



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

For

**Quectel Wireless Solutions Company Limited**  
Room501,Building 13,No.99 TianZhou Road, Xuhui District, Shanghai, China

**Test Model: EC25-A**  
**FCC ID: XMR201605EC25A**

<b>Report Type:</b> Original Report	<b>Product Type:</b> LTE Module
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Report Number: <u>RTWK160705001-00</u>	
Report Date: <u>2016-07-01</u>	
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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## GENERAL INFORMATION

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

The Quectel Wireless Solutions Company Limited's product, model number: EC25-A (FCC ID: XMR201605EC25A) or the "EUT" in this report was a LTE Module , which was measured approximately 32mm(L) × 29mm(W) × 2.4mm(H) . rated with input voltage: DC 3.8 V , EUT Operating Voltage Range: 3.5~4.2V.

\* Note: The product ' s series model number: EC25-A and EC25-A MiniPCIe. The difference between them was explained in the attached declaration letter.

\* All measurement and test data in this report was gathered from production sample serial number: 20160519001 (Assigned by BACL, Shenzhen).The EUT supplied by the applicant was received on 2016-05-19.

### Objective

This type approval report is prepared on behalf of Quectel Wireless Solutions Company Limited in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E and Part 27 of the Federal Communication Commission's rules.

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

### Related Submittal(s)/Grant(s)

N/A

### Test Methodology

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

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

Applicable Standards: TIA/EIA 603-D.

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

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz.and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(Taiwan) 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Test site at Bay Area Compliance Laboratories Corp. (Taiwan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2103. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 431084. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Justification

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

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

### Equipment Modifications

No modifications were made to the EUT.

### Specific accessory equipment

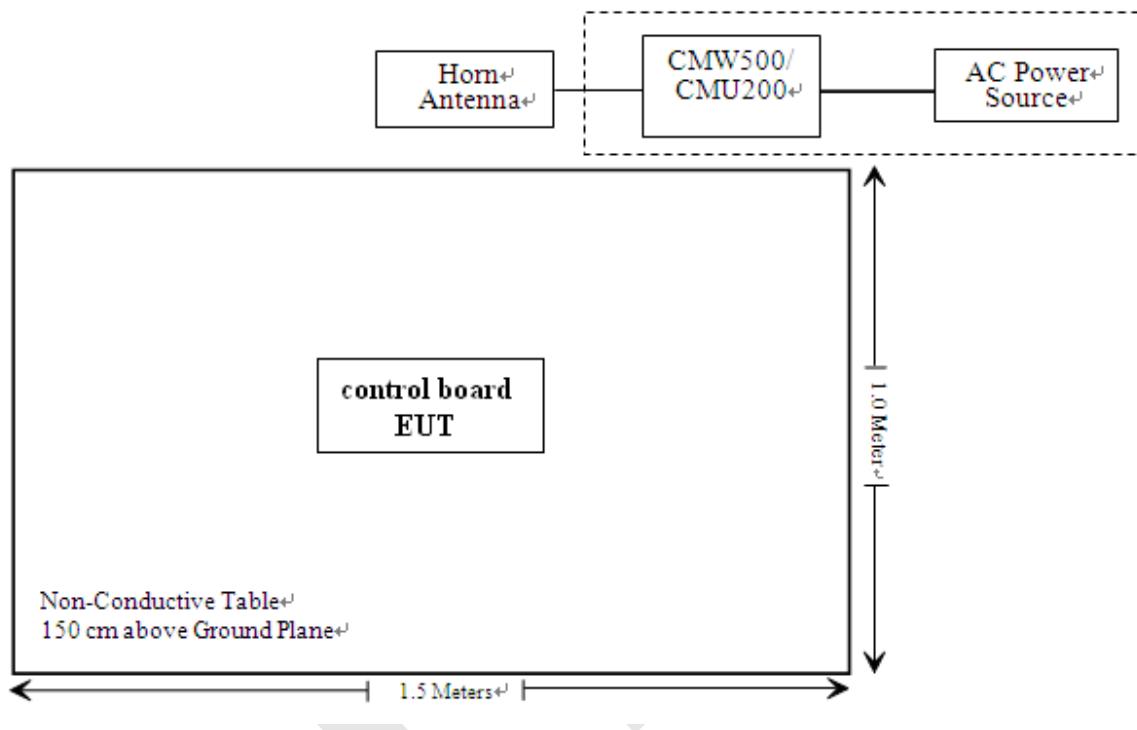
Description	parameter	Serial Number
WCDMA antenna	PCB Antenna, antenna Gain: 1dBi for 850 MHz 1dBi for 1900 MHz	N/A
LTE antenna	PCB Antenna, antenna Gain: 1dBi for 700MHz 1dBi for 1700MHz 1dBi for 1900 MHz	N/A

### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.0002K50
Dell	Notebook	E6410	N/A
Quectel	Test Fixer	N/A	N/A
Shanghai Jingsai Electronic Techology Co.,Ltd.	ADAPATER I/P: AC 100-240V, 50-60Hz O/P: DC 5V, 2A, 12W	JS-400K	N/A
Quectel Wireless Solutions	Control Board	S2-W2231	MP76121D4000228

**External Cable List and Details**

Cable Description	Length (m)	From Port	To
/	/	/	/

**Block Diagram of Test Setup**

## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307, §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliance
§2.1046; § 22.913 (a); § 24.232 (c); §27.50 (d) (h)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Spurious Radiated Emissions	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

## FCC §1.1307& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart § 2.1051 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

S = PG/4 π R<sup>2</sup> = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
WCDMA (Band V)	824.0	1.0	1.26	23.5	223.87	20	0.056	0.549
WCDMA (Band II)	1850.0	1.0	1.26	23.5	223.87	20	0.056	1.0
LTE (Band II)	1850.0	1.0	1.26	24	251.19	20	0.063	1.0
LTE (Band IV)	1755.0	1.0	1.26	24	251.19	20	0.063	1.0
(Band XII)	699	1.0	1.26	24	251.19	20	0.063	0.466

Note :

(1) Target Power =the max power including Tune-up tolerance, the tune up power declared by manufacturer as:  
WCDMA Band V =  $22.5 \pm 1$  dBm; WCDMA Band II =  $22.5 \pm 1$  dBm; FDD Band II=  $22 \pm 2$  dBm ;  
FDD Band IV=  $22 \pm 2$  dBm ; FDD Band XII=  $22 \pm 2$  dBm

Result: The device meet FCC MPE at 20 cm distance



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

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



## **§2.1046; § 22.913 (a);§ 24.232 (c); §27.50 (d) - RF OUTPUT POWER**

### **Applicable Standards**

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

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..

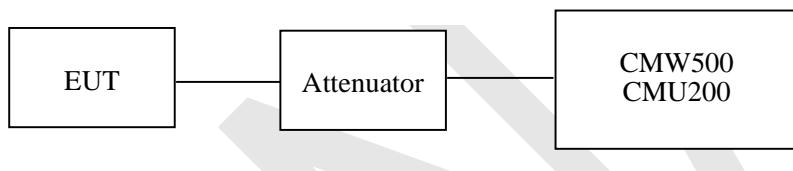
According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz. The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

According to §27.50, the maximum EIRP must not exceed 3Watts (34.77dBm) for 699-716MHz.

### **Test Procedure**

#### *Conducted method:*

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



**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI	100540	2015-07-25	2016-07-24
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891	2015-11-23	2016-11-23
R&S	Wideband Radio Communication tester	CMW500	1201.002K50-146520-wh	2015-11-23	2016-11-23
Rohde & Schwarz	Spectrum Analyzer	FSU 26	200268	2015-07-29	2016-08-28

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

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

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0kPa

The testing was performed by David. Hsu on 2016-05-27.

**Conducted Power****Cellular Band (Part 22H)**

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band V)	Normal	Rel 99	1	22.96	22.81	22.87
			1	23.21	23.18	23.10
			2	23.02	22.86	22.95
			3	22.88	22.79	22.85
			4	22.82	22.73	22.83
		Rel 8 HSUPA	1	23.03	23.05	23.04
			2	22.86	22.73	22.69
			3	22.88	22.72	22.82
			4	22.82	22.69	22.72
			5	22.85	22.68	22.76
		HSPA+	1	23.05	22.54	22.76

**PCS Band (Part 24E)**

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band II)	Normal	Rel 99	1	22.96	22.92	22.92
			1	23.12	22.81	22.96
			2	23.03	22.91	22.88
			3	22.68	22.75	22.84
			4	22.58	22.77	22.63
		Rel 8 HSUPA	1	22.77	22.92	22.87
			2	22.81	22.72	22.65
			3	22.73	22.53	22.76
			4	22.89	22.77	22.54
			5	22.81	22.75	22.57
		HSPA+	1	23.10	22.83	22.97

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

<b>Mode</b>	<b>Channel</b>	<b>PAR (dB)</b>	<b>Limit (dB)</b>
WCDMA (BPSK)	Low	3.21	13
	Middle	3.26	13
	High	3.22	13
HSDPA (16QAM)	Low	2.93	13
	Middle	2.82	13
	High	2.59	13
HSUPA (BPSK)	Low	2.81	13
	Middle	2.85	13
	High	2.77	13
HSPA+ (16QAM)	Low	2.63	13
	Middle	2.52	13
	High	2.41	13

**PCS Band**

<b>Mode</b>	<b>Channel</b>	<b>PAR (dB)</b>	<b>Limit (dB)</b>
WCDMA (BPSK)	Low	2.75	13
	Middle	2.78	13
	High	2.80	13
HSDPA (16QAM)	Low	2.64	13
	Middle	2.43	13
	High	2.54	13
HSUPA (BPSK)	Low	2.52	13
	Middle	2.36	13
	High	2.66	13
HSPA+ (16QAM)	Low	2.43	13
	Middle	2.29	13
	High	2.16	13

**LTE Band II:****Maximum Output Power**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
1.4M	QPSK	1#0	23.55	23.84	23.62	33.00
		1#3	23.48	23.76	23.56	
		1#5	23.59	23.78	23.69	
		3#0	23.33	23.43	23.37	
		3#1	23.27	23.49	23.30	
		3#3	23.21	23.38	23.26	
		6#0	22.73	22.74	22.58	
	16-QAM	1#0	23.02	22.66	22.94	
		1#3	22.93	22.60	22.87	
		1#5	22.97	22.57	22.81	
		3#0	22.57	22.34	22.46	
		3#1	22.63	22.42	22.55	
		3#3	22.61	22.37	22.51	
		6#0	21.98	21.74	21.87	
3M	QPSK	1#0	23.74	23.80	23.87	33.00
		1#7	23.79	23.69	23.82	
		1#14	23.75	23.66	23.84	
		8#0	23.39	23.33	23.40	
		8#4	23.44	23.37	23.34	
		8#7	23.38	23.40	23.38	
		15#0	22.80	22.67	22.79	
	16-QAM	1#0	22.98	22.78	22.90	
		1#7	22.92	22.61	22.85	
		1#14	22.94	22.68	22.99	
		8#0	22.63	22.64	22.44	
		8#4	22.62	22.59	22.51	
		8#7	22.55	22.62	22.48	
		15#0	22.00	21.56	21.93	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
5M	QPSK	1#0	23.75	23.81	23.67	33.00
		1#12	23.80	23.73	23.63	
		1#24	23.67	23.79	23.69	
		12#0	23.38	23.42	23.46	
		12#6	23.41	23.37	23.33	
		12#11	23.34	23.29	23.39	
		25#0	22.69	22.85	22.67	
	16-QAM	1#0	22.79	22.78	22.46	
		1#12	22.72	22.80	22.49	
		1#24	22.78	22.82	22.53	
		12#0	22.48	22.46	22.22	
		12#6	22.37	22.43	22.28	
		12#11	22.43	22.38	22.26	
		25#0	21.97	21.94	21.85	
10M	QPSK	1#0	23.72	23.88	23.72	33.00
		1#24	23.66	23.69	23.80	
		1#49	23.69	23.77	23.69	
		25#0	23.47	23.55	23.48	
		25#12	23.49	23.58	23.47	
		25#24	23.55	23.52	23.50	
		50#0	22.72	22.86	22.84	
	16-QAM	1#0	22.78	22.62	22.56	
		1#24	22.83	22.51	22.48	
		1#49	22.77	22.47	22.63	
		25#0	22.58	22.32	22.28	
		25#12	22.46	22.29	22.20	
		25#24	22.33	22.36	22.29	
		50#0	21.84	21.69	21.61	
15M	QPSK	1#0	23.71	23.72	23.65	33.00
		1#37	23.60	23.69	23.62	
		1#74	23.66	23.64	23.69	
		36#0	23.40	23.31	23.26	
		36#17	23.31	23.36	23.20	
		36#35	23.38	23.32	23.27	
		75#0	22.78	22.92	22.81	
	16-QAM	1#0	22.60	22.73	22.58	
		1#37	22.65	22.77	22.51	
		1#74	22.71	22.79	22.57	
		36#0	22.26	22.45	22.29	
		36#17	22.19	22.49	22.21	
		36#35	22.13	22.43	22.18	
		75#0	21.72	21.60	21.66	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
20M	QPSK	1#0	23.57	23.71	23.60	33.00
		1#49	23.62	23.59	23.55	
		1#99	23.64	23.68	23.69	
		50#0	23.39	23.38	23.48	
		50#24	23.28	23.33	23.40	
		50#49	23.32	23.39	23.41	
		100#0	22.91	22.97	22.60	
	16-QAM	1#0	22.69	22.62	22.85	
		1#49	22.64	22.61	22.81	
		1#99	22.62	22.58	22.78	
		50#0	22.27	22.32	22.46	
		50#24	22.30	22.27	22.42	
		50#49	22.34	22.30	22.39	
		100#0	21.77	21.58	21.73	

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

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	20M	3.64	4.48	3.96	13.00
	100 RB		6.20	6.52	6.40	13.00
16-QAM	1 RB	20M	4.36	5.56	4.60	13.00
	100 RB		7.08	7.04	7.16	13.00

**LTE Band IV****Maximum Output Power**

<b>Test Bandwidth</b>	<b>Test Modulation</b>	<b>Resource Block &amp; RB offset</b>	<b>Low Channel (dBm)</b>	<b>Middle Channel (dBm)</b>	<b>High Channel (dBm)</b>	<b>Limit (dBm)</b>
1.4M	QPSK	1#0	23.74	23.67	23.78	30.00
		1#3	23.71	23.61	23.81	
		1#5	23.67	23.63	23.75	
		3#0	23.49	23.47	23.64	
		3#1	23.53	23.40	23.47	
		3#3	23.45	23.45	23.55	
		6#0	22.75	22.50	22.81	
	16-QAM	1#0	23.07	23.02	23.14	
		1#3	23.15	22.95	23.22	
		1#5	23.20	22.99	23.16	
		3#0	22.70	22.56	22.73	
		3#1	22.67	22.60	22.68	
		3#3	22.74	22.58	22.75	
		6#0	22.21	22.06	22.17	
3M	QPSK	1#0	23.65	23.48	23.74	30.00
		1#7	23.63	23.45	23.67	
		1#14	23.72	23.49	23.72	
		8#0	23.31	23.22	23.41	
		8#4	23.35	23.14	23.35	
		8#7	23.40	23.10	23.32	
		15#0	22.64	22.47	22.88	
	16-QAM	1#0	22.96	22.91	23.02	
		1#7	22.92	22.86	22.97	
		1#14	22.88	22.90	23.05	
		8#0	22.54	22.54	22.75	
		8#4	22.58	22.42	22.66	
		8#7	22.62	22.50	22.80	
		15#0	22.03	21.91	22.08	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
5M	QPSK	1#0	23.69	23.20	23.51	30.00
		1#12	23.67	23.14	23.44	
		1#24	23.74	23.16	23.49	
		12#0	23.36	22.83	23.07	
		12#6	23.32	22.79	23.22	
		12#11	23.27	22.77	23.15	
		25#0	22.52	22.39	22.70	
	16-QAM	1#0	23.01	22.80	22.97	
		1#12	23.04	22.83	22.92	
		1#24	22.97	22.89	22.95	
		12#0	22.70	22.45	22.58	
		12#6	22.62	22.43	22.56	
		12#11	22.64	22.36	22.63	
		25#0	21.97	21.85	22.06	
10M	QPSK	1#0	23.67	23.33	23.55	30.00
		1#24	23.63	23.39	23.47	
		1#49	23.72	23.45	23.54	
		25#0	23.27	22.96	23.17	
		25#12	23.21	22.84	23.24	
		25#24	23.18	22.93	23.20	
		50#0	22.62	22.54	22.73	
	16-QAM	1#0	22.89	22.81	22.92	
		1#24	22.82	22.75	22.90	
		1#49	22.86	22.78	22.97	
		25#0	22.59	22.47	22.60	
		25#12	22.64	22.55	22.65	
		25#24	22.65	22.48	22.69	
		50#0	21.84	21.78	21.95	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
15M	QPSK	1#0	23.64	23.32	23.61	30.00
		1#37	23.71	23.39	23.67	
		1#74	23.68	23.27	23.55	
		36#0	23.27	22.97	23.28	
		36#17	23.33	22.93	23.33	
		36#35	23.24	22.88	23.31	
		75#0	22.47	22.15	22.61	
	16-QAM	1#0	22.84	22.68	22.86	
		1#37	22.79	22.74	22.73	
		1#74	22.72	22.66	22.79	
		36#0	22.43	22.24	22.44	
		36#17	22.47	22.20	22.42	
		36#35	22.40	22.28	22.51	
		75#0	21.73	21.66	21.83	
20M	QPSK	1#0	23.46	22.98	23.26	30.00
		1#49	23.50	22.92	23.20	
		1#99	23.44	22.96	23.14	
		50#0	23.03	22.60	22.85	
		50#24	22.98	22.54	22.82	
		50#49	23.07	22.48	22.77	
		100#0	22.34	22.00	22.27	
	16-QAM	1#0	22.95	22.82	23.01	
		1#49	22.92	22.77	22.98	
		1#99	22.99	22.85	22.92	
		50#0	22.73	22.40	22.52	
		50#24	22.66	22.35	22.54	
		50#49	22.79	22.38	22.60	
		100#0	21.97	21.74	21.85	

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

Test Modulation	Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)	
QPSK	1 RB	20M	4.48	3.88	4.36	13.00
	100 RB		6.48	6.20	6.48	13.00
16-QAM	1 RB	20M	5.48	4.68	5.16	13.00
	100 RB		6.96	7.00	7.08	13.00

**LTE Band XII:****Maximum Output Power**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
1.4M	QPSK	1#0	23.52	23.37	23.29	34.77
		1#3	23.46	23.25	23.35	
		1#5	23.55	23.31	23.30	
		3#0	23.21	22.90	23.04	
		3#1	23.26	22.96	23.07	
		3#3	23.17	22.92	22.99	
		6#0	22.61	22.73	22.12	
	16-QAM	1#0	22.83	22.81	22.62	
		1#3	22.77	22.78	22.68	
		1#5	22.75	22.76	22.76	
		3#0	22.31	22.41	22.35	
		3#1	22.36	22.46	22.41	
		3#3	22.57	22.68	22.36	
		6#0	21.70	21.94	21.69	
3M	QPSK	1#0	23.58	23.71	23.41	34.77
		1#7	23.63	23.77	23.36	
		1#14	23.66	23.65	23.44	
		8#0	23.16	23.22	23.04	
		8#4	23.08	23.27	23.06	
		8#7	23.13	23.31	23.12	
		15#0	22.92	22.89	22.62	
	16-QAM	1#0	22.88	23.03	22.67	
		1#7	22.91	22.96	22.71	
		1#14	22.94	22.98	22.66	
		8#0	22.39	22.53	22.20	
		8#4	22.35	22.59	22.17	
		8#7	22.40	22.56	22.15	
		15#0	21.77	22.01	21.83	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
5M	QPSK	1#0	23.67	23.64	23.61	34.77
		1#12	23.75	23.61	23.69	
		1#24	23.70	23.65	23.66	
		12#0	23.26	23.48	23.28	
		12#6	23.21	23.44	23.19	
		12#11	23.25	23.47	23.24	
		25#0	22.58	22.59	22.41	
	16-QAM	1#0	22.89	23.00	22.56	
		1#12	22.81	22.96	22.48	
		1#24	22.84	23.04	22.52	
		12#0	22.44	22.71	22.25	
		12#6	22.49	22.66	22.31	
		12#11	22.41	22.63	22.22	
		25#0	21.79	21.89	21.69	
10M	QPSK	1#0	23.52	23.84	23.43	34.77
		1#24	23.47	23.82	23.51	
		1#49	23.56	23.87	23.46	
		25#0	23.20	23.40	22.99	
		25#12	23.22	23.48	22.92	
		25#24	23.16	23.41	22.95	
		50#0	22.49	22.70	22.28	
	16-QAM	1#0	22.96	23.09	22.73	
		1#24	23.03	23.14	22.65	
		1#49	22.99	23.10	22.69	
		25#0	22.56	22.74	22.26	
		25#12	22.50	22.79	22.30	
		25#24	22.53	22.71	22.24	
		50#0	21.72	21.96	21.64	

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

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	10M	3.92	4.72	4.68	13.00
	50 RB		5.24	5.56	5.40	13.00
16-QAM	1 RB	10M	4.68	5.64	5.56	13.00
	50 RB		6.28	6.52	6.40	13.00

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

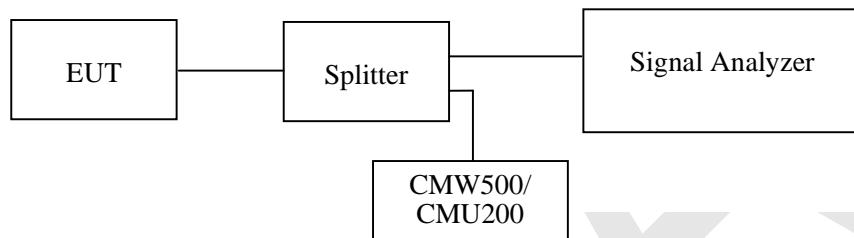
### Applicable Standards

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

### Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) & 100 kHz (WCDMA) and the 26 dB & 99% bandwidth was recorded.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2015-09-02	2016-09-02
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891	2015-11-23	2016-11-23
R&S	Wideband Radio Communication tester	CMW500	1201.002K50-146520-wh	2015-11-23	2016-11-23
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

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

## Test Data

### Environmental Conditions

Temperature:	21 °C
Relative Humidity:	49 %
ATM Pressure:	101.0kPa

The testing was performed by David. Hsu on 2016-05-23&2016-05-31.

EUT operation mode: Transmitting

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

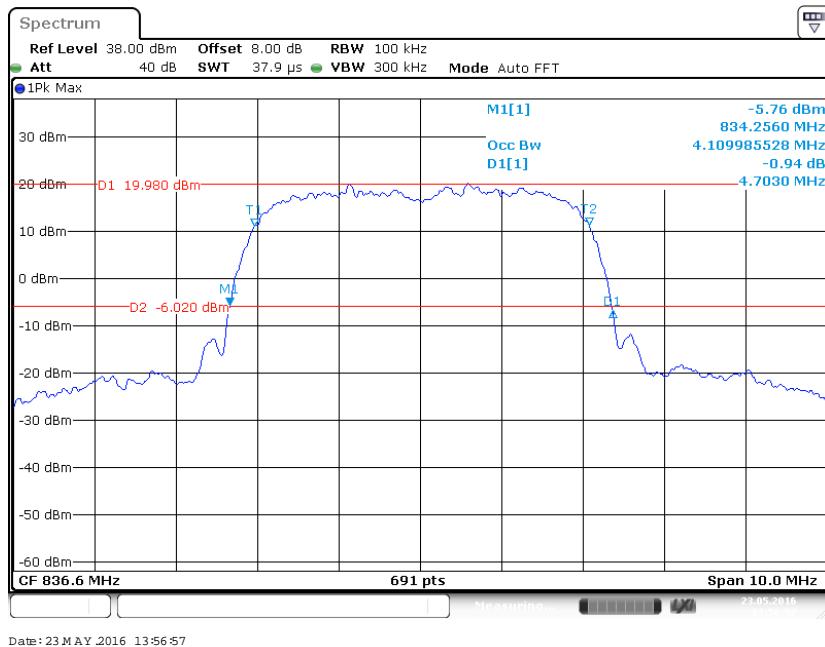
### Cellular Band (Part 22H)

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA (BPSK)	836.6	4.110	4.703
HSUPA (BPSK)	836.6	4.128	4.709
HSDPA (16QAM)	836.6	4.148	4.749

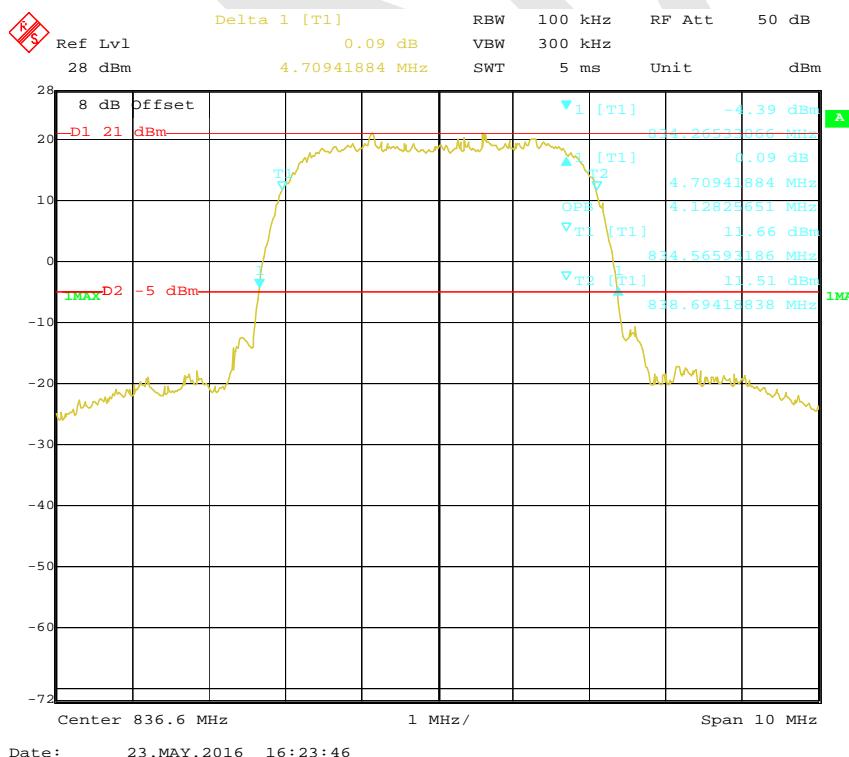
### PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA (BPSK)	1880.0	4.124	4.689
HSUPA (BPSK)	1880.0	4.148	4.729
HSDPA (16QAM)	1880.0	4.148	4.749

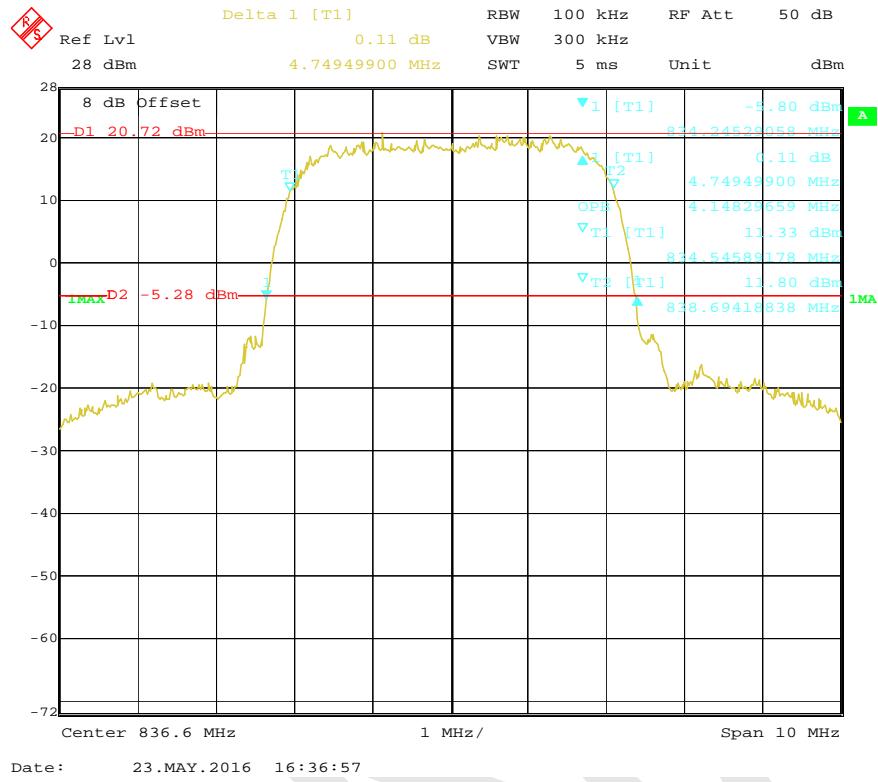
**Cellular Band (Part 22H)**  
**99% Occupied & 26 dB Emissions Bandwidth for WCDMA (BPSK) Mode**



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

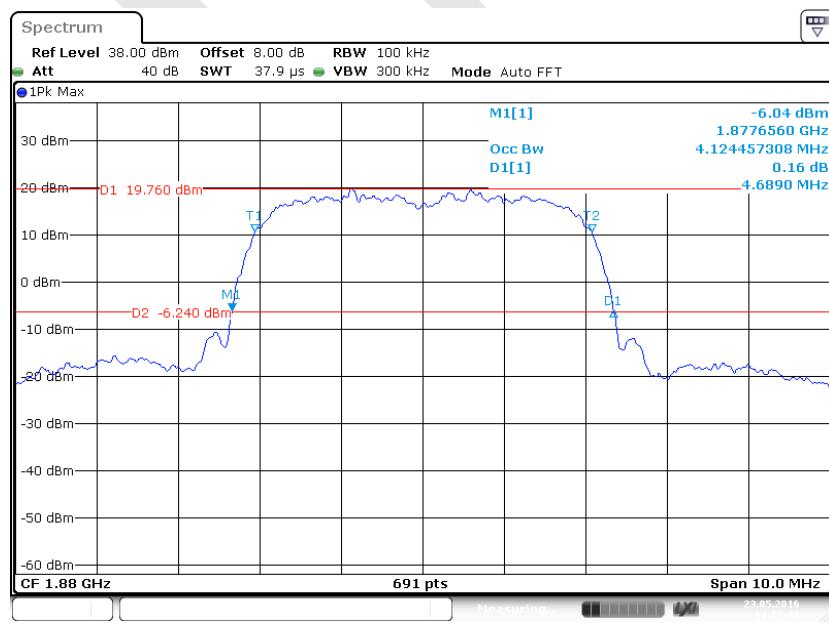


### 99% Occupied & 26 dB Emissions Bandwidth for HSDPA (16QAM) Mode

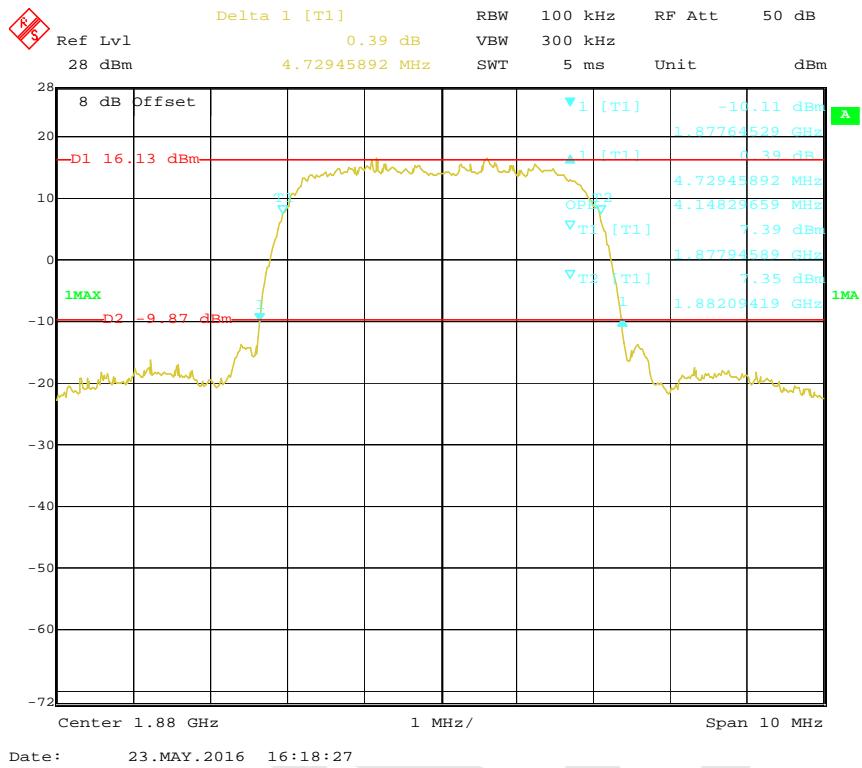


### PCS Band (Part 24E)

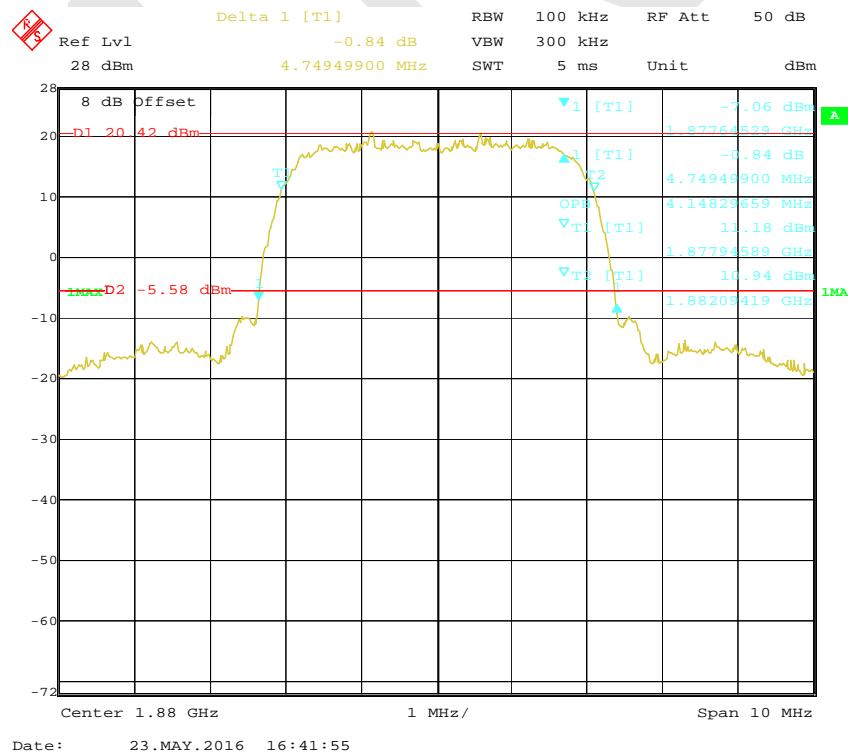
### 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (BPSK) Mode



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

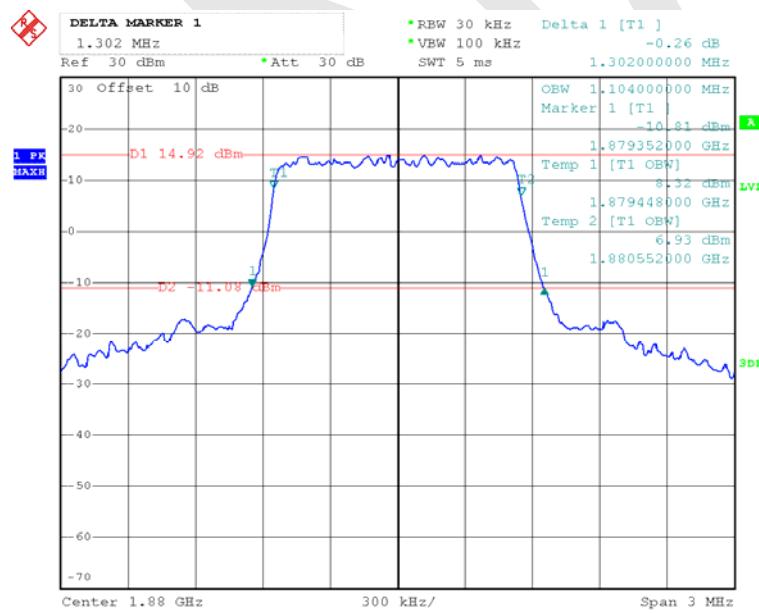


### 99% Occupied & 26 dB Emissions Bandwidth for HSDPA (16QAM) Mode

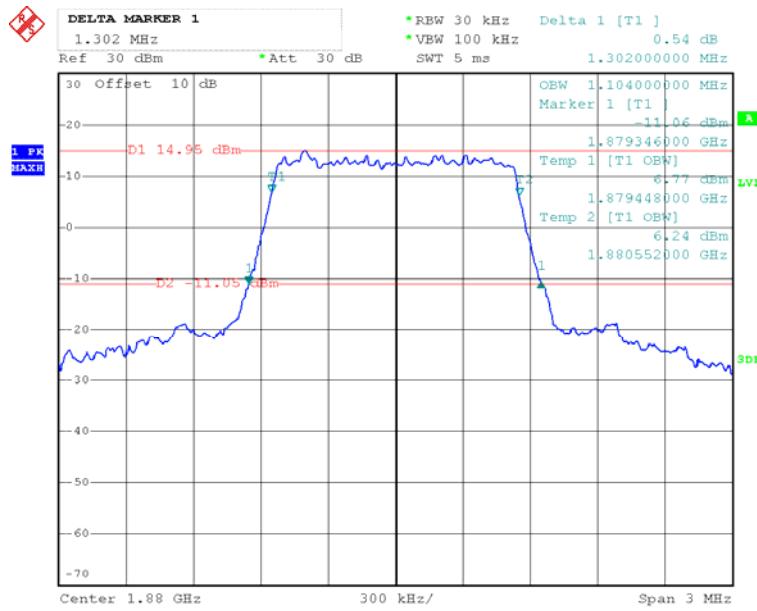


**LTE Band II:**

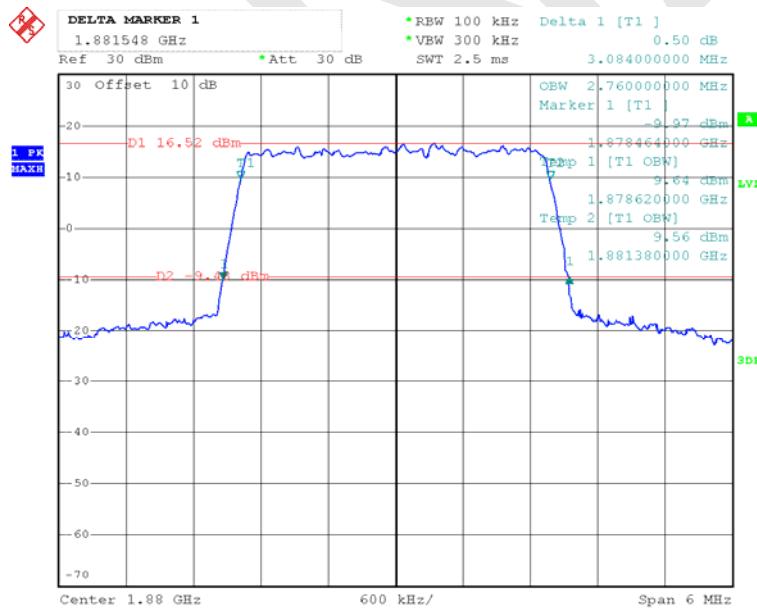
Test Modulation	Test Bandwidth	Test Channel	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	1.4M	Middle	1.104	1.302
	3M		2.760	3.084
	5M		4.540	5.048
	10M		9.120	10.228
	15M		13.560	14.988
	20M		18.640	21.360
16-QAM	1.4M	Middle	1.104	1.302
	3M		2.760	3.072
	5M		4.540	5.068
	10M		9.120	10.280
	15M		13.560	15.060
	20M		18.640	21.440

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

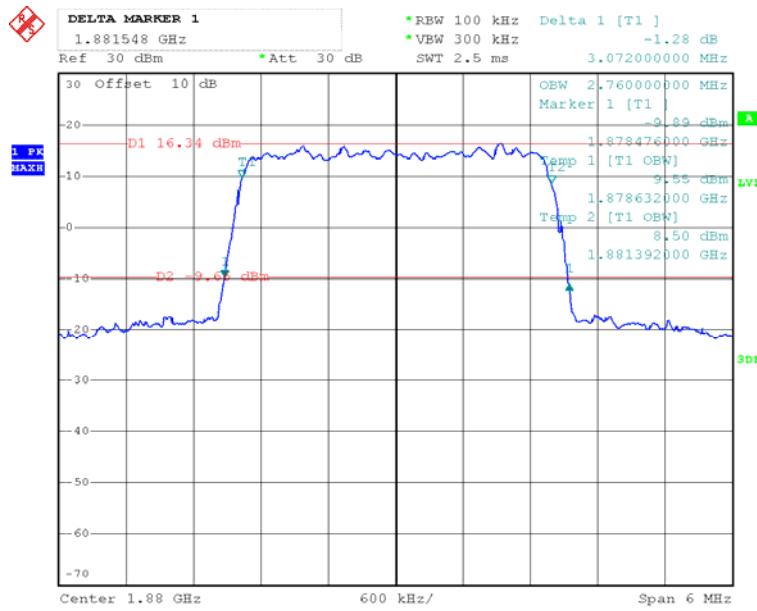
Date: 31.MAY.2016 13:25:44

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

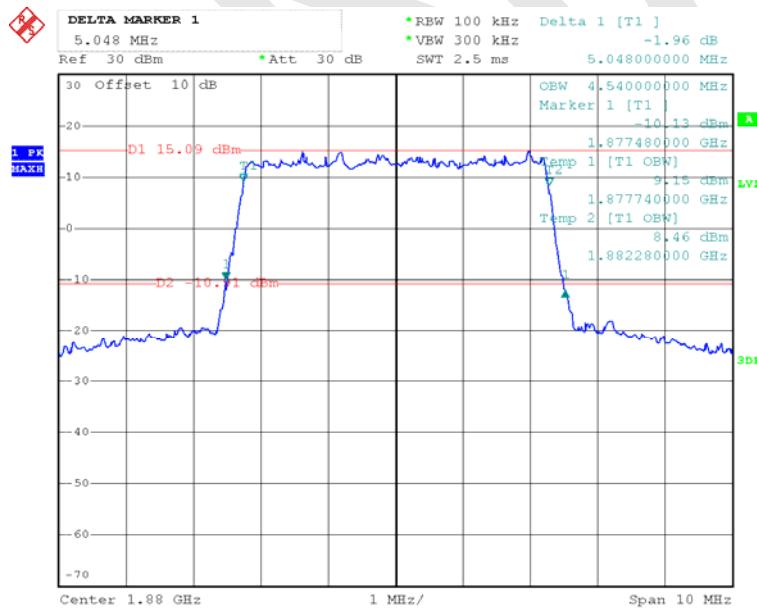
Date: 31.MAY.2016 13:28:04

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

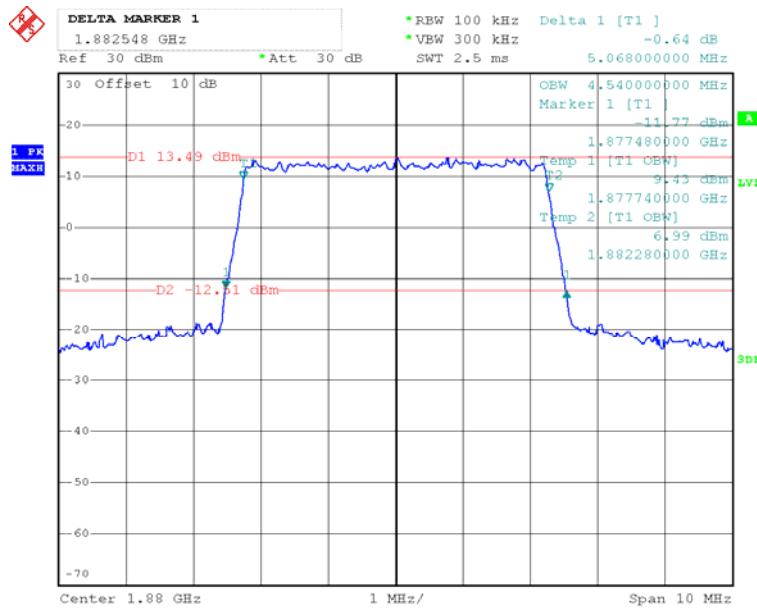
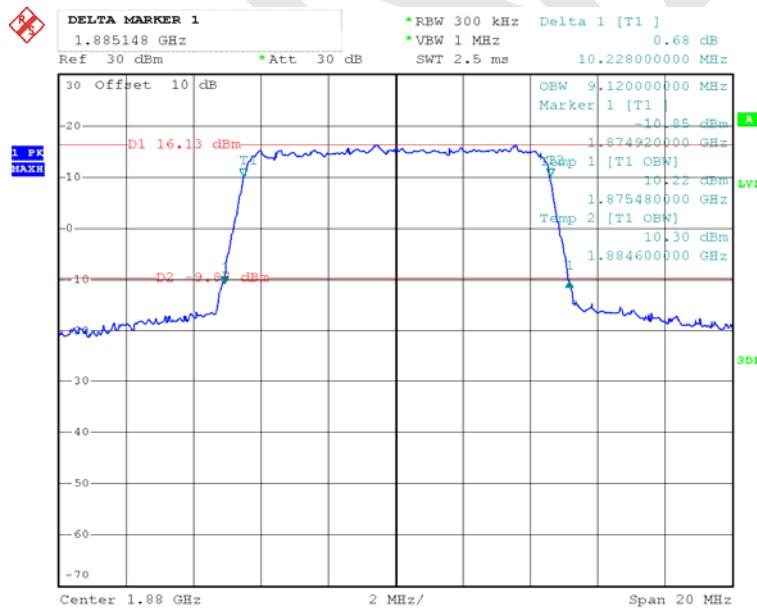
Date: 31.MAY.2016 13:33:21

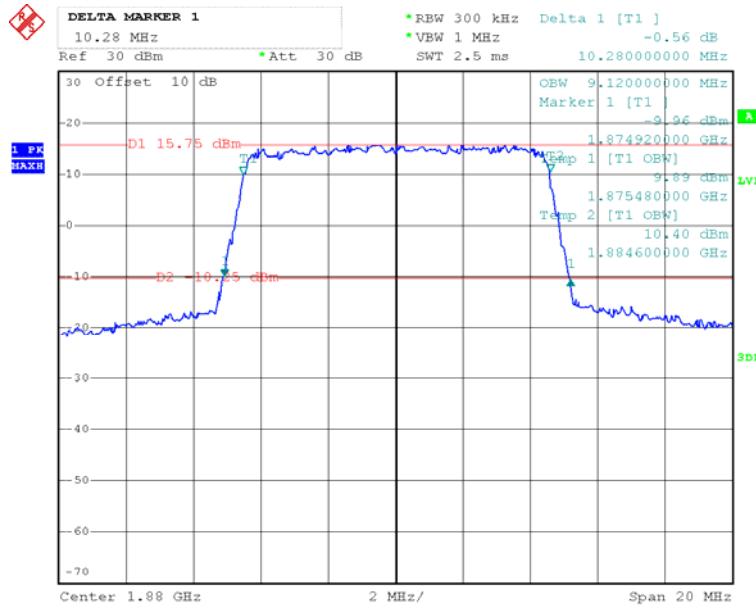
**16-QAM (3.0 MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel**

Date: 31.MAY.2016 13:31:26

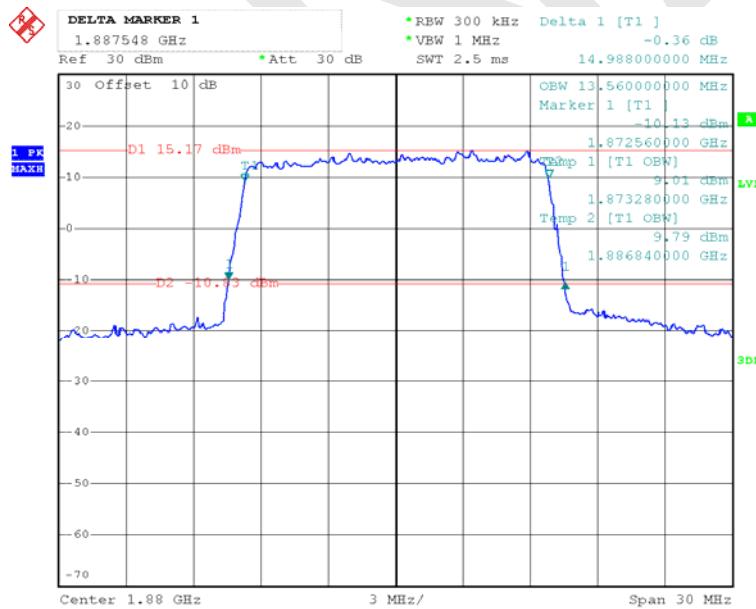
**QPSK (5.0 MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel**

Date: 31.MAY.2016 13:35:34

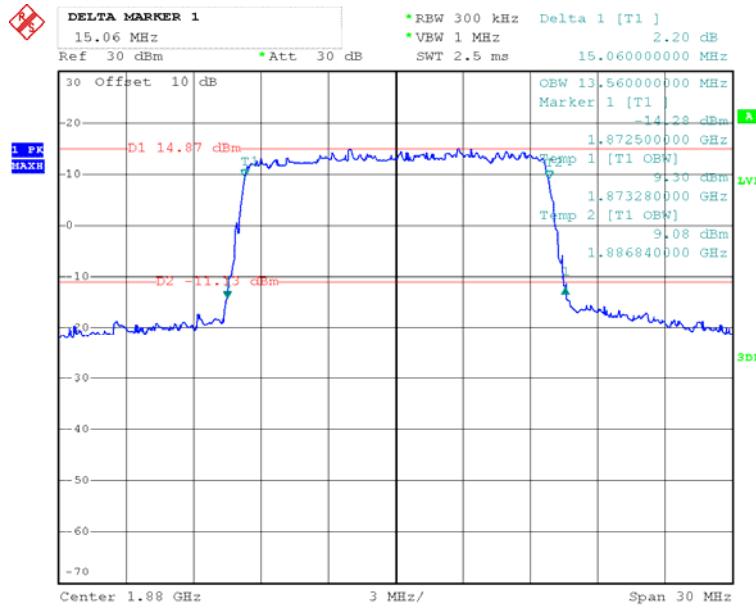
**16-QAM (5.0 MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel****QPSK (10.0 MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel**

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

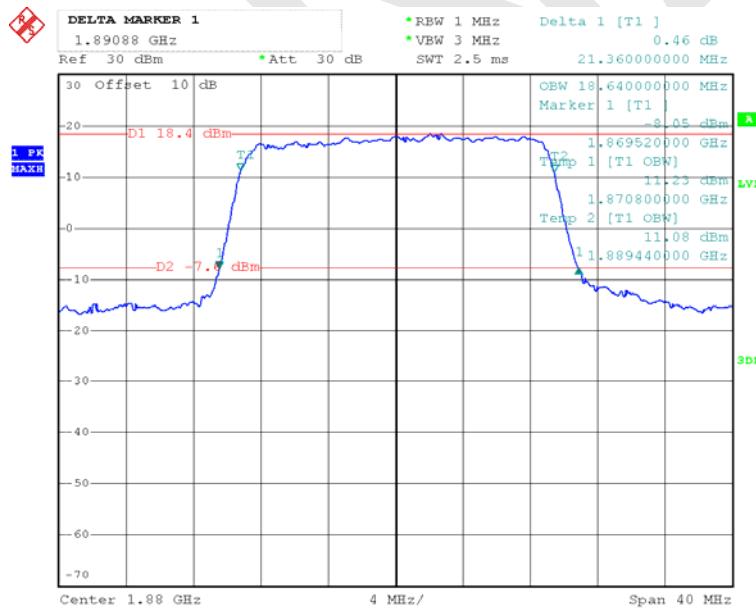
Date: 31.MAY.2016 19:44:33

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

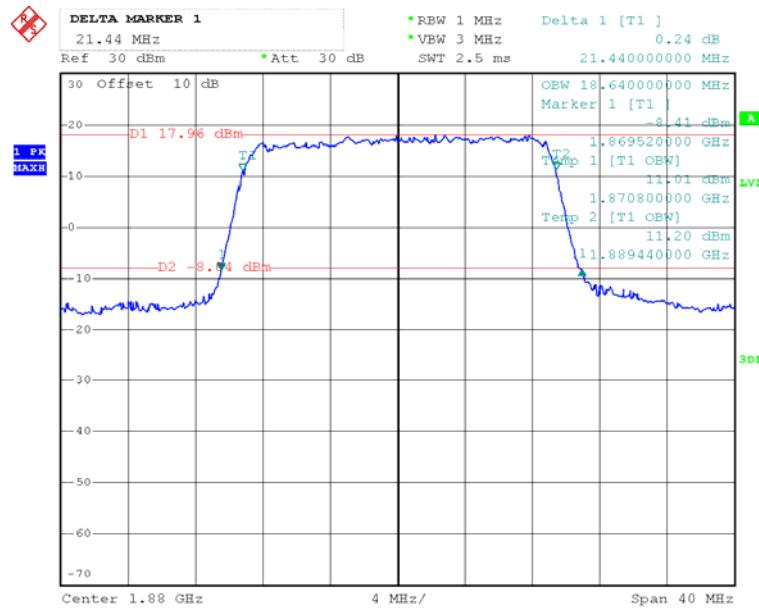
Date: 31.MAY.2016 13:47:30

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

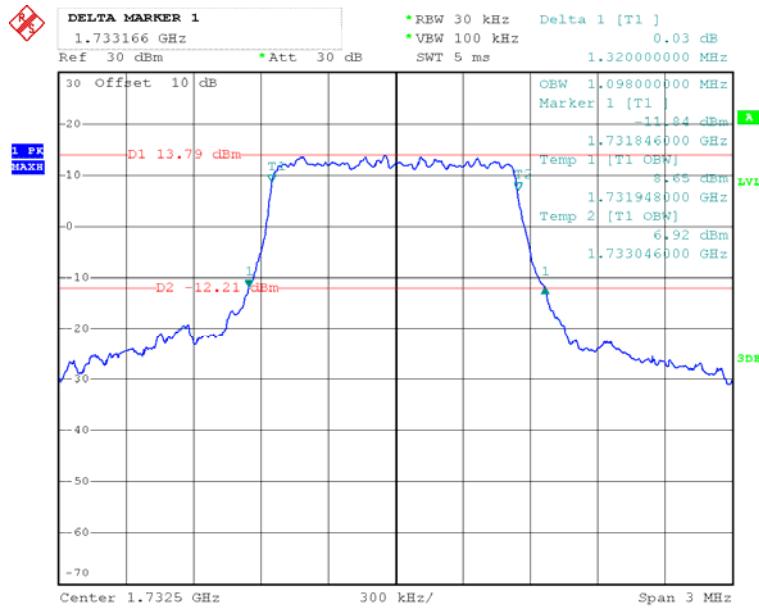
Date: 31.MAY.2016 19:41:35

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

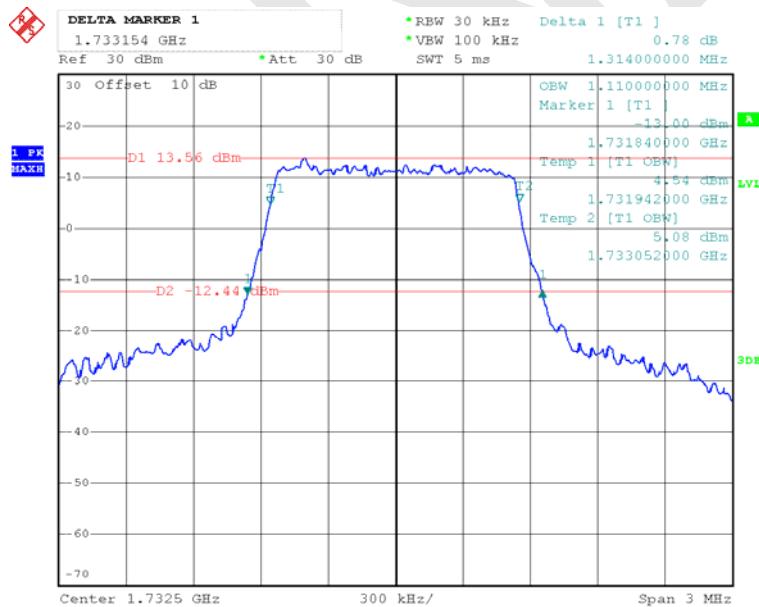
Date: 31.MAY.2016 13:50:51

**16-QAM (20.0 MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel****LTE Band IV:**

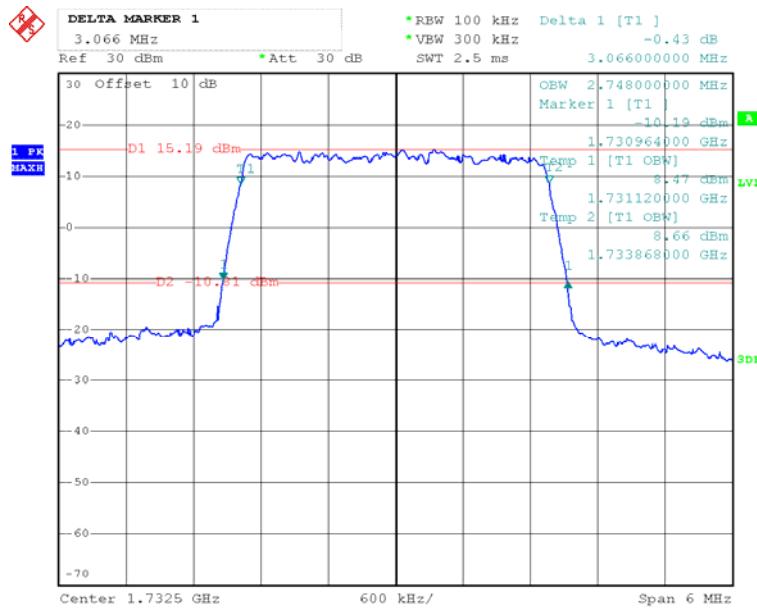
Test Modulation	Test Bandwidth	Test Channel	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	1.4M	Middle	1.098	1.320
	3M		2.748	3.066
	5M		4.520	5.010
	10M		9.080	10.270
	15M		13.500	15.010
	20M		18.480	20.950
16-QAM	1.4M	Middle	1.110	1.314
	3M		2.760	3.078
	5M		4.520	5.050
	10M		9.080	10.360
	15M		13.500	15.060
	20M		18.480	21.120

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

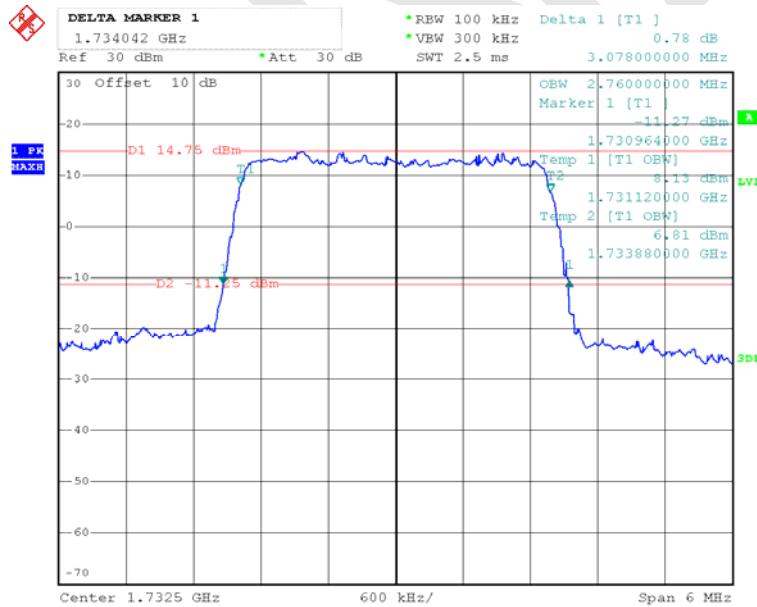
Date: 31.MAY.2016 16:46:59

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

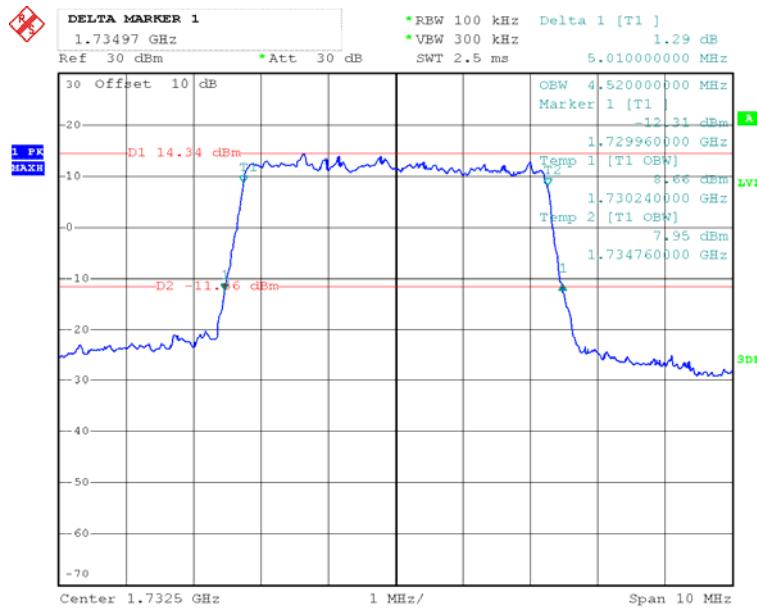
Date: 31.MAY.2016 16:43:24

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

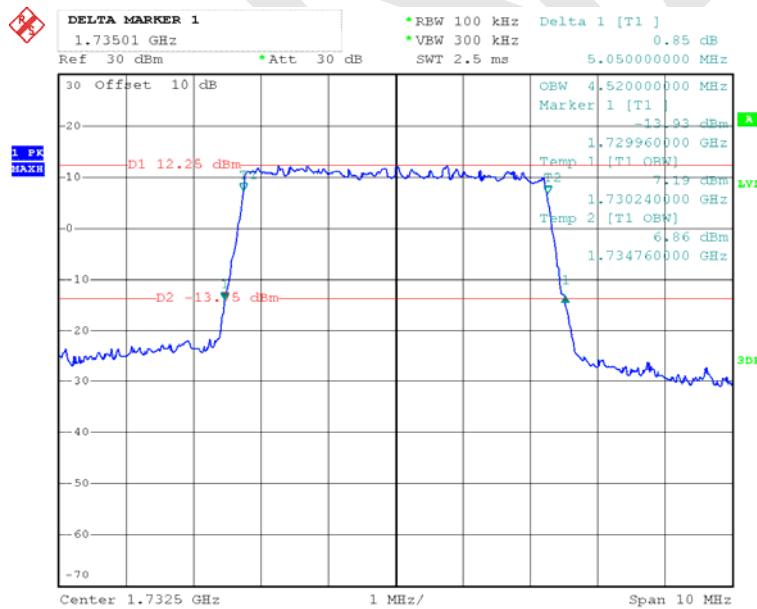
Date: 31.MAY.2016 16:51:07

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

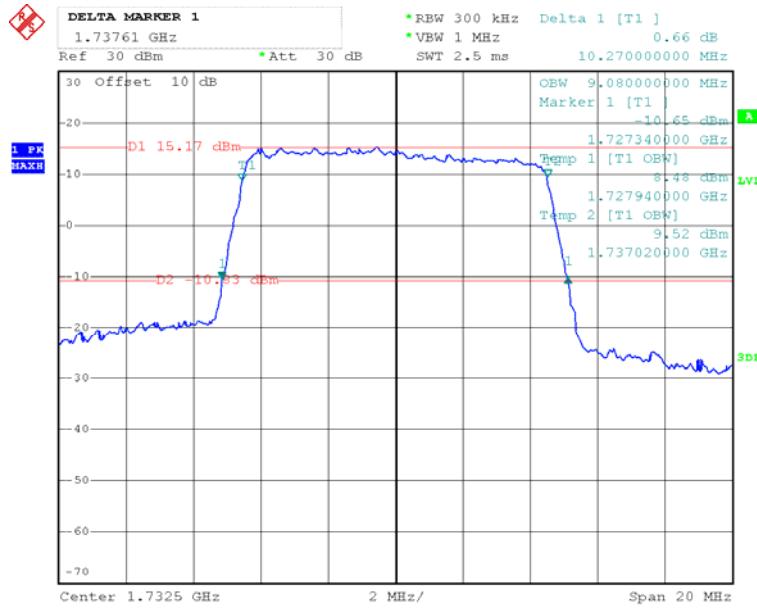
Date: 31.MAY.2016 16:48:54

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

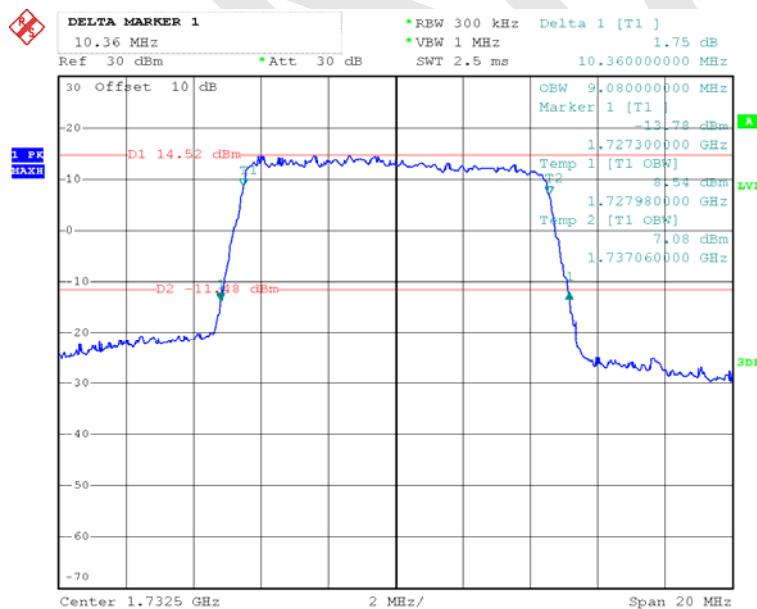
Date: 31.MAY.2016 16:55:59

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

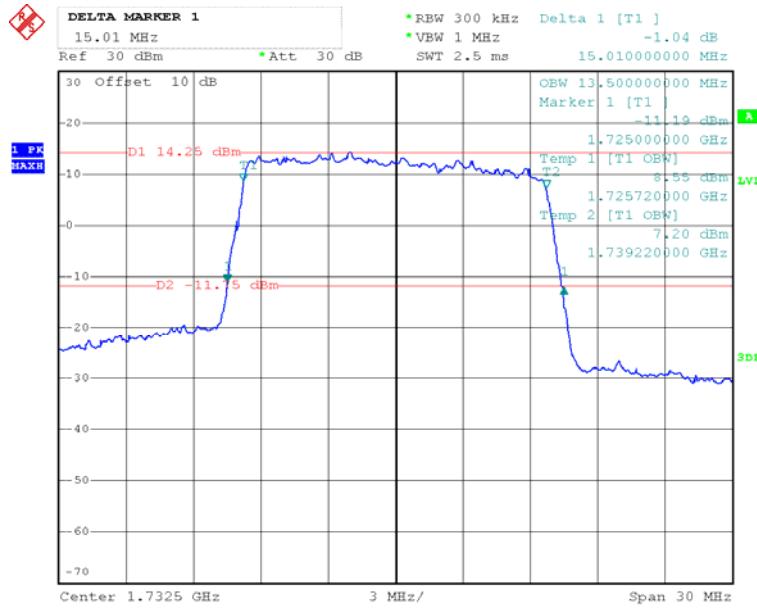
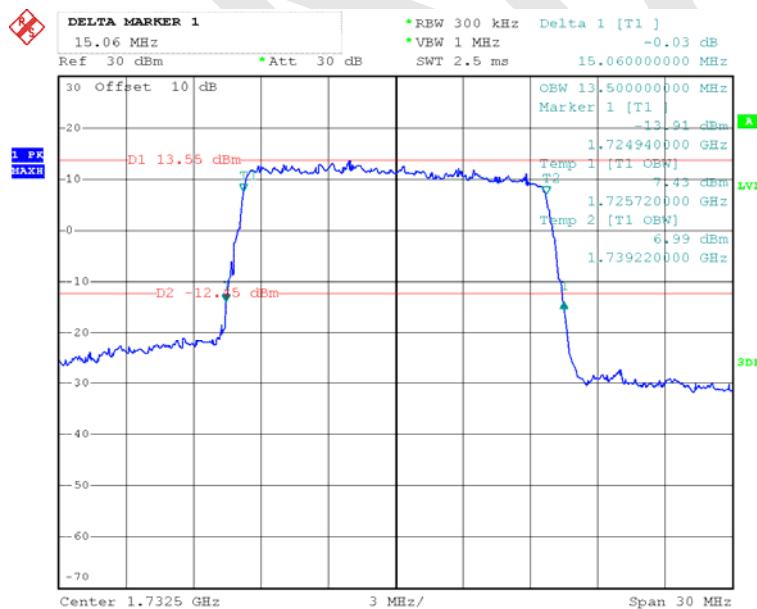
Date: 31.MAY.2016 16:53:20

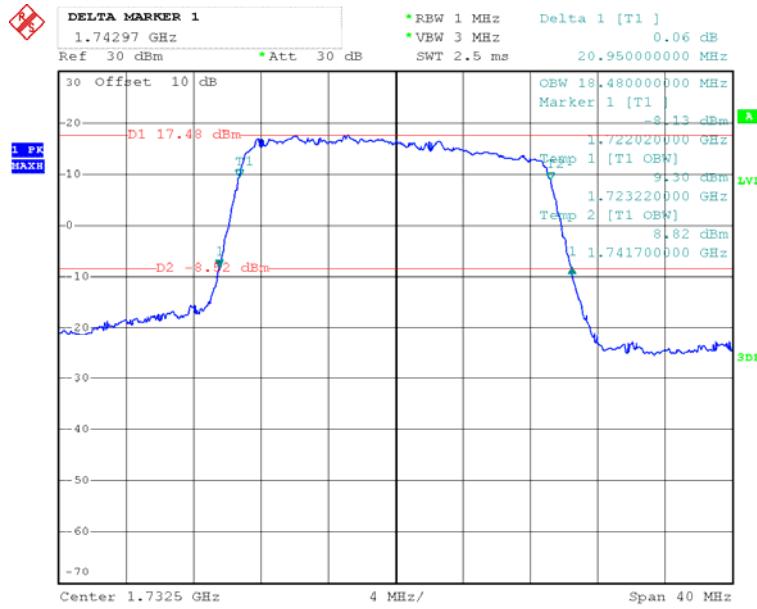
**QPSK (10.0 MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel**

Date: 31.MAY.2016 16:59:05

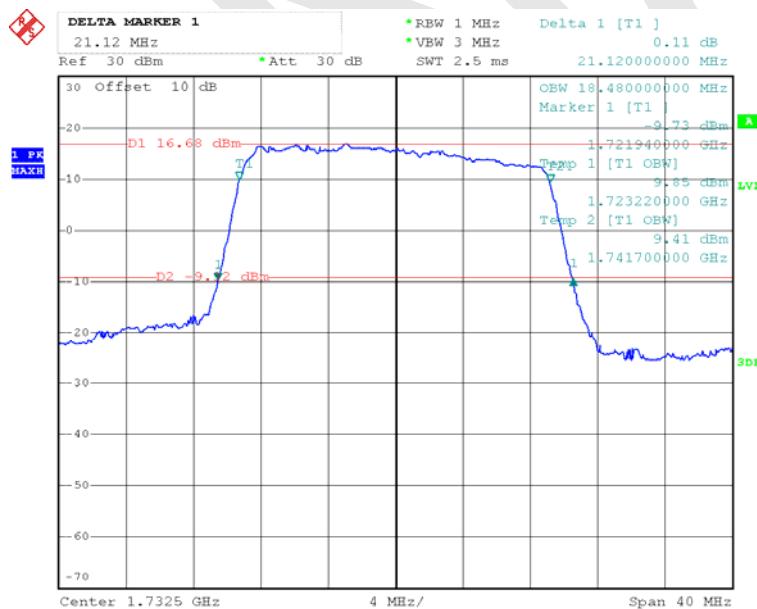
**16-QAM (10.0MHz) - 99% Occupied & 26 dB Bandwidth, Middle channel**

Date: 31.MAY.2016 19:47:08

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

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

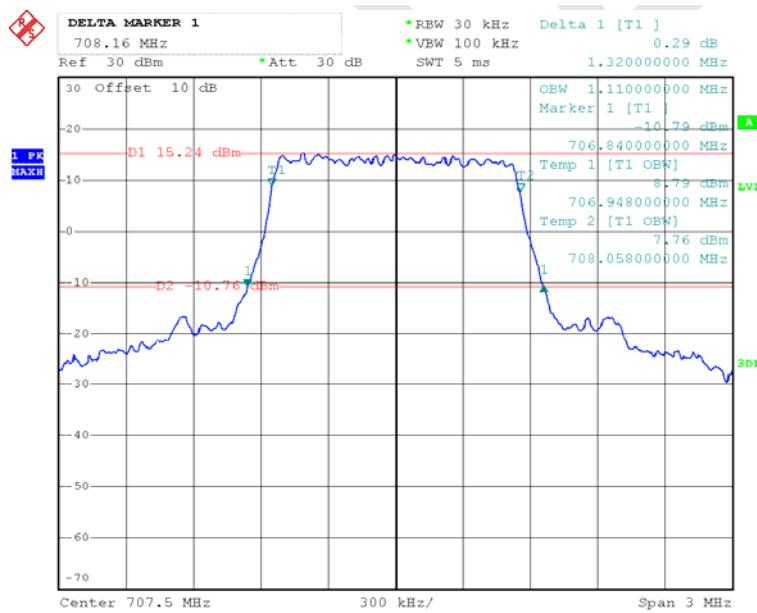
Date: 31.MAY.2016 17:03:35

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

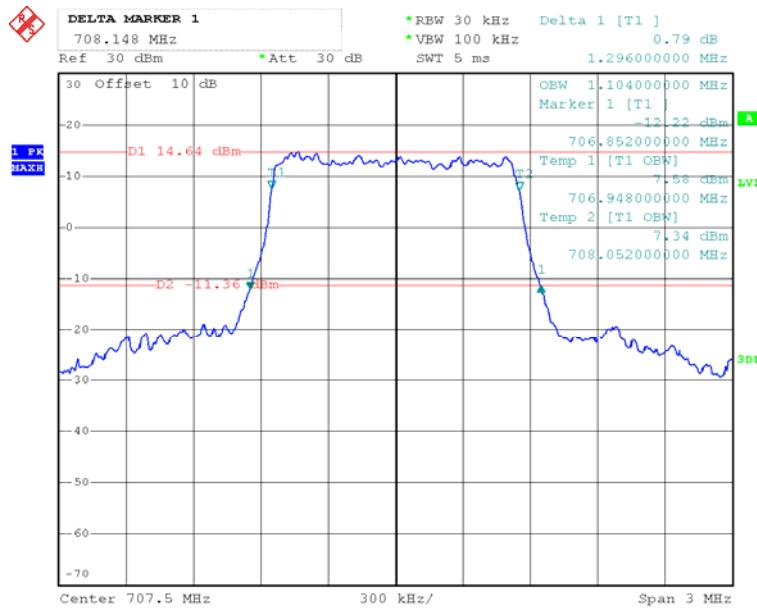
Date: 31.MAY.2016 19:52:29

**LTE Band XII:**

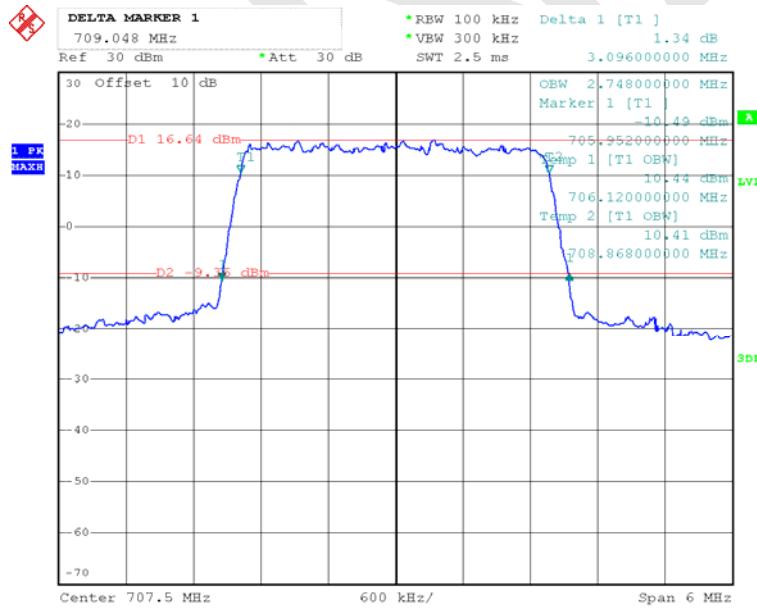
Test Modulation	Test Bandwidth	Test Channel	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	1.4M	Middle	1.110	1.320
	3M		2.748	3.096
	5M		4.540	4.988
	10M		9.120	10.280
16-QAM	1.4M	Middle	1.104	1.296
	3M		2.760	3.084
	5M		4.540	5.060
	10M		9.120	10.320

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

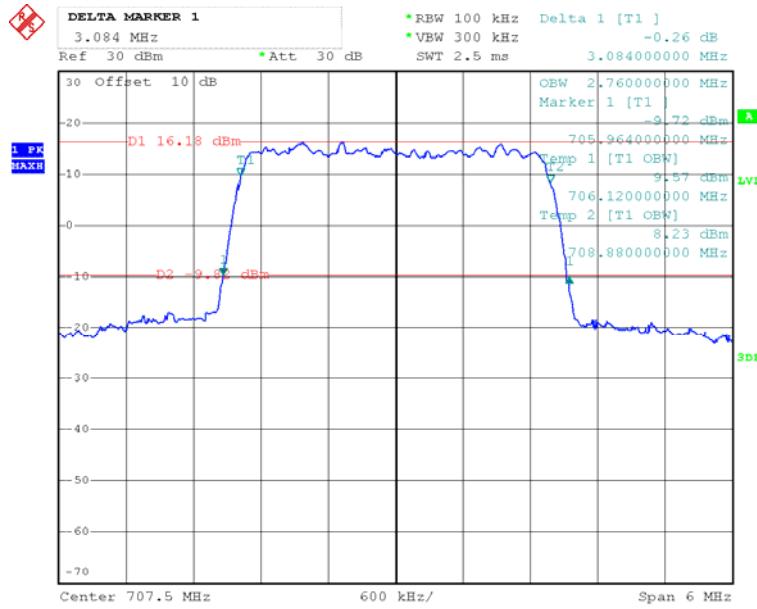
Date: 31.MAY.2016 17:07:55

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

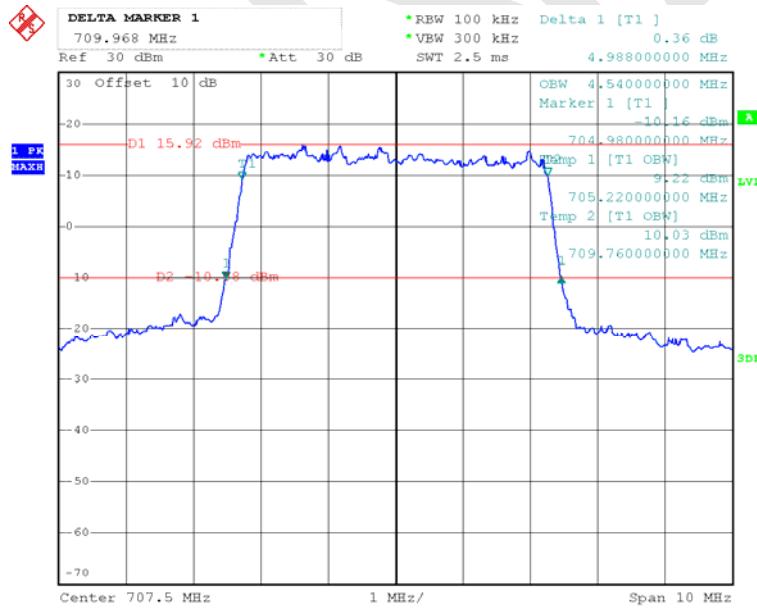
Date: 31.MAY.2016 17:09:52

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

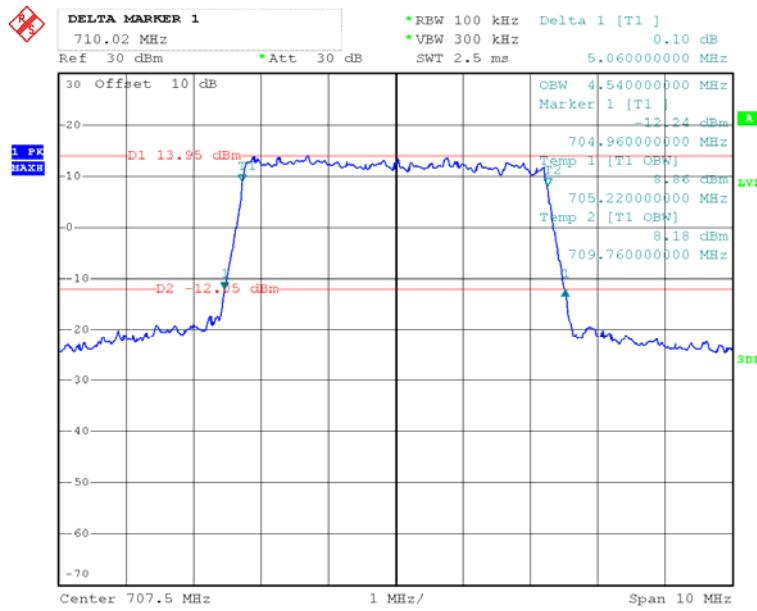
Date: 31.MAY.2016 17:12:18

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

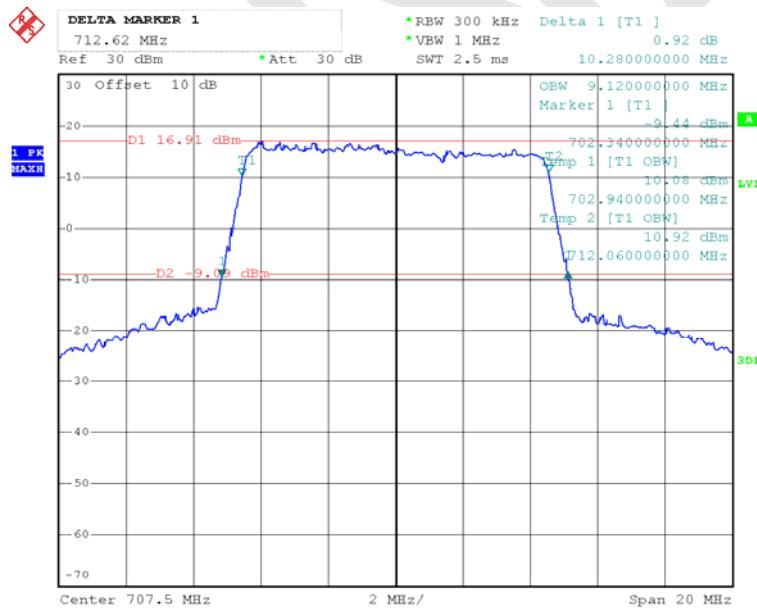
Date: 31.MAY.2016 17:15:02

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

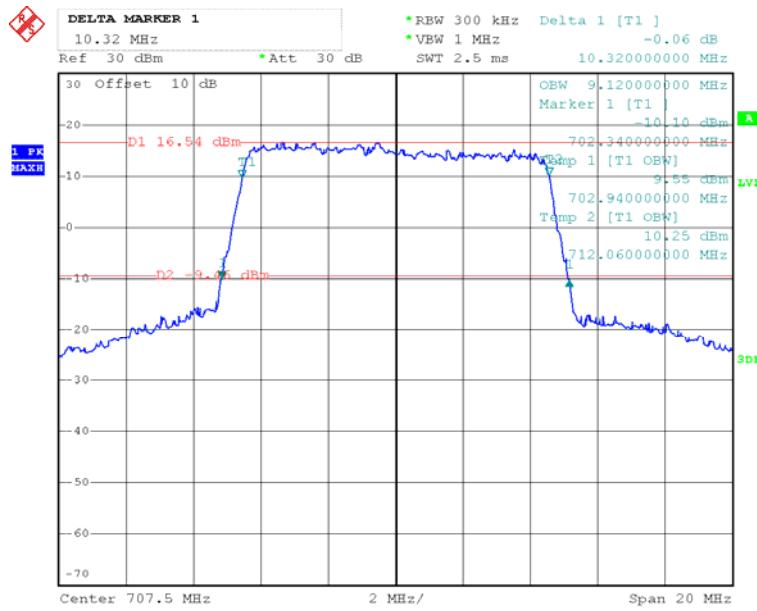
Date: 31.MAY.2016 17:16:57

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

Date: 31.MAY.2016 17:19:27

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

Date: 31.MAY.2016 17:21:43

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

Date: 31.MAY.2016 19:54:09

## § 2.1051; § 22.917 (a);§ 24.238 (a); §27.53 (h)(m) SPURIOUS EMISSIONS AT ANTENNA TERMINALS

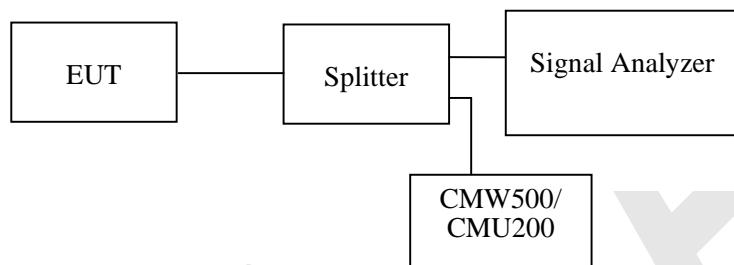
### Applicable Standards

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891	2015-11-23	2016-11-23
R&S	Wideband Radio Communication tester	CMW500	1201.002K50-146520-wh	2015-11-23	2016-11-23
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

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

## Test Data

### Environmental Conditions

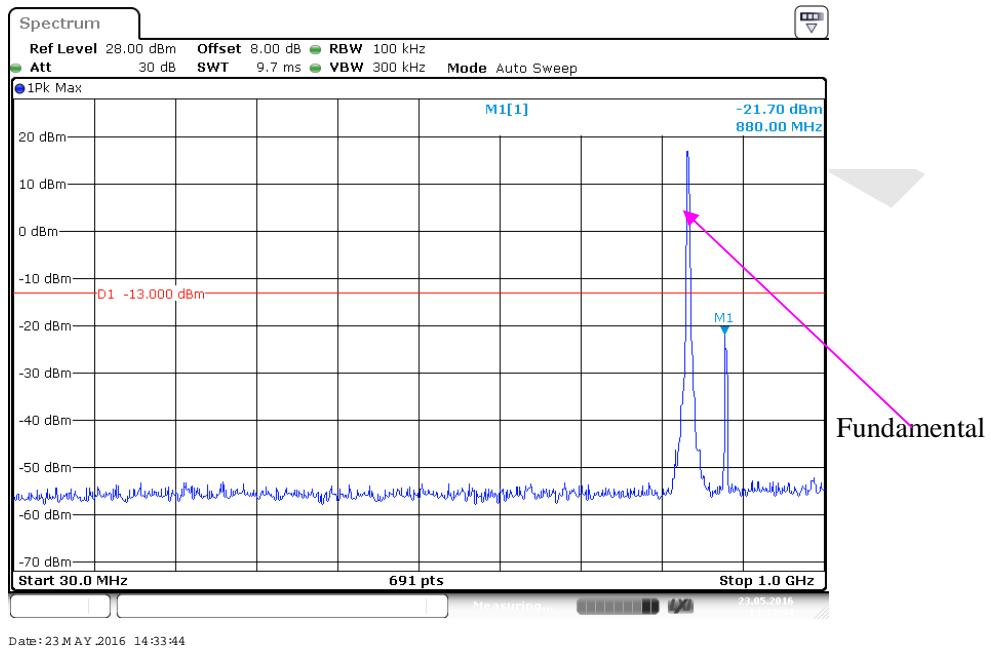
Temperature:	20~23 °C
Relative Humidity:	48~50 %
ATM Pressure:	100.5~101.0kPa

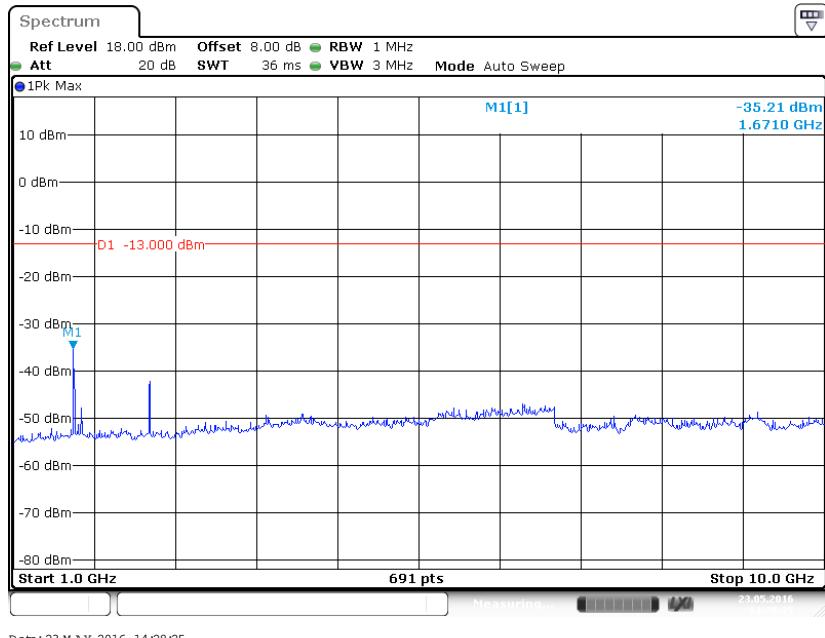
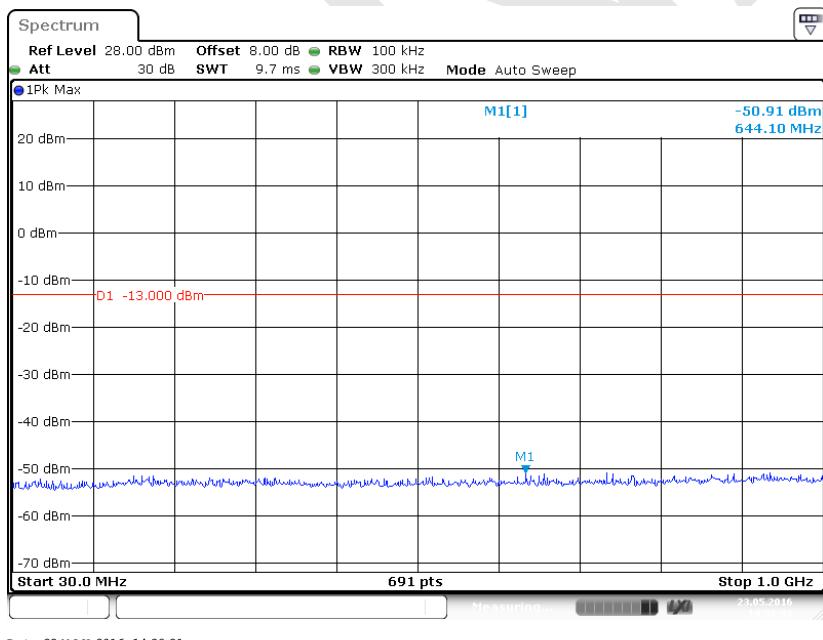
The testing was performed by David. Hsu on 2016-05-23&2016-05-31.

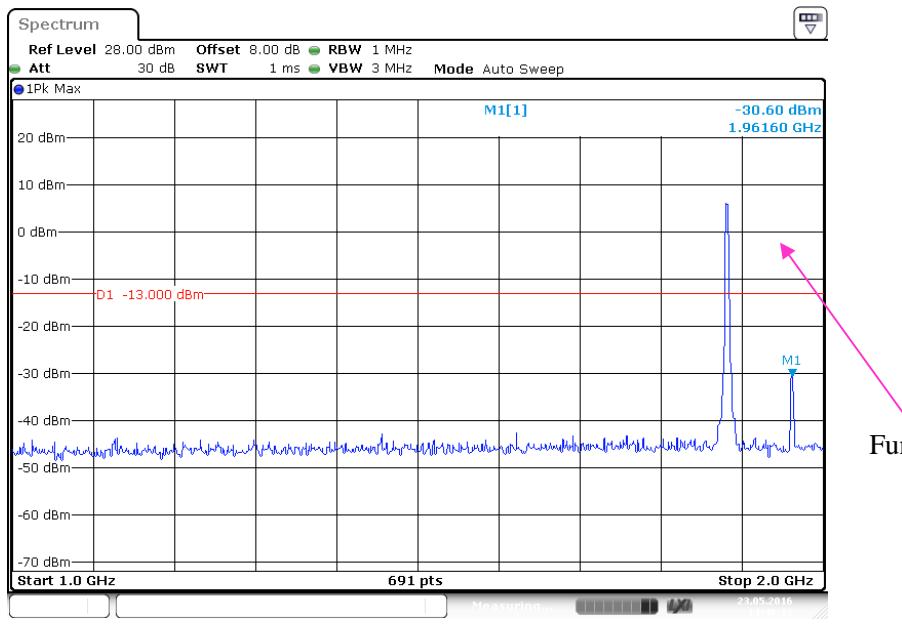
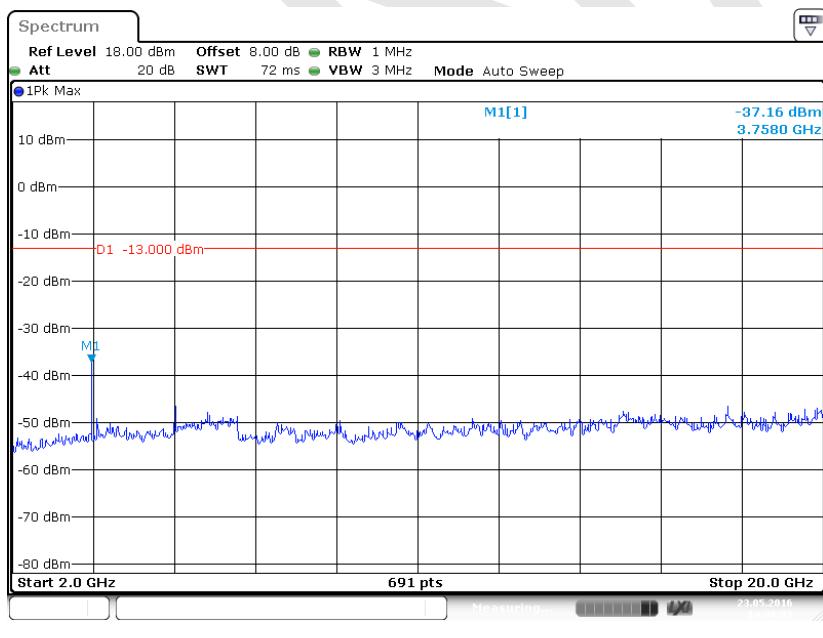
Please refer to the following plots.

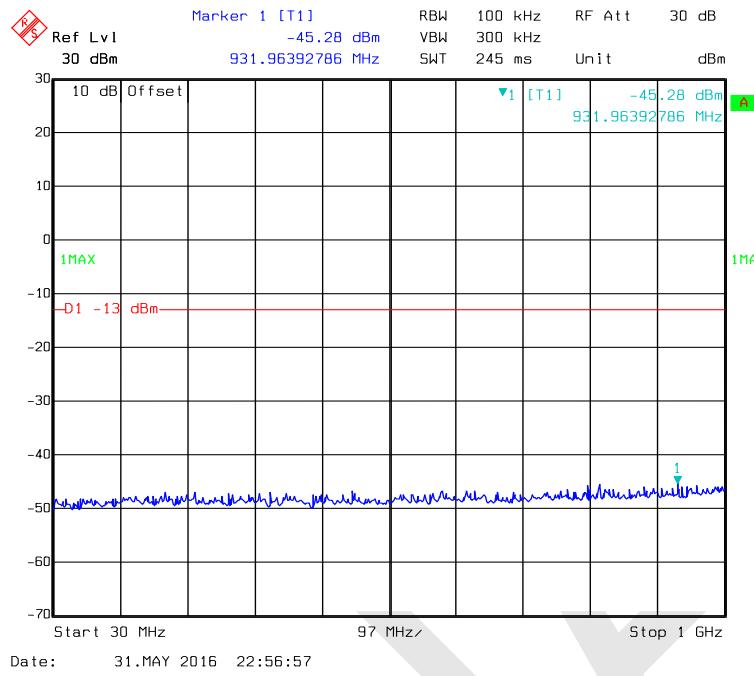
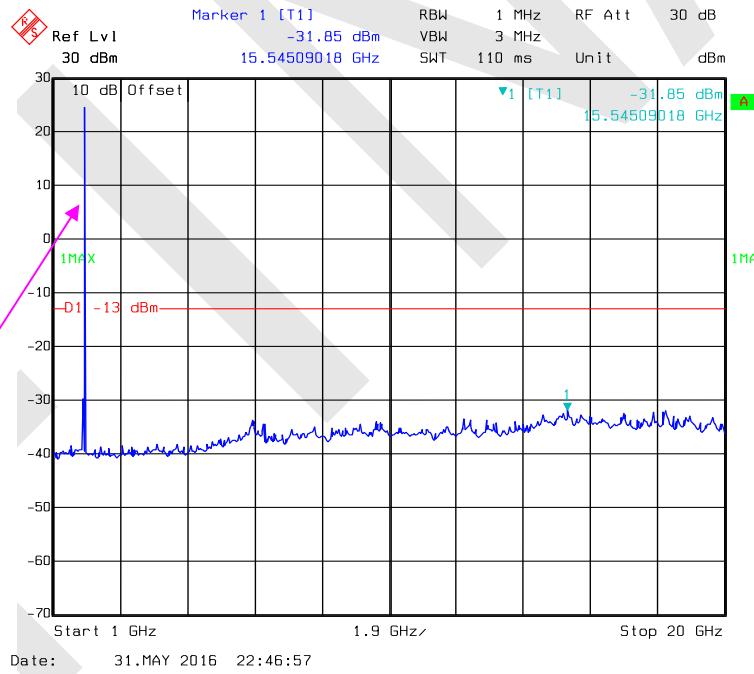
### Cellular Band (Part 22H)

#### 30 MHz – 1GHz(WCDMA Mode)

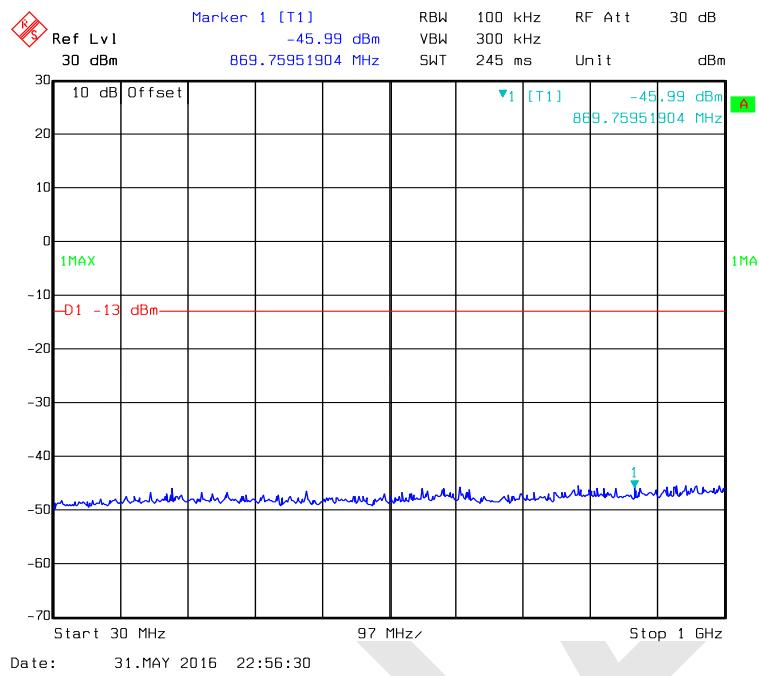
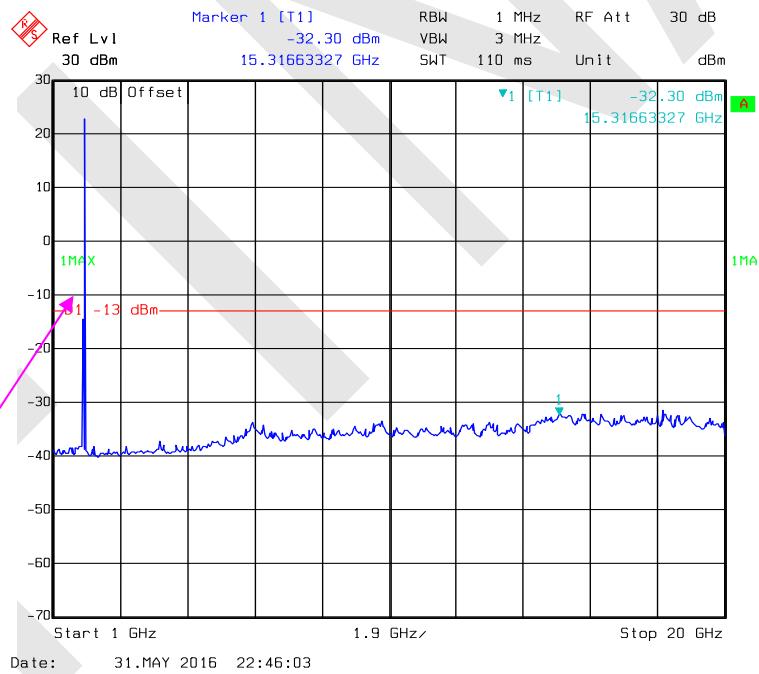


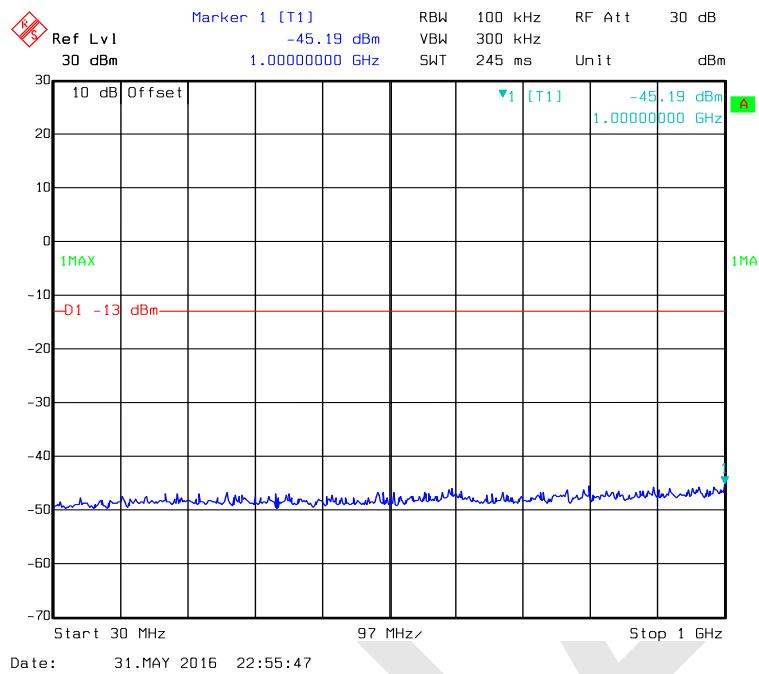
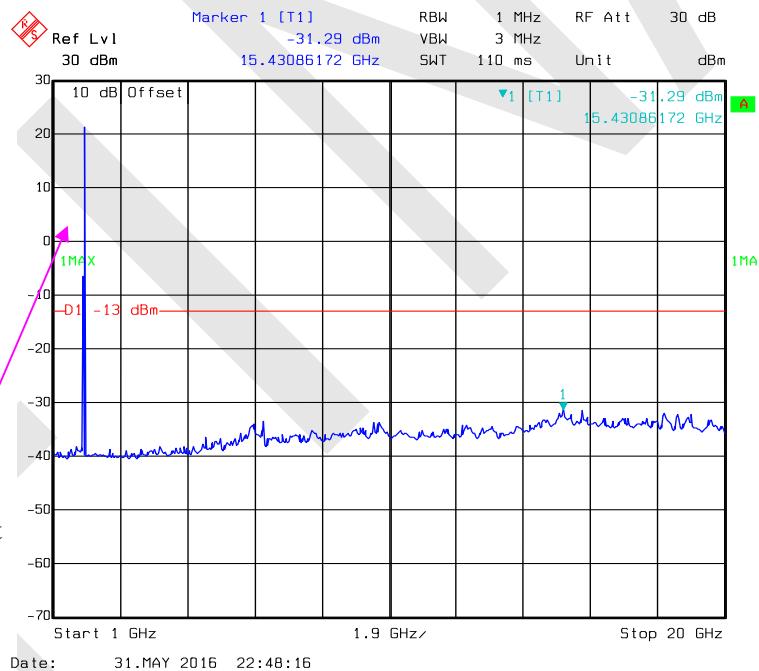
**1 GHz – 10 GHz (WCDMA Mode)****PCS Band (Part 24E)****30 MHz – 1 GHz (WCDMA Mode)**

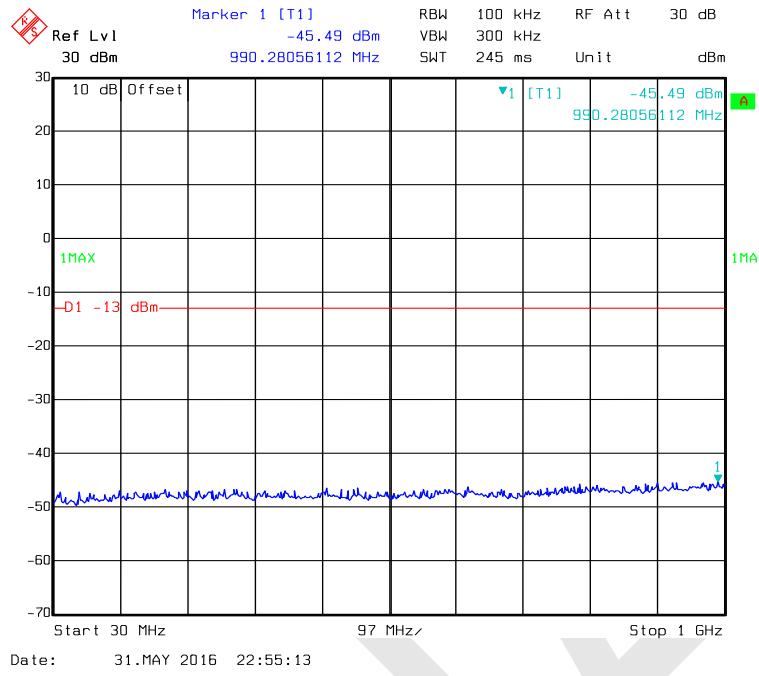
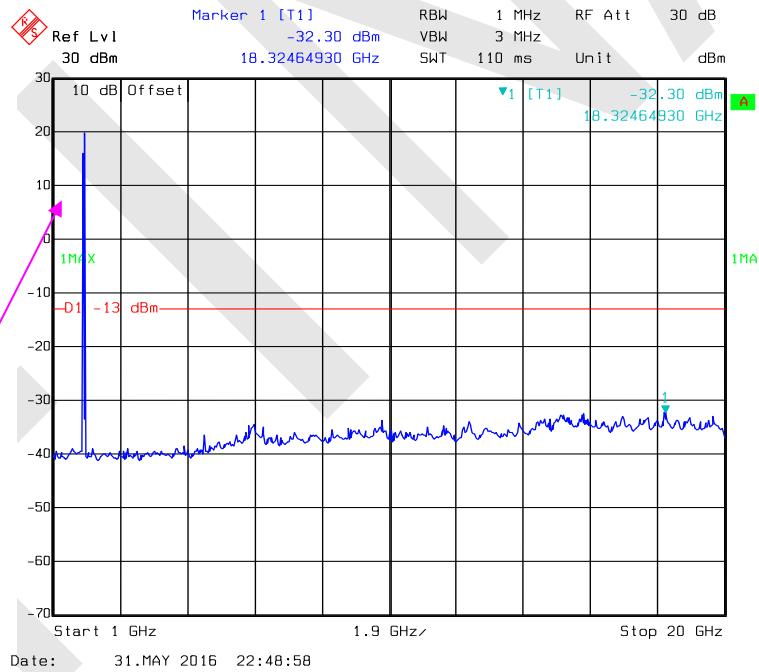
**1 GHz – 2 GHz (WCDMA Mode)****2 GHz – 20 GHz (WCDMA Mode)**

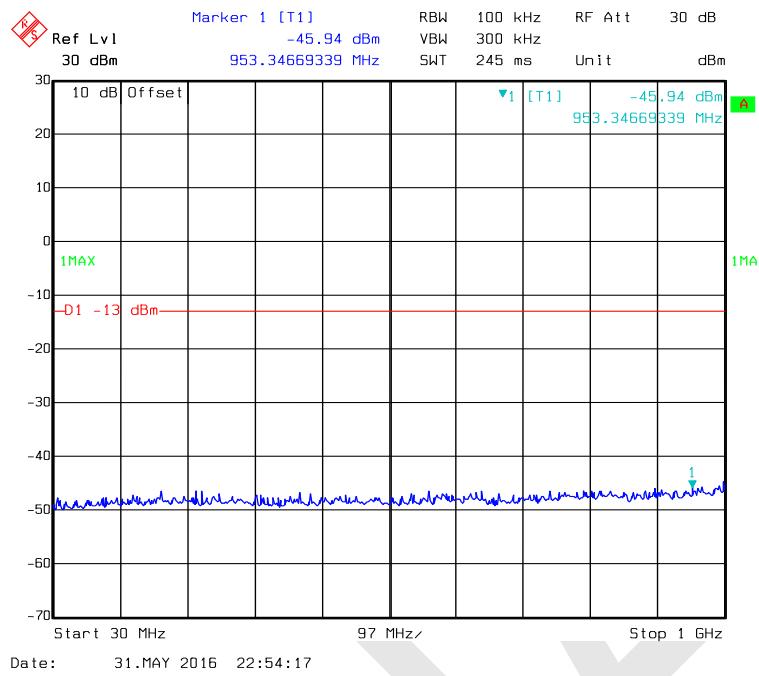
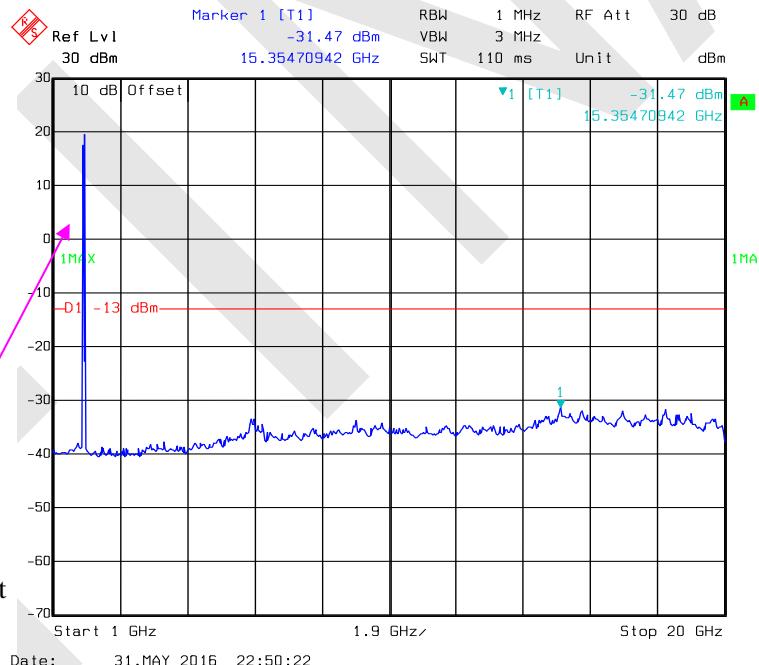
**LTE Band II:****30 MHz - 1 GHz (1.4 MHz, Middle Channel)****1 GHz – 20 GHz (1.4 MHz, Middle Channel)**

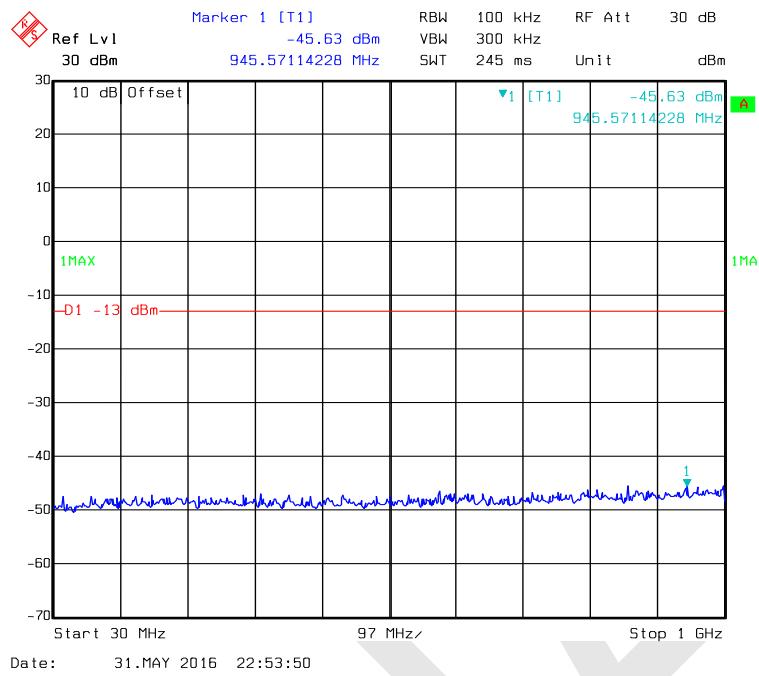
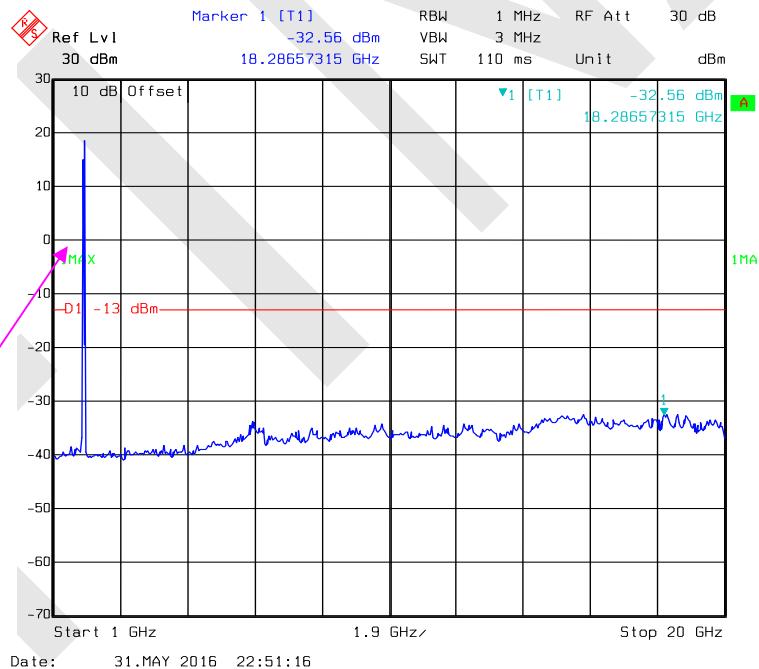
Fundamental test

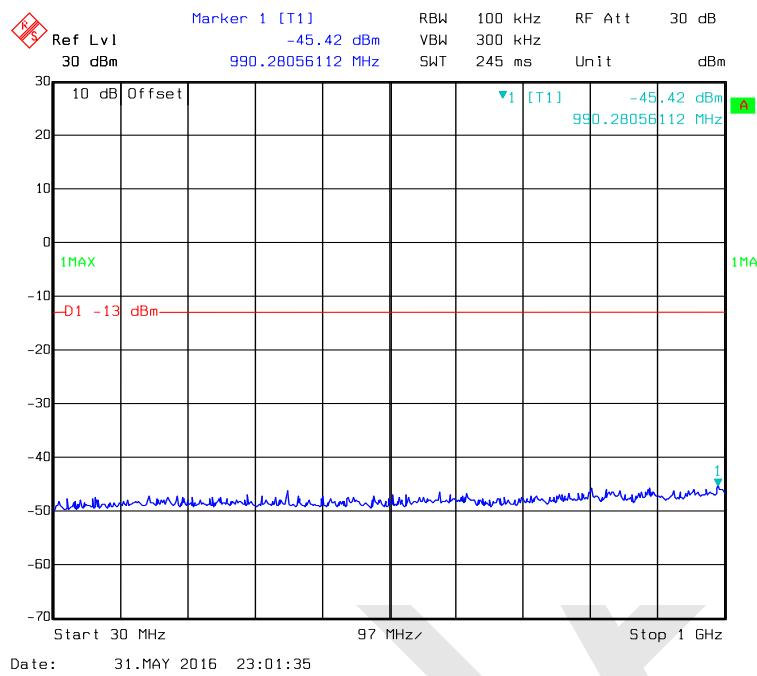
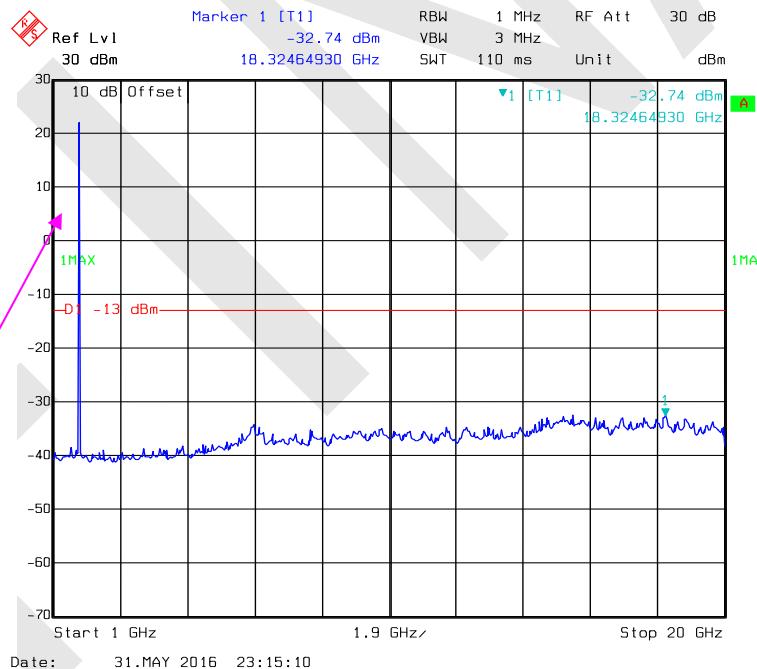
**30 MHz - 1 GHz (3.0 MHz, Middle Channel)****1 GHz – 20 GHz (3.0 MHz, Middle Channel)**

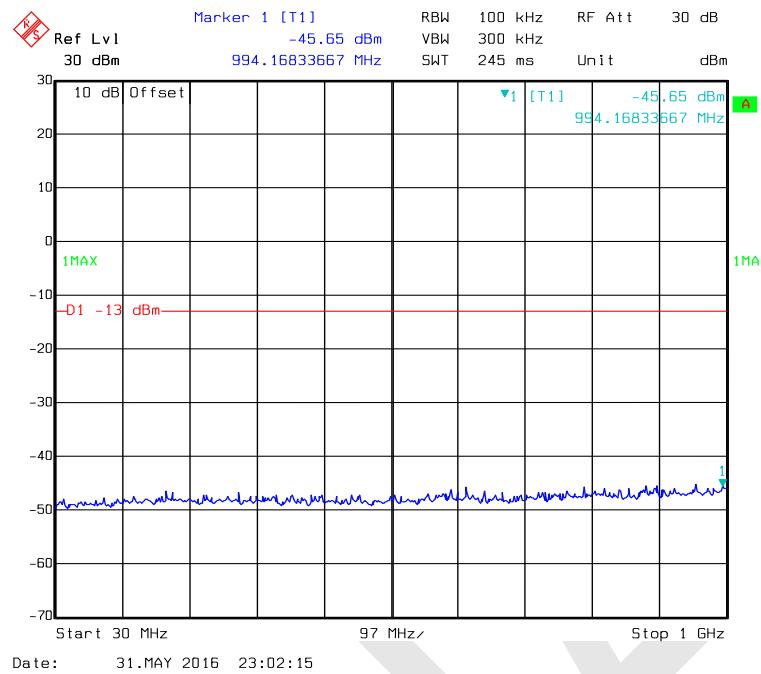
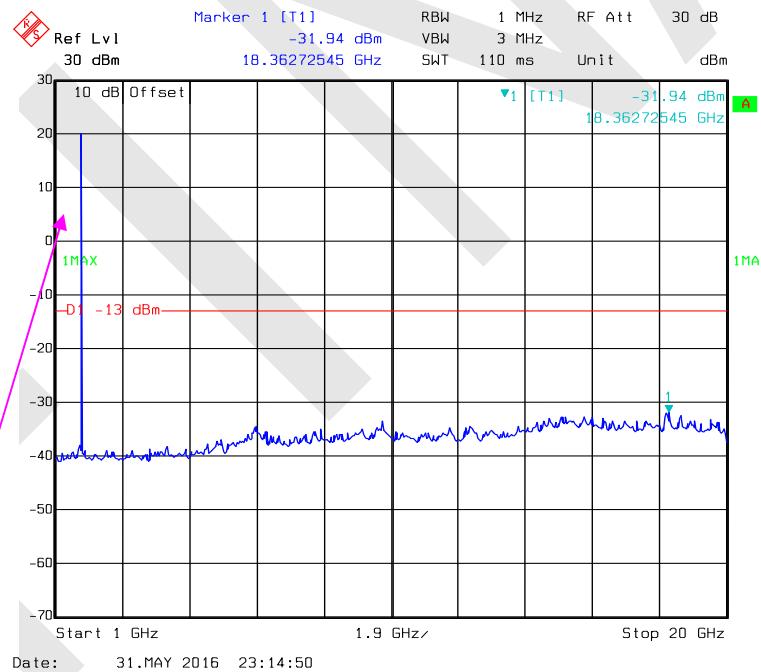
**30 MHz - 1 GHz (5.0 MHz, Middle Channel)****1 GHz – 20 GHz (5.0 MHz, Middle Channel)**

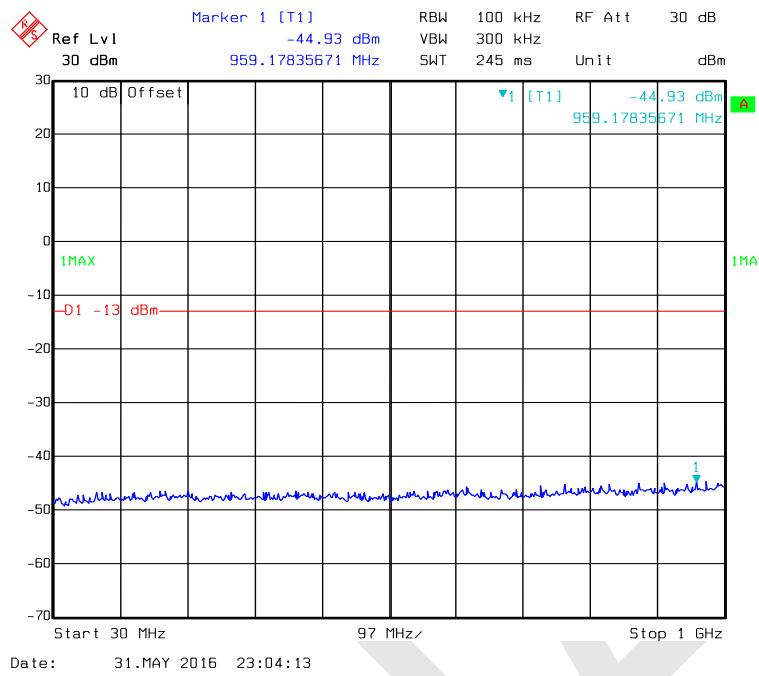
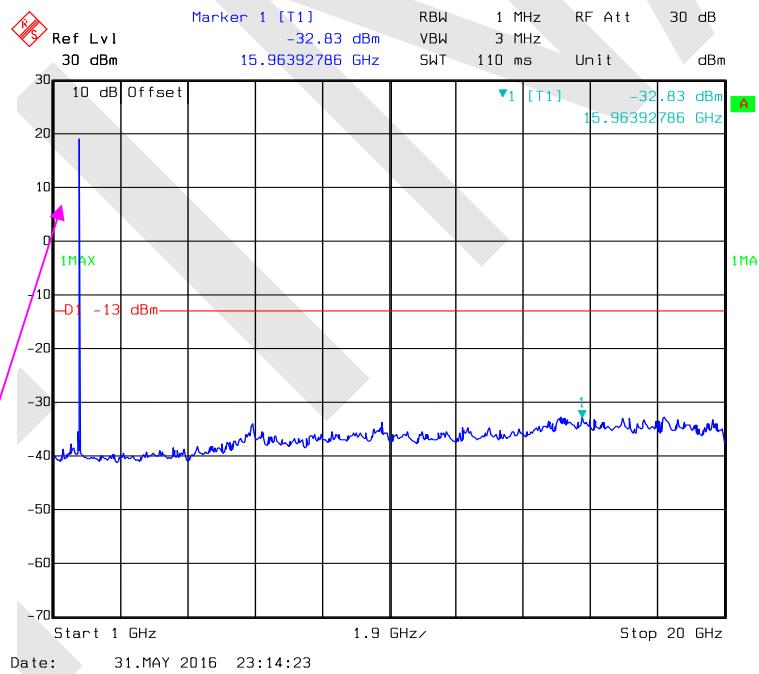
**30 MHz - 1 GHz (10.0 MHz, Middle Channel)****1 GHz – 20 GHz (10.0 MHz, Middle Channel)**

**30 MHz - 1 GHz (15.0 MHz, Middle Channel)****1 GHz –20 GHz (15.0 MHz, Middle Channel)**

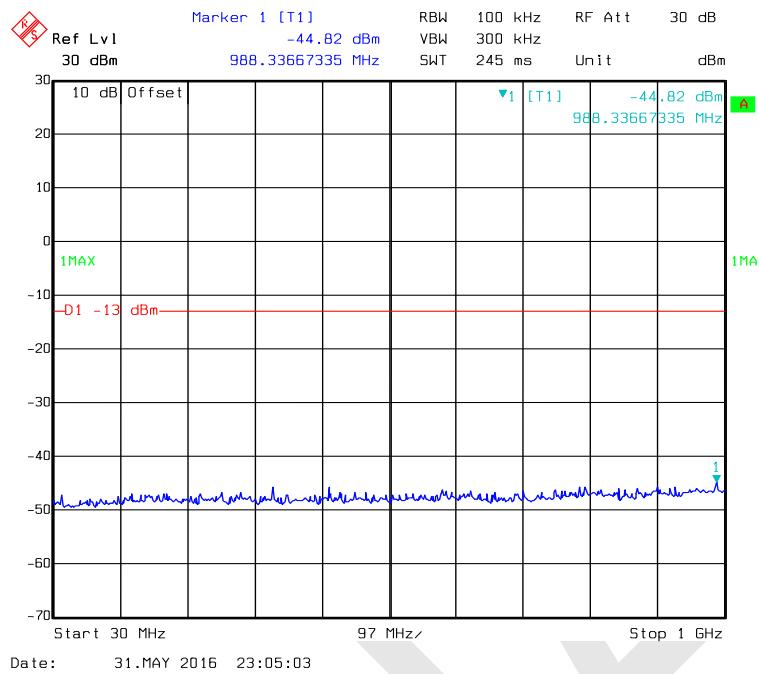
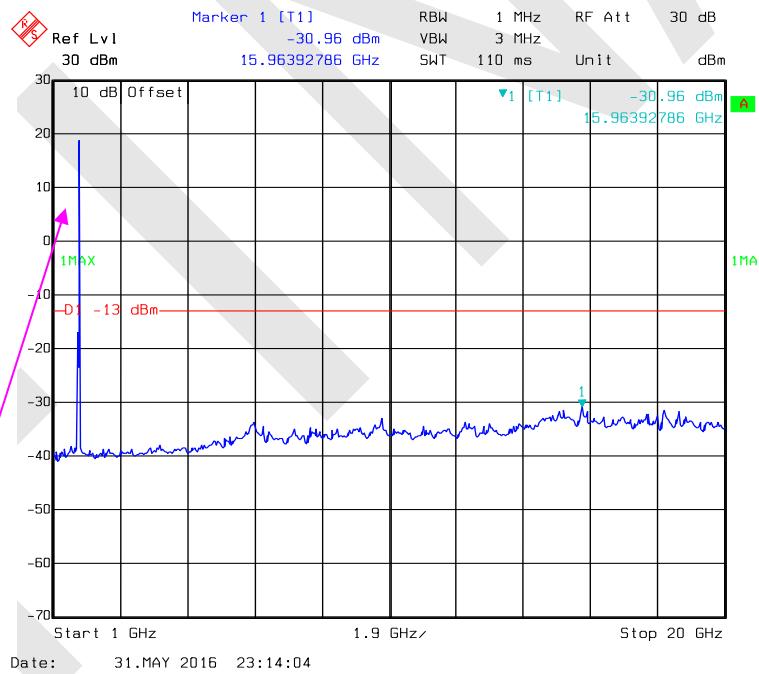
**30 MHz - 1 GHz (20.0 MHz, Middle Channel)****1 GHz -20 GHz (20.0 MHz, Middle Channel)**

**LTE Band IV:****30 MHz - 1 GHz (1.4 MHz, Middle Channel)****1 GHz – 20 GHz (1.4 MHz, Middle Channel)**

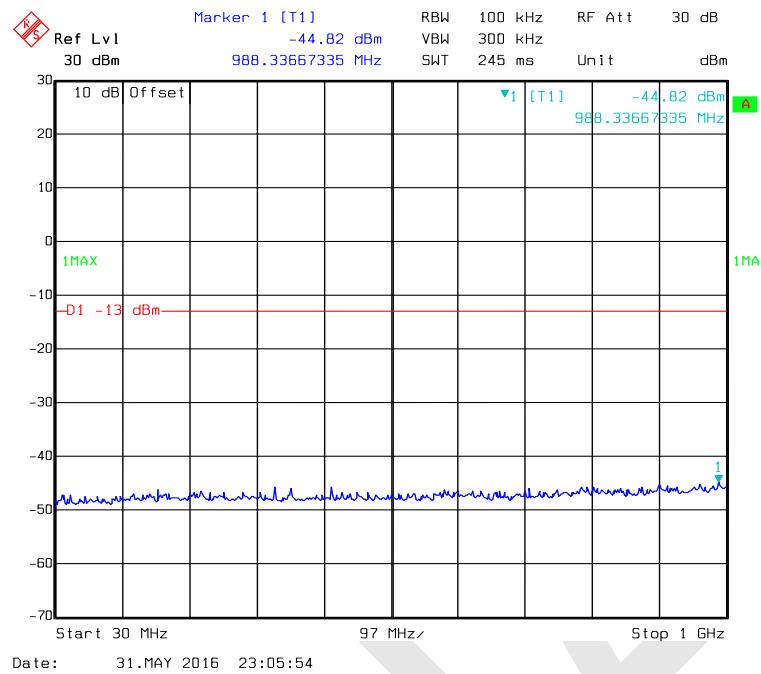
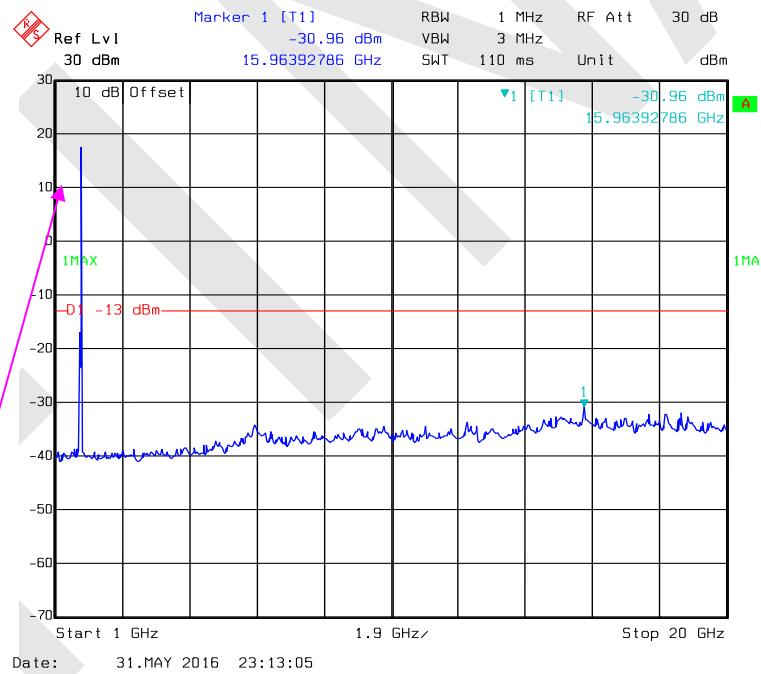
**30 MHz - 1 GHz (3.0 MHz, Middle Channel)****1 GHz – 20 GHz (3.0 MHz, Middle Channel)**

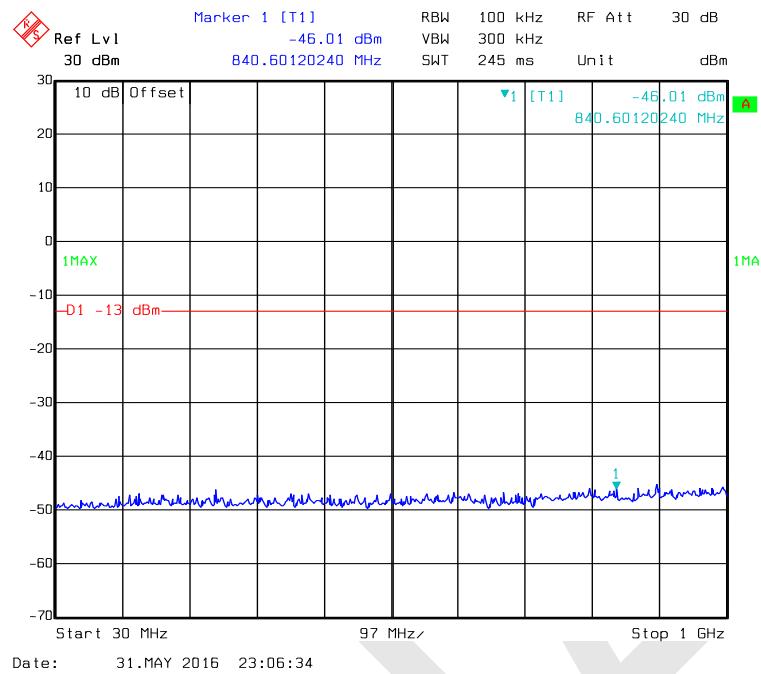
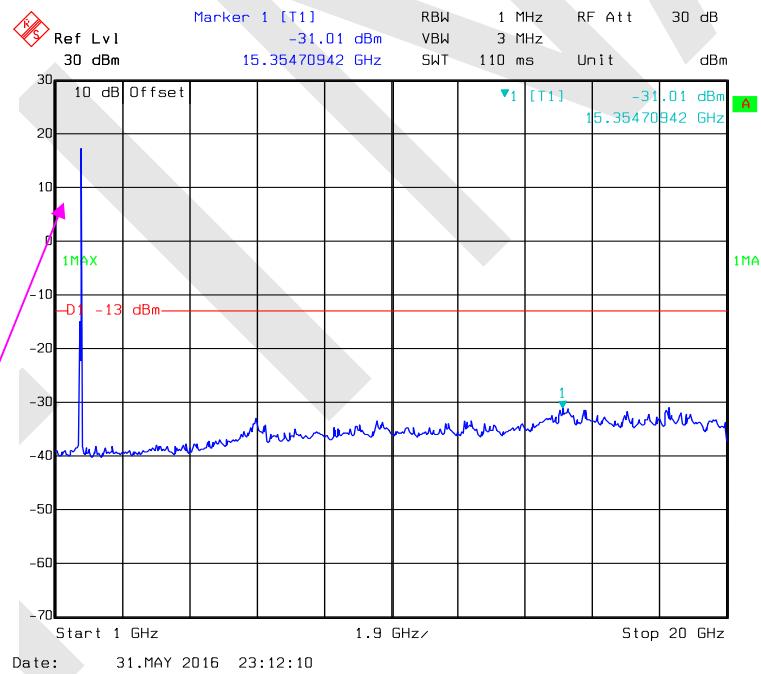
**30 MHz - 1 GHz (5.0 MHz, Middle Channel)****1 GHz – 20 GHz (5.0 MHz, Middle Channel)**

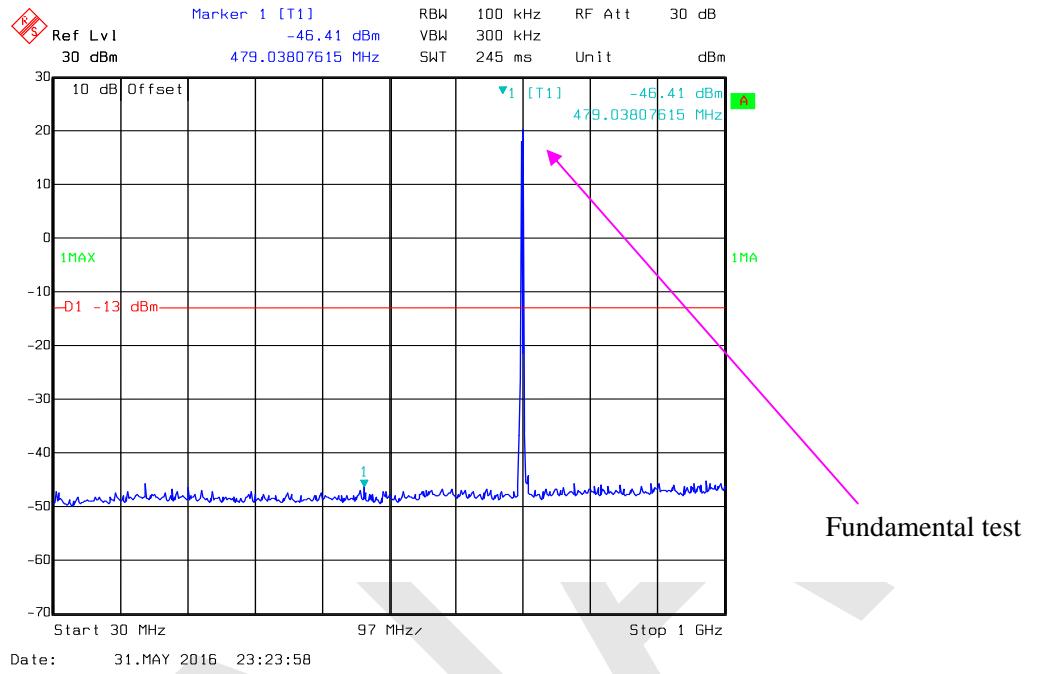
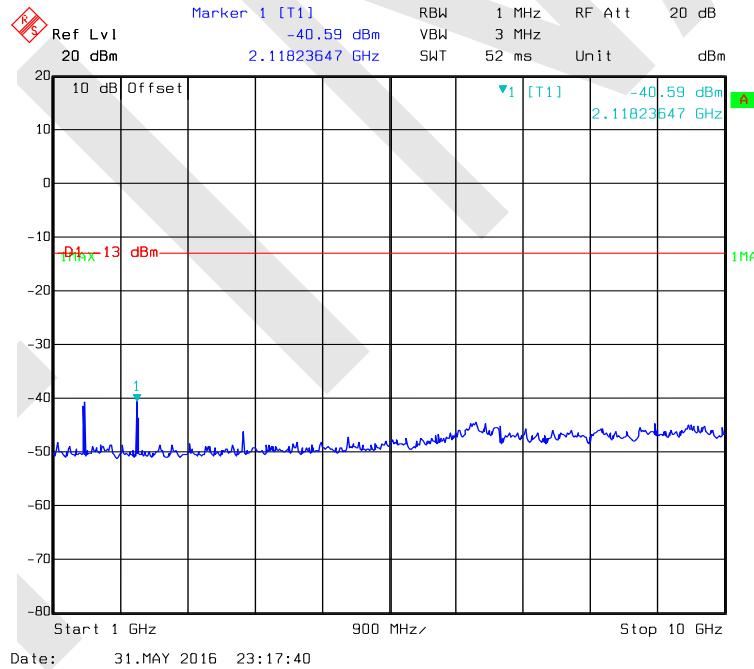
Fundamental test

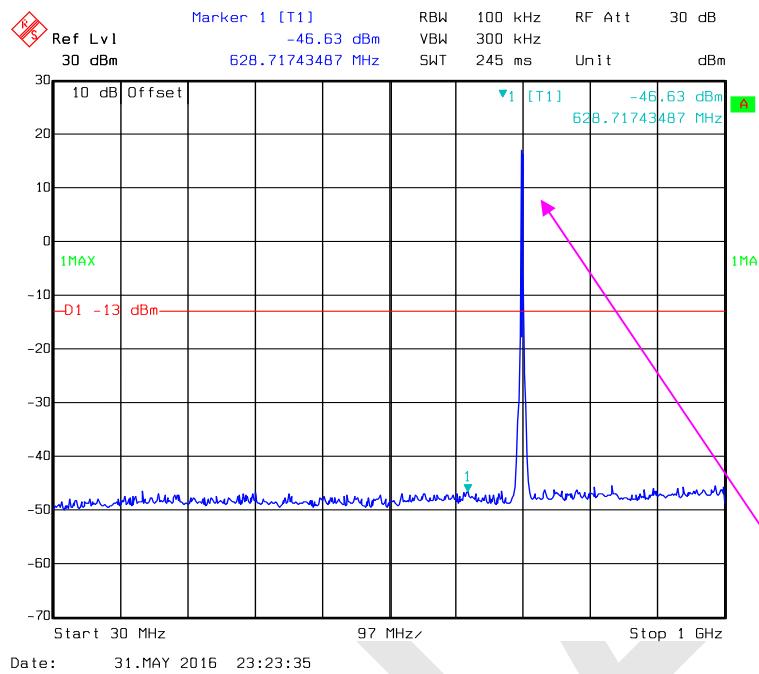
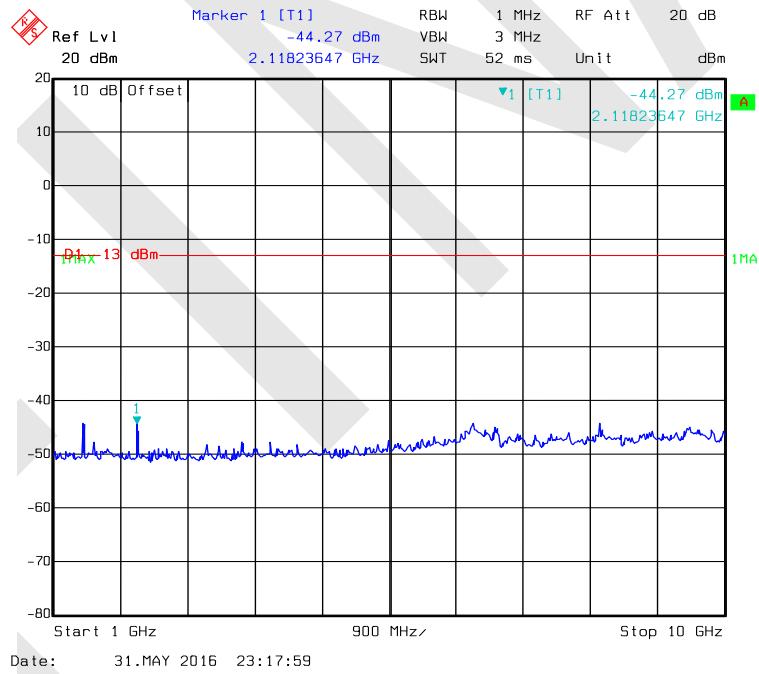
**30 MHz - 1 GHz (10.0 MHz, Middle Channel)****1 GHz –20 GHz (10.0 MHz, Middle Channel)**

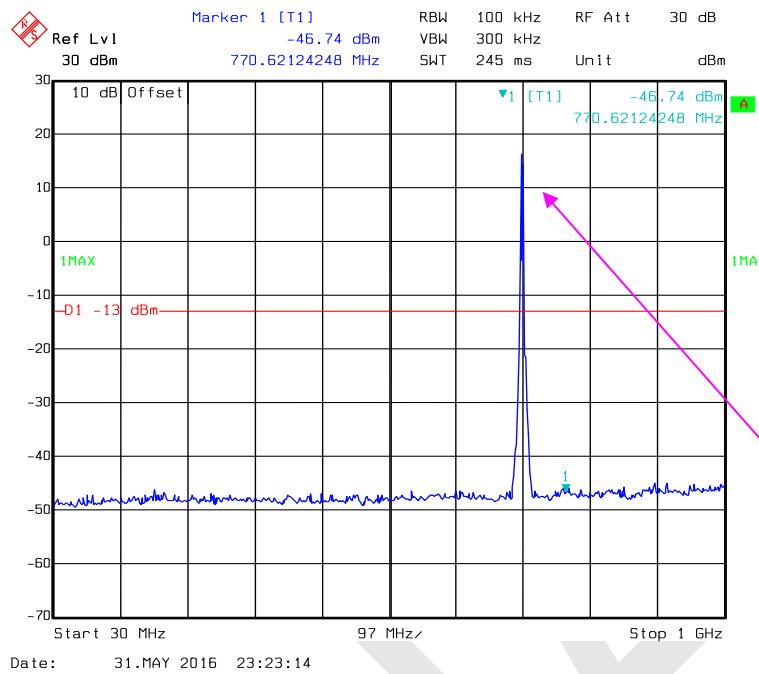
Fundamental test

**30 MHz - 1 GHz (15.0 MHz, Middle Channel)****1 GHz –20 GHz (15.0 MHz, Middle Channel)**

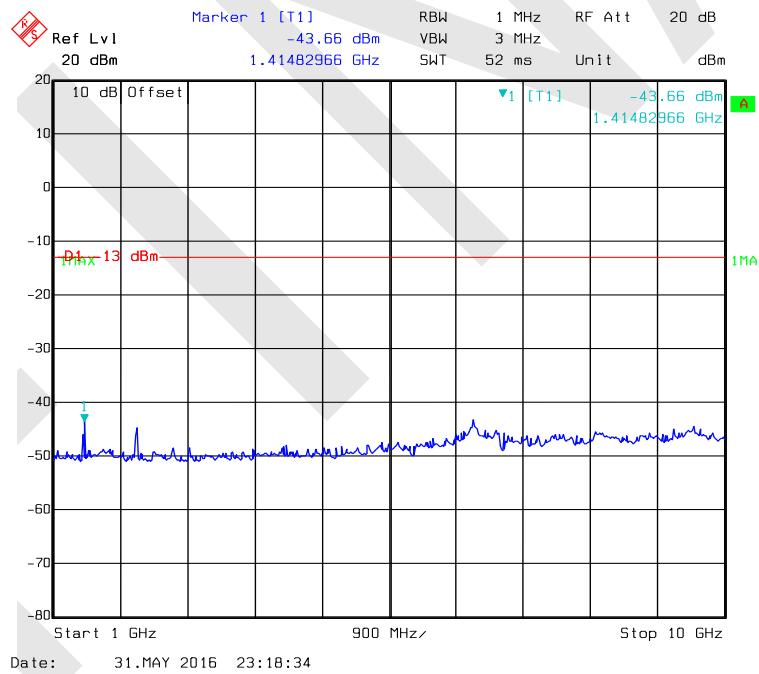
**30 MHz - 1 GHz (20.0 MHz, Middle Channel)****1 GHz –20 GHz (20.0 MHz, Middle Channel)**

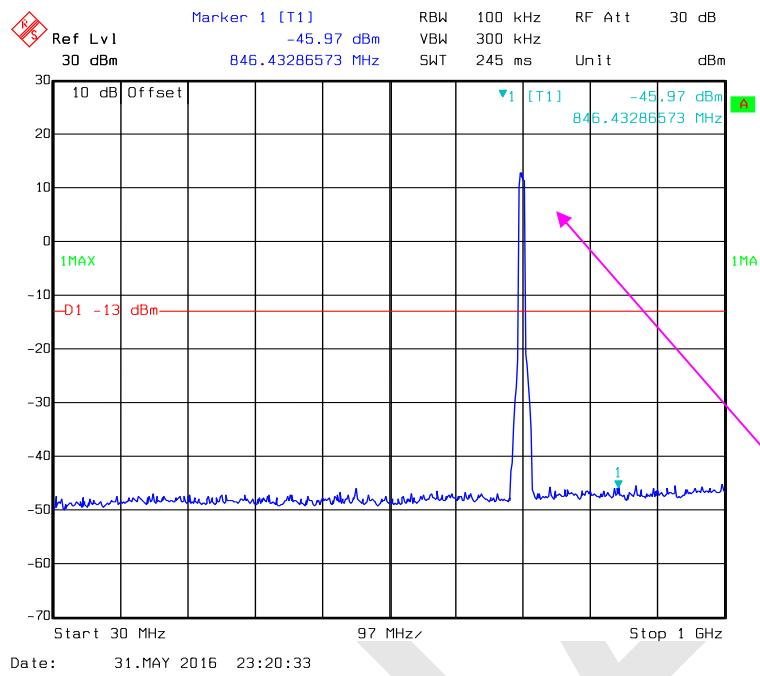
**LTE Band XII:****30 MHz - 1 GHz (1.4 MHz, Middle Channel)****1 GHz – 10 GHz (1.4 MHz, Middle Channel)**

**30 MHz - 1 GHz (3.0 MHz, Middle Channel)****1 GHz – 10 GHz (3.0 MHz, Middle Channel)**

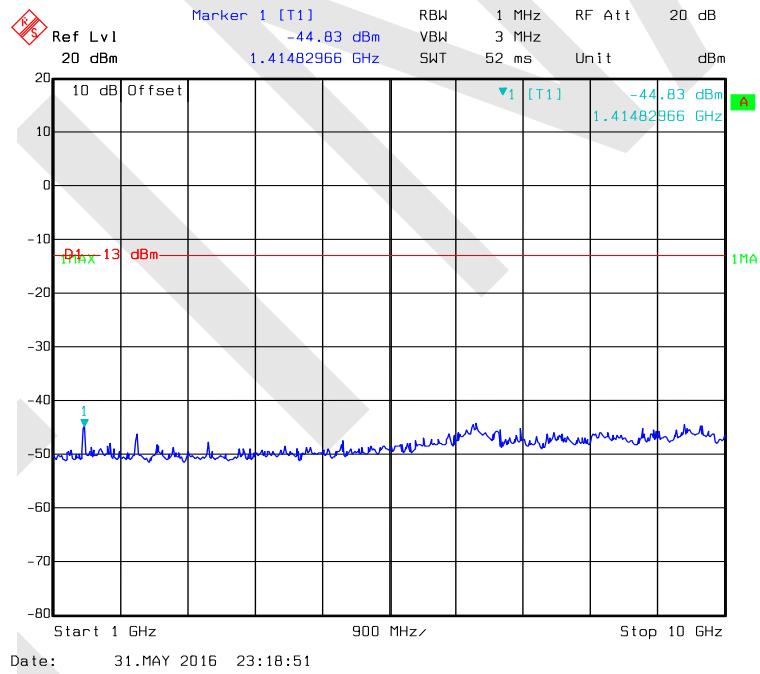
**30 MHz - 1 GHz (5.0 MHz, Middle Channel)**

Fundamental test

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

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

Fundamental test

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

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

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

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

**Test Procedure**

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

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

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

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

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

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

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Sonoma	Amplifier	310N	130601	2015-07-02	2016-07-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100540	2015-07-25	2016-07-24
Sunol Sciences	Broadband Antenna	JB6	A050115	2015-06-15	2016-06-14
Mini	Amplifier	ZVA-213-S+	460901516	2015-08-21	2016-08-21
EMCO	Horn Antenna	3115	9311-4158	2015-05-08	2016-05-07
ETS	Horn Antenna	3115	6431	2015-11-07	2016-11-06
Rohde & Schwarz	Spectrum Analyzer	FSU 26	200268	2015-07-29	2016-08-28
EMCO	Turn Table	2081-1.21	9709-1885	N.C.R	N.C.R
EMCO	Antenna Tower	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
R&S	Software	EMC32	V9.10.00	NCR	NCR
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-12-16	2016-12-15

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

## Test Data

### Environmental Conditions

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

The testing was performed by David. Hsu on 2016-05-04&2016-05-31.

Test mode: Transmitting

*Test mode: Transmitting (Pre-scan with Low, Middle, High channel, and the worse case data as below)*

**30 MHz ~ 10 GHz:**

**Cellular Band (Part 22H)**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
<b>WCDMA Mode, Middle channel</b>										
477.50	35.25	185	1.8	H	-61.66	0.47	0	-62.13	-13	49.13
477.50	36.51	165	2.3	V	-60.40	0.47	0	-60.87	-13	47.87
1673.20	37.68	120	2.0	H	-62.85	1.60	6.90	-57.55	-13	44.55
1673.20	38.78	35	2.1	V	-61.75	1.60	6.90	-56.45	-13	43.45

**30 MHz ~ 20 GHz:**

**PCS Band (Part 24E)**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 24E	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
<b>WCDMA Mode, Middle channel</b>										
477.50	34.84	202	1.8	H	-62.07	0.47	0	-62.54	-13	49.54
477.50	36.35	89	2.0	V	-60.56	0.47	0	-61.03	-13	48.03
3760.00	46.68	255	1.9	H	-56.55	1.90	9.90	-48.55	-13	35.55
3760.00	47.83	235	2.2	V	-55.40	1.90	9.90	-47.40	-13	34.40

*Test mode: Transmitting (Pre-scan with all the bandwidth, and worse case as below)*

### LTE Band II:

#### QPSK

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>QPSK 1.4MHz Bandwidth Middle Channel</b>								
3760.000	H	45.21	-49.1	13.8	2.9	-38.2	-13.0	25.2
3760.000	V	48.56	-44.5	13.8	2.9	-33.6	-13.0	20.6
5640.000	H	44.35	-47.3	14.0	2.1	-35.4	-13.0	22.4
5640.000	V	47.82	-43.8	14.0	2.1	-31.9	-13.0	18.9
291.500	H	36.09	-71.5	0.0	0.5	-72.0	-13.0	59.0
273.800	V	37.46	-67.9	0.0	0.5	-68.4	-13.0	55.4

#### 16-QAM

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>16-QAM 1.4MHz Bandwidth Middle Channel</b>								
3760.000	H	44.71	-49.6	13.8	2.9	-38.7	-13.0	25.7
3760.000	V	47.13	-45.9	13.8	2.9	-35.0	-13.0	22.0
5640.000	H	43.85	-47.8	14.0	2.1	-35.9	-13.0	22.9
5640.000	V	47.13	-44.5	14.0	2.1	-32.6	-13.0	19.6
291.500	H	36.28	-71.3	0.0	0.5	-71.8	-13.0	58.8
273.800	V	37.01	-68.4	0.0	0.5	-68.9	-13.0	55.9

### LTE Band IV

#### QPSK:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>QPSK 1.4MHz Bandwidth Middle Channel</b>								
3465.000	H	45.31	-51.6	13.9	1.9	-39.6	-13.0	26.6
3465.000	V	48.79	-47.4	13.9	1.9	-35.4	-13.0	22.4
5197.500	H	43.27	-47.7	14.0	2.3	-36.0	-13.0	23.0
5197.500	V	46.13	-46.4	14.0	2.3	-34.7	-13.0	21.7
241.900	H	36.18	-71.9	0.0	0.5	-72.4	-13.0	59.4
280.400	V	37.52	-67.8	0.0	0.5	-68.3	-13.0	55.3

**16-QAM:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>16-QAM 1.4MHz Bandwidth Middle Channel</b>								
3465.000	H	45.08	-51.9	13.9	1.9	-39.9	-13.0	26.9
3465.000	V	47.65	-48.5	13.9	1.9	-36.5	-13.0	23.5
5197.500	H	43.62	-47.4	14.0	2.3	-35.7	-13.0	22.7
5197.500	V	45.97	-46.6	14.0	2.3	-34.9	-13.0	21.9
241.900	H	36.61	-71.5	0.0	0.5	-72.0	-13.0	59.0
280.400	V	37.48	-67.8	0.0	0.5	-68.3	-13.0	55.3

**LTE Band XII:****QPSK:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>QPSK 1.4MHz Bandwidth Middle Channel</b>								
1415.000	H	47.61	-53.2	9.0	1.3	-45.5	-13.0	32.5
1415.000	V	49.13	-51.4	9.0	1.3	-43.7	-13.0	30.7
2122.500	H	45.12	-50.8	11.2	1.4	-41.0	-13.0	28.0
2122.500	V	46.34	-48.3	11.2	1.4	-38.5	-13.0	25.5
260.700	H	36.89	-71.1	0.0	0.5	-71.6	-13.0	58.6
299.400	V	37.60	-67.4	0.0	0.5	-67.9	-13.0	54.9

**16-QAM:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>16-QAM 1.4MHz Bandwidth Middle Channel</b>								
1415.000	H	44.87	-56	9.0	1.3	-48.3	-13.0	35.3
1415.000	V	46.70	-53.9	9.0	1.3	-46.2	-13.0	33.2
2122.500	H	43.13	-52.8	11.2	1.4	-43.0	-13.0	30.0
2122.500	V	44.06	-50.6	11.2	1.4	-40.8	-13.0	27.8
260.700	H	36.41	-71.6	0.0	0.5	-72.1	-13.0	59.1
299.400	V	37.25	-67.7	0.0	0.5	-68.2	-13.0	55.2

Note:

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

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

### Applicable Standards

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

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

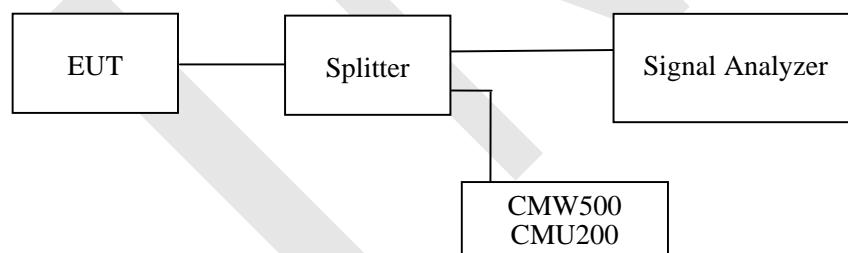
According to FCC §27.53 (h)(m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

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

### 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 Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891	2015-11-23	2016-11-23
R&S	Wideband Radio Communication tester	CMW500	1201.002K50-146520-wh	2015-11-23	2016-11-23
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

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

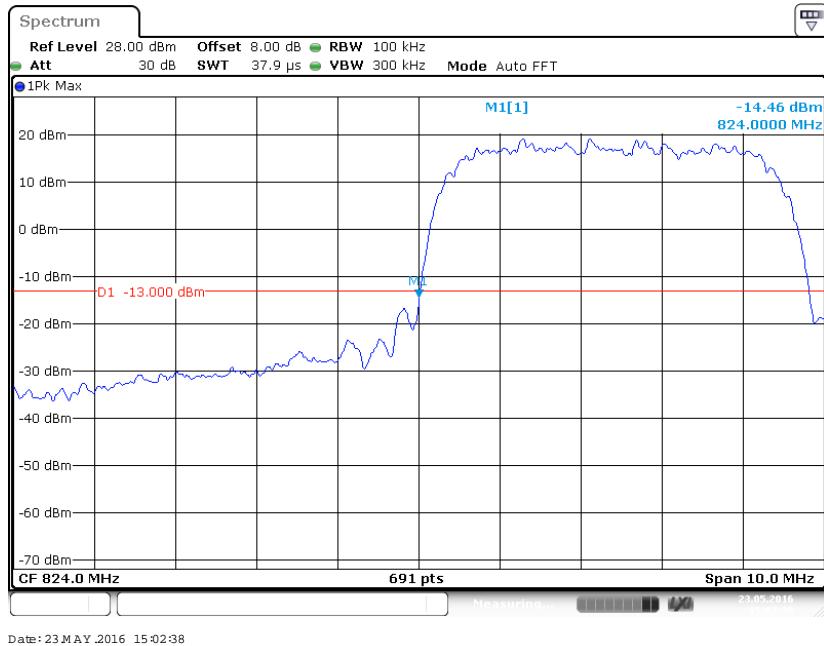
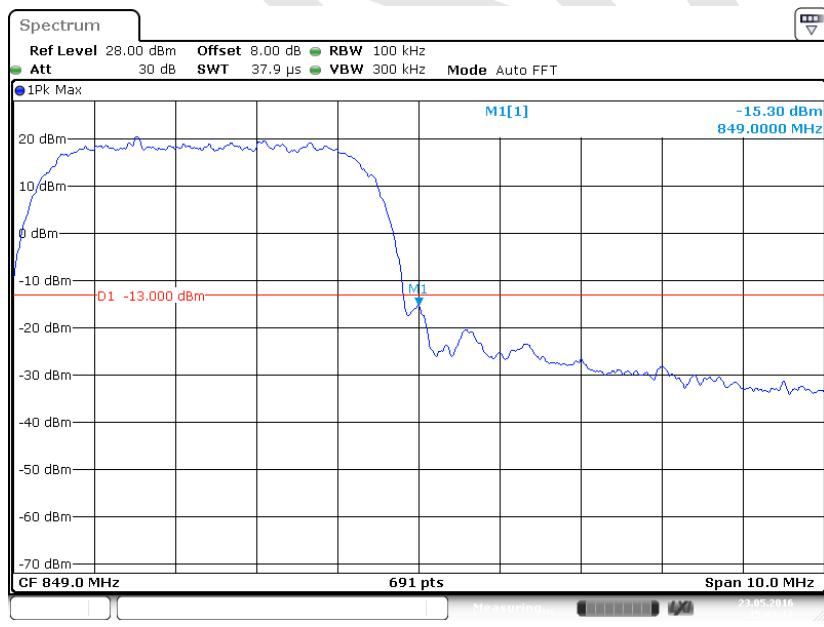
**Test Data****Environmental Conditions**

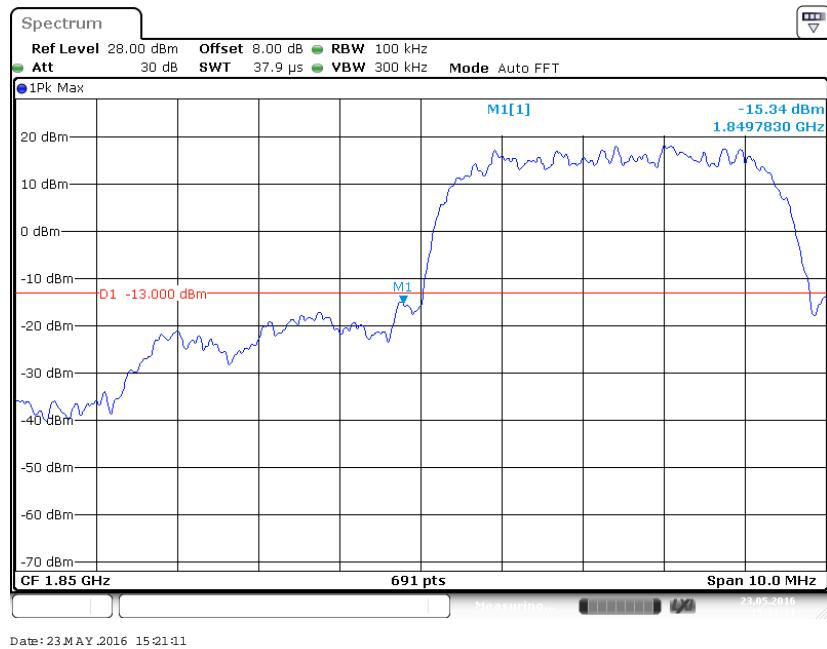
<b>Temperature:</b>	20~23 °C
<b>Relative Humidity:</b>	48~52 %
<b>ATM Pressure:</b>	100.5~101.0kPa

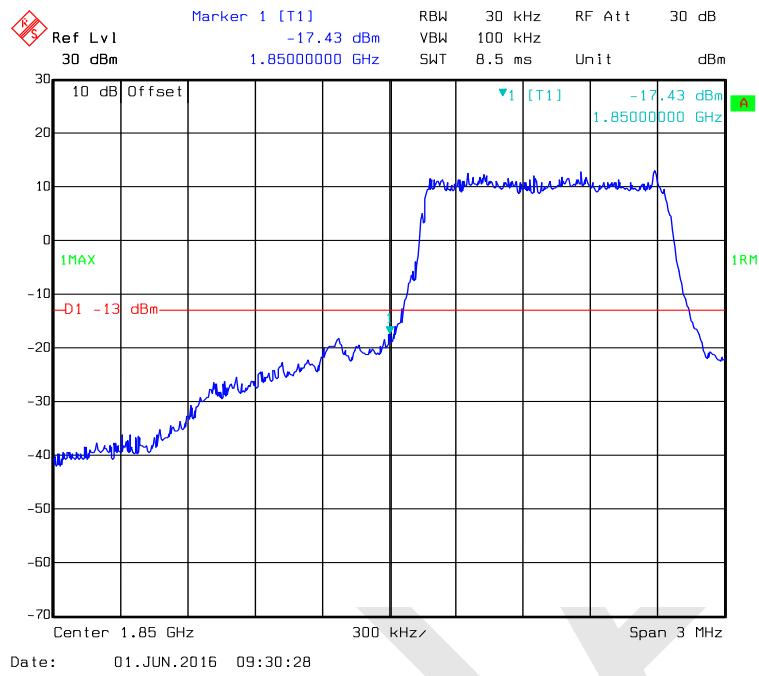
The testing was performed by David. Hsu on 2016-05-23&2016-06-01&2016-06-29.

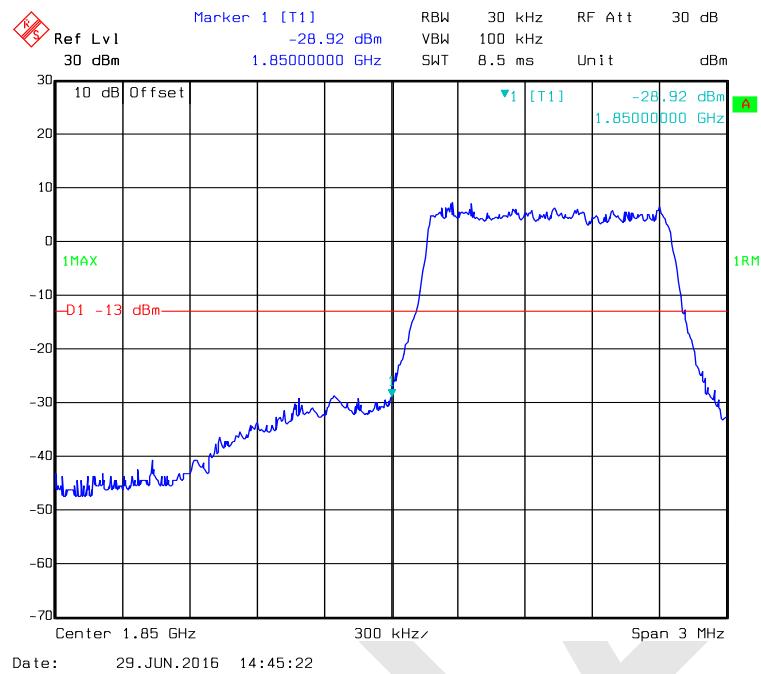
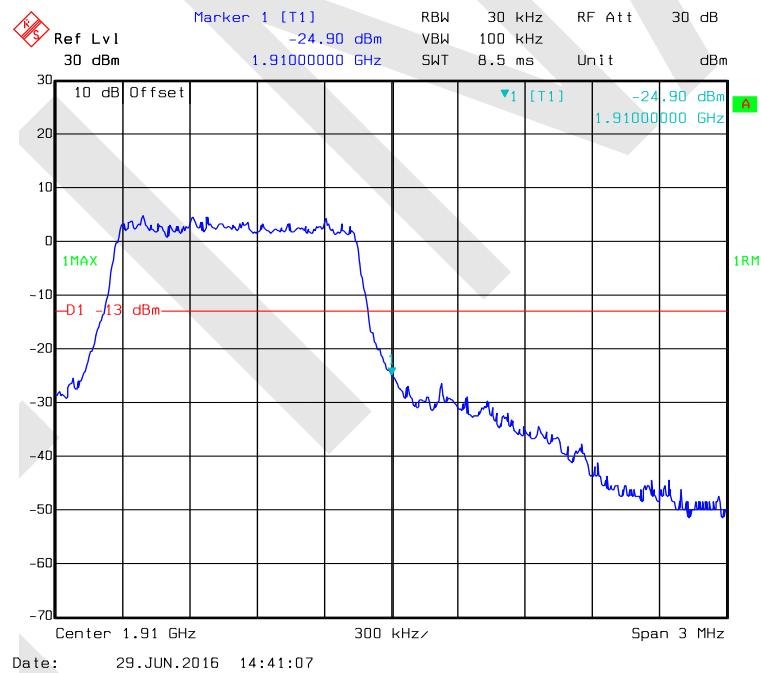
EUT operation mode: Transmitting

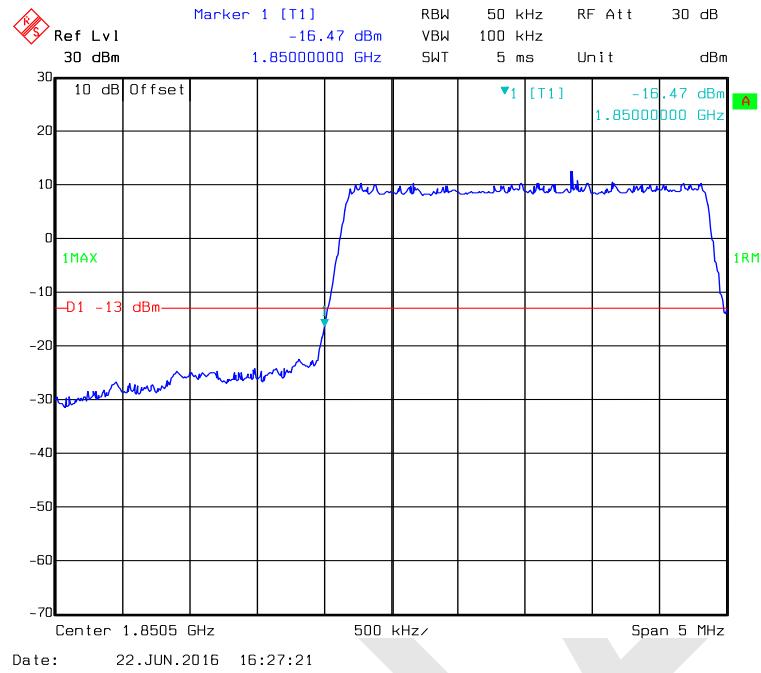
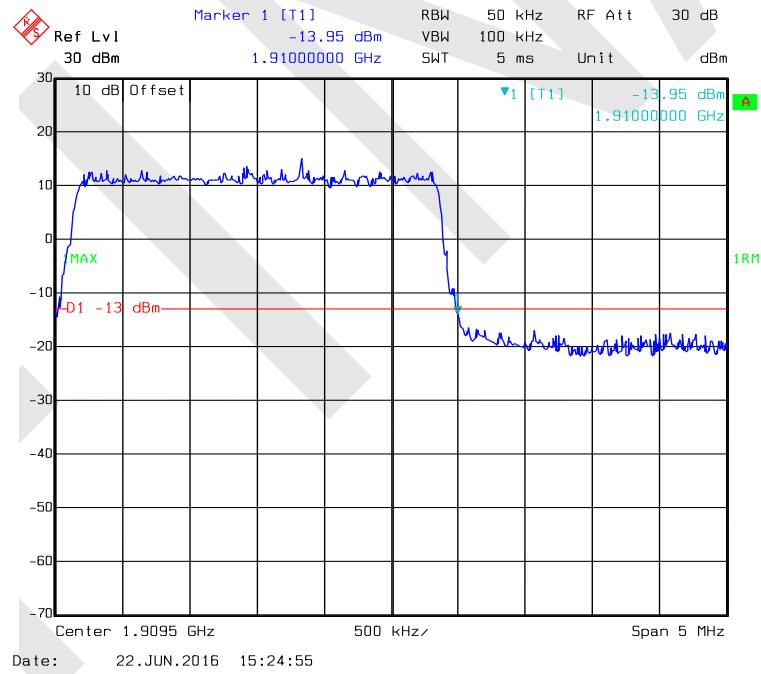
Test Result: Compliance. Please refer to the following plots.

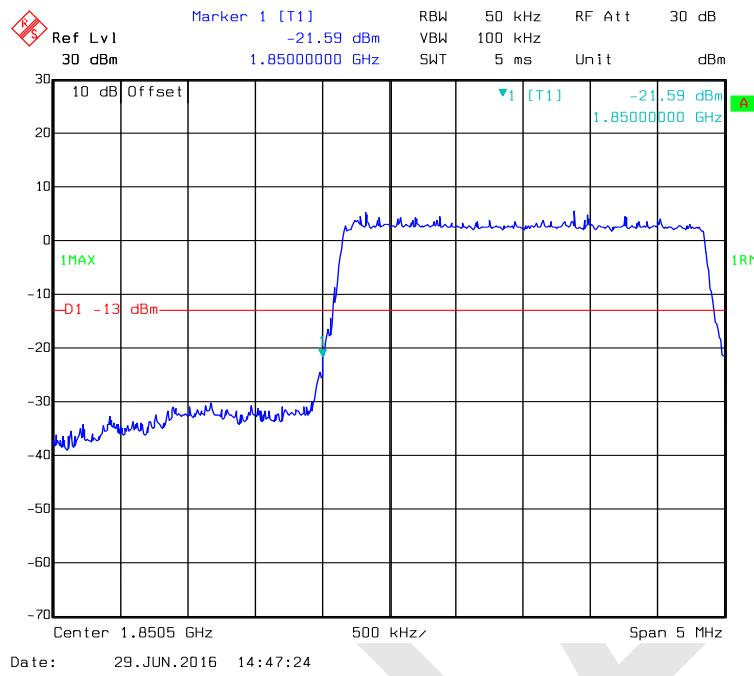
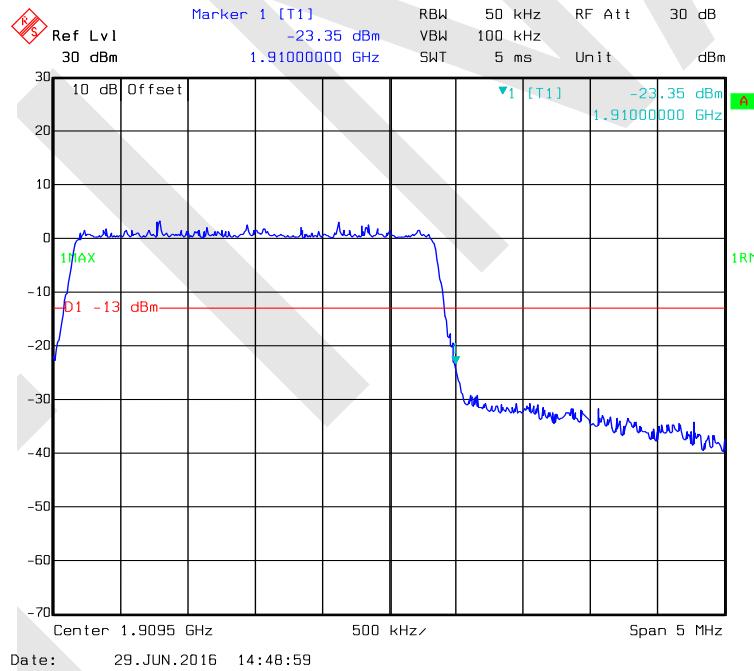
**Cellular Band, Left Band Edge for WCDMA Mode****Cellular Band, Right Band Edge for WCDMA Mode**

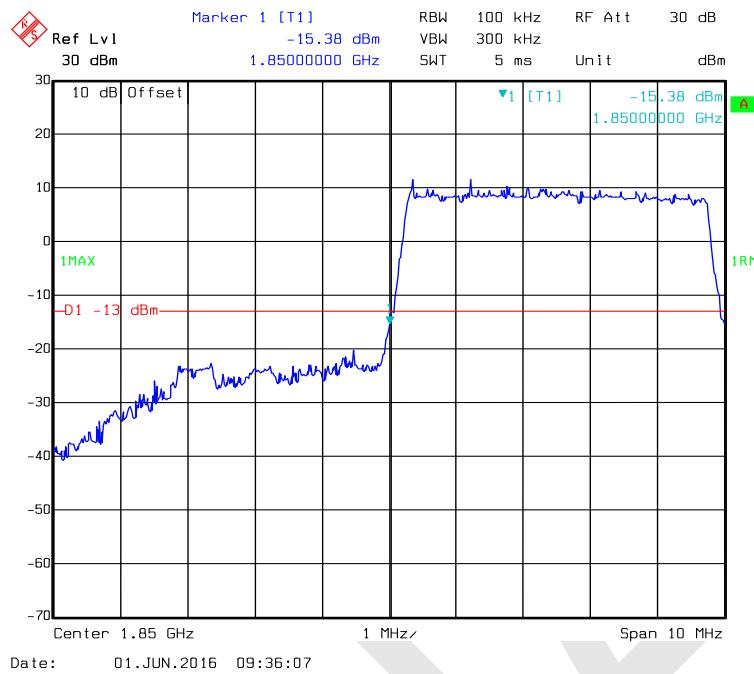
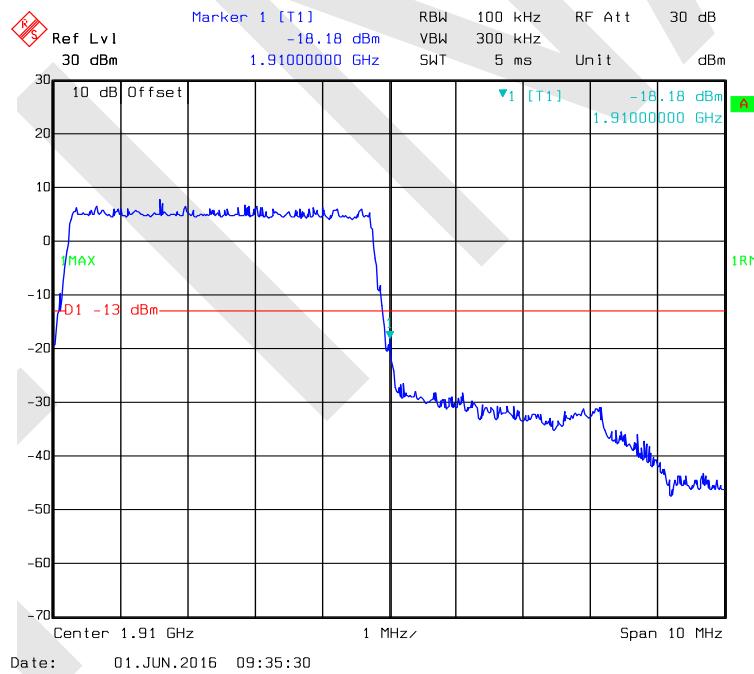
**PCS Band, Left Band Edge for WCDMA Mode****PCS Band, Right Band Edge for WCDMA Mode**

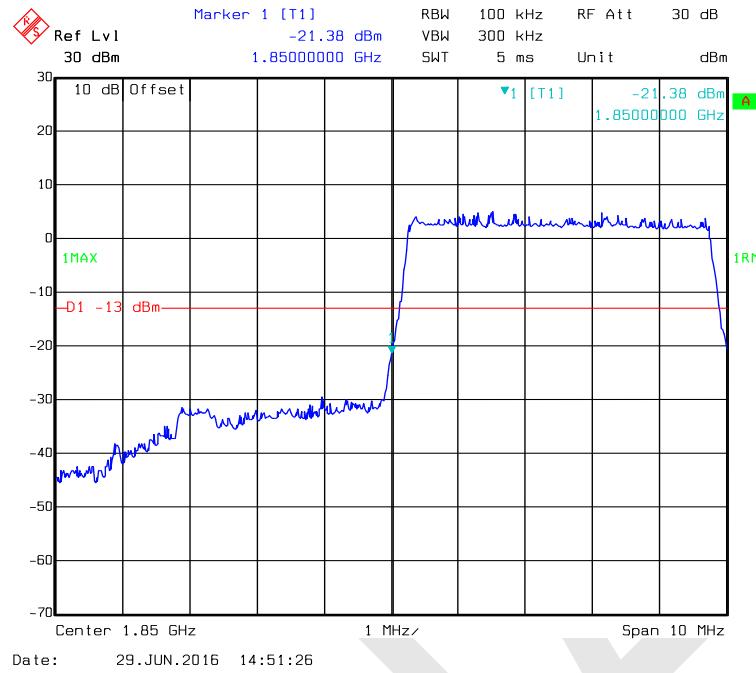
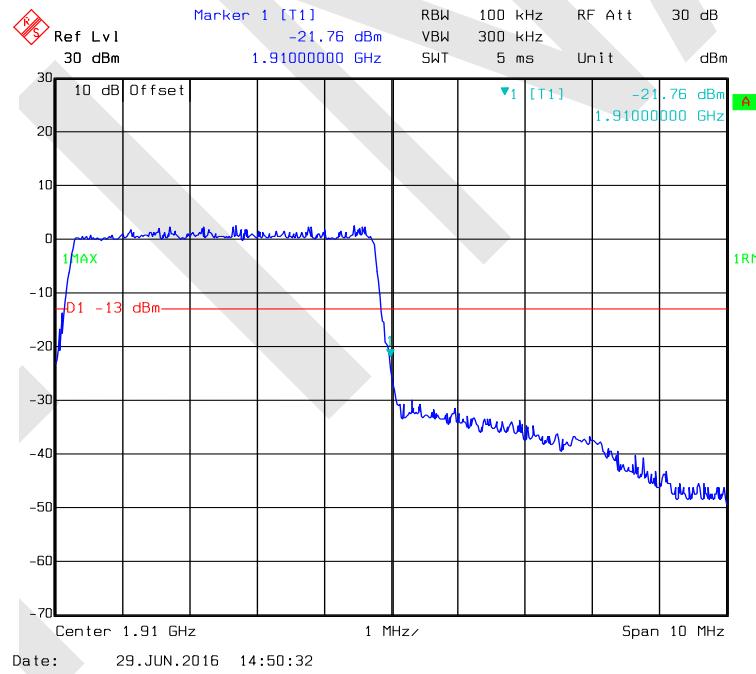
**LTE Band II:****QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

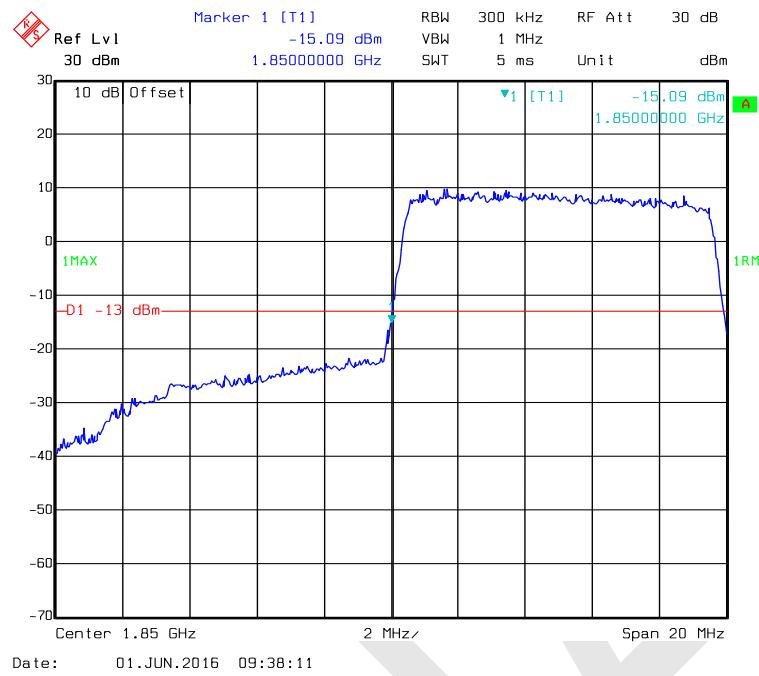
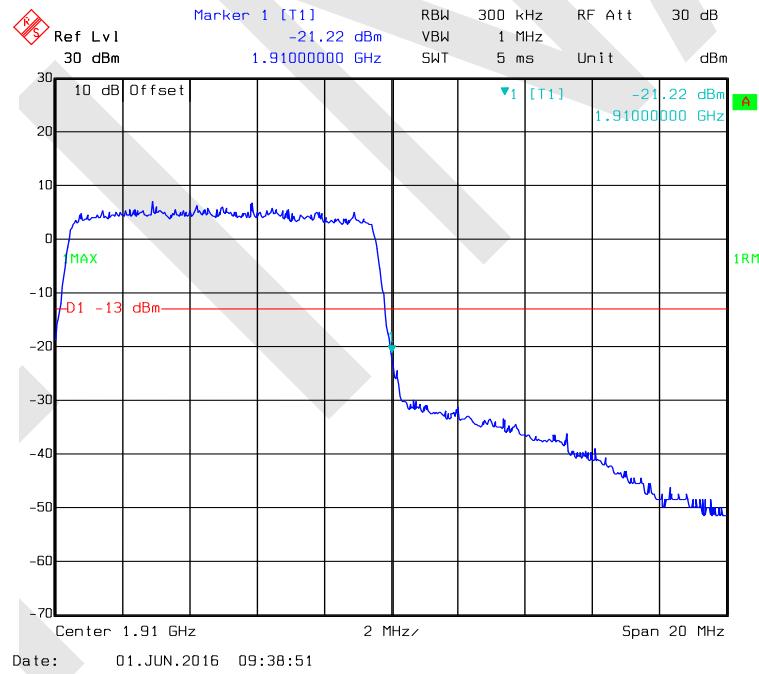
**16-QAM (1.4 MHz, FULL RB) - Left Band Edge****16-QAM (1.4 MHz, FULL RB) - Right Band Edge**

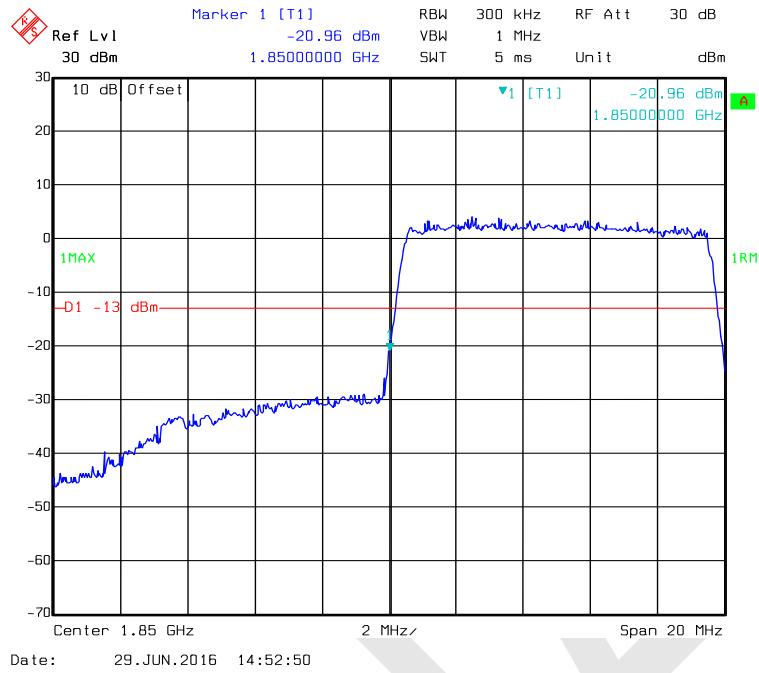
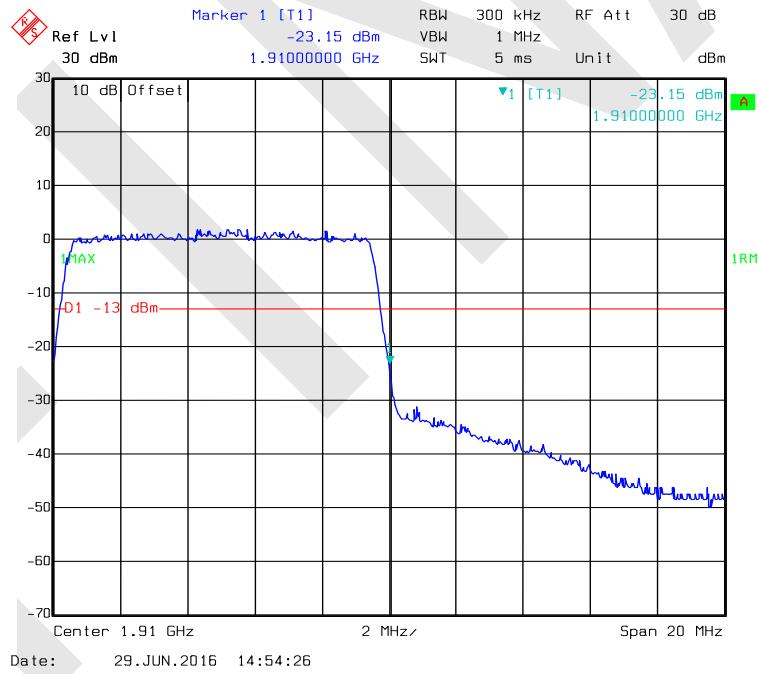
**QPSK (3.0 MHz, FULL RB) - Left Band Edge****QPSK (3.0 MHz, FULL RB) - Right Band Edge**

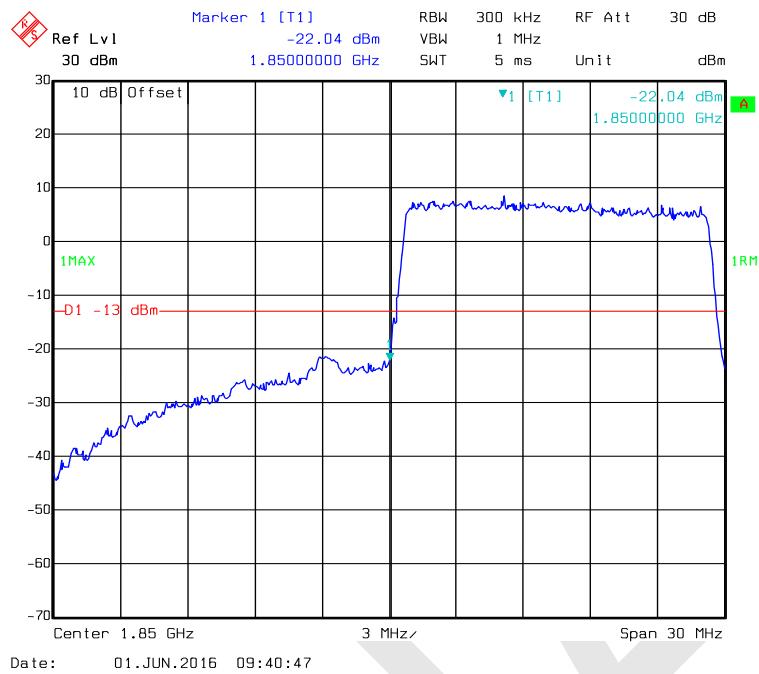
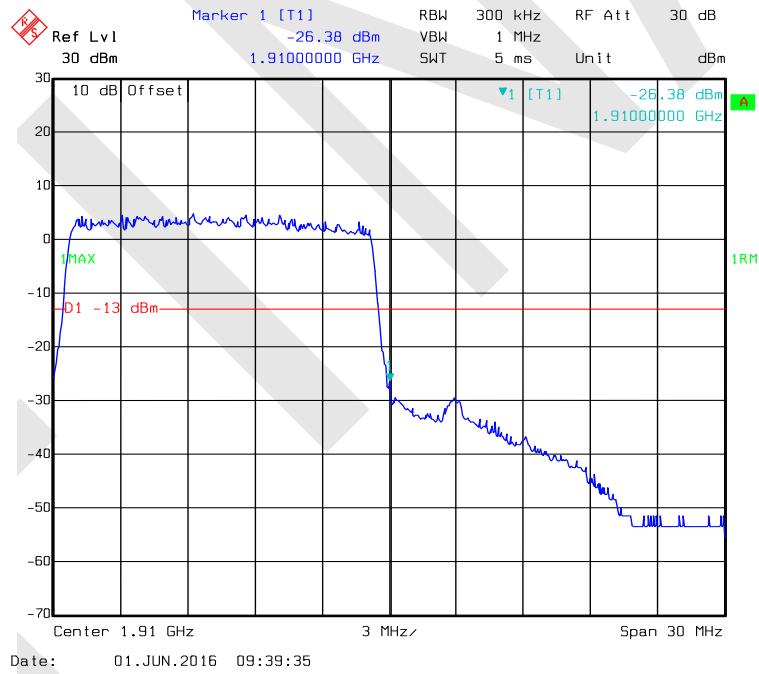
**16-QAM (3.0 MHz, FULL RB) - Left Band Edge****16-QAM (3.0 MHz, FULL RB) - Right Band Edge**

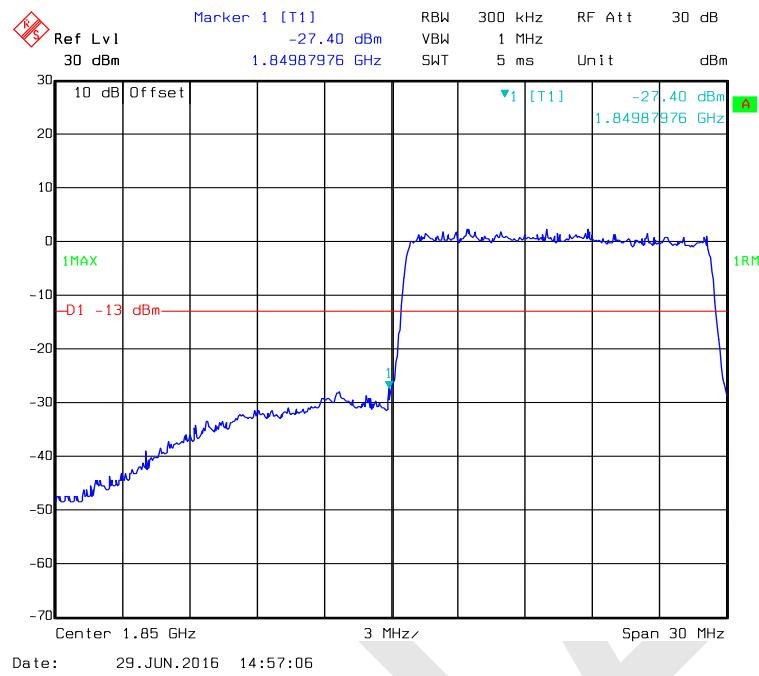
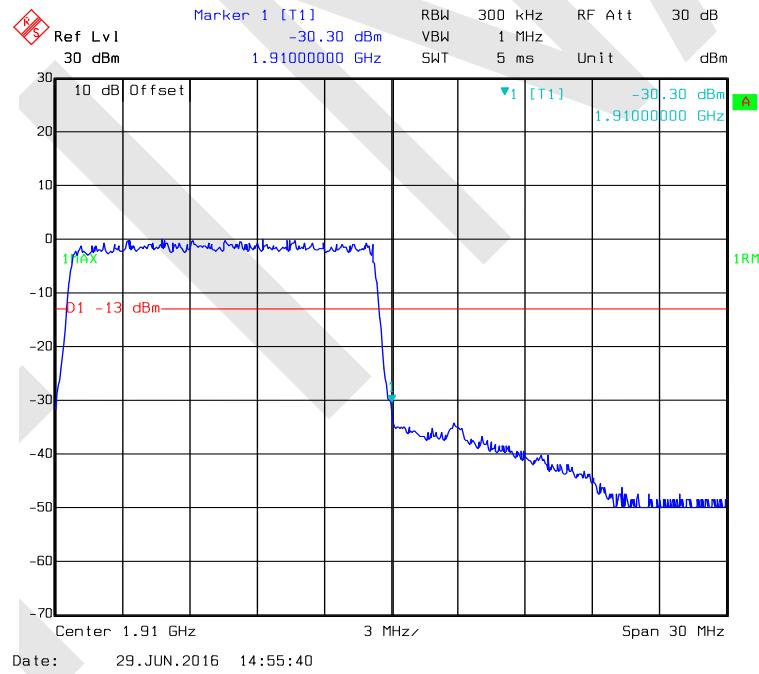
**QPSK (5.0 MHz, FULL RB) - Left Band Edge****QPSK (5.0 MHz, FULL RB) - Right Band Edge**

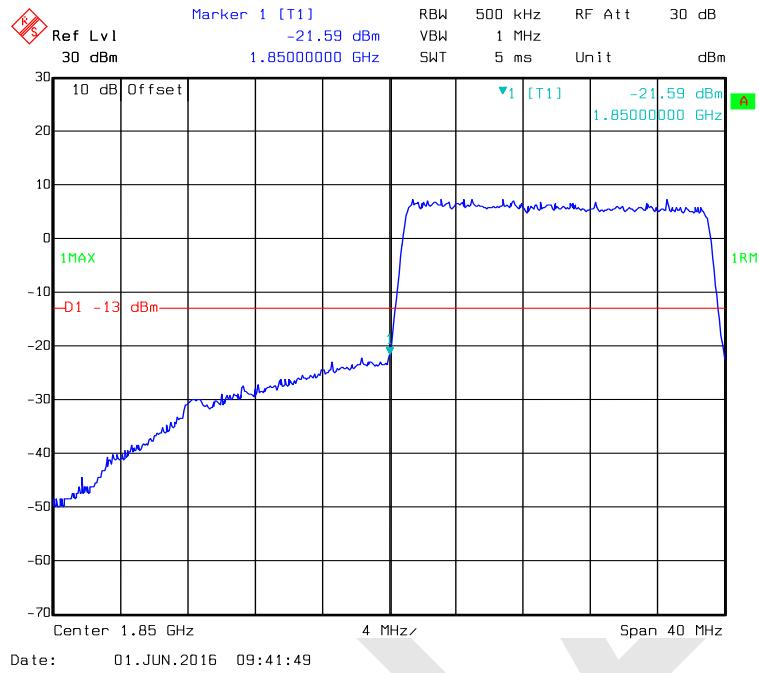
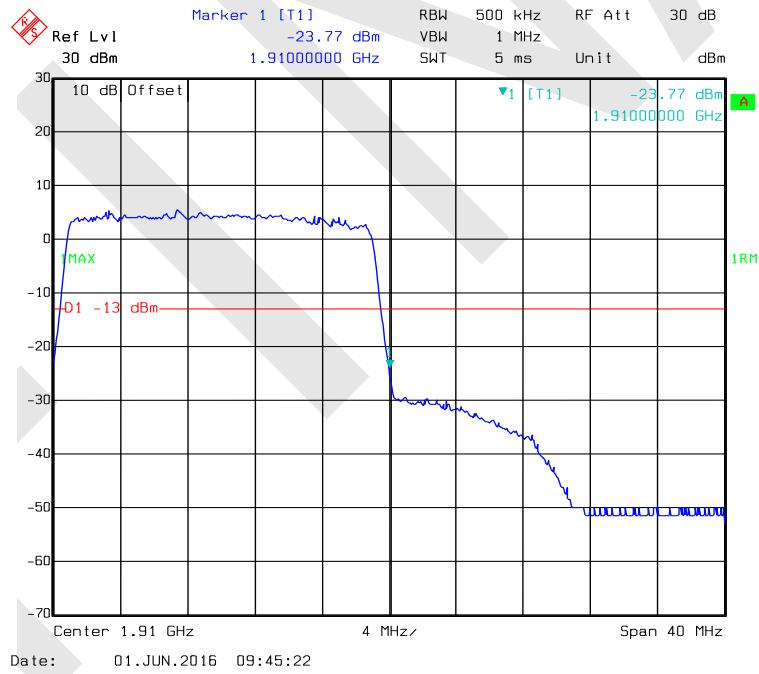
**16-QAM (5.0 MHz, FULL RB) - Left Band Edge****16-QAM (5.0 MHz, FULL RB) - Right Band Edge**

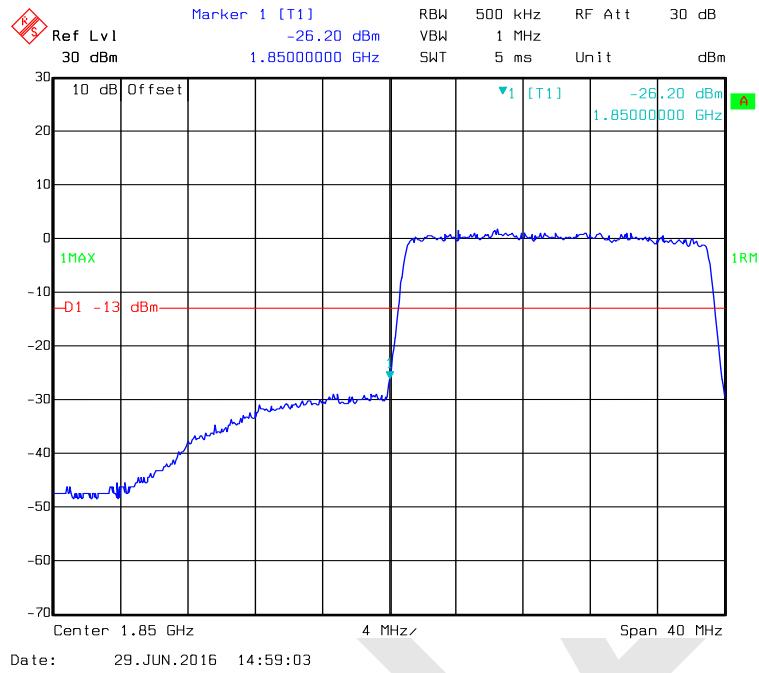
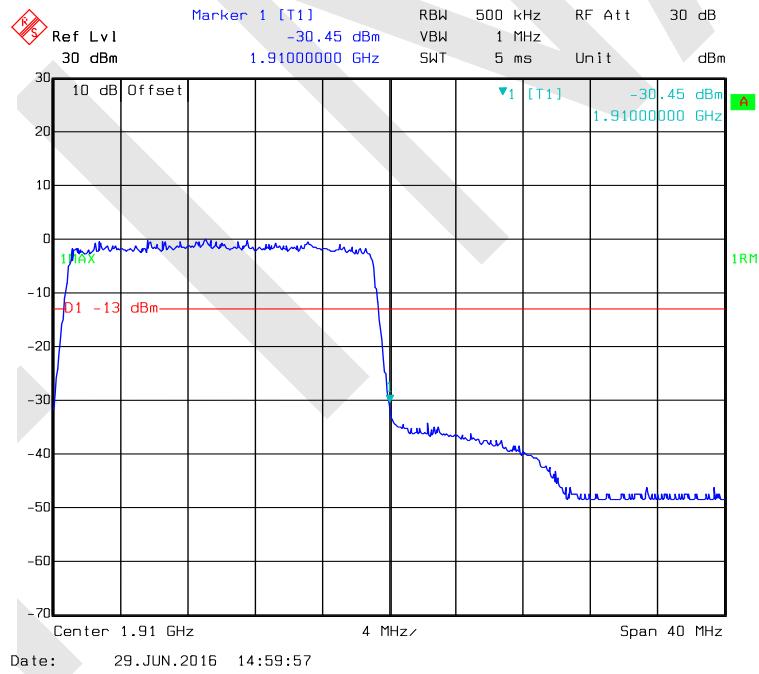
**QPSK (10.0 MHz, FULL RB) - Left Band Edge****QPSK (10.0 MHz, FULL RB) - Right Band Edge**

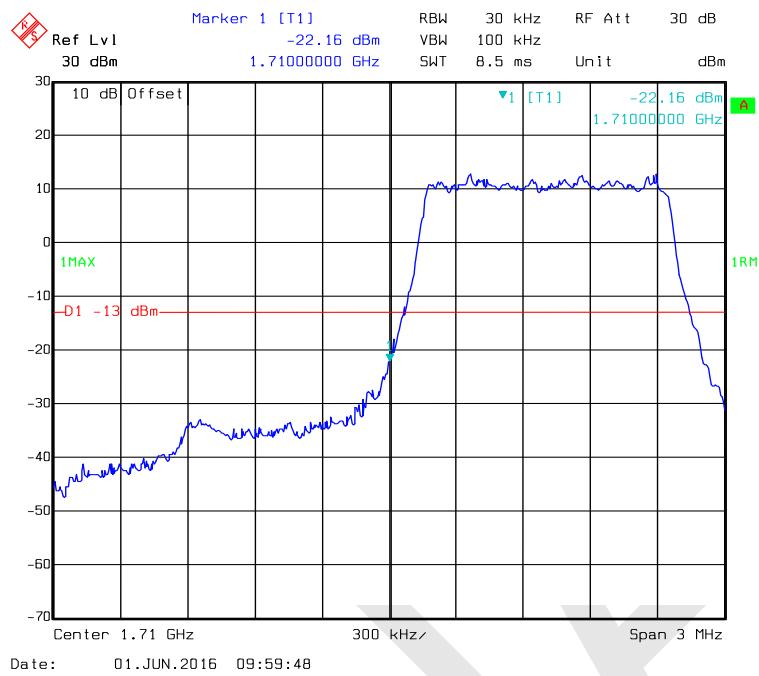
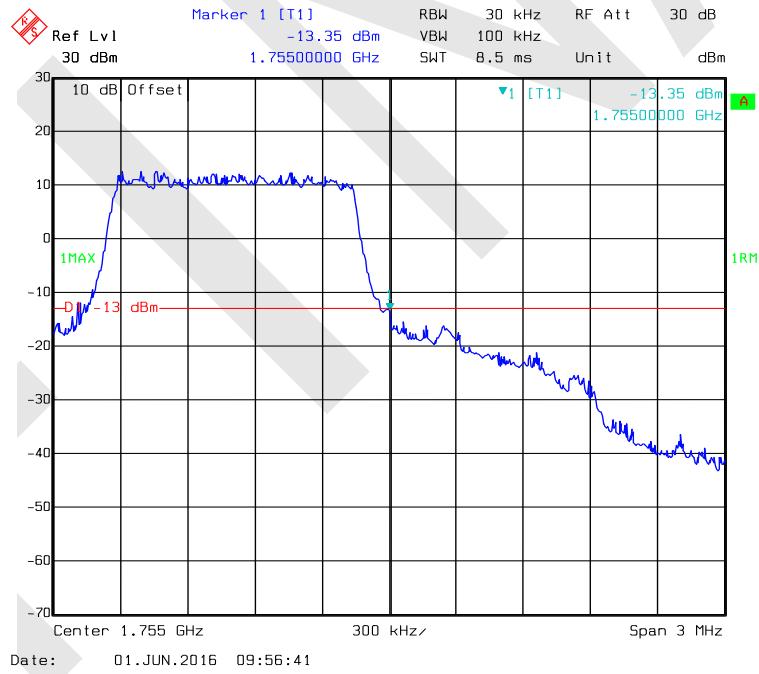
**16-QAM (10.0 MHz, FULL RB) - Left Band Edge****16-QAM (10.0 MHz, FULL RB) - Right Band Edge**

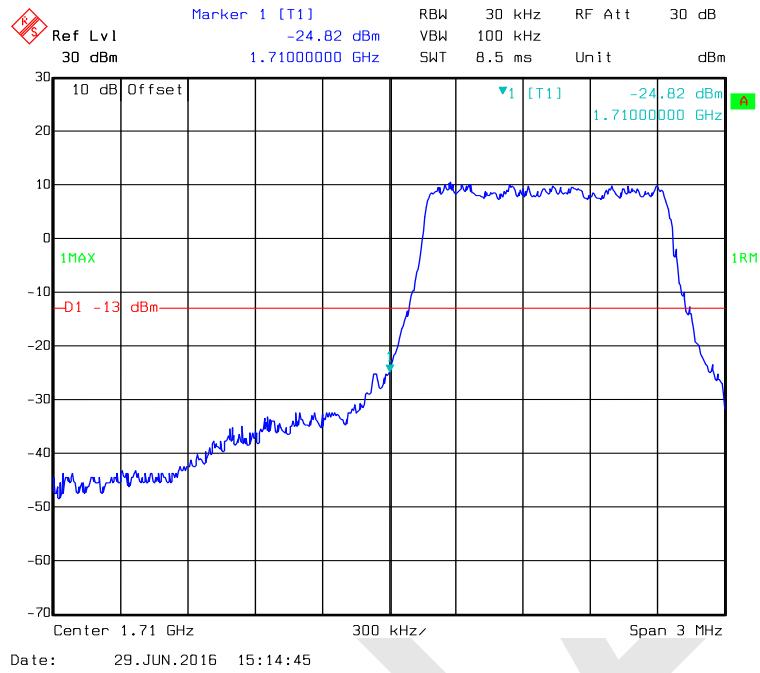
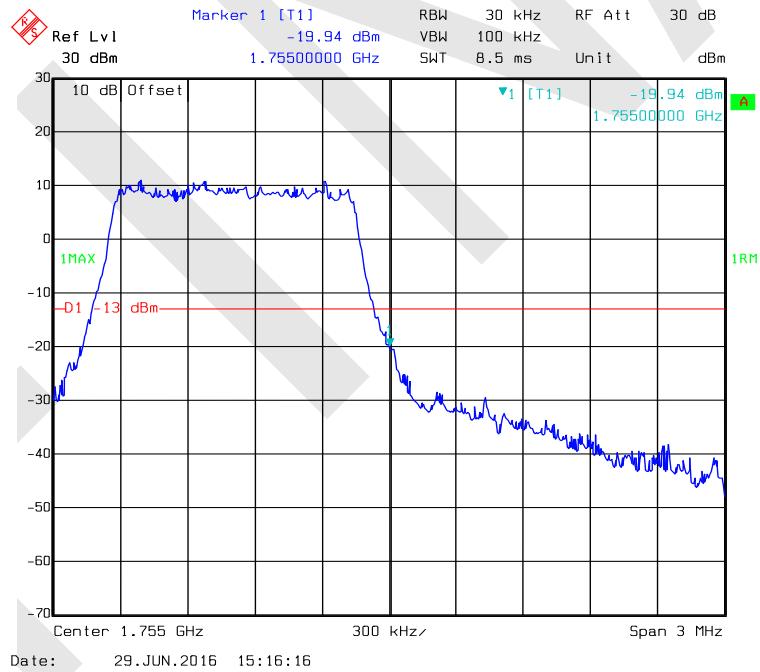
**QPSK (15.0 MHz, FULL RB) - Left Band Edge****QPSK (15.0 MHz, FULL RB) - Right Band Edge**

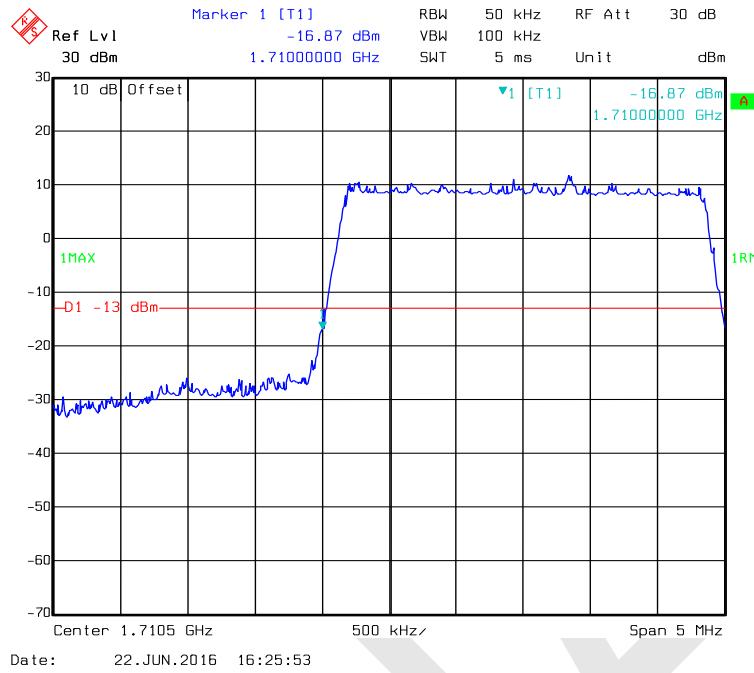
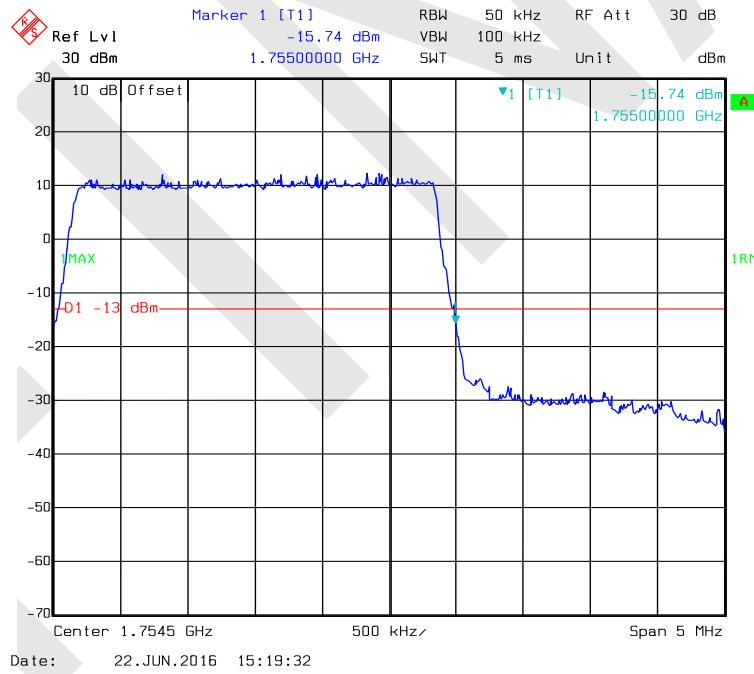
**16-QAM (15.0 MHz, FULL RB) - Left Band Edge****16-QAM (15.0 MHz, FULL RB) - Right Band Edge**

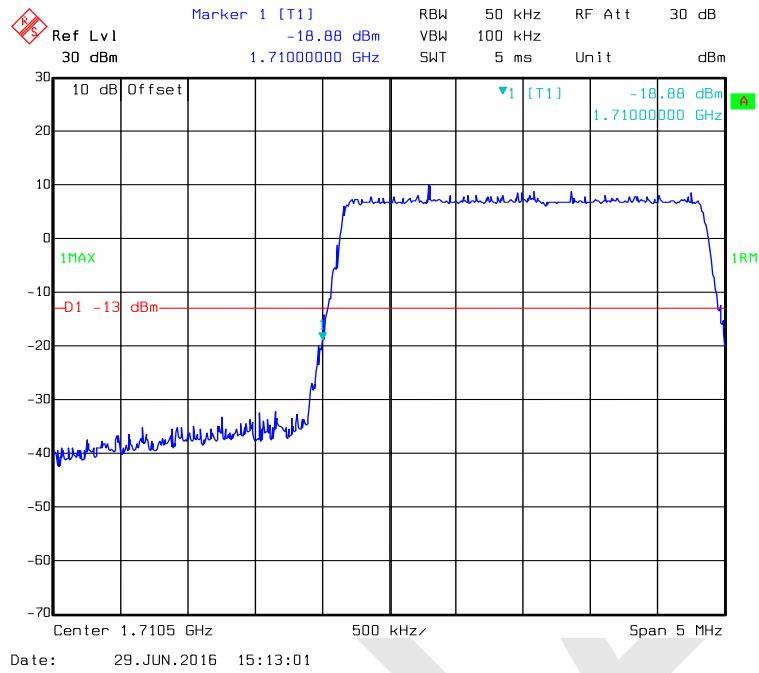
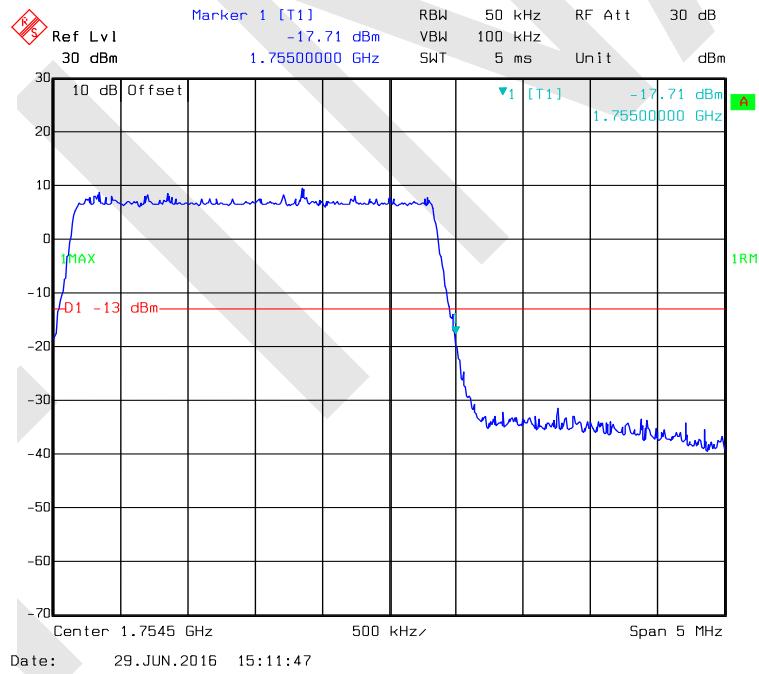
**QPSK (20.0 MHz, FULL RB) - Left Band Edge****QPSK (20.0 MHz, FULL RB) - Right Band Edge**

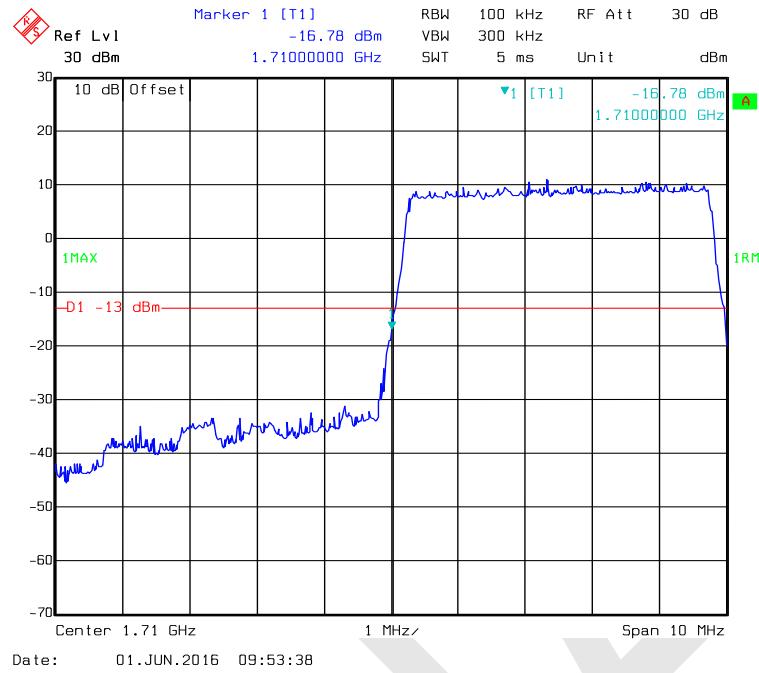
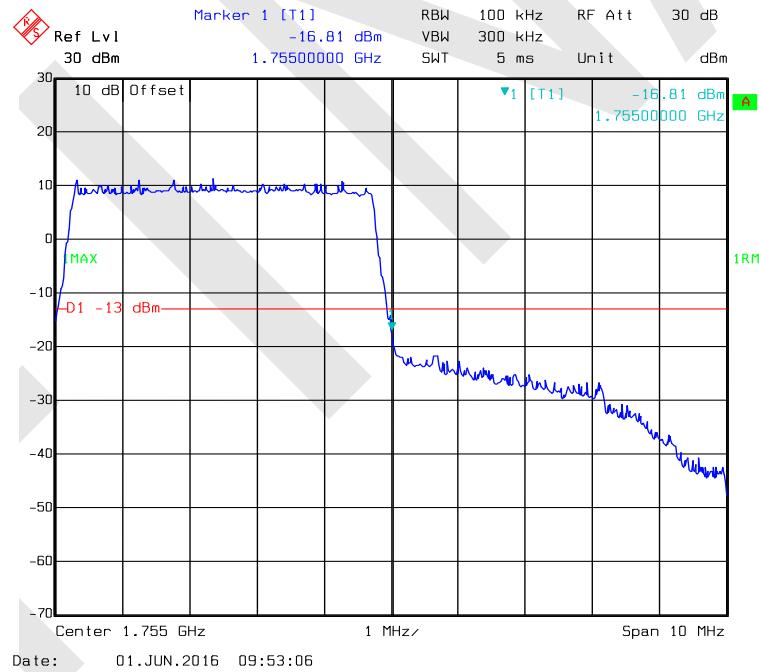
**16-QAM (20.0 MHz, FULL RB) - Left Band Edge****16-QAM (20.0 MHz, FULL RB) - Right Band Edge**

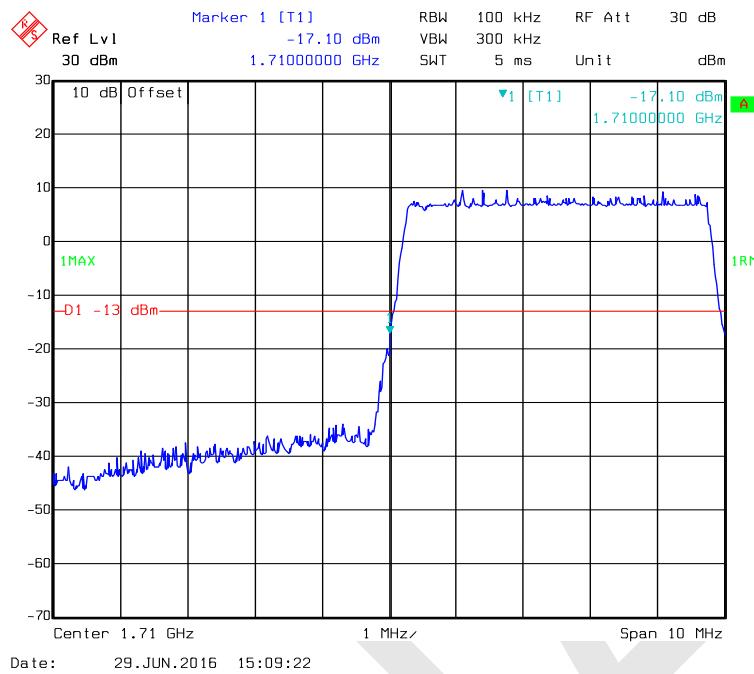
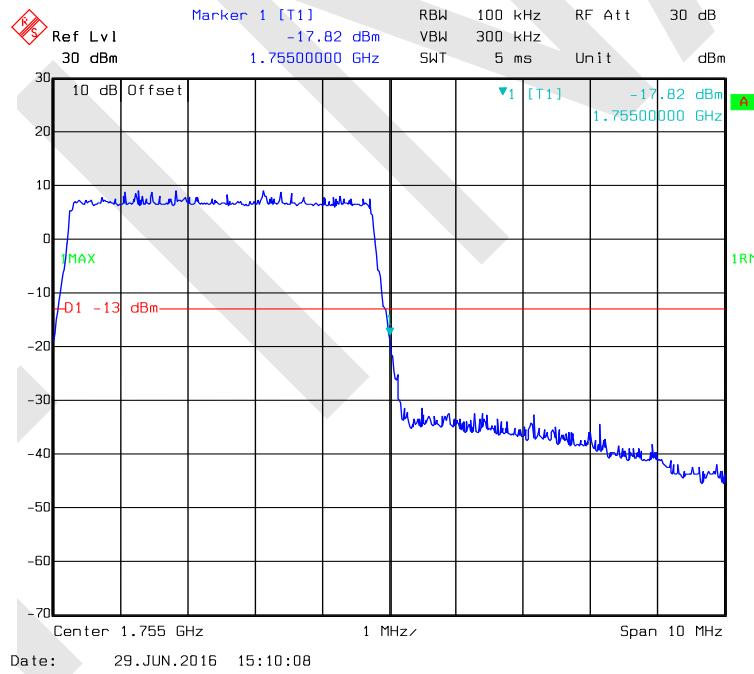
**LTE Band IV:****QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

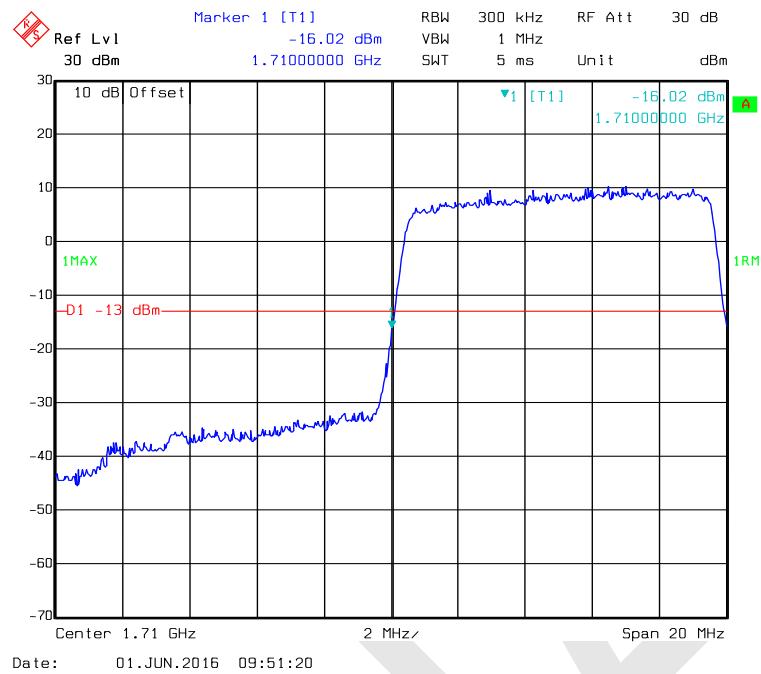
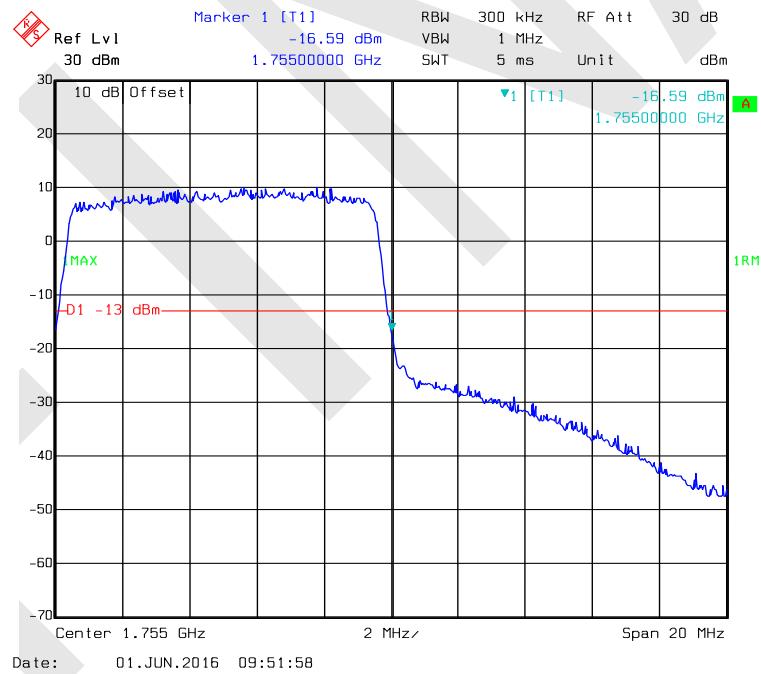
**16-QAM (1.4 MHz, FULL RB) - Left Band Edge****16-QAM (1.4 MHz, FULL RB) - Right Band Edge**

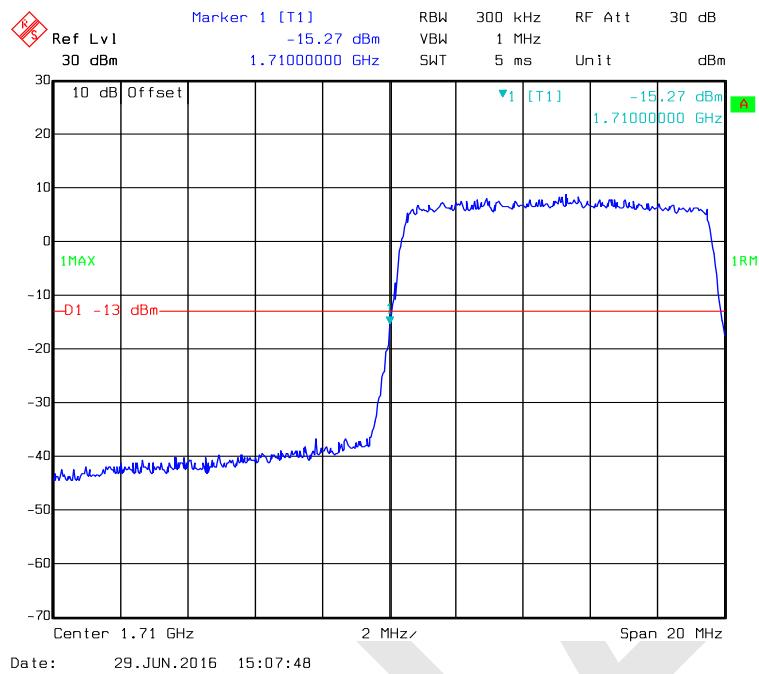
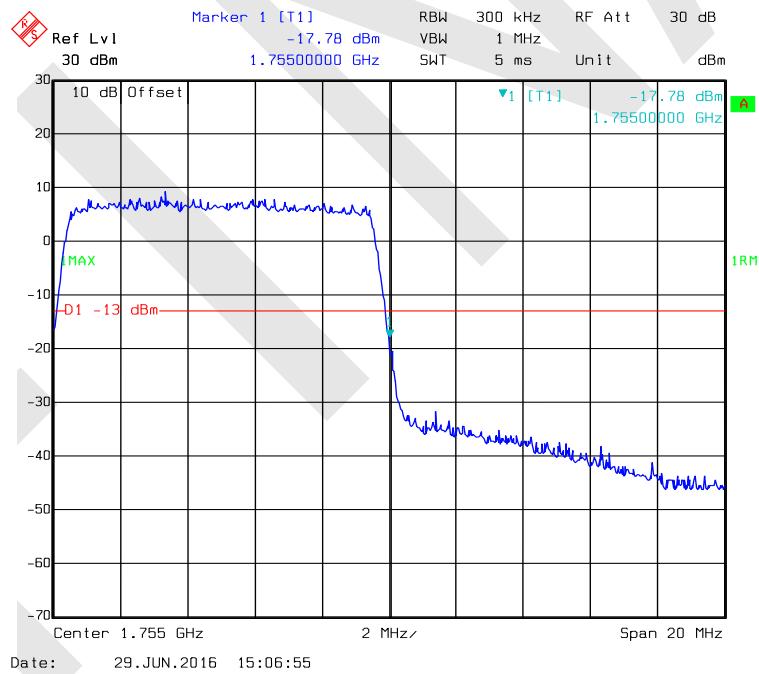
**QPSK (3.0 MHz, FULL RB) - Left Band Edge****QPSK (3.0 MHz, FULL RB) - Right Band Edge**

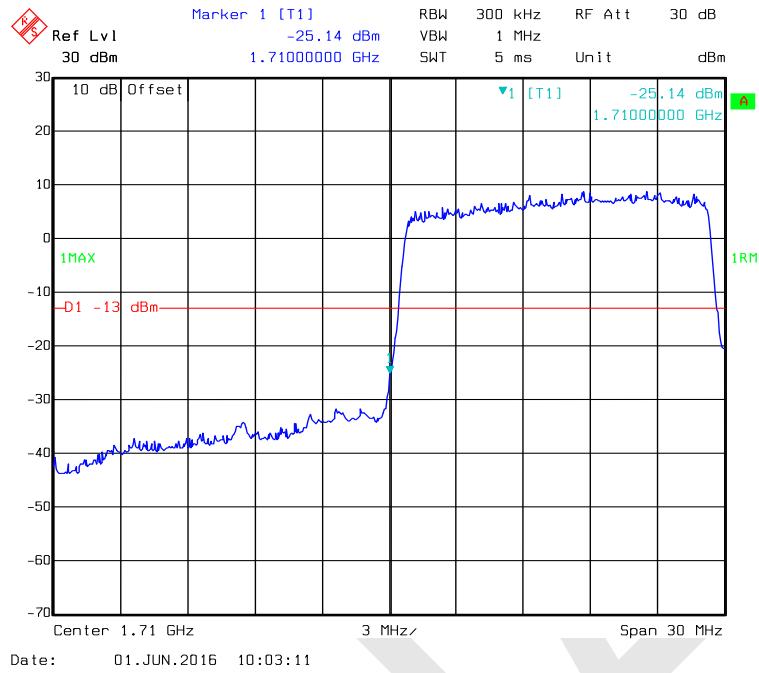
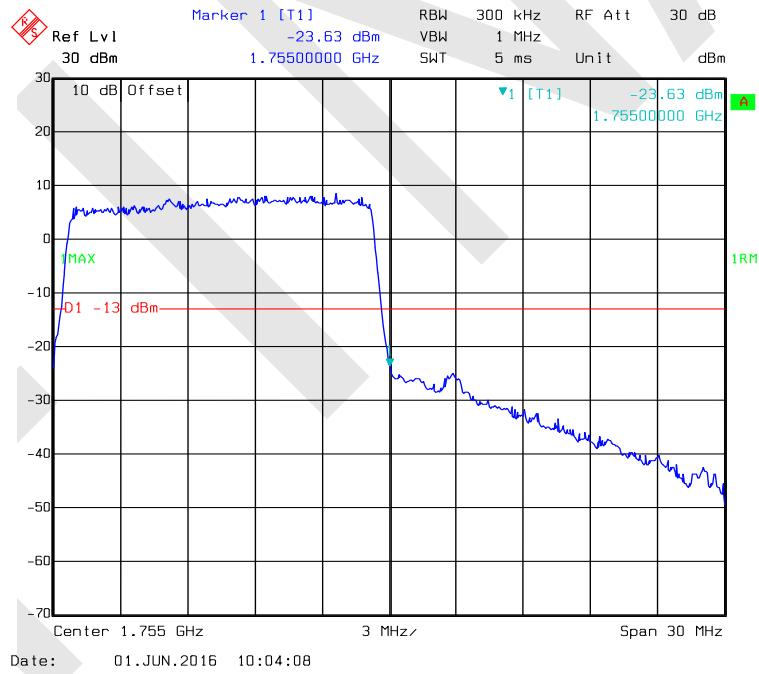
**16-QAM (3.0 MHz, FULL RB) - Left Band Edge****16-QAM (3.0 MHz, FULL RB) - Right Band Edge**

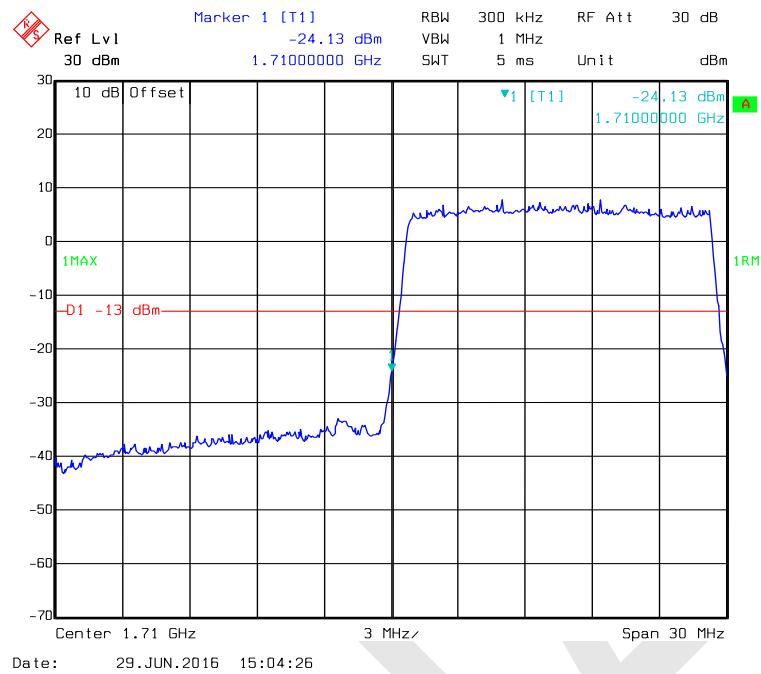
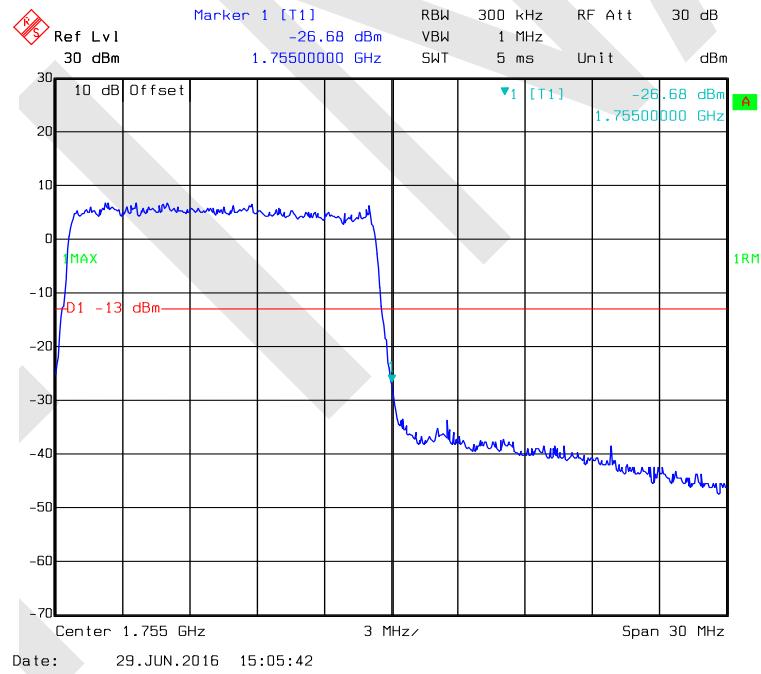
**QPSK (5.0 MHz, FULL RB) - Left Band Edge****QPSK (5.0 MHz, FULL RB) - Right Band Edge**

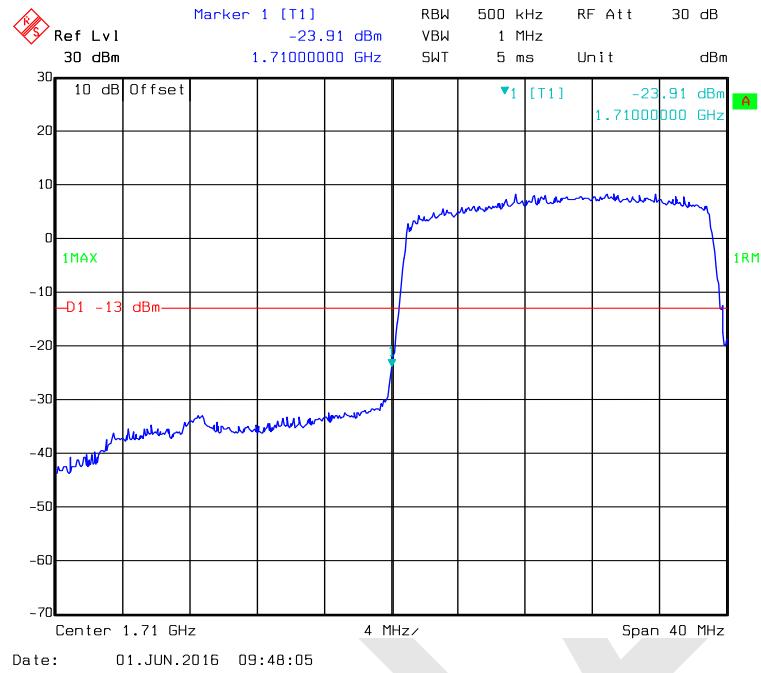
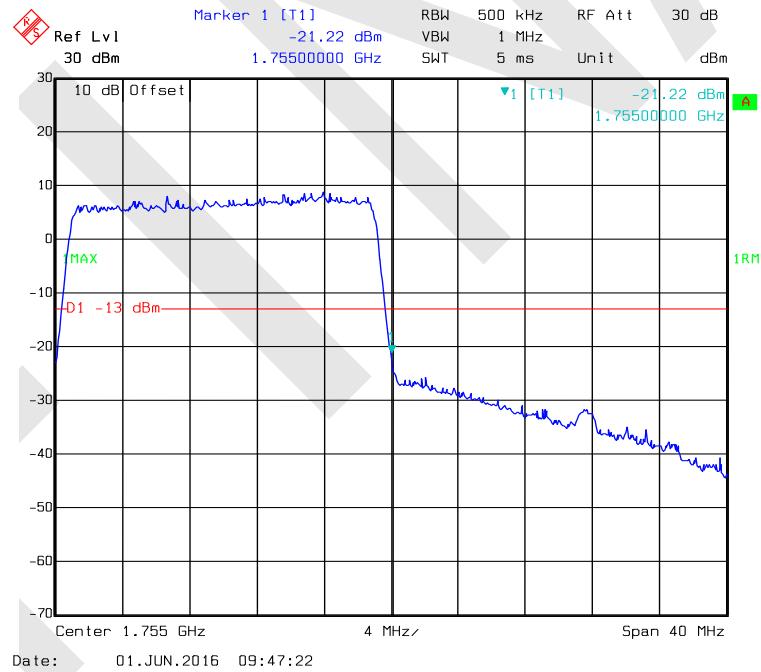
**16-QAM (5.0 MHz, FULL RB) - Left Band Edge****16-QAM (5.0 MHz, FULL RB) - Right Band Edge**

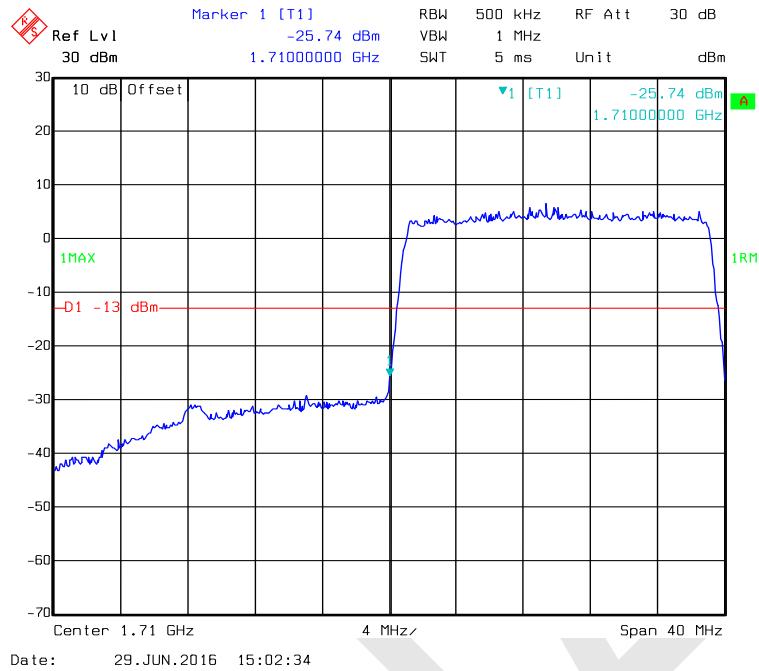
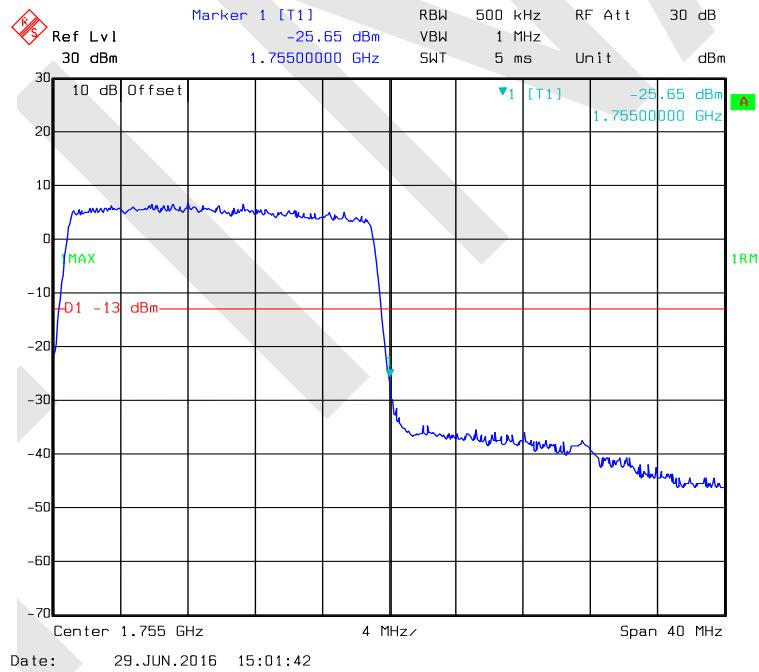
**QPSK (10.0MHz, FULL RB) - Left Band Edge****QPSK (10.0MHz, FULL RB) - Right Band Edge**

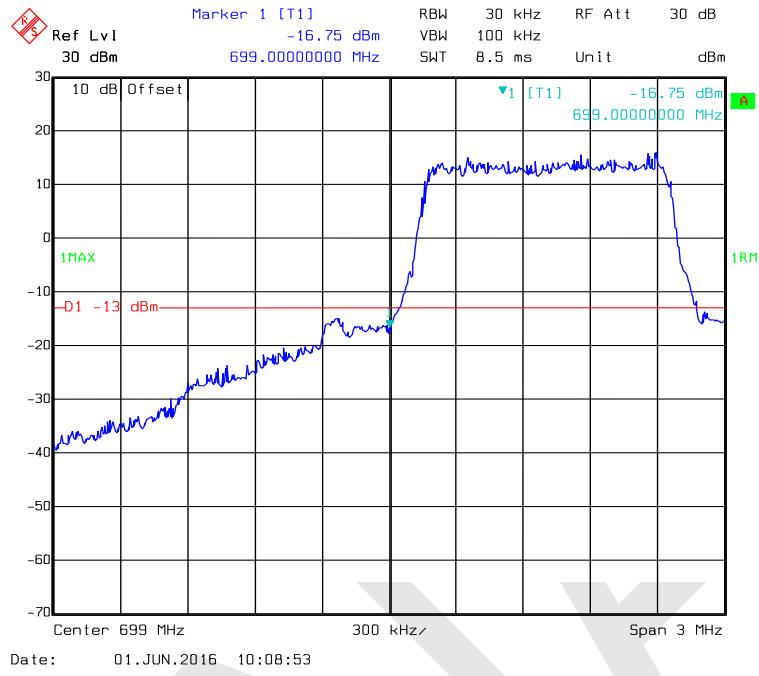
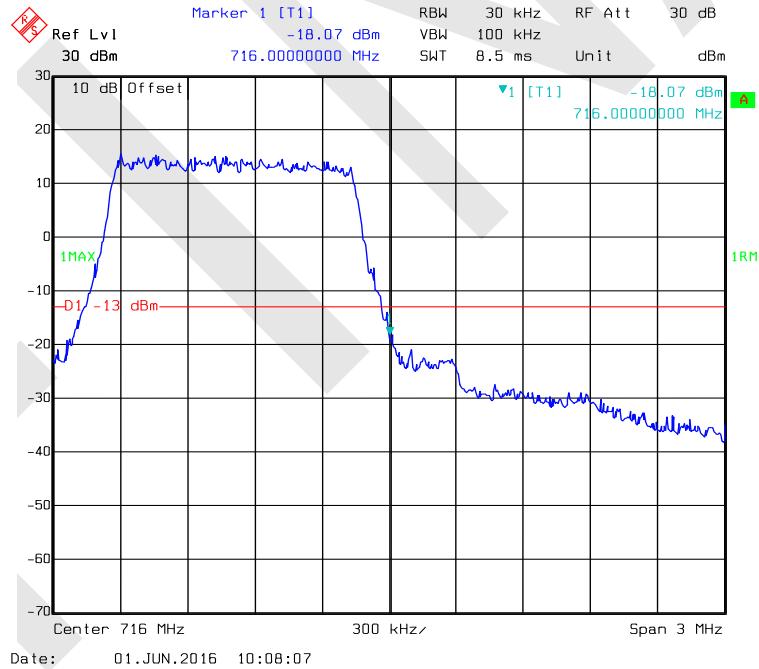
**16-QAM (10.0 MHz, FULL RB) - Left Band Edge****16-QAM (10.0 MHz, FULL RB) - Right Band Edge**

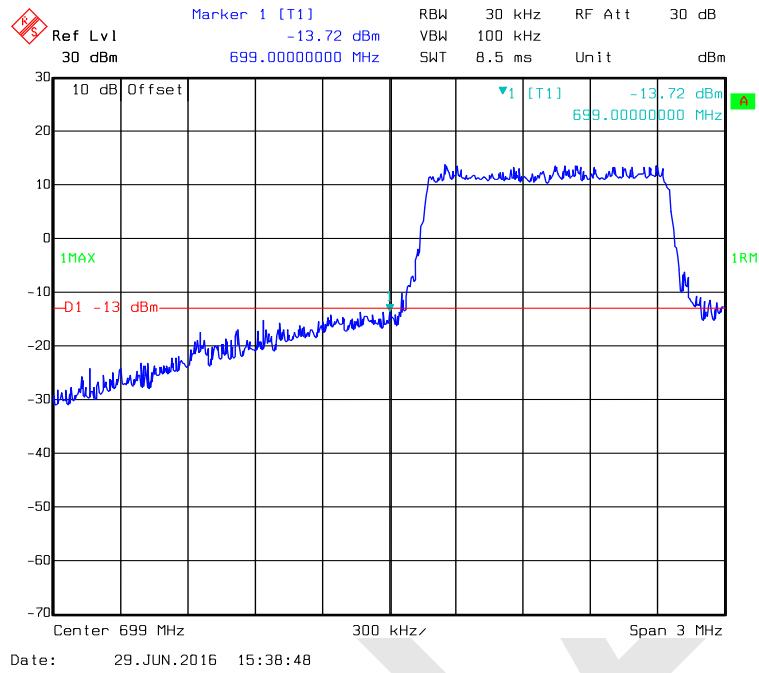
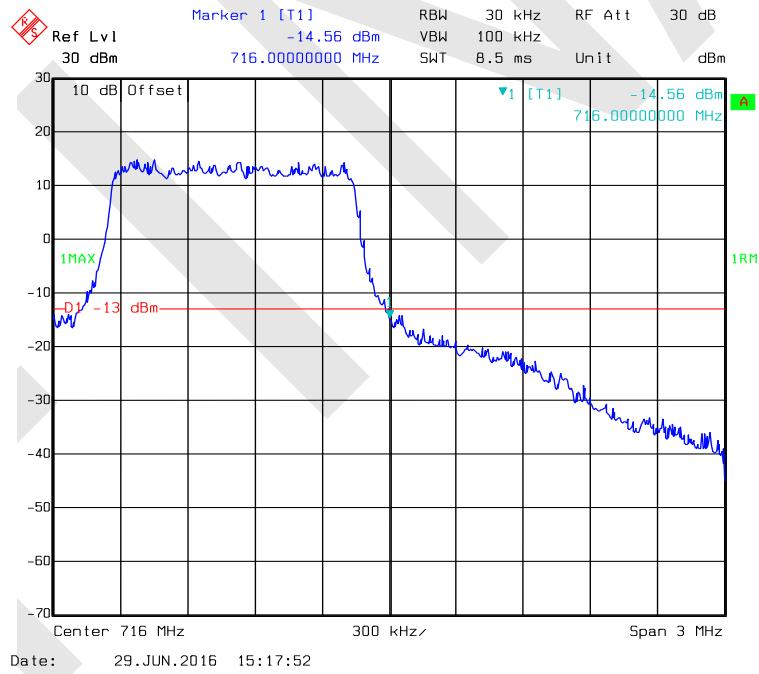
**QPSK (15.0MHz, FULL RB) - Left Band Edge****QPSK (15.0MHz, FULL RB) - Right Band Edge**

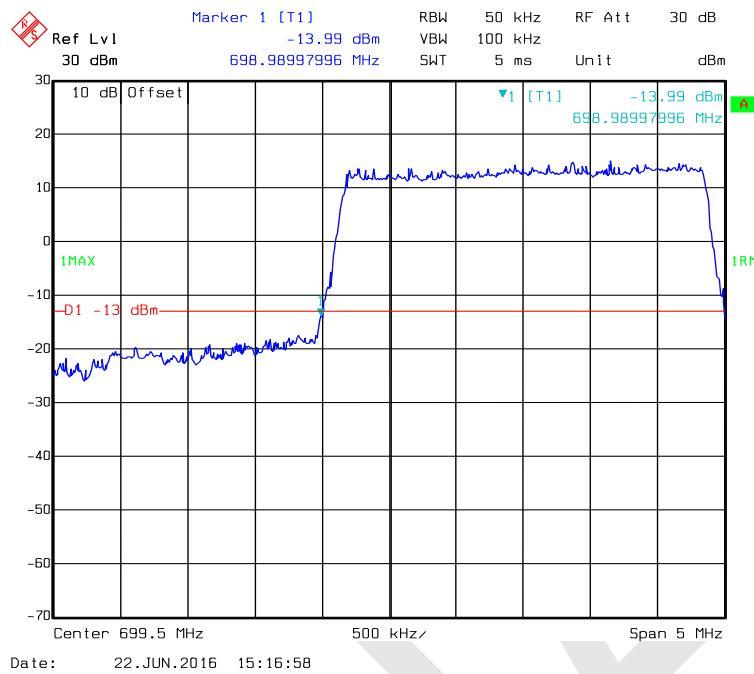
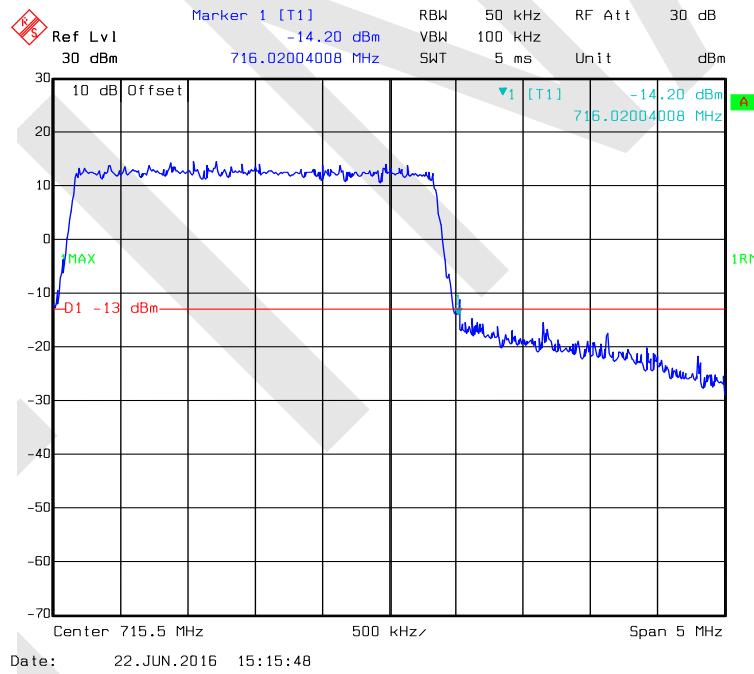
**16-QAM (15.0 MHz, FULL RB) - Left Band Edge****16-QAM (15.0 MHz, FULL RB) - Right Band Edge**

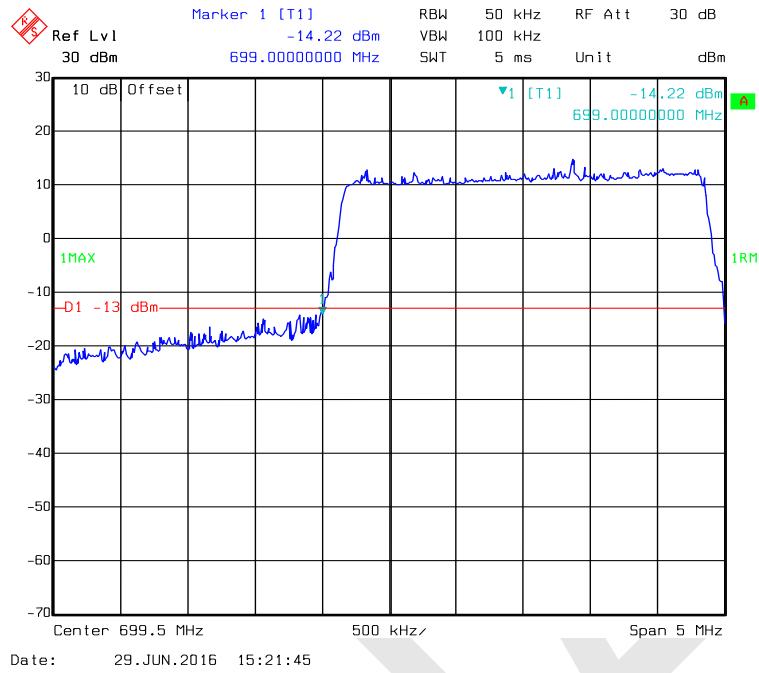
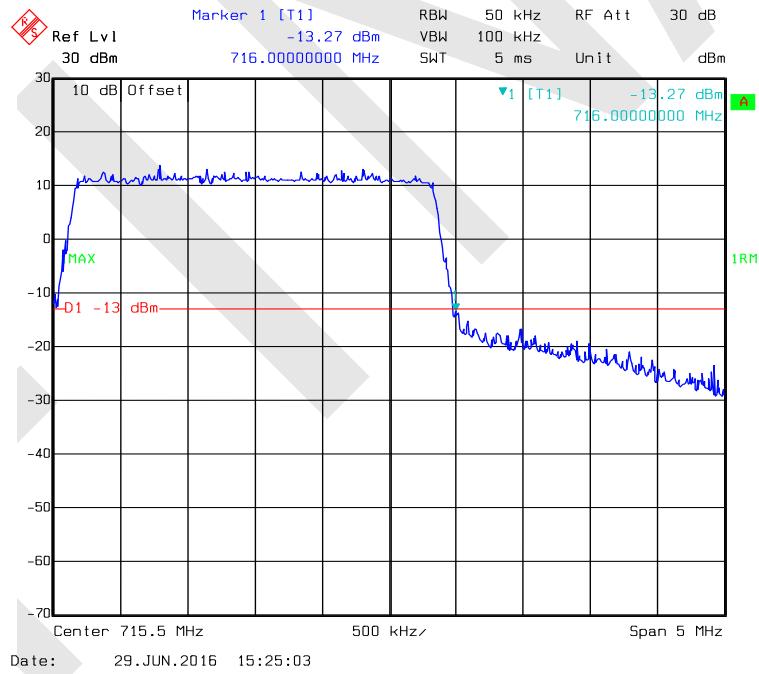
**QPSK (20.0MHz, FULL RB) - Left Band Edge****QPSK (20.0MHz, FULL RB) - Right Band Edge**

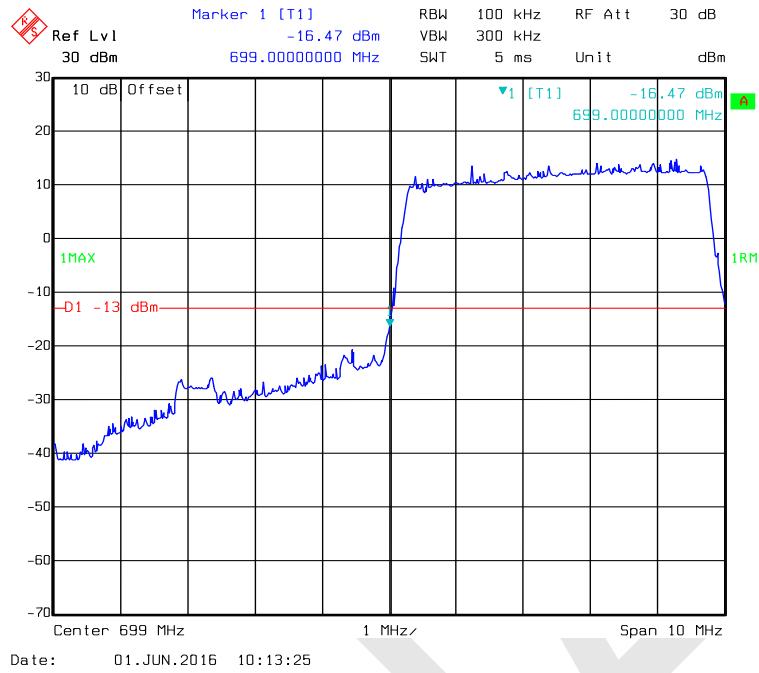
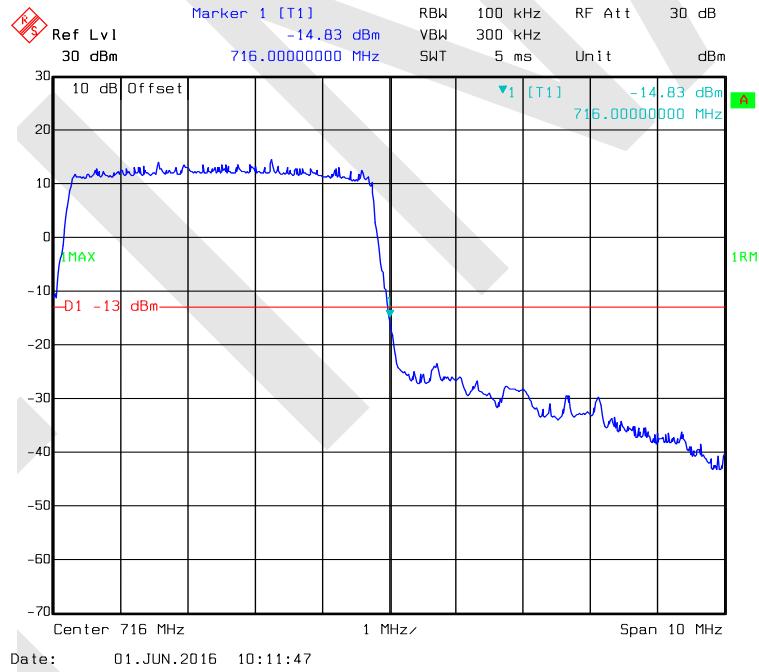
**16-QAM (20.0 MHz, FULL RB) - Left Band Edge****16-QAM (20.0 MHz, FULL RB) - Right Band Edge**

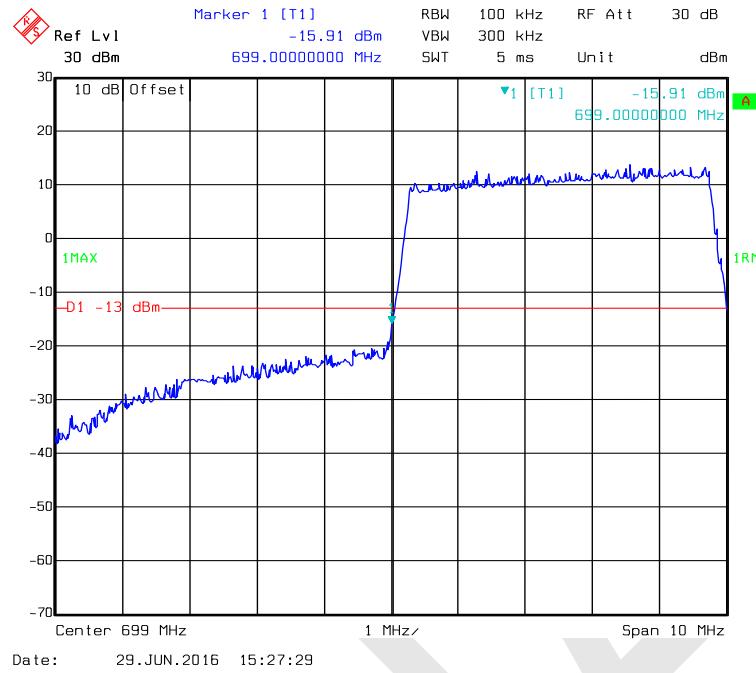
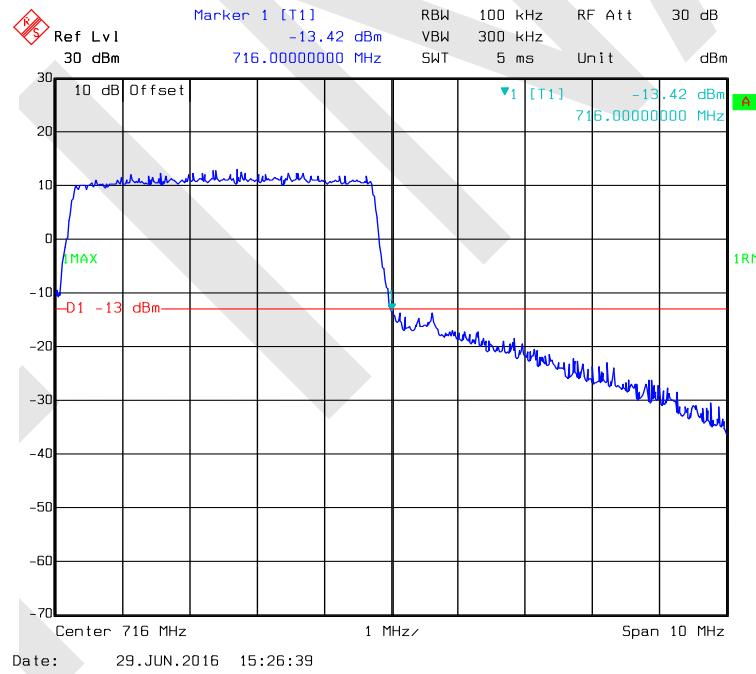
**LTE Band XII:****QPSK (1.4 MHz, FULL RB) - Left Band Edge****QPSK (1.4 MHz, FULL RB) - Right Band Edge**

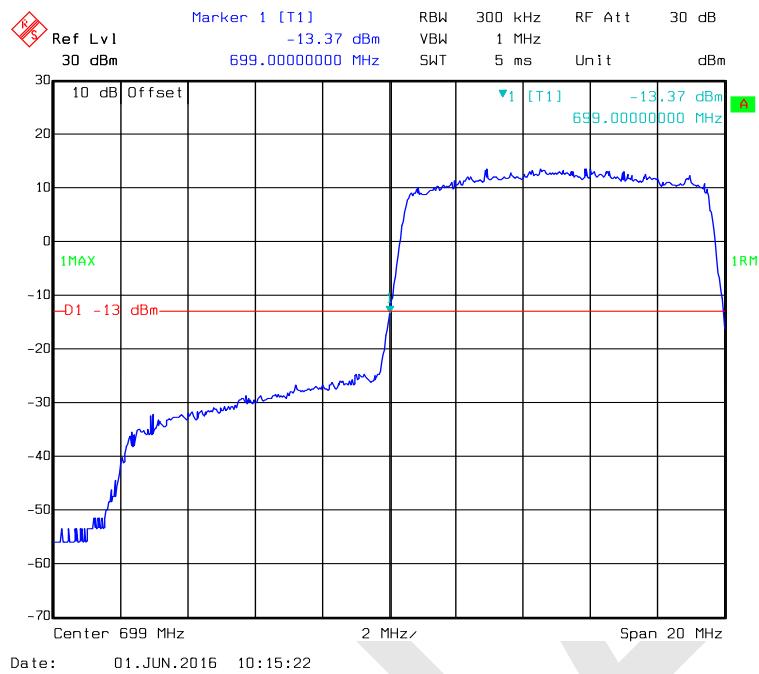
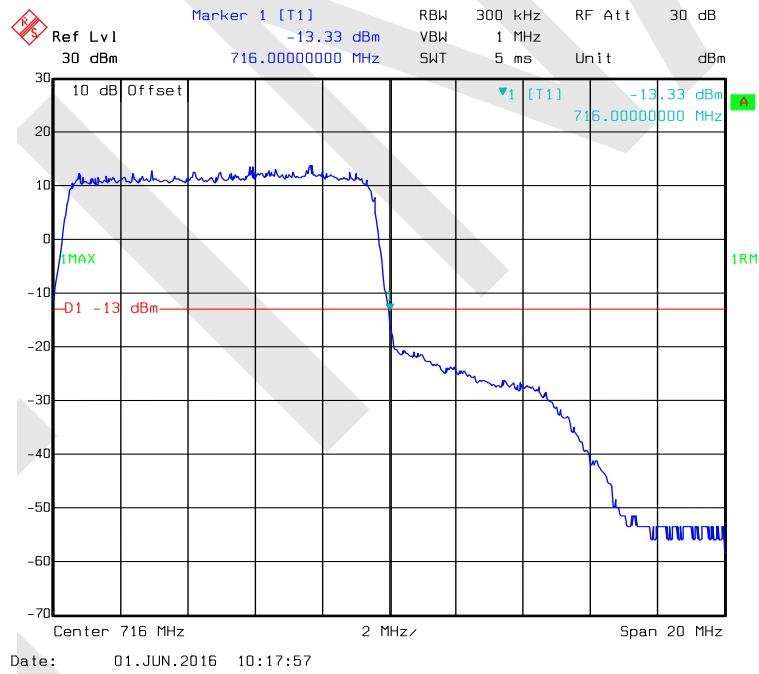
**16-QAM (1.4 MHz, FULL RB) - Left Band Edge****16-QAM (1.4 MHz, FULL RB) - Right Band Edge**

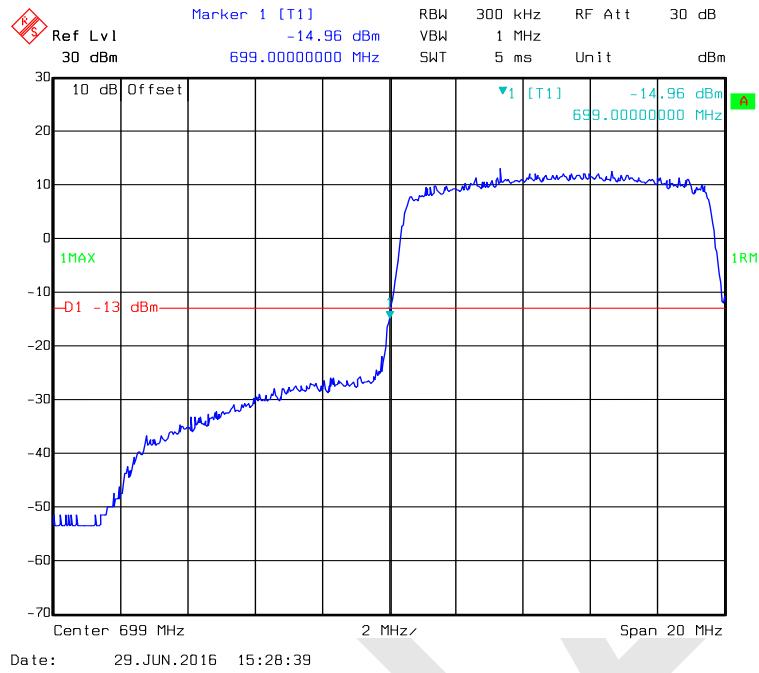
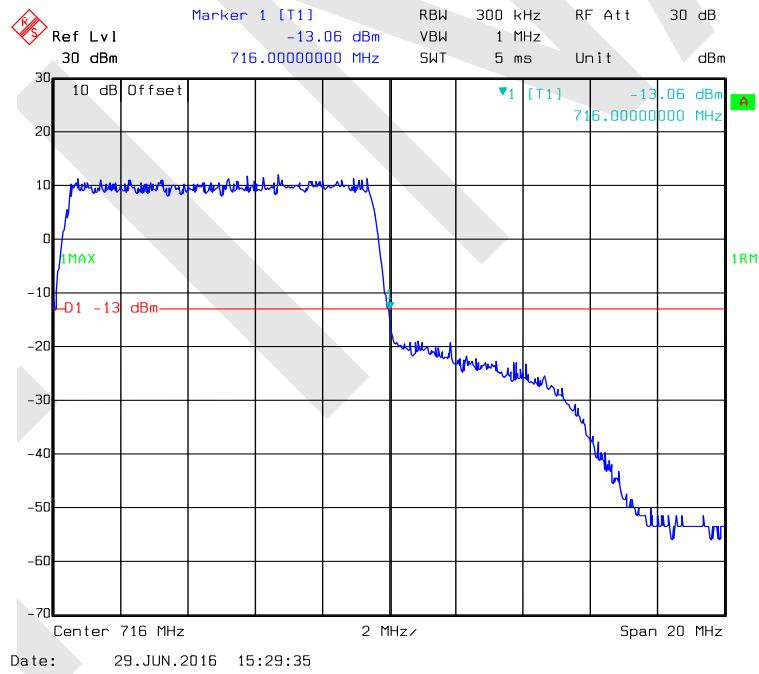
**QPSK (3.0 MHz, FULL RB) - Left Band Edge****QPSK (3.0 MHz, FULL RB) - Right Band Edge**

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

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

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

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

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

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

### Applicable Standards

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

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

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

**Frequency Tolerance for Transmitters in the Public Mobile Services**

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

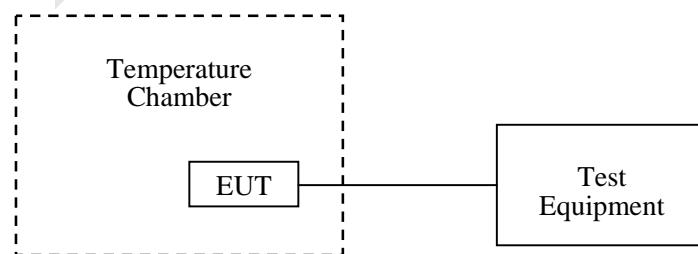
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

### 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
BACL	Temperature Chamber	BTH - 150	30023	2015-11-12	2016-11-11
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891	2015-11-23	2016-11-23
R&S	Wideband Radio Communication tester	CMW500	1201.002K50 -146520-wh	2015-11-23	2016-11-23
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

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

## Test Data

### Environmental Conditions

Temperature:	23 °C
Relative Humidity:	50 %
ATM Pressure:	101.0kPa

The testing was performed by David. Hsu on 2016-05-23&2016-06-01.

EUT operation mode: Transmitting

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

**Cellular Band (Part 22H)****WCDMA Mode**

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	4.31	0.0052	2.5
-20		3.23	0.0039	2.5
-10		3.21	0.0038	2.5
0		3.12	0.0037	2.5
10		2.31	0.0028	2.5
20		2.15	0.0026	2.5
30		1.61	0.0019	2.5
40		3.10	0.0037	2.5
50		2.30	0.0027	2.5
25	V min.= 3.5	5.24	0.0063	2.5
25	V max.= 4.2	6.36	0.0076	2.5

**PCS Band (Part 24E)****WCDMA Mode**

Middle Channel, $f_0 = 1880.0$ MHz				
Temperature (°C)	Power Supplied (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	5.22	0.0027	pass
-20		3.14	0.0016	pass
-10		3.16	0.0016	pass
0		2.38	0.0011	pass
10		4.19	0.0021	pass
20		6.34	0.0032	pass
30		4.25	0.0021	pass
40		2.17	0.0011	pass
50		5.27	0.0027	pass
25	V min.= 3.5	6.03	0.0032	pass
25	V max.= 4.2	7.10	0.0037	pass

**Band II:**

10.0 MHz Middle Channel, $f_o=1880.0$ MHz (QPSK)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	-2.31	-0.0012	pass
-20		-2.16	-0.0011	pass
-10		-2.28	-0.0012	pass
0		-2.19	-0.0012	pass
10		-2.25	-0.0012	pass
20		-2.22	-0.0012	pass
30		-2.32	-0.0012	pass
40		-2.21	-0.0012	pass
50		-2.31	-0.0012	pass
25	V min.= 3.5	-2.26	-0.0012	pass
25	V max.= 4.2	-2.28	-0.0012	pass

10.0 MHz Middle Channel, $f_o=1880.0$ MHz (16QAM)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	-3.20	-0.0017	pass
-20		-3.08	-0.0016	pass
-10		-3.11	-0.0017	pass
0		-3.13	-0.0017	pass
10		-3.16	-0.0017	pass
20		-3.14	-0.0017	pass
30		-3.15	-0.0017	pass
40		-3.13	-0.0017	pass
50		-3.18	-0.0017	pass
25	V min.= 3.5	-3.16	-0.0017	pass
25	V max.= 4.2	-3.15	-0.0017	pass

**Band IV:**

10.0 MHz Middle Channel, $f_o=1732.5$ MHz (QPSK)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	0.16	0.0001	pass
-20		0.18	0.0001	pass
-10		0.12	0.0001	pass
0		0.24	0.0001	pass
10		0.22	0.0001	pass
20		0.19	0.0001	pass
30		0.59	0.0003	pass
40		0.51	0.0003	pass
50		0.67	0.0004	pass
25	V min.= 3.5	0.63	0.0004	pass
25	V max.= 4.2	0.61	0.0004	pass

10.0 MHz Middle Channel, $f_o=1732.5$ MHz (16QAM)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	0.11	0.0001	pass
-20		0.29	0.0002	pass
-10		0.21	0.0001	pass
0		0.18	0.0001	pass
10		0.23	0.0001	pass
20		0.17	0.0001	pass
30		0.11	0.0001	pass
40		0.21	0.0001	pass
50		0.21	0.0001	pass
25	V min.= 3.5	0.25	0.0001	pass
25	V max.= 4.2	0.17	0.0001	pass

**LTE Band XII:**

10.0 MHz Middle Channel, $f_o=707.5$ MHz (QPSK)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	3.79	0.0015	pass
-20		3.71	0.0015	pass
-10		3.70	0.0015	pass
0		3.68	0.0015	pass
10		3.80	0.0015	pass
20		3.61	0.0014	pass
30		3.77	0.0015	pass
40		3.81	0.0015	pass
50		3.72	0.0015	pass
25	V min.= 3.5	3.71	0.0015	pass
25	V max.= 4.2	3.84	0.0015	pass

10.0 MHz Middle Channel, $f_o=707.5$ MHz (16QAM)				
Temperature (°C)	Power Supplied (V <sub>DC</sub> )	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	3.20	0.0013	0.0001
-20		3.18	0.0013	0.0002
-10		3.14	0.0012	0.0001
0		3.17	0.0013	0.0001
10		3.16	0.0012	0.0001
20		3.35	0.0013	0.0001
30		3.39	0.0013	0.0001
40		3.21	0.0013	0.0001
50		3.14	0.0012	0.0001
25	V min.= 3.5	3.21	0.0013	0.0001
25	V max.= 4.2	3.16	0.0012	0.0001

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