



# FCC RF Test Report

**APPLICANT** : ASUSTeK COMPUTER INC.  
**EQUIPMENT** : ASUS Phone(Mobile Phone)  
**BRAND NAME** : ASUS  
**MODEL NAME** : ASUS\_I005D, ASUS\_I005DC  
**FCC ID** : MSQI005D  
**STANDARD** : 47 CFR Part 2, 27(H), 27(F), 27(N)  
**CLASSIFICATION** : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Nov. 03, 2020 and completely tested on Jan. 05, 2021. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Reviewed by: Jason Jia / Supervisor

Approved by: James Huang / Manager



**Sporton International (Kunshan) Inc.**

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China**



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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG0N0335D	Rev. 01	Initial issue of report	Feb. 02, 2021



## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§27.50(b)(10) §27.50(c)(10)	Effective Radiated Power (Band 12) (Band 13) (Band 17) (Band 71)	ERP < 3 Watt	PASS	-
3.5	N/A	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §27.53(c)(2)(4) §27.53(g)	Conducted Band Edge Measurement (Band 12) (Band 13) (Band 17) (Band 71)	< 43+10log <sub>10</sub> (P[Watts])	PASS	-
3.8	§2.1051 §27.53(c)(2) §27.53(g)	Conducted Spurious Emission (Band 12) (Band 13) (Band 17) (Band 71)	< 43+10log <sub>10</sub> (P[Watts])	PASS	-
3.9	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§2.1053 §27.53(c)(2) §27.53(f) §27.53(g)	Radiated Spurious Emission (Band 12) (Band 13) (Band 17) (Band 71)	< 43+10log <sub>10</sub> (P[Watts])	PASS	Under limit 8.36 dB at 1564.000 MHz

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



# 1 General Description

## 1.1 Applicant

ASUSTeK COMPUTER INC.

1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

## 1.2 Manufacturer 1

Guangdong Enok Communication Co., Ltd.

No. 137, 139, Lixiang Road., Songmushan Village, Dalang Town, Dongguan City, Guangdong Province, China

## 1.3 Manufacturer 2

PT. SAT NUSAPERSADA TBK

JALAN PELITA VI. NO. 99, BATAM, 29443, INDONESIA

## 1.4 Product Feature of Equipment Under Test

Product Feature	
Equipment	ASUS Phone(Mobile Phone)
Brand Name	ASUS
Model Name	ASUS_I005D, ASUS_I005DC
FCC ID	MSQI005D
EUT supports Radios application	GSM/WCDMA/LTE/5G NR/NFC/GNSS WLAN 2.4GHz 802.11b/g/n/ax HT20/HT40/HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 WLAN 5GHz 802.11ax HE20/HE40/HE80 Bluetooth BR/EDR/LE
IMEI Code	Conducted: 869498050029096/869498050029103 Radiation: 352977280003313/352977280003321
HW Version	R2.0B
SW Version	Android R
EUT Stage	Identical Prototype

Note: The differences between two Models: ASUS\_I005D and ASUS\_I005DC refer to the Product Equality Declaration.



### 1.5 Product Specification of Equipment Under Test

Standards-related Product Specification	
<b>Tx Frequency</b>	LTE Band 12 : 699.7 MHz ~ 715.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 17 : 706.5 MHz ~ 713.5 MHz LTE Band 71: 665.5 MHz ~ 695.5MHz
<b>Rx Frequency</b>	LTE Band 12 : 729.7 MHz ~ 745.3 MHz LTE Band 13 : 748.5 MHz ~ 753.5 MHz LTE Band 17 : 736.5 MHz ~ 743.5 MHz LTE Band 71: 619.5 MHz ~ 649.5MHz
<b>Bandwidth</b>	LTE Band 12 : 1.4MHz / 3MHz / 5MHz / 10MHz LTE Band 13 : 5MHz / 10MHz LTE Band 17 : 5MHz / 10MHz LTE Band 71 : 5MHz / 10MHz / 15MHz / 20MHz
<b>Maximum Output Power to Antenna</b>	LTE Band 12 : 25.15 dBm LTE Band 13 : 24.25 dBm LTE Band 17 : 24.95 dBm LTE Band 71 : 25.35 dBm
<b>Antenna Gain</b>	LTE Band 12 : -2.0 dBi LTE Band 13 : -5.5 dBi LTE Band 17 : -2.0 dBi LTE Band 71 : -2.7 dBi
<b>Type of Modulation</b>	QPSK / 16QAM / 64QAM

**Note:** The maximum ERP/EIRP is calculated from max Output power and max antenna gain, only the maximum ERP/EIRP is shown in the report

### 1.6 Modification of EUT

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



### 1.7 Maximum ERP Power, Frequency Tolerance, and Emission Designator

LTE Band 12		QPSK			16QAM		
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)
10	704.0 ~ 711.0	9M05G7D	0.0106	0.1259	9M03W7D	-	0.1084
LTE Band 13		QPSK			16QAM		
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)
10	782.0	9M01G7D	0.0066	0.0457	9M01W7D	-	0.0395
LTE Band 17		QPSK			16QAM		
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)
10	709.0 ~ 711.0	9M05G7D	0.0106	0.1259	9M03W7D	-	0.1084
LTE Band 71		QPSK			16QAM		
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)
20	673.0 ~ 688.0	17M9G7D	0.0049	0.1122	17M9W7D	-	0.0975

**Note:**

1. LTE Band 12 overlaps the entire frequency range of LTE Band 17. Therefore, the test results provided in this report covers Band 12 as well as Band 17.
2. Based on engineering evaluation, only the maximum bandwidth and the worst modulation test results are shown in the report.



### 1.8 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

<b>Test Firm</b>	Sporton International (Kunshan) Inc.		
<b>Test Site Location</b>	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	03CH04-KS TH01-KS	CN1257	314309

### 1.9 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a

### 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, 27(H), 27(F), 27(N)
- ANSI C63.26-2015
- FCC KDB 971168 D01 Power Meas License Digital Systems v03r01
- 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

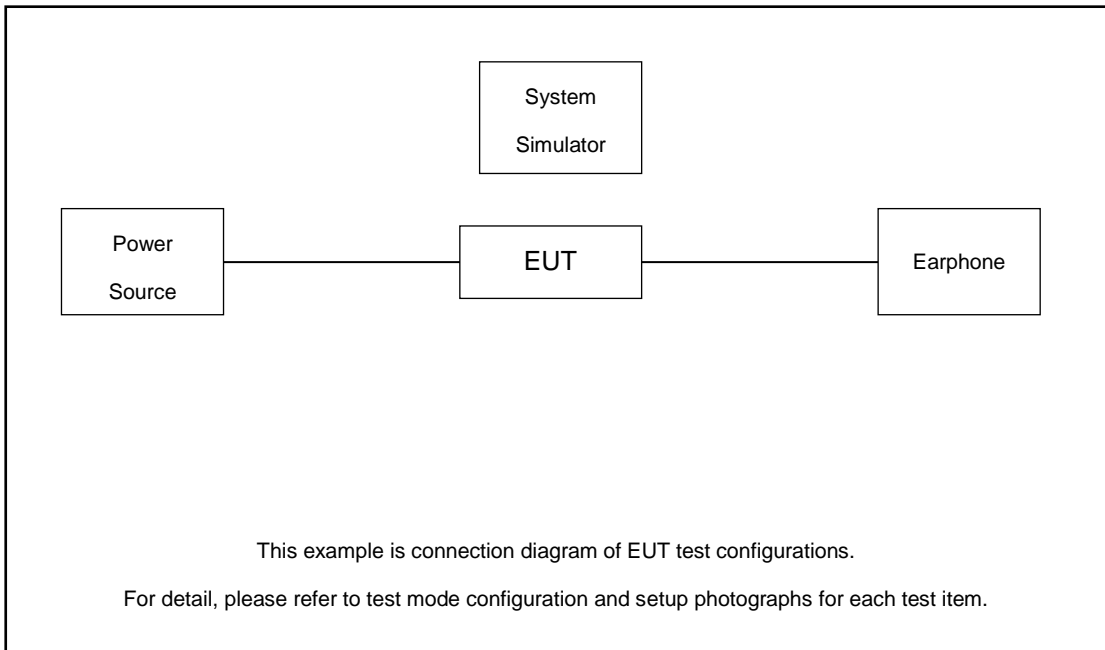
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas License Digital Systems v03r01 with maximum output power.

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

Test Items	Band	Bandwidth (MHz)						Modulation			RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
Max. Output Power	12	v	v	v	v	-	-	v	v	v	v	v	v	v	v	v
	13	-	-	v	v	-	-	v	v	v	v	v	v	v	v	v
	17	-	-	v	v	-	-	v	v	v	v	v	v	v	v	v
	71	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	12				v	-	-	v	v	v			v		v	
	13	-	-		v	-	-	v	v	v			v		v	
	71	-	-				v	v	v	v			v		v	
26dB and 99% Bandwidth	12				v	-	-	v	v				v		v	
	13	-	-		v	-	-	v	v				v		v	
	71	-	-				v	v	v				v		v	
Conducted Band Edge	12	v	v	v	v	-	-	v	v	v	v		v	v		v
	13	-	-	v	v	-	-	v	v	v	v		v	v		v
	71	-	-	v	v	v	v	v	v	v	v		v	v		v
Conducted Spurious Emission	12	v	v	v	v	-	-	v			v			v	v	v
	13	-	-	v	v	-	-	v			v			v	v	v
	71	-	-	v	v	v	v	v			v			v	v	v
Frequency Stability	12				v	-	-	v			v				v	
	13	-	-		v	-	-	v			v				v	
	71	-	-				v	v			v				v	
E.R.P / E.I.R.P	12	v	v	v	v	-	-	v	v	v	v			v	v	v
	13	-	-	v	v	-	-	v	v	v	v			v	v	v
	71	-	-	v	v	v	v	v	v	v	v			v	v	v
Radiated Spurious Emission	12	Worst Case												v	v	v
	13	Worst Case												v	v	v
	71	Worst Case												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.
4. LTE Band 12 overlaps the entire frequency range of LTE Band 17. Therefore, the test results provided in this report covers Band 12 as well as Band 17.
5. All test items are based on engineering evaluation.

## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Power Supply	GWINSTEK	PSS-2002	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
3.	LTE Base Station	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m
4.	Earphone	N/A	N/A	N/A	Unshielded,1.8m	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 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.

$$\text{Offset} = \text{RF cable loss.}$$

Following shows an offset computation example with cable loss 4.2 dB.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 \text{ (dB)} \end{aligned}$$

## 2.5 Frequency List of Low/Middle/High Channels

LTE Band 12 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	23060	23095	23130
	Frequency	704	707.5	711
5	Channel	23035	23095	23155
	Frequency	701.5	707.5	713.5
3	Channel	23025	23095	23165
	Frequency	700.5	707.5	714.5
1.4	Channel	23017	23095	23173
	Frequency	699.7	707.5	715.3

LTE Band 13 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	23230	-
	Frequency	-	782	-
5	Channel	23205	23230	23255
	Frequency	779.5	782	784.5



LTE Band 17 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	23780	23790	23800
	Frequency	709	710	711
5	Channel	23755	23790	23825
	Frequency	706.5	710	713.5

LTE Band 71 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	133222	133322	133372
	Frequency	673.0	680.5	688.0
15	Channel	133197	133297	133397
	Frequency	670.5	680.5	690.5
10	Channel	133172	133272	133422
	Frequency	668.0	678.0	693.0
5	Channel	133147	133247	133447
	Frequency	665.5	675.5	695.5

### 3 Conducted Test Items

#### 3.1 Measuring Instruments

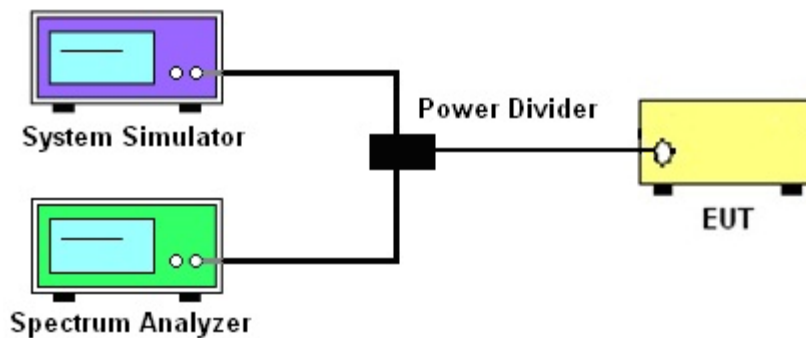
See list of measuring instruments of this test report.

#### 3.2 Test Setup

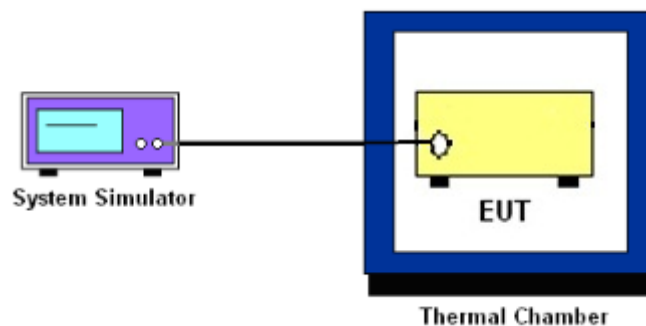
##### 3.2.1 Conducted Output Power



##### 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 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 12, Band 13 and Band 17 and Band 71.

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 testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.



## **3.5 Peak-to-Average Ratio**

### **3.5.1 Description of the PAR Measurement**

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

### **3.5.2 Test Procedures**

1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.



### 3.6 Occupied Bandwidth

#### 3.6.1 Description of Occupied Bandwidth Measurement

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

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

#### 3.6.2 Test Procedures

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





### 3.7 Conducted Band Edge

#### 3.7.1 Description of Conducted Band Edge Measurement

27.53 (c)

For operations in the 776-788 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $65 + 10 \log_{10} p(\text{watts})$ , dB, for mobile and portable equipment.

27.53 (g)

For operations in the 600MHz band and 698 -746 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 100 kHz bandwidth. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

#### 3.7.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW  $\geq$  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. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.

Example:

$$\begin{aligned} &\text{The limit line is derived from } 43 + 10\log(P)\text{dB below the transmitter power } P(\text{Watts}) \\ &= P(\text{W}) - [43 + 10\log(P)] \text{ (dB)} \\ &= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm.} \end{aligned}$$



### 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.

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

#### 3.8.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. The limit line is derived from  $43 + 10\log(P)$ dB below the transmitter power P(Watts)  
=  $P(W) - [43 + 10\log(P)]$  (dB)  
=  $[30 + 10\log(P)]$  (dBm) -  $[43 + 10\log(P)]$  (dB)  
= -13dBm.



## 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  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

### 3.9.2 Test Procedures for Temperature Variation

1. The testing follows ANSI C63.26 section 5.6.4
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to  $-30^{\circ}\text{C}$  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  $10^{\circ}\text{C}$  step up to  $50^{\circ}\text{C}$ . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

### 3.9.3 Test Procedures for Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at  $20\pm 5^{\circ}\text{C}$  and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

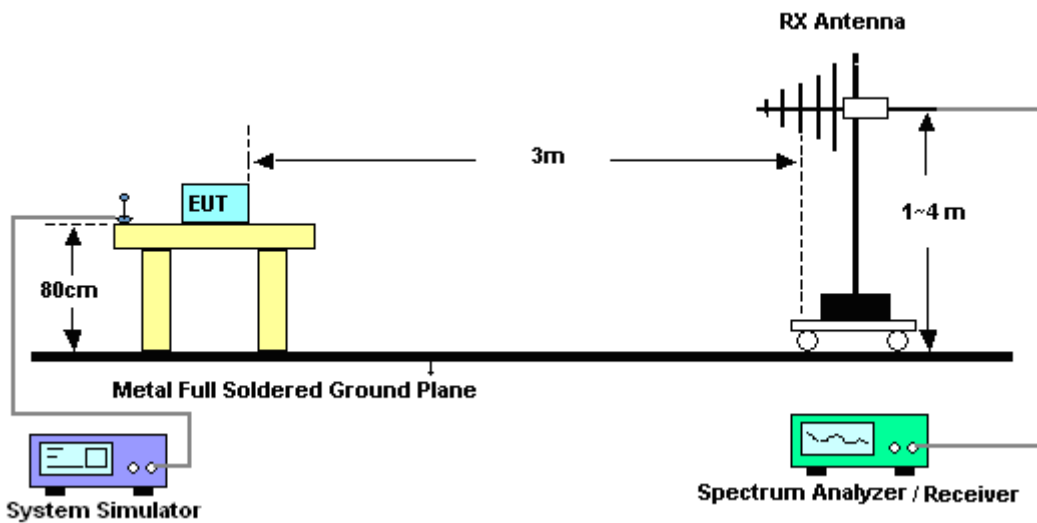
## 4 Radiated Test Items

### 4.1 Measuring Instruments

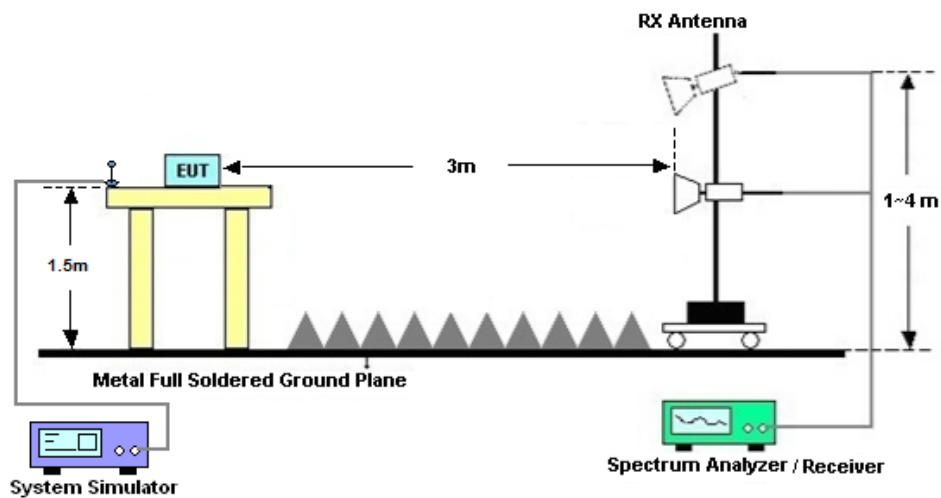
See list of measuring instruments of this test report.

### 4.2 Test Setup

#### 4.2.1 For radiated test from 30MHz to 1GHz



#### 4.2.2 For radiated test above 1GHz



### 4.3 Test Result of Radiated Test

Please refer to Appendix B.



## 4.4 Radiated Spurious Emission

### 4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI C63.26. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

For LTE Band 13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions 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.

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

### 4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10.  $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11.  $ERP \text{ (dBm)} = EIRP - 2.15$
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $43 + 10\log(P)$ dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)] \text{ (dB)}$   
 $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$   
 $= -13\text{dBm}.$

13. For Band 7, 38, 41:

The limit line is derived from  $55 + 10\log(P)$ 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
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Nov. 02, 2020	Dec. 18, 2020	Nov. 01, 2021	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 03, 2020	Dec. 18, 2020	Jul. 02, 2021	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 15, 2020	Jan. 05, 2021	Apr. 14, 2021	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jan. 02, 2021	Jan. 05, 2021	Jan. 01, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1356	1GHz~18GHz	Apr. 20, 2020	Jan. 05, 2021	Apr. 19, 2021	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 09, 2020	Jan. 05, 2021	Nov. 08, 2021	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 02, 2021	Jan. 05, 2021	Jan. 01, 2022	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 08, 2020	Jan. 05, 2021	Jan. 07, 2021	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1 0P	2025788	1Ghz-18Ghz	Jan. 02, 2021	Jan. 05, 2021	Jan. 01, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 14, 2020	Jan. 05, 2021	Oct. 13, 2021	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jan. 05, 2021	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jan. 05, 2021	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jan. 05, 2021	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required.



## 6 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.3dB
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### Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB
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### Appendix A. Test Results of Conducted Test

#### Conducted Output Power(Average power)

LTE Band 12:

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				23060	23095	23130
Frequency (MHz)				704	707.5	711
10	QPSK	1	0	25.08	25.15	24.97
10	QPSK	1	25	25.01	24.93	24.91
10	QPSK	1	49	25.02	25.01	24.94
10	QPSK	25	0	24.23	24.25	24.06
10	QPSK	25	12	24.16	24.15	24.01
10	QPSK	25	25	24.10	24.10	24.09
10	QPSK	50	0	24.14	24.15	24.04
10	16QAM	1	0	24.50	24.42	24.36
10	64QAM	1	0	23.42	23.30	23.19
Channel				23035	23095	23155
Frequency (MHz)				701.5	707.5	713.5
5	QPSK	1	0	25.01	25.01	24.94
5	16QAM	1	0	24.42	24.29	24.28
Channel				23025	23095	23165
Frequency (MHz)				700.5	707.5	714.5
3	QPSK	1	0	25.04	25.09	24.92
3	16QAM	1	0	24.49	24.32	24.34
Channel				23017	23095	23173
Frequency (MHz)				699.7	707.5	715.3
1.4	QPSK	1	0	25.13	24.93	24.89
1.4	16QAM	1	0	24.49	24.28	24.25





**LTE Band 13:**

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				23230		
Frequency (MHz)				782		
10	QPSK	1	0	-	24.25	-
10	QPSK	1	25		24.20	
10	QPSK	1	49		24.19	
10	QPSK	25	0		23.36	
10	QPSK	25	12		23.36	
10	QPSK	25	25		23.43	
10	QPSK	50	0		23.40	
10	16QAM	1	0		23.62	
10	64QAM	1	0		22.37	
Channel					23205	
Frequency (MHz)				779.5	782	784.5
5	QPSK	1	0	24.23	24.24	24.22
5	16QAM	1	0	23.61	23.54	23.52

**LTE Band 17:**

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				23780	23790	23800
Frequency (MHz)				709	710	711
10	QPSK	1	0	24.86	24.95	24.84
10	QPSK	1	25	24.88	24.94	24.91
10	QPSK	1	49	24.94	24.79	24.93
10	QPSK	25	0	23.94	23.96	23.97
10	QPSK	25	12	24.03	24.05	24.03
10	QPSK	25	25	24.11	24.13	24.10
10	QPSK	50	0	23.97	24.00	23.99
10	16QAM	1	0	24.34	24.33	24.35
10	64QAM	1	0	23.21	23.25	23.23
Channel				23755	23790	23825
Frequency (MHz)				706.5	710	713.5
5	QPSK	1	0	24.80	24.85	24.89
5	16QAM	1	0	24.27	24.29	24.31



LTE Band 71:

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				133222	133322	133372
Frequency (MHz)				673	683	688
20	QPSK	1	0	24.91	25.35	25.07
20	QPSK	1	49	24.87	25.11	25.22
20	QPSK	1	99	25.10	24.96	25.32
20	QPSK	50	0	24.01	24.17	24.25
20	QPSK	50	24	24.03	24.26	24.32
20	QPSK	50	50	24.20	24.38	24.37
20	QPSK	100	0	24.13	24.31	24.29
20	16QAM	1	0	24.44	24.74	24.71
20	64QAM	1	0	23.39	23.29	23.59
Channel				133197	133297	133397
Frequency (MHz)				670.5	680.5	690.5
15	QPSK	1	0	25.02	25.22	25.31
15	16QAM	1	0	24.34	24.51	24.67
Channel				133172	133272	133422
Frequency (MHz)				668	678	693
10	QPSK	1	0	24.87	25.09	25.32
10	16QAM	1	0	24.27	24.46	24.71
Channel				133147	133247	133447
Frequency (MHz)				665.5	675.5	695.5
5	QPSK	1	0	24.90	25.00	25.33
5	16QAM	1	0	24.24	24.32	24.64



**ERP/EIRP**

LTE Band 12 (GT - LC = -2.0 dB) QPSK									
Bandwidth	1.4M			3M			5M		
Channel	23017	23095	23173	23025	23095	23165	23035	23095	23155
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	699.7	707.5	715.3	700.5	707.5	714.5	701.5	707.5	713.5
Conducted Power (dBm)	25.13	24.93	24.89	25.04	25.09	24.92	25.01	25.01	24.94
Conducted Power (Watts)	0.3258	0.3112	0.3083	0.3192	0.3228	0.3105	0.3170	0.3170	0.3119
ERP(dBm)	20.98	20.78	20.74	20.89	20.94	20.77	20.86	20.86	20.79
ERP(Watts)	0.1253	0.1197	0.1186	0.1227	0.1242	0.1194	0.1219	0.1219	0.1199

LTE Band 12 (GT - LC = -2.0 dB) QPSK			
Bandwidth	10M		
Channel	23060	23095	23130
	(Low)	(Mid)	(High)
Frequency (MHz)	704	707.5	711
Conducted Power (dBm)	25.08	25.15	24.97
Conducted Power (Watts)	0.3221	0.3273	0.3141
ERP(dBm)	20.93	21.00	20.82
ERP(Watts)	0.1239	0.1259	0.1208



LTE Band 12 (GT - LC = -2.0 dB) 16QAM									
Bandwidth	1.4M			3M			5M		
Channel	23017	23095	23173	23025	23095	23165	23035	23095	23155
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	699.7	707.5	715.3	700.5	707.5	714.5	701.5	707.5	713.5
Conducted Power (dBm)	24.49	24.28	24.25	24.49	24.32	24.34	24.42	24.29	24.28
Conducted Power (Watts)	0.2812	0.2679	0.2661	0.2812	0.2704	0.2716	0.2767	0.2685	0.2679
ERP(dBm)	20.34	20.13	20.10	20.34	20.17	20.19	20.27	20.14	20.13
ERP(Watts)	0.1081	0.1030	0.1023	0.1081	0.1040	0.1045	0.1064	0.1033	0.1030

LTE Band 12 (GT - LC = -2.0 dB) 16QAM			
Bandwidth	10M		
Channel	23060	23095	23130
	(Low)	(Mid)	(High)
Frequency (MHz)	704	707.5	711
Conducted Power (dBm)	24.50	24.42	24.36
Conducted Power (Watts)	0.2818	0.2767	0.2729
ERP(dBm)	20.35	20.27	20.21
ERP(Watts)	0.1084	0.1064	0.1050



LTE Band 12 (GT - LC = -2.0 dB) 64QAM			
Bandwidth	10M		
Channel	23060	23095	23130
	(Low)	(Mid)	(High)
Frequency (MHz)	704	707.5	711
Conducted Power (dBm)	23.42	23.30	23.19
Conducted Power (Watts)	0.2198	0.2138	0.2084
ERP(dBm)	19.27	19.15	19.04
ERP(Watts)	0.0845	0.0822	0.0802



LTE Band 13 (GT - LC = -5.5 dB) QPSK						
Bandwidth	5M			10M		
Channel	23205	23230	23255	23230		
	(Low)	(Mid)	(High)	-	(Mid)	-
Frequency	779.5	782	784.5	-	782	-
(MHz)						
Conducted Power (dBm)	24.23	24.24	24.22	-	24.25	-
Conducted Power (Watts)	0.2649	0.2655	0.2642	-	0.2661	-
ERP(dBm)	16.58	16.59	16.57	-	16.60	-
ERP(Watts)	0.0455	0.0456	0.0454	-	0.0457	-

LTE Band 13 (GT - LC = -5.5 dB) 16QAM						
Bandwidth	5M			10M		
Channel	23205	23230	23255	23230		
	(Low)	(Mid)	(High)	-	(Mid)	-
Frequency	779.5	782	784.5	-	782	-
(MHz)						
Conducted Power (dBm)	23.61	23.54	23.52	-	23.62	-
Conducted Power (Watts)	0.2296	0.2259	0.2249	-	0.2301	-
ERP(dBm)	15.96	15.89	15.87	-	15.97	-
ERP(Watts)	0.0394	0.0388	0.0386	-	0.0395	-

LTE Band 13 (GT - LC = -5.5 dB) 64QAM			
Bandwidth	10M		
Channel	23230		
	-	(Mid)	-
Frequency	-	782	-
(MHz)			
Conducted Power (dBm)	-	22.37	-
Conducted Power (Watts)	-	0.1726	-
ERP(dBm)	-	14.72	-
ERP(Watts)	-	0.0296	-



LTE Band 71 (GT - LC = -2.7 dB) QPSK									
Bandwidth	5M			10M			15M		
Channel	133147	133297	133447	133172	133297	133422	133197	133297	133397
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	665.5	680.5	695.5	668	680.5	693	670.5	680.5	690.5
(MHz)									
Conducted Power (dBm)	24.90	25.00	25.33	24.87	25.09	25.32	25.02	25.22	25.31
Conducted Power (Watts)	0.3090	0.3162	0.3412	0.3069	0.3228	0.3404	0.3177	0.3327	0.3396
ERP(dBm)	20.05	20.15	20.48	20.02	20.24	20.47	20.17	20.37	20.46
ERP(Watts)	0.1012	0.1035	0.1117	0.1005	0.1057	0.1114	0.1040	0.1089	0.1112

LTE Band 71 (GT - LC = -2.7 dB) QPSK			
Bandwidth	20M		
Channel	133222	133297	133372
	(Low)	(Mid)	(High)
Frequency	673	680.5	688
(MHz)			
Conducted Power (dBm)	24.91	25.35	25.07
Conducted Power (Watts)	0.3097	0.3428	0.3214
ERP(dBm)	20.06	20.50	20.22
ERP(Watts)	0.1014	0.1122	0.1052



LTE Band 71 (GT - LC = -2.7 dB) 16QAM									
Bandwidth	5M			10M			15M		
Channel	133147	133297	133447	133172	133297	133422	133197	133297	133397
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	665.5	680.5	695.5	668	680.5	693	670.5	680.5	690.5
Conducted Power (dBm)	24.24	24.32	24.64	24.27	24.46	24.71	24.34	24.51	24.67
Conducted Power (Watts)	0.2655	0.2704	0.2911	0.2673	0.2793	0.2958	0.2716	0.2825	0.2931
ERP(dBm)	19.39	19.47	19.79	19.42	19.61	19.86	19.49	19.66	19.82
ERP(Watts)	0.0869	0.0885	0.0953	0.0875	0.0914	0.0968	0.0889	0.0925	0.0959

LTE Band 71 (GT - LC = -2.7 dB) 16QAM			
Bandwidth	20M		
Channel	133222	133297	133372
	(Low)	(Mid)	(High)
Frequency (MHz)	673	680.5	688
Conducted Power (dBm)	24.44	24.74	24.71
Conducted Power (Watts)	0.2780	0.2979	0.2958
ERP(dBm)	19.59	19.89	19.86
ERP(Watts)	0.0910	0.0975	0.0968





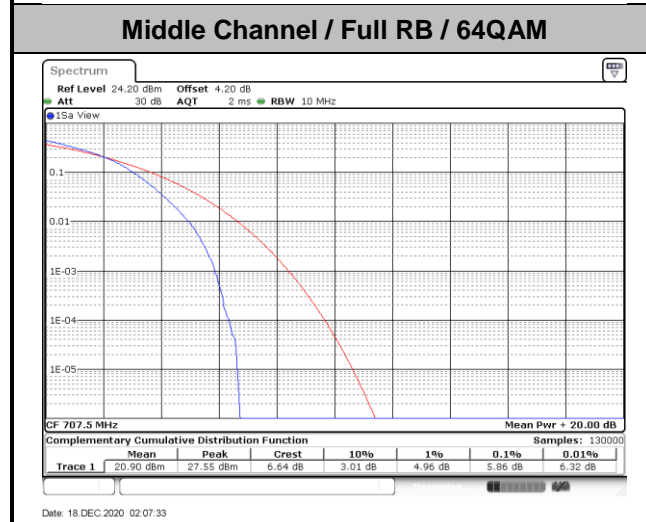
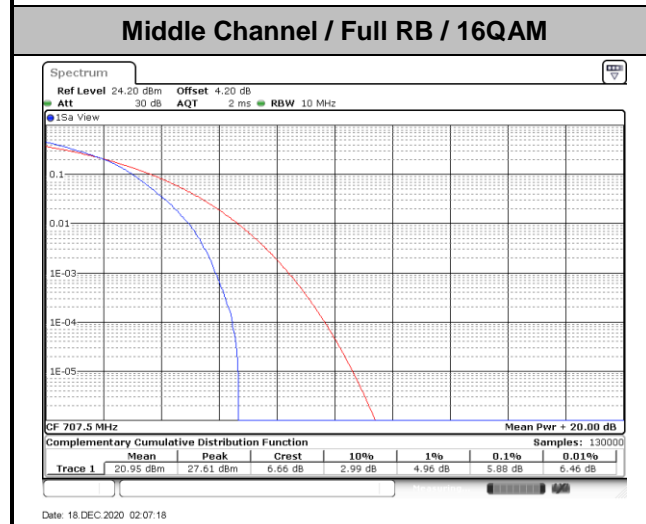
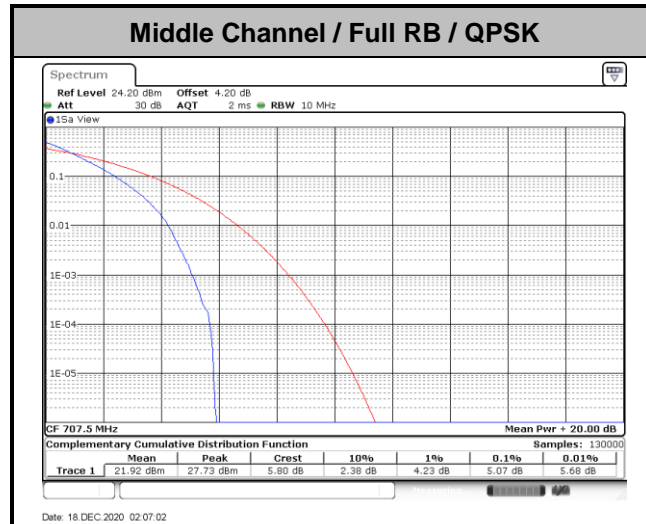
LTE Band 71 (GT - LC = -2.7 dB) 64QAM			
Bandwidth	20M		
Channel	133222	133297	133372
	(Low)	(Mid)	(High)
Frequency	673	680.5	688
(MHz)			
Conducted Power (dBm)	23.39	23.29	23.59
Conducted Power (Watts)	0.2183	0.2133	0.2286
ERP(dBm)	18.54	18.44	18.74
ERP(Watts)	0.0714	0.0698	0.0748



## LTE Band 12

### Peak-to-Average Ratio

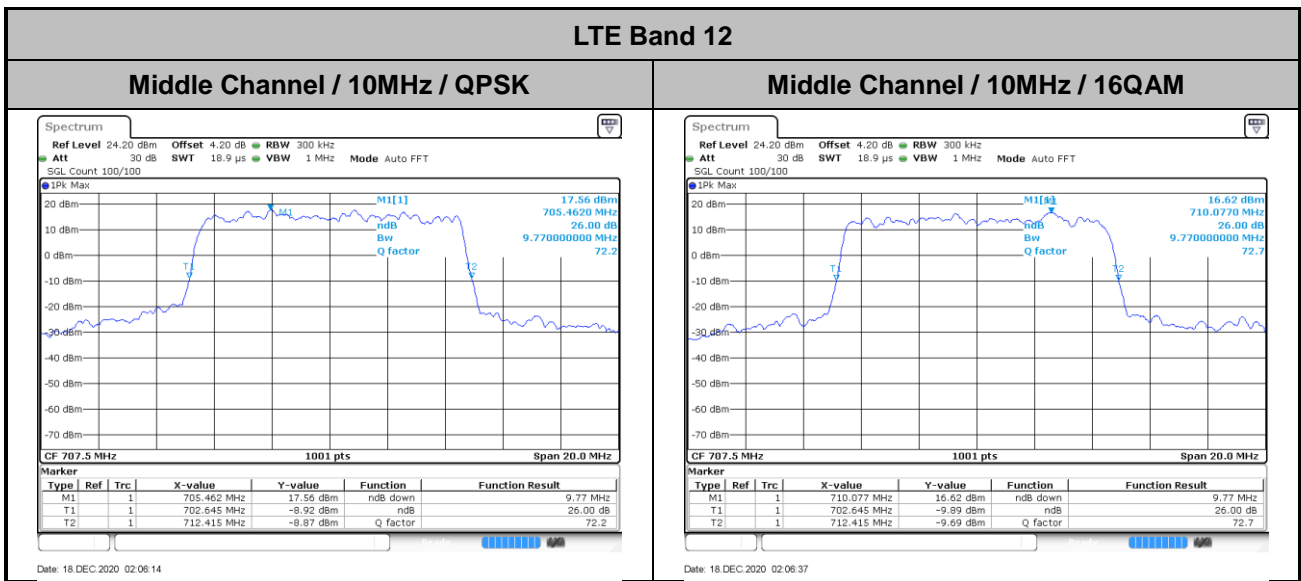
Mode	LTE Band 12 / 10MHz			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	5.07	5.88	5.86	<b>PASS</b>





**26dB Bandwidth**

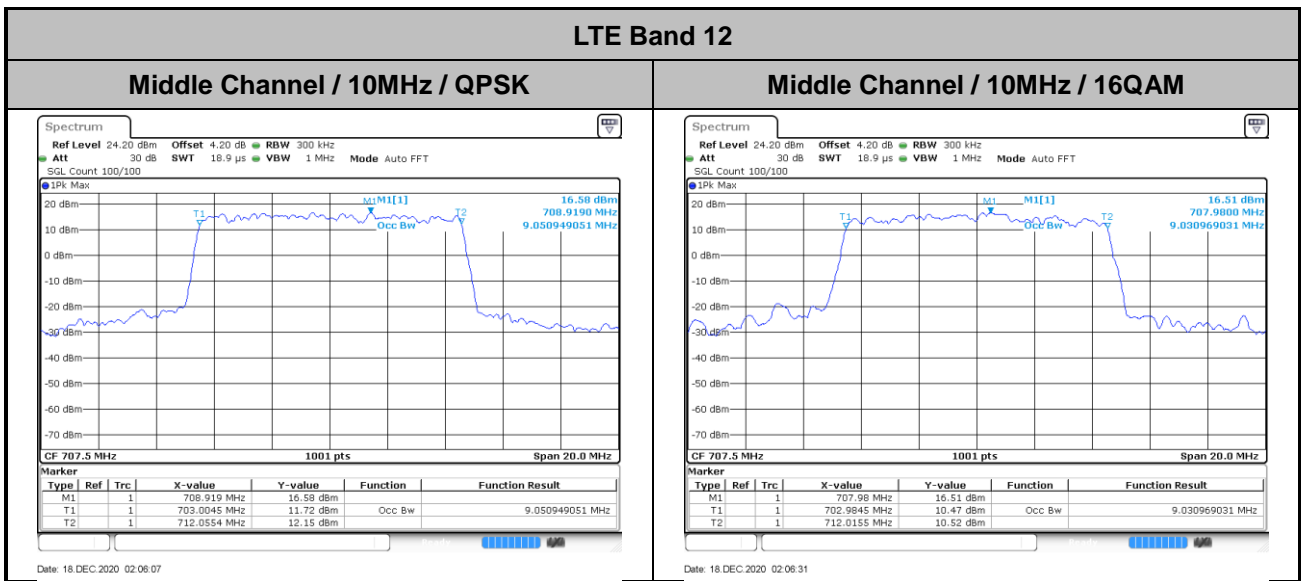
Mode	LTE Band 12 : 26dB BW(MHz)	
BW	10MHz	
Mod.	QPSK	16QAM
Middle CH	9.77	9.77





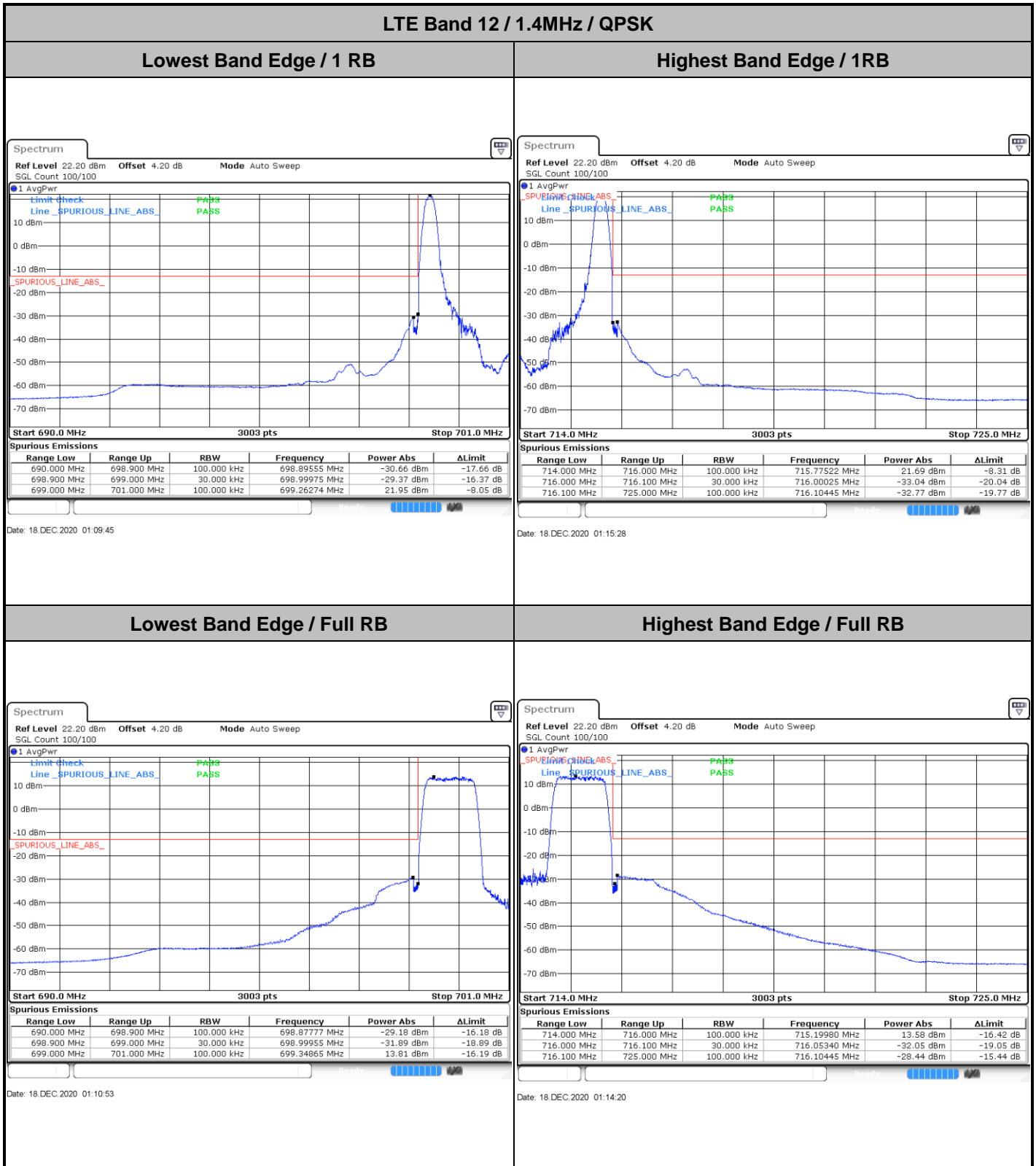
# Occupied Bandwidth

Mode	LTE Band 12 : 99%OBW(MHz)	
BW	10MHz	
Mod.	QPSK	16QAM
Middle CH	9.05	9.03





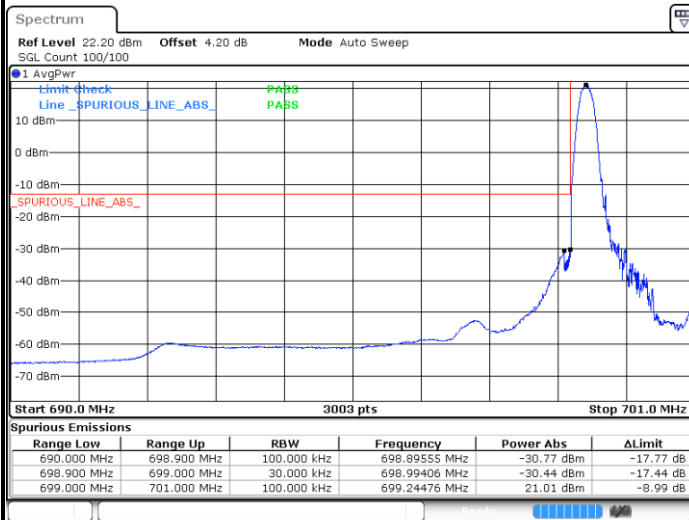
# Conducted Band Edge





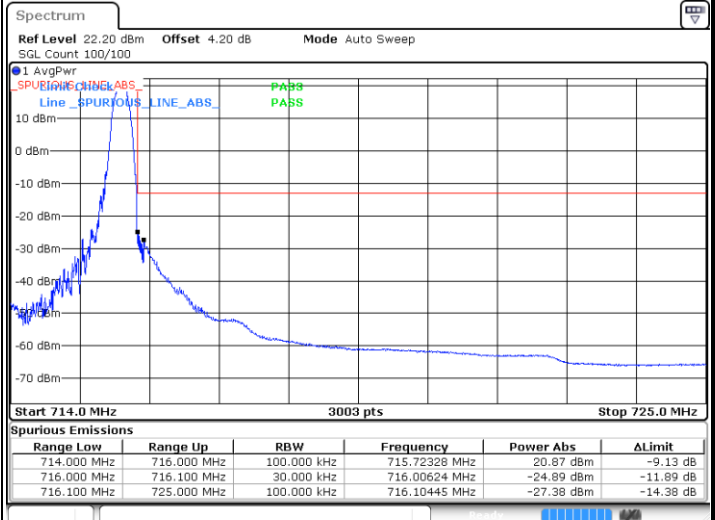
LTE Band 12 / 1.4MHz / 16QAM

Lowest Band Edge / 1 RB



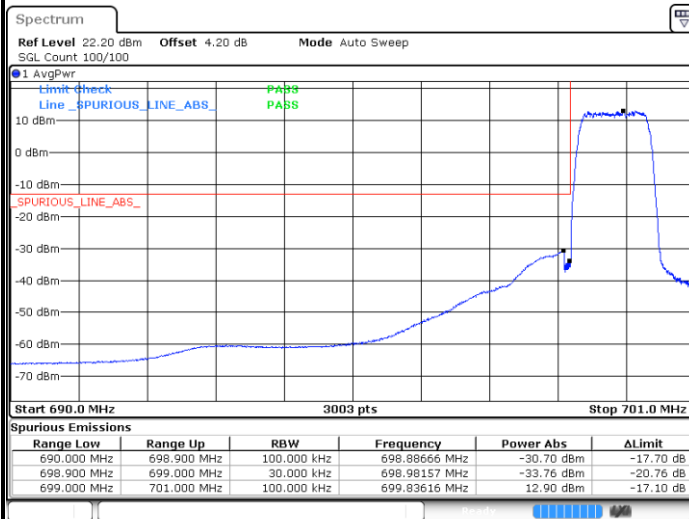
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Highest Band Edge / 1 RB



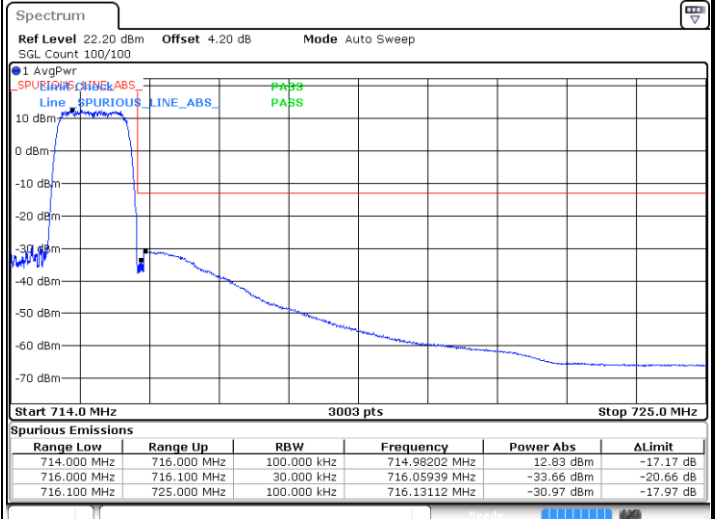
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Lowest Band Edge / Full RB



Date: 18 DEC 2020 01:12:02

Highest Band Edge / Full RB

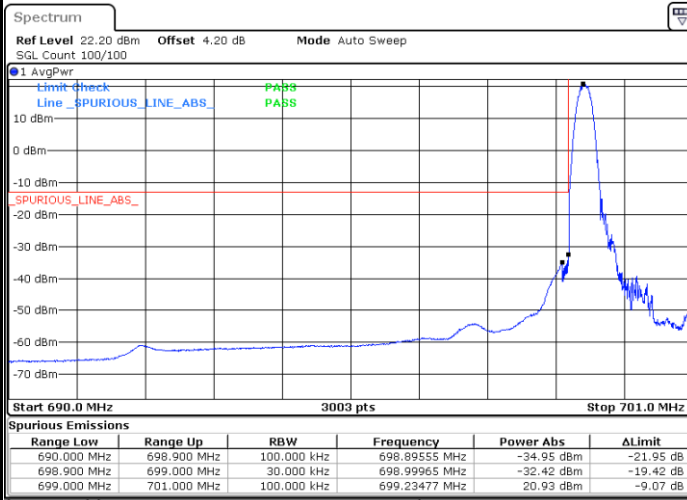


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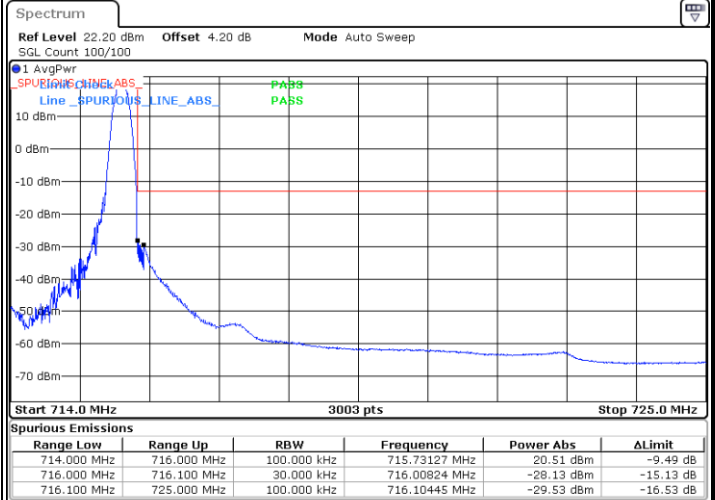
LTE Band 12 / 1.4MHz / 64QAM

Lowest Band Edge / 1 RB



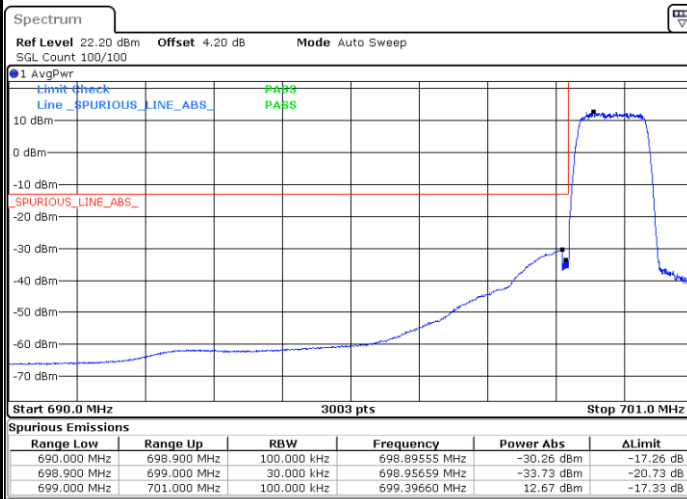
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Highest Band Edge / 1 RB



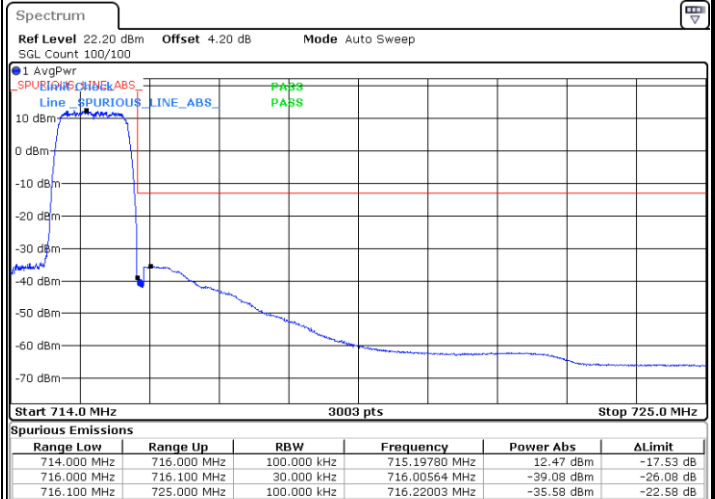
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Lowest Band Edge / Full RB



Date: 18 DEC 2020 01:48:42

Highest Band Edge / Full RB



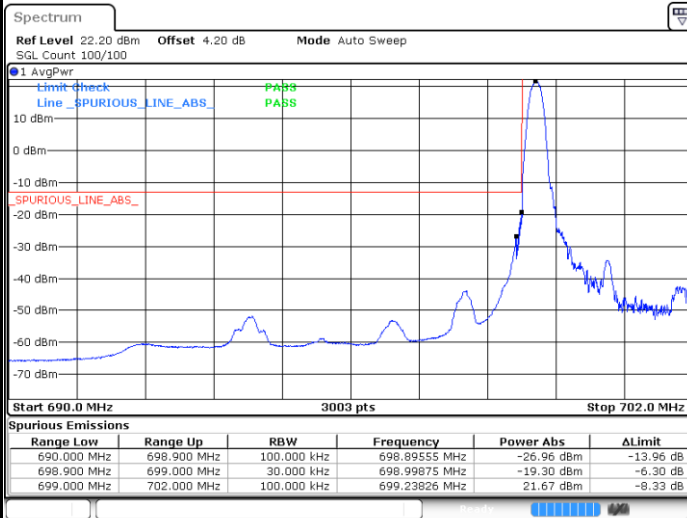
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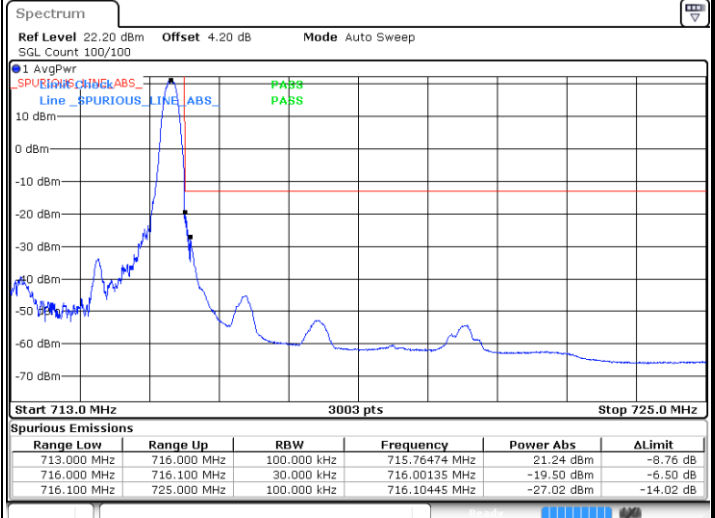
LTE Band 12 / 3MHz / QPSK

Lowest Band Edge / 1RB



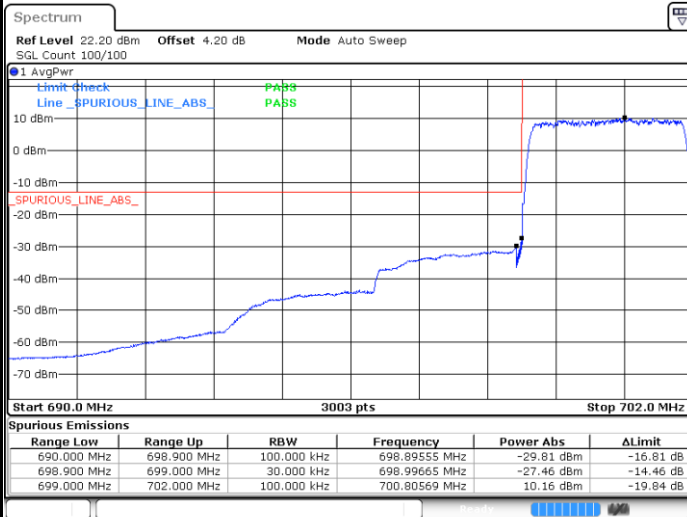
Date: 18 DEC 2020 01:18:55

Highest Band Edge / 1 RB



Date: 18 DEC 2020 01:24:38

Lowest Band Edge / Full RB



Date: 18 DEC 2020 01:20:03

Highest Band Edge / Full RB

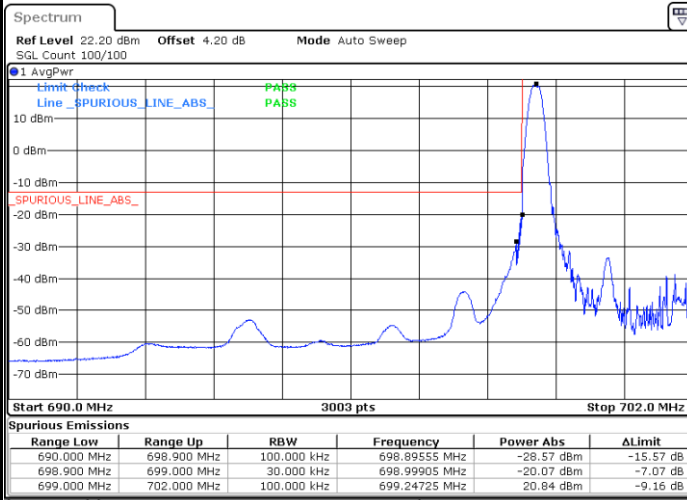


Date: 18 DEC 2020 01:23:29



LTE Band 12 / 3MHz / 16QAM

Lowest Band Edge / 1 RB



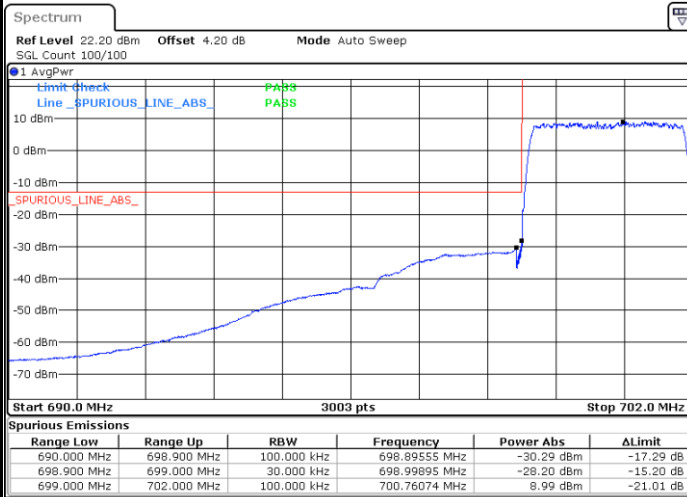
Date: 18. DEC. 2020 01:17:46

Highest Band Edge / 1 RB



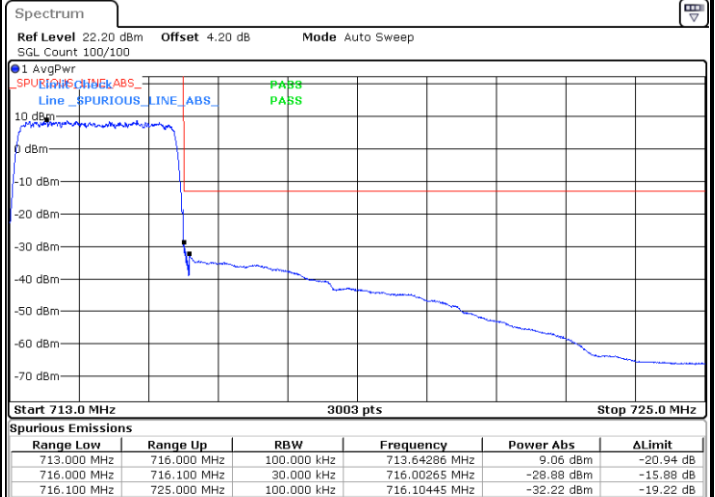
Date: 18. DEC. 2020 01:25:47

Lowest Band Edge / Full RB

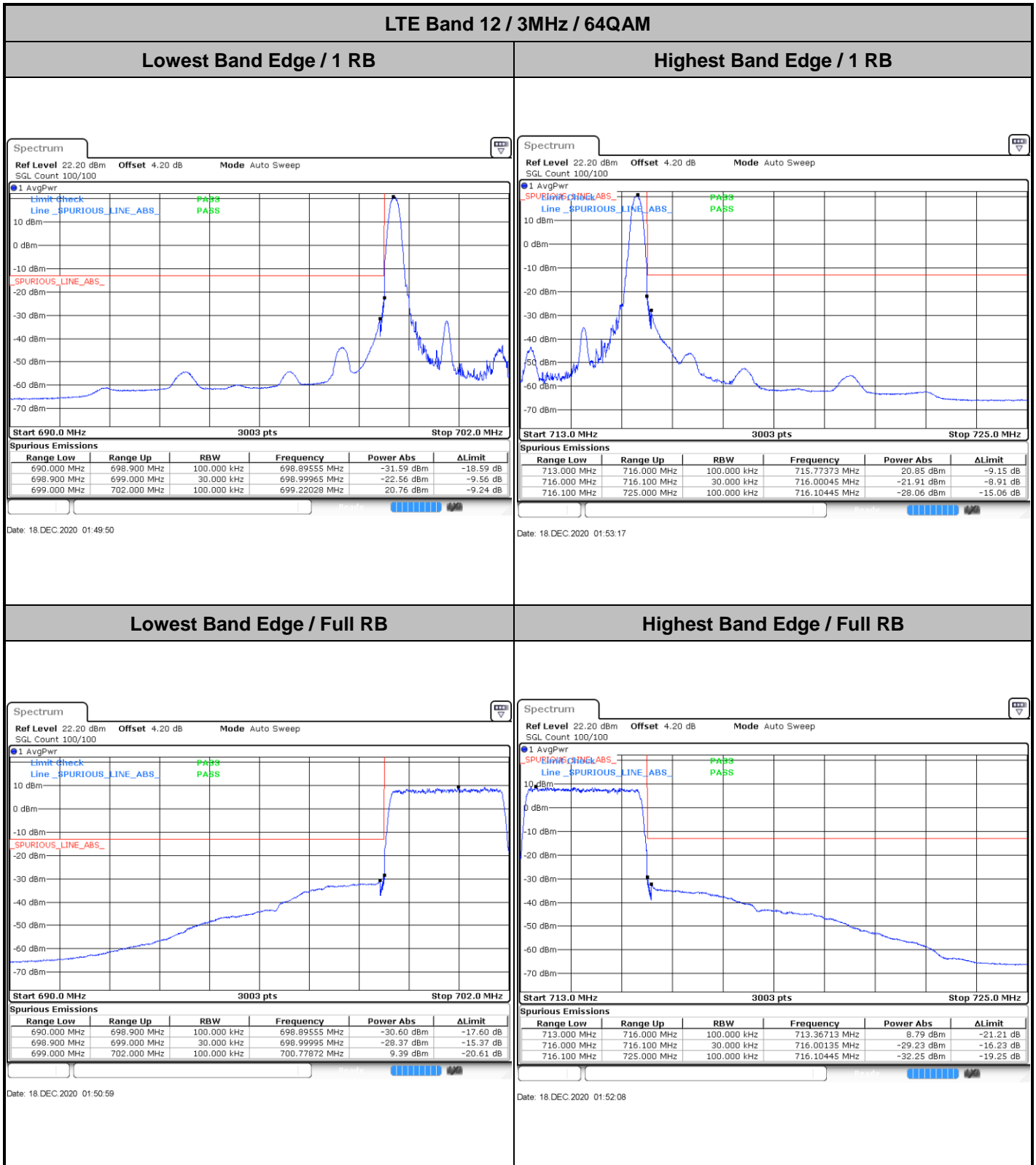


Date: 18. DEC. 2020 01:21:12

Highest Band Edge / Full RB



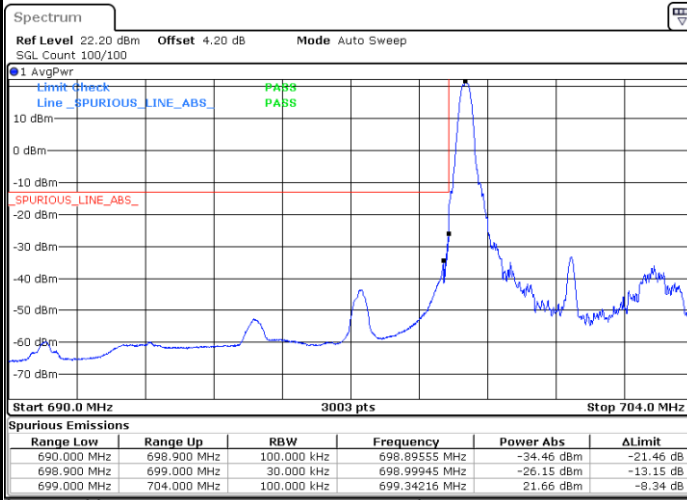
Date: 18. DEC. 2020 01:22:21





LTE Band 12 / 5MHz / QPSK

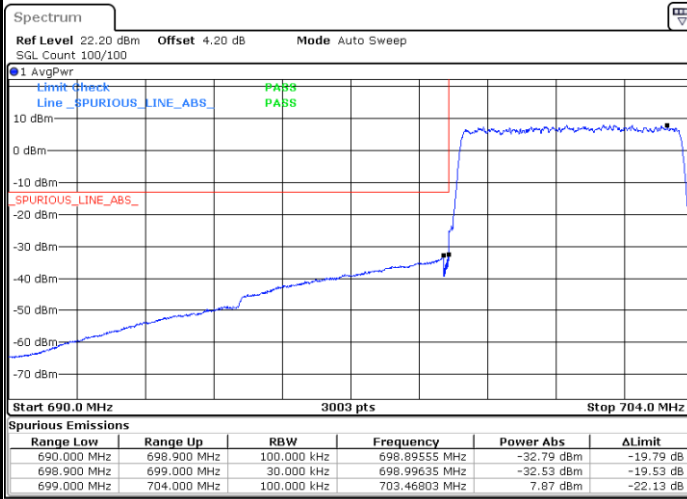
Lowest Band Edge / 1 RB



Highest Band Edge / 1 RB



Lowest Band Edge / Full RB



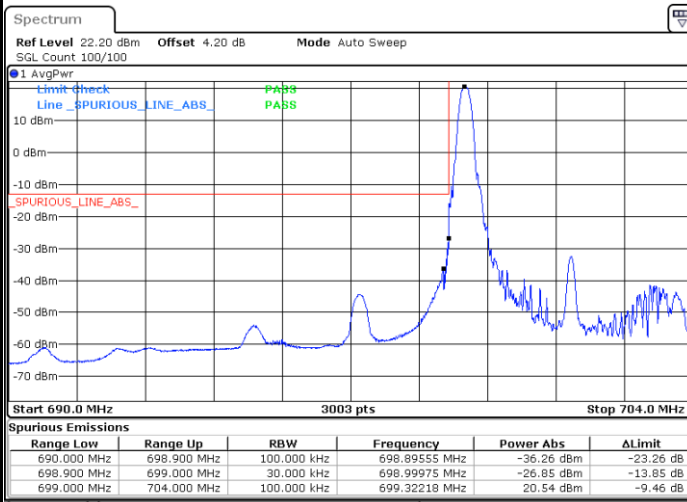
Highest Band Edge / Full RB





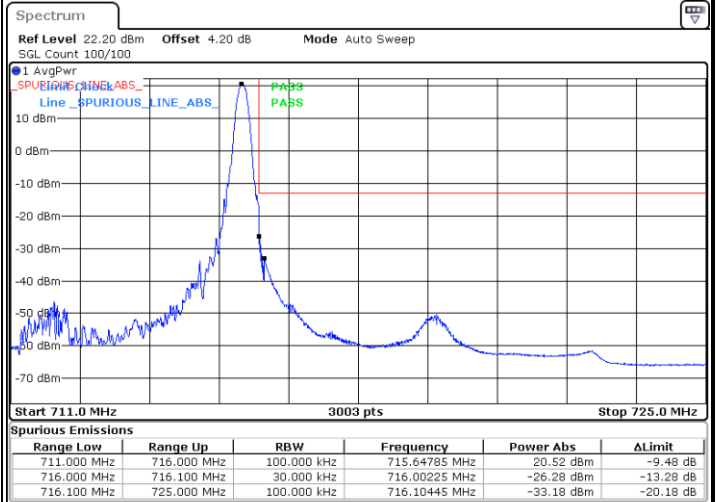
LTE Band 12 / 5MHz / 16QAM

Lowest Band Edge / 1RB



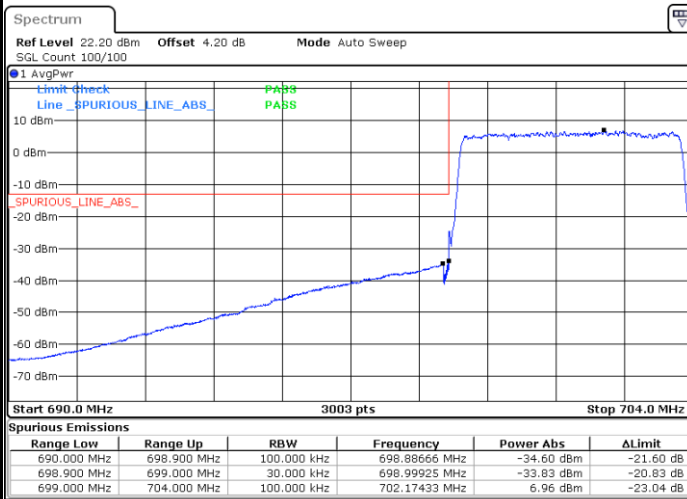
Date: 18 DEC 2020 01:26:55

Highest Band Edge / 1 RB



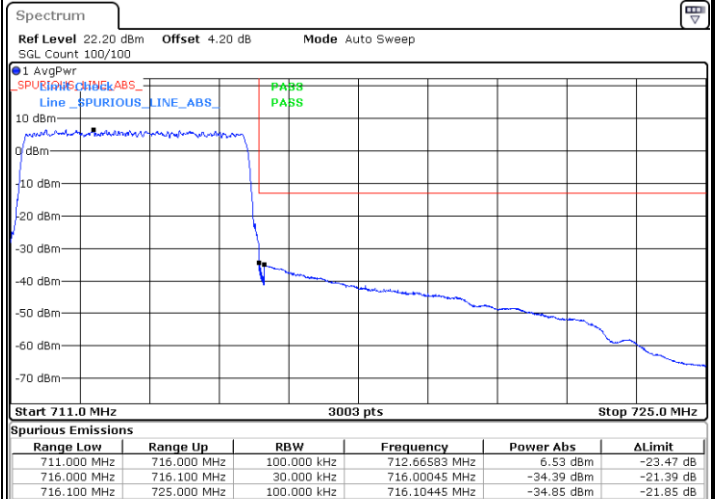
Date: 18 DEC 2020 01:34:56

Lowest Band Edge / Full RB



Date: 18 DEC 2020 01:30:21

Highest Band Edge / Full RB

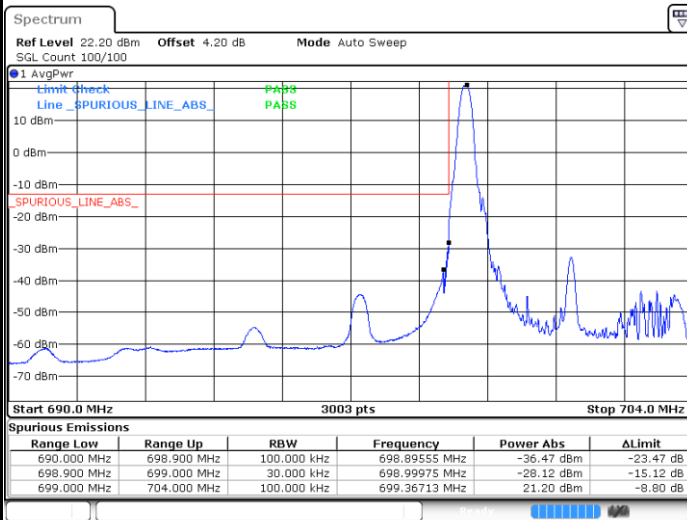


Date: 18 DEC 2020 01:31:30



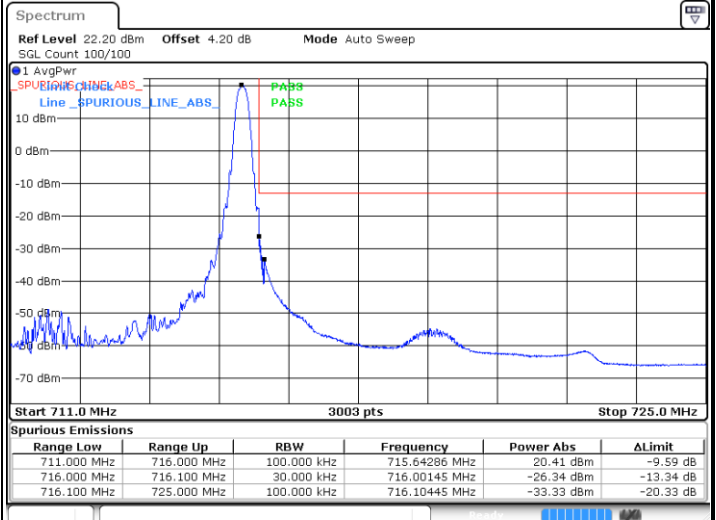
LTE Band 12 / 5MHz / 64QAM

Lowest Band Edge / 1RB



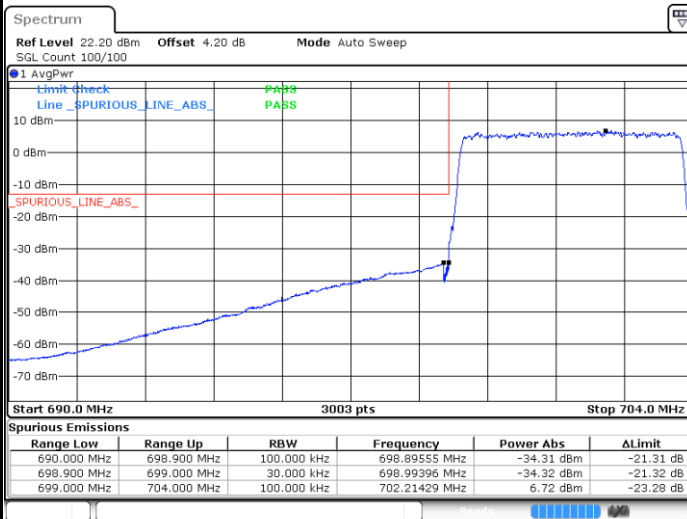
Date: 18. DEC. 2020 01:56:43

Highest Band Edge / 1 RB



Date: 18. DEC. 2020 01:55:34

Lowest Band Edge / Full RB



Date: 18. DEC. 2020 01:57:52

Highest Band Edge / Full RB

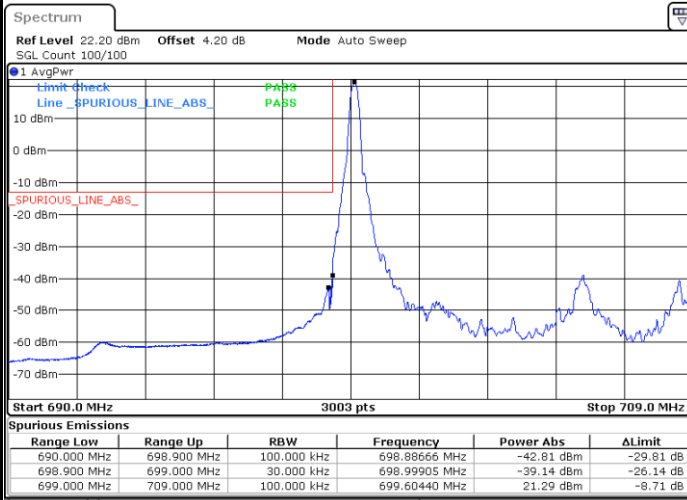


Date: 18. DEC. 2020 01:54:25



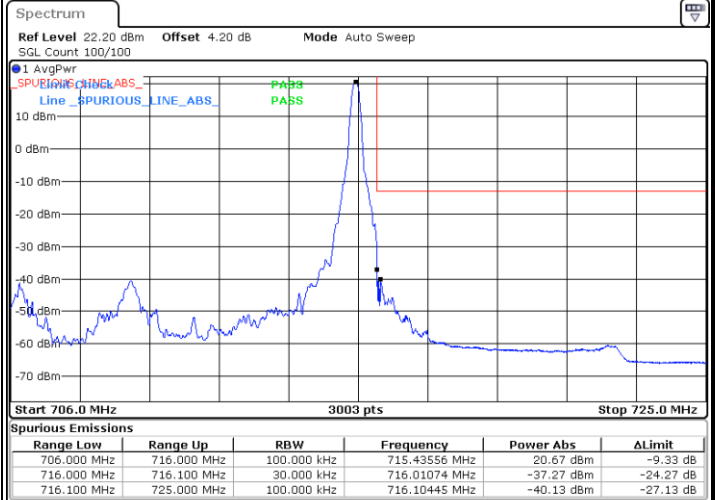
LTE Band 12 / 10MHz / QPSK

Lowest Band Edge / 1 RB



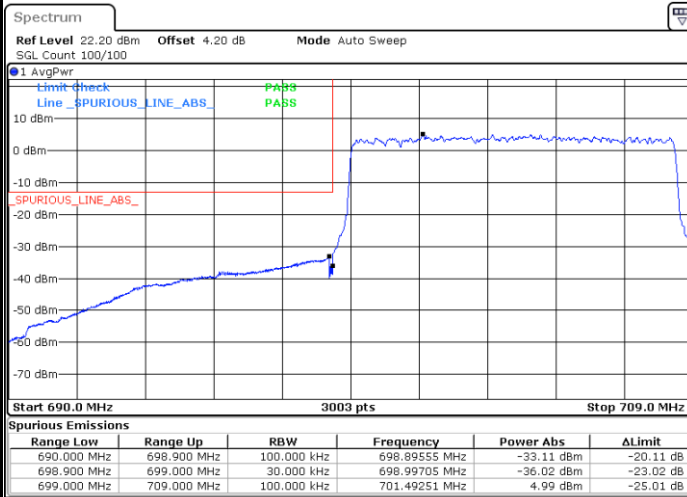
Date: 18 DEC 2020 01:37:14

Highest Band Edge / 1 RB



Date: 18 DEC 2020 01:42:58

Lowest Band Edge / Full RB



Date: 18 DEC 2020 01:38:23

Highest Band Edge / Full RB

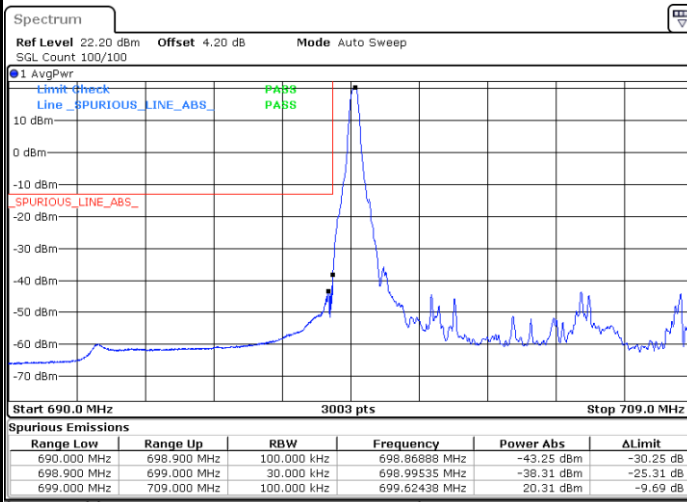


Date: 18 DEC 2020 01:41:49



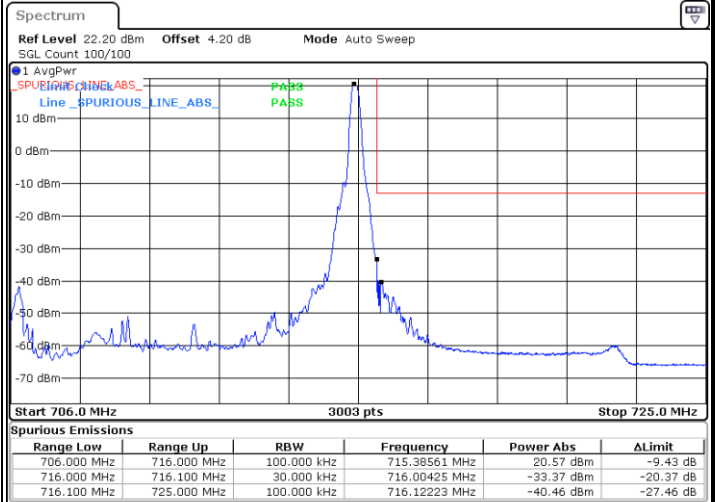
LTE Band 12 / 10MHz / 16QAM

Lowest Band Edge / 1 RB



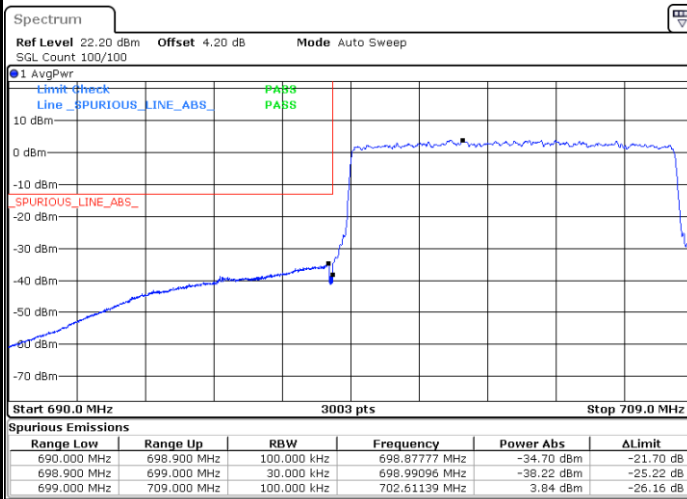
Date: 18. DEC. 2020 01:36:05

Highest Band Edge / 1 RB



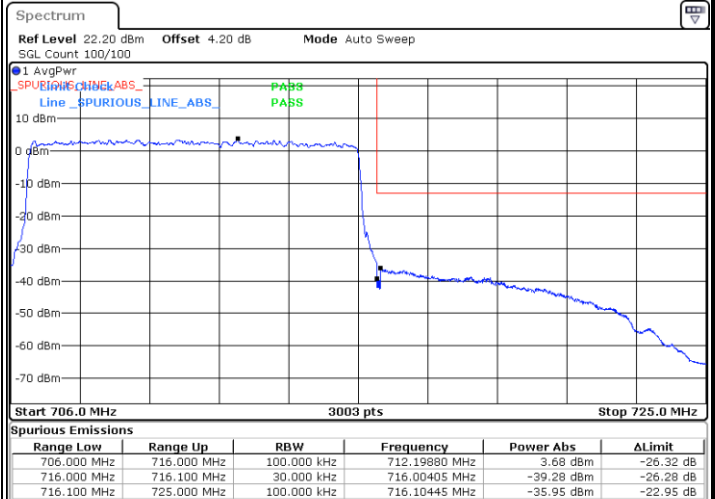
Date: 18. DEC. 2020 01:44:06

Lowest Band Edge / Full RB



Date: 18. DEC. 2020 01:39:31

Highest Band Edge / Full RB



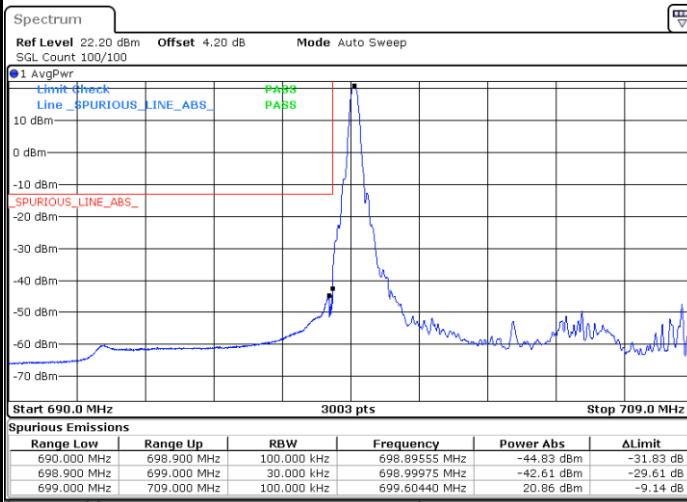
Date: 18. DEC. 2020 01:40:40





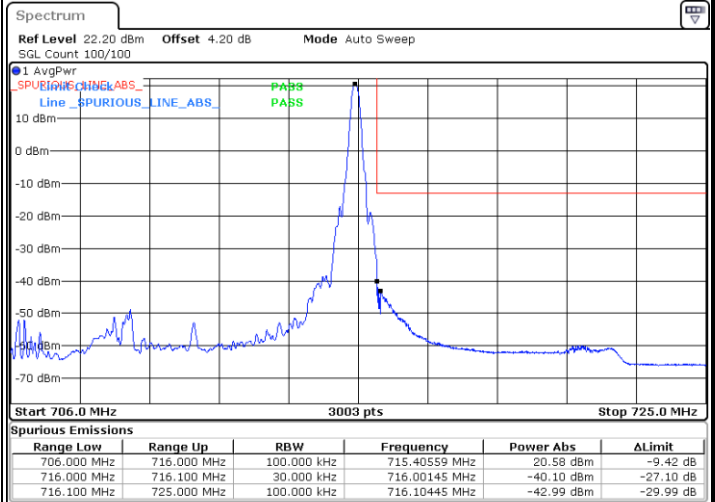
LTE Band 12 / 10MHz / 64QAM

Lowest Band Edge / 1 RB



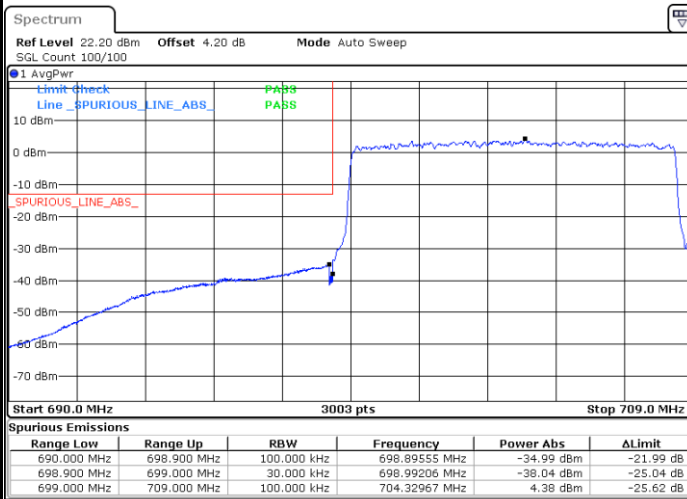
Date: 18 DEC 2020 02:01:18

Highest Band Edge / 1 RB



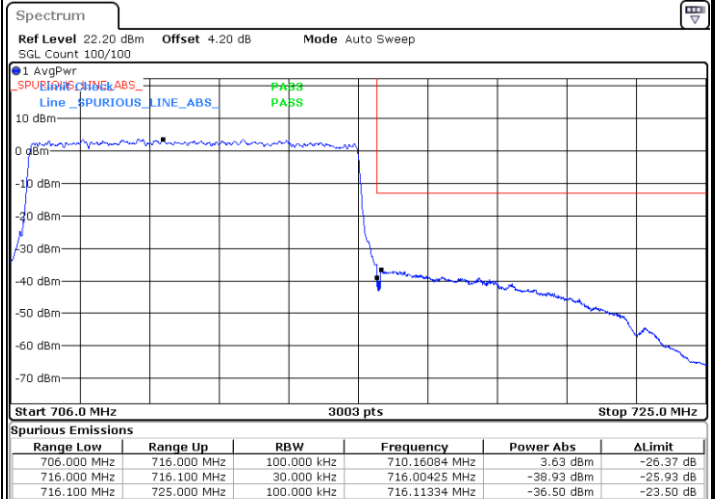
Date: 18 DEC 2020 02:00:09

Lowest Band Edge / Full RB



Date: 18 DEC 2020 02:02:27

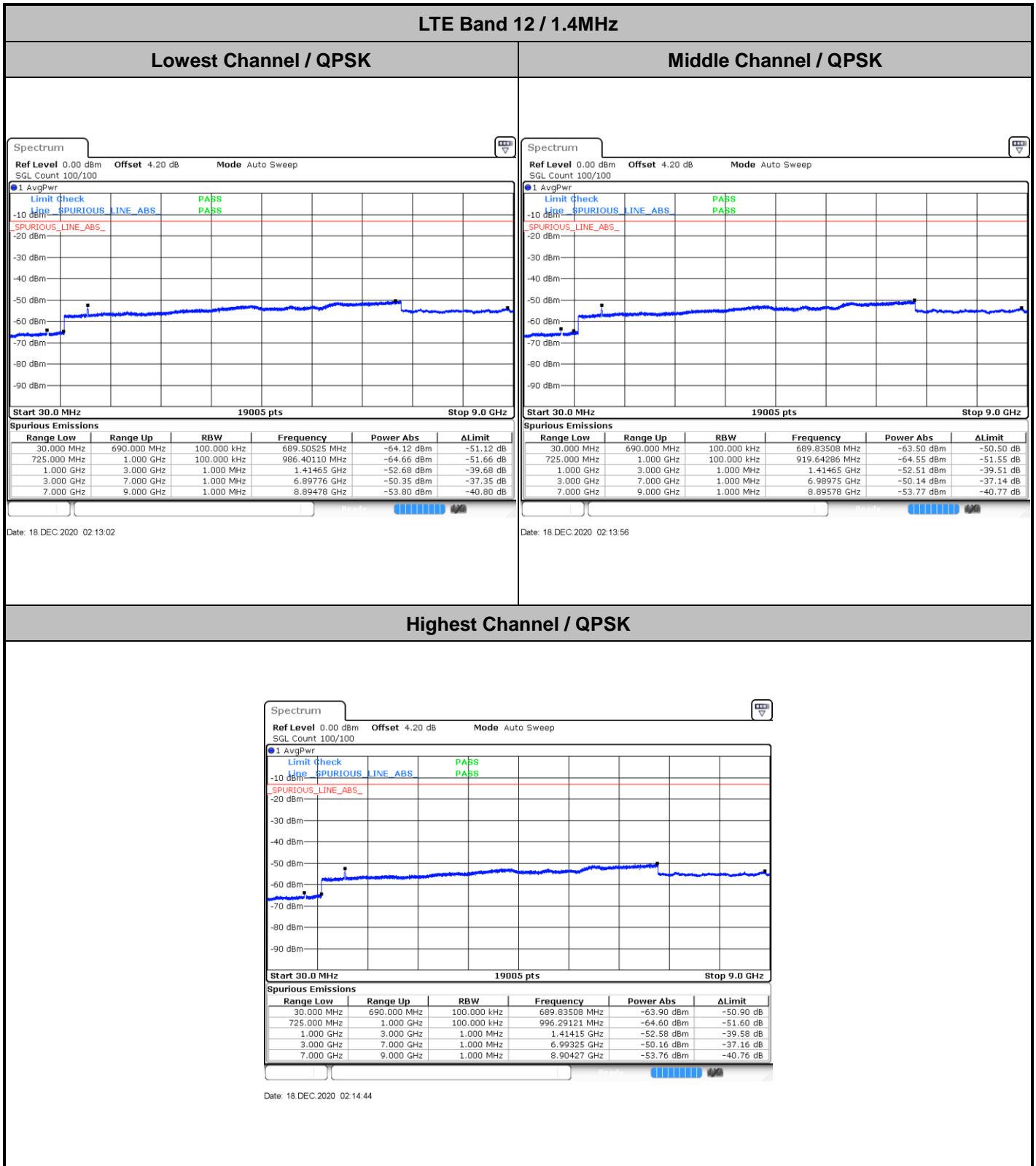
Highest Band Edge / Full RB



Date: 18 DEC 2020 01:59:00



## Conducted Spurious Emission

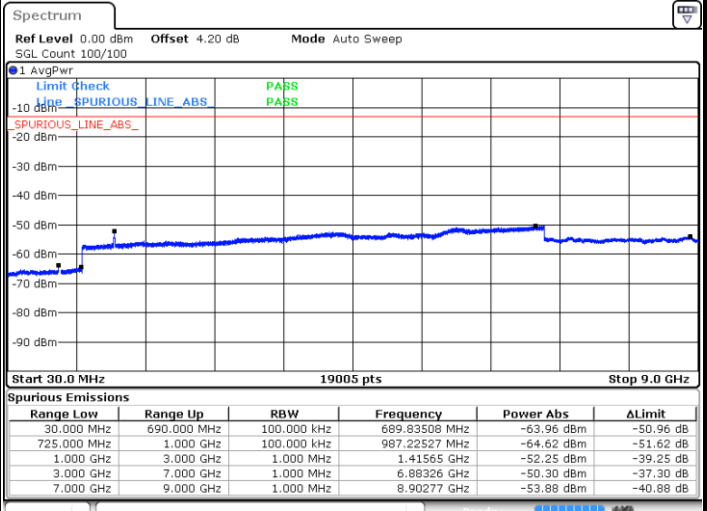
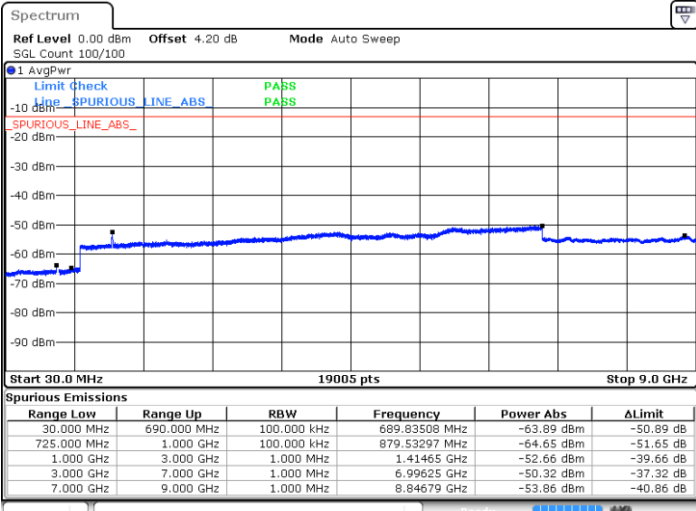




LTE Band 12 / 3MHz

Lowest Channel / QPSK

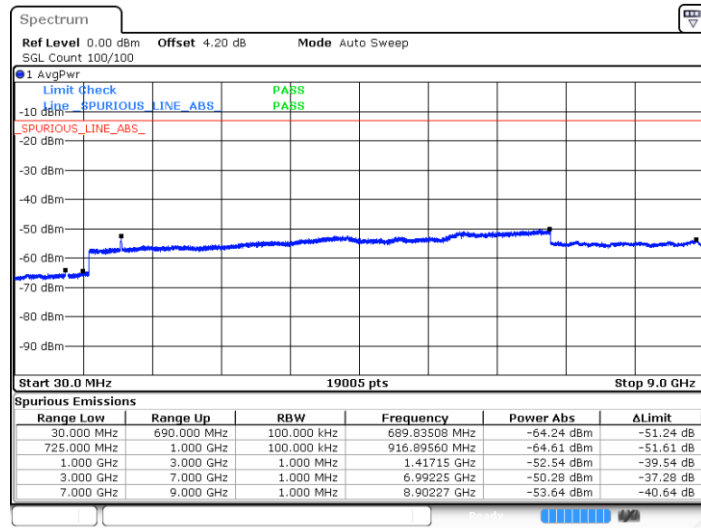
Middle Channel / QPSK



Date: 18 DEC.2020 02:11:41

Date: 18 DEC.2020 02:12:04

Highest Channel / QPSK



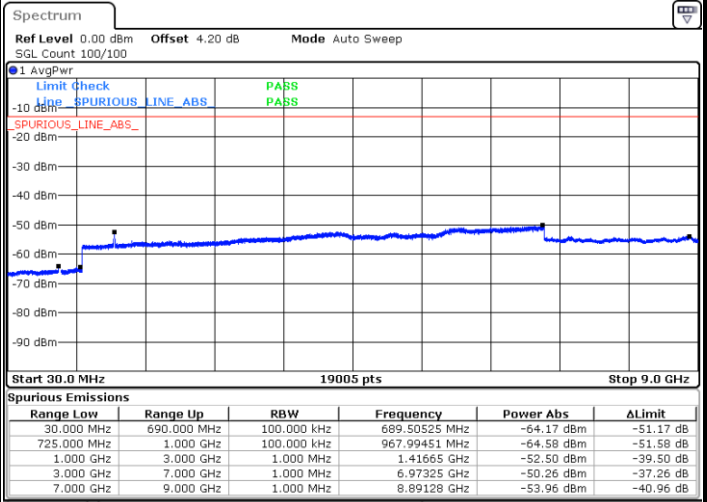
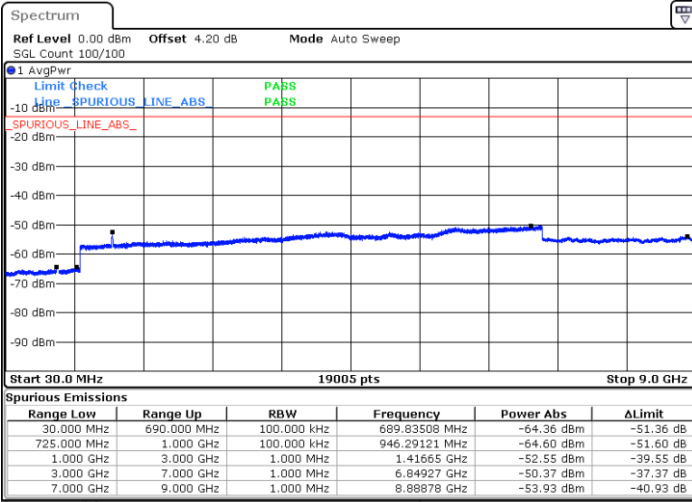
Date: 18 DEC.2020 02:12:26



LTE Band 12 / 5MHz

Lowest Channel / QPSK

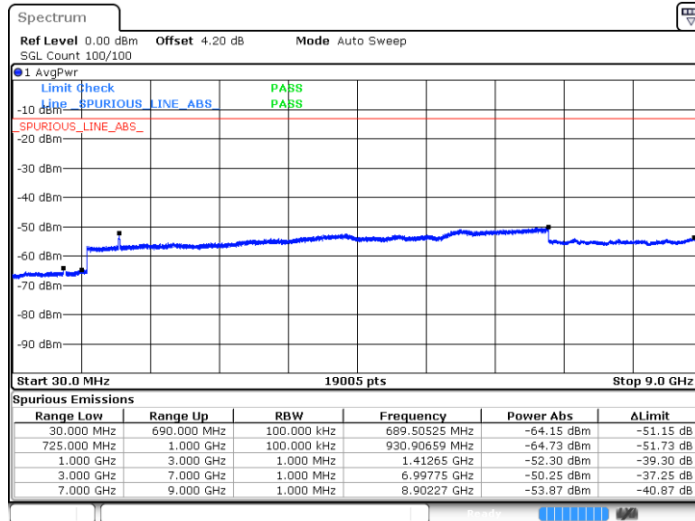
Middle Channel / QPSK



Date: 18 DEC.2020 02:10:18

Date: 18 DEC.2020 02:10:51

Highest Channel / QPSK

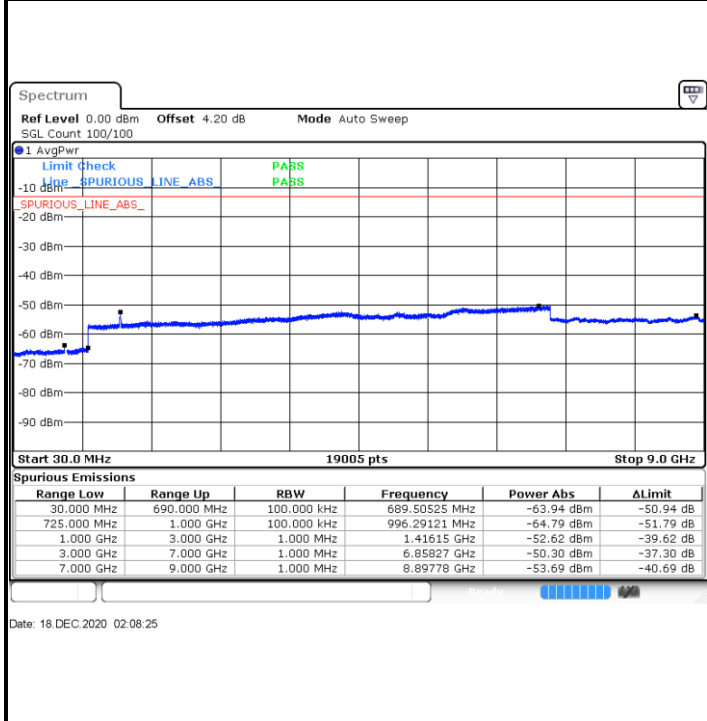


Date: 18 DEC.2020 02:11:14

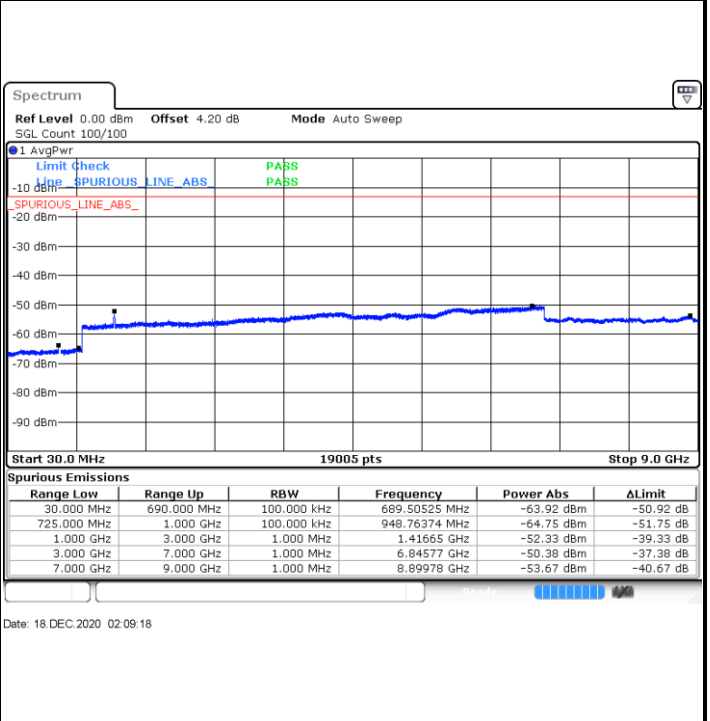


**LTE Band 12 / 10MHz**

**Lowest Channel / QPSK**



**Middle Channel / QPSK**



**Highest Channel / QPSK**

