FCC RF Test Report

APPLICANT	: Shenzhen Gongjin Electronics Co.,Ltd.
EQUIPMENT	: Nokia Smart Node
BRAND NAME	: Nokia
MODEL NAME	: Nokia Multi-Standard Smart Node B2B14B66 (SN4IBN)
FCC ID	: V4V1SN4IBN
STANDARD	: 47 CFR Part 2, 24(E), 27(L)
CLASSIFICATION	: PCS Licensed Transmitter (PCB)
TEST DATE(S)	: Jun. 24, 2021 ~ Jul. 01, 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.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager

ACCREDITED Cert #5145.02

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
FG151309A	Rev. 01	Initial issue of report	Jul. 30, 2021

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§24.232(a)	Equivalent Isotropic Radiated Power (Band 2)	EIRP < 1640Watt	PASS	
	§27.50(d)(2)	Equivalent Isotropic Radiated Power (Band 66)	EIRP < 1640Watt	PASS	
3.5	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §24.238(a) §27.53(h)	Conducted Band Edge Measurement (Band 2) (Band 66)	< 43+10log10(P[Watts])	PASS	-
3.8	§2.1051 §24.238(a) §27.53(h)	Conducted Spurious Emission (Band 2) (Band 66)	< 43+10log10(P[Watts])	PASS	-
3.9	§2.1055 §24.235 §27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§2.1053 §24.238(a) §27.53(h)	Radiated Spurious Emission (Band 2) (Band 66)	< 43+10log$_{10}$(P[Watts])	PASS	Under limit 30.31 dB at 8620.00 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

Shenzhen Gongjin Electronics Co.,Ltd.
No.2 Danzi North Road, Kengzi Street, Pingshan District, Shenzhen, Guangdong, 518122, P.R. China

1.2 Manufacturer

Nokia Solutions and Networks Oy
Karakaari 7, 02610 Espoo, Finland

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Nokia Smart Node
Brand Name	Nokia
Model Name	Nokia Multi-Standard Smart Node B2B14B66 (SN4IBN)
FCC ID	V4V1SN4IBN
HW Version	V03
SW Version	56850
EUT Stage	Production Unit

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 2 : 1930 MHz ~ 1990 MHz LTE Band 66 : 2110 MHz~ 2180 MHz
Rx Frequency	LTE Band 2 : 1850 MHz ~ 1910 MHz LTE Band 66 : 1710 MHz ~ 1780 MHz
Bandwidth	LTE: LTE Band 2 : 5MHz / 10MHz / 15MHz / 20MHz LTE Band 66 : 5MHz / 10MHz / 15MHz / 20MHz NB-IOT Category NB1: 200kHz
Sub-carrier Speacing	NB-IOT Category NB1: LTE Band 2 : 15kHz LTE Band 66 : 15kHz
NB-IoT Operating Type	Guard-band
Maximum Output Power to Antenna	LTE: <MIMO Ant. 1+2> LTE Band 2 : 25.27 dBm <MIMO Ant. 3+4> LTE Band 66 : 24.60 dBm NB-IOT Category NB1: <MIMO Ant. 1+2> LTE Band 2 : 24.50 dBm

	<MIMO Ant. 3+4> LTE Band 66 : 24.72 dBm
Antenna Type	WWAN : Dipole Antenna
Antenna Gain	<SISO Ant. 1/2> LTE Band 2 : 3.20 dBi <SISO Ant. 3/4> LTE Band 66 : 2.90 dBi <MIMO Ant. 1+2> LTE Band 2 : 6.21 dBi <MIMO Ant. 3+4> LTE Band 66 : 5.91 dBi
Type of Modulation	LTE: QPSK / 16QAM / 64QAM NB-IOT Category NB1 : QPSK

Note:

1. For SISO & MIMO mode, the RSE testing has assessed only MIMO mode by referring to their higher conducted power.
2. The maximum ERP/EIRP is calculated from max output power and max antenna gain, only the maximum ERP/EIRP is shown on the report for MIMO mode.
3. The device is a low-power RF transmitter for LTE.
4. LTE Tx is non-signaling mode.
5. LTE only support full RB mode.
6. LTE supports Category NB1 and can only be used with LTE at the same time.
7. MIMO Gain = SISO Gain + Array Gain(10log 2)

1.5 Modification of EUT

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

1.6 Maximum EIRP and Emission Designator

LTE:

LTE Band 2_UL MIMO		QPSK		16QAM	
BW (MHz)	**Frequency Range (MHz)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**
20	1940.0 ~ 1980.0	1.4063	18M6G7D	1.2958	18M5W7D
LTE Band 66_UL MIMO		**QPSK**		**16QAM**	
BW (MHz)	**Frequency Range (MHz)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**
20	2120.0 ~ 2170.0	1.1257	18M8G7D	1.0898	18M6W7D

Note: All modulations have been tested, only the maximum bandwidth and the worst modulation test results are shown in the report.

NB-IOT Category NB1:

LTE Band 2_UL MIMO		QPSK	
BW (MHz)	Frequency Range (MHz)	Maximum EIRP(W)	Emission Designator (99%OBW)
20	1940.0 ~ 1980.0	1.1776	18M4G7D
LTE Band 66_UL MIMO		QPSK	
BW (MHz)	Frequency Range (MHz)	Maximum EIRP(W)	Emission Designator (99%OBW)
20	2120.0 ~ 2170.0	1.1566	19M0G7D

Note: Test combination is LTE Band 2 + NB-IOT, LTE Band 66 + NB-IOT.

1.7 Testing Location

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

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	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		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-KS TH01-KS	CN1257	314309

1.8 Test Software

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

1.9 Applicable Standards

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

- 47 CFR Part 2, 24(E), 27(L)
- 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.

The WWAN Tx mode was pre-scanned for harmonics in three orthogonal panels (Y, Z and X planes) for both horizontal and vertical polarizations, and then the worst mode(X planes) was performed the full test and recorded in this report.

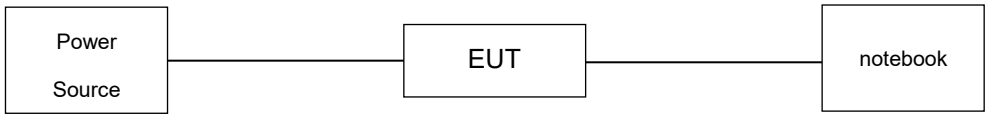
LTE:

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	2	-	-	v	v	v	v	v	v	v	-	-	v	v	v	v
	66	-	-	v	v	v	v	v	v	v	-	-	v	v	v	v
Peak-to-Average Ratio	2	-	-				v	v	v	v	-	-	v		v	
	66	-	-				v	v	v	v	-	-	v		v	
26dB and 99% Bandwidth	2	-	-				v	v	v		-	-	v		v	
	66	-	-				v	v	v		-	-	v		v	
Conducted Band Edge	2	-	-	v	v	v	v	v	v	v	-	-	v	v		v
	66	-	-	v	v	v	v	v	v	v	-	-	v	v		v
Conducted Spurious Emission	2	-	-	v	v	v	v	v			-	-	v	v	v	v
	66	-	-	v	v	v	v	v			-	-	v	v	v	v
Frequency Stability	2	-	-				v	v			-	-	v	v		v
	66	-	-				v	v			-	-	v	v		v
E.R.P / E.I.R.P	2	-	-	v	v	v	v	v	v	v	-	-	v	v	v	v
	66	-	-	v	v	v	v	v	v	v	-	-	v	v	v	v
Radiated Spurious Emission	2	Worst Case													v	
	66	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 test items are based on engineering evaluation.															

NB-IOT Category NB1:

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	2	-	-	-	v	v	v	v	-	-	-	-	v	v	v	v
	66	-	-	-	v	v	v	v	-	-	-	-	v	v	v	v
Peak-to-Average Ratio	2	-	-	-			v	v	-	-	-	-	v		v	
	66	-	-	-			v	v	-	-	-	-	v		v	
26dB and 99% Bandwidth	2	-	-	-			v	v	-	-	-	-	v		v	
	66	-	-	-			v	v	-	-	-	-	v		v	
Conducted Band Edge	2	-	-	-	v	v	v	v	-	-	-	-	v	v		v
	66	-	-	-	v	v	v	v	-	-	-	-	v	v		v
Conducted Spurious Emission	2	-	-	-	v	v	v	v	-	-	-	-	v	v	v	v
	66	-	-	-	v	v	v	v	-	-	-	-	v	v	v	v
Frequency Stability	2	-	-	-			v	v	-	-	-	-	v	v		v
	66	-	-	-			v	v	-	-	-	-	v	v		v
E.R.P / E.I.R.P	2	-	-	-	v	v	v	v	-	-	-	-	v	v	v	v
	66	-	-	-	v	v	v	v	-	-	-	-	v	v	v	v
Radiated Spurious Emission	2	Worst Case													v	
	66	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. 4. Pretest the power of guard band with LTE L/M/H channel, and only the worst power (Low Location with Low channel) of NB-IOT show in the report. 5. Test combination is LTE Band 2 + NB-IOT, LTE Band 66 + NB-IOT.															

2.2 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

For detail, please refer to test mode configuration and setup photographs for each test item.

2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m

2.4 Measurement Results Explanation Example

For all conducted test items:

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

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5.5 dB and 20dB attenuator.

Example :

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

= 5.5 + 20 = 25.5 (dB)

2.5 Frequency List of Low/Middle/High Channels

LTE Band 2 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	700	900	1100
	Frequency	1940	1960	1980
15	Channel	675	900	1125
	Frequency	1937.5	1960	1982.5
10	Channel	650	900	1150
	Frequency	1935	1960	1985
5	Channel	625	900	1175
	Frequency	1932.5	1960	1987.5

LTE Band 66 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	66536	66786	67036
	Frequency	2120	2145	2170
15	Channel	66511	66786	67061
	Frequency	2117.5	2145	2172.5
10	Channel	66486	66786	67086
	Frequency	2115	2145	2175
5	Channel	66461	66786	67111
	Frequency	2112.5	2145	2177.5

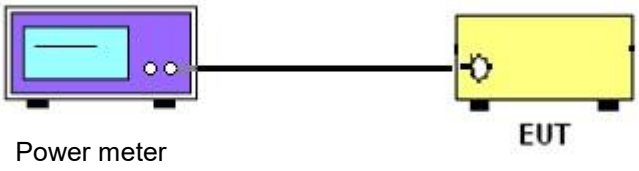
3 Conducted Test Items

3.1 Measuring Instruments

See list of measuring instruments of this test report.

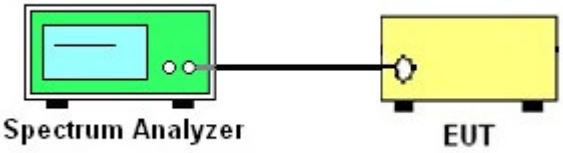
3.2 Test Setup

3.2.1 Conducted Output Power

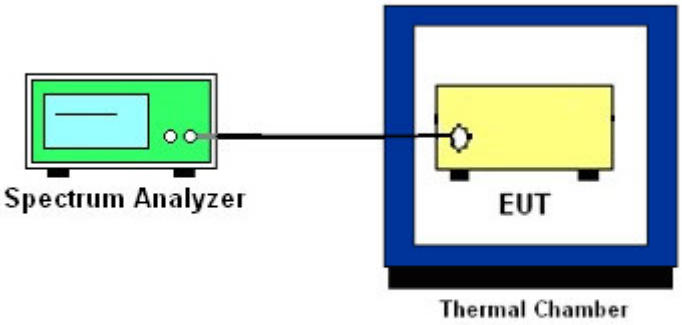


Power meter

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/EIRP

3.4.1 Description of the Conducted Output Power Measurement and ERP/EIRP Measurement

LTE Band 2

§2 4.232 (a)(2)Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP)

LTE Band 66

§27.50(d)(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz;

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 power meter.
3. Set EUT at maximum power perform non-signaling mode.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the power meter.

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 perform non-signaling mode.
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 perform non-signaling mode.
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

24.238 (a)

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 1MHz bandwidth. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53 (h)

For operations in the 2110-2155 MHz and 2155-2180 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.7.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and perform non-signaling mode.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
6. Set spectrum analyzer with RMS detector.
7. 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:

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

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

   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.

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^{th} harmonic.

3.8.2 Test Procedures

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

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..

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 spectrum analyzer.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.9.3 Test Procedures for Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at 20±5°C and connected with the spectrum analyzer.
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.

3.9.4 Test Result

The EUT was operated at the lowest and highest channel, and the frequency at these points shall be recorded as FL and FH respectively. The test results shows that both FL and FH fall within the frequency range of the device design to determine frequency stability

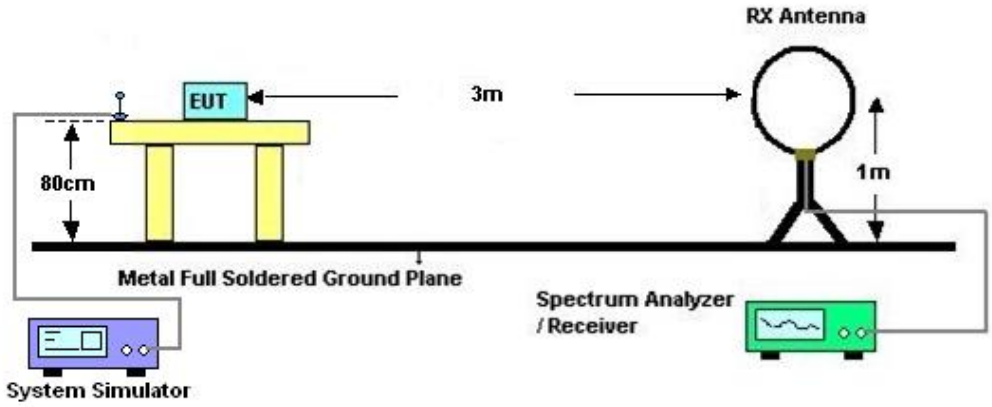
4 Radiated Test Items

4.1 Measuring Instruments

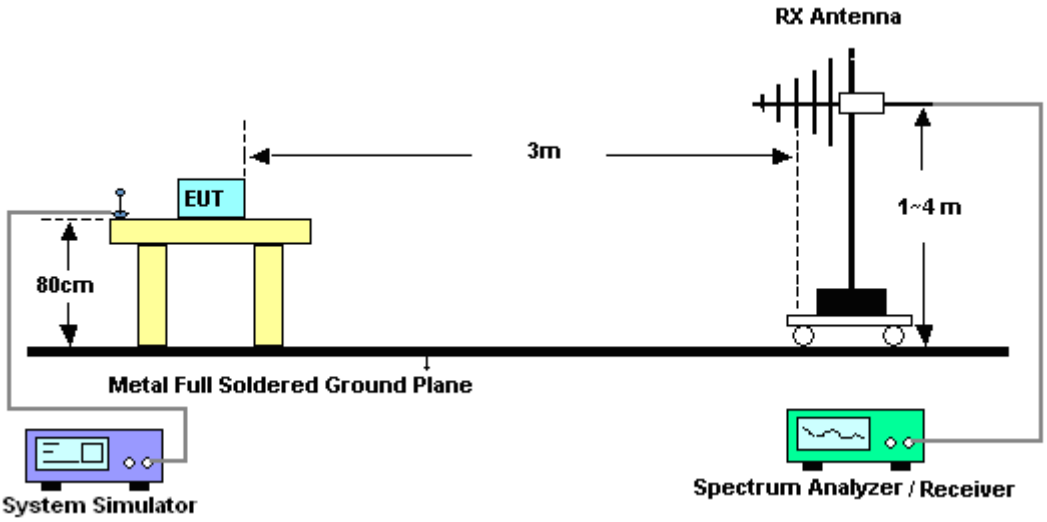
See list of measuring instruments of this test report.

4.2 Test Setup

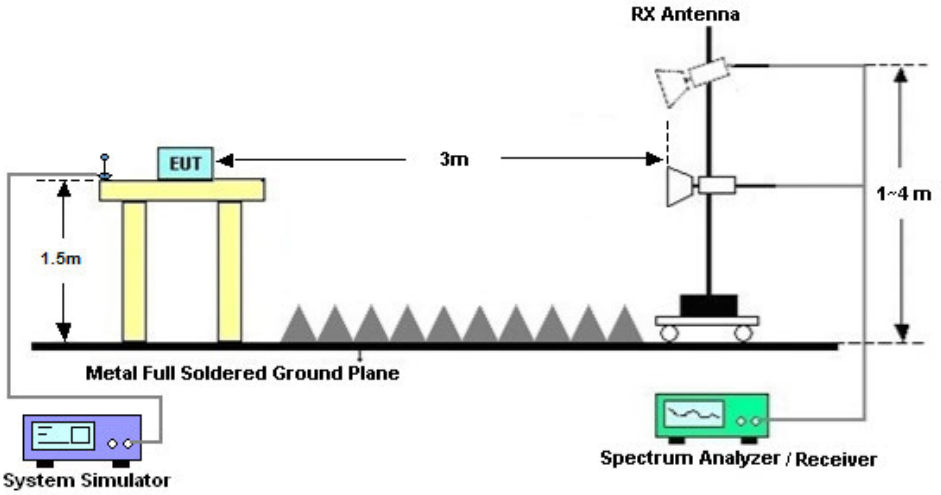
4.2.1 For radiated test below 30MHz



4.2.2 For radiated test from 30MHz to 1GHz



4.2.3 For radiated test above 1GHz



4.3 Test Result of Radiated Test

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

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.

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, set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

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. 01, 2020	Jun. 24, 2021~ Jul. 01, 2021	Oct. 31, 2021	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 07, 2021	Jun. 24, 2021~ Jul. 01, 2021	Jan. 06, 2022	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 07, 2021	Jun. 24, 2021~ Jul. 01, 2021	Jan. 06, 2022	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 03, 2020	Jun. 24, 2021~ Jul. 01, 2021	Jul. 02, 2021	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 13, 2021	Jul. 01, 2021	Apr. 12, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 1, 2020	Jul. 01, 2021	Oct. 31, 2021	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2021	Jul. 01, 2021	May 29, 2022	Radiation (03CH04-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Apr. 01, 2021	Jul. 01, 2021	Mar. 31, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Jan. 06, 2021	Jul. 01, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 06, 2021	Jul. 01, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 07, 2021	Jul. 01, 2021	Jan. 06, 2022	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jan. 06, 2021	Jul. 01, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 14, 2020	Jul. 01, 2021	Oct. 13, 2021	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 01, 2021	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 01, 2021	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 01, 2021	NCR	Radiation (03CH04-KS)
Band Reject Filter	WI	WRCG 1850-1910-1835-1925-40-8SS	1850-1910-1835-1925 Tunable Notch	SN 15	NCR	Jul. 01, 2021	NCR	Radiation (03CH04-KS)
High Pass Filter	WI	WHKX12-935-1000-15000-40ST	1G High Pass	SN 2	NCR	Jul. 01, 2021	NCR	Radiation (03CH04-KS)
High pass Filter	WI	WHKX12-2805-3000-18000-40ST	3G High Pass	SN 8	NCR	Jul. 01, 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**

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

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

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

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

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power) and EIRP

LTE:

LTE Band 2:

Ant.	BW	Modulation	Channel	Frequency (MHz)	Gain (dB)	Power (dBm)	EIRP (dbm)	EIRP power (W)
1+2	5M	QPSK	625	1932.5	6.21	25.03	31.24	1.3290
		QPSK	900	1960	6.21	24.50	30.71	1.1783
		QPSK	1175	1987.5	6.21	24.47	30.68	1.1702
	10M	QPSK	650	1935	6.21	24.82	31.03	1.2678
		QPSK	900	1960	6.21	24.67	30.88	1.2233
		QPSK	1150	1985	6.21	24.58	30.79	1.1998
	15M	QPSK	675	1937.5	6.21	24.59	30.80	1.2011
		QPSK	900	1960	6.21	24.79	31.00	1.2602
		QPSK	1125	1982.5	6.21	24.88	31.09	1.2844
	20M	QPSK	700	1940	6.21	25.23	31.44	1.3934
		QPSK	900	1960	6.21	25.27	31.48	1.4063
		QPSK	1100	1980	6.21	24.71	30.92	1.2362
	5M	16QAM	625	1932.5	6.21	24.54	30.75	1.1872
		16QAM	900	1960	6.21	24.48	30.69	1.1733
		16QAM	1175	1987.5	6.21	24.68	30.89	1.2285
	10M	16QAM	650	1935	6.21	24.60	30.81	1.2038
		16QAM	900	1960	6.21	24.69	30.90	1.2307
		16QAM	1150	1985	6.21	24.59	30.80	1.2011
	15M	16QAM	675	1937.5	6.21	24.91	31.12	1.2928
		16QAM	900	1960	6.21	24.70	30.91	1.2321
		16QAM	1125	1982.5	6.21	24.79	31.00	1.2582
	20M	16QAM	700	1940	6.21	24.92	31.13	1.2958
		16QAM	900	1960	6.21	24.91	31.12	1.2928
		16QAM	1100	1980	6.21	24.74	30.95	1.2447
	5M	64QAM	625	1932.5	6.21	24.47	30.68	1.1686
		64QAM	900	1960	6.21	24.62	30.83	1.2112
		64QAM	1175	1987.5	6.21	24.57	30.78	1.1965
	10M	64QAM	650	1935	6.21	24.70	30.91	1.2319
		64QAM	900	1960	6.21	24.65	30.86	1.2181
		64QAM	1150	1985	6.21	24.61	30.82	1.2079
	15M	64QAM	675	1937.5	6.21	24.91	31.12	1.2928
		64QAM	900	1960	6.21	24.88	31.09	1.2854
		64QAM	1125	1982.5	6.21	24.84	31.05	1.2741
	20M	64QAM	700	1940	6.21	24.90	31.11	1.2914
		64QAM	900	1960	6.21	24.85	31.06	1.2756
		64QAM	1100	1980	6.21	24.83	31.04	1.2708

LTE Band 66:

Ant.	BW	Modulation	Channel	Frequency (MHz)	Gain (dB)	Power (dBm)	EIRP (dbm)	EIRP power (W)
3+4	5M	QPSK	66461	2112.5	5.91	24.59	30.50	1.1226
		QPSK	66786	2145	5.91	24.43	30.34	1.0810
		QPSK	67111	2177.5	5.91	24.48	30.39	1.0940
	10M	QPSK	66486	2115	5.91	24.12	30.03	1.0060
		QPSK	66786	2145	5.91	24.12	30.03	1.0075
		QPSK	67086	2175	5.91	24.24	30.15	1.0353
	15M	QPSK	66511	2117.5	5.91	24.22	30.13	1.0302
		QPSK	66786	2145	5.91	24.19	30.10	1.0243
		QPSK	67061	2172.5	5.91	24.35	30.26	1.0607
	20M	QPSK	66536	2120	5.91	24.44	30.35	1.0845
		QPSK	66786	2145	5.91	24.60	30.51	1.1257
		QPSK	67036	2170	5.91	24.39	30.30	1.0710
	5M	16QAM	66461	2112.5	5.91	24.07	29.98	0.9959
		16QAM	66786	2145	5.91	24.22	30.13	1.0309
		16QAM	67111	2177.5	5.91	24.28	30.19	1.0448
	10M	16QAM	66486	2115	5.91	24.10	30.01	1.0024
		16QAM	66786	2145	5.91	24.18	30.09	1.0212
		16QAM	67086	2175	5.91	24.44	30.35	1.0832
	15M	16QAM	66511	2117.5	5.91	24.41	30.32	1.0757
		16QAM	66786	2145	5.91	24.44	30.35	1.0832
		16QAM	67061	2172.5	5.91	24.38	30.29	1.0681
	20M	16QAM	66536	2120	5.91	24.44	30.35	1.0832
		16QAM	66786	2145	5.91	24.38	30.29	1.0698
		16QAM	67036	2170	5.91	24.43	30.34	1.0818
	5M	64QAM	66461	2112.5	5.91	24.21	30.12	1.0282
		64QAM	66786	2145	5.91	24.33	30.24	1.0577
		64QAM	67111	2177.5	5.91	24.11	30.02	1.0040
	10M	64QAM	66486	2115	5.91	24.08	29.99	0.9982
		64QAM	66786	2145	5.91	24.23	30.14	1.0337
		64QAM	67086	2175	5.91	24.39	30.30	1.0716
	15M	64QAM	66511	2117.5	5.91	24.37	30.28	1.0667
		64QAM	66786	2145	5.91	24.44	30.35	1.0832
		64QAM	67061	2172.5	5.91	24.41	30.32	1.0757
	20M	64QAM	66536	2120	5.91	24.33	30.24	1.0564
		64QAM	66786	2145	5.91	24.35	30.26	1.0612
		64QAM	67036	2170	5.91	24.46	30.37	1.0898

NB-IOT Category NB1:

LTE Band 2:

Ant.	BW	Modulation	Channel	Frequency (MHz)	Gain (dB)	Power (dBm)	EIRP (dbm)	EIRP power (W)
1+2	10M	QPSK	650	1935	6.21	24.33	30.54	1.1320
		QPSK	900	1960	6.21	24.12	30.33	1.0791
		QPSK	1150	1985	6.21	24.11	30.32	1.0754
	15M	QPSK	675	1937.5	6.21	24.42	30.63	1.1572
		QPSK	900	1960	6.21	24.34	30.55	1.1345
		QPSK	1125	1982.5	6.21	24.22	30.43	1.1030
	20M	QPSK	700	1940	6.21	24.41	30.62	1.1536
		QPSK	900	1960	6.21	24.22	30.43	1.1046
		QPSK	1100	1980	6.21	24.50	30.71	1.1776

LTE Band 66:

Ant.	BW	Modulation	Channel	Frequency (MHz)	Gain (dB)	Power (dBm)	EIRP (dbm)	EIRP power (W)
3+4	10M	QPSK	66486	2115	5.91	24.25	30.16	1.0383
		QPSK	66786	2145	5.91	23.93	29.84	0.9639
		QPSK	67086	2175	5.91	24.21	30.12	1.0272
	15M	QPSK	66511	2117.5	5.91	24.20	30.11	1.0247
		QPSK	66786	2145	5.91	24.34	30.25	1.0582
		QPSK	67061	2172.5	5.91	24.41	30.32	1.0770
	20M	QPSK	66536	2120	5.91	24.55	30.46	1.1123
		QPSK	66786	2145	5.91	24.72	30.63	1.1566
		QPSK	67036	2170	5.91	24.61	30.52	1.1261

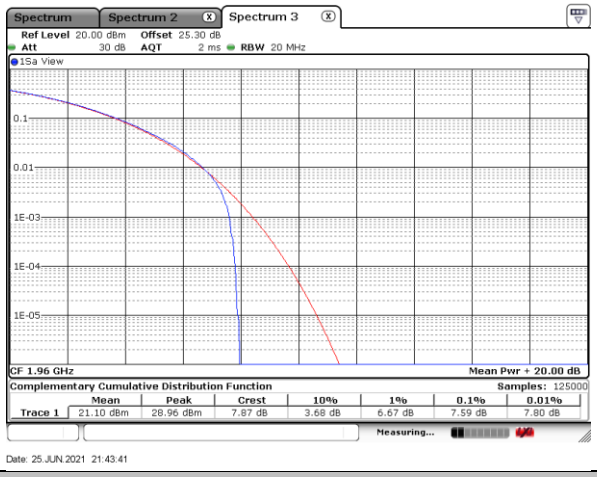
For LTE:

LTE Band 2 MIMO Ant. 1

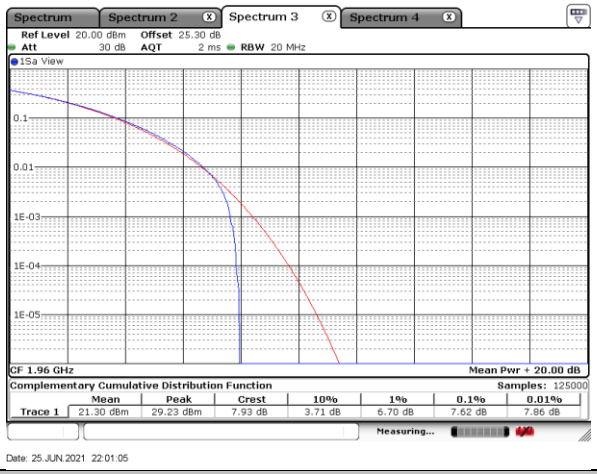
Peak-to-Average Ratio

Mode	LTE Band 2 / 20MHz			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	7.59	7.62	7.59	PASS

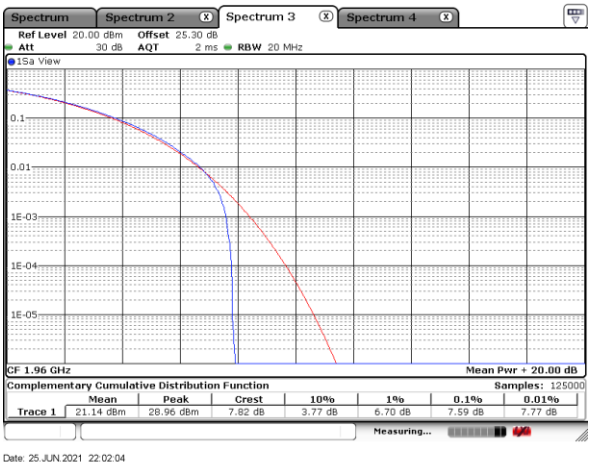
LTE Band 2 / 20MHz
Middle Channel / Full RB/ QPSK



Middle Channel / Full RB/ 16QAM

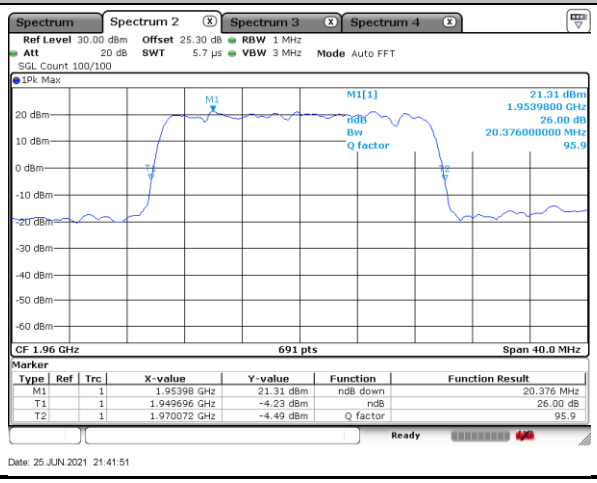
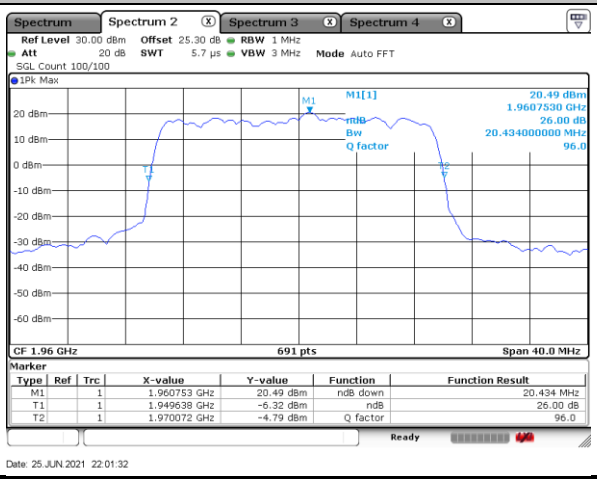


Middle Channel / Full RB/ 64QAM



26dB Bandwidth

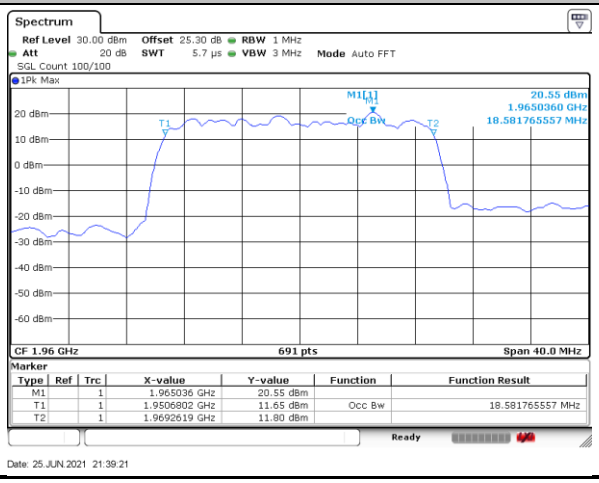
Mode	LTE Band 2 : 26dB BW(MHz)	
BW	20MHz	
Mod.	QPSK	16QAM
Middle CH	20.38	20.43

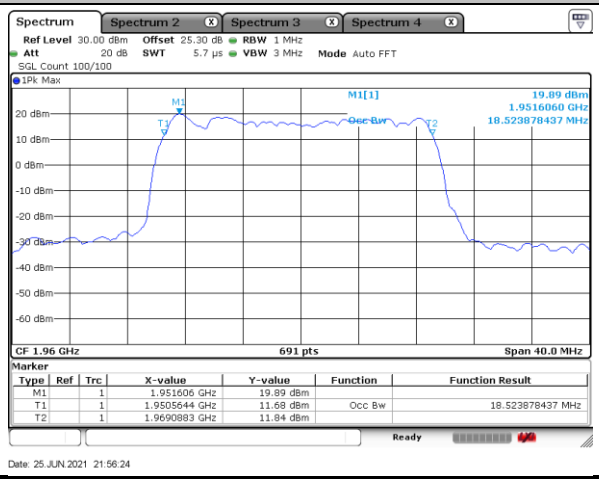
LTE Band 2	
Middle Channel / 20MHz / QPSK	Middle Channel / 20MHz / 16QAM
	

Occupied Bandwidth

Mode	LTE Band 2 : 99%OBW(MHz)	
BW	20MHz	
Mod.	QPSK	16QAM
Middle CH	18.58	18.52

LTE Band 2	
Middle Channel / 20MHz / QPSK	Middle Channel / 20MHz / 16QAM

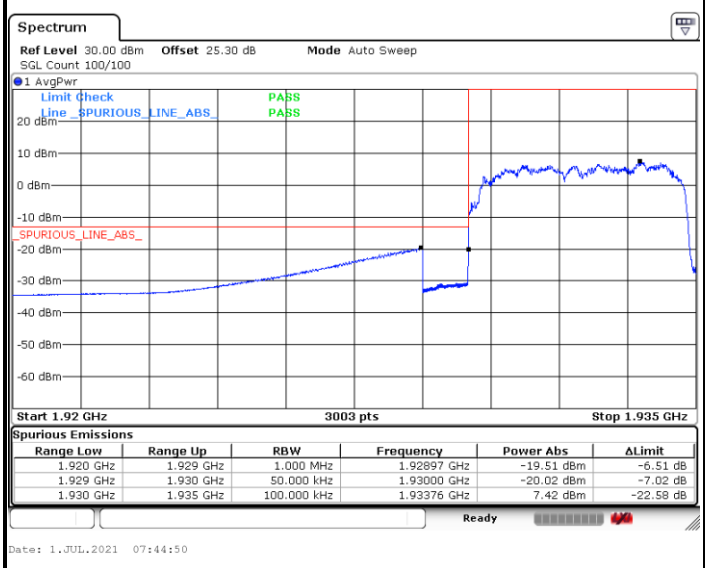




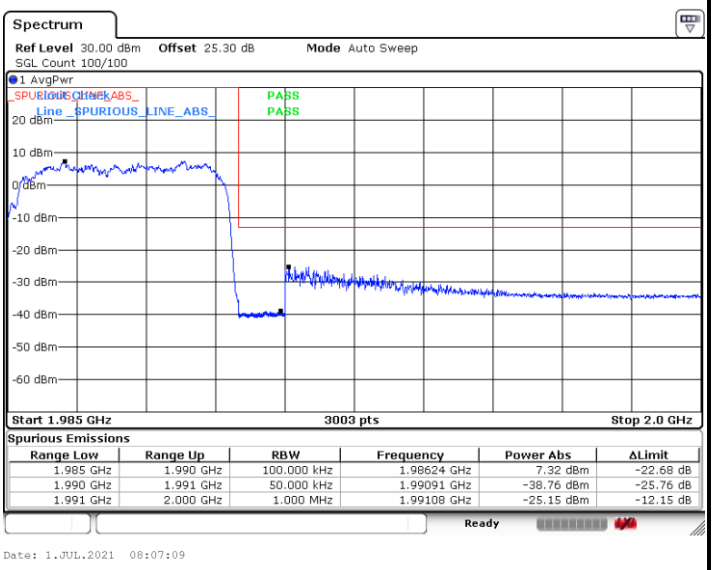
Conducted Band Edge

LTE Band 2 / 5MHz / QPSK

Lowest Band Edge / Full RB

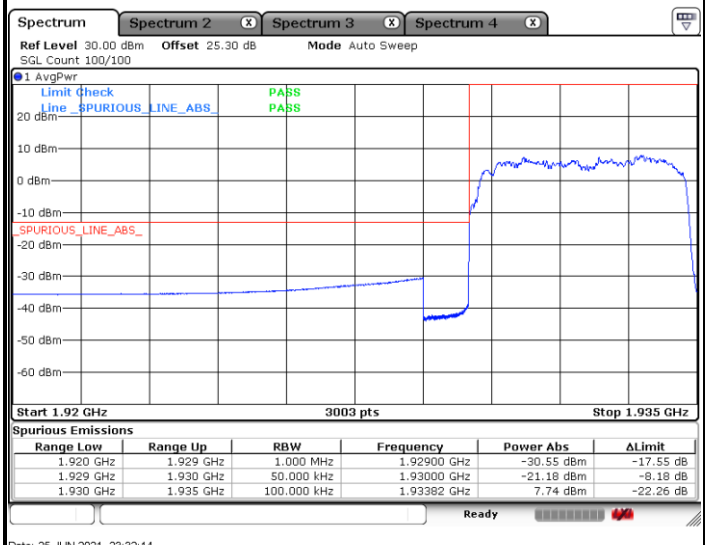


Highest Band Edge / Full RB

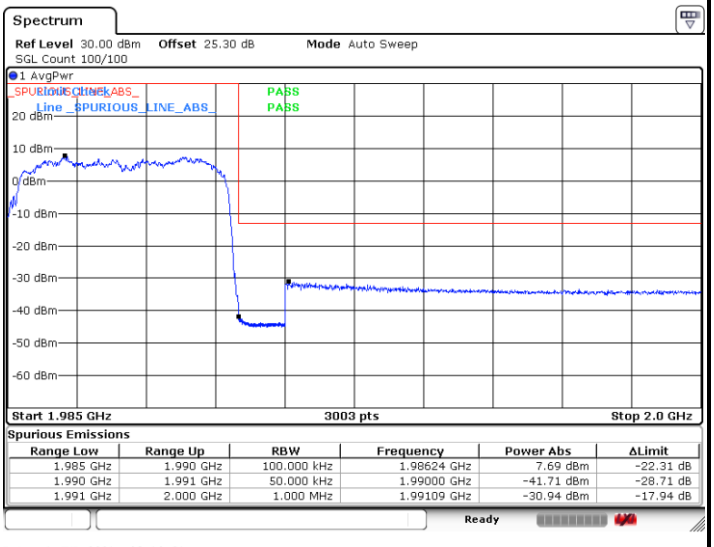


LTE Band 2 / 5MHz / 16QAM

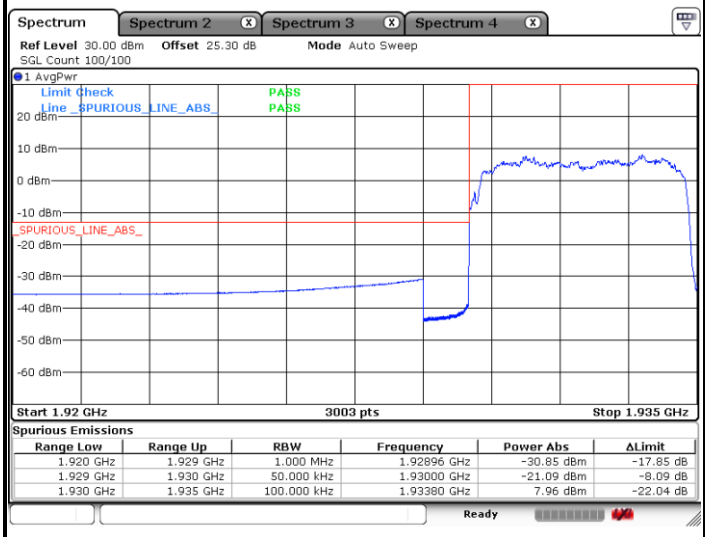
Lowest Band Edge / Full RB

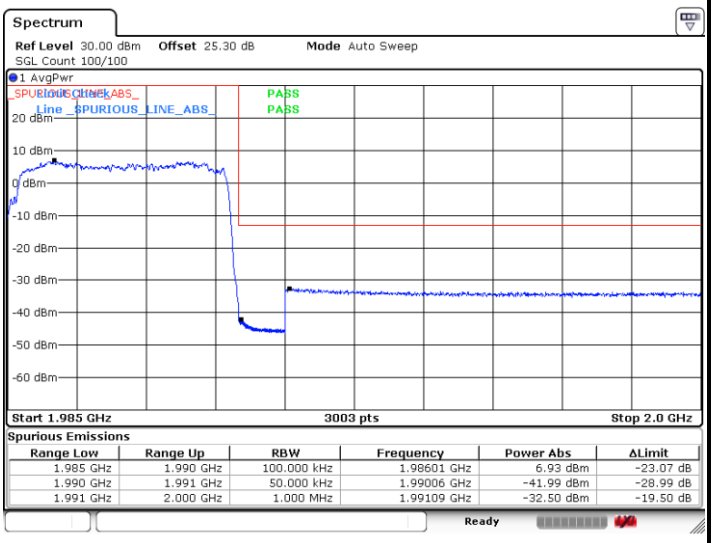


Highest Band Edge / Full RB



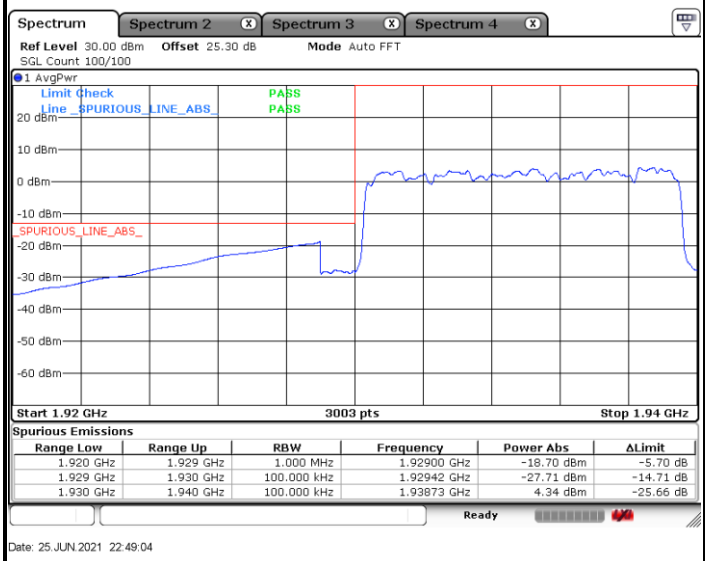
LTE Band 2 / 5MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**





LTE Band 2 / 10MHz / QPSK

Lowest Band Edge / Full RB



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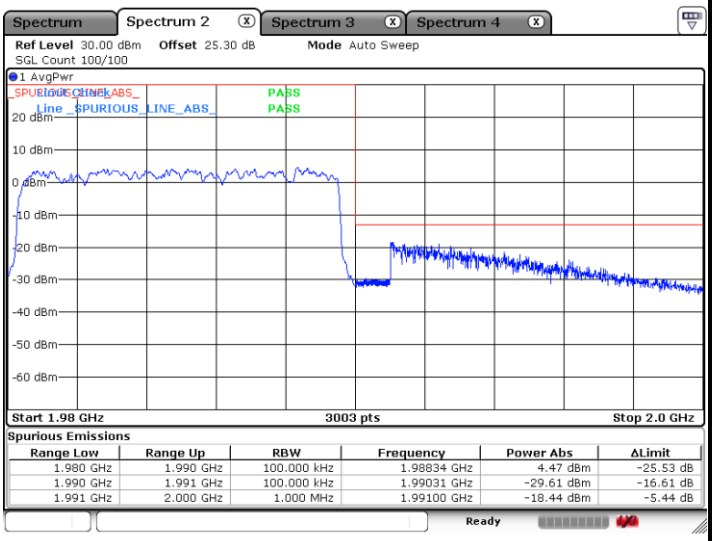
Highest Band Edge / Full RB



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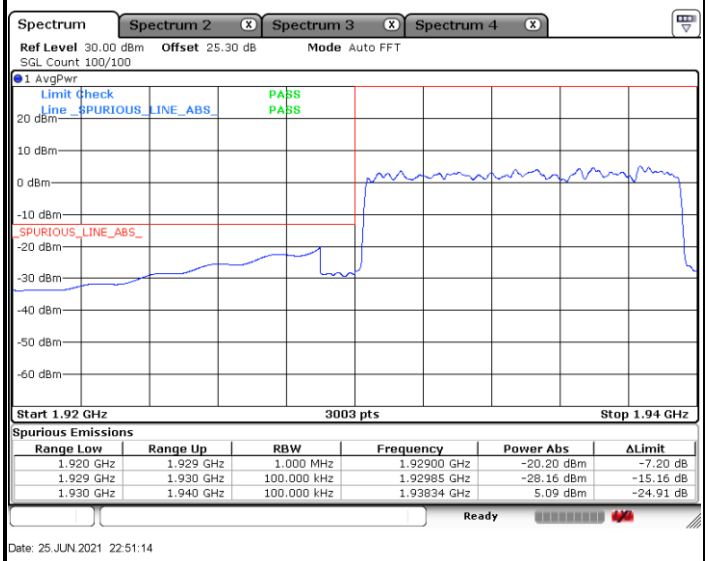
LTE Band 2 / 10MHz / 16QAM

Lowest Band Edge / Full RB



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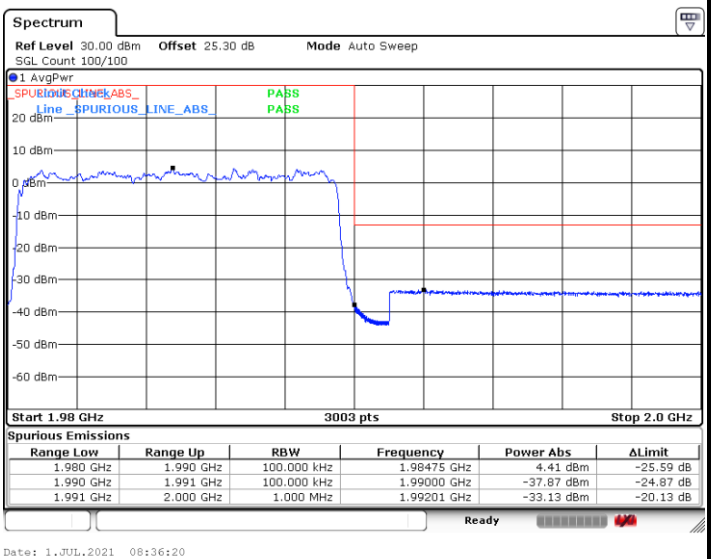
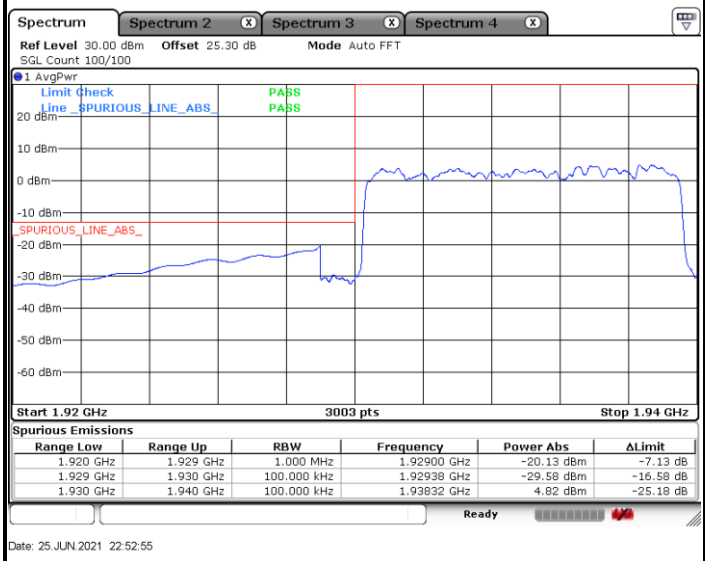
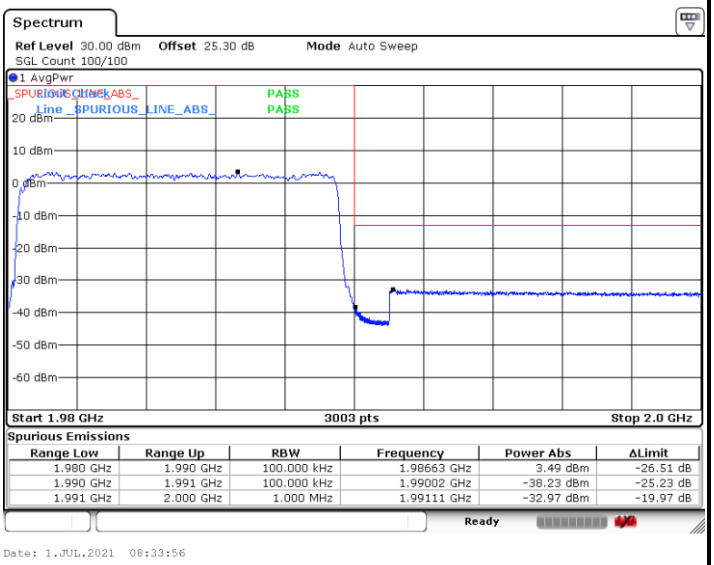
Highest Band Edge / Full RB



Date: 1.JUL.2021 08:36:20

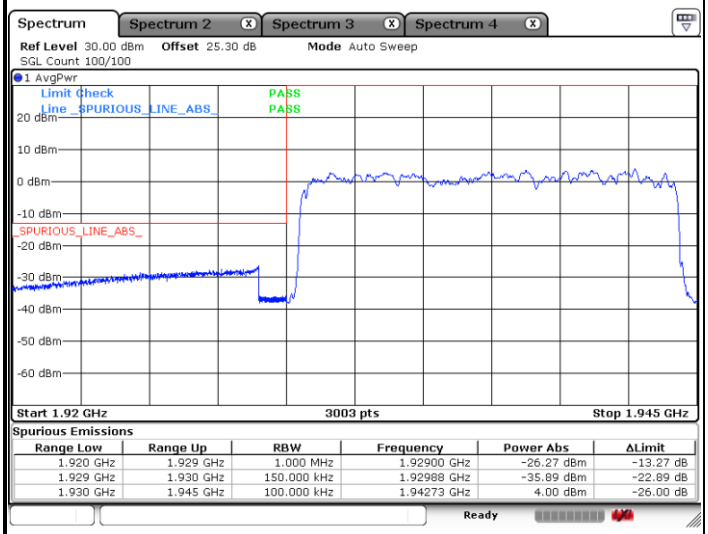
LTE Band 2 / 10MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**





LTE Band 2 / 15MHz / QPSK

Lowest Band Edge / Full RB



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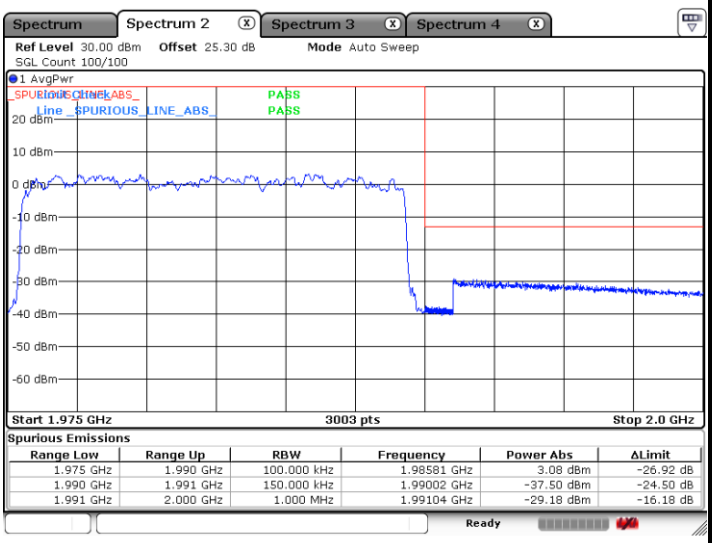
Highest Band Edge / Full RB



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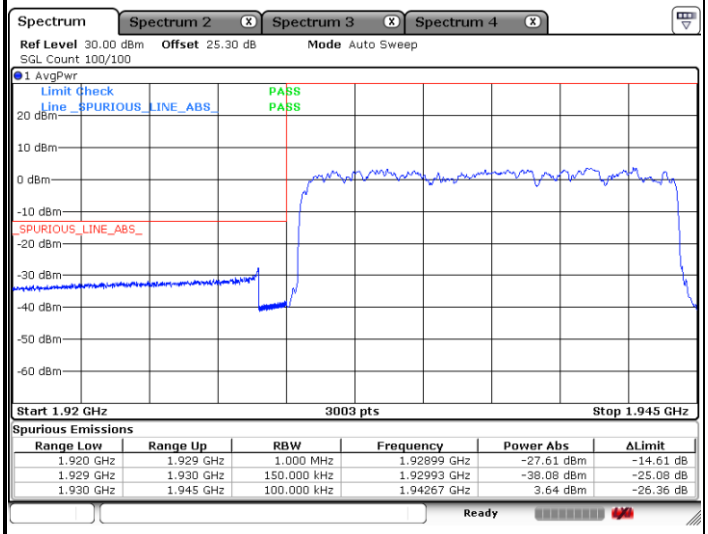
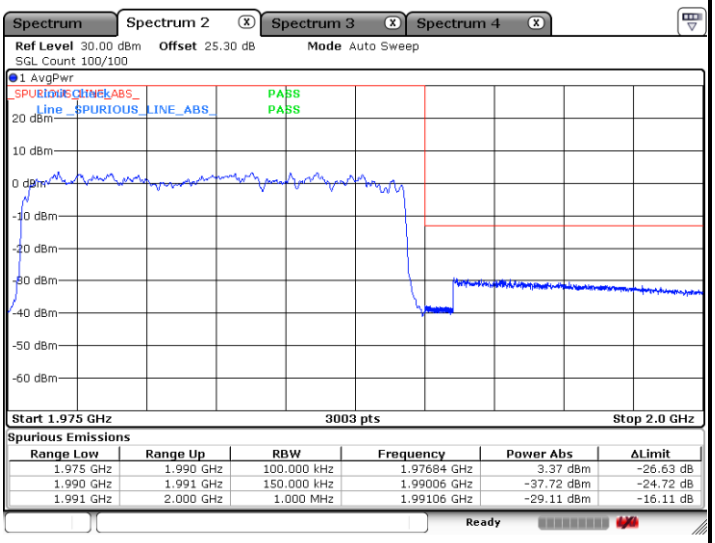
LTE Band 2 / 15MHz / 16QAM

Lowest Band Edge / Full RB



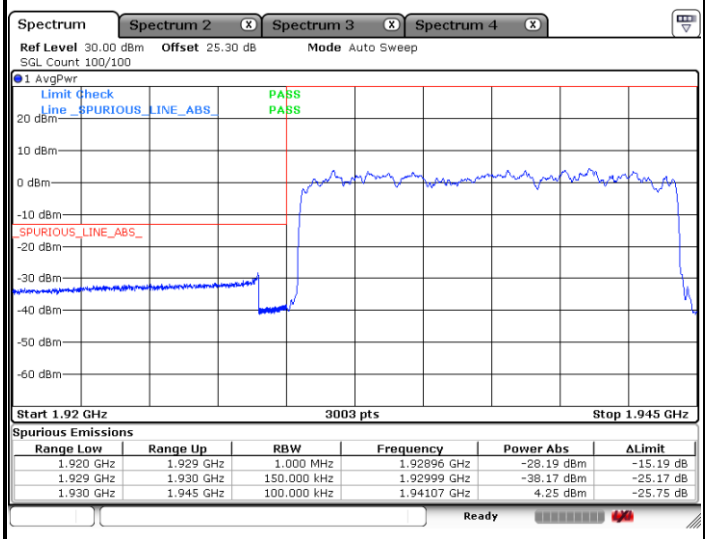
Date: 25.JUN.2021 22:27:04

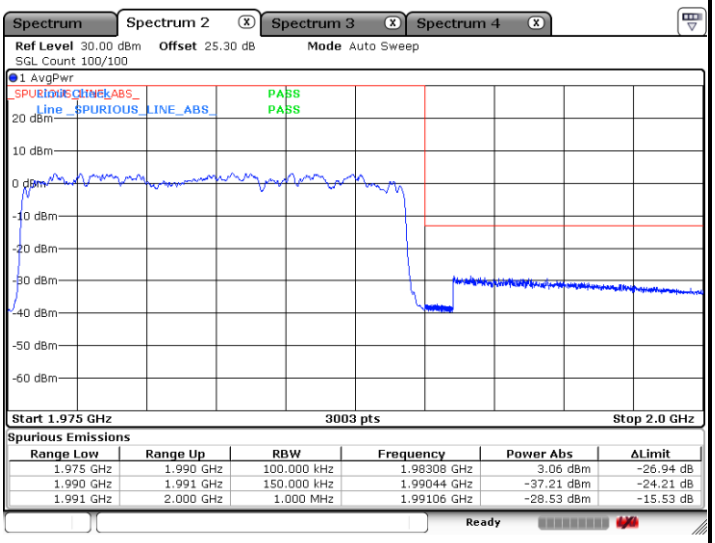
Highest Band Edge / Full RB



Date: 25.JUN.2021 22:37:11

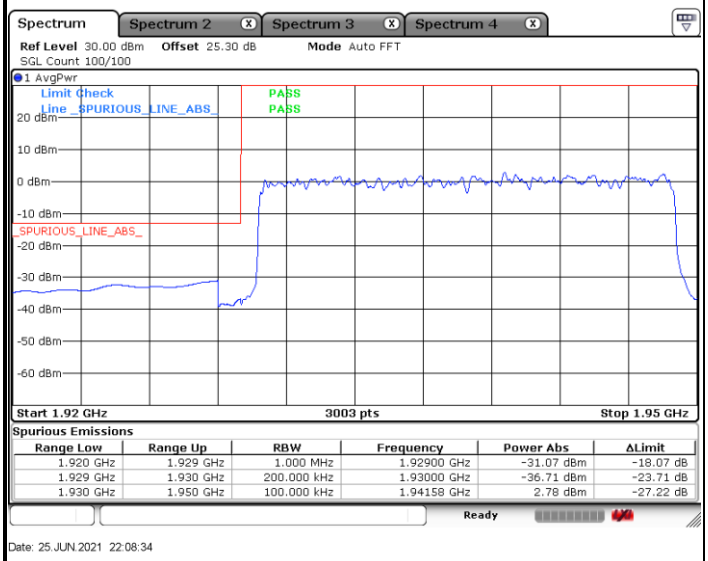
LTE Band 2 / 15MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**





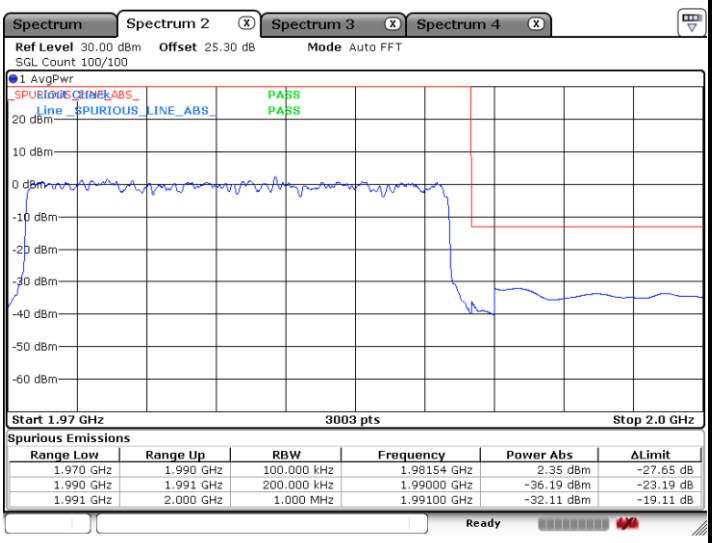
LTE Band 2 / 20MHz / QPSK

Lowest Band Edge / Full RB



Date: 25.JUN.2021 22:08:34

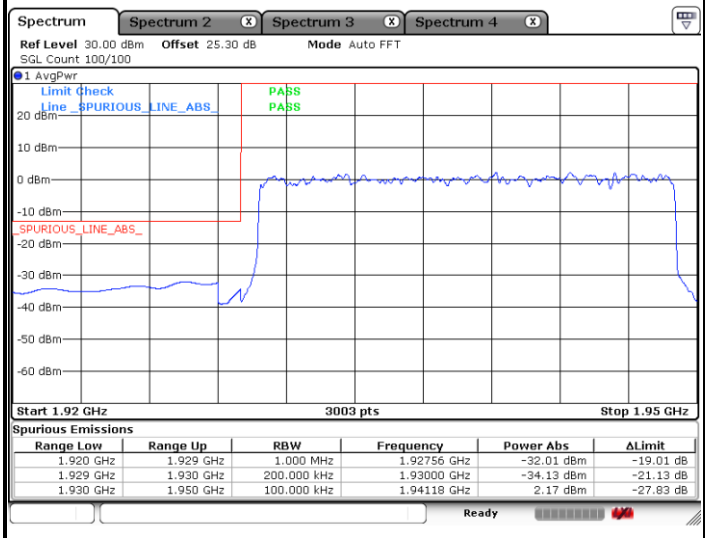
Highest Band Edge / Full RB



Date: 25.JUN.2021 22:18:41

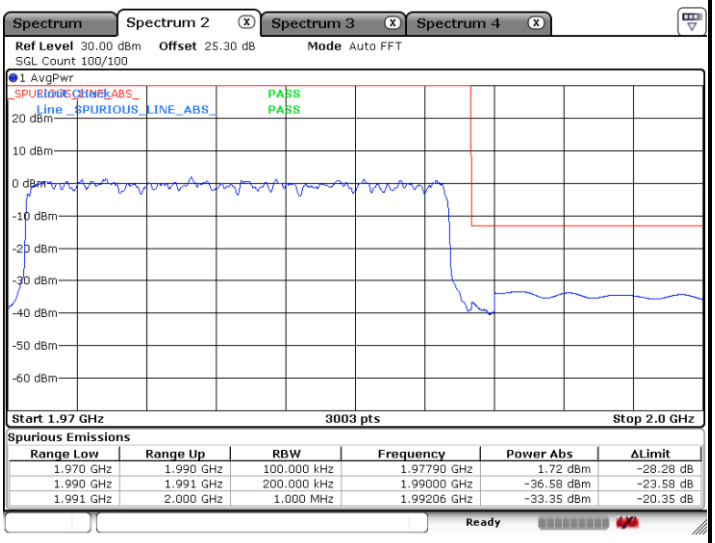
LTE Band 2 / 20MHz / 16QAM

Lowest Band Edge / Full RB



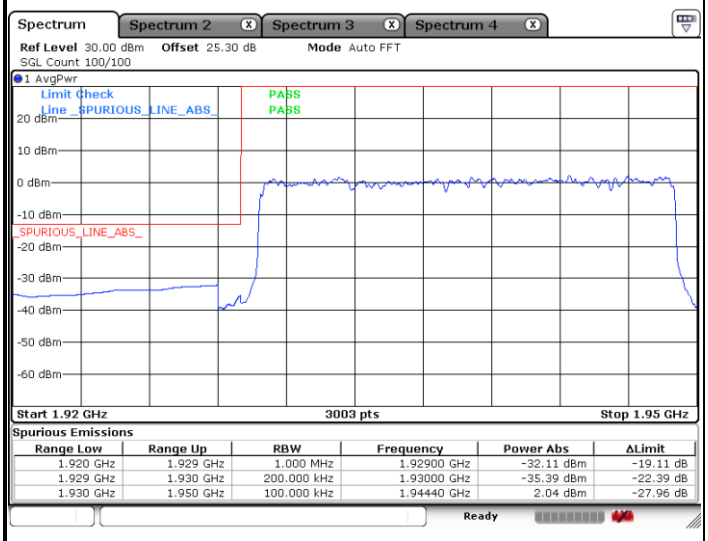
Date: 25.JUN.2021 22:11:13

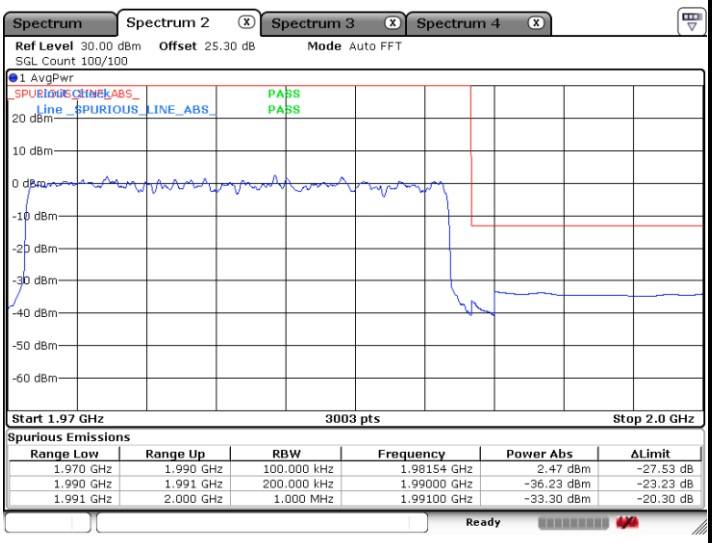
Highest Band Edge / Full RB



Date: 25.JUN.2021 22:19:10

LTE Band 2 / 20MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**

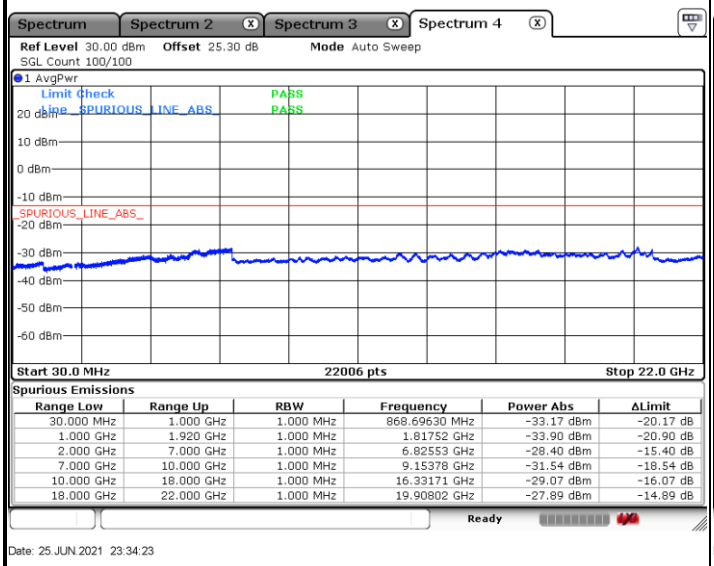




Conducted Spurious Emission

LTE Band 2 / 5MHz

Lowest Channel / QPSK

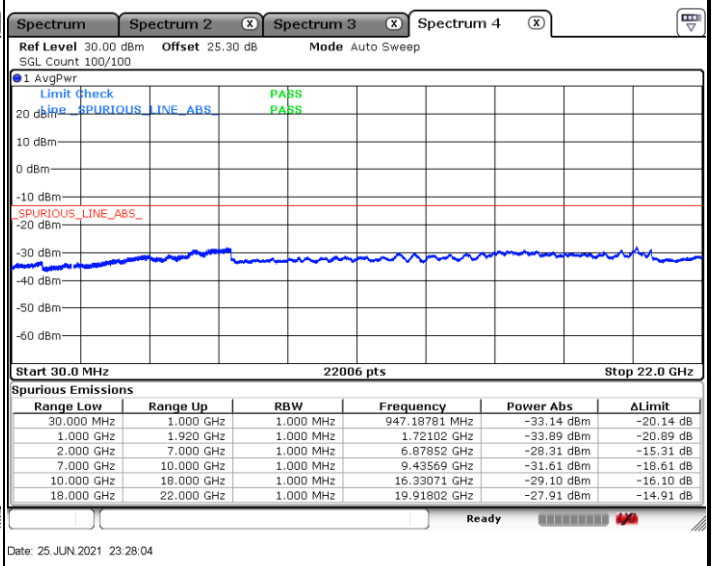


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	868.69630 MHz	-33.17 dBm	-20.17 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.81752 GHz	-33.90 dBm	-20.90 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.82553 GHz	-28.40 dBm	-15.40 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.15378 GHz	-31.54 dBm	-18.54 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.33171 GHz	-29.07 dBm	-16.07 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90802 GHz	-27.89 dBm	-14.89 dB

Date: 25.JUN.2021 23:34:23

Middle Channel / QPSK

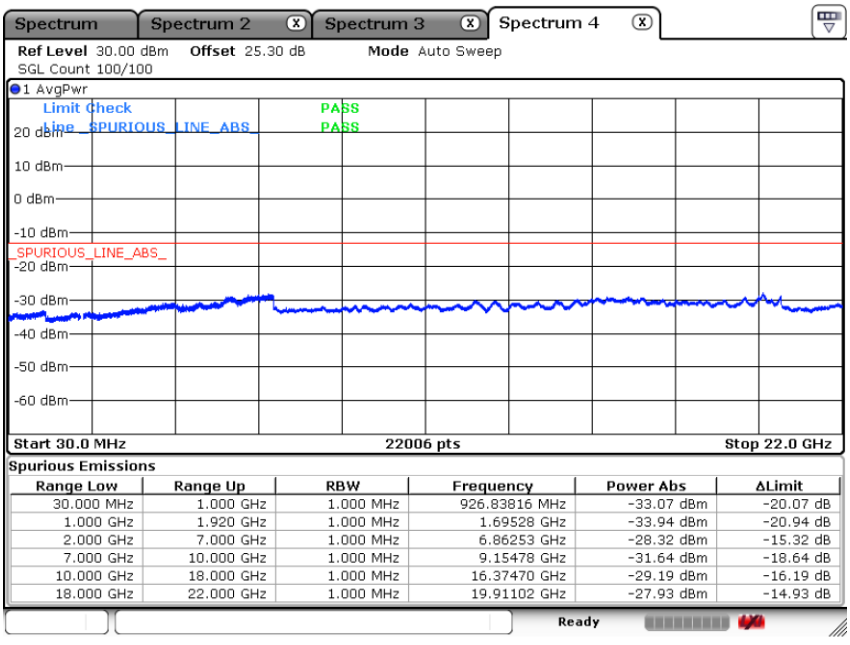


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	947.18781 MHz	-33.14 dBm	-20.14 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.72102 GHz	-33.89 dBm	-20.89 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.87852 GHz	-28.31 dBm	-15.31 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.43569 GHz	-31.61 dBm	-18.61 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.33071 GHz	-29.10 dBm	-16.10 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91802 GHz	-27.91 dBm	-14.91 dB

Date: 25.JUN.2021 23:28:04

Highest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	926.83816 MHz	-33.07 dBm	-20.07 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.69528 GHz	-33.94 dBm	-20.94 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.86253 GHz	-28.32 dBm	-15.32 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.15478 GHz	-31.64 dBm	-18.64 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.37470 GHz	-29.19 dBm	-16.19 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91102 GHz	-27.93 dBm	-14.93 dB

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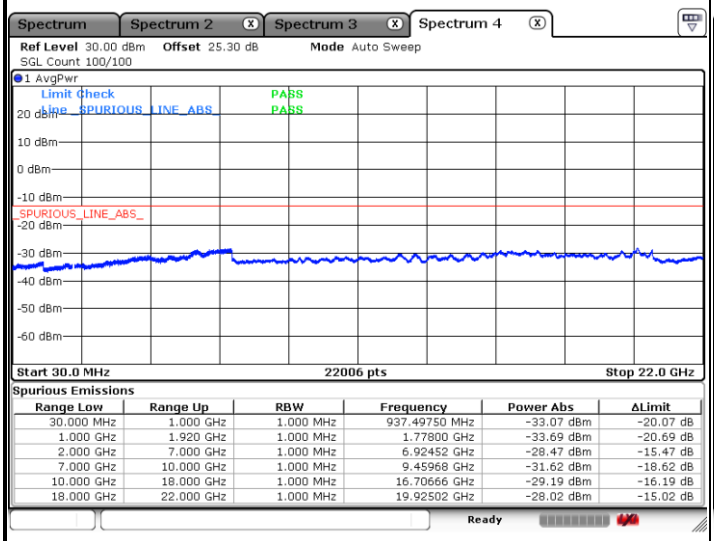
LTE Band 2 / 10MHz

Lowest Channel / QPSK

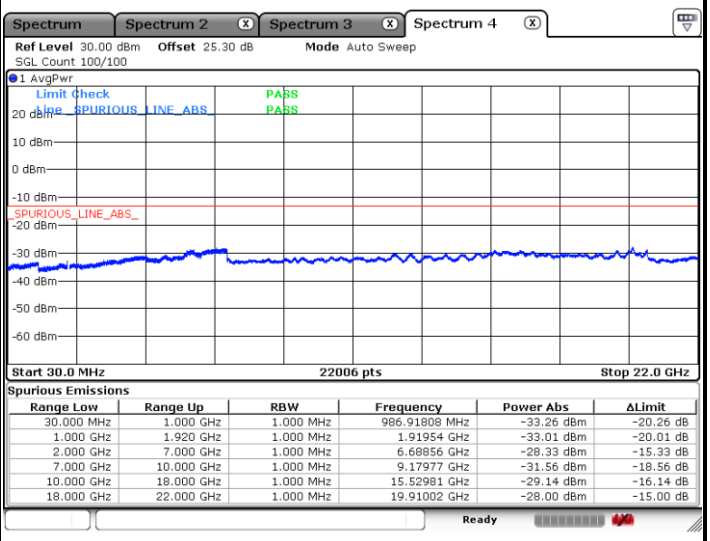


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	937.49750 MHz	-33.07 dBm	-20.07 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.77800 GHz	-33.69 dBm	-20.69 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.92452 GHz	-28.47 dBm	-15.47 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.45968 GHz	-31.62 dBm	-18.62 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.70666 GHz	-29.19 dBm	-16.19 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.92502 GHz	-28.02 dBm	-15.02 dB

Date: 25.JUN.2021 22:52:05

Middle Channel / QPSK

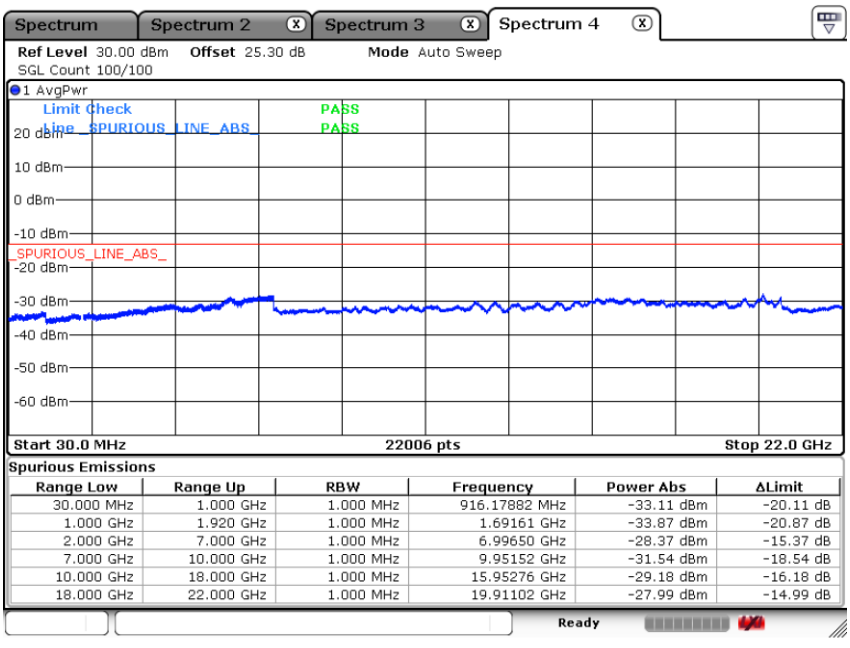


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	986.91808 MHz	-33.26 dBm	-20.26 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.91954 GHz	-33.01 dBm	-20.01 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.68856 GHz	-28.33 dBm	-15.33 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.17977 GHz	-31.56 dBm	-18.56 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.52981 GHz	-29.14 dBm	-16.14 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91002 GHz	-28.00 dBm	-15.00 dB

Date: 25.JUN.2021 22:55:17

Highest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	916.17882 MHz	-33.11 dBm	-20.11 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.69161 GHz	-33.87 dBm	-20.87 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.99650 GHz	-28.37 dBm	-15.37 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.95152 GHz	-31.54 dBm	-18.54 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.95276 GHz	-29.18 dBm	-16.18 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91102 GHz	-27.99 dBm	-14.99 dB

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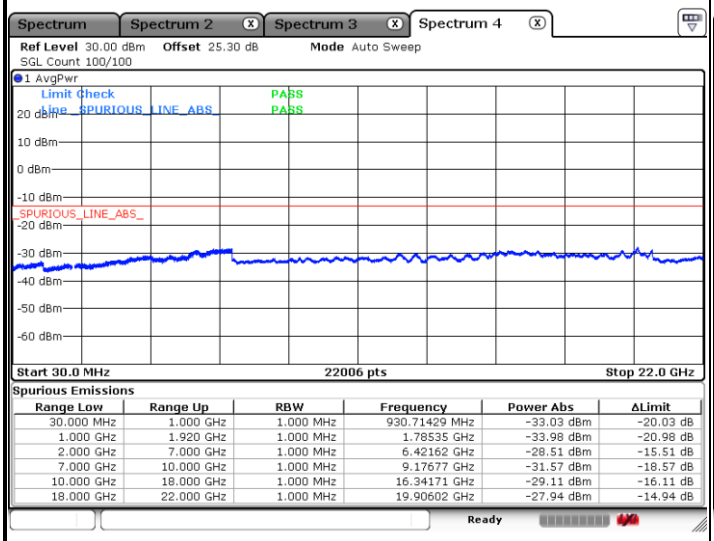
LTE Band 2 / 15MHz

Lowest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	930.71429 MHz	-33.03 dBm	-20.03 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.78535 GHz	-33.98 dBm	-20.98 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.42162 GHz	-28.51 dBm	-15.51 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.17677 GHz	-31.57 dBm	-18.57 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.34171 GHz	-29.11 dBm	-16.11 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90602 GHz	-27.94 dBm	-14.94 dB

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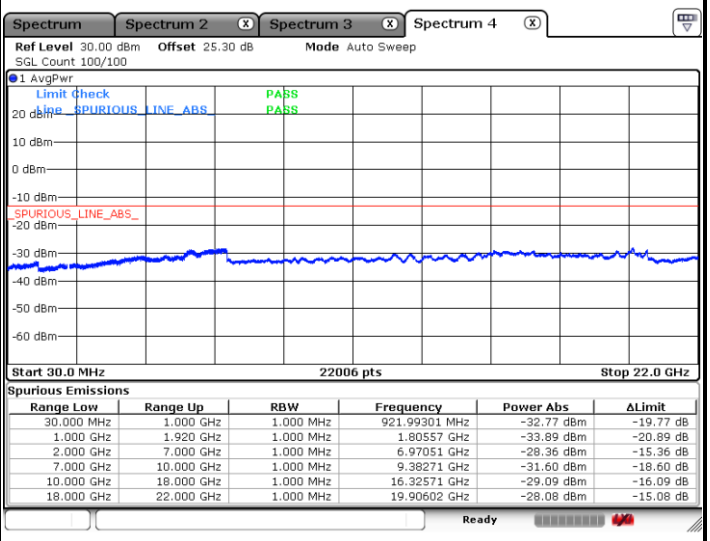
Middle Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	921.99301 MHz	-32.77 dBm	-19.77 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.80557 GHz	-33.89 dBm	-20.89 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.97051 GHz	-28.36 dBm	-15.36 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.38271 GHz	-31.60 dBm	-18.60 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.32571 GHz	-29.09 dBm	-16.09 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90602 GHz	-28.08 dBm	-15.08 dB

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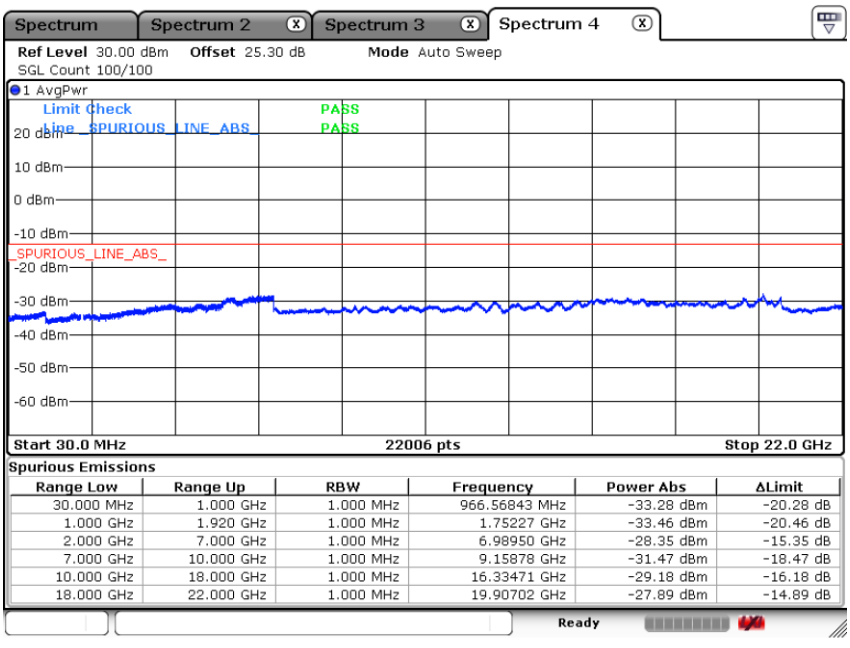
Highest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	966.56843 MHz	-33.28 dBm	-20.28 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.75227 GHz	-33.46 dBm	-20.46 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.98950 GHz	-28.35 dBm	-15.35 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.15878 GHz	-31.47 dBm	-18.47 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.33471 GHz	-29.18 dBm	-16.18 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90702 GHz	-27.89 dBm	-14.89 dB

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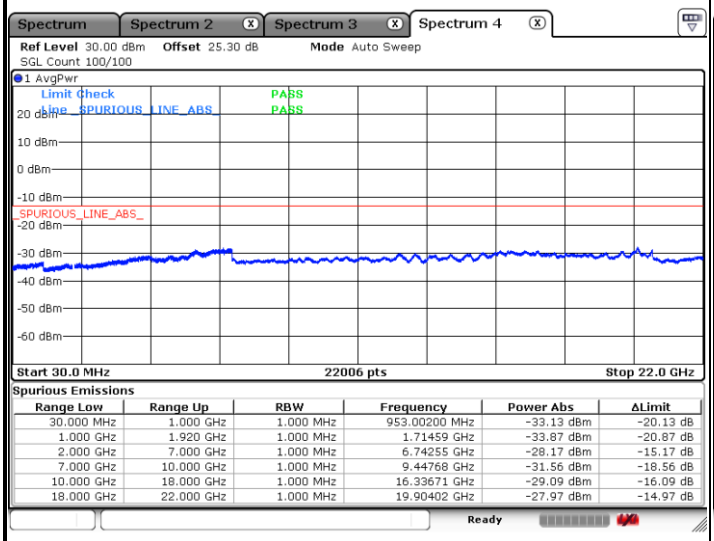
LTE Band 2 / 20MHz

Lowest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	953.00200 MHz	-33.13 dBm	-20.13 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.71459 GHz	-33.87 dBm	-20.87 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.74255 GHz	-28.17 dBm	-15.17 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.44768 GHz	-31.56 dBm	-18.56 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.33671 GHz	-29.09 dBm	-16.09 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90402 GHz	-27.97 dBm	-14.97 dB

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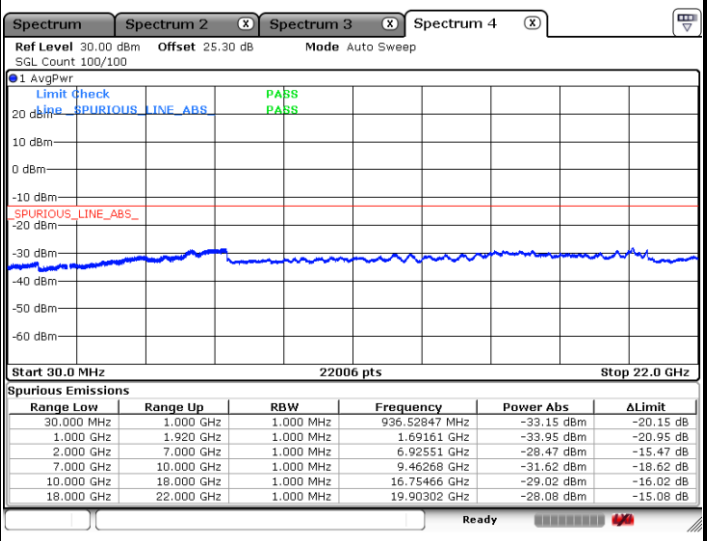
Middle Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	936.52847 MHz	-33.15 dBm	-20.15 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.69161 GHz	-33.95 dBm	-20.95 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.92551 GHz	-28.47 dBm	-15.47 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.46268 GHz	-31.62 dBm	-18.62 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.75466 GHz	-29.02 dBm	-16.02 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90302 GHz	-28.08 dBm	-15.08 dB

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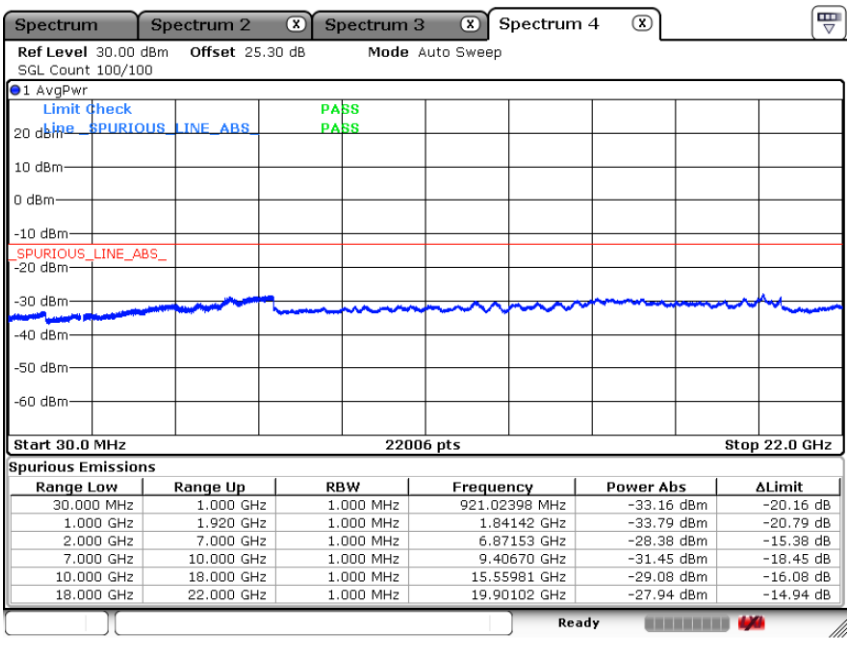
Highest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	921.02398 MHz	-33.16 dBm	-20.16 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.84142 GHz	-33.79 dBm	-20.79 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.87153 GHz	-28.38 dBm	-15.38 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.40670 GHz	-31.45 dBm	-18.45 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.55981 GHz	-29.08 dBm	-16.08 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90102 GHz	-27.94 dBm	-14.94 dB

Date: 25.JUN.2021 22:03:38

Frequency Stability

Test Conditions		LTE Band 2 BW 20M (QPSK)				Limit
Temperature (°C)	Voltage (Volt)	1940MHz		1980MHz		Note 2
		FL	FH	FL	FH	Result
50	Normal Voltage	1930.81	1949.045	1970.796	1989.03	PASS
40	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
30	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
20(Ref.)	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
10	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
0	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
-10	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
-20	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
-30	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
20	Maximum Voltage	1930.81	1949.045	1970.796	1989.03	
20	Normal Voltage	1930.81	1949.045	1970.796	1989.03	
20	Minimum Voltage	1930.81	1949.045	1970.738	1989.03	

Note:

1. Normal Voltage =120 V. ; Minimum Voltage =102 V. ; Maximum Voltage =138 V.
2. Note: The frequency fundamental emissions stay within the authorized frequency block.

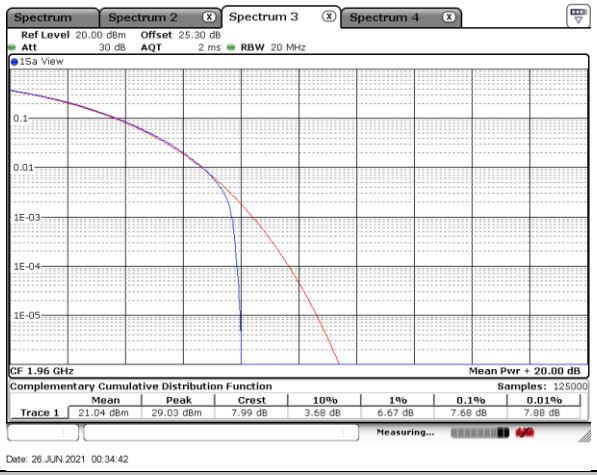
LTE Band 2 MIMO Ant. 2

Peak-to-Average Ratio

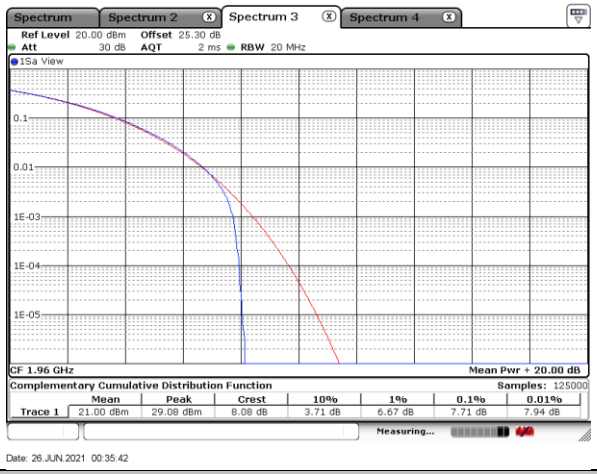
Mode	LTE Band 2 / 20MHz			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	7.68	7.71	7.77	PASS

LTE Band 2 / 20MHz

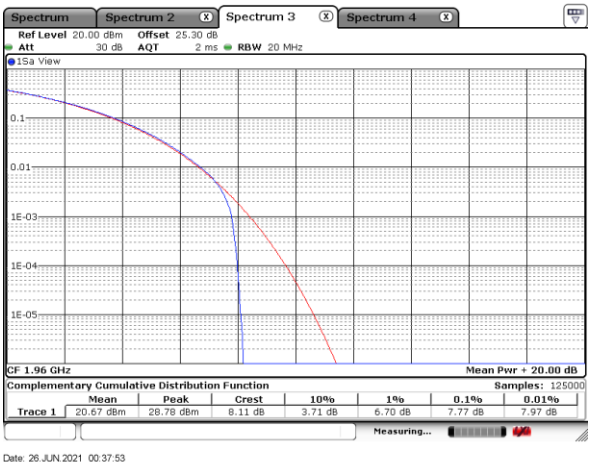
Middle Channel / Full RB/ QPSK



Middle Channel / Full RB/ 16QAM



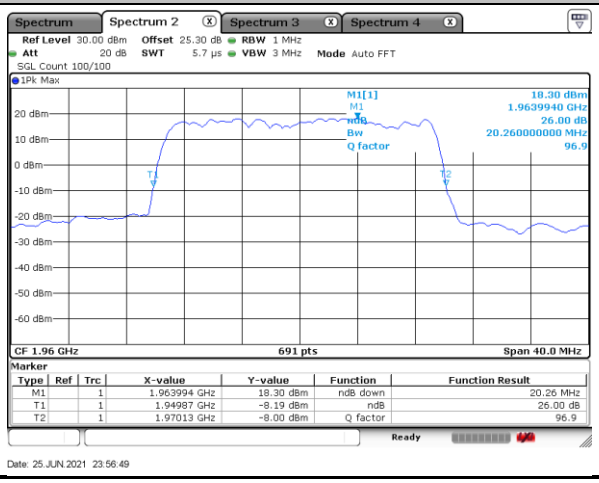
Middle Channel / Full RB/ 64QAM

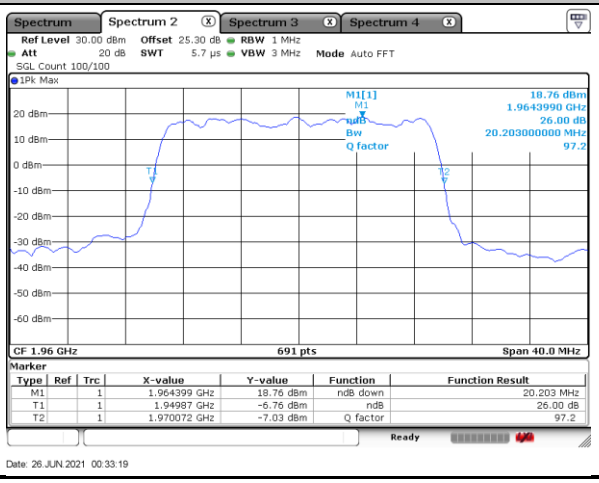


26dB Bandwidth

Mode	LTE Band 2 : 26dB BW(MHz)	
BW	20MHz	
Mod.	QPSK	16QAM
Middle CH	20.26	20.20

LTE Band 2	
Middle Channel / 20MHz / QPSK	Middle Channel / 20MHz / 16QAM

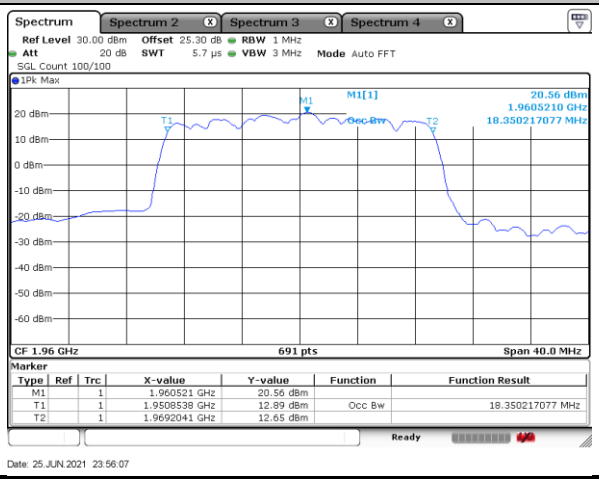


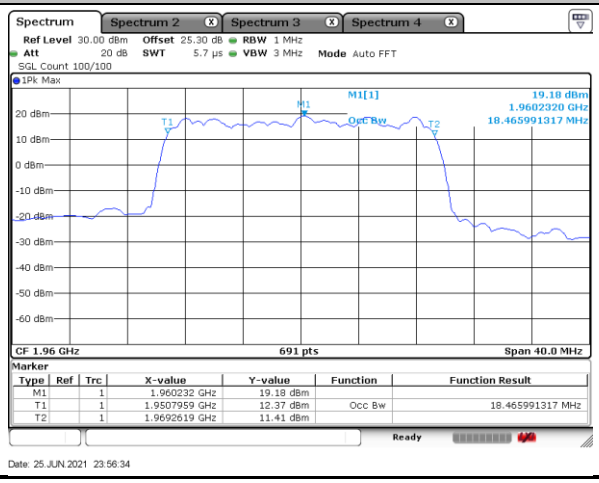


Occupied Bandwidth

Mode	LTE Band 2 : 99%OBW(MHz)	
BW	20MHz	
Mod.	QPSK	16QAM
Middle CH	18.35	18.47

LTE Band 2	
Middle Channel / 20MHz / QPSK	Middle Channel / 20MHz / 16QAM

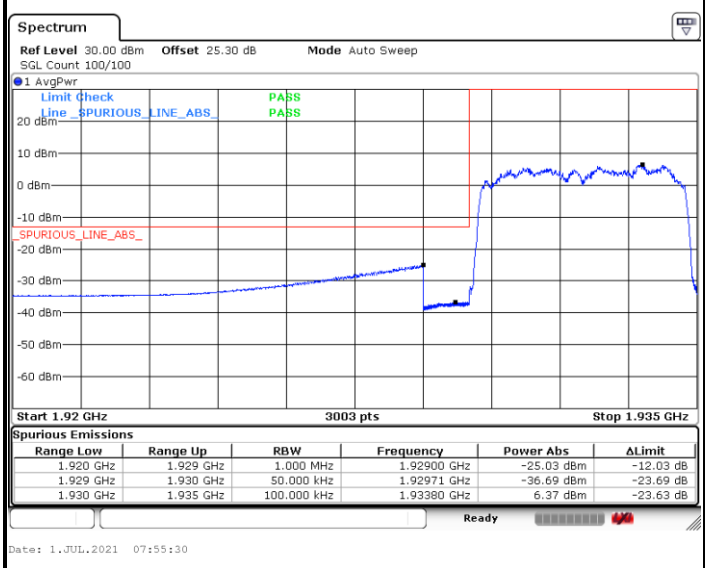




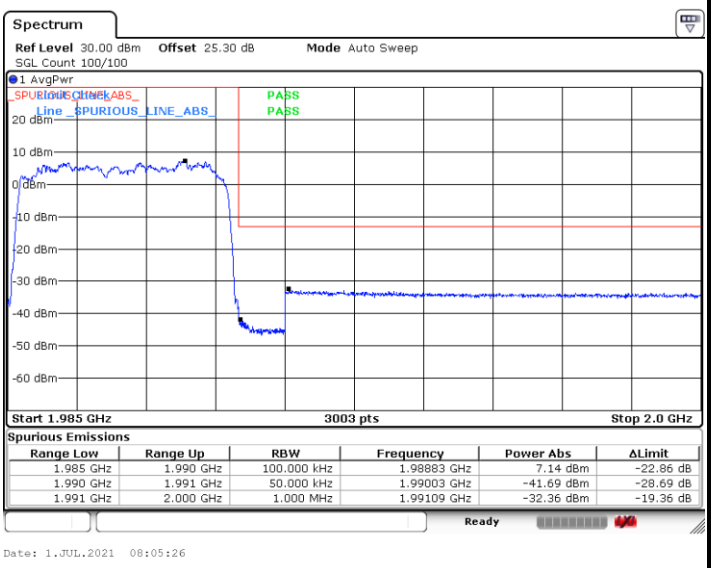
Conducted Band Edge

LTE Band 2 / 5MHz / QPSK

Lowest Band Edge / Full RB

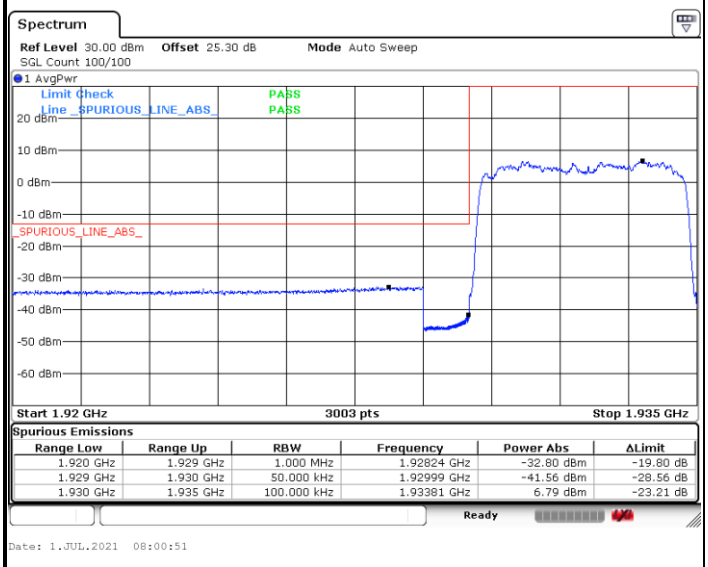


Highest Band Edge / Full RB

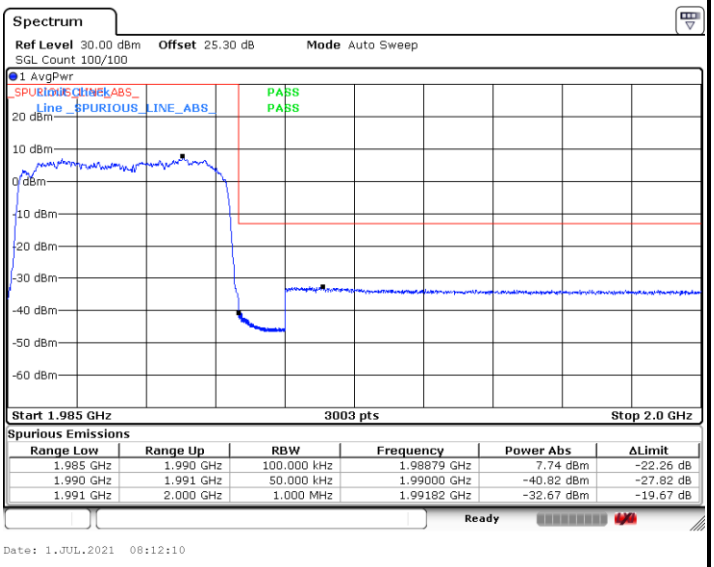


LTE Band 2 / 5MHz / 16QAM

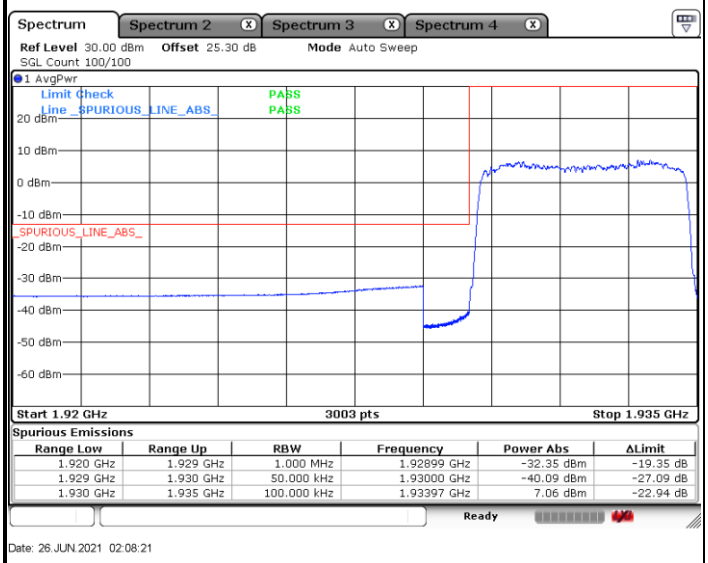
Lowest Band Edge / Full RB

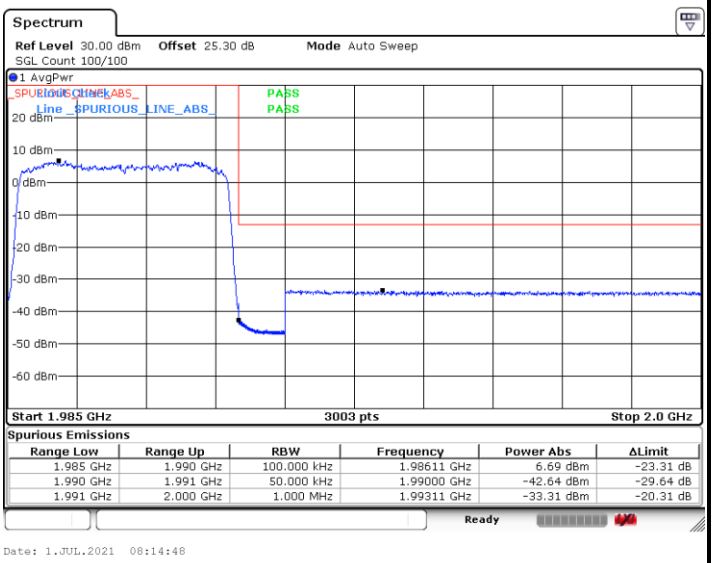


Highest Band Edge / Full RB



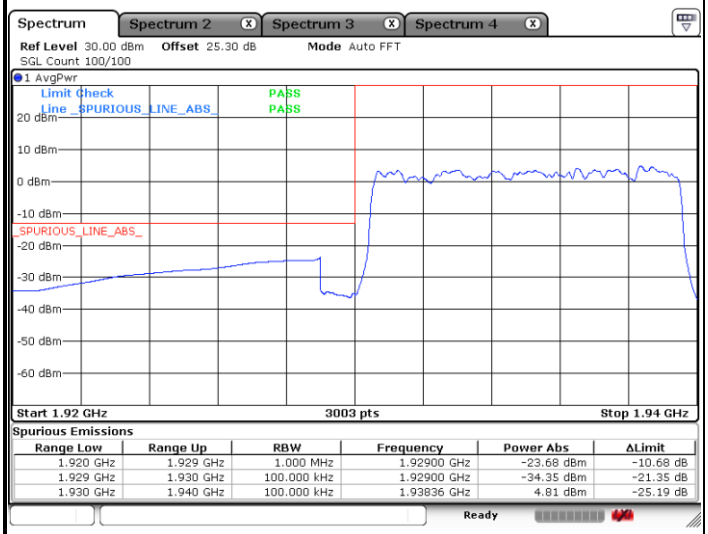
LTE Band 2 / 5MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**





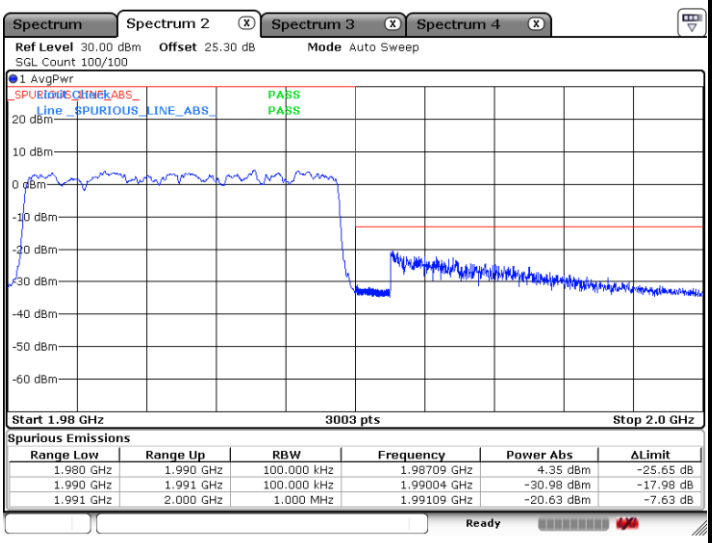
LTE Band 2 / 10MHz / QPSK

Lowest Band Edge / Full RB



Date: 26.JUN.2021 01:25:00

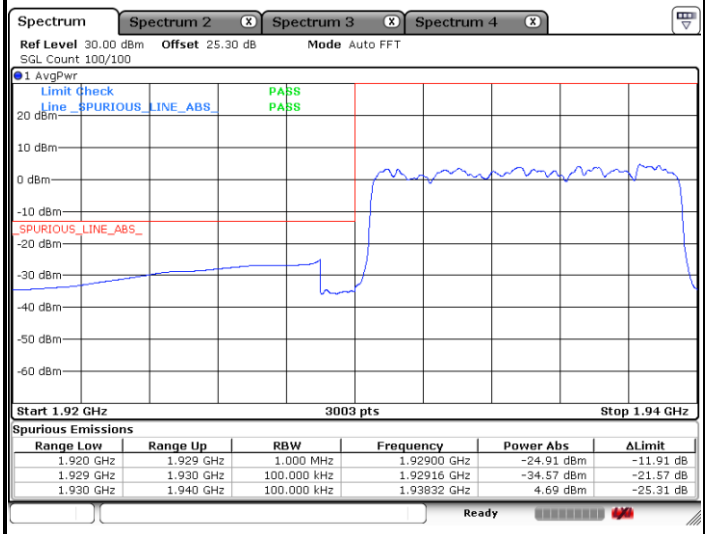
Highest Band Edge / Full RB



Date: 26.JUN.2021 01:35:06

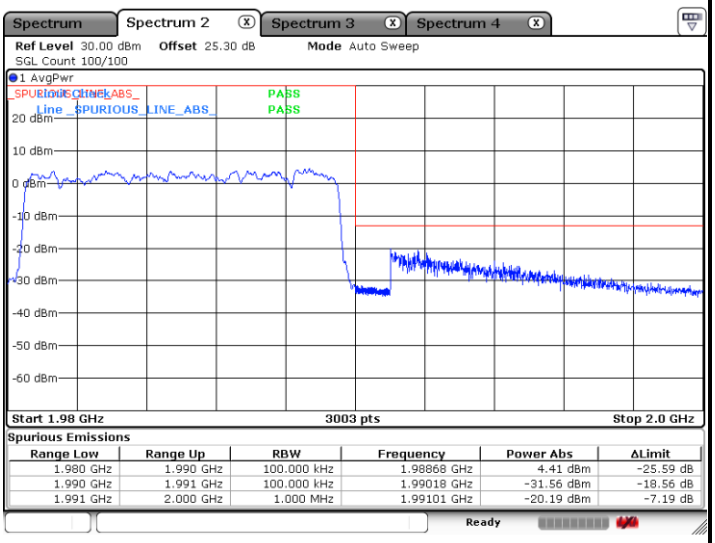
LTE Band 2 / 10MHz / 16QAM

Lowest Band Edge / Full RB



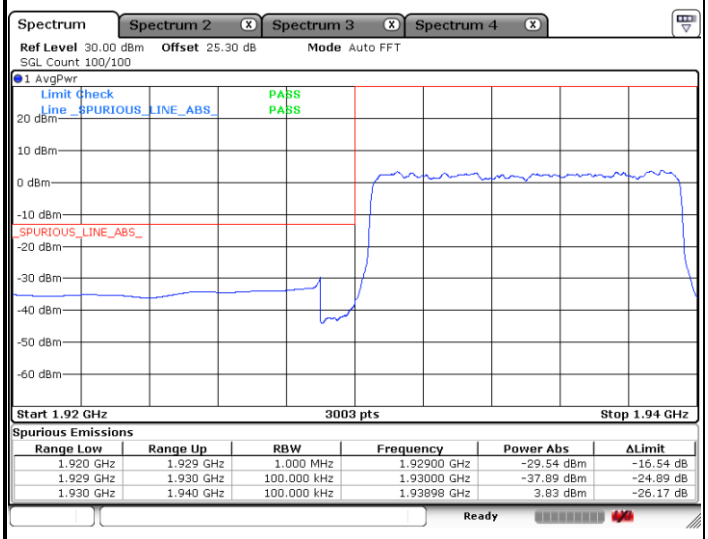
Date: 26.JUN.2021 01:25:26

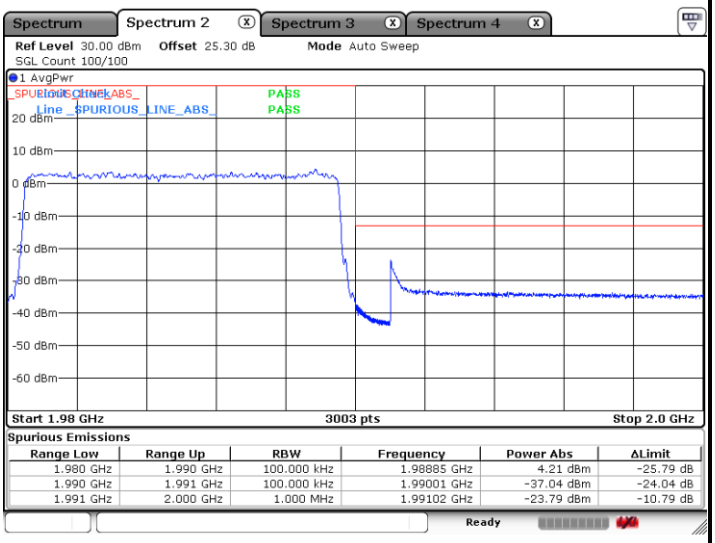
Highest Band Edge / Full RB



Date: 26.JUN.2021 01:35:24

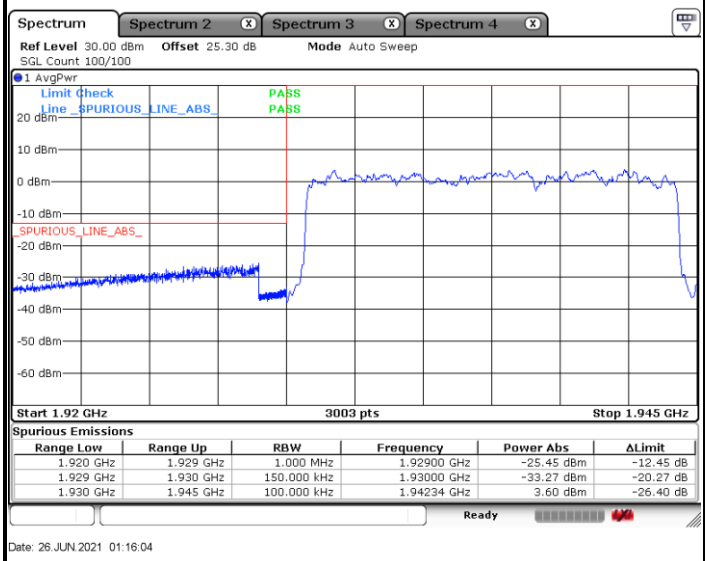
LTE Band 2 / 10MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**





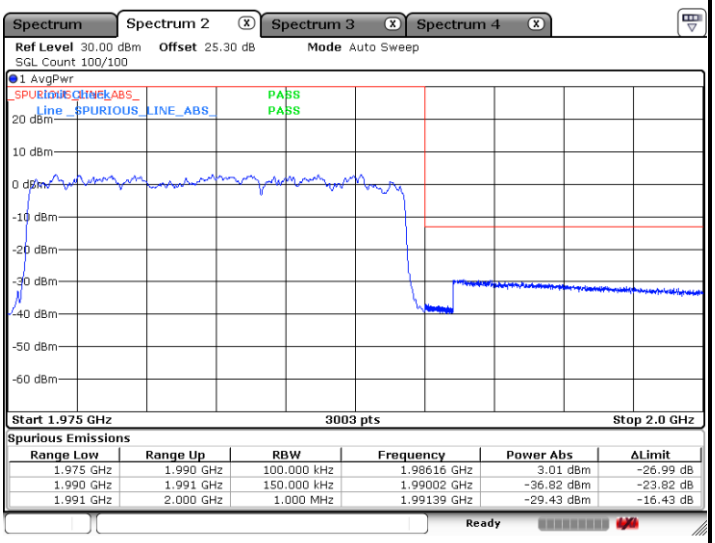
LTE Band 2 / 15MHz / QPSK

Lowest Band Edge / Full RB



Date: 26.JUN.2021 01:16:04

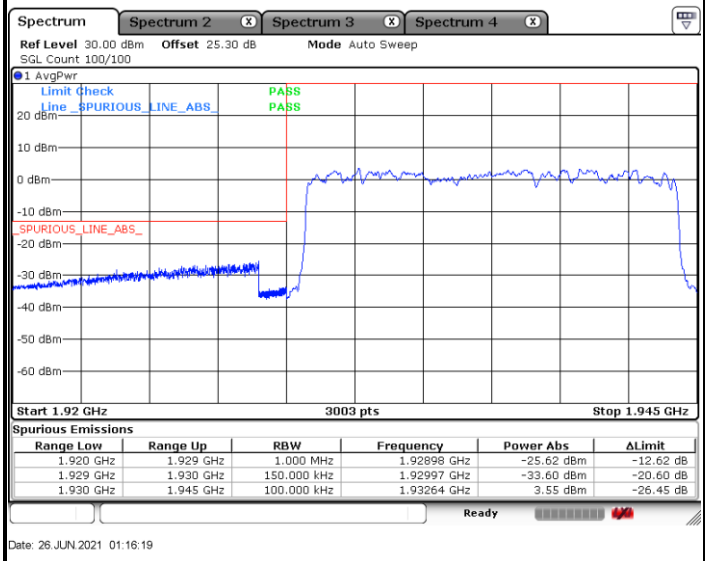
Highest Band Edge / Full RB



Date: 26.JUN.2021 01:05:36

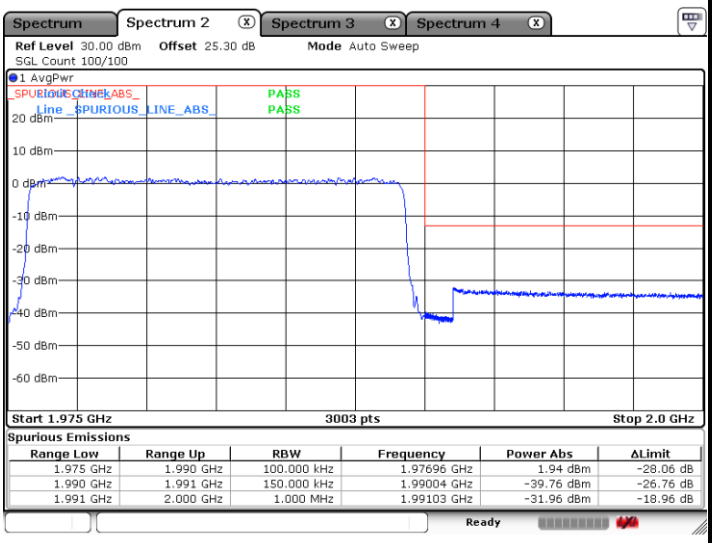
LTE Band 2 / 15MHz / 16QAM

Lowest Band Edge / Full RB



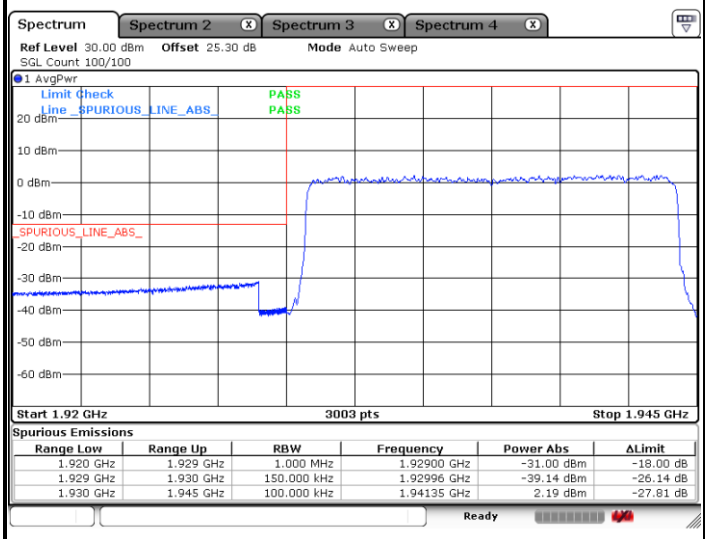
Date: 26.JUN.2021 01:16:19

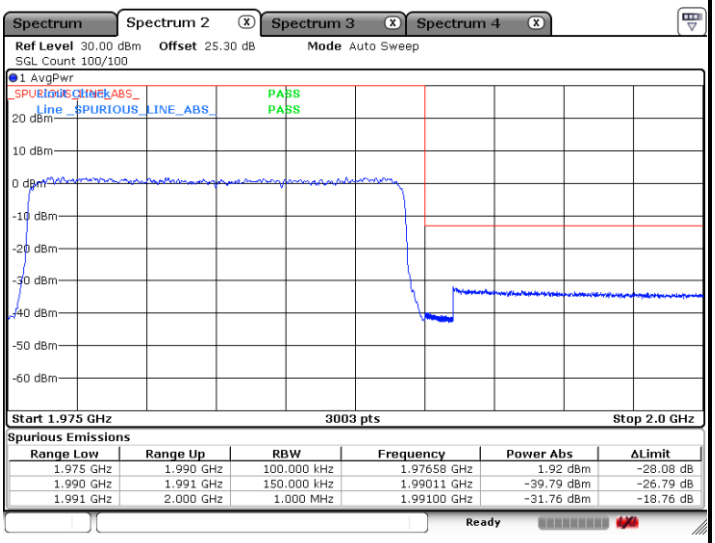
Highest Band Edge / Full RB



Date: 26.JUN.2021 01:07:45

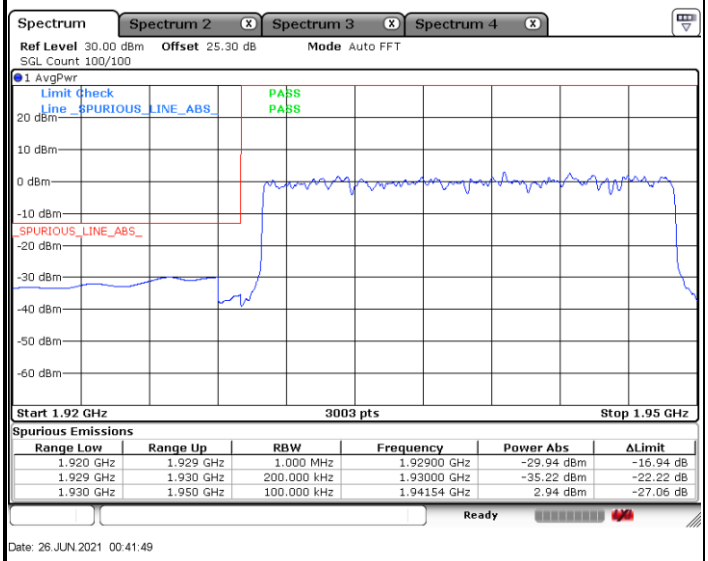
LTE Band 2 / 15MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**





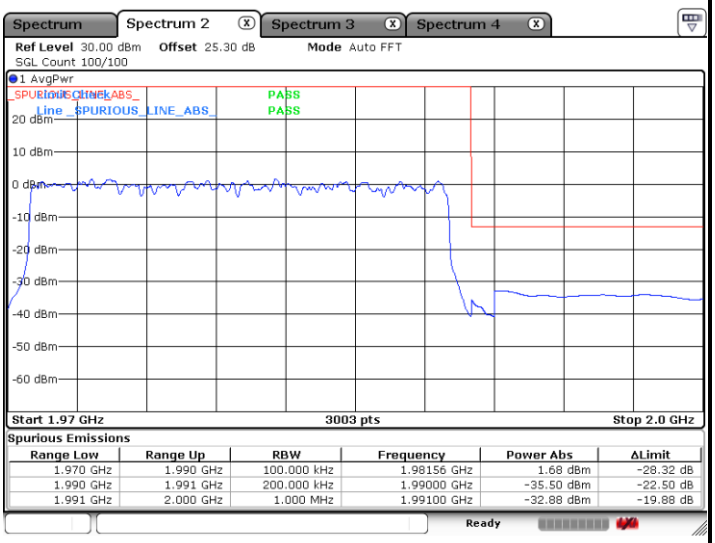
LTE Band 2 / 20MHz / QPSK

Lowest Band Edge / Full RB



Date: 26.JUN.2021 00:41:49

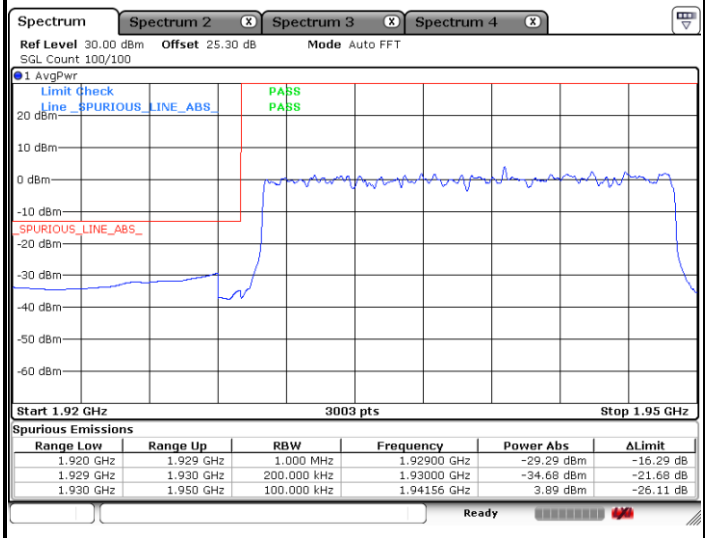
Highest Band Edge / Full RB



Date: 26.JUN.2021 00:58:35

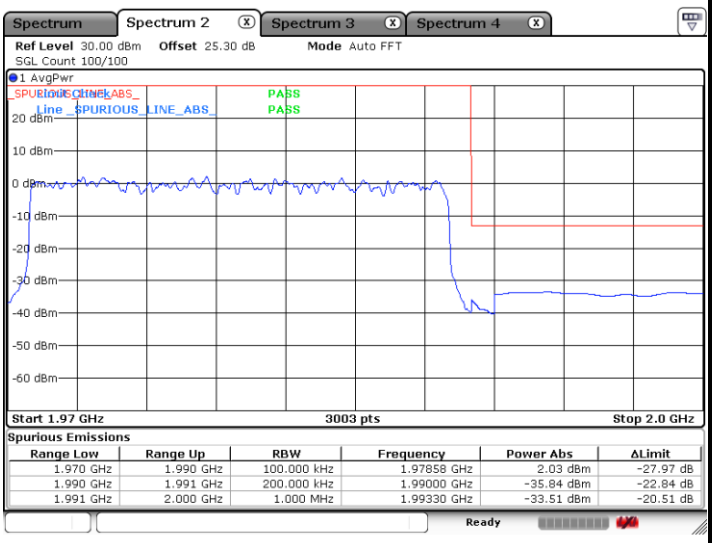
LTE Band 2 / 20MHz / 16QAM

Lowest Band Edge / Full RB



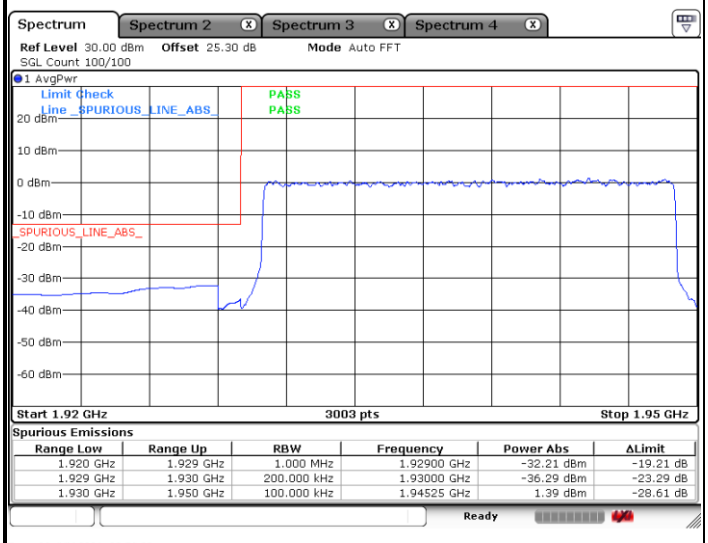
Date: 26.JUN.2021 00:44:21

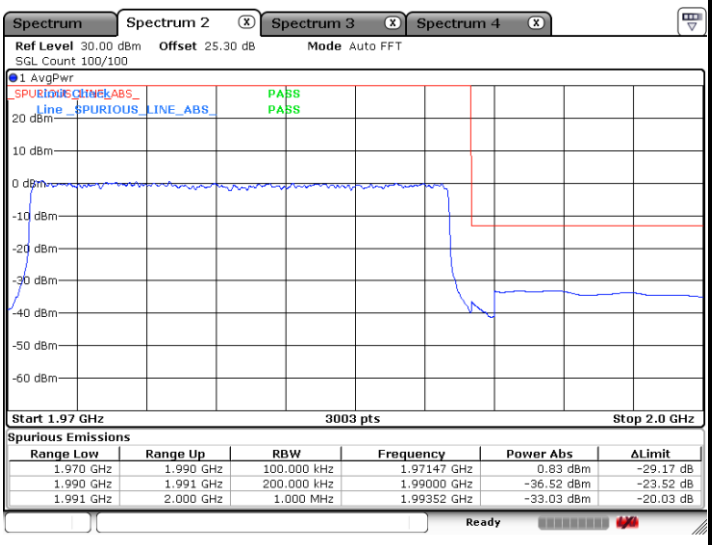
Highest Band Edge / Full RB



Date: 26.JUN.2021 00:59:34

LTE Band 2 / 20MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**

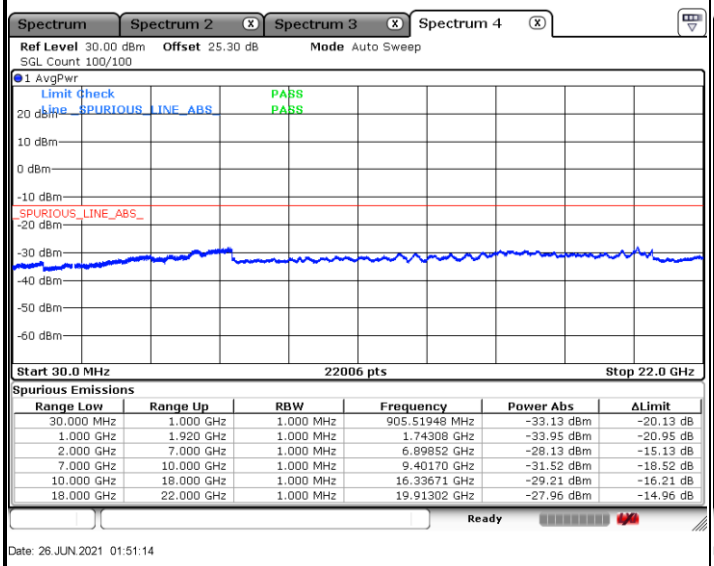




Conducted Spurious Emission

LTE Band 2 / 5MHz

Lowest Channel / QPSK

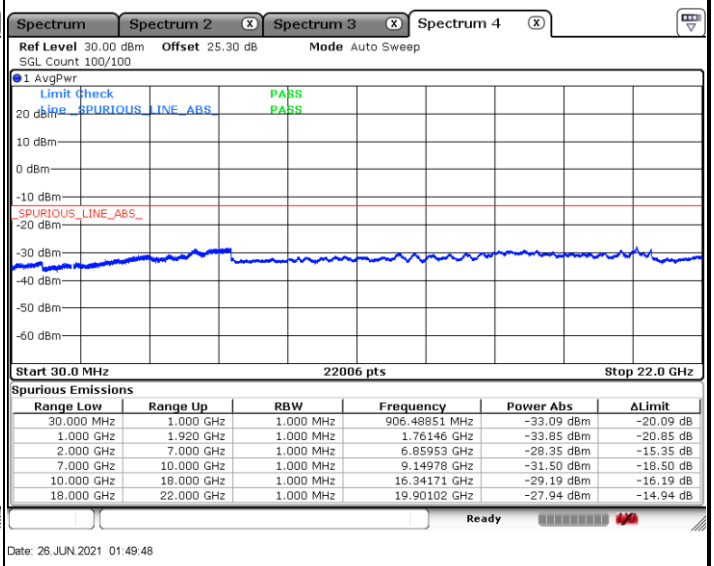


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	905.51948 MHz	-33.13 dBm	-20.13 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.74308 GHz	-33.95 dBm	-20.95 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.89852 GHz	-28.13 dBm	-15.13 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.40170 GHz	-31.52 dBm	-18.52 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.33671 GHz	-29.21 dBm	-16.21 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91302 GHz	-27.96 dBm	-14.96 dB

Date: 26.JUN.2021 01:51:14

Middle Channel / QPSK

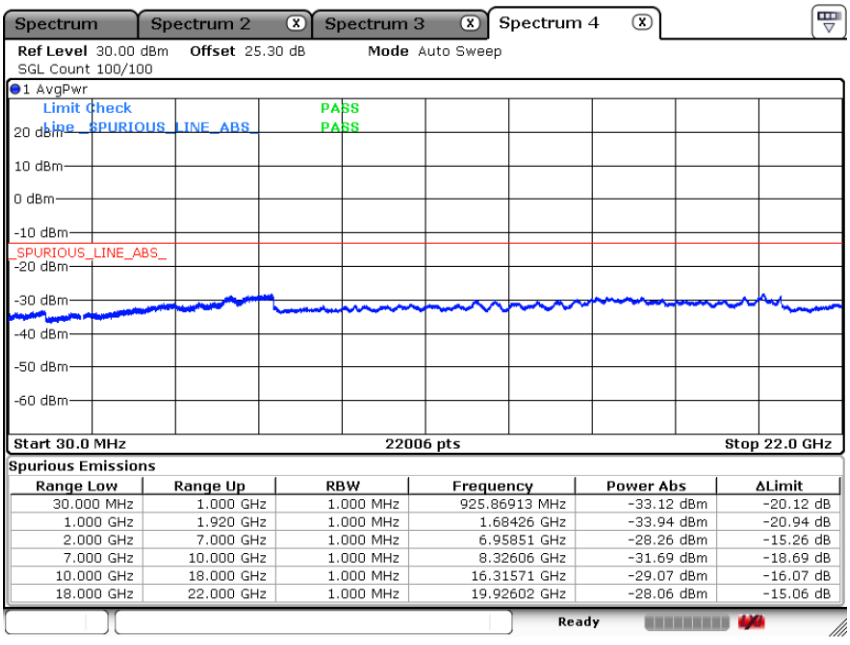


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	906.48851 MHz	-33.09 dBm	-20.09 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.76146 GHz	-33.85 dBm	-20.85 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.85953 GHz	-28.35 dBm	-15.35 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.14978 GHz	-31.50 dBm	-18.50 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.34171 GHz	-29.19 dBm	-16.19 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90102 GHz	-27.94 dBm	-14.94 dB

Date: 26.JUN.2021 01:49:48

Highest Channel / QPSK



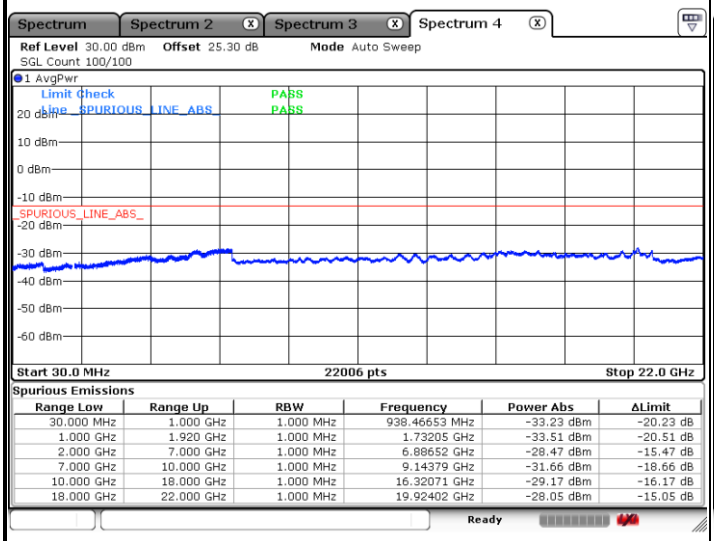
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	925.86913 MHz	-33.12 dBm	-20.12 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.68426 GHz	-33.94 dBm	-20.94 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.95851 GHz	-28.26 dBm	-15.26 dB
7.000 GHz	10.000 GHz	1.000 MHz	8.32606 GHz	-31.69 dBm	-18.69 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.31571 GHz	-29.07 dBm	-16.07 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.92602 GHz	-28.06 dBm	-15.06 dB

Date: 26.JUN.2021 01:46:34

LTE Band 2 / 10MHz

Lowest Channel / QPSK

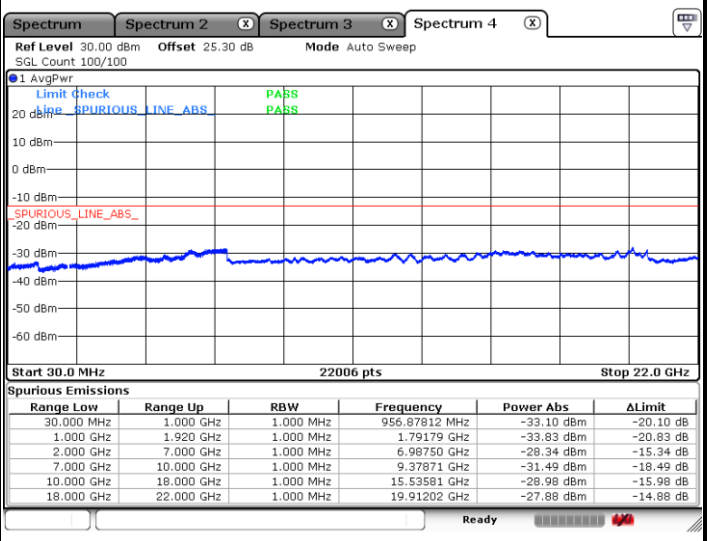


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	938.46653 MHz	-33.23 dBm	-20.23 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.73205 GHz	-33.51 dBm	-20.51 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.88652 GHz	-28.47 dBm	-15.47 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.14379 GHz	-31.66 dBm	-18.66 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.32071 GHz	-29.17 dBm	-16.17 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.92402 GHz	-28.05 dBm	-15.05 dB

Date: 26.JUN.2021 01:30:29

Middle Channel / QPSK

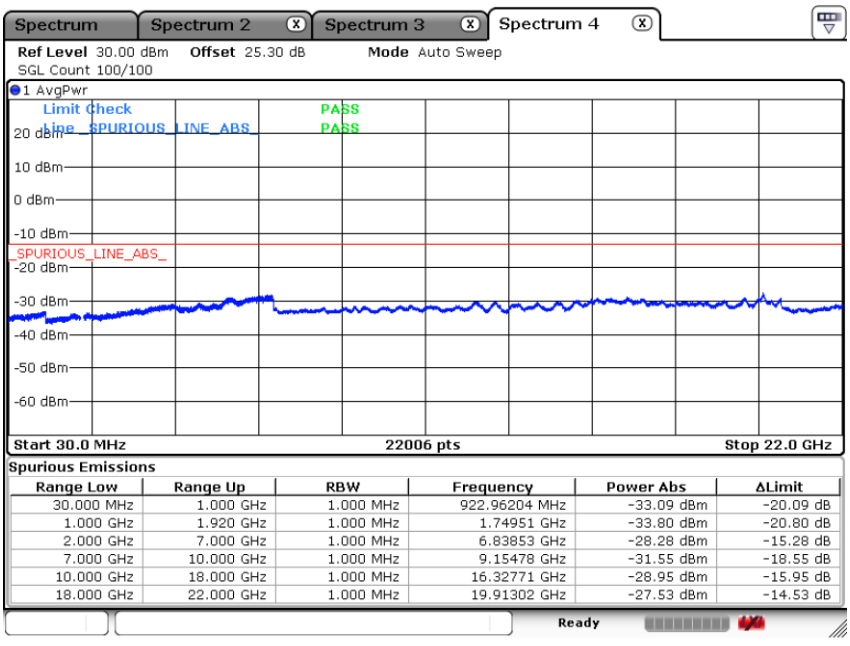


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	956.87812 MHz	-33.10 dBm	-20.10 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.79179 GHz	-33.83 dBm	-20.83 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.98750 GHz	-28.34 dBm	-15.34 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.37871 GHz	-31.49 dBm	-18.49 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.53581 GHz	-28.98 dBm	-15.98 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91202 GHz	-27.88 dBm	-14.88 dB

Date: 26.JUN.2021 01:29:15

Highest Channel / QPSK



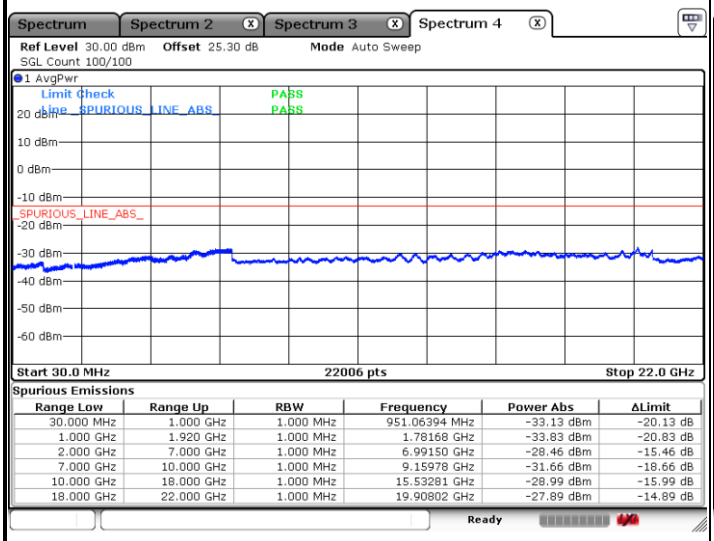
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	922.96204 MHz	-33.09 dBm	-20.09 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.74951 GHz	-33.80 dBm	-20.80 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.83853 GHz	-28.28 dBm	-15.28 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.15478 GHz	-31.55 dBm	-18.55 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.32771 GHz	-28.95 dBm	-15.95 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91302 GHz	-27.53 dBm	-14.53 dB

Date: 26.JUN.2021 01:31:54

LTE Band 2 / 15MHz

Lowest Channel / QPSK

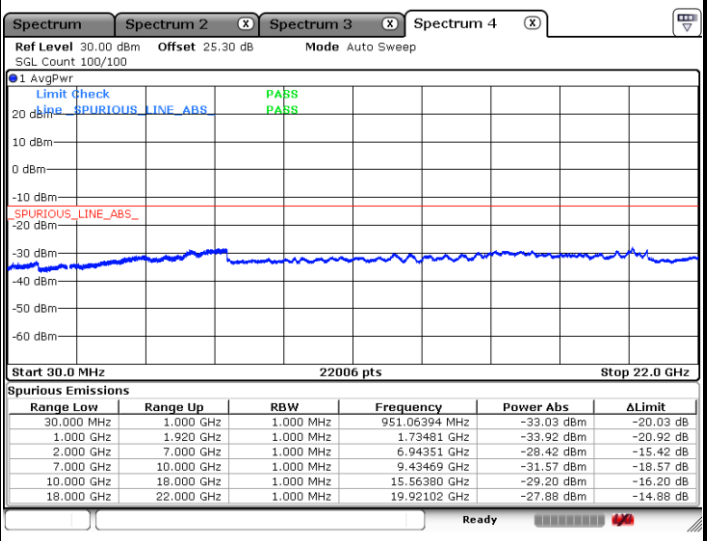


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	951.06394 MHz	-33.13 dBm	-20.13 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.78168 GHz	-33.83 dBm	-20.83 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.99150 GHz	-28.46 dBm	-15.46 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.15978 GHz	-31.66 dBm	-18.66 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.53281 GHz	-28.99 dBm	-15.99 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90802 GHz	-27.89 dBm	-14.89 dB

Date: 26.JUN.2021 01:12:52

Middle Channel / QPSK

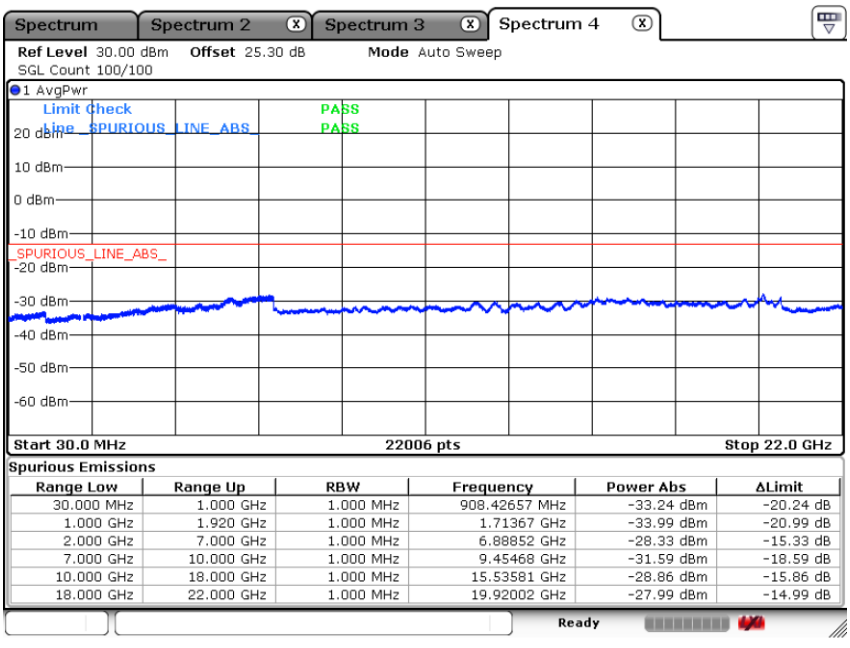


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	951.06394 MHz	-33.03 dBm	-20.03 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.73481 GHz	-33.92 dBm	-20.92 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.94351 GHz	-28.42 dBm	-15.42 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.43469 GHz	-31.57 dBm	-18.57 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.56380 GHz	-29.20 dBm	-16.20 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.92102 GHz	-27.88 dBm	-14.88 dB

Date: 26.JUN.2021 01:11:03

Highest Channel / QPSK



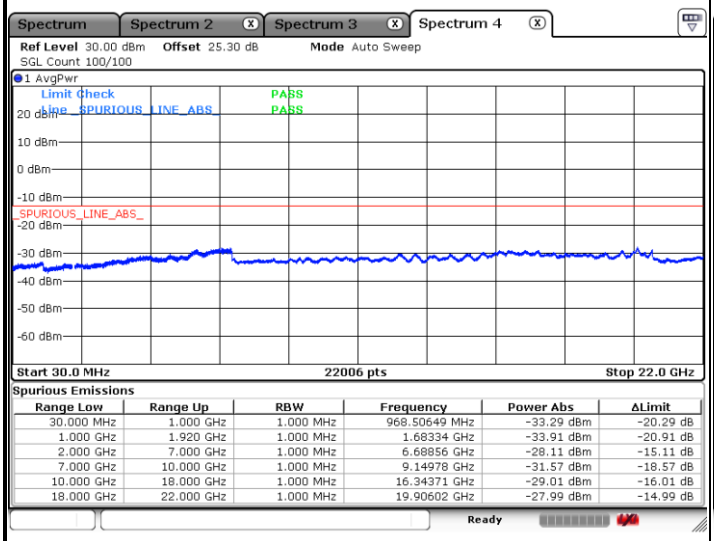
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	908.42657 MHz	-33.24 dBm	-20.24 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.71367 GHz	-33.99 dBm	-20.99 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.88852 GHz	-28.33 dBm	-15.33 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.45468 GHz	-31.59 dBm	-18.59 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.53581 GHz	-28.86 dBm	-15.86 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.92002 GHz	-27.99 dBm	-14.99 dB

Date: 26.JUN.2021 01:09:21

LTE Band 2 / 20MHz

Lowest Channel / QPSK

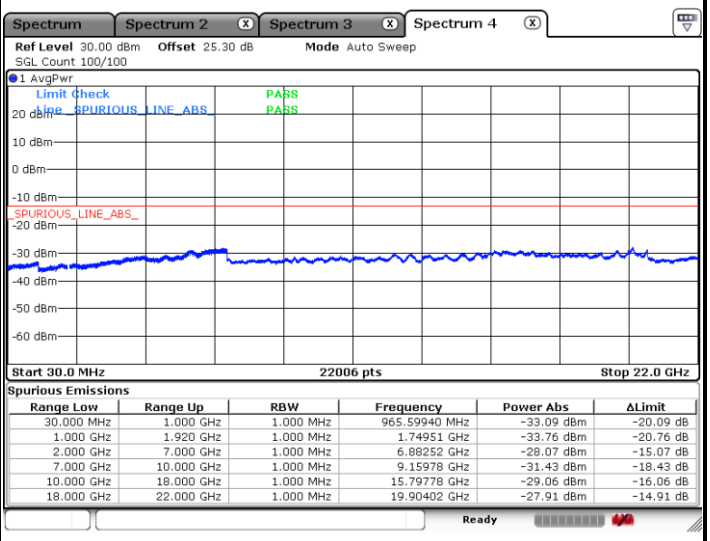


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	968.50649 MHz	-33.29 dBm	-20.29 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.68334 GHz	-33.91 dBm	-20.91 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.68856 GHz	-28.11 dBm	-15.11 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.14978 GHz	-31.57 dBm	-18.57 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.34371 GHz	-29.01 dBm	-16.01 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90602 GHz	-27.99 dBm	-14.99 dB

Date: 25.JUN.2021 23:52:26

Middle Channel / QPSK

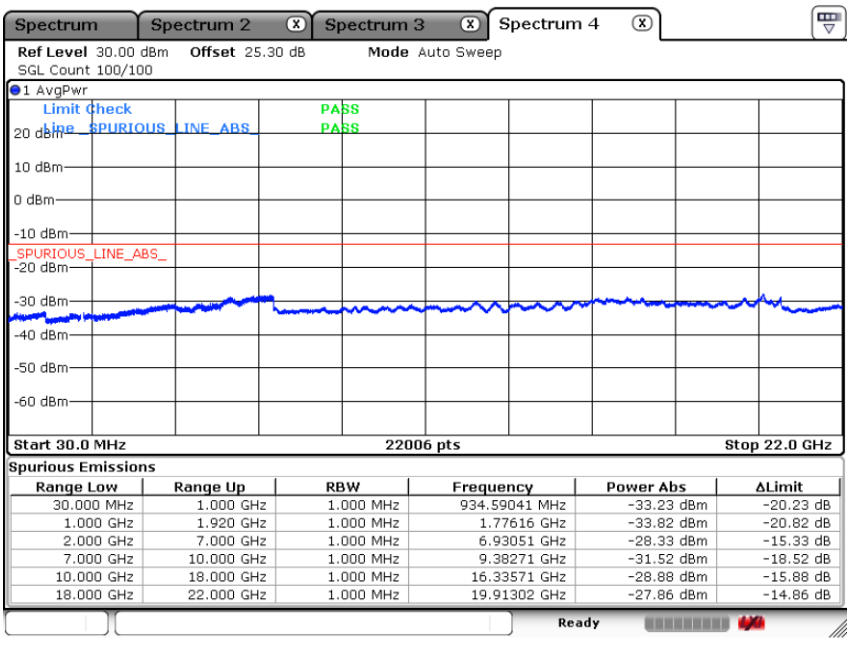


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	965.59940 MHz	-33.09 dBm	-20.09 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.74951 GHz	-33.76 dBm	-20.76 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.88252 GHz	-28.07 dBm	-15.07 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.15978 GHz	-31.43 dBm	-18.43 dB
10.000 GHz	18.000 GHz	1.000 MHz	15.79778 GHz	-29.06 dBm	-16.06 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.90402 GHz	-27.91 dBm	-14.91 dB

Date: 25.JUN.2021 23:53:18

Highest Channel / QPSK



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	934.59041 MHz	-33.23 dBm	-20.23 dB
1.000 GHz	1.920 GHz	1.000 MHz	1.77616 GHz	-33.82 dBm	-20.82 dB
2.000 GHz	7.000 GHz	1.000 MHz	6.93051 GHz	-28.33 dBm	-15.33 dB
7.000 GHz	10.000 GHz	1.000 MHz	9.38271 GHz	-31.52 dBm	-18.52 dB
10.000 GHz	18.000 GHz	1.000 MHz	16.33571 GHz	-28.88 dBm	-15.88 dB
18.000 GHz	22.000 GHz	1.000 MHz	19.91302 GHz	-27.86 dBm	-14.86 dB

Date: 25.JUN.2021 23:55:20

Frequency Stability

Test Conditions		LTE Band 2 BW 20M (QPSK)				Limit
Temperature (°C)	Voltage (Volt)	1940MHz		1980MHz		Note 2
		FL	FH	FL	FH	Result
50	Normal Voltage	1930.984	1949.045	1970.97	1989.03	PASS
40	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
30	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
20(Ref.)	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
10	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
0	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
-10	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
-20	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
-30	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
20	Maximum Voltage	1930.984	1949.045	1970.97	1989.03	
20	Normal Voltage	1930.984	1949.045	1970.97	1989.03	
20	Minimum Voltage	1930.984	1949.045	1970.97	1989.03	

Note:

1. Normal Voltage =120 V. ; Minimum Voltage =102 V. ; Maximum Voltage =138 V.
2. Note: The frequency fundamental emissions stay within the authorized frequency block.

LTE Band 66 MIMO Ant. 3

Peak-to-Average Ratio

Mode	LTE Band 66 / 20MHz			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	7.74	7.83	7.77	PASS