



# FCC RADIO TEST REPORT

FCC ID	2AFZZK1G
Equipment	Mobile Phone
Brand Name	Xiaomi
Model Name	M2102K1G
Applicant	Xiaomi Communications Co., Ltd. #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer	Xiaomi Communications Co., Ltd. #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Standard	FCC Part 15 Subpart C §15.247

The product was received on Jan. 07, 2021 and testing was started from Jan. 10, 2021 and completed on Jan. 28, 2021. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in 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. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Lunis Win

Reviewed by: Louis Wu SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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## History of this test report

Report No.	Version	Description	Issued Date
FR110703A	01	Initial issue of report	Feb. 10, 2021



## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(1)	Number of Channels	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	Pass	-
3.4	2.1049	99% Occupied Bandwidth	Reporting only	-
3.5	15.247(b)(1)	Peak Output Power	Pass	-
3.6	15.247(d)	Conducted Band Edges	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 8.94 dB at 52.310 MHz
3.9	15.207	AC Conducted Emission	Pass	Under limit 13.35 dB at 4.934 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	Pass	-

#### 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.

Reviewed by: Wii Chang Report Producer: Tina Chuang



## **1** General Description

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

GSM/WCDMA/LTE/5G NR, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, Wi-Fi 6E 802.11ax, NFC, WPC/WPT, and GNSS.

Product Specification subjective to this standard				
	WWAN: PIFA Antenna			
	WLAN 2.4GHz:			
	<ant. 5="">: PIFA Antenna</ant.>			
	<ant. 7="">: PIFA Antenna</ant.>			
	WLAN 5GHz:			
	<ant. 11="">: PIFA Antenna</ant.>			
	<ant. 8="">: PIFA Antenna</ant.>			
Antonno Tuno	WLAN 6GHz:			
Antenna Type	<ant. 11="">: PIFA Antenna</ant.>			
	<ant. 8="">: PIFA Antenna</ant.>			
	Bluetooth:			
	<ant. 5="">: PIFA Antenna</ant.>			
	<ant. 7="">: PIFA Antenna</ant.>			
	GPS / Glonass / Galileo / BDS: PIFA Antenna			
	NFC: Planar Antenna			
	WPC/WPT: Coil antenna			
	Antenna information			

2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	Ant. 5: -2.46 Ant. 7: -2.58
Remark: The above EUT's information	on was declared by	manufacturer. Please refer to Comments and

Explanations in report summary.

## **1.2 Modification of EUT**

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



### **1.3 Testing Location**

Test Site         SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory			
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No. TH05-HY, CO05-HY		

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site         SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory			
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855		
Test Site No.	Sporton Site No. 03CH11-HY		

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW0007

## **1.4 Applicable Standards**

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

#### Remark:

- 1. All test items were verified and recorded according to the standards and without any deviation during the test.
- 2. The TAF code is not including all the FCC KDB listed without accreditation.

#### **Test Configuration of Equipment Under Test** 2

## 2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	0	2402	27	2429	54	2456
	1	2403	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12 13	2414	39	2441	66	2468
2400-2483.5 MHz		2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	78	2480
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-

### 2.2 Test Mode

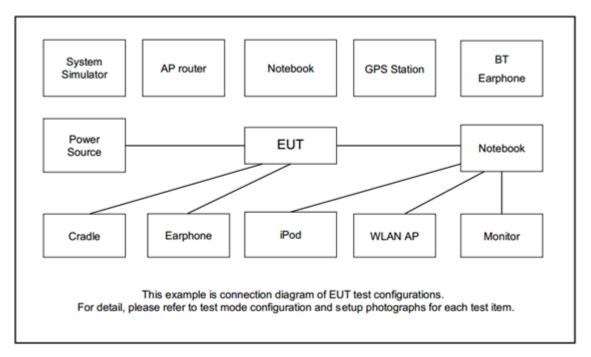
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z and WPC Charging Mode. The worst cases (X Plane for Ant. 5 and WPC Charging Mode; Z Plane for Ant. 7) were recorded in this report, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

	Summary table of Test Cases								
Test Item	Data Rate / Modulation								
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi$ /4-DQPSK	Bluetooth EDR 3Mbps 8-DPSK						
Conducted	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz						
Test Cases	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz						
	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz						
		Bluetooth BR 1Mbps GFS	(						
Radiated	Mode 1: CH00_2402 MHz								
Test Cases	Mode 2: CH39_2441 MHz								
		Mode 3: CH78_2480 MHz							
AC Conducted	Mode 1 : Bluetooth Link	+ WLAN (2.4GHz) Link	+ MPEG4 + USB Cable						
Emission	(Charging from Adapter)								
<b>Remark:</b> For radiated test cases, the worst mode data rate 1Mbps was reported only since the highest RF output power in the preliminary tests. The conducted spurious emissions a conducted band edge measurement for other data rates were not worse than 1Mbps, no other significantly frequencies found in conducted spurious emission.									

The following summary table is showing all test modes to demonstrate in compliance with the standard.



## 2.3 Connection Diagram of Test System



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	Notebook	Dell	Latitude 3400	FCC DoC	N/A	AC I/P : Unshielded, 1.2m DC O/P : Shielded, 1.8m
5.	Mobile Phone	Xiaomi	M2102K1G	2AFZZK1G	N/A	N/A



### 2.5 EUT Operation Test Setup

The RF test items make the EUT get into the engineering modes to contact with base station to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

### 2.6 Measurement Results Explanation Example

#### For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

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

= 4.2 + 10 = 14.2 (dB)



## 3 Test Result

### 3.1 Number of Channel Measurement

### 3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.1.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 7.8.3.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Enable the EUT hopping function.
- Use the following spectrum analyzer settings: Span = the frequency band of operation;
   RBW = 300kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
- 6. The number of hopping frequency used is defined as the number of total channel.
- 7. Record the measurement data derived from spectrum analyzer.

### 3.1.4 Test Setup



Spectrum Analyzer

EUT

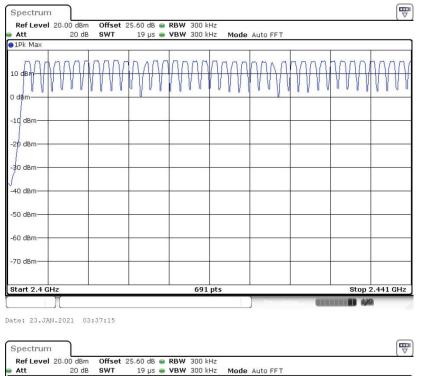


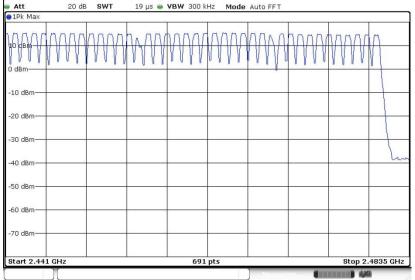
### 3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

#### <Ant. 5>

#### Number of Hopping Channel Plot on Channel 00 - 78





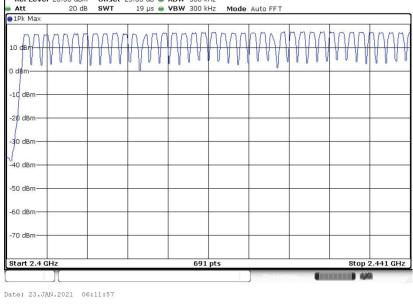
Date: 23.JAN.2021 03:38:30



#### <Ant. 7>

#### Spectrum Ref Level 20.00 dBm Att 20 dB Offset 25.60 dB ● RBW 300 kHz SWT 19 µs ● VBW 300 kHz Mode Auto FFT ●1Pk Max M nr AΠ M nnr 10 dB 1 Y ľ 0 de -10 dBm

Number of Hopping Channel Plot on Channel 00 - 78



Spectrun	ı )								
	20.00 dBm		25.60 dB 👄						
🖷 Att	20 dB	SWT	19 µs 🖷	<b>VBW</b> 300 k	Hz Mode	Auto FFT			
⊖1Pk Max									
	AAAA	AAAA	MM	AM	ANA	AAAA	MAA	MM	$\mathbb{N}$
-10 dBm									
-20 dBm									
-30 dBm									w
-40 dBm									
-60 dBm								-	
-70 dBm									
Start 2.44	1 GHz			691	pts			Stop 2.	.4835 GHz
						Meesud			1

Date: 23.JAN.2021 06:12:31

### **3.2 Hopping Channel Separation Measurement**

### 3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

### **3.2.2 Measuring Instruments**

See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.2.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Enable the EUT hopping function.
- Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 300kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
- 6. Measure and record the results in the test report.

### 3.2.4 Test Setup



Spectrum Analyzer

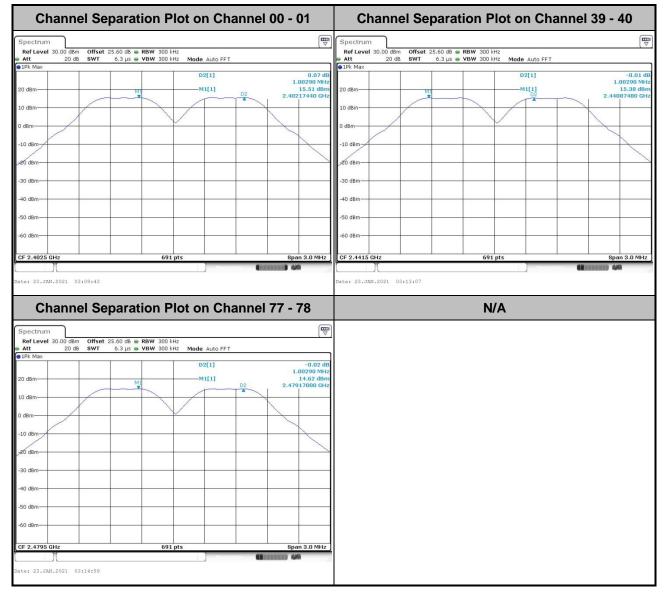
### 3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.



### <Ant. 5>

#### <1Mbps>





#### <2Mbps>

Spectrum Ref Level 30.00 dBm Offset	paration Plot on Cha	nnel 00 - 01	Channel Separation Plot on Channel 39 - 4	0
Ref Level 20.02 days off			Spectrum	T T
Att 20 dB SWT	25.60 dB	· · · · · · · · · · · · · · · · · · ·	Ref Level 30.00 dBm Offset 25.60 dB  RBW 300 kHz Att 20 dB SWT 6.3 µs VBW 300 kHz Mode Auto FFT	
1Pk Max	M1[1]	13.93 dBm	P1Pk Max     D2[1]	0.02 d
20 dBm	D2[1]	2.40217440 GHz 0.07 dB	20 dBm	0290 MH 3.79 dBr
		D2 1.00290 MHz	M3 D2 2.4411	7440 GH
10 dBm			10 dBm	
0 dBm			0 d8m	1
-10/dBm			-10,08m	/
-20 dBm			-20 dBm-	
-30 dBm			-30 dBm	
-40 dBm			-40 dBm	
-50 dBm			-50 dBm	
-60 dBm			-60 dBm	
CF 2.4025 GHz	691 pts	Span 3.0 MHz	CF 2.4415 GHz 691 pts Span	3.0 MHz
Channel Se	paration Plot on Cha		N/A	
Spectrum				
Ref Level         30.00         dBm         Offset           Att         20 dB         SWT           1Pk Max	25.60 dB • RBW 300 kHz 6.3 μs • VBW 300 kHz Mode Auto FFT			
JPK Mdx	M1[1]	13.01 dBm 2.47887480 GHz		
20 dBm	D2[1]	0.01 dB 1.00290 MHz		
10 dBm				
0 dBm				
-10 dBm				
-20 dBm				
-30 dBm				
programme and a second s				
5000000000000				
-40 dBm				
5000000000000				
-40 dBm				
-40 dBm	691 pts	Span 3.0 MHz		



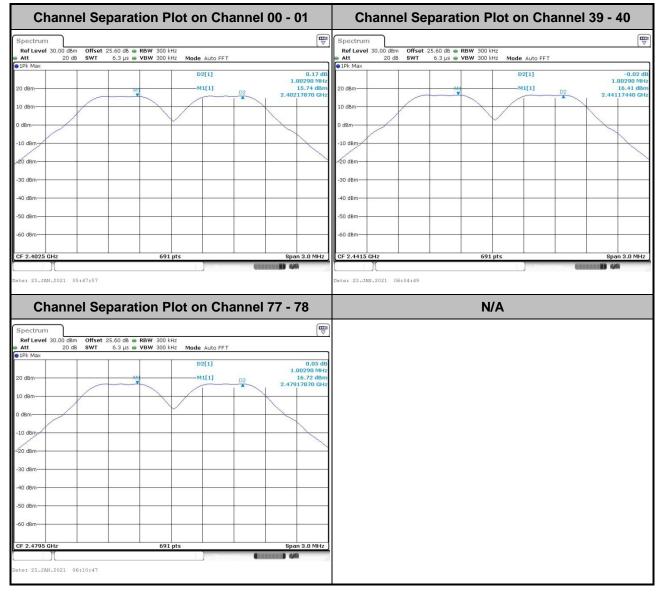
#### <3Mbps>

Channel Sep	paration Plot on C	hannel 00 - 01	Channel Sepa	aration Plot on Chani	
Spectrum			Spectrum		
Att 20 dB SWT	5.60 dB   RBW 300 kHz  6.3 µs   VBW 300 kHz  Mode Auto	FFT	Att 20 dB SWT 6.	0 dB 🖷 RBW 300 kHz 3 µs 🖷 VBW 300 kHz 🛛 Mode Auto FFT	
20 dBm	D2[1] M1[1]	0.08 dB 1.00290 MHz 13.95 dBm	20 dBm	M1[1] D2[1]	13.79 dBm 2.44089650 GHz 0.00 dB
10 dBm	M	D2 2.40217440 GHz	10 dBm		1.00290 MHz
0 dBm			0 dBm		
-10 dBm-			-10 dBm-		
-20 dBm-			-20 dBm-		
-30 dBm			-30 dBm		
-40 dBm			-40 dBm-		
-50 dBm			-50 dBm		
-60 dBm			-60 dBm		
CF 2.4025 GHz	691 pts	Span 3.0 MHz	CF 2.4415 GHz	691 pts	Span 3.0 MHz
Υ.		60			
				Meanuting	(
ate: 23.JAN.2021 03:28:43			Date: 23.JAN.2021 03:31:31		(IIIIIII) 4/8
	paration Plot on C	Channel 77 - 78	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep	paration Plot on C		Date: 23.JAN.2021 03:31:31	N/A	(
Channel Sep Spectrum Ref Level 30.00 dBm Offset 2	5.60 dB 🖷 RBW 300 kHz		Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 22 Att 20 dB SWT	5.60 dB ● RBW 300 kHz 6.3 µs ● VBW 300 kHz Mode Auto	(∰) FFT	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 22 Att 20 dB SwT	5.60 dB 🖷 RBW 300 kHz	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 2: 101k Max 20 dBm 10 dBm	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	(₩) FFT -0.44 dB 1.00290 MHz 1.4-40 dBm	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 21 20 dB SWT 1Pk Max 20 dBm 0 dBm 0 dBm 0 dBm	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 21 20 dBm 20 dBm 10 dBm -10 dBm	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:91	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 22 20 dB SWT 21Pk Max 20 dBm 10 dBm 10 dBm 20 dBm 20 dBm	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 22 20 dB SWT 21Pk Max 20 dBm 10 dBm 10 dBm 20 dBm 20 dBm	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:91	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 2: 20 dBm Offse	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sex	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:31	N/A	
Channel Sep Spectrum Ref Level 30.00 dBm Offset 2 20 dB SWT 1Pk Max 20 dBm 10 dBm -10 dBm -30 dBm	5.60 dB <b>e RBW</b> 300 kHz 6.3 µs <b>e VBW</b> 300 kHz 02[1]	FFT -0.44 dB 1.00290 MH2 14.40 dBm 02 2.47499770 GH2	Date: 23.JAN.2021 03:31:31	N/A	



### <Ant. 7>

#### <1Mbps>





#### <2Mbps>

Channel Sep	paration Plot on Ch	nannel 00 - 01	Channel Sepa	aration Plot on Chann	el 39 - 40
Spectrum			Spectrum		
Att 20 dB SWT	.60 dB 👜 RBW 300 kHz 6.3 μs 🖶 VBW 300 kHz 🛛 Mode Auto FF	т	Att 20 dB SWT 6.3	0 dB 👜 RBW 300 kHz 3 µs 📾 VBW 300 kHz 🛛 Mode Auto FFT	
20 dBm	M1[1]	15.57 dBm 2.40217440 GHz 0.36 dB 2 1.00290 MHz	PIPk Max     20 dBm     M1	D2[1] 	-0.01 dE 1.00290 MHz 14.84 dBm 2.44087480 GHz
10 dBm			10 dBm-		
-10 dBm			-10/dBm		
-30 dBm			-30 dBm		
40 dBm			-40 dBm		
60 dBm	691 pts	Span 3.0 MHz	-60 dBm	691 pts	Span 3.0 MHz
te: 23.JJAN.2021 06:20:22 Channel Sep	paration Plot on Ch	nannel 77 - 78	Date: 23.JAN.2021 06:27:29	N/A	
Spectrum					
Ref Level 30.00 dBm Offset 25					
20 dBm	D2[1] M1 V	0.07 dB 1.00290 MHz 15.06 dBm 02 2.47917870 GHz			
10 dBm					
10/dBm					
30 dBm					
50 dBm					
60 dBm- CF 2.4795 GHz	691 pts	Span 3.0 MHz			
Date: 23.JAN.2021 06:54:43					



#### <3Mbps>

Channel Sepa	aration Plot on Chanr	nel 00 - 01	Channel Sepa	aration Plot on Chann	el 39 - 40
Spectrum			Spectrum		
Ref Level 30.00 dBm Offset 25.60 Att 20 dB SWT 6.3	0 dB 👄 RBW 300 kHz 3 µs 🖷 VBW 300 kHz 🛛 Mode Auto FFT		Ref Level 30.00 dBm Offset 25.6 Att 20 dB SWT 6.	0 dB 🖷 RBW 300 kHz .3 µs 🖷 VBW 300 kHz 🛛 Mode Auto FFT	
1Pk Max	M1[1]	14.23 dBm	● 1Pk Max	D2[1]	0.02 dB
20 dBm	D2[1]	2.40187050 GHz 1.67 dB	20 dBm	M1[1]	1.00290 MHz 14.81 dBm
MI		1.00290 MHz	ZU UBII		2.44087050 GHz
10 dBm			10 dBm		
0 dBm			0 dBm		
-10 dBm			-10,dBm		
-10,000			-to abin		
-20 dBm-			-20 dBm-		
-30 dBm			-30 dBm		
40.40-			10 /0		
-40 dBm-			-40 dBm		
-50 dBm-			-50 dBm		
-60 dBm			-60 dBm-		
CF 2.4025 GHz	691 pts	Span 3.0 MHz	CF 2.4415 GHz	691 pts	Span 3.0 MHz
Channel Sepa	aration Plot on Chanr	nel 77 - 78		N/A	
Spectrum					
Att 20 dB SWT 6.3	0 dB 🖷 RBW 300 kHz 3 µs 🖷 VBW 300 kHz 🛛 Mode Auto FFT				
●1Pk Max	D2[1]	0.24 dB			
20 dBm		1.00290 MHz 16.50 dBm			
		2.47885310 GHz			
10 dBm					
0 dBm					
-10,dBm					
-20 dBm					
-30 dBm					
10 40 -					
-40 dBm					
-50 dBm-					
-60 dBm-					
CF 2.4795 GHz	691 pts	Span 3.0 MHz			
	2 teas office	(			
Date: 23.JAN.2021 07:18:22					



### 3.3 Dwell Time Measurement

### 3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

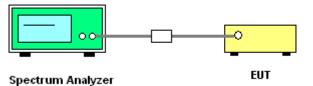
### 3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.3.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.4.
- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Enable the EUT hopping function.
- 5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
- 6. Measure and record the results in the test report.

### 3.3.4 Test Setup

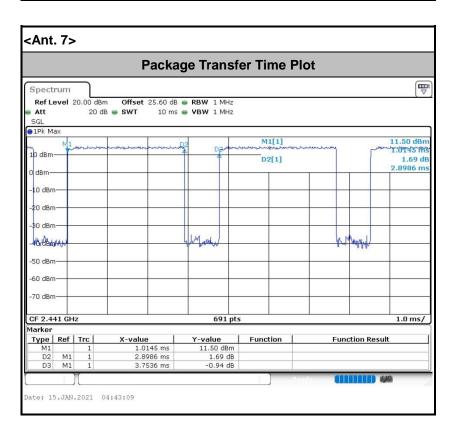


### 3.3.5 Test Result of Dwell Time

Please refer to Appendix A.



	Packa	ige Transf	er Time F	Plot	
Spectrum					
Ref Level 20.00 da		<ul> <li>RBW 1 MHz</li> <li>VBW 1 MHz</li> </ul>			
SGL		-			
€1Pk Max					
V	D2	D <mark>3</mark>	M1[1]		14.06 dB
10 dBm	4	1			260.9 μ
			D2[1]		-0.11 d 2.8841 m
0 dBm					2.0041 II
-10 dBm					
-10 uBm					
-20 dBm	_	_			
-30 dBm		_			
	L AMINA	li ale		younghand	
440 dBm	ma has	Mrd .		the althe	
-50 dBm					
-So abiii					
-60 dBm				-	
-70 dBm					
CF 2.441 GHz		691 pt	5		1.0 ms,
Marker Type   Ref   Trc	X-value	Y-value	Function	Function	Pocult
M1 1	260.9 µs	14.06 dBm	Function	Function	Result
D2 M1 1	2.8841 ms	-0.11 dB			
D3 M1 1	3.7536 ms	-0.01 dB			
				ALL	ANG



#### Remark:

**1.** In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit  $(0.4 \times 79)$  (s),Hops Over Occupancy Time comes to  $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$  hops.

**2.** In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit  $(0.4 \times 20)$  (s), Hops Over Occupancy Time comes to  $(800 / 6 / 20) \times (0.4 \times 20) = 53.33$  hops.

3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time



### 3.4 20dB and 99% Bandwidth Measurement

### 3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

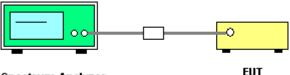
### 3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.4.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
  Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
  RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
  Trace = max hold.
- Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
   RBW ≥ 1-5% of the 99% bandwidth; VBW ≥ 3 \* RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
- 6. Measure and record the results in the test report.

### 3.4.4 Test Setup



Spectrum Analyzer

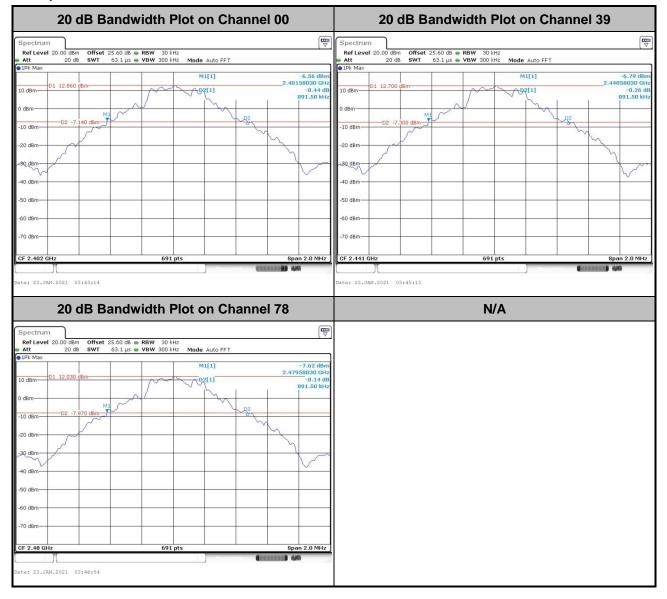
### 3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.



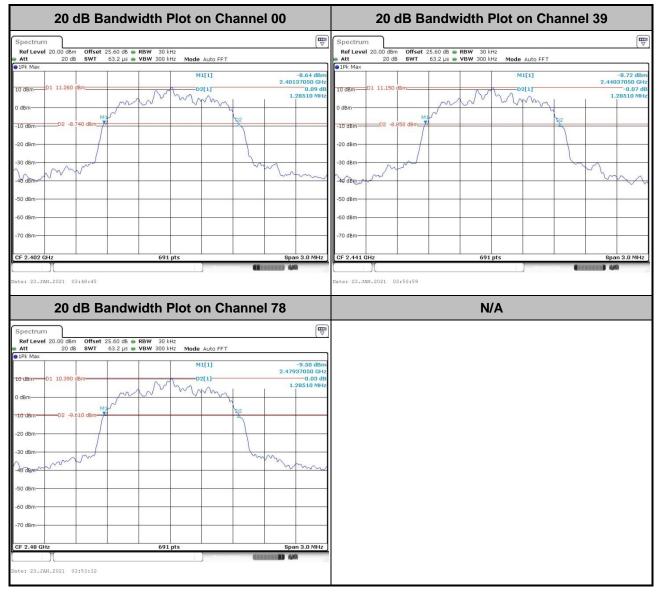
#### <Ant. 5>

#### <1Mbps>



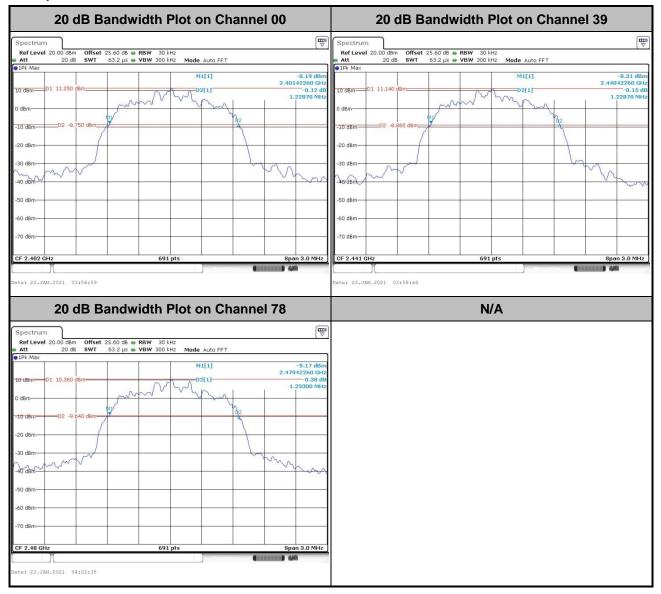


#### <2Mbps>





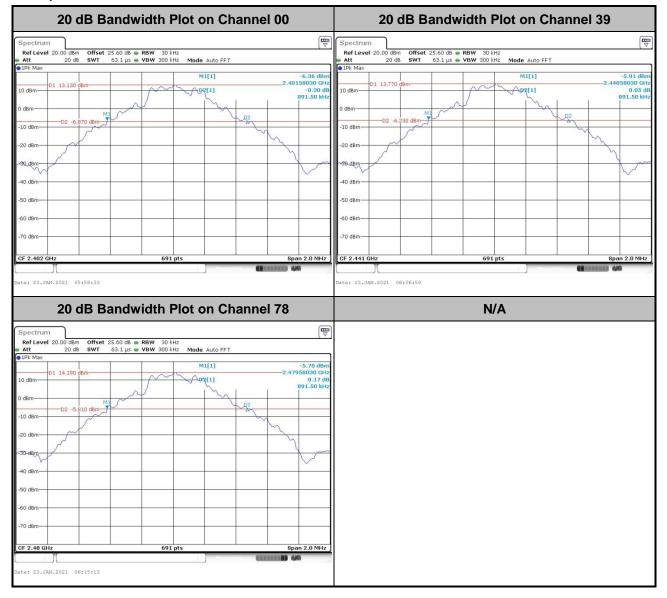
#### <3Mbps>





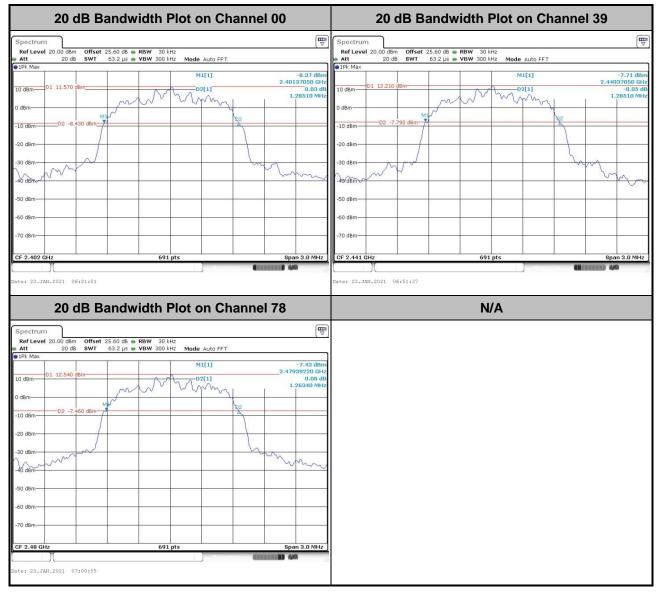
#### <Ant. 7>

#### <1Mbps>



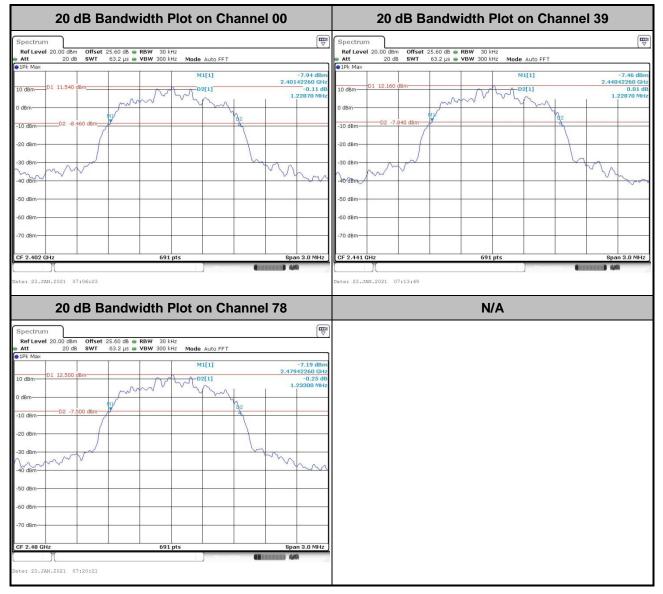


#### <2Mbps>





#### <3Mbps>



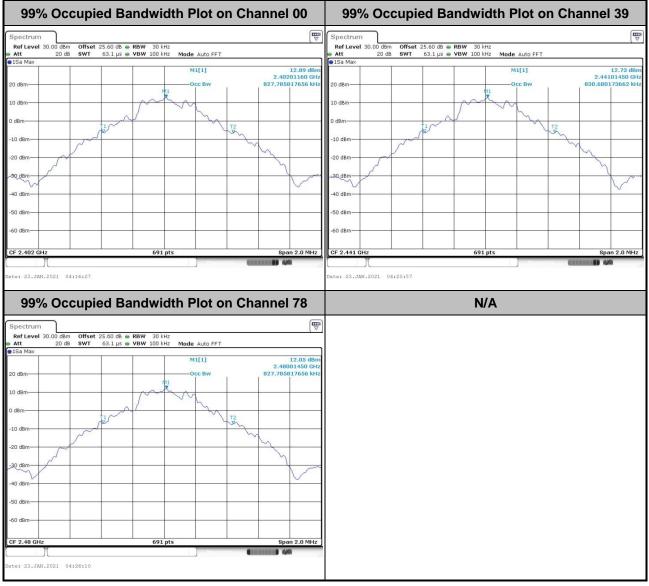


### 3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

#### <Ant. 5>

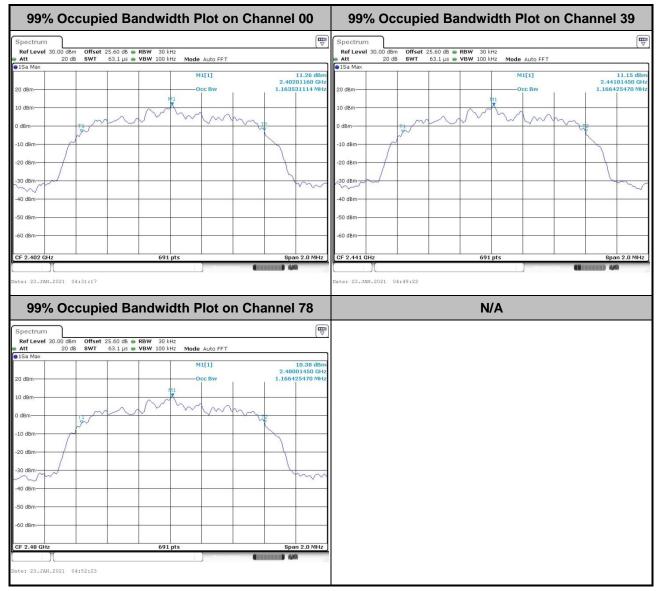
#### <1Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



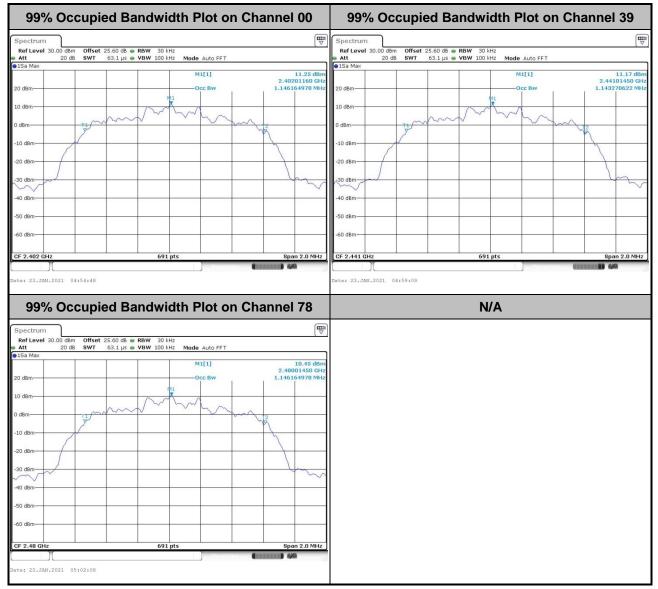
#### <2Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



#### <3Mbps>

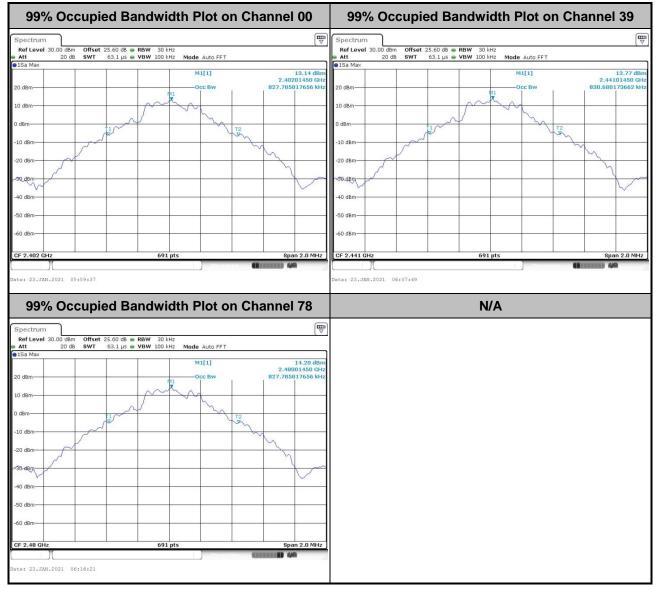


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



### <Ant. 7>

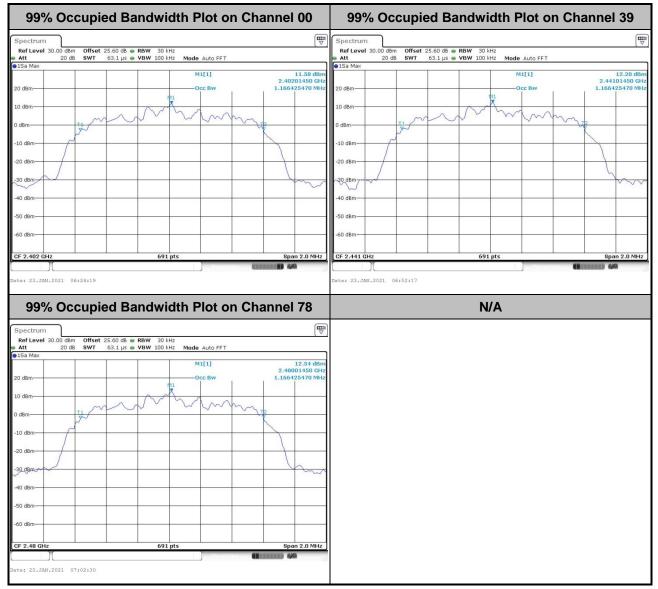
#### <1Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



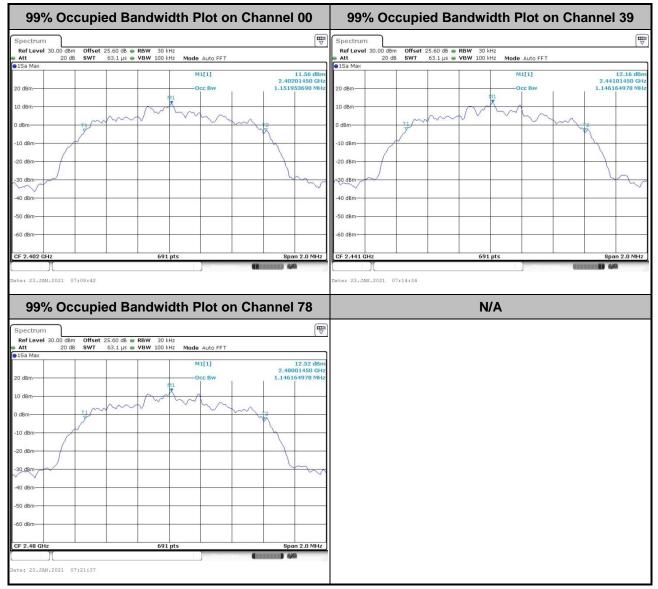
#### <2Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



#### <3Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



### 3.5 Output Power Measurement

### 3.5.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

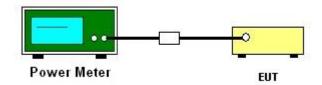
### 3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.5.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.5.
- 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power with cable loss and record the results in the test report.
- 5. Measure and record the results in the test report.

### 3.5.4 Test Setup



### 3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

### 3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.



### 3.6 Conducted Band Edges Measurement

### 3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

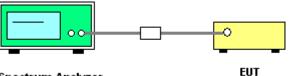
### 3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.6.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.6.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- 3. Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
- 4. Enable hopping function of the EUT and then repeat step 2. and 3.
- 5. Measure and record the results in the test report.

### 3.6.4 Test Setup



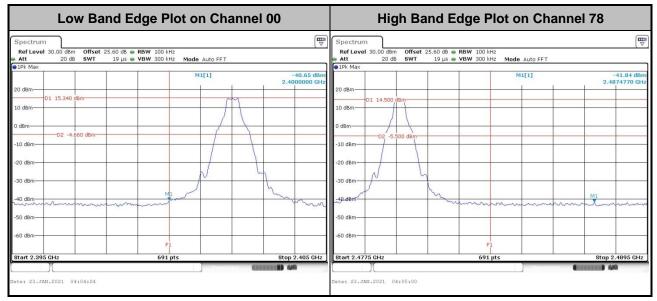
Spectrum Analyzer



### 3.6.5 Test Result of Conducted Band Edges

#### <Ant. 5>

#### <1Mbps>



#### <2Mbps>

Low Band	Edge Plot on Channel 0	0 Hig	h Band Edge Plot on Ch	annel 78
Spectrum		Spectrum		
	dB 🖷 RBW 100 kHz us 🖶 VBW 300 kHz 🛛 Mode Auto FFT	Ref Level 30.00 dBm Att 20 dB		
	M1[1]	-40.51 dBm 2.4000000 GHz	M1[1]	-40.90 dBn 2.4844730 GH:
D1 13.720 dBm		20 dBm-01 12.890 d	dam	
10 dBm	Man	10 dBm		
0 dBm		0 dBm		
-10 dBm		-10 dBm	110 dBm	
-20 dBm		-20 dBm		
-30 dBm	Ant	-30 dBm		
40 dBm	umpmmm <sup>M2</sup>	1 mm rtodem	MI	mmmmmmmm
-50 dBm		-50 dBm		
-60 dBm		-60 dBm		
Start 2.395 GHz	F1 691 pts	Stop 2.405 GHz Start 2.4775 GHz	691 pts	Stop 2.4895 GHz
			U91 pts	



#### <3Mbps>

Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 78
Spectrum         (The section of the section of	Spectrum         Image: Constraint of the sector of t
0 dBm 01 13.870 dBm 02 -6.130 dBm 04	20 dBm 2.4891270 GHz 20 dBm 21 12.980 dBm 20 0 dBm 20 1 2.980 dBm 20 0 dBm 20 -7.020 dBm 20 -10 dBm 20 -7.020 dBm 20 -20 dBm 20 -30 dBm 20 -50 dBm 20 -50 dBm 20 -60 dBm 20 -51
Start 2.395 GHz         691 pts         Stop 2.405 GHz	Start 2.4775 GHz         691 pts         Stop 2.4895 GHz           Date: 23.JJAN.2021 04:10:44         04:10:44         04:10:44

#### <Ant. 7>

#### <1Mbps>

Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 78
Spectrum         Image: Constraint of the second seco	Spectrum         Image: Constraint of the sector of th
20 d8m         M1[1]        41.63 d8m           20 d8m         01 15.580 d8m         2.3965850 GHz           10 d8m	20 dBm         01 16.600 dBm         2.4839900 GHz           10 dBm         0 dBm         0         0           0 dBm         0         0         0         0           10 dBm         0         0         0         0         0           10 dBm         0         0         0         0         0         0         0           10 dBm         0
-60 d8m F1 Start 2.395 GHz 691 pts Stop 2.405 GHz Date: 23.JJNL2021 05159102	-60 dBm F1 Start 2.4775 GHz 691 pts Stop 2.4895 GHz Date: 23.JJN.2021 06:15:45



#### <2Mbps>

Low Band Edge Plot on Cha	nnel 00	High Band Edge Plot on Channel 78	
Spectrum           Ref Level 30.00 dBm         Offset 25.60 dB • RBW 100 kHz           Att         20 dB SWT         19 µs • VBW 300 kHz         Mode Auto FFT           • IPk Max         M1[1]	-40.74 dBm	RefLevel 30.00 dBm         Offset 25.60 dB         RBW 100 kHz           Att         20 dB         SWT         19 µs         VSW         300 kHz         Mode Auto FFT           @ IPK Max         0         SWT         19 µs         VSW         300 kHz         Mode Auto FFT	-+1.15 dBm
20 dBm 0 1 13.990 dBm 0 dBm 0 dBm -10 dBm -20 dBm -20 dBm -30 dBm -30 dBm -60 dBm -60 dBm -10 dBm -		20 dBm 01 14.940 dBm 0 1 0 dBm 0 0 dBm 0 0 dBm 0 0 dBm 0 0	MI
Start 2.395 GHz         691 pts	Stop 2.405 GHz	Start 2.4775 GHz         691 pts         Stor           Date:         23.JAN.2021         07:01:23         07:01:23	p 2.4895 GHz

#### <3Mbps>

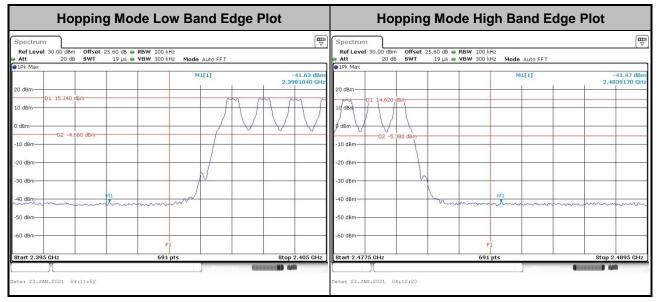
Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 78			
Ref Level 30.00 dBm         Offset 25.60 dB ● RBW 100 kHz         Mode Auto FFT           Att         20 dB         SWT         19 µs ● VBW 300 kHz         Mode Auto FFT           JPk Max         MI[1]         -40.56 dB         2.3999710 GF	Ref Level 30.00 dBm         Offset 25.60 dB         ■ RBW 100 kHz           Att         20 dB         SWT         19 μs         ■ VBW 300 kHz         Mode Auto FFT           ● 19k Max         ■         ■         ■ MI[1]        41.35 dBm			
0 dBm 01 14.100 dBm 02 -5 200 dBm 04 04 04 04 04 04 04 04 04 04 04 04 04	20 dBm 01 15.020 dBm 01 15.020 dBm 01 0 dBm 02 -4.580 dBm 01 02 -4.580 dBm 01 0 dBm 02 -4.580 dBm 01 02 -4.5			
tart 2.395 GHz 691 pts Stop 2.405 GHz	Start 2.4775 GHz 691 pts Stop 2.4895 GHz			



### 3.6.6 Test Result of Conducted Hopping Mode Band Edges

#### <Ant. 5>

#### <1Mbps>



#### <2Mbps>

Hopping Mode Low Band Edge Plot			l	Hopping	Mode	High B	and Edg	je Plot	
	d8 🖷 RBW 100 kHz		Spectrum Ref Level 30.		25.60 dB 🖷 RBW				
Att 20 dB SWT 19      19      19      19      19      19	us 🖷 VBW 300 kHz 🛛 Mode Auto FFT		Att 1Pk Max	20 dB SWT	19 µs 💩 VBW	300 kHz Mod	e Auto FFT		
20 dBm	M1[1]	-41.48 dBm 2.3968160 GHz					M1[1]		41.10 dBn 82760 GH:
D1 13.580 dBm	- Maria	man	20 dBm 01 1	2.990 dBm					
0 dBm			0 dBm	w h					
-10 dBm			-10 dBm	D2 -7.010 dBm					
-20 dBm-			-20 dBm						
-30 dBm			-30 dBm		M			M	1
-50 dBm			-50 dBm		mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mmm	m	um
-60 dBm-			-60 dBm			F1			
Start 2.395 GHz	691 pts	Stop 2.405 GHz	Start 2.4775 G	łz		691 pts			4895 GHz
Date: 23.JAN.2021 04:13:20	-Nearorine	CHILL 8 44	Date: 23.JAN.20	21 04:13:58			Modeuting	(IIIIII) 44	



#### <3Mbps>

Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge Plot
Spectrum         Image: Constraint of the sector of t	Spectrum         (100 kHz)           Ref Level 30.00 dBm         Offset 25.60 dB         RBW 100 kHz           Att         20 dB         SWT         19 µs         VBW 300 kHz
	Att 20 dB SWT 19 µS      VBW 300 kH2 Mode Auto FFT      IPk Max
	Start 2.4775 GHz         691 pts         Stop 2.4895 GHz           Date: 23.JAN.2021 04:15:26         ####################################

#### <Ant. 7>

#### <1Mbps>

Hopping Mo	Hopping Mode High Band Edge Plot						
Spectrum Ref Level 30.00 dBm Offset 25.60 dB Att 20 dB SWT 19 μs 1Pk Max	RBW 100 kHz     VBW 300 kHz     Mode Auto FFT     M1[1]	-40.75 dBm	Spectrum Ref Level 30.00 dBm Att 20 dB 1Pk Max		VBW 300 kHz Mode	Auto FFT	-41.24 dBm
20 dBm 01 15.610 dBm 0 dBm -D2 -4.390 dBm -10 dBm -20 dBm		2.3964830 CHz	20 dBm 10 dBm 0 dBm -20 dBm -20 dBm				2.4891960 GHz
-30 dBm	F1		-30 dBm		F1		MI
Streeter (IIIIII) 🚧			Start 2.4775 GHz	5:12:50	691 pts	Nexima	Stop 2.4895 GHz