

# FCC RF Test Report

APPLICANT	: Xiaomi Communications Co., Ltd.
EQUIPMENT	: Mobile Phone
BRAND NAME	: Xiaomi
MODEL NAME	: 2201122G
FCC ID	: 2AFZZ122G
STANDARD	: 47 CFR Part 2, 27(M)
CLASSIFICATION	: PCS Licensed Transmitter Held to Ear (PCE)
TEST DATE(S)	: Aug. 10, 2021 ~ Dec. 02, 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.

JasonJia

Reviewed by: Jason Jia / Supervisor

Acepwany



Approved by: Alex Wang / Manager

Sporton International (Kunshan) Inc.

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



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# **REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG101701C	Rev. 01	Initial issue of report	Dec. 20, 2021



# SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
	§2.1046	Conducted Output Power	-	Report Only	-
3.4	§27.50(h)(2)	Equivalent Isotropic Radiated Power (Band 7) (Band 38) (Band 41)	EIRP < 2Watt	PASS	-
3.5	N/A	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	-	Report Only	-
3.7	§27.53(m)(4)	Conducted Band Edge Measurement (Band 7) (Band 38) (Band 41)	§27.53(m)(4)	PASS	-
3.8	§2.1051 §27.53(m)(4)	Conducted Spurious Emission (Band 7) (Band 38) (Band 41)	< 55+10log <sub>10</sub> (P[Watts])	PASS	-
3.9	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§2.1053 §27.53(m)(4)	Radiated Spurious Emission (Band 7) (Band 38) (Band 41)	< 55+10log <sub>10</sub> (P[Watts])	PASS	Under limit 26.73 dB at 5168.000 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

#### Xiaomi Communications Co., Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

## 1.2 Manufacturer

#### Xiaomi Communications Co., Ltd.

#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

## **1.3 Product Feature of Equipment Under Test**

Product Feature						
Equipment	Mobile Phone					
Brand Name	Xiaomi					
Model Name	2201122G					
FCC ID	2AFZZ122G					
IMEI Code	Conducted: 863690050059314/ 863690050059322 Radiation: 863690050059678/863690050059686					
HW Version	P2.1					
SW Version	MIUI 13					
EUT Stage	Identical Prototype					

## **1.4 Product Specification of Equipment Under Test**

S	tandards-related Product Specification
	LTE Band 7 : 2500 MHz ~ 2570 MHz
Tx Frequency	LTE Band 38 : 2570 MHz ~ 2620 MHz
	LTE Band 41 : 2496 MHz ~ 2690 MHz
	LTE Band 7 : 2620 MHz ~ 2690 MHz
Rx Frequency	LTE Band 38: 2570 MHz ~ 2620 MHz
	LTE Band 41 : 2496 MHz ~ 2690 MHz
	LTE Band 7 : 5MHz/ 10MHz / 15MHz / 20MHz
Bandwidth	LTE Band 38 : 5MHz / 10MHz / 15MHz / 20MHz
	LTE Band 41: 5MHz / 10MHz / 15MHz / 20MHz
	<ant 0=""></ant>
	LTE Band 7 : 21.57 dBm
	LTE Band 38 : 21.58 dBm
	LTE Band 41 : 22.38 dBm 20.98
Maximum Output Power to	LTE Band 7_CA : 21.11 dBm
Antenna	LTE Band 38_CA : 21.34 dBm
Antenna	<ant 3=""></ant>
	LTE Band 7 : 24.46 dBm
	LTE Band 38 : 24.40 dBm
	LTE Band 41 : 24.41 dBm 20.63
	LTE Band 7_CA : 24.00 dBm



	LTE Band 38_CA : 24.17 dBm
	<ant 4=""></ant>
	LTE Band 7: 23.50 dBm
	LTE Band 38 : 23.08 dBm
	LTE Band 41 : 23.10 dBm
	LTE Band 7_CA : 23.33 dBm
	LTE Band 38_CA : 22.74 dBm
	<ant 5=""></ant>
	LTE Band 7 : 23.16 dBm
	LTE Band 38 : 23.24 dBm
	LTE Band 41 : 23.27 dBm 20.63
	LTE Band 7_CA : 22.70 dBm
	LTE Band 38_CA : 22.74 dBm
	<ant 0=""></ant>
	LTE Band 7: -3.0 dBi
	LTE Band 38 : -3.0 dBi
	LTE Band 41 : -3.0 dBi
	<ant 3=""></ant>
	LTE Band 7: -1.5 dBi
	LTE Band 38 : -1.5 dBi
	LTE Band 41 : -1.5 dBi
Antenna Gain	<ant 4=""></ant>
	LTE Band 7 : -2.4 dBi
	LTE Band 38 : -2.4 dBi
	LTE Band 41 : -2.4 dBi
	<ant 5=""></ant>
	LTE Band 7: -2.6 dBi
	LTE Band 38 : -2.6 dBi
	LTE Band 41 : -2.6 dBi
Type of Modulation	QPSK / 16QAM / 64QAM / 256QAM

**Remark:** The maximum ERP/EIRP is calculated from max output power and antenna gain, only the maximum ERP/EIRP is shown in the report: LTE B7/38/41 for Ant.3.

## **1.5 Modification of EUT**

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



# 1.6 Maximum EIRP Power and Emission Designator

L	TE Band 7	QP	SK	16QAM/64QAM/256QAM			
BW (MHz)	Range Designator		Designator	Maximum EIRP(W)	Emission Designator (99%OBW)		
20	2510.0 ~ 2560.0	0.1977	18M3G7D	0.1549	18M4W7D		
Ľ	TE Band 38	QP	SK	16QAM/64QA	M/256QAM		
BW Frequency (MHz) (MHz)		Maximum EIRP(W)	Emission Designator (99%OBW)	Maximum EIRP(W)	Emission Designator (99%OBW)		
20	2580.0 ~ 2610.0	0.1954	18M3G7D	0.1552	18M3W7D		
Ľ	TE Band 41	QP	SK	16QAM/64QA	M/256QAM		
BW Frequency (MHz) (MHz)		Maximum Emission EIRP(W) (99%OBW		Maximum EIRP(W)	Emission Designator (99%OBW)		
20	2506.0 ~ 2680.0	0.1954	18M3G7D	0.1552	18M3W7D		

LTE Band 7 CA	QP	SK	16QAM/64QAM/256QAM			
BW (MHz)	Maximum EIRP(W)	Designator		Emission Designator (99%OBW)		
20MHz+20MHz	0.1778	37M8G7D	0.1535	37M9W7D		
LTE Band 38 CA	QP	SK	16QAM/64QA	M/256QAM		
LTE Band 38 CA BW (MHz)	QP Maximum EIRP(W)	SK Emission Designator (99%OBW)	16QAM/64QA Maximum EIRP(W)	M/256QAM Emission Designator (99%OBW)		

**Note:**LTE Band 41 overlaps the entire frequency range of LTE Band 38. Therefore, the test results provided in this report covers Band 41 as well as Band 38.



## **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	Jiangsu Province 2153 TEL : +86-512-579001	o. 1098, Pengxi North Road, Kunshan Economic Development Zone angsu Province 215300 People's Republic of China EL : +86-512-57900158 AX : +86-512-57900958						
	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.					
Test Site No.	03CH04-KS TH01-KS	CN1257	314309					

## 1.8 Test Software

I	ltem	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, 27(M)
- 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.

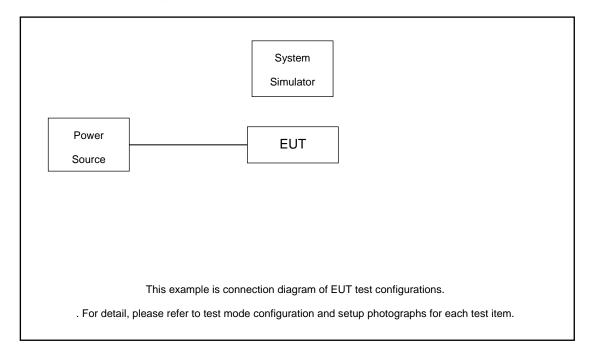
			E	Bandwid	dth (MH	z)			Mod	lulation			RB #		Tes	t Char	nnel
Test Items	Band	1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QA M	1	Half	Full	L	М	н
Max.	7	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Output	38	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Power	41	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Av	7	-	-				v	v	v	v	v			v		v	
erage Ratio	41	-	-				v	v	v	v	v			v		v	
26dB and	7	-	-				v	v	v					v		v	
99% Bandwidth	41	-	-				v	v	v					v		v	
Conducted	7	-	-	v	v	v	v	v	v	v	v	v		v	v		v
Band Edge	41	-	-	v	v	v	v	v	v	v	v	v		v	v		v
Conducted	7	-	-	v	v	v	v	v				v			v	v	v
Spurious Emission	41	-	-	v	v	v	v	v				v			v	v	v
Frequency	7	-	-				v	v						v		v	
Stability	41	-	-				v	v						v		v	
	7	-	-	v	v	v	v	v	v	v	v	v			v	v	v
E.R.P/	38	-	-	v	v	v	v	v	v	v	v	v			v	v	v
E.I.R.P	41	-	-	v	v	v	v	v	v	v	v	v			v	v	v
Radiated	7			l		L		Wors	st Case		L					v	
Spurious Emission	41							Wors	st Case							v	
Note	<ol> <li>Th</li> <li>Th</li> <li>Siz</li> </ol>	ne mark ne devid ze/offse	c "-" mea ce is inve	ns that the the the the stigated odulation	his band I from 30 ns in exp	width is MHz to loratory	not sup 10 time: test. Su	s of funda bsequen	amental s		adiated sp ase emissi				der diff	erent	RB



Test Items	Band				Ba	Indwid	lth (MI	Hz)					Modula	tion		RB #			Test ann		
Test items	Band	20+20	20+15	15+20	20+10	10+20	20+5	5+20	15+15	15+10	10+15	QPSK	16QAM	64QAM	256Q AM	1	Half	Full	L	М	н
Max. Output	7C_CA	v	v	v	v	v	-	-	v	v	-	v	v	v	v	v	v	v	v	v	v
Power	38C_CA	v	-	-	-	-	-	-	v	-	-	v	v	v	v	v	v	v	v	v	v
26dB and	7C_CA	v					-	-			-	v	v			-		v	-	v	
99% Bandwidth	38C_CA	v	-	-	-	-	-	-		-	-	v	v					v		v	
Conducted	7C_CA	v	v	v	v	v	-	-	v	v	-	v	v	v	v	v		v	v		v
Band Edge	38C_CA	v	-	-	-	-	-	-	v	-	-	v	v	v	v	v		v	v		v
Conducted Spurious	7C_CA	v	v	v	v	v	-	-	v	v	-	v				v			v	v	v
Emission	38C_CA	v	-	-	-	-	-	-	v	-	-	v				v			v	v	v
E.I.R.P.	7C_CA	v	v	v	v	v	-	-	v	v	-	v	v	v	v	v			v	v	v
E.I.K.P.	38C_CA	v	-	-	-	-	-	-	v	-	-	v	v	>	v	v			v	v	v
Radiated Spurious	7C_CA									Worst	Case									v	
Emission	38C_CA									Worst	Case									v	
Note	<ol> <li>The</li> <li>The</li> <li>size</li> </ol>		'-" mea e is inve and m	ins tha estigati odulati	t this b ed fron ons in	andwid n 30MH explor	dth is r Hz to 1 atory te	not sup 0 time: est. Su	ported s of fur ıbsequ	ndame	ntal sig		adiated s ase emis					nder	differ	ent F	₹В



## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration and system

ltem	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.	Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
3.	Earphone	MI	EM023	N/A	Unshielded,1.2m	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 6.0dB.

Example :

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

= 6.0 (dB)



# 2.5 Frequency List of Low/Middle/High Channels

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

LTE Band 38 Channel and Frequency List									
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest					
20	Channel	37850	38000	38150					
20	Frequency	2580	2595	2610					
45	Channel	37825	38000	38175					
15	Frequency	2577.5	2595	2612.5					
10	Channel	37800	38000	38200					
10	Frequency	2575	2595	2615					
F	Channel	37775	38000	38225					
5	Frequency	2572.5	2595	2617.5					

LTE Band 41 Channel and Frequency List									
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest					
20	Channel	39750	40620	41490					
20	Frequency	2506	2593	2680					
45	Channel	39725	40620	41515					
15	Frequency	2503.5	2593	2682.5					
10	Channel	39700	40620	41540					
10	Frequency	2501	2593	2685					
F	Channel	39675	40620	41565					
5	Frequency	2498.5	2593	2687.5					



LTE Band 7C_CA Channel and Frequency List									
BW [MHz]	Channe	l/Frequency(MHz)	Lowest	Middle	Highest				
	DOO	Channel	20850	21001	21152				
00 . 00	PCC	Frequency	2510.0	2525.1	2540.2				
20 + 20	SCC	Channel	21048	21199	21350				
	500	Frequency	2529.8	2544.9	2560.0				
	PCC	Channel	20850	21026	21201				
20 + 15	PCC	Frequency	2510.0	2527.6	2545.1				
20 + 15	SCC	Channel	21021	21197	21372				
	500	Frequency	2527.1	2544.7	2562.2				
	PCC	Channel	20828	21003	21179				
15 + 20	PCC	Frequency	2507.8	2525.3	2542.9				
15 + 20	SCC	Channel	20999	21174	21350				
		Frequency	2524.9	2542.4	2560.0				
	PCC	Channel	20850	21051	21251				
20 + 10		Frequency	2510.0	2530.1	2550.1				
20 + 10	SCC	Channel	20994	21195	21395				
	500	Frequency	2524.4	2544.5	2564.5				
	PCC	Channel	20805	21006	21206				
10 + 20	PCC	Frequency	2505.5	2525.6	2545.6				
10 + 20	SCC	Channel	20949	21150	21350				
	500	Frequency	2519.9	2540.0	2560.0				
	PCC	Channel	20825	21025	21225				
15 + 15	PCC	Frequency	2507.5	2527.5	2547.5				
15 + 15	SCC	Channel	20975	21175	21375				
	SUC	Frequency	2522.5	2542.5	2562.5				
	PCC	Channel	20825	21051	21277				
15 . 10	FUU	Frequency	2507.5	2530.1	2552.7				
15 + 10	800	Channel	20945	21171	21397				
	SCC	Frequency	2519.5	2542.1	2564.7				



LTE Band 38C_CA Channel and Frequency List									
BW [MHz]	Channel	/Frequency(MHz)	Lowest	Middle	Highest				
	PCC	Channel	37850	37901	37952				
20.00	PCC	Frequency	2580.0	2585.1	2590.2				
20 + 20	SCC	Channel	38048	38099	38150				
		Frequency	2599.8	2604.9	2610.0				
	DCC	Channel	37825	37925	38025				
15, 15	PCC	Frequency	2577.5	2587.5	2597.5				
15+ 15	500	Channel	37975	38075	38175				
	SCC	Frequency	2592.5	2602.5	2612.5				



# 3 Conducted Test Items

## 3.1 Measuring Instruments

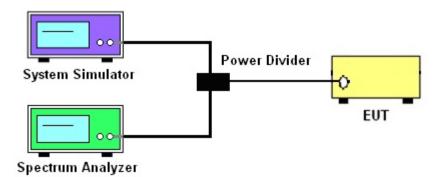
See list of measuring instruments of this test report.

## 3.2 Test Setup

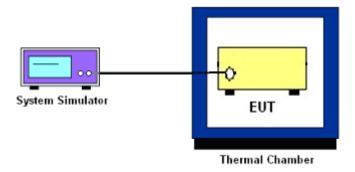
## 3.2.1 Conducted Output Power



3.2.2 Peak-to-Average Ratio, Occupied Bandwidth ,Conducted Band-Edge and Conducted Spurious Emission



## 3.2.3 Frequency Stability



## 3.3 Test Result of Conducted Test

Please refer to Appendix A.

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## 3.4 Conducted Output Power and EIRP

# 3.4.1 Description of the Conducted Output Power Measurement and EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 7 and Band 38 and Band 41. According to KDB 412172 D01 Power Approach,

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

 $P_T$  = transmitter output power in dBm

 $G_T$  = gain of the transmitting antenna in dBi

 $L_{C}$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

#### 3.4.2 Test Procedures

- 1. The 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.
- 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.
- Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
- 7. Determine the "-26 dB down amplitude" as equal to (Reference Value X).
- 8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "-X dB down amplitude" determined in step 6. If a marker is below this "-X dB down amplitude" value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- 9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.



## 3.7 Conducted Band Edge

### 3.7.1 Description of Conducted Band Edge Measurement

#### 27.53(m)(4)

For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

#### 3.7.2 Test Procedures

- 1. The testing follows 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 >= 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.
- 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.

9. For LTE Band 7, 38, 41, the other 40 dB, and 55 dB have additionally applied same calculation above.



## 3.8 Conducted Spurious Emission

#### 3.8.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

For Band 7,38,41:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $55 + 10 \log (P) dB$ .

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

#### 3.8.2 Test Procedures

- 1. The testing follows ANSI C63.26 section 5.7
- 2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- 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.
- 11. For Band 7, 38, 41
  - The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)
  - = P(W)- [55+ 10log(P)] (dB)
  - = [30+ 10log(P)] (dBm) [55+ 10log(P)] (dB)
  - = -25dBm.



## 3.9 Frequency Stability

#### 3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$ 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±5°C and connected with the system simulator.
- 3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value 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.



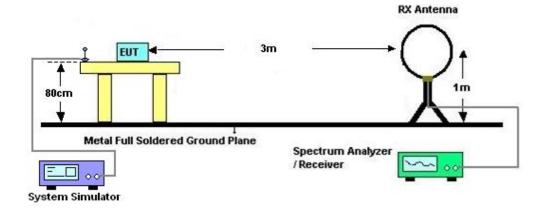
# 4 Radiated Test Items

## 4.1 Measuring Instruments

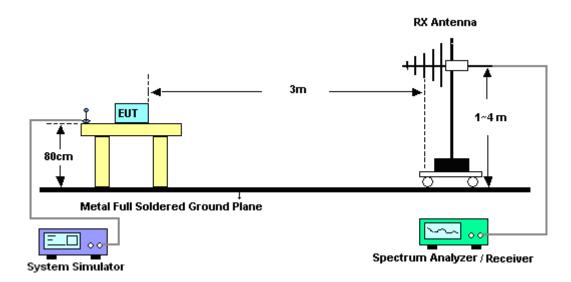
See list of measuring instruments of this test report.

## 4.2 Test Setup

#### 4.2.1 For radiated test below 30MHz

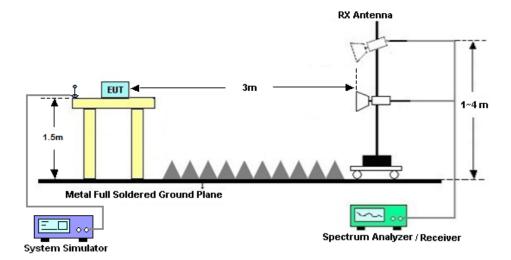


## 4.2.2 For radiated test from 30MHz to 1GHz





## 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 Band 7, 38, 41

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $55 + 10 \log (P) dB$ .

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

#### 4.4.2 Test Procedures

- 1. The testing follows 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 (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.

13. For Band 7, 38, 41:

The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)



# 5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 15, 2020	Aug. 10, 2021~	Oct. 14, 2021	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 14, 2021	Nov. 21, 2021	Oct. 13, 2022	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 12, 2021	Aug. 10, 2021~ Nov. 21, 2021	Jul. 11, 2022	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	Aug. 26, 2021	Aug. 10, 2021~ Nov. 21, 2021	Aug. 25, 2022	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 13, 2021	Dec. 02, 2021	Apr. 12, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Dec. 02, 2021	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2021	Dec. 02, 2021	May 29, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1356	1GHz~18GHz	Apr. 18, 2021	Dec. 02, 2021	Apr. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 06, 2021	Dec. 02, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 06, 2021	Dec. 02, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 07, 2021	Dec. 02, 2021	Jan. 06, 2022	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1 0P	2025788	1Ghz-18Ghz	Jan. 06, 2021	Dec. 02, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 13, 2021	Dec. 02, 2021	Oct. 12, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Dec. 02, 2021	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Dec. 02, 2021	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Dec. 02, 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	3.3dB
Confidence of 95% (U = 2Uc(y))	5.546

#### Uncertainty of Radiated Emission Measurement (1 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

				Power	Power	Power					
BW	Modulation	RB Size	RB	Low	Middle	High					
[MHz]	Modulation	RD SIZE	Offset	Ch. /	Ch. /	Ch. /		EIRP(W)			
				Freq.	Freq.	Freq.					
	Char	nnel		20850	20850	21350					
Frequency (MHz)				2510	2535	2560	L	L M H			
20	QPSK	1	0	24.32	24.46	24.10	0.1914	0.1977	0.1820		
20	QPSK	1	99	24.35	24.24	24.17	0.1928	0.1879	0.1849		
20	QPSK	100	0	23.27	23.29	23.14	0.1503	0.1510	0.1459		
20	16QAM	1	0	23.40	23.21	23.02	0.1549	0.1483	0.1419		
20	64QAM	1	0	22.38	22.26	21.90	0.1225	0.1191	0.1096		
20	256QAM	1	0	19.48	19.29	18.98	0.0628	0.0601	0.0560		
	Char	nnel		20825	21100	21375	EIRP(W)				
	Frequenc	y (MHz)		2507.5	2535	2562.5	L M H				
15	QPSK	1	0	24.41	24.25	23.96	0.1954	0.1884	0.1762		
15	16QAM	1	0	23.40	23.21	23.02	0.1549	0.1483	0.1419		
	Char	nnel		20800	21100	21400		EIRP(W)			
	Frequenc	y (MHz)		2505	2535	2565	L	М	н		
10	QPSK	1	0	24.25	24.45	24.08	0.1884	0.1972	0.1811		
10	16QAM	1	0	23.35	23.26	23.03	0.1531	0.1500	0.1422		
	Channel			20775	21100	21425		EIRP(W)			
	Frequenc	y (MHz)		2502.5	2535	2567.5	L	М	Н		
5	QPSK	1	0	24.35	24.20	23.92	0.1928	0.1862	0.1746		
5	16QAM	1	0	23.40	23.25	23.19	0.1549	0.1496	0.1476		



### LTE Band 38:

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	EIRP(W)		
Channel				37850	38000	38150			
Frequency (MHz)				2580	2595	2610	L	М	Н
20	QPSK	1	0	24.06	24.40	24.14	0.1803	0.1950	0.1837
20	QPSK	1	99	24.10	24.24	24.10	0.1820	0.1879	0.1820
20	QPSK	100	0	23.10	23.27	23.08	0.1445	0.1503	0.1439
20	16QAM	1	0	23.04	23.29	23.16	0.1426	0.1510	0.1466
20	64QAM	1	0	22.08	22.30	22.17	0.1143	0.1202	0.1167
20	256QAM	1	0	19.00	19.32	19.17	0.0562	0.0605	0.0585
	Channel				38000	38175	EIRP(W)		
	Frequen	cy (MHz)		2577.5	2595	2612.5	L	М	Н
15	QPSK	1	0	24.03	24.37	24.07	0.1791	0.1936	0.1807
15	16QAM	1	0	23.09	23.20	23.20	0.1442	0.1479	0.1479
	Cha	nnel		37800	38000	38200	EIRP(W)		
	Frequen	cy (MHz)		2575	2595	2615	L	М	Н
10	QPSK	1	0	24.11	24.26	24.15	0.1824	0.1888	0.1841
10	16QAM	1	0	23.01	23.27	23.12	0.1416	0.1503	0.1452
Channel				37775	38000	38225	EIRP(W)		
	Frequency (MHz)			2572.5	2595	2617.5	L	М	н
5	QPSK	1	0	24.12	24.23	24.13	0.1828	0.1875	0.1832
5	16QAM	1	0	23.02	23.24	23.21	0.1419	0.1493	0.1483



## LTE Band 41:

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	EIRP(W)		
Channel				39750	40620	41490			
Frequency (MHz)				2506	2593	2680	L	М	н
20	QPSK	1	0	24.23	24.41	24.26	0.1875	0.1954	0.1888
20	QPSK	1	99	24.23	24.34	24.29	0.1875	0.1923	0.1901
20	QPSK	100	0	23.27	23.42	23.34	0.1503	0.1556	0.1528
20	16QAM	1	0	23.31	23.41	23.25	0.1517	0.1552	0.1496
20	64QAM	1	0	22.38	22.36	22.41	0.1225	0.1219	0.1233
20	256QAM	1	0	19.33	19.53	19.30	0.0607	0.0635	0.0603
	Channel				40620	41515	EIRP(W)		
	Frequen	cy (MHz)		2503.5	2593	2682.5	L	М	н
15	QPSK	1	0	24.21	24.30	24.23	0.1866	0.1905	0.1875
15	16QAM	1	0	23.15	23.29	23.15	0.1462	0.1510	0.1462
	Cha	nnel		39700	40620	41540	EIRP(W)		
	Frequen	cy (MHz)		2501	2593	2685	L	М	н
10	QPSK	1	0	24.39	24.21	24.32	0.1945	0.1866	0.1914
10	16QAM	1	0	23.30	23.26	23.29	0.1514	0.1500	0.1510
Channel				39675	40620	41565	EIRP(W)		
	Frequency (MHz)			2498.5	2593	2687.5	L	М	н
5	QPSK	1	0	24.17	24.40	24.39	0.1849	0.1950	0.1945
5	16QAM	1	0	23.22	23.33	23.19	0.1486	0.1524	0.1476



## LTE Band 7C\_CA:

		Combina	ation 20MHz+2	0MHz (100RB	+100RB)			
Channel	Modulation	PCC		SCC		Measured		
	Modulation	RB Size	RB offset	RB Size	RB offset	Power	EIRP(W)	
L	QPSK	1	Max	1	0	23.94	0.1754	
М	QPSK	1	Max	1	0	24.00	0.1778	
н	QPSK	1	Max	1	0	23.89	0.1734	
L	16QAM	1	Max	1	0	23.15	0.1462	
М	16QAM	1	Max	1	0	23.36	0.1535	
н	16QAM	1	Max	1	0	23.02	0.1419	
L	64QAM	1	Max	1	0	19.89	0.0690	
М	64QAM	1	Max	1	0	20.03	0.0713	
Н	64QAM	1	Max	1	0	19.78	0.0673	
L	256QAM	1	Max	1	0	16.89	0.0346	
М	256QAM	1	Max	1	0	16.99	0.0354	
н	256QAM	1	Max	1	0	16.74	0.0334	
		Combin	ation 20MHz+′	15MHz (100RE	8+75RB)			
0	Modulation	PCC		SCC		Measured		
Channel		RB Size	RB offset	RB Size	RB offset	Power	EIRP(W)	
М	QPSK	1	Max	1	0	23.26	0.1500	
М	16QAM	1	Max	1	0	22.98	0.1406	
		Combin	ation 15MHz+2	20MHz (75RB+	-100RB)			
0		PCC		SCC		Measured		
Channel	Modulation	RB Size	RB offset	RB Size	RB offset	Power	EIRP(W)	
М	QPSK	1	Max	1	0	23.18	0.1472	
М	16QAM	1	Max	1	0	23.01	0.1416	
		Combir	nation 15MHz+	15MHz (75RB	+75RB)			
<u></u>		P	CC	SC	CC	Measured		
Channel	Modulation	RB Size	RB offset	RB Size	RB offset	Power	EIRP(W)	
М	QPSK	1	Max	1	0	23.03	0.1422	
М	16QAM	1	Max	1	0	22.89	0.1377	
		Combin	ation 20MHz+1	10MHz (100RE	8+50RB)			
Oherend		P	CC	SC	C	Measured		
Channel	Modulation	RB Size	RB offset	RB Size	RB offset	Power	EIRP(W)	
М	QPSK	1	Max	1	0	23.14	0.1459	
М	16QAM	1	Max	1	0	22.48	0.1253	

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	Combination 10MHz+20MHz (50RB+100RB)								
Channel	Modulation	PC	c	SC	c	Measured	EIRP(W)		
Channel	Modulation	RB Size	RB offset	RB Size	RB offset	Power			
М	QPSK	1	Max	1	0	22.69	0.1315		
М	16QAM	1	Max	1	0	22.14	0.1159		
		Combin	nation 15MHz+	10MHz (75RB·	+50RB)				
Channel	Modulation	PC	c	sc	c	Measured	EIRP(W)		
Charmer	wouldtion	RB Size	RB offset	RB Size	RB offset	Power			
М	QPSK	1	Max	1	0	22.96	0.1400		
М	16QAM	1	Max	1	0	22.39	0.1227		



## LTE Band 38C\_CA:

Combination 20MHz+20MHz (100RB+100RB)								
Channel	Modulation	PC	cc	SC	C	Measured	EIRP(W)	
Channer	wouldion	RB Size	RB offset	RB Size	RB offset	Power		
L	QPSK	1	Max	1	0	24.17	0.1849	
М	QPSK	1	Max	1	0	24.07	0.1807	
н	QPSK	1	Max	1	0	24.02	0.1786	
L	16QAM	1	Max	1	0	23.69	0.1656	
М	16QAM	1	Max	1	0	23.47	0.1574	
н	16QAM	1	Max	1	0	23.36	0.1535	
L	64QAM	1	Max	1	0	20.49	0.0793	
М	64QAM	1	Max	1	0	20.23	0.0746	
н	64QAM	1	Max	1	0	20.16	0.0735	
L	256QAM	1	Max	1	0	18.34	0.0483	
М	256QAM	1	Max	1	0	17.76	0.0423	
н	256QAM	1	Max	1	0	17.63	0.0410	
	Combination 15MHz+15MHz (75RB+75RB)							
	Modulation	PC	PCC		SCC			
Channel	Modulation	RB Size	RB offset	RB Size	RB offset	Power	EIRP(W)	
L	QPSK	1	Max	1	0	23.67	0.1648	
L	16QAM	1	Max	1	0	22.91	0.1384	

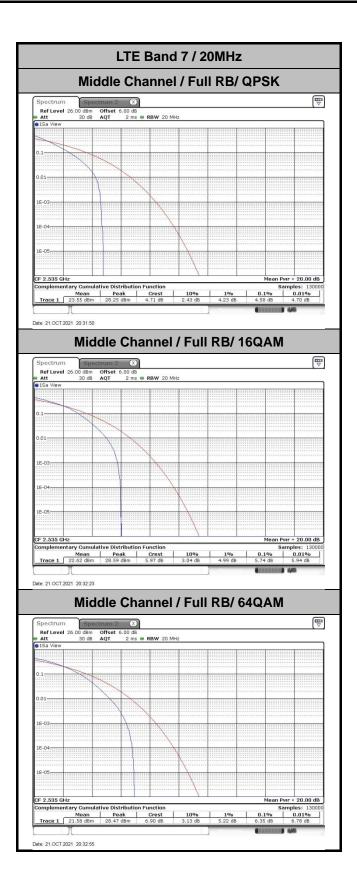


# LTE Band 7-PA1

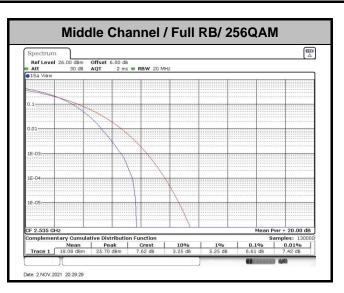
# Peak-to-Average Ratio

Mode	Ľ			
Mod.	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Result
Middle CH	4.58	5.74	6.35	PASS
Mod.	256QAM			Limit: 13dB
RB Size	Full RB			Result
Middle CH	6.61			PASS



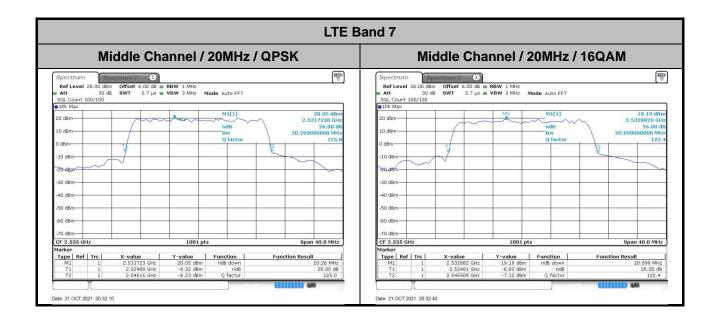






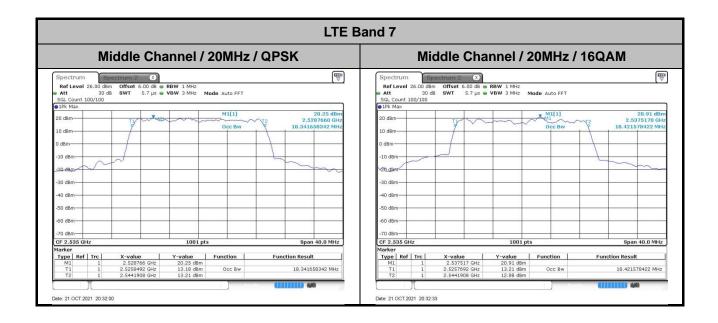
# 26dB Bandwidth

Mode	LTE Band 7 : 26dB BW(MHz)						
BW	20MHz						
Mod.	QPSK	16QAM					
Middle CH	20.26	20.70					



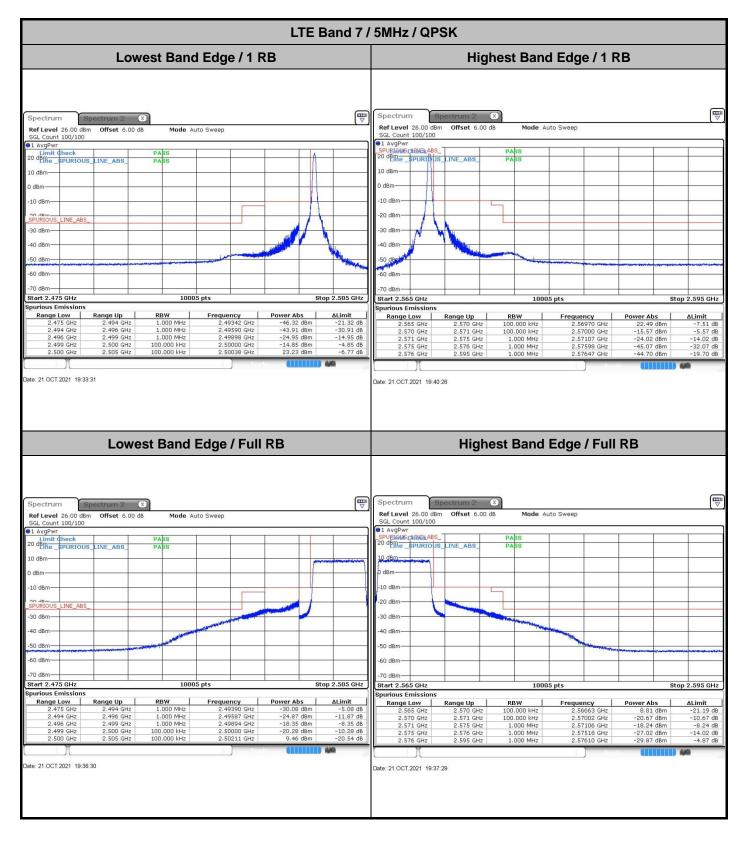
## **Occupied Bandwidth**

Mode	LTE Band 7 : 99%OBW(MHz)	
BW	20MHz	
Mod.	QPSK	16QAM
Middle CH	18.34	18.42





## Conducted Band Edge



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