



# FCC RADIO TEST REPORT

FCC ID	:	IHDT56AA6
Equipment	:	Wearable Cellular Device
Brand Name	:	Motorola
Model Name	:	XT2209-1
Applicant	:	Motorola Mobility, LLC 222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States
Manufacturer	:	Motorola Mobility, LLC 222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States
Standard	:	FCC Part 15 Subpart C §15.247

The product was received on Oct. 19, 2021 and testing was performed from Nov. 05, 2021 to Nov. 30, 2021. We, Sporton International Inc. Wensan 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 from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

# Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan

TEL : 886-3-327-0868
FAX : 886-3-327-0855
Report Template No.: BU5-FR15CBT Version 2.4



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# History of this test report

Report No.	Version	Description	Issue Date
FR1O2008A	01	Initial issue of report	Dec. 06, 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	9.97 dB under the limit at 30.000 MHz
3.9	15.207	AC Conducted Emission	Pass	18.65 dB under the limit at 0.940 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 product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

# Reviewed by: Keven Cheng

**Report Producer: Celery Wei** 



# **1** General Description

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

Product Feature					
Equipment	Wearable Cellular Device				
Brand Name	Motorola				
Model Name	XT2209-1				
FCC ID	IHDT56AA6				
	Conducted :	356636550004361			
IMEI Code	Conduction :	356636550004478			
	Radiation :	356636550004429			
	LTE/5G NR/GNSS				
	WLAN 11a/b/g/n HT20/HT40				
EUT supports Radios application	WLAN 11ac VHT20/VHT40/VHT80/VHT160				
	WLAN 11ax HE20/HE40/HE80/HE160				
	Bluetooth BR/EDR/LE				
HW Version	EVT1				
EUT Stage	Identical Prototype				

Remark: The above EUT's information was declared by manufacturer.

Accessory List				
Potton/	Brand Name :	Motorola		
Battery	Model Name :	NR70		



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

Product Specification is subject to this standard			
Tx/Rx Frequency Range2402 MHz ~ 2480 MHz			
Number of Channels	79		
<b>Carrier Frequency of Each Channel</b>	2402+n*1 MHz; n=0~78		
Maximum Output Power to Antenna	<pre><ant. 4=""> : Bluetooth BR(1Mbps) : 16.50 dBm (0.0447 W) Bluetooth EDR (2Mbps) : 15.59 dBm (0.0362 W) Bluetooth EDR (3Mbps) : 16.10 dBm (0.0407 W) <ant. 5=""> : Bluetooth BR(1Mbps) : 15.75 dBm (0.0376 W) Bluetooth EDR (2Mbps) : 14.92 dBm (0.0310 W) Bluetooth EDR (3Mbps) : 15.42 dBm (0.0348 W)</ant.></ant.></pre>		
99% Occupied Bandwidth	<pre><ant. 4=""> : Bluetooth BR(1Mbps) : 0.802 MHz Bluetooth EDR (2Mbps) : 1.167 MHz Bluetooth EDR (3Mbps) : 1.152 MHz <ant. 5=""> : Bluetooth BR(1Mbps) : 0.799 MHz Bluetooth EDR (2Mbps) : 1.166 MHz Bluetooth EDR (3Mbps) : 1.152 MHz</ant.></ant.></pre>		
Antenna Type / Gain	<ant. 4=""> : Printed ILA Antenna Type with gain -4.0 dBi <ant. 5=""> : Printed ILA Antenna Type with gain -5.6 dBi</ant.></ant.>		
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π /4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK		

**Remark:** The above EUT's information is declared by manufacturer. Please refer to Comments and Explanations in report summary.

# **1.3 Modification of EUT**

No modifications made to the EUT during the testing.



# **1.4 Testing Location**

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory		
Test Site LocationNo.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan TEL: +886-3-327-3456 FAX: +886-3-328-4978			
Test Site No.	Sporton Site No.		
Test Sile No.	CO05-HY (TAF Code: 1190)		
Demerk	The Conducted Emission test item subcontracted to Sporton International		
Remark	Inc. EMC & Wireless Communications Laboratory.		

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

Test Site	Sporton International Inc. Wensan Laboratory				
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan TEL: +886-3-327-0868 FAX: +886-3-327-0855				
Test Site No.	Sporton Site No.				
	TH05-HY, 03CH15-HY				

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

# 1.5 Applicable Standards

According to the specifications declared by 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 the test items were validated and recorded in accordance with the standards without any modification during the testing.
- 2. The TAF code is not including all the FCC KDB listed without accreditation.
- 3. 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 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	2414	39	2441	66	2468
2400-2483.5 MHz	13	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, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Y plane as worst plane, 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.

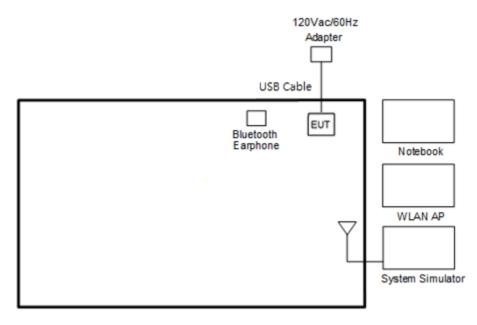
	Summary table of Test Cases				
Test Item	Data Rate / Modulation				
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi$ /4-DQPSK	Bluetooth EDR 3Mbps 8-DPSK		
Conducted	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz		
Test Cases	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz		
	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz		
	Bluetooth BR 1Mbps GFSK				
Radiated	diated Mode 1: CH00_2402 MHz				
Test Cases		Mode 2: CH39_2441 MHz			
	Mode 3: CH78_2480 MHz				
AC Conducted	Mode 1 : LTE Band 2 Lir	nk + Bluetooth Link + WLA	N (2.4GHz) Link + Bottom		
Emission	USB Port (Charging from AC 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 and conducted band edge measurement for other data rates were not worse than 1Mbps, and 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.

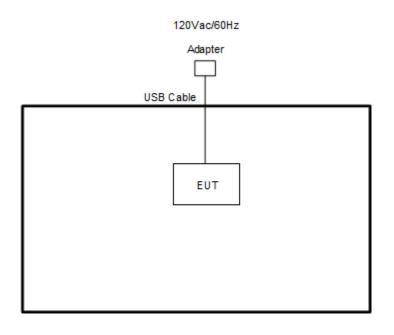


# 2.3 Connection Diagram of Test System

#### <AC Conducted Emission Mode>



#### <Bluetooth Tx Mode>





Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	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, 1.2 m DC O/P: Shielded, 1.8 m
5.	USB Cable	Samsung	N/A	N/A	Shielded,1.3m	N/A
6.	USB Cable	N/A	N/A	N/A	Unshielded, 0.8m	N/A
7.	AC Adapter	DVE	DSA-5PFM-05 FUS	FCC DoC	N/A	N/A
8.	AC Adapter	Samsung	GT-N7000	NA	N/A	N/A

# 2.4 Support Unit used in test configuration and system

# 2.5 EUT Operation Test Setup

The RF test items, utility "QRCT 4.0.00193.0" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes 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 10 dB 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

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- 4. Enable the EUT hopping function.
- Use the following spectrum analyzer settings: Span = the frequency band of operation;
   RBW = 300 kHz; 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



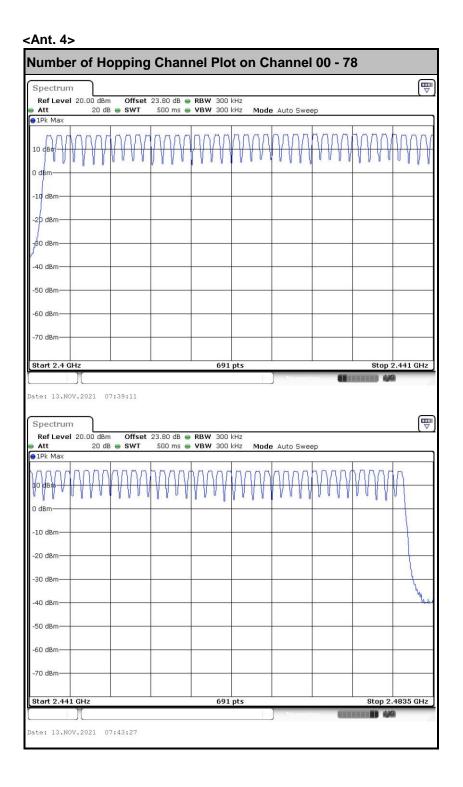
Spectrum Analyzer

EUT



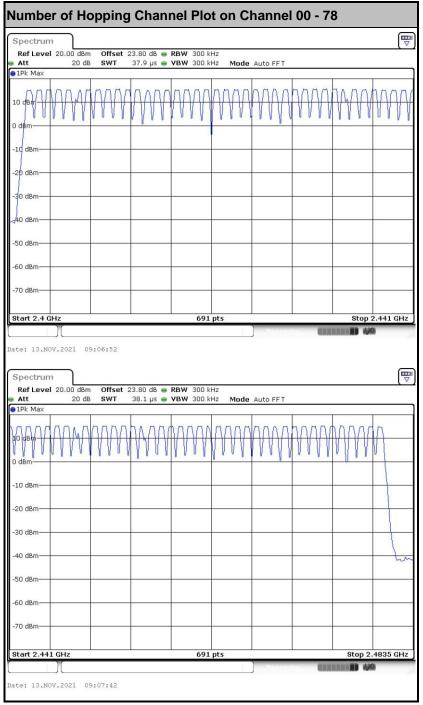
# 3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.





#### <Ant. 5>



# **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.

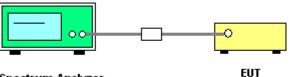
### **3.2.2 Measuring Instruments**

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to 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 = 300 kHz; 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

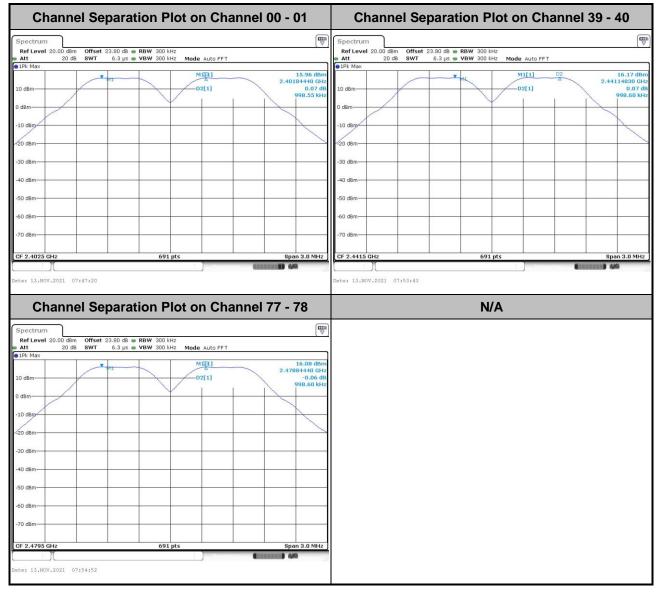
# 3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.



### <Ant. 4>

#### <1Mbps>





#### <2Mbps>

Shanner Oep	paration Plot on Cha	annel 00 - 01	Channel Sepa	aration Plot on Char	nnel 39 - 40
Spectrum			Spectrum		
Ref Level 20.00 dBm Offset 2 Att 20 dB SWT 1Pk Max	23.80 dB • RBW 300 kHz 6.3 µs • VBW 300 kHz Mode Auto FFT			0 dB 👄 RBW 300 kHz 3 µs 🖶 VBW 300 kHz 🛛 Mode Auto FFT	
10 dBm	M1[1] D2 D2[1]	13.31 dBm 2.40184440 GHz 0.06 dB	10 dBm	M1[1] D2 D2[1]	13.60 dBm 2.44084880 GHz 0.06 dB
0 dBm		998.60 kHz	0 dBm-		998.60 kHz
-10 dBm			-10 dBm		
-20 dBm-			-20 dBm-		
-30 dBm-			-30 dBm		
-40 dBm-			-40 dBm-		
-50 dBm-			-50 dBm		
-60 dBm-			-60 dBm		
-70 dBm			-70 dBm		
CF 2.4025 GHz	691 pts	Span 3.0 MHz	CF 2.4415 GHz	691 pts	Span 3.0 MHz
ate: 13.NOV.2021 08:06:53				,	
			Date: 13.NOV.2021 08:08:13		
Channel Ser	paration Plot on Cha	annel 77 - 78	Date: 13.NOV.2021 08:08:13	N/A	
	paration Plot on Cha		Date: 13.NOV.2021 08:08:13	N/A	
Spectrum Ref Level 20.00 dBm Offset 2	23.80 dB 👄 RBW 300 kHz	annel 77 - 78 ())	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum Ref Level 20.00 dBm Offset 2 Att 20 dB SWT	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz <b>Mode</b> Auto FFT	( <sup>m</sup> )	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum Ref Level 20.00 dBm Offset 2 Att 20 dB SWT 1Pk Max M1	23.80 dB 👄 RBW 300 kHz	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum Ref Level 20.00 dBm Offset 2 Att 20 dB SWT 1Pk Max MI 10 dBm MI	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum Ref Level 20.00 dBm Offset 2 Att 20 dB SWT 20 Hk Max 10 dBm Ma	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum           Ref Level 20.00 dBm         Offset 2           Att         20 dB         SWT           ID/R Max         M1           10 dBm         0           10 dBm         10 dBm	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum           Ref Level 20.00 dBm         Offset 2           Att 20 dB         SWT           1Pk Max         M1           0 dBm         M1           10 dBm         10 dBm           10 dBm         20 dBm	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum Ref Level 20.00 dBm Offset 2 Att 20 dB SWT 1Pk Max 0 dBm 0 0 dBm 0 20 dBm 0 20 dBm 0 30 dBm 0 0 dBm 0	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum           Ref Level 20.00 dBm         Offset 2           Att         20 dB         SWT           1Pk Max         MI           10 dBm         MI           10 dBm         MI           20 dB         MI           30 dBm         MI           40 dBm         MI	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum           Ref Level 20.00 dBm         Offset 2           Att 20 dB         SWT           1Pk Max         M1           10 dBm         M1           0 dBm         0           10 dBm         0           20 dB         0           30 dBm         0           40 dBm         0           50 dBm         0	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum         Offset 2           Ref Level 20.00 dBm         Offset 2           Att 20 dB         SWT           3IPk Max         MI           0 dBm	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	
Spectrum         Offset 2           Ref Level 20.00 dBm         Offset 2           Att 20 dB         SVT           JPk Max         M1           10 dBm         M1           10 dBm         0           50 dBm         0	23.80 dB <b>● RBW</b> 300 kHz 6.3 µs <b>● VBW</b> 300 kHz Mode Auto FFT [1] [2]	13.62 dBm 2.47884440 GHz	Date: 13.NOV.2021 00:00:13	N/A	



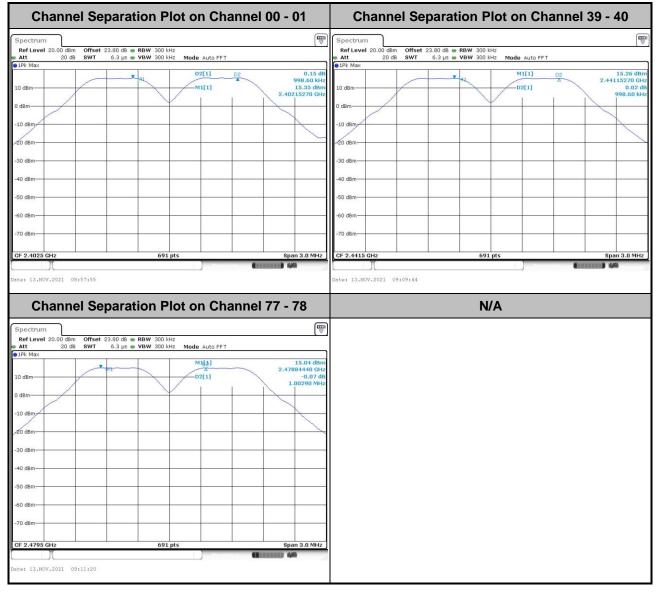
#### <3Mbps>

Channel Sepa	aration Plot on Ch	annel 00 - 01	Channel Separation Plot on Channel 39 - 40
Spectrum			Spectrum
	0 dB <b>⊕ RBW</b> 300 kHz 3 µs <b>⊕ VBW</b> 300 kHz   Mode Auto FFT		RefLevel 20.00 dBm Offset 23.80 dB RBW 300 kHz Att 20 dB SWT 6.3 µs VBW 300 kHz Mode Auto FFT
●1Pk Max		13.33 dBm	1Pk Max
10 dBm	M1 M1[1]	D2 2.40215270 GHz 0.06 dB	M1 M1[1] D2 2.44114830 10 d8m D2[1] Δ 2.44114830 0.007 0.
	DAL 1	998.60 kHz	1,00290 M
0 dBm			0 dBm
-10 dBm-			-10/d8m
-20 dBm-			-20 dBm-
-30 dBm			-30 dBm
-40 dBm			-40 dBm
-50 dBm-			-50 dBm
-60 dBm			-60 d8m-
-70 dBm			-70 dBm
CF 2.4025 GHz	691 pts	Span 3.0 MHz	CF 2.4415 GHz 691 pts Span 3.0 Mi
	) Messie	(11111) 4/4	
Date: 13.NOV.2021 08:10:49			Date: 13.NOV.2021 08:16:00
Channel Sepa	aration Plot on Ch	annel 77 - 78	N/A
Spectrum			
Att 20 dB SWT 6.	0 dB ● RBW 300 kHz 3 µs ● VBW 300 kHz Mode Auto FFT		
1Pk Max     M1	M1[1]	13.61 dBm	
10 dBm		2.47884440 GHz -0.06 dB	
		998.60 kHz	
0 dBm			
-10 dBm			
-20 dBm-			
-30 dBm-			
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm-			
05.0.4705.0115	601.01		
CF 2.4795 GHz	691 pts	Span 3.0 MHz	



#### <Ant. 5>

#### <1Mbps>





#### <2Mbps>

Channel Separa	ation Plot on Chan	nel 00 - 01	Channel Separation Plot on Channel 39 - 40
Att 20 dB SWT 6.3 μs	3 <b>© RBW</b> 300 kHz 5 <b>© VBW</b> 300 kHz <b>Mode</b> Auto FFT		RefLevel 20.00 dBm Offset 23.80 dB ● RBW 300 kHz ● Att 20 dB SWT 6.3 µs ● VBW 300 kHz Mode Auto FFT
1Pk Max     10 dBm     0 dBm     -10 dBm     -20 dBm     -20 dBm     -30 dBm     -40 dBm     -50	691 pts	12.65 dBm 2.40194800 GHz 0.12 db 998.60 kHz	• IPk Max         Mil         12.65           10 dBm         Mil         02         2.440844           10 dBm         02         2.440844         0.0           0 dBm         0.00291         0.00291         0.00291           0 dBm         0.00291         0.00291         0.00291           -10 dBm         0.00291         0.00291         0.00291           -20 dBm         0.00291         0.00291         0.00291           -30 dBm         0.00291         0.00291         0.00291           -50 dBm         0.00291         0.00291         0.00291           -60 dBm         0.00291         0.00291         0.00291           -70 dBm         0.00291         0.00291         0.00291           CF 2.4415 CHz         691 pts         Spon 3.0         0.00291
Spectrum			Date: 13,1007.2021 09:14:42: N/A
Att 20 dB SWT 6.3 µS     1Pk Max     1Pk Max     10 dBm     0 dBm     -10 /0Bm     -20 dBm     -30 dBm     -50 dBm     -5	VBW 300 kHz     Mode Auto FFT      M1[1]     D2     D2     D2     D2     D	12.56 dBm 2.47884440 GHz -0.07 dB 998.60 kHz	



#### <3Mbps>

Channel	Separation Plot on Ch	annel 00 - 01	Channel Separation Plot on Channel 39 - 4	40
Spectrum			Spectrum	
	ffset 23.80 d8 ⊜ RBW 300 kHz WT 6.3 µs ⊜ VBW 300 kHz Mode Auto FFT		RefLevel 20.00 dBm Offset 23.80 dB ● RBW 300 kHz ● Att 20 dB SWT 6.3 µs ● VBW 300 kHz Mode Auto FFT	
• 1Pk Max			e 1Pk Max	
	M1 M1[1]	02 2.40215270 GHz	D2 2.441	12.64 dBm 15270 GHz
10 dBm	D2[1]	0.09 dB 998.60 kHz	10 dBm D2[1]	0.07 dB 998.60 kHz
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-	
-70 dBm			-70 dBm-	
CF 2.4025 GHz	691 pts	Span 3.0 MHz	CF 2.4415 GHz 691 pts Spa	n 3.0 MHz
Channel	Separation Plot on Ch	annel 77 - 78	Date: 13,M0V.2021 09:19:02 N/A	
Spectrum				
	ffset 23.80 dB ⇔ RBW 300 kHz WT 6.3 µs ⇔ VBW 300 kHz Mode Auto FFT	1		
1Pk Max		12.57 dBm		
10 dBm	M1 D2 D2(1)	2.47884440 GHz -0.05 dB		
10 dBin	02[1]	1.00290 MHz		
0 dBm				
-10 dBm-				
-20 dBm				
-30 dBm				
-40 dBm				
-50 dBm				
-JU UBIT				
-60 dBm				
-70 dBm				
CF 2.4795 GHz	691 pts	Span 3.0 MHz		
Л	- Mercent	<b>H</b> IIIIII 49		
ate: 13.NOV.2021 09:20:	:34			
			1	



# 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.

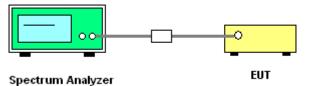
### **3.3.2 Measuring Instruments**

Please refer to the measuring equipment list in this test report.

### 3.3.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.4.
- 2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to 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

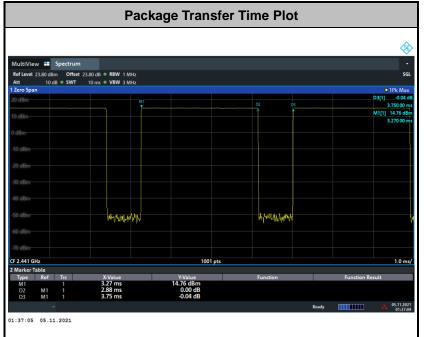


# 3.3.5 Test Result of Dwell Time

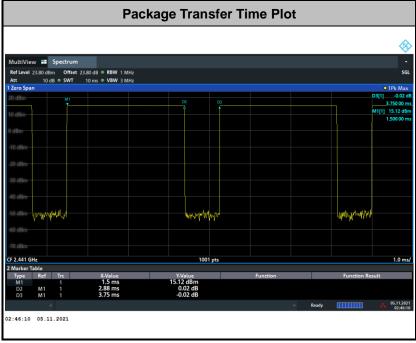
Please refer to Appendix A.



#### <Ant. 4>



#### <Ant. 5>



#### 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.

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Report Template No.: BU5-FR15CBT Version 2.4	Report Version	: 01



# 3.4 20dB and 99% Bandwidth Measurement

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

Reporting only

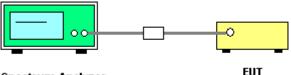
### 3.4.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- Use the following spectrum analyzer settings for 20 dB 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

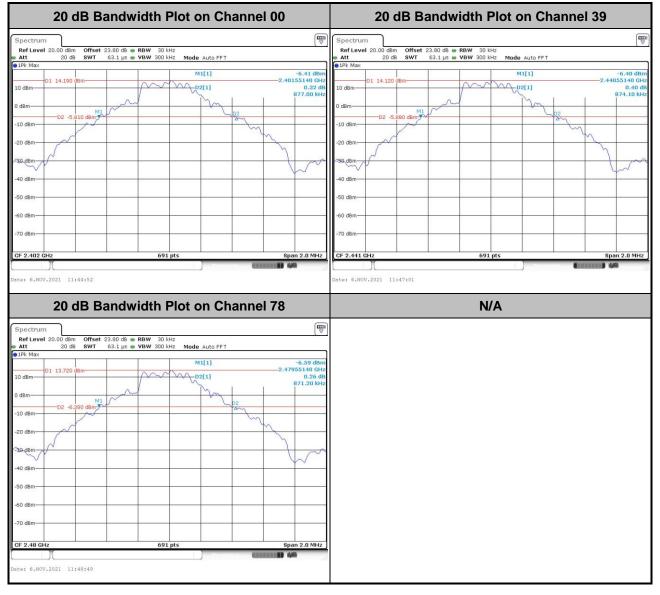
# 3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.



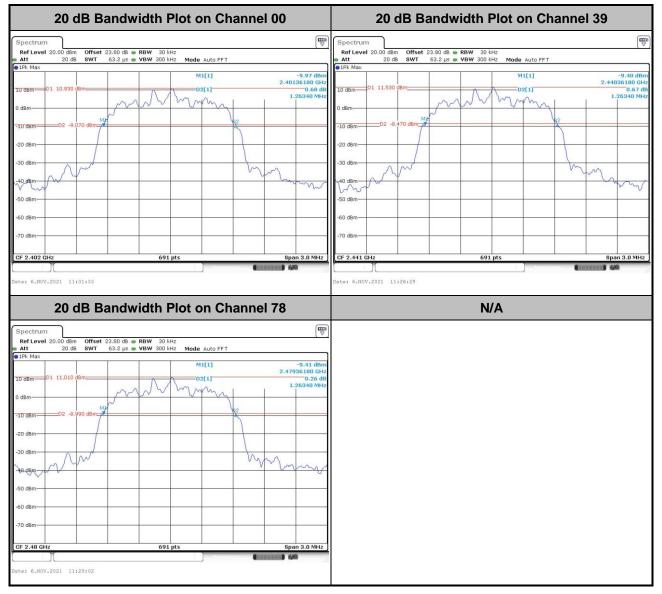
### <Ant. 4>

#### <1Mbps>



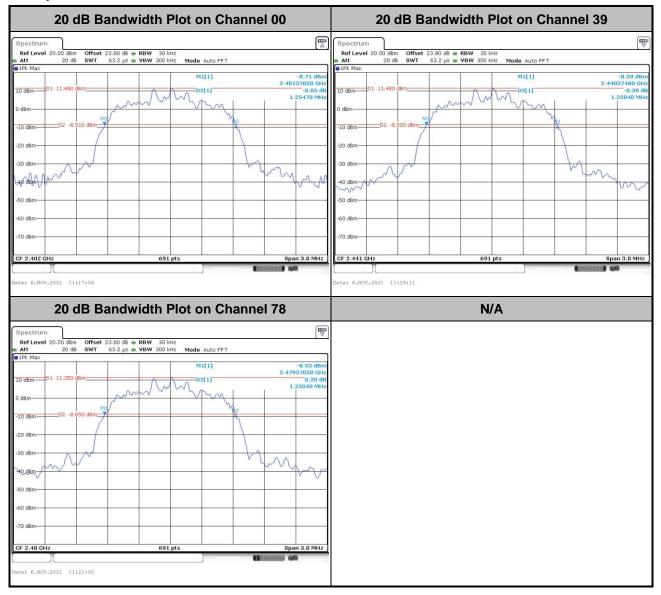


#### <2Mbps>





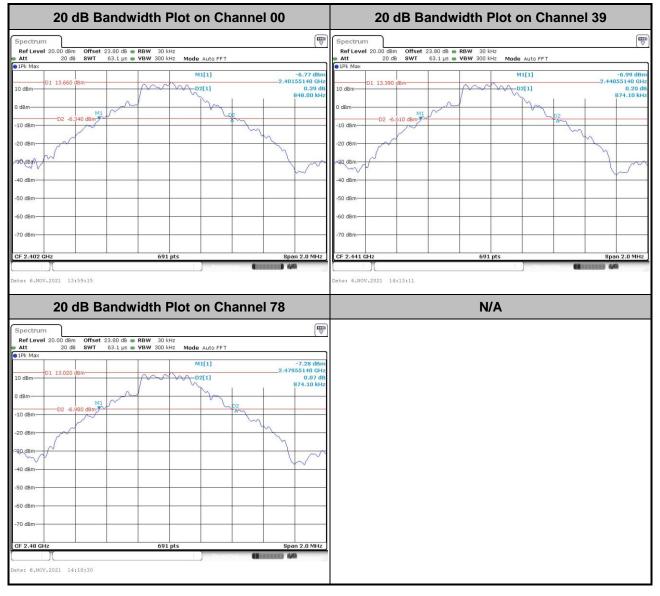
#### <3Mbps>





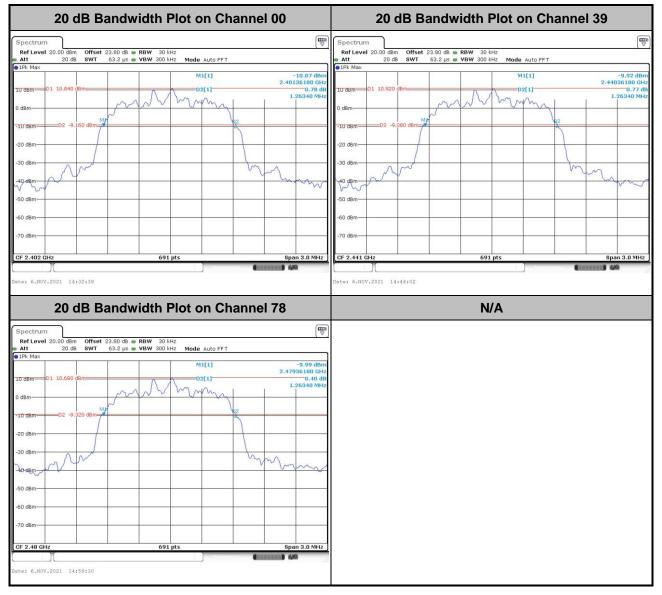
### <Ant. 5>

#### <1Mbps>



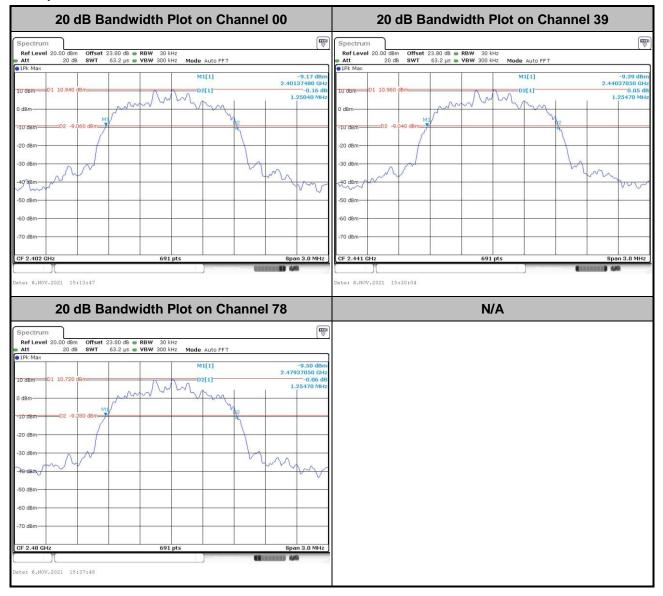


#### <2Mbps>





#### <3Mbps>

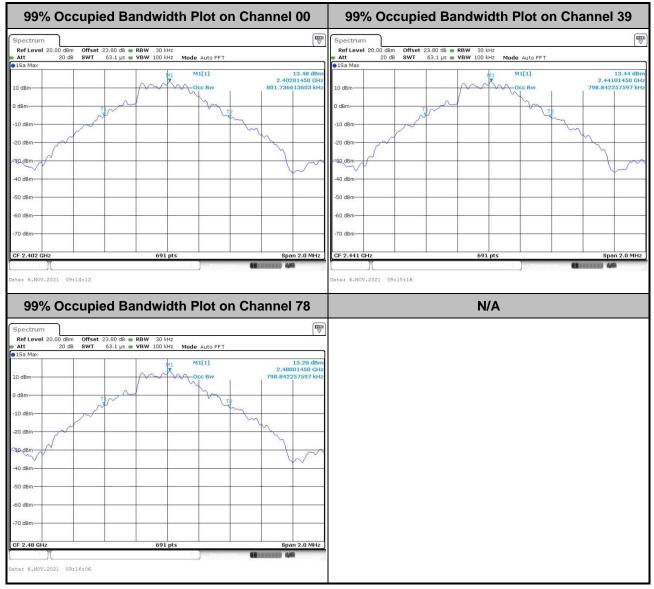


## 3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

#### <Ant. 4>

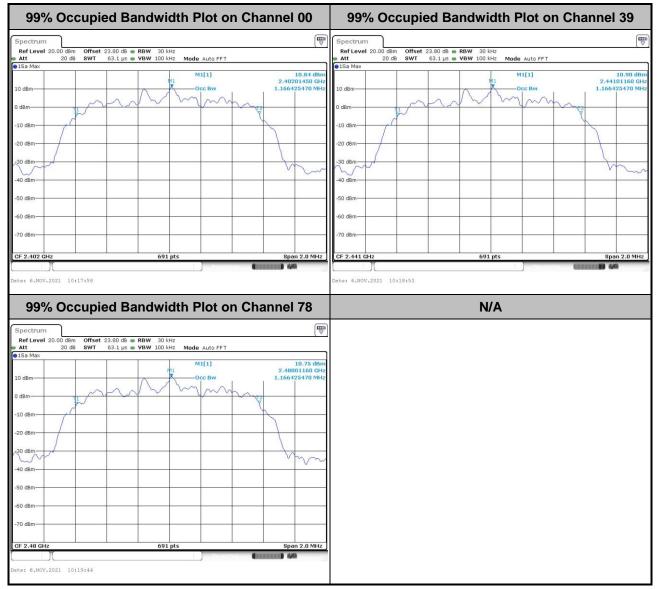
#### <1Mbps>



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

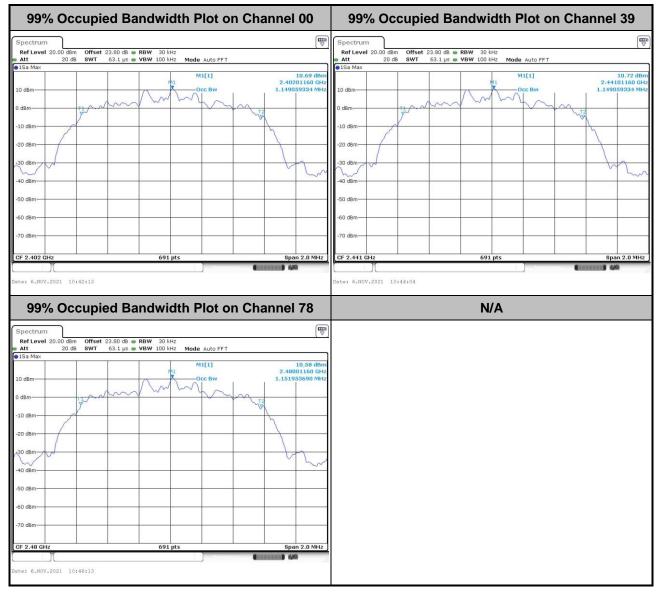


#### <2Mbps>





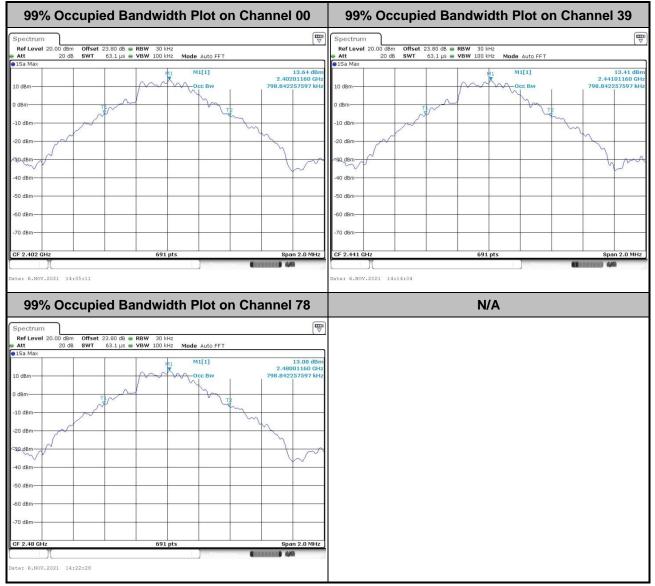
#### <3Mbps>





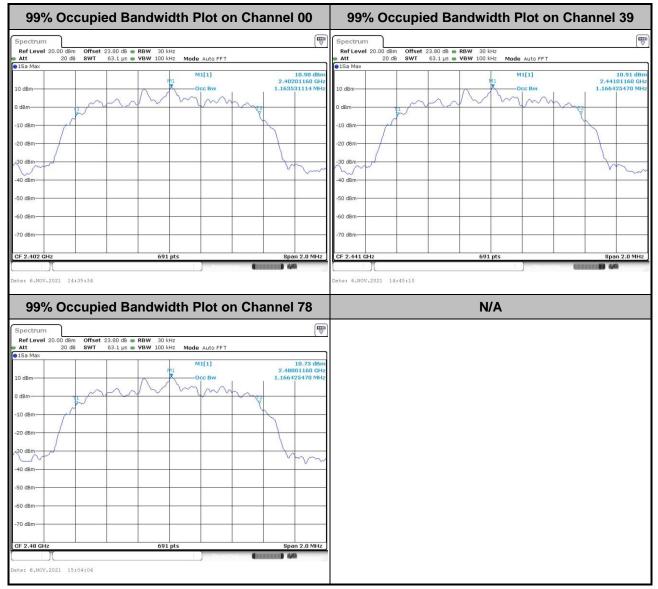
#### <Ant. 5>

#### <1Mbps>



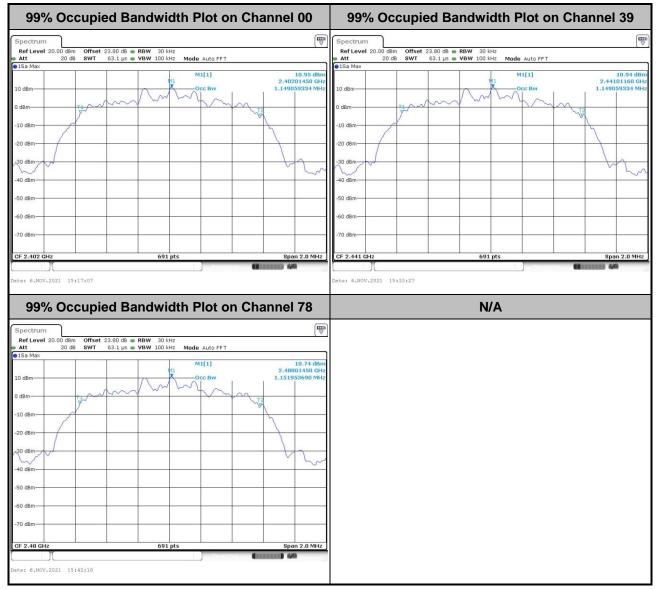


#### <2Mbps>





#### <3Mbps>





# 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.

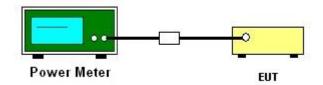
## 3.5.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to 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.

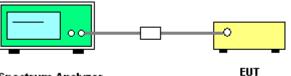
## 3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

## 3.6.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 7.8.6.
- 2. Set the maximum power setting and enable the EUT to transmit continuously.
- 3. Set RBW = 100 kHz, VBW = 300 kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz 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



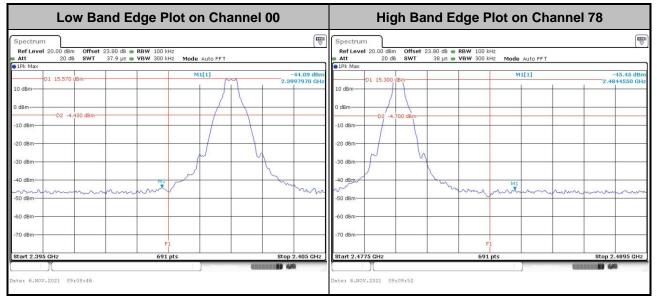
Spectrum Analyzer



# 3.6.5 Test Result of Conducted Band Edges

### <Ant. 4>

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Low Band Edge Plot on Chann	el 00	High	n Band Edge	Plot on Cha	nnel 78
Spectrum           Ref Level 20.00 dBm         Offset 23.80 dB         RBW 100 kHz           Att         20 dB         SWT         37.9 μs         VBW 300 kHz         Mode Auto FFT           JPK Max			Offset 23.80 dB ● RBW 10 SWT 38 μs ● VBW 30	0 kHz 0 kHz <b>Mode</b> Auto FFT	(E
IP/F Max         M1[1]           10 dBm         01 12.050 dBm           0 dBm         0           -10 dBm         0           -20 dBm         0           -30 dBm         0           -40 dBm         M1           -50 dBm         0	-44.91 dBm 2.3973610 GHz	10 dBm     11 2.900 gB     10 dBm     0 dBm     0 dBm     0 2 -7.10     -20 dBm     -30 dBm     -50 dBm     -60 dBm	0 dBm	M1[1]	-45.15 dBm 2.4856360 GHz
-70 dBm-F1 Start 2.395 GHz 691 pts	Stop 2.405 GHz	-70 dBm Start 2.4775 GHz		F1 91 pts	Stop 2.4895 GHz

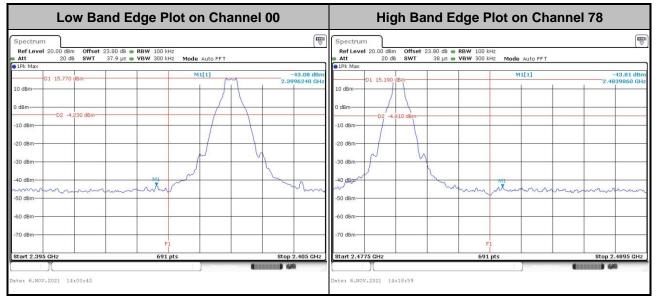


Low Band Ec	dge Plot on Chan	nel 00	High Ba	and Edge Plot on C	hannel 78
Spectrum Ref Level 20.00 dBm Offset 23.80 dB • Att 20 dB SWT 37.9 µs •	RBW 100 kHz VBW 300 kHz Mode Auto FFT		Spectrum Ref Level 20.00 dBm Offset Att 20 dB SWT	23.80 dB ● RBW 100 kHz 38 µs ● VBW 300 kHz Mode Auto FF	T
10 dBm         01 12,840 dBm           0 dBm         0           -10 dBm         -02 -7.160 dBm           -20 dBm         -30 dBm		-44,72 dBm 2.3997250 GHz	0 dBm 01 12:740 dBm 0 dBm 02 -7.260 dBm -10 dBm -02 -7.260 dBm -20 dBm	M1[1]	-45.28 dBm 2.4878940 GHz
-60 dBm	F1 691 pts	Stop 2.405 GHz	-40 dBm/ -50 dBm -60 dBm -70 dBm Btart 2.4775 GHz	F1 601 pts	5top 2.4895 GHz
Date: 6.NOV.2021 10;38:26	Mexempton	(IIIIIII) 4/2	Date: 6.NOV.2021 10:37:53		4999 <b>(1111) (4</b> 9



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Low Band Ed	dge Plot on Cha	nnel 00	High	Band Edge	Plot on Cha	annel 78
Spectrum Ref Level 20.00 dBm Offset 23.80 dB @				fset 23.80 dB 🖷 RBW 100		
Att 20 dB SWT 37.9 μs =	VBW 300 kHz Mode Auto FFT		Att 20 dB SV     10 pk Max	VT 38 µs 🖷 VBW 300	kHz Mode Auto FFT	
01 13.010 dBm-	M1[1]	-42.40 dBm 2.3997110 GHz	10 dBm		M1[1]	-43.46 dBm 2.4846110 GHz
0 dBm			0 dBm	Bm		
-20 dBm			-20 dBm			
-30 dBm	Mi mi	M	-30 dBm	m	Ma	
-50 dBm		m	-50 dBm	mm		
-60 dBm			-60 dBm			
Start 2.395 GHz	F1 691 pts	Stop 2.405 GHz	Start 2.4775 GHz	65	F1 91 pts	Stop 2.4895 GHz
Date: 6.NOV.2021 14:33:40			Date: 6.NOV.2021 14:59:1	5		



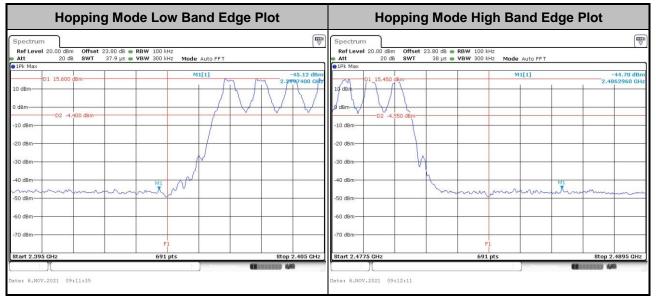
Spectrum         Spectrum	Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 78
MI[1]         -44.13 dBn           10 dBm         2.3974960 GHz           0 dBm         2.3974960 GHz           10 dBm         0.1 12.080 dBm           -00 dBm         0.0 dBm           -00 dBm         -00 - 5.910 dBm           -00 dBm         -00 - 7.120 dBm           -70 dBm         -00 - 7.120 dBm	RefLevel 20.00 dBm Offset 23.80 dB RBW 100 kHz Att 20 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT	Ref Level         20.00 dBm         Offset         23.80 dB         RBW         100 kHz           Att         20 dB         SWT         38 µs         VBW         300 kHz         Mode         Auto FFT
-30 dBm	10 dBm         01 13.090 dBm         23.3974960 G           0 dBm         0 dBm         0 dBm	Imm         M1[1]         -44.57 dBm           10 dBm         2.4846720 GHz         0           0 dBm         0         0
-70 dBm	-30 dBm	-30 dBm
	-70 dBm F1 Start 2.395 GHz 691 pts Stop 2.405 GH	-70 dBm



# 3.6.6 Test Result of Conducted Hopping Mode Band Edges

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Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge	e Plot
Spectrum           Ref Level 20.00 dBm         Offset 23.80 dB = RBW 100 kHz           Att         20 dB           SWT         37.9 μs           PIPK Max	Image: Spectrum         Spectrum           Ref Level 20.00 dBm         Offset 23.80 dB ● RBW 100 kHz           ● Att         20 dB           SWT         38 µs           ● DFk Max	
D1         12.930 dBm         M1[1]           10         dBm		-44.95 dBm 2.4870600 GHz
-20 d8m	-20 dBm	M
9	-60 dBm -70 dBm -70 dBm F1 Start 2.4775 GHz 691 pts	Stop 2.4895 GHz
Date: 6.NOV.2021 10:15:51	Date: 6,NGV.2021 10:16:19	<b>H</b>

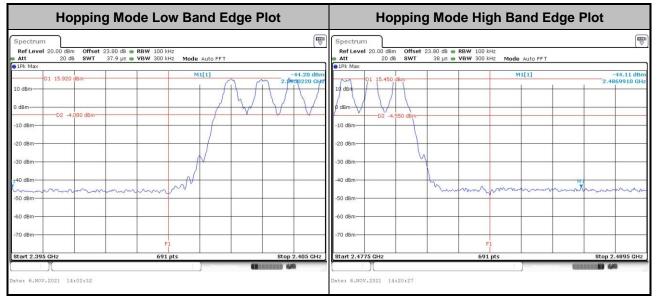


Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge Plot
Spectrum         Image: Constraint of the sector of t	Spectrum         mm           Ref Level 20.00 dBm         Offset 23.80 dB ■ RBW 100 kHz           ▲ tt         20 dB           SWT         38 µs ■ VBW 300 kHz           Mode Auto FFT
10 dBm         01 12.810 dBm	M1[1]         -44.76 dBm           10 VBm         2.4875640 GHz           30 VBm         2.4875640 GHz           0 dBm         0
-10 dBm 02 -7.190 dBm	-10 dBm
-40 #8m	-40 dBm
-60 d8m	-60 dBm
Start 2.395 GHz         691 pts         Stop 2.405 GHz           Date: 6.NOV.2021 10:39:55         0         0	Start 2.4775 GHz         691 pts         Stop 2.4895 GHz           Date: 6,NOV.2021 10:40:37         0         0



## <Ant. 5>

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Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge Plot
Spectrum         (1)           Ref Level 20.00 dBm         Offset 23.80 dB ● RBW 100 kHz         (1)	Spectrum         Image: Constraint of the second seco
0 dBm	M1[1]        43.79 dbm           10'd8m         2.4839130 GHz           0 d8m
-70 dBm F1 Stop 2.405 GHz Date: 6,NOV,2021 14:34:20	-50 dBm -60 dBm -70



Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge Plot
Spectrum         Image: Constraint of the sector of t	Spectrum         Image: Constraint of the sector of th
01         13.320 d8m         2.3961510 GHz           10 d8m         0         0           0 d8m         0         0           -10 d8m         0         0           -20 d8m         0         0           -30 d8m         0         0	01         12.770 dBm         2.4853230 GHz           01         0 dBm         0           -10         0 dBm         0           -20         0 dBm         0
-40 dBm50 dBm50 dBm70 dB	40 dBm 50 dBm -60 dBm -70 dBm -70 dBm F1 Start 2.4775 GHz 691 pts Stop 2.4895 GHz
Date: 6.NOV.2021 15:15:15	Date: 6.NOV.2021 15:41:23

# 3.7 Conducted Spurious Emission Measurement

# 3.7.1 Limit of Spurious Emission Measurement

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.

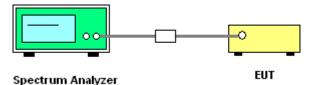
## 3.7.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

## 3.7.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 7.8.8.
- 2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurious must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

# 3.7.4 Test Setup

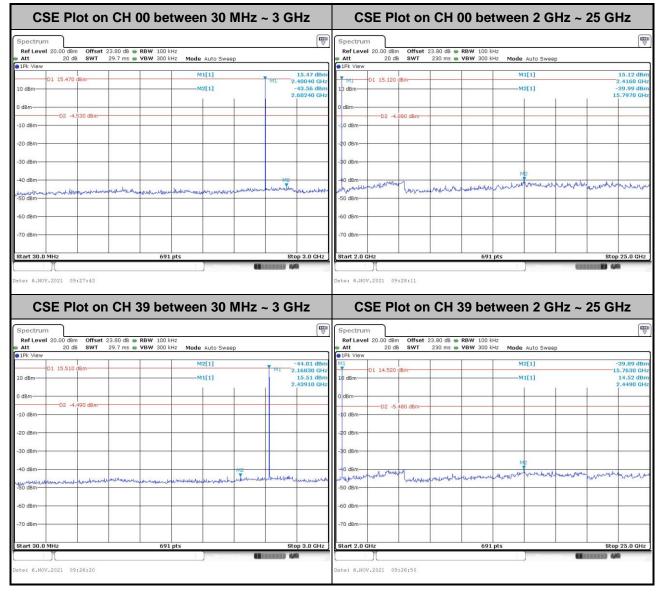




## 3.7.5 Test Result of Conducted Spurious Emission

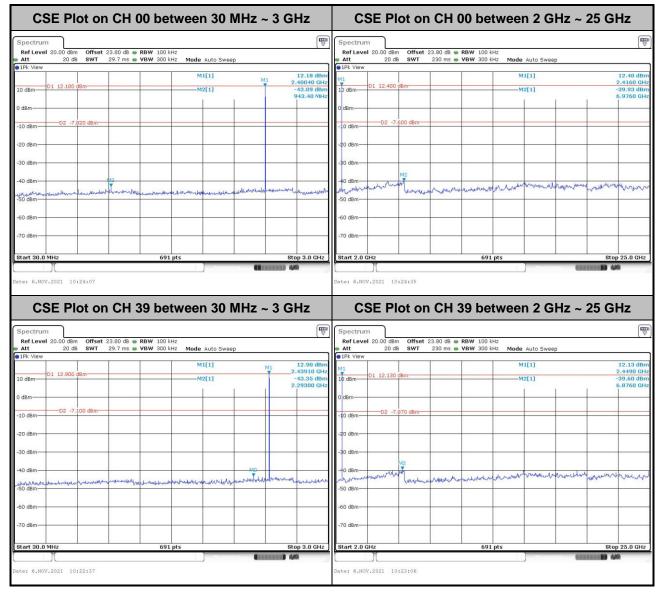
### <Ant. 4>

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CSE Plot on CH 7	78 between 30 MH	lz ~ 3 GHz	CSE PI	lot on CH	78 betwee	en 2 GHz -	~ 25 GHz
Spectrum Ref Level 20.00 dBm Offset 23.80 dB			Spectrum Ref Level 20.00 dBr				
	VBW 300 kHz Mode Auto Sweep		Att 20 di	8 SWT 230 ms 🖷	VBW 300 kHz Mod	le Auto Sweep	
01 15.240 dBm	M1[1]	15.24 dBm 2.47780 GHz -43.61 dBm 2.21130 GHz	0 1Pk View MI D1 15.320 10 dBm	dBm		M1[1] M2[1]	15.32 dBn 2.4830 GH -39.75 dBn 7.0090 GH
0 dBm			0 dBm	.680 dBm			
-30 dBm			-30 dBm	M2		where Antra met	an warden der aller aller
-50 dBm	warranne bener ann an the stand i see - we finder	unarrival rear Mangle charges	-50 dBm	Linundrounion	- Christmann mar a		
-70 dBm			-70 dBm				
Start 30.0 MHz	691 pts	Stop 3.0 GHz	Start 2.0 GHz		691 pts	Measuring	Stop 25.0 GHz
Date: 6.NOV.2021 09:17:31			Date: 6.NOV.2021 09	9:18:05			





CSE Plot on CH 7	78 between 30 MH	lz ~ 3 GHz	CSE Plot	on CH 78 b	etween 2 C	GHz ~ 25 G	Hz
	RBW 100 kHz YBW 300 kHz Mode Auto Sweep		Att 20 dB \$	Dffset 23.80 dB      RBW 10 SWT 230 ms      VBW 30		еер	
1Pk View     01 12.870 dBm     0 dBm     02 -7.130 dBm     -10 dBm     -20 dBm     -30 dBm     -30 dBm     -40 dBm     -50 dBm     -70 dBm     -70 dBm	M1[1]  M2[1]  M2	12.87 dBm 2.47780 GHz -43.43 dHz 2.65400 GHz 	0 dBm		MI[1] M2[1] M2[1] M2 M2 M2 M2 M2		11.67 dBm 2.4830 GH -39.10 dBm 15.7970 GH 15.7970 GH
Start 30.0 MHz	691 pts	Stop 3.0 GHz	Start 2.0 GHz		91 pts	St	op 25.0 GHz