

TEST REPORT

Applicant: Swiftech Company Ltd.

Address of Applicant: Dongcheng Industrial Zone,Xinping Road,Minzhong Town,Zhongshan City,Guangdong Province, China

Manufacturer/Factory: Swiftech Company Ltd.

Address of Manufacturer/Factory: Dongcheng Industrial Zone,Xinping Road,Minzhong Town,Zhongshan City,Guangdong Province, China

Equipment Under Test (EUT)

Product Name: INNOVATIVE PLAY SOLUTION

Model No.: HL10A

Trade Mark: Hitlit

FCC ID: 2AR5Y-HL10A

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: May 29, 2019

Date of Test: May 30, 2019-June 24, 2019

Date of report issued: June 25, 2019

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

A circular blue stamp from Global United Technology Services Co., Ltd. is overlaid on a handwritten signature in black ink. The stamp contains the text "GLOBAL UNITED TECHNOLOGY SERVICES CO., LTD." and "GLOBAL TESTING". The signature appears to be "Robinson Lo" and is dated "2019.6.25".

Robinson Lo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	June 25, 2019	Original

Prepared By:

Bill. yuan

Date:

June 25, 2019

Project Engineer

Check By:

Robinson
Reviewer

Date:

June 25, 2019

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(3)	Pass
Channel Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247(d)	Pass
Spurious Emission	15.205/15.209	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark : Test according to ANSI C63.10:2013

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	$\pm 4.64\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.64\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 3.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.44\text{dB}$	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

5 General Information

5.1 General Description of EUT

Product Name:	INNOVATIVE PLAY SOLUTION
Model No.:	HL10A
Serial No.:	HL10A-1
Hardware Version:	2G-1REV1.1[2019-05-10].PCB
Software Version:	V2.0
Test sample(s) ID:	GTS201905000230-1
Sample(s) Status:	Engineer sample
Operation Frequency:	2405MHz~2480MHz
Channel Numbers:	16
Channel Separation:	5MHz
Modulation type:	O-QPSK
Antenna Type:	Integral antenna
Antenna Gain:	4.0dBi (Declared by manufacturer)
Power Supply:	Battery: DC 3.7V, 3000mAh

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405MHz	15	2425MHz	19	2445MHz	23	2465MHz
12	2410MHz	16	2430MHz	20	2450MHz	24	2470MHz
13	2415MHz	17	2435MHz	21	2455MHz	25	2475MHz
14	2420MHz	18	2440MHz	22	2460MHz	26	2480MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2405MHz
The middle channel	2440MHz
The Highest channel	2480MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
<i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
AoHai Adapter	USB Charger	A9A-050100U-US1	N/A

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations: FCC —Registration No.: 381383 Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383. Industry Canada (IC) —Registration No.: 9079A-2 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2. NVLAP (LAB CODE:600179-0) Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.5 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China Tel: 0755-27798480 Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 27 2018	June. 26 2019
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 27 2018	June. 26 2019
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 27 2018	June. 26 2019
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 27 2018	June. 26 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 27 2018	June. 26 2019
9	Coaxial Cable	GTS	N/A	GTS211	June. 27 2018	June. 26 2019
10	Coaxial cable	GTS	N/A	GTS210	June. 27 2018	June. 26 2019
11	Coaxial Cable	GTS	N/A	GTS212	June. 27 2018	June. 26 2019
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 27 2018	June. 26 2019
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 27 2018	June. 26 2019
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 27 2018	June. 26 2019
15	Band filter	Amindeon	82346	GTS219	June. 27 2018	June. 26 2019
16	Power Meter	Anritsu	ML2495A	GTS540	June. 27 2018	June. 26 2019
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 27 2018	June. 26 2019
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 27 2018	June. 26 2019
19	Splitter	Agilent	11636B	GTS237	June. 27 2018	June. 26 2019
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 27 2018	June. 26 2019
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 20 2018	Oct. 19 2019
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 20 2018	Oct. 19 2019
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 20 2018	Oct. 19 2019
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 27 2018	June. 26 2019

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 27 2018	June. 26 2019
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 27 2018	June. 26 2019
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 27 2018	June. 26 2019
5	Coaxial Cable	GTS	N/A	GTS227	June. 27 2018	June. 26 2019
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 27 2018	June. 26 2019
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 27 2018	June. 26 2019

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 27 2018	June. 26 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 27 2018	June. 26 2019
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 27 2018	June. 26 2019
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 27 2018	June. 26 2019
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 27 2018	June. 26 2019
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 27 2018	June. 26 2019
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 27 2018	June. 26 2019
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 27 2018	June. 26 2019

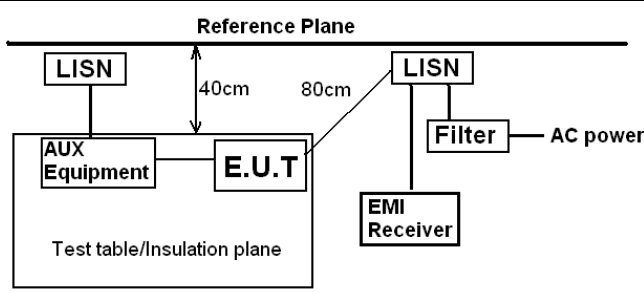
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 27 2018	June. 26 2019
2	Barometer	ChangChun	DYM3	GTS255	June. 27 2018	June. 26 2019

7 Test results and Measurement Data

7.1 Antenna requirement

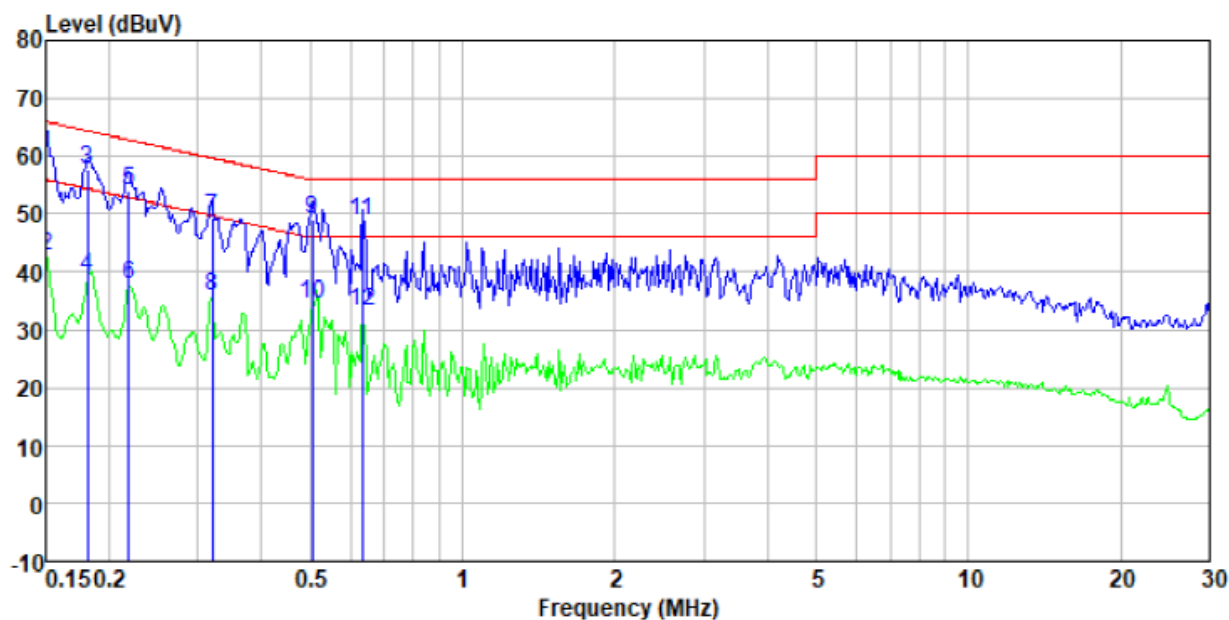
Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna:	
<i>The antenna is integral antenna, the best case gain of the antenna is 4dBi, Reference to the appendix II for details.</i>	

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																				
Test Method:	ANSI C63.10:2013																				
Test Frequency Range:	150KHz to 30MHz																				
Class / Severity:	Class B																				
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																				
Limit:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> * Decreases with the logarithm of the frequency.							Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																				
	Quasi-peak	Average																			
0.15-0.5	66 to 56*	56 to 46*																			
0.5-5	56	46																			
5-30	60	50																			
Test setup:	Reference Plane  Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m																				
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.																				
Test Instruments:	Refer to section 6.0 for details																				
Test mode:	Refer to section 5.2 for details																				
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar															
Test voltage:	AC 120V, 60Hz & DC 3.7V																				
Test results:	Pass																				

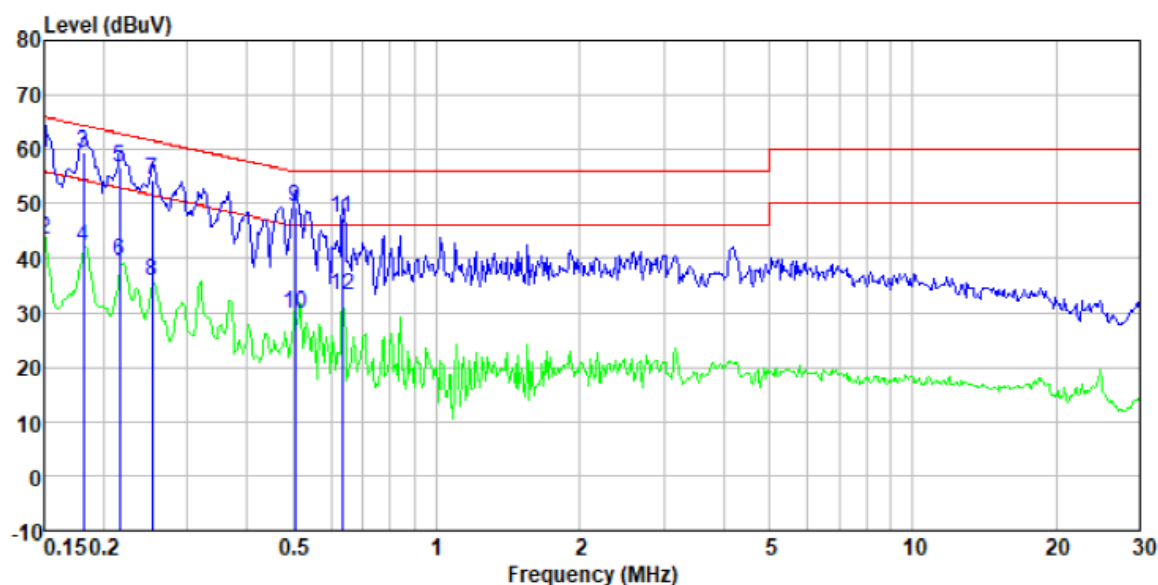
Measurement data

Test mode:	Transmitting mode	Phase Polarity:	Line
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Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.15	60.02	0.40	0.07	60.49	66.00	-5.51	QP
0.15	42.49	0.40	0.07	42.96	56.00	-13.04	Average
0.18	57.28	0.40	0.10	57.78	64.42	-6.64	QP
0.18	38.78	0.40	0.10	39.28	54.42	-15.14	Average
0.22	53.74	0.40	0.11	54.25	62.88	-8.63	QP
0.22	37.25	0.40	0.11	37.76	52.88	-15.12	Average
0.32	48.94	0.39	0.10	49.43	59.71	-10.28	QP
0.32	35.43	0.39	0.10	35.92	49.71	-13.79	Average
0.50	48.81	0.31	0.11	49.23	56.00	-6.77	QP
0.50	34.23	0.31	0.11	34.65	46.00	-11.35	Average
0.63	48.36	0.28	0.12	48.76	56.00	-7.24	QP
0.63	32.76	0.28	0.12	33.16	46.00	-12.84	Average

Test mode:	Transmitting mode	Phase Polarity:	Neutral
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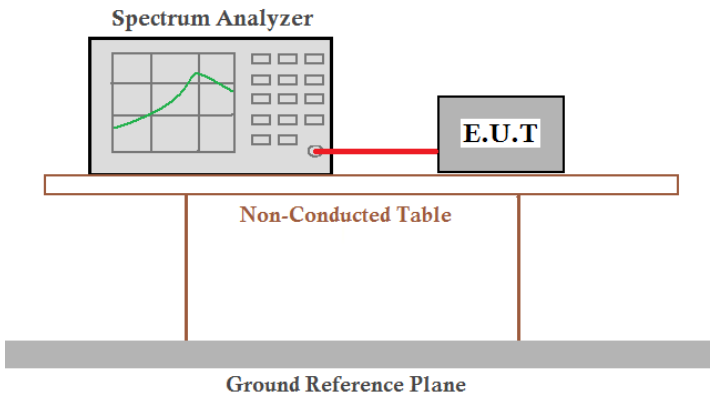


Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.15	59.09	0.40	0.07	59.56	66.00	-6.44	QP
0.15	42.93	0.40	0.07	43.40	56.00	-12.60	Average
0.18	59.04	0.40	0.10	59.54	64.42	-4.88	QP
0.18	41.53	0.40	0.10	42.03	54.42	-12.39	Average
0.22	56.33	0.40	0.11	56.84	62.96	-6.12	QP
0.22	38.84	0.40	0.11	39.35	52.96	-13.61	Average
0.25	53.87	0.40	0.10	54.37	61.64	-7.27	QP
0.25	35.38	0.40	0.10	35.88	51.64	-15.76	Average
0.50	49.07	0.31	0.11	49.49	56.00	-6.51	QP
0.50	29.49	0.31	0.11	29.91	46.00	-16.09	Average
0.63	46.96	0.28	0.12	47.36	56.00	-8.64	QP
0.63	32.76	0.28	0.12	33.16	46.00	-12.84	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

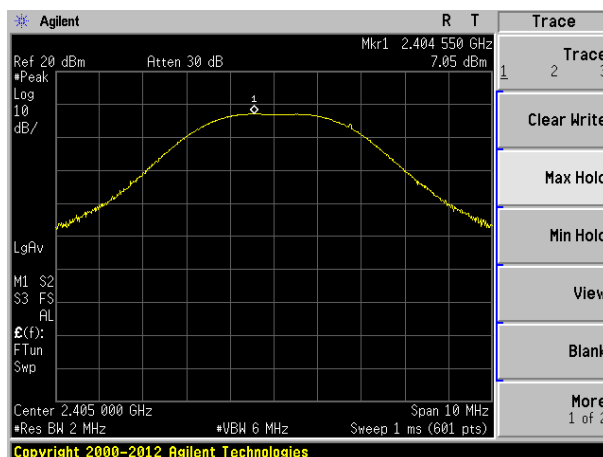
7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V05or02
Limit:	30dBm
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

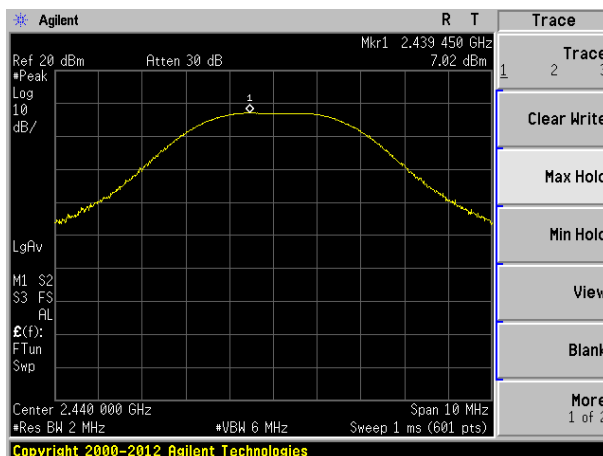
Measurement Data

Frequency (MHz)	Peak Output Power (dBm)	Limit(dBm)	Result
2405	7.05	30	PASS
2440	7.02		
2480	6.97		

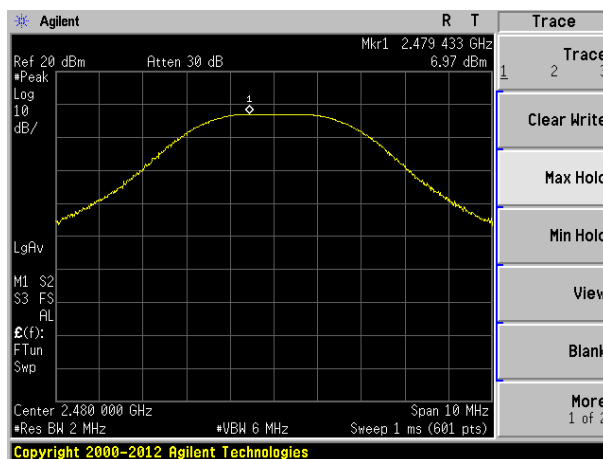
Test plot as follows:



2405MHz

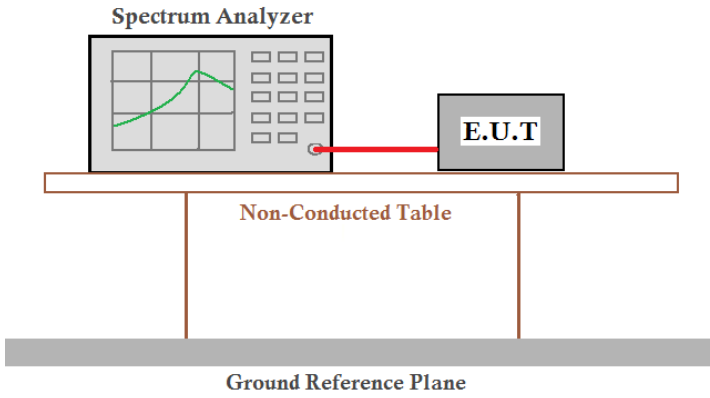


2440MHz



2480MHz

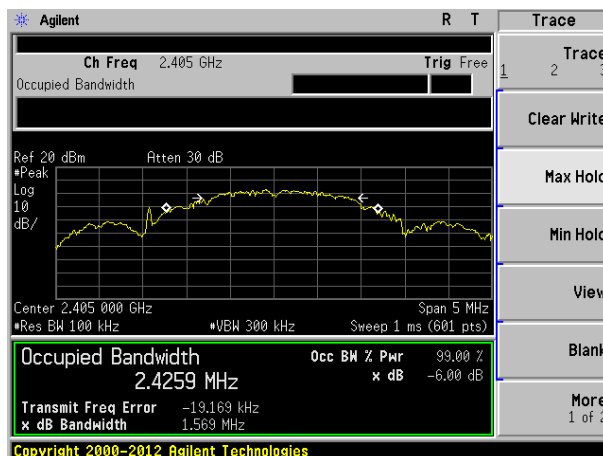
7.4 Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V05r02
Limit:	>500KHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

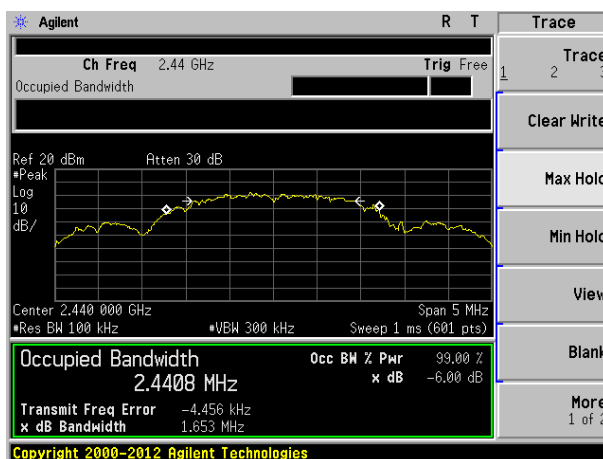
Measurement Data

Frequency (MHz)	Channel Bandwidth (MHz)	Limit(KHz)	Result
2405	1.569	>500	Pass
2440	1.653		
2480	1.878		

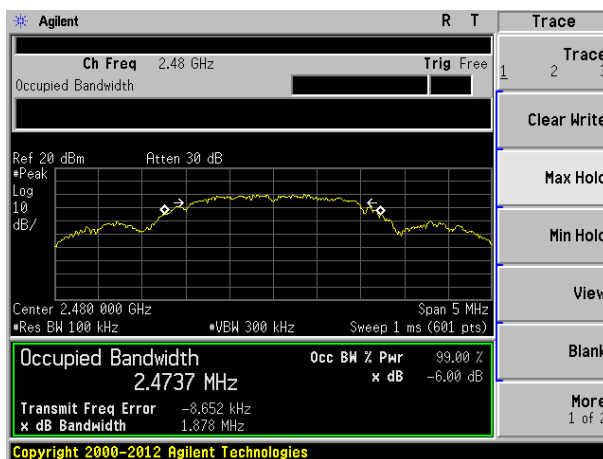
Test plot as follows:



2405MHz

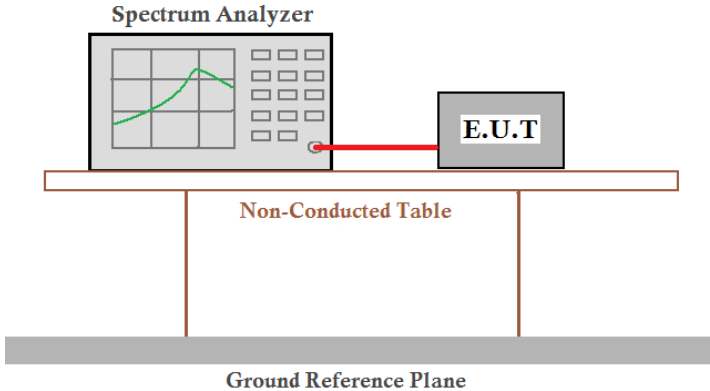


2440MHz



2480MHz

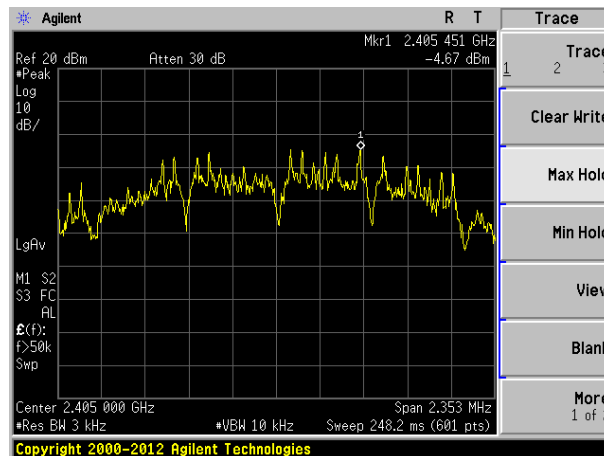
7.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V05r02
Limit:	8dBm/3kHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

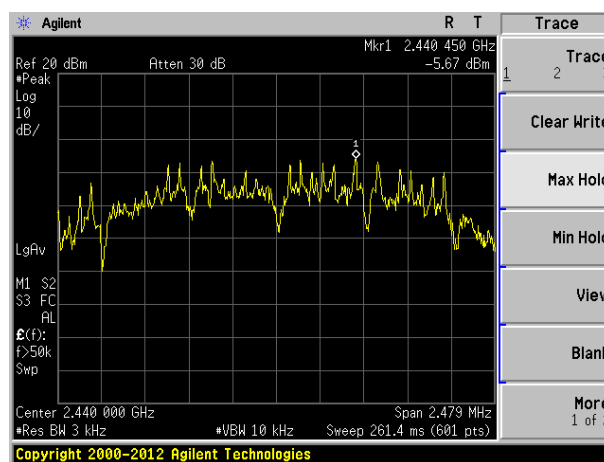
Measurement Data

Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Result
2405	-4.67	8.00	Pass
2440	-5.67		
2480	-6.77		

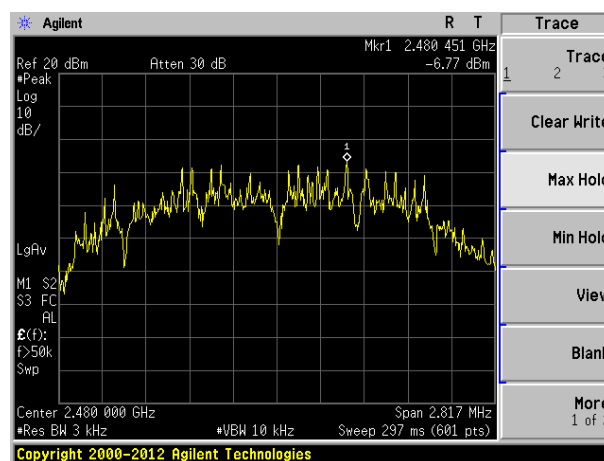
Test plot as follows:



2405MHz



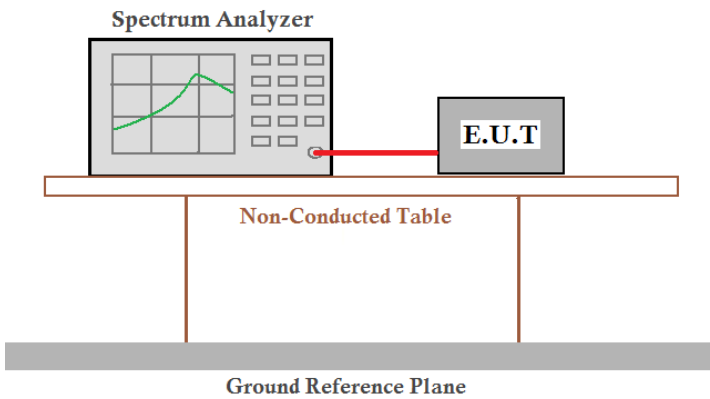
2440MHz



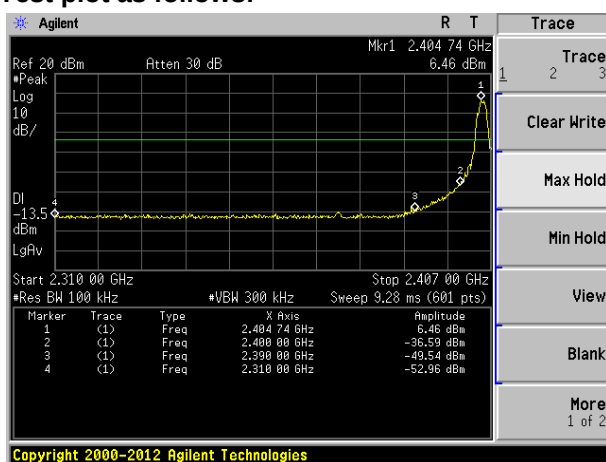
2480MHz

7.6 Band edges

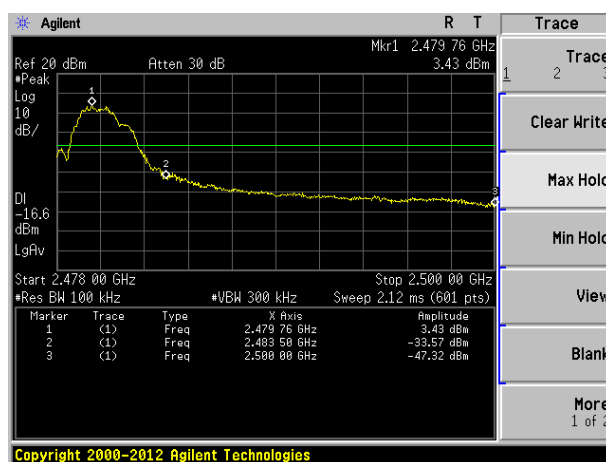
7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an Equipment Under Test (E.U.T.). Both are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

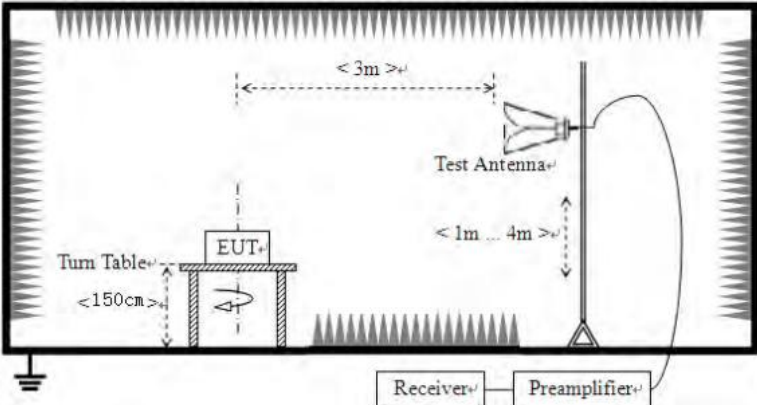


Lowest channel



Highest channel

7.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
		RMS	1MHz	3MHz	Average
Limit:	Frequency		Limit (dBuV/m @3m)		Value
	Above 1GHz		54.00		Average
			74.00		Peak
Test setup:					
Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test results:	Pass				

Measurement data:

Remark: The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.

Test Frequency:	2405MHz
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	36.82	27.21	5.30	24.64	44.69	74.00	-29.31	Horizontal
2390.00	44.58	27.41	5.38	24.71	52.66	74.00	-21.34	Horizontal
2310.00	35.19	27.21	5.30	24.64	43.06	74.00	-30.94	Vertical
2390.00	45.41	27.41	5.38	24.71	53.49	74.00	-20.51	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	25.42	27.21	5.30	24.64	33.29	54.00	-20.71	Horizontal
2390.00	34.24	27.41	5.38	24.71	42.32	54.00	-11.68	Horizontal
2310.00	25.46	27.21	5.30	24.64	33.33	54.00	-20.67	Vertical
2390.00	36.23	27.41	5.38	24.71	44.31	54.00	-9.69	Vertical

Test Frequency:	2480MHz
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	43.80	27.66	5.47	24.80	52.13	74.00	-21.87	Horizontal
2500.00	35.25	27.70	5.49	24.86	43.58	74.00	-30.42	Horizontal
2483.50	45.66	27.66	5.47	24.80	53.99	74.00	-20.01	Vertical
2500.00	35.71	27.70	5.49	24.86	44.04	74.00	-29.96	Vertical

Average value:

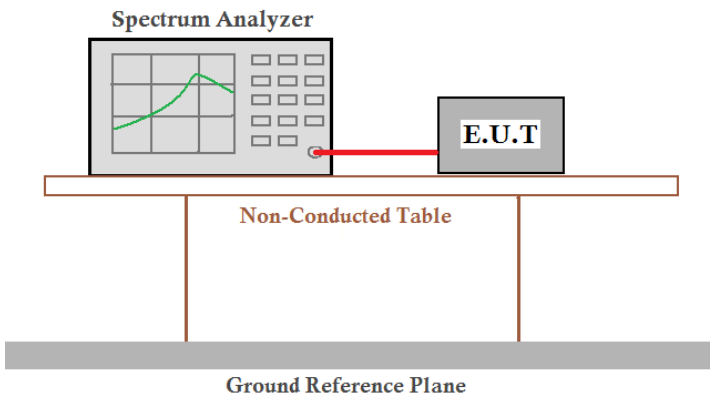
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	35.60	27.66	5.47	24.80	43.93	54.00	-10.07	Horizontal
2500.00	21.87	27.70	5.49	24.86	30.20	54.00	-23.80	Horizontal
2483.50	35.73	27.66	5.47	24.80	44.06	54.00	-9.94	Vertical
2500.00	22.36	27.70	5.49	24.86	30.69	54.00	-23.31	Vertical

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

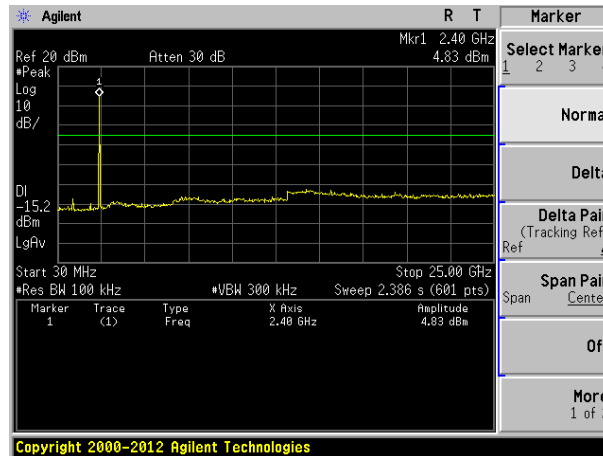
7.7 Spurious Emission

7.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

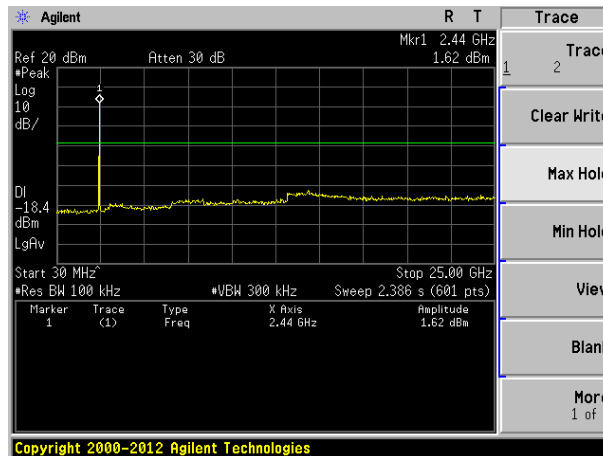
Test plot as follows:

Lowest channel



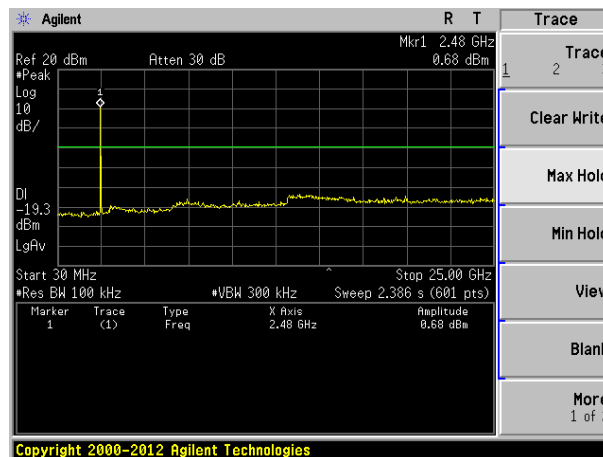
30MHz~25GHz

Middle channel



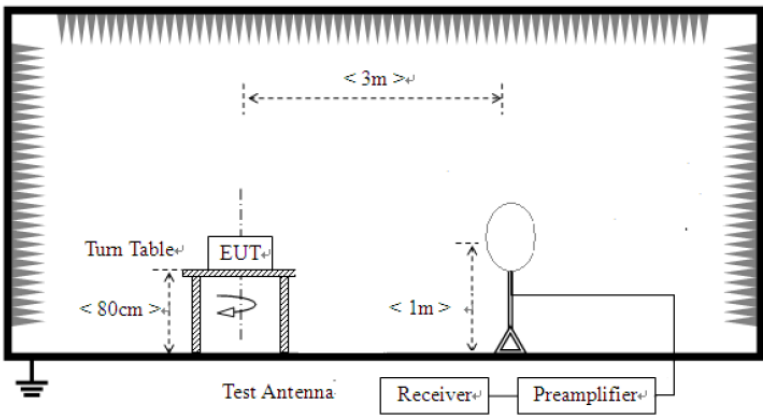
30MHz~25GHz

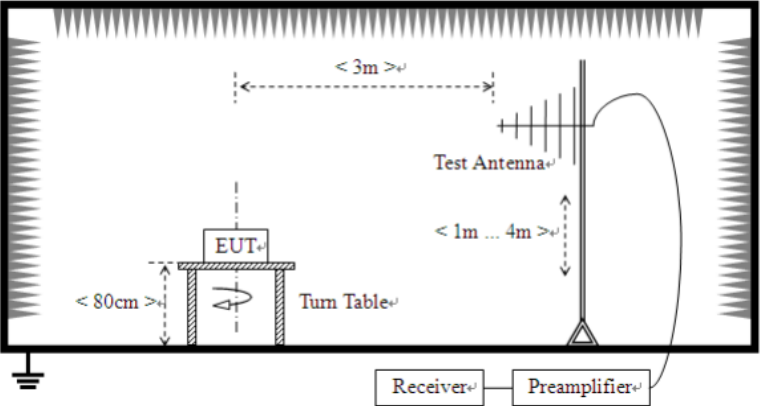
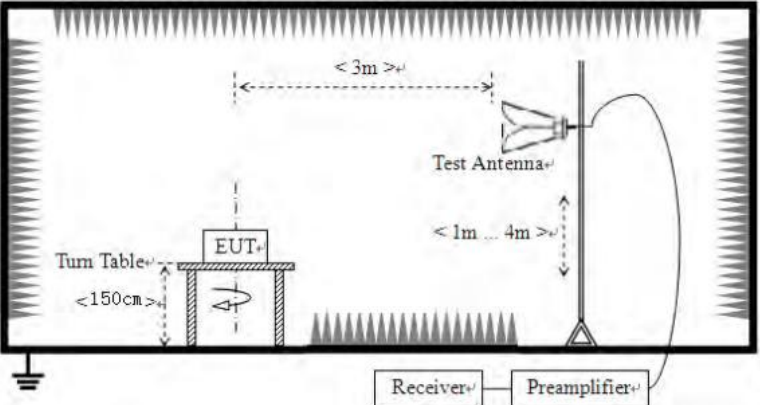
Highest channel



30MHz~25GHz

7.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit: (Spurious Emissions)	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Test setup:	For radiated emissions from 9kHz to 30MHz				
					
For radiated emissions from 30MHz to 1GHz					

	 For radiated emissions above 1GHz 
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test environment:	Temp.: 25 °C Humid.: 52% Press.: 1012mbar
Test voltage:	DC 3.7V
Test results:	Pass

Measurement data:

■ Below 30MHz

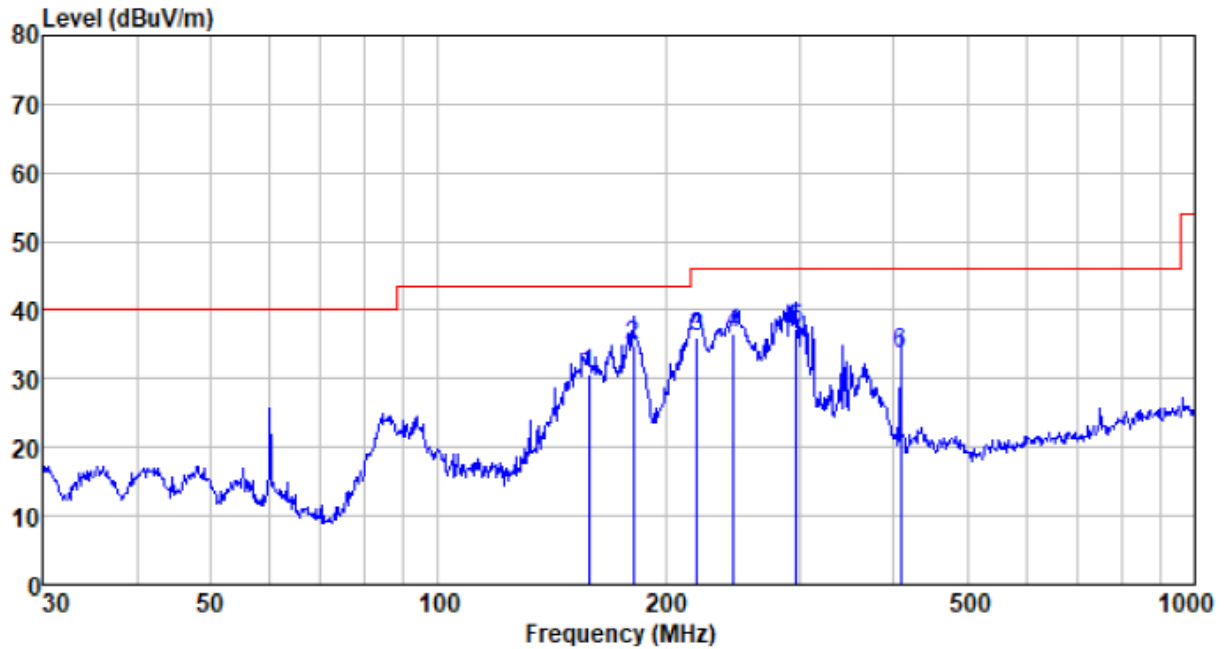
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

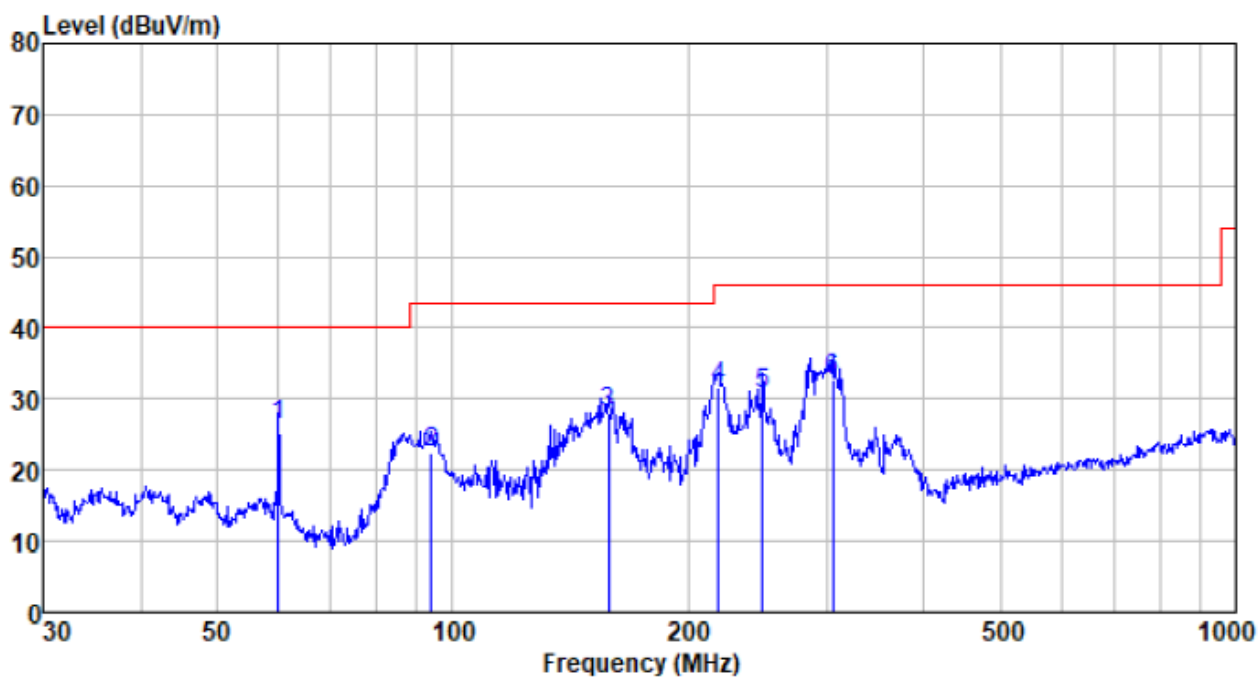
■ Below 1GHz

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
158.112	58.00	8.20	1.62	37.12	30.70	43.50	-12.80	QP
181.283	61.36	9.07	1.75	37.24	34.94	43.50	-8.56	QP
219.845	60.29	11.13	1.96	37.35	36.03	46.00	-9.97	QP
245.951	59.96	12.04	2.10	37.38	36.72	46.00	-9.28	QP
297.224	58.70	13.53	2.35	37.42	37.16	46.00	-8.84	QP
408.946	52.68	15.50	2.90	37.52	33.56	46.00	-12.44	QP

Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
59.859	50.31	11.32	0.86	36.32	26.17	40.00	-13.83	QP
94.098	46.75	11.31	1.14	36.67	22.53	43.50	-20.97	QP
158.112	55.44	8.20	1.62	37.12	28.14	43.50	-15.36	QP
218.309	55.97	11.09	1.95	37.35	31.66	46.00	-14.34	QP
248.552	53.86	12.11	2.12	37.38	30.71	46.00	-15.29	QP
305.680	54.21	13.71	2.39	37.43	32.88	46.00	-13.12	QP

■ Above 1GHz

Test Frequency:	2405MHz
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	37.18	31.36	9.37	37.73	40.18	74.00	-33.82	Vertical
7215.00	37.63	35.92	11.22	35.63	49.14	74.00	-24.86	Vertical
9620.00	37.33	37.76	12.92	34.94	53.07	74.00	-20.93	Vertical
12025.00	32.45	38.69	14.55	36.20	49.49	74.00	-24.52	Vertical
4810.00	33.76	31.36	9.37	37.73	36.76	74.00	-37.24	Horizontal
7215.00	33.76	35.92	11.22	35.63	45.27	74.00	-28.73	Horizontal
9620.00	32.26	37.76	12.92	34.94	48.00	74.00	-26.00	Horizontal
12025.00	36.41	38.69	14.55	36.20	53.45	74.00	-20.55	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	29.80	31.36	9.37	37.73	32.80	54.00	-21.20	Vertical
7215.00	29.11	35.92	11.22	35.63	40.62	54.00	-13.38	Vertical
9620.00	27.64	37.76	12.92	34.94	43.38	54.00	-10.62	Vertical
12025.00	26.08	38.69	14.55	36.20	43.12	54.00	-10.88	Vertical
4810.00	26.95	31.36	9.37	37.73	29.95	54.00	-24.05	Horizontal
7215.00	25.24	35.92	11.22	35.63	36.75	54.00	-17.25	Horizontal
9620.00	23.19	37.76	12.92	34.94	38.93	54.00	-15.07	Horizontal
12025.00	25.46	38.69	14.55	36.20	42.50	54.00	-11.50	Horizontal

Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test Frequency:	2440MHz
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	36.03	31.48	9.42	37.75	39.18	74.00	-34.82	Vertical
7320.00	36.08	36.17	11.30	35.60	47.95	74.00	-26.05	Vertical
9760.00	35.72	38.07	13.01	35.03	51.77	74.00	-22.23	Vertical
12200.00	32.11	38.62	14.67	36.31	49.09	74.00	-24.91	Vertical
4880.00	30.78	31.48	9.42	37.75	33.93	74.00	-40.07	Horizontal
7320.00	35.00	36.17	11.30	35.60	46.87	74.00	-27.13	Horizontal
9760.00	32.33	38.07	13.01	35.03	48.38	74.00	-25.62	Horizontal
12200.00	35.23	38.62	14.67	36.31	52.21	74.00	-21.79	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	30.64	31.48	9.42	37.75	33.79	54.00	-20.21	Vertical
7320.00	24.23	36.17	11.30	35.60	36.10	54.00	-17.90	Vertical
9760.00	23.01	38.07	13.01	35.03	39.06	54.00	-14.94	Vertical
12200.00	25.80	38.62	14.67	36.31	42.78	54.00	-11.22	Vertical
4880.00	29.50	31.48	9.42	37.75	32.65	54.00	-21.35	Horizontal
7320.00	28.00	36.17	11.30	35.60	39.87	54.00	-14.13	Horizontal
9760.00	25.65	38.07	13.01	35.03	41.70	54.00	-12.30	Horizontal
12200.00	25.03	38.62	14.67	36.31	42.01	54.00	-11.99	Horizontal

Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test Frequency:	2480MHz
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	38.41	31.63	9.48	37.78	41.74	74.00	-32.26	Vertical
7440.00	32.54	36.46	11.39	35.56	44.83	74.00	-29.17	Vertical
9920.00	36.09	38.42	13.13	35.14	52.50	74.00	-21.50	Vertical
12400.00	33.59	38.54	14.80	36.44	50.49	74.00	-23.51	Vertical
4960.00	40.37	31.63	9.48	37.78	43.70	74.00	-30.30	Horizontal
7440.00	35.67	36.46	11.39	35.56	47.96	74.00	-26.04	Horizontal
9920.00	33.71	38.42	13.13	35.14	50.12	74.00	-23.88	Horizontal
12400.00	32.48	38.54	14.80	36.44	49.38	74.00	-24.62	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	29.05	31.63	9.48	37.78	32.38	54.00	-21.62	Vertical
7440.00	31.30	36.46	11.39	35.56	43.59	54.00	-10.41	Vertical
9920.00	27.65	38.42	13.13	35.14	44.06	54.00	-9.94	Vertical
12400.00	26.07	38.54	14.80	36.44	42.97	54.00	-11.03	Vertical
4960.00	31.08	31.63	9.48	37.78	34.41	54.00	-19.59	Horizontal
7440.00	31.33	36.46	11.39	35.56	43.62	54.00	-10.38	Horizontal
9920.00	26.63	38.42	13.13	35.14	43.04	54.00	-10.96	Horizontal
12400.00	23.60	38.54	14.80	36.44	40.50	54.00	-13.50	Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

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