

FCC RF Test Report

APPLICANT	: Motorola Mobility LLC
EQUIPMENT	: Mobile Cellular Phone
BRAND NAME	: Motorola
MODEL NAME	: XT2115-1, XT2115-2, XT2115-3,
	XT2115-4, XT2115DL
FCC ID	: IHDT56ZG1
STANDARD	: FCC Part 15 Subpart C §15.247
CLASSIFICATION	: (DSS) Spread Spectrum Transmitter

The product was received on Aug. 13, 2020 and testing was completed on Aug. 31, 2020. We, Sporton International (Kunshan) Inc., 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.

This report contains data that were produced under subcontract by Sporton International (ShenZhen) Inc.

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.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR081310A	Rev. 01	Initial issue of report	Sep. 22, 2020



Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	NA	Pass	-
3.4	-	99% Bandwidth	-	Pass	-
3.5	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
		Radiated Band Edges			Under limit
3.8	15.247(d)	and Radiated Spurious	15.209(a) & 15.247(d)	Pass	15.46 dB at
		Emission			74.62 MHz
		AC Conducted			Under limit
3.9	15.207	Emission	15.207(a)	Pass	12.41 dB at
		EIIIISSIUII			0.658 MHz
3.10	15.203 &	Antenna Requirement	N/A	Pass	
5.10	15.247(b)		IN/A	1 055	-

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

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature				
Equipment	Mobile Cellular Phone			
Brand Name Motorola				
Model Name	XT2115-1, XT2115-2, XT2115-3, XT2115-4, XT2115DL			
FCC ID	IHDT56ZG1			
EUT supports Radios application	CDMA/GSM/WCDMA/LTE WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE			
IMEI Code	FM Receiver and GNSS Conducted: 3568871100079101 Conduction: 356887110008448 Radiation: 356887110008034			
HW Version	DVT2			
SW Version	QPC30.Q4-3			
EUT Stage	Identical Prototype			

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



1.4 Product Specification of Equipment Under Test

Standards-related Product Specification			
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz		
Number of Channels	79		
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78		
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 9.10 dBm (0.0081 W) Bluetooth EDR (2Mbps) : 8.80 dBm (0.0076 W) Bluetooth EDR (3Mbps) : 9.00 dBm (0.0079 W)		
99% Occupied Bandwidth	Bluetooth BR(1Mbps) : 0.845MHz Bluetooth EDR (2Mbps) : 1.166MHz Bluetooth EDR (3Mbps) : 1.152MHz		
Antenna Type / Gain	Loop Antenna with gain -3.5 dBi		
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) :π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK		

1.5 Modification of EUT

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

1.6 Specification of Accessory

Specification of Accessory						
AC Adapter 1	Brand Name	Motorola (Chenyang)	Model Name	MC-101		
AC Adapter 2	Brand Name	Motorola (Salcomp)	Model Name	MC-101		
Battery	Brand Name	Motorola (ATL)	Model Name	KX50		
USB Cable 1	Brand Name	Motorola (Saibao)	Model Name	SC18C24367		
USB Cable 2	Brand Name	Motorola (Luxshare)	Model Name	SC18C24368		



1.7 Testing Location

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

Test Firm	Sporton International (Kunshan) Inc.				
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958				
Toot Site No	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.		
Test Site No.	CO01-KS 03CH06-KS	CN1257	314309		

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.							
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595							
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.					
	TH01-SZ	CN1256	421272					

Test data subcontracted: Conducted test items in section 3.1~3.7 of this report.

1.8 Test Software

ltem	Site	Manufacture	Name	Version
1.	03CH06-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-KS	AUDIX	E3	6.2009-8-24



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 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- 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. 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, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) 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							
	Data Rate / Modulation						
Test Item	Bluetooth BR 1Mbps	Bluetooth EDR 2Mbps	Bluetooth EDR 3Mbps				
	GFSK	π/4-DQPSK	8-DPSK				
Conductod	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz				
Conducted	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz				
Test Cases	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz				
	Bluetooth BR 1Mbps GFSK Radiated Mode 1: CH00_2402 MHz						
Radiated							
Test Cases	Mode 2: CH39_2441 MHz						
	Mode 3: CH78_2480 MHz						
AC Conducted Emission	Conducted Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable 1(Charging from Adapter 1) + Earphone						
Remark:							
1. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate							
has the highest RF output power at preliminary tests, and no other significantly frequencies found in							
conducted spurious emission.							

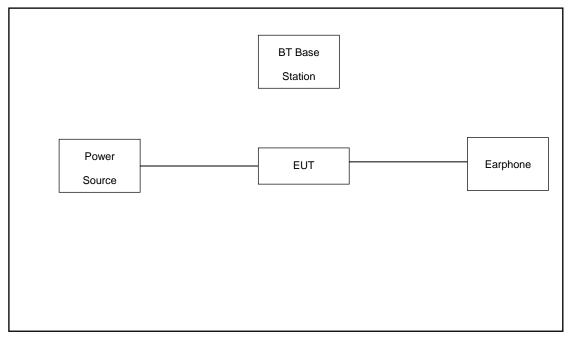
The following summary table is showing all test modes to demonstrate in compliance with the standard.

2. For Radiated Test Cases, The tests were performed with Adapter 1, Earphone and USB Cable 1.

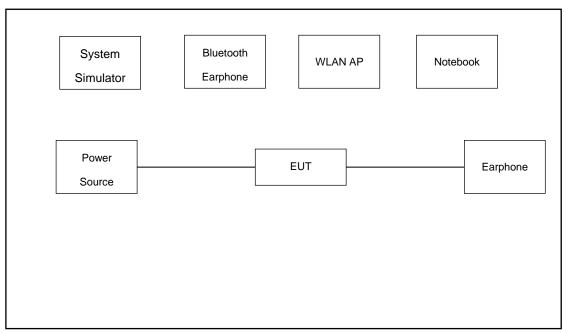


2.3 Connection Diagram of Test System

For Radiated Emission:



For AC Conducted Emission:





	2.4	Support	Unit used	in test	configuration	and system
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ltem	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Station	R&S	СВТ	N/A	N/A	Unshielded,1.8m
3.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
4.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
5.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
6.	SD Card	Kingston	8GB	N/A	N/A	N/A
7.	Earphone	N/A	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

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 3.3 dB and 20dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB). = 3.3 + 20 = 23.3 (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

The measuring equipment is listed in the section 4 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

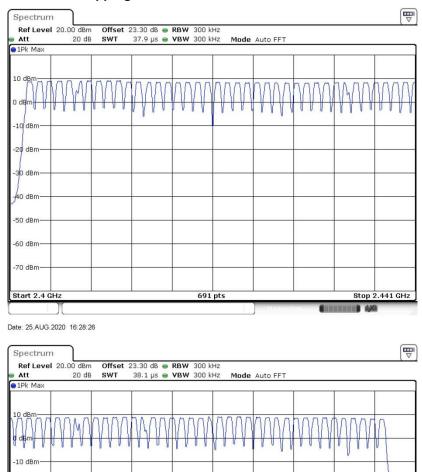


Spectrum Analyzer

3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.





691 pts

Number of Hopping Channel Plot on Channel 00 - 78

Date: 25.AUG.2020 16:30:26

Start 2.441 GHz

-20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm

Stop 2.4835 GHz



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

The measuring equipment is listed in the section 4 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

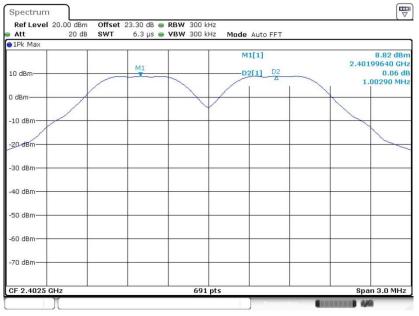
3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.



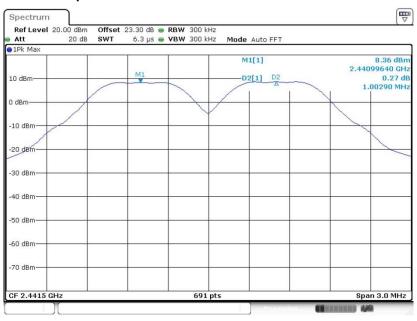
<1Mbps>

Channel Separation Plot on Channel 00 - 01



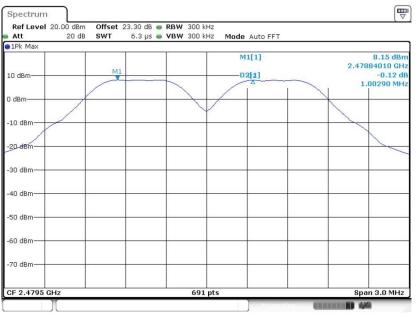
Date: 25.AUG.2020 15:59:28

Channel Separation Plot on Channel 39 - 40



Date: 25.AUG.2020 16:02:55



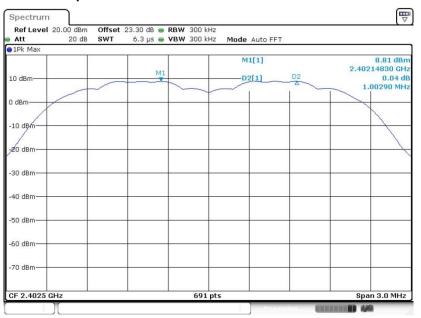


Channel Separation Plot on Channel 77 - 78

Date: 25.AUG.2020 16:05:37

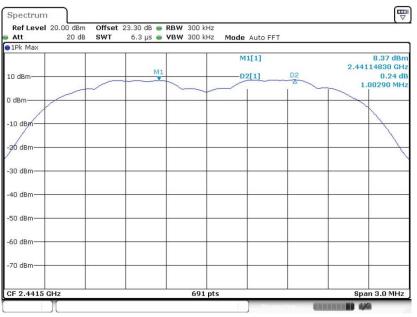
<2Mbps>

Channel Separation Plot on Channel 00 - 01



Date: 25.AUG.2020 16:56:47

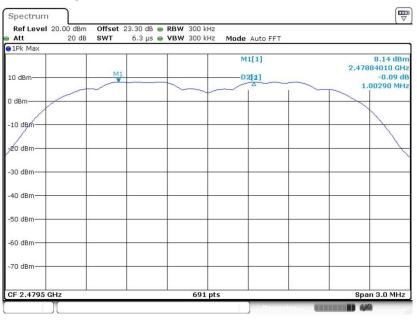




Channel Separation Plot on Channel 39 - 40

Date: 25.AUG.2020 16:54:44

Channel Separation Plot on Channel 77 - 78

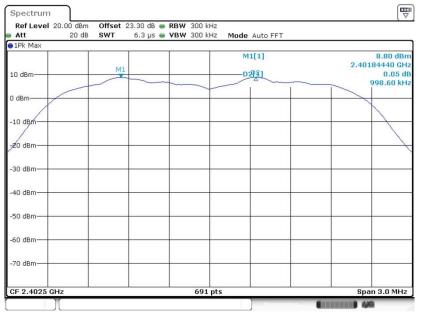


Date: 25.AUG.2020 16:59:17



<3Mbps>

Channel Separation Plot on Channel 00 - 01



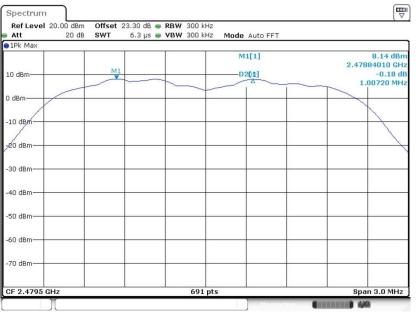
Date: 25.AUG.2020 17:25:12

Channel Separation Plot on Channel 39 - 40



Date: 25.AUG.2020 17:26:53





Channel Separation Plot on Channel 77 - 78

Date: 25.AUG.2020 17:29:44



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.

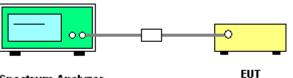
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 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

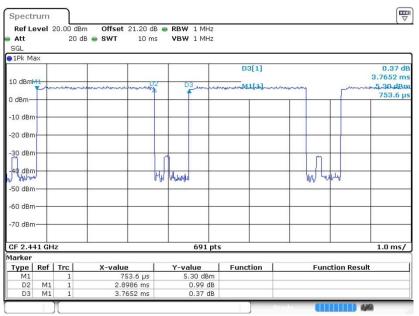


Spectrum Analyzer



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.



Package Transfer Time Plot

Date: 20.AUG.2020 13:02:32

Remark:

 In normal mode, hopping rate is 1600 hops/s with 6 slots (5 Transmit and 1 Receive slot) in 79 hopping channels.

With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4×79) (s), Hops Over Occupancy Time comes to $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$ hops.

- 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 x 20) (s),
 Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 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

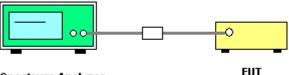
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 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% of the 99% bandwidth; VBW ≥ 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.



<1Mbps>

20 dB Bandwidth Plot on Channel 00



Date: 25.AUG.2020 16:08:37

20 dB Bandwidth Plot on Channel 39



Date: 25.AUG.2020 16:14:47



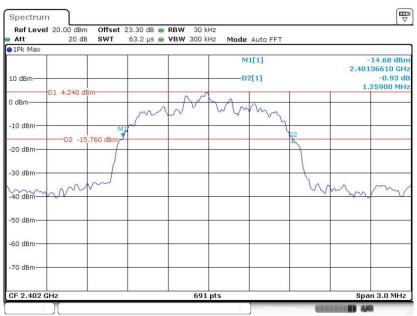


20 dB Bandwidth Plot on Channel 78

Date: 25.AUG.2020 16:21:51

<2Mbps>

20 dB Bandwidth Plot on Channel 00



Date: 25.AUG.2020 17:03:45





20 dB Bandwidth Plot on Channel 39

Date: 25.AUG.2020 17:10:43

20 dB Bandwidth Plot on Channel 78



Date: 25.AUG.2020 17:14:48



<3Mbps>

20 dB Bandwidth Plot on Channel 00



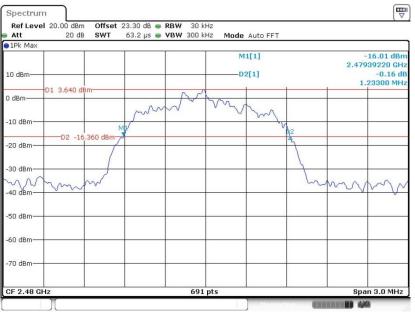
Date: 25.AUG.2020 17:31:46

20 dB Bandwidth Plot on Channel 39



Date: 25.AUG.2020 17:37:24





20 dB Bandwidth Plot on Channel 78

Date: 25.AUG.2020 17:42:54



3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

<1Mbps>

99% Occupied Bandwidth Plot on Channel 00



Date: 25.AUG.2020 16:09:49





99% Occupied Bandwidth Plot on Channel 39

Date: 25.AUG.2020 16:15:33





Date: 25.AUG.2020 16:22:49



<2Mbps>

99% Occupied Bandwidth Plot on Channel 00



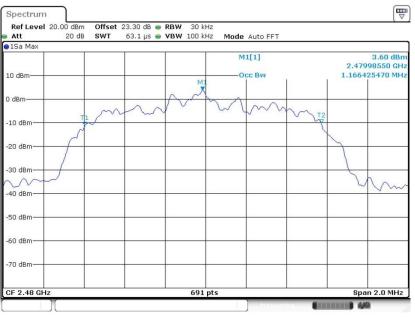
Date: 25.AUG.2020 17:04:46

99% Occupied Bandwidth Plot on Channel 39



Date: 25.AUG.2020 17:11:22



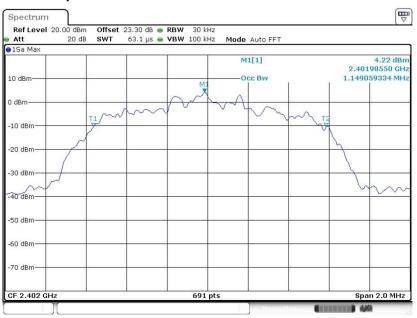


99% Occupied Bandwidth Plot on Channel 78

Date: 25.AUG.2020 17:15:49

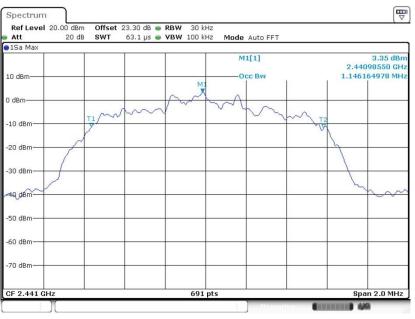
<3Mbps>

99% Occupied Bandwidth Plot on Channel 00



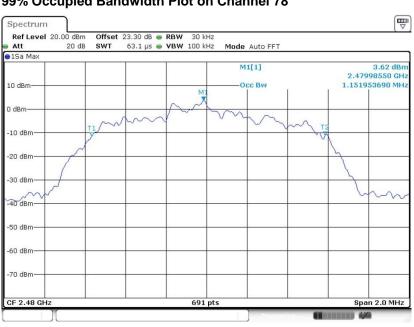
Date: 25.AUG.2020 17:32:43





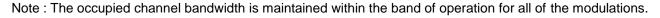
99% Occupied Bandwidth Plot on Channel 39

Date: 25.AUG.2020 17:38:02



99% Occupied Bandwidth Plot on Channel 78

Date: 25.AUG.2020 17:44:29





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: (1) 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. The power limit for 1Mbps, 2Mbps, 3Mbps and AFH modes are 0.125 watts.

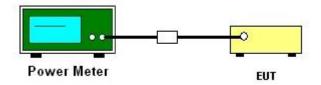
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 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.

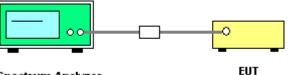
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 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



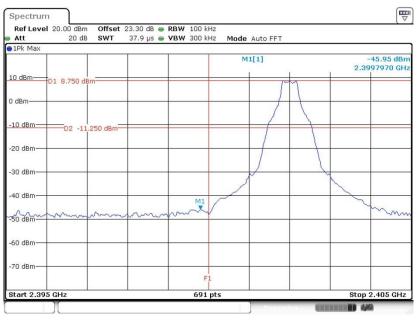
Spectrum Analyzer



3.6.5 Test Result of Conducted Band Edges

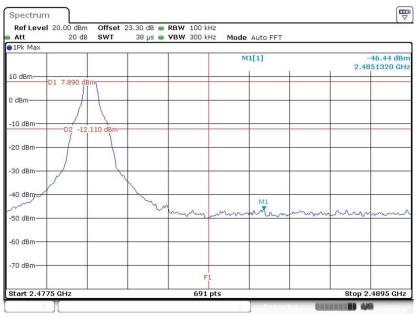
<1Mbps>

Low Band Edge Plot on Channel 00



Date: 25.AUG.2020 16:09:14

High Band Edge Plot on Channel 78

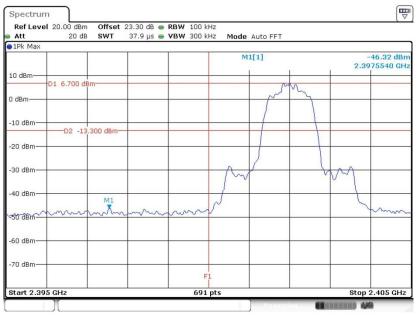


Date: 25.AUG.2020 16:22:11



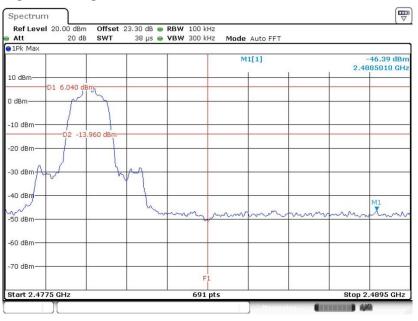
<2Mbps>

Low Band Edge Plot on Channel 00



Date: 25.AUG.2020 17:04:10

High Band Edge Plot on Channel 78

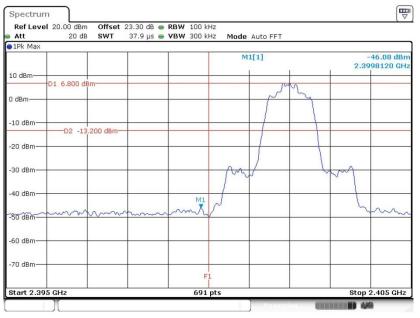


Date: 25.AUG.2020 17:15:10



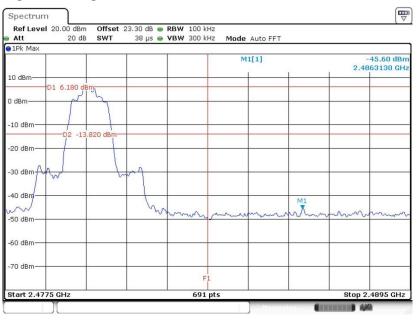
<3Mbps>

Low Band Edge Plot on Channel 00



Date: 25.AUG.2020 17:32:08

High Band Edge Plot on Channel 78



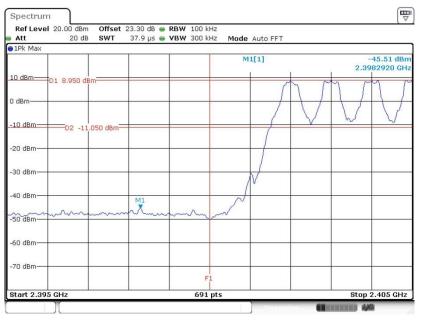
Date: 25.AUG.2020 17:43:43



3.6.6 Test Result of Conducted Hopping Mode Band Edges

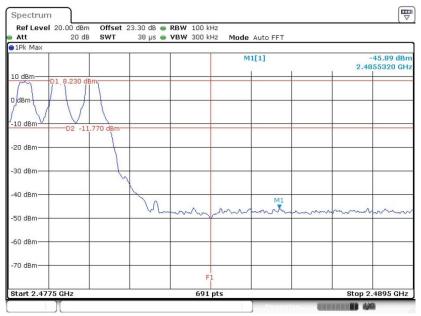
<1Mbps>

Hopping Mode Low Band Edge Plot



Date: 25.AUG.2020 16:31:43

Hopping Mode High Band Edge Plot

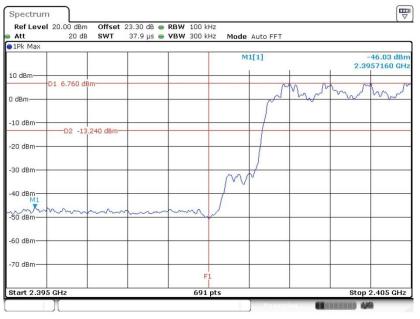


Date: 25.AUG.2020 16:33:29



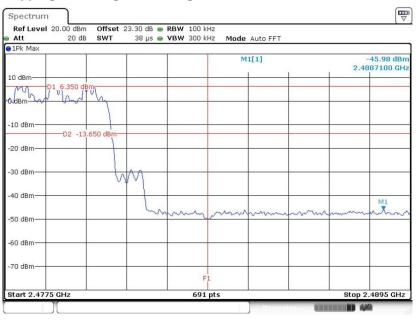
<2Mbps>

Hopping Mode Low Band Edge Plot



Date: 25.AUG.2020 16:42:38

Hopping Mode High Band Edge Plot

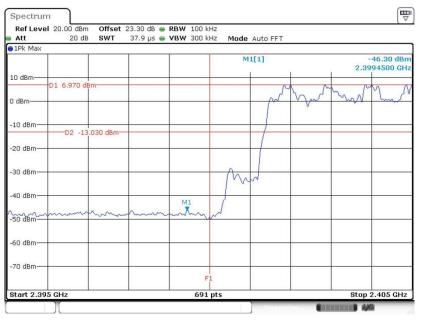


Date: 25.AUG.2020 16:44:02



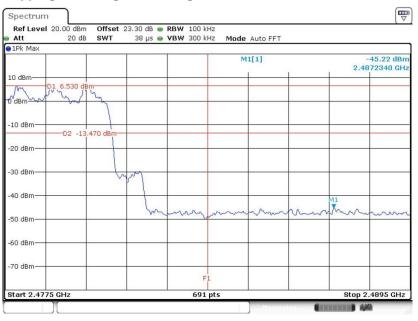
<3Mbps>

Hopping Mode Low Band Edge Plot



Date: 25.AUG.2020 17:48:31

Hopping Mode High Band Edge Plot



Date: 25.AUG.2020 17:50:59



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.

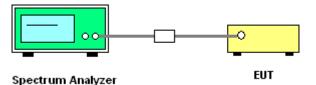
3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 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.
- Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs 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



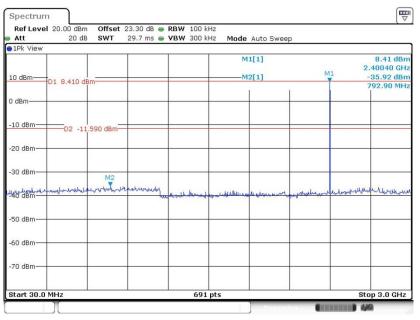
Sporton International (Kunshan) Inc. TEL : +86-512-57900158 FAX : +86-512-57900958 FCC ID: IHDT56ZG1



3.7.5 Test Result of Conducted Spurious Emission

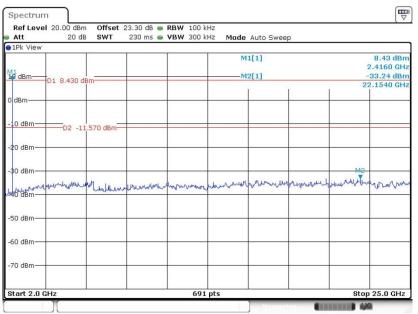
<1Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 25.AUG.2020 16:11:02

1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 25.AUG.2020 16:11:32



Spectrun									
Ref Leve Att	20.00 dBm 20 dB	Offset SWT	23.30 dB 👄 29.7 ms 👄			Auto Swee	n		
1Pk View	20 00	0111			ine mode	Hato once	P		
10 dBm	D1 7.650 dB	m				11[1] 12[1]		M1	7.65 dBm 2.43910 GHz -35.80 dBm 1.05510 GHz
0 dBm								-	1.03310 GHz
-10 dBm	D2 -12	.350 dBm—							
-20 dBm									
-30 dBm			M2						
40 dBm	asserted	workwall	umentury	tweetreestoon	and the second	here and the second	Mohrander	maharmo	Muhduman
-50 dBm									_
-60 dBm									
-70 dBm		-							
Start 30.0	MHz			691	pts				Stop 3.0 GHz
	Y					Measur		COLUMN D	4/6

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 25.AUG.2020 16:16:07

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Att	20 dB SWT 3	230 ms 👄 VBW 30() kHz Mode Auto Sw	/eep	
1Pk View					
			M1[1]		7.64 dBn 2.4490 GH
dBm			M2[1]		-32.98 dBr
D1 7.	640 dBm		1	- 1 - 1	22.2870 GH
0 dBm					
10 dBm)2 -12.360 dBm				
20 dBm-					
20 UBIII					
-30 dBm					M2
	winder	as a remain with make	en hour to deve the second	deep during manus	unanderen advor
40 dBm	" " " Winderland	and the second of the	C C C C C C C C C C C C C C C C C C C		
50 dBm					
60 dBm					
60 dBm		-			
70 dBm					

Date: 25.AUG.2020 16:16:38



Ref Leve	el 20.00 dBm 20 dB		23.30 dB 👄 29.7 ms 👄			Auto Swee	n		
1Pk View									
10 dBm	-D1 7.670 dl	Bm				1[1] 2[1]		M1	7.67 dBm 2.48210 GH -35.45 dBm 676.90 MH
0 dBm									
-10 dBm—	D2 -12	2.330 dBm-							
-20 dBm—									
-30 dBm—		M2							
40 dBm	hundrumer	markener	wheathing	fourther stored	en flynneusber	A stan melowith a	monorth	and and the second	mentilienter
-50 dBm—				s					
-60 dBm—									
-70 dBm—									
Start 30.0					pts				Stop 3.0 GHz

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 25.AUG.2020 16:23:27

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

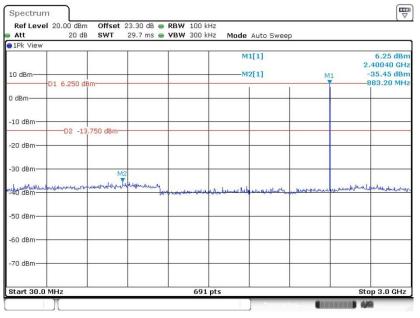
Att	el 20.00 dBm 20 dB		23.30 dB 🖷 230 ms 🖷	VBW 300		Auto Swee	р		
1Pk View		-	~		-				
					N	41[1]			6.57 dBn 2.4830 GH:
dLdBm-					N	12[1]			-32.56 dBn
T	D1 6.570 df	3m			-	1	1	1	6.9430 GH
dBm			-						-
10 dBm—		100 10							
	02 -13	.430 dBm-							
20 dBm—			_						1
		M2							
30 dBm—		X				CONTRACT.		and allow the	a le la
40 dBm	warman	Munin	with with the	manney	superior star	an Jan Alman	* Warner	and a second	- manan
ie dem									
50 dBm—				0	-				
60 dBm—							-		
70 dBm—	-		-						
Start 2.0	GHz			69	1 pts		1	Stop	25.0 GHz

Date: 25.AUG.2020 16:23:57



<2Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 25.AUG.2020 17:05:32

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

Ref Leve Att	el 20.00 dBm 20 dB		23.30 dB 👄 230 ms 👄	RBW 100 k VBW 300 k		Auto Swee	p		
1Pk View		9-58							
₩G dBm	-D1 5.890 d	D m				1[1] 2[1]			5.89 dBm 2.4160 GHz 33.30 dBm 8.2260 GHz
) dBm	-D1 3.890 u	BIII							
-10 dBm		+.110 dBm-							
-20 dBm—									
-30 dBm—						i an	4 <u>2</u>		
40 dBm	whitewith	whenever	waterhow	Uninterest	mandredury	Mranniarra	1 Webberrow	ware ware	and
-50 dBm—									
-60 dBm—									
-70 dBm—									
Start 2.0	GHz			691	nts			Stor	25.0 GHz

Date: 25.AUG.2020 17:06:02



Ref Leve	20.00 dBm	Offset	23.30 dB 👄	RBW 100 k	Hz				(-
Att	20 dB	SWT	29.7 ms 👄	VBW 300 k	Hz Mode	Auto Swee	р		
∋1Pk View									
					M	1[1]			5.45 dBm 2.43910 GHz
10 dBm					M	2[1]			-35.84 dBm
10 0.0111	D1 5.450 dBr	0						M1	642.50 MHz
0 dBm		M.							
o abiii									
-10 dBm									
-10 0011	D2 -14.5	50 dBm-							
-20 dBm		00 abm							
-20 ubm									
-30 dBm									
	P412		_						
multing	monowal	manuna	how when	and course of the	al a human and ha	should what	- providencember	muldwarnes	montheware
-40 0611-			1.	100 C 0. 00 00 00 0					
-50 dBm									
-30 ubiii-									
-60 dBm									
-oo usm									
-70 dBm									
-70 uBM									
Start 30.0	MHz			691	pts			S	top 3.0 GHz

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 25.AUG.2020 17:19:27

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Ref Level : Att		SWT		RBW 100 k VBW 300 k		Auto Swee	p		
1Pk View			~		_				
					M	1[1]			4.63 dBn 2.4490 GH
0 dBm					M	2[1]			-32.71 dBr
	1 4.630 dBm-								8.2930 GH
dBm-	1 4.000 0011								
10 dBm									-
	-D2 -15.37	70 dBm-							
20 dBm									
-30 dBm							12		
40 dBm	ahren manufacture	Les And Ball	Malphontal	munnely	undhundhant	manner	hughnered	normalis	mudelathrubs
40 dBm									1
50 dBm									
60 dBm									
70 dBm									
vo ubin-									
Start 2.0 GH	z			691	pts			Stop	25.0 GHz

Date: 25.AUG.2020 17:19:58



Ref Leve	20.00 dBm	Offset	23.30 dB 👄	RBW 100 k	Hz				
Att	20 dB	SWT	29.7 ms 👄	VBW 300 k	Hz Mode	Auto Swee	р		
1Pk View		2							
					м	1[1]			5.80 dBm 2.48210 GHz
10 dBm					M	M1	-35.20 dBm		
	D1 5.800 dB	im-				I	1		904.70 MHz
0 dBm									
-10 dBm									
	D2 -14	.200 dBm-							
-20 dBm									
-30 dBm		M	12						
you down	Muhammu			us takanal - th	all which and	una abrea	anternational	abour	Muhammun
TO GDIT									
-50 dBm									
-60 dBm				-					
-70 dBm			-						
Start 30.0				601	pts				Stop 3.0 GHz

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 25.AUG.2020 17:17:38

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

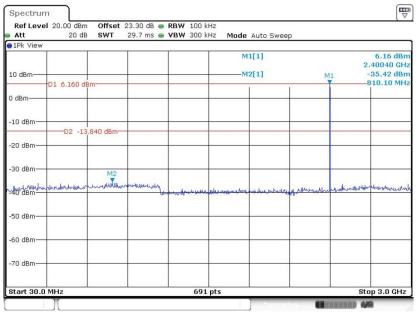
Ref Leve	el 20.00 dBm 20 dB	Offset SWT	23.30 dB 👄 230 ms 👄	RBW 100 k		Auto Swei	en		
1Pk View		0111			ine mode	Auto one	·P		
ւր_dBm—	-D1 5.710 dBr					1[1] 2[1]			5.71 dBn 2.4830 GH -32.94 dBn 6.2960 GH
) dBm	DI 5./10 UB								
-10 dBm—	D2 -14.2	200 dam-							
-20 dBm—	02 -14.2	290 0611							
-30 dBm—						M2			
40 dBm—	u hangerander	horizonda	opulation	www.mby	Monthemander	- war walk	Lerich wether	hubran	an finite of
50 dBm—									
60 dBm—									
-70 dBm—									
Start 2.0					pts				25.0 GHz

Date: 25.AUG.2020 17:18:07



<3Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 25.AUG.2020 17:34:31

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

Ref Level			23.30 dB 🧉				- 10-11		
Att 1Pk View	20 dB	SWT	230 ms 🧉	VBW 300	kHz Mode	Auto Swe	ер		
뷰 dBm	1 4.900 dBm					1[1] 2[1]			4.90 dBm 2.4160 GHz -32.88 dBm 21.5550 GHz
0 dBm	1 4.900 UBII								
-10 dBm		00 10							
-20 dBm		00 aBm—							
-30 dBm								M2	
40 dBm	unindual	likenderde	unreally	entertailerty	her malul har her her her her her her her her her he	on the well of the	an march	wholeshiller	huruhrd
-50 dBm									
-60 dBm									
-70 dBm									
	z				01 pts				p 25.0 GHz

Date: 25.AUG.2020 17:35:01



Ref Level	20.00 dBm	Offset	23.30 dB 👄	RBW 100 k	Hz				
Att	20 dB	SWT		VBW 300 k		Auto Sweep	2		
1Pk View	N9-0		2	10					
10 dBm					M			5.08 dBm 2.43910 GHz -35.97 dBm	
D dBmC	1 5.080 dB	m							857.40 MHz
-10 dBm	D2 -14.	920 dBm-							
-20 dBm									
-30 dBm		M2							
40 dBm	www.mark	rantentente	understrang	Jone Martine and	ang	and a second state	mp-onulane	monorward	unununu
-50 dBm									
-60 dBm									
-70 dBm									
	1Hz				pts				op 3.0 GHz

CSE Plot on Ch 39 between $30MHz \sim 3 GHz$

Date: 25.AUG.2020 17:38:36

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Ref Level 20.0 Att	0 dBm Offset 20 dB SWT	t 23.30 dB 👄 🖡 230 ms 👄 🛚	BW 100 kHz BW 300 kHz		Auto Sweep			
1Pk View			D 11 000 Mile	induc i	ato oncop			
Д dBm-				M1				4.80 dBr 2.4490 GH 33.34 dBr
	800 dBm							3.3600 GH
) dBm-								
10 dBm								
20 dBm	02 -15.200 dBm							
30 dBm						12		
40 dBm	within hours	hundrethen	newwww.uho	unmond	in Manua	Unundown	www.owhander	White
50 dBm								
50 dBm								
70 dBm								
tart 2.0 GHz			691 pt					25.0 GHz

Date: 25.AUG.2020 17:39:06



	el 20.00 dBm		23.30 dB 👄						
Att	20 dB	SWT	29.7 ms 👄	VBW 300 k	Hz Mode	Auto Swee	р		
1Pk View						1[1] 2[1]		M1	5.86 dBm 2.48210 GHz -35.80 dBm
0 dBm	-D1 5.860 dBn	n						Ì	896.10 MHz
-10 dBm—	D2 -14.1	.40 dBm							
-20 dBm—									
-30 dBm	haddenserve	M	- www.						ma shalled and a set
				an and and and	المركحين ومعالي المراجع	hutzes word deter.	Marner	allana	manshalahanangha
-50 dBm—									
-00 dBm									
Start 30.0					pts				Stop 3.0 GHz

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 25.AUG.2020 17:46:17

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Ref Level 20.00 dBm Att 20 dB		B 👄 RBW 100 kHz s 👄 VBW 300 kHz 🛛 Ma	de Auto Sweep	
1Pk View	011 200 11		de Auto Sweep	
μΩdBm ▼ D1 5.120 dB			M1[1] -M2[1]	5.12 dBr 2.4830 GH -33.28 dBr 21.3550 GH
) dBm				
10 dBm	.880 dBm			
20 dBm	.880 UBIII			
30 dBm				M2
40 dBm	Www.mar. Marches	when the week when the	had a second and the second and the second s	when when an a compart
50 dBm				
60 dBm				
70 dBm	-			

Date: 25.AUG.2020 17:47:03



3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency	Field Strength	Measurement Distance	
(MHz)	(microvolts/meter)	(meters)	
0.009 - 0.490	2400/F(kHz)	300	
0.490 – 1.705	24000/F(kHz)	30	
1.705 – 30.0	30	30	
30 - 88	100	3	
88 – 216	150	3	
216 - 960	200	3	
Above 960	500	3	

3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



3.8.3 Test Procedures

- 1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 4. Set to the maximum power setting and enable the EUT transmit continuously.
- 5. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f >1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = N₁*L₁+N₂*L₂+...+N_{n-1}*LN_{n-1}+N_n*L_n Where N₁ is number of type 1 pulses, L₁ is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
- 6. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
- 8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.76dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.