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CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 27

TEST REPORT

For

PYCOM LTD

High Point 9 Sydenham Road, Guildford Surrey GU1 3RX, Surrey, United Kingdom

FCC ID: 2AJMTG01R

Report Type:	**Product Type:**
Original Report	G01

Report Number:	RSH180305051-00
Report Date:	2018-05-16
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *PYCOM LTD's* product, model number: G01 1.0 *(FCC ID: 2AJMTG01R)* or the "EUT" in this report was a *G01*, which was measured approximately: 55 mm (L) × 20 mm (W) × 10 mm (H).

**All measurement and test data in this report was gathered from production sample serial number: 180305051 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-03-05.*

Objective

This test report is prepared on behalf of *PYCOM LTD* in accordance with Subpart 27 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS, Part 15.247 DTS submissions with FCC ID: 2AJMTG01R.

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 27 – Miscellaneous wireless communications services

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.

eMTC Auto Mode: Narrowband and resource blocks per cell BW

Test Item	LTE Band	Bandwidth(MHz)				Modulation		RB setting		Test channel
		5	10	15	20	QPSK	16QAM	NB	TBS Idx	
RF Output Power**	4	√	√	√	√	√	√	0	10	L/M/H
	12	√	√	×	×	√	√	0	10	L/M/H
	13	√	√	×	×	√	√	0	10	L/M/H*
Peak-to-average ratio	4	√	√	√	√	√	√	0	10	L/M/H
	12	√	√	×	×	√	√	0	10	L/M/H
	13	√	√	×	×	√	√	0	10	L/M/H*
Radiated power	4	√	√	√	√	√	√	0	10	M
	12	√	√	×	×	√	√	0	10	M
	13	√	√	×	×	√	√	0	10	M
Occupied Bandwidth	4	√	√	√	√	√	√	0	10	M
	12	√	√	×	×	√	√	0	10	M
	13	√	√	×	×	√	√	0	10	M
Spurious Emissions at Antenna Terminal	4	√	√	√	√	√	√	0	10	M
	12	√	√	×	×	√	√	0	10	M
	13	√	√	×	×	√	√	0	10	M
Field Strength of Spurious Radiation	4	√	√	√	√	√	√	0	10	M
	12	√	√	×	×	√	√	0	10	M
	13	√	√	×	×	√	√	0	10	M
Band Edge**	4	√	√	√	√	√	√	0/3@5MHz BW 0/7@10MHz BW 0/11@15MHz BW 0/15@20MHz BW	10	L/H
	12	√	√	×	×	√	√	0/3@5MHz BW 0/7@10MHz BW	10	L/H
	13	√	√	×	×	√	√	0/3@5MHz BW 0/7@10MHz BW	10	M*
Frequency stability	4	√	√	√	√	√	√	0	10	M
	12	√	√	×	×	√	√	0	10	M
	13	√	√	×	×	√	√	0	10	M

Note *: only middle channel with LTE band 13 @10MHz bandwidth.
Note**:Both RB 0 and RB 6 were test for QPSK, both RB 0 and RB 5 were test for 16QAM. other item only test RB 6 with QPSK and RB 5 with 16QAM.

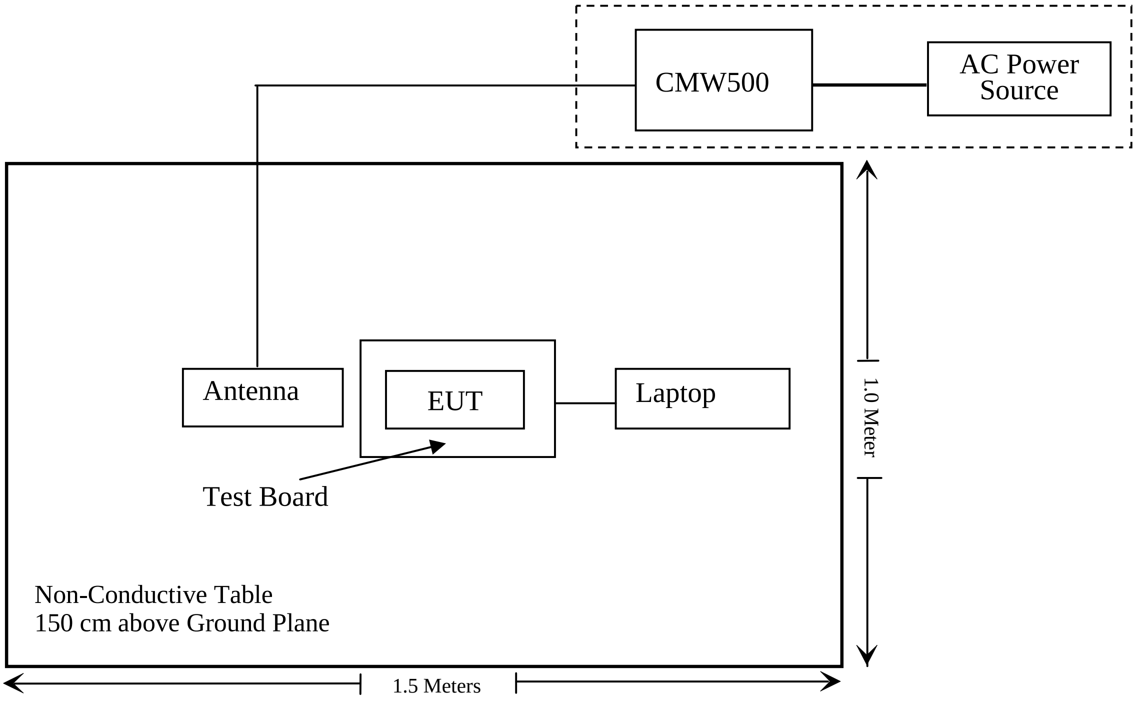
Equipment Modifications

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
DELL	Laptop	E6410	GYXJ3A00 JSD2
Pycom Ltd	Expansion Board	/	1630001501

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§2.1046; §27.50 (b) (c) (d)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049;§27.53	Occupied Bandwidth	Compliance
§ 2.1051; §27.53 (c) (f) (g)(h)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; §27.53 (c) (g) (h)	Field Strength of Spurious Radiation	Compliance
§27.53 (c) (g) (h)	Band Edge	Compliance
§ 2.1055; §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	FSIQ26	8386001028	2018-04-24	2019-04-24
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2017-11-19	2018-05-21
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-21
Anritsu	Signal Generator	68369B	004114	2017-12-07	2018-12-07
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2017-04-24	2018-04-24
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	2	2017-11-22	2018-05-22
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
Ducommun technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03

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
Agilent	ESG Vector Signal Generator	E4438C	MY42080875	2017-05-09	2018-05-09
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2017-04-24	2018-04-24
Ducommun technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22
WEINSCHEL	10dB Attenuator	5324	AU 3842	2017-11-22	2018-05-23
WEINSCHEL	3dB Attenuator	N/A	N/A	2017-11-22	2018-05-23
N/A	Power Splitter	N/A	N/A	2017-05-21	2018-05-21

* 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).

FCC §2.1047 - MODULATION CHARACTERISTIC

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

FCC § 2.1046, §27.50(b)(c) (d) - RF OUTPUT POWER

Applicable Standard

According to §27.50(b), Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

According to §27.50(c), Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

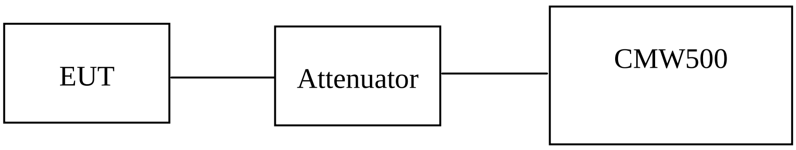
According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test Procedure

Conducted method:

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



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 Jacob Kong on 2018-05-15.

LTE Band 4:

Maximum Output Power

Bandwidth (MHz)	Modulation	RB size/ NB Index	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB Size=0, Index=10	22.78	22.96	22.67
		RB Size=6, Index=10	22.69	22.86	22.75
	16QAM	RB Size=0, Index=10	22.05	22.88	22.59
		RB Size=5, Index=10	22.56	22.76	22.88
10.0	QPSK	RB Size=0, Index=10	22.43	22.46	22.67
		RB Size=6, Index=10	22.35	22.38	22.86
	16QAM	RB Size=0, Index=10	22.29	22.70	22.69
		RB Size=5, Index=10	22.46	22.43	22.77
15.0	QPSK	RB Size=0, Index=10	22.16	22.86	22.76
		RB Size=6, Index=10	22.53	22.89	22.79
	16QAM	RB Size=0, Index=10	22.47	22.70	22.86
		RB Size=5, Index=10	22.30	22.34	22.71
20.0	QPSK	RB Size=0, Index=10	22.34	22.55	22.25
		RB Size=6, Index=10	22.46	22.75	22.34
	16QAM	RB Size=0, Index=10	22.51	22.63	22.47
		RB Size=5, Index=10	22.69	22.49	22.22

Peak-to-average ratio (PAR)

Bandwidth	Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
5MHz	QPSK	5.35	13	Pass
	16QAM	5.86	13	Pass
10MHz	QPSK	5.68	13	Pass
	16QAM	5.76	13	Pass
15MHz	QPSK	5.21	13	Pass
	16QAM	5.05	13	Pass
20MHz	QPSK	5.18	13	Pass
	16QAM	5.69	13	Pass

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									
1732.50	87.35	125	1.1	H	14.2	1.30	9.10	22.00	30
1732.50	85.02	120	1.2	V	12.5	1.30	9.10	20.30	30
10 MHz Bandwidth									
1732.50	86.55	360	1.2	H	13.5	1.30	9.10	21.30	30
1732.50	85.50	120	1.2	V	13.1	1.30	9.10	20.90	30
15 MHz Bandwidth									
1732.50	86.80	258	1.3	H	13.7	1.30	9.10	21.50	30
1732.50	84.72	175	1.3	V	12.2	1.30	9.10	20.00	30
20 MHz Bandwidth									
1732.50	86.75	142	1.4	H	13.4	1.30	9.10	21.20	30
1732.50	85.50	0	1.3	V	12.9	1.30	9.10	20.70	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									
5 MHz Bandwidth									
1732.50	88.24	0	1.4	H	15.1	1.30	9.10	22.9	30
1732.50	85.76	125	1.3	V	13.1	1.30	9.10	20.9	30
10 MHz Bandwidth									
1732.50	87.76	164	1.3	H	14.7	1.30	9.10	22.5	30
1732.50	85.52	186	1.5	V	13.1	1.30	9.10	20.9	30
15 MHz Bandwidth									
1732.50	88.00	196	1.4	H	14.9	1.30	9.10	22.7	30
1732.50	86.00	155	1.4	V	13.3	1.30	9.10	21.1	30
20 MHz Bandwidth									
1732.50	86.75	135	1.6	H	13.4	1.30	9.10	21.2	30
1732.50	85.50	124	1.5	V	12.9	1.30	9.10	20.7	30

LTE Band 12:

Bandwidth (MHz)	Modulation	RB size/ NB Index	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5	QPSK	RB Size=1, Index=10	21.79	21.67	21.79
		RB Size=6, Index=10	21.87	21.89	21.61
	16QAM	RB Size=1, Index=10	21.86	21.46	22.66
		RB Size=5, Index=10	21.72	21.53	22.45
10	QPSK	RB Size=1, Index=10	21.76	21.86	21.98
		RB Size=6, Index=10	21.79	21.96	21.86
	16QAM	RB Size=1, Index=10	21.75	22.18	21.79
		RB Size=5, Index=10	21.89	22.00	21.68

Peak-to-average ratio (PAR)

Bandwidth	Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
5MHz	QPSK	5.78	13	Pass
	16QAM	4.90	13	Pass
10MHz	QPSK	5.15	13	Pass
	16QAM	5.87	13	Pass

EIRP:

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									
707.5	91.70	320	1.3	H	22.3	0.62	0	21.68	34.77
707.5	91.35	156	1.3	V	22.4	0.62	0	21.78	34.77
10 MHz Bandwidth									
707.5	91.72	125	1.5	H	22	0.62	0	21.38	34.77
707.5	91.42	186	1.3	V	21.9	0.62	0	21.28	34.77

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									
5MHz Bandwidth									
707.5	91.02	175	1.6	H	21.6	0.62	0	20.98	34.77
707.5	90.21	124	1.4	V	21.5	0.62	0	20.88	34.77
10 MHz Bandwidth									
707.5	91.22	269	1.5	H	21.5	0.62	0	20.88	34.77
707.5	90.10	75	1.5	V	20.6	0.62	0	19.98	34.77

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

LTE Band 13:

Bandwidth (MHz)	Modulation	RB size/ NB Index	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5	QPSK	RB Size=1, Index=10	22.35	22.46	22.31
		RB Size=6, Index=10	22.46	22.56	22.49
	16QAM	RB Size=1, Index=10	22.49	22.36	22.67
		RB Size=5, Index=10	22.31	22.41	22.41
10	QPSK	RB Size=1, Index=10	/	22.51	/
		RB Size=6, Index=10	/	22.36	/
	16QAM	RB Size=1, Index=10	/	22.16	/
		RB Size=5, Index=10	/	22.67	/

Peak-to-average ratio (PAR)

Bandwidth	Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
5MHz	QPSK	6.35	13	Pass
	16QAM	6.12	13	Pass
10MHz	QPSK	6.22	13	Pass
	16QAM	6.10	13	Pass

EIRP:

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									
782	91.12	196	1.2	H	21.6	0.65	0	20.95	34.77
782	91.22	45	1.3	V	21.7	0.65	0	21.05	34.77
10 MHz Bandwidth									
782	91.52	258	1.3	H	22.0	0.65	0	21.35	34.77
782	91.41	143	1.2	V	21.2	0.65	0	20.55	34.77

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									
5MHz Bandwidth									
782	91.56	147	1.4	H	22.1	0.65	0	21.45	34.77
782	90.65	13	1.7	V	21.2	0.65	0	20.55	34.77
10 MHz Bandwidth									
782	91.79	25	1.6	H	22.3	0.65	0	21.65	34.77
782	91.19	169	1.3	V	21.0	0.65	0	20.35	34.77

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

FCC §2.1049 & §27.53 - OCCUPIED BANDWIDTH

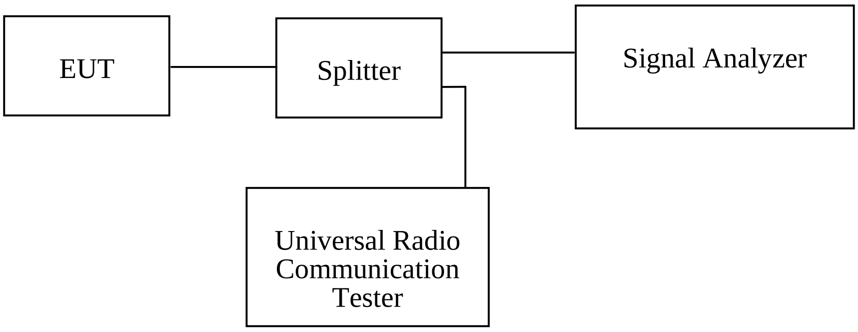
Applicable Standard

FCC 47 §2.1049 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:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2018-05-14.

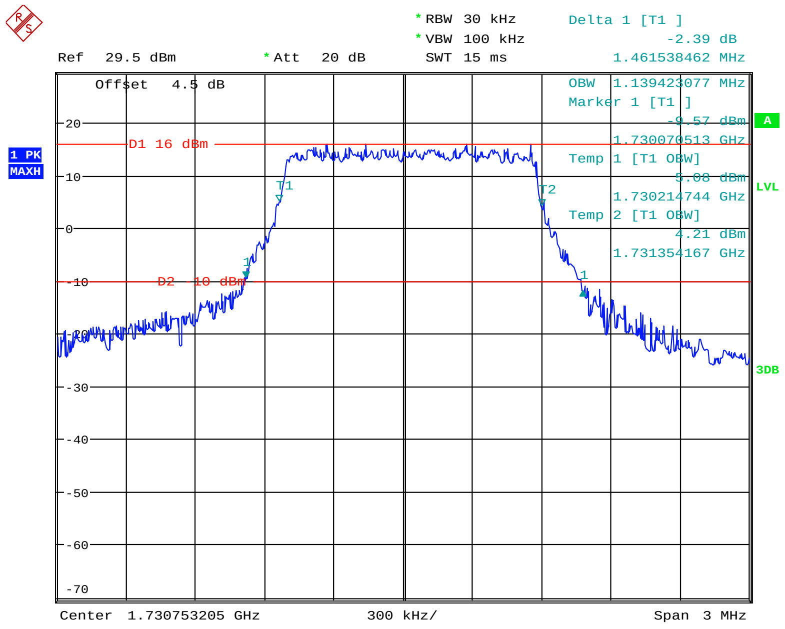
EUT operation mode: Transmitting

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

LTE Band 4: (Middle Channel)

Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
5.0	QPSK	1.139	1.462
	16QAM	0.976	1.404
10.0	QPSK	1.144	1.490
	16QAM	0.990	1.452
15.0	QPSK	1.125	1.726
	16QAM	0.995	1.423
20.0	QPSK	1.125	1.457
	16QAM	0.990	1.452

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



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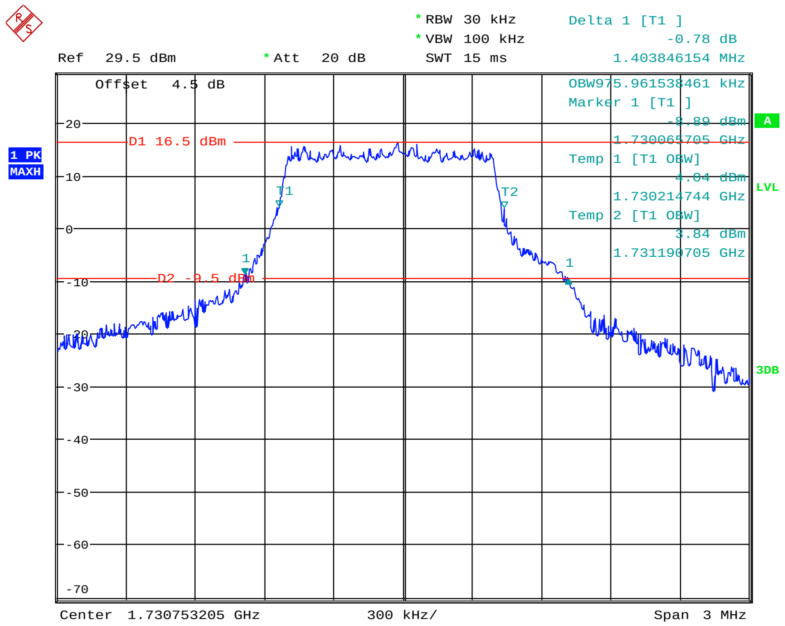
16-QAM (5.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



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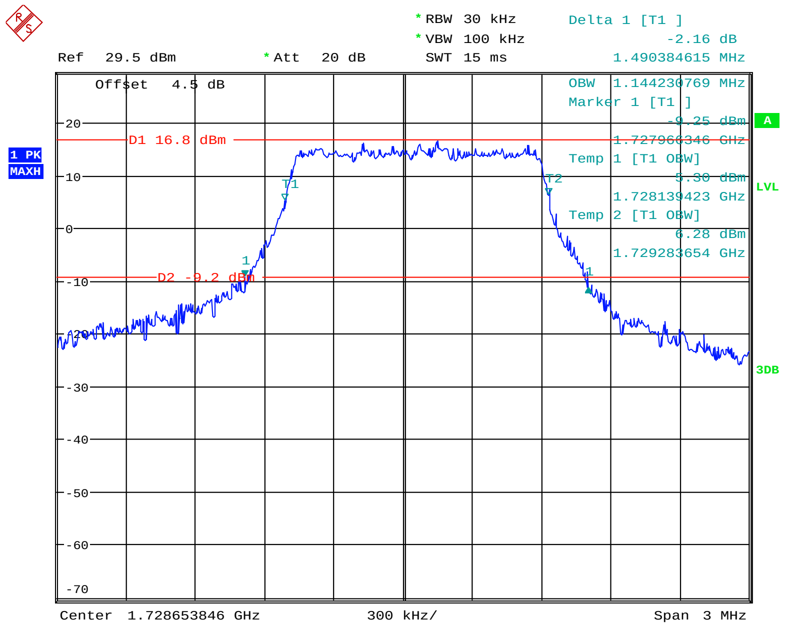
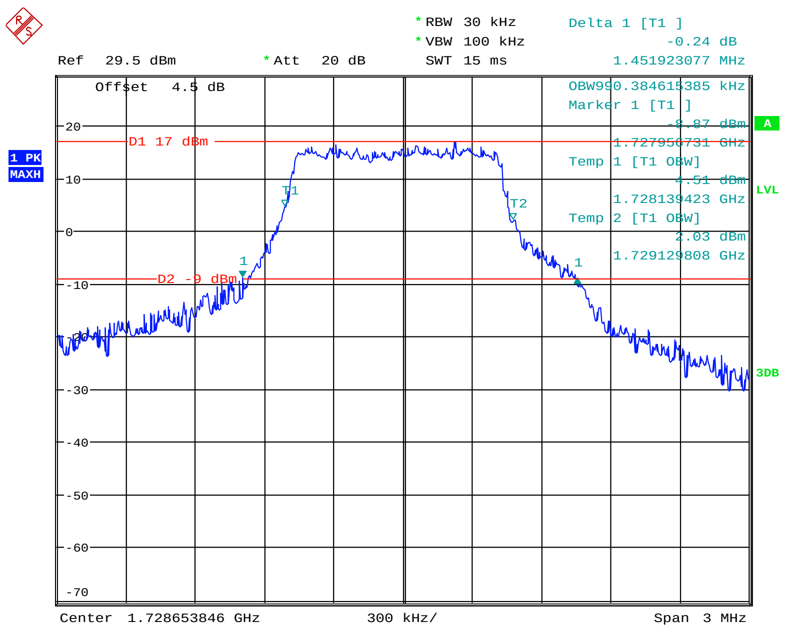
QPSK (10.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



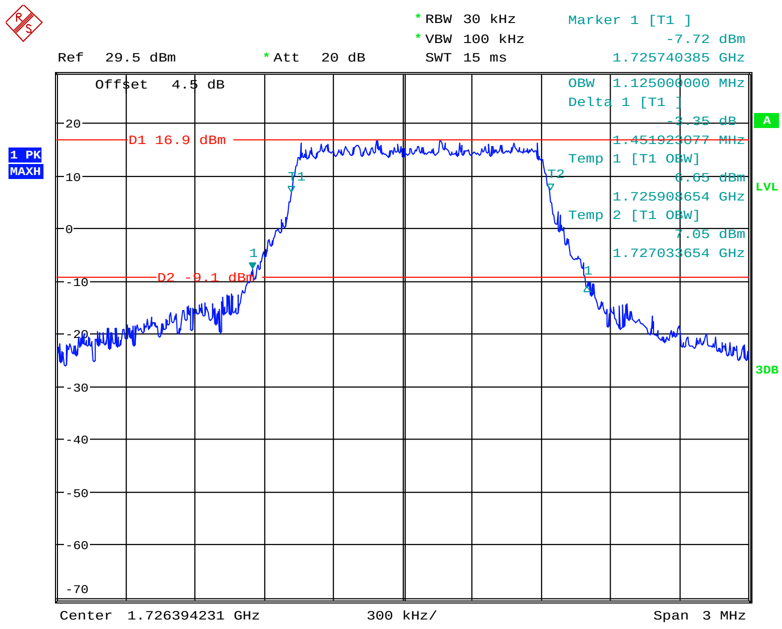
Date: 14.MAY.2018 13:25:07

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



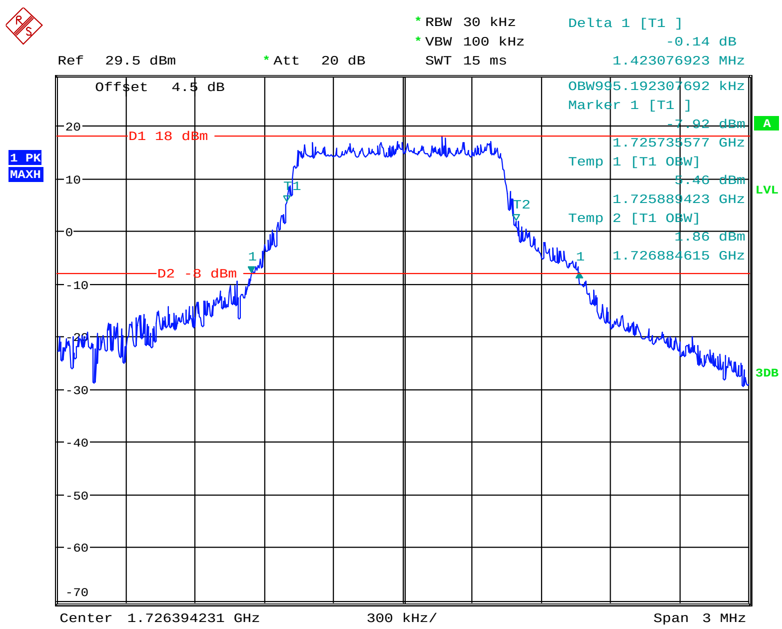
Date: 14.MAY.2018 13:27:13

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



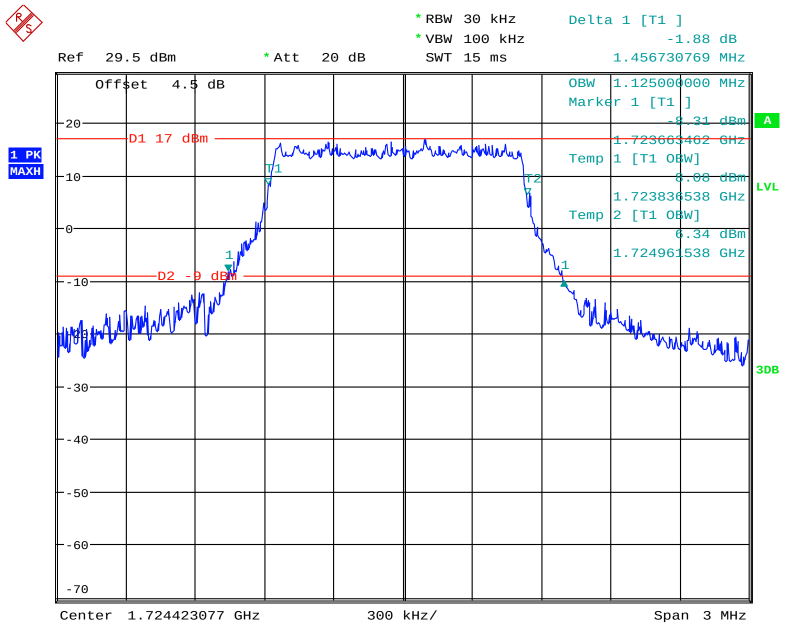
Date: 14.MAY.2018 13:44:13

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



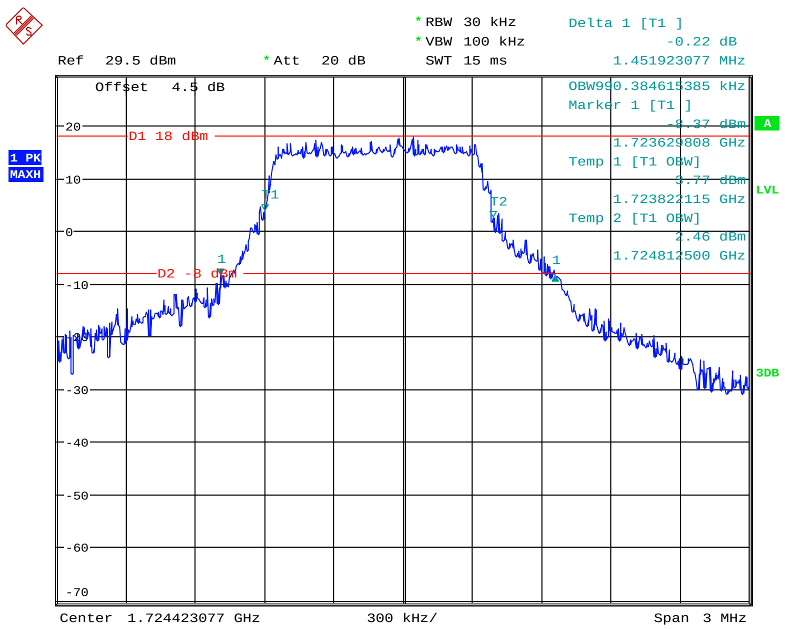
Date: 14.MAY.2018 13:45:34

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



Date: 14.MAY.2018 13:48:41

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

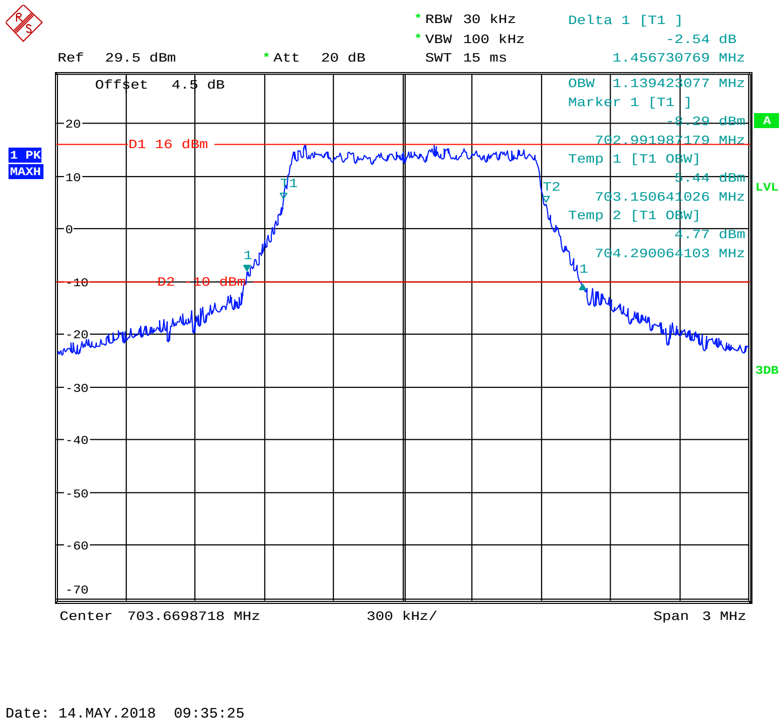


Date: 14.MAY.2018 13:50:16

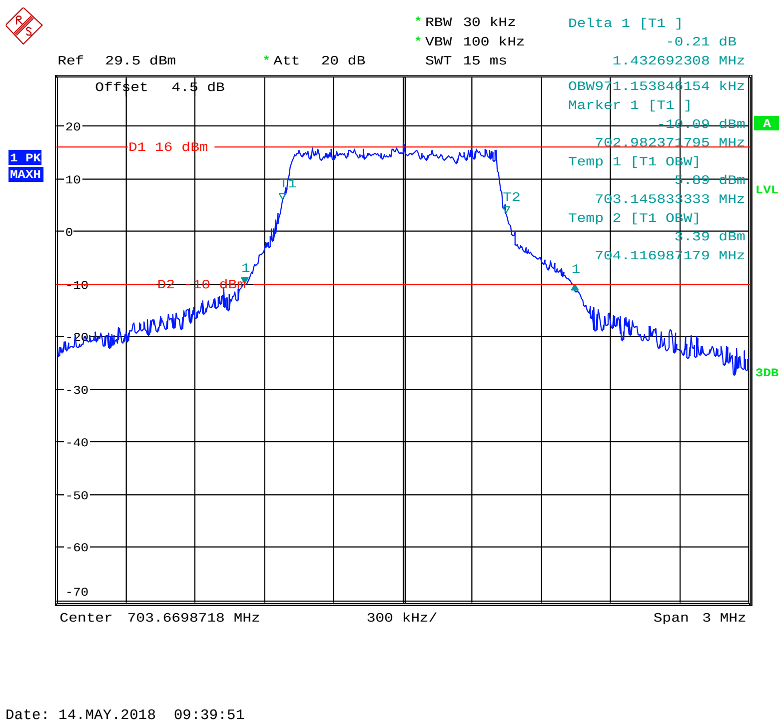
LTE Band 12: (Middle Channel)

Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
5.0	QPSK	1.139	1.457
	16QAM	0.971	1.433
10.0	QPSK	1.139	1.457
	16QAM	0.981	1.394

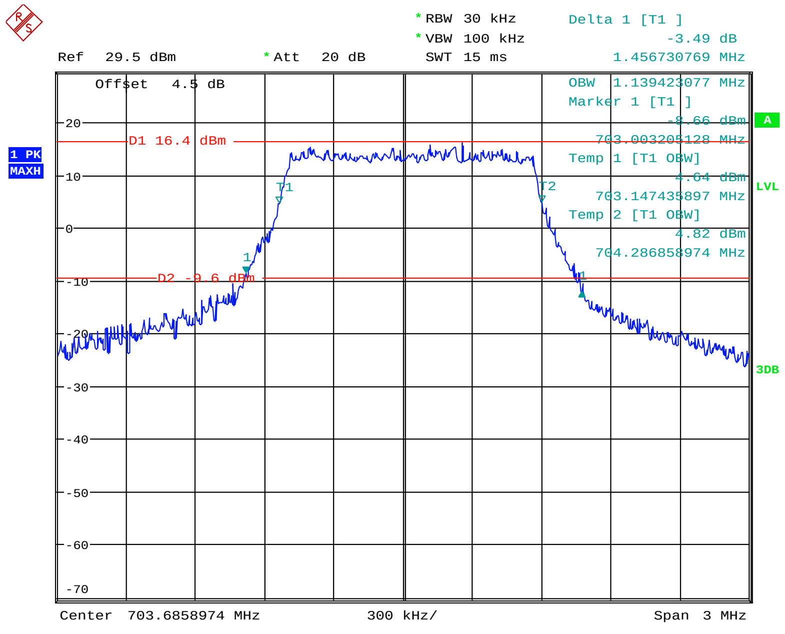
QPSK (5.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



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

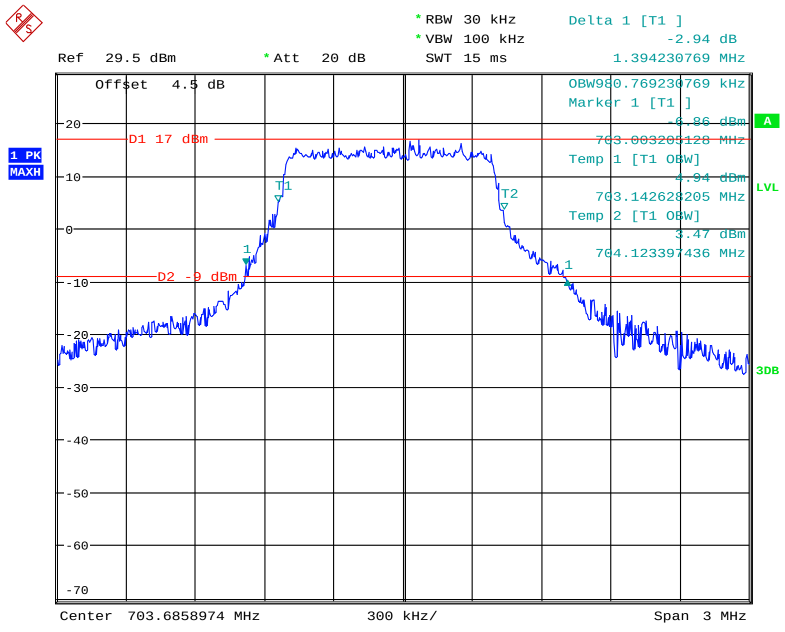


QPSK (10.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



Date: 14.MAY.2018 09:18:15

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

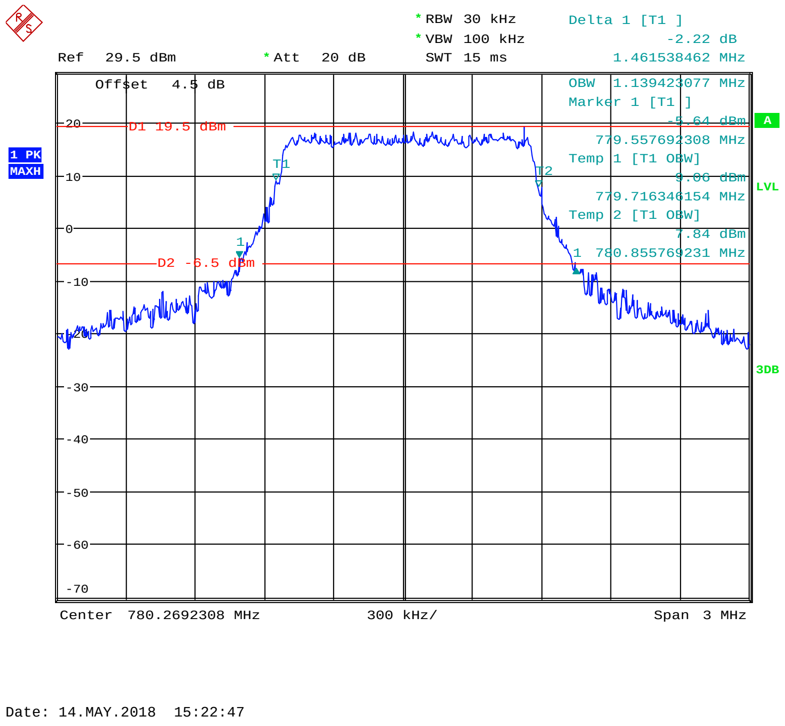


Date: 14.MAY.2018 09:22:38

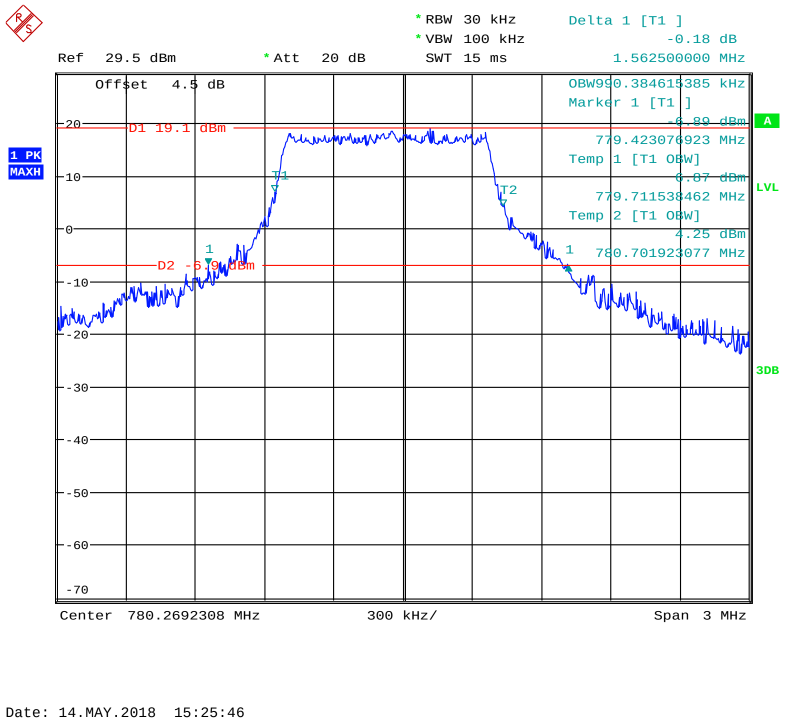
LTE Band 13: (Middle Channel)

Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
5.0	QPSK	1.139	1.462
	16QAM	0.990	1.563
10.0	QPSK	1.139	1.462
	16QAM	0.986	1.466

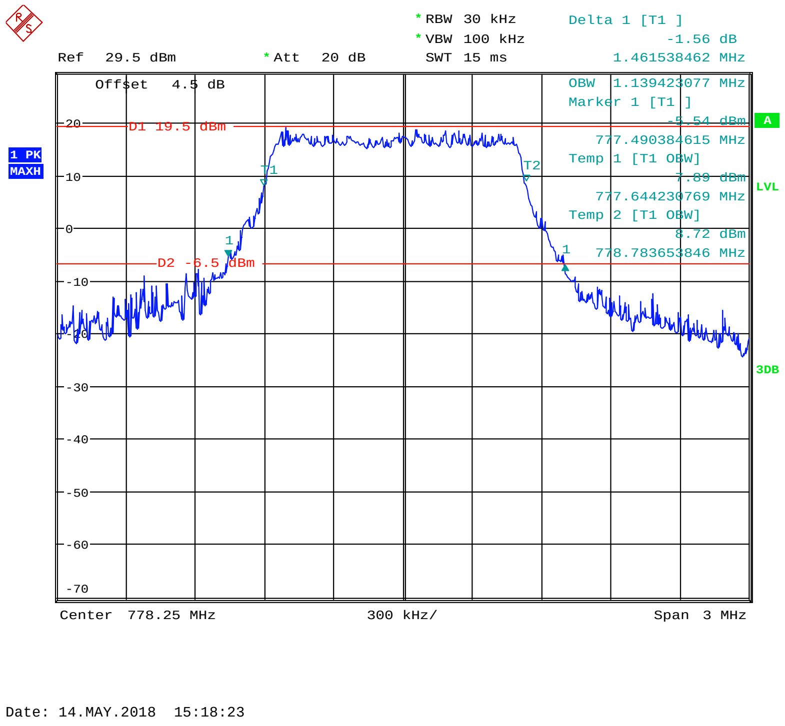
QPSK (5.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



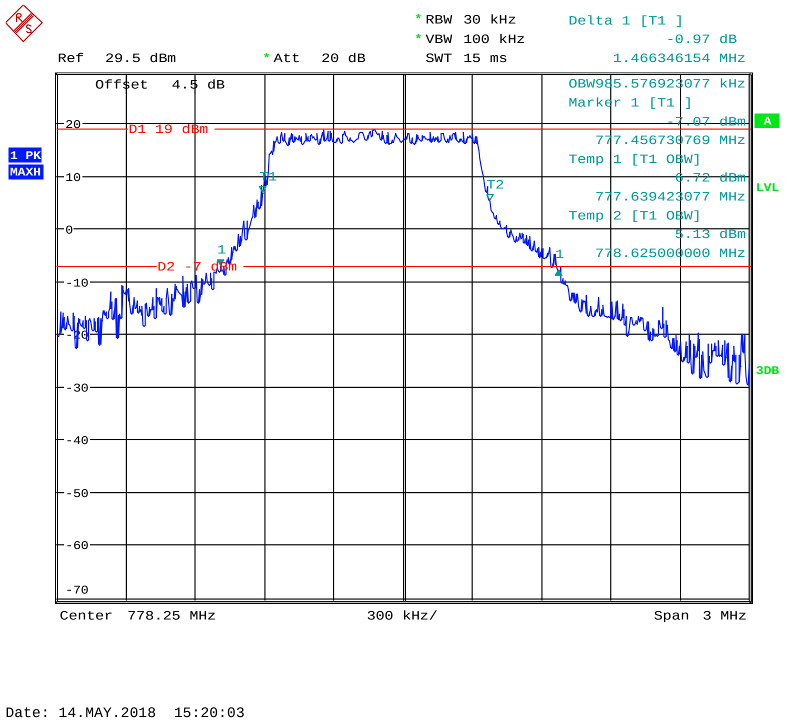
16-QAM (5.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



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



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



FCC §2.1051 §27.53 (c) (f) (g) (h) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

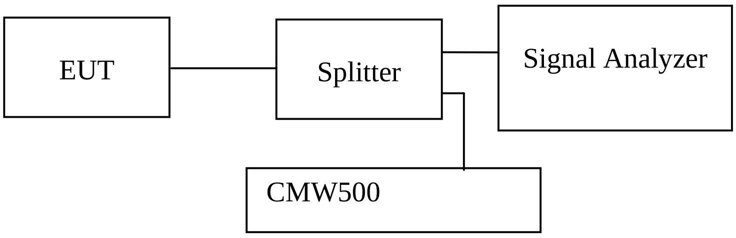
Applicable Standard

FCC §2.1051 and §27.53(c) (f) (g) (h).

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

Test Procedure

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



Test Data

Environmental Conditions

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

The testing was performed by Jacob Kong on 2018-05-14.

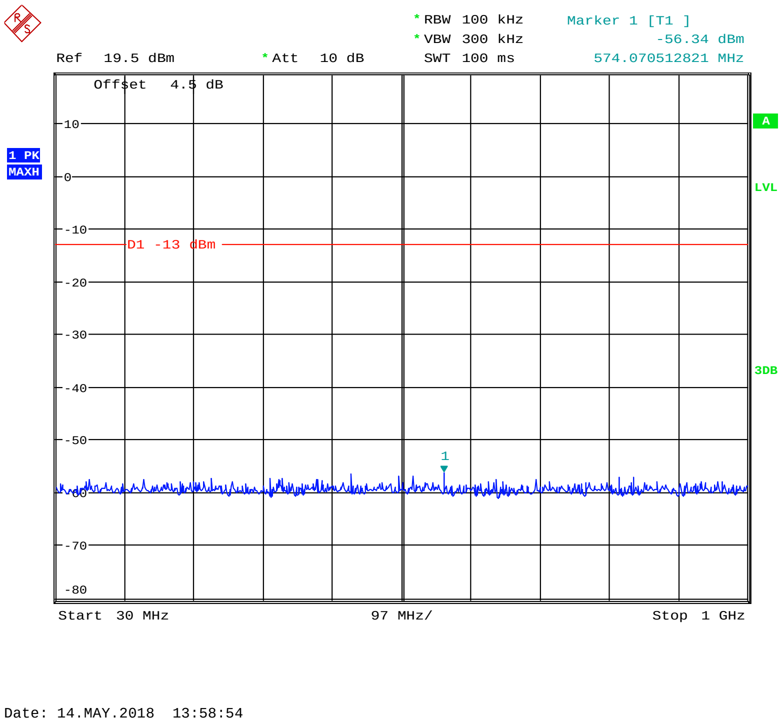
Test result: Compliance.

EUT operation mode: transmitting

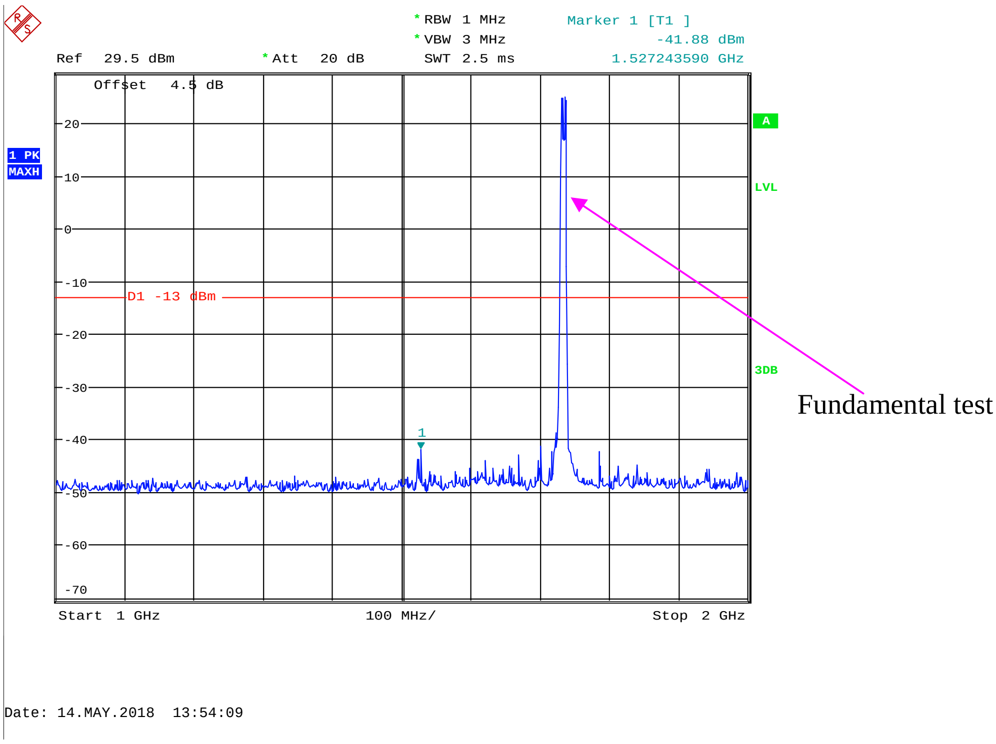
Please refer to the following plots.

LTE Band 4:

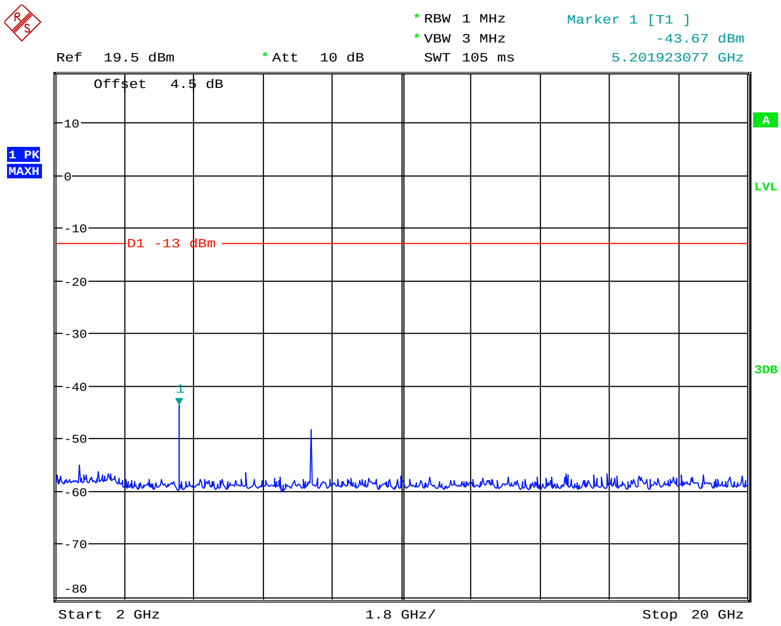
30 MHz - 1 GHz (5.0 MHz, Middle Channel)



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

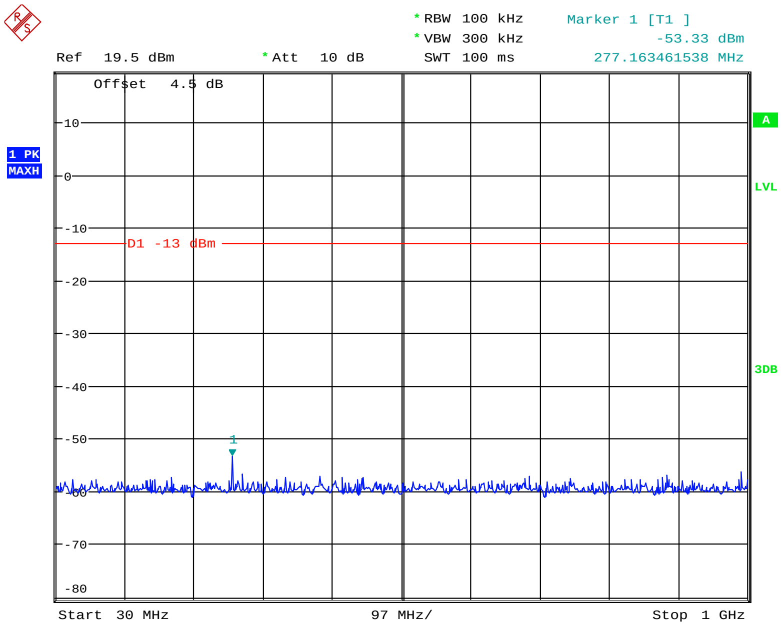


2 GHz – 20 GHz (5.0 MHz, Middle Channel)



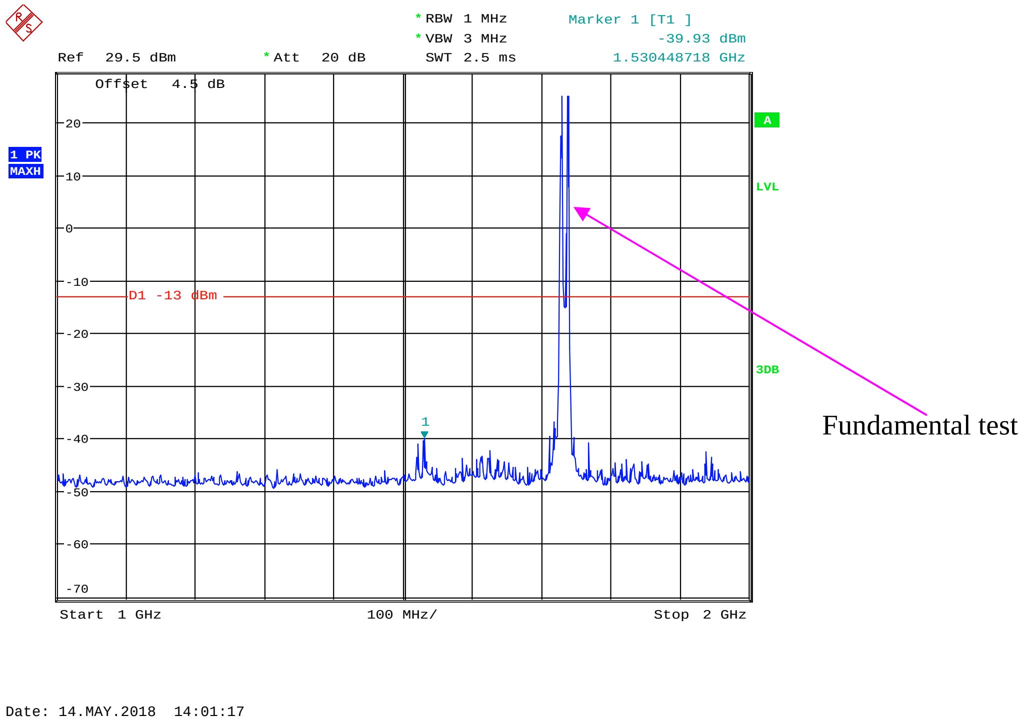
Date: 14.MAY.2018 13:59:50

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

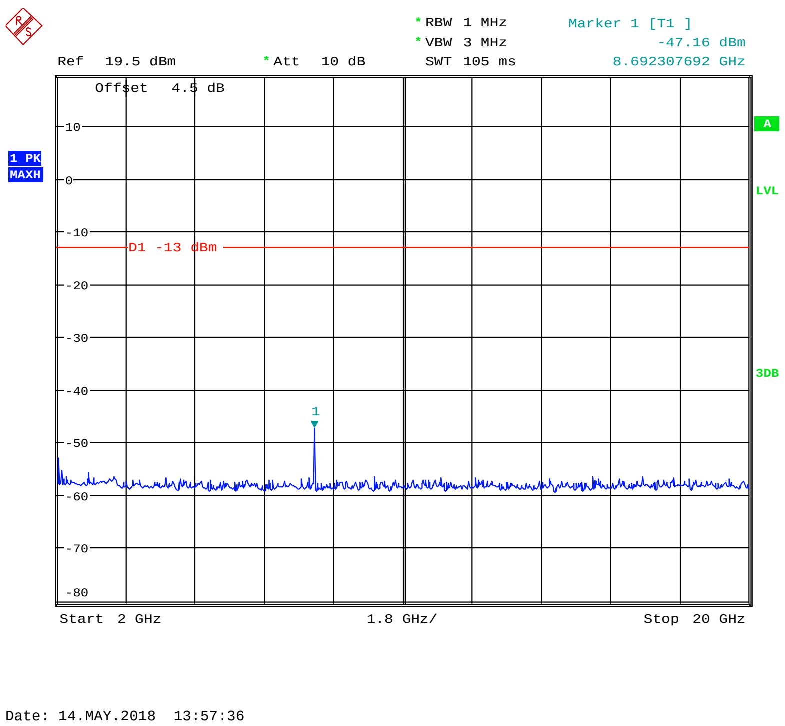


Date: 14.MAY.2018 13:57:59

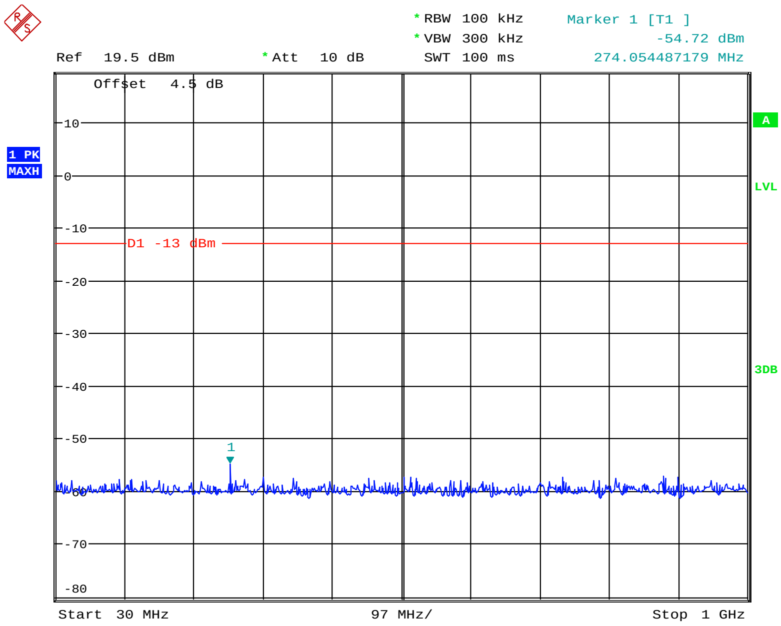
1 GHz – 2 GHz (10.0 MHz, Middle Channel)



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

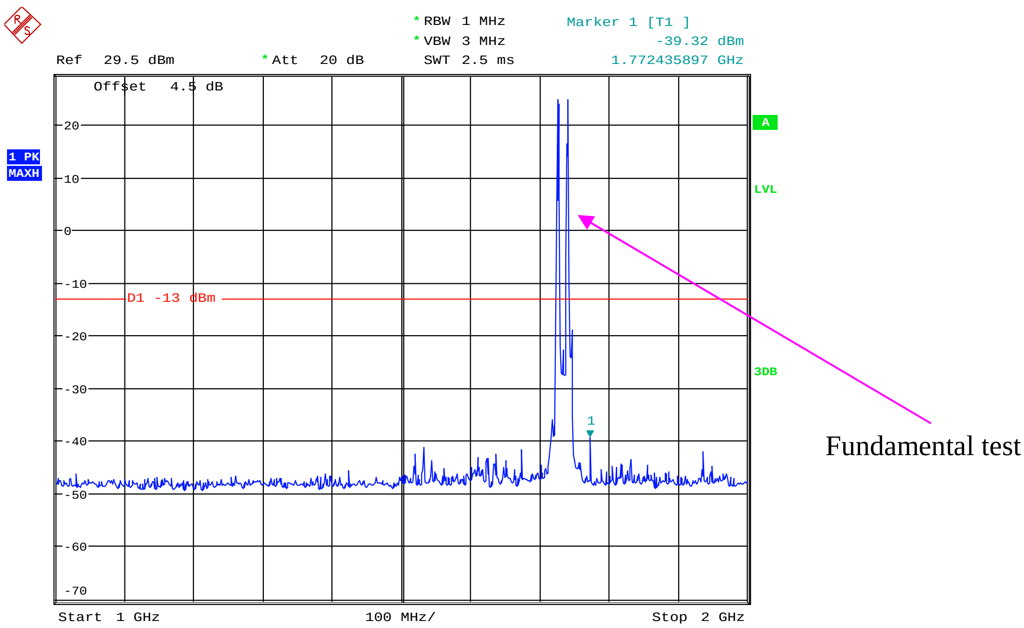


30 MHz - 1 GHz (15.0 MHz, Middle Channel)



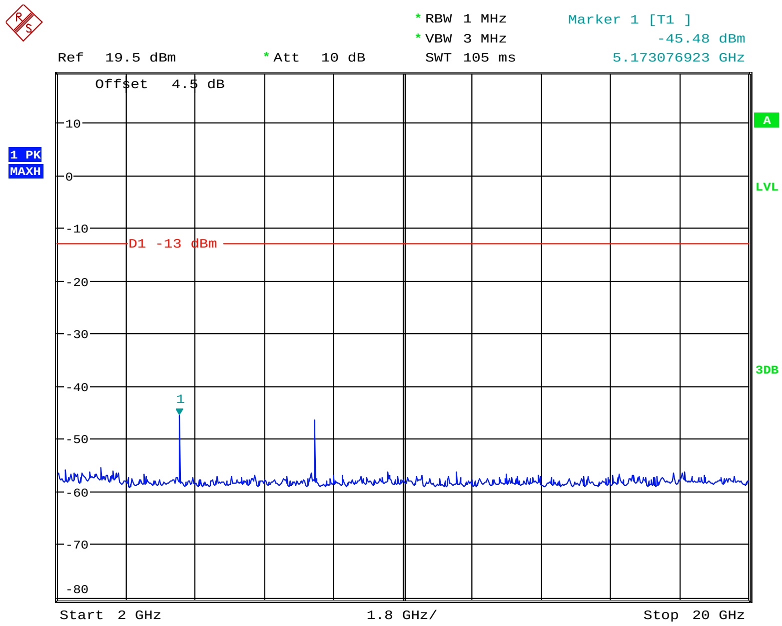
Date: 14.MAY.2018 14:08:45

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



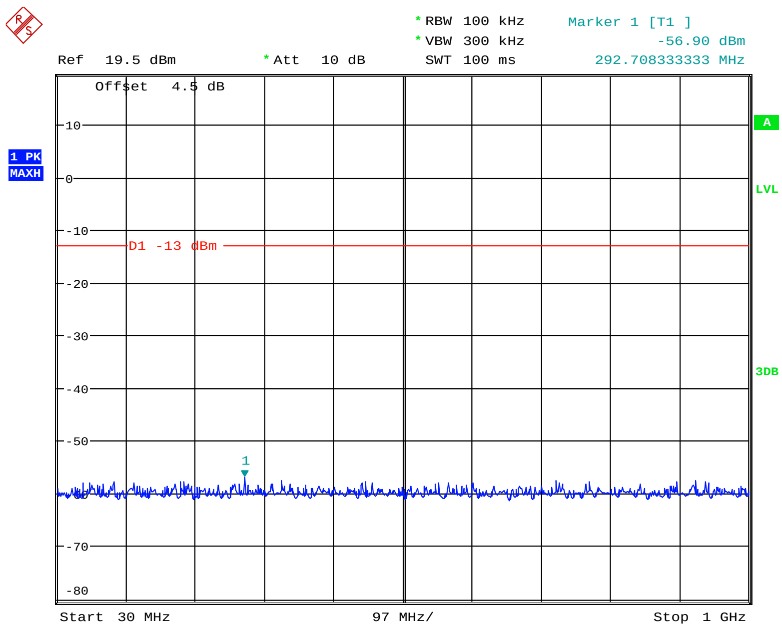
Date: 14.MAY.2018 14:04:02

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



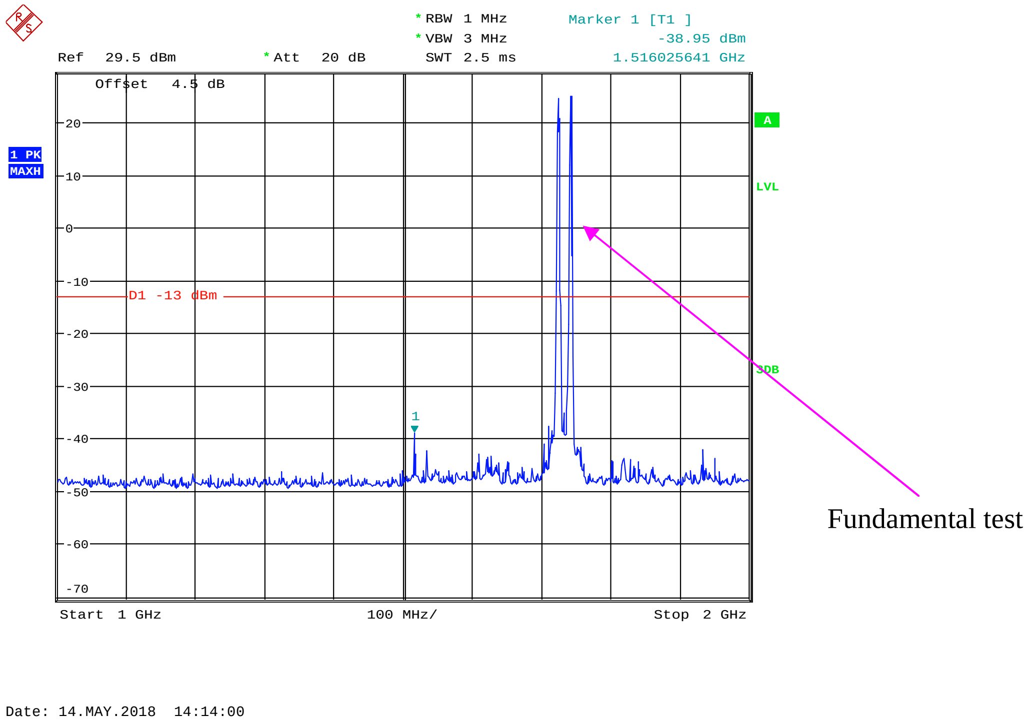
Date: 14.MAY.2018 14:04:24

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

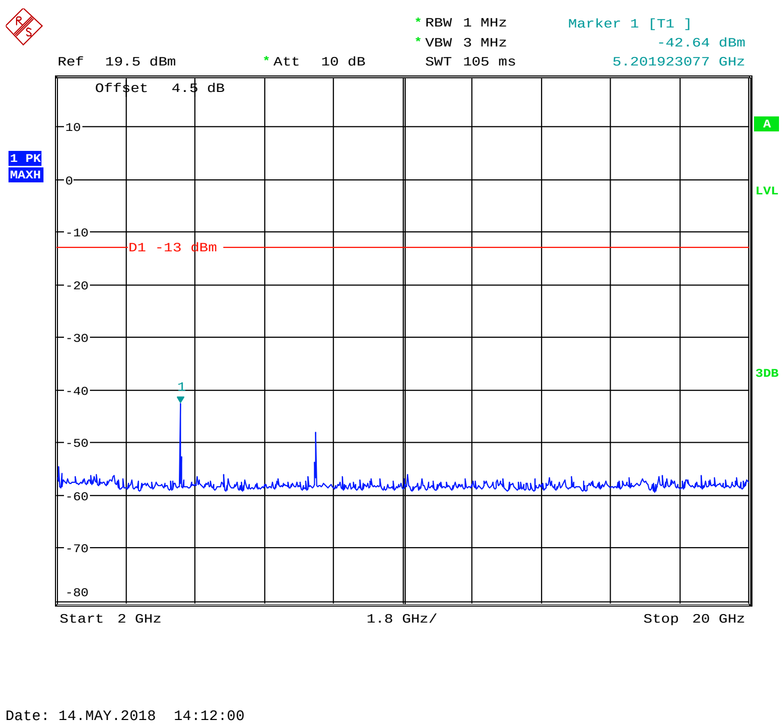


Date: 14.MAY.2018 14:11:25

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

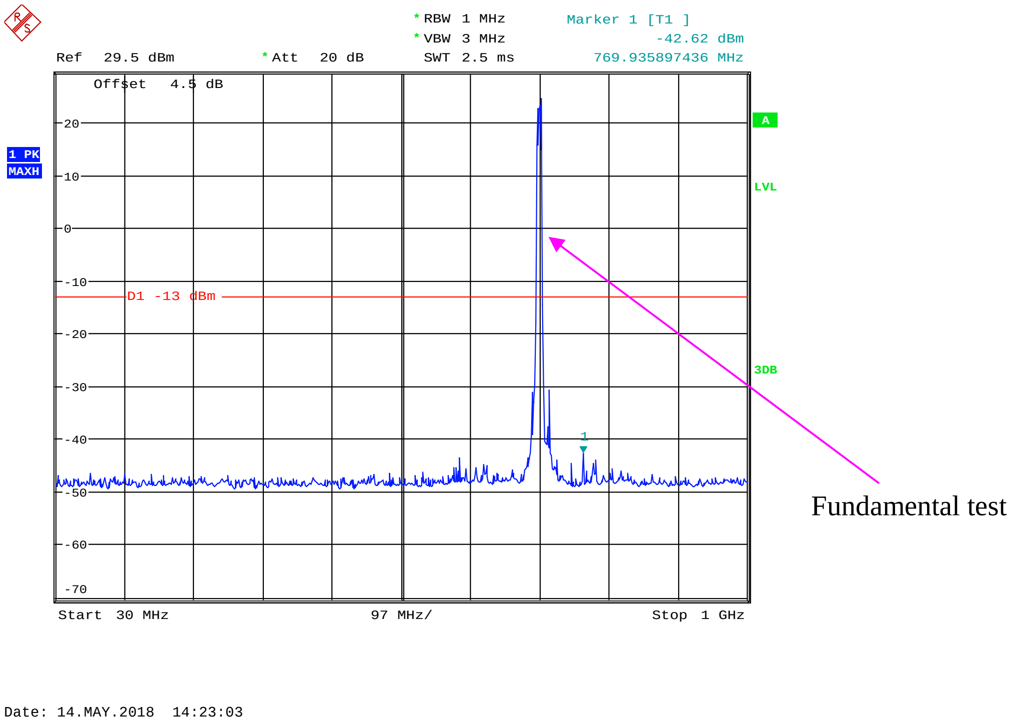


2 GHz – 20 GHz (20.0 MHz, Middle Channel)

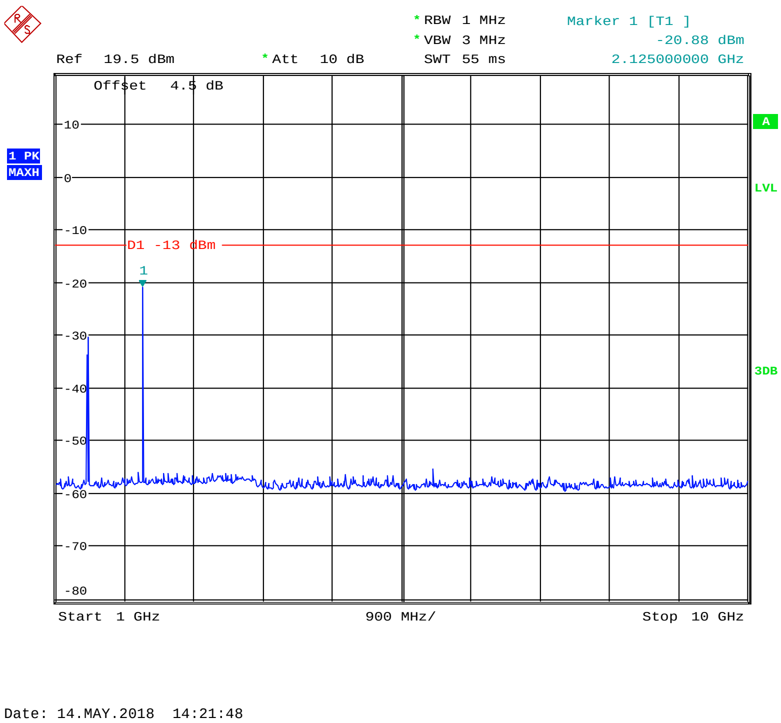


LTE Band 12:

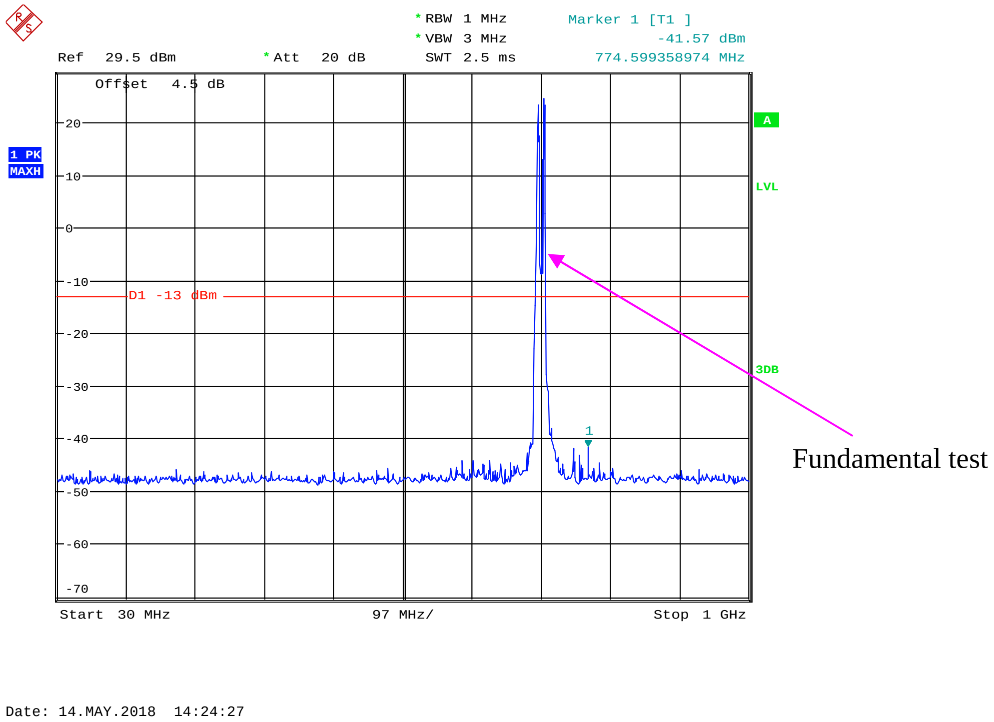
30 MHz – 1 GHz (5.0 MHz, Middle Channel)



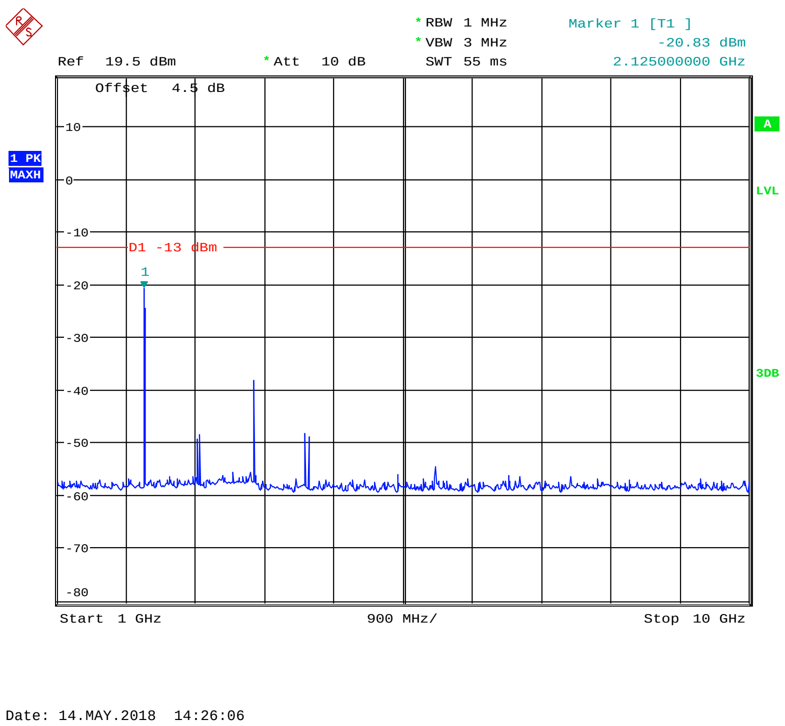
1 GHz – 8GHz (5.0 MHz, Middle Channel)



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

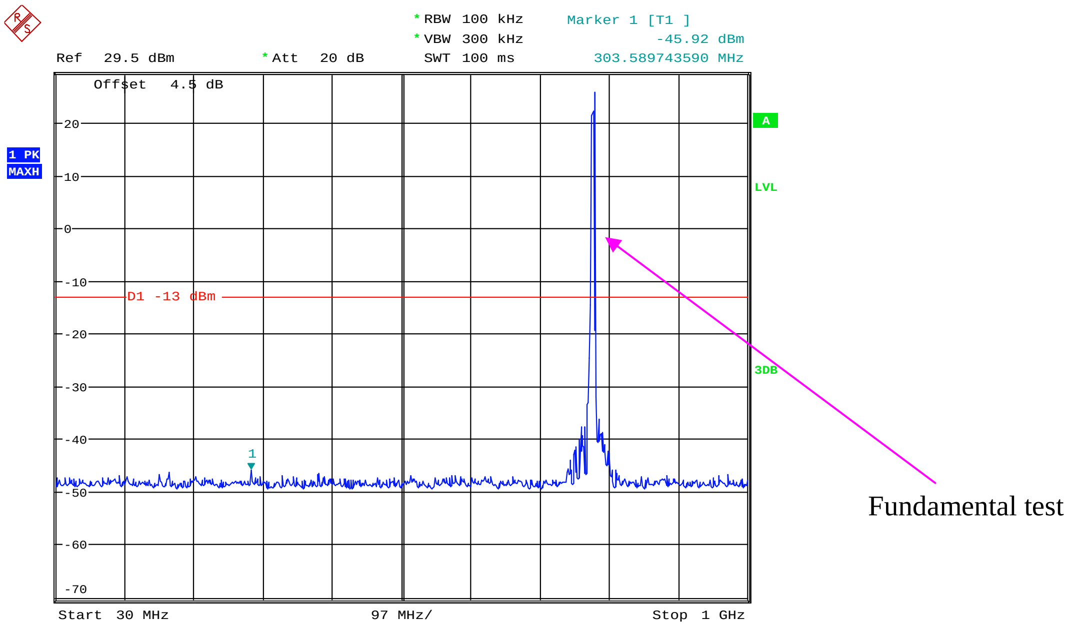


1 GHz – 8 GHz (10.0 MHz, Middle Channel)



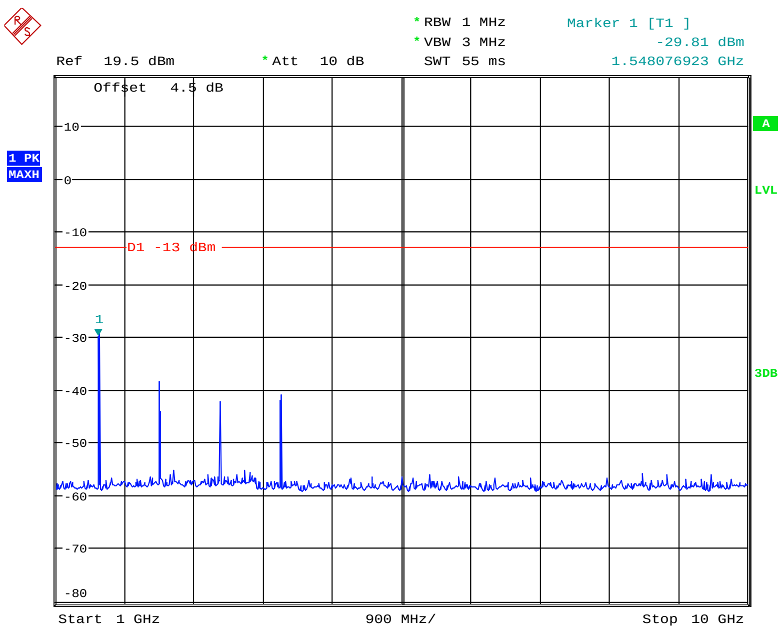
LTE Band 13:

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



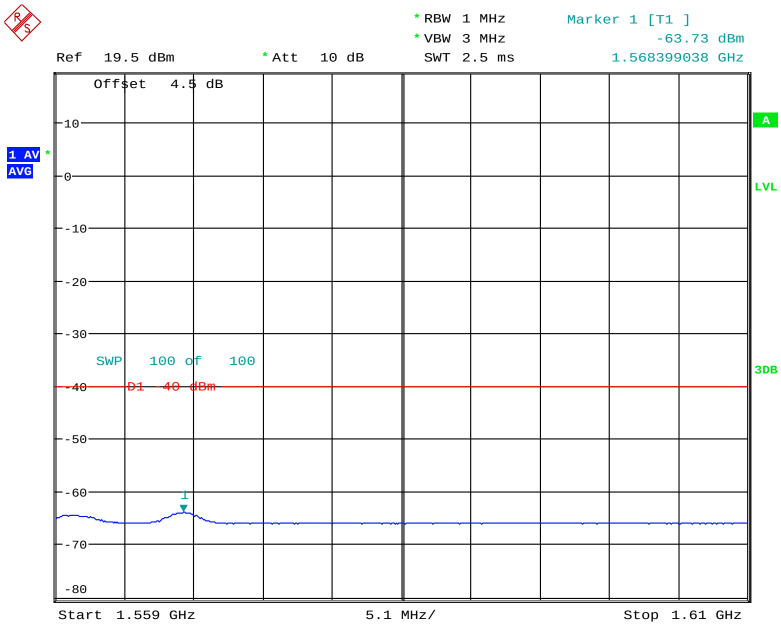
Date: 14.MAY.2018 14:52:57

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



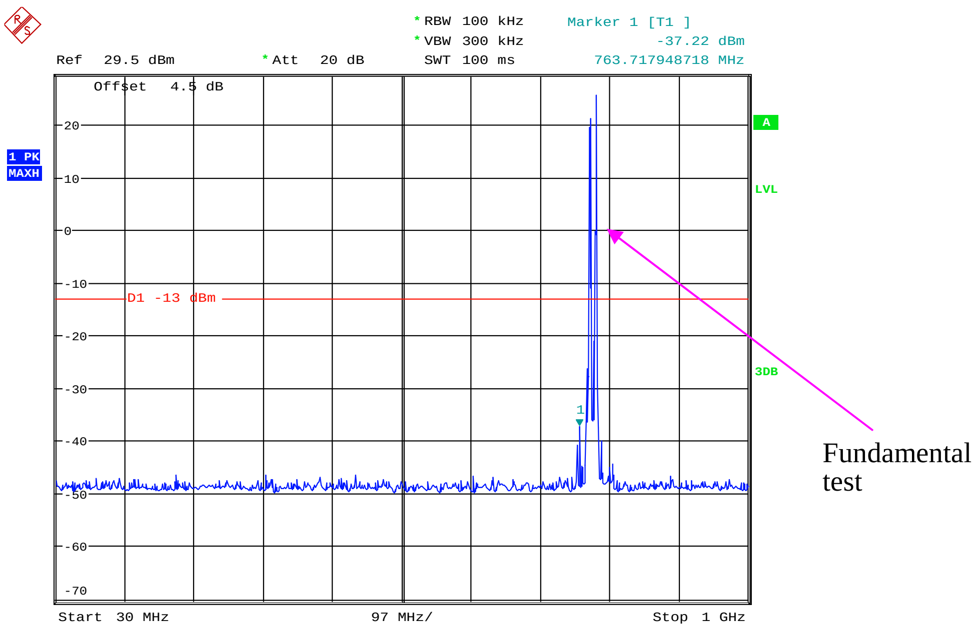
Date: 14.MAY.2018 14:45:55

1.559 GHz – 1.610 GHz (5.0 MHz, Middle Channel)



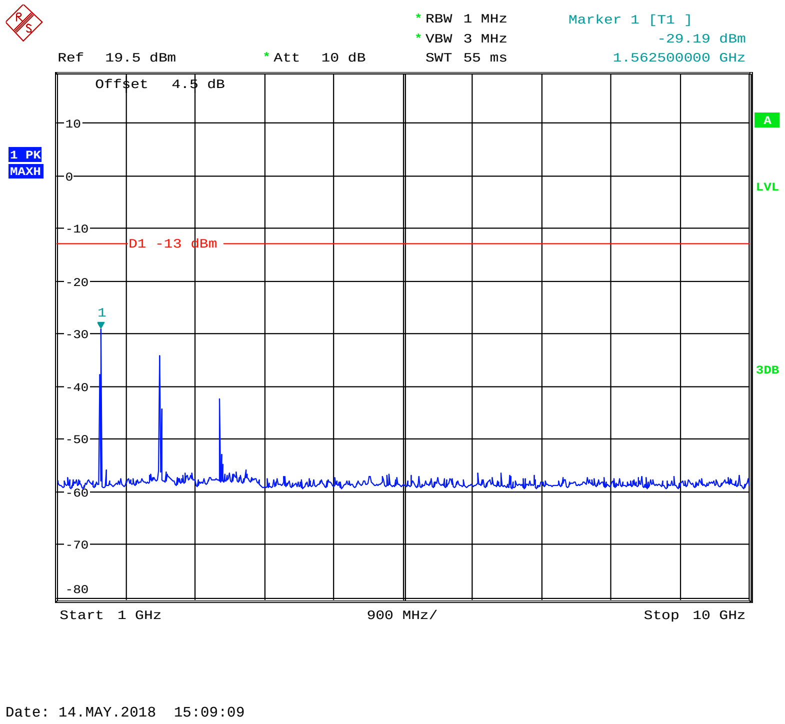
Date: 14.MAY.2018 14:50:40

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

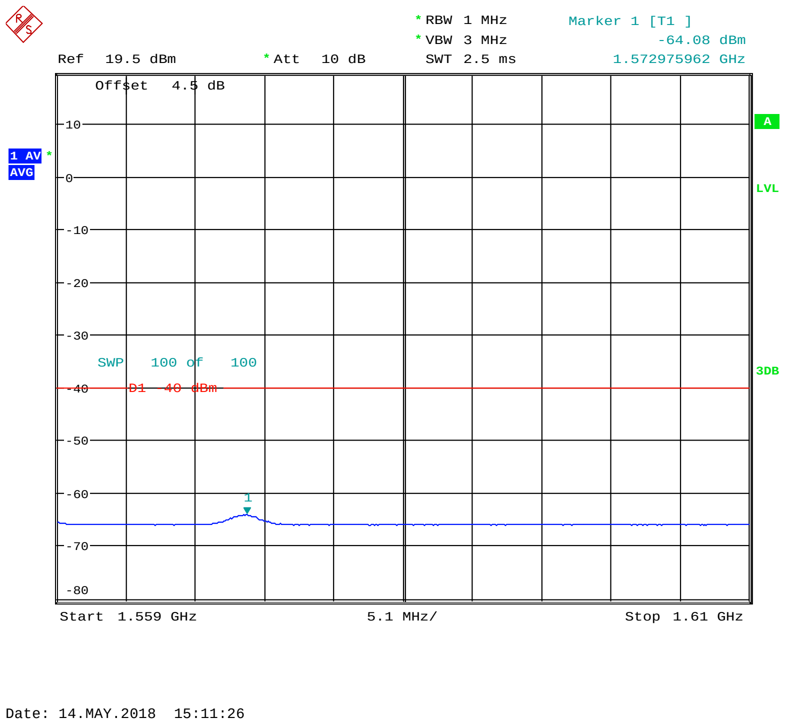


Date: 14.MAY.2018 15:14:10

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



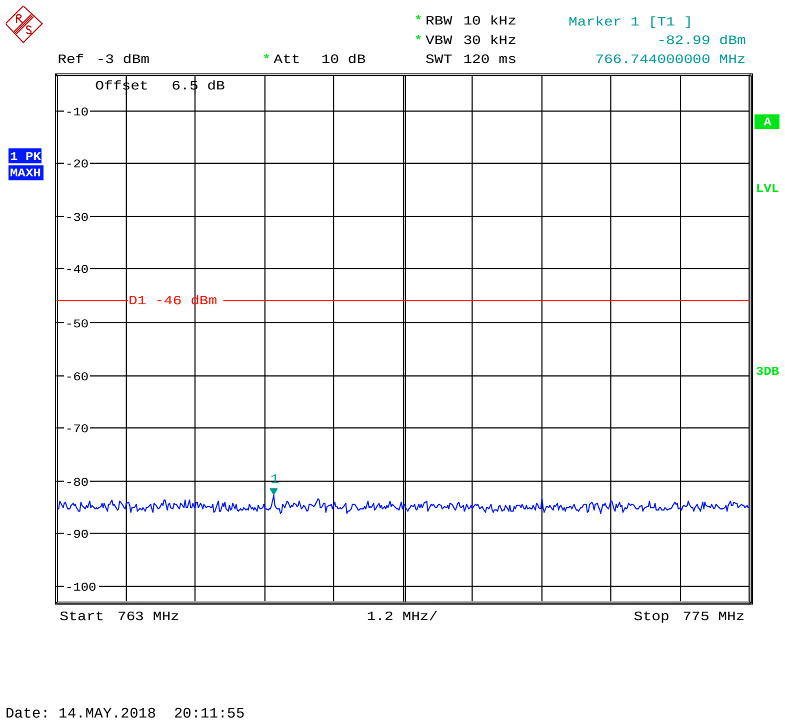
1.559 GHz – 1.610 GHz (10.0 MHz, Middle Channel)



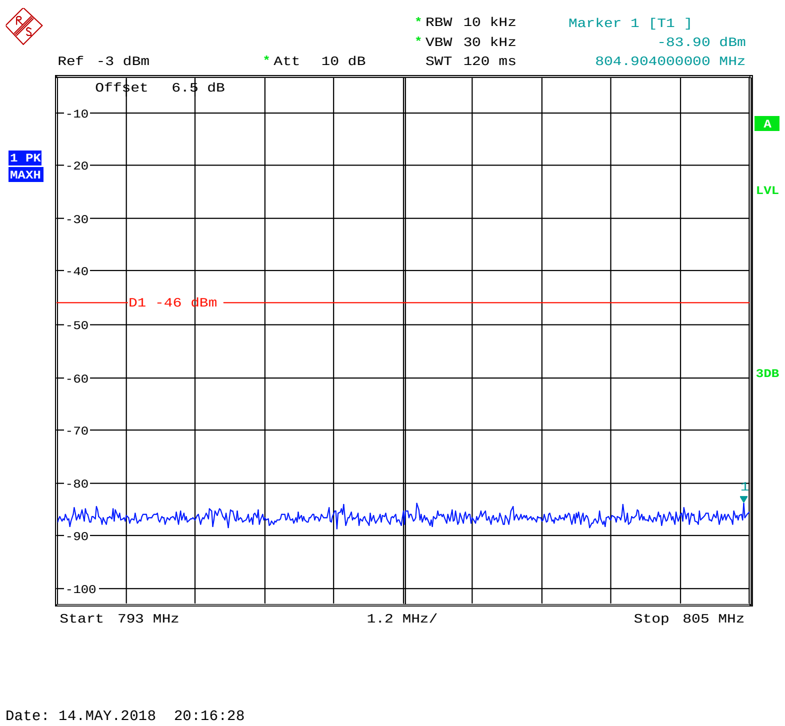
Additional Conducted Spurious Emissions Evaluations in accordance with FCC §27.53 (c)

Note: because of RBW 10kHz convert to 6.25kHz, 10lg(10/6.25)=2, offset added with more 2dB.

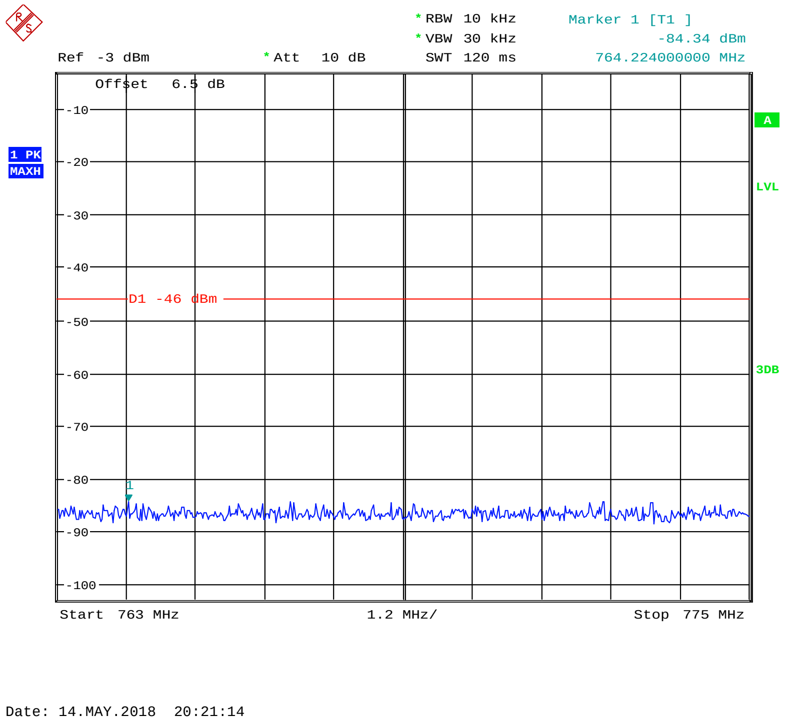
763 MHz – 775 MHz, 5MHz



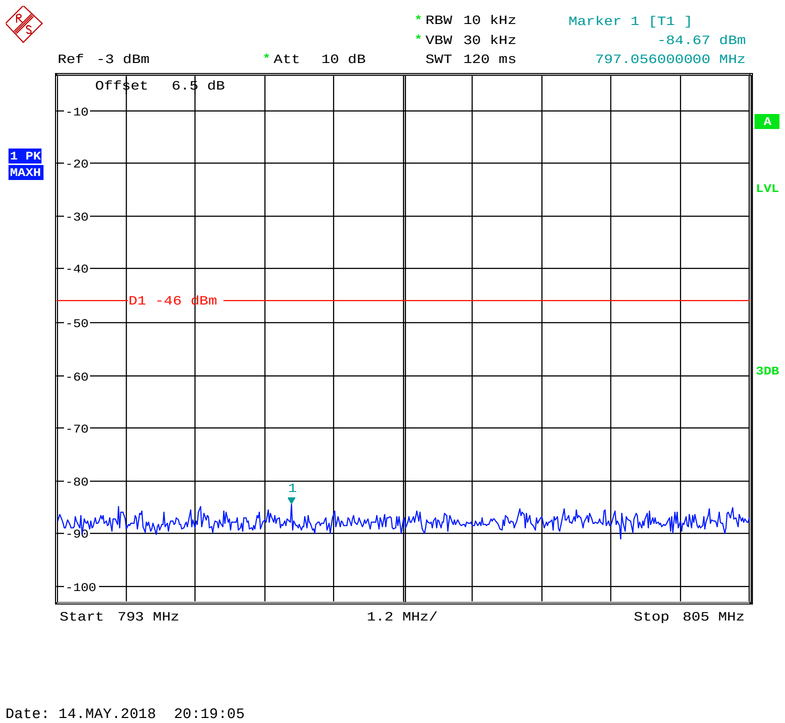
793 MHz – 805 MHz, 5MHz



763 MHz – 775 MHz, 10MHz



793 MHz – 805 MHz, 10MHz



FCC § 2.1053; §27.53 (c) (g)(h) SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053 and § 27.53(c) (g)(h)

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 Jacob Kong on 2018-05-15.

EUT operation mode: Transmitting

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

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

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna Height (m)	Rx Antenna Polar (H/V)	Substituted Level (dBm)	Substituted Cable Loss (dB)	Substituted Antenna Gain (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Band 4										
Test frequency range:30 MHz ~ 18 GHz										
3465.00	55.53	34	1.6	H	-44.9	1.50	12.00	-34.40	-13	21.40
3465.00	60.24	174	1.8	V	-40.9	1.50	12.00	-30.40	-13	17.40
5197.50	48.49	310	2.0	H	-50.1	1.60	12.10	-39.60	-13	26.60
5197.50	47.25	60	1.4	V	-50.9	1.60	12.10	-40.40	-13	27.40
6930.00	44.52	217	2.2	H	-51.0	1.80	11.30	-41.50	-13	28.50
6930.00	44.22	88	1.0	V	-51.4	1.80	11.30	-41.90	-13	28.90
Band 12										
Test frequency range: 30 MHz ~ 10GHz										
1415.00	51.67	309	1.2	H	-56.2	1.60	7.90	-49.90	-13	36.90
1415.00	54.04	179	1.6	V	-54.1	1.60	7.90	-47.80	-13	34.80
2122.50	73.89	48	2.3	H	-28.2	1.30	9.70	-19.80	-13	6.80
2122.50	75.96	105	2.3	V	-27.0	1.30	9.70	-18.60	-13	5.60
2830.00	48.1	328	2.5	H	-55.7	1.80	10.50	-47.00	-13	34.00
2830.00	48.59	37	2.3	V	-54.8	1.80	10.50	-46.10	-13	33.10
Band 13										
Test frequency range: 30 MHz ~ 10GHz										
1564.00	71.43	327	1.4	H	-36.6	1.40	8.70	-29.30	-13	16.30
1564.00	72.58	193	2.3	V	-35.2	1.40	8.70	-27.90	-13	14.90
2346.00	69.2	294	1.1	H	-35.3	1.30	10.00	-26.60	-13	13.60
2346.00	67.22	23	1.8	V	-37.2	1.30	10.00	-28.50	-13	15.50
3128.00	53.58	103	1.5	H	-47.7	1.70	11.30	-38.10	-13	25.10
3128.00	52.74	120	1.4	V	-48.4	1.70	11.30	-38.80	-13	25.80

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

§27.53 (c) (g)(h) - BAND EDGES

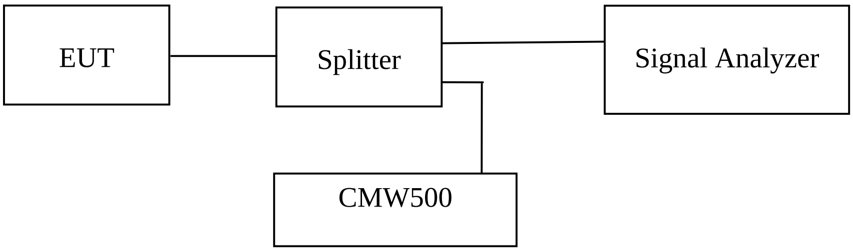
Applicable Standard

According to FCC §27.53(c) (g)(h), 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:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

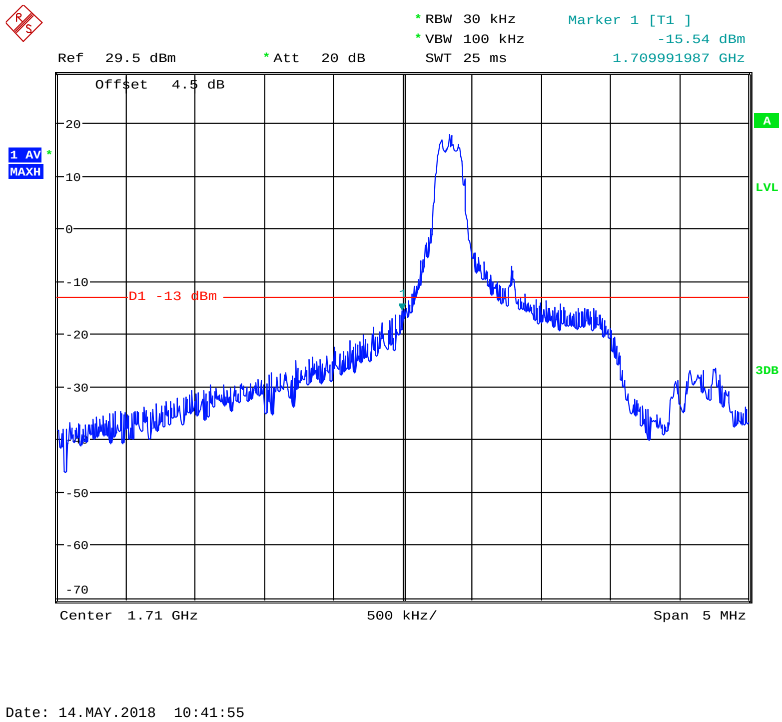
The testing was performed by Jacob Kong on 2018-05-14.

EUT operation mode: Transmitting

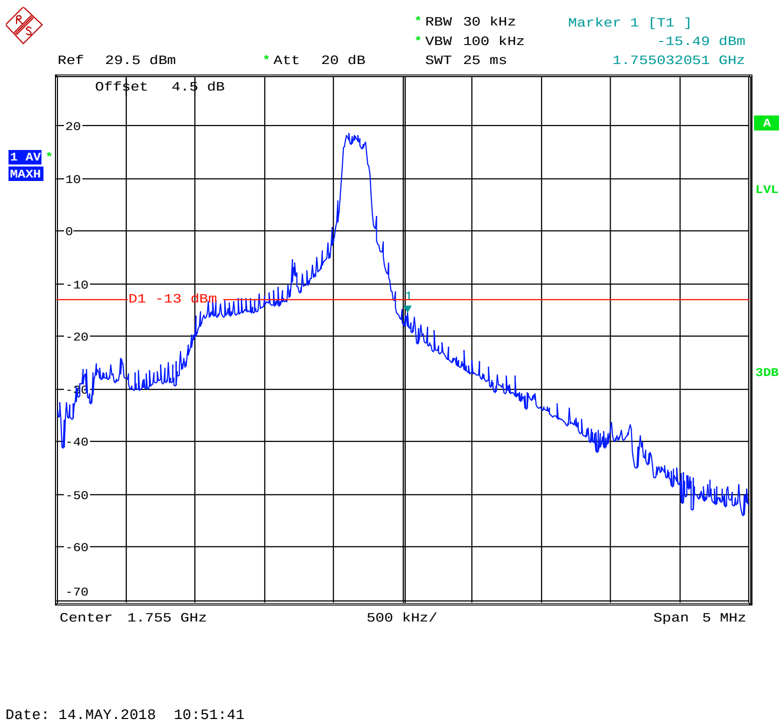
Test Result: Compliance. Please refer to the following plots.

Band 4:

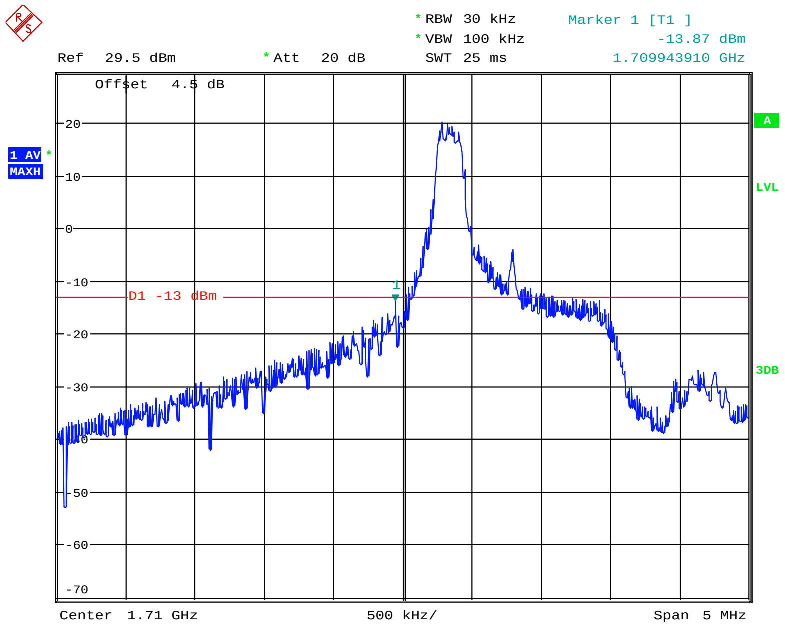
QPSK (5.0 MHz, RB0) - Left Band Edge



QPSK (5.0 MHz, RB0) - Right Band Edge

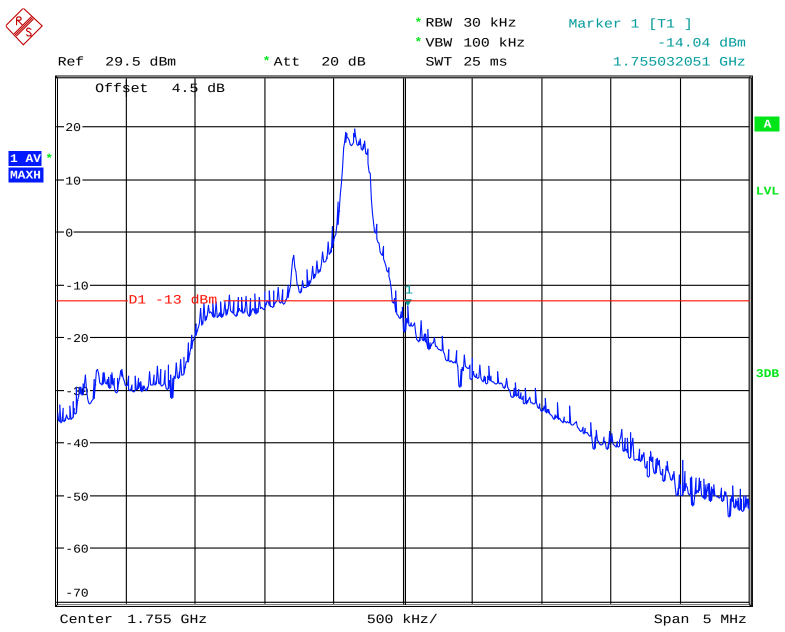


16-QAM (5.0 MHz, RB0) - Left Band Edge



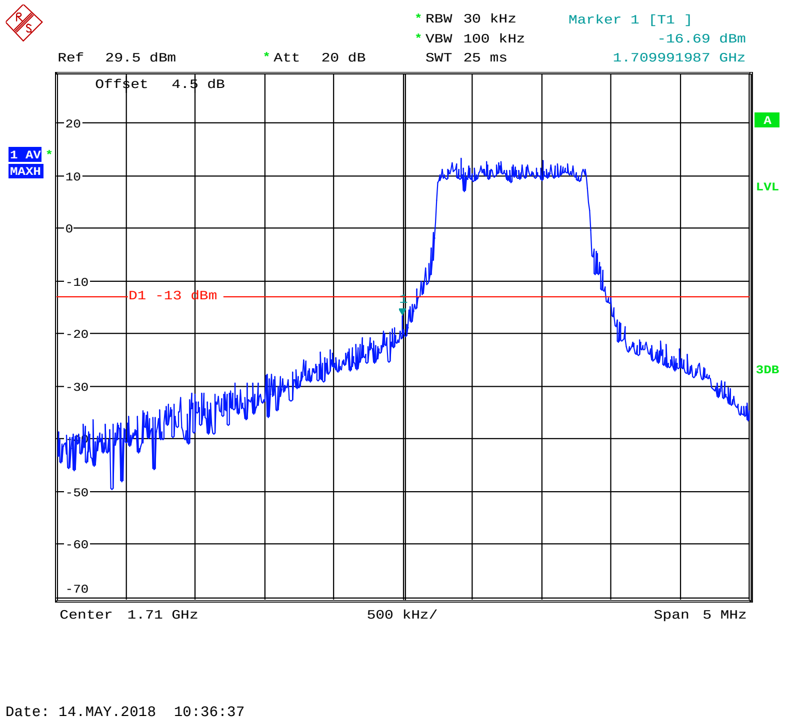
Date: 14.MAY.2018 10:43:58

16-QAM (5.0 MHz, RB0) - Right Band Edge

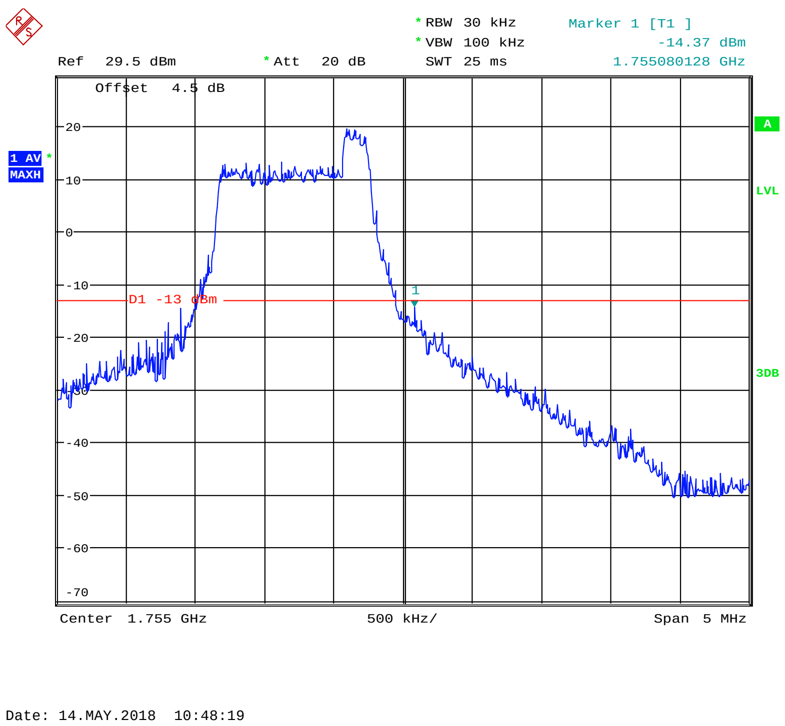


Date: 14.MAY.2018 10:53:35

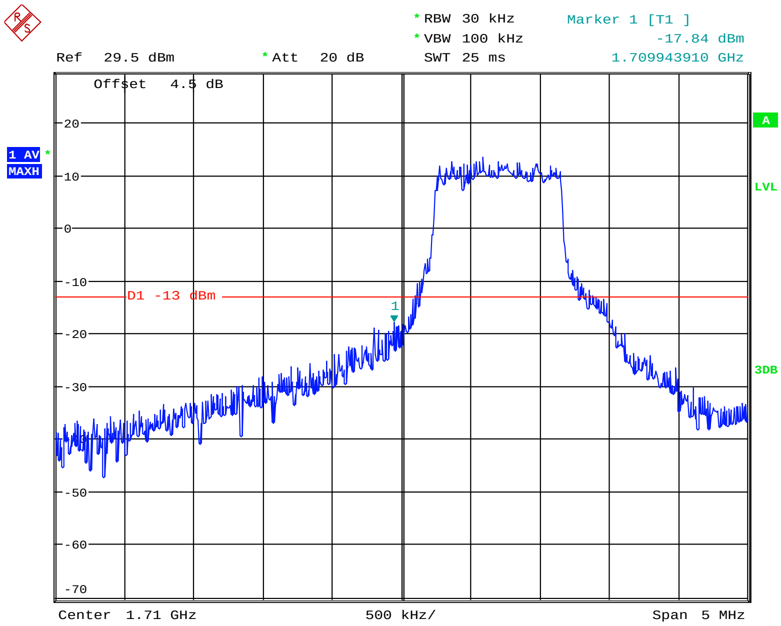
QPSK (5.0 MHz, RB6) - Left Band Edge



QPSK (5.0 MHz, RB6) - Right Band Edge

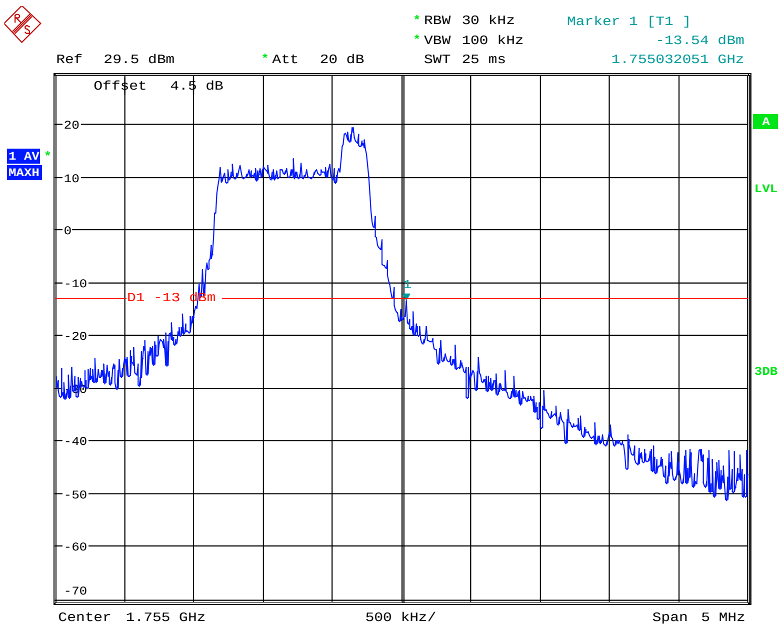


16-QAM (5.0 MHz, RB5) - Left Band Edge



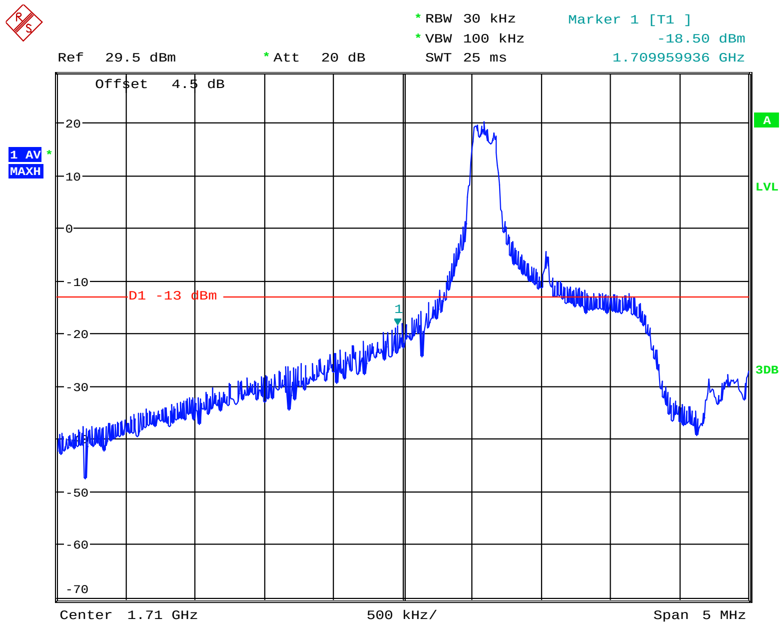
Date: 14.MAY.2018 10:45:43

16-QAM (5.0 MHz, RB5) - Right Band Edge



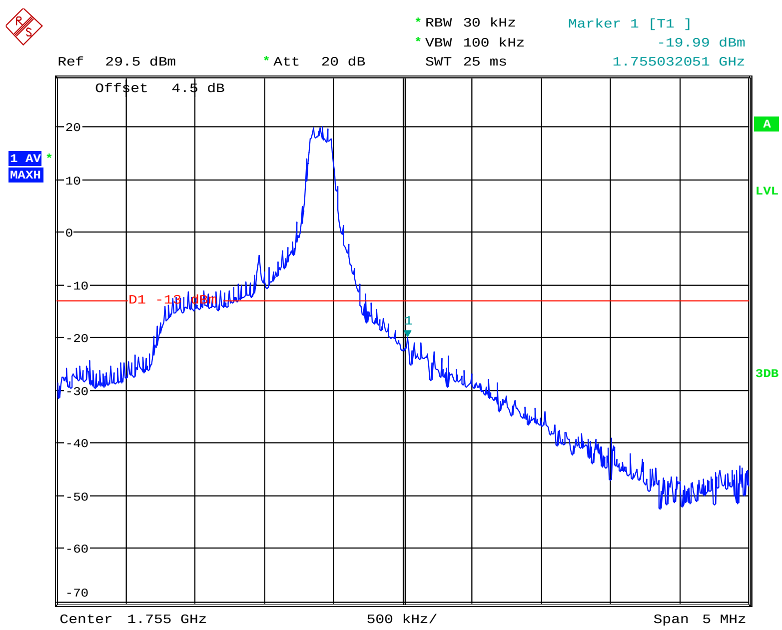
Date: 14.MAY.2018 10:54:47

QPSK (10.0 MHz, RB0) - Left Band Edge



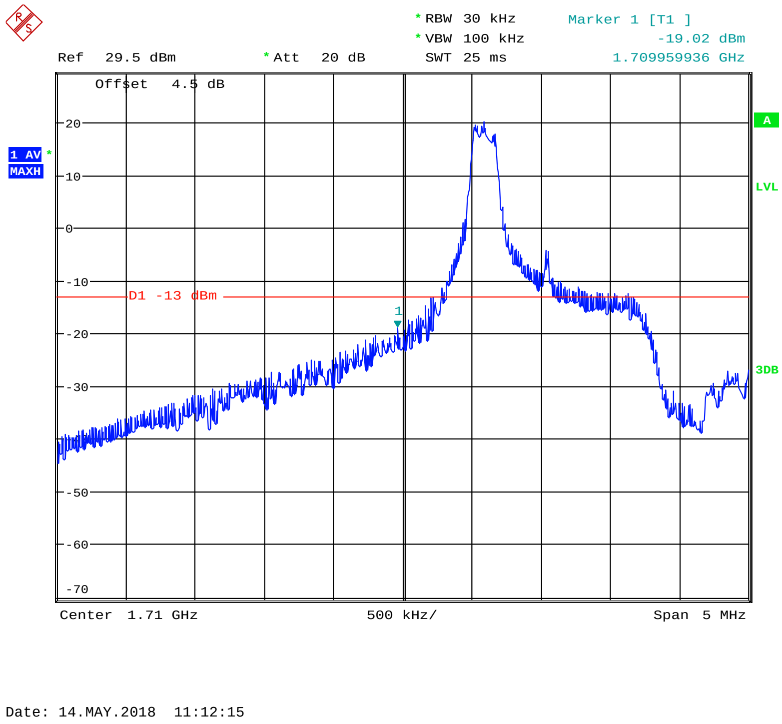
Date: 14.MAY.2018 11:10:12

QPSK (10.0 MHz, RB0) - Right Band Edge

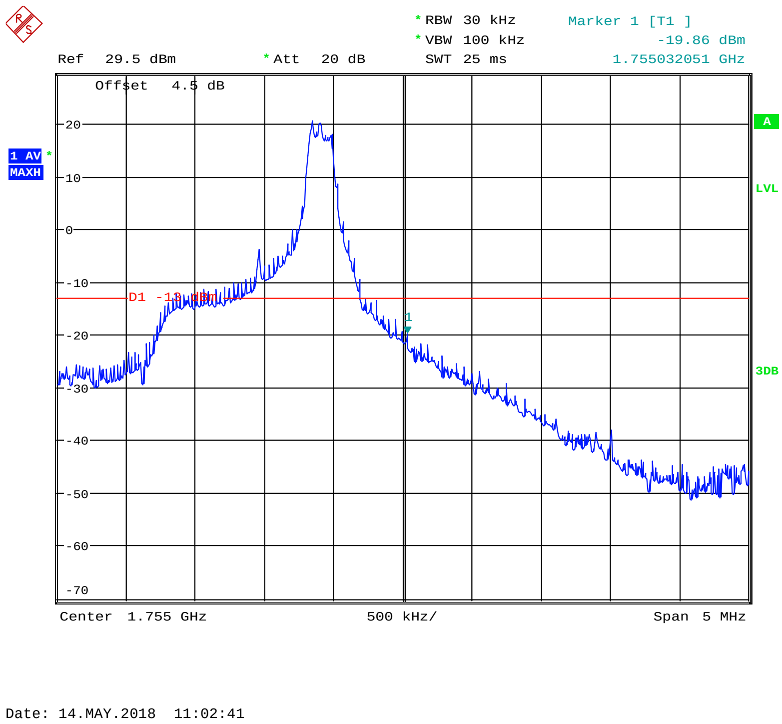


Date: 14.MAY.2018 10:59:57

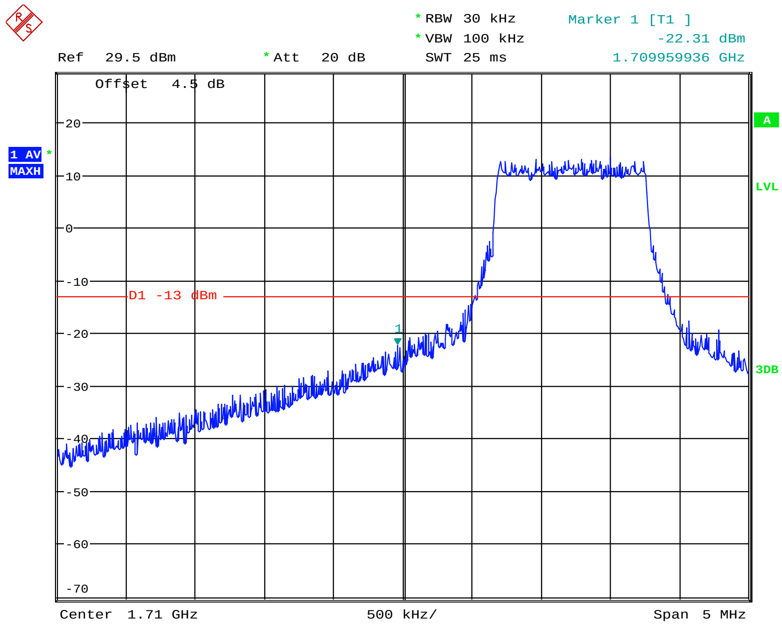
16-QAM (10.0 MHz, RB0) - Left Band Edge



16-QAM (10.0 MHz, RB0) - Right Band Edge

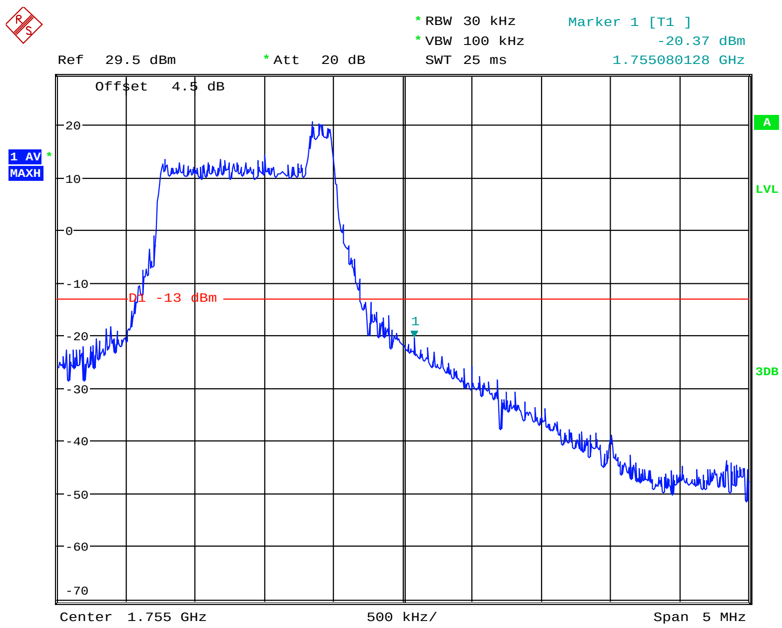


QPSK (10.0 MHz, RB6) - Left Band Edge



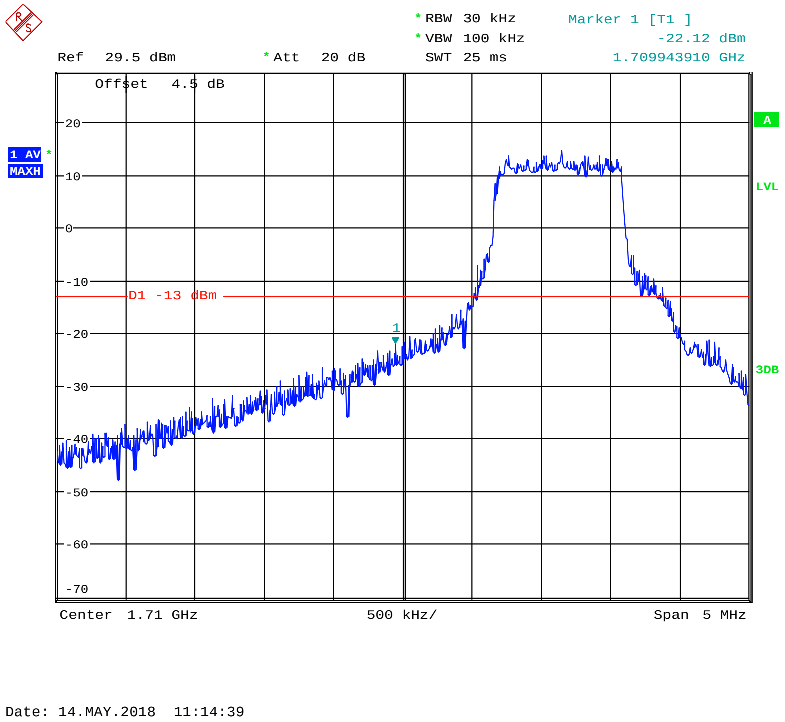
Date: 14.MAY.2018 11:07:30

QPSK (10.0 MHz, RB6) - Right Band Edge

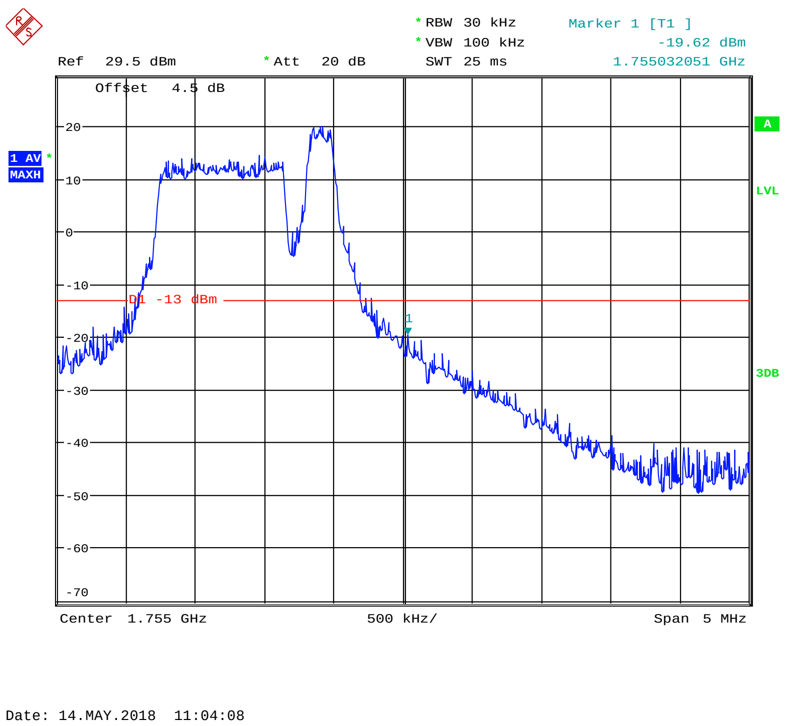


Date: 14.MAY.2018 10:57:56

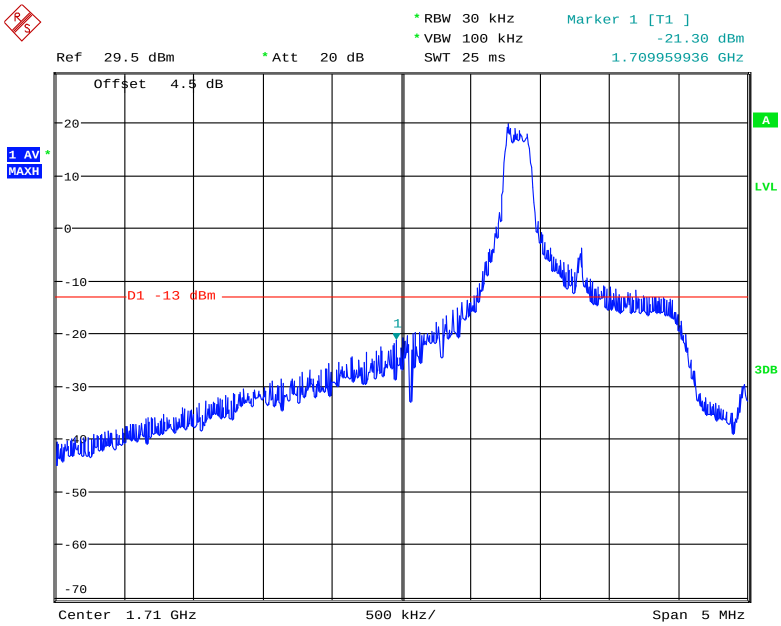
16-QAM (10.0 MHz, RB5) - Left Band Edge



16-QAM (10.0 MHz, RB5) - Right Band Edge

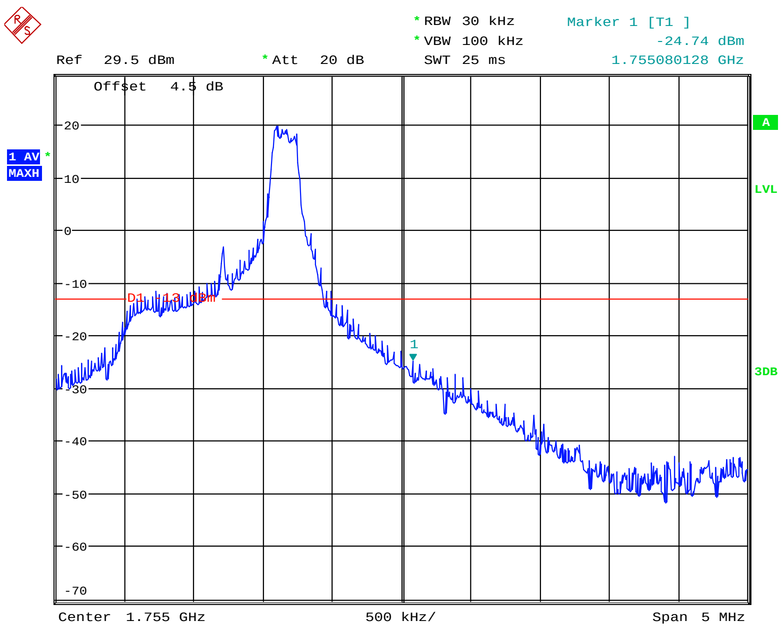


QPSK (15.0 MHz, RB0) - Left Band Edge



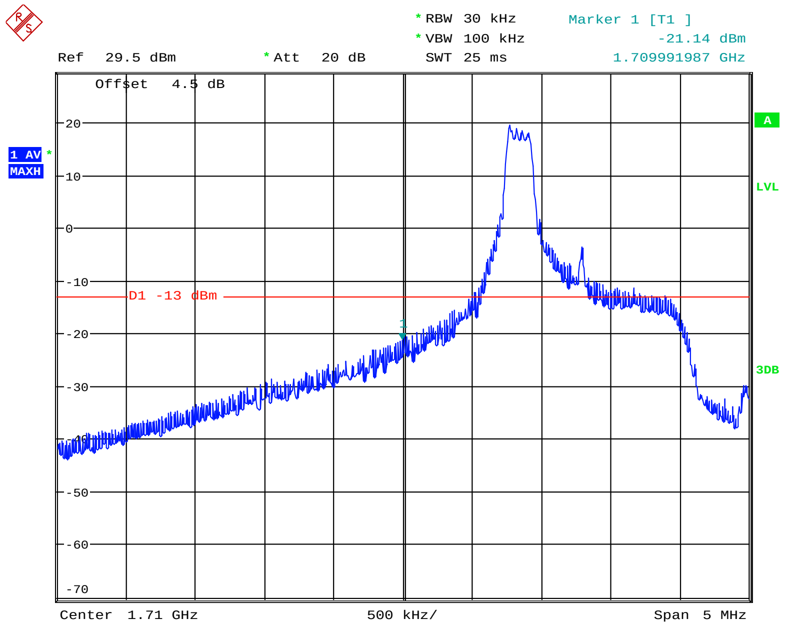
Date: 14.MAY.2018 11:21:17

QPSK (15.0 MHz, RB0) - Right Band Edge



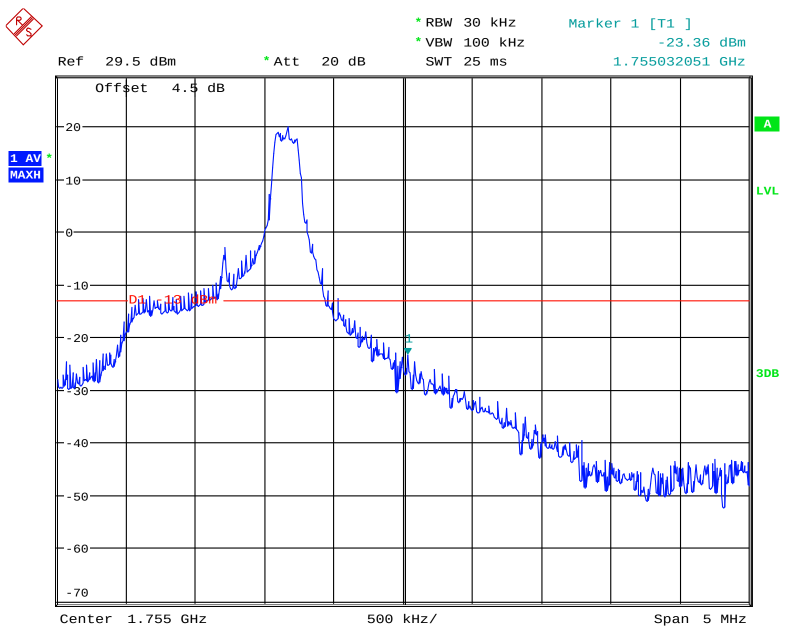
Date: 14.MAY.2018 11:38:54

16-QAM (15.0 MHz, RB0) - Left Band Edge



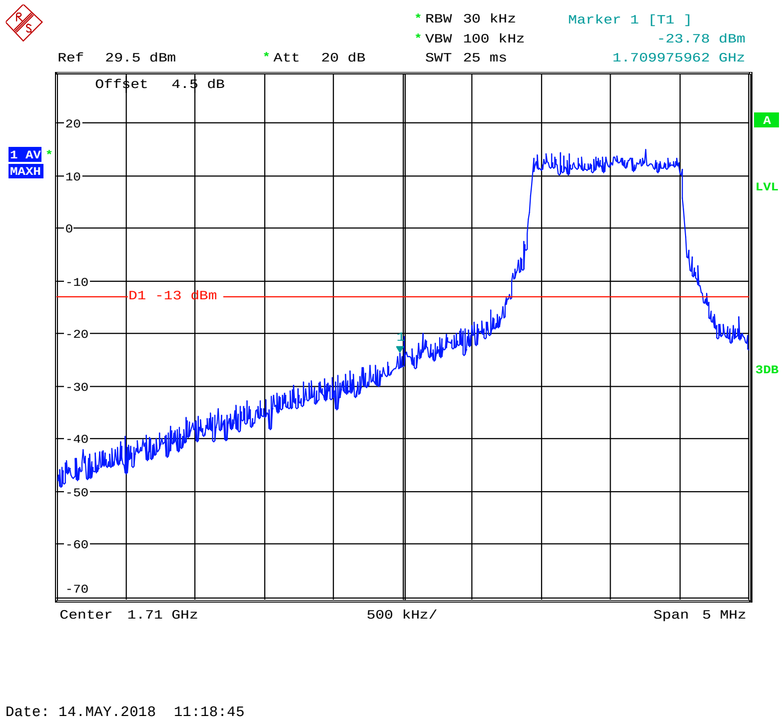
Date: 14.MAY.2018 11:31:13

16-QAM (15.0 MHz, RB0) - Right Band Edge

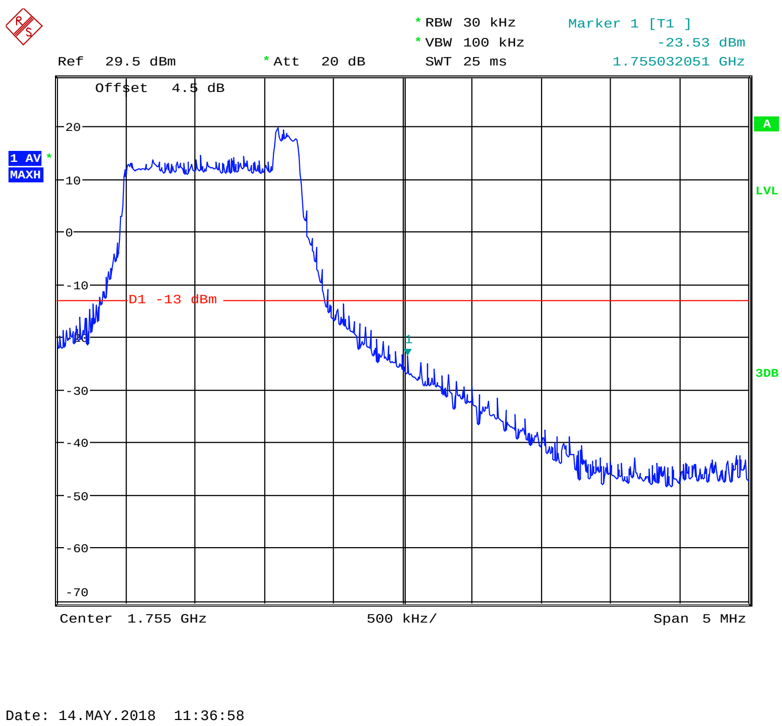


Date: 14.MAY.2018 11:40:38

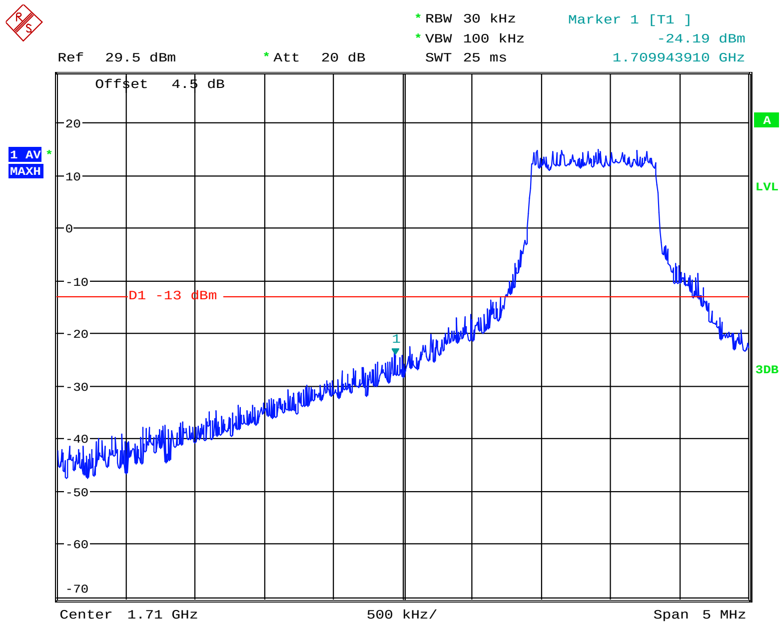
QPSK (15.0 MHz, RB6) - Left Band Edge



QPSK (15.0 MHz, RB6) - Right Band Edge

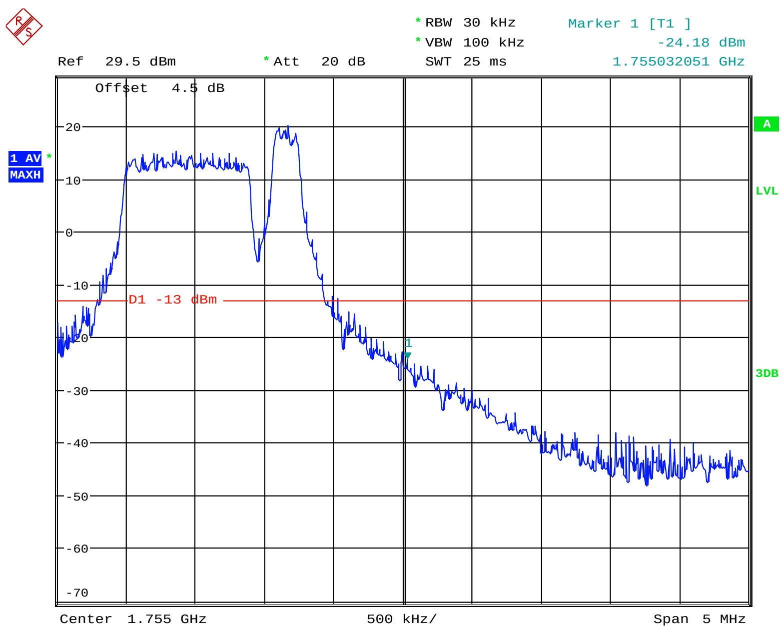


16-QAM (15.0 MHz, RB5) - Left Band Edge



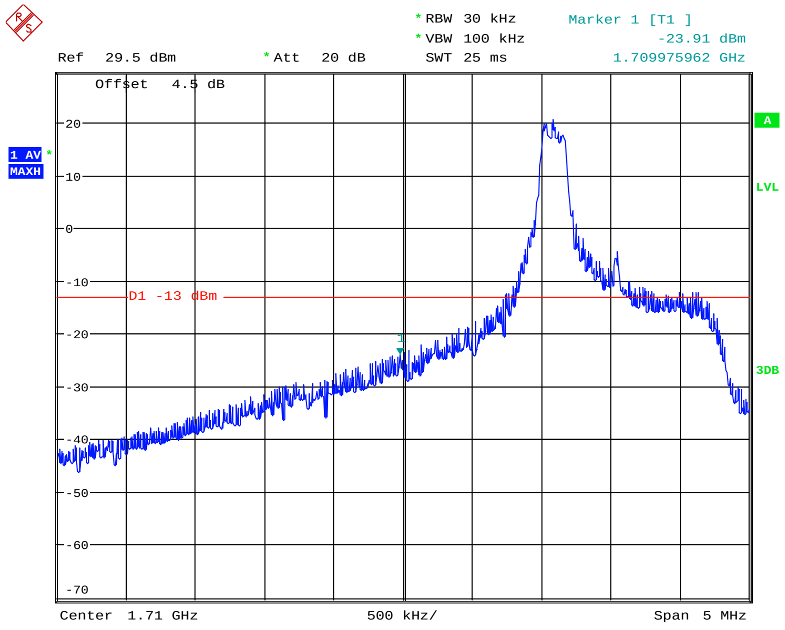
Date: 14.MAY.2018 11:26:44

16-QAM (15.0 MHz, RB5) - Right Band Edge



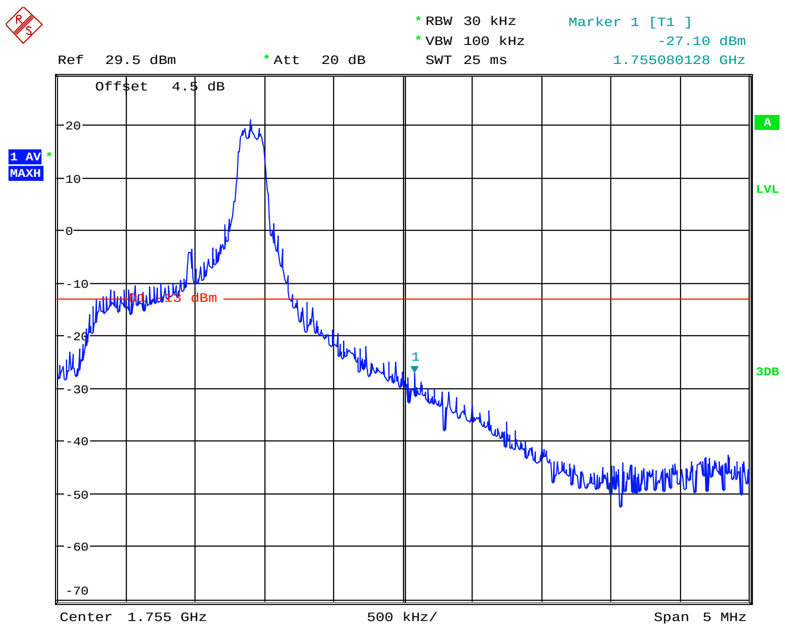
Date: 14.MAY.2018 11:42:34

QPSK (20.0 MHz, RB0) - Left Band Edge



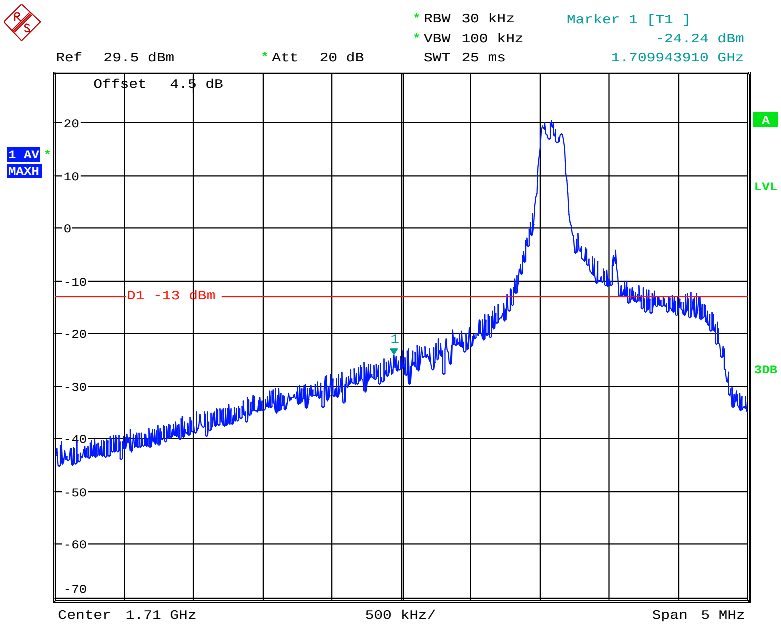
Date: 14.MAY.2018 13:12:41

QPSK (20.0 MHz, RB0) - Right Band Edge



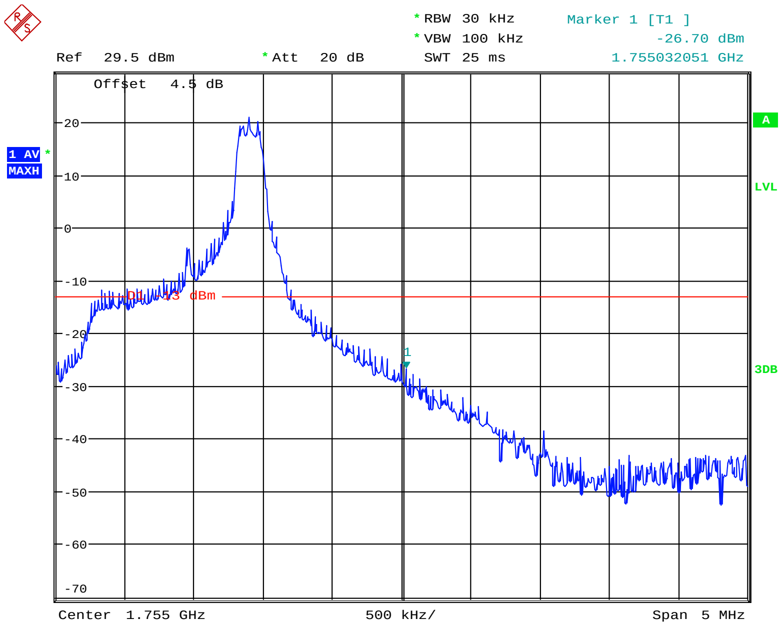
Date: 14.MAY.2018 11:49:25

16-QAM (20.0 MHz, RB0) - Left Band Edge



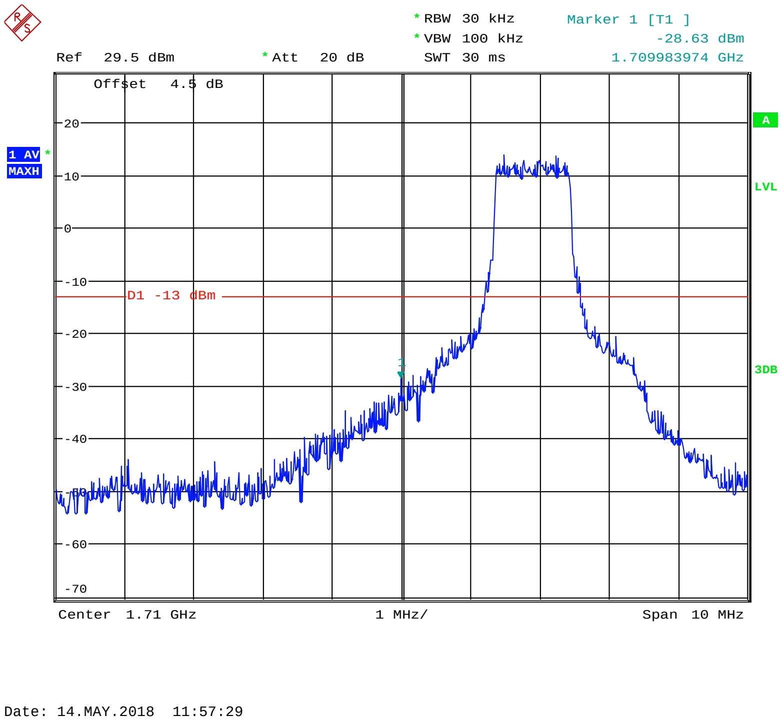
Date: 14.MAY.2018 12:00:48

16-QAM (20.0 MHz, RB0) - Right Band Edge

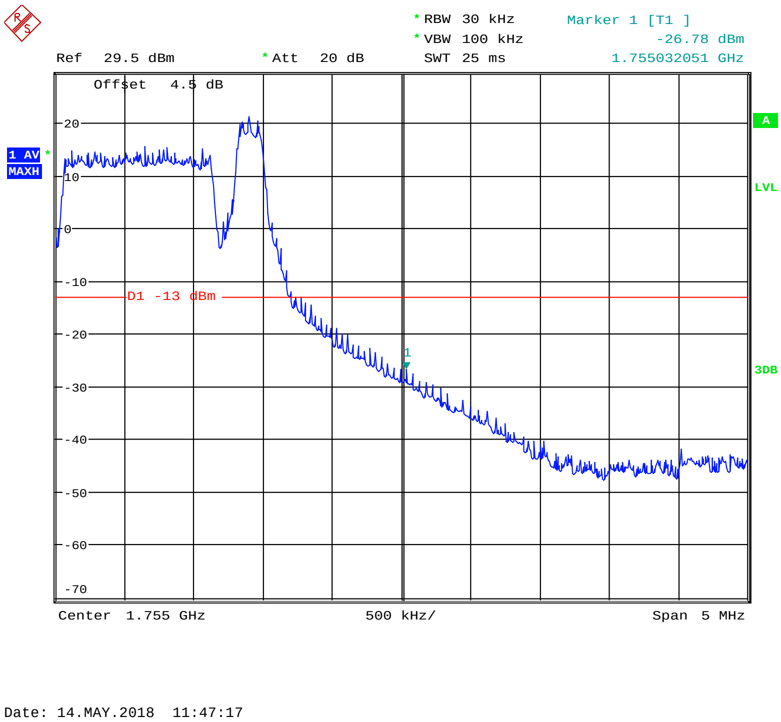


Date: 14.MAY.2018 11:51:23

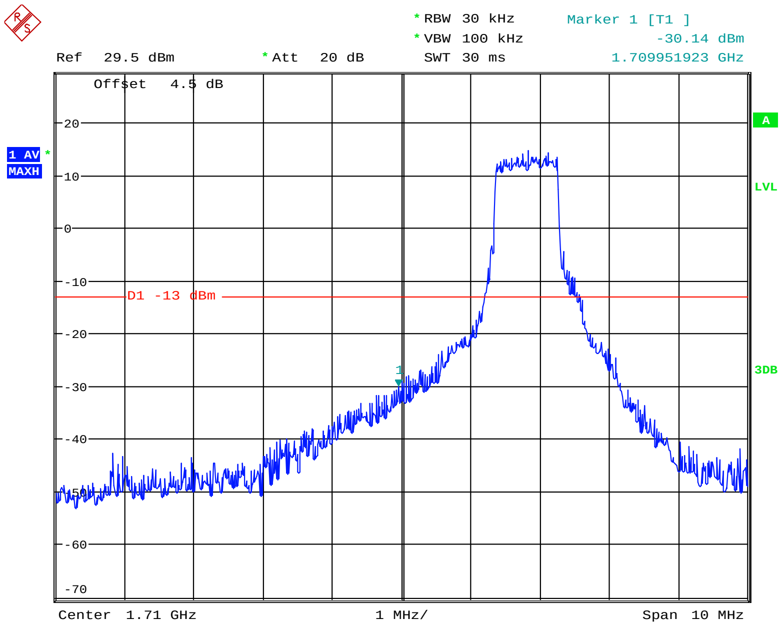
QPSK (20.0 MHz, RB6) - Left Band Edge



QPSK (20.0 MHz, RB6) - Right Band Edge

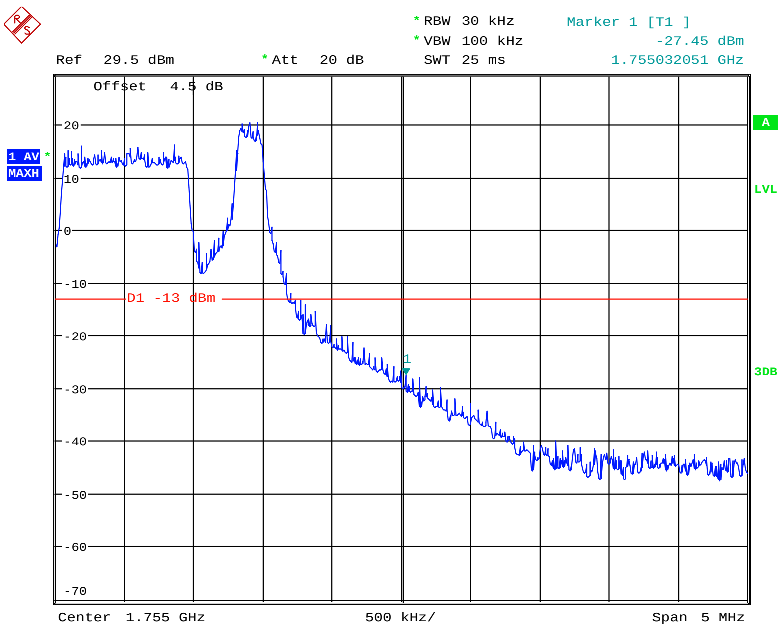


16-QAM (20.0 MHz, RB5) - Left Band Edge



Date: 14.MAY.2018 12:03:43

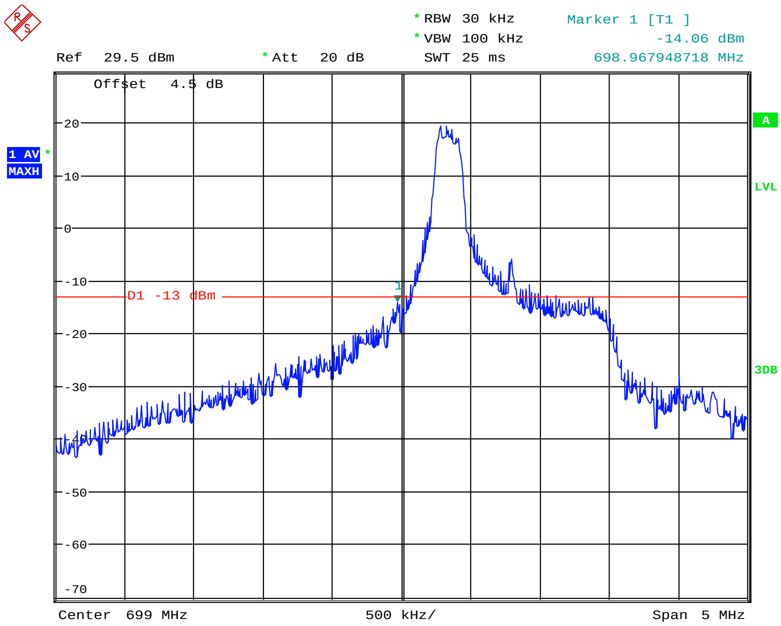
16-QAM (20.0 MHz, RB5) - Right Band Edge



Date: 14.MAY.2018 11:53:39

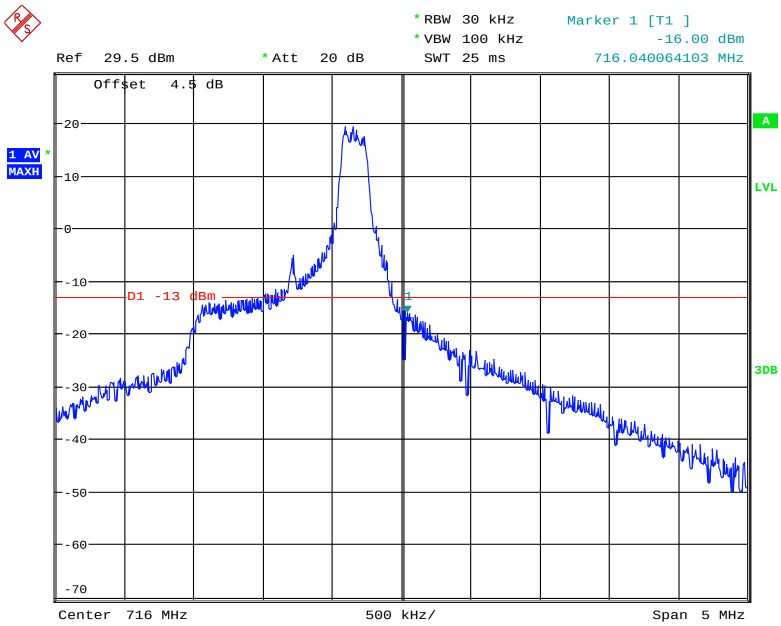
Band 12:

QPSK (5.0 MHz, RB0) - Left Band Edge



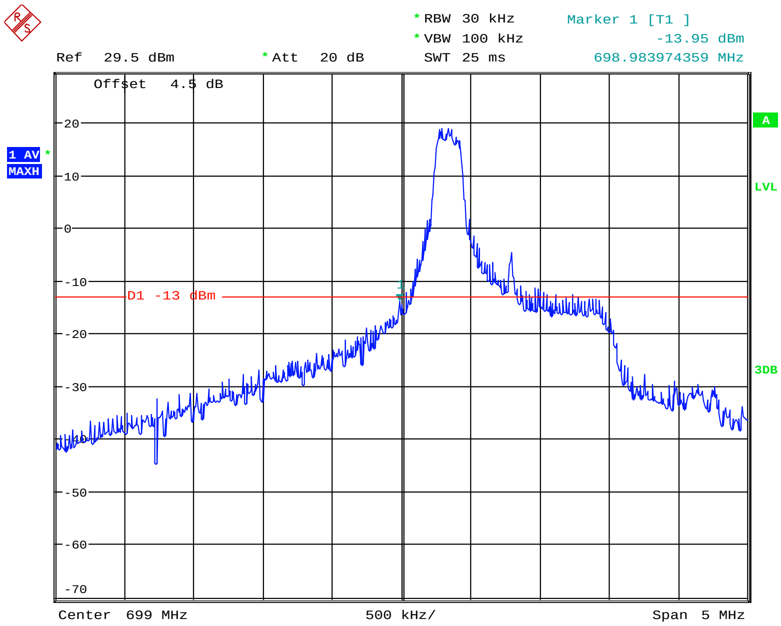
Date: 14.MAY.2018 09:49:11

QPSK (5.0 MHz, RB0) - Right Band Edge



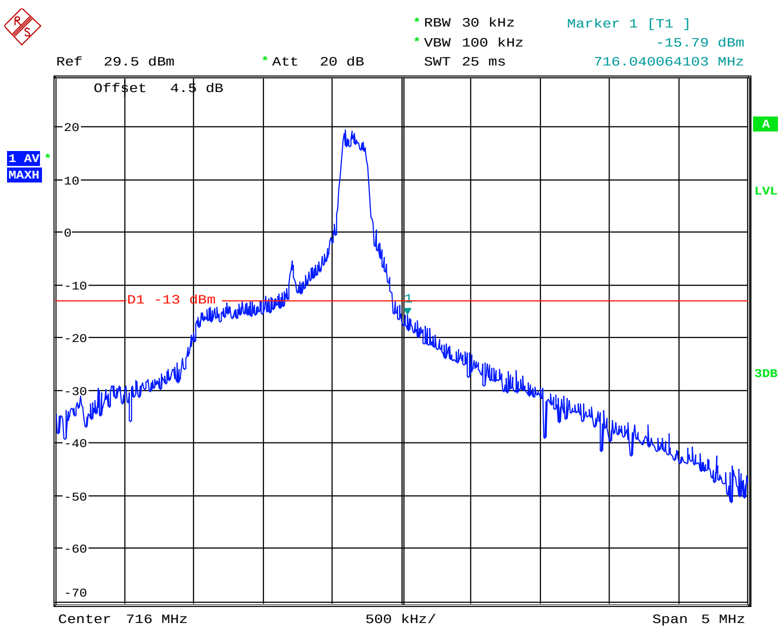
Date: 14.MAY.2018 10:03:05

16-QAM (5.0 MHz, RB0) - Left Band Edge



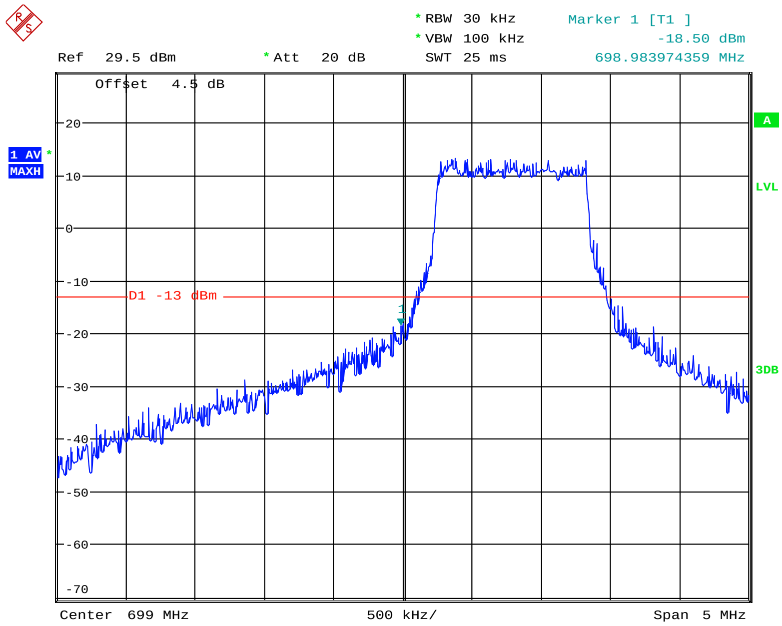
Date: 14.MAY.2018 09:51:19

16-QAM (5.0 MHz, RB0) - Right Band Edge



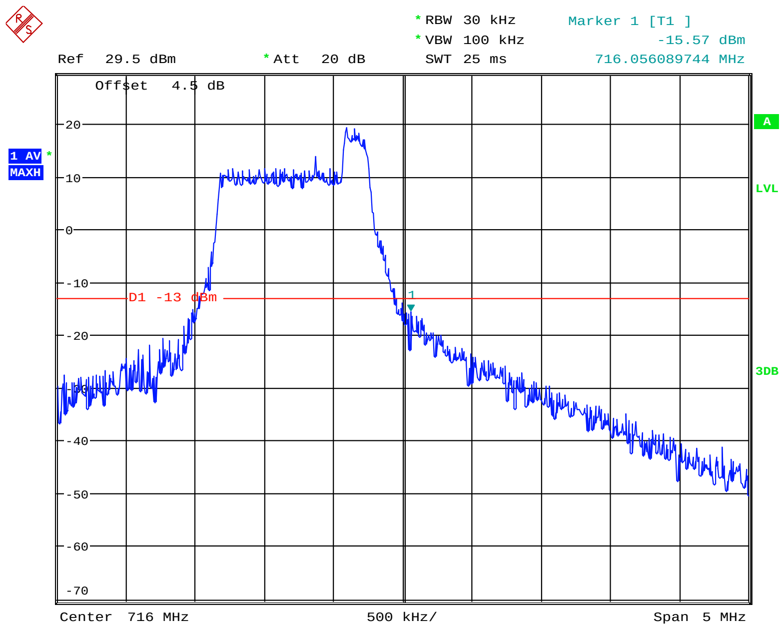
Date: 14.MAY.2018 10:05:02

QPSK (5.0 MHz, RB6) - Left Band Edge



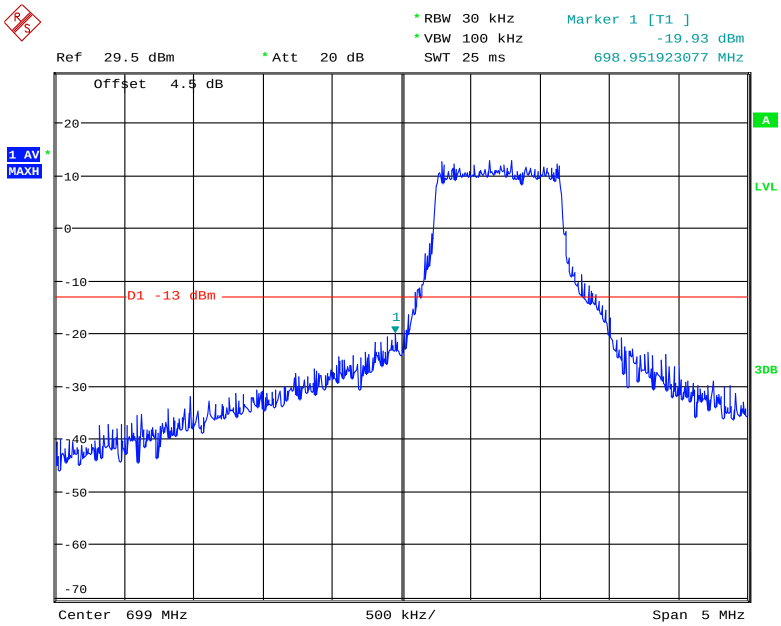
Date: 14.MAY.2018 09:46:57

QPSK (5.0 MHz, RB6) - Right Band Edge



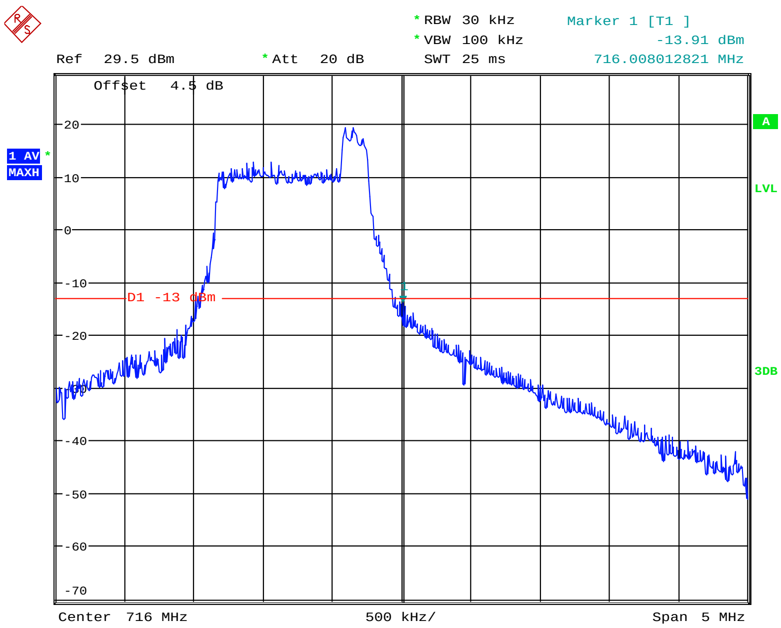
Date: 14.MAY.2018 10:00:10

16-QAM (5.0 MHz, RB5) - Left Band Edge



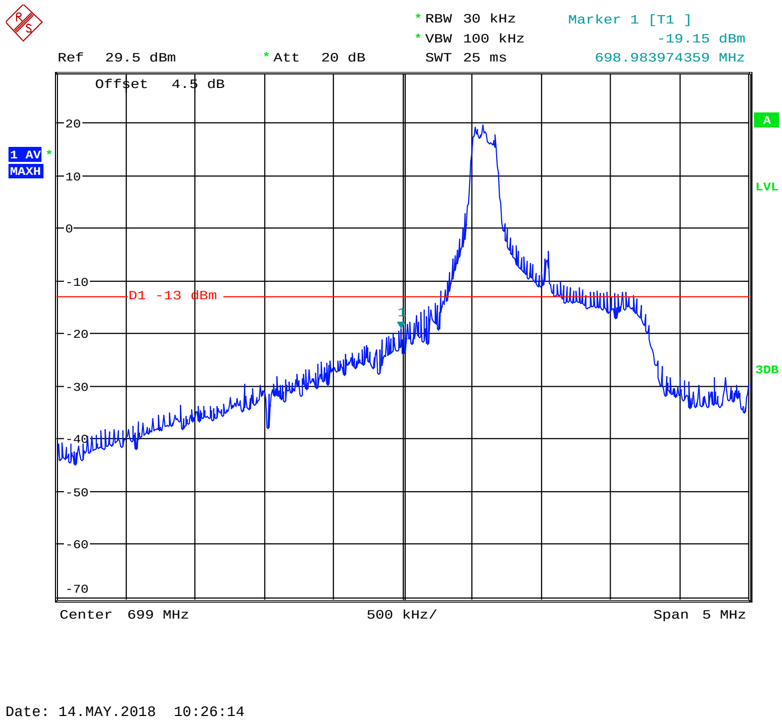
Date: 14.MAY.2018 09:53:30

16-QAM (5.0 MHz, RB5) - Right Band Edge

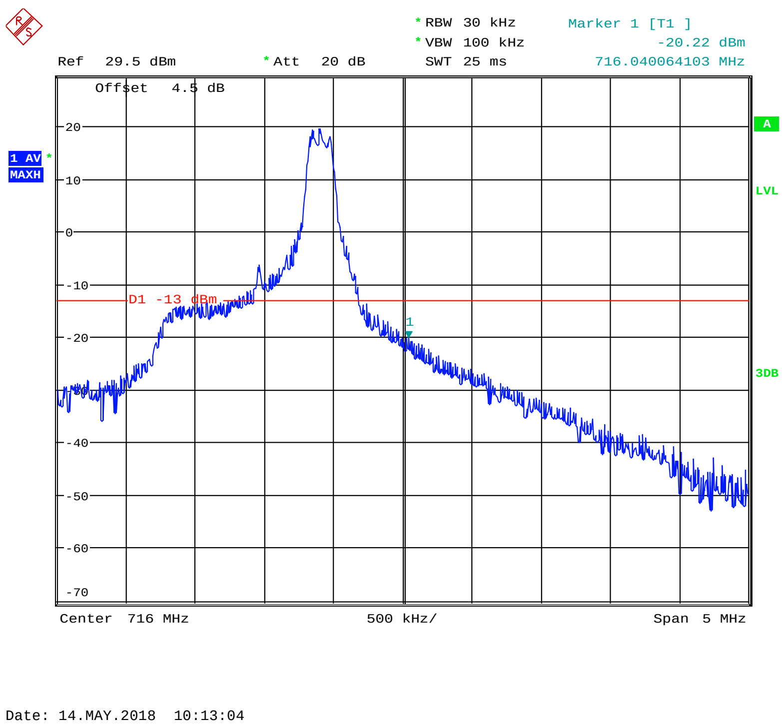


Date: 14.MAY.2018 10:07:49

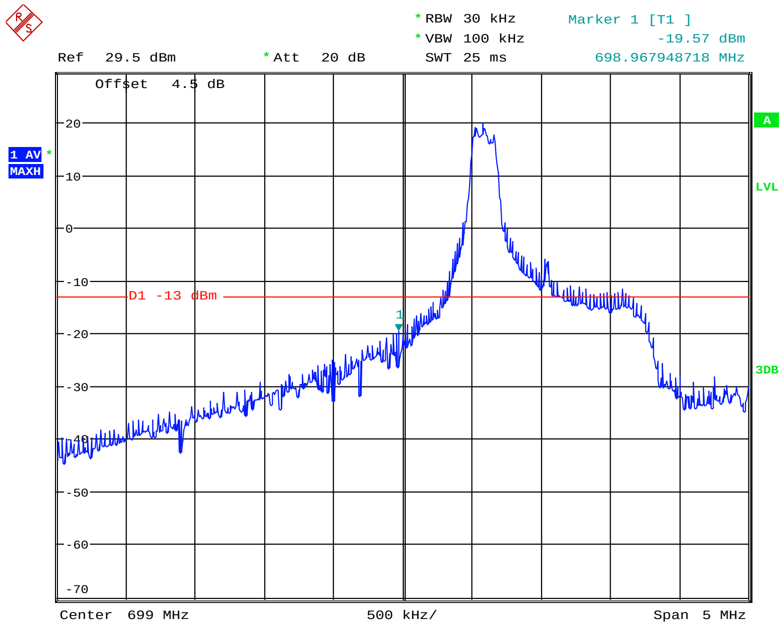
QPSK (10.0 MHz, RB0) - Left Band Edge



QPSK (10.0 MHz, RB0) - Right Band Edge

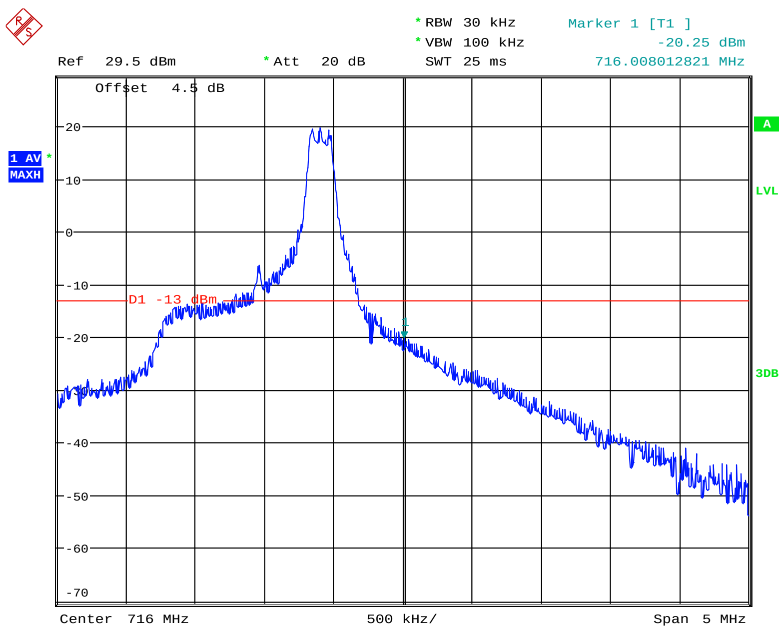


16-QAM (10.0 MHz, RB0) - Left Band Edge



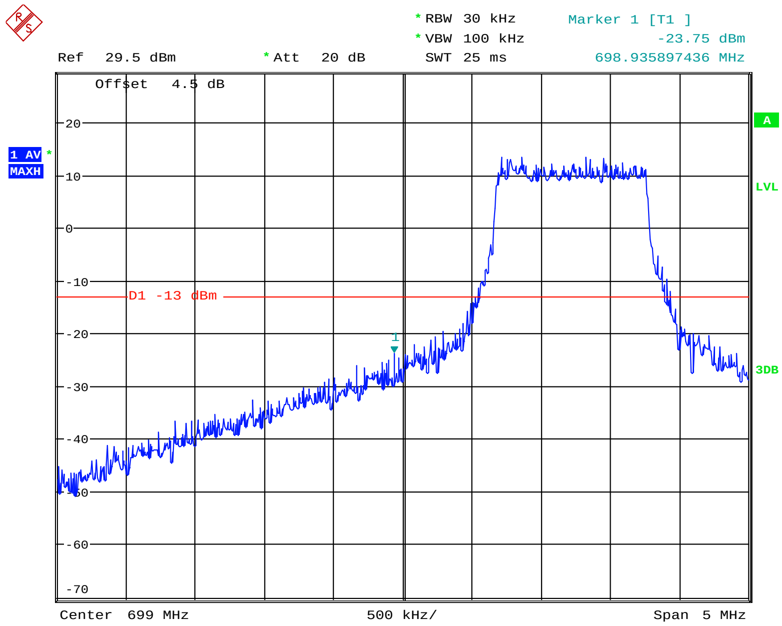
Date: 14.MAY.2018 10:28:14

16-QAM (10.0 MHz, RB0) - Right Band Edge



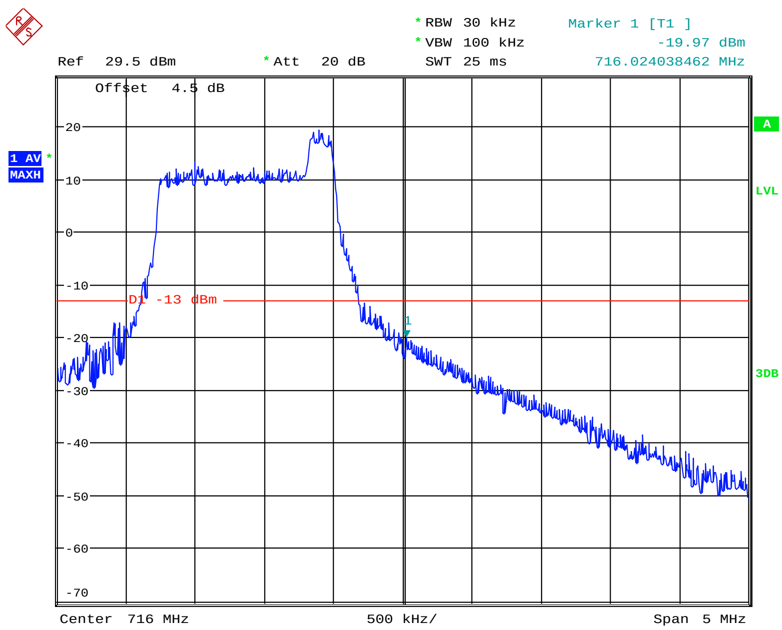
Date: 14.MAY.2018 10:15:06

QPSK (10.0 MHz, RB6) - Left Band Edge



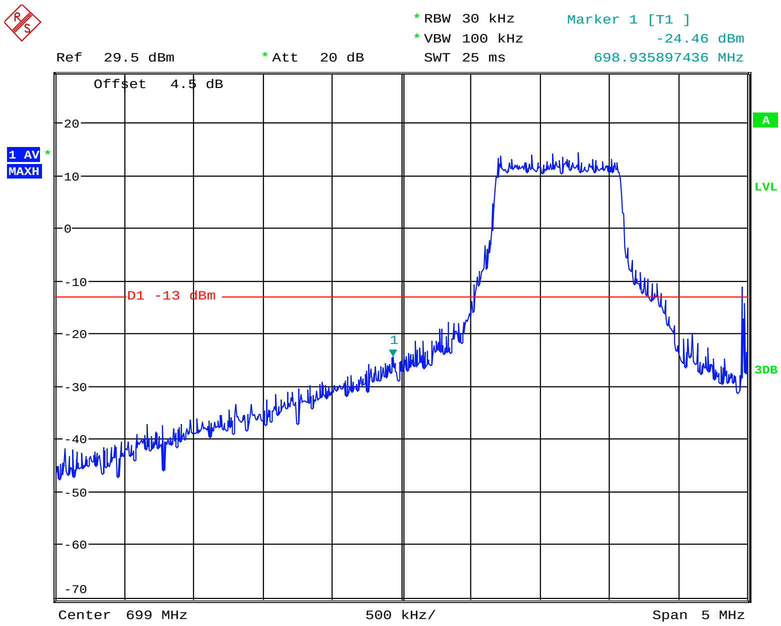
Date: 14.MAY.2018 10:23:31

QPSK (10.0 MHz, RB6) - Right Band Edge



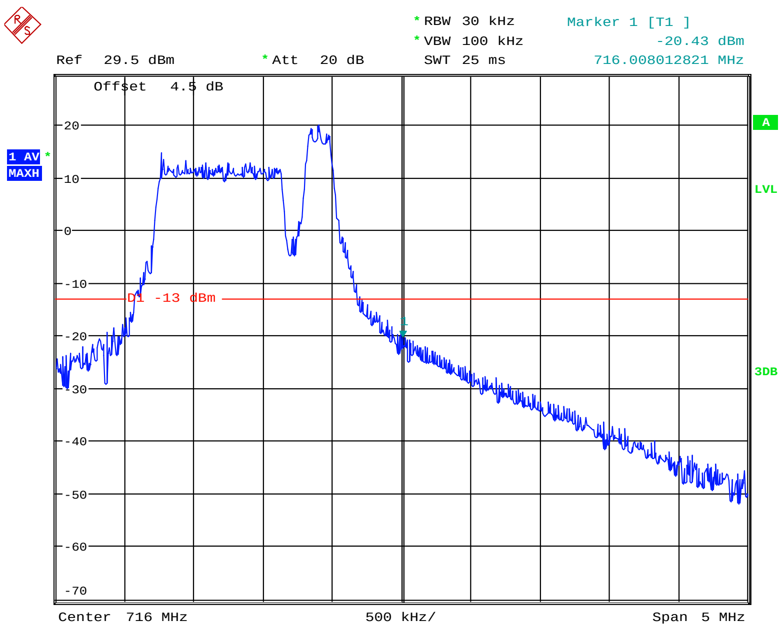
Date: 14.MAY.2018 10:11:06

16-QAM (10.0 MHz, RB5) - Left Band Edge



Date: 14.MAY.2018 10:31:21

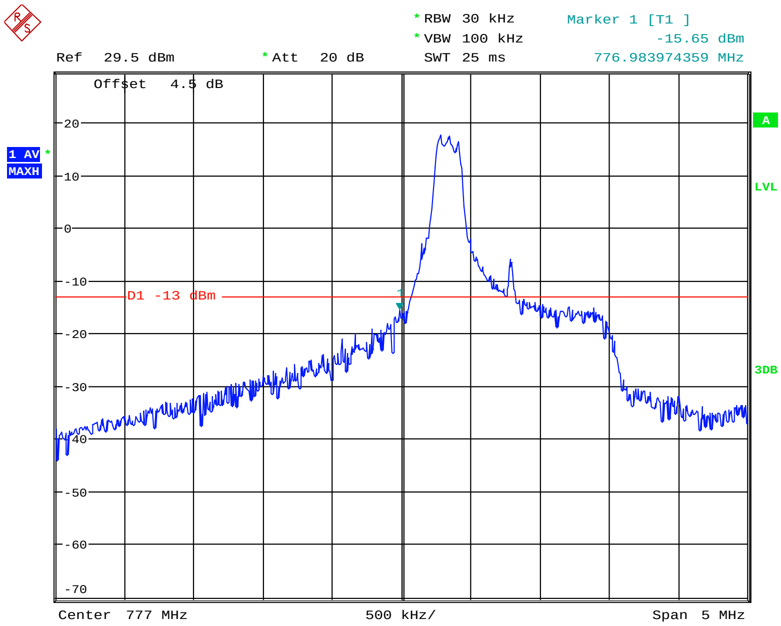
16-QAM (10.0 MHz, RB5) - Right Band Edge



Date: 14.MAY.2018 10:16:46

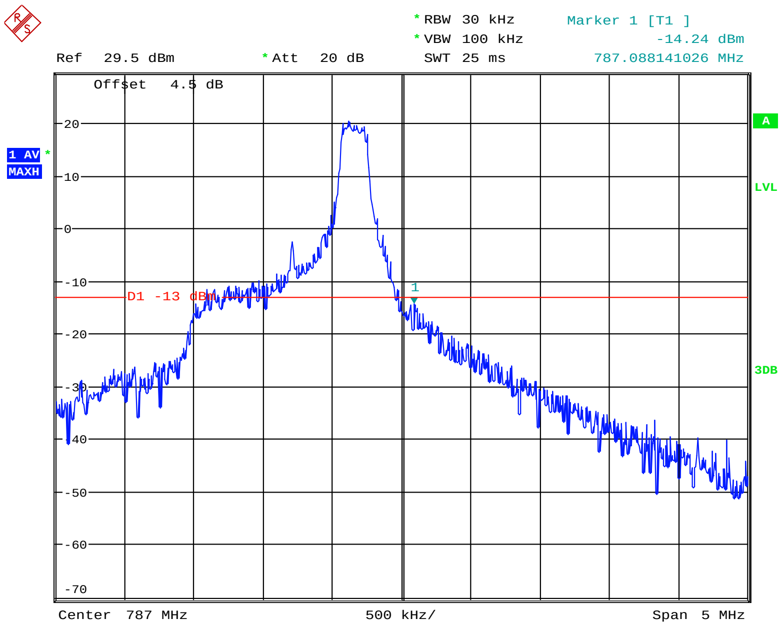
Band 13:

QPSK (5.0 MHz, RB0) - Left Band Edge



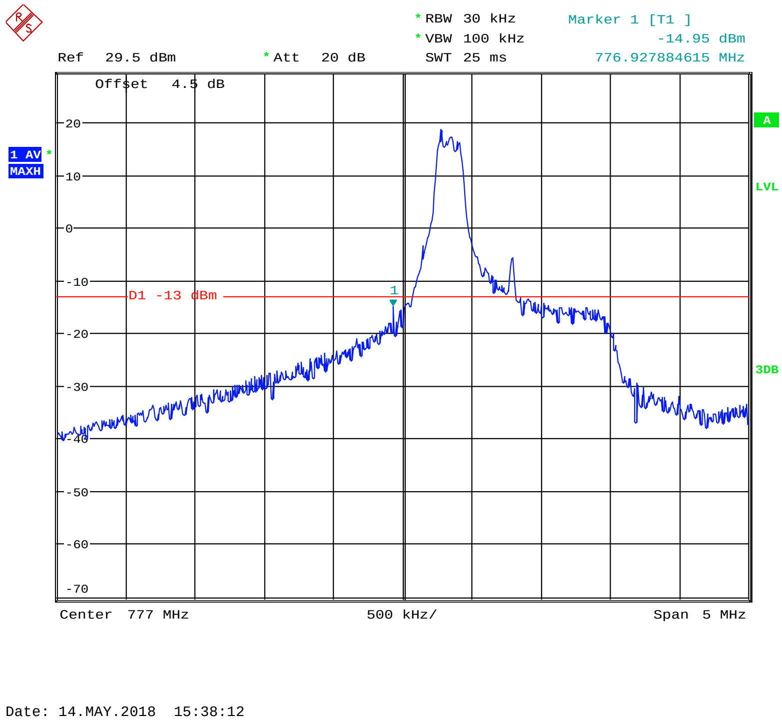
Date: 14.MAY.2018 15:35:47

QPSK (5.0 MHz, RB0) - Right Band Edge

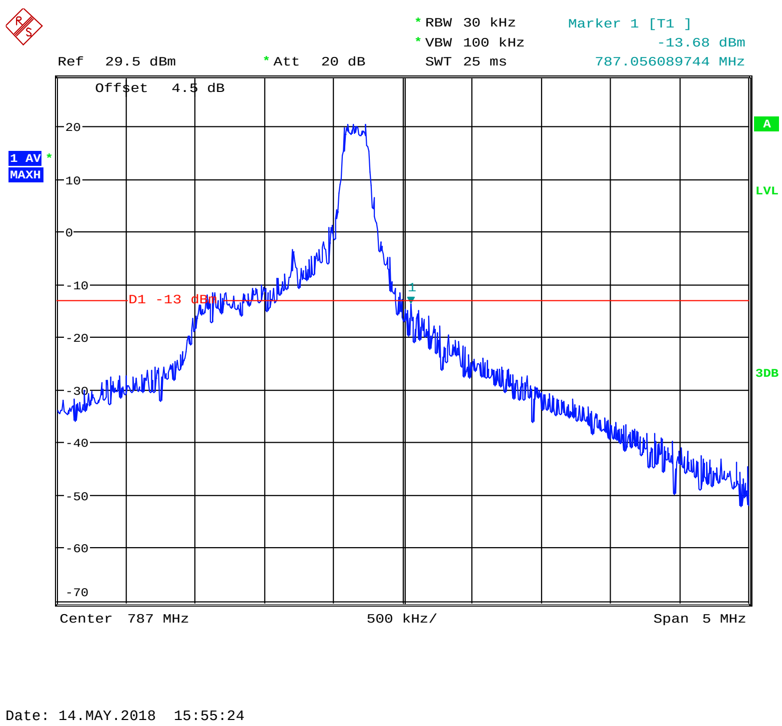


Date: 14.MAY.2018 15:52:20

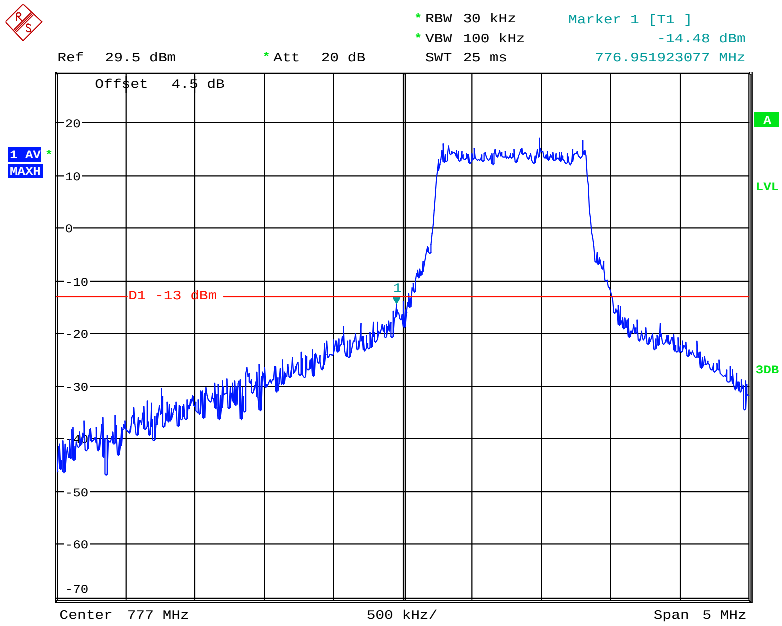
16-QAM (5.0 MHz, RB0) - Left Band Edge



16-QAM (5.0 MHz, RB0) - Right Band Edge

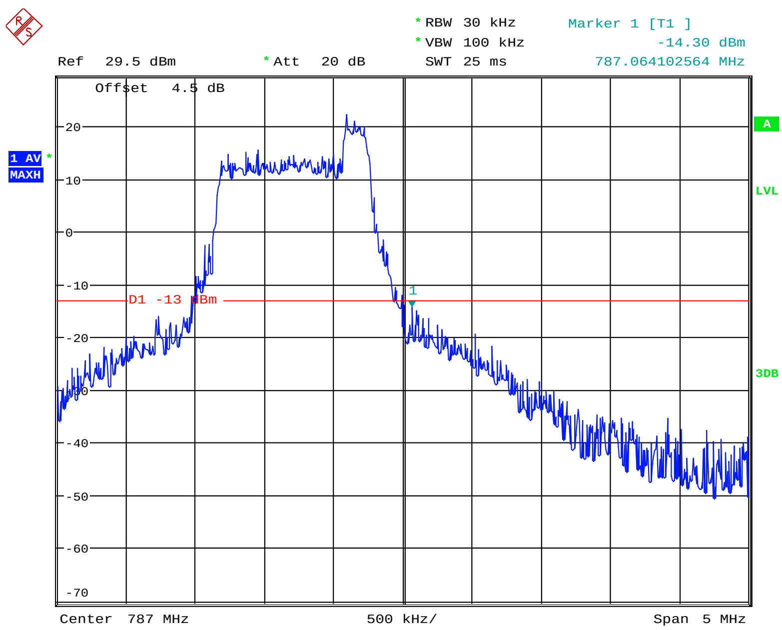


QPSK (5.0 MHz, RB6) - Left Band Edge



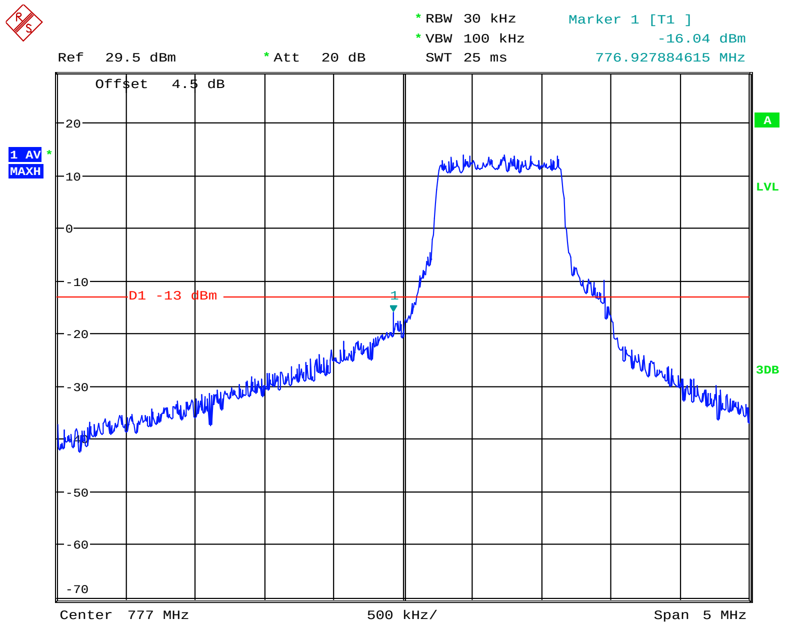
Date: 14.MAY.2018 15:32:48

QPSK (5.0 MHz, RB6) - Right Band Edge



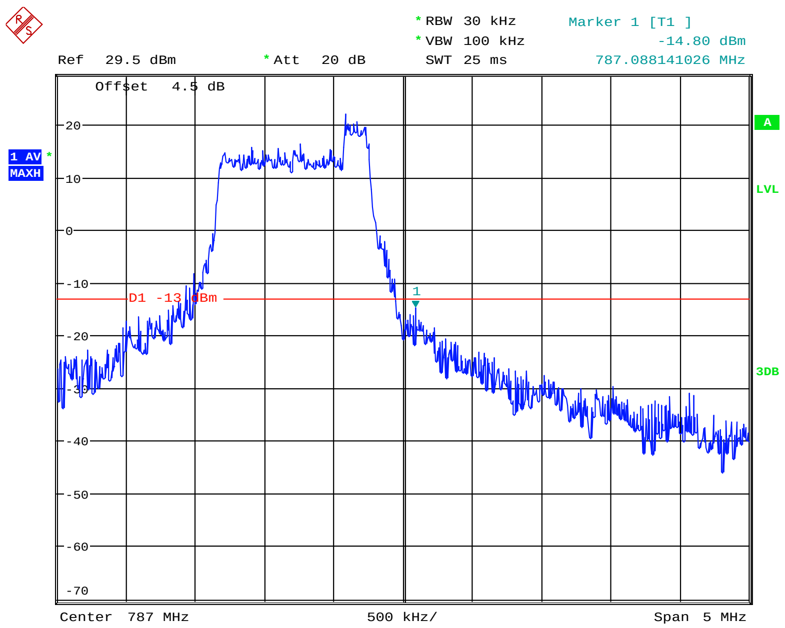
Date: 14.MAY.2018 15:50:41

16-QAM (5.0 MHz, RB5) - Left Band Edge



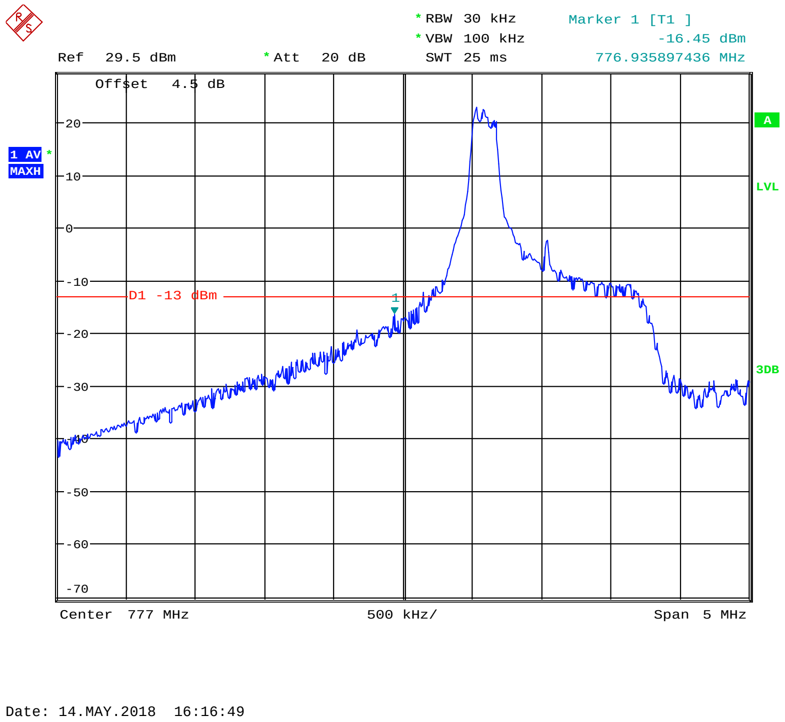
Date: 14.MAY.2018 15:40:15

16-QAM (5.0 MHz, RB5) - Right Band Edge

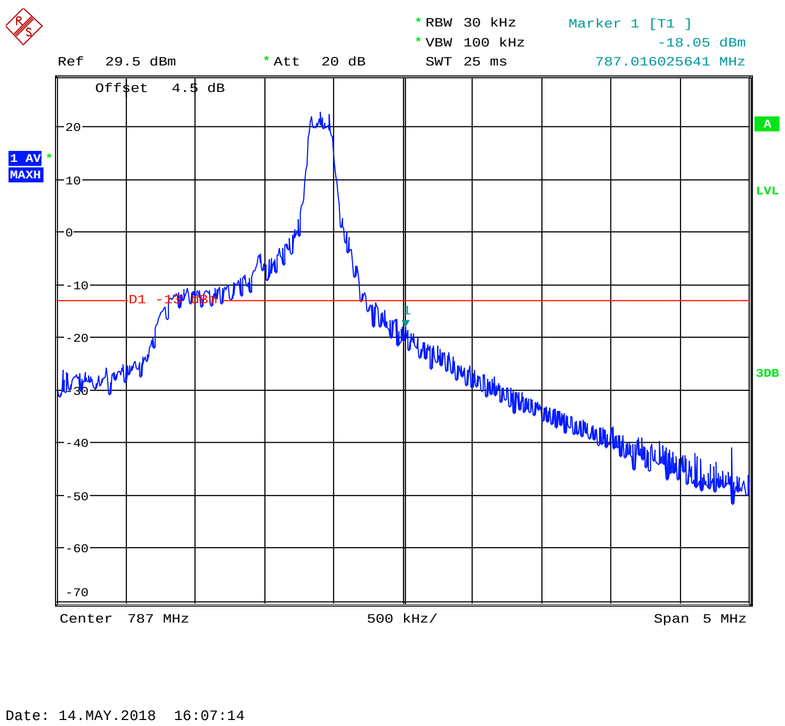


Date: 14.MAY.2018 15:56:30

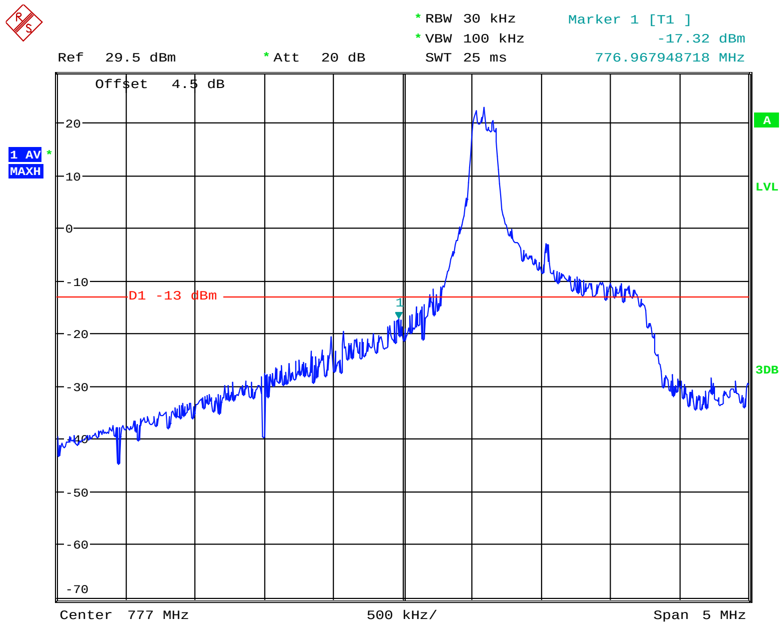
QPSK (10.0 MHz, RB0) - Left Band Edge



QPSK (10.0 MHz, RB0) - Right Band Edge

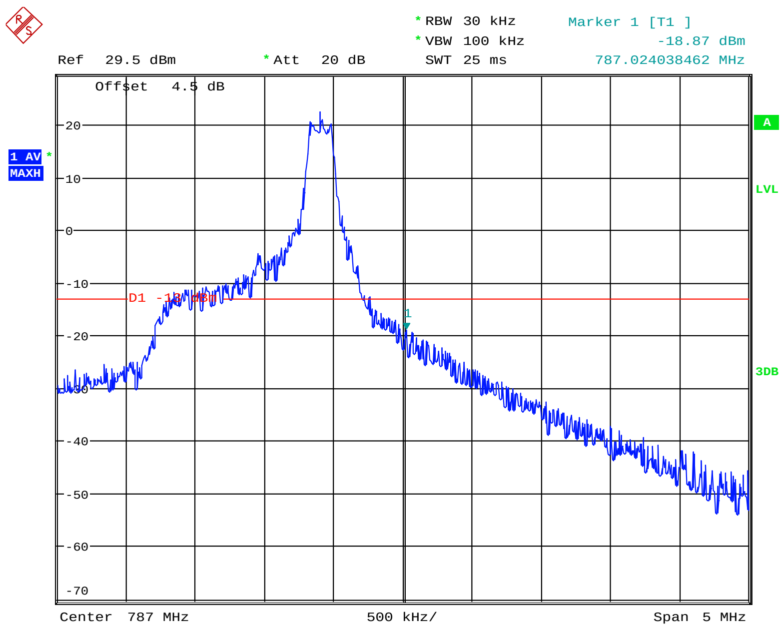


16-QAM (10.0 MHz, RB0) - Left Band Edge



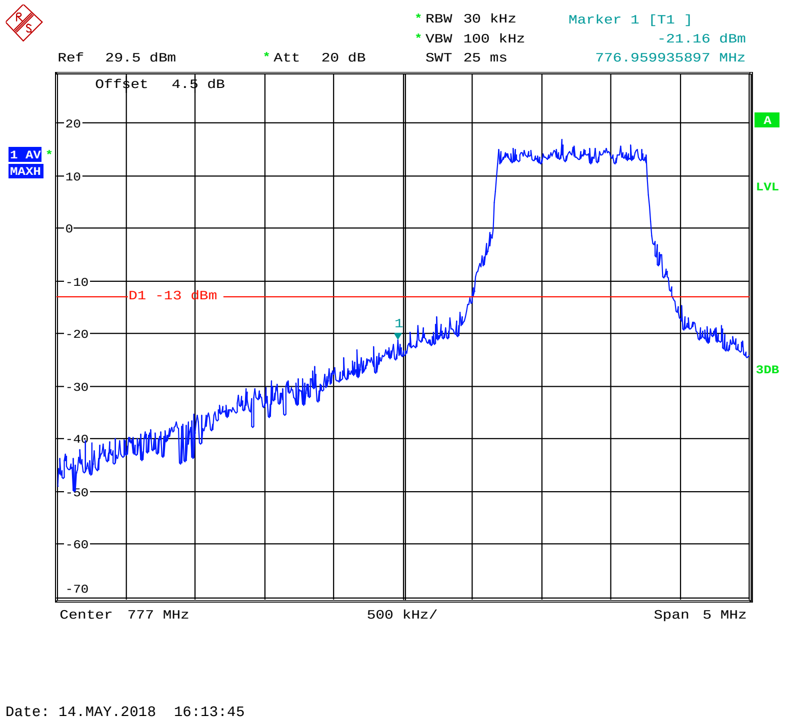
Date: 14.MAY.2018 16:19:06

16-QAM (10.0 MHz, RB0) - Right Band Edge

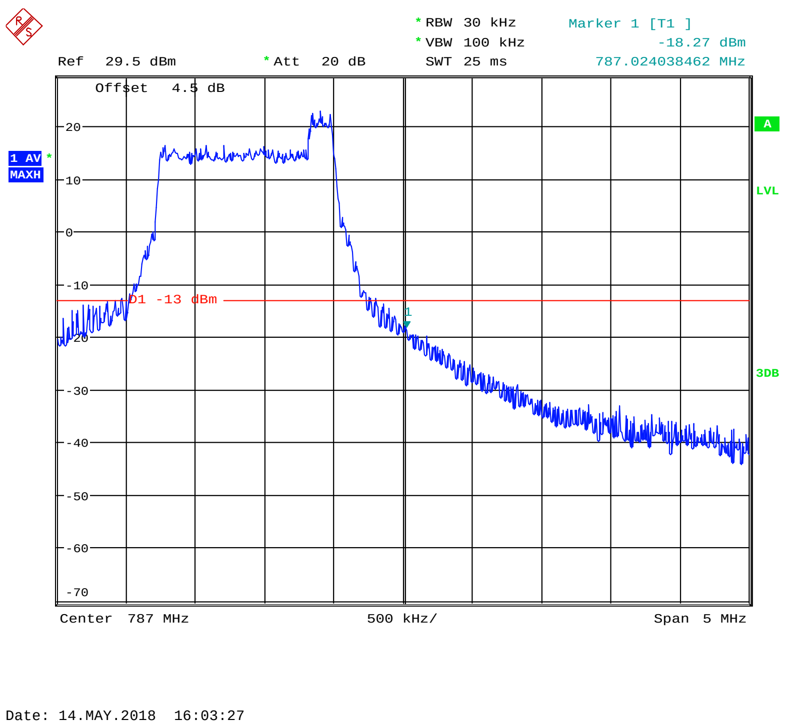


Date: 14.MAY.2018 16:09:05

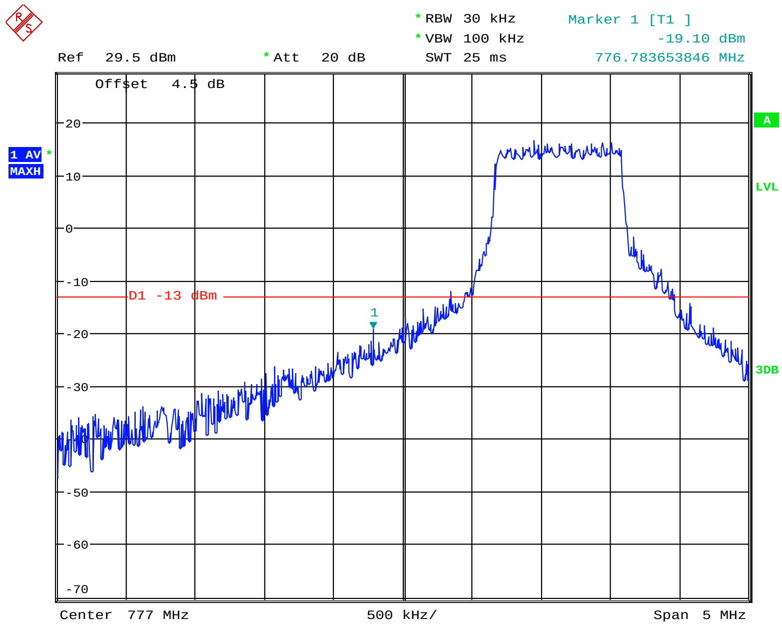
QPSK (10.0 MHz, RB6) - Left Band Edge



QPSK (10.0 MHz, RB6) - Right Band Edge

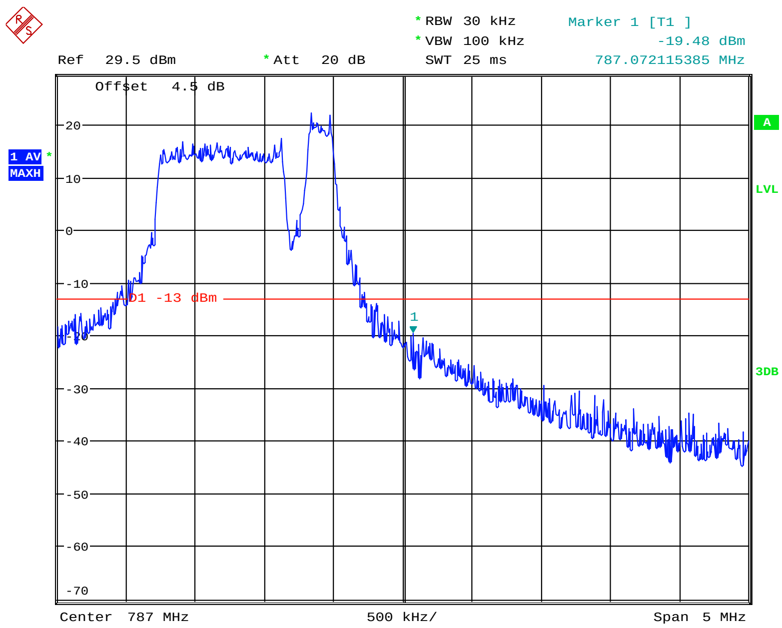


16-QAM (10.0 MHz, RB5) - Left Band Edge



Date: 14.MAY.2018 16:23:38

16-QAM (10.0 MHz, RB5) - Right Band Edge



Date: 14.MAY.2018 16:10:49

FCC § 2.1055; §27.54 - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055 and & §27.54.

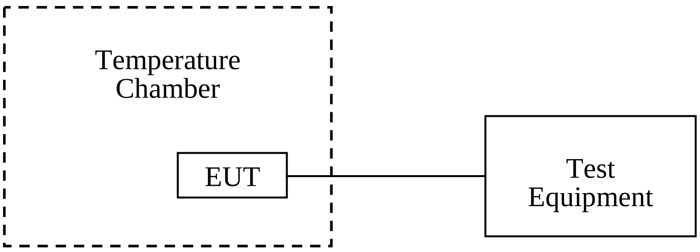
According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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 Jacob Kong on 2018-05-09.

EUT operation mode: Transmitting

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

Note：EUT power by Test Board, which USB port connect with PC.

QPSK:

Band 4:

10.0 MHz Middle Channel, f_o =1732.5 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.3V From Test Board	16	0.009	pass
-20		17	0.010	pass
-10		25	0.014	pass
0		23	0.013	pass
10		35	0.020	pass
20		39	0.023	pass
30		42	0.024	pass
40		19	0.011	pass
50		22	0.013	pass

Band 12:

10.0 MHz Middle Channel, f_o =707.5 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.3V From Test Board	-15	-0.021	pass
-20		-10	-0.014	pass
-10		-19	-0.027	pass
0		-25	-0.035	pass
10		-34	-0.048	pass
20		-26	-0.037	pass
30		-18	-0.025	pass
40		-34	-0.048	pass
50		-42	-0.059	pass

Band 13:

10.0 MHz Middle Channel, f_o =782 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.3V From Test Board	-35	-0.045	pass
-20		-26	-0.033	pass
-10		-42	-0.054	pass
0		-46	-0.059	pass
10		-51	-0.065	pass
20		-26	-0.033	pass
30		-33	-0.042	pass
40		-24	-0.031	pass
50		-25	-0.032	pass

16QAM:

Band 4:

10.0 MHz Middle Channel, f_o =707.5 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.3V From Test Board	35	0.020	pass
-20		16	0.009	pass
-10		15	0.009	pass
0		32	0.018	pass
10		26	0.015	pass
20		20	0.012	pass
30		27	0.016	pass
40		16	0.009	pass
50		33	0.019	pass

Band 12:

10.0 MHz Middle Channel, f_o =707.5 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.3V From Test Board	-35	-0.049	pass
-20		-42	-0.059	pass
-10		-26	-0.037	pass
0		-25	-0.035	pass
10		-36	-0.051	pass
20		-34	-0.048	pass
30		-19	-0.027	pass
40		-42	-0.059	pass
50		-33	-0.047	pass

Band 13:

10.0 MHz Middle Channel, f_o =782 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.3V From Test Board	15	0.019	pass
-20		13	0.017	pass
-10		8	0.010	pass
0		16	0.020	pass
10		14	0.018	pass
20		19	0.024	pass
30		25	0.032	pass
40		13	0.017	pass
50		28	0.036	pass

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