TESTING LABORATORY
CERTIFICATE # 4821.01

FCC PART 27

FCC PART 22H, PART 24E

TEST REPORT

For

Ruio Communication Technology Co.,Ltd

Room 2501, Broadegate Software Building, No, 1003 Keyuan Road, High-Tech Park, Nanshan District, Shenzhen, Guangdong, China

FCC ID: 2ALCI-FRESHFUNB937

Report Type:	**Product Type:**
Original Report	4G CPE

Report Number: RSZ181017001-00C

Report Date: 2018-11-07

Reviewed By: Rocky Kang, RF Engineer

Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen)
6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China
Tel: +86-755-33320018
Fax: +86-755-33320008
www.baclcorp.com.cn

This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*".

TABLE OF CONTENTS

GENERAL INFORMATION **3**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
OBJECTIVE 3
RELATED SUBMITTAL(S)/GRANT(S) 3
TEST METHODOLOGY 3
MEASUREMENT UNCERTAINTY 4
TEST FACILITY 4
SYSTEM TEST CONFIGURATION **5**
DESCRIPTION OF TEST CONFIGURATION 5
EQUIPMENT MODIFICATIONS 5
SUPPORT EQUIPMENT LIST AND DETAILS 5
EXTERNAL I/O CABLE 5
LISN 5
BLOCK DIAGRAM OF TEST SETUP 6
SUMMARY OF TEST RESULTS **7**
TEST EQUIPMENT LIST **8**
§2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE) **10**
FCC §2.1047 - MODULATION CHARACTERISTIC **12**
FCC § 2.1046, § 22.913 (A) & § 24.232 (C); §27.50 (D) (H) - RF OUTPUT POWER **13**
APPLICABLE STANDARD 13
TEST PROCEDURE 13
TEST DATA 13
FCC §2.1049, §22.917, §22.905 & §24.238 & §27.53 - OCCUPIED BANDWIDTH **40**
APPLICABLE STANDARD 40
TEST PROCEDURE 40
TEST DATA 40
FCC §2.1051, §22.917(A) & §24.238(A); §27.53 (H) (M) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS **69**
APPLICABLE STANDARD 69
TEST PROCEDURE 69
TEST DATA 69
FCC § 2.1053; § 22.917 (A);§ 24.238 (A); §27.53 (H)(M) SPURIOUS RADIATED EMISSIONS **101**
APPLICABLE STANDARD 101
TEST PROCEDURE 101
TEST DATA 101
FCC § 22.917 (A);§ 24.238 (A); §27.53 (H)(M) - BAND EDGES **106**
APPLICABLE STANDARD 106
TEST PROCEDURE 106
TEST DATA 106
FCC § 2.1055; § 22.355; § 24.235; §27.54 - FREQUENCY STABILITY **153**
APPLICABLE STANDARD 153
TEST PROCEDURE 153
TEST DATA 154

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Ruio Communication Technology Co.,Ltd's product, model number: B937
(FCC ID: 2ALCI-FRESHFUNB937) or the "EUT" in this report was a 4G CPE, which was measured approximately: 165 mm (L) × 150 mm (W) × 28 mm (H), rated with input voltage: DC 12.0 V from adapter.

**All measurement and test data in this report was gathered from production sample serial number: 181017001. (Assigned by BACL,Shenzhen). The EUT supplied by the applicant was received on 2018-10-17.*

Objective

This test report is prepared on behalf of *Ruio Communication Technology Co.,Ltd* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E and Subpart 27 of the Federal Communication Commissions rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and Part 15B JBP submissions with FCC ID: 2ALCI-FRESHFUNB937.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2-Subpart 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 emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±1.5dB
Unwanted Emission, conducted		±1.5dB
Emissions, radiated	Below 1GHz	±4.70dB
	Above 1GHz	±4.80dB
Temperature		±1℃
Supply voltages		±0.4%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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.

The device can use External or internal Antenna, but only external antenna can transmission when external antenna was installed.

Equipment Modifications

No modification was made to the EUT.

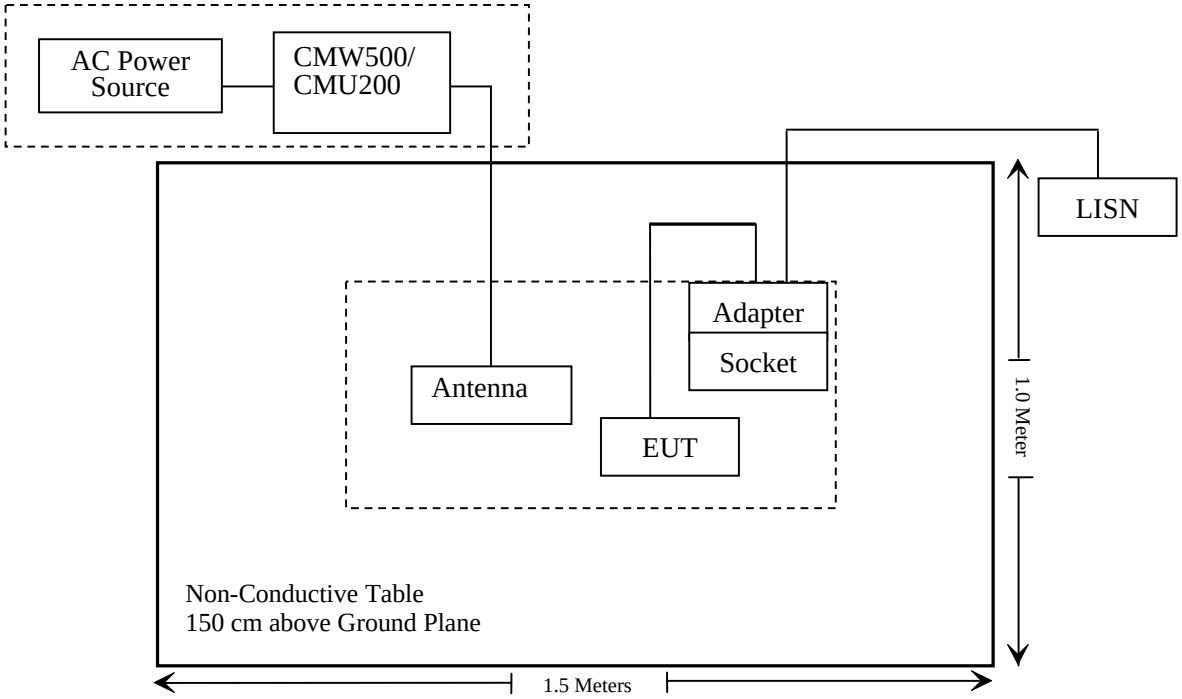
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-116218-UY
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605

External I/O Cable

Manufacturer	Description	Model	Serial Number
Un-shielding Un-detachable DC Power Cable	1.0	EUT	Adapter
Un-shielded Un-detachable AC cable	1.0	Socket	LISN

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§2.1091	Maxmum Permissible Exposure (MPE)	Compliance
§2.1046; § 22.913 (a); § 24.232 (c); §27.50 (d) (h)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235; §27.54;	Frequency stability	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017-12-22	2020-12-21
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-05-22	2018-11-22
Sonoma instrument	Amplifier	310N	186238	2018-05-12	2018-11-12
Anritsu	Signal Generator	68369B	004114	2017-12-24	2018-12-24
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-08-01	2019-02-01
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2018-08-18	2021-08-17
Ducommun technologies	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-08-01	2019-02-01
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-21
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2017-12-29	2020-12-28
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-08-01	2019-02-01

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-24	2018-12-24
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2017-12-21	2018-12-21
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
Rohde & Schwarz	Wideband Radio Communication Tester	CMU200	106891	2017-12-14	2018-12-14
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2018-06-23	2019-06-23
Ducommun technologies	RF Cable	RG-214	3	Each Time	
WEINSCHEL	10dB Attenuator	5324	AU 3842	Each Time	
Unknown	Power Splitter	227	6958	Each Time	

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

§2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

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

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

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

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

Result

Mode/Band	Frequency range (MHz)	Antenna Gain		Tune up Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
WiFi	2412-2462	4.00	2.51	20.0	100	20	0.050	1.0
WCDMA Band 5	824-849	3	2.00	22.5	177.83	20	0.071	0.55
WCDMA Band 2	1850-1910	3	2.00	22.5	177.83	20	0.071	1.0
LTE Band 4	1710-1755	2.5	1.78	23.5	223.87	20	0.079	1.0
LTE Band 5	824-849	3	2.00	23.0	199.53	20	0.079	0.55
LTE Band 7	2500-2570	2.5	1.78	24.0	251.19	20	0.089	1.0
LTE Band 66	1710-1780	2.5	1.78	23.5	223.87	20	0.079	1.0

Note: the maximum gain is external antenna used for MPE calculation.

Consider the transmit simultaneously:

The ratio =0.05/1.0+0.079/0.55=0.19＜1.0, simultaneous exposure is not required.

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E & 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 (d) (h) - RF OUTPUT POWER

Applicable Standard

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

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

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

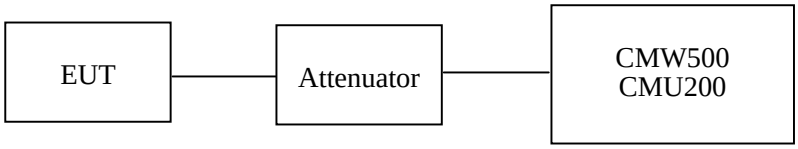
According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1780MHz.

According to §27.50(h), the maximum EIRP must not exceed 2Watts (33dBm) for 2500-2570MHz.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMW500/CMU200 through sufficient attenuation.



Radiated method:

TIA 603-D section 2.2.17

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Kiki Kong on 2018-11-03.

Conducted Power

Cellular Band (Part 22H)

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band V)	Normal	RMC12.2k		21.64	21.85	22.15
		HSDPA	1	20.64	20.75	21.02
			2	20.57	20.67	20.91
			3	20.71	20.81	21.01
			4	20.60	20.65	20.93
		HSUPA	1	20.59	20.86	20.56
			2	20.56	20.72	20.48
			3	20.45	20.69	20.61
			4	20.51	20.80	20.44
			5	20.49	20.74	20.60

PCS Band (Part 24E)

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band II)	Normal	RMC12.2k		21.66	22.36	22.15
		HSDPA	1	20.76	21.02	20.42
			2	20.63	20.93	20.42
			3	20.89	21.06	20.54
			4	20.69	20.94	20.39
		HSUPA	1	20.65	20.90	20.49
			2	20.71	20.81	20.44
			3	20.61	20.97	20.58
			4	20.59	20.79	20.41
			5	20.64	20.98	20.57

Peak-to-average ratio (PAR)

Cellular Band

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	2.58	13
	Middle	2.72	13
	High	2.85	13
HSDPA (16QAM)	Low	2.83	13
	Middle	2.62	13
	High	2.82	13
HSUPA (BPSK)	Low	2.88	13
	Middle	2.64	13
	High	2.83	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	3.74	13
	Middle	3.62	13
	High	3.87	13
HSDPA (16QAM)	Low	3.85	13
	Middle	3.63	13
	High	3.85	13
HSUPA (BPSK)	Low	3.86	13
	Middle	3.62	13
	High	3.86	13

Radiated Power

Internal Antenna

WCDMA Mode:

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
ERP for WCDMA Band V (Part 22H), Middle Channel										
836.6	81.84	40	1.6	H	20.5	0.7	0.0	19.80	38.45	18.65
836.6	77.56	223	1.6	V	17.6	0.7	0.0	16.90	38.45	21.55
EIRP for WCDMA Band II (Part 24E), Middle Channel										
1880.00	83.90	10	1.7	H	13.9	1.30	9.40	22.00	33.00	11.0
1880.00	85.65	296	1.0	V	15.4	1.30	9.40	23.50	33.00	9.5

External Antenna

WCDMA Mode:

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
ERP for WCDMA Band V (Part 22H), Middle Channel										
836.6	76.18	202	1.0	H	14.8	0.7	0.0	14.10	38.45	24.35
836.6	81.69	187	1.2	V	21.7	0.7	0.0	21.00	38.45	17.45
EIRP for WCDMA Band II (Part 24E), Middle Channel										
1880.00	85.66	32	1.7	H	15.6	1.30	9.40	23.70	33.00	9.3
1880.00	84.57	229	2.3	V	14.3	1.30	9.40	22.40	33.00	10.6

Note:
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

LTE Band 4:

Maximum Output Power

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB Size=1, RB Offset=0	22.72	22.68	22.61
		RB Size=1, RB Offset=2	22.60	22.55	22.65
		RB Size=1, RB Offset=5	22.36	22.62	22.59
		RB Size=3, RB Offset=0	22.44	22.41	22.39
		RB Size=3, RB Offset=1	22.28	22.38	22.26
		RB Size=3, RB Offset=2	22.25	22.20	22.24
		RB Size=6, RB Offset=0	22.19	22.20	22.18
	16QAM	RB Size=1, RB Offset=0	22.23	22.20	22.15
		RB Size=1, RB Offset=2	22.05	22.07	22.02
		RB Size=1, RB Offset=5	22.02	21.98	23.00
		RB Size=3, RB Offset=0	21.81	21.77	22.93
		RB Size=3, RB Offset=1	21.82	21.87	21.85
		RB Size=3, RB Offset=2	21.83	21.83	21.79
		RB Size=6, RB Offset=0	21.75	21.68	21.79
3.0	QPSK	RB Size=1, RB Offset=0	22.83	22.77	22.86
		RB Size=1, RB Offset=7	22.78	22.68	22.81
		RB Size=1, RB Offset=14	22.59	22.67	22.80
		RB Size=8, RB Offset=0	21.90	21.89	21.92
		RB Size=8, RB Offset=4	21.81	21.71	21.80
		RB Size=8, RB Offset=7	21.62	21.61	21.73
		RB Size=15, RB Offset=0	21.79	21.75	21.79
	16QAM	RB Size=1, RB Offset=0	22.11	22.11	22.06
		RB Size=1, RB Offset=7	22.14	22.04	22.04
		RB Size=1, RB Offset=14	22.23	21.83	21.91
		RB Size=8, RB Offset=0	20.87	20.82	20.95
		RB Size=8, RB Offset=4	20.68	20.83	20.96
		RB Size=8, RB Offset=7	20.44	20.64	20.86
		RB Size=15, RB Offset=0	20.79	20.74	20.81

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB Size=1, RB Offset=0	22.88	22.81	22.91
		RB Size=1, RB Offset=12	22.83	22.77	22.68
		RB Size=1, RB Offset=24	22.53	22.90	22.48
		RB Size=12, RB Offset=0	21.86	21.84	21.92
		RB Size=12, RB Offset=6	21.89	21.77	21.71
		RB Size=12, RB Offset=11	21.84	21.53	21.80
		RB Size=25, RB Offset=0	21.74	21.74	21.79
	16QAM	RB Size=1, RB Offset=0	22.00	21.59	21.66
		RB Size=1, RB Offset=12	21.83	21.43	21.76
		RB Size=1, RB Offset=24	21.83	21.41	21.60
		RB Size=12, RB Offset=0	20.81	20.78	20.83
		RB Size=12, RB Offset=6	20.79	20.71	20.69
		RB Size=12, RB Offset=11	20.60	20.49	20.60
		RB Size=25, RB Offset=0	20.81	20.72	20.79
10.0	QPSK	RB Size=1, RB Offset=0	22.83	22.79	22.76
		RB Size=1, RB Offset=24	22.76	22.81	22.67
		RB Size=1, RB Offset=49	22.67	22.71	22.64
		RB Size=25, RB Offset=0	21.82	21.76	21.77
		RB Size=25, RB Offset=12	21.80	21.71	21.70
		RB Size=25, RB Offset=24	21.89	21.59	21.56
		RB Size=50, RB Offset=0	21.60	21.54	21.56
	16QAM	RB Size=1, RB Offset=0	21.70	21.67	21.66
		RB Size=1, RB Offset=24	21.68	21.54	21.64
		RB Size=1, RB Offset=49	21.45	21.45	21.77
		RB Size=25, RB Offset=0	22.64	20.72	20.76
		RB Size=25, RB Offset=12	22.54	20.54	20.60
		RB Size=25, RB Offset=24	22.63	20.32	20.38
		RB Size=50, RB Offset=0	20.53	20.52	20.53

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15.0	QPSK	RB Size=1, RB Offset=0	22.16	22.11	22.40
		RB Size=1, RB Offset=37	22.08	21.96	22.25
		RB Size=1, RB Offset=74	22.05	22.05	22.26
		RB Size=36, RB Offset=0	22.05	22.06	22.03
		RB Size=36, RB Offset=18	22.08	22.01	21.96
		RB Size=36, RB Offset=37	22.14	21.72	21.66
		RB Size=75, RB Offset=0	21.90	21.90	22.04
	16QAM	RB Size=1, RB Offset=0	21.88	21.91	21.76
		RB Size=1, RB Offset=37	21.84	21.88	21.61
		RB Size=1, RB Offset=74	21.81	21.86	21.41
		RB Size=36, RB Offset=0	21.86	21.85	22.07
		RB Size=36, RB Offset=18	21.83	21.72	22.01
		RB Size=36, RB Offset=37	21.59	21.59	21.84
		RB Size=75, RB Offset=0	21.19	21.17	21.02
20.0	QPSK	RB Size=1, RB Offset=0	22.97	22.94	22.98
		RB Size=1, RB Offset=49	22.97	22.89	22.85
		RB Size=1, RB Offset=99	22.83	22.85	22.82
		RB Size=50, RB Offset=0	21.89	21.87	21.96
		RB Size=50, RB Offset=24	21.85	21.88	21.86
		RB Size=50, RB Offset=49	21.73	21.67	21.69
		RB Size=100, RB Offset=0	21.80	21.79	21.89
	16QAM	RB Size=1, RB Offset=0	22.02	21.97	22.10
		RB Size=1, RB Offset=49	21.95	21.89	21.91
		RB Size=1, RB Offset=99	21.92	21.74	21.91
		RB Size=50, RB Offset=0	20.91	20.89	21.03
		RB Size=50, RB Offset=24	20.81	20.90	20.98
		RB Size=50, RB Offset=49	20.55	20.75	20.90
		RB Size=100, RB Offset=0	20.81	20.84	20.95

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	6.48	13	Pass
QPSK (100RB Size)	6.51	13	Pass
16QAM (1RB Size)	7.30	13	Pass
16QAM (100RB Size)	7.32	13	Pass

Internal Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1732.50	87.95	305	1.1	H	14.8	1.30	8.90	22.40	30
1732.50	90.26	322	1.7	V	17.7	1.30	8.90	25.30	30
3 MHz Bandwidth									
1732.50	87.56	224	2.4	H	14.4	1.30	8.90	22.00	30
1732.50	89.36	45	2.0	V	16.8	1.30	8.90	24.40	30
5 MHz Bandwidth									
1732.50	87.41	315	2.4	H	14.2	1.30	8.90	21.80	30
1732.50	89.52	7	1.9	V	17.0	1.30	8.90	24.60	30
10 MHz Bandwidth									
1732.50	87.53	268	2.5	H	14.4	1.30	8.90	22.00	30
1732.50	89.24	197	2.1	V	16.7	1.30	8.90	24.30	30
15 MHz Bandwidth									
1732.50	87.16	247	2.2	H	14.0	1.30	8.90	21.60	30
1732.50	89.23	275	1.7	V	16.7	1.30	8.90	24.30	30
20 MHz Bandwidth									
1732.50	87.38	145	2.1	H	14.2	1.30	8.90	21.80	30
1732.50	89.28	3	2.0	V	16.7	1.30	8.90	24.30	30

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1732.50	87.48	74	1.9	H	14.3	1.30	8.90	21.90	30
1732.50	89.36	164	1.2	V	16.8	1.30	8.90	24.40	30
3 MHz Bandwidth									
1732.50	87.12	267	1.6	H	14.0	1.30	8.90	21.60	30
1732.50	88.65	109	1.1	V	16.1	1.30	8.90	23.70	30
5 MHz Bandwidth									
1732.50	86.24	141	1.9	H	13.1	1.30	8.90	20.70	30
1732.50	89.16	37	1.1	V	16.6	1.30	8.90	24.20	30
10 MHz Bandwidth									
1732.50	87.05	75	2.5	H	13.9	1.30	8.90	21.50	30
1732.50	89.31	343	2.0	V	16.7	1.30	8.90	24.30	30
15 MHz Bandwidth									
1732.50	87.22	273	2.3	H	14.1	1.30	8.90	21.70	30
1732.50	89.25	230	1.0	V	16.7	1.30	8.90	24.30	30
20 MHz Bandwidth									
1732.50	87.41	157	1.8	H	14.2	1.30	8.90	21.80	30
1732.50	89.02	310	1.6	V	16.5	1.30	8.90	24.10	30

External Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1732.50	89.56	76	2.2	H	16.4	1.30	8.90	24.00	30
1732.50	91.67	43	2.0	V	19.1	1.30	8.90	26.70	30
3 MHz Bandwidth									
1732.50	89.21	342	1.7	H	16.0	1.30	8.90	23.60	30
1732.50	91.27	107	1.7	V	18.7	1.30	8.90	26.30	30
5 MHz Bandwidth									
1732.50	89.02	125	1.3	H	15.9	1.30	8.90	23.50	30
1732.50	91.26	306	1.9	V	18.7	1.30	8.90	26.30	30
10 MHz Bandwidth									
1732.50	88.65	330	2.1	H	15.5	1.30	8.90	23.10	30
1732.50	90.95	63	2.2	V	18.4	1.30	8.90	26.00	30
15 MHz Bandwidth									
1732.50	88.79	144	2.2	H	15.6	1.30	8.90	23.20	30
1732.50	90.62	182	2.4	V	18.1	1.30	8.90	25.70	30
20 MHz Bandwidth									
1732.50	89.14	282	1.8	H	16.0	1.30	8.90	23.60	30
1732.50	91.17	209	2.1	V	18.6	1.30	8.90	26.20	30

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1732.50	89.99	292	1.0	H	16.8	1.30	8.90	24.40	30
1732.50	91.87	189	2.5	V	19.3	1.30	8.90	26.90	30
3 MHz Bandwidth									
1732.500	88.24	300	1.3	H	15.1	1.30	8.90	22.70	30
1732.50	90.58	323	1.1	V	18.0	1.30	8.90	25.60	30
5 MHz Bandwidth									
1732.50	89.62	126	1.9	H	16.5	1.30	8.90	24.10	30
1732.50	90.76	39	1.4	V	18.2	1.30	8.90	25.80	30
10 MHz Bandwidth									
1732.50	89.24	279	2.3	H	16.1	1.30	8.90	23.70	30
1732.50	90.58	2	1.3	V	18.0	1.30	8.90	25.60	30
15 MHz Bandwidth									
1732.50	88.14	326	2.0	H	15.0	1.30	8.90	22.60	30
1732.50	89.54	3	1.9	V	17.0	1.30	8.90	24.60	30
20 MHz Bandwidth									
1732.50	90.21	176	1.7	H	17.0	1.30	8.90	24.60	30
1732.50	91.84	293	1.2	V	19.3	1.30	8.90	26.90	30

LTE Band 5:

Maximum Output Power

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB Size=1, RB Offset=0	22.44	22.42	22.51
		RB Size=1, RB Offset=2	22.50	22.24	22.55
		RB Size=1, RB Offset=5	22.46	22.01	22.63
		RB Size=3, RB Offset=0	22.68	22.65	22.68
		RB Size=3, RB Offset=1	22.60	22.65	22.65
		RB Size=3, RB Offset=2	22.47	22.51	22.47
		RB Size=6, RB Offset=0	21.50	21.45	21.42
	16QAM	RB Size=1, RB Offset=0	21.92	21.92	21.97
		RB Size=1, RB Offset=2	21.82	21.85	21.80
		RB Size=1, RB Offset=5	21.75	21.86	21.89
		RB Size=3, RB Offset=0	22.84	21.86	21.80
		RB Size=3, RB Offset=1	22.85	21.71	21.85
		RB Size=3, RB Offset=2	22.65	21.73	21.62
		RB Size=6, RB Offset=0	20.70	20.70	20.75
3.0	QPSK	RB Size=1, RB Offset=0	22.49	22.47	22.48
		RB Size=1, RB Offset=7	22.32	22.40	22.29
		RB Size=1, RB Offset=14	22.34	22.22	22.27
		RB Size=8, RB Offset=0	21.57	21.60	21.67
		RB Size=8, RB Offset=4	21.51	21.47	21.72
		RB Size=8, RB Offset=7	21.38	21.29	21.65
		RB Size=15, RB Offset=0	21.64	21.62	21.68
	16QAM	RB Size=1, RB Offset=0	21.71	21.68	21.60
		RB Size=1, RB Offset=7	21.73	21.63	21.49
		RB Size=1, RB Offset=14	21.70	21.49	21.33
		RB Size=8, RB Offset=0	20.70	20.68	20.77
		RB Size=8, RB Offset=4	20.62	20.59	20.75
		RB Size=8, RB Offset=7	20.67	20.73	20.58
		RB Size=15, RB Offset=0	20.75	20.73	20.74

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB Size=1, RB Offset=0	22.73	22.66	22.75
		RB Size=1, RB Offset=12	22.58	22.54	22.62
		RB Size=1, RB Offset=24	22.57	22.54	22.68
		RB Size=12, RB Offset=0	21.77	21.65	21.69
		RB Size=12, RB Offset=6	21.75	21.65	21.69
		RB Size=12, RB Offset=11	21.52	21.72	21.66
		RB Size=25, RB Offset=0	21.74	21.69	21.76
	16QAM	RB Size=1, RB Offset=0	21.95	21.89	21.92
		RB Size=1, RB Offset=12	21.81	21.76	21.73
		RB Size=1, RB Offset=24	21.71	21.75	21.70
		RB Size=12, RB Offset=0	20.91	21.00	21.01
		RB Size=12, RB Offset=6	20.83	20.95	20.87
		RB Size=12, RB Offset=11	20.71	20.74	20.78
		RB Size=25, RB Offset=0	20.82	20.65	20.67
10.0	QPSK	RB Size=1, RB Offset=0	22.72	22.74	22.76
		RB Size=1, RB Offset=24	22.71	22.65	22.75
		RB Size=1, RB Offset=49	22.58	22.69	22.77
		RB Size=25, RB Offset=0	21.76	21.81	21.72
		RB Size=25, RB Offset=12	21.62	21.82	21.76
		RB Size=25, RB Offset=24	21.62	21.56	21.66
		RB Size=50, RB Offset=0	21.81	21.80	21.78
	16QAM	RB Size=1, RB Offset=0	22.21	22.21	22.28
		RB Size=1, RB Offset=24	22.12	22.13	22.28
		RB Size=1, RB Offset=49	22.17	22.14	22.10
		RB Size=25, RB Offset=0	20.84	20.85	20.84
		RB Size=25, RB Offset=12	20.64	20.65	20.88
		RB Size=25, RB Offset=24	20.57	20.69	20.67
		RB Size=50, RB Offset=0	20.93	20.87	20.90

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	6.26	13	Pass
QPSK (50RB Size)	6.33	13	Pass
16QAM (1RB Size)	7.21	13	Pass
16QAM (50RB Size)	7.34	13	Pass

External Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
836.5	86.27	224	2.1	H	24.9	0.7	0.0	24.20	38.45
836.5	86.55	333	1.7	V	26.6	0.7	0.0	25.90	38.45
3 MHz Bandwidth									
836.5	86.18	183	1.5	H	24.8	0.7	0.0	24.10	38.45
836.5	86.64	15	1.8	V	26.6	0.7	0.0	25.90	38.45
5 MHz Bandwidth									
836.5	86.21	116	1.9	H	24.8	0.7	0.0	24.10	38.45
836.5	86.77	116	1.7	V	26.8	0.7	0.0	26.10	38.45
10 MHz Bandwidth									
836.5	86.35	8	1.9	H	25.0	0.7	0.0	24.30	38.45
836.5	86.68	260	2.3	V	26.7	0.7	0.0	26.00	38.45

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
836.5	85.07	46	1.6	H	23.7	0.7	0.0	23.00	38.45
836.5	85.21	285	1.7	V	25.2	0.7	0.0	24.50	38.45
3 MHz Bandwidth									
836.5	85.34	191	2.4	H	24.0	0.7	0.0	23.30	38.45
836.5	85.67	146	1.1	V	25.7	0.7	0.0	25.00	38.45
5 MHz Bandwidth									
836.5	85.09	214	1.5	H	23.7	0.7	0.0	23.00	38.45
836.5	85.44	213	1.7	V	25.4	0.7	0.0	24.70	38.45
10 MHz Bandwidth									
836.5	85.38	257	2.2	H	24.0	0.7	0.0	23.30	38.45
836.5	85.62	188	1.8	V	25.6	0.7	0.0	24.90	38.45

Internal Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
836.5	83.21	217	1.8	H	21.8	0.7	0.0	21.10	38.45
836.5	83.09	286	1.3	V	23.1	0.7	0.0	22.40	38.45
3 MHz Bandwidth									
836.5	83.19	33	1.5	H	21.8	0.7	0.0	21.10	38.45
836.5	83.66	198	1.7	V	23.7	0.7	0.0	23.00	38.45
5 MHz Bandwidth									
836.5	83.07	182	2.5	H	21.7	0.7	0.0	21.00	38.45
836.5	83.67	79	1.9	V	23.7	0.7	0.0	23.00	38.45
10 MHz Bandwidth									
836.5	83.16	186	2.2	H	21.8	0.7	0.0	21.10	38.45
836.5	83.49	211	1.9	V	23.5	0.7	0.0	22.80	38.45

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
836.5	81.42	247	1.8	H	20.0	0.7	0.0	19.30	38.45
836.5	81.65	163	1.7	V	21.7	0.7	0.0	21.00	38.45
3 MHz Bandwidth									
836.5	81.22	107	2.4	H	19.8	0.7	0.0	19.10	38.45
836.5	81.49	87	2.5	V	21.5	0.7	0.0	20.80	38.45
5 MHz Bandwidth									
836.5	81.16	95	1.3	H	19.8	0.7	0.0	19.10	38.45
836.5	81.39	246	2.3	V	21.4	0.7	0.0	20.70	38.45
10 MHz Bandwidth									
836.5	81.01	31	1.3	H	19.6	0.7	0.0	18.90	38.45
836.5	81.62	326	1.3	V	21.6	0.7	0.0	20.90	38.45

LTE Band 7:

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5	QPSK	RB Size=1, RB Offset=0	22.93	22.96	22.54
		RB Size=1, RB Offset=12	22.79	22.48	22.32
		RB Size=1, RB Offset=24	23.38	22.98	22.86
		RB Size=12, RB Offset=0	21.99	21.55	21.30
		RB Size=12, RB Offset=6	22.02	21.59	21.39
		RB Size=12, RB Offset=11	22.12	21.57	21.53
		RB Size=25, RB Offset=0	22.04	21.60	22.30
	16QAM	RB Size=1, RB Offset=0	22.57	21.90	22.12
		RB Size=1, RB Offset=12	22.52	21.83	22.14
		RB Size=1, RB Offset=24	22.63	21.98	22.27
		RB Size=12, RB Offset=0	21.80	20.98	21.33
		RB Size=12, RB Offset=6	21.66	21.11	21.30
		RB Size=12, RB Offset=11	21.60	20.96	21.39
		RB Size=25, RB Offset=0	21.04	20.75	20.54
10	QPSK	RB Size=1, RB Offset=0	22.67	22.42	22.83
		RB Size=1, RB Offset=24	22.76	22.36	22.65
		RB Size=1, RB Offset=49	22.59	22.25	22.76
		RB Size=25, RB Offset=0	21.87	21.66	22.10
		RB Size=25, RB Offset=12	21.89	21.79	22.01
		RB Size=25, RB Offset=24	21.83	21.74	22.08
		RB Size=50, RB Offset=0	22.04	21.50	21.52
	16QAM	RB Size=1, RB Offset=0	21.88	22.06	21.93
		RB Size=1, RB Offset=24	21.70	22.17	22.01
		RB Size=1, RB Offset=49	21.80	22.26	22.02
		RB Size=25, RB Offset=0	21.02	21.23	21.27
		RB Size=25, RB Offset=12	21.18	21.16	21.09
		RB Size=25, RB Offset=24	21.05	21.31	21.23
		RB Size=50, RB Offset=0	21.16	20.57	20.68

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15	QPSK	RB Size=1, RB Offset=0	22.72	22.62	23.85
		RB Size=1, RB Offset=37	22.64	22.70	23.61
		RB Size=1, RB Offset=74	22.79	22.66	23.84
		RB Size=36, RB Offset=0	21.96	21.99	22.93
		RB Size=36, RB Offset=18	21.96	21.66	23.13
		RB Size=36, RB Offset=37	22.10	21.88	23.05
		RB Size=75, RB Offset=0	22.11	21.34	22.18
	16QAM	RB Size=1, RB Offset=0	22.02	21.79	22.67
		RB Size=1, RB Offset=37	21.94	21.49	22.71
		RB Size=1, RB Offset=74	22.02	21.71	22.80
		RB Size=36, RB Offset=0	21.13	20.97	21.94
		RB Size=36, RB Offset=18	21.29	20.99	21.76
		RB Size=36, RB Offset=37	21.11	21.05	21.80
		RB Size=75, RB Offset=0	20.72	20.52	21.31
20	QPSK	RB Size=1, RB Offset=0	22.76	22.97	23.57
		RB Size=1, RB Offset=49	22.72	22.91	23.40
		RB Size=1, RB Offset=99	22.95	23.12	23.68
		RB Size=50, RB Offset=0	22.02	22.18	22.76
		RB Size=50, RB Offset=24	22.08	22.19	22.78
		RB Size=50, RB Offset=49	22.02	22.11	22.80
		RB Size=100, RB Offset=0	22.24	21.69	22.44
	16QAM	RB Size=1, RB Offset=0	22.08	22.26	22.84
		RB Size=1, RB Offset=49	21.94	22.31	22.64
		RB Size=1, RB Offset=99	22.13	22.29	22.97
		RB Size=50, RB Offset=0	21.34	21.35	22.07
		RB Size=50, RB Offset=24	21.37	21.58	22.10
		RB Size=50, RB Offset=49	21.20	21.43	22.05
		RB Size=100, RB Offset=0	21.29	20.76	21.51

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	5.92	13	Pass
QPSK (100RB Size)	5.99	13	Pass
16QAM (1RB Size)	7.17	13	Pass
16QAM (100RB Size)	7.26	13	Pass

EIRP:

Internal Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
5 MHz Bandwidth									
2535.00	81.95	116	2.2	H	12.5	2.60	10.20	20.10	33
2535.00	87.89	236	1.8	V	19.0	2.60	10.20	26.60	33
10 MHz Bandwidth									
2535.00	82.31	126	1.5	H	12.8	2.60	10.20	20.40	33
2535.00	87.86	332	1.0	V	19.0	2.60	10.20	26.60	33
15 MHz Bandwidth									
2535.00	82.25	226	1.9	H	12.8	2.60	10.20	20.40	33
2535.00	87.46	289	1.4	V	18.6	2.60	10.20	26.20	33
20 MHz Bandwidth									
2535.00	82.27	212	1.9	H	12.8	2.60	10.20	20.40	33
2535.00	87.36	321	1.0	V	18.5	2.60	10.20	26.10	33

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
5 MHz Bandwidth									
2535.00	82.56	226	2.4	H	13.1	2.60	10.20	20.70	33
2535.00	88.01	119	1.8	V	19.1	2.60	10.20	26.70	33
10 MHz Bandwidth									
2535.00	82.41	144	1.4	H	12.9	2.60	10.20	20.50	33
2535.00	88.25	133	2.2	V	19.4	2.60	10.20	27.00	33
15 MHz Bandwidth									
2535.00	82.38	212	2.1	H	12.9	2.60	10.20	20.50	33
2535.00	87.56	152	1.6	V	18.7	2.60	10.20	26.30	33
20 MHz Bandwidth									
2535.00	82.15	61	1.6	H	12.7	2.60	10.20	20.30	33
2535.00	87.27	292	2.3	V	15.4	2.60	10.20	26.00	33

External Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
5 MHz Bandwidth									
2535.00	83.57	39	1.8	H	14.1	2.60	10.20	21.70	33
2535.00	88.13	299	1.2	V	19.3	2.60	10.20	26.90	33
10 MHz Bandwidth									
2535.00	83.54	192	2.2	H	14.1	2.60	10.20	21.70	33
2535.00	87.26	271	1.3	V	18.4	2.60	10.20	26.00	33
15 MHz Bandwidth									
2535.00	84.25	318	1.1	H	14.8	2.60	10.20	22.40	33
2535.00	87.89	121	2.0	V	19.0	2.60	10.20	26.60	33
20 MHz Bandwidth									
2535.00	83.69	289	2.4	H	14.2	2.60	10.20	21.80	33
2535.00	87.92	233	1.8	V	19.0	2.60	10.20	26.60	33

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
5 MHz Bandwidth									
2535.00	84.91	9	2.0	H	15.4	2.60	10.20	23.00	33
2535.00	87.21	151	1.4	V	18.3	2.60	10.20	25.90	33
10 MHz Bandwidth									
2535.00	84.96	357	1.1	H	15.5	2.60	10.20	23.10	33
2535.00	88.24	114	1.8	V	19.4	2.60	10.20	27.00	33
15 MHz Bandwidth									
2535.00	84.21	58	1.5	H	14.7	2.60	10.20	22.30	33
2535.00	87.02	346	1.1	V	18.1	2.60	10.20	25.70	33
20 MHz Bandwidth									
2535.00	83.95	118	1.9	H	14.5	2.60	10.20	22.10	33
2535.00	87.28	322	1.1	V	18.4	2.60	10.20	26.00	33

LTE Band 66:

Maximum Output Power

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB Size=1, RB Offset=0	22.70	22.68	22.61
		RB Size=1, RB Offset=2	22.60	22.60	22.67
		RB Size=1, RB Offset=5	22.35	22.60	22.59
		RB Size=3, RB Offset=0	22.46	22.38	22.37
		RB Size=3, RB Offset=1	22.29	22.35	22.23
		RB Size=3, RB Offset=2	22.21	22.17	22.22
		RB Size=6, RB Offset=0	22.20	22.18	22.13
	16QAM	RB Size=1, RB Offset=0	22.24	22.20	22.12
		RB Size=1, RB Offset=2	22.09	22.06	22.01
		RB Size=1, RB Offset=5	22.02	21.98	23.03
		RB Size=3, RB Offset=0	21.79	21.75	22.89
		RB Size=3, RB Offset=1	21.83	21.89	21.85
		RB Size=3, RB Offset=2	21.82	21.84	21.78
		RB Size=6, RB Offset=0	21.74	21.69	21.78
3.0	QPSK	RB Size=1, RB Offset=0	22.84	22.78	22.85
		RB Size=1, RB Offset=7	22.81	22.68	22.80
		RB Size=1, RB Offset=14	22.58	22.63	22.80
		RB Size=8, RB Offset=0	21.93	21.87	21.97
		RB Size=8, RB Offset=4	21.82	21.75	21.79
		RB Size=8, RB Offset=7	21.61	21.61	21.77
		RB Size=15, RB Offset=0	21.80	21.76	21.81
	16QAM	RB Size=1, RB Offset=0	22.12	22.09	22.07
		RB Size=1, RB Offset=7	22.10	22.02	22.02
		RB Size=1, RB Offset=14	22.19	21.84	21.95
		RB Size=8, RB Offset=0	20.89	20.83	20.93
		RB Size=8, RB Offset=4	20.70	20.80	20.96
		RB Size=8, RB Offset=7	20.47	20.63	20.82
		RB Size=15, RB Offset=0	20.78	20.80	20.79

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB Size=1, RB Offset=0	22.86	22.85	22.86
		RB Size=1, RB Offset=12	22.82	22.79	22.68
		RB Size=1, RB Offset=24	22.54	22.88	22.46
		RB Size=12, RB Offset=0	21.84	21.85	21.88
		RB Size=12, RB Offset=6	21.86	21.73	21.73
		RB Size=12, RB Offset=11	21.87	21.53	21.79
		RB Size=25, RB Offset=0	21.77	21.77	21.80
	16QAM	RB Size=1, RB Offset=0	22.02	21.63	21.67
		RB Size=1, RB Offset=12	21.84	21.41	21.74
		RB Size=1, RB Offset=24	21.84	21.43	21.59
		RB Size=12, RB Offset=0	20.82	20.77	20.82
		RB Size=12, RB Offset=6	20.80	20.73	20.67
		RB Size=12, RB Offset=11	20.57	20.49	20.61
		RB Size=25, RB Offset=0	20.75	20.73	20.79
10.0	QPSK	RB Size=1, RB Offset=0	22.83	22.79	22.74
		RB Size=1, RB Offset=24	22.76	22.83	22.66
		RB Size=1, RB Offset=49	22.66	22.71	22.65
		RB Size=25, RB Offset=0	21.80	21.77	21.76
		RB Size=25, RB Offset=12	21.80	21.72	21.65
		RB Size=25, RB Offset=24	21.89	21.58	21.52
		RB Size=50, RB Offset=0	21.57	21.58	21.58
	16QAM	RB Size=1, RB Offset=0	21.70	21.66	21.66
		RB Size=1, RB Offset=24	21.63	21.55	21.67
		RB Size=1, RB Offset=49	21.44	21.42	21.72
		RB Size=25, RB Offset=0	22.64	20.69	20.78
		RB Size=25, RB Offset=12	22.55	20.51	20.57
		RB Size=25, RB Offset=24	22.63	20.30	20.36
		RB Size=50, RB Offset=0	20.51	20.52	20.56

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15.0	QPSK	RB Size=1, RB Offset=0	22.15	22.07	22.39
		RB Size=1, RB Offset=37	22.05	21.95	22.24
		RB Size=1, RB Offset=74	22.06	22.04	22.26
		RB Size=36, RB Offset=0	22.03	22.04	22.04
		RB Size=36, RB Offset=18	22.10	21.99	21.93
		RB Size=36, RB Offset=37	22.12	21.69	21.63
		RB Size=75, RB Offset=0	21.91	21.94	22.04
	16QAM	RB Size=1, RB Offset=0	21.87	21.87	21.74
		RB Size=1, RB Offset=37	21.87	21.86	21.59
		RB Size=1, RB Offset=74	21.84	21.83	21.44
		RB Size=36, RB Offset=0	21.86	21.83	22.05
		RB Size=36, RB Offset=18	21.83	21.72	22.04
		RB Size=36, RB Offset=37	21.58	21.59	21.87
		RB Size=75, RB Offset=0	21.19	21.16	20.99
20.0	QPSK	RB Size=1, RB Offset=0	22.83	22.93	23.01
		RB Size=1, RB Offset=49	22.97	22.88	22.86
		RB Size=1, RB Offset=99	22.84	22.88	22.80
		RB Size=50, RB Offset=0	21.90	21.84	21.99
		RB Size=50, RB Offset=24	21.82	21.86	21.92
		RB Size=50, RB Offset=49	21.67	21.71	21.66
		RB Size=100, RB Offset=0	21.82	21.83	21.88
	16QAM	RB Size=1, RB Offset=0	22.03	21.99	22.10
		RB Size=1, RB Offset=49	21.96	21.89	21.90
		RB Size=1, RB Offset=99	21.97	21.74	21.92
		RB Size=50, RB Offset=0	20.91	20.88	21.02
		RB Size=50, RB Offset=24	20.80	20.86	21.03
		RB Size=50, RB Offset=49	20.56	20.74	20.90
		RB Size=100, RB Offset=0	20.81	20.81	20.95

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	6.17	13	Pass
QPSK (100RB Size)	6.41	13	Pass
16QAM (1RB Size)	7.28	13	Pass
16QAM (100RB Size)	7.44	13	Pass

Internal Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1745.00	86.61	214	1.4	H	13.4	1.30	8.90	21.00	30
1745.00	81.03	150	1.5	V	8.5	1.30	8.90	16.10	30
3 MHz Bandwidth									
1745.00	86.27	121	1.4	H	13.1	1.30	8.90	20.70	30
1745.00	80.74	65	2.3	V	8.2	1.30	8.90	15.80	30
5 MHz Bandwidth									
1745.00	85.89	344	2.5	H	12.7	1.30	8.90	20.30	30
1745.00	80.26	57	2.0	V	7.7	1.30	8.90	15.30	30
10 MHz Bandwidth									
1745.00	86.12	147	1.5	H	13.0	1.30	8.90	20.60	30
1745.00	80.27	330	1.9	V	7.7	1.30	8.90	15.30	30
15 MHz Bandwidth									
1745.00	85.77	9	1.6	H	12.6	1.30	8.90	20.20	30
1745.00	80.33	289	1.3	V	7.8	1.30	8.90	15.40	30
20 MHz Bandwidth									
1745.00	85.69	208	2.0	H	12.5	1.30	8.90	20.10	30
1745.00	80.41	326	1.1	V	7.8	1.30	8.90	15.40	30

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1745.00	86.83	115	1.7	H	13.7	1.30	8.90	21.30	30
1745.00	81.26	194	1.1	V	8.7	1.30	8.90	16.30	30
3 MHz Bandwidth									
1745.00	86.53	325	2.1	H	13.4	1.30	8.90	21.00	30
1745.00	80.86	32	2.1	V	8.3	1.30	8.90	15.90	30
5 MHz Bandwidth									
1745.00	85.63	172	2.2	H	12.5	1.30	8.90	20.10	30
1745.00	80.54	257	1.6	V	8.0	1.30	8.90	15.60	30
10 MHz Bandwidth									
1745.00	85.37	73	1.6	H	12.2	1.30	8.90	19.80	30
1745.00	80.49	207	1.4	V	7.9	1.30	8.90	15.50	30
15 MHz Bandwidth									
1745.00	86.13	301	1.0	H	13.0	1.30	8.90	20.60	30
1745.00	80.67	216	1.2	V	8.1	1.30	8.90	15.70	30
20 MHz Bandwidth									
1745.00	85.93	250	2.2	H	12.8	1.30	8.90	20.40	30
1745.00	80.66	326	2.0	V	8.1	1.30	8.90	15.70	30

External Antenna:

QPSK:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1745.00	81.33	25	2.1	H	8.2	1.30	8.90	15.80	30
1745.00	86.27	178	2.3	V	13.7	1.30	8.90	21.30	30
3 MHz Bandwidth									
1745.00	80.93	174	2.0	H	7.8	1.30	8.90	15.40	30
1745.00	85.84	197	1.5	V	13.3	1.30	8.90	20.90	30
5 MHz Bandwidth									
1745.00	80.77	65	1.8	H	7.6	1.30	8.90	15.20	30
1745.00	85.44	193	2.4	V	12.9	1.30	8.90	20.50	30
10 MHz Bandwidth									
1745.00	81.13	44	1.4	H	8.0	1.30	8.90	15.60	30
1745.00	86.11	95	2.3	V	13.5	1.30	8.90	21.10	30
15 MHz Bandwidth									
1745.00	80.53	86	1.1	H	7.4	1.30	8.90	15.00	30
1745.00	85.79	156	1.6	V	13.2	1.30	8.90	20.80	30
20 MHz Bandwidth									
1745.00	80.50	149	1.1	H	7.3	1.30	8.90	14.90	30
1745.00	85.48	227	1.7	V	12.9	1.30	8.90	20.50	30

16QAM:

Frequency (MHz)	Receiver Reading (dBµV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1745.00	81.03	338	2.0	H	7.9	1.30	8.90	15.50	30
1745.00	85.69	235	1.2	V	13.1	1.30	8.90	20.70	30
3 MHz Bandwidth									
1745.00	80.83	104	1.7	H	7.7	1.30	8.90	15.30	30
1745.00	85.46	14	1.4	V	12.9	1.30	8.90	20.50	30
5 MHz Bandwidth									
1745.00	80.59	310	1.2	H	7.4	1.30	8.90	15.00	30
1745.00	85.39	167	2.1	V	12.8	1.30	8.90	20.40	30
10 MHz Bandwidth									
1745.00	80.19	213	1.0	H	7.0	1.30	8.90	14.60	30
1745.00	84.99	328	2.2	V	12.4	1.30	8.90	20.00	30
15 MHz Bandwidth									
1745.00	80.71	227	2.4	H	7.5	1.30	8.90	15.10	30
1745.00	85.26	180	2.5	V	12.7	1.30	8.90	20.30	30
20 MHz Bandwidth									
1745.00	80.45	283	1.8	H	7.3	1.30	8.90	14.90	30
1745.00	85.62	197	1.2	V	13.1	1.30	8.90	20.70	30

Note:
All above data were tested with no amplifier
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

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

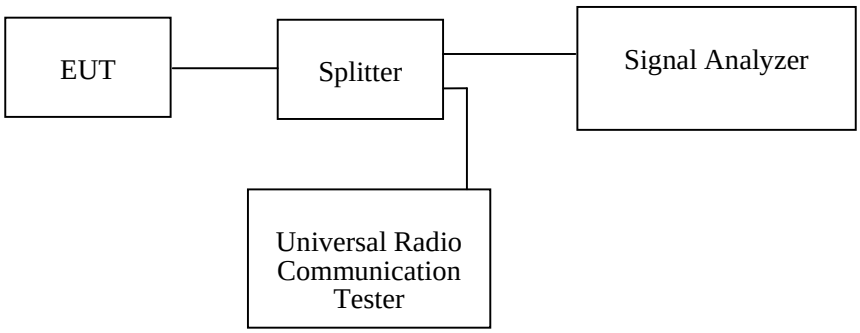
Applicable Standard

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:	24~25 ℃
Relative Humidity:	51~52 %
ATM Pressure:	101.0~101.2 kPa

The testing was performed by Kiki Kong from 2018-10-24 to 2018-11-07.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables and plots.

Cellular Band (Part 22H)

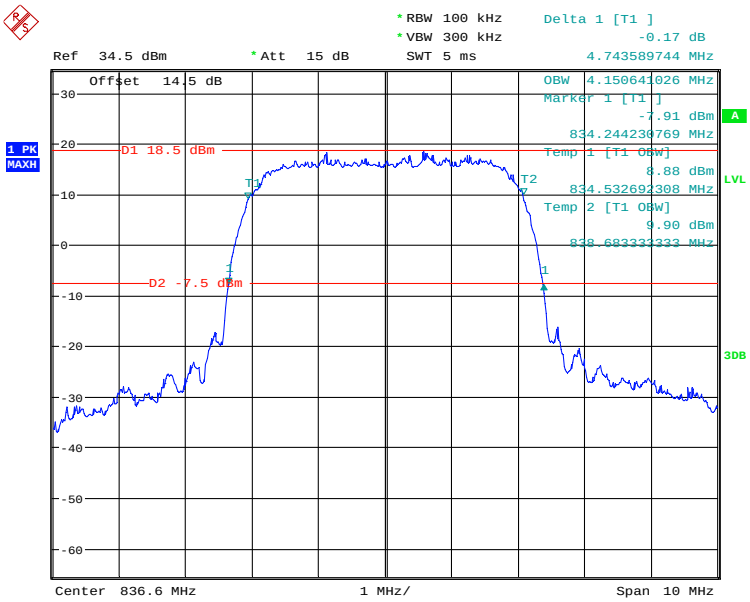
Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	836.6	4.151	4.744
HSUPA (BPSK)	836.6	4.167	4.744
HSDPA (16QAM)	836.6	4.167	4.744

PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	1880.0	4.119	4.712
HSUPA (BPSK)	1880.0	4.135	4.712
HSDPA (16QAM)	1880.0	4.135	4.712

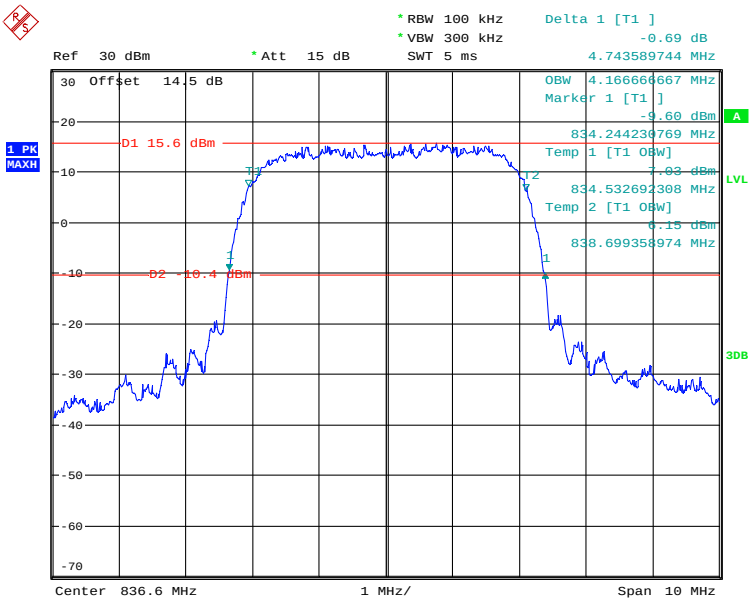
Cellular Band (Part 22H)

26 dB Emissions &99% Occupied Bandwidth for RMC (BPSK) Mode



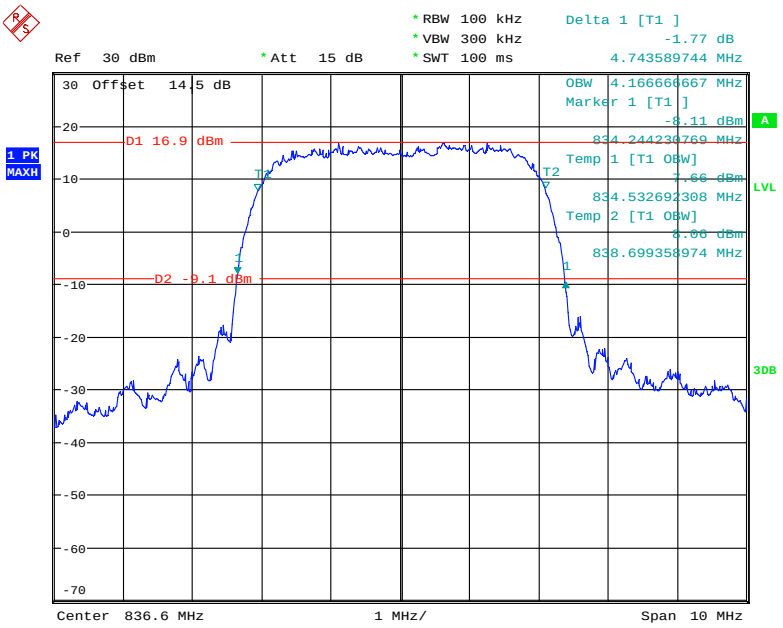
Date: 24.OCT.2018 19:42:05

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



Date: 24.OCT.2018 20:12:20

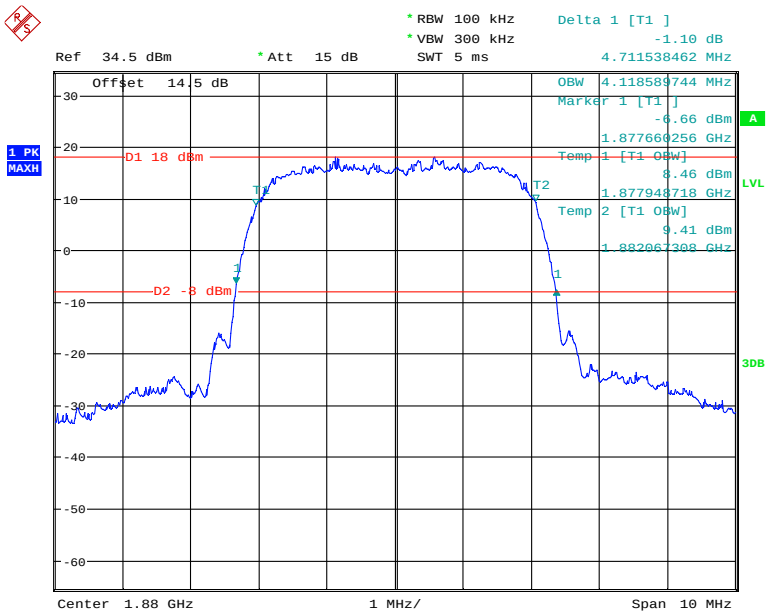
26 dB Emissions &99% Occupied Bandwidth for HSDPA (16QAM) Mode



Date: 24.OCT.2018 20:40:25

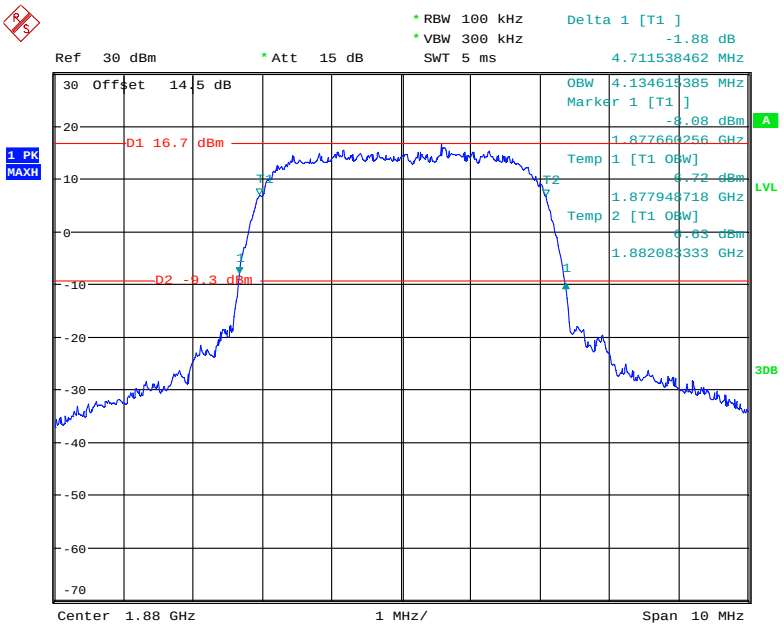
PCS Band (Part 24E)

26 dB Emissions &99% Occupied Bandwidth for RMC (BPSK) Mode



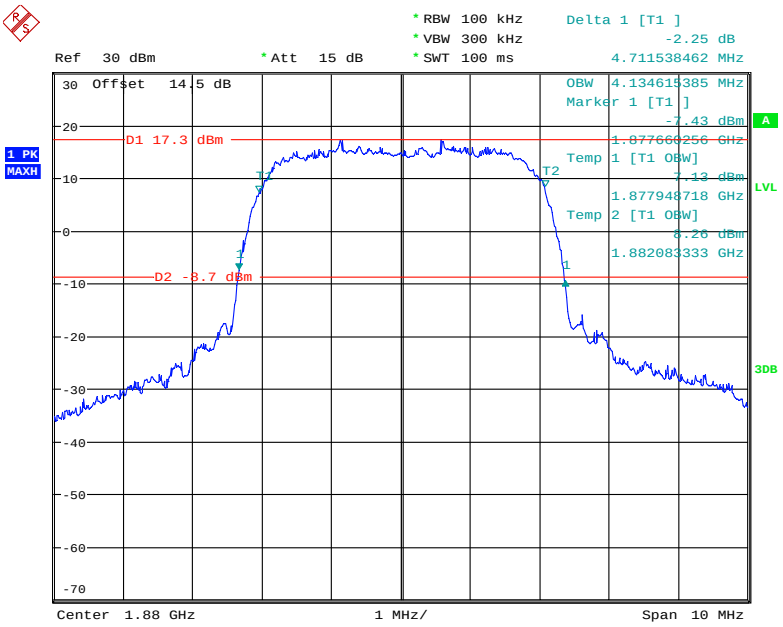
Date: 24.OCT.2018 19:46:27

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



Date: 24.OCT.2018 20:10:04

26 dB Emissions &99% Occupied Bandwidth for HSDPA (16QAM) Mode

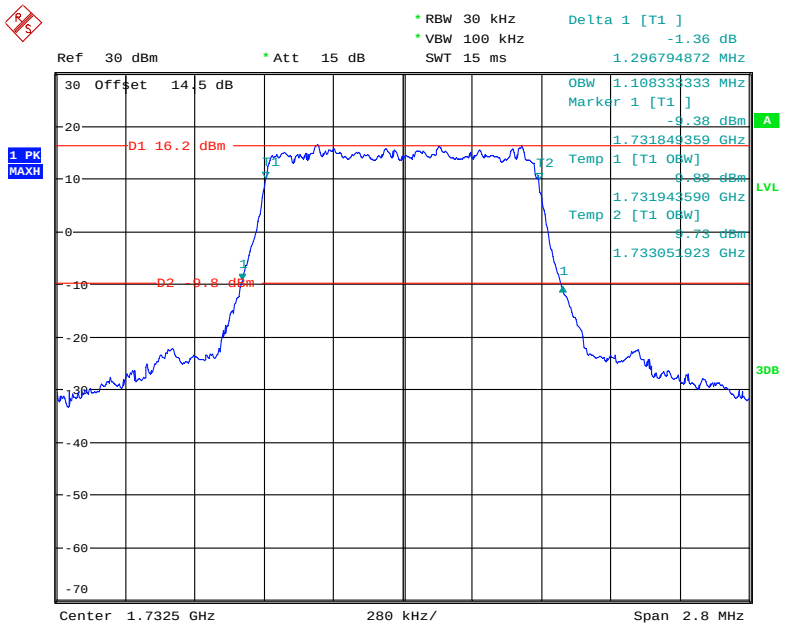


Date: 24.OCT.2018 20:41:44

LTE Band 4: (Middle Channel)

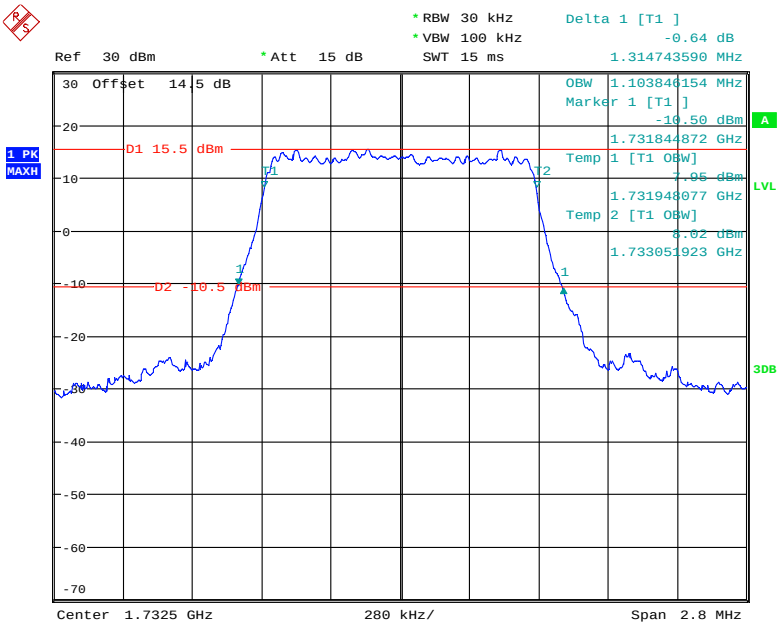
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
1.4	QPSK	1.108	1.297
	16QAM	1.104	1.315
3.0	QPSK	2.702	2.939
	16QAM	2.692	2.958
5.0	QPSK	4.535	5.016
	16QAM	4.519	5.010
10.0	QPSK	8.942	9.776
	16QAM	8.942	9.615
15.0	QPSK	13.462	14.439
	16QAM	13.365	14.567
20.0	QPSK	17.885	18.990
	16QAM	17.821	19.103

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



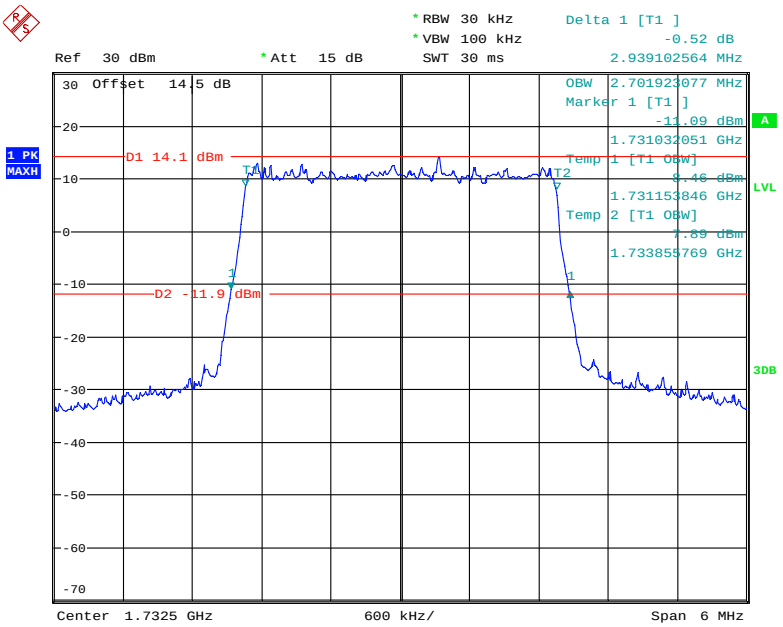
Date: 25.OCT.2018 00:18:20

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



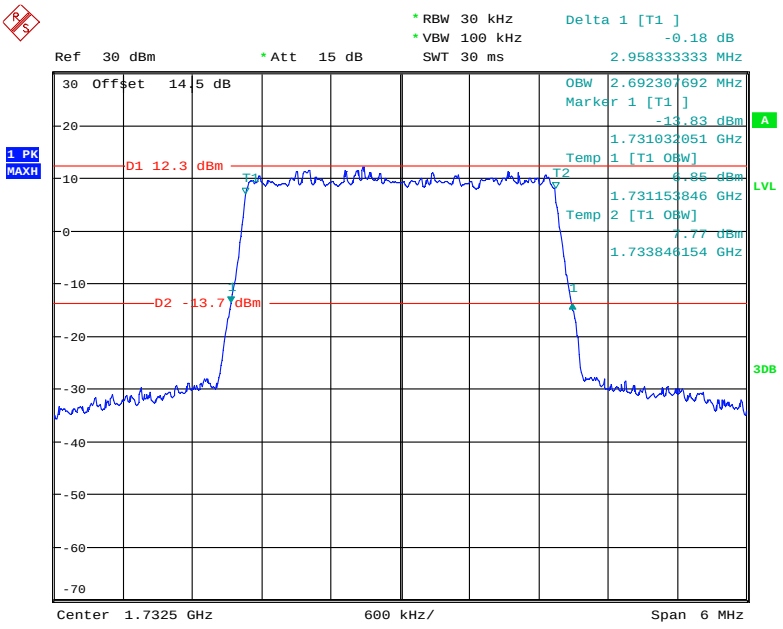
Date: 25.OCT.2018 00:17:29

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



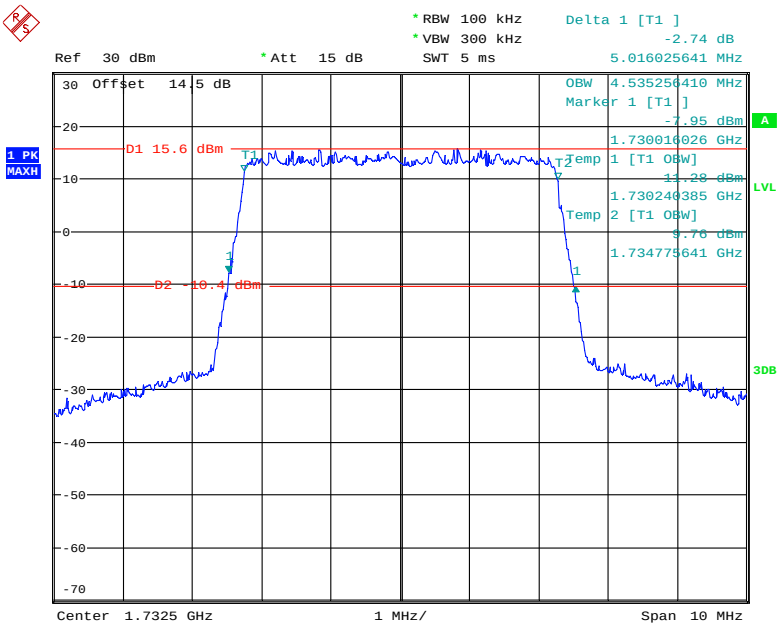
Date: 25.OCT.2018 00:20:24

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



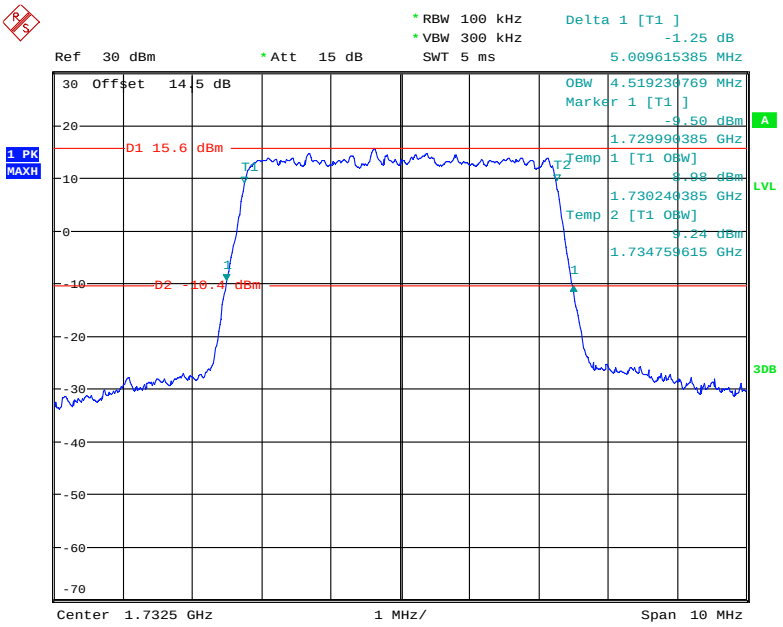
Date: 25.OCT.2018 00:19:23

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



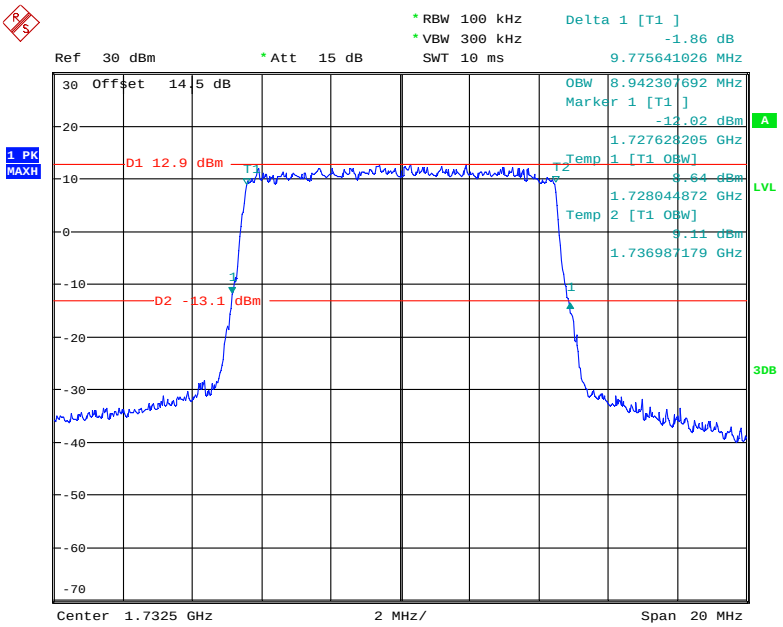
Date: 25.OCT.2018 00:24:05

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



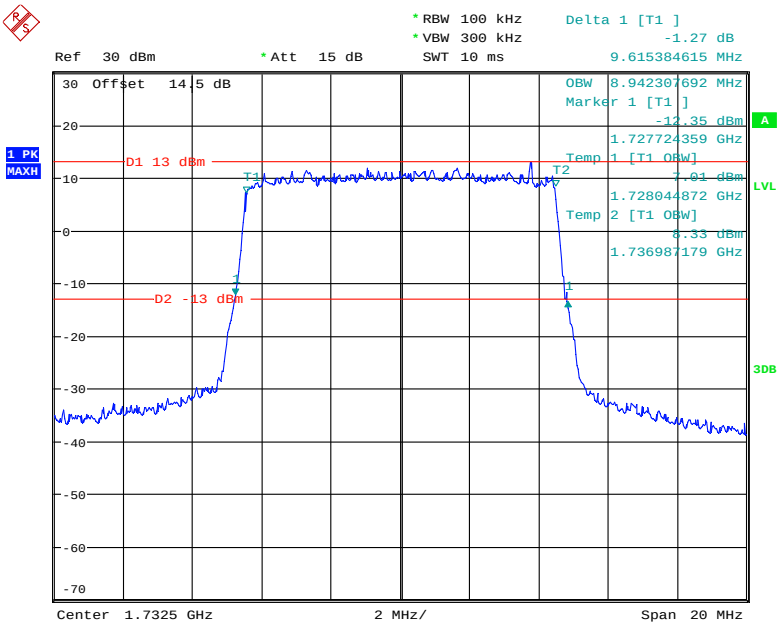
Date: 25.OCT.2018 00:23:17

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



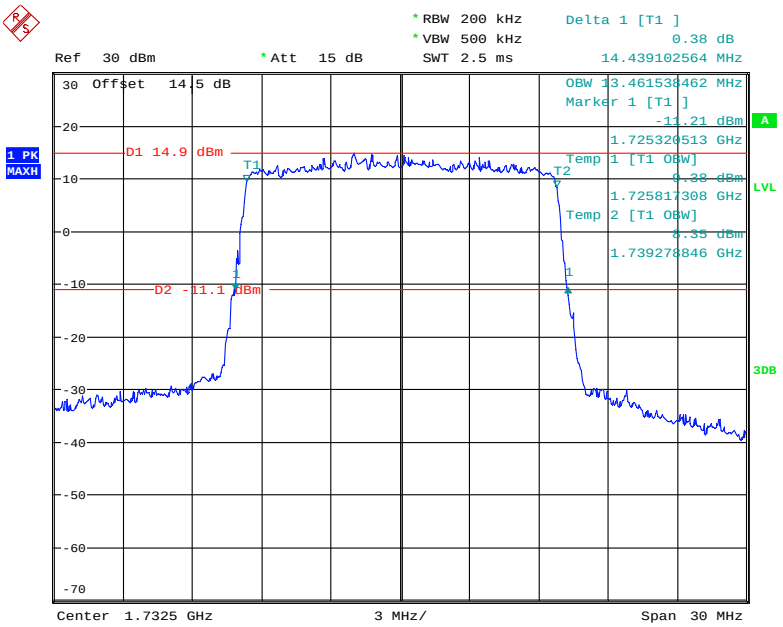
Date: 25.OCT.2018 00:26:08

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



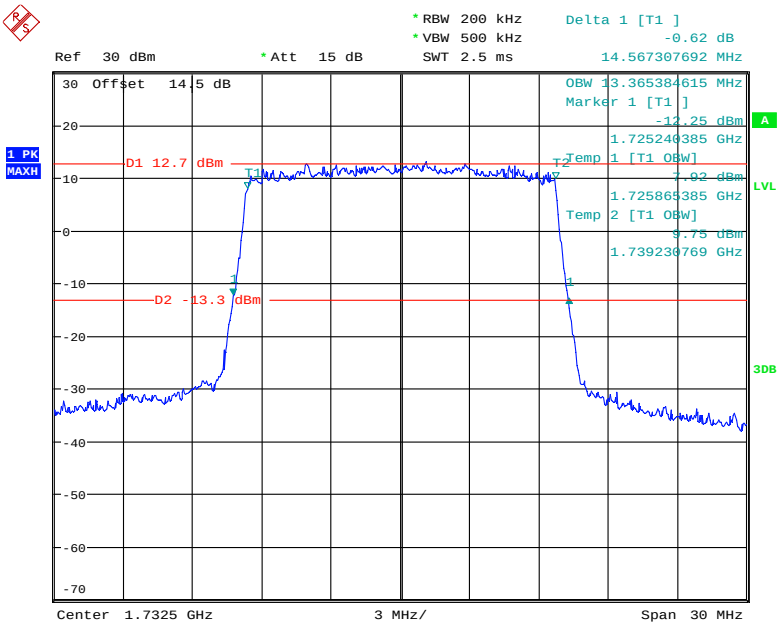
Date: 25.OCT.2018 00:25:03

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



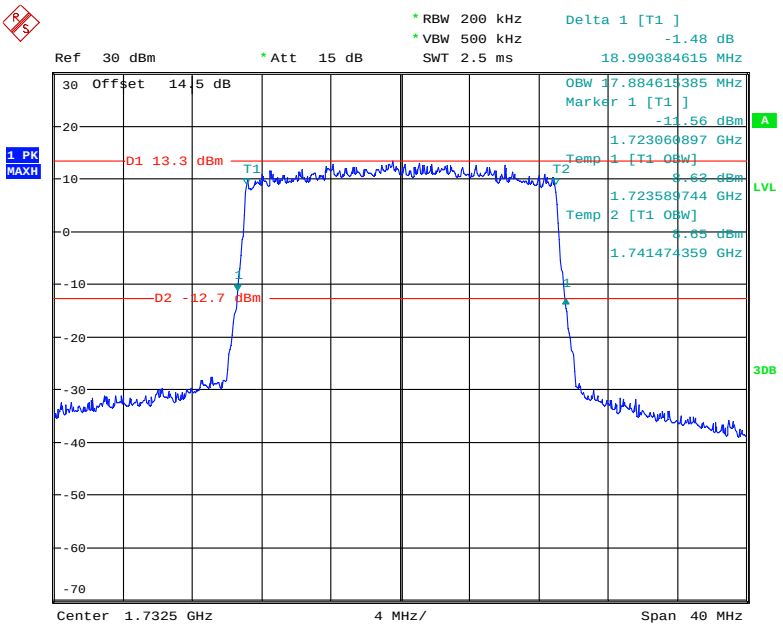
Date: 25.OCT.2018 00:27:35

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



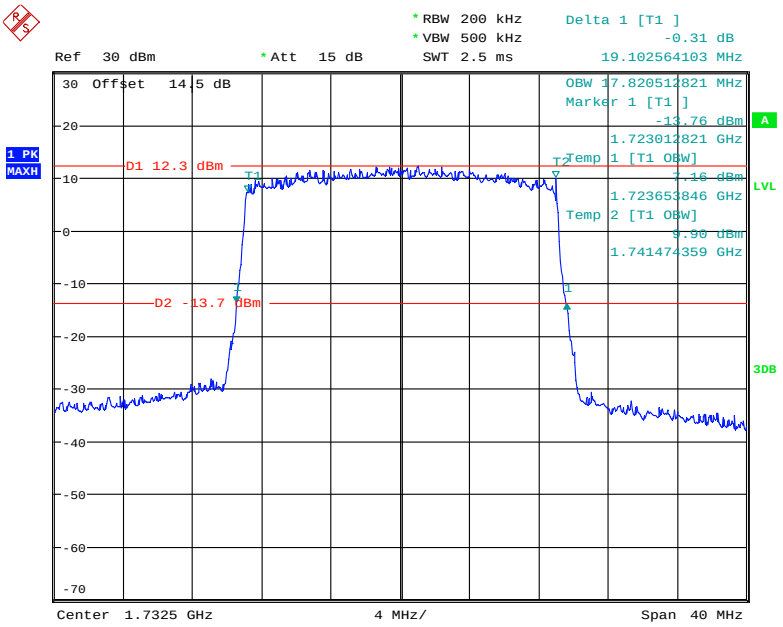
Date: 25.OCT.2018 00:28:38

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



Date: 25.OCT.2018 00:29:33

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

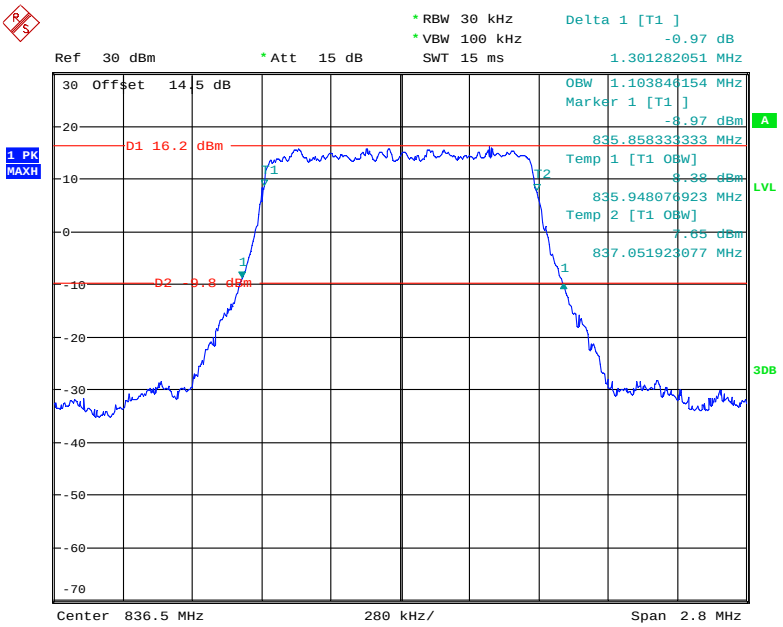


Date: 25.OCT.2018 00:30:37

LTE Band 5: (Middle Channel)

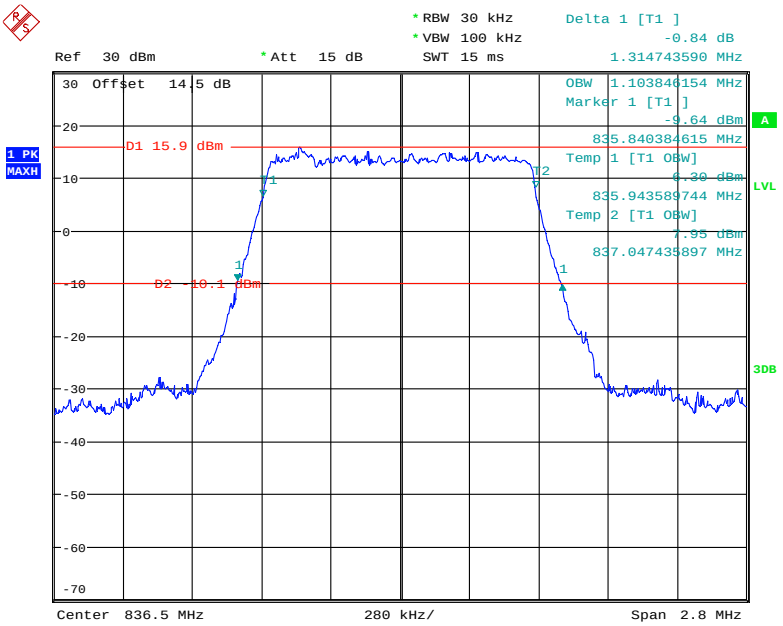
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
1.4	QPSK	1.104	1.301
	16QAM	1.104	1.315
3.0	QPSK	2.692	2.942
	16QAM	2.702	2.981
5.0	QPSK	4.503	5.000
	16QAM	4.519	5.048
10.0	QPSK	8.942	9.744
	16QAM	8.942	9.647

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



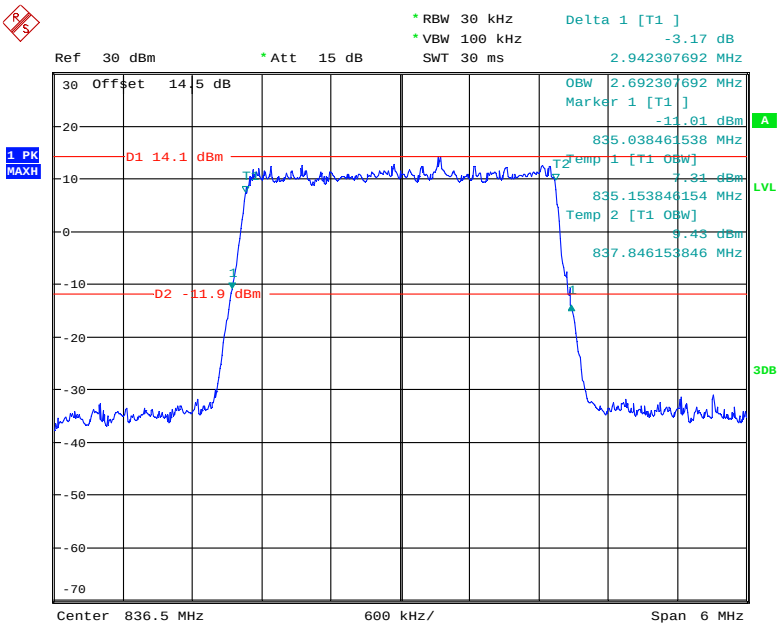
Date: 25.OCT.2018 00:14:18

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



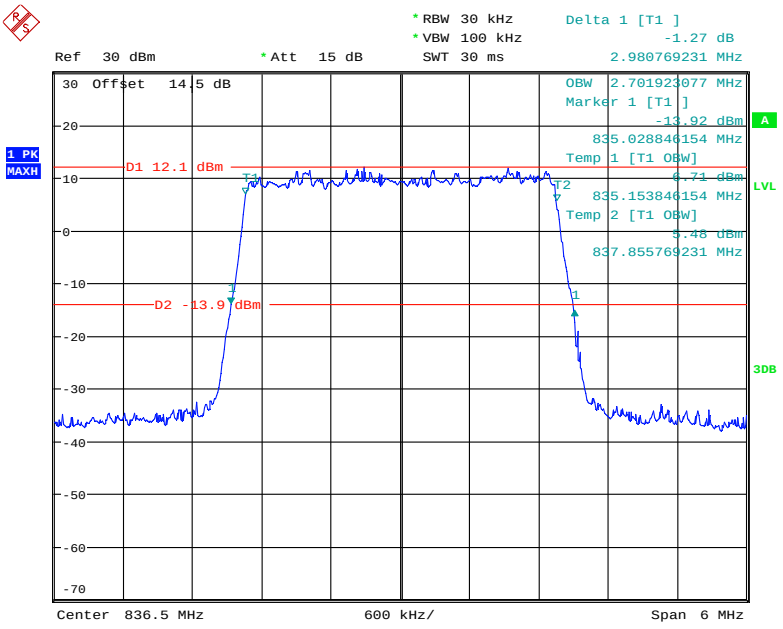
Date: 25.OCT.2018 00:15:27

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



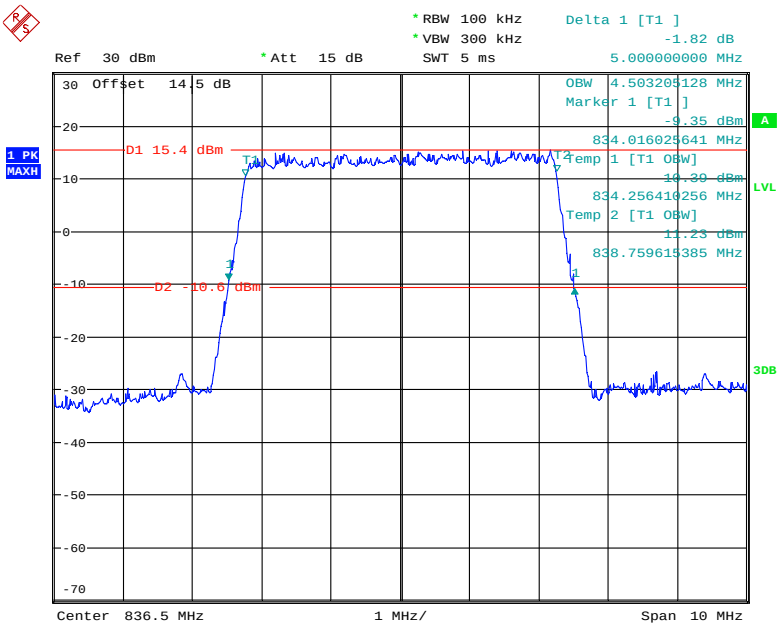
Date: 25.OCT.2018 00:11:43

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



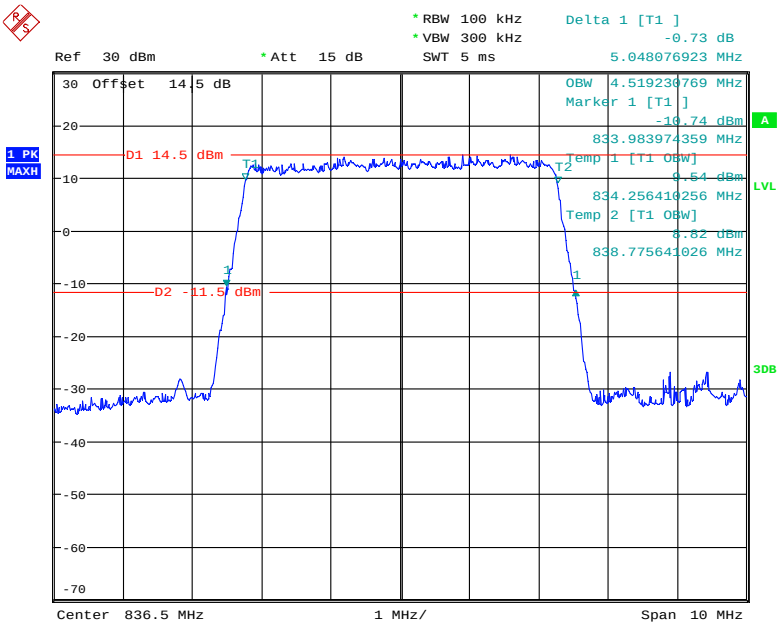
Date: 25.OCT.2018 00:12:46

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



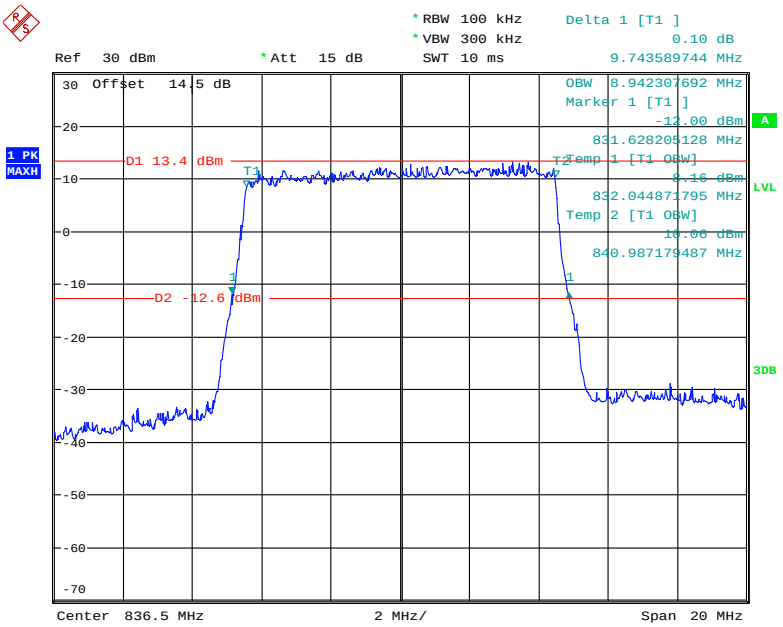
Date: 25.OCT.2018 00:06:47

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



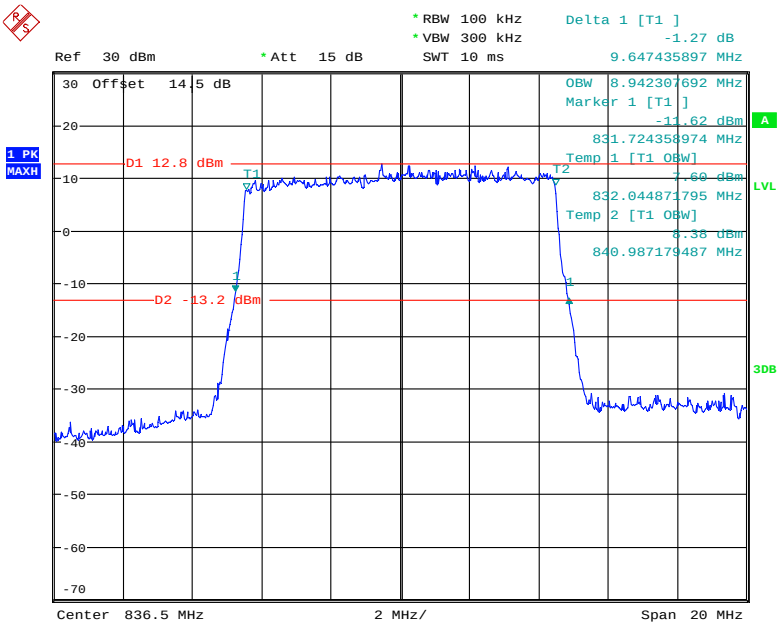
Date: 25.OCT.2018 00:08:05

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



Date: 25.OCT.2018 00:09:28

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

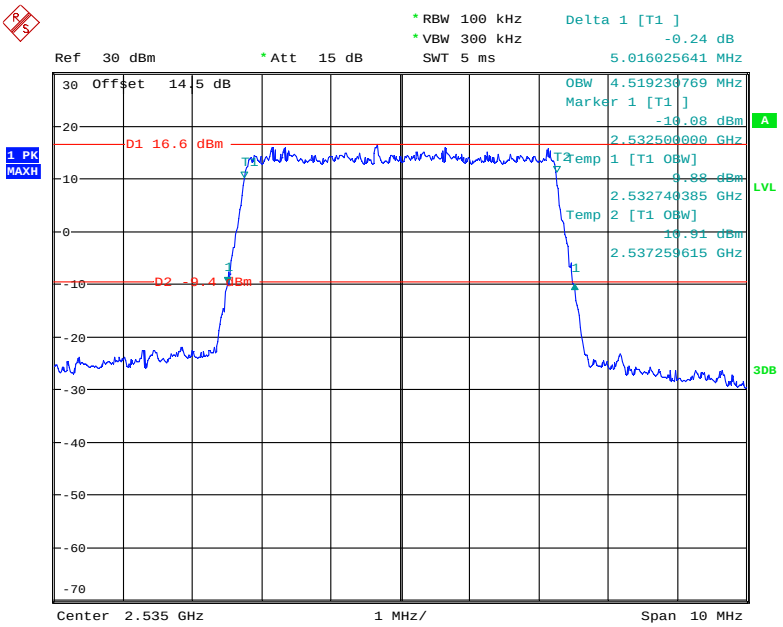


Date: 25.OCT.2018 00:32:47

LTE Band 7: (Middle Channel)

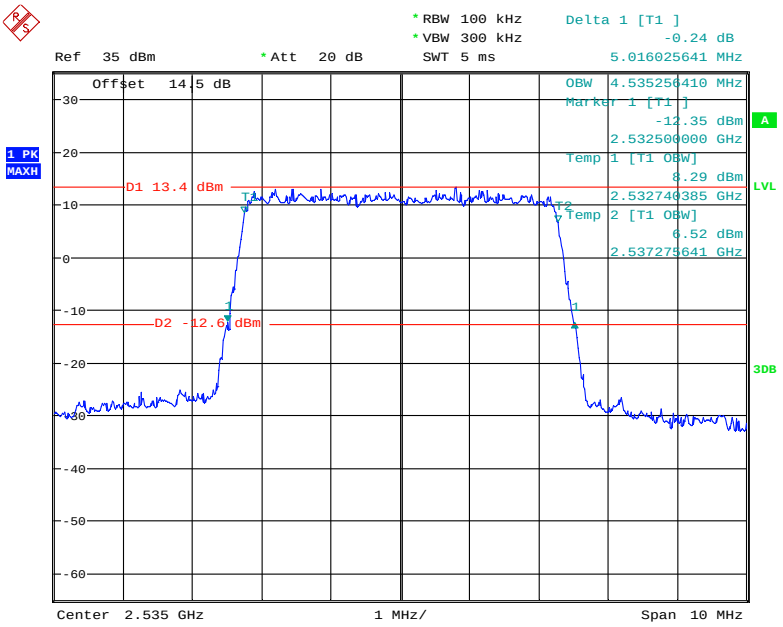
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
5.0	QPSK	4.519	5.016
	16QAM	4.535	5.016
10.0	QPSK	8.974	9.744
	16QAM	8.942	9.647
15.0	QPSK	13.510	14.567
	16QAM	13.413	14.519
20.0	QPSK	17.885	19.167
	16QAM	17.885	19.103

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



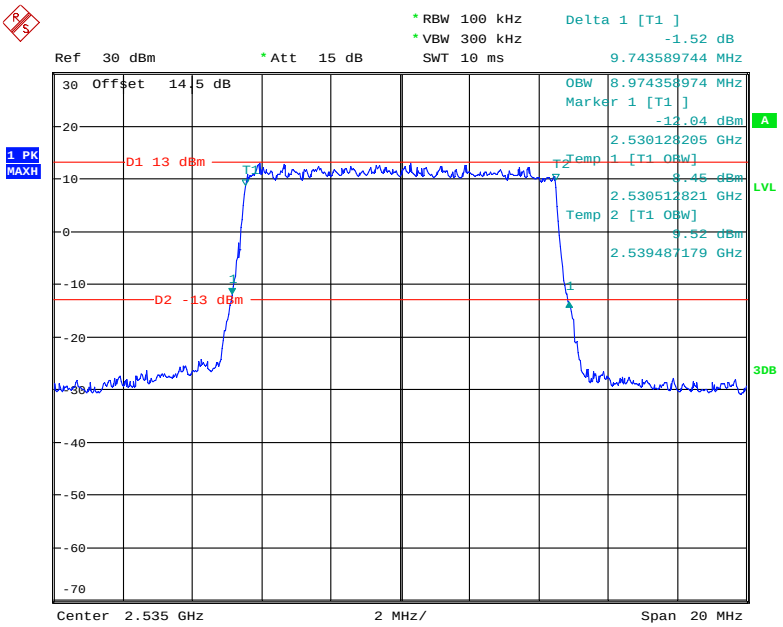
Date: 24.OCT.2018 23:54:48

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



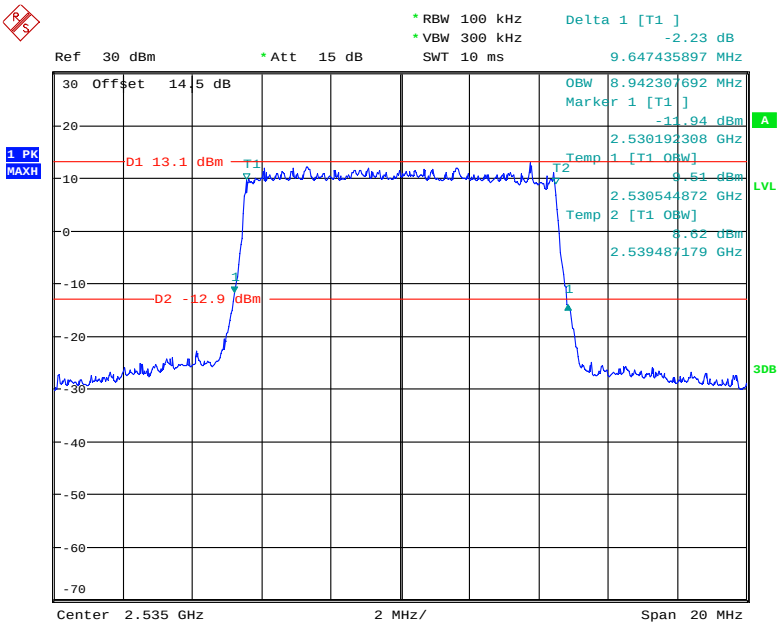
Date: 7.NOV.2018 14:35:29

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



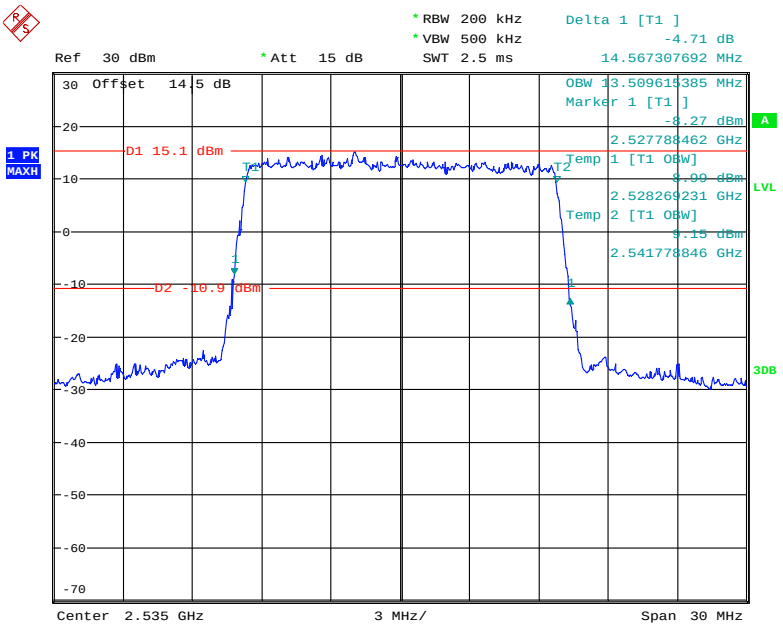
Date: 24.OCT.2018 23:57:11

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



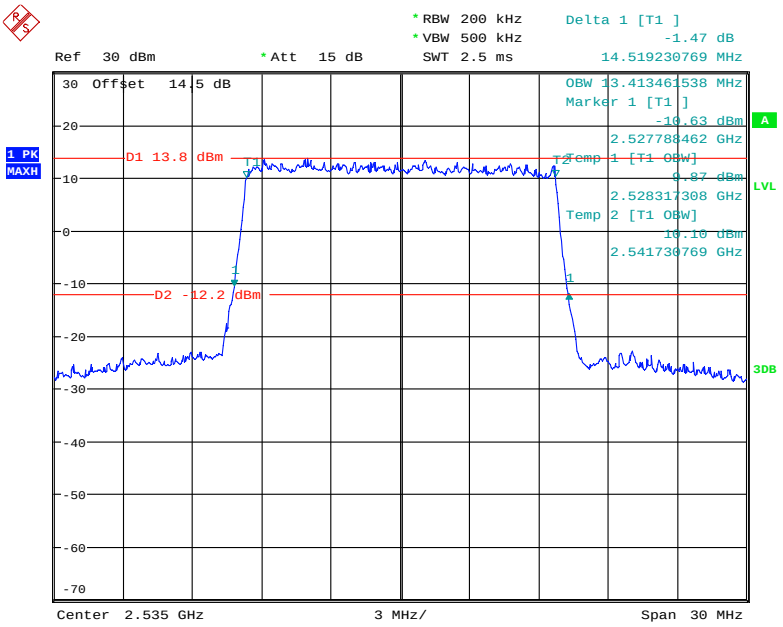
Date: 24.OCT.2018 23:56:08

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



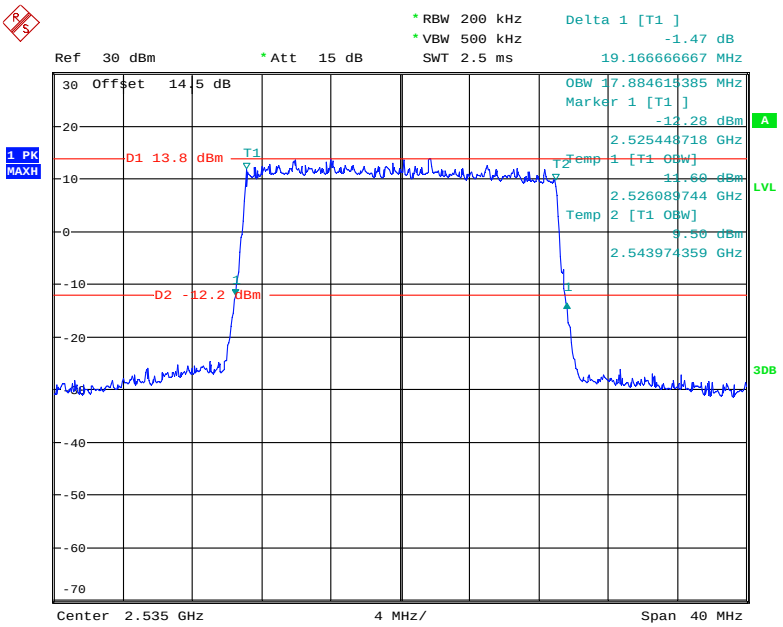
Date: 25.OCT.2018 00:01:18

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



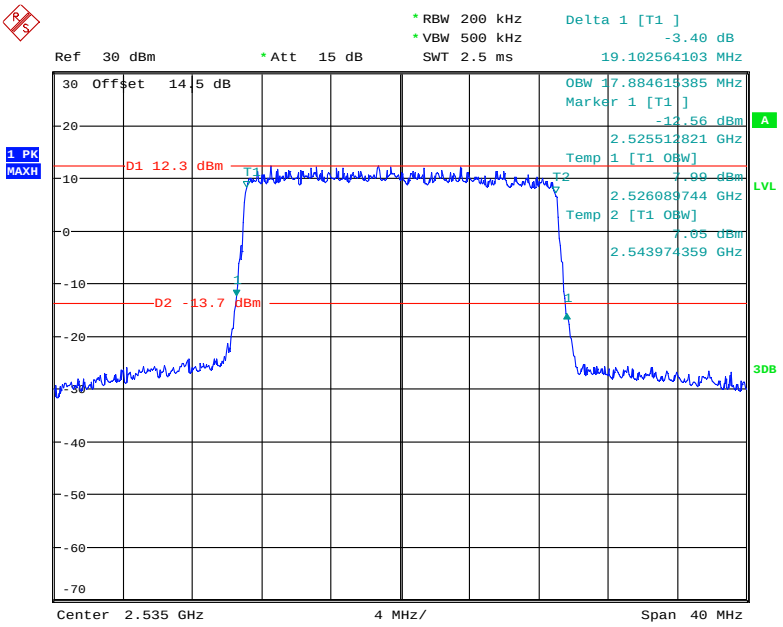
Date: 24.OCT.2018 23:59:24

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



Date: 25.OCT.2018 00:04:51

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

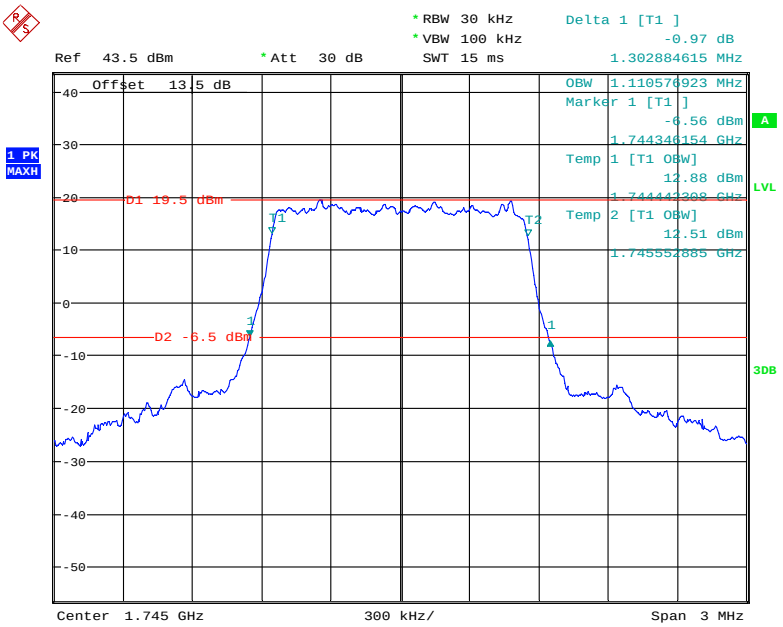


Date: 25.OCT.2018 00:03:33

LTE Band 66: (Middle Channel)

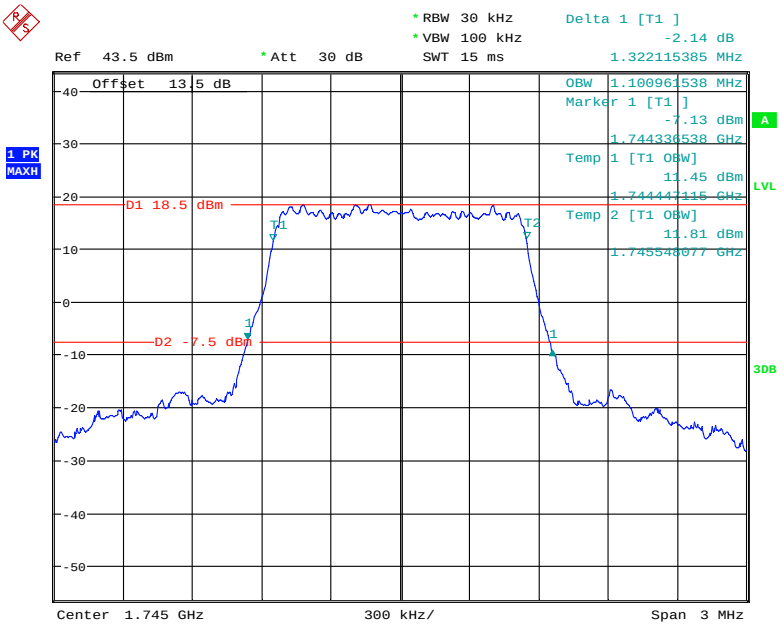
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
1.4	QPSK	1.111	1.303
	16QAM	1.101	1.322
3.0	QPSK	2.692	2.942
	16QAM	2.692	2.971
5.0	QPSK	4.535	5.064
	16QAM	4.519	5.032
10.0	QPSK	8.974	9.808
	16QAM	8.974	9.744
15.0	QPSK	13.462	14.712
	16QAM	13.413	14.615
20.0	QPSK	17.885	19.167
	16QAM	17.949	19.231

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



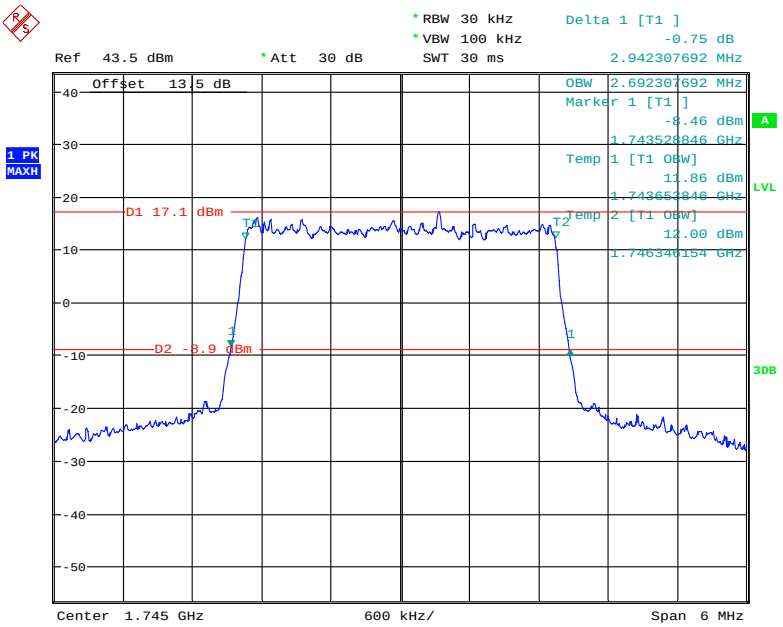
Date: 30.OCT.2018 22:56:05

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



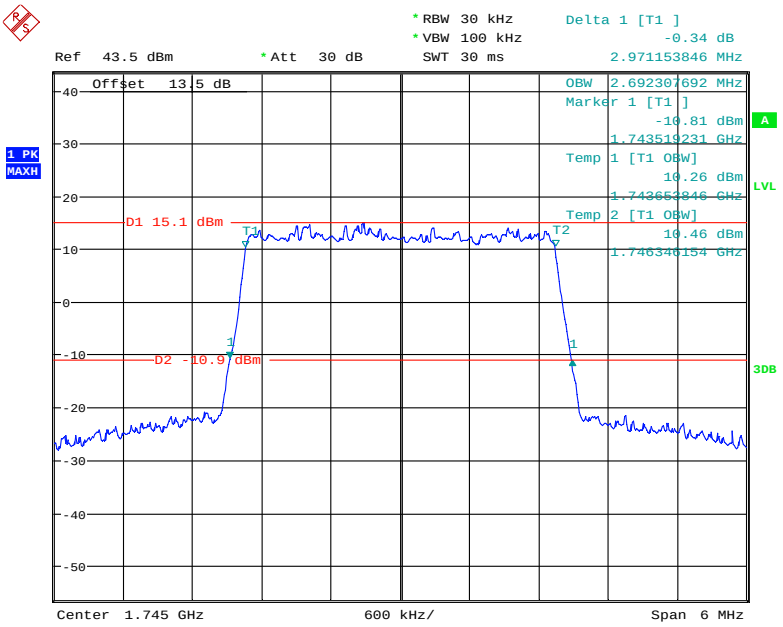
Date: 30.OCT.2018 22:58:15

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



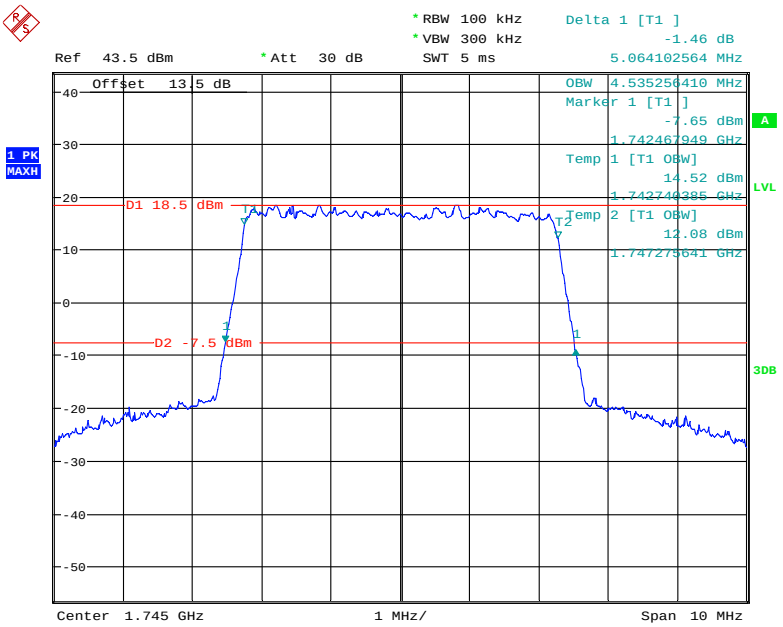
Date: 30.OCT.2018 23:00:28

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



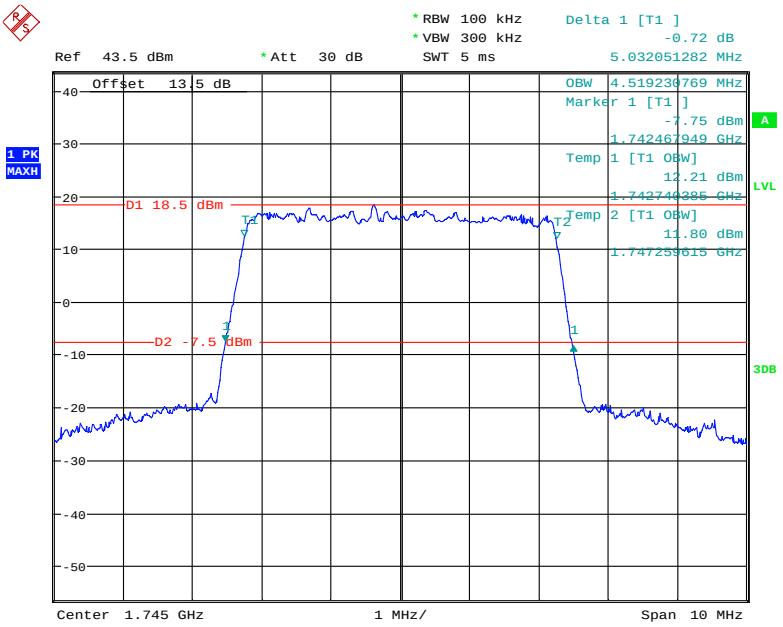
Date: 30.OCT.2018 23:02:08

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



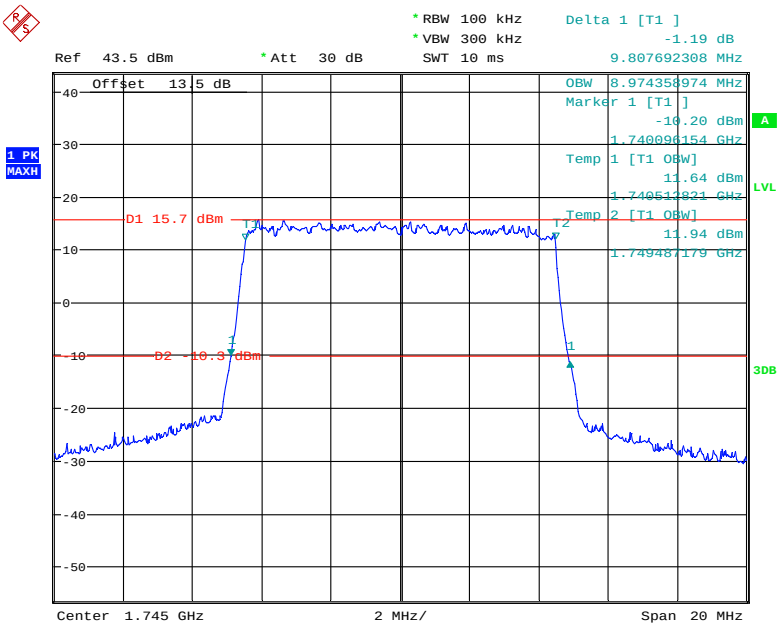
Date: 30.OCT.2018 23:04:23

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



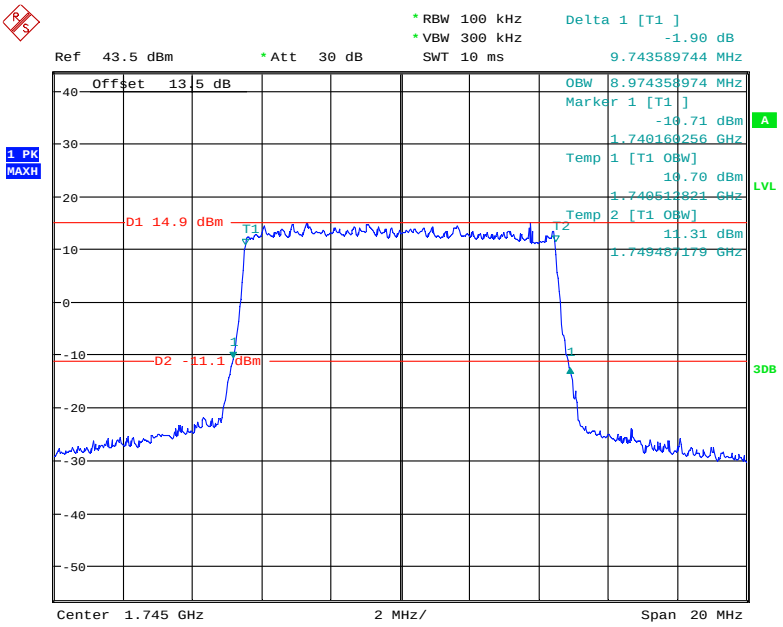
Date: 30.OCT.2018 23:06:03

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



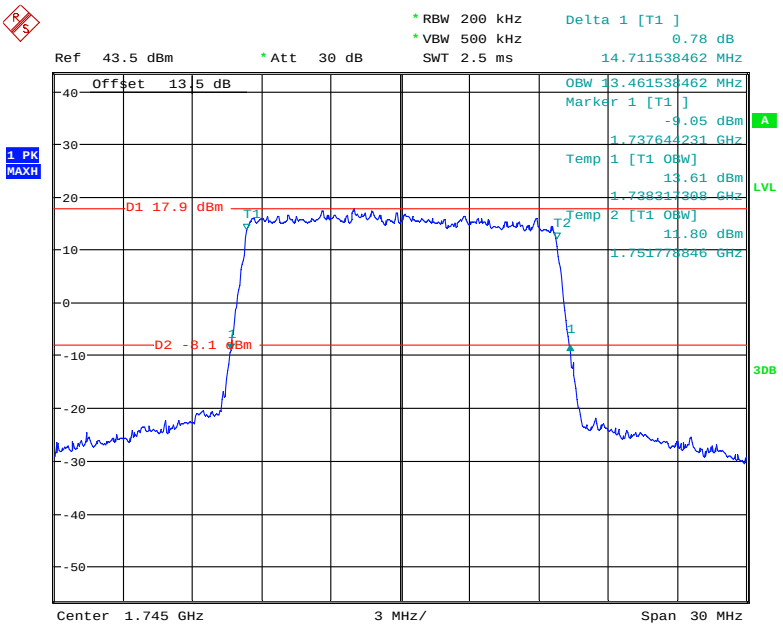
Date: 30.OCT.2018 23:08:26

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



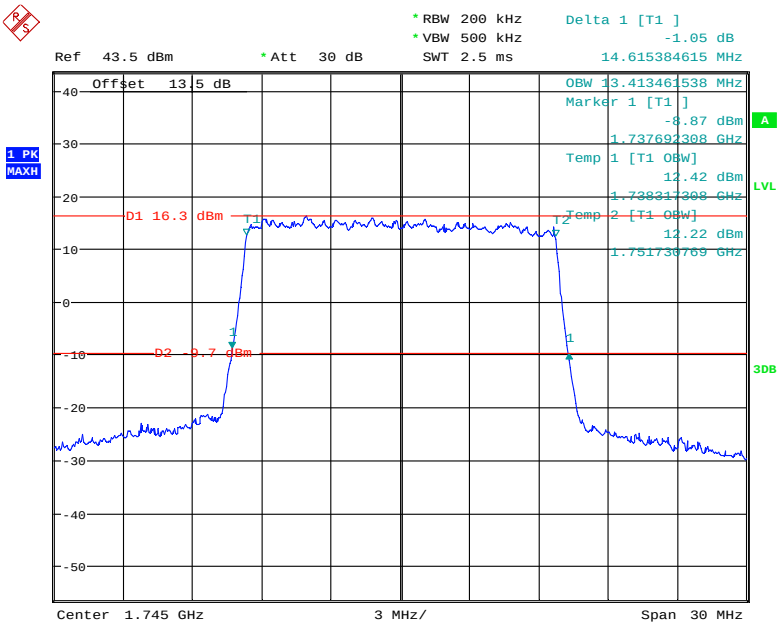
Date: 30.OCT.2018 23:10:16

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



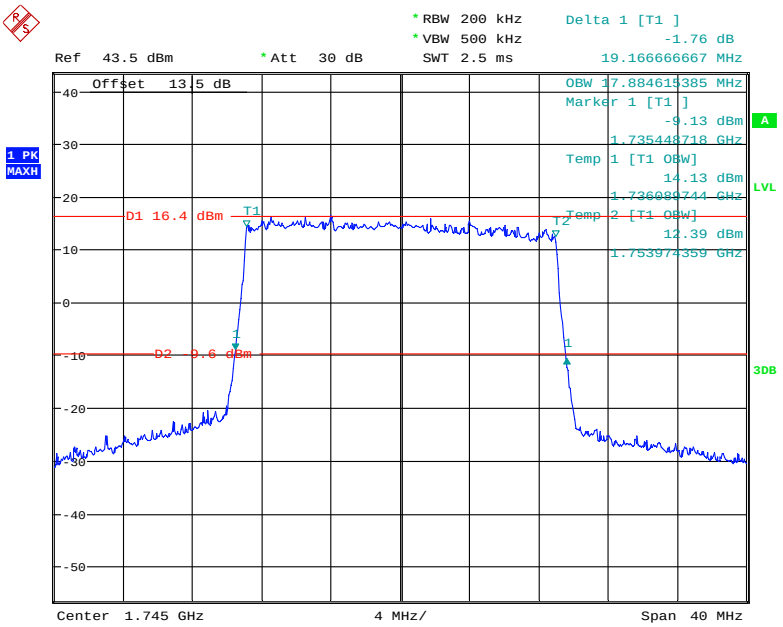
Date: 30.OCT.2018 23:13:54

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



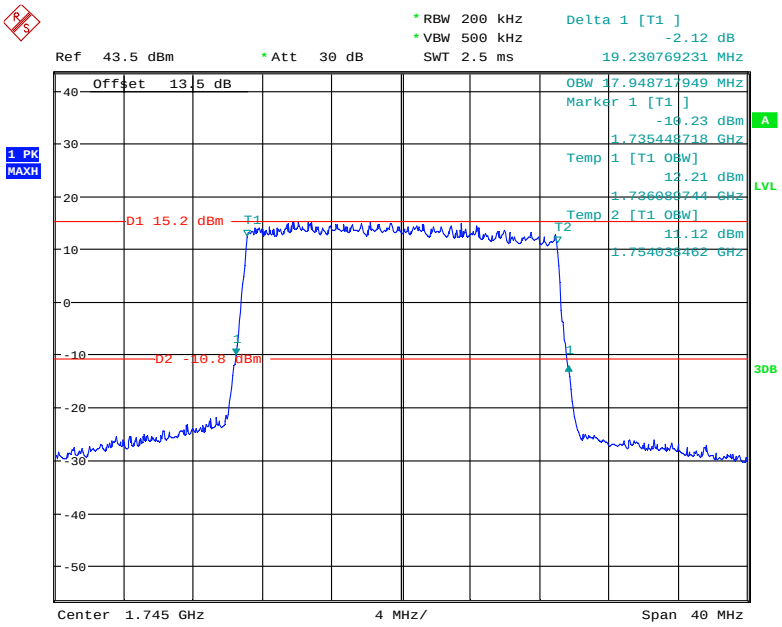
Date: 30.OCT.2018 23:17:27

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



Date: 30.OCT.2018 23:19:31

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



Date: 30.OCT.2018 23:21:51

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

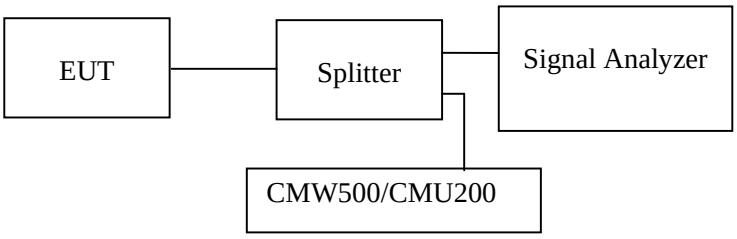
Applicable Standard

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

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

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

Temperature:	25~26 ℃
Relative Humidity:	52~54 %
ATM Pressure:	101.0 kPa

The testing was performed by Kiki Kong from 2018-10-24 to 2018-10-30.

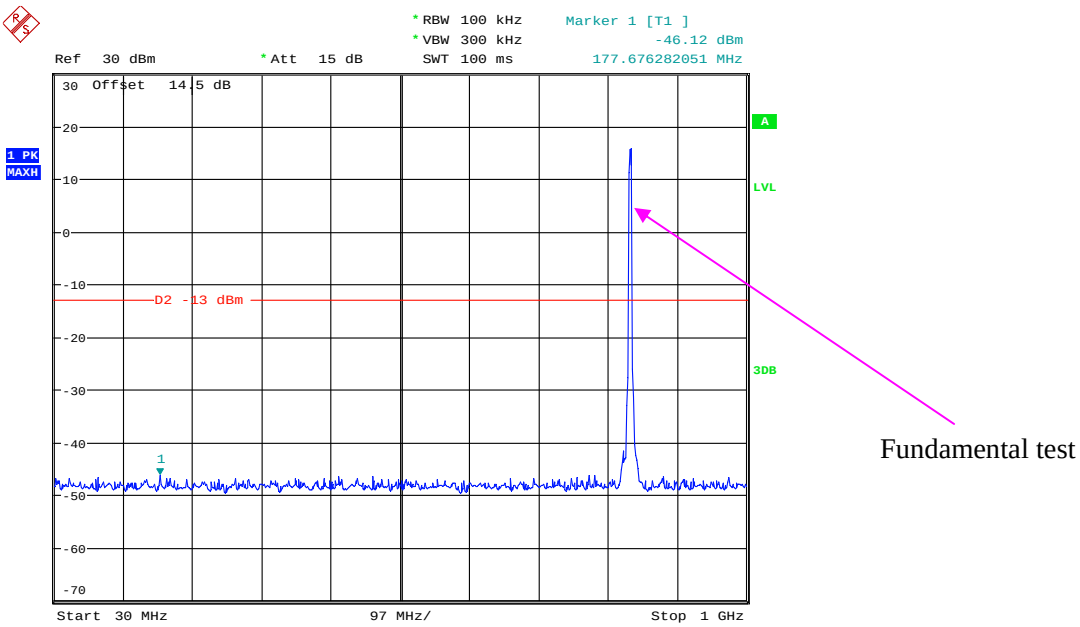
Test result: Compliance.

EUT operation mode: transmitting

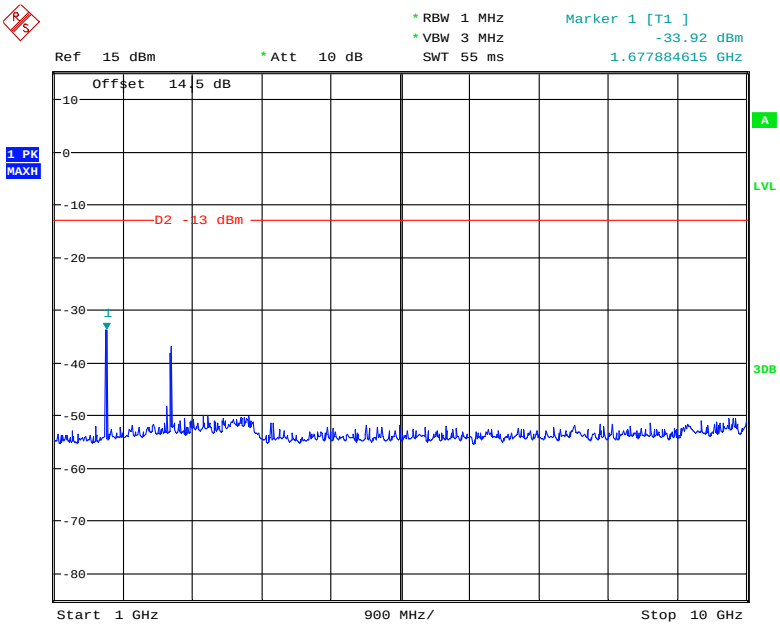
Please refer to the following plots.

Cellular Band (Part 22H)

30 MHz – 1 GHz (WCDMA Mode)



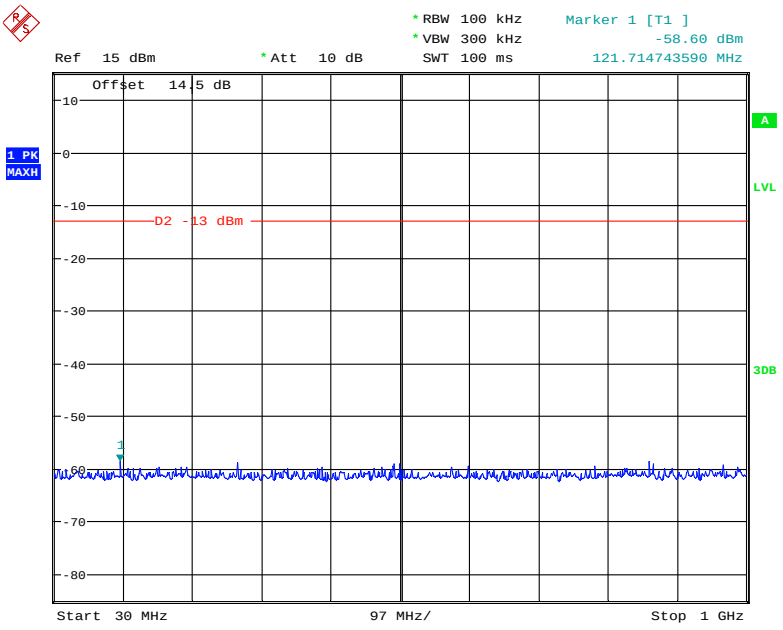
1 GHz – 10 GHz (WCDMA Mode)



Date: 24.OCT.2018 19:58:04

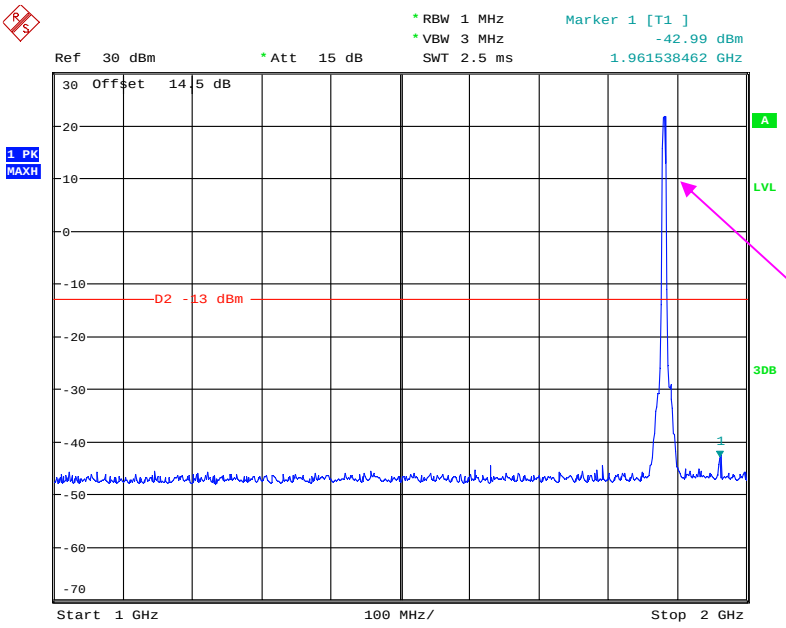
PCS Band (Part 24E)

30 MHz – 1 GHz (WCDMA Mode)



Date: 24.OCT.2018 20:03:04

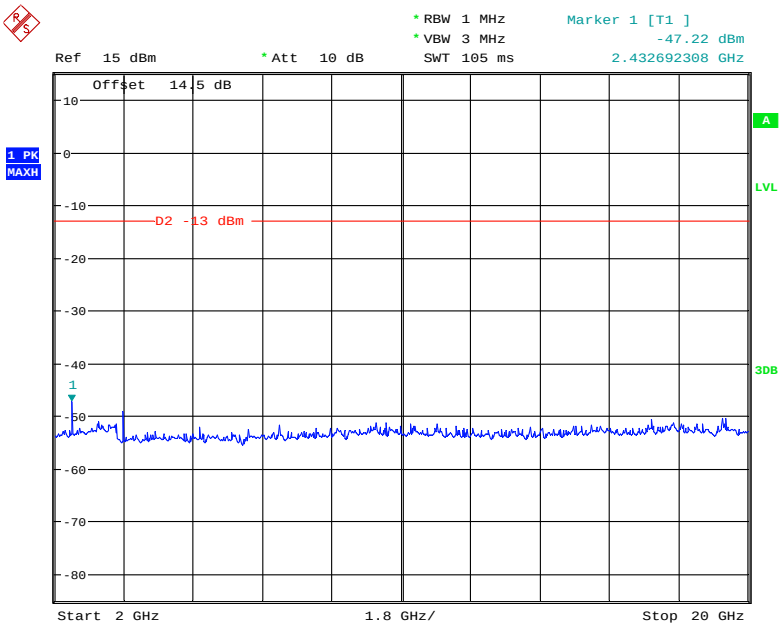
1 GHz – 2 GHz (WCDMA Mode)



Fundamental test

Date: 24.OCT.2018 20:04:55

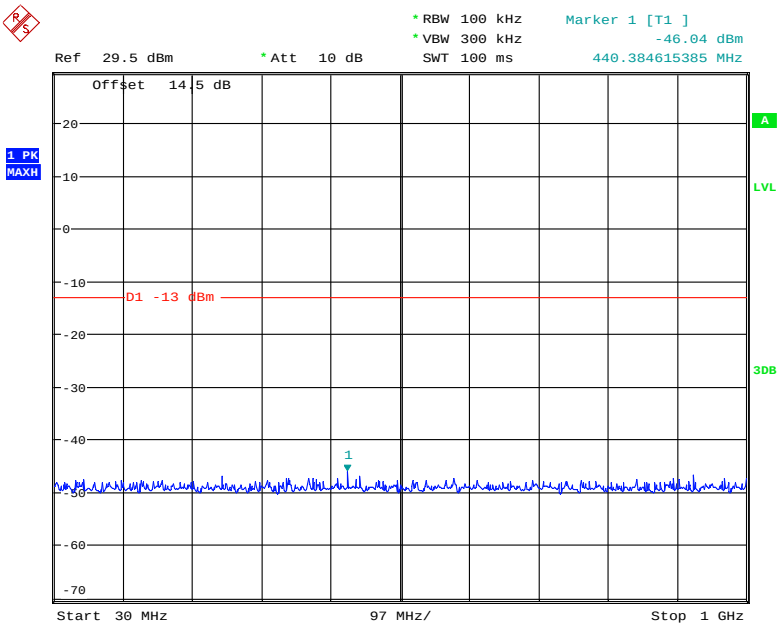
2 GHz – 20 GHz (WCDMA Mode)



Date: 24.OCT.2018 20:02:24

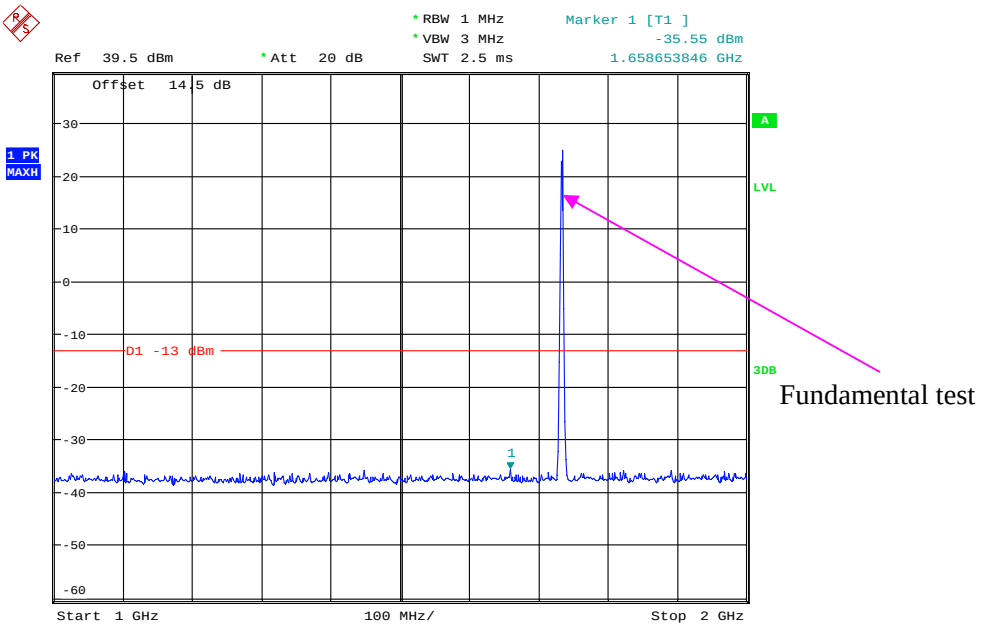
LTE Band 4(QPSK):

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



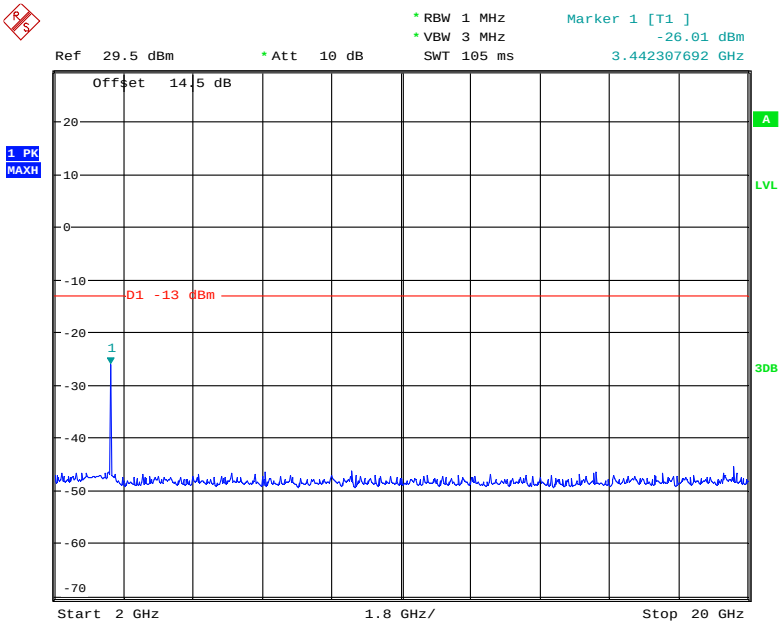
Date: 25.OCT.2018 23:24:01

1 GHz – 2 GHz (1.4 MHz, Middle Channel)



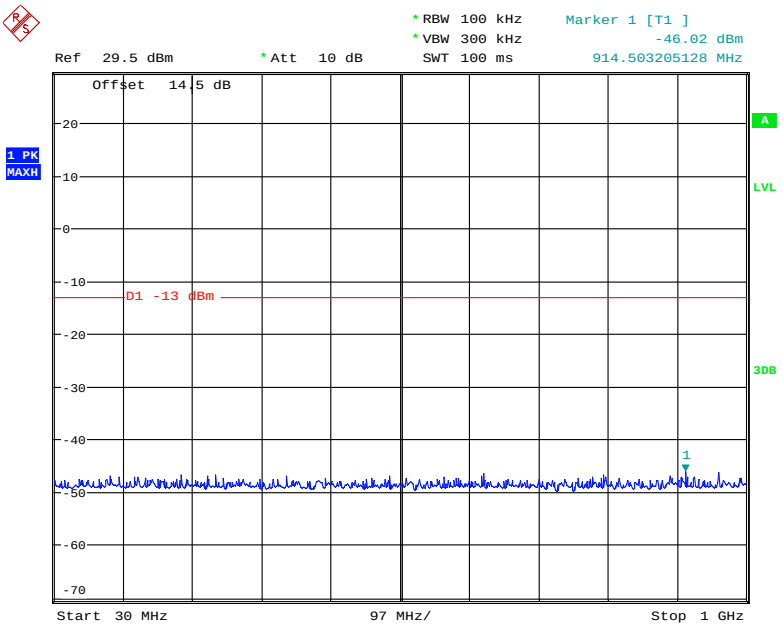
Date: 25.OCT.2018 23:26:08

2 GHz – 20 GHz (1.4 MHz, Middle Channel)



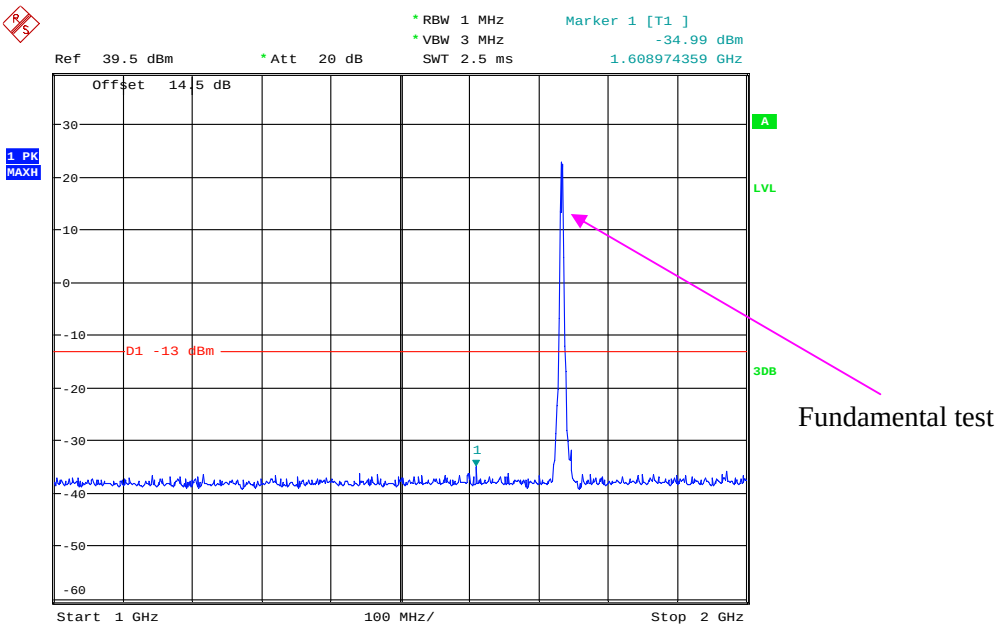
Date: 25.OCT.2018 23:27:23

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



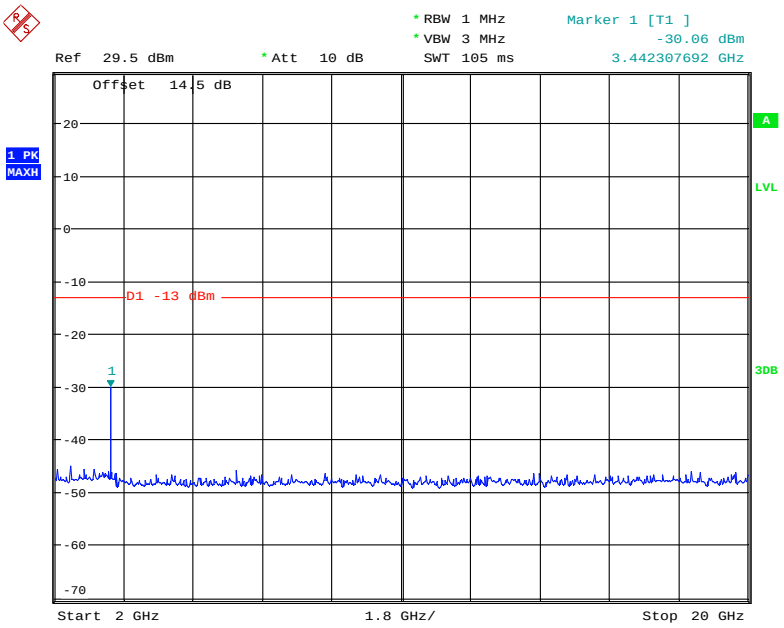
Date: 25.OCT.2018 23:42:57

1 GHz – 2 GHz (3.0 MHz, Middle Channel)



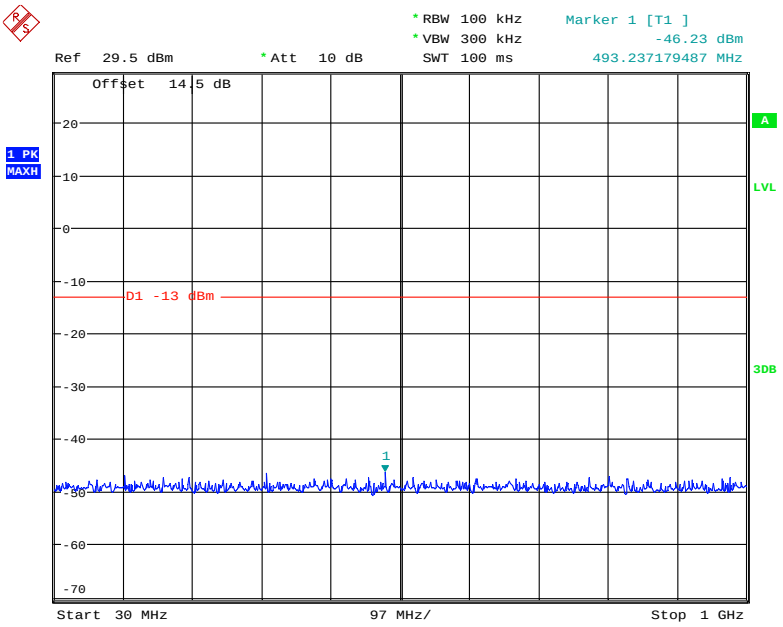
Date: 25.OCT.2018 23:30:56

2 GHz – 20 GHz (3.0 MHz, Middle Channel)



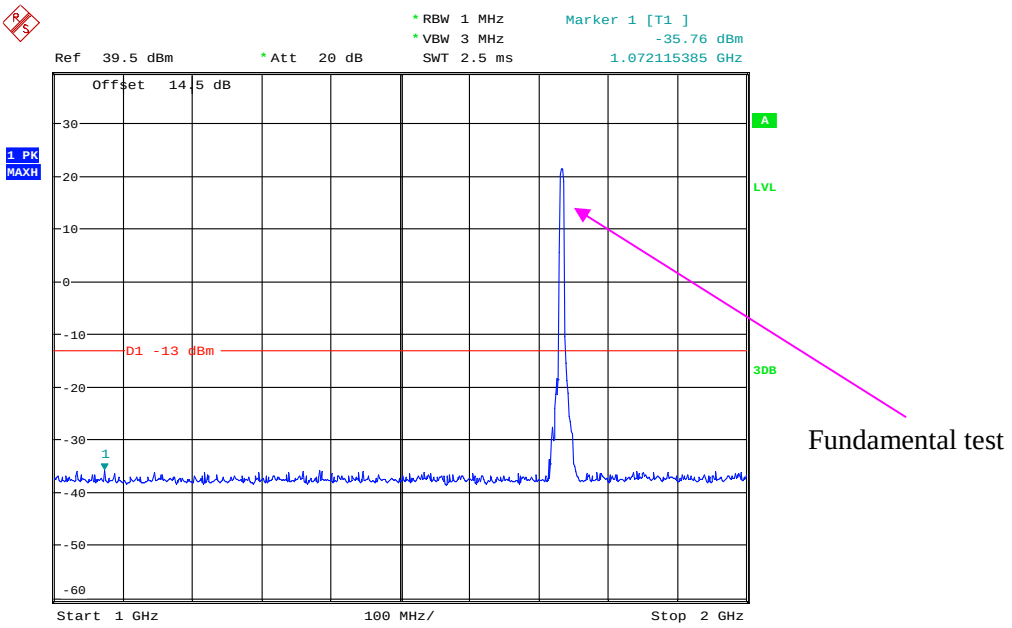
Date: 25.OCT.2018 23:28:53

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



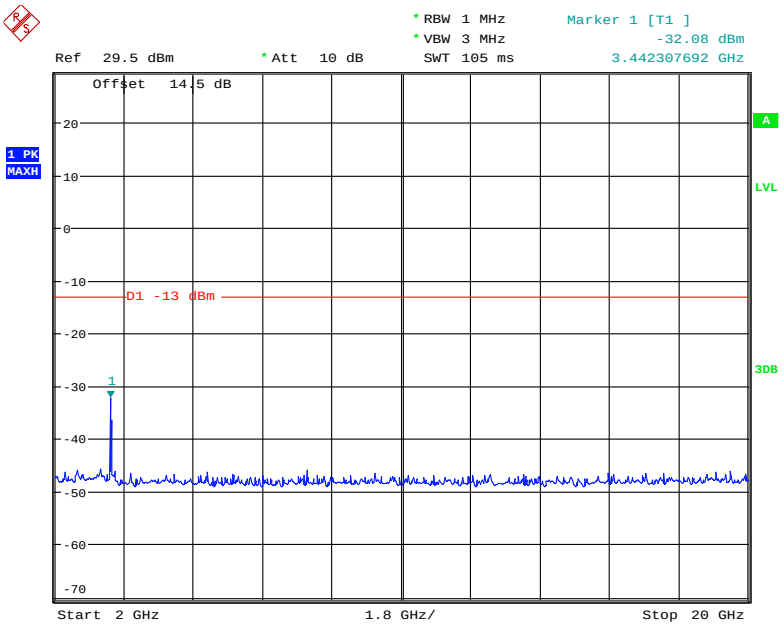
Date: 25.OCT.2018 23:43:59

1 GHz – 2 GHz (5.0 MHz, Middle Channel)



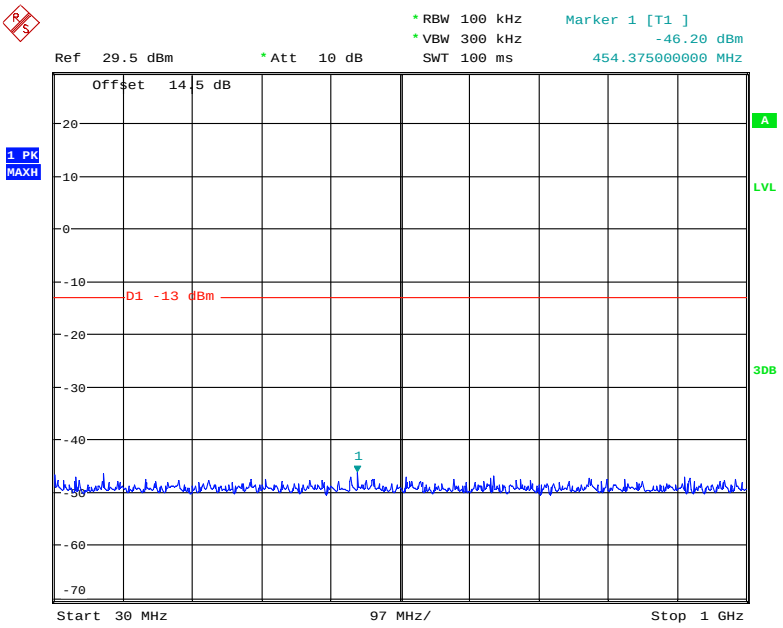
Date: 25.OCT.2018 23:45:50

2 GHz – 20 GHz (5.0 MHz, Middle Channel)



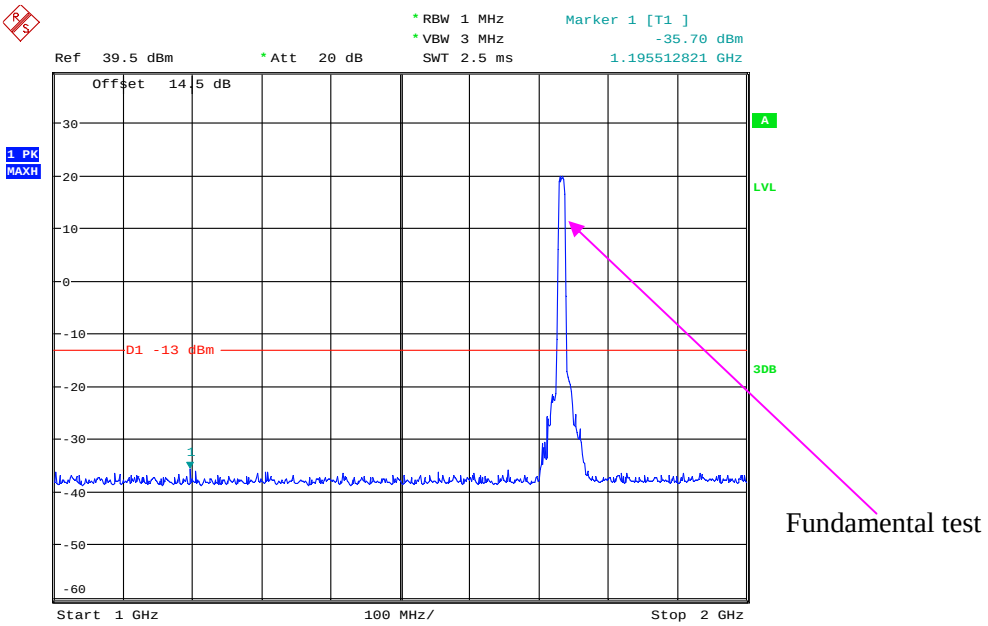
Date: 25.OCT.2018 23:47:12

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



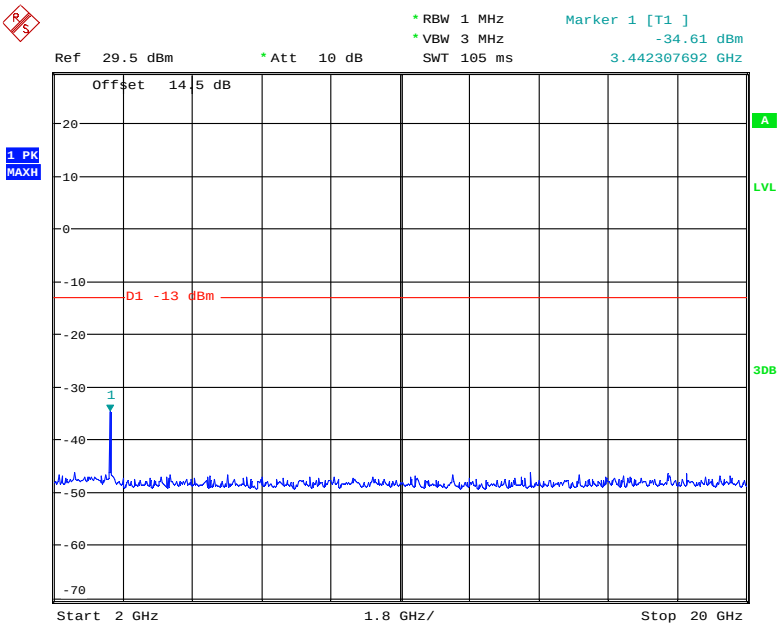
Date: 25.OCT.2018 23:49:37

1 GHz – 2 GHz (10.0 MHz, Middle Channel)



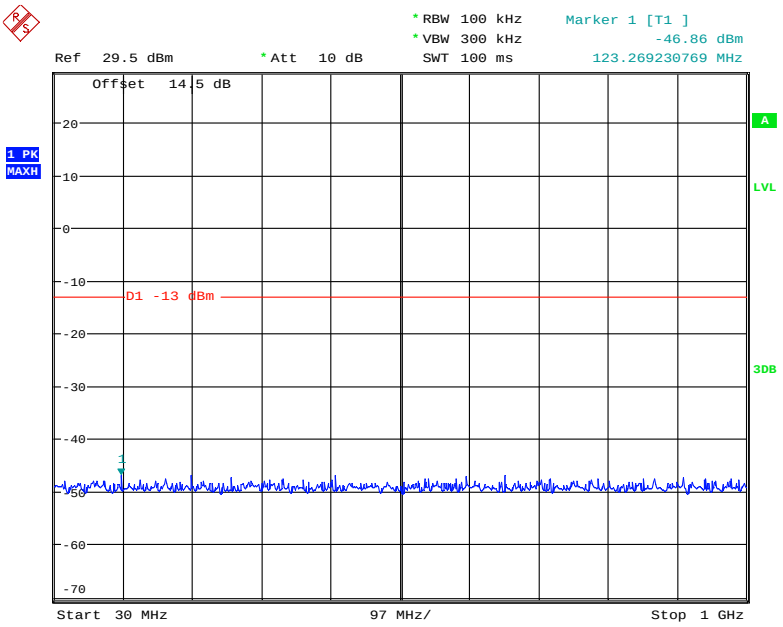
Date: 25.OCT.2018 23:48:54

2 GHz – 20 GHz (10.0 MHz, Middle Channel)



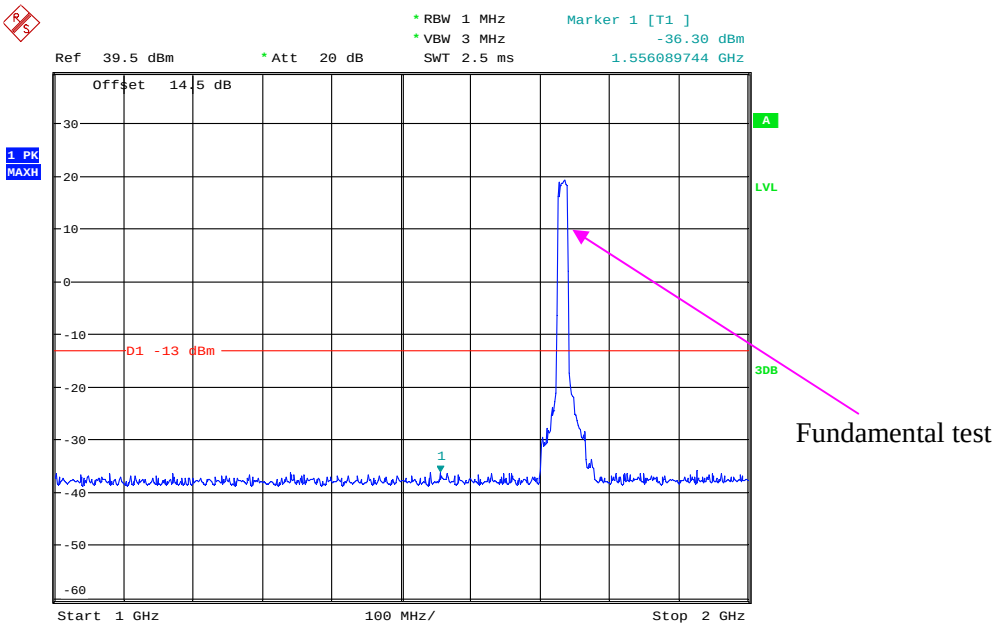
Date: 25.OCT.2018 23:47:45

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



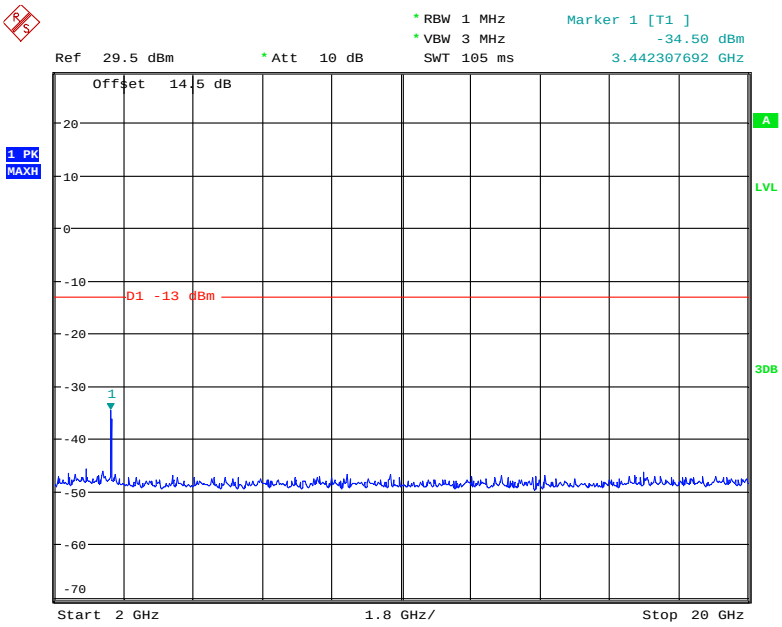
Date: 25.OCT.2018 23:50:24

1 GHz – 2 GHz (15.0 MHz, Middle Channel)



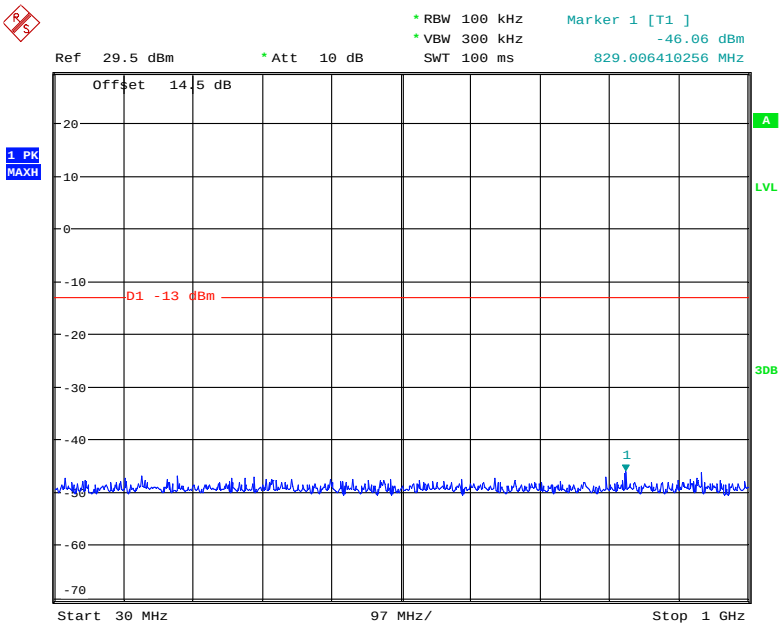
Date: 25.OCT.2018 23:51:32

2 GHz – 20 GHz (15.0 MHz, Middle Channel)



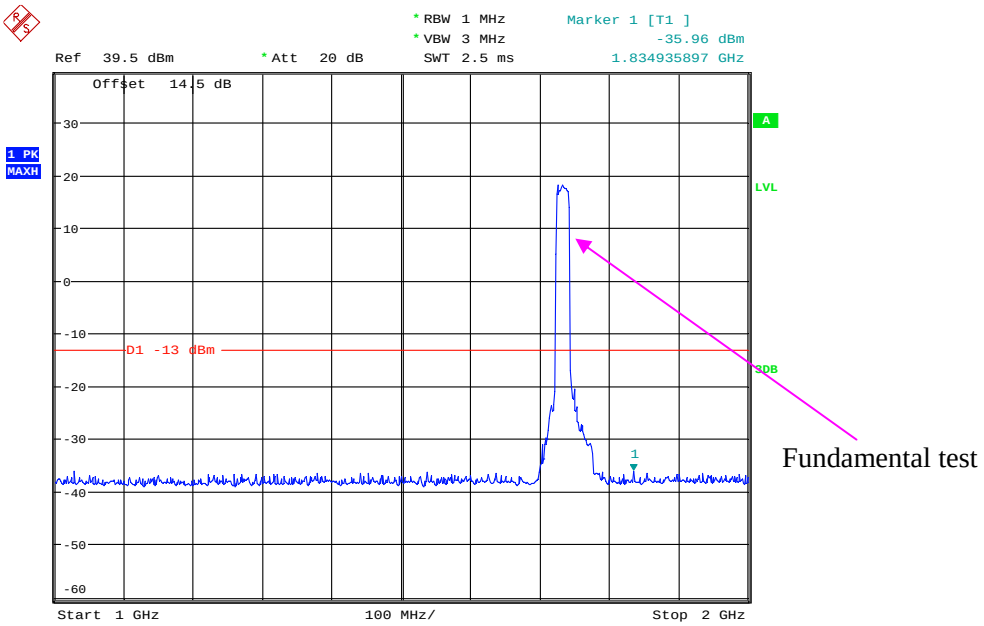
Date: 25.OCT.2018 23:51:59

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



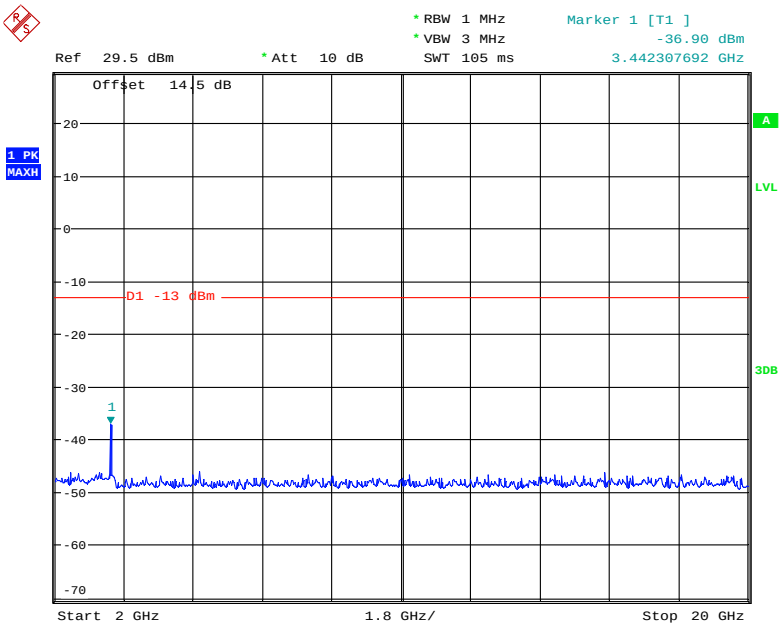
Date: 25.OCT.2018 23:53:41

1 GHz – 2 GHz (20.0 MHz, Middle Channel)



Date: 25.OCT.2018 23:53:13

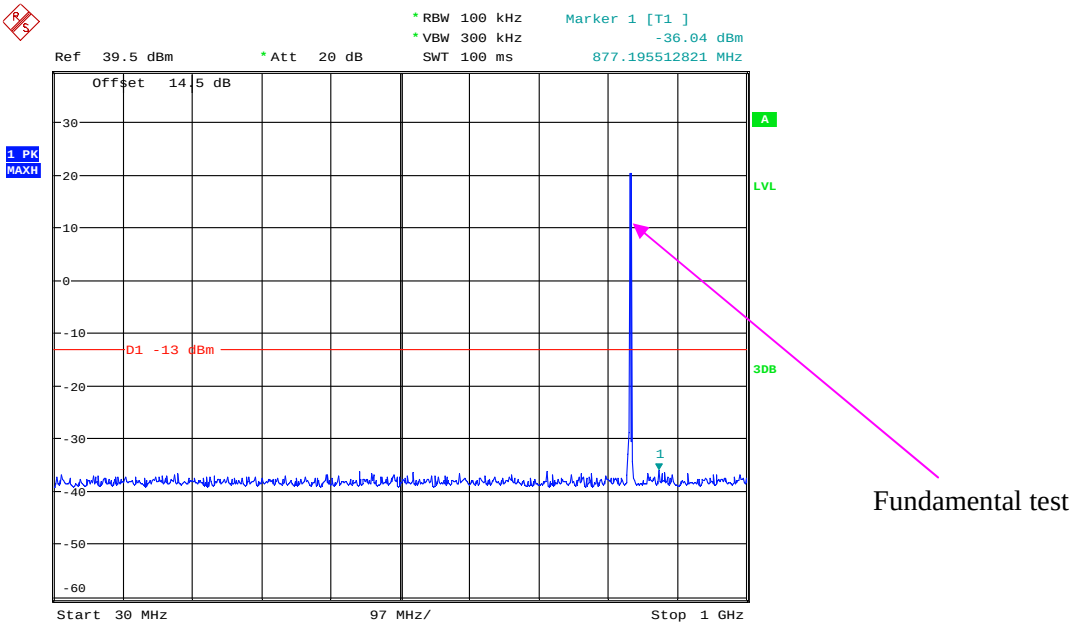
2 GHz –20 GHz (20.0 MHz, Middle Channel)



Date: 25.OCT.2018 23:52:20

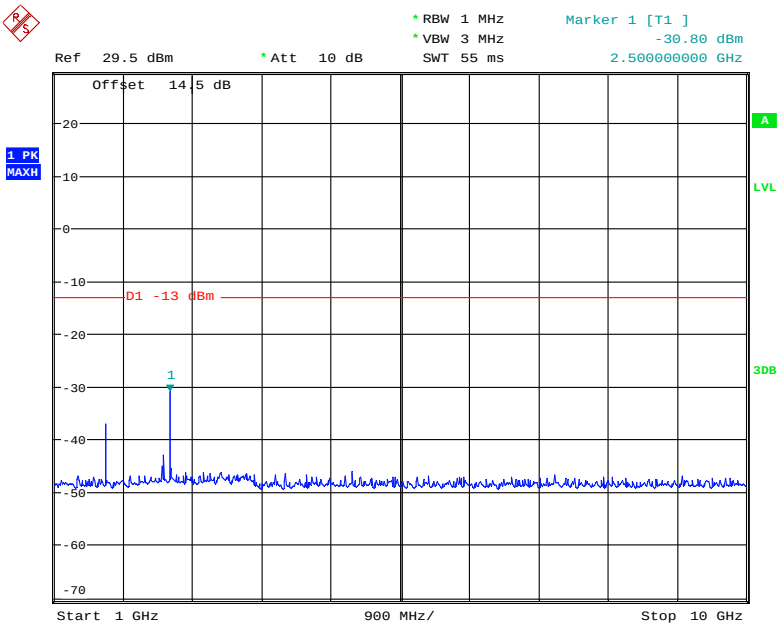
LTE Band 5(QPSK):

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



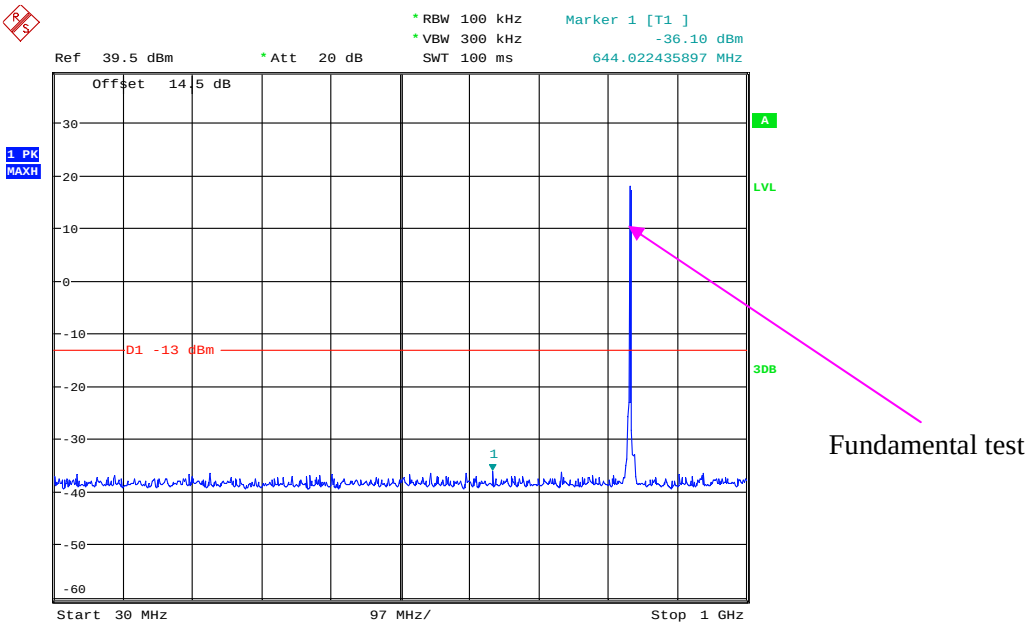
Date: 25.OCT.2018 23:16:56

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



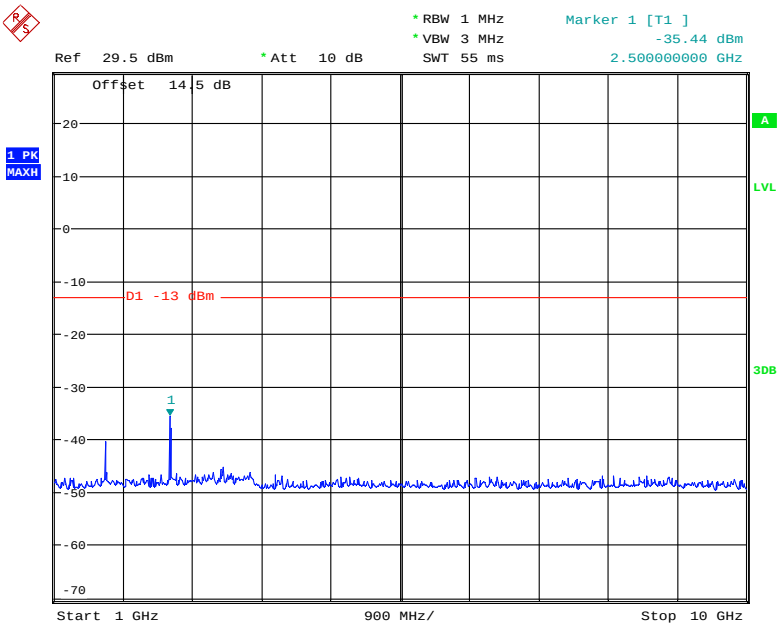
Date: 25.OCT.2018 23:17:37

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



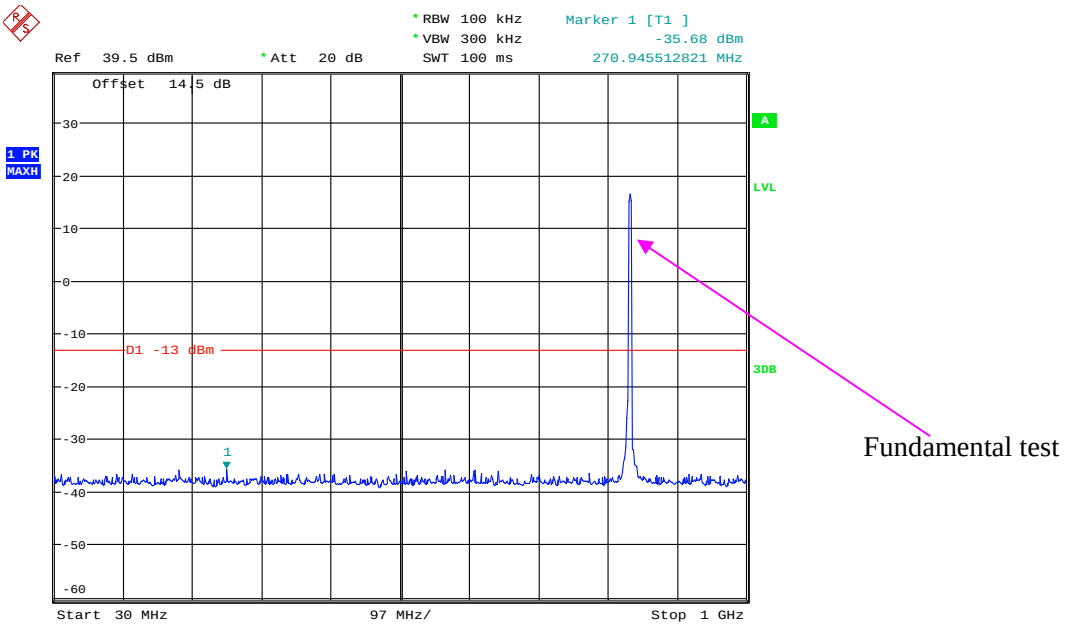
Date: 25.OCT.2018 23:18:59

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



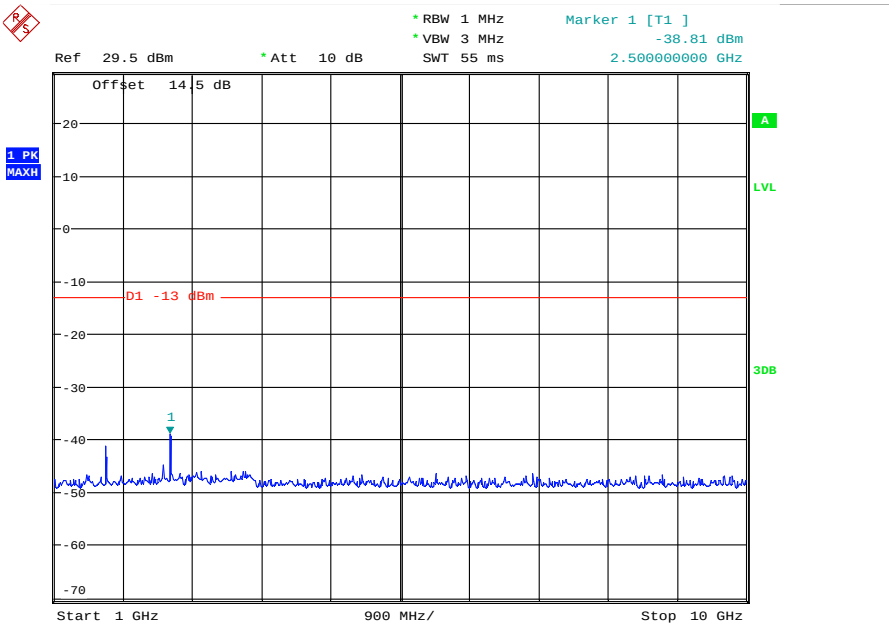
Date: 25.OCT.2018 23:17:59

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



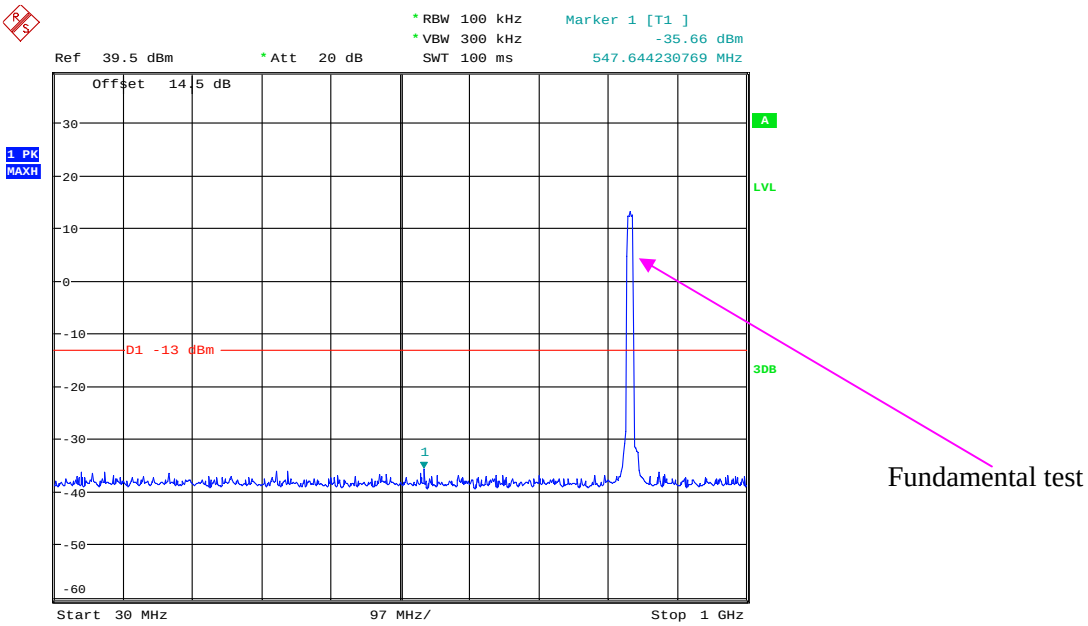
Date: 25.OCT.2018 23:20:22

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



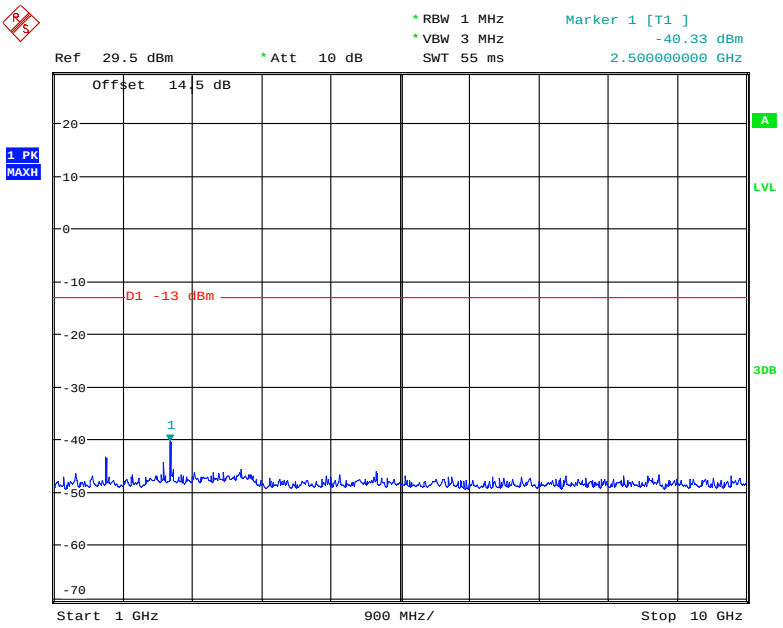
Date: 25.OCT.2018 23:21:04

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



Date: 25.OCT.2018 23:22:34

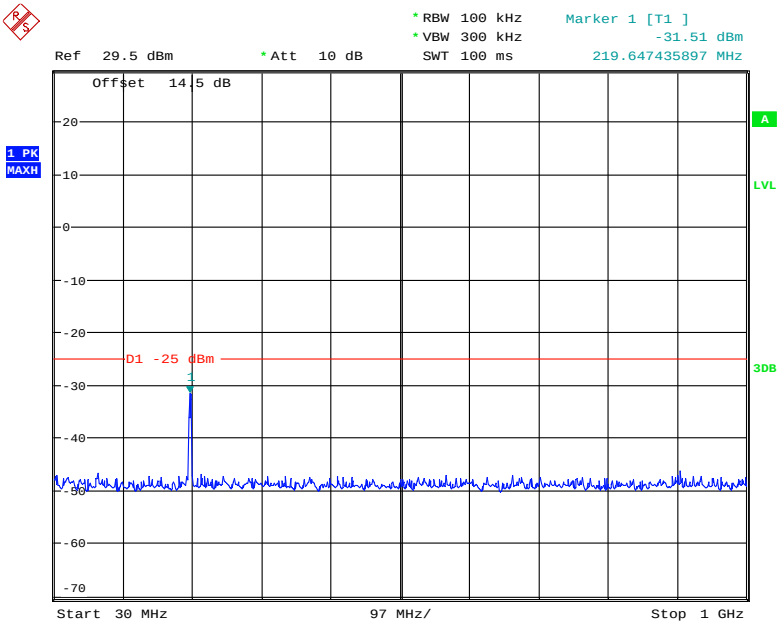
1 GHz – 10 GHz (10.0 MHz, Middle Channel)



Date: 25.OCT.2018 23:21:30

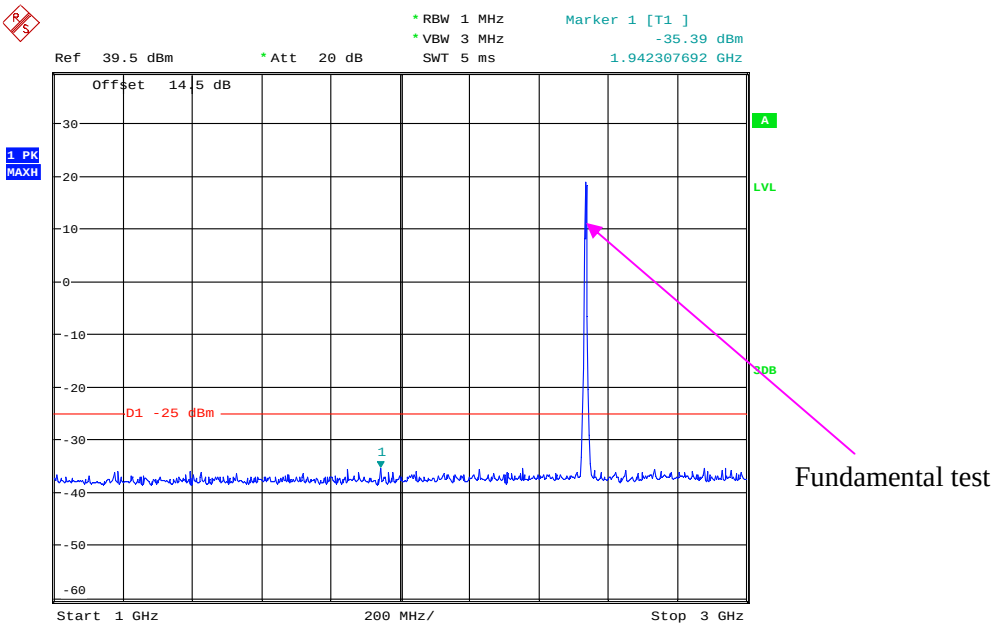
LTE Band 7(QPSK):

30 MHz – 1 GHz (5.0 MHz, Middle Channel)



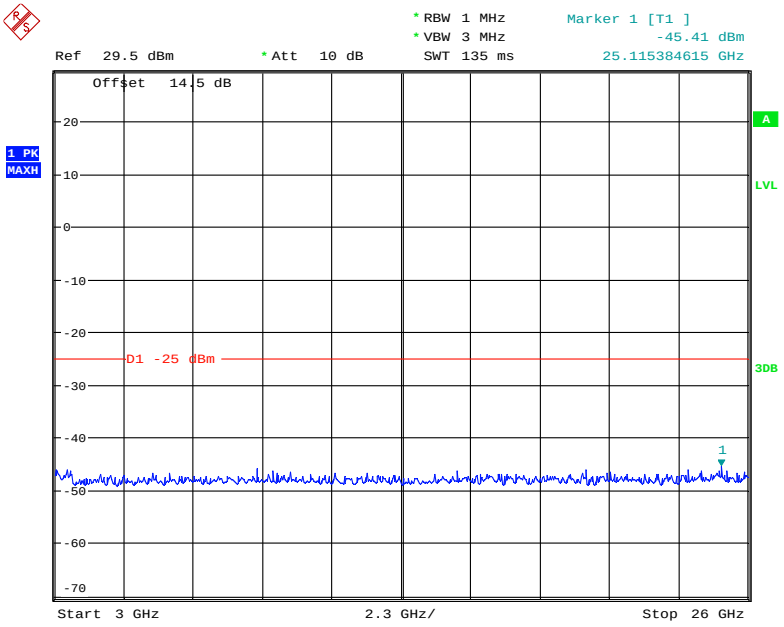
Date: 25.OCT.2018 23:02:03

1 GHz – 3.0 GHz (5.0 MHz, Middle Channel)



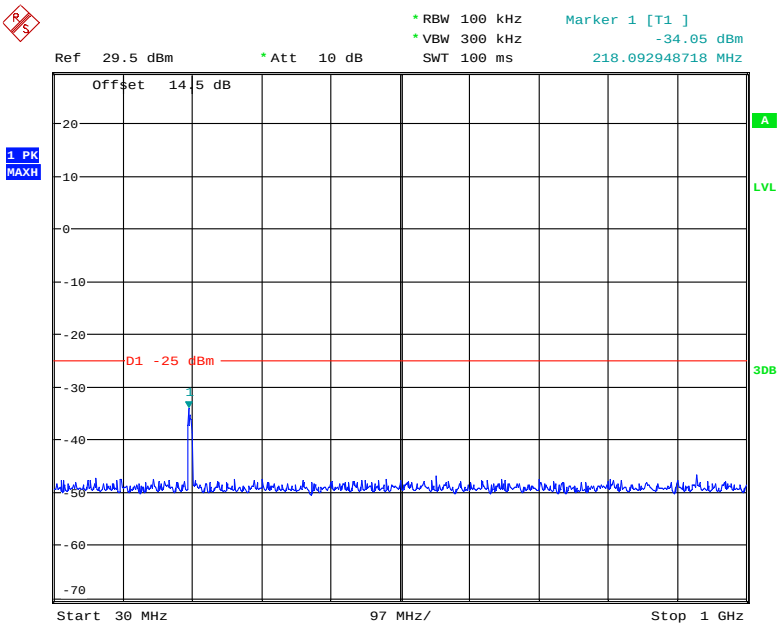
Date: 25.OCT.2018 23:11:20

3.0 GHz – 26 GHz (5.0 MHz, Middle Channel)



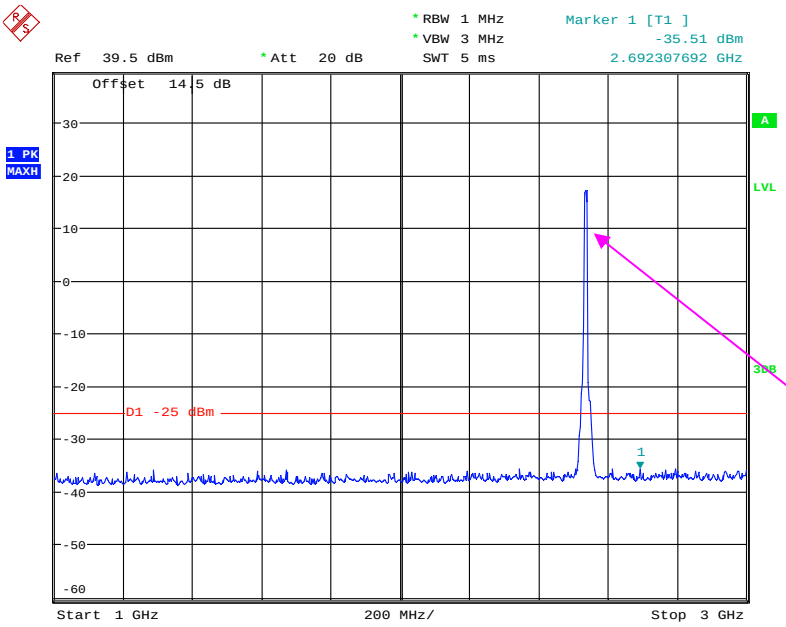
Date: 25.OCT.2018 23:11:47

30 MHz – 1.0 GHz (10.0 MHz, Middle Channel)



Date: 25.OCT.2018 23:05:47

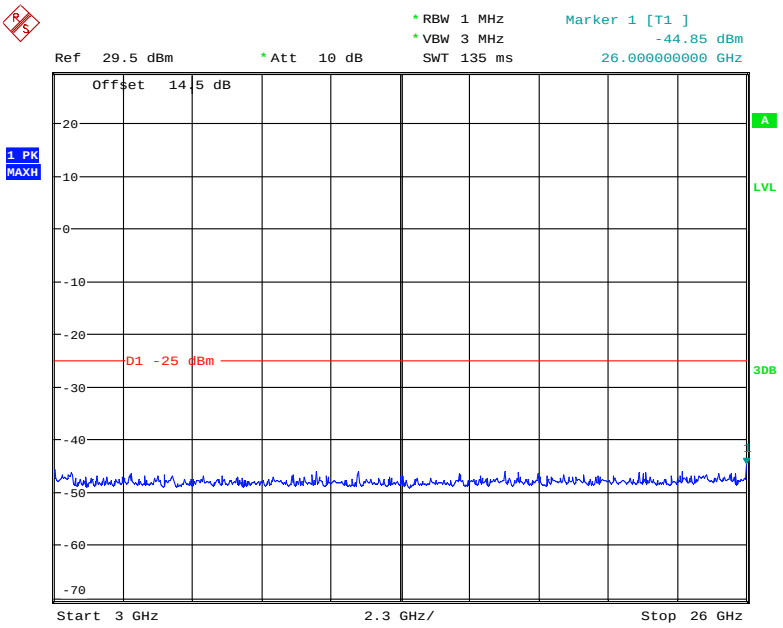
1 GHz – 3 GHz (10.0 MHz, Middle Channel)



Fundamental test

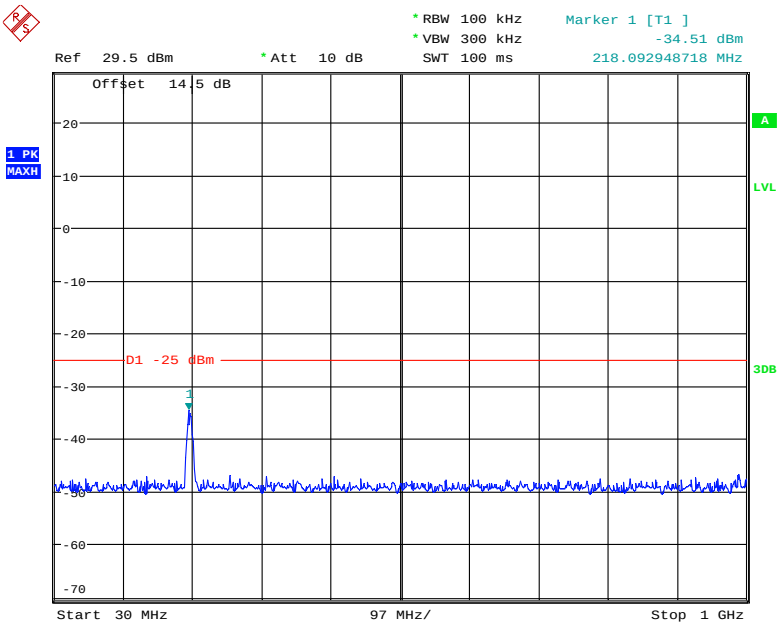
Date: 25.OCT.2018 23:10:17

3 GHz – 26 GHz (10.0 MHz, Middle Channel)



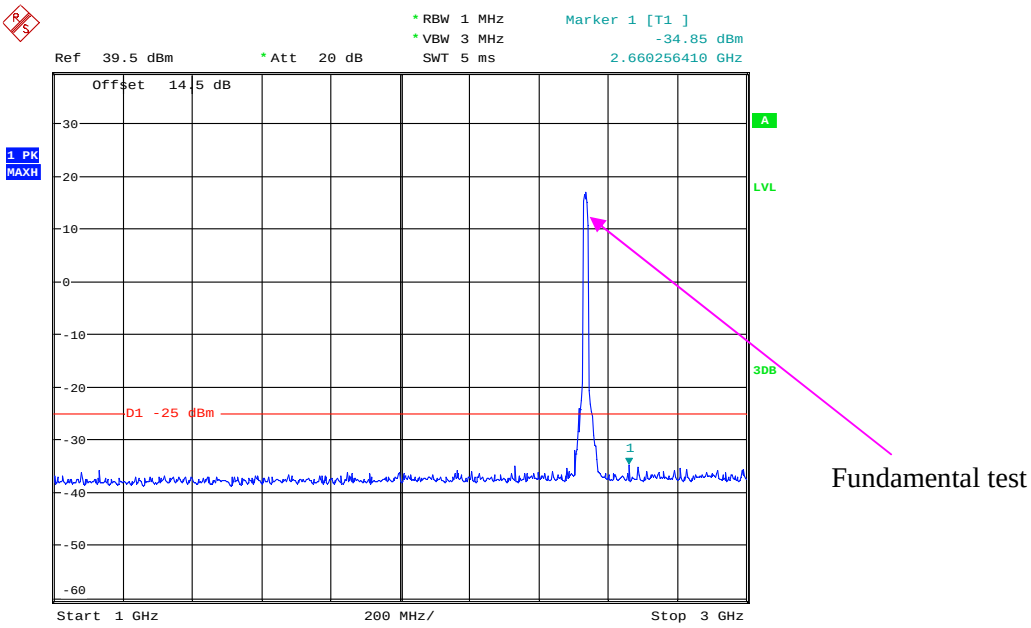
Date: 25.OCT.2018 23:09:33

30 MHz – 1 GHz (15.0 MHz, Middle Channel)



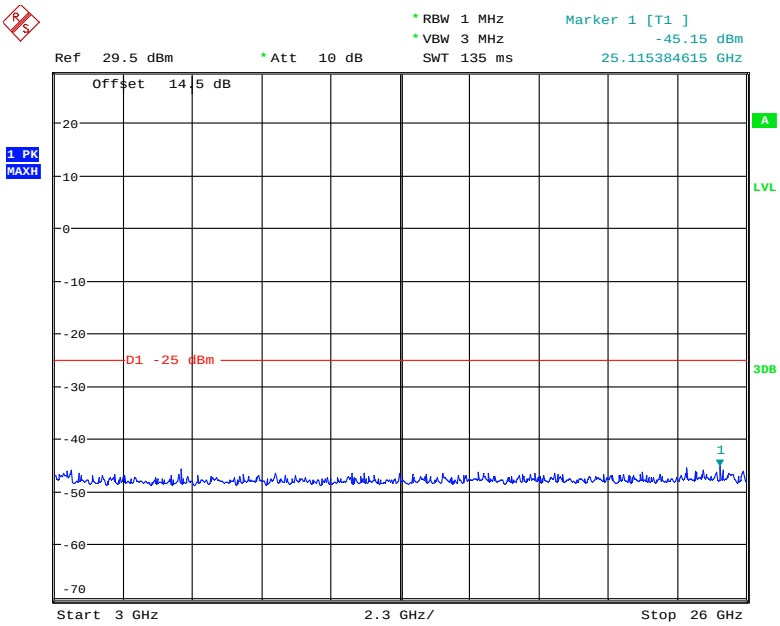
Date: 25.OCT.2018 23:06:10

1 GHz – 3 GHz (15.0 MHz, Middle Channel)



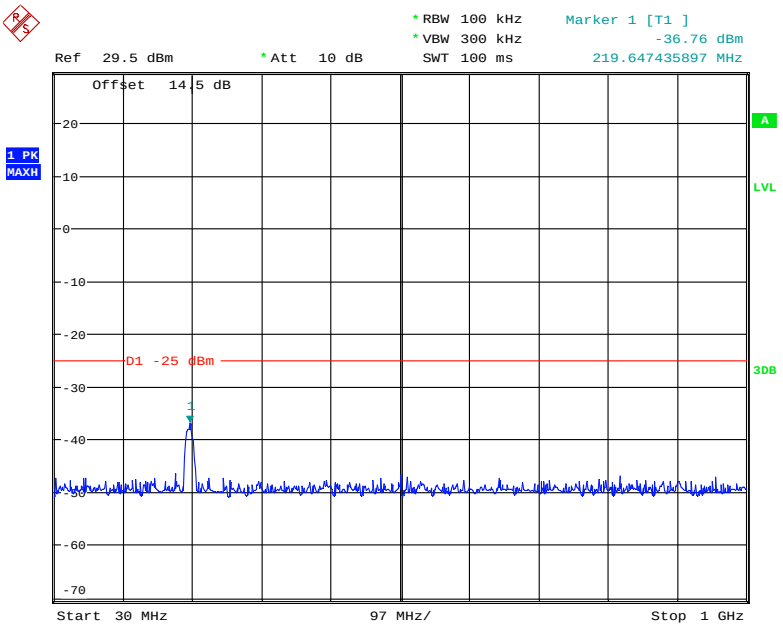
Date: 25.OCT.2018 23:08:09

3 GHz – 26 GHz (15.0 MHz, Middle Channel)



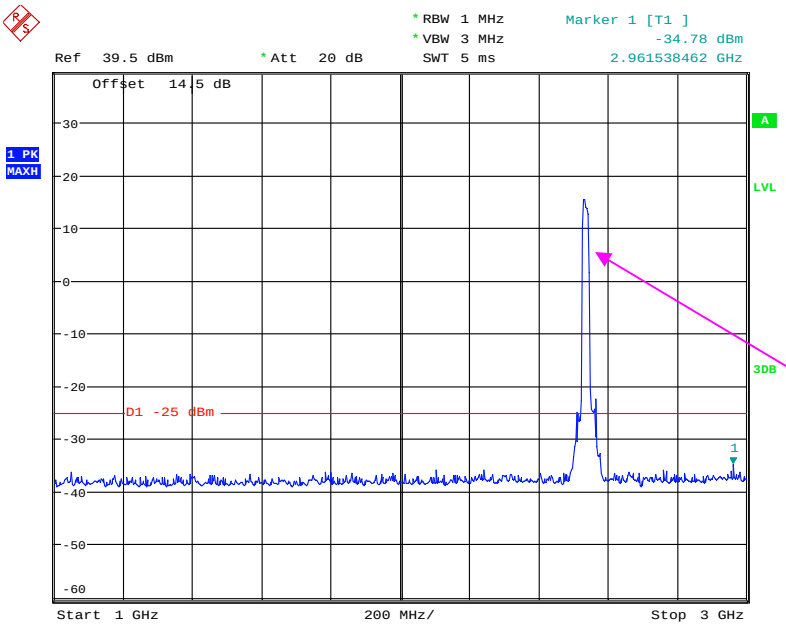
Date: 25.OCT.2018 23:09:00

30 MHz – 1 GHz (20.0 MHz, Middle Channel)



Date: 25.OCT.2018 23:13:29

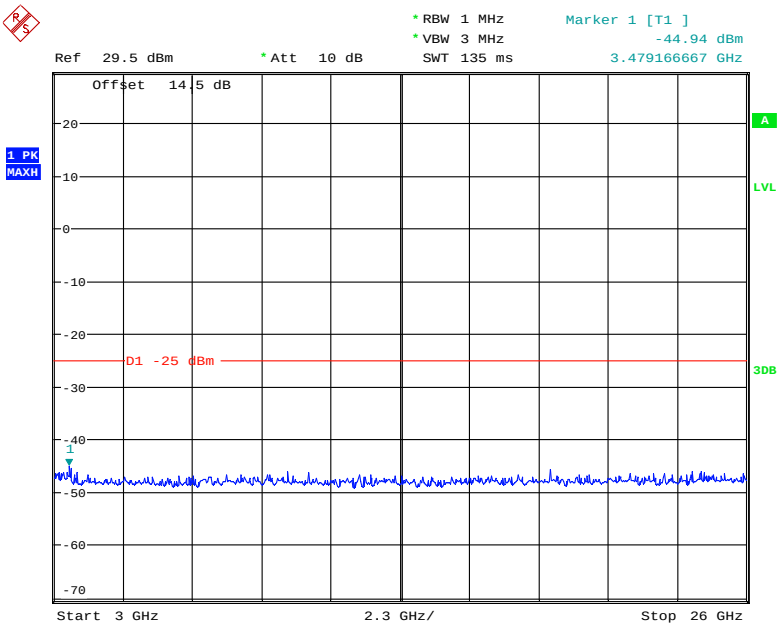
1 GHz – 3 GHz (20.0 MHz, Middle Channel)



Fundamental test

Date: 25.OCT.2018 23:12:54

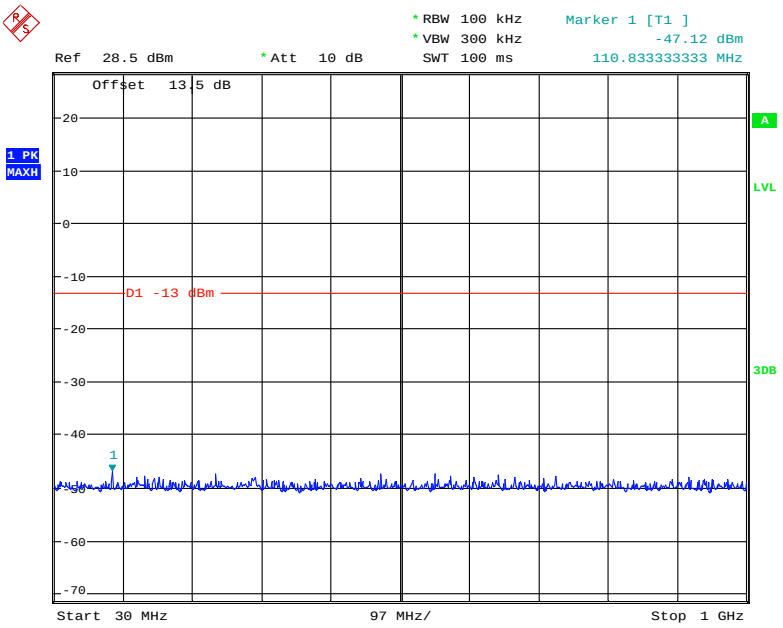
3 GHz – 26 GHz (20.0 MHz, Middle Channel)



Date: 25.OCT.2018 23:12:22

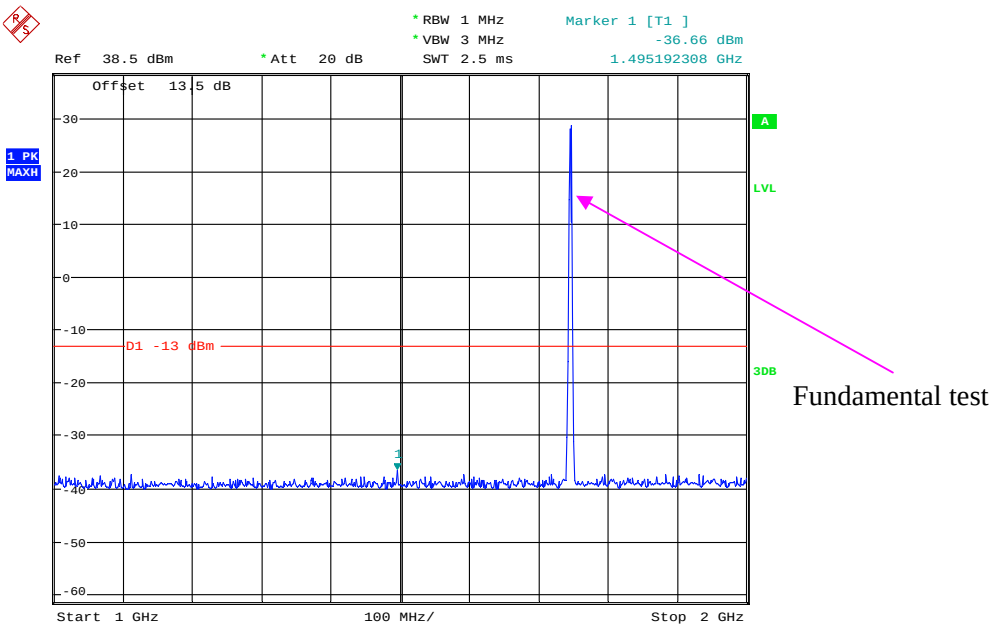
LTE Band 66(QPSK):

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



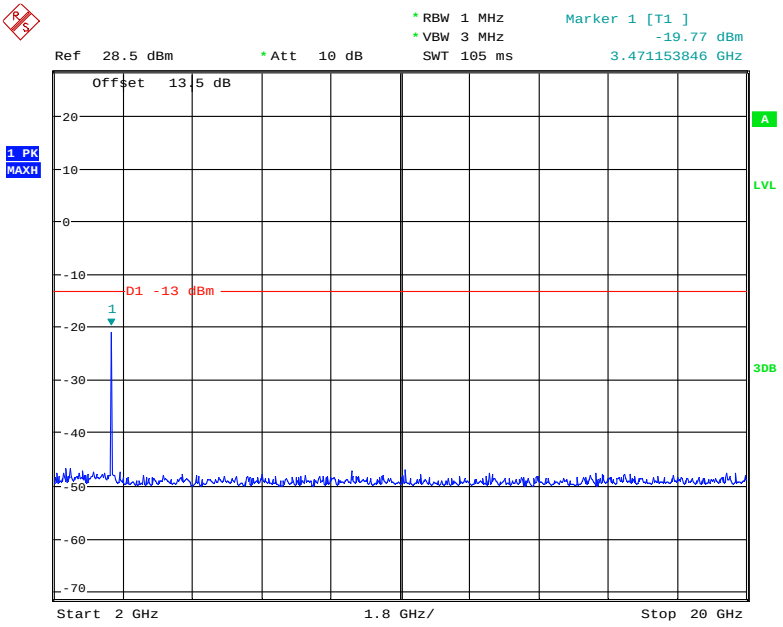
Date: 30.OCT.2018 23:40:54

1 GHz – 2 GHz (1.4 MHz, Middle Channel)



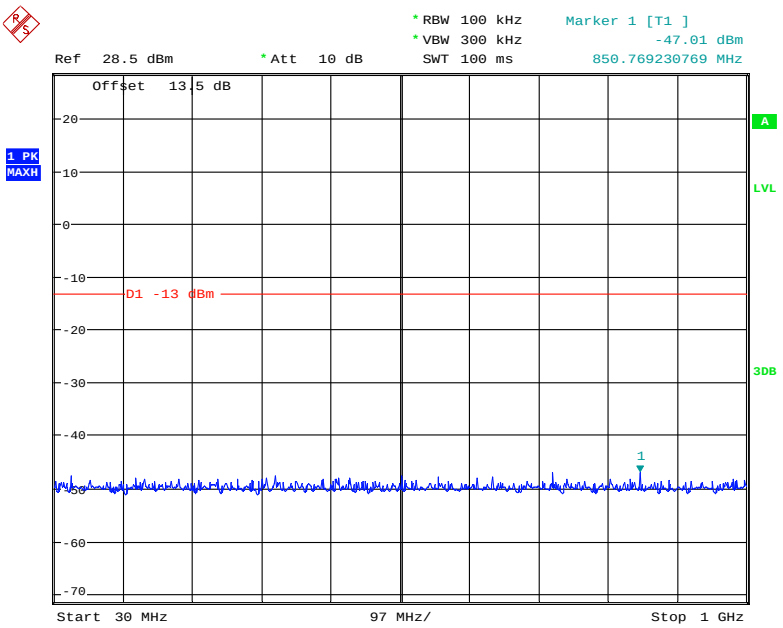
Date: 30.OCT.2018 23:40:03

2 GHz – 20 GHz (1.4 MHz, Middle Channel)



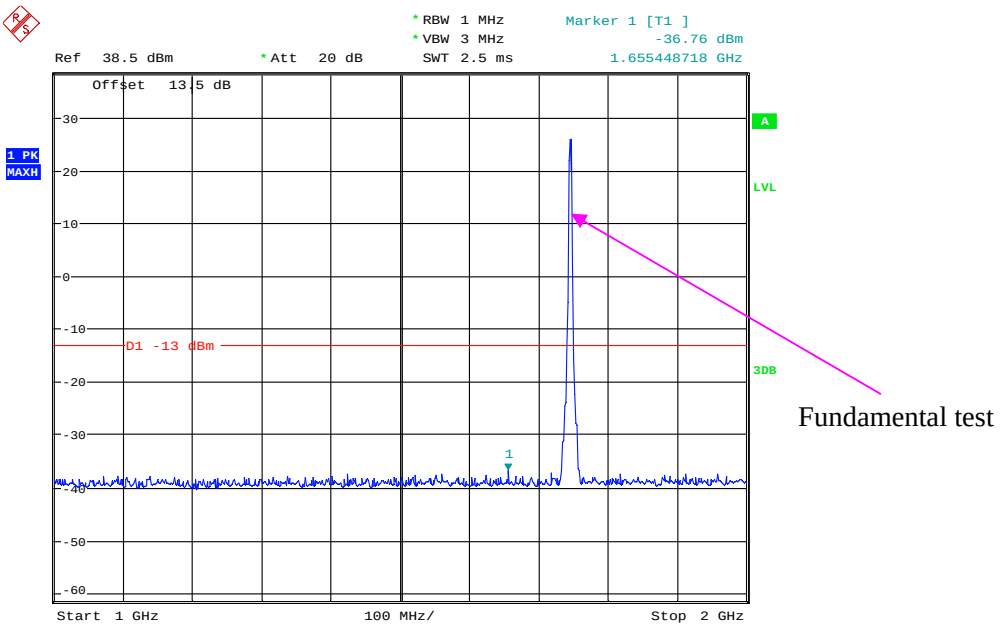
Date: 30.OCT.2018 23:39:15

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



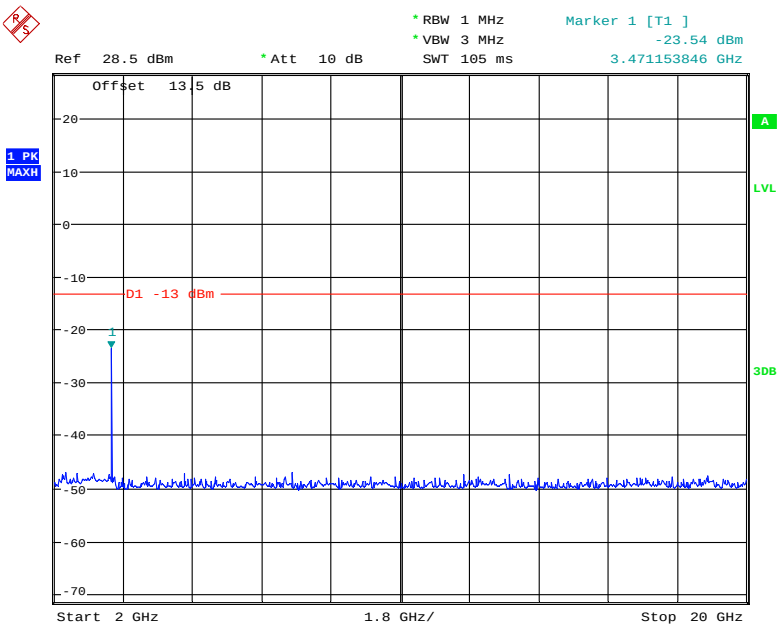
Date: 30.OCT.2018 23:36:40

1 GHz – 2 GHz (3.0 MHz, Middle Channel)



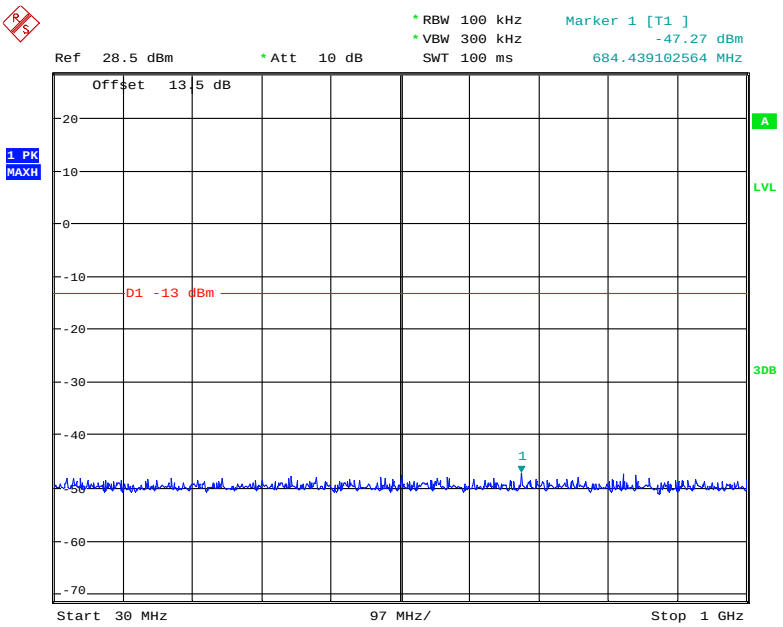
Date: 30.OCT.2018 23:37:48

2 GHz – 20 GHz (3.0 MHz, Middle Channel)



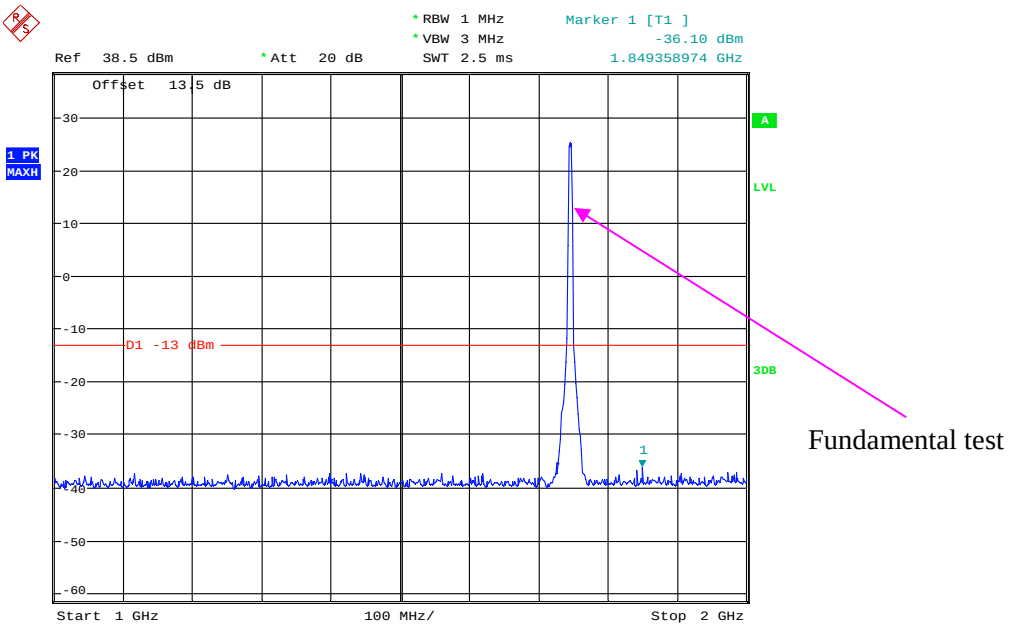
Date: 30.OCT.2018 23:38:26

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



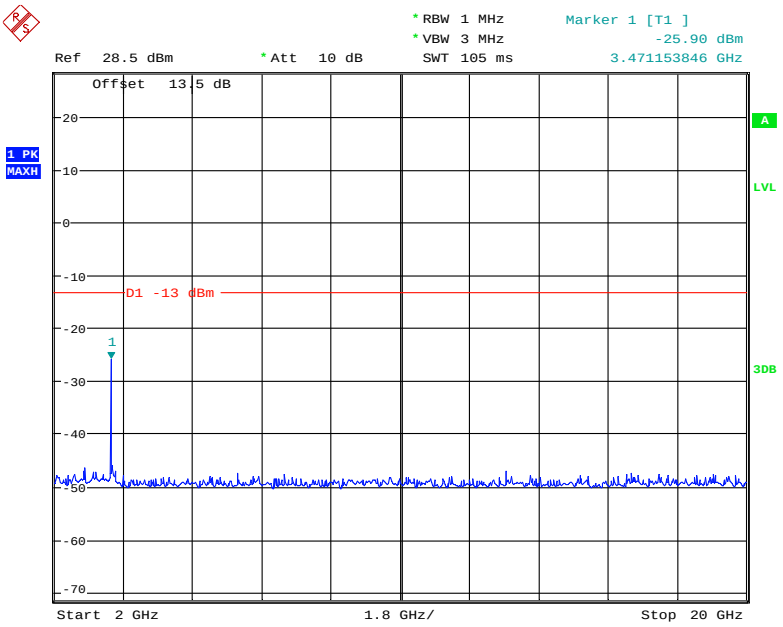
Date: 30.OCT.2018 23:35:36

1 GHz – 2 GHz (5.0 MHz, Middle Channel)



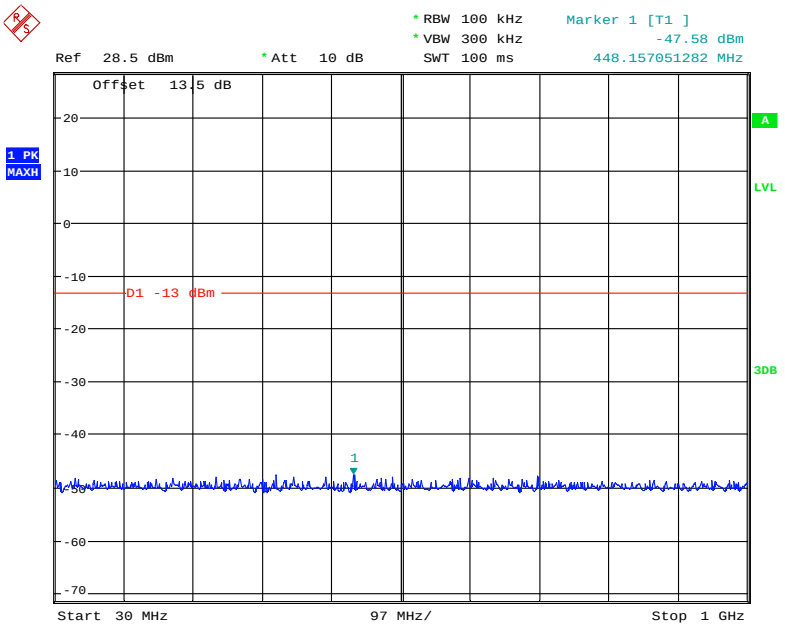
Date: 30.OCT.2018 23:34:55

2 GHz – 20 GHz (5.0 MHz, Middle Channel)



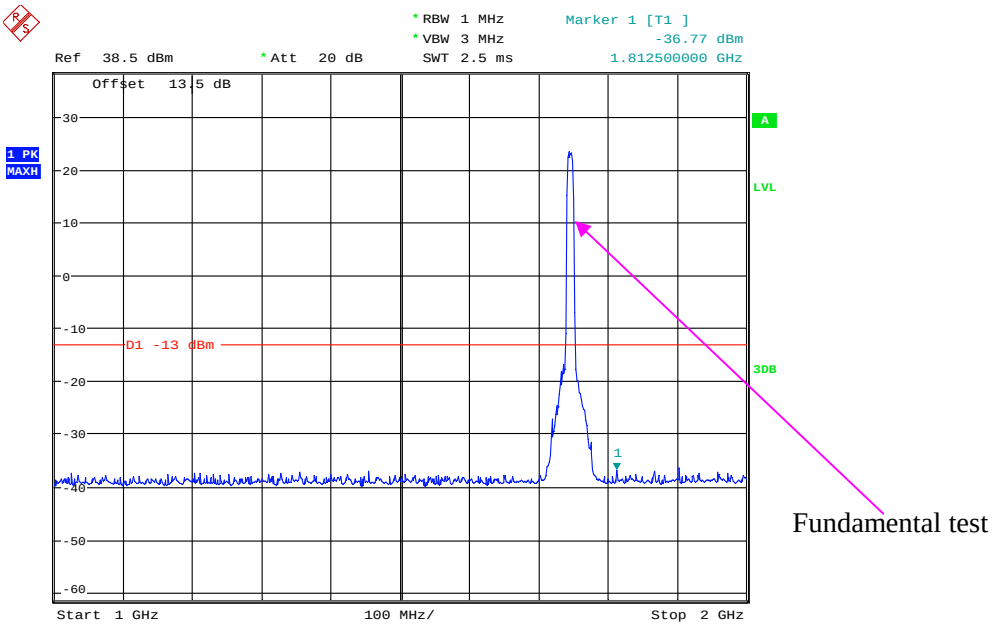
Date: 30.OCT.2018 23:33:31

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



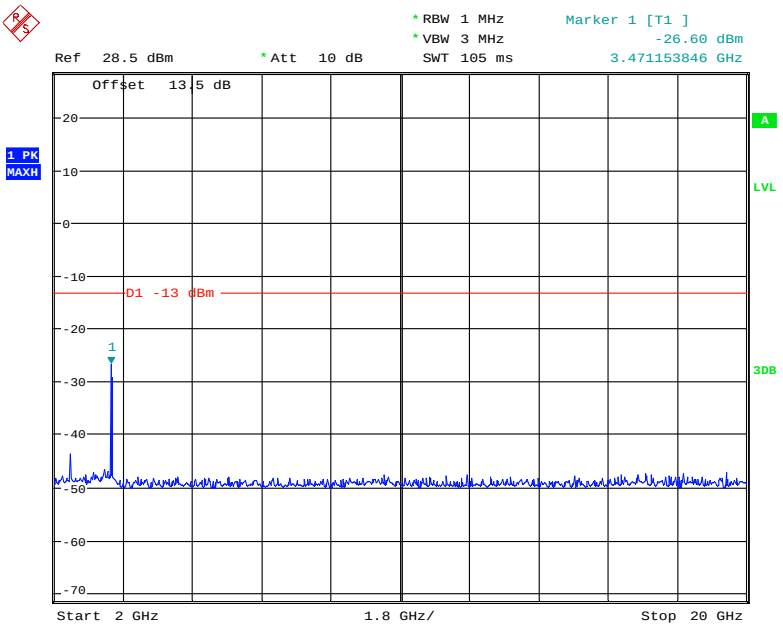
Date: 30.OCT.2018 23:30:30

1 GHz – 2 GHz (10.0 MHz, Middle Channel)



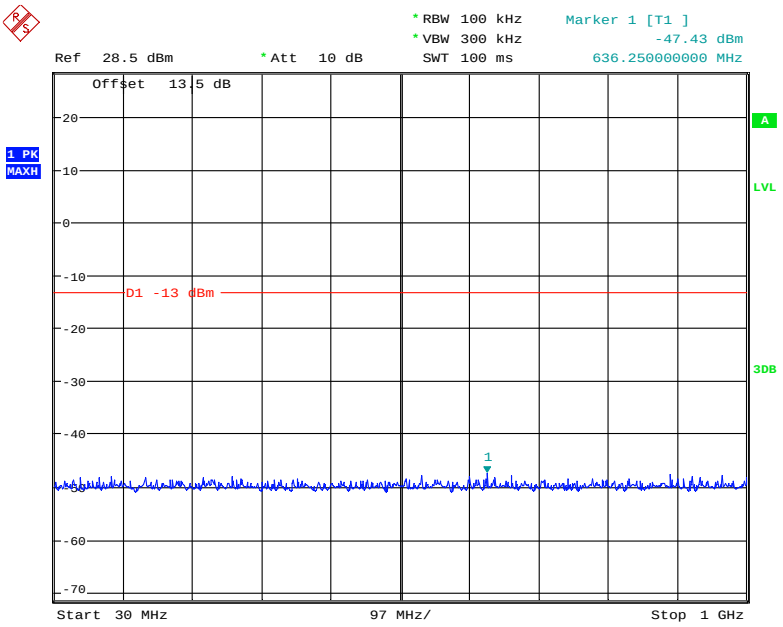
Date: 30.OCT.2018 23:32:14

2 GHz – 20 GHz (10.0 MHz, Middle Channel)



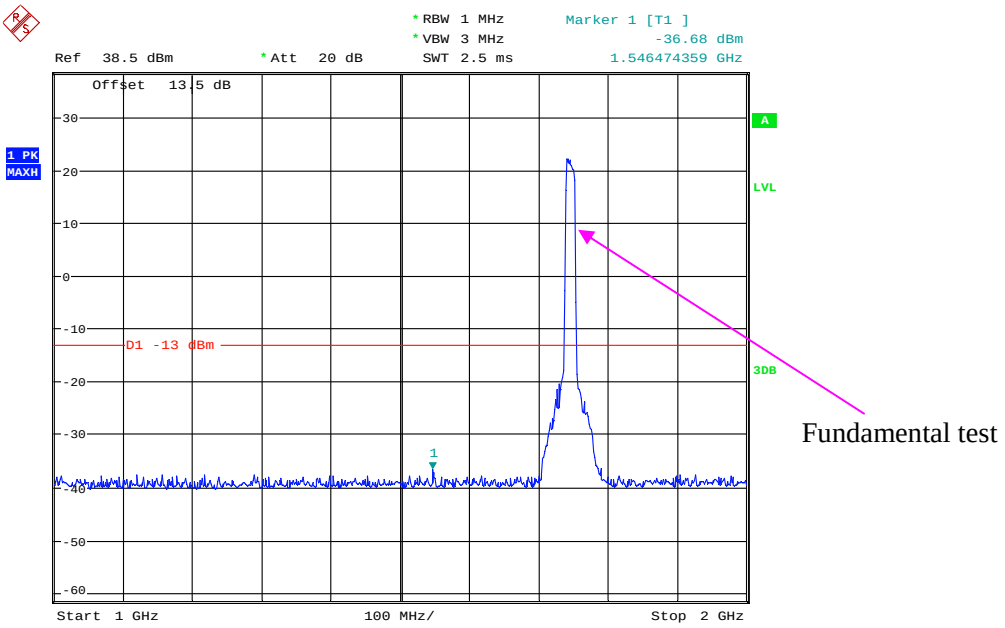
Date: 30.OCT.2018 23:33:04

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



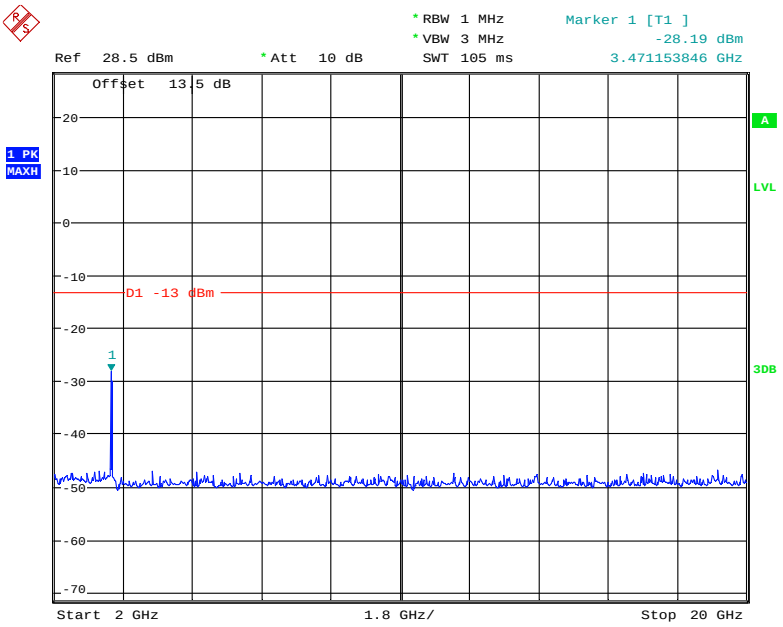
Date: 30.OCT.2018 23:29:05

1 GHz – 2 GHz (15.0 MHz, Middle Channel)



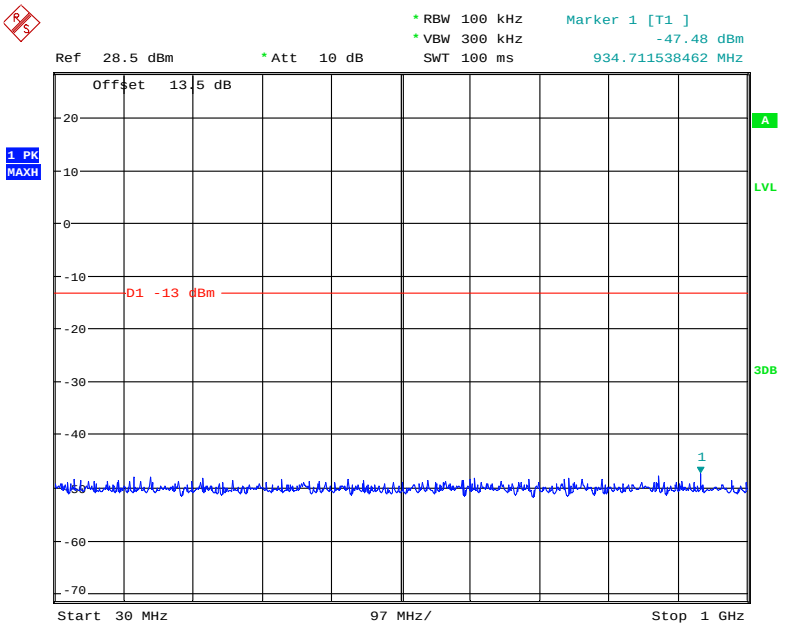
Date: 30.OCT.2018 23:28:12

2 GHz – 20 GHz (15.0 MHz, Middle Channel)



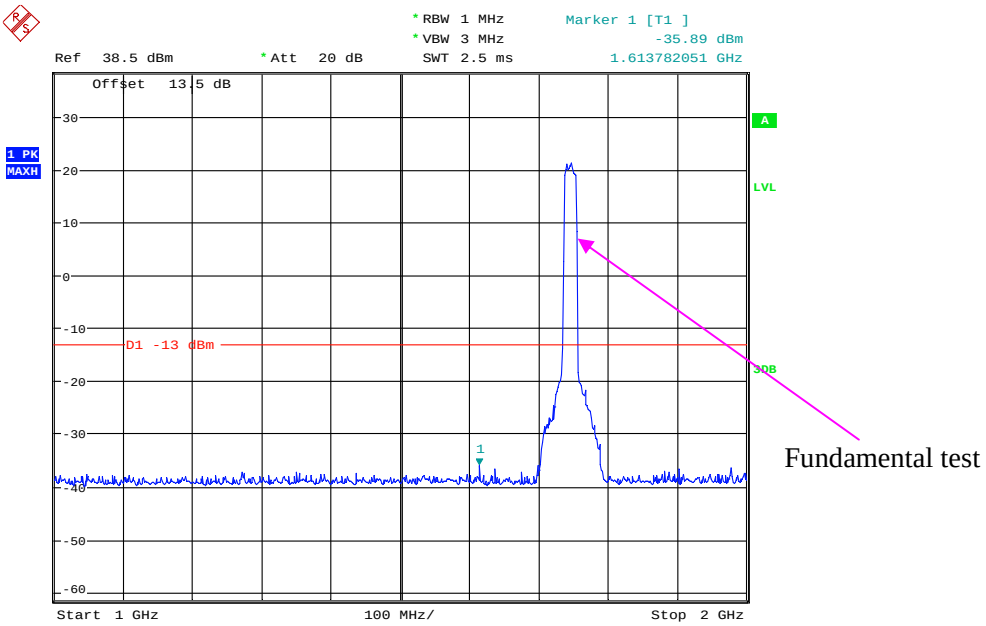
Date: 30.OCT.2018 23:27:24

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



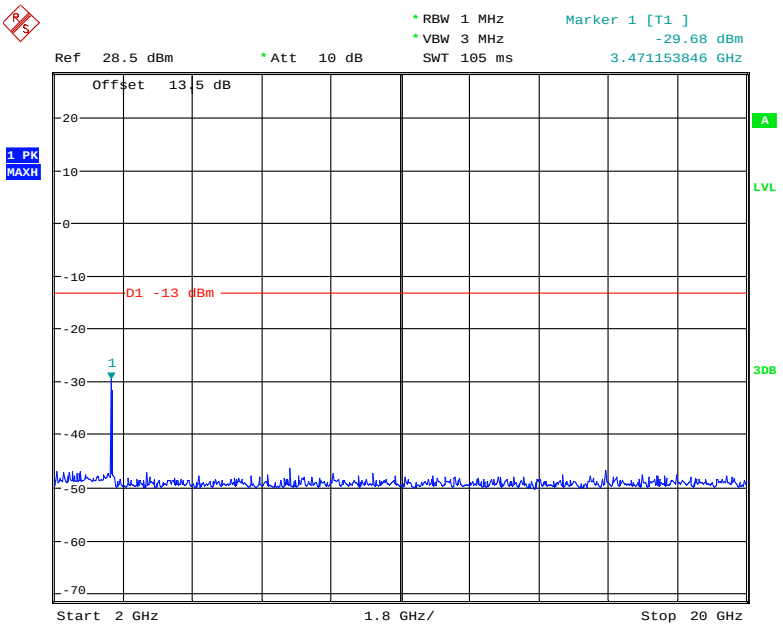
Date: 30.OCT.2018 23:24:15

1 GHz – 2 GHz (20.0 MHz, Middle Channel)



Date: 30.OCT.2018 23:26:30

2 GHz –20 GHz (20.0 MHz, Middle Channel)



Date: 30.OCT.2018 23:26:57

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

Applicable Standard

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

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 receiving 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.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Kiki Kong on 2018-11-03.

EUT operation mode: Transmitting

Pre-scan with Low, Middle and High channel, the worst case as below:

Internal Antenna:

30 MHz ~ 10 GHz:

Cellular Band (Part 22H)

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H	
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
WCDMA Mode, Middle channel										
235.67	31.85	287	2.3	H	-65.2	0.31	0	-65.51	-13	52.51
235.67	32.01	308	1.8	V	-65.0	0.31	0	-65.31	-13	52.31
1673.20	43.4	140	2.2	H	-63.7	1.30	8.90	-56.10	-13	43.10
1673.20	45.94	247	1.6	V	-60.5	1.30	8.90	-52.90	-13	39.90
2509.80	46.71	350	1.2	H	-56.8	2.60	10.20	-49.20	-13	36.20
2509.80	46.75	10	2.5	V	-56.2	2.60	10.20	-48.60	-13	35.60
3346.40	43.7	178	2.2	H	-56.6	1.50	11.70	-46.40	-13	33.40
3346.40	43.53	222	2.3	V	-56.8	1.50	11.70	-46.60	-13	33.60

30 MHz ~ 20 GHz:

PCS Band (Part 24E)

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 24E	
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
WCDMA Mode Band II, Middle channel										
235.67	31.62	63	1.6	H	-65.4	0.31	0	-65.71	-13	52.71
235.67	30.86	173	2.0	V	-66.1	0.31	0	-66.41	-13	53.41
3760.00	43.85	287	1.4	H	-57.4	1.50	11.80	-47.10	-13	34.10
3760.00	42.78	189	2.1	V	-58.0	1.50	11.80	-47.70	-13	34.70

LTE Band: *(Pre-scan with all the bandwidth, and worse case as below)*

Frequency	Receiver	Turntable	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
(MHz)	Reading (dBμV)	Angle Degree	Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Band 4 (QPSK)										
Test frequency range:30 MHz ~ 18 GHz										
235.67	31.25	255	1.6	H	-65.8	0.31	0	-66.11	-13	53.11
235.67	32.01	346	1.1	V	-65.0	0.31	0	-65.31	-13	52.31
3465.00	42.97	185	1.1	H	-57.4	1.50	12.00	-46.90	-13	33.90
3465.00	43.71	288	1.5	V	-57.4	1.50	12.00	-46.90	-13	33.90
Band 5(QPSK)										
Test frequency range:30 MHz ~ 10GHz										
235.67	31.86	197	2.3	H	-65.1	0.31	0	-65.41	-13	52.41
235.67	32.74	310	2.0	V	-64.3	0.31	0	-64.61	-13	51.61
1673.00	42.67	95	1.9	H	-64.4	1.30	8.90	-56.80	-13	43.80
1673.00	43.02	277	2.0	V	-63.5	1.30	8.90	-55.90	-13	42.90
Band 7(QPSK)										
Test frequency range: 30 MHz ~ 26GHz										
235.67	31.13	162	1.7	H	-65.9	0.31	0	-66.21	-25	41.21
235.67	32.52	19	1.2	V	-64.5	0.31	0	-64.81	-25	39.81
5070.00	42.95	16	1.2	H	-54.9	1.60	12.10	-44.40	-25	19.40
5070.00	43.88	261	1.7	V	-54.0	1.60	12.10	-43.50	-25	18.50
Band 66(QPSK)										
Test frequency range:30 MHz ~ 18 GHz										
235.67	31.13	162	1.7	H	-65.9	0.31	0	-66.21	-13	53.21
235.67	32.52	19	1.2	V	-64.5	0.31	0	-64.81	-13	51.81
3490.00	42.95	16	1.2	H	-57.4	1.50	12.00	-46.90	-13	33.90
3490.00	43.88	261	1.7	V	-57.2	1.50	12.00	-46.70	-13	33.70

External Antenna:

30 MHz ~ 10 GHz:

Cellular Band (Part 22H)

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H	
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
WCDMA Mode, Middle channel										
235.67	31.25	270	2.0	H	-65.8	0.31	0	-66.11	-13	53.11
235.67	30.57	285	2.2	V	-66.4	0.31	0	-66.71	-13	53.71
1673.20	43.98	337	1.8	H	-63.1	1.30	8.90	-55.50	-13	42.50
1673.20	43.5	99	1.3	V	-63.0	1.30	8.90	-55.40	-13	42.40
2509.80	47.96	95	1.4	H	-55.6	2.60	10.20	-48.00	-13	35.00
2509.80	48.14	87	1.9	V	-54.8	2.60	10.20	-47.20	-13	34.20
3346.40	44.29	25	2.1	H	-56.1	1.50	11.70	-45.90	-13	32.90
3346.40	43.48	334	1.8	V	-56.9	1.50	11.70	-46.70	-13	33.70

30 MHz ~ 20 GHz:

PCS Band (Part 24E)

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 24E	
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
WCDMA Mode Band II, Middle channel										
235.67	31.96	175	1.0	H	-65.0	0.31	0	-65.31	-13	52.31
235.67	31.01	262	1.6	V	-66.0	0.31	0	-66.31	-13	53.31
3760.00	44.89	10	1.6	H	-56.3	1.50	11.80	-46.00	-13	33.00
3760.00	44.61	126	1.9	V	-56.1	1.50	11.80	-45.80	-13	32.80

LTE Band: *(Pre-scan with all the bandwidth, and worse case as below)*

Frequency	Receiver	Turntable	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
(MHz)	Reading (dBμV)	Angle Degree	Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Band 4(QPSK)										
Test frequency range:30 MHz ~ 18 GHz										
235.67	32.25	204	1.0	H	-64.8	0.31	0	-65.11	-13	52.11
235.67	33.12	56	1.0	V	-63.9	0.31	0	-64.21	-13	51.21
3465.00	42.21	163	1.5	H	-58.3	1.50	12.00	-47.80	-13	34.80
3465.00	43.71	349	2.4	V	-57.6	1.50	12.00	-47.10	-13	34.10
Band 5(QPSK)										
Test frequency range:30 MHz ~ 10GHz										
235.67	31.01	329	1.3	H	-66.0	0.31	0	-66.31	-13	53.31
235.67	32.12	21	2.2	V	-64.9	0.31	0	-65.21	-13	52.21
1673.00	43.58	72	1.7	H	-63.5	1.30	8.90	-55.90	-13	42.90
1673.00	45.13	296	2.1	V	-61.3	1.30	8.90	-53.70	-13	40.70
Band 7										
Test frequency range: 30 MHz ~ 26GHz										
235.67	32.40	163	1.9	H	-64.6	0.31	0	-64.91	-25	39.91
235.67	32.96	189	2.3	V	-64.0	0.31	0	-64.31	-25	39.31
5070.00	43.34	296	2.4	H	-52.1	1.60	12.10	-41.60	-25	16.60
5070.00	43.38	273	2.2	V	-52.1	1.60	12.10	-41.60	-25	16.60
Band 66(QPSK)										
Test frequency range:30 MHz ~ 18 GHz										
235.67	31.64	49	1.3	H	-65.4	0.31	0	-65.71	-13	52.71
235.67	32.71	285	1.0	V	-64.3	0.31	0	-64.61	-13	51.61
3490.00	43.88	21	1.6	H	-56.5	1.50	12.00	-46.00	-13	33.00
3490.00	43.71	26	1.6	V	-57.4	1.50	12.00	-46.90	-13	33.90

Note:
1) Absolute Level = Substituted Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

FCC § 22.917 (a);§ 24.238 (a); §27.53 (h)(m) - BAND EDGES

Applicable Standard

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

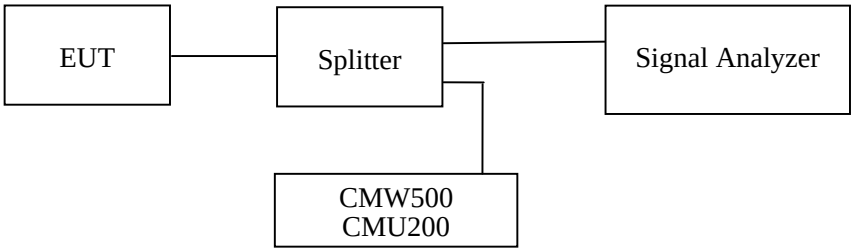
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to FCC §27.53 (h)(m), 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.

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

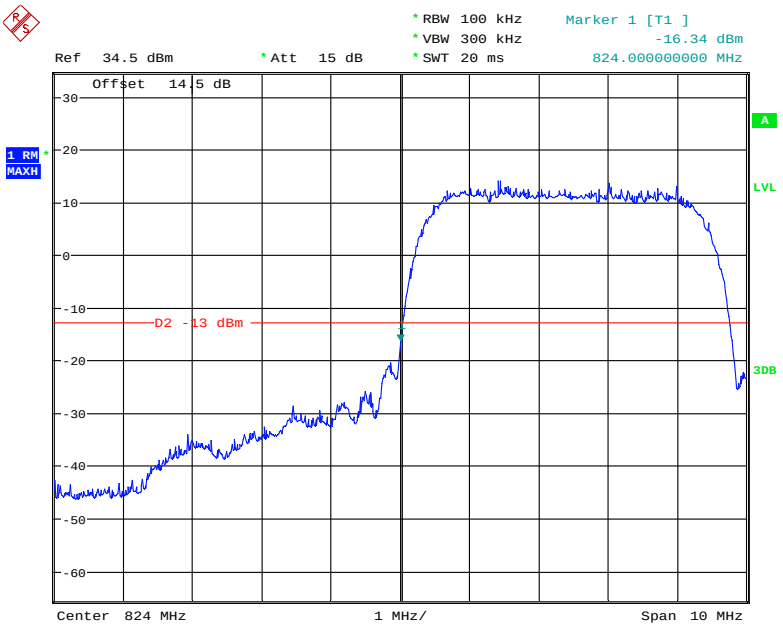
Temperature:	24~25 ℃
Relative Humidity:	51~52 %
ATM Pressure:	101.0~101.2 kPa

The testing was performed by Kiki Kong from 2018-10-24 to 2018-10-31.

EUT operation mode: Transmitting

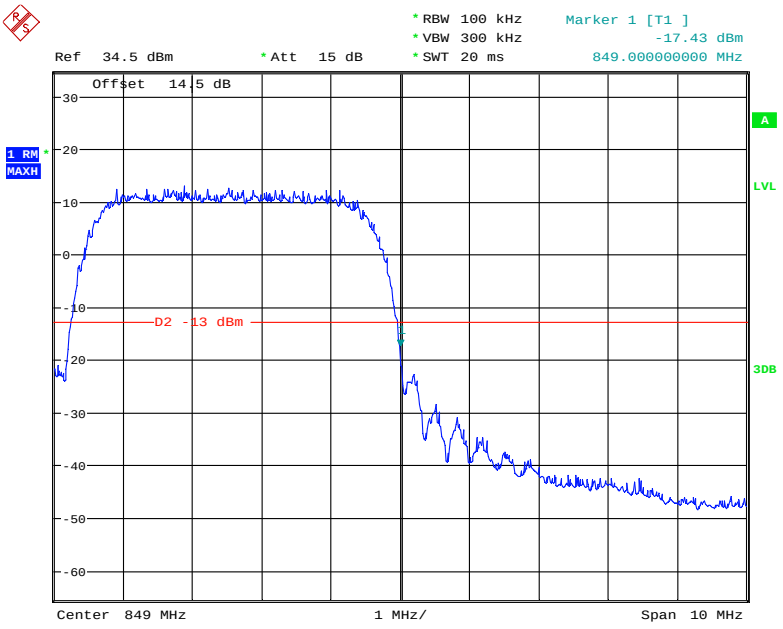
Test Result: Compliance. Please refer to the following plots.

Cellular Band, Left Band Edge for WCDMA (BPSK) Mode



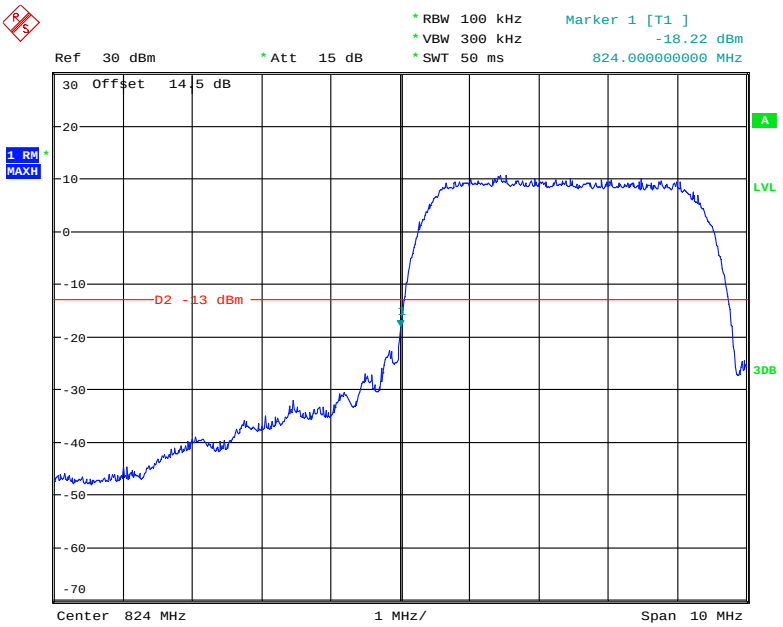
Date: 24.OCT.2018 19:51:35

Cellular Band, Right Band Edge for WCDMA (BPSK) Mode



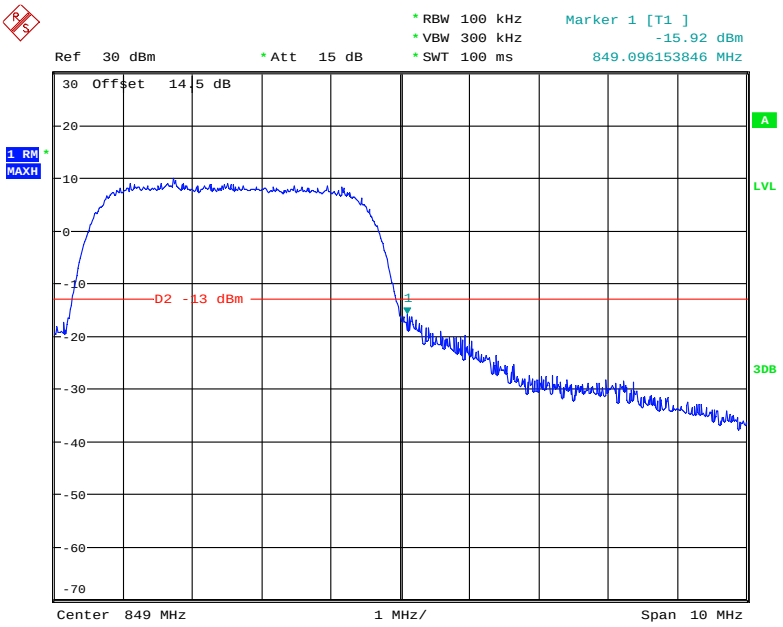
Date: 24.OCT.2018 19:50:46

Cellular Band, Left Band Edge for HSDPA (16QAM) Mode



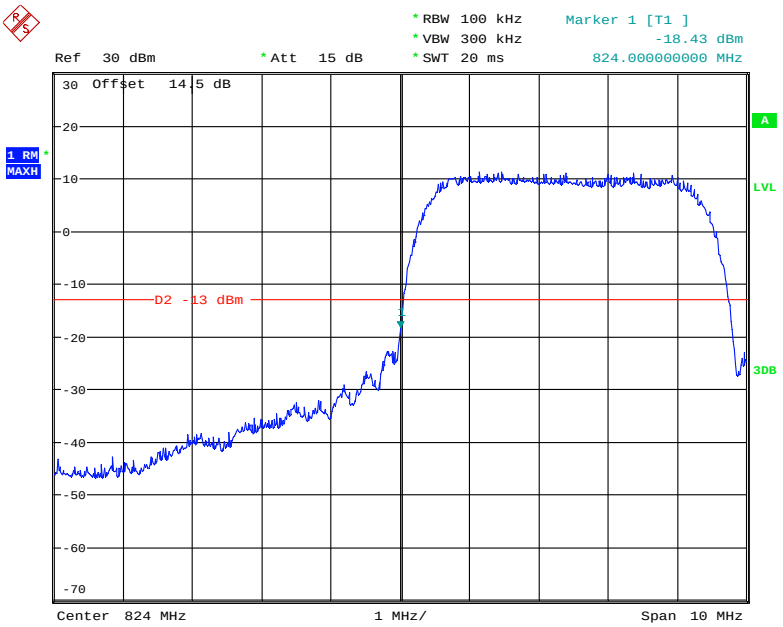
Date: 24.OCT.2018 20:31:59

Cellular Band, Right Band Edge for HSDPA (16QAM) Mode



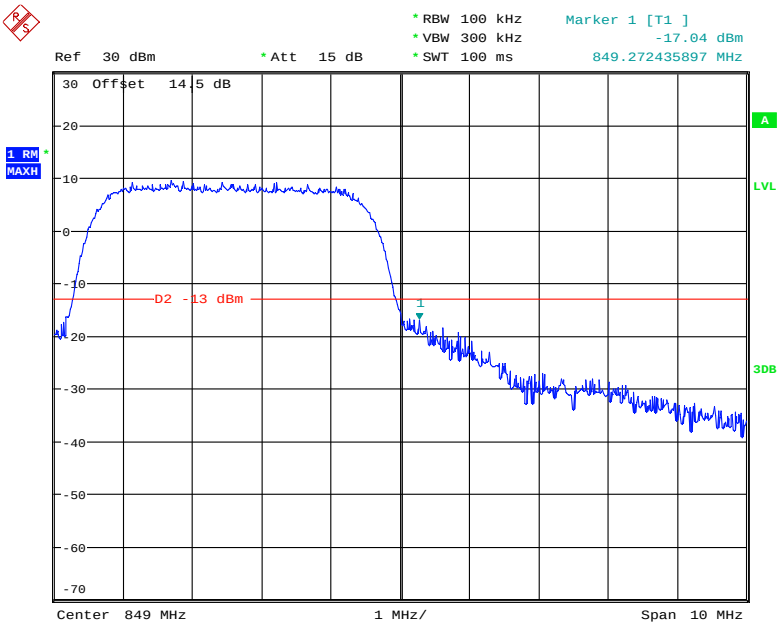
Date: 24.OCT.2018 20:36:48

Cellular Band, Left Band Edge for HSUPA (BPSK) Mode



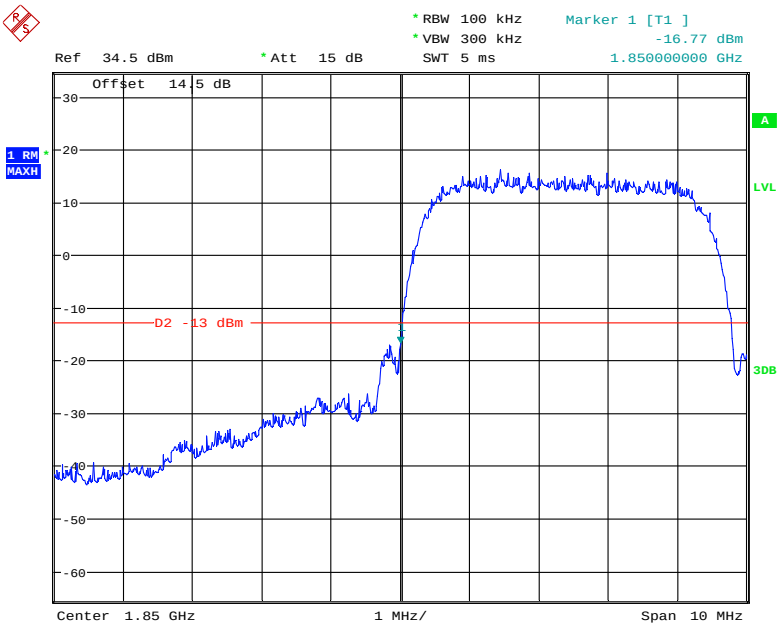
Date: 24.OCT.2018 20:14:14

Cellular Band, Right Band Edge for HSUPA (BPSK) Mode



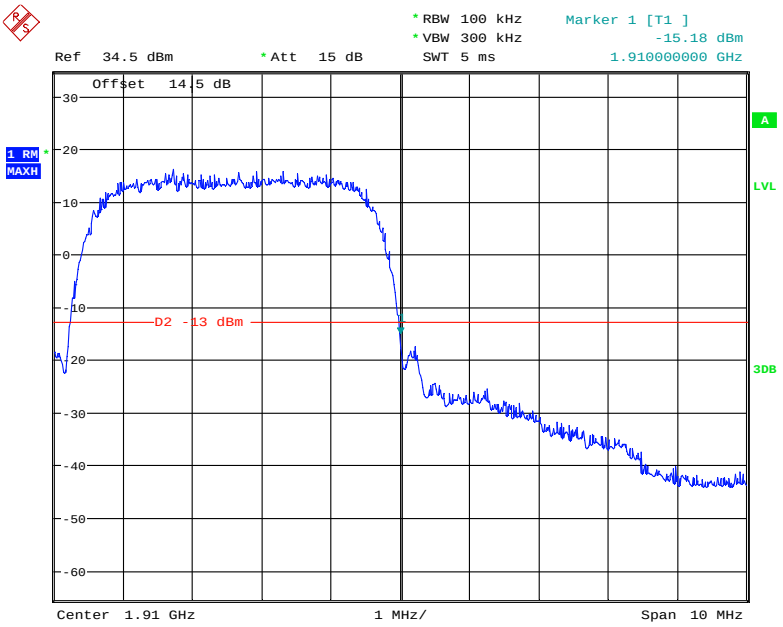
Date: 24.OCT.2018 20:37:39

PCS Band, Left Band Edge for WCDMA (BPSK) Mode



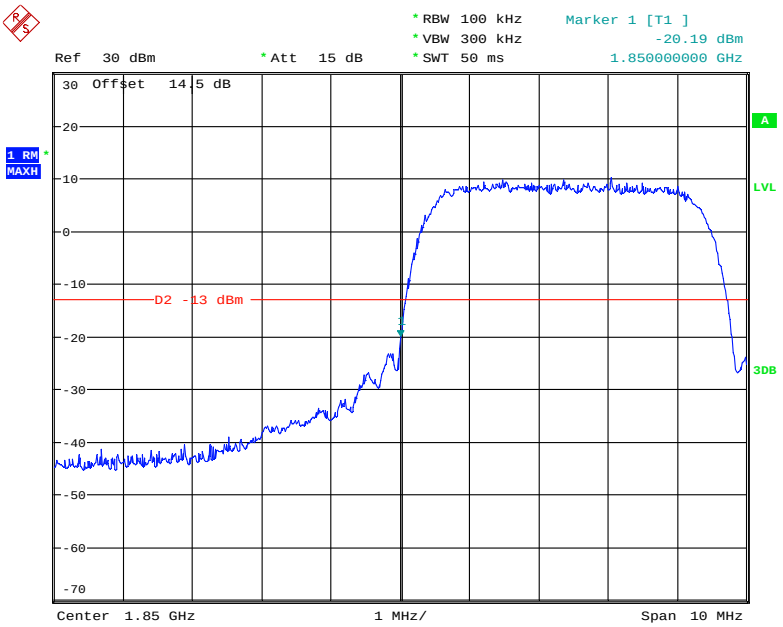
Date: 24.OCT.2018 19:48:08

PCS Band, Right Band Edge for WCDMA (BPSK) Mode



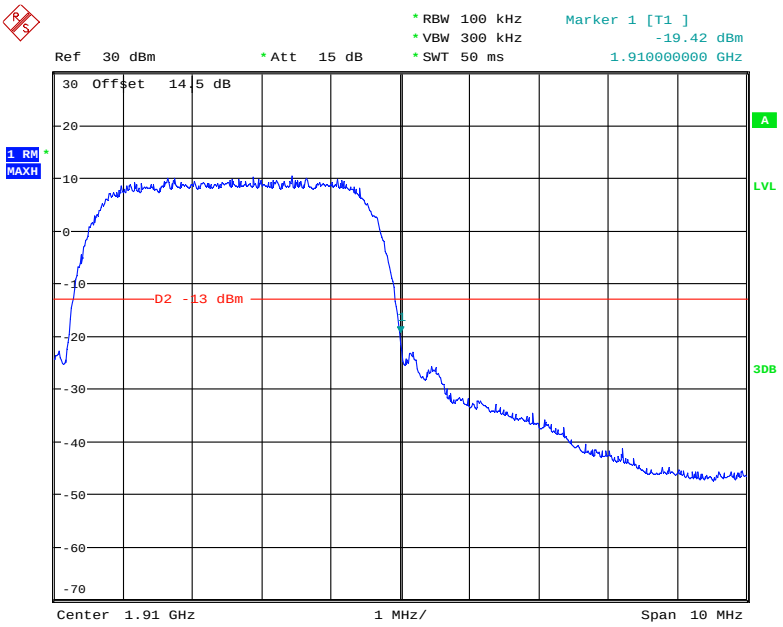
Date: 24.OCT.2018 19:49:17

PCS Band, Left Band Edge for HSDPA (16QAM) Mode



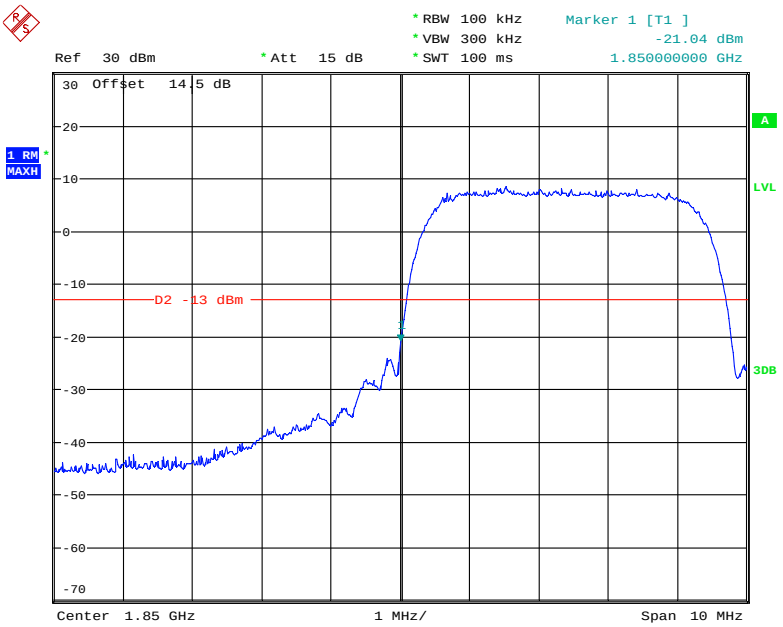
Date: 24.OCT.2018 20:29:20

PCS Band, Right Band Edge for HSDPA (16QAM) Mode



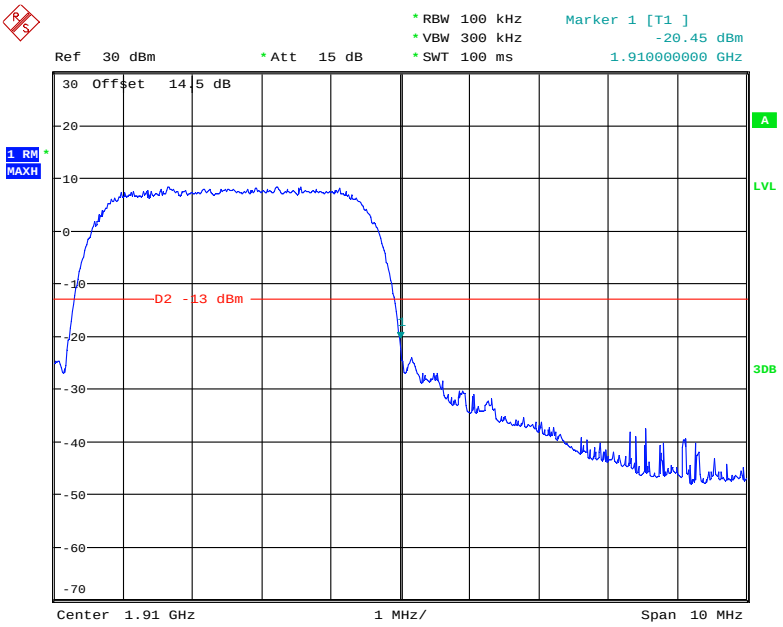
Date: 24.OCT.2018 20:30:23

PCS Band, Left Band Edge for HSUPA (BPSK) Mode



Date: 24.OCT.2018 20:26:18

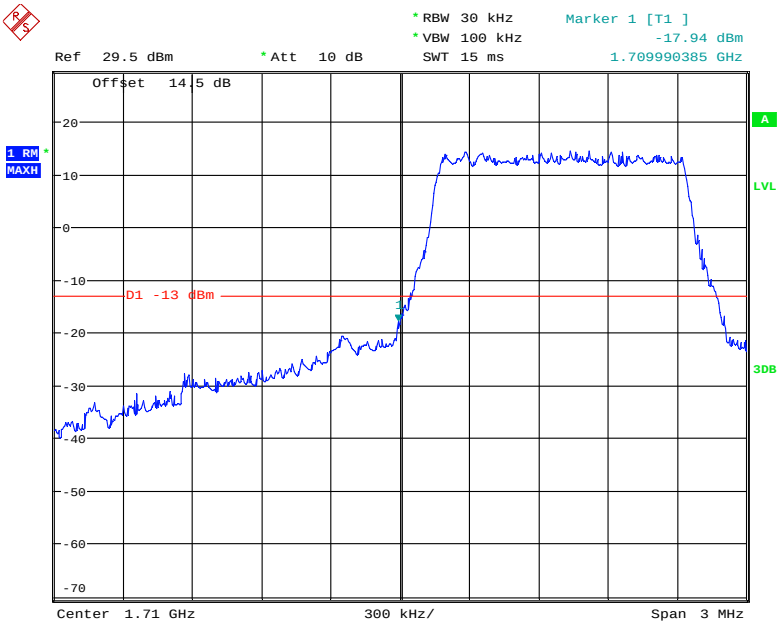
PCS Band, Right Band Edge for HSUPA (BPSK) Mode



Date: 24.OCT.2018 20:24:22

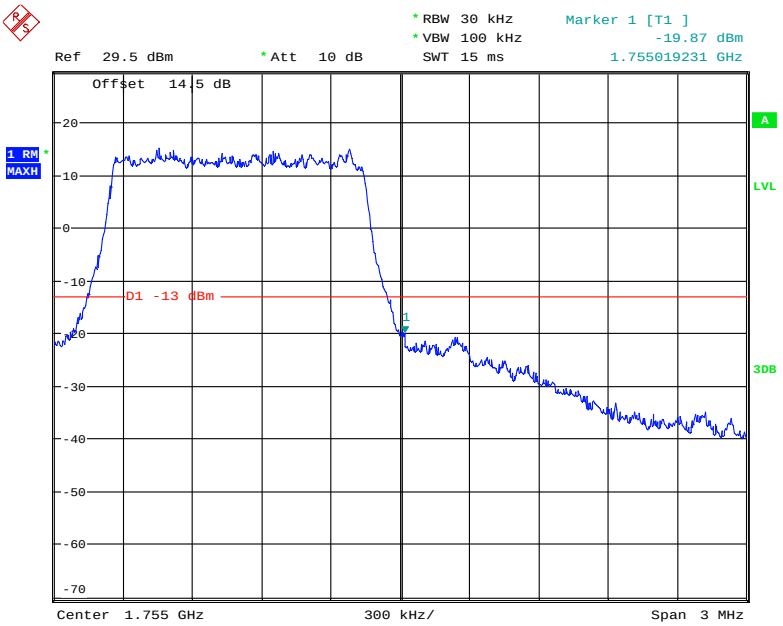
Band 4:

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



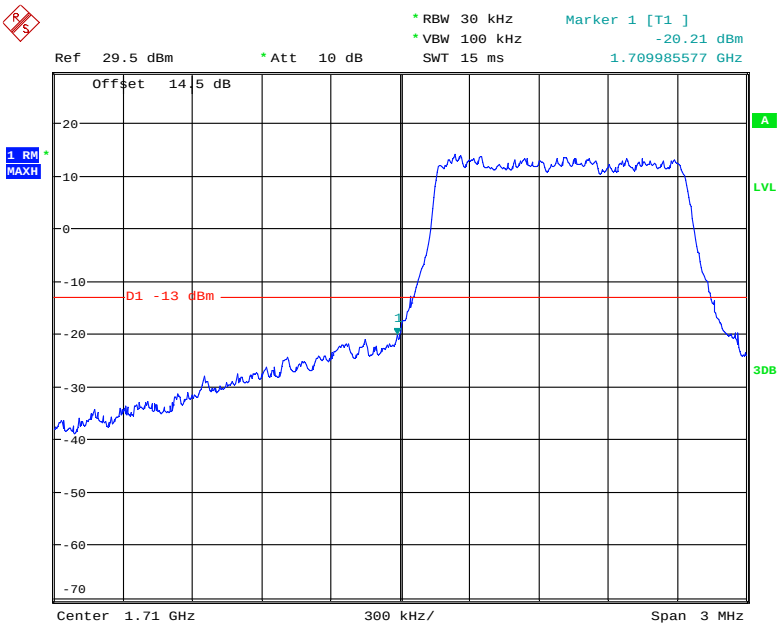
Date: 25.OCT.2018 20:37:19

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



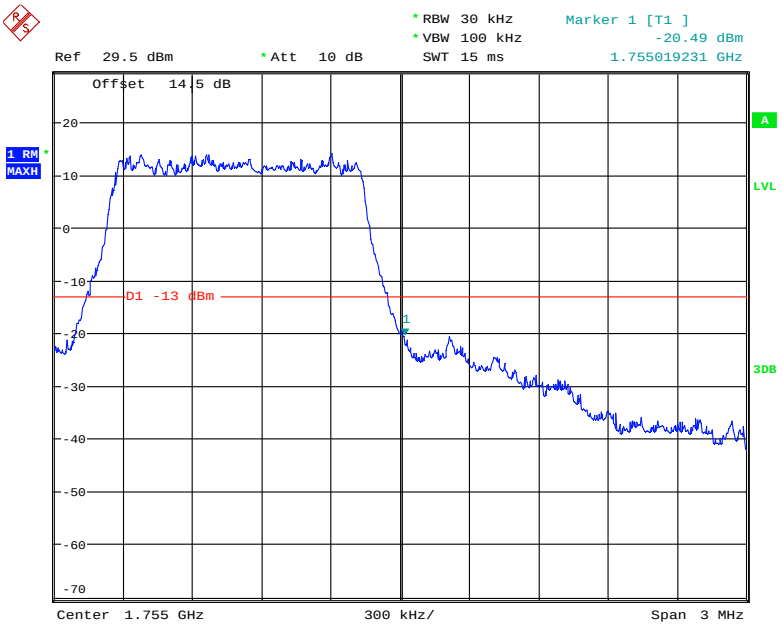
Date: 25.OCT.2018 20:42:44

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



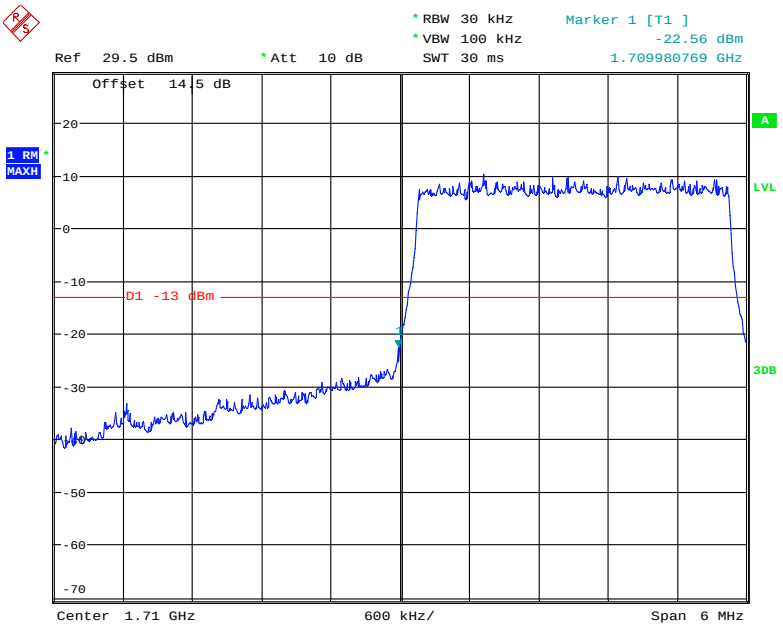
Date: 25.OCT.2018 20:40:29

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



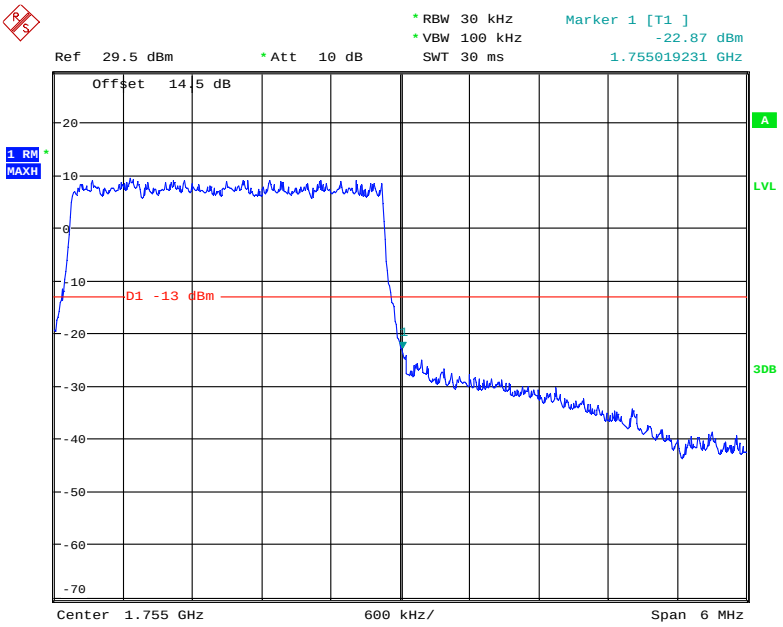
Date: 25.OCT.2018 20:41:53

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



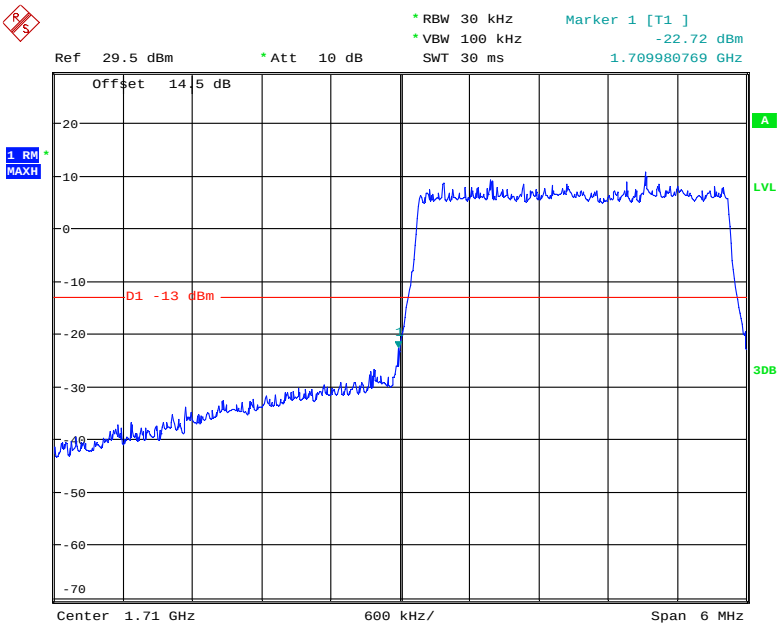
Date: 25.OCT.2018 20:47:19

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



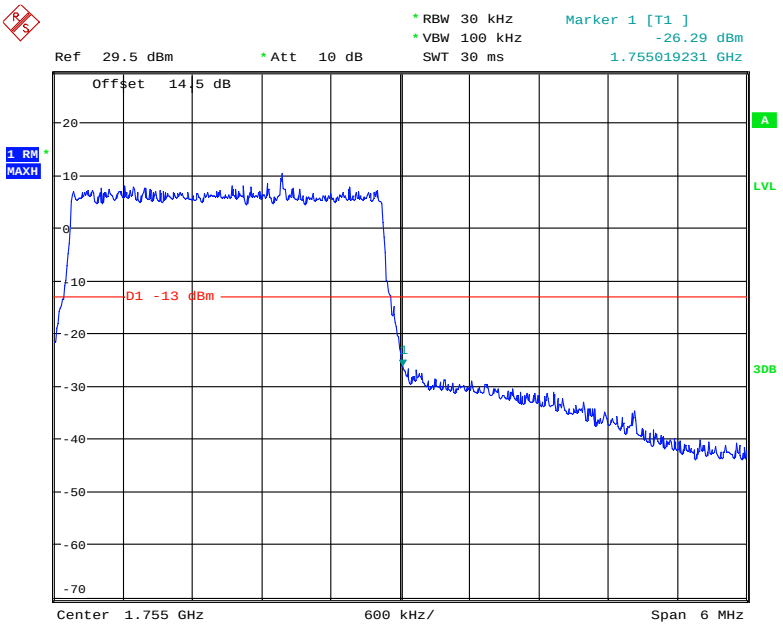
Date: 25.OCT.2018 20:44:34

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



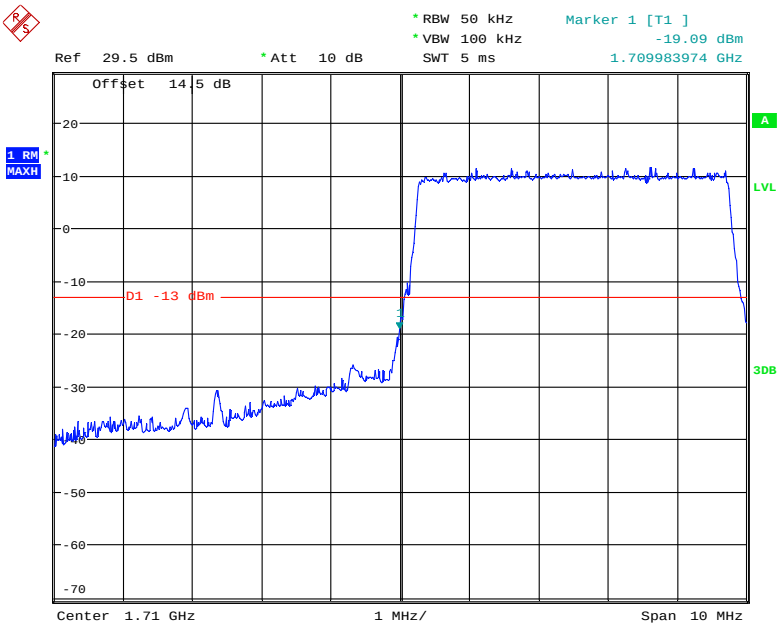
Date: 25.OCT.2018 20:46:14

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



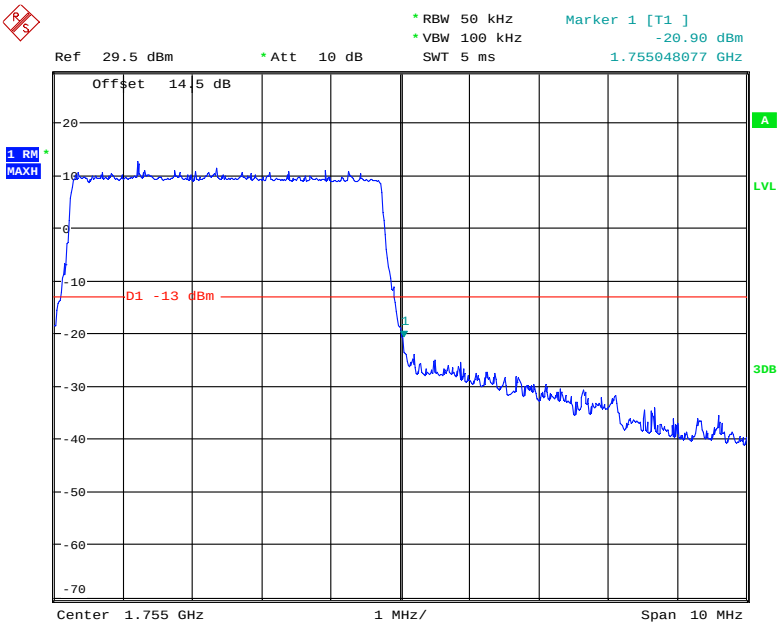
Date: 25.OCT.2018 20:45:14

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



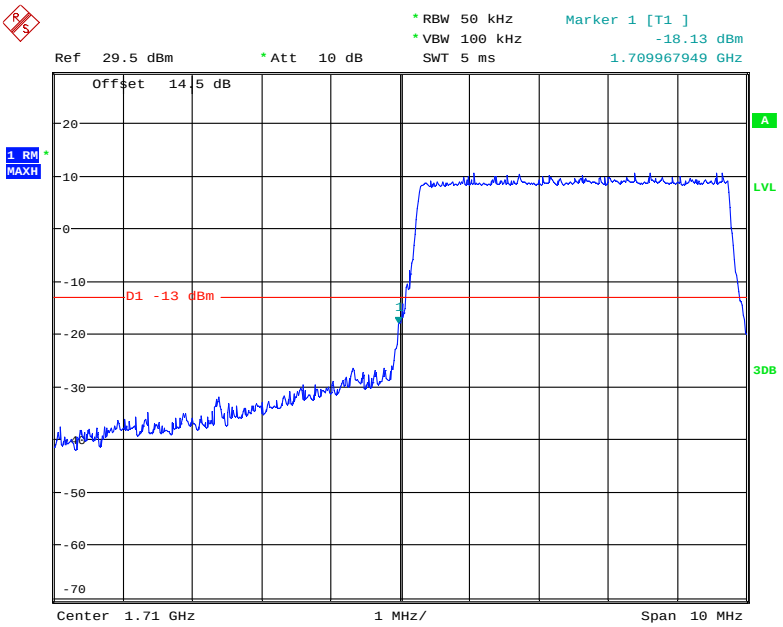
Date: 25.OCT.2018 20:48:44

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



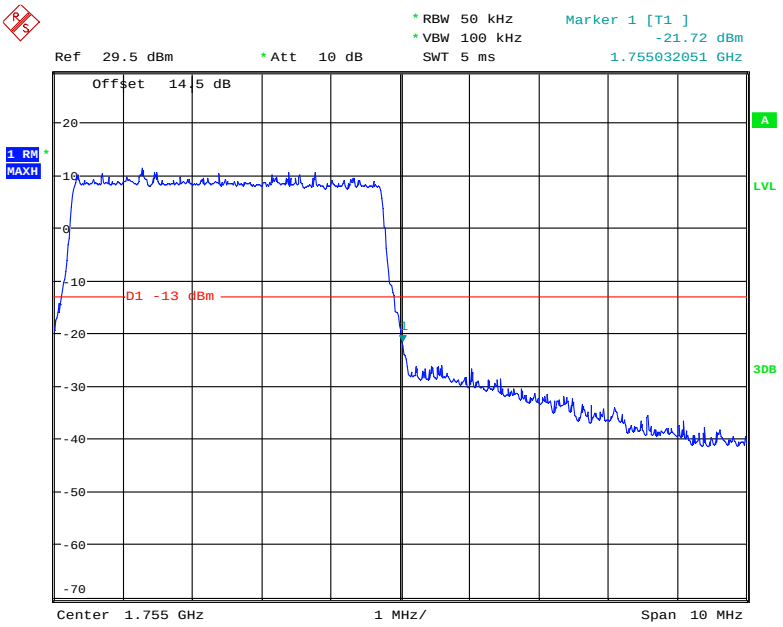
Date: 25.OCT.2018 20:51:52

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



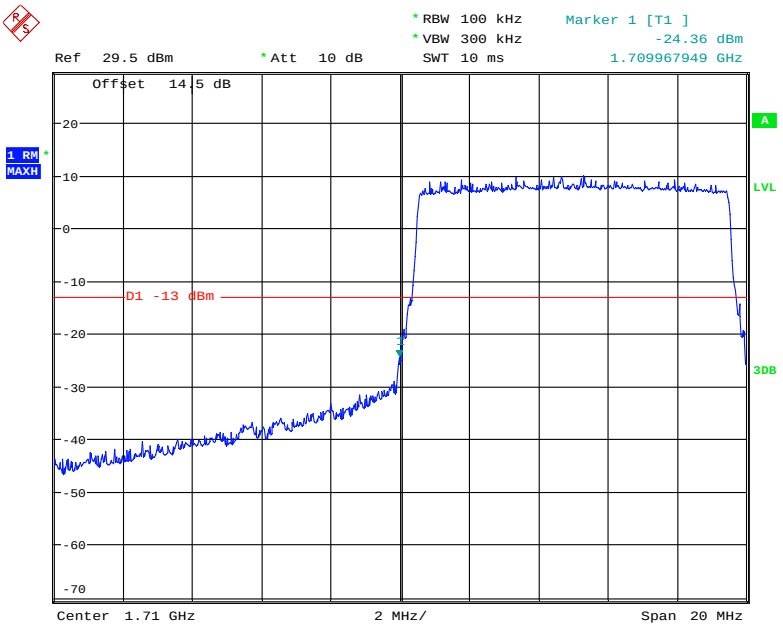
Date: 25.OCT.2018 20:49:49

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



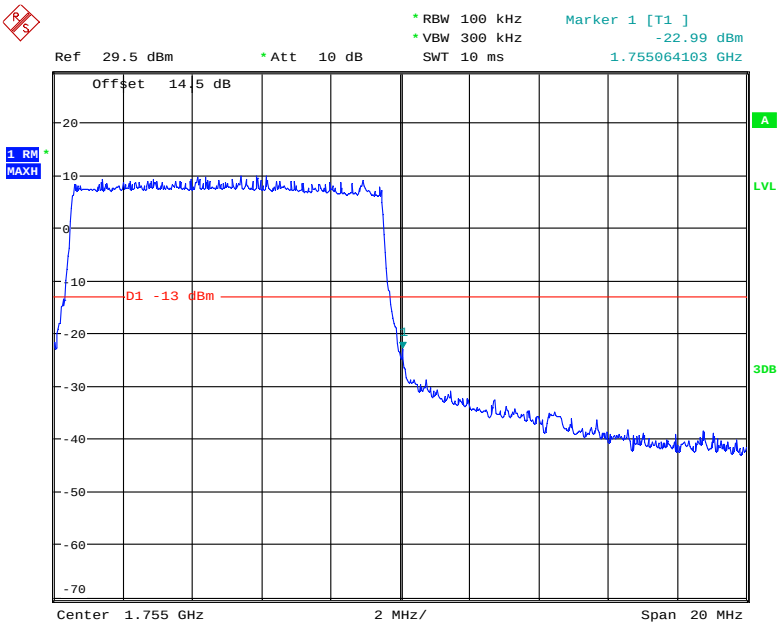
Date: 25.OCT.2018 20:50:50

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



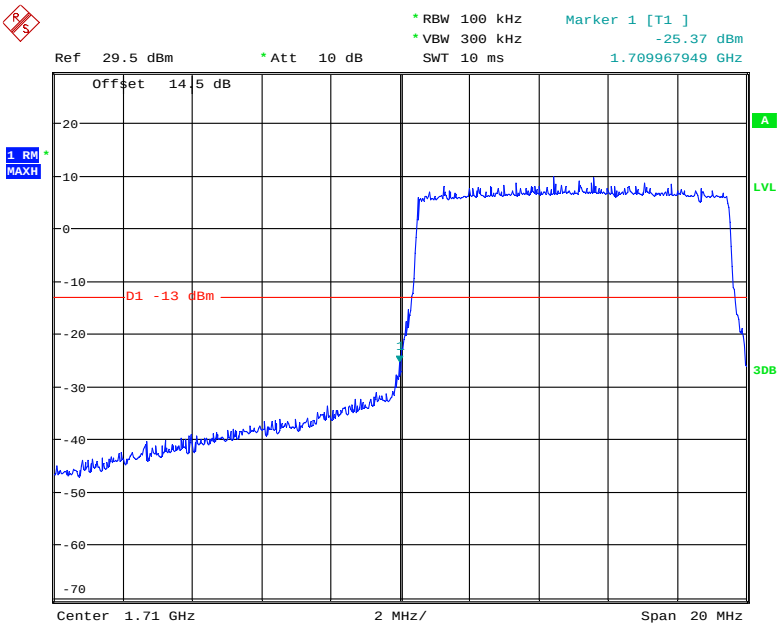
Date: 25.OCT.2018 20:58:33

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



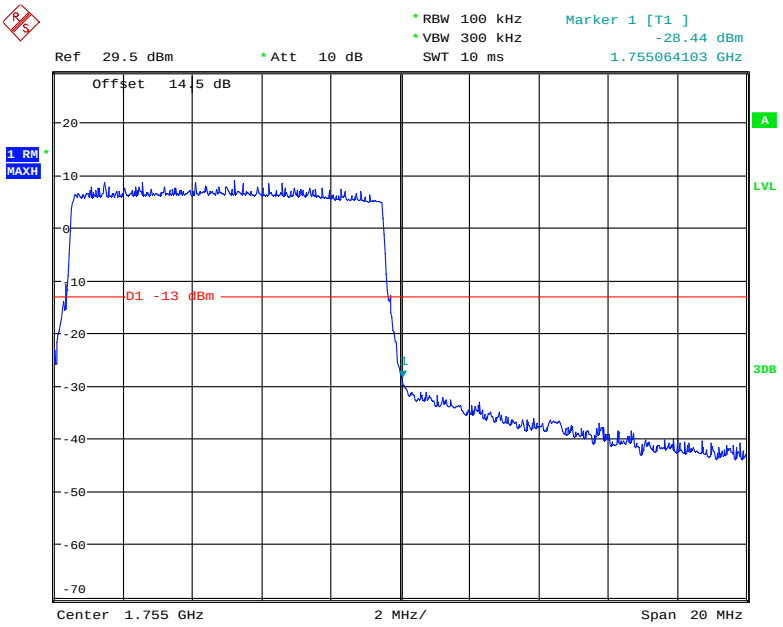
Date: 25.OCT.2018 20:54:51

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



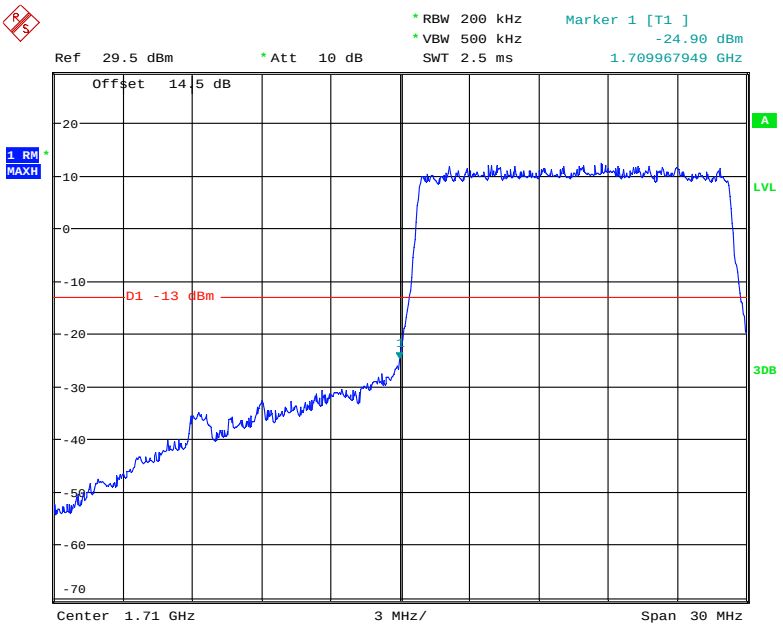
Date: 25.OCT.2018 20:57:54

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



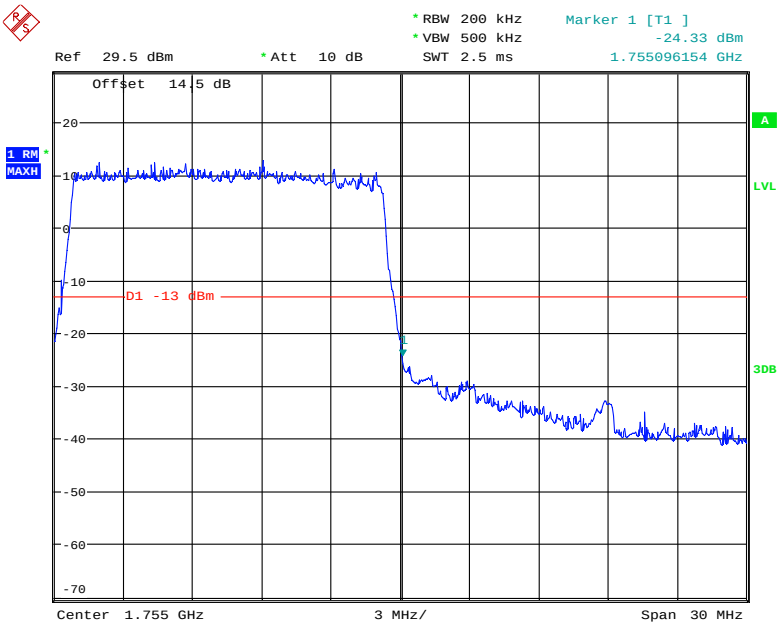
Date: 25.OCT.2018 20:56:51

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



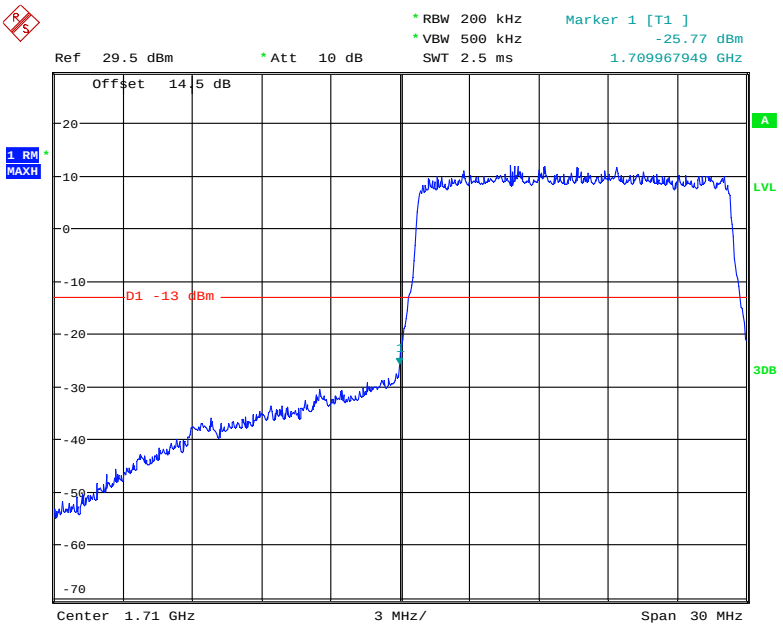
Date: 25.OCT.2018 21:00:27

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



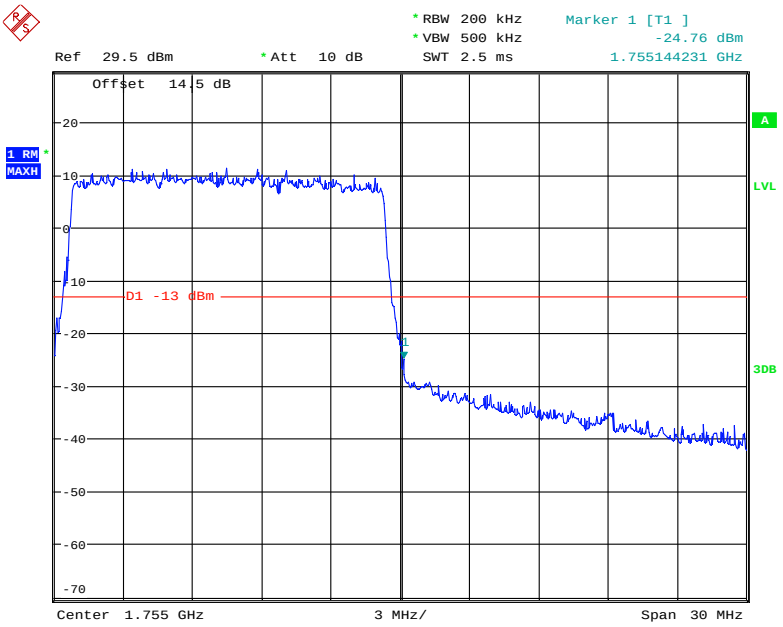
Date: 25.OCT.2018 21:04:08

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



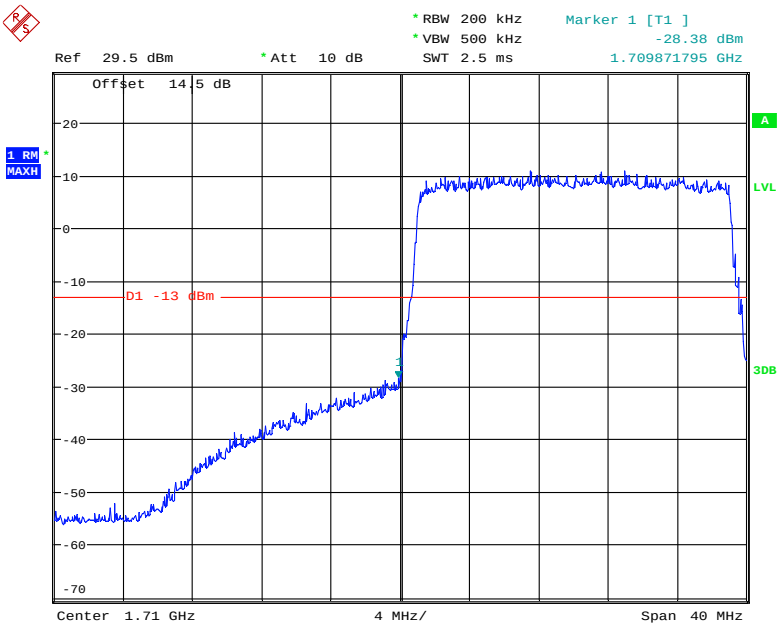
Date: 25.OCT.2018 21:01:56

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



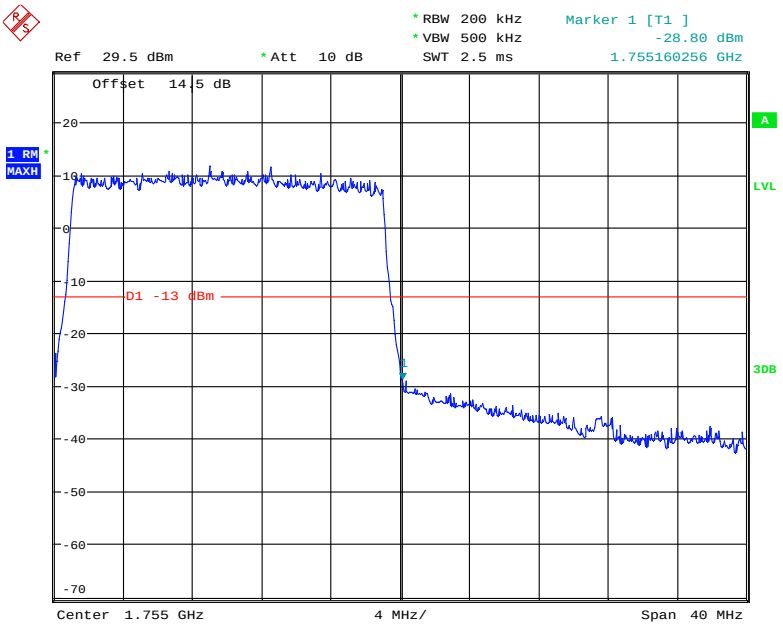
Date: 25.OCT.2018 21:03:21

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



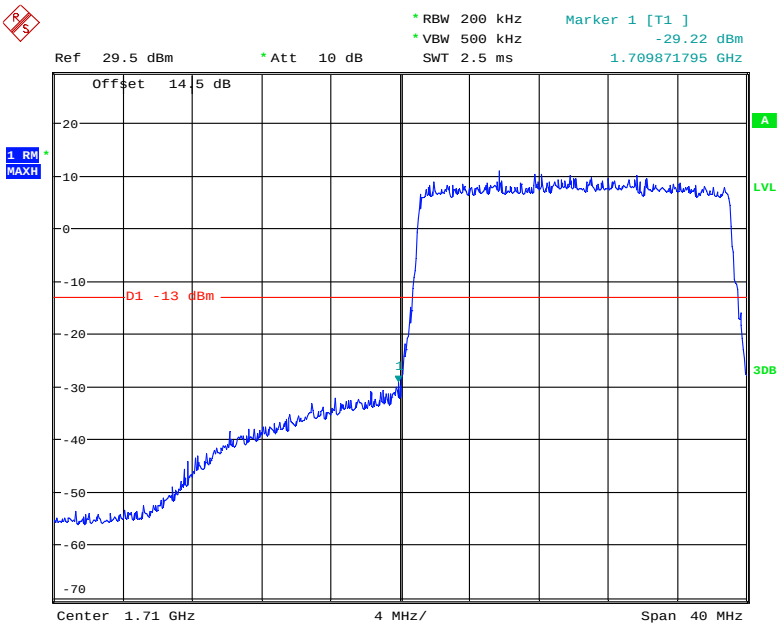
Date: 25.OCT.2018 21:10:34

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



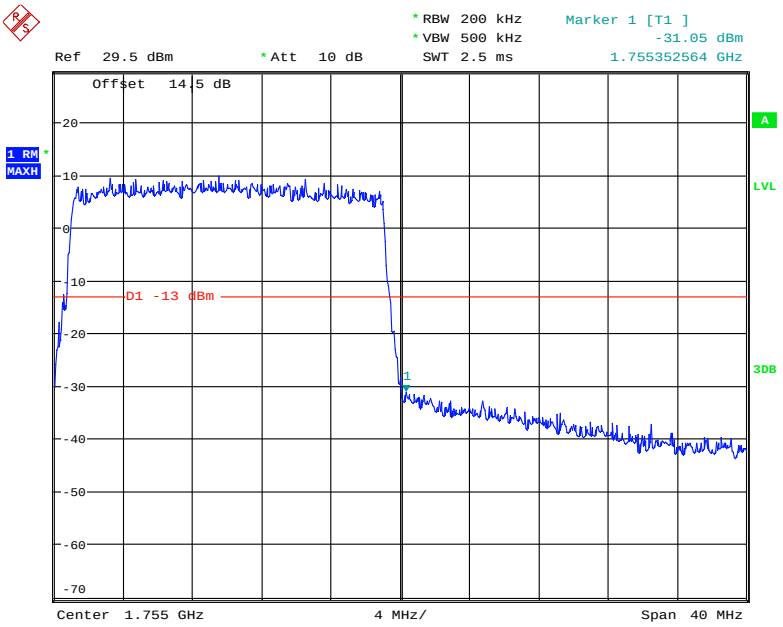
Date: 25.OCT.2018 21:07:44

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



Date: 25.OCT.2018 21:09:47

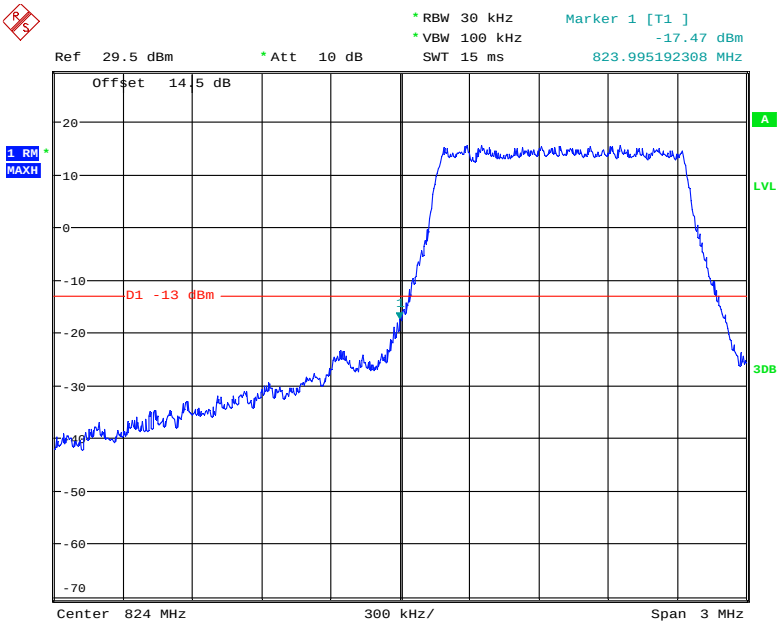
16-QAM (20.0 MHz, FULL RB) - Right Band Edge



Date: 25.OCT.2018 21:08:24

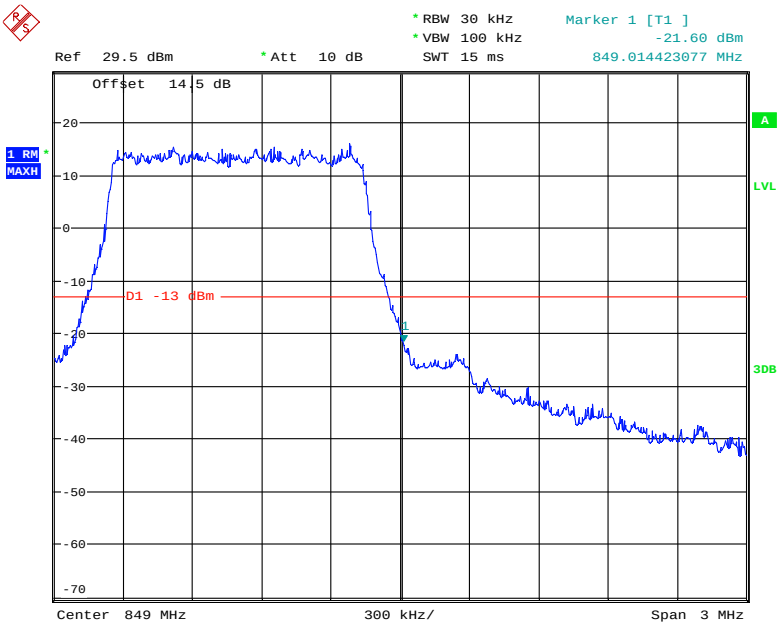
Band 5:

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



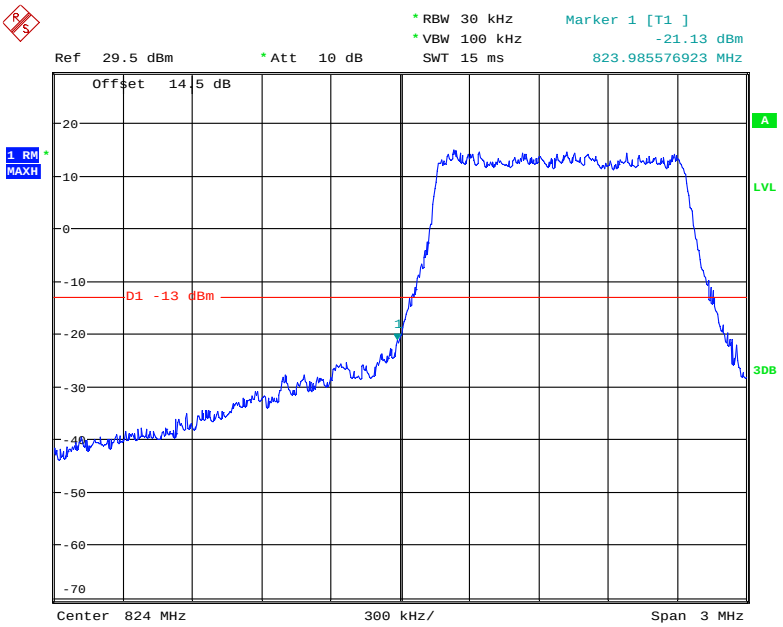
Date: 25.OCT.2018 21:20:54

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



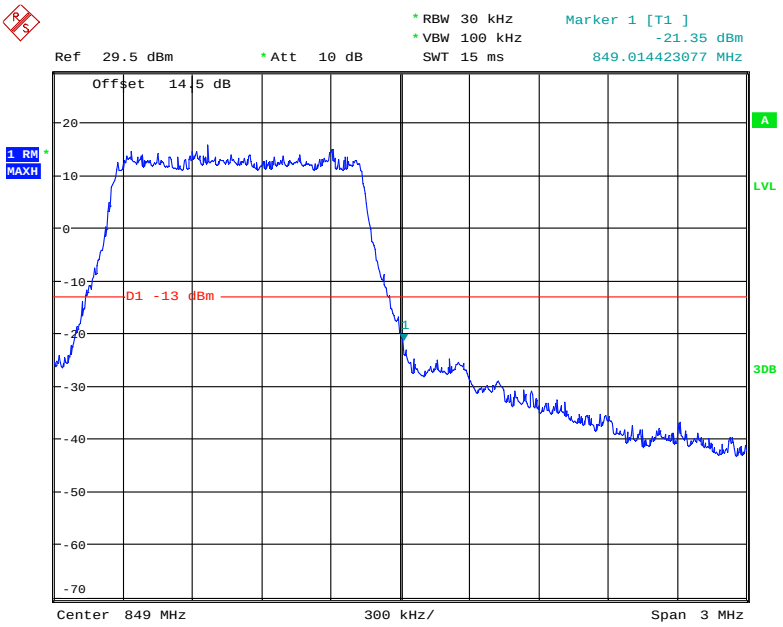
Date: 25.OCT.2018 21:23:33

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



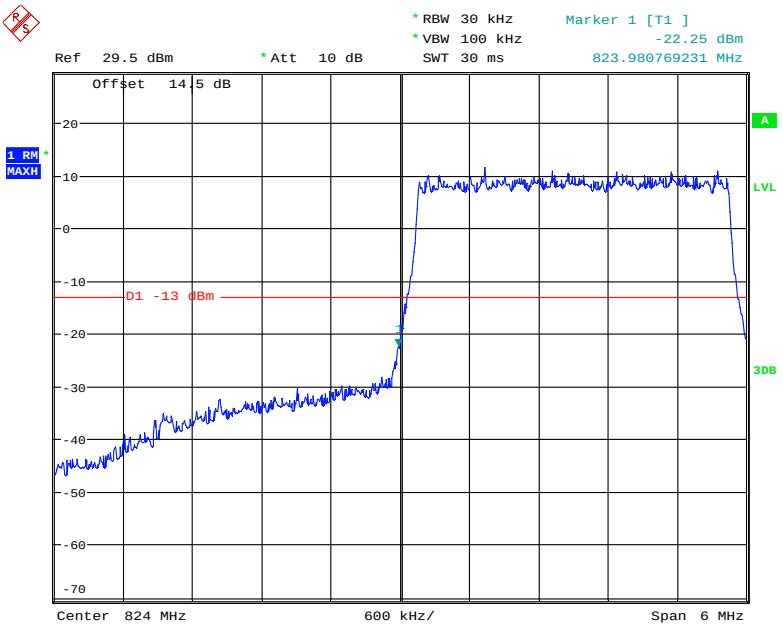
Date: 25.OCT.2018 21:21:46

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



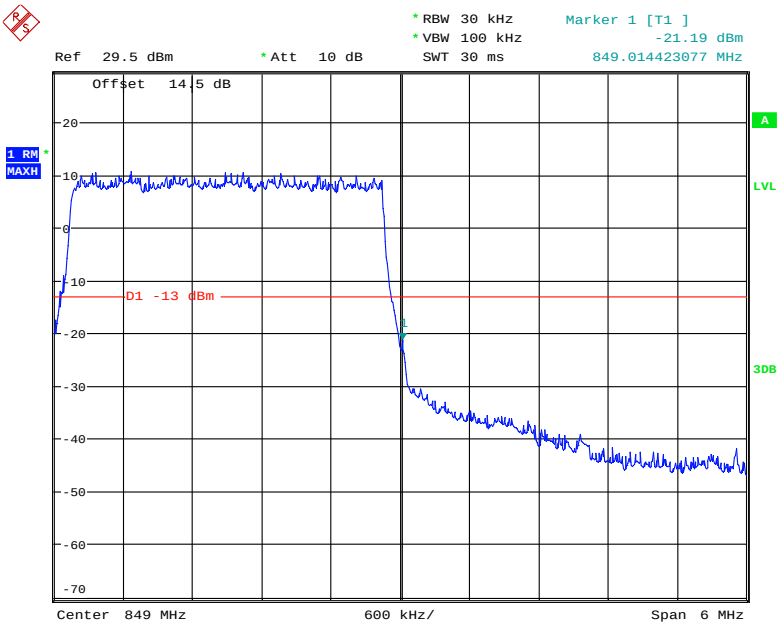
Date: 25.OCT.2018 21:22:56

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



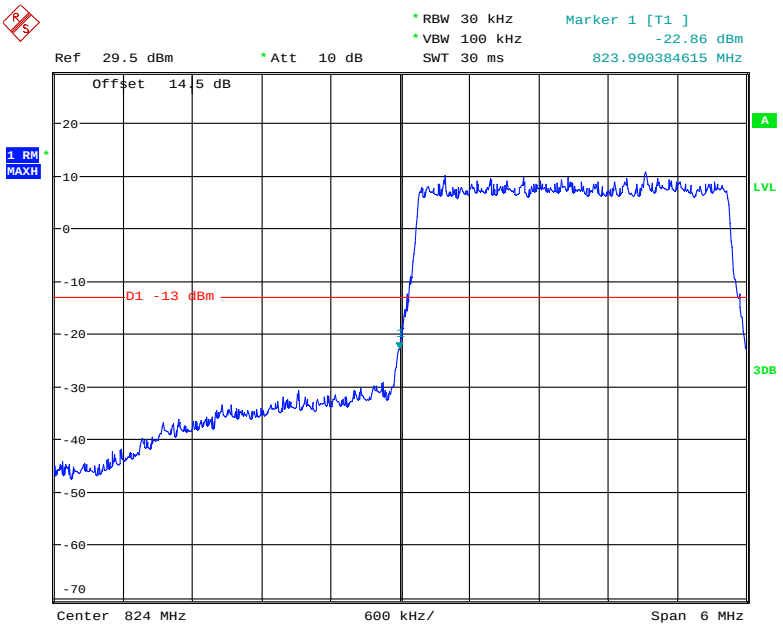
Date: 25.OCT.2018 21:27:38

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



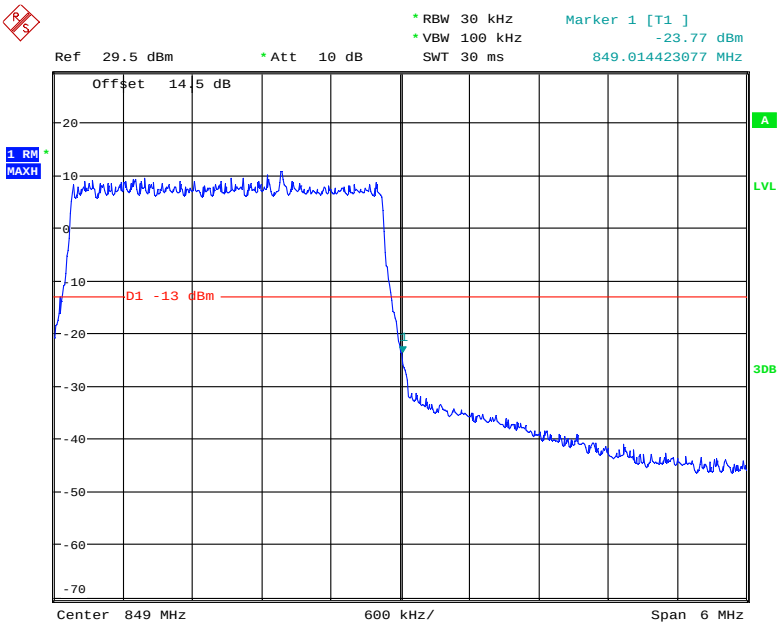
Date: 25.OCT.2018 21:24:27

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



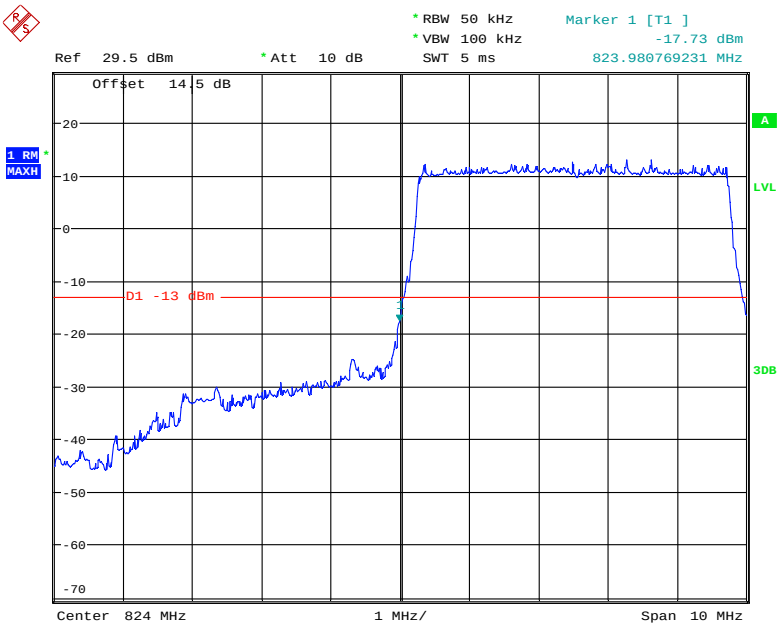
Date: 25.OCT.2018 21:26:29

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



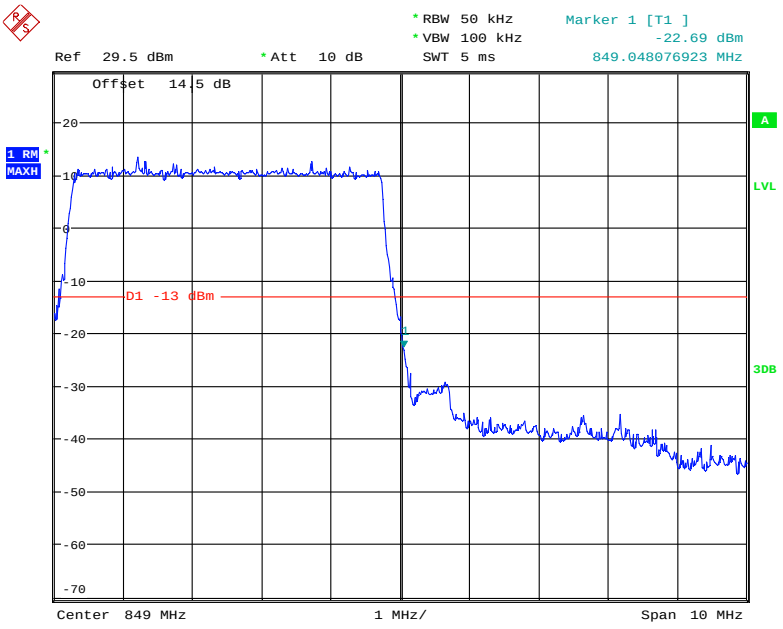
Date: 25.OCT.2018 21:25:25

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



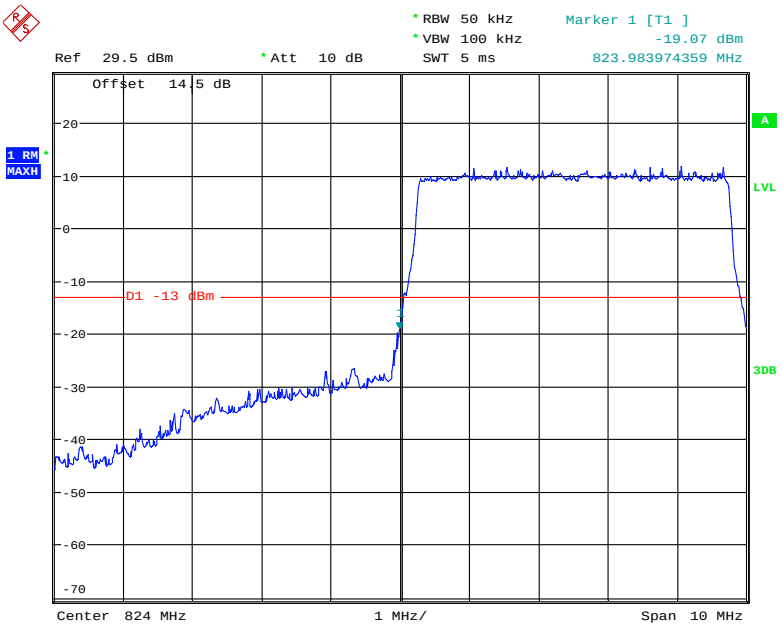
Date: 25.OCT.2018 21:28:53

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



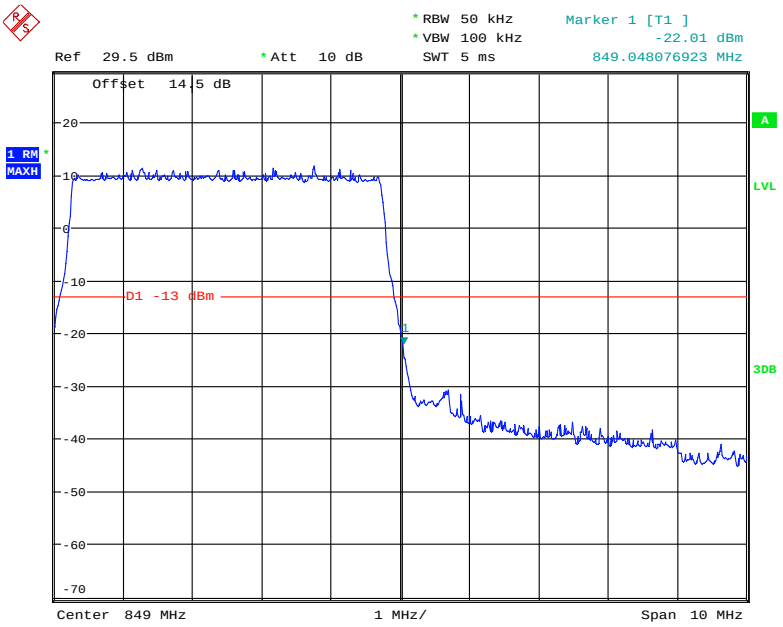
Date: 25.OCT.2018 21:31:29

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



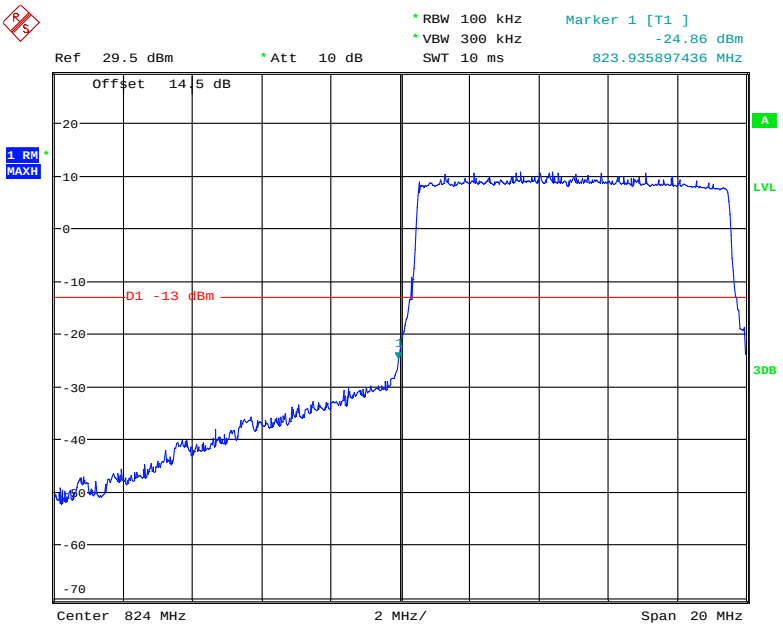
Date: 25.OCT.2018 21:29:46

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



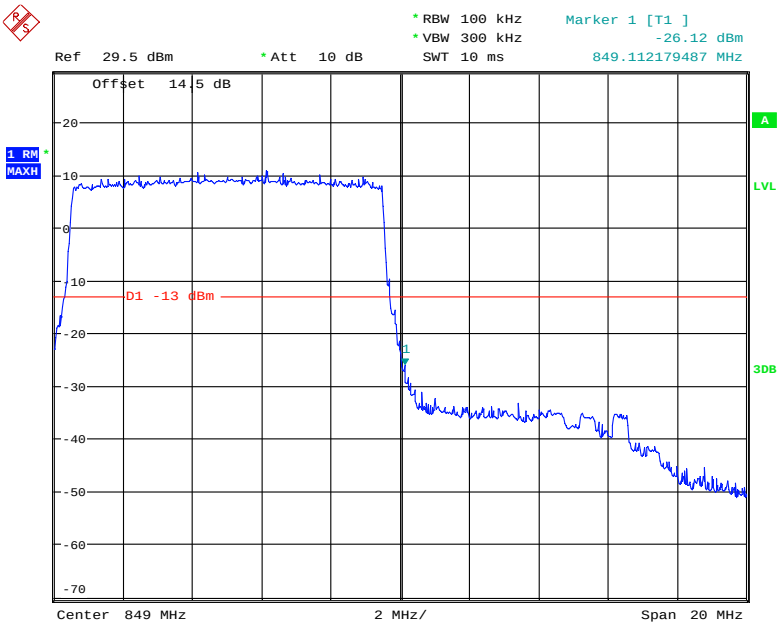
Date: 25.OCT.2018 21:30:56

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



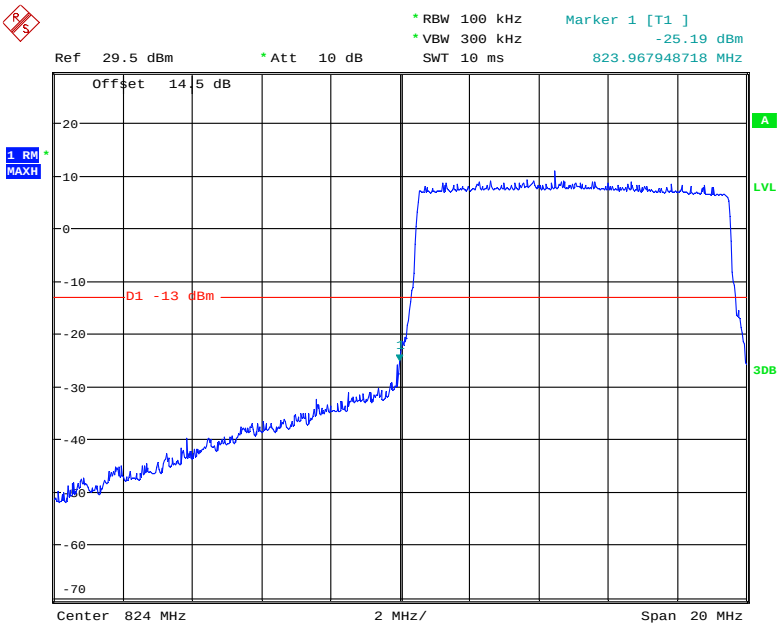
Date: 25.OCT.2018 21:37:18

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



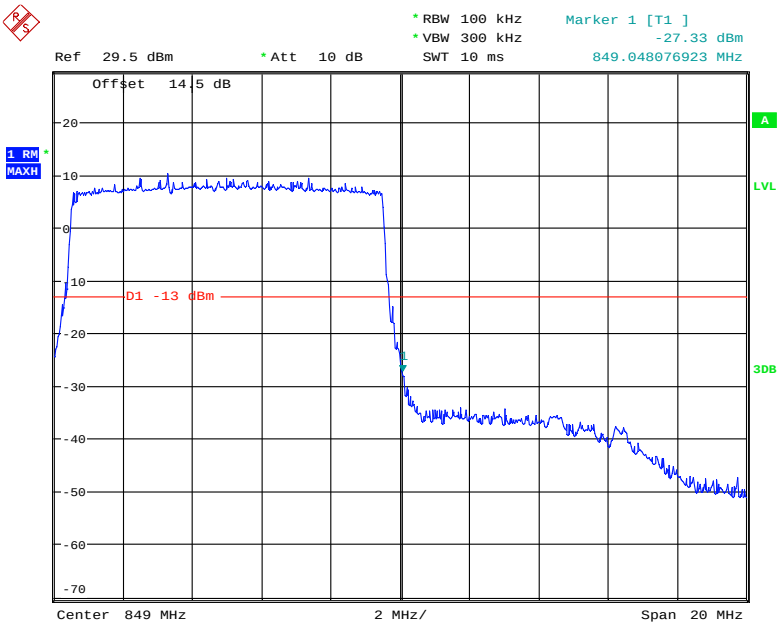
Date: 25.OCT.2018 21:33:48

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



Date: 25.OCT.2018 21:36:35

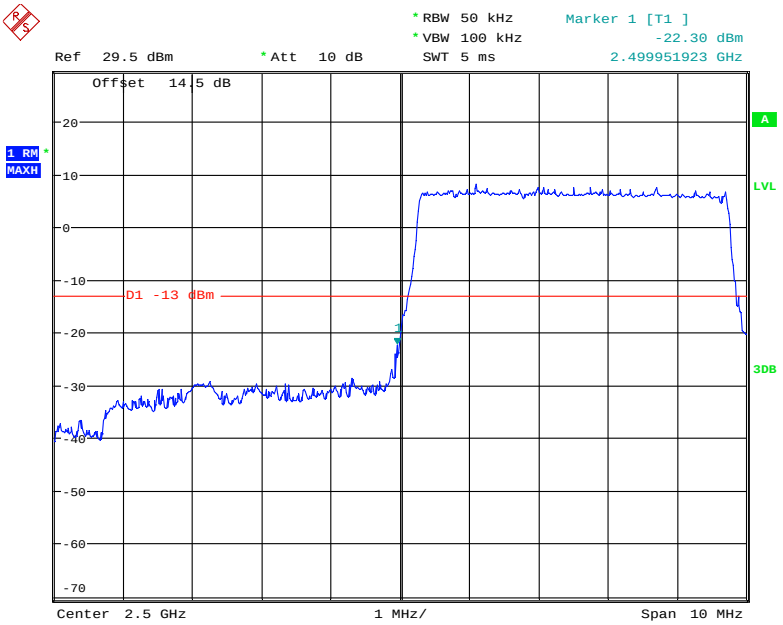
16-QAM (10.0 MHz, FULL RB) - Right Band Edge



Date: 25.OCT.2018 21:35:17

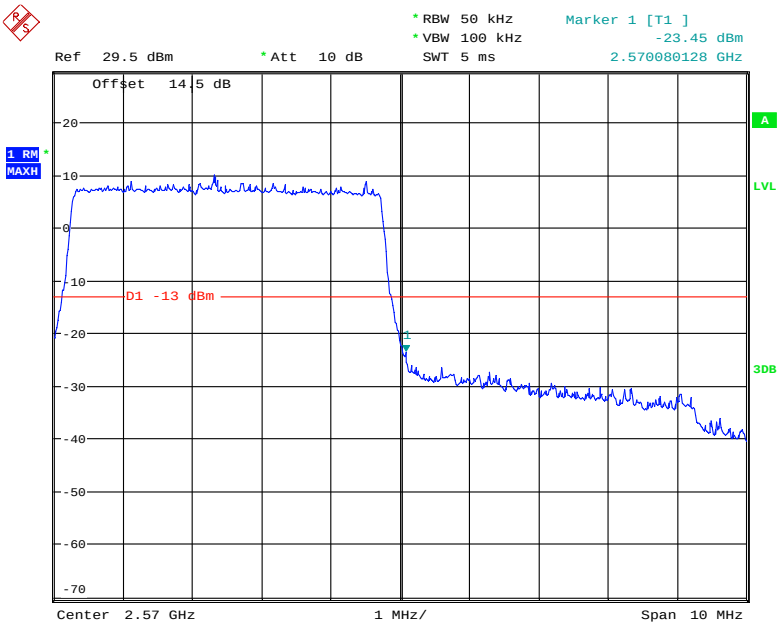
Band 7:

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



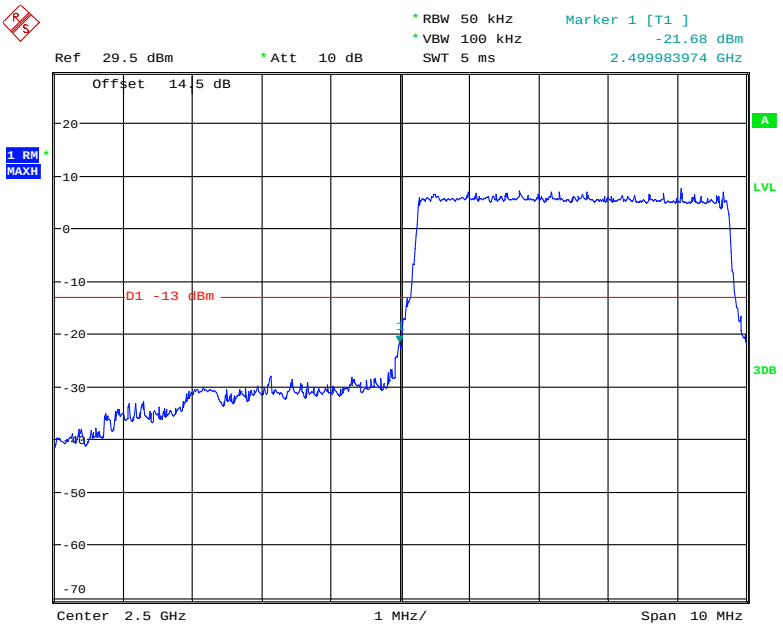
Date: 25.OCT.2018 21:41:36

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



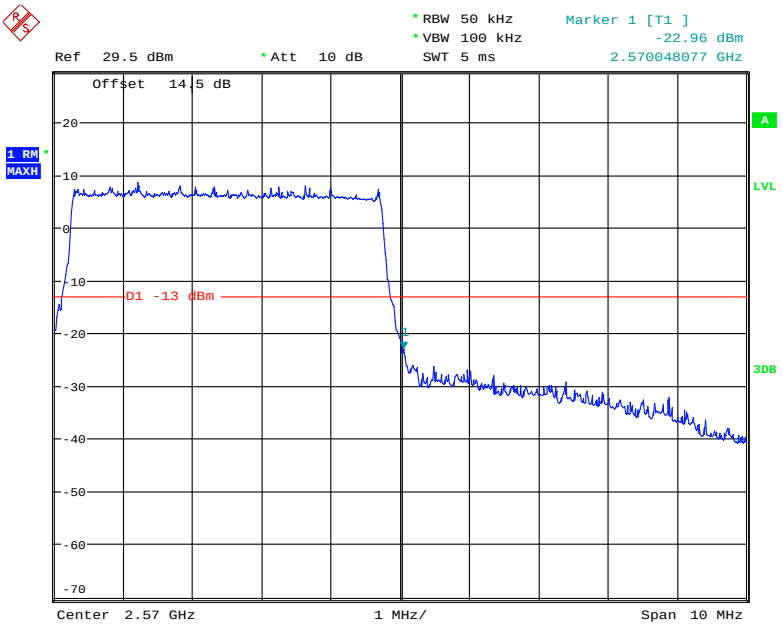
Date: 25.OCT.2018 21:45:46

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



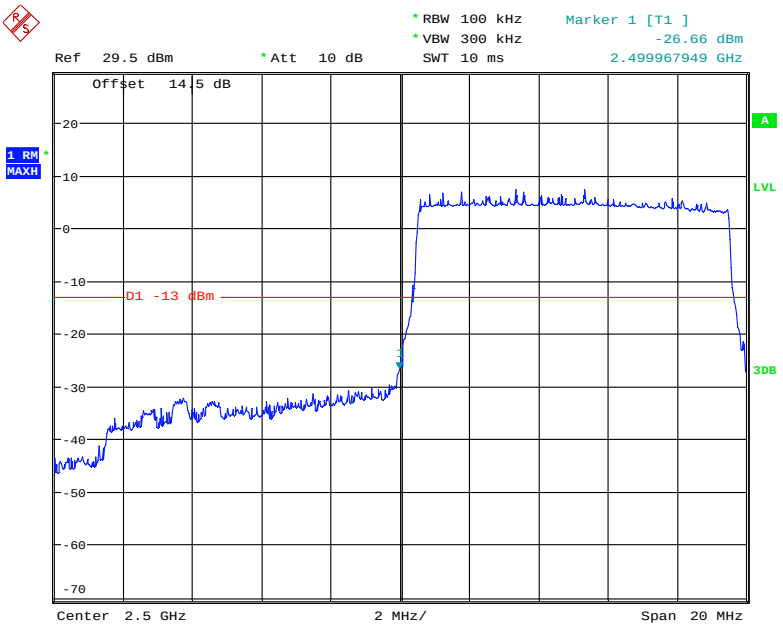
Date: 25.OCT.2018 21:42:50

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



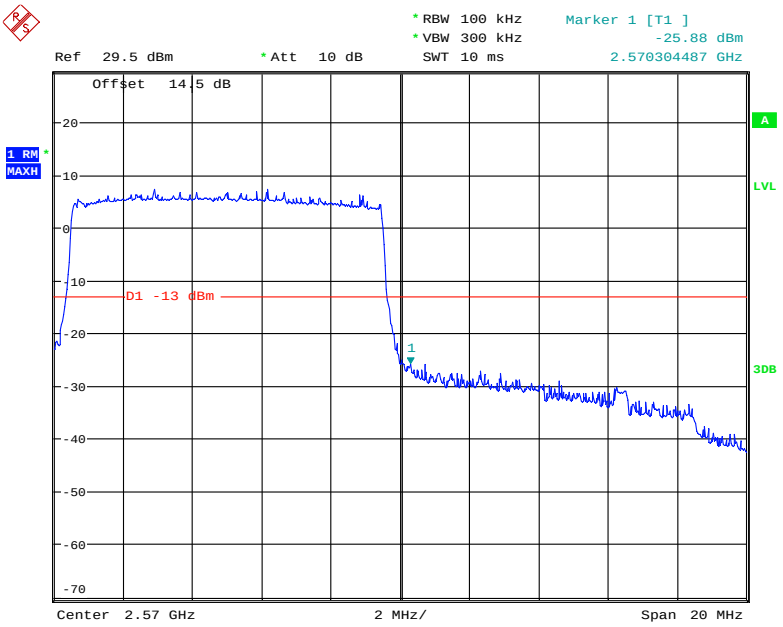
Date: 25.OCT.2018 21:45:00

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



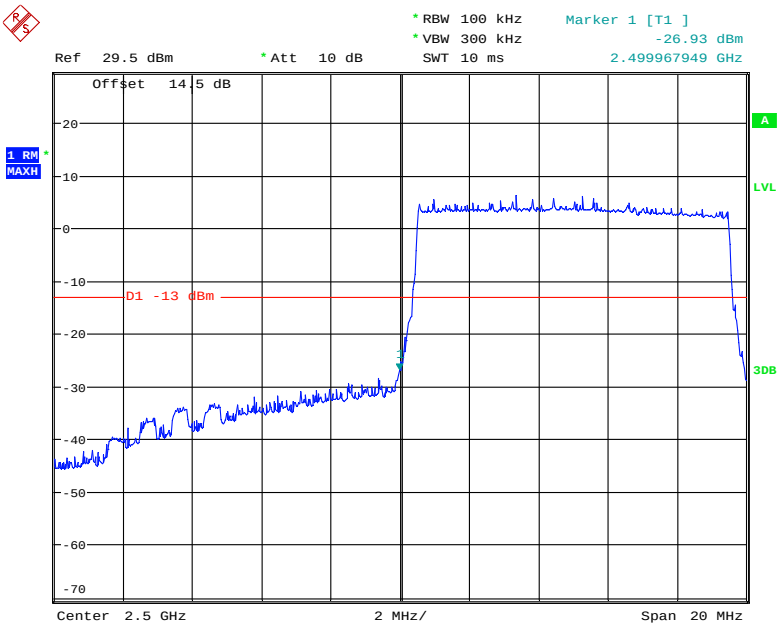
Date: 25.OCT.2018 21:51:25

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



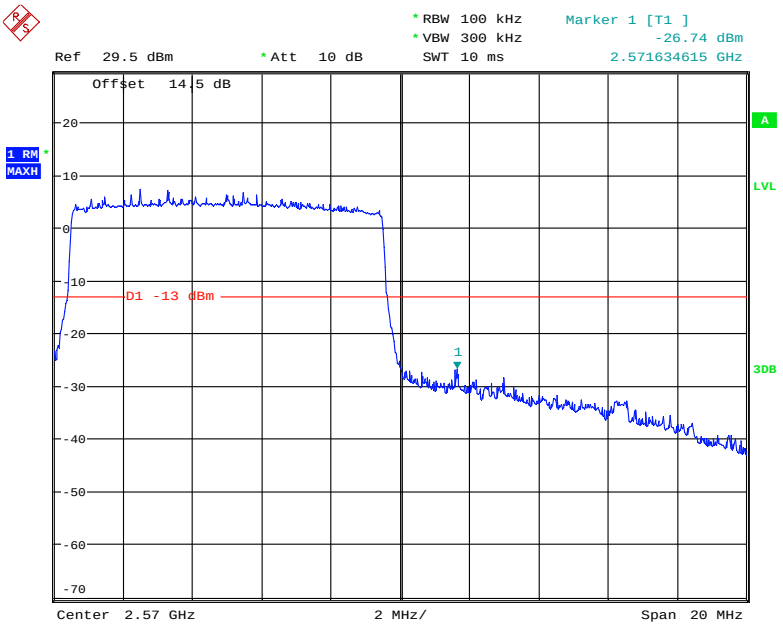
Date: 25.OCT.2018 21:48:14

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



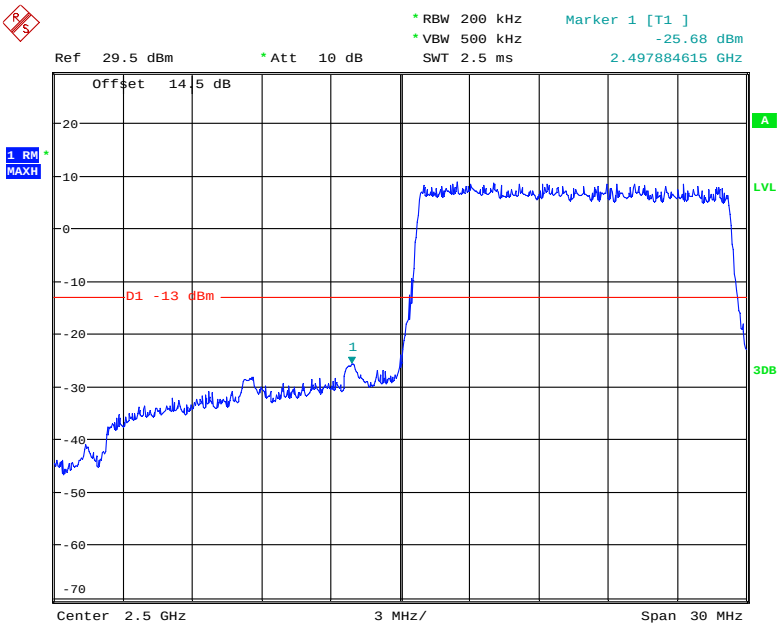
Date: 25.OCT.2018 21:50:46

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



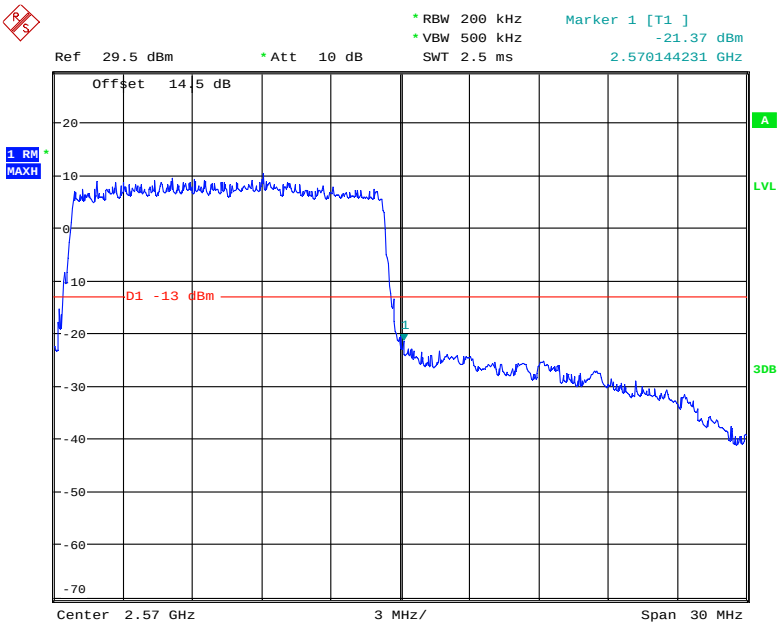
Date: 25.OCT.2018 21:49:51

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



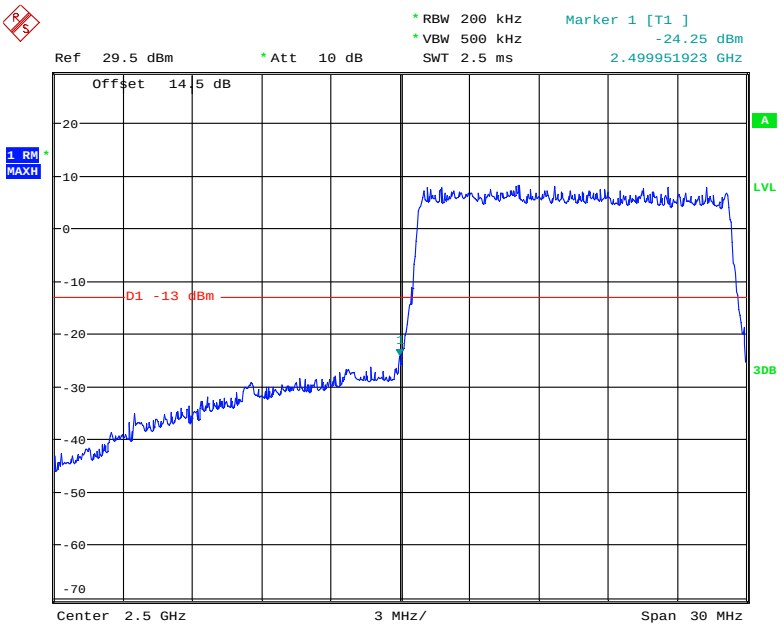
Date: 25.OCT.2018 21:53:58

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



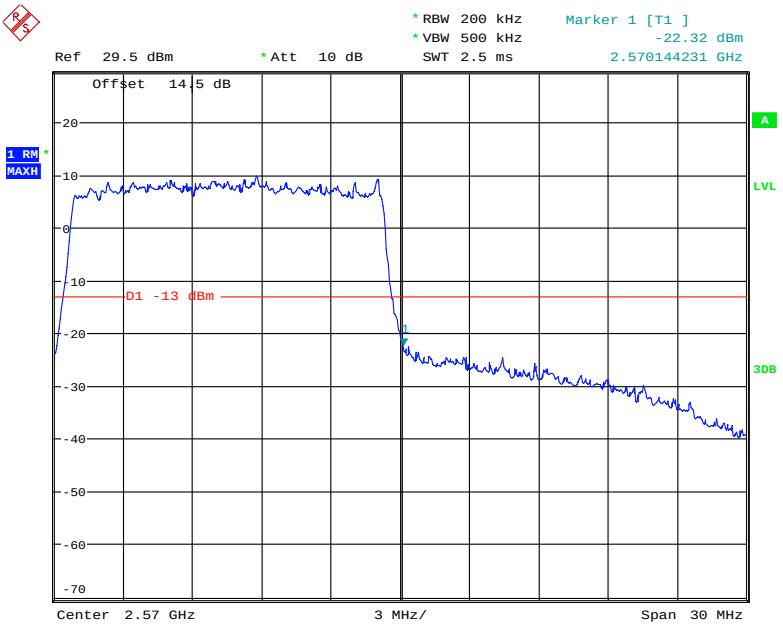
Date: 25.OCT.2018 22:05:50

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



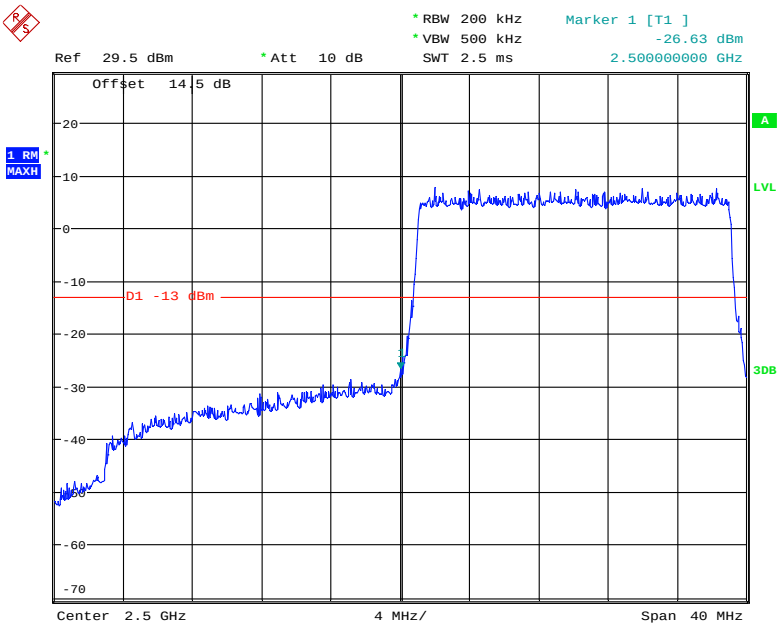
Date: 25.OCT.2018 21:54:55

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



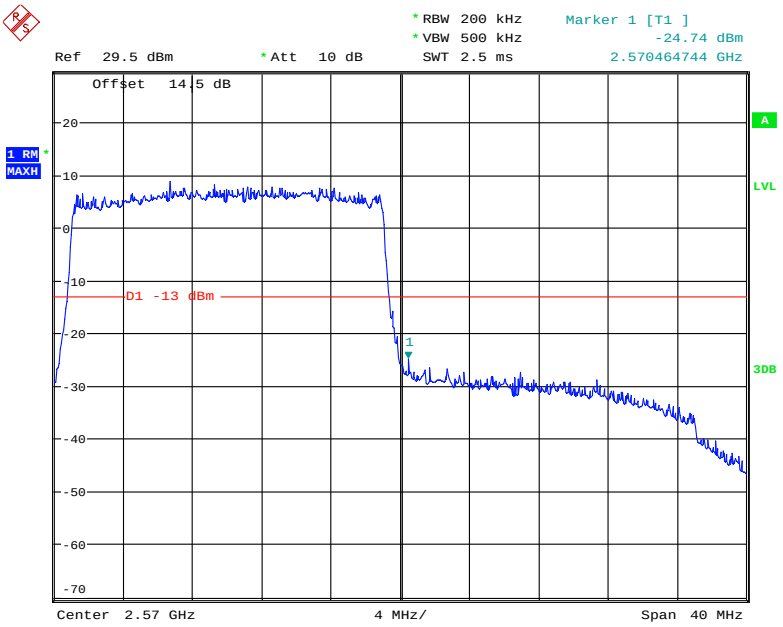
Date: 25.OCT.2018 22:05:15

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



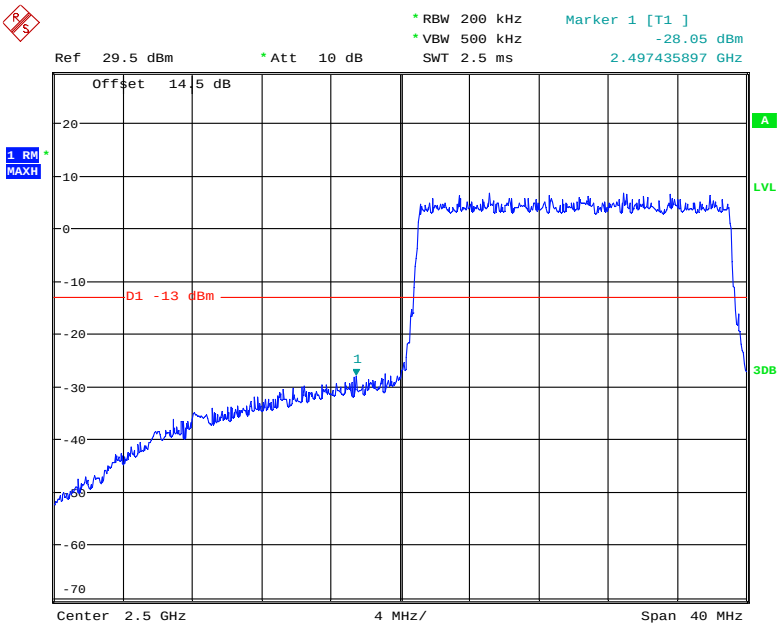
Date: 25.OCT.2018 22:10:37

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



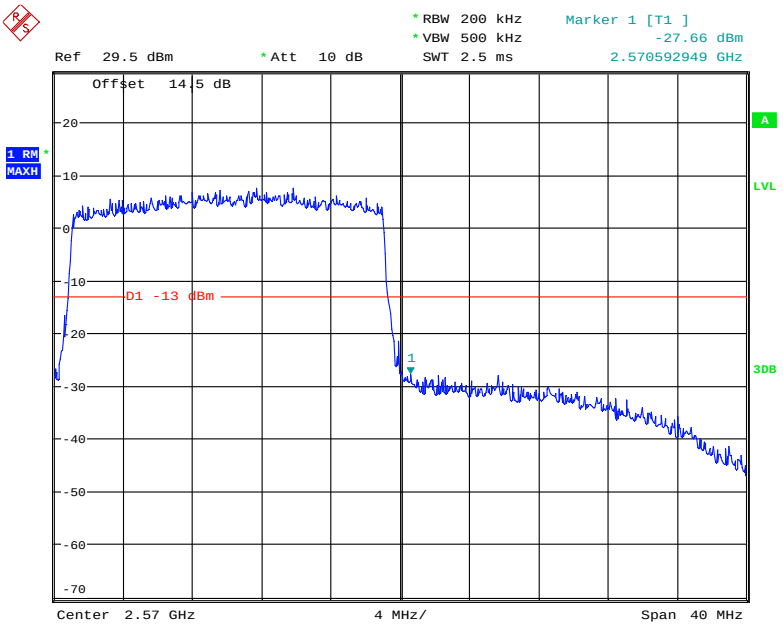
Date: 25.OCT.2018 22:07:16

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



Date: 25.OCT.2018 22:09:39

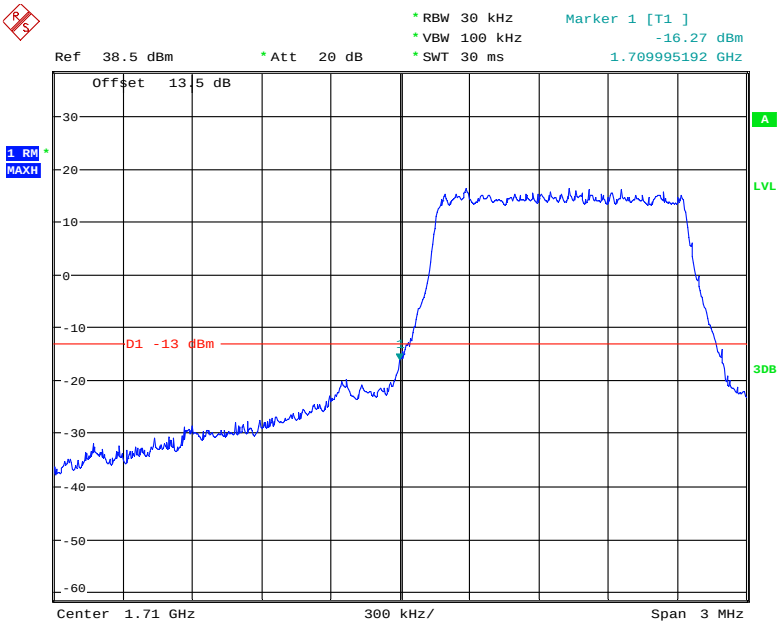
16-QAM (20.0 MHz, FULL RB) - Right Band Edge



Date: 25.OCT.2018 22:08:17

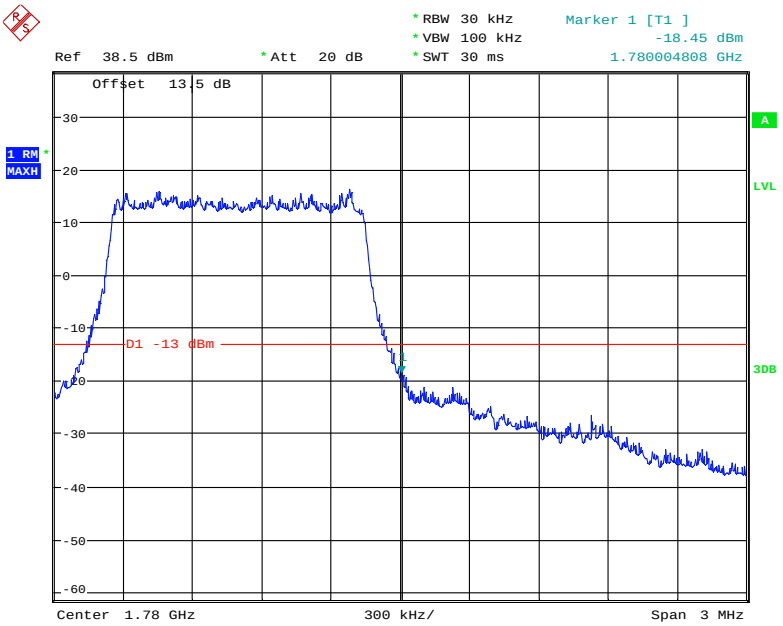
Band 66:

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



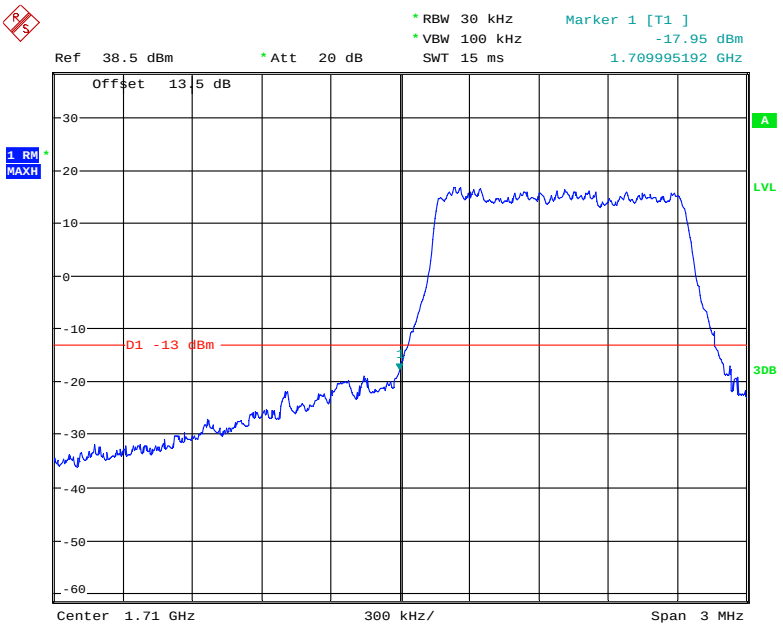
Date: 30.OCT.2018 23:49:35

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



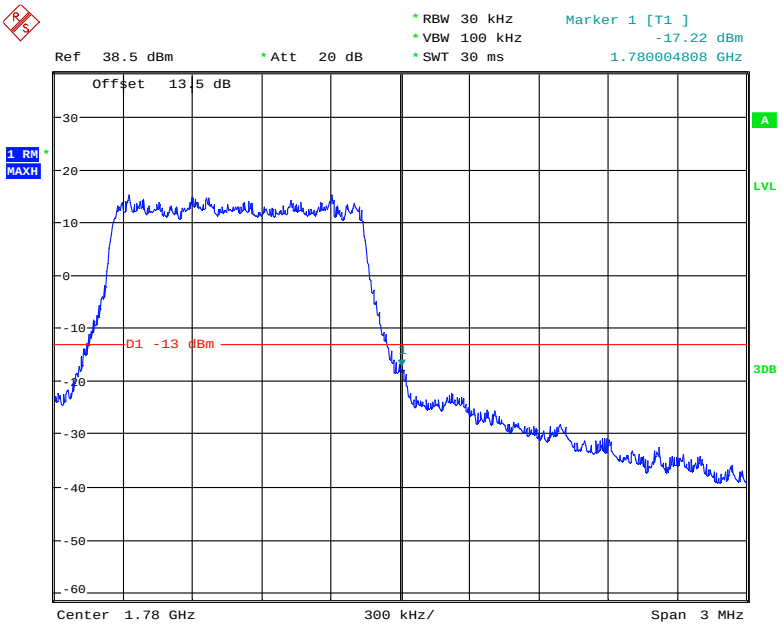
Date: 30.OCT.2018 23:51:33

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



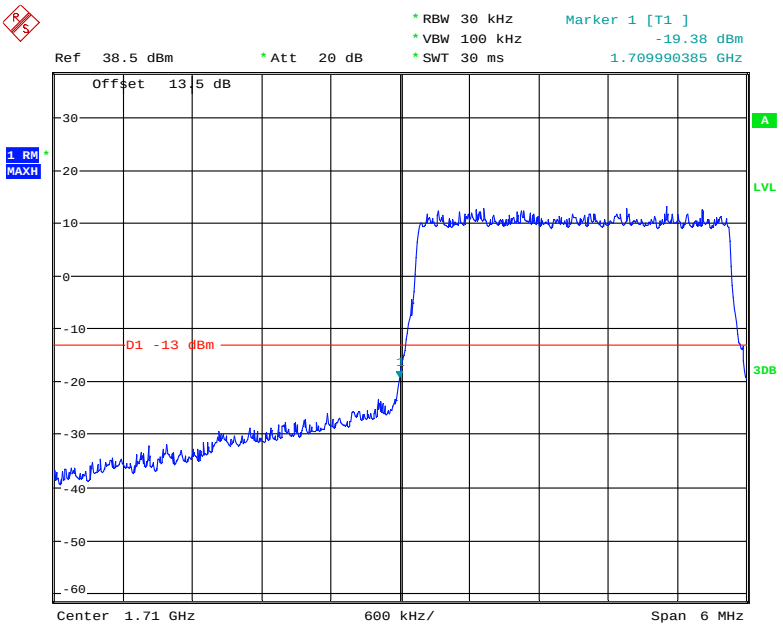
Date: 30.OCT.2018 23:46:47

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



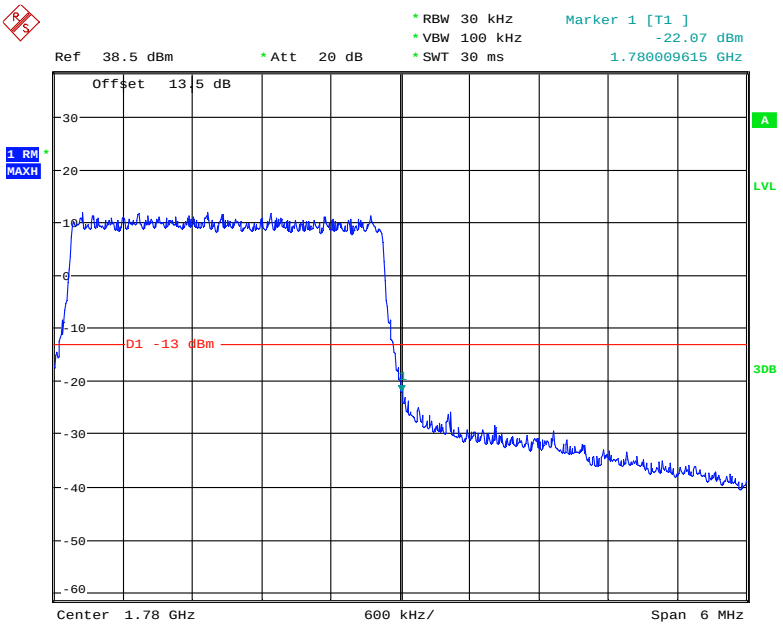
Date: 30.OCT.2018 23:52:30

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



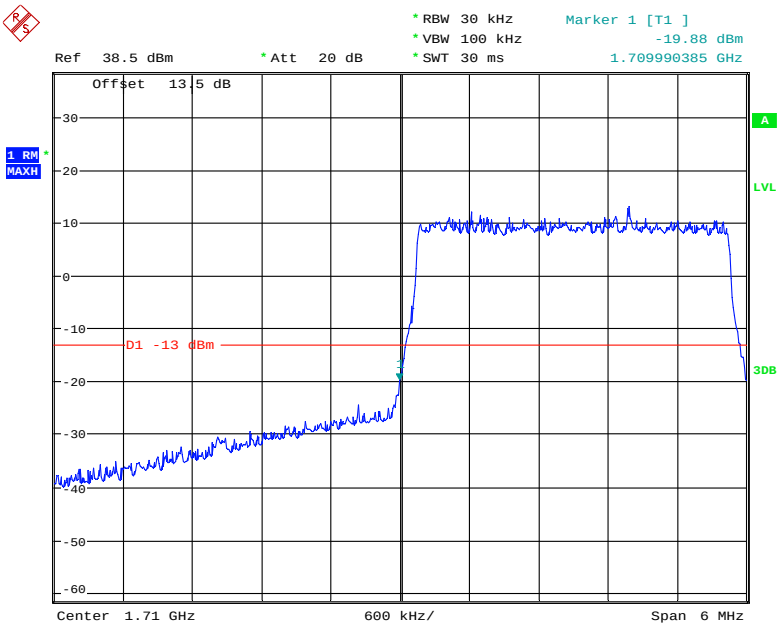
Date: 31.OCT.2018 00:00:13

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



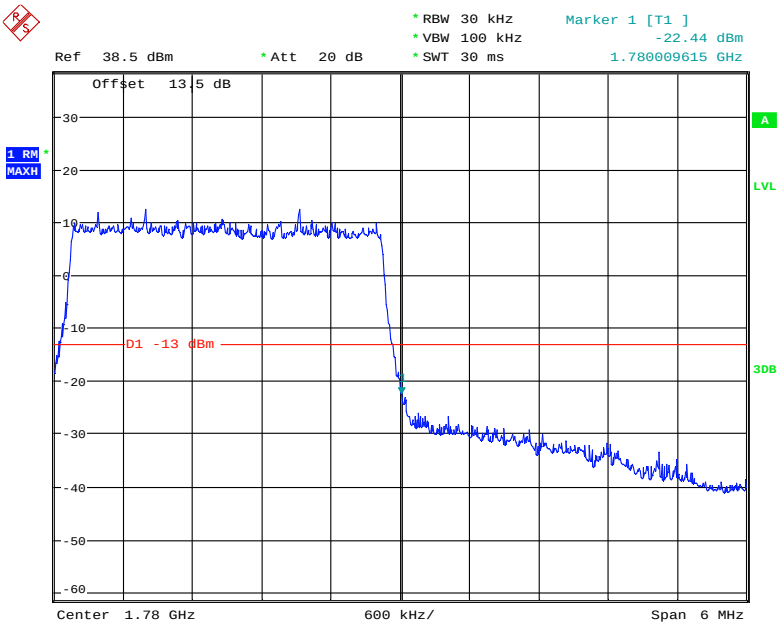
Date: 31.OCT.2018 00:01:13

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



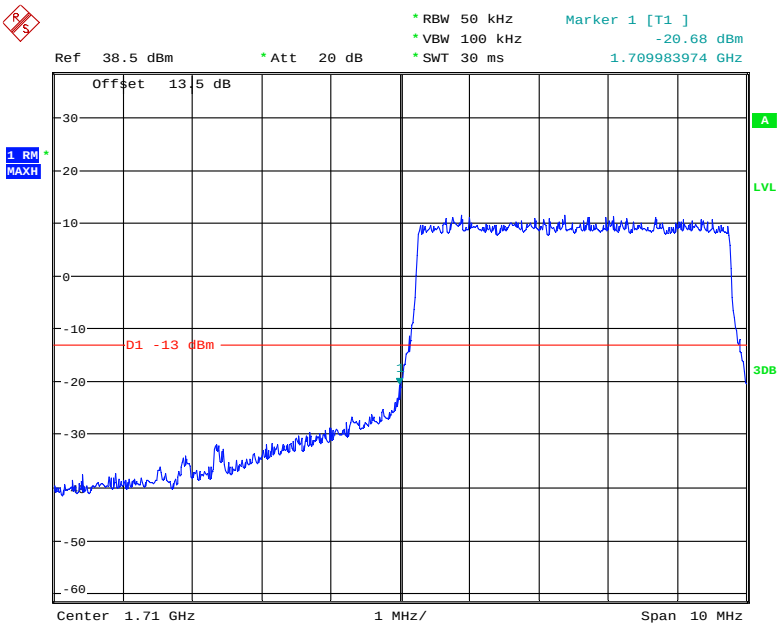
Date: 30.OCT.2018 23:59:37

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



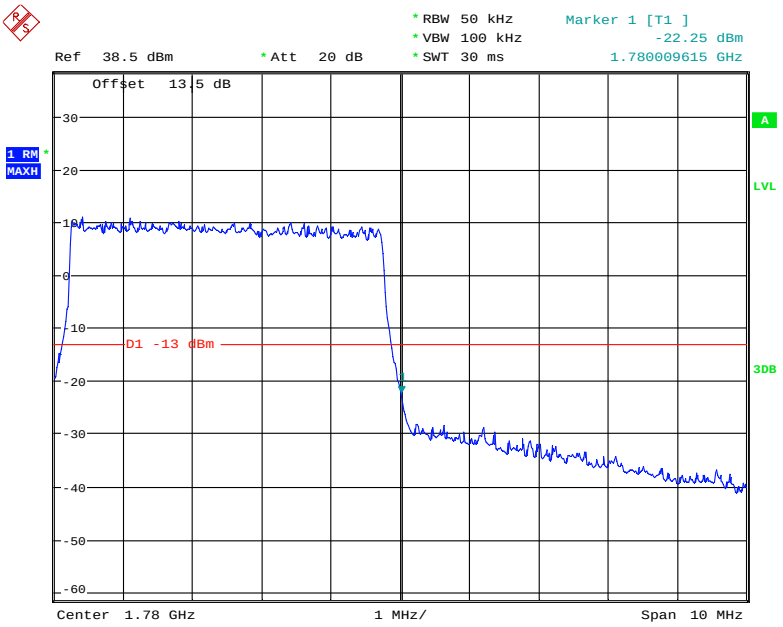
Date: 31.OCT.2018 00:01:55

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



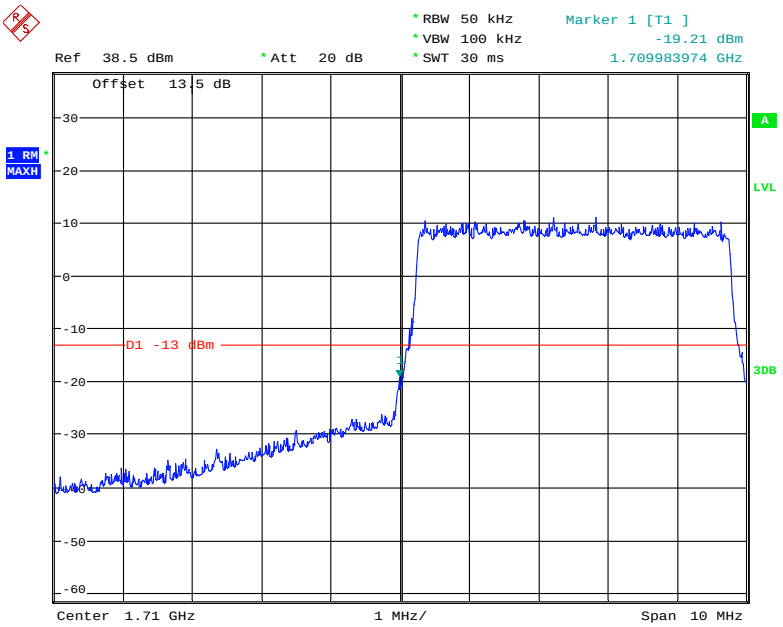
Date: 31.OCT.2018 00:05:33

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



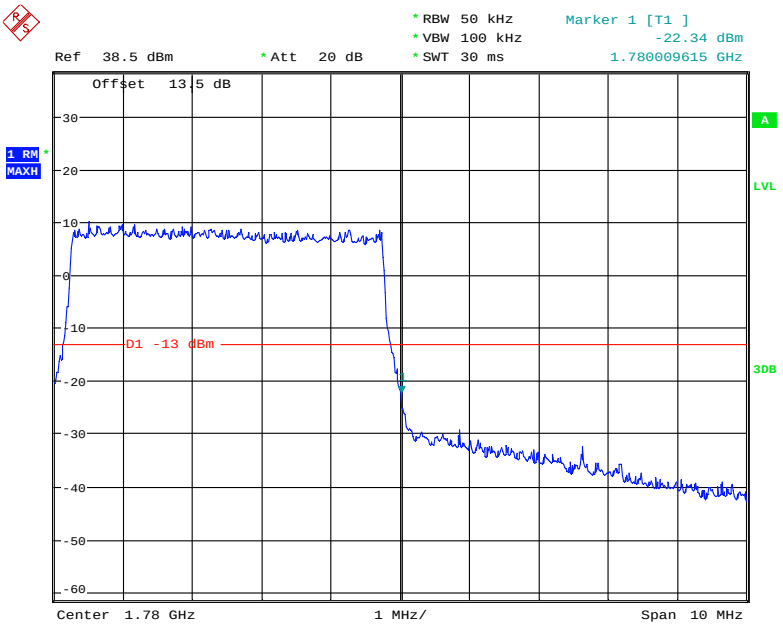
Date: 31.OCT.2018 00:04:36

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



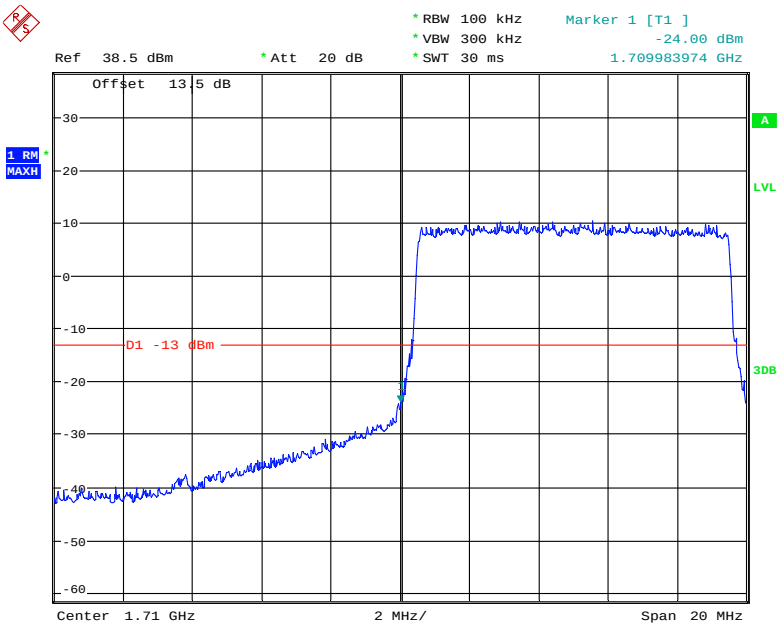
Date: 31.OCT.2018 00:06:18

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



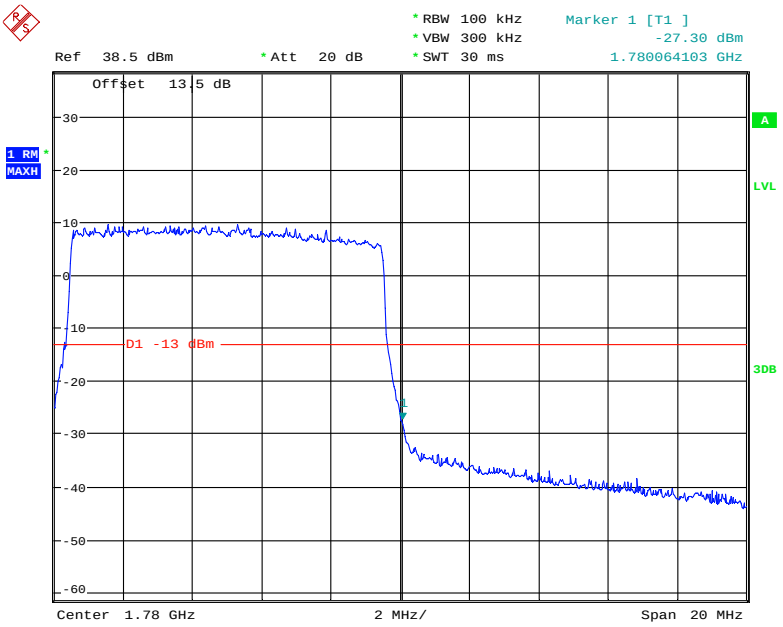
Date: 31.OCT.2018 00:02:59

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



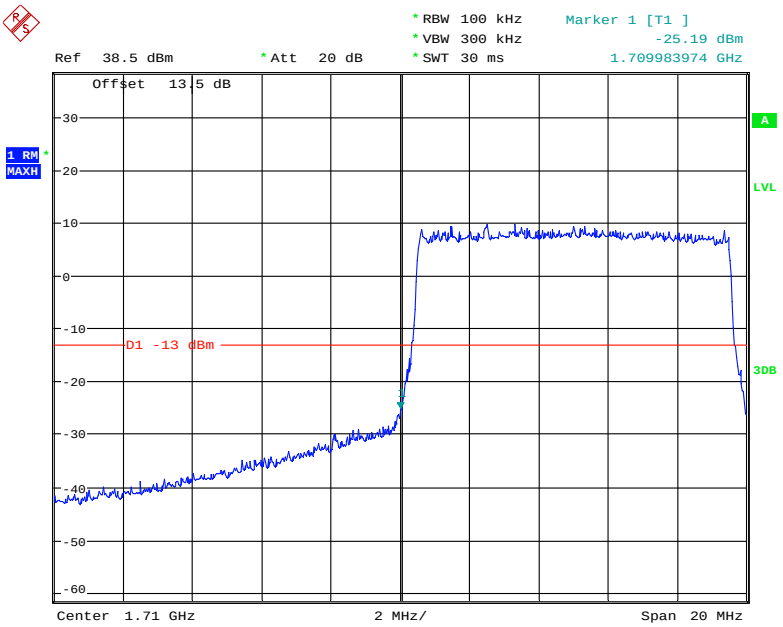
Date: 31.OCT.2018 00:07:48

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



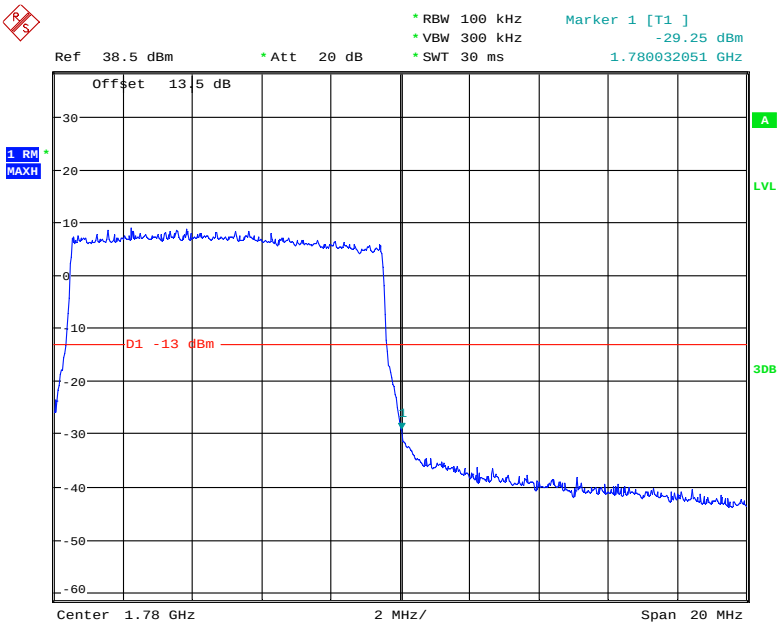
Date: 31.OCT.2018 00:10:39

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



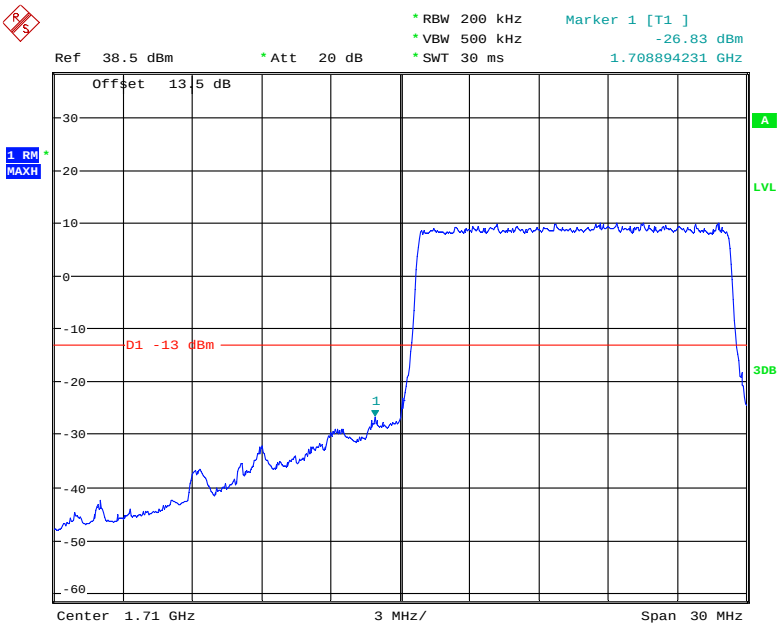
Date: 31.OCT.2018 00:08:59

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



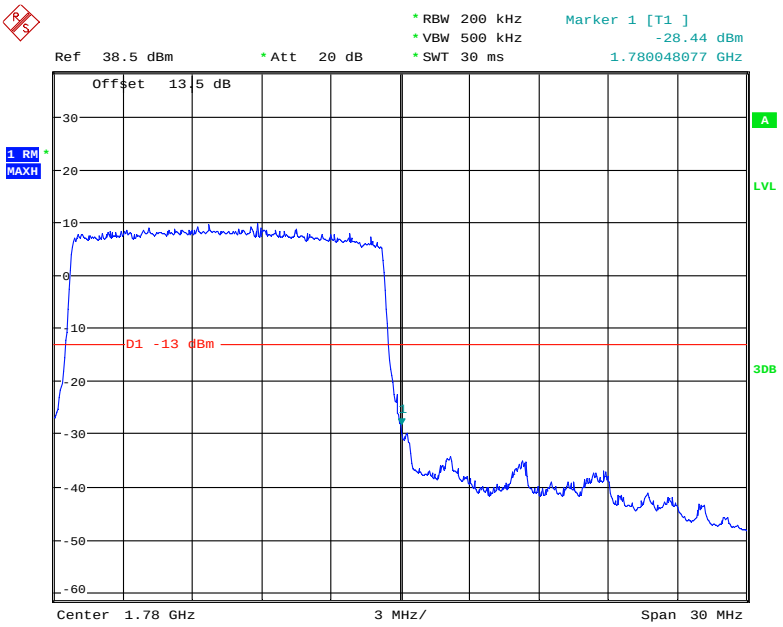
Date: 31.OCT.2018 00:11:37

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



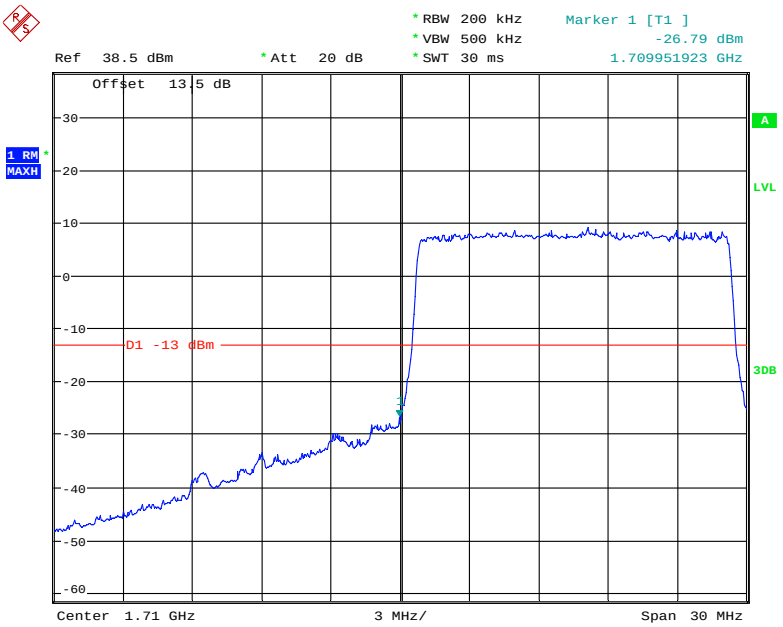
Date: 31.OCT.2018 00:14:21

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



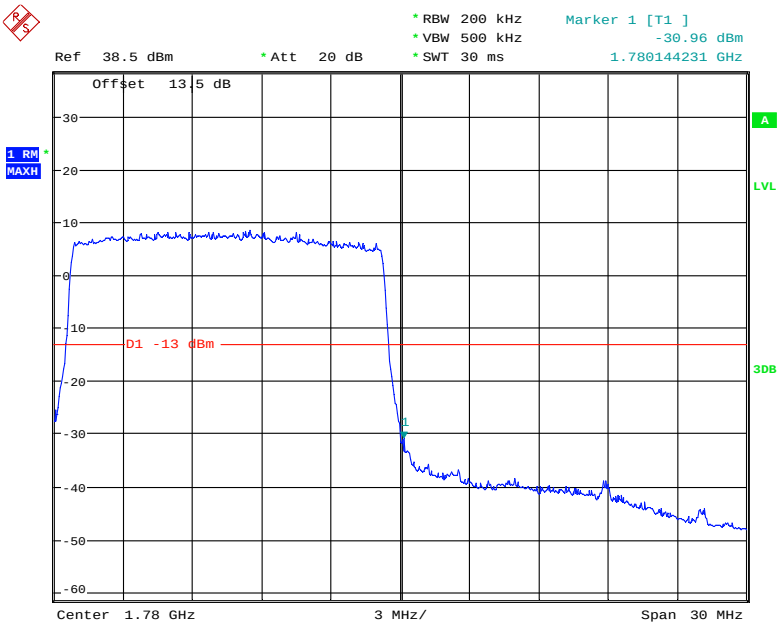
Date: 31.OCT.2018 00:16:26

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



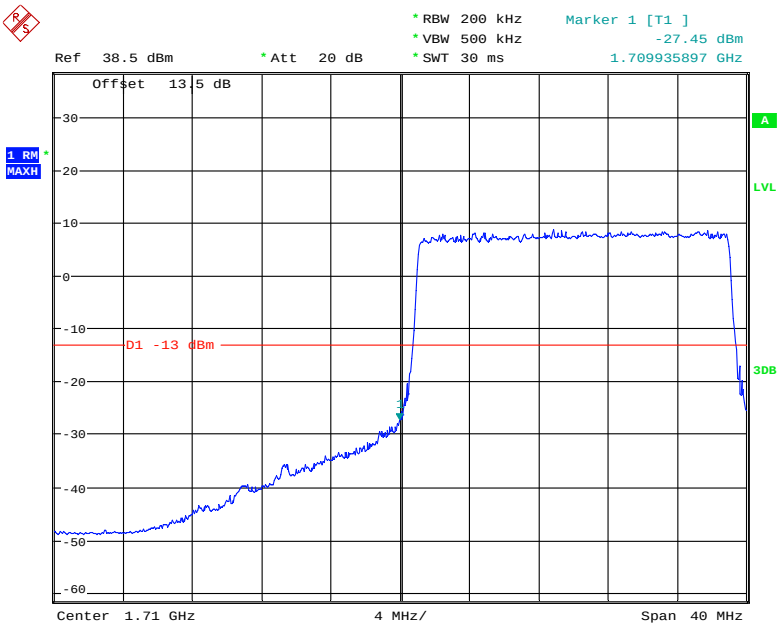
Date: 31.OCT.2018 00:13:08

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



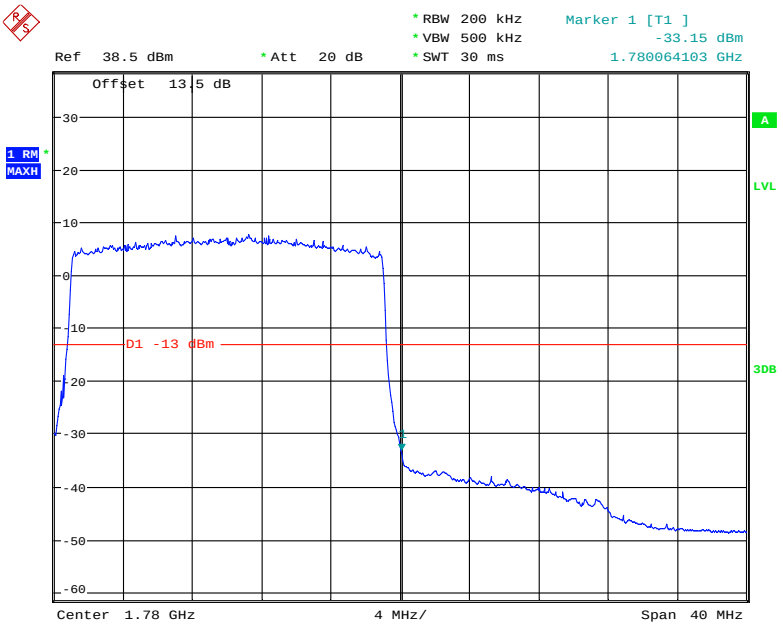
Date: 31.OCT.2018 00:17:01

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



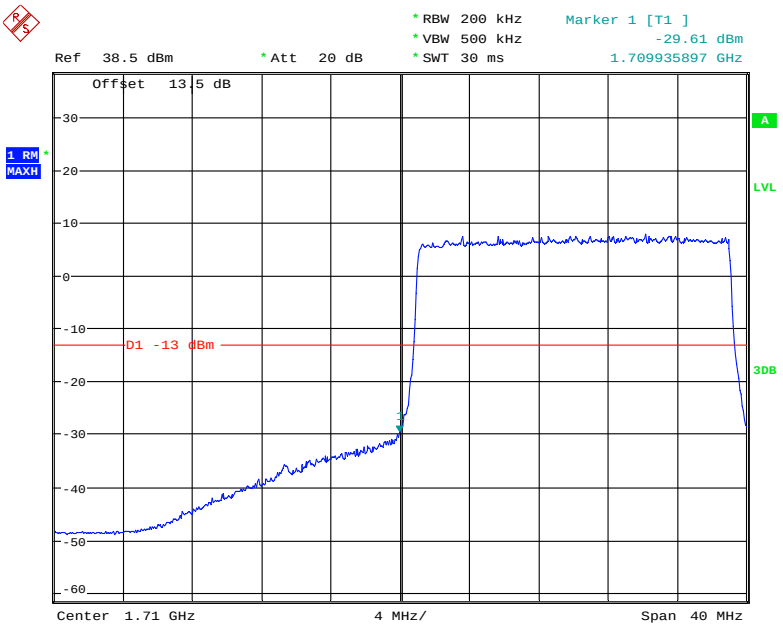
Date: 31.OCT.2018 00:24:37

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



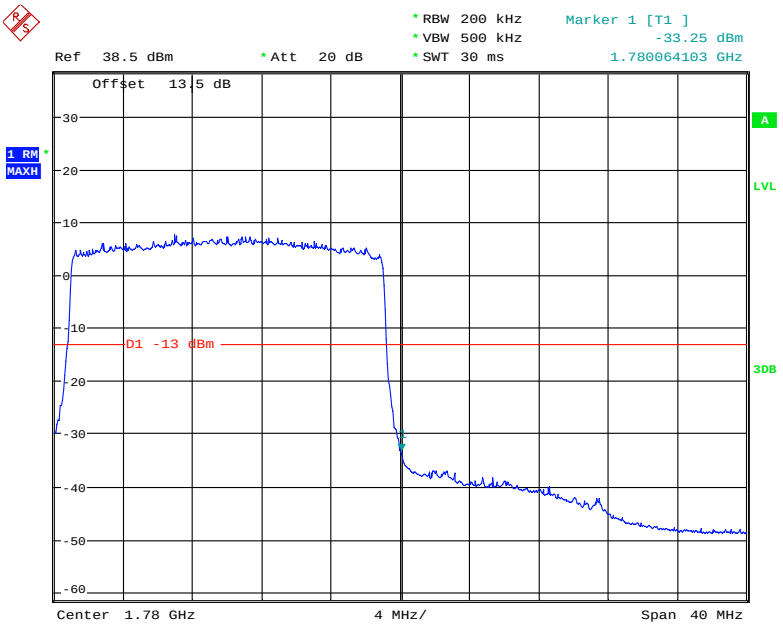
Date: 31.OCT.2018 00:20:15

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



Date: 31.OCT.2018 00:23:19

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



Date: 31.OCT.2018 00:22:01

FCC § 2.1055; § 22.355; § 24.235; §27.54 - FREQUENCY STABILITY

Applicable Standard

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

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

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

Frequency Tolerance for Transmitters in the Public Mobile Services

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

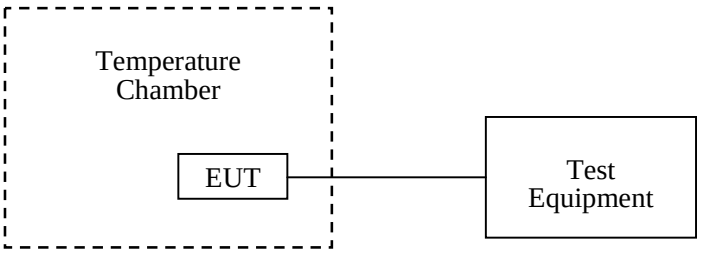
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

Test Procedure

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

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

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



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Kiki Kong on 2018-11-03.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables.

Cellular Band (Part 22H)

WCDMA Mode

Middle Channel, f_o =836.6MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	12	2	0.002391	2.5
-20		1	0.001195	2.5
-10		2	0.002391	2.5
0		-3	-0.003586	2.5
10		-1	-0.001195	2.5
20		-1	-0.001195	2.5
30		-2	-0.002391	2.5
40		3	0.003586	2.5
50		2	0.002391	2.5
20	V min.= 10.2	2	0.002391	2.5
	V max.= 13.8	3	0.003586	2.5

PCS Band (Part 24E)

WCDMA Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Voltage Supplied (V_{AC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	12	2	0.001064	pass
-20		-2	-0.001064	pass
-10		1	0.000532	pass
0		-3	-0.001596	pass
10		-2	-0.001064	pass
20		-4	-0.002128	pass
30		-3	-0.001596	pass
40		1	0.000532	pass
50		-2	-0.001064	pass
20	V min.= 10.2	2	0.001064	pass
	V max.= 13.8	1	0.000532	pass

LTE:

QPSK:

Band 4(5MHz Band width):

Temperature (℃)	Power Supplied (V_{DC})	F_L (MHz)	F_H (MHz)	F_L Limit (MHz)	F_H Limit (MHz)
-30	12	1710.13341	1754.85581	1710.0000	1755.0000
-20		1710.13333	1754.85585	1710.0000	1755.0000
-10		1710.13343	1754.85577	1710.0000	1755.0000
0		1710.13336	1754.85586	1710.0000	1755.0000
10		1710.13337	1754.85586	1710.0000	1755.0000
20		1710.13348	1754.85567	1710.0000	1755.0000
30		1710.13339	1754.85587	1710.0000	1755.0000
40		1710.13339	1754.85585	1710.0000	1755.0000
50		1710.13337	1754.85587	1710.0000	1755.0000
20	V min.= 10.2	1710.13338	1754.85582	1710.0000	1755.0000
	V max.= 13.8	1710.13339	1754.85579	1710.0000	1755.0000

Band 5:

10.0 MHz Middle Channel, f_o = 836.5MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	12	-7	-0.00837	2.5
-20		-6	-0.00717	2.5
-10		-4	-0.00478	2.5
0		-2	-0.00239	2.5
10		-1	-0.0012	2.5
20		-2	-0.00239	2.5
30		2	0.002391	2.5
40		4	0.004782	2.5
50		5	0.005977	2.5
20	V min.= 10.2	8	0.009564	2.5
	V max.= 13.8	6	0.007173	2.5

Band 7(5MHz Band width):

Temperature (℃)	**Power Supplied (V_{DC})**	**F_L (MHz)**	**F_H (MHz)**	**F_L Limit (MHz)**	**F_H Limit (MHz)**
-30	12	2500.14425	2569.88786	2500	2570
-20		2500.14425	2569.88791	2500	2570
-10		2500.14431	2569.88789	2500	2570
0		2500.14432	2569.88790	2500	2570
10		2500.14431	2569.88791	2500	2570
20		2500.14423	2569.88782	2500	2570
30		2500.14424	2569.88783	2500	2570
40		2500.14431	2569.88791	2500	2570
50		2500.14425	2569.88784	2500	2570
20	V min.= 10.2	2500.14426	2569.88784	2500	2570
	V max.= 13.8	2500.14423	2569.88784	2500	2570

Band 66(5MHz Band width):

Temperature (℃)	Voltage Supplied (V_{DC})	F_L (MHz)	F_H (MHz)	F_L Limit (MHz)	F_H Limit (MHz)
-30	12	1710.13006	1779.84103	1710	1780
-20		1710.13003	1779.84107	1710	1780
-10		1710.13005	1779.84106	1710	1780
0		1710.13000	1779.84106	1710	1780
10		1710.13007	1779.84107	1710	1780
20		1710.13000	1779.84100	1710	1780
30		1710.13002	1779.84102	1710	1780
40		1710.13007	1779.84103	1710	1780
50		1710.13005	1779.84104	1710	1780
20	V min.= 10.2	1710.13006	1779.84104	1710	1780
	V max.= 13.8	1710.13006	1779.84102	1710	1780

16QAM:

Band 4(5MHz Band width):

Temperature (℃)	Power Supplied (V_{DC})	F_L (MHz)	F_H (MHz)	F_L Limit (MHz)	F_H Limit (MHz)
-30	12	1710.13339	1754.85585	1710.0000	1755.0000
-20		1710.13337	1754.85579	1710.0000	1755.0000
-10		1710.13342	1754.85586	1710.0000	1755.0000
0		1710.13339	1754.85586	1710.0000	1755.0000
10		1710.13334	1754.85580	1710.0000	1755.0000
20		1710.13333	1754.85577	1710.0000	1755.0000
30		1710.13337	1754.85582	1710.0000	1755.0000
40		1710.13340	1754.85578	1710.0000	1755.0000
50		1710.13336	1754.85581	1710.0000	1755.0000
20	V min.= 10.2	1710.13339	1754.85578	1710.0000	1755.0000
	V max.= 13.8	1710.13337	1754.85580	1710.0000	1755.0000

Band 5:

10.0 MHz Middle Channel, f_o = 836.6MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	12	-7	-0.00837	2.5
-20		-4	-0.00478	2.5
-10		-5	-0.00598	2.5
0		-2	-0.00239	2.5
10		-1	-0.0012	2.5
20		2	0.002391	2.5
30		1	0.001195	2.5
40		2	0.002391	2.5
50		4	0.004782	2.5
20	V min.= 10.2	3	0.003586	2.5
	V max.= 13.8	7	0.008368	2.5

Band 7(5MHz Band width):

Temperature (℃)	**Voltage Supplied (V_{DC})**	**F_L (MHz)**	**F_H (MHz)**	**F_L Limit (MHz)**	**F_H Limit (MHz)**
-30	12	2500.14433	2569.88782	2500	2570
-20		2500.14431	2569.88783	2500	2570
-10		2500.14431	2569.88788	2500	2570
0		2500.14426	2569.88789	2500	2570
10		2500.14425	2569.88791	2500	2570
20		2500.14435	2569.88777	2500	2570
30		2500.14424	2569.88789	2500	2570
40		2500.14427	2569.88790	2500	2570
50		2500.14432	2569.88786	2500	2570
20	V min.= 10.2	2500.14433	2569.88787	2500	2570
	V max.= 13.8	2500.14427	2569.88784	2500	2570

Band 66(5MHz Band width):

Temperature (℃)	Voltage Supplied (V_{DC})	F_L (MHz)	F_H (MHz)	F_L Limit (MHz)	F_H Limit (MHz)
-30	12	1710.13000	1779.84103	1710	1780
-20		1710.13001	1779.84106	1710	1780
-10		1710.13007	1779.84109	1710	1780
0		1710.13005	1779.84102	1710	1780
10		1710.13004	1779.84101	1710	1780
20		1710.13000	1779.84100	1710	1780
30		1710.13005	1779.84106	1710	1780
40		1710.13002	1779.84101	1710	1780
50		1710.13001	1779.84102	1710	1780
20	V min.= 10.2	1710.13002	1779.84102	1710	1780
	V max.= 13.8	1710.13009	1779.84109	1710	1780

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