TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 27, FCC PART 22H

TEST REPORT

For

SHANGHAI WANWAY DIGITAL TECHNOLOGY CO., LTD

FLOOR 23 NO. 1999 WENCHUAN ROAD BAOSHAN DISTRICT SHANGHAI China

FCC ID: 2AWBA-G30

Report Type:	**Product Type:**
Original Report	GPS Tracker

Test Engineer:	Jack Jiao
Report Number:	RSHF200408001-00A
Report Date:	2020-05-11
Reviewed By:	Oscar Ye EMC Manager
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

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	SHANGHAI WANWAY DIGITAL TECHNOLOGY CO., LTD
Tested Model:	G30
Product Type:	GPS Tracker
Power Supply:	DC 3.7V from battery; DC 8-45V from external power supply
RF Function:	GPRS/EGPRS 850, WCDMA, LTE
Operating Band/Frequency:	GPRS/EGPRS 850: 824-849 MHz(TX), 869-894 MHz(RX) WCDMA Band V: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 5: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 41: 2555-2655 MHz(TX), 2555-2655MHz(RX)
Modulation Type:	GPRS/EGPRS 850: GMSK/8PSK; WCDMA: BPSK,QPSK,16QAM LTE: QPSK,16QAM
Antenna Type:	PIFA Antenna
Maximum Antenna Gain:	WCDMA, LTE, GPRS/EGPRS 850: 2.5dBi

**All measurement and test data in this report was gathered from production sample serial number: 20200408001. (Assigned by the BACL. The EUT supplied by the applicant was received on 2020-04-08)*

Objective

This type approval report is prepared on behalf of *SHANGHAI WANWAY DIGITAL TECHNOLOGY 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)

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
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%

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)
GPRS/EGPRS 850		Low	128	824.2
		Middle	190	836.6
		High	251	848.8
WCDMA Band V		Low	4132	826.4
		Middle	4183	836.6
		High	4233	846.6
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

Mode		Channel		Frequency (MHz)
LTE Band 41	5M	Low	40265	2557.5
		Middle	40740	2605.0
		High	41215	2652.5
	10M	Low	40290	2560.0
		Middle	40740	2605.0
		High	41190	2650.0
	15M	Low	40315	2562.5
		Middle	40740	2605.0
		High	41165	2647.5
	20M	Low	40340	2565.0
		Middle	40740	2605.0
		High	41140	2645.0

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

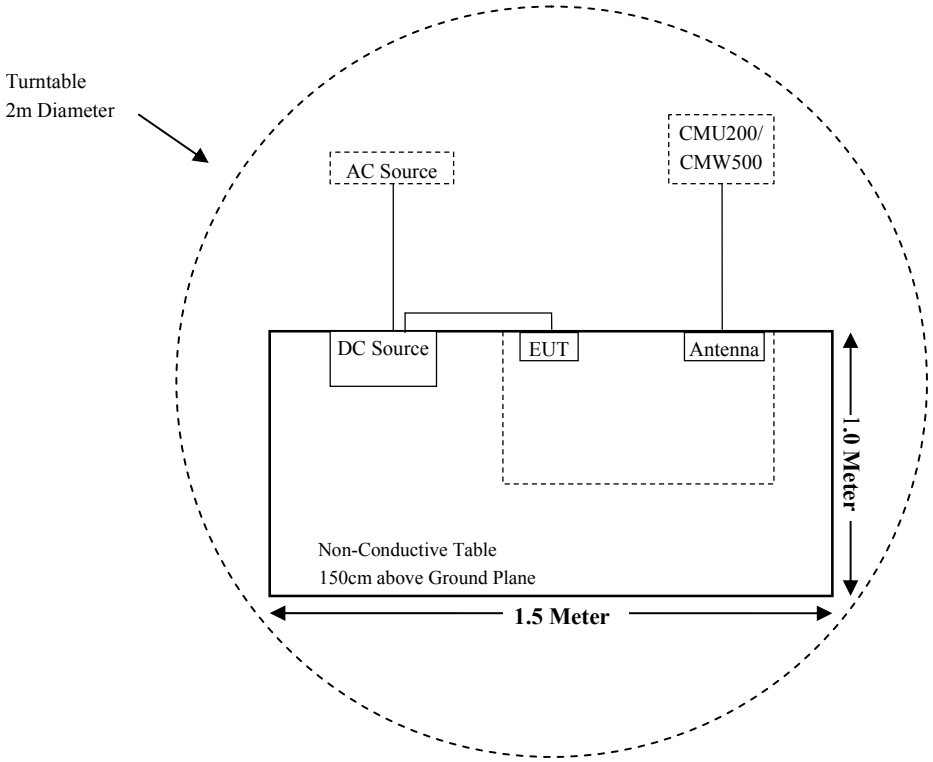
Manufacturer	Description	Model	Serial Number
Aihuaxin technology	Antenna	/	/
MCH	DC Source	MCH-303D-II	14070562
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478

External I/O Cable

Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	DC 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);27.50 h(2)	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905;§ 22.917; §27.53	Occupied Bandwidth	Compliant
§ 2.1051; § 22.917 (a);§27.53(m)	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053; § 22.917 (a) (m)	Spurious Radiated Emissions	Compliant
§ 22.917 (a) (m)	Band Edge	Compliant
§ 2.1055; § 22.355;§27.54	Frequency stability	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
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	2019-12-26	2022-12-25
Sunol Sciences	Bilog antenna	JB3	A060217	2017-08-04	2020-08-03
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 Tester	CMU200	110605	2019-11-30	2020-11-29
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20
Radiated Emission Test（Chamber 2#）					
HP	Signal Generator	HP 8341B	2624A00116	2019-11-30	2020-11-29
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-08-27	2020-08-26
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3115	6229	2019-12-12	2022-12-11
ETS-LINDGREN	Horn Antenna	3116	00084159	2019-12-12	2022-12-11
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-17	2023-01-16
Mini-Circuits	Amplifier	ZVA-183W-S+	220701818	2019-05-20	2020-05-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2020-03-22	2021-03-21
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-16	016	2019-08-15	2020-08-14
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605	2019-11-30	2020-11-29
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2019-11-30	2020-11-29
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2019-11-30	2020-11-29
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605	2019-11-30	2020-11-29
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20
Mini-Ciruits	Power splitter	ZFRSC-14-S+	SF019411452	2019-11-10	2020-11-09
BACL	Temperature & Humidity Chamber	BTH-150	30023	2019-10-10	2020-10-09
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2019-10-10	2020-10-09
SHANGHAI WANWAY	RF Cable	SHANGHAI WANWAY 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, 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);

Calculated Data:

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)			
GPRS/EGPRS 850	824.2-848.8	2.50	1.78	27.00	501.19	20	0.1773	0.55
WCDMA Band V	826.4-846.6	2.50	1.78	24.00	251.19	20	0.0889	0.55
LTE B5	824.7-848.3	2.50	1.78	24.50	281.84	20	0.0997	0.55
LTE B41	2557.5-2652.5	2.50	1.78	24.00	251.19	20	0.0889	1.00

Note 1:

GPRS 850: Tune-up maximum output power with 1 slots is 33.50 dBm, 2 slots is 33.00 dBm, 3 slots is 30.50 dBm, 4 slots is 30.00 dBm, so the tune-up time based Ave. power compared to sloted Ave. power is 27.00dBm.
EGPRS 850: Tune-up maximum output power with 1 slots is 27.00 dBm, 2 slots is 26.00 dBm, 3 slots is 24.00 dBm, 4 slots is 22.00 dBm, so the tune-up time based Ave. power compared to sloted Ave. power is 20.00dBm.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.26 dB	-3 dB

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.

FCC §2.1046; § 22.913 (a); §27.50 h(2) - 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).

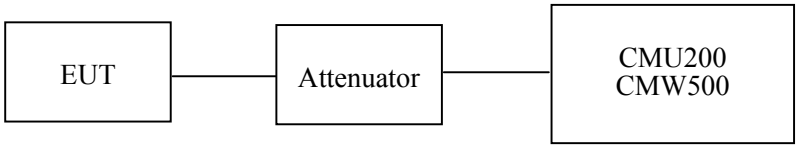
According to §27.50 (2), Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

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 CMW500/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. LOSS = Generator Output Power (dBm) – 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:

ERP (dBm) = LVL (dBm) + 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:
EIRP (dBm) = ERP (dBm) + 2.15 (dB)

Test Data

Environmental Conditions

Temperature:	23.2℃
Relative Humidity:	53%
ATM Pressure:	101.3kPa

The testing was performed by Jack Jiao on 2020-04-28.

Conducted Power:

GPRS/EGPRS 850 Band

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.20	33.22	32.42	30.25	29.96	38.45
	190	836.60	33.31	32.59	30.32	29.97	38.45
	251	848.80	33.21	32.66	30.34	29.38	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.20	26.84	25.95	23.96	21.31	38.45
	190	836.60	26.94	25.85	23.87	21.54	38.45
	251	848.80	26.42	25.79	23.89	21.31	38.45

WCDMA Band V

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band V)	Normal	Rel 99	1	23.42	23.78	23.86
		HSDPA	1	22.21	22.16	22.06
			2	21.90	22.03	21.74
			3	22.08	22.11	22.04
			4	22.11	22.32	22.71
		HSUPA	1	21.83	22.07	22.21
			2	22.04	22.14	22.10
			3	21.79	22.12	22.31
			4	22.12	22.17	22.43
			5	21.99	22.06	21.83
		HSPA+	1	21.74	22.16	22.30

Maximum Output Power:

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	23.32	23.15	23.08
		1#12	24.28	23.45	23.50
		1#24	23.85	23.55	24.11
		12#0	23.47	23.83	23.78
		12#6	23.63	24.06	23.82
		12#11	23.37	24.23	23.77
		25#0	23.65	24.24	23.36
	16-QAM	1#0	23.70	23.51	23.37
		1#12	23.52	24.07	23.75
		1#24	24.17	24.15	23.28
		12#0	23.74	24.02	23.57
		12#6	24.24	23.84	23.31
		12#11	24.18	23.27	23.67
		25#0	23.63	24.00	23.40
3M	QPSK	1#0	24.13	23.87	23.60
		1#24	24.04	23.48	23.54
		1#49	24.07	23.77	23.74
		25#0	23.59	23.79	23.53
		25#12	24.31	23.45	23.66
		25#24	23.49	23.62	24.06
		50#0	24.22	23.31	23.68
	16-QAM	1#0	24.26	23.68	23.45
		1#24	24.31	23.97	23.32
		1#49	24.32	23.61	23.15
		25#0	23.62	23.39	23.19
		25#12	24.03	23.53	23.16
		25#24	23.84	24.17	23.30
		50#0	23.55	23.31	23.16

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	23.49	23.32	23.15
		1#37	24.13	24.22	23.43
		1#74	24.33	23.28	23.60
		36#0	23.81	24.13	23.39
		36#17	24.47	23.90	24.24
		36#35	23.81	23.85	24.23
		75#0	23.51	23.47	23.66
	16-QAM	1#0	24.49	23.57	24.30
		1#37	23.86	23.73	23.51
		1#74	23.75	23.33	24.17
		36#0	23.66	23.99	23.77
		36#17	24.44	23.30	24.15
		36#35	24.02	23.37	23.78
		75#0	23.63	23.29	24.03
10M	QPSK	1#0	24.08	23.90	24.07
		1#49	24.04	23.95	23.41
		1#99	24.16	24.17	23.56
		50#0	23.54	23.56	23.91
		50#24	23.95	24.17	24.00
		50#49	23.79	24.17	23.75
		100#0	24.38	23.43	24.30
	16-QAM	1#0	24.11	23.83	24.15
		1#49	23.71	23.52	23.78
		1#99	23.78	23.48	23.62
		50#0	23.53	23.58	23.36
		50#24	23.81	23.96	23.43
		50#49	24.41	23.64	23.41
		100#0	24.03	23.37	24.02

LTE Band 41

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	23.32	22.58	23.01
		1#12	21.49	21.31	21.84
		1#24	21.99	22.11	21.33
		12#0	21.61	21.19	21.10
		12#6	22.10	21.29	21.79
		12#11	21.99	21.85	21.81
		25#0	21.77	21.94	22.00
	16-QAM	1#0	22.00	21.64	21.58
		1#12	21.98	21.87	21.25
		1#24	21.89	21.83	21.61
		12#0	21.73	21.18	21.03
		12#6	21.83	21.68	21.22
		12#11	21.67	21.34	21.49
		25#0	22.19	21.17	21.60
10M	QPSK	1#0	23.21	23.02	22.98
		1#24	21.88	21.23	22.19
		1#49	21.73	21.56	21.72
		25#0	21.65	21.54	21.45
		25#12	21.16	21.58	22.11
		25#24	21.33	21.79	21.90
		50#0	21.92	21.68	21.56
	16-QAM	1#0	21.29	22.10	22.07
		1#24	21.24	21.27	22.12
		1#49	21.11	22.09	22.01
		25#0	21.88	21.34	22.33
		25#12	21.46	22.10	22.24
		25#24	21.05	21.47	22.08
		50#0	21.34	21.73	22.14

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	23.14	23.06	23.56
		1#37	21.33	21.69	21.80
		1#74	21.29	21.56	21.15
		36#0	21.17	21.49	21.96
		36#17	21.56	21.40	22.02
		36#35	21.17	21.43	21.80
		75#0	21.59	22.01	22.13
	16-QAM	1#0	21.59	21.45	21.62
		1#37	21.15	21.11	21.42
		1#74	20.99	21.80	21.73
		36#0	21.21	21.85	22.01
		36#17	21.17	21.98	21.92
		36#35	21.06	21.85	21.26
		75#0	21.40	21.08	21.27
20M	QPSK	1#0	22.87	23.06	22.96
		1#49	21.16	21.76	21.58
		1#99	21.85	21.91	21.09
		50#0	21.76	21.69	21.32
		50#24	21.25	21.06	21.10
		50#49	21.06	21.60	21.72
		100#0	21.50	21.39	21.78
	16-QAM	1#0	21.21	21.49	21.67
		1#49	21.55	20.95	21.45
		1#99	21.77	20.95	21.44
		50#0	21.50	21.13	21.72
		50#24	20.99	21.13	21.13
		50#49	21.55	21.60	20.84
		100#0	21.17	21.04	21.79

Peak-to-average ratio (PAR):

GSM 850 Band

Mode	Channel	PAR (dB)	Limit (dB)
GPRS	Low	4.18	≤ 13
	Middle	4.19	≤ 13
	High	4.02	≤ 13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	5.04	≤ 13
	Middle	5.12	≤ 13
	High	5.14	≤ 13

WCDMA Band V

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA (Rel99)	Low	3.31	≤ 13
	Middle	3.37	≤ 13
	High	3.32	≤ 13
WCDMA (HSDPA)	Low	2.73	≤ 13
	Middle	2.72	≤ 13
	High	2.69	≤ 13
WCDMA (HSUPA)	Low	2.83	≤ 13
	Middle	2.88	≤ 13
	High	2.96	≤ 13
WCDMA (HSPA+)	Low	2.59	≤ 13
	Middle	2.64	≤ 13
	High	2.69	≤ 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		5.40	5.69	5.71	≤ 13
16-QAM	1 RB	10M	4.61	4.73	4.66	≤ 13
	50 RB		6.56	6.72	6.58	≤ 13

LTE Band 41

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	20M	3.52	4.63	3.41	≤ 13
	100 RB		5.45	6.65	5.44	≤ 13
16-QAM	1 RB	20M	4.27	4.26	4.37	≤ 13
	100 RB		6.22	6.27	6.38	≤ 13

Radiated Power:

GPRS/EGPRS Mode

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)			
GPRS 850, Middle Channel (ERP)										
836.6	100.71	77	200	H	37.05	0.63	-1.10	35.32	38.45	3.13
836.6	100.36	310	157	V	36.7	0.63	-1.10	34.97	38.45	3.48
EGPRS 850, Middle Channel (ERP)										
836.6	91.35	56	152	H	27.69	0.63	-1.10	25.96	38.45	12.49
836.6	91.78	254	175	V	28.12	0.63	-1.10	26.39	38.45	12.06

WCDMA Mode

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 Band V, Middle Channel(ERP)										
836.6	86.48	40	187	H	22.97	0.63	-1.10	21.24	38.45	17.21
836.6	87.39	201	130	V	23.88	0.63	-1.10	22.15	38.45	16.30

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/dBi)			
QPSK 1.4M BW Middle Channel								
836.5	H	89.82	24.35	0.63	-1.14	22.58	38.45	15.87
836.5	V	90.73	25.26	0.63	-1.14	23.49	38.45	14.96
16-QAM 1.4M BW Middle Channel								
836.5	H	89.15	23.68	0.63	-1.14	21.91	38.45	16.54
836.5	V	90.14	24.67	0.63	-1.14	22.90	38.45	15.55
QPSK 3M BW Middle Channel								
836.5	H	89.53	24.06	0.63	-1.14	22.29	38.45	16.16
836.5	V	90.25	24.78	0.63	-1.14	23.01	38.45	15.44
16-QAM 3M BW Middle Channel								
836.5	H	89.23	23.76	0.63	-1.14	21.99	38.45	16.46
836.5	V	90.34	24.87	0.63	-1.14	23.10	38.45	15.35
QPSK 5M BW Middle Channel								
836.5	H	89.78	24.31	0.63	-1.14	22.54	38.45	15.91
836.5	V	90.34	24.87	0.63	-1.14	23.10	38.45	15.35
16-QAM 5M BW Middle Channel								
836.5	H	89.51	24.04	0.63	-1.14	22.27	38.45	16.18
836.5	V	90.57	25.10	0.63	-1.14	23.33	38.45	15.12
QPSK 10M BW Middle Channel								
836.5	H	89.29	23.82	0.63	-1.14	22.05	38.45	16.40
836.5	V	90.09	24.62	0.63	-1.14	22.85	38.45	15.60
16-QAM 10M BW Middle Channel								
836.5	H	89.17	23.70	0.63	-1.14	21.93	38.45	16.52
836.5	V	90.34	24.87	0.63	-1.14	23.10	38.45	15.35

EIRP:

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 (dBd/dBi)			
QPSK 5M BW Middle Channel								
2605	H	77.19	7.57	0.9	10.05	16.72	33	16.28
2605	V	79.39	9.70	0.9	10.05	18.85	33	14.15
16-QAM 5M BW Middle Channel								
2605	H	77.05	7.43	0.89	10.05	16.59	33	16.41
2605	V	79.04	9.35	0.89	10.05	18.51	33	14.49
QPSK 10M BW Middle Channel								
2605	H	77.02	7.40	0.89	10.05	16.56	33	16.44
2605	V	79.12	9.43	0.89	10.05	18.59	33	14.41
16-QAM 10M BW Middle Channel								
2605	H	76.86	7.24	0.89	10.05	16.4	33	16.6
2605	V	78.94	9.25	0.89	10.05	18.41	33	14.59
QPSK 15M BW Middle Channel								
2605	H	76.56	6.94	0.89	10.05	16.10	33	16.90
2605	V	78.68	8.99	0.89	10.05	18.15	33	14.85
16-QAM 15M BW Middle Channel								
2605	H	76.42	6.80	0.89	10.05	15.96	33	17.04
2605	V	78.91	9.22	0.89	10.05	18.38	33	14.62
QPSK 20M BW Middle Channel								
2605	H	76.24	6.62	0.89	10.05	15.78	33	17.22
2605	V	78.37	8.68	0.89	10.05	17.84	33	15.16
16-QAM 20M BW Middle Channel								
2605	H	76.11	6.49	0.89	10.05	15.65	33	17.35
2605	V	78.38	8.69	0.89	10.05	17.85	33	15.15

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

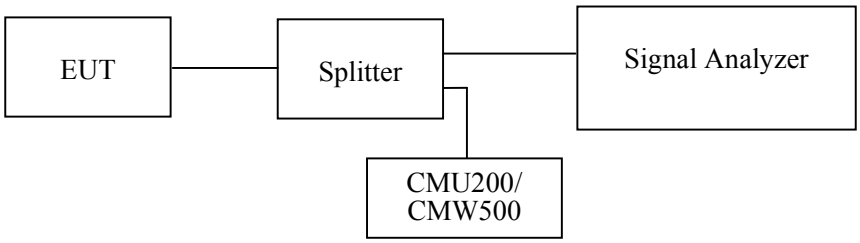
Applicable Standards

FCC 47 §2.1049, §22.917, §22.905; §27.53.

Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) & 100 kHz (WCDMA) & 20 kHz/30 kHz/50 kHz/100 kHz/200 kHz (LTE), and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	23.2~24.1℃
Relative Humidity:	50~53%
ATM Pressure:	100.5~101.3kPa

The testing was performed by Jack Jiao from 2020-04-28 to 2020-05-11.

EUT operation mode: Transmitting

Test Result: Compliance.

GSM 850 Band

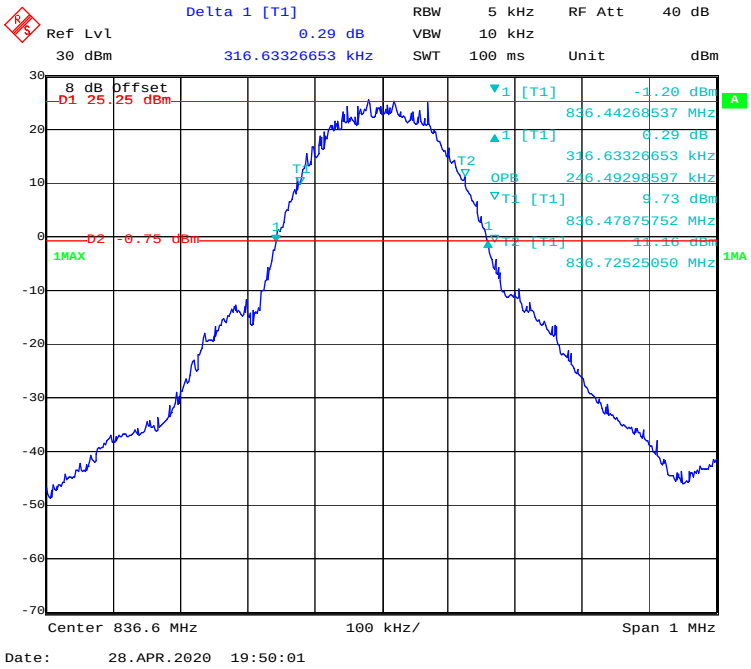
Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GSM (GMSK)	836.6	0.317	0.246
EGPRS (8PSK)	836.6	0.315	0.246

WCDMA Band V

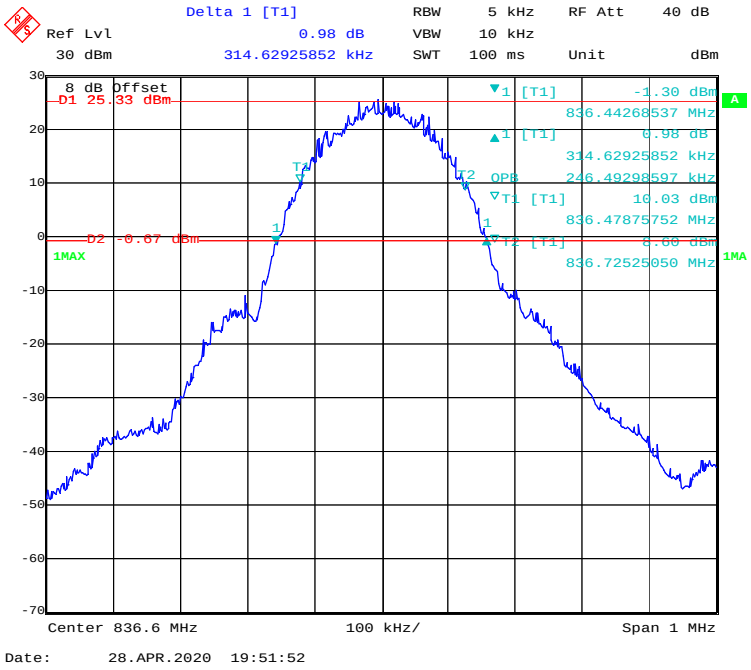
Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
WCDMA (Rel 99)	836.6	4.729	4.148
WCDMA (HSDPA)	836.6	4.709	4.148
WCDMA (HSUPA)	836.6	4.749	4.128
WCDMA (HSPA+)	836.6	4.729	4.148

GSM 850 Band

99% Occupied & 26 dB Emissions Bandwidth for GSM (GMSK) Mode

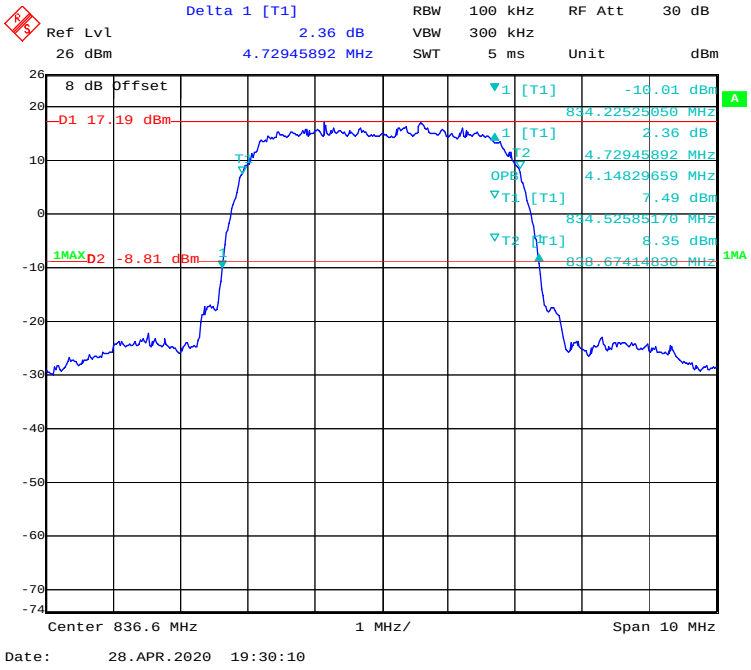


99% Occupied & 26 dB Emissions Bandwidth for EGPRS (GMSK) Mode

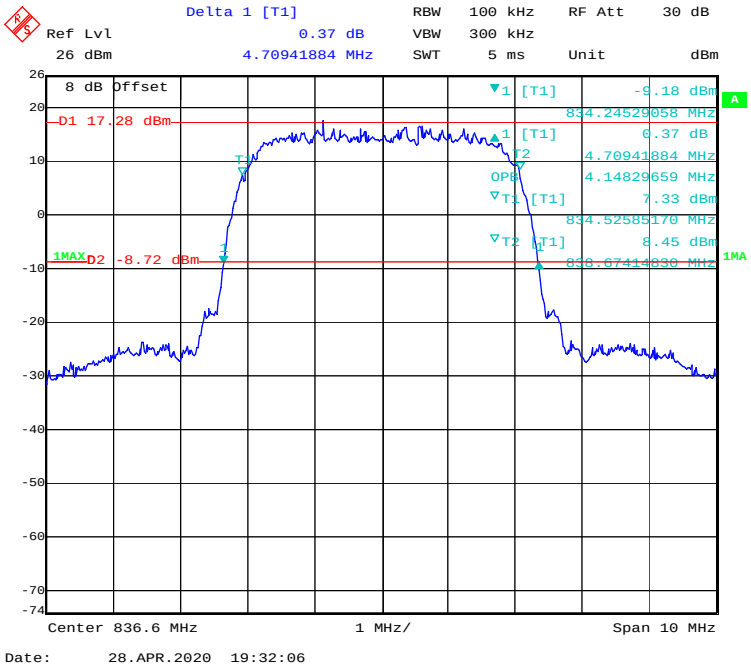


WCDMA Band V

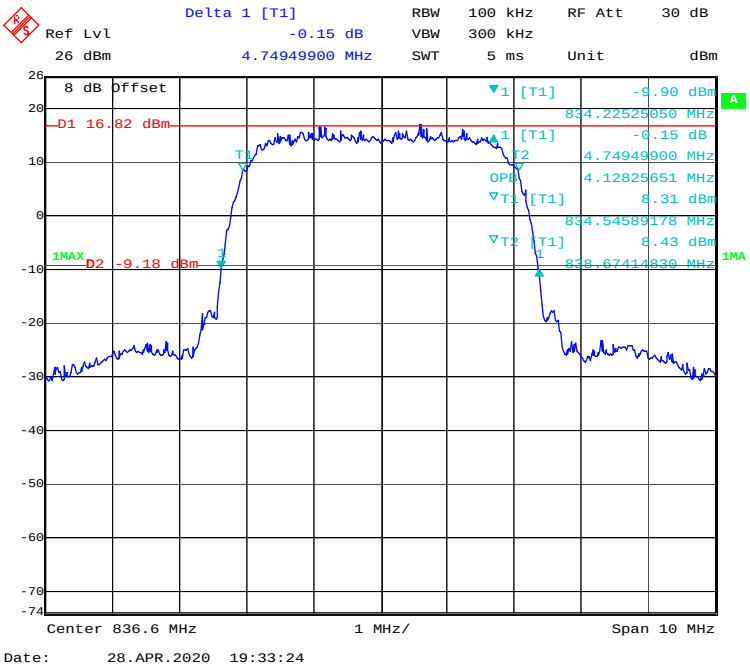
99% Occupied & 26 dB Emissions Bandwidth for WCDMA (Rel 99) Mode



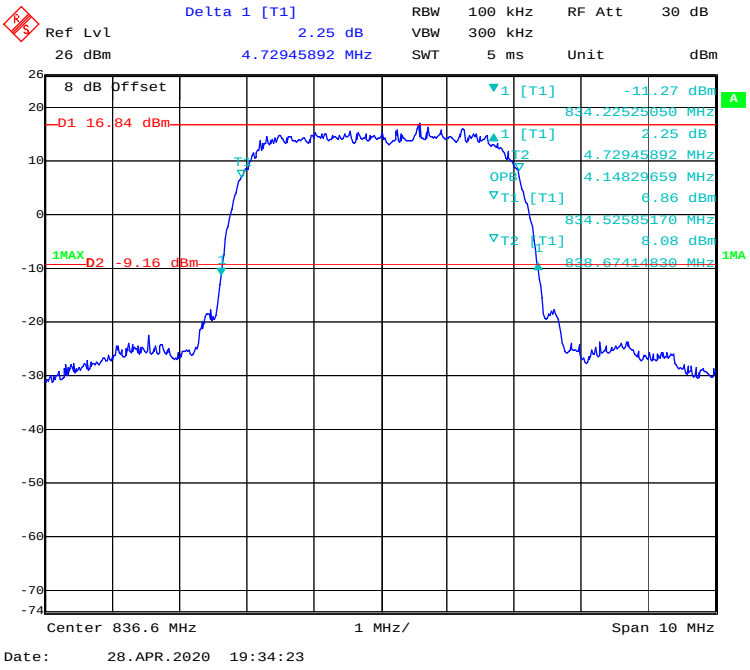
99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSDPA) Mode



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



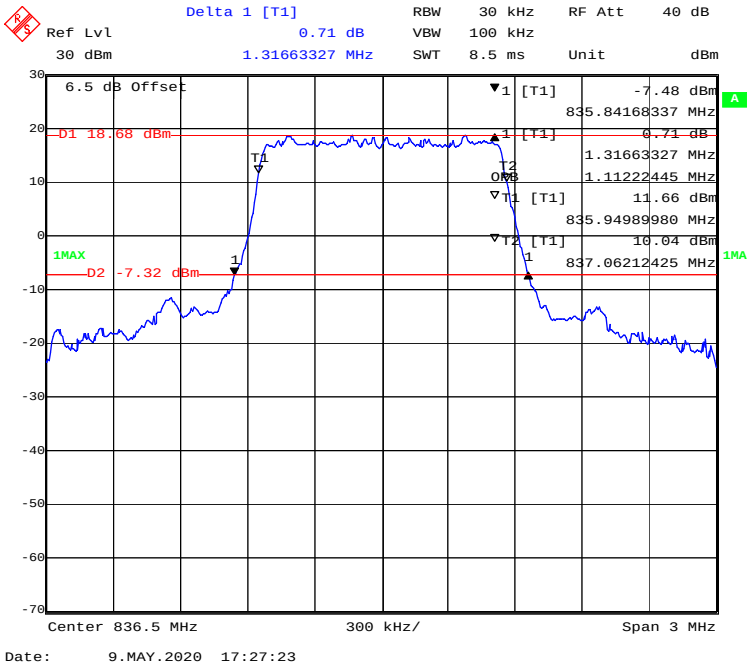
99% Occupied & 26 dB Emissions Bandwidth for WCDMA (HSPA+) Mode



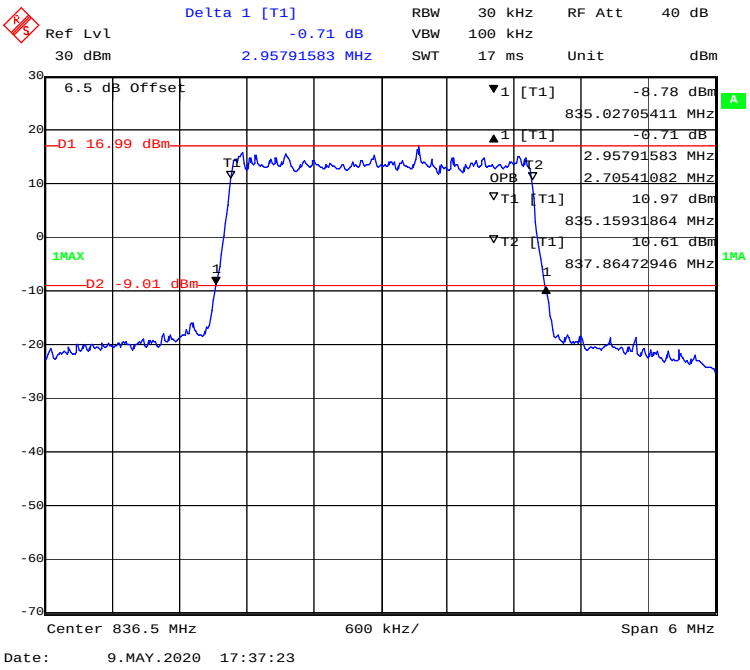
LTE Band 5:

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	1.4M	Middle	1.317	1.112
	3M		2.958	2.705
	5M		5.010	4.509
	10M		9.820	8.978
16-QAM	1.4M	Middle	1.317	1.112
	3M		2.958	2.705
	5M		4.990	4.529
	10M		9.820	8.978

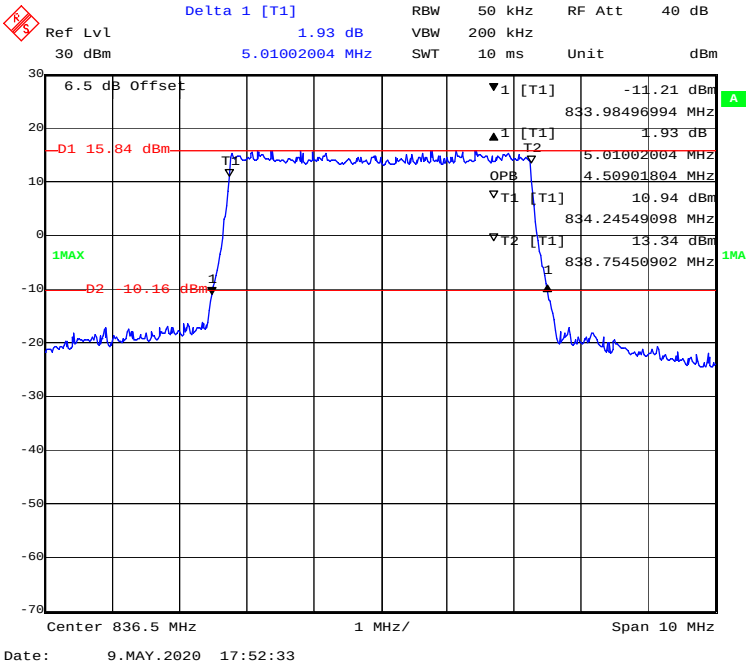
QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



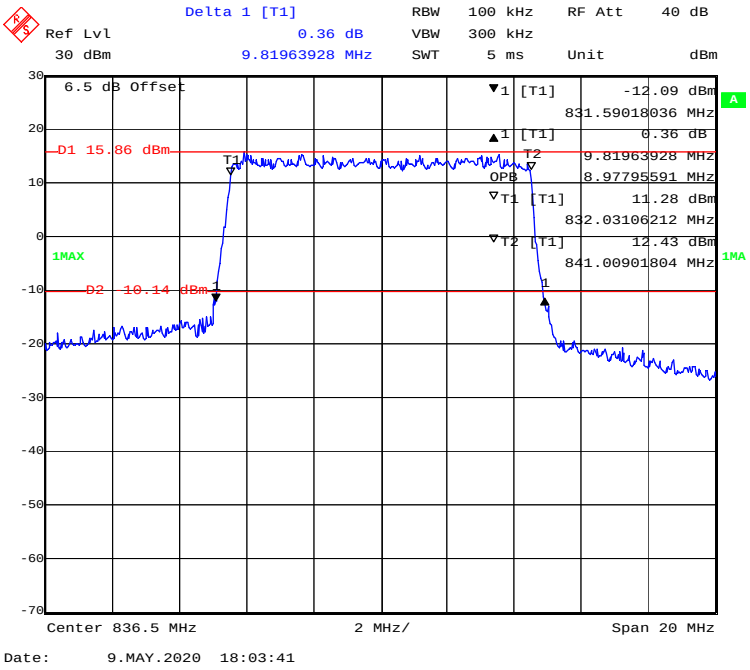
QPSK (3.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



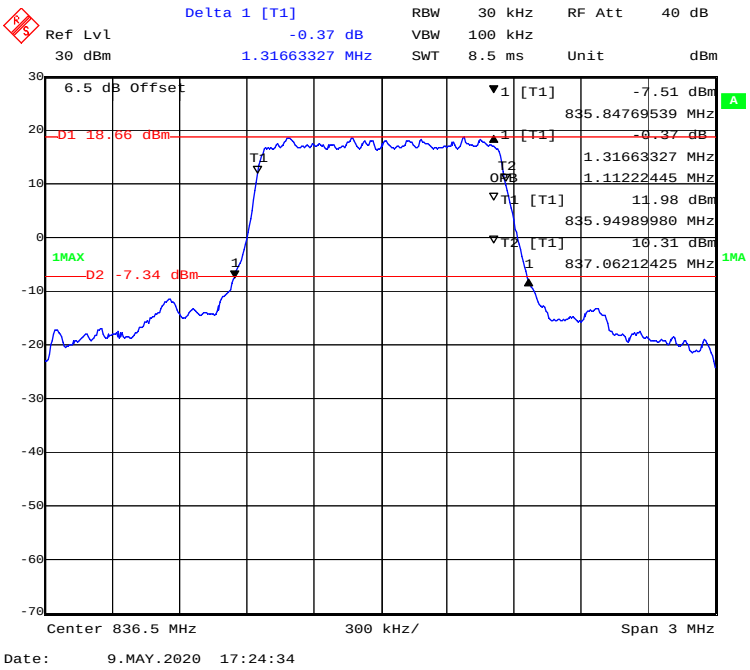
QPSK (5.0MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



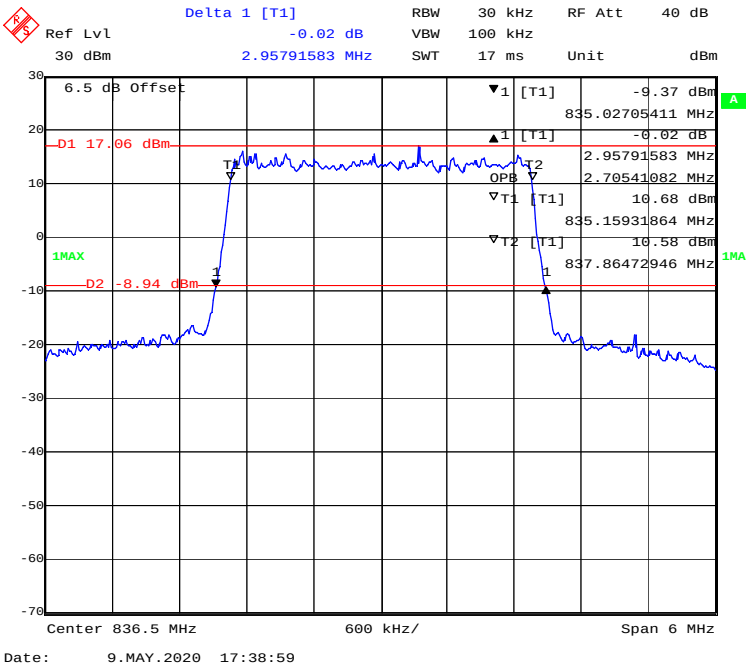
QPSK (10.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



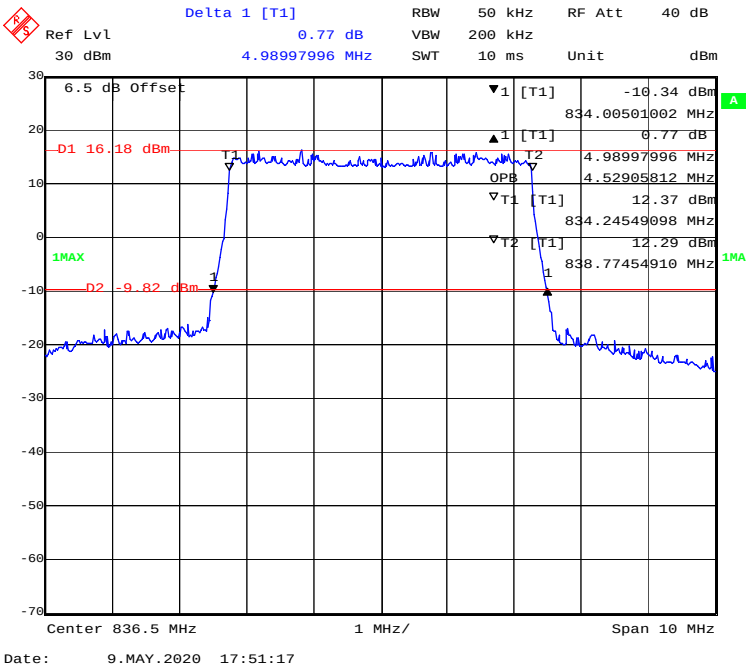
16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



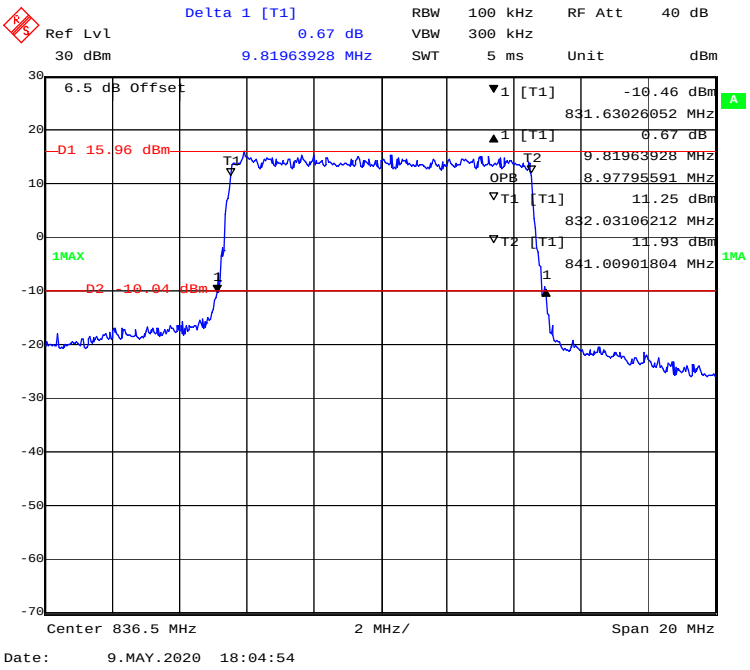
16-QAM (3.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



16-QAM (5.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



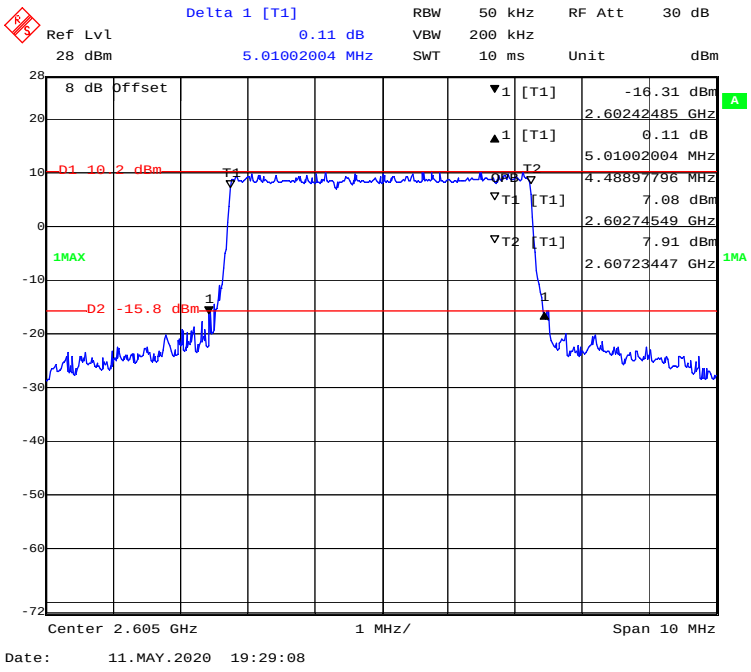
16-QAM (10.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



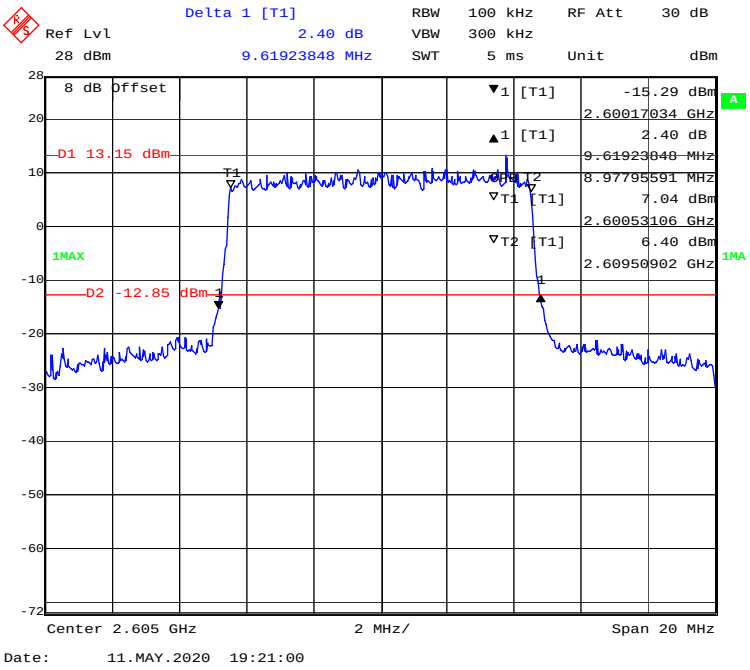
LTE Band 41:

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth	99% Occupied Bandwidth
			MHz	MHz
QPSK	5M	Middle	5.010	4.489
	10M		9.619	8.978
	15M		16.112	13.587
	20M		20.922	17.956
16-QAM	5M	Middle	4.930	4.489
	10M		9.579	8.978
	15M		16.293	13.587
	20M		19.719	18.036

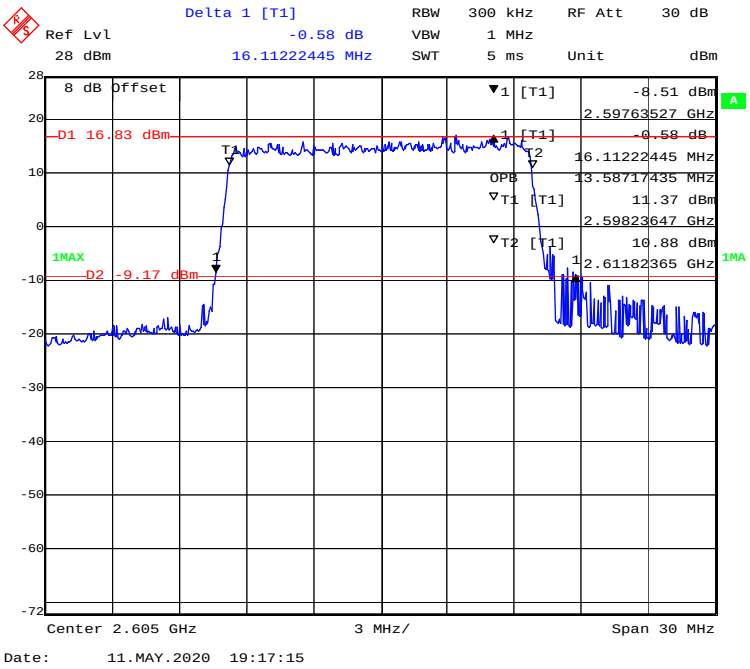
QPSK (5.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



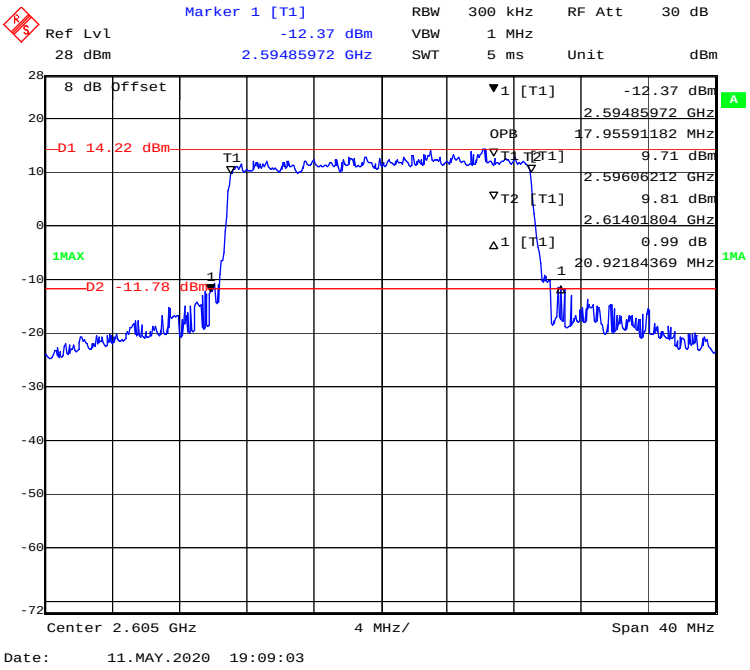
QPSK (10.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



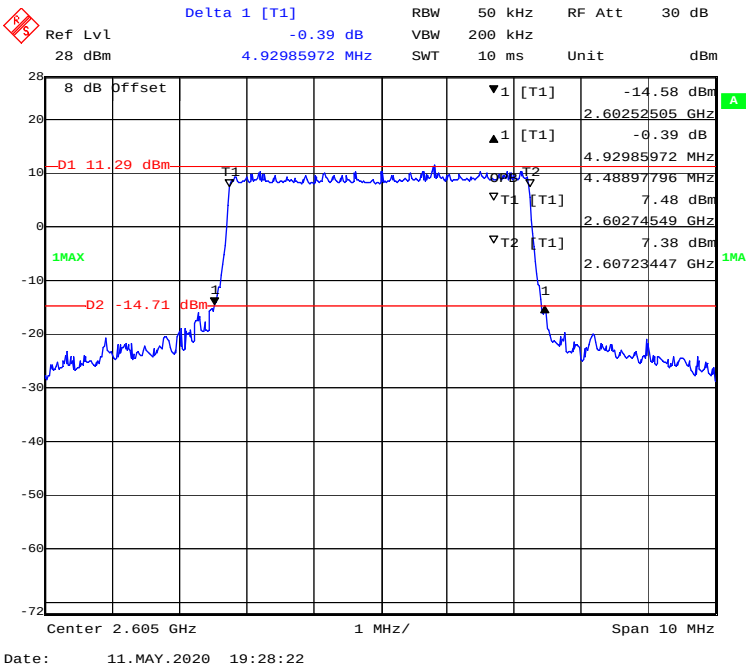
QPSK (15.0MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



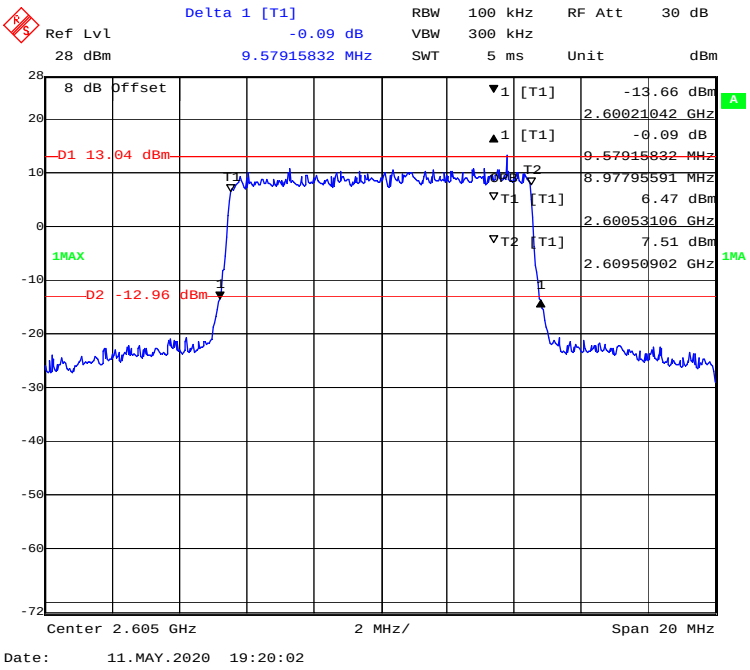
QPSK (20.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



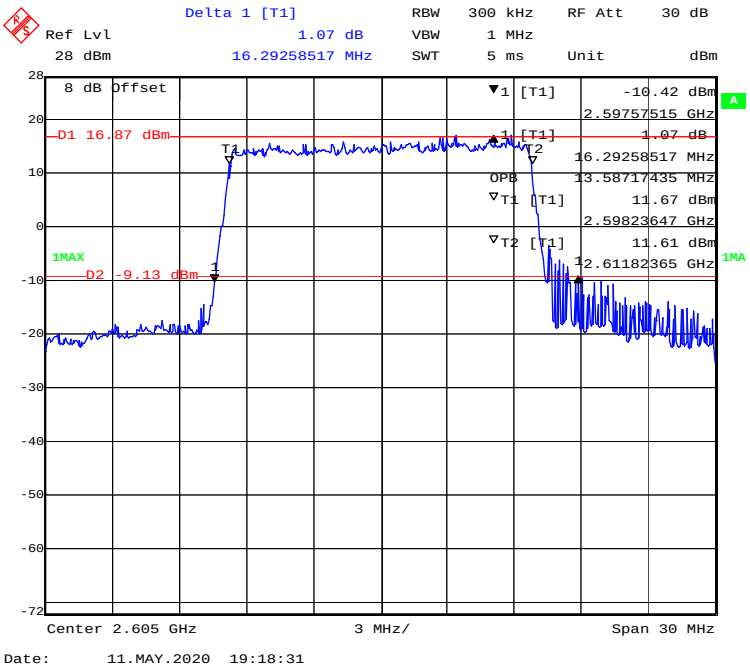
16-QAM (5.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



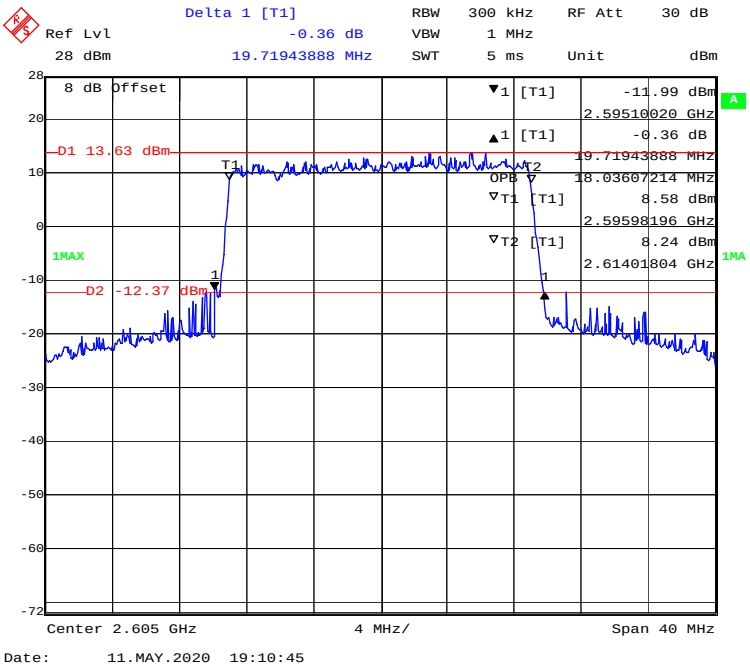
16-QAM (10.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



16-QAM (15.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



16-QAM (20.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



FCC § 2.1051; § 22.917 (a); §27.53 (m) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

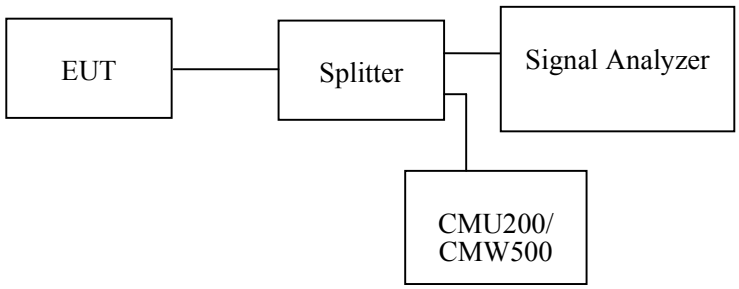
FCC §2.1051, §22.917(a) and and §27.53 (m).

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

According to §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 100 kHz 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:	23.2~24.1℃
Relative Humidity:	50~53%
ATM Pressure:	100.5~101.3kPa

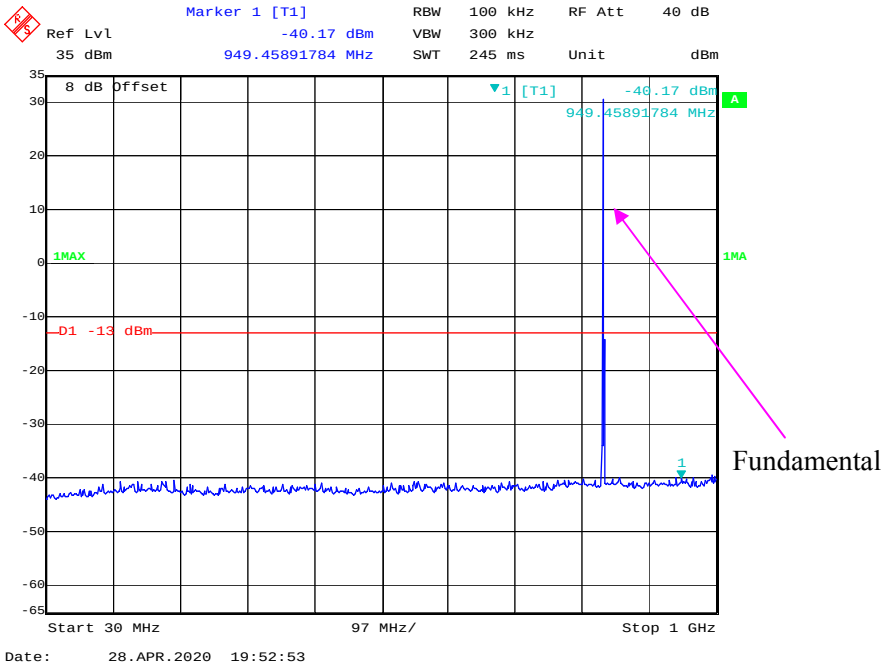
The testing was performed by Jack Jiao from 2020-04-28 to 2020-05-11.

EUT operation mode: Transmitting

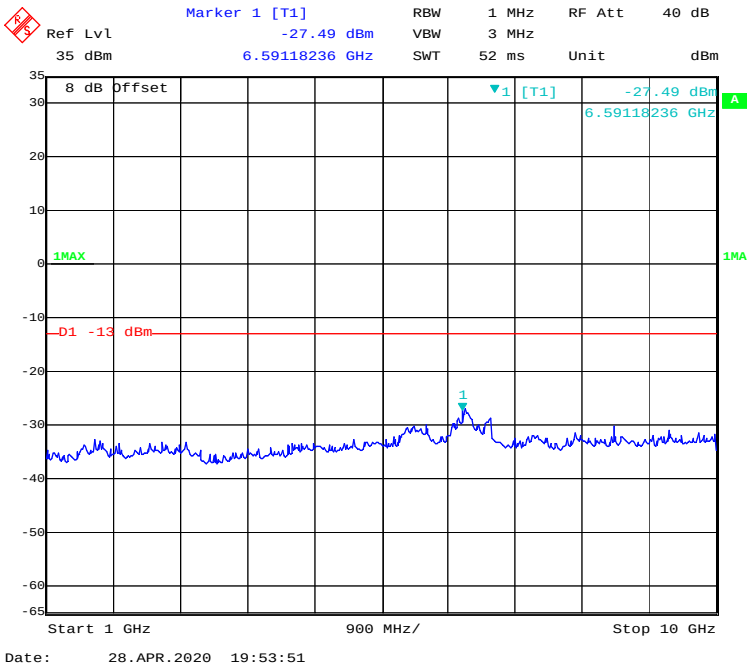
Test Result: Compliance.

GSM 850 Band:

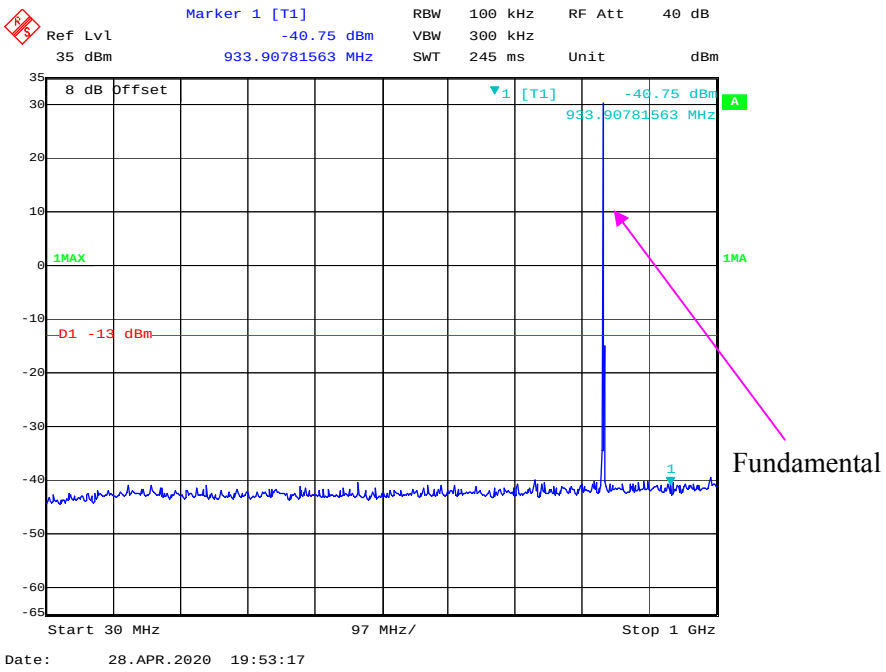
30 MHz – 1GHz(GSM Mode)



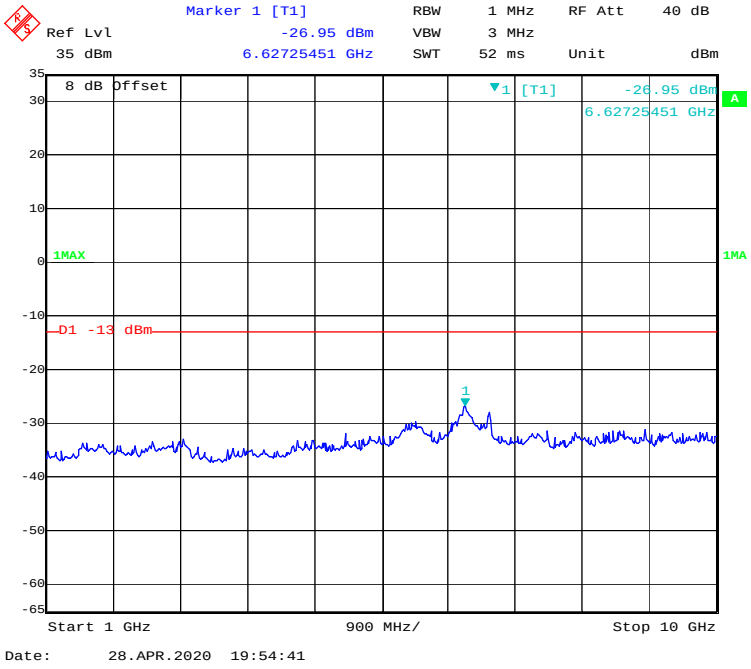
1 GHz – 10 GHz (GSM Mode)



30 MHz – 1GHz(EGPRS Mode)

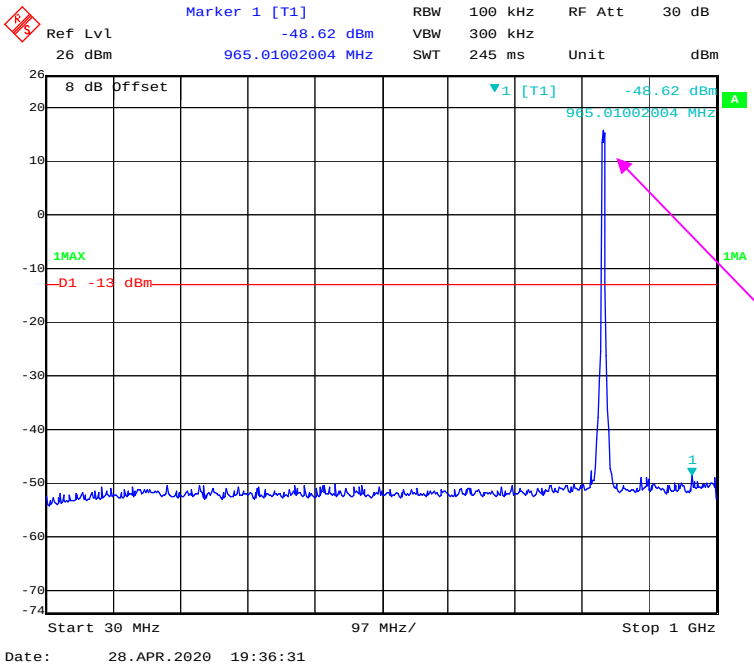


1 GHz – 10 GHz (EGPRS Mode)



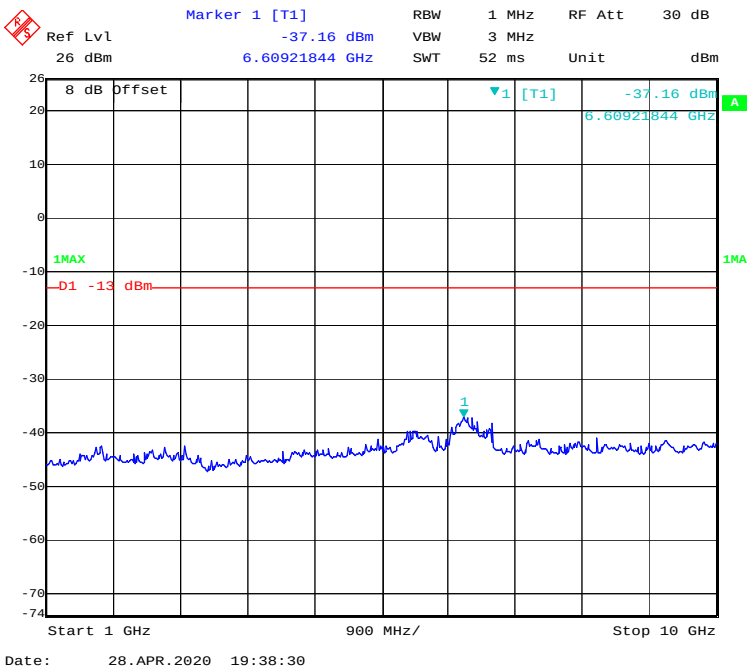
WCDMA Band V:

30 MHz – 1GHz WCDMA (Rel 99) Mode

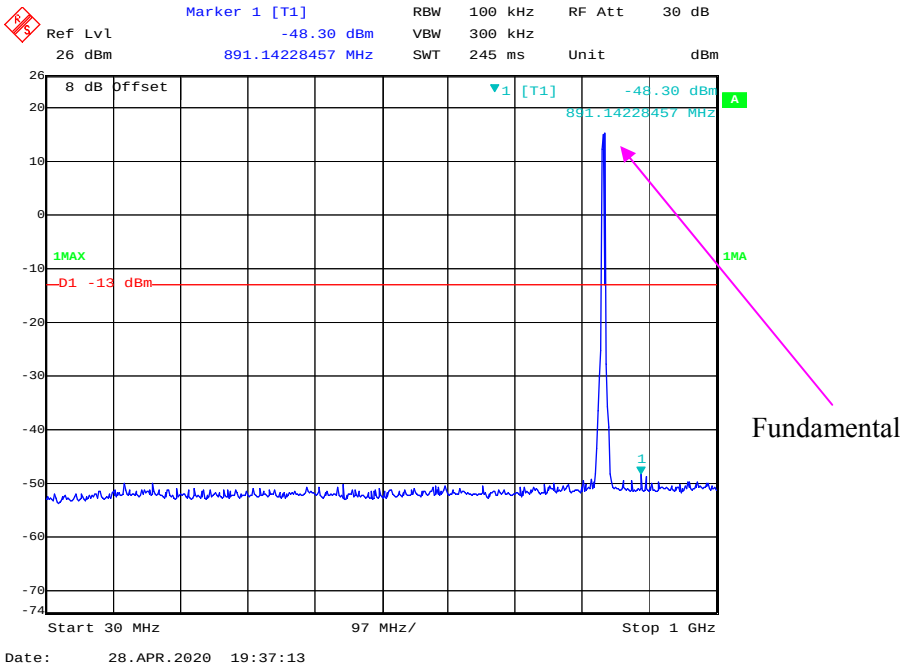


Fundamental

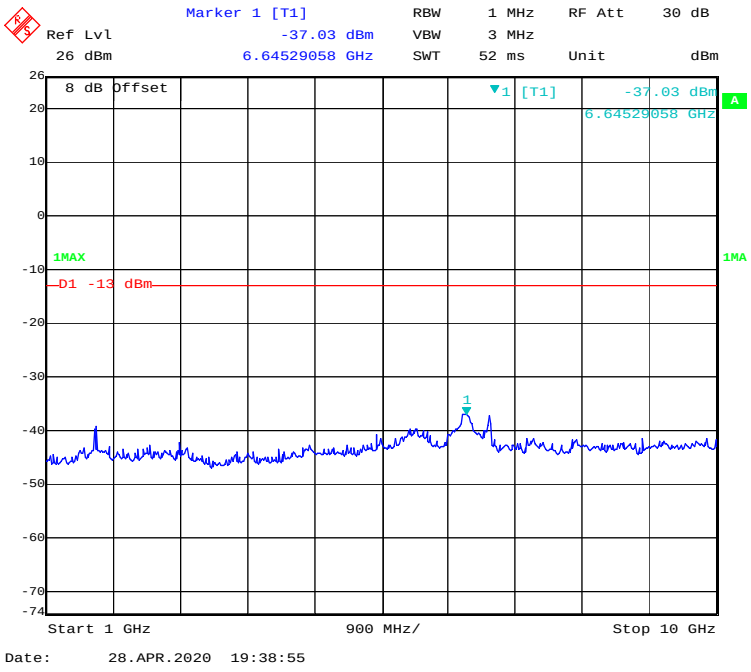
1 GHz – 10 GHz WCDMA (Rel 99) Mode



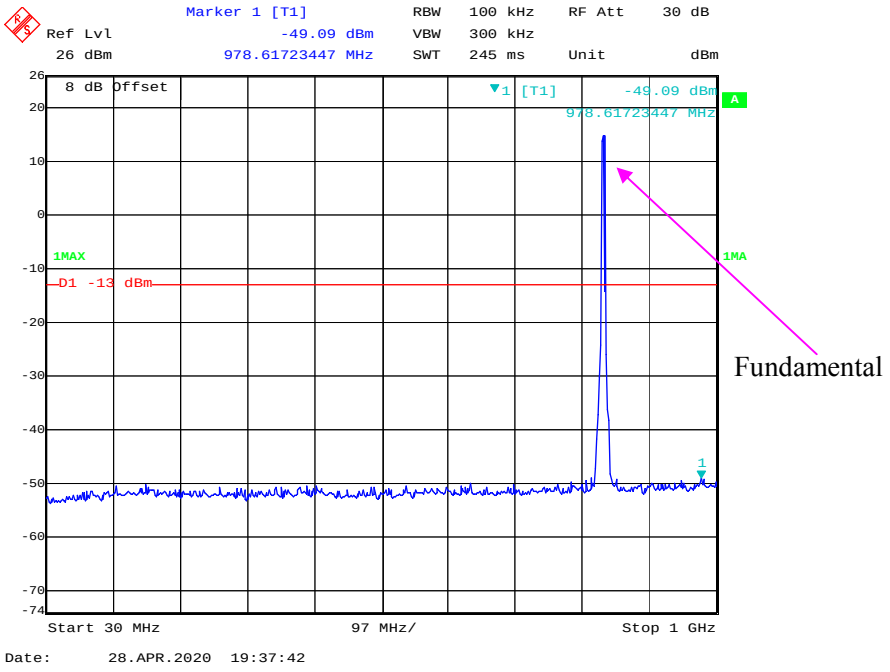
30 MHz – 1GHz WCDMA (HSDPA) Mode



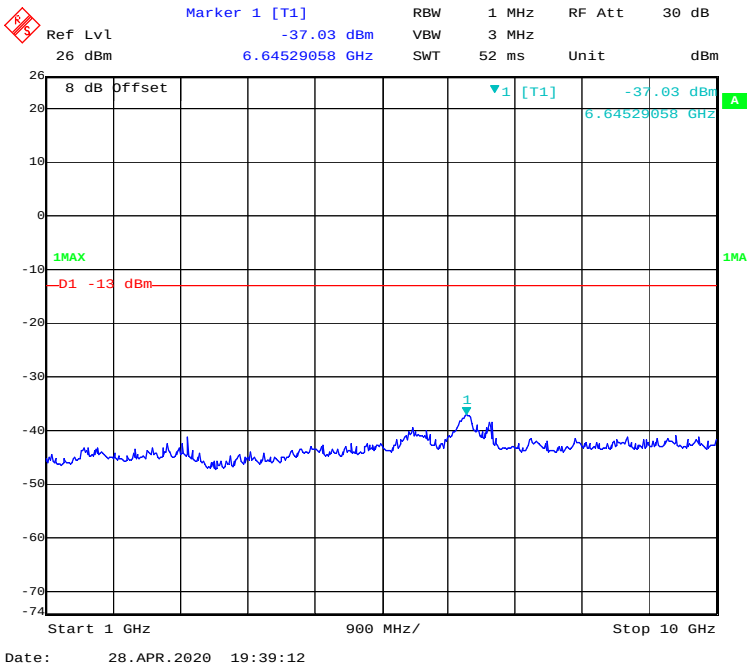
1 GHz – 10 GHz WCDMA (HSDPA) Mode



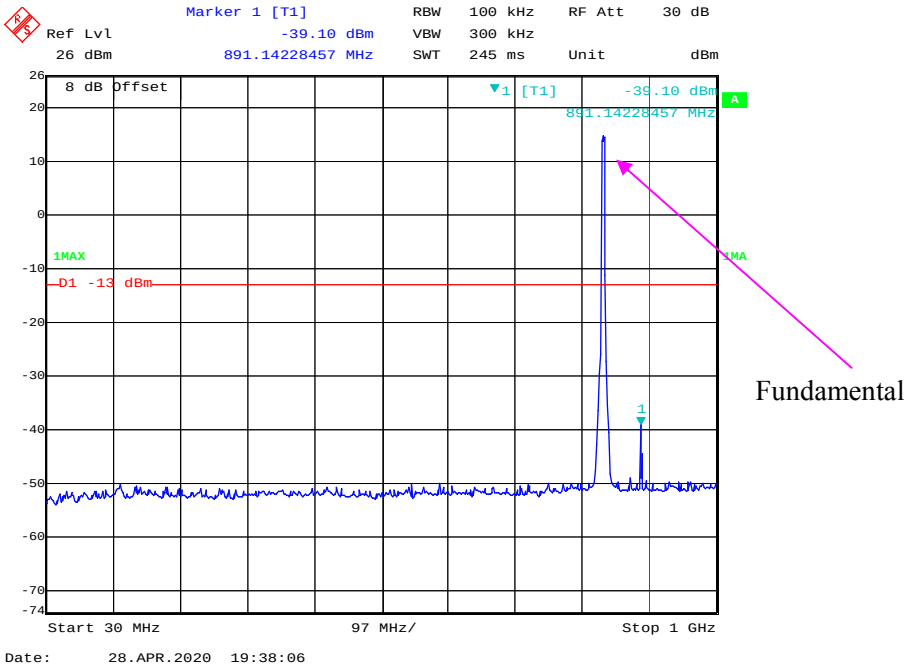
30 MHz – 1GHz WCDMA (HSUPA) Mode



1 GHz – 10 GHz WCDMA (HSUPA) Mode



30 MHz – 1GHz WCDMA (HSPA+) Mode



Date: 28.APR.2020 19:38:06

1 GHz – 10 GHz WCDMA (HSPA+) Mode

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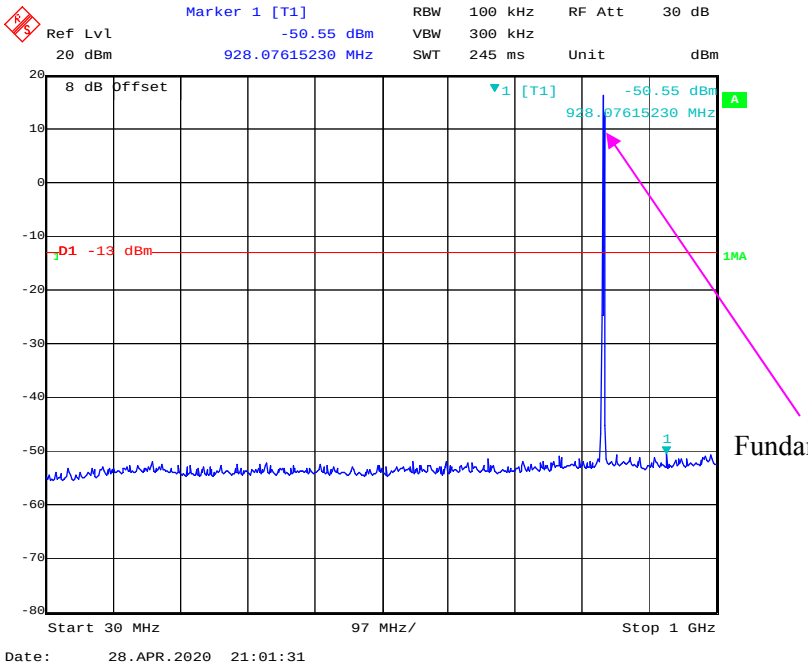
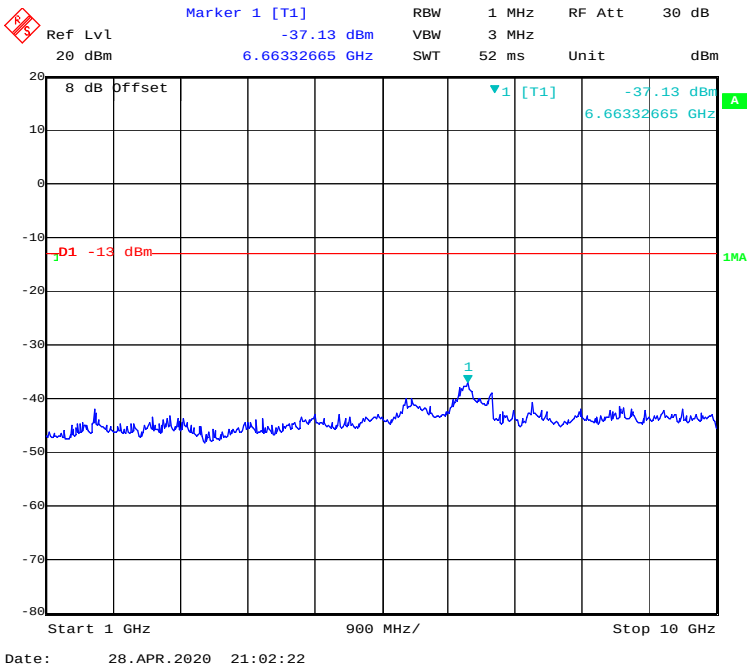
LTE Band 5:

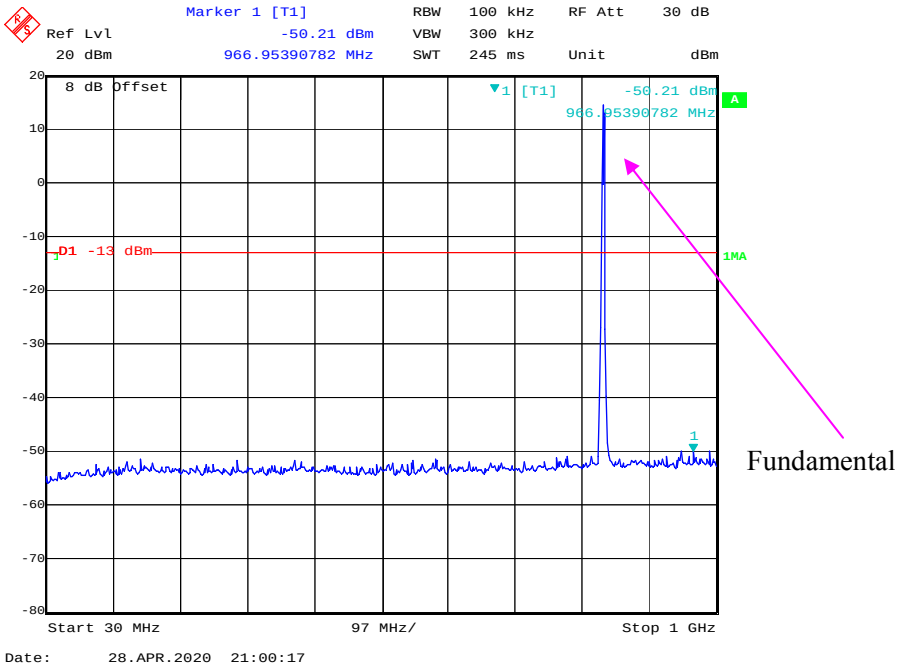
30 MHz - 1 GHz (QPSK, 1.4 MHz, Middle Channel)



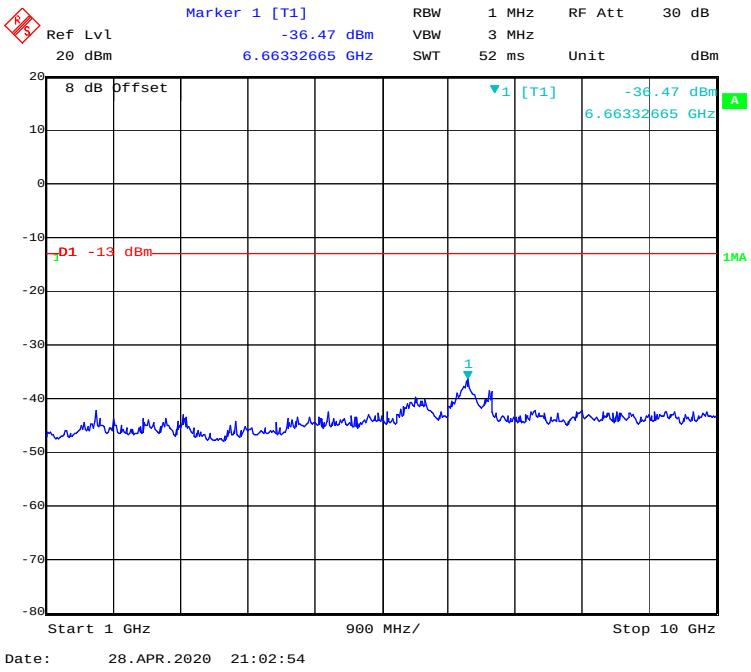
1 GHz – 10 GHz (QPSK, 1.4 MHz, Middle Channel)



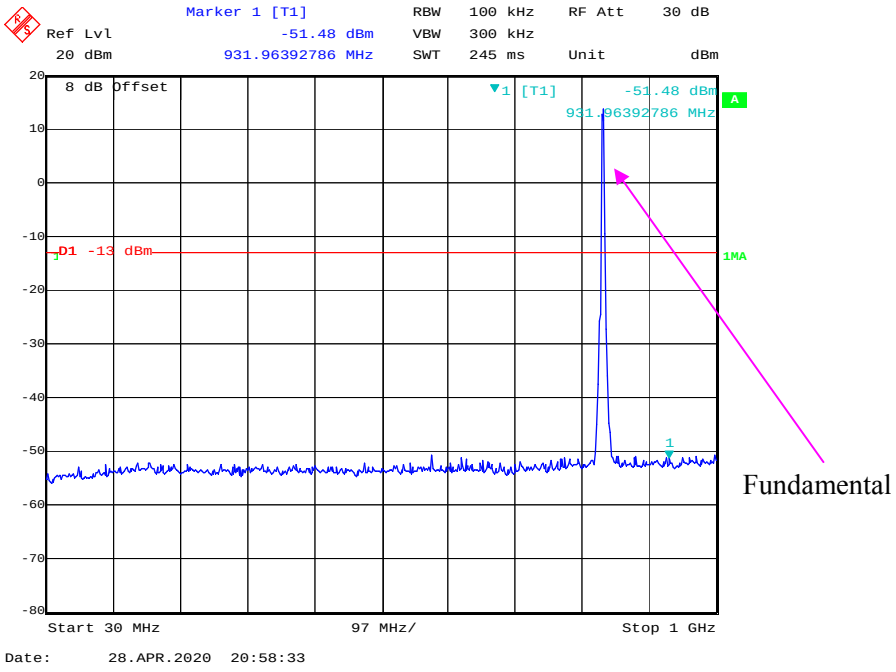
30 MHz - 1 GHz (QPSK, 3.0 MHz, Middle Channel)



1 GHz – 26.5 GHz (QPSK, 3.0 MHz, Middle Channel)

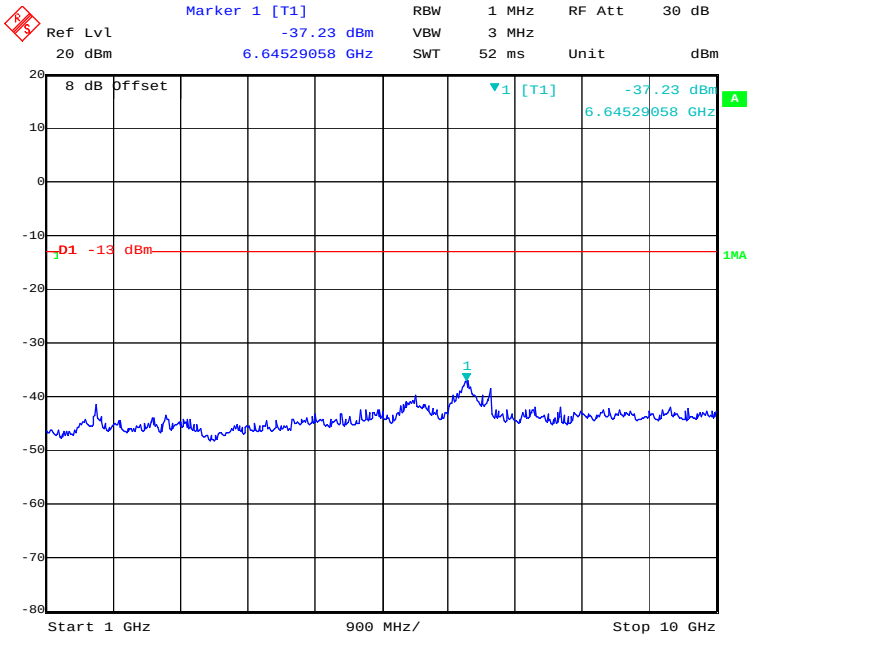


30 MHz - 1 GHz (QPSK, 5.0 MHz, Middle Channel)



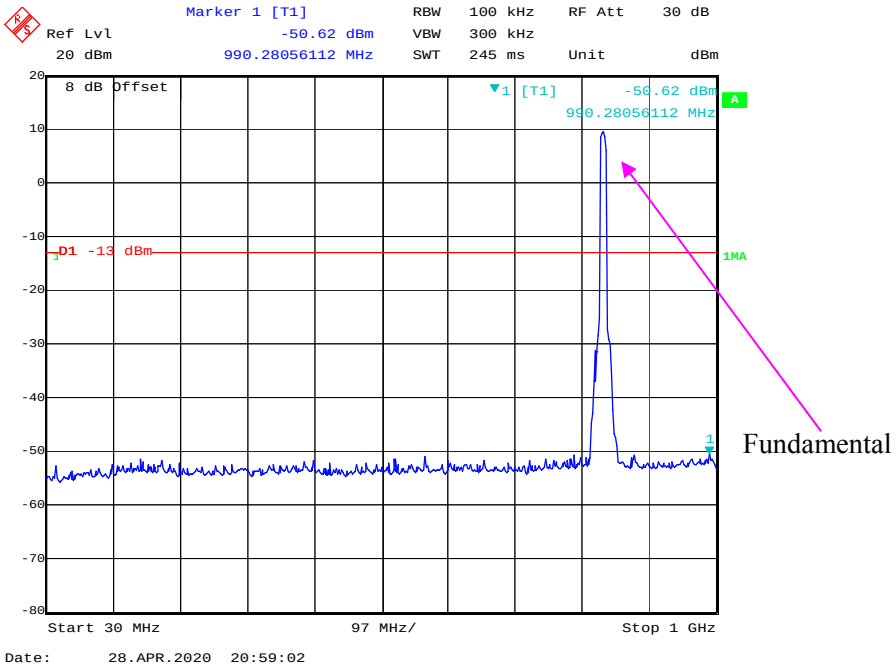
Date: 28.APR.2020 20:58:33

1 GHz – 10 GHz (QPSK, 5.0MHz, Middle Channel)

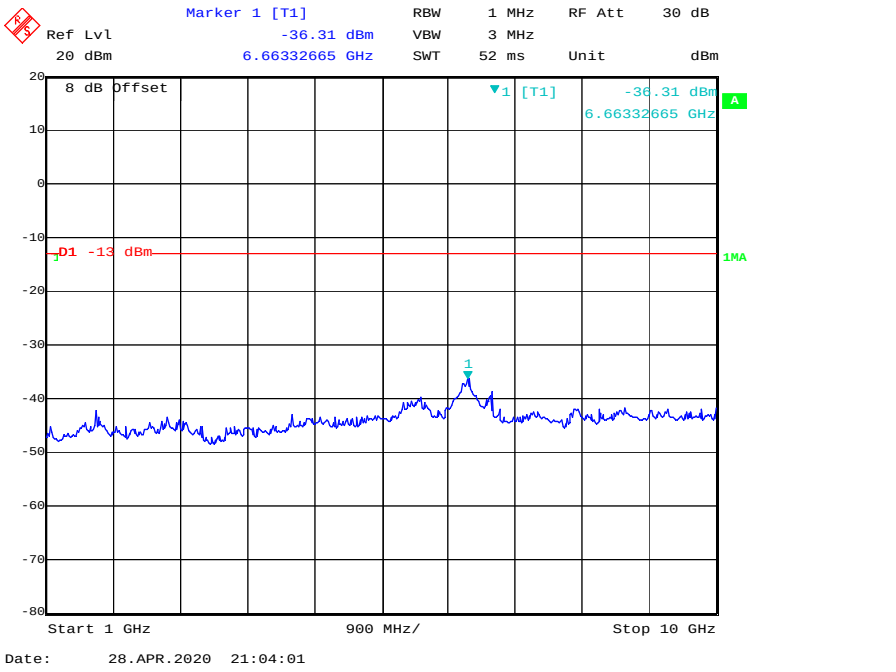


Date: 28.APR.2020 21:03:24

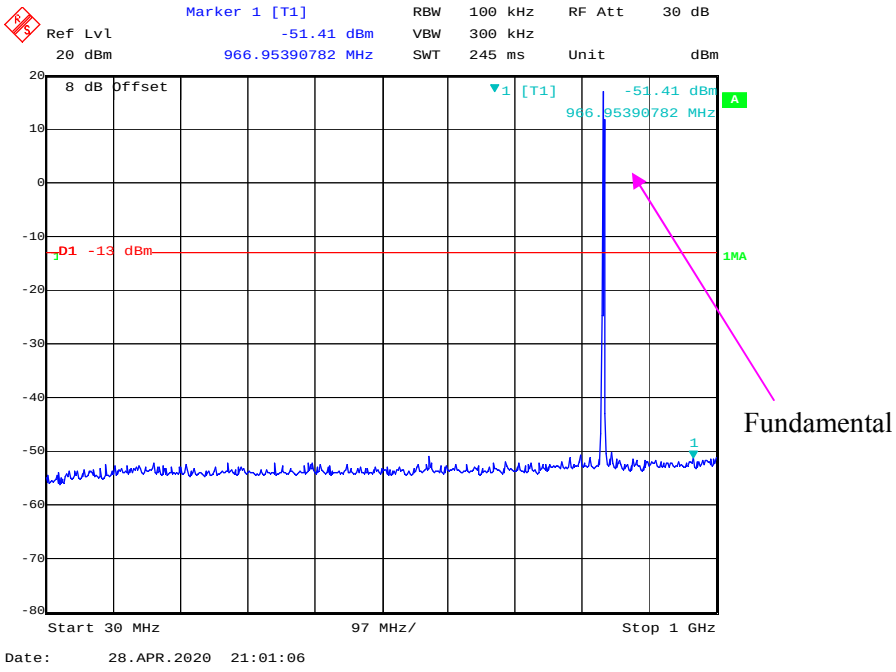
30 MHz - 1 GHz (QPSK, 10.0 MHz, Middle Channel)



1 GHz – 26.5 GHz (QPSK, 10.0 MHz, Middle Channel)

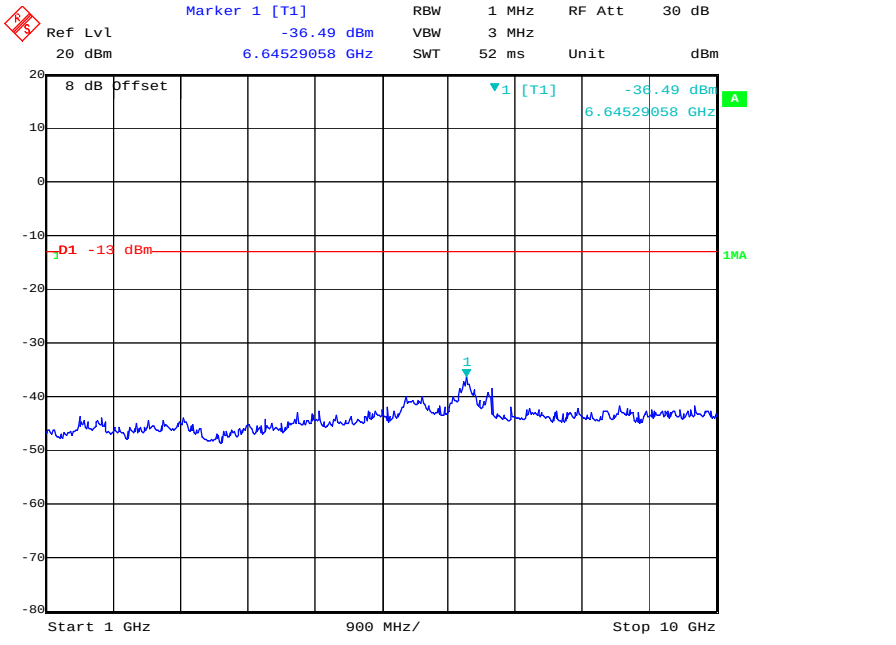


30 MHz - 1 GHz (16QAM, 1.4 MHz, Middle Channel)



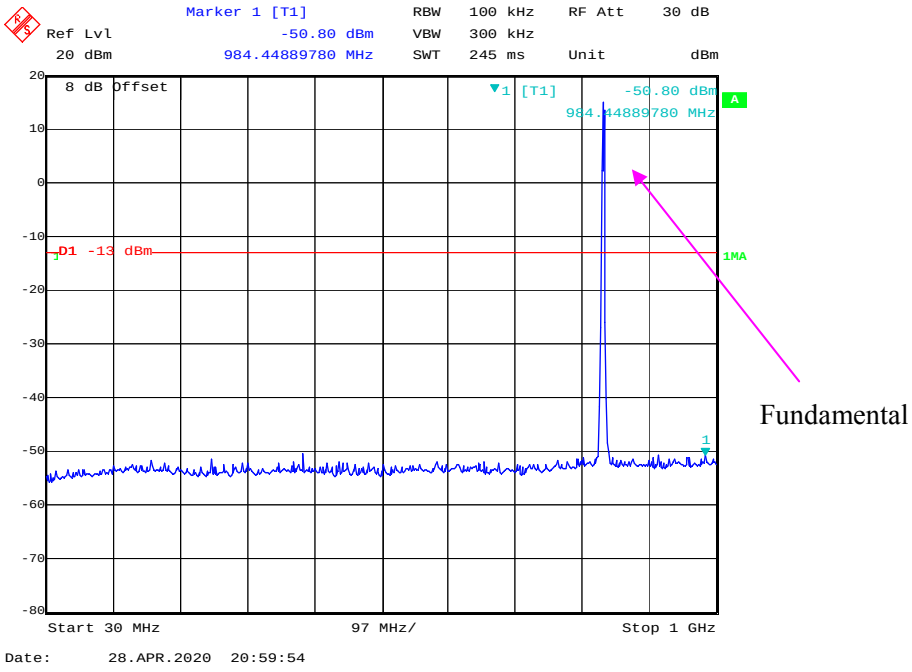
Date: 28.APR.2020 21:01:06

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



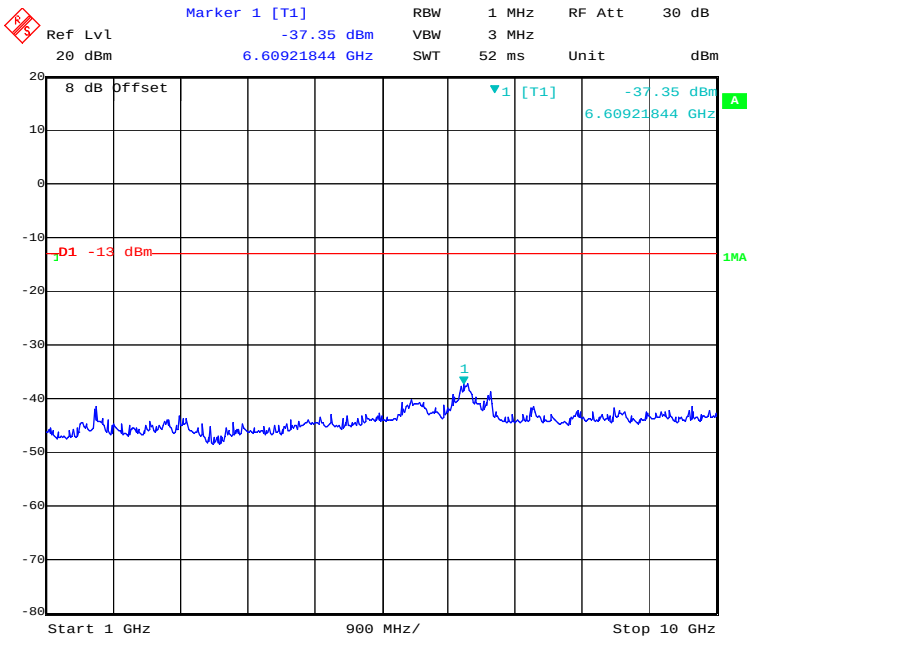
Date: 28.APR.2020 21:02:11

30 MHz - 1 GHz (16QAM, 3.0 MHz, Middle Channel)



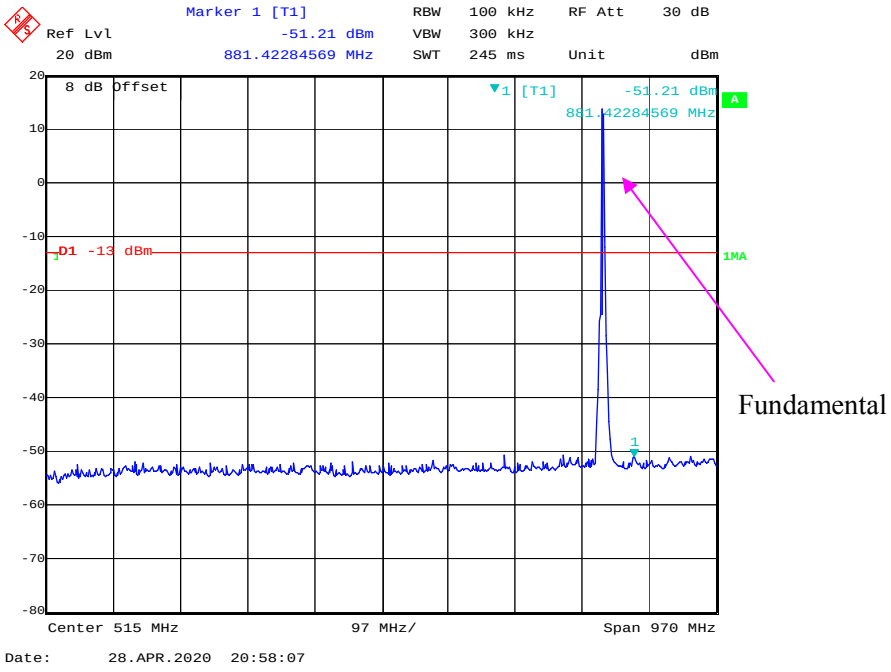
Date: 28.APR.2020 20:59:54

1 GHz – 10 GHz (16QAM, 3.0 MHz, Middle Channel)

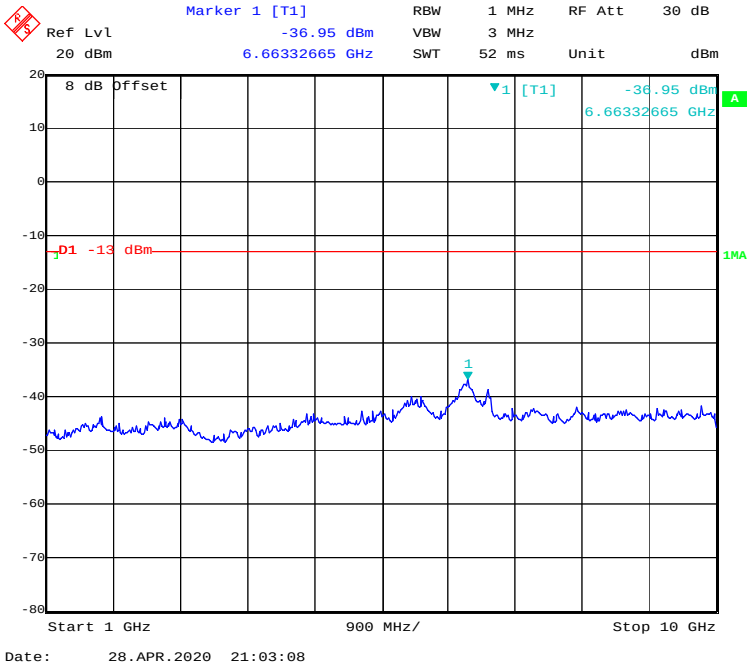


Date: 28.APR.2020 21:02:39

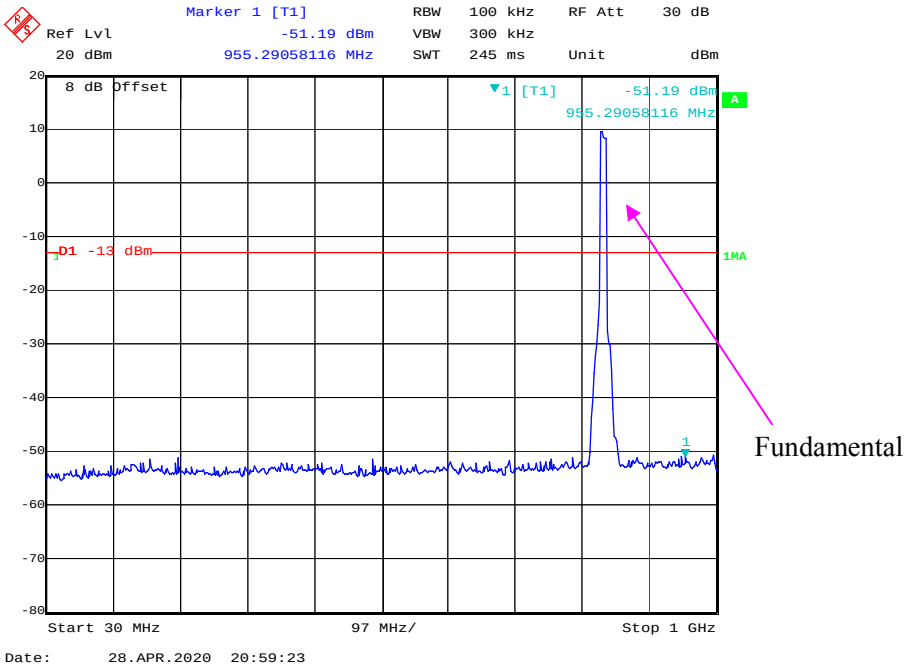
30 MHz - 1 GHz (16QAM, 5.0 MHz, Middle Channel)



1 GHz – 10 GHz (16QAM, 5.0MHz, Middle Channel)

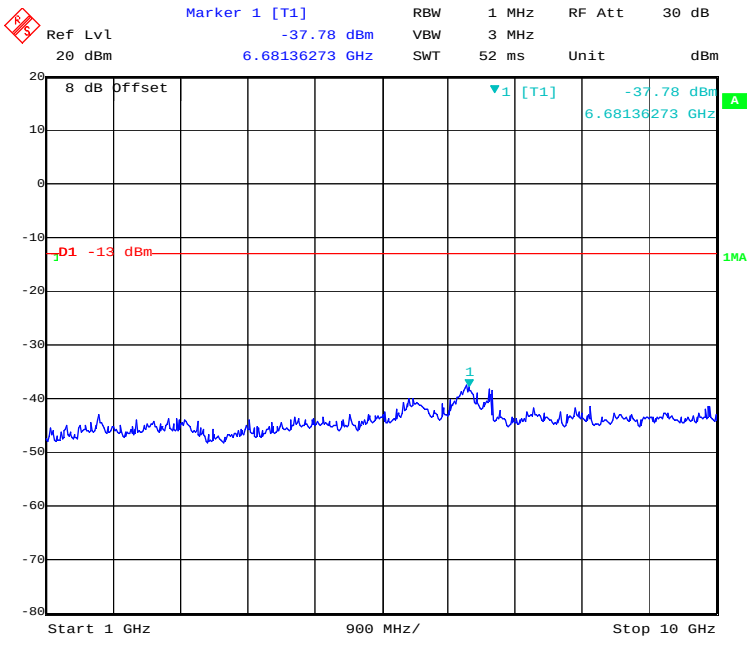


30 MHz - 1 GHz (16QAM, 10.0 MHz, Middle Channel)



Date: 28.APR.2020 20:59:23

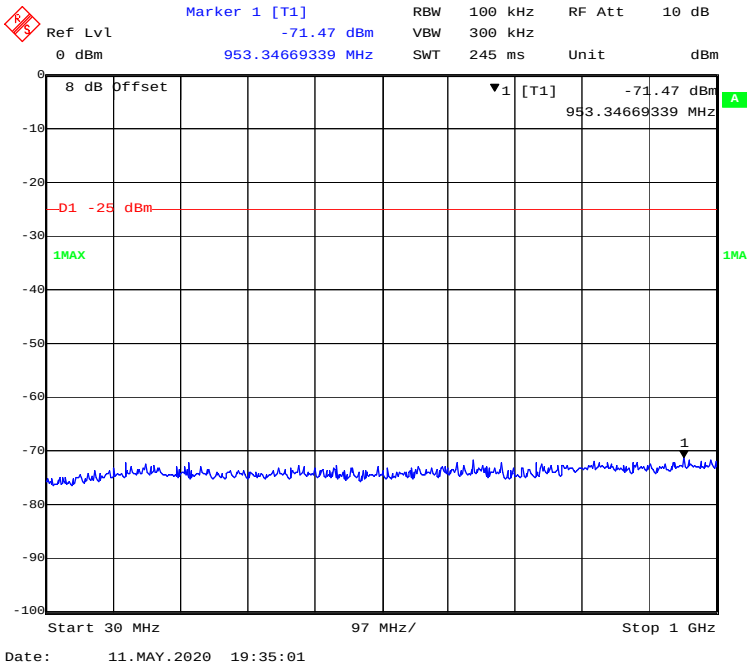
1 GHz – 10 GHz (16QAM, 10.0 MHz, Middle Channel)



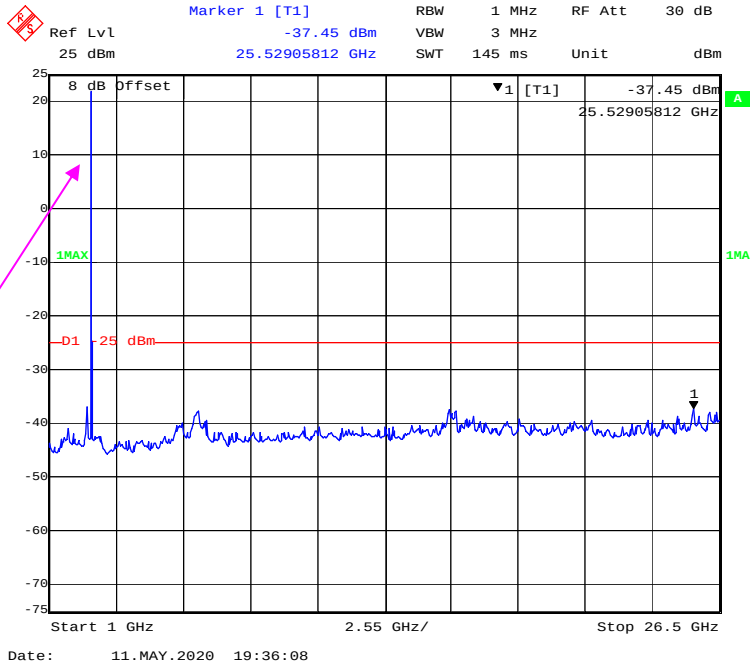
Date: 28.APR.2020 21:03:39

LTE Band 41

30 MHz - 1 GHz (QPSK, 5.0 MHz, Middle Channel)

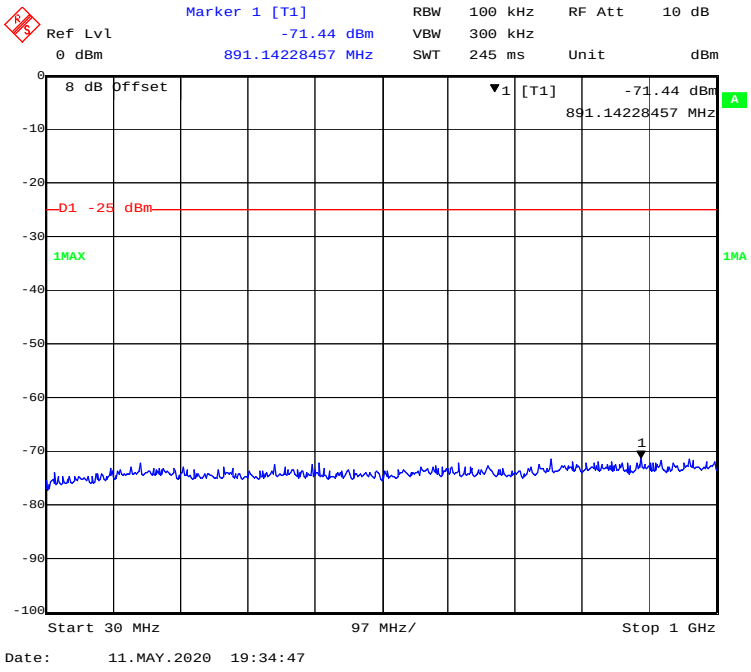


1 GHz – 26.5 GHz (QPSK, 5.0 MHz, Middle Channel)

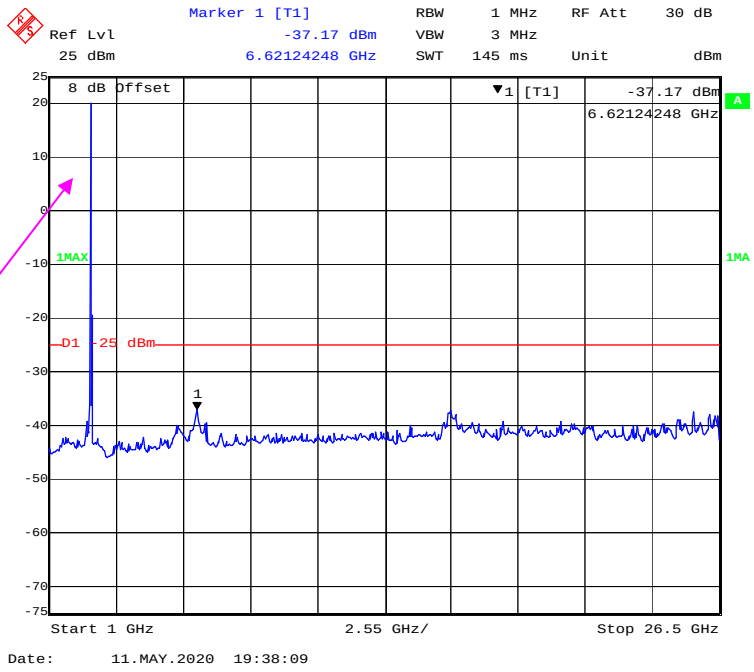


Fundamental

30 MHz - 1 GHz (QPSK, 10.0 MHz, Middle Channel)

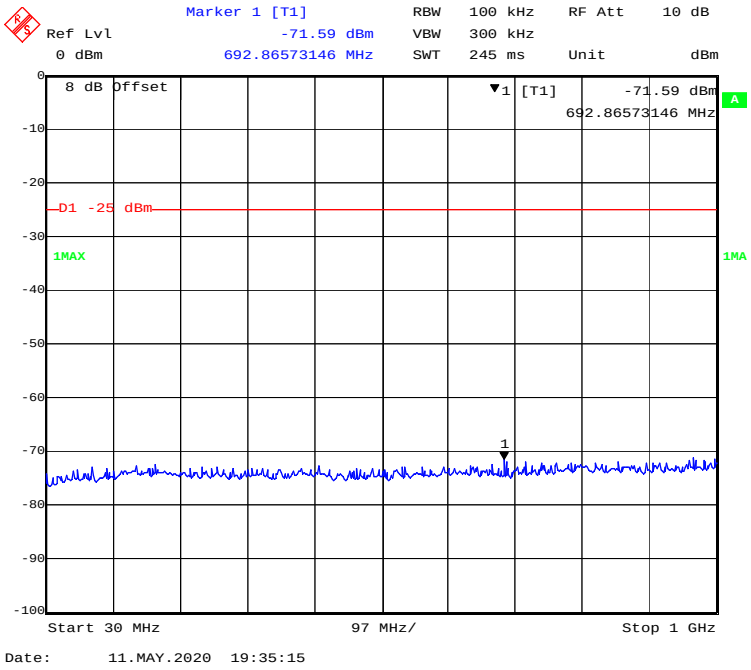


1 GHz – 26.5 GHz (QPSK, 10.0 MHz, Middle Channel)

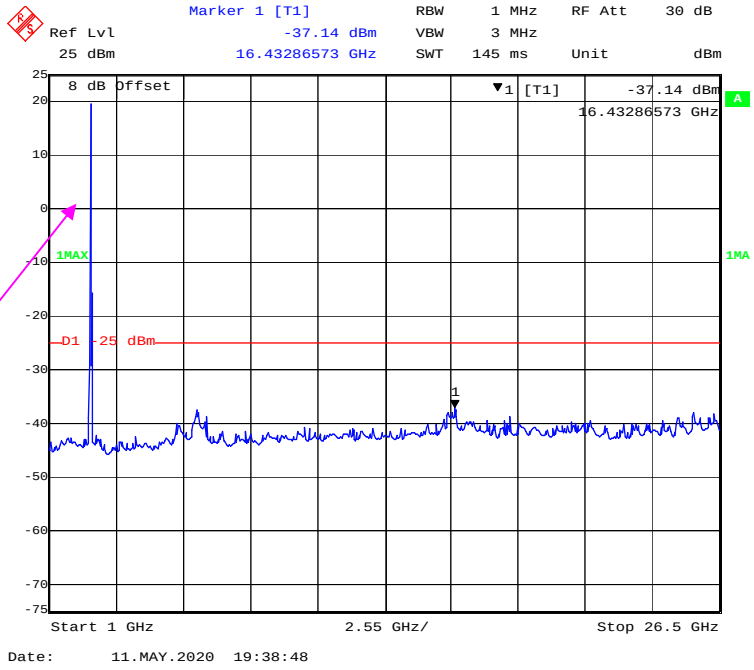


Fundamental

30 MHz - 1 GHz (QPSK, 15.0 MHz, Middle Channel)

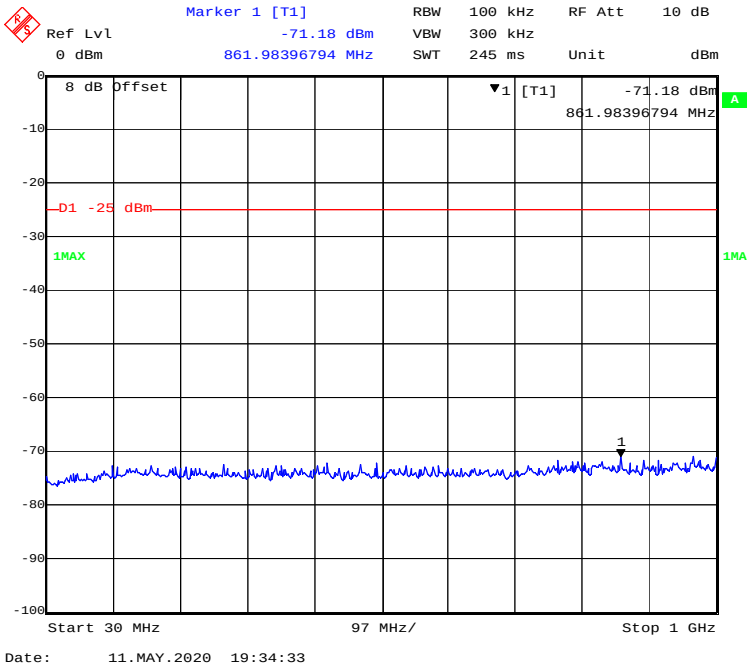


1 GHz – 26.5 GHz (QPSK, 15.0MHz, Middle Channel)

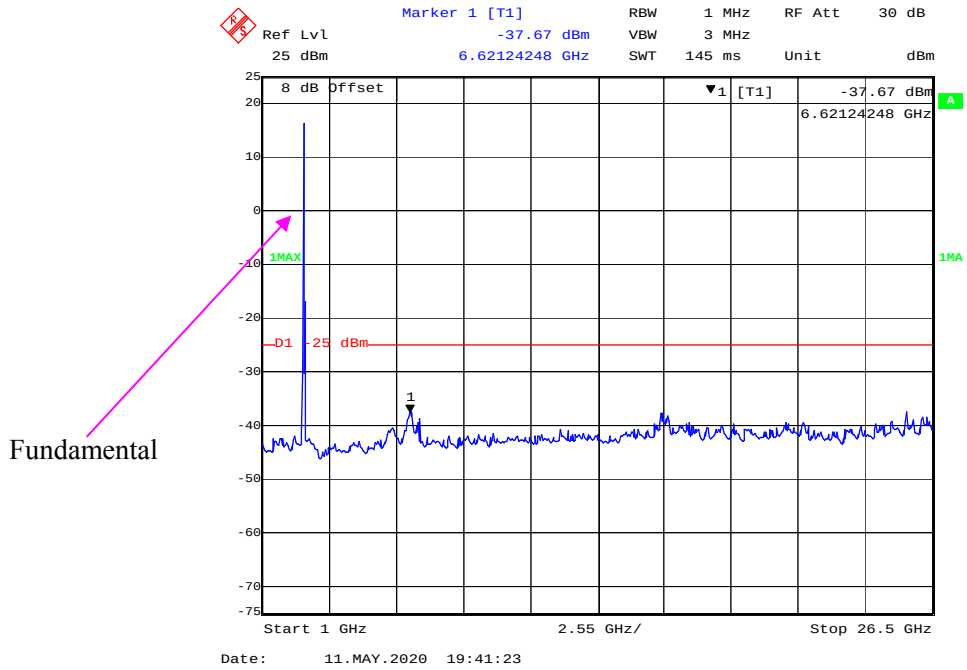


Fundamental

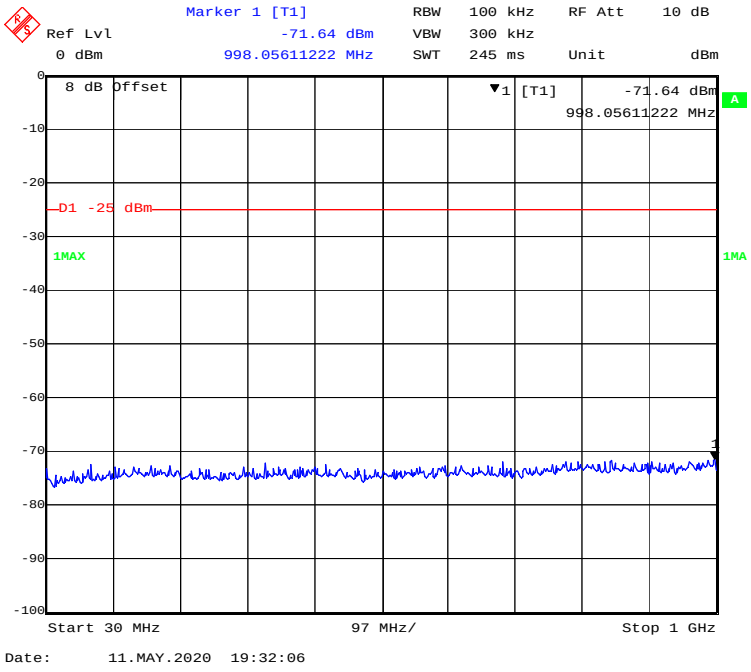
30 MHz - 1 GHz (QPSK, 20.0 MHz, Middle Channel)



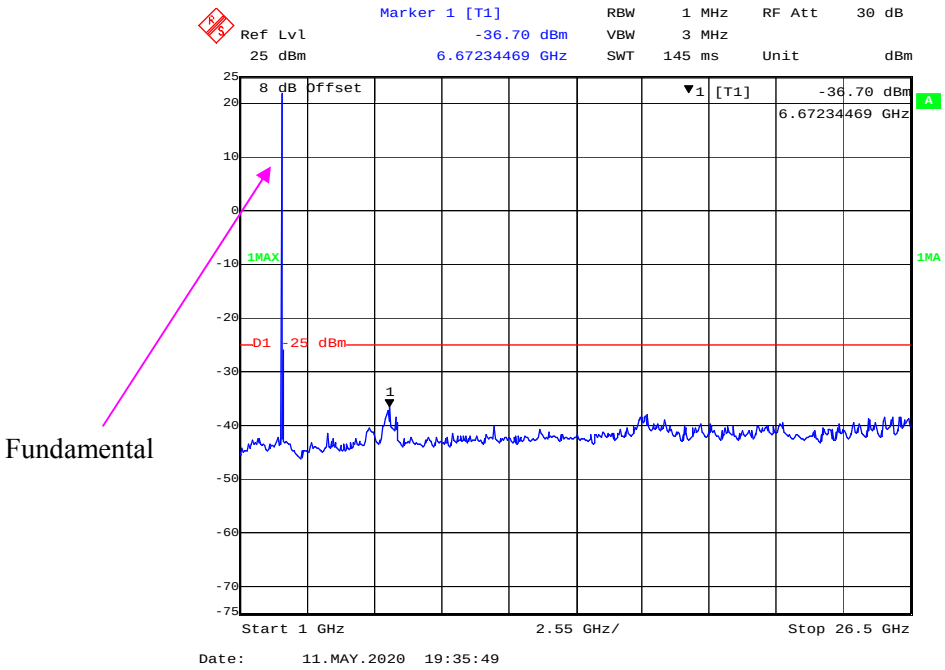
1 GHz – 26.5 GHz (QPSK, 20.0 MHz, Middle Channel)



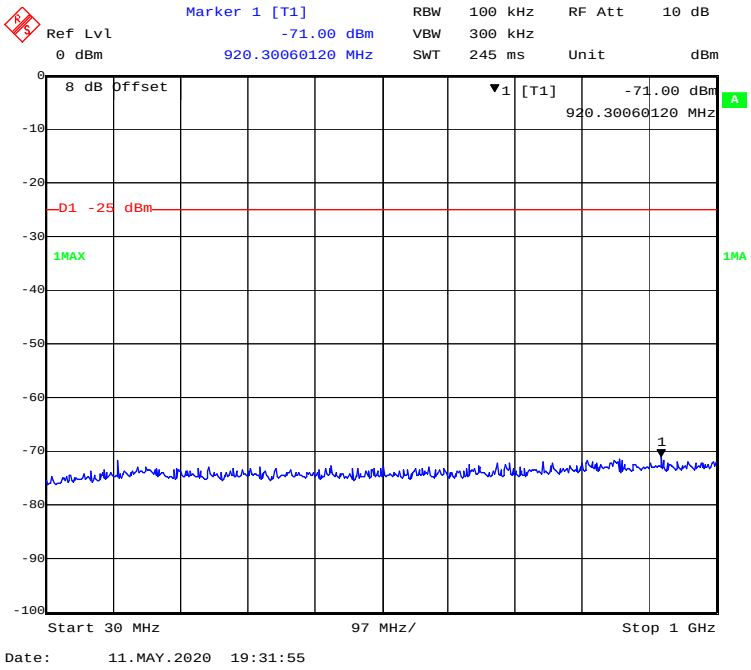
30 MHz - 1 GHz (16QAM, 5.0 MHz, Middle Channel)



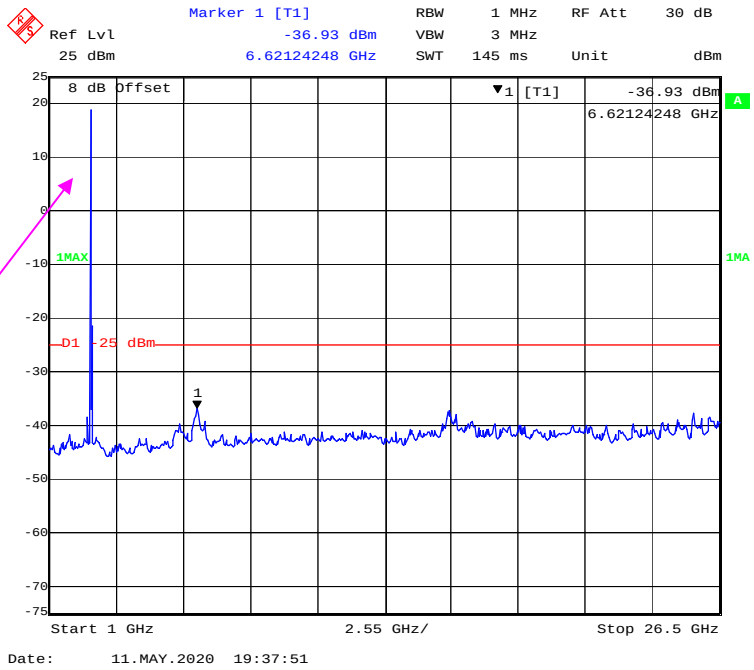
1 GHz – 26.5 GHz (16QAM, 5.0 MHz, Middle Channel)



30 MHz - 1 GHz (16QAM, 10.0 MHz, Middle Channel)

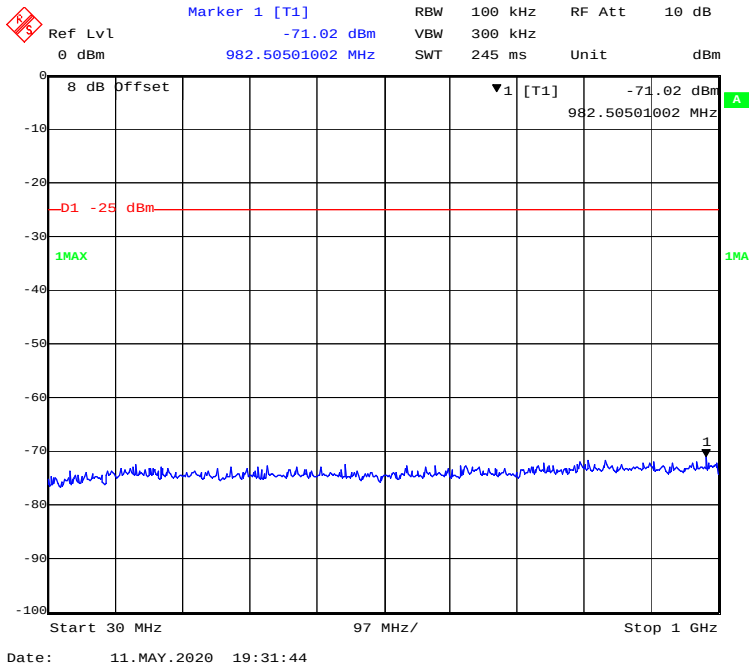


1 GHz – 26.5 GHz (16QAM, 10.0 MHz, Middle Channel)

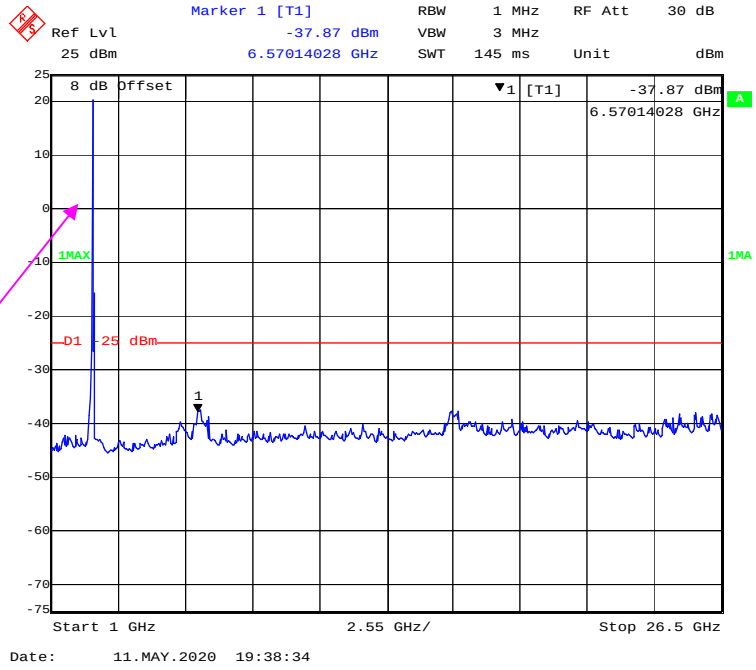


Fundamental

30 MHz - 1 GHz (16QAM, 15.0 MHz, Middle Channel)

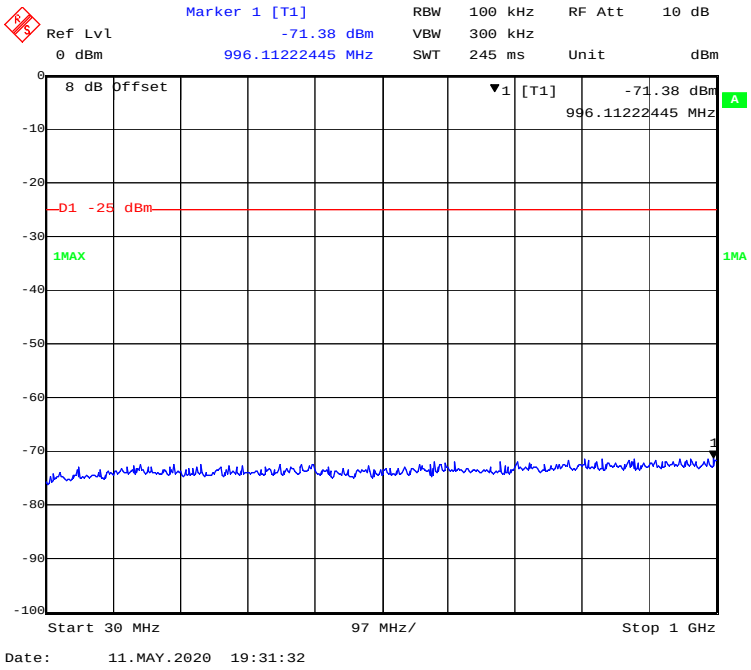


1 GHz – 26.5 GHz (16QAM, 15.0MHz, Middle Channel)

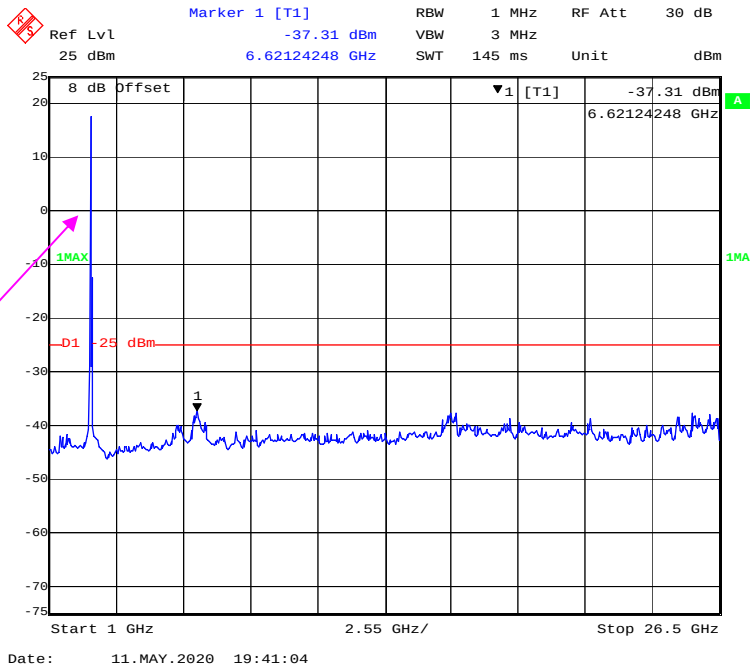


Fundamental

30 MHz - 1 GHz (16QAM, 20.0 MHz, Middle Channel)



1 GHz – 26.5 GHz (16QAM, 20.0 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)

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.

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

Test Procedure

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

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

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

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

Spurious emissions in dB = 10 lg (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:	22.9℃~23.2℃
Relative Humidity:	51 %~53 %
ATM Pressure:	101.3kPa~101.7kPa

The testing was performed by Jack Jiao from 2020-04-24 to 2020-04-28.

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

30 MHz ~ 10 GHz:

GSM 850 Band

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)			
GSM Mode, Middle channel										
400.05	55.25	195	210	H	-49.96	0.52	-1.35	-51.83	-13	38.83
400.05	56.29	56	158	V	-48.92	0.52	-1.35	-50.79	-13	37.79
1673.20	68.39	78	125	H	-35	0.84	8.48	-27.36	-13	14.36
1673.20	65.97	96	139	V	-37.42	0.84	8.48	-29.78	-13	16.78
2509.80	46.06	86	114	H	-54.88	0.89	10.09	-45.68	-13	32.68
2509.80	49.06	124	175	V	-51.88	0.89	10.09	-42.68	-13	29.68

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										
400.05	58.47	219	143	H	-46.74	0.53	-1.35	-48.62	-13	35.62
400.05	57.16	91	127	V	-48.05	0.53	-1.35	-49.93	-13	36.93
1673.20	45.28	145	104	H	-52.33	0.83	8.2	-44.96	-13	31.96
1673.20	46.79	264	201	V	-51.36	0.83	8.2	-43.99	-13	30.99
2509.80	38.68	339	127	H	-56.91	0.89	10.1	-47.7	-13	34.7
2509.80	39.16	39	156	V	-56.75	0.89	10.1	-47.54	-13	34.54

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

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

30 MHz ~ 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										
400.05	58.46	219	143	H	-46.75	0.53	-1.35	-48.63	-13	35.63
400.05	57.26	91	127	V	-47.95	0.53	-1.35	-49.83	-13	36.83
1673.00	37.64	351	200	H	-67.89	0.84	8.48	-60.25	-13	47.25
1673.00	36.40	300	200	V	-69.13	0.84	8.48	-61.49	-13	48.49
2509.50	34.02	44	200	H	-67.93	0.89	10.09	-58.73	-13	45.73
2509.50	33.29	13	100	V	-68.66	0.89	10.09	-59.46	-13	46.46
16-QAM 1.4MHz Bandwidth Middle Channel										
400.05	57.69	219	143	H	-47.52	0.53	-1.35	-49.40	-13	36.40
400.05	56.49	91	127	V	-48.72	0.53	-1.35	-50.60	-13	37.60
1673.00	38.57	342	200	H	-66.96	0.84	8.48	-59.32	-13	46.32
1673.00	39.47	106	200	V	-66.06	0.84	8.48	-58.42	-13	45.42
2509.50	35.07	275	200	H	-66.88	0.89	10.09	-57.68	-13	44.68
2509.50	36.01	83	100	V	-65.94	0.89	10.09	-56.74	-13	43.74

30MHz~26GHz:

LTE Band 41:

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										
160.21	52.41	209	200	H	-51.76	0.38	-6.17	-58.31	-25	33.31
160.21	50.96	32	200	V	-50.17	0.38	-6.17	-56.72	-25	31.72
5210.00	42.39	253	100	H	-59.68	1.10	10.30	-50.48	-25	25.48
5210.00	43.36	264	200	V	-58.92	1.10	10.30	-49.72	-25	24.72
7815.00	33.35	218	100	H	-62.09	1.82	10.04	-53.87	-25	28.87
7815.00	40.54	116	100	V	-55.00	1.82	10.04	-46.78	-25	21.78
16-QAM 5MHz Bandwidth Middle Channel										
160.21	52.55	210	100	H	-51.62	0.38	-6.17	-58.17	-25	33.17
160.21	50.86	181	100	V	-50.27	0.38	-6.17	-56.82	-25	31.82
5210.00	40.53	34	100	H	-61.54	1.10	10.30	-52.34	-25	27.34
5210.00	41.66	298	100	V	-60.62	1.10	10.30	-51.42	-25	26.42
7815.00	36.79	198	100	H	-58.65	1.82	10.04	-50.43	-25	25.43
7815.00	39.66	246	100	V	-55.88	1.82	10.04	-47.66	-25	22.66

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

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

Applicable Standards

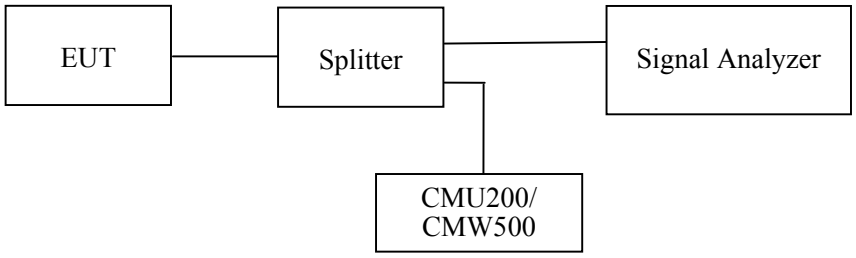
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

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

Test Procedure

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

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



Test Data

Environmental Conditions

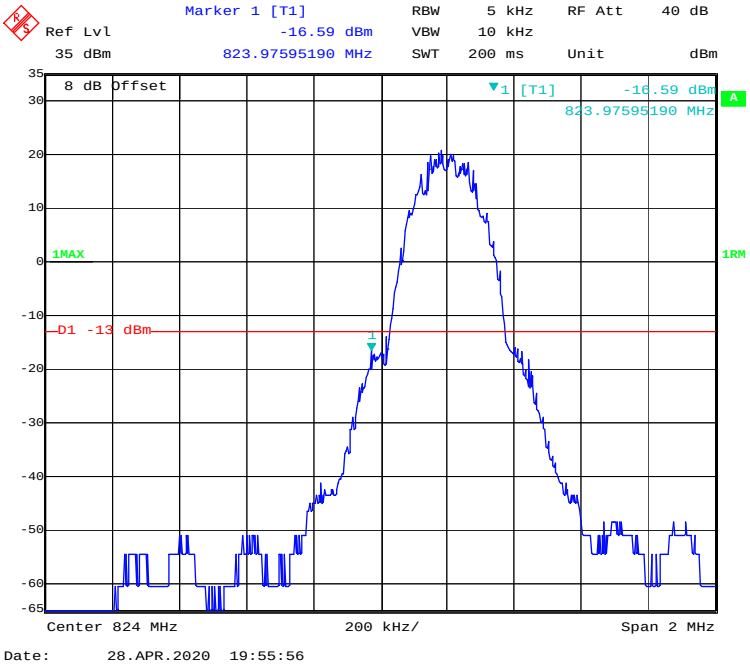
Temperature:	23.2~24.1℃
Relative Humidity:	50~53%
ATM Pressure:	100.5~101.3kPa

The testing was performed by Jack Jiao from 2020-04-28 to 2020-05-11.

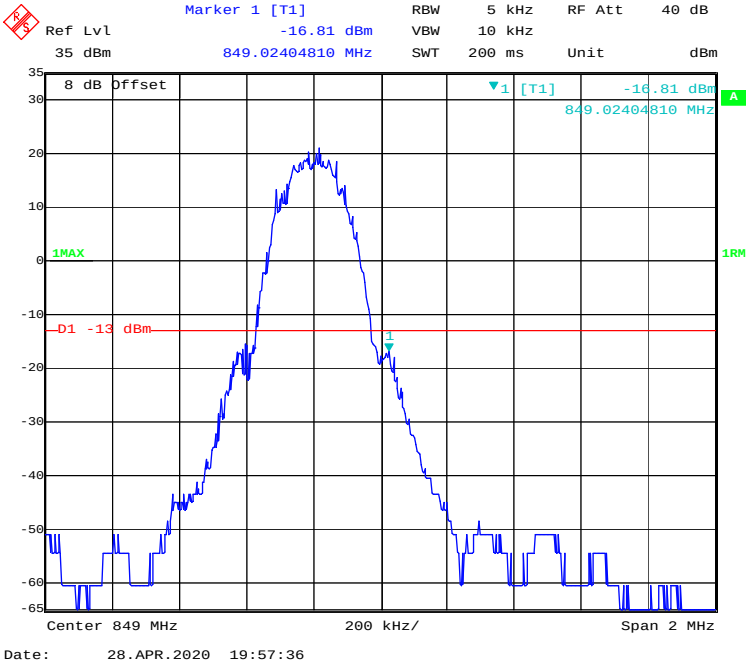
EUT operation mode: Transmitting
Test Result: Compliance.

GSM 850 Band:

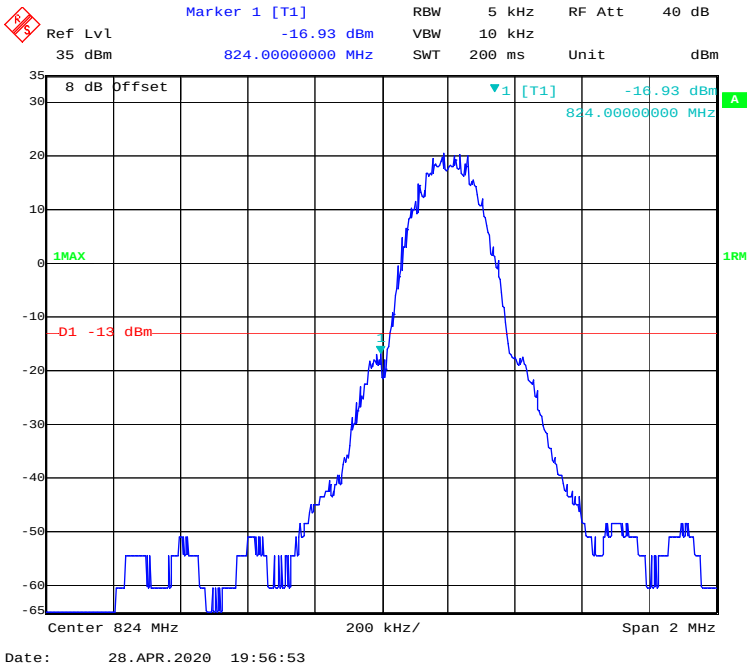
GPRS Mode, Left Band Edge



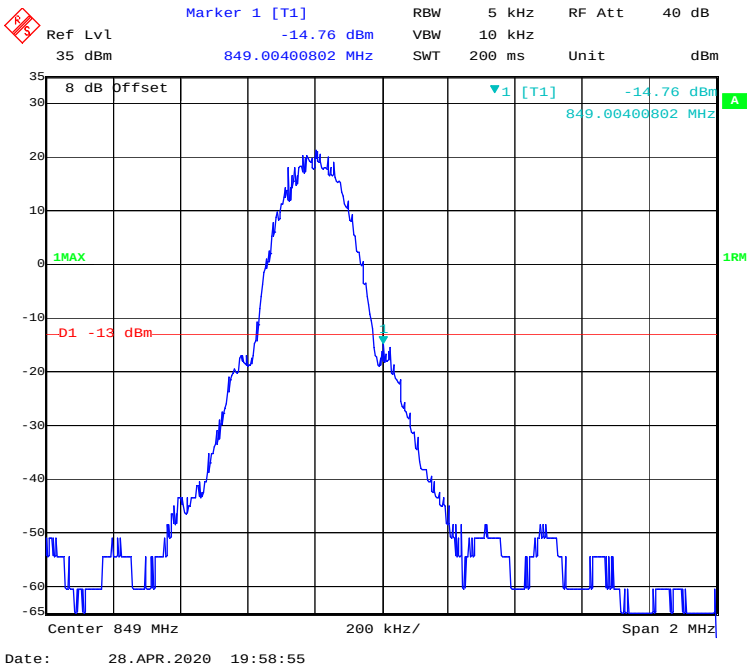
GPRS Mode, Right Band Edge



EGPRS Mode, Left Band Edge

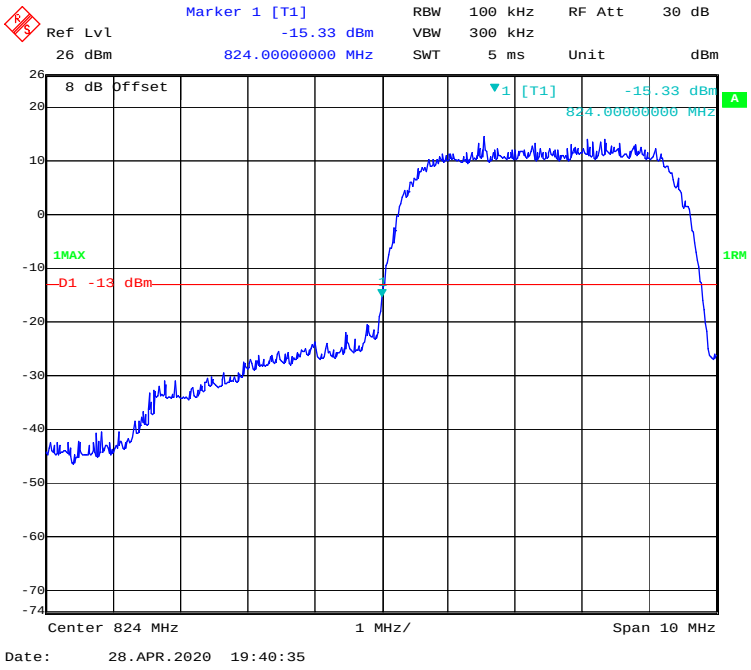


EGPRS Mode, Right Band Edge

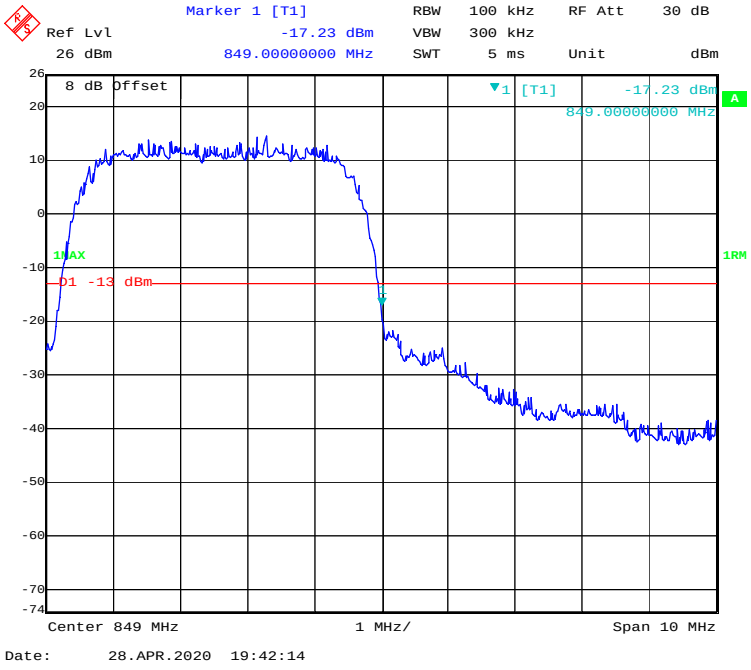


WCDMA Band V

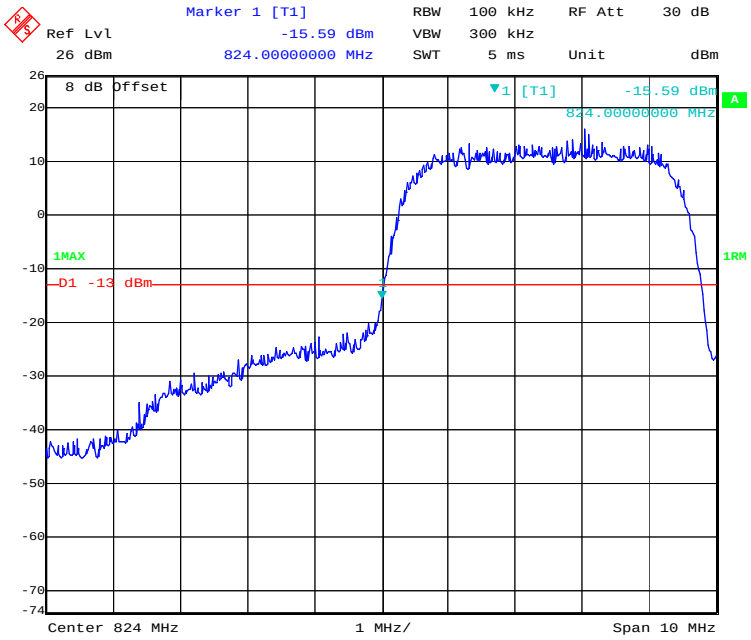
WCDMA (Rel 99) Mode, Left Band Edge



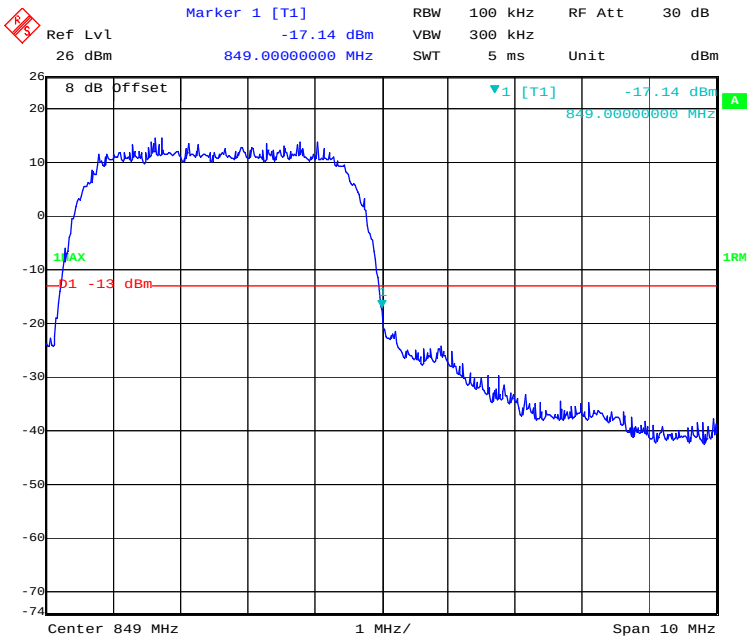
WCDMA (Rel 99) Mode, Right Band Edge



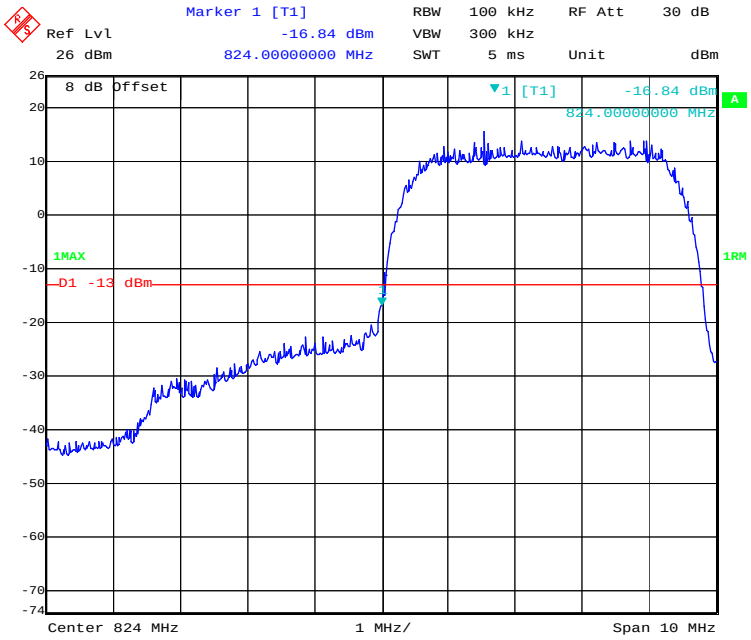
WCDMA (HSDPA) Mode, Left Band Edge



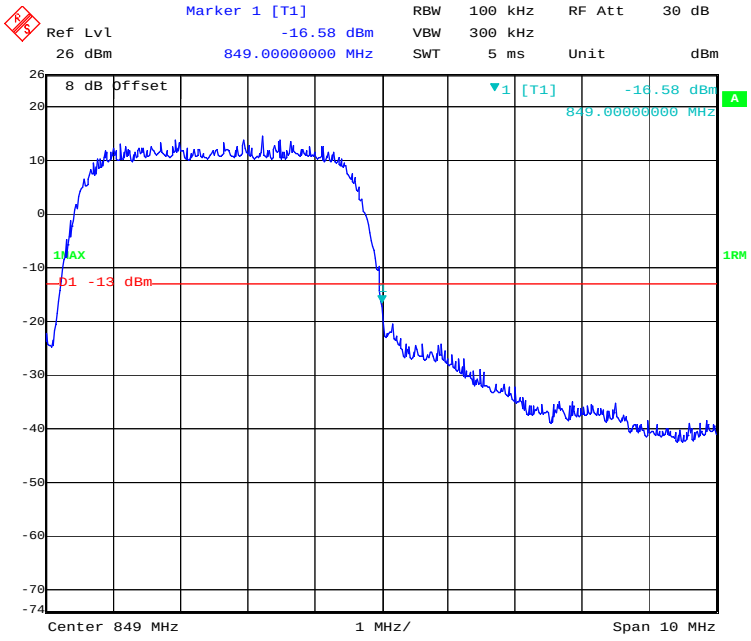
WCDMA (HSDPA) Mode, Right Band Edge



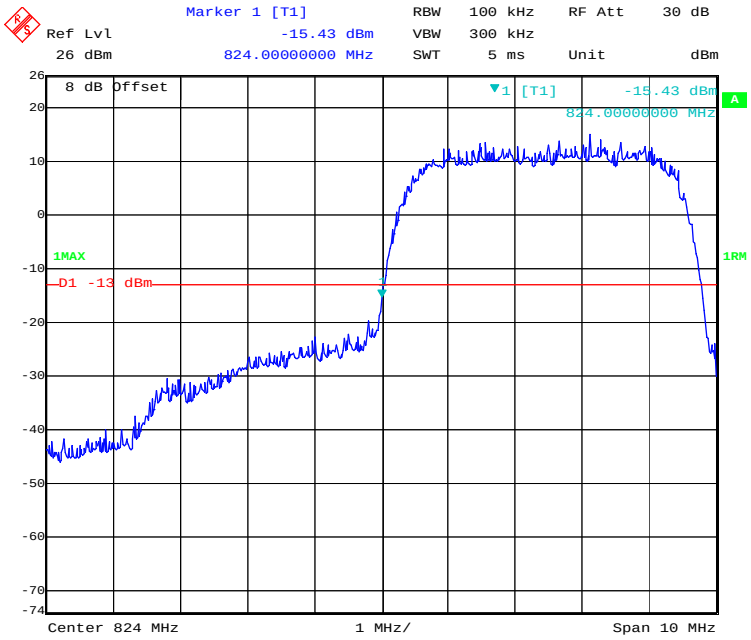
WCDMA (HSUPA) Mode, Left Band Edge



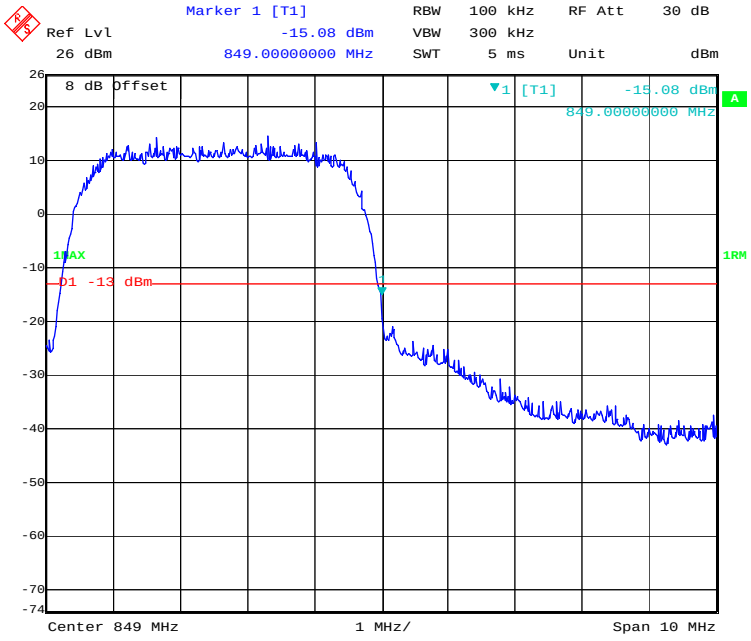
WCDMA (HSUPA) Mode, Right Band Edge



WCDMA (HSPA+) Mode, Left Band Edge

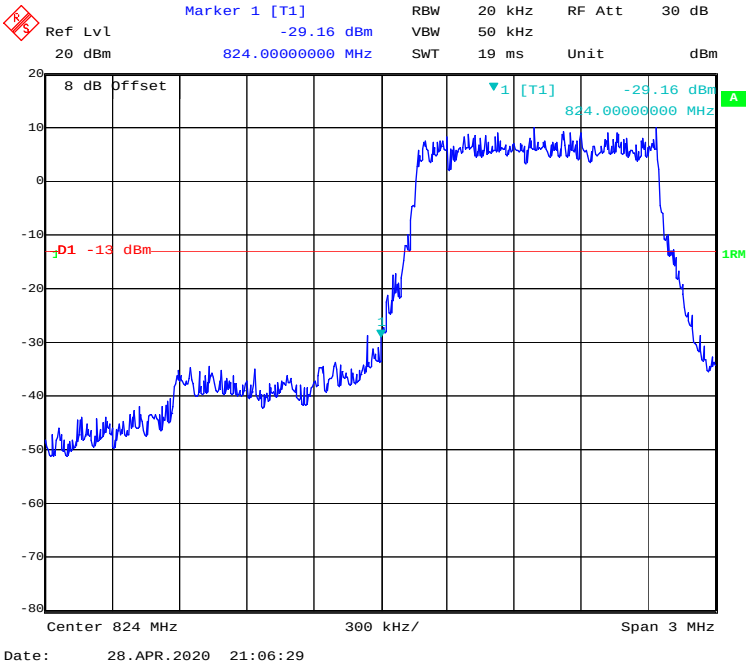


WCDMA (HSPA+) Mode, Right Band Edge

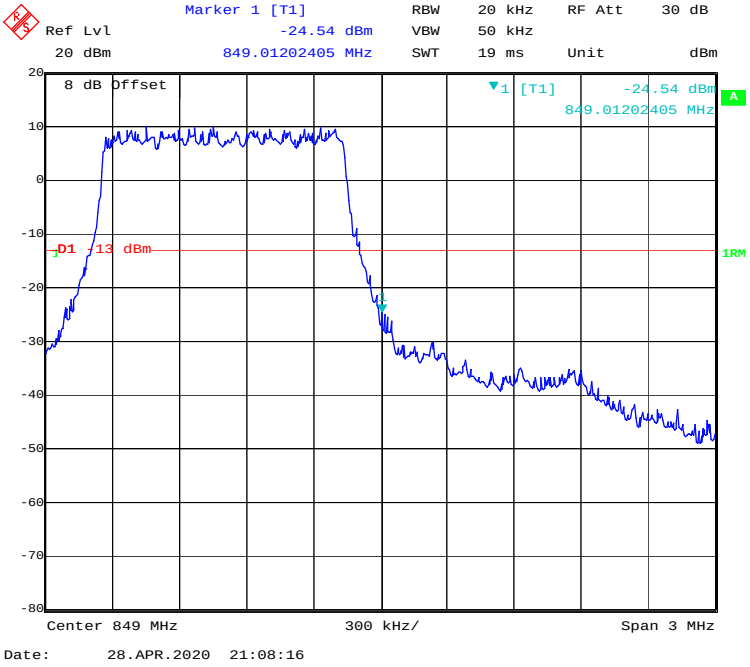


LTE Band 5:

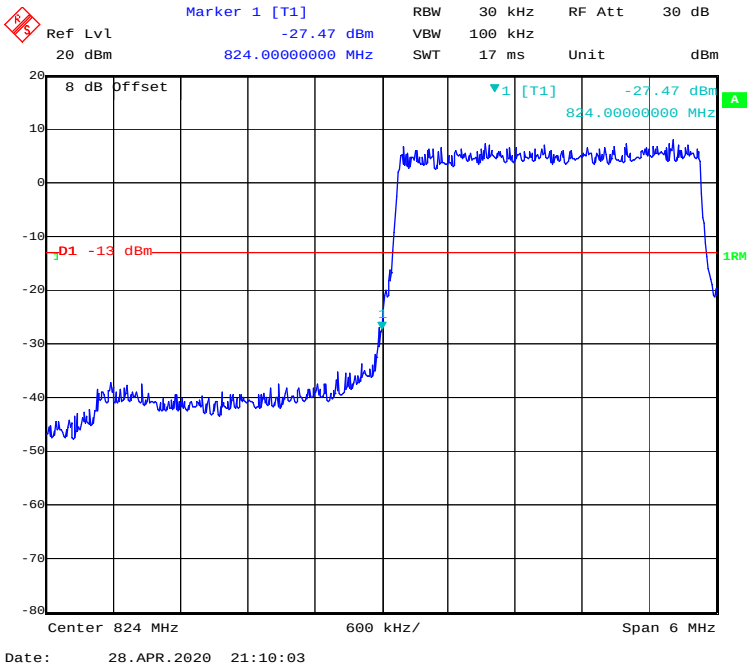
QPSK (1.4 MHz, FULL RB) - Left Band Edge



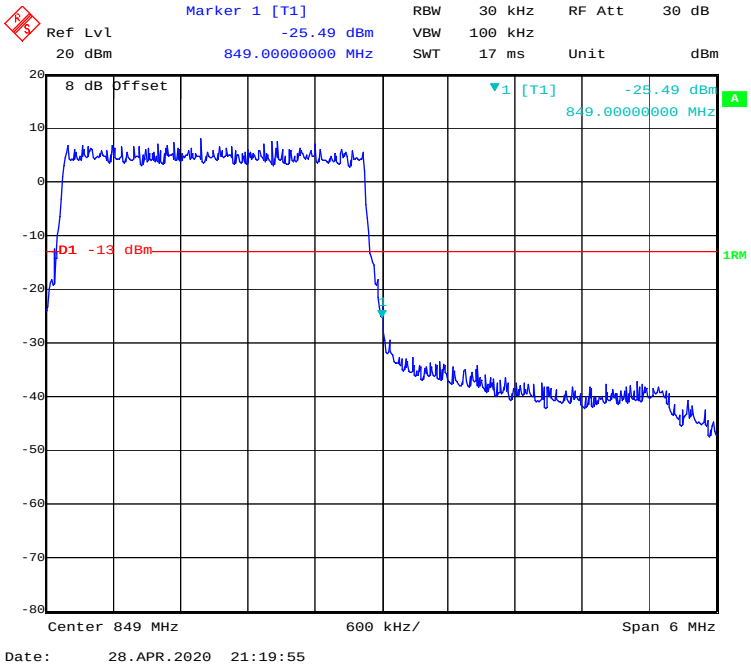
QPSK (1.4 MHz, FULL RB) - Right Band Edge



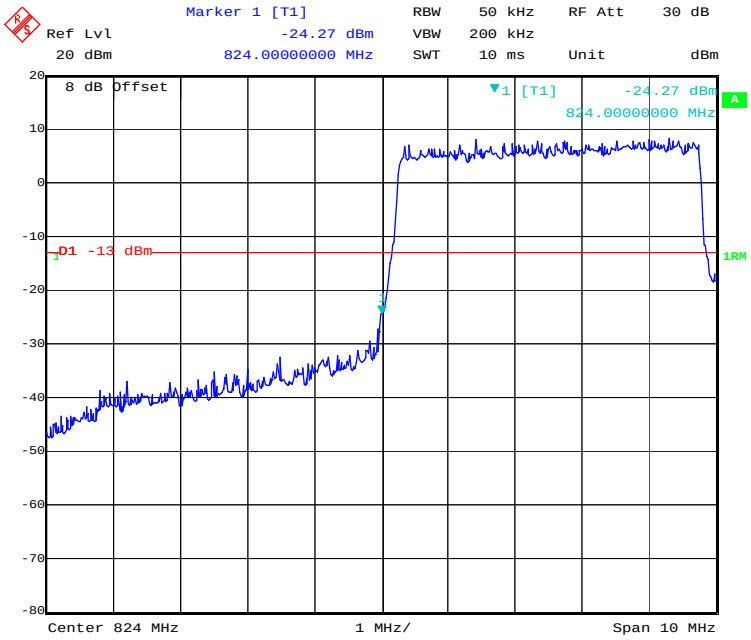
QPSK (3.0 MHz, FULL RB) - Left Band Edge



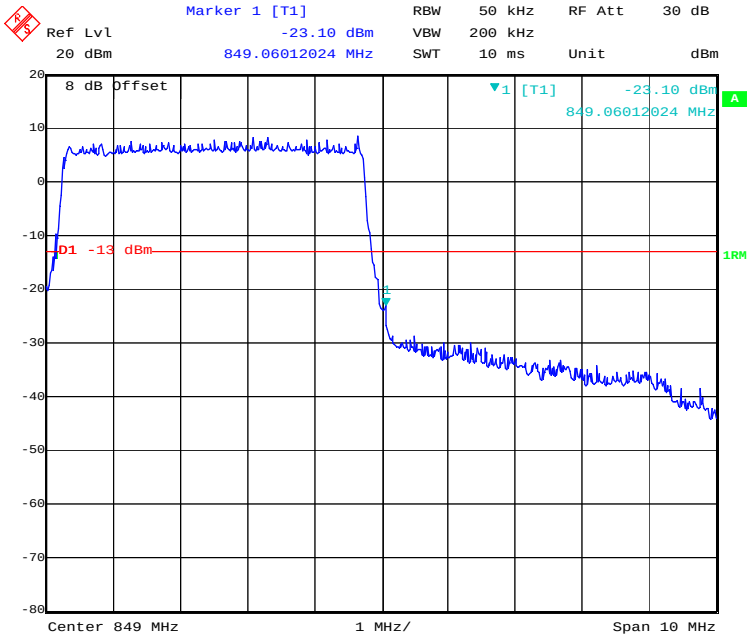
QPSK (3.0 MHz, FULL RB) - Right Band Edge



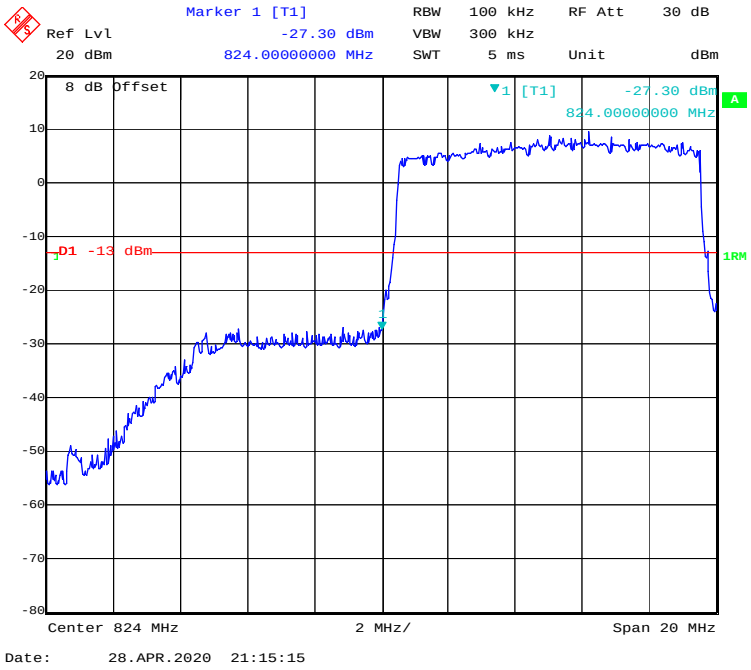
QPSK (5.0 MHz, FULL RB) - Left Band Edge



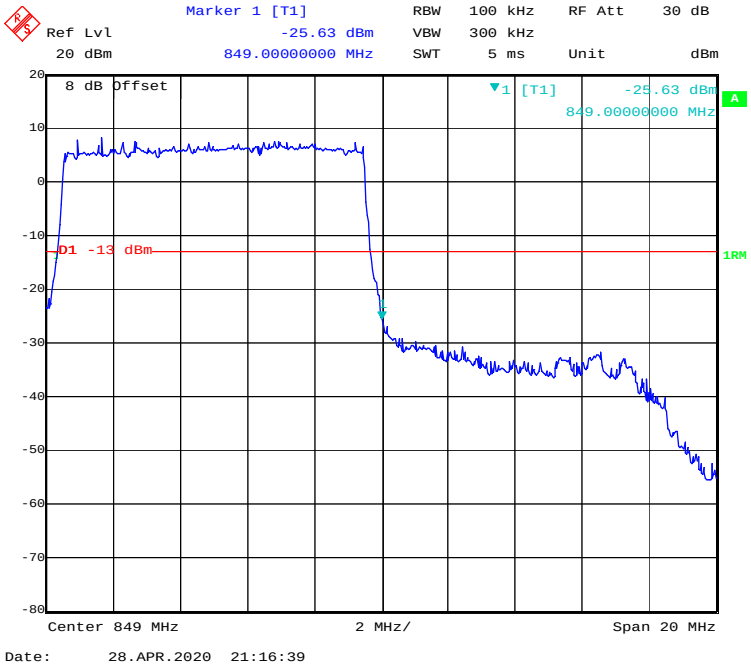
QPSK (5.0 MHz, FULL RB) - Right Band Edge



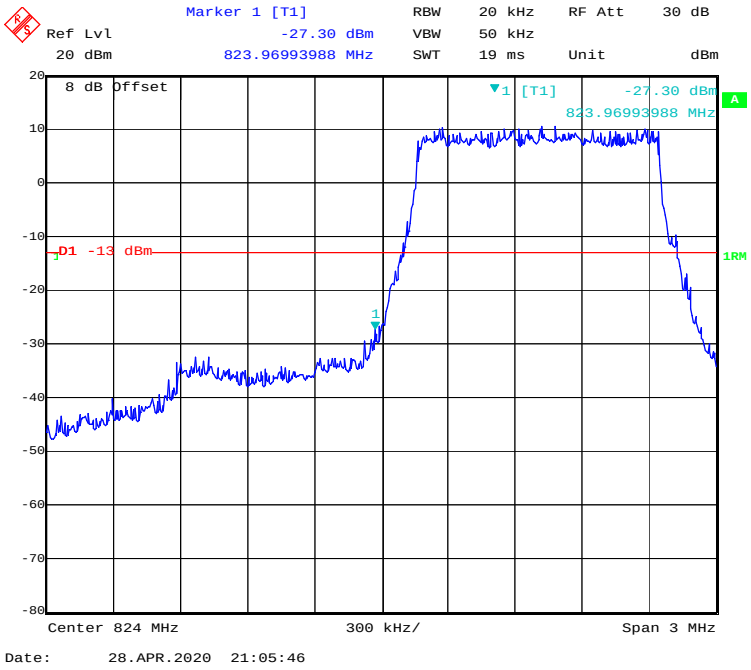
QPSK (10.0 MHz, FULL RB) - Left Band Edge



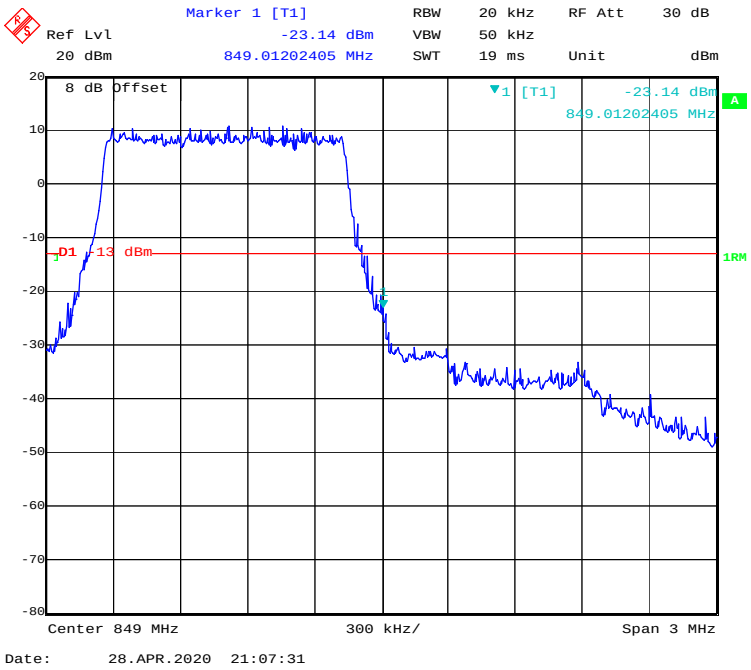
QPSK (10.0 MHz, FULL RB) - Right Band Edge



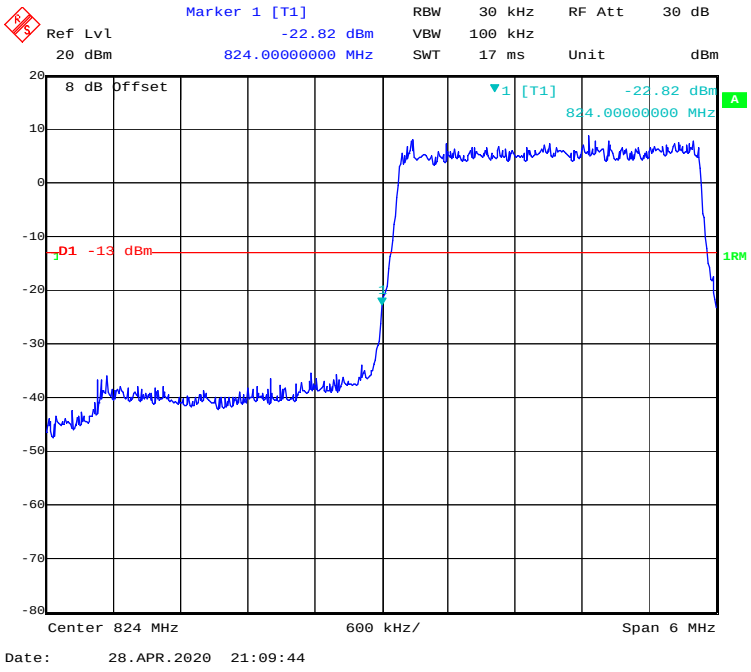
16-QAM (1.4 MHz, FULL RB) - Left Band Edge



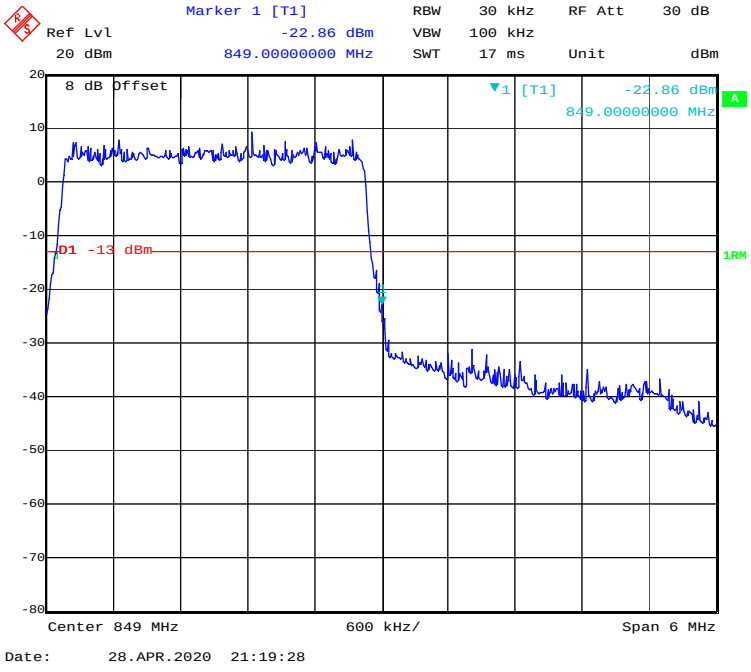
16-QAM (1.4 MHz, FULL RB) - Right Band Edge



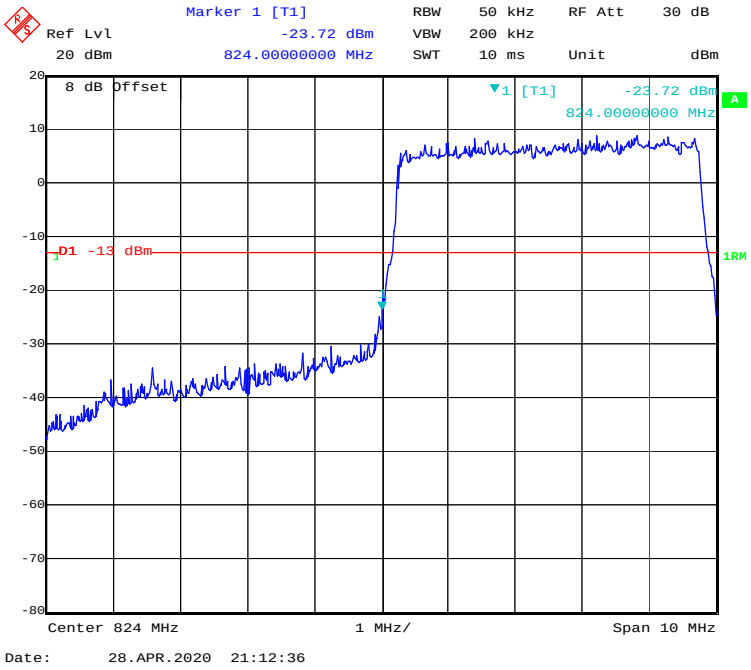
16-QAM (3.0 MHz, FULL RB) - Left Band Edge



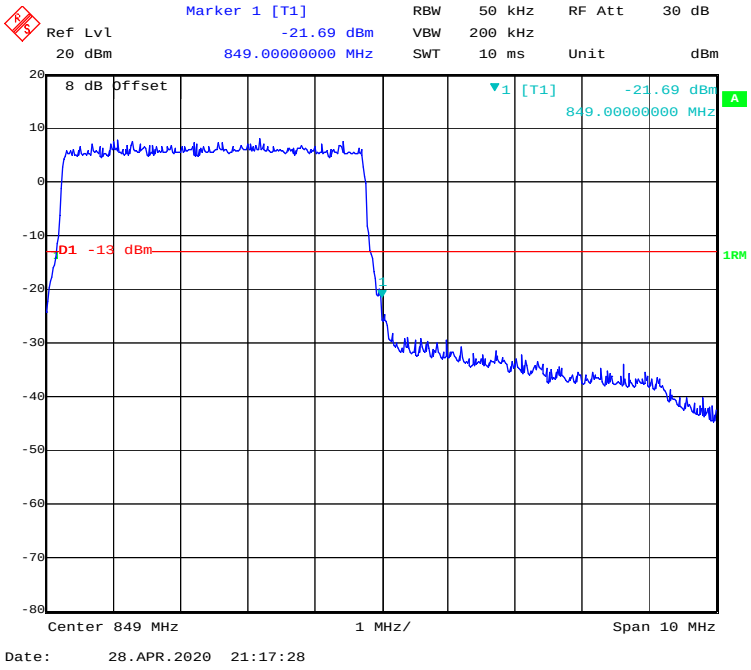
16-QAM (3.0 MHz, FULL RB) - Right Band Edge



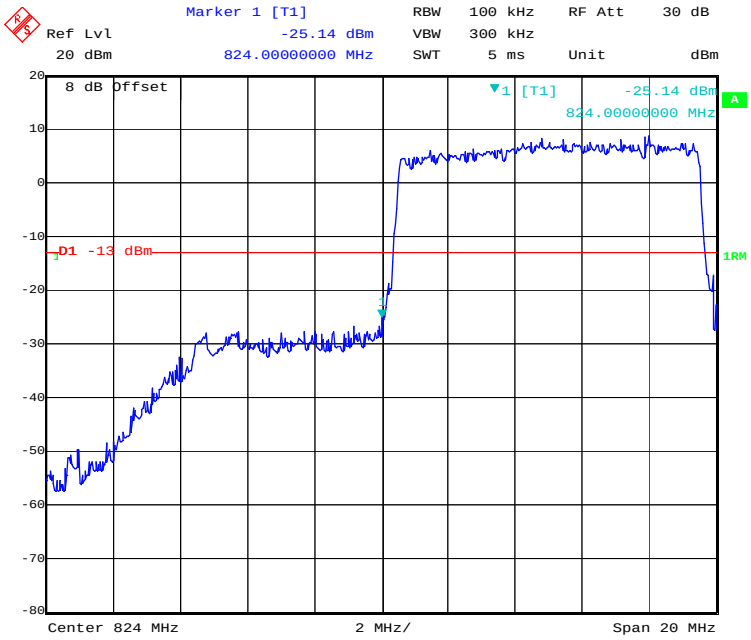
16-QAM (5.0 MHz, FULL RB) - Left Band Edge



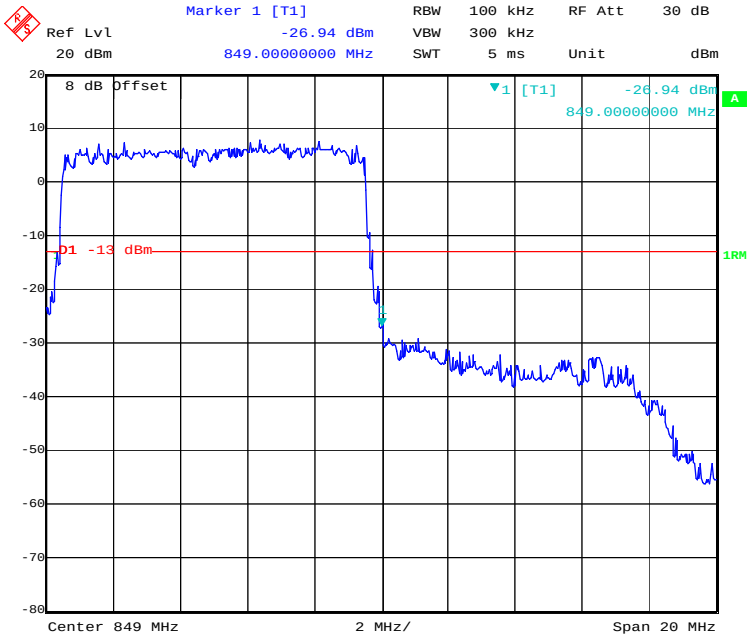
16-QAM (5.0 MHz, FULL RB) - Right Band Edge



16-QAM (10.0 MHz, FULL RB) - Left Band Edge

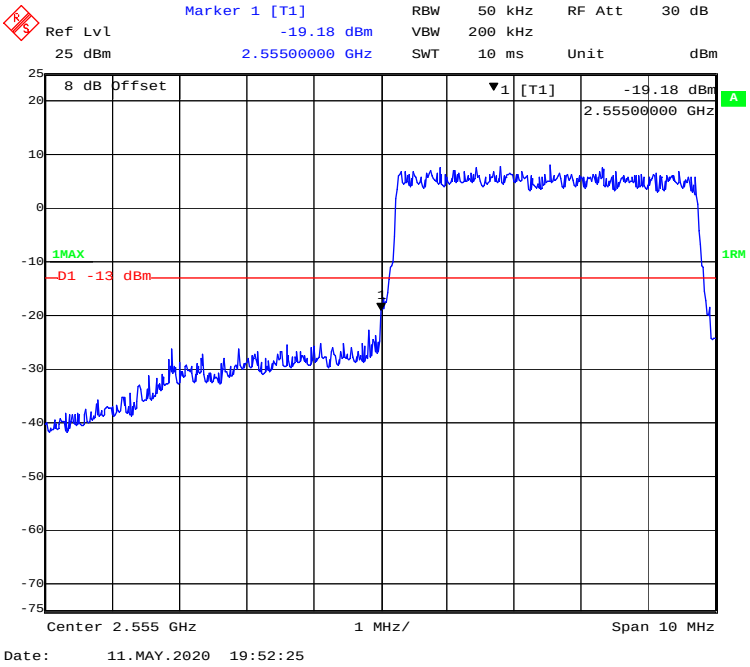


16-QAM (10.0 MHz, FULL RB) - Right Band Edge

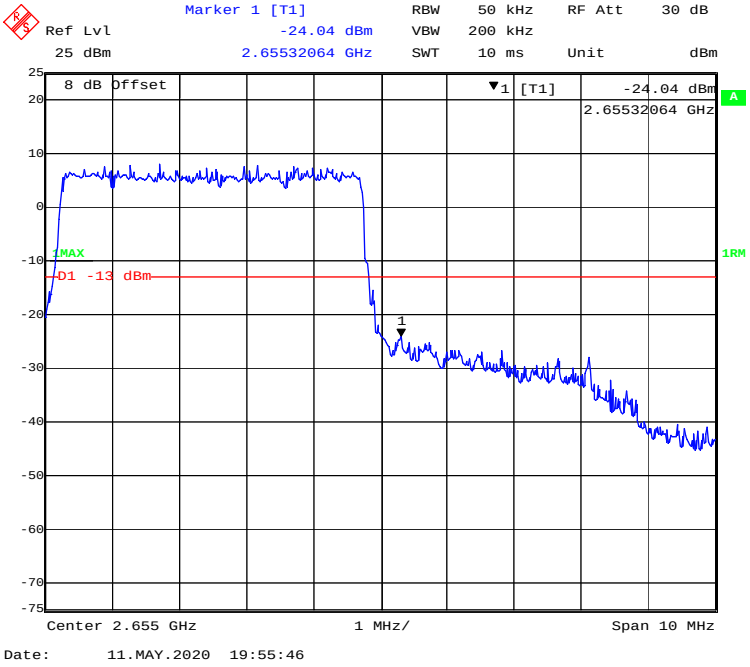


LTE Band 41:

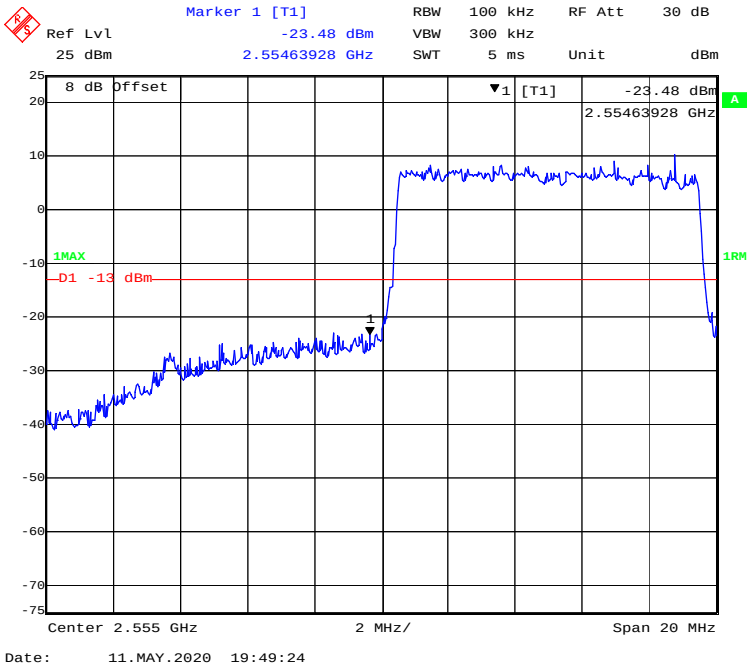
QPSK (5.0 MHz, FULL RB) - Left Band Edge



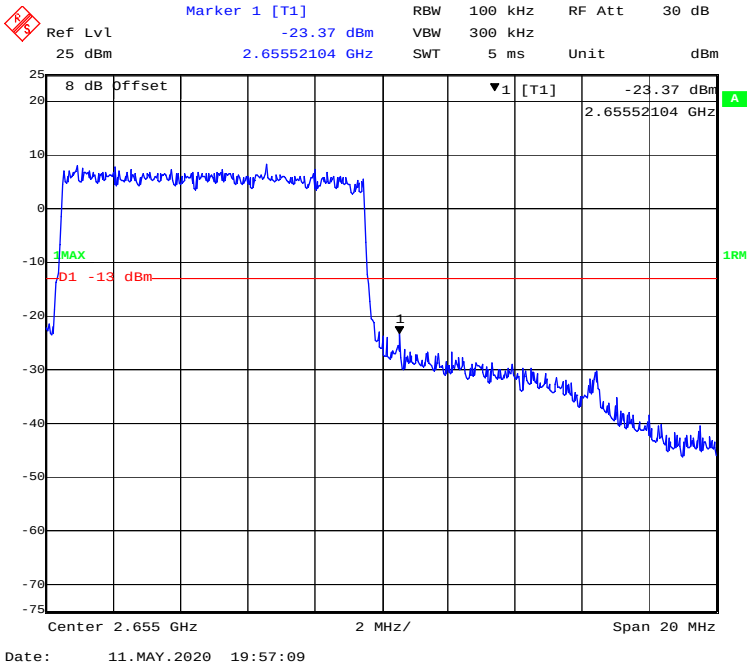
QPSK (5.0 MHz, FULL RB) - Right Band Edge



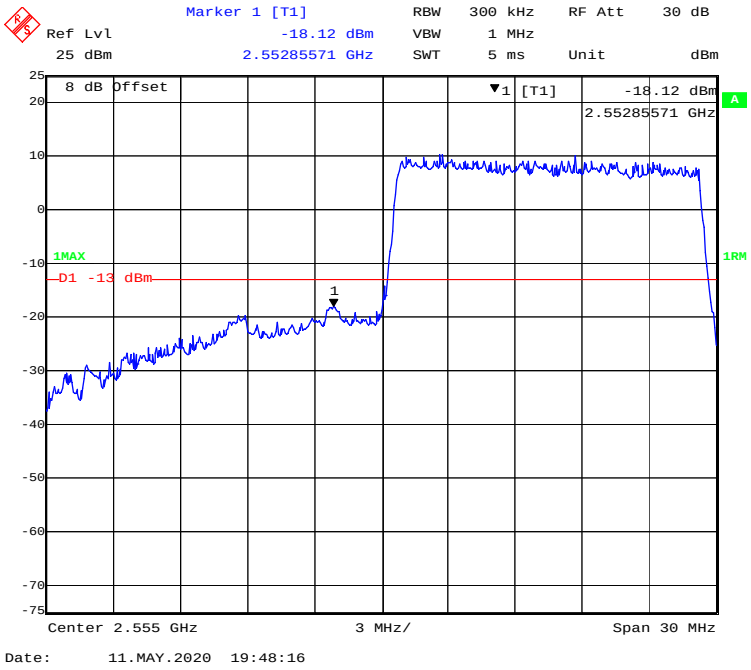
QPSK (10.0 MHz, FULL RB) - Left Band Edge



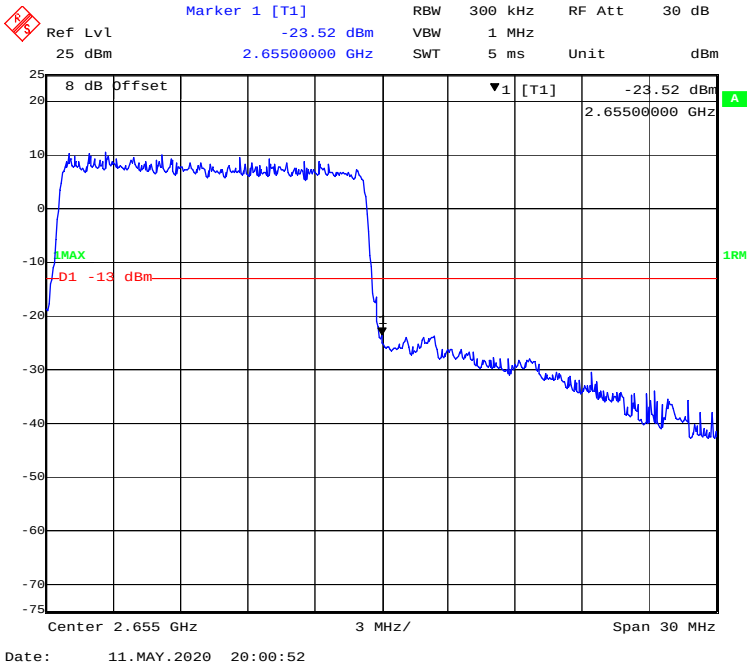
QPSK (10.0 MHz, FULL RB) - Right Band Edge



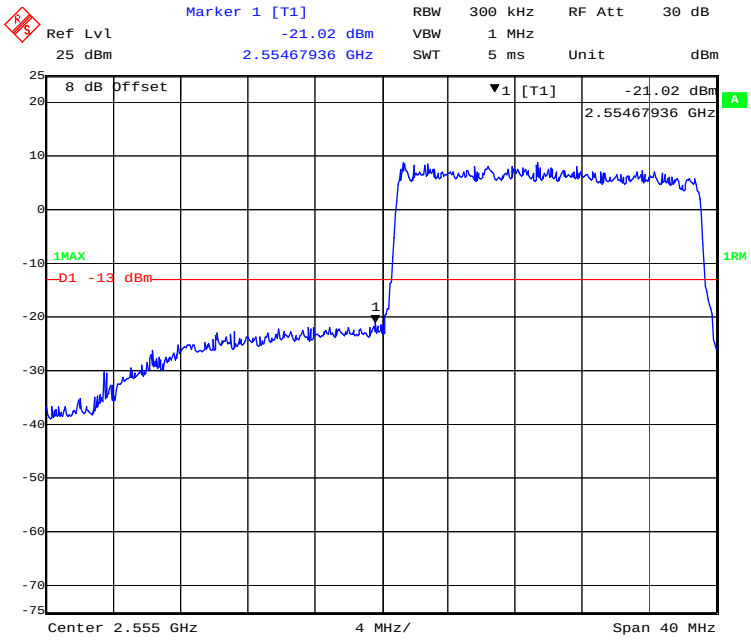
QPSK (15.0 MHz, FULL RB) - Left Band Edge



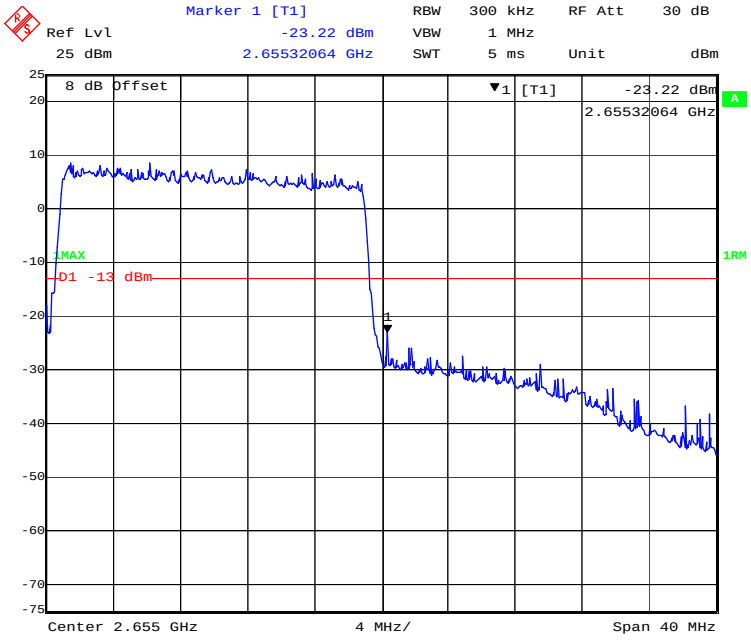
QPSK (15.0 MHz, FULL RB) - Right Band Edge



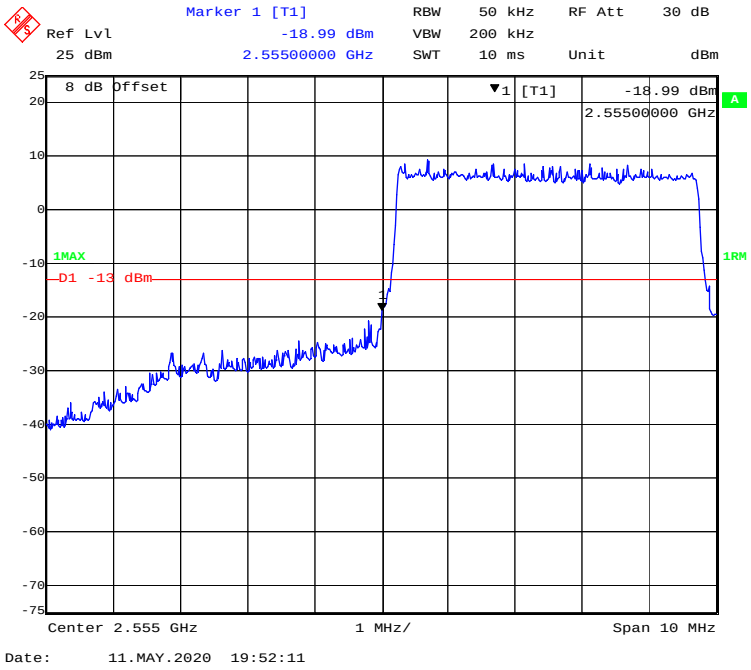
QPSK (20.0 MHz, FULL RB) - Left Band Edge



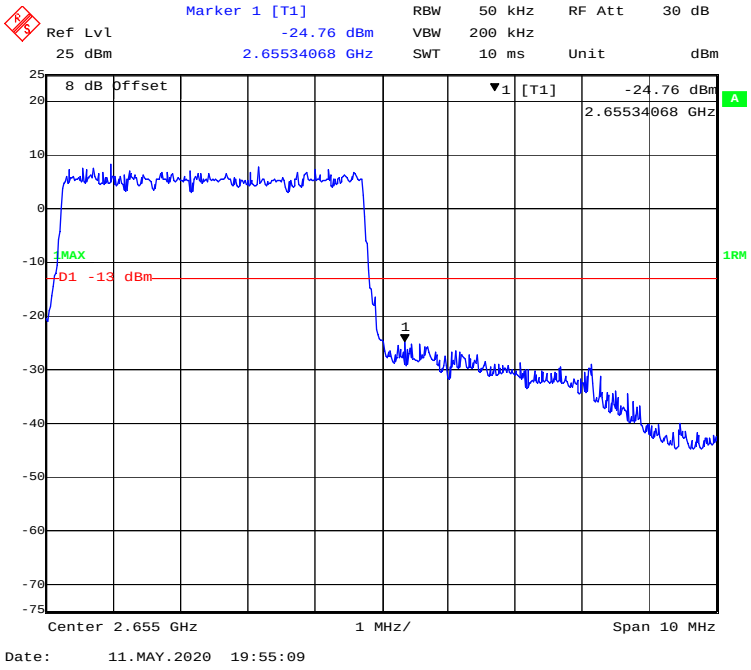
QPSK (20.0 MHz, FULL RB) - Right Band Edge



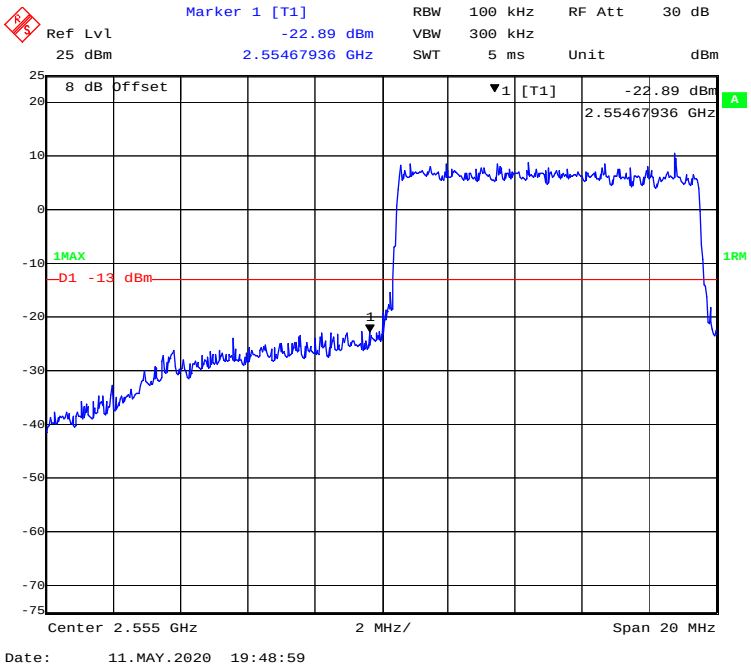
16-QAM (5.0 MHz, FULL RB) - Left Band Edge



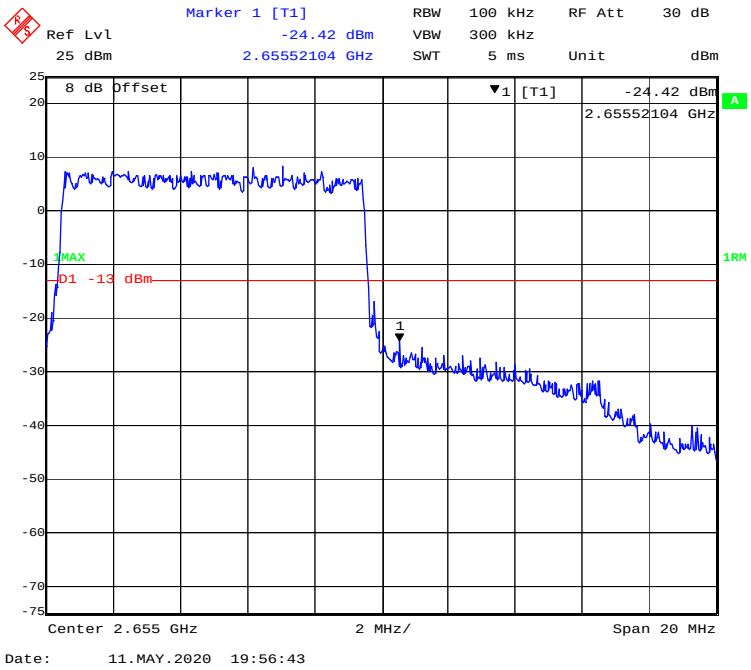
16-QAM (5.0 MHz, FULL RB) - Right Band Edge



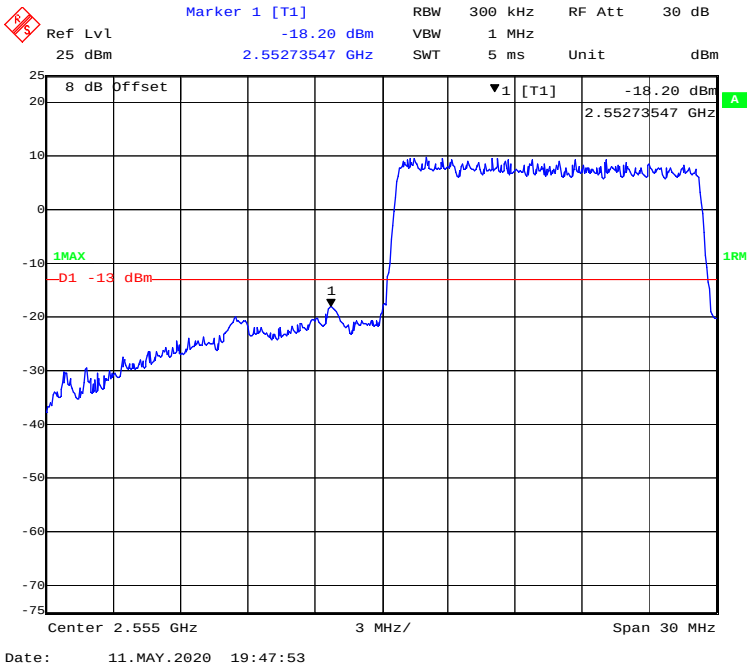
16-QAM (10.0 MHz, FULL RB) - Left Band Edge



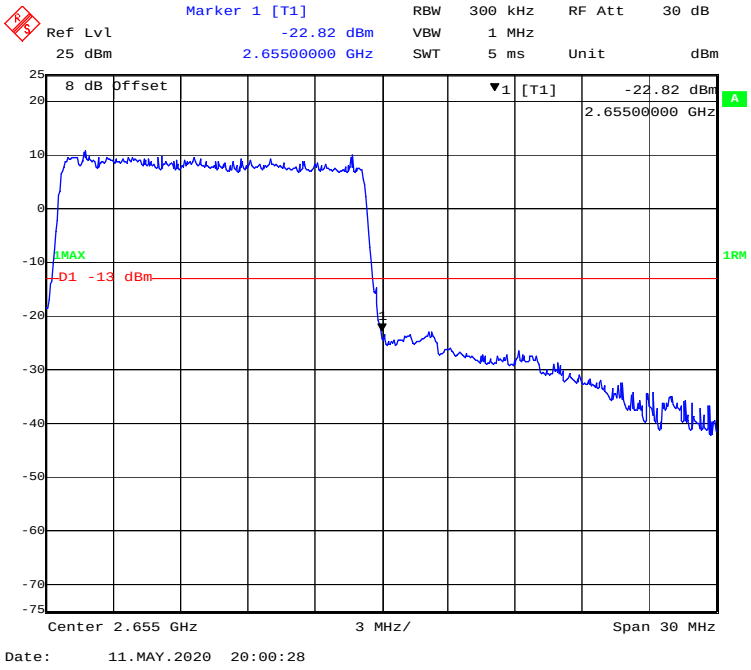
16-QAM (10.0 MHz, FULL RB) - Right Band Edge



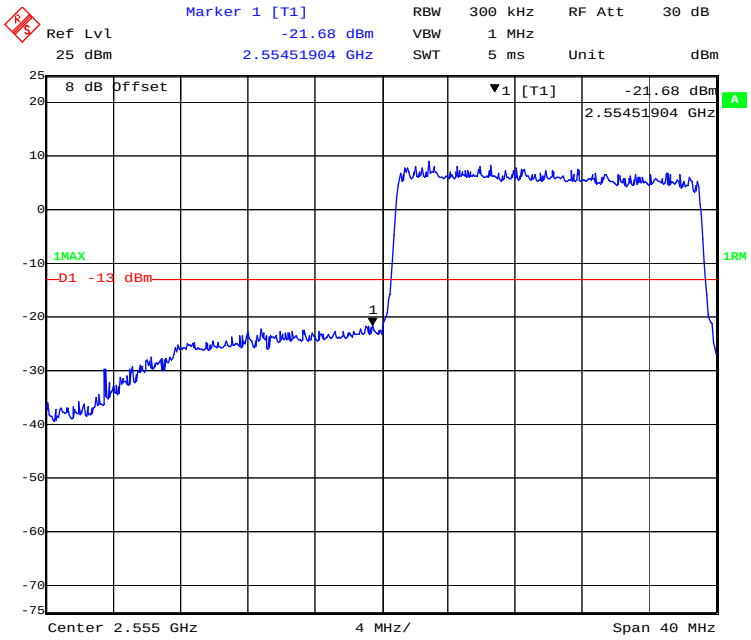
16-QAM (15.0 MHz, FULL RB) - Left Band Edge



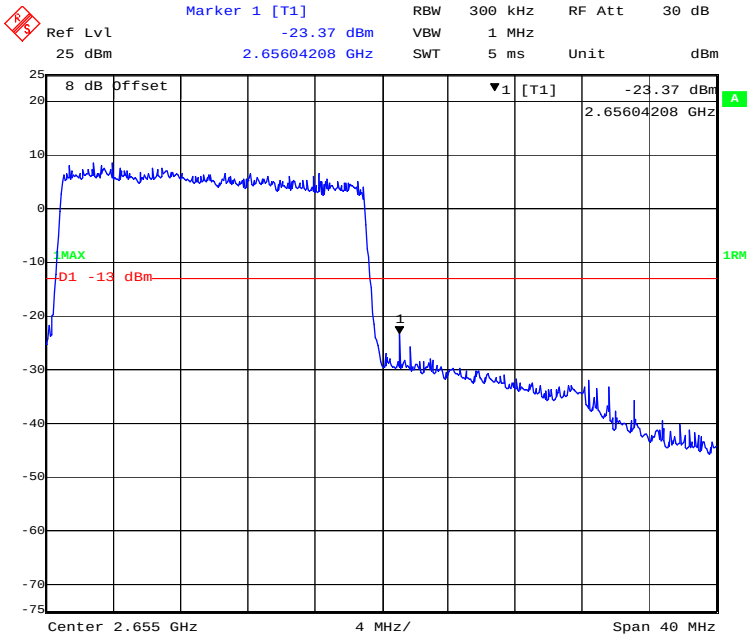
16-QAM (15.0 MHz, FULL RB) - Right Band Edge



16-QAM (20.0 MHz, FULL RB) - Left Band Edge



16-QAM (20.0 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

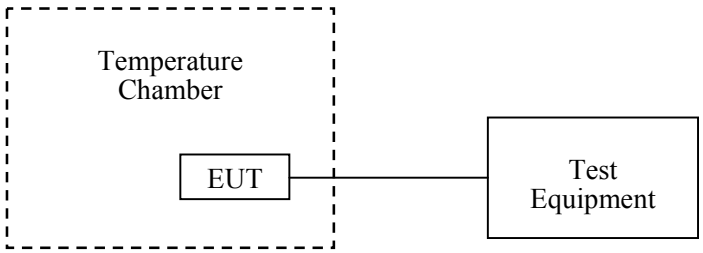
Frequency Range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

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:	23.9 ℃
Relative Humidity:	53 %
ATM Pressure:	101.5 kPa

The testing was performed by Jack Jiao on 2020-05-07.

EUT operation mode: Transmitting

Test Result: Compliance.

Powered by battery:

GPRS/EGPRS 850 Band:

GPRS Mode, Middle Channel, f_o=836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.7	10	0.01195	2.5
-20		11	0.01315	2.5
-10		12	0.01434	2.5
0		5	0.00598	2.5
10		10	0.01195	2.5
20		8	0.00956	2.5
30		8	0.00956	2.5
40		12	0.01434	2.5
50		11	0.01315	2.5
25	V min.= 3.33	8	0.00956	2.5
25	V max.= 4.07	6	0.00717	2.5

EGPRS Mode, Middle Channel, f_o=836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-20	3.7	12	0.01434	2.5
-15		11	0.01315	2.5
-10		5	0.00598	2.5
0		6	0.00717	2.5
10		9	0.01076	2.5
20		11	0.01315	2.5
30		8	0.00956	2.5
40		5	0.00598	2.5
50		7	0.00837	2.5
25	V min.= 3.33	5	0.00598	2.5
25	V max.= 4.07	3	0.00359	2.5

WCDMA Band V:

WCDMA Mode, Middle Channel, f_o = 836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.7	14	0.0167	2.5
-20		6	0.0072	2.5
-10		11	0.0131	2.5
0		12	0.0143	2.5
10		10	0.0120	2.5
20		7	0.0084	2.5
30		9	0.0108	2.5
40		5	0.0060	2.5
50		8	0.0096	2.5
25	V min.= 3.33	12	0.0143	2.5
25	V max.= 4.07	7	0.0084	2.5

LTE Band 5:

Middle Channel, f_o = 836.5 MHz (QPSK)				
Temperature	**Power Supplied**	**Frequency Error**	**Frequency Error**	**Limit**
(℃)	**(V_{DC})**	**(Hz)**	**(ppm)**	**(ppm)**
-30	3.7	11	0.0132	2.5
-20		12	0.0143	2.5
-10		8	0.0096	2.5
0		5	0.0060	2.5
10		5	0.0060	2.5
20		7	0.0084	2.5
30		8	0.0096	2.5
40		10	0.0120	2.5
50		5	0.0060	2.5
25	V min.= 3.33	8	0.0096	2.5
25	V max.= 4.07	9	0.0108	2.5

Middle Channel, f_o = 836.5 MHz (16-QAM)				
Temperature	**Power Supplied**	**Frequency Error**	**Frequency Error**	**Limit**
(℃)	**(V_{DC})**	**(Hz)**	**(ppm)**	**(ppm)**
-30	3.7	12	0.0143	2.5
-20		4	0.0048	2.5
-10		9	0.0108	2.5
0		8	0.0096	2.5
10		5	0.0060	2.5
20		6	0.0072	2.5
30		7	0.0084	2.5
40		8	0.0096	2.5
50		10	0.0120	2.5
25	V min.= 3.33	8	0.0096	2.5
25	V max.= 4.07	11	0.0132	2.5

LTE Band 41:

Low Channel & High Channel (QPSK) /Channel Bandwidth:20MHz					
Temperature	Power Supplied	F_L	F_H	F_L Limit	F_H Limit
(℃)	(V_{DC})	(MHz)	(MHz)	(MHz)	(MHz)
-30	3.7	2555.1468	2654.9961	2555	2655
-20		2555.0481	2654.9556	2555	2655
-10		2555.0669	2654.8591	2555	2655
0		2555.1190	2654.8943	2555	2655
10		2555.0362	2654.9802	2555	2655
20		2555.0130	2654.8406	2555	2655
30		2555.1409	2654.9241	2555	2655
40		2555.0315	2654.9092	2555	2655
50		2555.1947	2654.9133	2555	2655
25	V min.= 3.3	2555.0591	2654.8389	2555	2655
25	V max.= 4.2	2555.1863	2654.8456	2555	2655

Low Channel & High Channel (16-QAM) /Channel Bandwidth:20MHz					
Temperature	Power Supplied	F_L	F_H	F_L Limit	F_H Limit
(℃)	(V_{DC})	(MHz)	(MHz)	(MHz)	(MHz)
-30	3.7	2555.0599	2654.8706	2555	2655
-20		2555.0880	2654.8939	2555	2655
-10		2555.1346	2654.8907	2555	2655
0		2555.0578	2654.8564	2555	2655
10		2555.1382	2654.9062	2555	2655
20		2555.0886	2654.8279	2555	2655
30		2555.1703	2654.9291	2555	2655
40		2555.1198	2654.8325	2555	2655
50		2555.0022	2654.9599	2555	2655
25	V min.= 3.3	2555.0220	2654.8444	2555	2655
25	V max.= 4.2	2555.1061	2654.9842	2555	2655

Powered by DC Source:

GPRS/EGPRS 850 Band:

GPRS Mode, Middle Channel, f_o=836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	12	9	0.01076	2.5
-20		12	0.01434	2.5
-10		5	0.00598	2.5
0		8	0.00956	2.5
10		9	0.01076	2.5
20		5	0.00598	2.5
30		11	0.01315	2.5
40		9	0.01076	2.5
50		5	0.00598	2.5
25	V min.= 8	6	0.00717	2.5
25	V max.= 45	5	0.00598	2.5

EGPRS Mode, Middle Channel, f_o=836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-20	12	14	0.01673	2.5
-15		12	0.01434	2.5
-10		6	0.00717	2.5
0		8	0.00956	2.5
10		8	0.00956	2.5
20		12	0.01434	2.5
30		9	0.01076	2.5
40		6	0.00717	2.5
50		8	0.00956	2.5
25	V min.= 8	6	0.00717	2.5
25	V max.= 45	5	0.00598	2.5

WCDMA Band V:

WCDMA Mode, Middle Channel, f_o = 836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	12	13	0.0155	2.5
-20		9	0.0108	2.5
-10		10	0.0120	2.5
0		12	0.0143	2.5
10		11	0.0131	2.5
20		8	0.0096	2.5
30		6	0.0072	2.5
40		7	0.0084	2.5
50		11	0.0131	2.5
25	V min.= 8	10	0.0120	2.5
25	V max.= 45	6	0.0072	2.5

LTE Band 5:

Middle Channel, f_o = 836.5 MHz (QPSK)				
Temperature	**Power Supplied**	**Frequency Error**	**Frequency Error**	**Limit**
(℃)	**(V_{DC})**	**(Hz)**	**(ppm)**	**(ppm)**
-30	12	96	0.1148	2.5
-20		11	0.0132	2.5
-10		5	0.0060	2.5
0		7	0.0084	2.5
10		6	0.0072	2.5
20		9	0.0108	2.5
30		12	0.0143	2.5
40		11	0.0132	2.5
50		5	0.0060	2.5
25	V min.= 8	6	0.0072	2.5
25	V max.= 45	7	0.0084	2.5

Middle Channel, f_o = 836.6 MHz (16-QAM)				
Temperature	**Power Supplied**	**Frequency Error**	**Frequency Error**	**Limit**
(℃)	**(V_{DC})**	**(Hz)**	**(ppm)**	**(ppm)**
-30	12	11	0.0132	2.5
-20		3	0.0036	2.5
-10		6	0.0072	2.5
0		7	0.0084	2.5
10		3	0.0036	2.5
20		13	0.0155	2.5
30		3	0.0036	2.5
40		8	0.0096	2.5
50		10	0.0120	2.5
25	V min.= 8	8	0.0096	2.5
25	V max.= 45	8	0.0096	2.5

LTE Band 41:

Low Channel & High Channel (QPSK) /Channel Bandwidth:20MHz					
Temperature	Power Supplied	F_L	F_H	F_L Limit	F_H Limit
(℃)	(V_{DC})	(MHz)	(MHz)	(MHz)	(MHz)
-30	12	2555.1675	2654.8953	2555	2655
-20		2555.0614	2654.9412	2555	2655
-10		2555.0754	2654.9671	2555	2655
0		2555.1566	2654.9927	2555	2655
10		2555.0182	2654.9263	2555	2655
20		2555.0035	2654.8936	2555	2655
30		2555.1266	2654.9606	2555	2655
40		2555.0117	2654.9627	2555	2655
50		2555.0969	2654.9608	2555	2655
25	V min.= 8	2555.1558	2654.9857	2555	2655
25	V max.= 45	2555.0133	2654.8544	2555	2655

Low Channel & High Channel (16-QAM) /Channel Bandwidth:20MHz					
Temperature	Power Supplied	F_L	F_H	F_L Limit	F_H Limit
(℃)	(V_{DC})	(MHz)	(MHz)	(MHz)	(MHz)
-30	12	2555.0725	2654.9621	2555	2655
-20		2555.0877	2654.9367	2555	2655
-10		2555.0018	2654.9880	2555	2655
0		2555.0389	2654.9163	2555	2655
10		2555.0340	2654.9214	2555	2655
20		2555.0321	2654.8543	2555	2655
30		2555.0221	2654.8562	2555	2655
40		2555.0977	2654.9525	2555	2655
50		2555.0267	2654.8484	2555	2655
25	V min.= 8	2555.0329	2654.9498	2555	2655
25	V max.= 45	2555.1018	2654.9210	2555	2655

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