RF TEST REPORT

Report No.: 18020543-FCC-R1
Supersede Report No.: N/A

Applicant	Nanjing Hanlong Technology Co., Ltd.
Product Name	IP PHONE
Model No.	UC912E
Serial No.	N/A
Test Standard	FCC Part 15.247: 2017, ANSI C63.10: 2013
Test Date	March 29 to June 30, 2018
Issue Date	August 8, 2018
Test Result	☑ **Pass** ☐ **Fail**
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

peter Wei	Amos. Xia	
Peter Wei **Test Engineer**	**Amos Xia** **Engineer Reviewer**	

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Test result presented in this test report is applicable to the tested sample only

Issued by:
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Laboratories Introduction

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Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
18020543-FCC-R1	NONE	Original	August 8, 2018

2. Customer information

Applicant Name	Nanjing Hanlong Technology Co., Ltd.
Applicant Add	5th Floor, 1st Building, Huashen Tech Park, 10 Huashen Temple, Yuhuatai Dis, Nanjing China
Manufacturer	Nanjing Hanlong Technology Co., Ltd.
Manufacturer Add	5th Floor, 1st Building, Huashen Tech Park, 10 Huashen Temple, Yuhuatai Dis, Nanjing China

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	694825
IC Test Site No.	4842B-1
Test Software	EZ_EMC

4. Equipment under Test (EUT) Information

Description of EUT:	IP PHONE
Main Model:	UC912E
Serial Model:	N/A
Date EUT received:	May 21, 2018
Test Date(s):	March 29 to June 30, 2018
Antenna Gain:	BT: 3.8 dBi
Type of Modulation:	BT: GFSK, π/4DQPSK, 8DPSK
RF Operating Frequency (ies):	BT: 2402-2480 MHz
Max. Output Power:	1.042 dBm
Number of Channels:	BT: 79CH
Port:	Power Port, Internet Port, PC Port, Earphone Port, Phone Port
Input Power:	AC Adapter: MODEL: RD0501200-C55-KOG INPUT: 100-240V~50/60Hz 250mA OUTPUT: DC 5V 1.2A POE: DC48V 500 mA
Trade Name :	Htek
FCC ID:	2ACUGUC912ESERIAL

Operating Channel list

Channel	Frequency(MHz)	Channel	Frequency(MHz)	Channel	Frequency(MHz)	Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	2402	17	2419	34	2436	51	2453	68	2470
01	2403	18	2420	35	2437	52	2454	69	2471
02	2404	19	2421	36	2438	53	2455	70	2472
03	2405	20	2422	37	2439	54	2456	71	2473
04	2406	21	2423	38	2440	55	2457	72	2474
05	2407	22	2424	39	2441	56	2458	73	2475
06	2408	23	2425	40	2442	57	2459	74	2476
07	2409	24	2426	41	2443	58	2460	75	2477
08	2410	25	2427	42	2444	59	2461	76	2478
09	2411	26	2428	43	2445	60	2462	77	2479
10	2412	27	2429	44	2446	61	2463	78	2480
11	2413	28	2430	45	2447	62	2464		
12	2414	29	2431	46	2448	63	2465		
13	2415	30	2432	47	2449	64	2466		
14	2416	31	2433	48	2450	65	2467		
15	2417	32	2434	49	2451	66	2468		
16	2418	33	2435	50	2452	67	2469		

5. Test Summary

The product was tested in accordance with the following specifications.
All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247(a)(1)	Channel Separation	Compliance
§15.247(a)(1)	20 dB Bandwidth	Compliance
§15.247(b)(1)	Peak Output Power	Compliance
§15.247(a)(1)(iii)	Number of Hopping Channel	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(d)	Band Edge	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions	Compliance

Measurement Uncertainty

Emissions		
Test Item	**Description**	**Uncertainty**
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 15.203, 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 shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.

b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit. And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 1 antenna:

A permanently attached antenna for BT/WIFI/BLE, the gain is 3.8 dBi .

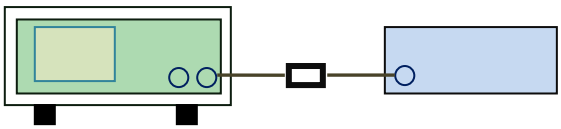
Antenna must be permanently attached to the unit ,it meets up with the ANTENNA REQUIREMENT.

Result: Compliant.

6.2 Channel Separation

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	June 30, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(a)(1)	a)	Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) ≥1% of the span - Video (or Average) Bandwidth (VBW) ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.		
Remark			
Result	☒Pass ☐Fail		

Test Data ☒Yes ☐N/A

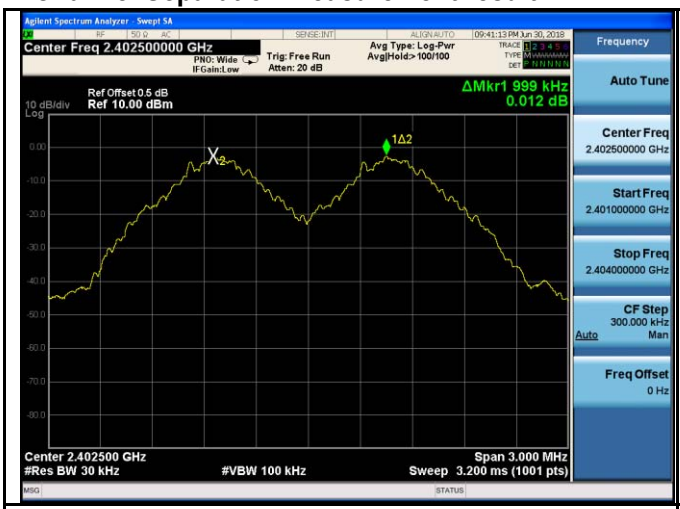
Test Plot ☒Yes (See below) ☐N/A

Channel Separation measurement result

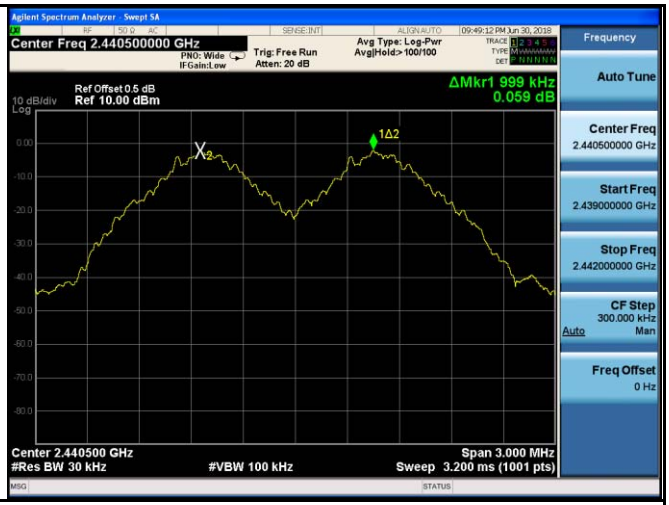
Type Modulation	CH	CH Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	0.999	0.683	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	0.999	0.684	Pass
	Adjacency Channel	2441			
	High Channel	2480	0.999	0.685	Pass
	Adjacency Channel	2479			
CH Separation π/4 DQPSK	Low Channel	2402	0.999	0.872	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.872	Pass
	Adjacency Channel	2441			
	High Channel	2480	0.999	0.874	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.873	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.875	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.877	Pass
	Adjacency Channel	2479			

Test Plots

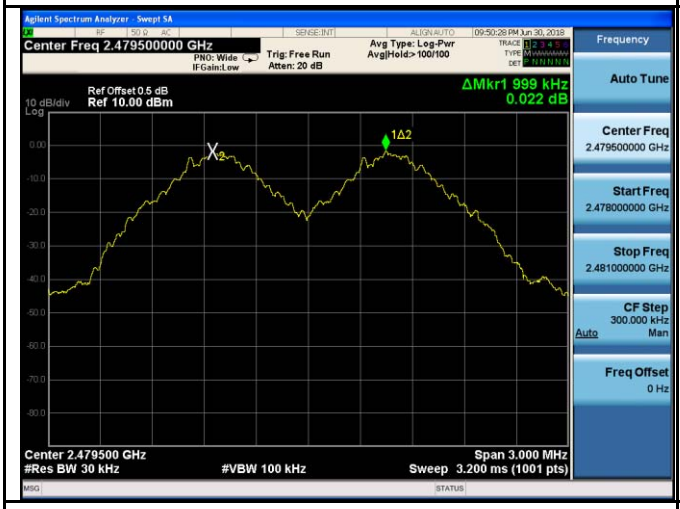
Channel Separation measurement result



GFSK - Low Channel



GFSK - Middle Channel

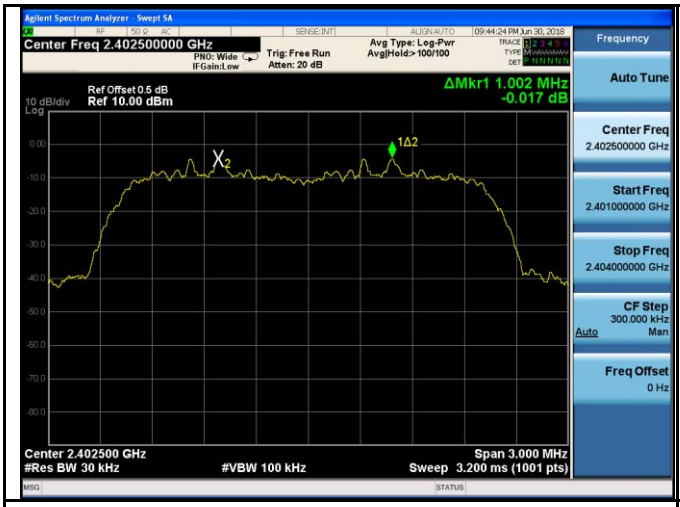


GFSK - High Channel

π/4 DQPSK - Low Channel

π/4 DQPSK - Middle Channel

π/4 DQPSK - High Channel



8DPSK - Low Channel

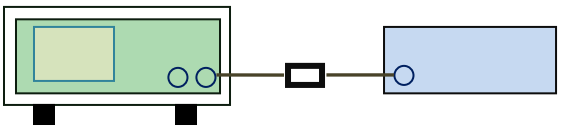
8DPSK - Middle Channel

8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	June 30, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)	a)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW ≥1% of the 20 dB bandwidth - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold. - The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☒Pass ☐ Fail		

Test Data ☒Yes ☐ N/A

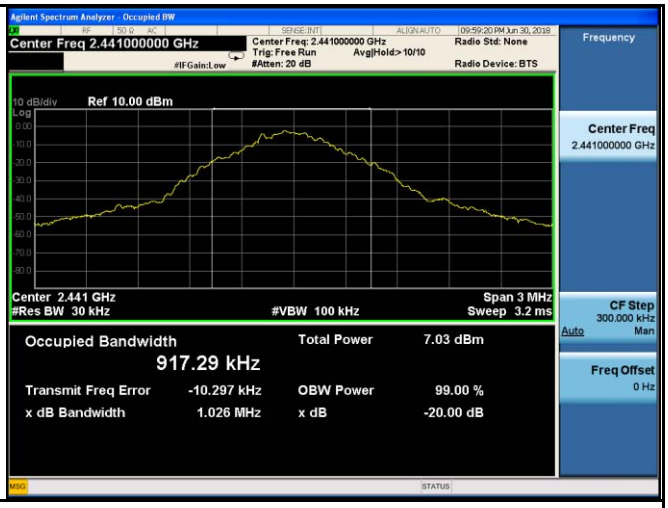
Test Plot ☒Yes (See below) ☐ N/A

Measurement result

Modulation	CH	CH Freq (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	1.024	0.9177
	Mid	2441	1.026	0.9173
	High	2480	1.027	0.9199
π/4 DQPSK	Low	2402	1.308	1.1964
	Mid	2441	1.308	1.1962
	High	2480	1.311	1.1978
8-DPSK	Low	2402	1.310	1.1965
	Mid	2441	1.313	1.1977
	High	2480	1.316	1.1989

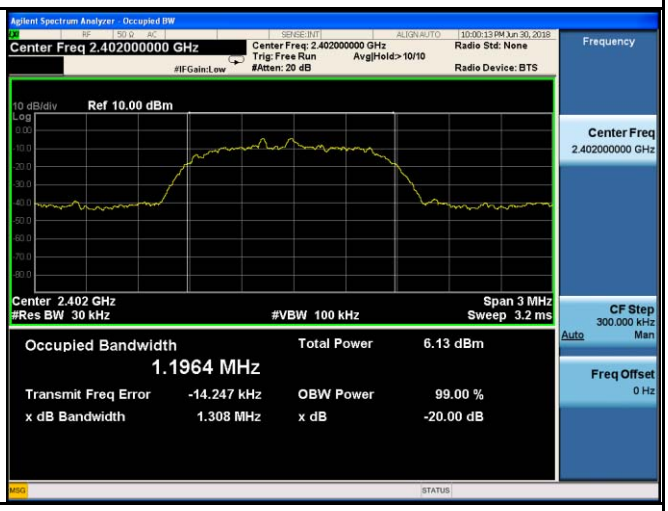
Test Plots
20dB Bandwidth measurement result

GFSK - Low Channel

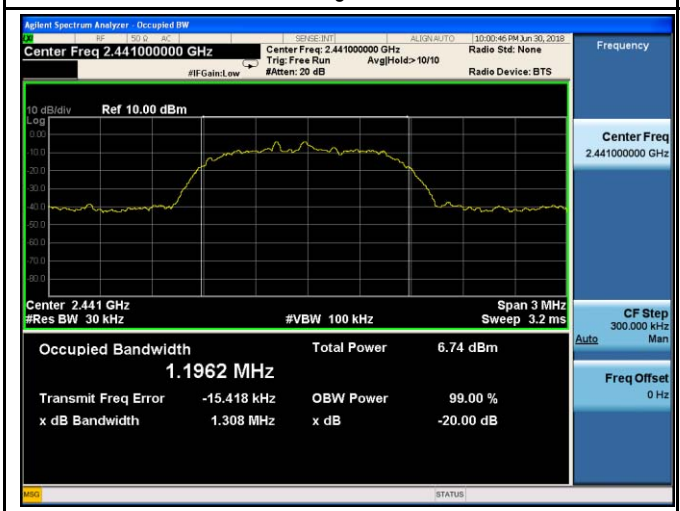


GFSK - Middle Channel

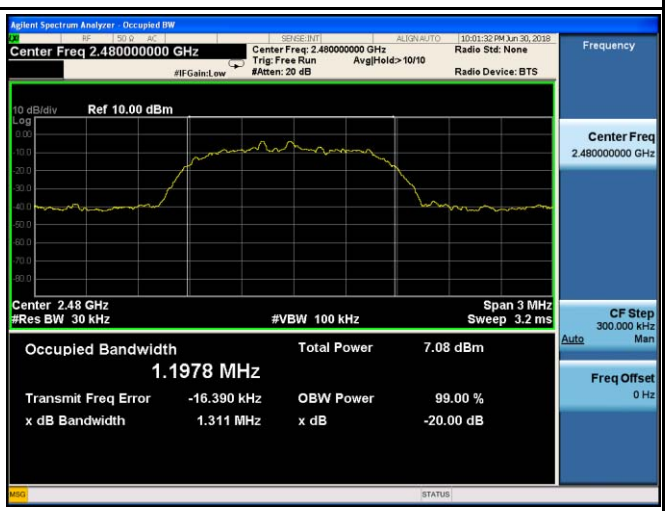
GFSK - High Channel



π/4 DQPSK - Low Channel

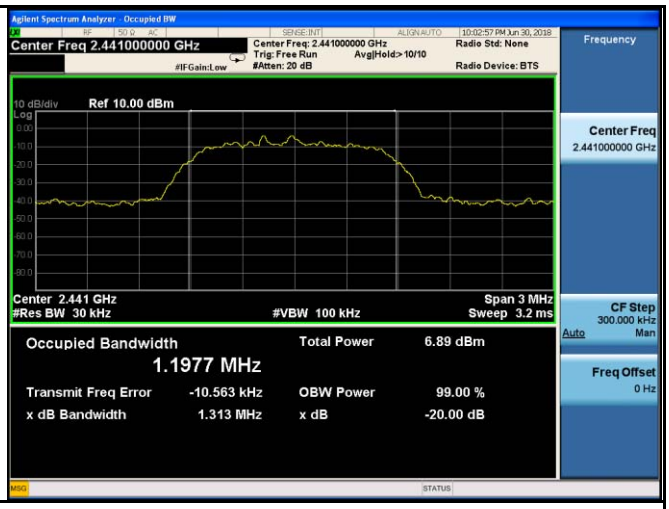


π/4 DQPSK - Middle Channel



π/4 DQPSK - High Channel

8DPSK - Low Channel



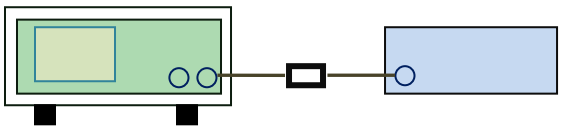
8DPSK - Middle Channel

8DPSK - High Channel

6.4 Peak Output Power

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	June 30, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (2)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤1 Watt	☒
	b)	FHSS in 5725-5850MHz: ≤1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤0.125 Watt.	☒
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤0.25 Watt	☐
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤1 Watt	☐
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel - RBW > the 20 dB bandwidth of the emission being measured - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. - Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer.		
Remark			
Result	☒Pass ☐ Fail		

Test Data ☒Yes ☐N/A

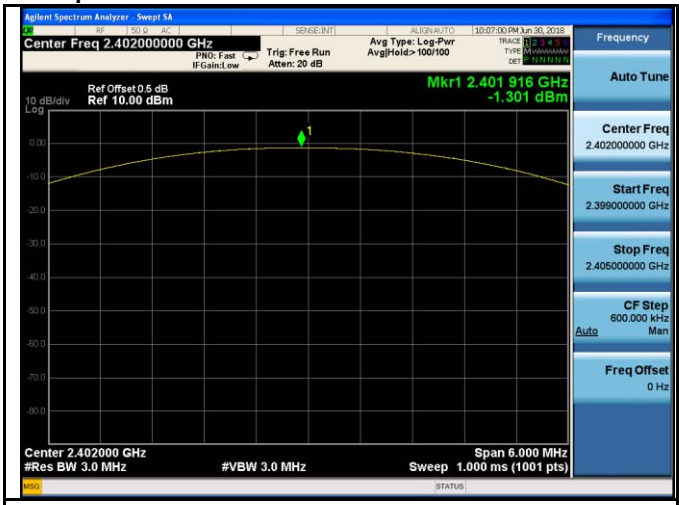
Test Plot ☒Yes (See below) ☐N/A

Peak Output Power measurement result

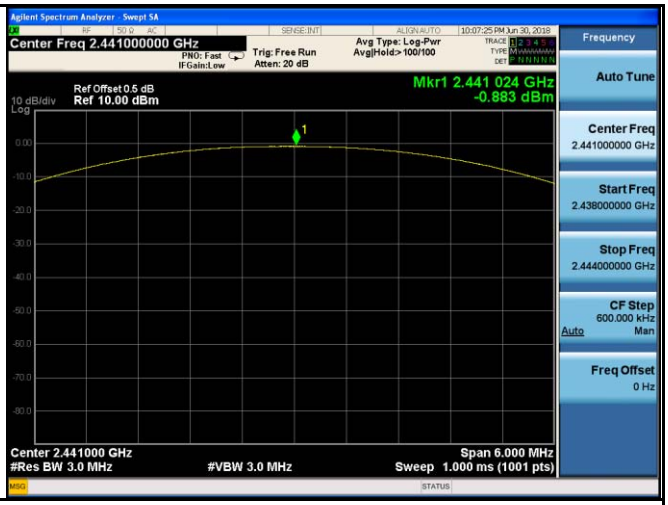
Type	Modulation	CH	Freq (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output Power	GFSK	Low	2402	-1.301	1000	Pass
		Mid	2441	-0.883	1000	Pass
		High	2480	-0.540	1000	Pass
	π/4 DQPSK	Low	2402	0.025	125	Pass
		Mid	2441	0.470	125	Pass
		High	2480	0.825	125	Pass
	8-DPSK	Low	2402	0.311	125	Pass
		Mid	2441	0.727	125	Pass
		High	2480	1.042	125	Pass

Test Plots

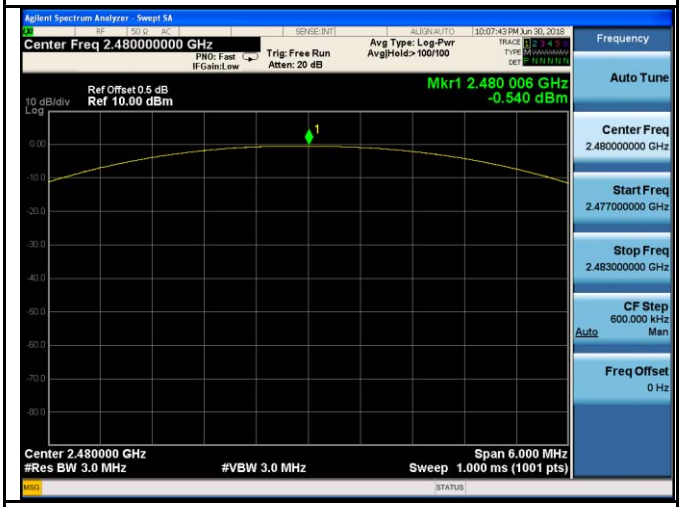
Output Power measurement result



GFSK Output power - Low CH 2402

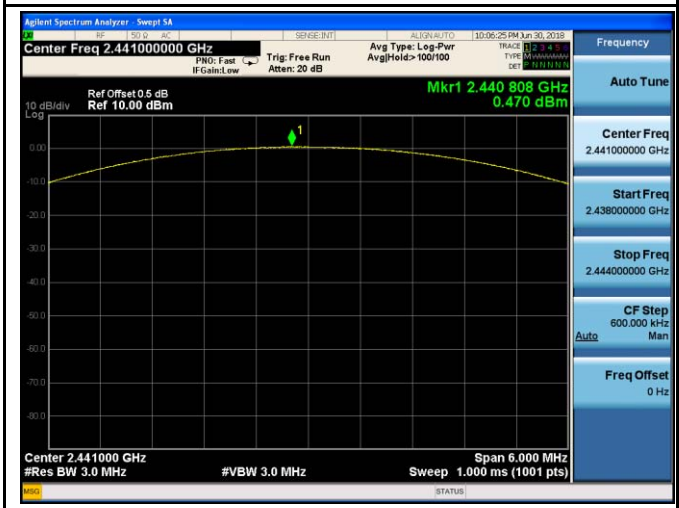


GFSK Output power - Mid CH 2441

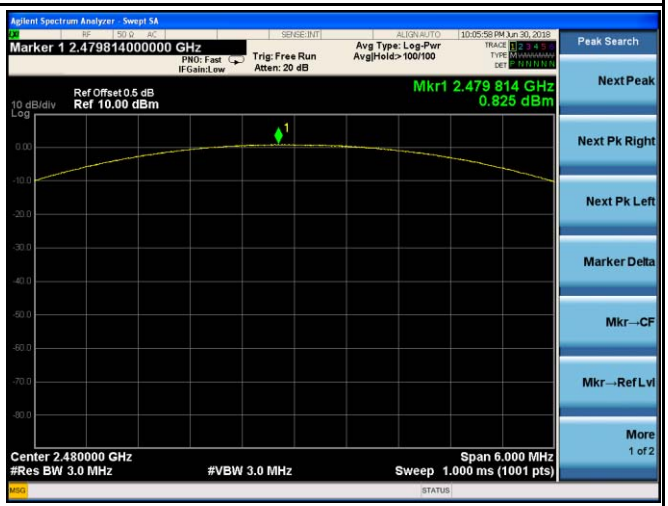


GFSK Output power - High CH 2480

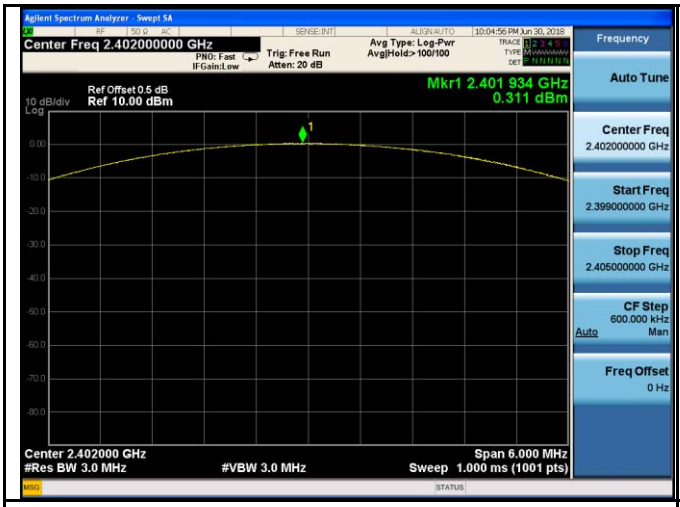
π/4 DQPSK Output power - Low CH 2402



π/4 DQPSK Output power - Mid CH 2441

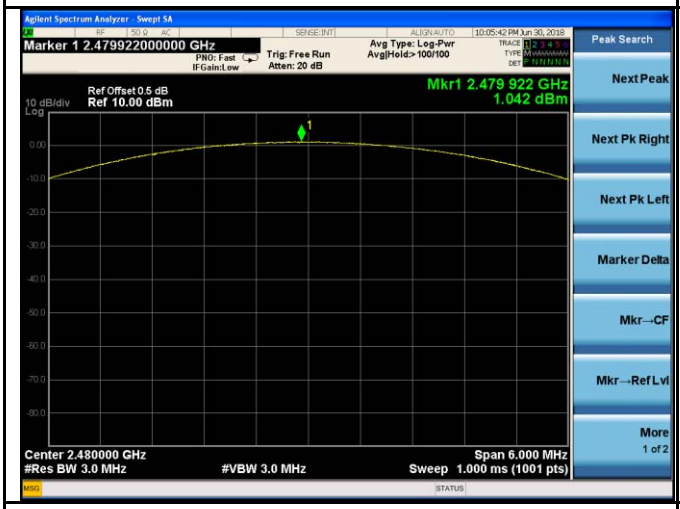


π/4 DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402

8DPSK Output power - Mid CH 2441

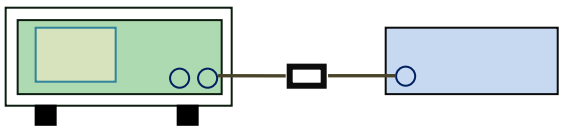


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	June 30, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	FHSS in 2400-2483.5MHz ≥ 15 channels	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: The EUT must have its hopping function enabled. - Span = the frequency band of operation - RBW ≥1% of the span - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow trace to fully stabilize. - It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☒Pass ☐Fail		

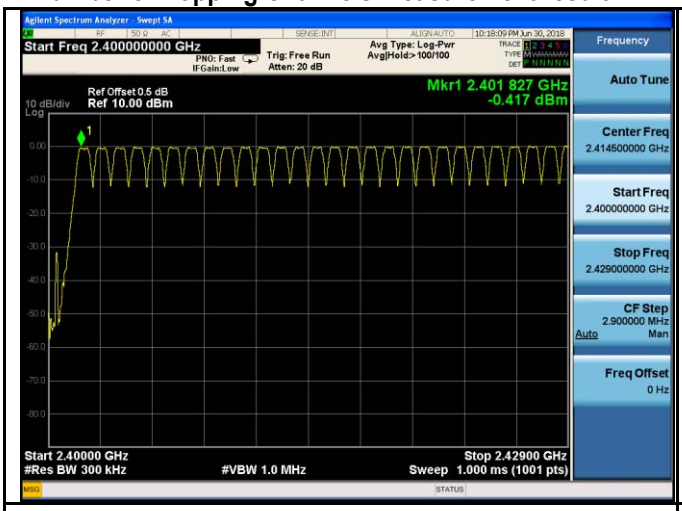
Test Data ☒Yes ☐N/A
Test Plot ☒Yes (See below) ☐N/A

Number of Hopping Channel measurement result

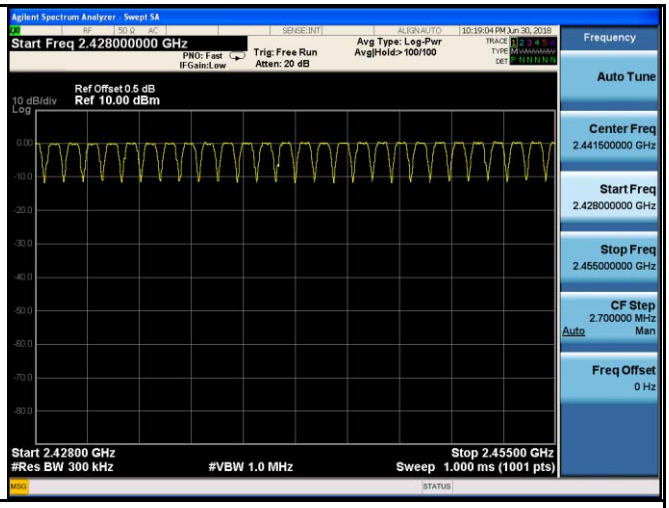
Type	Modulation	Frequency Range	Number of Hopping Channel	Limit
Number of Hopping Channel	GFSK	2400-2483.5	79	15
	π/4 DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

Test Plots

Number of Hopping Channels measurement result

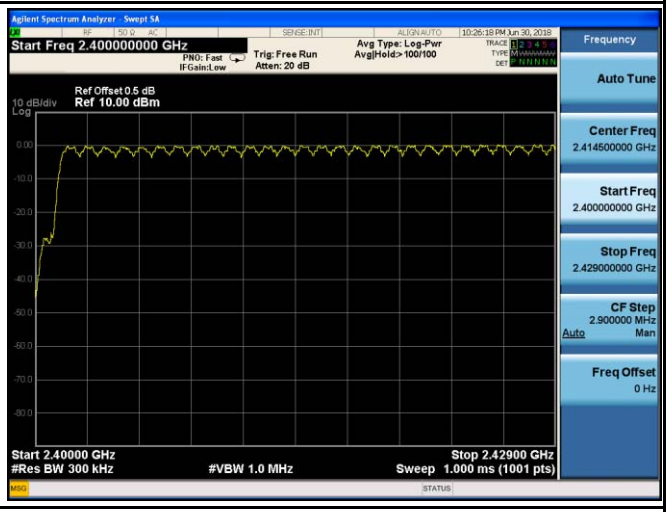


GFSK Number of Hopping Channels - 1

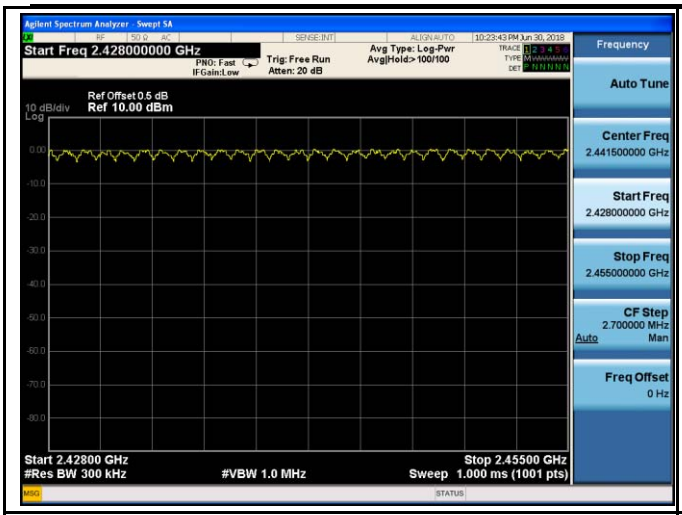


GFSK Number of Hopping Channels -2

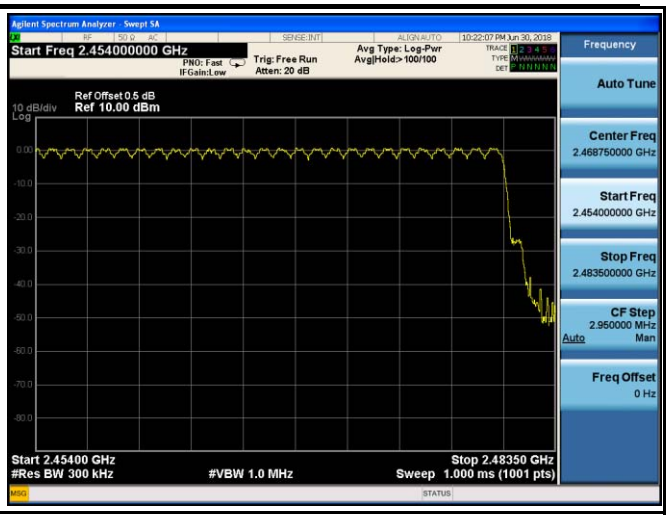
GFSK Number of Hopping Channels – 3



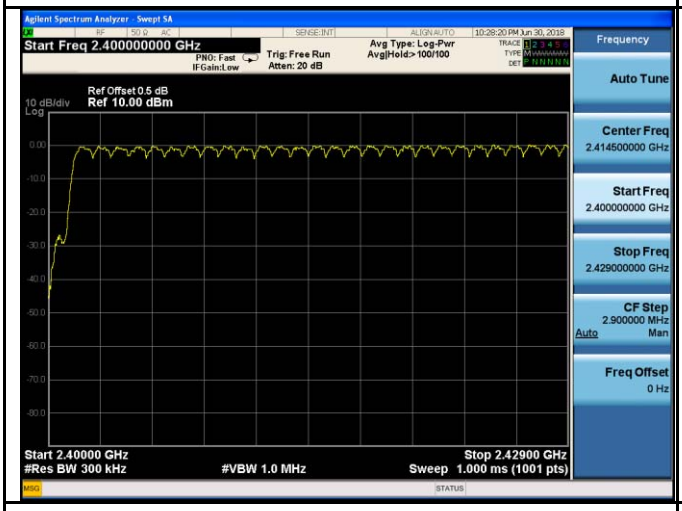
π/4 DQPSK Number of Hopping Channels - 1



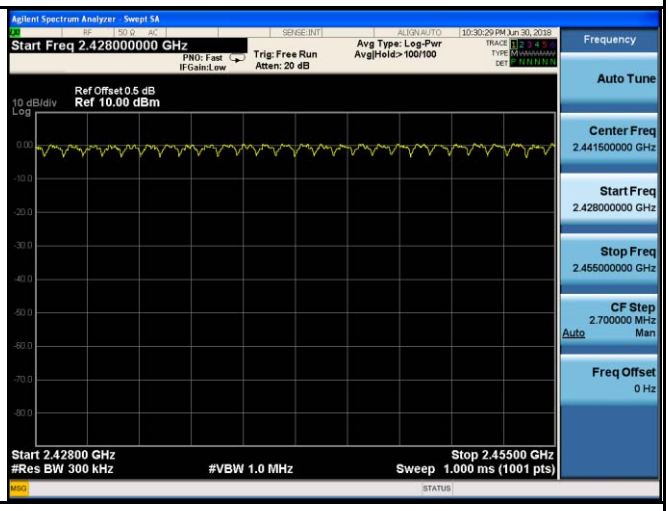
π/4 DQPSK Number of Hopping Channels - 2



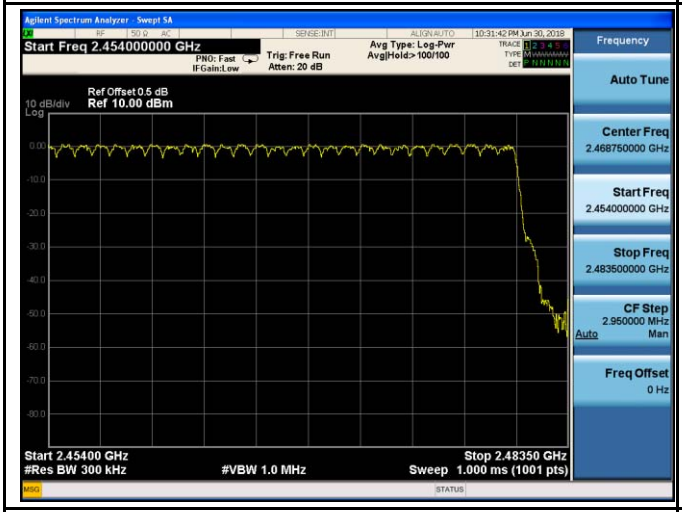
π/4 DQPSK Number of Hopping Channels - 3



8DPSK Number of Hopping Channels - 1



8DPSK Number of Hopping Channels - 2

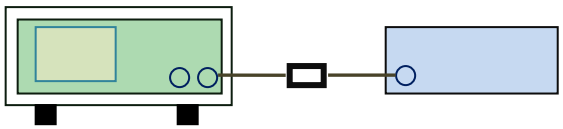


8DPSK Number of Hopping Channels - 3

6.6 Time of Occupancy (Dwell Time)

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	June 30, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	Dwell Time < 0.4s	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥RBW - Sweep = as necessary to capture the entire dwell time per hopping channel - Detector function = peak - Trace = max hold - use the marker-delta function to determine the dwell time		
Remark			
Result	☒Pass ☐ Fail		

Test Data ☒Yes ☐ N/A

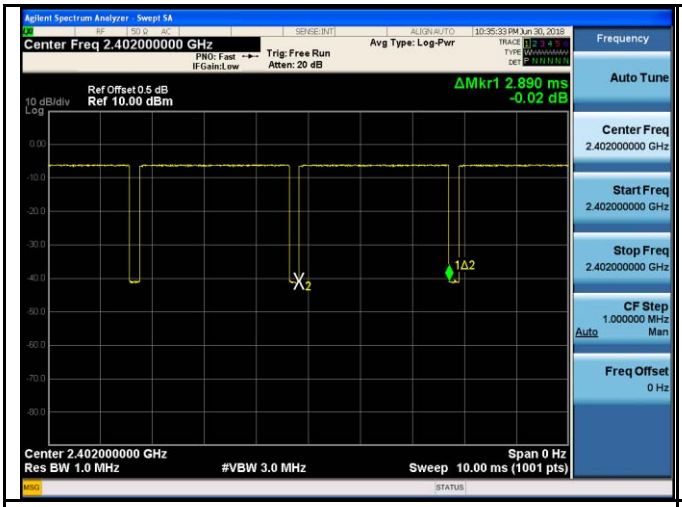
Test Plot ☒Yes (See below) ☐ N/A

Dwell Time measurement result

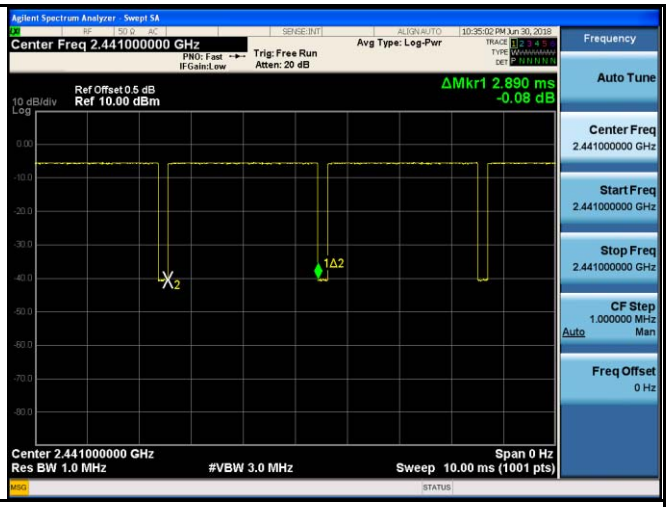
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.890	308.3	400	Pass
		Mid	2.890	308.3	400	Pass
		High	2.900	309.3	400	Pass
	π/4 DQPSK	Low	2.910	310.4	400	Pass
		Mid	2.910	310.4	400	Pass
		High	2.920	311.5	400	Pass
	8-DPSK	Low	2.930	312.5	400	Pass
		Mid	2.910	310.4	400	Pass
		High	2.910	310.4	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

Note：All packet have been tested（DH1、DH3、DH5）,but only worst（DH5）case is the reported.

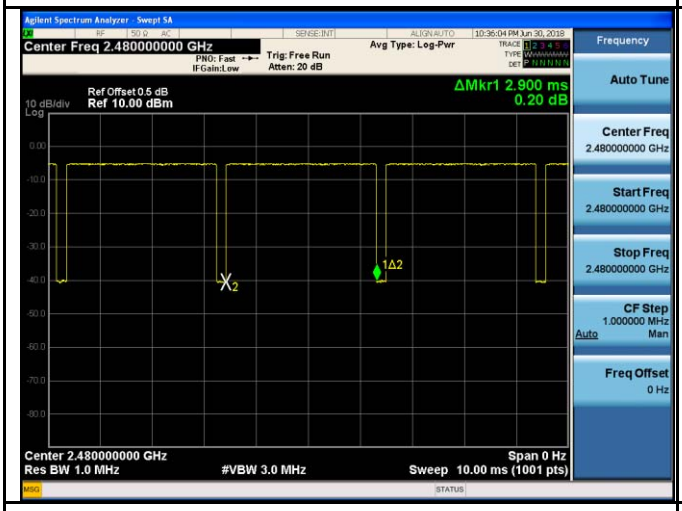
Test Plots
Dwell Time measurement result



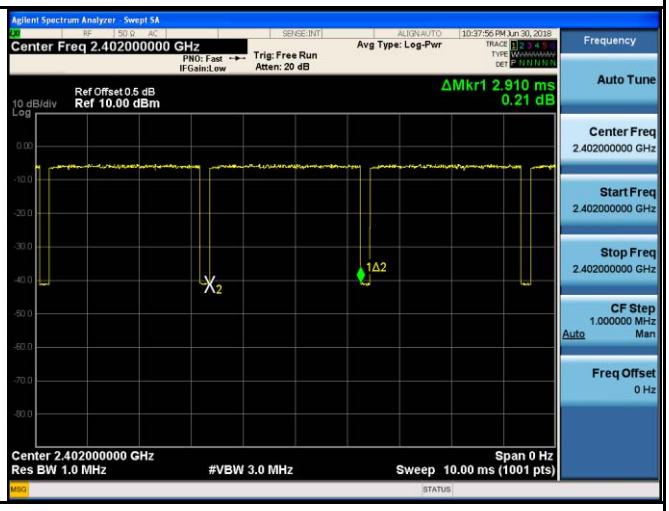
GFSK - Low CH 2402



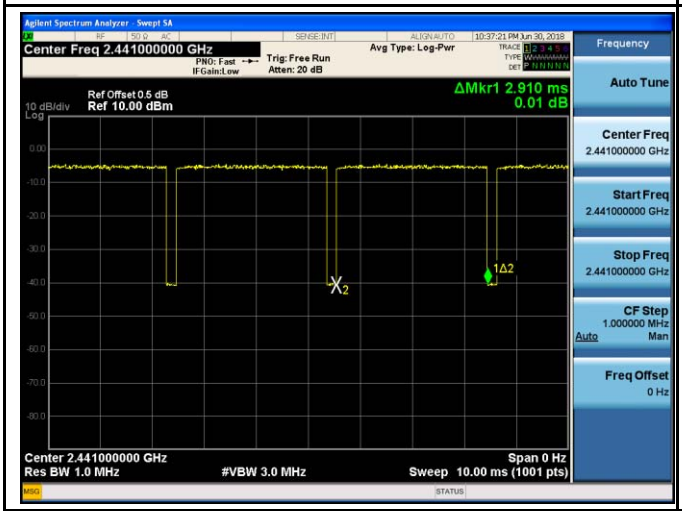
GFSK - Mid CH 2441



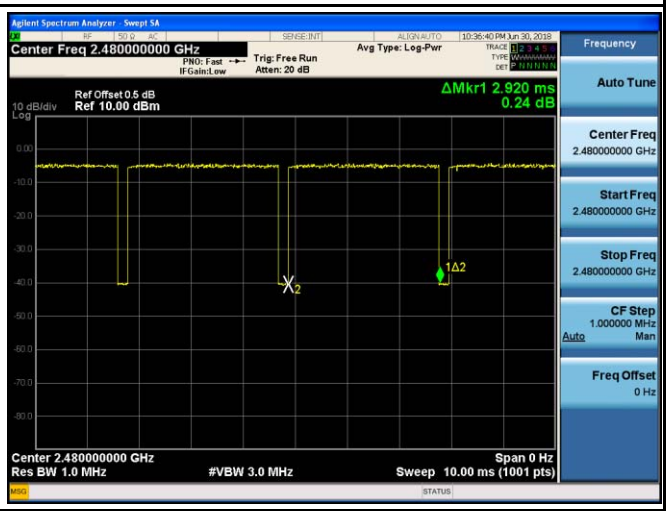
GFSK - High CH 2480



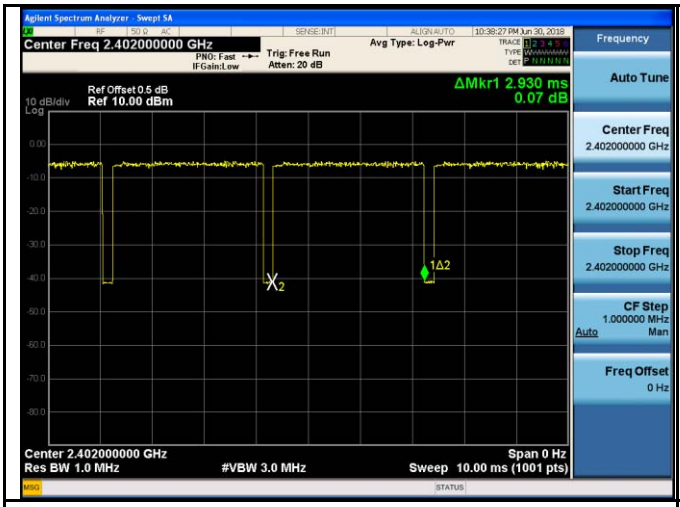
π/4 DQPSK - Low CH 2402



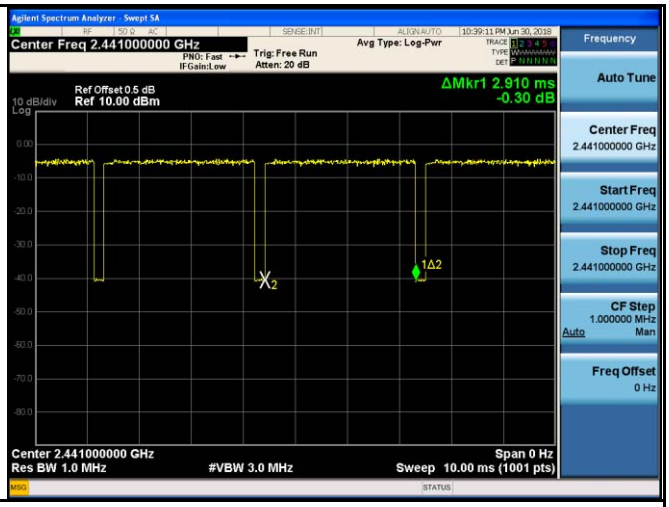
π/4 DQPSK - Mid CH 2441



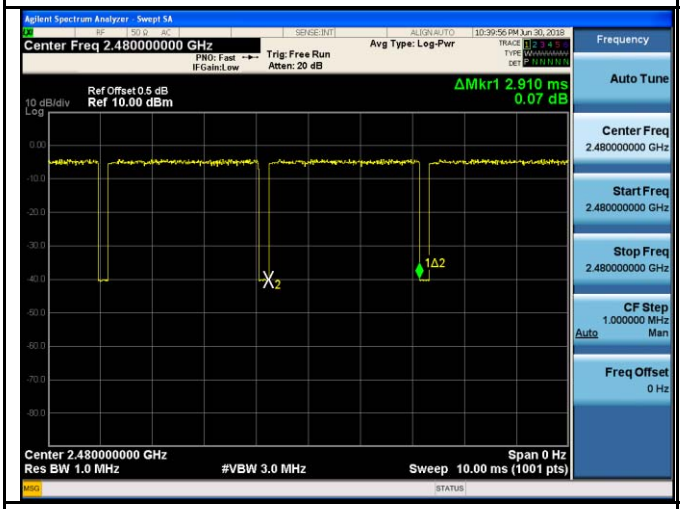
π/4 DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441



8DPSK - High CH 2480

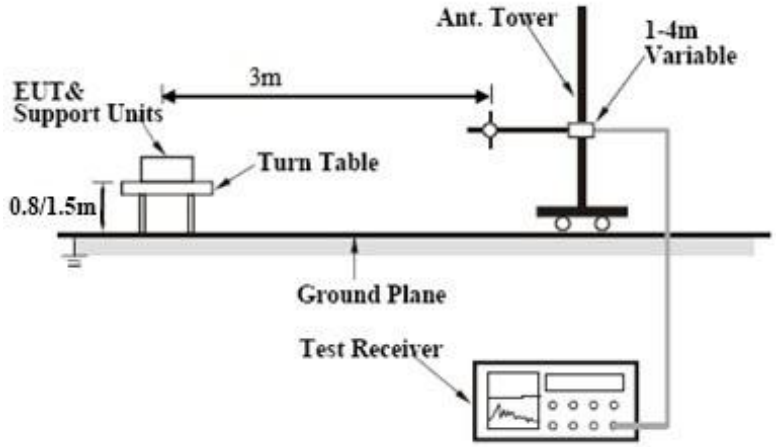
6.7 Band Edge

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	June 21, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits.	☒

Test Setup



Test Procedure

The test follows FCC Public Notice DA 00-705 Measurement Guidelines.

Radiated Method Only

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:
  a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.
  b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.
  c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.

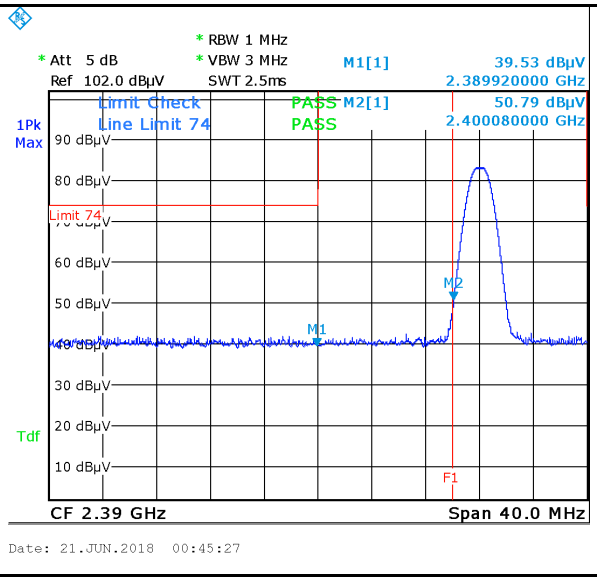
Remark

Result	☒Pass ☐Fail

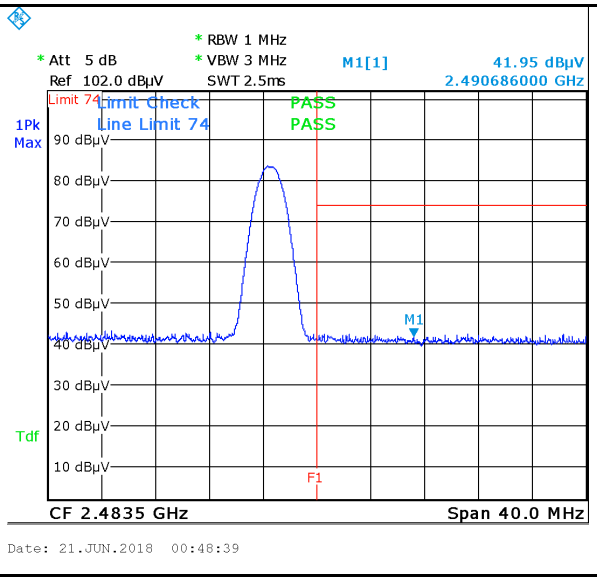
Test Data ☐Yes ☒N/A

Test Plot ☒Yes (See below) ☐N/A

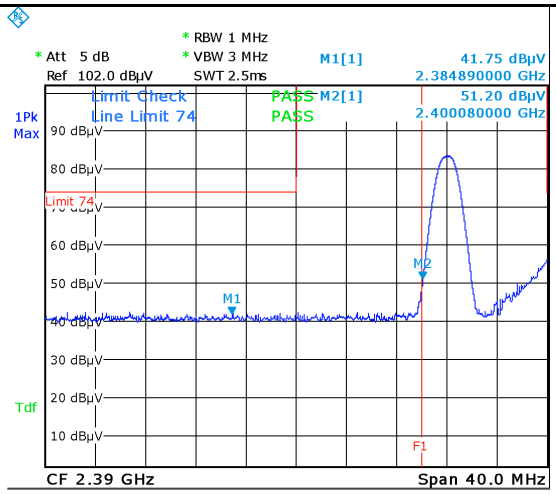
Test Plots



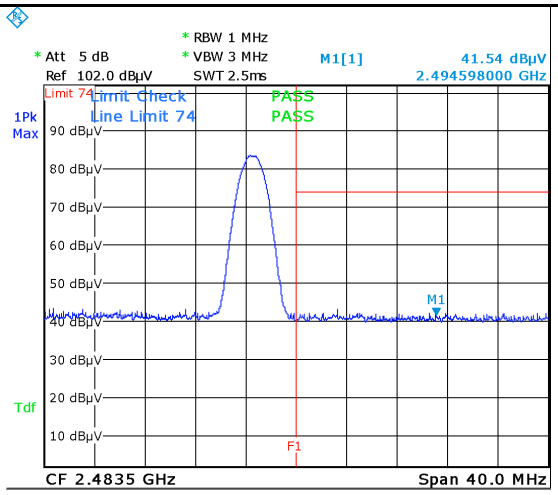
GFSK - Left Side - PK



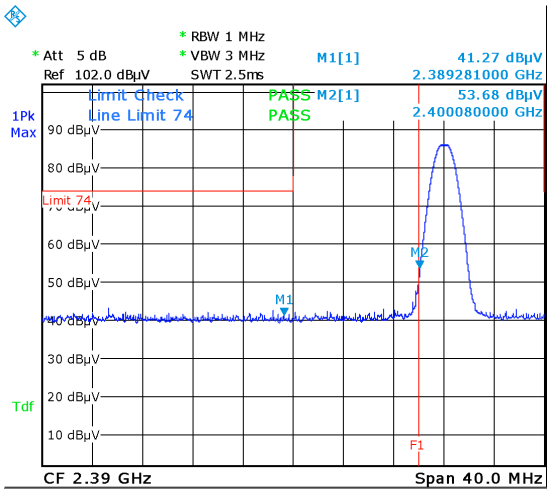
GFSK - Right Side - PK



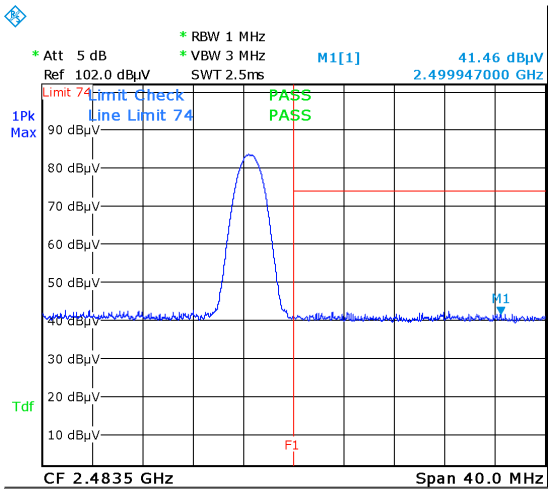
π /4 DQPSK - Left Side - PK



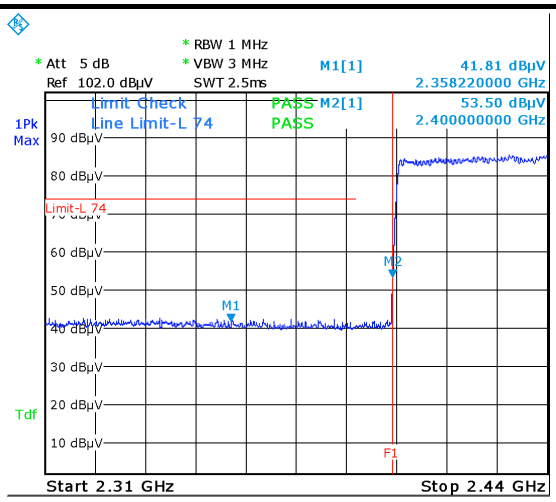
π /4 DQPSK - Right Side - PK



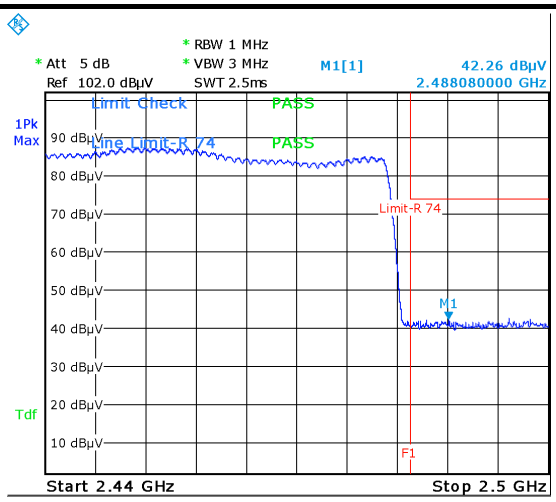
8DPSK - Left Side - PK



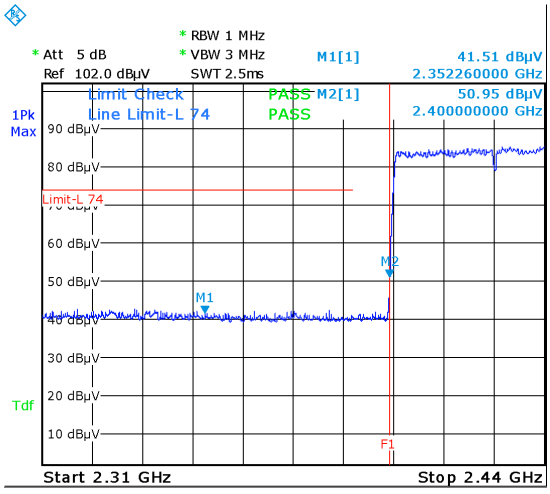
8DPSK - Right Side - PK



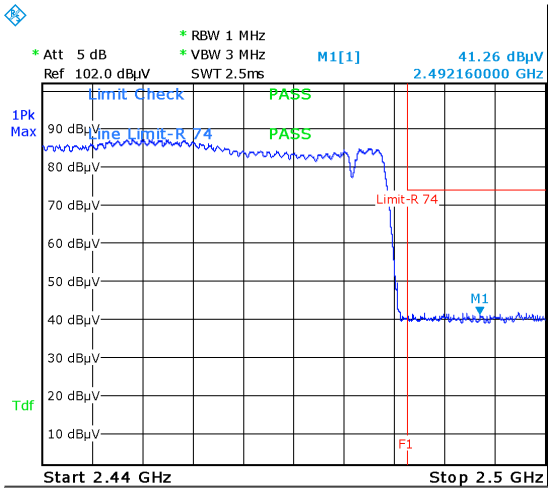
GFSK - Left Side – PK – Hopping



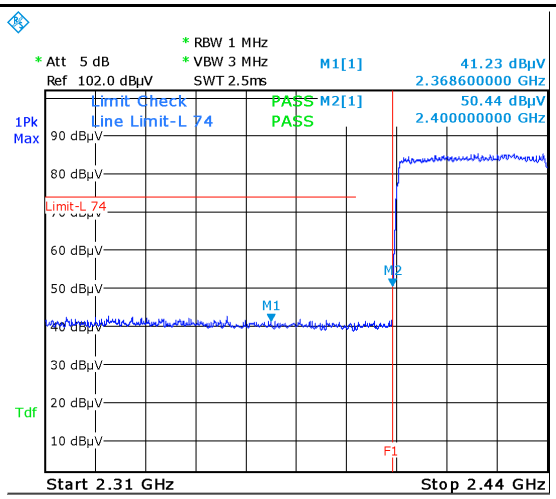
GFSK - Right Side - PK – Hopping



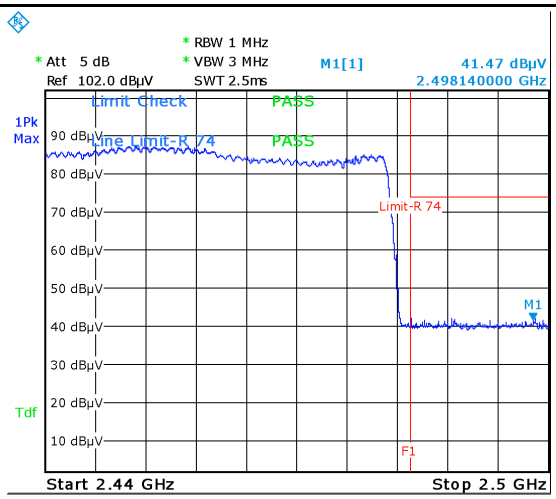
π /4 DQPSK - Left Side – PK – Hopping



π /4 DQPSK - Right Side - PK – Hopping



8DPSK - Left Side – PK – Hopping



8DPSK - Right Side - PK – Hopping

6.8 Conducted Emissions

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	March 29, 2018
Tested By :	Peter Wei

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices 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, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	☒

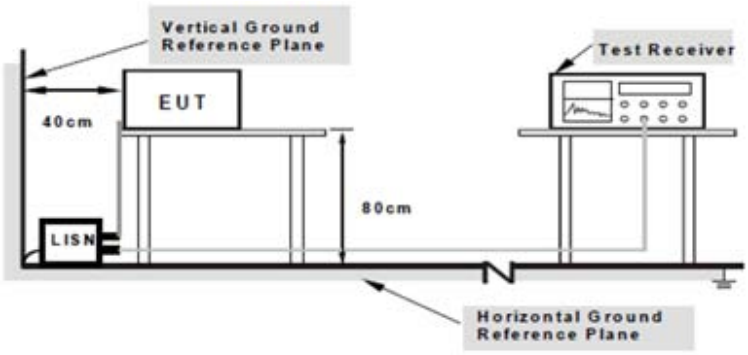
Class A Limit

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Class B Limit

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

Procedure

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50 [mu]H/50 EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz.
8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Remark

Result	☒Pass ☐Fail

Test Data ☒Yes ☐N/A

Test Plot ☒Yes (See below) ☐N/A

Data sample

No.	Frequency	Reading	Detector	Lisn/lsn	Ps_Lmt	Cab_L	Result	Limit	Margin
	(MHz)	(dBμV)		(dB)	(dB)	(dB)	(dBμV)	(dBμV)	(dB)

Frequency (MHz) = Emission frequency in MHz

Reading (dBμV) = Receiver Reading Value

Detector=Quasi Peak Detector or Average Detector

Lisn/ISN= Insertion loss of LISN

Ps_Lmt= Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Cab_L= cable loss

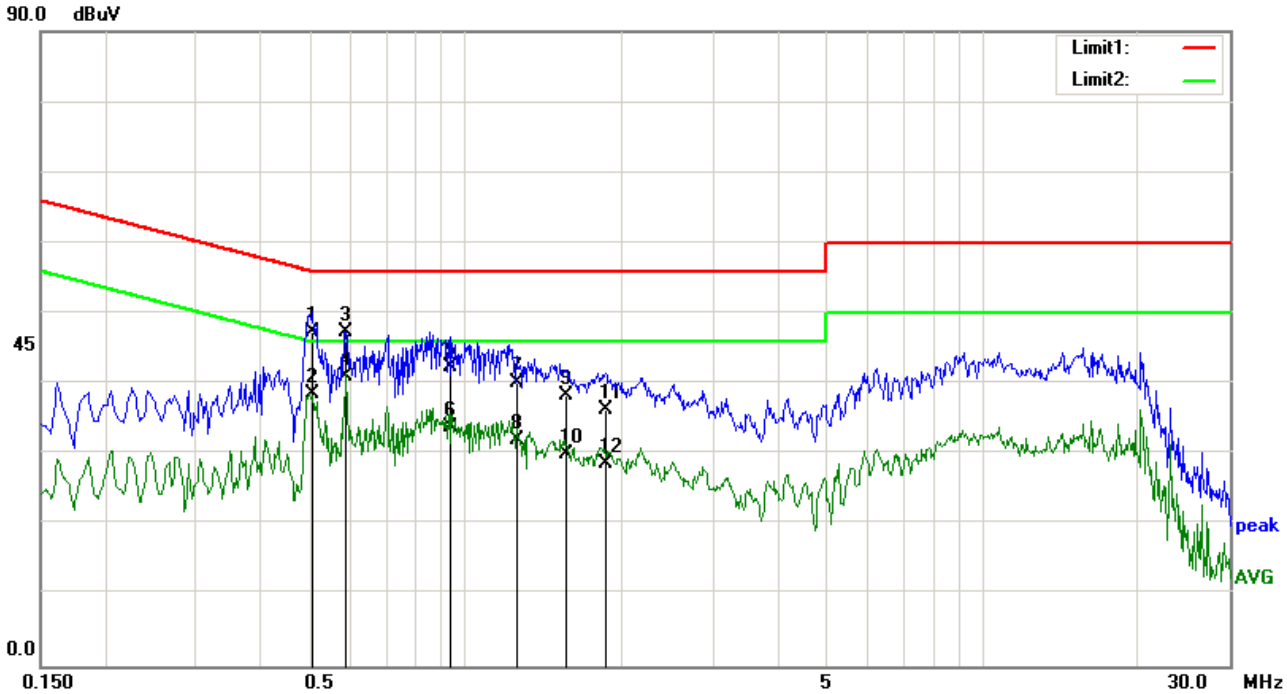
Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

Margin (dB) = Result (dBμV) – limit (dBμV)

Test Mode(Adapter) :	Normal Working Mode

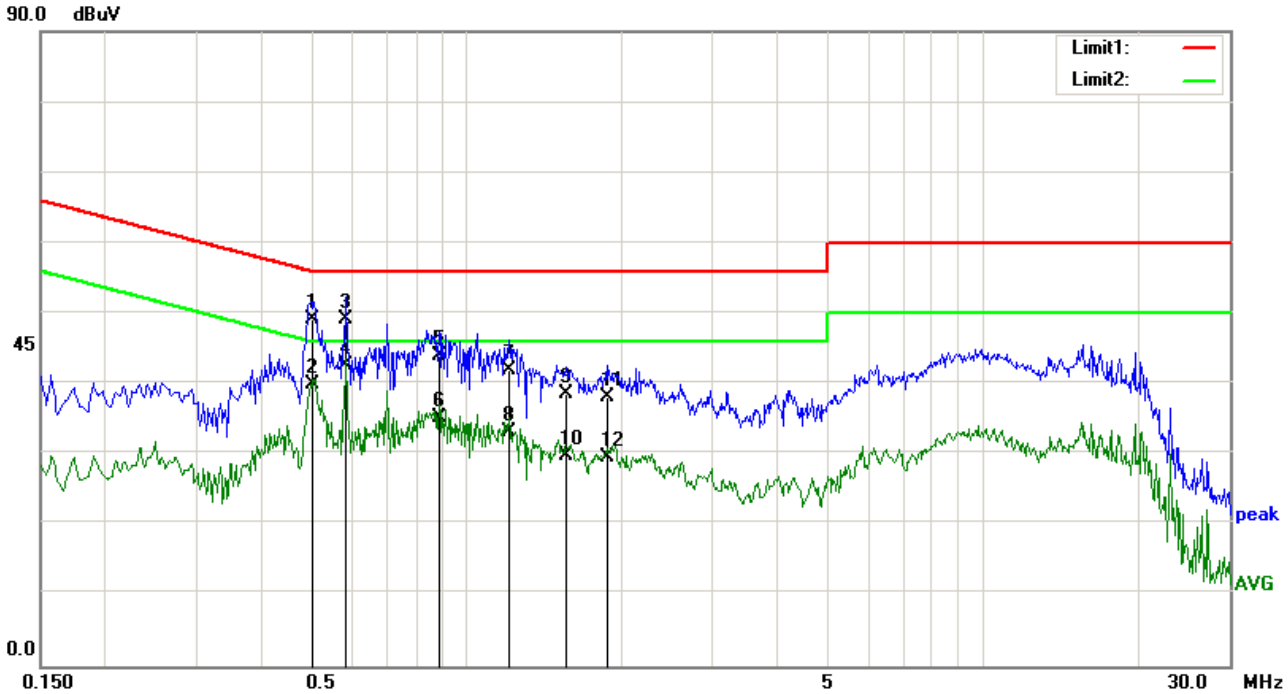


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.5060	37.07	QP	0.12	-10.00	0.21	47.40	56.00	-8.60
2	0.5060	28.19	AVG	0.12	-10.00	0.21	38.52	46.00	-7.48
3	0.5860	37.03	QP	0.12	-10.00	0.21	47.36	56.00	-8.64
4	0.5860	30.83	AVG	0.12	-10.00	0.21	41.16	46.00	-4.84
5	0.9340	32.13	QP	0.14	-10.00	0.19	42.46	56.00	-13.54
6	0.9340	23.47	AVG	0.14	-10.00	0.19	33.80	46.00	-12.20
7	1.2500	29.91	QP	0.15	-10.00	0.21	40.27	56.00	-15.73
8	1.2500	21.72	AVG	0.15	-10.00	0.21	32.08	46.00	-13.92
9	1.5620	27.95	QP	0.15	-10.00	0.20	38.30	56.00	-17.70
10	1.5620	19.63	AVG	0.15	-10.00	0.20	29.98	46.00	-16.02
11	1.8620	26.00	QP	0.16	-10.00	0.20	36.36	56.00	-19.64
12	1.8620	18.24	AVG	0.16	-10.00	0.20	28.60	46.00	-17.40

Test Mode(Adapter) :	Normal Working Mode

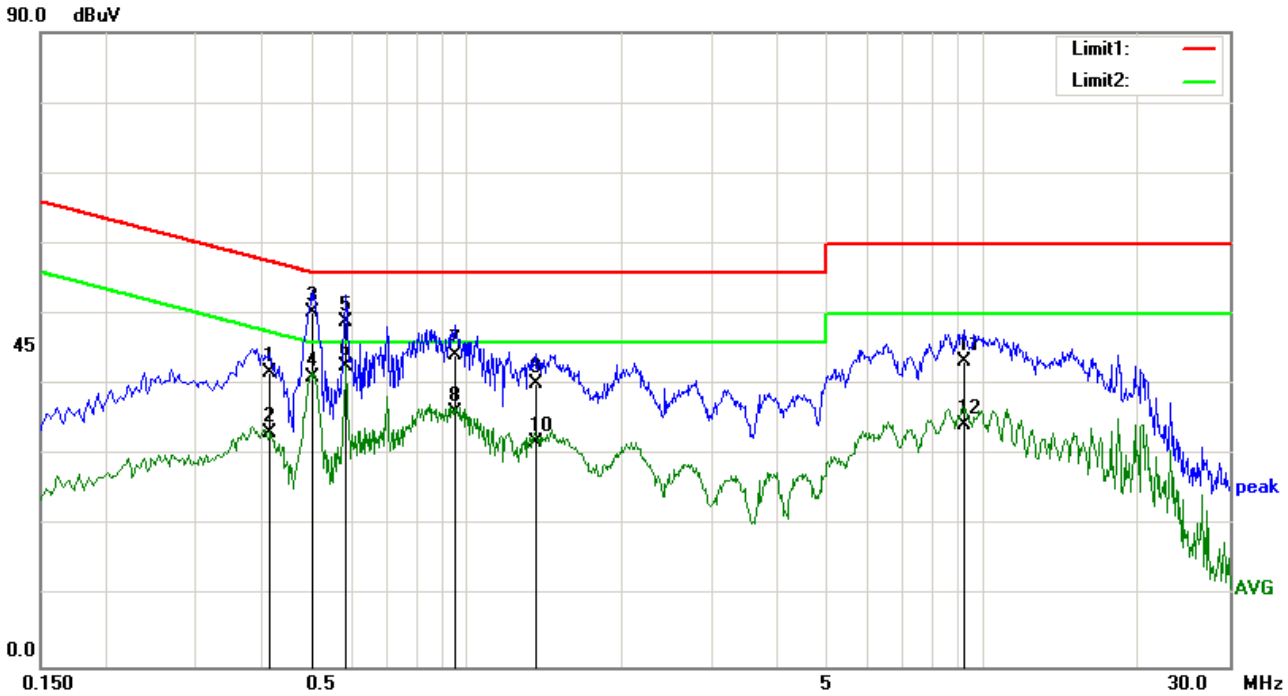


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/lsn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.5020	38.80	QP	0.11	-10.00	0.21	49.12	56.00	-6.88
2	0.5020	29.60	AVG	0.11	-10.00	0.21	39.92	46.00	-6.08
3	0.5860	38.78	QP	0.11	-10.00	0.21	49.10	56.00	-6.90
4	0.5860	32.34	AVG	0.11	-10.00	0.21	42.66	46.00	-3.34
5	0.8860	33.60	QP	0.13	-10.00	0.19	43.92	56.00	-12.08
6	0.8860	24.82	AVG	0.13	-10.00	0.19	35.14	46.00	-10.86
7	1.2100	31.59	QP	0.14	-10.00	0.21	41.94	56.00	-14.06
8	1.2100	22.95	AVG	0.14	-10.00	0.21	33.30	46.00	-12.70
9	1.5660	28.21	QP	0.15	-10.00	0.20	38.56	56.00	-17.44
10	1.5660	19.45	AVG	0.15	-10.00	0.20	29.80	46.00	-16.20
11	1.8740	27.78	QP	0.16	-10.00	0.20	38.14	56.00	-17.86
12	1.8740	19.24	AVG	0.16	-10.00	0.20	29.60	46.00	-16.40

Test Mode(Adapter) :	Normal Working Mode

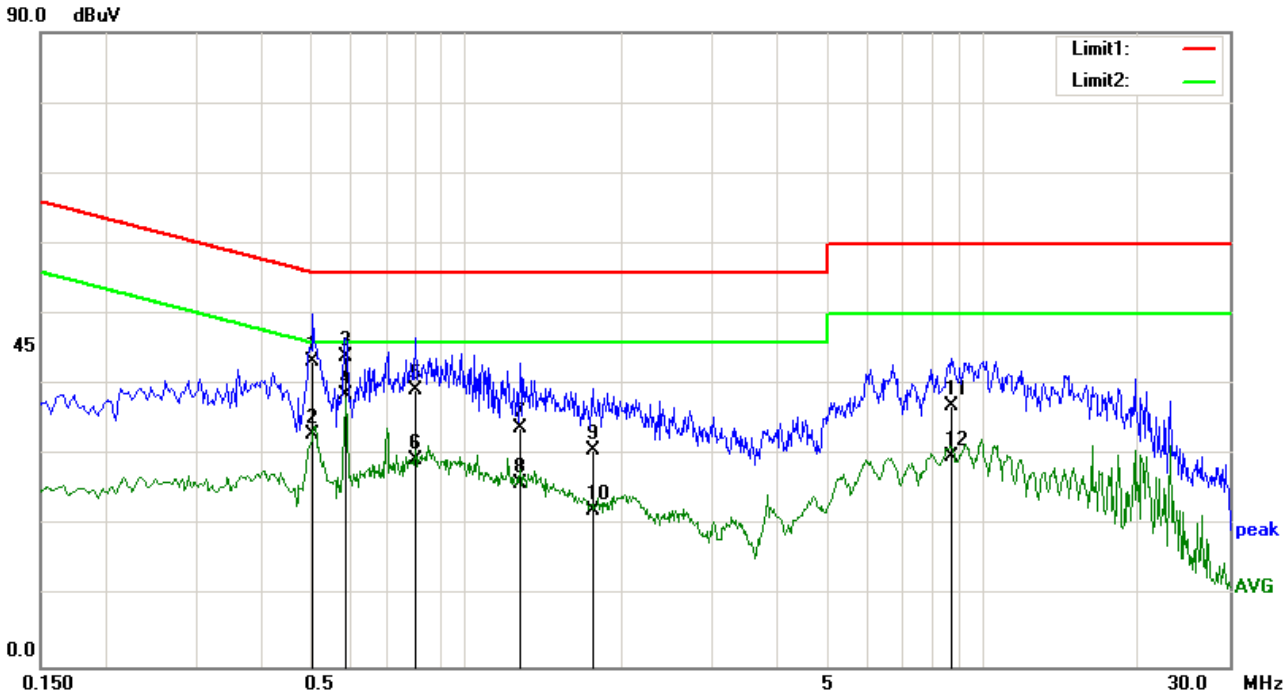


Test Data

Phase Line Plot at 230Vac, 50Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.4180	31.48	QP	0.11	-10.00	0.21	41.80	57.49	-15.69
2	0.4180	22.96	AVG	0.11	-10.00	0.21	33.28	47.49	-14.21
3	0.5020	40.05	QP	0.12	-10.00	0.21	50.38	56.00	-5.62
4	0.5020	30.69	AVG	0.12	-10.00	0.21	41.02	46.00	-4.98
5	0.5860	38.54	QP	0.12	-10.00	0.21	48.87	56.00	-7.13
6	0.5860	32.34	AVG	0.12	-10.00	0.21	42.67	46.00	-3.33
7	0.9500	33.81	QP	0.14	-10.00	0.19	44.14	56.00	-11.86
8	0.9500	25.83	AVG	0.14	-10.00	0.19	36.16	46.00	-9.84
9	1.3620	29.80	QP	0.15	-10.00	0.21	40.16	56.00	-15.84
10	1.3620	21.51	AVG	0.15	-10.00	0.21	31.87	46.00	-14.13
11	9.1900	32.37	QP	0.46	-10.00	0.38	43.21	60.00	-16.79
12	9.1900	23.37	AVG	0.46	-10.00	0.38	34.21	50.00	-15.79

Test Mode(Adapter) :	Normal Working Mode

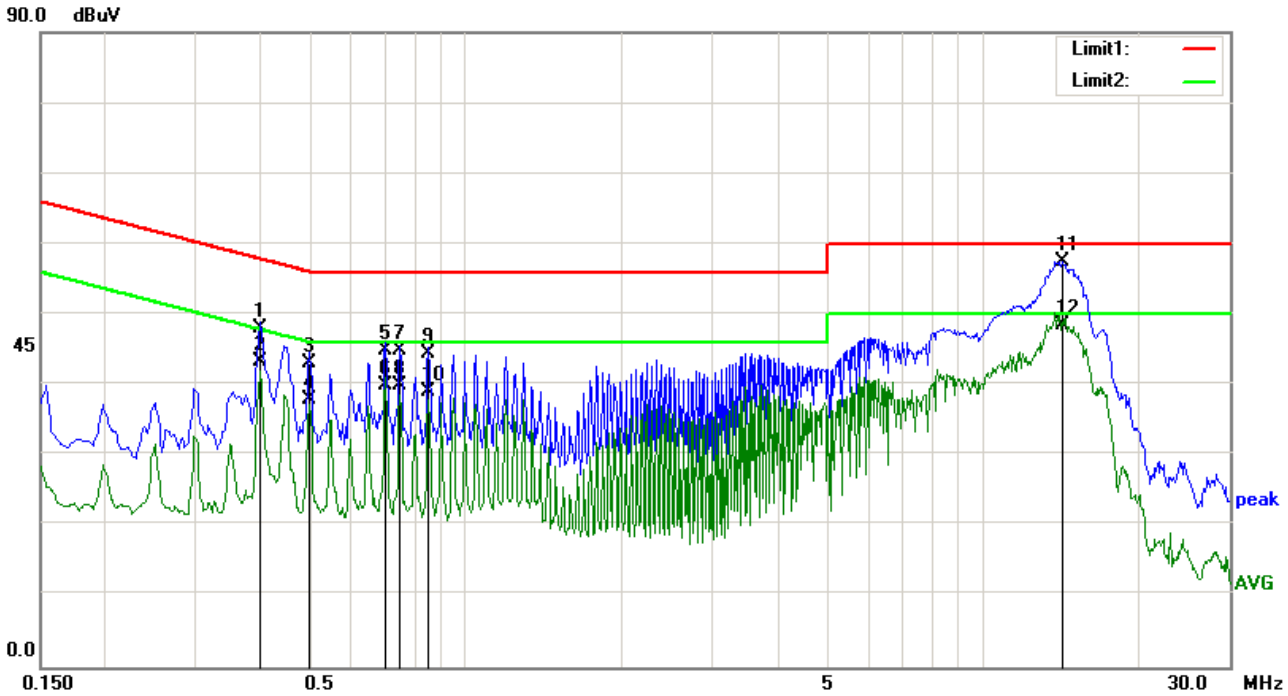


Test Data

Phase Neutral Plot at 230Vac, 50Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.5060	33.09	QP	0.11	-10.00	0.21	43.41	56.00	-12.59
2	0.5060	22.55	AVG	0.11	-10.00	0.21	32.87	46.00	-13.13
3	0.5860	33.75	QP	0.11	-10.00	0.21	44.07	56.00	-11.93
4	0.5860	28.26	AVG	0.11	-10.00	0.21	38.58	46.00	-7.42
5	0.7980	29.00	QP	0.12	-10.00	0.20	39.32	56.00	-16.68
6	0.7980	19.09	AVG	0.12	-10.00	0.20	29.41	46.00	-16.59
7	1.2740	23.49	QP	0.14	-10.00	0.21	33.84	56.00	-22.16
8	1.2740	15.57	AVG	0.14	-10.00	0.21	25.92	46.00	-20.08
9	1.7620	20.26	QP	0.16	-10.00	0.21	30.63	56.00	-25.37
10	1.7620	11.75	AVG	0.16	-10.00	0.21	22.12	46.00	-23.88
11	8.6900	26.06	QP	0.48	-10.00	0.37	36.91	60.00	-23.09
12	8.6900	18.92	AVG	0.48	-10.00	0.37	29.77	50.00	-20.23

Test Mode(POE) :	Normal Working Mode

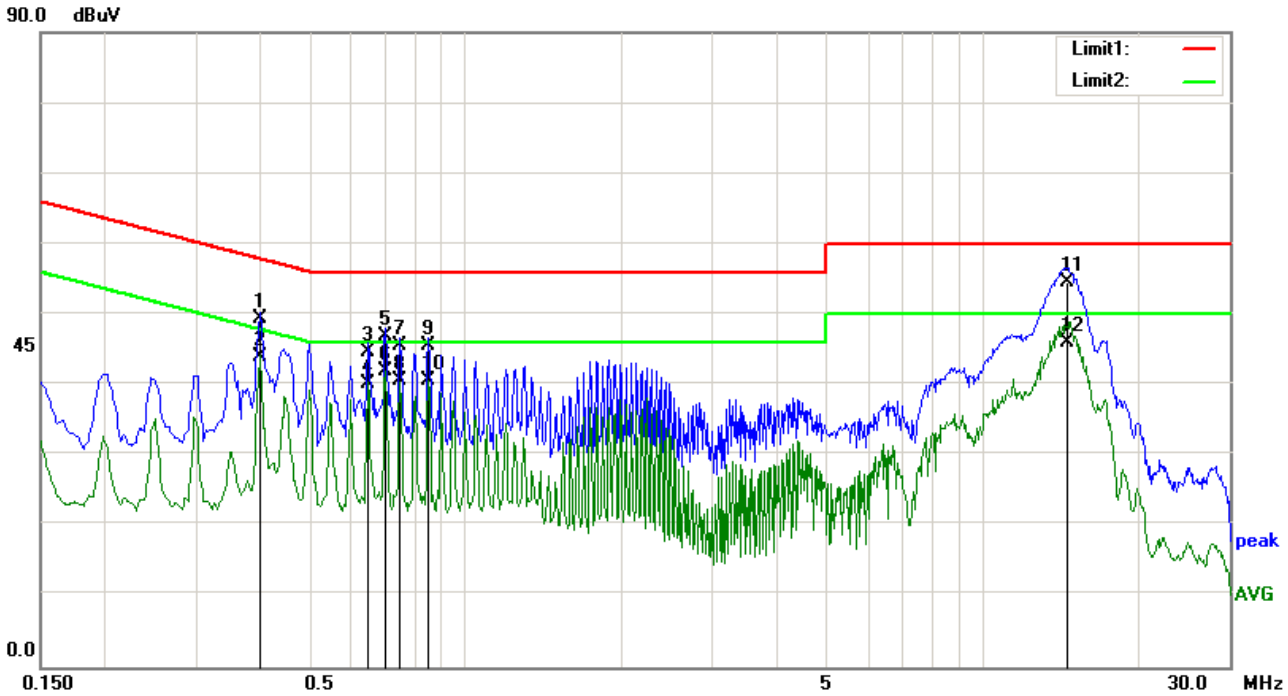


Test Data

Phase Line

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.3980	37.77	QP	0.11	-10.00	0.21	48.09	57.90	-9.81
2	0.3980	33.00	AVG	0.11	-10.00	0.21	43.32	47.90	-4.58
3	0.4980	32.76	QP	0.12	-10.00	0.21	43.09	56.03	-12.94
4	0.4980	27.59	AVG	0.12	-10.00	0.21	37.92	46.03	-8.11
5	0.6980	34.62	QP	0.13	-10.00	0.20	44.95	56.00	-11.05
6	0.6980	29.56	AVG	0.13	-10.00	0.20	39.89	46.00	-6.11
7	0.7460	34.47	QP	0.13	-10.00	0.20	44.80	56.00	-11.20
8	0.7460	29.58	AVG	0.13	-10.00	0.20	39.91	46.00	-6.09
9	0.8460	34.08	QP	0.13	-10.00	0.20	44.41	56.00	-11.59
10	0.8460	28.71	AVG	0.13	-10.00	0.20	39.04	46.00	-6.96
11	14.2740	46.22	QP	0.81	-10.00	0.47	57.50	60.00	-2.50
12	14.2740	37.27	AVG	0.81	-10.00	0.47	48.55	50.00	-1.45

Test Mode(POE) :	Normal Working Mode



Test Data

Phase Neutral

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.3980	39.08	QP	0.11	-10.00	0.21	49.40	57.90	-8.50
2	0.3980	33.76	AVG	0.11	-10.00	0.21	44.08	47.90	-3.82
3	0.6460	34.36	QP	0.12	-10.00	0.20	44.68	56.00	-11.32
4	0.6460	29.88	AVG	0.12	-10.00	0.20	40.20	46.00	-5.80
5	0.6980	36.50	QP	0.12	-10.00	0.20	46.82	56.00	-9.18
6	0.6980	31.68	AVG	0.12	-10.00	0.20	42.00	46.00	-4.00
7	0.7460	35.22	QP	0.12	-10.00	0.20	45.54	56.00	-10.46
8	0.7460	30.35	AVG	0.12	-10.00	0.20	40.67	46.00	-5.33
9	0.8460	35.24	QP	0.12	-10.00	0.20	45.56	56.00	-10.44
10	0.8460	30.33	AVG	0.12	-10.00	0.20	40.65	46.00	-5.35
11	14.5260	43.10	QP	0.91	-10.00	0.47	54.48	60.00	-5.52
12	14.5260	34.63	AVG	0.91	-10.00	0.47	46.01	50.00	-3.99

6.9 Radiated Emissions

Temperature	28°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	March 29, 2018
Tested By :	Peter Wei

Requirement(s):

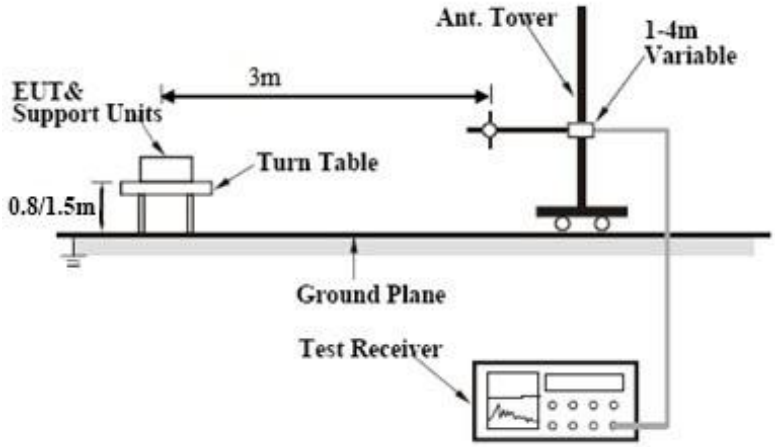
Spec	Item	Requirement	Applicable
47CFR§15.209	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	☒

Class A Limit

Frequency range (MHz)	Field Strength (μV/m)
30 – 88	90
88 – 216	150
216 – 960	210
Above 960	300

Class B Limit

Frequency range (MHz)	Field Strength (μV/m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Test Setup	
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz

	with Peak detection for Average Measurement as below at frequency above 1GHz. 5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	
Result	☒Pass ☐Fail

Test Data ☒Yes ☐N/A

Test Plot ☒Yes (See below) ☐N/A

Data sample

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBμV/m)		(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)

Frequency (MHz) = Emission frequency in MHz

Reading (dBμV/m) = Receiver Reading Value

Detector= Peak Detector or Quasi Peak Detector

Ant_F=Antenna Factor

PA_G=Pre-Amplifier Gain

Cab_L=Cable Loss

Result (dBμV/m) = Read ing Value + Corrected Value

Limit (dBμV/m) = Limit stated in standard

Height (cm) = Height of Receiver antenna

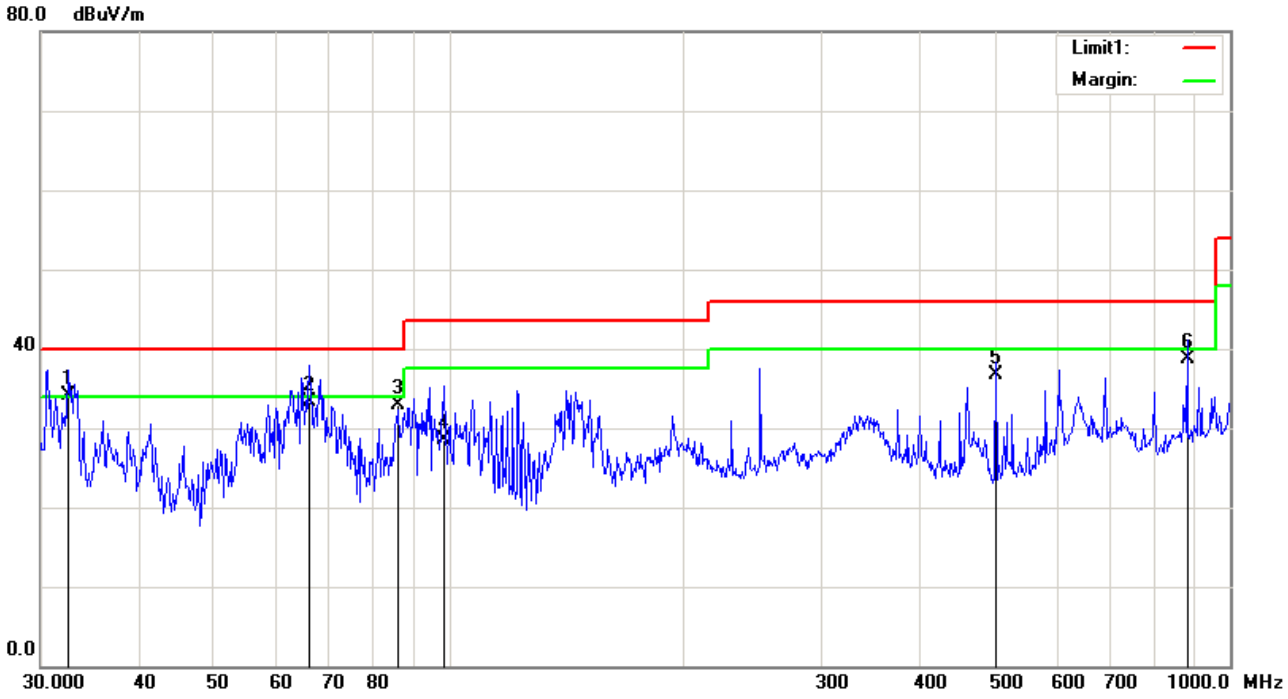
Degree = Turn table degree

Calculation Formula:

Margin (dB) = Result (dBμV/m) – limit (dBμV/m)

Test Mode(Adapter) :	Normal Working Mode

Below 1GHz



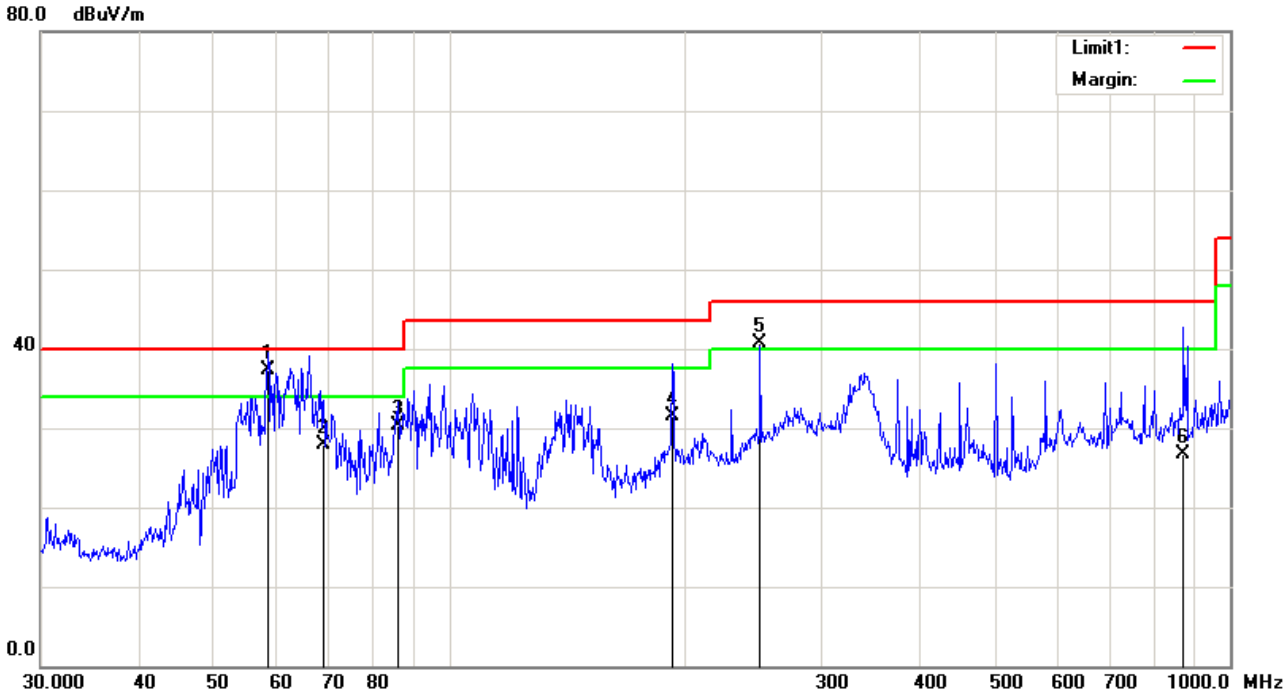
Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBμV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	32.5198	58.71	QP	20.13	45.66	0.92	34.10	40.00	-5.90	100	259
2	66.2662	70.13	QP	9.48	47.70	1.39	33.30	40.00	-6.70	100	35
3	85.8984	70.53	QP	8.32	47.43	1.48	32.90	40.00	-7.10	100	76
4	98.4866	62.67	QP	10.79	46.56	1.60	28.50	43.50	-15.00	121	360
5	501.1790	67.13	QP	15.38	49.27	3.56	36.80	46.00	-9.20	100	162
6	881.4067	56.67	QP	23.28	45.95	4.80	38.80	46.00	-7.20	200	322

Test Mode(Adapter) :	**Normal Working Mode**

Below 1GHz



Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBμV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	58.6126	73.59	QP	9.54	47.12	1.29	37.30	40.00	-2.70	300	148
2	69.1141	63.80	QP	10.61	47.84	1.43	28.00	40.00	-12.00	200	154
3	85.8984	66.72	QP	9.63	47.43	1.48	30.40	40.00	-9.60	200	154
4	193.0945	63.29	QP	12.98	46.90	2.23	31.60	43.50	-11.90	200	201
5	250.3012	70.87	QP	15.16	47.74	2.51	40.80	46.00	-5.20	100	181
6	872.1832	45.31	QP	22.78	46.06	4.77	26.80	46.00	-19.20	100	213

Test Mode:	Transmitting BT Mode (GFSK)

Mode: GFSK (Worst Case)

Above 1GHz

Low Channel (2402 MHz)

Horizontal

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1595	53.98	peak	28.95	50.31	3.91	36.53	74	-37.47	200	154
2	1748	62.34	peak	29.84	51.04	4.00	45.14	74	-28.86	100	343
3	1833	59.95	peak	30.33	51.45	4.01	42.84	74	-31.16	100	231
4	2139	55.53	peak	31.38	52.35	4.13	38.69	74	-35.31	100	74
5	2564	56.89	peak	31.59	52.66	4.11	39.93	74	-34.07	200	139
6	4804	58.74	peak	33.18	53.35	6.10	44.67	74	-29.33	200	221

Vertical

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1595	55.34	peak	28.95	50.31	3.91	37.89	74	-36.11	100	212
2	1833	59.45	peak	30.33	51.45	4.01	42.34	74	-31.66	200	349
3	1986	53.98	peak	31.22	52.17	3.95	36.98	74	-37.02	100	121
4	2139	54.01	peak	31.38	52.35	4.13	37.17	74	-36.83	100	126
5	2581	52.76	peak	31.59	52.67	4.12	35.80	74	-38.20	200	231
6	4804	50.13	peak	33.18	53.35	6.10	36.06	74	-37.94	200	66

Middle Channel (2441 MHz)

Horizontal

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1901	62.34	peak	30.73	51.77	3.98	45.28	74	-28.72	200	247
2	2139	55.89	peak	31.38	52.35	4.13	39.05	74	-34.95	200	123
3	2598	52.76	peak	31.59	52.67	4.13	35.81	74	-38.19	100	156
4	4882	59.57	peak	33.33	53.66	6.00	45.24	74	-28.76	100	189
5	5981	45.98	peak	33.40	51.36	5.87	33.89	74	-40.11	200	173
6	7324	48.34	peak	34.82	55.04	7.15	35.27	74	-38.73	200	298

Vertical

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1595	54.63	peak	28.95	50.31	3.91	37.18	74	-36.82	100	245
2	1867	56.89	peak	30.53	51.61	3.99	39.80	74	-34.20	100	267
3	2139	57.08	peak	31.38	52.35	4.13	40.24	74	-33.76	100	342
4	4882	52.57	peak	33.33	53.66	6.00	38.24	74	-35.76	200	178
5	5709	54.23	peak	33.46	52.57	6.12	33.24	74	-40.76	100	98
6	7324	50.09	peak	34.82	55.04	7.15	37.02	74	-36.98	100	160

High Channel (2480 MHz)

Horizontal

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	1595	53.98	peak	28.95	50.31	3.91	36.53	74	-37.47	100	29
2	1850	60.66	peak	30.43	51.53	4.00	43.56	74	-30.44	100	298
3	2139	55.87	peak	31.38	52.35	4.13	39.03	74	-34.97	200	144
4	2632	52.37	peak	31.59	52.68	4.15	35.43	74	-38.57	100	131
5	4960	56.55	peak	33.51	54.04	5.88	41.90	74	-32.10	100	57
6	7443	50.36	peak	35.01	54.87	7.33	37.83	74	-36.17	200	326

Vertical

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	1595	55.56	peak	28.95	50.31	3.91	38.11	74	-35.89	100	187
2	1850	60.51	peak	30.43	51.53	4.00	43.41	74	-30.59	200	134
3	2139	52.57	peak	31.38	52.35	4.13	35.73	74	-38.27	100	21
4	4960	49.94	peak	33.51	54.04	5.88	35.29	74	-38.71	200	68
5	6032	46.15	peak	33.45	51.38	5.85	34.07	74	-39.93	200	345
6	7443	51.04	peak	35.01	54.87	7.33	38.51	74	-35.49	100	158

Note:We test 3 modulations, only show GFSK test data in the report.

Annex A. TEST INSTRUMENT

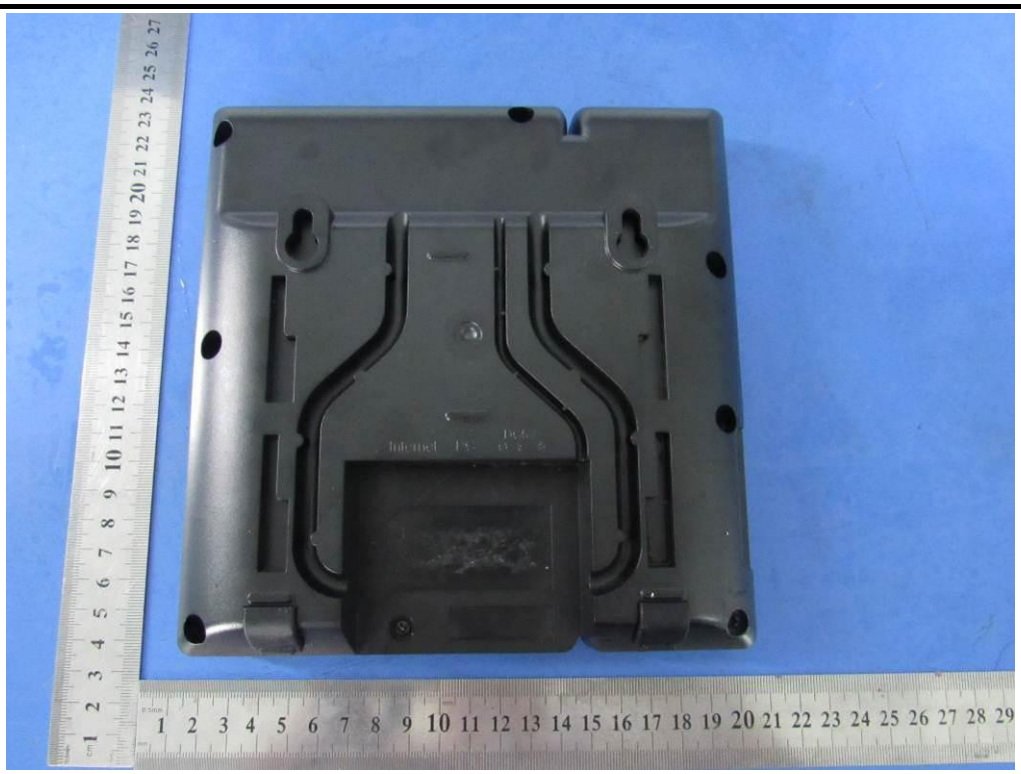
Instrument	Model	Serial #	Cal Date	Cal Due	In use
Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	04/26/2018	04/25/2019	☒
V-LISN	ESH3-Z5	838979/005	04/26/2018	04/25/2019	☒
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	04/26/2018	04/25/2019	☒
SIEMIC EZ_EMC Conducted Emissions	Ver.ICP-03A1	N/A	N/A	N/A	☒
RF Conducted Test					
R&S EMI Receiver	ESPI3	101216	04/26/2018	04/25/2019	☒
Power Splitter	1#	1#	04/26/2018	04/25/2019	☒
Spectrum Analyzer	N9010A	MY47191130	04/26/2018	04/25/2019	☒
Radiated Emissions					
Spectrum Analyzer	N9010A	MY47191130	04/26/2018	04/25/2019	☒
R&S EMI Receiver	ESPI3	101216	04/26/2018	04/25/2019	☒
Antenna (30MHz~6GHz)	JB6	A121411	05/19/2018	05/18/2019	☒
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	04/26/2018	04/25/2019	☒
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	04/26/2018	04/25/2019	☒
Horn Antenna (18~40GHz)	AH-840	101013	04/26/2018	04/25/2019	N/A
Microwave Pre-Amp (18~40GHz)	PA-840	181250	04/26/2018	04/25/2019	N/A
Hp Pre-Amplifier	8447F	1937A01160	04/26/2018	04/25/2019	☒
Agilent Pre-Amplifier	8449B	N/A	04/26/2018	04/25/2019	☒
SIEMIC EZ_EMC Conducted Emissions	Ver.ICP-03A1	N/A	N/A	N/A	☒

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

The Whole Package – Front View

EUT - Top View

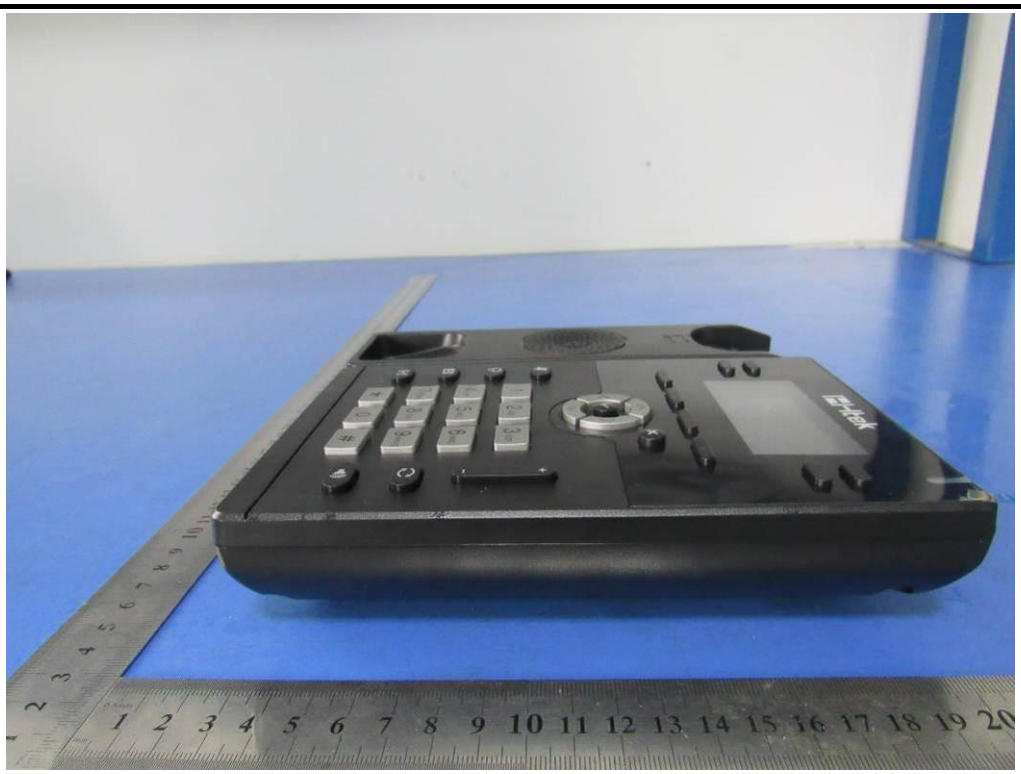


EUT - Bottom View

EUT - Front View

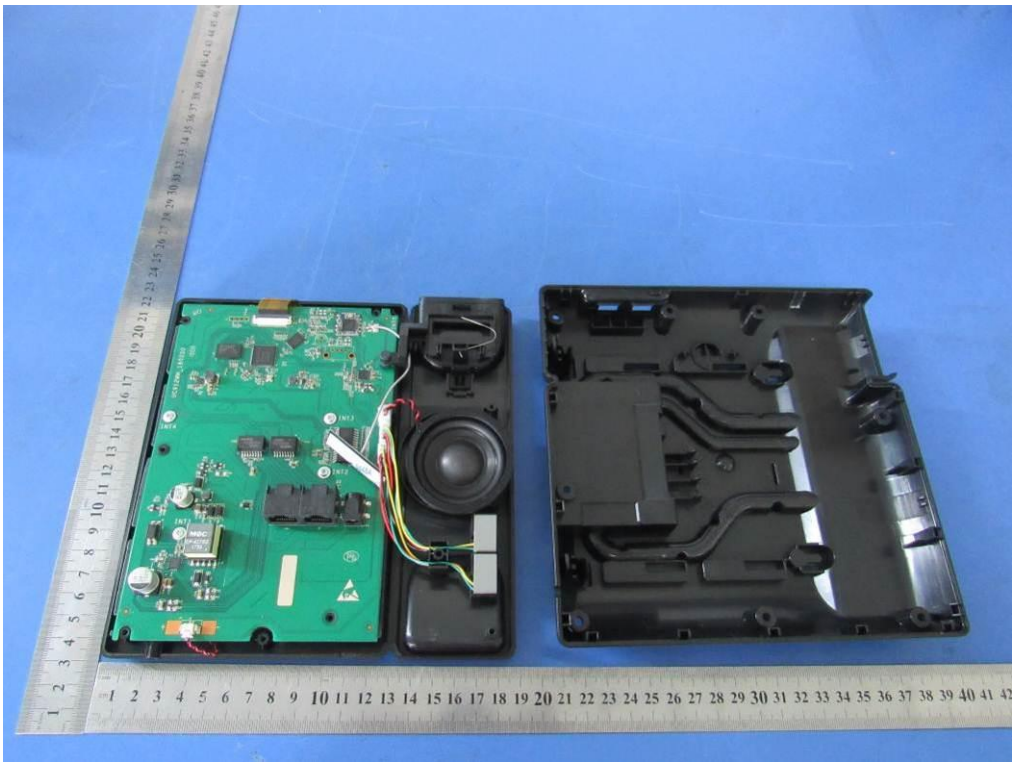
EUT - Rear View

EUT - Left View

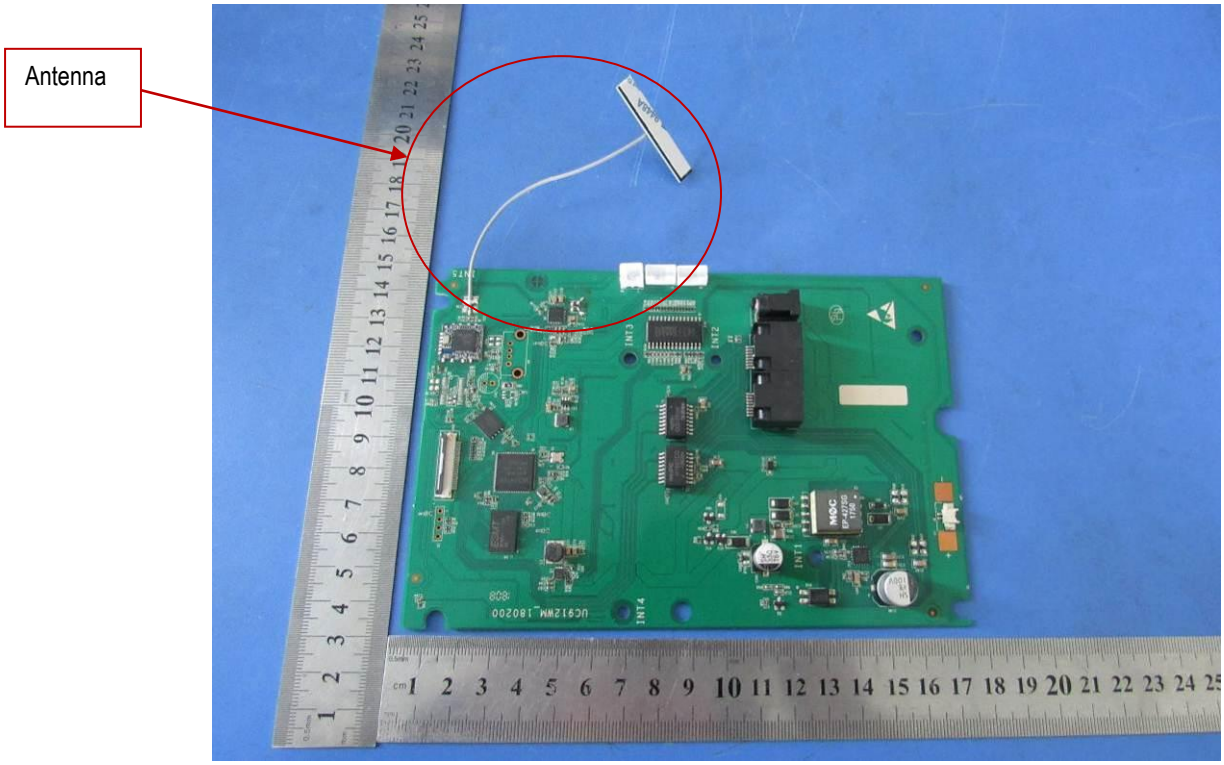


EUT - Right View

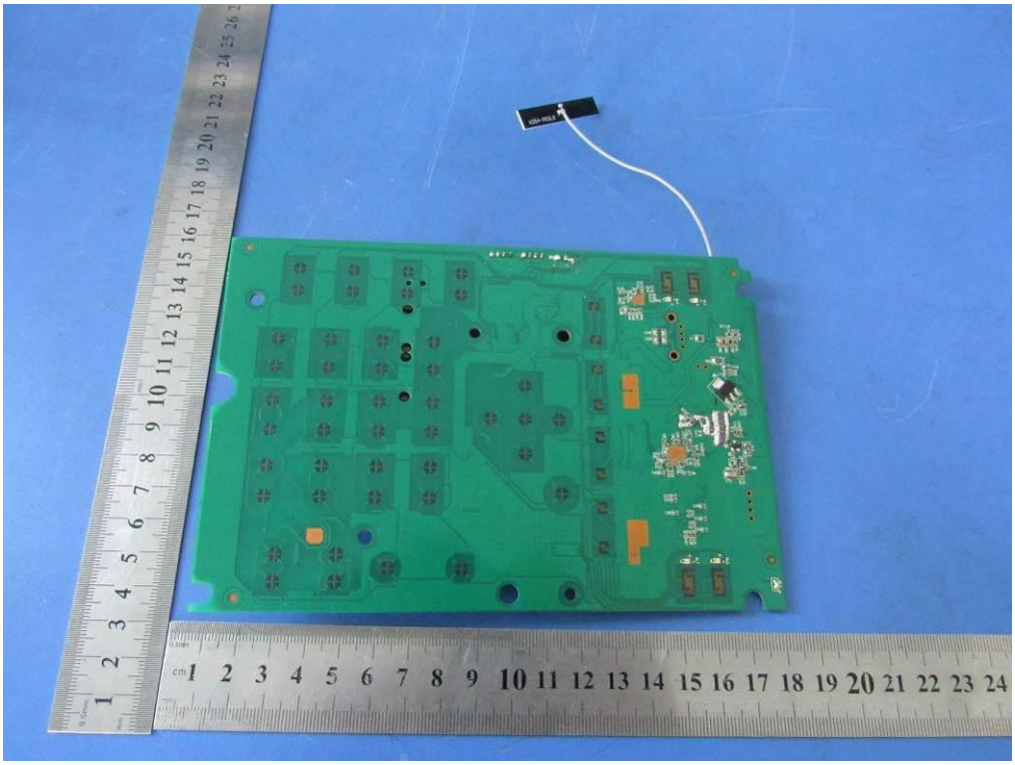
Annex B.ii. Photograph: EUT Internal Photo



EUT Uncover – Front View



EUT PCBA – Front View

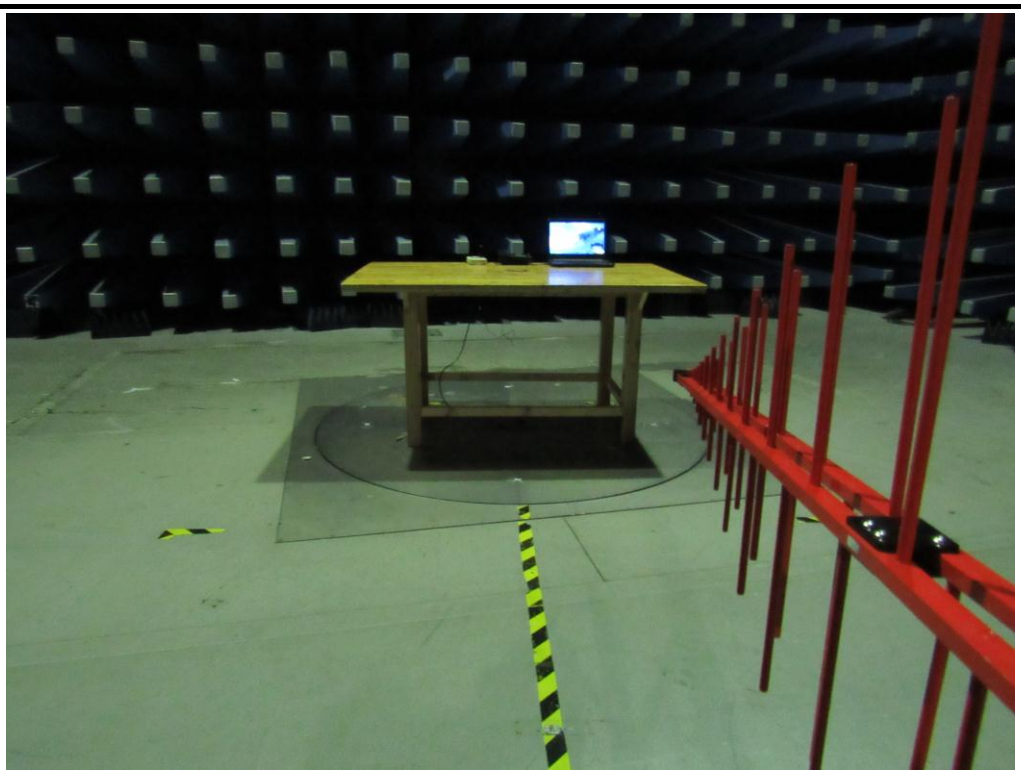


EUT PCBA– Rear View

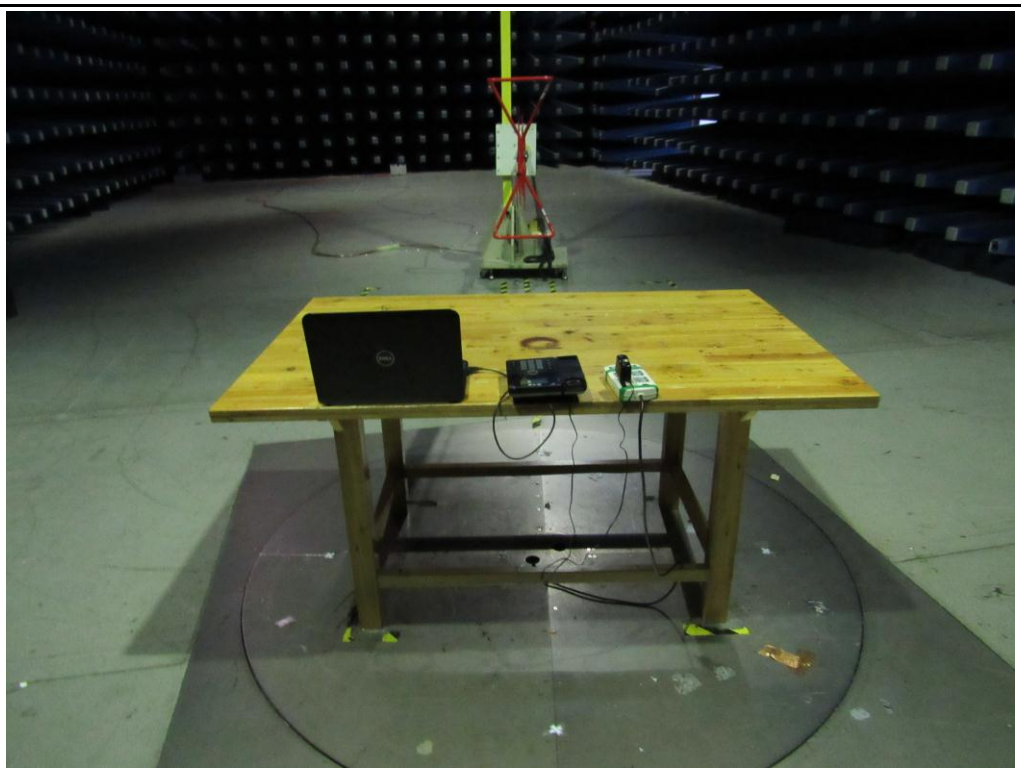
Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup Front View

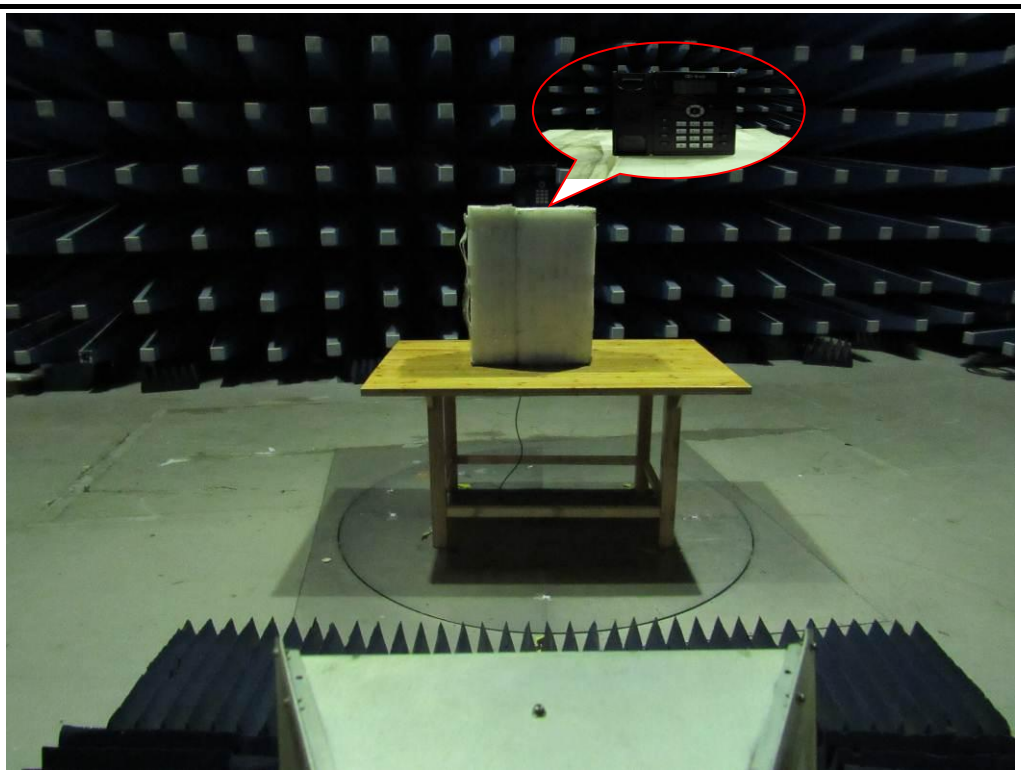
Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Front View Below 1GHz



Radiated Spurious Emissions Test Setup Rear View Below 1GHz

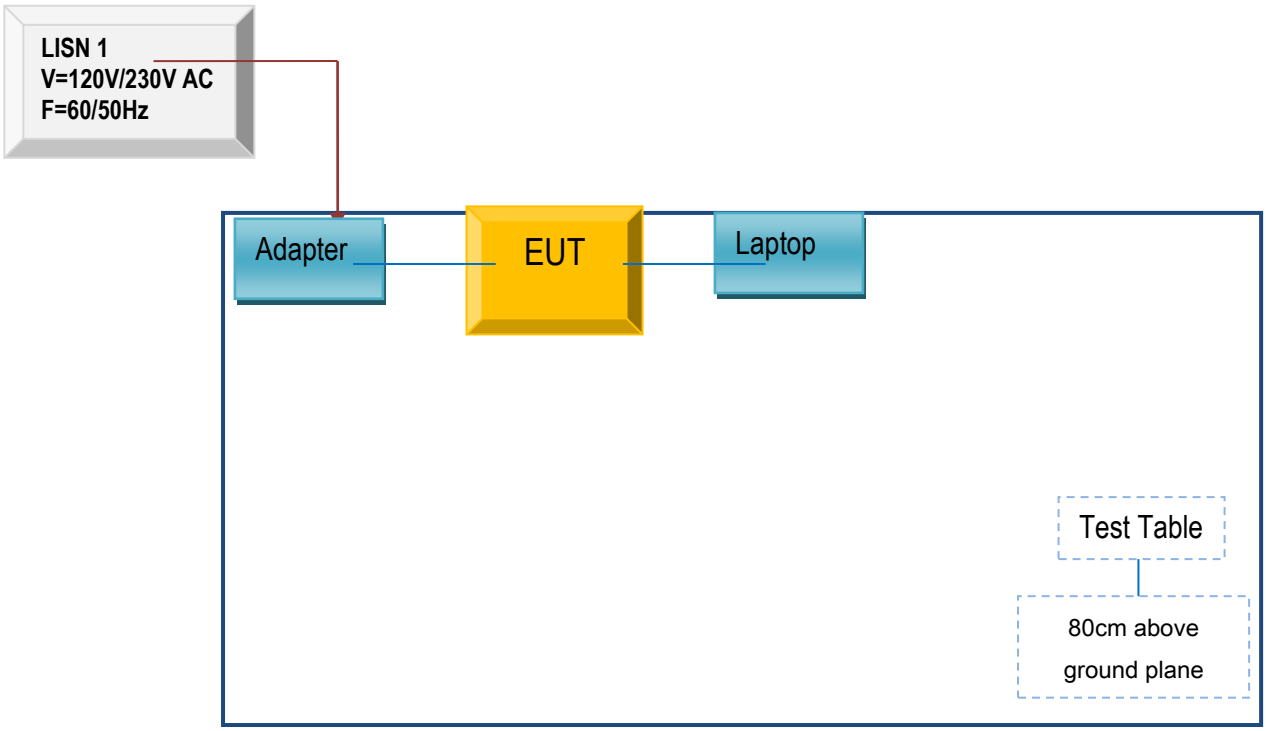


Radiated Spurious Emissions Test Setup Above 1GHz

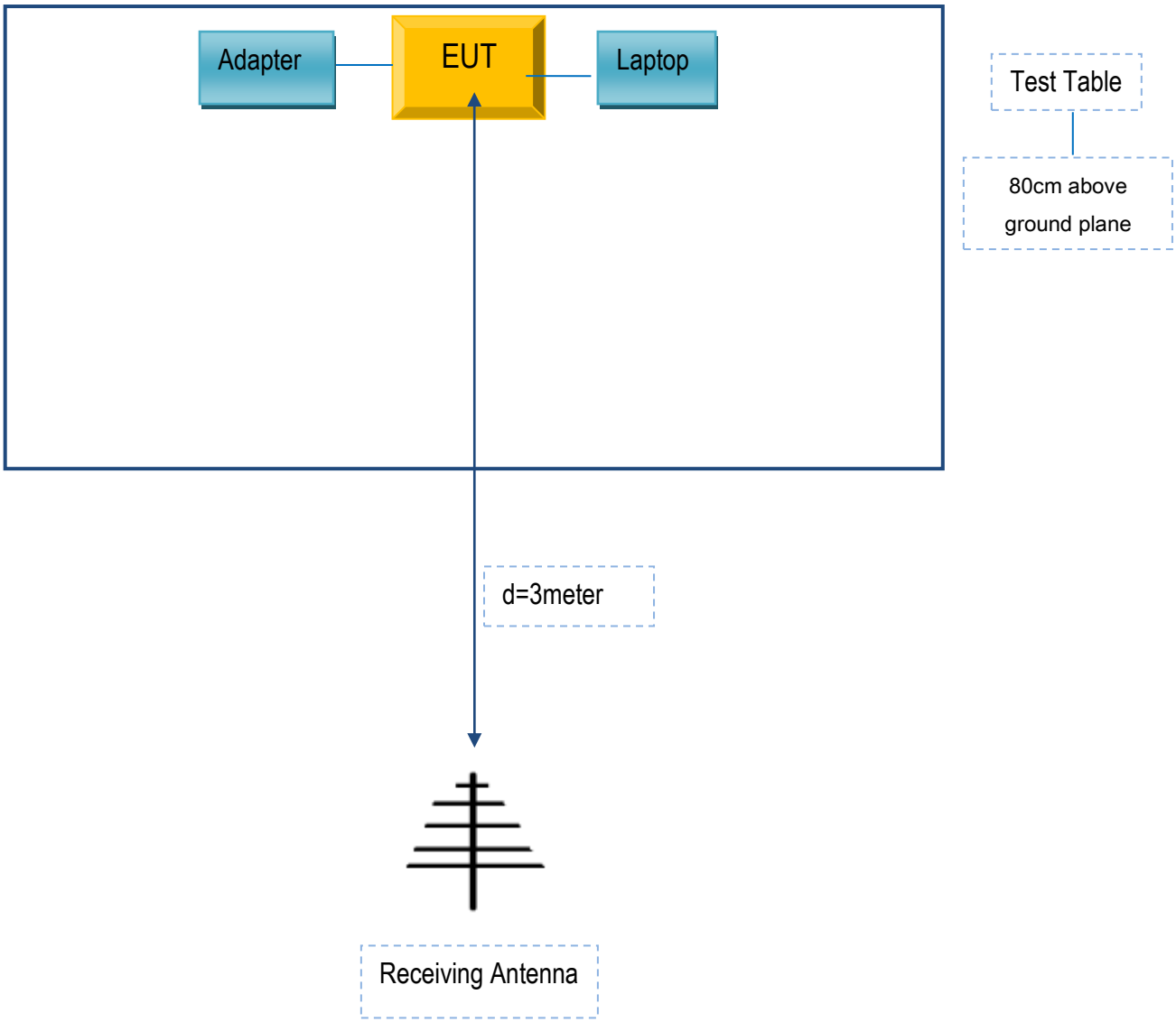
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
HP	Laptop	4321S	N/A
N/A	Earphone	N/A	N/A
PROCET	POE	PT-PSE101	PT1050000242

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
Power Cable	Un-shielding	No	0.8m	N/A

Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A