

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

For

Shanghai Rising Digital Co.,Ltd.

No 318, Chuanda Road, Pudong New District, Shanghai, China

FCC ID: 2AJONSEED-10IA-55

Report Type: Original Report	Product Type: 5.5 Generation Intelligent Screen
Test Engineer:	Sam Ye <i>Sam Ye</i>
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Reviewed By:	Oscar Ye EMC Manager <i>Oscar Ye</i>
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 Rising Digital Co.,Ltd.
Tested Model	SEED-10IA-55(G)
Product Type	5.5 Generation Intelligent Screen
Power Supply	DC 24V
RF Function	GPRS/EGPRS, LTE
Operating Band/Frequency	GSM850: 824-849 MHz(TX), 869-894 MHz(RX) PCS1900: 1850-1910 MHz(TX); 1930-1990 MHz (RX) LTE Band 5: 824-849 MHz(TX), 869-894 MHz(RX) LTE Band 41: 2496-2690 MHz(TX/RX)
Modulation Type	GPRS: GMSK, EGPRS: 8PSK; LTE: QPSK,16QAM
Maximum Antenna Gain	GPRS/EGPRS: 0.6dBi LTE Band5: 0.6dBi; LTE Band41: 3.7dBi

*All measurement and test data in this report was gathered from production sample serial number: 20191011002.
(Assigned by the BACL. The EUT supplied by the applicant was received on 2019-10-11)

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 24-Subpart E and Part 27 of the Federal Communication Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submittals with FCC ID: 2AJONSEED-10IA-55

Test Methodology

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

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

Applicable Standards: TIA/EIA 603-D.

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

Measurement Uncertainty

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

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

Test Facility

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

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

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

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

Channel List

Mode		Channel		Frequency (MHz)
GPRS/EGPRS 850		Low	128	824.2
		Middle	190	836.6
		High	251	848.8
GPRS/EGPRS 1900		Low	512	1850.2
		Middle	661	1880.0
		High	810	1909.8
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	2498.5
		Middle	40740	2593.0
		High	41215	2687.5
	10M	Low	40290	2501.0
		Middle	40740	2593.0
		High	41190	2685.0
	15M	Low	40315	2503.5
		Middle	40740	2593.0
		High	41165	2682.5
	20M	Low	40340	2506.0
		Middle	40740	2593.0
		High	41140	2680.0

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

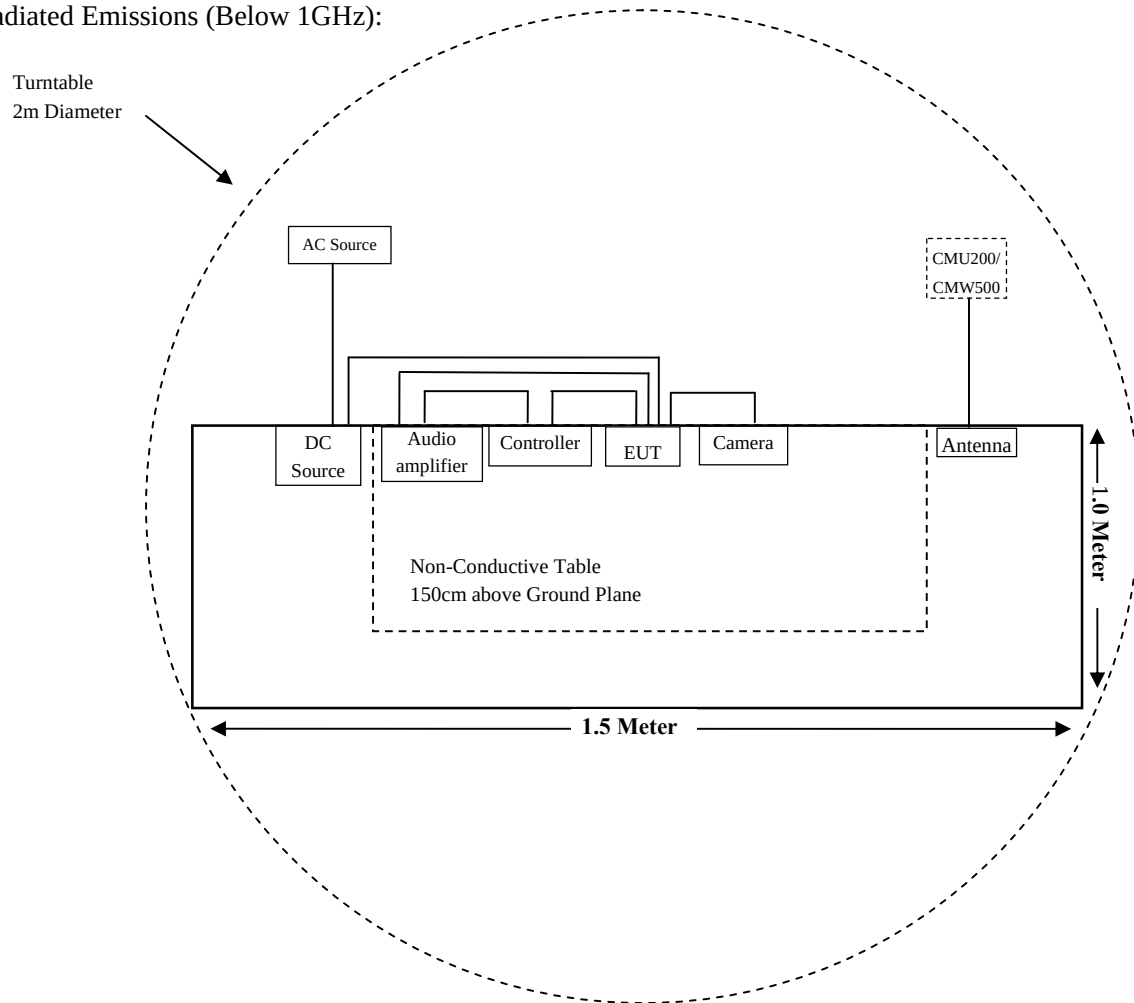
Manufacturer	Description	Model	Serial Number
Waylens Inc.	Antenna	/	/
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605
R & S	Wideband Radio Communication Tester	CMW500	104478
ZHAOXIN	DC Power Supply	RXN-605D	DC002

External I/O Cable

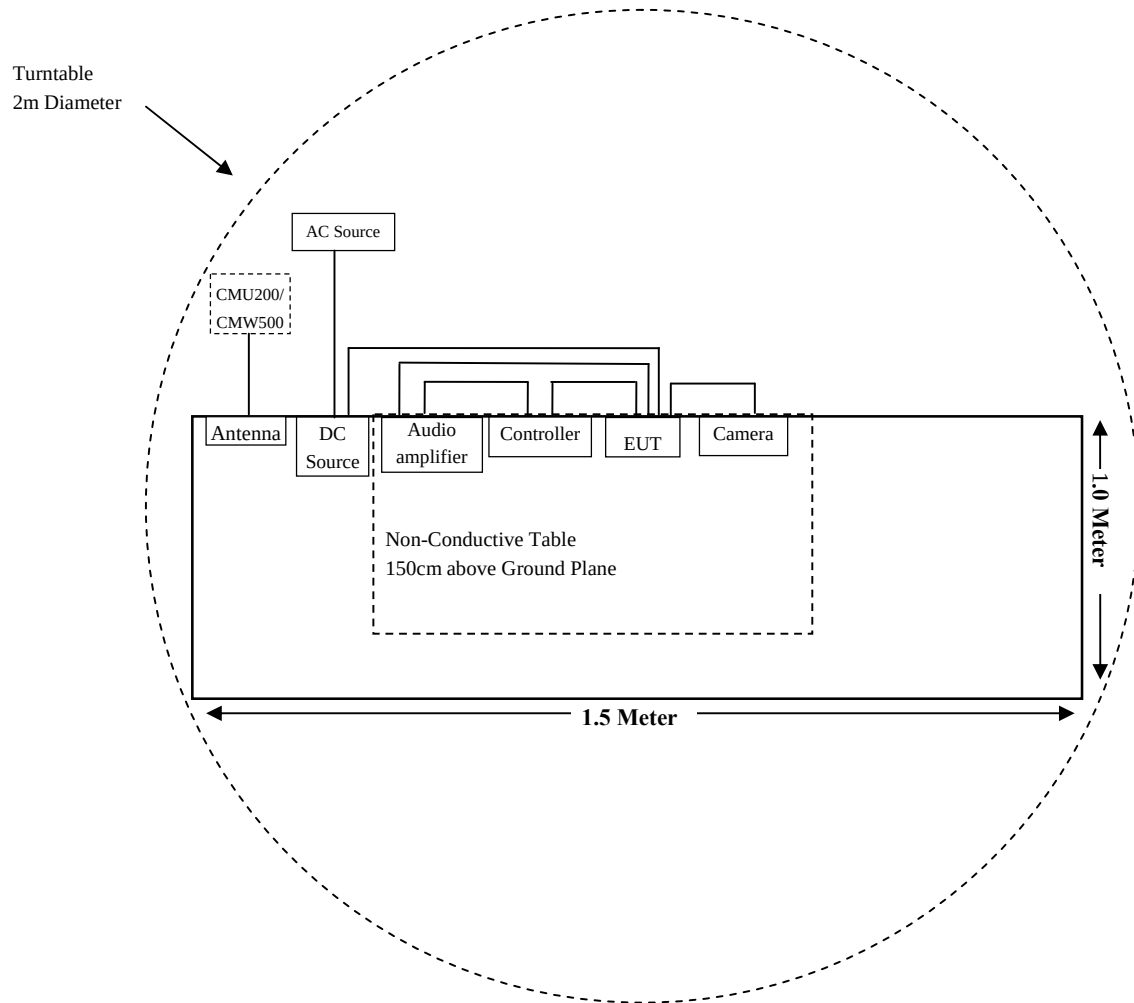
Cable Description	Length (m)	From Port	To
Power Cable	1.2	EUT	Controller
Power Cable	1.2	Controller	Audio amplifier
Power Cable	1.5	EUT	Audio amplifier
Power Cable	1.2	EUT	Camera
Power Cable	1.0	EUT	DC Source
Power Cable	1.0	DC Source	AC Source

Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 & §2.1091	Maximum Permissible Exposure(MPE)	Compliant
§2.1046; § 22.913 (a);§ 24.232 (c); § 27.50 (h);	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53;	Occupied Bandwidth	Compliant
§ 2.1051; § 22.917 (a); § 24.238 (a); §27.53 (m)	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (m)	Spurious Radiated Emissions	Compliant
§ 22.917 (a); § 24.238 (a); §27.53 (m)	Band Edge	Compliant
§ 2.1055; § 22.355; § 24.235; §27.54;	Frequency Stability	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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	2019-11-12	2020-11-11
R & S	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	9207-3900	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	2019-12-12	2022-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-16	016	2019-08-15	2020-08-14
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605	2019-11-12	2020-11-11
R & S	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2019-11-30	2020-11-29
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605	2019-11-12	2020-11-11
R & S	Wideband Radio Communication Tester	CMW500	104478	2019-07-21	2020-07-20
Mini-Circuits	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
Shanghai Rising Digital Co.,Ltd.	RF Cable	Shanghai Rising Digital Co.,Ltd. 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/cm²)	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/cm²);

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:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	1.0	1.26	6.50	4.47	20	0.0011	1.00
GPRS/EGPRS 850	824.2-848.8	0.6	1.15	27.00	501.19	20	0.1145	0.55
GPRS/EGPRS 1900	1850.2-1909.8	0.6	1.15	23.50	223.87	20	0.0512	1.00
LTE Band 5	824.2-848.8	0.6	1.15	22.50	177.83	20	0.0406	0.55
LTE Band 41	2498.5-2687.5	3.7	2.34	23.50	223.87	20	0.1045	1.00

Note:

GPRS 850: Tune-up maximum output power with 4 slot is 30.00 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 27.00 dBm.

GPRS 1900: Tune-up Maximum output power with 4 slot is 26.50 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 23.50 dBm.

EGPRS 850: Tune-up maximum output power with 4 slot is 26.00 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 23.00 dBm.

EGPRS 1900: Tune-up Maximum output power with 4 slot is 23.00 dBm, so the tune-up time based Ave. power compared to slotted Ave. power is 20.00 dBm.

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

Note: GPRS/EGPRS/LTE and BLE can transmit simultaneously; the worst condition is below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.1145/0.55 + 0.0011/1.00 = 0.2093 < 1.0$$

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

FCC §2.1047 - MODULATION CHARACTERISTIC

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

FCC §2.1046; § 22.913 (a); § 24.232 (c) ;§27.50 (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 (38.45dBm).

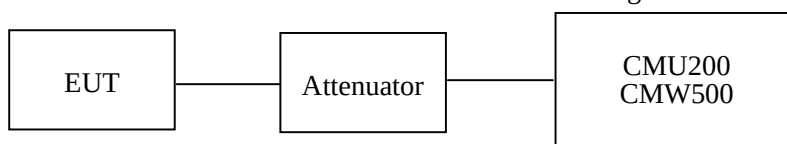
According to FCC §2.1046 and §24.232 (c), mobile and portable stations are limited to 2 watts (33dBm) EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(h), the maximum transmitter output power not exceed 2Watts (33dBm)

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

Test Procedure**Conducted method:**

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

**Radiated Output Power:**

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

- a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
- b) Key the transmitter, then rotate the EUT 360o azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
- c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
- d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used,raise and lower the test antenna to obtain a maximum reading.
$$\text{LOSS} = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$$

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

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

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

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

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

Test Data

Environmental Conditions

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

The testing was performed by Sam Ye on 2020-03-13.

Conducted Power:

GSM 850 Band

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	32.21	31.10	30.15	29.94	38.45
	190	836.6	32.12	31.20	30.22	29.95	38.45
	251	848.8	32.11	32.16	30.24	29.34	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.2	26.83	25.94	25.43	24.87	38.45
	190	836.6	26.24	25.54	25.74	25.53	38.45
	251	848.8	26.75	25.78	25.56	24.69	38.45

PCS 1900 Band

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	29.21	28.24	27.36	26.12	33.00
	661	1880.0	29.12	28.14	27.28	26.24	33.00
	810	1909.8	29.03	28.24	27.40	26.22	33.00

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	512	1850.2	25.68	24.16	23.54	22.95	33.00
	661	1880.0	25.78	24.32	23.15	22.64	33.00
	810	1909.8	25.84	24.25	23.17	22.24	33.00

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	22.12	22.27	22.34
		1#3	21.75	22.03	22.00
		1#5	21.90	21.92	22.10
		3#0	21.69	21.78	22.04
		3#1	22.01	22.09	22.15
		3#3	21.90	21.95	22.05
		6#0	21.69	21.68	21.67
	16-QAM	1#0	21.35	21.31	21.27
		1#3	21.04	21.01	21.05
		1#5	21.02	21.05	20.95
		3#0	20.86	20.82	21.05
		3#1	20.99	21.05	21.05
		3#3	20.99	21.10	20.93
		6#0	20.77	20.78	20.56
3M	QPSK	1#0	21.21	21.34	21.23
		1#7	20.92	21.14	20.85
		1#14	20.91	21.13	20.96
		8#0	20.85	20.96	20.92
		8#4	21.00	21.08	21.08
		8#7	21.04	21.15	21.08
		15#0	20.82	20.77	20.81
	16-QAM	1#0	20.59	20.45	20.44
		1#7	20.35	20.19	20.05
		1#14	20.35	20.09	20.06
		8#0	20.36	19.96	20.02
		8#4	20.31	20.14	20.21
		8#7	20.28	20.29	20.29
		15#0	19.97	20.07	19.95

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	22.01	21.75	21.39
		1#12	21.72	21.37	21.18
		1#24	21.66	21.52	21.05
		12#0	21.69	21.49	21.16
		12#6	21.79	21.59	21.25
		12#11	21.89	21.61	21.11
		25#0	21.61	21.40	20.75
	16-QAM	1#0	21.22	21.05	20.41
		1#12	20.83	20.79	20.09
		1#24	20.88	20.84	20.19
		12#0	21.00	20.60	20.16
		12#6	21.05	20.90	20.27
		12#11	20.89	20.66	20.27
		25#0	20.51	20.34	19.95
10M	QPSK	1#0	22.13	21.98	22.06
		1#24	21.77	21.73	21.73
		1#49	21.79	21.70	21.68
		25#0	21.77	21.61	21.59
		25#12	21.76	21.61	21.78
		25#24	21.81	21.61	21.83
		50#0	21.52	21.32	21.50
	16-QAM	1#0	21.15	20.99	21.12
		1#24	20.87	20.77	20.92
		1#49	20.92	20.74	20.82
		25#0	20.76	20.75	20.89
		25#12	20.76	20.79	20.75
		25#24	20.92	20.73	20.87
		50#0	20.55	20.42	20.62

LTE Band 41

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	1#0	23.30	22.83	23.20
		1#12	21.46	21.87	21.56
		1#24	21.67	21.35	21.32
		12#0	21.43	21.28	21.45
		12#6	21.93	21.99	21.20
		12#11	21.92	21.84	21.35
		25#0	21.51	21.89	21.40
	16-QAM	1#0	21.67	21.33	21.35
		1#12	21.71	21.95	21.81
		1#24	22.25	21.75	21.22
		12#0	21.57	21.53	21.61
		12#6	22.22	22.06	21.80
		12#11	22.00	21.83	21.03
		25#0	21.65	21.81	21.62
10M	QPSK	1#0	23.29	22.98	22.86
		1#24	21.32	21.37	21.52
		1#49	21.57	21.86	21.90
		25#0	21.81	21.22	22.17
		25#12	21.94	22.07	21.94
		25#24	21.64	21.72	22.11
		50#0	21.05	21.59	22.32
	16-QAM	1#0	21.77	21.82	21.98
		1#24	21.07	21.21	22.13
		1#49	21.79	21.97	22.35
		25#0	21.98	22.08	22.07
		25#12	21.19	22.01	22.01
		25#24	21.80	21.29	21.41
		50#0	21.21	21.51	21.52

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	23.10	22.96	22.69
		1#37	21.11	21.74	22.03
		1#74	21.60	21.54	21.62
		36#0	21.71	22.04	21.64
		36#17	21.42	21.83	21.73
		36#35	20.99	21.93	21.65
		75#0	21.72	22.04	21.13
	16-QAM	1#0	21.63	21.78	21.38
		1#37	21.53	21.23	22.07
		1#74	20.99	21.31	21.66
		36#0	20.76	21.63	21.73
		36#17	21.25	21.90	21.60
		36#35	21.66	21.78	21.98
		75#0	20.90	21.26	21.24
20M	QPSK	1#0	22.89	22.93	22.60
		1#49	21.24	21.40	21.41
		1#99	20.88	21.15	21.47
		50#0	21.48	21.25	21.59
		50#24	21.63	21.84	21.49
		50#49	21.35	21.29	21.19
		100#0	21.47	21.33	20.87
	16-QAM	1#0	21.06	21.71	21.01
		1#49	21.05	20.94	21.54
		1#99	21.34	21.64	21.24
		50#0	21.54	21.60	20.82
		50#24	21.44	21.85	21.77
		50#49	21.48	21.03	21.19
		100#0	21.14	21.88	21.40

Peak-to-average ratio (PAR):**GSM 850**

Mode	Channel	PAR (dB)	Limit (dB)
GPRS	Low	4.29	13
	Middle	4.26	13
	High	4.09	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	5.16	13
	Middle	5.17	13
	High	5.16	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	3.89	3.62	13
	50 RB		5.29	5.88	5.52	13
16-QAM	1 RB	10M	4.61	4.69	4.66	13
	50 RB		6.66	6.77	6.64	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		5.57	6.70	5.42	13
16-QAM	1 RB	20M	4.27	4.26	4.37	13
	100 RB		6.29	6.20	6.30	13

Radiated Power:**GSM 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)										
836.60	98.31	57	127	H	34.62	0.63	-1.14	32.85	38.45	5.60
836.60	96.13	125	150	V	28.98	0.63	-1.14	27.21	38.45	11.24
EGPRS 850, Middle Channel (ERP)										
836.60	91.89	57	123	H	28.2	0.63	-1.14	26.43	38.45	12.02
836.60	90.24	245	220	V	23.09	0.63	-1.14	21.32	38.45	17.13
GPRS 1900, Middle Channel (EIRP)										
1880.00	92.14	228	147	H	21.35	0.85	8.81	29.31	33.00	3.69
1880.00	87.18	134	89	V	16.08	0.85	8.81	24.04	33.00	8.96
EGPRS 1900, Middle Channel (EIRP)										
1880.00	88.51	228	168	H	17.72	0.85	8.81	25.68	33.00	7.32
1880.00	83.02	134	210	V	11.92	0.85	8.81	19.88	33.00	13.12

EIRP:**LTE Band 5**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Submitted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 1.4M BW Middle Channel								
836.50	H	89.04	25.35	0.63	-1.14	23.58	38.45	14.87
836.50	V	84.13	16.98	0.63	-1.14	15.21	38.45	23.24
16-QAM 1.4M BW Middle Channel								
836.50	H	87.16	23.47	0.63	-1.14	21.70	38.45	16.75
836.50	V	83.52	16.37	0.63	-1.14	14.60	38.45	23.85
QPSK 3M BW Middle Channel								
836.50	H	88.16	24.47	0.63	-1.14	22.70	38.45	15.75
836.50	V	82.14	14.99	0.63	-1.14	13.22	38.45	25.23
16-QAM 3M BW Middle Channel								
836.50	H	87.66	23.97	0.63	-1.14	22.20	38.45	16.25
836.50	V	83.02	15.87	0.63	-1.14	14.10	38.45	24.35
QPSK 5M BW Middle Channel								
836.50	H	88.47	24.78	0.63	-1.14	22.15	38.45	16.30
836.50	V	84.56	17.41	0.63	-1.14	15.64	38.45	22.81
16-QAM 5M BW Middle Channel								
836.50	H	87.51	23.82	0.63	-1.14	22.05	38.45	16.40
836.50	V	83.46	16.31	0.63	-1.14	14.54	38.45	23.91
QPSK 10M BW Middle Channel								
836.50	H	87.43	23.74	0.63	-1.14	21.97	38.45	16.48
836.50	V	82.51	15.36	0.63	-1.14	13.59	38.45	24.86
16-QAM 10M BW Middle Channel								
836.50	H	87.11	23.42	0.63	-1.14	21.65	38.45	16.80
836.50	V	82.31	15.16	0.63	-1.14	13.39	38.45	25.06

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								
2593.00	H	78.19	8.57	0.89	9.96	17.64	33.00	15.36
2593.00	V	80.39	10.70	0.89	9.96	19.77	33.00	13.23
16-QAM 5M BW Middle Channel								
2593.00	H	78.05	8.43	0.89	10.05	17.59	33.00	15.41
2593.00	V	80.04	10.35	0.89	10.05	19.51	33.00	13.49
QPSK 10M BW Middle Channel								
2593.00	H	78.02	8.40	0.89	10.05	17.56	33.00	15.44
2593.00	V	80.12	10.43	0.89	10.05	19.59	33.00	13.41
16-QAM 10M BW Middle Channel								
2593.00	H	77.86	8.24	0.89	10.05	17.40	33.00	15.60
2593.00	V	79.94	10.25	0.89	10.05	19.41	33.00	13.59
QPSK 15M BW Middle Channel								
2593.00	H	77.56	7.94	0.89	10.05	17.10	33.00	15.90
2593.00	V	79.68	9.99	0.89	10.05	19.15	33.00	13.85
16-QAM 15M BW Middle Channel								
2593.00	H	77.42	7.80	0.89	10.05	16.96	33.00	16.04
2593.00	V	79.91	10.22	0.89	10.05	19.38	33.00	13.62
QPSK 20M BW Middle Channel								
2593.00	H	77.24	7.62	0.89	10.05	16.78	33.00	16.22
2593.00	V	79.37	9.68	0.89	10.05	18.84	33.00	14.16
16-QAM 20M BW Middle Channel								
2593.00	H	77.11	7.49	0.89	10.05	16.65	33.00	16.35
2593.00	V	79.38	9.69	0.89	10.05	18.85	33.00	14.15

Note:

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

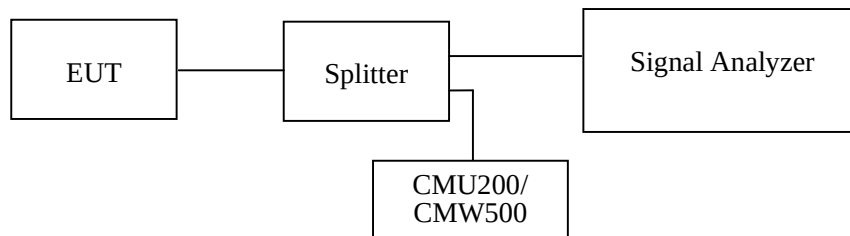
FCC §2.1049, §22.917, §22.905 , §24.238&§27.53 - OCCUPIED BANDWIDTH**Applicable Standards**

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

Test Procedure

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

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

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

Temperature:	23.5~25.6 °C
Relative Humidity:	23~25 %
ATM Pressure:	103.3~104.7 kPa

The testing was performed by Sam Ye from 2020-03-14 to 2020-03-24.

EUT operation mode: Transmitting

Test Result: Compliant

GSM 850

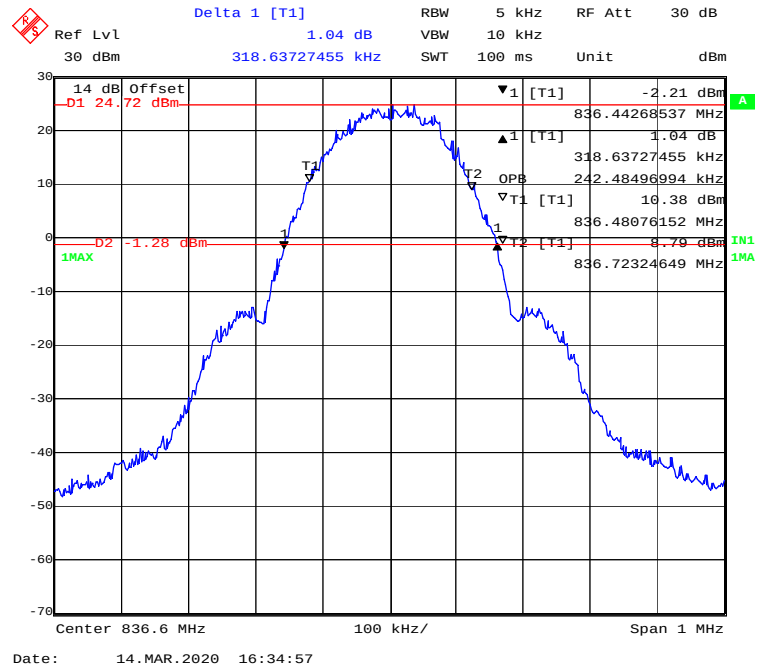
Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GPRS (GMSK)	836.6	0.319	0.242
EGPRS (8PSK)	836.6	0.301	0.236

PCS 1900

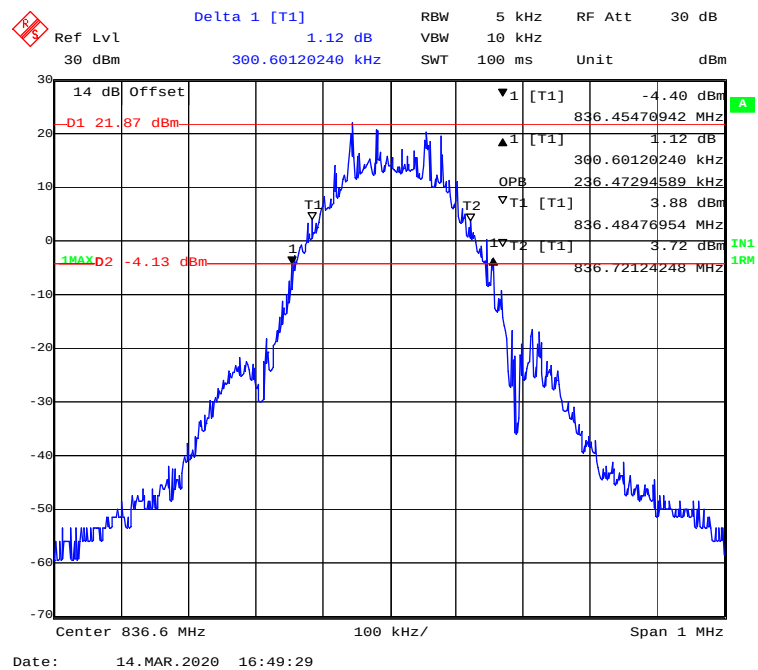
Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GPRS (GMSK)	1880.0	0.315	0.246
EGPRS (8PSK)	1880.0	0.317	0.244

GSM 850

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

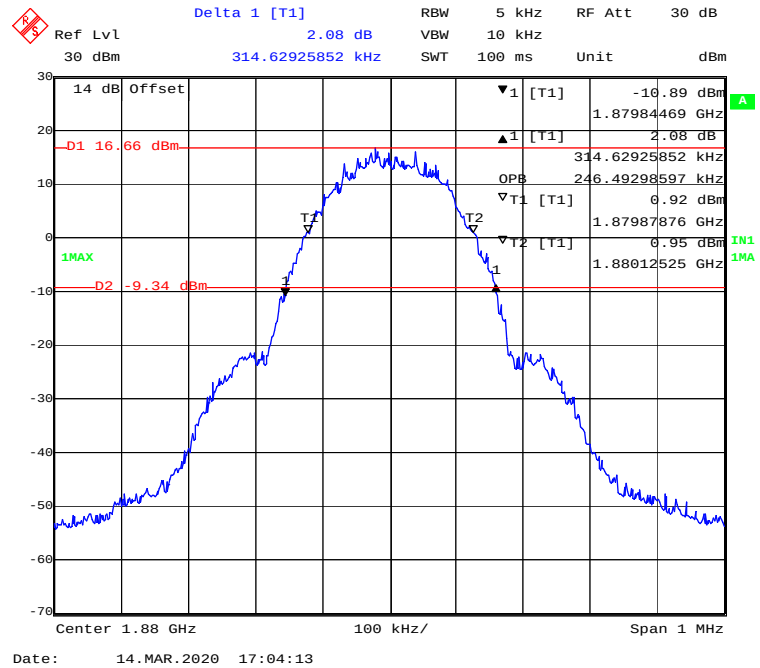


99% Occupied & 26 dB Emissions Bandwidth for EGPRS (8PSK) Mode

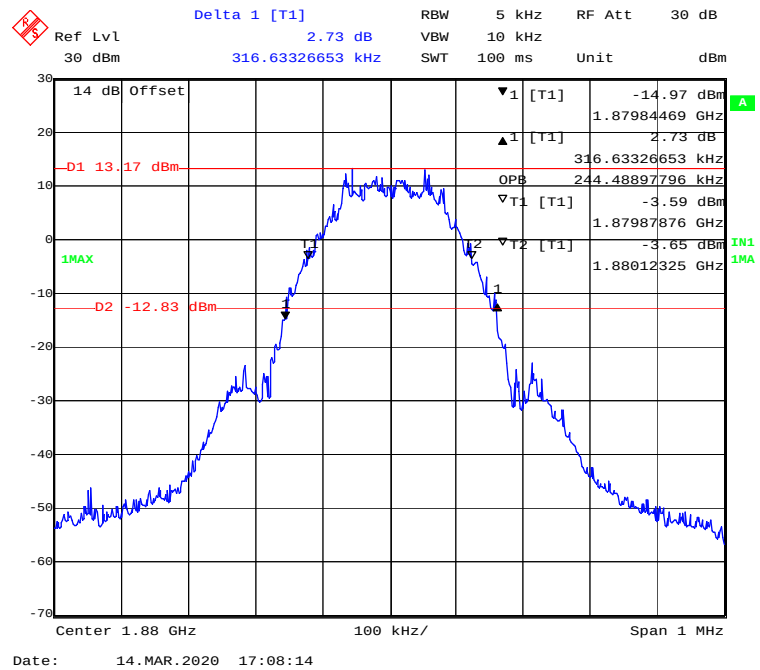


PCS 1900 Band

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

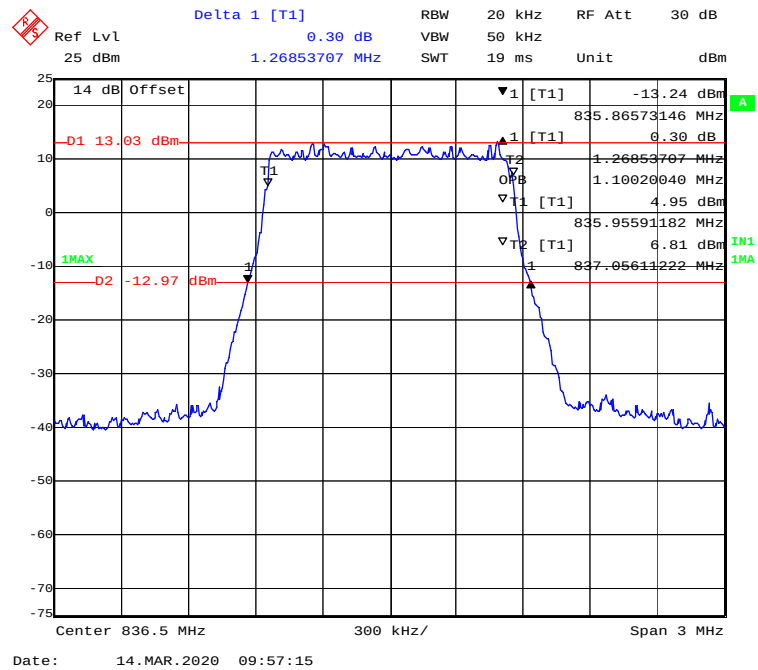
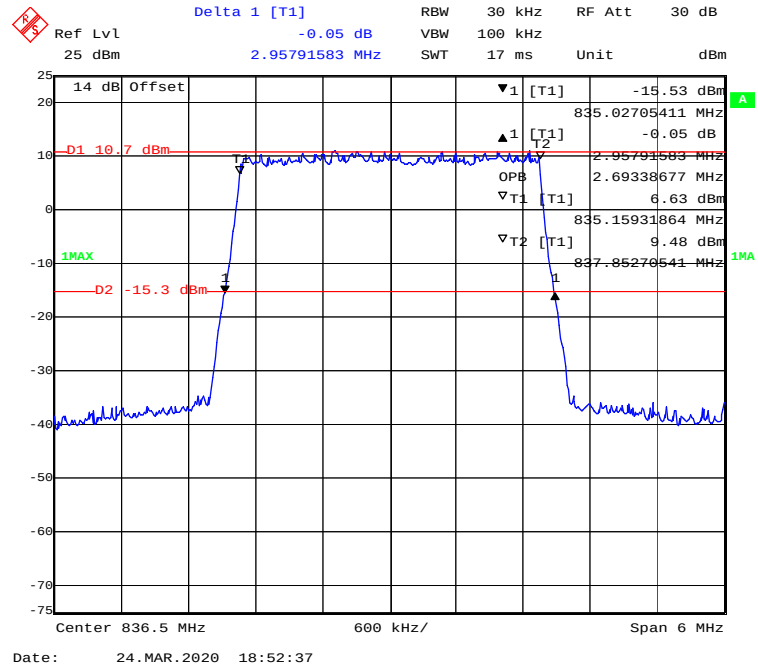


99% Occupied & 26 dB Emissions Bandwidth for EGPRS (8PSK) Mode

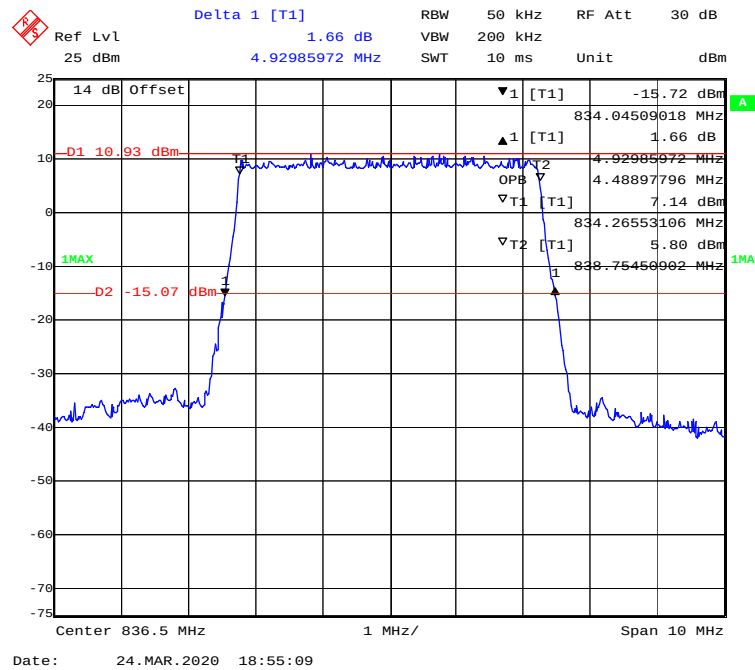


LTE Band 5:

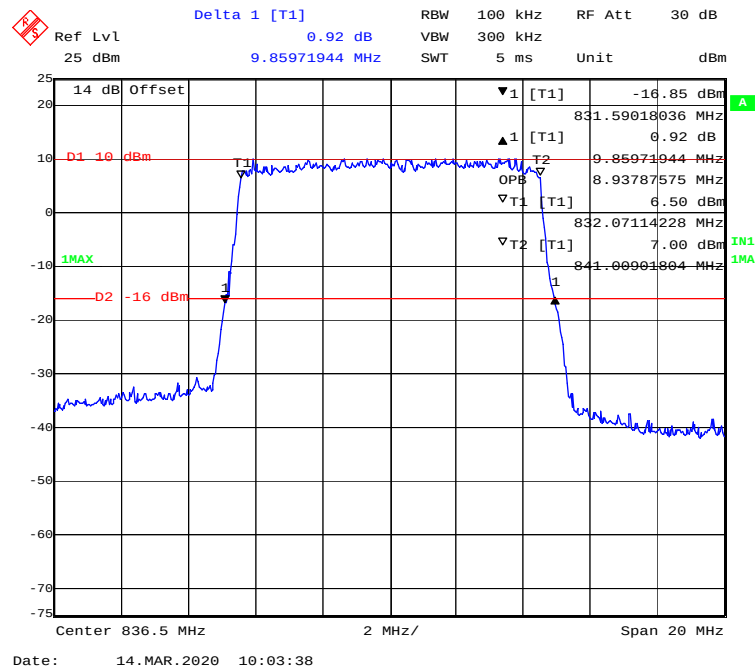
Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
QPSK	1.4M	Middle	1.269	1.100
	3M		2.957	2.693
	5M		4.930	4.489
	10M		9.860	8.938
16-QAM	1.4M	Middle	1.293	1.094
	3M		2.934	2.693
	5M		4.930	4.489
	10M		9.619	8.938

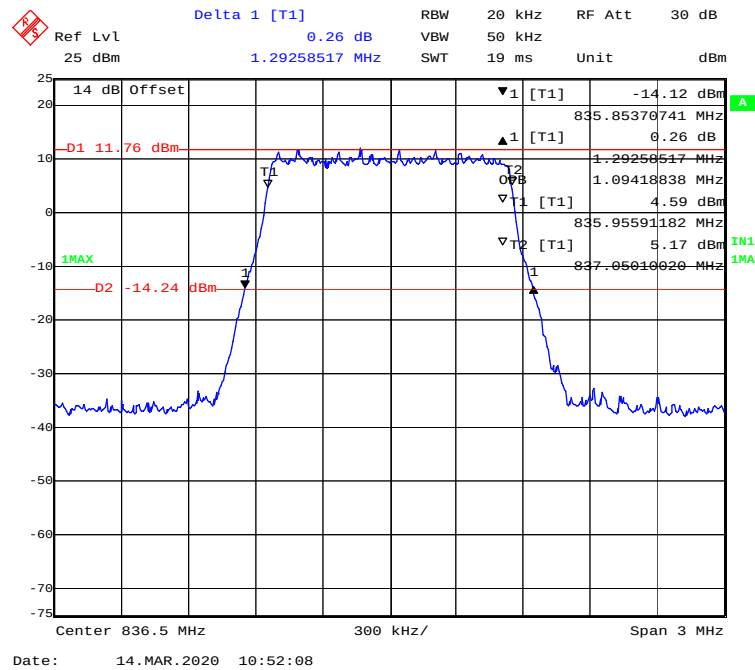
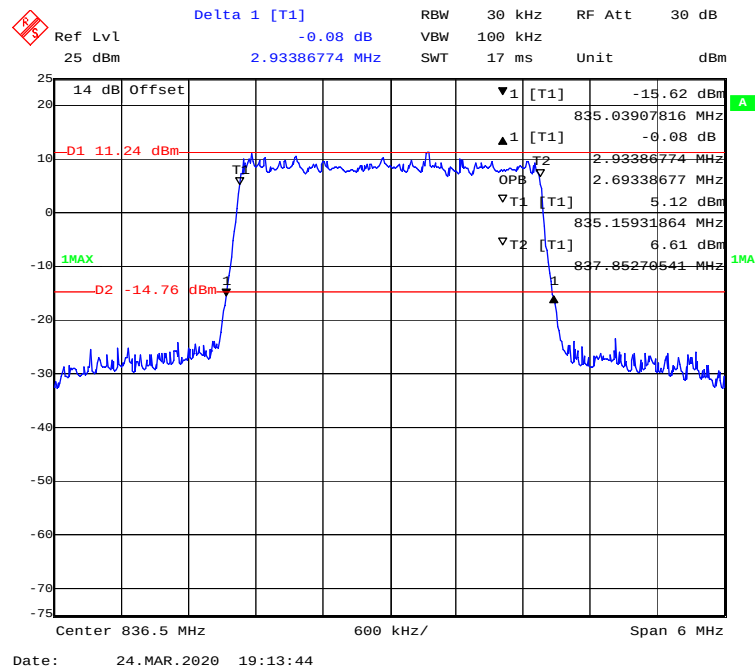
QPSK (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**QPSK (3.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

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

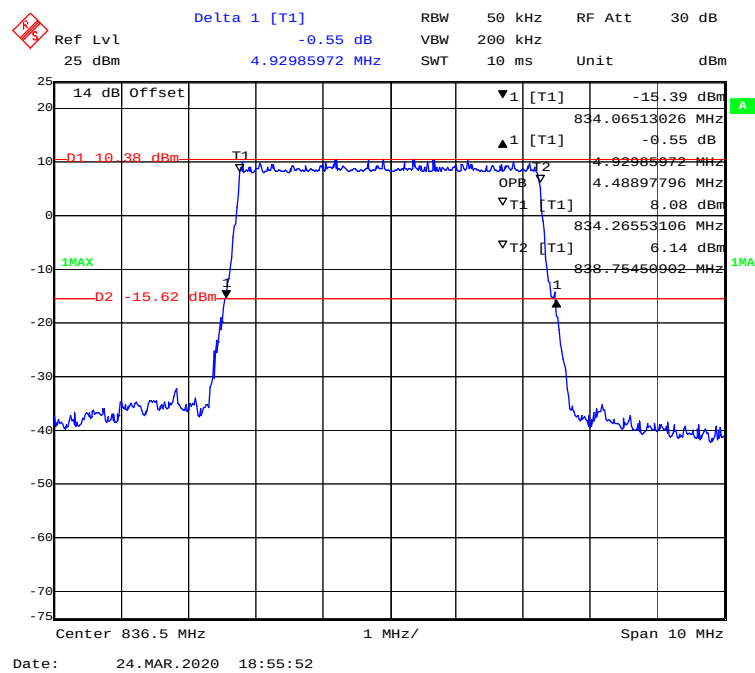


QPSK (10.0MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel

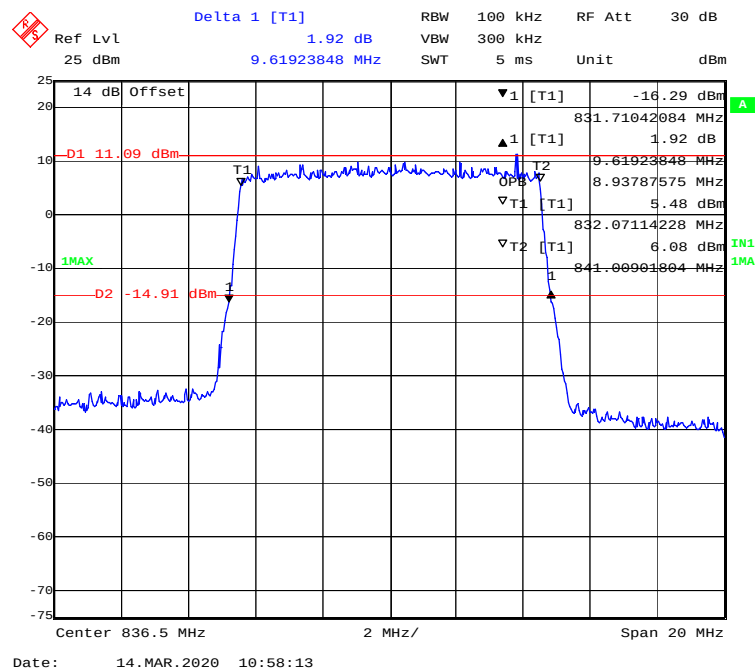


16-QAM (1.4 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**16-QAM (3.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

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

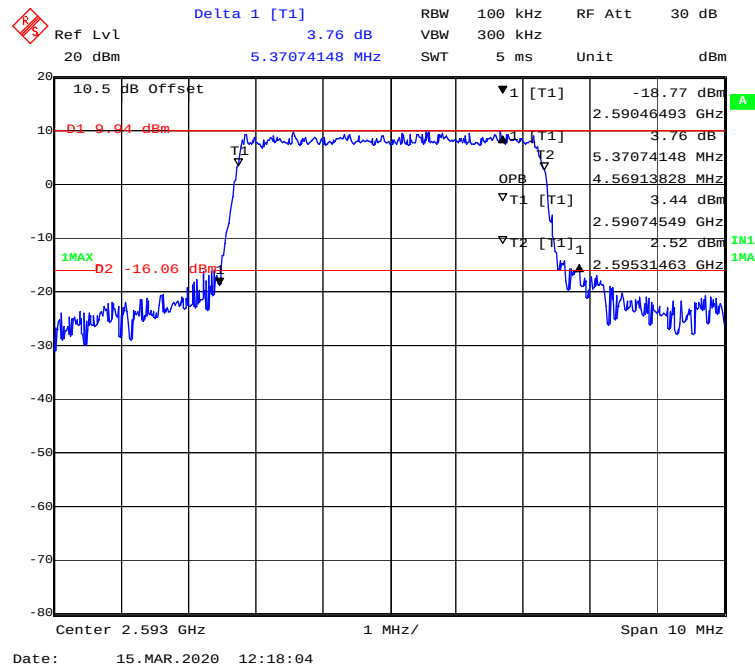
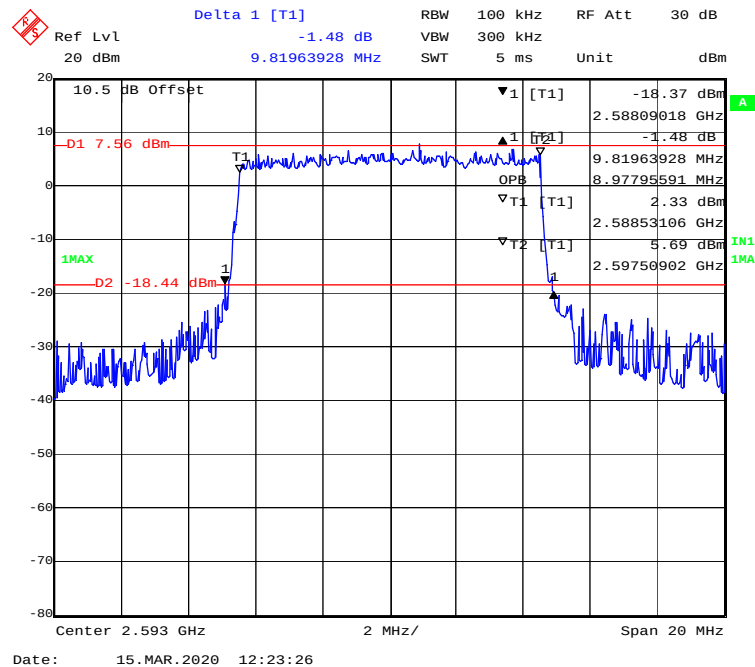


16-QAM (10.0 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel



LTE Band 41:

Test Modulation	Test Bandwidth	Test Channel	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
QPSK	5M	Middle	5.371	4.569
	10M		9.820	8.978
	15M		15.271	13.527
	20M		19.800	17.956
16-QAM	5M	Middle	5.251	4.549
	10M		9.739	8.938
	15M		15.932	13.527
	20M		19.960	17.956

LTE Band 41:**QPSK (5MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel****QPSK (10 MHz) - 99% Occupied & 26 dB Emissions Bandwidth, Middle channel**

Delta 1 [T1]

Ref Lvl -2.25 dB

20 dBm 15.27054108 MHz

RBW 300 kHz RF Att 30 dB

SWT 5 ms Unit dBm

10.5 dB Offset

D1 0.70 dBm

1MAX -16.21 dBm

T1

▼1 [T1] -17.42 dBm

2.58551503 GHz

▼2 [T1] -2.25 dB

15.27054108 MHz

OPB 13.52705411 MHz

▼T1 [T1] 4.24 dBm

2.58629659 GHz

▼T2 [T1] 5.28 dBm

2.59982365 GHz

Center 2.593 GHz 3 MHz/ Span 30 MHz

Date: 15. MAR. 2020 12:27:03

Delta 1 [T1] 3.58 dB

Ref Lvl 20 dBm

19.79959920 MHz

RBW 300 kHz

SWT 5 ms

RF Att 30 dB

Unit dBm

10.5 dB Offset

D1 9.6 dBm

19.79959920 MHz

19.79959920 MHz

OPB 17.9559182 MHz

T1 [T1] 4.40 dBm

T2 [T1] 3.66 dBm

D2 -16.4 dBm

1MAX

IN1 1MA

Center 2.593 GHz

4 MHz/

Span 40 MHz

Date: 15.MAR.2020 12:31:05

Delta 1 [T1]

Ref Lvl -0.01 dB

20 dBm 5.25050100 MHz

RBW 100 kHz RF Att 30 dB

SWT 5 ms Unit dBm

10.5 dB Offset

D1 9.49 dBm

1 [T1] -0.01 dB

2 [T1] 5.25050100 MHz

OPB 4.54909820 MHz

▽T1 [T1] 3.88 dBm

▽T2 [T1] 1.86 dBm

1 2.59074549 GHz

1 2.59529459 GHz

1MAX -16.51 dBm

1MA -16.17 dBm

Center 2.593 GHz 1 MHz/ Span 10 MHz

Date: 15.MAR.2020 12:20:08

Delta 1 [T1] 0.16 dB

Ref Lvl 20 dBm

RBW 100 kHz RF Att 30 dB

SWT 5 ms Unit dBm

10.5 dB Offset

D1 7.86 dBm

T1

OPB

1MAX

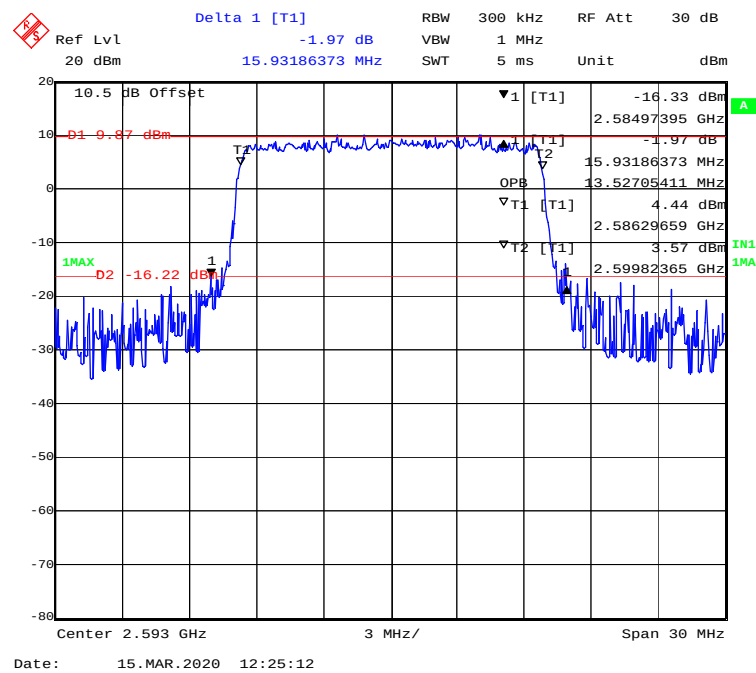
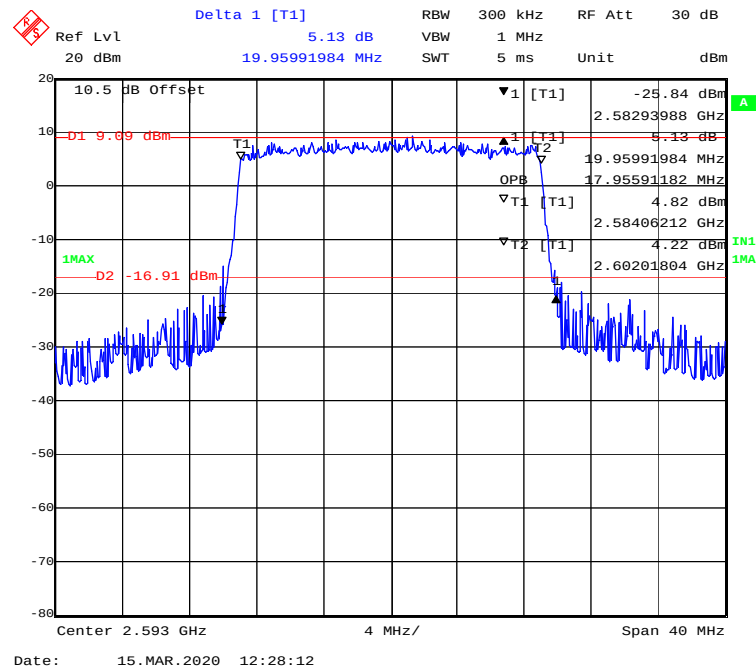
D2 -18.14 dBm

1

▼1 [T1]	-19.15 dBm
▲1 [T1]	0.16 dB
▽1 [T1]	2.58809018 GHz
▽2 [T1]	9.73947896 MHz
▽3 [T1]	8.93787575 MHz
▽T1 [T1]	2.41 dBm
▽T2 [T1]	2.58857114 GHz
▽T3 [T1]	3.05 dBm
▽T4 [T1]	2.59750902 GHz

Center 2.593 GHz 2 MHz/ Span 20 MHz

Date: 15. MAR. 2020 12:21:45

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

FCC § 2.1051; § 22.917 (a); § 24.238 (a) & §27.53 (m)- SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

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

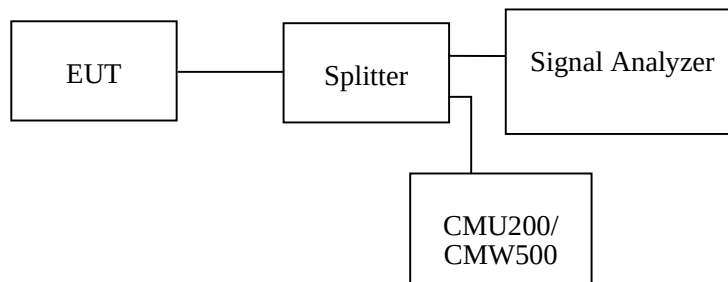
The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

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 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

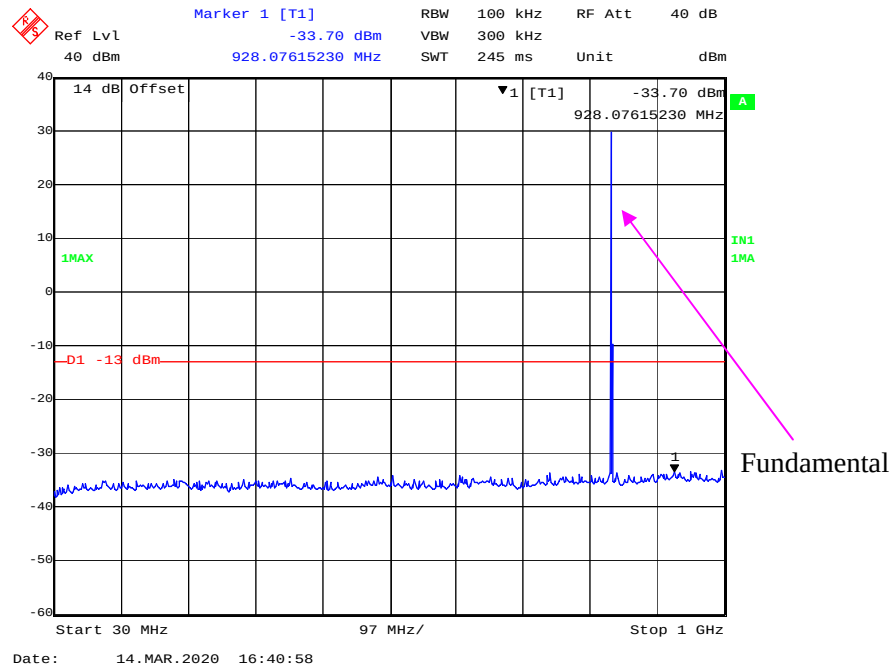
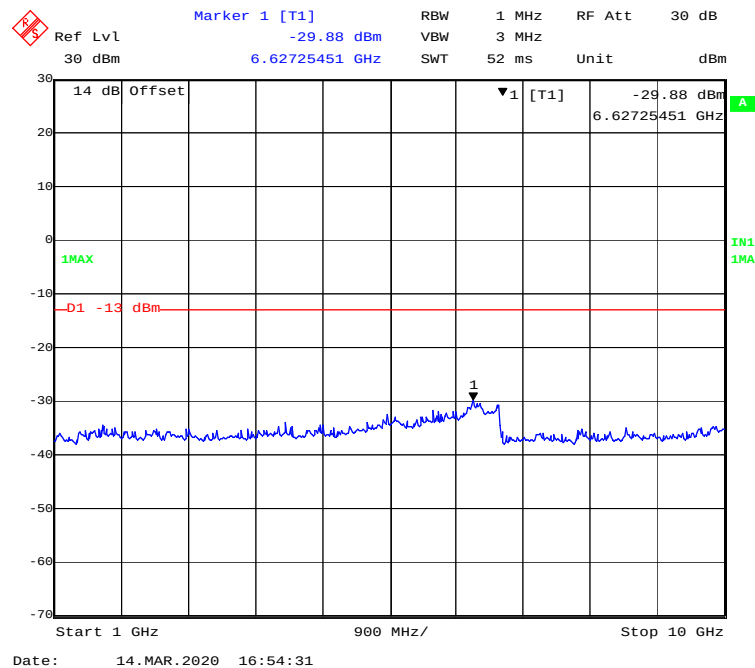
Environmental Conditions

Temperature:	23.2-23.5 °C
Relative Humidity:	51-23 %
ATM Pressure:	101.1-103.3 kPa

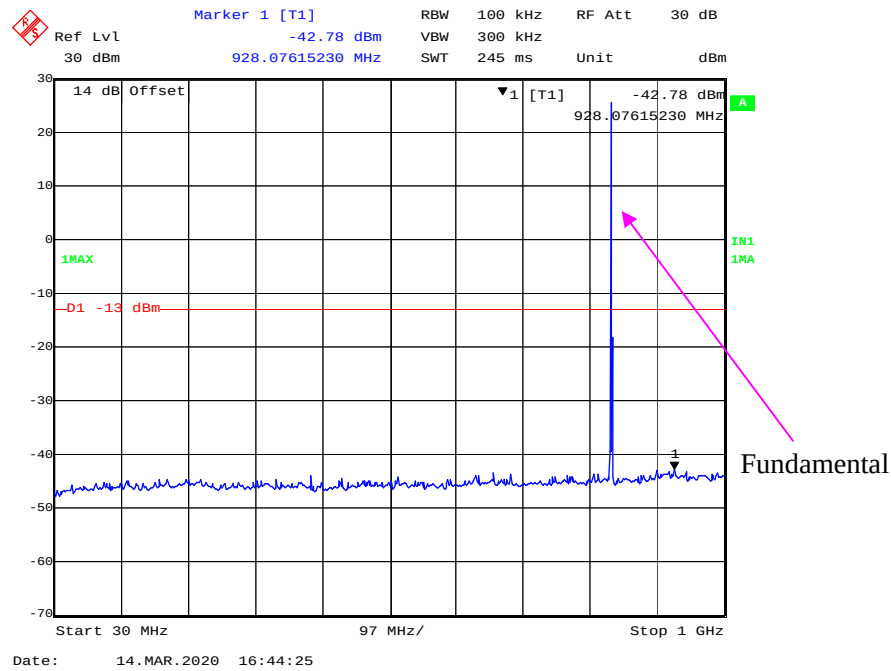
The testing was performed by Sam Ye from 2020-03-14 to 2020-03-15.

EUT operation mode: Transmitting

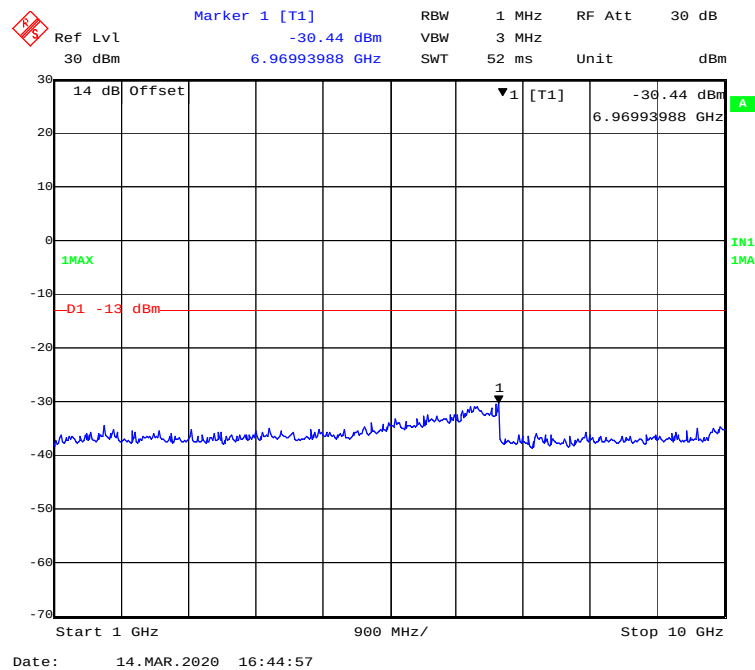
Test Result: Compliant

GSM 850 Band:**30 MHz – 1GHz(GPRS Mode)****1 GHz – 10 GHz (GPRS Mode)**

30 MHz – 1GHz(EGPRS Mode)

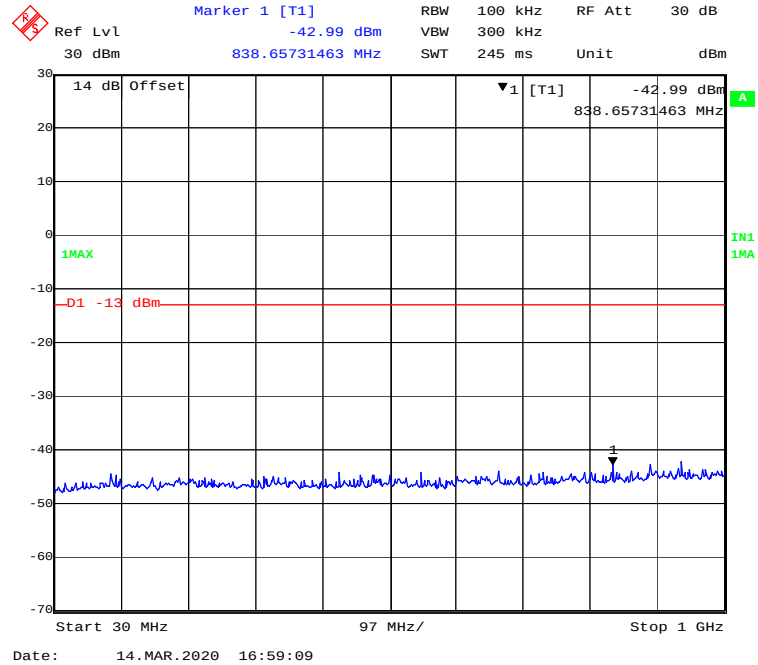


1 GHz – 10 GHz (EGPRS Mode)

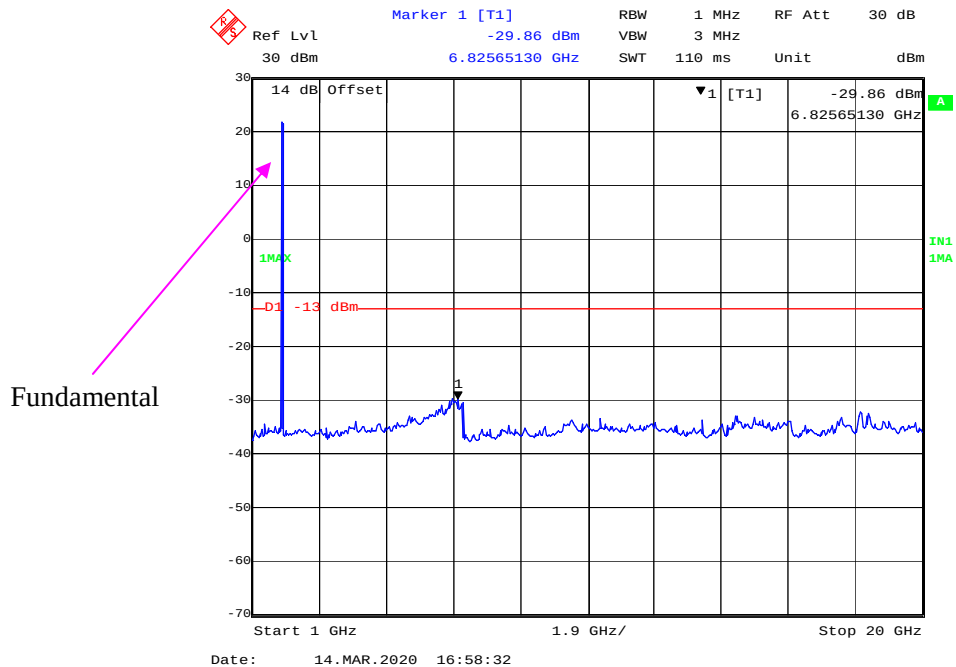


PCS 1900 Band:

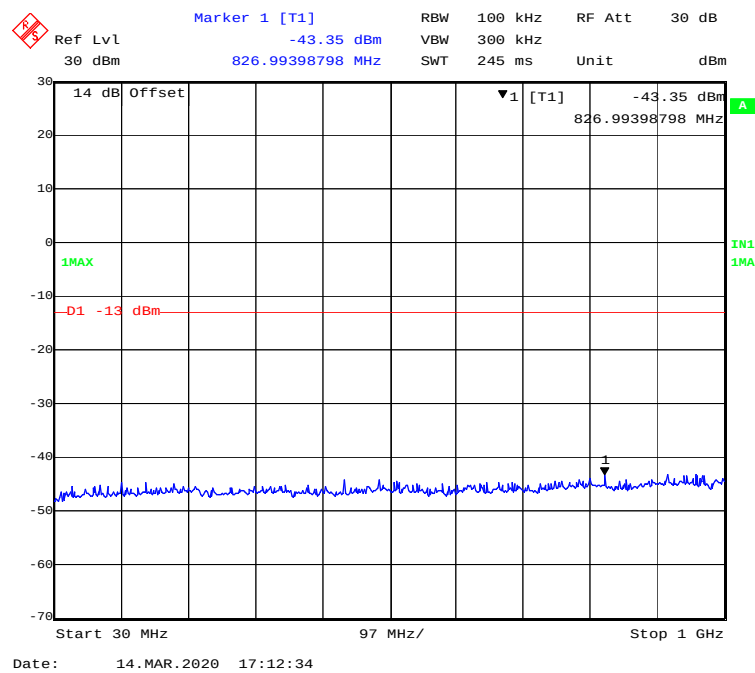
30 MHz – 1GHz(GPRS Mode)



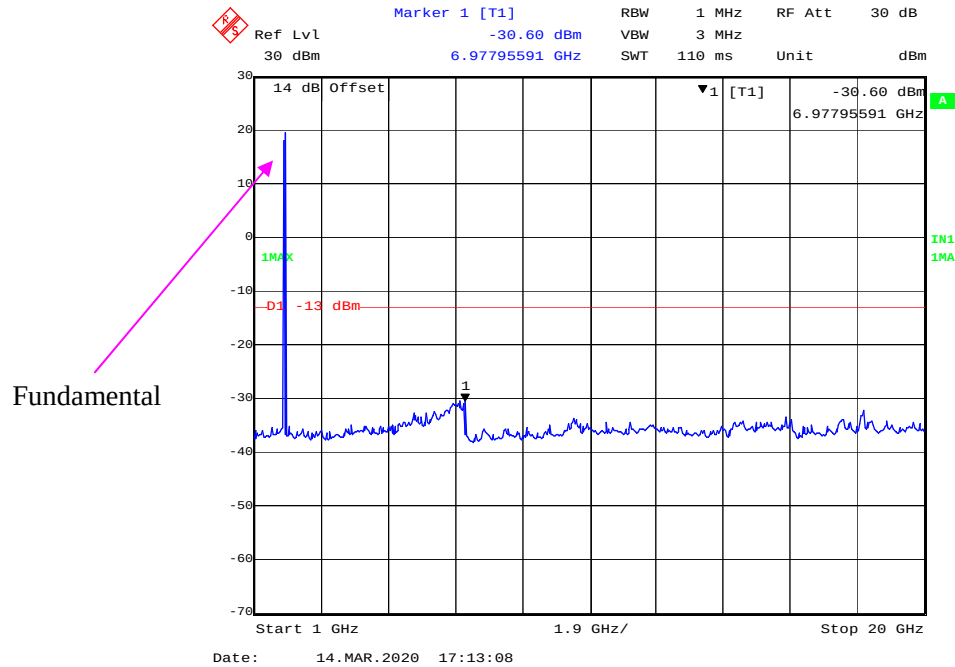
1 GHz – 20 GHz (GPRS Mode)

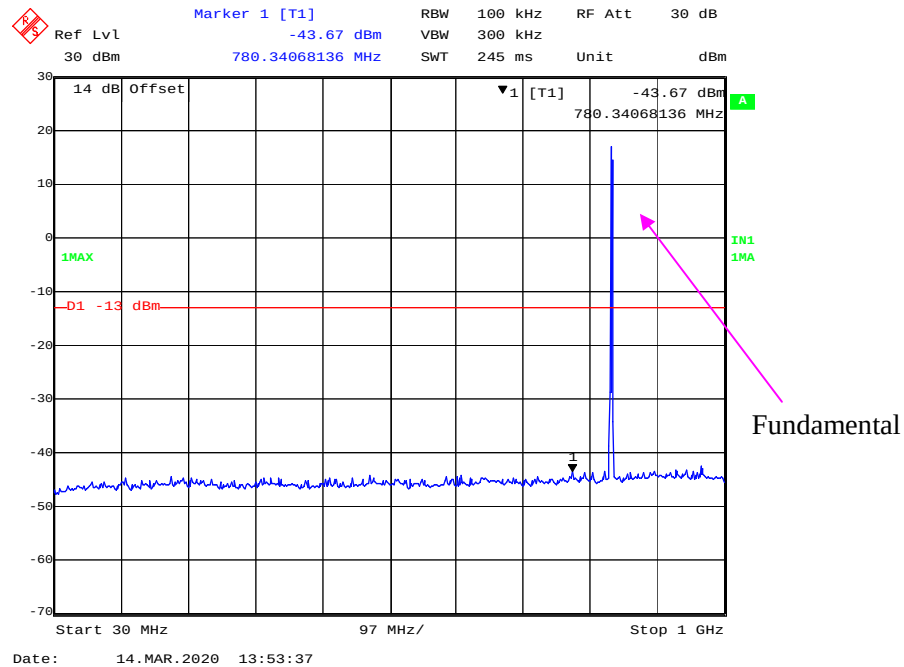
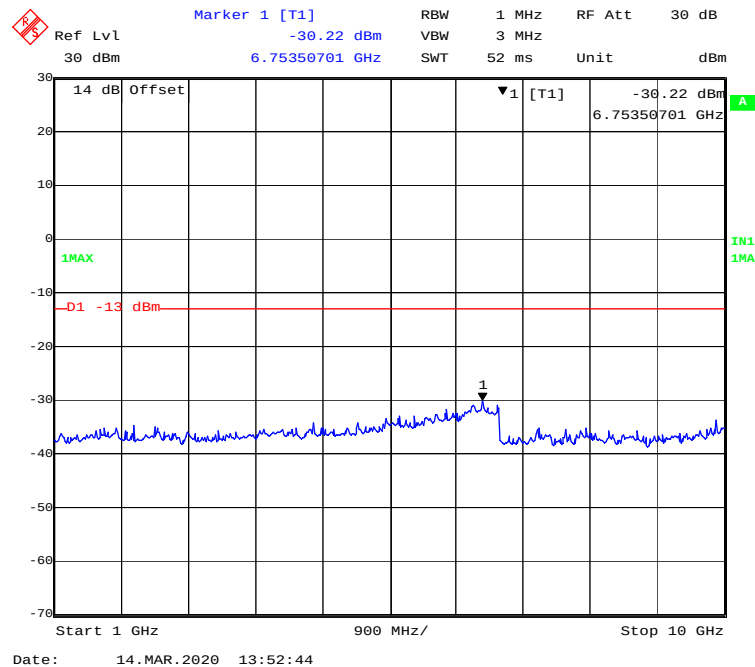


30 MHz – 1GHz(EGPRS Mode)

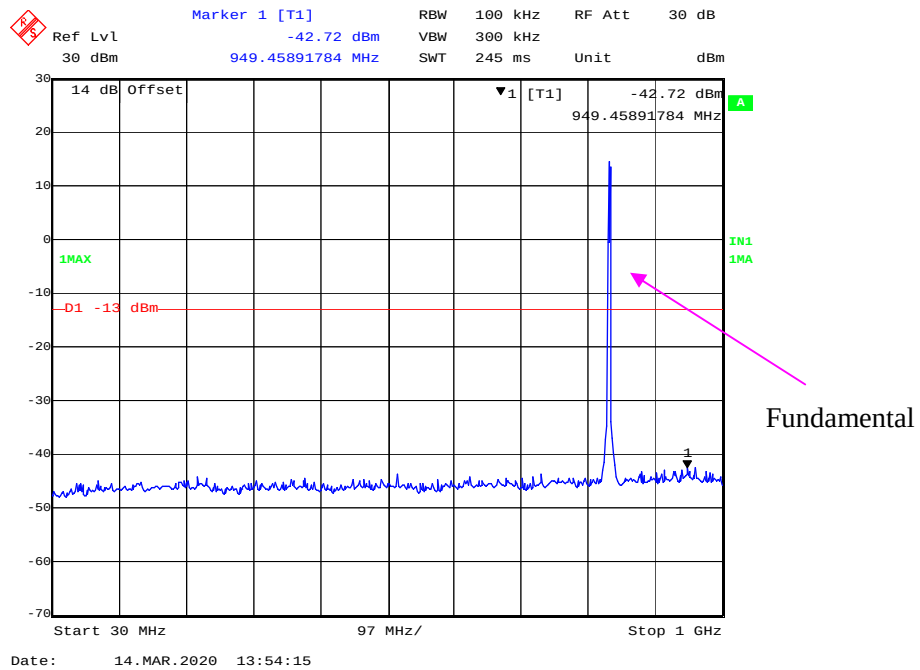


1 GHz – 20 GHz (EGPRS Mode)

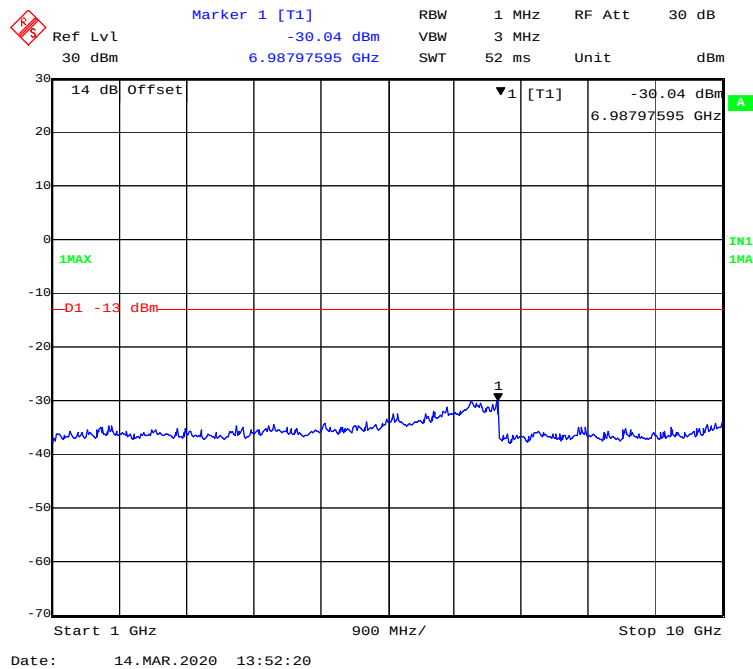


LTE Band 5:**30 MHz - 1 GHz (1.4 MHz, QPSK, Middle Channel)****1 GHz – 10 GHz (1.4 MHz, QPSK, Middle Channel)**

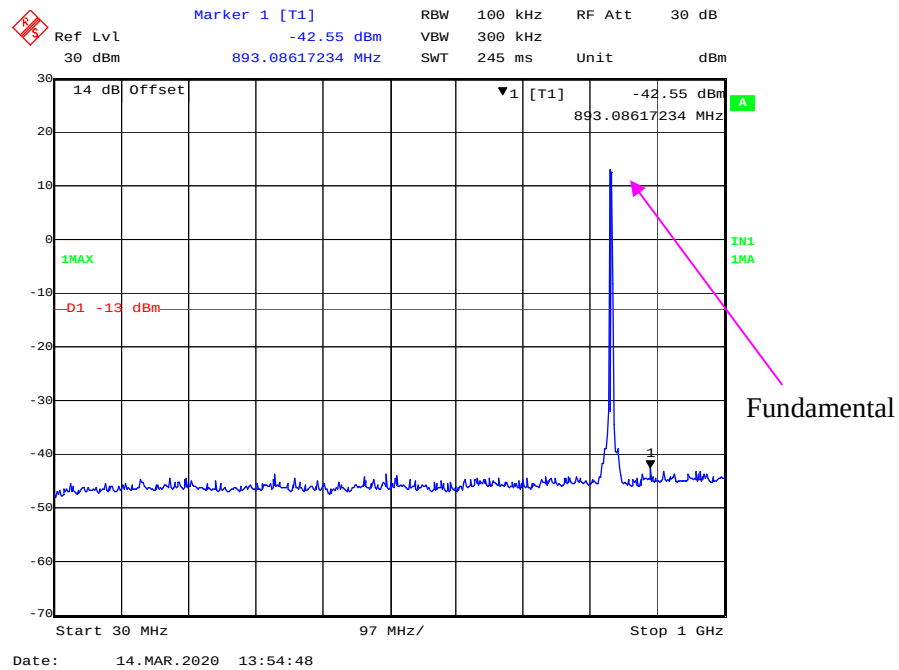
30 MHz - 1 GHz (3.0 MHz, QPSK, Middle Channel)



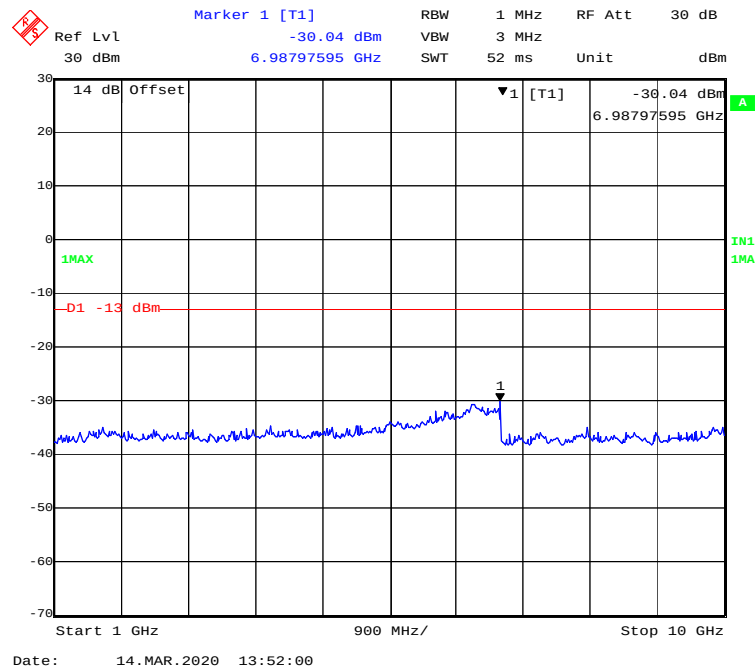
1 GHz – 10 GHz (3.0 MHz, QPSK, Middle Channel)



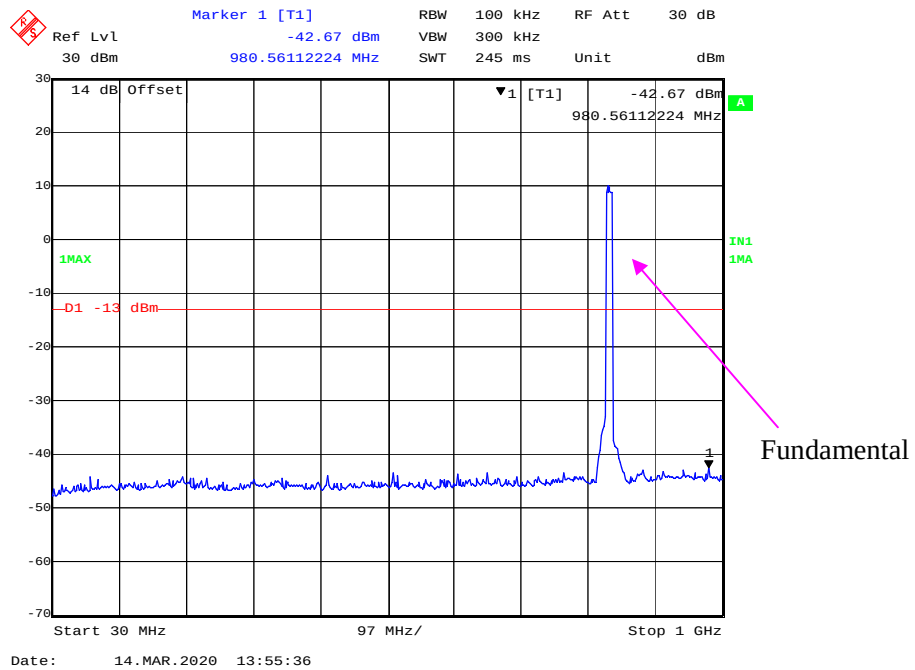
30 MHz - 1 GHz (5.0 MHz, QPSK, Middle Channel)



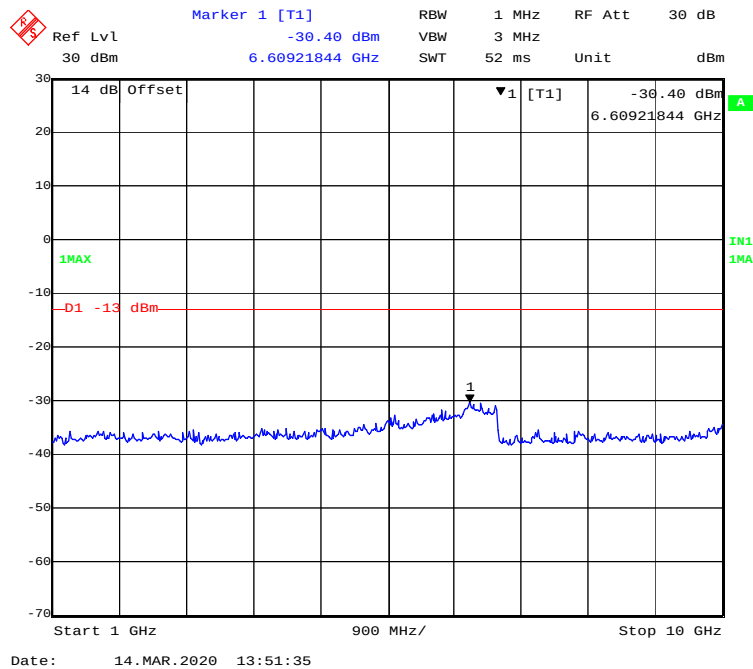
1 GHz – 10 GHz (5.0MHz, QPSK, Middle Channel)



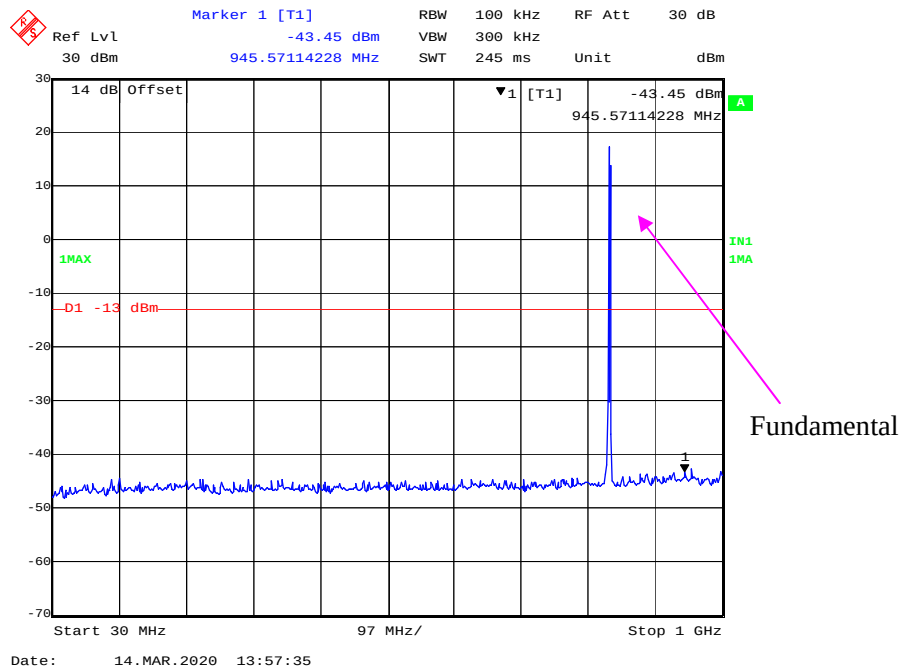
30 MHz - 1 GHz (10.0 MHz, QPSK, Middle Channel)



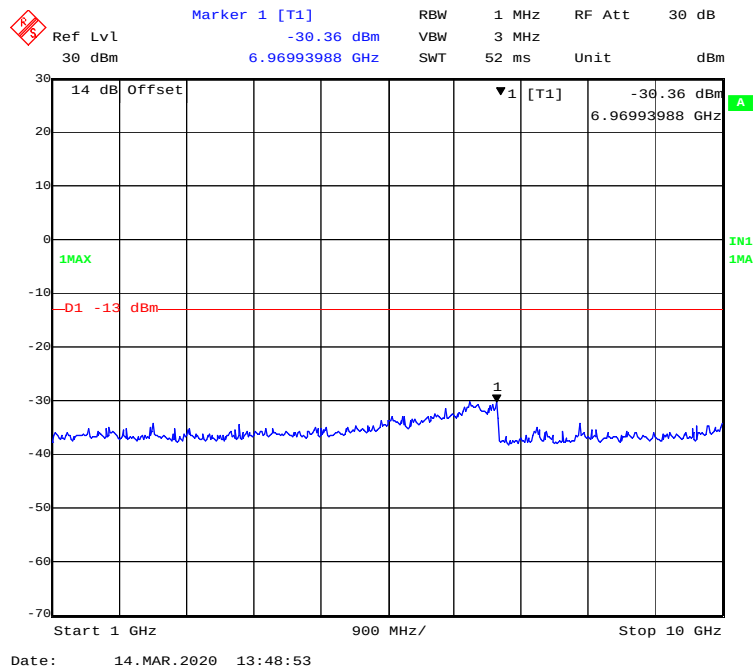
1 GHz – 10 GHz (10.0 MHz, QPSK, Middle Channel)



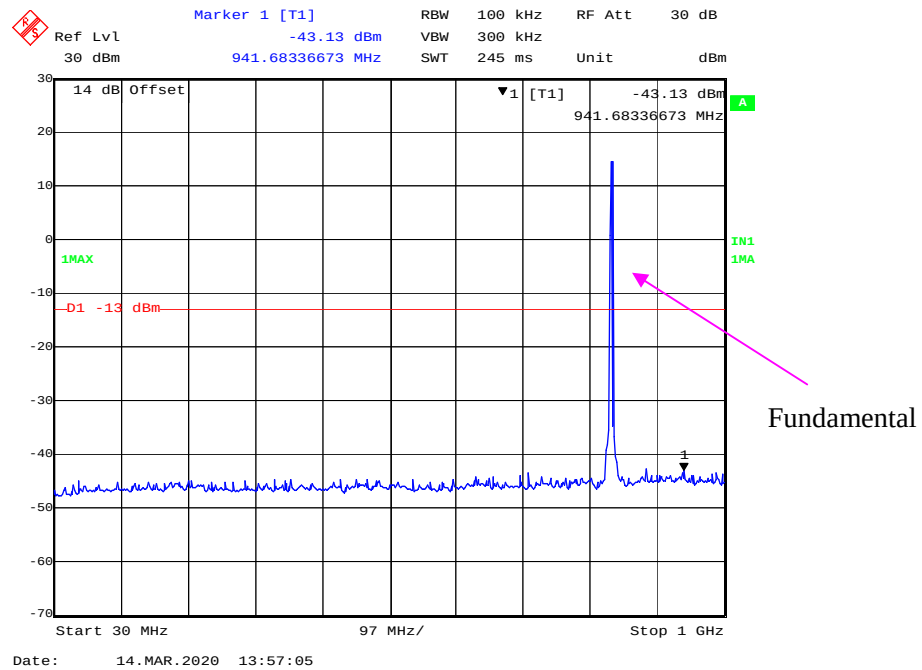
30 MHz - 1 GHz (1.4 MHz, 16-QAM, Middle Channel)



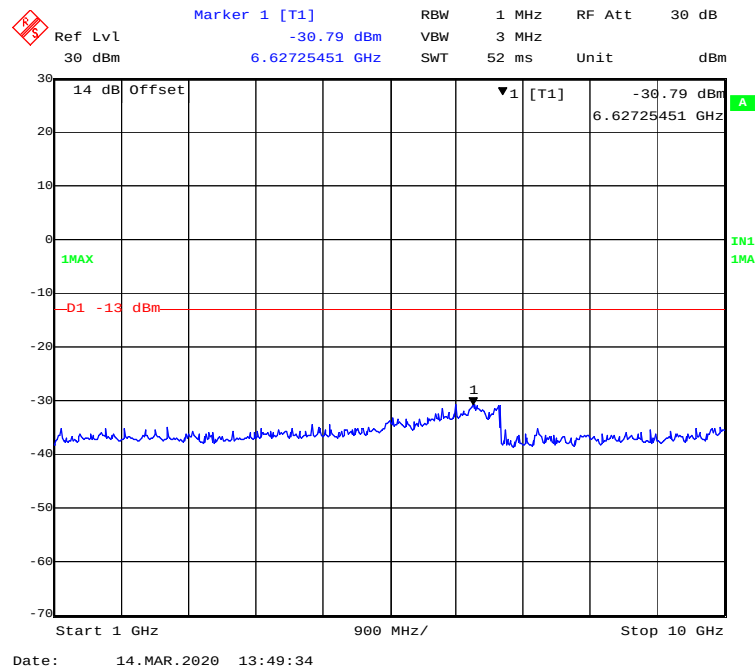
1 GHz – 10 GHz (1.4 MHz, 16-QAM, Middle Channel)



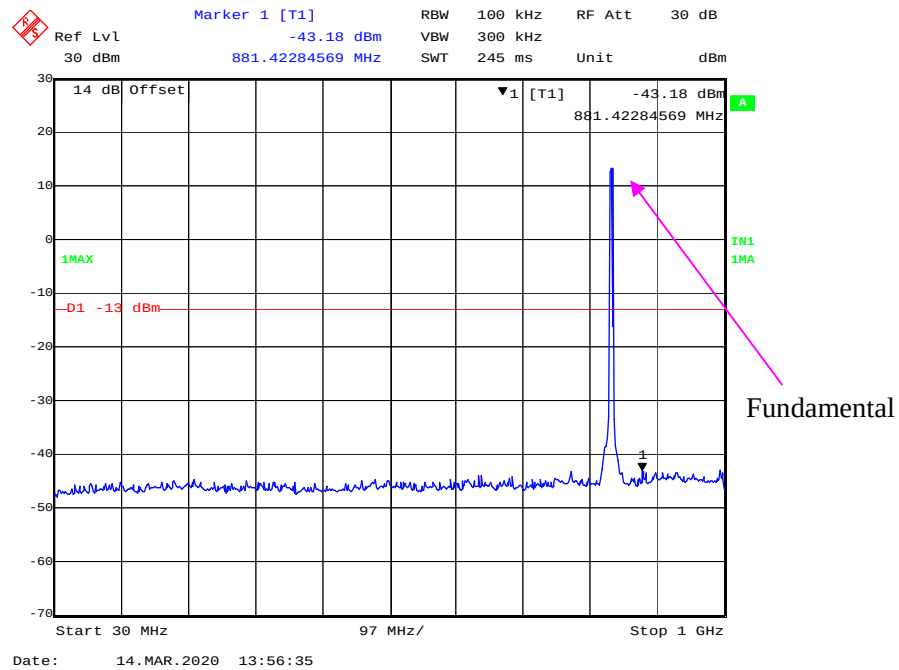
30 MHz - 1 GHz (3.0 MHz, 16-QAM, Middle Channel)



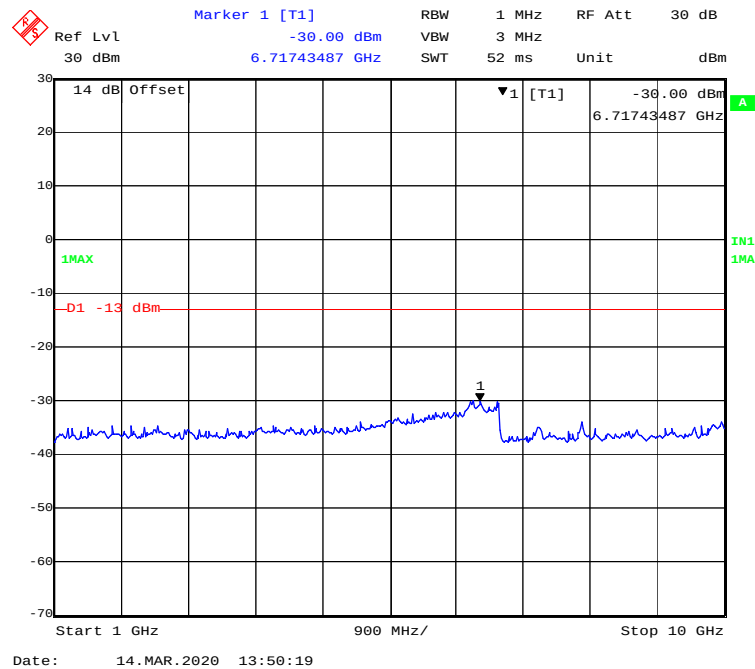
1 GHz – 10 GHz (3.0 MHz, 16-QAM, Middle Channel)



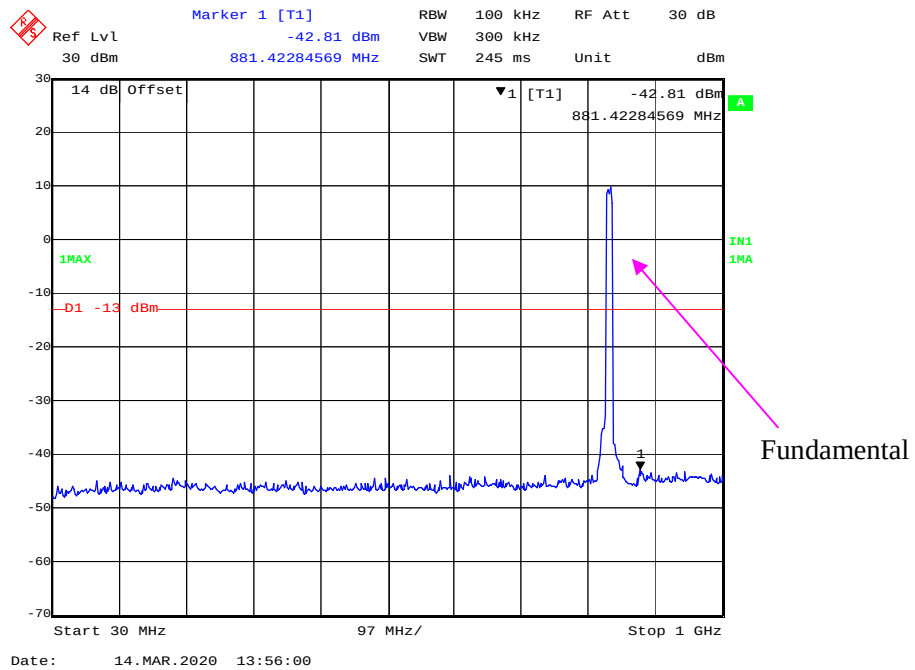
30 MHz - 1 GHz (5.0 MHz, 16-QAM, Middle Channel)



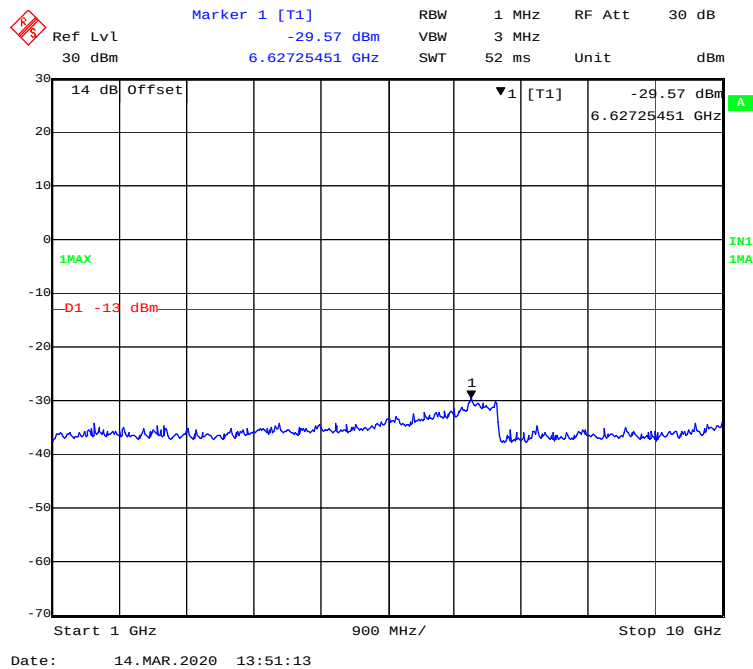
1 GHz – 10 GHz (5.0MHz, 16-QAM, Middle Channel)



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

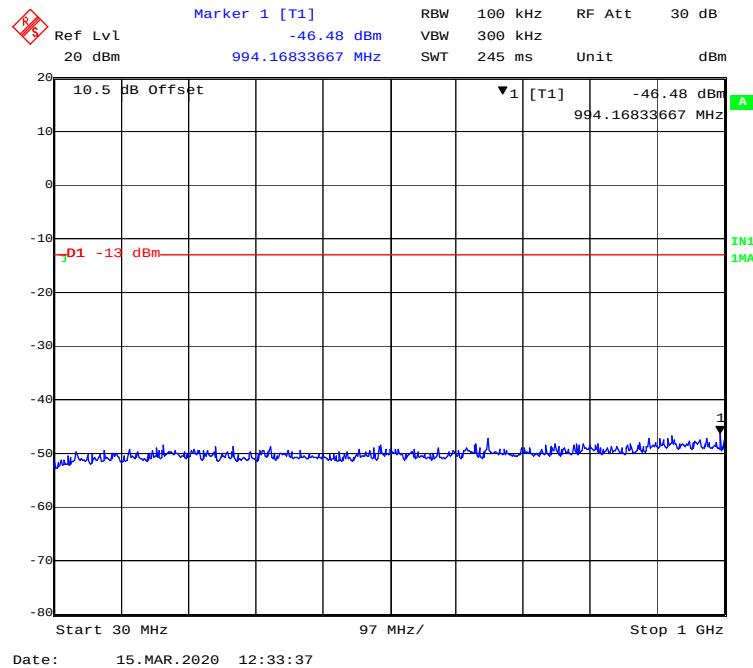
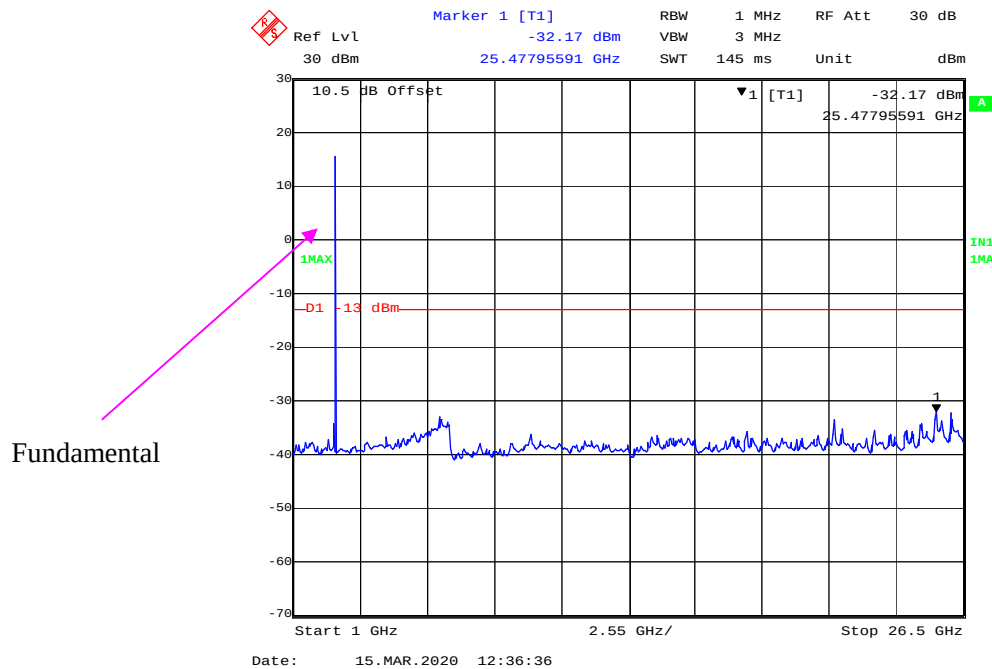


1 GHz – 10 GHz (10.0 MHz, 16-QAM, Middle Channel)

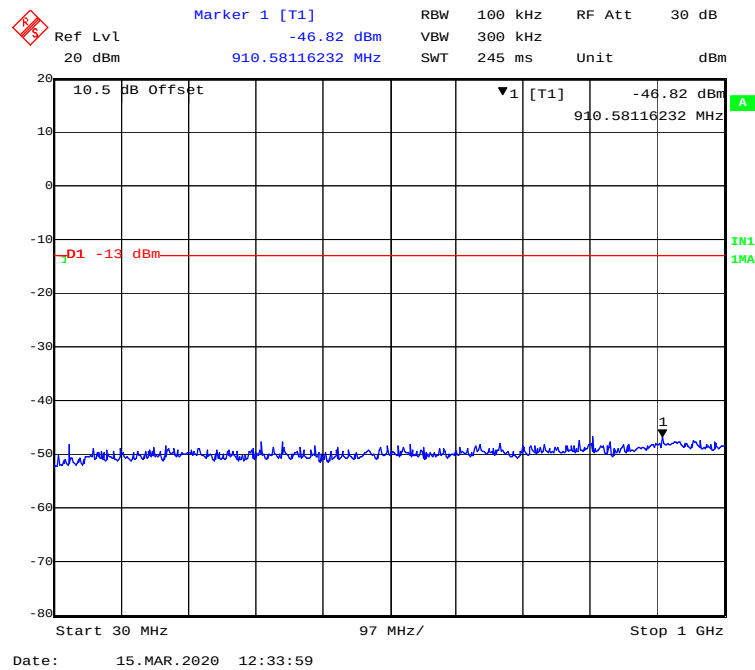


LTE Band 41:

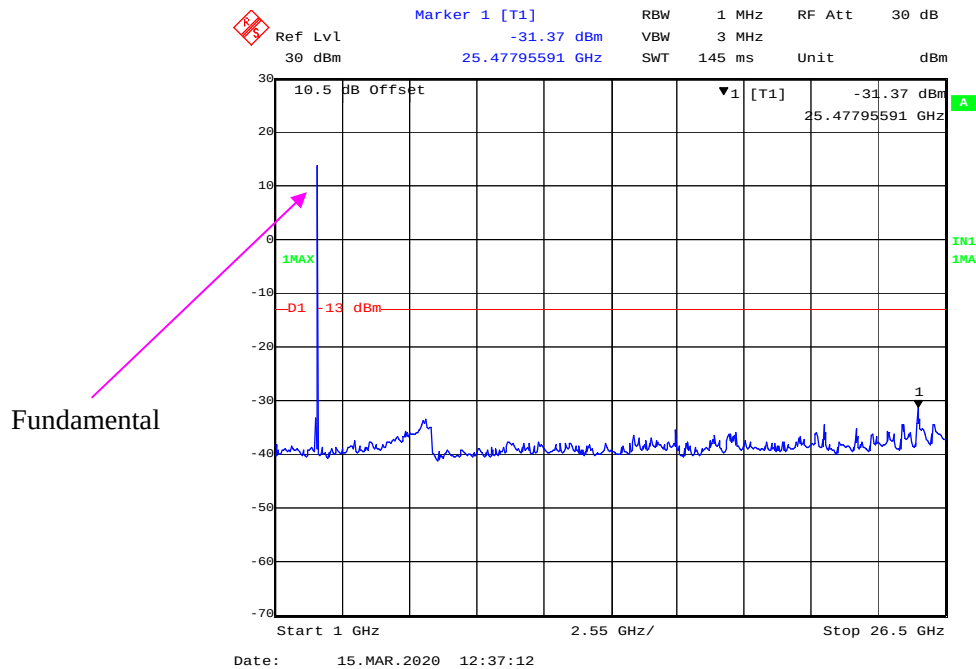
(Note: The limit is -25dBm, the worst case is -31.37dBm which below the limit, so the test result is compliant)

30 MHz - 1 GHz (5 MHz, QPSK, Middle Channel)**1 GHz – 26 GHz (5 MHz, QPSK, Middle Channel)**

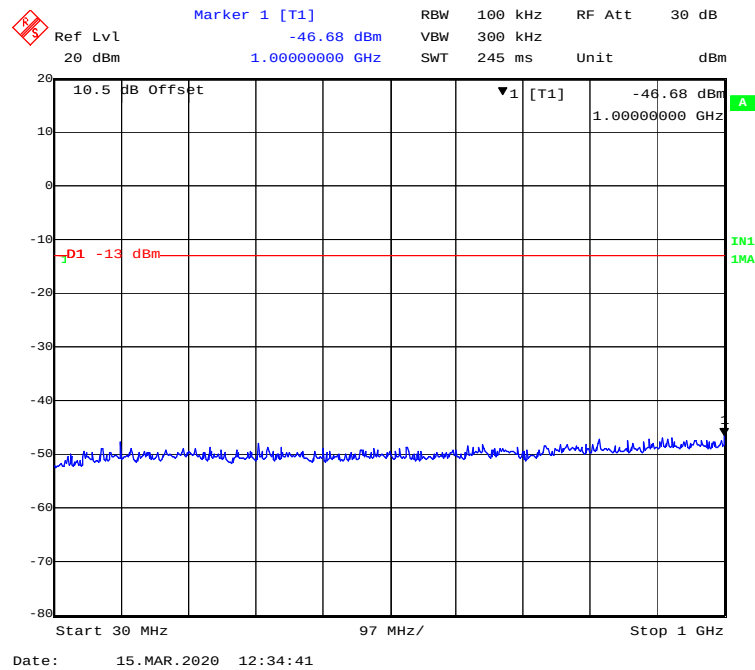
30 MHz - 1 GHz (10 MHz, QPSK, Middle Channel)



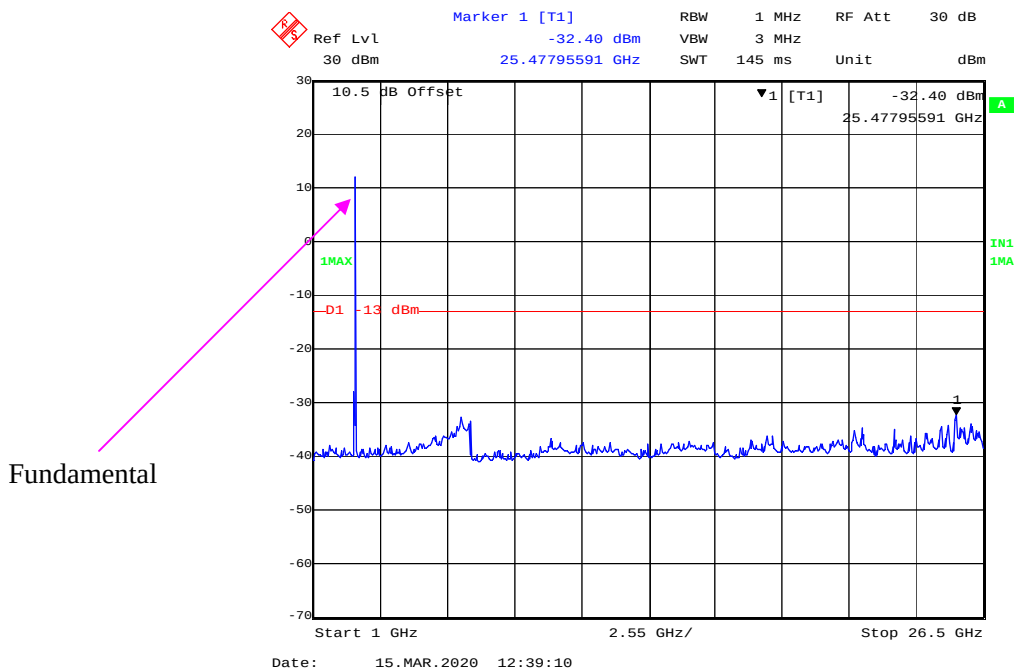
1 GHz - 26 GHz (10 MHz, QPSK, Middle Channel)



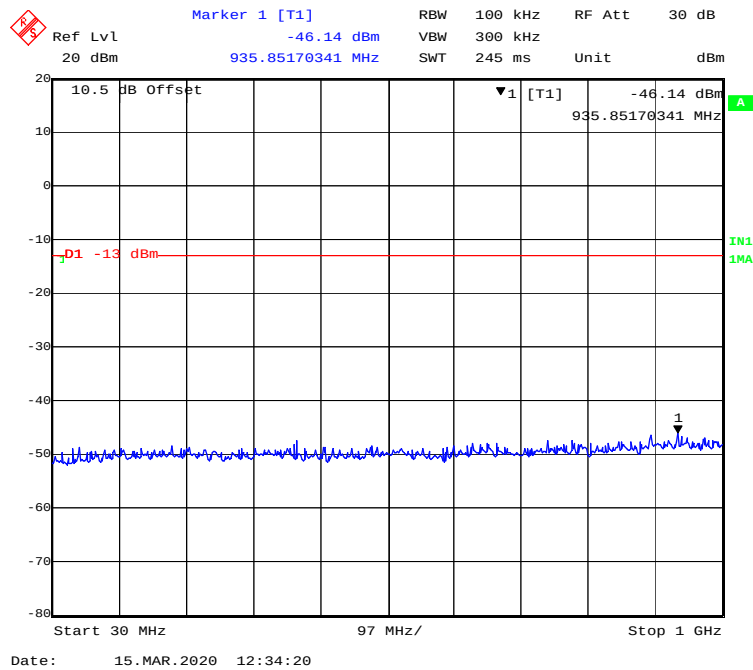
30 MHz - 1 GHz (15 MHz, QPSK, Middle Channel)



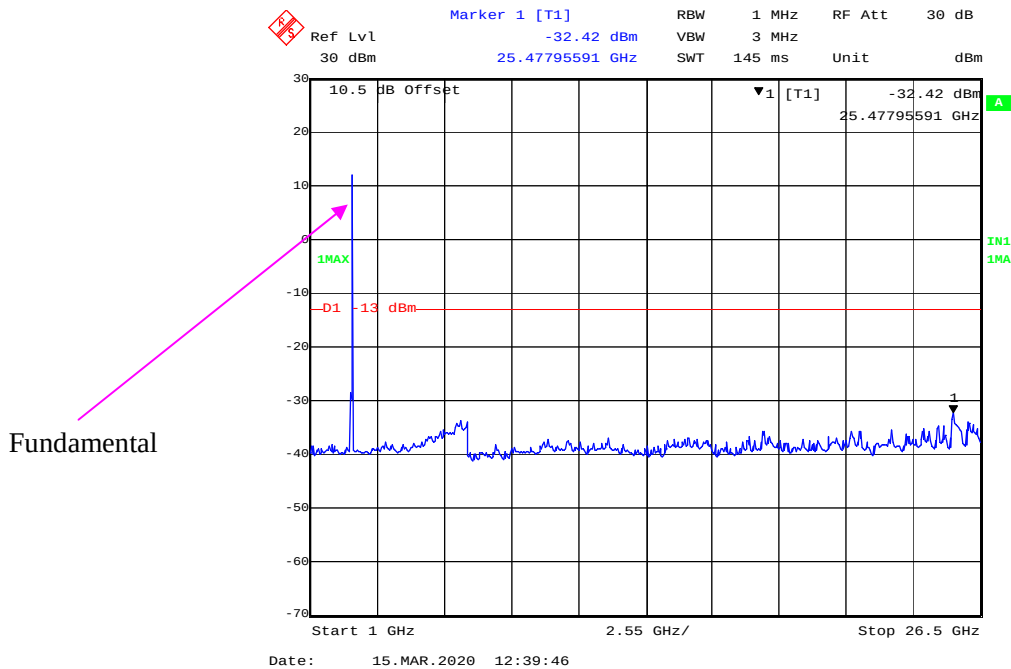
1 GHz – 26 GHz (15MHz, QPSK, Middle Channel)



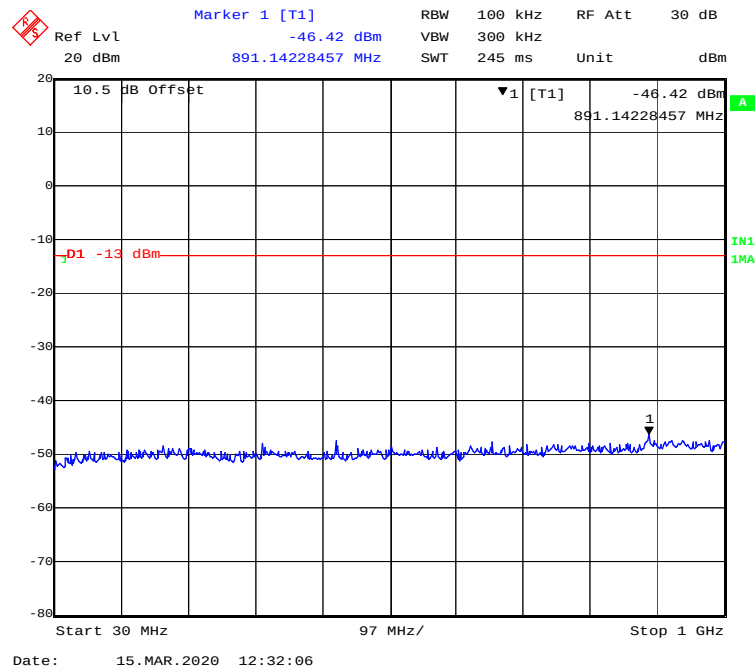
30 MHz - 1 GHz (20 MHz, QPSK, Middle Channel)



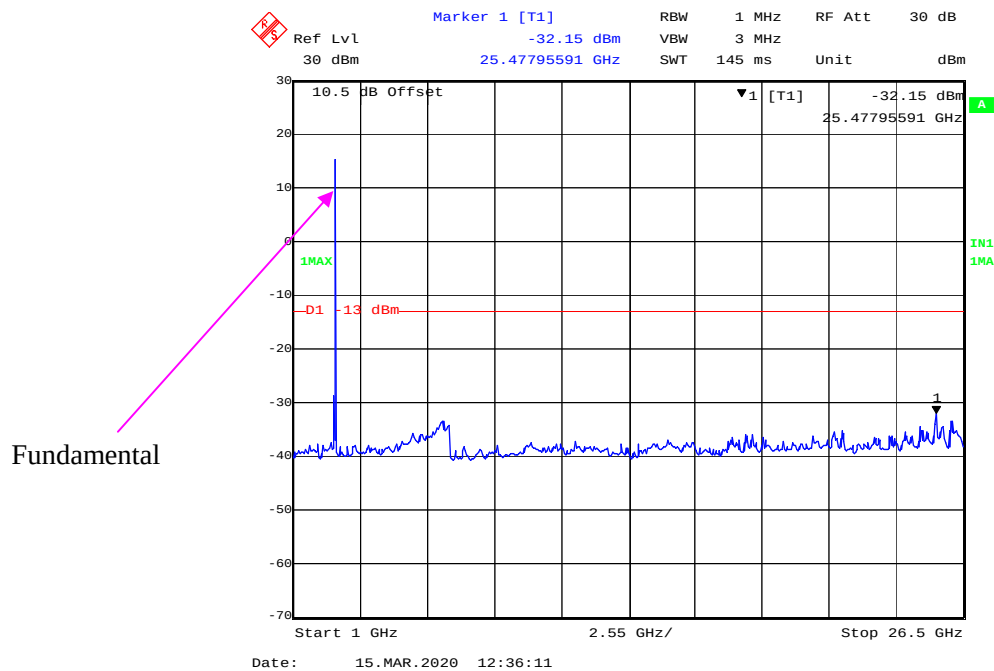
1 GHz – 26 GHz (20 MHz, QPSK, Middle Channel)



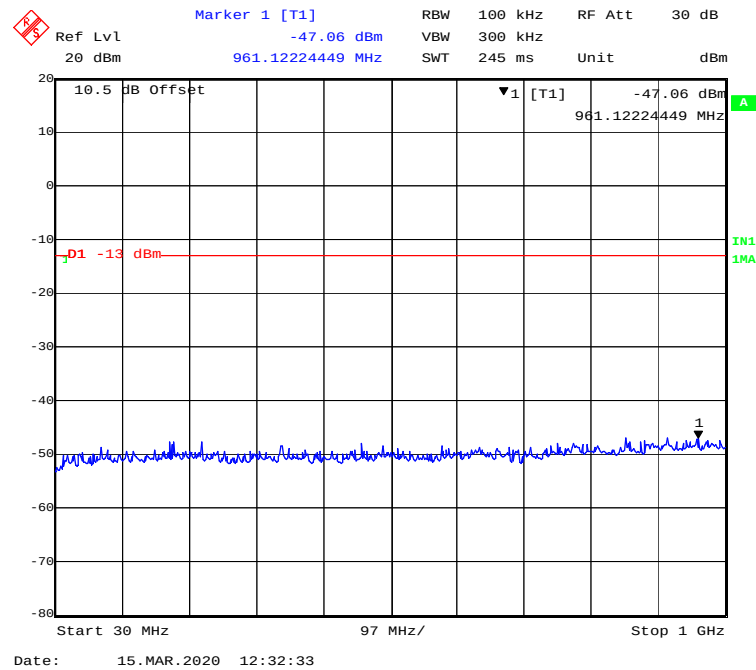
30 MHz - 1 GHz (5 MHz, 16-QAM, Middle Channel)



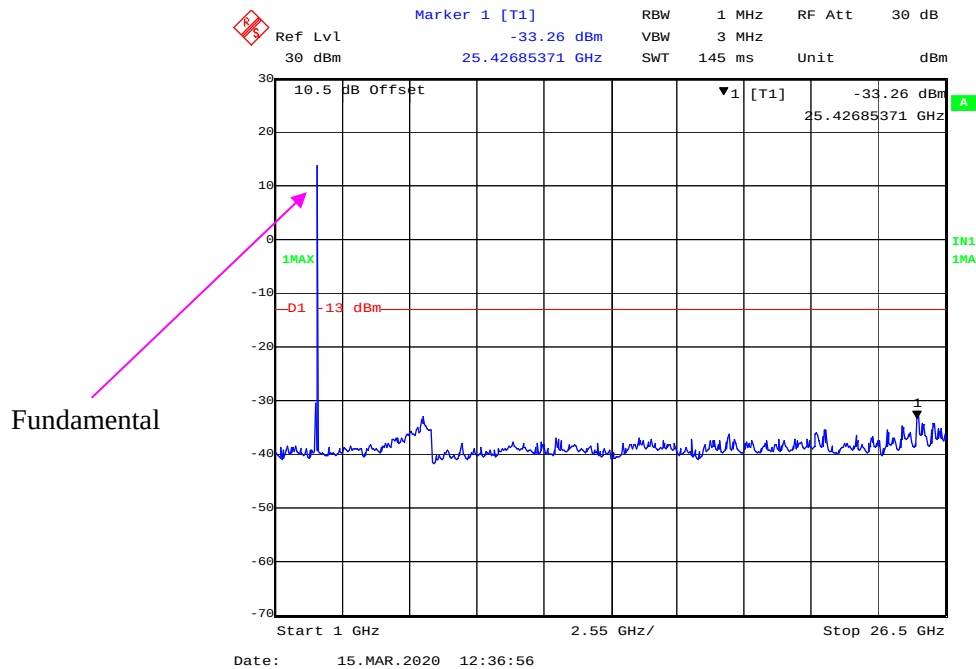
1 GHz – 26 GHz (5 MHz, 16-QAM, Middle Channel)



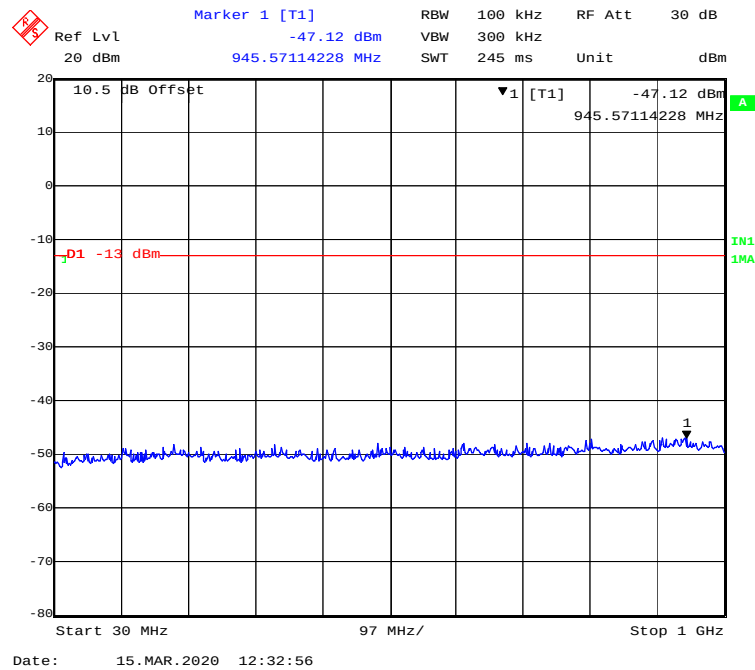
30 MHz - 1 GHz (10 MHz, 16-QAM, Middle Channel)



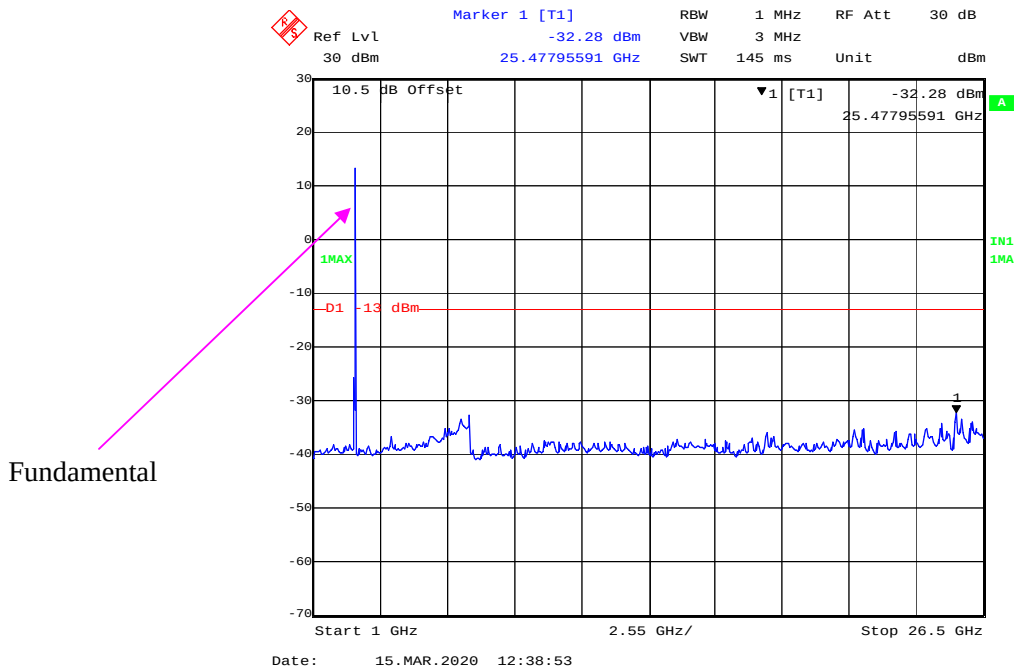
1 GHz -26 GHz (10 MHz, 16-QAM, Middle Channel)



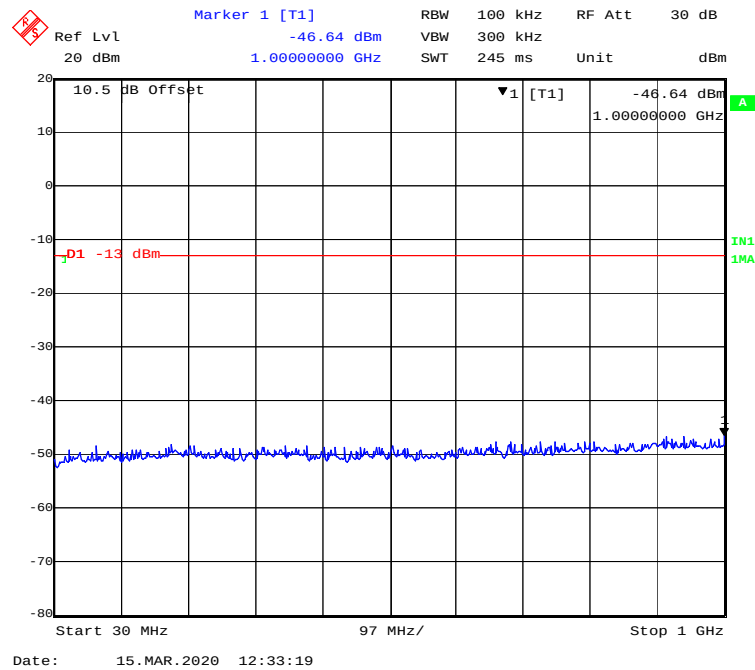
30 MHz - 1 GHz (15 MHz, 16-QAM, Middle Channel)



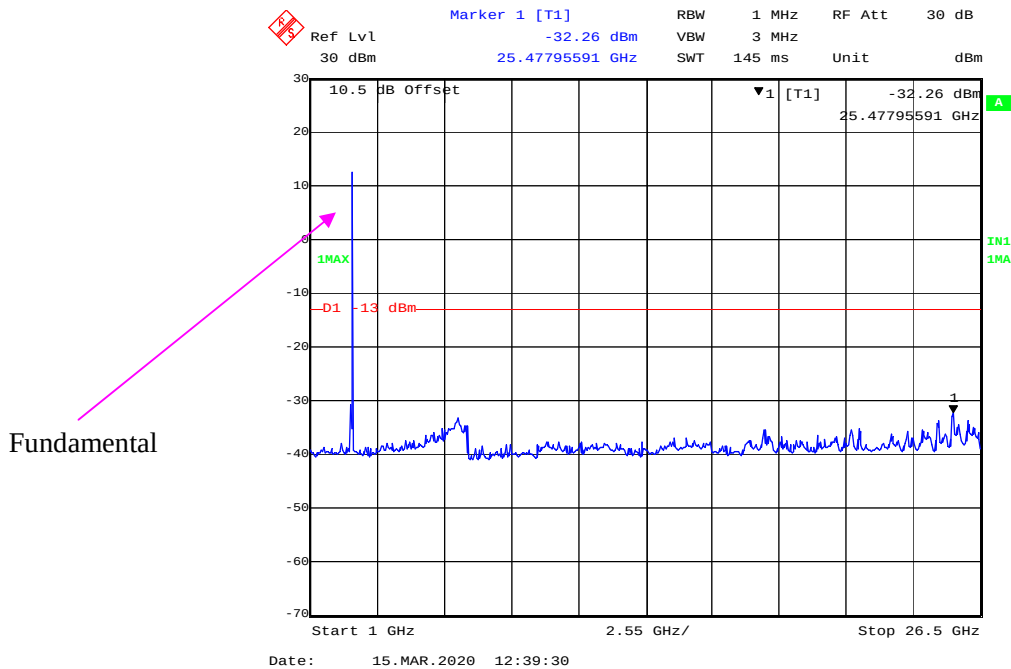
1 GHz – 26 GHz (15MHz, 16-QAM, Middle Channel)



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



1 GHz – 26 GHz (20 MHz, 16-QAM, Middle Channel)



FCC § 2.1053; § 22.917 (a); § 24.238 (a) & §27.53 (m) - SPURIOUS RADIATED EMISSIONS

Applicable Standards

FCC § 2.1053, §22.917(a) ,§ 24.238(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.

24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

§ 27.53(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 = $10 \lg (\text{TX pwr in Watts}/0.001)$ – the absolute level

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

Test Data**Environmental Conditions**

Temperature:	23.2℃
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Sam Ye on 2020-03-15.

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										
160.21	45.60	10	163	H	-58.57	0.38	-6.17	-65.12	-13	52.12
160.21	51.42	292	211	V	-49.71	0.38	-6.17	-56.26	-13	43.26
1673.20	63.13	177	202	H	-47.82	0.84	8.48	-40.18	-13	27.18
1673.20	68.44	270	205	V	-42.76	0.84	8.48	-35.12	-13	22.12
2509.80	48.14	286	214	H	-60.48	0.89	10.09	-51.28	-13	38.28
2509.80	54.97	205	163	V	-53.72	0.89	10.09	-44.52	-13	31.52

30 MHz ~ 20 GHz:**PCS 1900 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)			
GPRS Mode, Middle channel										
160.21	45.36	347	212	H	-58.81	0.38	-6.17	-65.36	-13	52.36
160.21	51.54	288	223	V	-49.59	0.38	-6.17	-56.14	-13	43.14
3760.00	44.54	139	184	H	-59.15	0.95	9.74	-50.36	-13	37.36
3760.00	47.76	97	202	V	-56.25	0.95	9.74	-47.46	-13	34.46
5640.00	41.41	358	123	H	-59.10	1.15	10.47	-49.78	-13	36.78
5640.00	43.37	44	254	V	-57.44	1.15	10.47	-48.12	-13	35.12

Note:

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

Test mode: Transmitting (Pre-scan with all the bandwidth, and worse case 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 1.4MHz Bandwidth Middle Channel										
160.21	45.47	34	173	H	-58.70	0.38	-6.17	-65.25	-13	52.25
160.21	52.54	323	151	V	-48.59	0.38	-6.17	-55.14	-13	42.14
1673.00	52.53	261	162	H	-58.42	0.84	8.48	-50.78	-13	37.78
1673.00	54.37	130	174	V	-56.83	0.84	8.48	-49.19	-13	36.19
2509.50	47.95	231	165	H	-60.67	0.89	10.09	-51.47	-13	38.47
2509.50	48.84	57	174	V	-59.85	0.89	10.09	-50.65	-13	37.65
16-QAM 1.4MHz Bandwidth Middle Channel										
160.21	44.55	243	174	H	-59.62	0.38	-6.17	-66.17	-13	53.17
160.21	51.50	193	162	V	-49.63	0.38	-6.17	-56.18	-13	43.18
1673.00	52.82	291	155	H	-58.13	0.84	8.48	-50.49	-13	37.49
1673.00	56.00	327	144	V	-55.20	0.84	8.48	-47.56	-13	34.56
2509.50	47.06	72	164	H	-61.56	0.89	10.09	-52.36	-13	39.36
2509.50	47.33	79	174	V	-61.36	0.89	10.09	-52.16	-13	39.16

LTE Band 41 (30 MHz ~ 26 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										
160.21	45.54	327	212	H	-58.63	0.38	-6.17	-65.18	-25	40.18
160.21	52.20	163	177	V	-48.93	0.38	-6.17	-55.48	-25	30.48
5186.00	43.14	289	153	H	-58.93	1.10	10.30	-49.73	-25	24.73
5186.00	44.82	38	154	V	-57.46	1.10	10.30	-48.26	-25	23.26
7779.00	35.06	254	213	H	-60.38	1.82	10.04	-52.16	-25	27.16
7779.00	41.63	263	203	V	-53.91	1.82	10.04	-45.69	-25	20.69
16-QAM 5MHz Bandwidth Middle Channel										
160.21	45.55	74	144	H	-58.62	0.38	-6.17	-65.17	-25	40.17
160.21	52.52	141	184	V	-48.61	0.38	-6.17	-55.16	-25	30.16
5186.00	42.18	133	152	H	-59.89	1.10	10.30	-50.69	-25	25.69
5186.00	42.60	134	174	V	-59.68	1.10	10.30	-50.48	-25	25.48
7779.00	41.59	349	155	H	-53.85	1.82	10.04	-45.63	-25	20.63
7779.00	41.16	345	163	V	-54.38	1.82	10.04	-46.16	-25	21.16

Note:

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

FCC § 22.917 (a); § 24.238 (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 §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

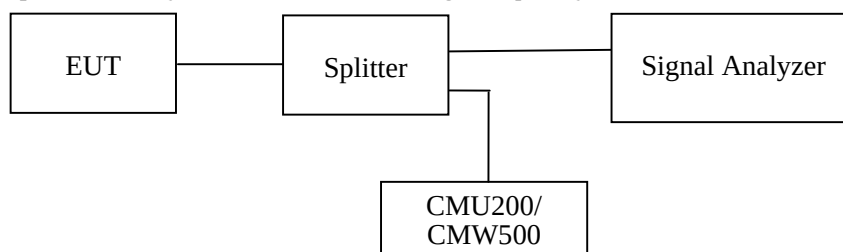
For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB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

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

Test Procedure

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

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



Test Data

Environmental Conditions

Temperature:	23.2-23.5 °C
Relative Humidity:	51-23 %
ATM Pressure:	101.1-103.3 kPa

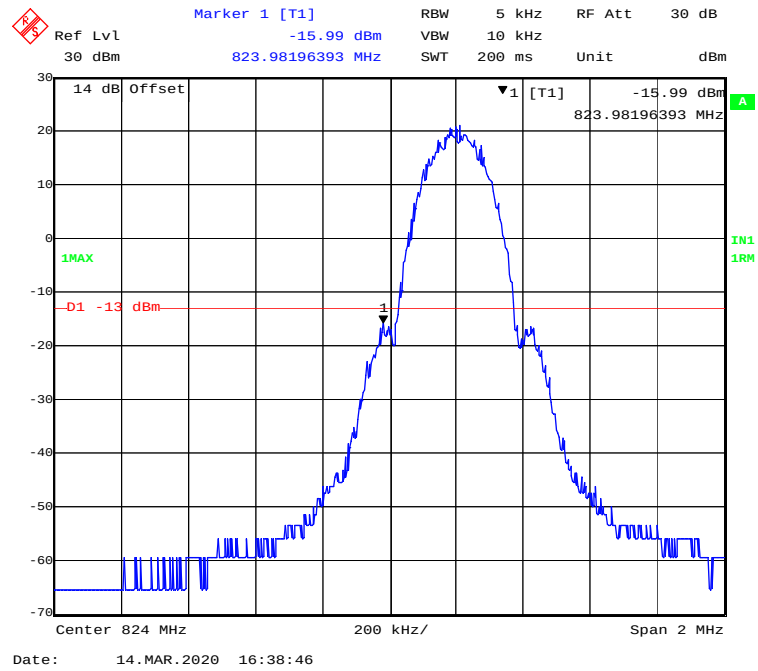
The testing was performed by Sam Ye from 2020-03-14 to 2020-03-15.

EUT operation mode: Transmitting

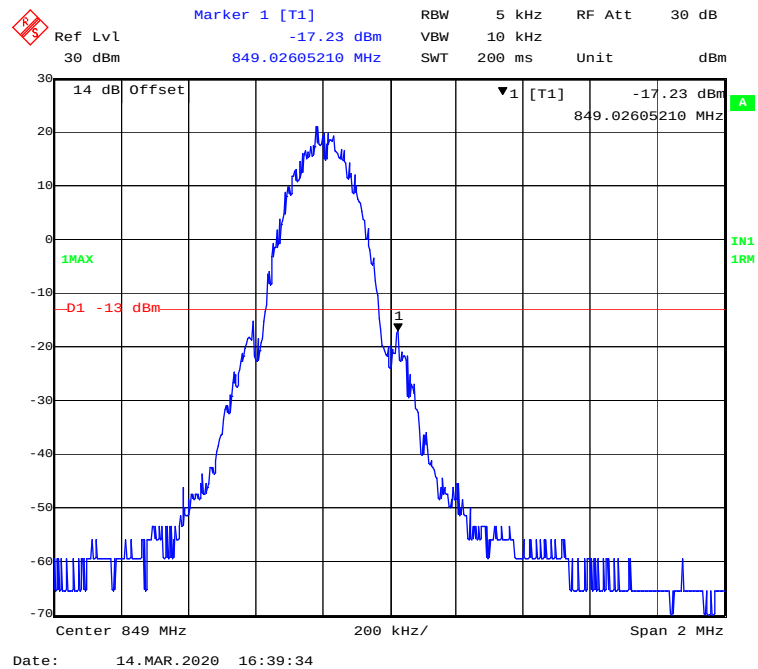
Test Result: Compliant

GSM 850 Band:

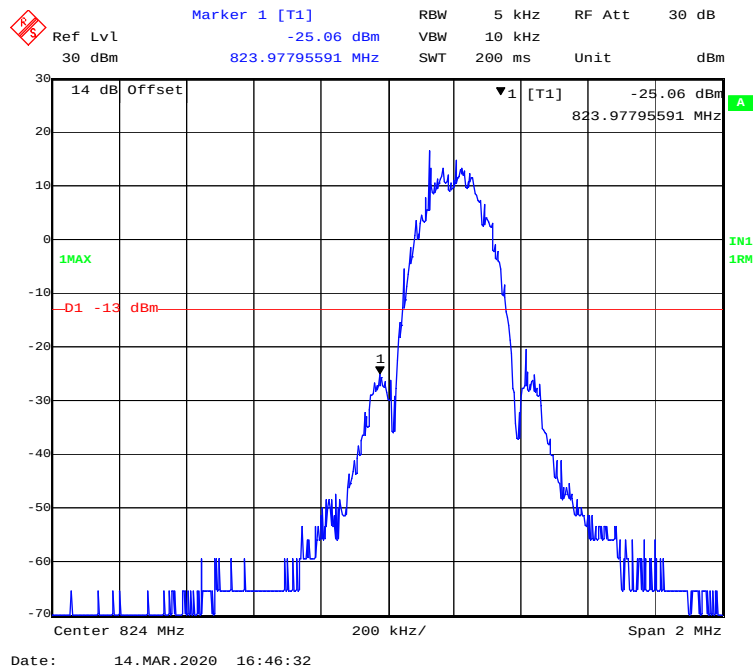
GPRS Mode, Left Band Edge



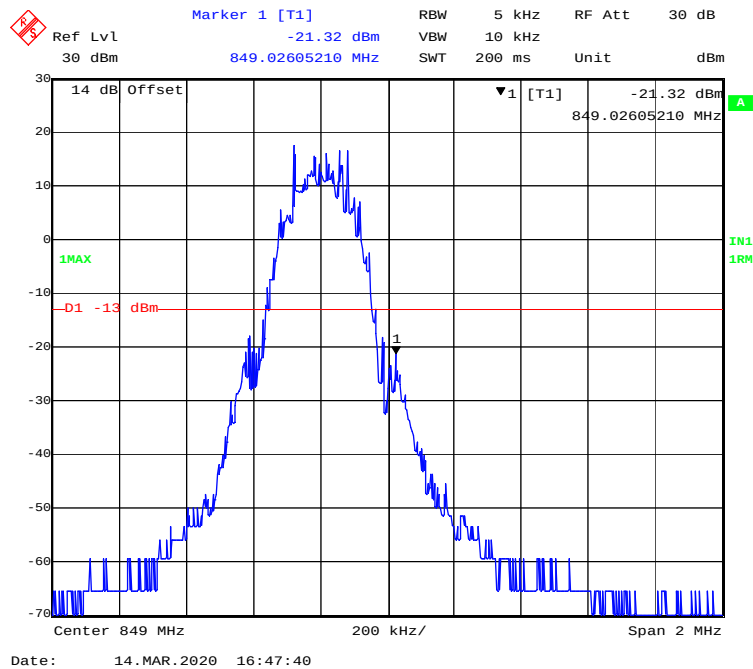
GPRS Mode, Right Band Edge



EGPRS Mode, Left Band Edge

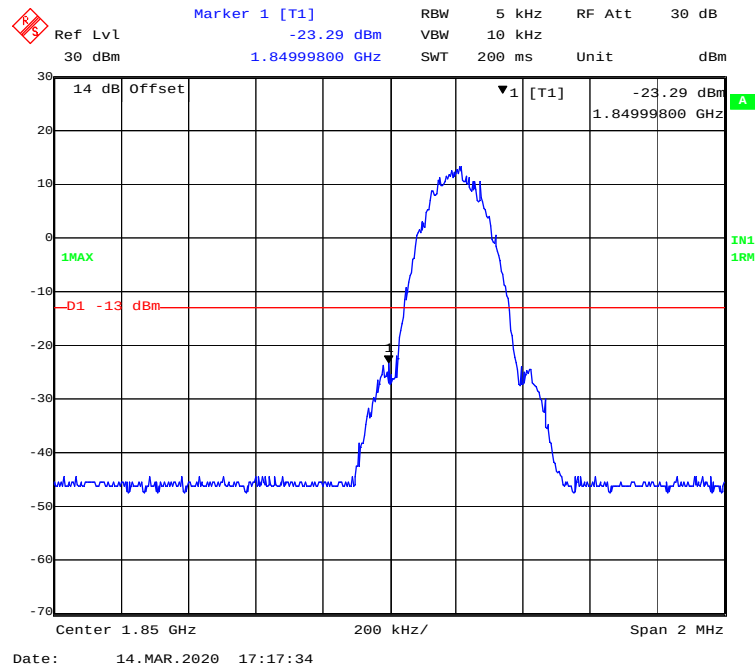


EGPRS Mode, Right Band Edge

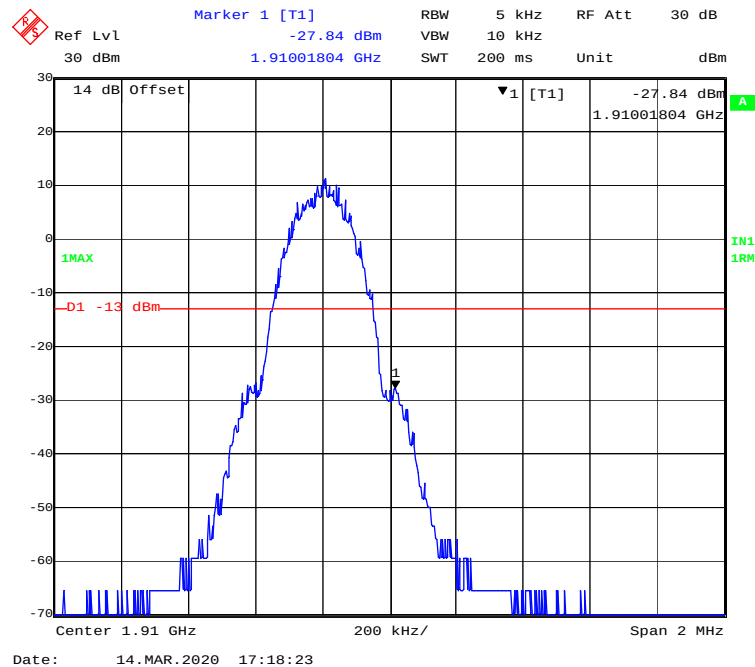


PCS 1900 Band:

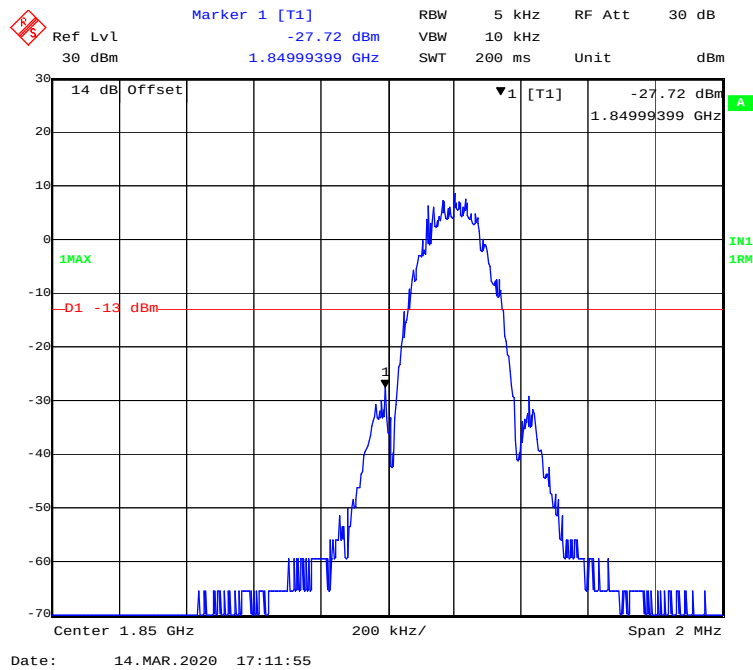
GPRS Mode, Left Band Edge



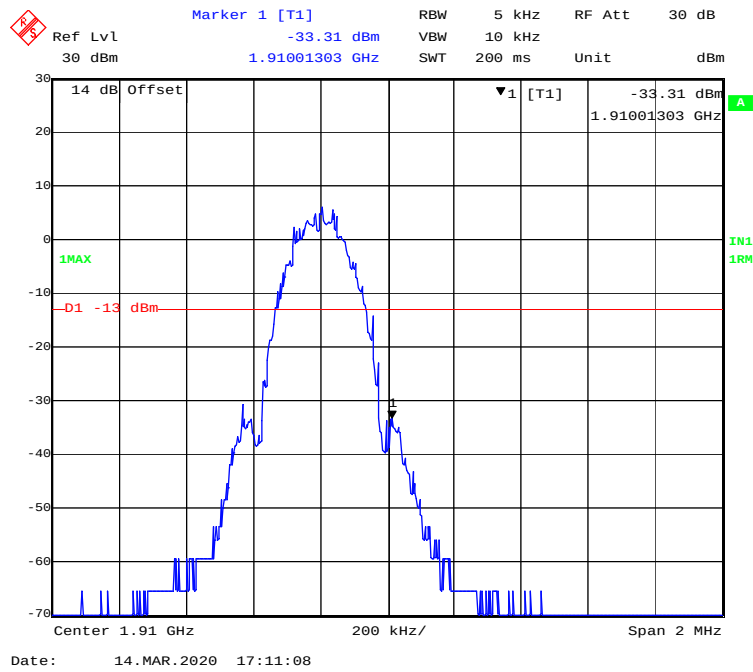
GPRS Mode, Right Band Edge

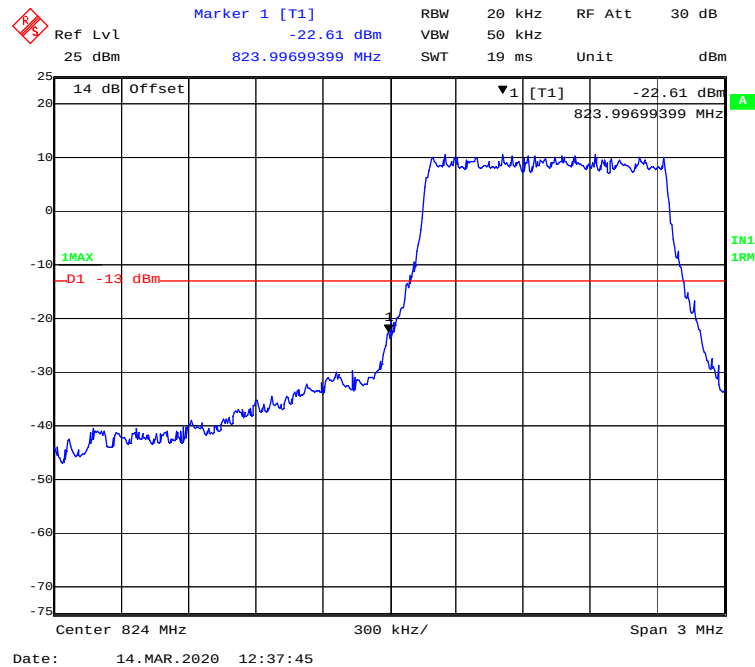
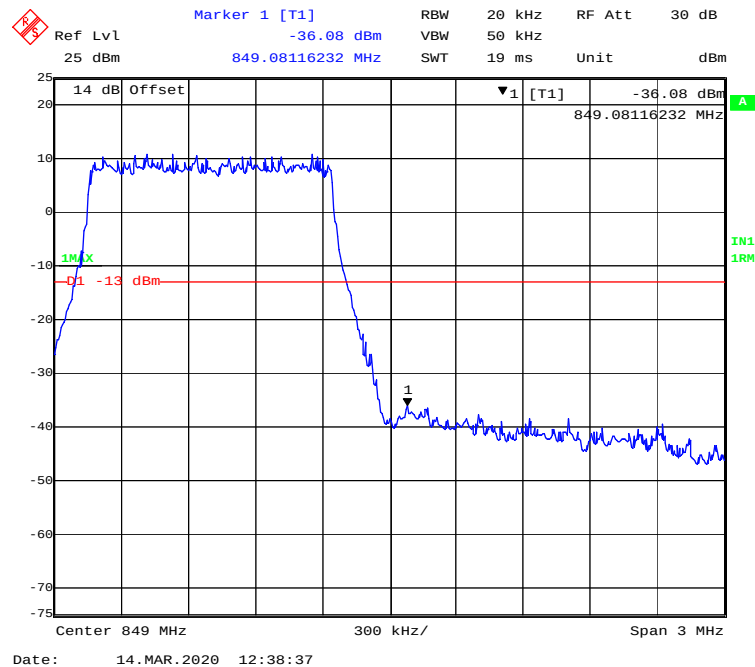


EGPRS Mode, Left Band Edge

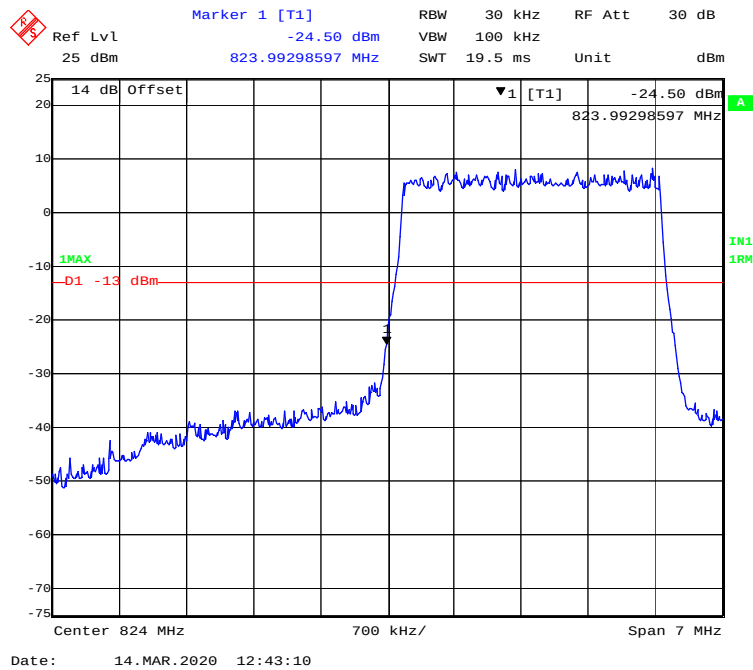


EGPRS Mode, Right Band Edge

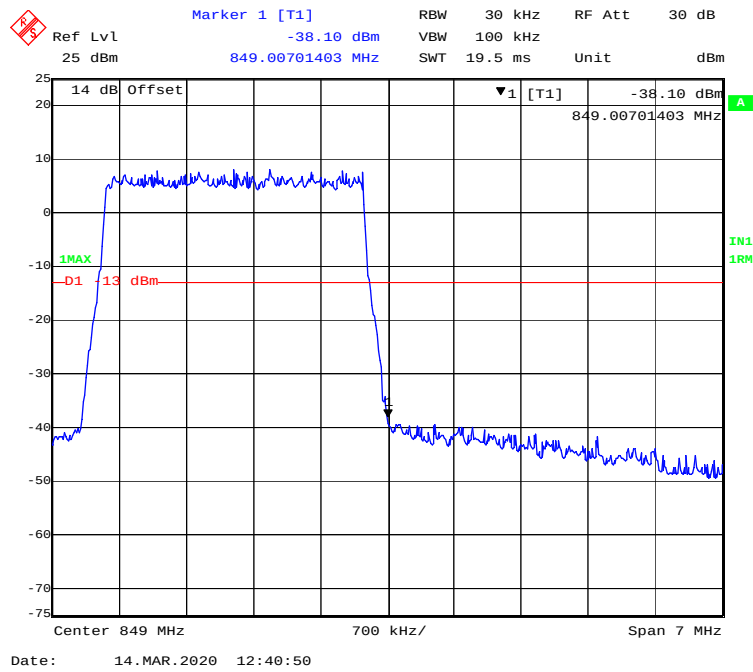


LTE Band 5:**QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

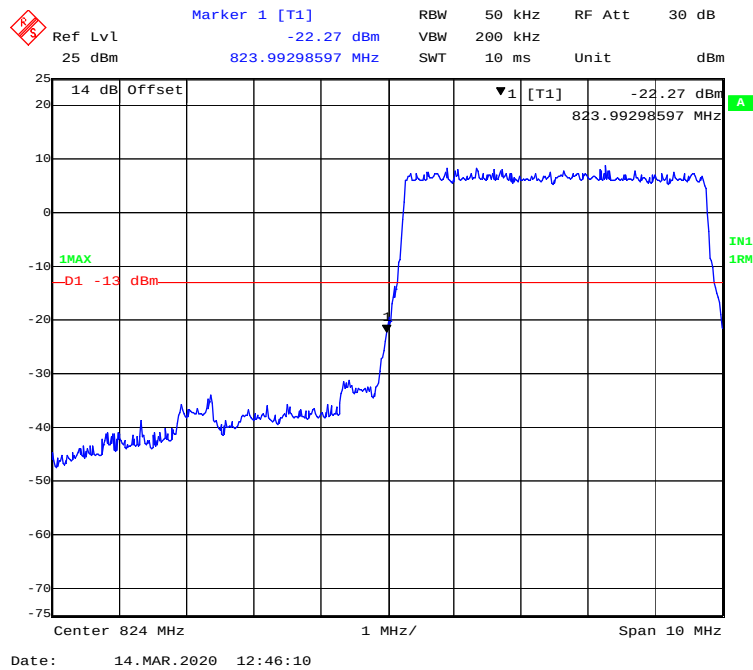
QPSK (3.0 MHz, FULL RB) - Left Band Edge



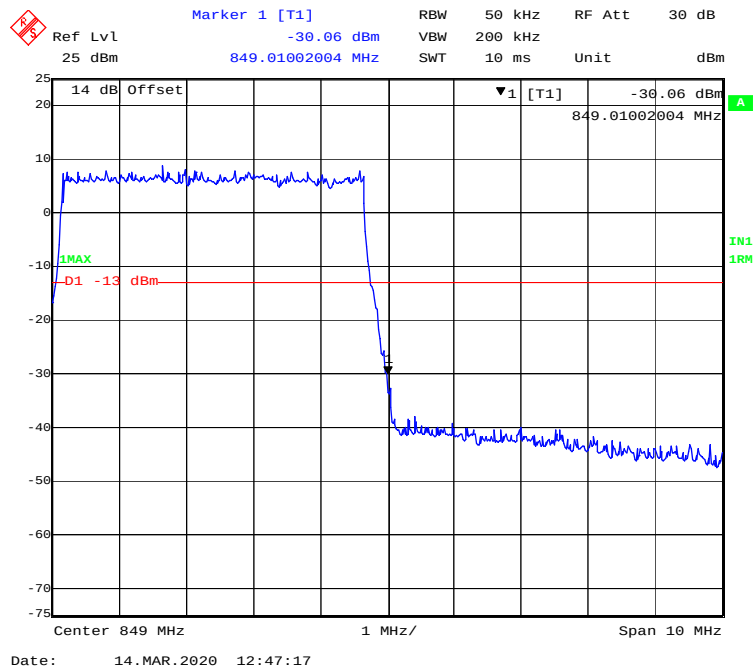
QPSK (3.0 MHz, FULL RB) - Right Band Edge



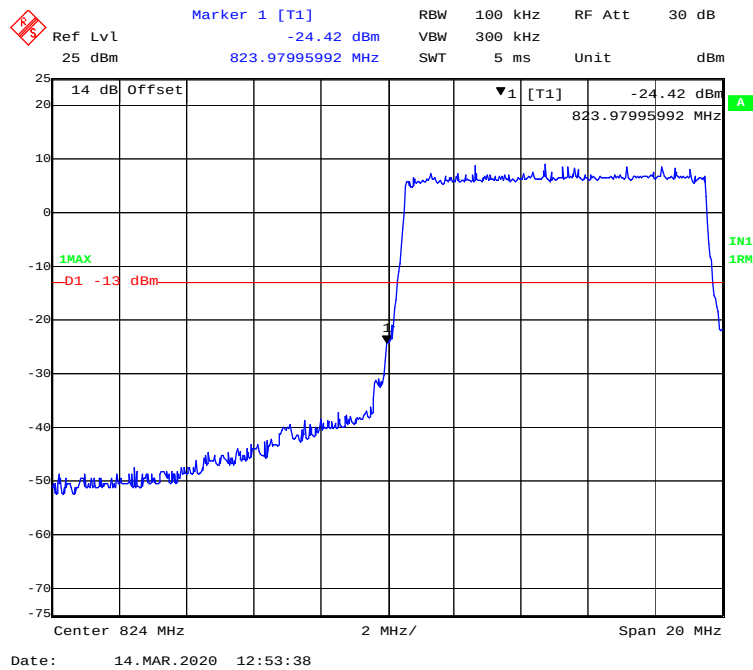
QPSK (5.0 MHz, FULL RB) - Left Band Edge



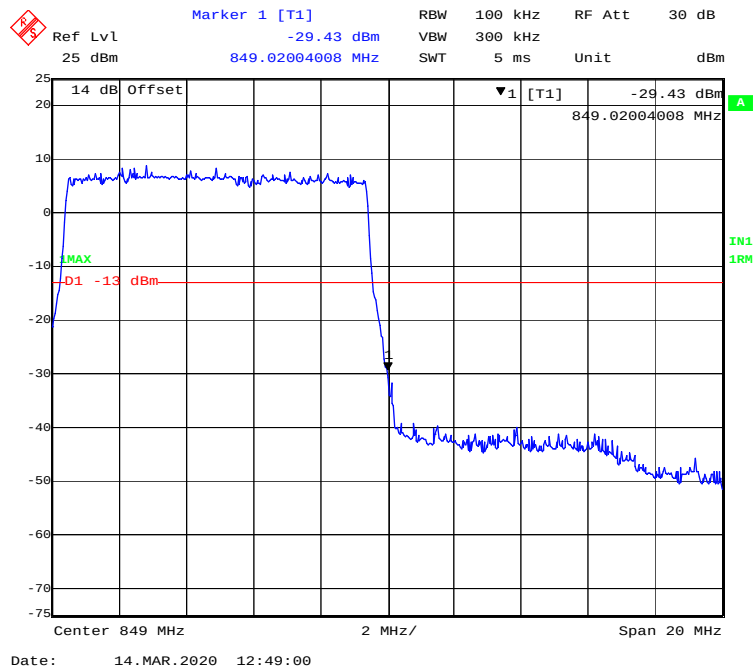
QPSK (5.0 MHz, FULL RB) - Right Band Edge



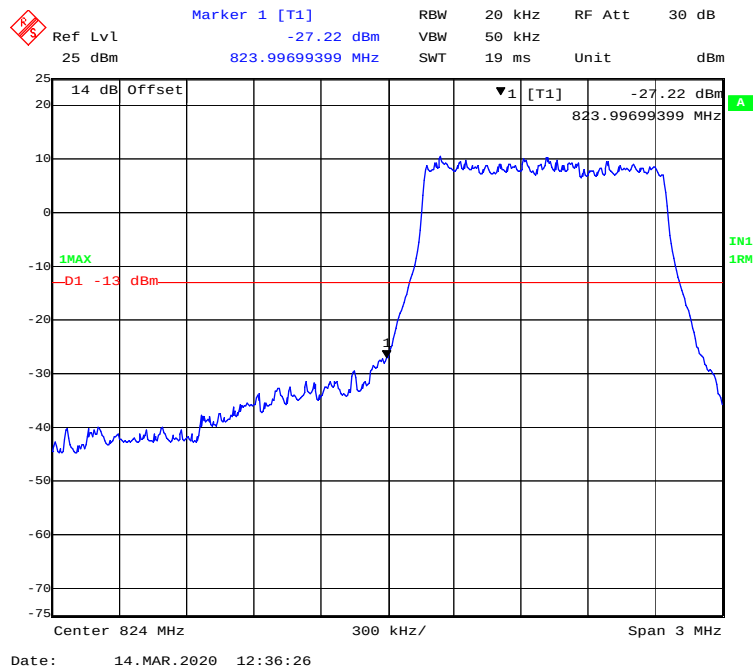
QPSK (10.0 MHz, FULL RB) - Left Band Edge



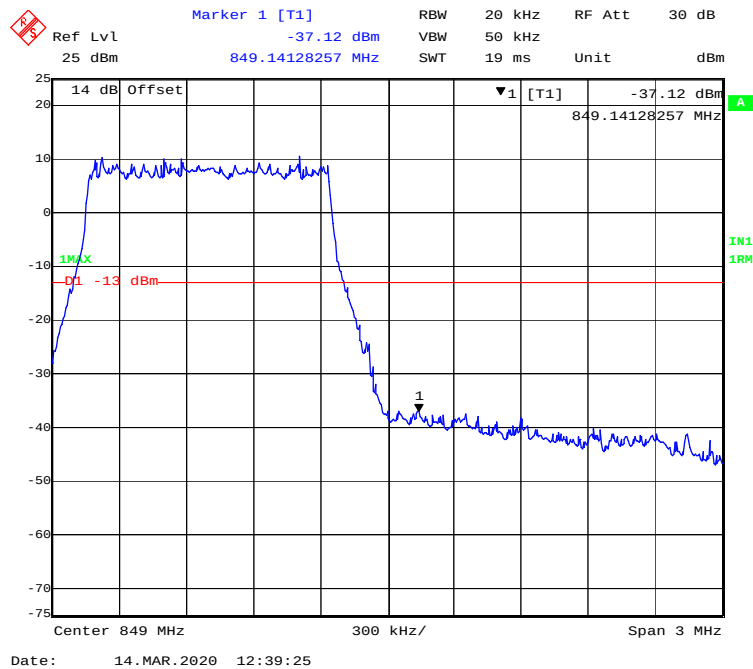
QPSK (10.0 MHz, FULL RB) - Right Band Edge



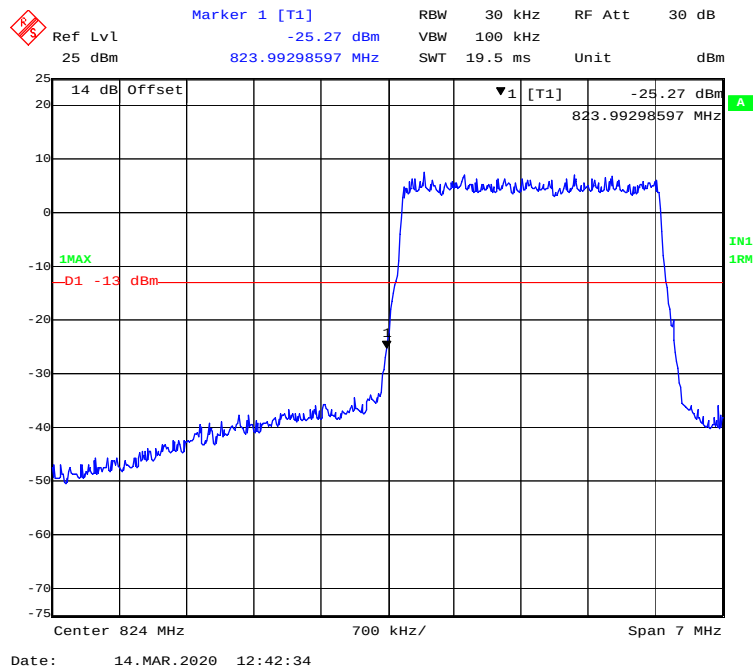
16-QAM (1.4 MHz, FULL RB) - Left Band Edge



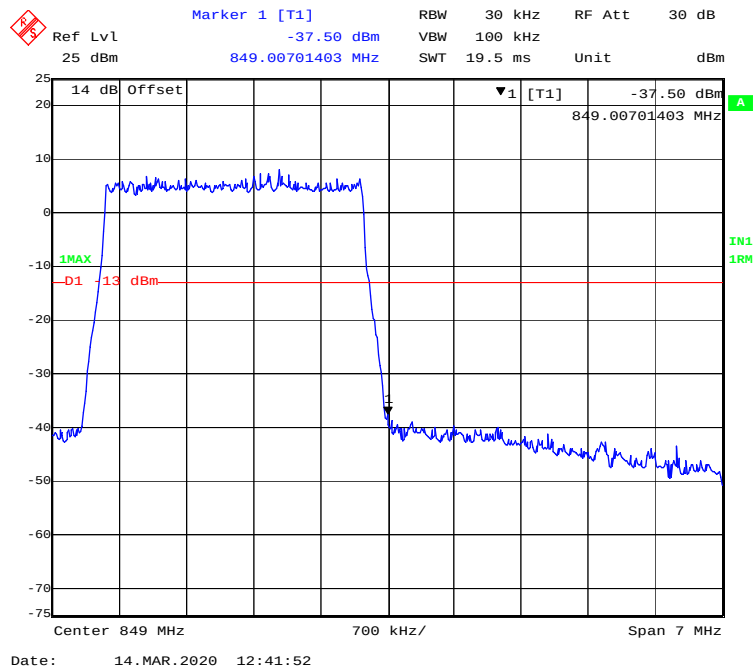
16-QAM (1.4 MHz, FULL RB) - Right Band Edge



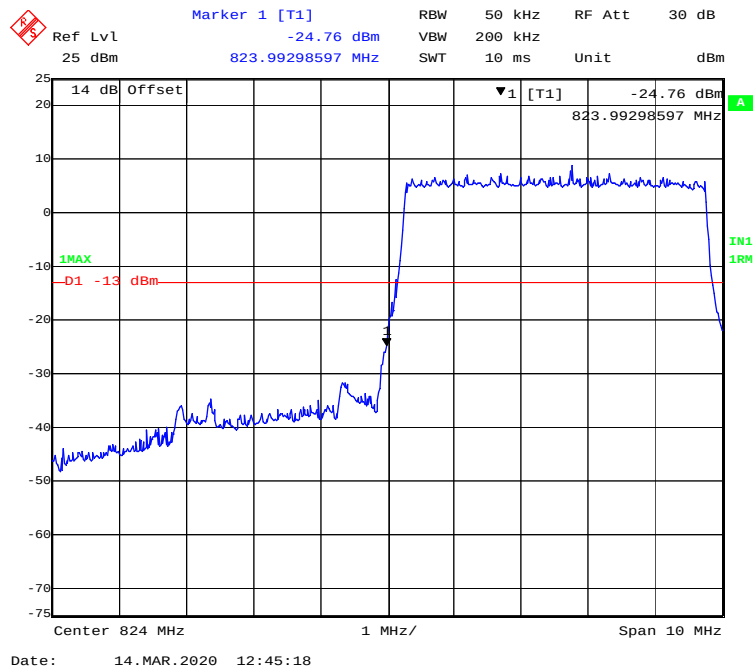
16-QAM (3.0 MHz, FULL RB) - Left Band Edge



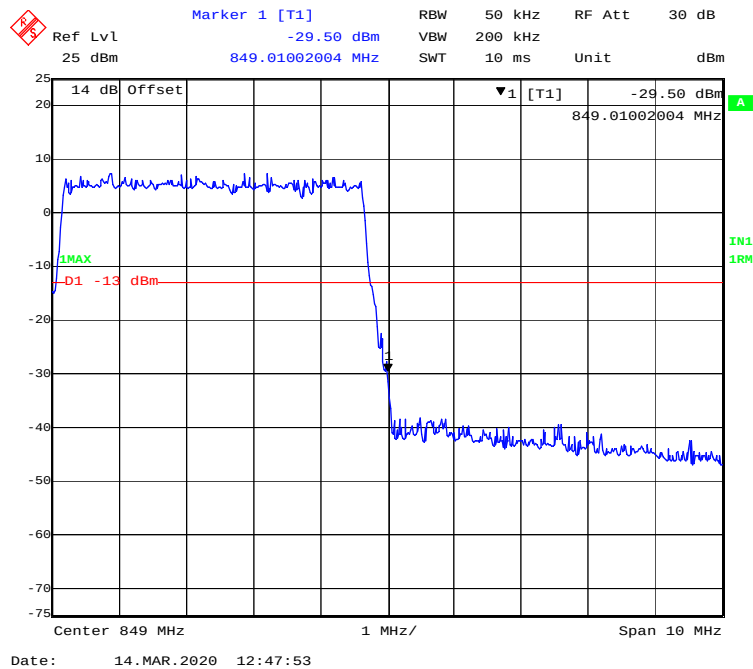
16-QAM (3.0 MHz, FULL RB) - Right Band Edge



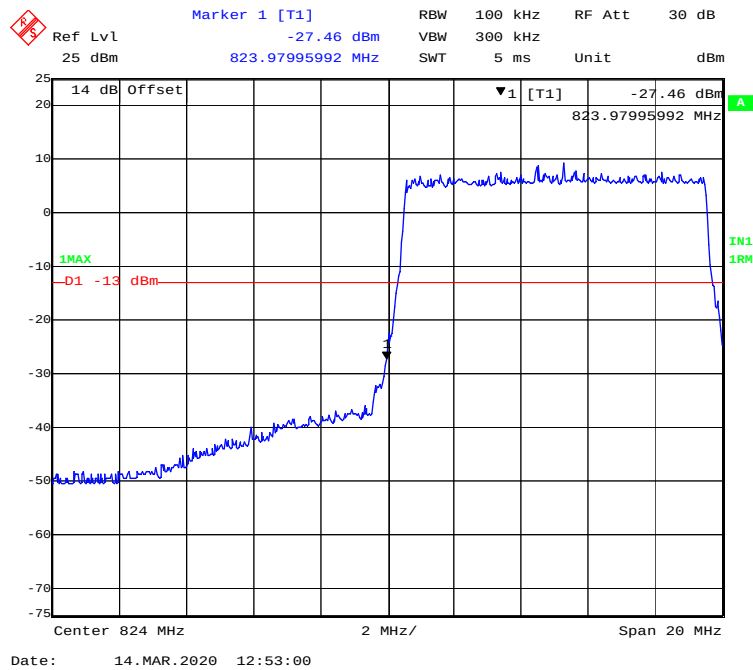
16-QAM (5.0 MHz, FULL RB) - Left Band Edge



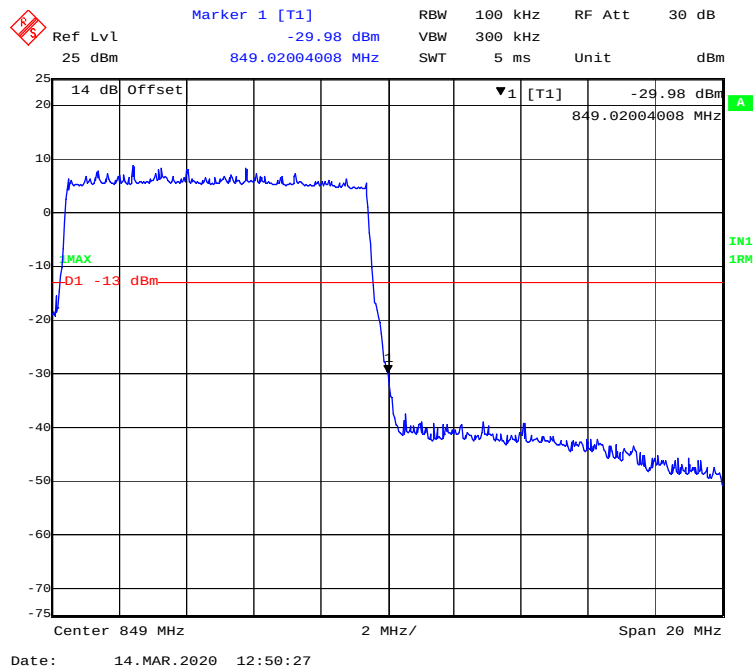
16-QAM (5.0 MHz, FULL RB) - Right Band Edge



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

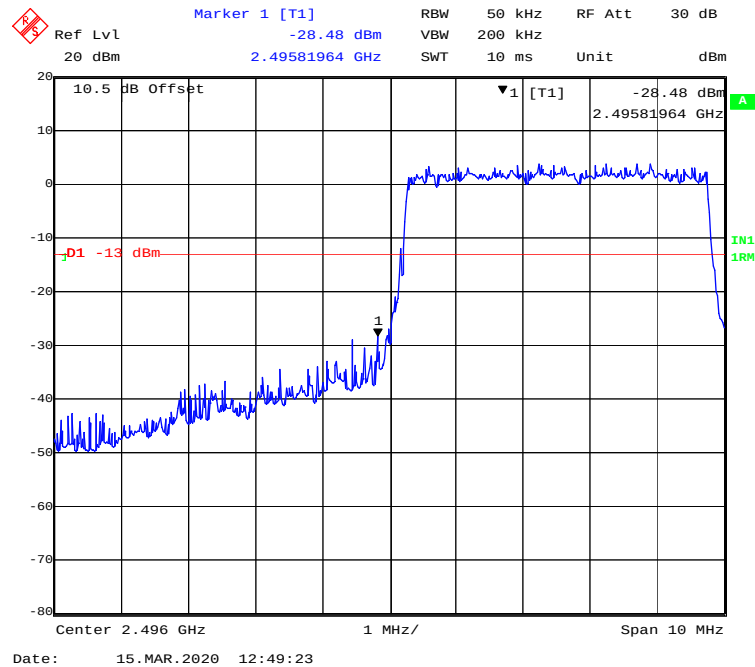


16-QAM (10.0 MHz, FULL RB) - Right Band Edge

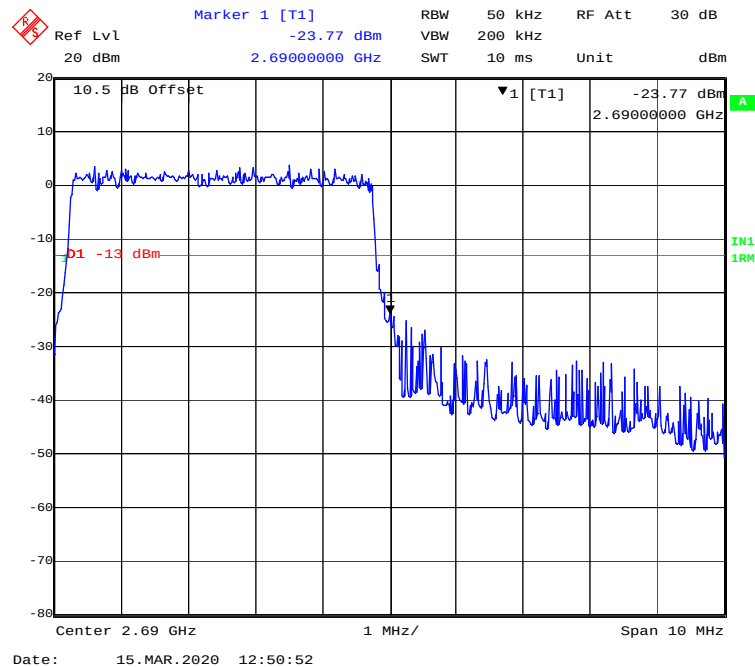


LTE Band 41:

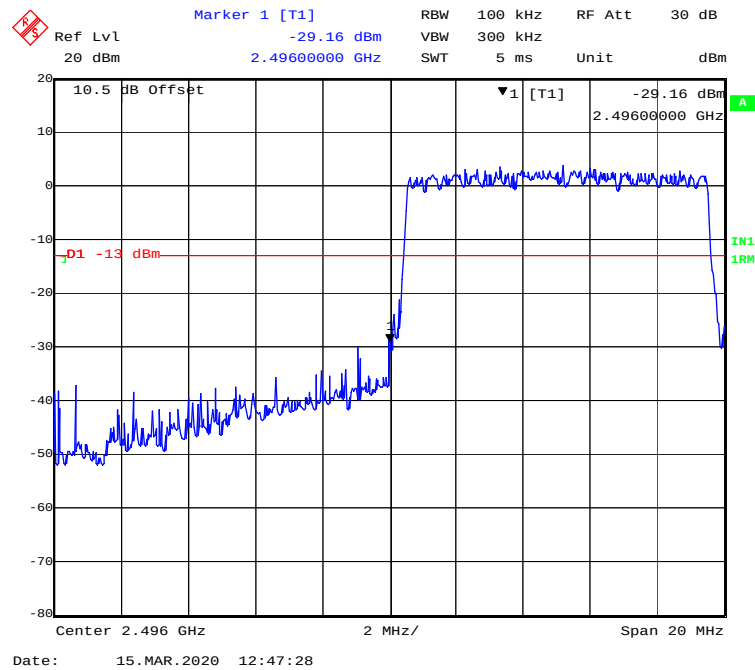
QPSK (5 MHz, FULL RB) - Left Band Edge



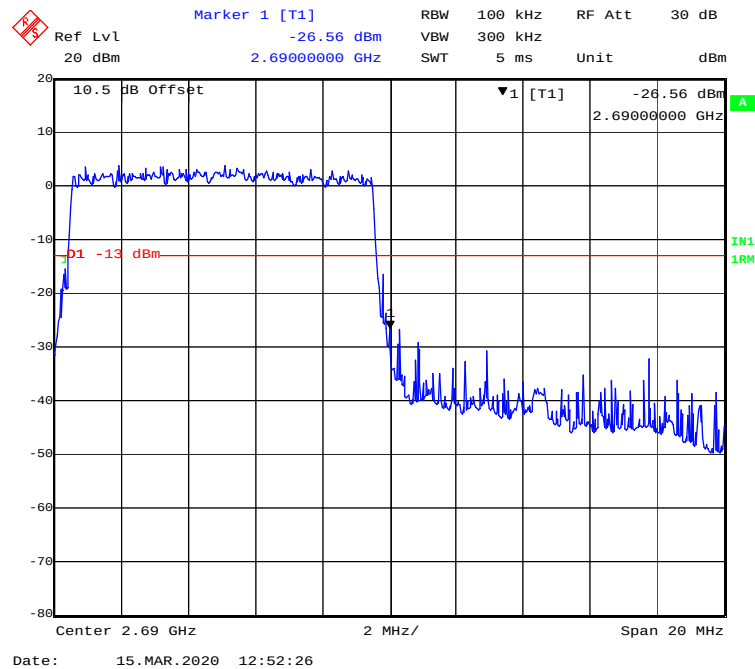
QPSK (5 MHz, FULL RB) - Right Band Edge



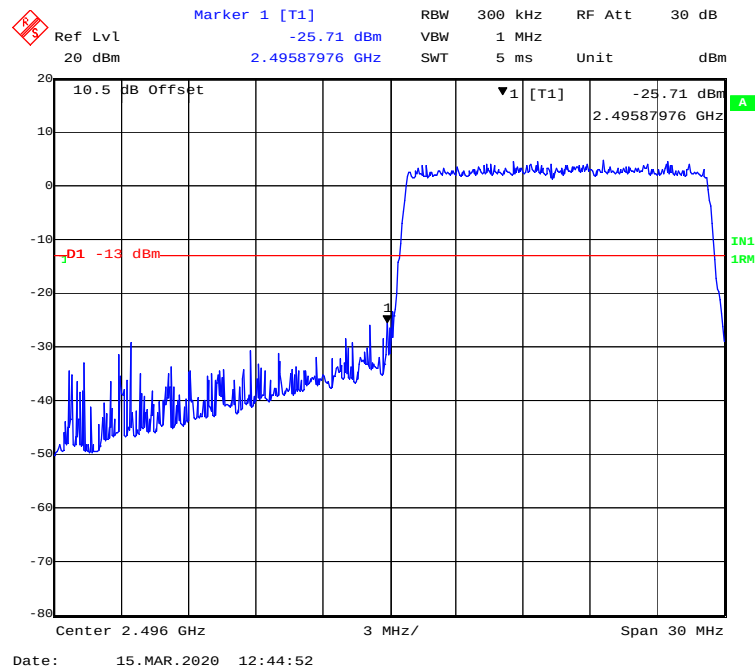
QPSK (10 MHz, FULL RB) - Left Band Edge



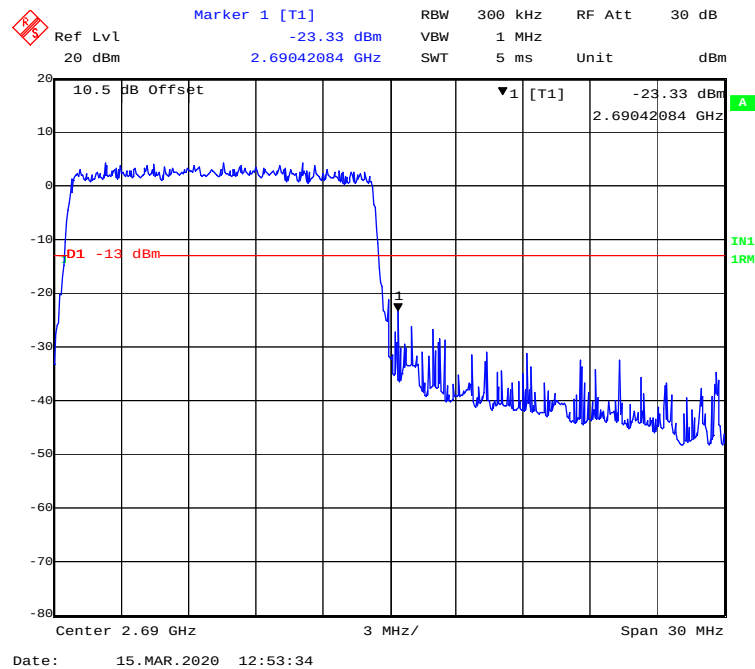
QPSK (10 MHz, FULL RB) - Right Band Edge



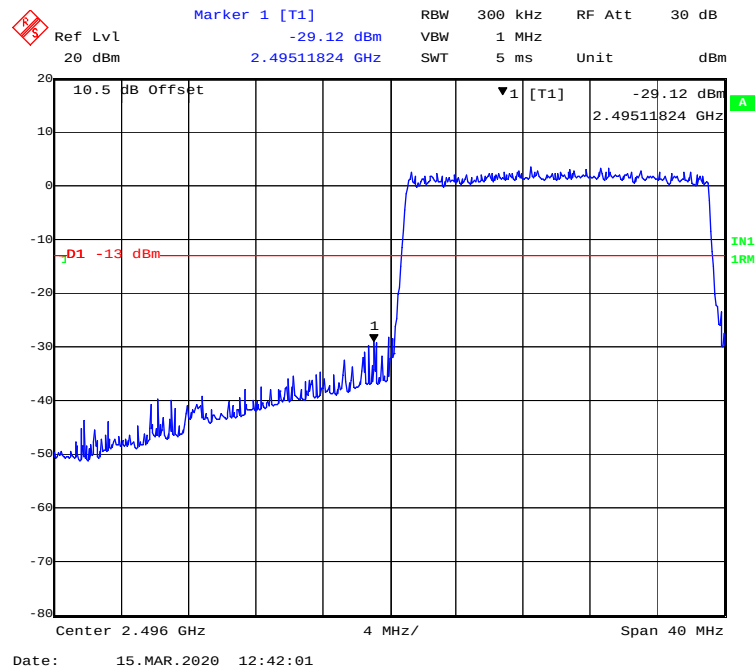
QPSK (15MHz, FULL RB) - Left Band Edge



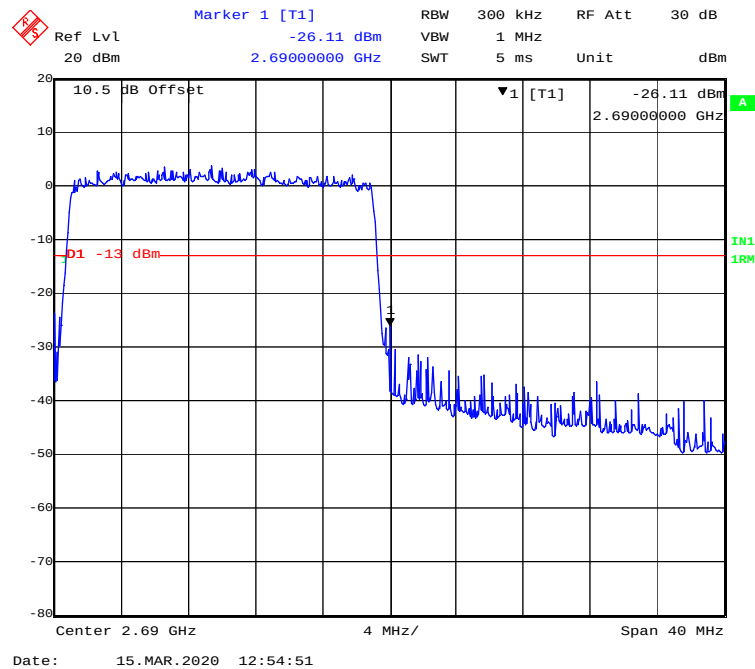
QPSK (15 MHz, FULL RB) - Right Band Edge



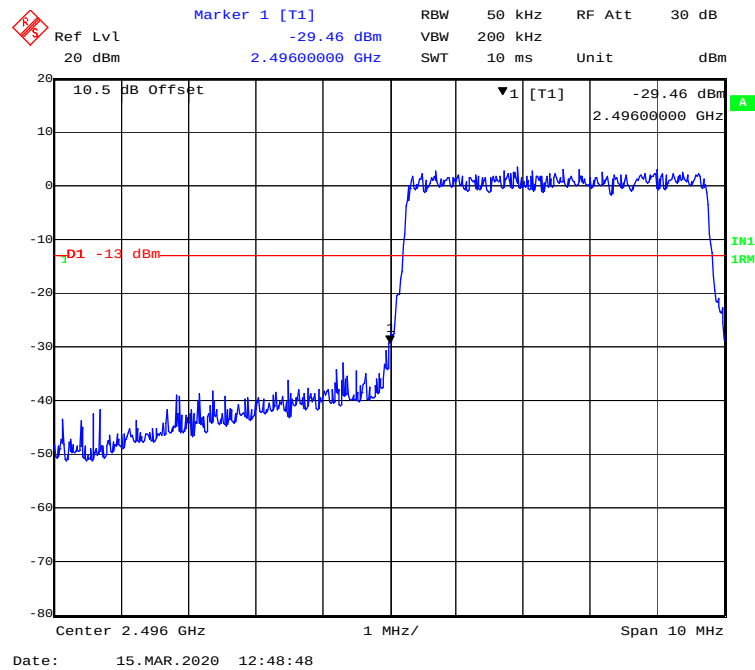
QPSK (20MHz, FULL RB) - Left Band Edge



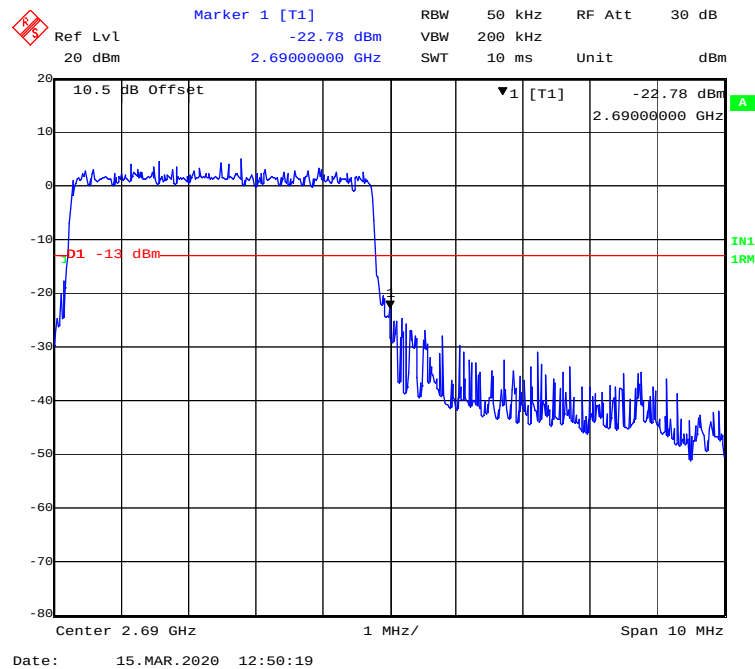
QPSK (20 MHz, FULL RB) - Right Band Edge



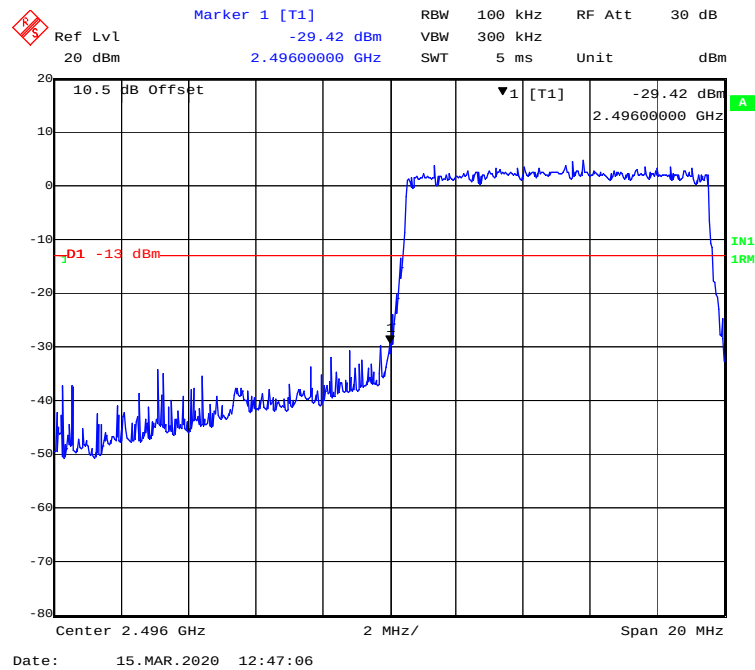
16-QAM (5MHz, FULL RB) - Left Band Edge



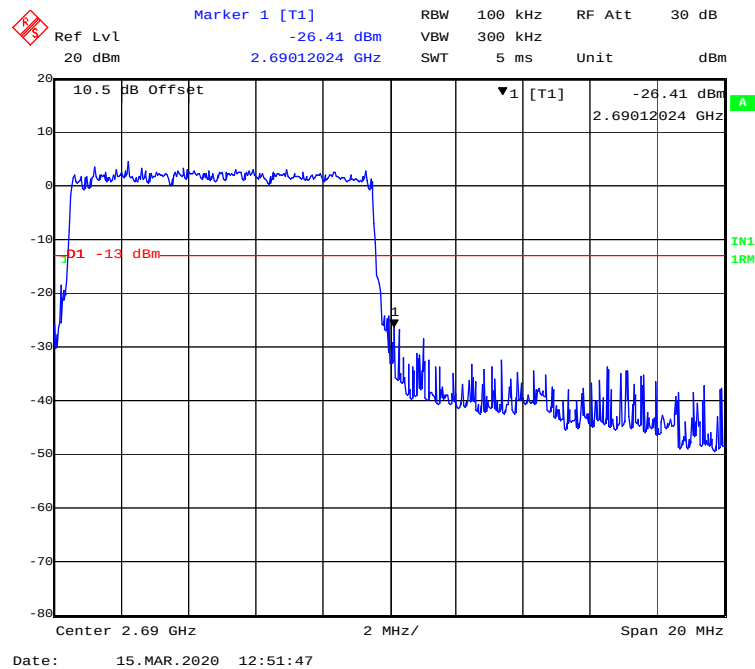
16-QAM (5MHz, FULL RB) - Right Band Edge



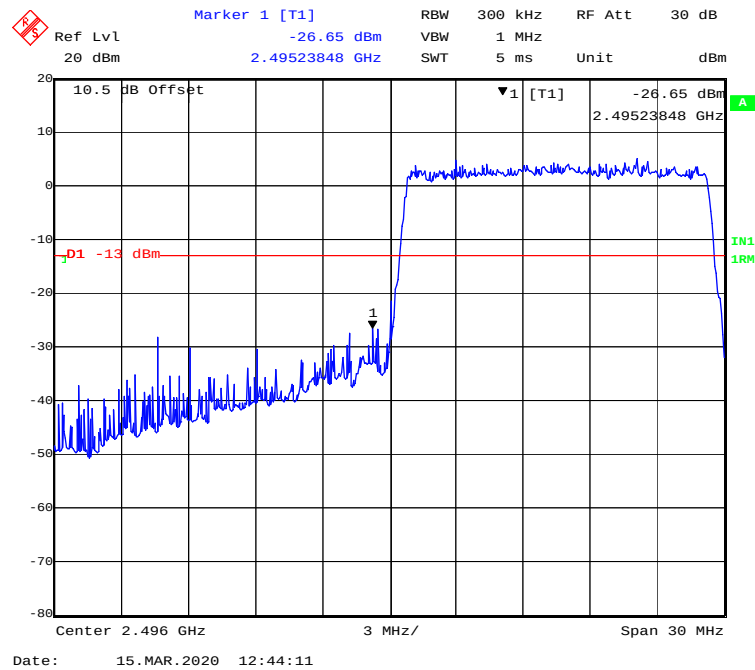
16-QAM (10 MHz, FULL RB) - Left Band Edge



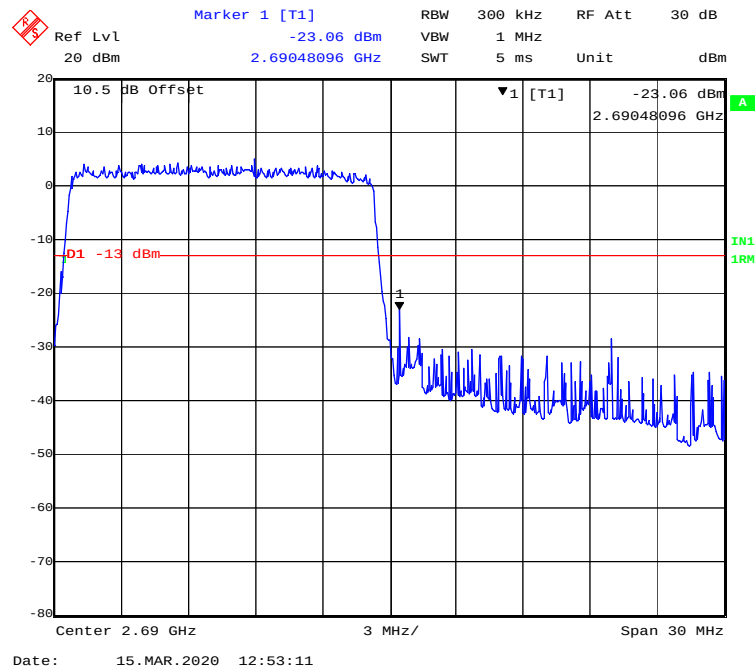
16-QAM (10 MHz, FULL RB) - Right Band Edge



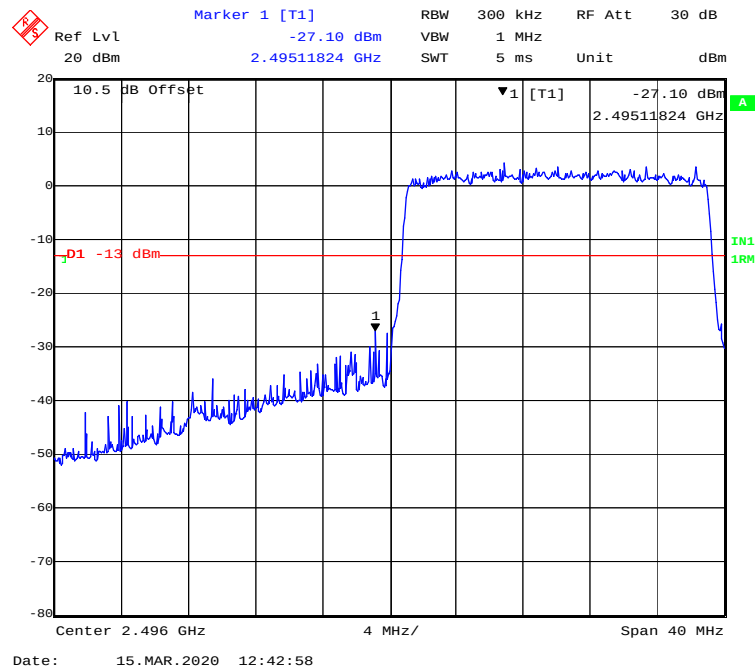
16-QAM (15 MHz, FULL RB) - Left Band Edge



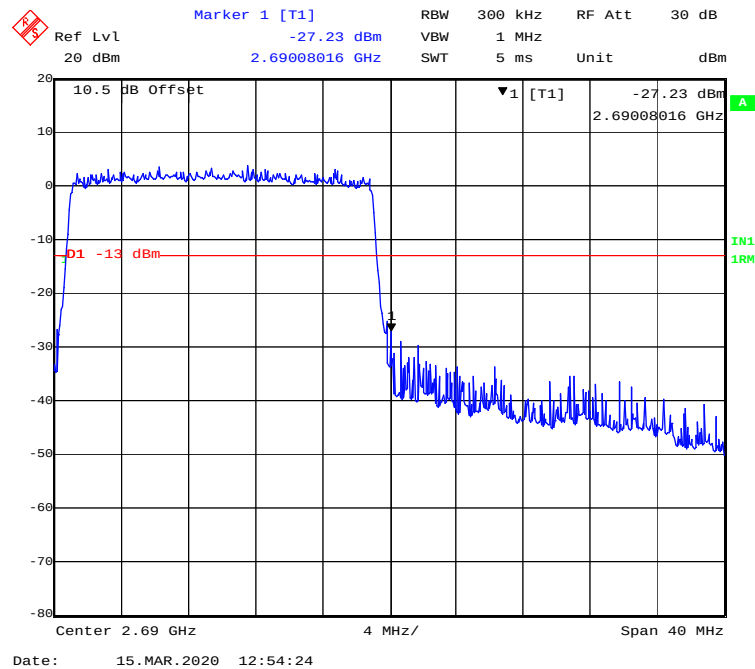
16-QAM (15 MHz, FULL RB) - Right Band Edge



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



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



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

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

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

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

Frequency Tolerance for Transmitters in the Public Mobile Services

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

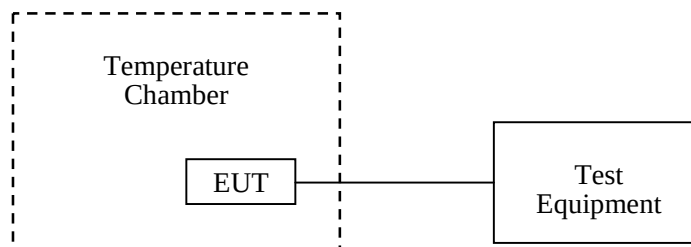
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.

Test Procedure

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

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

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



Test Data**Environmental Conditions**

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

The testing was performed by Sam Ye on 2020-03-16.

EUT operation mode: Transmitting

Test Result: Compliant.

GSM 850 Band

GPRS Mode, Middle Channel, $f_o=836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	24	12	0.01434	2.5
-20		12	0.01434	2.5
-10		11	0.01315	2.5
0		8	0.00956	2.5
10		10	0.01195	2.5
20		13	0.01554	2.5
30		9	0.01076	2.5
40		8	0.00956	2.5
50		11	0.01315	2.5
25	V min.= 21.6	8	0.00956	2.5
25	V max.=26.4	5	0.00598	2.5

EGPRS Mode, Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	24	11	0.01315	2.5
-20		8	0.00956	2.5
-10		5	0.00598	2.5
0		11	0.01315	2.5
10		13	0.01554	2.5
20		11	0.01315	2.5
30		15	0.01793	2.5
40		11	0.01315	2.5
50		5	0.00598	2.5
25	V min.= 21.6	6	0.00717	2.5
25	V max.=26.4	4	0.00478	2.5

PCS 1900 Band

GPRS Mode, Middle Channel, $f_0 = 1880.0$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	24	-5	-0.00266	pass
-20		-10	-0.00532	pass
-10		-6	-0.00319	pass
0		-5	-0.00266	pass
10		-9	-0.00479	pass
20		-5	-0.00266	pass
30		-3	-0.00160	pass
40		-8	-0.00426	pass
50		-11	-0.00585	pass
25	V min.= 21.6	-10	-0.00532	pass
25	V max.=26.4	-5	-0.00266	pass

EGPRS Mode, Middle Channel, $f_o=1880.0$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	24	-8	-0.00426	pass
-20		-6	-0.00319	pass
-10		-8	-0.00426	pass
0		-5	-0.00266	pass
10		-6	-0.00319	pass
20		-5	-0.00266	pass
30		-7	-0.00372	pass
40		-11	-0.00585	pass
50		-9	-0.00479	pass
25	V min.= 21.6	-6	-0.00319	pass
25	V max.=26.4	-5	-0.00266	pass

LTE Band 5

Middle Channel, f_0 =836.5 MHz (QPSK)				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	24	12	0.0143	2.5
-20		15	0.0179	2.5
-10		12	0.0143	2.5
0		13	0.0155	2.5
10		10	0.0120	2.5
20		8	0.0096	2.5
30		6	0.0072	2.5
40		9	0.0108	2.5
50		9	0.0108	2.5
25	V min.= 21.6	11	0.0132	2.5
25	V max.=26.4	10	0.0120	2.5

Middle Channel, f_0 =836.5 MHz(16-QAM)				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	24	12	0.0143	2.5
-20		11	0.0132	2.5
-10		12	0.0143	2.5
0		10	0.0120	2.5
10		9	0.0108	2.5
20		12	0.0143	2.5
30		10	0.0120	2.5
40		8	0.0096	2.5
50		9	0.0108	2.5
25	V min.= 21.6	11	0.0132	2.5
25	V max.=26.4	13	0.0155	2.5

LTE Band 41

Low Channel & High Channel (QPSK)					
Temperature	Power Supplied	F_L	F_H	F_L Limit	F_H Limit
(°C)	(V_{DC})	(MHz)	(MHz)	(MHz)	(MHz)
-30	24	2496.0698	2689.9456	2496	2690
-20		2496.0656	2689.9425	2496	2690
-10		2496.0663	2689.9435	2496	2690
0		2496.0617	2689.9441	2496	2690
10		2496.0618	2689.9458	2496	2690
20		2496.0632	2689.9426	2496	2690
30		2496.0614	2689.9435	2496	2690
40		2496.0625	2689.9478	2496	2690
50		2496.0623	2689.9451	2496	2690
25	V min.= 21.6	2496.0647	2689.9458	2496	2690
25	V max.= 26.4	2496.0612	2689.9487	2496	2690

Low Channel & High Channel (16-QAM)					
Temperature	Power Supplied	F_L	F_H	F_L Limit	F_H Limit
(°C)	(V_{DC})	(MHz)	(MHz)	(MHz)	(MHz)
-30	24	2496.0652	2689.9457	2496	2690
-20		2496.0614	2689.9437	2496	2690
-10		2496.0645	2689.9487	2496	2690
0		2496.0647	2689.9465	2496	2690
10		2496.0641	2689.9457	2496	2690
20		2496.0623	2689.9475	2496	2690
30		2496.0654	2689.9425	2496	2690
40		2496.0682	2689.9447	2496	2690
50		2496.0614	2689.9457	2496	2690
25	V min.= 21.6	2496.0652	2689.9485	2496	2690
25	V max.= 26.4	2496.0653	2689.9448	2496	2690

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