

FCC RF Test Report

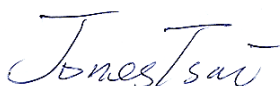
APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT1929-4(SS)
FCC ID : IHDT56XE1
STANDARD : FCC 47 CFR Part 2, 90
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Jan. 18, 2018 and completely tested on Mar. 02, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI / TIA-603-E 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 INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG811821F	Rev. 01	Initial issue of report	Mar. 05, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting only	PASS	-
	§90.542 (a)(7)	Effective Radiated Power	ERP < 3Watt	PASS	-
3.5	-	Peak-to-Average Ratio	<13dB	N/A	Reporting only
3.6	§2.1049	Occupied Bandwidth	Reporting only	PASS	-
3.7	§2.1053 §90.543 (e)(2)	Conducted Band Edge Measurement	Refer standard	PASS	-
3.8	§2.1051 §90.210(n)	Emission Mask	Mask B	PASS	-
3.9	§2.1053 §90.543 (e)(3)	Conducted Spurious Emission	$< 43+10\log_{10}(P[\text{Watts}])$	PASS	-
3.10	§2.1055 §90.539 (e)	Frequency Stability Temperature & Voltage	$< \pm 1.25 \text{ ppm}$	PASS	-
4.4	§2.1053 §90.543 (e)(3) §90.543 (f)	Radiated Spurious Emission	$< 43+10\log_{10}(P[\text{Watts}])$	PASS	Under limit 6.03 dB at 1576.000 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	XT1929-4(SS)
FCC ID	IHDT56XE1
IMEI Code	Conducted : IMEI: 351886090013043 Radiation : IMEI: 351886090015329
EUT supports Radios application	CDMA/EV-DO/GSM/EGPRS/WCDMA/HSPA/LTE/GNSS/NFC WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	DVT2
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Accessory List	
AC Adapter 1	Brand Name : Motorola
	Model Name : SC-22 SPN5970A
	Manufacturer : Salom
AC Adapter 2	Brand Name : Motorola
	Model Name : SC-22 SPN5993A
	Manufacturer : Chenyang
Battery	Brand Name : Motorola
	Model Name : JS40
	Manufacturer : SUNWODA
C2Audio Cable 1	Brand Name : Motorola
	Model Name : SC18C27844
	Manufacturer : Luxshare
C2Audio Cable 2	Brand Name : Motorola
	Model Name : SC18C27845
	Manufacturer : Cabletech
USB Cable 1	Brand Name : Cabletech
	Model Name : SKN6473A
USB Cable 2	Brand Name : FOXLINK
	Model Name : SKN6473A 17195-C 0403532
USB Cable 3	Brand Name : SAIBAO
	Model Name : SKN6473A 17214-C 1127044
USB Cable 4	Brand Name : Luxshare
	Model Name : SKN6473A 17227-C 1126538

1.4 Product Specification of Equipment Under Test

Product Feature	
Tx Frequency	790.5 MHz ~ 795.5 MHz
Rx Frequency	760.5 MHz ~ 765.5 MHz
Bandwidth	5MHz / 10MHz
Maximum Output Power to Antenna	22.71dBm
Antenna Type	Dipole Antenna
Antenna Gain	-5.3 dBi
Type of Modulation	QPSK / 16QAM / 64QAM

1.5 Emission Designator

LTE Band 14		QPSK			16QAM			64QAM		
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum ERP(W)	Emission Designator (99%OBW)	Frequency Tolerance (ppm)	Maximum EIRP(W)
5	790.5 ~ 795.5	4M51G7D	-	0.0335	4M51W7D	-	0.0285	4M51W7D	-	0.0225
10	793	9M01G7D	0.0061	0.0336	9M03W7D	-	0.0289	9M03W7D	-	0.0227

1.6 Modification of EUT

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

1.7 Testing Site

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No.
	TH05-HY

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No.
	03CH12-HY

1.8 Applied Standards

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

- ♦ 47 CFR Part 2, Part 90(R)
- ♦ ANSI / TIA-603-E
- ♦ FCC KDB 971168 Measurement Guidance of License Digital Systems v03
- ♦ 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

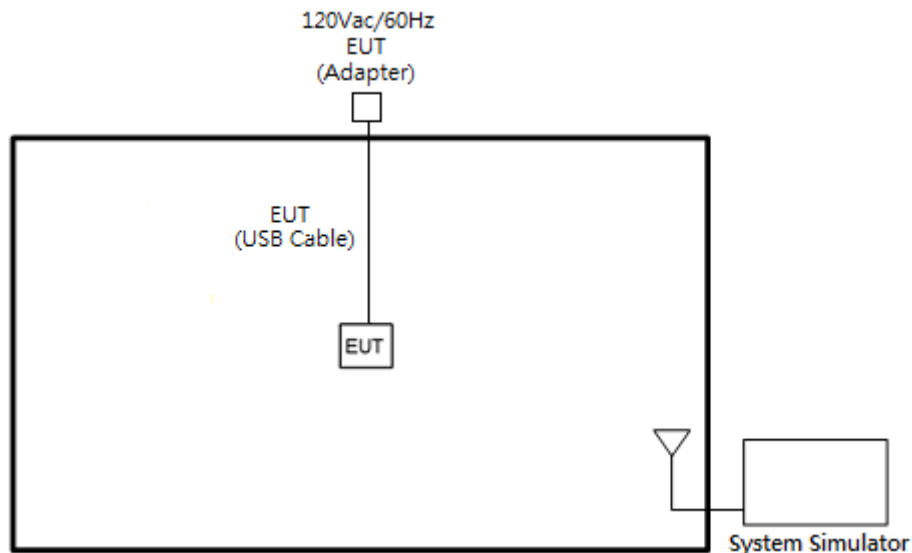
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03 with maximum output power.

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

Conducted Test Cases	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	14	-	-	v	v	-	-	v	v	v	v	v	v	v	v
26dB and 99% Bandwidth	14	-	-	v	v	-	-	v	v			v	v	v	v
Conducted Band Edge	14	-	-	v	v	-	-	v	v	v		v	v		v
Emission Mask	14	-	-	v	v	-	-	v	v	v		v	v	v	v
Conducted Spurious Emission	14	-	-	v	v	-	-	v	v	v			v	v	v
Frequency Stability	14	-	-		v	-	-	v				v		v	
E.R.P	14	-	-	v	v	-	-	v	v	v			v	v	v
Radiated Spurious Emission	14	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. 4. All the radiated test cases were performance with Adapter 1, C2Audio Cable 1, and USB Cable 1.														

2.2 Connection Diagram of Test System

<EUT with Adapter>



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.	Earphone	Motorola	SH38C16618	N/A	Unshielded, 1.2 m	N/A

2.4 Measurement Results Explanation Example

For all conducted test items:

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

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.5 dB and 10dB attenuator.

Example :

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\
 &= 4.5 + 10 = 14.5 \text{ (dB)}
 \end{aligned}$$

2.5 Frequency List of Low/Middle/High Channels

LTE Band 14 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	23330	-
	Frequency	-	793	-
5	Channel	23305	23330	23355
	Frequency	790.5	793	795.5

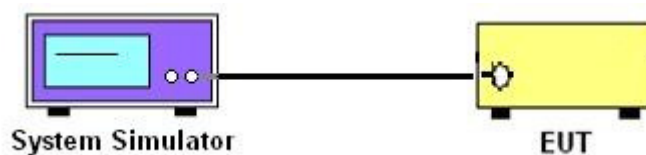
3 Conducted Test Items

3.1 Measuring Instruments

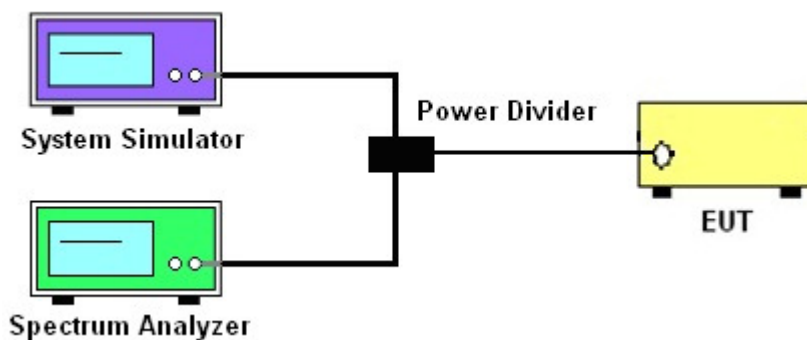
The measuring equipment is listed in the section 5 of this test report

3.2 Test Setup

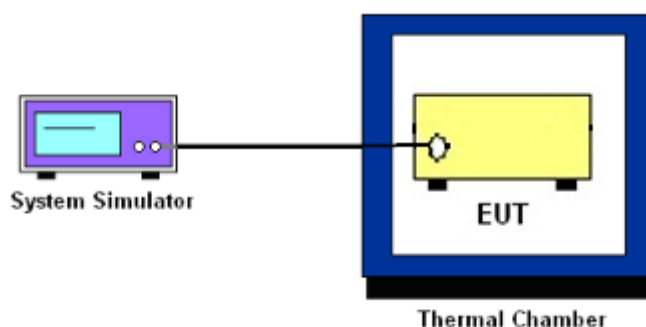
3.2.1 Conducted Output Power



3.2.2 Peak-to-Average Ratio, Occupied Bandwidth, Conducted Band-Edge, Emission Mask, 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 Measurement and ERP

3.4.1 Description of the Conducted Output Power Measurement and ERP 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 ERP of mobile transmitters must not exceed 3 Watts for LTE Band 14.

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

The testing follows FCC KDB 971168 v03 Section 5.7.1

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. 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

The testing follows FCC KDB 971168 v03 Section 4.2.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. 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.
3. 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.
4. Set the detection mode to peak, and the trace mode to max hold.
5. 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)
6. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
7. 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.
8. 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

90.543(e)

- (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.
- (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

3.7.2 Test Procedures

The testing follows FCC KDB 971168 v03 Section 6.0.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. Set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
5. Set spectrum analyzer with RMS detector.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. Checked that all the results comply with the emission limit line.

The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

3.8 Emission Mask

3.8.1 Description of Emissions Mask Measurement

Transmitters designed must meet the emission mask comply with the emission mask provisions of FCC Part 90.210(n).

3.8.2 Test Procedures

The testing follows FCC KDB 971168 v03 Section 6.0.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The power of the modulated signal was measured on a spectrum analyzer using an RMS and 10 second sweep time in order to maximize the level.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.9 Conducted Spurious Emission

3.9.1 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.

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

3.9.2 Test Procedures

The testing follows FCC KDB 971168 v03 Section 6.0.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. 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.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. Make the measurement with the spectrum analyzer's, for under 1GHz RBW = 100kHz, VBW = 300kHz and for above 1GHz RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

3.10 Frequency Stability Measurement

3.10.1 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 ± 1.25 ppm of the center frequency.

3.10.2 Test Procedures for Temperature Variation

The testing follows FCC KDB 971168 v03 Section 9.0.

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

3.10.3 Test Procedures for Voltage Variation

The testing follows FCC KDB 971168 v03 Section 9.0.

1. The EUT was placed in a temperature chamber at $20 \pm 5^{\circ}\text{C}$ and connected with the system simulator.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

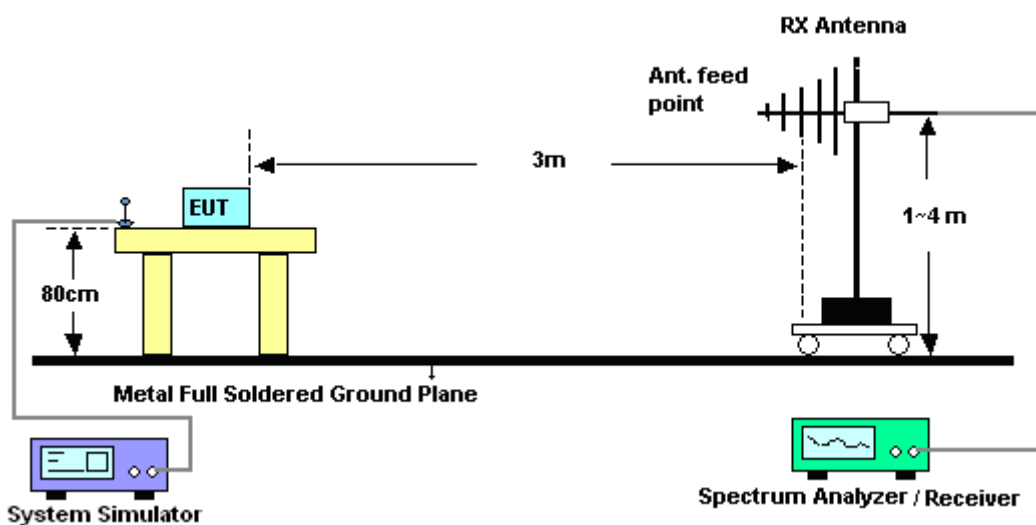
4 Radiated Test Items

4.1 Measuring Instruments

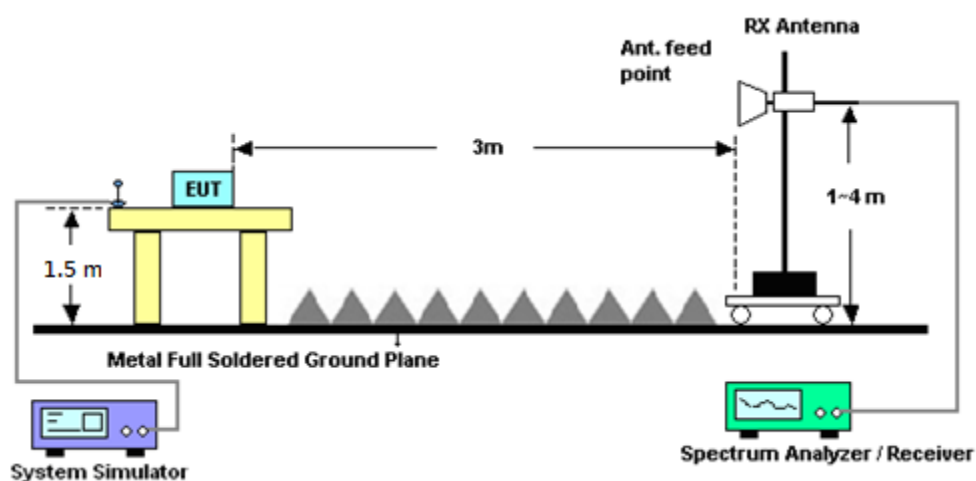
See list of measuring instruments of this test report.

4.2 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Radiated Spurious Emission Measurement

4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E. 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 operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

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

4.4.2 Test Procedures

The testing follows FCC KDB 971168 v03 Section 5.8 and ANSI / TIA-603-E Section 2.2.12.

1. 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.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. 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.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from $43 + 10\log(P)$ 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
LTE Base Station	Anritsu	MT8820C	6201432821	GSM/GPRS /WCDMA/LTE	Oct. 13, 2017	Jan. 18, 2018~ Mar. 02, 2018	Oct. 12, 2018	Conducted (TH05-HY)
Base Station(Measure)	Anritsu	MT8821C	6201664755	GSM / GPRS /WCDMA / LTE FDD/TDD with 44) /LTE-3	Mar. 23, 2017	Jan. 18, 2018~ Mar. 02, 2018	Mar. 22, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101397	10Hz~40GHz	Nov. 09, 2017	Jan. 18, 2018~ Mar. 02, 2018	Nov. 08, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	100895	9kHz~30GHz	Apr. 25, 2017	Jan. 18, 2018~ Mar. 02, 2018	Apr. 24, 2018	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-30℃~70℃	Aug. 28, 2017	Jan. 18, 2018~ Mar. 02, 2018	Aug. 27, 2018	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V~20V 0.5A~5A	Oct. 06, 2017	Jan. 18, 2018~ Mar. 02, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	Feb. 16, 2018~ Mar. 02, 2018	Jul. 17, 2018	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 21, 2016	Feb. 16, 2018~ Mar. 02, 2018	Dec. 20, 2018	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	40103&07	30MHz to 1GHz	Jan. 10, 2018	Feb. 16, 2018~ Mar. 02, 2018	Jan. 09, 2019	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Jun. 15, 2017	Feb. 16, 2018~ Mar. 02, 2018	Jun. 14, 2018	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 22, 2017	Feb. 16, 2018~ Mar. 02, 2018	May 21, 2018	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Feb. 02, 2018	Feb. 16, 2018~ Mar. 02, 2018	Feb. 01, 2019	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 15, 2017	Feb. 16, 2018~ Mar. 02, 2018	Mar. 14, 2018	Radiation (03CH13-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Feb. 16, 2018~ Mar. 02, 2018	N/A	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Feb. 16, 2018~ Mar. 02, 2018	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Feb. 16, 2018~ Mar. 02, 2018	N/A	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz- 40GHz	Nov. 10, 2017	Feb. 16, 2018~ Mar. 02, 2018	Nov. 09, 2018	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 27, 2017	Feb. 16, 2018~ Mar. 02, 2018	Nov. 26, 2018	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1G~18GHz	Mar. 17, 2017	Feb. 16, 2018~ Mar. 02, 2018	Mar. 16, 2018	Radiation (03CH13-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	May 22, 2017	Feb. 16, 2018~ Mar. 02, 2018	May 21, 2018	Radiation (03CH13-HY)

6 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.07
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.48
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.92
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Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

LTE Band 14 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	-	22.71	-
10	1	25		-	22.56	-
10	1	49		-	22.47	-
10	25	0		-	21.67	-
10	25	12		-	21.60	-
10	25	25		-	21.57	-
10	50	0		-	21.60	-
10	1	0	16-QAM	-	22.06	-
10	1	25		-	21.90	-
10	1	49		-	21.79	-
10	25	0		-	20.71	-
10	25	12		-	20.71	-
10	25	25		-	20.68	-
10	50	0		-	20.71	-
10	1	0	64-QAM	-	21.01	-
10	1	25		-	20.83	-
10	1	49		-	20.76	-
10	25	0		-	19.74	-
10	25	12		-	19.74	-
10	25	25		-	19.64	-
10	50	0		-	19.74	-
5	1	0	QPSK	22.70	22.61	22.55
5	1	12		22.56	22.52	22.47
5	1	24		22.54	22.49	22.44
5	12	0		21.74	21.61	21.58
5	12	7		21.65	21.62	21.54
5	12	13		21.60	21.53	21.51
5	25	0		21.58	21.57	21.50
5	1	0	16-QAM	22.00	21.91	21.85
5	1	12		21.88	21.85	21.82
5	1	24		21.87	21.81	21.74
5	12	0		20.83	20.70	20.69
5	12	7		20.75	20.69	20.66
5	12	13		20.68	20.67	20.62
5	25	0		20.71	20.67	20.60
5	1	0	64-QAM	20.97	20.86	20.80
5	1	12		20.81	20.79	20.74
5	1	24		20.80	20.76	20.70
5	12	0		19.86	19.76	19.69
5	12	7		19.78	19.75	19.71
5	12	13		19.72	19.69	19.63
5	25	0		19.72	19.66	19.63

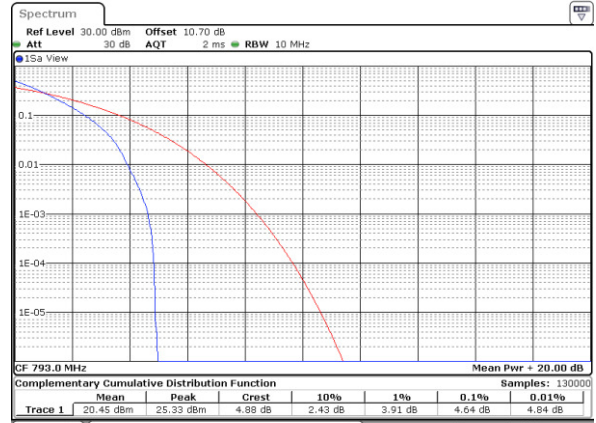
LTE Band 14

Peak-to-Average Ratio

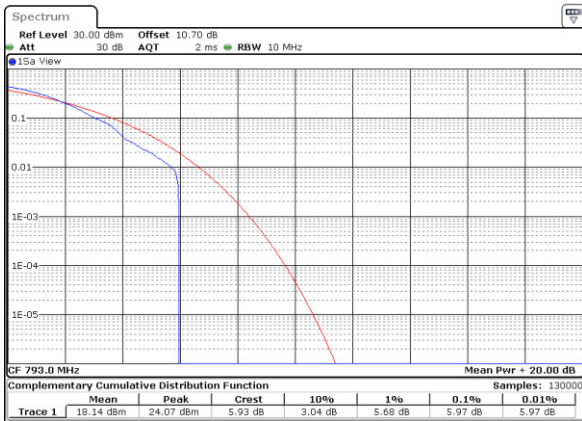
Mode	LTE Band 14 / 10MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	Full RB	Result
Lowest CH	-	-	-	-	PASS
Middle CH	5.83	4.64	5.97	5.88	
Highest CH	-	-	-	-	
Mode	LTE Band 14 / 10MHz				
Mod.	64QAM				Limit: 13dB
RB Size	1RB	Full RB			Result
Lowest CH	-	-	-	-	PASS
Middle CH	5.80	6.46	-	-	
Highest CH	-	-	-	-	

LTE Band 14 / 10MHz / QPSK
Middle Channel / 1RB

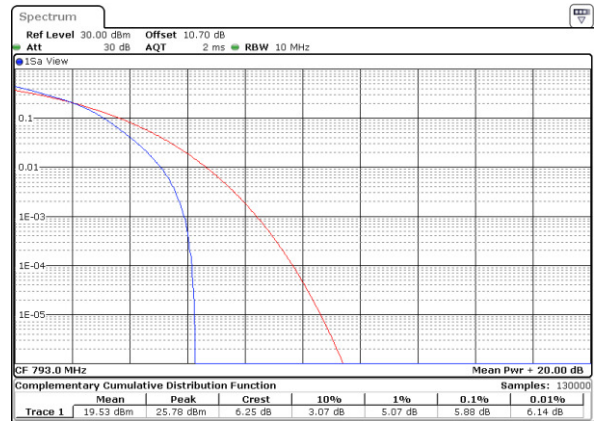

Date: 18 FEB 2018 19:30:28

Middle Channel / Full RB


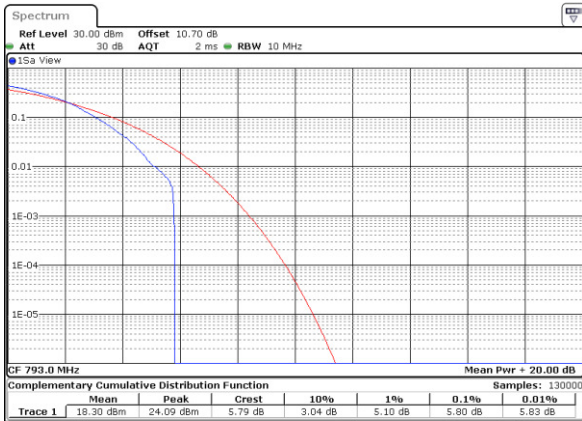
Date: 18 FEB 2018 19:09:20

LTE Band 14 / 20MHz / 16QAM
Middle Channel / 1RB


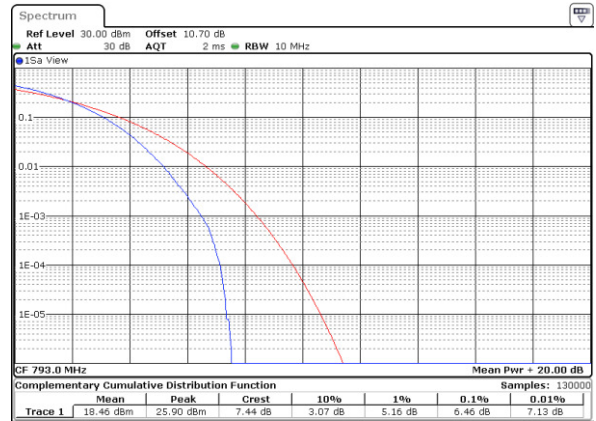
Date: 18 FEB 2018 19:30:14

Middle Channel / Full RB


Date: 18 FEB 2018 19:06:03

LTE Band 14 / 20MHz / 64QAM
Middle Channel / 1RB


Date: 18 FEB 2018 19:30:54

Middle Channel / Full RB


Date: 18 FEB 2018 19:04:25

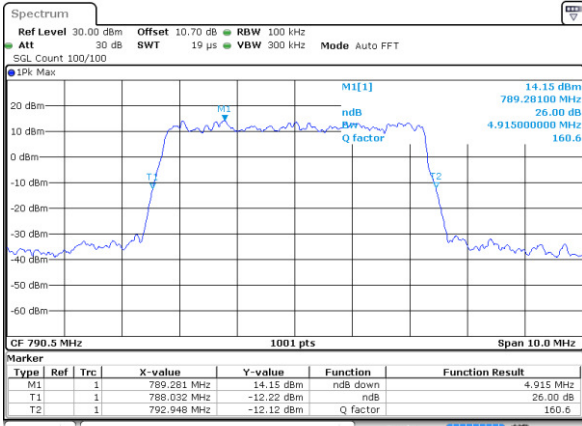
**26dB Bandwidth**

Mode	LTE Band 14 : 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	-	-	-	-	4.92	4.94	-	-	-	-	-	-
Middle CH	-	-	-	-	4.94	4.90	9.95	9.89	-	-	-	-
Highest CH	-	-	-	-	4.87	4.92	-	-	-	-	-	-
Mode	LTE Band 14 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	64QAM		64QAM		64QAM		64QAM		64QAM		64QAM	
Lowest CH	-	-	-	-	4.93	-	-	-		-		-
Middle CH	-	-	-	-	4.89	-	9.81	-		-		-
Highest CH	-	-	-	-	4.91	-	-	-		-		-



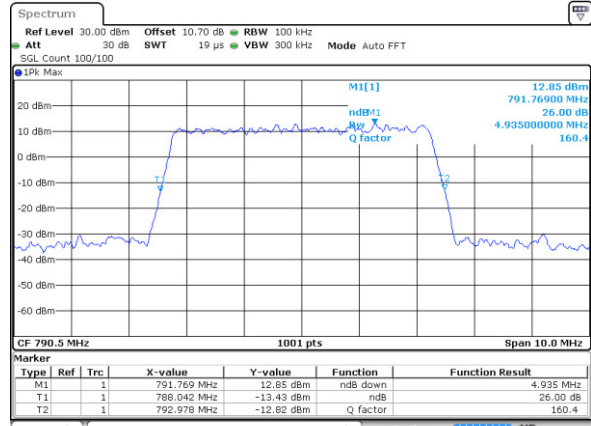
LTE Band 14

Lowest Channel / 5MHz / QPSK



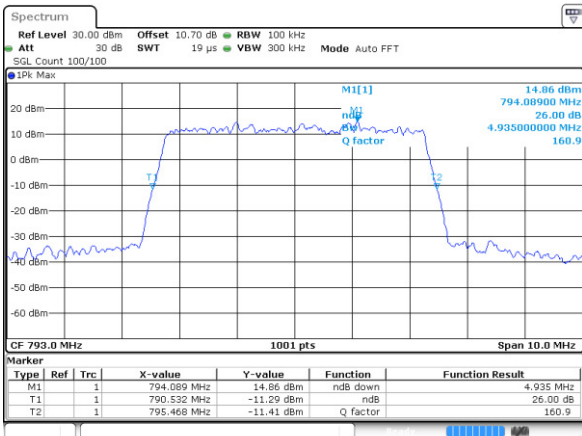
Date: 18 FEB 2018 17:04:22

Lowest Channel / 5MHz / 16QAM



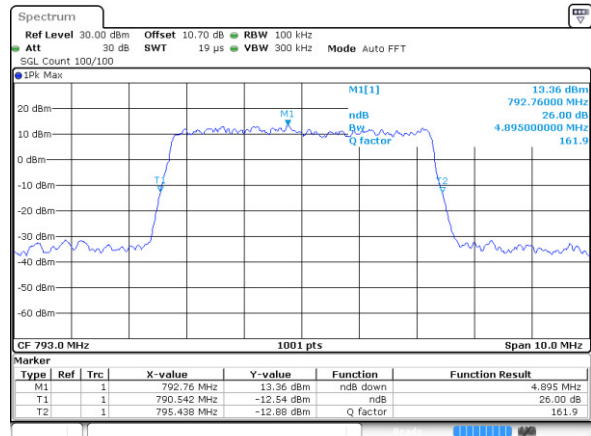
Date: 18 FEB 2018 17:09:51

Middle Channel / 5MHz / QPSK



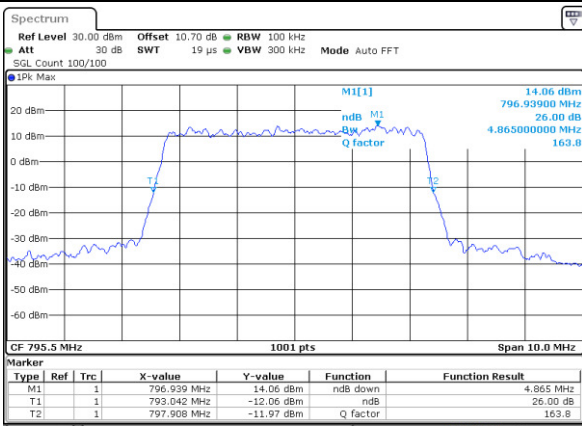
Date: 18 FEB 2018 18:33:16

Middle Channel / 5MHz / 16QAM



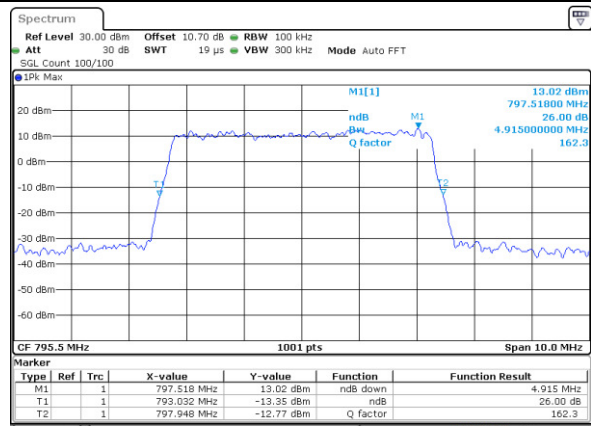
Date: 18 FEB 2018 18:25:20

Highest Channel / 5MHz / QPSK



Date: 18 FEB 2018 18:46:00

Highest Channel / 5MHz / 16QAM

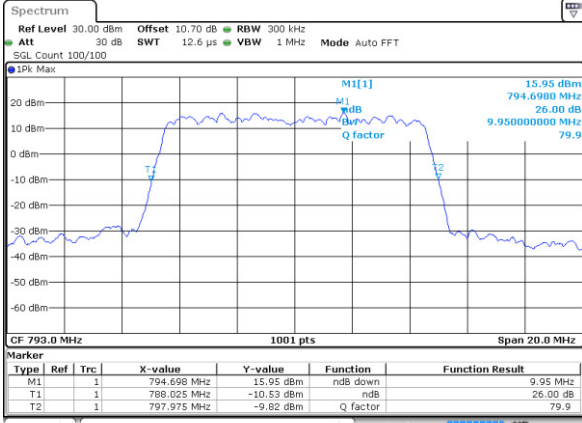


Date: 18 FEB 2018 18:45:20



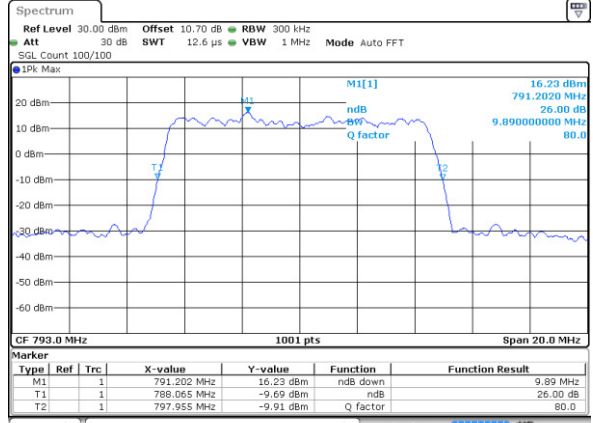
LTE Band 14

Middle Channel / 10MHz / QPSK



Date: 18 FEB 2018 19:09:08

Middle Channel / 10MHz / 16QAM

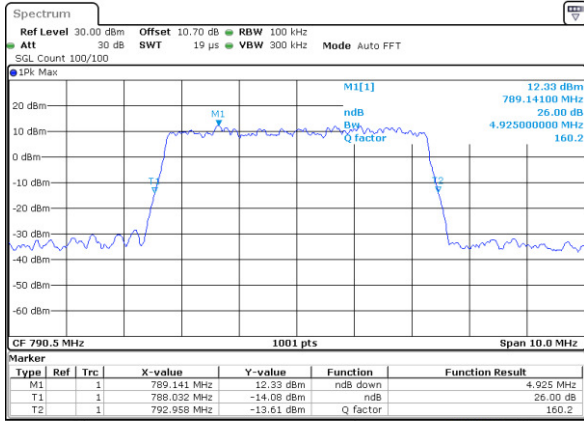


Date: 18 FEB 2018 19:05:25



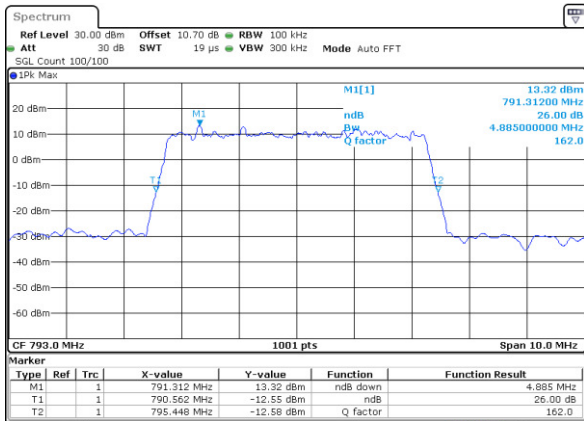
LTE Band 14

Lowest Channel / 5MHz / 64QAM



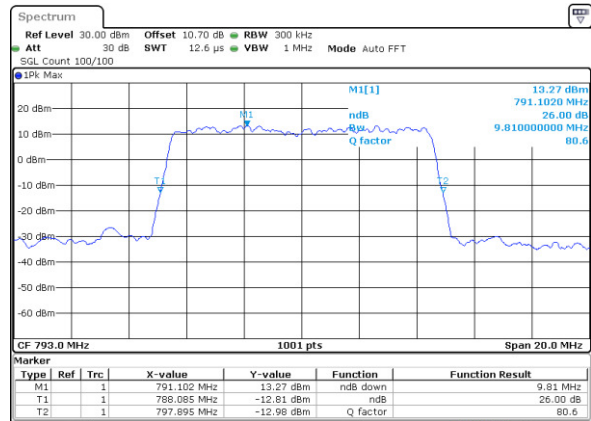
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Middle Channel / 5MHz / 64QAM



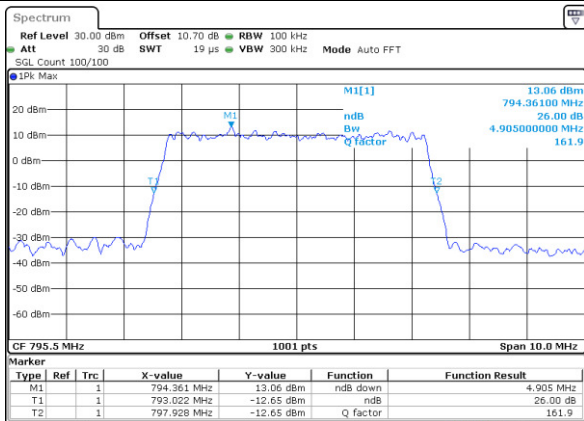
Date: 18 FEB 2018 18:24:59

Middle Channel / 10MHz / 64QAM



Date: 18 FEB 2018 19:02:17

Highest Channel / 5MHz / 64QAM



Date: 18 FEB 2018 18:46:55

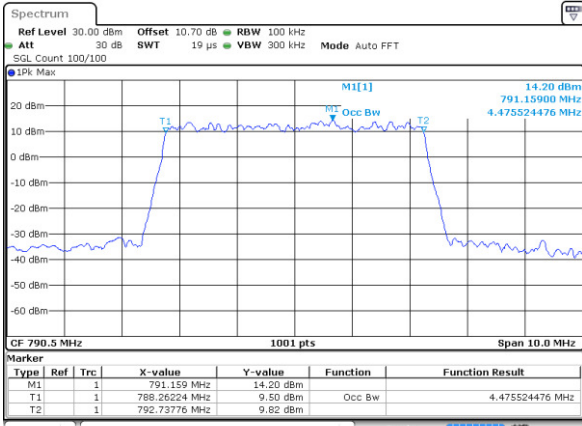
**Occupied Bandwidth**

Mode	LTE Band 14 : 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	4.5	-	-	-	-	-	-
Middle CH	-	-	-	-	4.51	4.51	9.01	9.03	-	-	-	-
Highest CH	-	-	-	-	4.48	4.48	-	-	-	-	-	-
Mode	LTE Band 14 : 99%OBW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	64QAM		64QAM		64QAM		64QAM		64QAM		64QAM	
Lowest CH	-	-	-	-	4.48	-	-	-		-		-
Middle CH	-	-	-	-	4.50	-	9.03	-		-		-
Highest CH	-	-	-	-	4.51	-	-	-		-		-



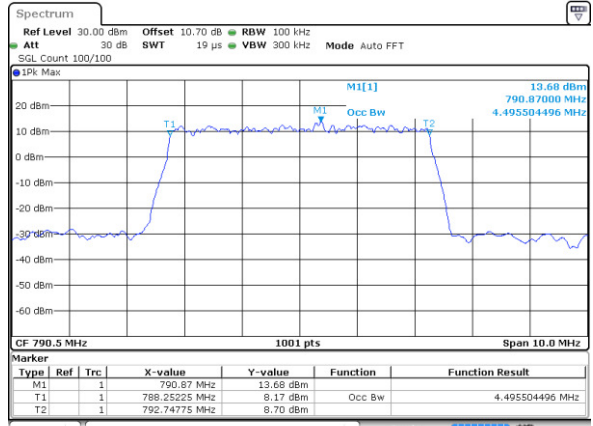
LTE Band 14

Lowest Channel / 5MHz / QPSK



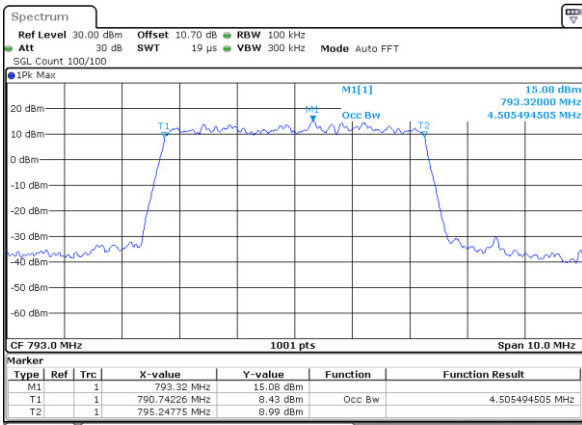
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Lowest Channel / 5MHz / 16QAM



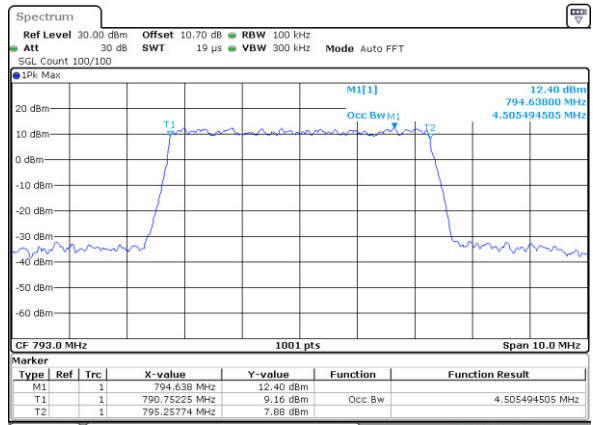
Date: 18 FEB 2018 17:09:30

Middle Channel / 5MHz / QPSK



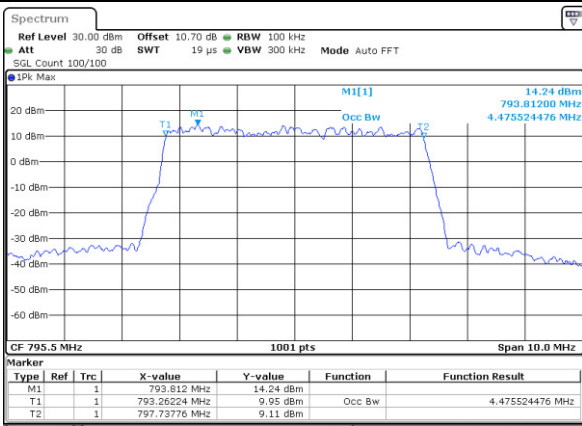
Date: 18 FEB 2018 18:33:02

Middle Channel / 5MHz / 16QAM



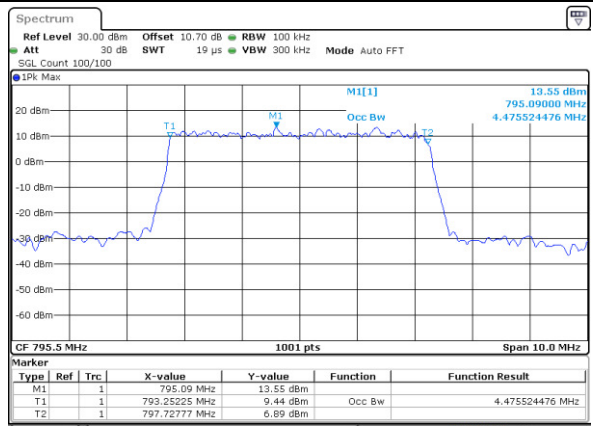
Date: 18 FEB 2018 18:25:12

Highest Channel / 5MHz / QPSK



Date: 18 FEB 2018 18:45:42

Highest Channel / 5MHz / 16QAM

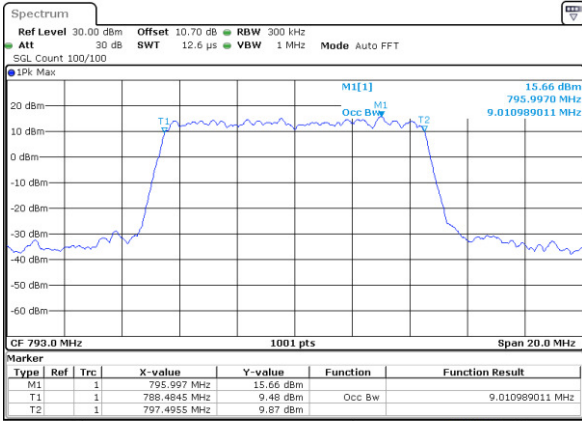


Date: 18 FEB 2018 18:45:29



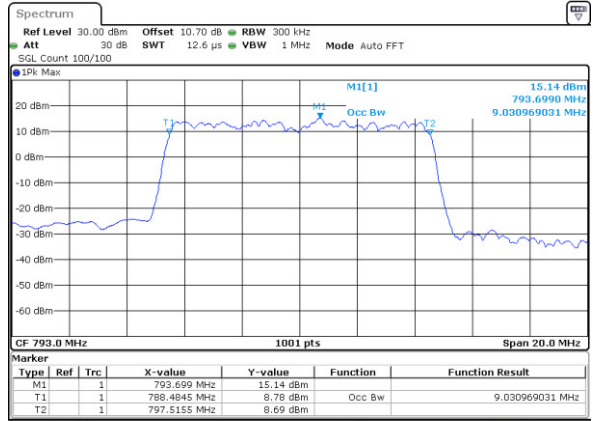
LTE Band 14

Middle Channel / 10MHz / QPSK



Date: 18 FEB 2018 19:08:57

Middle Channel / 10MHz / 16QAM

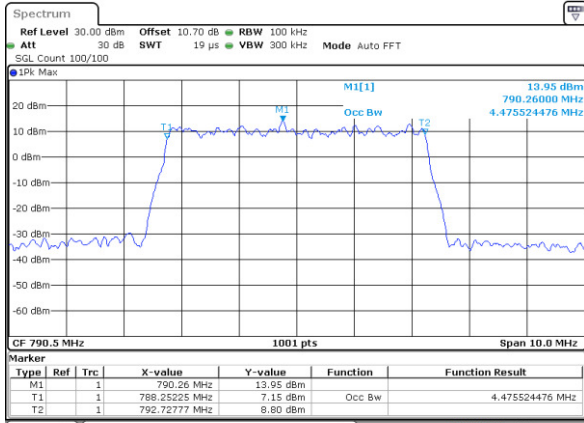


Date: 18 FEB 2018 19:05:13



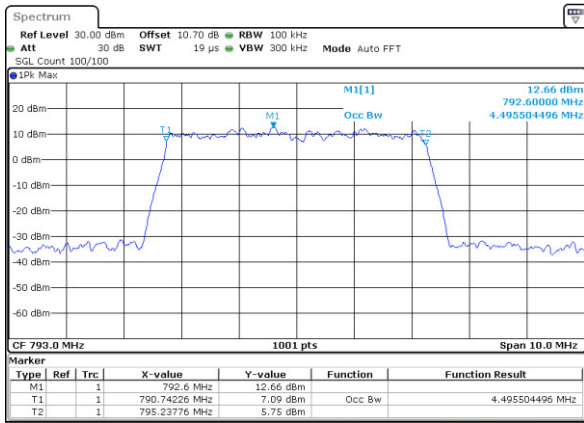
LTE Band 14

Lowest Channel / 5MHz / 64QAM



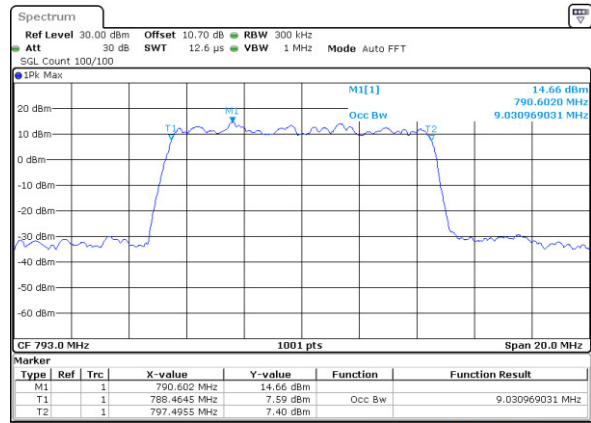
Date: 18 FEB 2018 17:19:59

Middle Channel / 5MHz / 64QAM



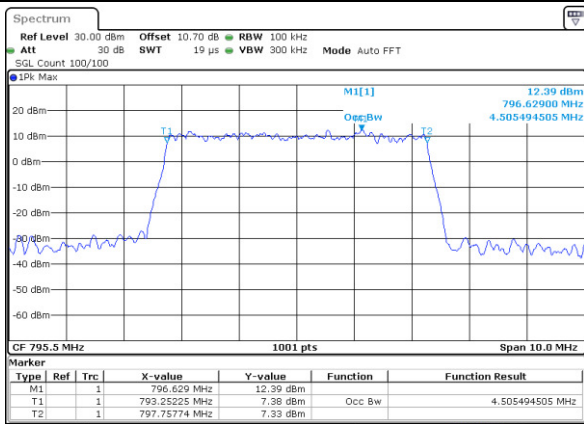
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Middle Channel / 10MHz / 64QAM

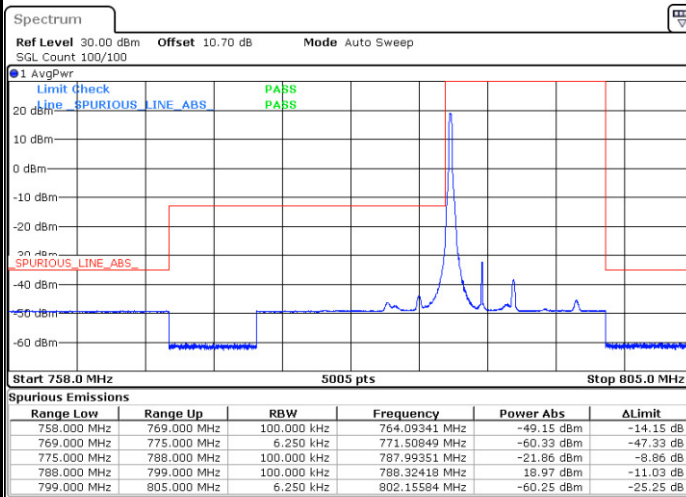
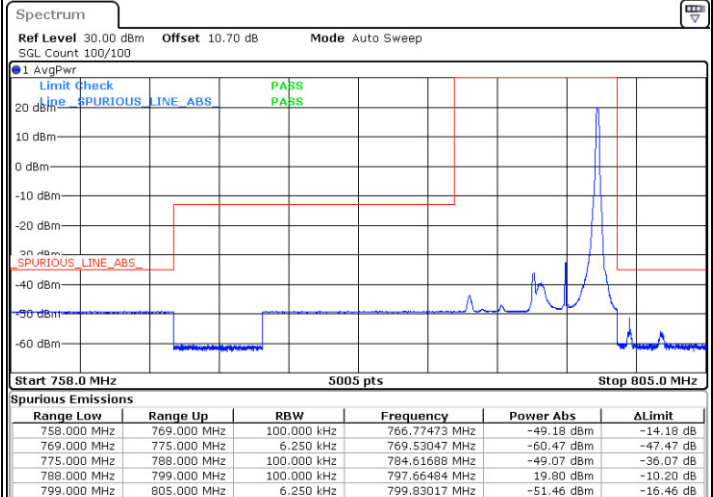
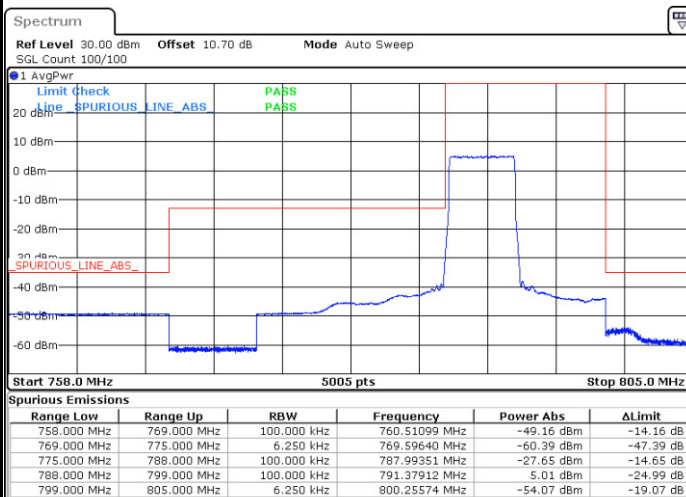
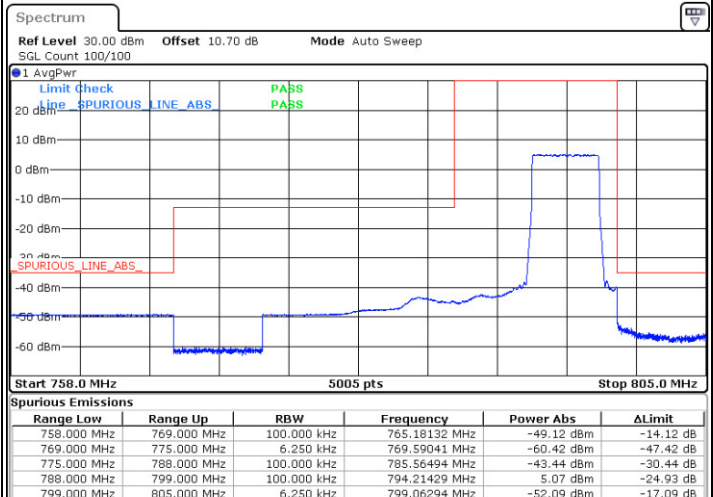


Date: 18 FEB 2018 19:02:08

Highest Channel / 5MHz / 64QAM



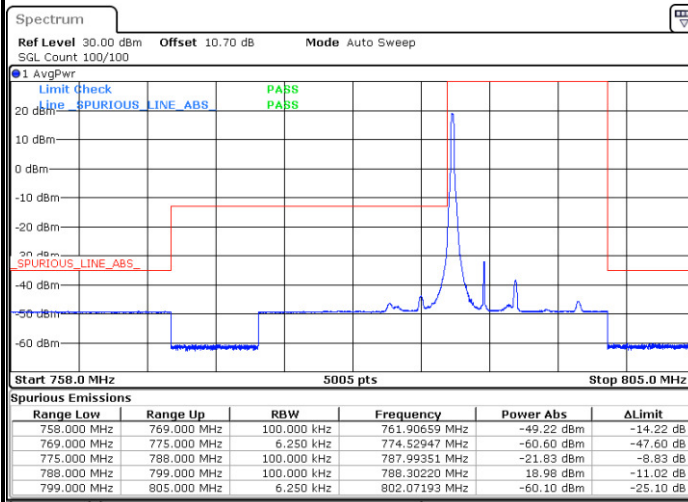
Date: 18 FEB 2018 18:46:43

**Conducted Band Edge****LTE Band 14 / 5MHz / QPSK****Lowest Band Edge / 1 RB****Highest Band Edge / 1 RB****Lowest Band Edge / Full RB****Highest Band Edge / Full RB**



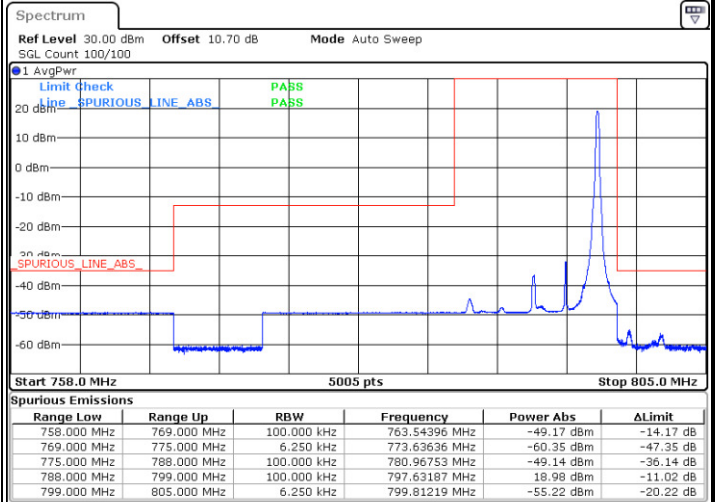
LTE Band 14 / 5MHz / 16QAM

Lowest Band Edge / 1 RB



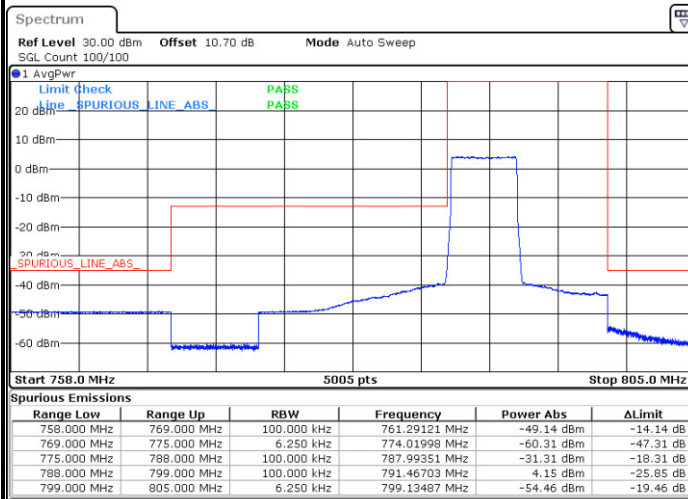
Date: 18.FEB.2018 18:10:41

Highest Band Edge / 1 RB



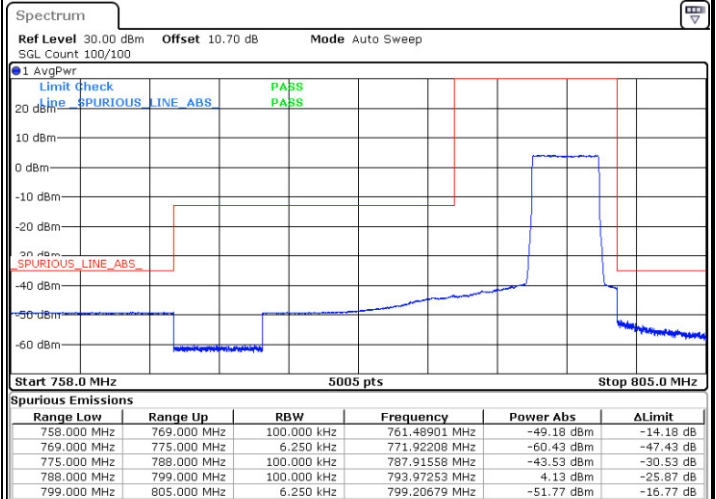
Date: 18.FEB.2018 18:55:23

Lowest Band Edge / Full RB



Date: 18.FEB.2018 17:12:33

Highest Band Edge / Full RB

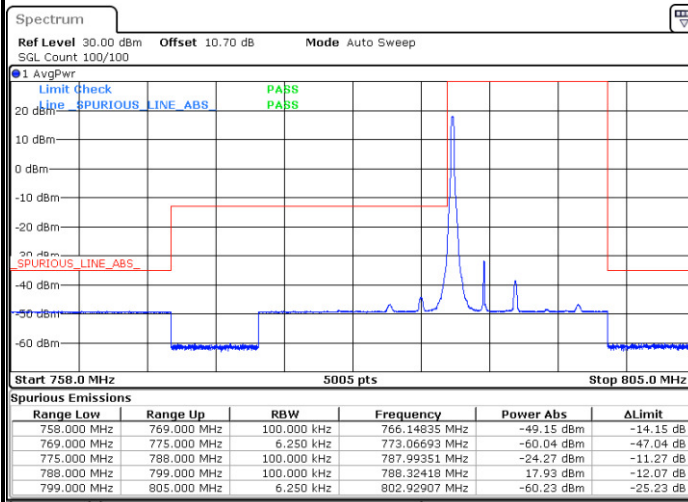


Date: 18.FEB.2018 18:39:57



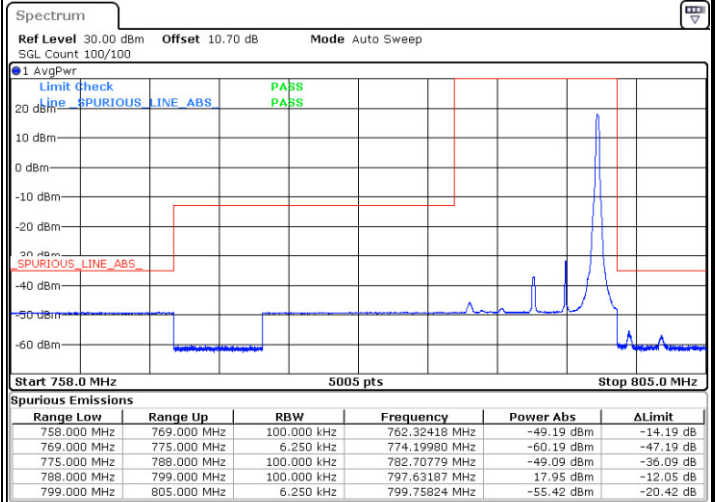
LTE Band 14 / 5MHz / 64QAM

Lowest Band Edge / 1RB



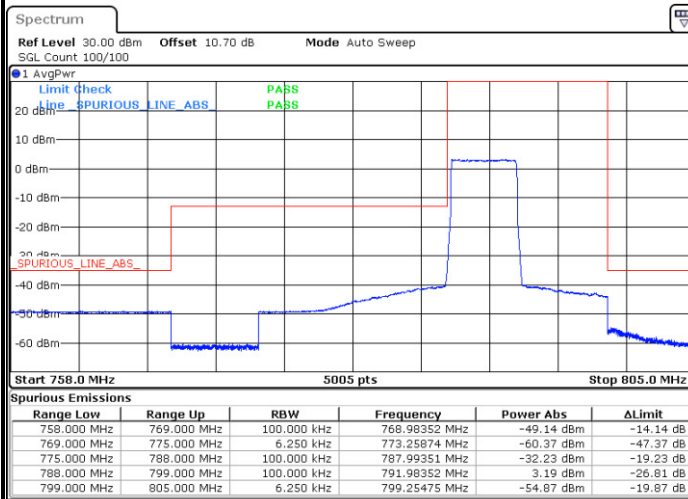
Date: 18.FEB.2018 18:05:59

Highest Band Edge / 1 RB



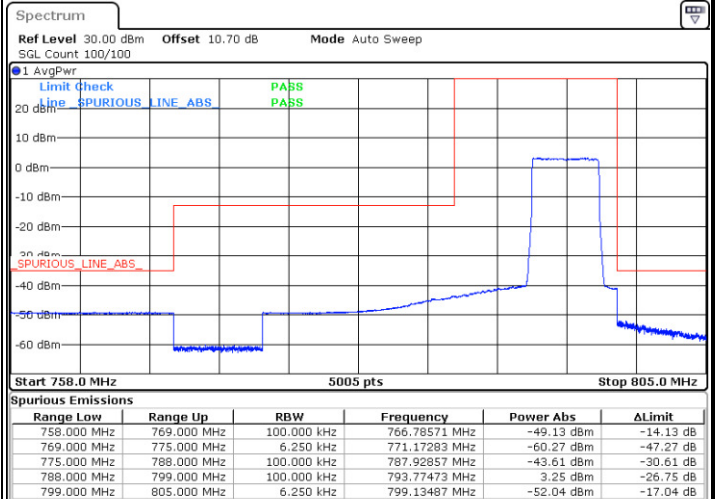
Date: 18.FEB.2018 19:00:39

Lowest Band Edge / Full RB



Date: 18.FEB.2018 17:19:11

Highest Band Edge / Full RB

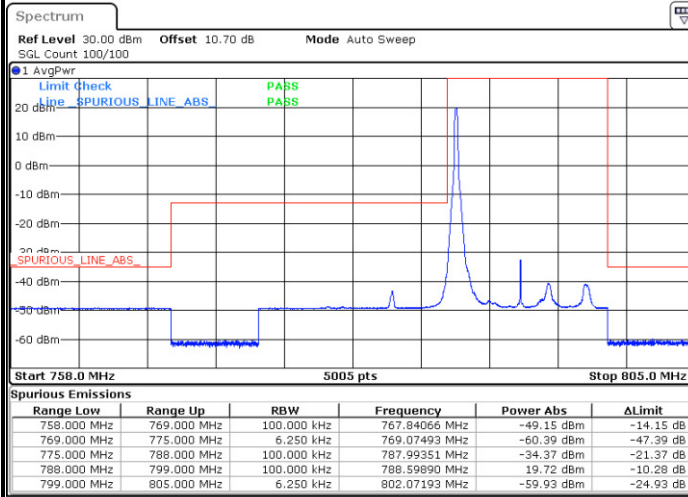


Date: 18.FEB.2018 18:49:21



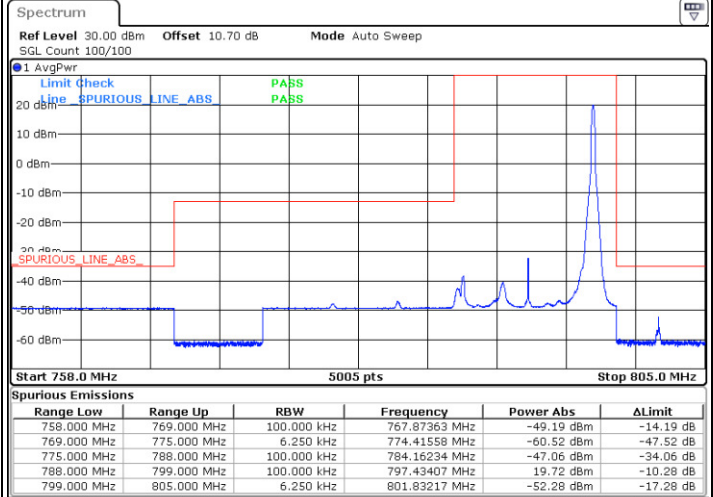
LTE Band 14 / 10MHz / QPSK

Lowest Band Edge / 1 RB



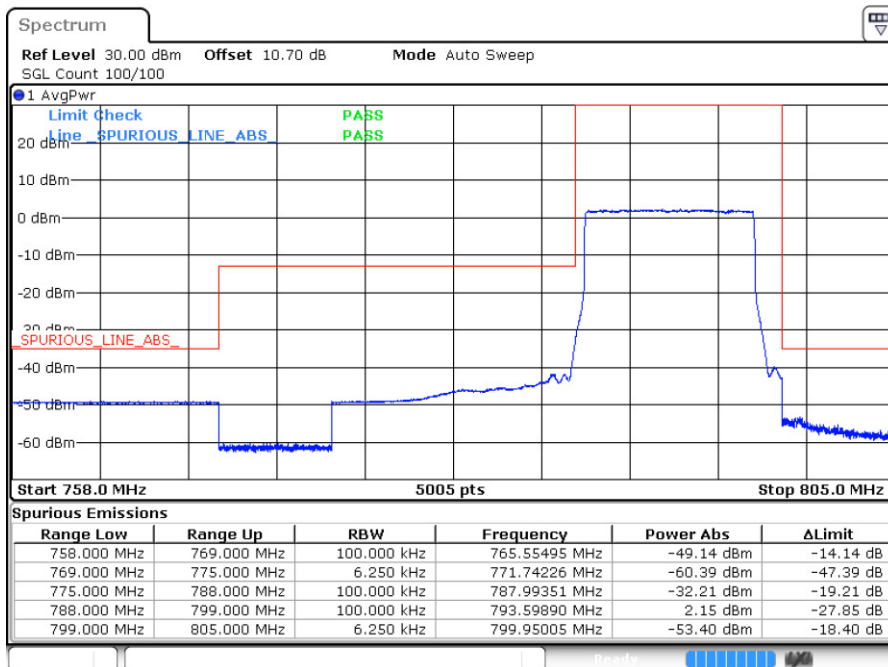
Date: 18.FEB.2018 19:14:10

Highest Band Edge / 1 RB



Date: 18.FEB.2018 19:36:27

Band Edge / Full RB

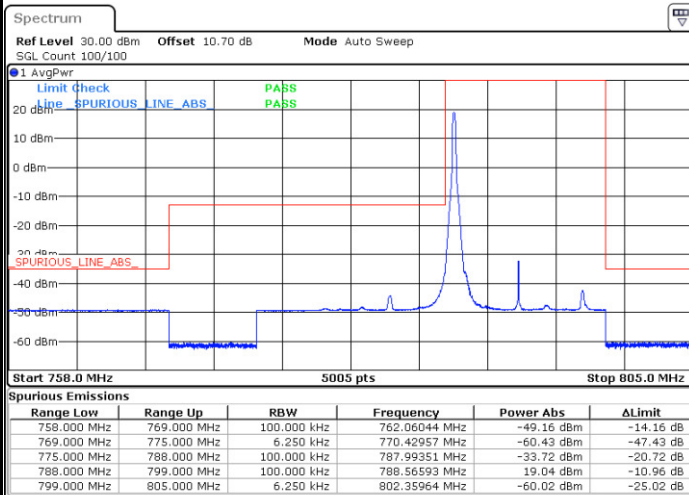


Date: 18.FEB.2018 19:11:38



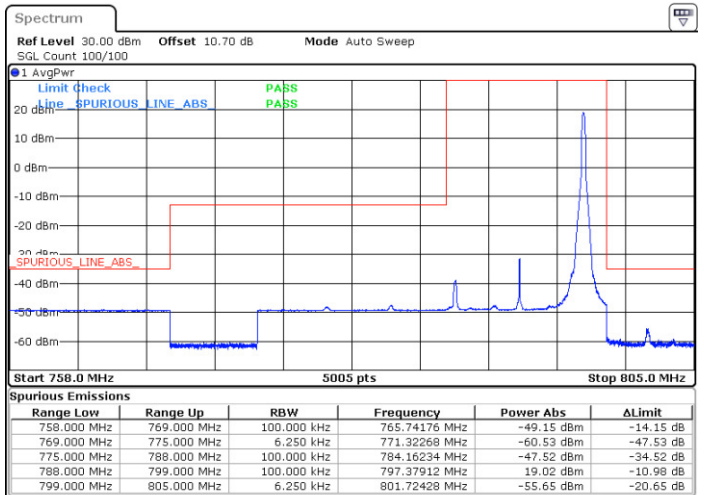
LTE Band 14 / 10MHz / 16QAM

Lowest Band Edge / 1 RB



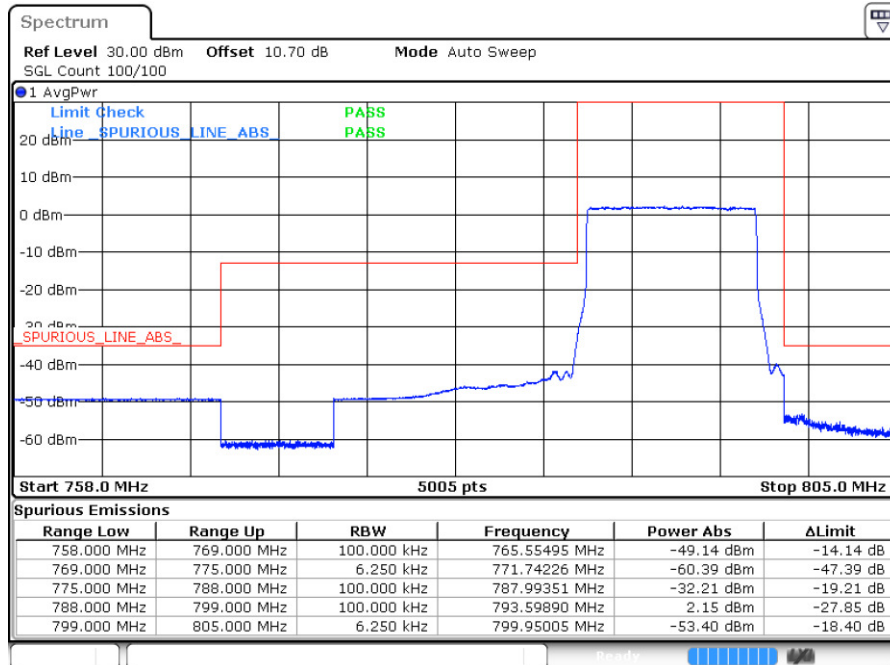
Date: 18.FEB.2018 19:39:35

Highest Band Edge / 1 RB



Date: 18.FEB.2018 19:34:57

Band Edge / Full RB

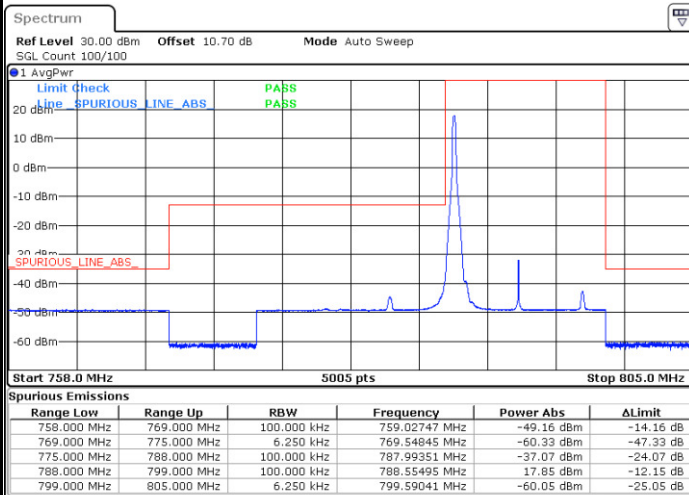


Date: 18.FEB.2018 19:11:38



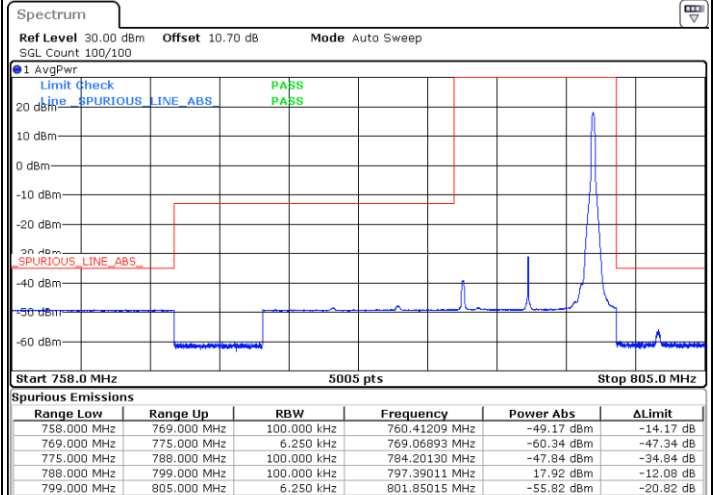
LTE Band 14 / 10MHz / 64QAM

Lowest Band Edge / 1 RB



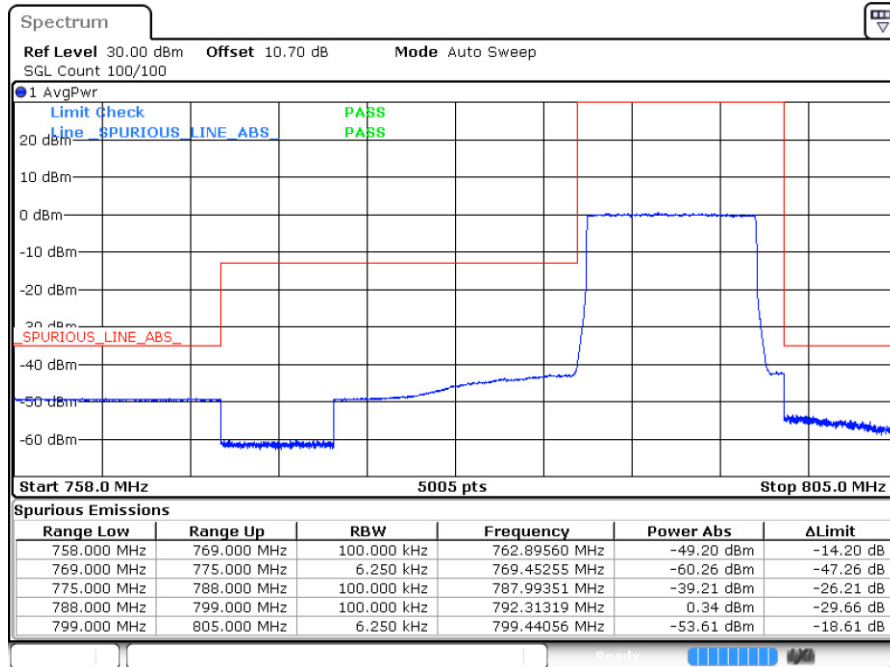
Date: 18.FEB.2018 19:26:26

Highest Band Edge / 1 RB



Date: 18.FEB.2018 19:33:09

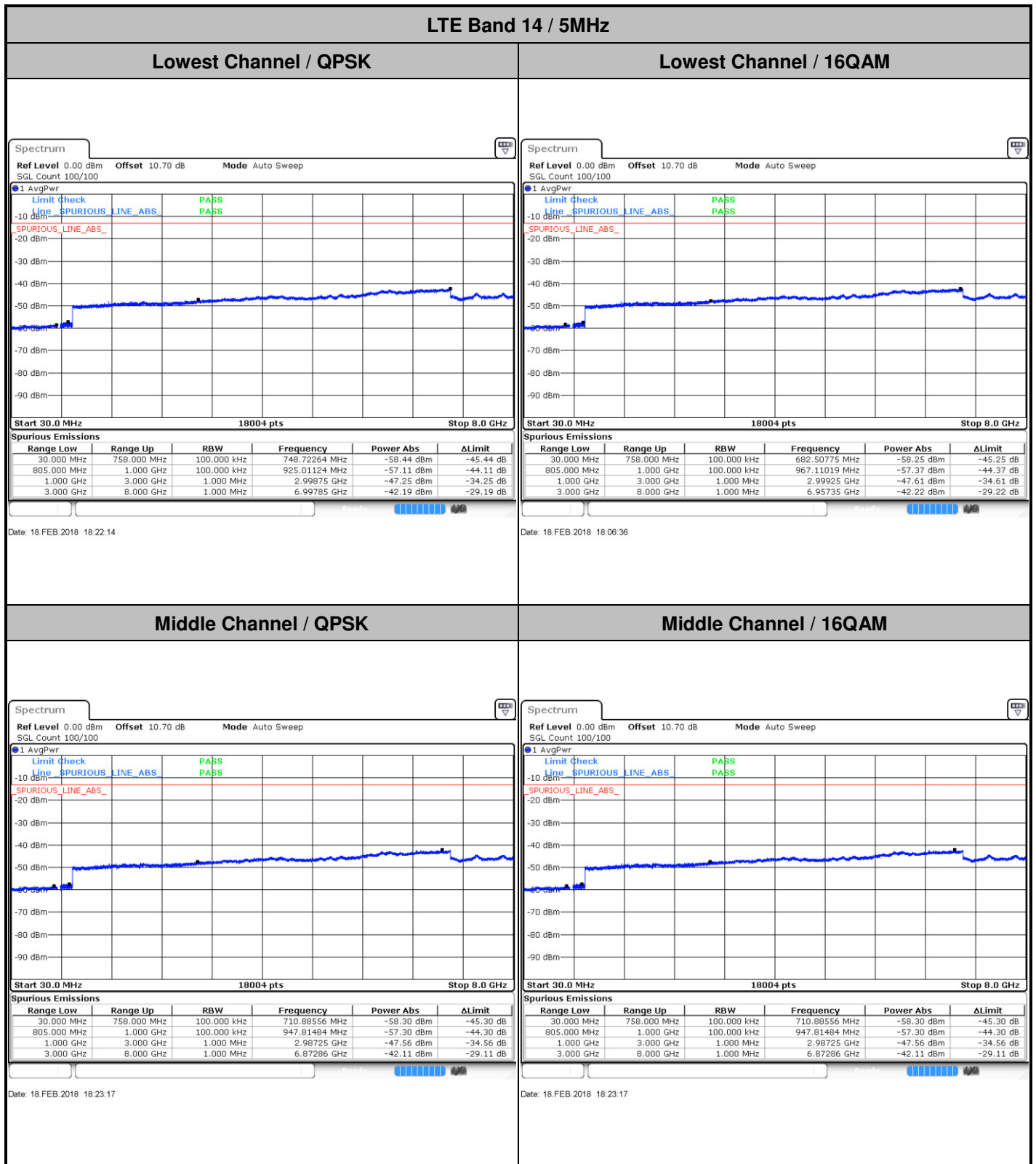
Band Edge / Full RB



Date: 18.FEB.2018 19:03:50



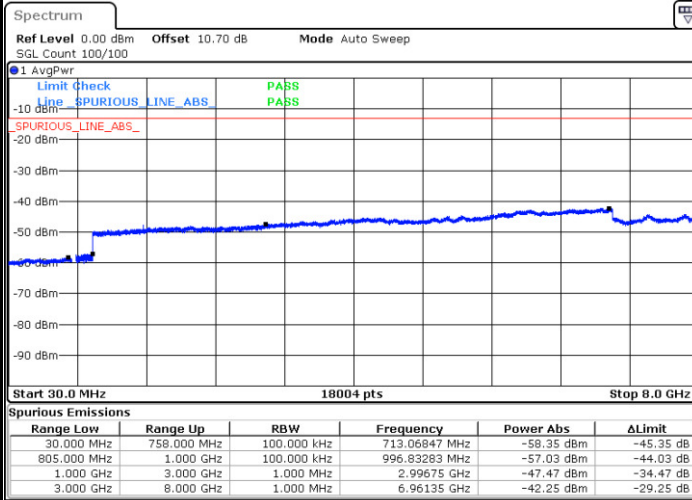
Conducted Spurious Emission





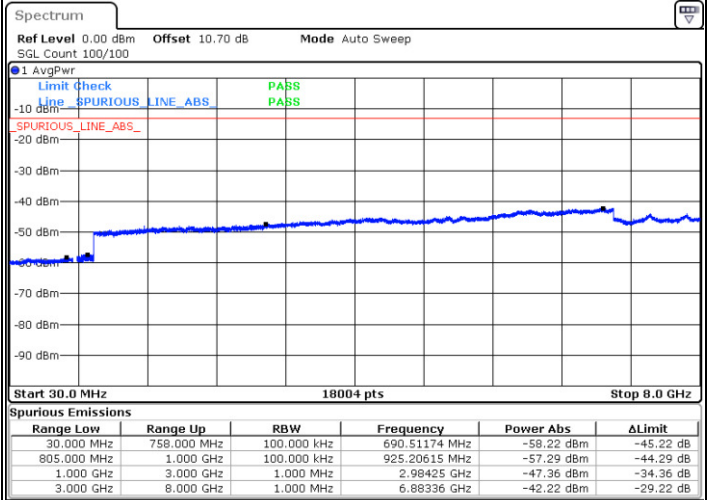
LTE Band 14 / 5MHz

Highest Channel / QPSK



Date: 18 FEB 2018 18:51:38

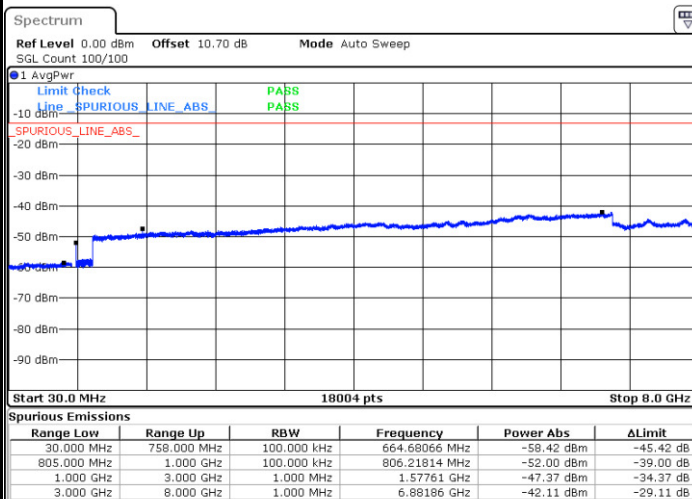
Highest Channel / 16QAM



Date: 18 FEB 2018 18:51:03

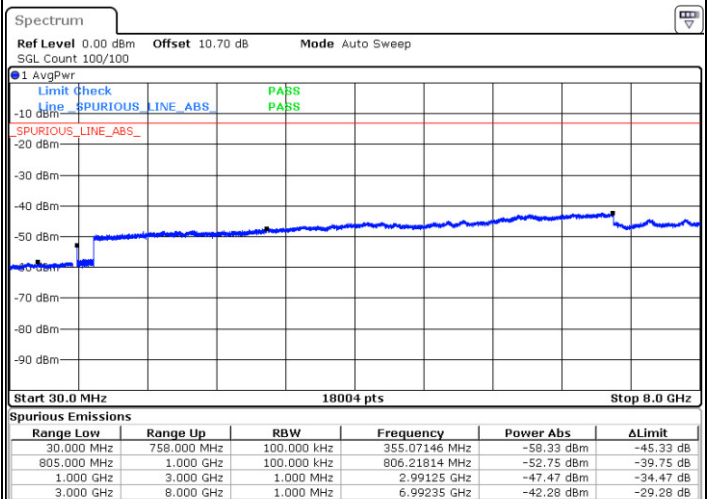
LTE Band 14 / 10MHz

Middle Channel / QPSK



Date: 18 FEB 2018 19:14:29

Middle Channel / 16QAM



Date: 18 FEB 2018 19:15:03

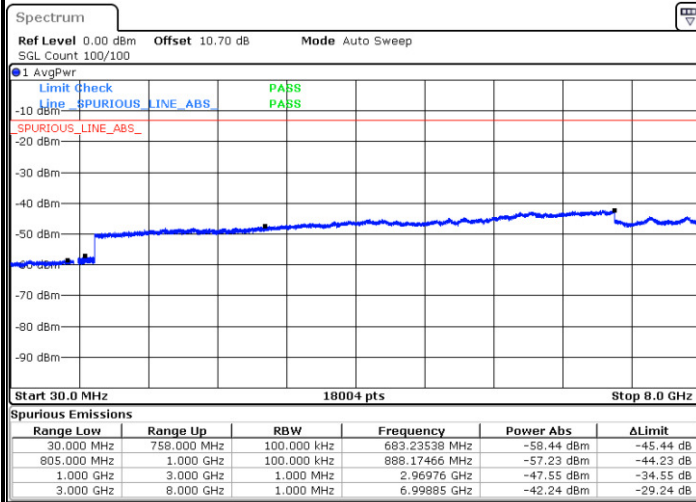
Highest Channel / QPSK

Highest Channel / 16QAM



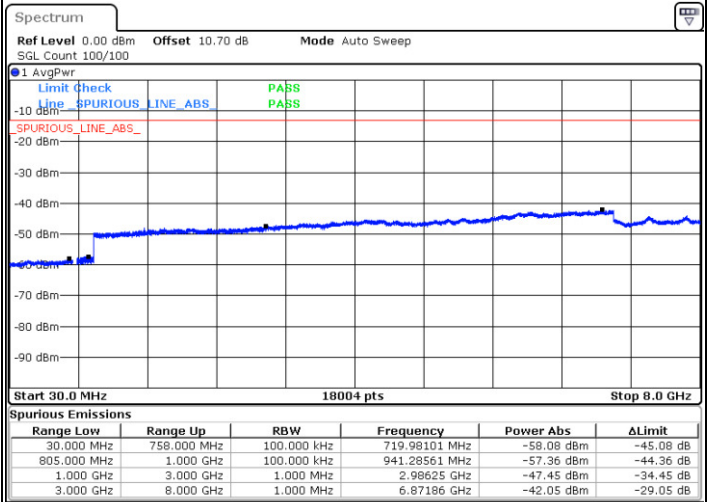
LTE Band 14 / 5MHz

Lowest Channel / 64QAM



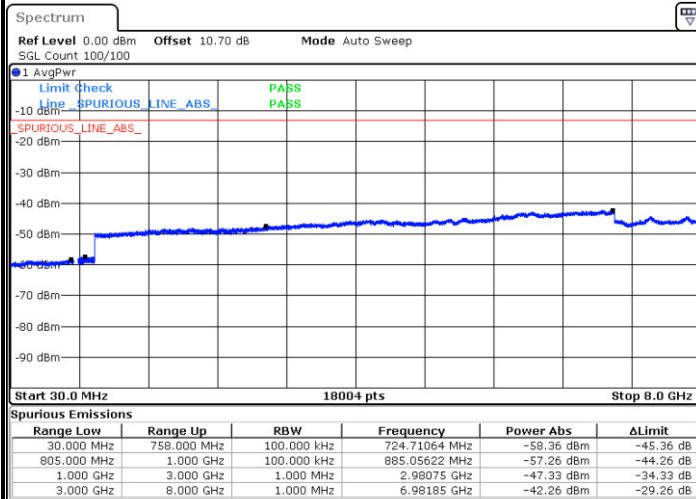
Date: 18 FEB 2018 17:54:53

Middle Channel / 64QAM



Date: 18 FEB 2018 18:24:13

Highest Channel / 64QAM

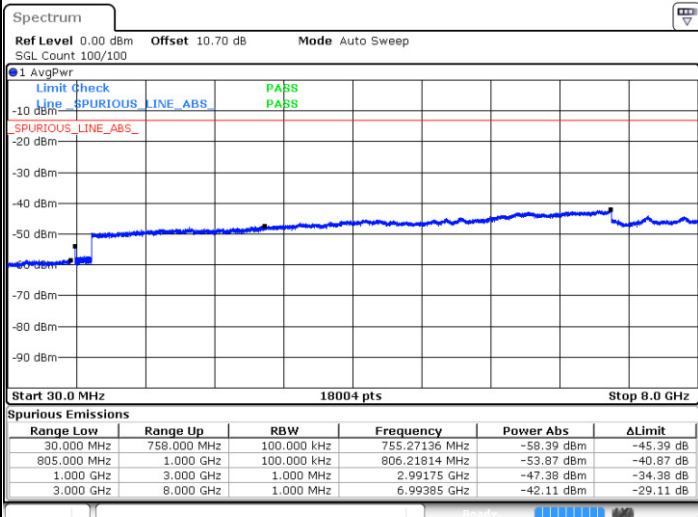


Date: 18 FEB 2018 18:50:42



LTE Band 14 / 10MHz

Middle Channel / 64QAM



Date: 18 FEB 2018 19:27:23

Frequency Stability

Test Conditions		LTE Band 14 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 10MHz	Note 2.
		Deviation (ppm)	Result
50	Normal Voltage	0.0050	PASS
40	Normal Voltage	0.0038	
30	Normal Voltage	0.0010	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0005	
0	Normal Voltage	0.0052	
-10	Normal Voltage	0.0038	
-20	Normal Voltage	0.0013	
-30	Normal Voltage	0.0029	
20	Maximum Voltage	0.0038	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0061	

Note:

1. Normal Voltage =3.8 V. ; Battery End Point (BEP) =3.6 V. ; Maximum Voltage =4.4 V.
2. The frequency fundamental emissions stay within the authorized frequency block.



Appendix B. Test Results of ERP and Radiated Test

ERP

LTE Band 14 / 5MHz (Average) (GT - LC = -5.3 dB)							
Channel	Mode	RB		Conducted		ERP	
		Size	Offset	Power (dBm)	Power (Watts)	ERP(dBm)	ERP(W)
Lowest	QPSK	1	0	22.70	0.1862	15.25	0.0335
Middle		1	0	22.61	0.1824	15.16	0.0328
Highest		1	0	22.55	0.1799	15.10	0.0324
Lowest	16QAM	1	0	22.00	0.1585	14.55	0.0285
Middle		1	0	21.91	0.1552	14.46	0.0279
Highest		1	0	21.85	0.1531	14.40	0.0275
Lowest	64QAM	1	0	20.97	0.1250	13.52	0.0225
Middle		1	0	20.86	0.1219	13.41	0.0219
Highest		1	0	20.80	0.1202	13.35	0.0216
Limit	ERP < 3W			Result		PASS	

LTE Band 14 / 10MHz (Average) (GT - LC = -5.3 dB)							
Channel	Mode	RB		Conducted		ERP	
		Size	Offset	Power (dBm)	Power (Watts)	ERP(dBm)	ERP(W)
Lowest	QPSK	-	-	-	-	-	-
Middle		1	0	22.71	0.1866	15.26	0.0336
Highest		-	-	-	-	-	-
Lowest	16QAM	-	-	-	-	-	-
Middle		1	0	22.06	0.1607	14.61	0.0289
Highest		-	-	-	-	-	-
Lowest	64QAM	-	-	-	-	-	-
Middle		1	0	21.01	0.1262	13.56	0.0227
Highest		-	-	-	-	-	-
Limit	ERP < 3W			Result		PASS	

**Radiated Spurious Emission****Part90R LTE Band 14**

LTE Band 14 / 10MHz / QPSK									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1576	-51.93	-42.15	-9.78	-66.4	-57.07	1.20	8.49	H
	2364	-58.81	-13	-45.81	-75.96	-65.63	1.42	10.39	H
	3152	-55.36	-13	-42.36	-76.02	-62.98	1.58	11.36	H
									H
									H
									H
									H
	1576	-48.18	-42.15	-6.03	-62.65	-53.32	1.20	8.49	V
	2364	-59.35	-13	-46.35	-76.5	-66.17	1.42	10.39	V
	3152	-56.16	-13	-43.16	-76.82	-63.78	1.58	11.36	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.