




FCC PART 27  
FCC PART 22H, PART 24E  
TEST REPORT  
For  
**SENWA MEXICO, S.A.DE C.V**

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ALVARO OBREGON, Mexico

**FCC ID: 2AAA6-LS5I**

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<b>Report Number:</b> RSZ180108001-00D	
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**GENERAL INFORMATION**

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**Product Description for Equipment under Test (EUT)**

The *SENWA MEXICO, S.A.DE C.V*'s product, model number: *LS5I (FCC ID: 2AAA6-LS5I)* or the "EUT" in this report was a *Mobile Phone*, which was measured approximately: 14.1 cm (L) \* 7.1 cm (W) \* 0.8 cm (H), rated with input voltage: DC 3.8 V from rechargeable li-ion battery or DC 5.0V from adapter.

**Adapter Information:**

Model: LS5I

Input: AC 100-240V, 50/60Hz, 0.2A

Output: DC 5V, 1000 mA

*\*All measurement and test data in this report was gathered from production sample serial number: 1702961 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-01-08.*

**Objective**

This test report is prepared on behalf of *SENWA MEXICO, S.A.DE C.V* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E and Subpart 27 of the Federal Communication Commissions rules.

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

**Related Submittal(s)/Grant(s)**

FCC Part 15.247 DTS & DSS submissions with FCC ID: 2AAA6-LS5I.

**Test Methodology**

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

Part 22 Subpart H - Public Mobile Services

Part 24 Subpart E - Personal Communication Services

Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D 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.

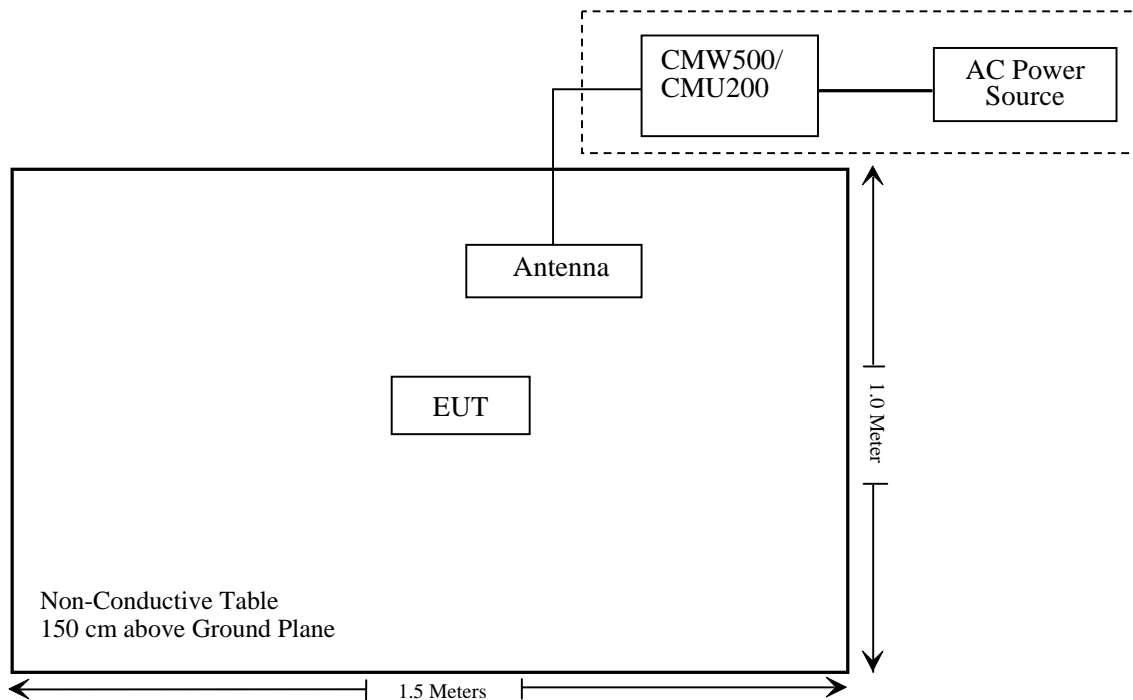
### Equipment Modifications

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**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§1.1307, §2.1093	RF Exposure (SAR)	Compliance*
§2.1046; § 22.913 (a); § 24.232 (c); §27.50 (d) (h)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235; §27.54;	Frequency stability	Compliance

Note: \* Please refer to SAR report released by BACL, report number: RSZ180108001-20.

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test</b>					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017-12-29	2020-12-28
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	2017-12-07	2018-12-07
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2017-12-07	2018-12-07
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	2017-11-19	2018-05-21
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-29
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2017-12-29	2020-12-29
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
<b>RF Conducted Test</b>					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-05	2018-12-05
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2017-11-22	2018-11-22
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
Aglient	ESG Vector Signal Generator	E4438C	MY42080875	2017-05-09	2018-05-09
Rohde & Schwarz	Wideband Radio Communication Tester	CMU200	106891	2017-12-14	2018-12-14
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2017-04-24	2018-04-24
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2017-08-19	2018-08-19
Ducommun technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22
WEINSCHEL	3dB Attenuator	N/A	N/A	2017-11-22	2018-05-23
WEINSCHEL	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).



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## **FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION**

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### **Applicable Standard**

FCC§1.1310 and §2.1093.

### **Test Result**

Compliance, please refer to the SAR report: RSZ180108001-20.

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## **FCC §2.1047 - MODULATION CHARACTERISTIC**

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

**FCC § 2.1046, § 22.913 (a) & § 24.232 (c); §27.50 (d) (h) - RF OUTPUT POWER**

**Applicable Standard**

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

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

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

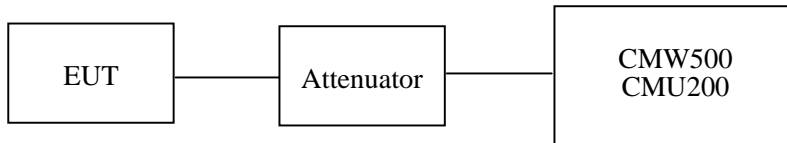
According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.

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

**Test Procedure**

*Conducted method:*

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



*Radiated method:*

TIA 603-D section 2.2.17

**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	23~25 °C
<b>Relative Humidity:</b>	48~51 %
<b>ATM Pressure:</b>	100.0~101.1 kPa

*The testing was performed by Rocky Kang from 2018-01-10 to 2018-01-16.*

**Conducted Power**

**Cellular Band (Part 22H)**

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	32.06	38.45
	190	836.6	31.94	38.45
	251	848.8	31.84	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	31.99	30.22	28.35	26.88	38.45
	190	836.6	31.94	30.15	28.27	26.86	38.45
	251	848.8	31.86	30.09	28.23	26.84	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		21.72	21.70	21.68
		HSDPA	1	20.75	20.67	20.81
			2	20.63	20.63	20.70
			3	20.82	20.78	20.92
			4	20.63	20.57	20.75
		HSUPA	1	21.07	21.17	20.86
			2	20.98	21.08	20.77
			3	21.15	21.25	20.93
			4	20.99	21.04	20.76
			5	21.16	21.24	20.89
		HSPA+	1	20.49	20.50	20.63

**PCS Band (Part 24E)**

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	512	1850.2	29.03	33
	661	1880.0	28.62	33
	810	1909.8	28.61	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	28.98	26.76	25.07	23.60	33
	661	1880.0	28.56	26.72	25.04	23.58	33
	810	1909.8	28.55	26.70	25.06	23.58	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		21.53	21.39	21.37
		HSDPA	1	20.47	20.51	20.47
			2	20.35	20.41	20.41
			3	20.58	20.61	20.56
			4	20.43	20.40	20.39
		HSUPA	1	20.44	20.53	20.57
			2	20.33	20.49	20.51
			3	20.50	20.65	20.68
			4	20.37	20.40	20.53
			5	20.48	20.57	20.63
		HSPA+	1	20.51	20.43	20.62

**Peak-to-average ratio (PAR)****Cellular Band**

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.45	13
	Middle	0.36	13
	High	0.44	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	3.95	13
	Middle	3.89	13
	High	3.92	13
HSDPA (16QAM)	Low	3.94	13
	Middle	3.82	13
	High	3.98	13
HSUPA (BPSK)	Low	3.97	13
	Middle	3.81	13
	High	3.99	13

**PCS Band**

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.46	13
	Middle	0.32	13
	High	0.45	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	4.25	13
	Middle	4.03	13
	High	4.28	13
HSDPA (16QAM)	Low	4.29	13
	Middle	4.07	13
	High	4.26	13
HSUPA (BPSK)	Low	4.27	13
	Middle	4.06	13
	High	4.24	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	90.73	89	1.8	H	30.7	0.7	0	30.00	38.45	8.45
836.6	84.23	115	1.5	V	24.2	0.7	0	23.50	38.45	14.95
EIRP for PCS Band (Part 24E), Middle Channel										
1880.00	92.09	150	2.3	H	22.0	1.30	8.50	29.20	33	3.80
1880.00	88.86	242	1.8	V	18.6	1.30	8.50	25.80	33	7.20

**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	81.23	212	2.0	H	21.3	0.7	0	20.6	38.45	17.85
836.6	77.61	157	1.6	V	17.6	0.7	0	16.9	38.45	21.55
EIRP for WCDMA Band II (Part 24E), Middle Channel										
1880.00	84.03	192	1.7	H	14.0	1.30	8.50	21.20	33	11.80
1880.00	84.58	60	2.3	V	14.3	1.30	8.50	21.50	33	11.50

**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	21.78	22.22	21.86
		RB Size=1, RB Offset=2	21.65	22.18	21.75
		RB Size=1, RB Offset=5	21.89	22.27	21.95
		RB Size=3, RB Offset=0	21.72	22.12	21.72
		RB Size=3, RB Offset=1	21.68	22.02	21.63
		RB Size=3, RB Offset=2	21.75	22.21	21.82
		RB Size=6, RB Offset=0	21.68	22.04	21.78
	16QAM	RB Size=1, RB Offset=0	21.84	22.17	21.78
		RB Size=1, RB Offset=2	21.77	22.12	21.70
		RB Size=1, RB Offset=5	21.95	22.20	21.81
		RB Size=3, RB Offset=0	21.78	22.14	21.74
		RB Size=3, RB Offset=1	21.67	22.05	21.64
		RB Size=3, RB Offset=2	21.82	22.24	21.84
		RB Size=6, RB Offset=0	21.63	22.01	21.57
3.0	QPSK	RB Size=1, RB Offset=0	21.78	22.04	21.52
		RB Size=1, RB Offset=7	21.72	22.00	21.43
		RB Size=1, RB Offset=14	21.88	22.12	21.63
		RB Size=8, RB Offset=0	21.75	21.96	21.39
		RB Size=8, RB Offset=4	21.83	22.14	21.55
		RB Size=8, RB Offset=7	21.23	21.50	21.26
		RB Size=15, RB Offset=0	21.84	22.15	21.86
	16QAM	RB Size=1, RB Offset=0	21.89	22.04	21.94
		RB Size=1, RB Offset=7	21.77	21.92	21.89
		RB Size=1, RB Offset=14	21.94	22.10	22.04
		RB Size=8, RB Offset=0	21.79	21.97	21.90
		RB Size=8, RB Offset=4	21.99	22.14	21.99
		RB Size=8, RB Offset=7	21.78	22.13	21.75
		RB Size=15, RB Offset=0	21.87	22.26	21.92

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	21.89	22.09	21.97
		RB Size=1, RB Offset=12	21.95	21.99	21.85
		RB Size=1, RB Offset=24	21.95	22.17	22.03
		RB Size=12, RB Offset=0	21.79	22.02	21.91
		RB Size=12, RB Offset=6	21.98	22.17	22.02
		RB Size=12, RB Offset=11	22.08	22.15	21.84
		RB Size=25, RB Offset=0	21.84	22.10	21.86
	16QAM	RB Size=1, RB Offset=0	21.84	22.17	21.87
		RB Size=1, RB Offset=12	21.95	22.11	21.83
		RB Size=1, RB Offset=24	21.93	22.30	21.99
		RB Size=12, RB Offset=0	21.72	22.14	21.74
		RB Size=12, RB Offset=6	21.92	22.22	21.99
		RB Size=12, RB Offset=11	22.07	22.24	21.14
		RB Size=25, RB Offset=0	21.84	22.11	21.88
10.0	QPSK	RB Size=1, RB Offset=0	21.76	22.11	21.74
		RB Size=1, RB Offset=24	21.95	22.05	21.71
		RB Size=1, RB Offset=49	21.83	22.22	21.79
		RB Size=25, RB Offset=0	21.70	22.03	21.68
		RB Size=25, RB Offset=12	21.82	22.21	21.82
		RB Size=25, RB Offset=24	22.04	22.25	21.78
		RB Size=50, RB Offset=0	22.15	22.38	22.17
	16QAM	RB Size=1, RB Offset=0	21.89	22.12	21.87
		RB Size=1, RB Offset=24	21.95	22.06	21.78
		RB Size=1, RB Offset=49	21.99	22.16	21.93
		RB Size=25, RB Offset=0	21.84	22.03	21.77
		RB Size=25, RB Offset=12	22.01	22.18	21.94
		RB Size=25, RB Offset=24	22.04	22.17	21.87
		RB Size=50, RB Offset=0	22.12	22.38	22.17

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	21.84	22.18	21.85
		RB Size=1, RB Offset=37	21.95	22.06	21.74
		RB Size=1, RB Offset=74	21.93	22.25	21.95
		RB Size=36, RB Offset=0	21.79	22.08	21.79
		RB Size=36, RB Offset=18	21.92	22.31	21.95
		RB Size=36, RB Offset=37	22.03	22.32	21.84
		RB Size=75, RB Offset=0	22.19	22.38	22.24
	16QAM	RB Size=1, RB Offset=0	21.86	22.18	21.88
		RB Size=1, RB Offset=37	21.95	22.12	21.79
		RB Size=1, RB Offset=74	21.98	22.24	21.98
		RB Size=36, RB Offset=0	21.75	22.08	21.84
		RB Size=36, RB Offset=18	21.91	22.23	21.94
		RB Size=36, RB Offset=37	22.02	22.26	21.84
		RB Size=75, RB Offset=0	21.98	22.10	21.94
20.0	QPSK	RB Size=1, RB Offset=0	21.83	22.19	21.85
		RB Size=1, RB Offset=49	21.95	22.15	21.73
		RB Size=1, RB Offset=99	21.90	22.28	21.93
		RB Size=50, RB Offset=0	21.73	22.11	21.78
		RB Size=50, RB Offset=24	21.95	22.27	21.94
		RB Size=50, RB Offset=49	22.01	22.25	21.84
		RB Size=100, RB Offset=0	22.15	22.38	22.17
	16QAM	RB Size=1, RB Offset=0	21.45	21.86	21.57
		RB Size=1, RB Offset=49	21.95	21.82	21.44
		RB Size=1, RB Offset=99	21.52	21.96	21.63
		RB Size=50, RB Offset=0	21.34	21.77	21.51
		RB Size=50, RB Offset=24	21.55	21.96	21.62
		RB Size=50, RB Offset=49	21.56	21.92	21.65
		RB Size=100, RB Offset=0	21.45	21.86	21.57

**Peak-to-average ratio (PAR)**

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	5.48	13	Pass
QPSK (100RB Size)	4.00	13	Pass
16QAM (1RB Size)	5.73	13	Pass
16QAM (100RB Size)	4.35	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	84.56	312	1.1	H	14.5	1.30	8.50	21.70	33
1880.00	83.27	184	2.4	V	13.0	1.30	8.50	20.20	33
3 MHz Bandwidth									
1880.00	84.29	351	1.0	H	14.2	1.30	8.50	21.40	33
1880.00	84.40	333	2.0	V	14.1	1.30	8.50	21.30	33
5 MHz Bandwidth									
1880.00	84.79	117	2.2	H	14.7	1.30	8.50	21.90	33
1880.00	83.57	197	2.4	V	13.3	1.30	8.50	20.50	33
10 MHz Bandwidth									
1880.00	84.76	350	1.5	H	14.7	1.30	8.50	21.90	33
1880.00	83.67	132	1.3	V	13.4	1.30	8.50	20.60	33
15 MHz Bandwidth									
1880.00	84.70	114	2.3	H	14.7	1.30	8.50	21.90	33
1880.00	84.35	253	1.1	V	14.1	1.30	8.50	21.30	33
20 MHz Bandwidth									
1880.00	84.67	263	1.7	H	14.6	1.30	8.50	21.80	33
1880.00	83.59	125	1.9	V	13.3	1.30	8.50	20.50	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	84.28	273	1.6	H	14.2	1.30	8.50	21.40	33
1880.00	83.42	77	1.1	V	13.2	1.30	8.50	20.40	33
3 MHz Bandwidth									
1880.00	84.31	278	1.3	H	14.3	1.30	8.50	21.50	33
1880.00	83.96	41	1.8	V	13.7	1.30	8.50	20.90	33
5 MHz Bandwidth									
1880.00	84.67	320	1.9	H	14.6	1.30	8.50	21.80	33
1880.00	83.60	318	2.3	V	13.3	1.30	8.50	20.50	33
10 MHz Bandwidth									
1880.00	83.95	153	1.1	H	13.9	1.30	8.50	21.10	33
1880.00	83.17	246	1.5	V	12.9	1.30	8.50	20.10	33
15 MHz Bandwidth									
1880.00	84.20	95	1.8	H	14.2	1.30	8.50	21.40	33
1880.00	83.13	187	1.8	V	12.9	1.30	8.50	20.10	33
20 MHz Bandwidth									
1880.00	83.67	19	1.2	H	13.6	1.30	8.50	20.80	33
1880.00	83.21	93	1.2	V	12.9	1.30	8.50	20.10	33

**LTE Band 4:**

Maximum Output Power

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB Size=1, RB Offset=0	22.24	22.48	22.17
		RB Size=1, RB Offset=2	21.95	22.42	22.05
		RB Size=1, RB Offset=5	22.34	22.55	22.26
		RB Size=3, RB Offset=0	22.17	22.35	22.10
		RB Size=3, RB Offset=1	22.31	22.57	22.23
		RB Size=3, RB Offset=2	22.07	22.47	21.26
		RB Size=6, RB Offset=0	22.04	22.15	22.04
	16QAM	RB Size=1, RB Offset=0	22.27	22.51	22.32
		RB Size=1, RB Offset=2	22.23	22.48	22.28
		RB Size=1, RB Offset=5	22.35	22.54	22.41
		RB Size=3, RB Offset=0	22.22	22.45	22.24
		RB Size=3, RB Offset=1	22.38	22.56	22.35
		RB Size=3, RB Offset=2	22.39	22.62	22.44
		RB Size=6, RB Offset=0	21.84	22.15	21.75
3.0	QPSK	RB Size=1, RB Offset=0	22.14	22.30	22.16
		RB Size=1, RB Offset=7	22.08	22.23	22.05
		RB Size=1, RB Offset=14	22.22	22.33	22.21
		RB Size=8, RB Offset=0	22.02	22.26	22.11
		RB Size=8, RB Offset=4	22.18	22.35	22.24
		RB Size=8, RB Offset=7	22.07	22.22	22.03
		RB Size=15, RB Offset=0	22.12	22.30	22.07
	16QAM	RB Size=1, RB Offset=0	22.17	22.34	22.15
		RB Size=1, RB Offset=7	22.07	22.29	22.03
		RB Size=1, RB Offset=14	22.23	22.38	22.26
		RB Size=8, RB Offset=0	22.14	22.22	22.07
		RB Size=8, RB Offset=4	22.29	22.47	22.18
		RB Size=8, RB Offset=7	22.17	22.34	22.15
		RB Size=15, RB Offset=0	22.04	22.32	22.01

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	22.07	22.24	22.05
		RB Size=1, RB Offset=12	21.98	22.17	21.96
		RB Size=1, RB Offset=24	22.18	22.29	22.09
		RB Size=12, RB Offset=0	22.00	22.15	21.94
		RB Size=12, RB Offset=6	22.11	22.29	22.10
		RB Size=12, RB Offset=11	21.97	22.12	21.99
		RB Size=25, RB Offset=0	21.87	22.14	21.95
	16QAM	RB Size=1, RB Offset=0	22.04	22.23	22.02
		RB Size=1, RB Offset=12	21.98	22.15	21.96
		RB Size=1, RB Offset=24	22.10	22.31	22.06
		RB Size=12, RB Offset=0	21.92	22.13	21.96
		RB Size=12, RB Offset=6	22.13	22.28	22.14
		RB Size=12, RB Offset=11	22.17	22.36	22.10
		RB Size=25, RB Offset=0	21.84	22.13	21.82
10.0	QPSK	RB Size=1, RB Offset=0	22.14	22.35	22.16
		RB Size=1, RB Offset=24	22.01	22.29	22.06
		RB Size=1, RB Offset=49	22.18	22.46	22.22
		RB Size=25, RB Offset=0	22.04	22.29	22.08
		RB Size=25, RB Offset=12	22.21	22.38	22.29
		RB Size=25, RB Offset=24	22.08	22.28	22.12
		RB Size=50, RB Offset=0	22.14	22.32	22.17
	16QAM	RB Size=1, RB Offset=0	22.17	22.35	22.19
		RB Size=1, RB Offset=24	22.05	22.29	22.15
		RB Size=1, RB Offset=49	22.24	22.45	22.22
		RB Size=25, RB Offset=0	22.12	22.24	22.15
		RB Size=25, RB Offset=12	22.28	22.48	22.30
		RB Size=25, RB Offset=24	22.14	22.37	22.18
		RB Size=50, RB Offset=0	22.14	22.26	22.03

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15.0	QPSK	RB Size=1, RB Offset=0	22.01	22.26	22.08
		RB Size=1, RB Offset=37	21.96	22.14	21.96
		RB Size=1, RB Offset=74	22.09	22.32	22.12
		RB Size=36, RB Offset=0	21.91	22.19	21.98
		RB Size=36, RB Offset=18	22.11	22.30	22.13
		RB Size=36, RB Offset=37	22.14	22.31	22.12
		RB Size=75, RB Offset=0	23.17	23.36	23.18
	16QAM	RB Size=1, RB Offset=0	22.07	22.26	22.05
		RB Size=1, RB Offset=37	21.94	22.14	21.96
		RB Size=1, RB Offset=74	22.13	22.31	22.16
		RB Size=36, RB Offset=0	22.02	22.19	21.94
		RB Size=36, RB Offset=18	22.12	22.38	22.09
		RB Size=36, RB Offset=37	22.00	22.15	21.98
		RB Size=75, RB Offset=0	21.95	22.12	21.82
20.0	QPSK	RB Size=1, RB Offset=0	22.03	22.18	22.01
		RB Size=1, RB Offset=49	21.90	22.08	21.97
		RB Size=1, RB Offset=99	22.07	22.27	22.11
		RB Size=50, RB Offset=0	21.96	22.14	21.95
		RB Size=50, RB Offset=24	22.15	22.30	22.14
		RB Size=50, RB Offset=49	21.84	22.17	21.85
		RB Size=100, RB Offset=0	21.76	22.05	21.78
	16QAM	RB Size=1, RB Offset=0	21.89	22.07	21.84
		RB Size=1, RB Offset=49	21.85	21.96	21.78
		RB Size=1, RB Offset=99	21.97	22.12	21.90
		RB Size=50, RB Offset=0	21.80	21.94	21.80
		RB Size=50, RB Offset=24	21.98	22.14	21.89
		RB Size=50, RB Offset=49	21.87	22.05	21.87
		RB Size=100, RB Offset=0	21.78	22.04	21.84



**Peak-to-average ratio (PAR)**

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	5.38	13	Pass
QPSK (100RB Size)	4.35	13	Pass
16QAM (1RB Size)	5.96	13	Pass
16QAM (100RB Size)	4.69	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									
1.4 MHz Bandwidth									
1732.50	85.44	277	1.1	H	12.3	1.30	9.10	20.10	30
1732.50	82.39	127	1.0	V	9.8	1.30	9.10	17.60	30
3 MHz Bandwidth									
1732.50	85.62	220	2.2	H	12.5	1.30	9.10	20.30	30
1732.50	83.14	87	1.3	V	10.6	1.30	9.10	18.40	30
5 MHz Bandwidth									
1732.50	85.67	39	1.2	H	12.5	1.30	9.10	20.30	30
1732.50	82.74	339	1.6	V	10.2	1.30	9.10	18.00	30
10 MHz Bandwidth									
1732.50	85.74	259	1.9	H	12.6	1.30	9.10	20.40	30
1732.50	82.63	193	1.8	V	10.1	1.30	9.10	17.90	30
15 MHz Bandwidth									
1732.50	84.84	281	2.2	H	11.7	1.30	9.10	19.50	30
1732.50	82.82	125	1.2	V	10.3	1.30	9.10	18.10	30
20 MHz Bandwidth									
1732.50	84.79	318	2.4	H	11.6	1.30	9.10	19.40	30
1732.50	82.94	7	1.7	V	10.4	1.30	9.10	18.20	30

**16QAM:**

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
1732.50	85.78	38	2.4	H	12.6	1.30	9.10	20.40	30
1732.50	83.09	331	1.3	V	10.5	1.30	9.10	18.30	30
3 MHz Bandwidth									
1732.50	85.64	67	1.1	H	12.5	1.30	9.10	20.30	30
1732.50	82.55	146	1.4	V	10.0	1.30	9.10	17.80	30
5 MHz Bandwidth									
1732.50	85.92	326	2.3	H	12.8	1.30	9.10	20.60	30
1732.50	83.60	301	2.5	V	11.0	1.30	9.10	18.80	30
10 MHz Bandwidth									
1732.50	85.72	300	1.3	H	12.6	1.30	9.10	20.40	30
1732.50	83.71	317	1.4	V	11.1	1.30	9.10	18.90	30
15 MHz Bandwidth									
1732.50	85.90	47	2.3	H	12.7	1.30	9.10	20.50	30
1732.50	83.54	127	1.5	V	11.0	1.30	9.10	18.80	30
20 MHz Bandwidth									
1732.50	85.65	225	1.4	H	12.5	1.30	9.10	20.30	30
1732.50	83.71	48	2.0	V	11.1	1.30	9.10	18.90	30

**LTE Band 7:**

Maximum Output Power

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	21.27	21.64	21.34
		RB Size=1, RB Offset=12	21.21	21.59	21.26
		RB Size=1, RB Offset=24	21.34	21.74	21.46
		RB Size=12, RB Offset=0	21.16	21.56	21.28
		RB Size=12, RB Offset=6	21.33	21.74	21.44
		RB Size=12, RB Offset=11	21.42	21.62	21.41
		RB Size=25, RB Offset=0	20.54	20.70	20.48
	16QAM	RB Size=1, RB Offset=0	21.34	21.67	21.31
		RB Size=1, RB Offset=12	21.25	21.59	21.19
		RB Size=1, RB Offset=24	21.43	21.72	21.35
		RB Size=12, RB Offset=0	21.22	21.56	21.21
		RB Size=12, RB Offset=6	21.40	21.78	21.38
		RB Size=12, RB Offset=11	21.31	21.65	21.37
		RB Size=25, RB Offset=0	20.52	20.67	20.41
10.0	QPSK	RB Size=1, RB Offset=0	21.38	21.64	21.35
		RB Size=1, RB Offset=24	21.35	21.58	21.23
		RB Size=1, RB Offset=49	21.41	21.70	21.44
		RB Size=25, RB Offset=0	21.28	21.61	21.30
		RB Size=25, RB Offset=12	21.46	21.69	21.42
		RB Size=25, RB Offset=24	21.44	21.73	21.45
		RB Size=50, RB Offset=0	20.52	20.89	20.62
	16QAM	RB Size=1, RB Offset=0	21.24	21.64	21.34
		RB Size=1, RB Offset=24	21.13	21.57	21.26
		RB Size=1, RB Offset=49	21.31	21.75	21.44
		RB Size=25, RB Offset=0	21.20	21.57	21.29
		RB Size=25, RB Offset=12	21.36	21.73	21.46
		RB Size=25, RB Offset=24	21.33	21.67	21.31
		RB Size=50, RB Offset=0	20.72	20.97	20.72

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	21.04	21.18	21.02
		RB Size=1, RB Offset=37	20.94	21.09	20.93
		RB Size=1, RB Offset=74	21.17	21.27	21.10
		RB Size=36, RB Offset=0	20.92	21.12	20.97
		RB Size=36, RB Offset=18	21.11	21.29	21.11
		RB Size=36, RB Offset=37	21.03	21.14	21.05
		RB Size=75, RB Offset=0	20.52	20.69	20.42
	16QAM	RB Size=1, RB Offset=0	21.05	21.27	21.06
		RB Size=1, RB Offset=37	20.92	21.21	20.97
		RB Size=1, RB Offset=74	21.11	21.31	21.16
		RB Size=36, RB Offset=0	20.93	21.14	20.94
		RB Size=36, RB Offset=18	21.17	21.37	21.16
		RB Size=36, RB Offset=37	21.18	21.30	21.18
		RB Size=75, RB Offset=0	20.54	20.81	20.42
20.0	QPSK	RB Size=1, RB Offset=0	21.34	21.85	21.37
		RB Size=1, RB Offset=49	21.24	21.76	21.32
		RB Size=1, RB Offset=99	21.40	21.98	21.49
		RB Size=50, RB Offset=0	21.26	21.81	21.25
		RB Size=50, RB Offset=24	21.45	21.88	21.44
		RB Size=50, RB Offset=49	21.44	21.91	21.47
		RB Size=100, RB Offset=0	20.32	20.75	20.37
	16QAM	RB Size=1, RB Offset=0	21.75	22.13	21.84
		RB Size=1, RB Offset=49	21.69	22.07	21.78
		RB Size=1, RB Offset=99	21.78	22.18	21.87
		RB Size=50, RB Offset=0	21.63	22.07	21.79
		RB Size=50, RB Offset=24	21.80	22.19	21.92
		RB Size=50, RB Offset=49	21.85	22.05	21.92
		RB Size=100, RB Offset=0	20.78	21.18	20.84

**Peak-to-average ratio (PAR)**

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	5.60	13	Pass
QPSK (100RB Size)	4.58	13	Pass
16QAM (1RB Size)	5.18	13	Pass
16QAM (100RB Size)	4.54	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									
2535.00	82.39	239	1.4	H	12.9	2.60	9.30	19.60	33
2535.00	83.74	37	1.1	V	14.9	2.60	9.30	21.60	33
10 MHz Bandwidth									
2535.00	83.67	192	2.0	H	14.2	2.60	9.30	20.90	33
2535.00	83.90	133	2.3	V	15.0	2.60	9.30	21.70	33
15 MHz Bandwidth									
2535.00	83.17	246	1.3	H	13.7	2.60	9.30	20.40	33
2535.00	83.59	48	2.4	V	14.7	2.60	9.30	21.40	33
20 MHz Bandwidth									
2535.00	82.86	332	1.0	H	13.4	2.60	9.30	20.10	33
2535.00	83.42	118	2.0	V	14.5	2.60	9.30	21.20	33

**16QAM:**

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
5 MHz Bandwidth									
2535.00	82.89	41	2.5	H	13.4	2.60	9.30	20.10	33
2535.00	83.69	27	2.1	V	14.8	2.60	9.30	21.50	33
10 MHz Bandwidth									
2535.00	82.45	315	2.4	H	13.0	2.60	9.30	19.70	33
2535.00	83.57	142	1.9	V	14.7	2.60	9.30	21.40	33
15 MHz Bandwidth									
2535.00	82.69	241	1.9	H	13.2	2.60	9.30	19.90	33
2535.00	83.05	356	2.3	V	14.2	2.60	9.30	20.90	33
20 MHz Bandwidth									
2535.00	82.14	305	2.0	H	12.7	2.60	9.30	19.40	33
2535.00	83.97	41	2.3	V	15.1	2.60	9.30	21.80	33

**Note:**

All above data were tested with no amplifier

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

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

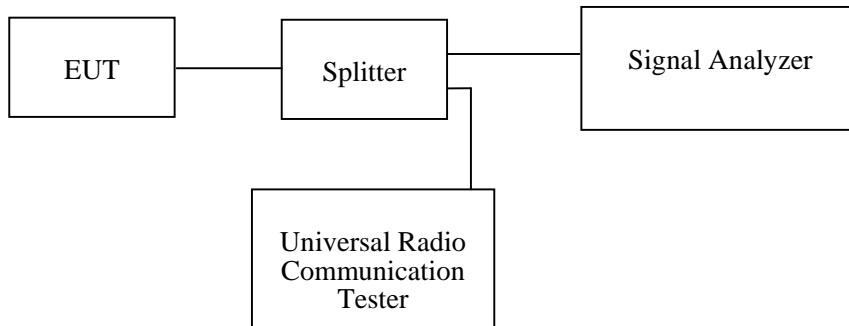
**Applicable Standard**

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

**Test Procedure**

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

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



**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	24~25 °C
<b>Relative Humidity:</b>	48~50 %
<b>ATM Pressure:</b>	100.0~101.0 kPa

*The testing was performed by Rocky Kang from 2018-01-15 to 2018-01-16.*

*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	248.91	321.30

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	836.6	4.096	4.674
HSUPA (BPSK)	836.6	4.096	4.674
HSDPA (16QAM)	836.6	4.096	4.674

**PCS Band (Part 24E)**

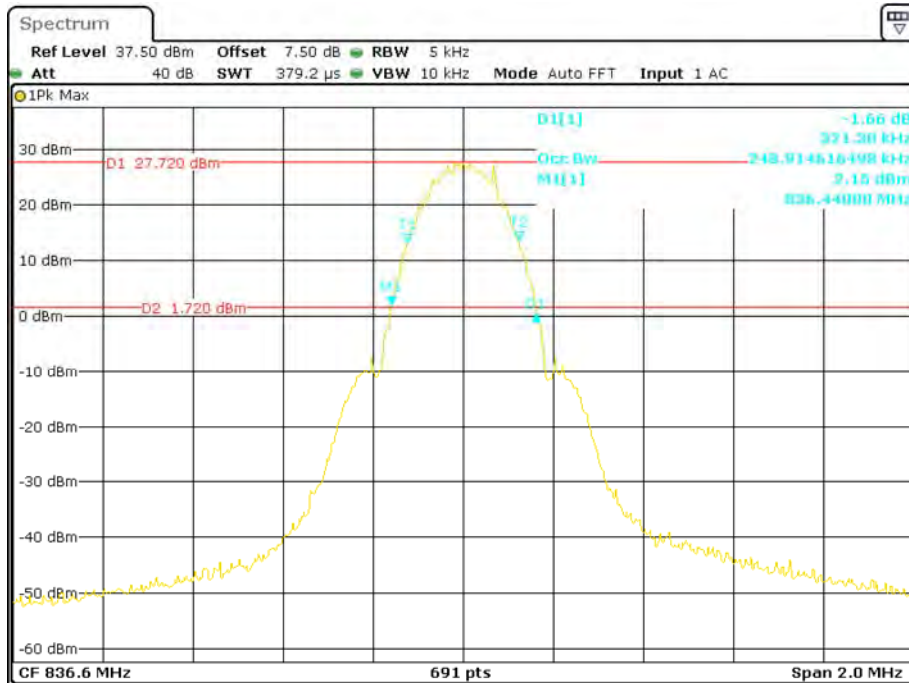
Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	1880.0	248.91	321.30

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	1880.0	4.081	4.674
HSUPA (BPSK)	1880.0	4.096	4.674
HSDPA (16QAM)	1880.0	4.081	4.674



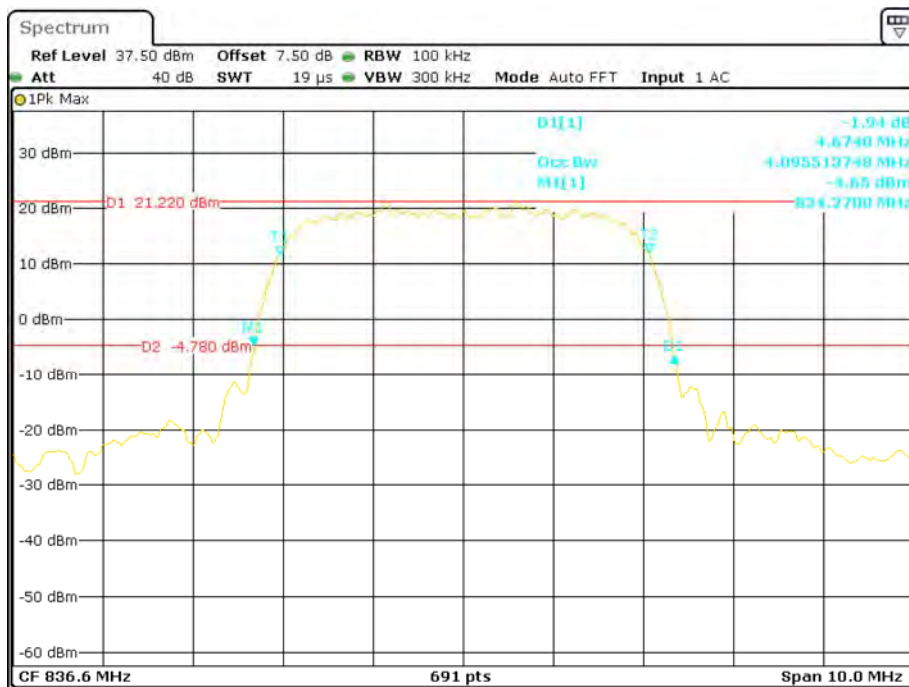
**Cellular Band (Part 22H)**

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



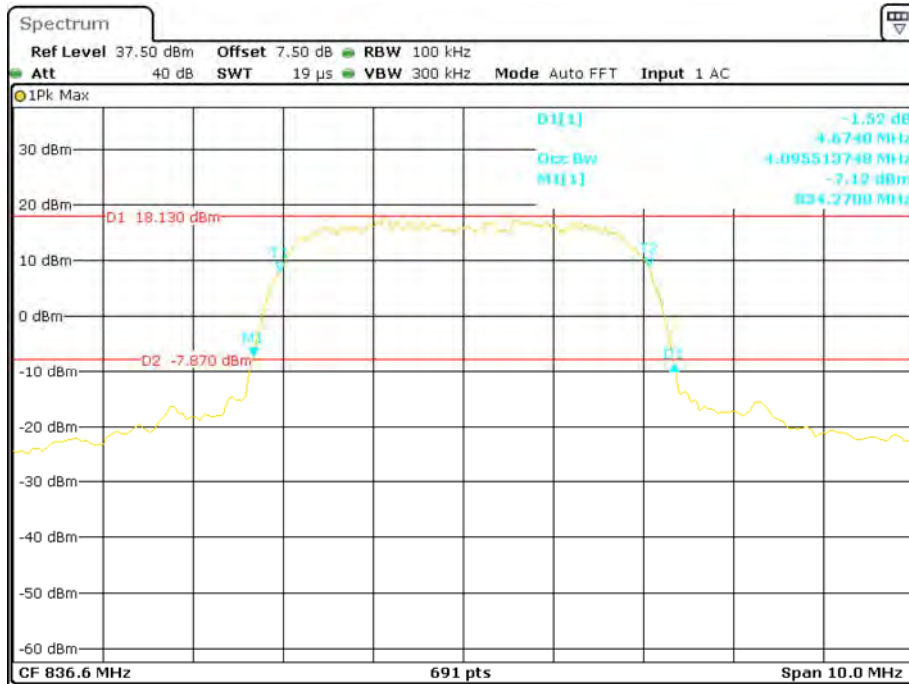
Date: 19.JAN.2018 11:05:24

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



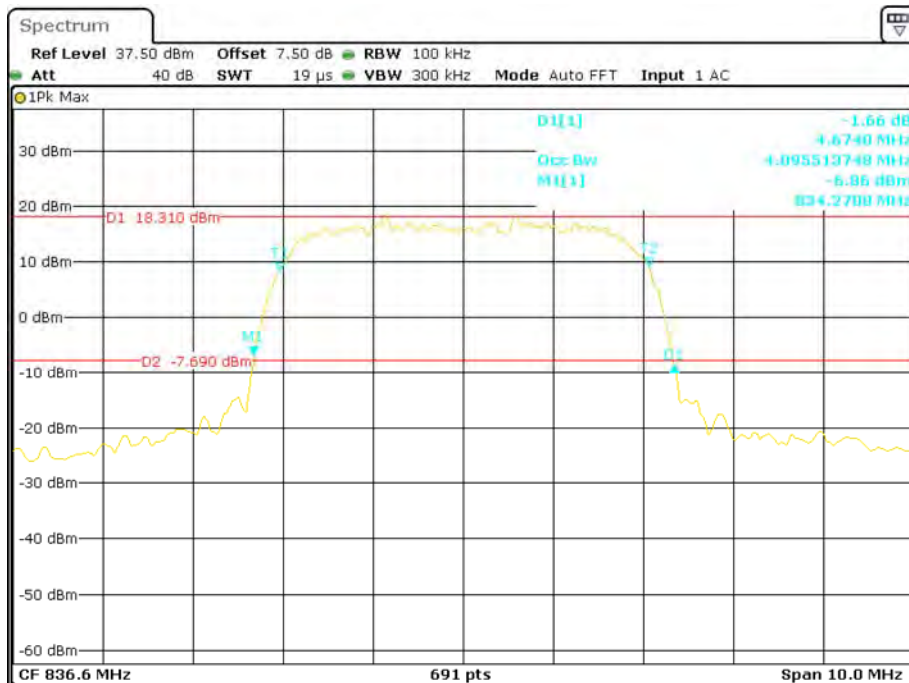
Date: 19.JAN.2018 13:21:26

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



Date: 19.JAN.2018 13:37:20

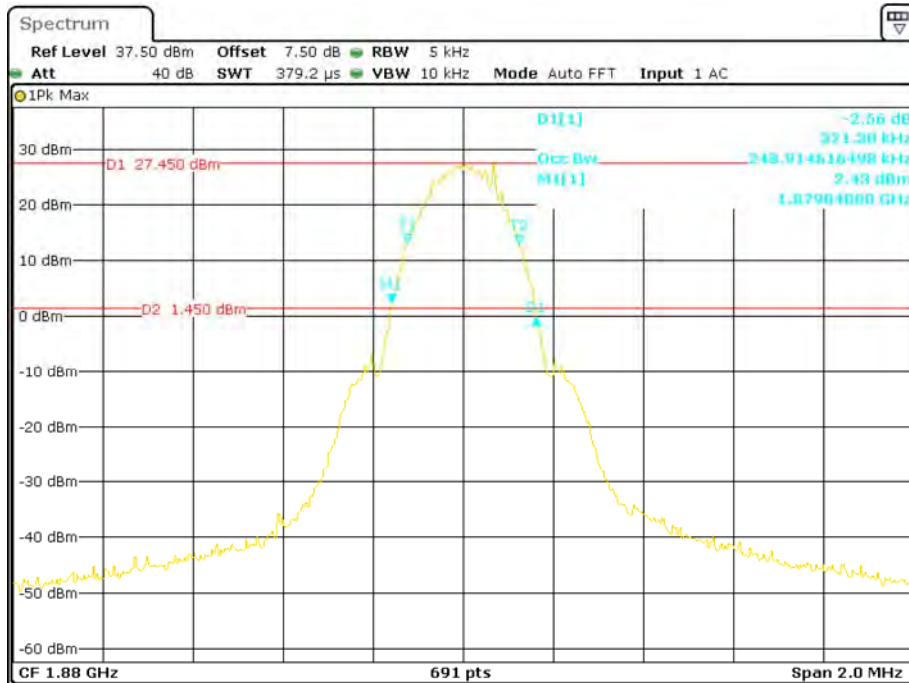
**26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode**



Date: 19.JAN.2018 13:26:59

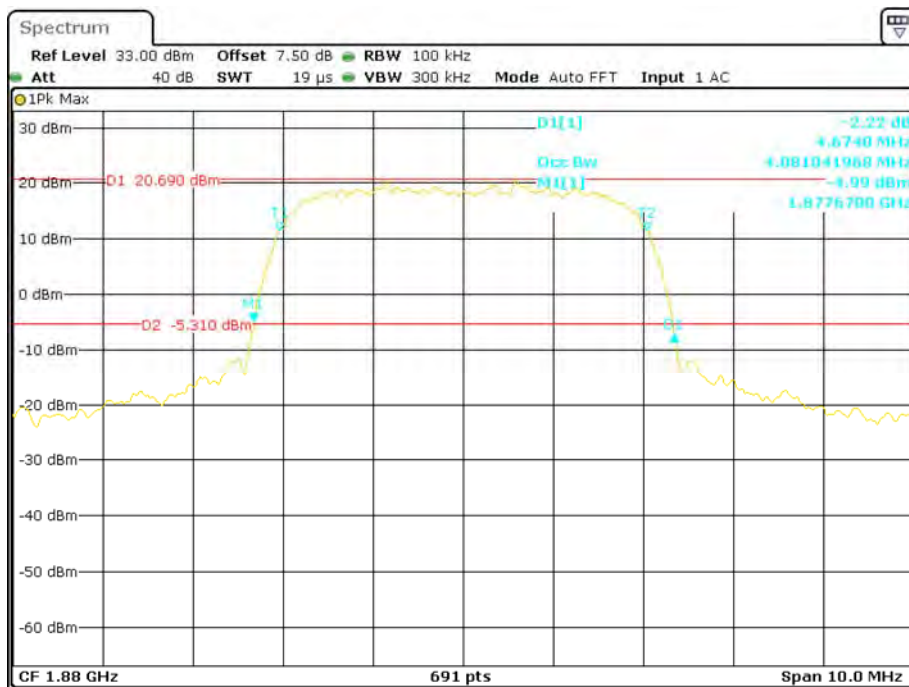
**PCS Band (Part 24E)**

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



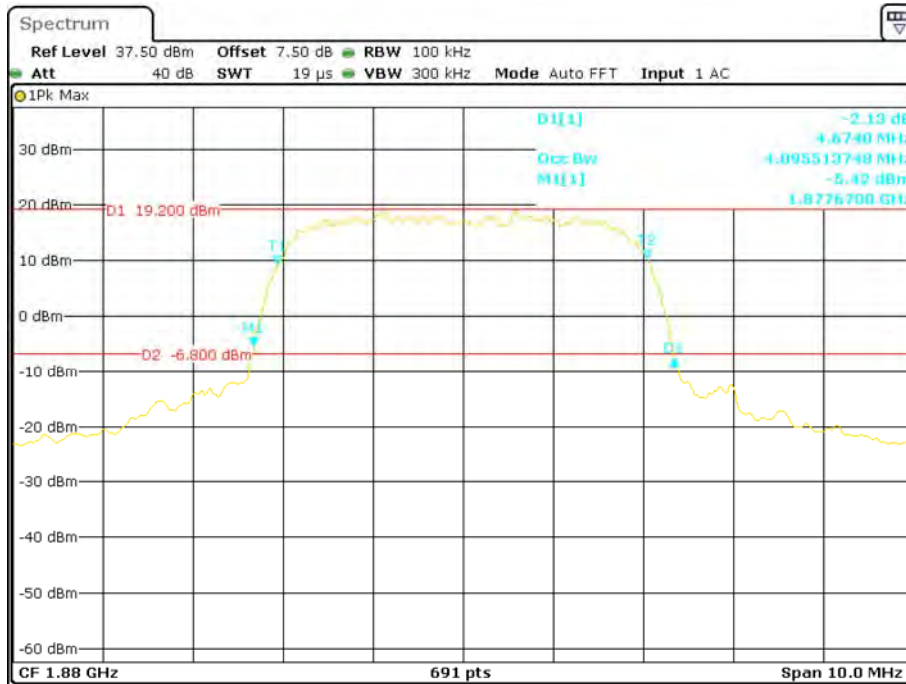
Date: 19.JAN.2018 11:15:40

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



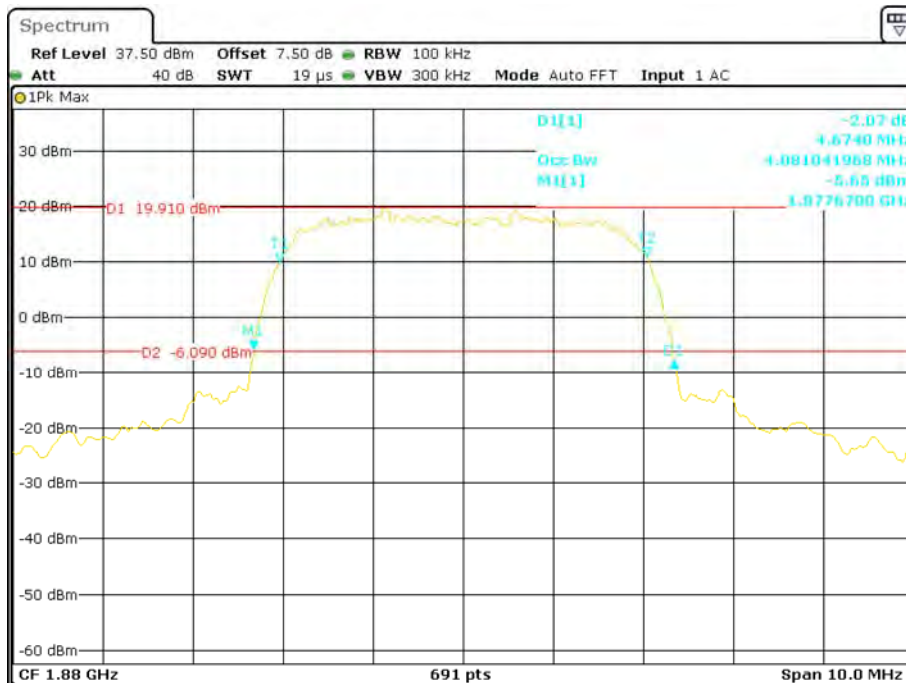
Date: 19.JAN.2018 13:08:37

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



Date: 19.JAN.2018 13:35:18

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

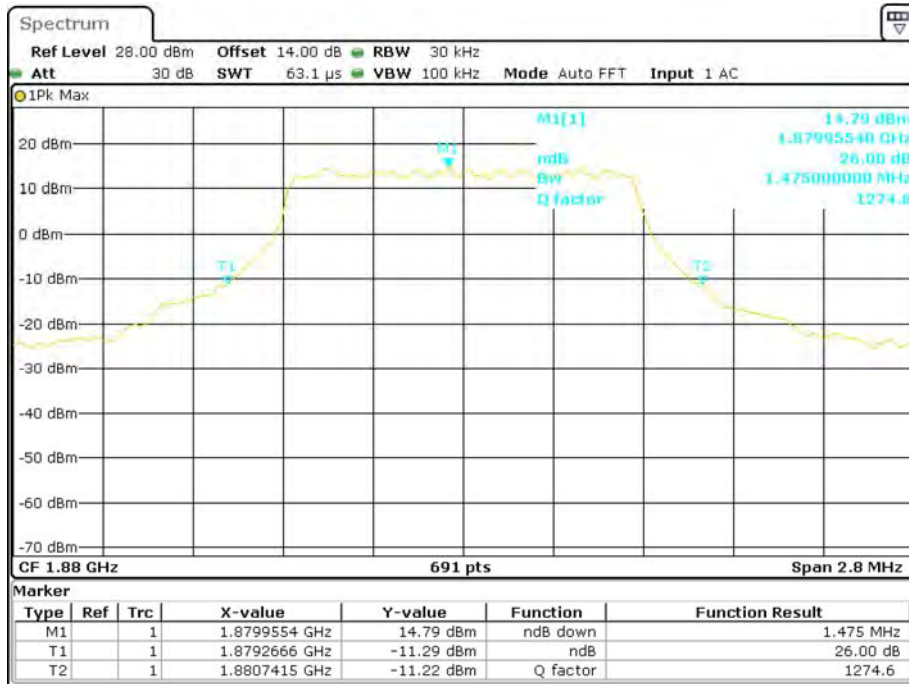


Date: 19.JAN.2018 13:32:32

**LTE Band 2: (Middle Channel)**

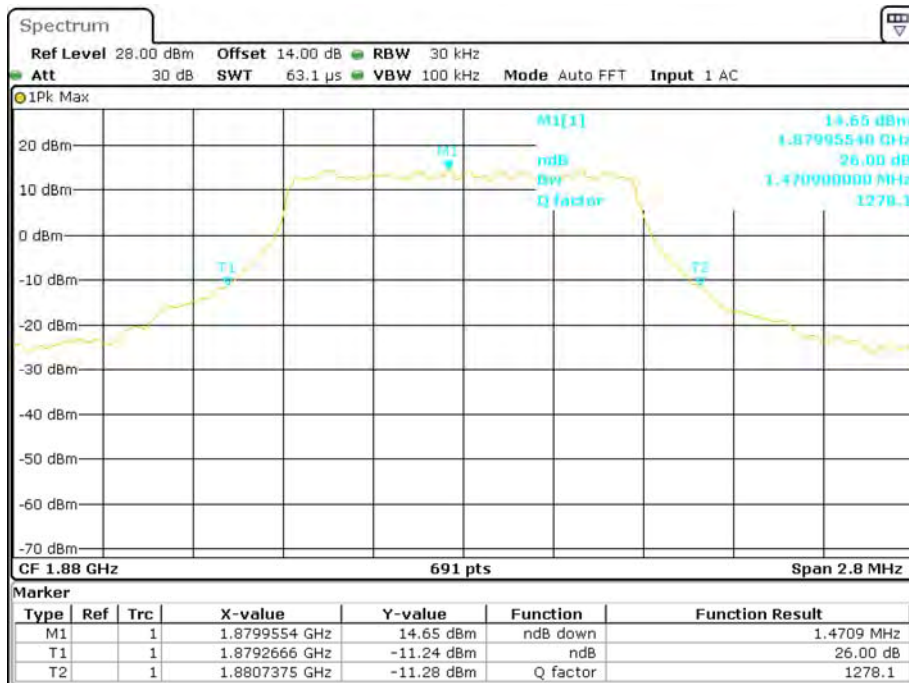
<b>Bandwidth (MHz)</b>	<b>Modulation</b>	<b>99% Occupied Bandwidth (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>
1.4	QPSK	1.106	1.475
	16QAM	1.110	1.471
3.0	QPSK	2.692	3.039
	16QAM	2.683	3.030
5.0	QPSK	4.544	5.398
	16QAM	4.559	5.412
10.0	QPSK	8.973	9.783
	16QAM	8.973	9.870
15.0	QPSK	13.546	15.022
	16QAM	13.546	15.152
20.0	QPSK	18.003	19.682
	16QAM	18.003	19.566

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



Date: 15.JAN.2018 11:34:16

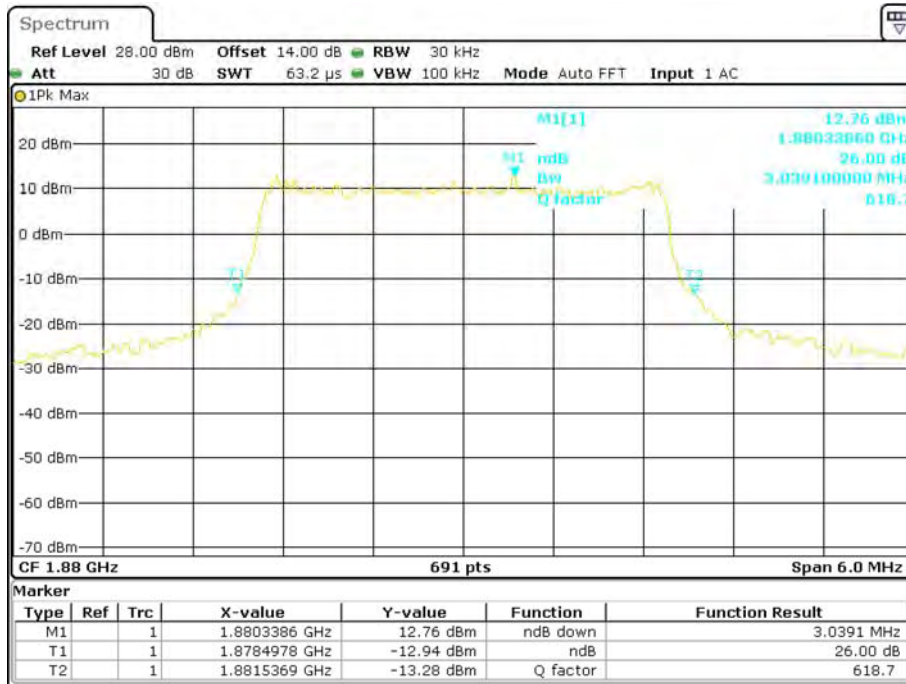
**16-QAM (1.4 MHz) - 26 dB Emission Bandwidth, Middle channel**



Date: 15.JAN.2018 11:35:09

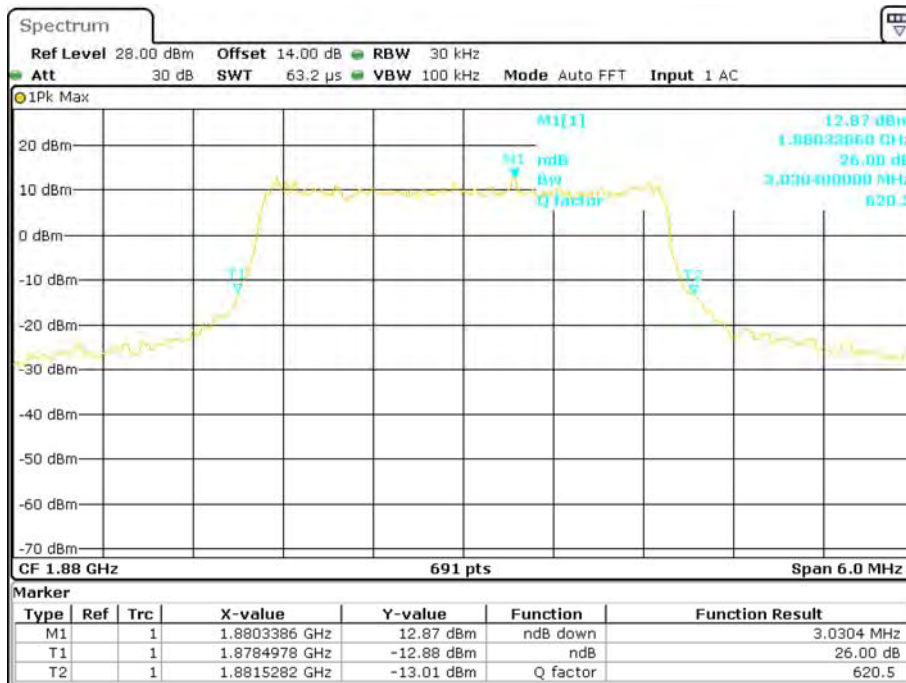


**QPSK (3.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



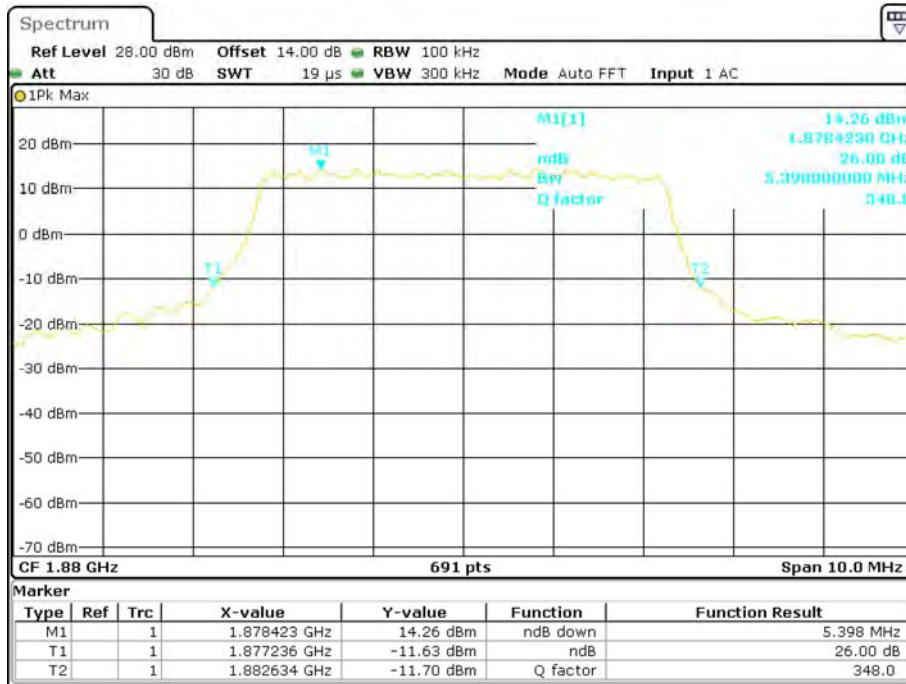
Date: 15.JAN.2018 11:36:15

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



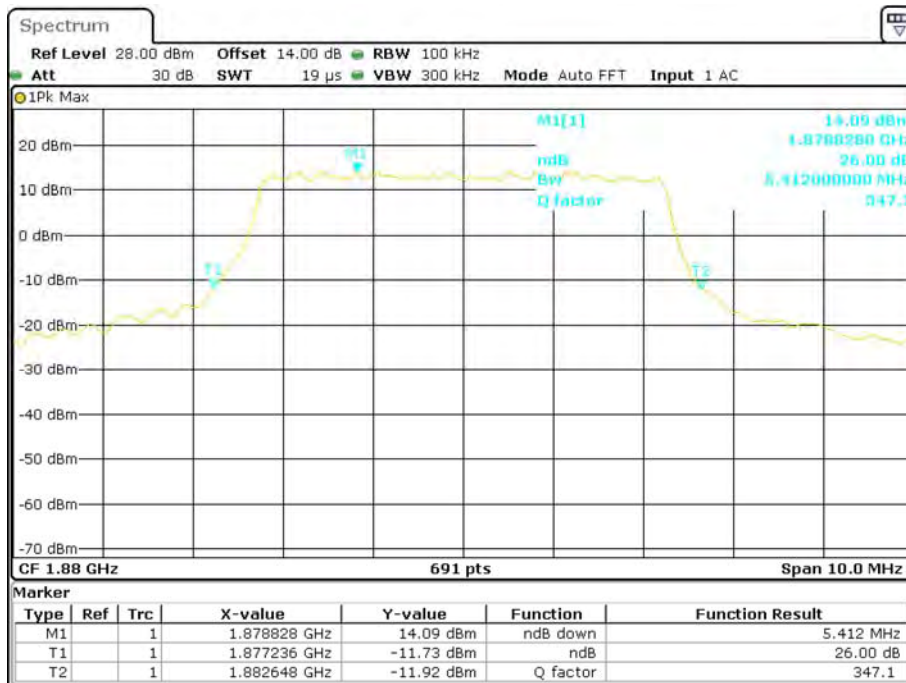
Date: 15.JAN.2018 11:35:42

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



Date: 15.JAN.2018 11:39:23

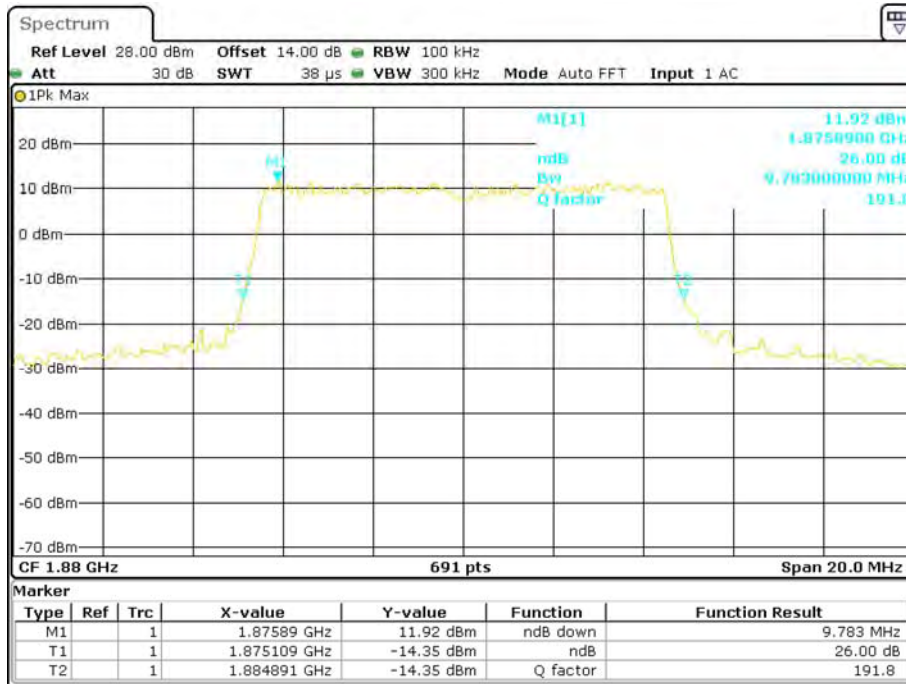
**16-QAM (5.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



Date: 15.JAN.2018 11:39:57

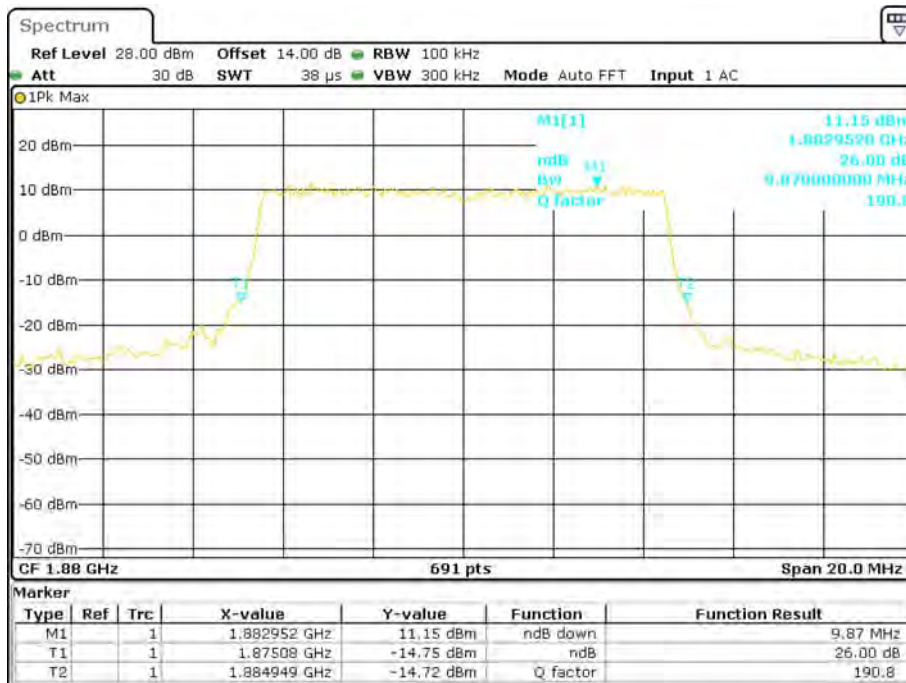


**QPSK (10.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



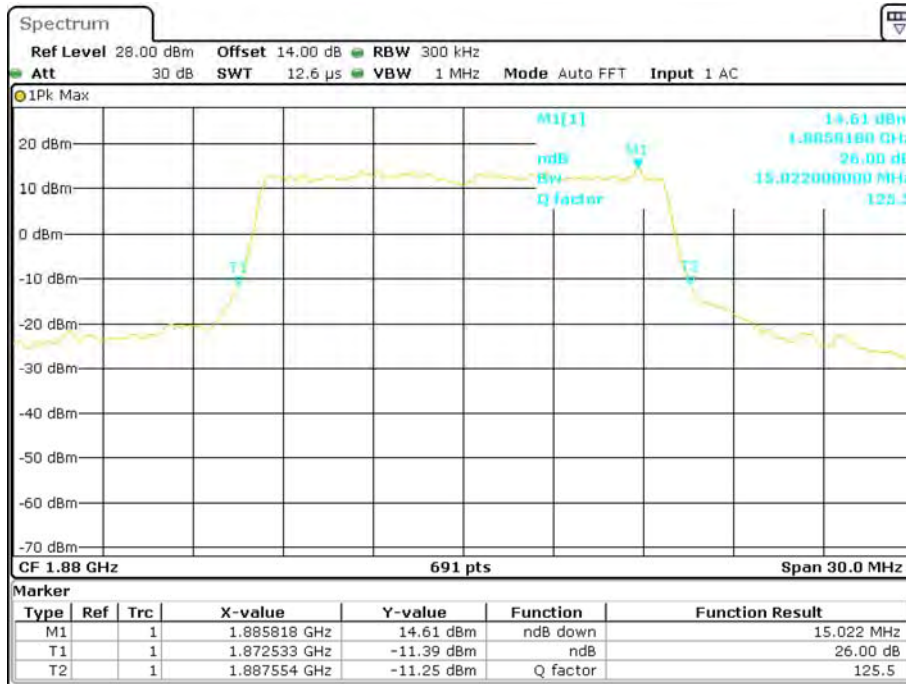
Date: 15.JAN.2018 11:41:34

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



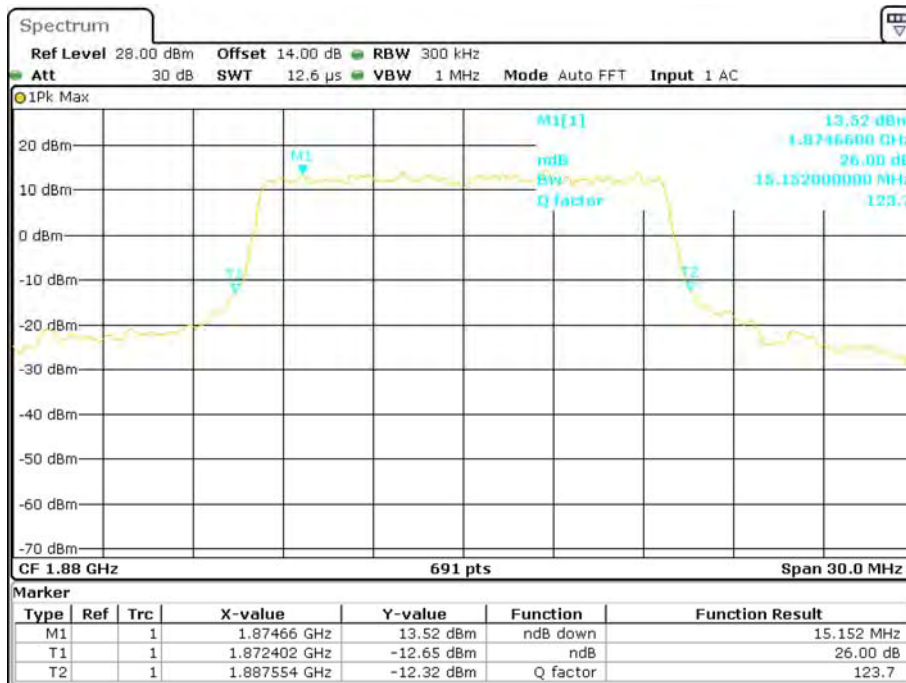
Date: 15.JAN.2018 11:41:00

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



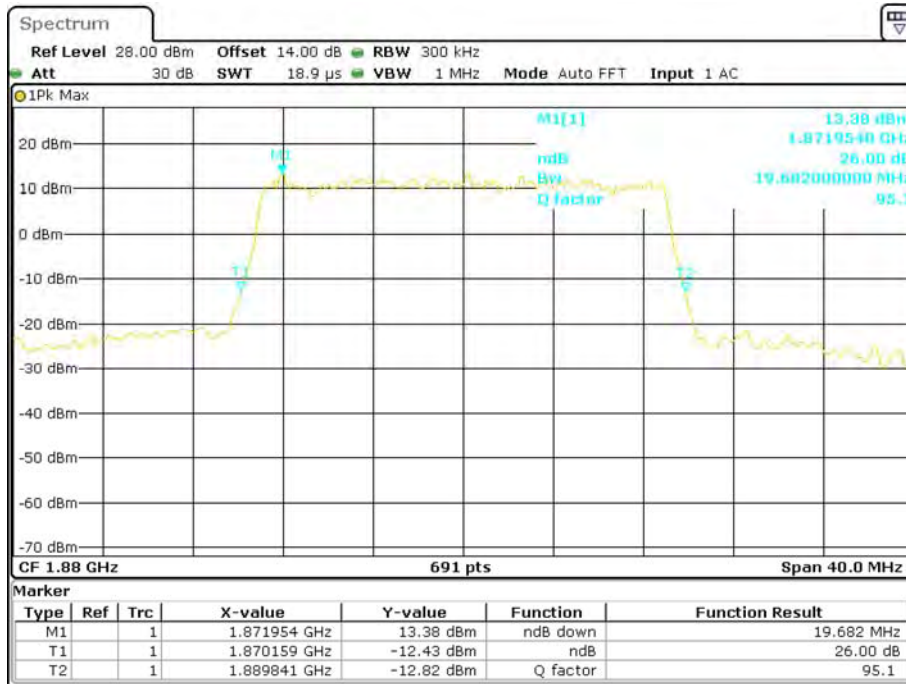
Date: 15.JAN.2018 11:43:58

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



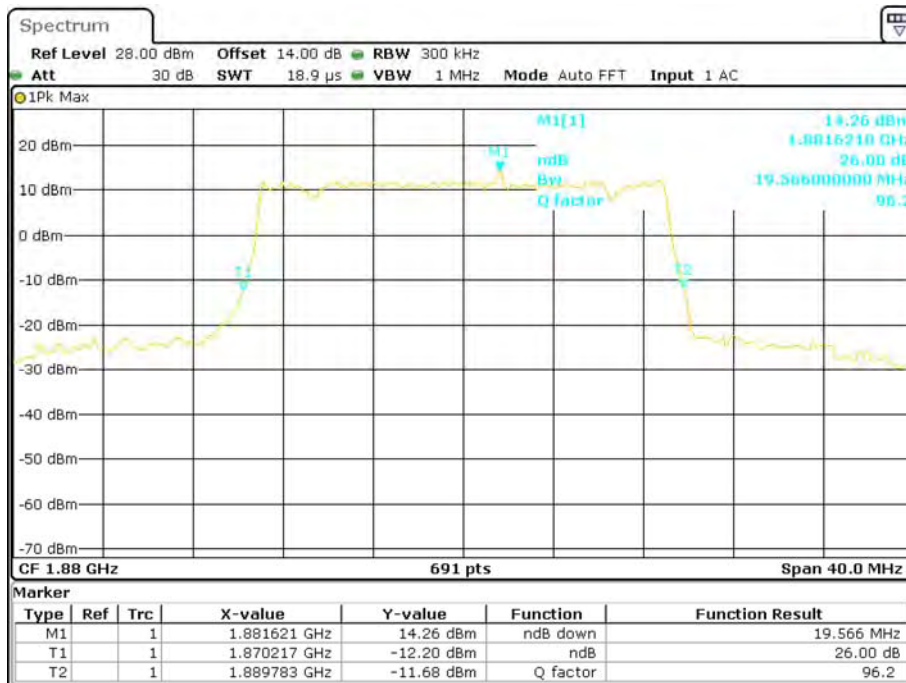
Date: 15.JAN.2018 11:44:38

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



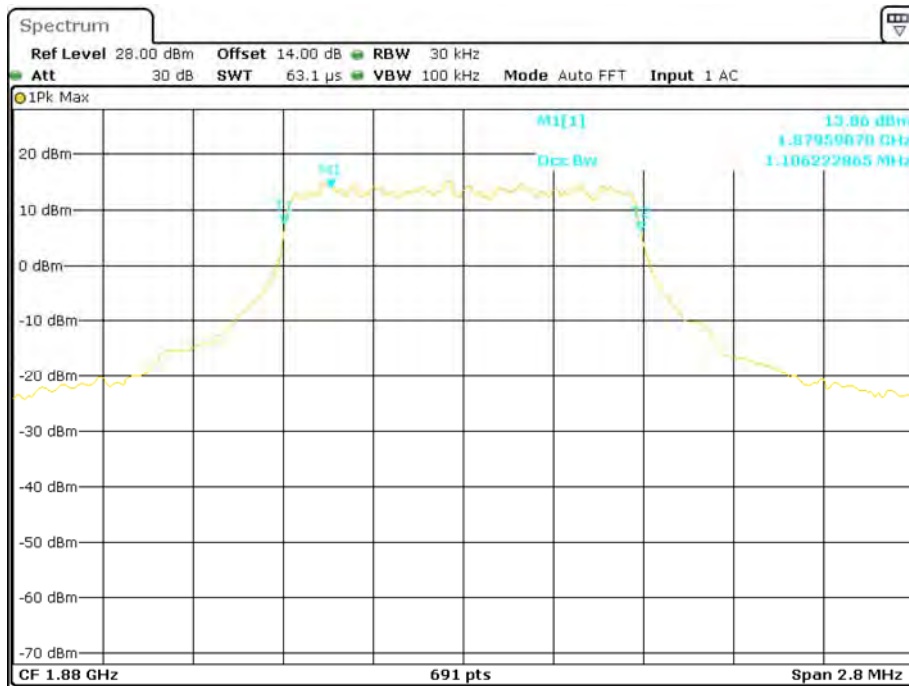
Date: 15.JAN.2018 11:46:16

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



Date: 15.JAN.2018 11:45:20

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



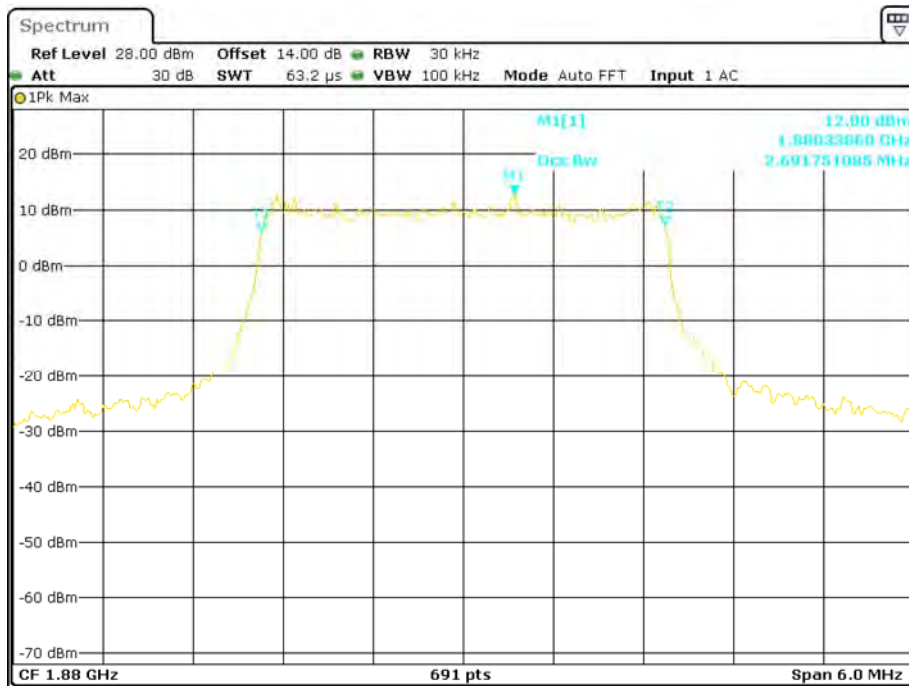
Date: 15.JAN.2018 10:18:57

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



Date: 15.JAN.2018 10:20:22

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



Date: 15.JAN.2018 10:25:28

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



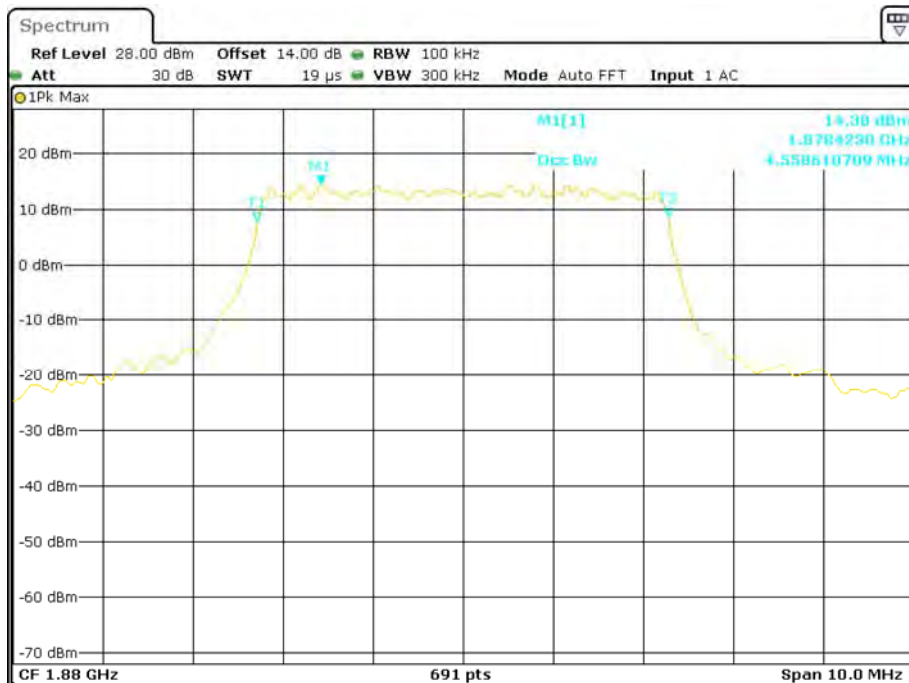
Date: 15.JAN.2018 10:24:52

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



Date: 15.JAN.2018 10:27:08

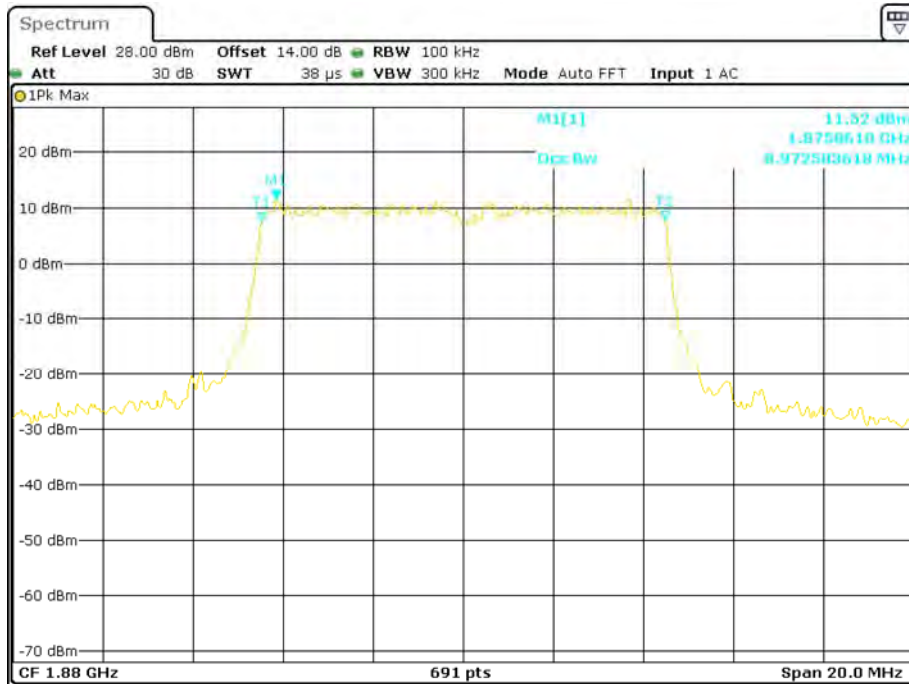
### 16-QAM (5.0 MHz) - 99% Occupied Bandwidth, Middle channel



Date: 15.JAN.2018 10:28:59

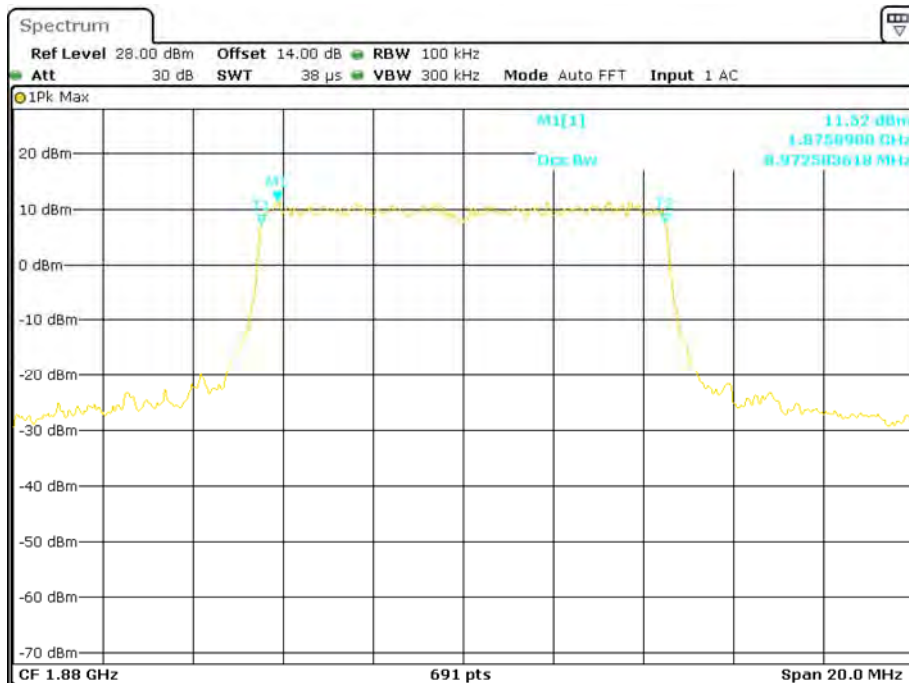


**QPSK (10.0 MHz) - 99% Occupied Bandwidth, Middle channel**



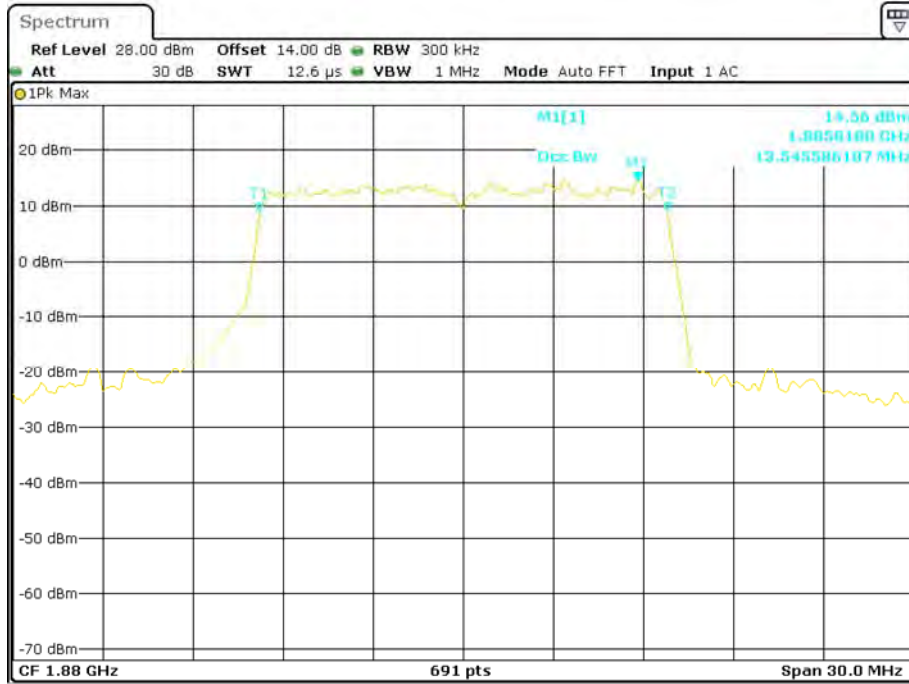
Date: 15.JAN.2018 10:30:34

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



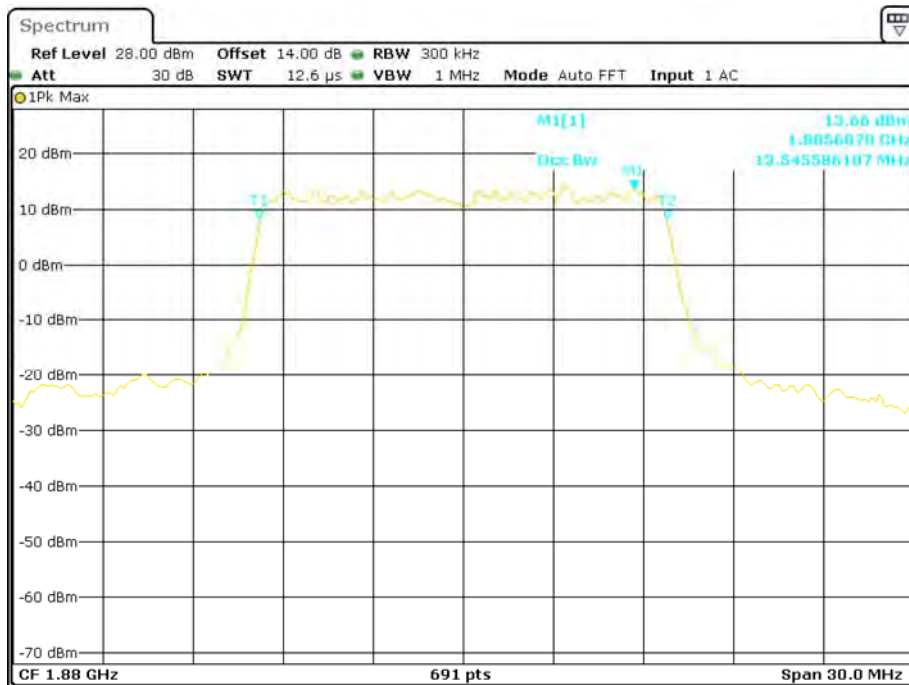
Date: 15.JAN.2018 10:30:02

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



Date: 15.JAN.2018 10:31:36

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



Date: 15.JAN.2018 10:32:17

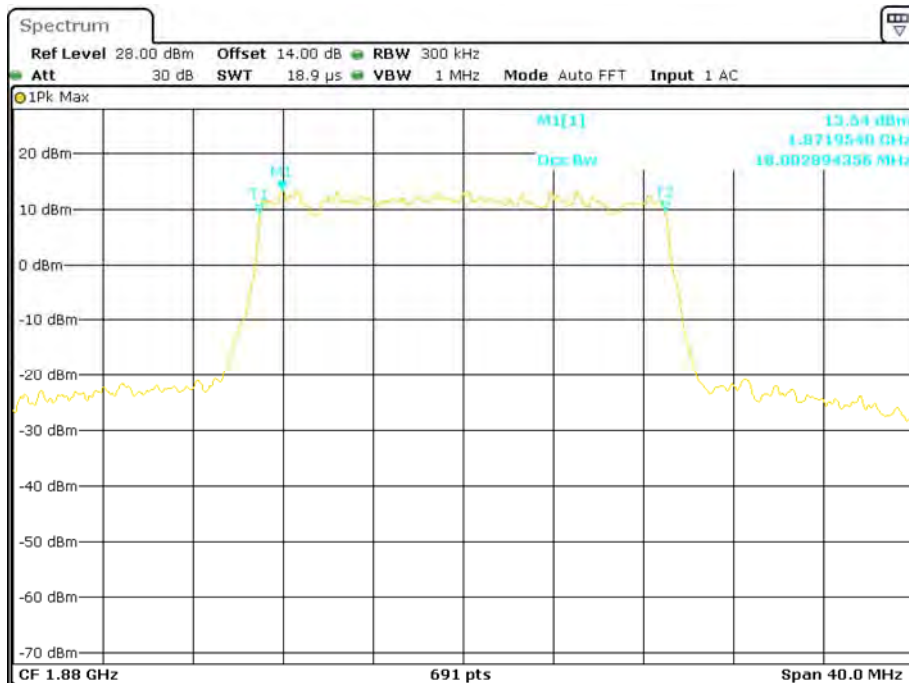


### QPSK (20.0 MHz) - 99% Occupied Bandwidth, Middle channel



Date: 15.JAN.2018 10:33:51

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

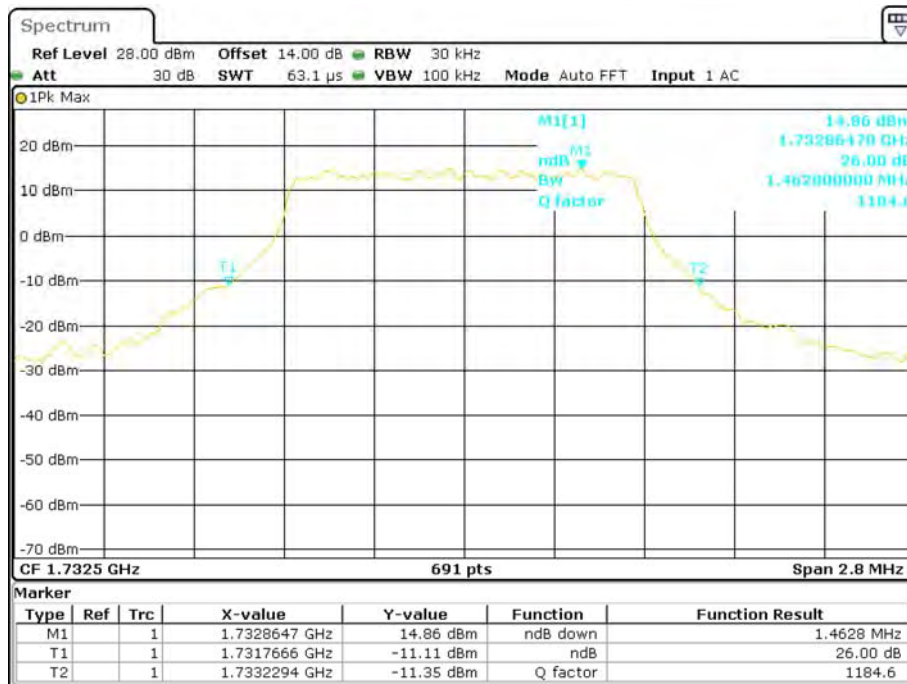


Date: 15.JAN.2018 10:33:13

**LTE Band 4: (Middle Channel)**

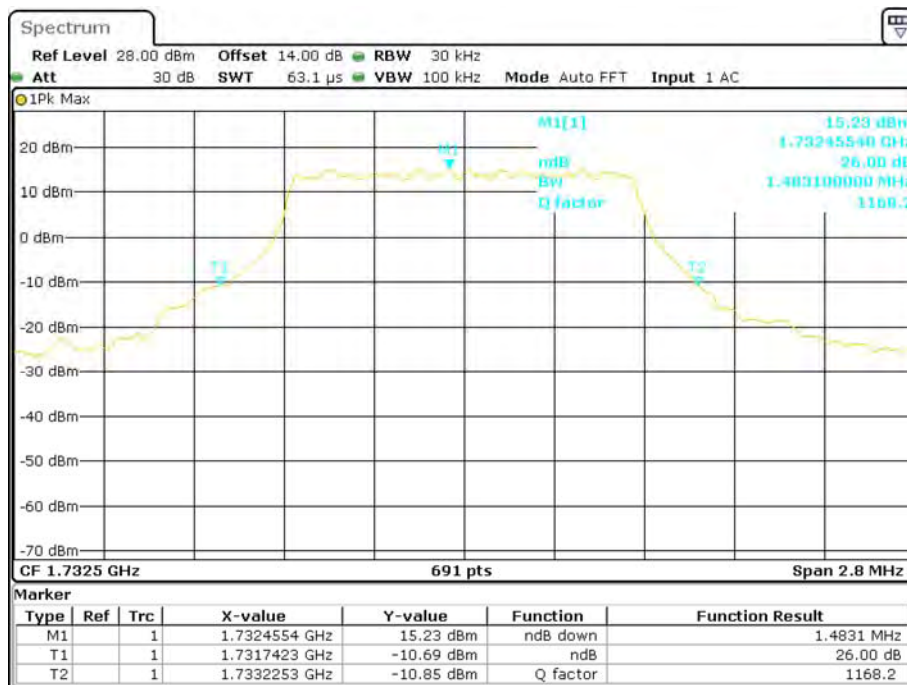
<b>Bandwidth (MHz)</b>	<b>Modulation</b>	<b>99% Occupied Bandwidth (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>
1.4	QPSK	1.110	1.463
	16QAM	1.110	1.483
3.0	QPSK	2.683	3.022
	16QAM	2.683	3.004
5.0	QPSK	4.544	5.340
	16QAM	4.544	5.384
10.0	QPSK	8.973	9.754
	16QAM	8.973	9.783
15.0	QPSK	13.502	15.282
	16QAM	13.502	15.152
20.0	QPSK	17.945	19.624
	16QAM	17.887	19.450

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



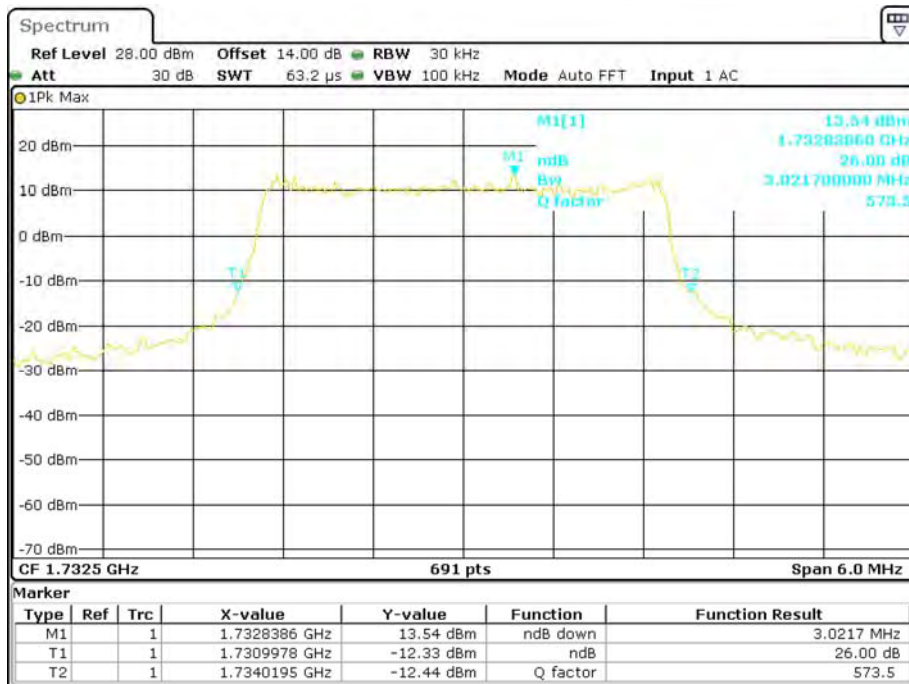
Date: 15.JAN.2018 12:59:32

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



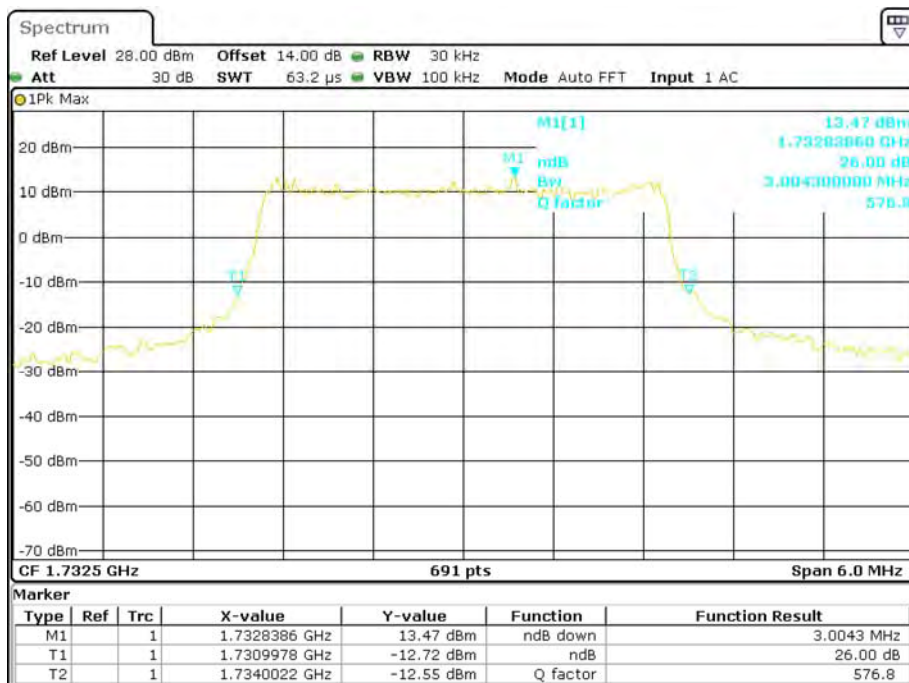
Date: 15.JAN.2018 13:03:37

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



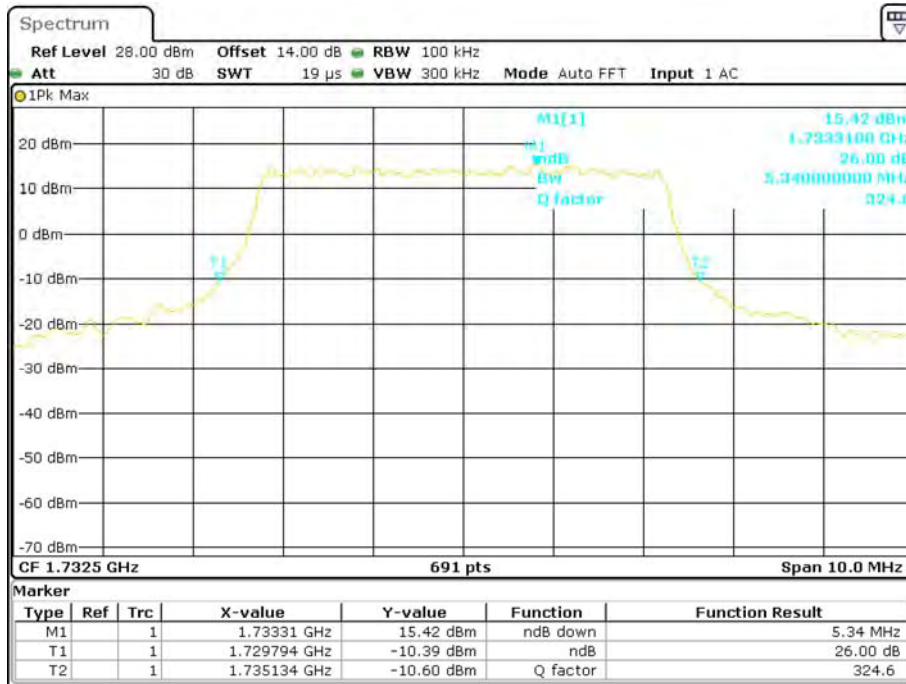
Date: 15.JAN.2018 13:05:22

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



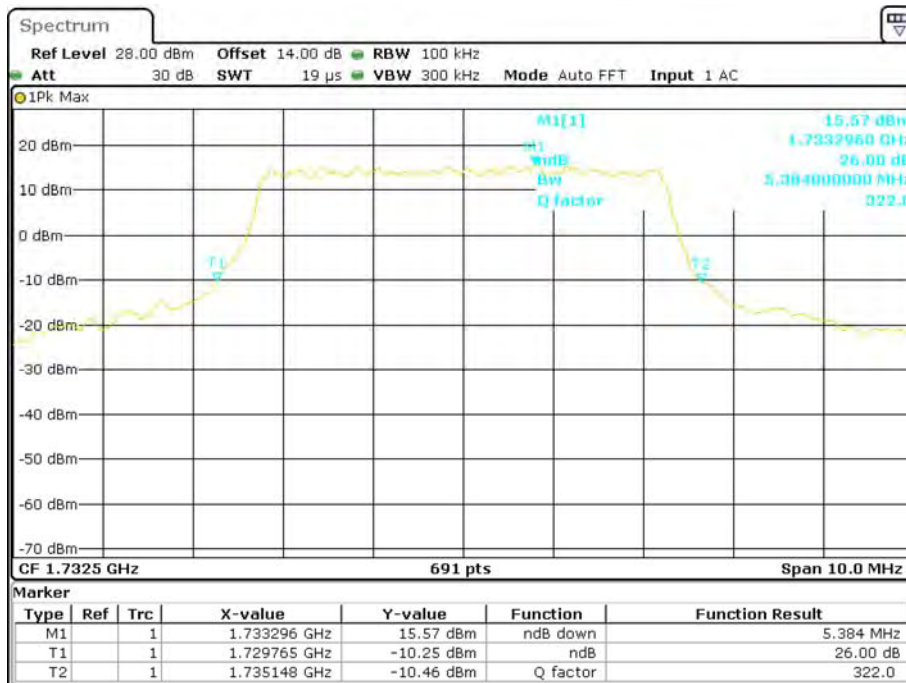
Date: 15.JAN.2018 13:04:44

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



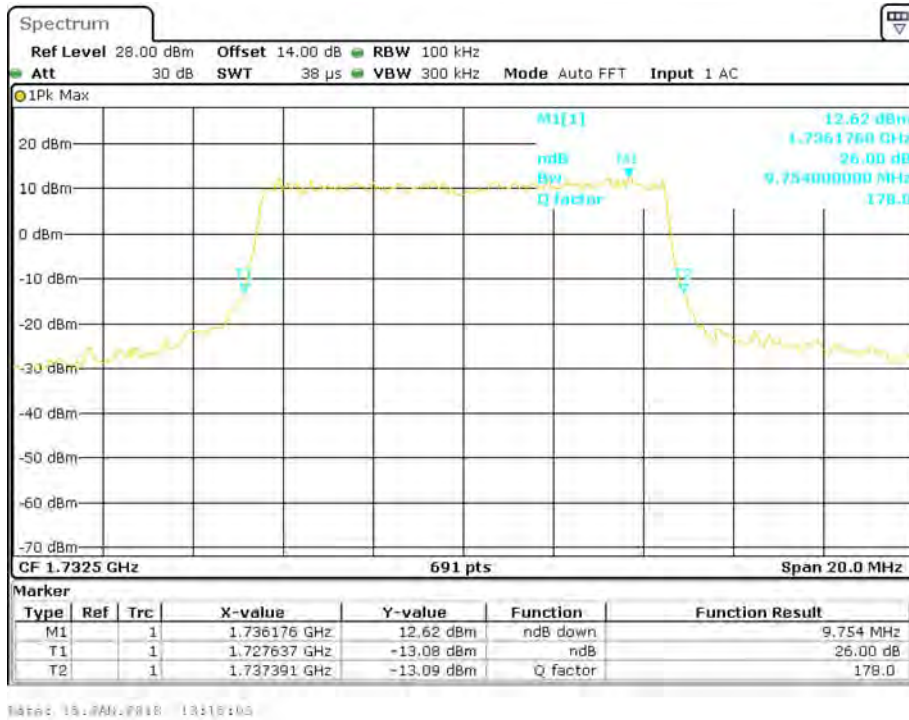
Date: 15.JAN.2018 13:14:13

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

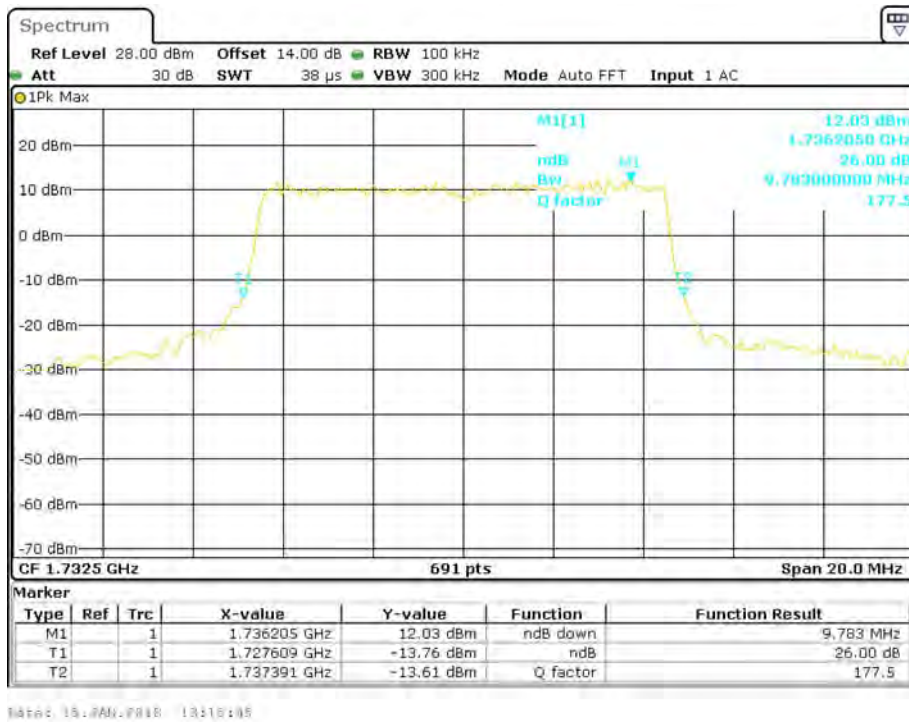


Date: 15.JAN.2018 13:13:35

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

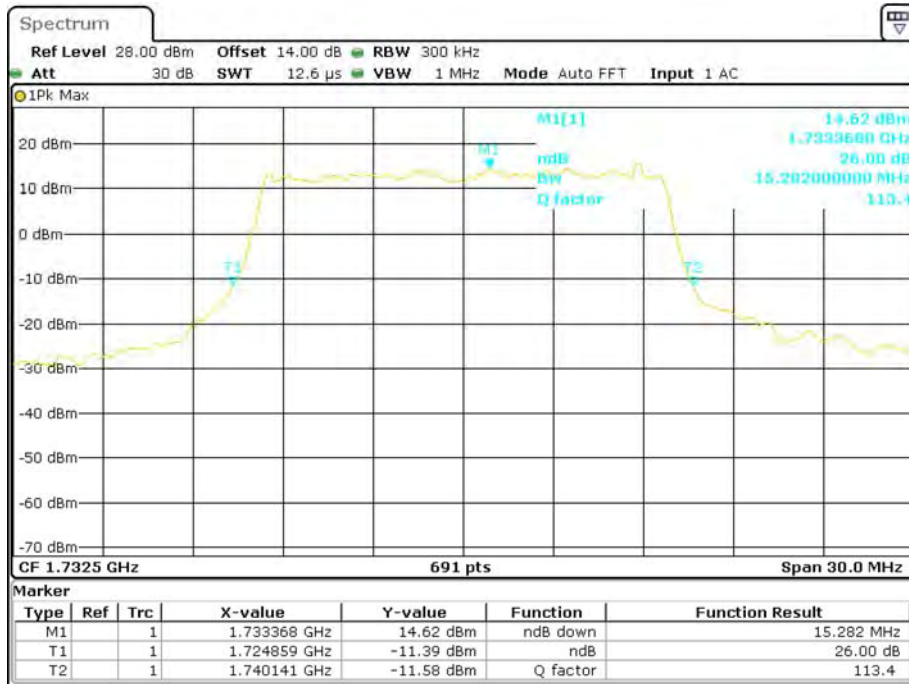


**16-QAM (10.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



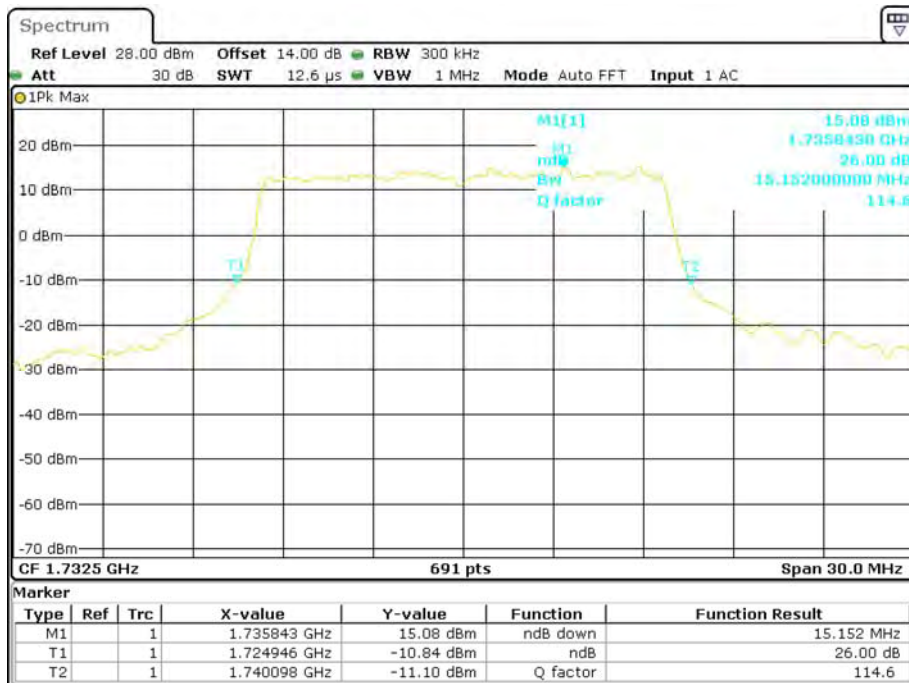


**QPSK (15.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



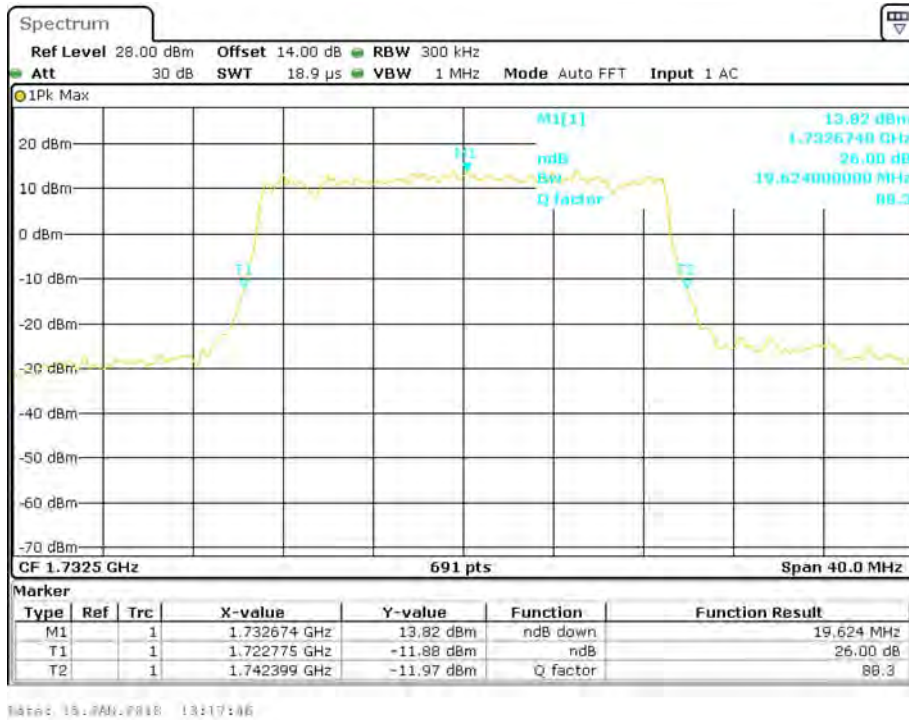
Date: 15.JAN.2018 13:17:08

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

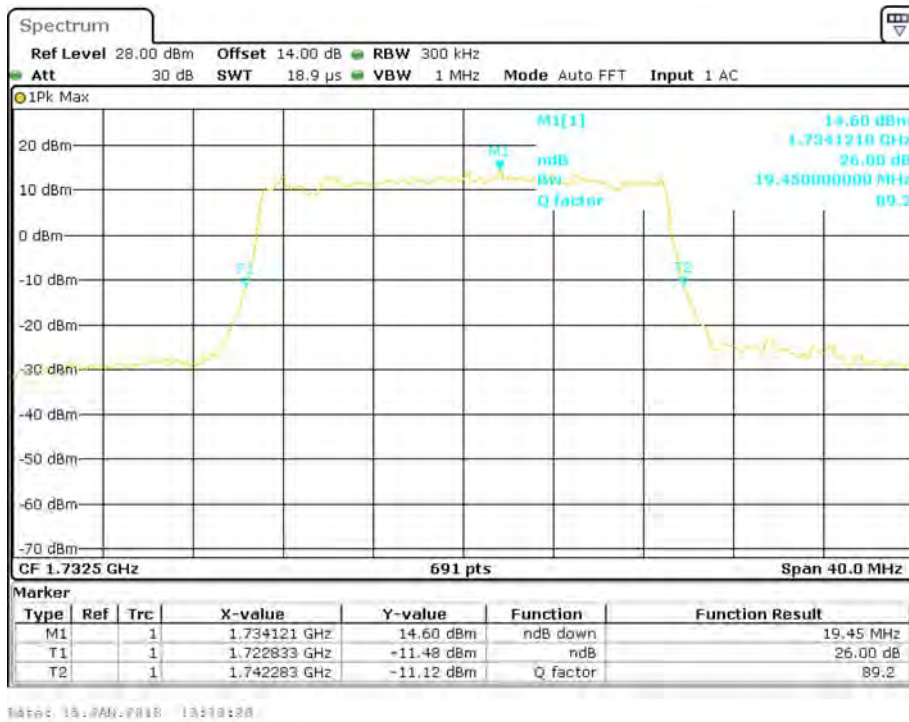


Date: 15.JAN.2018 13:16:35

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

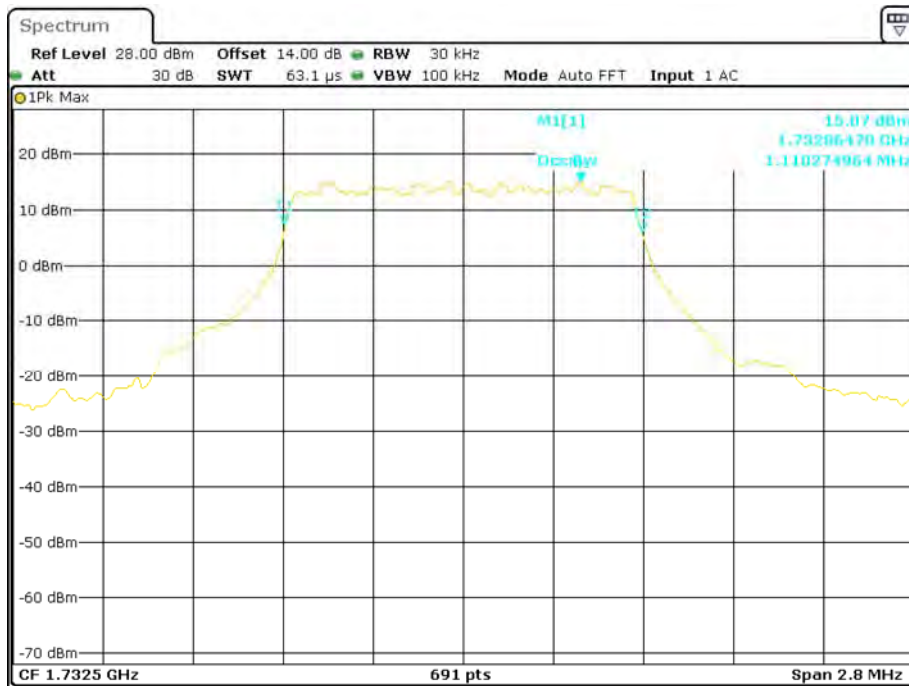


**16-QAM (20.0 MHz) - 26 dB Emission Bandwidth, Middle channel**





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



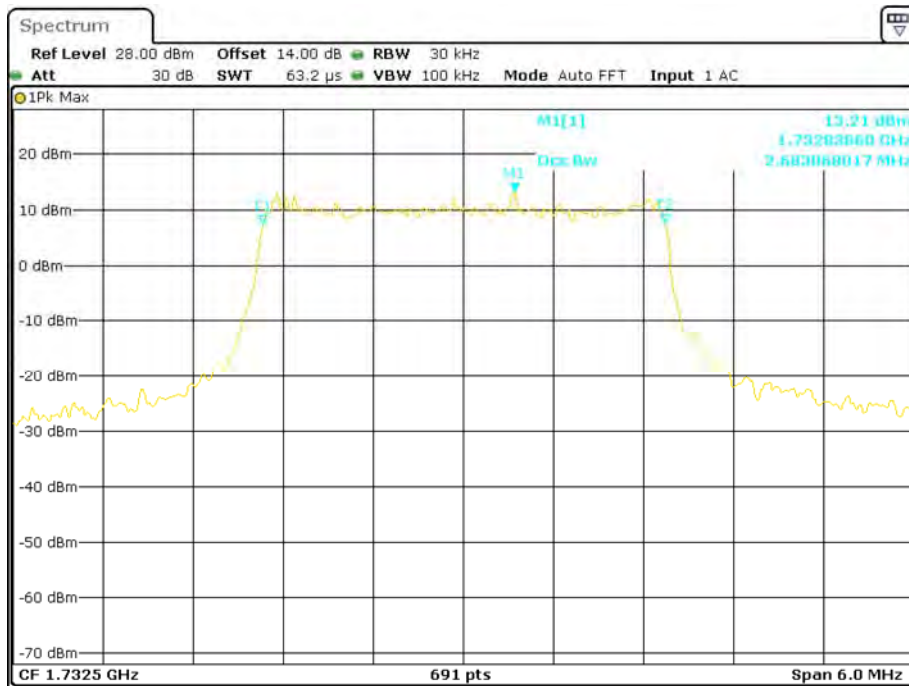
Date: 15.JAN.2018 10:37:31

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



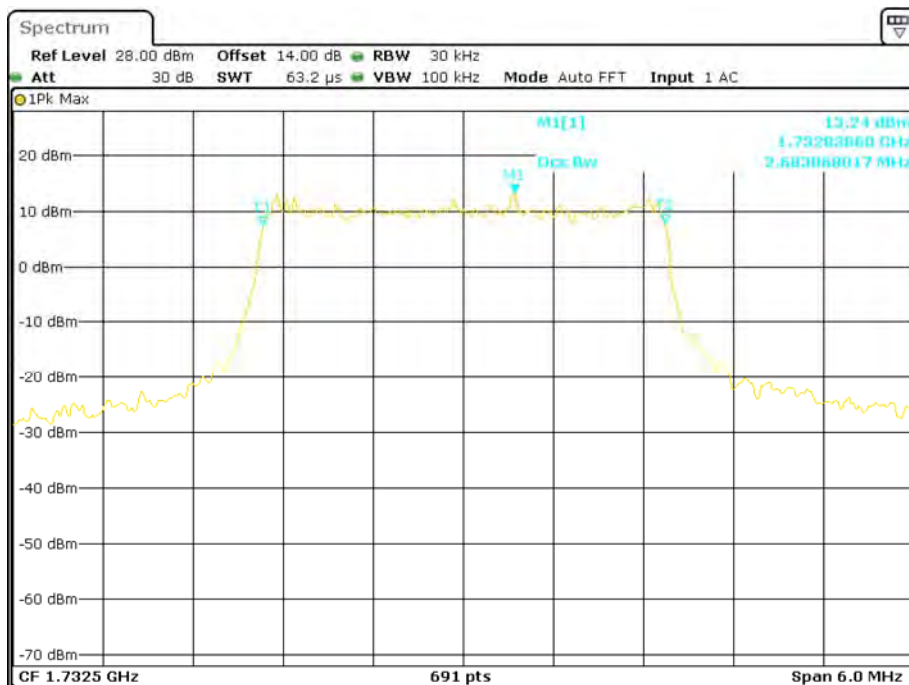
Date: 15.JAN.2018 10:38:00

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



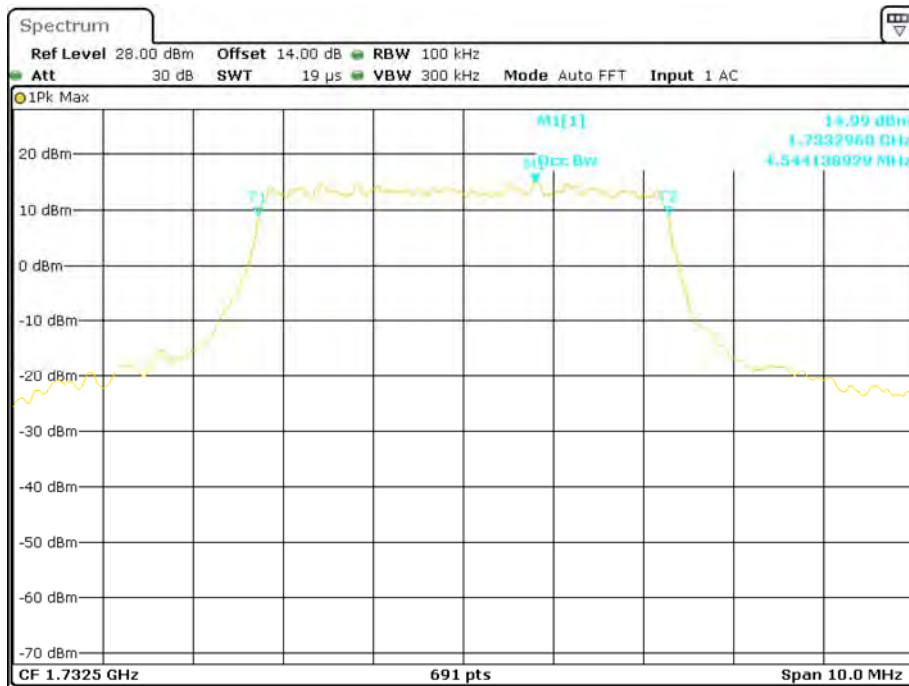
Date: 15.JAN.2018 10:39:52

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



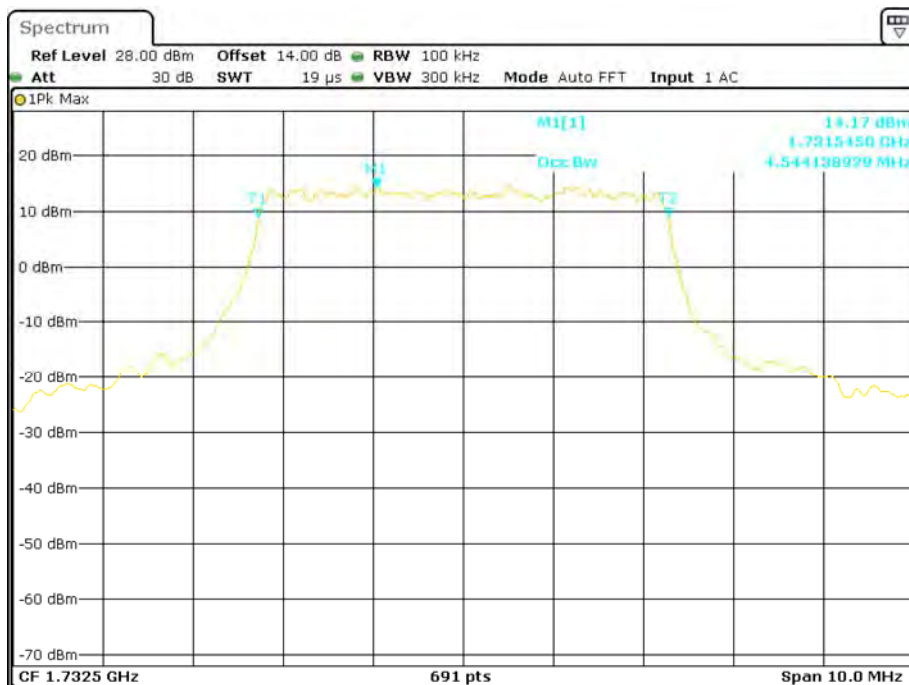
Date: 15.JAN.2018 10:39:23

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



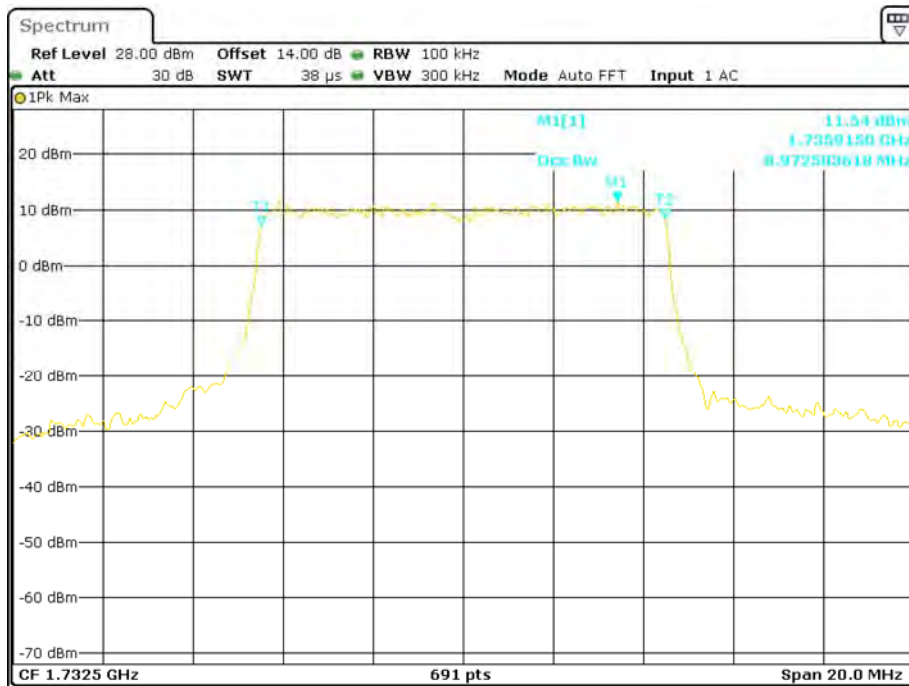
Date: 15.JAN.2018 10:41:24

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



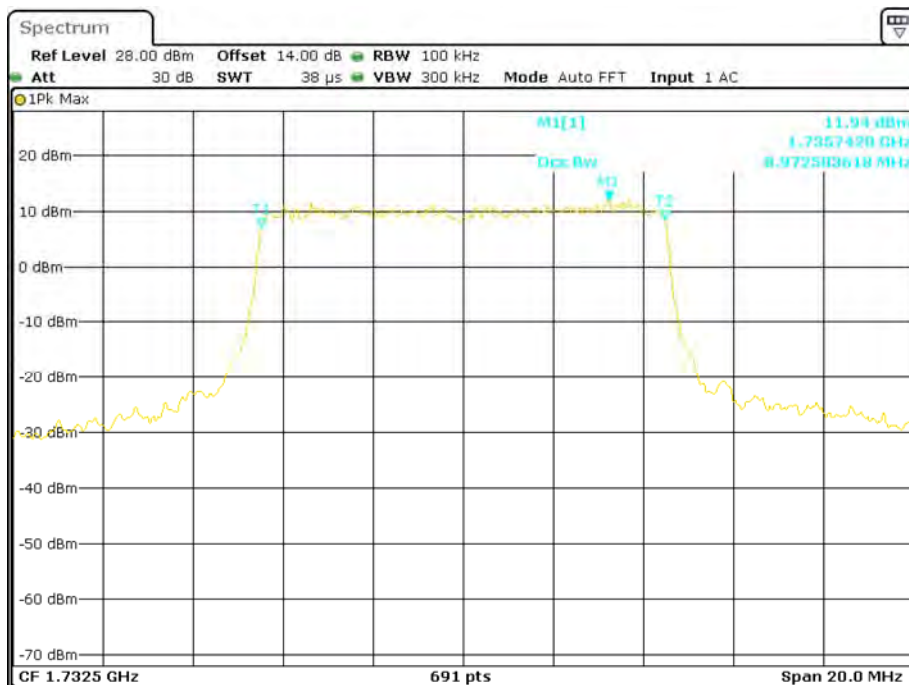
Date: 15.JAN.2018 10:41:55

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



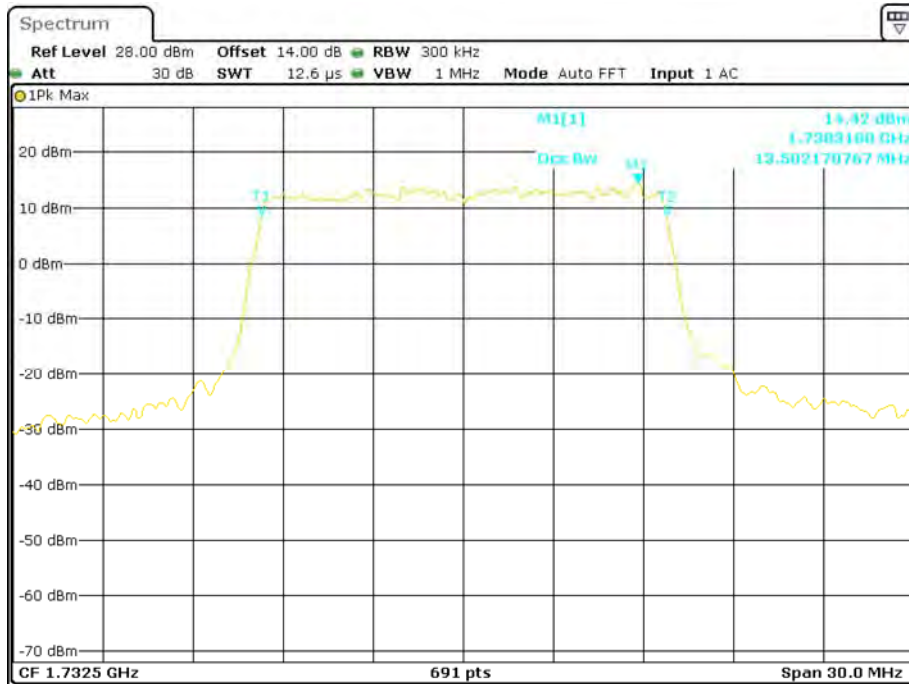
Date: 15.JAN.2018 10:45:33

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



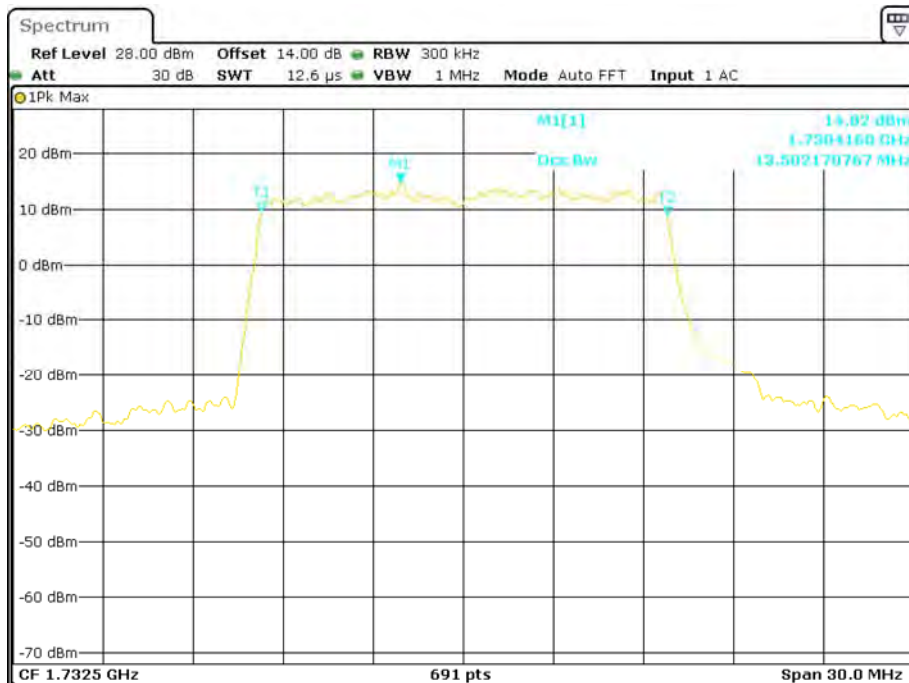
Date: 15.JAN.2018 10:44:53

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



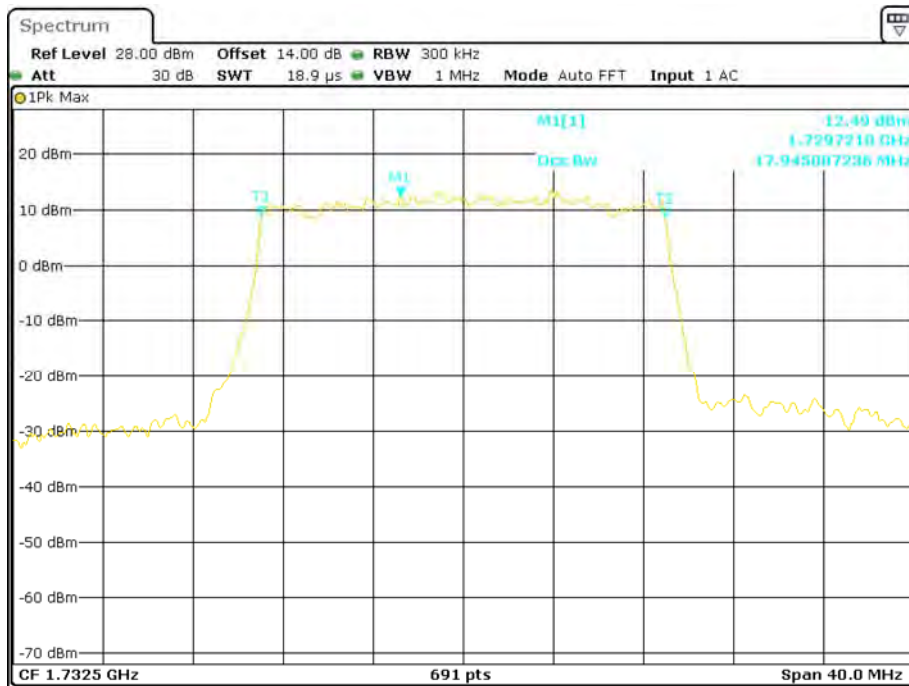
Date: 15.JAN.2018 10:46:13

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



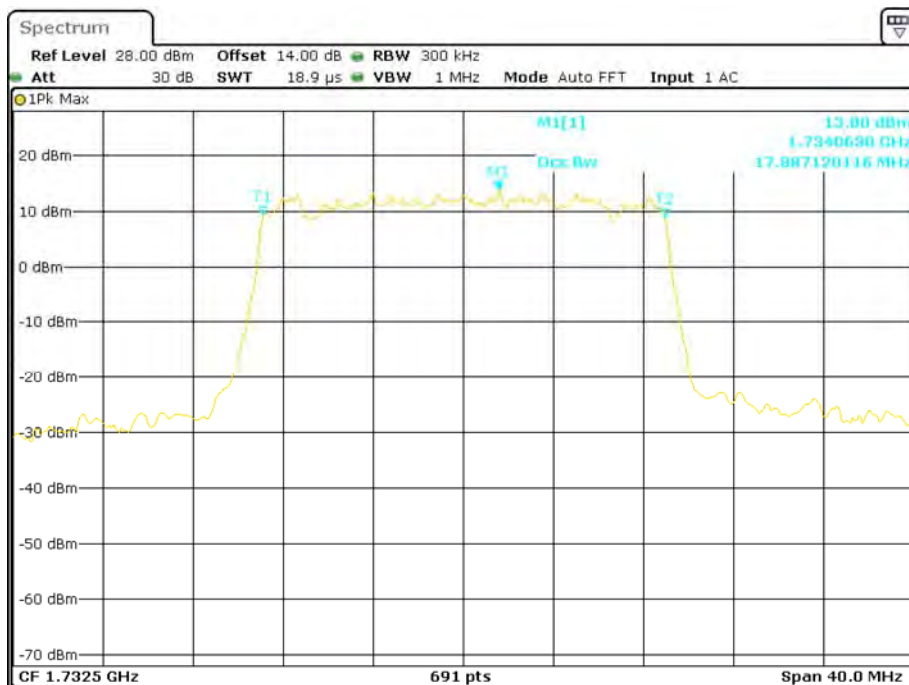
Date: 15.JAN.2018 10:46:45

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



Date: 15.JAN.2018 10:47:51

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



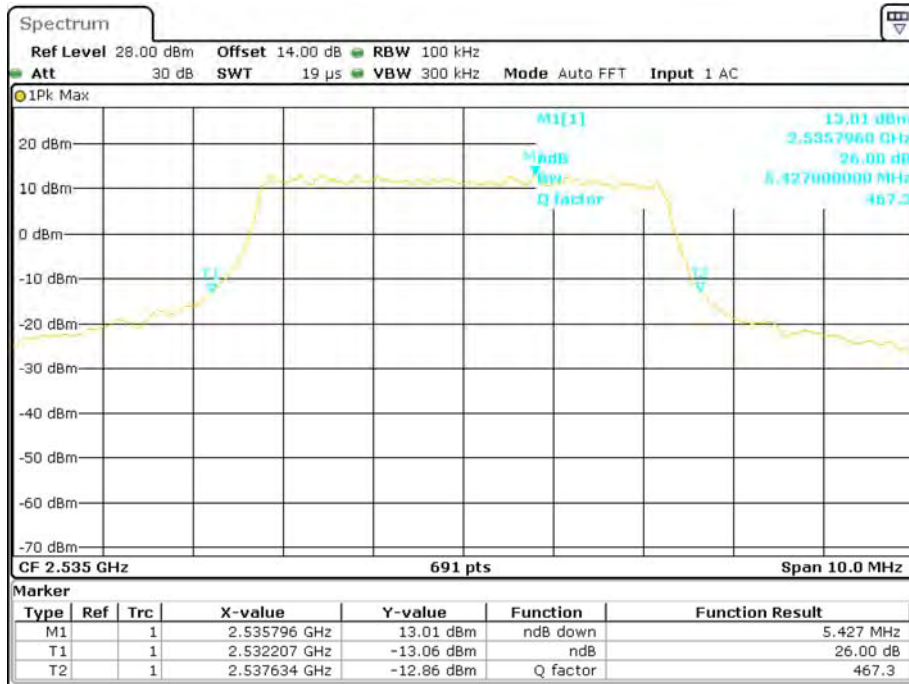
Date: 15.JAN.2018 10:47:20

**LTE Band 7: (Middle Channel)**

<b>Bandwidth (MHz)</b>	<b>Modulation</b>	<b>99% Occupied Bandwidth (MHz)</b>	<b>26 dB Emission Bandwidth (MHz)</b>
5.0	QPSK	4.544	5.427
	16QAM	4.544	5.398
10.0	QPSK	8.973	9.870
	16QAM	9.001	9.783
15.0	QPSK	13.546	14.891
	16QAM	13.502	15.152
20.0	QPSK	18.003	19.508
	16QAM	18.003	19.682

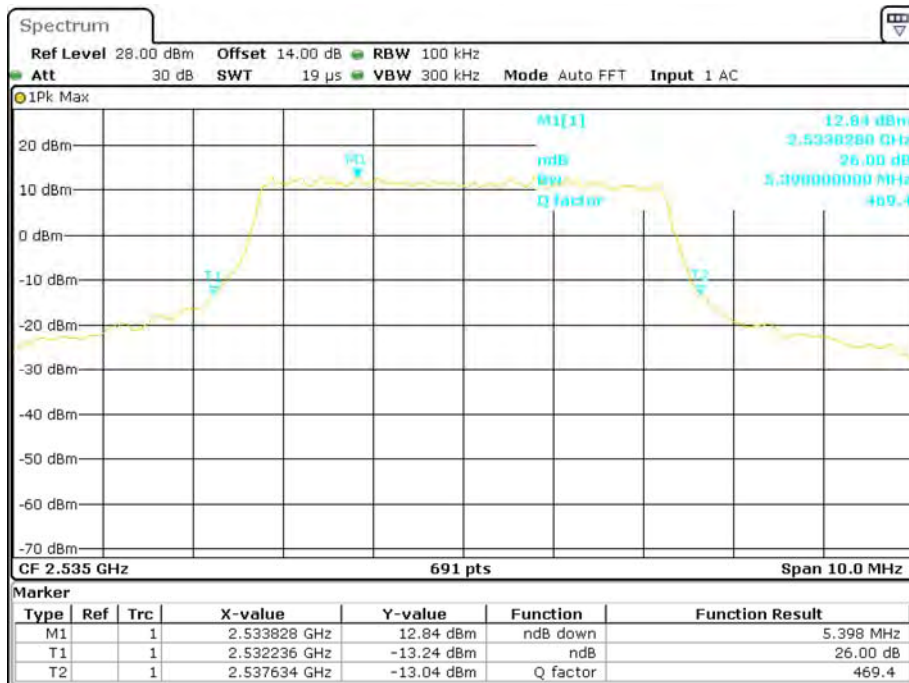


**QPSK (5.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



Date: 15.JAN.2018 11:21:39

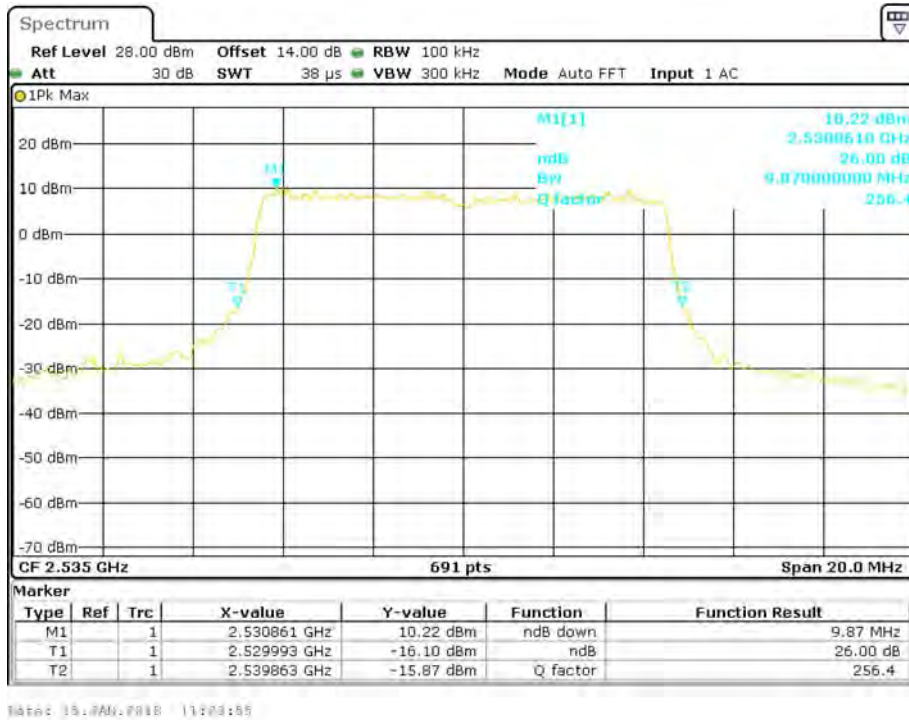
**16-QAM (5.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



Date: 15.JAN.2018 11:22:47



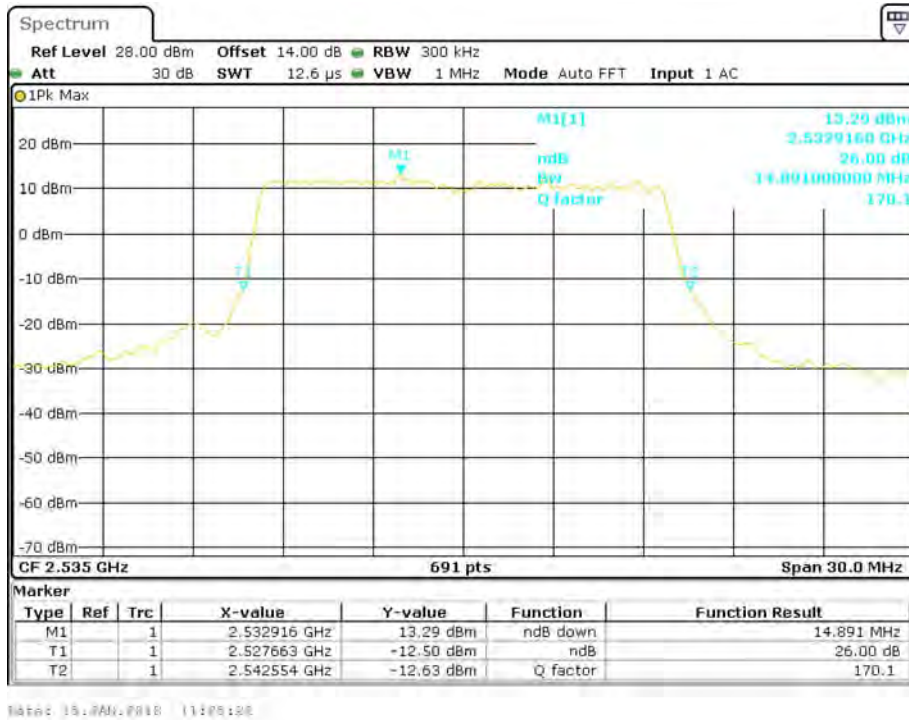
**QPSK (10.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



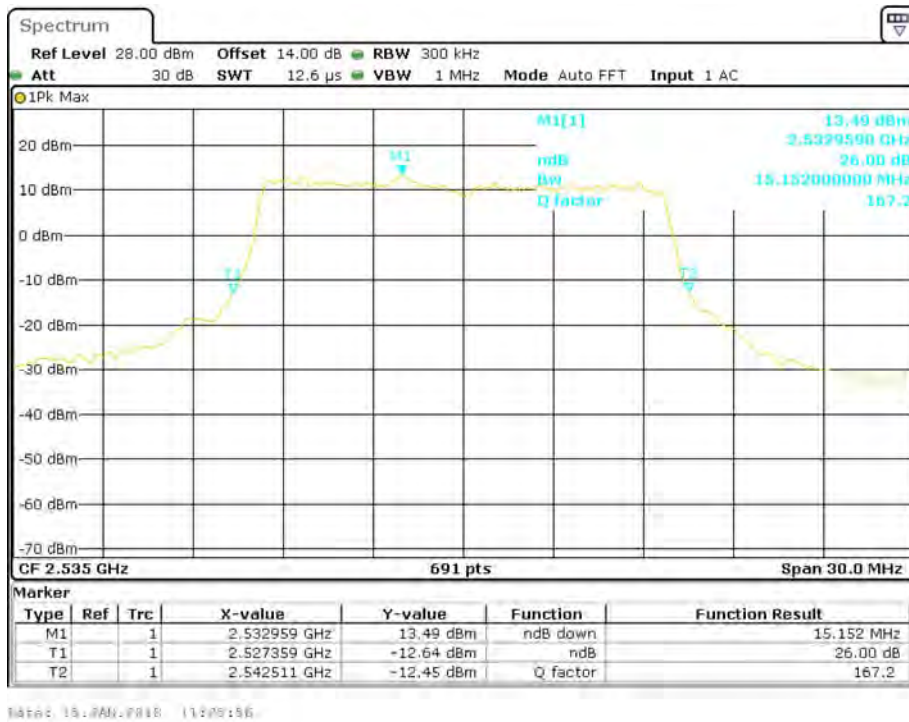
**16-QAM (10.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



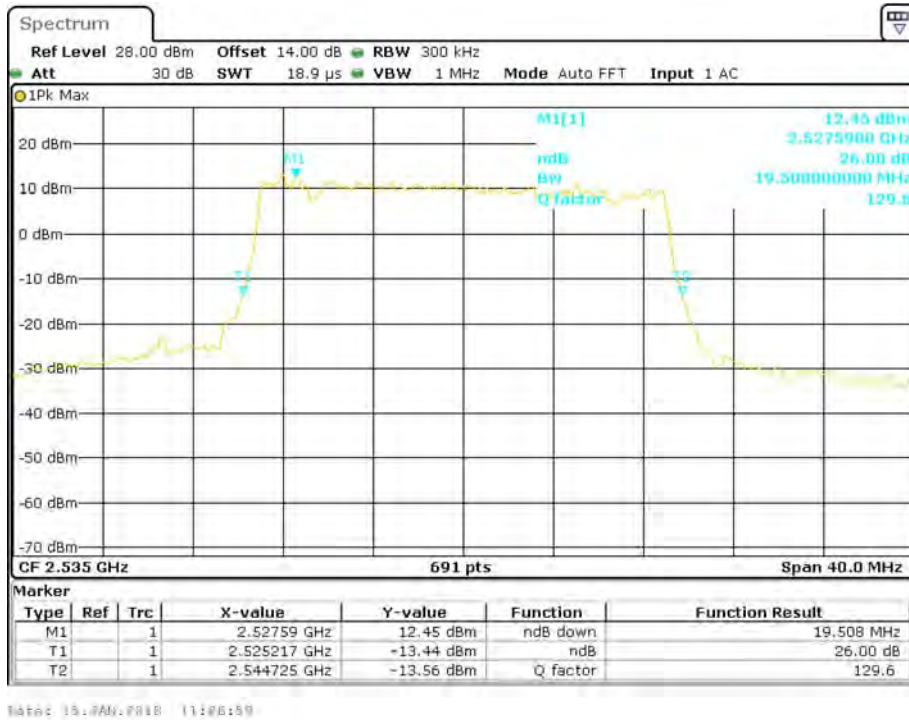
**QPSK (15.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



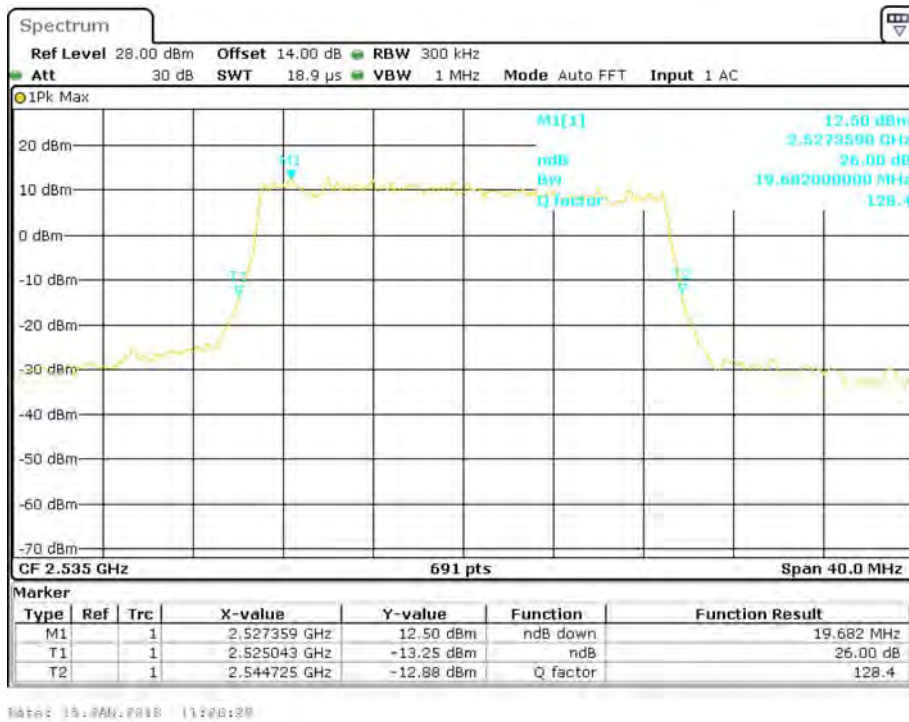
**16-QAM (15.0 MHz) - 26 dB Emission Bandwidth, Middle channel**



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



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

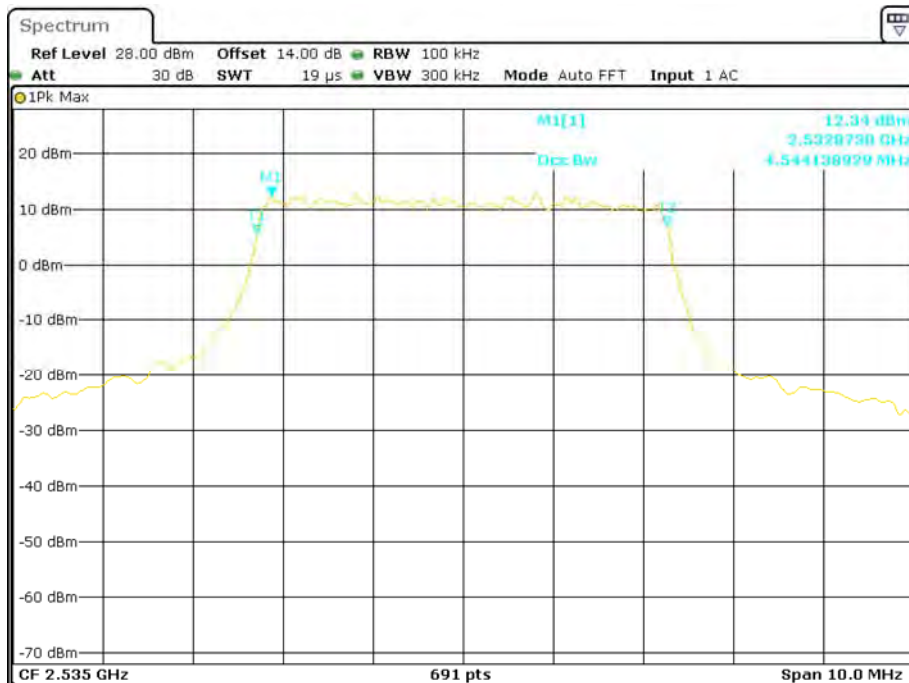


### QPSK (5.0 MHz) - 99% Occupied Bandwidth, Middle channel



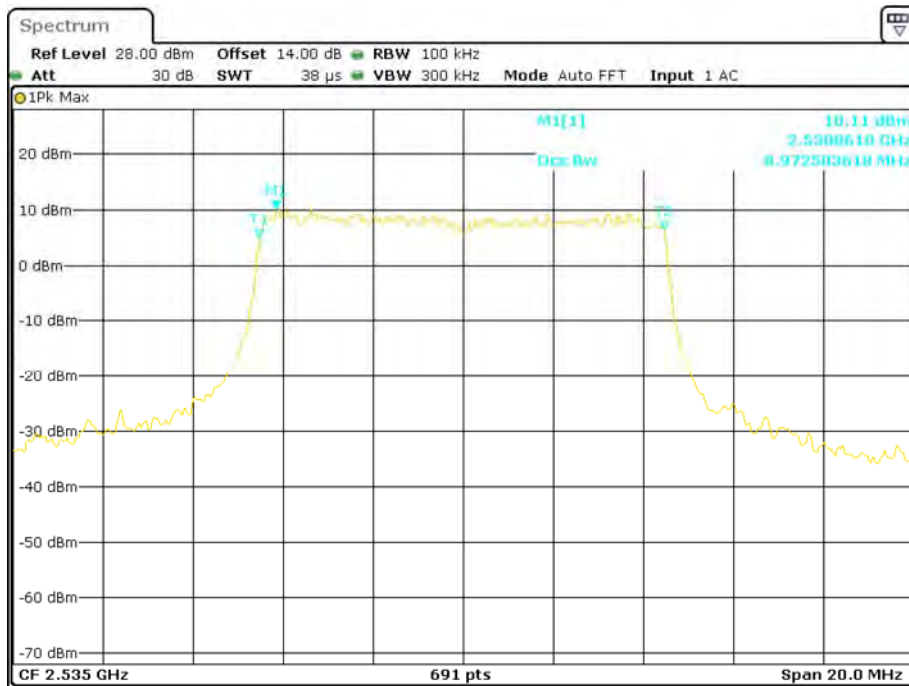
Date: 15.JAN.2018 10:50:21

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



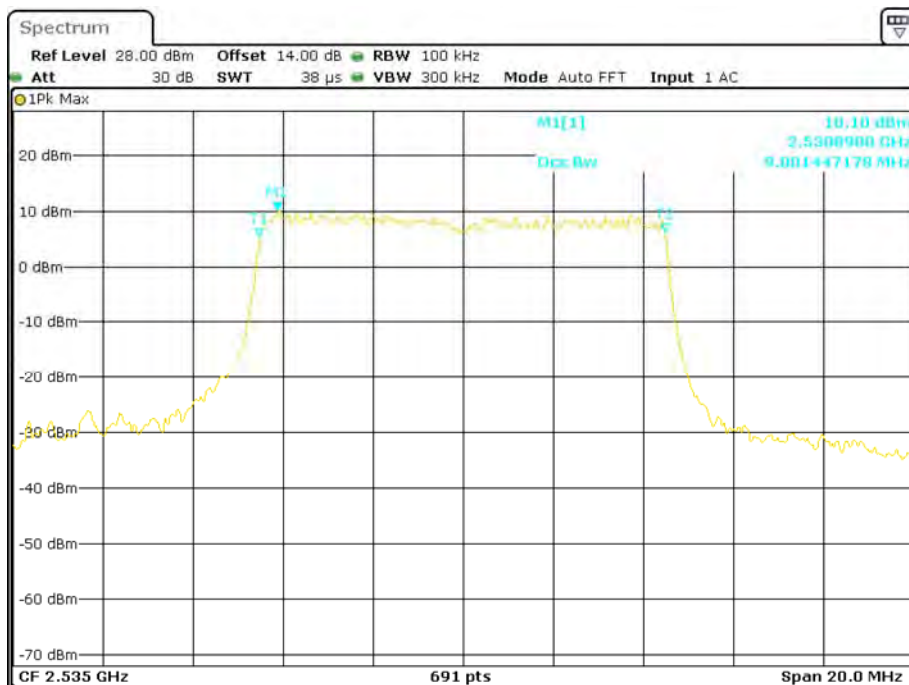
Date: 15.JAN.2018 10:51:11

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



Date: 15.JAN.2018 10:52:35

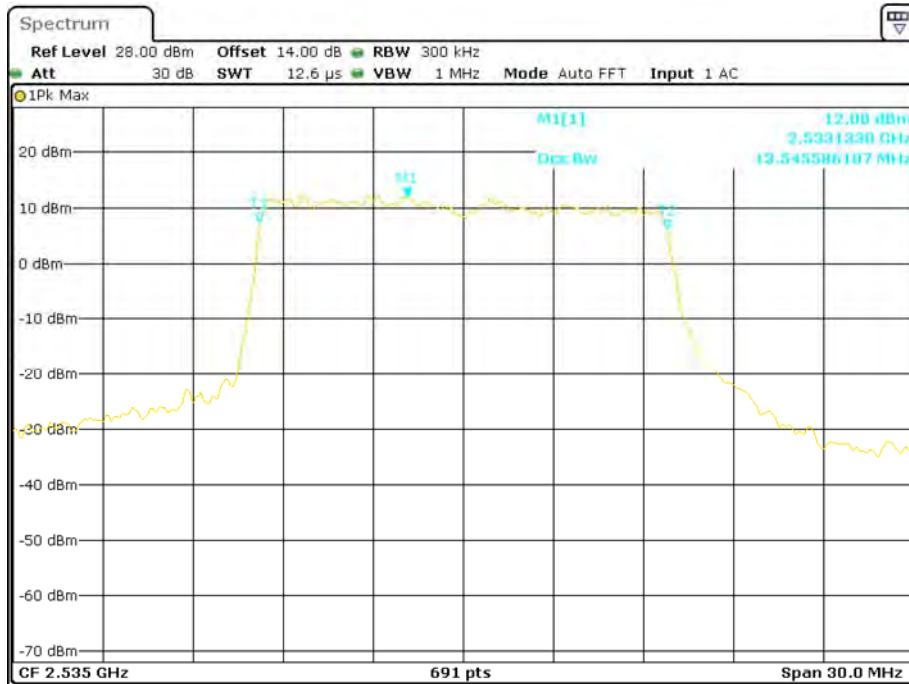
**16-QAM (10.0 MHz) - 99% Occupied Bandwidth, Middle channel**



Date: 15.JAN.2018 10:51:50

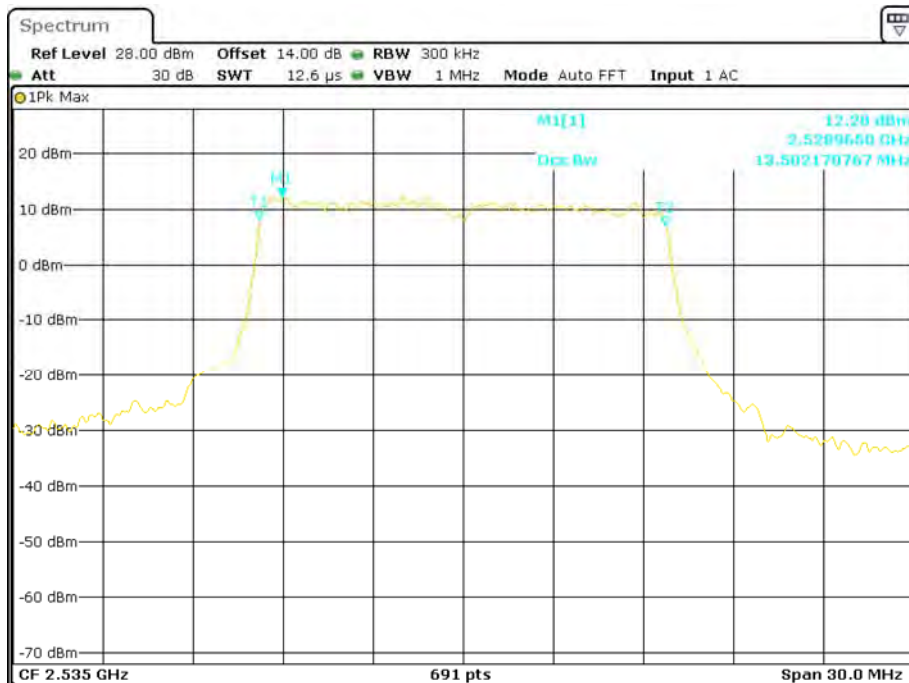


**QPSK (15.0 MHz) - 99% Occupied Bandwidth, Middle channel**



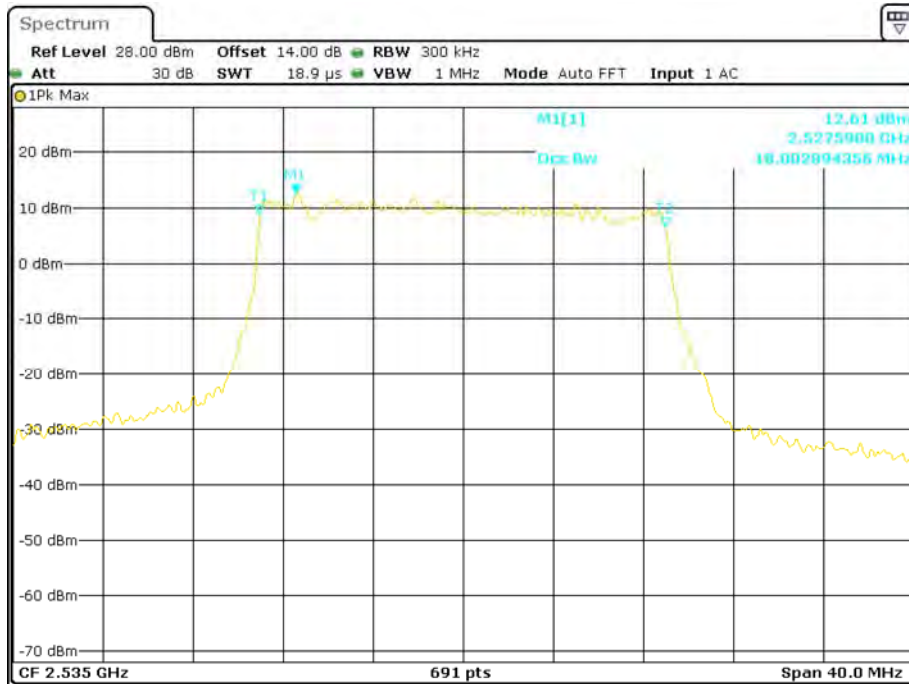
Date: 15.JAN.2018 10:53:15

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



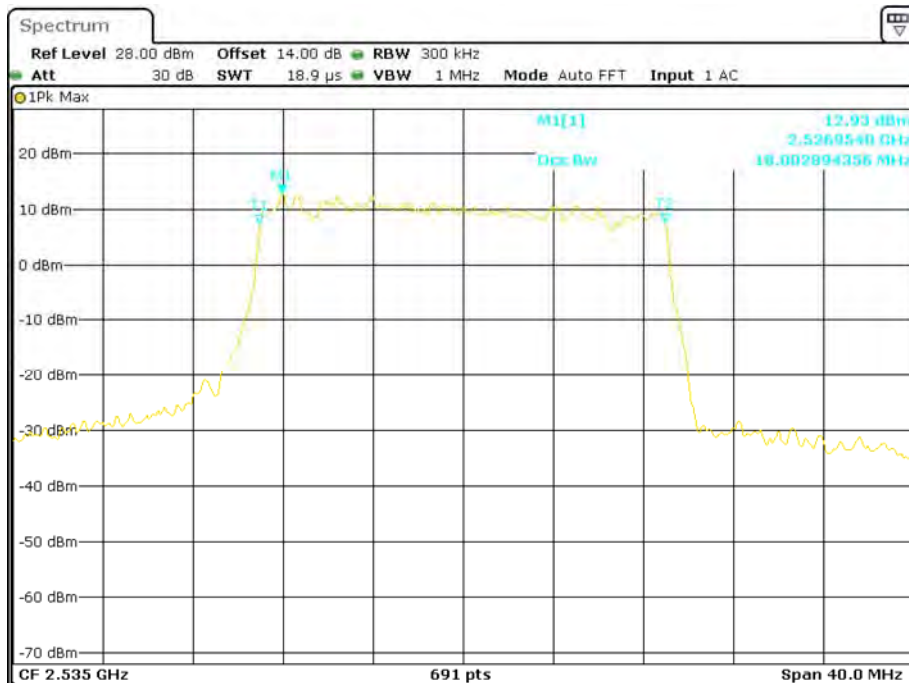
Date: 15.JAN.2018 10:53:42

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



Date: 15.JAN.2018 10:55:03

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



Date: 15.JAN.2018 10:54:28

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

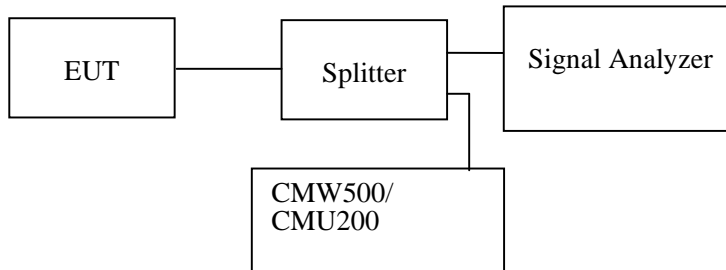
**Applicable Standard**

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

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

**Test Procedure**

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



**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	24~25 °C
<b>Relative Humidity:</b>	50~55 %
<b>ATM Pressure:</b>	100.0~101.0 kPa

*The testing was performed by Rocky Kang from 2018-01-19 to 2018-01-27.*

*Test result: Compliance,*

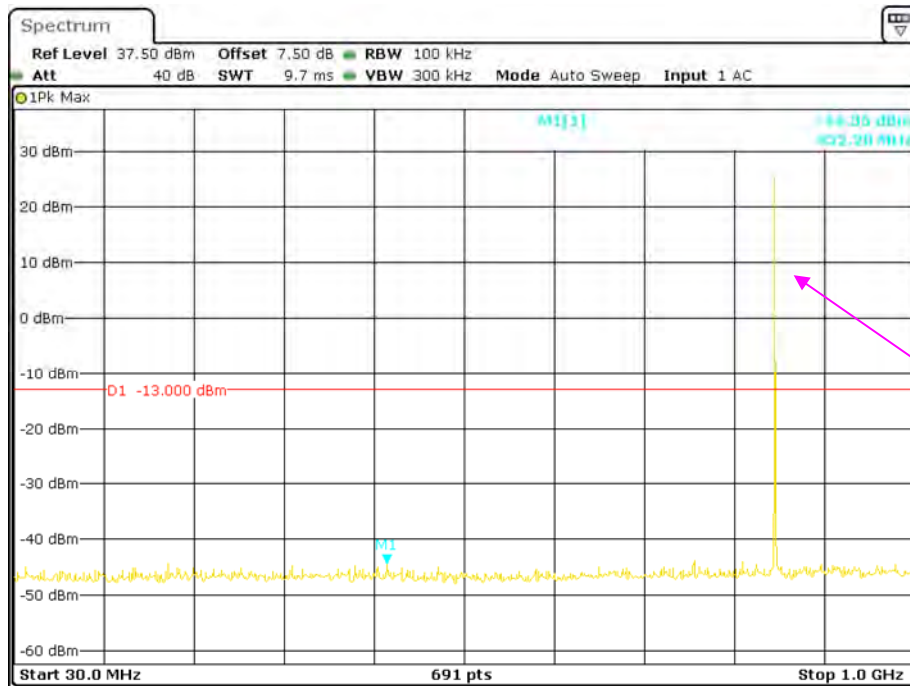
*EUT operation mode: transmitting*

*Please refer to the following plots.*



Cellular Band (Part 22H)

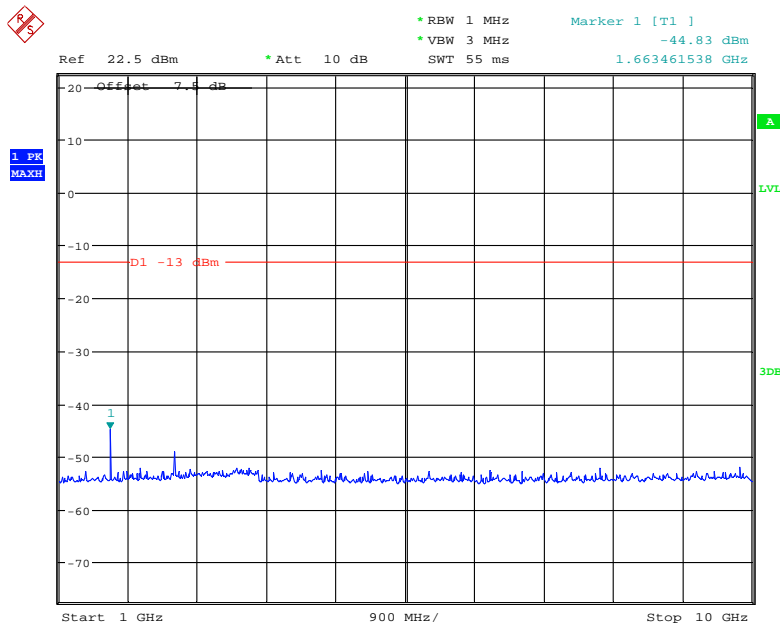
30 MHz – 1 GHz (GSM Mode)



Fundamental test

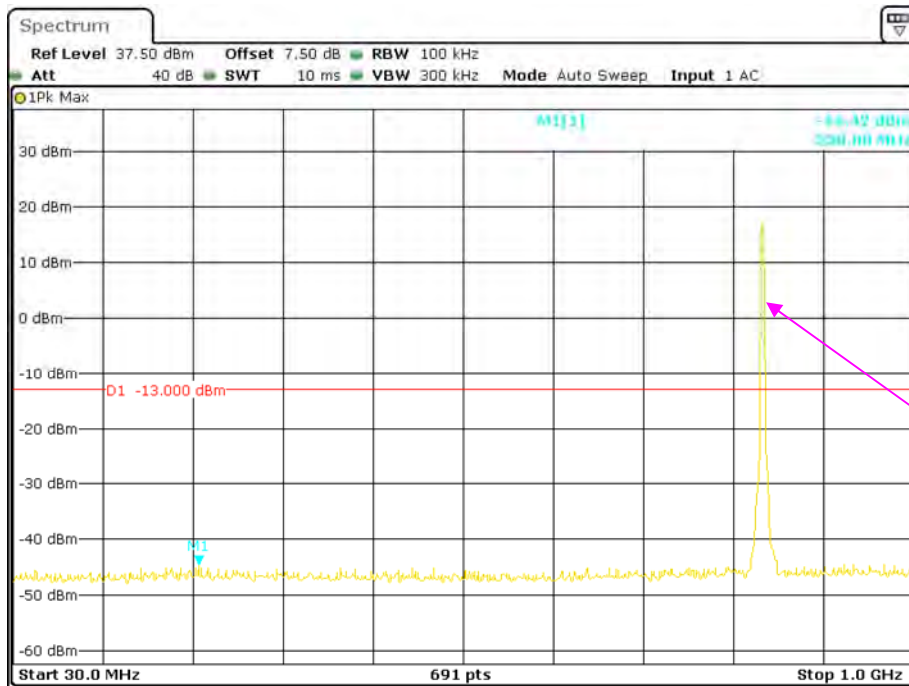
Date: 19.JAN.2018 11:09:29

1 GHz – 10 GHz (GSM Mode)



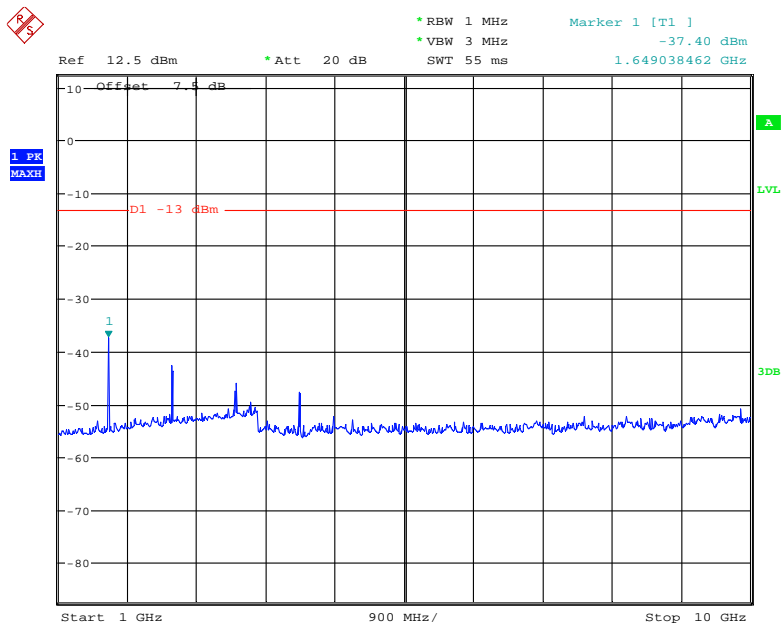
Date: 27.JAN.2018 18:11:33

### 30 MHz – 1 GHz (WCDMA Mode)



Date: 19.JAN.2018 13:16:09

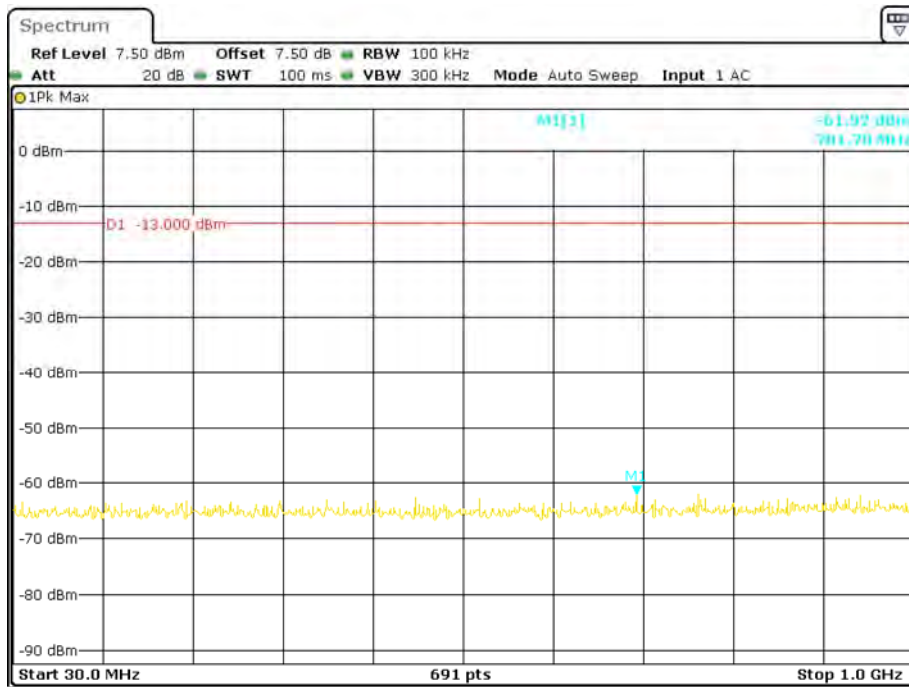
### 1 GHz – 10 GHz (WCDMA Mode)



Date: 27.JAN.2018 18:24:47

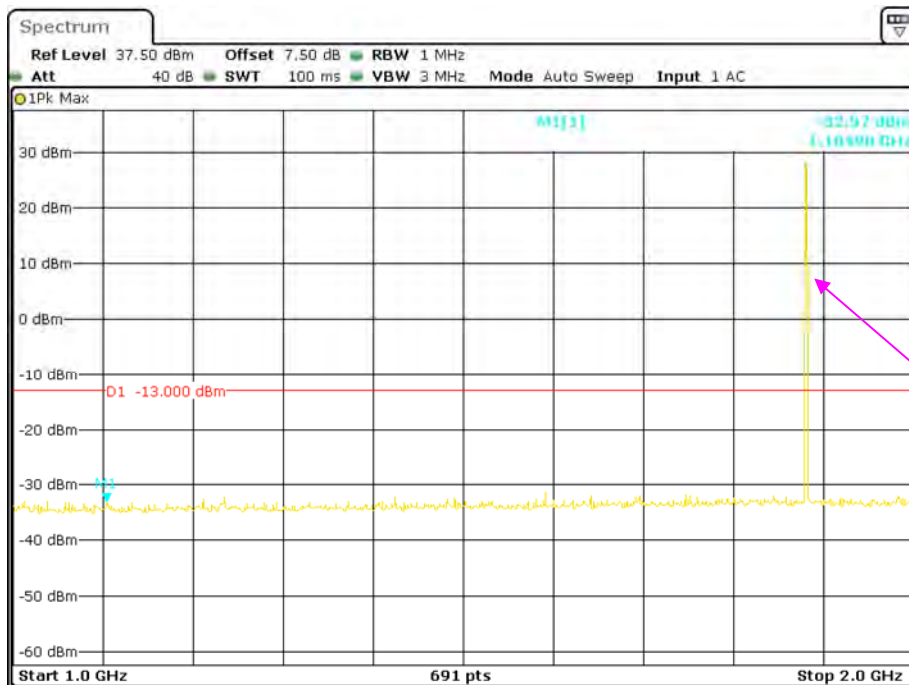
PCS Band (Part 24E)

30 MHz – 1 GHz (GSM Mode)



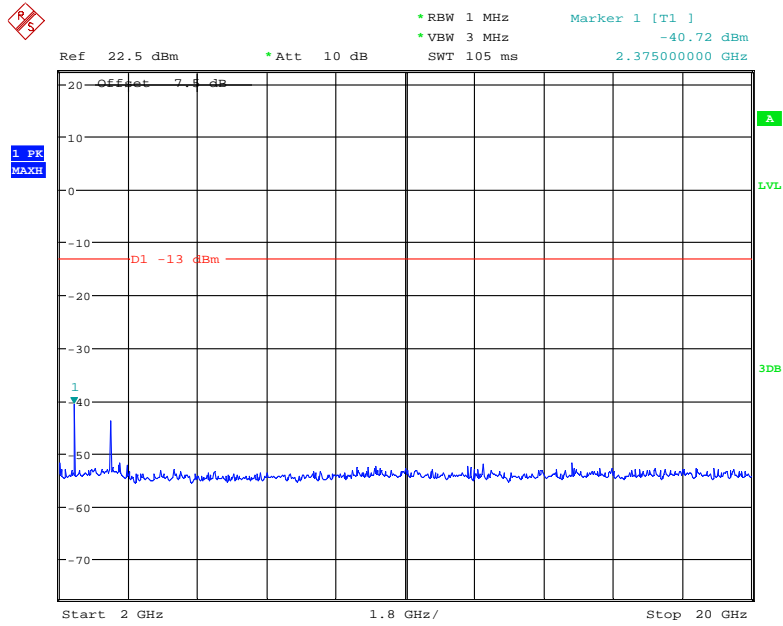
Date: 19.JAN.2018 13:57:26

1 GHz – 2 GHz (GSM Mode)



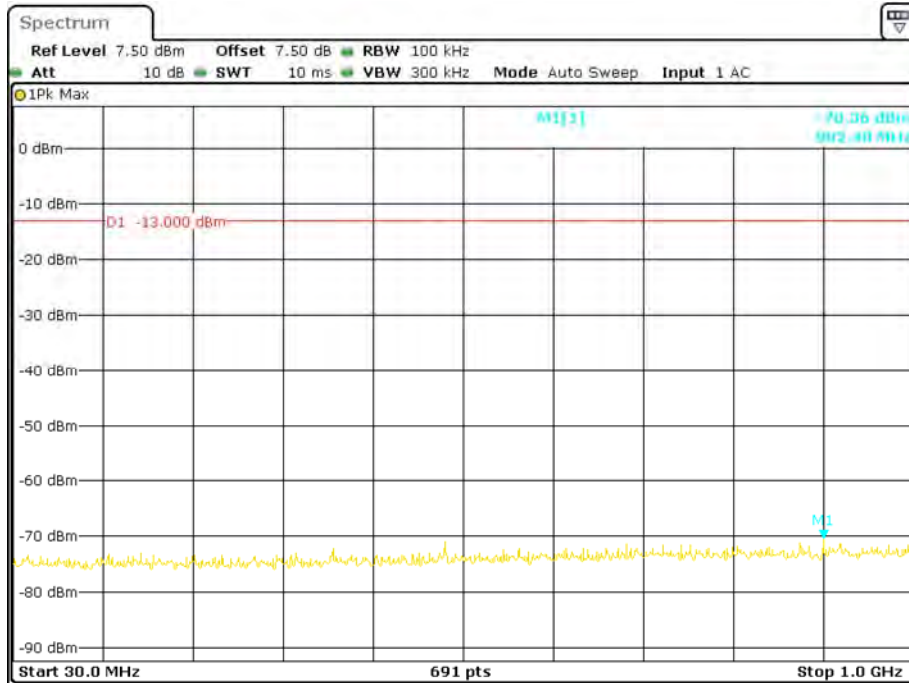
Date: 19.JAN.2018 13:56:27

### 2 GHz – 20 GHz (GSM Mode)



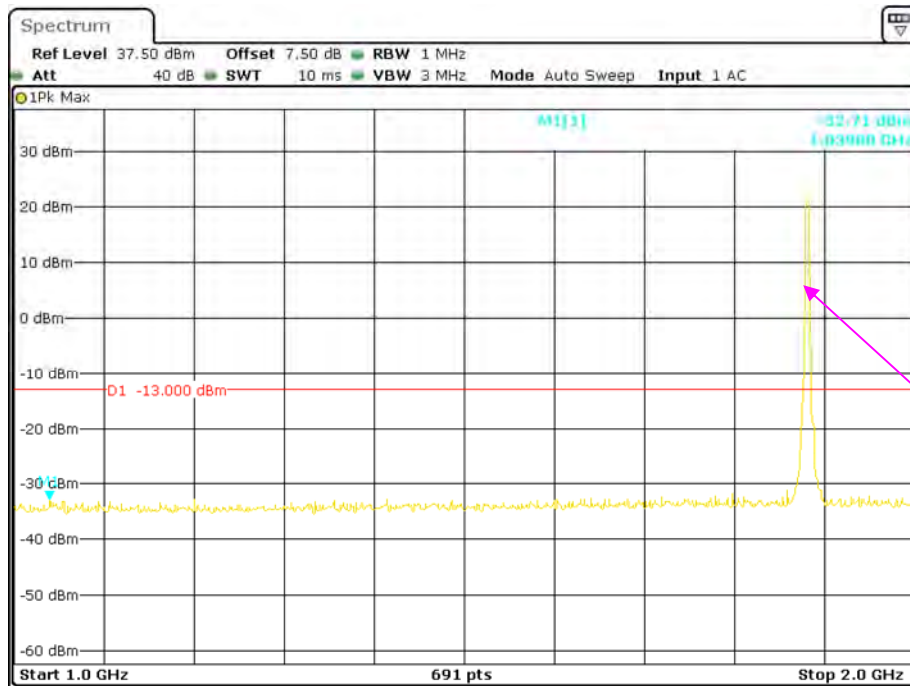
Date: 27.JAN.2018 18:13:45

### 30 MHz – 1 GHz (WCDMA Mode)



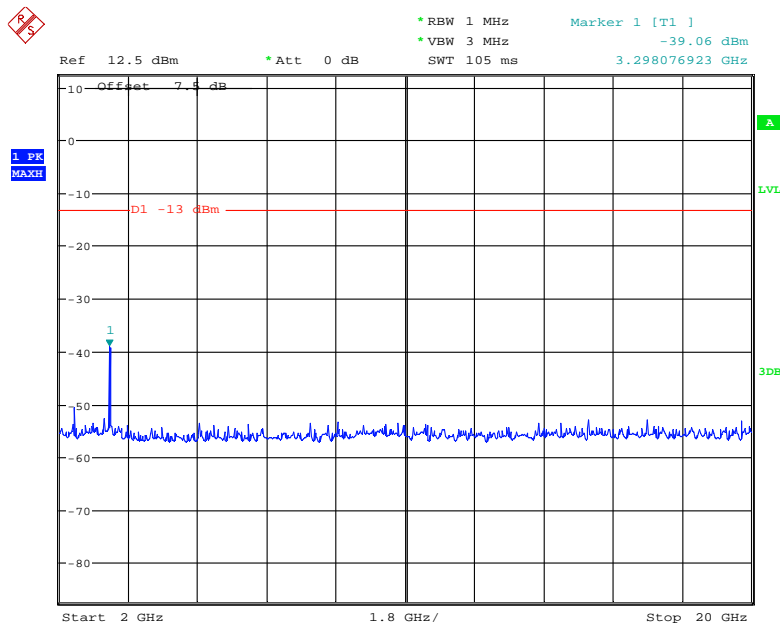
Date: 19.JAN.2018 13:14:10

### 1 GHz – 2 GHz (WCDMA Mode)



Date: 19.JAN.2018 13:14:52

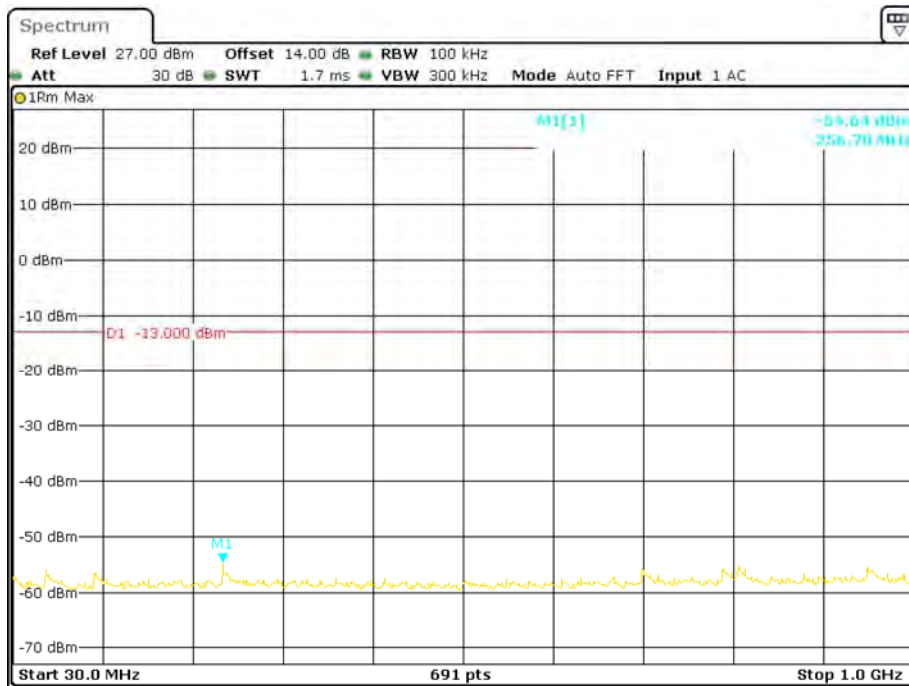
### 2 GHz – 20 GHz (WCDMA Mode)



Date: 27.JAN.2018 18:24:02

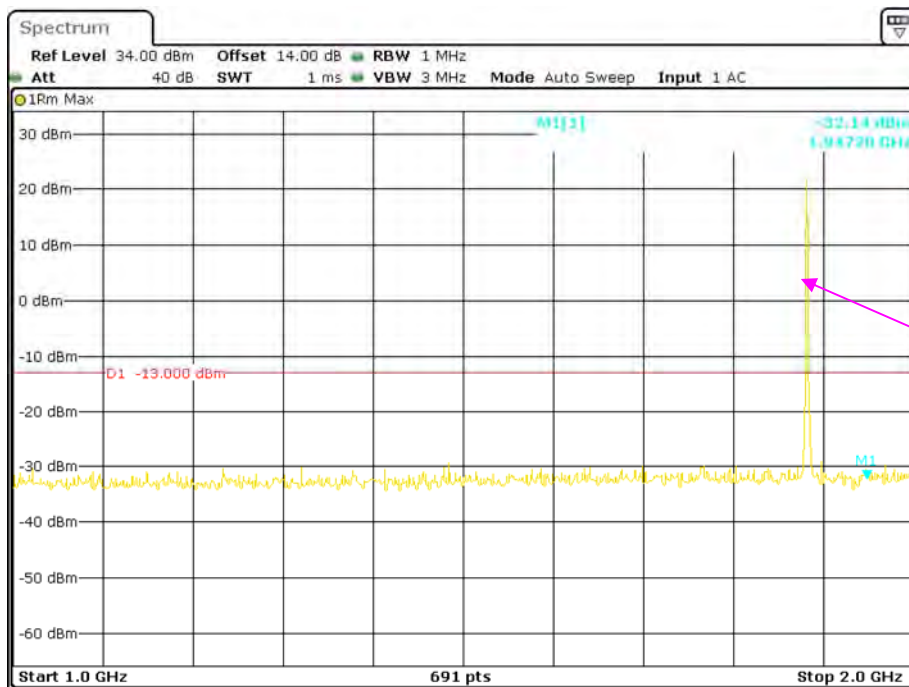
**LTE Band 2: (QPSK)**

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



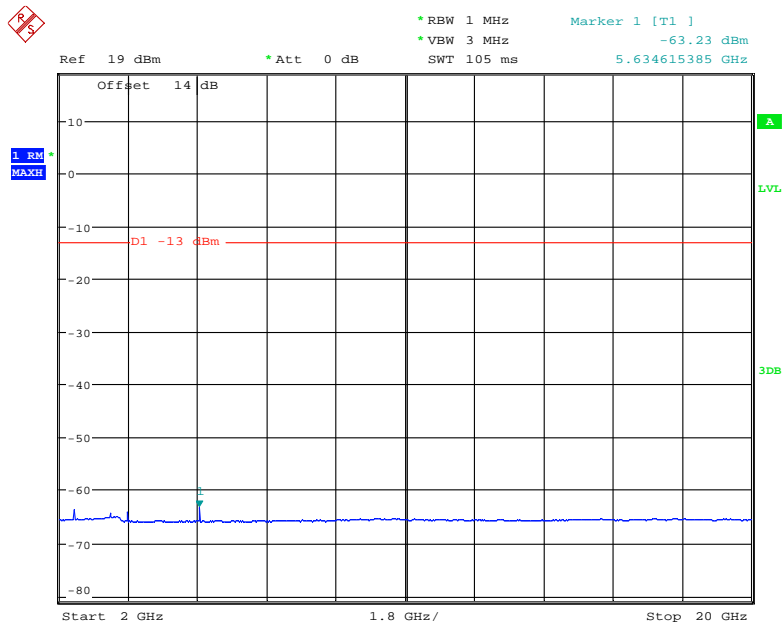
Date: 16.JAN.2018 09:44:11

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



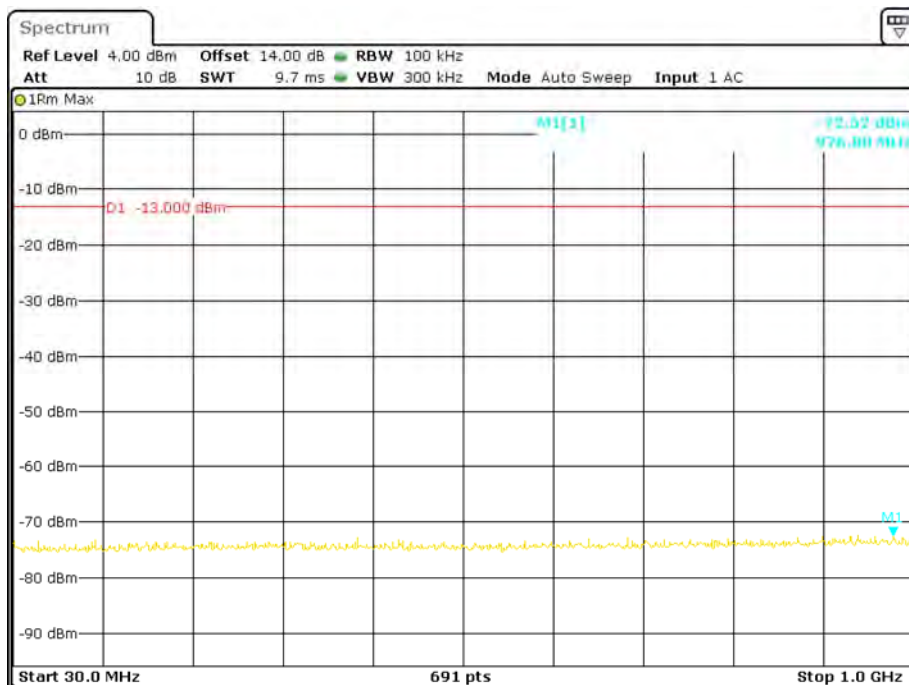
Date: 19.JAN.2018 09:02:27

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



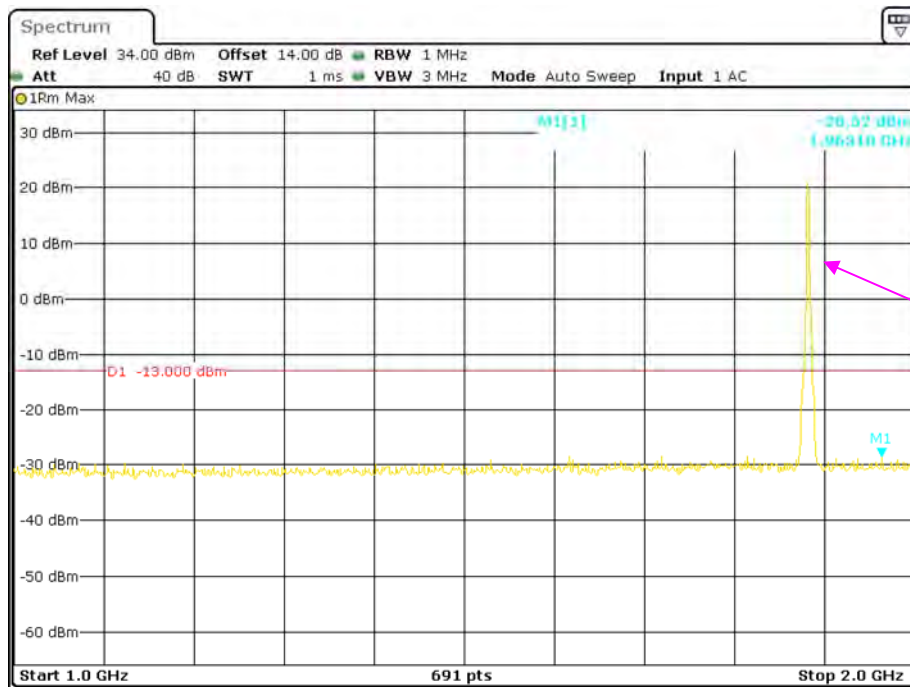
Date: 27.JAN.2018 18:36:20

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



Date: 19.JAN.2018 08:59:27

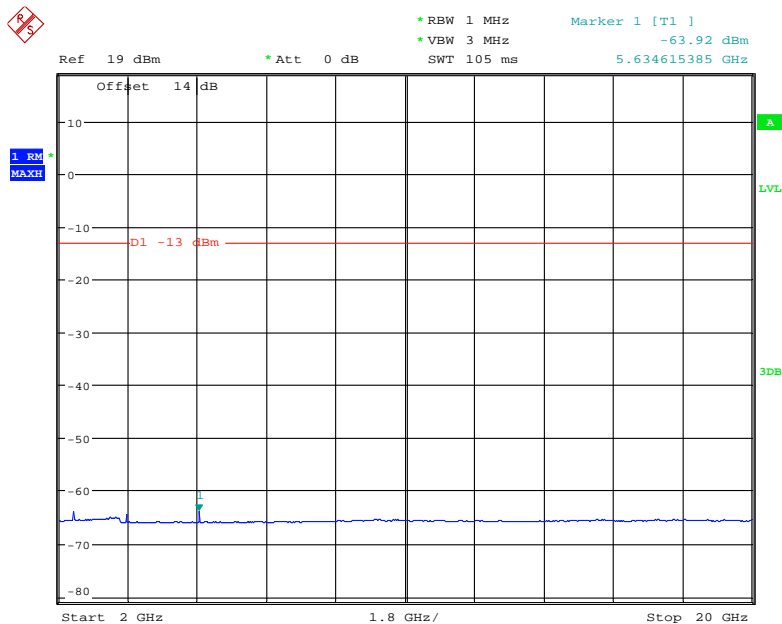
### 1 GHz - 2 GHz (3.0 MHz, Middle Channel)



Fundamental test

Date: 19.JAN.2018 09:03:07

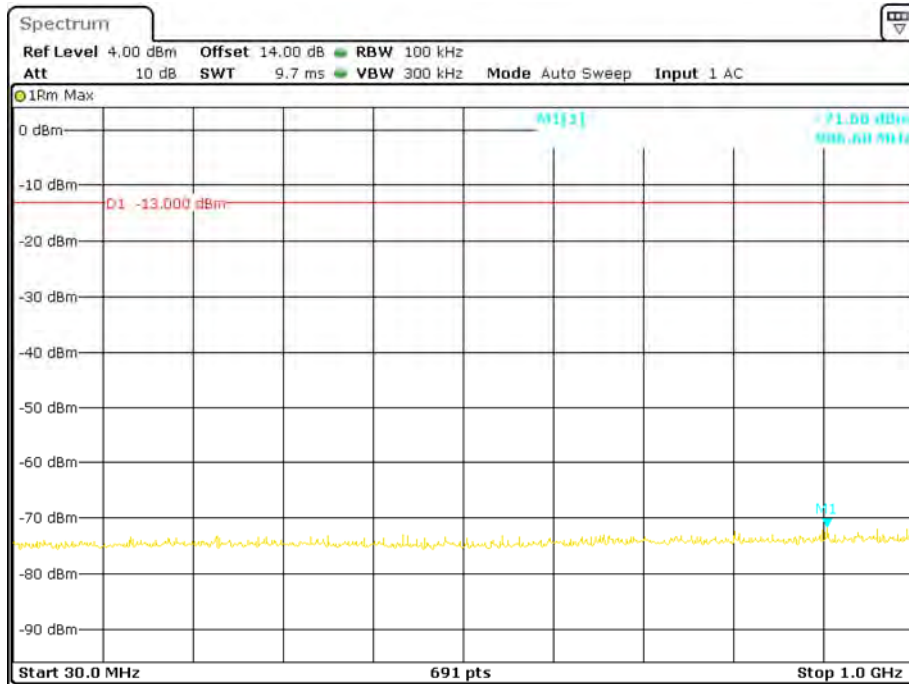
### 2 GHz - 20 GHz (3.0 MHz, Middle Channel)



Date: 27.JAN.2018 18:37:19

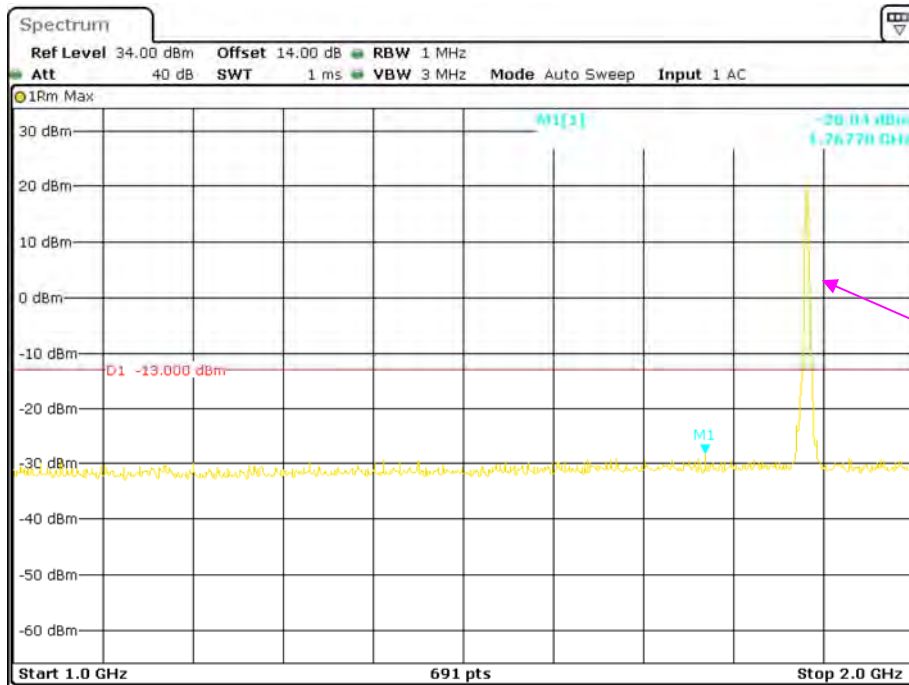


30 MHz - 1 GHz (5.0 MHz, Middle Channel)



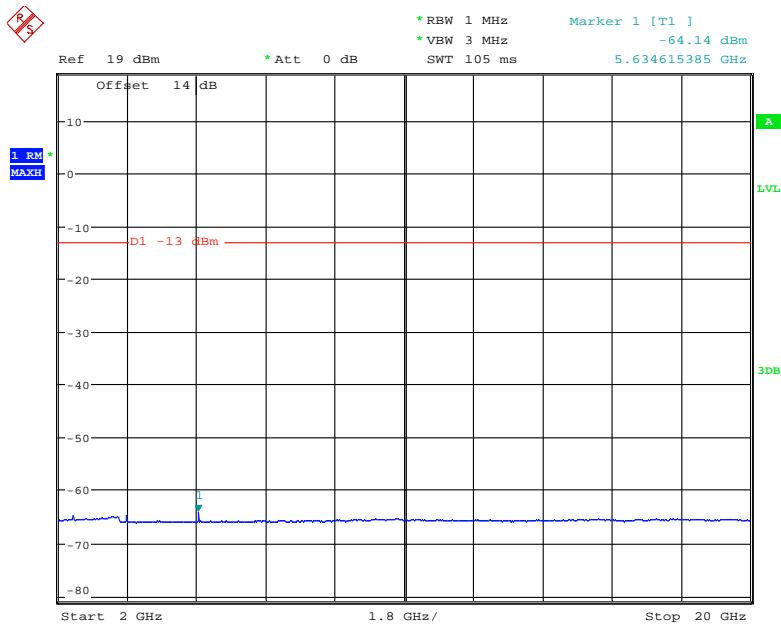
Date: 19.JAN.2018 09:00:10

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



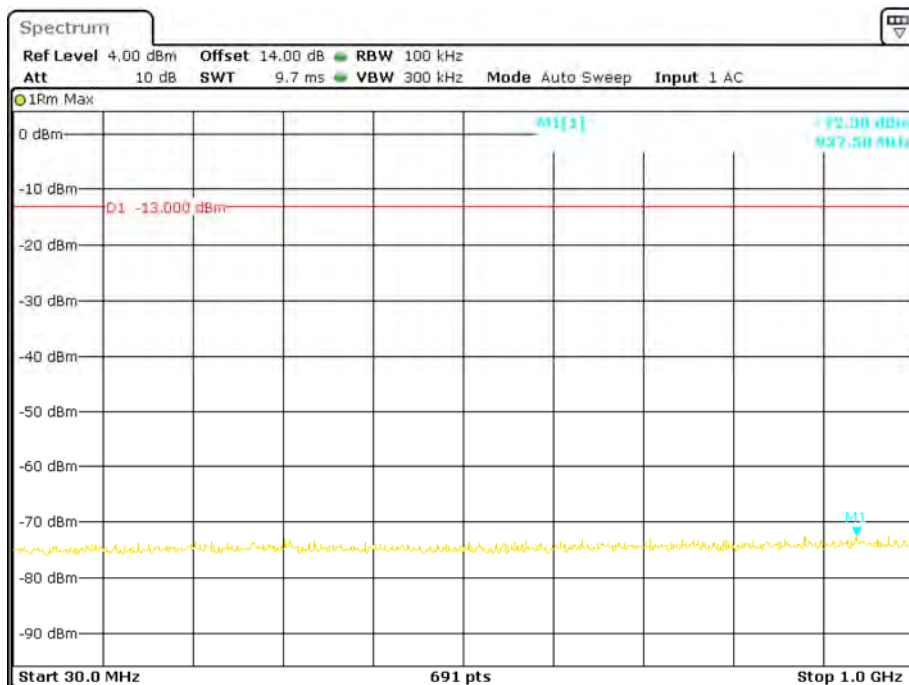
Date: 19.JAN.2018 09:03:33

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



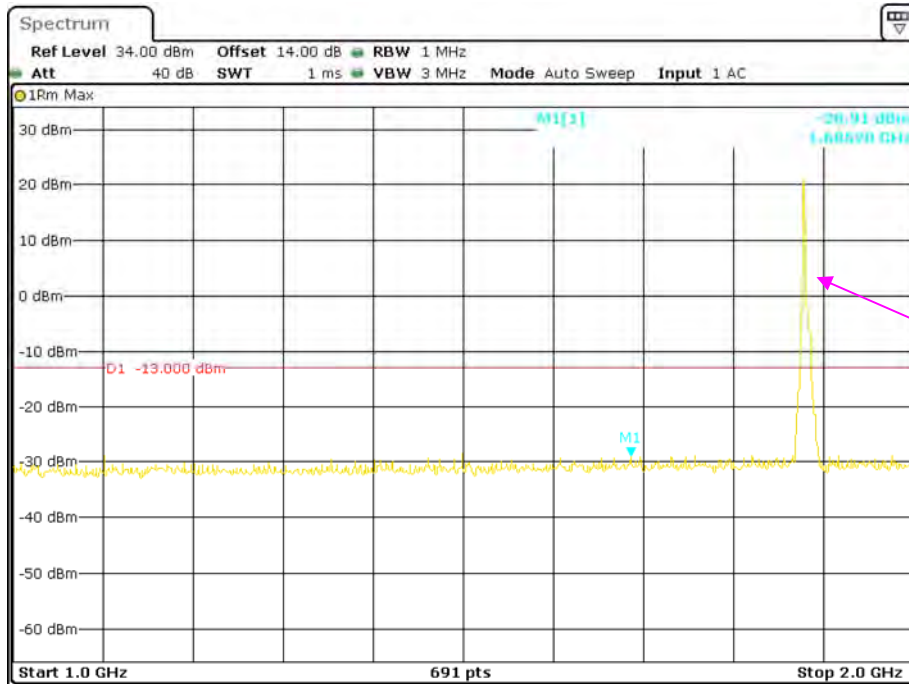
Date: 27.JAN.2018 18:38:54

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



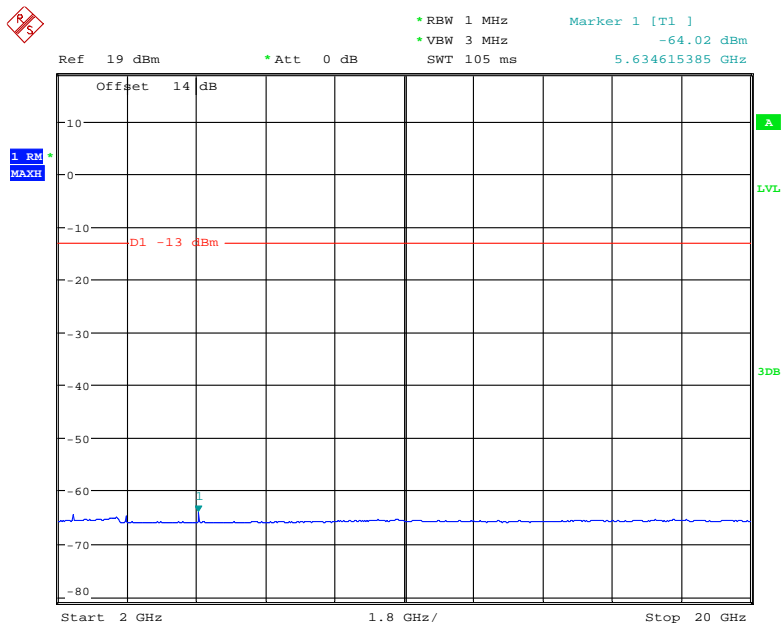
Date: 19.JAN.2018 09:00:30

### 1 GHz - 2 GHz (10.0 MHz, Middle Channel)



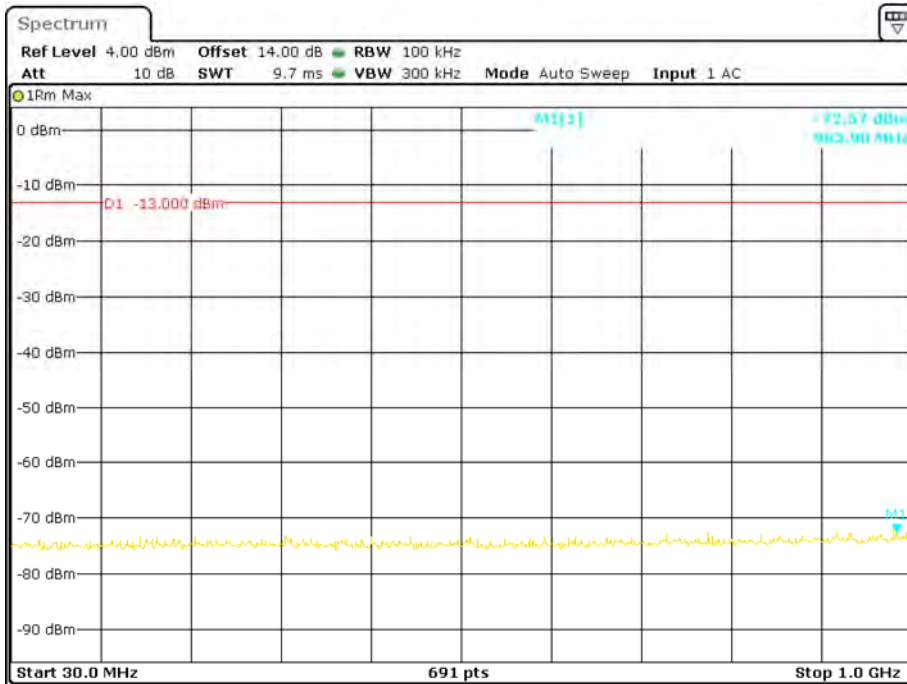
Date: 19.JAN.2018 09:04:06

### 2 GHz - 20 GHz (10.0 MHz, Middle Channel)



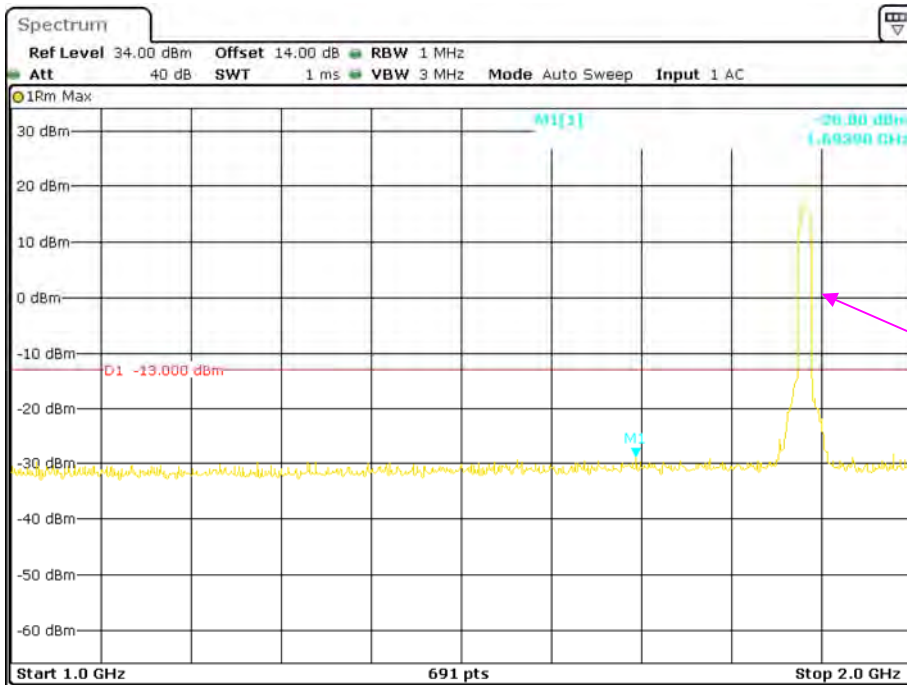
Date: 27.JAN.2018 18:38:23

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



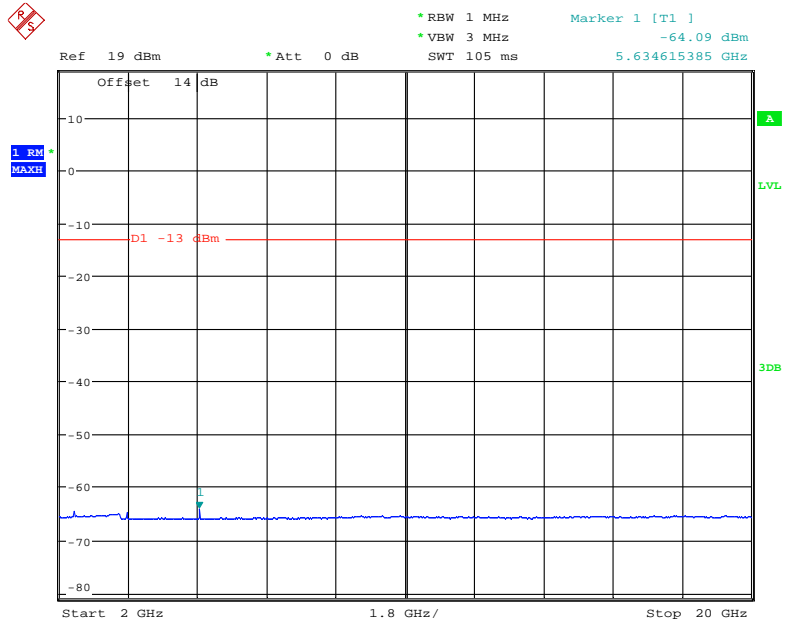
Date: 19.JAN.2018 09:00:49

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



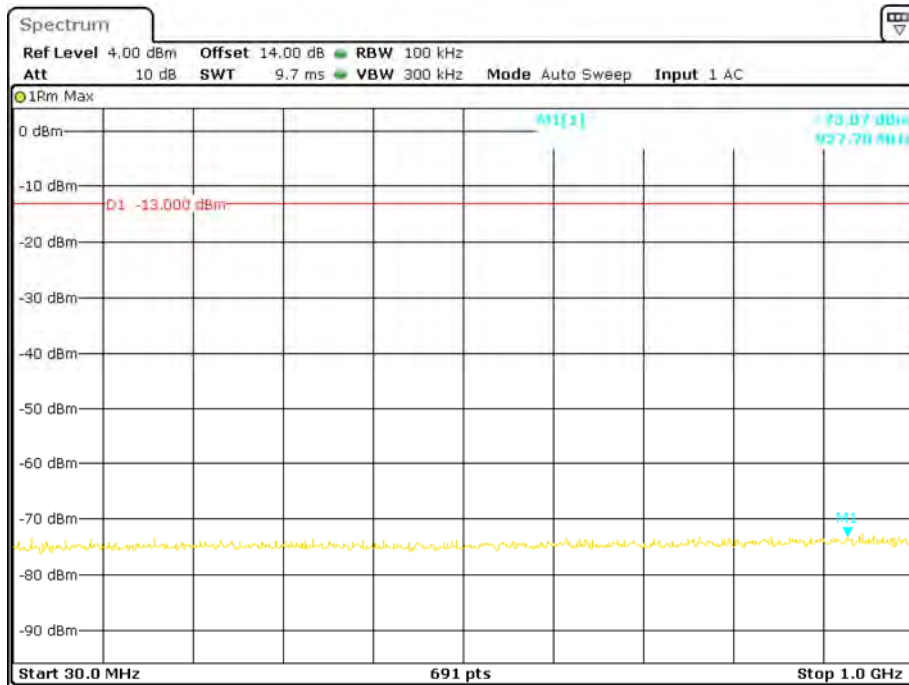
Date: 19.JAN.2018 09:04:34

### 2 GHz - 20 GHz (15.0 MHz, Middle Channel)



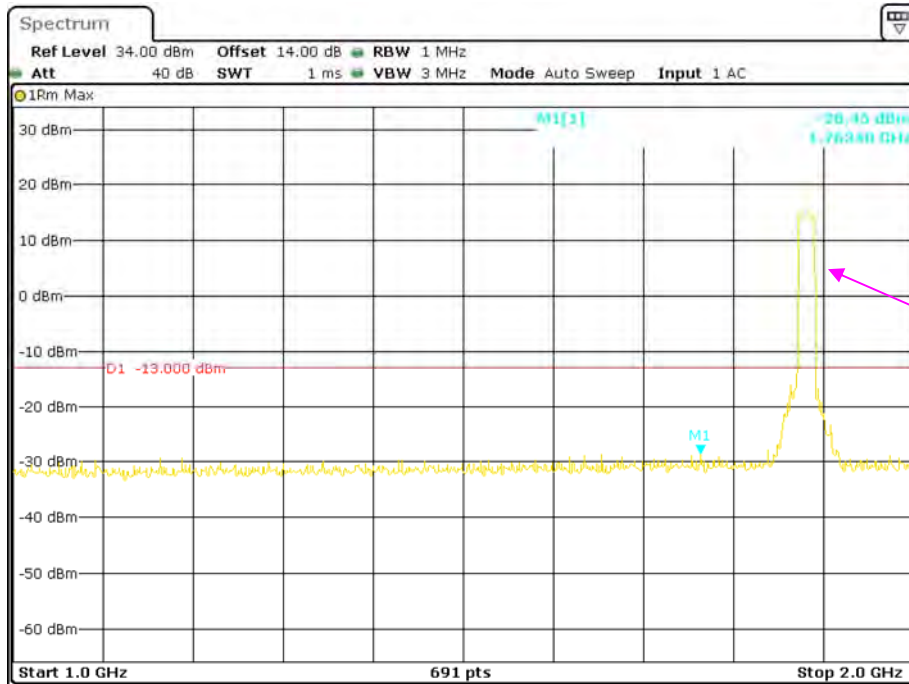
Date: 27.JAN.2018 18:39:26

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



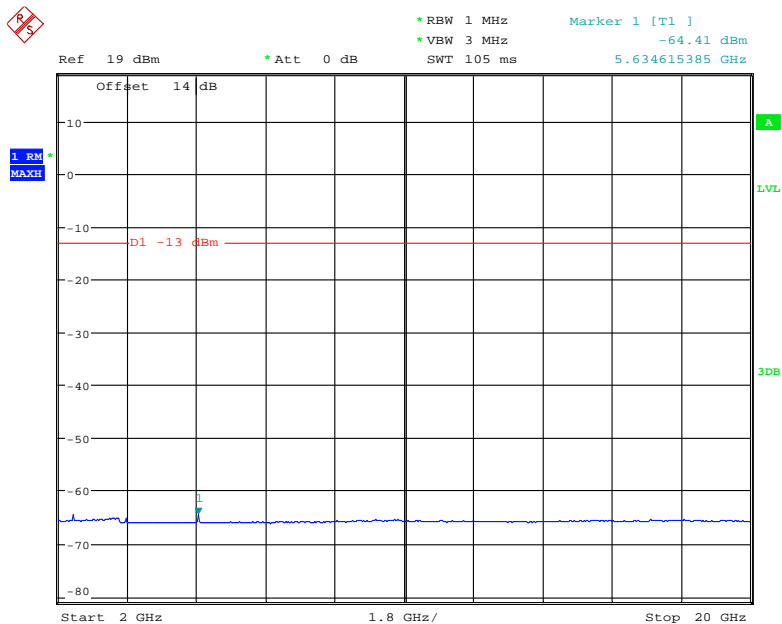
Date: 19.JAN.2018 09:01:08

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



Date: 19.JAN.2018 09:04:59

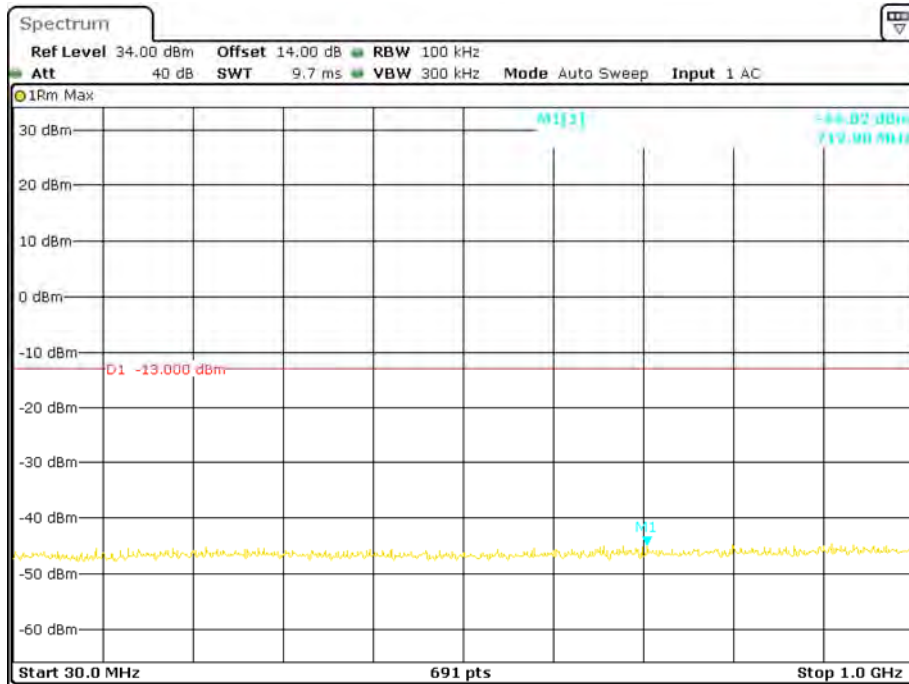
### 2 GHz - 20 GHz (20.0 MHz, Middle Channel)



Date: 27.JAN.2018 18:39:52

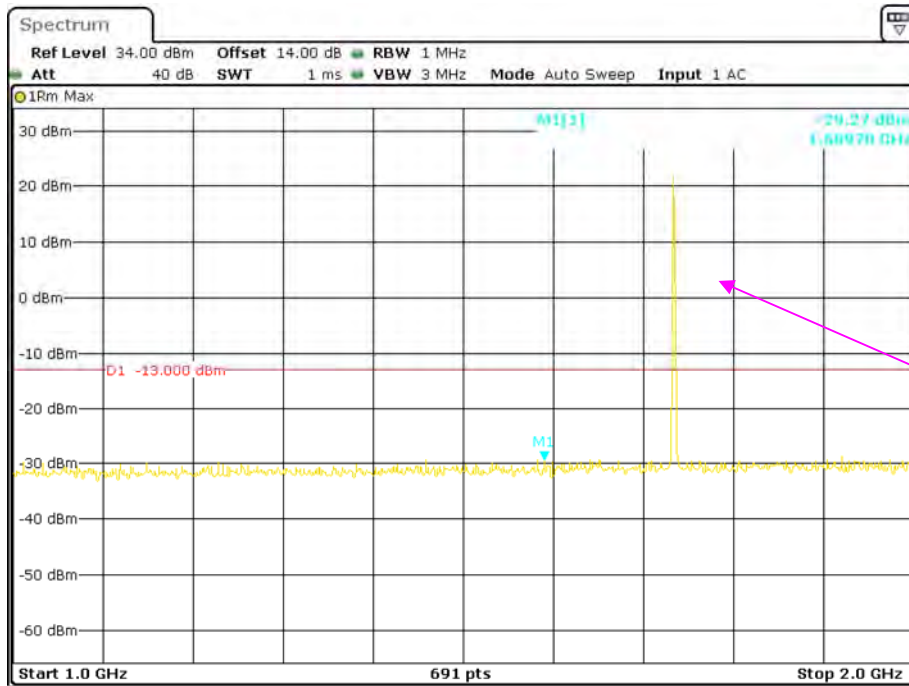
**LTE Band 4: (QPSK)**

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



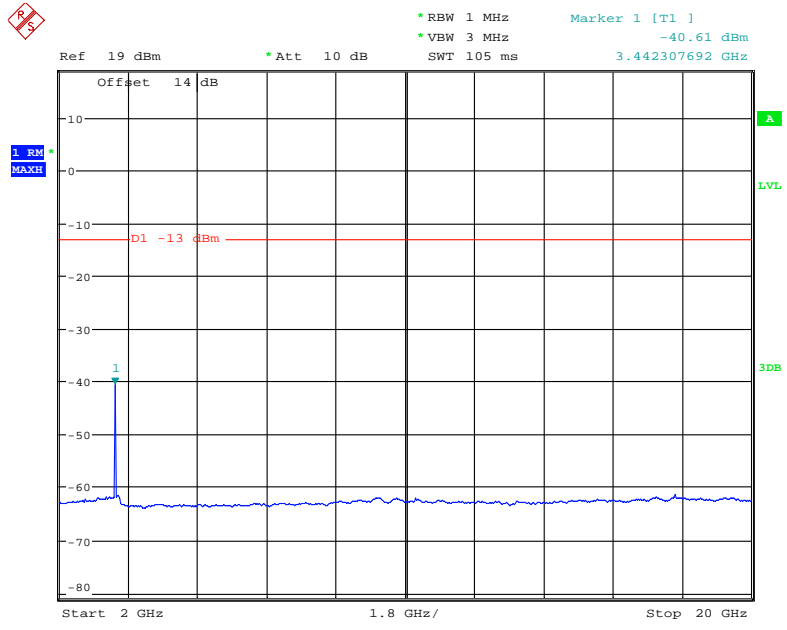
Date: 19.JAN.2018 09:09:15

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



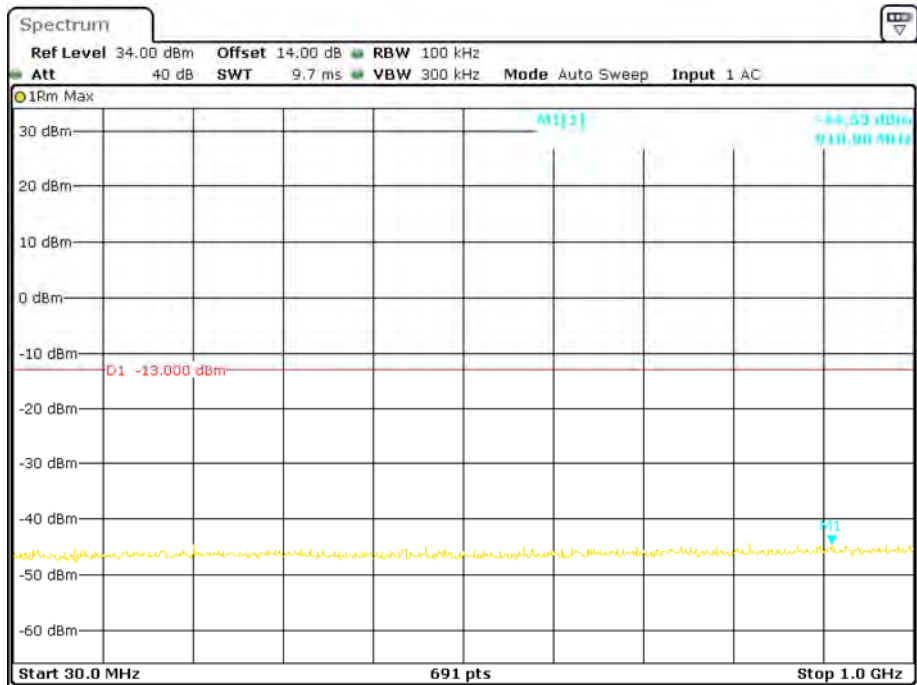
Date: 19.JAN.2018 09:06:31

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



Date: 27.JAN.2018 18:40:59

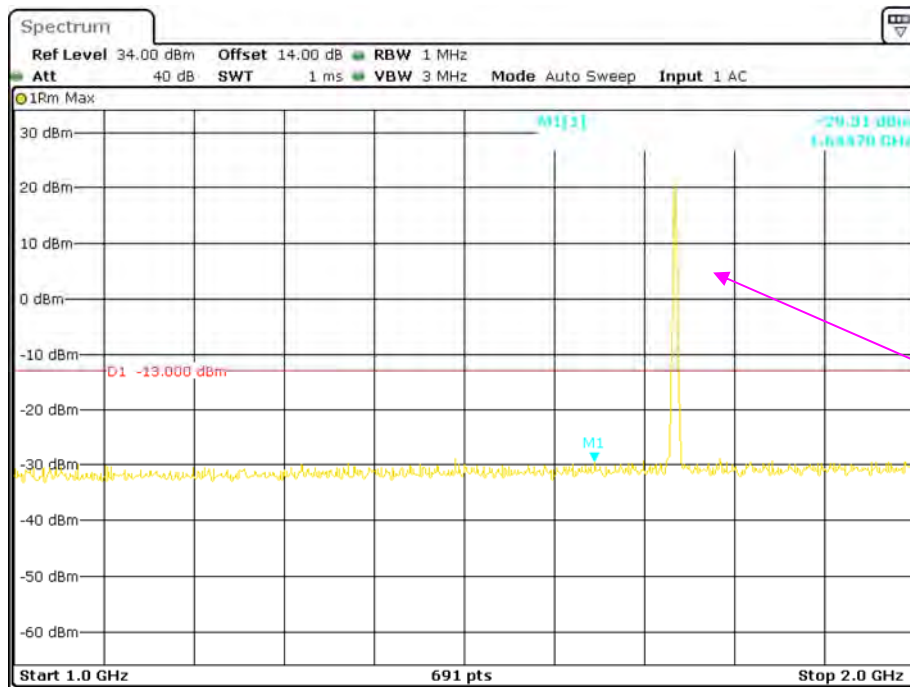
### 30 MHz - 1 GHz (3.0 MHz, Middle Channel)



Date: 19.JAN.2018 09:09:50

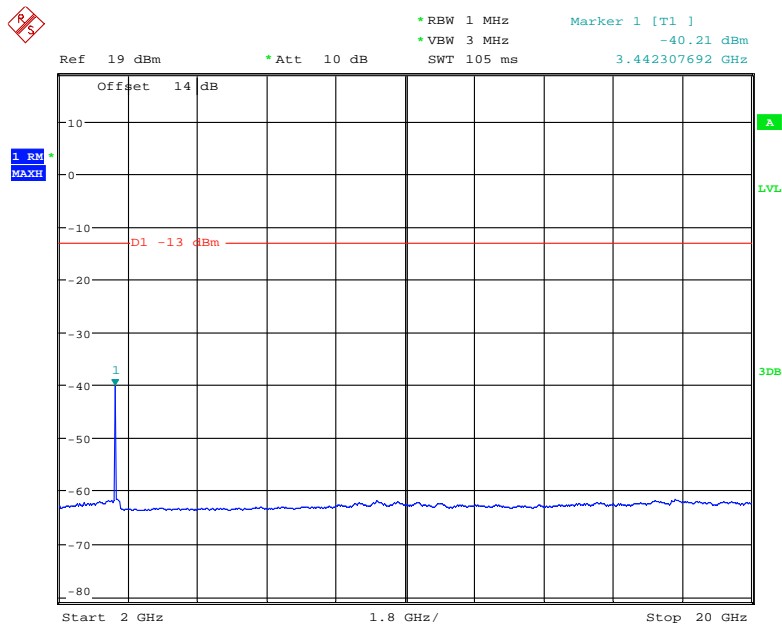


### 1 GHz - 2 GHz (3.0 MHz, Middle Channel)



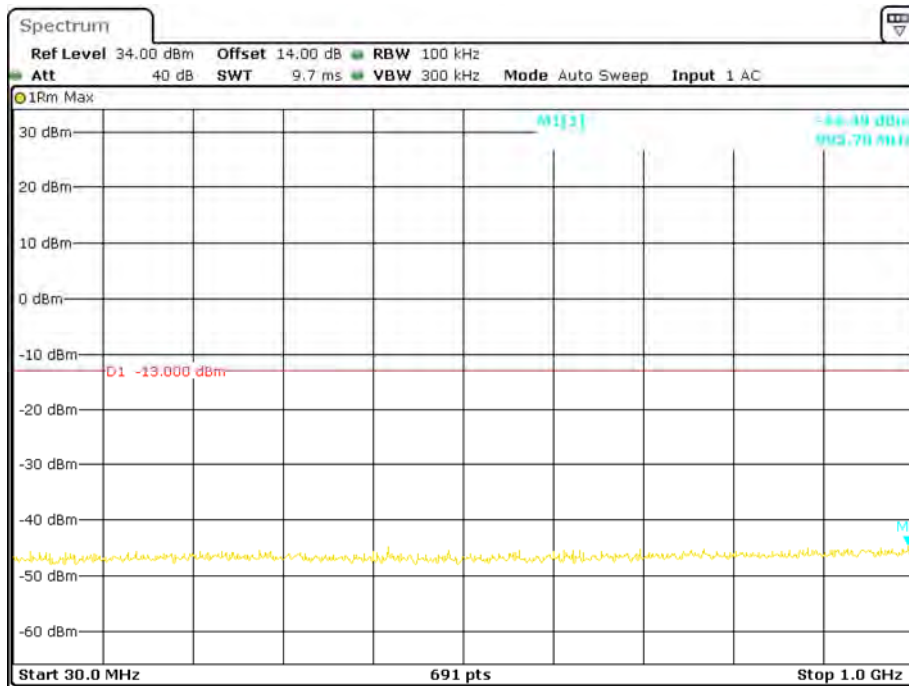
Date: 19.JAN.2018 09:06:58

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



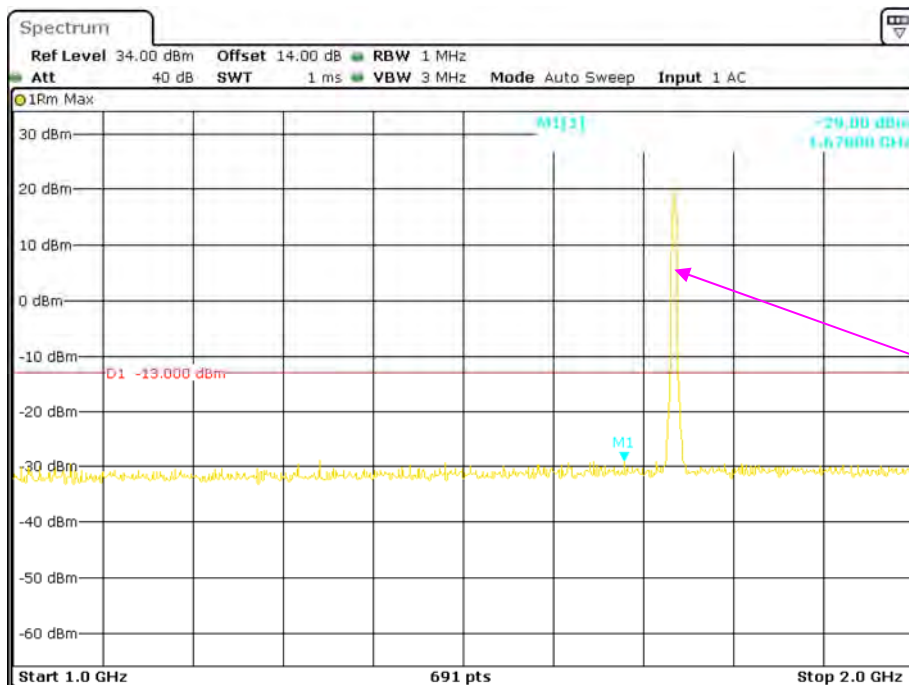
Date: 27.JAN.2018 18:41:20

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



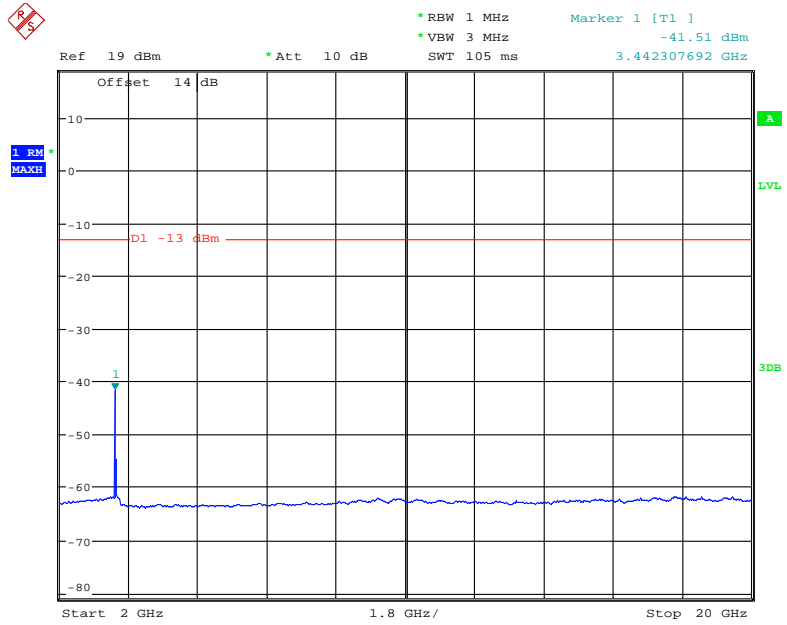
Date: 19.JAN.2018 09:10:08

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



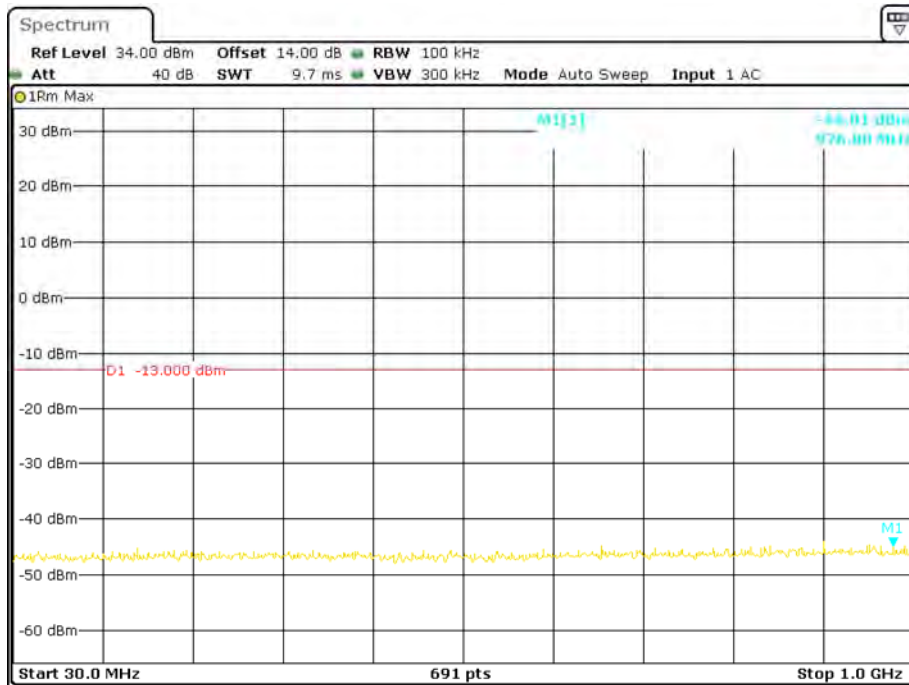
Date: 19.JAN.2018 09:07:21

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



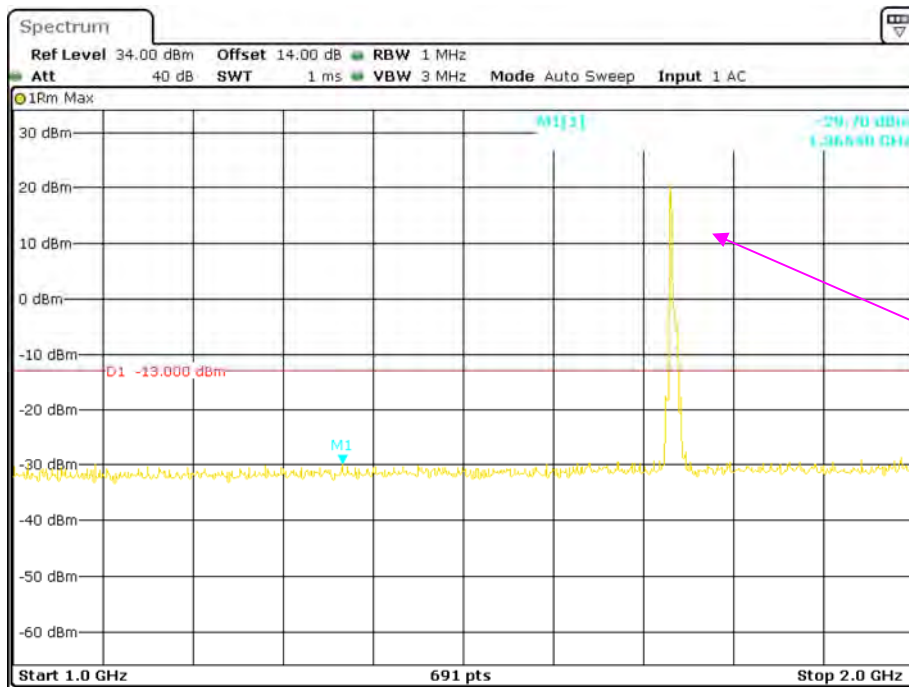
Date: 27.JAN.2018 18:41:38

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



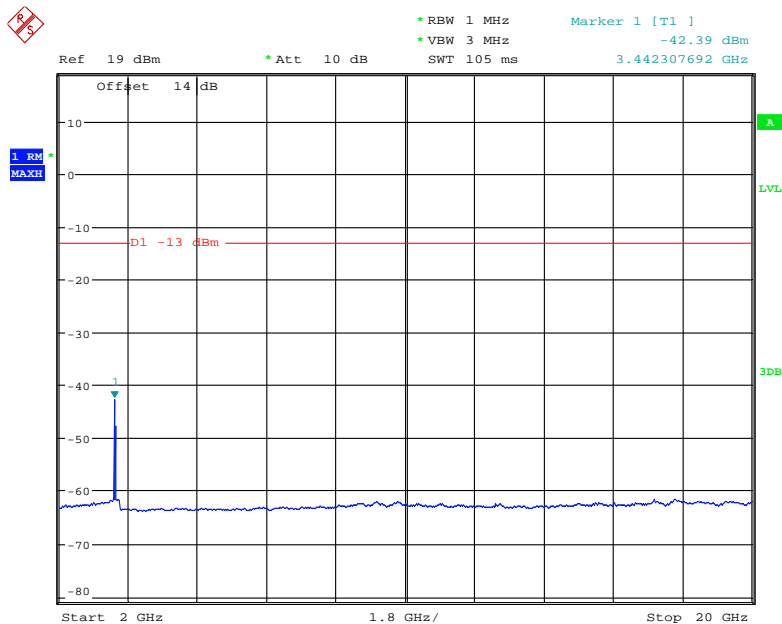
Date: 19.JAN.2018 09:10:27

### 1 GHz - 2 GHz (10.0 MHz, Middle Channel)

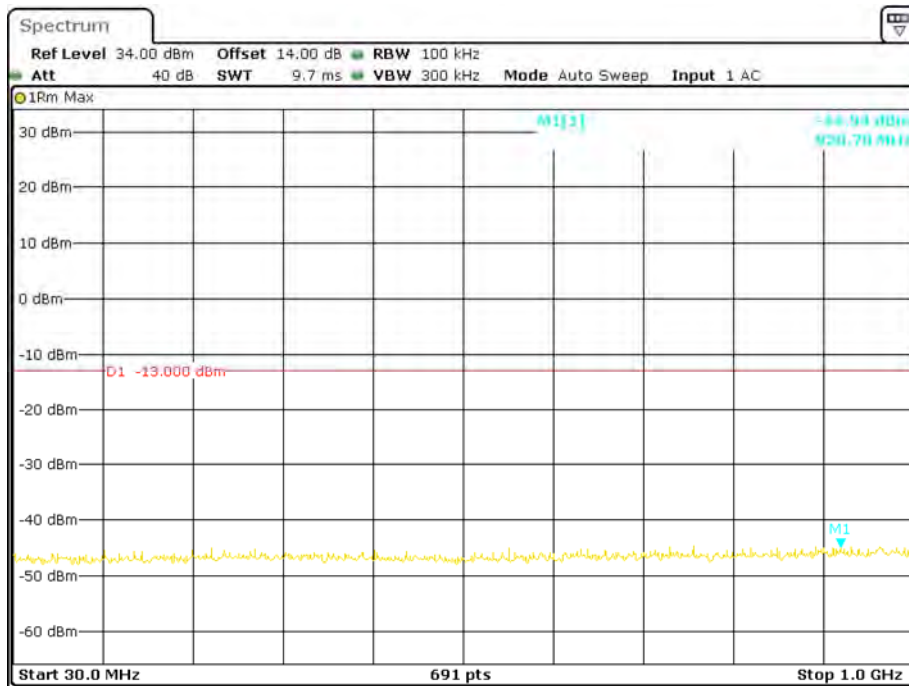


Fundamental test

### 2 GHz - 20 GHz (10.0 MHz, Middle Channel)

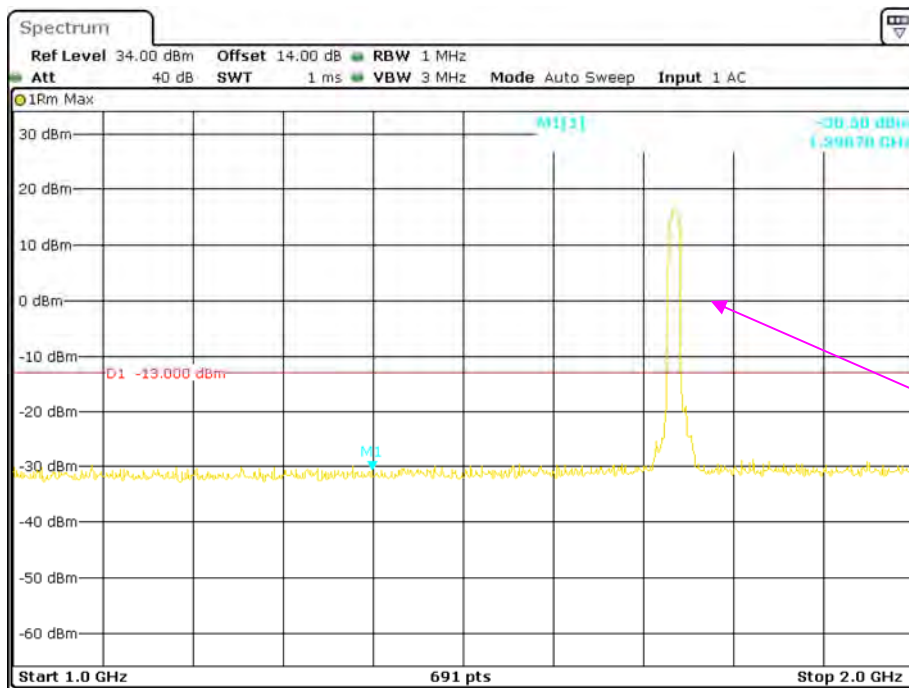


### 30 MHz - 1 GHz (15.0 MHz, Middle Channel)



Date: 19.JAN.2018 09:11:02

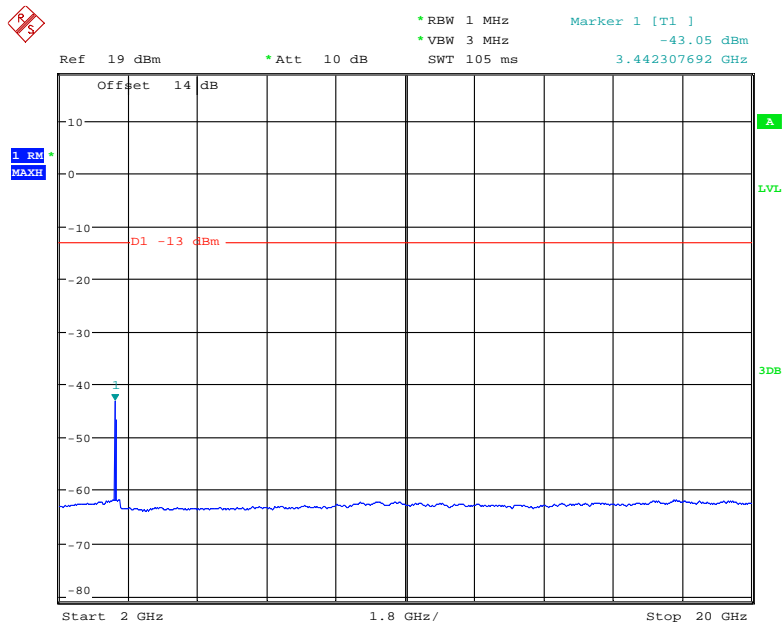
### 1 GHz - 2 GHz (15.0 MHz, Middle Channel)



Date: 19.JAN.2018 09:08:08

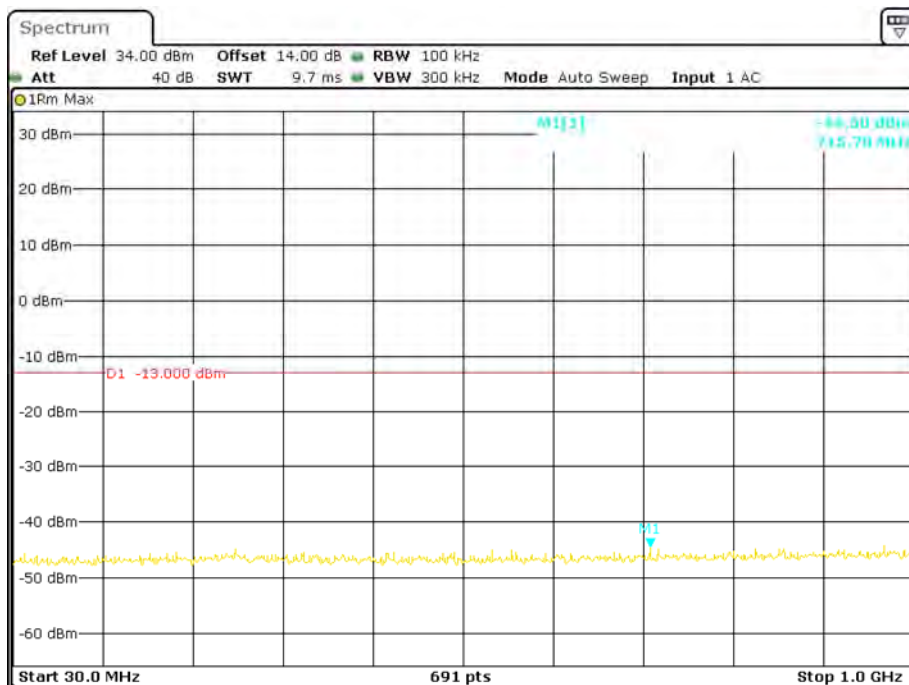
Fundamental test

**2 GHz - 20 GHz (15.0 MHz, Middle Channel)**



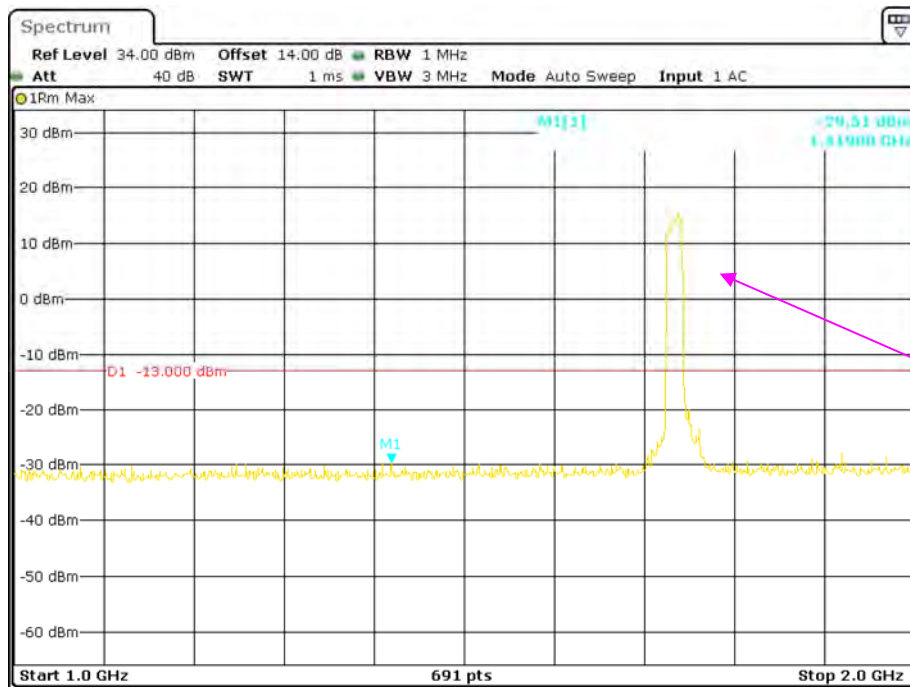
Date: 27.JAN.2018 18:42:12

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



Date: 19.JAN.2018 09:11:21

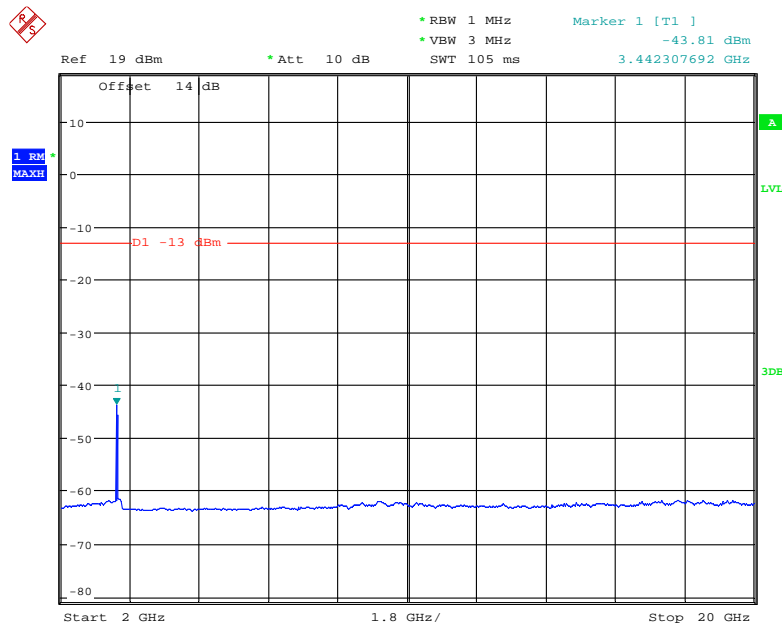
### 1 GHz - 3 GHz (20.0 MHz, Middle Channel)



Fundamental test

Date: 19.JAN.2018 09:08:28

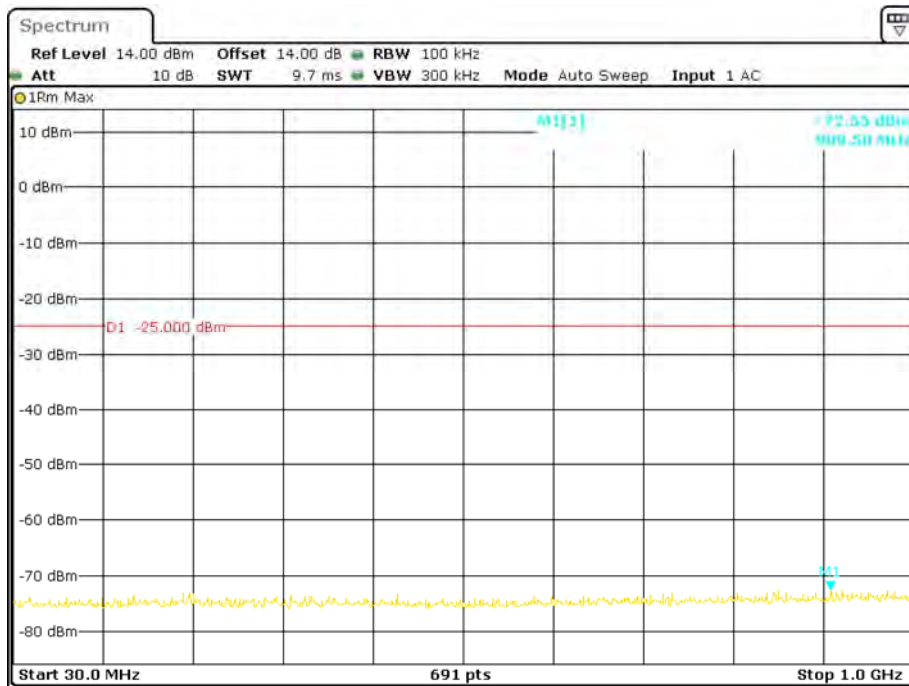
### 2 GHz - 26 GHz (20.0 MHz, Middle Channel)



Date: 27.JAN.2018 18:42:27

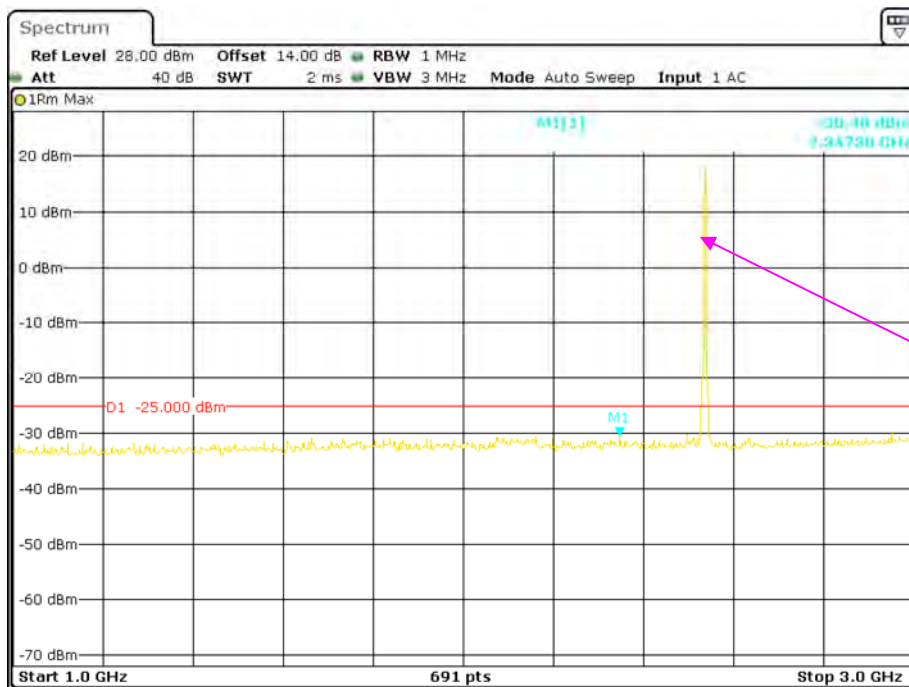
**LTE Band 7: (QPSK)**

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



Date: 19.JAN.2018 09:15:22

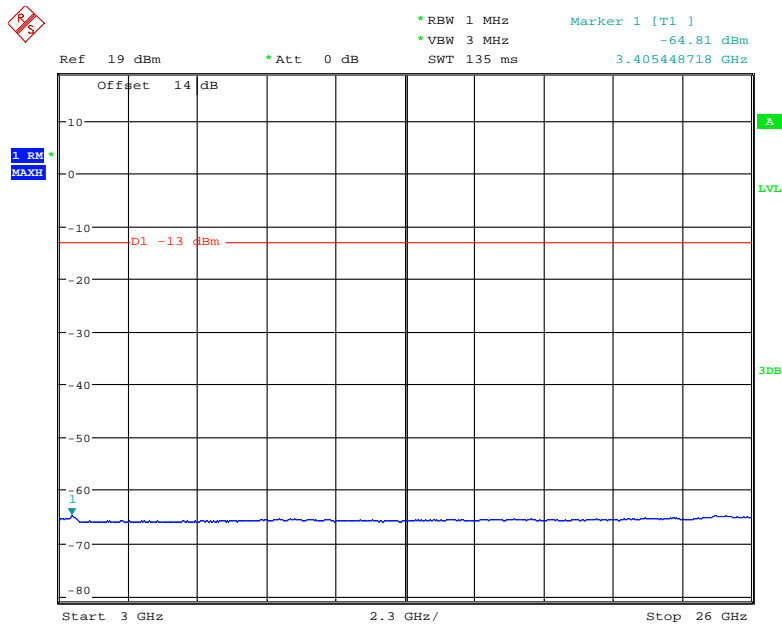
**1 GHz - 3 GHz (5.0 MHz, Middle Channel)**



Date: 19.JAN.2018 09:17:26

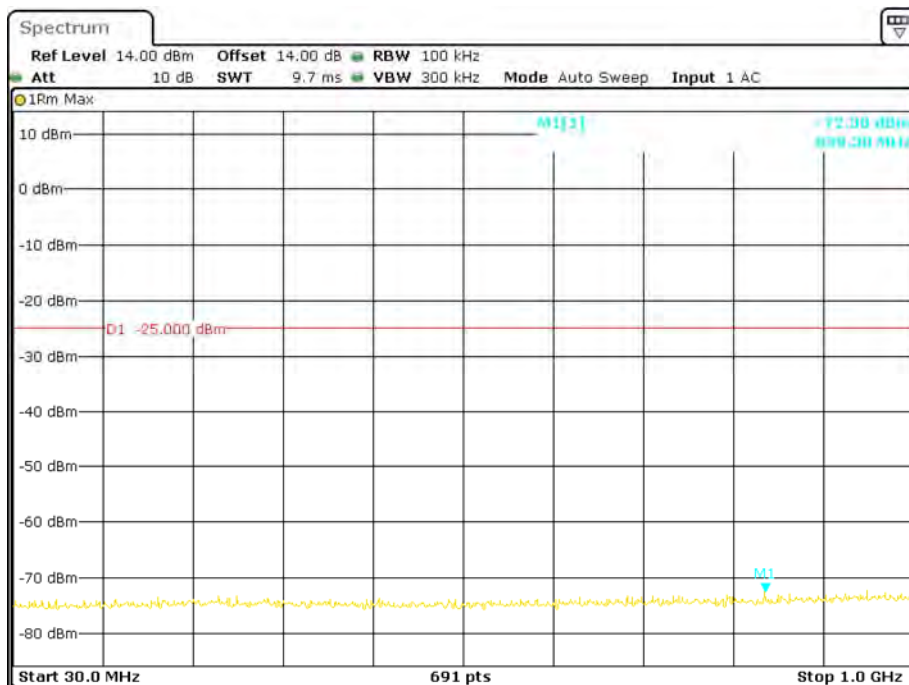


### 3 GHz - 26 GHz (5.0 MHz, Middle Channel)



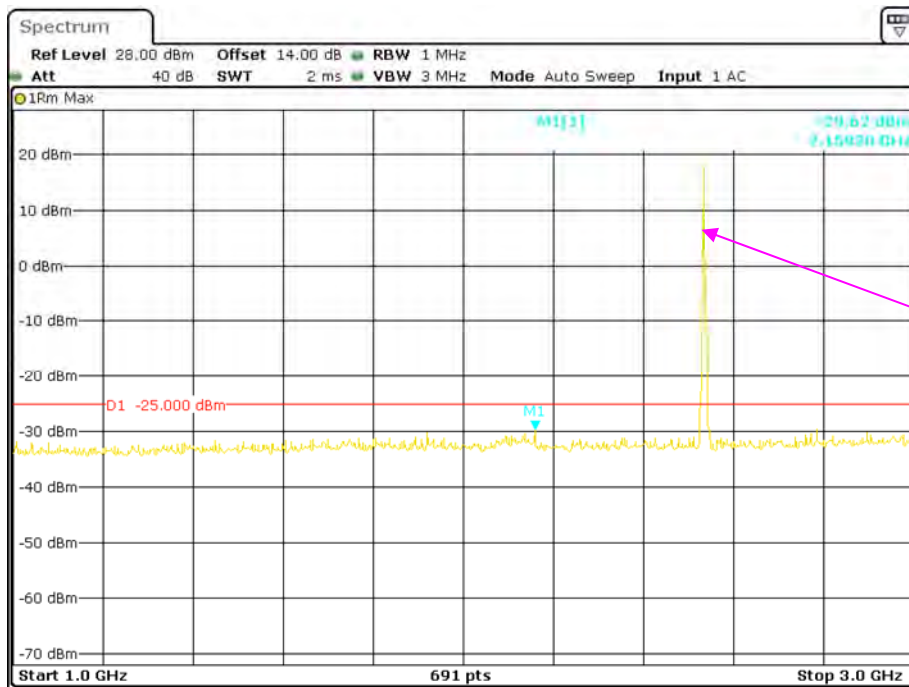
Date: 27.JAN.2018 18:43:54

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



Date: 19.JAN.2018 09:15:42

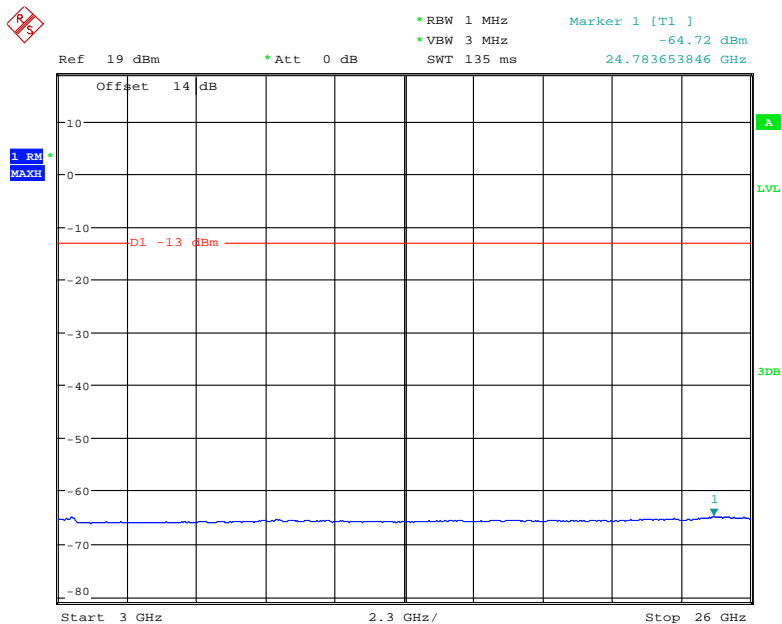
### 1 GHz - 3 GHz (10.0 MHz, Middle Channel)



Date: 19.JAN.2018 09:17:57

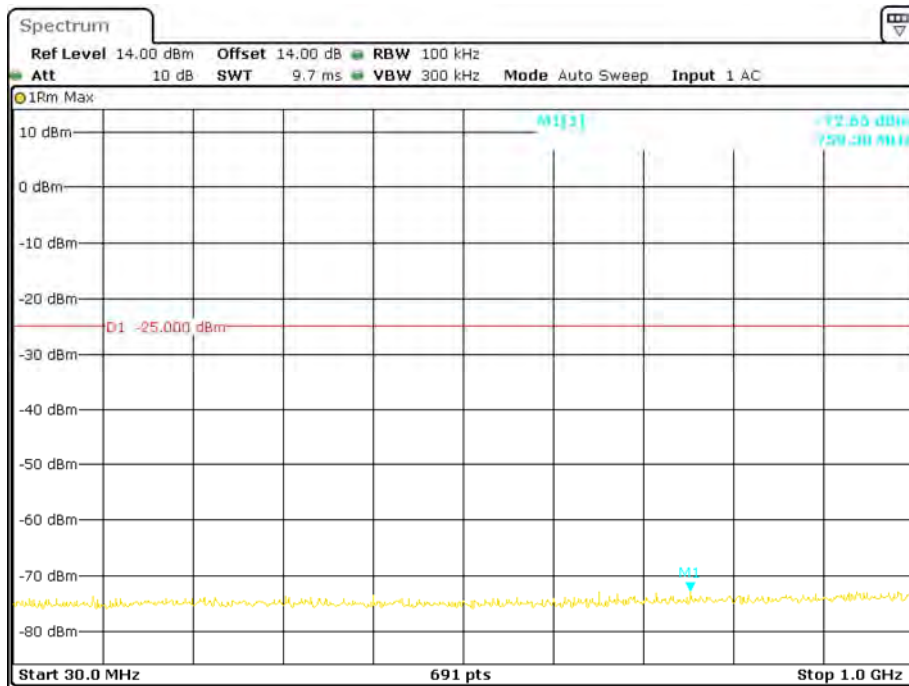
Fundamental test

### 3 GHz - 26 GHz (10.0 MHz, Middle Channel)



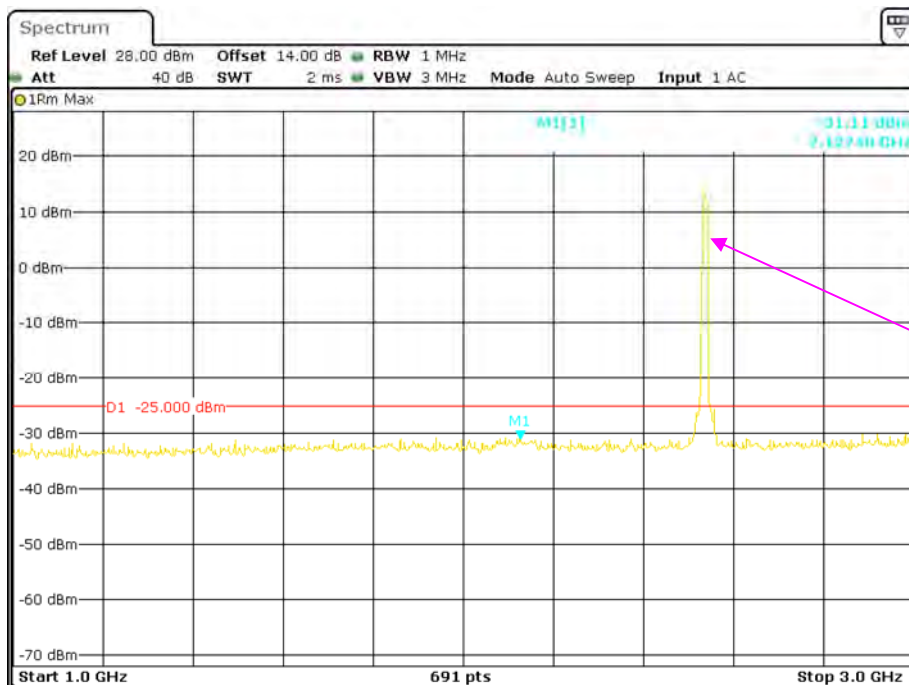
Date: 27.JAN.2018 18:44:23

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



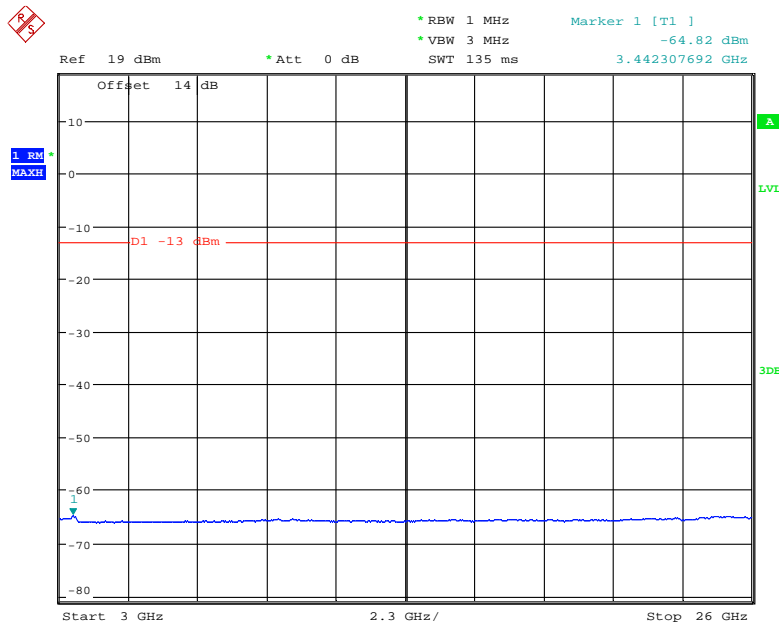
Date: 19.JAN.2018 09:16:01

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



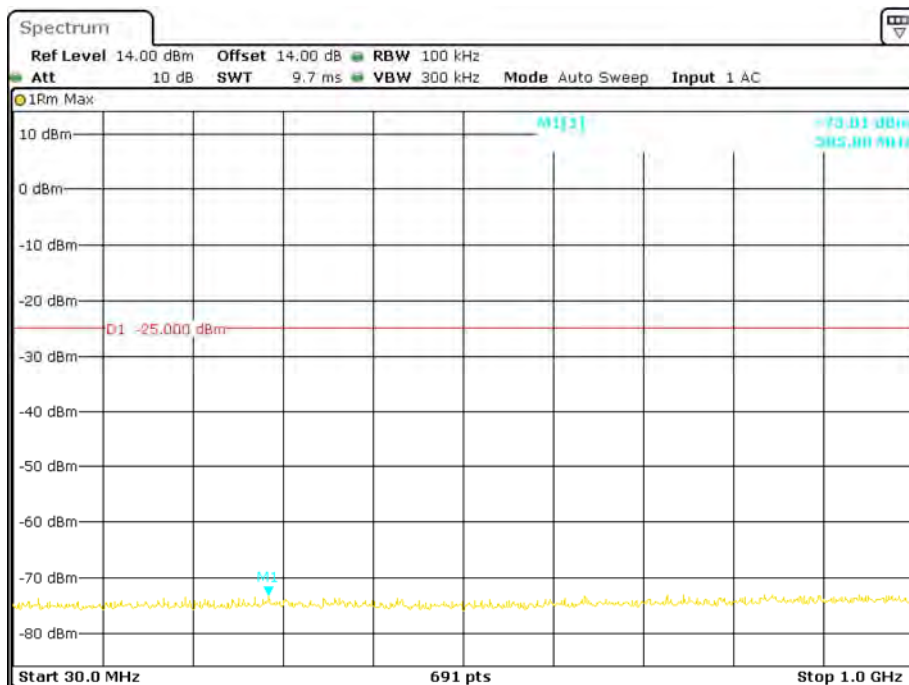
Date: 19.JAN.2018 09:18:21

**3 GHz - 26 GHz (15.0 MHz, Middle Channel)**



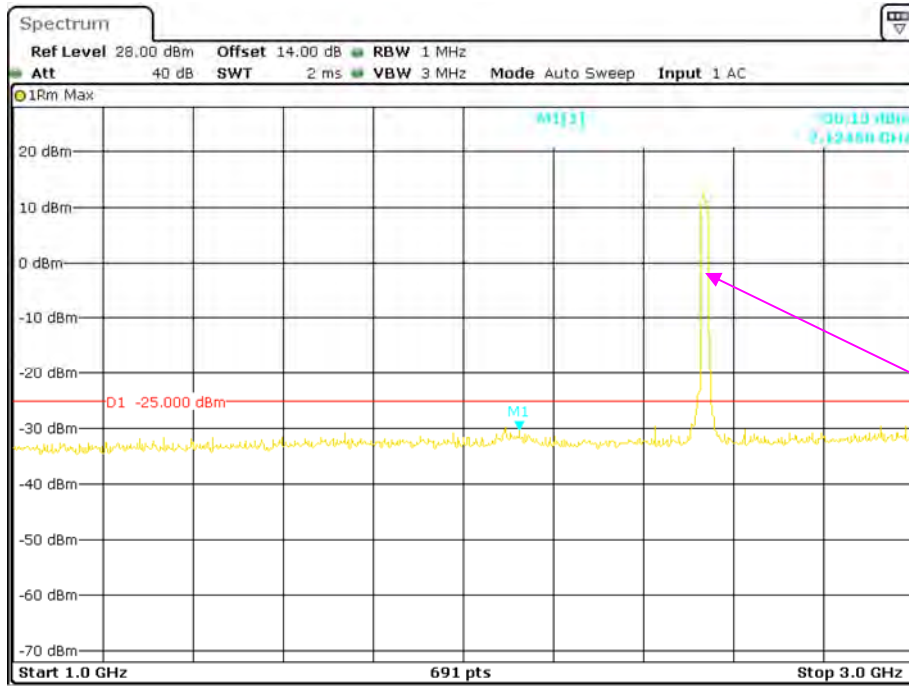
Date: 27.JAN.2018 18:44:45

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



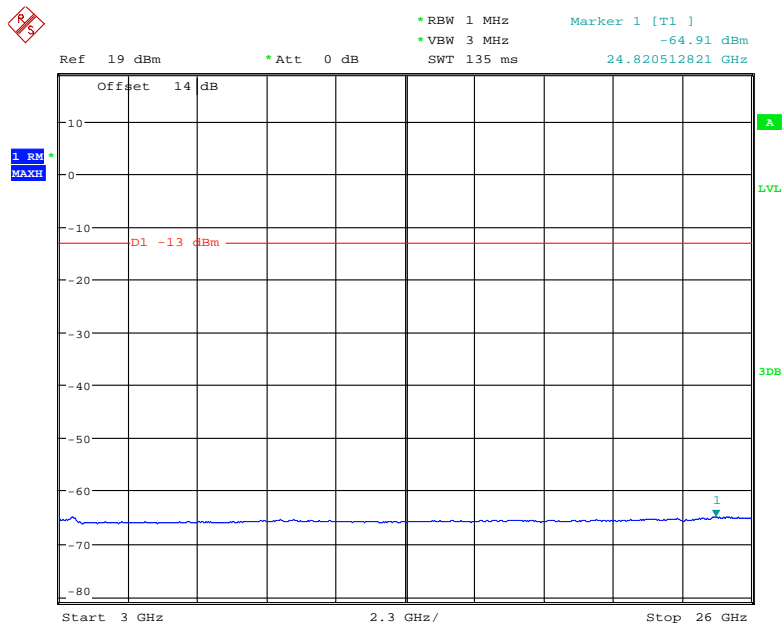
Date: 19.JAN.2018 09:15:00

### 1 GHz - 3 GHz (20.0 MHz, Middle Channel)



Date: 19.JAN.2018 09:18:44

### 3 GHz - 26 GHz (20.0 MHz, Middle Channel)



Date: 27.JAN.2018 18:45:02

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

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

**Test Procedure**

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

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

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

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

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	48 %
<b>ATM Pressure:</b>	110.0 kPa

*The testing was performed by Rocky Kang on 2018-01-29.*

*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										
209.97	35.68	287	1.8	H	-61.3	0.30	0	-61.60	-13	48.60
209.97	35.23	83	2.3	V	-61.8	0.30	0	-62.10	-13	49.10
1673.20	49.79	337	1.6	H	-57.3	1.30	9.10	-49.50	-13	36.50
1673.20	55.42	61	2.2	V	-51.1	1.30	9.10	-43.30	-13	30.30
2509.80	53.56	245	2.5	H	-50.0	2.60	9.30	-43.30	-13	30.30
2509.80	52.56	98	1.0	V	-50.4	2.60	9.30	-43.70	-13	30.70
3346.40	42.87	164	2.5	H	-57.5	1.50	9.60	-49.40	-13	36.40
3346.40	42.74	340	1.9	V	-57.6	1.50	9.60	-49.50	-13	36.50
WCDMA Mode, Middle channel										
209.97	35.63	359	2.4	H	-61.4	0.30	0	-61.70	-13	48.70
209.97	36.05	346	2.0	V	-60.9	0.30	0	-61.20	-13	48.20
1673.20	49.34	118	1.5	H	-57.7	1.30	9.10	-49.90	-13	36.90
1673.20	47.37	111	1.9	V	-59.1	1.30	9.10	-51.30	-13	38.30
2509.80	49.34	336	2.4	H	-54.2	2.60	9.30	-47.50	-13	34.50
2509.80	46.90	205	1.5	V	-56.0	2.60	9.30	-49.30	-13	36.30
3346.40	40.63	16	2.0	H	-59.7	1.50	9.60	-51.60	-13	38.60
3346.40	40.35	188	2.4	V	-60.0	1.50	9.60	-51.90	-13	38.90

**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										
209.97	36.44	316	2.2	H	-60.6	0.30	0	-60.90	-13	47.90
209.97	36.56	152	2.3	V	-60.4	0.30	0	-60.70	-13	47.70
3760.00	48.04	323	1.8	H	-53.2	1.50	9.70	-45.00	-13	32.00
3760.00	47.41	174	1.0	V	-53.3	1.50	9.70	-45.10	-13	32.10
5640.00	49.32	182	2.0	H	-48.3	1.70	11.20	-38.80	-13	25.80
5640.00	48.02	127	1.7	V	-49.2	1.70	11.20	-39.70	-13	26.70
WCDMA Mode, Middle channel										
209.97	35.20	354	1.6	H	-61.8	0.30	0	-62.10	-13	49.10
209.97	36.77	27	1.7	V	-60.2	0.30	0	-60.50	-13	47.50
3760.00	43.15	166	1.2	H	-58.1	1.50	9.70	-49.90	-13	36.90
3760.00	43.15	155	1.3	V	-57.6	1.50	9.70	-49.40	-13	36.40
5640.00	42.99	157	2.1	H	-54.6	1.70	11.20	-45.10	-13	32.10
5640.00	43.59	245	1.4	V	-53.7	1.70	11.20	-44.20	-13	31.20



**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										
209.97	35.71	241	2.4	H	-61.3	0.30	0	-61.60	-13	48.60
209.97	35.41	270	2.2	V	-61.6	0.30	0	-61.90	-13	48.90
3760.00	43.1	177	2.4	H	-58.1	1.50	9.70	-49.90	-13	36.90
3760.00	43.25	31	1.5	V	-57.5	1.50	9.70	-49.30	-13	36.30
Band 4, Middle channel, QPSK, 1.4MHz										
Test frequency range: 30 MHz ~ 18 GHz										
209.97	36.14	210	2.0	H	-60.9	0.30	0	-61.20	-13	48.20
209.97	35.43	219	1.7	V	-61.6	0.30	0	-61.90	-13	48.90
3465.00	42.97	216	2.0	H	-58.2	1.50	9.70	-50.00	-13	37.00
3465.00	42.68	2	1.7	V	-59.2	1.50	9.70	-51.00	-13	38.00
Band 7, Middle channel, QPSK, 5MHz										
Test frequency range: 30 MHz ~ 26 GHz										
209.97	36.78	315	1.9	H	-60.2	0.30	0	-60.50	-25	35.50
209.97	36.32	194	1.8	V	-60.7	0.30	0	-61.00	-25	36.00
5070.00	46.83	157	1.9	H	-51.0	1.60	11.20	-41.40	-25	16.40
5070.00	46.2	350	1.9	V	-51.7	1.60	11.20	-42.10	-25	17.10
7605.00	51.13	12	2.1	H	-44.1	2.10	11.60	-34.60	-25	9.60
7605.00	50.96	184	2.4	V	-44.0	2.10	11.60	-34.50	-25	9.50

**Note:**

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

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

**Applicable Standard**

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

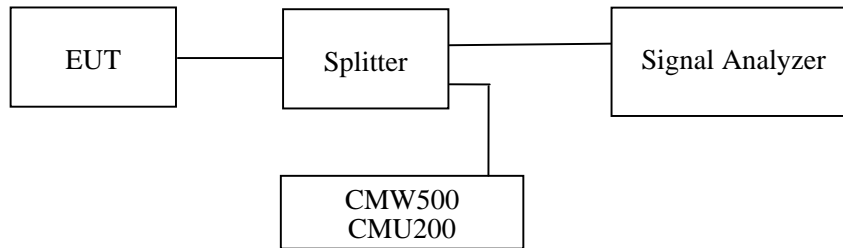
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to FCC §27.53 (h)(m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

**Test Procedure**

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

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



**Test Data**

**Environmental Conditions**

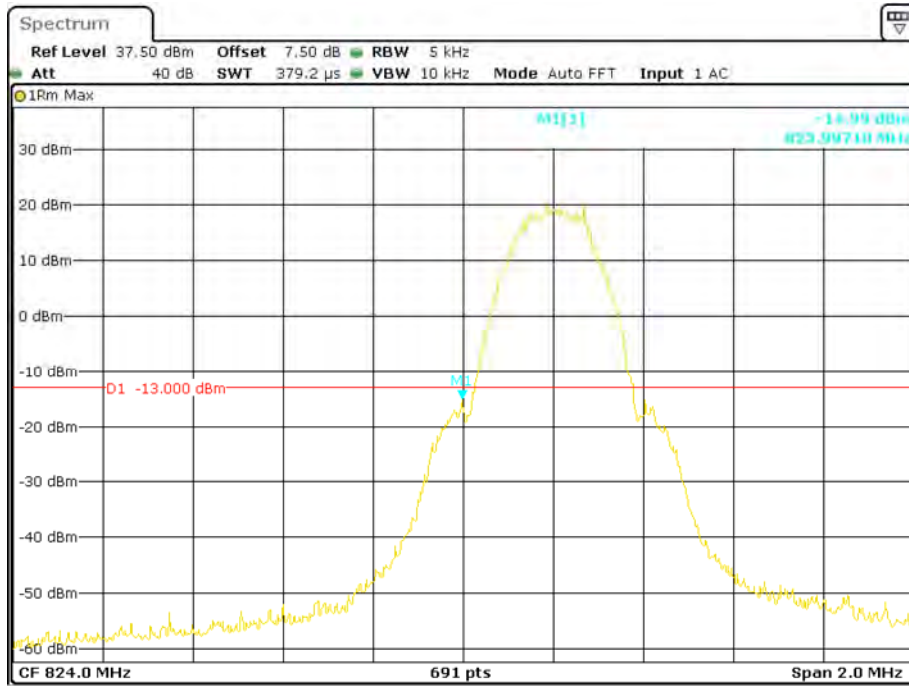
<b>Temperature:</b>	24~25 °C
<b>Relative Humidity:</b>	48~50 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Rocky Kang from 2018-01-15 to 2018-01-19.*

*EUT operation mode: Transmitting*

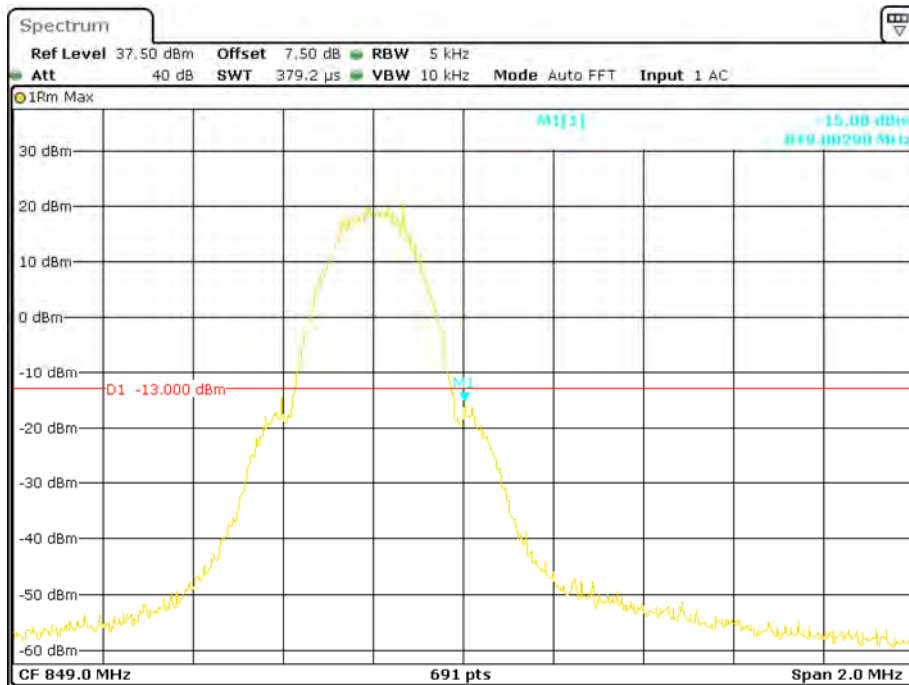
*Test Result: Compliance. Please refer to the following plots.*

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



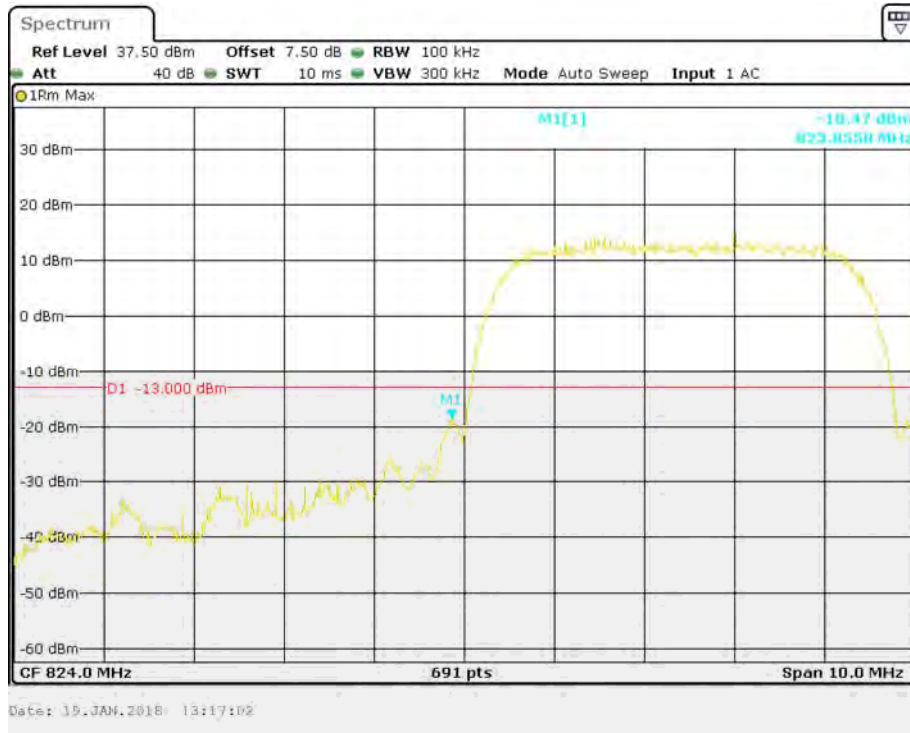
Date: 19.JAN.2018 11:07:34

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

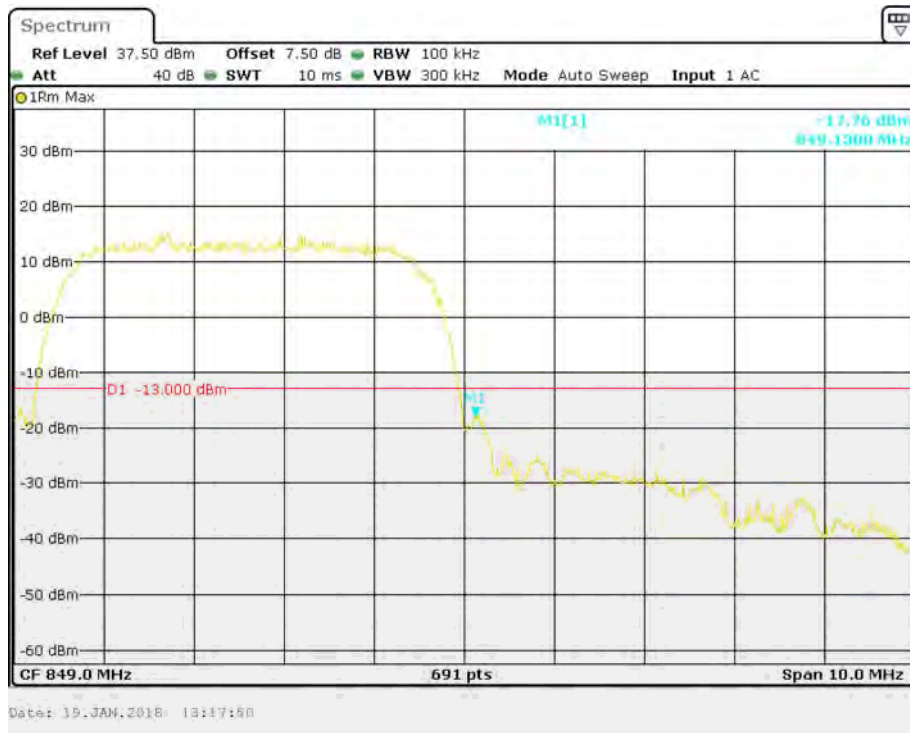


Date: 19.JAN.2018 11:08:14

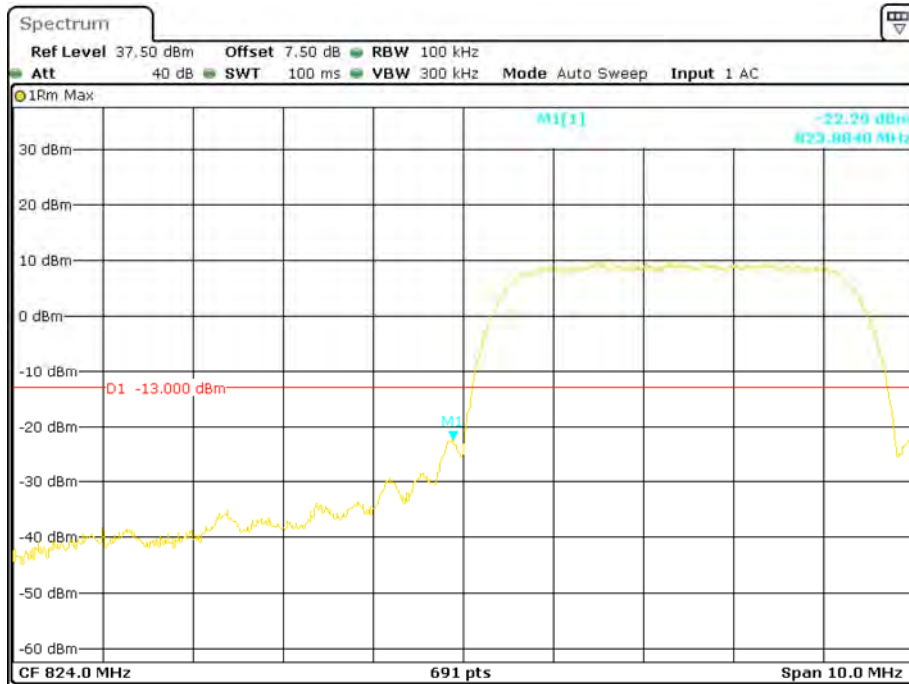
### Cellular Band, Left Band Edge for WCDMA (BPSK) Mode



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

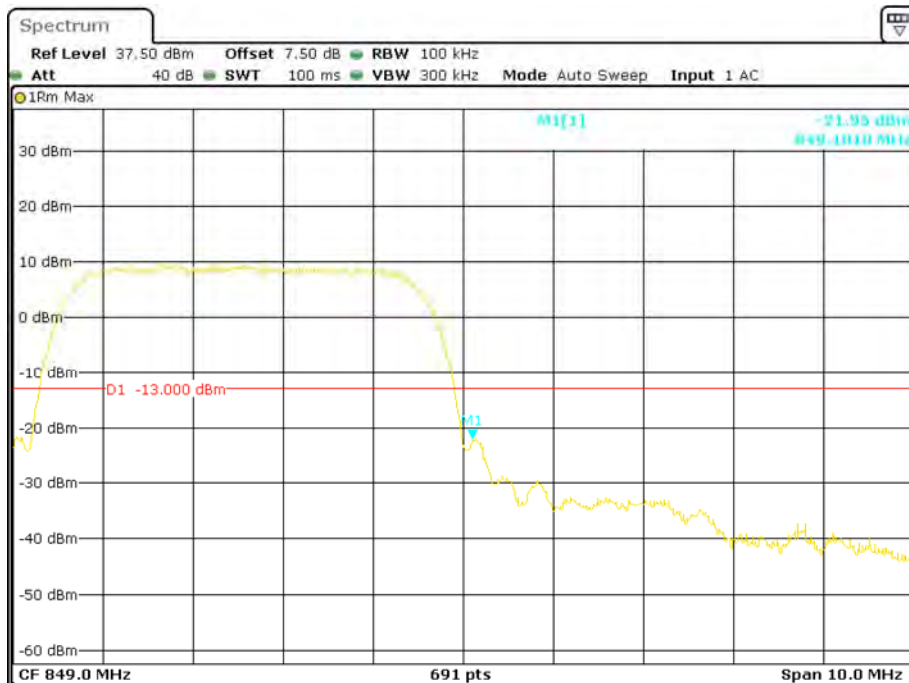


### Cellular Band, Left Band Edge for HSDPA (16QAM) Mode



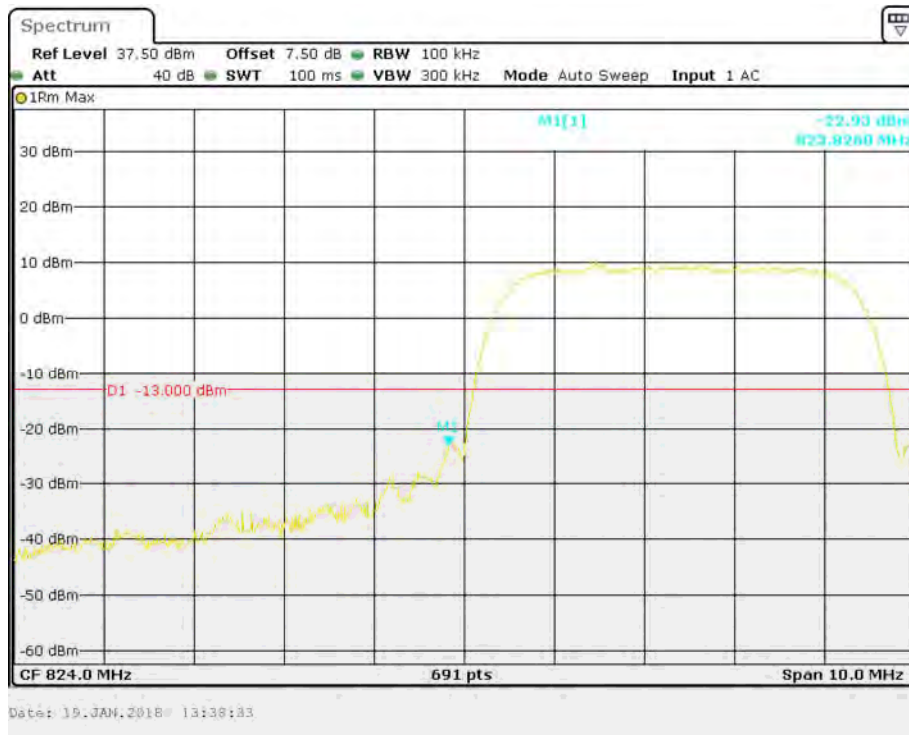
Date: 19.JAN.2018 13:27:58

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

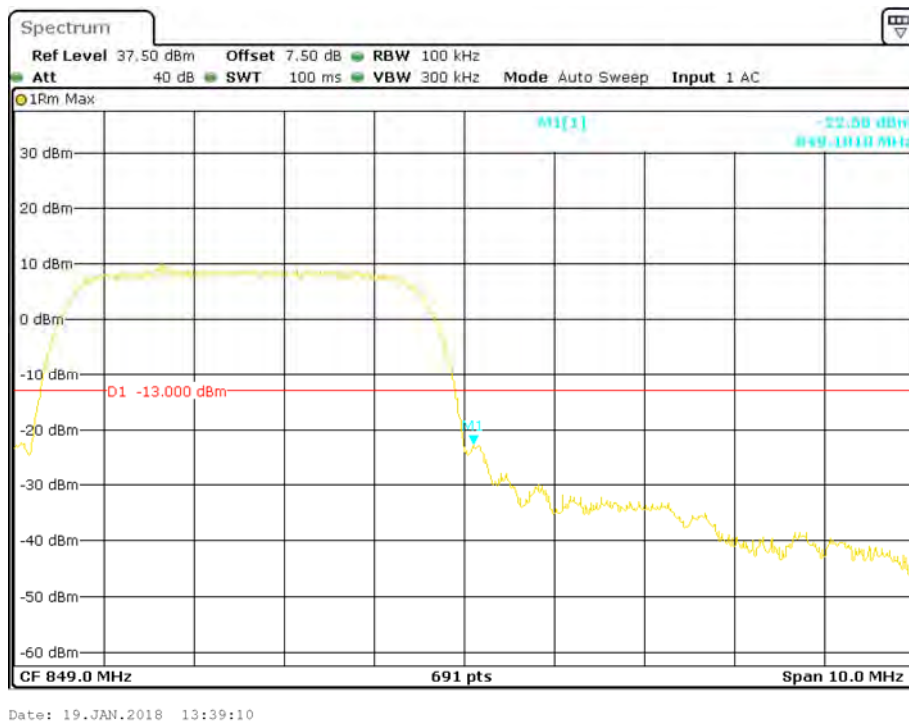


Date: 19.JAN.2018 13:28:39

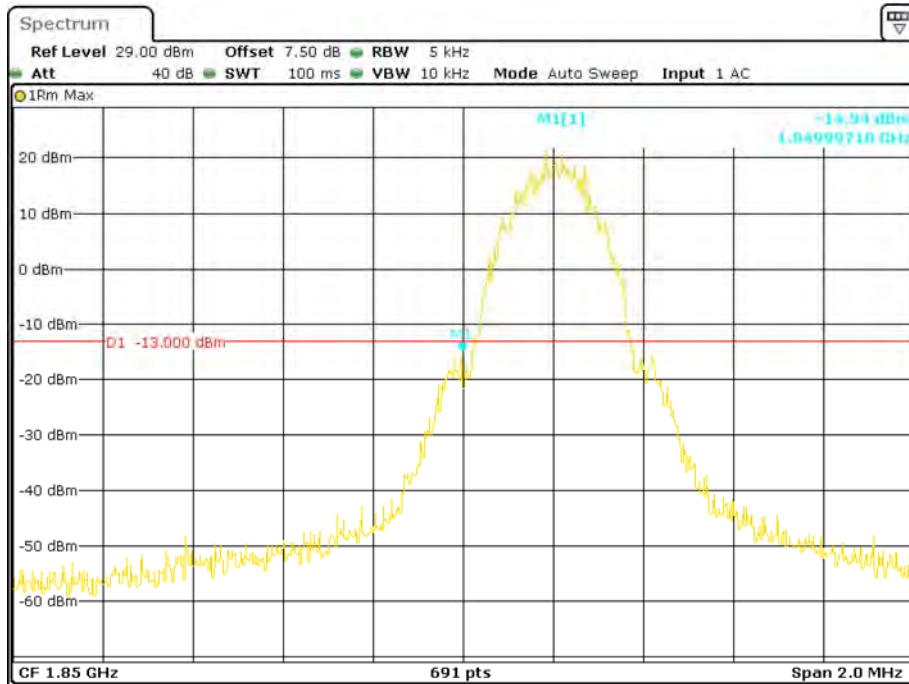
### Cellular Band, Left Band Edge for HSUPA (BPSK) Mode



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

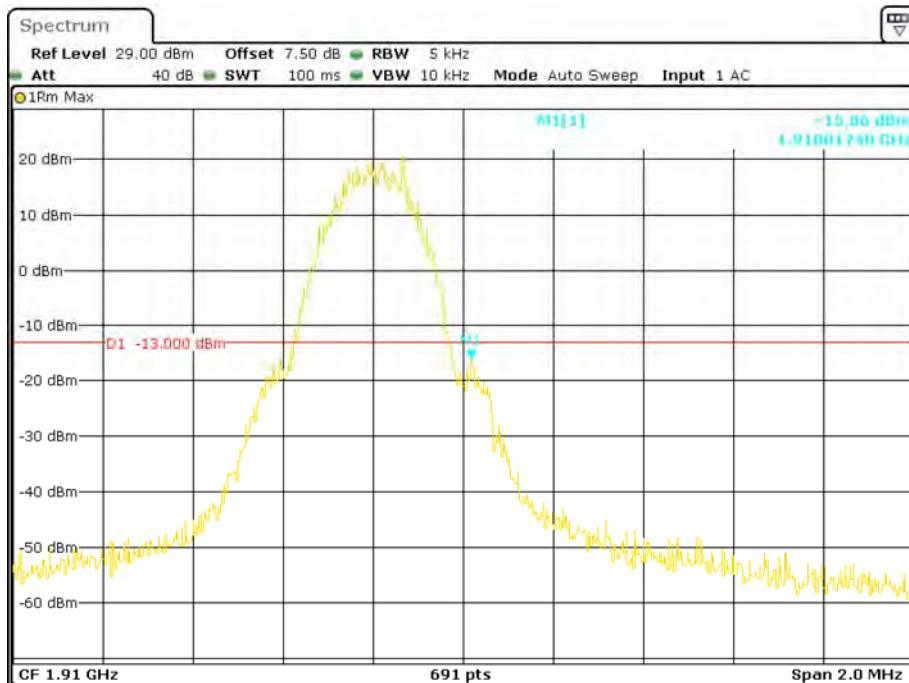


### PCS Band, Left Band Edge for GSM (GMSK) Mode



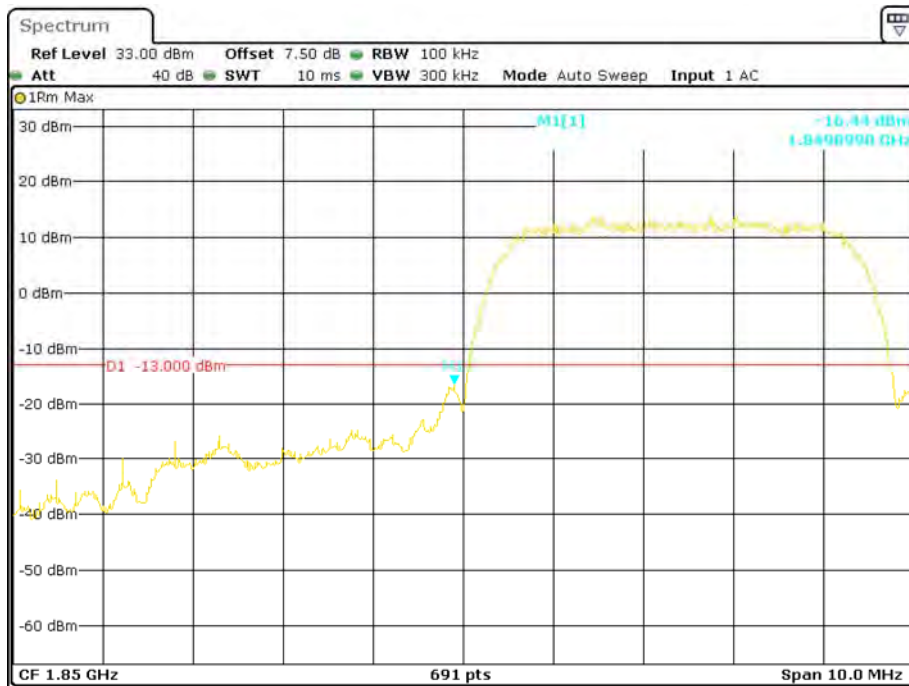
Date: 19.JAN.2018 13:51:06

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



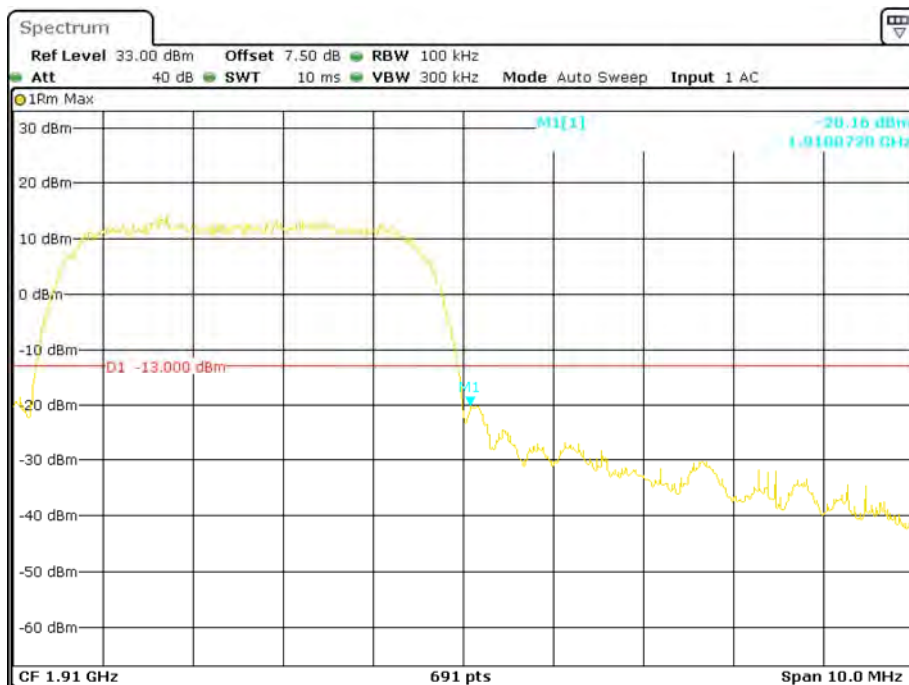
Date: 19.JAN.2018 13:52:16

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



Date: 19.JAN.2018 13:11:19

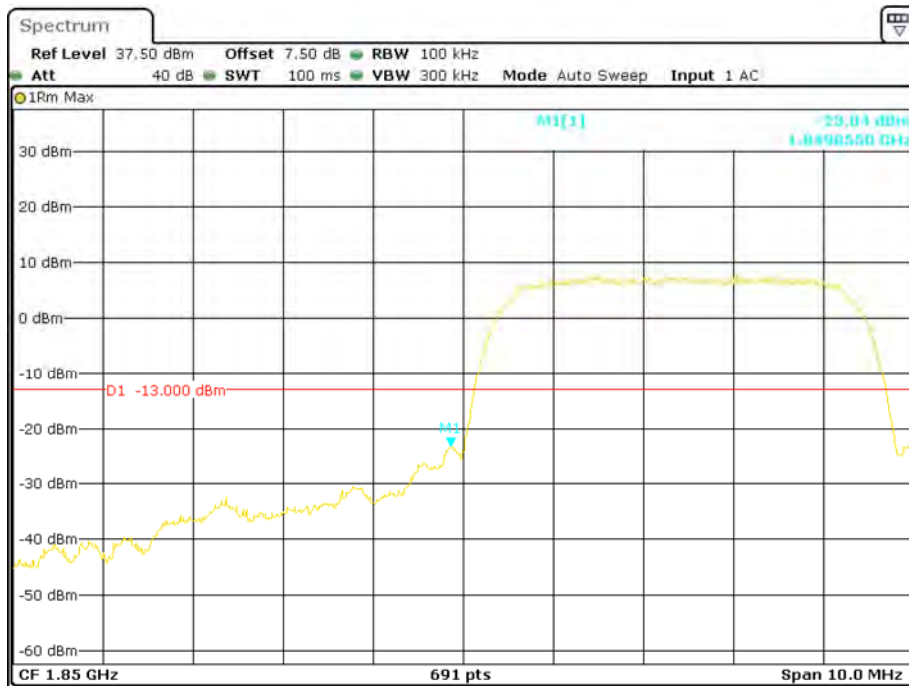
### PCS Band, Right Band Edge for WCDMA (BPSK) Mode



Date: 19.JAN.2018 13:12:18

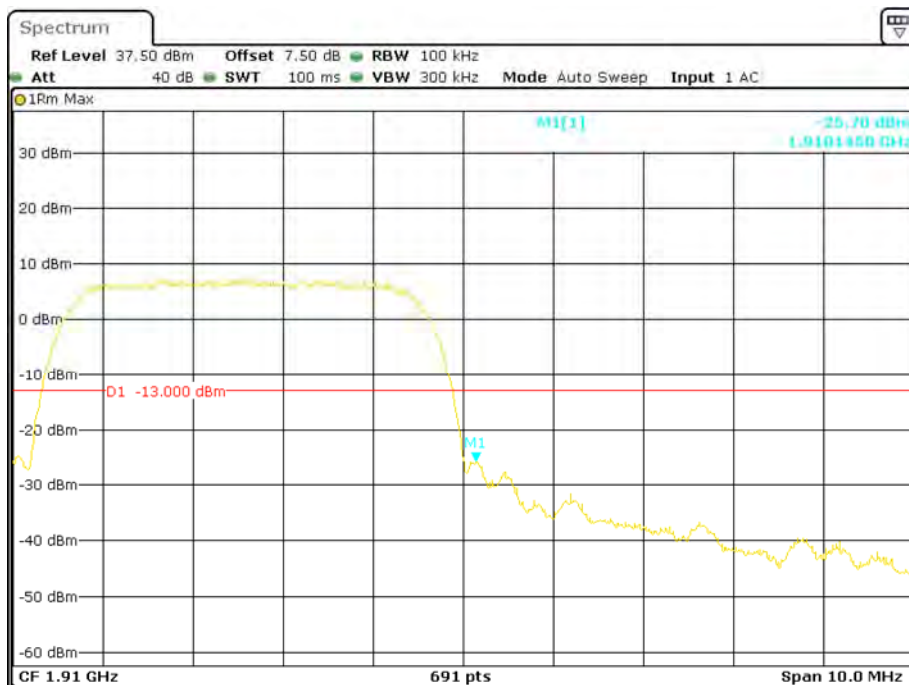


PCS Band, Left Band Edge for HSDPA (16QAM) Mode



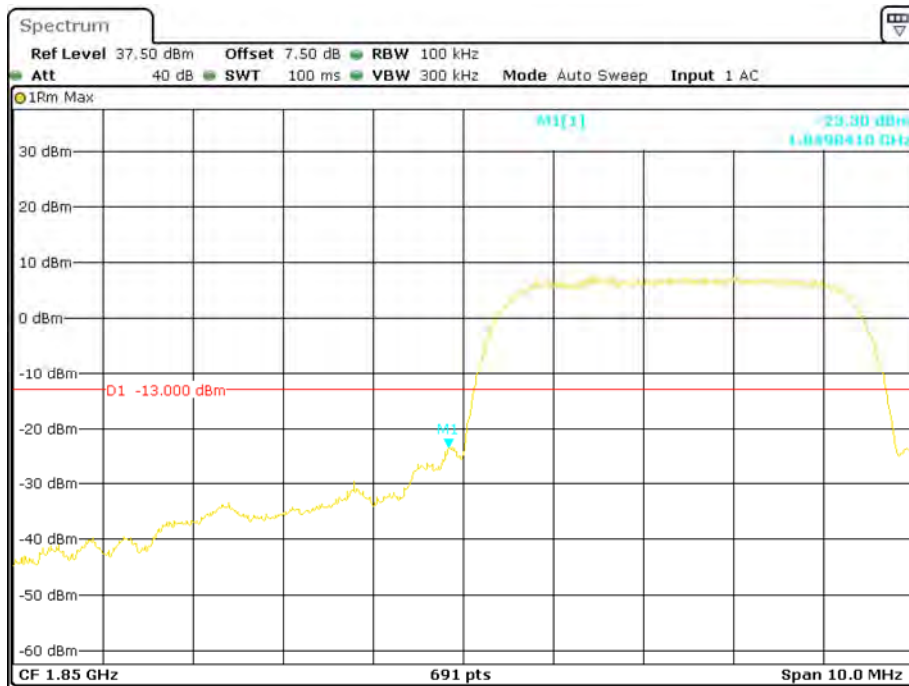
Date: 19.JAN.2018 13:30:13

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



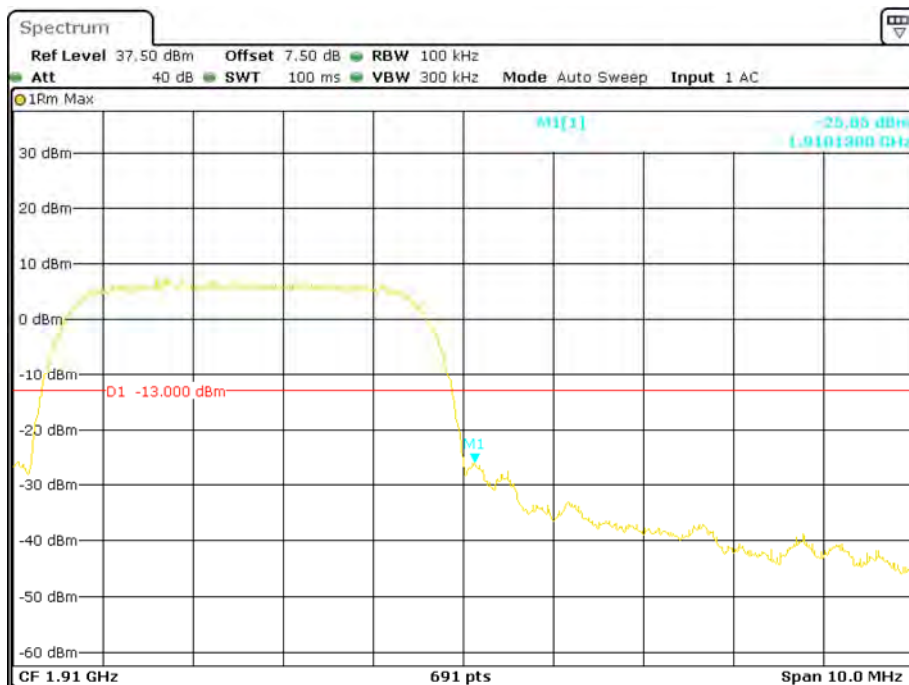
Date: 19.JAN.2018 13:29:30

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



Date: 19.JAN.2018 13:40:19

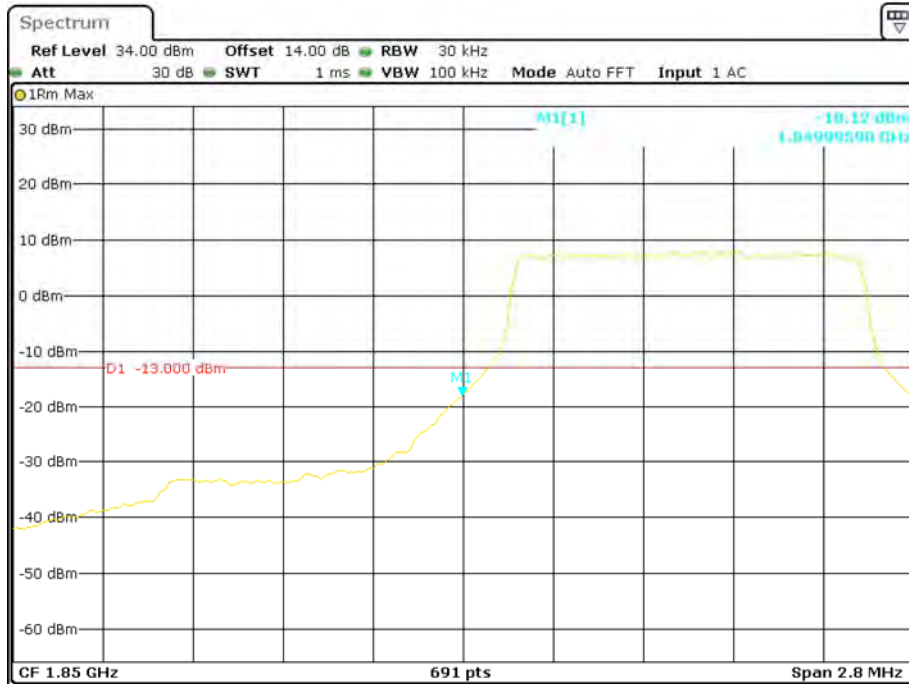
### PCS Band, Right Band Edge for HSUPA (BPSK) Mode



Date: 19.JAN.2018 13:40:55

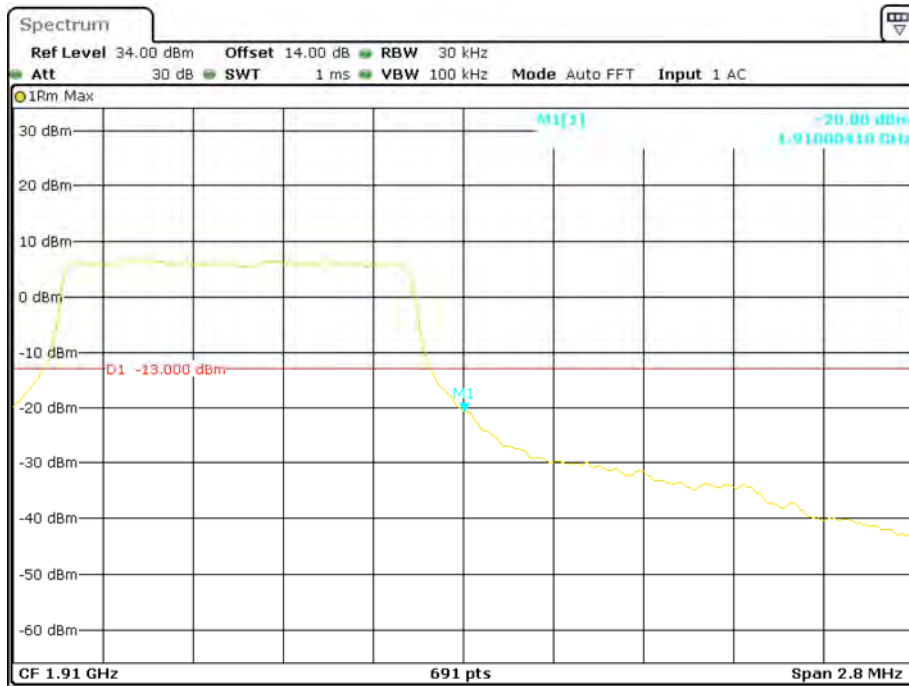
**LTE Band 2:**

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



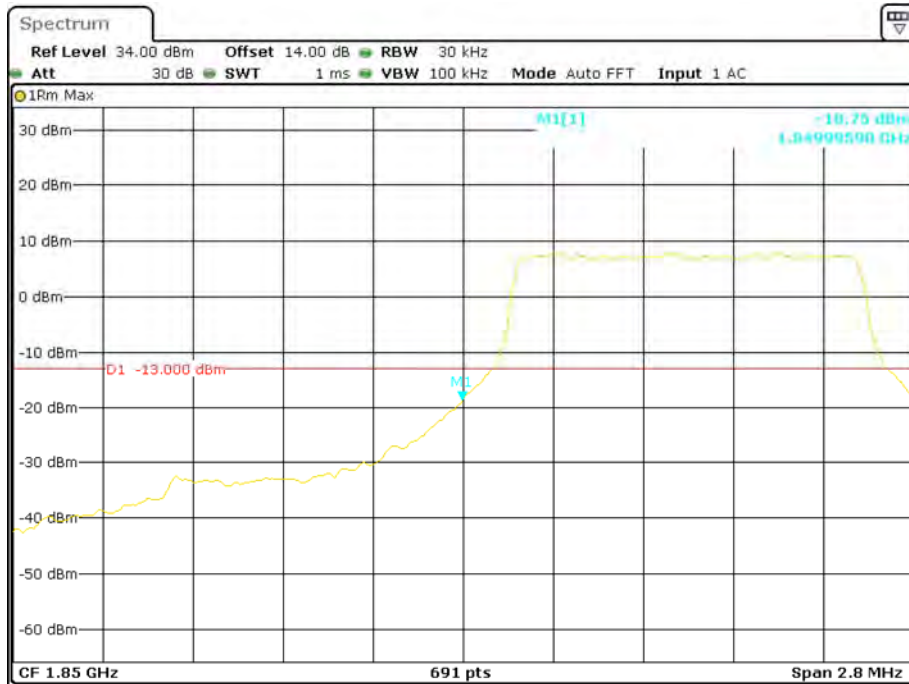
Date: 15.JAN.2018 13:26:54

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



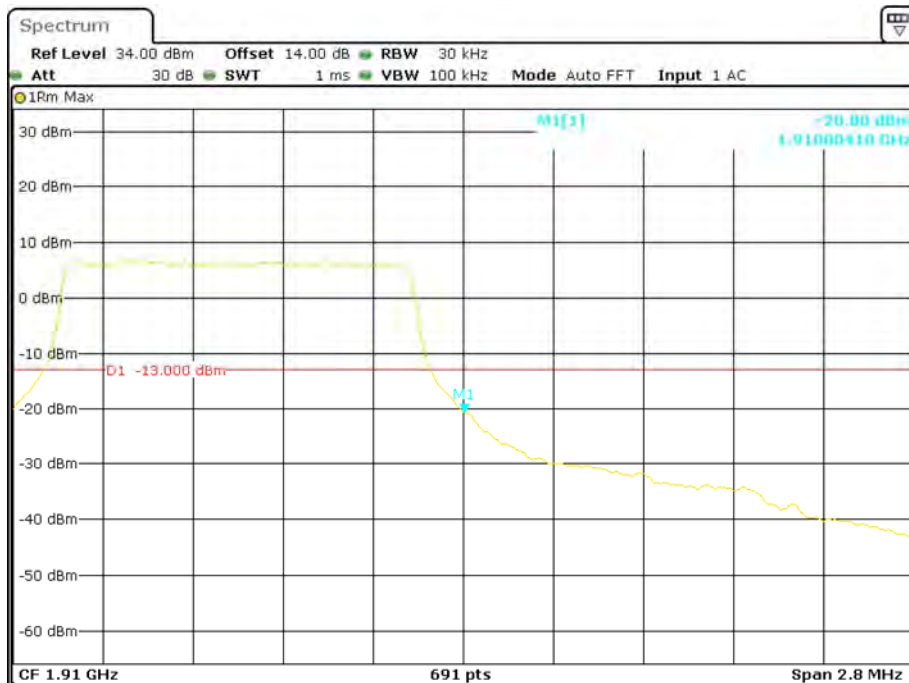
Date: 15.JAN.2018 13:28:38

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



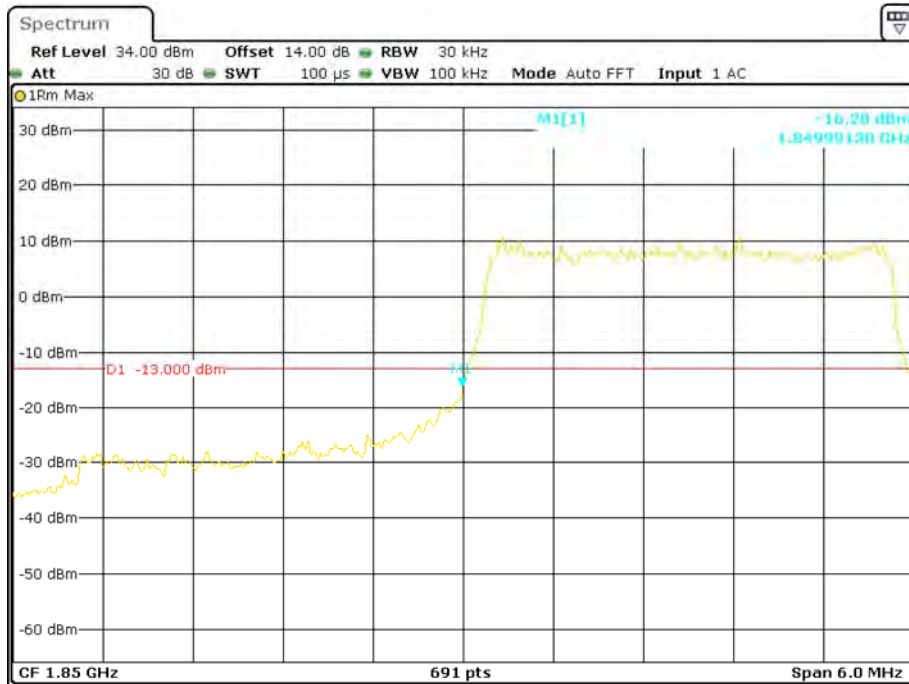
Date: 15.JAN.2018 13:30:16

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



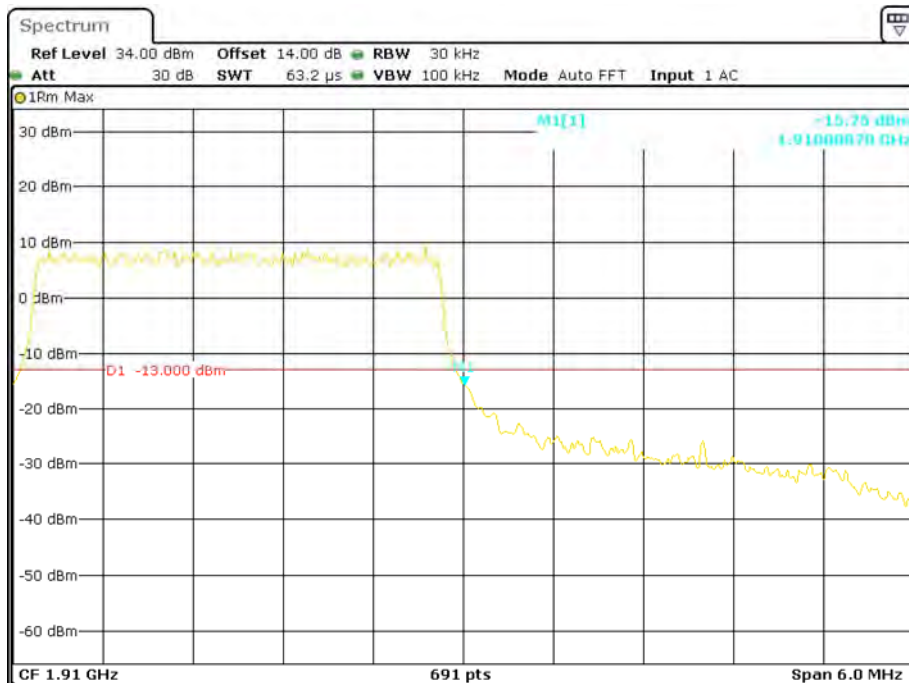
Date: 15.JAN.2018 13:29:09

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



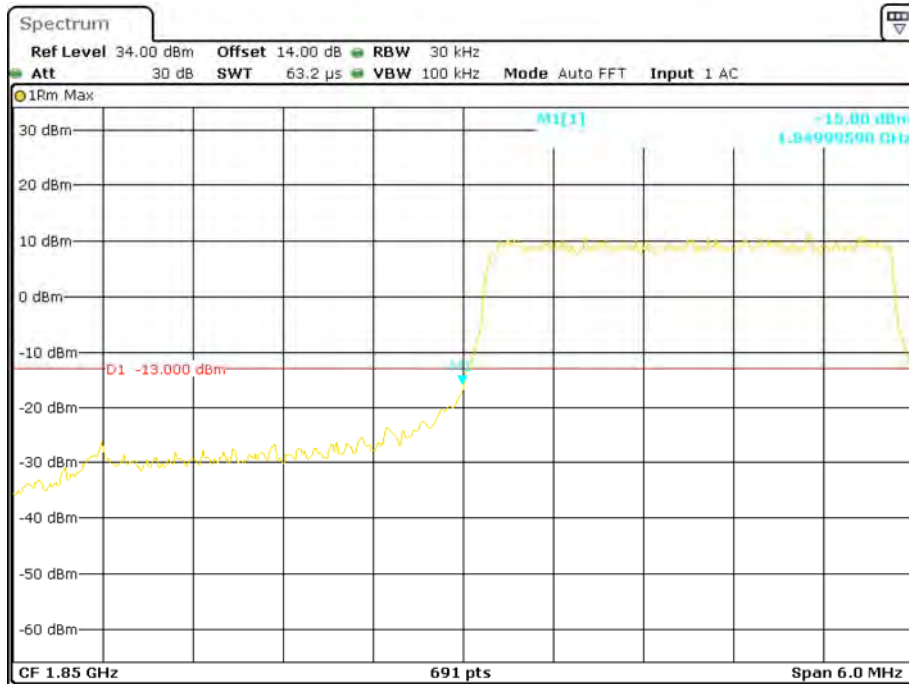
Date: 15.JAN.2018 14:05:38

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



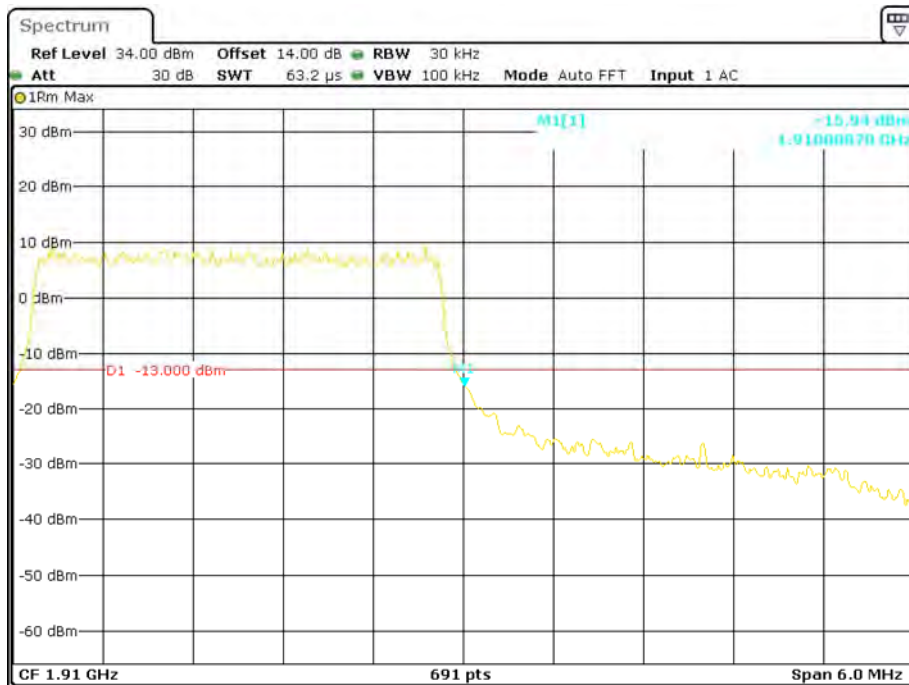
Date: 15.JAN.2018 14:03:40

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



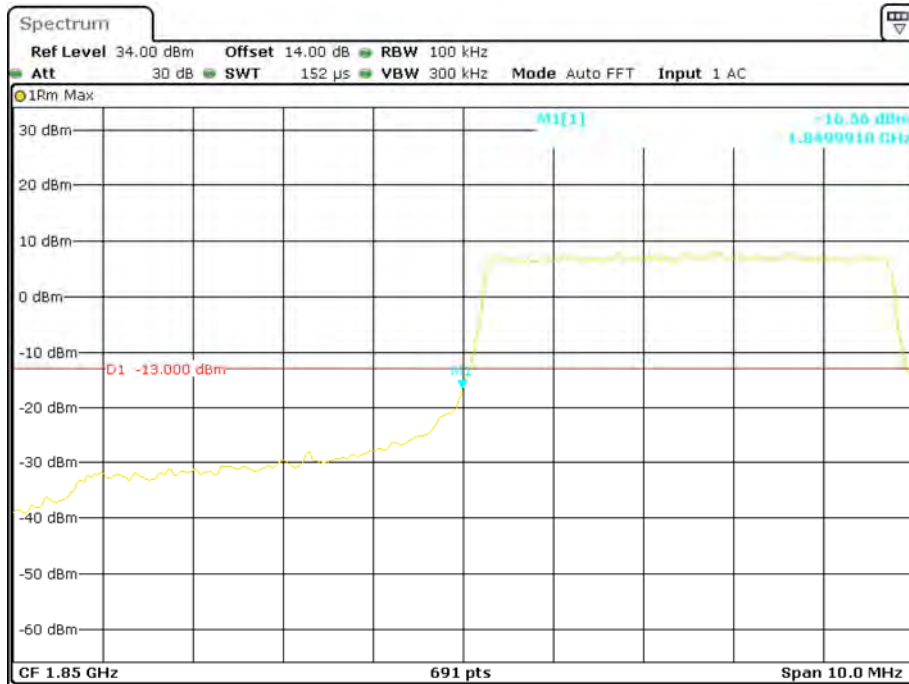
Date: 15.JAN.2018 14:01:47

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



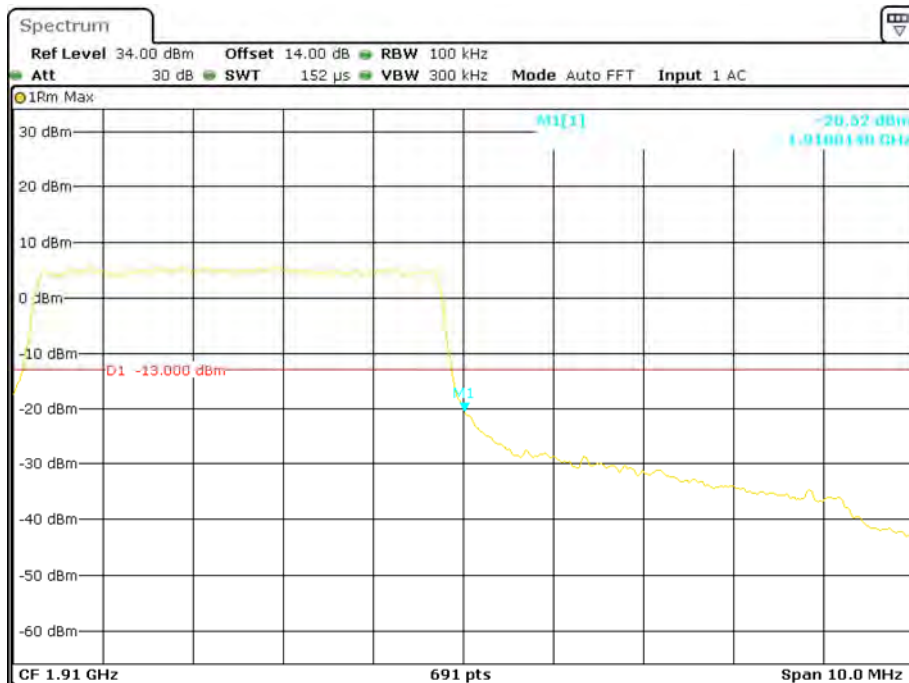
Date: 15.JAN.2018 14:03:07

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



Date: 15.JAN.2018 14:09:40

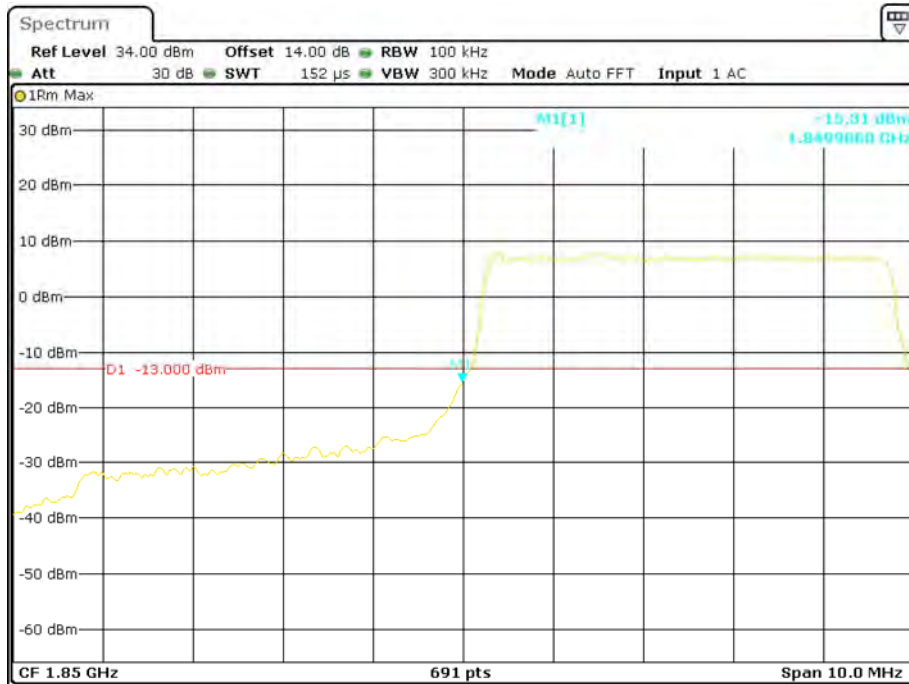
### QPSK (5.0 MHz, FULL RB) - Right Band Edge



Date: 15.JAN.2018 14:10:51

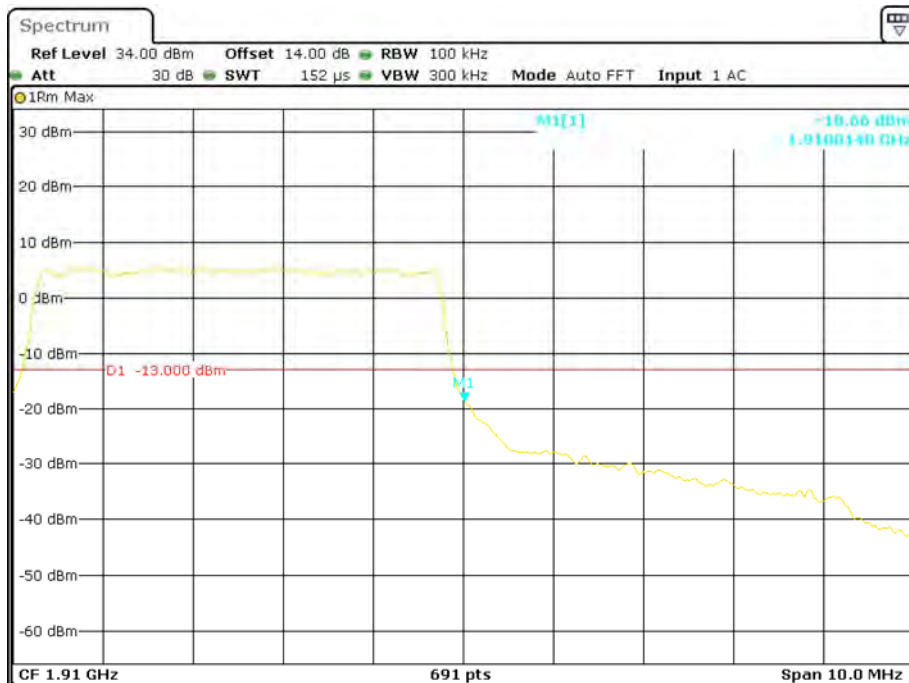


### 16-QAM (5.0 MHz, FULL RB) - Left Band Edge



Date: 15.JAN.2018 14:13:47

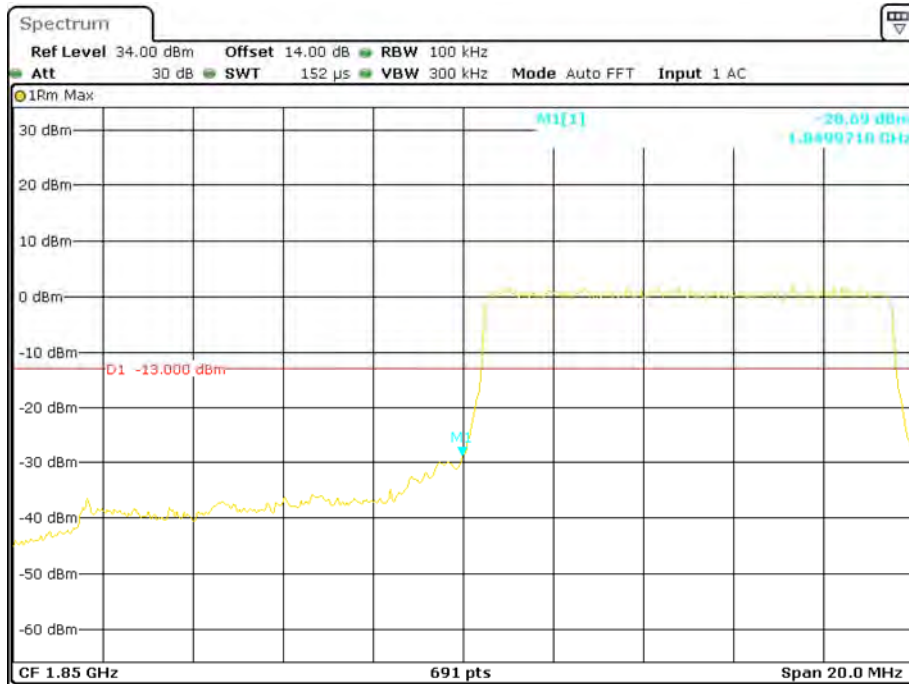
### 16-QAM (5.0 MHz, FULL RB) - Right Band Edge



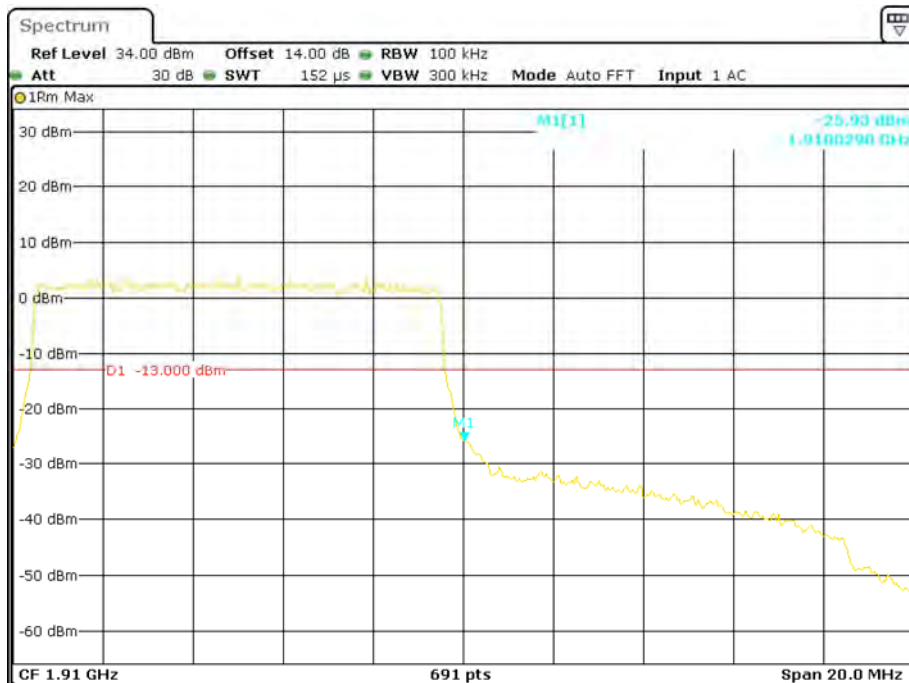
Date: 15.JAN.2018 14:11:21



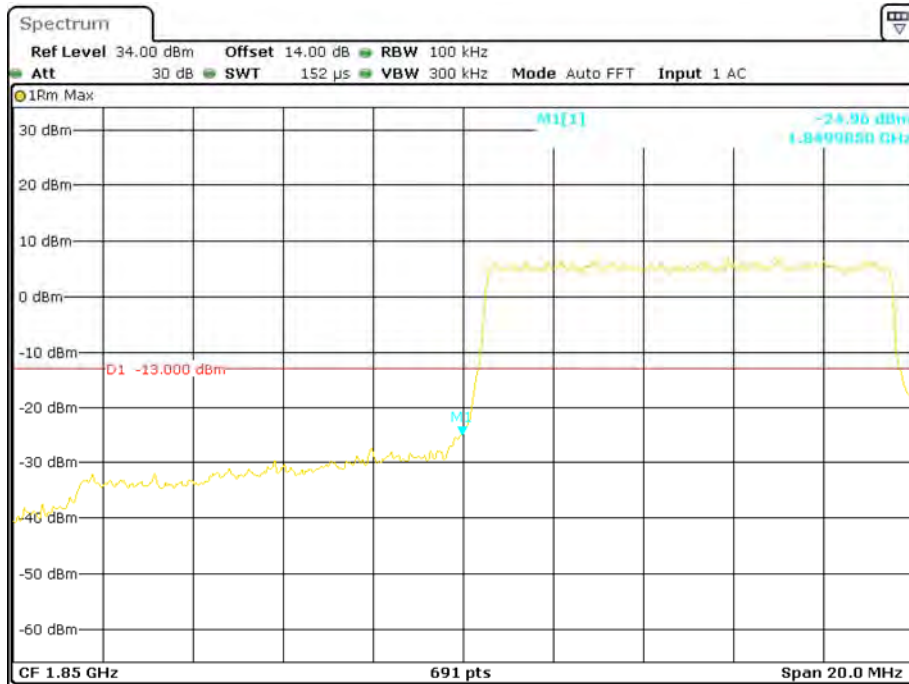
### QPSK (10.0 MHz, FULL RB) - Left Band Edge



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

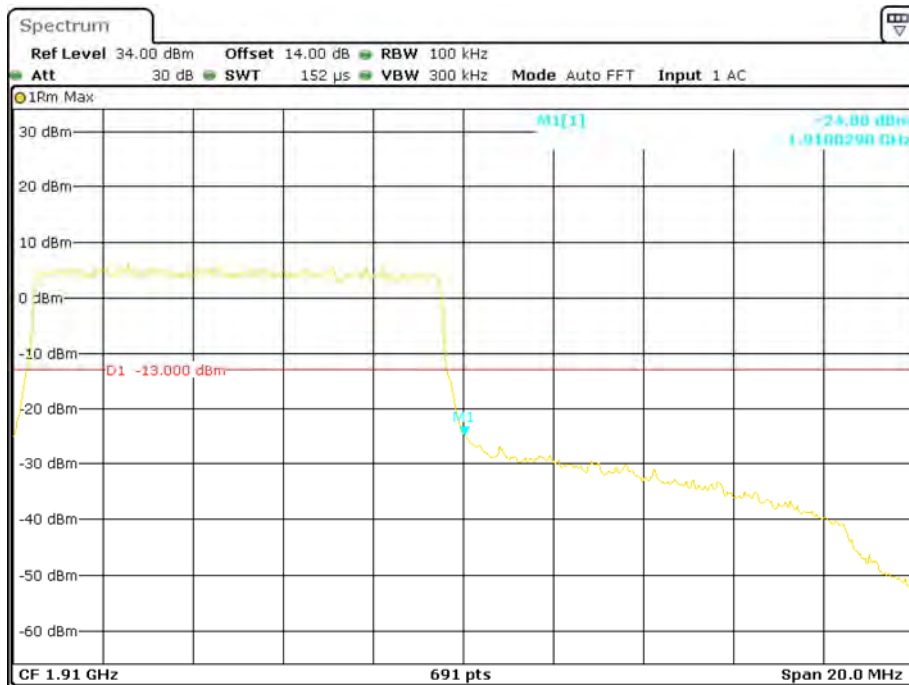


### 16-QAM (10.0 MHz, FULL RB) - Left Band Edge



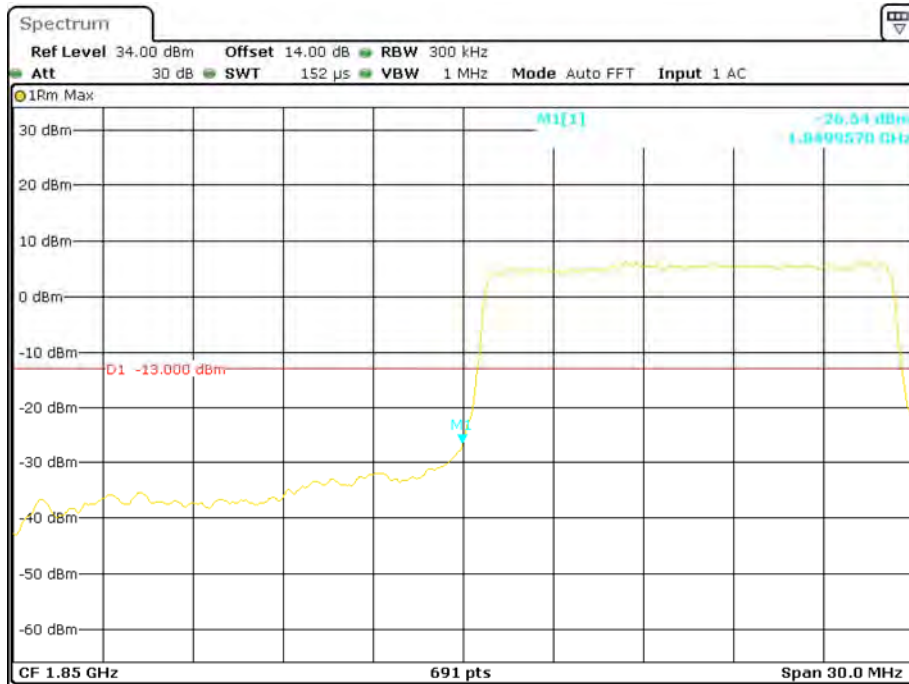
Date: 15.JAN.2018 14:33:59

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



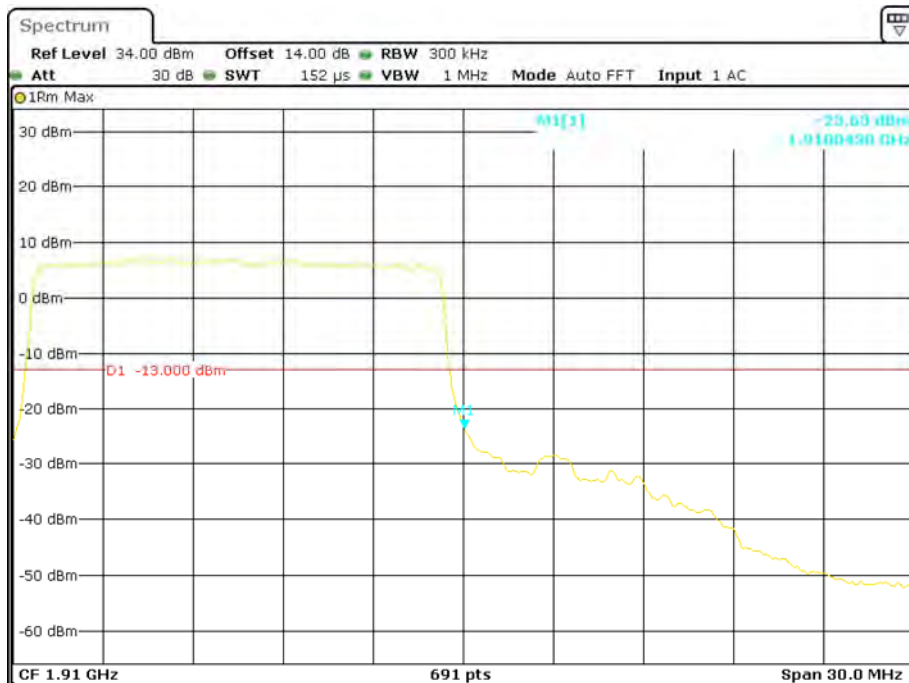
Date: 15.JAN.2018 14:35:07

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



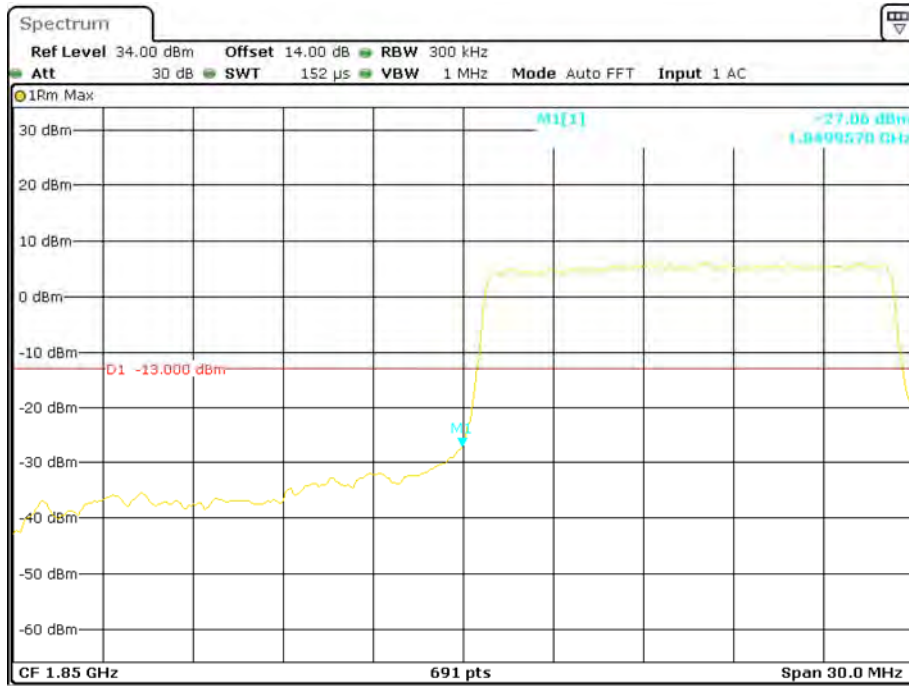
Date: 15.JAN.2018 14:41:23

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



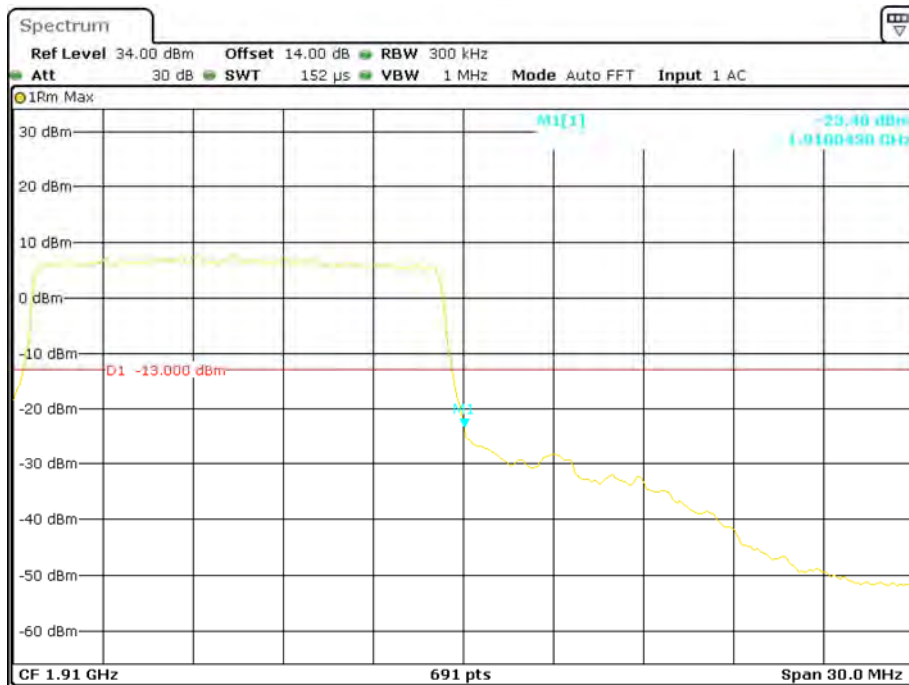
Date: 15.JAN.2018 14:43:04

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



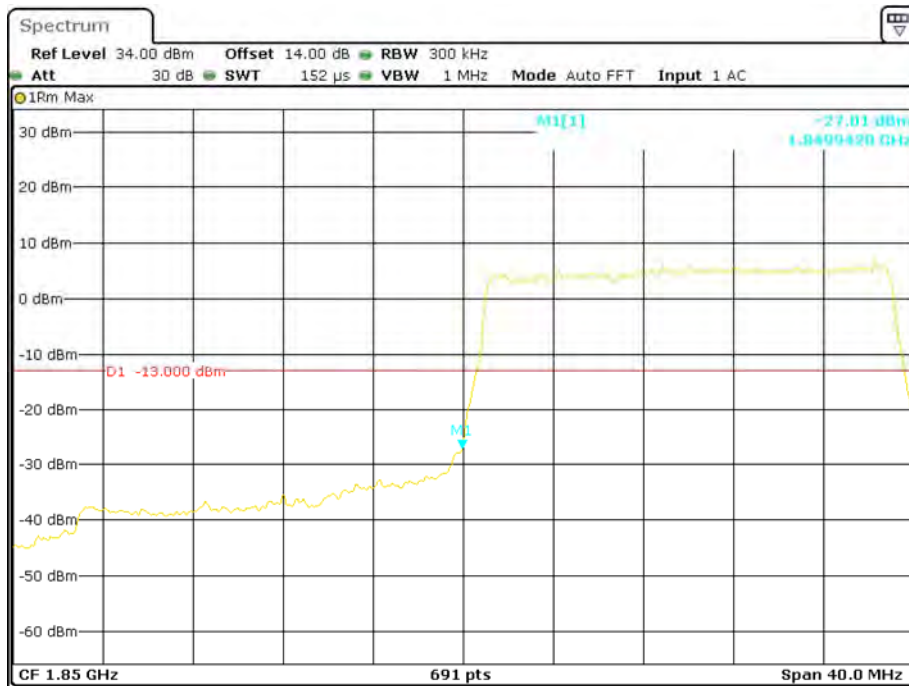
Date: 15.JAN.2018 14:40:41

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



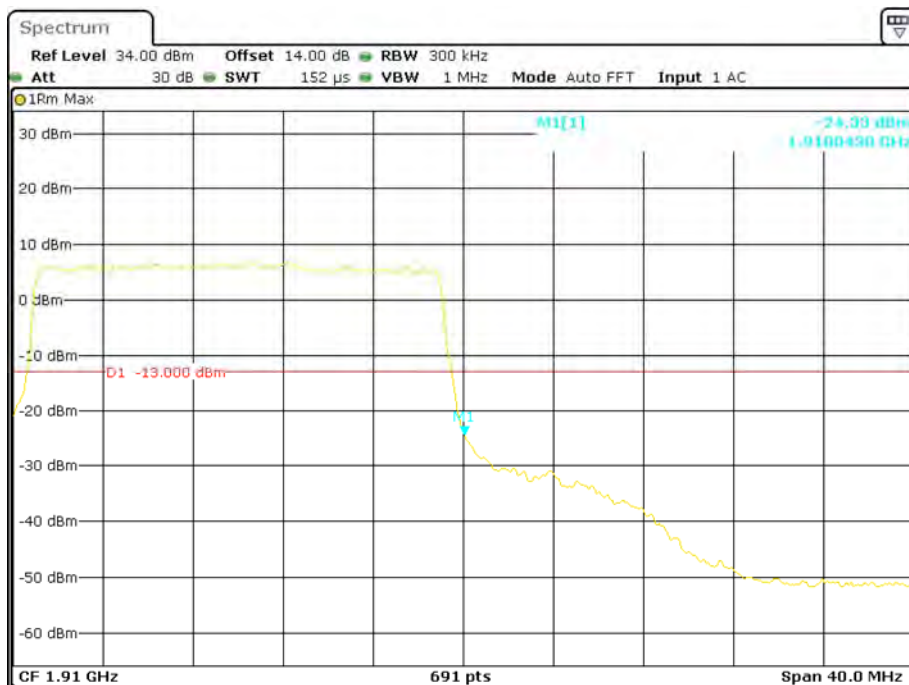
Date: 15.JAN.2018 14:39:47

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



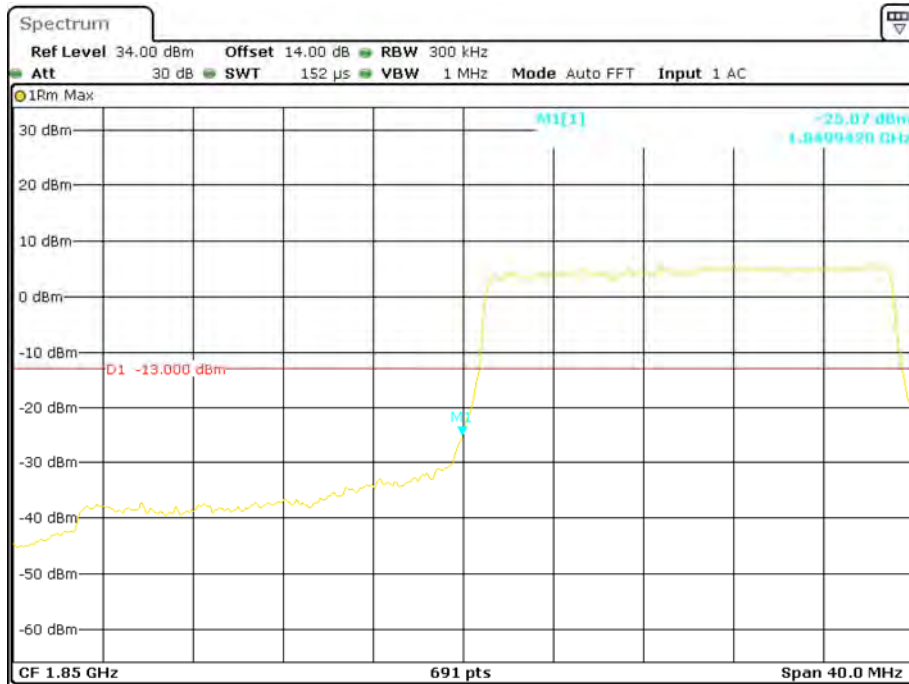
Date: 15.JAN.2018 14:45:59

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



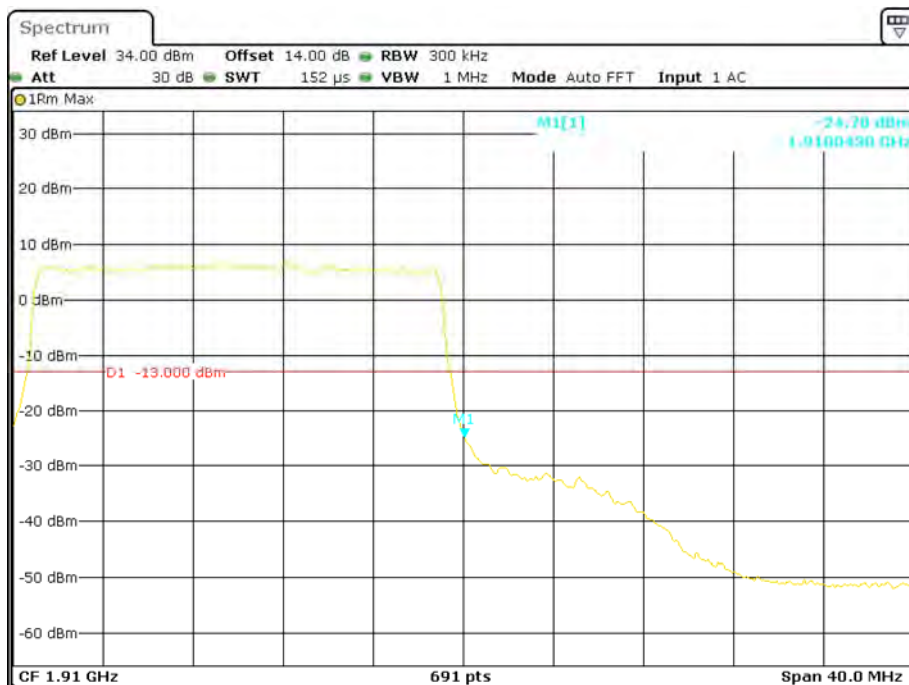
Date: 15.JAN.2018 14:44:11

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



Date: 15.JAN.2018 14:45:28

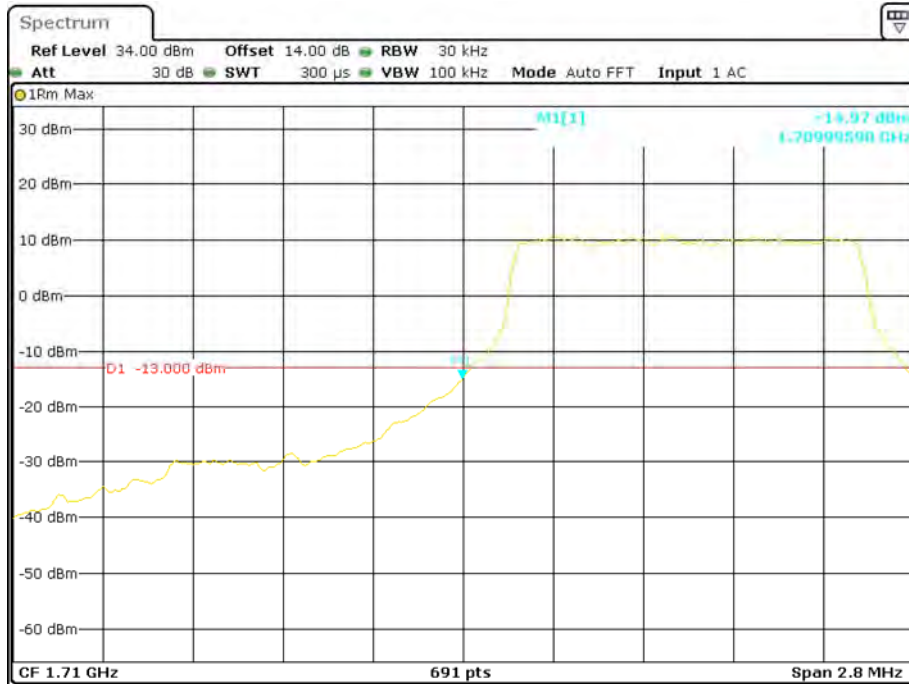
### 16-QAM (20.0 MHz, FULL RB) - Right Band Edge



Date: 15.JAN.2018 14:44:46

**LTE Band 4:**

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



Date: 15.JAN.2018 14:55:42

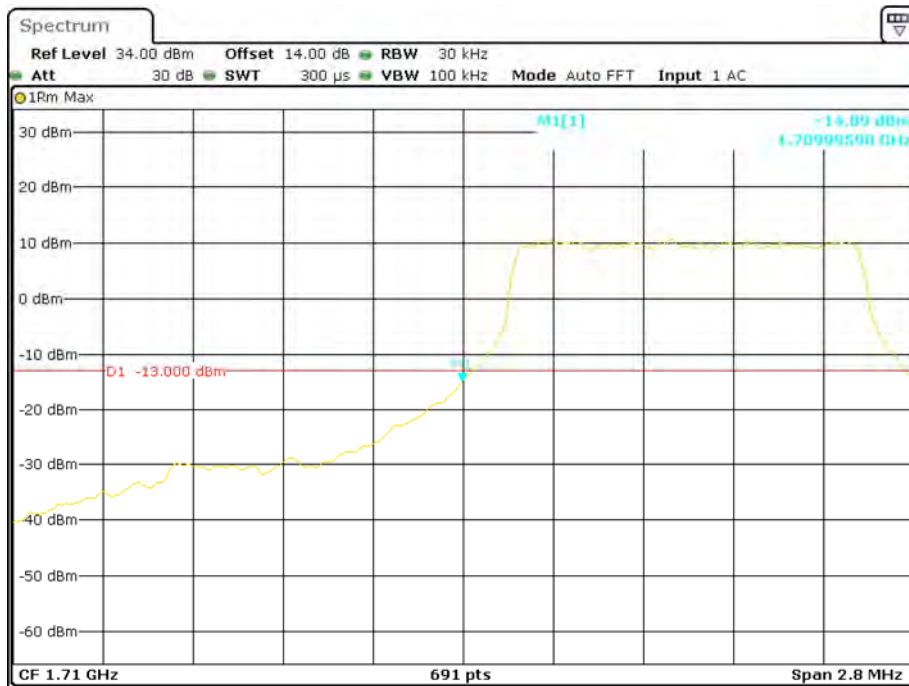
**QPSK (1.4 MHz, FULL RB) - Right Band Edge**



Date: 16.JAN.2018 09:32:51

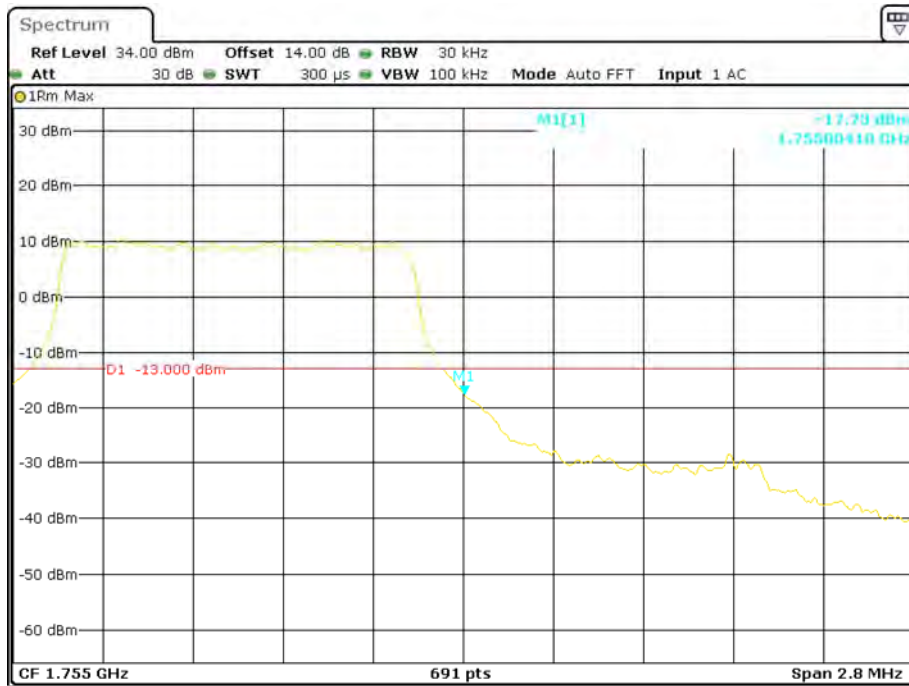


### 16-QAM (1.4 MHz, FULL RB) - Left Band Edge



Date: 15.JAN.2018 14:55:00

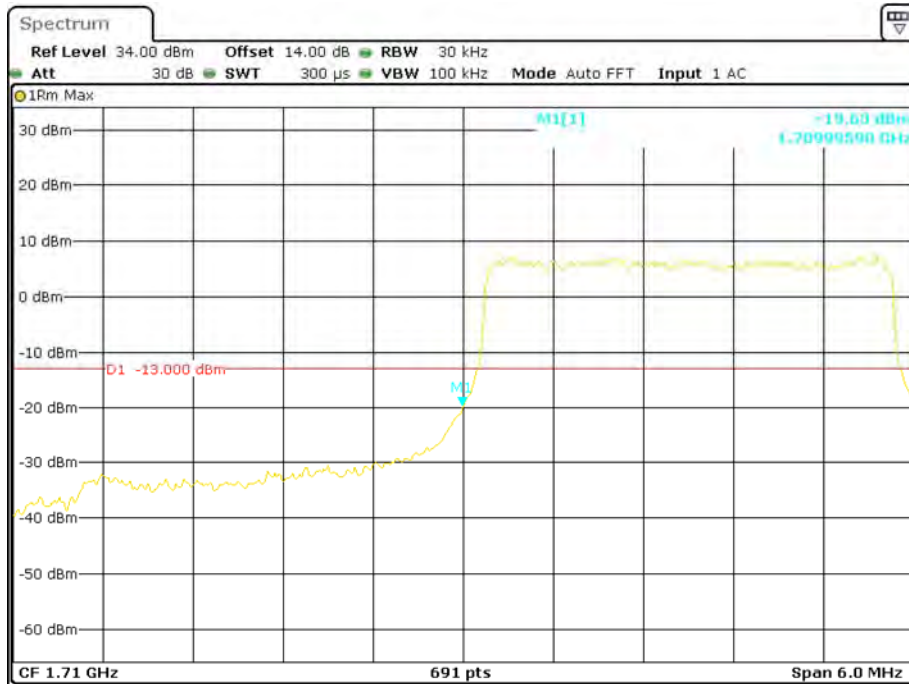
### 16-QAM (1.4 MHz, FULL RB) - Right Band Edge



Date: 15.JAN.2018 14:54:13

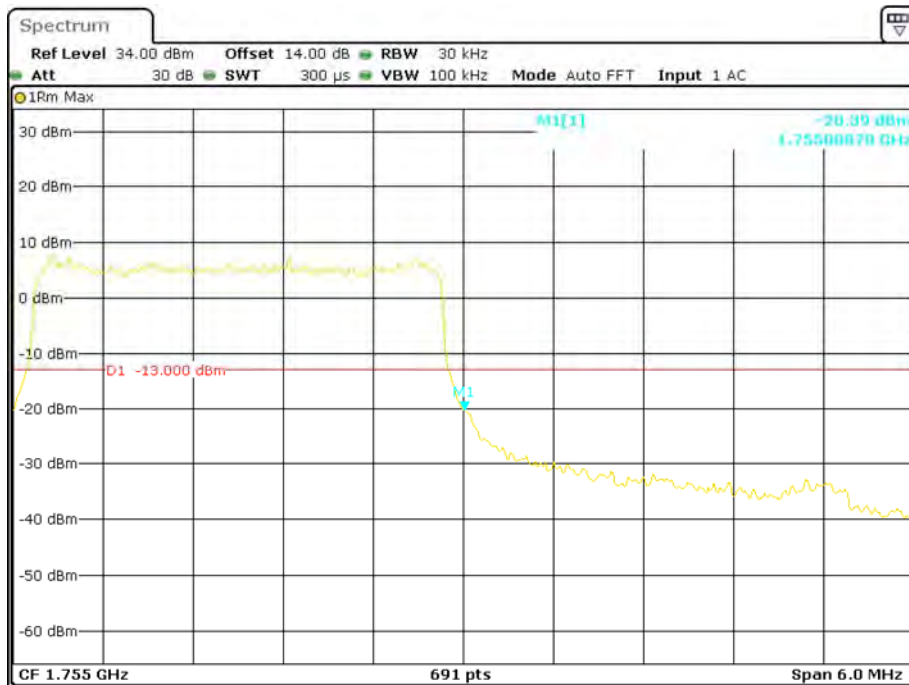


### QPSK (3.0 MHz, FULL RB) - Left Band Edge



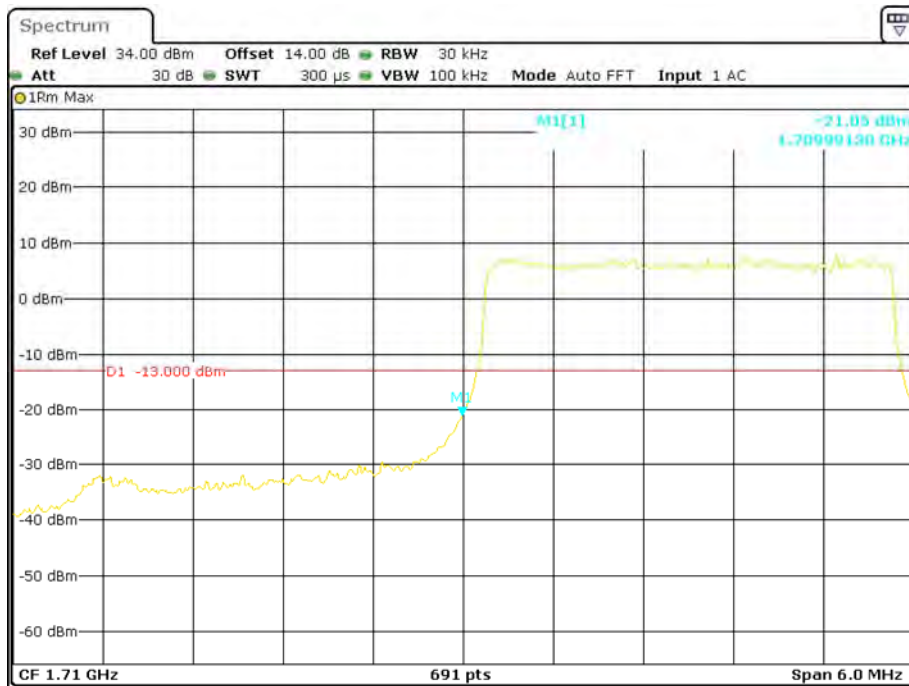
Date: 15.JAN.2018 14:57:40

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



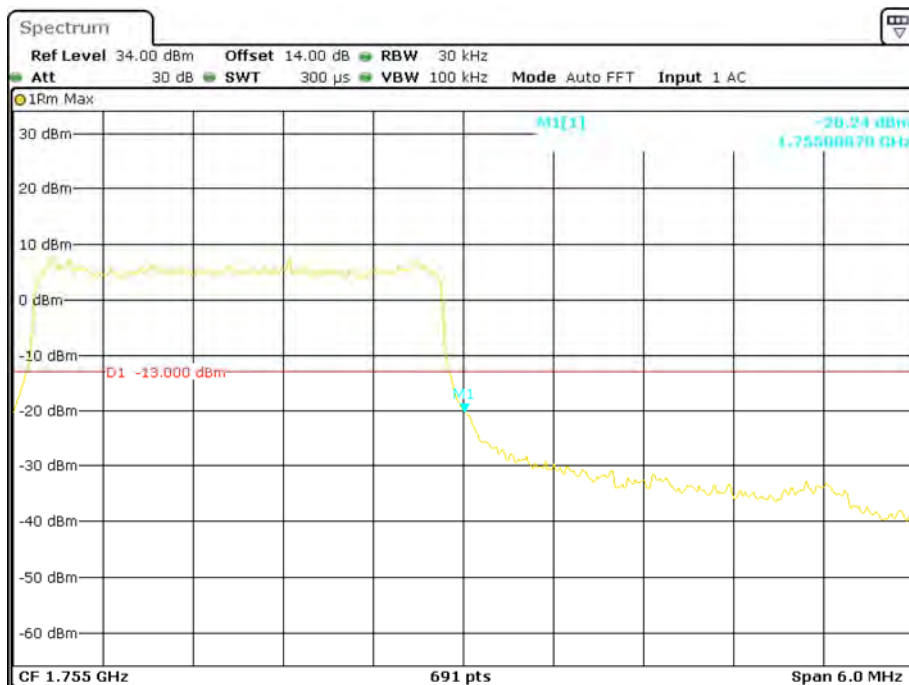
Date: 15.JAN.2018 14:58:48

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



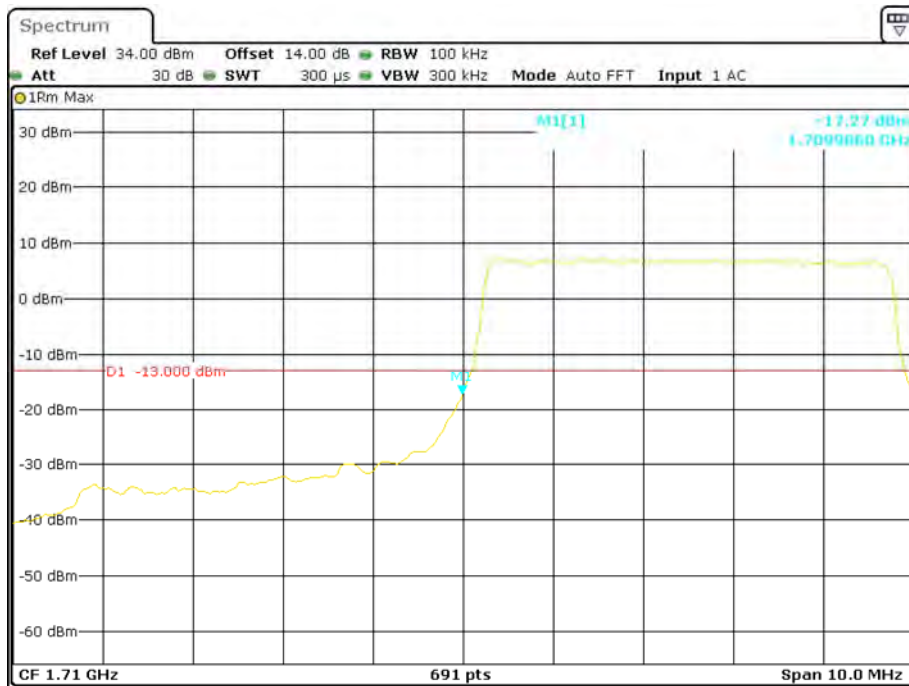
Date: 15.JAN.2018 15:05:06

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



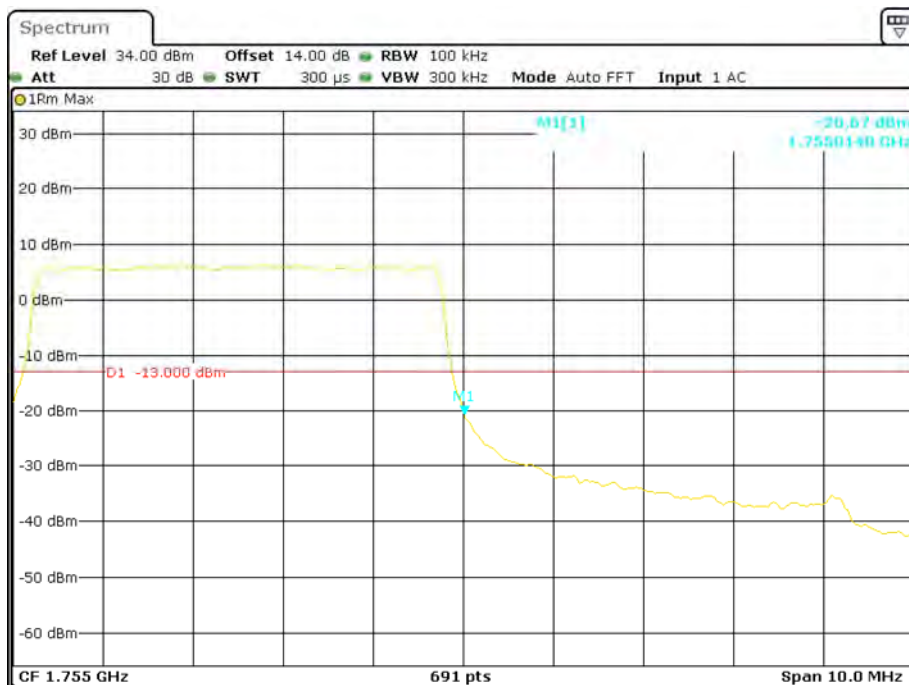
Date: 15.JAN.2018 14:59:19

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



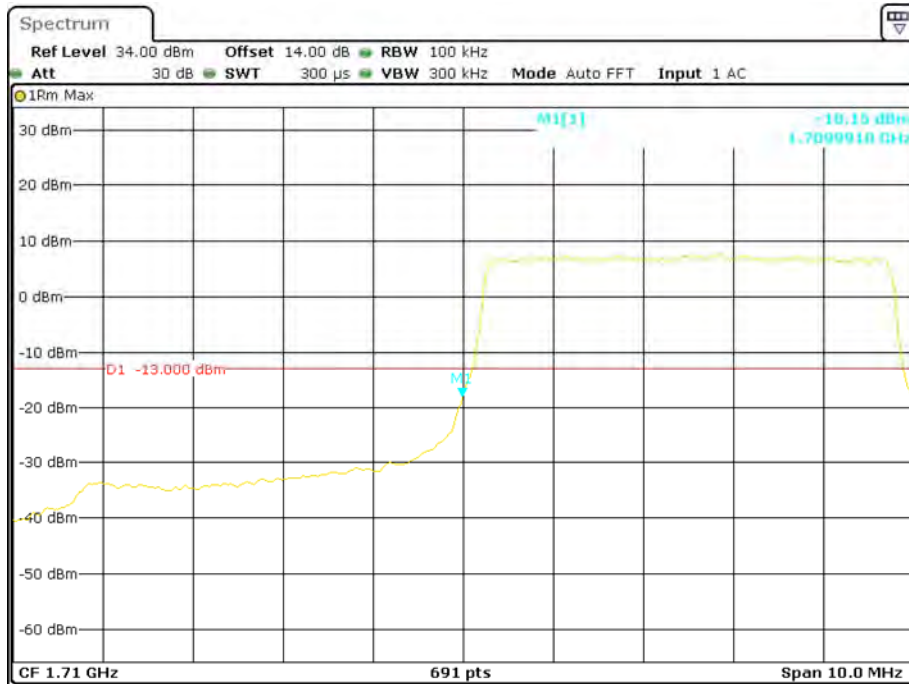
Date: 15.JAN.2018 15:13:30

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



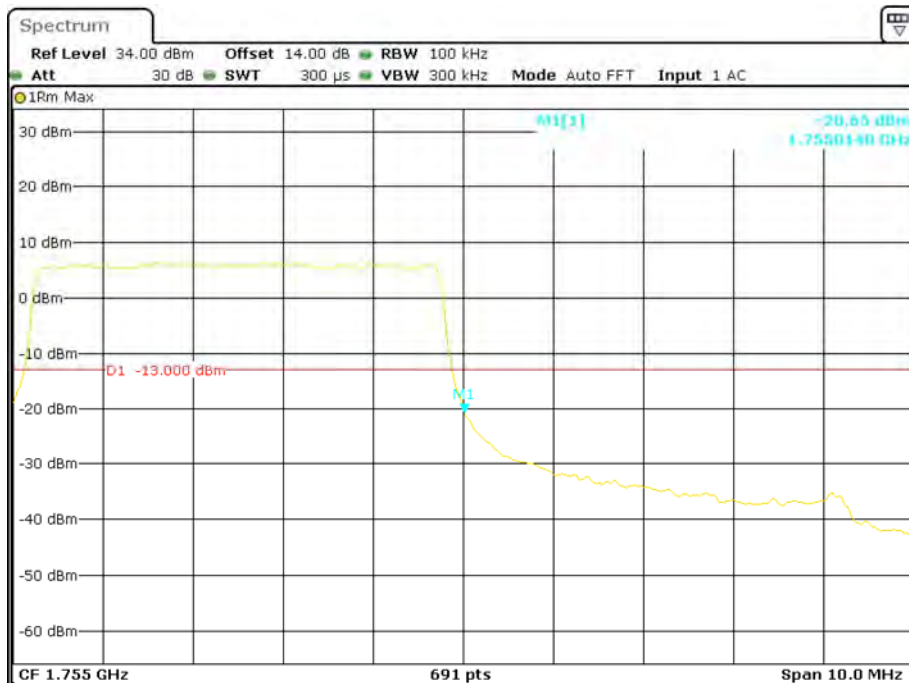
Date: 15.JAN.2018 15:12:32

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



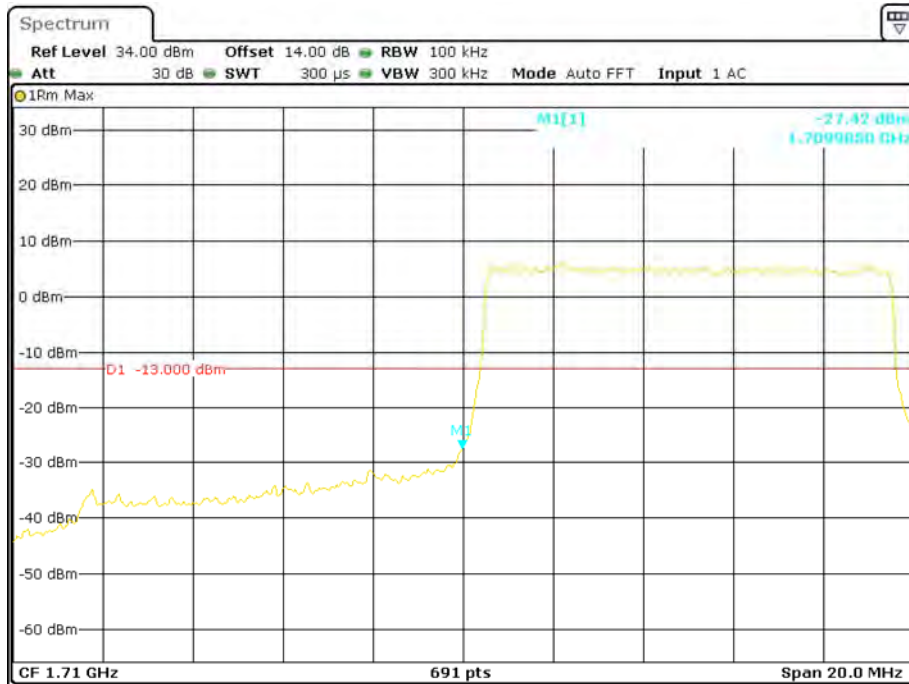
Date: 15.JAN.2018 15:10:37

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



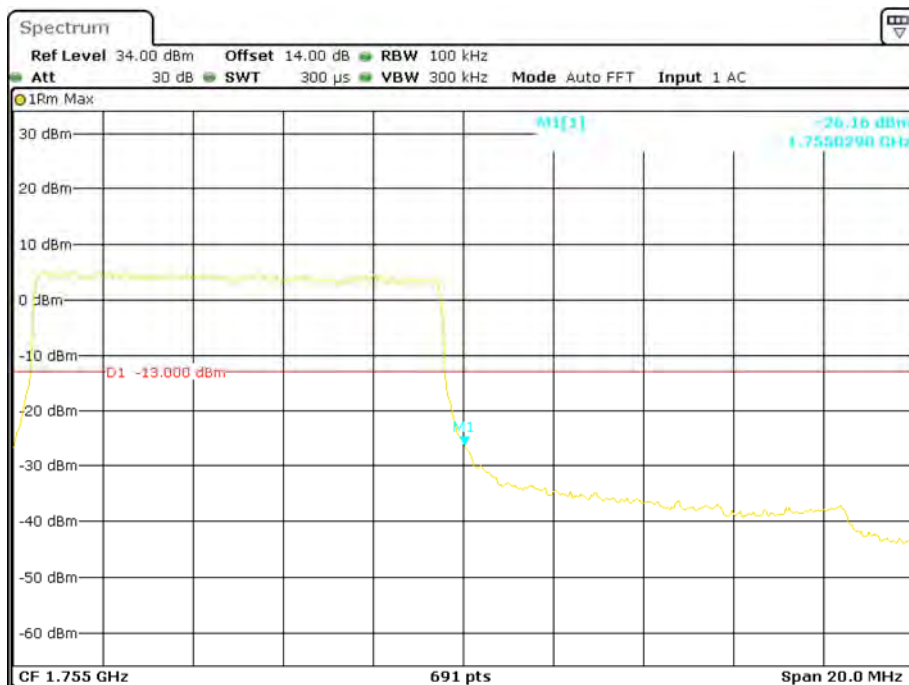
Date: 15.JAN.2018 15:11:27

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



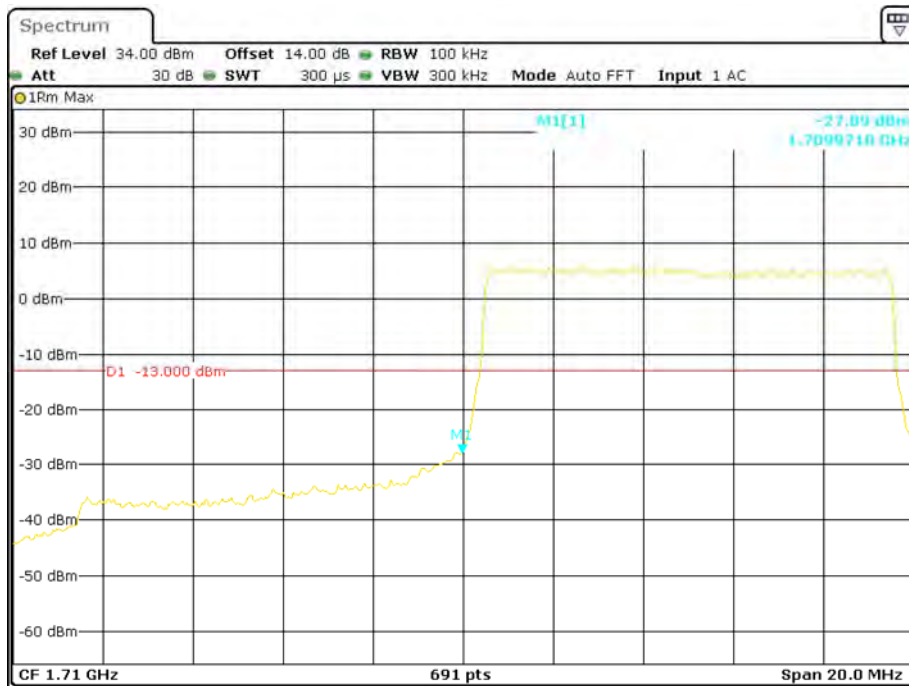
Date: 15.JAN.2018 15:16:41

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



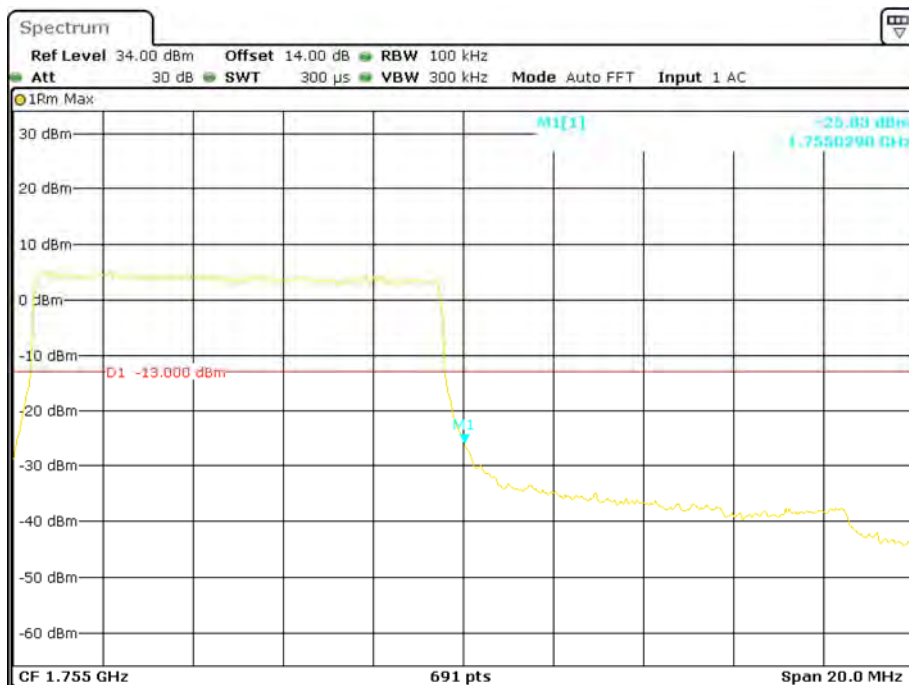
Date: 15.JAN.2018 15:18:06

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



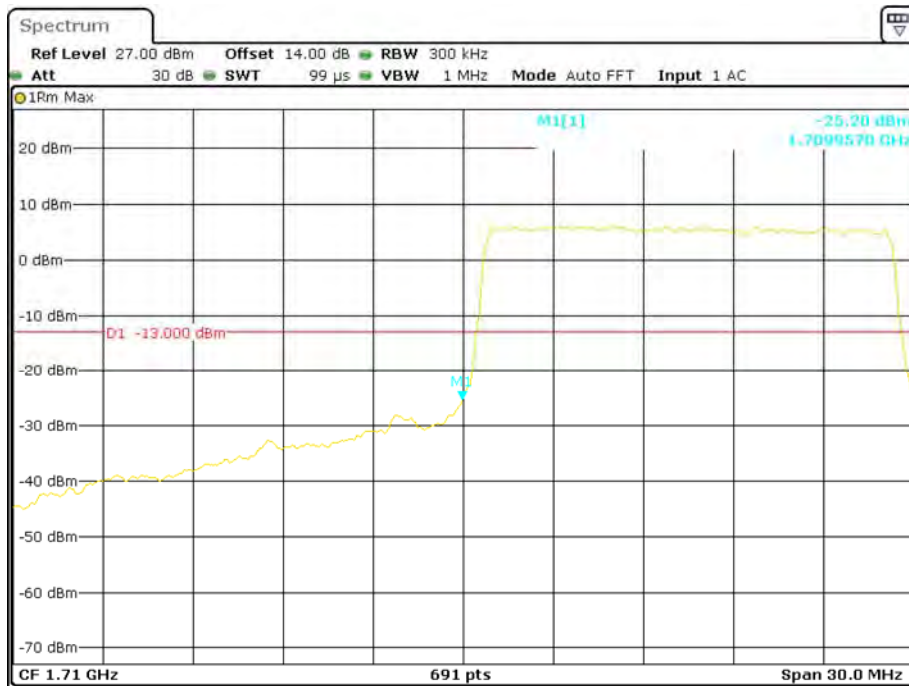
Date: 15.JAN.2018 15:19:48

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



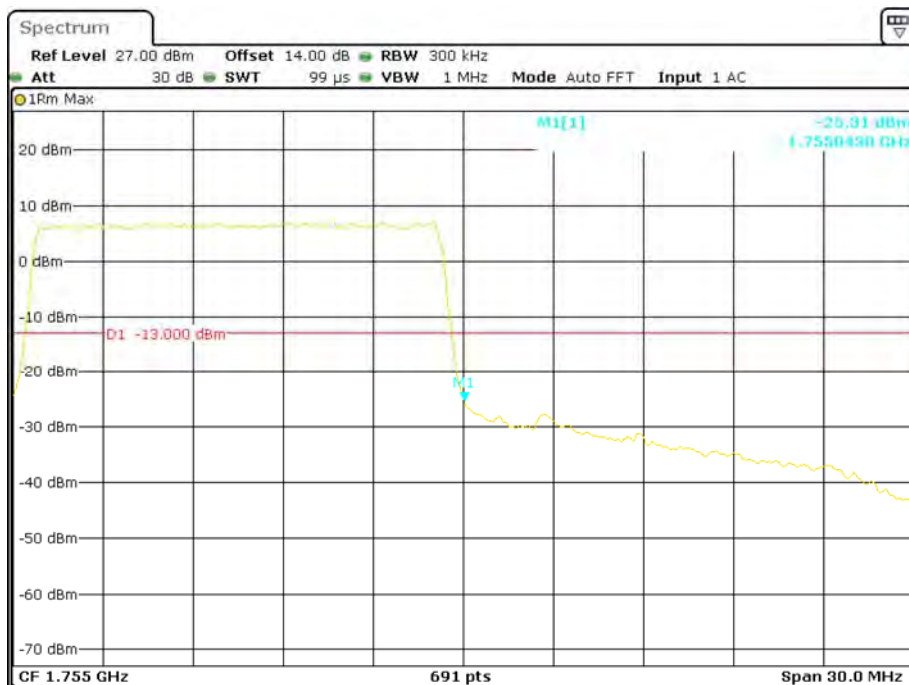
Date: 15.JAN.2018 15:18:38

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



Date: 16.JAN.2018 09:26:25

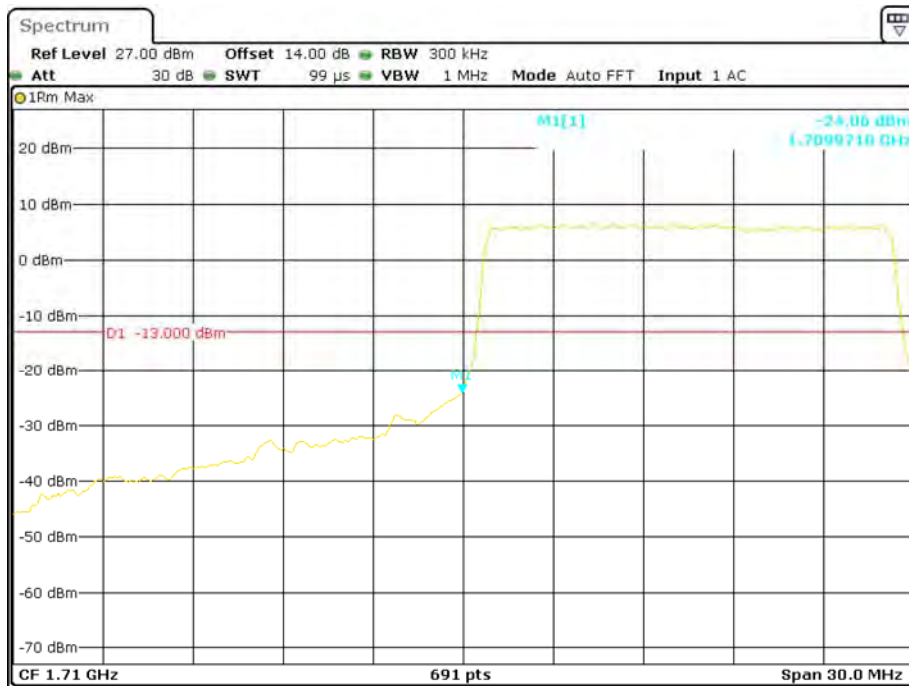
### QPSK (15.0 MHz, FULL RB) - Right Band Edge



Date: 16.JAN.2018 09:24:00

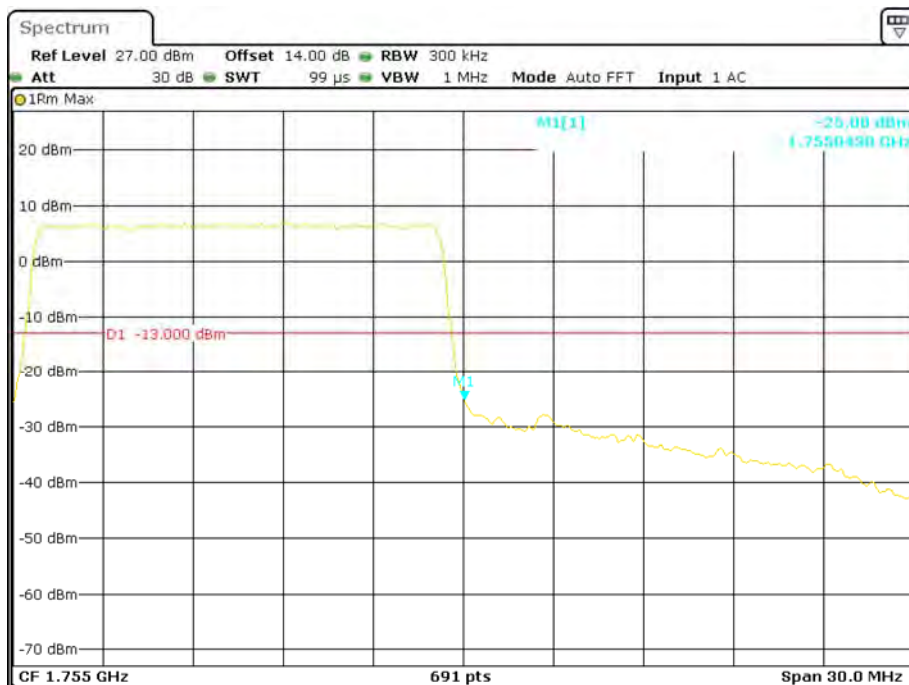


### 16-QAM (15.0 MHz, FULL RB) - Left Band Edge



Date: 16.JAN.2018 09:21:27

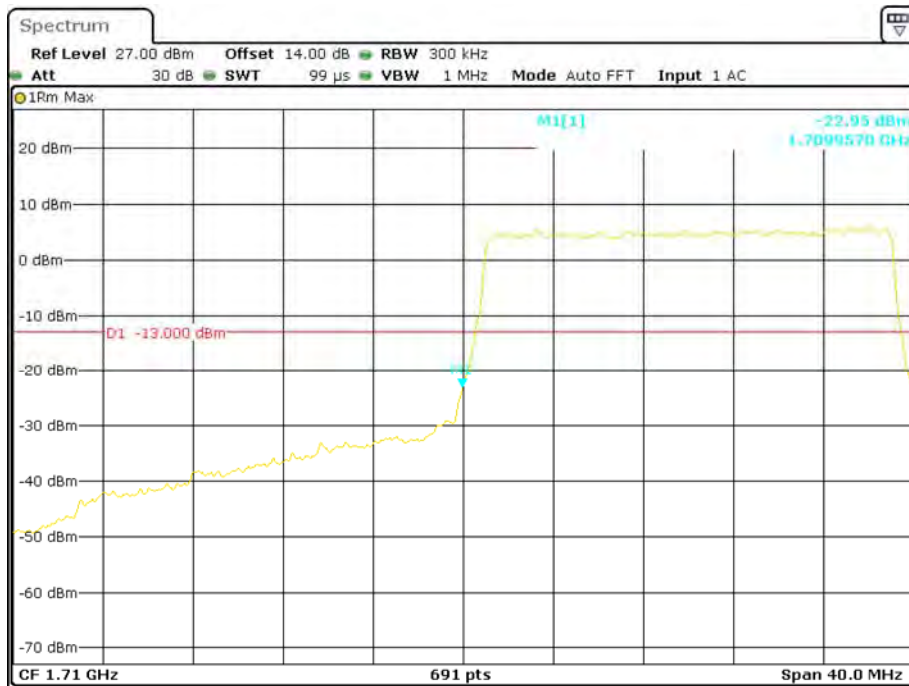
### 16-QAM (15.0 MHz, FULL RB) - Right Band Edge



Date: 16.JAN.2018 09:22:51

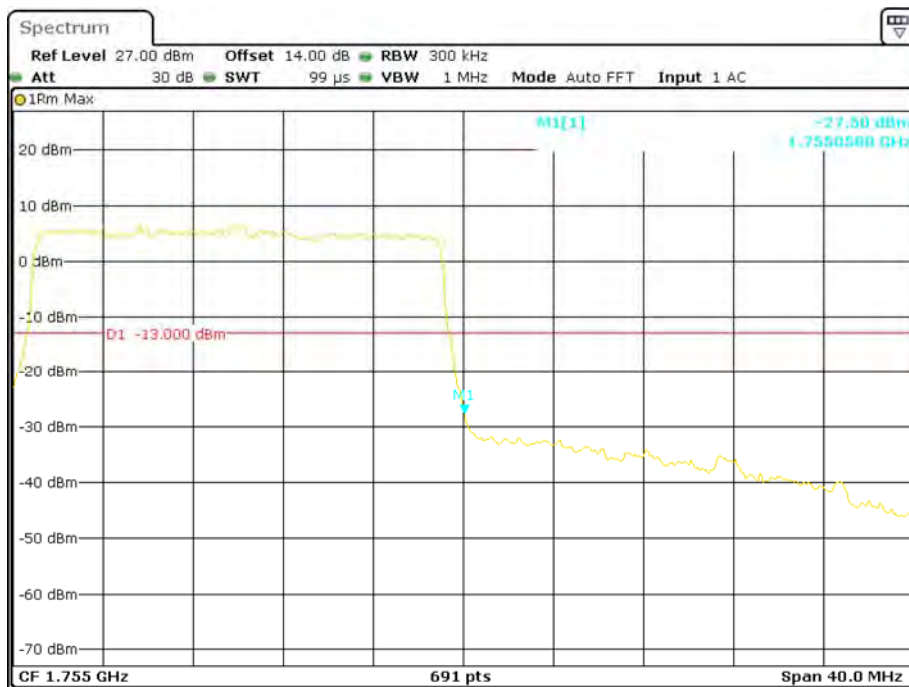


### QPSK (20.0 MHz, FULL RB) - Left Band Edge



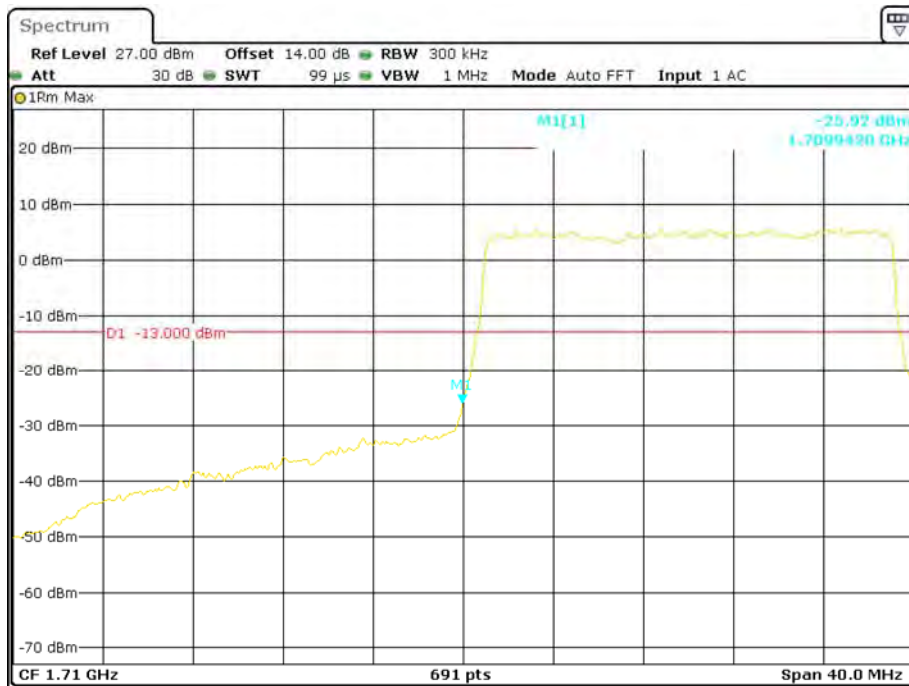
Date: 16.JAN.2018 09:27:29

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



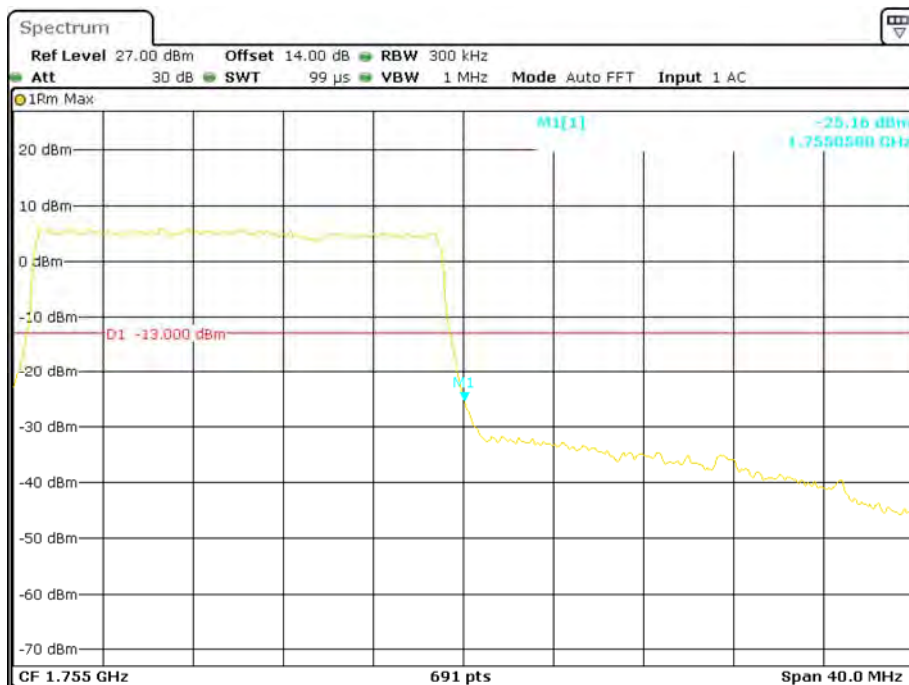
Date: 16.JAN.2018 09:28:13

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



Date: 16.JAN.2018 09:29:20

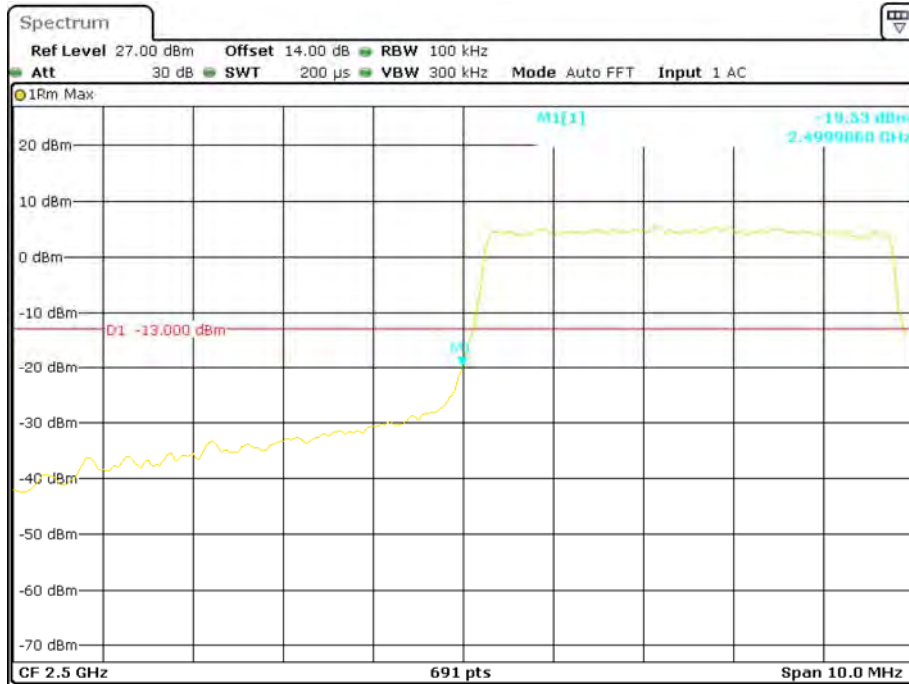
### 16-QAM (20.0 MHz, FULL RB) - Right Band Edge



Date: 16.JAN.2018 09:28:40

**LTE Band 7:**

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



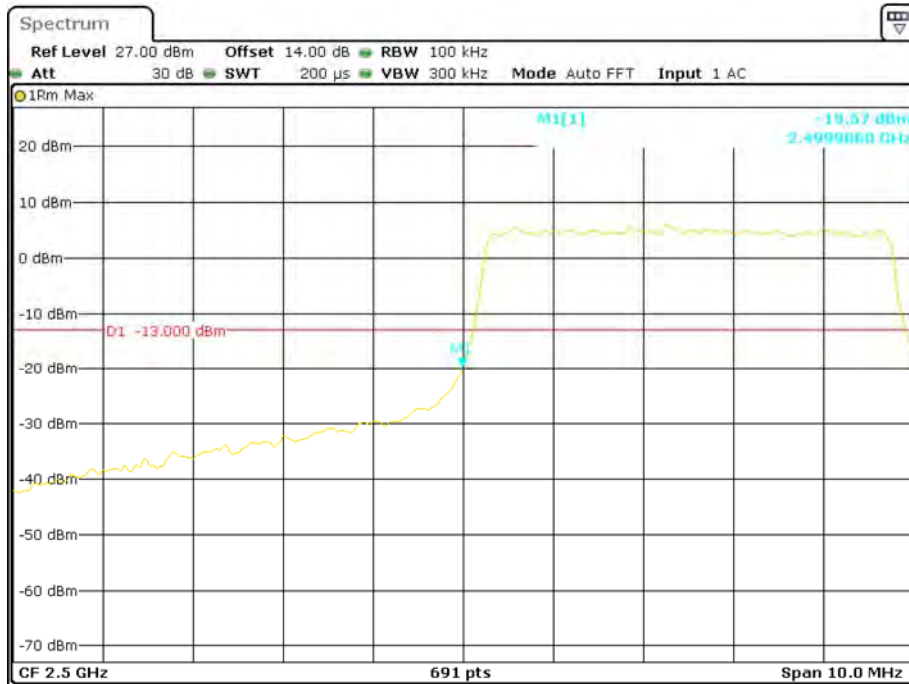
Date: 16.JAN.2018 09:14:10

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



Date: 16.JAN.2018 09:13:25

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



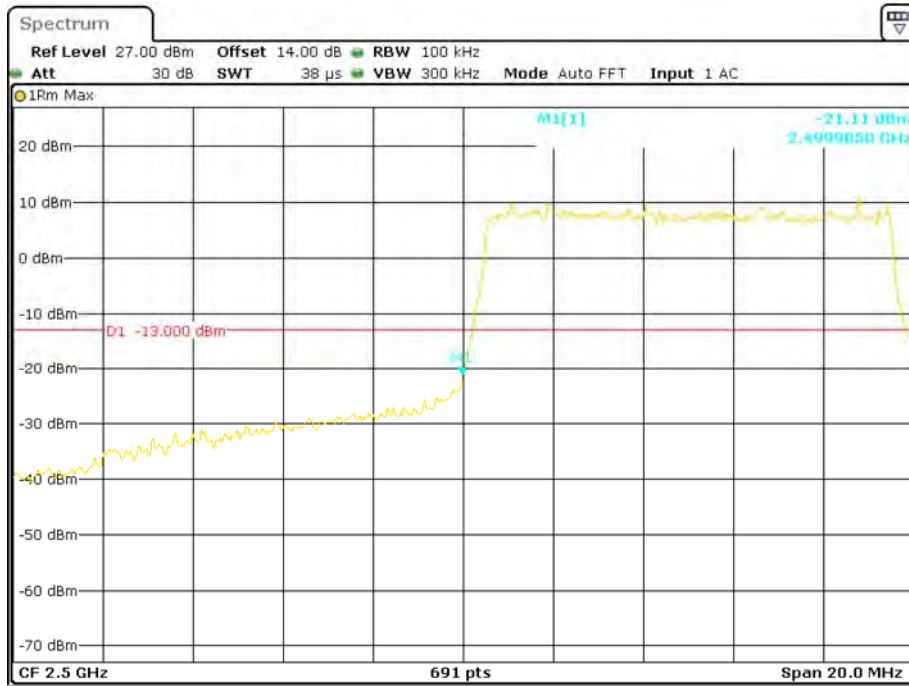
Date: 16.JAN.2018 09:11:59

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



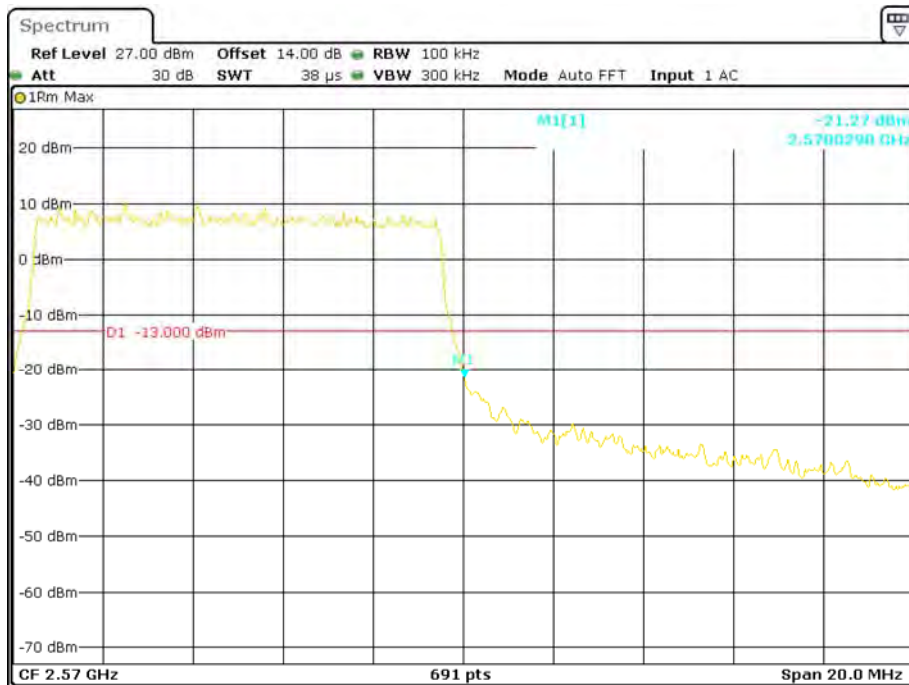
Date: 16.JAN.2018 09:12:57

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



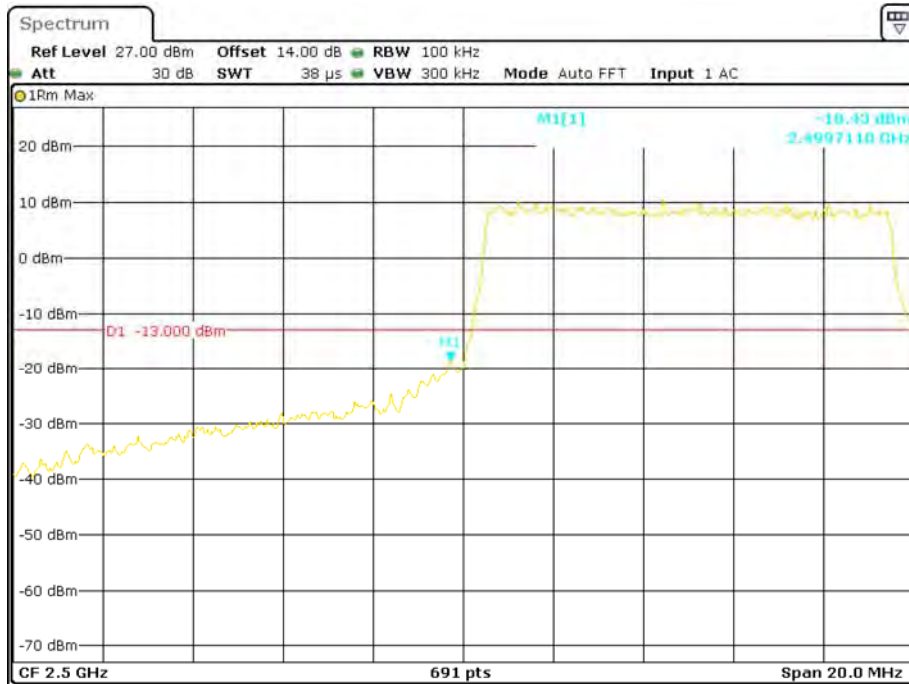
Date: 16.JAN.2018 09:16:06

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



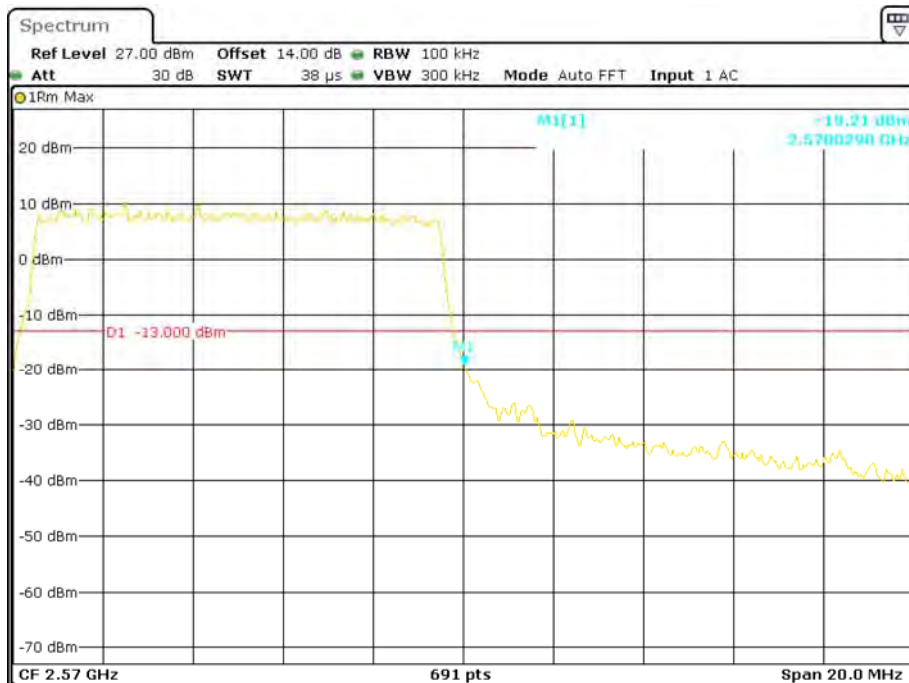
Date: 16.JAN.2018 09:16:47

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



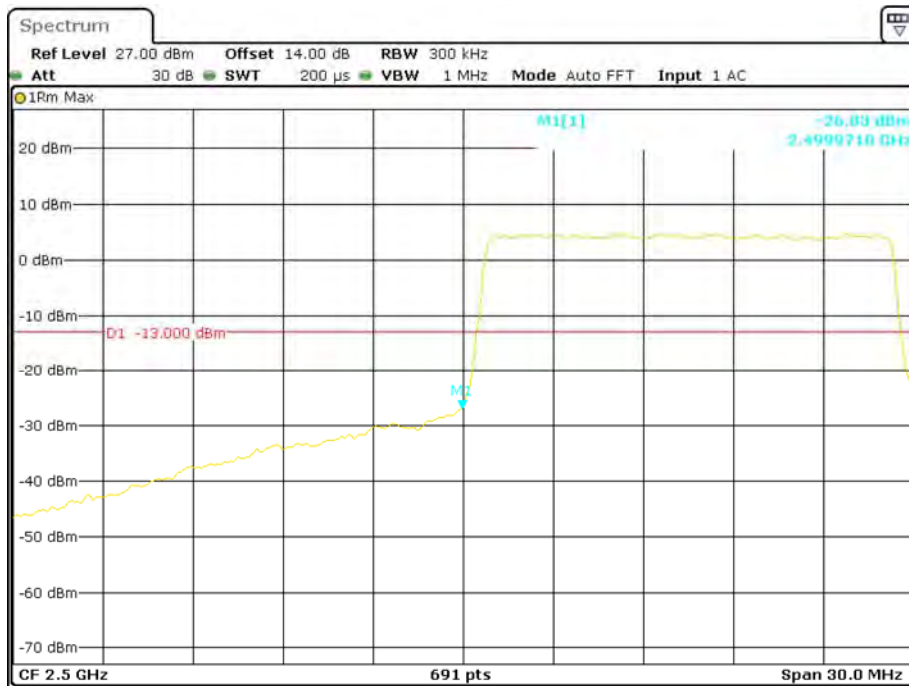
Date: 16.JAN.2018 09:18:51

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



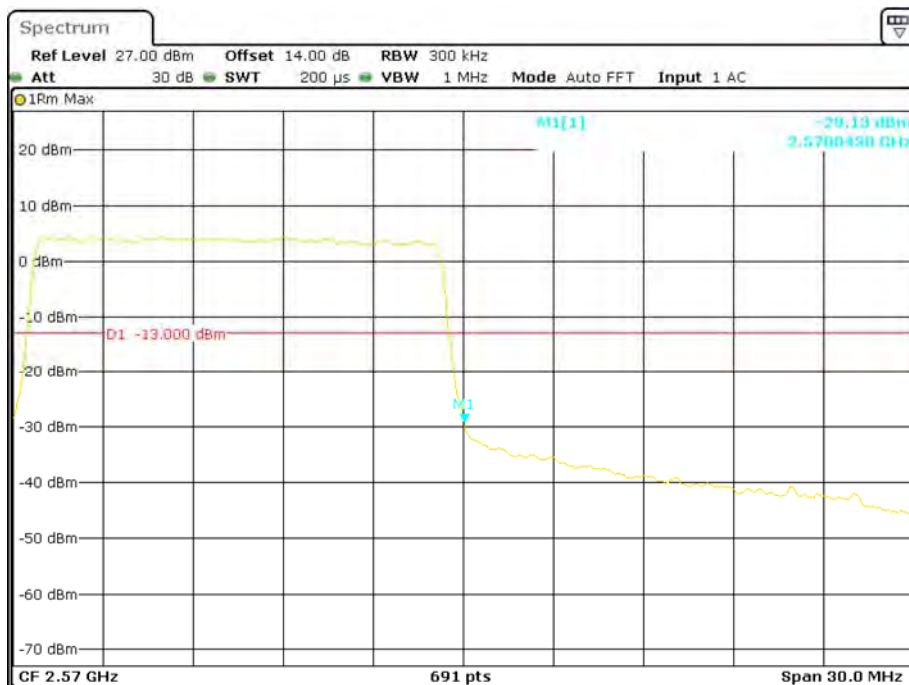
Date: 16.JAN.2018 09:17:19

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



Date: 16.JAN.2018 09:02:16

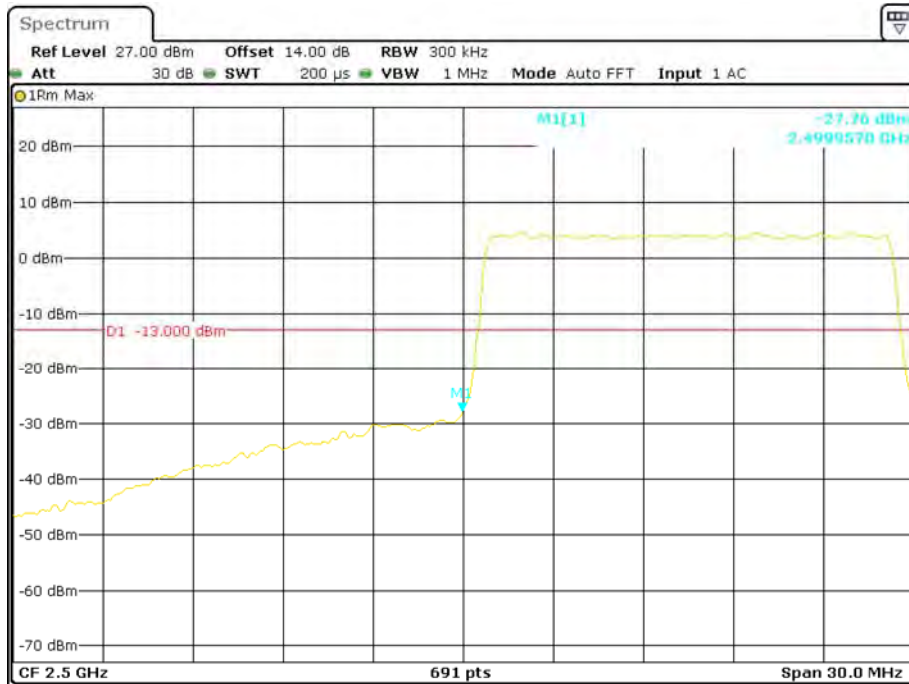
### QPSK (15.0 MHz, FULL RB) - Right Band Edge



Date: 16.JAN.2018 09:02:56

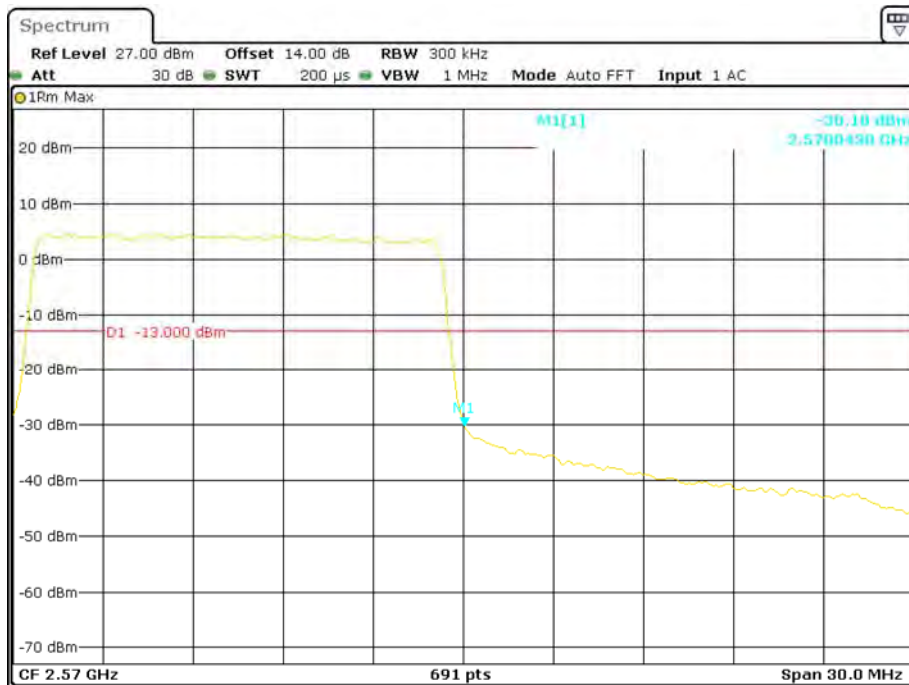


### 16-QAM (15.0 MHz, FULL RB) - Left Band Edge



Date: 16.JAN.2018 09:04:11

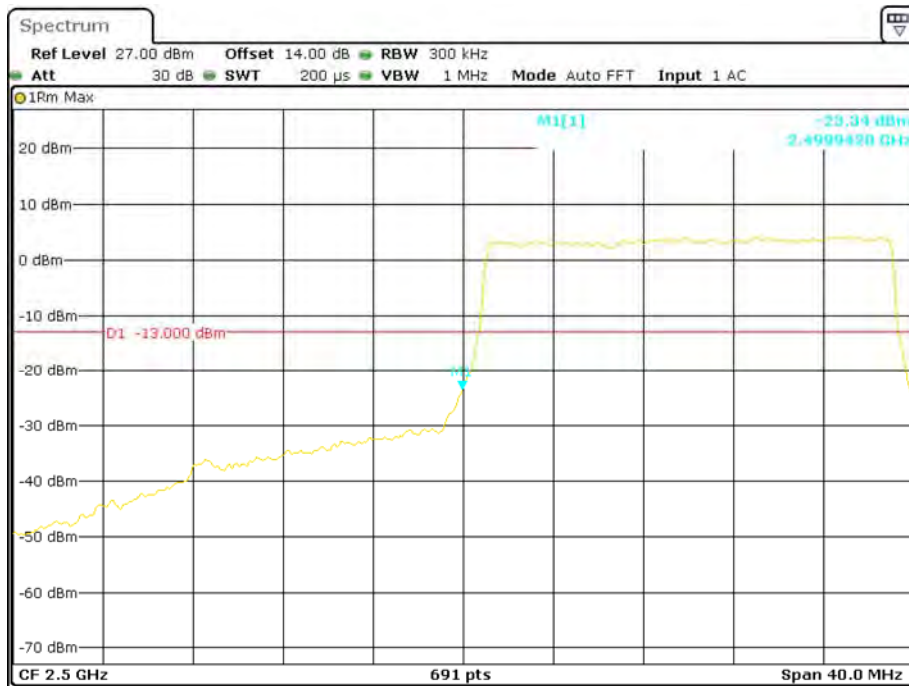
### 16-QAM (15.0 MHz, FULL RB) - Right Band Edge



Date: 16.JAN.2018 09:03:25

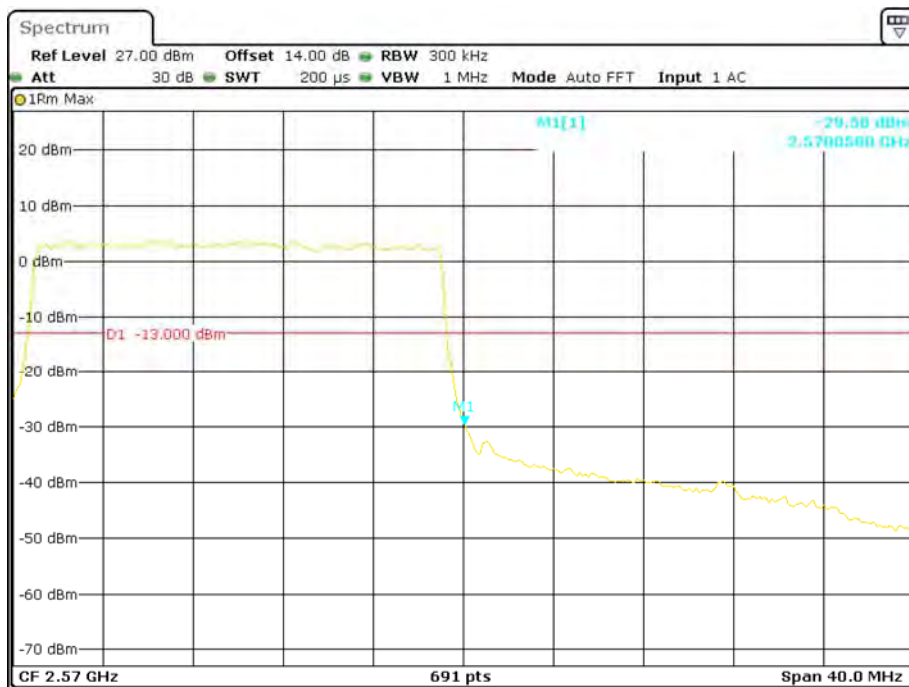


### QPSK (20.0 MHz, FULL RB) - Left Band Edge



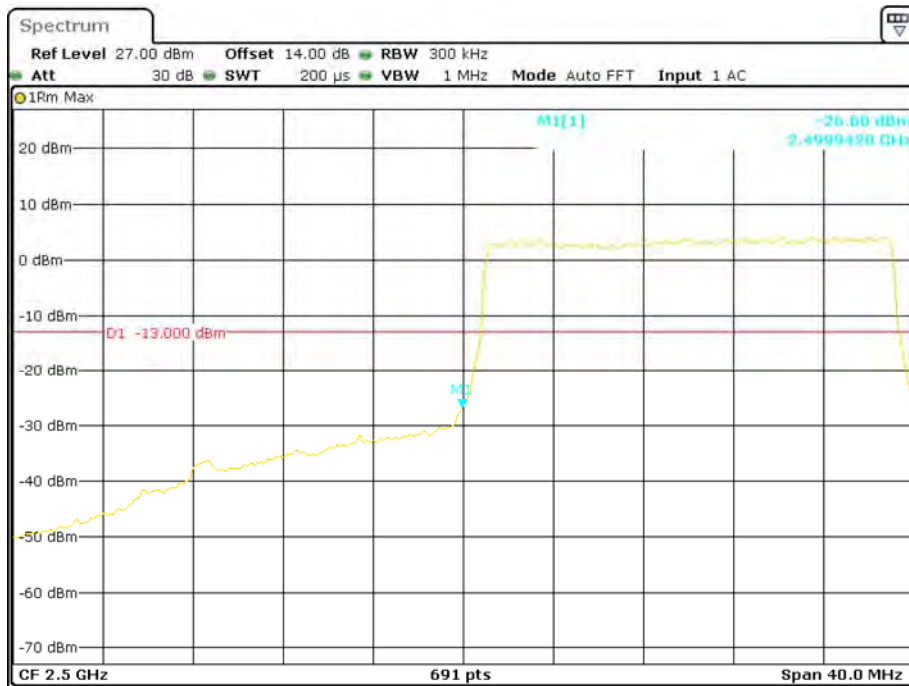
Date: 16.JAN.2018 09:08:41

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



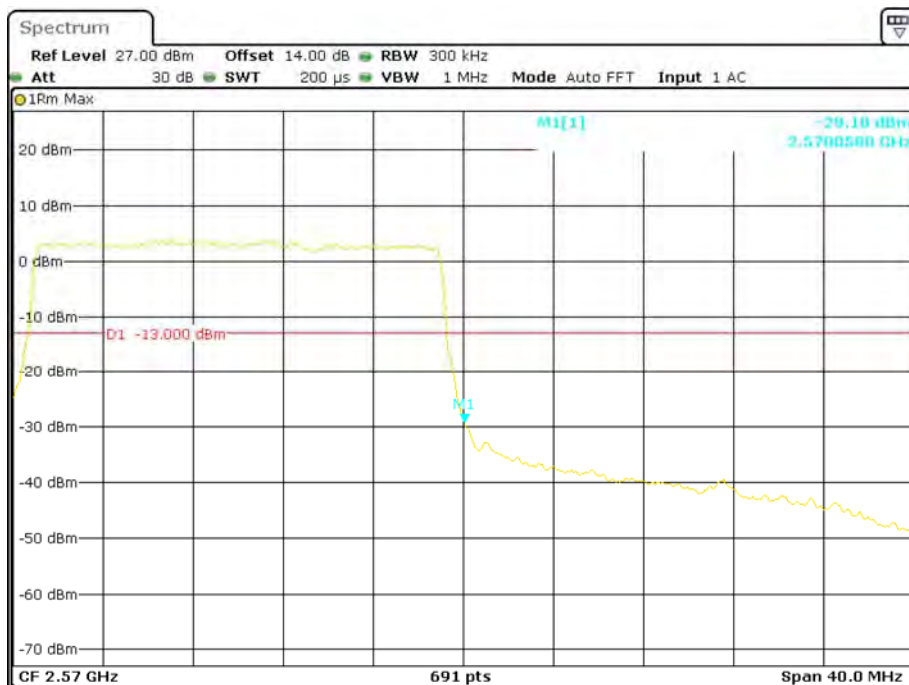
Date: 16.JAN.2018 09:09:26

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



Date: 16.JAN.2018 09:10:33

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



Date: 16.JAN.2018 09:09:55

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

**Applicable Standard**

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

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

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

Frequency Tolerance for Transmitters in the Public Mobile Services

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

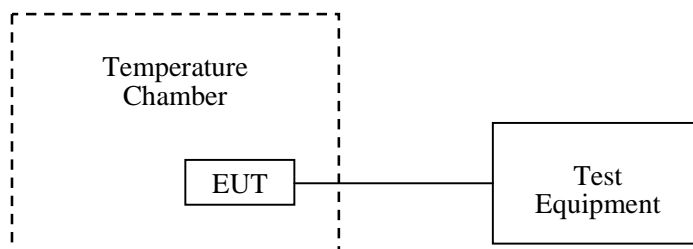
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

**Test Procedure**

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

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

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



**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Rocky Kang on 2018-01-19.*

*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 <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	23	0.02749	2.5
-20		23	0.02749	2.5
-10		22	0.02630	2.5
0		22	0.02630	2.5
10		22	0.02630	2.5
20		21	0.02510	2.5
30		22	0.02630	2.5
40		23	0.02749	2.5
50		25	0.02988	2.5
25		V min.= 3.5	27	0.03227
	V max.= 4.2	29	0.03466	2.5

**WCDMA Mode**

Middle Channel, $f_0 = 836.6\text{MHz}$				
Temperature (°C)	Voltage Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	6	0.00717	2.5
-20		6	0.00717	2.5
-10		5	0.00598	2.5
0		5	0.00598	2.5
10		5	0.00598	2.5
20		4	0.00478	2.5
30		5	0.00598	2.5
40		5	0.00598	2.5
50		6	0.00717	2.5
25		V min.= 3.5	6	0.00717
	V max.= 4.2	7	0.00837	2.5

**PCS Band (Part 24E)**

**GSM Mode**

Middle Channel, $f_0 = 1880.0\text{ MHz}$				
Temperature (°C)	Voltage Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	25	0.01330	pass
-20		25	0.01330	pass
-10		25	0.01330	pass
0		24	0.01277	pass
10		24	0.01277	pass
20		22	0.01170	pass
30		24	0.01277	pass
40		30	0.01596	pass
50		32	0.01702	pass
25		V min.= 3.5	35	0.01862
	V max.= 4.2	37	0.01968	pass

**WCDMA Mode**

<b>Middle Channel, f<sub>0</sub>=1880.0 MHz</b>				
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Result</b>
-30	3.8	6	0.00319	pass
-20		6	0.00319	pass
-10		6	0.00319	pass
0		5	0.00266	pass
10		5	0.00266	pass
20		4	0.00213	pass
30		7	0.00372	pass
40		7	0.00372	pass
50		10	0.00532	pass
25		V min.= 3.5	12	0.00638
	V max.= 4.2	15	0.00798	pass

**LTE:  
QPSK:**

**Band 2:**

<b>10.0 MHz Middle Channel, f<sub>0</sub>=1880 MHz</b>				
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Frequency Error (Hz)</b>	<b>Frequency Error (ppm)</b>	<b>Result</b>
-30	3.8	-12	-0.00638	pass
-20		-12	-0.00638	pass
-10		-11	-0.00585	pass
0		-11	-0.00585	pass
10		-11	-0.00585	pass
20		-10	-0.00532	pass
30		-11	-0.00585	pass
40		-12	-0.00638	pass
50		-13	-0.00691	pass
20		V min.= 3.5	-15	-0.00798
	V max.= 4.2	-17	-0.00904	pass

**Band 4:**

10.0 MHz Middle Channel, $f_0 = 1732.5$ MHz				
Temperature (°C)	Voltage Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	11	0.00635	pass
-20		11	0.00635	pass
-10		10	0.00577	pass
0		10	0.00577	pass
10		10	0.00577	pass
20		9	0.00519	pass
30		10	0.00577	pass
40		11	0.00635	pass
50		12	0.00693	pass
20		V min.= 3.5	14	0.00808
	V max.= 4.2	16	0.00924	pass

**Band 7:**

10.0 MHz Middle Channel, $f_0 = 2535$ MHz				
Temperature (°C)	Voltage Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	-4	-0.00158	pass
-20		-4	-0.00158	pass
-10		-4	-0.00158	pass
0		-2	-0.00079	pass
10		-2	-0.00079	pass
20		-1	-0.00039	pass
30		-2	-0.00079	pass
40		-3	-0.00118	pass
50		-4	-0.00158	pass
20		V min.= 3.5	-6	-0.00237
	V max.= 4.2	-9	-0.00355	pass

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