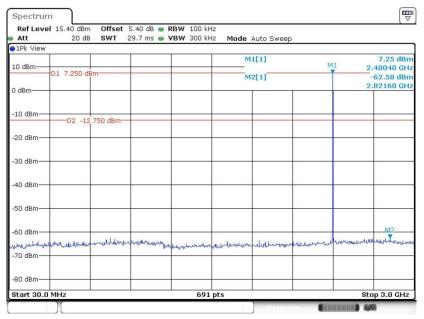


3.7.5 Test Result of Conducted Spurious Emission

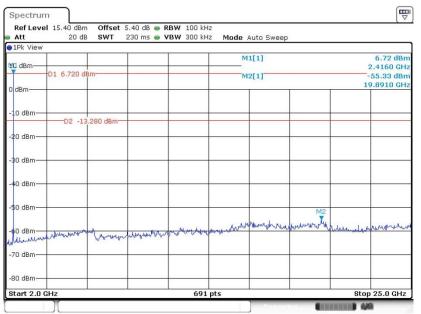
<1Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 26.MAY.2020 07:01:24

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



Date: 26.MAY.2020 07:01:53



Ref Level 15.40 dB Att 20 d			Auto Sweep	
1Pk View				
10 dBm			M1[1]	M1 7.83 dBn 2.43910 GH
D1 7.830	dBm		M2[1]	-62.41 dBn
D dBm				1.15400 GH
-10 dBm	12.170 dBm			
-20 dBm	12.170 UBII			
-30 dBm				
-40 dBm				
-50 dBm				
-60 dBm		12		
	al and more than the second	heaven work where the	mullimmedulement	ward becauted and a second
-70 dBm				
-80 dBm				
-80 dBm		691 pts		Stop 3

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 26.MAY.2020 07:14:48

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Att	20 dB	SWT	230 ms 👄	VBW 300 kH	z Mode	Auto Sweep			
1Pk View	T		Ĩ	T		1[1]			7.75 dB
dBm-	01 7.750 dBn				IM	util			2.4490 GH
L. L.	JI 7.750 UBI				M	12[1]			55.52 dB
dBm								1	9.8240 GH
10 dBm	D2 -12.2	50 dBm-		_					
20 dBm									
0 dBm									
0 dBm				-					
i0 dBm							M2		
O dBm	uphrestration	trunto	mound	mat and the second	working the development	durin welling	mound	Lasodudus	mon
O dBm									
30 dBm				-					
tart 2.0 Gl	17			691	nts			Stor	25.0 GH

Date: 26.MAY.2020 07:15:16



Att	20 de	SWT	29.7 ms 👄	VBW 300 kH	iz Mode A	uto Sweep				
●1Pk View		-								
10 dBm					M1	[1]		6.63 dBr M1 2.48210 GH		
	D1 6.630 d	8m-			M2	[1]		T	-62.62 dBn	
0 dBm			_					_	2.63250 GHz	
-10 dBm										
	D2 -13	3.370 dBm-								
-20 dBm—										
-30 dBm	-	1 m								
-40 dBm—										
-50 dBm										
									M2	
-60 dBm-		S.L. State	dle and east as	and the second	and the second second			1	utrourourous a	
-70 dBm-	an and the second	and an	Manuscharabier and	havenunged	to have been and well	unnumbered	entrustrustrust	1	a	
-/o u8m—										
-80 dBm										
-oo ubiii										

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 26.MAY.2020 07:16:11

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Att 1Pk View	20 de	SWT	230 IIIS 🖷	VBW 300 kH	12 Moue	Auto Sweep	6		
10 dBm-					N	11[1]			5.89 dBi
V ubin	D1 5.890 d	Bm			N	12[1]			2.4830 GF -55.60 dB
) dBm	D1 0.070 G					12[1]			3.7190 GH
10 dBm-	-								<u> </u>
	D2 -14	1.110 dBm-							
20 dBm—									
30 dBm				-					
40 dBm—				<u>.</u>					
50 dBm—									M2
60 dBm—	ulportallitution	w	Mahan	www.www.ww	mount	mumority	uhanahitte	Advision	hundren
whenter	ullance and	manul							
70 dBm—									
80 dBm									
start 2.0	CH7			691	pts			Sto	p 25.0 GHz

Date: 26.MAY.2020 07:16:38



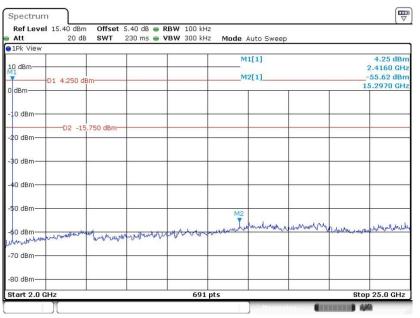
<2Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz

Att 1Pk View	20 di	SWT	29.7 ms 👄	VBW 300 K	HZ Mode	Auto Sweep				
10 dBm-						1[1]	м	5.43 dBn 41 2.40040 GH		
D dBm	D1 5.430 dBm				M2[1]				62.45 dBm 91.80 MHz	
-10 dBm										
-20 dBm	D2 -14	4.570 dBm-								
-30 dBm				0						
-40 dBm										
-50 dBm										
-60 dBm		M	-					Lanne, Jul	htere Olympic Large	
-70 dBm-	Helevennum	Hanna and a start of the second	ana ang ang ang ang ang ang ang ang ang	- the house	krollennen	waynalesta	maplehilder	MAN AND W-	aller aller aller	
-80 dBm										

Date: 26.MAY.2020 07:35:19

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 26.MAY.2020 07:35:47



Att	l 15.40 dBm 20 dB		29.7 ms -	RBW 100 kH /BW 300 kH		Auto Sweep			
1Pk View									
10 dBm	dBm			M1[1] M2[1]			N		6.00 dBn 43910 GH: 61.56 dBn
D dBm	DI 6.000 u	500			IM.	2[1]			64110 GH:
-10 dBm		000 10-							
-20 dBm	D2 -14	.000 dBm-							
-30 dBm	-								
-40 dBm									
-50 dBm									
-60 dBm								M2	
70 dBm—	whenter	hinganight	makener	nonormalized	lawormandeh	halphalar	mental	rundunununun	monandrahand
80 dBm									

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 26.MAY.2020 07:32:06

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Att	20 dB	SWT	230 ms 🥌	VBW 300 kH	z Mode	Auto Sweep			
1Pk View	1			1	M	1[1]			6.18 dBr
adBm			_	-					2.4490 GH
	D1 6.180 d	3m			M	2[1]			-55.58 dBi 9.8570 GF
) dBm								-	5.0070 G
10 dBm—									
	D2 -13	.820 dBm-							-
20 dBm—									
30 dBm—				0					
40 dBm—									
50 dBm							M2		
					Jul .	he white to a			me protingene
60 dBm-	moundation	Munhows	MUMMAN	physican	they departed to		0.001 0.00	4 Mar march	anal and
70 dBm-									
, o abiii									
80 dBm									
Start 2.0	GH7			691	pts			Stor	25.0 GHz

Date: 26.MAY.2020 07:32:33



●1Pk View						Auto Swee			
10 dBm—				M1[1]				4.89 dBm 2.47780 GHz	
0 dBm	D1 4.890 dE	3m			M	2[1]			-62.59 dBm 969.10 MHz
-10 dBm—									
-20 dBm—	D2 -15	.110 dBm-					-		
-30 dBm—		2		6					
-40 dBm—		2							
-50 dBm—					-				
-60 dBm—		and between	M2						nermucharthunger
-70 dBm—	an anthrough the		our premi	whenter	trheline water the	aununun an an	and same and		
								_	

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 26.MAY.2020 07:17:54

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Att	el 15.40 dBm 20 dB	SWT		RBW 100 k VBW 300 k		Auto Sweep			
1Pk View			~						
LO dBm—					N	11[1]			3.85 dBn 2.4830 GH
11					N	12[1]			-53.98 dBr
dBm	D1 3.850 dBr	n						1	9.9050 GH
10 dBm—									_
	D2 -16.3	150 dBm-							
20 dBm—		200 0011				-		-	-
30 dBm—				6	-		-		
40 dBm—									-
			10.07						
50 dBm—			M2						
			in the second seco	R all line in	4 Northarth	underwaren and	erement	Hickenburgen	" nutrather
Junion	renerverenter	Comments	unantities	when a man	and the second				
70 dBm—									
80 dBm—									_
tart 2.0				60	1 pts			01.0	p 25.0 GHz

Date: 26.MAY.2020 07:18:22



<3Mbps>

CSE Plot on Ch 00 between 30MHz ~ 3 GHz

Att 1Pk View	20 dE	SWT	29.7 1113	VBW 300 kH	iz Moue	Auto Sweep				
10 dBm-						11[1]	N	5.47 dBr /1 2.40040 GH		
0 dBm	D1 5.470 dBm				-191	12[1]			-61.79 dBn .81300 GH:	
-10 dBm—										
-20 dBm—	D2 -14	+.530 dBm-								
-30 dBm		~								
-40 dBm—									-	
-50 dBm—										
-60 dBm								1.4.0	M2	
-70 dBm-	ullanunn	1 martine	hurrand	mound	menuphana	white	wheentheter	Margan	hour work as	
-80 dBm										
Start 30.0	MHz			691	nts			Stu	op 3.0 GHz	

Date: 26.MAY.2020 07:38:55

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

Att	20 dB S	WT 230	ms 🥌 VI	BW 300 kH	z Mode	Auto Sweep	i -			
1Pk View										
Q dBm					M	1[1]		5.24 dB 2.4160 Gł		
	1 5.240 dBm-				M2[1]				-55.61 dBn	
dBm-							1	1	5.7630 GH	
0 dBm		10				-				
20 dBm	D2 -14.760	aBm								
30 dBm							-			
40 dBm									-	
50 dBm					N	10				
50 dBm	ntraturation	man	wyuhn	w wowar	monumentalion	an war ward	and a second second second second	Hunshmunkerl	million	
70 dBm										
30 dBm										
tart 2.0 GH	_			601	pts			Otar	25.0 GHz	

Date: 26.MAY.2020 07:39:21



Att	20 dE	SWT	29.7 ms 👄		e moue	Auto Sweep			
10 dBm-					M	1[1]		M1 2	5.92 dBm
	D1 5.920 d	Bm	_		M	2[1]			62.52 dBm
0 dBm								2	.64970 GHz
-10 dBm								_	
-20 dBm	D2 -14	1.080 dBm-						_	
-30 dBm				C					
-40 dBm						-			
-50 dBm			-						
-60 dBm								M2	
1	athrewetherten	allowelles and all	when when he was	ui	ullunder	hammak	nementer	harpunnt	Hudershyun
70 dBm—			U*						
-80 dBm									
	MHz			691					p 3.0 GHz

CSE Plot on Ch 39 between 30MHz ~ 3 GHz

Date: 26.MAY.2020 07:47:21

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

Att	20 dB	SWT	230 ms 🥃	VBW 300 kH	IZ Mode	Auto Sweep	Ú.		
1Pk View	1		1	1	M	11[1]			6.17 dBr
dBm-									2.4490 GH
	D1 6.170 dB	m			M	12[1]			55.34 dB
dBm								1	9.9240 GH
10 dBm			_						
		830 dBm-		-					1
20 dBm									
30 dBm									
40 dBm									
50 dBm							M2		
						As real As a real	X.		1.1.1.10
60 dBm	Karahanna	n unhanal	unturn	and the second	and a strather we	in marth and M	There a al	Mark Maria And	nh narwan
		C Q i i oq							
70 dBm									
80 dBm				-					
Start 2.0 GI	47			601	pts			Stor	25.0 GHz

Date: 26.MAY.2020 07:46:43



Att 1Pk View	20 dB	SWT	29.7 ms 👄	VBW 300 KH	Iz Mode Auto S	Sweep		
91PK VIEW	1		Ĩ	<u> </u>	M1[1]			4.97 dBm
10 dBm—		-					M1	2.47780 GHz
	D1 4.970 dt	3m			M2[1]_		- T	61.99 dBm
0 dBm			-				_	2.71420 GHz
-10 dBm—								
	D2 -15	.030 dBm-						
-20 dBm—								
(e-1)-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1								
-30 dBm—								_
-40 dBm—		8						
-40 UBIII-								
-50 dBm—								
00 0011								
-60 dBm								N12
lass we rate	in hour morelles	ahardellor mar	ullisturiently	ushinghan	mmulliner	henopporcelinstel	maller	wenthourseles
-70 dBm—		-						
-80 dBm		2		2			-	

CSE Plot on Ch 78 between 30MHz ~ 3 GHz

Date: 26.MAY.2020 07:41:50

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

Att	20 dB	SWT	230 ms 👄	VBW 300 kH	lz Mode	Auto Sweep			
1Pk View									
LO dBm					M	1[1]			4.02 dBr 2.4830 GH
/1 T	D1 4.020 df	200			M	2[1]			-55.11 dB
dBm—	D1 4.020 di	2011						1	9.8240 GH
10 dBm									
20 dBm—	D2 -15	.980 dBm-							
0 dBm									
0 dBm—									-
0 dBm—							M2		
0 dBm-	when the manage	when when a	manterer	pang-barrent and	parameter	handruch	northernan	Hadden and these	nowing
70 dBm—									
30 dBm									
tart 2.0 (GHz			691	pts			Sto	25.0 GHz

Date: 26.MAY.2020 07:42:24



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

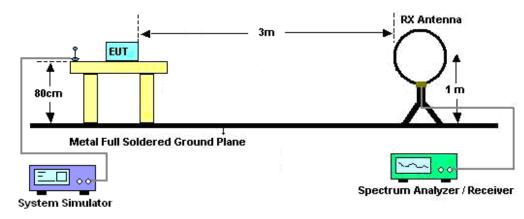
- 1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3. For each suspected 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 (-24.76 dB) 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.

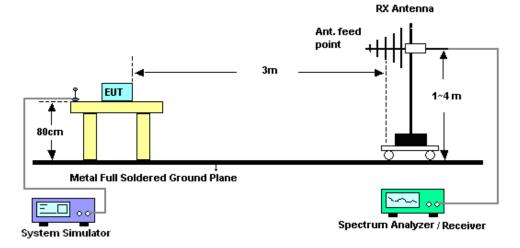


3.8.4 Test Setup

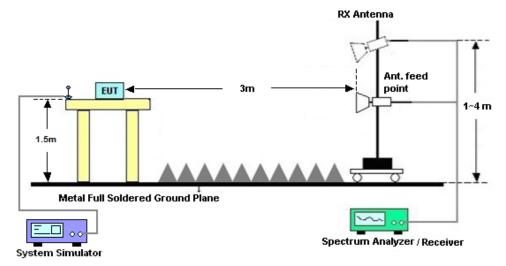
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



Sporton International (Kunshan) Inc. TEL : +86-512-57900158 FAX : +86-512-57900958 FCC ID: ZNFK200HMW



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

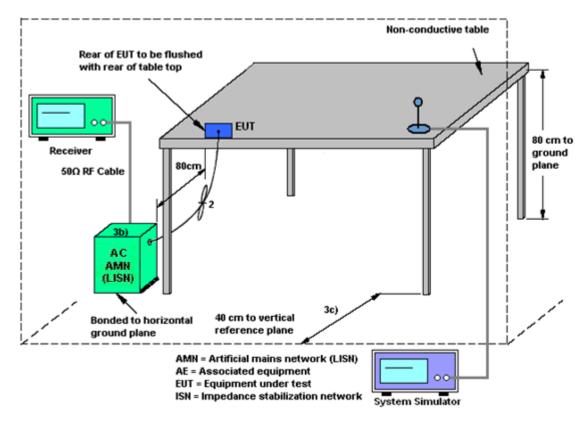
The measuring equipment is listed in the section 4 of this test report.

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	May 26, 2020	Nov. 01, 2020	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GH z	Jan. 13, 2020	May 26, 2020	Jan. 12, 2021	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 13, 2020	May 26, 2020	Jan. 12, 2021	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY572901 51	3Hz~8.5GHz;M ax 30dBm	Jul. 18, 2019	May 08, 2020	Jul. 17, 2020	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz-44G,MAX 30dB	Apr. 15, 2020	May 08, 2020	Apr. 14, 2021	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 10, 2019	May 08, 2020	Nov. 09, 2020	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2019	May 08, 2020	May 29, 2020	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 26, 2020	May 08, 2020	Apr. 25, 2021	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2019	May 08, 2020	Nov. 09, 2020	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Aug. 06, 2019	May 08, 2020	Aug. 05, 2020	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 08, 2020	May 08, 2020	Jan. 07, 2021	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1Ghz-18Ghz	Aug. 17, 2019	May 08, 2020	Aug. 16, 2020	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY532703 16	500MHz~26.5G Hz	Oct. 18, 2019	May 08, 2020	Oct. 17, 2020	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	May 08, 2020	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 08, 2020	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 08, 2020	NCR	Radiation (03CH05-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 14, 2020	May 25, 2020	Apr. 13, 2021	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 18, 2019	May 25, 2020	Oct. 17, 2020	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Oct. 28, 2019	May 25, 2020	Oct. 27, 2020	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 18, 2019	May 25, 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	2.9 dB
of 95% (U = 2Uc(y))	2:9 dB

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

Measuring Uncertainty for a Level of Confidence	E 0 dB
of 95% (U = 2Uc(y))	5.0 dB

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

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

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

Measuring Uncertainty for a Level of Confidence	E 0 dP
of 95% (U = 2Uc(y))	5.0 dB



Appendix A. Conducted Test Results

Report Number : FR043015A

Bluetooth

Test Engineer:	Asa Cheng	Temperature:	20~26	°C
Test Date:	2020/5/26	Relative Humidity:	40~51	%

<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 (kHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.958	0.894	998.550	0.6387	Pass
DH	1Mbps	1	39	2441	0.935	0.897	1002.890	0.6233	Pass
DH	1Mbps	1	78	2480	0.973	0.897	998.550	0.6483	Pass
2DH	2Mbps	1	0	2402	1.259	1.161	1033.290	0.8393	Pass
2DH	2Mbps	1	39	2441	1.259	1.161	846.600	0.8393	Pass
2DH	2Mbps	1	78	2480	1.255	1.158	1285.090	0.8365	Pass
3DH	3Mbps	1	0	2402	1.229	1.143	1154.850	0.8191	Pass
3DH	3Mbps	1	39	2441	1.233	1.143	1150.510	0.8220	Pass
3DH	3Mbps	1	78	2480	1.229	1.146	950.850	0.8191	Pass

	<u>TEST RESULTS DATA</u> Dwell Time											
Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail						
Nomal	79	106.67	2.900	0.31	0.4	Pass						
AFH	20	53.33	2.900	0.15	0.4	Pass						

					<u>ST RESUL</u> Peak Powe
DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
	0	1	8.82	20.97	Pass
DH1	39		9.55	20.97	Pass
5	78	1	7.94	20.97	Pass
		4 <u>·</u> 4			
2DH	CH.	NTX	Peak Power	Power Limit	Test
201	-		(dBm)	(dBm)	Result
	0	1	8.90	20.97	Pass
2DH1	39	1	9.58	20.97	Pass
	78	1	7.90	20.97	Pass
					_
3DH	CH.	NTX	Peak Power	Power Limit	Test
5011	OH.		(dBm)	(dBm)	Result
	0	1	9.31	20.97	Pass
3DH1	39	1	10.05	20.97	Pass
	78	1	8.40	20.97	Pass

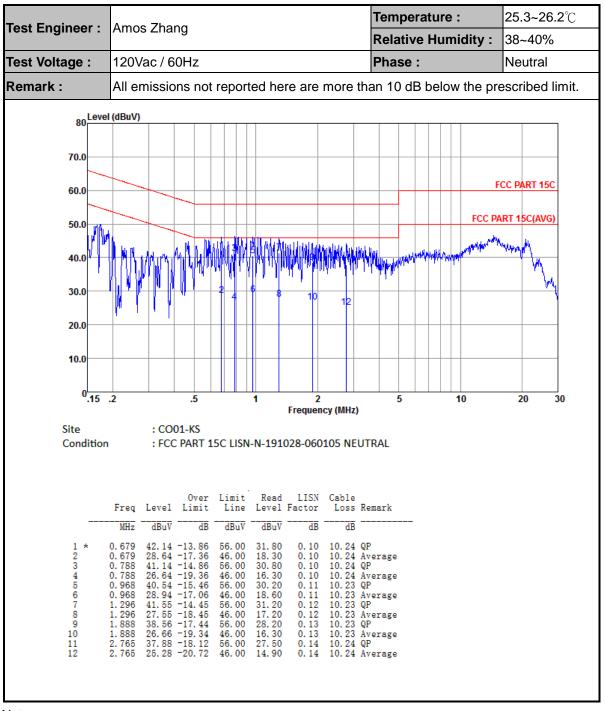
<u>TEST RESULTS DATA</u> Number of Hopping Frequency									
Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail						
79	79	> 15	Pass						



Appendix B. AC Conducted Emission Test Results

Test Engineer :	Amos Zhang	Temperature :	25.3~26.2℃ 38~40%	
rest Engineer.		Relative Humidity :		
Test Voltage :	120Vac / 60Hz	Phase :	Line	
Remark :	All emissions not reported here are more	e than 10 dB below the pr	escribed limit.	
80 Leve	- (dBuV)			
70.0				
60.0			FCC PART 15C	
ALM.		FCC P	ART 15C(AVG)	
50.0				
40.0	H APPER I. With An Akababababababababababababababababababab	ULULI JICHARAMAN A MANY	M	
20.0 2	n – 11. M. W. V. VII. VII. M. da ara ha onder a de la difican-da de			
30.0		12		
20.0			<u>``</u>	
10.0				
10.0				
0 .15	.2 .5 1 2	5 10	20 30	
Site	Frequency (MH : CO01-KS	2)		
Condition	: FCC PART 15C LISN-L-191028-060105 LI	NE		
	Over Limit Read LISN Cabl			
	Freq Level Limit Line Level Factor Los 	s Remark 		
1	0.169 47.07 -17.96 65.03 36.61 0.03 10.4	3 QP		
2 3 4 5 *	0.169 30.97 -24.06 55.03 20.51 0.03 10.4 0.187 44.93 -19.22 64.15 34.50 0.04 10.3	9 QP		
4 5 * 6	0.187 27.93 -26.22 54.15 17.50 0.04 10.3 0.379 42.13 -16.17 58.30 31.81 0.05 10.2 0.379 22.53 -25.77 48.30 12.21 0.05 10.2	7 QP		
7 8	0.871 36.11 -19.89 56.00 25.79 0.08 10.2 0.871 24.41 -21.59 46.00 14.09 0.08 10.2	4 QP 4 Average		
10	1.276 31.92 -24.08 56.00 21.60 0.09 10.2 1.276 22.52 -23.48 46.00 12.20 0.09 10.2 3.408 32.52 -27.48 60.00 21.80 0.34 10.3	3 Average		
	3.408 24.82 -25.18 50.00 14.10 0.34 10.3			





Note:

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



Appendix C. Radiated Spurious Emission

2.4GHz 2400~2483.5MH	łz
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BT Note Frequency Level Limit Read Antenna Cable Preamp Table Peak Pol. Over Ant Limit Line Level Factor Loss Factor Pos Pos Avg. (dBµV/m) (dB) (dBµV/m) (MHz) (dBµV) (dB/m) (dB) (dB) (P/A) (H/V) (cm) deg) 2321.31 55.31 -18.69 74 48.9 31.16 6.92 31.67 213 348 Ρ Н * 2321.31 30.55 -23.45 54 ------А Н * 2402 99.27 92.68 31.2 7.04 31.65 213 348 Ρ Н ВΤ 2402 74.51 Н ---А ---CH00 2329.89 Ρ V 53.81 -20.19 74 47.4 31.16 6.92 31.67 102 89 2402MHz * 29.05 2329.89 -24.95 54 ------А V * 7.04 2402 94.87 88.28 31.2 31.65 102 89 Ρ V 2402 70.11 ----А V --31.77 31.58 Ρ 2484.58 54.72 -19.2874 47.37 7.16 н 177 98 * 2484.58 29.96 -24.04 54 А Н ------Ρ 2480 100 92.65 31.77 7.16 31.58 177 98 Н BT 2480 75.24 ---А Н ---CH 78 2495.74 55.15 -18.85 74 47.64 31.89 7.18 31.56 377 55 Ρ V 2480MHz * 2495.74 30.39 -23.61 54 А V ------Ρ V 2480 96.58 89.23 31.77 7.16 31.58 377 55 2480 71.82 А V _ _ _ _ --No other spurious found. 1. Remark 2. All results are PASS against Peak and Average limit line.

BT (Band Edge @ 3m)



_	BT (Harmonic @ 3m)												
вт	Note	Frequency Level Over Limit Limit Line Line		Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.		
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT		4806	39.17	-34.83	74	57.68	33.7	9.81	62.02	150	360	Ρ	н
CH 00 2402MHz		4806	39.3	-34.7	74	57.81	33.7	9.81	62.02	150	360	Р	V
		4884	40.19	-33.81	74	58.39	33.77	9.95	61.92	100	360	Р	Н
BT		7320	42.47	-31.53	74	55.81	35.89	12.64	61.87	100	360	Р	Н
CH 39		4884	39.66	-34.34	74	57.86	33.77	9.95	61.92	100	360	Р	V
2441MHz		7320	43.13	-30.87	74	56.47	35.89	12.64	61.87	100	360	Р	V
		4962	38.1	-35.9	74	55.92	33.85	10.13	61.8	150	360	Р	Н
BT		7440	39.74	-34.26	74	52.65	36.11	12.84	61.86	150	360	Р	Н
CH 78 2480MHz		4962	37.83	-36.17	74	55.65	33.85	10.13	61.8	150	360	Р	V
2400111172		7440	41.69	-32.31	74	54.6	36.11	12.84	61.86	150	360	Р	V
Remark		o other spurio I results are P		st Peak	and Averag	e limit lin	е.						

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	_imit Line L		Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		31.94	17	-23	40	26.38	21.8	0.79	31.97	-	-	Р	н
		128.94	16.77	-26.73	43.5	30.21	16.78	1.72	31.94	-	-	Р	Н
		143.49	16.85	-26.65	43.5	29.92	17.07	1.8	31.94	-	-	Р	Н
		157.07	17.57	-25.93	43.5	30.7	16.91	1.89	31.93	-	-	Р	Н
0.4011-		930.16	29.72	-16.28	46	26.14	30.23	4.53	31.18	100	0	Р	Н
2.4GHz BT		985.45	29.73	-24.27	54	25.11	30.62	4.66	30.66	-	-	Р	Н
LF		36.79	17.35	-22.65	40	27.33	21.14	0.84	31.96	-	-	Р	V
		75.59	17.94	-22.06	40	35.3	13.28	1.27	31.91	-	-	Р	V
		164.83	14.65	-28.85	43.5	28.06	16.58	1.94	31.93	-	-	Р	V
		776.9	27.05	-18.95	46	26.74	28.34	4.15	32.18	-	-	Р	V
		857.41	29.04	-16.96	46	27.15	29.28	4.35	31.74	100	0	Р	V
		978.66	29.13	-24.87	54	24.54	30.67	4.64	30.72	-	-	Р	V
	1. No	o other spurio	us found.										
Remark	2. AI	I results are P	ASS agains	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".

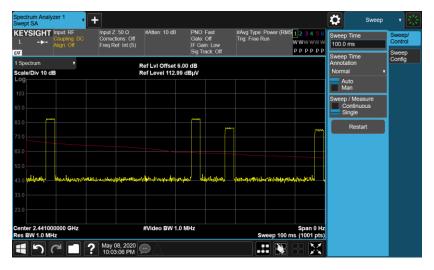


Appendix D. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 39

ectrum Ana rept SA	· .	•	+	t Z: 50 Ω	#Atten: 10 d	0	PNO:	Fact	HAug Tupo: I	Dowor (DM			Marker	• 🕃
EYSIGH . ↔→	Coupli Align:	ng: DC	Corr	ections: Off Ref: Int (S)	#Atten. To u		Gate: IF Gai		Trig: Free R	un	S <mark>123456</mark> WWWWWW PPPPP	Select Mar Marker 3	ker	
Spectrum		•			Ref LvI Offse	et 6.00 (dB	acit. On		ΔMkr3	3.750 ms	Marker ∆ 3.75000 r		Settings
ale/Div 10	dB			F	Ref Level 11	2.99 dE	μV				0.46 dB	Marker Me	ode	Peak Search
			<u>01</u>			<u>∂2∆1</u>		3∆1				Norma		Pk Searc Config
.0						1						💿 Delta (Δ)	Propertie
												Fixed		Marker
	w	("woinath	/			rtion	wed				wateria	off		Function
												Delta	Marker	Marker
nter 2.4410 s BW 1.0 N		GHz			#Video BW	1.0 M⊦	z		Sw	eep 10.0	Span 0 Hz ns (1001 pts)	(Rese Marker Ta	et Delta) ble	Counter
Marker Table		•										On		
Mode	Trace	Scale		Х	Y		Funct	ion F	unction Width	Fund	tion Value	/ Marke	r Settings	
1 N 2 Δ1	1	t t	(Δ)	2.120 ms	84.16 dE (Δ) -0.5181							< Dia	igram Č	
3 Δ1	1	t	(Δ) (Δ)		(Δ) -0.3101 (Δ) 0.4601						_	All Ma	rkers Off	
4														
5												Couple Ma On	arkers	
				_								Off		
		-	Ma	y 08, 2020 ⊿	\frown \land									

3DH5 on time (Count Pulses) Plot on Channel 39



Note:

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