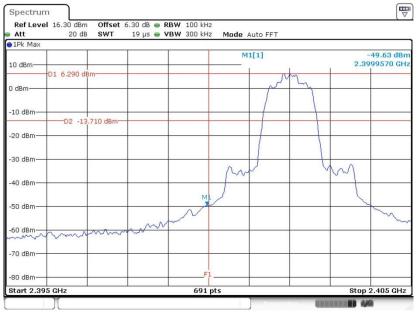


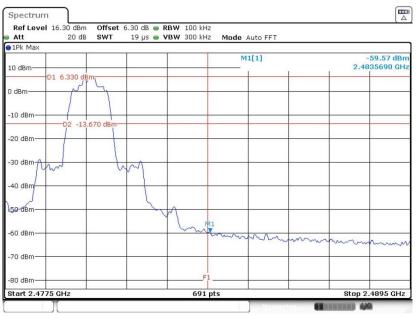
<3Mbps>

Low Band Edge Plot on Channel 00



Date: 4.SEP.2020 20:50:08

High Band Edge Plot on Channel 78



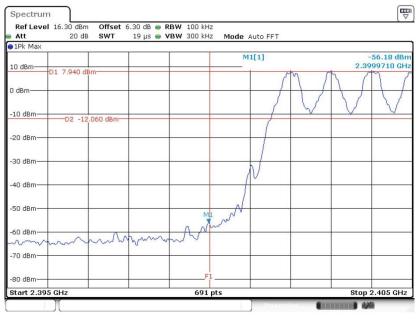
Date: 4.SEP.2020 21:02:53



3.6.6 Test Result of Conducted Hopping Mode Band Edges

<1Mbps>

Hopping Mode Low Band Edge Plot



Date: 4.SEP.2020 19:44:49

Hopping Mode High Band Edge Plot

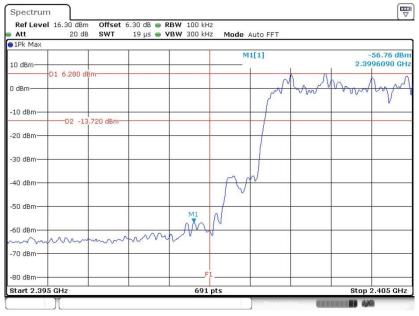


Date: 4.SEP.2020 19:57:13



<2Mbps>

Hopping Mode Low Band Edge Plot



Date: 4.SEP.2020 20:18:10

Hopping Mode High Band Edge Plot

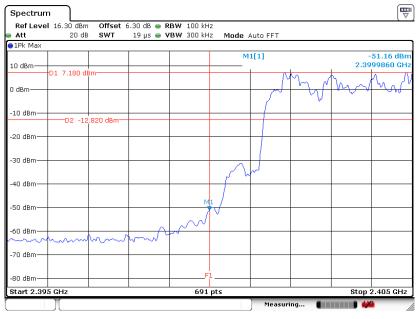


Date: 4.SEP.2020 20:44:51



<3Mbps>

Hopping Mode Low Band Edge Plot



Date: 16.SEP.2020 20:30:37

Hopping Mode High Band Edge Plot



Date: 4.SEP.2020 21:03:23



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.

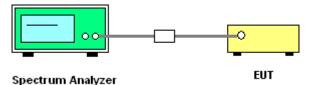
3.7.2 Measuring Instruments

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



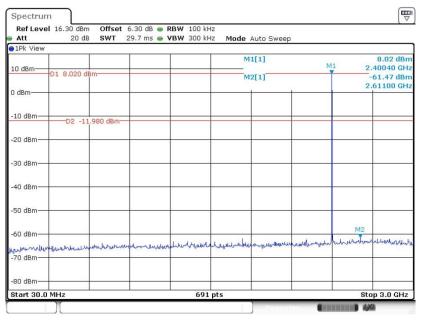
Sporton International (Kunshan) Inc. TEL : +86-512-57900158 FAX : +86-512-57900958 FCC ID: IHDT56ZH1



3.7.5 Test Result of Conducted Spurious Emission

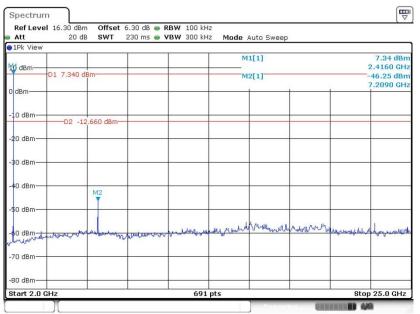
<1Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 4.SEP.2020 19:47:07

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



Date: 4.SEP.2020 19:47:35



Att	el 16.30 dBm 20 dB			RBW 100 kH VBW 300 kH		Auto Sweep)		
1Pk View									
10 dBm						1[1]		M1	7.72 dBn 2.43910 GH:
	D1 7.720 dt	3m-			M	2[1]			-62.02 dBn 2.77430 GH
D dBm									
-10 dBm—	D2 -12	.280 dBm-						_	
-20 dBm—		64							-
-30 dBm									
-40 dBm—									
-50 dBm—									
-60 dBm—	-		11	·					M2
70 dBm-	n your work	prouverland	ondiannametry	incompany	punither	maghenedroperand	enounder	A water was	www.udwew
80 dBm—									

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

Date: 4.SEP.2020 21:14:43

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

	0 dB SWT 23	80 ms 🥌 VBW 3	300 kHz Mode	Auto Sweep		
1Pk View						
dBm			n	41[1]		7.44 dBi 2.4490 GH
D1 7.44	40 dBm		N	42[1]		-50.09 dBi
dBm-				1		7.3090 GH
Jubin						
10 dBm						
D2	-12.560 dBm					
20 dBm-						
30 dBm						
40 dBm						
	M2					
50 dBm	- T					
			mundran	allaha she	. In such as	and the second
60 dBm	washall the way	www.parter parts both	- and the second	a h and have be	New & Manny	www.thereader
70 dBm						
80 dBm		-				

Date: 4.SEP.2020 21:15:12



Ref Leve Att	el 16.30 dBm 20 dB	Offset SWT	6.30 dB 👄 29.7 ms 👄			le Auto Sweer	1		
1Pk View									
10 dBm	D1 8.860 dB	m 				M1[1]			8.86 dBn .48210 GH
) dBm					_	M2[1]	1 1		-61.39 dBn .73140 GH:
-10 dBm—	D2 -11.	140 dBm-			_				
20 dBm—					_				
30 dBm—					_				
40 dBm—						_			
50 dBm—					_	_	-	_	
-60 dBm—								La Lander ma	M2
or dBm—	Hunnerschutze	inguilheren	holman	whitelenant	untwikture	mounteren	Marine		
80 dBm—									

CSE Plot on Ch 78 between $30MHz \sim 3 GHz$

Date: 4.SEP.2020 20:01:50

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Ref Level 16 Att	20 dB SWT	6.30 dB 👄 R 230 ms 👄 V			Auto Sweep			
1Pk View	2010			~				
				м	1[1]			8.55 dBr 2.4830 GH
D1	8.550 dBm			M	2[1]			51.60 dBr
dBm-							, j	7.4420 GH
10 dBm								
	-D2 -11.450 dBm-							
20 dBm-		_						
30 dBm			-					
40 dBm		-						
	M2							
50 dBm	The second se							
			h . Para a	H.H. hola bar	Munimuch	morrowbell	unodypalade	Halleli maded
CO dBm	med for a when when when when when when when when	with man and the althe	n n n n n n n n n n n n n n n n n n n				the state of the	A. 0.0. A. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
70 dBm			a					
/ C GDIII								
80 dBm								
Start 2.0 GHz			691				Otan	25.0 GHz

Date: 4.SEP.2020 20:13:31



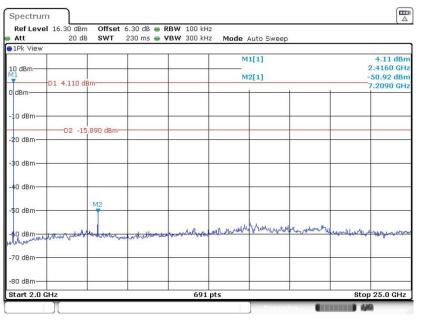
<2Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz

Att 1Pk View	20 dB	SWT	29.7 ms 📟	VBW 300 kH	12 Mode	Auto Sweep			
10 dBm-					M	1[1]		2	4.86 dBn 40040 GH;
10 UBIII-	-D1 4.860 dB				M	2[1]	MI	1	61.97 dBn
0 dBm	TUI 4.860 de	sm		-				2.	92910 GH:
-10 dBm—									
-20 dBm	D2 -15	.140 dBm-							
-30 dBm		-							
-40 dBm									
-50 dBm									
-60 dBm								1.04 to day to	M2
տահերություն -70 dBm—	John Markand	versailelides	nannuable	hundred	duidentheme	d-horan state	ounderter	manhronghair	monterrally

Date: 4.SEP.2020 21:16:38

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 4.SEP.2020 21:17:08



Att	20 dB	SWT	29.7 ms 🕳 🛚	/BW 300 kH	z Mode	Auto Sweep			
∋1Pk View	,		-						
10 dBm	-D1 6.150 dl	300				1[1] 2[1]	M	2.4	6.15 dBm 3910 GHz
0 dBm	01 0.130 0								i9700 GHz
-10 dBm—	D2 -13	.850 dBm-							
-20 dBm—			-						
-30 dBm—	-								
-40 dBm—									
-50 dBm—									
-60 dBm—	-		- Ann ar		contract II server.			M2	dehand of the second
տուսակա -70 dBm—	wheel and a second s	hollinghili	www.www.	und Marillanta	and a construction of the	uninground	environment		. Aanta
-80 dBm—									

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 4.SEP.2020 20:42:13

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

) dB SWT 230	ms 🥌 VBW 300 kH	z Mode Auto Swee	р	
1Pk View			M1[1]		6.24 dBr
A dBm			10111		2.4490 GF
D1 6.24	0 dBm		M2[1]	25.71 25.	19.5910 GH
dBm					
10 dBm					
	-13.760 dBm				
20 dBm					
30 dBm					
0 dBm	_				
50 dBm				M2	
			add an and reason	4 hours and all and	
O dBm	of the market white we have	how we want the stand the stand the stand and the stand an		N LOND CO COMPLEMENT	and a star and a star and a star a
70 dBm					
30 dBm					
start 2.0 GHz		691	pts		Stop 25.0 GHz

Date: 4.SEP.2020 20:42:46



Att 1Pk View	20 dB	SWT	29.7 ms 🖷 🛚	DH 300 Ki	moue	Auto Sweep			
					М	1[1]			5.64 dBm
10 dBm	D1 5.640 d	3m			M	2[1]		M1	2.47780 GHz 61.72 dBm
0 dBm	-							-	2.67120 GHz
-10 dBm—									
-20 dBm—	D2 -14	.360 dBm-							
-30 dBm									
-40 dBm—									
-50 dBm—		~							
-60 dBm—	-								M2
70 dBm-	holementer	where where	mohahabadenda	enertherether	druber in robbi	have and	-unall-ladester	-white lighter	workershered

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 4.SEP.2020 21:18:14

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Att	16.30 dBm 20 dB	SWT	6.30 dB 👄 🖡 230 ms 👄 🚺			Auto Sweep			
1Pk View									
					M	1[1]			5.23 dBn 2.4830 GH:
10 dBm	D1 5.230 dB				M	2[1]			-53.32 dBn
D dBm	TD1 5.230 UB	ur.							7.4420 GH
-10 dBm									
-20 dBm	D2 -14.	770 dBm-							
20 UBIII-									
-30 dBm									
-40 dBm									
S0 dBm—		M2							
€0 dBm	www.owwww	Munu	Munder	e un analytic	manne	Whather was	rankhar	Manuallie	and the states
Uniteritation									
-70 dBm									
-80 dBm									
Start 2.0	GHz			691	pts		1	Stop	25.0 GHz

Date: 4.SEP.2020 21:18:44



<3Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz

Att 1Pk View	20 dB	SWT	29.7 113	VBW 300 kł	12 Moue	Auto Sweep			
10 dBm						1[1]	M		4.83 dBn .40040 GH:
	D1 4.830 de	3m			M	2[1]			61.76 dBn 83880 GH;
D dBm						1		2	.03000 GH2
-10 dBm									
-20 dBm		.170 dBm—							
-30 dBm									
-40 dBm									
100000000									
-50 dBm									
-60 dBm			. (k)		the states of A	Junillycourt	Naudarthana	heledenteril	M2 multim
70 dBm	when which which and	and the second of the second o	and a second	tam	and software of a				
-80 dBm									

Date: 4.SEP.2020 21:21:14

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

Ref Level 16.30 0 Att 20		IB 👄 RBW 100 kH Is 👄 VBW 300 kH		5	
1Pk View					
			M1[1]		4.45 dBn 2.4160 GH
l0 dBm			M2[1]		-55.76 dBn
D1 4.45	0 dBm		1	1 1	15.7970 GH:
10 dBm				-	
20 dBm	-15.550 dBm				
30 dBm					
40 dBm					
50 dBm			M2		
60 d8m	mand it is	un an dullater	and your mary	h dynam war	Shadmour & s. S. d
60 dBm	and a gentle way was	where a construction of	V V		0.000
70 dBm					
80 dBm					
Start 2.0 GHz		691	pts		Stop 25.0 GHz

Date: 4.SEP.2020 21:21:43



Ref Lev	el 16.30 dBm 20 dB	Offset SWT	6.30 dB 👄 🖡 29.7 ms 👄 V			Auto Sweep			
1Pk View									
10 dBm	D1 6.230 dB	-				1[1] 2[1]	MI		6.23 dBn 43910 GH: 61.93 dBn
) dBm	101 0.230 00						1		64970 GH
-10 dBm—	D2 -13	770 dBm-							
20 dBm—	02 -13	770 dbm							
-30 dBm—									
40 dBm—									
50 dBm—									
60 dBm—					S	1		M2	Kitzunda
لیساسر 70 dBm—	a have been able and	mandelementel	her when the second	Hurund	i jin ya dala	un u	unimerational		01 w U
80 dBm—									

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 4.SEP.2020 21:00:11

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Att	l 16.30 dBm 20 dB		6.30 dB 👄 🖡 230 ms 👄 🕅			Auto Sweep			
1Pk View			2						
					M	1[1]			5.58 dBn
1Ω dBm	D1 5.580 df	2			M	2[1]			2.4490 GH -53.51 dBr
D dBm	DI 5.580 di	SIT					8		7.3090 GH
Jasm-									
-10 dBm									
	D2 -14	.420 dBm-							
-20 dBm									
-30 dBm			-	-		-			-
-40 dBm									
-50 dBm		M2							
			Manutacture	and a	the summer	marines	nus northered	di tra	
40 dBm	hourset	- and half the former	Minhoutanthere	the stand and the state	Wells, Place			Welf Description of the	and the second of the second of the second sec
-70 dBm									
-70 u8m-									
-80 dBm									
Start 2.0 (691					p 25.0 GHz

Date: 4.SEP.2020 21:00:44



Att	el 16.30 dBm 20 dB		29.7 ms 👄	VBW 300 kH	z Mode	Auto Sweep			
1Pk View	·				-				
10 dBm	D1 6.210 df	3				1[1] 2[1]		M1	6.21 dBn 2.47780 GH:
) dBm	DI 0.210 u	5111							2.74000 GH
-10 dBm—	02 12	.790 dBm-							
20 dBm—	02 -13	.790 ubm							
-30 dBm—	1	2					-		
40 dBm—									
50 dBm—									
-60 dBm—							al a st	wa Unde	M2
70 dBm—	anthonistrafidmente	helmonthean	helperned formed	hunder	hand the short	united at the second	a and a grand of the	4.0	manutur
-80 dBm—									

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 4.SEP.2020 21:06:01

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Att	20 dB	SWT	230 ms 👄	VBW 300 kH	z Mode	Auto Sweep)		
1Pk View				1	1				
0 dBm					M	1[1]			5.12 dB
Tabin	D1 5.120 de	3m	_		M	2[1]			54.51 dB
dBm						1		1.	5.8300 GF
10 dBm—									
	D2 -14	.880 dBm—							
0 dBm—		14							
0 dBm—		-							
0 dBm—									
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				and Martin	and in mapping	hranderesper	at another the	والمراجعة والمراجع	A. BI Law And How they
U dBm	herentwood	white has a ferr	Muturbursh	hand a mare				Profession and the second	and free and a second second
70 dBm—									
30 dBm—									
tart 2.0	GHz			691	pts			Stor	25.0 GHz

Date: 4.SEP.2020 21:06:29



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

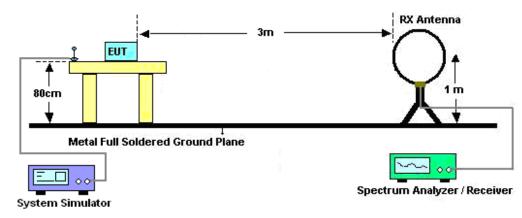
- 1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3. For each suspected 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 average 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.

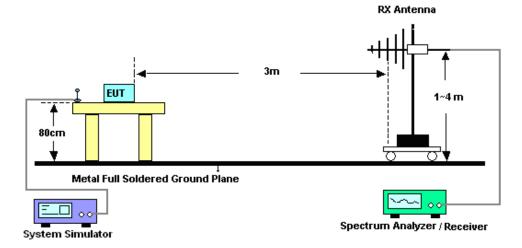


3.8.4 Test Setup

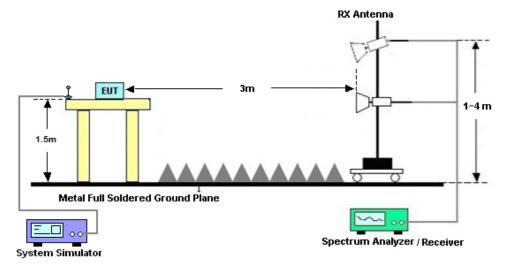
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.8.7 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix D.



3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted	limit (dBµV)
Frequency of emission (MHZ)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.9.2 Measuring Instruments

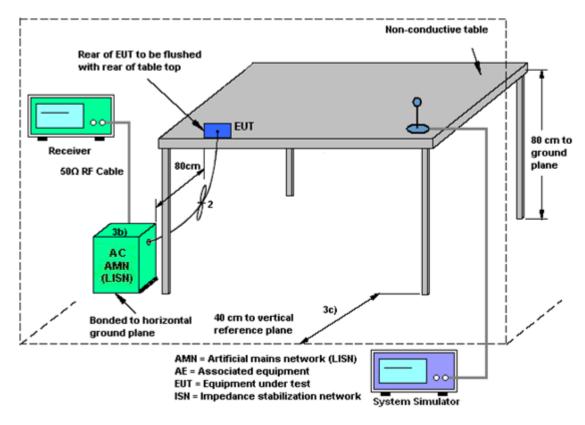
The measuring equipment is listed in the section 4 of this test report.

3.9.3 Test Procedures

- 1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- 6. Both sides of AC line were checked for maximum conducted interference.
- 7. The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.



3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.10 Antenna Requirements

3.10.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Nov. 02, 2019	Aug. 26, 2020~ Sep. 16, 2020	Nov. 01, 2020	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GH z	Jan. 15, 2020	Aug. 26, 2020~ Sep. 16, 2020	Jan. 14, 2021	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 08, 2020	Aug. 26, 2020~ Sep. 16, 2020	Jan. 07, 2021	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY572901 51	3Hz~8.5GHz;M ax 30dBm	Jul. 17, 2020	Sep. 15, 2020	Jul. 16, 2021	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz-44G,MAX 30dB	Apr. 15, 2020	Sep. 15, 2020	Apr. 14, 2021	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 10, 2019	Sep. 15, 2020	Nov. 09, 2020	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jun. 08, 2020	Sep. 15, 2020	Jun. 07, 2021	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 26, 2020	Sep. 15, 2020	Apr. 25, 2021	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2019	Sep. 15, 2020	Nov. 09, 2020	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Apr. 14, 2020	Sep. 15, 2020	Apr. 13, 2021	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 08, 2020	Sep. 15, 2020	Jan. 07, 2021	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2012228	1Ghz-18Ghz	Oct. 18, 2019	Sep. 15, 2020	Oct. 17, 2020	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY532703 16	500MHz~26.5G Hz	Oct. 18, 2019	Sep. 15, 2020	Oct. 17, 2020	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Sep. 15, 2020	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Sep. 15, 2020	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Sep. 15, 2020	NCR	Radiation (03CH05-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 14, 2020	Aug. 18, 2020	Apr. 13, 2021	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 18, 2019	Aug. 18, 2020	Oct. 17, 2020	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Oct. 28, 2019	Aug. 18, 2020	Oct. 27, 2020	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 18, 2019	Aug. 18, 2020	Oct. 17, 2020	Conduction (CO01-KS)

NCR: No Calibration Required



5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	2.94dB
of 95% (U = 2Uc(y))	2.94uB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	5.0dB
of 95% (U = 2Uc(y))	5.00B

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence	5.0dB
of 95% (U = 2Uc(y))	3.00B

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence	5.0dB
of 95% (U = 2Uc(y))	3.00B



Appendix A. Conducted Test Results

Report Number : FR073102A

Bluetooth

Test Engineer:	Albert Shi	Temperature:	21~24	°C
Test Date:	2020/8/26~2020/9/16	Relative Humidity:	45~51	%

	<u>TEST RESULTS DATA</u> 20dB and 99% Occupied Bandwidth and Hopping Channel Separation								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.929	0.848	998.600	0.6194	Pass
DH	1Mbps	1	39	2441	0.929	0.851	989.900	0.6194	Pass
DH	1Mbps	1	78	2480	0.923	0.848	998.600	0.6155	Pass
2DH	2Mbps	1	0	2402	1.242	1.164	998.600	0.8278	Pass
2DH	2Mbps	1	39	2441	1.246	1.164	998.600	0.8307	Pass
2DH	2Mbps	1	78	2480	1.242	1.166	1002.900	0.8278	Pass
3DH	3Mbps	1	0	2402	1.211	1.149	1002.900	0.8075	Pass
3DH	3Mbps	1	39	2441	1.211	1.149	963.800	0.8075	Pass
3DH	3Mbps	1	78	2480	1.216	1.149	1002.900	0.8104	Pass

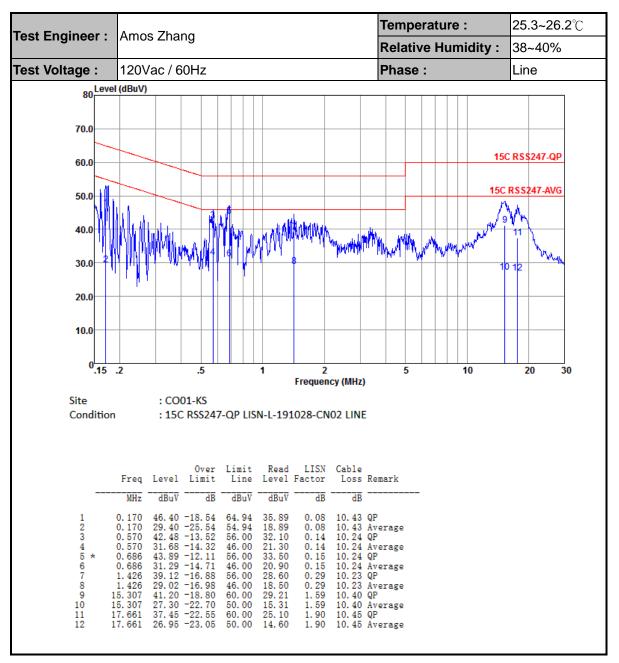
			<u>TE</u> \$	ST RESULTS Dwell Time		
Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec) (MHz)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Nomal	79	106.67	2.8957	0.31	0.4	Pass
AFH	20	53.33	2.8957	0.15	0.4	Pass

					<u>ST RESUL</u> Peak Powe
DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
	0	1	8.36	20.97	Pass
DH1	39	1	9.32	20.97	Pass
5	78	1	9.21	20.97	Pass
		<u> </u>	-		
2DH	CH.	NTX	Peak Power	Power Limit	Test
2011	Сп.		(dBm)	(dBm)	Result
	0	1	7.93	20.97	Pass
2DH1	39	1	8.60	20.97	Pass
	78	1	8.71	20.97	Pass
				-	
3DH	CH.	NTX	Peak Power	Power Limit	Test
UDIT	OH.		(dBm)	(dBm)	Result
	0	1	8.07	20.97	Pass
3DH1	39	1	8.98	20.97	Pass
	78	1	8.94	20.97	Pass

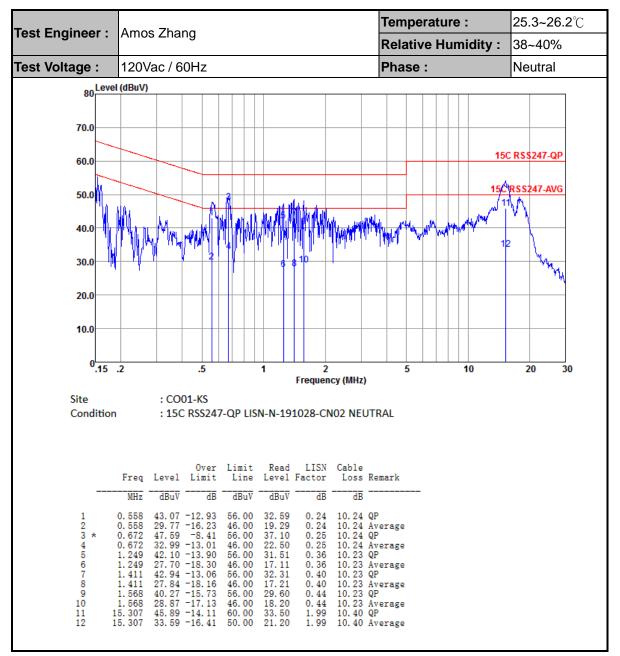
		<u>TEST RES</u> Number of Ho	SULTS DA	
Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail	
79	79	> 15	Pass	



Appendix B. AC Conducted Emission Test Results







Note:

- 1. Level(dBµV) = Read Level(dBµV) + LISN Factor(dB) + Cable Loss(dB)
- 2. Over Limit(dB) = Level(dBµV) Limit Line(dBµV)



Appendix C. Radiated Spurious Emission

2.4GHz	2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2366.55	54.82	-19.18	74	47.86	31.18	7.44	31.66	100	242	Ρ	Н
	*	2366.55	30.06	-23.94	54	-	-	-	-	-	-	А	Н
DT	*	2402	102.36	-	-	95.31	31.2	7.5	31.65	100	242	Ρ	Н
BT CH00		2402	77.60	-	-	-	-	-	-	-	-	А	Н
2402MHz		2312.34	55.4	-18.6	74	48.57	31.15	7.36	31.68	312	8	Ρ	V
240210112	*	2312.34	30.64	-23.36	54	-	-	-	-	-	-	А	V
	*	2402	98.87	-	-	91.82	31.2	7.5	31.65	312	8	Р	V
		2402	74.11	-	-	-	-	-	-	-	-	А	V
	*	2491.48	55.41	-18.59	74	47.43	31.89	7.67	31.58	100	76	Р	Η
		2491.48	30.65	-23.35	54	-	-	-	-	-	-	А	Η
		2480	101.86	-	-	94.03	31.77	7.64	31.58	100	76	Р	Η
BT		2480	77.10	-	-	-	-	-	-	-	-	А	Н
CH 78 2480MHz	*	2487.88	55.56	-18.44	74	47.58	31.89	7.67	31.58	363	357	Р	V
240010172		2487.88	30.80	-23.20	54	-	-	-	-	-	-	А	V
		2480	98.58	-	-	90.75	31.77	7.64	31.58	363	357	Р	V
		2480	73.82	-	-	-	-	-	-	-	-	А	V
Remark		o other spurio I results are F		st Peak	and Averag	je limit lin	е.						



_				I	BT (Harmo	onic @ 3	Sm)						_
ВТ	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos		Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT		4801.5	37.92	-36.08	74	53.48	33.7	10.78	60.04	150	360	Р	н
CH 00 2402MHz		4801.5	38.45	-35.55	74	54.01	33.7	10.78	60.04	150	360	Р	V
		4884	40.06	-33.94	74	55.45	33.77	10.87	60.03	100	360	Р	н
ВТ СН 39		7320	42.31	-31.69	74	53.54	35.89	13.4	60.52	100	360	Ρ	Н
СП 39 2441MHz		4884	41.14	-32.86	74	56.53	33.77	10.87	60.03	100	360	Ρ	V
244110112		7320	42.63	-31.37	74	53.86	35.89	13.4	60.52	100	360	Ρ	V
57		4962	39.21	-34.79	74	54.39	33.85	10.98	60.01	150	360	Ρ	Н
BT		7440	41.9	-32.1	74	52.82	36.11	13.51	60.54	150	360	Ρ	н
CH 78 2480MHz		4962	39.02	-34.98	74	54.2	33.85	10.98	60.01	150	360	Ρ	V
2400141112		7440	41.12	-32.88	74	52.04	36.11	13.51	60.54	150	360	Ρ	V
Remark		o other spurio I results are P		st Peak	and Averag	e limit lin	e.						

2.4GHz 2400~2483.5MHz



Emission below 1GHz

2.4GHz BT (LF)

ВТ	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		30.97	18.66	-21.34	40	26.11	24.57	1.26	33.28	-	-	Р	н
		95.96	20.44	-23.06	43.5	35.67	15.58	2.21	33.02	-	-	Р	Н
		152.22	22.16	-21.34	43.5	35.6	16.98	2.78	33.2	-	-	Р	Н
		276.38	28.31	-17.69	46	38.44	19.27	3.75	33.15	-	-	Р	Н
0.4011-		868.08	28.52	-17.48	46	24.83	29.23	6.62	32.16	100	0	Р	Н
2.4GHz BT		972.84	29.48	-24.52	54	23.71	30.82	7	32.05	-	-	Р	Н
LF		30.97	23.54	-16.46	40	30.99	24.57	1.26	33.28	-	-	Р	V
		52.31	25.26	-14.74	40	42.89	13.9	1.63	33.16	100	0	Р	V
		95.96	19.66	-23.84	43.5	34.89	15.58	2.21	33.02	-	-	Р	V
		273.47	20.83	-25.17	46	30.78	19.47	3.73	33.15	-	-	Р	V
		861.29	27.91	-18.09	46	24.25	29.25	6.59	32.18	-	-	Р	V
		967.02	29.03	-24.97	54	23.22	30.86	6.98	32.03	-	-	Р	V
	1. No	o other spurio	us found.										
Remark		l results are P		st limit li	ne.								



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any
	unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	Р	н
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	А	Н

1. Level(dBµV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBµV/m) – Limit Line(dBµV/m)

For Peak Limit @ 2390MHz:

1. Level(dBµV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

- = 32.22(dB/m) + 4.58(dB) + 54.51(dBµV) 35.86 (dB)
- = 55.45 (dBµV/m)
- 2. Over Limit(dB)
- = Level(dBµV/m) Limit Line(dBµV/m)
- $= 55.45(dB\mu V/m) 74(dB\mu V/m)$
- = -18.55(dB)

For Average Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- = 32.22(dB/m) + 4.58(dB) + 42.6(dBµV) 35.86 (dB)
- = 43.54 (dBµV/m)
- 2. Over Limit(dB)
- = Level(dBµV/m) Limit Line(dBµV/m)
- $= 43.54(dB\mu V/m) 54(dB\mu V/m)$
- = -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".

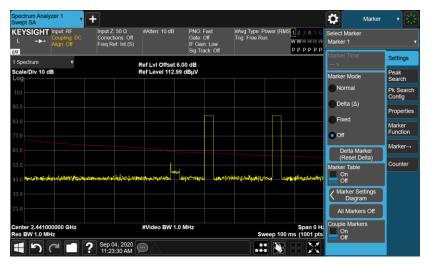


Appendix D. Duty Cycle Plots

A			
dB Δ BμV	Mkr3 3.750 ms -0.02 dB	Marker ∆ Time 3.75000 ms	Settings Peak
ври	-0.02 00	Marker Mode	Peak Search
3Δ1		Normal	Pk Searc Config
		 Delta (Δ) 	Properti
	www.grolapar	Fixed Off	Marker Functio
		Delta Marker	Marker-
			Counter
		On Off	
Function Function Width	Function Value	Marker Settings	
		All Markers Off	
		Couple Markers On	
	Hz Swe	Нz	All Marker Soft Punction Function Function

DH5 on time (One Pulse) Plot on Channel 00

DH5 on time (Count Pulses) Plot on Channel 00



Note:

- 1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
- 2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
- 3. DH5 has the highest duty cycle worst case and is reported.