FCC RF Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	9840, 9841
FCC ID	:	IHDT56VE4
STANDARD	:	47 CFR Part 2, 22(H), 27(M)
CLASSIFICATION	:	PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Oct. 15, 2016 and completely tested on Nov. 05, 2016. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-D-2010 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 (SHENZHEN) INC., the test report shall not be reproduced except in full.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG6O1212-06B	Rev. 01	Initial issue of report	Nov. 05, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§24.232(c) §27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 41)	EIRP < 2Watt	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	§2.1053 §22.917(a)	Radiated Spurious Emission (Band 5)	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 29.12 dB at 10384.000 MHz
	§2.1053 §27.53(m)(4)	Radiated Spurious Emission (Band 41)	< $55+10\log_{10}$(P[Watts])		

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	9840, 9841
FCC ID	IHDT56VE4
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 v3.0+EDR/Bluetooth v4.0 LE/ Bluetooth v4.2 LE
IMEI Code	Conducted: 351859080010253/351859080010261 Radiation: 351859080013752/351859080013760
HW Version	DVT2
SW Version	NPN25.93_1146
EUT Stage	Identical Prototype

Remark: There are two types of EUT sample 1 and sample 2, the differences between two samples are only for SIM slot, sample 1 is dual SIM slot, sample 2 is single SIM slot. According to the difference, we only choose the 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 : 2557.5 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 : 2557.5 MHz ~ 2652.5 MHz
Bandwidth	LTE Band 5 : 1.4MHz / 3MHz / 5MHz / 10MHz LTE Band 7 : 5MHz/ 10MHz / 15MHz / 20MHz LTE Band 38 : 5MHz / 10MHz / 15MHz / 20MHz LTE Band 41 : 5MHz / 10MHz / 15MHz / 20MHz
Maximum Output Power	LTE Band 41 : 23.89 dBm
Antenna Gain	LTE Band 41 : 2.81 dBi
Type of Modulation	QPSK / 16QAM

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter	**Brand Name**	Motorola(Salom)	**Model Name**	SSW-2680US/SSW-2680UK/ SSW-2680EU/SSW-2680JP/ SSW-2680TW/SSW-2680AU
	Power Rating	I/P: 100-240 Vac, 500mA, O/P: 5 Vdc,1600mA or 9Vdc,1600mA or 12Vdc,1200mA		
Battery	**Brand Name**	motorola(Amperex)	**Model Name**	HG40
	Power Rating	3.8Vdc,2810/3000mAh (Min/Typ)	**Type**	Li-ion
USB Cable	**Brand Name**	Motorola	**Model Name**	SKN6461A
	Signal Line Type	1.0 meter, non-shielded cable, without ferrite core		
Earphone	**Brand Name**	Motorola (Jiangxi Lianchuang)	**Model Name**	MEMD1532B080008
	Signal Line Type	1.2 meter, non-shielded cable, without ferrite core		

1.6 Modification of EUT

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

1.7 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: 9840, 9841, FCC ID: IHDT56VE4) is electrically identical to the reference device (Model: 9836, FCC ID: IHDT56VE1) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 178919 D01.

1.6.2 Difference Section

For details concerning the similarity with respect to component placement, mechanical/electrical design etc., some difference of population/depopulation to enable support of different cellular bands, please refer to the Operational Description.

The re-used RF data includes the following bands provided in Appendix D (Sporton RF Report No. FG6O1212B for the reference device Model: 9836,, FCC ID: IHDT56VE1):

1.6.3 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 radiated spurious emission, Conducted Band-edge and Conducted spurious emission, the test result were consistent with FCC ID: IHDT56VE1.

The difference between previous and current is change WWAN antenna matching (Antenna1:824MHz~849MHz), so we only report the test of radiated spurious emission, but LTE band41(2555 MHz ~ 2655 MHz) is a new band, so we choose to complete testing of this band only.

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.

1.6.4 Reference detail Section:

Equipment Class	Reference FCC ID	Folder Test/RF Exposure	Report Title/Section
PCE	IHDT56VE1	Part22H.24E.27L.27M.27F.27H (FG6O1212B)	All sections applicable for LTE Band 7/38 and Conducted test data for LTE Band 5.

1.8 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	2557.5 ~ 2652.5	4M50G7D	-	0.4634	4M51W7D	-	0.3802
10	2560 ~ 2650	9M03G7D	0.0026	0.4581	9M05W7D	-	0.3597
15	2652.5 ~ 2647.5	13M4G7D	-	0.4667	13M4W7D	-	0.3565
20	2565 ~ 2645	18M3G7D	-	0.4677	18M5W7D	-	0.3639

1.9 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.**
	TH01-KS

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
Test Site No.	**Sporton Site No.**	**FCC Registration No.**
	03CH02-SZ	566869

1.10 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 / TIA / EIA-603-D-2010
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

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

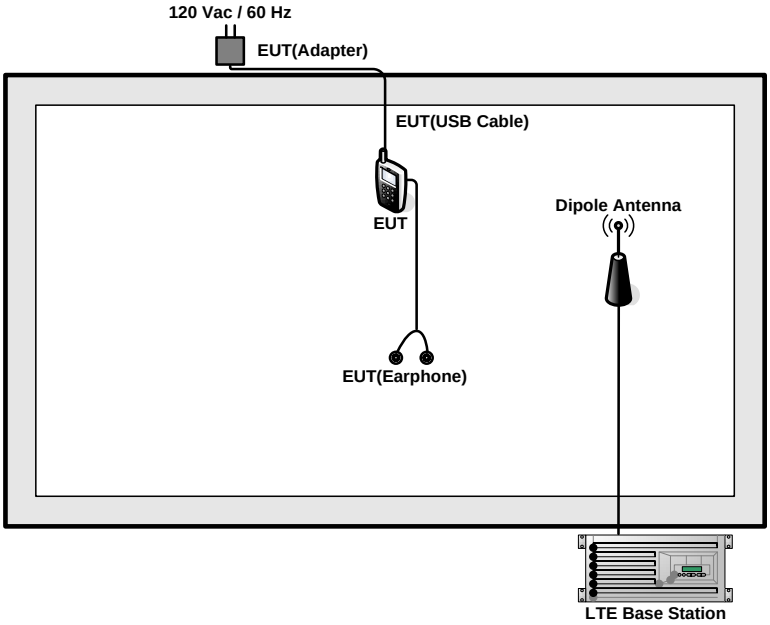
2.1 Test Mode

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	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	5	v	v	v	v	-	-	v		v				v	
	41	-	-	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.	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 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 RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 6.0 dB.

Example :

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

= 6.0 (dB)

2.5 Frequency List of Low/Middle/High Channels

LTE Band 5 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	20450	20525	20600
	Frequency	829	836.5	844
5	Channel	20425	20525	20625
	Frequency	826.5	836.5	846.5
3	Channel	20415	20525	20635
	Frequency	825.5	836.5	847.5
1.4	Channel	20407	20525	20643
	Frequency	824.7	836.5	848.3

LTE Band 41 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	40340	40740	41140
	Frequency	2565	2605	2645
15	Channel	40315	40740	41165
	Frequency	2562.5	2605	2647.5
10	Channel	40290	40740	41190
	Frequency	2560	2605	2650
5	Channel	40265	40740	41215
	Frequency	2557.5	2605	2652.5

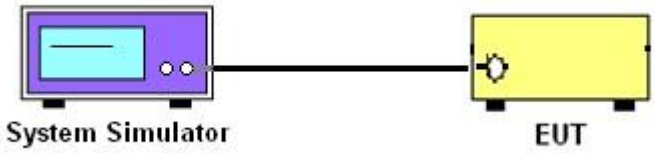
3 Conducted Test Items

3.1 Measuring Instruments

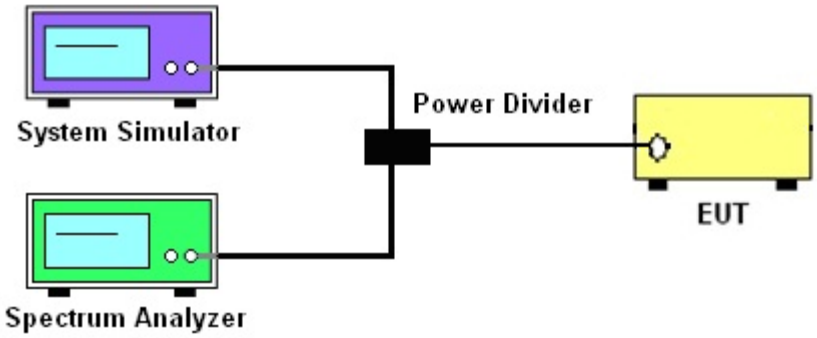
See list of measuring instruments of this test report.

3.2 Test Setup

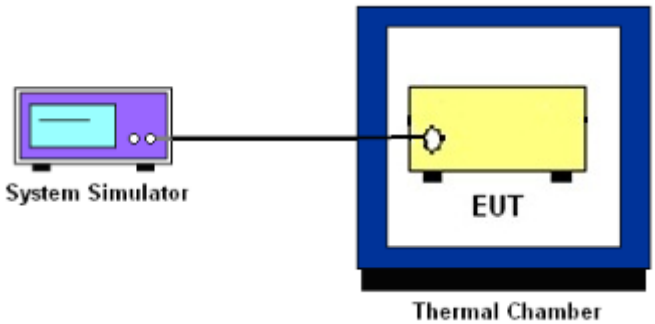
3.2.1 Conducted Output Power



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 and EIRP

3.4.1 Description of the Conducted Output Power Measurement and EIRP 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.

The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 41.

According to KDB 412172 D01 Power Approach,

EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

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. 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 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.
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.
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 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.
7. Set spectrum analyzer with RMS detector.
8. Offset has included the duty factor for LTE Band 41. Duty factor =10 log (1/x), where x is the measured duty cycle.
9. Taking the record of maximum spurious emission.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
11. 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.
12. 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 FCC KDB 971168 v02r02 Section 9.0.
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 FCC KDB 971168 v02r02 Section 9.0.
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 measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

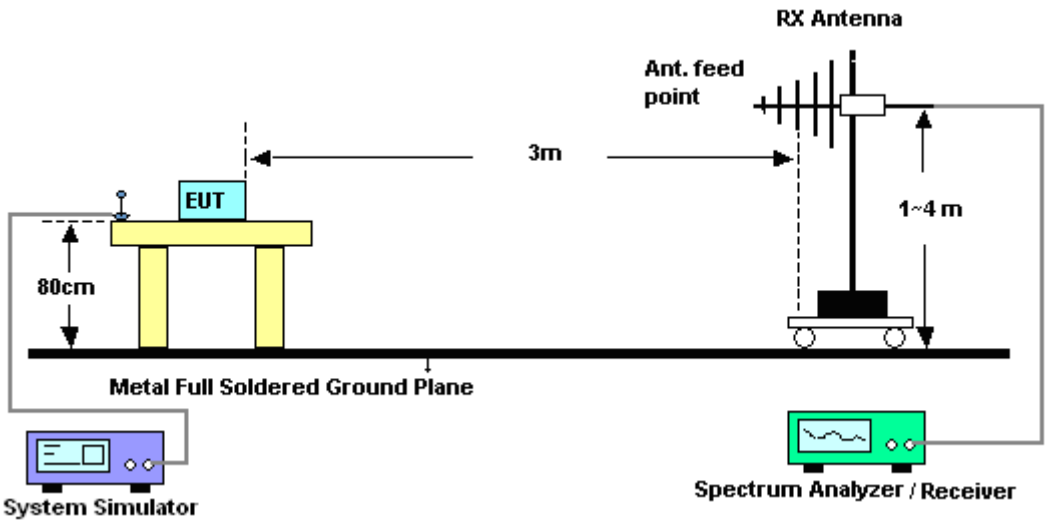
4 Radiated Test Items

4.1 Measuring Instruments

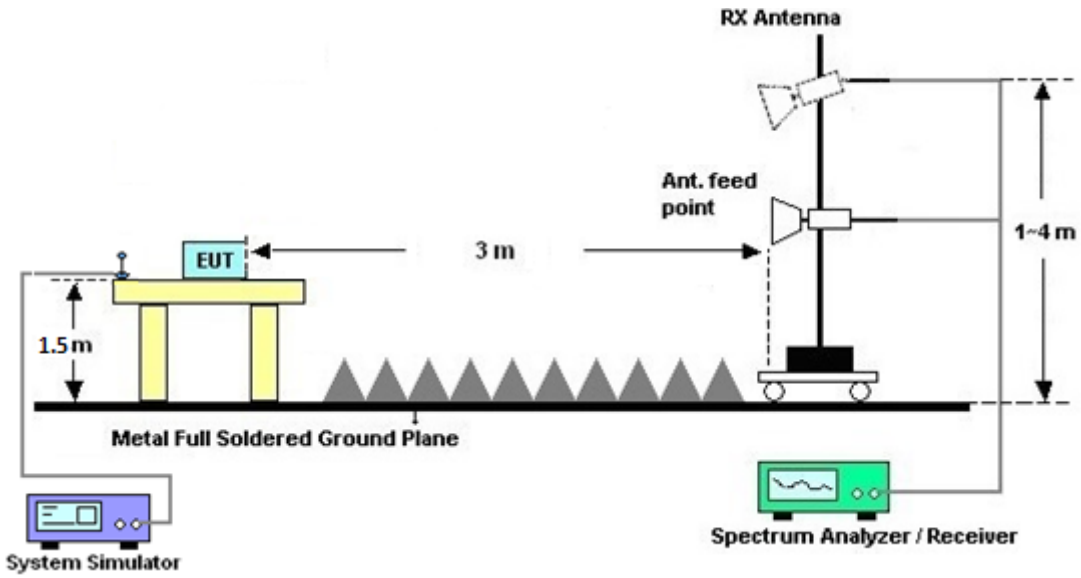
See list of measuring instruments of this test report.

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 Radiated Spurious Emission

4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-D-2010. 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.

4.4.2 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively 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.
12. For Band 41:
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
    EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
    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	FSV40	101040	10Hz~40GHz	Aug. 09, 2016	Nov. 02, 2016~ Nov. 04, 2016	Aug. 08, 2017	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 13, 2016	Nov. 02, 2016~ Nov. 04, 2016	Oct. 12, 2017	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101041	10kHz~40GHz;Max 30dBm	Oct. 11, 2016	Nov. 05, 2016	Oct. 10, 2017	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	May 21, 2016	Nov. 05, 2016	May 20, 2017	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1285	1GHz~18GHz	Jan. 11, 2016	Nov. 05, 2016	Jan. 10, 2017	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Aug. 10, 2016	Nov. 05, 2016	Aug. 09, 2017	Radiation (03CH02-SZ)
Amplifier	Agilent	8449B	3008A01023	1GHz~26.5GHz	Oct. 11, 2016	Nov. 05, 2016	Oct. 10, 2017	Radiation (03CH02-SZ)
Amplifier	HP	8447F	3113A04622	9kHz~1300MHz / 30 dB	Jul. 16, 2016	Nov. 05, 2016	Jul. 15, 2017	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 16, 2016	Nov. 05, 2016	Jul. 15, 2017	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002470	N/A	NCR	Nov. 05, 2016	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Nov. 05, 2016	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Nov. 05, 2016	NCR	Radiation (03CH02-SZ)

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))	**2.5 dB**

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.3dB**

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.7dB**

Appendix A. Test Results of Conducted Test

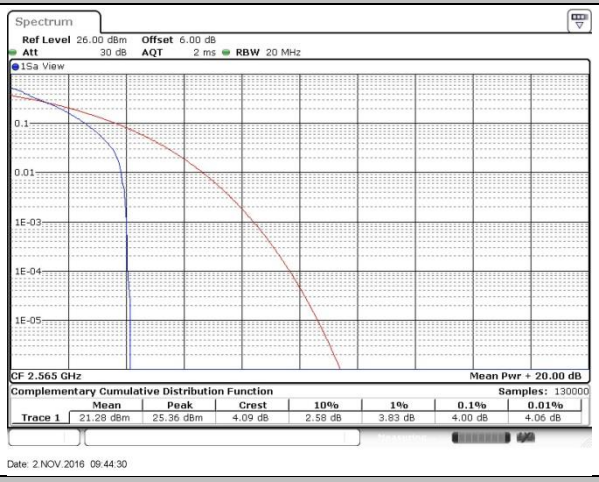
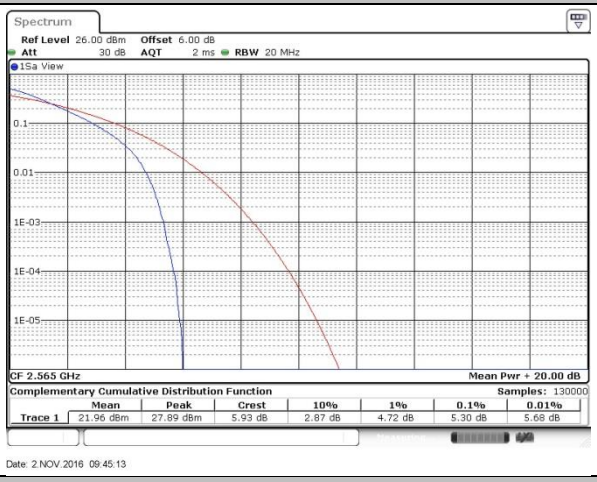
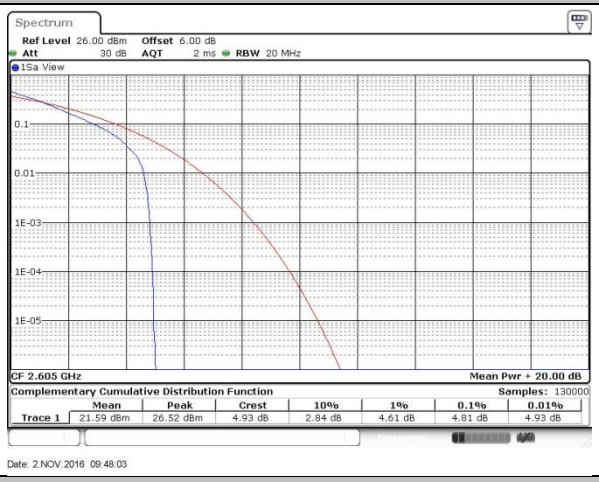
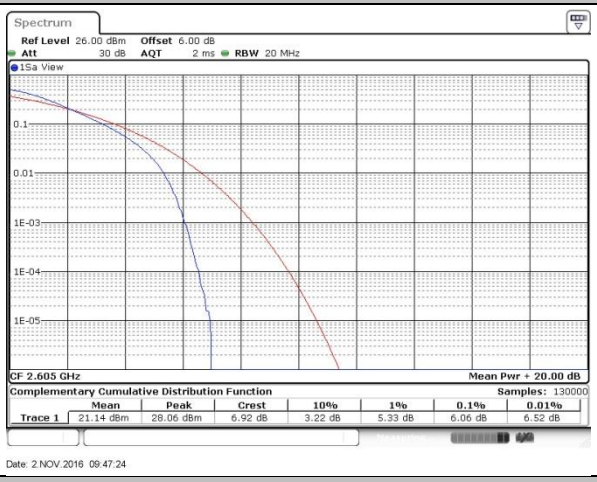
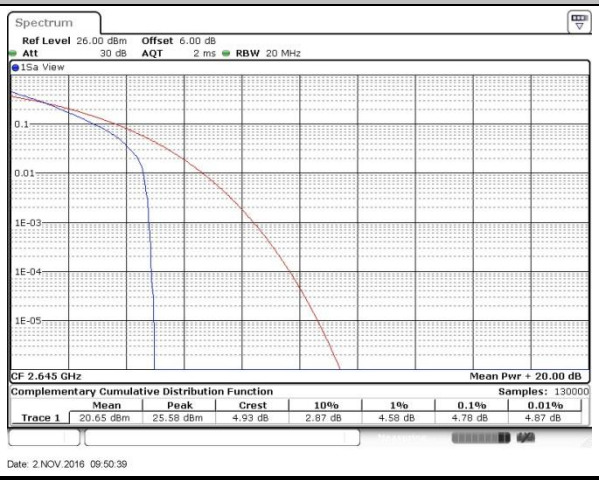
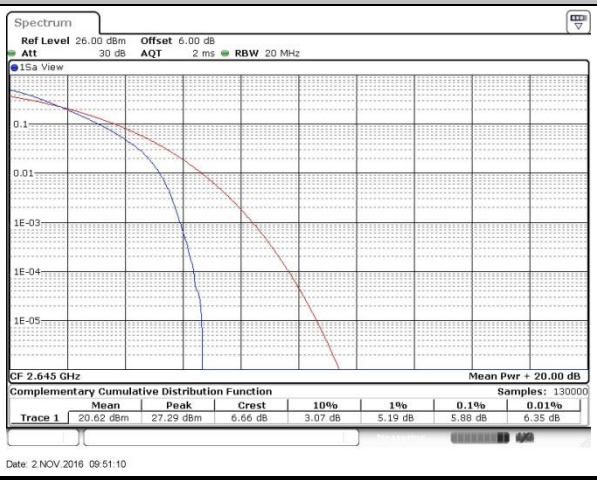
Conducted Output Power(Average power)

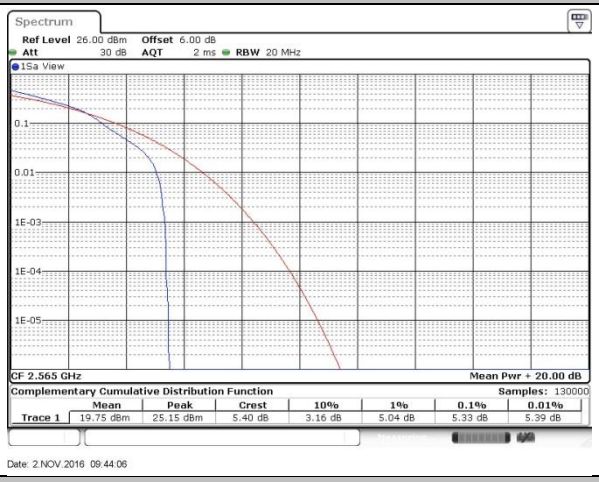
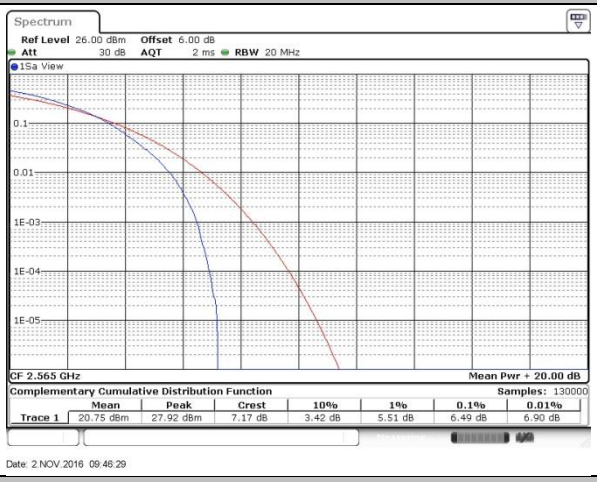
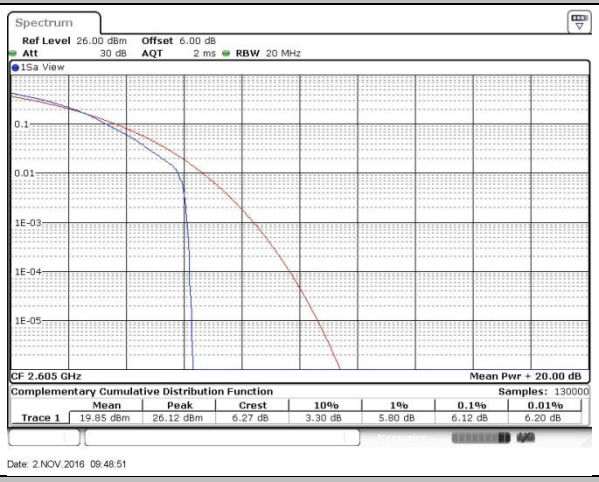
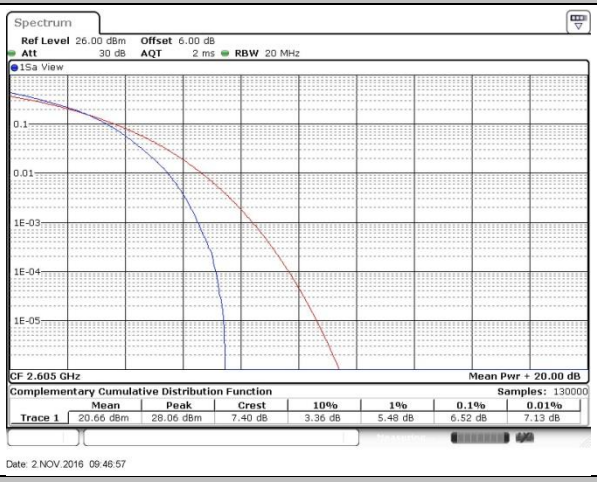
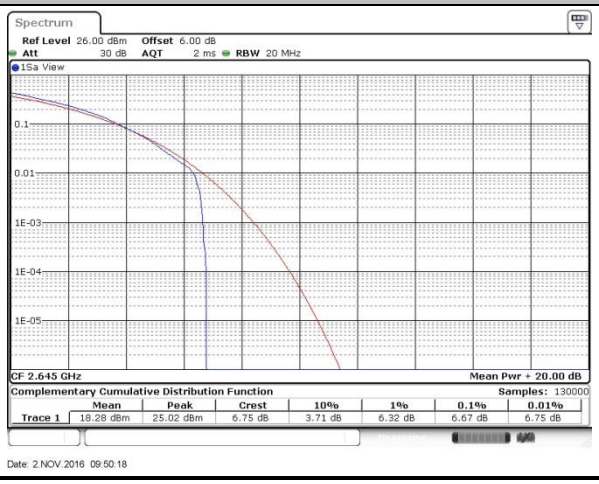
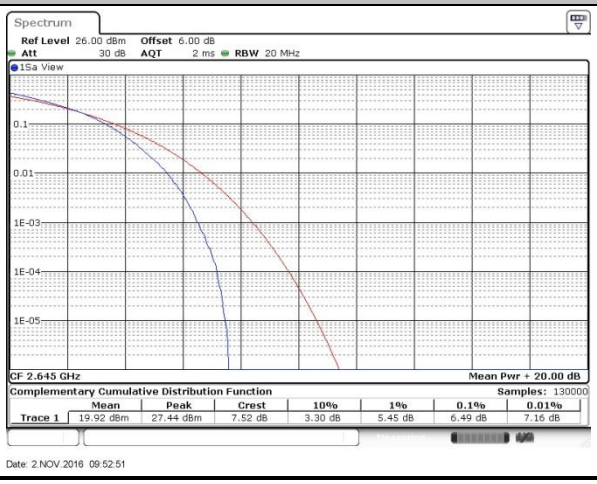
LTE Band 41 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
20	1	0	QPSK	23.76	23.52	23.04
20	1	49		23.89	23.59	23.36
20	1	99		23.58	23.38	23.03
20	50	0		22.96	22.91	22.55
20	50	24		22.95	22.86	22.49
20	50	50		22.90	22.72	22.29
20	100	0		22.88	22.69	22.38
20	1	0	16-QAM	22.64	22.18	21.71
20	1	49		22.60	22.80	22.06
20	1	99		22.46	22.27	21.87
20	50	0		21.75	21.73	21.22
20	50	24		21.80	21.81	21.26
20	50	50		21.86	21.69	21.48
20	100	0		21.88	21.82	21.15
15	1	0	QPSK	23.74	23.55	22.99
15	1	37		23.88	23.81	23.36
15	1	74		23.76	23.41	23.21
15	36	0		22.94	22.91	22.31
15	36	20		22.86	22.84	22.29
15	36	39		22.87	22.70	22.53
15	75	0		22.99	22.71	22.47
15	1	0	16-QAM	22.71	22.31	21.78
15	1	37		22.69	22.41	22.44
15	1	74		22.53	22.37	21.77
15	36	0		21.80	21.91	21.24
15	36	20		21.96	21.82	21.42
15	36	39		21.89	21.79	21.37
15	75	0		21.89	21.78	21.33

LTE Band 41 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	23.80	23.58	23.12
10	1	25		23.80	23.57	23.16
10	1	49		23.77	23.51	23.09
10	25	0		22.81	22.71	22.28
10	25	12		22.94	22.84	22.29
10	25	25		22.93	22.71	22.31
10	50	0		22.97	22.40	22.35
10	1	0	16-QAM	22.49	22.29	21.84
10	1	25		22.75	22.58	22.09
10	1	49		22.47	22.27	21.83
10	25	0		21.80	21.82	21.48
10	25	12		21.79	21.86	21.47
10	25	25		21.83	21.79	21.45
10	50	0		21.80	21.63	21.23
5	1	0	QPSK	23.58	23.44	22.97
5	1	12		23.85	23.60	23.29
5	1	24		23.70	23.31	22.93
5	12	0		22.89	22.61	22.31
5	12	7		22.91	22.59	22.28
5	12	13		22.94	22.74	22.33
5	25	0		22.87	22.59	22.26
5	1	0	16-QAM	22.51	22.16	22.10
5	1	12		22.99	22.38	22.03
5	1	24		22.69	22.21	21.80
5	12	0		21.90	21.69	21.26
5	12	7		21.89	21.81	21.22
5	12	13		21.86	21.66	21.25
5	25	0		21.88	21.56	21.45

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	5.30	5.33	6.49	PASS
Middle CH	4.81	6.06	6.12	6.52	
Highest CH	4.78	5.88	6.67	6.49	

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**
	

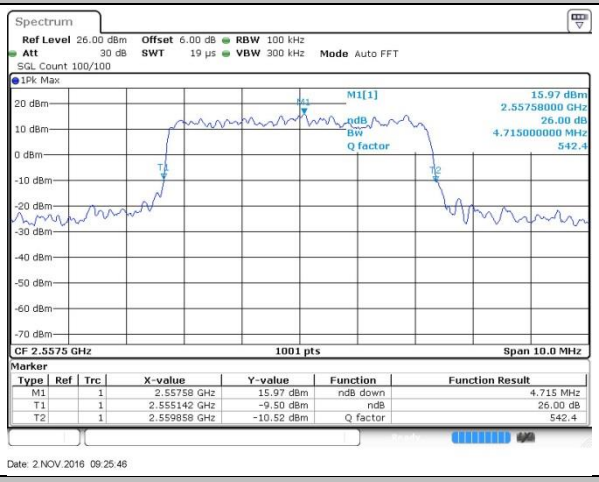
LTE Band 41 / 20MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

26dB Bandwidth

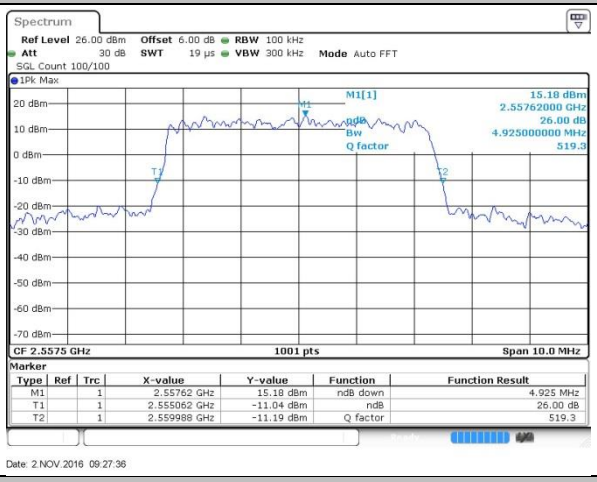
Mode	LTE Band 41 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH					4.715	4.925	9.73	9.71	14.116	14.116	20.06	20.10
Middle CH					4.855	4.905	9.69	9.69	14.476	14.206	20.10	20.10
Highest CH					4.975	4.895	9.75	9.63	14.356	14.386	20.06	20.06

LTE Band 41

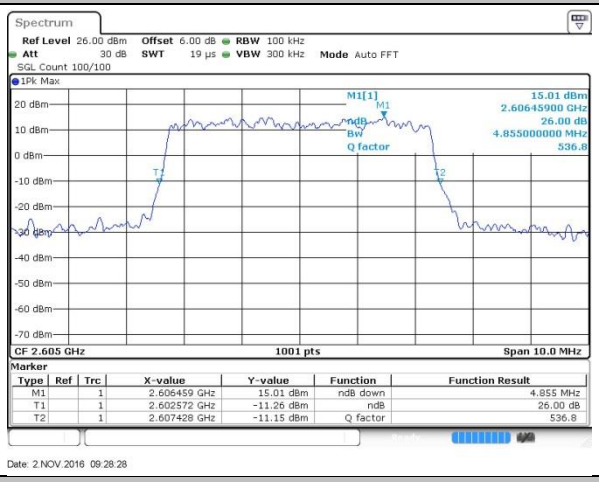
Lowest Channel / 5MHz / QPSK



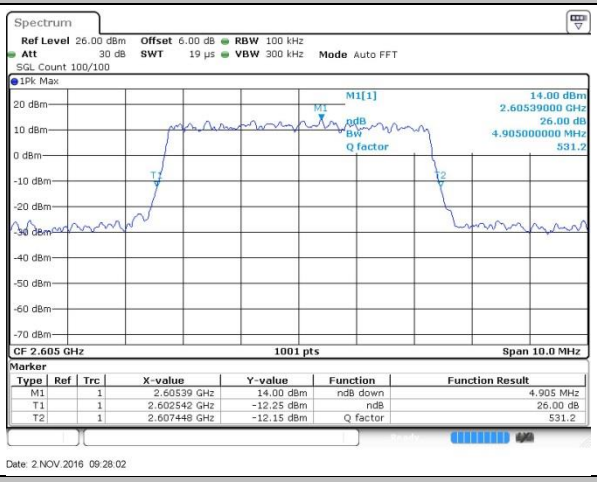
Lowest Channel / 5MHz / 16QAM



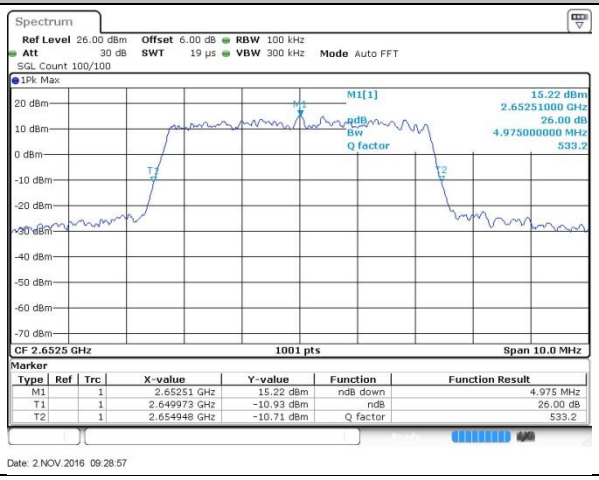
Middle Channel / 5MHz / QPSK



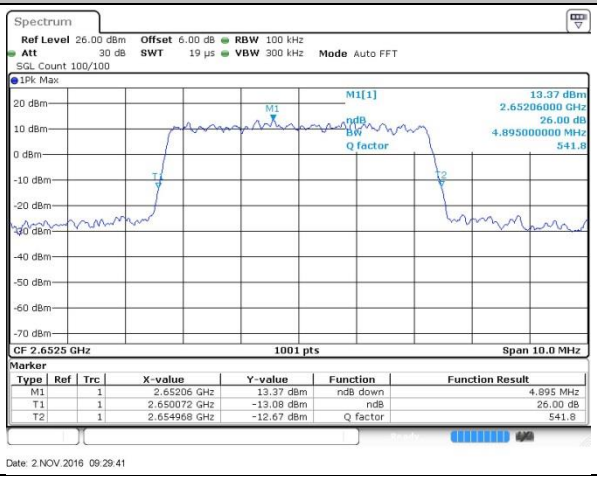
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

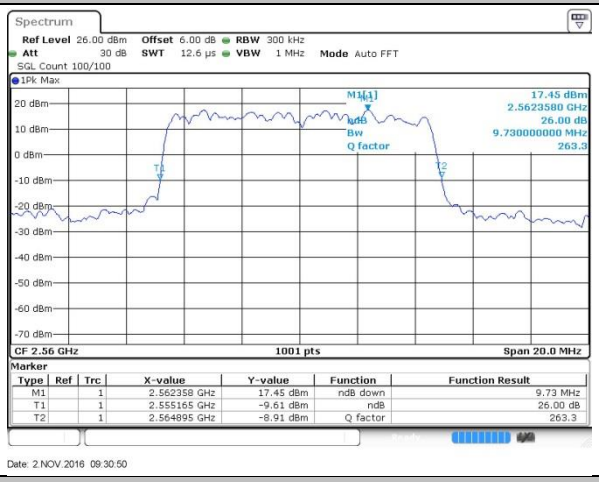


Highest Channel / 5MHz / 16QAM

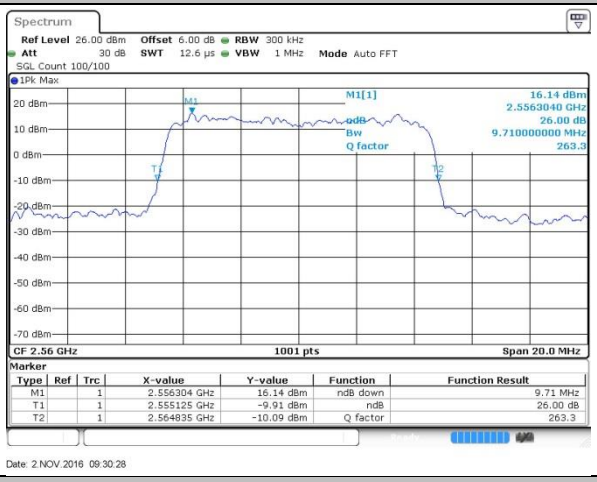


LTE Band 41

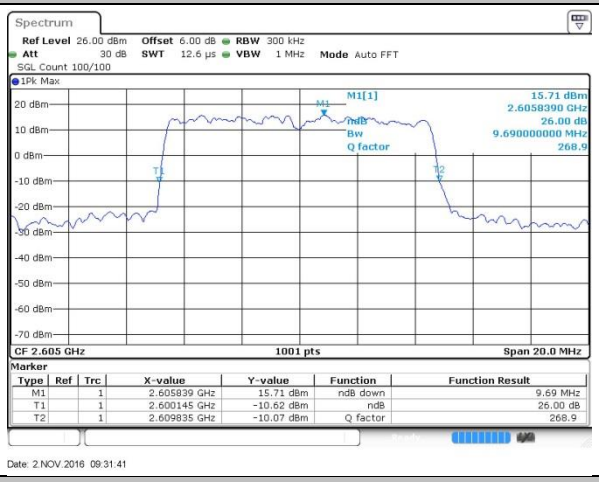
Lowest Channel / 10MHz / QPSK



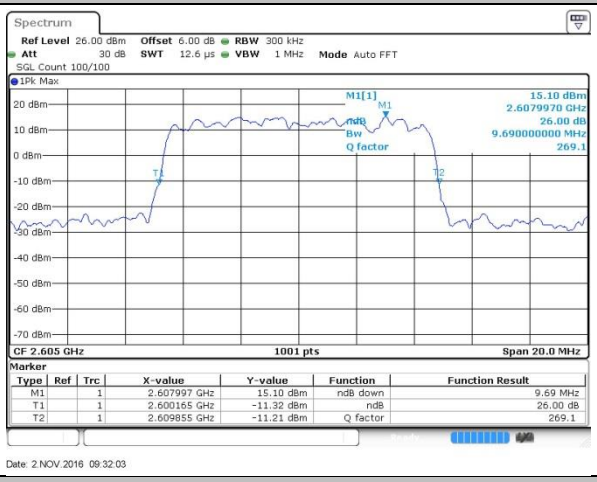
Lowest Channel / 10MHz / 16QAM



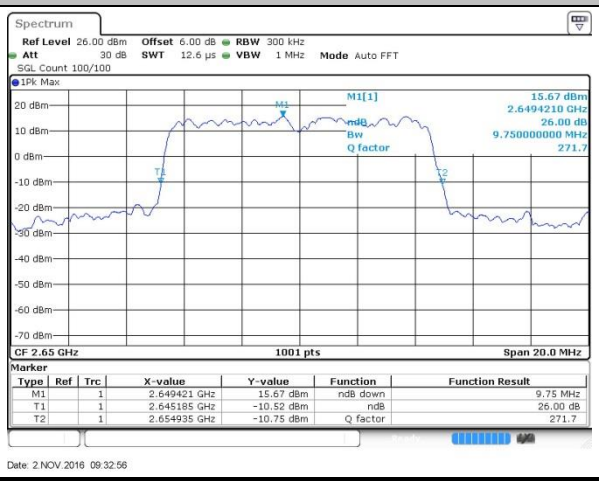
Middle Channel / 10MHz / QPSK



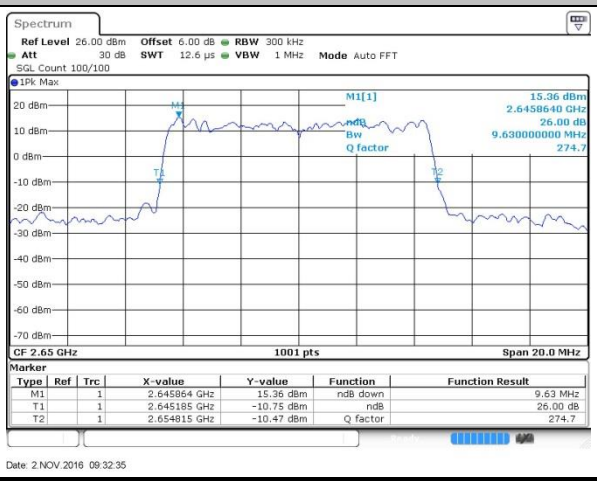
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

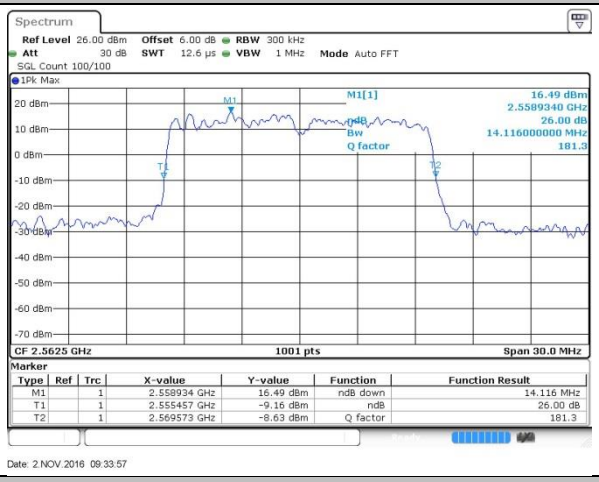


Highest Channel / 10MHz / 16QAM

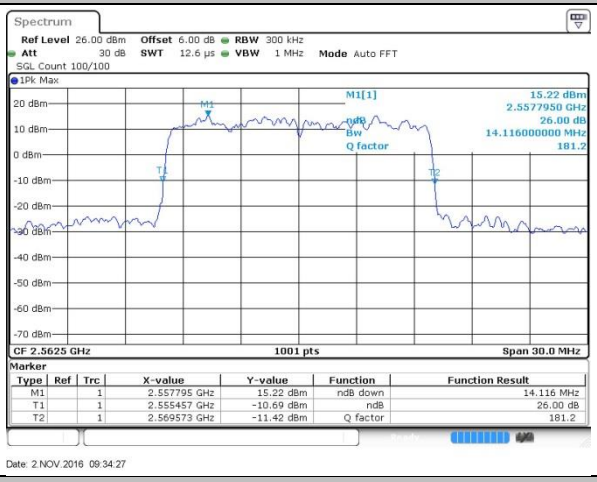


LTE Band 41

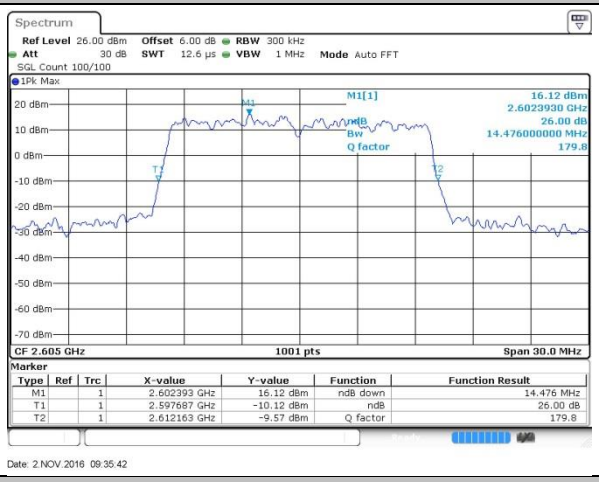
Lowest Channel / 15MHz / QPSK



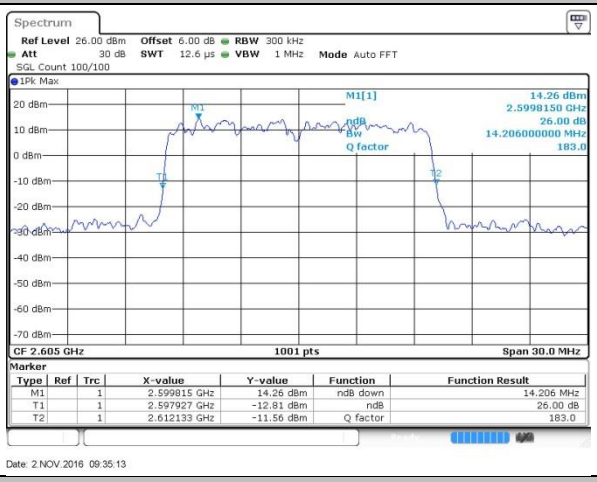
Lowest Channel / 15MHz / 16QAM



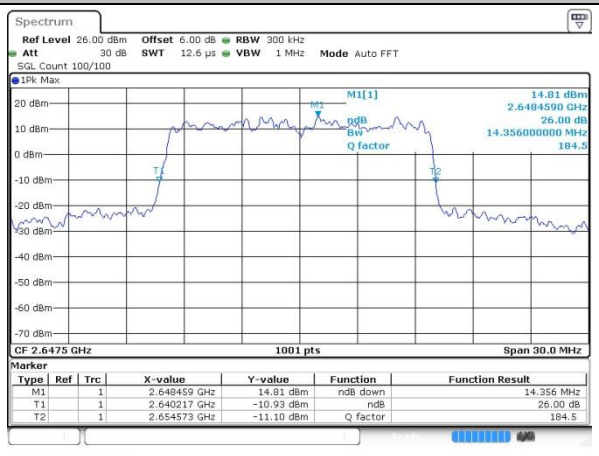
Middle Channel / 15MHz / QPSK



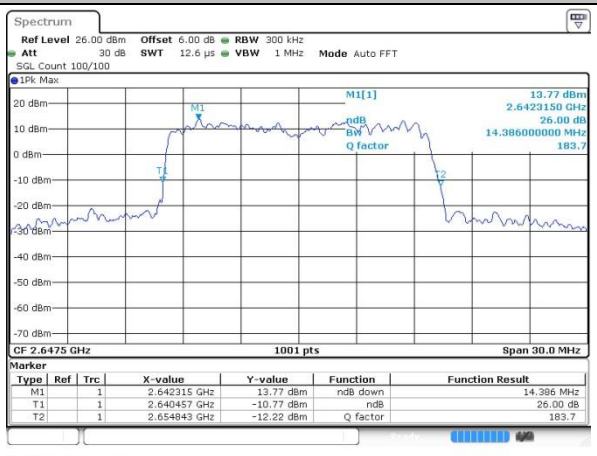
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

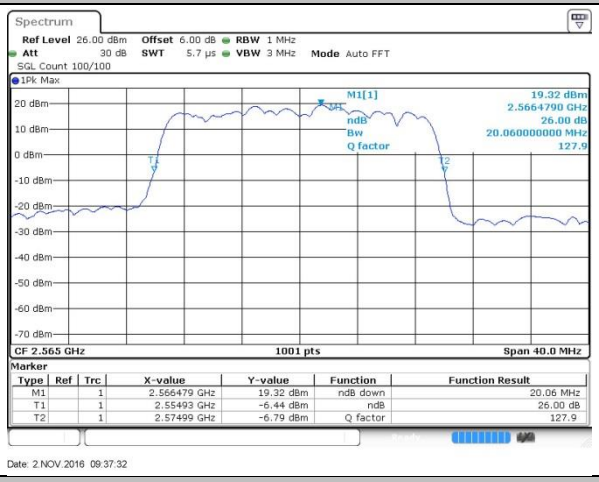


Highest Channel / 15MHz / 16QAM

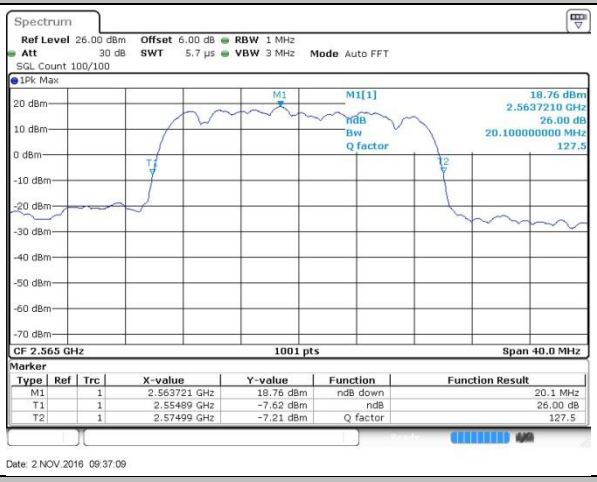


LTE Band 41

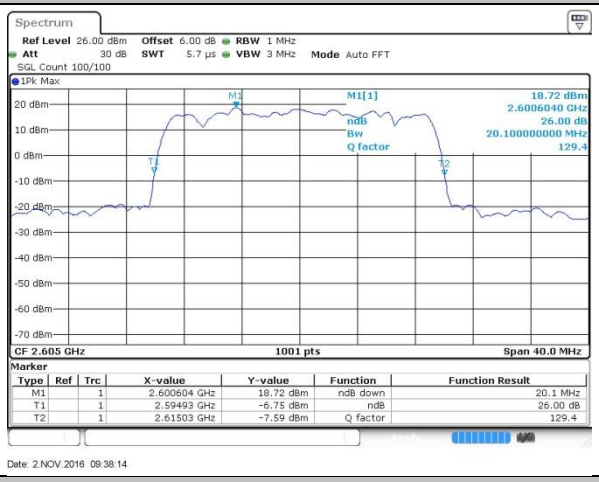
Lowest Channel / 20MHz / QPSK



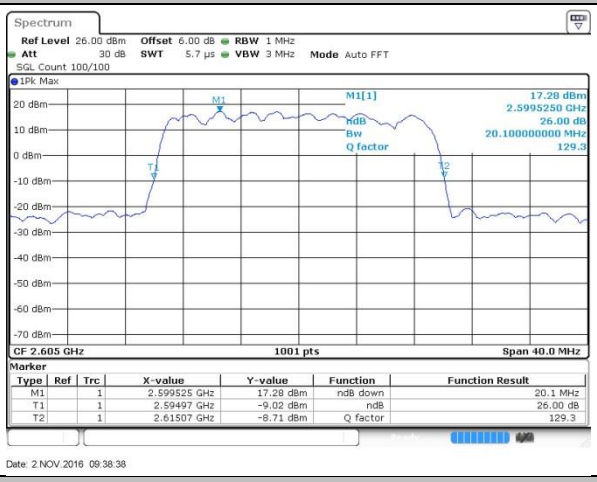
Lowest Channel / 20MHz / 16QAM



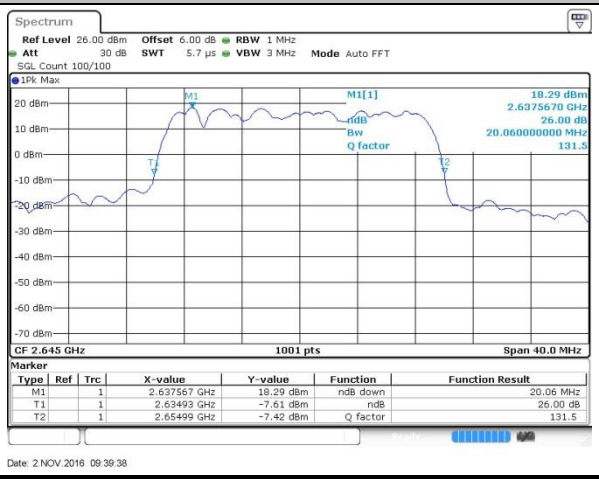
Middle Channel / 20MHz / QPSK



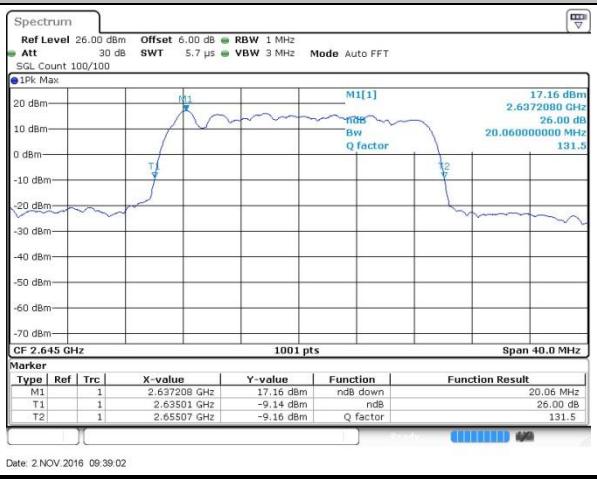
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK



Highest Channel / 20MHz / 16QAM

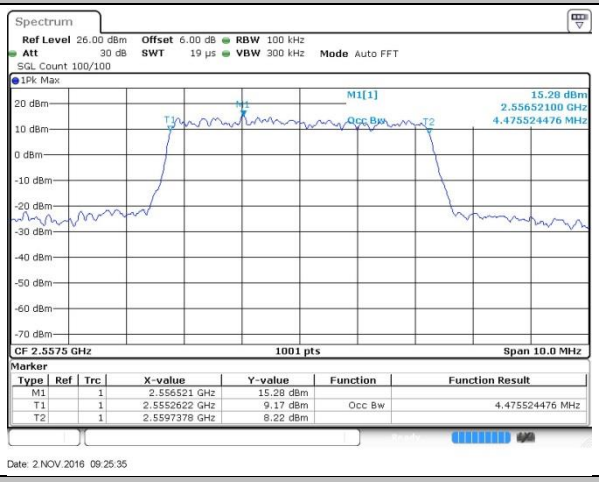


Occupied Bandwidth

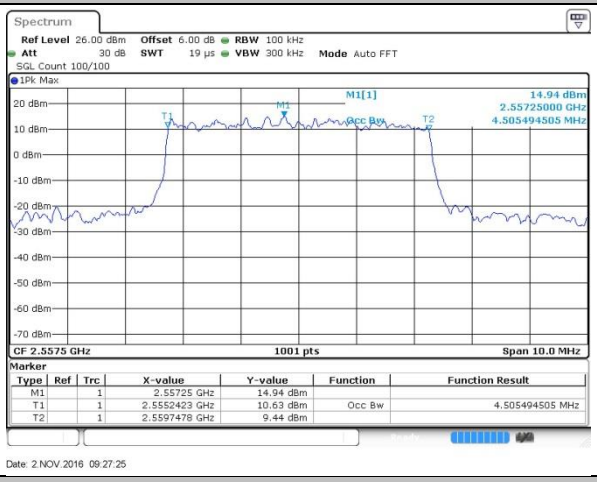
Mode	LTE Band 41 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH					4.48	4.51	8.97	8.97	13.43	13.43	18.26	18.42
Middle CH					4.50	4.50	8.95	9.03	13.43	13.40	18.34	18.54
Highest CH					4.48	4.47	9.03	9.05	13.43	13.43	18.26	18.14

LTE Band 41

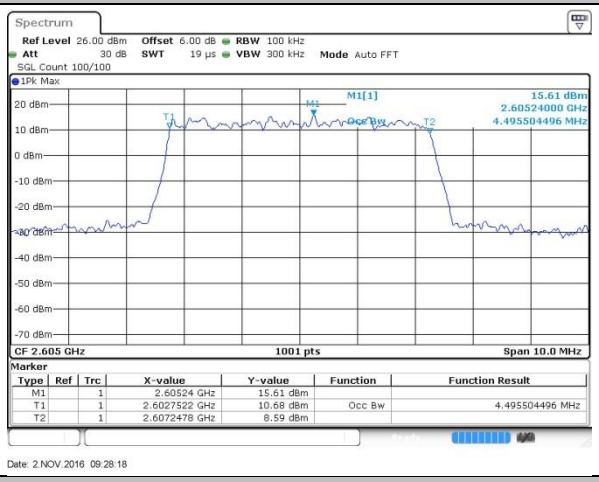
Lowest Channel / 5MHz / QPSK



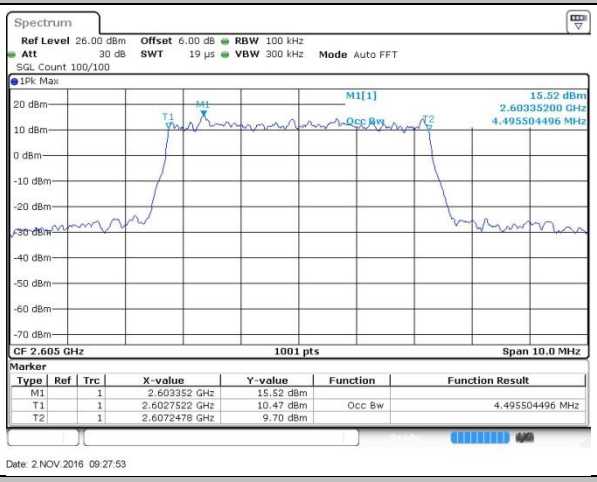
Lowest Channel / 5MHz / 16QAM



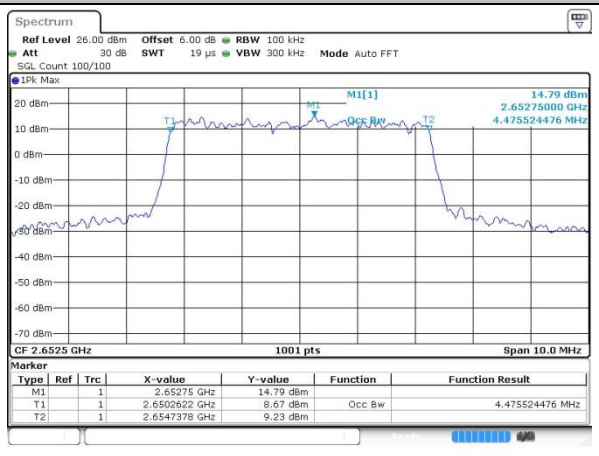
Middle Channel / 5MHz / QPSK



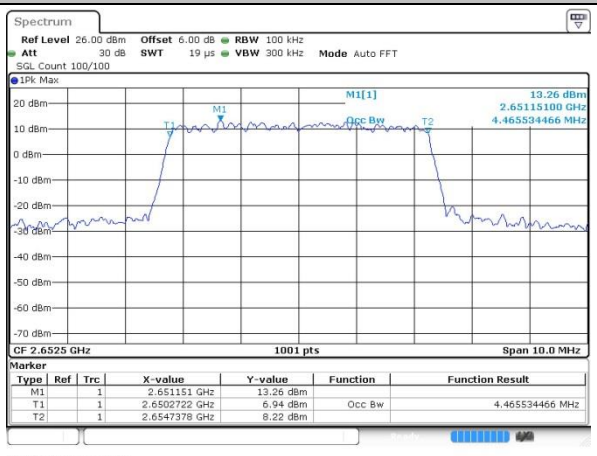
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

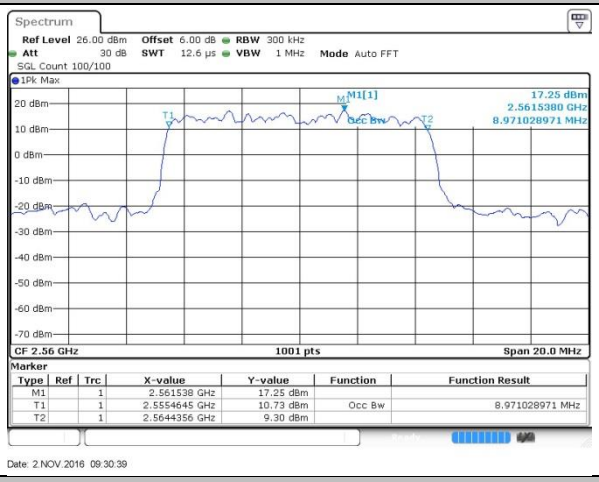


Highest Channel / 5MHz / 16QAM

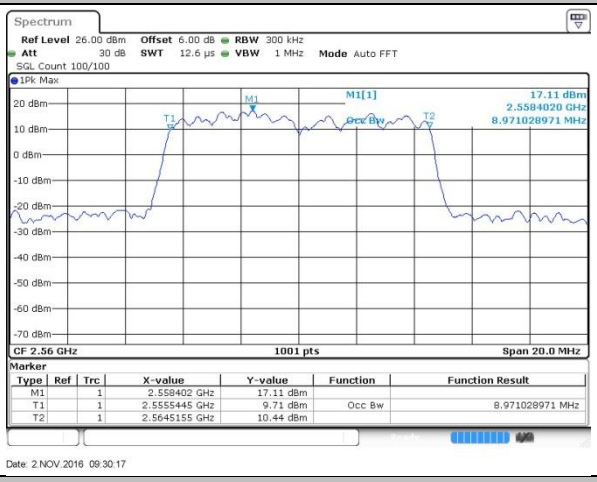


LTE Band 41

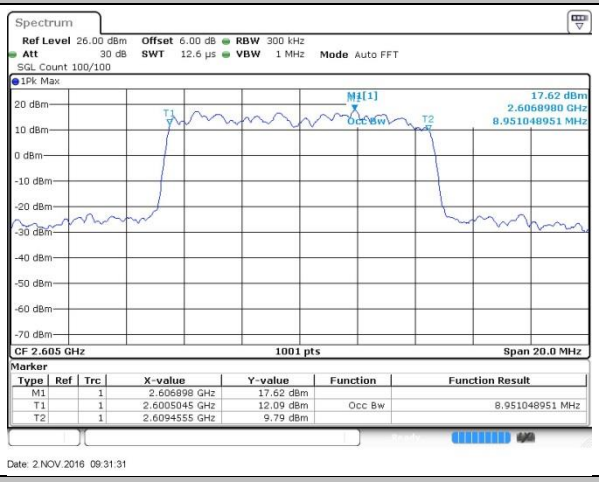
Lowest Channel / 10MHz / QPSK



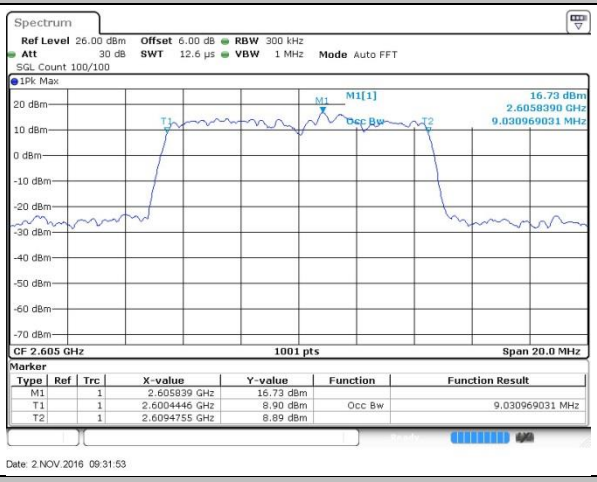
Lowest Channel / 10MHz / 16QAM



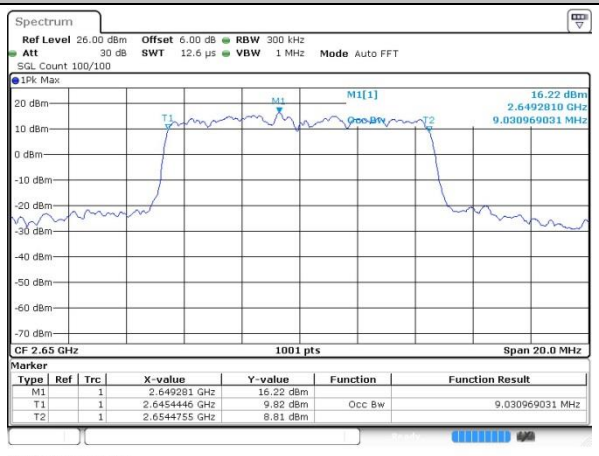
Middle Channel / 10MHz / QPSK



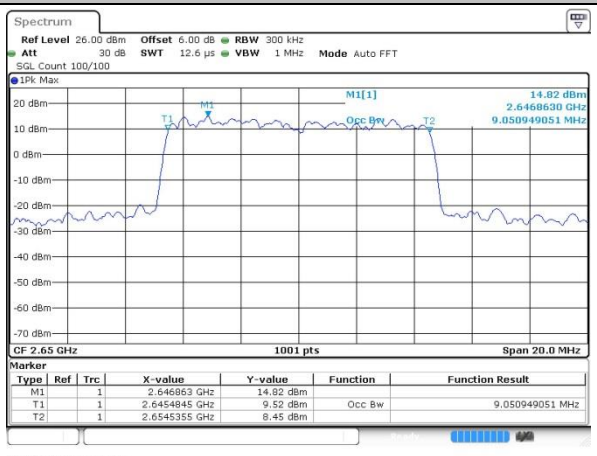
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

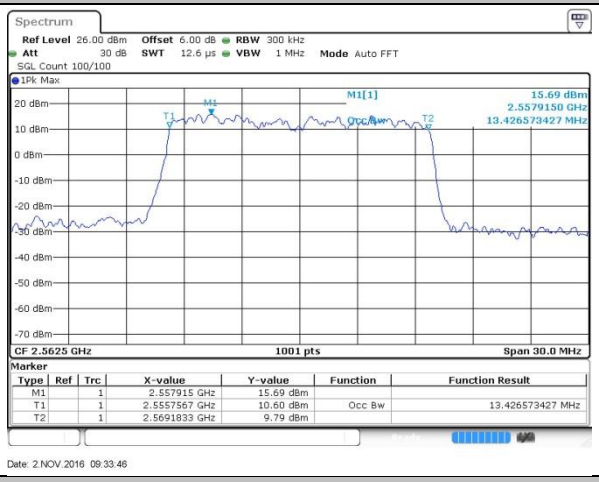


Highest Channel / 10MHz / 16QAM

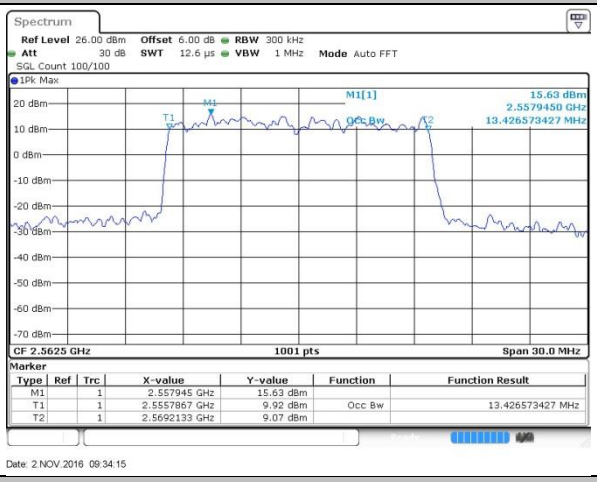


LTE Band 41

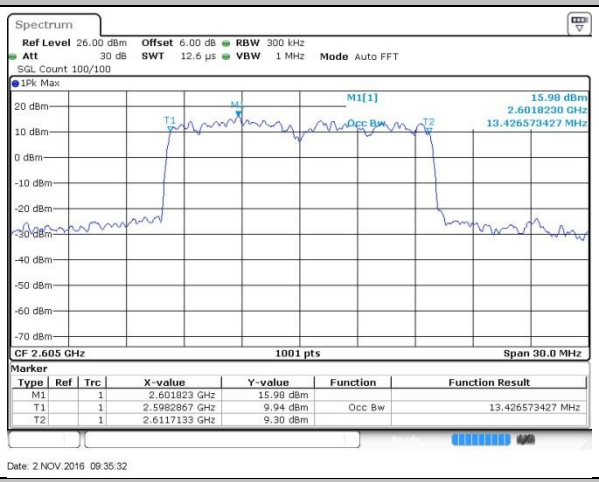
Lowest Channel / 15MHz / QPSK



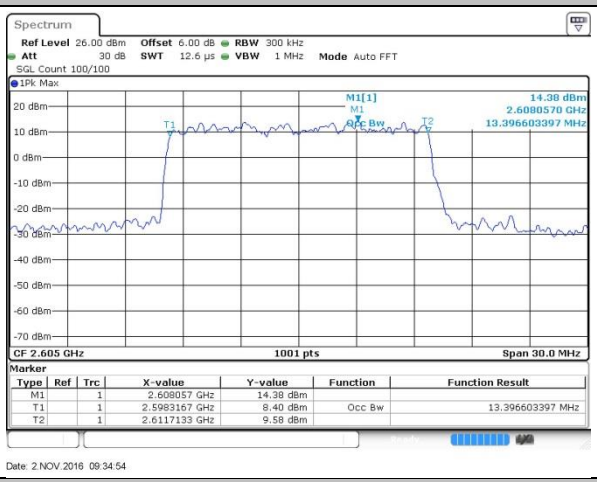
Lowest Channel / 15MHz / 16QAM



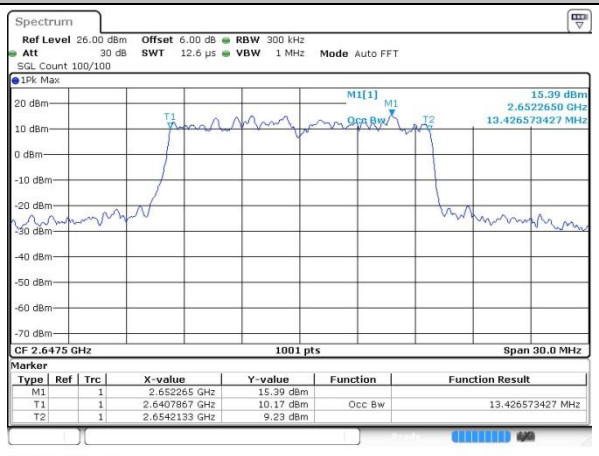
Middle Channel / 15MHz / QPSK



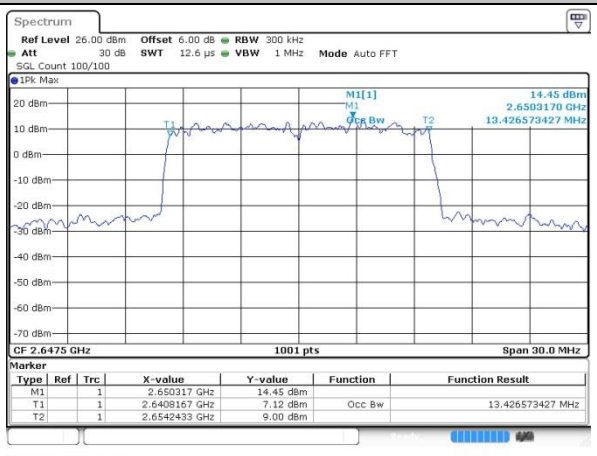
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

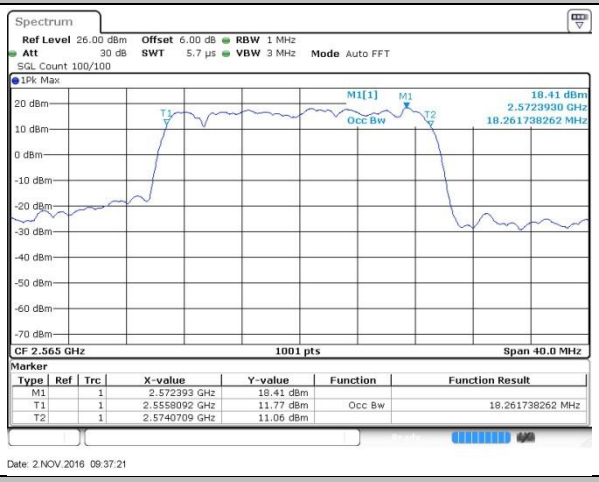


Highest Channel / 15MHz / 16QAM

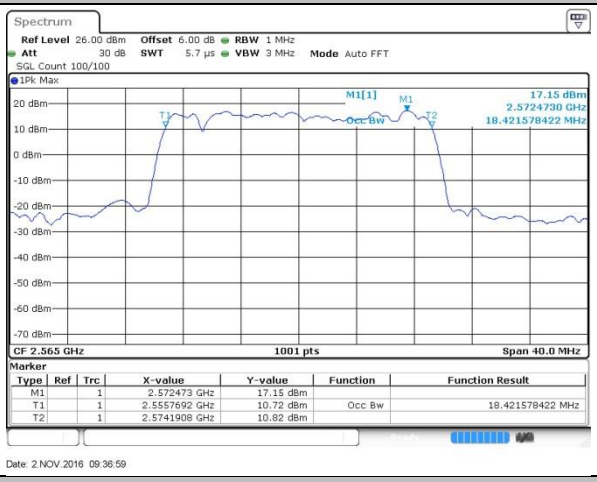


LTE Band 41

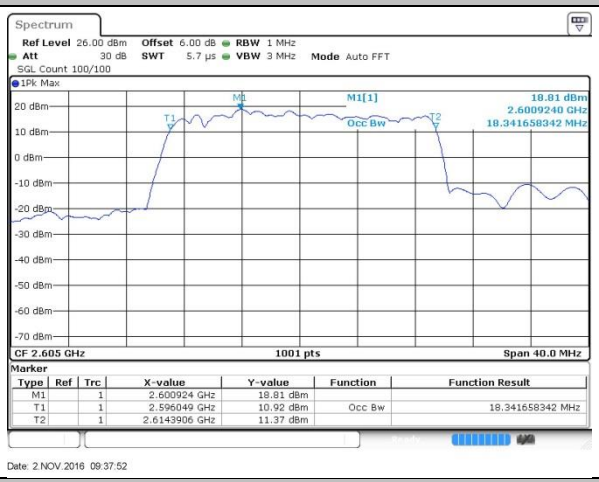
Lowest Channel / 20MHz / QPSK



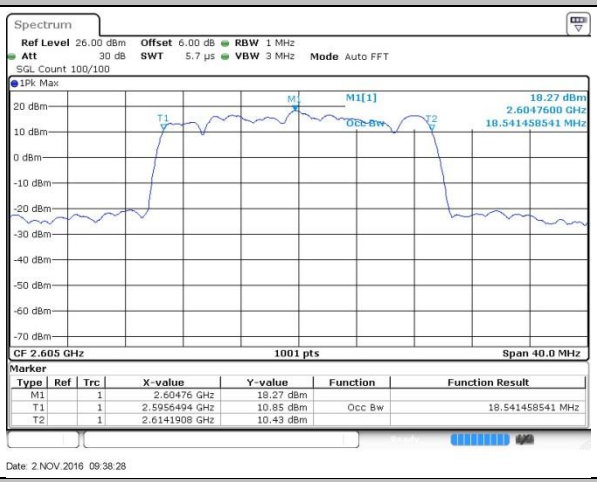
Lowest Channel / 20MHz / 16QAM



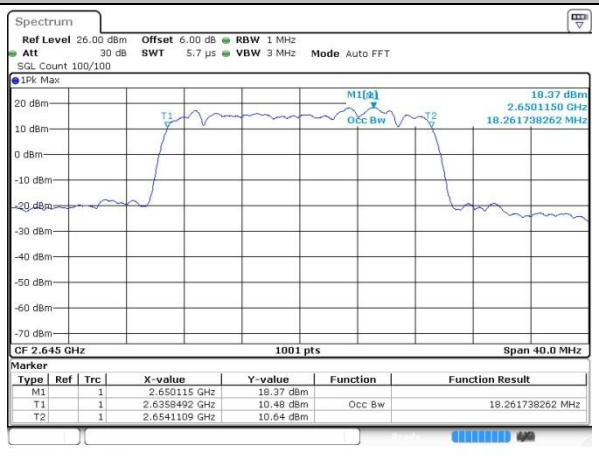
Middle Channel / 20MHz / QPSK



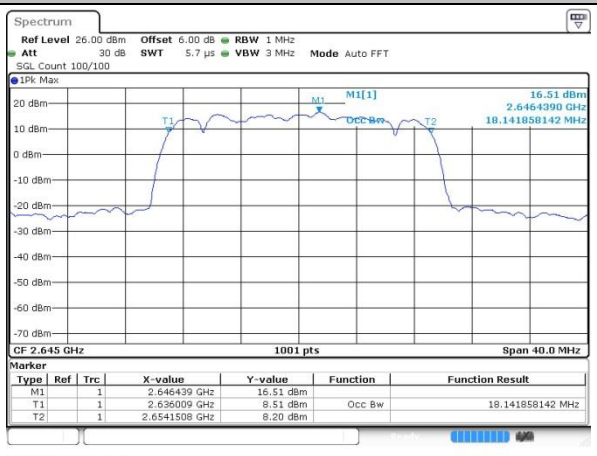
Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK



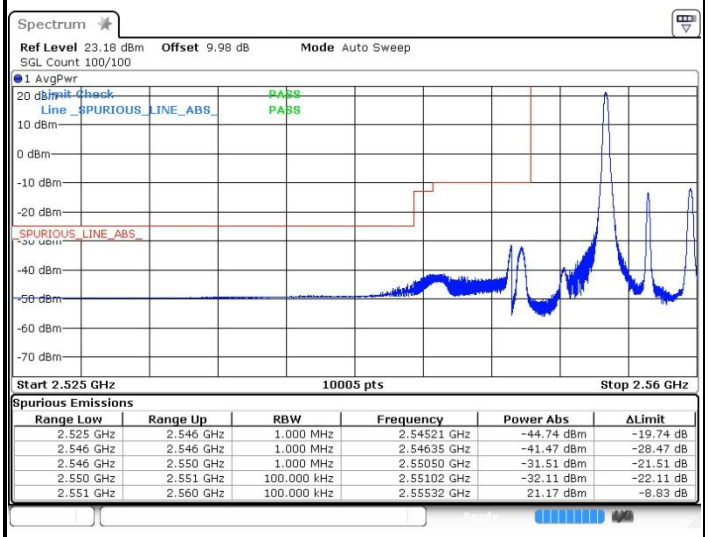
Highest Channel / 20MHz / 16QAM



Conducted Band Edge

LTE Band 41 / 5MHz / QPSK

Lowest Band Edge / 1 RB

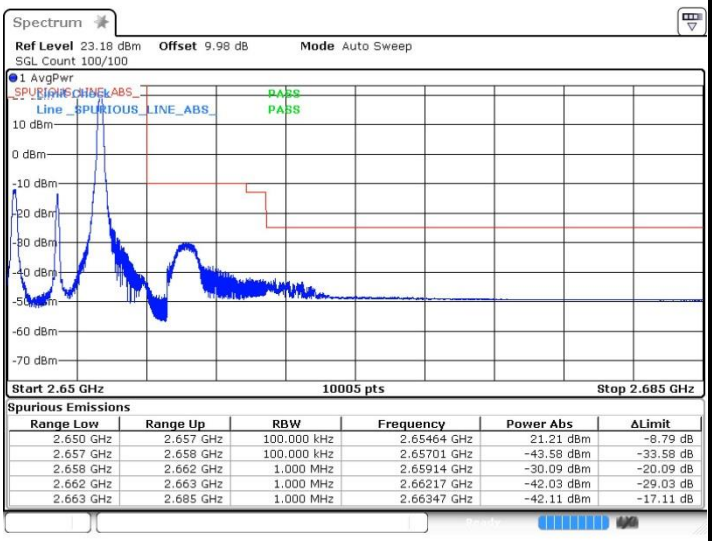


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.525 GHz	2.546 GHz	1.000 MHz	2.54521 GHz	-44.74 dBm	-19.74 dB
2.546 GHz	2.546 GHz	1.000 MHz	2.54635 GHz	-41.47 dBm	-28.47 dB
2.546 GHz	2.550 GHz	1.000 MHz	2.55050 GHz	-31.51 dBm	-21.51 dB
2.550 GHz	2.551 GHz	100.000 kHz	2.55102 GHz	-32.11 dBm	-22.11 dB
2.551 GHz	2.560 GHz	100.000 kHz	2.55532 GHz	21.17 dBm	-8.83 dB

Date: 4.NOV.2016 09:18:05

Highest Band Edge / 1 RB

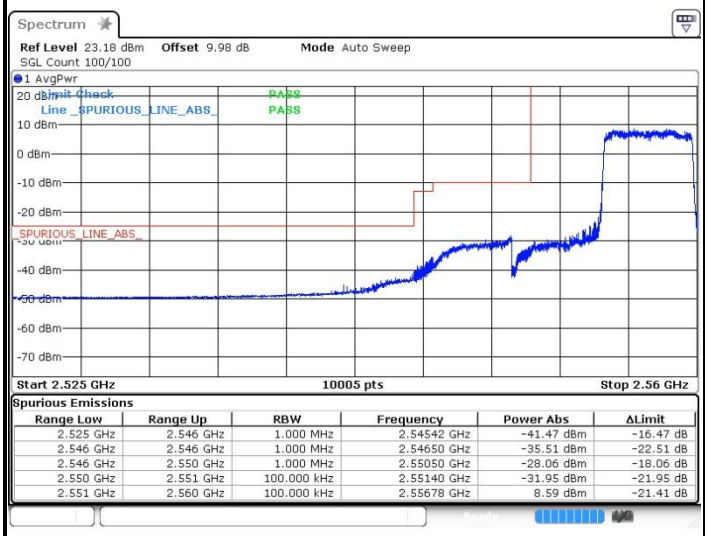


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.650 GHz	2.657 GHz	100.000 kHz	2.65464 GHz	21.21 dBm	-8.79 dB
2.657 GHz	2.658 GHz	100.000 kHz	2.65701 GHz	-43.58 dBm	-33.58 dB
2.658 GHz	2.662 GHz	1.000 MHz	2.65914 GHz	-30.09 dBm	-20.09 dB
2.662 GHz	2.663 GHz	1.000 MHz	2.66217 GHz	-42.03 dBm	-29.03 dB
2.663 GHz	2.685 GHz	1.000 MHz	2.66347 GHz	-42.11 dBm	-17.11 dB

Date: 4.NOV.2016 09:30:33

Lowest Band Edge / Full RB

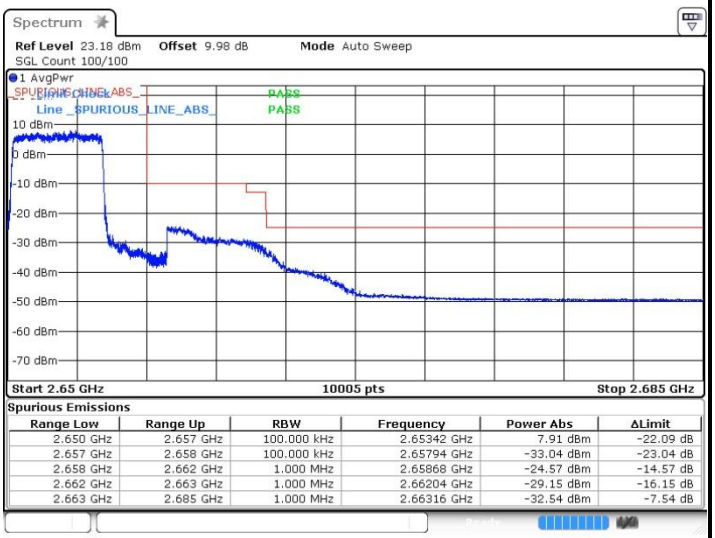


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.525 GHz	2.546 GHz	1.000 MHz	2.54542 GHz	-41.47 dBm	-16.47 dB
2.546 GHz	2.546 GHz	1.000 MHz	2.54650 GHz	-35.51 dBm	-22.51 dB
2.546 GHz	2.550 GHz	1.000 MHz	2.55050 GHz	-28.06 dBm	-18.06 dB
2.550 GHz	2.551 GHz	100.000 kHz	2.55140 GHz	-31.95 dBm	-21.95 dB
2.551 GHz	2.560 GHz	100.000 kHz	2.55678 GHz	8.59 dBm	-21.41 dB

Date: 4.NOV.2016 09:22:03

Highest Band Edge / Full RB



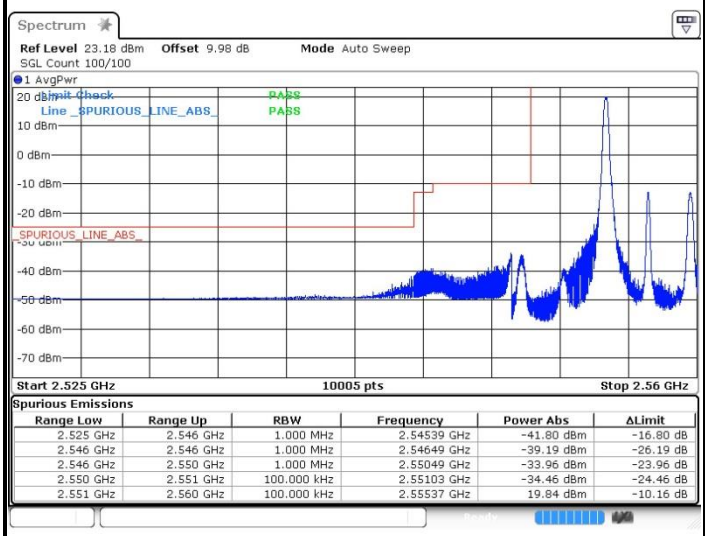
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.650 GHz	2.657 GHz	100.000 kHz	2.65342 GHz	7.91 dBm	-22.09 dB
2.657 GHz	2.658 GHz	100.000 kHz	2.65794 GHz	-33.04 dBm	-23.04 dB
2.658 GHz	2.662 GHz	1.000 MHz	2.65868 GHz	-24.57 dBm	-14.57 dB
2.662 GHz	2.663 GHz	1.000 MHz	2.66204 GHz	-29.15 dBm	-16.15 dB
2.663 GHz	2.685 GHz	1.000 MHz	2.66316 GHz	-32.54 dBm	-7.54 dB

Date: 4.NOV.2016 09:23:21

LTE Band 41 / 5MHz / 16QAM

Lowest Band Edge / 1RB

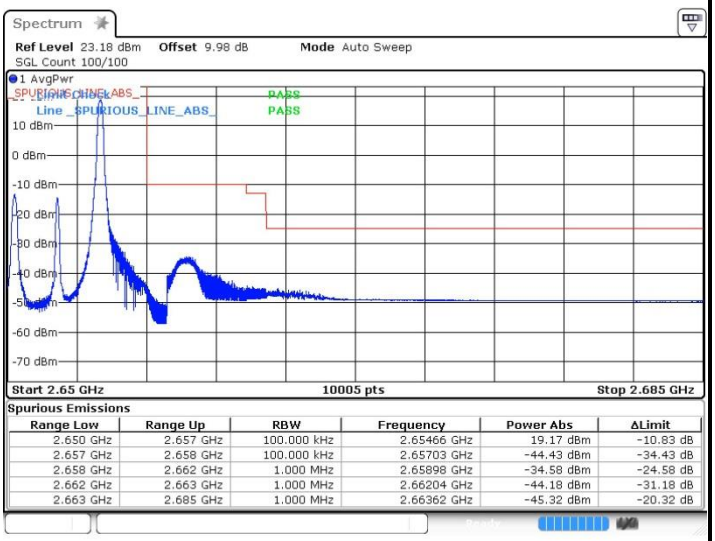


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.525 GHz	2.546 GHz	1.000 MHz	2.54539 GHz	-41.80 dBm	-16.80 dB
2.546 GHz	2.546 GHz	1.000 MHz	2.54649 GHz	-39.19 dBm	-26.19 dB
2.546 GHz	2.550 GHz	1.000 MHz	2.55049 GHz	-33.96 dBm	-23.96 dB
2.550 GHz	2.551 GHz	100.000 kHz	2.55103 GHz	-34.46 dBm	-24.46 dB
2.551 GHz	2.560 GHz	100.000 kHz	2.55537 GHz	19.84 dBm	-10.16 dB

Date: 4.NOV.2016 09:20:41

Highest Band Edge / 1 RB

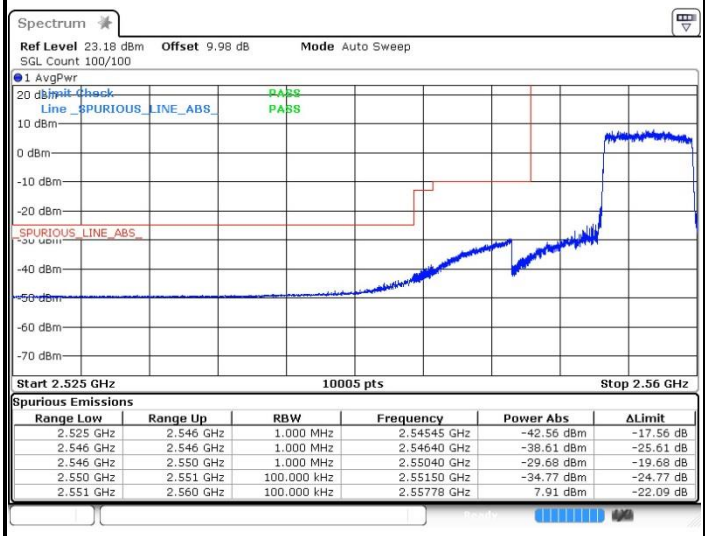


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.650 GHz	2.657 GHz	100.000 kHz	2.65466 GHz	19.17 dBm	-10.83 dB
2.657 GHz	2.658 GHz	100.000 kHz	2.65703 GHz	-44.43 dBm	-34.43 dB
2.658 GHz	2.662 GHz	1.000 MHz	2.65898 GHz	-34.58 dBm	-24.58 dB
2.662 GHz	2.663 GHz	1.000 MHz	2.66204 GHz	-44.18 dBm	-31.18 dB
2.663 GHz	2.685 GHz	1.000 MHz	2.66362 GHz	-45.32 dBm	-20.32 dB

Date: 4.NOV.2016 09:27:22

Lowest Band Edge / Full RB

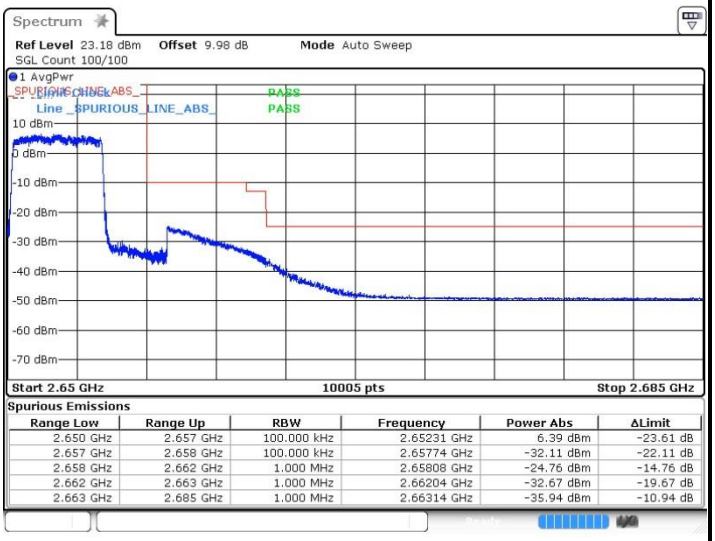


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.525 GHz	2.546 GHz	1.000 MHz	2.54545 GHz	-42.56 dBm	-17.56 dB
2.546 GHz	2.546 GHz	1.000 MHz	2.54640 GHz	-38.61 dBm	-25.61 dB
2.546 GHz	2.550 GHz	1.000 MHz	2.55040 GHz	-29.68 dBm	-19.68 dB
2.550 GHz	2.551 GHz	100.000 kHz	2.55150 GHz	-34.77 dBm	-24.77 dB
2.551 GHz	2.560 GHz	100.000 kHz	2.55778 GHz	7.91 dBm	-22.09 dB

Date: 4.NOV.2016 09:21:23

Highest Band Edge / Full RB



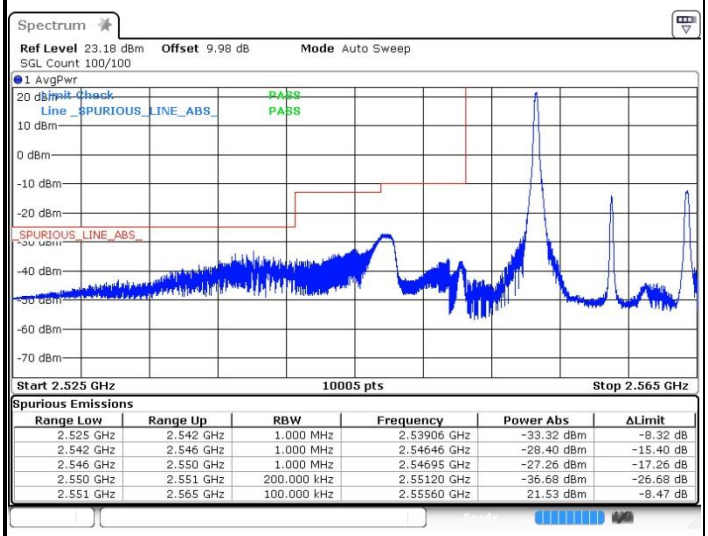
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.650 GHz	2.657 GHz	100.000 kHz	2.65231 GHz	6.39 dBm	-23.61 dB
2.657 GHz	2.658 GHz	100.000 kHz	2.65774 GHz	-32.11 dBm	-22.11 dB
2.658 GHz	2.662 GHz	1.000 MHz	2.65808 GHz	-24.76 dBm	-14.76 dB
2.662 GHz	2.663 GHz	1.000 MHz	2.66204 GHz	-32.67 dBm	-19.67 dB
2.663 GHz	2.685 GHz	1.000 MHz	2.66314 GHz	-35.94 dBm	-10.94 dB

Date: 4.NOV.2016 09:23:59

LTE Band 41 / 10MHz / QPSK

Lowest Band Edge / 1 RB

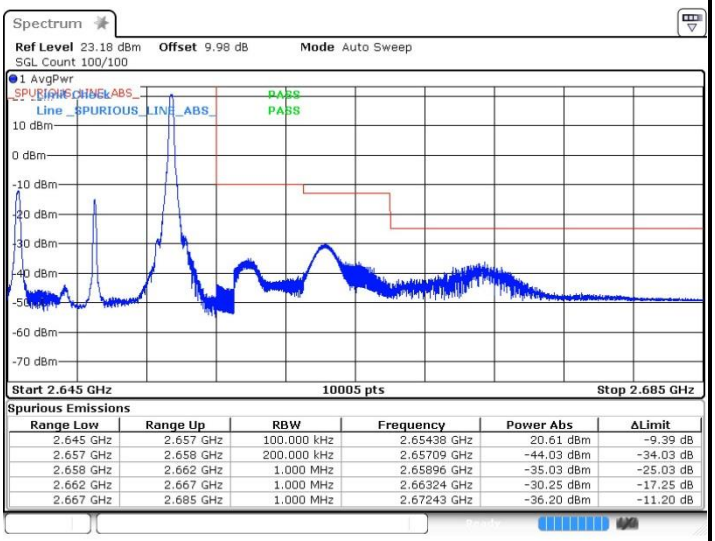


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.525 GHz	2.542 GHz	1.000 MHz	2.53906 GHz	-33.32 dBm	-8.32 dB
2.542 GHz	2.546 GHz	1.000 MHz	2.54646 GHz	-28.40 dBm	-15.40 dB
2.546 GHz	2.550 GHz	1.000 MHz	2.54695 GHz	-27.26 dBm	-17.26 dB
2.550 GHz	2.551 GHz	200.000 kHz	2.55120 GHz	-36.68 dBm	-26.68 dB
2.551 GHz	2.565 GHz	100.000 kHz	2.55560 GHz	21.53 dBm	-8.47 dB

Date: 4.NOV.2016 09:40:23

Highest Band Edge / 1 RB

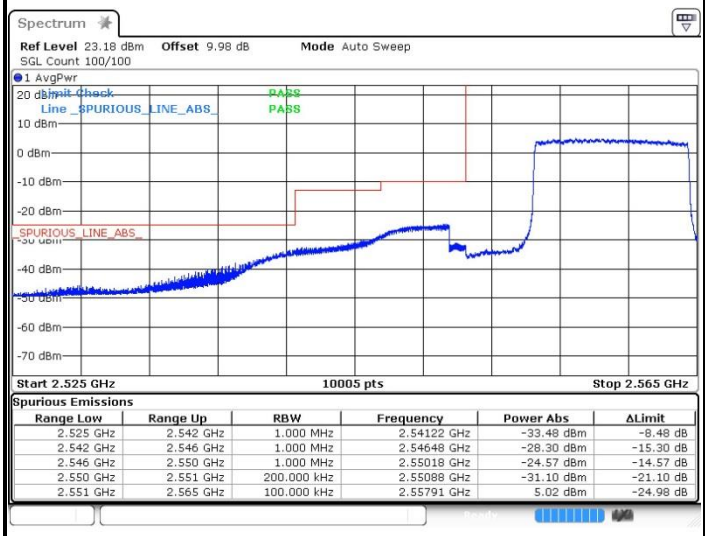


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.645 GHz	2.657 GHz	100.000 kHz	2.65438 GHz	20.61 dBm	-9.39 dB
2.657 GHz	2.658 GHz	200.000 kHz	2.65709 GHz	-44.03 dBm	-34.03 dB
2.658 GHz	2.662 GHz	1.000 MHz	2.65896 GHz	-35.03 dBm	-25.03 dB
2.662 GHz	2.667 GHz	1.000 MHz	2.66324 GHz	-30.25 dBm	-17.25 dB
2.667 GHz	2.685 GHz	1.000 MHz	2.67243 GHz	-36.20 dBm	-11.20 dB

Date: 4.NOV.2016 10:05:37

Lowest Band Edge / Full RB

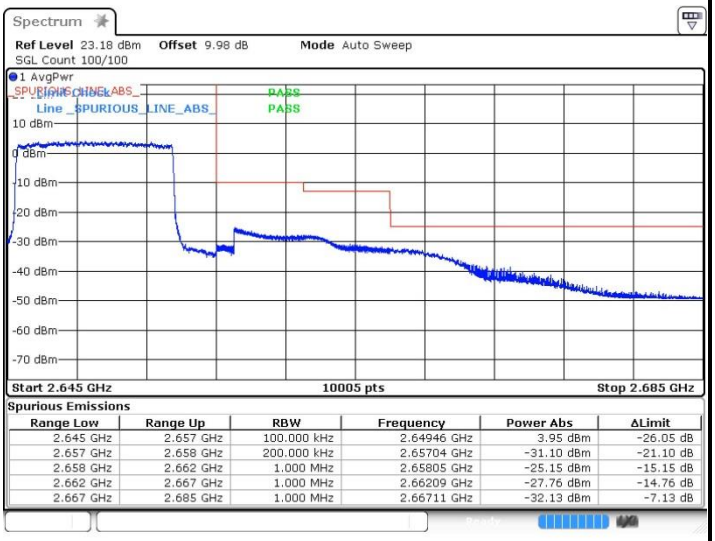


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.525 GHz	2.542 GHz	1.000 MHz	2.54122 GHz	-33.48 dBm	-8.48 dB
2.542 GHz	2.546 GHz	1.000 MHz	2.54648 GHz	-28.30 dBm	-15.30 dB
2.546 GHz	2.550 GHz	1.000 MHz	2.55018 GHz	-24.57 dBm	-14.57 dB
2.550 GHz	2.551 GHz	200.000 kHz	2.55088 GHz	-31.10 dBm	-21.10 dB
2.551 GHz	2.565 GHz	100.000 kHz	2.55791 GHz	5.02 dBm	-24.98 dB

Date: 4.NOV.2016 09:51:49

Highest Band Edge / Full RB



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.645 GHz	2.657 GHz	100.000 kHz	2.64946 GHz	3.95 dBm	-26.05 dB
2.657 GHz	2.658 GHz	200.000 kHz	2.65704 GHz	-31.10 dBm	-21.10 dB
2.658 GHz	2.662 GHz	1.000 MHz	2.65805 GHz	-25.15 dBm	-15.15 dB
2.662 GHz	2.667 GHz	1.000 MHz	2.66209 GHz	-27.76 dBm	-14.76 dB
2.667 GHz	2.685 GHz	1.000 MHz	2.66711 GHz	-32.13 dBm	-7.13 dB

Date: 4.NOV.2016 09:53:25