

FCC PART 22H, PART 24E

TEST REPORT

For

MOVILTELCO TRADE, S.L

C/ ABTAO, 25-1 A MADRID (28007) Spain

FCC ID: 2ACQKTELCO016

Report Type: Original Report	Product Type: Mobile phone
Report Number:	RSZ180209006-00D
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *MOVILTELCO TRADE, S.L's* product, model number: *L452 (FCC ID: 2ACQKTELCO016)* or the "EUT" in this report was a *Mobile phone*, which was measured approximately: 13.70 cm (L) * 6.65 cm (W) * 0.96 cm (H), rated with input voltage: DC 3.7 V from battery or DC 5.0V from adapter.

Adapter Information:

Model: L452

Input: AC 100-240V, 50/60Hz, 0.15A

Output: DC 5V, 1000 mA

Notes: This series products model: L452D, L452E, L452F and L452 are electrically identical, only named differently. Model L452 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

**All measurement and test data in this report was gathered from production sample serial number: 1800196 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-02-09.*

Objective

This test report is prepared on behalf of *MOVILTELCO TRADE, S.L* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E 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 & DSS and Part 15B JBP submissions with FCC ID: 2ACQKTELCO016.

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

Applicable Standards: TIA/EIA 603-D and KDB 971168 D01 v03.

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 °C
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. : 382179, the FCC Designation No. : CN5001.

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.

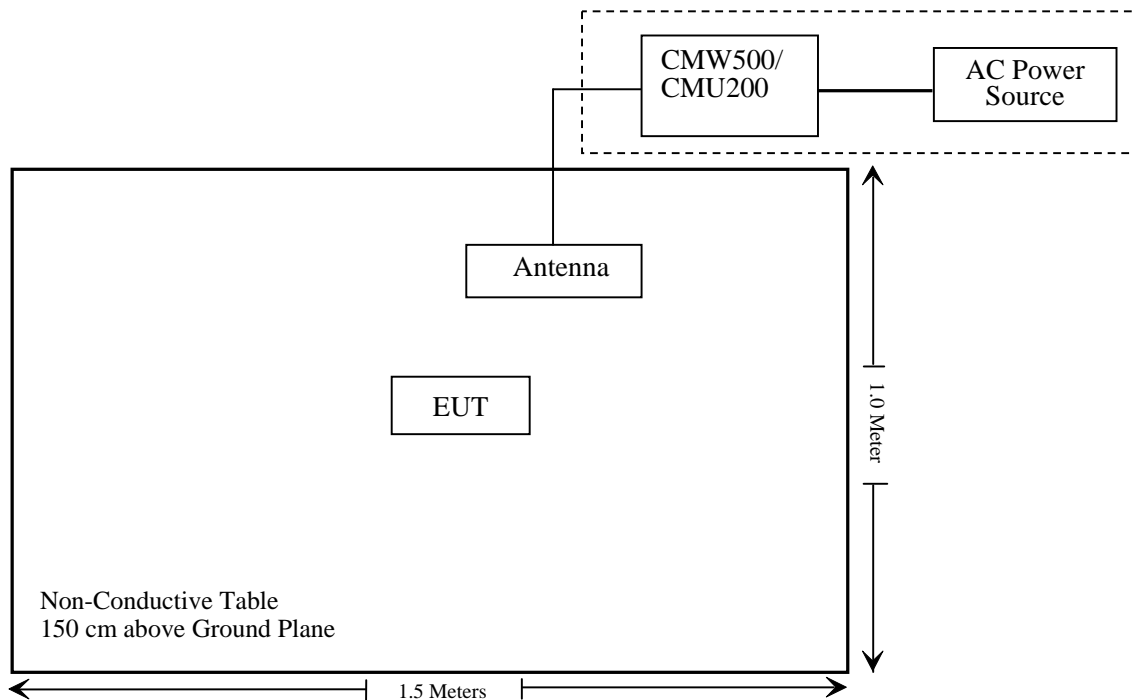
Equipment Modifications

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

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307, §2.1093	RF Exposure (SAR)	Compliance*
§2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a)	Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235	Frequency stability	Compliance

Note: * Please refer to SAR report released by BACL, report number: RSZ180209006-20.

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	2017-04-24	2018-04-24
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2017-12-17	2020-12-16
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	2017-12-24	2018-12-24
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
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
Rohde & Schwarz	Wideband Radio Communication Tester	CMU200	106891	2017-05-09	2018-05-09
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2017-12-14	2018-12-14
Ducommun technologies	RF Cable	RG-214	3	2017-08-19	2018-08-19
WEINSCHTEL	10dB Attenuator	5324	AU 3842	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 §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ180209006-20.

FCC §2.1047 - MODULATION CHARACTERISTIC

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

FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER

Applicable Standard

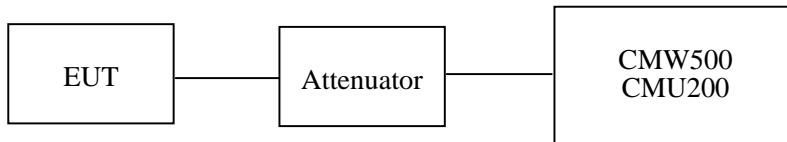
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

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.

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:	22 °C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Jacob Kong on 2018-02-24.

Conducted Power

Cellular Band (Part 22H)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	31.29	38.45
	190	836.6	31.31	38.45
	251	848.8	31.25	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	31.37	28.89	27.09	24.98	38.45
	190	836.6	31.35	28.90	27.14	25.06	38.45
	251	848.8	31.28	28.85	27.08	25.09	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.2	25.90	24.93	23.01	21.42	38.45
	190	836.6	25.82	24.97	23.00	21.48	38.45
	251	848.8	25.76	24.63	23.08	21.64	38.45

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band V)	Normal	RMC12.2k		22.22	22.15	22.23
		HSDPA	1	21.57	21.54	21.46
			2	21.51	21.41	21.41
			3	21.61	21.63	21.51
			4	21.54	21.48	21.42
		HSUPA	1	21.16	21.17	21.14
			2	21.08	21.06	21.08
			3	21.23	21.22	21.19
			4	21.04	21.13	21.02
			5	21.28	21.25	21.20

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	512	1850.2	28.18	33
	661	1880.0	28.42	33
	810	1909.8	28.41	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	28.03	25.41	24.37	22.23	33
	661	1880.0	28.31	25.62	24.54	22.34	33
	810	1909.8	28.26	25.50	24.35	22.15	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	512	1850.2	24.54	23.37	22.67	20.31	33
	661	1880.0	24.05	23.46	22.05	19.74	33
	810	1909.8	24.95	23.99	21.87	19.62	33

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band II)	Normal	RMC12.2k		21.72	21.53	21.49
		HSDPA	1	20.82	20.90	20.74
			2	20.73	20.85	20.65
			3	20.92	21.03	20.84
			4	20.75	20.85	20.66
		HSUPA	1	20.47	20.54	20.31
			2	20.39	20.49	20.35
			3	20.60	20.59	20.37
			4	20.41	20.42	20.39
			5	20.57	20.66	20.41

Peak-to-average ratio (PAR)

Cellular Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.21	13
	Middle	0.13	13
	High	0.22	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	0.36	13
	Middle	0.34	13
	High	0.28	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	2.84	13
	Middle	2.63	13
	High	2.85	13
HSDPA (16QAM)	Low	2.87	13
	Middle	2.66	13
	High	2.82	13
HSUPA (BPSK)	Low	2.88	13
	Middle	2.64	13
	High	2.81	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.23	13
	Middle	0.08	13
	High	0.14	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	0.32	13
	Middle	0.26	13
	High	0.44	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	3.85	13
	Middle	3.64	13
	High	3.87	13
HSDPA (16QAM)	Low	3.84	13
	Middle	3.66	13
	High	3.85	13
HSUPA (BPSK)	Low	3.89	13
	Middle	3.63	13
	High	3.82	13

Radiated Power

GSM Mode:

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H/24E	
			Height (m)	Polar (H/V)	Level (dBm)	Cable loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
ERP for Cellular Band (Part 22H), Middle Channel										
836.6	84.56	199	2.1	H	22.5	0.7	0.0	21.80	38.45	16.65
836.6	90.87	11	1.2	V	30.4	0.7	0.0	29.70	38.45	8.75
EIRP for PCS Band (Part 24E), Middle Channel										
1880.00	86.39	200	1.1	H	16.3	1.30	9.40	24.40	33	8.6
1880.00	88.73	179	2.0	V	18.5	1.30	9.40	26.60	33	6.4

EDGE 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, Cellular Band (Part 22H), Middle Channel										
836.6	76.67	18	1.1	H	14.6	0.7	0.0	13.90	38.45	24.55
836.6	84.13	6	1.2	V	23.7	0.7	0.0	23.00	38.45	15.45
EIRP, PCS Band (Part 24E), Middle Channel										
1880.00	81.56	166	1.4	H	11.5	1.30	8.50	18.70	33	14.3
1880.00	84.39	44	1.2	V	14.1	1.30	8.50	21.30	33	11.7

WCDMA Mode:

Frequency (MHz)	Receiver Reading (dBµV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H/24E	
			Height (m)	Polar (H/V)	Level (dBm)	Cable loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
ERP for WCDMA Band V (Part 22H), Middle Channel										
836.6	71.95	341	1.3	H	9.9	0.7	0.0	9.20	38.45	29.25
836.6	82.14	134	1.1	V	21.7	0.7	0.0	21.00	38.45	17.45
EIRP for WCDMA Band II (Part 24E), Middle Channel										
1880.00	81.18	178	2.1	H	11.1	1.30	9.40	19.20	33	13.8
1880.00	82.38	345	1.7	V	12.1	1.30	9.40	20.20	33	12.8

Note:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

LTE Band 2:

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	22.05	22.27	22.01
		RB Size=1, RB Offset=2	21.94	22.20	21.91
		RB Size=1, RB Offset=5	22.15	22.34	22.13
		RB Size=3, RB Offset=0	21.78	21.95	21.72
		RB Size=3, RB Offset=1	21.68	21.85	21.62
		RB Size=3, RB Offset=2	21.83	22.02	21.78
		RB Size=6, RB Offset=0	21.42	21.75	21.35
	16QAM	RB Size=1, RB Offset=0	22.08	22.27	22.09
		RB Size=1, RB Offset=2	22.04	22.21	22.05
		RB Size=1, RB Offset=5	22.13	22.31	22.19
		RB Size=3, RB Offset=0	21.74	21.95	21.73
		RB Size=3, RB Offset=1	21.61	21.86	21.62
		RB Size=3, RB Offset=2	21.83	22.06	21.83
		RB Size=6, RB Offset=0	21.46	21.77	21.49
3.0	QPSK	RB Size=1, RB Offset=0	22.38	22.74	22.42
		RB Size=1, RB Offset=7	22.29	22.62	22.33
		RB Size=1, RB Offset=14	22.42	22.86	22.51
		RB Size=8, RB Offset=0	22.15	22.31	22.18
		RB Size=8, RB Offset=4	22.10	22.27	22.14
		RB Size=8, RB Offset=7	22.23	22.38	22.21
		RB Size=15, RB Offset=0	21.75	22.04	21.71
	16QAM	RB Size=1, RB Offset=0	22.32	22.75	22.41
		RB Size=1, RB Offset=7	22.27	22.68	22.33
		RB Size=1, RB Offset=14	22.43	22.85	22.47
		RB Size=8, RB Offset=0	22.18	22.35	22.16
		RB Size=8, RB Offset=4	22.07	22.31	22.09
		RB Size=8, RB Offset=7	22.26	22.46	22.24
		RB Size=15, RB Offset=0	21.54	21.99	21.63

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	22.26	22.4	22.15
		RB Size=1, RB Offset=12	22.21	22.35	22.05
		RB Size=1, RB Offset=24	22.37	22.47	22.24
		RB Size=12, RB Offset=0	21.87	22.06	21.82
		RB Size=12, RB Offset=6	21.80	22.02	21.69
		RB Size=12, RB Offset=11	21.98	22.19	21.92
		RB Size=25, RB Offset=0	21.45	21.79	21.54
	16QAM	RB Size=1, RB Offset=0	22.22	22.43	22.11
		RB Size=1, RB Offset=12	22.12	22.34	22.05
		RB Size=1, RB Offset=24	22.29	22.56	22.16
		RB Size=12, RB Offset=0	21.89	22.15	21.86
		RB Size=12, RB Offset=6	21.82	22.05	21.74
		RB Size=12, RB Offset=11	21.96	22.21	21.99
		RB Size=25, RB Offset=0	21.54	21.83	21.57
10.0	QPSK	RB Size=1, RB Offset=0	21.95	22.12	21.87
		RB Size=1, RB Offset=24	21.86	22.07	21.75
		RB Size=1, RB Offset=49	21.99	22.21	21.90
		RB Size=25, RB Offset=0	21.83	22.07	21.85
		RB Size=25, RB Offset=12	21.80	22.00	21.74
		RB Size=25, RB Offset=24	21.88	22.15	21.97
		RB Size=50, RB Offset=0	21.75	22.00	21.84
	16QAM	RB Size=1, RB Offset=0	21.92	22.08	21.84
		RB Size=1, RB Offset=24	21.83	22.03	21.71
		RB Size=1, RB Offset=49	21.97	22.19	21.89
		RB Size=25, RB Offset=0	21.72	21.95	21.71
		RB Size=25, RB Offset=12	21.64	21.84	21.65
		RB Size=25, RB Offset=24	21.85	22.06	21.78
		RB Size=50, RB Offset=0	21.45	21.86	21.57

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	21.43	21.73	21.37
		RB Size=1, RB Offset=37	21.35	21.65	21.26
		RB Size=1, RB Offset=74	21.55	21.78	21.47
		RB Size=36, RB Offset=0	21.42	21.68	21.48
		RB Size=36, RB Offset=18	21.34	21.60	21.41
		RB Size=36, RB Offset=37	21.51	21.80	21.54
		RB Size=75, RB Offset=0	21.42	21.65	21.34
	16QAM	RB Size=1, RB Offset=0	21.45	21.70	21.32
		RB Size=1, RB Offset=37	21.40	21.58	21.26
		RB Size=1, RB Offset=74	21.51	21.83	21.42
		RB Size=36, RB Offset=0	21.34	21.51	21.37
		RB Size=36, RB Offset=18	21.24	21.42	21.34
		RB Size=36, RB Offset=37	21.45	21.63	21.42
		RB Size=75, RB Offset=0	21.15	21.37	21.18
20.0	QPSK	RB Size=1, RB Offset=0	22.75	23.03	22.81
		RB Size=1, RB Offset=49	22.63	22.99	22.76
		RB Size=1, RB Offset=99	22.79	23.11	22.93
		RB Size=50, RB Offset=0	21.57	21.84	21.59
		RB Size=50, RB Offset=24	21.52	21.72	21.52
		RB Size=50, RB Offset=49	21.64	21.89	21.69
		RB Size=100, RB Offset=0	21.34	21.59	21.24
	16QAM	RB Size=1, RB Offset=0	22.74	23.02	22.72
		RB Size=1, RB Offset=49	22.71	22.94	22.63
		RB Size=1, RB Offset=99	22.86	23.12	22.76
		RB Size=50, RB Offset=0	22.26	22.51	22.17
		RB Size=50, RB Offset=24	22.22	22.39	22.14
		RB Size=50, RB Offset=49	22.29	22.63	22.26
		RB Size=100, RB Offset=0	21.54	21.83	21.45

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	5.63	13	Pass
QPSK (100RB Size)	5.95	13	Pass
16QAM (1RB Size)	6.57	13	Pass
16QAM (100RB Size)	7.38	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									
1.4 MHz Bandwidth									
1880.00	80.34	259	1.7	H	10.3	1.30	9.40	18.40	33
1880.00	83.12	145	2.1	V	12.9	1.30	9.40	21.00	33
3 MHz Bandwidth									
1880.00	79.64	268	2.2	H	9.6	1.30	9.40	17.70	33
1880.00	82.26	85	2.0	V	12.0	1.30	9.40	20.10	33
5 MHz Bandwidth									
1880.00	80.34	77	1.3	H	10.3	1.30	9.40	18.40	33
1880.00	82.57	270	1.6	V	12.3	1.30	9.40	20.40	33
10 MHz Bandwidth									
1880.00	79.55	344	2.1	H	9.5	1.30	9.40	17.60	33
1880.00	82.49	298	1.7	V	12.2	1.30	9.40	20.30	33
15 MHz Bandwidth									
1880.00	80.13	87	1.3	H	10.1	1.30	9.40	18.20	33
1880.00	82.86	105	2.4	V	12.6	1.30	9.40	20.70	33
20 MHz Bandwidth									
1880.00	80.23	240	1.6	H	10.2	1.30	9.40	18.30	33
1880.00	83.12	351	1.7	V	12.9	1.30	9.40	21.00	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									
1.4 MHz Bandwidth									
1880.00	80.11	266	2.3	H	10.1	1.30	9.40	18.20	33
1880.00	84.73	214	1.9	V	14.5	1.30	9.40	22.60	33
3 MHz Bandwidth									
1880.00	79.86	110	2.5	H	9.8	1.30	9.40	17.90	33
1880.00	83.54	159	1.1	V	13.3	1.30	9.40	21.40	33
5 MHz Bandwidth									
1880.00	79.34	93	1.2	H	9.3	1.30	9.40	17.40	33
1880.00	82.91	258	1.6	V	12.6	1.30	9.40	20.70	33
10 MHz Bandwidth									
1880.00	80.13	22	1.1	H	10.1	1.30	9.40	18.20	33
1880.00	82.54	94	1.2	V	12.3	1.30	9.40	20.40	33
15 MHz Bandwidth									
1880.00	79.69	48	1.3	H	9.6	1.30	9.40	17.70	33
1880.00	82.35	79	1.1	V	12.1	1.30	9.40	20.20	33
20 MHz Bandwidth									
1880.00	80.58	72	1.6	H	10.5	1.30	9.40	18.60	33
1880.00	83.44	271	2.2	V	13.2	1.30	9.40	21.30	33

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	22.05	22.22	22.07
		RB Size=1, RB Offset=2	21.98	22.13	21.99
		RB Size=1, RB Offset=5	22.11	22.31	22.12
		RB Size=3, RB Offset=0	22.78	23.02	22.81
		RB Size=3, RB Offset=1	22.74	22.98	22.72
		RB Size=3, RB Offset=2	22.89	23.09	22.88
		RB Size=6, RB Offset=0	20.78	21.00	20.74
	16QAM	RB Size=1, RB Offset=0	22.09	22.26	22.03
		RB Size=1, RB Offset=2	22.05	22.14	21.90
		RB Size=1, RB Offset=5	22.19	22.33	22.06
		RB Size=3, RB Offset=0	21.56	21.84	21.61
		RB Size=3, RB Offset=1	21.50	21.73	21.55
		RB Size=3, RB Offset=2	21.64	21.94	21.71
		RB Size=6, RB Offset=0	21.26	21.54	21.28
3.0	QPSK	RB Size=1, RB Offset=0	22.07	22.3	22.08
		RB Size=1, RB Offset=7	21.94	22.18	22.00
		RB Size=1, RB Offset=14	22.15	22.42	22.18
		RB Size=8, RB Offset=0	21.67	21.91	21.64
		RB Size=8, RB Offset=4	21.56	21.80	21.59
		RB Size=8, RB Offset=7	21.76	21.99	21.73
		RB Size=15, RB Offset=0	21.32	21.60	21.24
	16QAM	RB Size=1, RB Offset=0	22.01	22.28	22.03
		RB Size=1, RB Offset=7	21.91	22.16	21.93
		RB Size=1, RB Offset=14	22.13	22.33	22.12
		RB Size=8, RB Offset=0	21.64	21.97	21.69
		RB Size=8, RB Offset=4	21.55	21.85	21.62
		RB Size=8, RB Offset=7	21.71	22.05	21.80
		RB Size=15, RB Offset=0	21.35	21.62	21.42

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	22.15	22.36	22.16
		RB Size=1, RB Offset=12	22.03	22.26	22.07
		RB Size=1, RB Offset=24	22.27	22.43	22.26
		RB Size=12, RB Offset=0	21.67	21.95	21.62
		RB Size=12, RB Offset=6	21.62	21.82	21.51
		RB Size=12, RB Offset=11	21.73	22.00	21.67
		RB Size=25, RB Offset=0	21.32	21.66	21.27
	16QAM	RB Size=1, RB Offset=0	22.26	22.4	22.21
		RB Size=1, RB Offset=12	22.19	22.33	22.12
		RB Size=1, RB Offset=24	22.36	22.46	22.31
		RB Size=12, RB Offset=0	21.63	21.92	21.66
		RB Size=12, RB Offset=6	21.57	21.87	21.55
		RB Size=12, RB Offset=11	21.75	21.96	21.76
		RB Size=25, RB Offset=0	21.32	21.64	21.27
10.0	QPSK	RB Size=1, RB Offset=0	22.12	22.37	22.15
		RB Size=1, RB Offset=24	22.00	22.29	22.04
		RB Size=1, RB Offset=49	22.23	22.50	22.26
		RB Size=25, RB Offset=0	21.71	21.95	21.73
		RB Size=25, RB Offset=12	21.59	21.84	21.63
		RB Size=25, RB Offset=24	21.82	22.03	21.83
		RB Size=50, RB Offset=0	21.25	21.64	21.34
	16QAM	RB Size=1, RB Offset=0	22.15	22.31	22.17
		RB Size=1, RB Offset=24	22.06	22.19	22.12
		RB Size=1, RB Offset=49	22.19	22.39	22.25
		RB Size=25, RB Offset=0	21.61	21.94	21.63
		RB Size=25, RB Offset=12	21.49	21.82	21.54
		RB Size=25, RB Offset=24	21.70	22.02	21.75
		RB Size=50, RB Offset=0	21.24	21.56	21.34

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	4.89	13	Pass
QPSK (100RB Size)	5.33	13	Pass
16QAM (1RB Size)	5.16	13	Pass
16QAM (100RB Size)	6.04	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									
1.4 MHz Bandwidth									
836.5	82.06	277	1.2	H	20.0	0.7	0.0	19.30	38.45
836.5	82.77	181	1.8	V	22.3	0.7	0.0	21.60	38.45
3 MHz Bandwidth									
836.5	81.92	223	2.2	H	19.9	0.7	0.0	19.20	38.45
836.5	82.87	108	2.3	V	22.4	0.7	0.0	21.70	38.45
5 MHz Bandwidth									
836.5	81.85	328	2.5	H	19.8	0.7	0.0	19.10	38.45
836.5	82.91	112	1.2	V	22.5	0.7	0.0	21.80	38.45
10 MHz Bandwidth									
836.5	81.75	174	1.5	H	19.7	0.7	0.0	19.00	38.45
836.5	82.73	118	1.6	V	22.3	0.7	0.0	21.60	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	81.88	61	1.5	H	19.8	0.7	0.0	19.10	38.45
836.5	82.15	285	2.3	V	21.7	0.7	0.0	21.00	38.45
3 MHz Bandwidth									
836.5	81.82	183	1.1	H	19.8	0.7	0.0	19.10	38.45
836.5	83.21	342	2.0	V	22.8	0.7	0.0	22.10	38.45
5 MHz Bandwidth									
836.5	81.71	194	1.4	H	19.7	0.7	0.0	19.00	38.45
836.5	82.43	212	1.4	V	22.0	0.7	0.0	21.30	38.45
10 MHz Bandwidth									
836.5	82.35	313	1.5	H	20.3	0.7	0.0	19.60	38.45
836.5	82.31	153	2.0	V	21.9	0.7	0.0	21.20	38.45

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 - OCCUPIED BANDWIDTH

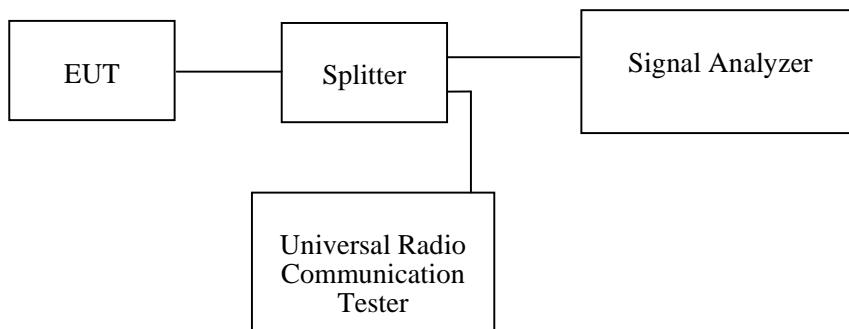
Applicable Standard

FCC 47 §2.1049, §22.917, §22.905, §24.238.

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:	22~25 °C
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Jacob Kong from 2018-02-12 to 2018-02-24.

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 (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	836.6	246.8	317.3
EGPRS(8PSK)	836.6	246.8	317.3

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	836.6	4.119	4.712
HSUPA (BPSK)	836.6	4.103	4.679
HSDPA (16QAM)	836.6	4.103	4.696

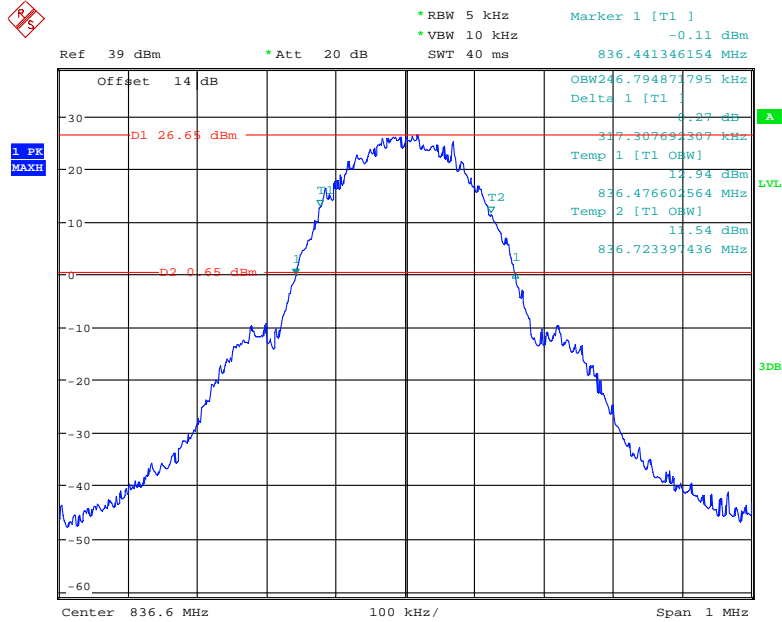
PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	1880.0	243.6	320.5
EGPRS(8PSK)	1880.0	248.4	317.3

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	1880.0	4.103	4.679
HSUPA (BPSK)	1880.0	4.103	4.696
HSDPA (16QAM)	1880.0	4.103	4.663

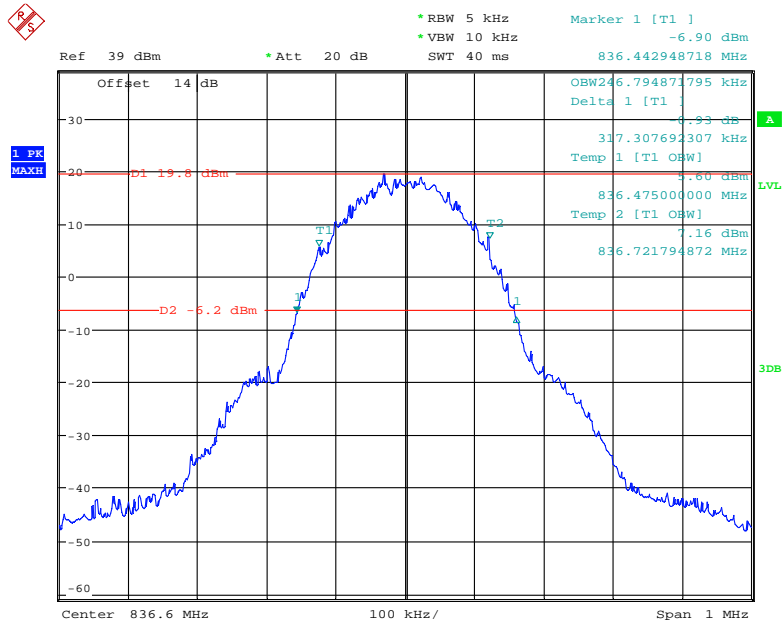
Cellular Band (Part 22H)

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



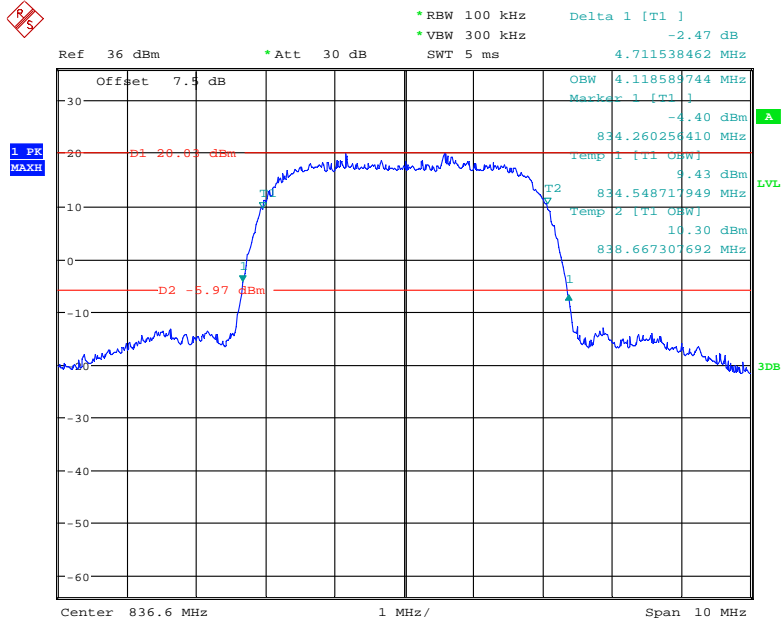
Date: 23.FEB.2018 23:13:00

26 dB Emissions & 99% Occupied Bandwidth for EDGE Mode



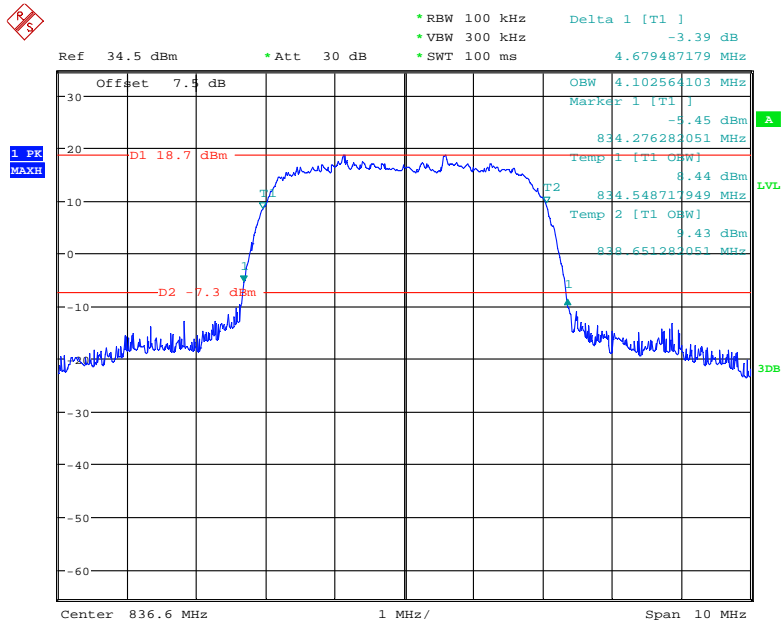
Date: 24.FEB.2018 00:45:28

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



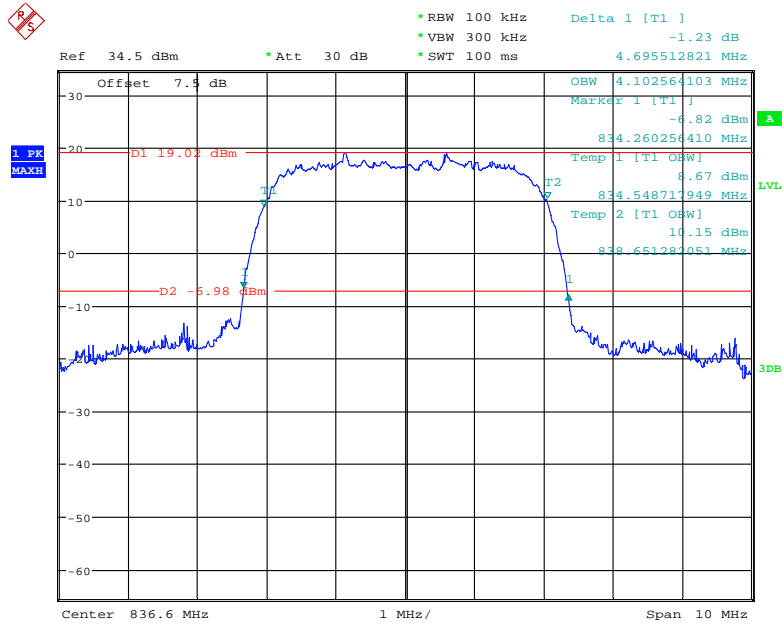
Date: 12.FEB.2018 15:31:42

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



Date: 12.FEB.2018 15:58:02

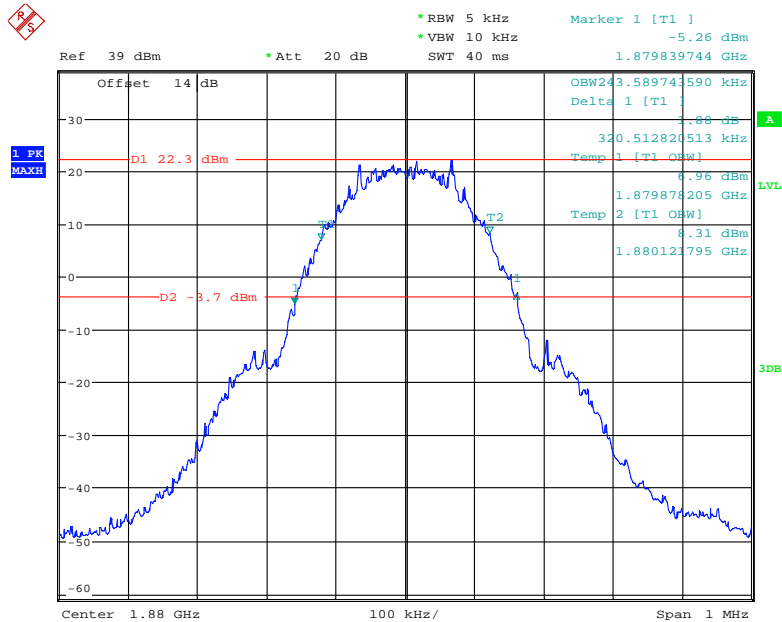
26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode



Date: 12.FEB.2018 15:53:57

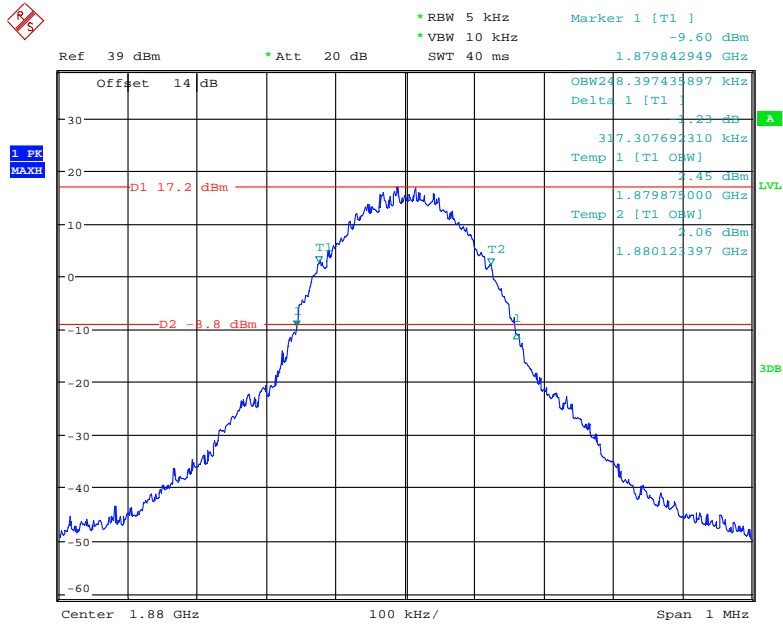
PCS Band (Part 24E)

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



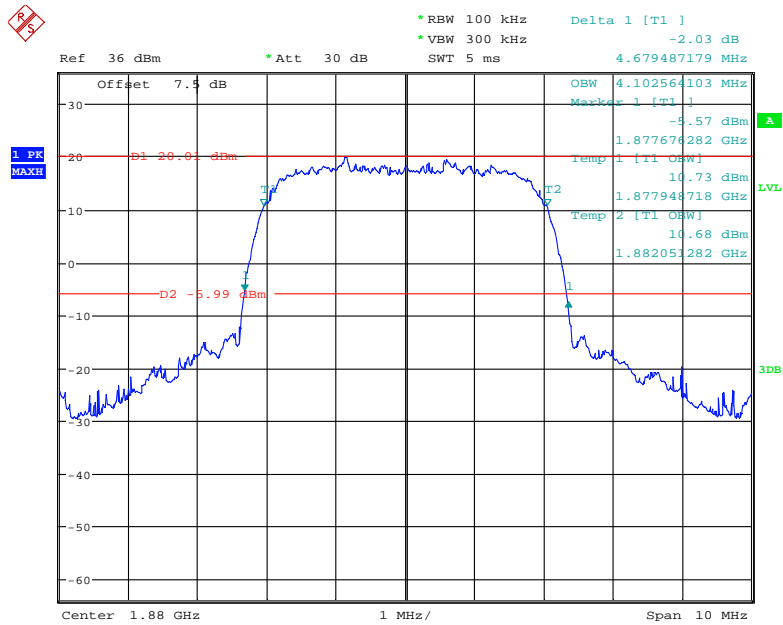
Date: 23.FEB.2018 23:16:19

26 dB Emissions & 99% Occupied Bandwidth for EDGE Mode



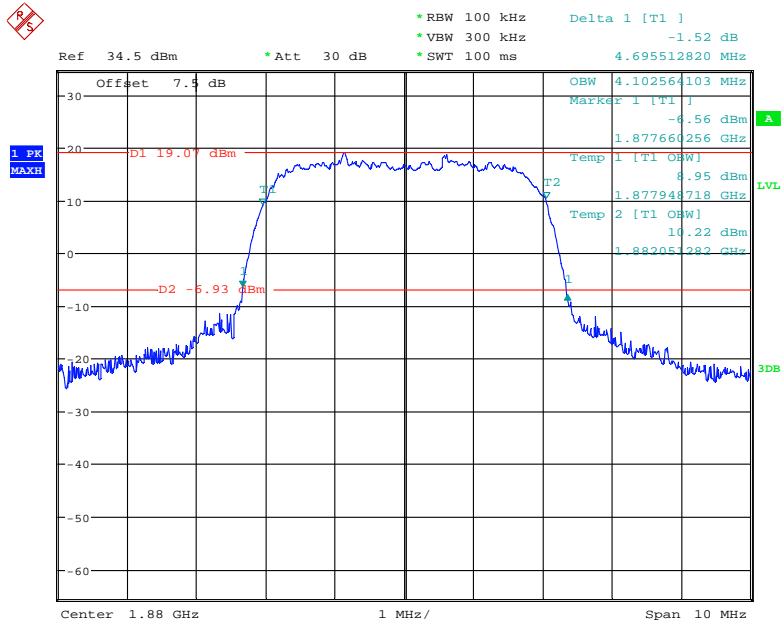
Date: 24.FEB.2018 00:39:25

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



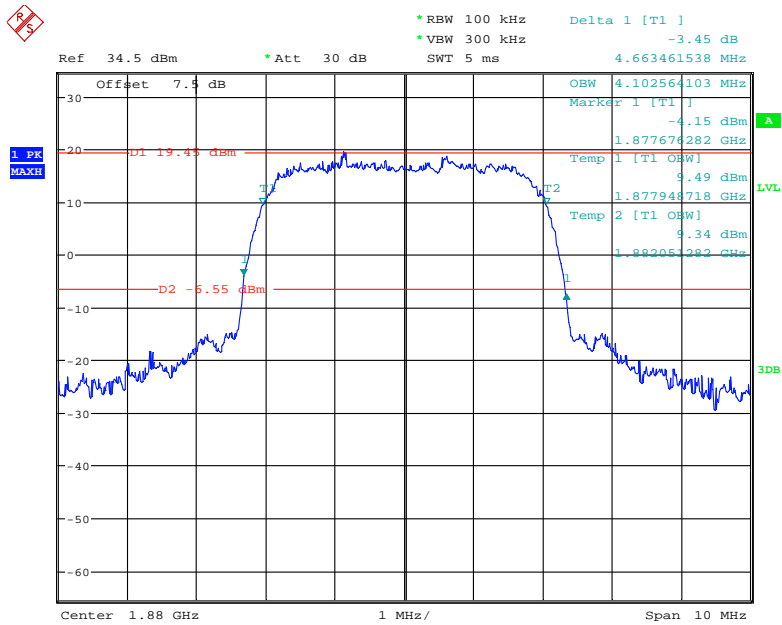
Date: 12.FEB.2018 15:23:15

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



Date: 12.FEB.2018 16:03:34

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

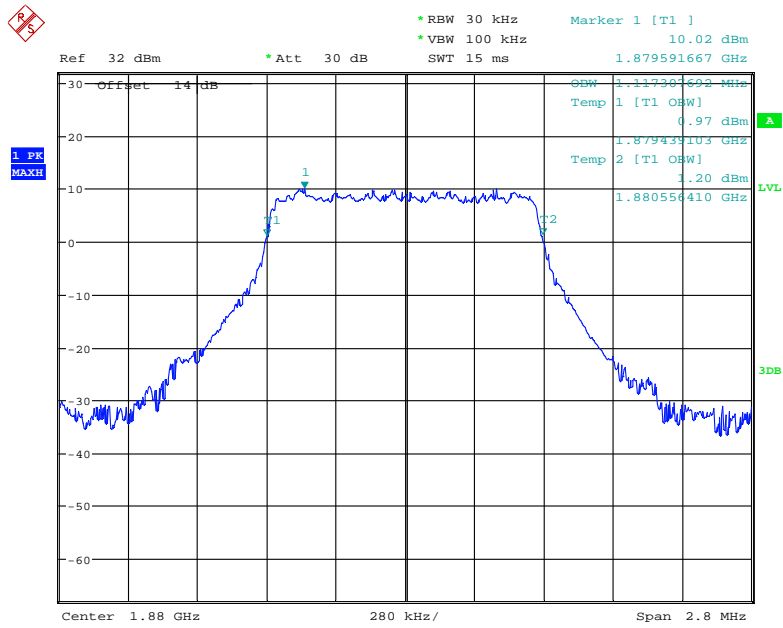


Date: 12.FEB.2018 15:47:30

LTE Band 2: (Middle Channel)

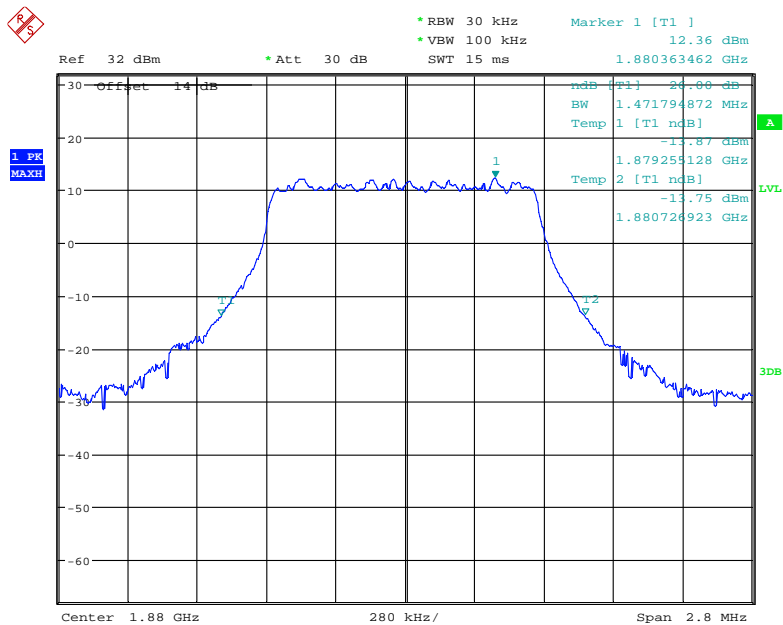
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
1.4	QPSK	1.117	1.472
	16QAM	1.117	1.476
3.0	QPSK	2.692	3.010
	16QAM	2.692	3.019
5.0	QPSK	4.551	5.144
	16QAM	4.535	5.144
10.0	QPSK	8.974	9.904
	16QAM	9.006	9.840
15.0	QPSK	13.558	15.529
	16QAM	13.606	15.240
20.0	QPSK	18.077	20.128
	16QAM	18.013	20.000

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



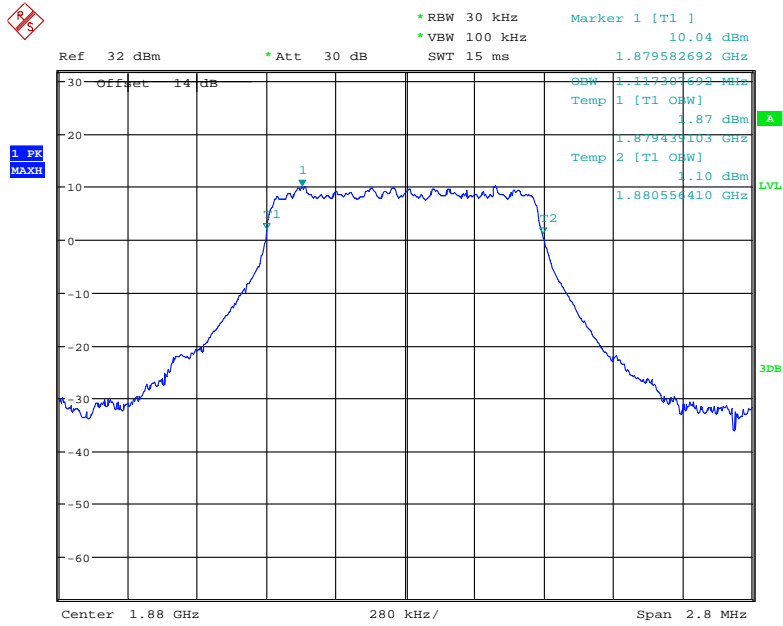
Date: 12.FEB.2018 10:04:03

QPSK (1.4 MHz) - 26 dB Bandwidth, Middle channel



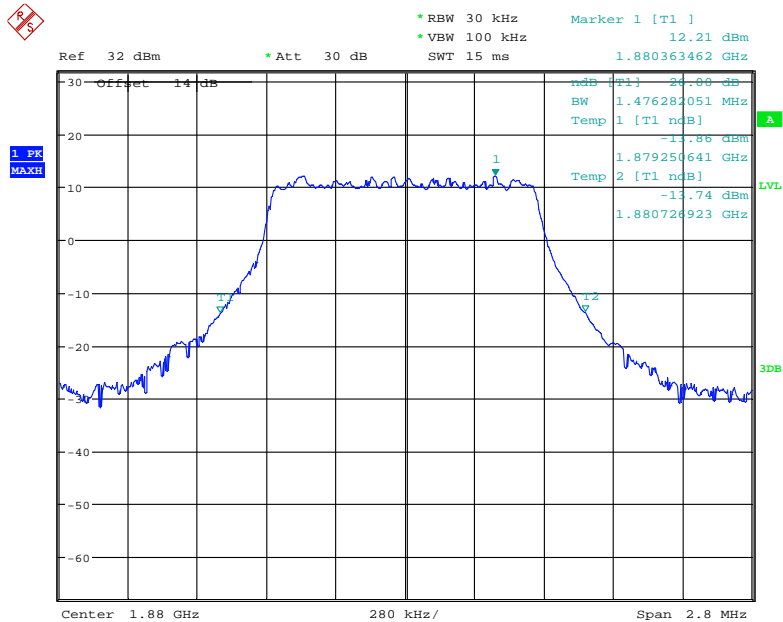
Date: 12.FEB.2018 10:35:50

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



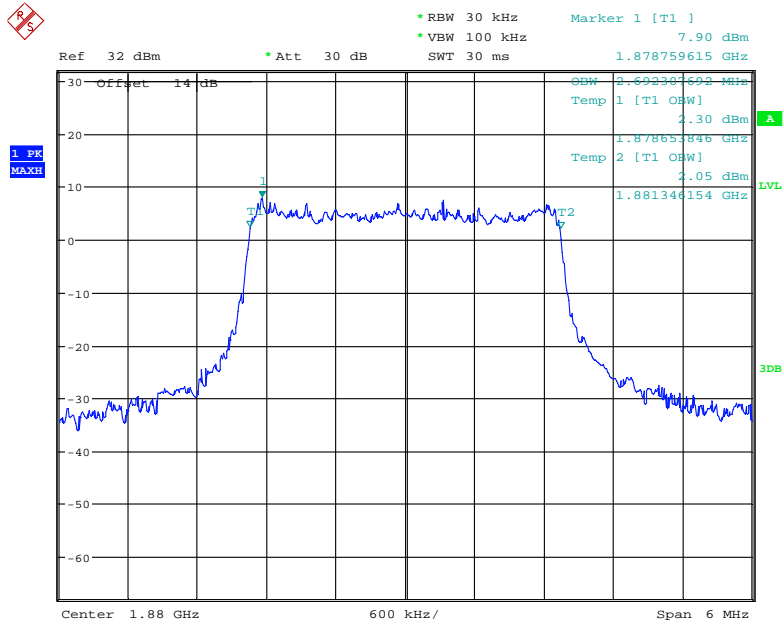
Date: 12.FEB.2018 10:04:46

16-QAM (1.4 MHz) - 26 dB Bandwidth, Middle channel



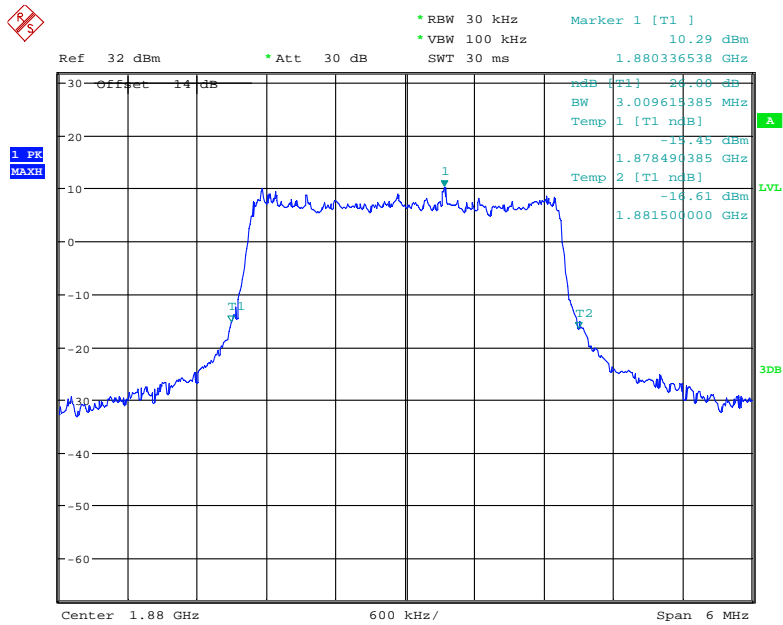
Date: 12.FEB.2018 10:35:02

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



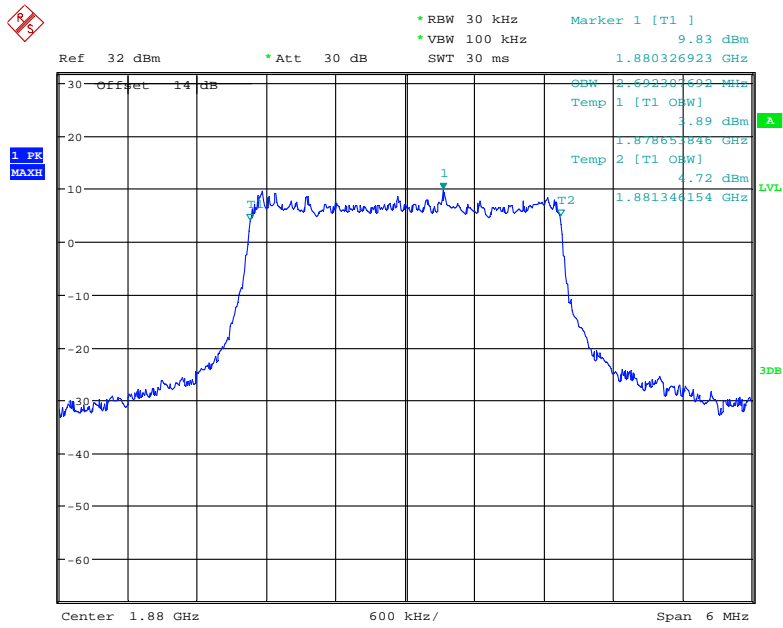
Date: 12.FEB.2018 10:03:22

QPSK (3.0 MHz) - 26 dB Bandwidth, Middle channel



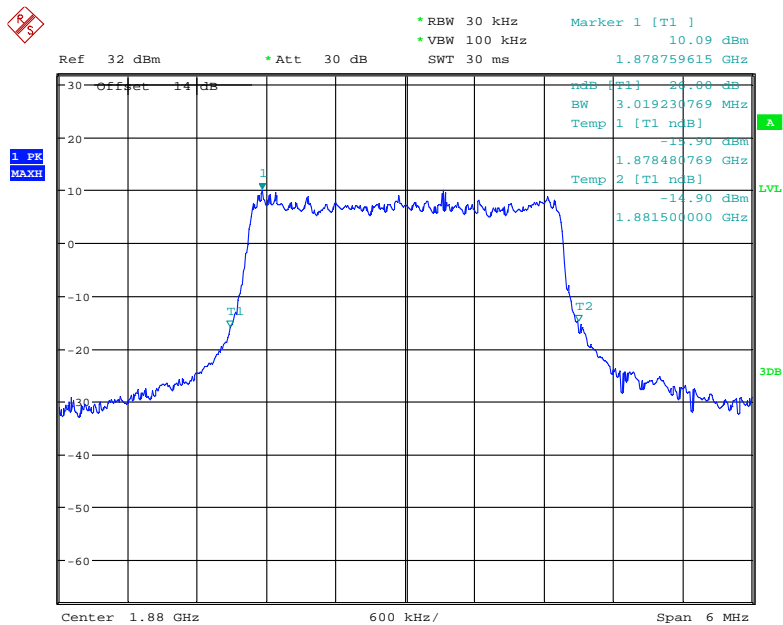
Date: 12.FEB.2018 10:36:39

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



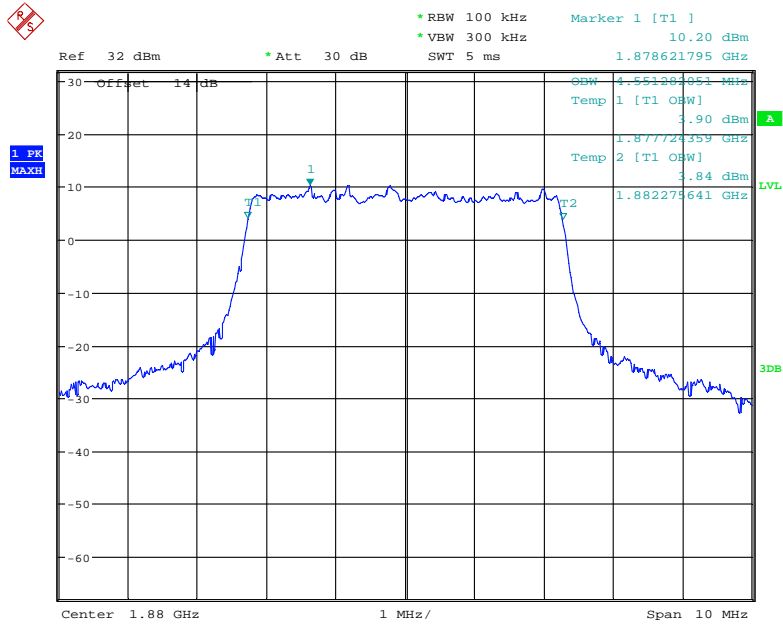
Date: 12.FEB.2018 10:02:52

16-QAM (3.0 MHz) - 26 dB Bandwidth, Middle channel



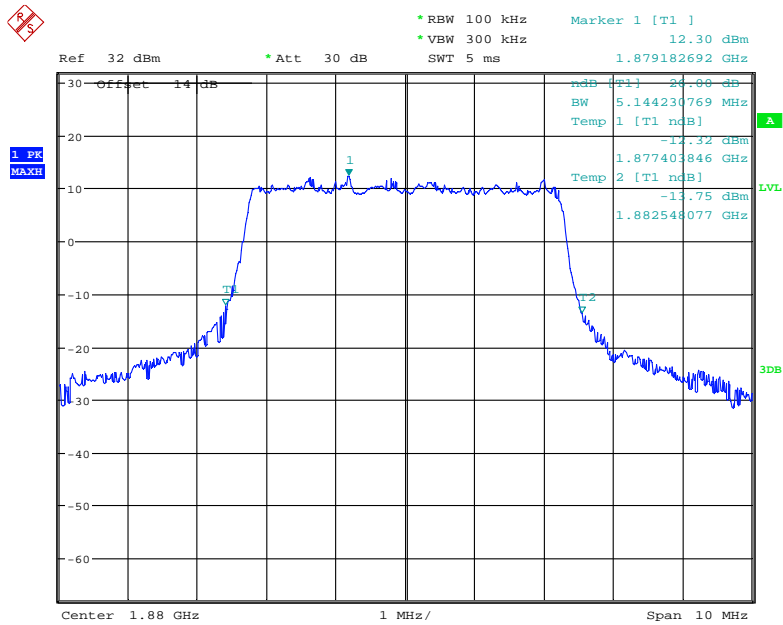
Date: 12.FEB.2018 10:37:07

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



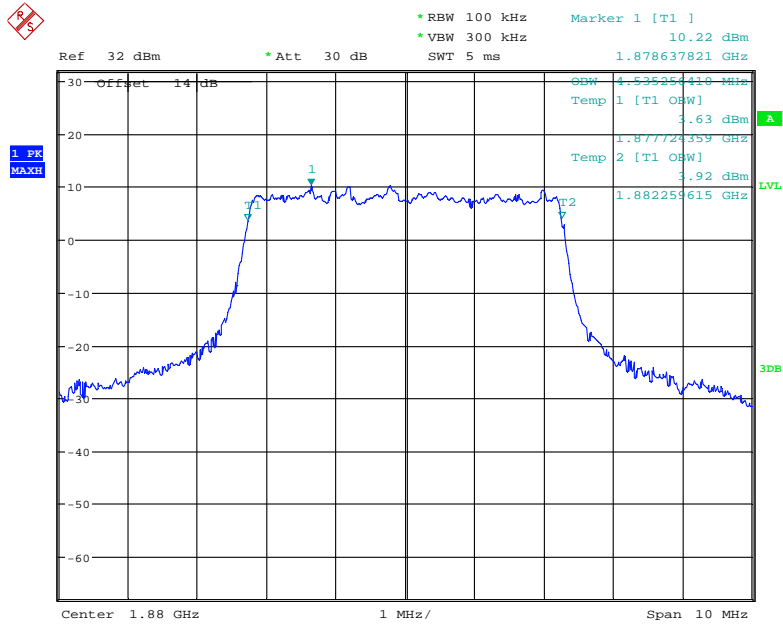
Date: 12.FEB.2018 10:07:39

QPSK (5.0 MHz) - 26 dB Bandwidth, Middle channel



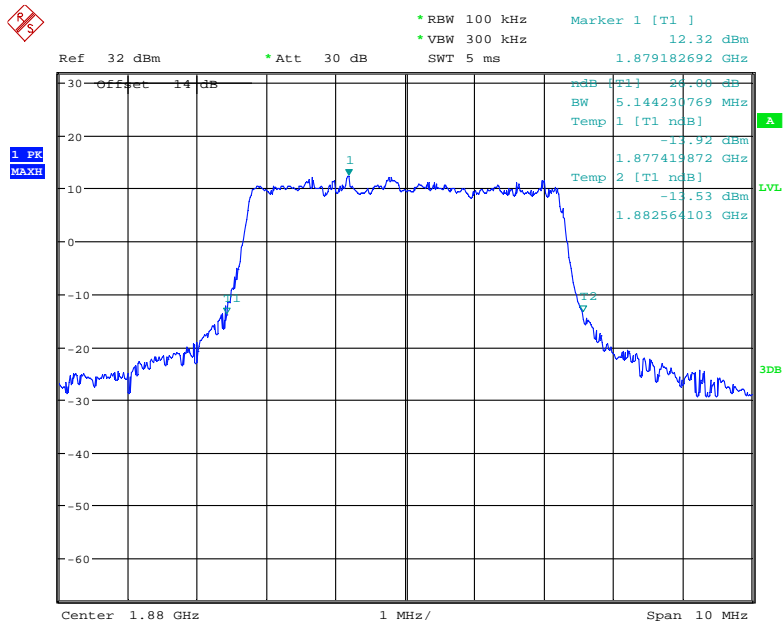
Date: 12.FEB.2018 10:38:42

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



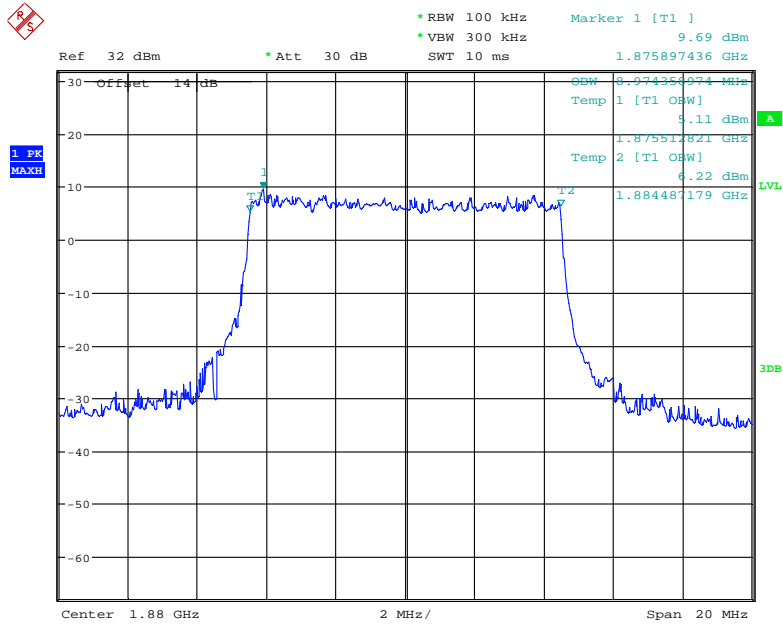
Date: 12.FEB.2018 10:06:33

16-QAM (5.0 MHz) - 26 dB Bandwidth, Middle channel



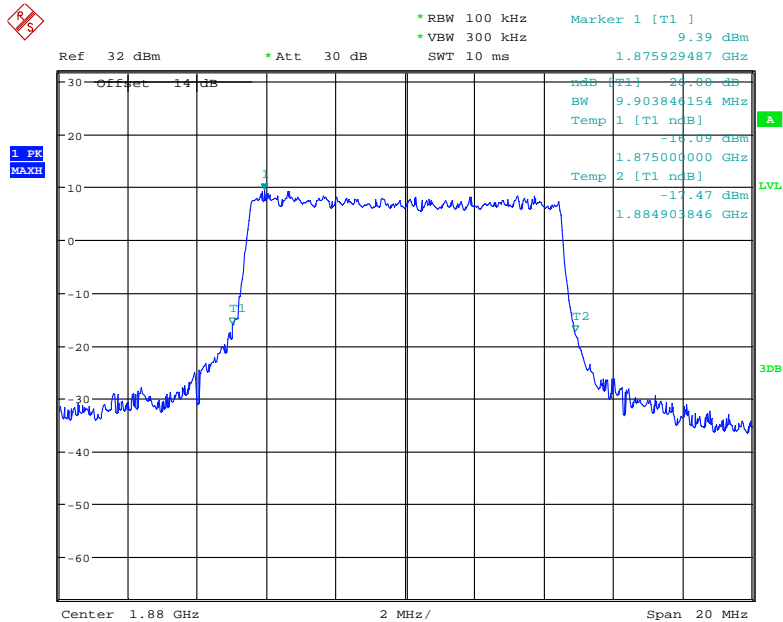
Date: 12.FEB.2018 10:38:02

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



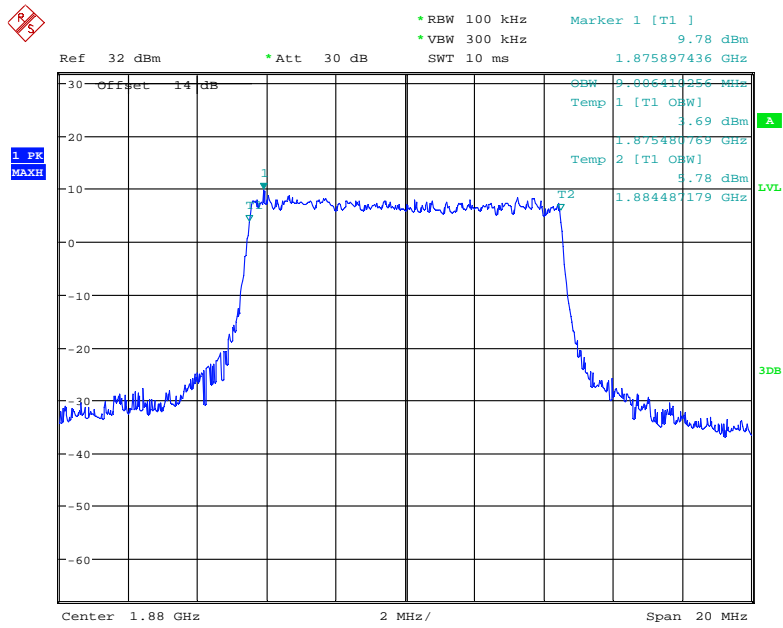
Date: 12.FEB.2018 10:16:47

QPSK (10.0 MHz) - 26 dB Bandwidth, Middle channel



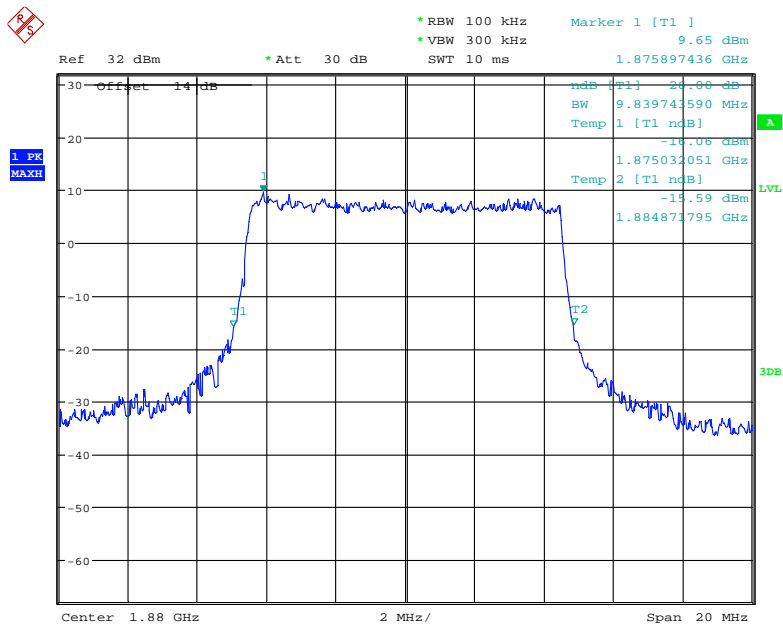
Date: 12.FEB.2018 10:39:24

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



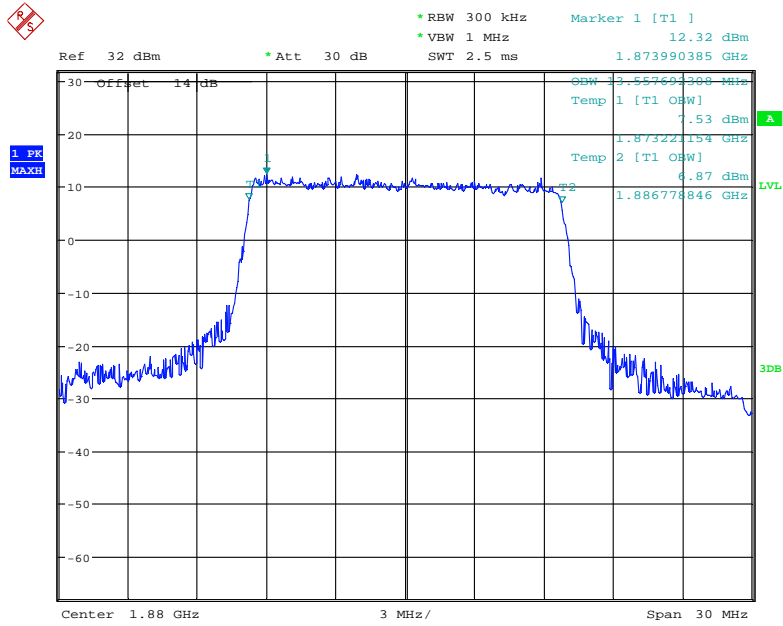
Date: 12.FEB.2018 10:17:37

16-QAM (10.0 MHz) - 26 dB Bandwidth, Middle channel



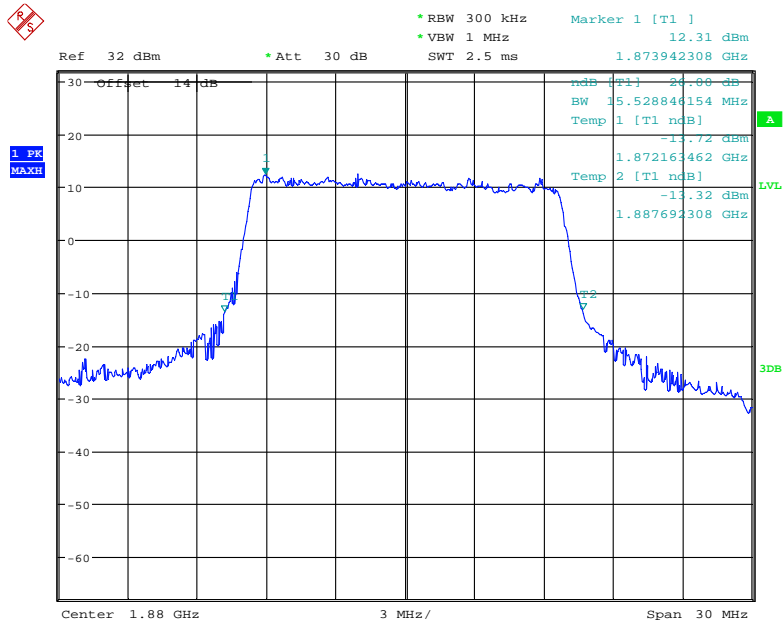
Date: 12.FEB.2018 10:40:01

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



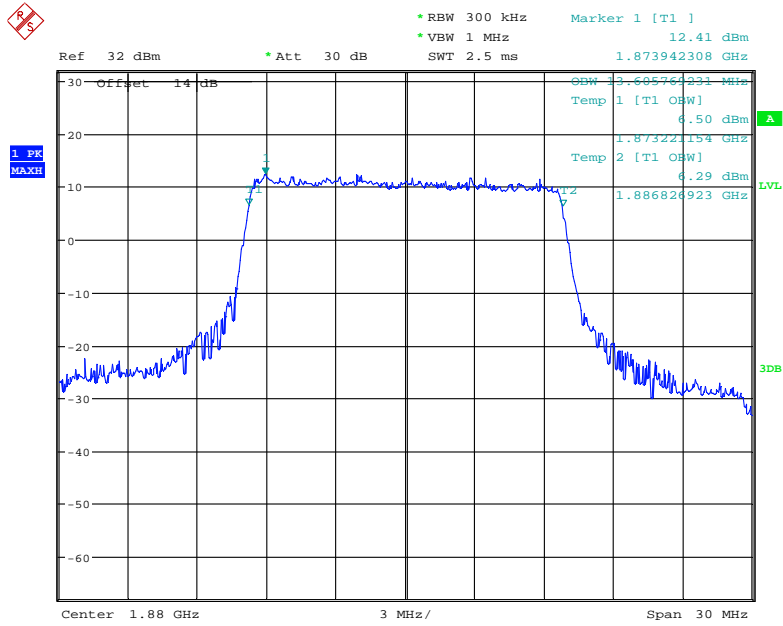
Date: 12.FEB.2018 10:19:26

QPSK (15.0 MHz) - 26 dB Bandwidth, Middle channel



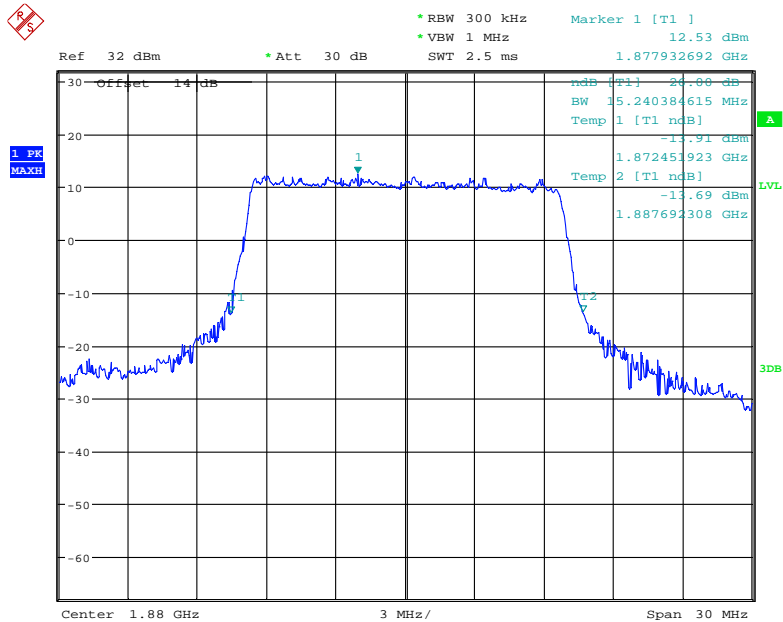
Date: 12.FEB.2018 10:41:39

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



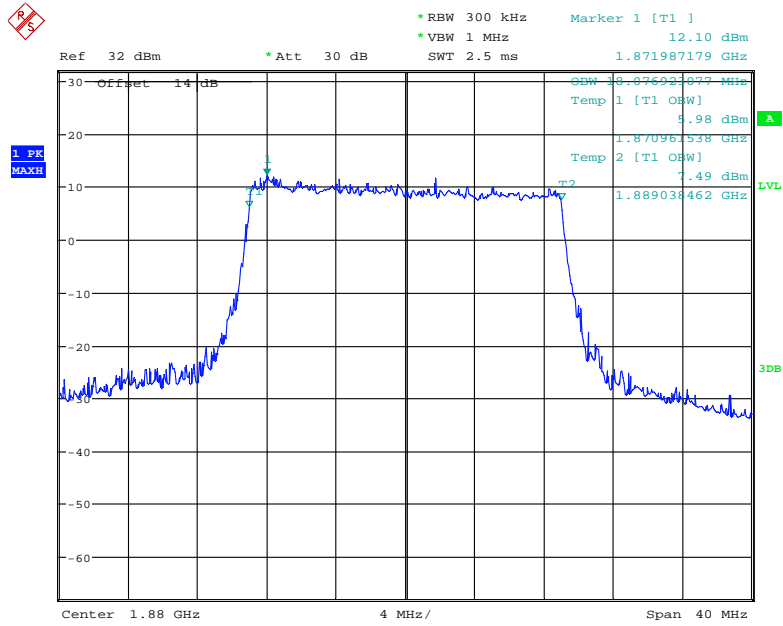
Date: 12.FEB.2018 10:18:54

16-QAM (15.0 MHz) - 26 dB Bandwidth, Middle channel



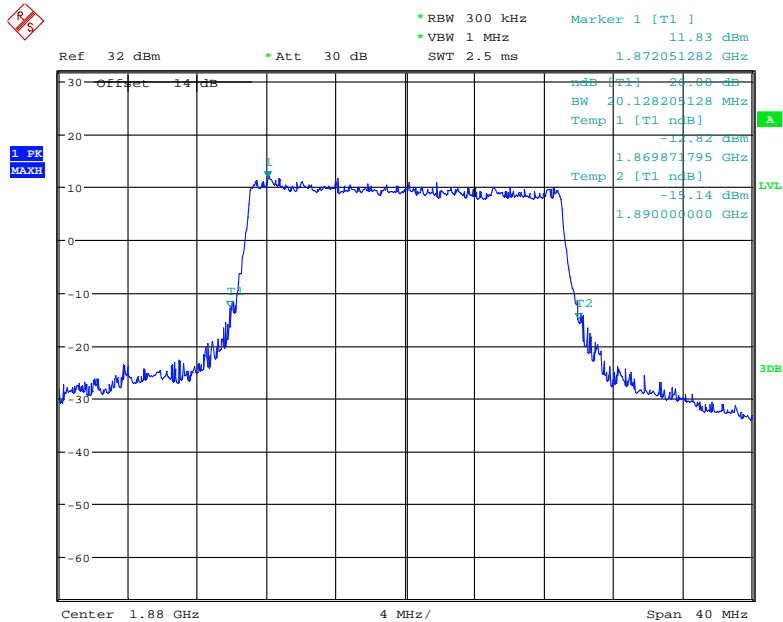
Date: 12.FEB.2018 10:40:54

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



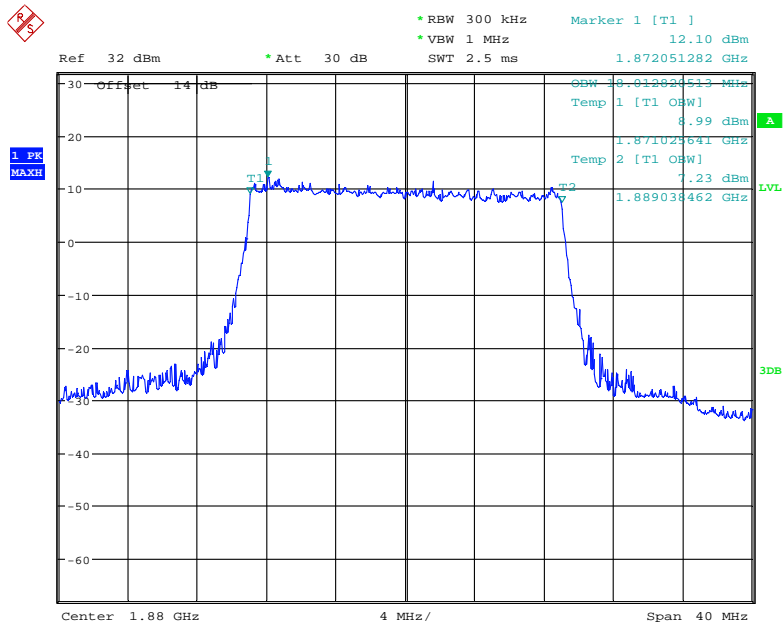
Date: 12.FEB.2018 10:20:03

QPSK (20.0 MHz) - 26 dB Bandwidth, Middle channel



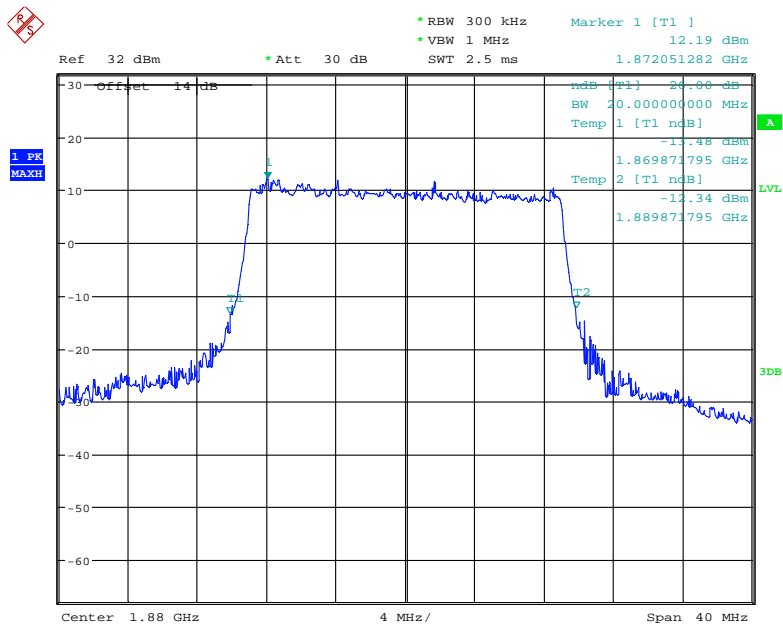
Date: 12.FEB.2018 10:42:29

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



Date: 12.FEB.2018 10:20:39

16-QAM (20.0 MHz) - 26 dB Bandwidth, Middle channel

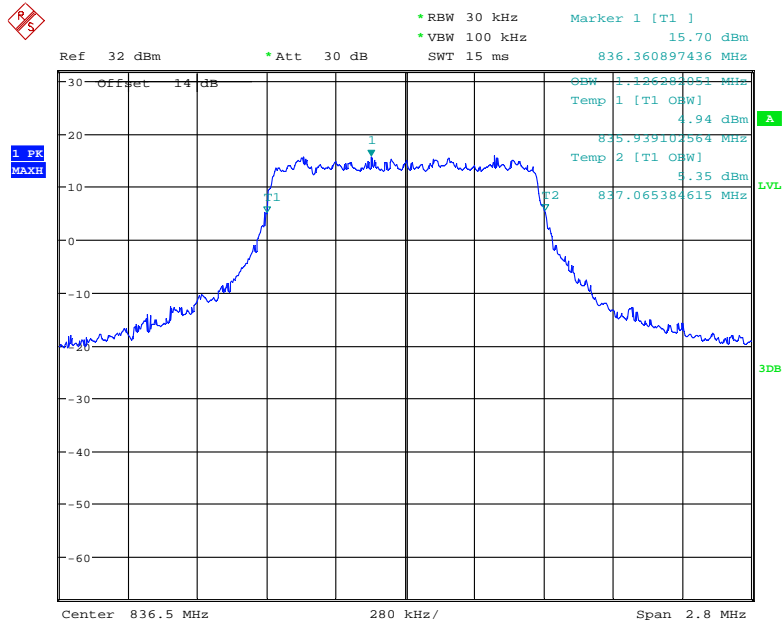


Date: 12.FEB.2018 10:43:02

LTE Band 5: (Middle Channel)

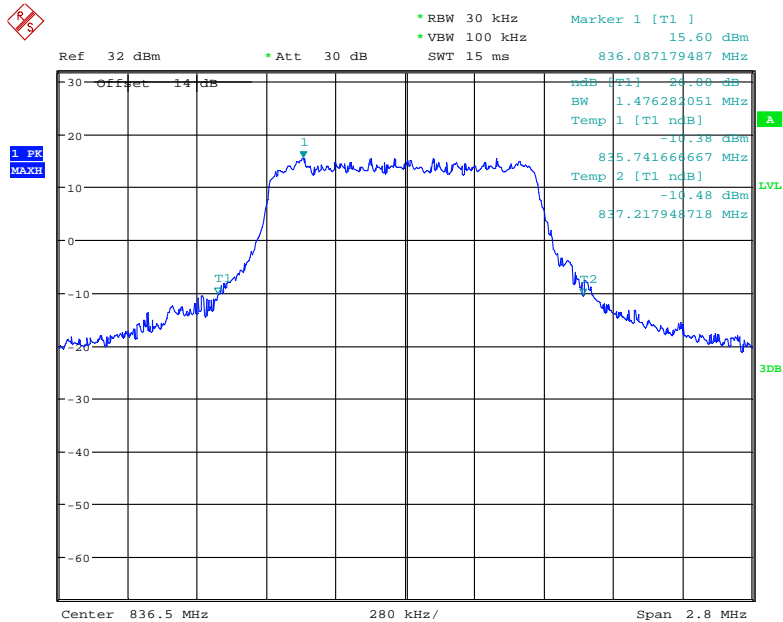
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
1.4	QPSK	1.126	1.476
	16QAM	1.122	1.508
3.0	QPSK	2.702	3.010
	16QAM	2.692	3.029
5.0	QPSK	4.535	5.128
	16QAM	4.519	5.128
10.0	QPSK	8.974	9.872
	16QAM	9.006	9.808

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



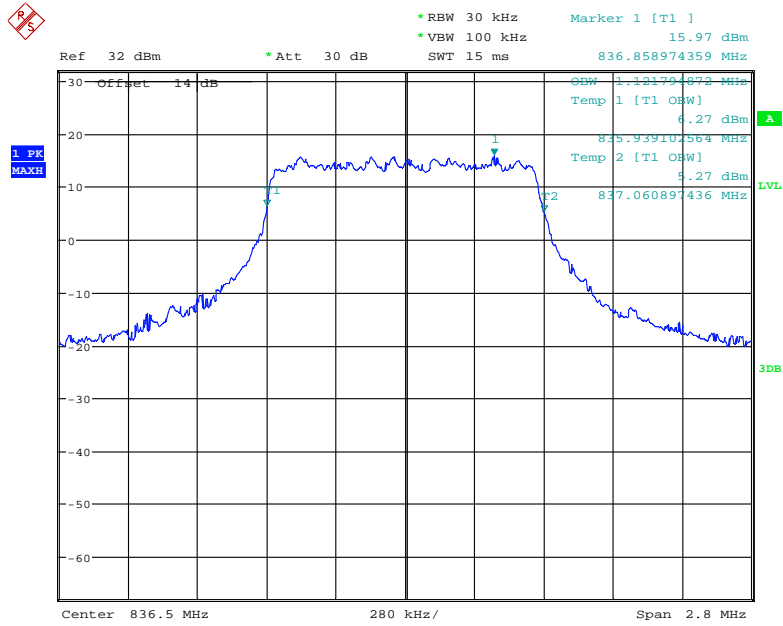
Date: 12.FEB.2018 10:22:54

QPSK (1.4 MHz) - 26 dB Bandwidth, Middle channel



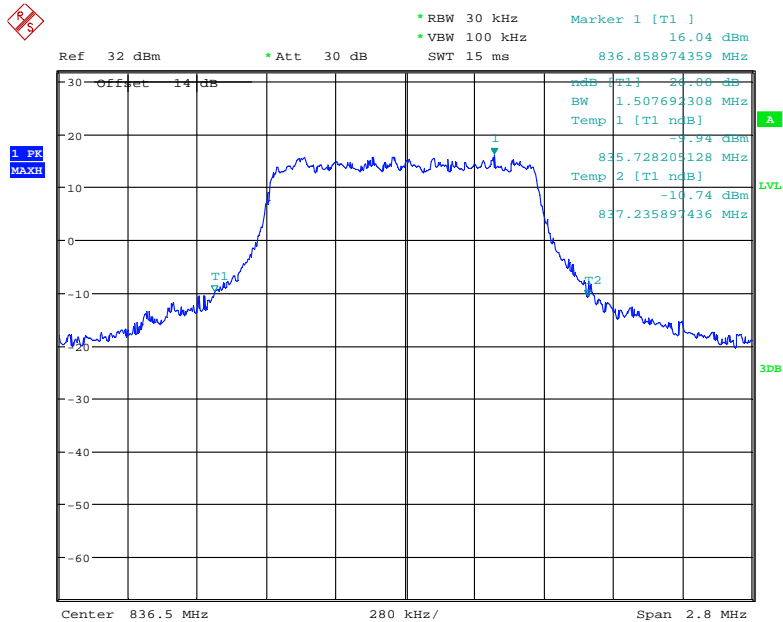
Date: 12.FEB.2018 10:29:40

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



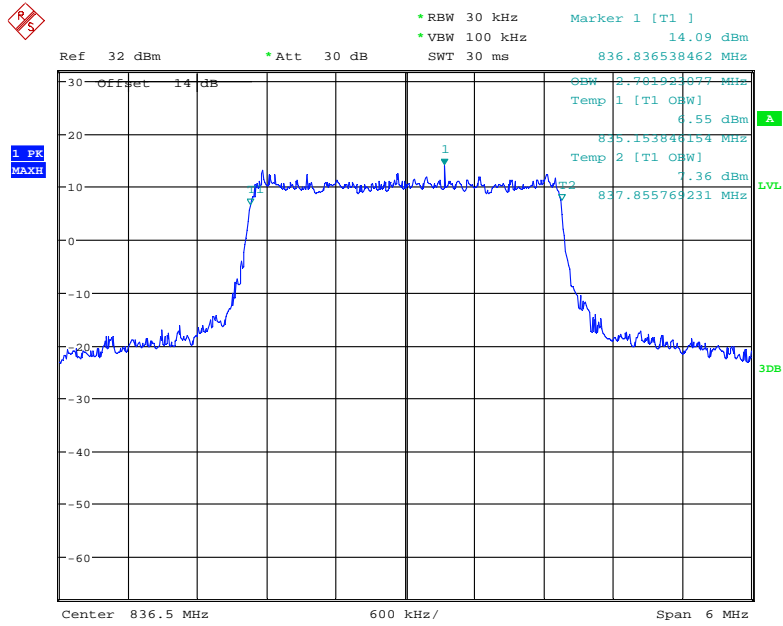
Date: 12.FEB.2018 10:22:16

16-QAM (1.4 MHz) - 26 dB Bandwidth, Middle channel



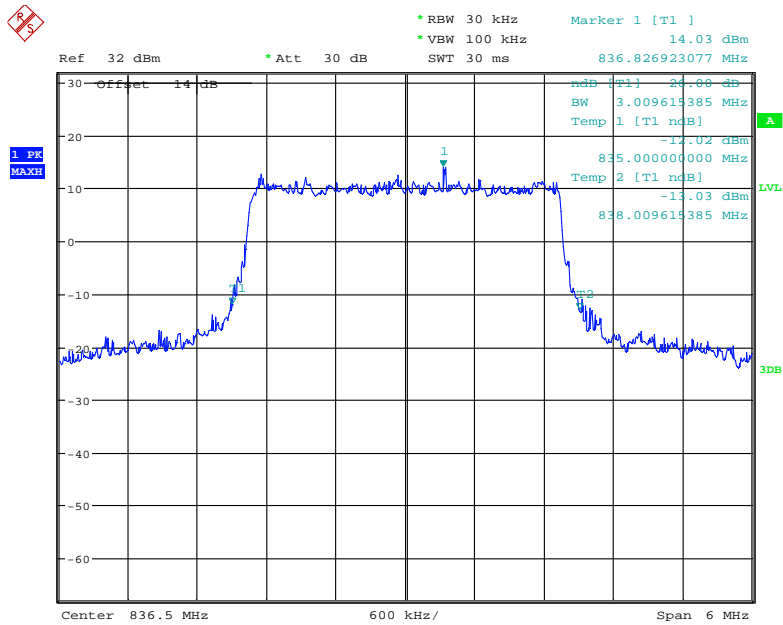
Date: 12.FEB.2018 10:28:55

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



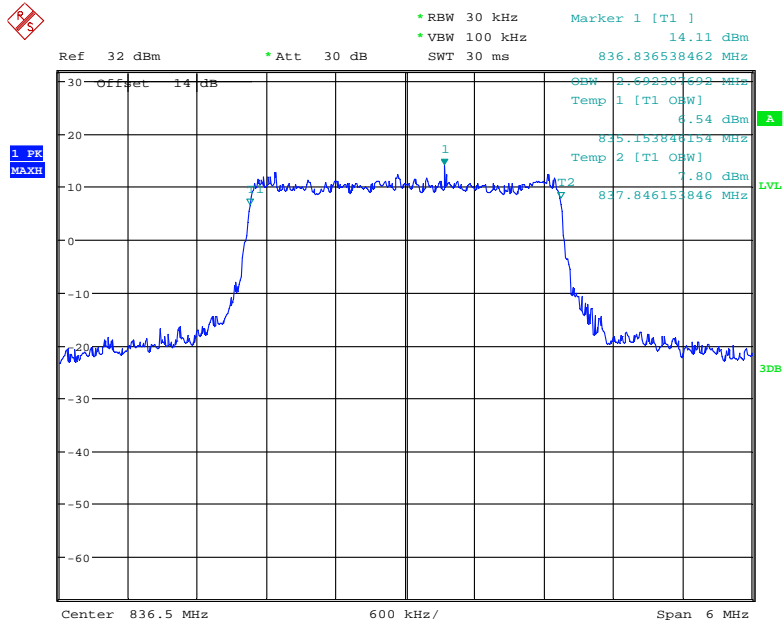
Date: 12.FEB.2018 10:23:28

QPSK (3.0 MHz) - 26 dB Bandwidth, Middle channel



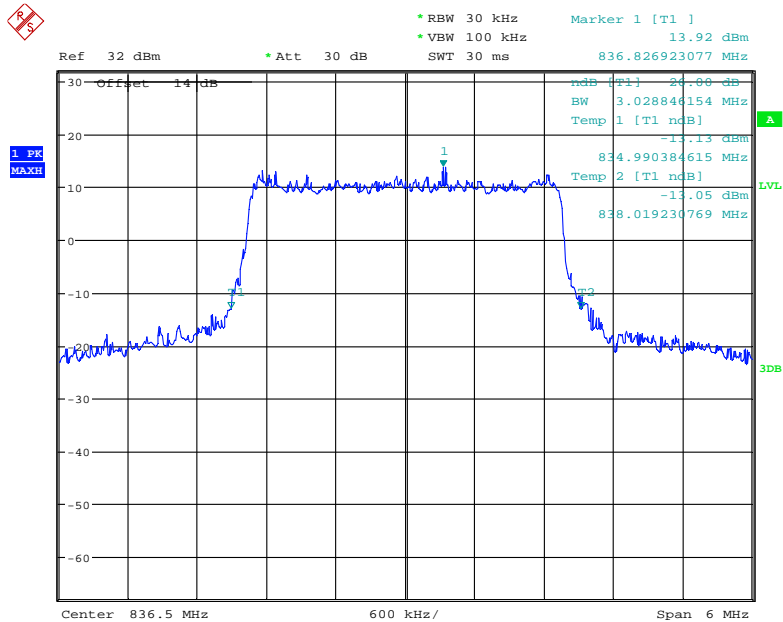
Date: 12.FEB.2018 10:30:04

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



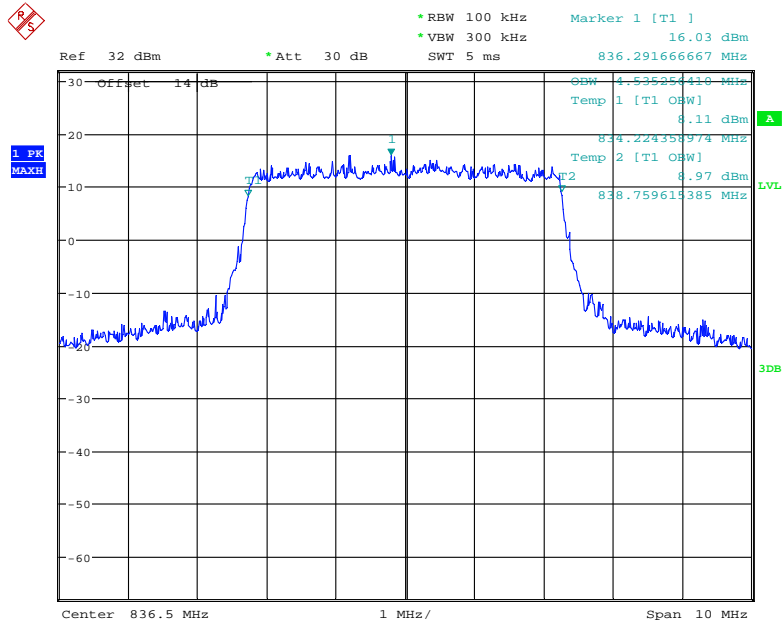
Date: 12.FEB.2018 10:24:00

16-QAM (3.0 MHz) - 26 dB Bandwidth, Middle channel



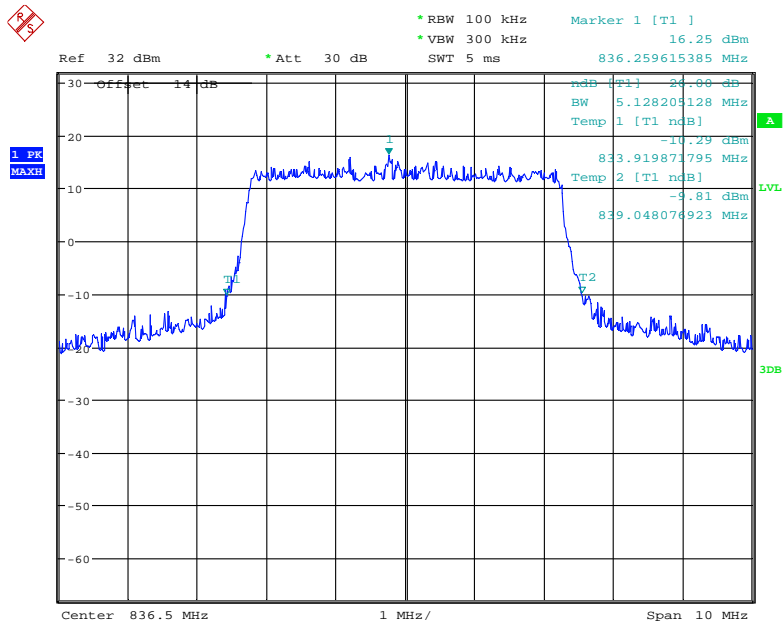
Date: 12.FEB.2018 10:30:33

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



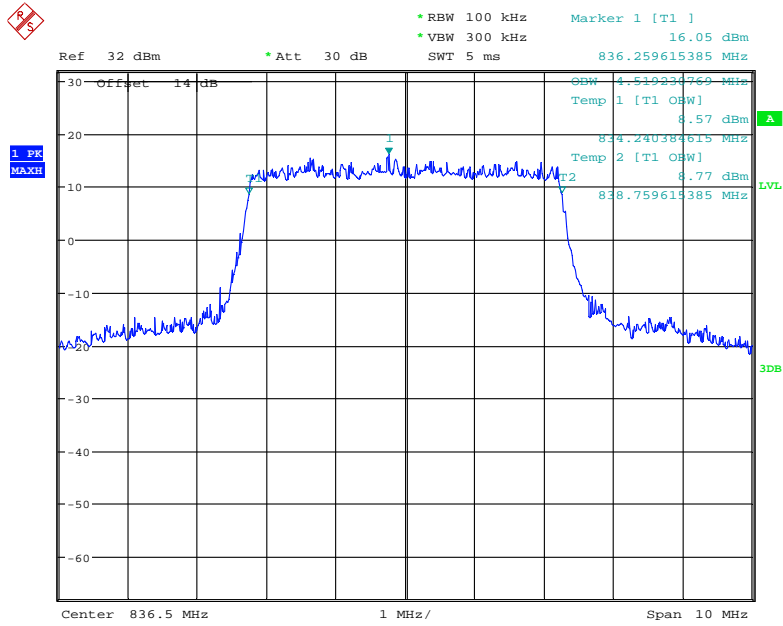
Date: 12.FEB.2018 10:25:11

QPSK (5.0 MHz) - 26 dB Bandwidth, Middle channel



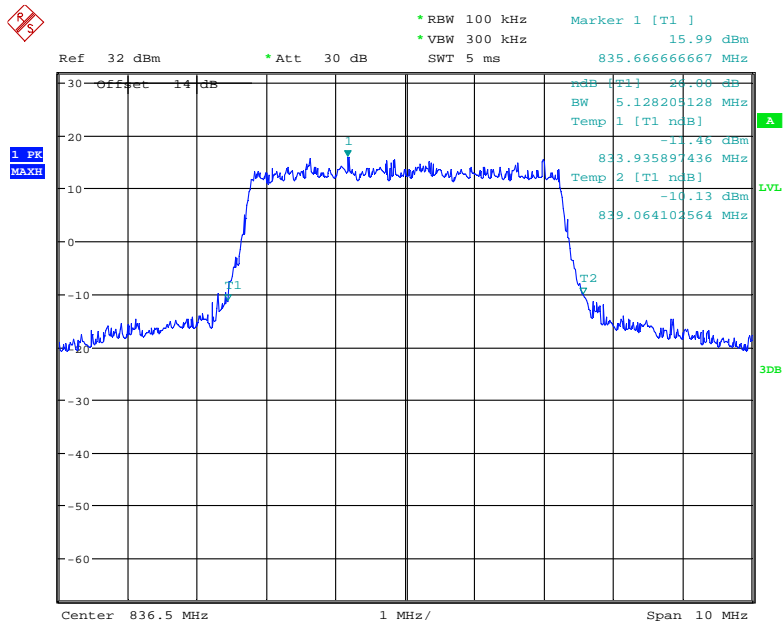
Date: 12.FEB.2018 10:31:40

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



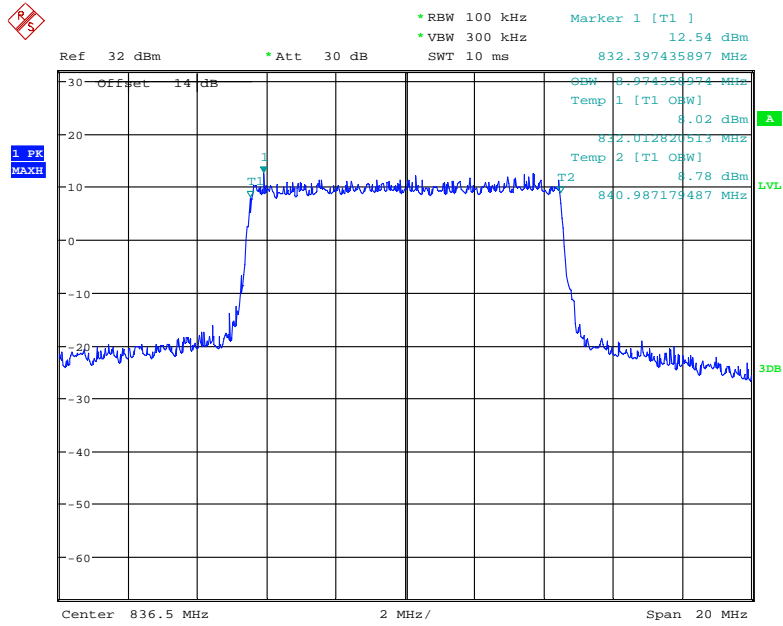
Date: 12.FEB.2018 10:24:40

16-QAM (5.0 MHz) - 26 dB Bandwidth, Middle channel



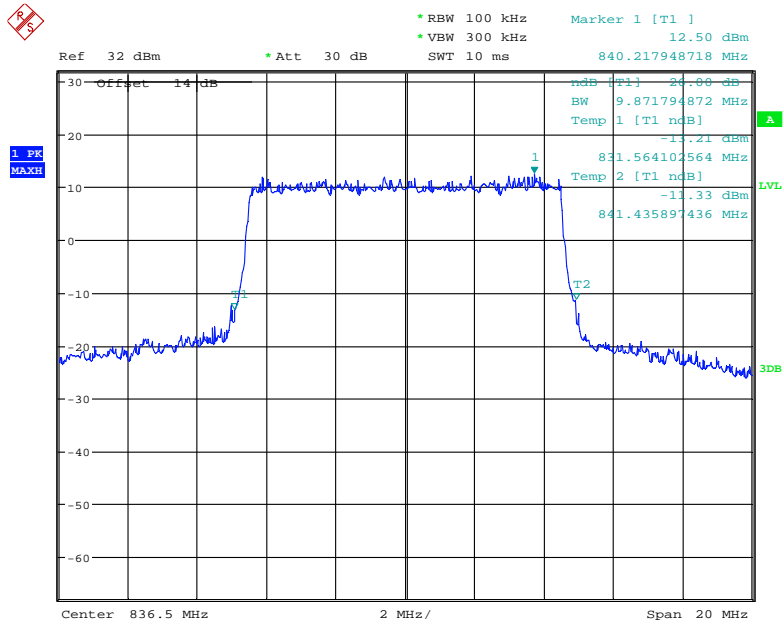
Date: 12.FEB.2018 10:31:15

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



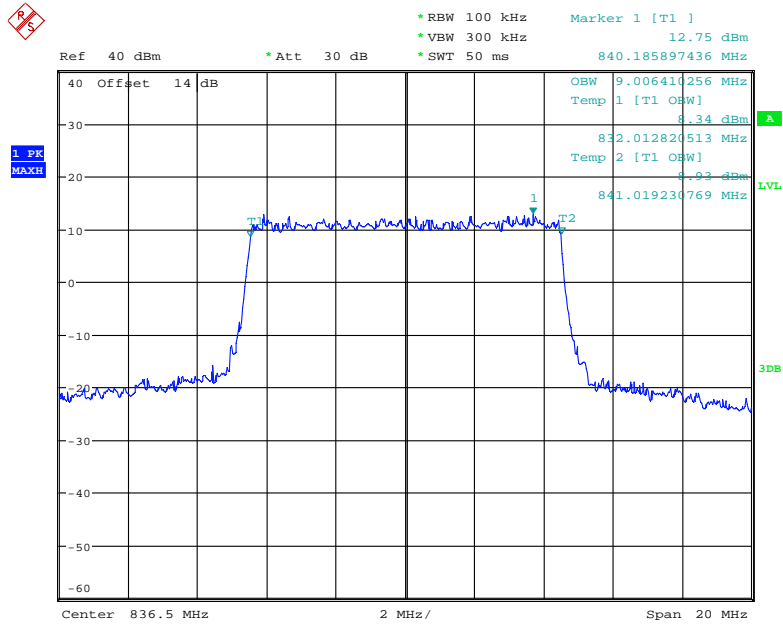
Date: 12.FEB.2018 10:25:39

QPSK (10.0 MHz) - 26 dB Bandwidth, Middle channel



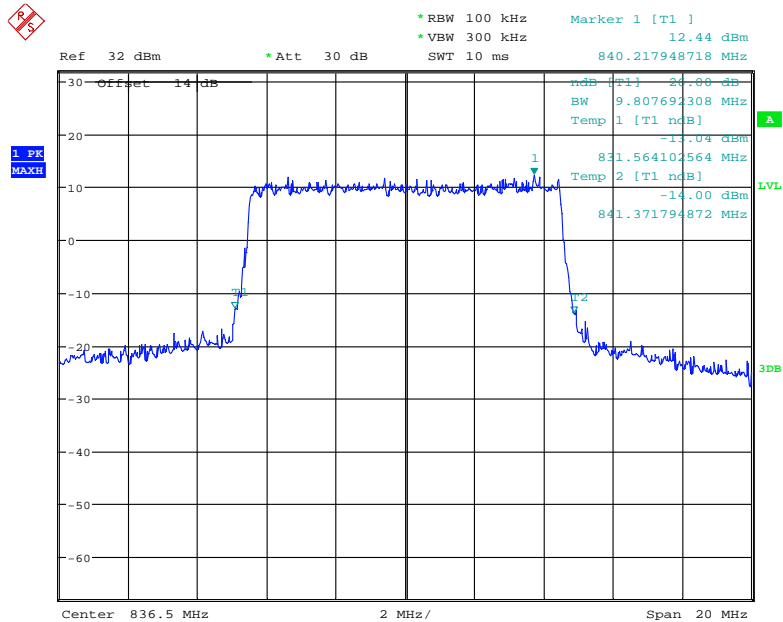
Date: 12.FEB.2018 10:32:17

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



Date: 12.FEB.2018 13:08:17

16-QAM (10.0 MHz) - 26 dB Bandwidth, Middle channel



Date: 12.FEB.2018 10:32:43

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

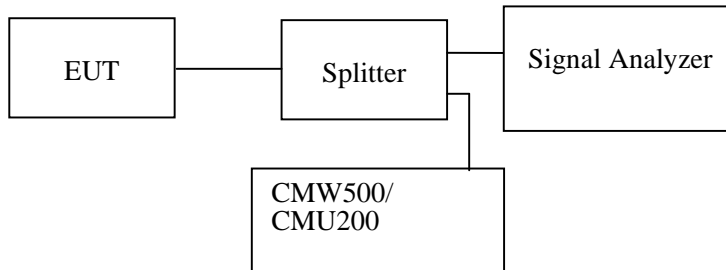
Applicable Standard

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

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:	22~25 °C
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Jacob Kong from 2018-02-12 to 2018-02-23.

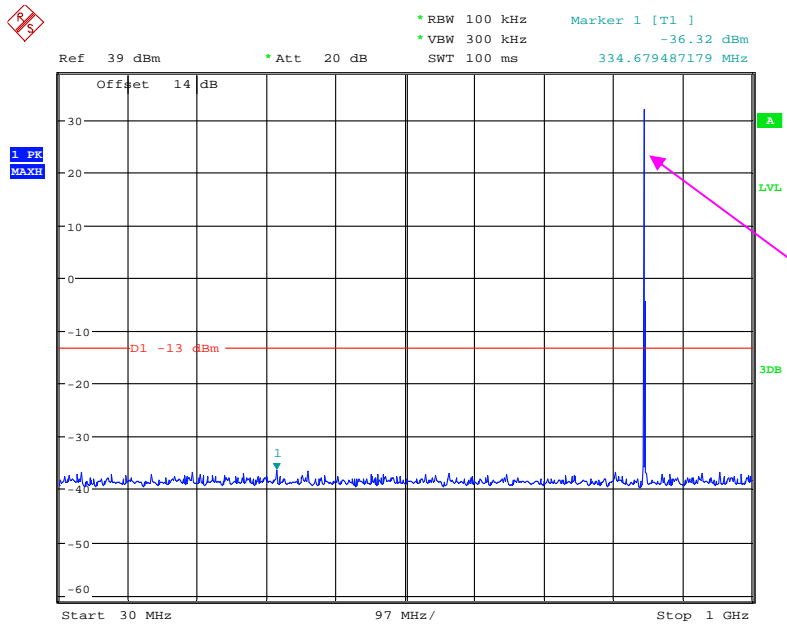
Test result: Compliance,

EUT operation mode: transmitting

Please refer to the following plots.

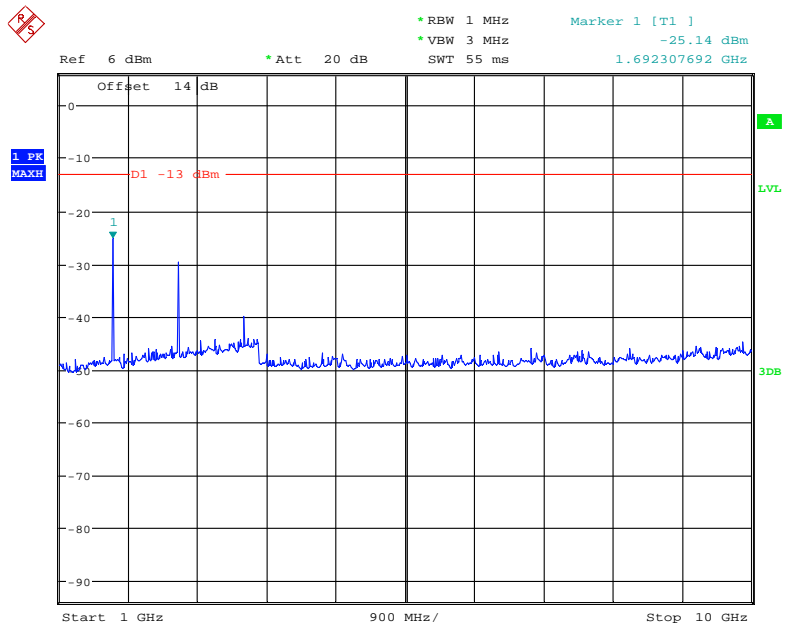
Cellular Band (Part 22H)

30 MHz – 1 GHz (GSM Mode)



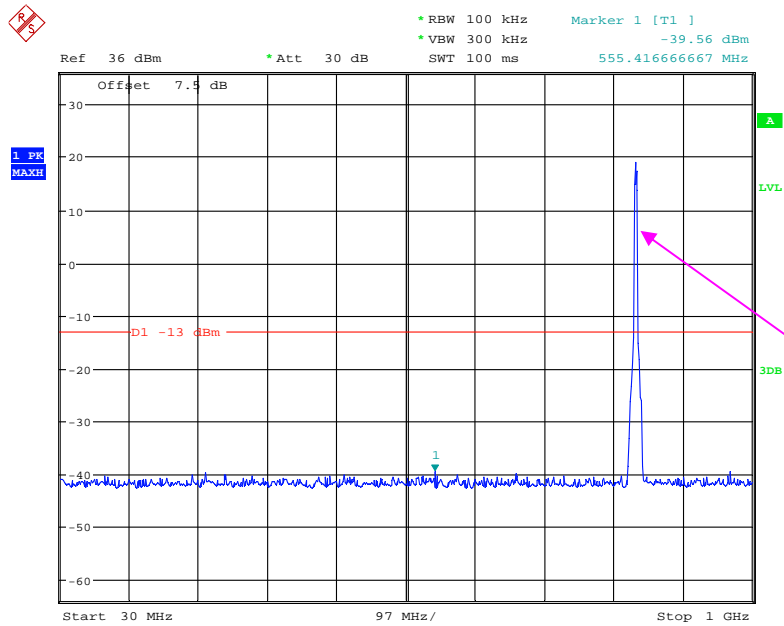
Date: 23.FEB.2018 23:25:08

1 GHz – 10 GHz (GSM Mode)



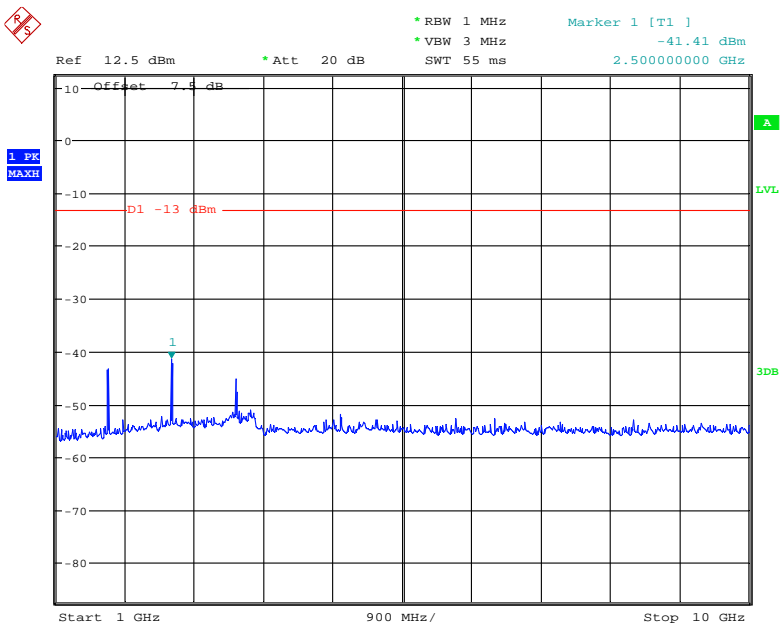
Date: 23.FEB.2018 23:25:45

30 MHz – 1 GHz (WCDMA Mode)



Date: 12.FEB.2018 15:32:40

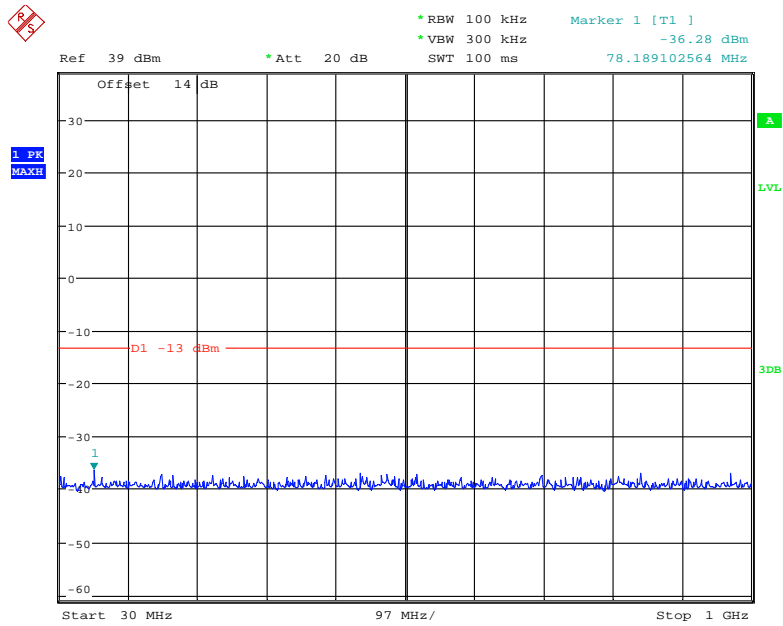
1 GHz – 10 GHz (WCDMA Mode)



Date: 12.FEB.2018 15:33:31

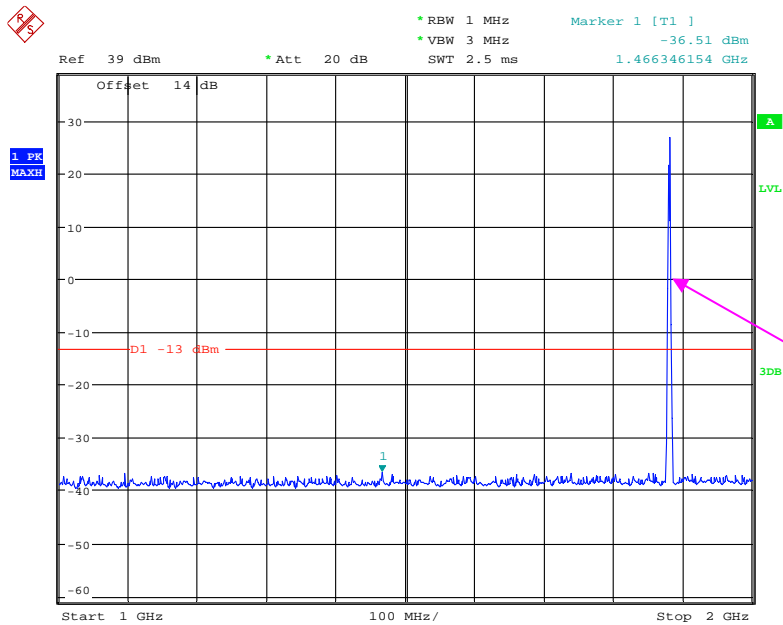
PCS Band (Part 24E)

30 MHz – 1 GHz (GSM Mode)



Date: 23.FEB.2018 23:28:57

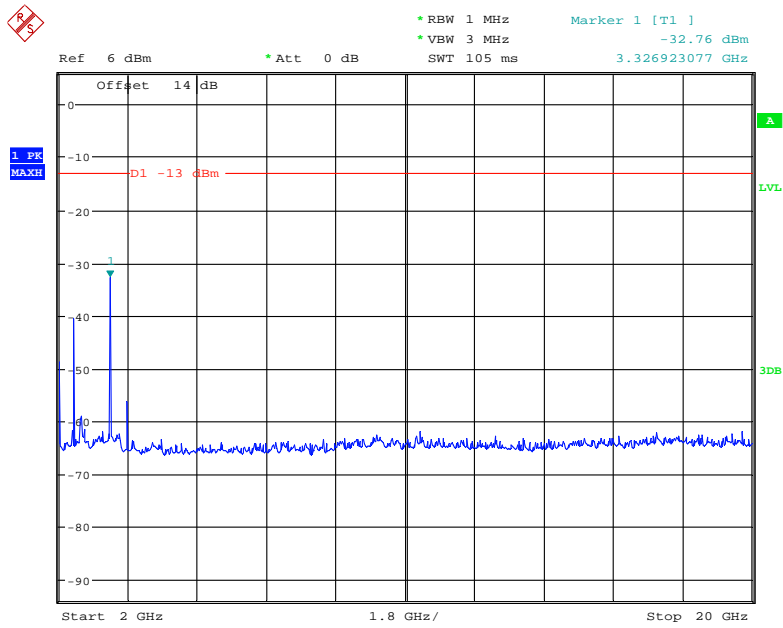
1 GHz – 2 GHz (GSM Mode)



Fundamental test

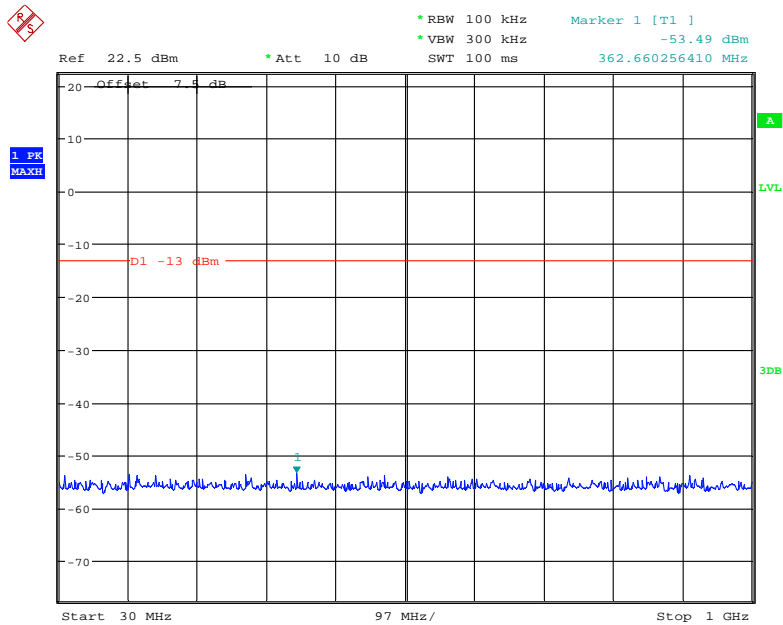
Date: 23.FEB.2018 23:28:23

2 GHz – 20 GHz (GSM Mode)



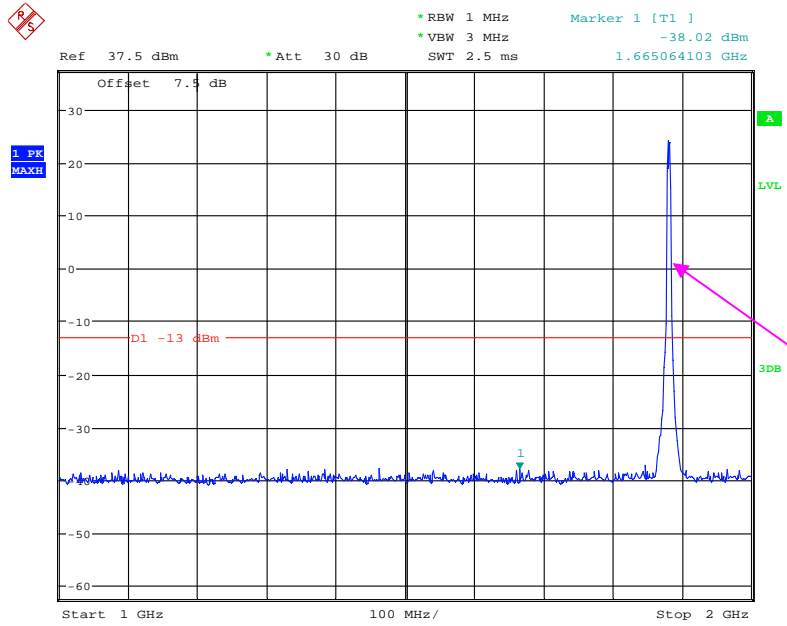
Date: 23.FEB.2018 23:27:28

30 MHz – 1 GHz (WCDMA Mode)



Date: 12.FEB.2018 15:25:48

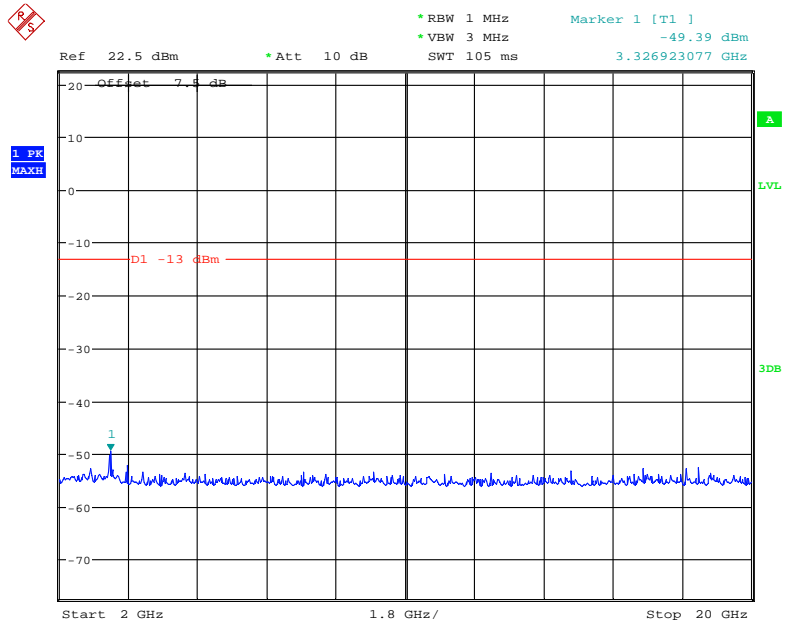
1 GHz – 2 GHz (WCDMA Mode)



Fundamental test

Date: 12.FEB.2018 15:26:40

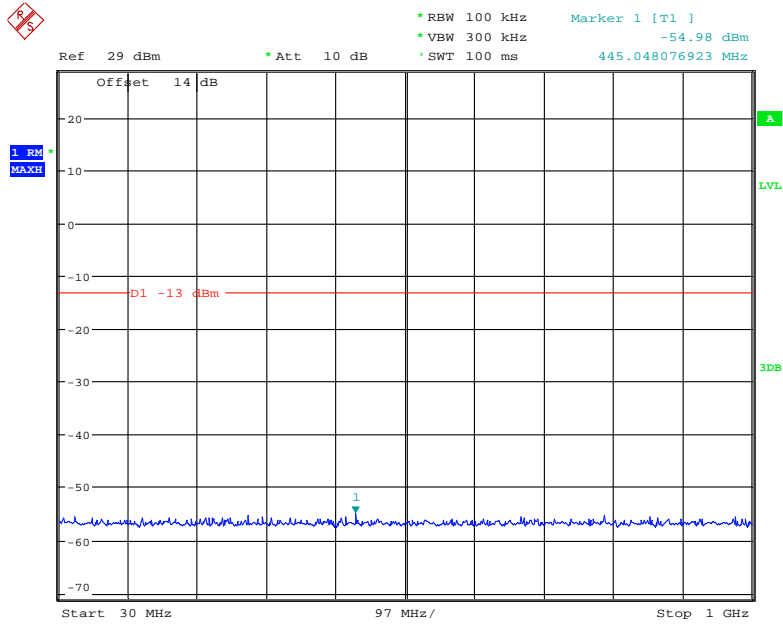
2 GHz – 20 GHz (WCDMA Mode)



Date: 12.FEB.2018 15:27:04

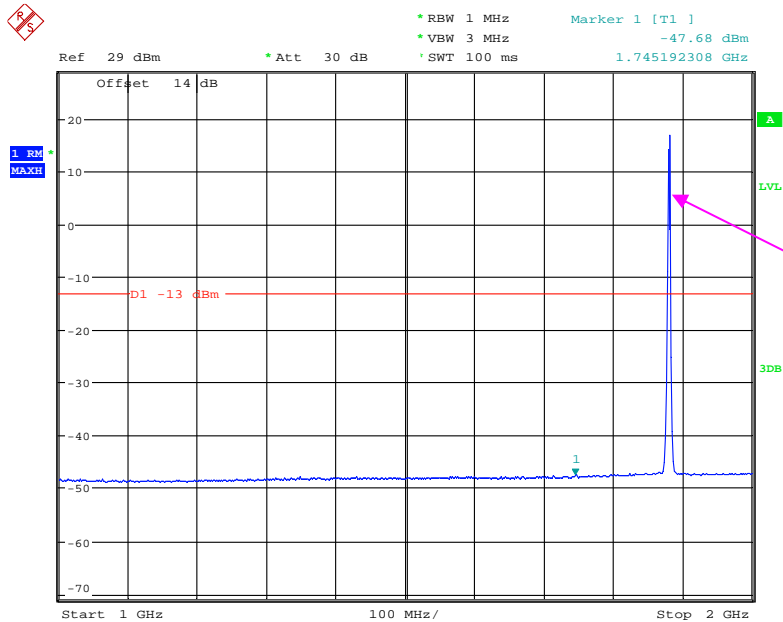
LTE Band 2: (QPSK)

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



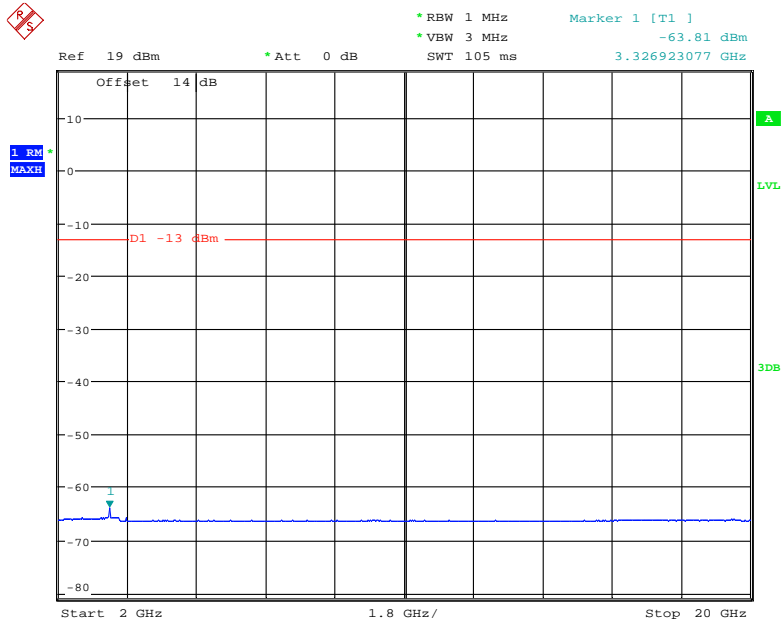
Date: 12.FEB.2018 13:27:41

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



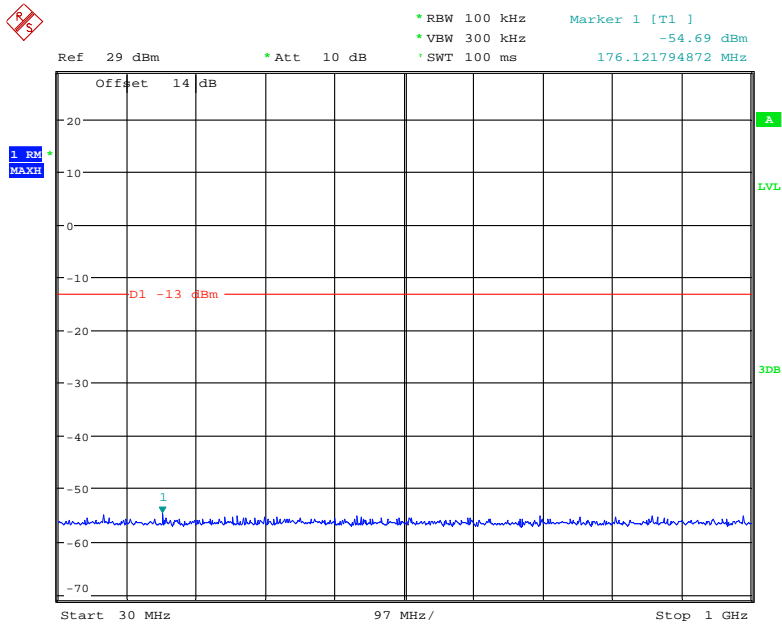
Date: 12.FEB.2018 13:32:13

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



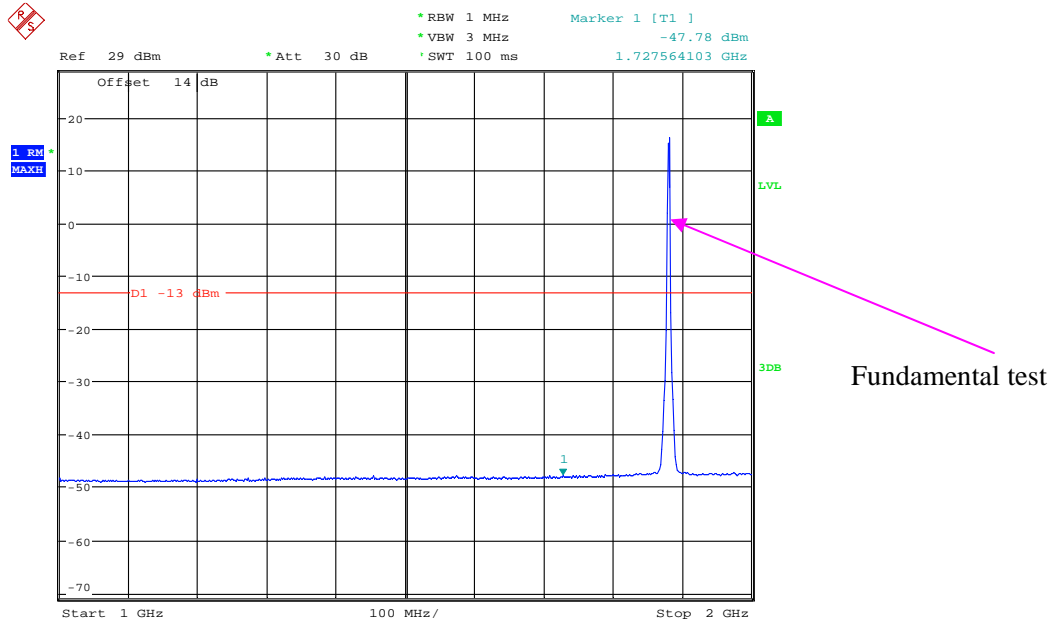
Date: 12.FEB.2018 13:36:04

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



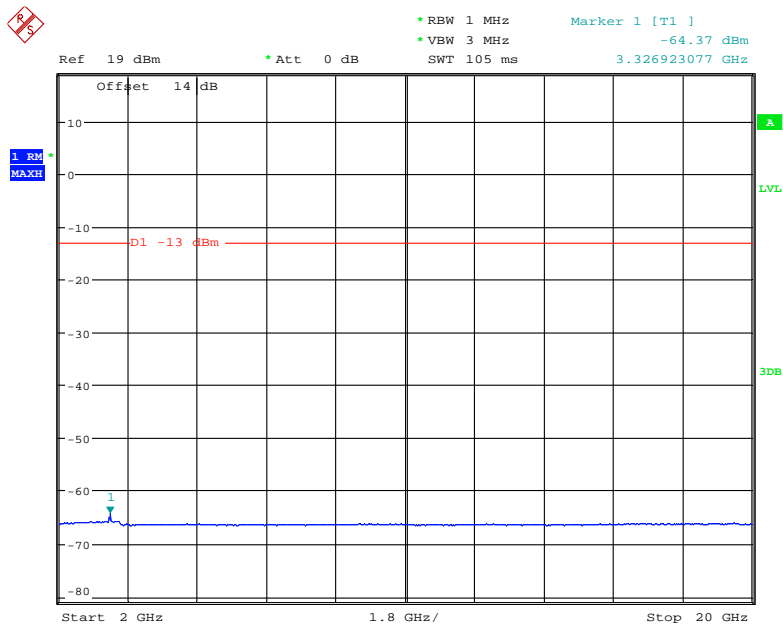
Date: 12.FEB.2018 13:28:55

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



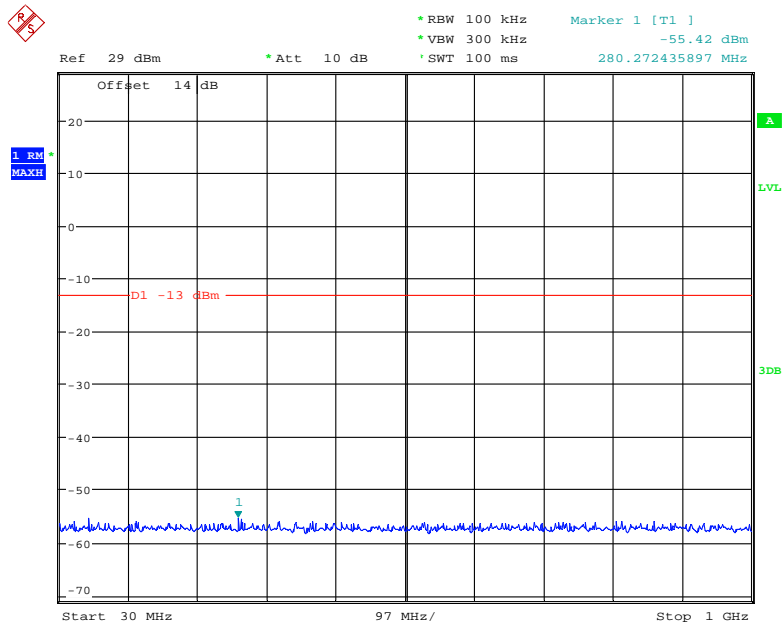
Date: 12.FEB.2018 13:32:49

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



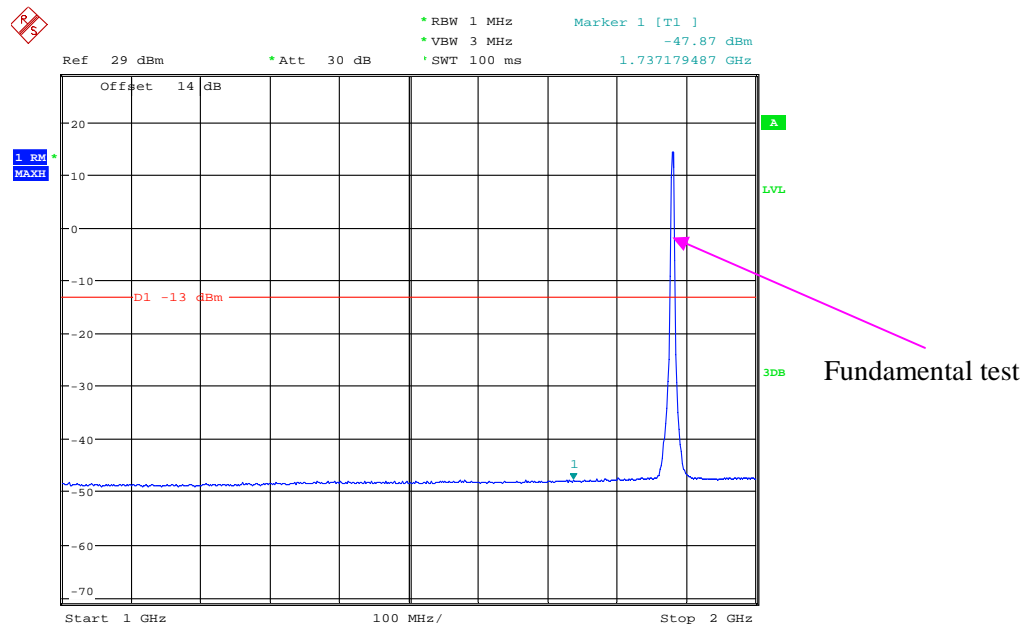
Date: 12.FEB.2018 13:36:30

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



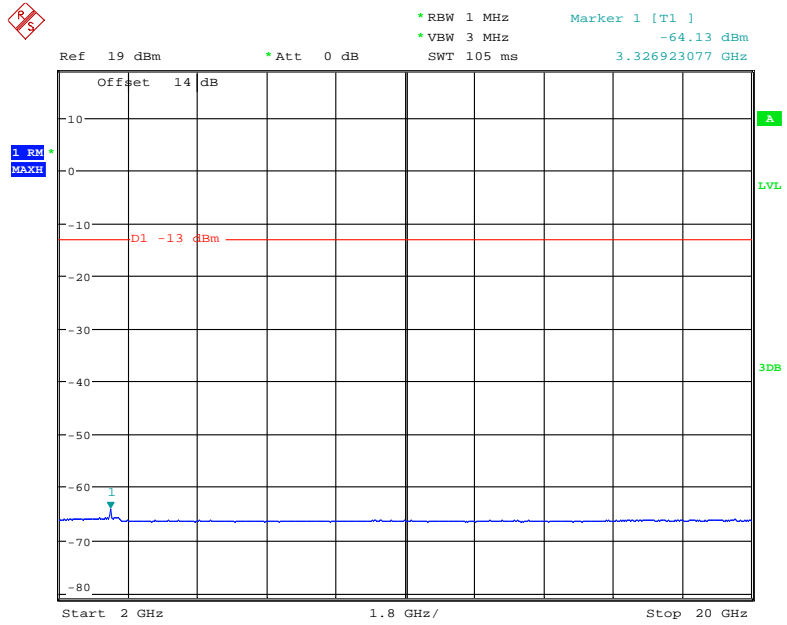
Date: 12.FEB.2018 13:29:11

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



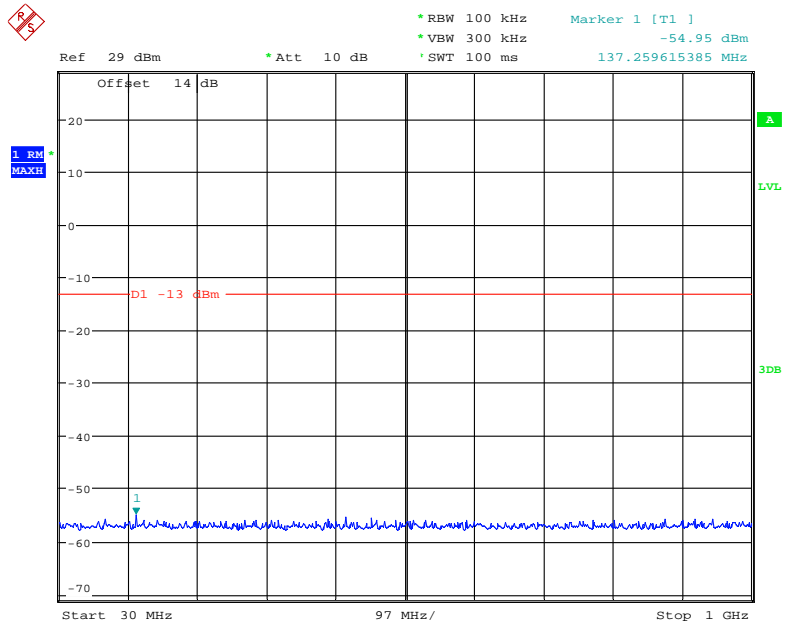
Date: 12.FEB.2018 13:33:14

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



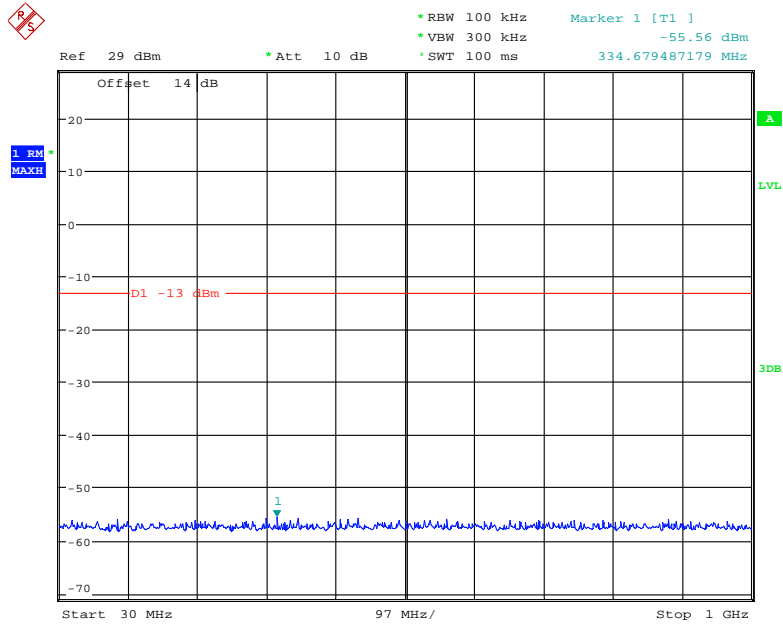
Date: 12.FEB.2018 13:36:46

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



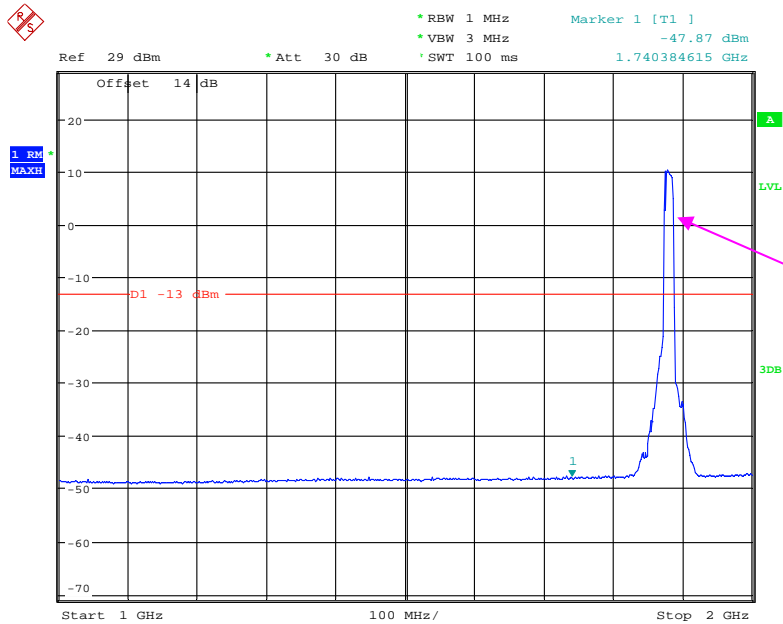
Date: 12.FEB.2018 13:29:29

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



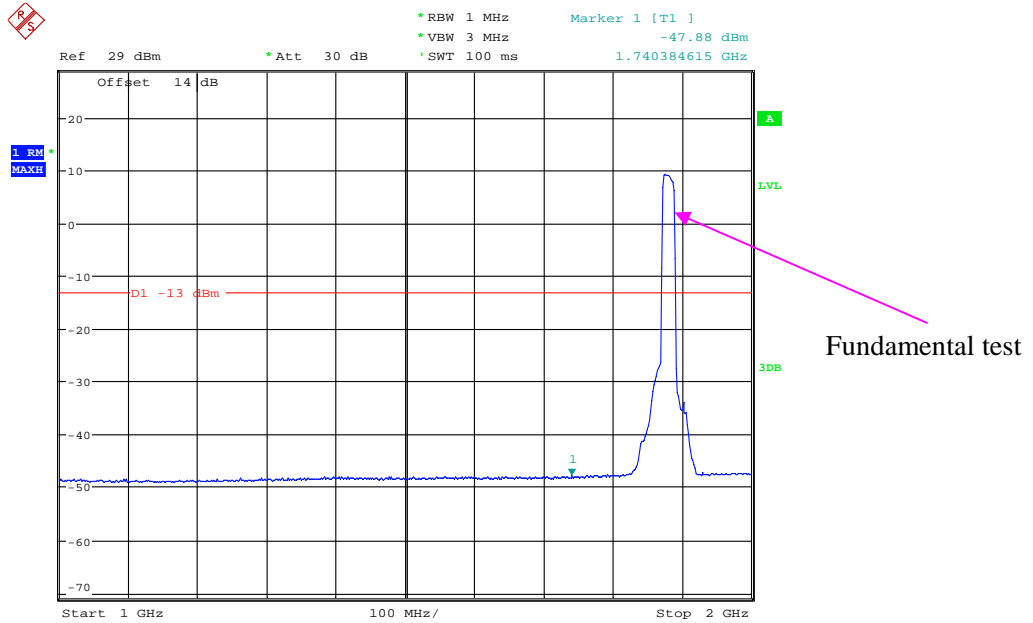
Date: 12.FEB.2018 13:29:44

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



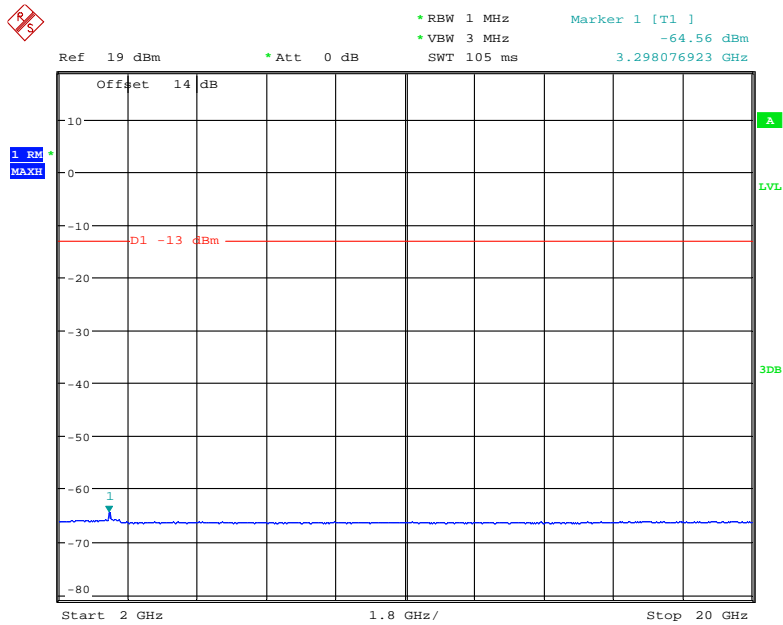
Date: 12.FEB.2018 13:34:22

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



Date: 12.FEB.2018 13:34:47

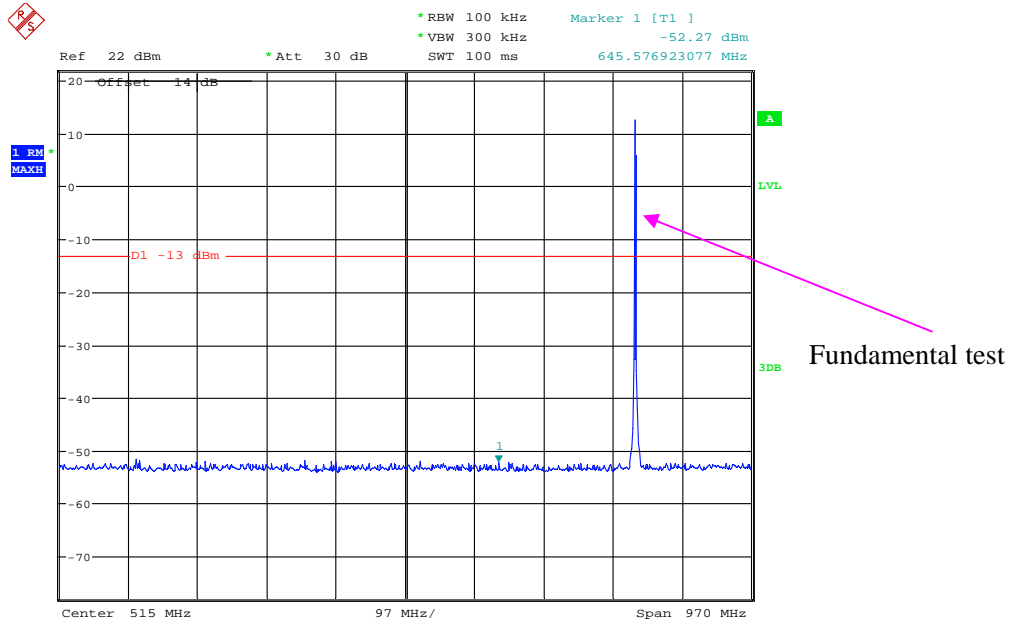
2 GHz - 20 GHz (20.0 MHz, Middle Channel)



Date: 12.FEB.2018 13:37:30

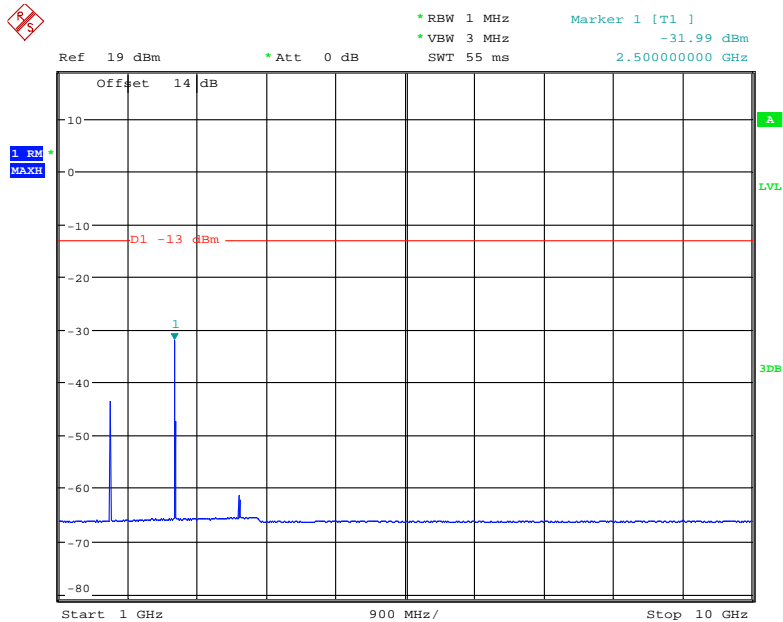
LTE Band 5: (QPSK)

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



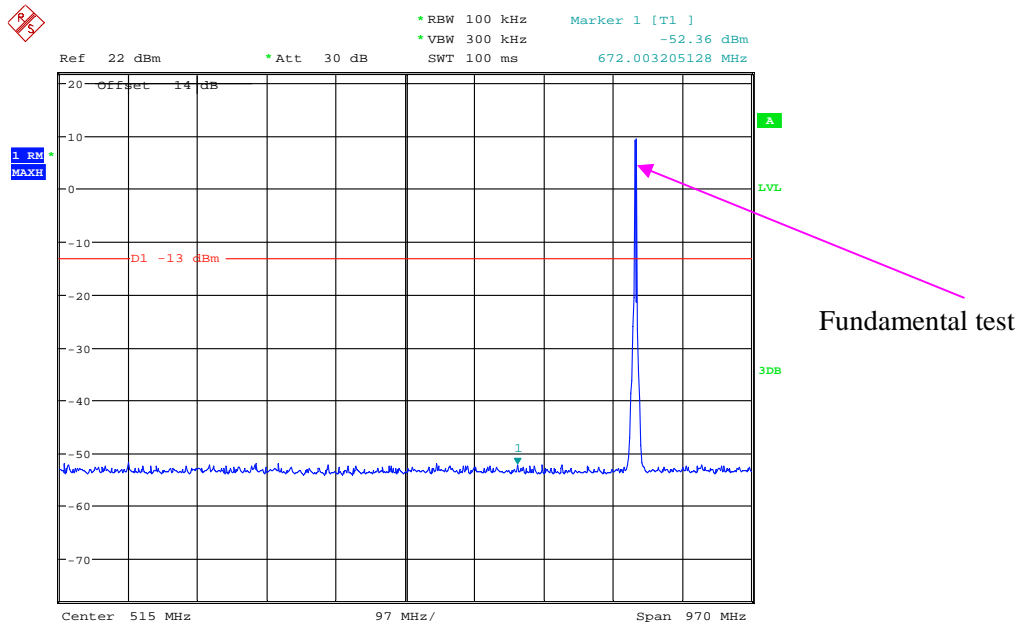
Date: 12.FEB.2018 13:42:04

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



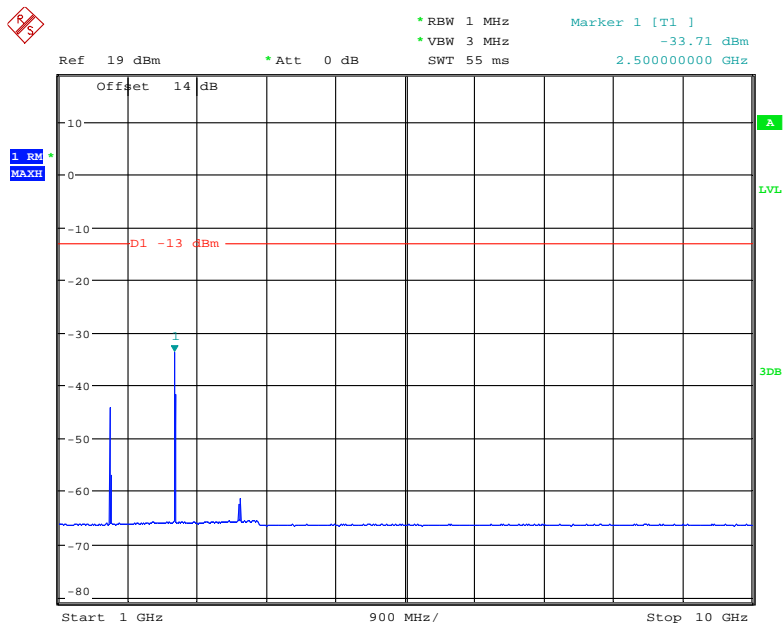
Date: 12.FEB.2018 13:39:09

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



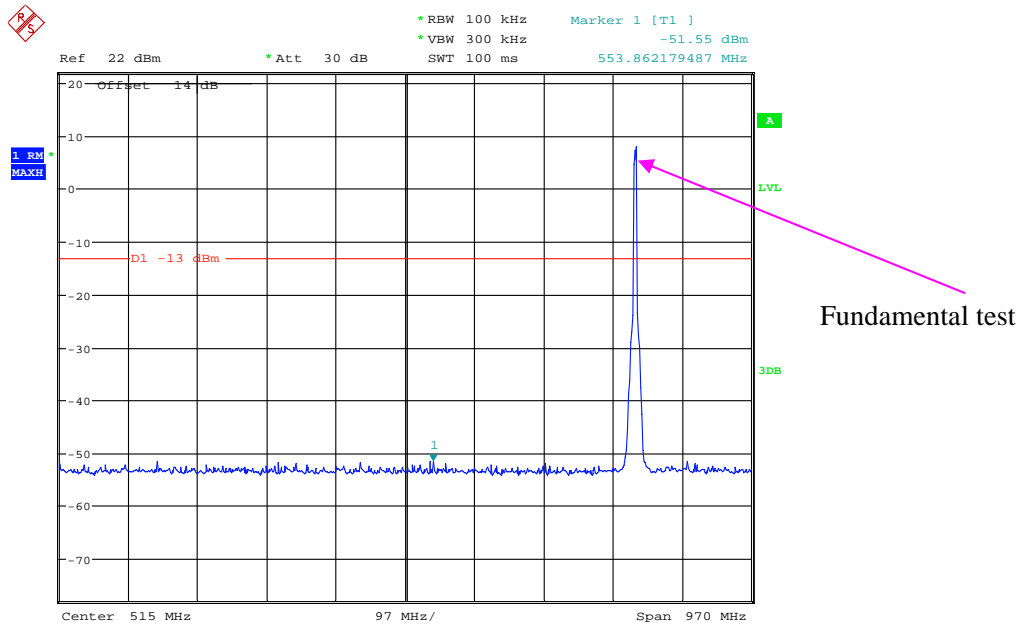
Date: 12.FEB.2018 13:42:27

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



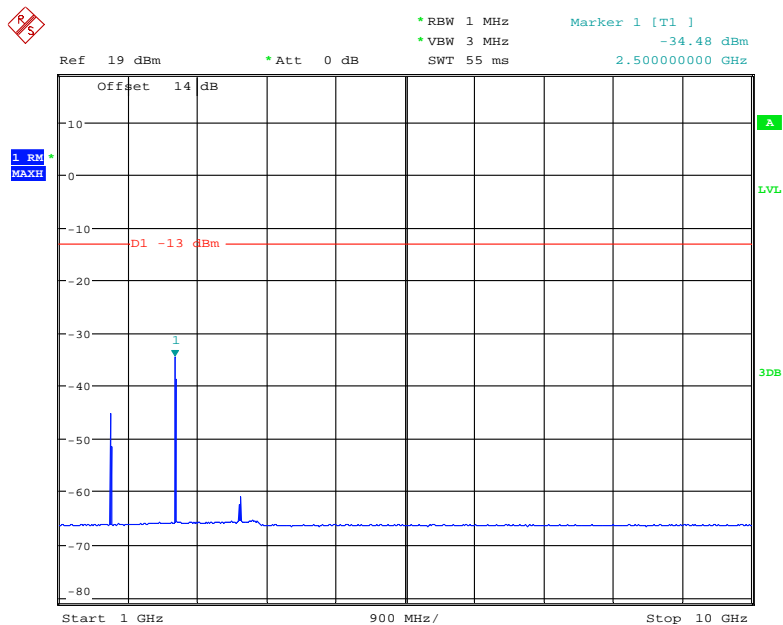
Date: 12.FEB.2018 13:39:37

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



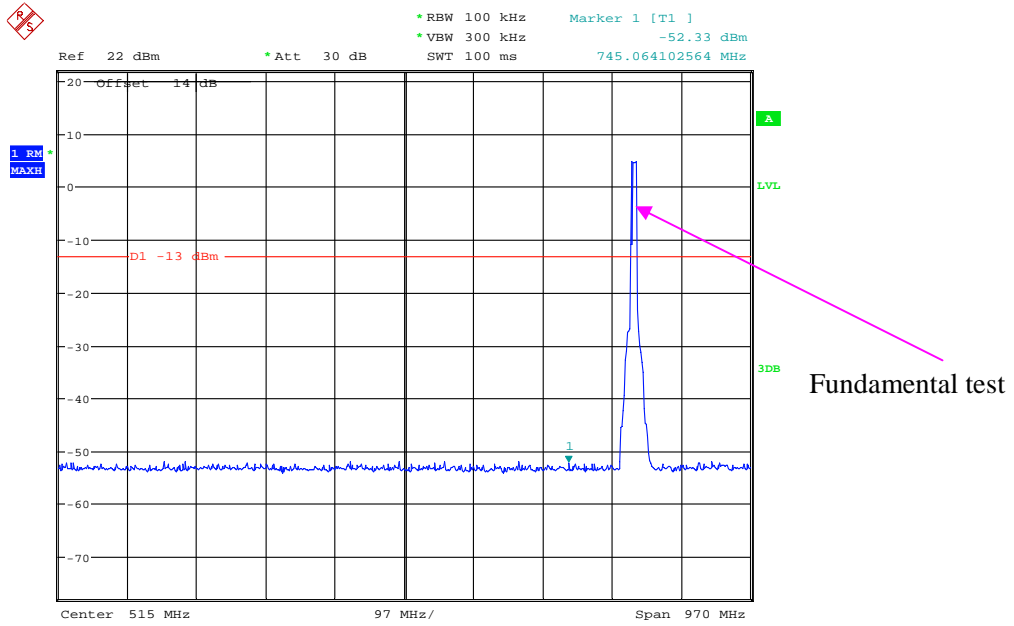
Date: 12.FEB.2018 13:42:50

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



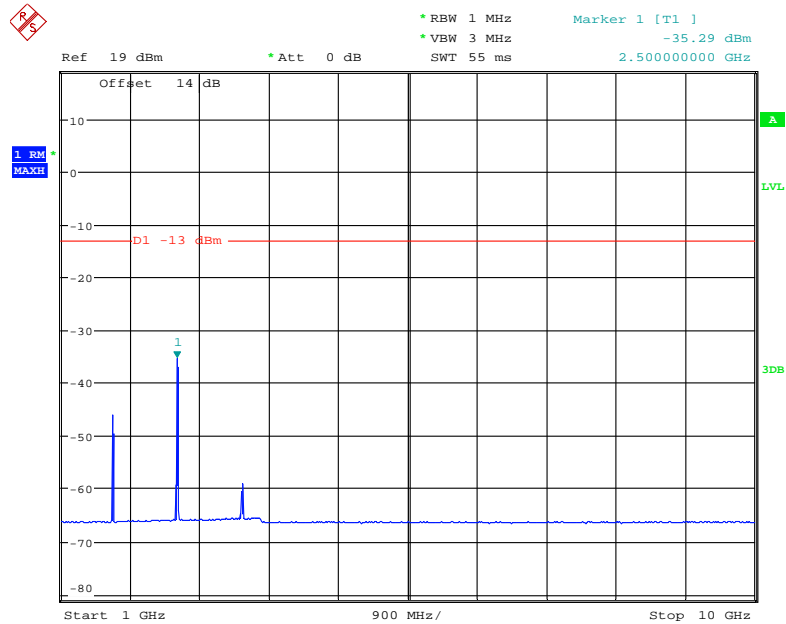
Date: 12.FEB.2018 13:39:54

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



Date: 12.FEB.2018 13:41:08

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



Date: 12.FEB.2018 13:40:09

FCC § 2.1053; § 22.917 (a);§ 24.238 (a)- SPURIOUS RADIATED EMISSIONS**Applicable Standard**

FCC § 2.1053, §22.917(a) and § 24.238(a)

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:	22 °C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Jacob Kong on 2018-02-13.

EUT operation mode: Transmitting

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

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)
GSM Mode, Middle channel										
916.33	34.31	27	2.4	H	-62.7	0.70	0	-63.40	-13	50.40
916.33	33.60	299	1.8	V	-63.4	0.70	0	-64.10	-13	51.10
1673.20	57.1	90	2.3	H	-50.0	1.30	8.90	-42.40	-13	29.40
1673.20	59.64	87	1.9	V	-46.8	1.30	8.90	-39.20	-13	26.20
2509.80	45.77	264	1.6	H	-57.8	2.60	10.20	-50.20	-13	37.20
2509.80	51.39	189	1.5	V	-51.5	2.60	10.20	-43.90	-13	30.90
3346.40	45.22	194	2.4	H	-55.1	1.50	11.70	-44.90	-13	31.90
3346.40	46.23	55	1.7	V	-54.1	1.50	11.70	-43.90	-13	30.90
WCDMA Mode, Middle channel										
916.33	34.24	196	2.2	H	-62.8	0.70	0	-63.50	-13	50.50
916.33	33.70	58	1.1	V	-63.3	0.70	0	-64.00	-13	51.00
1673.20	45.22	167	2.1	H	-61.9	1.30	8.90	-54.30	-13	41.30
1673.20	44.16	301	1.6	V	-62.3	1.30	8.90	-54.70	-13	41.70
2509.80	48.47	177	2.0	H	-55.1	2.60	10.20	-47.50	-13	34.50
2509.80	46.71	114	2.1	V	-56.2	2.60	10.20	-48.60	-13	35.60
3346.40	42.71	311	2.4	H	-57.6	1.50	11.70	-47.40	-13	34.40
3346.40	42.55	350	1.9	V	-57.8	1.50	11.70	-47.60	-13	34.60

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)
GSM Mode, Middle channel										
916.33	33.36	70	1.4	H	-63.6	0.70	0	-64.30	-13	51.30
916.33	33.86	213	1.8	V	-63.1	0.70	0	-63.80	-13	50.80
3760.00	58.51	304	2.0	H	-42.7	1.50	11.80	-32.40	-13	19.40
3760.00	62.67	318	2.4	V	-38.1	1.50	11.80	-27.80	-13	14.80
9400.00	51.08	153	2.2	H	-44.2	2.20	11.50	-34.90	-13	21.90
9400.00	54.51	61	2.3	V	-41.0	2.20	11.50	-31.70	-13	18.70
WCDMA Mode, Middle channel										
916.33	33.51	76	1.7	H	-63.5	0.70	0	-64.20	-13	51.20
916.33	34.79	244	1.2	V	-62.2	0.70	0	-62.90	-13	49.90
3760.00	46.77	339	2.1	H	-54.5	1.50	11.80	-44.20	-13	31.20
3760.00	47.62	201	2.0	V	-53.1	1.50	11.80	-42.80	-13	29.80

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

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)			
Band 2, Middle channel, QPSK, 1.4MHz										
Test frequency range: 30 MHz ~ 20 GHz										
916.33	33.96	324	2.2	H	-63.0	0.70	0	-63.70	-13	50.70
916.33	34.21	200	1.1	V	-62.8	0.70	0	-63.50	-13	50.50
3760.00	45.37	150	1.8	H	-55.9	1.50	11.80	-45.60	-13	32.60
3760.00	48.82	98	1.0	V	-51.9	1.50	11.80	-41.60	-13	28.60
Band 5, Middle channel, QPSK, 1.4MHz										
Test frequency range: 30 MHz ~ 10 GHz										
916.33	33.07	108	1.8	H	-63.9	0.70	0	-64.60	-13	51.60
916.33	34.64	12	2.0	V	-62.4	0.70	0	-63.10	-13	50.10
1673.00	44.38	319	1.2	H	-62.7	1.30	8.90	-55.10	-13	42.10
1673.00	45.29	312	1.1	V	-61.2	1.30	8.90	-53.60	-13	40.60
2509.50	44.54	328	2.5	H	-59.0	2.60	10.20	-51.40	-13	38.40
2509.50	46.21	102	2.4	V	-56.7	2.60	10.20	-49.10	-13	36.10

Note:

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

FCC § 22.917 (a); § 24.238 (a) - BAND EDGES

Applicable Standard

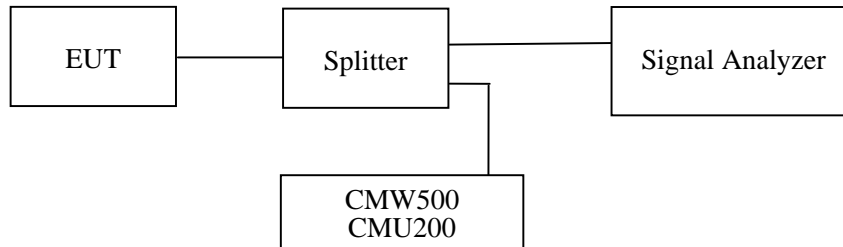
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

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.

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

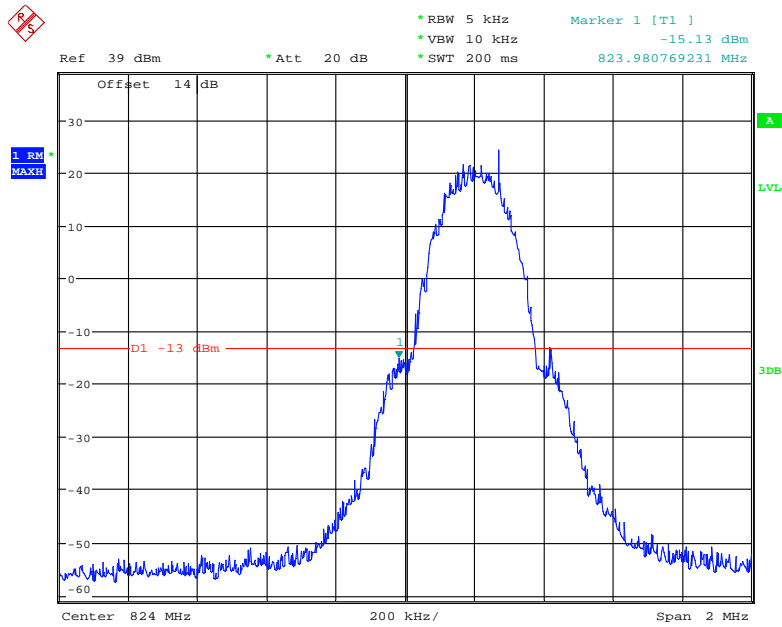
Temperature:	22~25 °C
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Jacob Kong from 2018-02-12 to 2018-03-06.

EUT operation mode: Transmitting

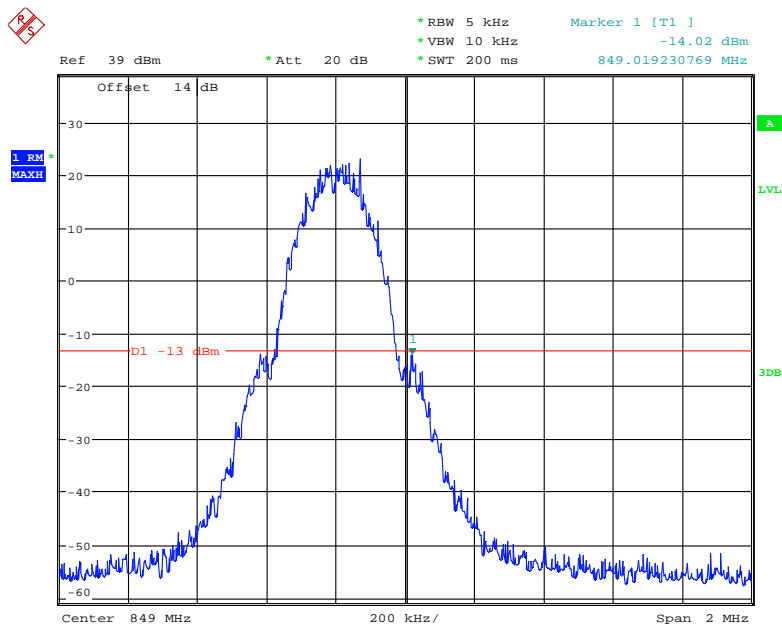
Test Result: Compliance. Please refer to the following plots.

Cellular Band, Left Band Edge for GSM (GMSK) Mode



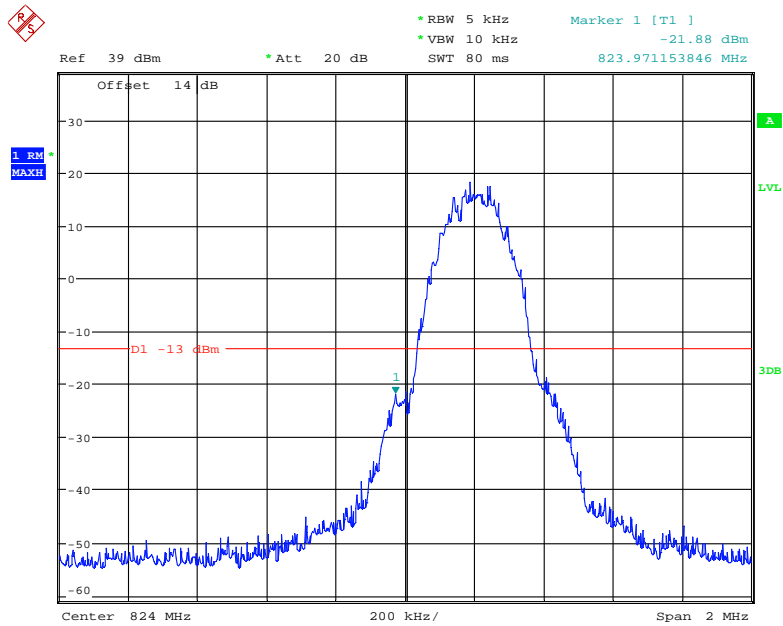
Date: 23.FEB.2018 23:21:16

Cellular Band, Right Band Edge for GSM (GMSK) Mode



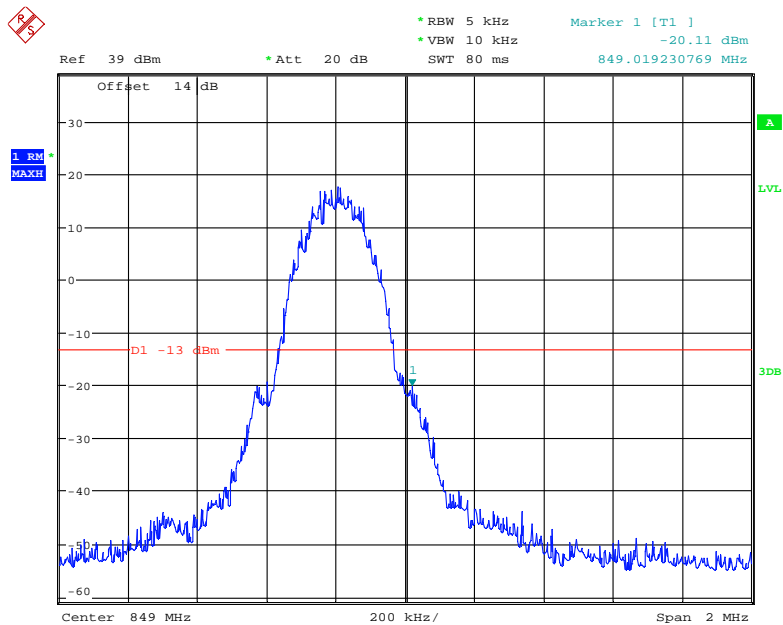
Date: 23.FEB.2018 23:22:10

Cellular Band, Left Band Edge for EDGE Mode



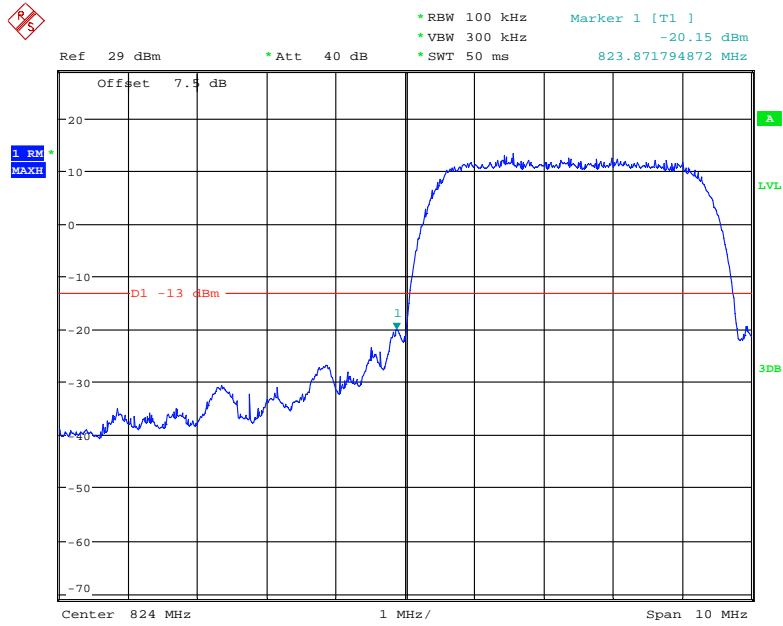
Date: 24.FEB.2018 00:46:41

Cellular Band, Right Band Edge for EDGE Mode



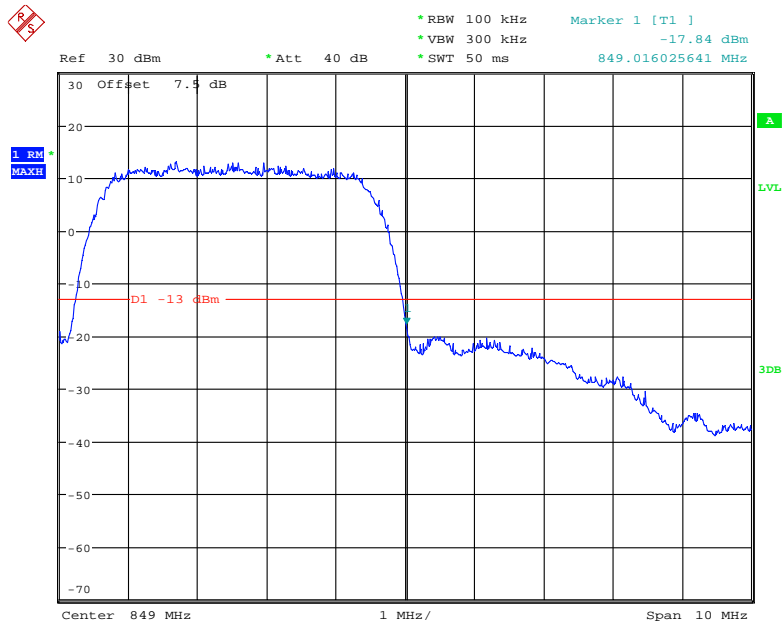
Date: 24.FEB.2018 00:47:23

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



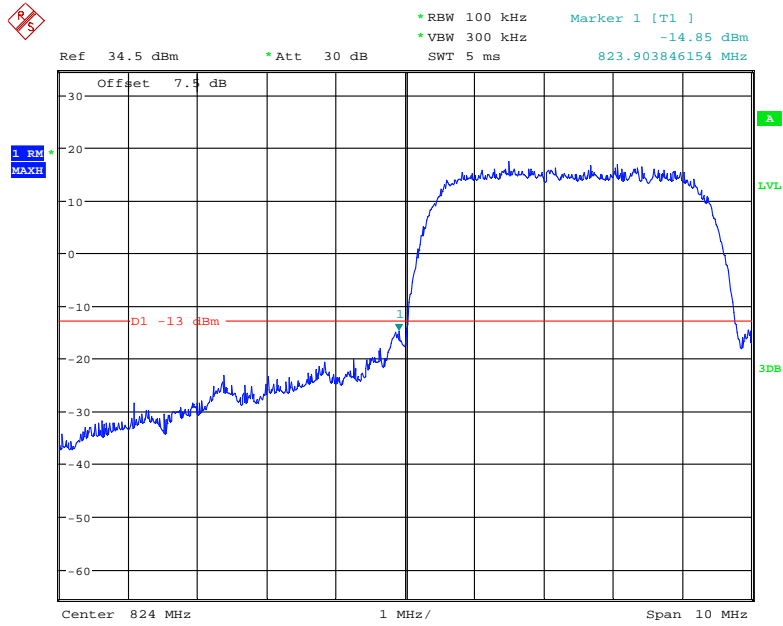
Date: 12.FEB.2018 15:35:17

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



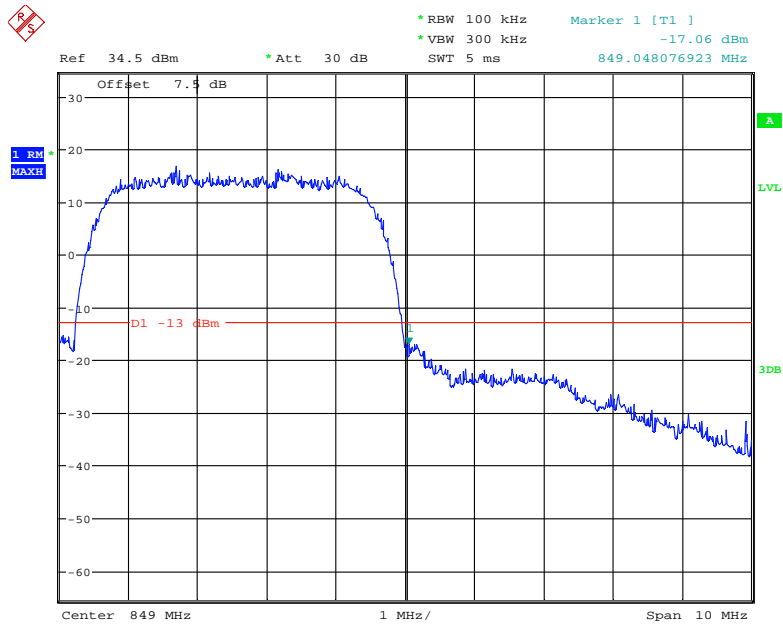
Date: 12.FEB.2018 15:35:55

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



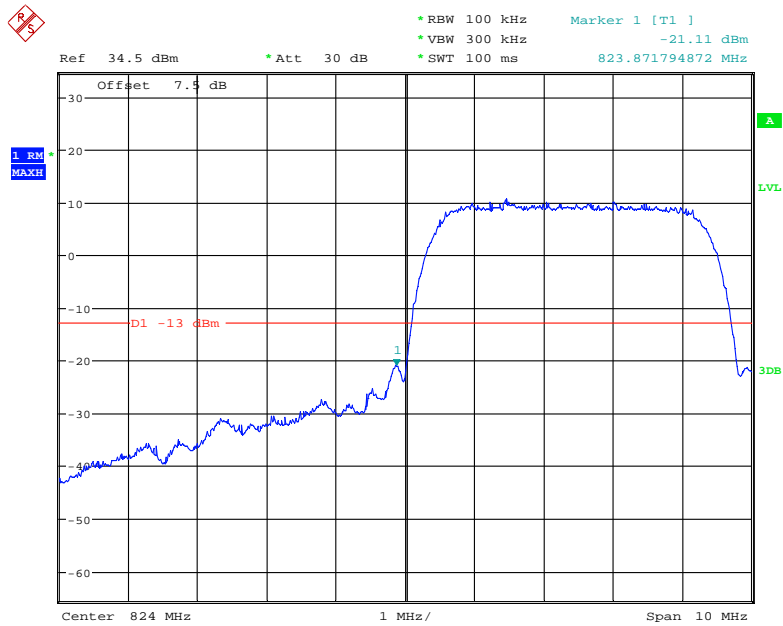
Date: 12.FEB.2018 15:45:02

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



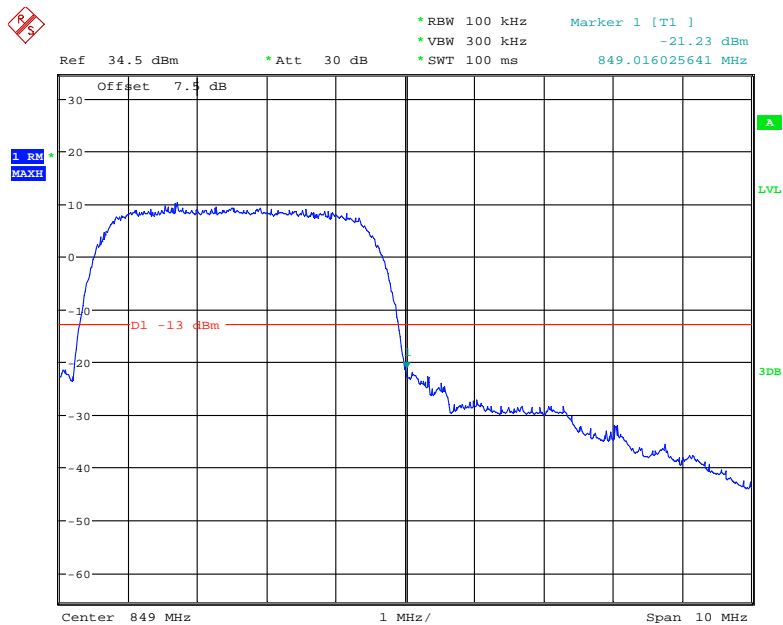
Date: 12.FEB.2018 15:45:57

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



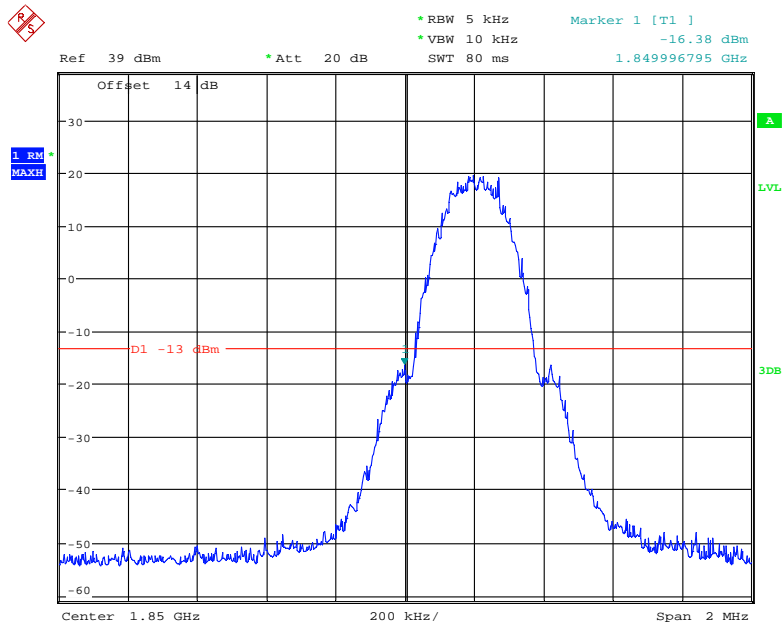
Date: 12.FEB.2018 15:59:13

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



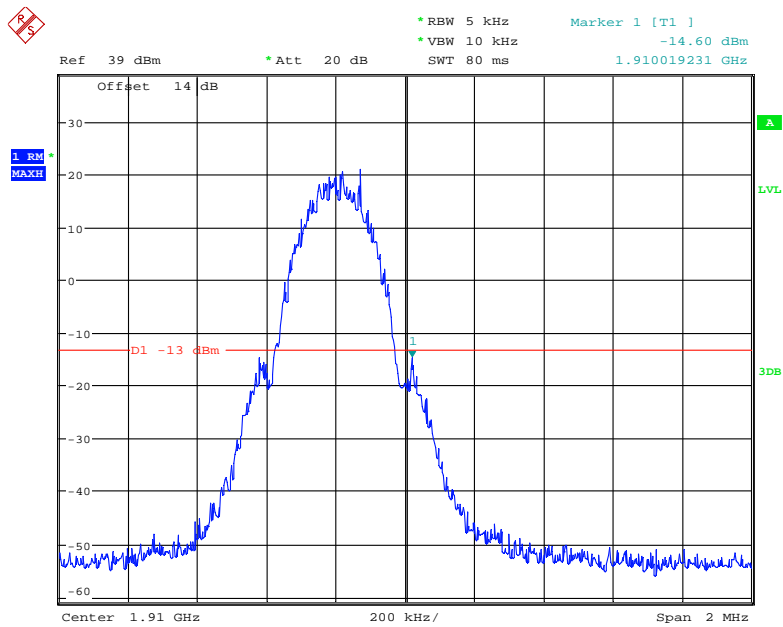
Date: 12.FEB.2018 15:59:56

PCS Band, Left Band Edge for GSM (GMSK) Mode



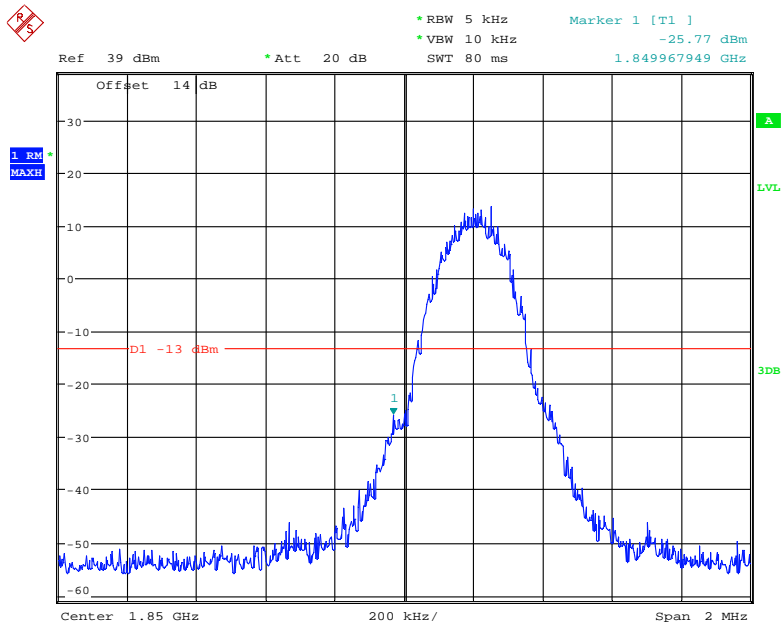
Date: 23.FEB.2018 23:18:36

PCS Band, Right Band Edge for GSM (GMSK) Mode



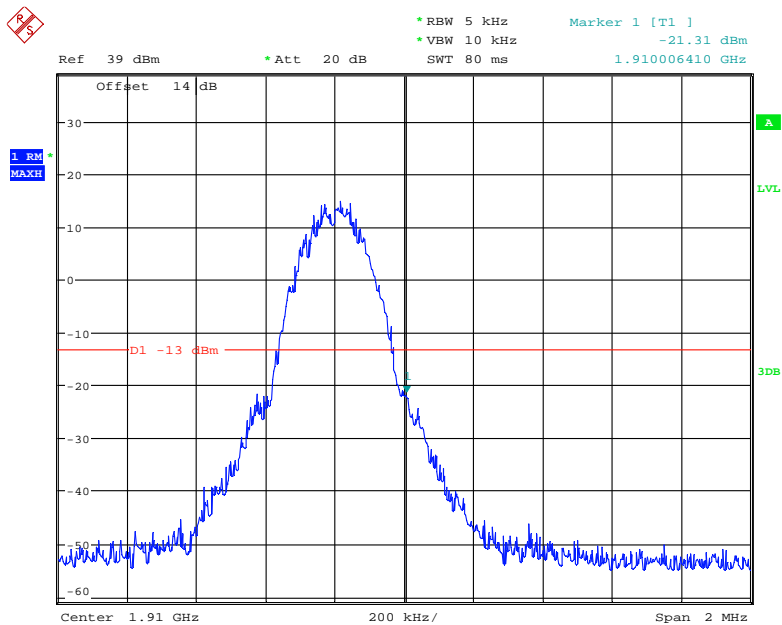
Date: 23.FEB.2018 23:19:18

PCS Band, Left Band Edge for EDGE Mode



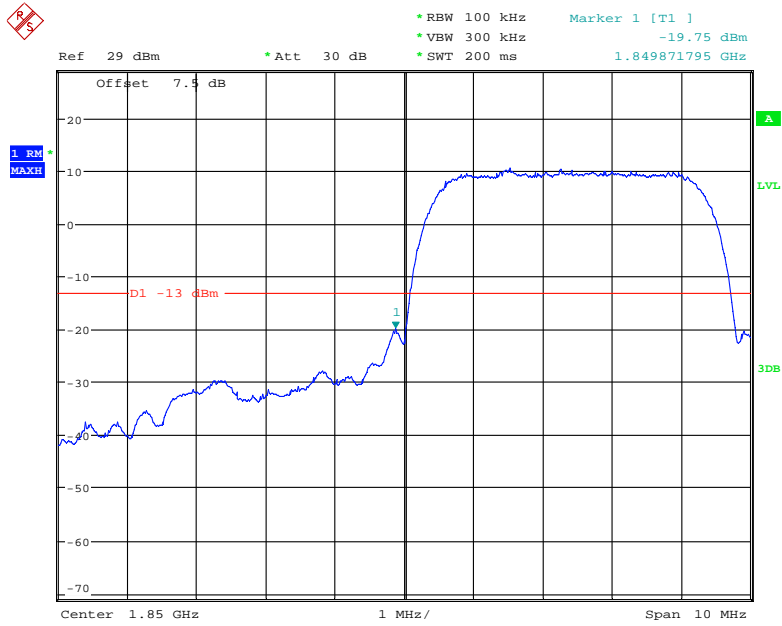
Date: 24.FEB.2018 00:51:43

PCS Band, Right Band Edge for EDGE Mode



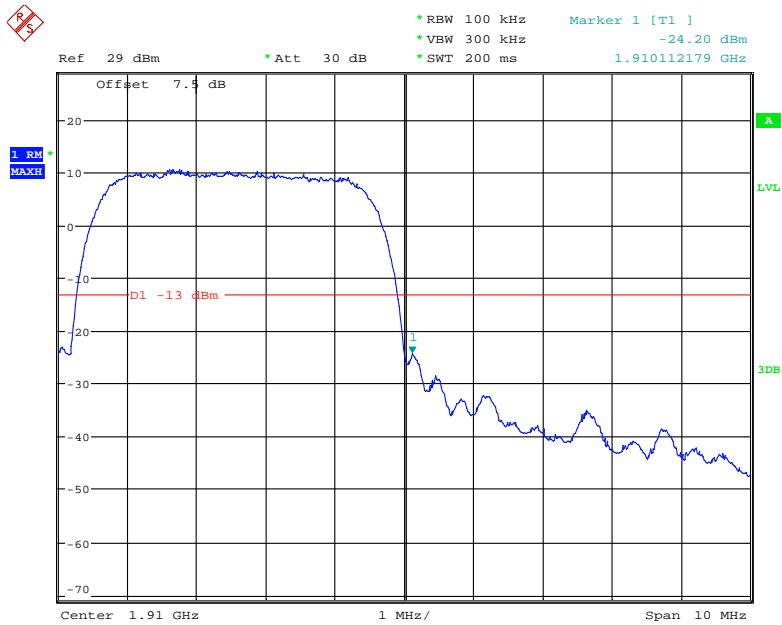
Date: 24.FEB.2018 00:53:05

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



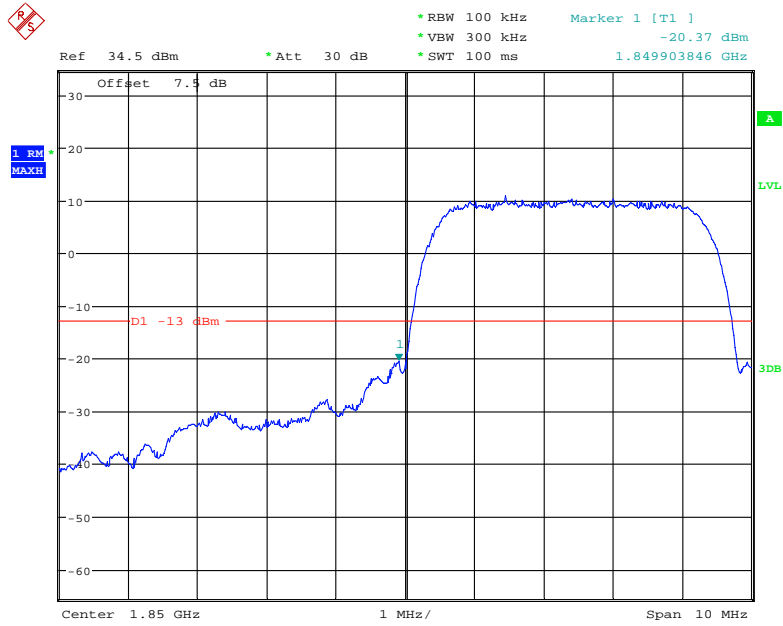
Date: 12.FEB.2018 15:28:34

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



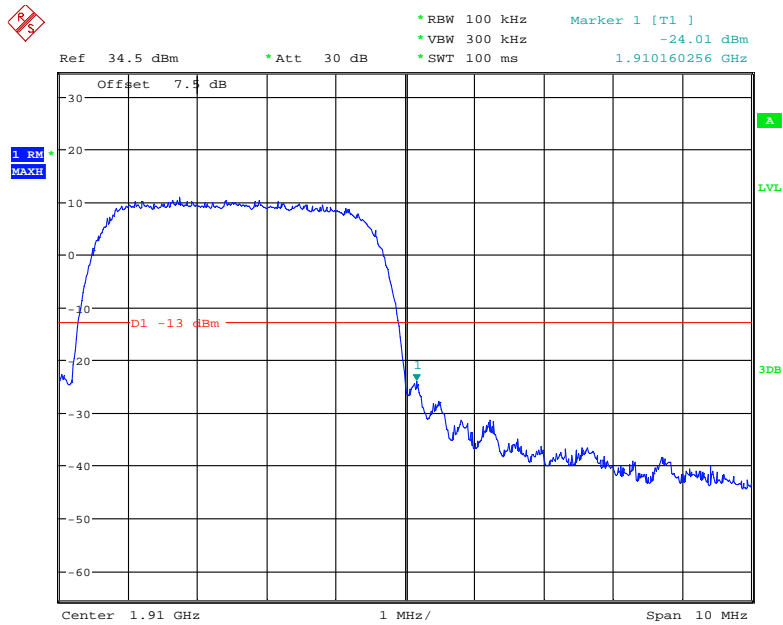
Date: 12.FEB.2018 15:29:17

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



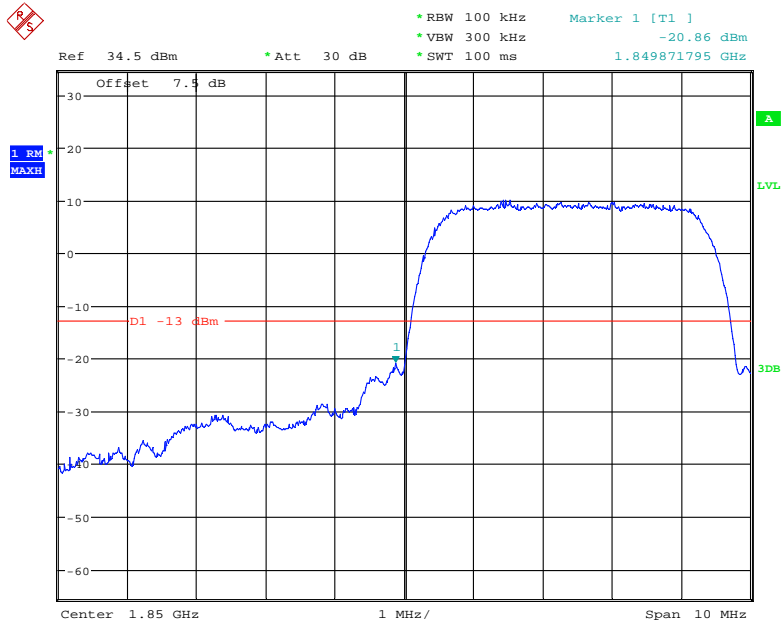
Date: 12.FEB.2018 15:50:49

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



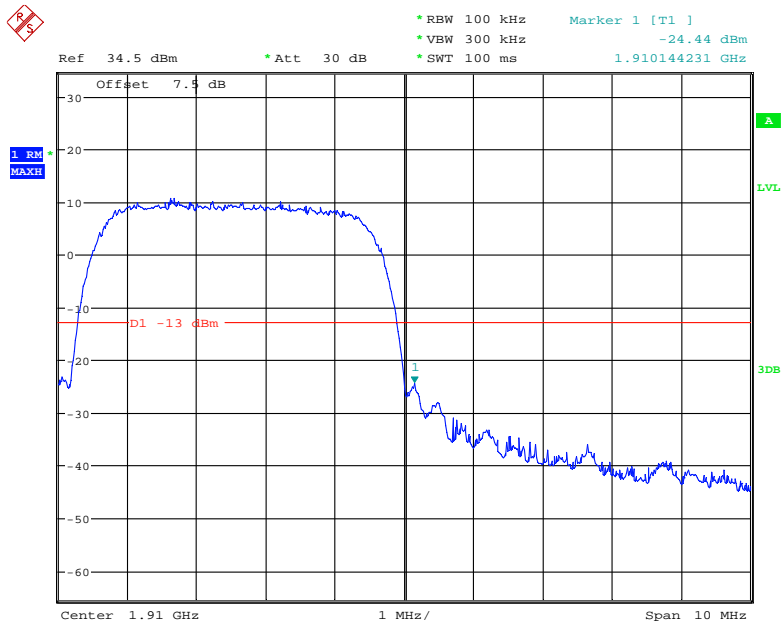
Date: 12.FEB.2018 15:51:31

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



Date: 12.FEB.2018 16:01:48

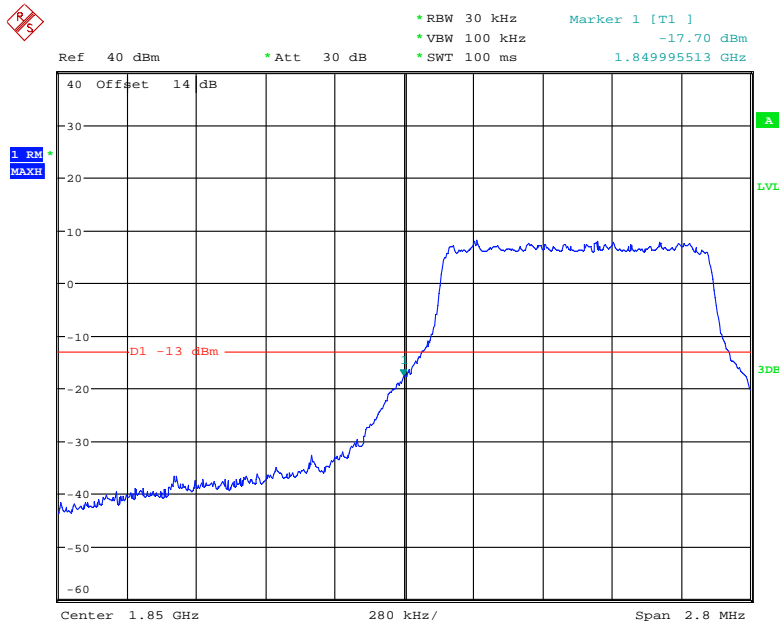
PCS Band, Right Band Edge for HSUPA (BPSK) Mode



Date: 12.FEB.2018 16:00:48

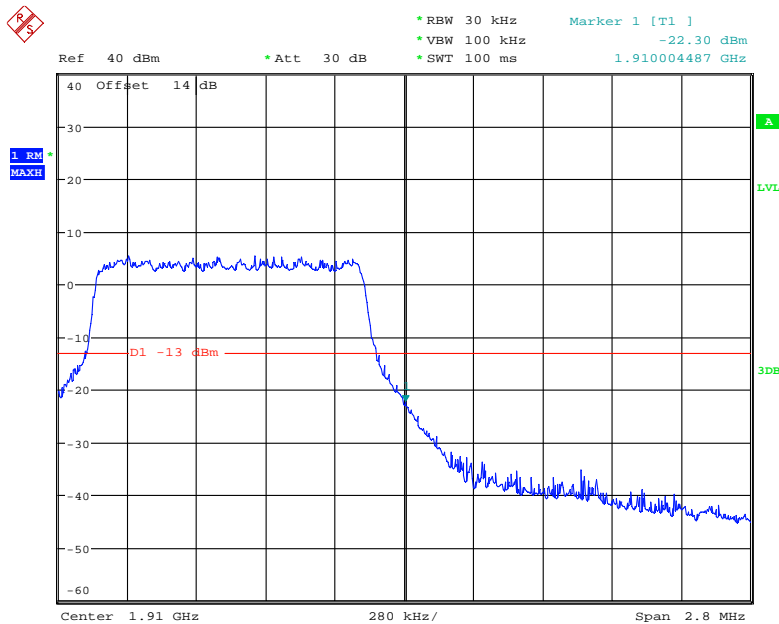
LTE Band 2:

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



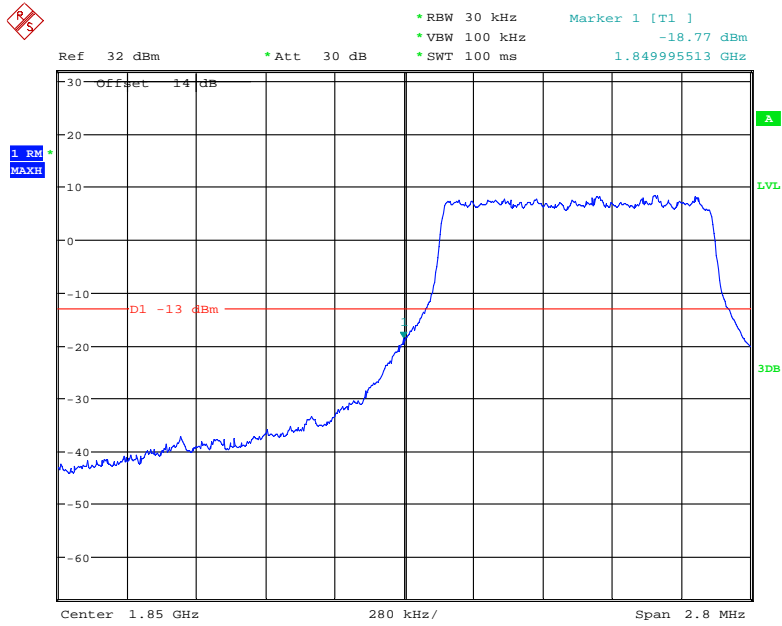
Date: 12.FEB.2018 10:53:13

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



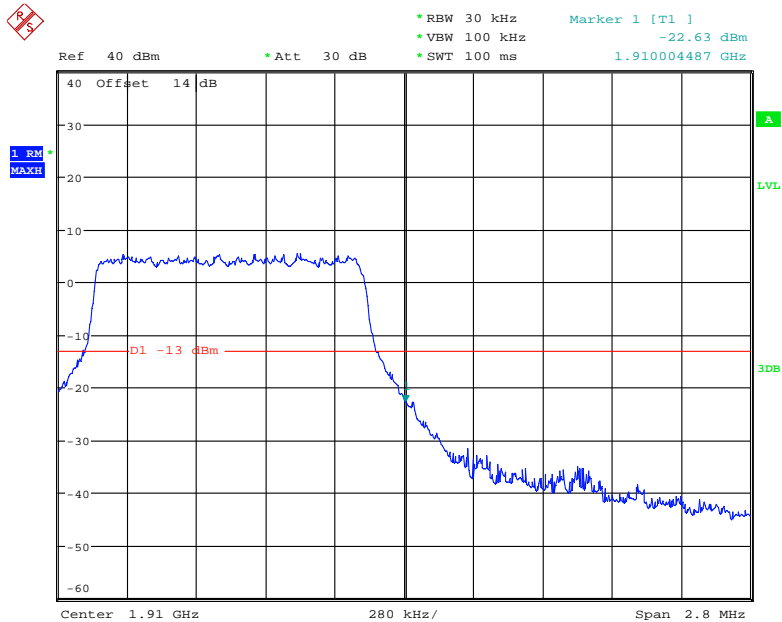
Date: 12.FEB.2018 10:52:26

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



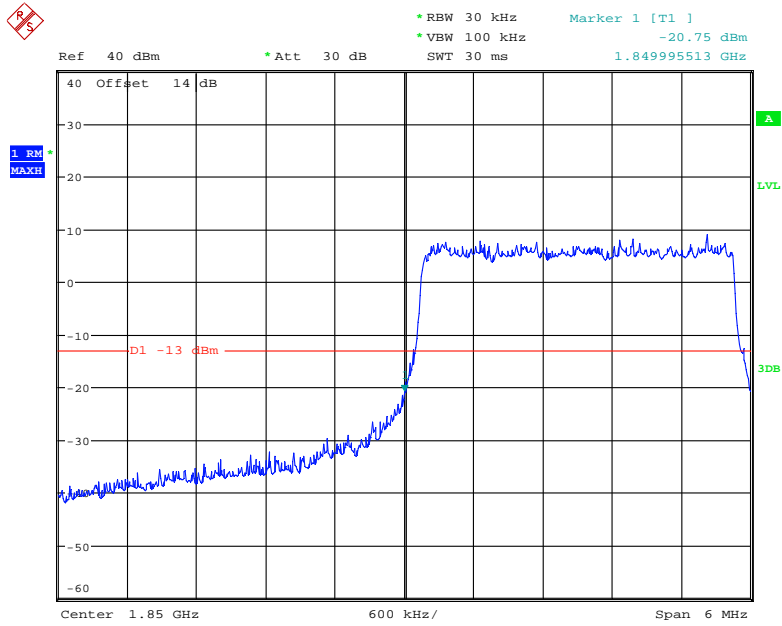
Date: 12.FEB.2018 10:48:03

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



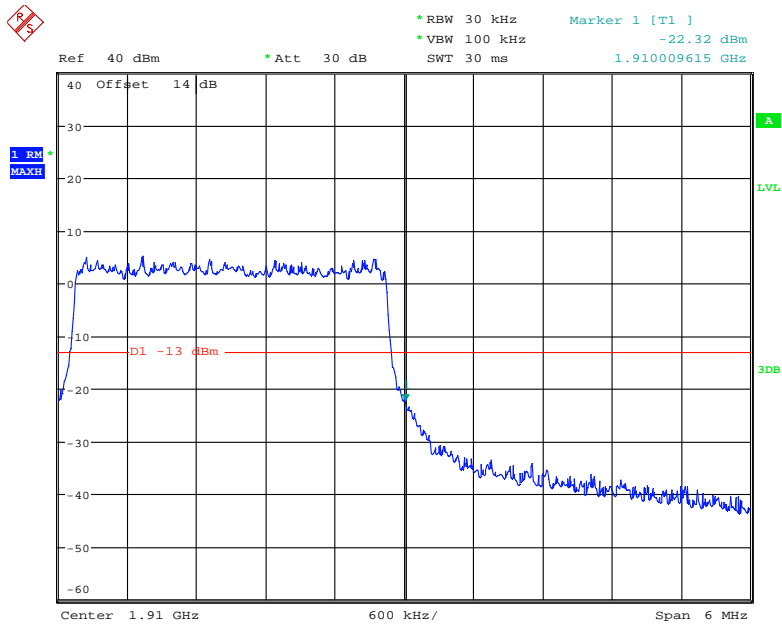
Date: 12.FEB.2018 10:51:28

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



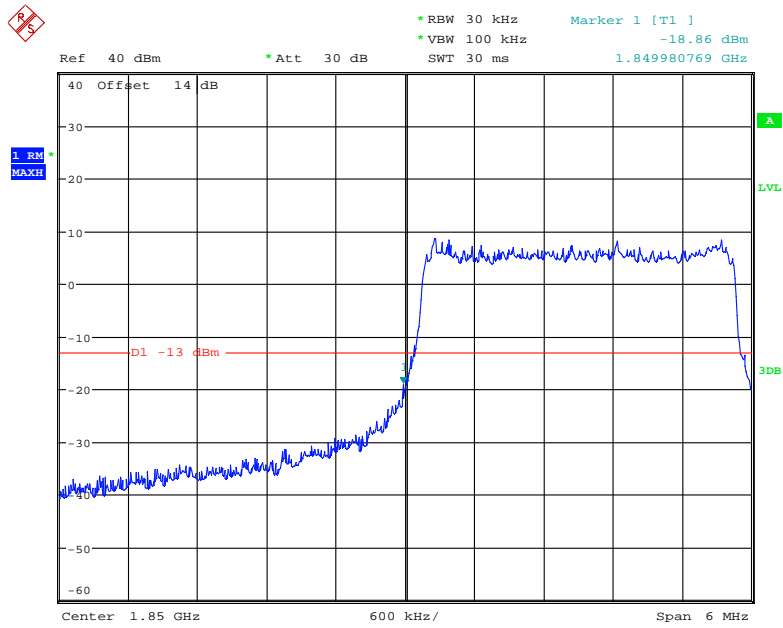
Date: 12.FEB.2018 10:58:05

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



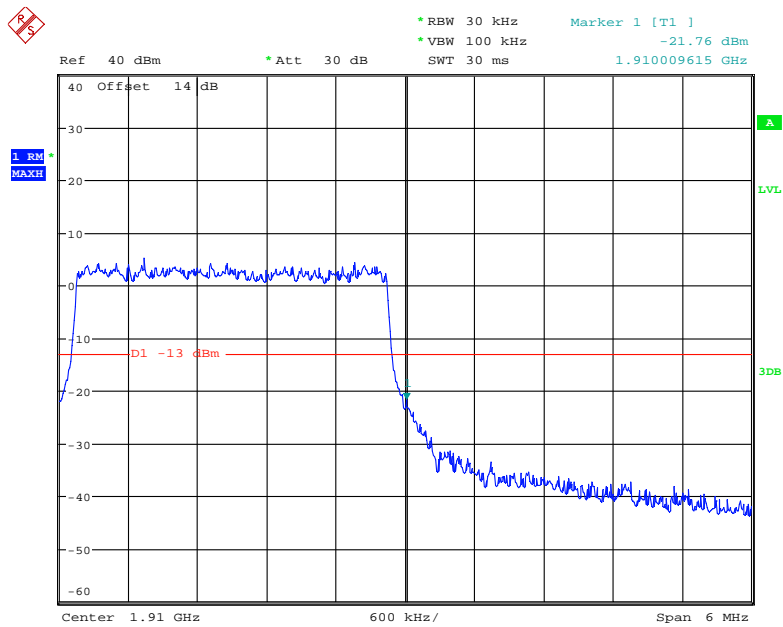
Date: 12.FEB.2018 10:59:35

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



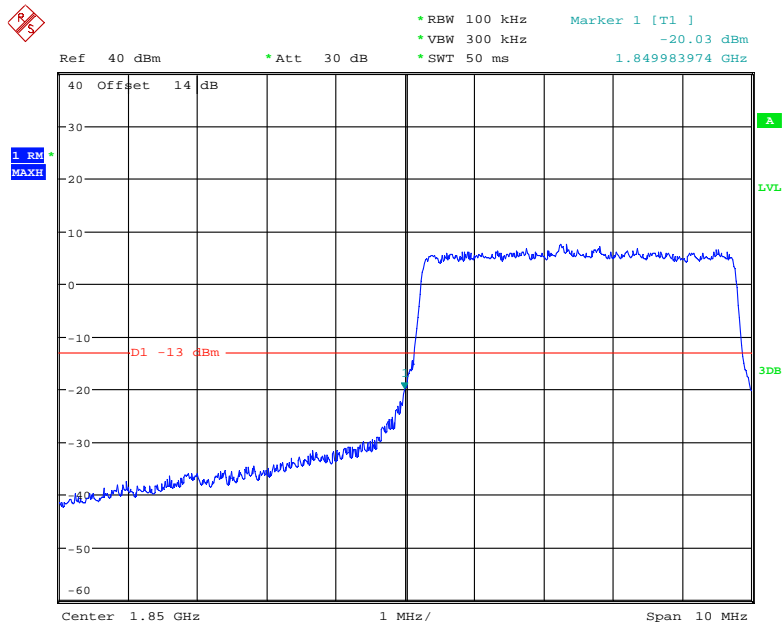
Date: 12.FEB.2018 11:01:30

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



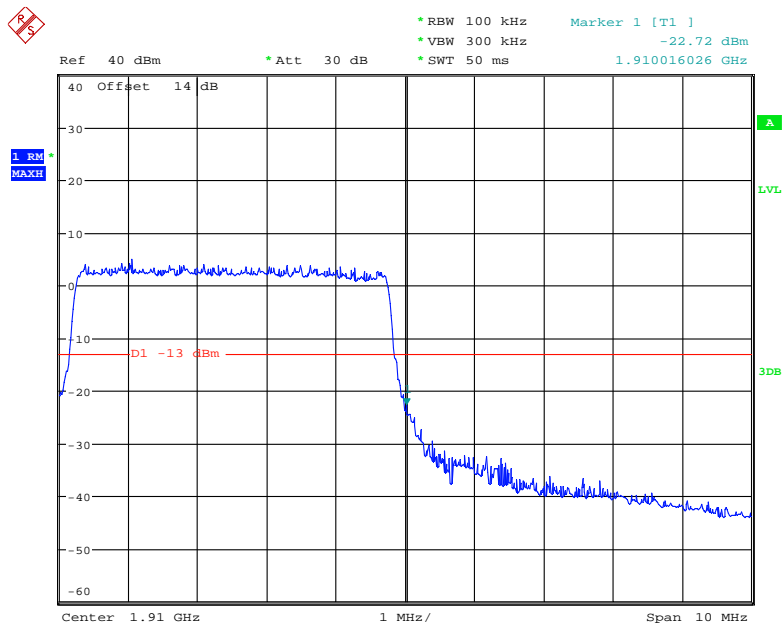
Date: 12.FEB.2018 11:00:27

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



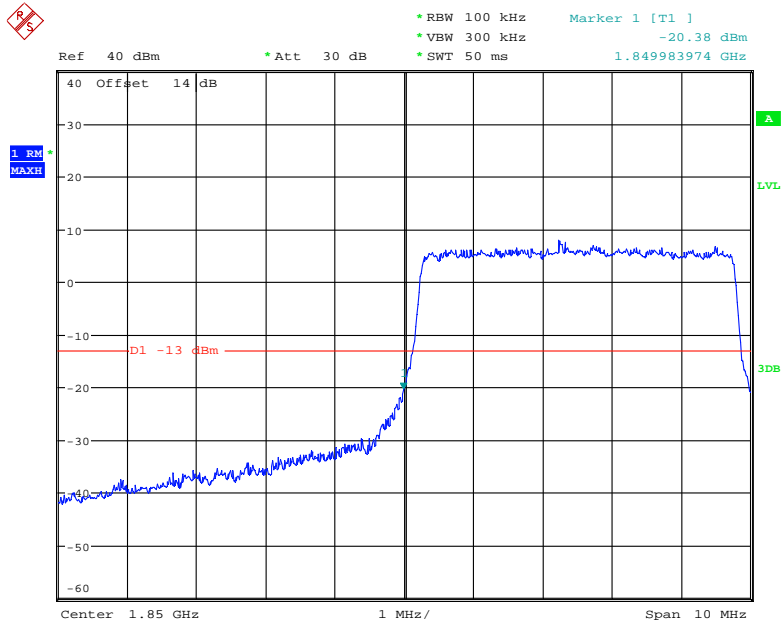
Date: 12.FEB.2018 11:06:50

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



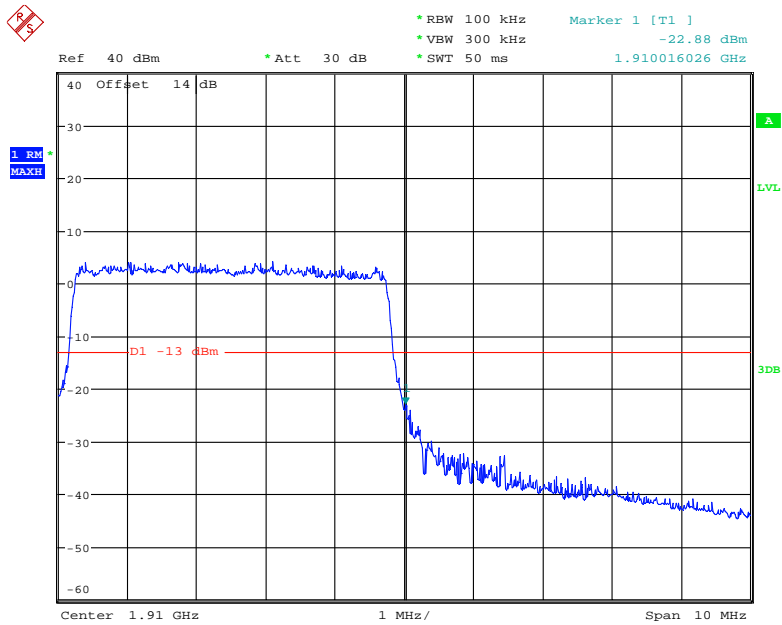
Date: 12.FEB.2018 11:07:32

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



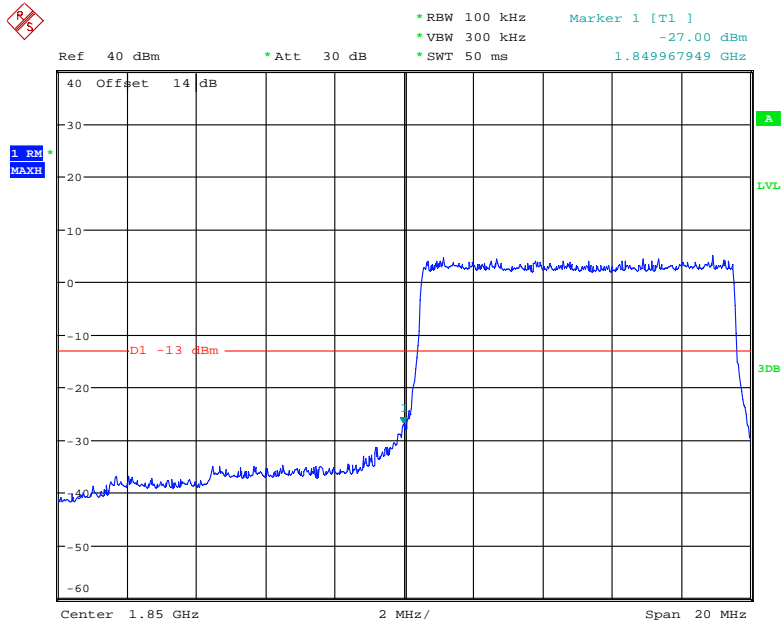
Date: 12.FEB.2018 11:09:18

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



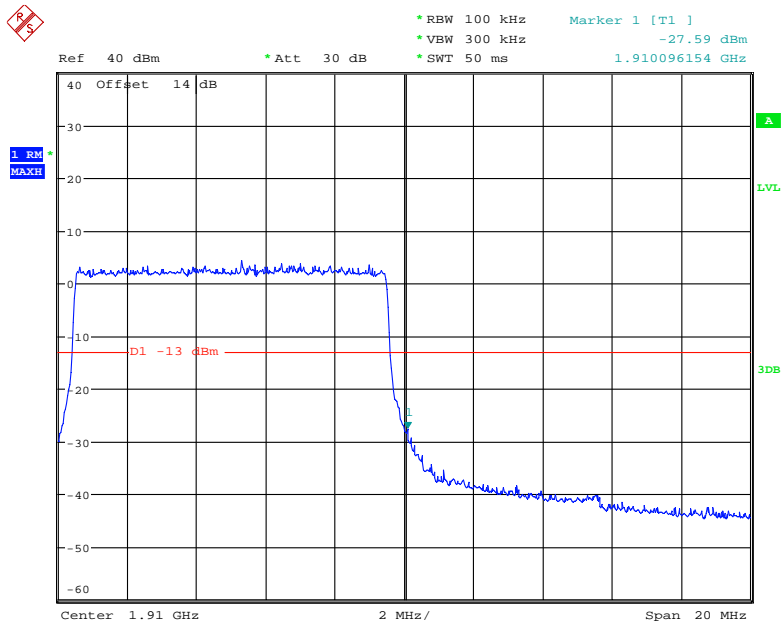
Date: 12.FEB.2018 11:08:03

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



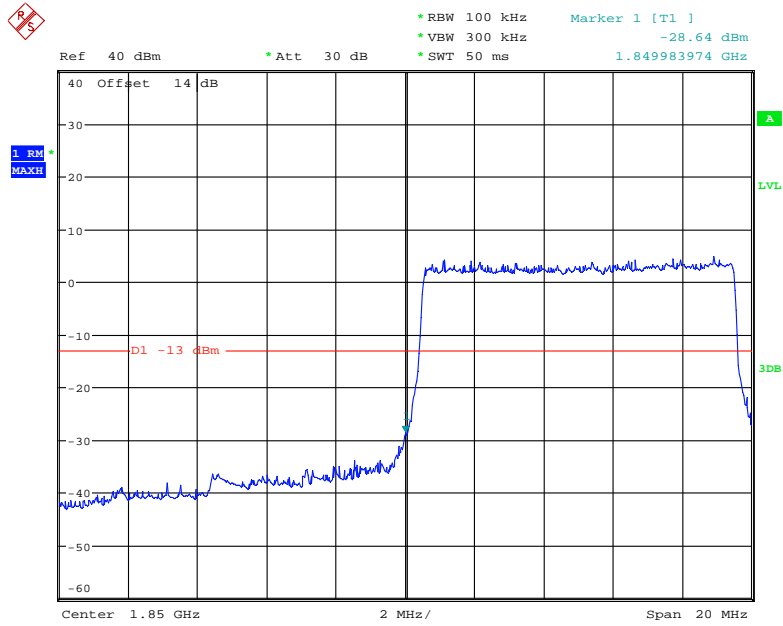
Date: 12.FEB.2018 11:25:37

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



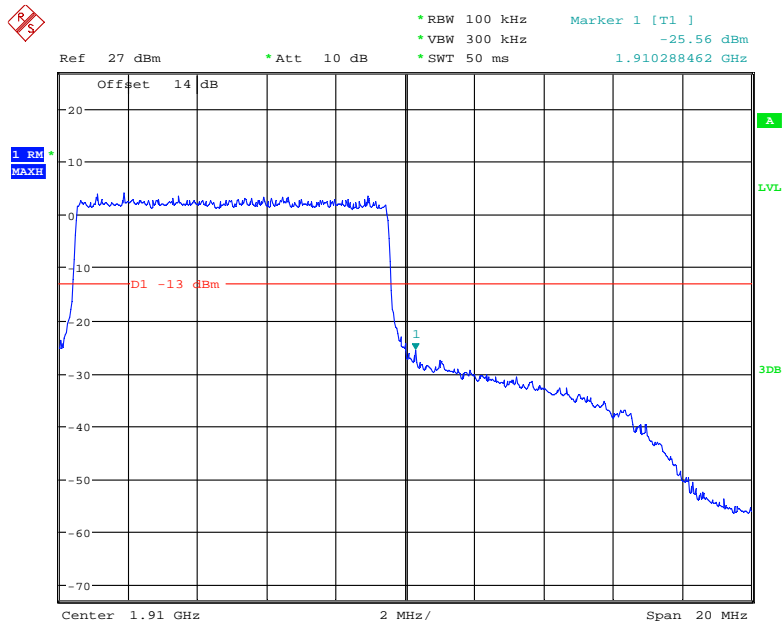
Date: 12.FEB.2018 11:21:35

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



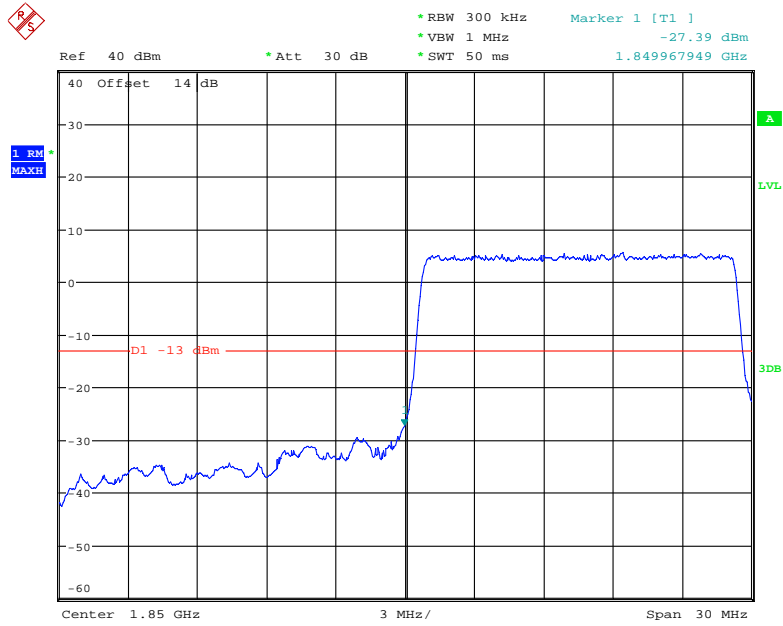
Date: 12.FEB.2018 11:10:34

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



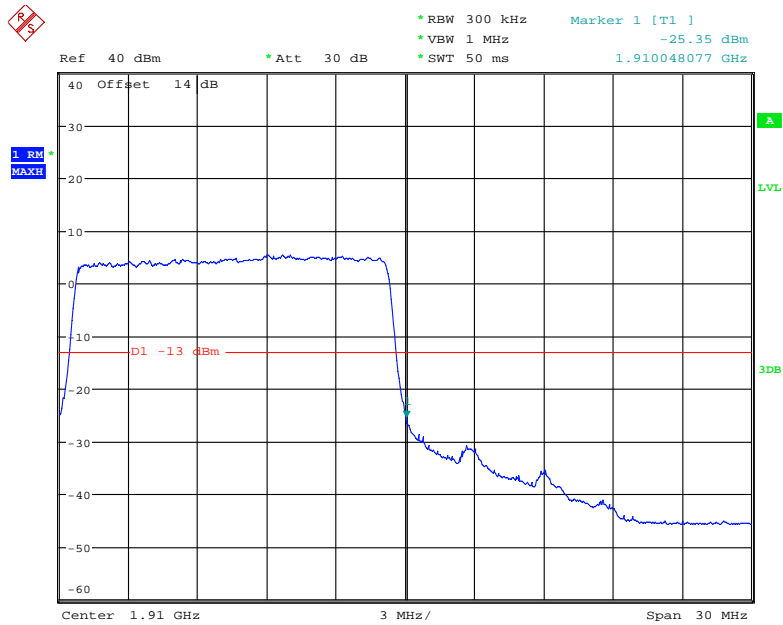
Date: 6.MAR.2018 23:03:44

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



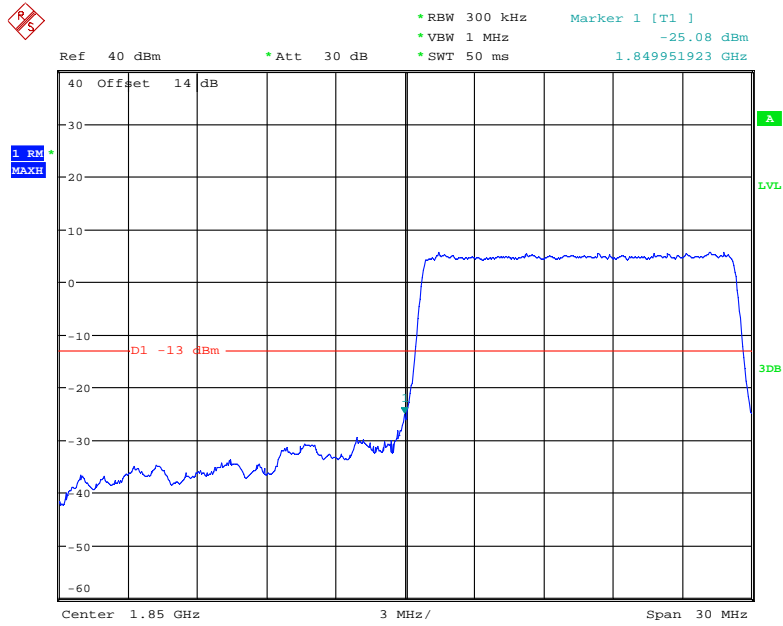
Date: 12.FEB.2018 11:39:38

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



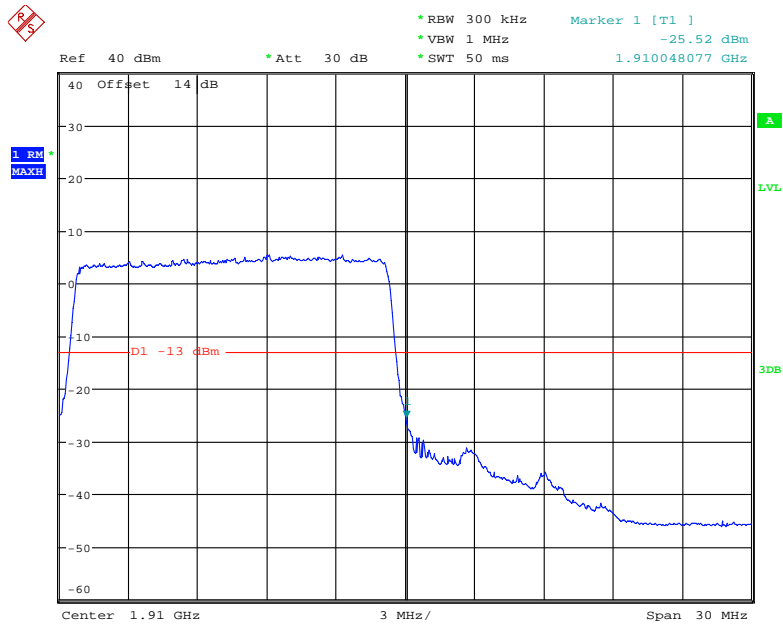
Date: 12.FEB.2018 11:40:52

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



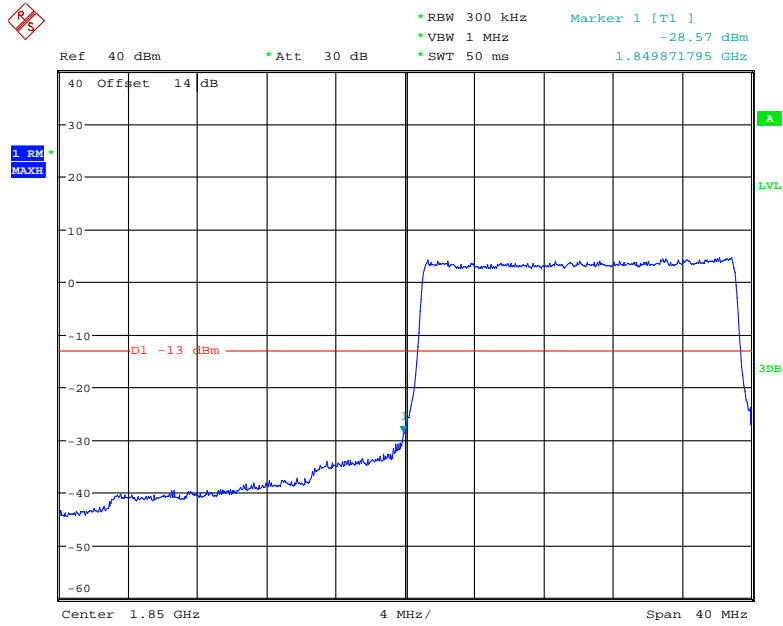
Date: 12.FEB.2018 11:42:22

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



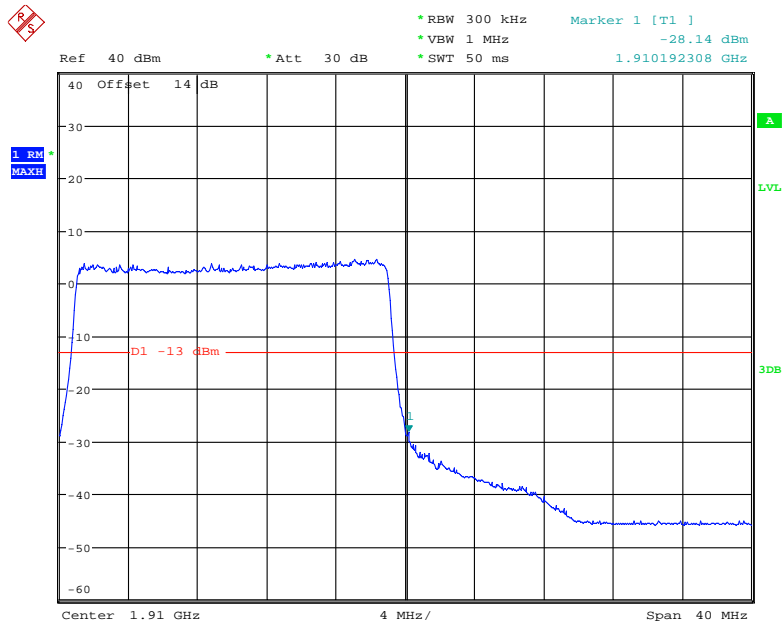
Date: 12.FEB.2018 11:41:34

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



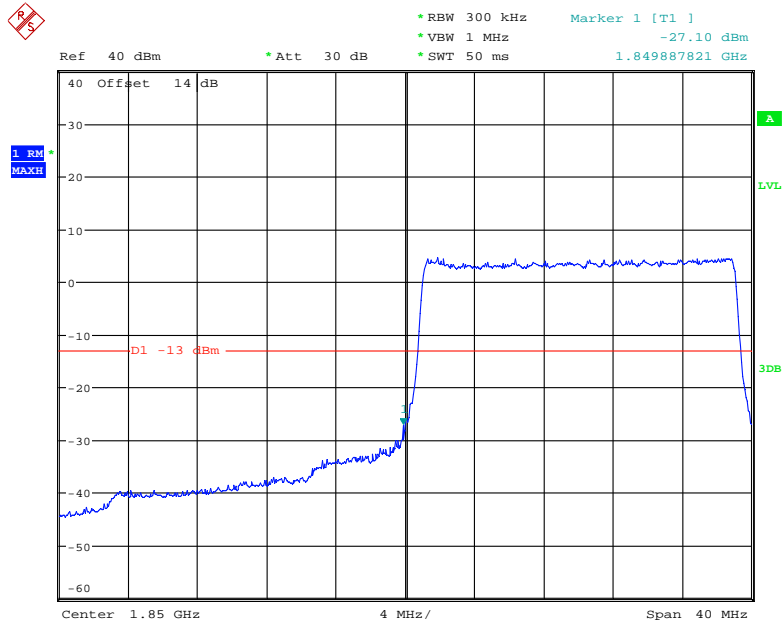
Date: 12.FEB.2018 11:47:48

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



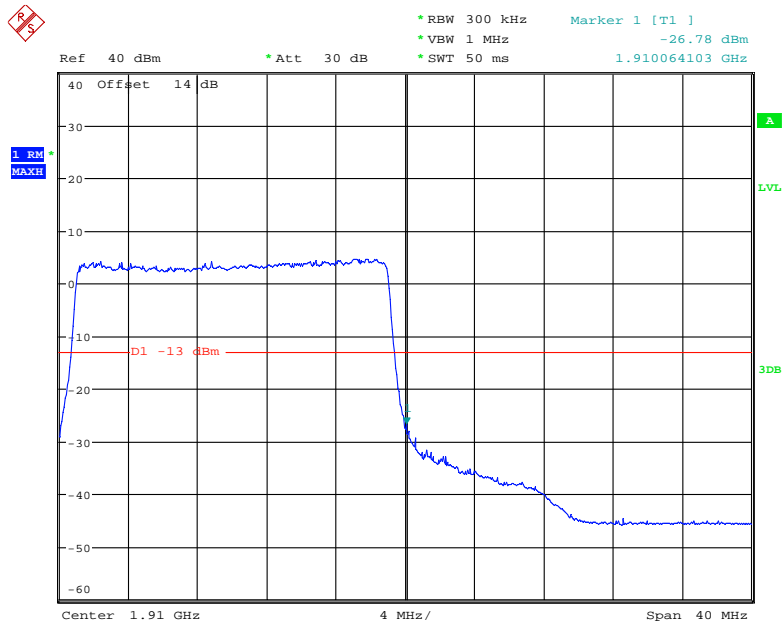
Date: 12.FEB.2018 11:46:32

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



Date: 12.FEB.2018 11:44:37

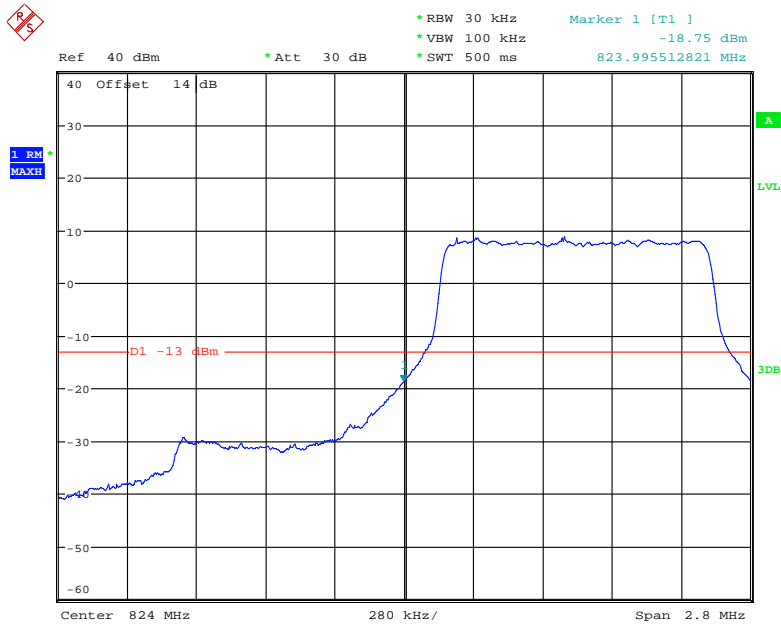
16-QAM (20.0 MHz, FULL RB) - Right Band Edge



Date: 12.FEB.2018 11:45:48

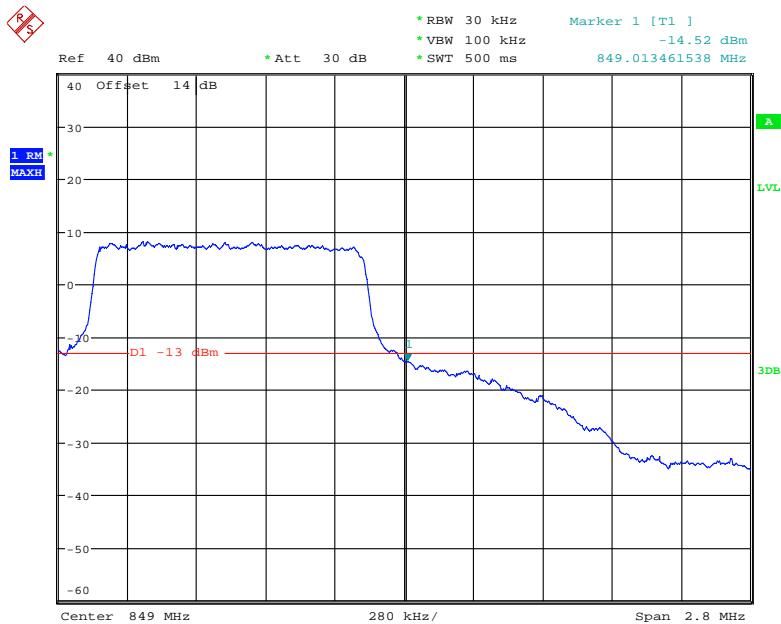
LTE Band 5:

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



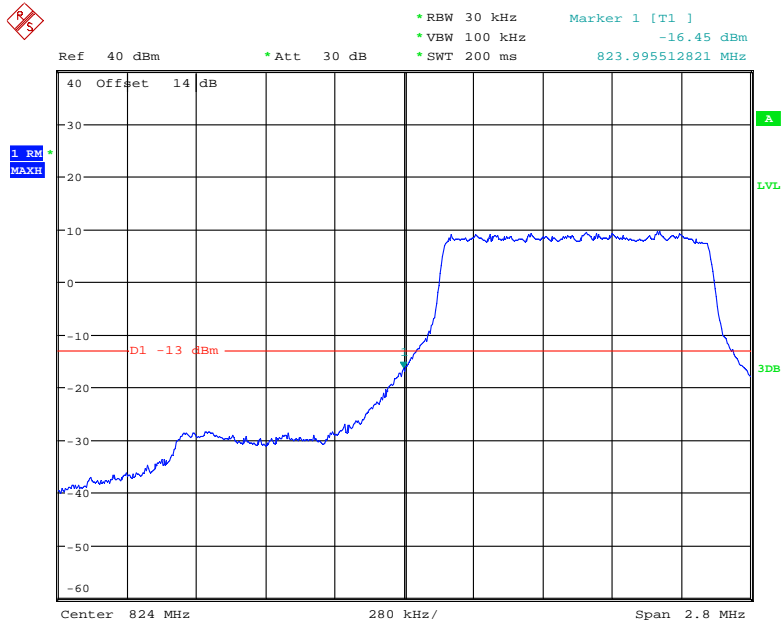
Date: 12.FEB.2018 13:15:01

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



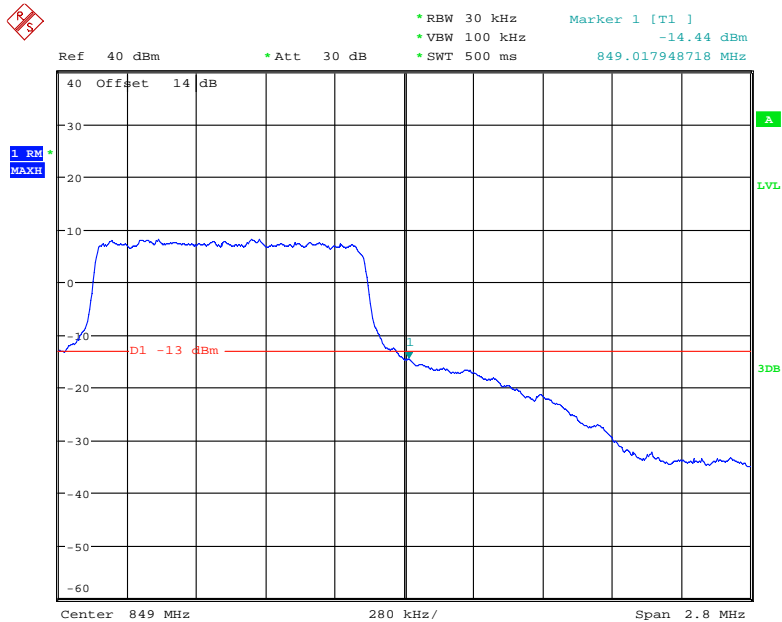
Date: 12.FEB.2018 13:13:29

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



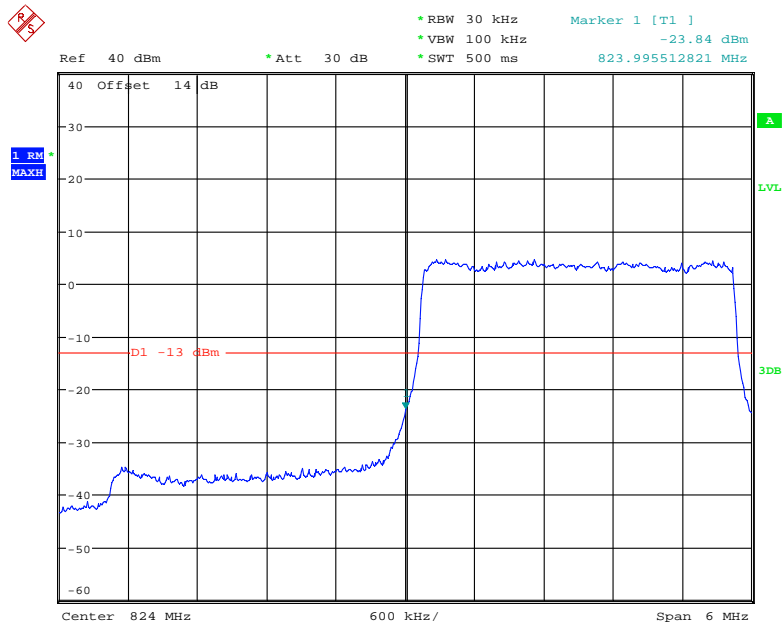
Date: 12.FEB.2018 13:10:49

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



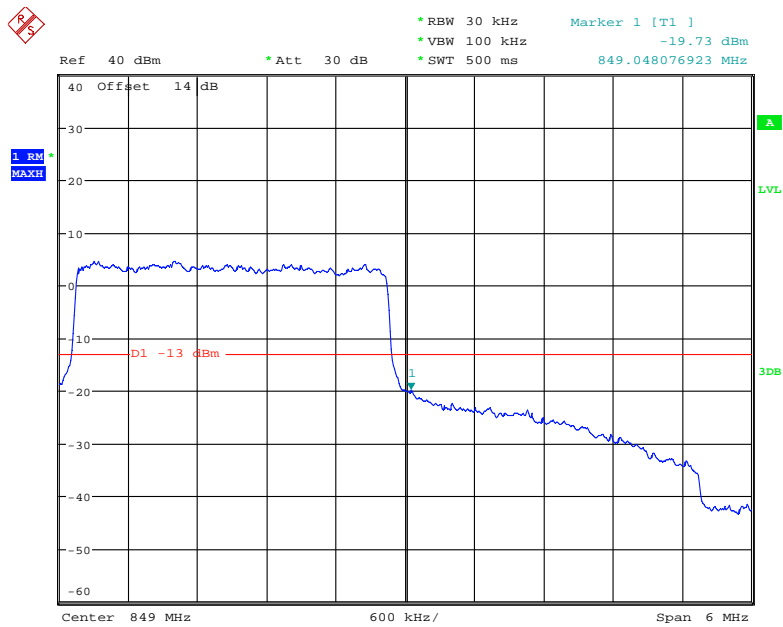
Date: 12.FEB.2018 13:12:43

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



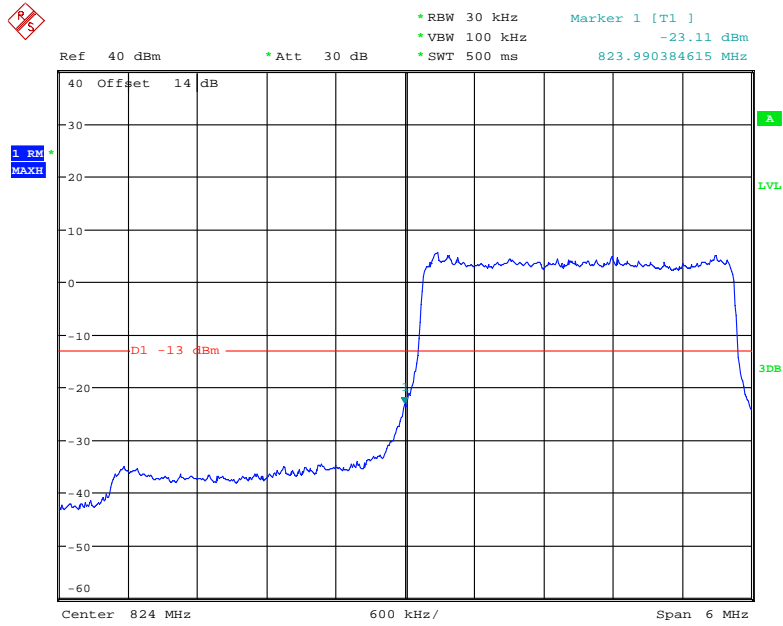
Date: 12.FEB.2018 13:15:46

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



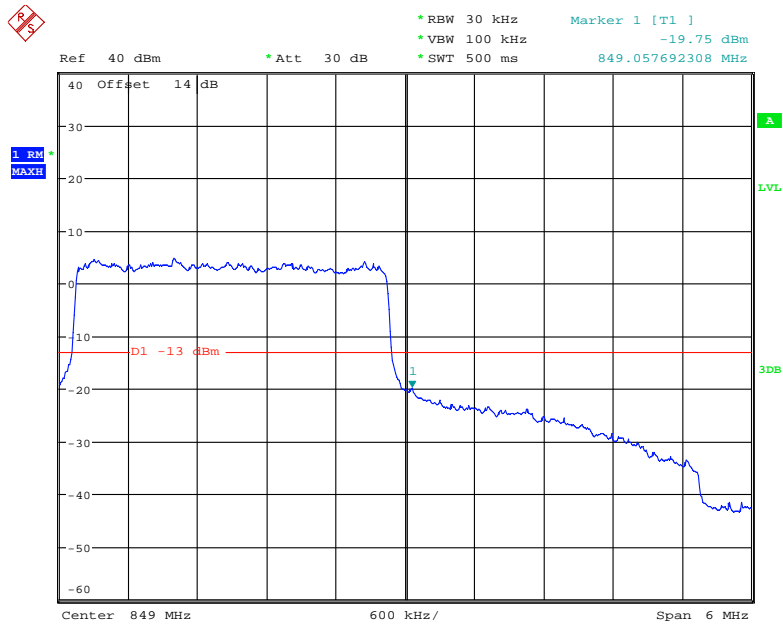
Date: 12.FEB.2018 13:16:38

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



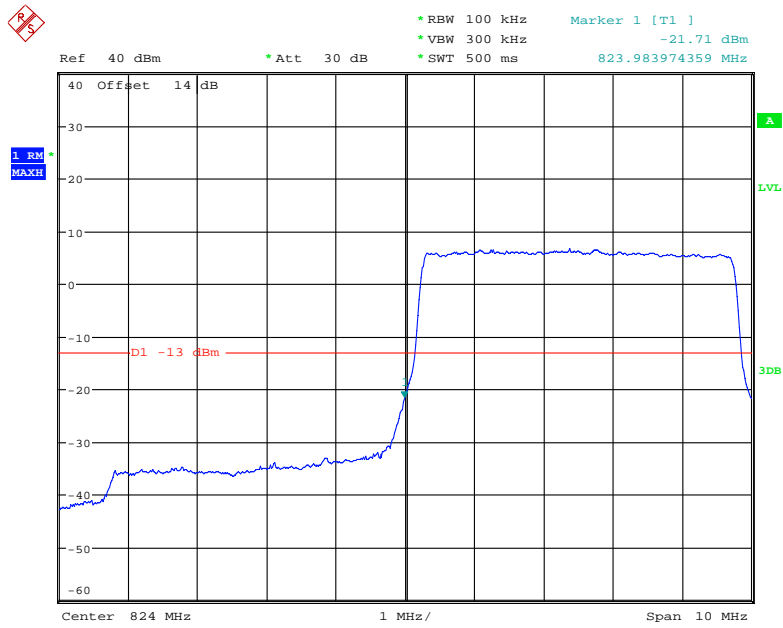
Date: 12.FEB.2018 13:17:55

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



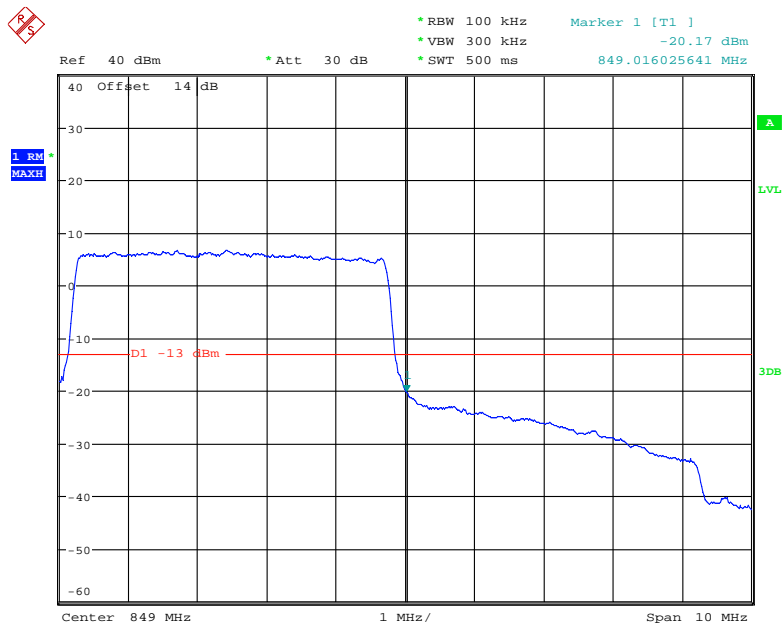
Date: 12.FEB.2018 13:17:09

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



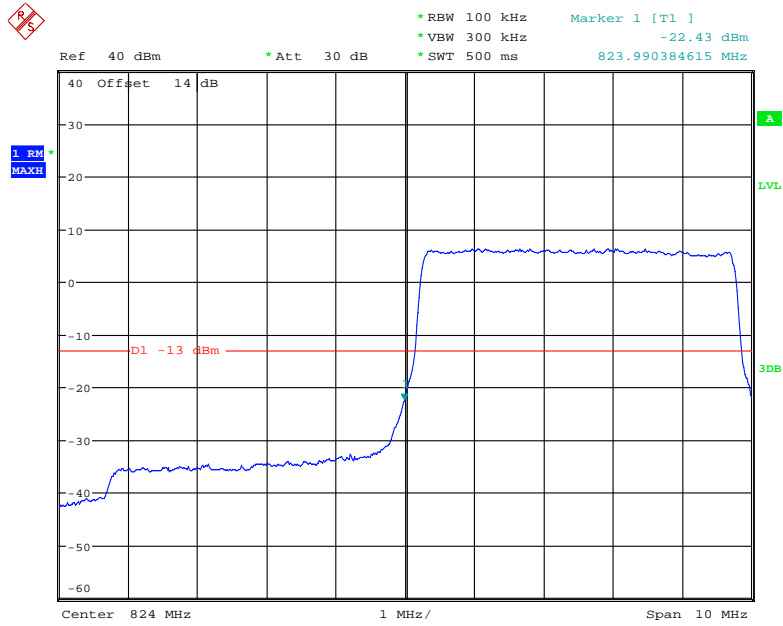
Date: 12.FEB.2018 13:21:58

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



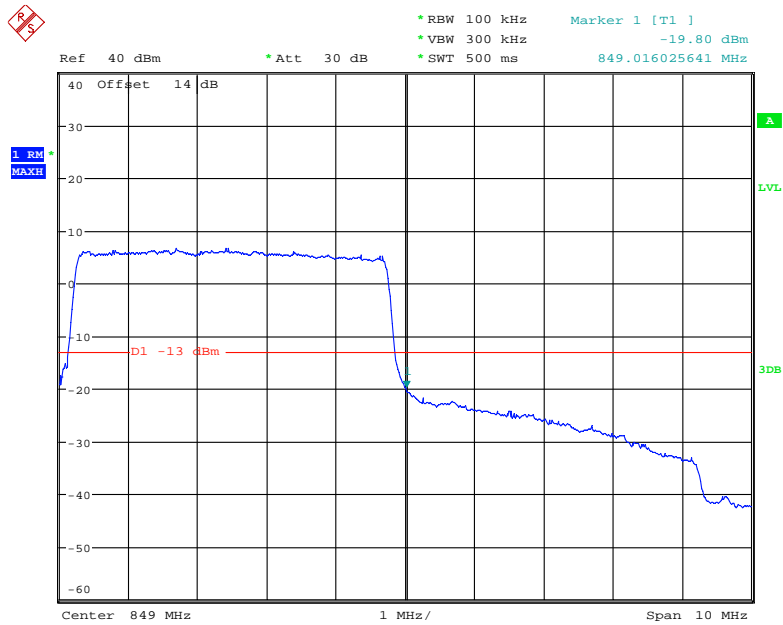
Date: 12.FEB.2018 13:20:10

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



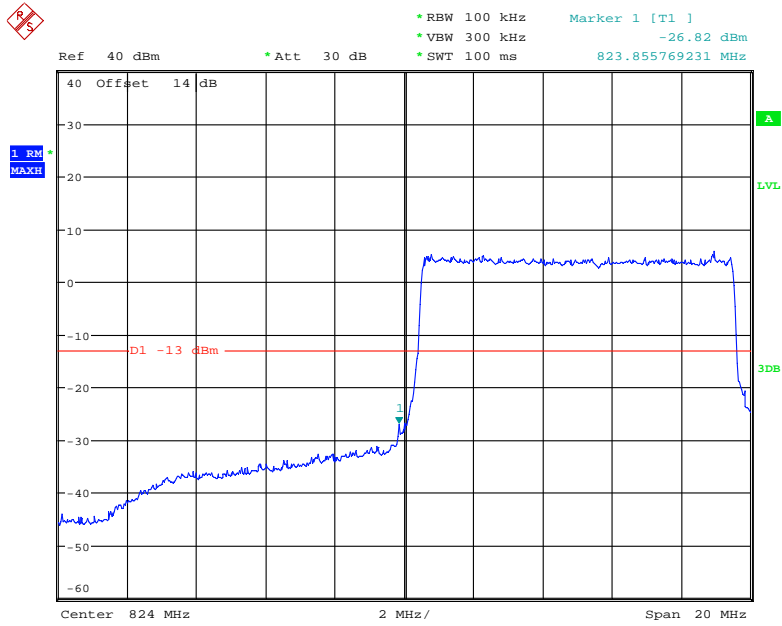
Date: 12.FEB.2018 13:18:49

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



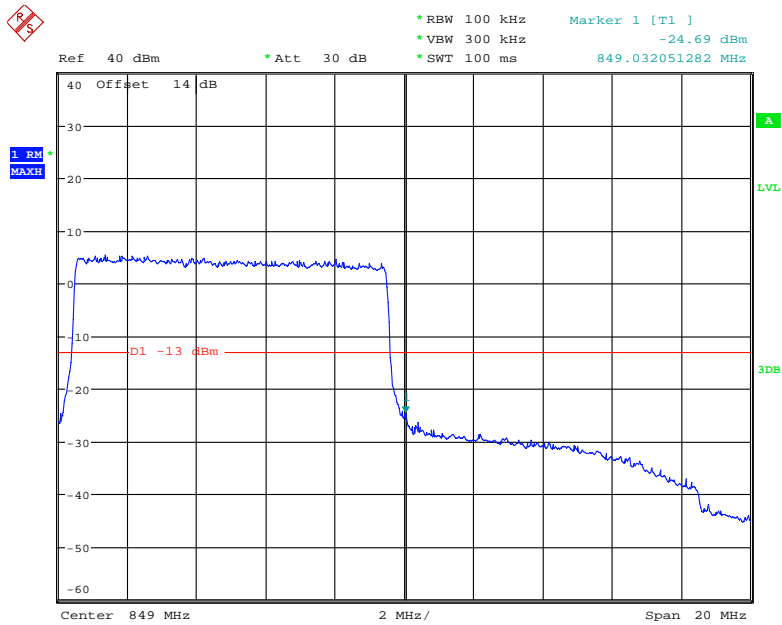
Date: 12.FEB.2018 13:21:05

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



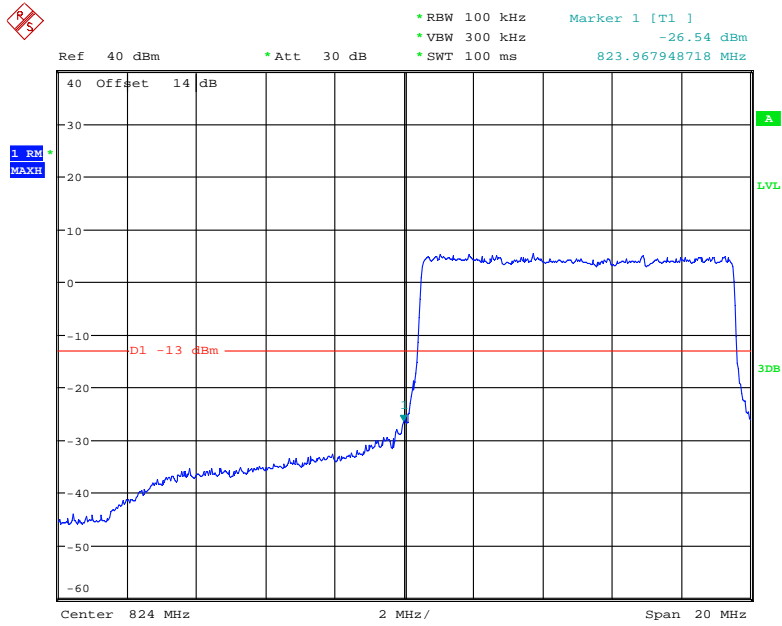
Date: 12.FEB.2018 13:23:13

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



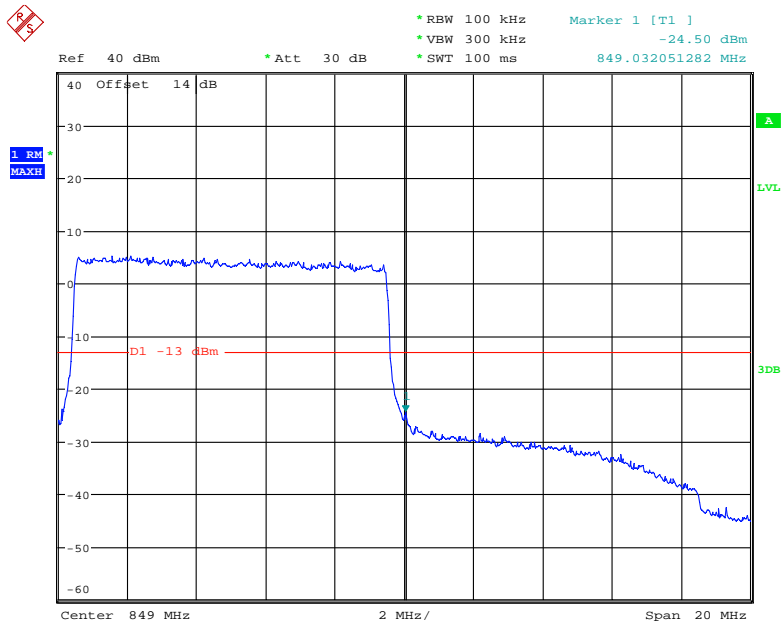
Date: 12.FEB.2018 13:23:53

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



Date: 12.FEB.2018 13:25:02

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



Date: 12.FEB.2018 13:24:20

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

Applicable Standard

FCC § 2.1055, §22.355, §24.235.

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

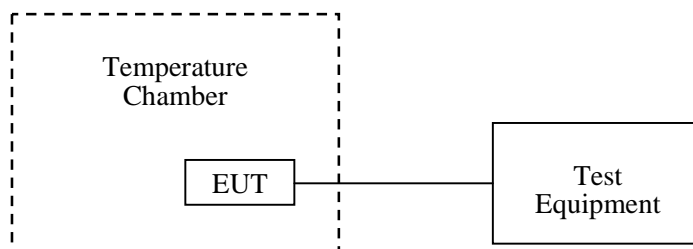
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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:	22 °C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Jacob Kong on 2018-02-24.

EUT operation mode: Transmitting

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

Cellular Band (Part 22H)

GSM Mode

Middle Channel, $f_0 = 836.6\text{MHz}$				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	-3	-0.0036	2.5
-20		-7	-0.0084	2.5
-10		-2	-0.0024	2.5
0		-5	-0.0060	2.5
10		-6	-0.0072	2.5
20		1	0.0012	2.5
30		-3	-0.0036	2.5
40		-4	-0.0048	2.5
50		7	0.0084	2.5
25		V min.= 3.5	-8	-0.0096
	V max.= 4.2	-6	-0.0072	2.5

EDGE Mode

Middle Channel, $f_0=836.6\text{MHz}$				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	5	0.0060	2.5
-20		-4	-0.0048	2.5
-10		3	0.0036	2.5
0		-2	-0.0024	2.5
10		-3	-0.0036	2.5
20		-7	-0.0084	2.5
30		-8	-0.0096	2.5
40		4	0.0048	2.5
50		-6	-0.0072	2.5
25		V min.= 3.5	-3	-0.0036
25	V max.= 4.2	9	0.01076	2.5

WCDMA Mode

Middle Channel, $f_0=836.6\text{MHz}$				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	-8	-0.00956	2.5
-20		-8	-0.00956	2.5
-10		-5	-0.00598	2.5
0		-5	-0.00598	2.5
10		-5	-0.00598	2.5
20		-1	-0.00120	2.5
30		-5	-0.00598	2.5
40		-8	-0.00956	2.5
50		-10	-0.01195	2.5
25		V min.= 3.5	-12	-0.01434
	V max.= 4.2	-12	-0.01434	2.5

PCS Band (Part 24E)

GSM Mode

Middle Channel, $f_o = 1880.0$ MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	12	0.0064	pass
-20		7	0.0037	pass
-10		15	0.0080	pass
0		11	0.0059	pass
10		9	0.0048	pass
20		-16	-0.0085	pass
30		8	0.0043	pass
40		6	0.0032	pass
50		5	0.0027	pass
25		V min.= 3.5	7	0.0037
	V max.= 4.2	9	0.0048	pass

EDGE Mode

Middle Channel, $f_o = 1880.0$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	-14	-0.0074	pass
-20		-7	-0.0037	pass
-10		-10	-0.0053	pass
0		-11	-0.0059	pass
10		-23	-0.0122	pass
20		-6	-0.0032	pass
30		-8	-0.0043	pass
40		-7	-0.0037	pass
50		-2	-0.0011	pass
25		V min.= 3.5	-6	-0.0032
25	V max.= 4.2	21	0.01117	pass

WCDMA Mode

Middle Channel, $f_0=1880.0$ MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	20	0.01064	pass
-20		20	0.01064	pass
-10		20	0.01064	pass
0		10	0.00532	pass
10		10	0.00532	pass
20		4	0.00213	pass
30		40	0.02128	pass
40		50	0.02660	pass
50		60	0.03191	pass
25	V min.= 3.5	70	0.03723	pass
	V max.= 4.2	82	0.04362	pass

**LTE:
QPSK:**

Band 2:

20.0 MHz Middle Channel, $f_0=1880$ MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	-15	-0.00798	pass
-20		-15	-0.00798	pass
-10		-12	-0.00638	pass
0		-12	-0.00638	pass
10		-12	-0.00638	pass
20		-10	-0.00532	pass
30		-15	-0.00798	pass
40		-20	-0.01064	pass
50		-25	-0.01330	pass
20	V min.= 3.5	-35	-0.01862	pass
	V max.= 4.2	-43	-0.02287	pass

Band 5:

20.0 MHz Middle Channel, $f_o = 836.5$ MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	-8	-0.00956	2.5
-20		-8	-0.00956	2.5
-10		-5	-0.00598	2.5
0		-5	-0.00598	2.5
10		-5	-0.00598	2.5
20		-1	-0.00120	2.5
30		-5	-0.00598	2.5
40		-10	-0.01195	2.5
50		-12	-0.01435	2.5
20	V min.= 3.5	-20	-0.02391	2.5
	V max.= 4.2	-20	-0.02391	2.5

16QAM:

Band 2:

20.0 MHz Middle Channel, $f_o = 1880$ MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.7	-6	-0.00319	pass
-20		-10	-0.00532	pass
-10		-8	-0.00426	pass
0		-5	-0.00266	pass
10		-7	-0.00372	pass
20		-13	-0.00691	pass
30		-11	-0.00585	pass
40		-6	-0.00319	pass
50		-9	-0.00479	pass
20	V min.= 3.5	-4	-0.00213	pass
	V max.= 4.2	-10	-0.00532	pass

Band 5:

20.0 MHz Middle Channel, $f_0 = 836.5$ MHz				
Temperature (°C)	Voltage Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	-1	-0.00120	2.5
-20		-6	-0.00717	2.5
-10		-2	-0.00239	2.5
0		0	0	2.5
10		-4	-0.00478	2.5
20		3	0.00359	2.5
30		-2	-0.00239	2.5
40		-6	-0.00717	2.5
50		3	0.00359	2.5
20		V min.= 3.5	4	0.00478
	V max.= 4.2	-3	-0.00359	2.5

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