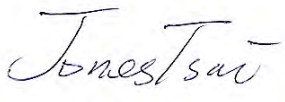
FCC RF Test Report

APPLICANT	:	Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT	:	Portable Tablet Computer
BRAND NAME	:	lenovo
MODEL NAME	:	Lenovo YT3-850M
FCC ID	:	O57YT3850M
STANDARD	:	47 CFR Part 2, 22(H), 27(M), 27(L)
CLASSIFICATION	:	PCS Licensed Transmitter (PCB)

The product was received on Apr. 27, 2015 and completely tested on May 22, 2015. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and the testing has shown the tested sample to be in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

Testing Laboratory
2627

SPORTON INTERNATIONAL (KUNSHAN) INC.
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APPENDIX A. TEST RESULTS OF CONDUCTED TEST

APPENDIX B. TEST RESULTS OF RADIATED TEST

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG542707B	Rev. 01	Initial issue of report	Jun. 02, 2015

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
3.5	N/A	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §22.917(a) §27.53(g)	Conducted Band Edge Measurement (Band 4) (Band 5)	< 43+10log10(P[Watts])	PASS	-
	§2.1051 §27.53(m)(4)	Conducted Band Edge Measurement (Band 7) (Band 38)	< 5MHz: -10 dBm 5 MHz~6MHz or 26dB(BW): -13 dBm ≥6MHz or 26dB(BW): -25 dBm		
3.8	§2.1051 §22.917(a) §27.53(g)	Conducted Spurious Emission (Band 4) (Band 5)	< 43+10log10(P[Watts])	PASS	-
	§2.1051 §27.53(m)(4)	Conducted Spurious Emission (Band 7) (Band 38)	< $55+10\log_{10}$(P[Watts])		
3.9	§2.1055 §22.355 §27.54	Frequency Stability Temperature & Voltage	< 2.5 ppm for Part 22 Within Authorized Band	PASS	

Report Section	FCC Rule	Description	Limit	Result	Remark
4.4	§22.913(a)(2)	Effective Radiated Power (Band 5)	ERP < 7 Watt	PASS	
	§27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 7)(Band 38)	EIRP < 2Watt		
	§27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	EIRP < 1Watt		
4.5	§2.1053 §22.917(a) §27.53(h)	Radiated Spurious Emission (Band 4) (Band 5)	< $43+10\log_{10}(P[Watts])$	PASS	Under limit 4.31 dB at 10104.000 MHz
	§2.1053 §27.53(m)(4)	Radiated Spurious Emission (Band 7) (Band 38)	< $55+10\log_{10}(P[Watts])$		

1 General Description

1.1 Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.
No. 68 Building, 199 Fenju Road, Wai Gao Qiao FTZ, Shanghai, China

1.2 Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	lenovo
Model Name	Lenovo YT3-850M
FCC ID	O57YT3850M
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/ HSPA+(Downlink Only)/DC-HSDPA/LTE WLAN2.4GHz 802.11b/g/n HT20 Bluetooth v3.0+EDR/Bluetooth v4.0 LE
HW Version	LenovoPad YT3-850M
SW Version	YT3-850M_150515
EUT Stage	Identical Prototype

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 7 : 2502.5 MHz ~ 2567.5 MHz LTE Band 38 : 2572.5 MHz ~ 2617.5 MHz
Rx Frequency	LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz LTE Band 5 : 869.7 MHz ~ 893.3 MHz LTE Band 7 : 2622.5MHz ~ 2687.5 MHz LTE Band 38 : 2572.5 MHz ~ 2617.5 MHz
Bandwidth	LTE Band 4 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 5 : 1.4MHz / 3MHz / 5MHz / 10MHz LTE Band 7 : 5MHz/ 10MHz / 15MHz / 20MHz LTE Band 38 : 5MHz / 10MHz / 15MHz / 20MHz
Maximum Output Power to Antenna	LTE Band 4 : 22.66 dBm LTE Band 5 : 22.69 dBm LTE Band 7 : 22.84 dBm LTE Band 38 : 22.27 dBm
Type of Modulation	QPSK / 16QAM

1.5 Component List

Note: there are six types of EUT, sample 1/3/5 are the 1st source, the difference between the three types are just for flash memory, sample 2/4/6 are the 2nd source, the difference between the three types are also for flash memory, the difference between 1st source and 2nd source are for Flash/LCM/TP/Front Camera/Side key FPC/Main FPC and battery. The details refer the following table. According to the difference, we evaluate is not affect RF performance, so only choose sample 1 to perform RF test.

Component	Sample 1	Sample 2	Sample 3
Flash	(Hynix) H9TQ26ABJTMCUR-KUM	(Samsung) KMR4Z0001A-B803	(SAMSUNG) KMR820001M-B609
LCM	(BOE) NT35523	(Dongshan Precision) S6D7AA0X04	(BOE) NT35523
TP	(O-FILM) MCF-080-2123	(Mutto) IST700	(O-FILM) MCF-080-2123
Front_camera	(O-FILM) L8865A80 8MP OV8865 COB 30PIN BtoB	(ShunYu) OV8865+Largan5008+TDK 657	(O-FILM) L8865A80 8MP OV8865 COB 30PIN BtoB
Side key FPC	(JZRXD) LXF_P5000_-Side key&USB connection FPC assembly	(Rosinda) LXF_P5000_-Side key&USB connection FPC assembly	(JZRXD) LXF_P5000_-Side key&USB connection FPC assembly
Main FPC	(JZRXD) LXF_P5000_-LCD Transfer FPC	(Rosinda) LXF_P5000_-LCD Transfer FPC	(JZRXD) LXF_P5000_-LCD Transfer FPC
Battery	(Sunwoda) L15D2K31;3.75V6400mAh; LGC18650	(Celxpert) L15D2K31;3.75V6400mAh; SDI18650	(Sunwoda) L15D2K31;3.75V6400mAh;LGC18650

Component	Sample 4	Sample 5	Sample 6
Flash	(Hynix) H9TQ17ABJTMCUR-KUM	(SAMSUNG) KMQ82000SM-B418	(Hynix) H9TQ17A8GTMCUR-KUM
LCM	(Dongshan Precision) S6D7AA0X04	(BOE) NT35523	(Dongshan Precision) S6D7AA0X04
TP	(Mutto) IST700	(O-FILM) MCF-080-2123	(Mutto) IST700
Front_camera	(ShunYu) OV8865+Largan5008+TDK657	(O-FILM) L8865A80 8MP OV8865 COB 30PIN BtoB	(ShunYu) OV8865+Largan5008+TDK657
Side key FPC	(Rosinda) LXF_P5000_-Side key&USB connection FPC assembly	(JZRXD) LXF_P5000_-Side key&USB connection FPC assembly	(Rosinda) LXF_P5000_-Side key&USB connection FPC assembly
Main FPC	(Rosinda) LXF_P5000_-LCD Transfer FPC	(JZRXD) LXF_P5000_-LCD Transfer FPC	(Rosinda) LXF_P5000_-LCD Transfer FPC
Battery	(Celxpert) L15D2K31;3.75V6400mAh; SDI18650	(Sunwoda) L15D2K31;3.75V6400mAh; LGC18650	(Celxpert) L15D2K31;3.75V6400mAh;SDI18650

1.6 Modification of EUT

No modifications are made to the EUT during all test items.

1.7 Emission Designator

LTE Band 4	QPSK			16QAM		
BW(MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
1.4	1M10G7D	-	0.3206	1M10W7D	-	0.2541
3	2M73G7D	-	0.3251	2M72W7D	-	0.2523
5	4M51G7D	-	0.3357	4M50W7D	-	0.2649
10	9M07G7D	0.0110	0.3499	9M03W7D	-	0.2649
15	13M5G7D	-	0.3170	13M5W7D	-	0.2553
20	18M4G7D	-	0.3342	18M5W7D	-	0.2529
LTE Band 5	QPSK			16QAM		
BW(MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
1.4	1M10G7D	-	0.1167	1M10W7D	-	0.0966
3	2M73G7D	-	0.1426	2M73W7D	-	0.1122
5	4M51G7D	-	0.1239	4M50W7D	-	0.0995
10	9M07G7D	0.0191	0.1151	9M05W7D	-	0.0923

LTE Band 7	QPSK			16QAM		
BW(MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
5	4M51G7D	-	0.4550	4M51W7D	-	0.3981
10	9M09G7D	0.0012	0.4256	9M05W7D	-	0.3802
15	13M5G7D	-	0.4853	13M5W7D	-	0.3589
20	18M5G7D	-	0.5047	18M5W7D	-	0.3420
LTE Band 38	QPSK			16QAM		
BW(MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)
5	4M52G7D	-	0.3350	4M50W7D	-	0.2723
10	9M07G7D	0.0090	0.3622	9M03W7D	-	0.2972
15	13M5G7D	-	0.3491	13M5W7D	-	0.2704
20	18M5G7D	-	0.3097	18M5W7D	-	0.2891

1.8 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	**Sporton Site No.**		**FCC Registration No.**
	TH01-KS	03CH02-KS	418269

1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 2, 22(H), 27(L), 27(M)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

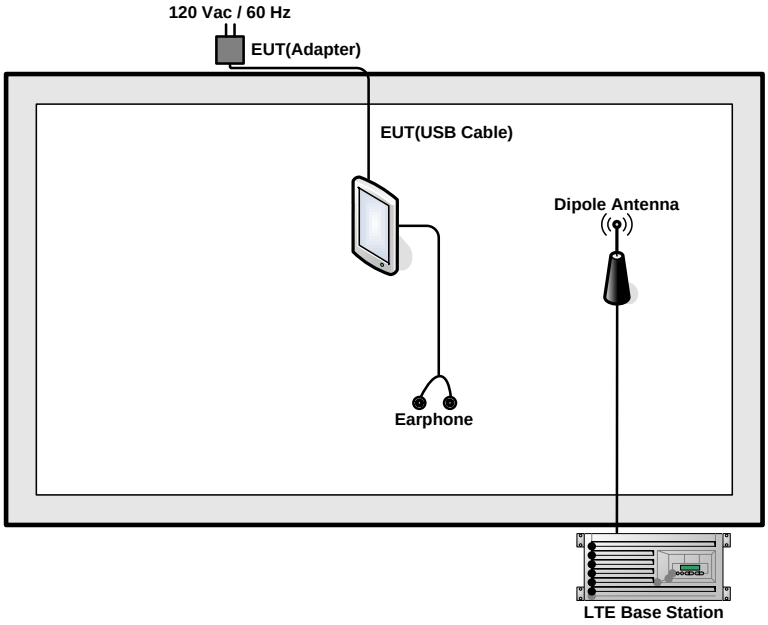
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	5	v	v	v	v	-	-	v	v	v	v	v	v	v	v
	7	-	-	v	v	v	v	v	v	v	v	v	v	v	v
	38	-	-	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	4						v	v	v	v		v	v	v	v
	5				v	-	-	v	v	v		v	v	v	v
	7	-	-				v	v	v	v		v	v	v	v
	38	-	-				v	v	v	v		v	v	v	v
26dB and 99% Bandwidth	4	v	v	v	v	v	v	v	v			v	v	v	v
	5	v	v	v	v	-	-	v	v			v	v	v	v
	7	-	-	v	v	v	v	v	v			v	v	v	v
	38	-	-	v	v	v	v	v	v			v	v	v	v
Conducted Band Edge	4	v	v	v	v	v	v	v	v	v		v	v		v
	5	v	v	v	v	-	-	v	v	v		v	v		v
	7	-	-	v	v	v	v	v	v	v		v	v		v
	38	-	-	v	v	v	v	v	v	v		v	v		v

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Conducted Spurious Emission	4	v	v	v	v	v	v	v	v	v			v	v	v
	5	v	v	v	v	-	-	v	v	v			v	v	v
	7	-	-	v	v	v	v	v	v	v			v	v	v
	38	-	-	v	v	v	v	v	v	v			v	v	v
Frequency Stability	4				v			v				v		v	
	5				v	-	-	v				v		v	
	7	-	-		v			v				v		v	
	38	-	-		v			v				v		v	
E.R.P./ E.I.R.P.	4	v	v	v	v	v	v	v	v	v			v	v	v
	5	v	v	v	v	-	-	v	v	v			v	v	v
	7	-	-	v	v	v	v	v	v	v			v	v	v
	38	-	-	v	v	v	v	v	v	v			v	v	v
Radiated Spurious Emission	4	v	v	v	v	v	v	v		v				v	
	5	v	v	v	v	-	-	v		v				v	
	7	-	-	v	v	v	v	v		v				v	
	38	-	-	v	v	v	v	v		v				v	
Note	1. The mark "v " means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.														

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Power Supply	GW INSTEK	GPD-2303S	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
3.	Earphone	SH100	N/A	N/A	N/A	N/A

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5.0 dB and 10dB attenuator.

Example :

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 5.0 + 10 = 15.0 (dB)

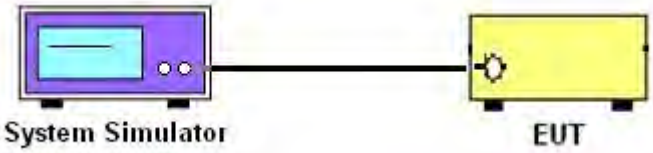
3 Conducted Test Items

3.1 Measuring Instruments

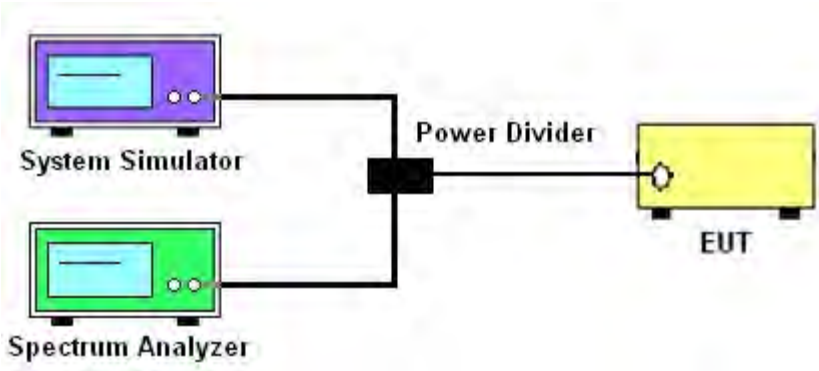
See list of measuring instruments of this test report.

3.2 Test Setup

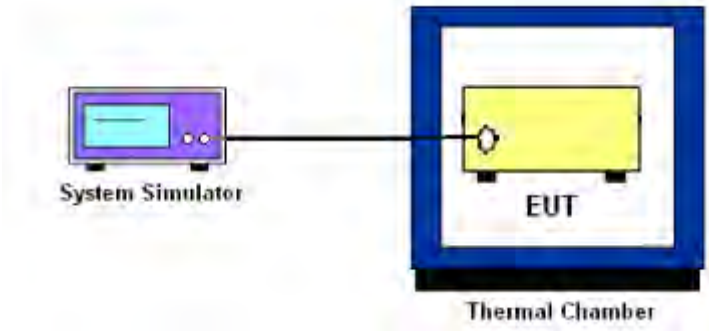
3.2.1 Conducted Output Power



3.2.2 Peak-to-Average Ratio, Occupied Bandwidth ,Conducted Band-Edge and Conducted Spurious Emission



3.2.3 Frequency Stability



3.3 Test Result of Conducted Test

Please refer to Appendix A.

3.4 Conducted Output Power

3.4.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

3.4.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.5 Peak-to-Average Ratio

3.5.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.5.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.7.1.
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

3.6 Occupied Bandwidth

3.6.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.6.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 4.2.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.

3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

22.917(a) for Band 5

For operations in the 824 – 849 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53 (h) for Band 4

For operations in the 1710 – 1755 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53(m)(4) and RSS-199 for Band 7,38:

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 that 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.

3.7.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)

   = P(W)- [43 + 10log(P)] (dB)

   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)

   = -13dBm.

   <For Band 7, 38>

   The limit line is derived from 55+ 10log(P)dB below the transmitter power P(Watts)

   = P(W)- [55 + 10log(P)] (dB)

   = [30 + 10log(P)] (dBm) - [55 + 10log(P)] (dB)

   = -25dBm.

3.8 Conducted Spurious Emission

3.8.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

For Band 7,38:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 55 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10^{th} harmonic.

3.8.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.
9. For Band 7, 38
   The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [55 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [55 + 10log(P)] (dB)
   = -25dBm.

3.9 Frequency Stability

3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

3.9.2 Test Procedures for Temperature Variation

1. The EUT was set up in the thermal chamber and connected with the system simulator.
2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.9.3 Test Procedures for Voltage Variation

1. The testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

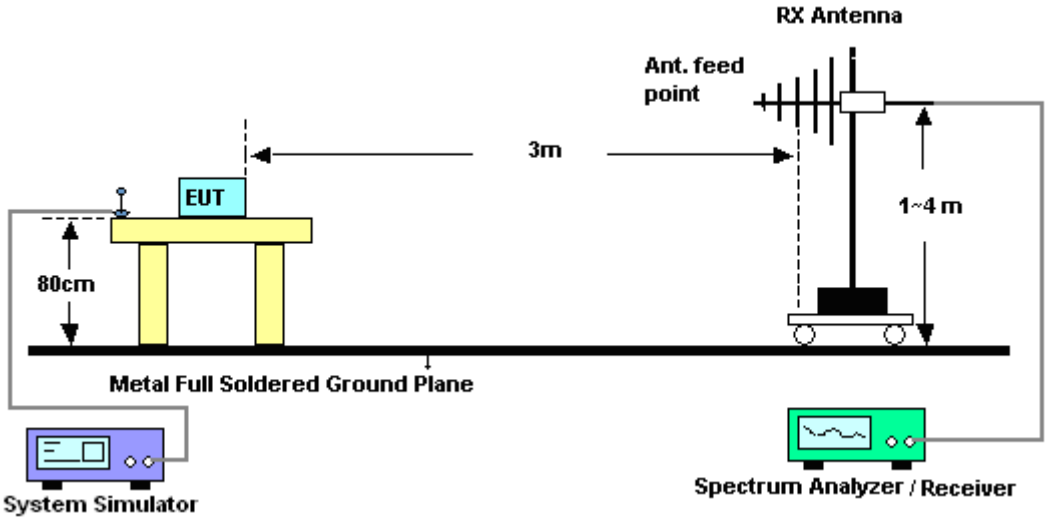
4 Radiated Test Items

4.1 Measuring Instruments

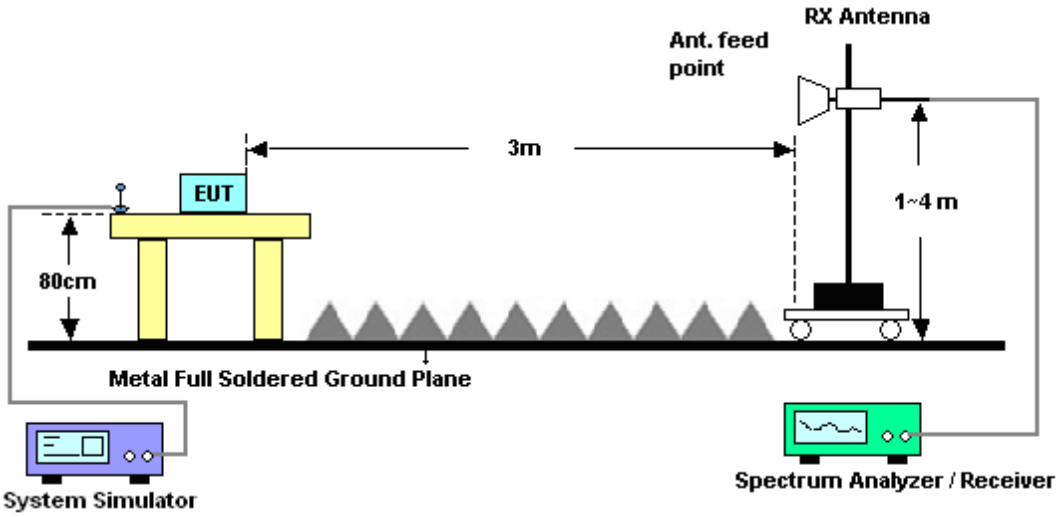
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test from 30MHz to 1GHz



4.2.2 For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Effective Radiated Power and Effective Isotropic Radiated Power

4.4.1 Description of the ERP/EIRP Measurement

Effective radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r02. Mobile and portable (hand-held) stations operating are limited to average ERP of 7 watts with LTE band 5.

Equivalent isotropic radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r02. Mobile and portable (hand-held) stations operating are limited to average EIRP of 2 watts with LTE band 7 / 38 and 1 watt with LTE band 4.

4.4.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.2.1. and ANSI / TIA-603-C-2004 Section 2.2.17.
2. The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01.
3. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power. The maximum emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
4. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by the substitution antenna at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP was calculated with the correction factor, EIRP = LVL + Correction factor and ERP = EIRP - 2.15. Take the record of the output power at substitution antenna.

	LTE					
LTE BW	1.4M	3M	5M	10M	15M	20M
Span	3MHz	6MHz	10MHz	20MHz	30MHz	40MHz
RBW	30kHz	100kHz	100kHz	300kHz	300kHz	300kHz
VBW	100kHz	300kHz	300kHz	1MHz	1MHz	1MHz
Detector	RMS	RMS	RMS	RMS	RMS	RMS
Trace	Average	Average	Average	Average	Average	Average
Average Type	Power	Power	Power	Power	Power	Power
Sweep Count	100	100	100	100	100	100

4.5 Radiated Spurious Emission

4.5.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

For Band 7, 38

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 55 + 10 log (P) dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.5.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-C-2004 Section 2.2.12.
2. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.
    For Band 7,38:
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
12. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
13. ERP (dBm) = EIRP - 2.15

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	100845	9kHz~30GHz	Oct. 28, 2014	May 08, 2015~ May 22, 2015	Oct. 27, 2015	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 25, 2014	May 08, 2015~ May 22, 2015	Oct. 24, 2015	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 29, 2014	May 10, 2015~ May 18, 2015	Sep. 28, 2015	Radiation (03CH02-KS)
Spectrum Analyzer	R&S	FSV40	101040	10kHz~40GHz;Max 30dBm	Sep. 25, 2014	May 10, 2015~ May 18, 2015	Sep. 24, 2015	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	37879	30MHz~2GHz	Sep. 13, 2014	May 10, 2015~ May 18, 2015	Sep. 12, 2015	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 08, 2014	May 10, 2015~ May 18, 2015	Nov. 07, 2015	Radiation (03CH02-KS)
Active Horn Antenna	com-power	AHA-118	701030	1GHz~18GHz	Nov. 08, 2014	May 10, 2015~ May 18, 2015	Nov. 07, 2015	Radiation (03CH02-KS)
SHF-EHF Horn	com-power	AH-840	101070	18GHz~40GHz	Sep. 04, 2014	May 10, 2015~ May 18, 2015	Sep. 03, 2015	Radiation (03CH02-KS)
Amplifier	com-power	PA-103A	161069	1kHz~1000MHz / 32 dB	May 04, 2015	May 10, 2015~ May 18, 2015	May 03, 2016	Radiation (03CH02-KS)
Amplifier	Agilent	8449B	3008A02384	1GHz~26.5GHz Gain 30dB	Oct. 28, 2014	May 10, 2015~ May 18, 2015	Oct. 27, 2015	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	May 10, 2015~ May 18, 2015	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	May 10, 2015~ May 18, 2015	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	May 10, 2015~ May 18, 2015	NCR	Radiation (03CH02-KS)

6 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.1 dB**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
1.4	1	0	QPSK	22.52	22.17	22.28
1.4	1	2		22.47	22.45	22.12
1.4	1	5		22.45	22.36	22.17
1.4	3	0		22.42	22.31	22.19
1.4	3	1		22.41	22.40	22.19
1.4	3	2		22.45	22.38	22.22
1.4	6	0		21.32	21.29	21.13
1.4	1	0	16-QAM	21.74	21.18	21.26
1.4	1	2		21.70	21.24	21.53
1.4	1	5		21.18	21.62	21.42
1.4	3	0		21.50	21.05	21.12
1.4	3	1		21.59	21.59	21.47
1.4	3	2		21.71	21.55	21.46
1.4	6	0		20.35	20.14	19.95
3	1	0	QPSK	22.63	22.34	22.32
3	1	7		22.52	22.53	22.42
3	1	14		22.32	22.42	22.26
3	8	0		21.39	21.31	21.26
3	8	4		21.46	21.32	21.33
3	8	7		21.46	21.30	21.26
3	15	0		21.33	21.25	21.27
3	1	0	16-QAM	21.88	21.48	21.63
3	1	7		21.79	21.52	21.46
3	1	14		21.66	21.33	21.48
3	8	0		20.55	20.47	20.41
3	8	4		20.54	20.48	20.31
3	8	7		20.54	20.20	20.34
3	15	0		20.20	20.30	20.29

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	22.26	22.23	22.29
5	1	12		22.34	22.53	22.22
5	1	24		22.38	22.20	22.28
5	12	0		21.44	21.37	21.33
5	12	6		21.40	21.21	21.23
5	12	11		21.38	21.19	21.21
5	25	0		21.36	21.29	21.24
5	1	0	16-QAM	21.57	21.50	21.63
5	1	12		21.55	21.56	21.46
5	1	24		21.66	21.55	21.32
5	12	0		20.39	20.33	20.22
5	12	6		20.35	20.32	20.24
5	12	11		20.33	20.31	20.24
5	25	0		20.41	20.50	20.33
10	1	0	QPSK	22.45	22.33	22.50
10	1	24		22.39	22.65	22.36
10	1	49		22.40	22.36	22.27
10	25	0		21.48	21.35	21.40
10	25	12		21.43	21.30	21.32
10	25	24		21.28	21.29	21.24
10	50	0		21.33	21.33	21.27
10	1	0	16-QAM	21.81	21.29	21.79
10	1	24		21.58	21.24	21.59
10	1	49		21.49	21.70	21.37
10	25	0		20.36	20.55	20.45
10	25	12		20.57	20.50	20.38
10	25	24		20.40	20.35	20.32
10	50	0		20.38	20.35	20.34

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
15	1	0	QPSK	22.41	22.58	22.48
15	1	37		22.34	22.55	22.35
15	1	74		22.32	22.33	21.99
15	36	0		21.63	21.41	21.43
15	36	18		21.51	21.26	21.38
15	36	37		21.43	21.29	21.24
15	75	0		21.45	21.33	21.31
15	1	0	16-QAM	21.88	21.86	21.53
15	1	37		21.71	21.18	21.47
15	1	74		21.42	21.12	21.06
15	36	0		20.47	20.44	20.45
15	36	18		20.48	20.29	20.22
15	36	37		20.52	20.31	20.13
15	75	0		20.39	20.44	20.22
20	1	0	QPSK	22.60	22.66	22.63
20	1	49		22.58	22.46	22.58
20	1	99		22.41	22.29	22.13
20	50	0		21.53	21.56	21.33
20	50	24		21.39	21.31	21.39
20	50	49		21.21	21.29	21.17
20	100	0		21.42	21.44	21.37
20	1	0	16-QAM	21.97	21.92	21.59
20	1	49		21.60	21.30	21.41
20	1	99		21.44	21.44	21.44
20	50	0		20.45	20.50	20.37
20	50	24		20.36	20.35	20.35
20	50	49		20.21	20.29	20.14
20	100	0		20.48	20.56	20.23

LTE Band 5 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
1.4	1	0	QPSK	22.31	22.42	22.57
1.4	1	2		22.57	22.50	22.52
1.4	1	5		22.56	22.31	22.28
1.4	3	0		22.36	22.45	22.50
1.4	3	1		22.51	22.63	22.47
1.4	3	2		22.21	22.45	22.44
1.4	6	0		21.61	21.60	21.56
1.4	1	0	16-QAM	21.54	21.61	21.82
1.4	1	2		21.84	21.74	21.82
1.4	1	5		21.36	21.79	21.81
1.4	3	0		21.25	21.90	21.76
1.4	3	1		21.56	21.92	21.84
1.4	3	2		21.56	21.37	21.83
1.4	6	0		20.44	20.51	20.28
3	1	0	QPSK	22.41	22.52	22.56
3	1	7		22.50	22.36	22.59
3	1	14		22.45	22.29	22.41
3	8	0		21.48	21.58	21.53
3	8	4		21.58	21.65	21.53
3	8	7		21.52	21.62	21.60
3	15	0		21.50	21.60	21.40
3	1	0	16-QAM	21.78	21.84	21.89
3	1	7		21.85	21.88	21.84
3	1	14		21.89	21.69	21.25
3	8	0		20.63	20.76	20.51
3	8	4		20.56	20.73	20.62
3	8	7		20.69	20.70	20.52
3	15	0		20.32	20.76	20.39

LTE Band 5 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	22.51	22.60	22.60
5	1	12		22.32	22.58	22.58
5	1	24		22.56	22.41	22.42
5	12	0		21.54	21.53	21.49
5	12	6		21.50	21.51	21.52
5	12	11		21.63	21.61	21.51
5	25	0		21.53	21.61	21.50
5	1	0	16-QAM	21.73	21.86	21.75
5	1	12		21.91	21.88	21.79
5	1	24		21.88	21.58	21.71
5	12	0		20.57	20.59	20.51
5	12	6		20.53	20.55	20.42
5	12	11		20.57	20.57	20.46
5	25	0		20.54	20.60	20.54
10	1	0	QPSK	22.56	22.40	22.45
10	1	24		22.68	22.61	22.69
10	1	49		22.44	22.52	22.38
10	25	0		21.51	21.57	21.63
10	25	12		21.56	21.57	21.61
10	25	24		21.52	21.49	21.55
10	50	0		21.52	21.63	21.60
10	1	0	16-QAM	21.63	21.91	21.28
10	1	24		21.87	21.93	21.92
10	1	49		21.77	21.83	21.76
10	25	0		20.54	20.61	20.75
10	25	12		20.62	20.62	20.64
10	25	24		20.56	20.46	20.59
10	50	0		20.45	20.70	20.43

LTE Band 7 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	21.75	21.76	21.95
5	1	12		21.89	21.80	22.12
5	1	24		21.86	21.88	21.89
5	12	0		20.84	20.95	21.06
5	12	6		20.91	20.89	20.95
5	12	11		20.91	20.96	21.00
5	25	0		20.89	21.07	21.02
5	1	0	16-QAM	21.14	21.20	21.20
5	1	12		21.12	21.12	21.24
5	1	24		21.08	21.19	21.13
5	12	0		19.86	19.95	20.33
5	12	6		19.94	19.97	19.98
5	12	11		19.97	19.97	19.78
5	25	0		20.03	20.14	20.16
10	1	0	QPSK	22.44	22.57	22.76
10	1	24		22.60	22.65	22.46
10	1	49		22.35	22.64	22.65
10	25	0		21.65	21.65	21.75
10	25	12		21.62	21.77	21.71
10	25	24		21.55	21.70	21.65
10	50	0		21.60	21.65	21.65
10	1	0	16-QAM	21.60	21.74	21.80
10	1	24		22.34	21.56	21.52
10	1	49		21.69	21.80	21.63
10	25	0		20.73	20.74	20.60
10	25	12		20.76	20.63	20.52
10	25	24		20.49	20.69	20.56
10	50	0		20.64	20.68	20.65

LTE Band 7 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
15	1	0	QPSK	22.65	22.58	22.73
15	1	37		22.76	22.59	22.61
15	1	74		22.61	22.61	22.60
15	36	0		21.68	21.77	21.77
15	36	18		21.49	21.69	21.69
15	36	37		21.51	21.70	21.62
15	75	0		21.61	21.78	21.73
15	1	0	16-QAM	22.10	21.65	22.35
15	1	37		21.54	21.64	22.00
15	1	74		21.74	22.20	21.43
15	36	0		20.74	20.75	20.90
15	36	18		20.51	20.69	20.72
15	36	37		20.61	20.74	20.70
15	75	0		20.57	20.70	20.71
20	1	0	QPSK	22.69	22.80	22.84
20	1	49		22.59	22.79	22.64
20	1	99		22.54	22.78	22.60
20	50	0		21.72	21.77	21.92
20	50	24		21.57	21.75	21.68
20	50	49		21.52	21.71	21.67
20	100	0		21.67	21.80	21.90
20	1	0	16-QAM	21.92	21.78	22.40
20	1	49		22.08	22.17	21.95
20	1	99		21.80	22.08	21.88
20	50	0		20.68	20.66	20.87
20	50	24		20.55	20.67	20.54
20	50	49		20.49	20.72	20.61
20	100	0		20.61	20.67	20.73

LTE Band 38 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	22.08	21.88	21.92
5	1	12		22.15	21.95	22.01
5	1	24		22.06	21.89	22.00
5	12	0		21.17	21.06	21.09
5	12	6		21.23	20.99	20.97
5	12	11		21.22	20.90	20.94
5	25	0		21.20	21.03	21.02
5	1	0	16-QAM	21.26	21.16	21.05
5	1	12		21.23	21.02	20.95
5	1	24		21.32	21.04	20.89
5	12	0		19.97	20.10	20.13
5	12	6		20.11	19.78	20.08
5	12	11		20.18	19.79	20.09
5	25	0		20.36	19.96	20.18
10	1	0	QPSK	22.18	21.86	21.87
10	1	24		22.21	22.04	22.09
10	1	49		21.98	21.69	21.75
10	25	0		21.15	21.06	21.07
10	25	12		21.20	21.05	21.02
10	25	24		21.37	21.06	21.03
10	50	0		21.23	21.06	21.10
10	1	0	16-QAM	21.24	21.22	21.16
10	1	24		21.40	21.18	21.21
10	1	49		21.31	20.93	20.83
10	25	0		20.18	20.19	20.09
10	25	12		20.36	20.22	20.01
10	25	24		20.43	20.21	20.03
10	50	0		20.27	19.93	19.96

LTE Band 38 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
15	1	0	QPSK	22.15	22.09	22.11
15	1	37		22.10	21.99	21.90
15	1	74		22.06	22.12	21.96
15	36	0		21.29	21.05	21.22
15	36	18		21.35	21.02	20.97
15	36	37		21.21	21.05	20.99
15	75	0		21.22	21.07	21.07
15	1	0	16-QAM	21.18	21.24	21.40
15	1	37		21.26	20.90	20.98
15	1	74		20.99	21.21	21.08
15	36	0		20.22	19.88	20.12
15	36	18		20.10	19.77	19.98
15	36	37		20.13	20.07	20.01
15	75	0		20.18	19.93	20.01
20	1	0	QPSK	22.17	22.00	22.06
20	1	49		22.27	22.05	22.12
20	1	99		21.88	21.81	21.84
20	50	0		21.36	21.16	21.31
20	50	24		21.31	21.10	21.20
20	50	49		21.12	21.06	21.05
20	100	0		21.27	21.08	21.20
20	1	0	16-QAM	21.32	21.30	21.15
20	1	49		21.26	21.04	21.03
20	1	99		20.96	21.26	20.92
20	50	0		20.33	20.09	20.19
20	50	24		20.30	19.96	20.07
20	50	49		20.08	19.93	19.94
20	100	0		20.17	20.02	20.07

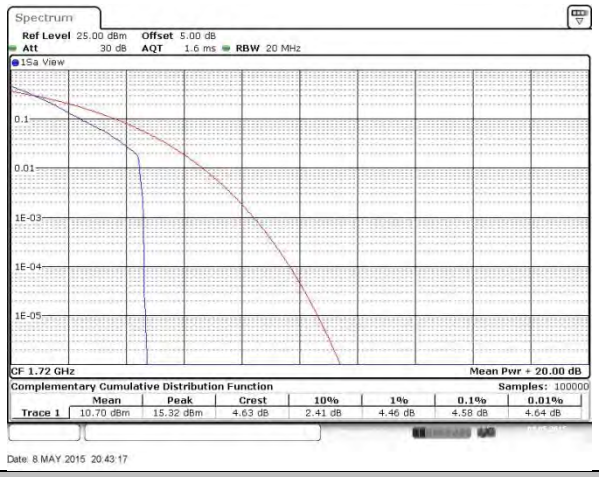
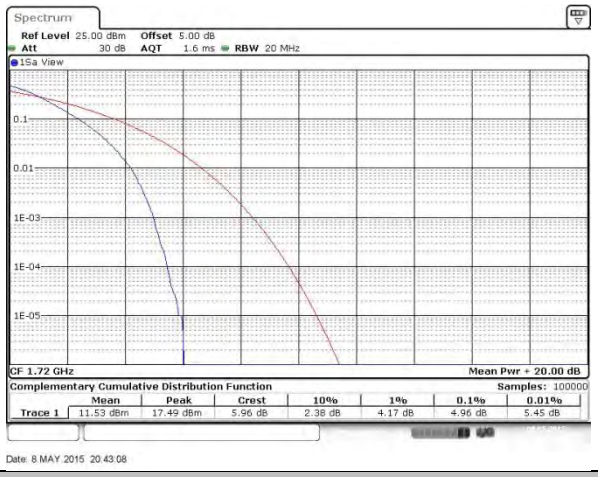
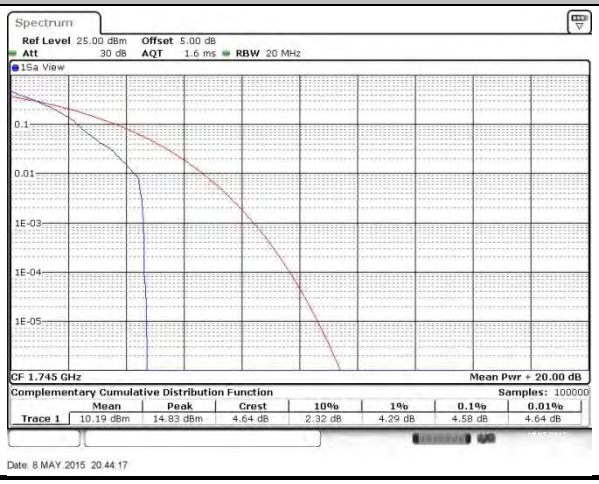
Peak-to-Average Ratio

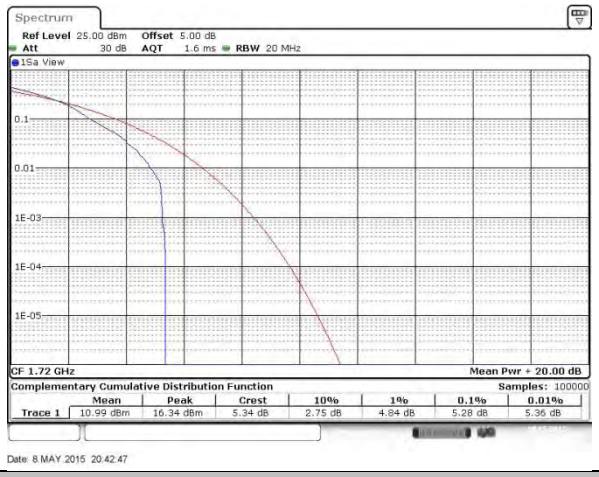
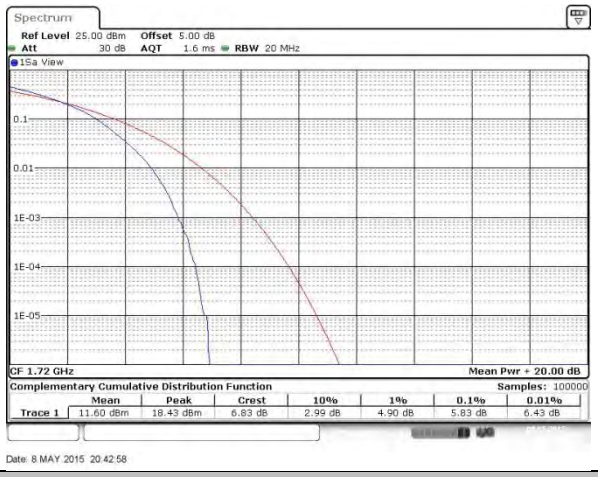
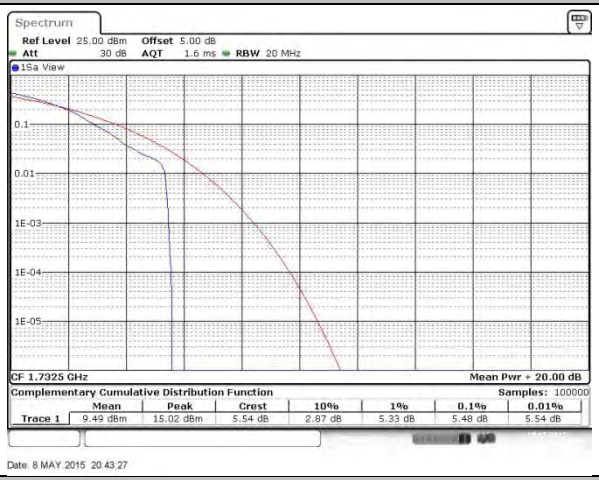
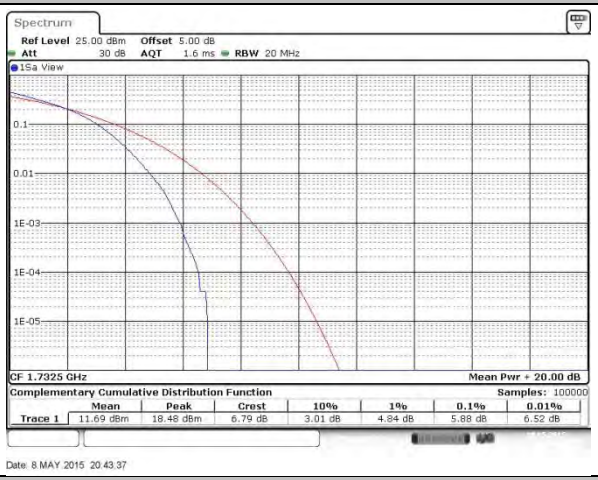
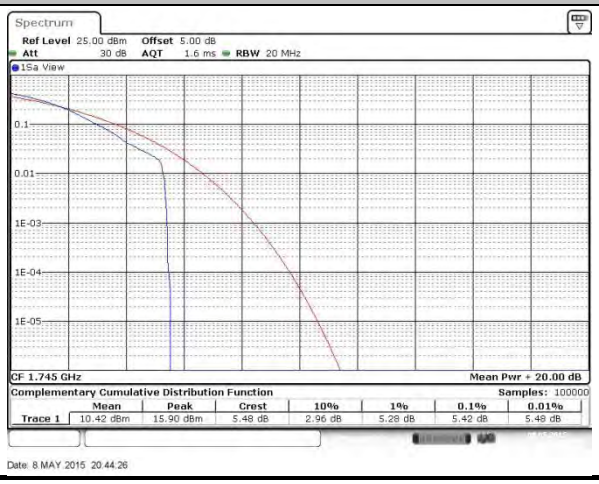
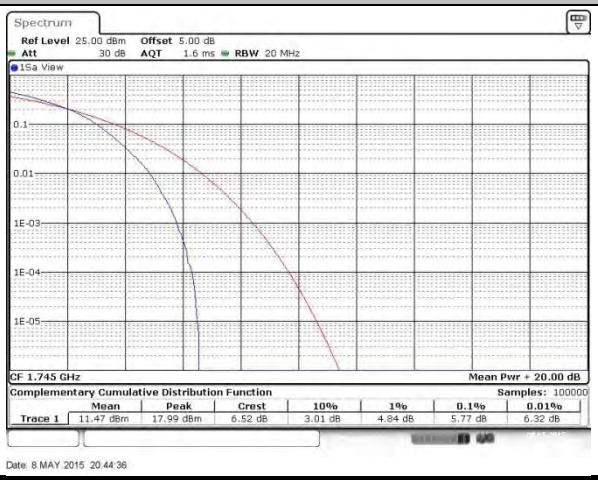
Mode	LTE Band 4 / 20MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	RB Size	Result
Lowest CH	4.58	4.96	5.28	5.83	PASS
Middle CH	4.67	5.01	5.48	5.88	
Highest CH	4.58	4.72	5.42	5.77	

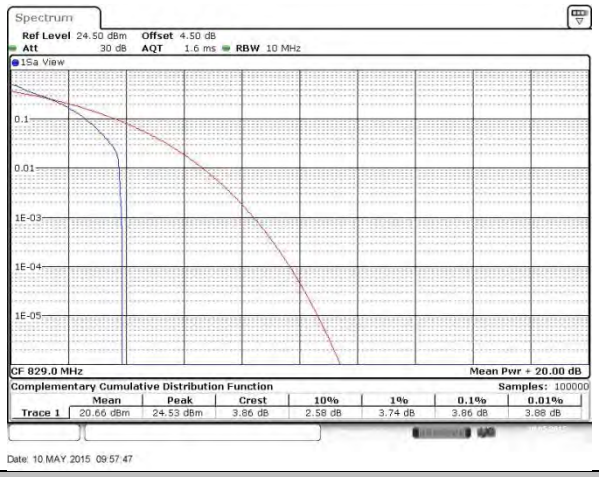
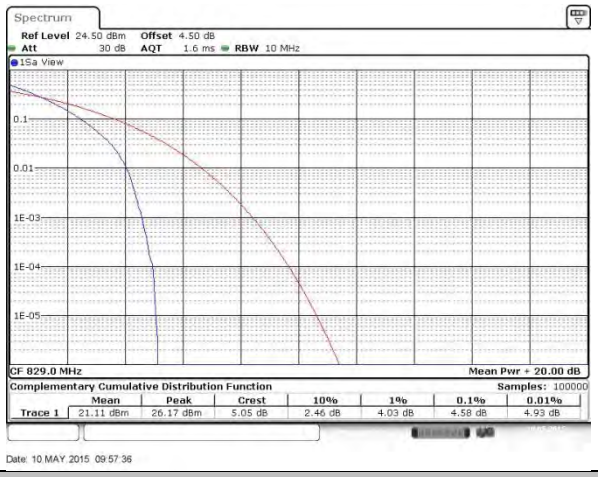
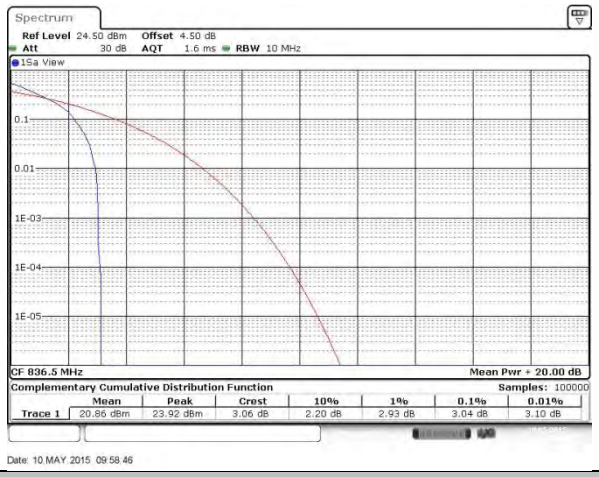
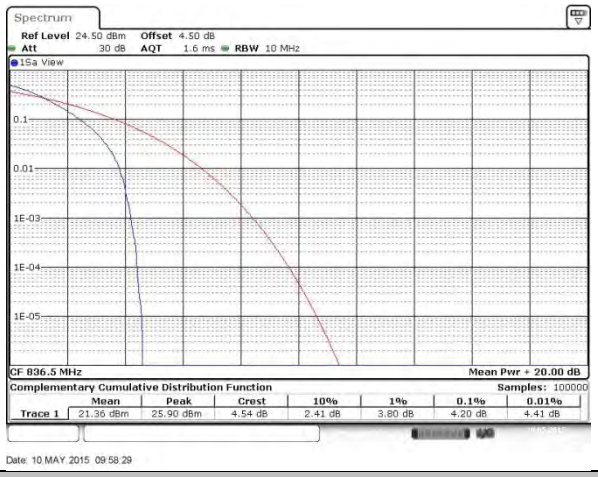
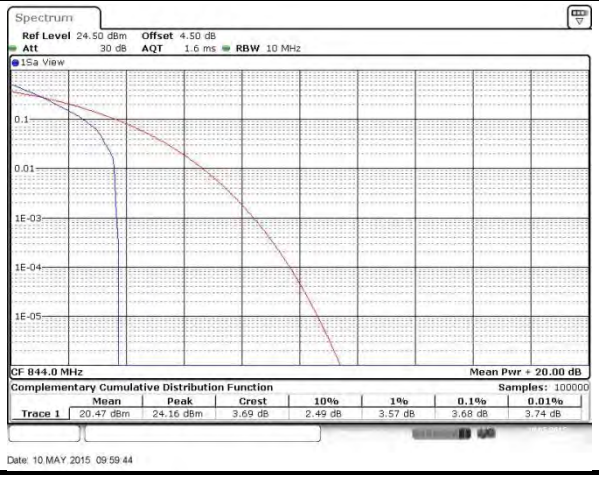
Mode	LTE Band 5 / 10MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	RB Size	Result
Lowest CH	3.86	4.58	4.84	5.62	PASS
Middle CH	3.04	4.20	4.03	5.45	
Highest CH	3.68	4.72	4.29	5.74	

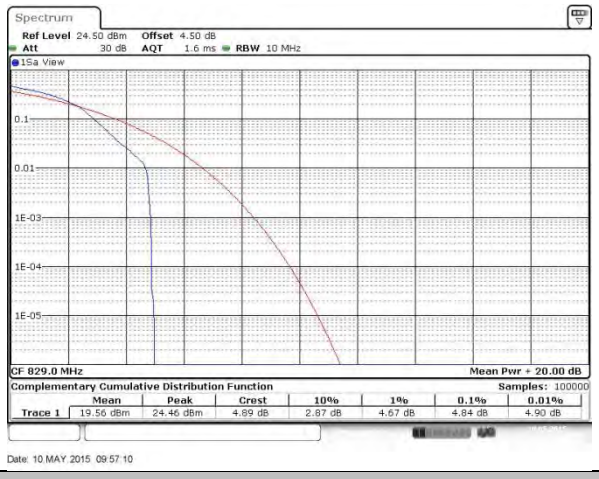
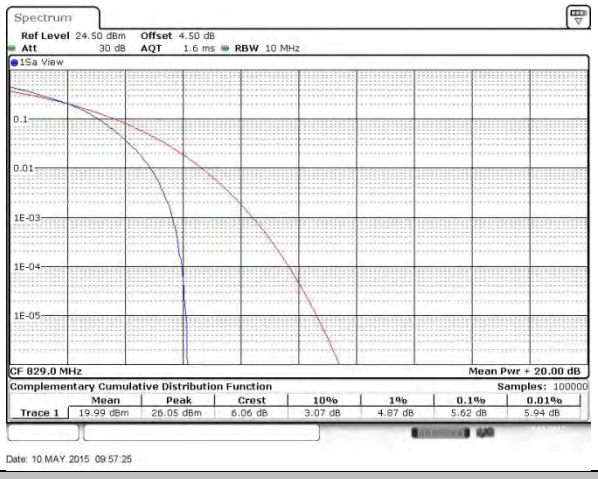
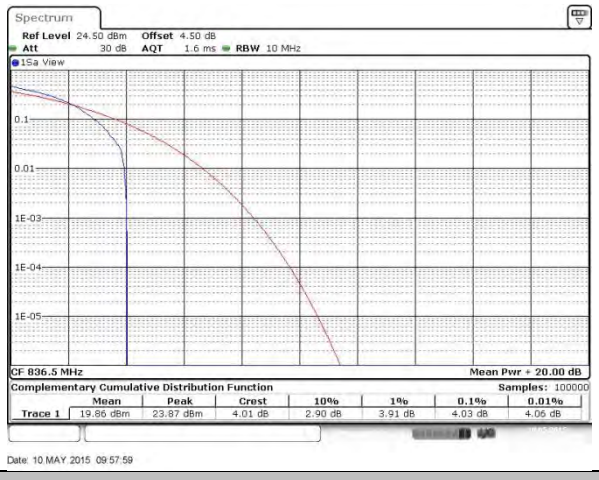
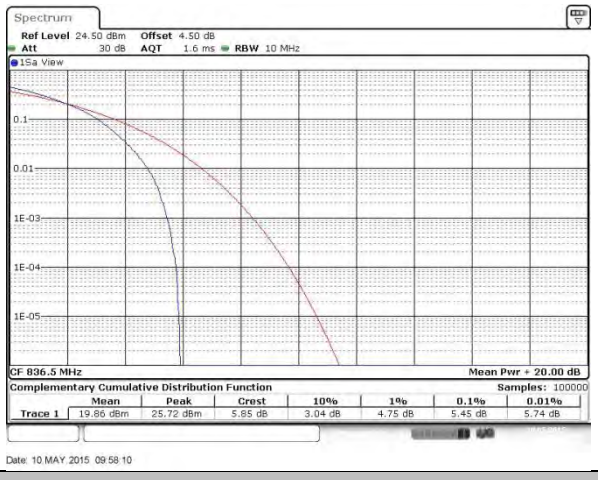
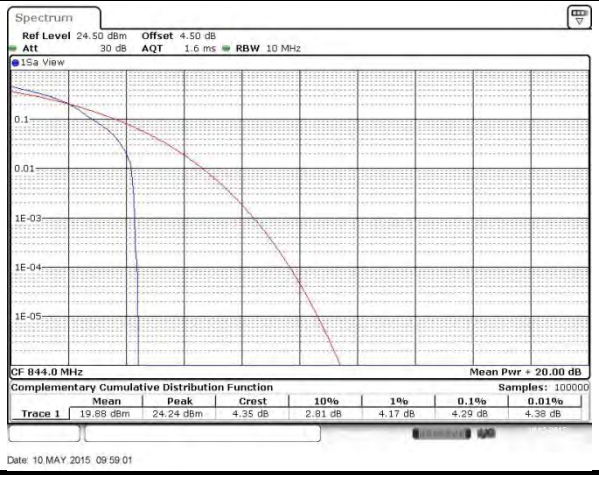
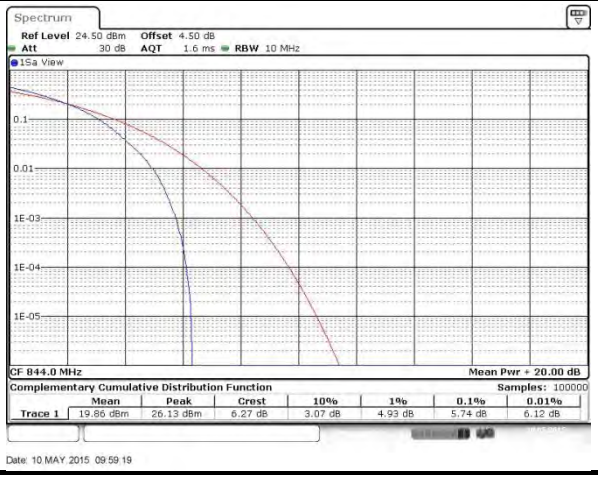
Mode	LTE Band 7 / 20MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	RB Size	Result
Lowest CH	3.80	4.32	4.41	5.33	PASS
Middle CH	4.03	4.99	4.87	5.71	
Highest CH	3.59	4.41	4.58	5.71	

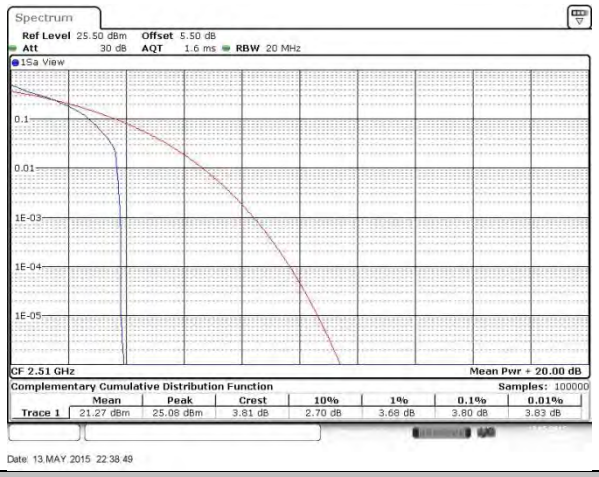
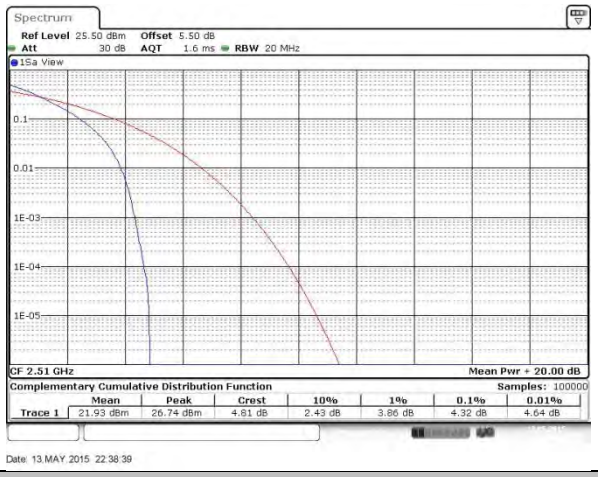
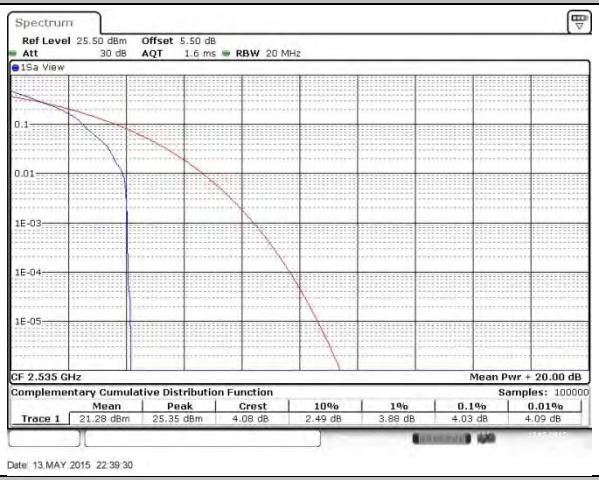
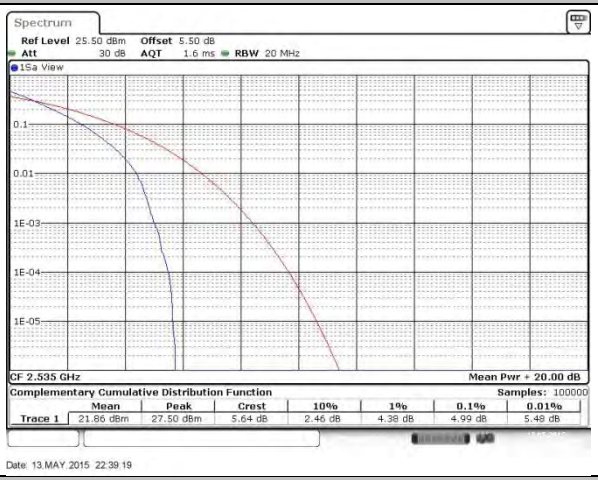
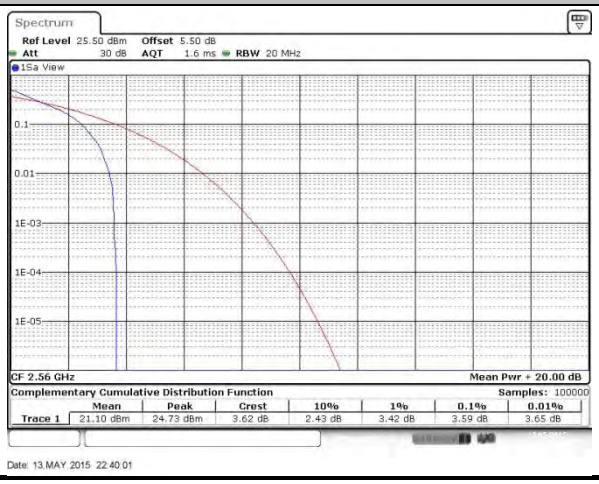
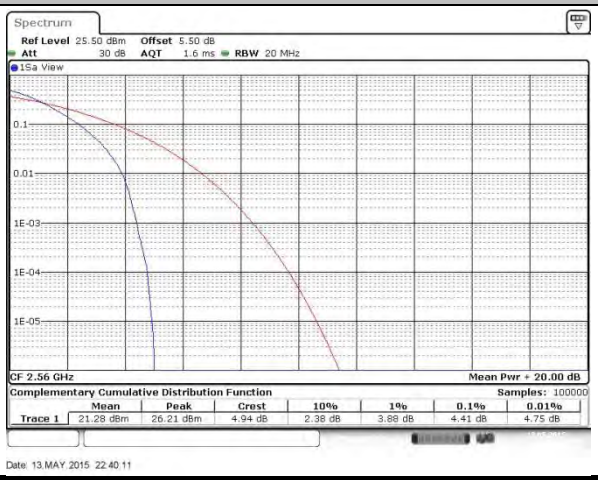
Mode	LTE Band 38 / 20MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	RB Size	Result
Lowest CH	4.72	4.93	4.84	5.65	PASS
Middle CH	5.13	5.01	5.42	6.17	
Highest CH	5.51	5.16	5.62	5.94	

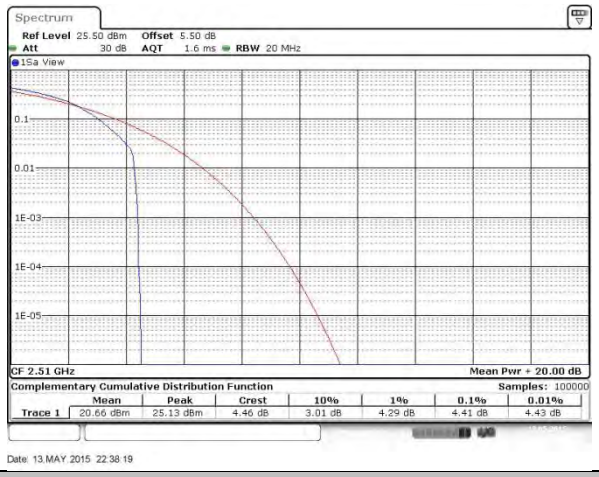
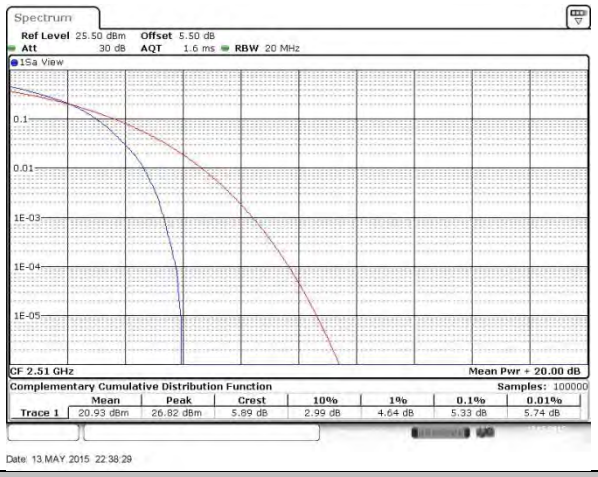
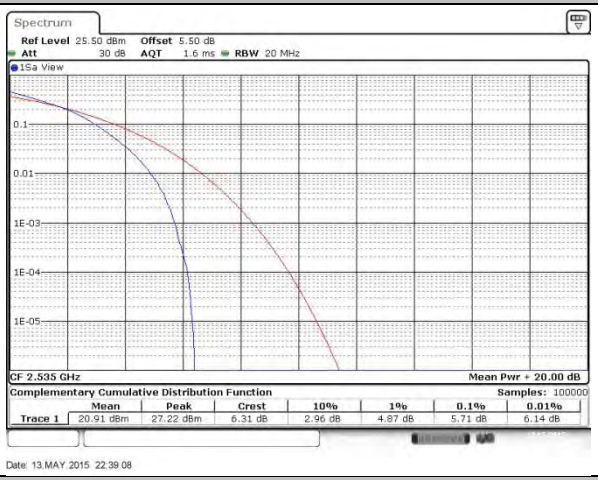
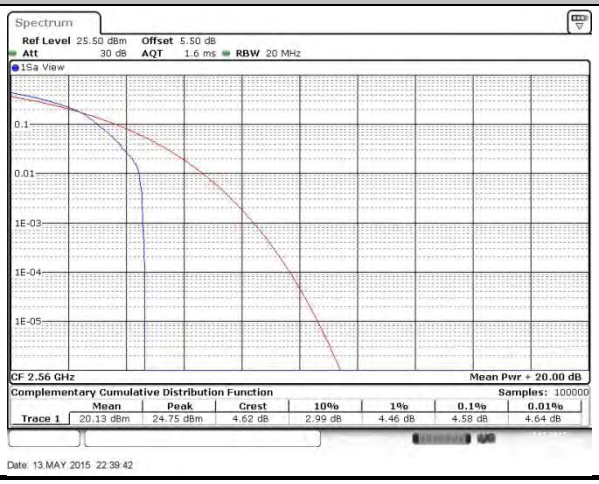
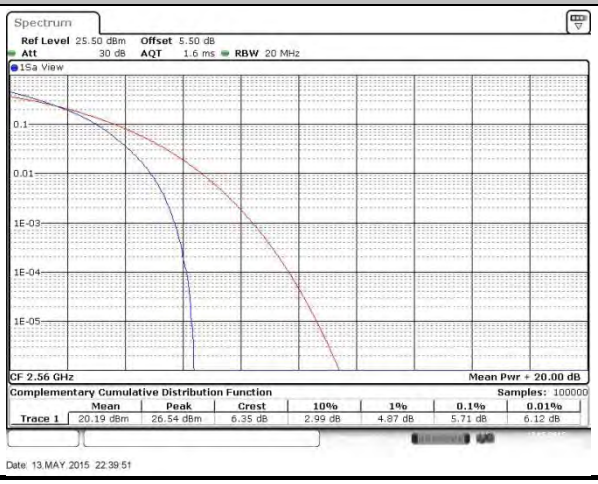
LTE Band 4 / 20MHz / QPSK	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
Highest Channel / 1RB	**Highest Channel / Full RB**
	

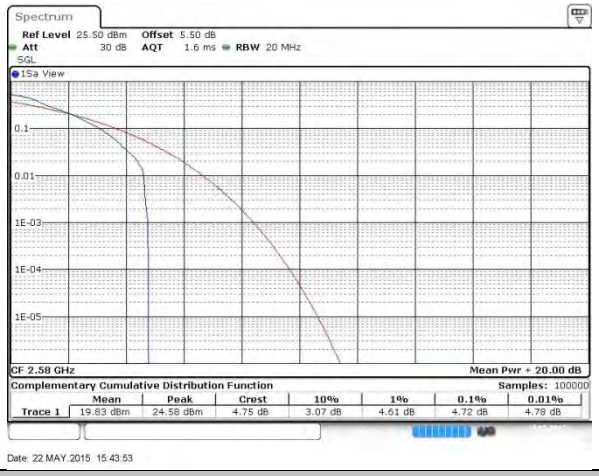
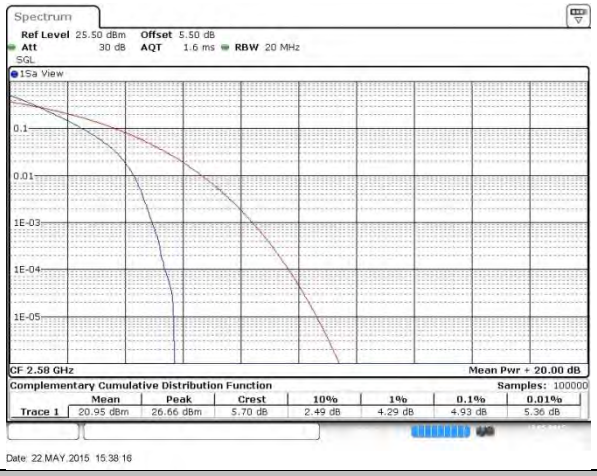
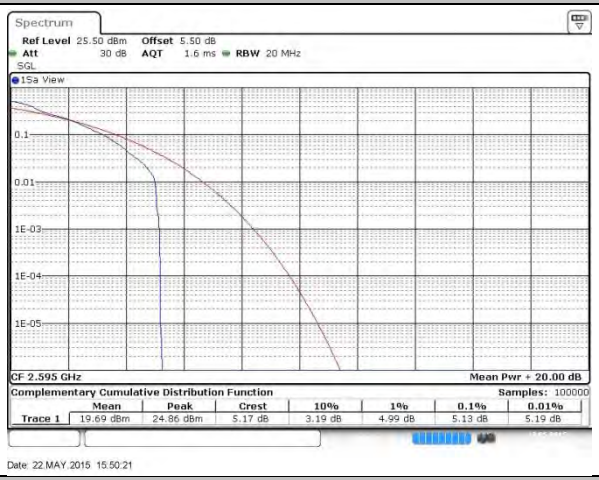
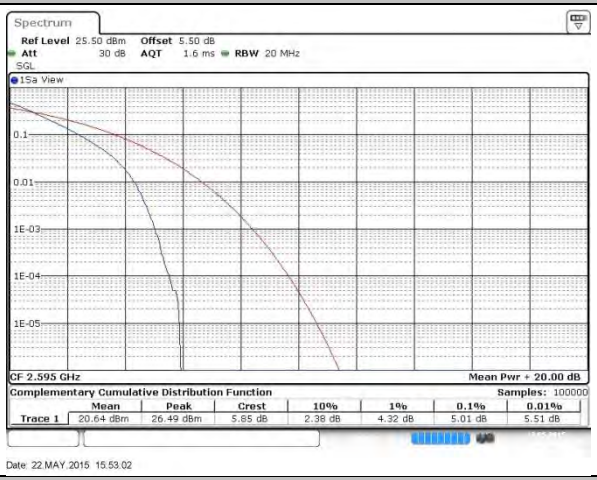
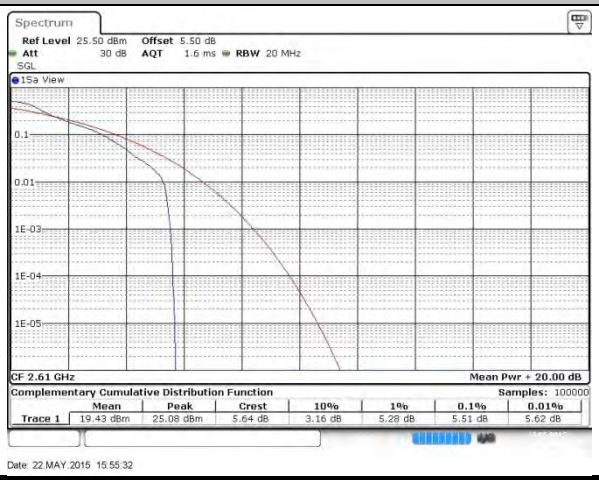
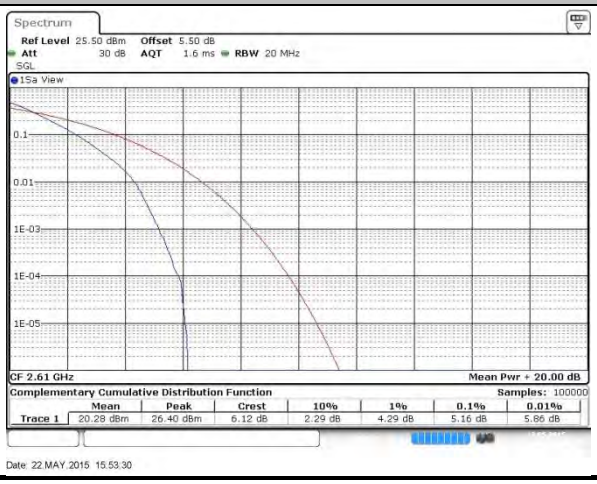
LTE Band 4 / 20MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

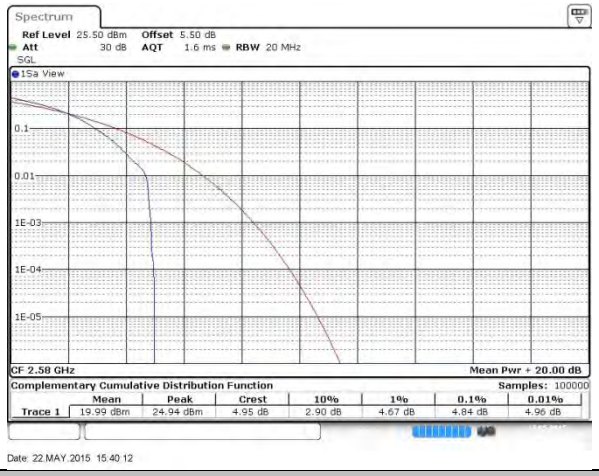
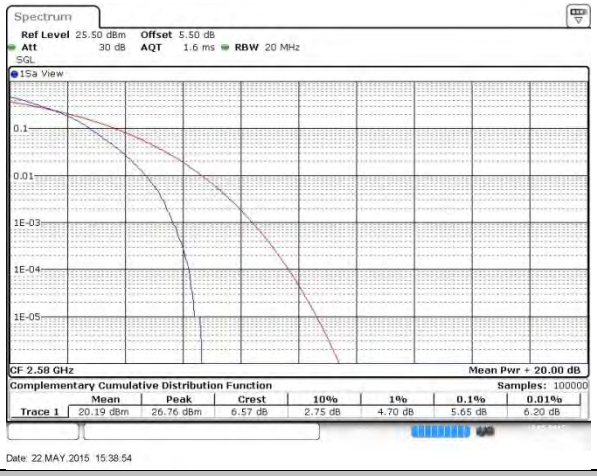
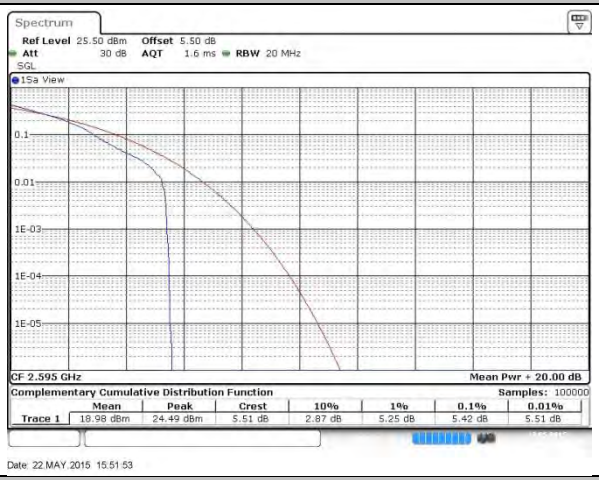
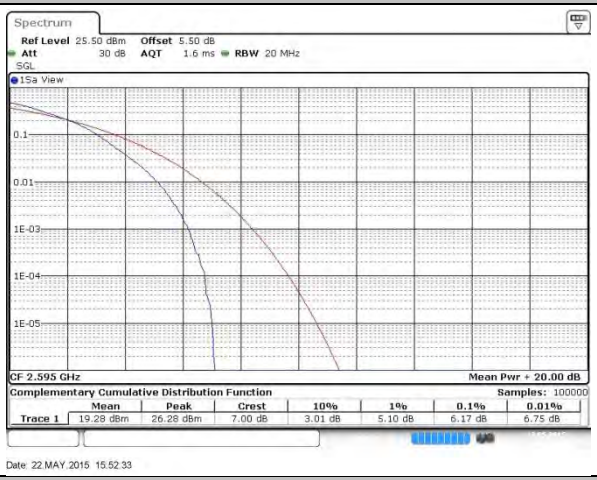
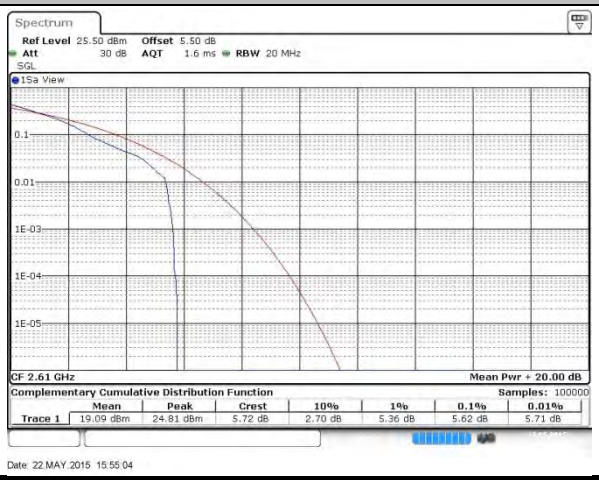
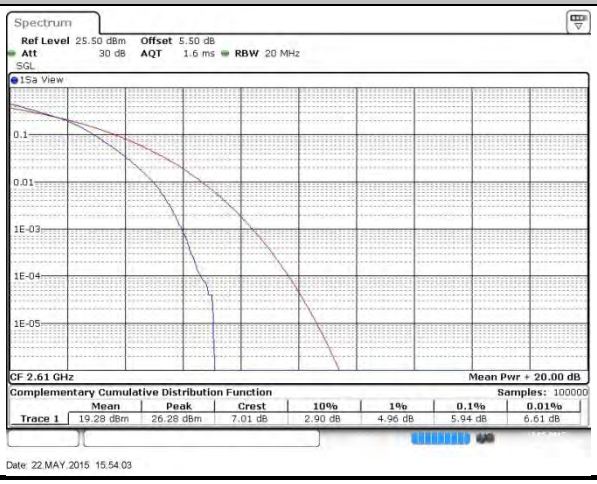
LTE Band 5 / 10MHz / QPSK	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 5 / 10MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 7 / 20MHz / QPSK	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 7 / 20MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 38 / 20MHz / QPSK	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 38 / 20MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

26dB Bandwidth

Mode	LTE Band 4 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	1.284	1.298	3.051	3.051	5.055	5.025	10.030	9.970	14.625	14.655	20.460	20.180
Middle CH	1.284	1.301	3.051	3.051	5.045	5.045	9.970	9.950	14.715	14.685	20.539	20.220
Highest CH	1.284	1.298	3.051	3.051	5.055	5.035	10.070	10.030	14.685	14.715	20.100	20.300

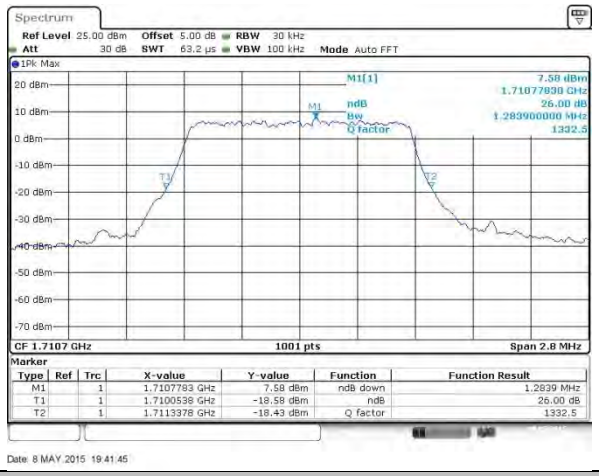
Mode	LTE Band 5 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	1.278	1.298	3.045	3.057	5.045	5.055	10.030	9.910	-	-	-	-
Middle CH	1.287	1.298	3.057	3.063	5.055	5.005	10.130	9.910	-	-	-	-
Highest CH	1.281	1.301	3.045	3.045	5.045	5.035	9.970	9.990	-	-	-	-

Mode	LTE Band 7 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	5.055	5.045	10.030	9.930	14.745	14.655	20.939	20.380
Middle CH	-	-	-	-	5.045	5.055	10.070	9.990	14.805	14.655	20.260	20.340
Highest CH	-	-	-	-	5.045	5.065	9.950	10.070	14.655	14.655	20.300	20.340

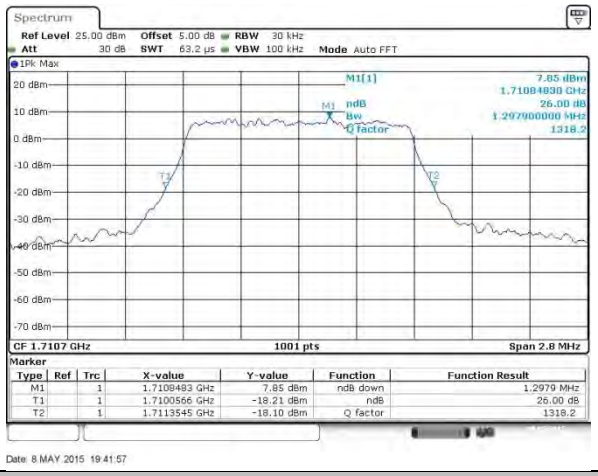
Mode	LTE Band 38 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	5.225	5.035	10.010	9.910	15.345	14.865	22.058	20.300
Middle CH	-	-	-	-	5.245	5.035	9.950	9.990	14.745	14.655	20.659	20.260
Highest CH	-	-	-	-	5.215	5.045	9.990	9.930	14.715	14.865	20.340	20.739

LTE Band 4

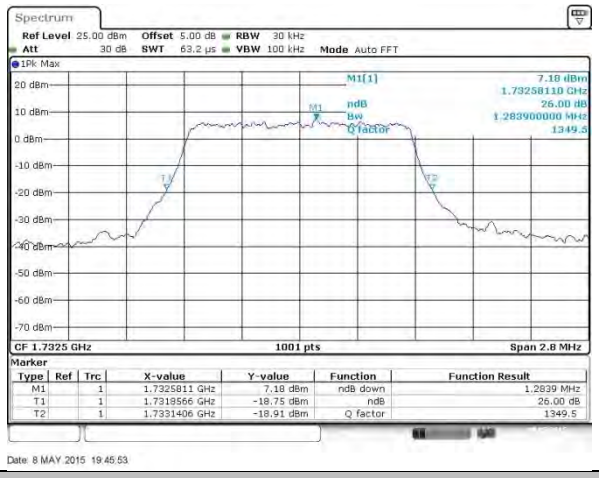
Lowest Channel / 1.4MHz / QPSK



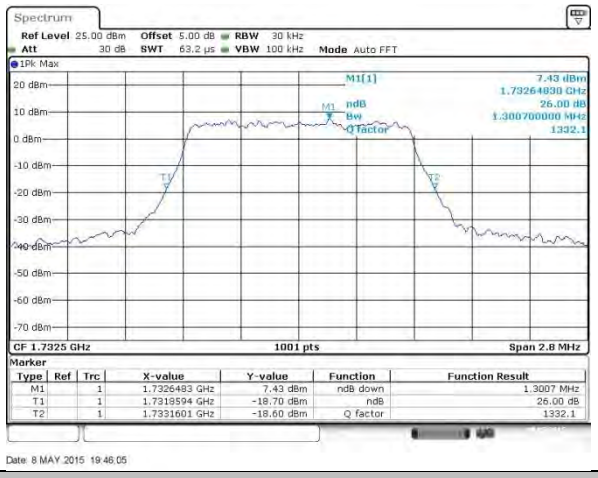
Lowest Channel / 1.4MHz / 16QAM



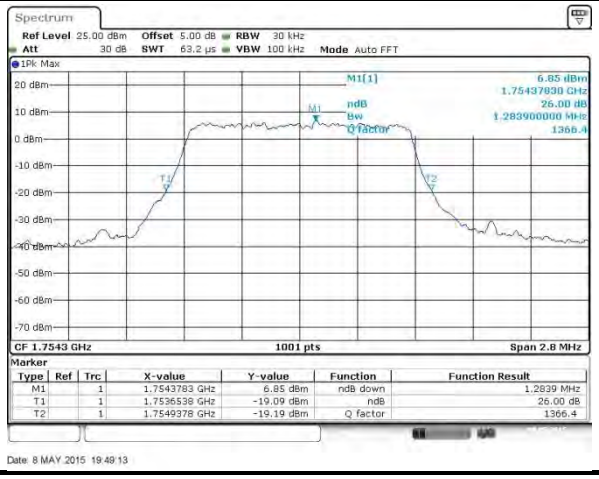
Middle Channel / 1.4MHz / QPSK



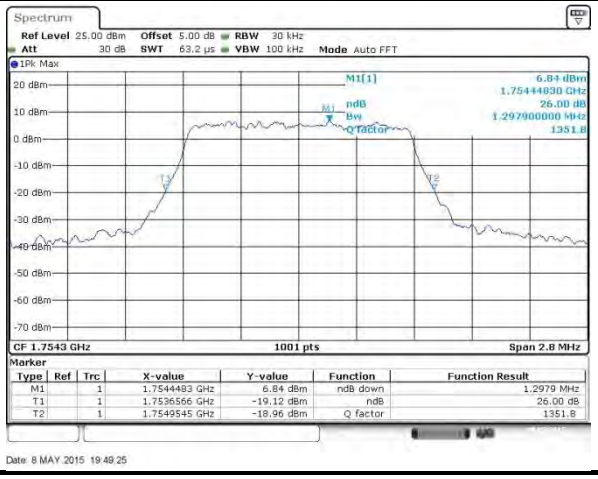
Middle Channel / 1.4MHz / 16QAM



Highest Channel / 1.4MHz / QPSK

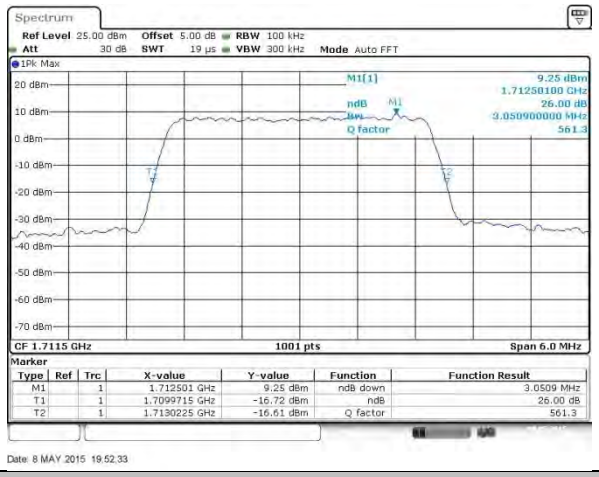


Highest Channel / 1.4MHz / 16QAM

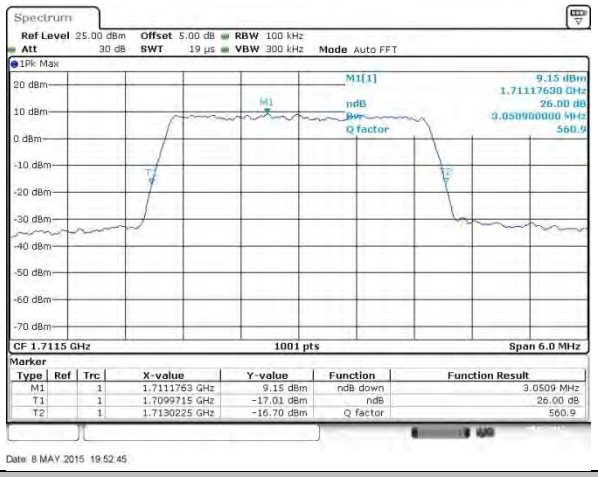


LTE Band 4

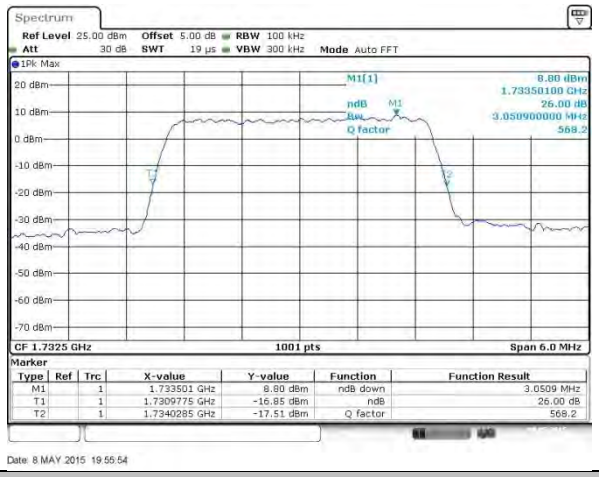
Lowest Channel / 3MHz / QPSK



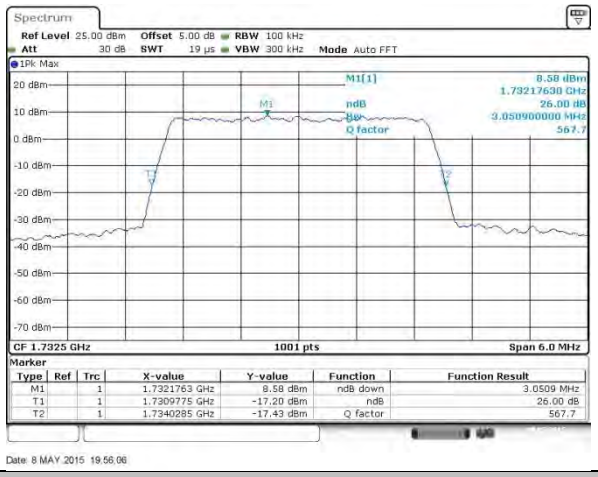
Lowest Channel / 3MHz / 16QAM



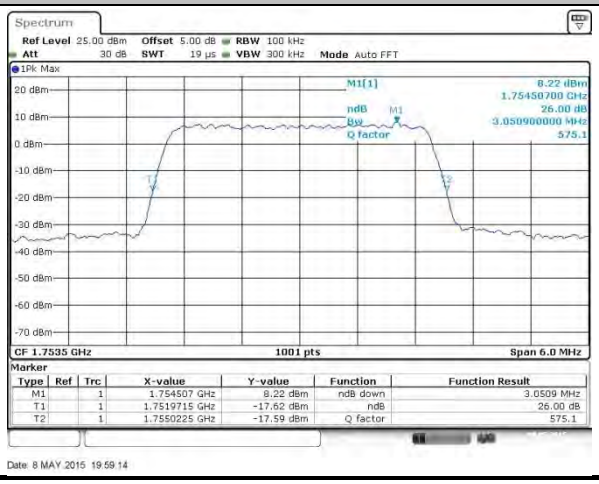
Middle Channel / 3MHz / QPSK



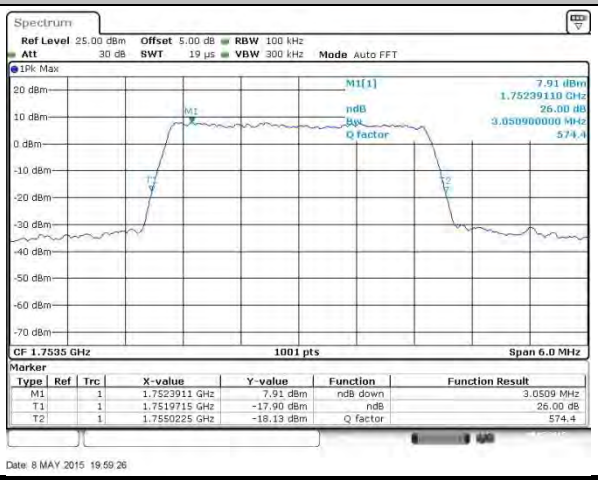
Middle Channel /3MHz / 16QAM



Highest Channel /3MHz / QPSK

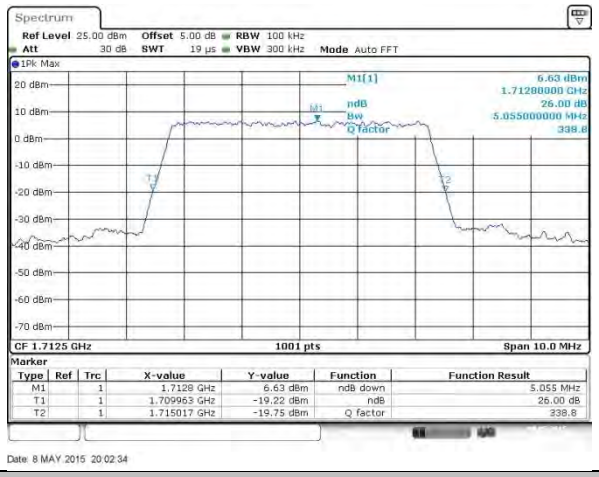


Highest Channel /3MHz / 16QAM

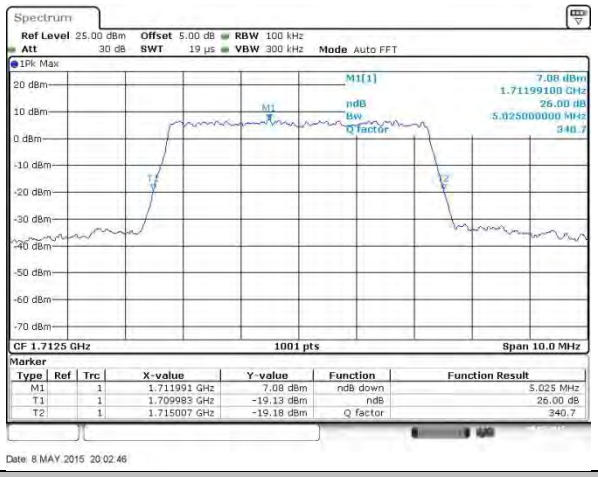


LTE Band 4

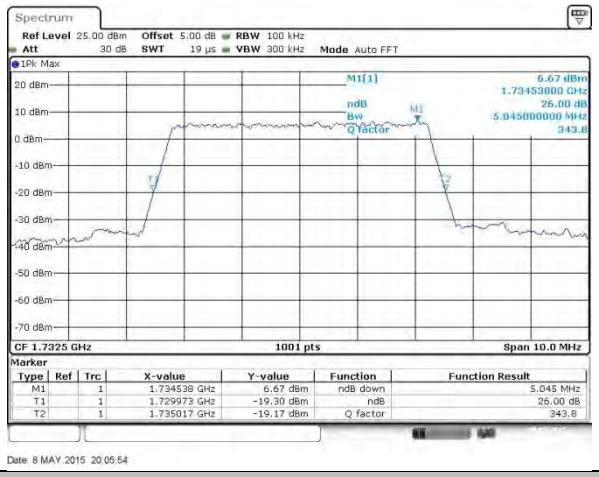
Lowest Channel / 5MHz / QPSK



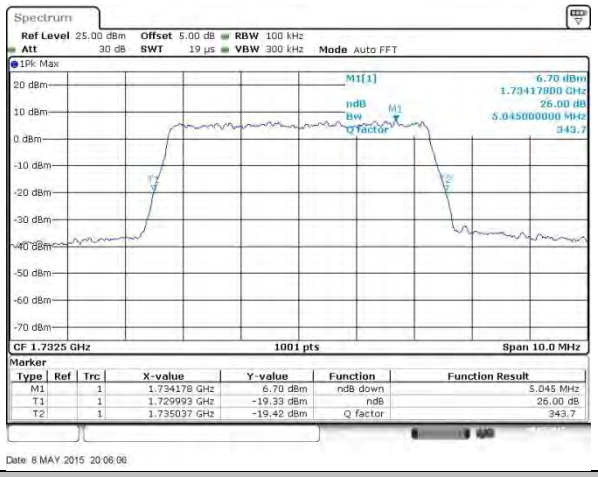
Lowest Channel / 5MHz / 16QAM



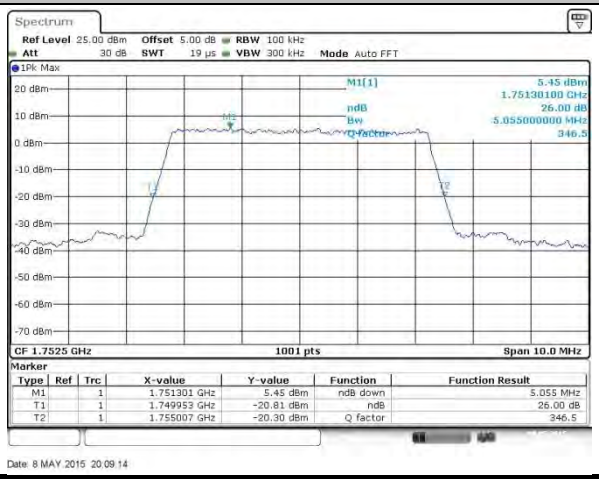
Middle Channel / 5MHz / QPSK



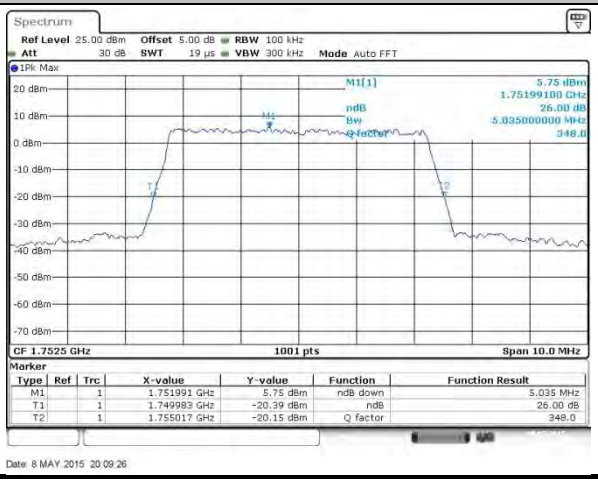
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

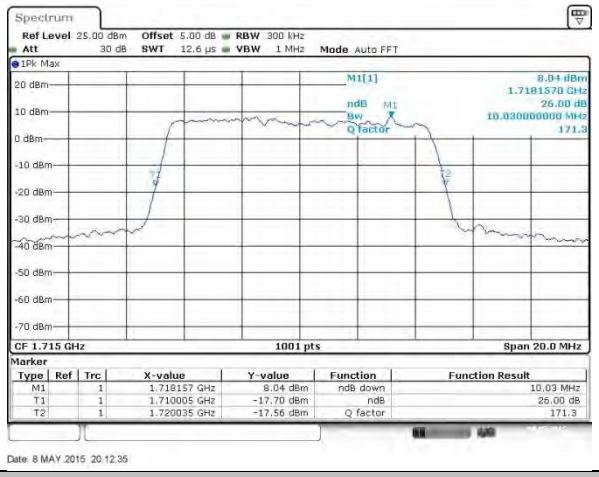


Highest Channel / 5MHz / 16QAM

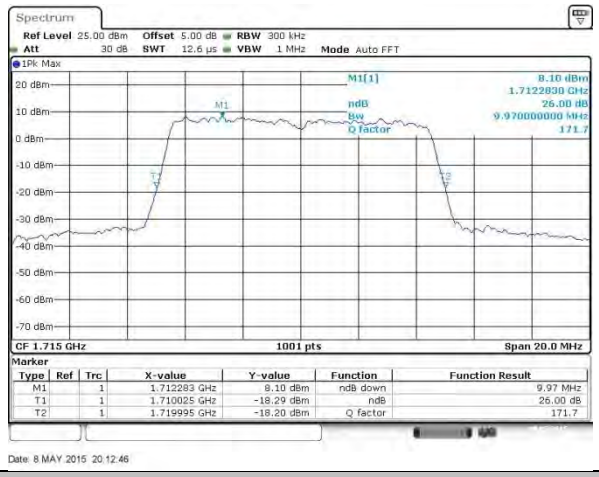


LTE Band 4

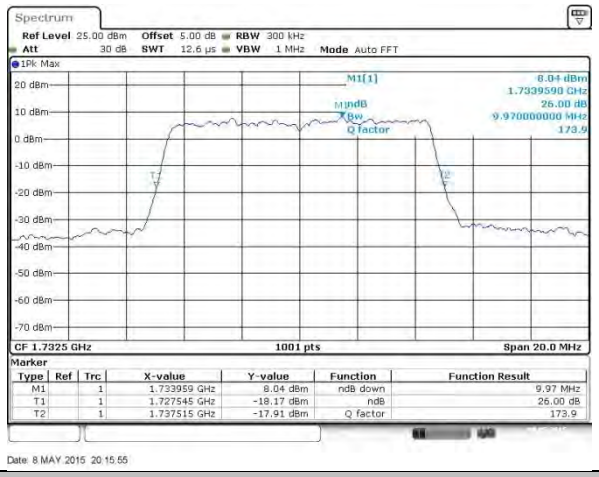
Lowest Channel / 10MHz / QPSK



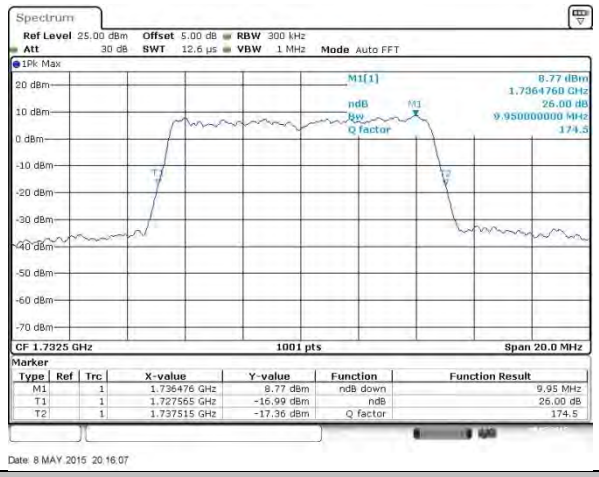
Lowest Channel / 10MHz / 16QAM



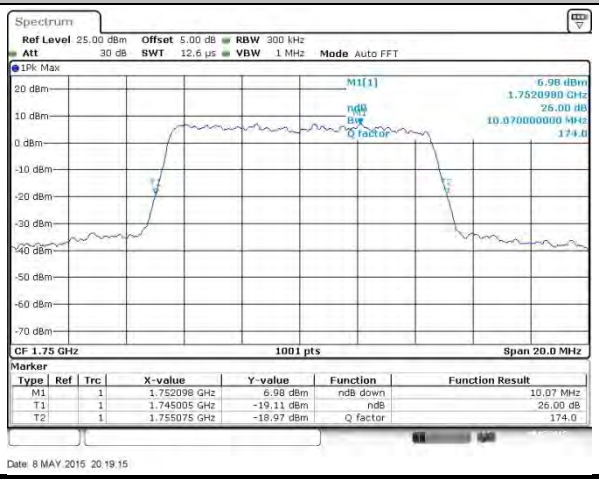
Middle Channel / 10MHz / QPSK



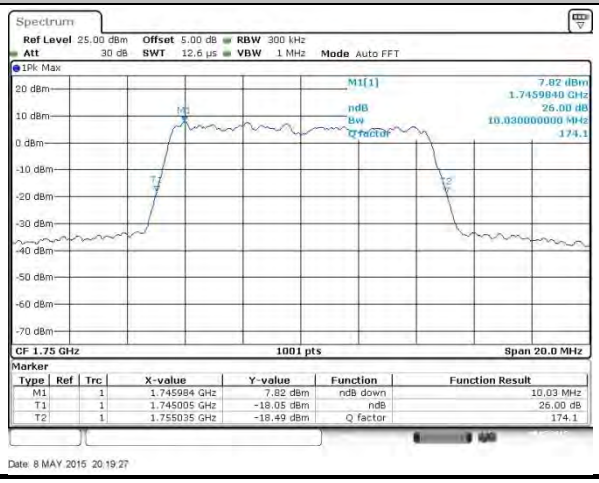
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

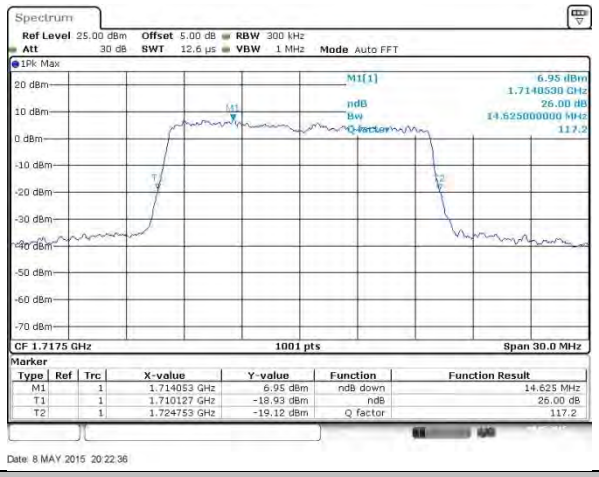


Highest Channel / 10MHz / 16QAM

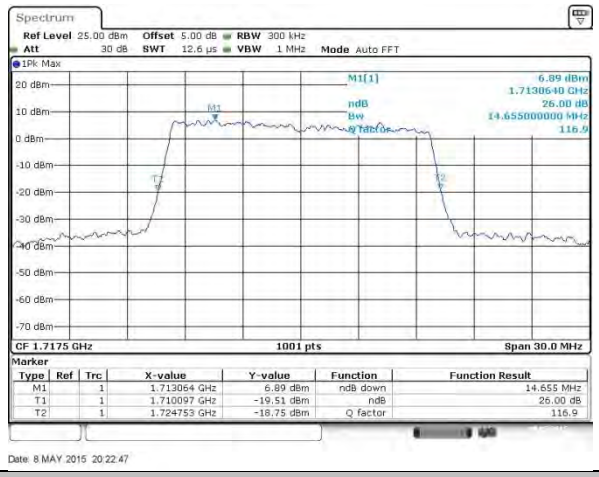


LTE Band 4

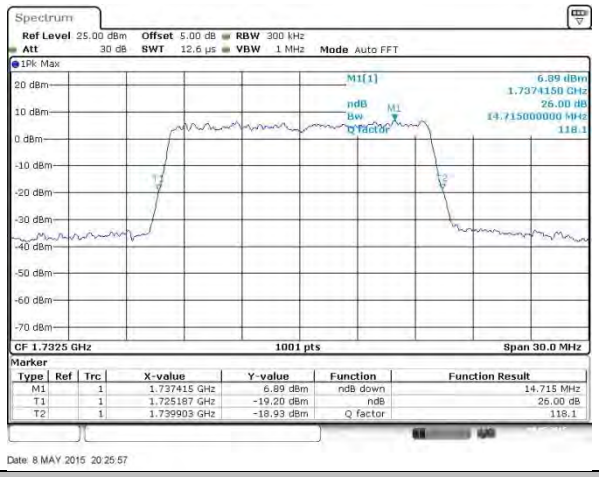
Lowest Channel / 15MHz / QPSK



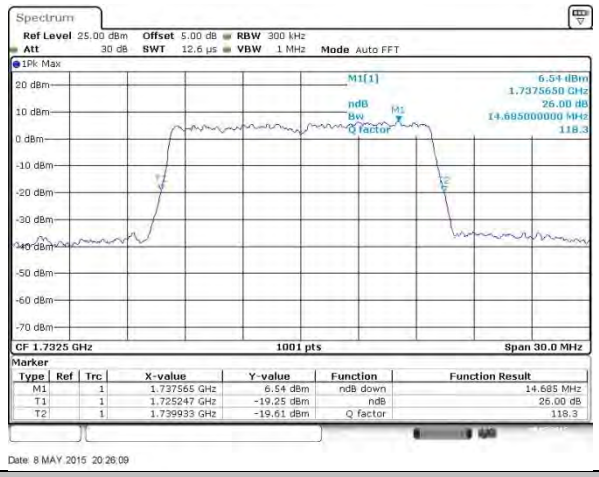
Lowest Channel / 15MHz / 16QAM



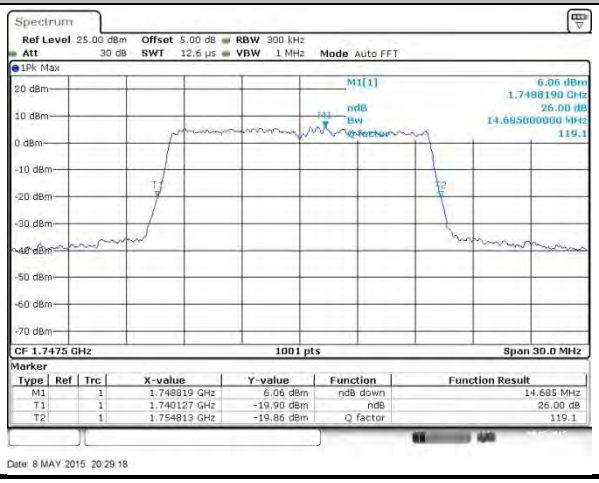
Middle Channel / 15MHz / QPSK



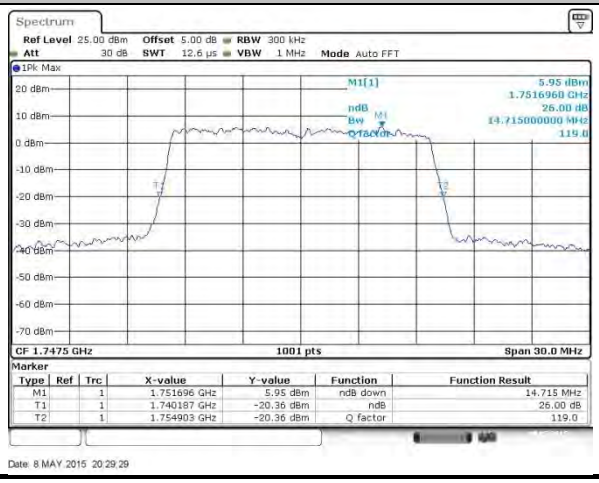
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

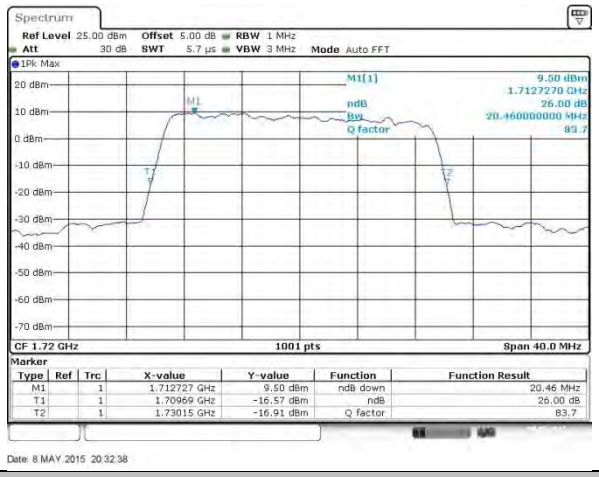


Highest Channel / 15MHz / 16QAM

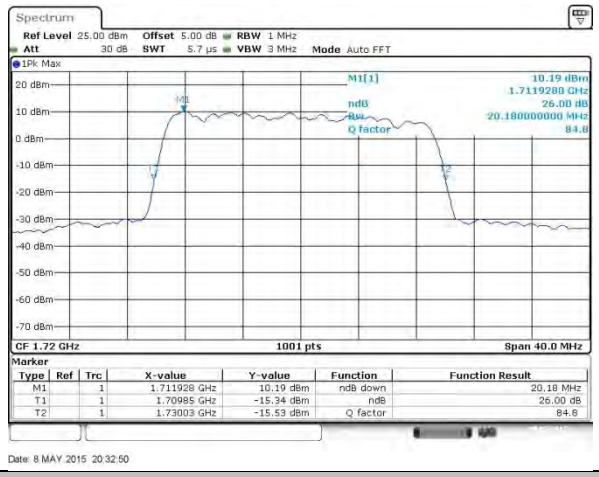


LTE Band 4

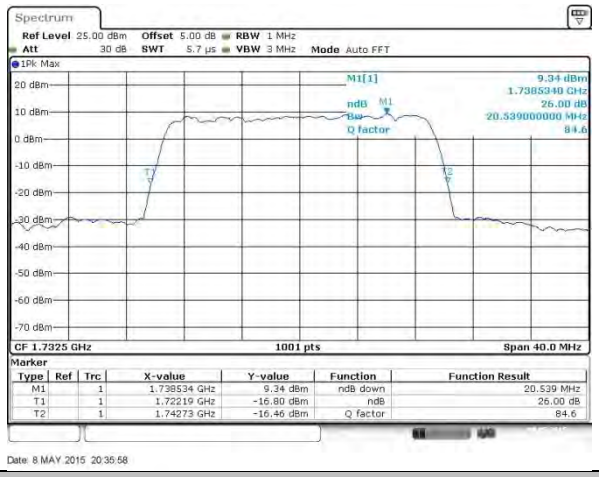
Lowest Channel / 20MHz / QPSK



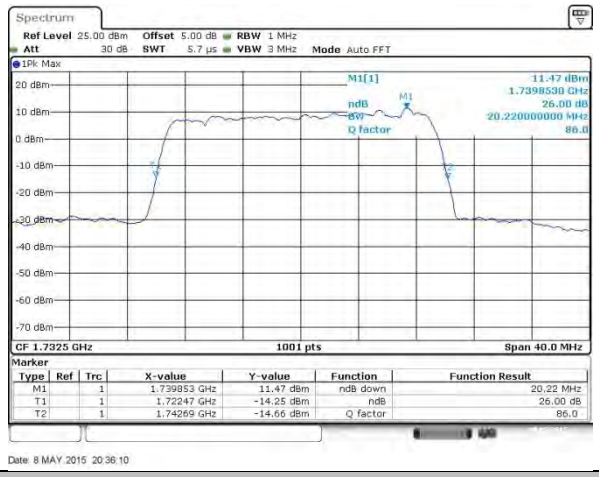
Lowest Channel / 20MHz / 16QAM



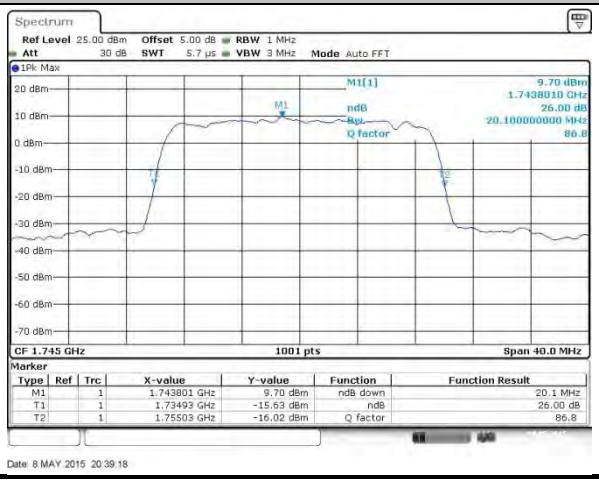
Middle Channel / 20MHz / QPSK



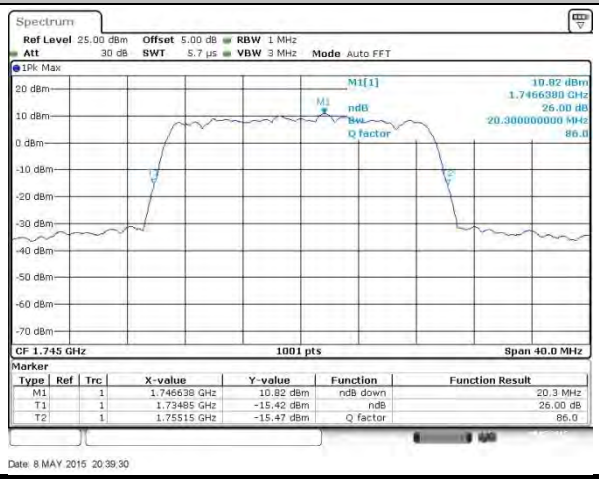
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK

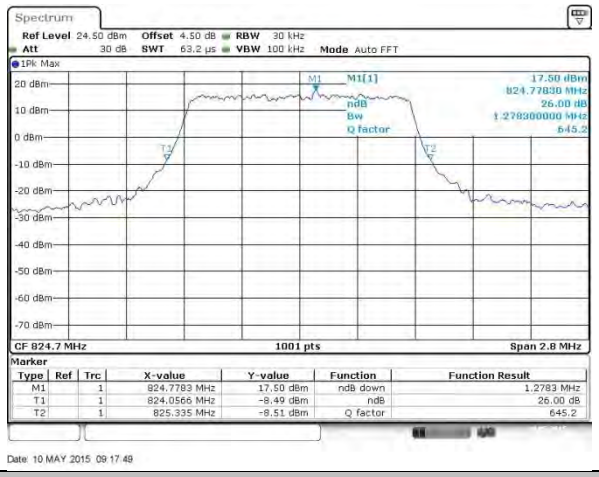


Highest Channel / 20MHz / 16QAM

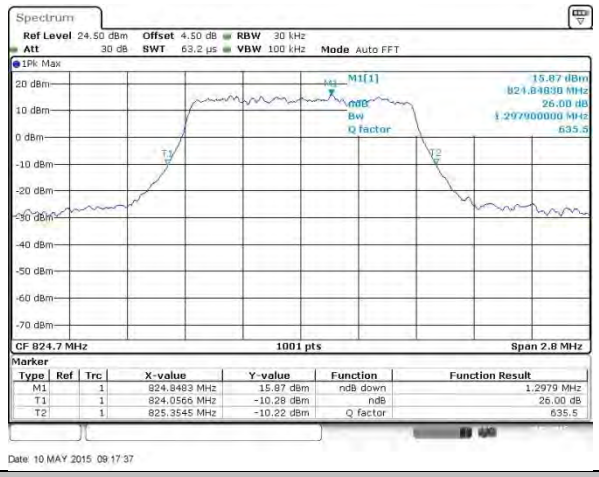


LTE Band 5

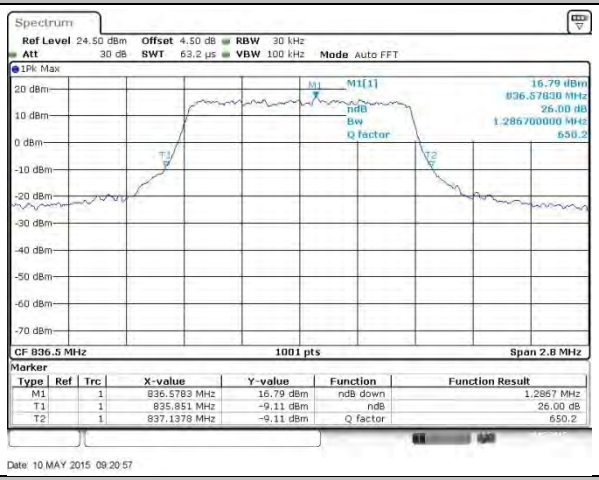
Lowest Channel / 1.4MHz / QPSK



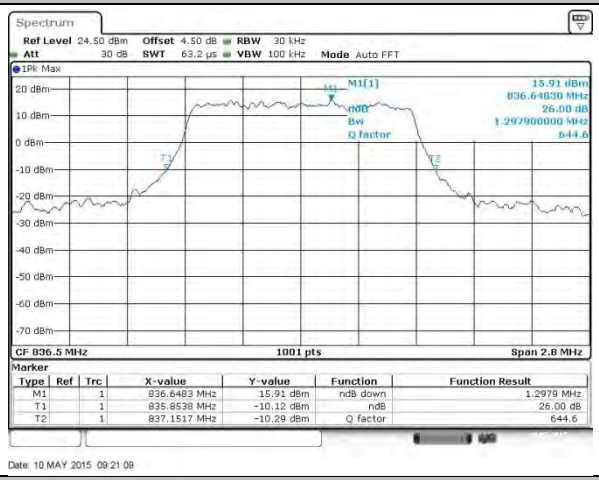
Lowest Channel / 1.4MHz / 16QAM



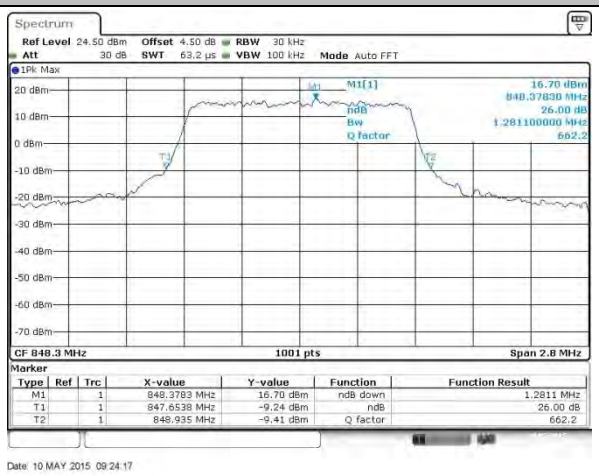
Middle Channel / 1.4MHz / QPSK



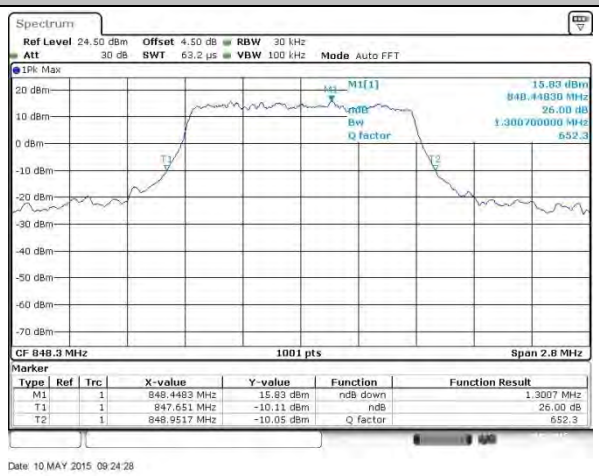
Middle Channel / 1.4MHz / 16QAM



Highest Channel / 1.4MHz / QPSK

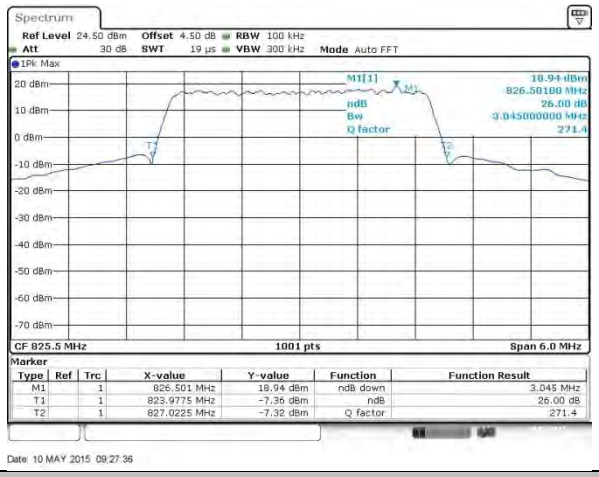


Highest Channel / 1.4MHz / 16QAM

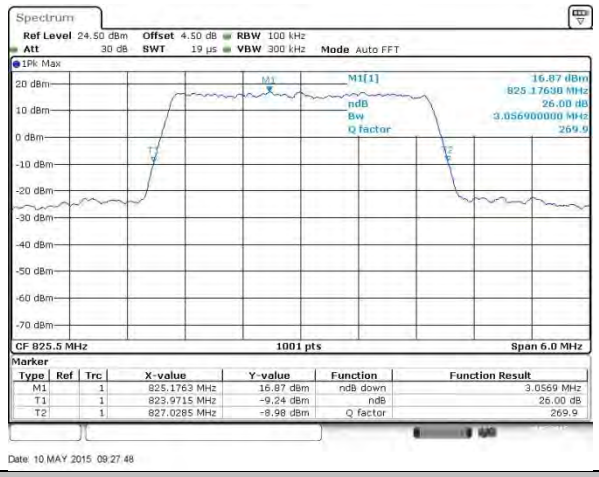


LTE Band 5

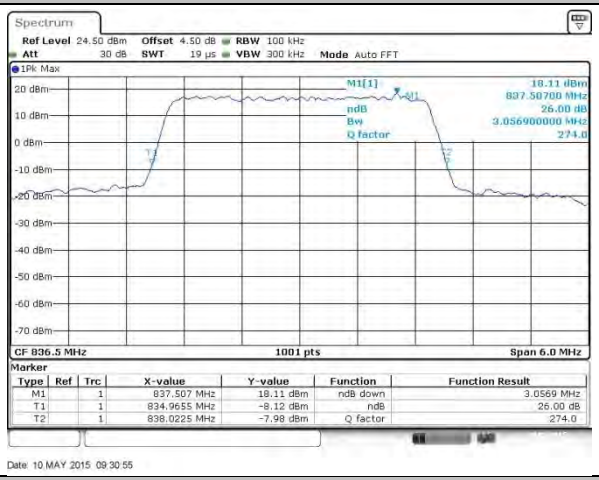
Lowest Channel / 3MHz / QPSK



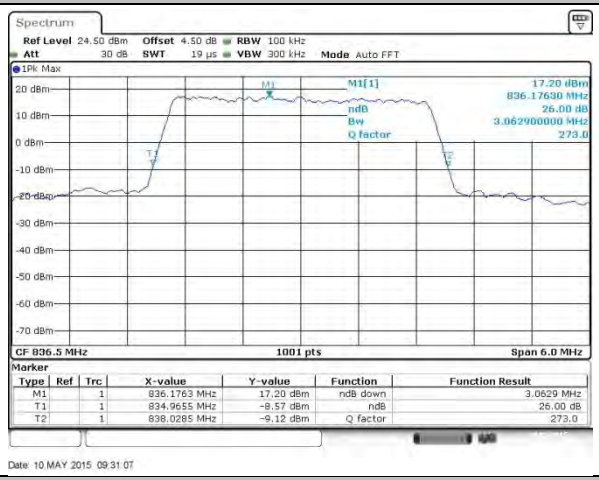
Lowest Channel / 3MHz / 16QAM



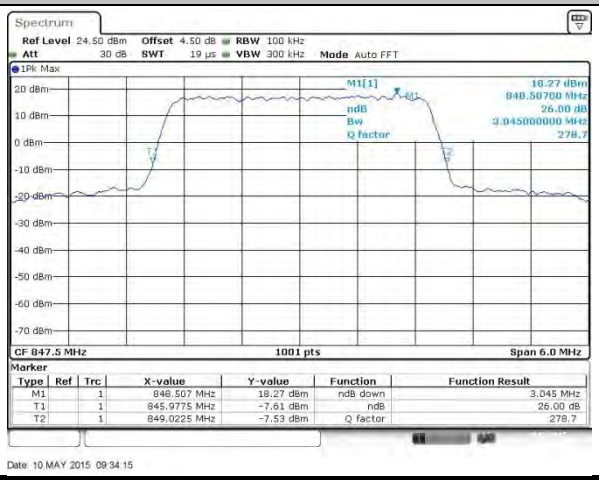
Middle Channel / 3MHz / QPSK



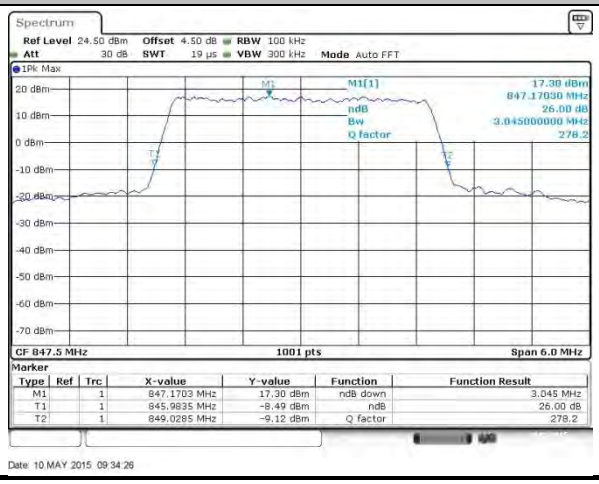
Middle Channel /3MHz / 16QAM



Highest Channel /3MHz / QPSK

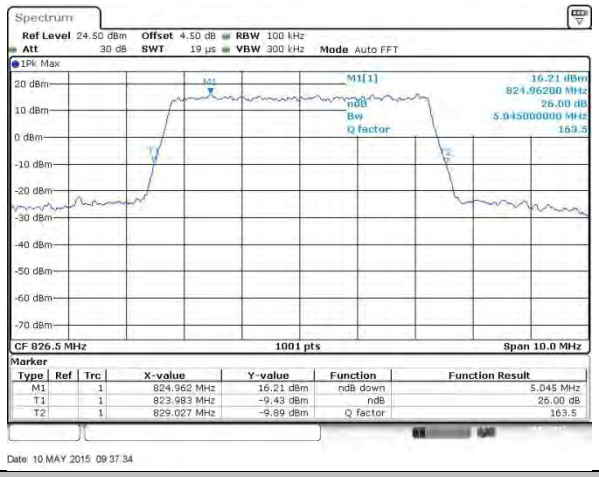


Highest Channel /3MHz / 16QAM

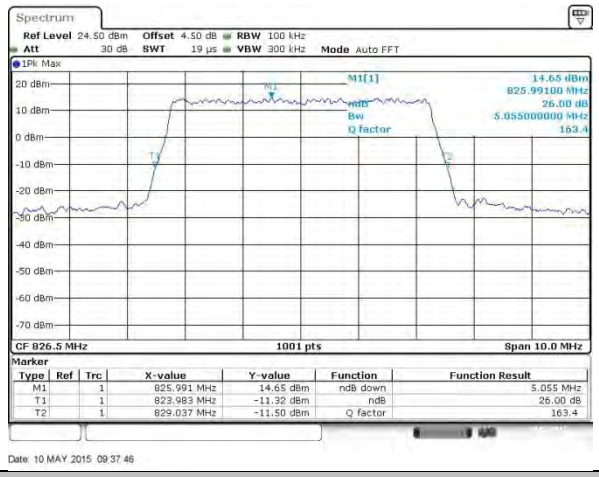


LTE Band 5

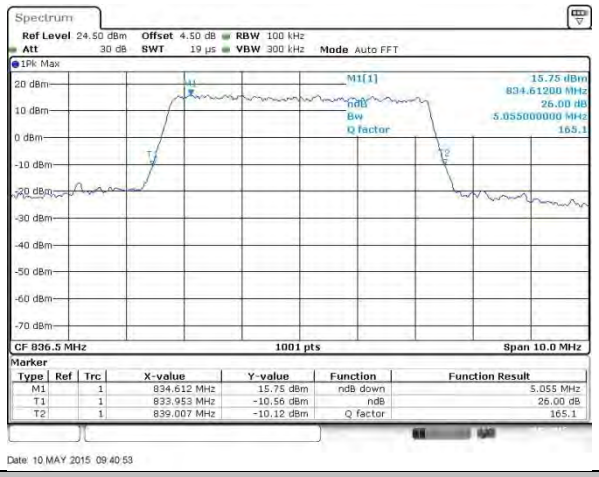
Lowest Channel / 5MHz / QPSK



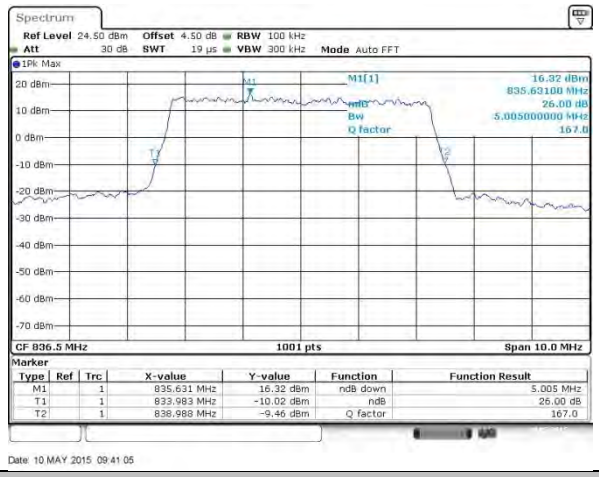
Lowest Channel / 5MHz / 16QAM



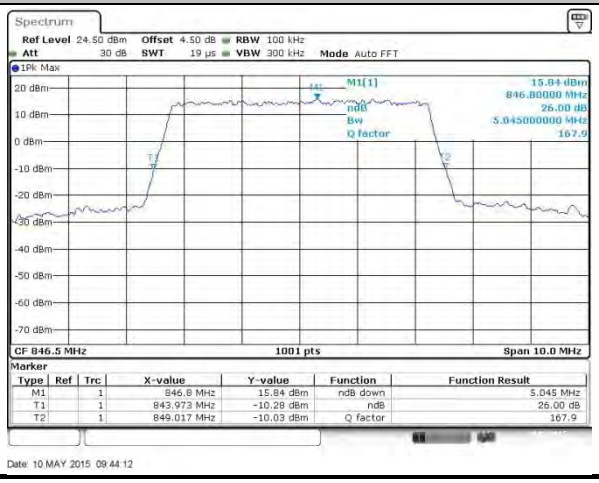
Middle Channel / 5MHz / QPSK



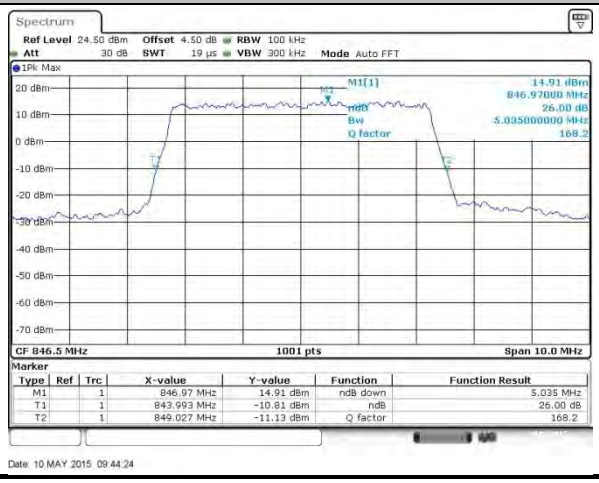
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

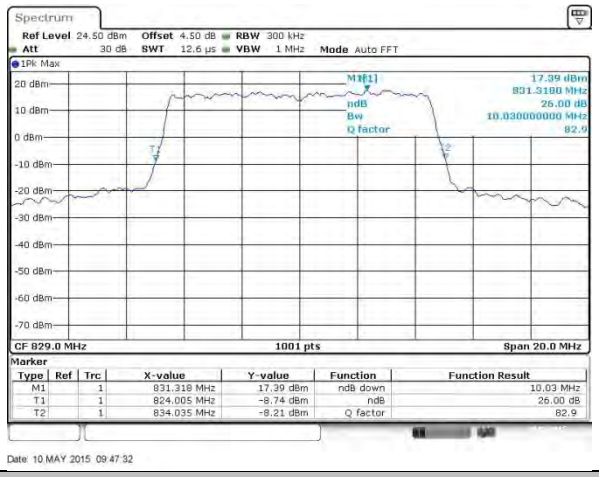


Highest Channel / 5MHz / 16QAM

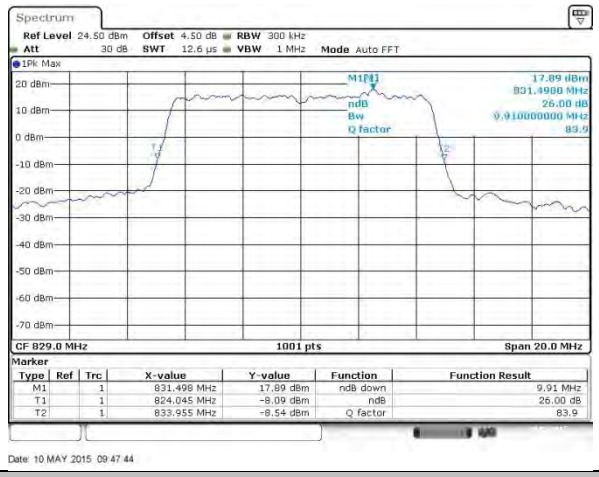


LTE Band 5

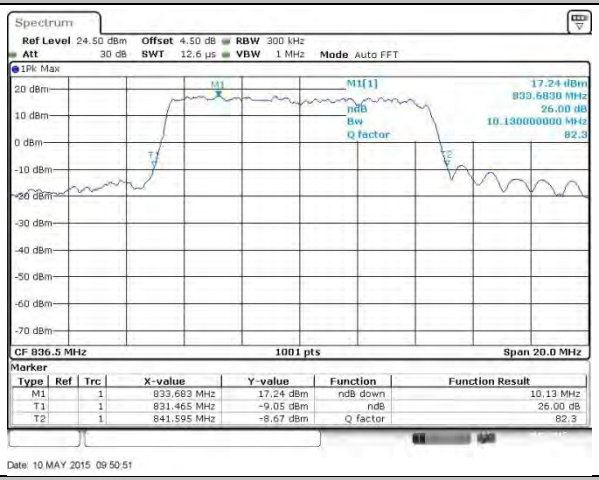
Lowest Channel / 10MHz / QPSK



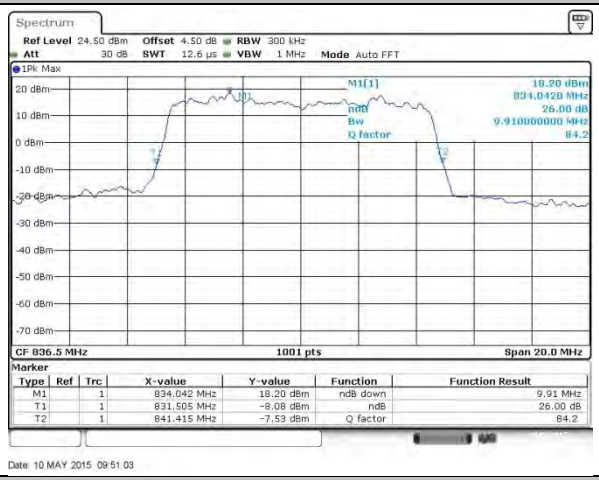
Lowest Channel / 10MHz / 16QAM



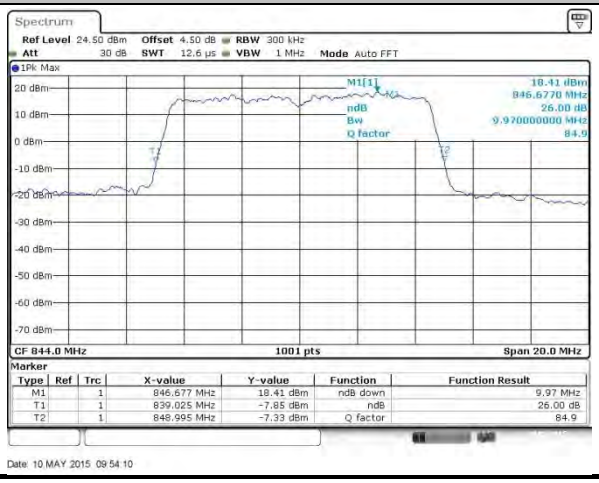
Middle Channel / 10MHz / QPSK



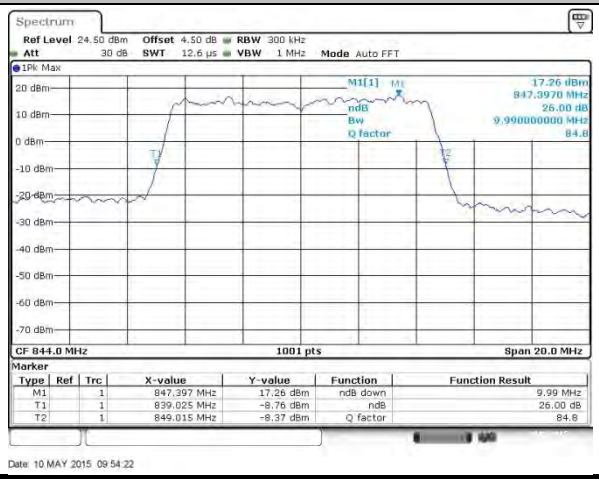
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

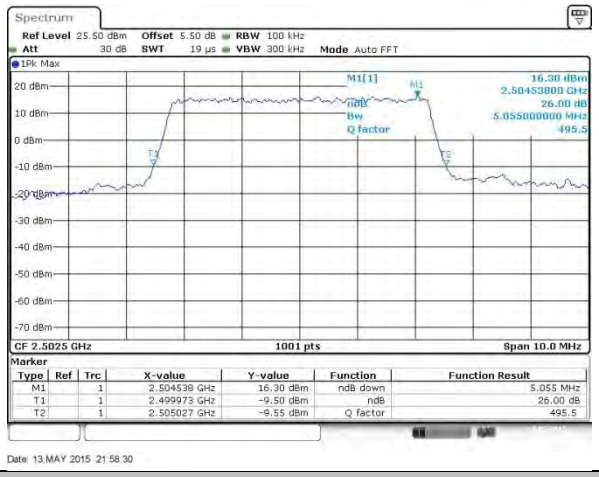


Highest Channel / 10MHz / 16QAM

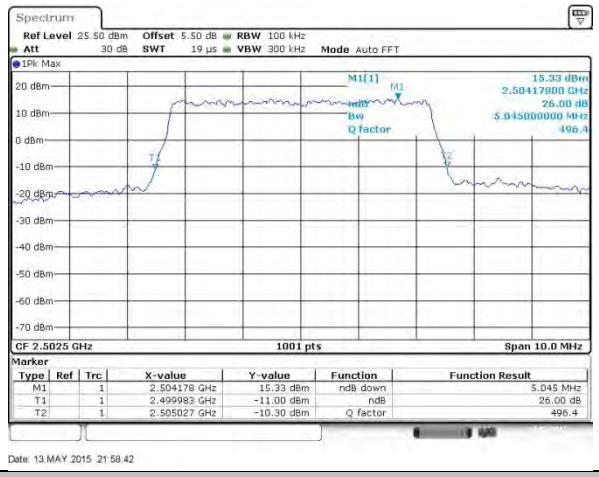


LTE Band 7

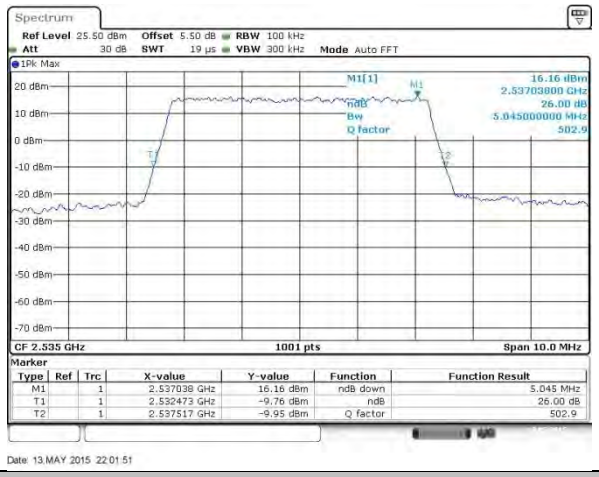
Lowest Channel / 5MHz / QPSK



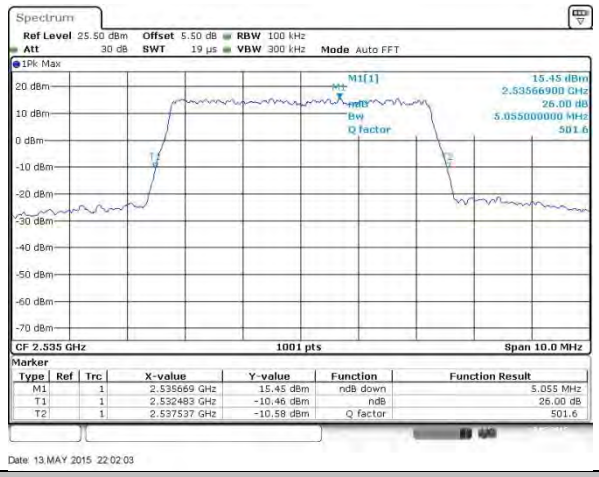
Lowest Channel / 5MHz / 16QAM



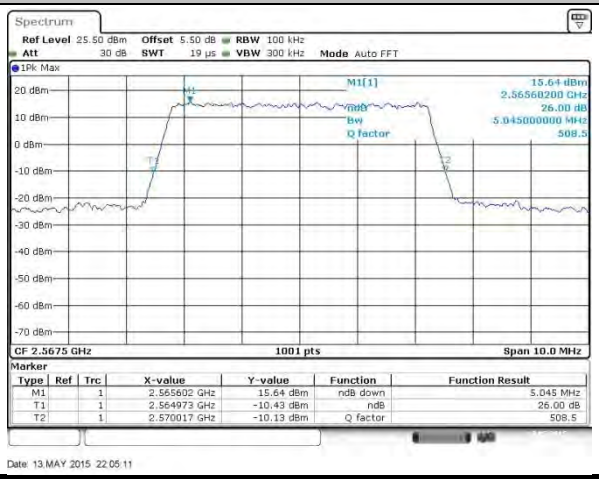
Middle Channel / 5MHz / QPSK



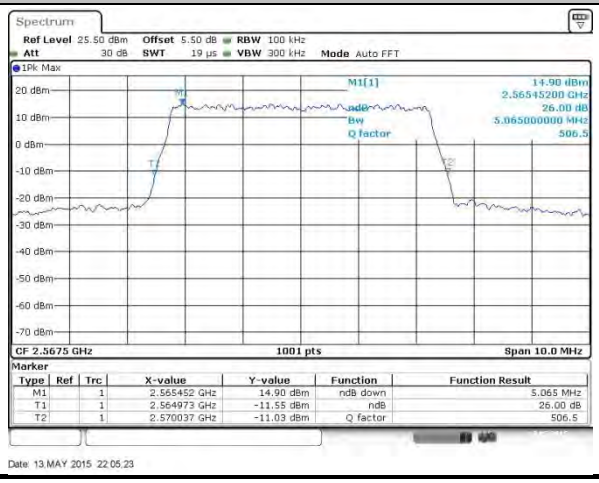
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

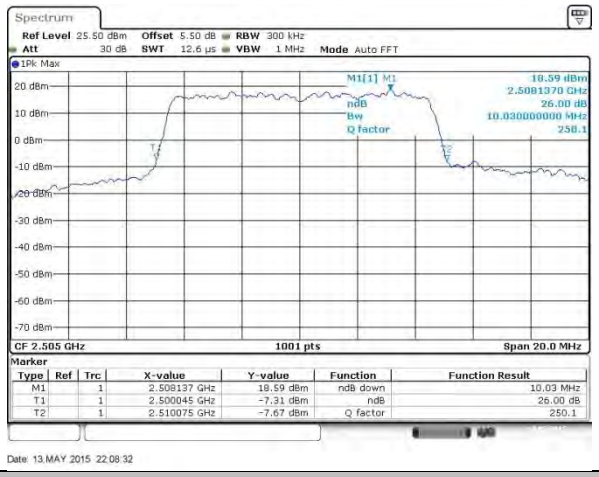


Highest Channel / 5MHz / 16QAM

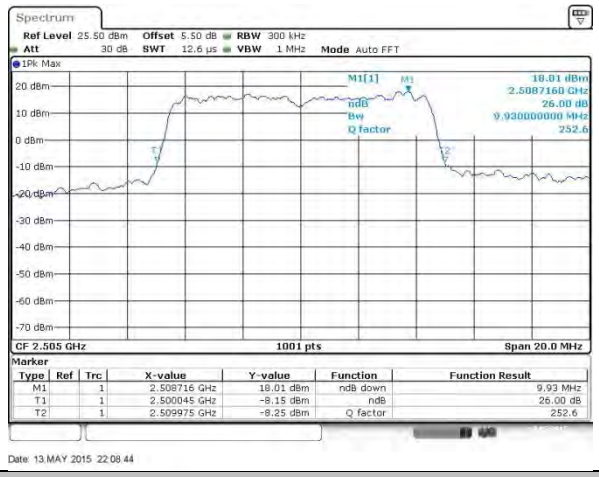


LTE Band 7

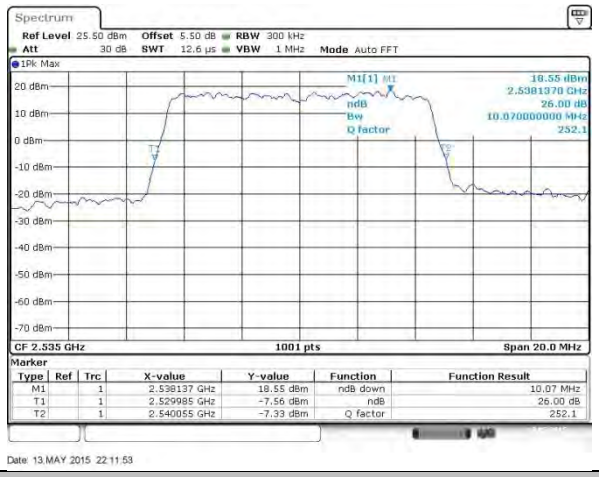
Lowest Channel / 10MHz / QPSK



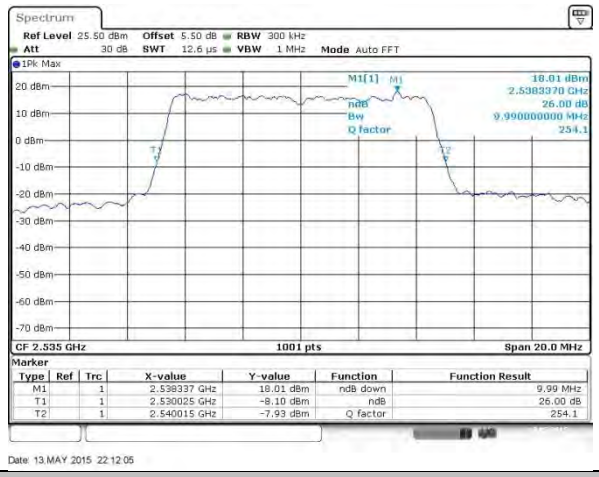
Lowest Channel / 10MHz / 16QAM



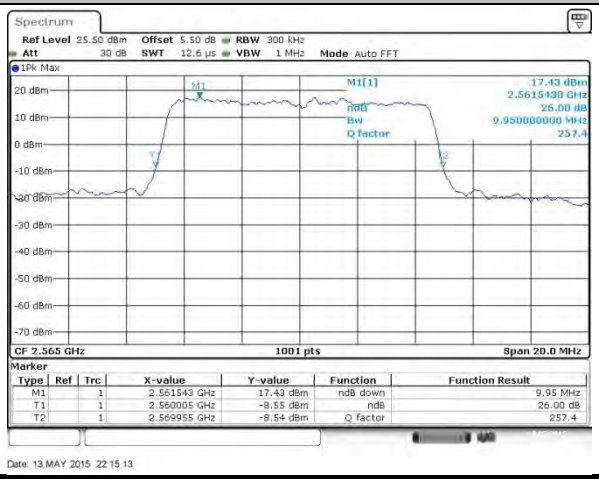
Middle Channel / 10MHz / QPSK



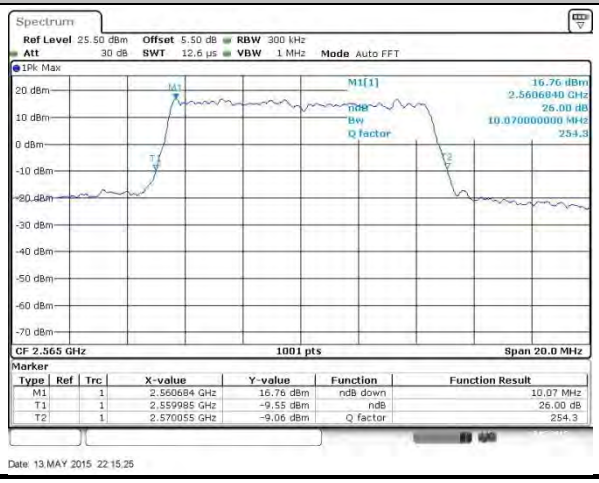
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

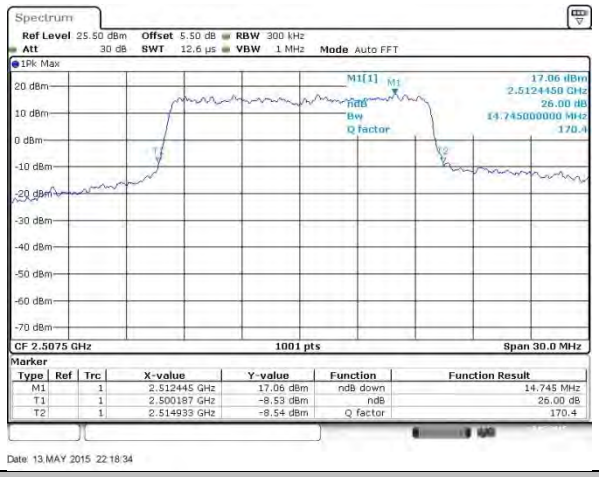


Highest Channel / 10MHz / 16QAM

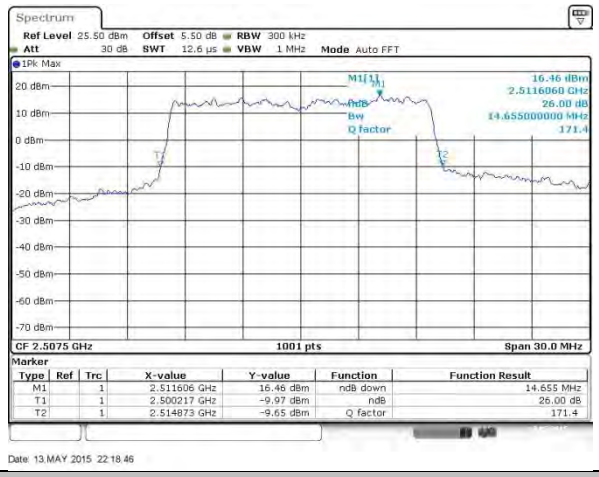


LTE Band 7

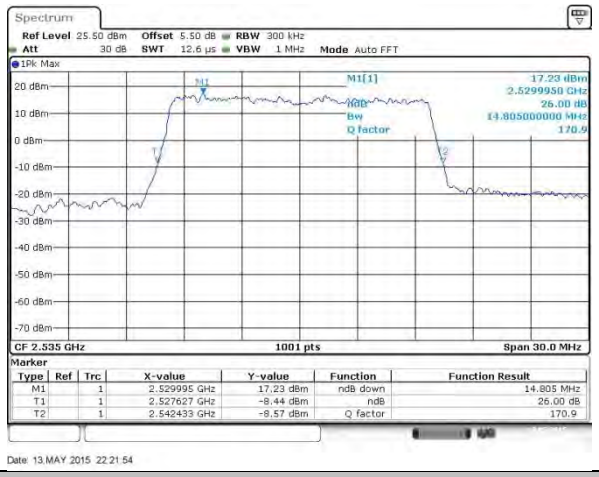
Lowest Channel / 15MHz / QPSK



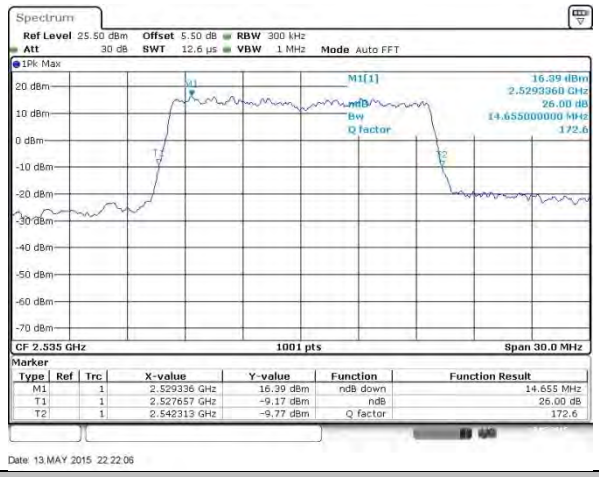
Lowest Channel / 15MHz / 16QAM



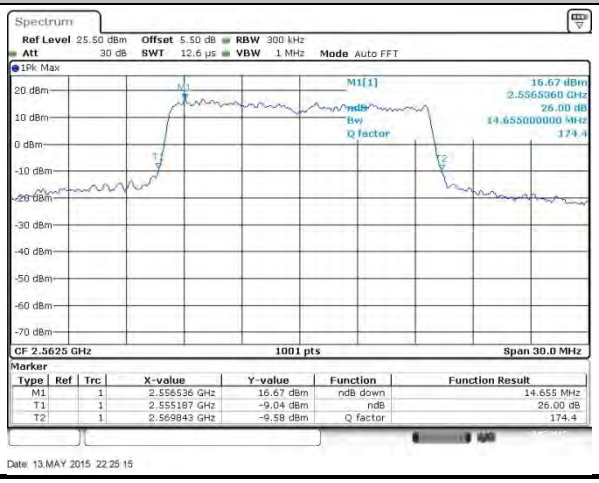
Middle Channel / 15MHz / QPSK



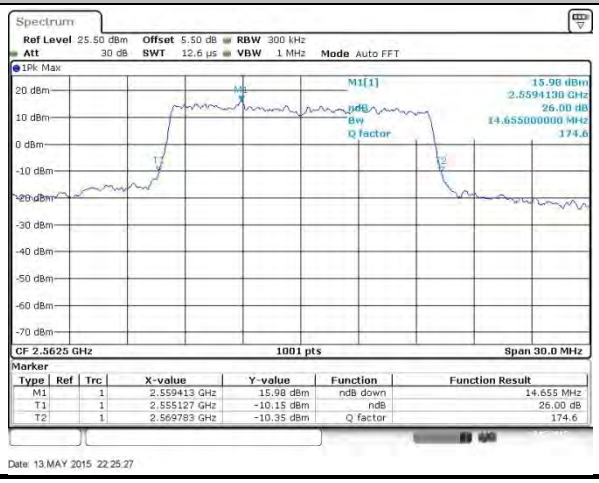
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

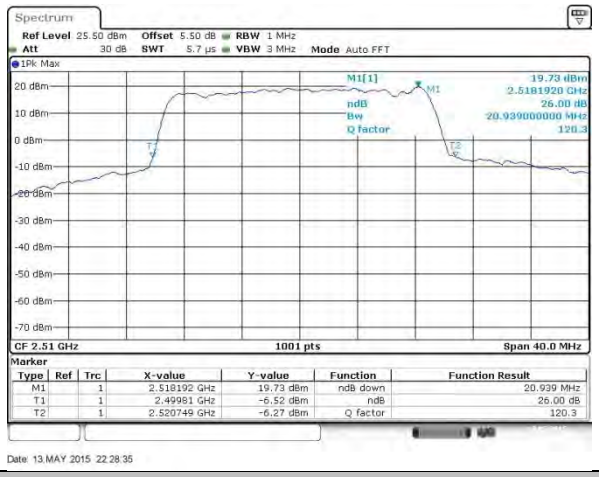


Highest Channel / 15MHz / 16QAM

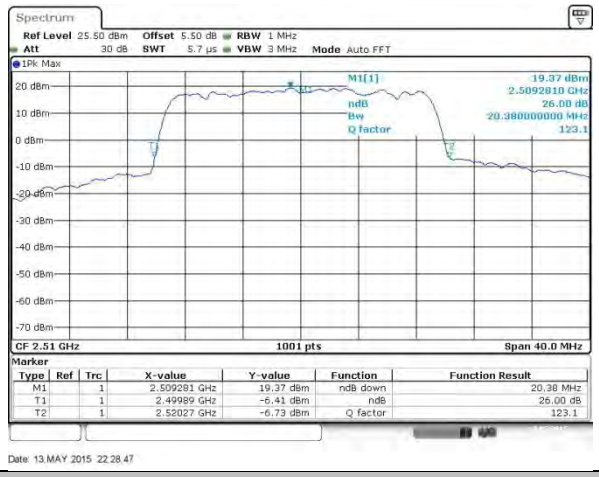


LTE Band 7

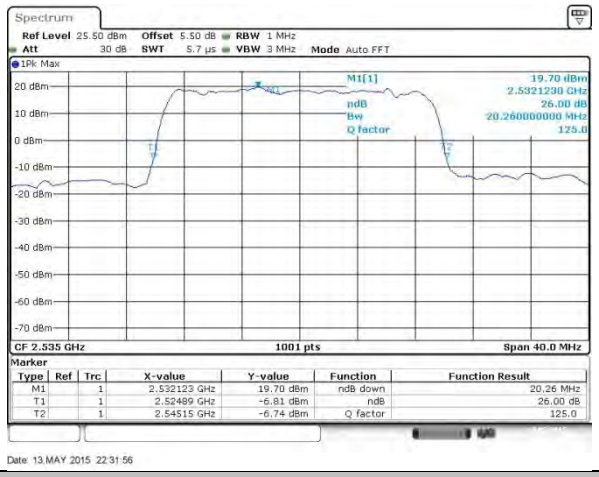
Lowest Channel / 20MHz / QPSK



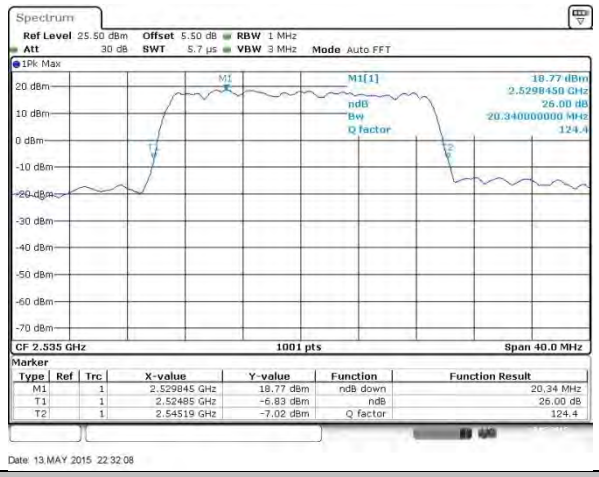
Lowest Channel / 20MHz / 16QAM



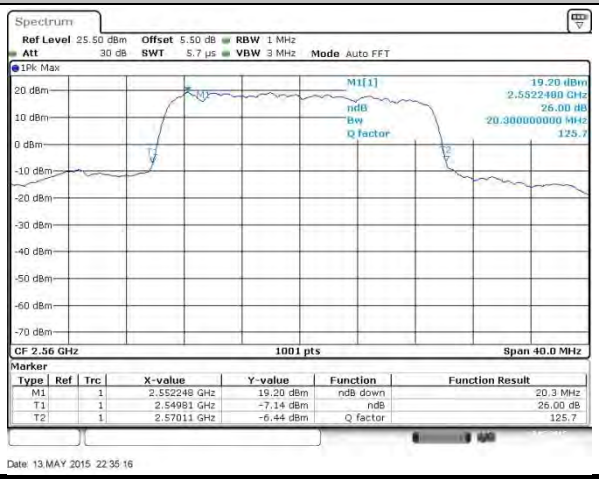
Middle Channel / 20MHz / QPSK



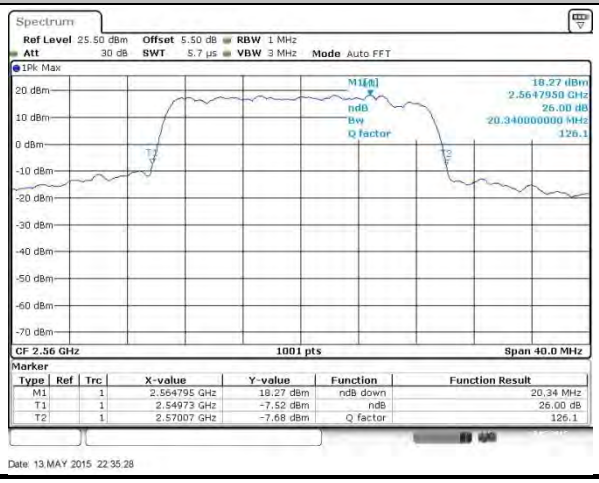
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK

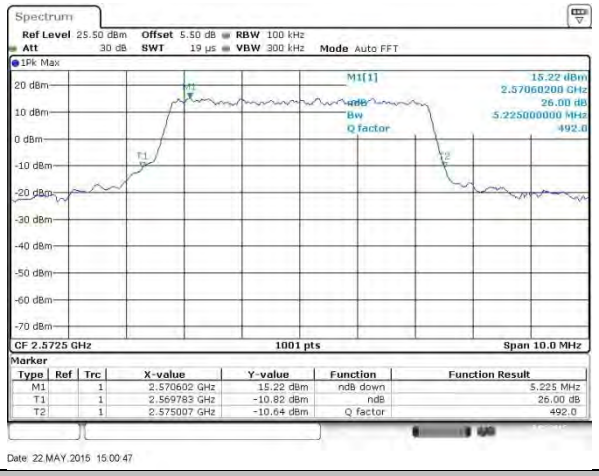


Highest Channel / 20MHz / 16QAM

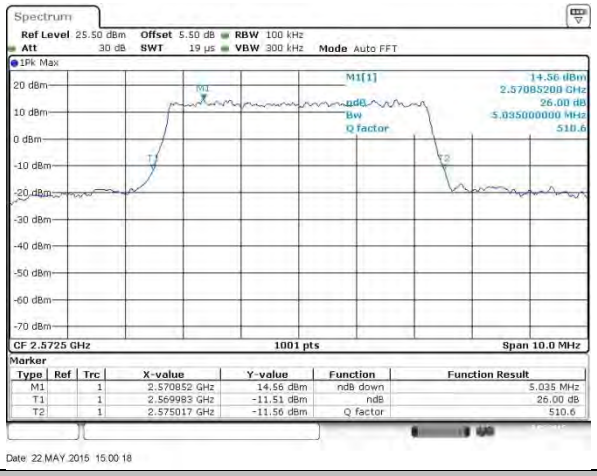


LTE Band 38

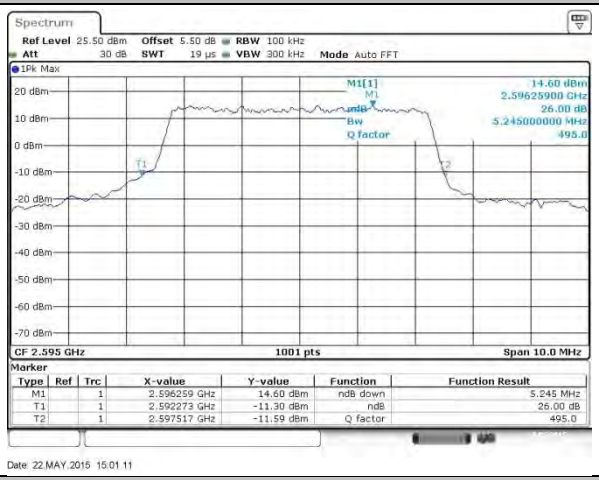
Lowest Channel / 5MHz / QPSK



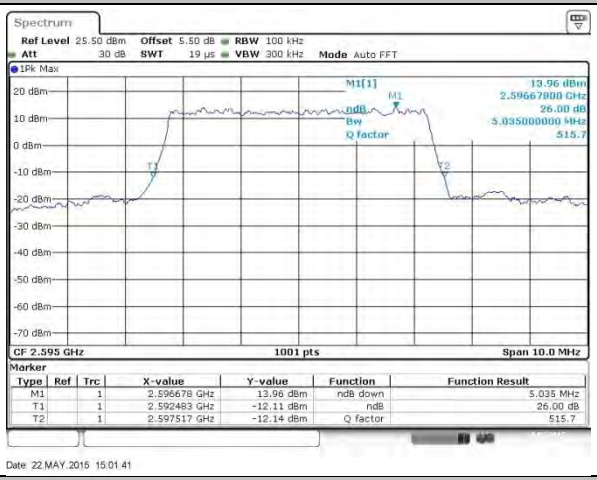
Lowest Channel / 5MHz / 16QAM



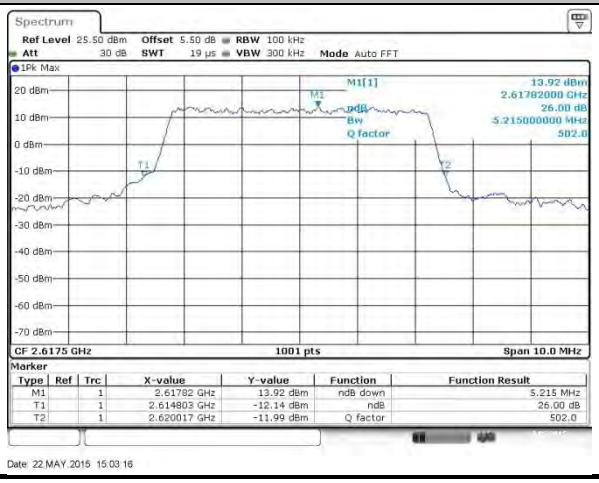
Middle Channel / 5MHz / QPSK



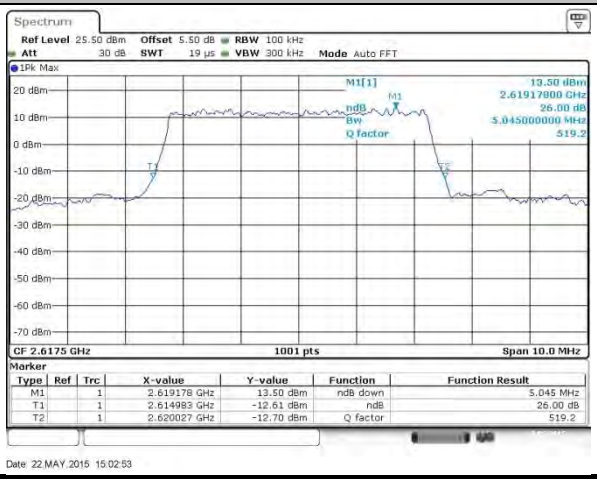
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

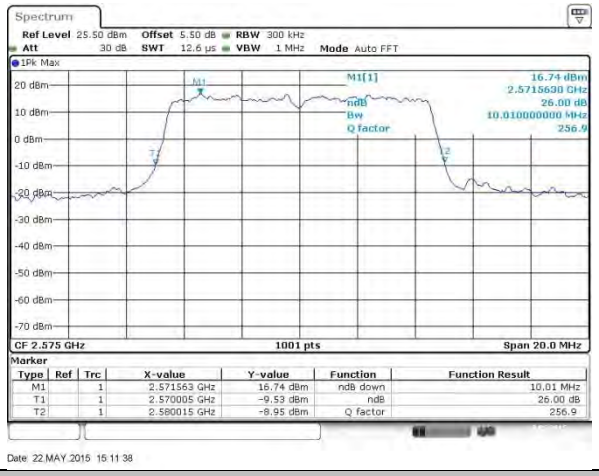


Highest Channel / 5MHz / 16QAM

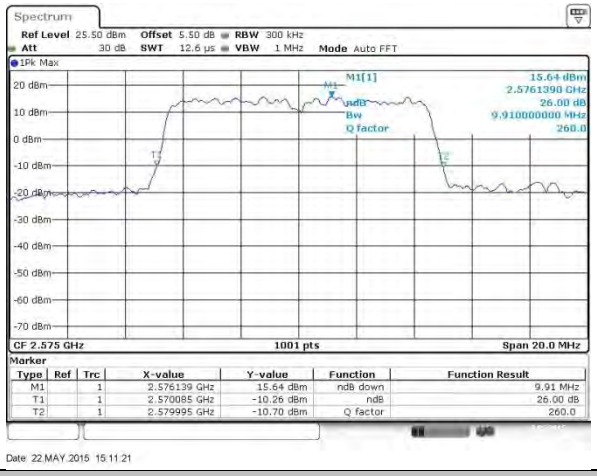


LTE Band 38

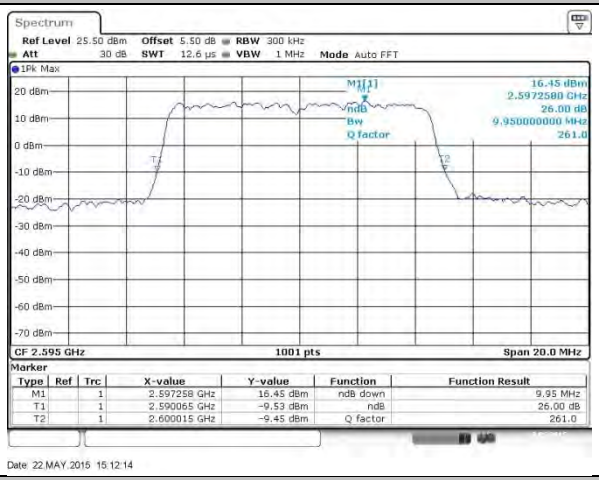
Lowest Channel / 10MHz / QPSK



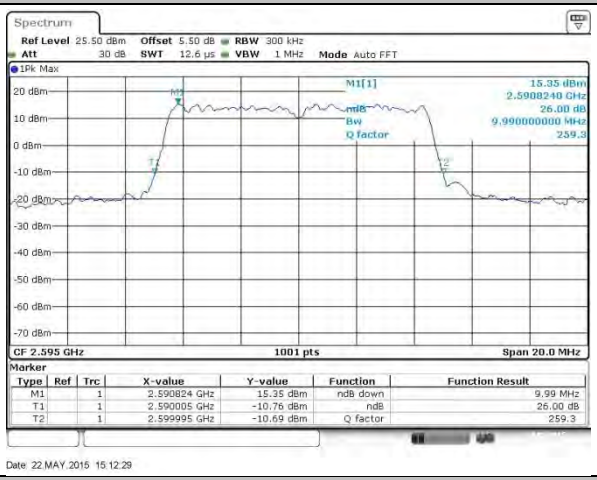
Lowest Channel / 10MHz / 16QAM



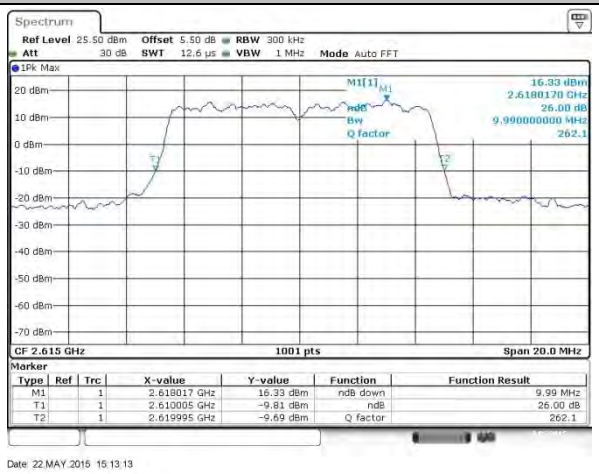
Middle Channel / 10MHz / QPSK



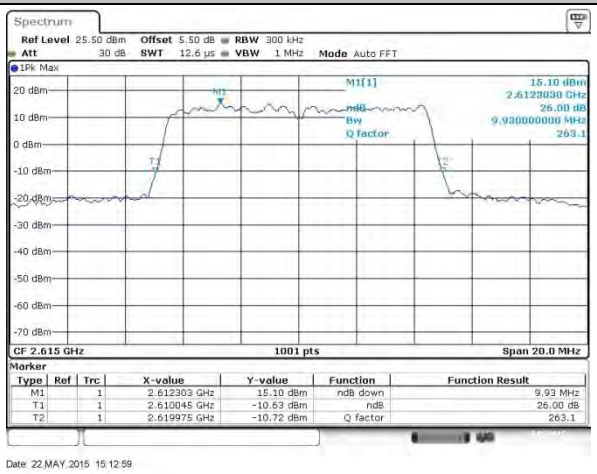
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

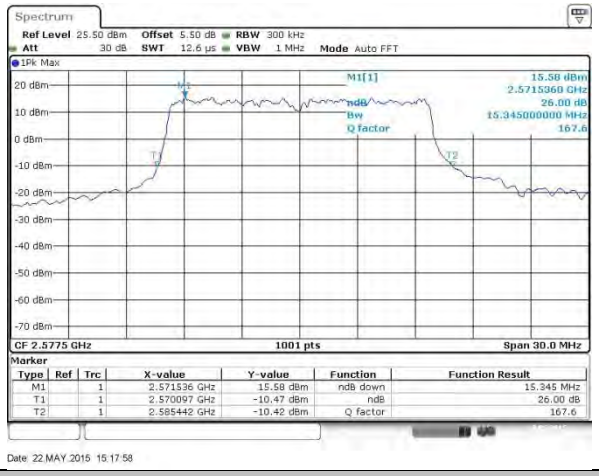


Highest Channel / 10MHz / 16QAM

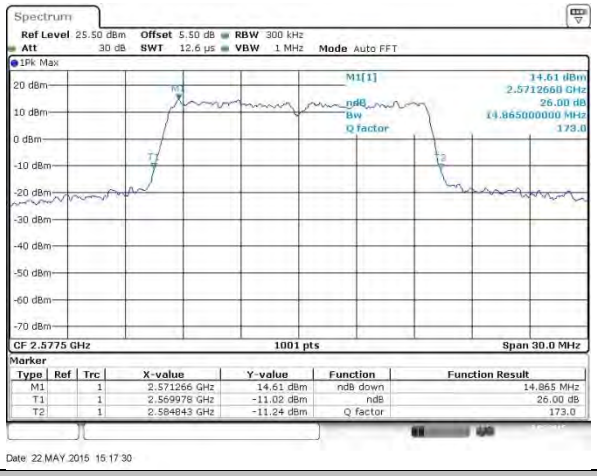


LTE Band 38

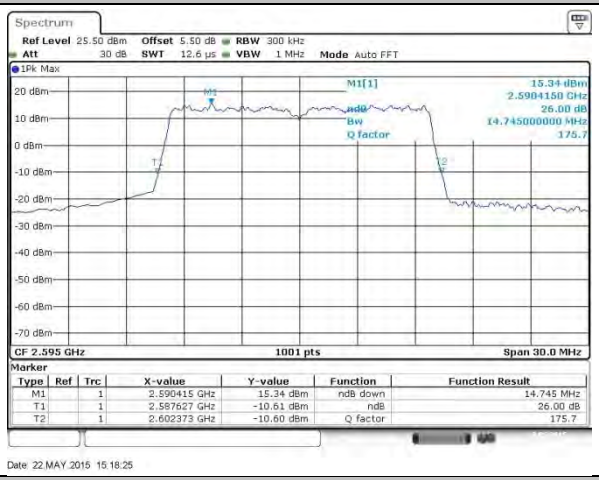
Lowest Channel / 15MHz / QPSK



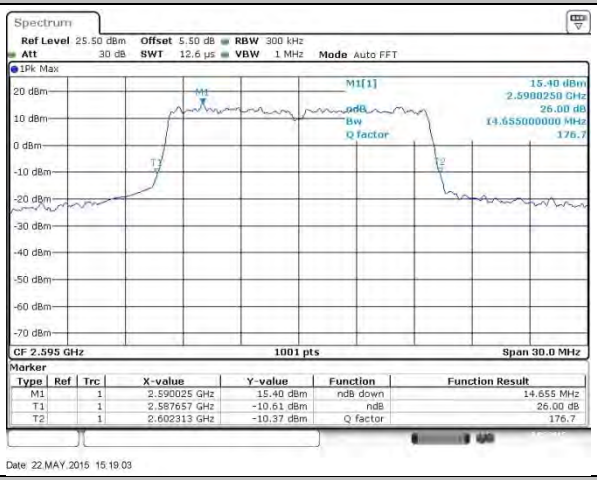
Lowest Channel / 15MHz / 16QAM



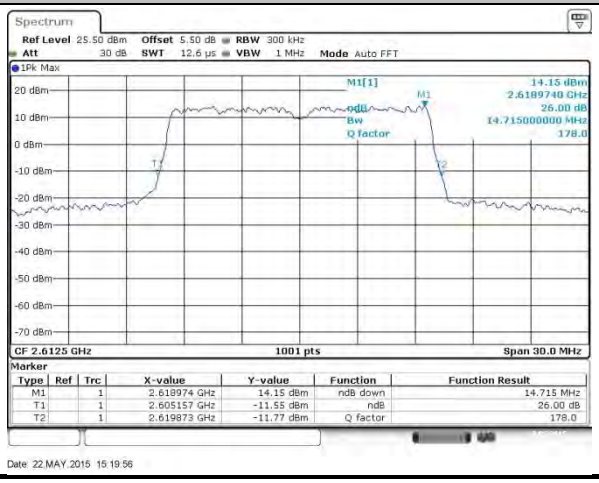
Middle Channel / 15MHz / QPSK



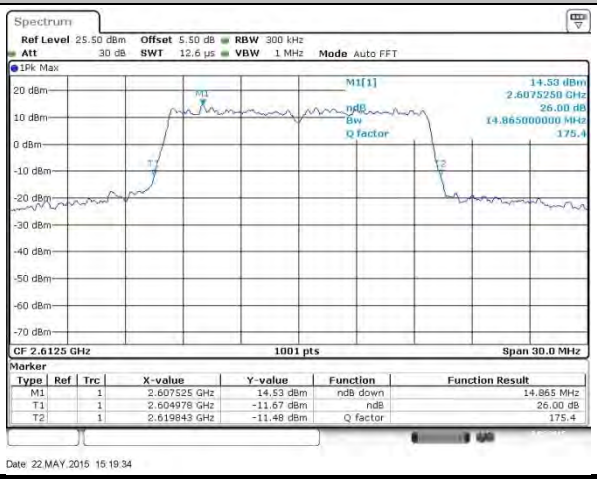
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

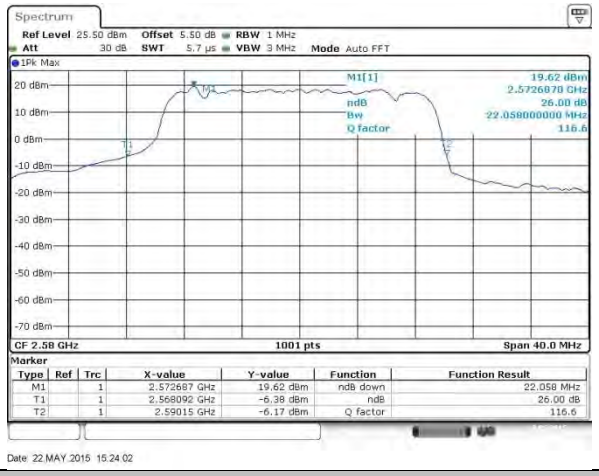


Highest Channel / 15MHz / 16QAM

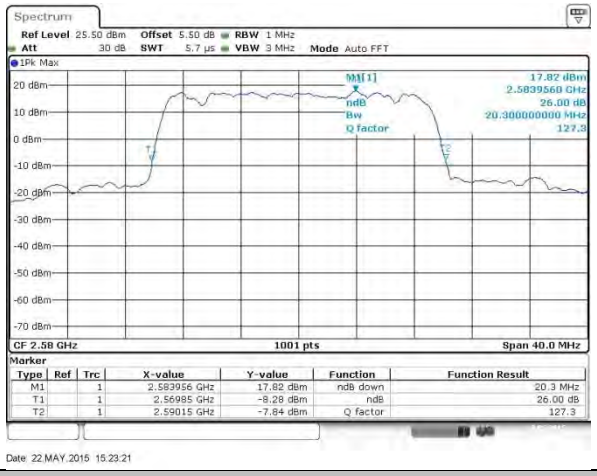


LTE Band 38

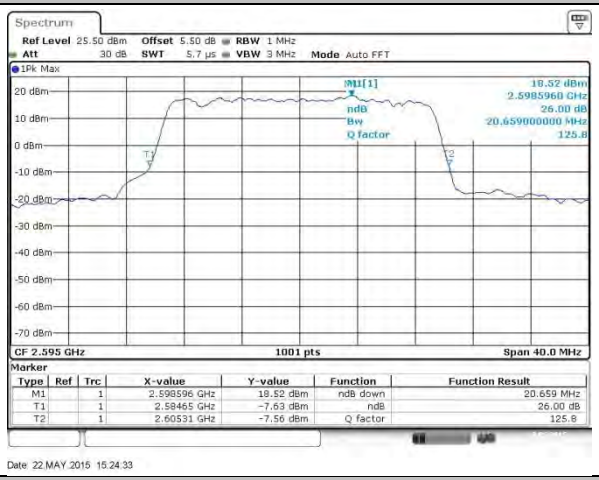
Lowest Channel / 20MHz / QPSK



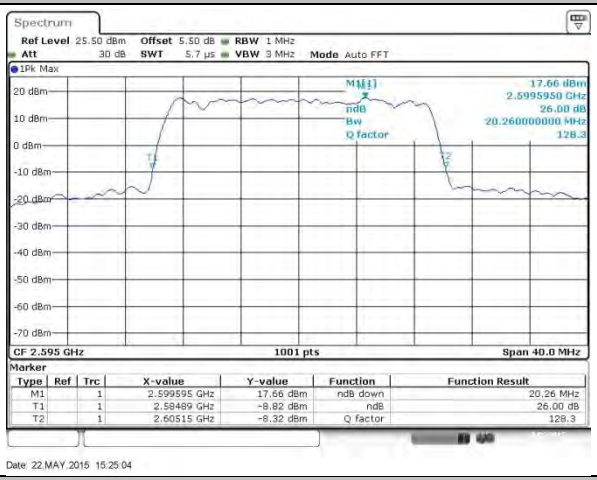
Lowest Channel / 20MHz / 16QAM



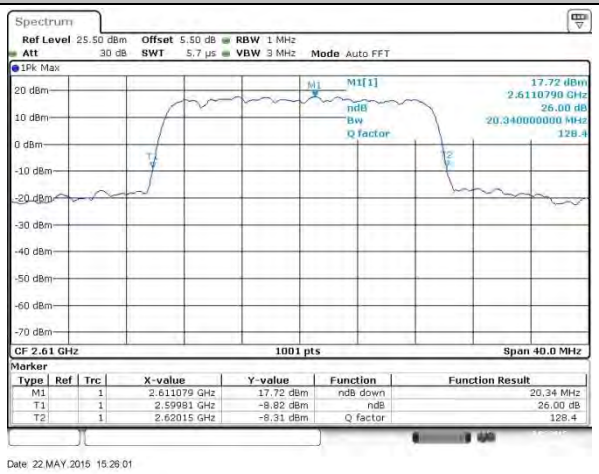
Middle Channel / 20MHz / QPSK



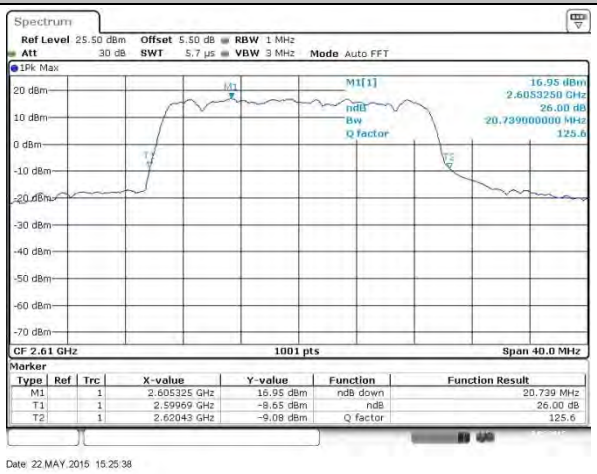
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK



Highest Channel / 20MHz / 16QAM



Occupied Bandwidth

Mode	LTE Band 4 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	1.094	1.097	2.721	2.721	4.496	4.496	9.051	9.011	13.427	13.457	18.422	18.462
Middle CH	1.097	1.097	2.727	2.721	4.496	4.496	9.011	9.031	13.457	13.516	18.422	18.462
Highest CH	1.097	1.097	2.727	2.715	4.505	4.496	9.071	8.991	13.487	13.457	18.262	18.262

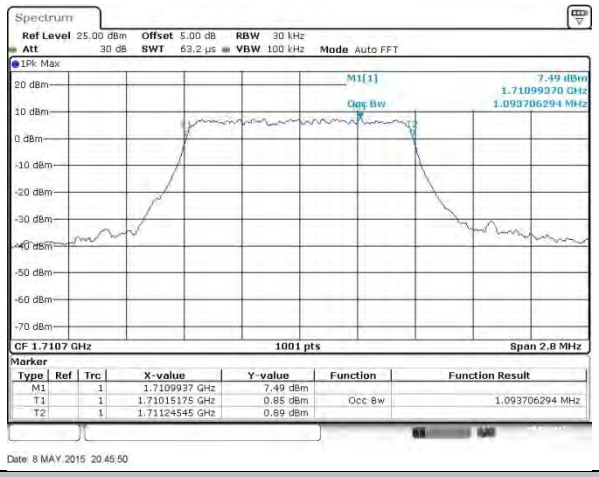
Mode	LTE Band 5 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	1.094	1.097	2.733	2.727	4.505	4.496	9.071	8.991	-	-	-	-
Middle CH	1.097	1.099	2.727	2.733	4.505	4.496	9.031	9.051	-	-	-	-
Highest CH	1.097	1.097	2.715	2.715	4.496	4.496	9.031	9.051	-	-	-	-

Mode	LTE Band 7 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	4.505	4.505	9.091	9.051	13.516	13.516	18.382	18.501
Middle CH	-	-	-	-	4.496	4.496	9.071	9.031	13.487	13.487	18.501	18.462
Highest CH	-	-	-	-	4.496	4.505	9.091	9.031	13.516	13.457	18.462	18.342

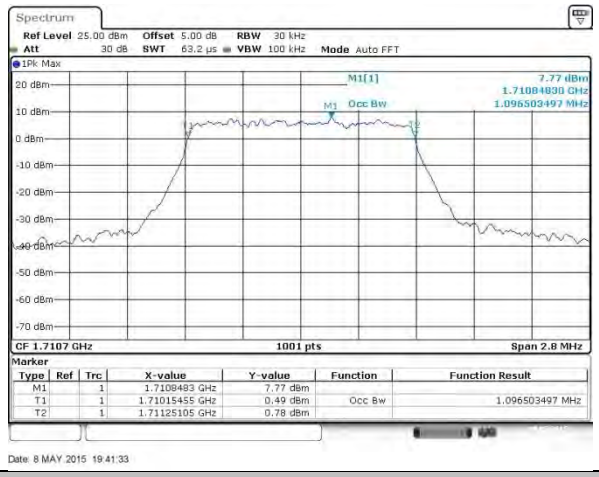
Mode	LTE Band 38 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	-	-	-	-	4.515	4.496	9.011	9.031	13.487	13.516	18.342	18.422
Middle CH	-	-	-	-	4.515	4.496	9.031	9.011	13.427	13.546	18.422	18.382
Highest CH	-	-	-	-	4.505	4.496	9.071	9.031	13.487	13.516	18.462	18.501

LTE Band 4

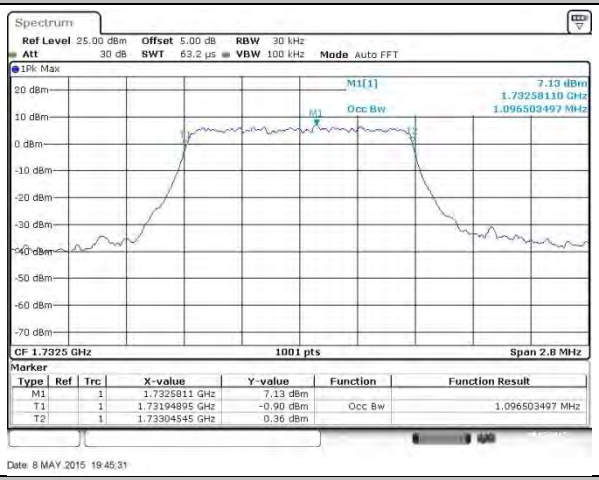
Lowest Channel / 1.4MHz / QPSK



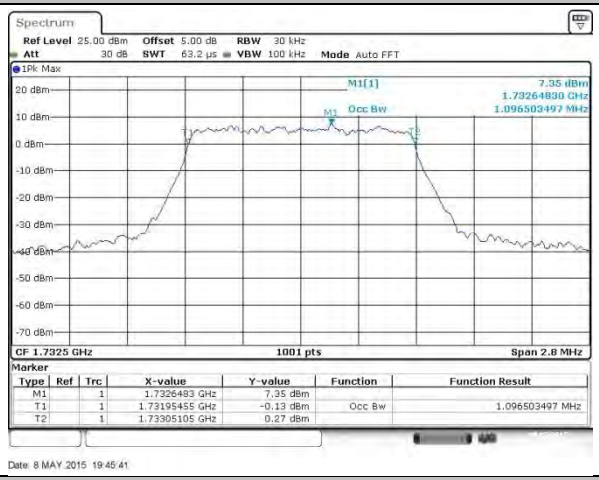
Lowest Channel / 1.4MHz / 16QAM



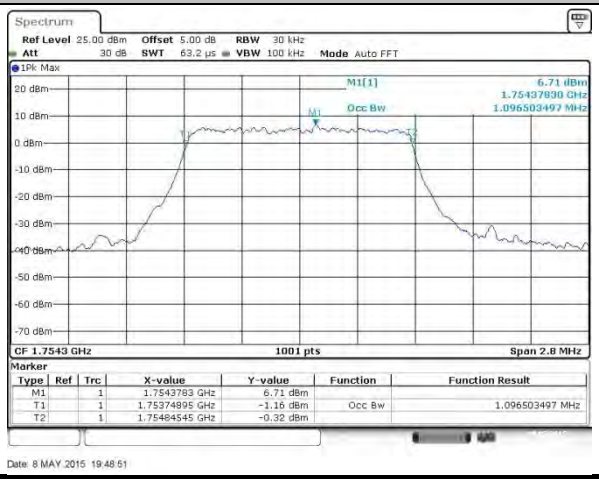
Middle Channel / 1.4MHz / QPSK



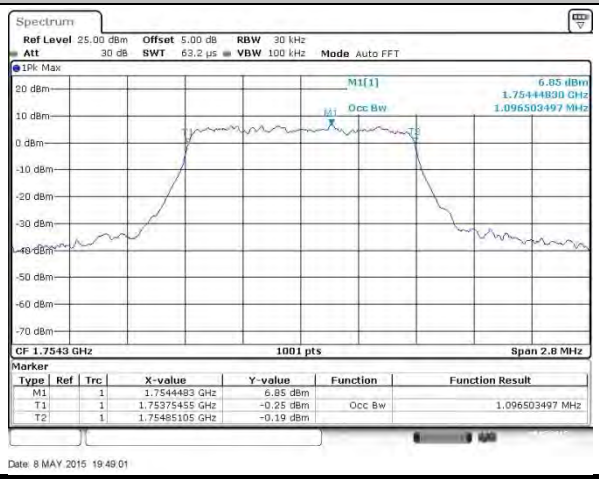
Middle Channel / 1.4MHz / 16QAM



Highest Channel / 1.4MHz / QPSK

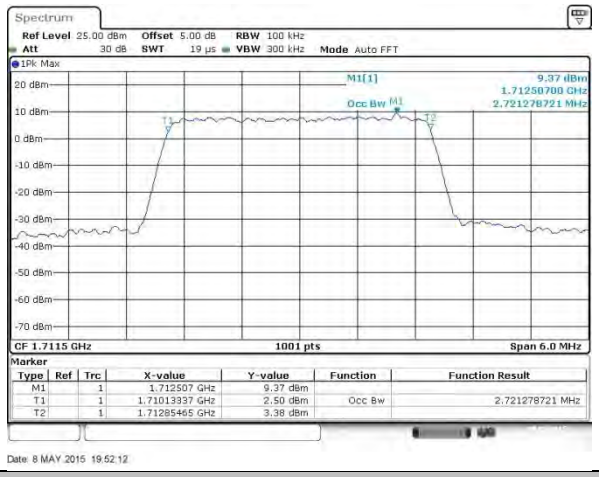


Highest Channel / 1.4MHz / 16QAM

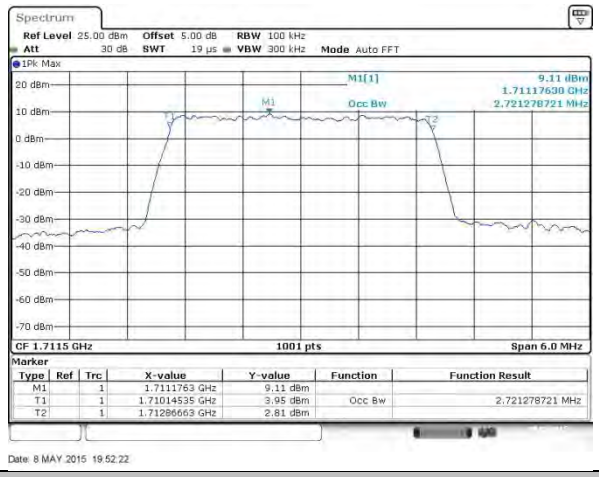


LTE Band 4

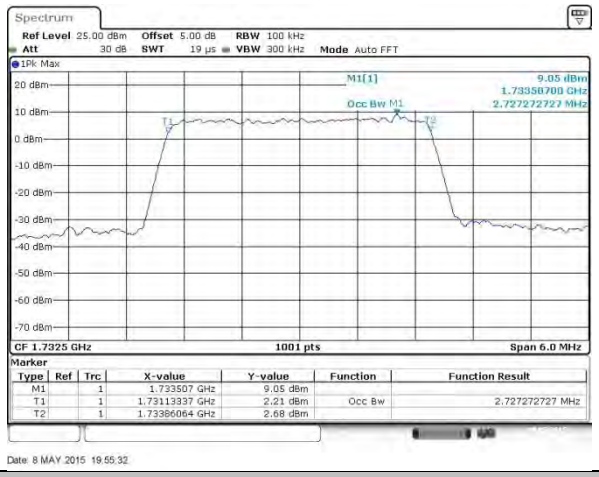
Lowest Channel / 3MHz / QPSK



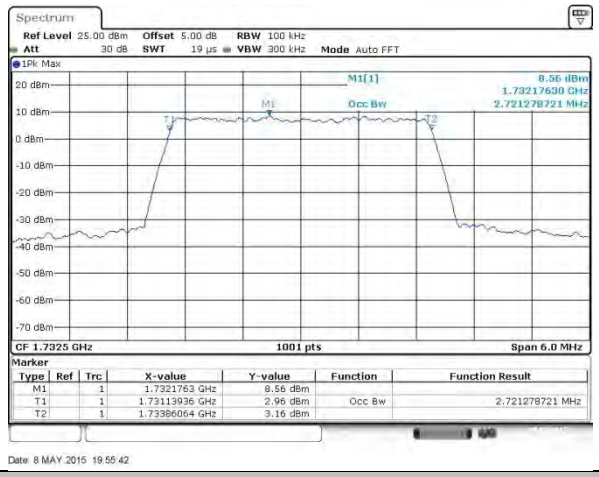
Lowest Channel / 3MHz / 16QAM



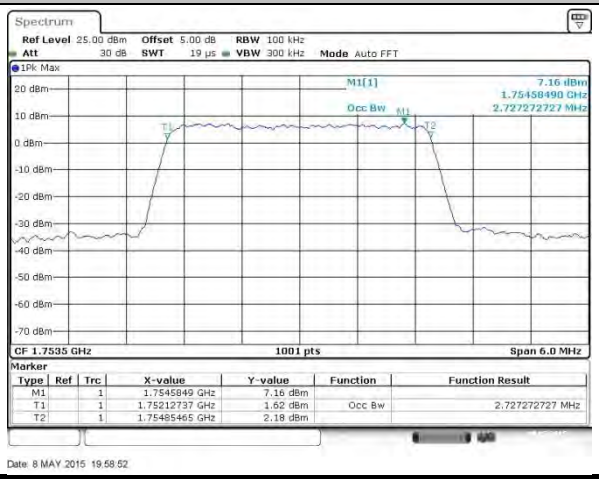
Middle Channel / 3MHz / QPSK



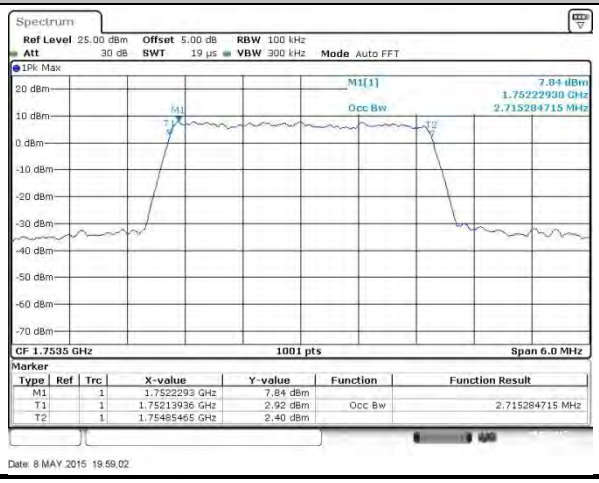
Middle Channel / 3MHz / 16QAM



Highest Channel / 3MHz / QPSK

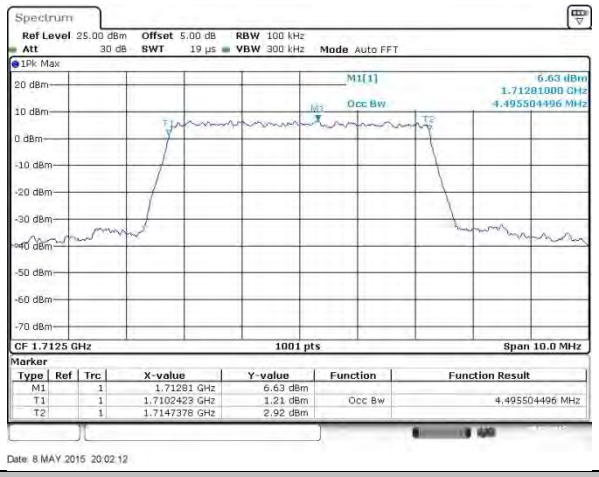


Highest Channel / 3MHz / 16QAM

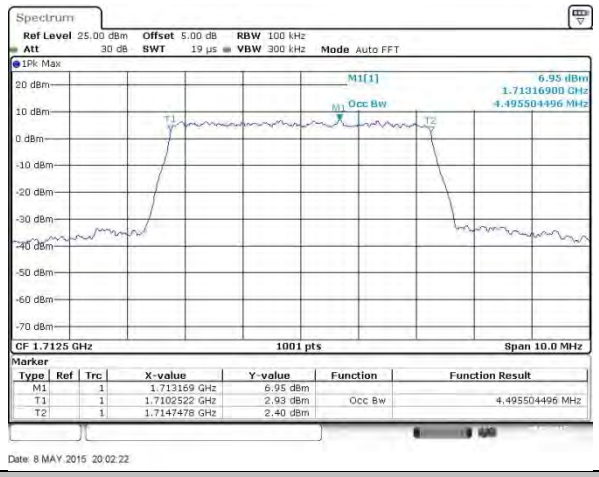


LTE Band 4

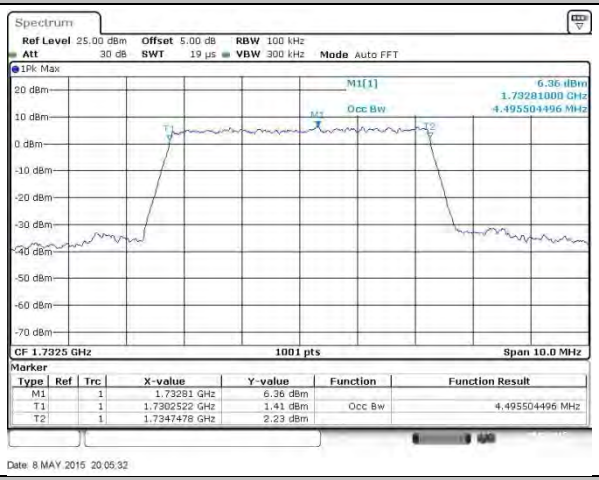
Lowest Channel / 5MHz / QPSK



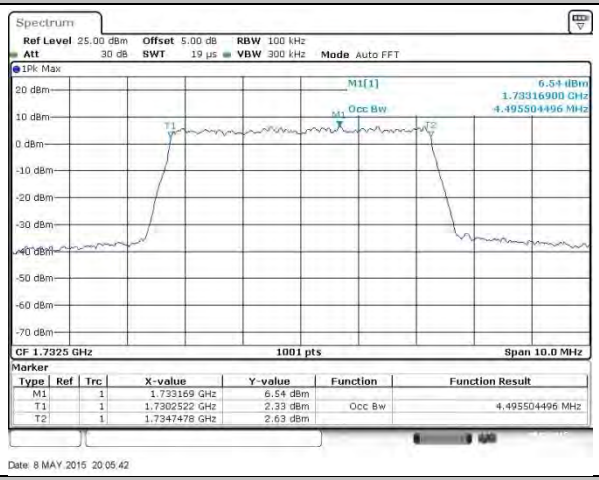
Lowest Channel / 5MHz / 16QAM



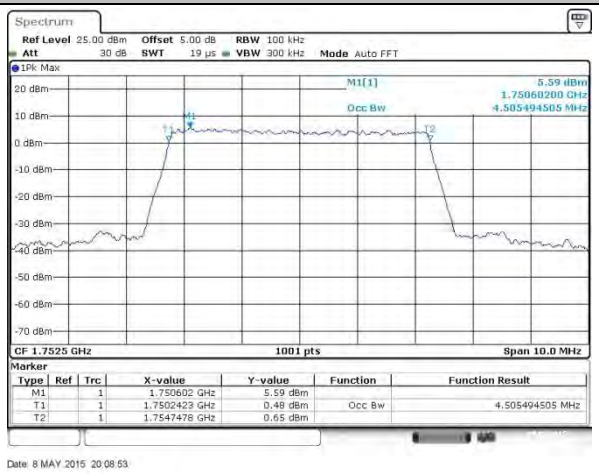
Middle Channel / 5MHz / QPSK



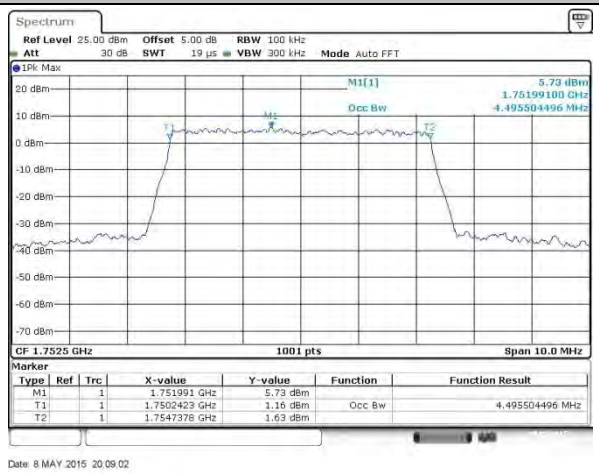
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

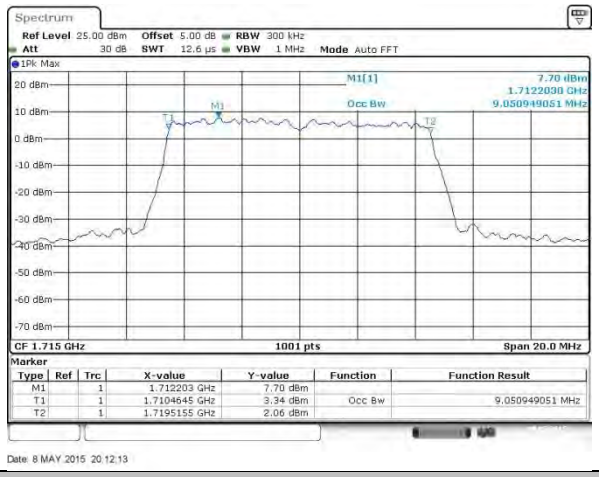


Highest Channel / 5MHz / 16QAM

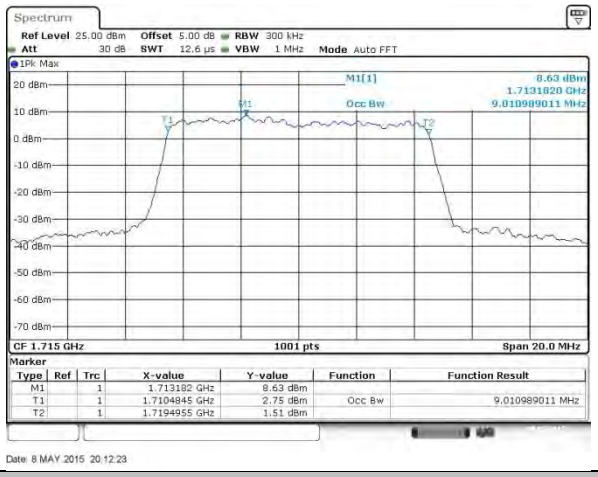


LTE Band 4

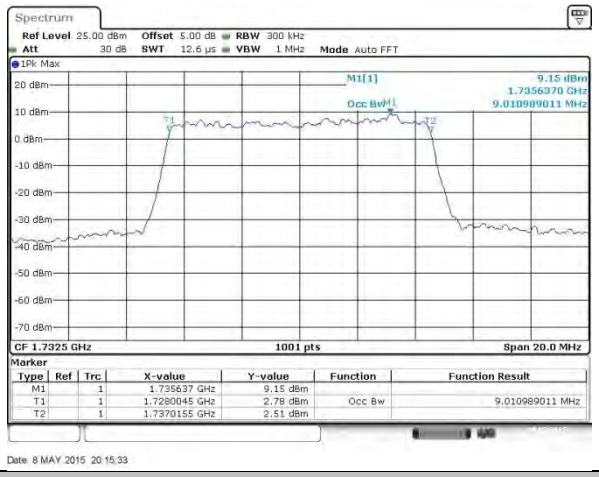
Lowest Channel / 10MHz / QPSK



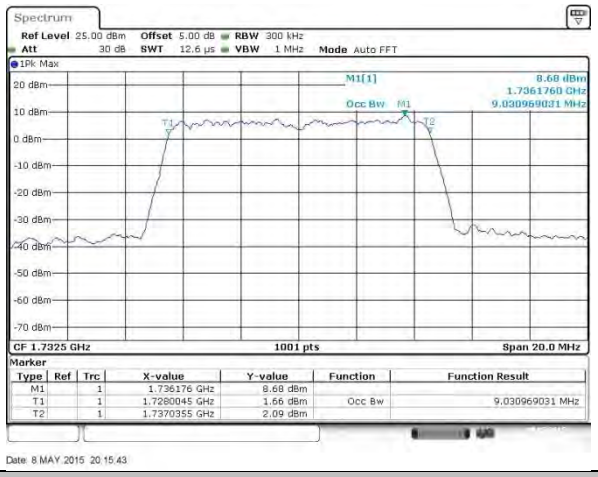
Lowest Channel / 10MHz / 16QAM



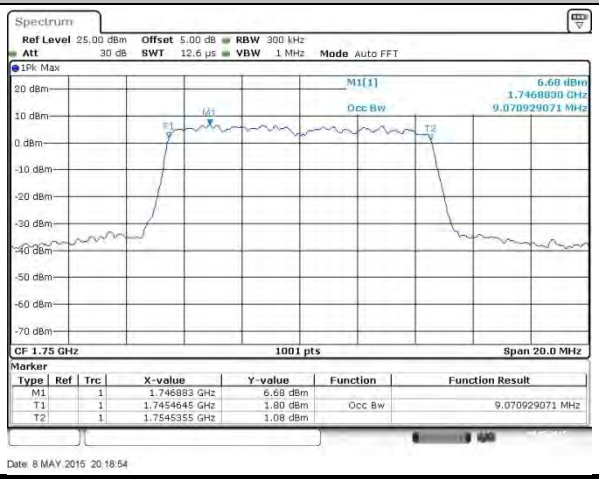
Middle Channel / 10MHz / QPSK



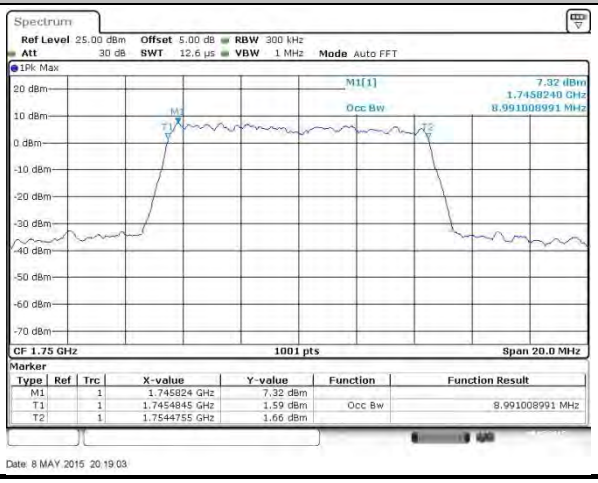
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

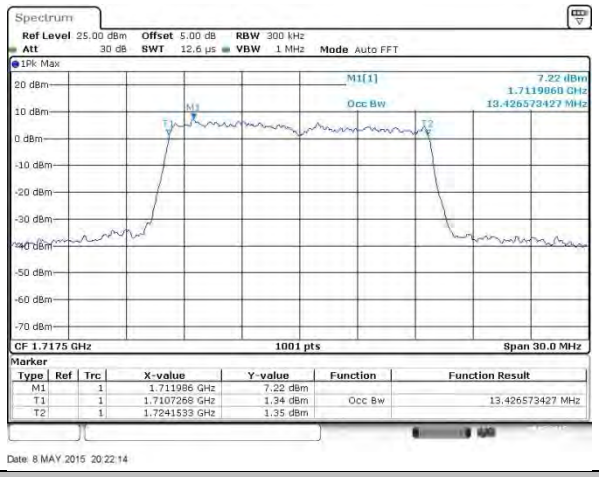


Highest Channel / 10MHz / 16QAM

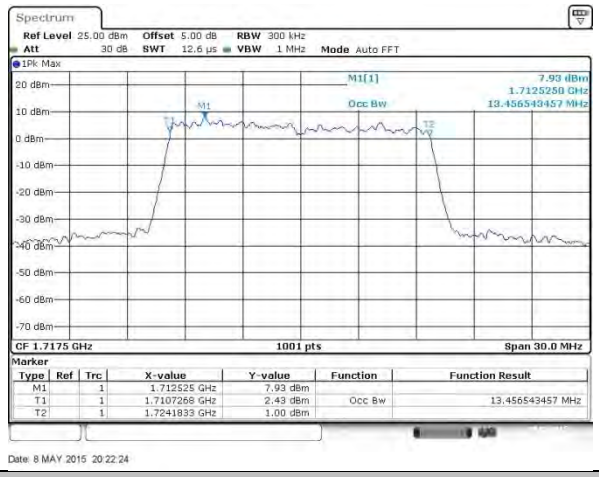


LTE Band 4

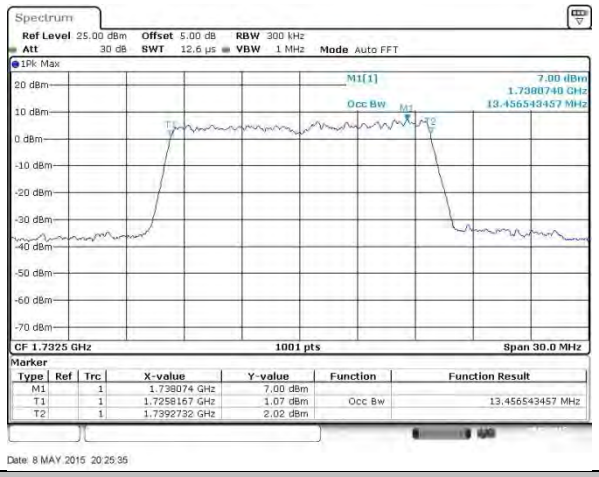
Lowest Channel / 15MHz / QPSK



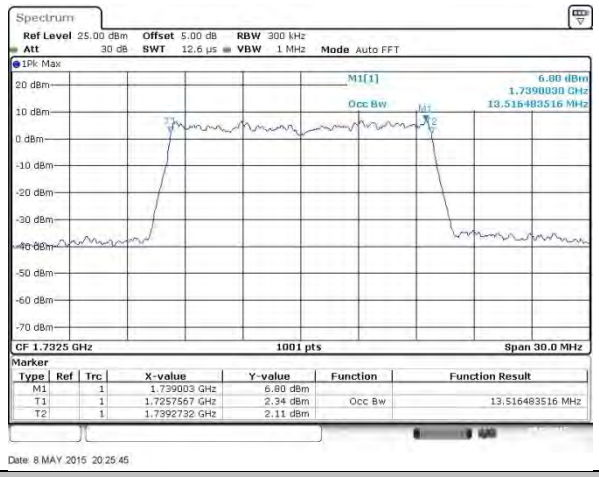
Lowest Channel / 15MHz / 16QAM



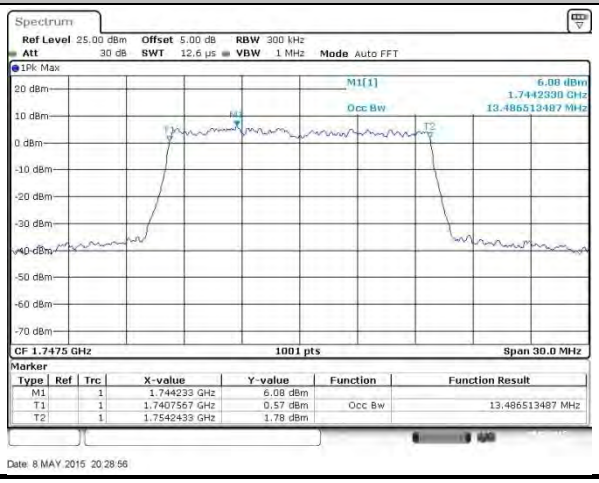
Middle Channel / 15MHz / QPSK



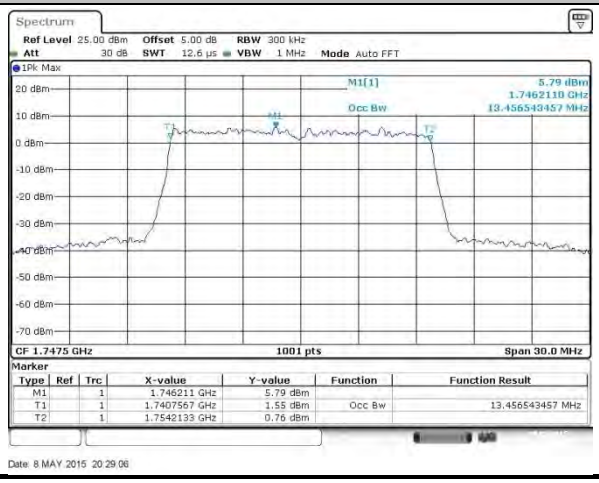
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

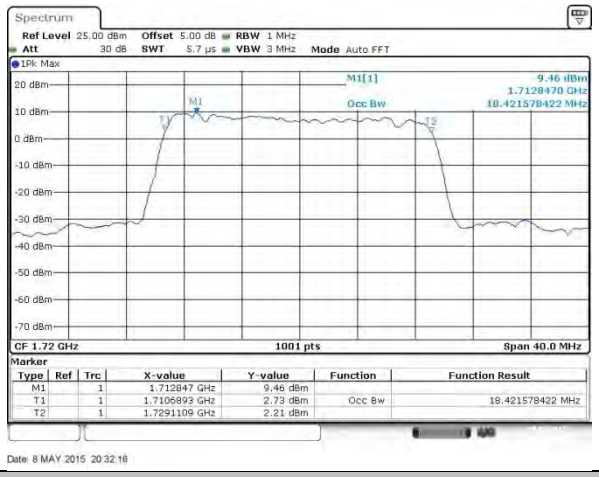


Highest Channel / 15MHz / 16QAM

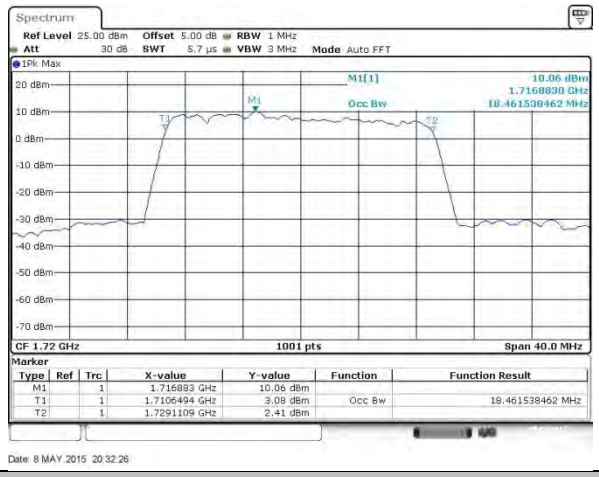


LTE Band 4

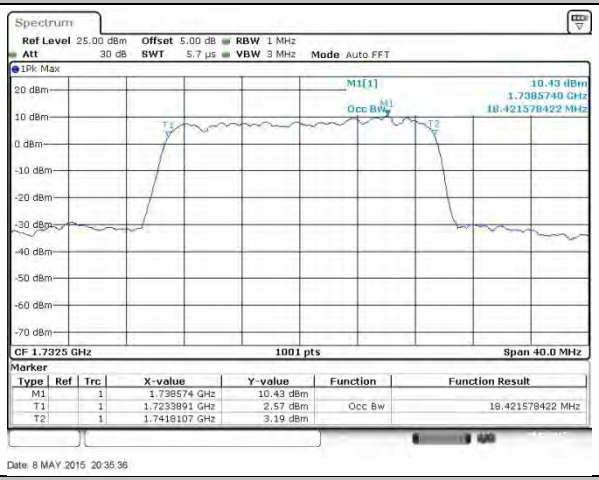
Lowest Channel / 20MHz / QPSK



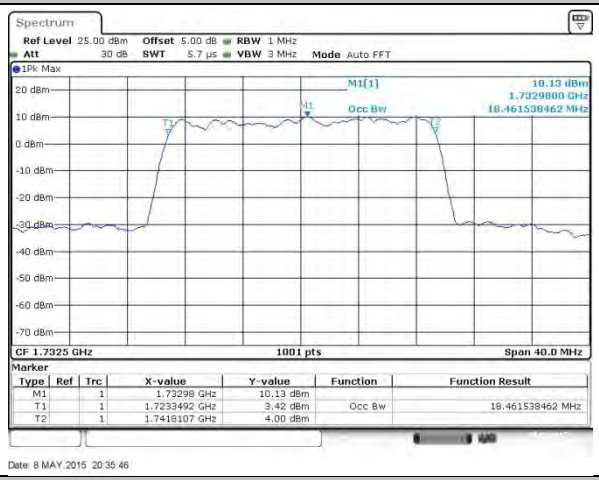
Lowest Channel / 20MHz / 16QAM



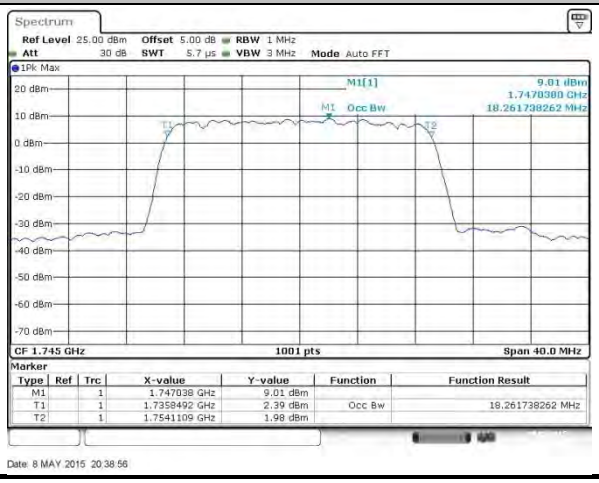
Middle Channel / 20MHz / QPSK



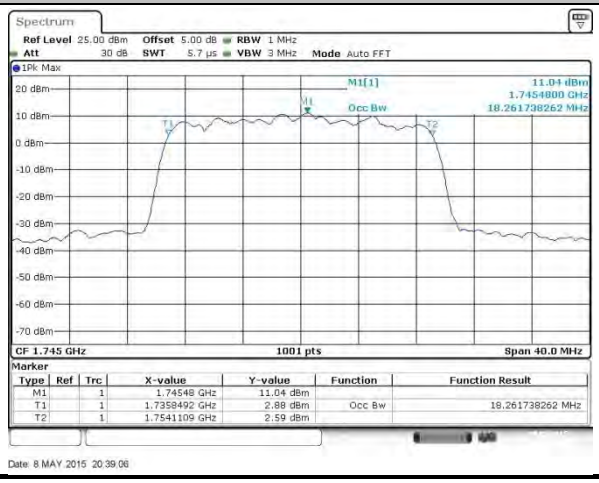
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK

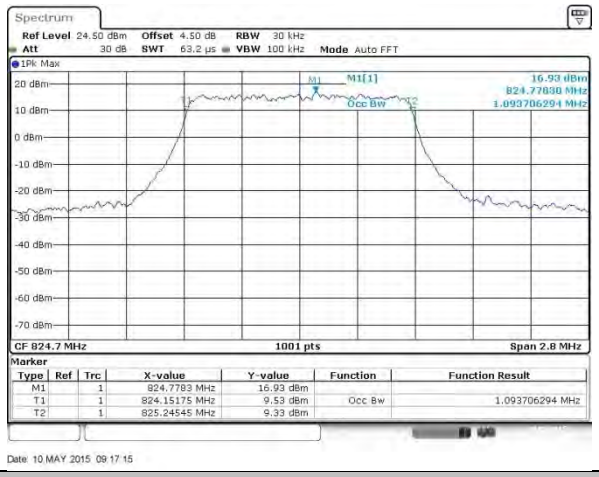


Highest Channel / 20MHz / 16QAM

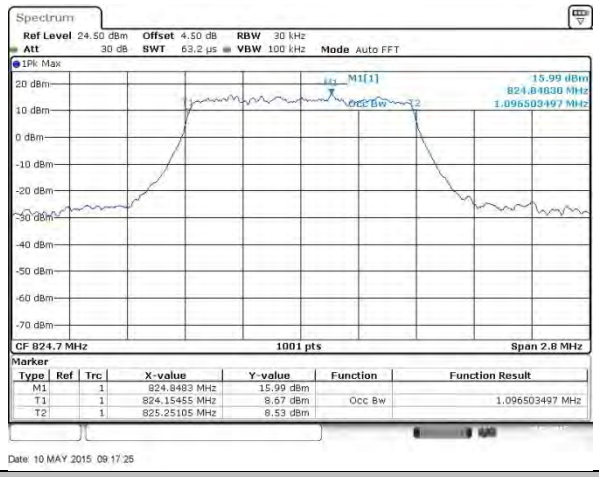


LTE Band 5

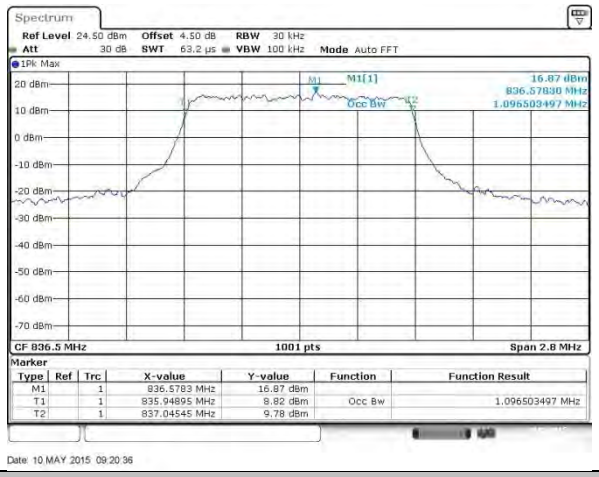
Lowest Channel / 1.4MHz / QPSK



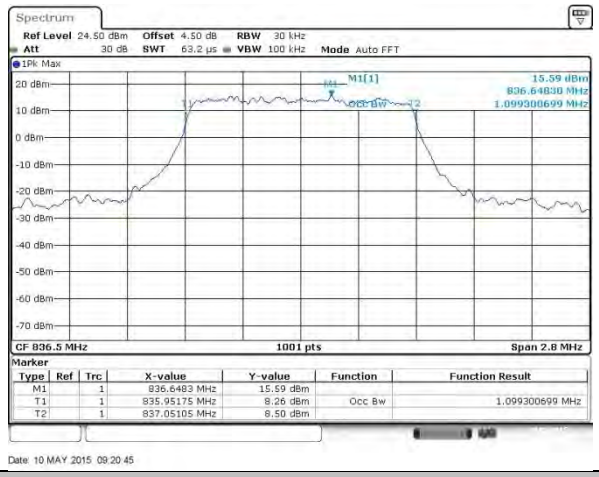
Lowest Channel / 1.4MHz / 16QAM



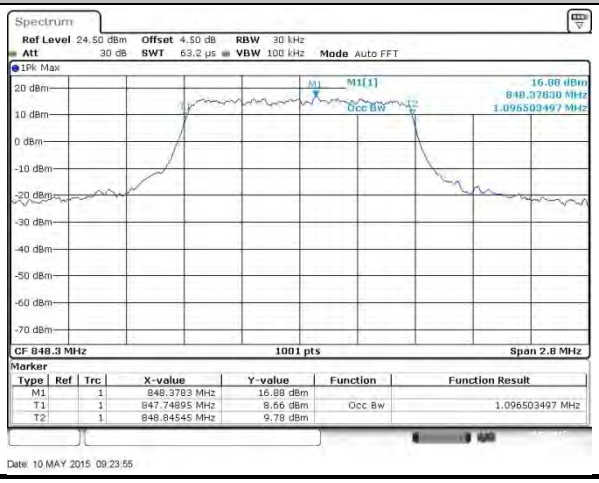
Middle Channel / 1.4MHz / QPSK



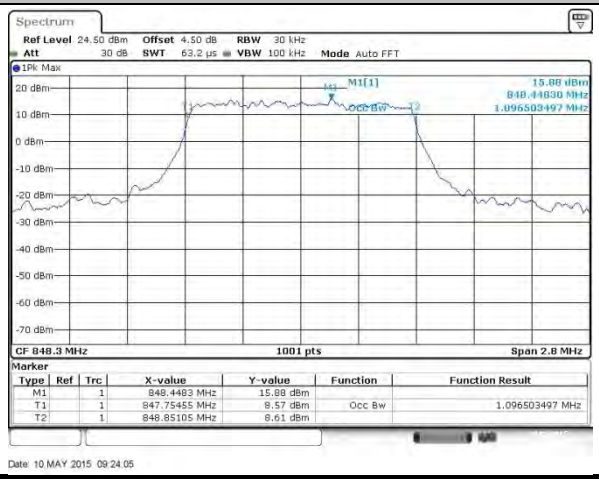
Middle Channel / 1.4MHz / 16QAM



Highest Channel / 1.4MHz / QPSK

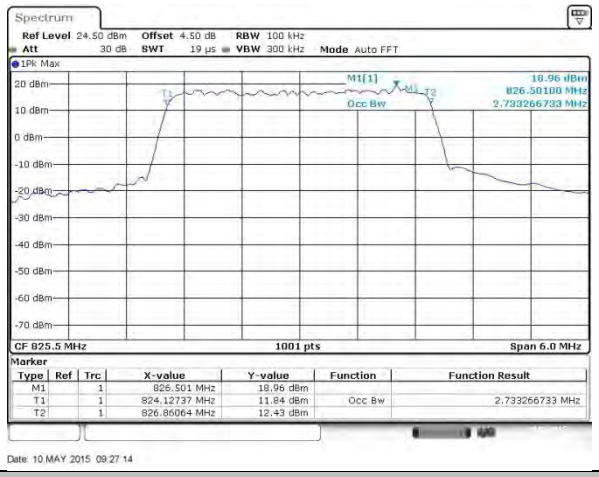


Highest Channel / 1.4MHz / 16QAM

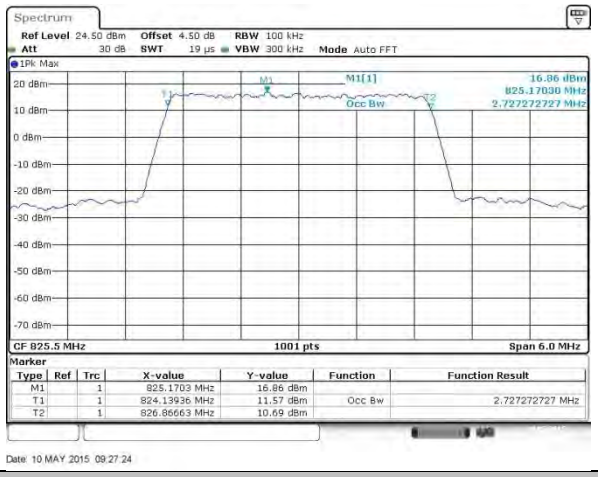


LTE Band 5

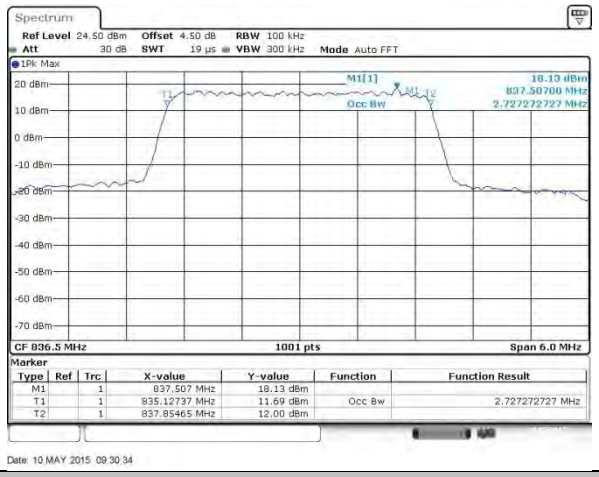
Lowest Channel / 3MHz / QPSK



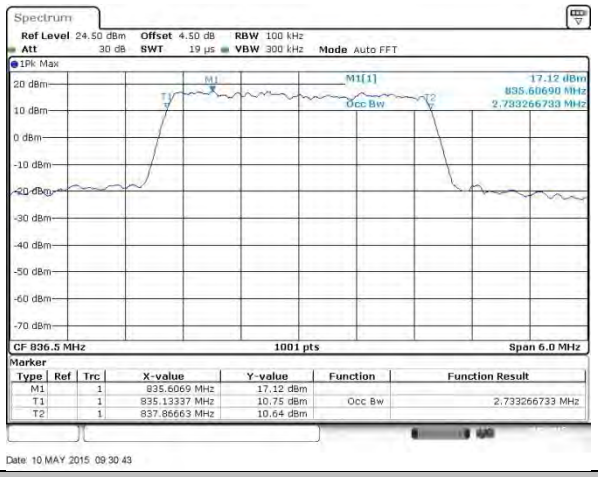
Lowest Channel / 3MHz / 16QAM



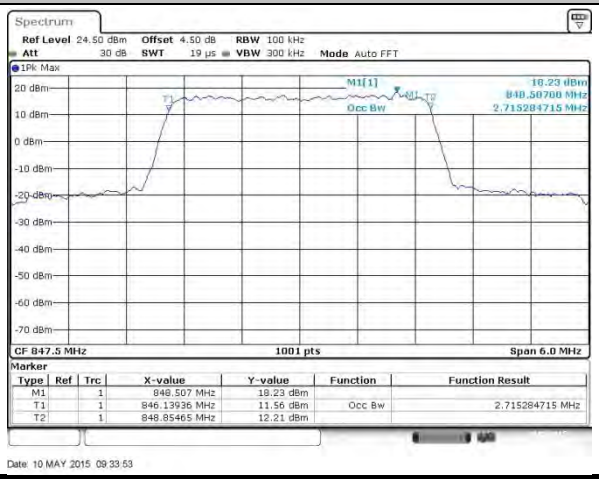
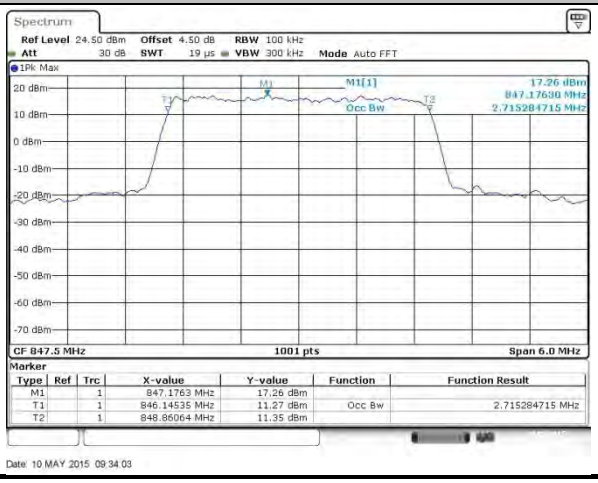
Middle Channel / 3MHz / QPSK



Middle Channel / 3MHz / 16QAM



Highest Channel / 3MHz / QPSK



Highest Channel / 3MHz / 16QAM