FCC RF Test Report

APPLICANT	:	**Motorola Mobility LLC**
EQUIPMENT	:	**Mobile Cellular Phone**
BRAND NAME	:	**Motorola**
MODEL NAME	:	**XT1941-4, XT1941-1**
FCC ID	:	**IHDT56XK2**
STANDARD	:	**47 CFR Part 2, 22(H), 27(M)**
CLASSIFICATION	:	**PCS Licensed Transmitter Held to Ear (PCE)**

The product was received on Jun. 04, 2018 and completely tested on Jul. 02, 2018. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown 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.

James Huang

NVLAP® TESTING
NVLAP LAB CODE 600155-0

Approved by: James Huang / Manager

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China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG860402-01B	Rev. 01	Initial issue of report	Jul. 30, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
3.5	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§27.53(m)(4)	Conducted Band Edge Measurement (Band 41)	§27.53(m)(4)	PASS	-
3.8	§2.1051 §27.53(m)(4)	Conducted Spurious Emission (Band 41)	< $55+10\log_{10}$(P[Watts])	PASS	-
3.9	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§24.232(c) §27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 41)	EIRP < 2Watt	PASS	-
4.5	§2.1053 §27.53(m)(4)	Radiated Spurious Emission (Band 41)	< $55+10\log_{10}$(P[Watts])	PASS	Under limit 12.84 dB at 7756.000 MHz

1 General Description

1.1. Applicant

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2. Manufacturer

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT1941-4, XT1941-1
FCC ID	IHDT56XK2
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM uplink is not supported)/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 Bluetooth BR/EDR/LE
IMEI Code	Conducted: N/A Radiation: 355541090013552/355541090013560
HW Version	DVT1B
SW Version	fastboot_deen_oem_userdebug_8.1.0_OPK28.26_f325_intcfg-test-keys_oem
EUT Stage	Identical Prototype

Note: There are two types of EUT sample 1 and sample 2, the differences between two samples are only for SIM slot, the sample 1(model name XT1941-4) is dual SIM slot, the sample 2(model name XT1941-1) is single SIM slot. According to the difference, we choose sample 1 to perform full test

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	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 LTE Band 41 : 2537.5 MHz ~ 2652.5 MHz
Rx Frequency	LTE Band 5 : 869.7 MHz ~ 893.3 MHz LTE Band 7 : 2622.5 MHz ~ 2687.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41 : 2537.5 MHz ~ 2652.5 MHz
Bandwidth	LTE Band 41 : 5MHz / 10MHz / 15MHz / 20MHz
Maximum Output Power to Antenna	LTE Band 41 : 23.43 dBm
Antenna Gain	LTE Band 41 : -4.50 dBi
Type of Modulation	QPSK / 16QAM

1.5. Modification of EUT

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

1.6. Re-use of Measured Data

1.6.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: XT1941-4, XT1941-1, FCC ID: IHDT56XK2) is electrically identical to the reference device (Model: XT1941-5, XT1941-3, FCC ID: IHDT56XK1) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 484596 D01.

1.6.2 Difference Section

For details concerning the similarity with respect to component placement, mechanical/electrical design etc., please refer to the Product Equality Declaration.

The re-used RF data includes the following bands provided in Appendix D (Sporton RF Report No. FG860402B for the reference device Model: XT1941-5, XT1941-3, FCC ID: IHDT56XK1).

1.6.3 Reference detail Section:

Equipment Class	Reference FCC ID	Folder Test	Report Title/Section
PCE (2G/3G)	IHDT56XK1	Part22H.24E.27L(FG860402A)	All sections applicable except for WCDMA Band IV
PCE (LTE)	IHDT56XK1	Part22H.24E.27L.27M (FG860402B)	All sections applicable for LTE Band 5/7

1.6.4 Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, spot check measurements were performed on the subject device for the radiated spurious emission, the test result were consistent with FCC ID: IHDT56XK1 and LTE Band 41 to full test, LTE Band 38 is covered by the Band 41.

Assertions concerning the similarity of these devices are based on representations by the applicant. The applicant accepts full responsibility for the validity of the similarity claim, and for the determination that verification test data are sufficient to support it.

Test Item	Mode	IHDT56XK1 Worst Result	IHDT56XK2 Worst Result	Difference (dB)
Radiated Spurious Emission (Haromic) (dBm)	GSM 850	-36.75	-37.38	0.63
	PCS 1900	-41.83	-47.34	5.51
	LTE Band 7 - BW 20M	-39.48	-42.20	2.72

1.7. Maximum EIRP Power, Frequency Tolerance, and Emission Designator

LTE Band 41		QPSK			16QAM		
BW (MHz)	**Frequency Range (MHz)**	**Emission Designator (99%OBW)**	**Frequency Tolerance (ppm)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**	**Frequency Tolerance (ppm)**	**Maximum EIRP(W)**
5	2537.5 ~ 2652.5	4M52G7D	-	0.3321	4M50W7D	-	0.2468
10	2540.0 ~ 2650.0	9M03G7D	0.0021	0.2805	9M05W7D	-	0.2390
15	2542.5 ~ 2647.5	13M5G7D	-	0.3295	13M4W7D	-	0.2558
20	2545.0 ~ 2645.0	18M4G7D	-	0.3252	18M3W7D	-	0.2802

1.8. Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No. is CN5013.

Test Site	Sporton International (Kunshan) Inc.		
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**		**FCC Test Firm Registration No.**
	TH01-KS	03CH02-KS	630927

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(M)
- ANSI C63.26-2015
- FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

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.

1.10. Specification of Accessory

Specification of Accessory				
AC Adapter 1 (US)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-51
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (EU)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-52
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (UK)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-53
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		

AC Adapter 1(IND)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-54
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (AU)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-55
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (AR)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-56
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (BR)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-57
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (PRC)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-58
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 1 (Chile)	**Brand Name**	Motorola(Salom)	**Model Name**	SC-52
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 2 (US)	**Brand Name**	Motorola(chenyang)	**Model Name**	SC-51
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 2 (EU)	**Brand Name**	Motorola(chenyang)	**Model Name**	SC-52
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 2 (UK)	**Brand Name**	Motorola(chenyang)	**Model Name**	SC-53
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 2 (AU)	**Brand Name**	Motorola(chenyang)	**Model Name**	SC-55
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 2 (AR)	**Brand Name**	Motorola(chenyang)	**Model Name**	SC-56
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
AC Adapter 2 (PRC)	**Brand Name**	Motorola(chenyang)	**Model Name**	SC-58
	Power Rating	I/P: 100 - 240 Vac, 0.6A, O/P: 5Vdc 3000mA; 9Vdc 2000mA; 12Vdc 1500mA		
Battery	**Brand Name**	Motorola	**Model Name**	JE40
	Power Rating	3.8Vdc, 2820mAh	**Type**	Li-ion
Earphone	**Brand Name**	Motorola (New Leader)	**Model Name**	NLD-EM307E-09SF
	Signal Line	1.2 meter, non-shielded cable, with w/o ferrite core		
USB Cable 1	**Brand Name**	Motorola(Liqi)	**Model Name**	LQ-03500079
	Signal Line	1.0 meter, non-shielded cable, with w/o ferrite core		
USB Cable 2	**Brand Name**	Motorola (Saibao)	**Model Name**	SLQ-A1111A
	Signal Line	1.0 meter, non-shielded cable, with w/o ferrite core		

2 Test Configuration of Equipment Under Test

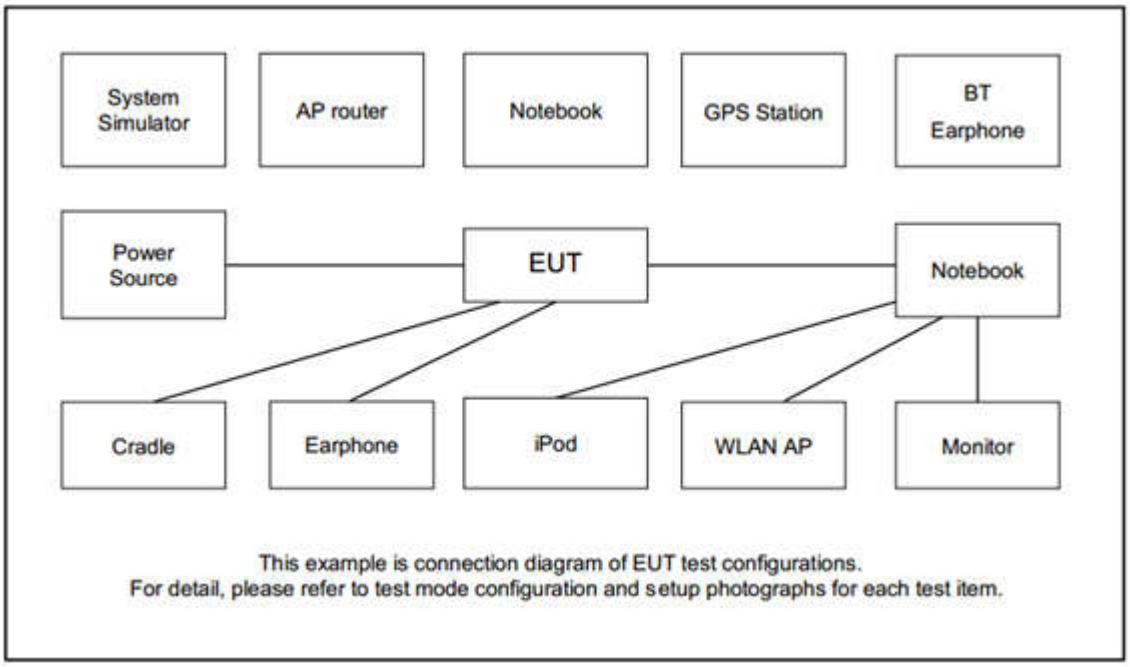
2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas License Digital Systems v03r01 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	41	-	-	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	41	-	-				v	v	v	v		v	v	v	v
26dB and 99% Bandwidth	41	-	-	v	v	v	v	v	v			v	v	v	v
Conducted Band Edge	41	-	-	v	v	v	v	v	v	v		v	v		v
Conducted Spurious Emission	41	-	-	v	v	v	v	v	v	v			v	v	v
Frequency Stability	41	-	-		v			v				v		v	
E.I.R.P	41	-	-	v	v	v	v	v	v	v			v	v	v
Radiated Spurious Emission	41	Worst Case												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.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	GW INSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m

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.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 5.4 dB.

Example :

Offset(dB) = RF cable loss(dB).

= 5.4 (dB)

2.5 Frequency List of Low/Middle/High Channels

LTE Band 41 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	40140	40640	41140
	Frequency	2545	2595	2645
15	Channel	40115	40640	41165
	Frequency	2542.5	2595	2647.5
10	Channel	40090	40640	41190
	Frequency	2540	2595	2650
5	Channel	40065	40640	41215
	Frequency	2537.5	2595	2652.5

3 Conducted Test Items

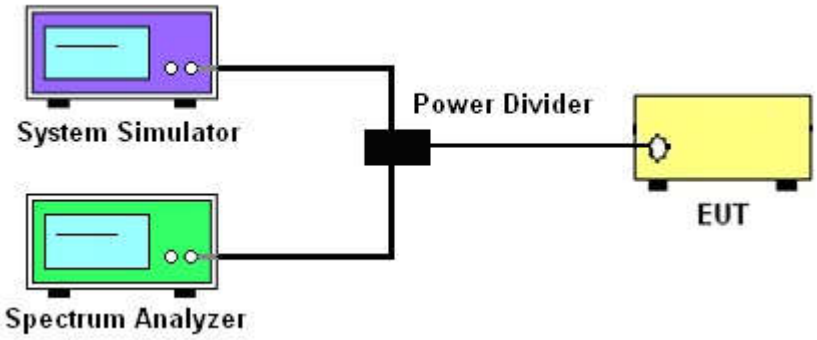
3.1 Measuring Instruments

See list of measuring instruments of this test report.

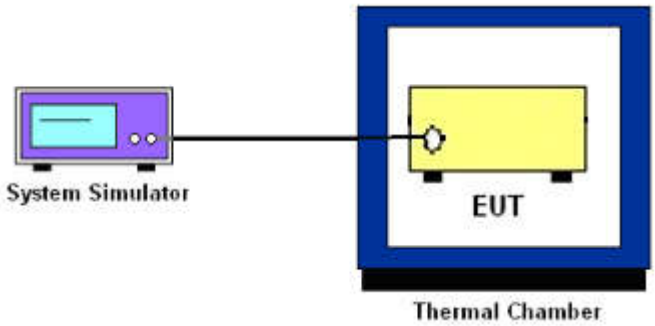
3.2 Test Setup

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 testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. 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 ANSI C63.26 Section 5.2.3.4 (CCDF).
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 ANSI C63.26 Section 5.4
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

27.53(m)(4)

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 ANSI C63.26 section 5.7
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.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used and the measured power was integrated over the full required measurement bandwidth of 1 MHz.
6. Set spectrum analyzer with RMS detector.
7. Offset has included the duty factor for LTE Band 41. Duty factor =10 log (1/x), where x is the measured duty cycle
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
9. Checked that all the results comply with the emission limit line.
   Example:
   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.
10. For LTE Band 41, the other 40 dB, and 55 dB have additionally applied same calculation above.

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 41:

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 ANSI C63.26 section 5.7
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.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. 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.
11. For Band 41
    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 testing follows ANSI C63.26 section 5.6.4
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. 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.
4. 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 ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at 20±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 for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

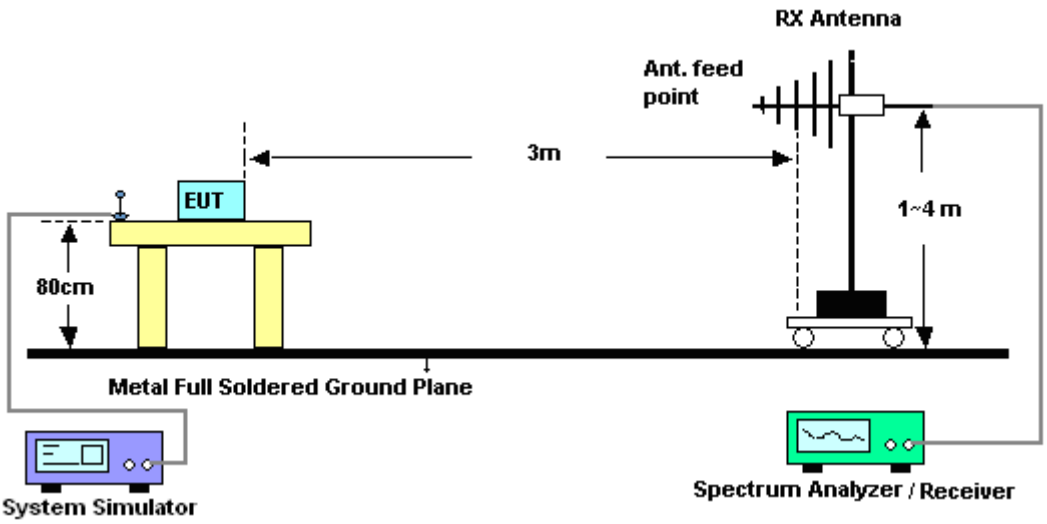
4 Radiated Test Items

4.1 Measuring Instruments

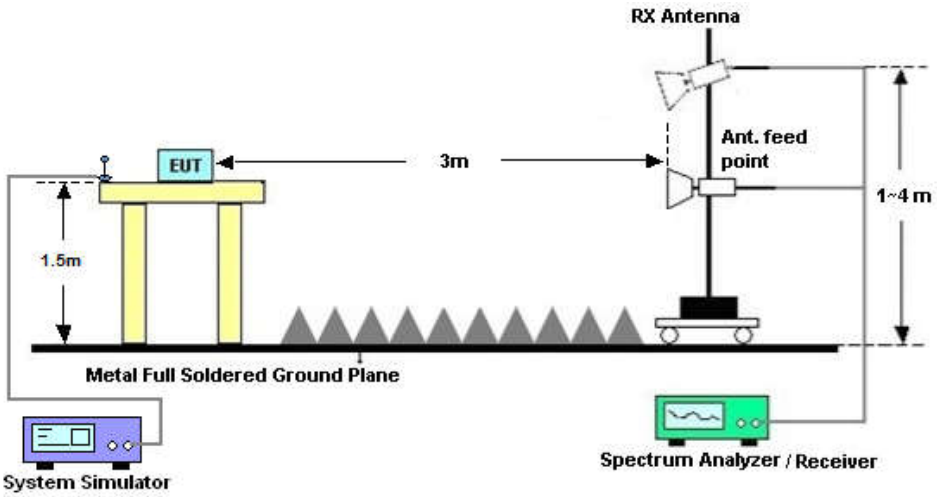
See list of measuring instruments of this test report.

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 Isotropic Radiated Power

4.4.1 Description of the EIRP Measurement

Equivalent isotropic radiated power output measurements by substitution method according to ANSI C63.26, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas License Digital Systems v03r01. Mobile and portable (hand-held) stations operating are limited to average EIRP of 2 watts with LTE band 41.

4.4.2 Test Procedures

1. The EUT was placed on a non-conductive rotating platform (0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz) 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.
2. 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.
3. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to ANSI C63.26. 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 Average					
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 C63.26. 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 41

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 ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna 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 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. 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.
13. For Band 41:
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 08, 2017	Jun. 27, 2018	Aug. 07, 2018	Conducted (TH01-KS)
Radio communication analyzer	Anritsu	MT8820C	6201300652	2G/3G/LTE_ full band	Aug. 08, 2017	Jun. 27, 2018	Aug. 07, 2018	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 12, 2017	Jun. 27, 2018	Oct. 11, 2018	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44G,MAX 30dB	Apr. 17, 2018	Jul. 02, 2018	Apr. 16, 2019	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz-2GHz	Jan. 29, 2018	Jul. 02, 2018	Jan. 28, 2019	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 21, 2017	Jul. 02, 2018	Oct. 20, 2018	Radiation (03CH02-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1	2025788	100MHz-18GHz	Apr. 17, 2018	Jul. 02, 2018	Apr. 16, 2019	Radiation (03CH02-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 07, 2018	Jul. 02, 2018	Feb. 06, 2019	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Aug. 07, 2017	Jul. 02, 2018	Aug. 06, 2018	Radiation (03CH02-KS)
Amplifier	Agilent	8449B	3008A02384	1-26.5GHz Gain 30dB	Oct. 12, 2017	Jul. 02, 2018	Oct. 11, 2018	Radiation (03CH02-KS)
Amplifier	MITEQ	TTA1840-35 -HG	1887435	18~40GHz	Oct. 12, 2017	Jul. 02, 2018	Oct. 11, 2018	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Jul. 02, 2018	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Jul. 02, 2018	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Jul. 02, 2018	NCR	Radiation (03CH02-KS)

NCR: No Calibration Required

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))	**3.3dB**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.8dB**

Appendix A. Test Results of Conducted Test

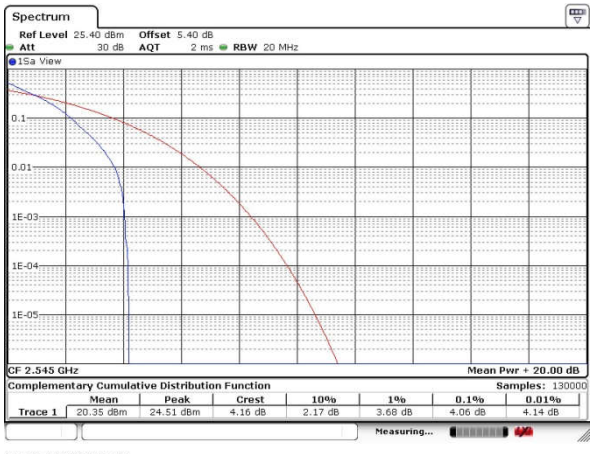
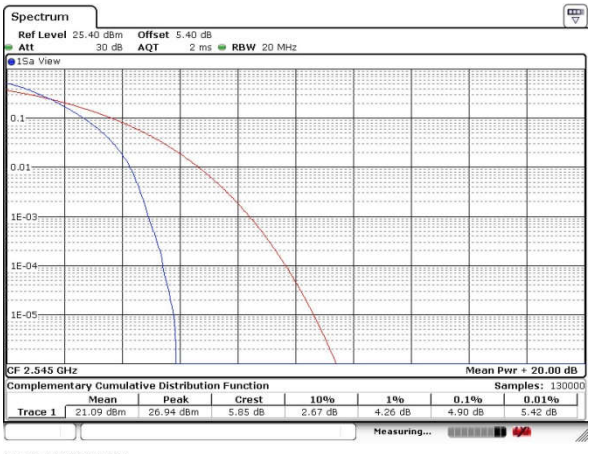
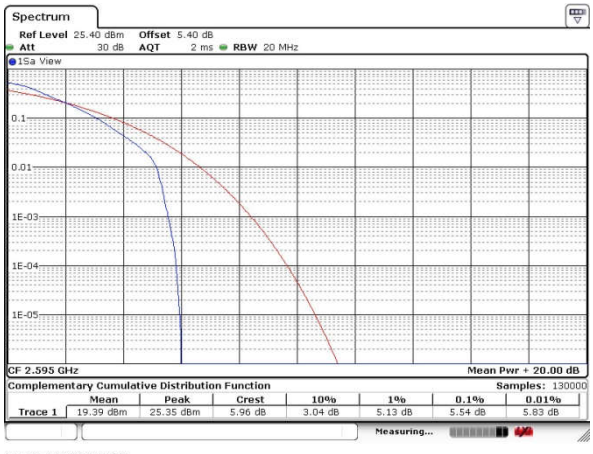
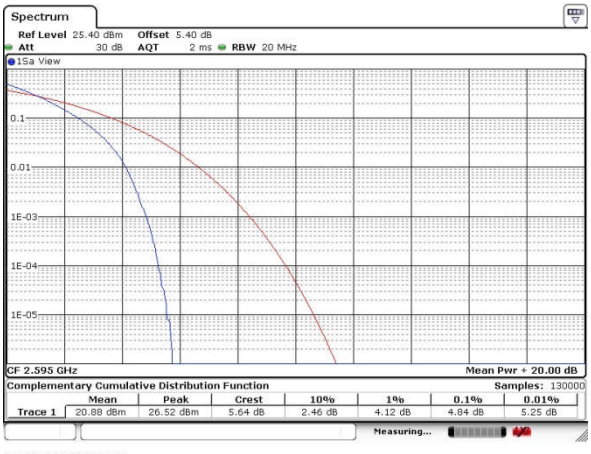
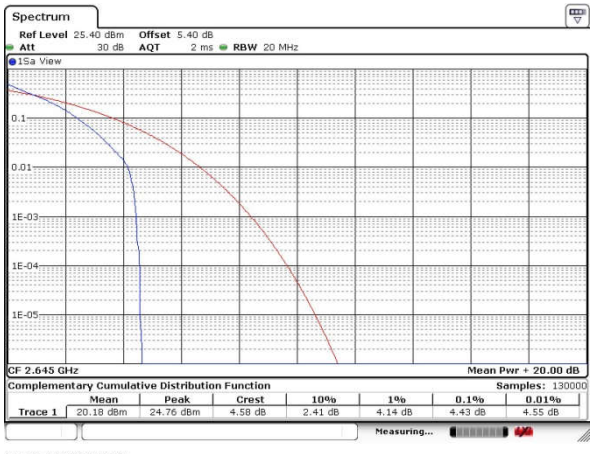
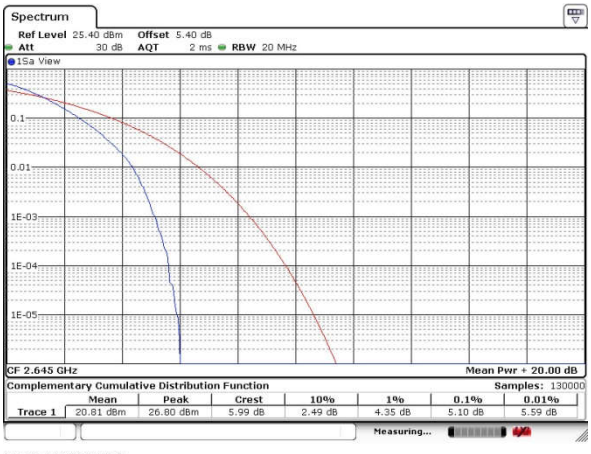
Conducted Output Power(Average power)

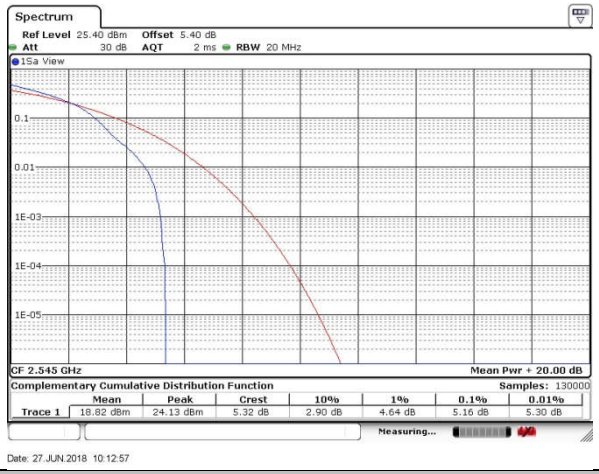
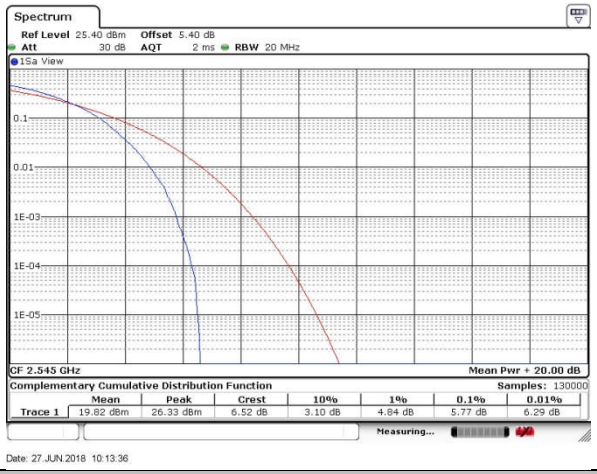
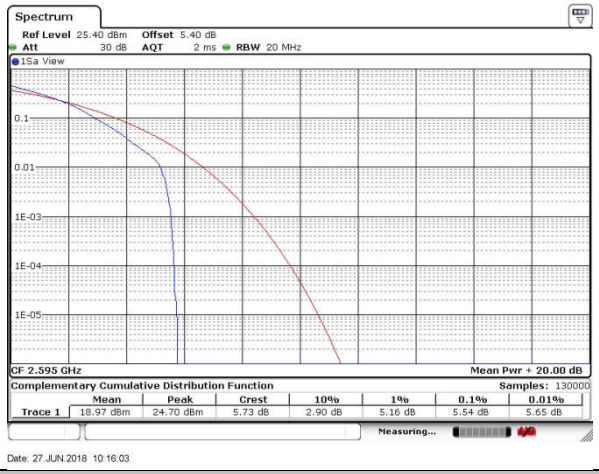
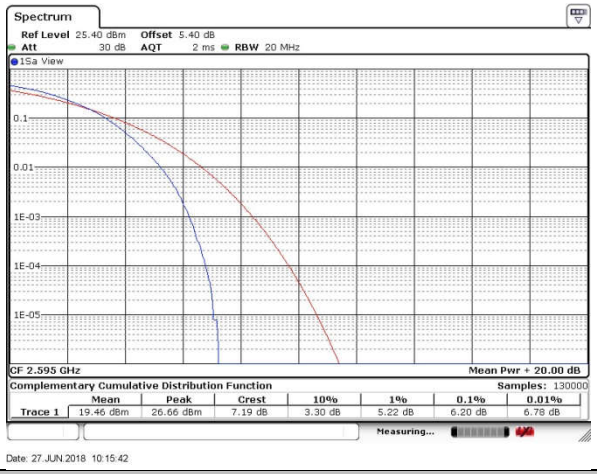
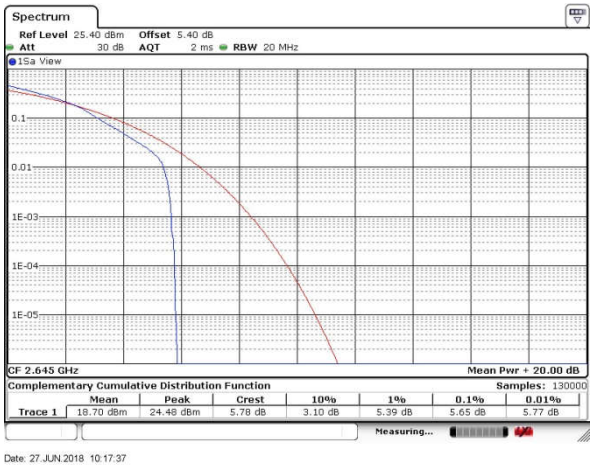
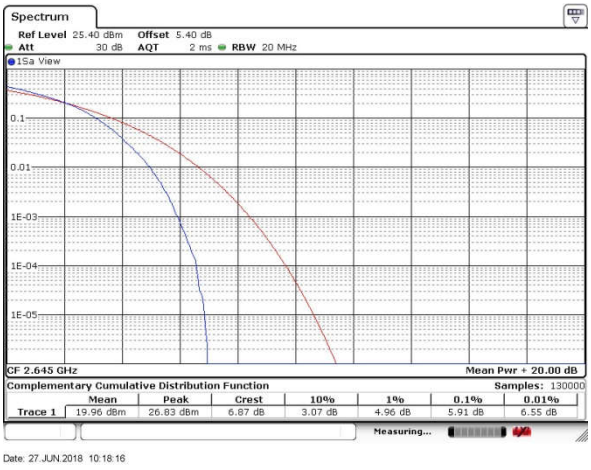
LTE Band 41 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
20	1	0	QPSK	22.70	23.15	23.43
20	1	49		23.12	23.38	23.35
20	1	99		22.86	23.37	23.29
20	50	0		21.94	22.25	22.38
20	50	24		22.02	22.28	22.33
20	50	50		22.08	22.40	22.23
20	100	0		22.06	22.43	22.36
20	1	0	16-QAM	22.12	22.08	22.28
20	1	49		21.81	22.34	22.17
20	1	99		21.84	22.19	21.82
20	50	0		20.87	21.40	21.37
20	50	24		21.23	21.28	21.36
20	50	50		21.05	21.37	21.29
20	100	0		20.98	21.30	21.33
15	1	0	QPSK	22.82	23.20	23.36
15	1	37		22.89	23.28	23.41
15	1	74		22.74	23.30	22.90
15	36	0		21.92	22.10	22.27
15	36	20		21.91	22.18	22.07
15	36	39		21.95	22.29	22.13
15	75	0		21.91	22.22	22.17
15	1	0	16-QAM	21.72	22.08	22.16
15	1	37		21.60	22.37	22.12
15	1	74		21.57	22.09	22.10
15	36	0		20.86	21.14	21.15
15	36	20		20.97	21.28	21.01
15	36	39		21.16	21.17	21.06
15	75	0		21.34	21.22	21.18

LTE Band 41 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	22.85	23.08	23.30
10	1	25		22.92	23.30	23.35
10	1	49		22.91	23.18	23.08
10	25	0		21.88	22.30	22.05
10	25	12		21.93	22.19	22.06
10	25	25		21.91	22.28	22.06
10	50	0		21.89	22.31	22.07
10	1	0	16-QAM	21.70	22.17	22.04
10	1	25		21.67	22.14	21.94
10	1	49		21.80	22.14	21.98
10	25	0		21.12	21.20	21.33
10	25	12		21.17	21.18	21.32
10	25	25		21.16	21.52	21.35
10	50	0		21.06	21.30	21.20
5	1	0	QPSK	22.69	22.48	22.50
5	1	12		22.88	22.66	22.69
5	1	24		22.71	22.90	22.78
5	12	0		22.03	22.10	22.36
5	12	7		21.75	22.28	22.21
5	12	13		21.77	22.10	21.89
5	25	0		22.08	22.00	22.06
5	1	0	16-QAM	22.00	22.17	22.12
5	1	12		22.05	22.07	22.16
5	1	24		22.01	22.28	22.49
5	12	0		20.58	21.17	20.69
5	12	7		20.82	21.17	20.88
5	12	13		20.77	21.00	20.99
5	25	0		20.95	20.98	20.89

Peak-to-Average Ratio

Mode	LTE Band 41 / 20MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	Full RB	Result
Lowest CH	4.06	4.9	5.16	5.77	PASS
Middle CH	5.54	4.84	5.54	6.2	
Highest CH	4.43	5.1	5.65	5.91	

LTE Band 41 / 20MHz / QPSK	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

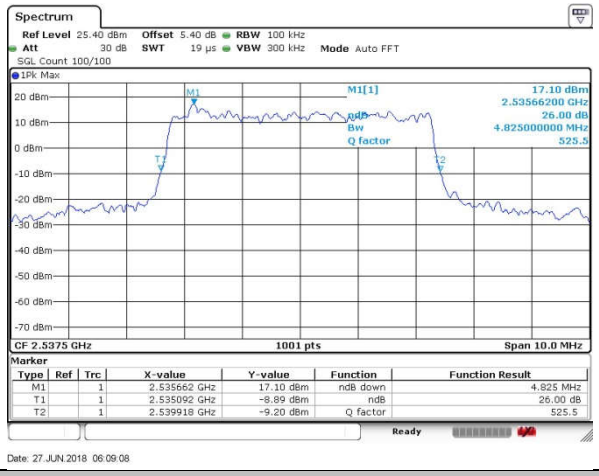
LTE Band 41 / 20MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

26dB Bandwidth

Mode												
BW	5MHz		10MHz		15MHz		20MHz					
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM				
Lowest CH	4.825	4.835	9.69	9.67	14.446	14.296	20.06	20.1				
Middle CH	4.715	4.775	10.01	9.79	14.266	14.266	19.98	20.14				
Highest CH	4.885	4.765	9.71	9.61	14.206	14.236	20.22	20.14				

LTE Band 41

Lowest Channel / 5MHz / QPSK



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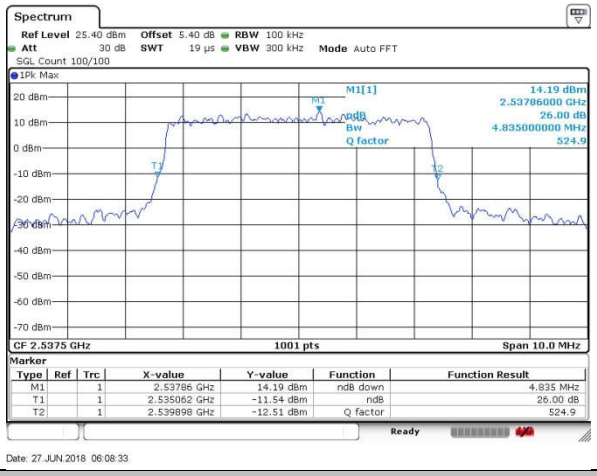
Lowest Channel / 5MHz / 16QAM



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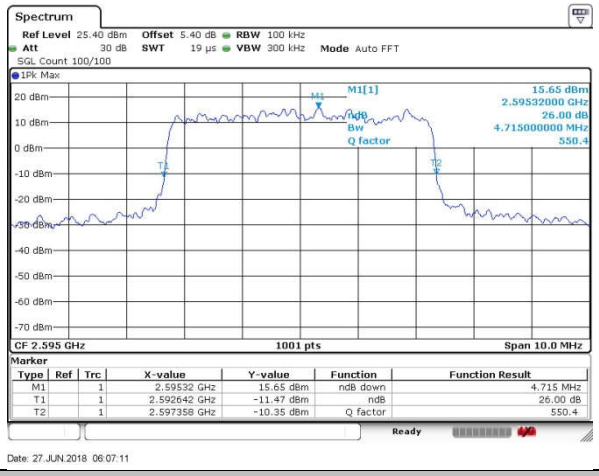
Middle Channel / 5MHz / QPSK



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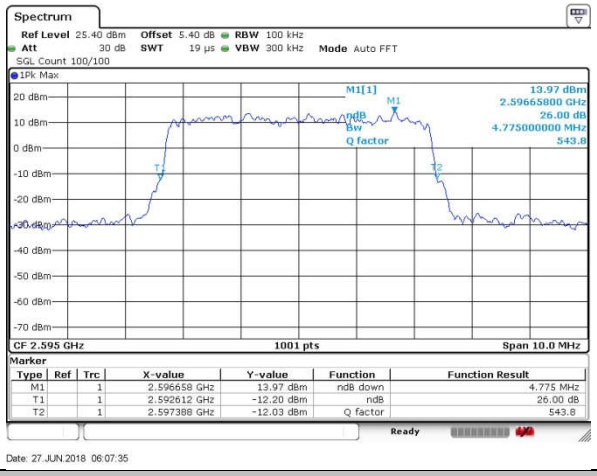
Middle Channel / 5MHz / 16QAM



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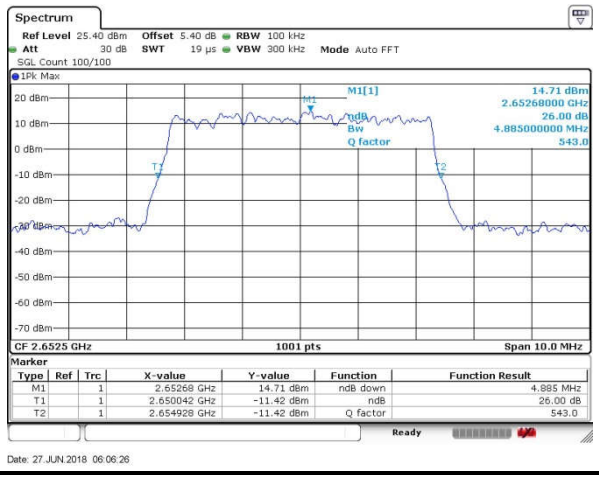
Highest Channel / 5MHz / QPSK



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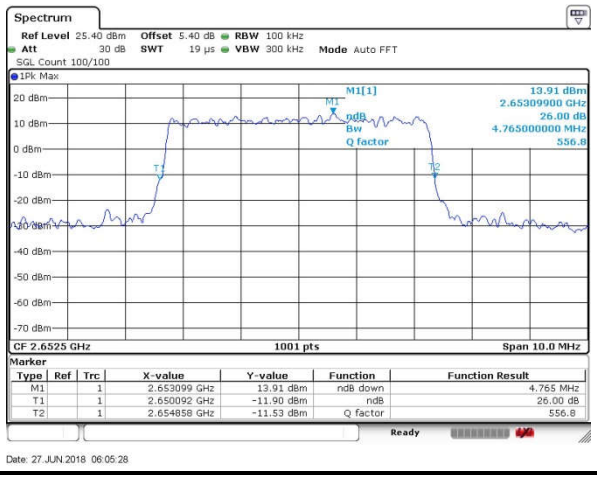
Highest Channel / 5MHz / 16QAM



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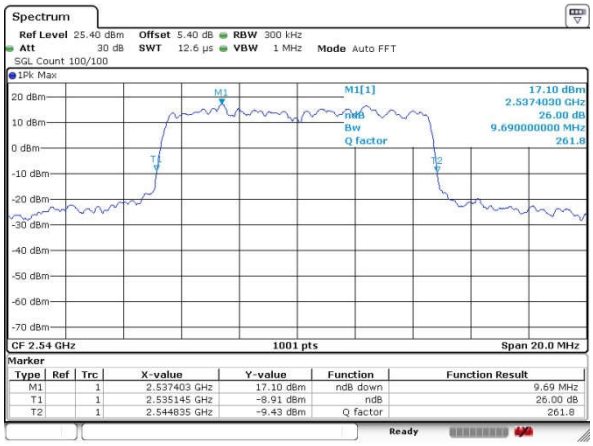
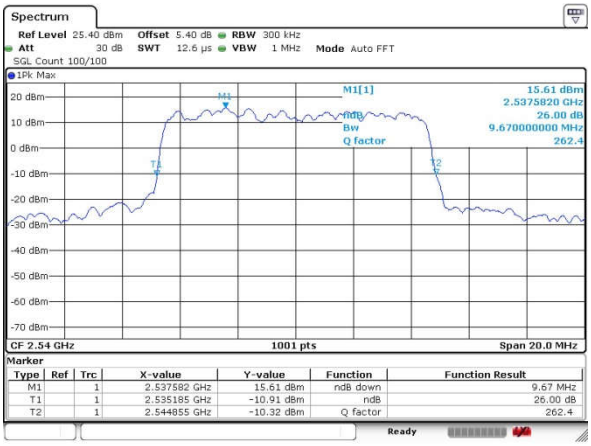
LTE Band 41

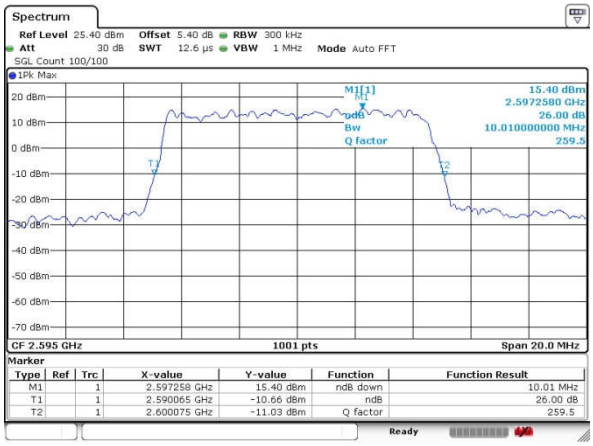
Lowest Channel / 10MHz / QPSK



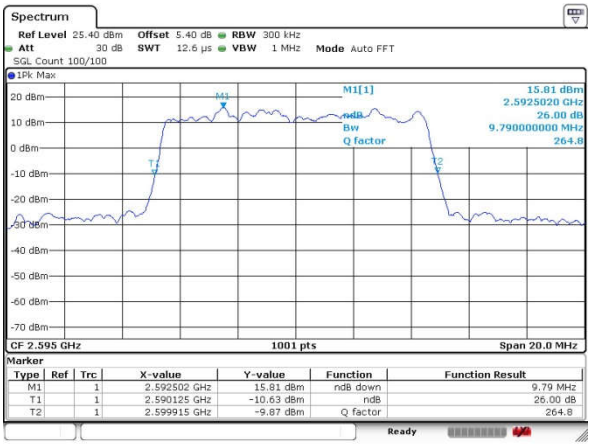
Lowest Channel / 10MHz / 16QAM



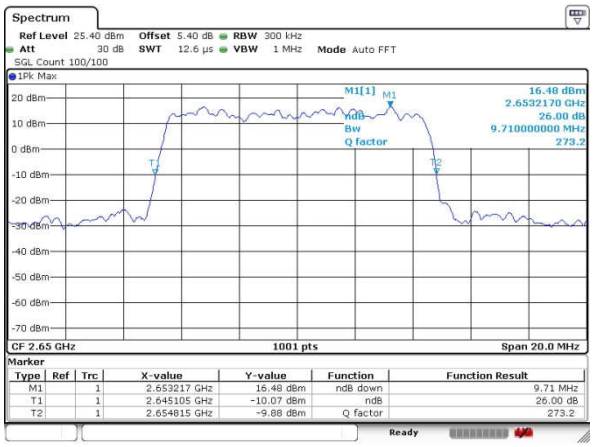
Middle Channel / 10MHz / QPSK



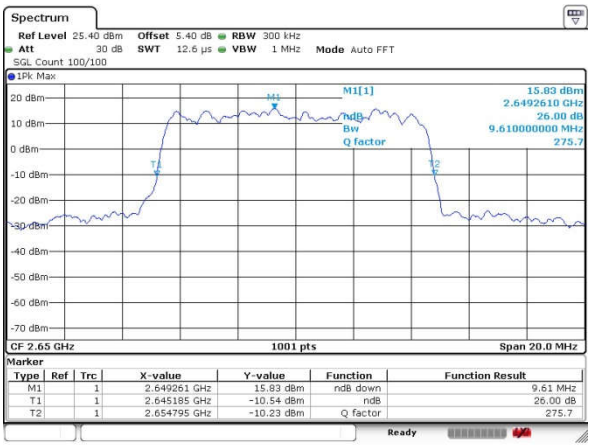
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

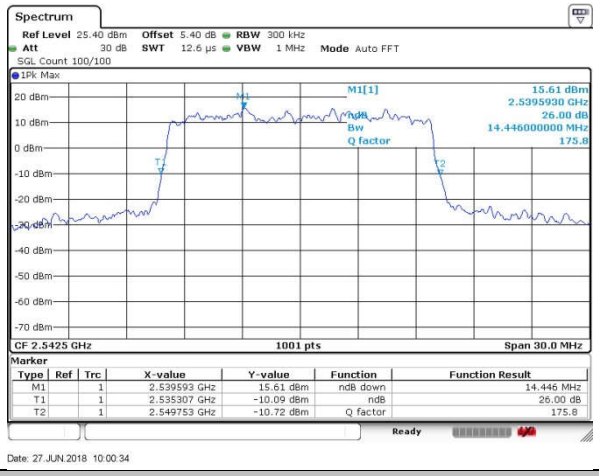


Highest Channel / 10MHz / 16QAM

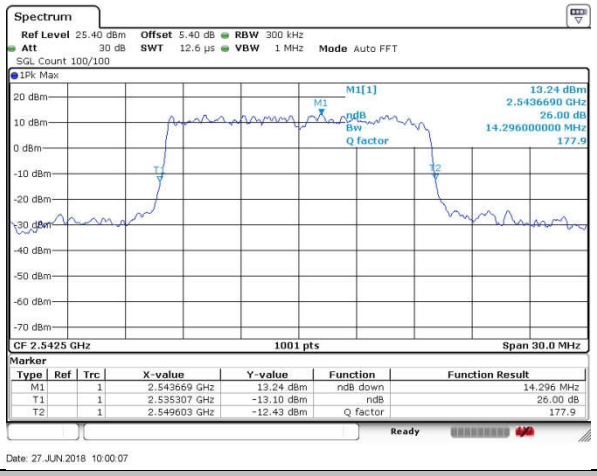


LTE Band 41

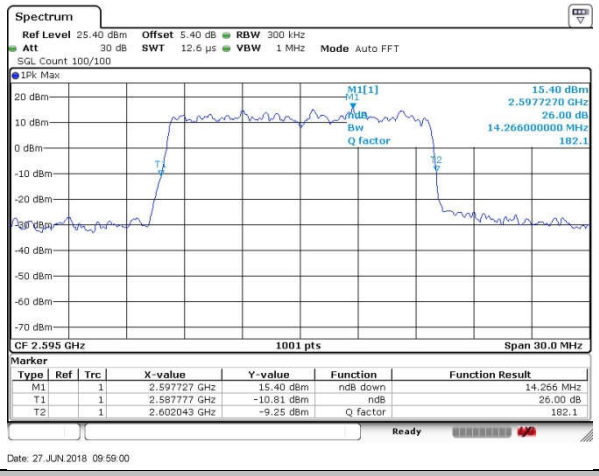
Lowest Channel / 15MHz / QPSK



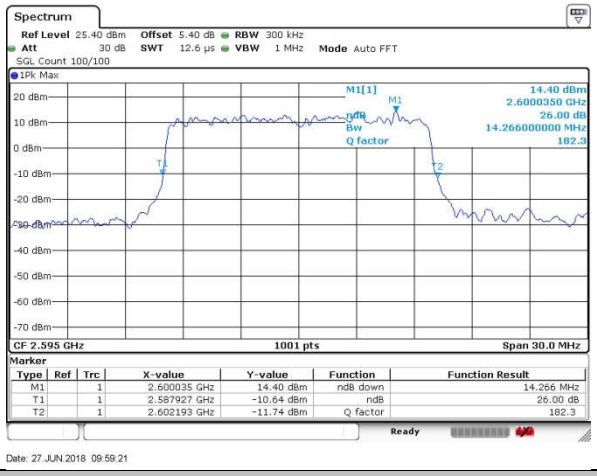
Lowest Channel / 15MHz / 16QAM



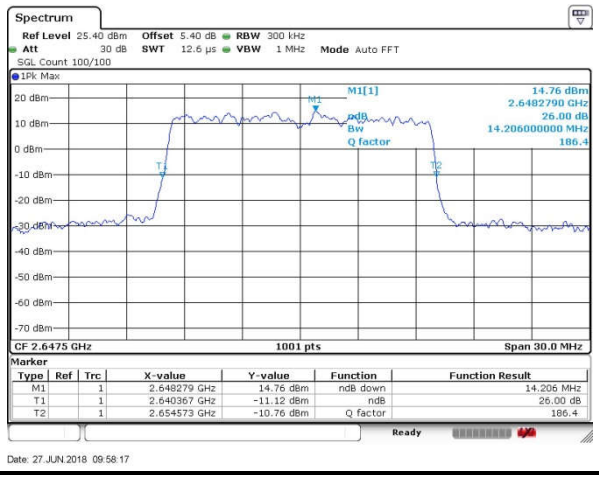
Middle Channel / 15MHz / QPSK



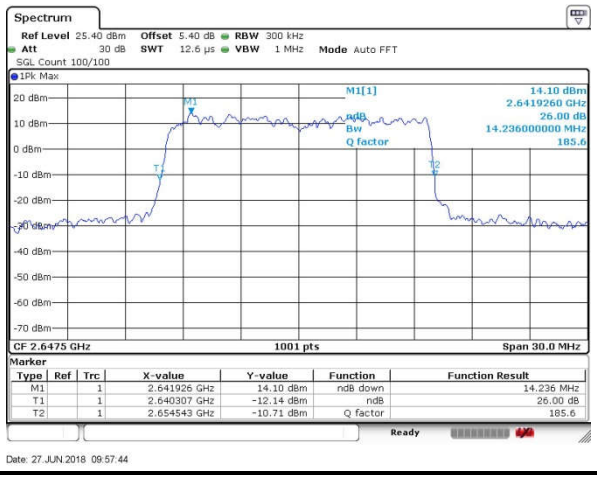
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

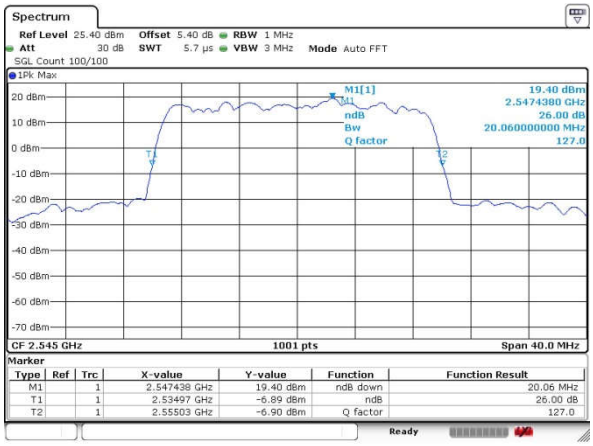


Highest Channel / 15MHz / 16QAM

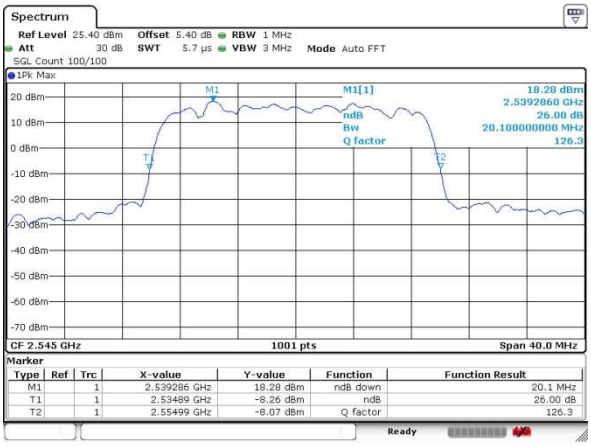


LTE Band 41

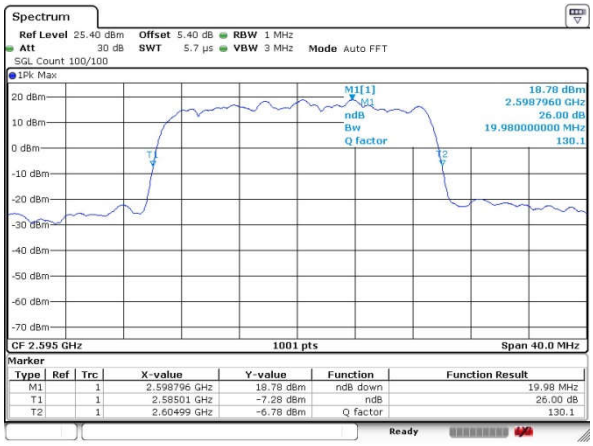
Lowest Channel / 20MHz / QPSK



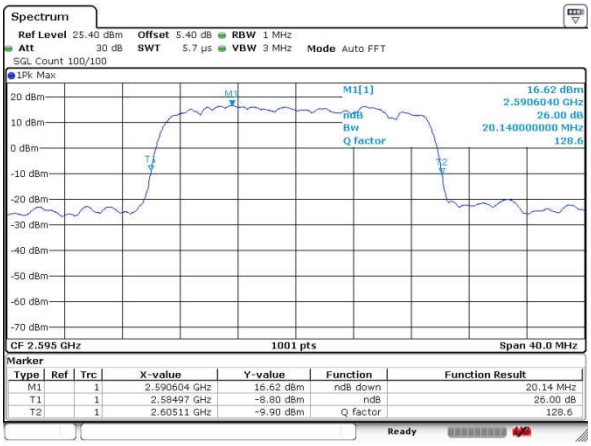
Lowest Channel / 20MHz / 16QAM



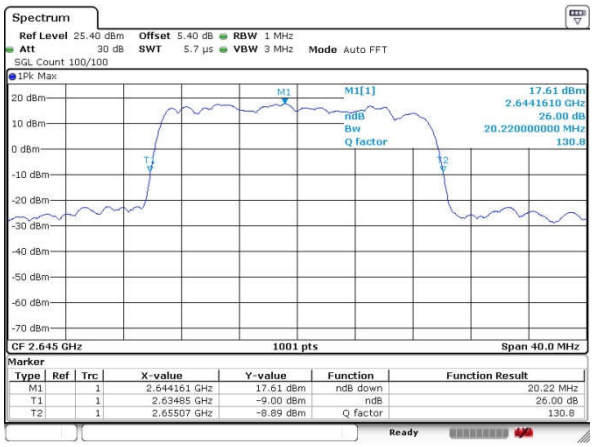
Middle Channel / 20MHz / QPSK



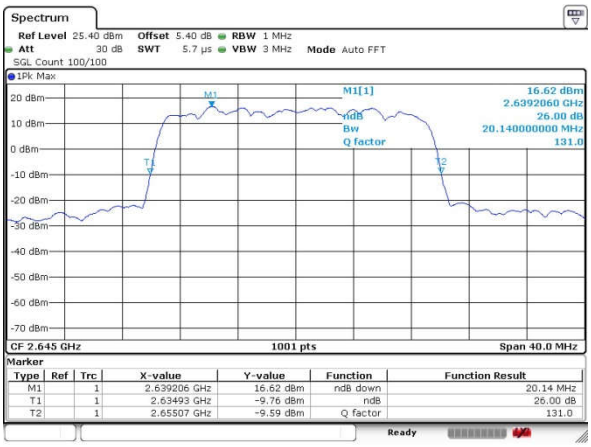
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK



Highest Channel / 20MHz / 16QAM

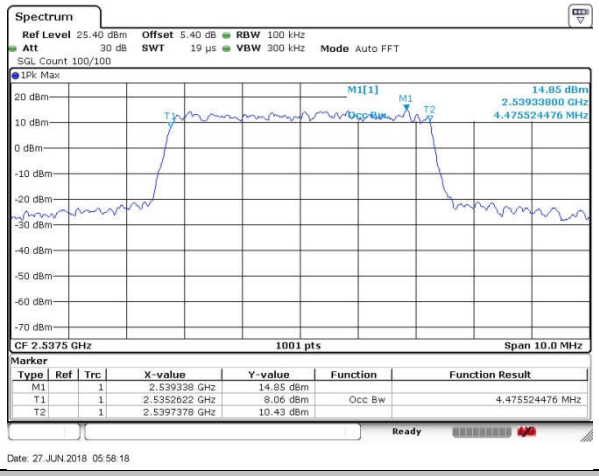


Occupied Bandwidth

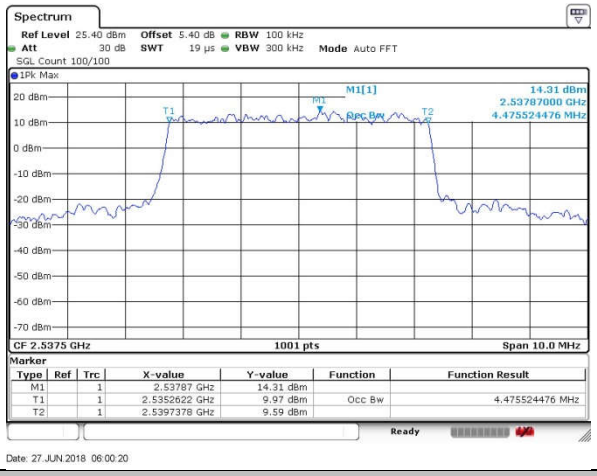
Mode	LTE Band 41 : 99%OBW(MHz)											
BW	5MHz		10MHz		15MHz		20MHz					
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM				
Lowest CH	4.48	4.48	9.01	9.01	13.46	13.43	18.42	18.18				
Middle CH	4.49	4.47	8.97	9.05	13.34	13.43	18.18	18.26				
Highest CH	4.52	4.5	9.03	8.99	13.4	13.4	18.18	18.3				

LTE Band 41

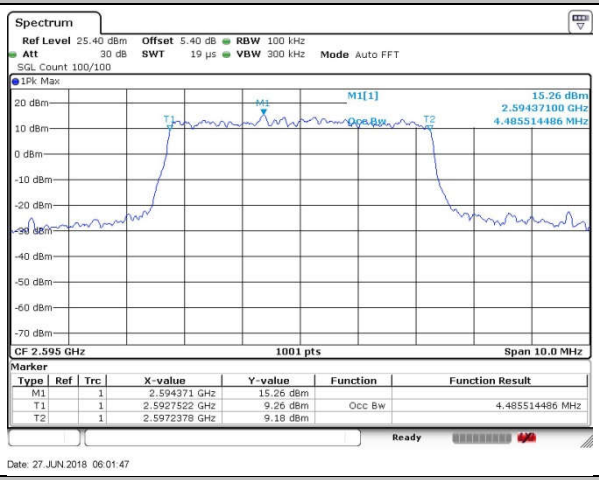
Lowest Channel / 5MHz / QPSK



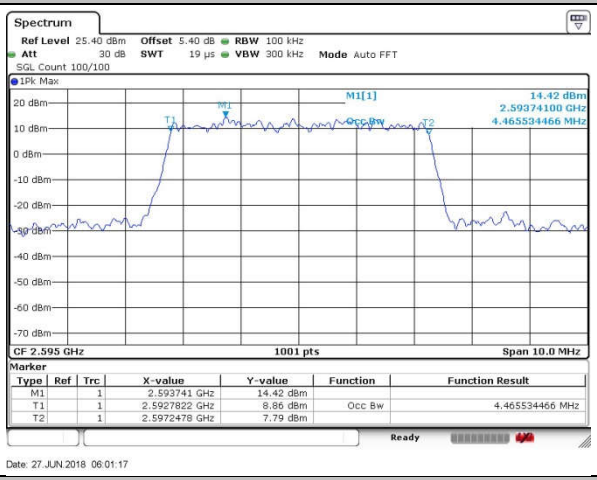
Lowest Channel / 5MHz / 16QAM



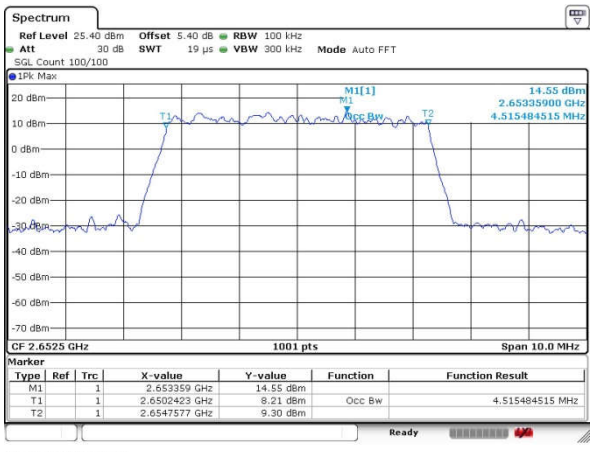
Middle Channel / 5MHz / QPSK



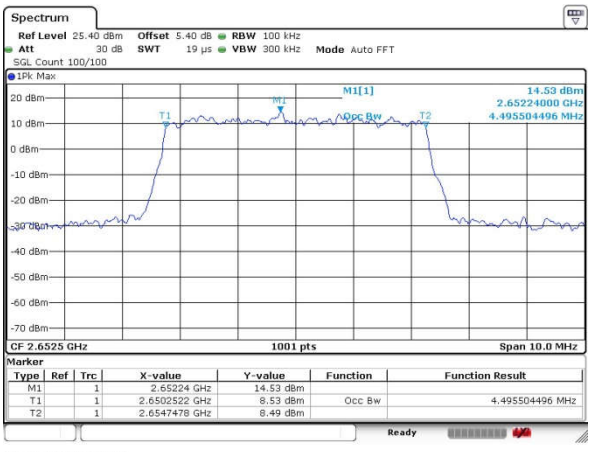
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

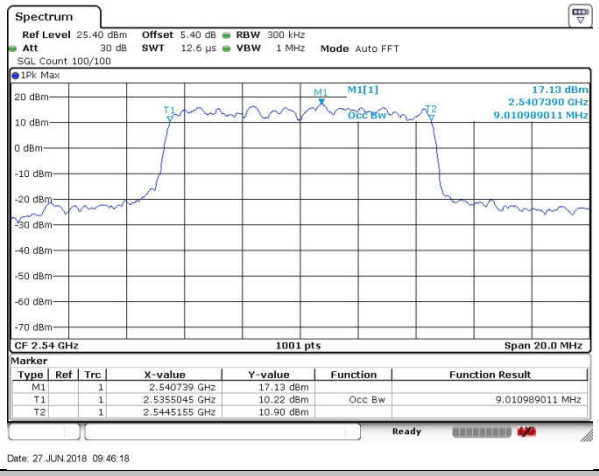


Highest Channel / 5MHz / 16QAM

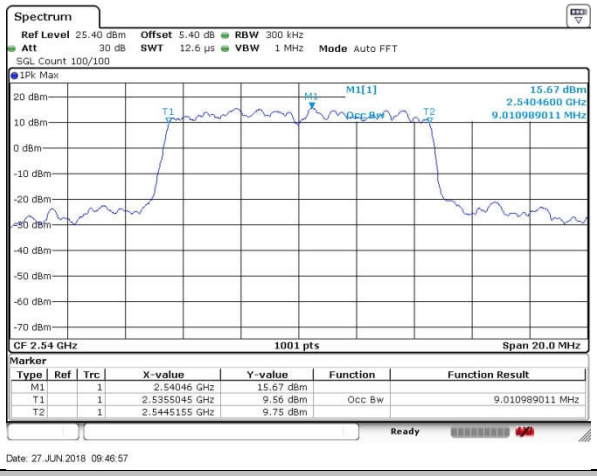


LTE Band 41

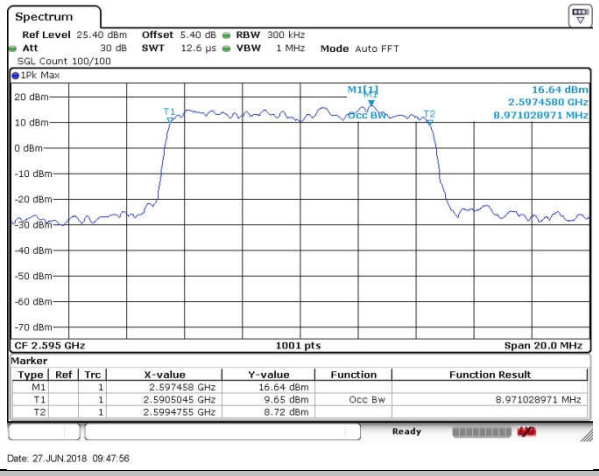
Lowest Channel / 10MHz / QPSK



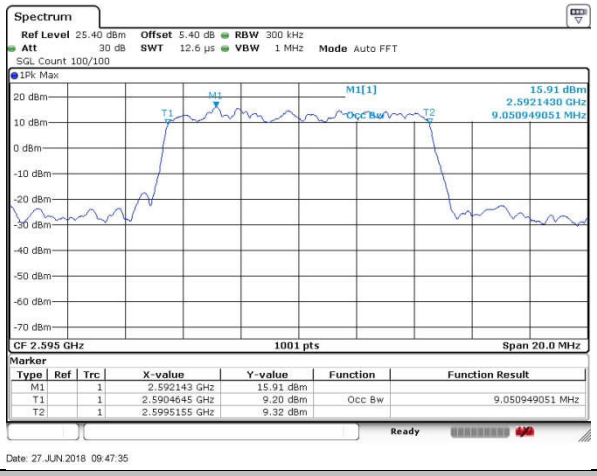
Lowest Channel / 10MHz / 16QAM



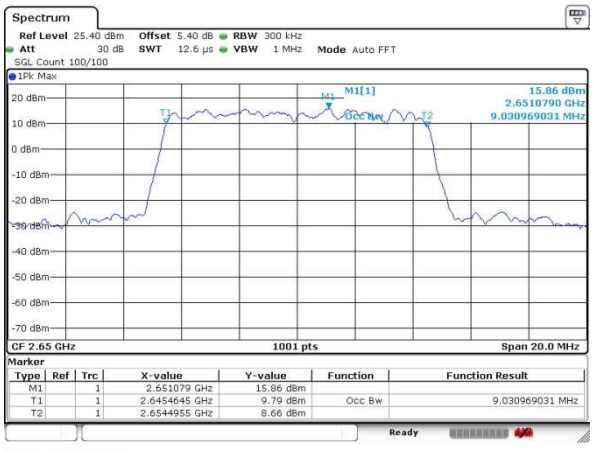
Middle Channel / 10MHz / QPSK



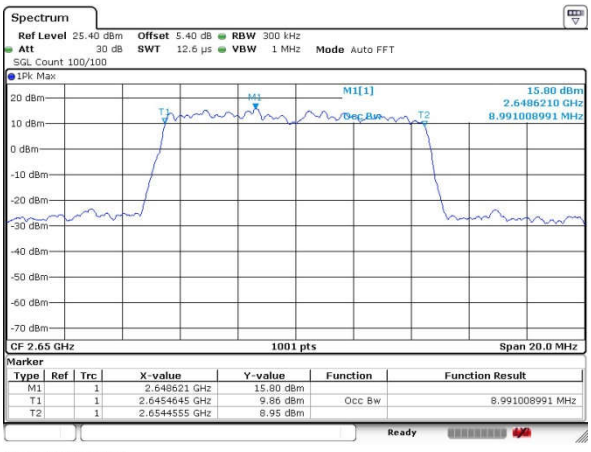
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

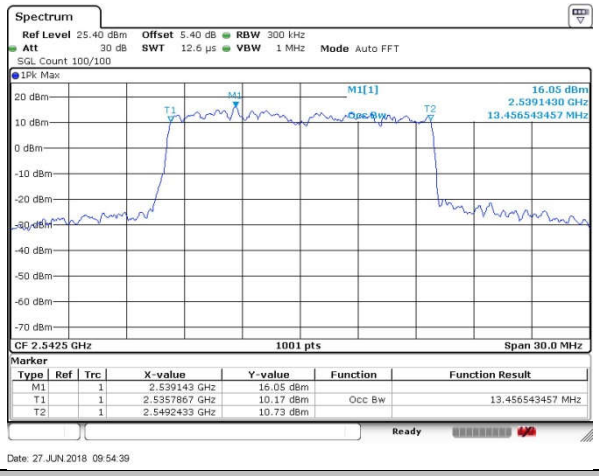


Highest Channel / 10MHz / 16QAM

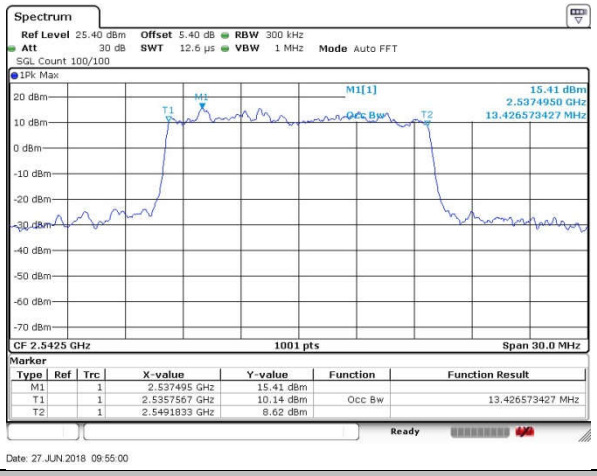


LTE Band 41

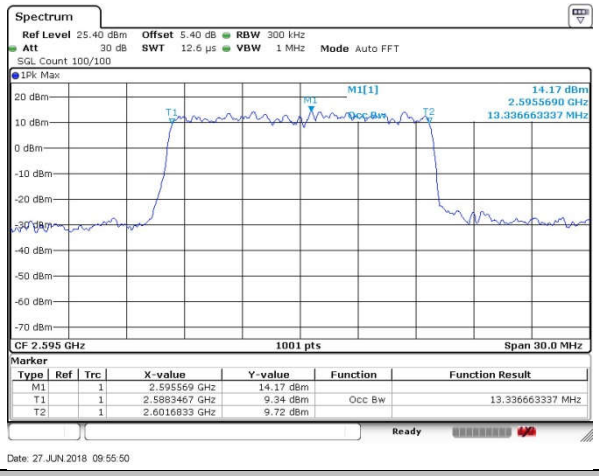
Lowest Channel / 15MHz / QPSK



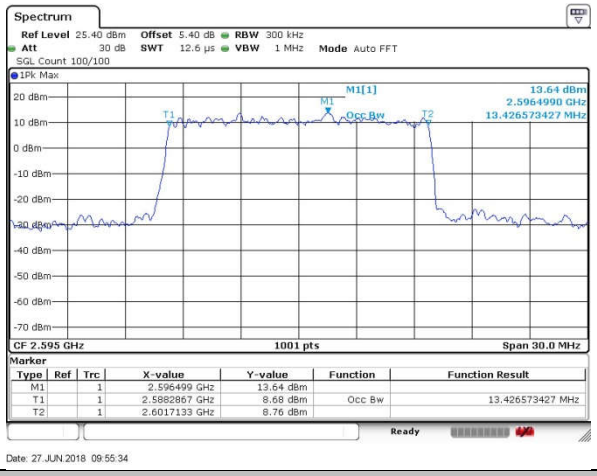
Lowest Channel / 15MHz / 16QAM



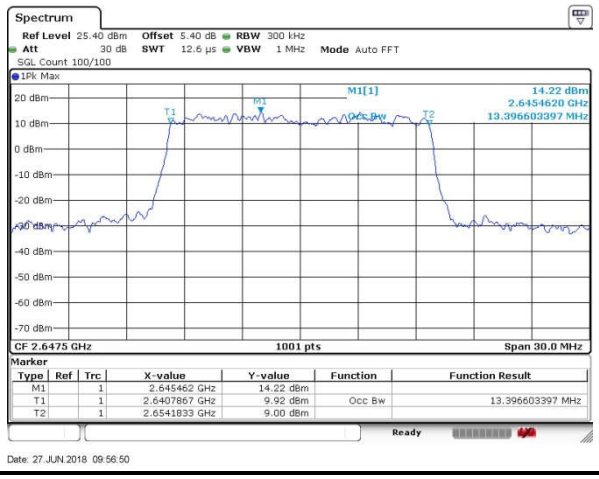
Middle Channel / 15MHz / QPSK



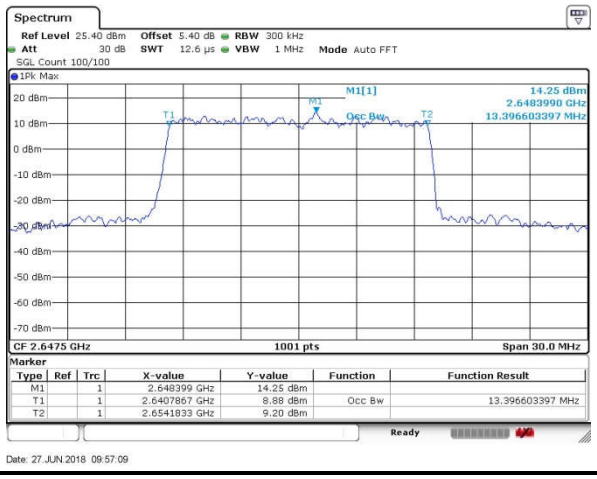
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

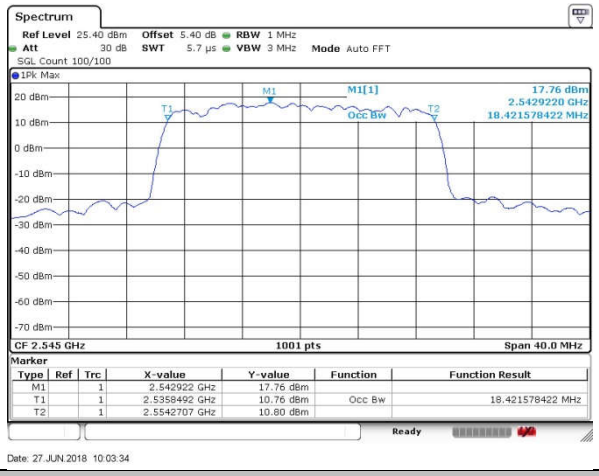


Highest Channel / 15MHz / 16QAM

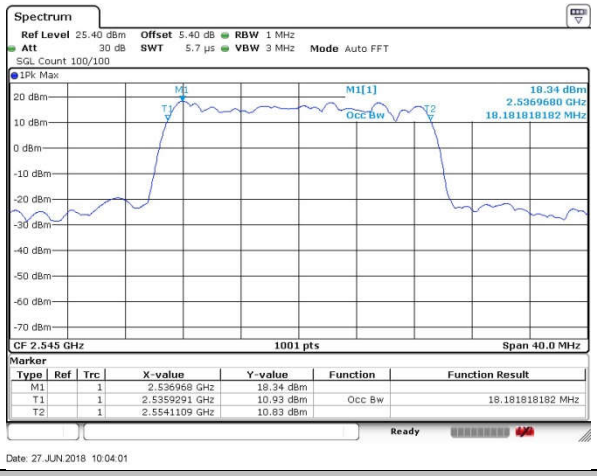


LTE Band 41

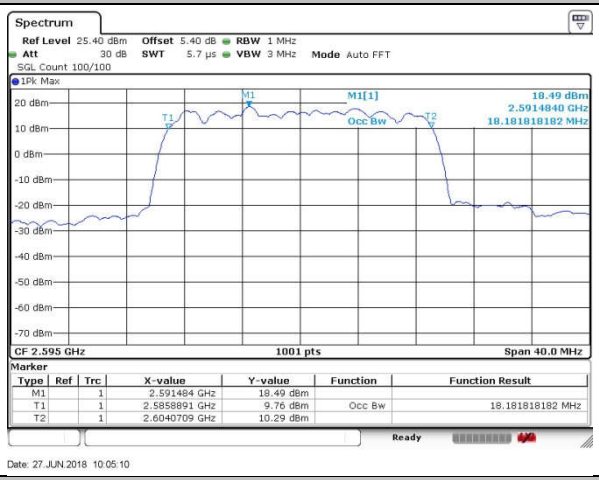
Lowest Channel / 20MHz / QPSK



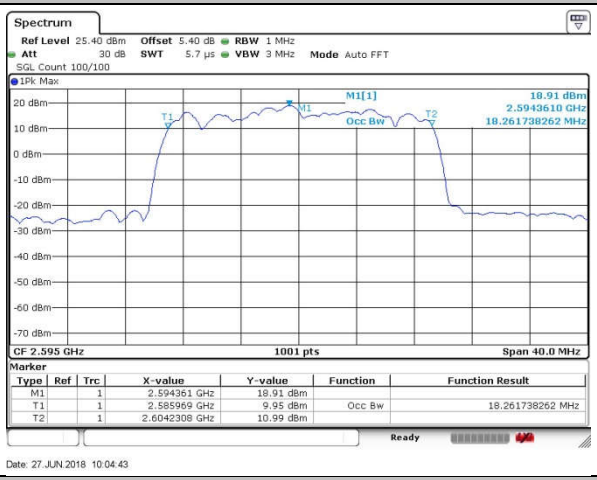
Lowest Channel / 20MHz / 16QAM



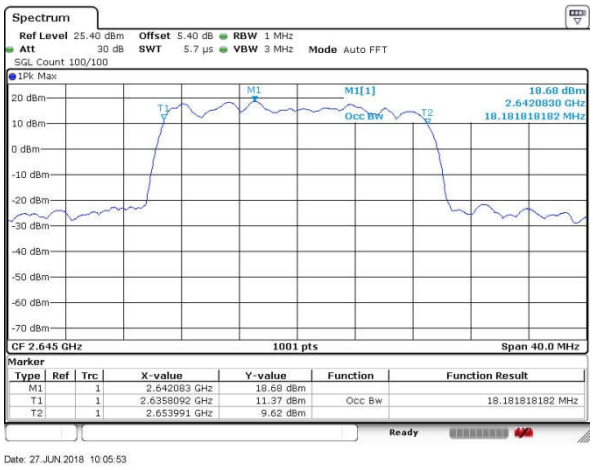
Middle Channel / 20MHz / QPSK



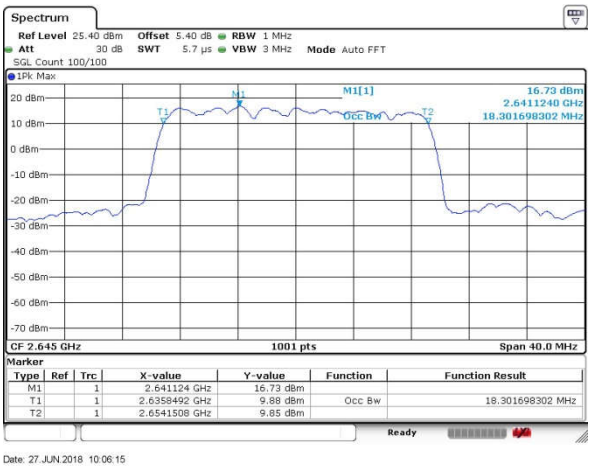
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK



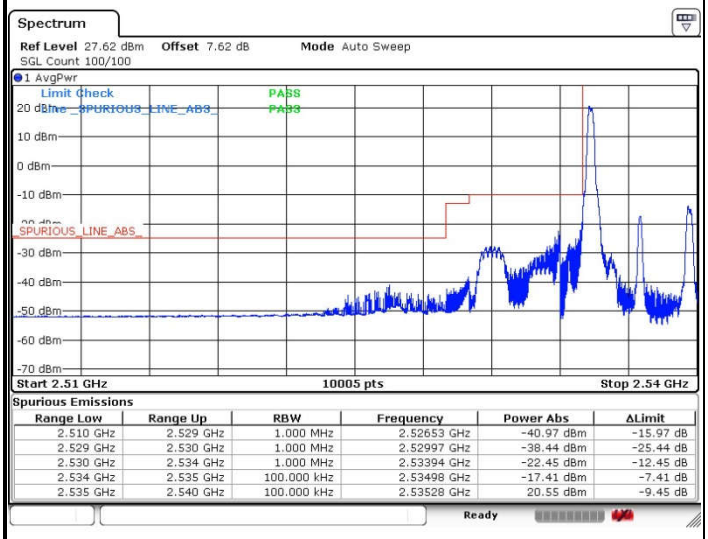
Highest Channel / 20MHz / 16QAM



Conducted Band Edge

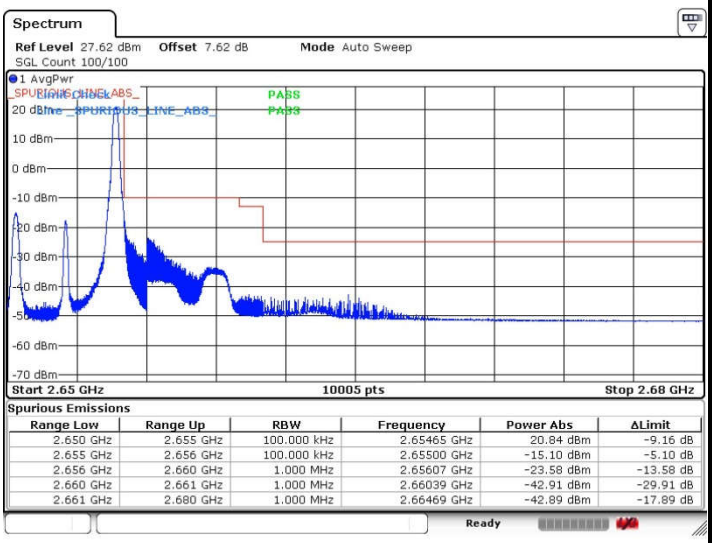
LTE Band 41 / 5MHz / QPSK

Lowest Band Edge / 1 RB



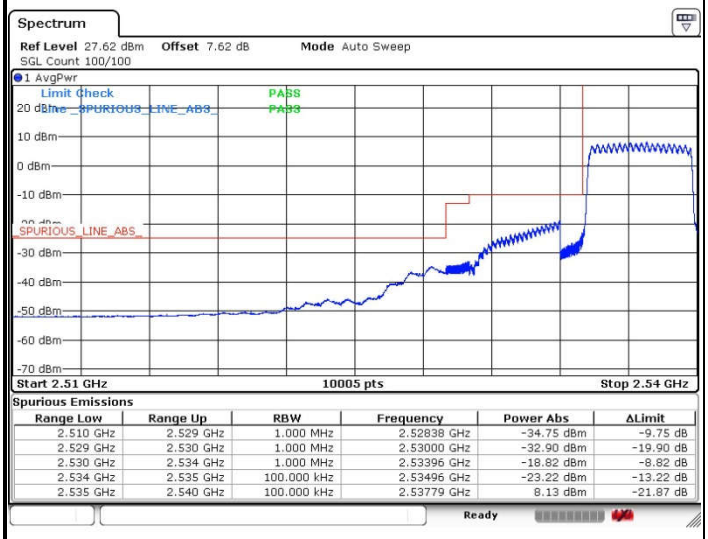
Date: 27.JUN.2018 06:19:45

Highest Band Edge / 1 RB



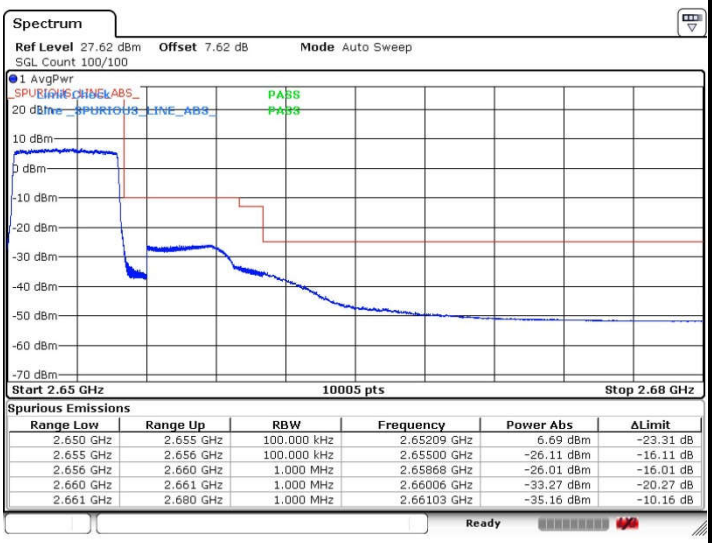
Date: 27.JUN.2018 06:32:23

Lowest Band Edge / Full RB



Date: 27.JUN.2018 06:23:54

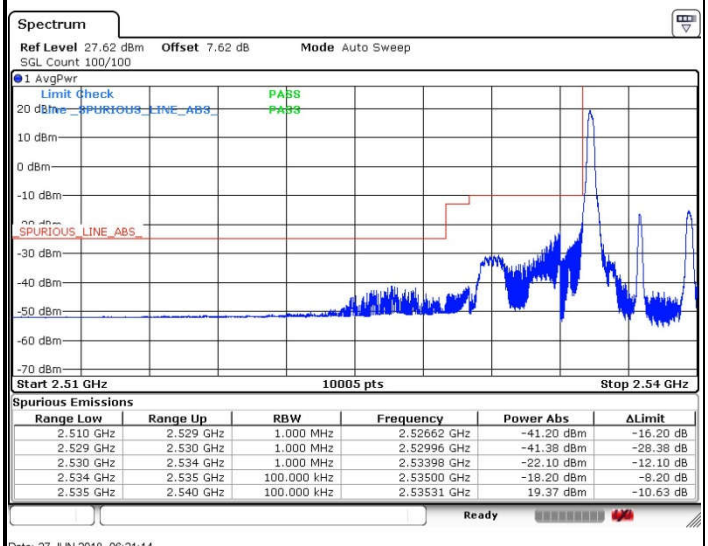
Highest Band Edge / Full RB



Date: 27.JUN.2018 06:27:56

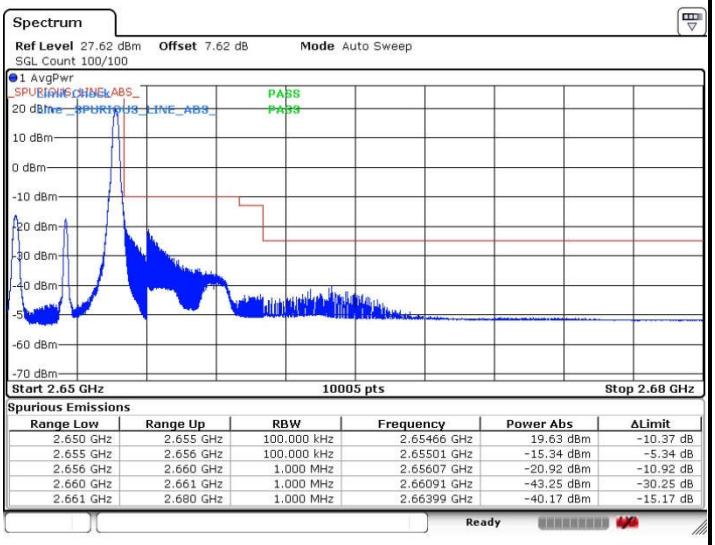
LTE Band 41 / 5MHz / 16QAM

Lowest Band Edge / 1 RB



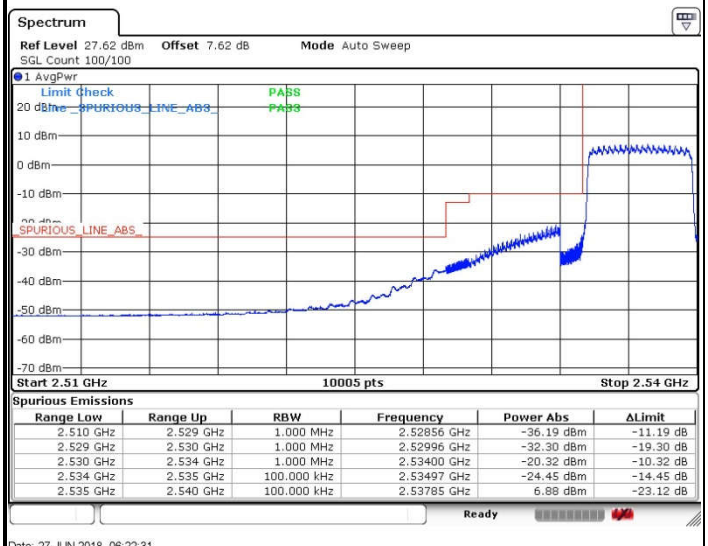
Date: 27.JUN.2018 06:21:14

Highest Band Edge / 1 RB



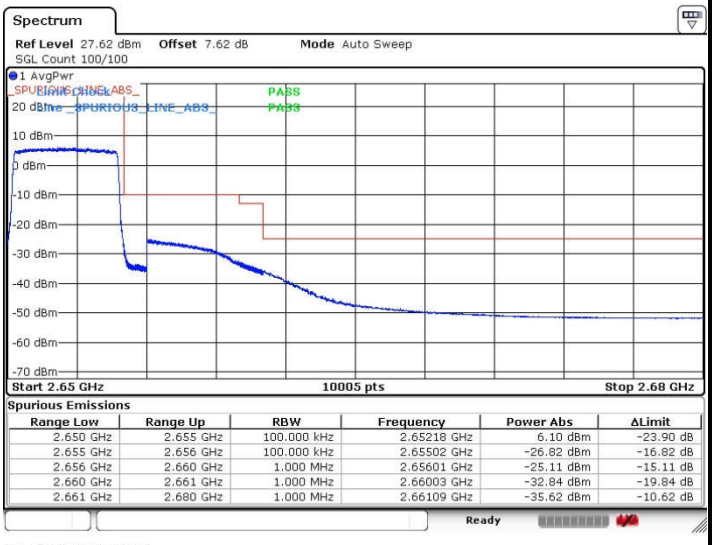
Date: 27.JUN.2018 06:30:51

Lowest Band Edge / Full RB



Date: 27.JUN.2018 06:22:31

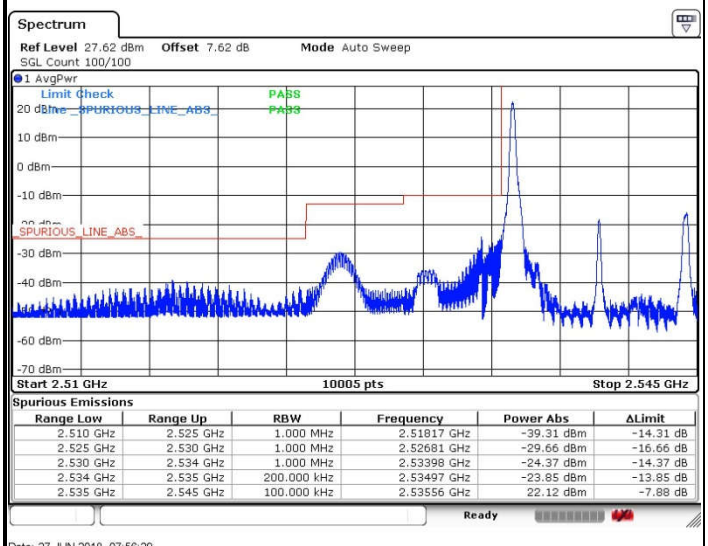
Highest Band Edge / Full RB



Date: 27.JUN.2018 06:29:27

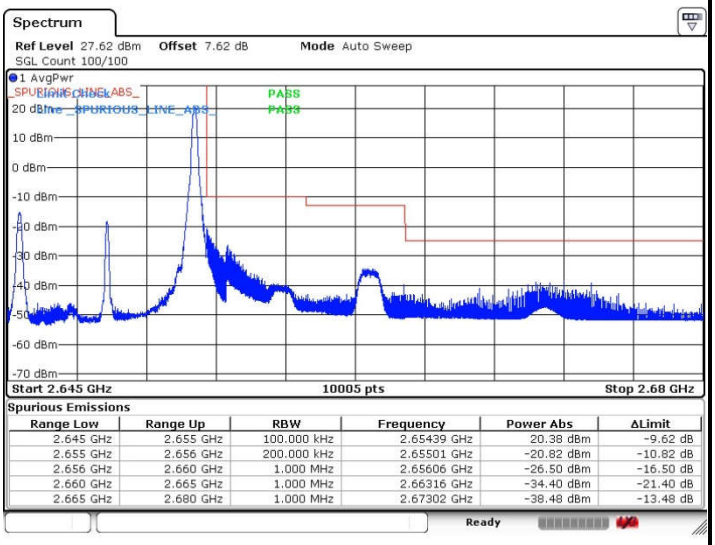
LTE Band 41 / 10MHz / QPSK

Lowest Band Edge / 1 RB



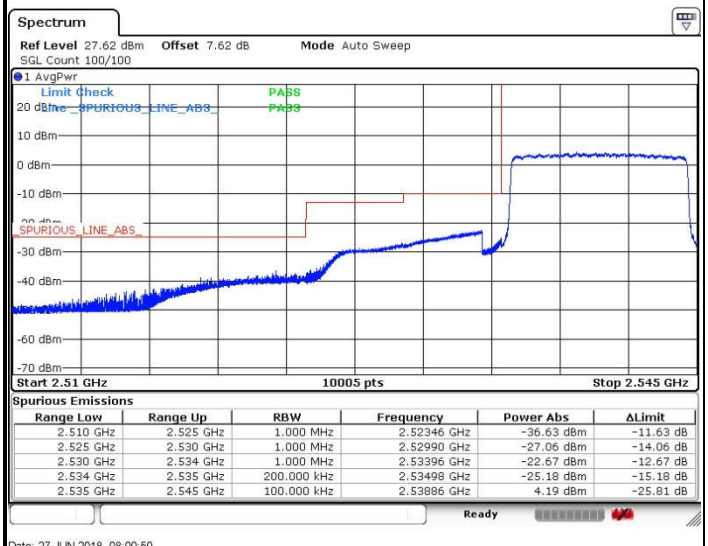
Date: 27.JUN.2018 07:56:29

Highest Band Edge / 1 RB



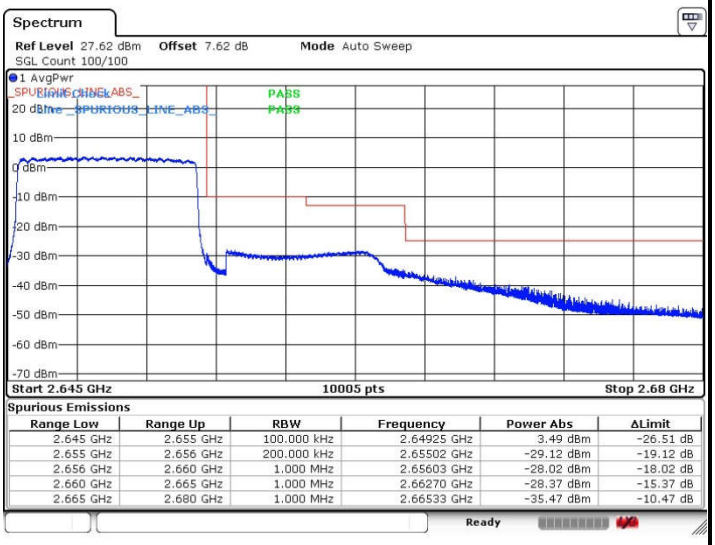
Date: 27.JUN.2018 08:07:08

Lowest Band Edge / Full RB



Date: 27.JUN.2018 08:00:50

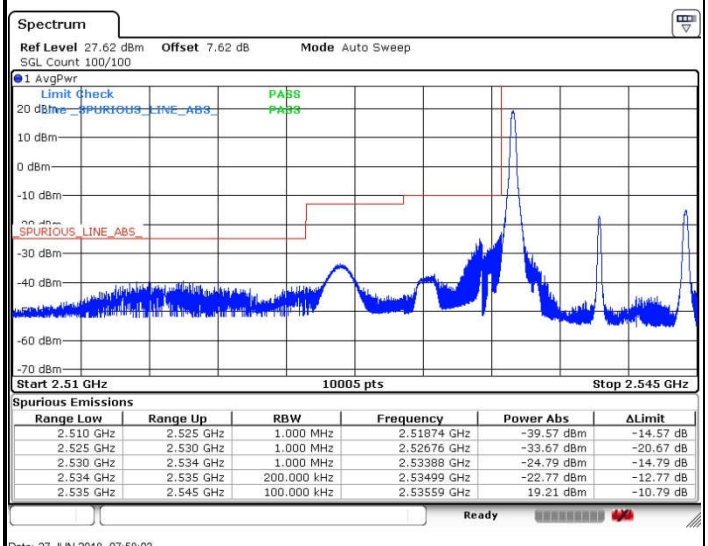
Highest Band Edge / Full RB



Date: 27.JUN.2018 08:03:30

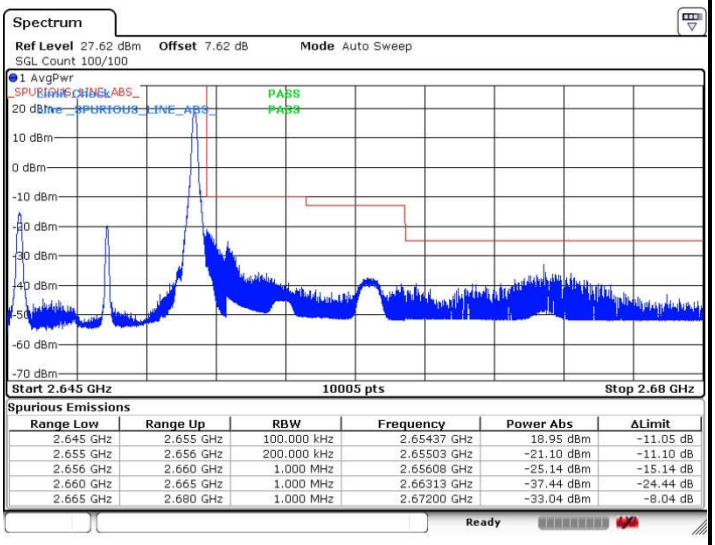
LTE Band 41 / 10MHz / 16QAM

Lowest Band Edge / 1 RB



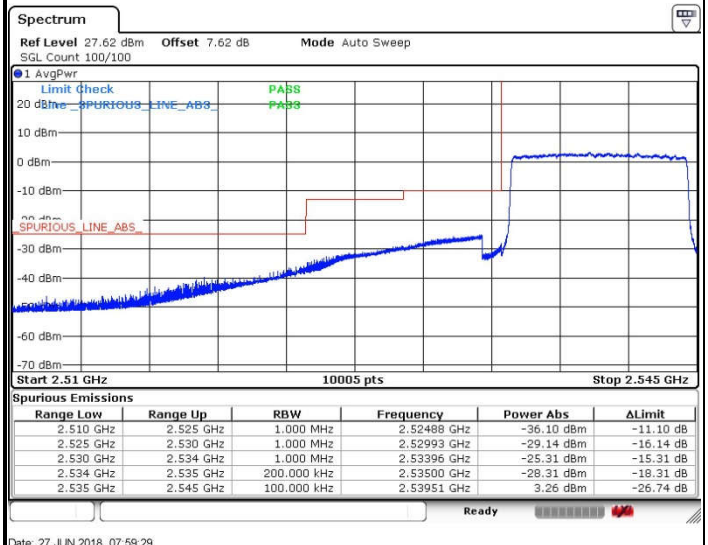
Date: 27.JUN.2018 07:58:03

Highest Band Edge / 1 RB



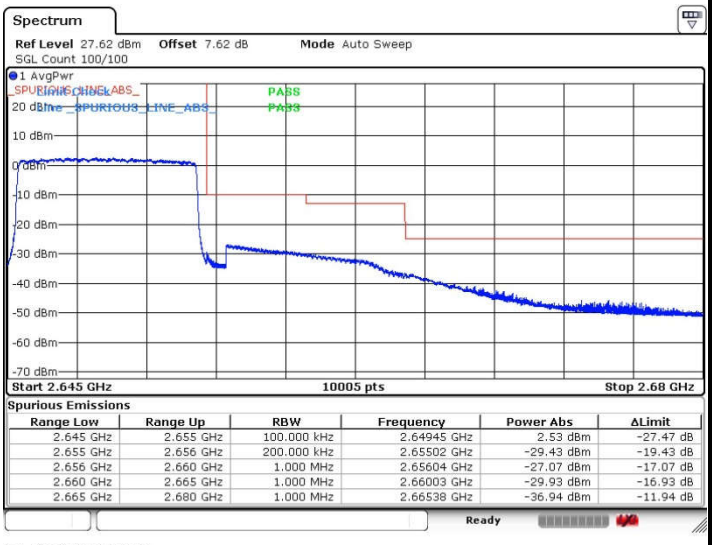
Date: 27.JUN.2018 08:05:55

Lowest Band Edge / Full RB



Date: 27.JUN.2018 07:59:29

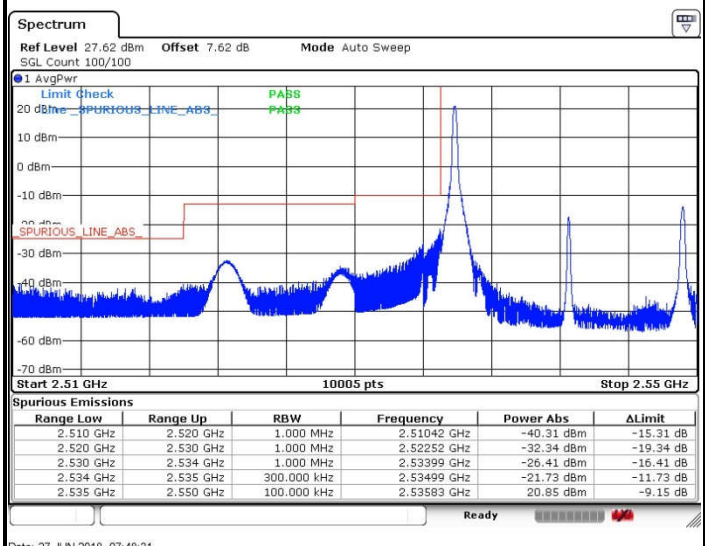
Highest Band Edge / Full RB



Date: 27.JUN.2018 08:04:38

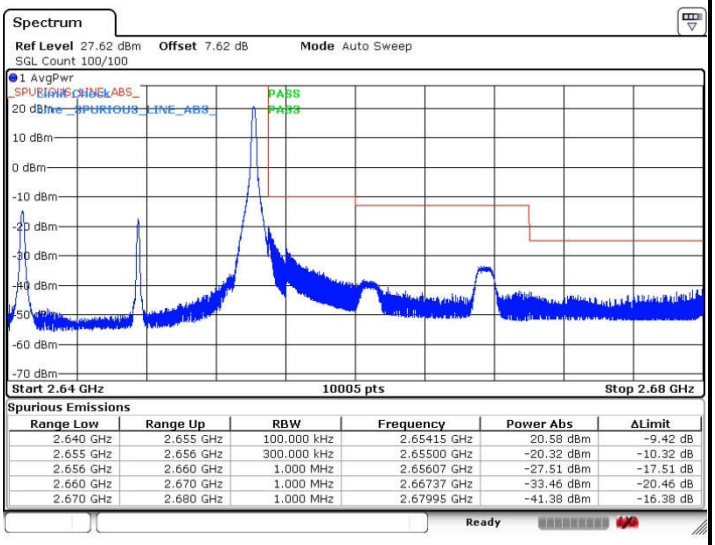
LTE Band 41 / 15MHz / QPSK

Lowest Band Edge / 1 RB



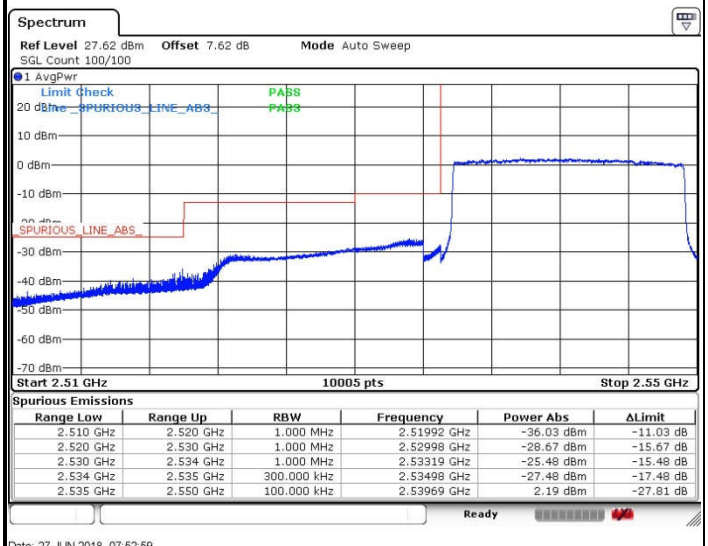
Date: 27.JUN.2018 07:48:31

Highest Band Edge / 1 RB



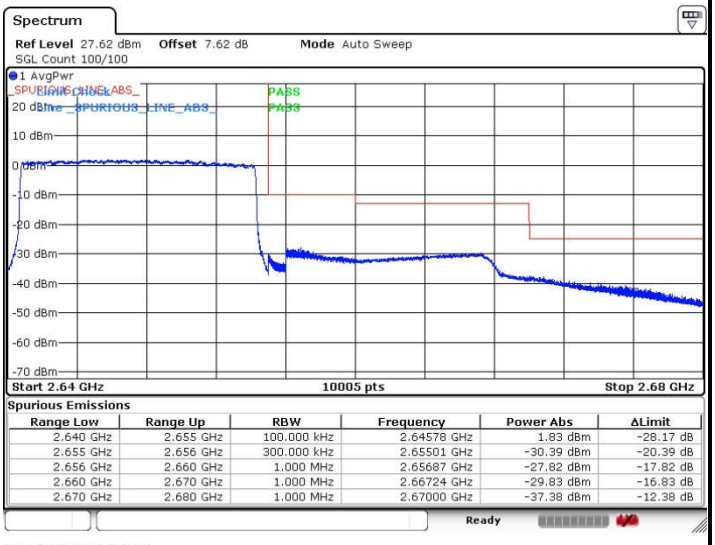
Date: 27.JUN.2018 07:43:40

Lowest Band Edge / Full RB



Date: 27.JUN.2018 07:52:59

Highest Band Edge / Full RB



Date: 27.JUN.2018 07:39:20