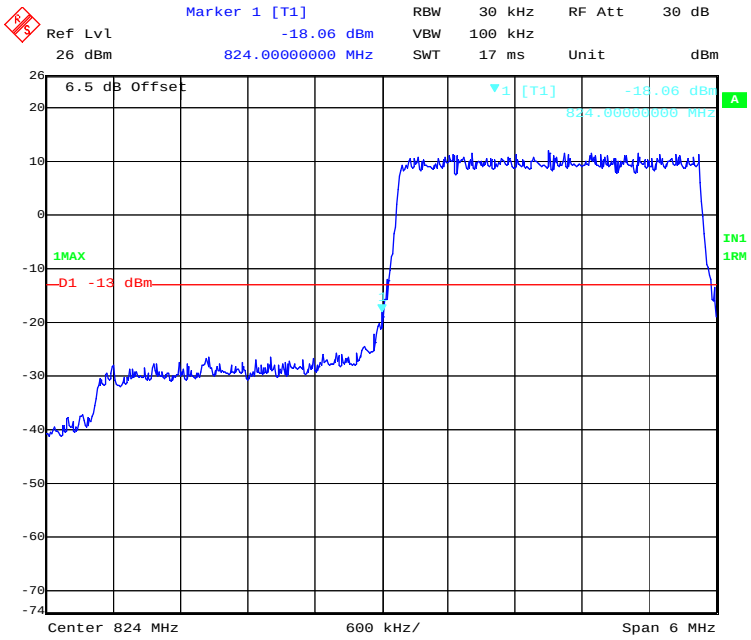
QPSK (1.4 MHz, FULL RB) - Left Band Edge



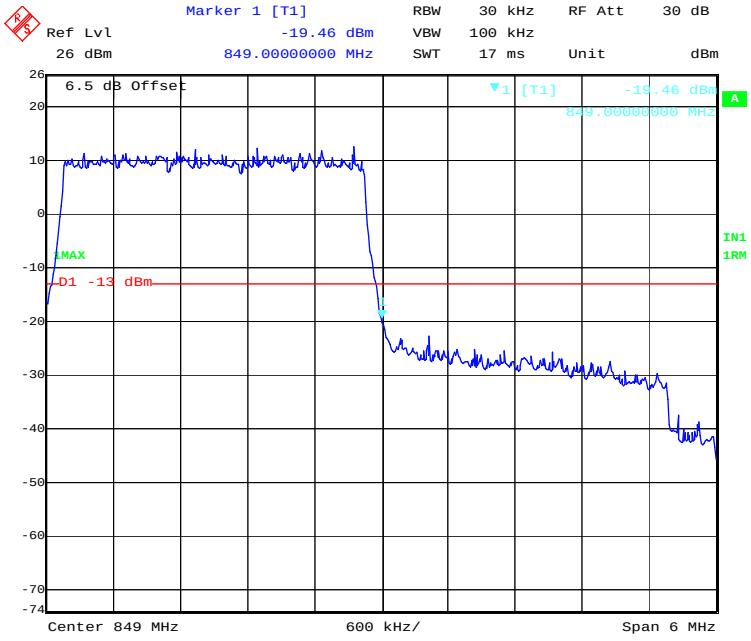
QPSK (1.4 MHz, FULL RB) - Right Band Edge



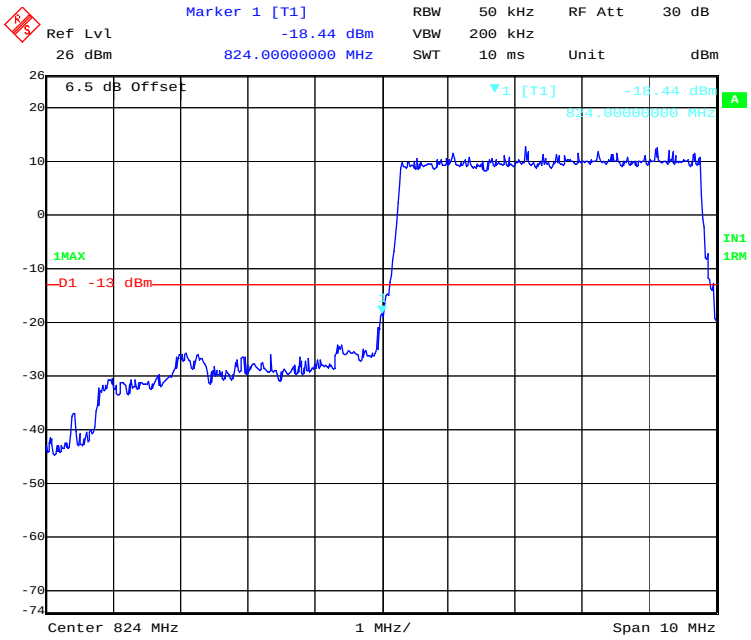
QPSK (3 MHz, FULL RB) - Left Band Edge



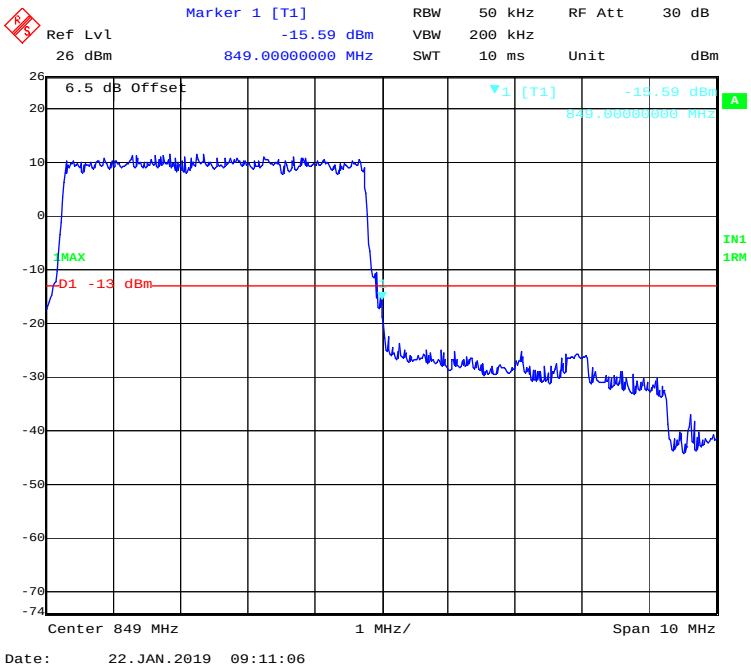
QPSK (3 MHz, FULL RB) - Right Band Edge



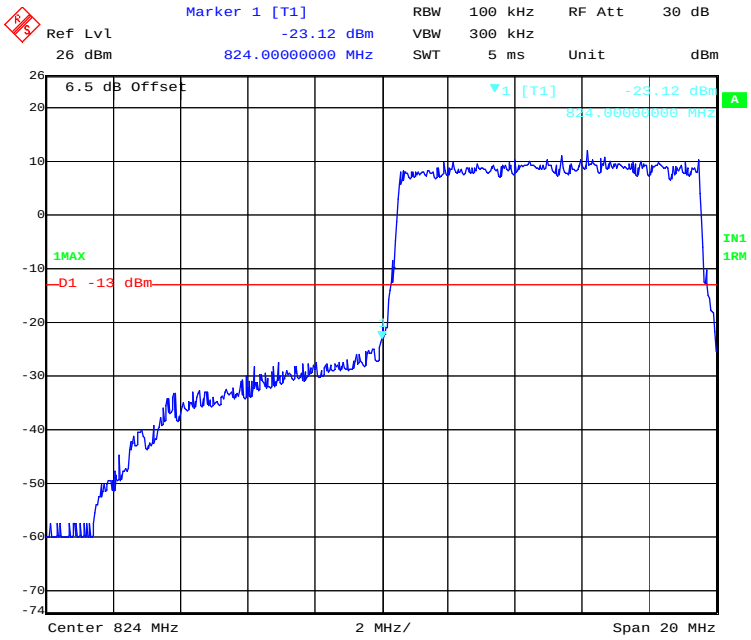
QPSK (5 MHz, FULL RB) - Left Band Edge



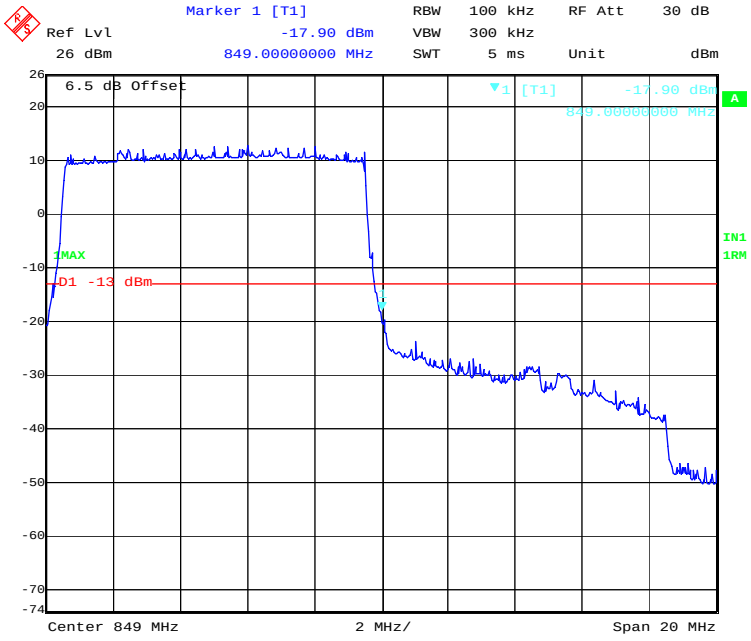
QPSK (5 MHz, FULL RB) - Right Band Edge



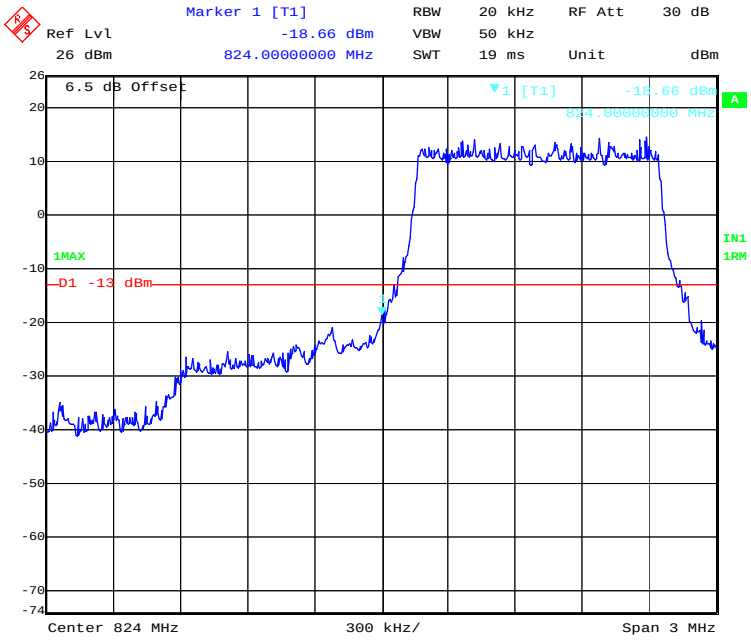
QPSK (10 MHz, FULL RB) - Left Band Edge



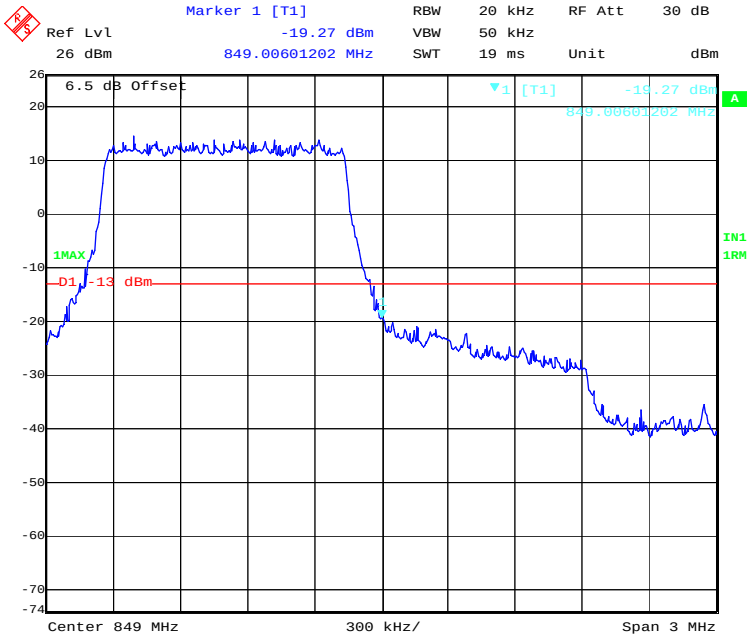
QPSK (10 MHz, FULL RB) - Right Band Edge



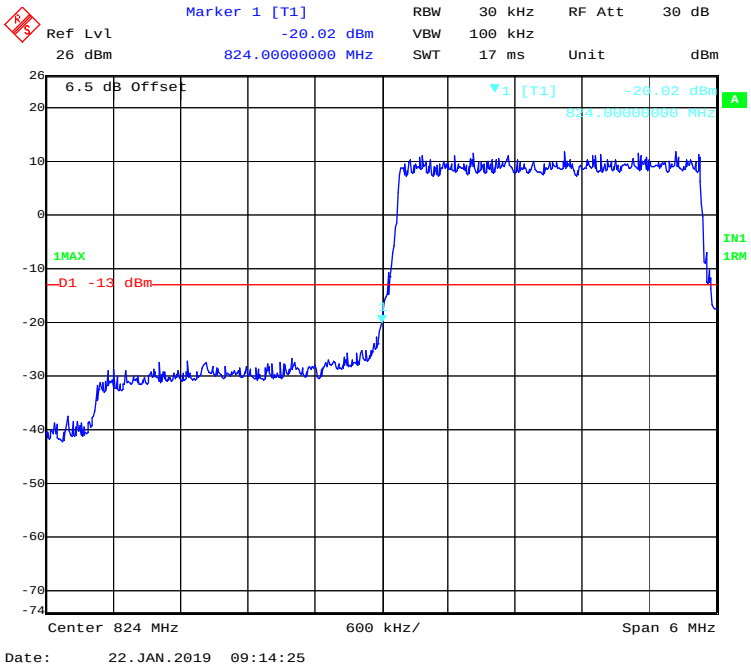
16-QAM (1.4 MHz, FULL RB) - Left Band Edge



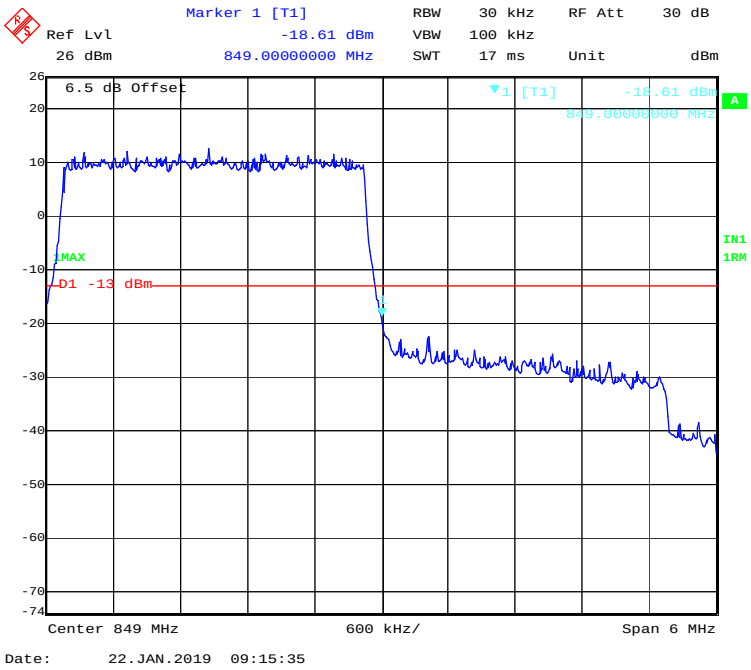
16-QAM (1.4 MHz, FULL RB) - Right Band Edge



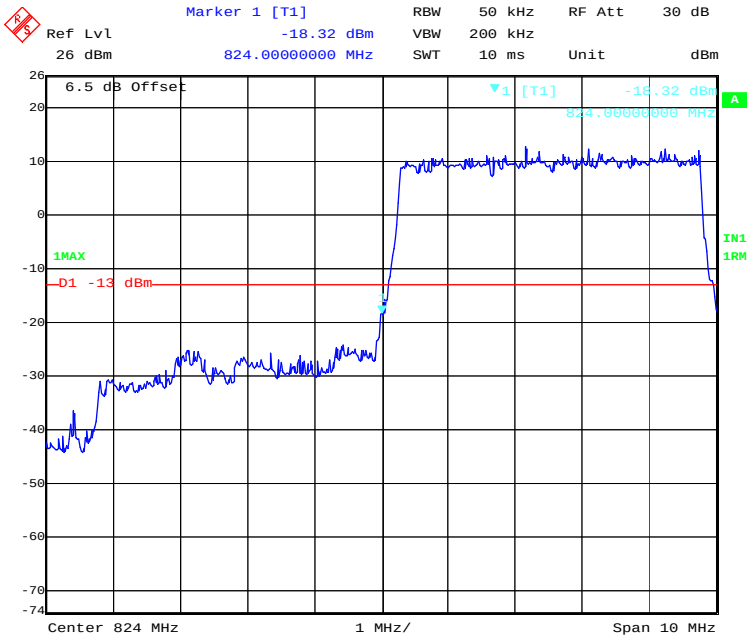
16-QAM (3 MHz, FULL RB) - Left Band Edge



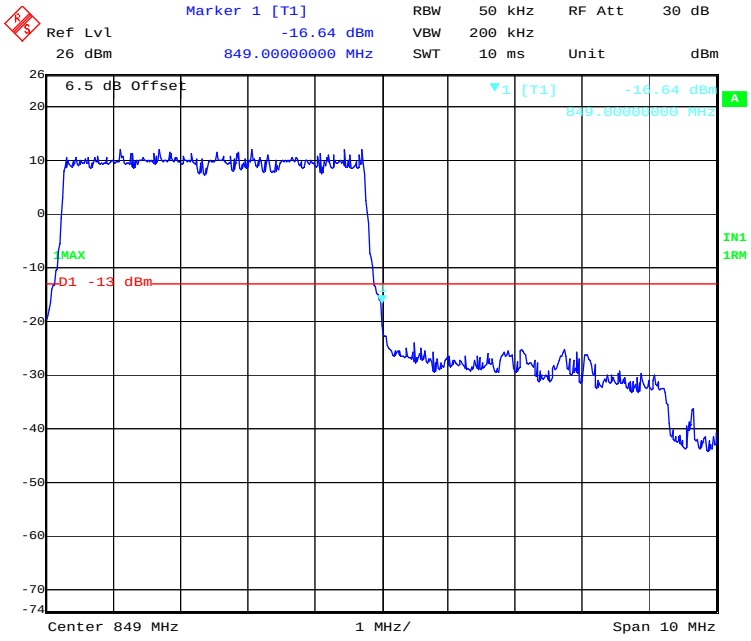
16-QAM (3 MHz, FULL RB) - Right Band Edge



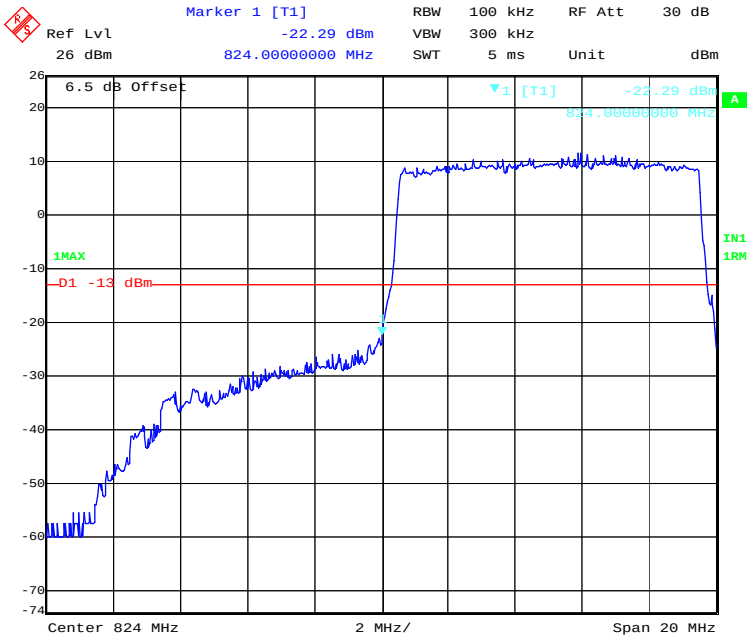
16-QAM (5 MHz, FULL RB) - Left Band Edge



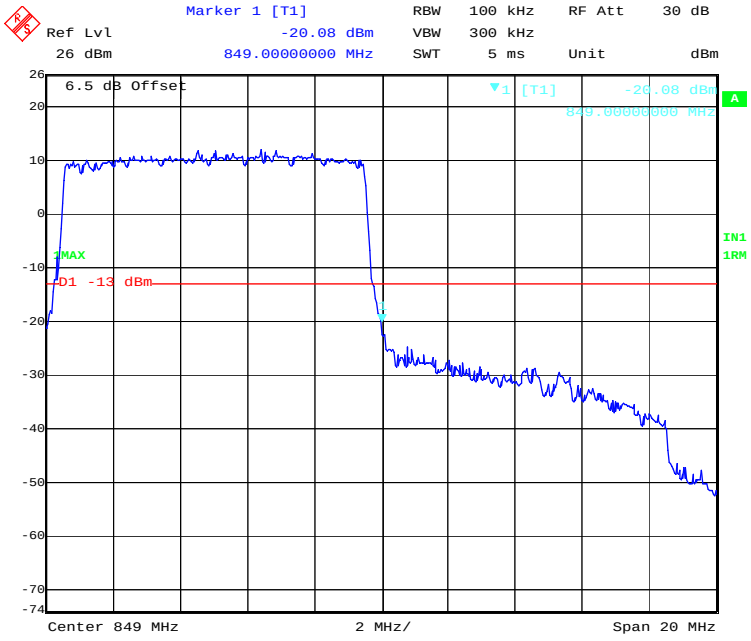
16-QAM (5 MHz, FULL RB) - Right Band Edge



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

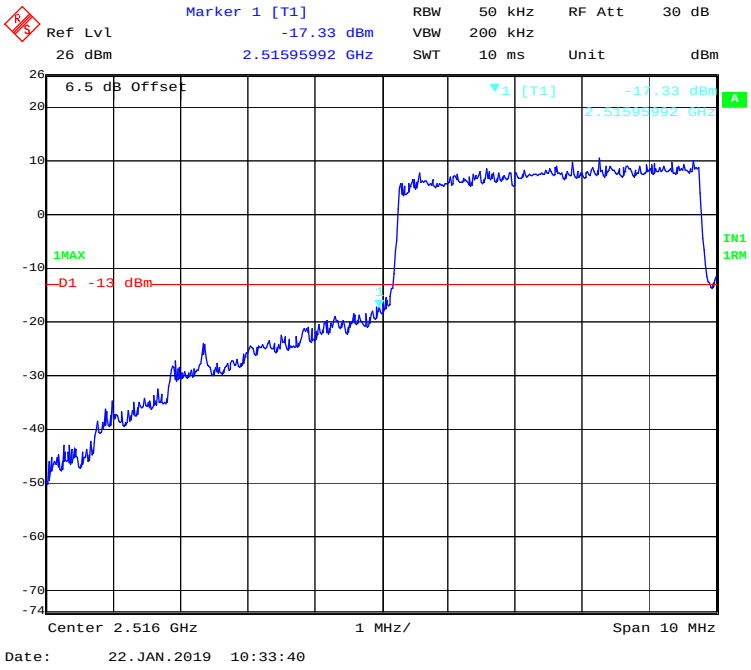


16-QAM (10 MHz, FULL RB) - Right Band Edge

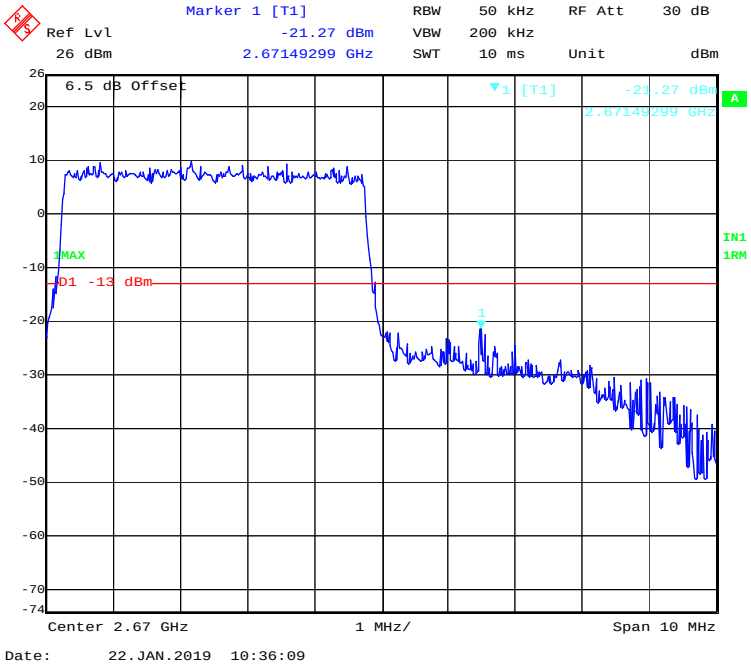


LTE Band 41:

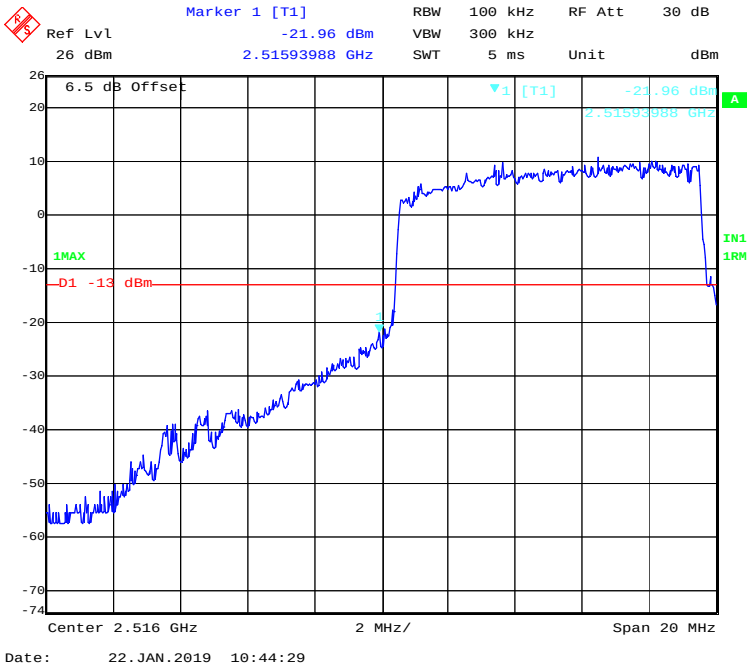
QPSK (5 MHz, FULL RB) - Left Band Edge



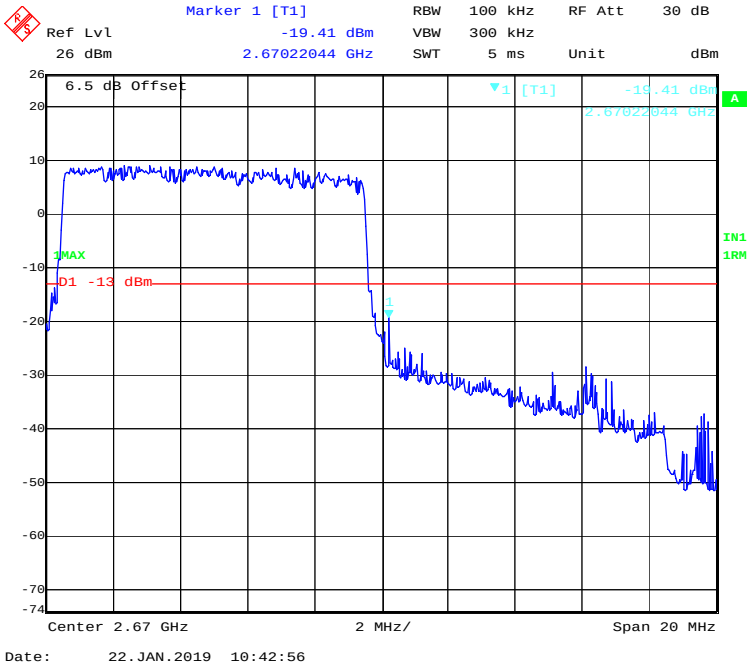
QPSK (5 MHz, FULL RB) - Right Band Edge



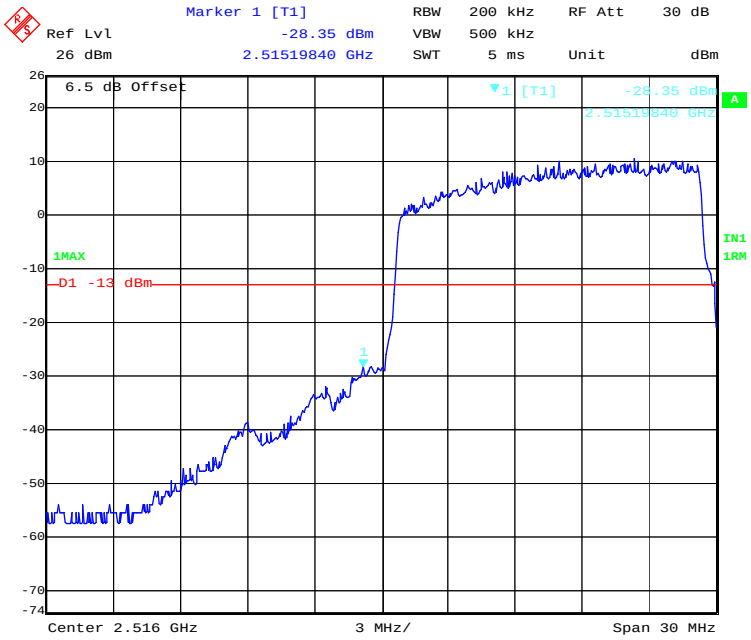
QPSK (10 MHz, FULL RB) - Left Band Edge



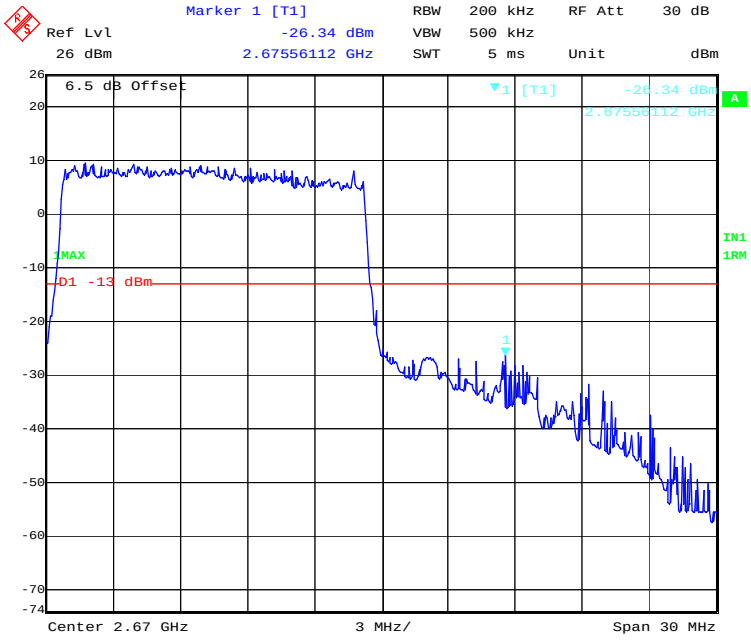
QPSK (10 MHz, FULL RB) - Right Band Edge



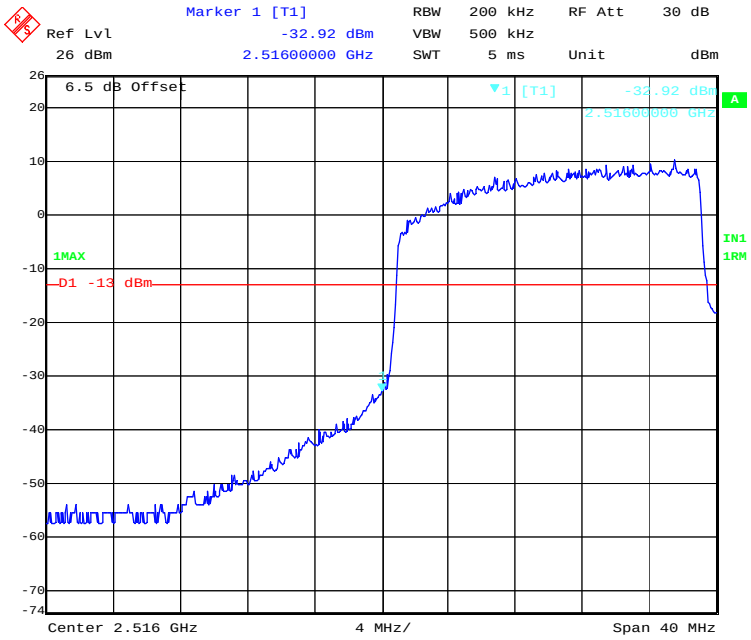
QPSK (15MHz, FULL RB) - Left Band Edge



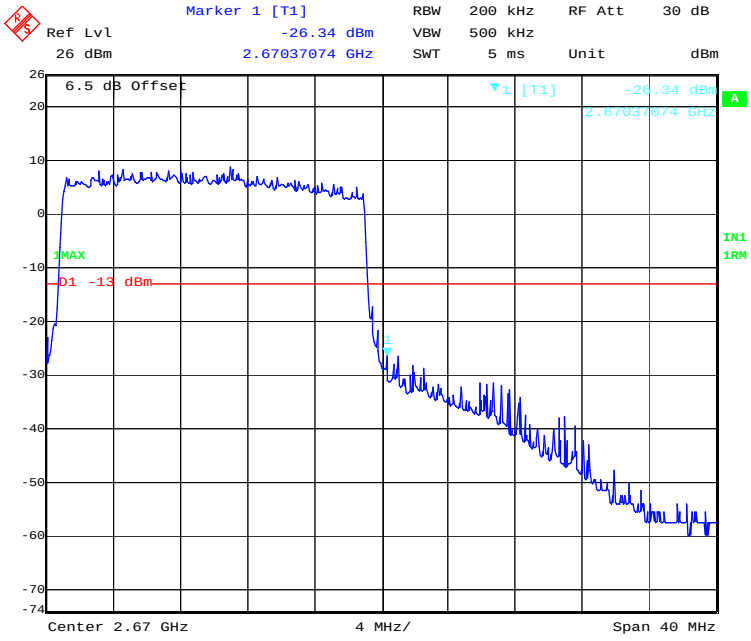
QPSK (15 MHz, FULL RB) - Right Band Edge



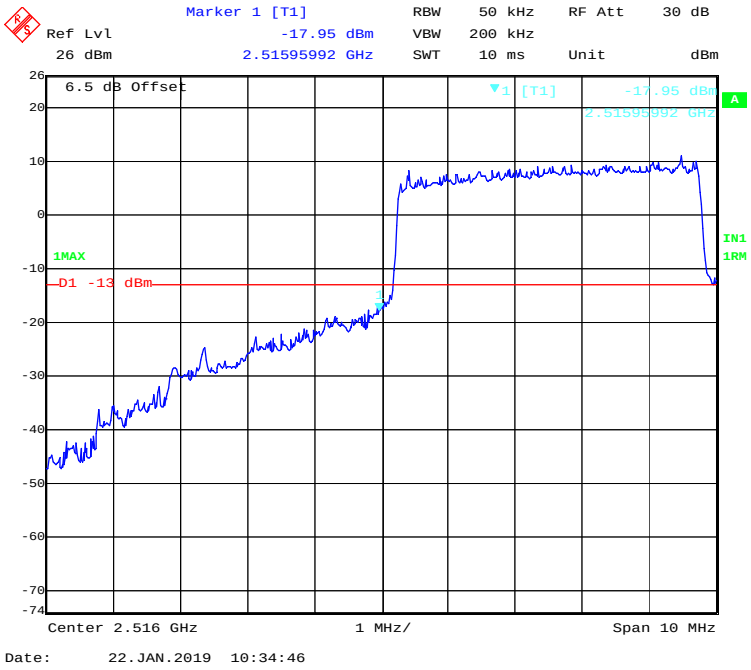
QPSK (20MHz, FULL RB) - Left Band Edge



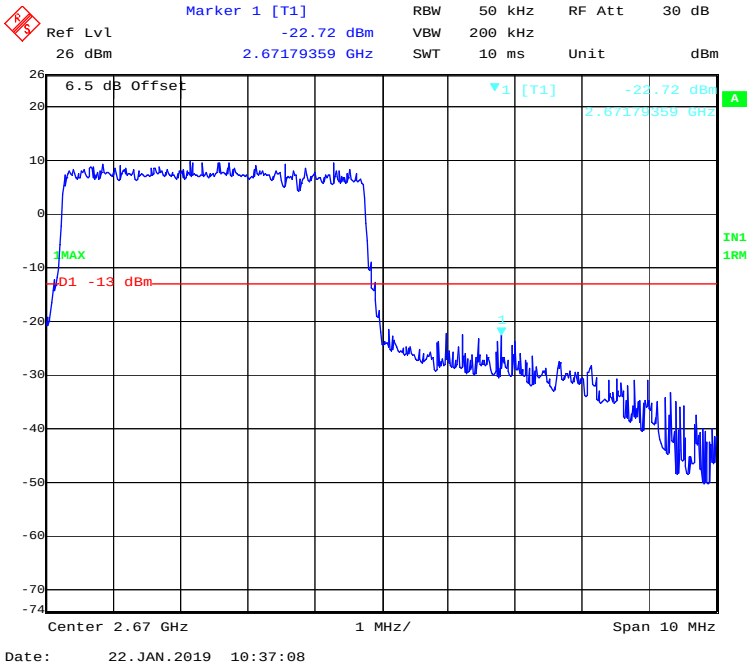
QPSK (20 MHz, FULL RB) - Right Band Edge



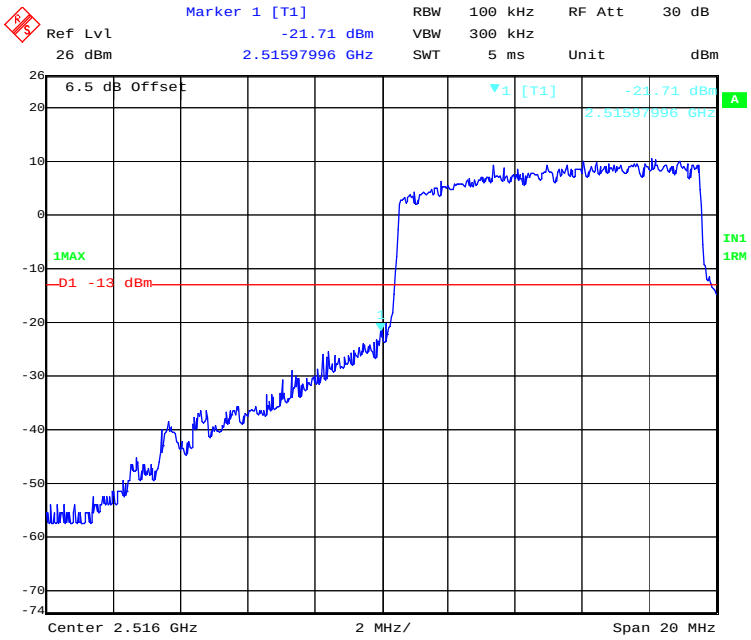
16-QAM (5MHz, FULL RB) - Left Band Edge



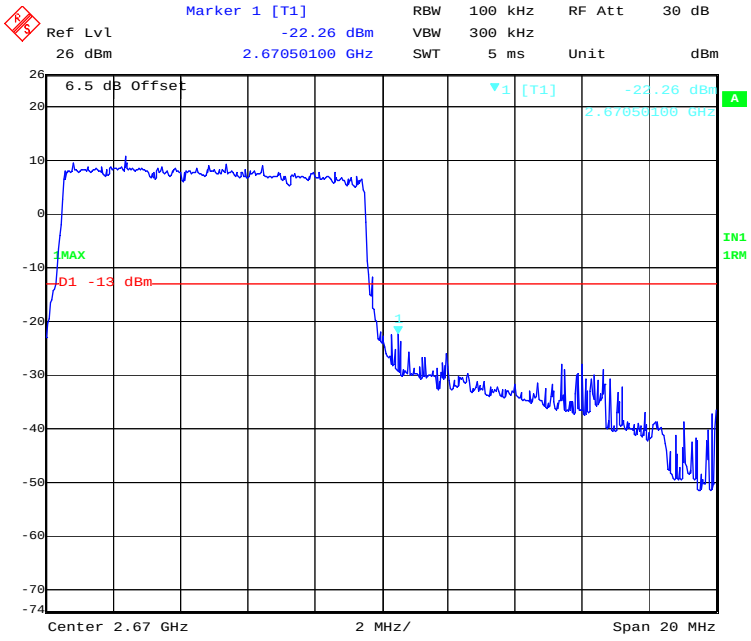
16-QAM (5MHz, FULL RB) - Right Band Edge



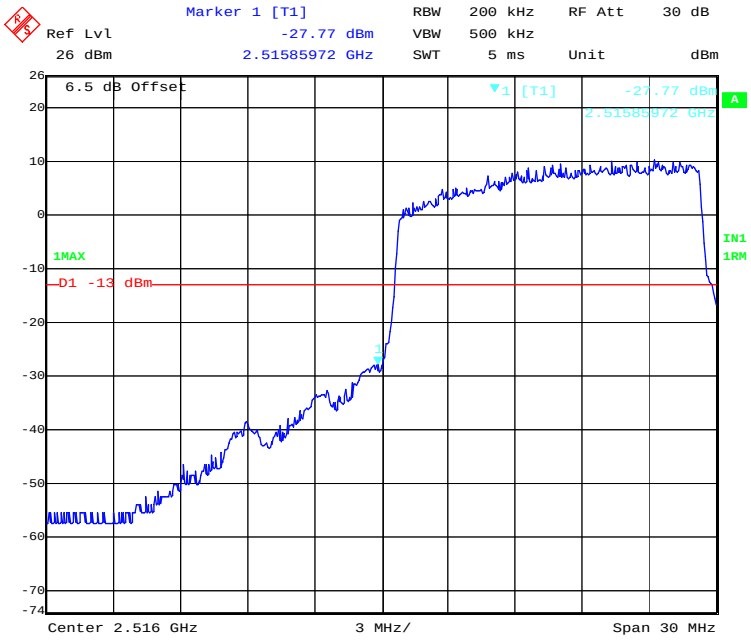
16-QAM (10 MHz, FULL RB) - Left Band Edge



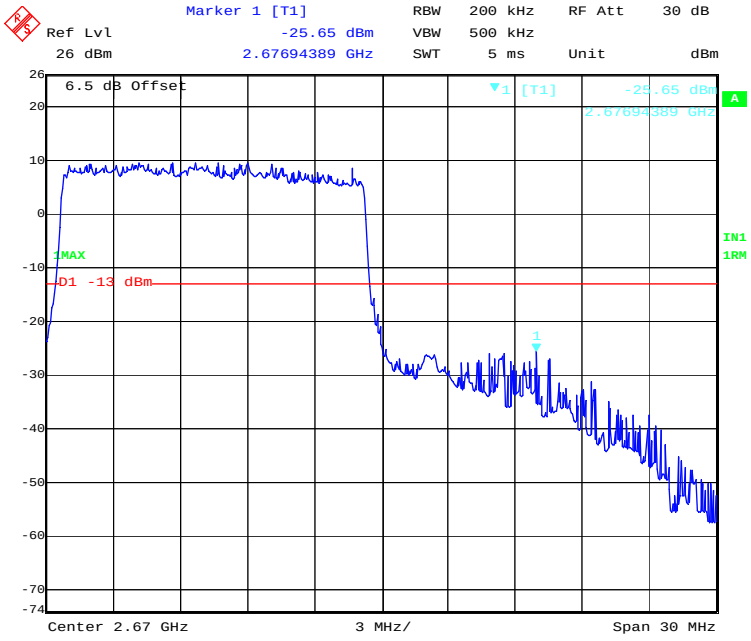
16-QAM (10 MHz, FULL RB) - Right Band Edge



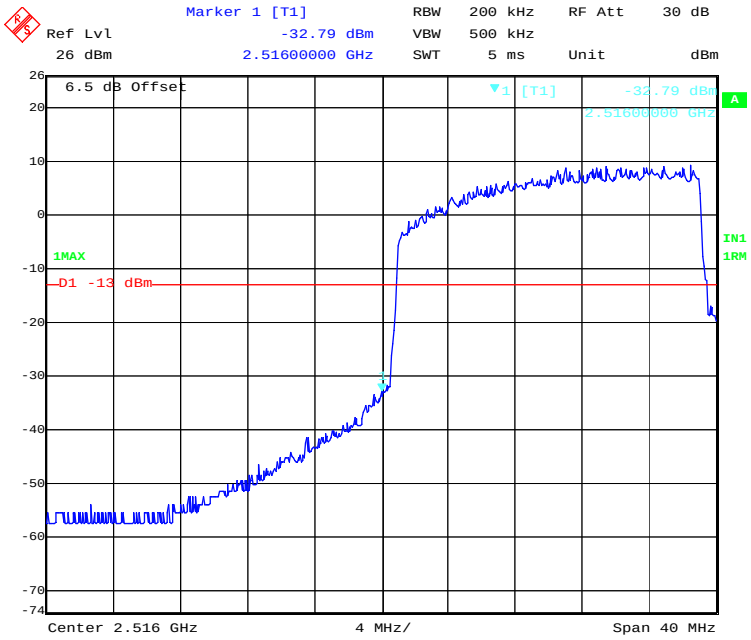
16-QAM (15 MHz, FULL RB) - Left Band Edge



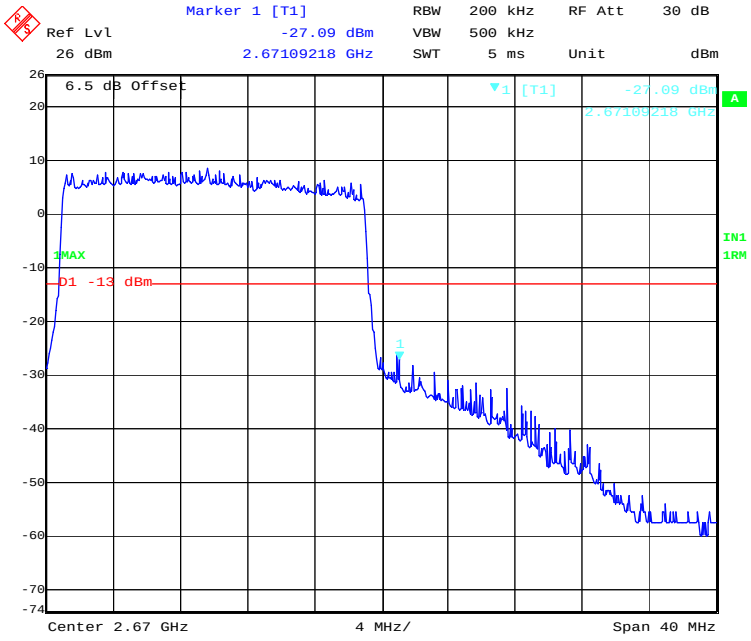
16-QAM (15 MHz, FULL RB) - Right Band Edge



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



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



FCC §2.1055 & §22.355 & §27.54 - FREQUENCY STABILITY

Applicable Standards

FCC §2.1055, §22.355 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

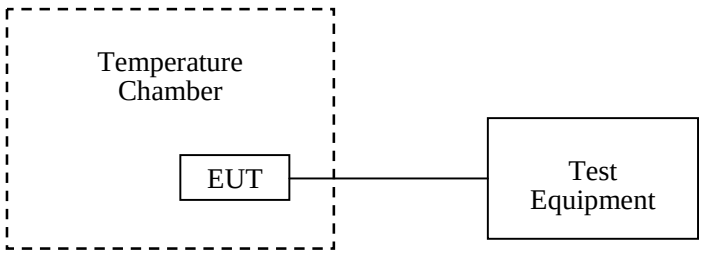
Frequency Range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

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

Temperature:	23.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Hope Zhang on 2019-01-22.

EUT operation mode: Transmitting(the worst case data as below)

Test Result: Compliance.

LTE Band 5:

Middle Channel, f_o =836.5 MHz (QPSK)				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-25	24.0	15	0.0179	2.5
-20		13	0.0155	2.5
-10		16	0.0191	2.5
0		12	0.0143	2.5
10		14	0.0167	2.5
20		3	0.0036	2.5
30		8	0.0096	2.5
40		15	0.0179	2.5
50		9	0.0108	2.5
20	V min.= 20.4	8	0.0096	2.5
20	V max.= 27.6	10	0.0120	2.5

Middle Channel, f_o =836.5 MHz (16QAM)				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-25	24.0	8	0.0096	2.5
-20		11	0.0132	2.5
-10		10	0.0120	2.5
0		8	0.0096	2.5
10		9	0.0108	2.5
20		-4	-0.0048	2.5
30		2	0.0024	2.5
40		4	0.0048	2.5
50		5	0.0060	2.5
20	V min.= 20.4	6	0.0072	2.5
20	V max.= 27.6	8	0.0096	2.5

LTE Band 41:

Low Channel & High Channel (QPSK)					
Temperature (℃)	**Power Supplied (V_{DC})**	**F_L (MHz)**	**F_H (MHz)**	**F_L Limit (MHz)**	**F_H Limit (MHz)**
-25	24.0	2516.0080	2669.0007	2516	2670
-20		2516.0122	2669.9890	2516	2670
-10		2516.0201	2669.9971	2516	2670
0		2516.0620	2669.9962	2516	2670
10		2516.0101	2669.9988	2516	2670
20		2516.0132	2669.9897	2516	2670
30		2516.0253	2669.9889	2516	2670
40		2516.0315	2669.9915	2516	2670
50		2516.0151	2669.9893	2516	2670
20	V min.= 20.4	2516.0638	2669.9952	2516	2670
20	V max.= 27.6	2516.0746	2669.9970	2516	2670

Low Channel & High Channel (16QAM)					
Temperature (℃)	**Power Supplied (V_{DC})**	**F_L (MHz)**	**F_H (MHz)**	**F_L Limit (MHz)**	**F_H Limit (MHz)**
-25	24.0	2516.0023	2669.0081	2516	2670
-20		2516.0063	2669.1056	2516	2670
-10		2516.1089	2669.0035	2516	2670
0		2516.1066	2669.0275	2516	2670
10		2516.0124	2669.1177	2516	2670
20		2516.1045	2669.1019	2516	2670
30		2516.0174	2669.0212	2516	2670
40		2516.0020	2669.0173	2516	2670
50		2516.0069	2669.0380	2516	2670
20	V min.= 20.4	2516.2018	2669.0104	2516	2670
20	V max.= 27.6	2516.0122	2669.0067	2516	2670

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