



FCC RF Test Report

APPLICANT : Quectel Wireless Solutions Co., Ltd.
EQUIPMENT : Smart LTE Module with Wi-Fi & Bluetooth
BRAND NAME : Quectel
MODEL NAME : SC20-AX
FCC ID : XMR202201SC20AX
STANDARD : 47 CFR Part 2, 22(H), 24(E), 27(L), 27(M), 27(H),
27(F), 90(S)
CLASSIFICATION : PCS Licensed Transmitter (PCB)
TEST DATE(S) : Jan. 04, 2022 ~ Jan. 20, 2022

We, Sporton International Inc. (Kunshan), 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 Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager



Sporton International Inc. (Kunshan)

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



TABLE OF CONTENTS

REVISION HISTORY 3
SUMMARY OF TEST RESULT 4
1 GENERAL DESCRIPTION 5
1.1 Applicant 5
1.2 Manufacturer 5
1.3 Product Feature of Equipment Under Test 5
1.4 Product Specification of Equipment Under Test 5
1.5 Modification of EUT 6
1.6 Re-use of Measured Data 6
1.7 Maximum Conducted Power and Emission Designator 8
1.8 Testing Location 10
1.9 Test Software 10
1.10 Applicable Standards 10
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST 11
2.1 Test Mode 11
2.2 Connection Diagram of Test System 12
2.3 Support Unit used in test configuration and system 12
2.4 Measurement Results Explanation Example 12
2.5 Frequency List of Low/Middle/High Channels 13
3 CONDUCTED TEST ITEMS 17
3.1 Measuring Instruments 17
3.2 Test Setup 17
3.3 Test Result of Conducted Test 17
3.4 Conducted Output Power and ERP/EIRP 18
3.5 Peak-to-Average Ratio 19
3.6 Occupied Bandwidth 20
3.7 Conducted Band Edge 21
3.8 Conducted Spurious Emission 22
3.9 Frequency Stability 23
4 RADIATED TEST ITEMS 24
4.1 Measuring Instruments 24
4.2 Test Setup 24
4.3 Test Result of Radiated Test 25
4.4 Radiated Spurious Emission 26
5 LIST OF MEASURING EQUIPMENT 27
6 UNCERTAINTY OF EVALUATION 28
APPENDIX A. TEST RESULTS OF CONDUCTED TEST
APPENDIX B. TEST RESULTS OF RADIATED TEST
APPENDIX C. TEST SETUP PHOTOGRAPHS



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	-	Report Only	-
	§22.913(a)(5)	Effective Radiated Power (Band 5) (Band 26)	ERP < 7 Watt	PASS	-
	§27.50(b)(10) §27.50(c)(10)	Effective Radiated Power (Band 12) (Band 13)	ERP < 3 Watt		-
	§24.232(c) §27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 2) (Band 25) (Band 7)	EIRP < 2Watt		-
	§27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	EIRP < 1Watt		-
3.5	N/A	Peak-to-Average Ratio	<13 dB		PASS
3.6	§2.1049	Occupied Bandwidth	-	Report Only	-
3.7	§2.1051 §27.53(c)(2)(4)	Conducted Band Edge Measurement (Band 13)	< 43+10log ₁₀ (P[Watts])	PASS	-
3.8	§2.1051 §27.53(c)(2)	Conducted Spurious Emission (Band 13)	< 43+10log ₁₀ (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)	Radiated Spurious Emission (Band 13)	< 43+10log ₁₀ (P[Watts])	PASS	Under limit 22.53 dB at 1560.000 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

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.2 Manufacturer

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart LTE Module with Wi-Fi & Bluetooth
Brand Name	Quectel
Model Name	SC20-AX
FCC ID	XMR202201SC20AX
HW Version	R1.0
SW Version	SC20AXPAR09A05
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 2 : 1850 MHz ~ 1910 MHz LTE Band 4 : 1710 MHz ~ 1755 MHz LTE Band 5 : 824 MHz ~ 849 MHz LTE Band 7 : 2500 MHz ~ 2570 MHz LTE Band 12 : 699 MHz ~ 716 MHz LTE Band 13 : 777 MHz ~ 787 MHz LTE Band 25 : 1850 MHz ~ 1915 MHz LTE Band 26 : 824 MHz ~ 849 MHz LTE Band 26(90S) : 814 MHz ~ 824 MHz
Rx Frequency	LTE Band 2 : 1930 MHz ~ 1990 MHz LTE Band 4 : 2110 MHz ~ 2155 MHz LTE Band 5 : 869 MHz ~ 894 MHz LTE Band 7 : 2620 MHz ~ 2690 MHz LTE Band 12 : 729 MHz ~ 746 MHz LTE Band 13 : 746 MHz ~ 756 MHz LTE Band 25 : 1930 MHz ~ 1995 MHz LTE Band 26 : 869 MHz ~ 894 MHz LTE Band 26(90S) : 859 MHz ~ 869 MHz
Bandwidth	LTE Band 2 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 4 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 5 : 1.4MHz / 3MHz / 5MHz / 10MHz



	LTE Band 7 : 5MHz/ 10MHz / 15MHz / 20MHz LTE Band 12 : 1.4MHz / 3MHz / 5MHz / 10MHz LTE Band 13 : 5MHz / 10MHz LTE Band 25 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 26 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz
Maximum Output Power to Antenna	LTE Band 13 : 23.37 dBm
Antenna Gain	LTE Band 2 : 1.59 dBi LTE Band 4 : 2.00 dBi LTE Band 5 : 2.53 dBi LTE Band 7 : 3.00 dBi LTE Band 12 : 3.00 dBi LTE Band 13 : 4.00 dBi LTE Band 25 : 1.59 dBi LTE Band 26 : 2.00 dBi
Type of Modulation	QPSK / 16QAM

1.5 Modification of EUT

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

1.6 Re-use of Measured Data

1.6.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: SC20-AX, FCC ID: XMR202201SC20AX) is electrically identical to the reference device (Model: SC20-AL, FCC ID: XMR201911SC20AL) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 484596 D01.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID: XMR202201SC20AX .

1.6.2 Difference Section

The main difference between FCC ID: XMR201911SC20AL and FCC ID: XMR202201SC20AX is as below:

- SC20-AX uses MCP memory while SC20-AL uses EMCP memory, so the layout of memory part is different
- SC20-AX added U1007 to optimize the Tx performance of B13
- U1502 changed the WiFi 2.4G SAW package size

Other differences and all the details of similarity and difference can be found in the confidential documents (SC20-AX _Operational Description of Product Equality Declaration).



1.6.3 Reference detail Section:

Rule Part	Equipment Class	Frequency Band (MHz)	Reference FCC ID(Parent)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Report Title/Section
22, 24, 27, 90	PCB (LTE)	B2/4/5/7/12/13/25/26	XMR201911SC20AL	Original Grant	FG9N1435B	XMR202201SC20AX	All sections applicable except ERP/EIRP and LTE Band 13 for full test

1.6.4 Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, spot check measurements were performed on the subject device for the following test items, the test result were consistent with FCC ID: XMR201911SC20AL.

Summary for power and RSE spot check for each rule entry and technology is listed as below:

Test Item	Mode	XMR201911SC20AL Worst Result	XMR202201SC20AX Worst Result	Difference (dB)
Conducted Power(dBm)	LTE Band 2	23.54	23.54	0
	LTE Band 4	23.81	23.81	0
	LTE Band 5	23.50	23.50	0
	LTE Band 7	24.08	24.08	0
	LTE Band 12	23.64	23.64	0
	LTE Band 25	23.51	23.51	0
	LTE Band 26	23.41	23.41	0
Radiated Spurious Emission(dBm)	LTE Band 7 BW_20M-H	-16.29	-13.62	2.67

Conclusion:

Radiated spurious emission test against the variant model based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model.

Based on the spot check test result, the test data from the original model is representative for the variant model. The power level and RSE spot check are shown within expected level compliant to limit line.

We are using power measurements from the original parent model reports to list on the grant.



1.7 Maximum Conducted Power and Emission Designator

LTE Band 2		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
1.4	1850.7 ~ 1909.3	0.2075	-	0.1766	-
3	1851.5 ~ 1908.5	0.2168	-	0.1714	-
5	1852.5 ~ 1907.5	0.2128	-	0.1791	-
10	1855.0 ~ 1905.0	0.2183	-	0.1854	-
15	1857.5 ~ 1902.5	0.2259	-	0.1923	-
20	1860.0 ~ 1900.0	0.2148	-	0.1807	-
LTE Band 25		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
1.4	1850.7 ~ 1914.3	0.2118	-	0.1854	-
3	1851.5 ~ 1913.5	0.2163	-	0.1730	-
5	1852.5 ~ 1912.5	0.2208	-	0.1795	-
10	1855.0 ~ 1910.0	0.2244	-	0.1791	-
15	1857.5 ~ 1907.5	0.2133	-	0.1762	-
20	1860.0 ~ 1905.0	0.2188	-	0.1746	-
LTE Band 4		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
1.4	1710.7 ~ 1754.3	0.2388	-	0.2046	-
3	1711.5 ~ 1753.5	0.2280	-	0.1923	-
5	1712.5 ~ 1752.5	0.2301	-	0.1963	-
10	1715.0 ~ 1750.0	0.2301	-	0.1972	-
15	1717.5 ~ 1747.5	0.2312	-	0.2000	-
20	1720.0 ~ 1745.0	0.2404	-	0.2118	-
LTE Band 5		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
1.4	824.7 ~ 848.3	0.2234	-	0.1862	-
3	825.5 ~ 847.5	0.2239	-	0.1923	-
5	826.5 ~ 846.5	0.2223	-	0.1923	-
10	829.0 ~ 844.0	0.2203	-	0.2118	-



LTE Band 7		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
5	2502.5 ~ 2567.5	0.2559	-	0.2193	-
10	2505.0 ~ 2565.0	0.2512	-	0.2113	-
15	2507.5 ~ 2562.5	0.2506	-	0.2228	-
20	2510.0 ~ 2560.0	0.2559	-	0.2198	-
LTE Band 12		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
1.4	699.7 ~ 715.3	0.2208	-	0.1871	-
3	700.5 ~ 714.5	0.2312	-	0.1858	-
5	701.5 ~ 713.5	0.2265	-	0.1897	-
10	704.0 ~ 711.0	0.2312	-	0.1871	-
LTE Band 13		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
5	779.5 ~ 784.5	0.2094	-	0.1963	4M50W7D
10	782.0	0.2173	9M05G7D	0.1816	9M01W7D
LTE Band 26		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
1.4	824.7 ~ 848.3	0.2118	-	0.1849	-
3	825.5 ~ 847.5	0.2188	-	0.1977	-
5	826.5 ~ 846.5	0.2193	-	0.1986	-
10	829.0 ~ 844.0	0.2188	-	0.2046	-
15	831.5 ~ 841.5	0.2109	-	0.2051	-
CH26765	821.5	0.2138	-	0.1910	-



1.8 Testing Location

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

Test Firm	Sporton International Inc. (Kunshan)		
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

1.9 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, 22(H), 24(E), 27(L), 27(M), 27(H), 27(F)
- 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

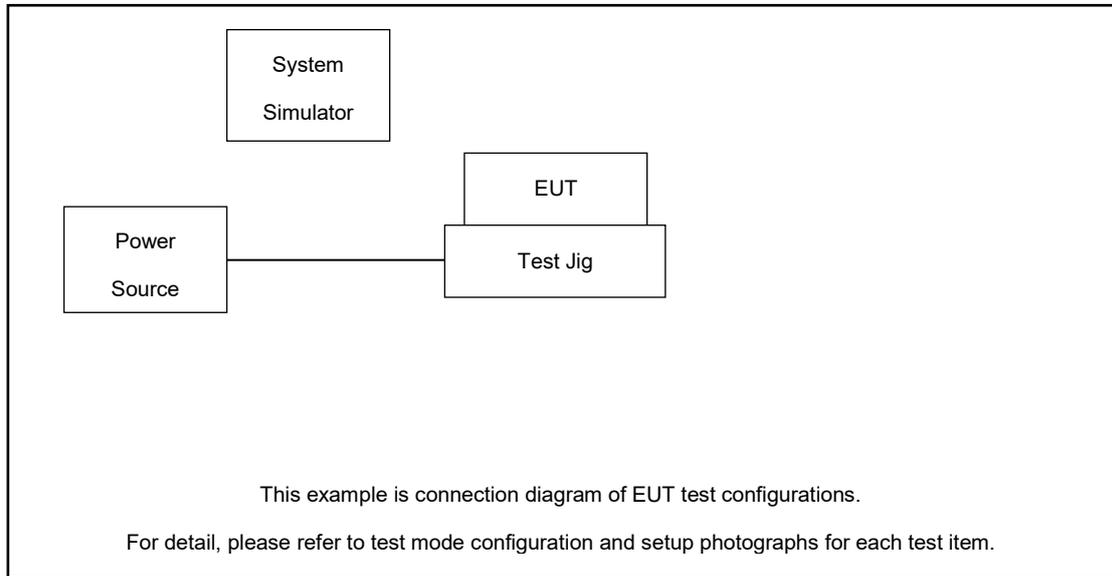
2.1 Test Mode

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	2	v	v	v	v	v	v	v	v		v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v		v	v	v	v	v	v
	5	v	v	v	v	-	-	v	v		v	v	v	v	v	v
	7	-	-	v	v	-	-	v	v		v	v	v	v	v	v
	12	-	-	v	v	-	-	v	v		v	v	v	v	v	v
	13	-	-	v	v	-	-	v	v		v	v	v	v	v	v
	25	v	v	v	v	v	v	v	v		v	v	v	v	v	v
	26	v	v	v	v	v	-	v	v		v	v	v	v	v	v
Peak-to-Average Ratio	13	-	-		v	-	-	v	v				v		v	
26dB and 99% Bandwidth	13	-	-		v	-	-	v	v				v		v	
Conducted Band Edge	13	-	-	v	v	-	-	v	v		v		v	v		v
Conducted Spurious Emission	13	-	-	v	v	-	-	v			v			v	v	v
Frequency Stability	13	-	-		v	-	-	v					v		v	
E.R.P / E.I.R.P	13	-	-	v	v	-	-	v	v		v			v	v	v
Radiated Spurious Emission	13	Worst Case												v		
Note	<ol style="list-style-type: none"> The mark "v" means that this configuration is chosen for testing The mark "-" means that this bandwidth is not supported. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported. 															

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

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

Offset = RF cable loss.

Following shows an offset computation example with cable loss 4.6 dB.

Example :

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



= 4.6 (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	18700	18900	19100
	Frequency	1860	1880	1900
15	Channel	18675	18900	19125
	Frequency	1857.5	1880	1902.5
10	Channel	18650	18900	19150
	Frequency	1855	1880	1905
5	Channel	18625	18900	19175
	Frequency	1852.5	1880	1907.5
3	Channel	18615	18900	19185
	Frequency	1851.5	1880	1908.5
1.4	Channel	18607	18900	19193
	Frequency	1850.7	1880	1909.3

LTE Band 4 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	20050	20175	20300
	Frequency	1720	1732.5	1745
15	Channel	20025	20175	20325
	Frequency	1717.5	1732.5	1747.5
10	Channel	20000	20175	20350
	Frequency	1715	1732.5	1750
5	Channel	19975	20175	20375
	Frequency	1712.5	1732.5	1752.5
3	Channel	19965	20175	20385
	Frequency	1711.5	1732.5	1753.5
1.4	Channel	19957	20175	20393
	Frequency	1710.7	1732.5	1754.3



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

LTE Band 7 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	20850	21100	21350
	Frequency	2510	2535	2560
15	Channel	20825	21100	21375
	Frequency	2507.5	2535	2562.5
10	Channel	20800	21100	21400
	Frequency	2505	2535	2565
5	Channel	20775	21100	21425
	Frequency	2502.5	2535	2567.5

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 25 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	26140	26340	26590
	Frequency	1860	1880	1905
15	Channel	26115	26340	26615
	Frequency	1857.5	1880	1907.5
10	Channel	26090	26340	26640
	Frequency	1855	1880	1910
5	Channel	26065	26340	26665
	Frequency	1852.5	1880	1912.5
3	Channel	26055	26340	26675
	Frequency	1851.5	1880	1913.5
1.4	Channel	26047	26340	26683
	Frequency	1850.7	1880	1914.3

LTE Band 26 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	26865	26915	26965
	Frequency	831.5	836.5	841.5
10	Channel	26840	26915	26990
	Frequency	829	836.5	844
5	Channel	26815	26915	27015
	Frequency	826.5	836.5	846.5
3	Channel	26805	26915	27025
	Frequency	825.5	836.5	847.5
1.4	Channel	26797	26915	27033
	Frequency	824.7	836.5	848.3



LTE Band 26 Channel and Frequency List (Part 90S)				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	26765	-	-
	Frequency	821.5	-	-
10	Channel	-	26740	-
	Frequency	-	819	-
5	Channel	26715	26740	26765
	Frequency	816.5	819	821.5
3	Channel	26705	26740	26775
	Frequency	815.5	819	822.5
1.4	Channel	26697	26740	26783
	Frequency	814.7	819	823.3

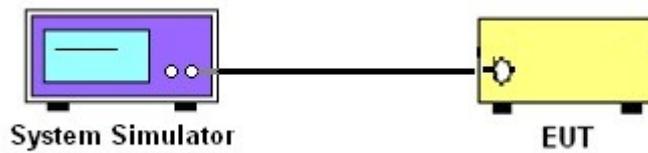
3 Conducted Test Items

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 Conducted Output Power



3.3 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

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 7 Watts for LTE Band 5 and Band 26.

The ERP of mobile transmitters must not exceed 3 Watts for LTE Band 12 and Band 13.

The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 2 and Band 25 and Band 7.

The EIRP of mobile transmitters must not exceed 1 Watts for LTE Band 4.

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(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.

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:

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

9. When using the integration method, the starting frequency of the integration shall be centered at one-half of the RBW away from the band edge.



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 10th 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°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 $20\pm 5^{\circ}\text{C}$ 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.

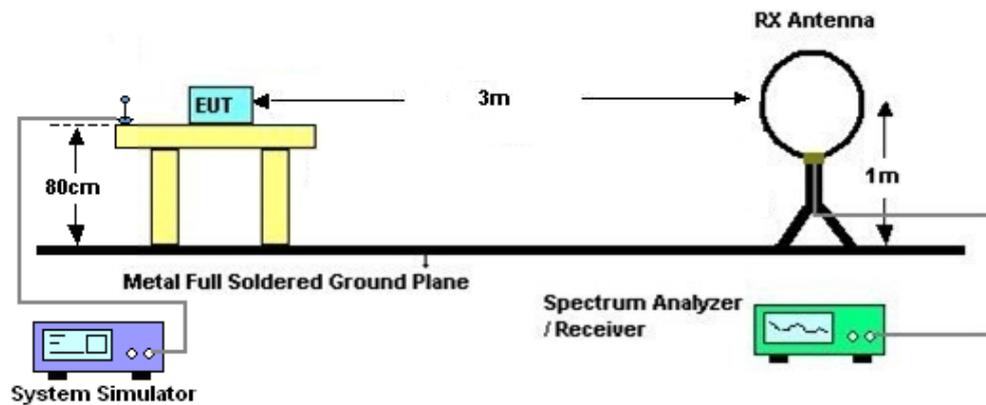
4 Radiated Test Items

4.1 Measuring Instruments

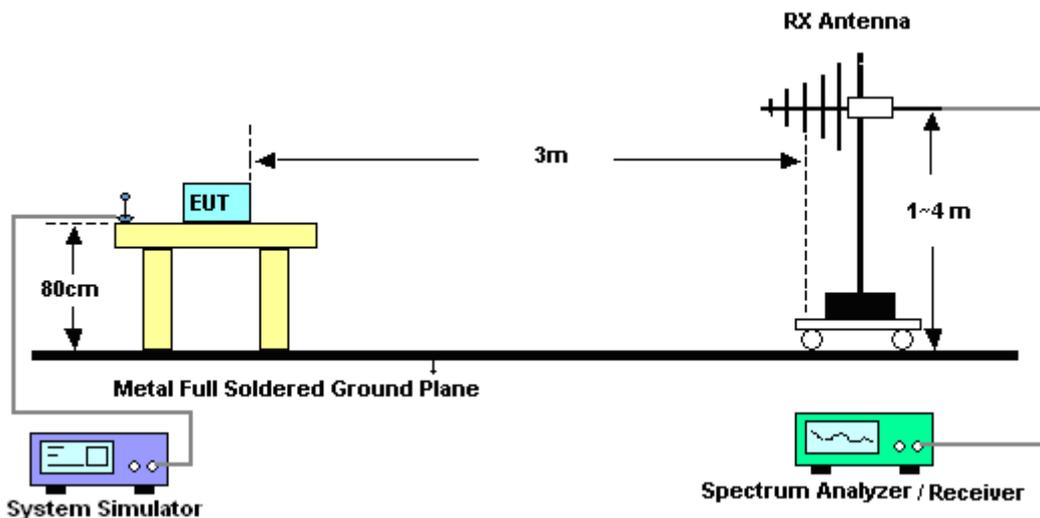
See list of measuring instruments of this test report.

4.2 Test Setup

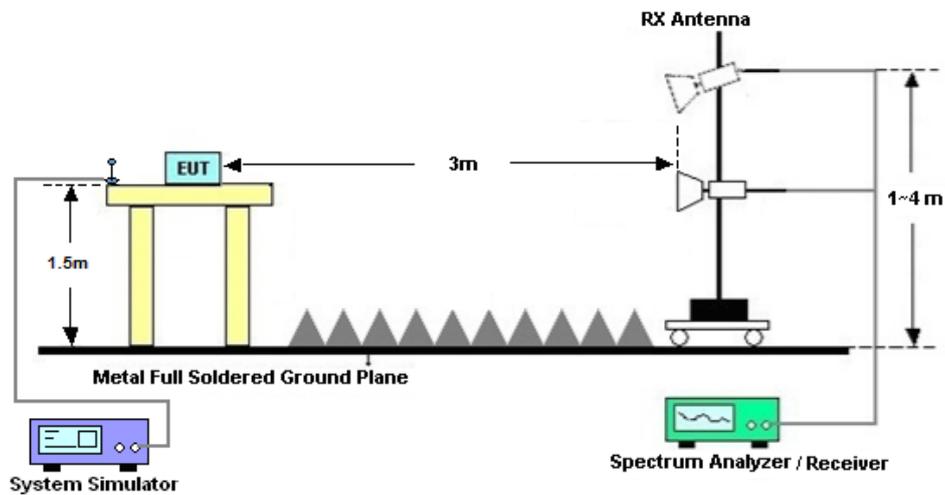
4.2.1 For radiated test below 30MHz



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.

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)
= $P(W) - [43 + 10\log(P)]$ (dB)
= $[30 + 10\log(P)]$ (dBm) - $[43 + 10\log(P)]$ (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	Oct. 14, 2021	Jan. 04, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	Aug. 26, 2021	Jan. 04, 2022	Aug. 25, 2022	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 12, 2021	Jan. 04, 2022	Jul. 11, 2022	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44G,MAX 30dB	Apr. 13, 2021	Jan. 20, 2022	Apr. 12, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jan. 20, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz~1GHz	May 30, 2021	Jan. 20, 2022	May 29, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1356	1GHz~18GHz	Apr. 18, 2021	Jan. 20, 2022	Apr. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz~1GHz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jan. 05, 2022	Jan. 20, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 13, 2021	Jan. 20, 2022	Oct. 12, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jan. 20, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jan. 20, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jan. 20, 2022	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

Test Engineer :	Carl Ni	Temperature :	22~23°C
		Relative Humidity :	41~42%

Conducted Output Power(Average power) and ERP/EIRP

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		23.37	
10	QPSK	1	25		23.13	
10	QPSK	1	49		22.98	
10	QPSK	25	0		22.15	
10	QPSK	25	12		22.10	
10	QPSK	25	25		22.05	
10	QPSK	50	0		22.13	
10	16QAM	1	0		22.28	
10	16QAM	1	25		22.59	
10	16QAM	1	49		22.06	
10	16QAM	25	0		20.99	
10	16QAM	25	12		21.14	
10	16QAM	25	25		21.21	
10	16QAM	50	0		21.05	
Channel				23205	23230	23255
Frequency (MHz)				779.5	782	784.5
5	QPSK	1	0	23.12	23.20	23.21
5	QPSK	1	12	23.03	23.29	22.77
5	QPSK	1	24	23.05	23.13	22.99
5	QPSK	12	0	22.19	22.00	22.19
5	QPSK	12	7	22.10	22.13	22.08
5	QPSK	12	13	21.99	22.14	22.13
5	QPSK	25	0	22.01	22.06	22.19
5	16QAM	1	0	21.97	22.09	21.82
5	16QAM	1	12	21.59	22.01	21.76
5	16QAM	1	24	21.78	22.93	21.47
5	16QAM	12	0	20.94	20.92	21.12
5	16QAM	12	7	21.07	20.83	21.11
5	16QAM	12	13	20.90	20.93	21.10
5	16QAM	25	0	20.78	20.81	21.27



LTE Band 2 (GT - LC = 1.59 dB) QPSK									
Bandwidth	1.4M			3M			5M		
Channel	18607	18900	19193	18615	18900	19185	18625	18900	19175
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	1850.7	1880	1909.3	1851.5	1880	1908.5	1852.5	1880	1907.5
(MHz)									
Conducted Power (dBm)	22.89	23.17	22.85	23.13	23.36	23.05	23.28	23.00	22.89
Conducted Power (Watts)	0.1945	0.2075	0.1928	0.2056	0.2168	0.2018	0.2128	0.1995	0.1945
EIRP(dBm)	24.48	24.76	24.44	24.72	24.95	24.64	24.87	24.59	24.48
EIRP(Watts)	0.2805	0.2992	0.2780	0.2965	0.3126	0.2911	0.3069	0.2877	0.2805

LTE Band 2 (GT - LC = 1.59 dB) QPSK									
Bandwidth	10M			15M			20M		
Channel	18650	18900	19150	18675	18900	19125	18650	18900	19100
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	1855	1880	1905	1857.5	1880	1902.5	1860	1880	1900
(MHz)									
Conducted Power (dBm)	23.39	23.23	23.12	23.13	23.54	23.25	23.12	23.32	23.23
Conducted Power (Watts)	0.2183	0.2104	0.2051	0.2056	0.2259	0.2113	0.2051	0.2148	0.2104
EIRP(dBm)	24.98	24.82	24.71	24.72	25.13	24.84	24.71	24.91	24.82
EIRP(Watts)	0.3148	0.3034	0.2958	0.2965	0.3258	0.3048	0.2958	0.3097	0.3034



LTE Band 2 (GT - LC = 1.59 dB) 16QAM									
Bandwidth	1.4M			3M			5M		
Channel	18607	18900	19193	18615	18900	19185	18625	18900	19175
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1850.7	1880	1909.3	1851.5	1880	1908.5	1852.5	1880	1907.5
Conducted Power (dBm)	21.81	22.47	21.94	22.34	22.18	21.82	22.53	22.46	22.41
Conducted Power (Watts)	0.1517	0.1766	0.1563	0.1714	0.1652	0.1521	0.1791	0.1762	0.1742
EIRP(dBm)	23.40	24.06	23.53	23.93	23.77	23.41	24.12	24.05	24.00
EIRP(Watts)	0.2188	0.2547	0.2254	0.2472	0.2382	0.2193	0.2582	0.2541	0.2512

LTE Band 2 (GT - LC = 1.59 dB) 16QAM									
Bandwidth	10M			15M			20M		
Channel	18650	18900	19150	18675	18900	19125	18650	18900	19100
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1855	1880	1905	1857.5	1880	1902.5	1860	1880	1900
Conducted Power (dBm)	22.32	22.68	22.43	22.14	22.84	22.47	22.57	22.52	22.02
Conducted Power (Watts)	0.1706	0.1854	0.1750	0.1637	0.1923	0.1766	0.1807	0.1786	0.1592
EIRP(dBm)	23.91	24.27	24.02	23.73	24.43	24.06	24.16	24.11	23.61
EIRP(Watts)	0.2460	0.2673	0.2523	0.2360	0.2773	0.2547	0.2606	0.2576	0.2296



LTE Band 4 (GT - LC = 2.00 dB) QPSK									
Bandwidth	1.4M			3M			5M		
Channel	19957	20175	20393	19965	20175	20385	19975	20175	20375
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1710.7	1732.5	1754.3	1711.5	1732.5	1753.5	1712.5	1732.5	1752.5
Conducted Power (dBm)	23.78	23.40	23.30	23.51	23.58	23.40	23.58	23.62	23.43
Conducted Power (Watts)	0.2388	0.2188	0.2138	0.2244	0.2280	0.2188	0.2280	0.2301	0.2203
EIRP(dBm)	25.78	25.40	25.30	25.51	25.58	25.40	25.58	25.62	25.43
EIRP(Watts)	0.3784	0.3467	0.3388	0.3556	0.3614	0.3467	0.3614	0.3648	0.3491

LTE Band 4 (GT - LC = 2.00 dB) QPSK									
Bandwidth	10M			15M			20M		
Channel	20000	20175	20350	20025	20175	20325	20050	20175	20300
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1715	1732.5	1750	1717.5	1732.5	1747.5	1720	1732.5	1745
Conducted Power (dBm)	23.49	23.62	23.37	23.64	23.52	23.43	23.81	23.47	23.60
Conducted Power (Watts)	0.2234	0.2301	0.2173	0.2312	0.2249	0.2203	0.2404	0.2223	0.2291
EIRP(dBm)	25.49	25.62	25.37	25.64	25.52	25.43	25.81	25.47	25.60
EIRP(Watts)	0.3540	0.3648	0.3443	0.3664	0.3565	0.3491	0.3811	0.3524	0.3631



LTE Band 4 (GT - LC = 2.00 dB) 16QAM									
Bandwidth	1.4M			3M			5M		
Channel	19957	20175	20393	19965	20175	20385	19975	20175	20375
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1710.7	1732.5	1754.3	1711.5	1732.5	1753.5	1712.5	1732.5	1752.5
Conducted Power (dBm)	23.11	22.17	22.14	22.28	22.67	22.84	22.66	22.93	22.49
Conducted Power (Watts)	0.2046	0.1648	0.1637	0.1690	0.1849	0.1923	0.1845	0.1963	0.1774
EIRP(dBm)	25.11	24.17	24.14	24.28	24.67	24.84	24.66	24.93	24.49
EIRP(Watts)	0.3243	0.2612	0.2594	0.2679	0.2931	0.3048	0.2924	0.3112	0.2812

LTE Band 4 (GT - LC = 2.00 dB) 16QAM									
Bandwidth	10M			15M			20M		
Channel	20000	20175	20350	20025	20175	20325	20050	20175	20300
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1715	1732.5	1750	1717.5	1732.5	1747.5	1720	1732.5	1745
Conducted Power (dBm)	22.95	22.43	22.89	22.62	23.01	22.46	23.26	22.67	22.62
Conducted Power (Watts)	0.1972	0.1750	0.1945	0.1828	0.2000	0.1762	0.2118	0.1849	0.1828
EIRP(dBm)	24.95	24.43	24.89	24.62	25.01	24.46	25.26	24.67	24.62
EIRP(Watts)	0.3126	0.2773	0.3083	0.2897	0.3170	0.2793	0.3357	0.2931	0.2897



LTE Band 5 (GT - LC = 2.53 dB) QPSK									
Bandwidth	1.4M			3M			5M		
Channel	20407	20525	20643	20415	20525	20635	20425	20525	20625
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	824.7	836.5	848.3	825.5	836.5	847.5	826.5	836.5	846.5
Conducted Power (dBm)	23.49	23.17	23.29	23.50	23.38	22.94	23.20	23.47	23.47
Conducted Power (Watts)	0.2234	0.2075	0.2133	0.2239	0.2178	0.1968	0.2089	0.2223	0.2223
ERP(dBm)	23.87	23.55	23.67	23.88	23.76	23.32	23.58	23.85	23.85
ERP(Watts)	0.2438	0.2265	0.2328	0.2443	0.2377	0.2148	0.2280	0.2427	0.2427

LTE Band 5 (GT - LC = 2.53 dB) QPSK			
Bandwidth	10M		
Channel	20450	20525	20600
	(Low)	(Mid)	(High)
Frequency (MHz)	829	836.5	844
Conducted Power (dBm)	23.43	23.31	23.22
Conducted Power (Watts)	0.2203	0.2143	0.2099
ERP(dBm)	23.81	23.69	23.60
ERP(Watts)	0.2404	0.2339	0.2291



LTE Band 5 (GT - LC = 2.53 dB) 16QAM									
Bandwidth	1.4M			3M			5M		
Channel	20407	20525	20643	20415	20525	20635	20425	20525	20625
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	824.7	836.5	848.3	825.5	836.5	847.5	826.5	836.5	846.5
Conducted Power (dBm)	22.70	22.43	22.00	22.84	22.44	22.38	22.23	22.84	22.26
Conducted Power (Watts)	0.1862	0.1750	0.1585	0.1923	0.1754	0.1730	0.1671	0.1923	0.1683
ERP(dBm)	23.08	22.81	22.38	23.22	22.82	22.76	22.61	23.22	22.64
ERP(Watts)	0.2032	0.1910	0.1730	0.2099	0.1914	0.1888	0.1824	0.2099	0.1837

LTE Band 5 (GT - LC = 2.53 dB) 16QAM			
Bandwidth	10M		
Channel	20450	20525	20600
	(Low)	(Mid)	(High)
Frequency (MHz)	829	836.5	844
Conducted Power (dBm)	23.26	22.82	22.35
Conducted Power (Watts)	0.2118	0.1914	0.1718
ERP(dBm)	23.64	23.20	22.73
ERP(Watts)	0.2312	0.2089	0.1875



LTE Band 7 (GT - LC = 3.00 dB) QPSK			
Bandwidth	5M		
Channel	20775	21100	21425
	(Low)	(Mid)	(High)
Frequency	2502.5	2535	2567.5
(MHz)			
Conducted Power (dBm)	23.60	23.62	24.08
Conducted Power (Watts)	0.2291	0.2301	0.2559
EIRP(dBm)	26.60	26.62	27.08
EIRP(Watts)	0.4571	0.4592	0.5105

LTE Band 7 (GT - LC = 3.00 dB) QPSK									
Bandwidth	10M			15M			20M		
Channel	20800	21100	21400	20825	21100	21375	20850	21100	21350
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	2505	2535	2565	2507.5	2535	2562.5	2510	2535	2560
(MHz)									
Conducted Power (dBm)	23.69	24.00	23.92	23.67	23.99	23.98	24.01	23.86	24.08
Conducted Power (Watts)	0.2339	0.2512	0.2466	0.2328	0.2506	0.2500	0.2518	0.2432	0.2559
EIRP(dBm)	26.69	27.00	26.92	26.67	26.99	26.98	27.01	26.86	27.08
EIRP(Watts)	0.4667	0.5012	0.4920	0.4645	0.5000	0.4989	0.5023	0.4853	0.5105



LTE Band 7 (GT - LC = 3.00 dB) 16QAM			
Bandwidth	5M		
Channel	20775	21100	21425
	(Low)	(Mid)	(High)
Frequency	2502.5	2535	2567.5
(MHz)			
Conducted Power (dBm)	23.25	22.78	23.41
Conducted Power (Watts)	0.2113	0.1897	0.2193
EIRP(dBm)	26.25	25.78	26.41
EIRP(Watts)	0.4217	0.3784	0.4375

LTE Band 7 (GT - LC = 3.00 dB) 16QAM									
Bandwidth	10M			15M			20M		
Channel	20800	21100	21400	20825	21100	21375	20850	21100	21350
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	2505	2535	2565	2507.5	2535	2562.5	2510	2535	2560
(MHz)									
Conducted Power (dBm)	22.59	23.05	23.25	22.69	23.05	23.48	22.89	23.29	23.42
Conducted Power (Watts)	0.1816	0.2018	0.2113	0.1858	0.2018	0.2228	0.1945	0.2133	0.2198
EIRP(dBm)	25.59	26.05	26.25	25.69	26.05	26.48	25.89	26.29	26.42
EIRP(Watts)	0.3622	0.4027	0.4217	0.3707	0.4027	0.4446	0.3882	0.4256	0.4385



LTE Band 12 (GT - LC = 3.00 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)	23.44	23.30	23.34	23.55	23.37	23.64	23.47	23.32	23.55
Conducted Power (Watts)	0.2208	0.2138	0.2158	0.2265	0.2173	0.2312	0.2223	0.2148	0.2265
ERP(dBm)	24.29	24.15	24.19	24.40	24.22	24.49	24.32	24.17	24.40
ERP(Watts)	0.2685	0.2600	0.2624	0.2754	0.2642	0.2812	0.2704	0.2612	0.2754

LTE Band 12 (GT - LC = 3.00 dB) QPSK			
Bandwidth	10M		
Channel	23060	23095	23130
	(Low)	(Mid)	(High)
Frequency (MHz)	704	707.5	711
Conducted Power (dBm)	23.25	23.64	23.61
Conducted Power (Watts)	0.2113	0.2312	0.2296
ERP(dBm)	24.10	24.49	24.46
ERP(Watts)	0.2570	0.2812	0.2793



LTE Band 12 (GT - LC = 3.00 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)	22.72	22.09	22.66	22.11	22.69	22.69	22.75	22.51	22.78
Conducted Power (Watts)	0.1871	0.1618	0.1845	0.1626	0.1858	0.1858	0.1884	0.1782	0.1897
ERP(dBm)	23.57	22.94	23.51	22.96	23.54	23.54	23.60	23.36	23.63
ERP(Watts)	0.2275	0.1968	0.2244	0.1977	0.2259	0.2259	0.2291	0.2168	0.2307

LTE Band 12 (GT - LC = 3.00 dB) 16QAM			
Bandwidth	10M		
Channel	23060	23095	23130
	(Low)	(Mid)	(High)
Frequency (MHz)	704	707.5	711
Conducted Power (dBm)	22.68	22.72	22.11
Conducted Power (Watts)	0.1854	0.1871	0.1626
ERP(dBm)	23.53	23.57	22.96
ERP(Watts)	0.2254	0.2275	0.1977



LTE Band 13 (GT - LC = 4.00 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)	23.12	23.20	23.21	-	23.37	-
Conducted Power (Watts)	0.2051	0.2089	0.2094	-	0.2173	-
ERP(dBm)	24.97	25.05	25.06	-	25.22	-
ERP(Watts)	0.3141	0.3199	0.3206	-	0.3327	-

LTE Band 13 (GT - LC = 4.00 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)	21.78	22.93	21.47	-	22.59	-
Conducted Power (Watts)	0.1507	0.1963	0.1403	-	0.1816	-
ERP(dBm)	23.63	24.78	23.32	-	24.44	-
ERP(Watts)	0.2307	0.3006	0.2148	-	0.2780	-



LTE Band 25 (GT - LC = 1.59 dB) QPSK									
Bandwidth	1.4M			3M			5M		
Channel	26407	26340	26683	26055	26340	26675	26065	26340	26665
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1850.7	1880	1914.3	1851.5	1880	1913.5	1852.5	1880	1912.5
Conducted Power (dBm)	23.20	23.26	23.21	23.29	23.35	23.10	23.44	23.33	23.13
Conducted Power (Watts)	0.2089	0.2118	0.2094	0.2133	0.2163	0.2042	0.2208	0.2153	0.2056
EIRP(dBm)	24.79	24.85	24.80	24.88	24.94	24.69	25.03	24.92	24.72
EIRP(Watts)	0.3013	0.3055	0.3020	0.3076	0.3119	0.2944	0.3184	0.3105	0.2965

LTE Band 25 (GT - LC = 1.59 dB) QPSK									
Bandwidth	10M			15M			20M		
Channel	26090	26340	26640	26115	26340	26615	26140	26340	26590
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1855	1880	1910	1857.5	1880	1907.5	1860	1880	1905
Conducted Power (dBm)	23.45	23.51	23.06	23.14	23.29	23.08	23.40	23.08	23.23
Conducted Power (Watts)	0.2213	0.2244	0.2023	0.2061	0.2133	0.2032	0.2188	0.2032	0.2104
EIRP(dBm)	25.04	25.10	24.65	24.73	24.88	24.67	24.99	24.67	24.82
EIRP(Watts)	0.3192	0.3236	0.2917	0.2972	0.3076	0.2931	0.3155	0.2931	0.3034



LTE Band 25 (GT - LC = 1.59 dB) 16QAM									
Bandwidth	1.4M			3M			5M		
Channel	26407	26340	26683	26055	26340	26675	26065	26340	26665
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1850.7	1880	1914.3	1851.5	1880	1913.5	1852.5	1880	1912.5
Conducted Power (dBm)	22.16	22.68	21.99	22.38	22.34	22.25	22.49	22.54	21.90
Conducted Power (Watts)	0.1644	0.1854	0.1581	0.1730	0.1714	0.1679	0.1774	0.1795	0.1549
EIRP(dBm)	23.75	24.27	23.58	23.97	23.93	23.84	24.08	24.13	23.49
EIRP(Watts)	0.2371	0.2673	0.2280	0.2495	0.2472	0.2421	0.2559	0.2588	0.2234

LTE Band 25 (GT - LC = 1.59 dB) 16QAM									
Bandwidth	10M			15M			20M		
Channel	26090	26340	26640	26115	26340	26615	26140	26340	26590
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency (MHz)	1855	1880	1910	1857.5	1880	1907.5	1860	1880	1905
Conducted Power (dBm)	22.09	22.53	22.53	22.23	22.09	22.46	22.32	22.42	22.18
Conducted Power (Watts)	0.1618	0.1791	0.1791	0.1671	0.1618	0.1762	0.1706	0.1746	0.1652
EIRP(dBm)	23.68	24.12	23.72	23.82	23.68	24.05	23.91	24.01	23.77
EIRP(Watts)	0.2333	0.2582	0.2355	0.2410	0.2333	0.2541	0.2460	0.2518	0.2382



LTE Band 26 (GT - LC = 2.00 dB) QPSK									
Bandwidth	1.4M			3M			5M		
Channel	26797	26915	27033	26805	26915	27025	26815	26915	27015
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	824.7	836.5	848.3	825.5	836.5	847.5	826.5	836.5	846.5
(MHz)									
Conducted Power (dBm)	23.12	23.03	23.26	23.40	23.33	23.31	23.35	23.30	23.41
Conducted Power (Watts)	0.2051	0.2009	0.2118	0.2188	0.2153	0.2143	0.2163	0.2138	0.2193
ERP(dBm)	22.97	22.88	23.11	23.25	23.18	23.16	23.20	23.15	23.26
ERP(Watts)	0.1982	0.1941	0.2046	0.2113	0.2080	0.2070	0.2089	0.2065	0.2118

LTE Band 26 (GT - LC = 2.00 dB) QPSK							
Bandwidth	10M			15M			15M
Channel	26840	26915	26990	26865	26915	26965	26765
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)
Frequency	829	836.5	844	831.5	836.5	841.5	821.5
(MHz)							
Conducted Power (dBm)	23.37	23.25	23.40	23.16	23.24	23.01	23.30
Conducted Power (Watts)	0.2173	0.2113	0.2188	0.2070	0.2109	0.2000	0.2138
ERP(dBm)	23.22	23.10	23.25	23.01	23.09	22.86	23.15
ERP(Watts)	0.2099	0.2042	0.2113	0.2000	0.2037	0.1932	0.2065



LTE Band 26 (GT - LC = 2.00 dB) 16QAM									
Bandwidth	1.4M			3M			5M		
Channel	26797	26915	27033	26805	26915	27025	26815	26915	27015
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)
Frequency	824.7	836.5	848.3	825.5	836.5	847.5	826.5	836.5	846.5
(MHz)									
Conducted Power (dBm)	22.67	22.65	21.99	22.96	22.53	22.85	22.17	22.09	22.98
Conducted Power (Watts)	0.1849	0.1841	0.1581	0.1977	0.1791	0.1928	0.1648	0.1618	0.1986
ERP(dBm)	22.52	22.50	21.84	22.81	22.38	22.70	22.02	21.94	22.83
ERP(Watts)	0.1786	0.1778	0.1528	0.1910	0.1730	0.1862	0.1592	0.1563	0.1919

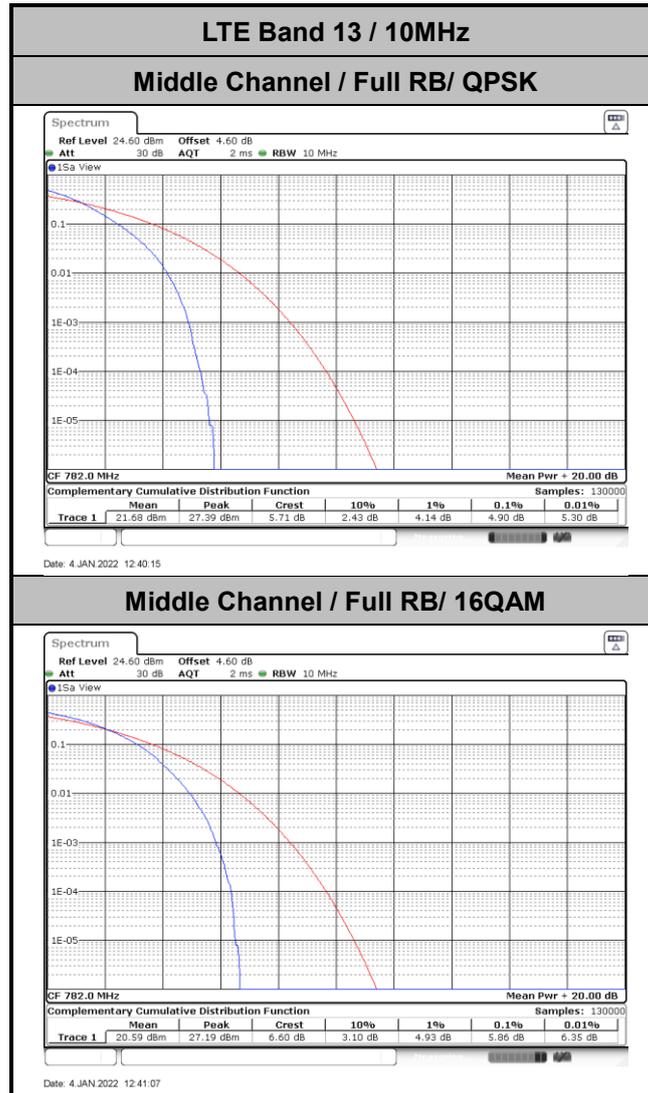
LTE Band 26 (GT - LC = 2.00 dB) 16QAM							
Bandwidth	10M			15M			15M
Channel	26840	26915	26990	26865	26915	26965	26765
	(Low)	(Mid)	(High)	(Low)	(Mid)	(High)	(Low)
Frequency	829	836.5	844	831.5	836.5	841.5	821.5
(MHz)							
Conducted Power (dBm)	23.11	22.56	22.43	22.19	23.12	22.08	22.81
Conducted Power (Watts)	0.2046	0.1803	0.1750	0.1656	0.2051	0.1614	0.1910
ERP(dBm)	22.96	22.41	22.28	23.01	22.97	21.93	22.66
ERP(Watts)	0.1977	0.1742	0.1690	0.2000	0.1982	0.1560	0.1845



LTE Band 13

Peak-to-Average Ratio

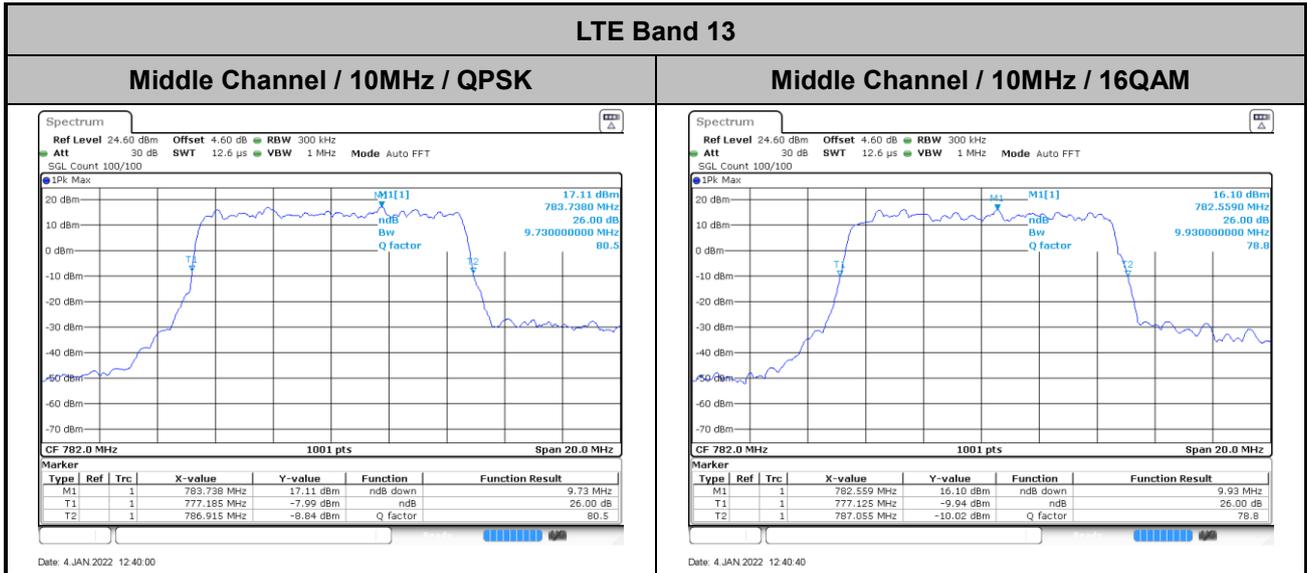
Mode	LTE Band 13 / 10MHz				
Mod.	QPSK	16QAM	-	-	Limit: 13dB
RB Size	Full RB	Full RB	-	-	Result
Middle CH	4.9	5.86	-	-	PASS





26dB Bandwidth

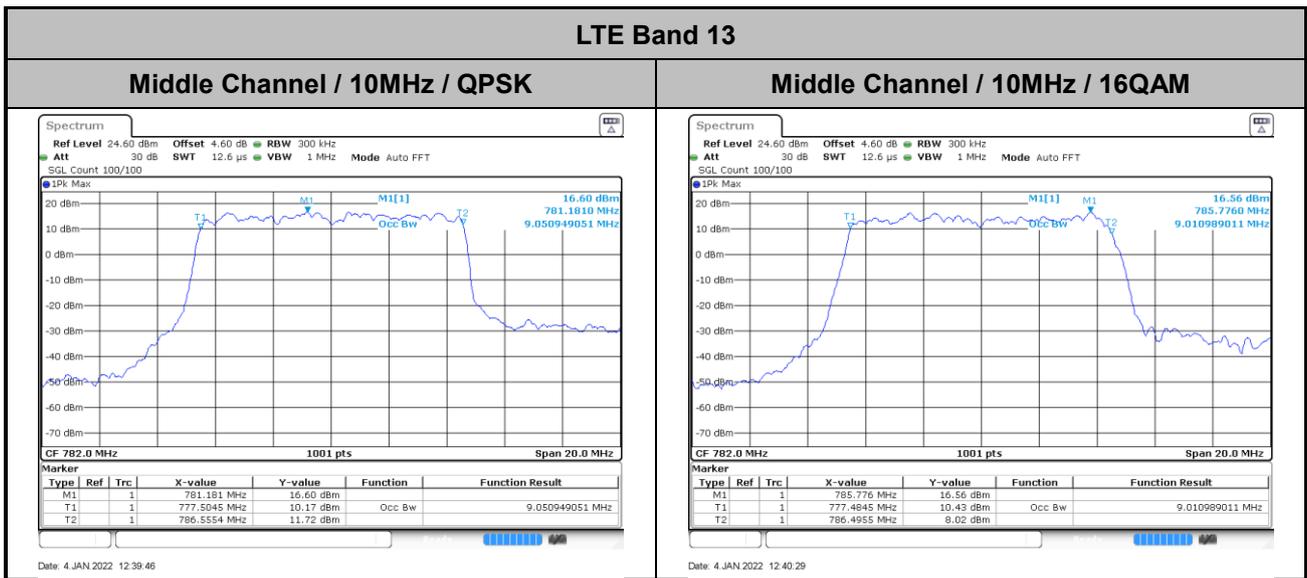
Mode	LTE Band 13 : 26dB BW(MHz)	
BW	10MHz	
Mod.	QPSK	16QAM
Middle CH	9.73	9.93





Occupied Bandwidth

Mode	LTE Band 13 : 99%OBW(MHz)	
BW	10MHz	
Mod.	QPSK	16QAM
Middle CH	9.05	9.01



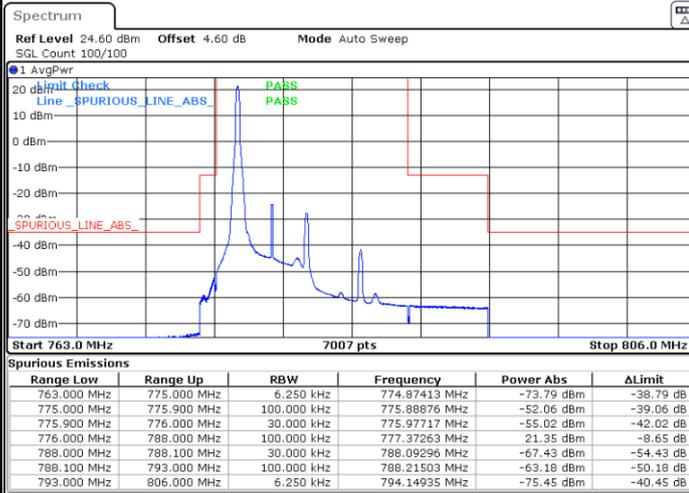


Conducted Band Edge

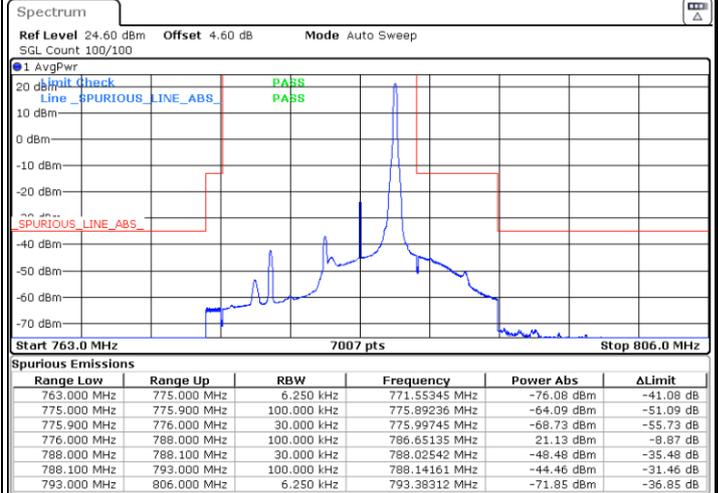
LTE Band 13 / 5MHz / QPSK

Lowest Band Edge / 1 RB

Highest Band Edge / 1 RB



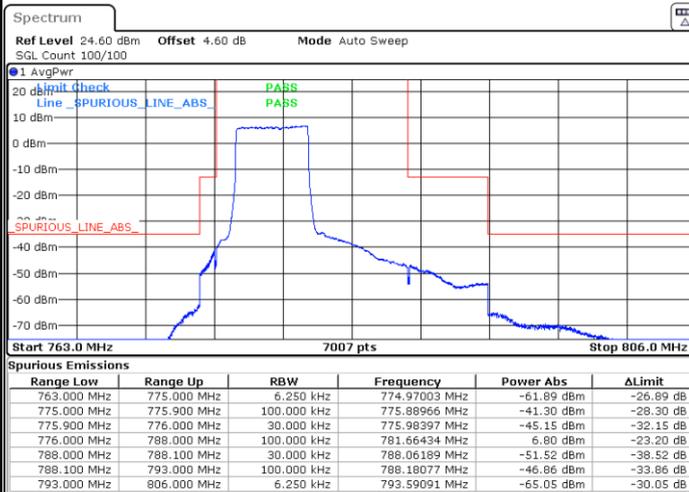
Date: 4 JAN 2022 13:51:33



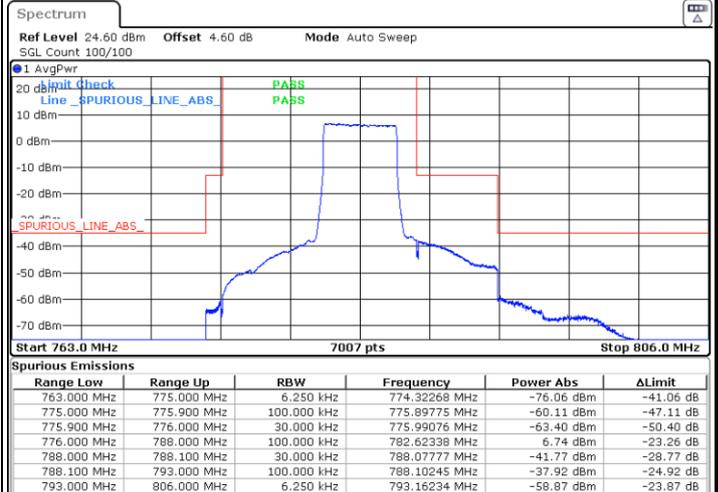
Date: 4 JAN 2022 12:49:51

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 4 JAN 2022 12:58:02



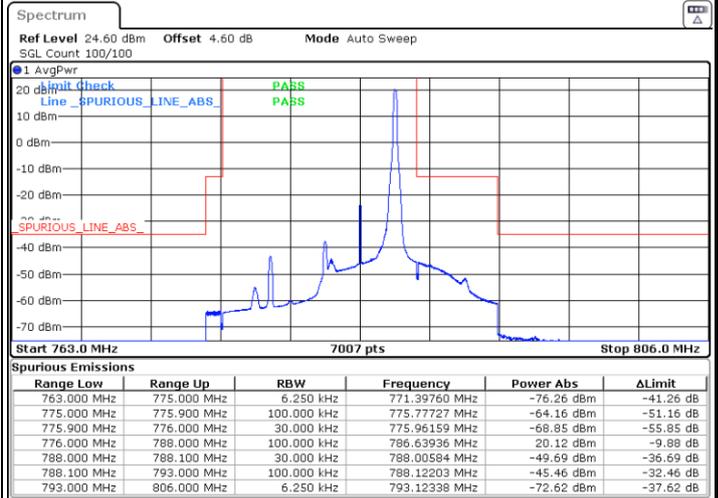
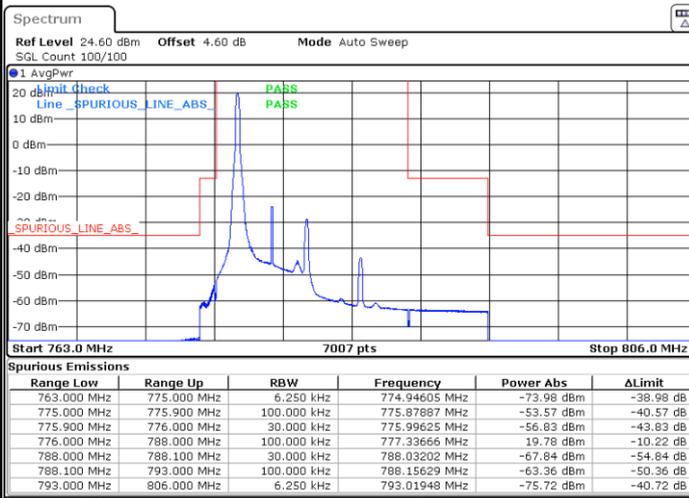
Date: 4 JAN 2022 12:56:41



LTE Band 13 / 5MHz / 16QAM

Lowest Band Edge / 1RB

Highest Band Edge / 1 RB

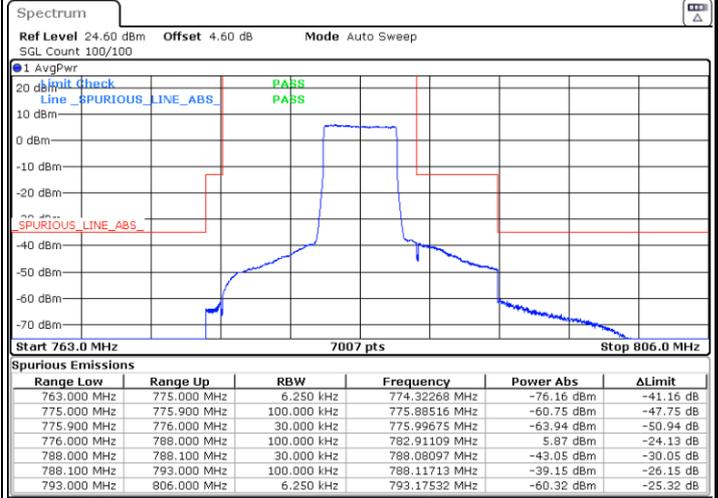
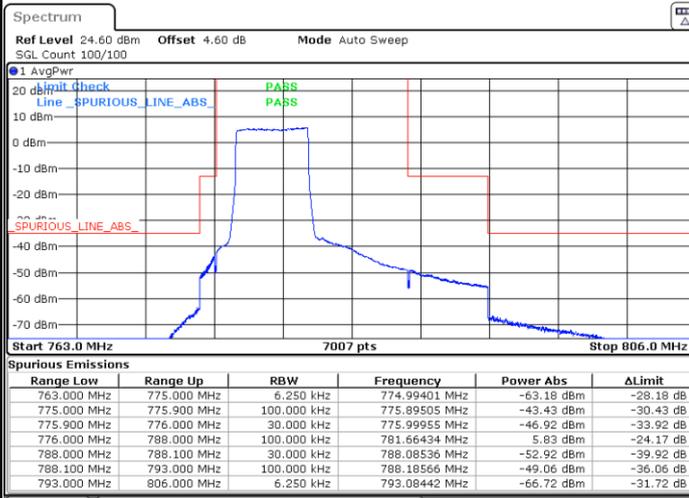


Date: 4 JAN 2022 13:50:23

Date: 4 JAN 2022 12:50:59

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 4 JAN 2022 12:59:13

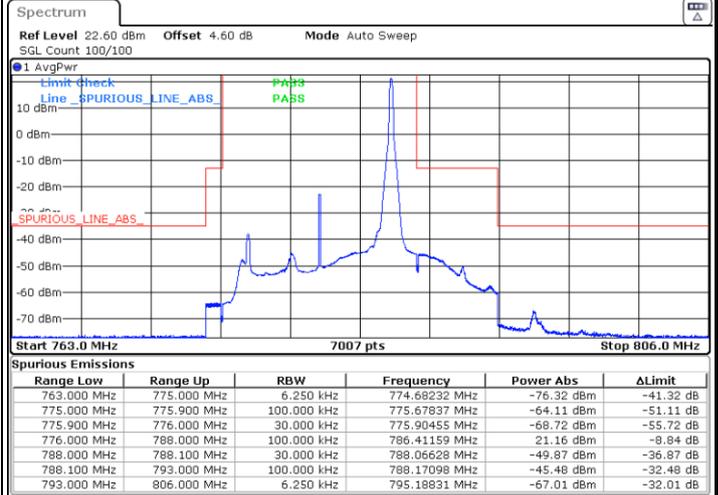
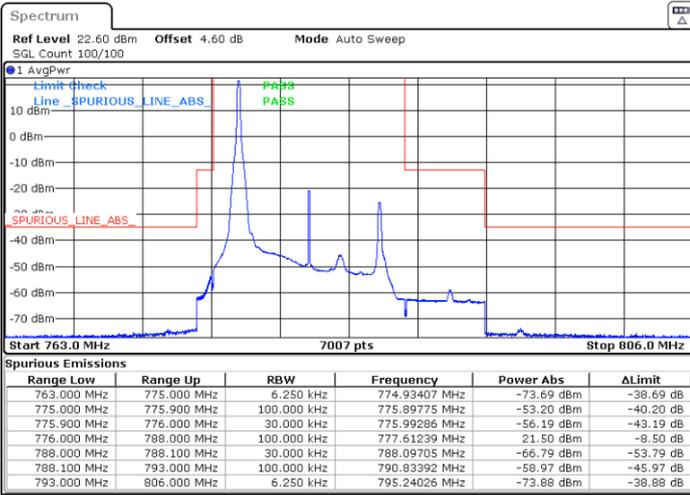
Date: 4 JAN 2022 12:55:29



LTE Band 13 / 10MHz / QPSK

middle Band Edge / 1 RB

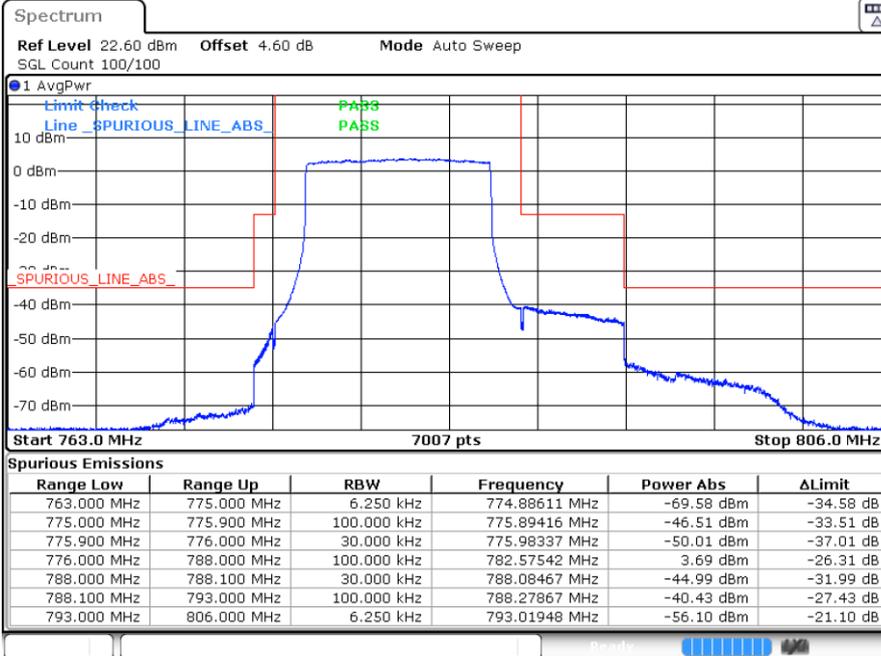
middle Band Edge / 1 RB



Date: 4 JAN 2022 12:24:55

Date: 4 JAN 2022 12:33:20

Middle Band Edge / Full RB

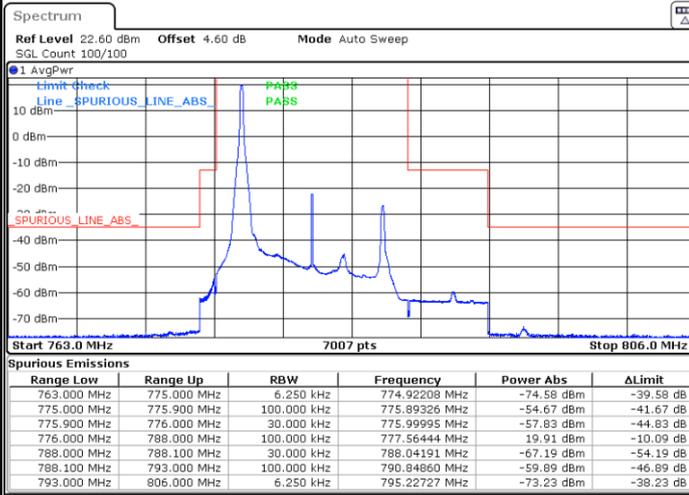


Date: 4 JAN 2022 12:34:46



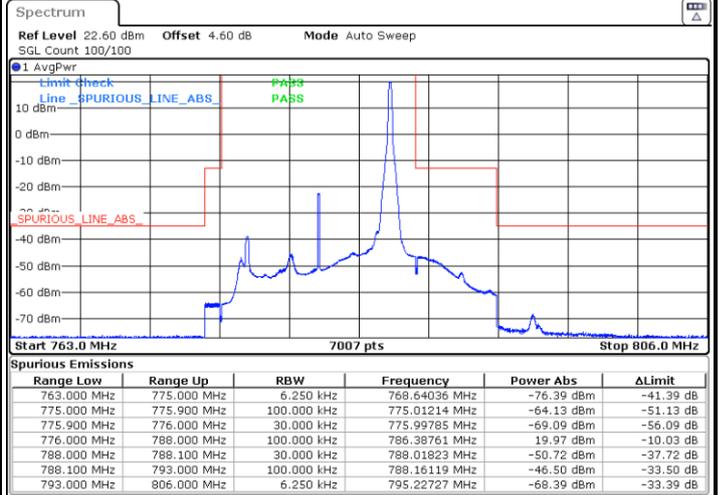
LTE Band 13 / 10MHz / 16QAM

middle Band Edge / 1 RB



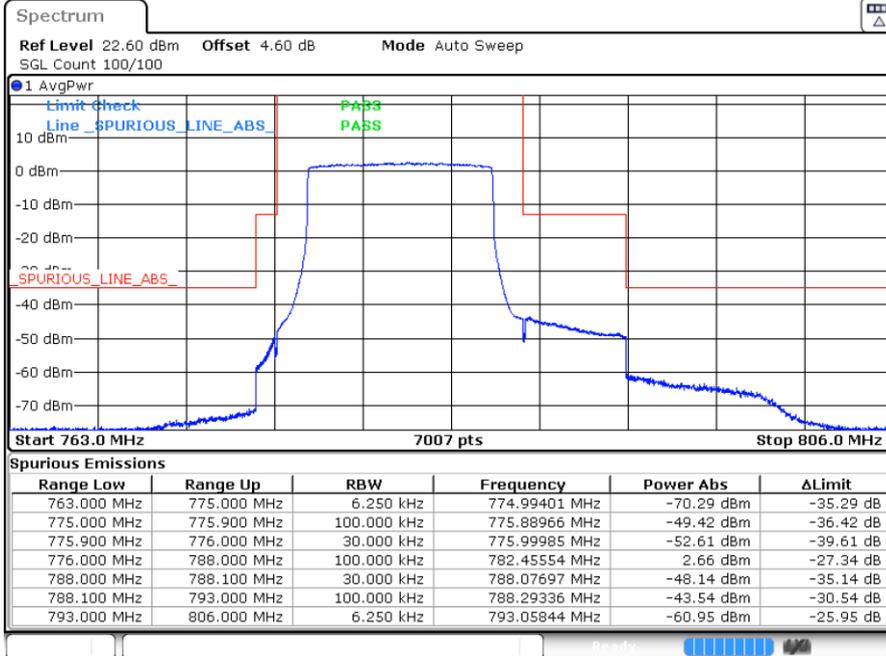
Date: 4 JAN 2022 12:26:15

middle Band Edge / 1 RB



Date: 4 JAN 2022 12:31:56

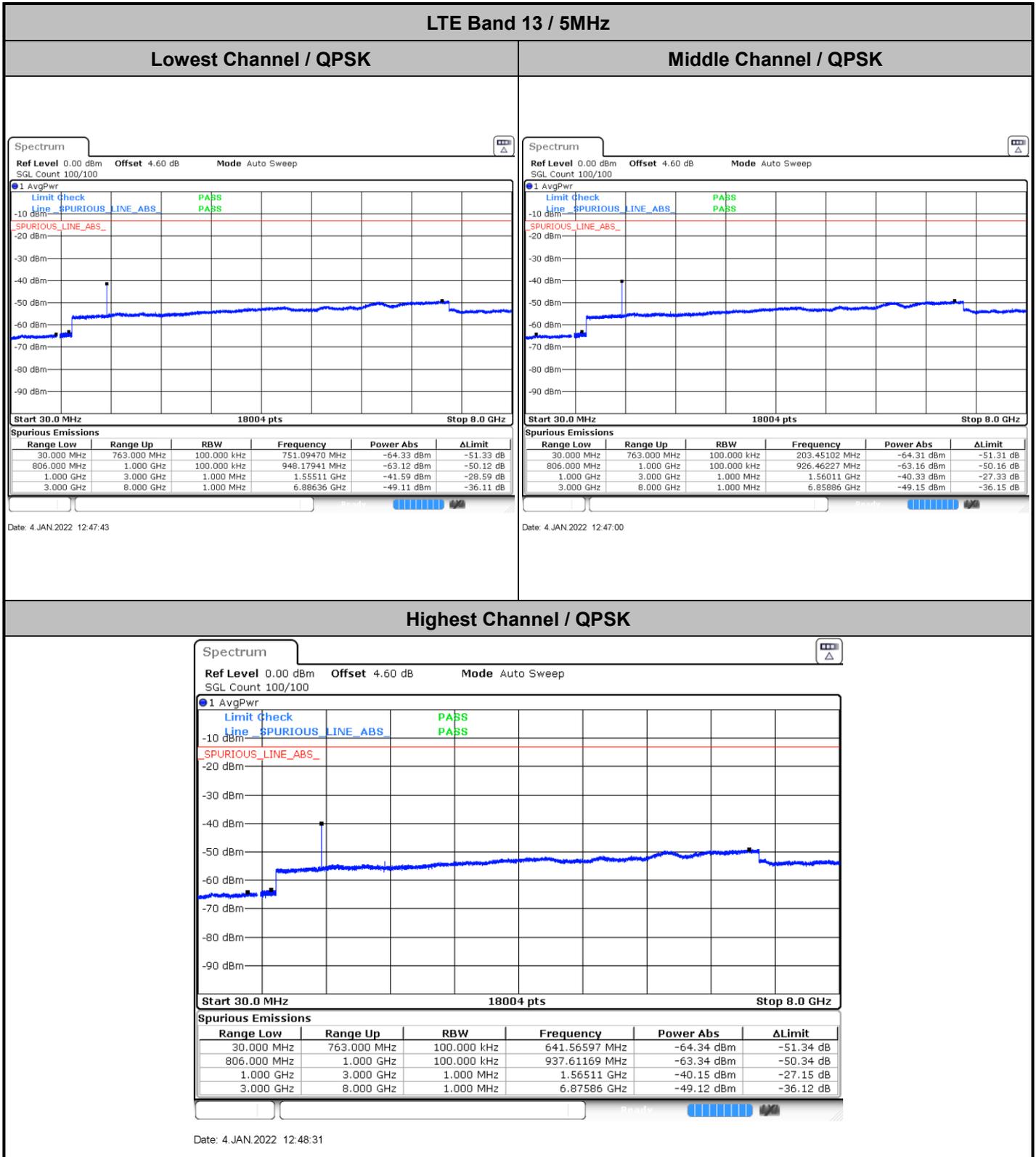
middle Band Edge / Full RB



Date: 4 JAN 2022 12:36:02



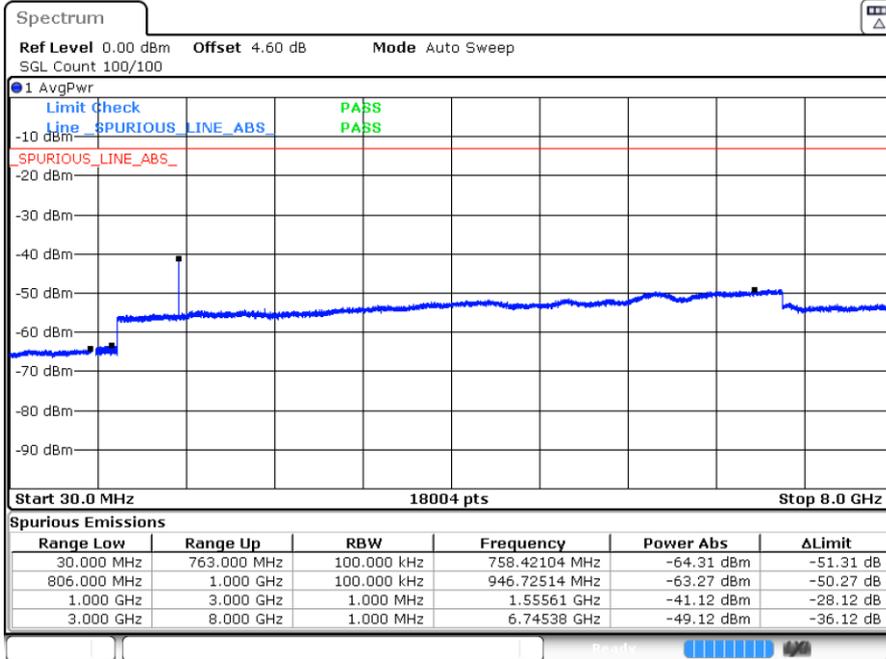
Conducted Spurious Emission





LTE Band 13 / 10MHz

Middle Channel / QPSK



Date: 4.JAN.2022 12:38:25



Frequency Stability

Test Conditions		LTE Band 13 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 10MHz	Note 2.
		Deviation (ppm)	Result
50	Normal Voltage	0.0019	PASS
40	Normal Voltage	0.0016	
30	Normal Voltage	0.0027	
20(Ref.)	Normal Voltage	0.0011	
10	Normal Voltage	0.0024	
0	Normal Voltage	0.0023	
-10	Normal Voltage	0.0019	
-20	Normal Voltage	0.0014	
-30	Normal Voltage	0.0006	
20	Maximum Voltage	0.0008	
20	Normal Voltage	0.0009	
20	Battery End Point	0.0022	

Note:

1. Normal Voltage =3.8 V. ; Battery End Point (BEP) =3.5 V. ; Maximum Voltage =4.2 V.
2. Note: The frequency fundamental emissions stay within the authorized frequency block.



Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Chris Chen	Temperature :	22~23°C
		Relative Humidity :	41~42%

LTE Band 13 / 5MHz / QPSK								
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	1552	-66.23	-42.15	-24.08	-68.86	1.09	5.87	H
	2328	-60.93	-13	-47.93	-63.33	1.37	5.92	H
	3112	-58.99	-13	-45.99	-62.88	1.64	7.68	H
	1552	-65.34	-42.15	-23.19	-67.97	1.09	5.87	V
	2328	-58.94	-13	-45.94	-61.34	1.37	5.92	V
	3112	-58.94	-13	-45.94	-62.83	1.64	7.68	V
Middle	1560	-64.68	-42.15	-22.53	-67.31	1.09	5.87	H
	2336	-60.75	-13	-47.75	-63.15	1.37	5.92	H
	3120	-59.15	-13	-46.15	-63.04	1.64	7.68	H
	1560	-65.15	-42.15	-23.00	-67.78	1.09	5.87	V
	2336	-59.23	-13	-46.23	-61.63	1.37	5.92	V
	3120	-58.92	-13	-45.92	-62.81	1.64	7.68	V
Highest	1560	-65.98	-42.15	-23.83	-68.61	1.09	5.87	H
	2344	-61.04	-13	-48.04	-63.44	1.37	5.92	H
	3128	-59.33	-13	-46.33	-63.22	1.64	7.68	H
	1560	-65.05	-42.15	-22.90	-67.68	1.09	5.87	V
	2344	-59.68	-13	-46.68	-62.08	1.37	5.92	V
	3128	-59.29	-13	-46.29	-63.18	1.64	7.68	V

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

LTE Band 13 / 10MHz / QPSK								
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1552	-65.66	-13	-52.66	-68.29	1.09	5.87	H
	2328	-60.67	-13	-47.67	-63.07	1.37	5.92	H
	3112	-58.71	-13	-45.71	-62.60	1.64	7.68	H
	1552	-65.18	-13	-52.18	-67.81	1.09	5.87	V
	2328	-59.39	-13	-46.39	-61.79	1.37	5.92	V
	3112	-58.72	-13	-45.72	-62.61	1.64	7.68	V

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