RF TEST REPORT

Report No.: 17070973-FCC-R2

Supersede Report No.: N/A

Applicant	DASAN ELECTRON CO., LTD.
Product Name	Wireless Headset
Model No.	DW-779UB
Serial No.	DW-779U; DW-779;X400P-U;X400;FSPW2015MU;FSPW2015M; X400P-UB, FSPW2016MUB, HSW100U, HSW100UB
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013
Test Date	April 01 to April 13, 2017
Issue Date	October 18, 2017
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	

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

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

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
17070973-FCC-R2	NONE	Original	October 18, 2017

2. Customer information

Applicant Name	DASAN ELECTRON CO., LTD.
Applicant Add	#307, P-1 dong, Gyunggi Techno Park, 1271-11, Sa-dong, Sangnok-Gu, Ansan-si, Gyunggi-Do, 426-901, KOREA
Manufacturer	DASAN ELECTRON CO., LTD.
Manufacturer Add	#307, P-1 dong, Gyunggi Techno Park, 1271-11, Sa-dong, Sangnok-Gu, Ansan-si, Gyunggi-Do, 426-901, KOREA

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao’ an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	535293
IC Test Site No.	4842E-1
Test Software of Radiated Emission	Radiated Emission Program-To Shenzhen v2.0
Test Software of Conducted Emission	EZ-EMC(ver.Icp-03A1)

4. Equipment under Test (EUT) Information

Description of EUT:	Wireless Headset
Main Model:	DW-779UB
Serial Model:	DW-779U; DW-779;X400P-U;X400;FSPW2015MU;FSPW2015M; X400P-UB, FSPW2016MUB, HSW100U, HSW100UB
Date EUT received:	March 31, 2017
Test Date(s):	April 01 to April 13, 2017
Equipment Category：	DSS
Antenna Gain:	FP:-0.04dBi PP:0.80dBi Bluetooth: -0.22dBi
Antenna Type:	DECT: Monopole antenna Bluetooth: Patch antenna
Type of Modulation:	DECT: GFSK Bluetooth: GFSK, π /4DQPSK, 8DPSK
RF Operating Frequency (ies):	DECT: 1921.536 MHz~1928.448 MHz (Tx/Rx) Bluetooth: 2402-2480 MHz
Max. Output Power:	4.639dBm
Number of Channels:	DECT: 5CH Bluetooth: 79CH
Port:	Power port, USB port, Handset port, Telephone port, RJ45 port

Input Power:	AC Adapter 1: Model: WCF0900050A 1BA Input: AC100 ~ 240V, 50/60Hz,0.15A Output: DC 9.0V, 0.5A Adapter 2: Model: SK01G-0900050U Input: AC100 ~ 240V, 50/60Hz,0.2A Output: DC 9.0V, 0.5A
Trade Name :	Freemate
FCC ID:	WF2DW-779UB

Note: In this report, we have chosen the main model DW-779UB for testing. The difference among models was explained in the declaration letter.

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& Restricted Band	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions& Restricted Band	Compliance

Measurement Uncertainty

Parameter	Uncertainty
AC Power Line Conducted Emissions (150kHz~30MHz)	±3.11dB
Radiated Emission(30MHz~1GHz)	±5.12dB
Radiated Emission(1GHz~6GHz)	±5.34dB

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 2 antennas:
A permanently attached Monopole antenna for DECT, the gain is -0.04dBi for FP/PP.
A permanently attached Patch antenna for Bluetooth, the gain is -0.22dBi for Bluetooth.

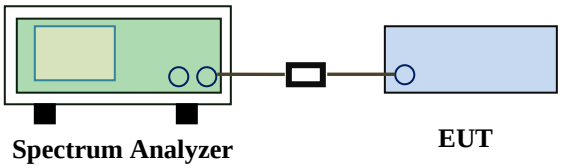
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	23 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	April 12, 2017
Tested By :	Loren Luo

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

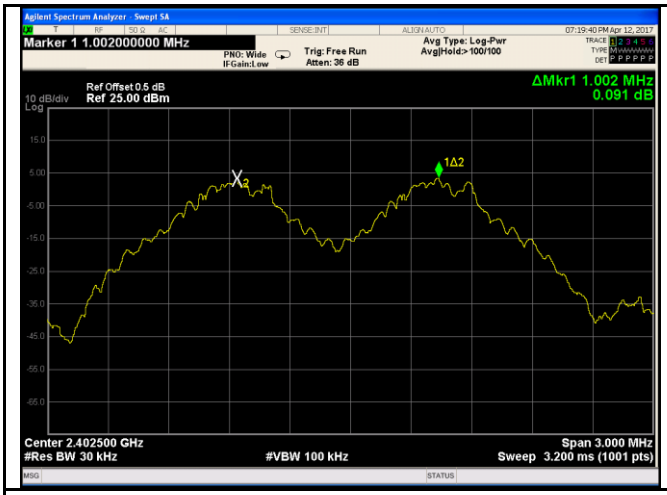
Test Plot ☑ Yes (See below) ☐ N/A

Channel Separation measurement result

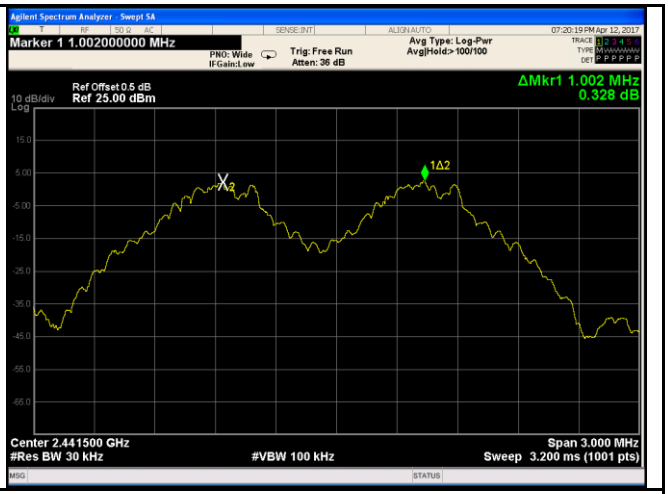
Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.631	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.629	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.630	Pass
	Adjacency Channel	2479			
CH Separation π /4 DQPSK	Low Channel	2402	1.002	0.839	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.835	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.837	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.852	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.841	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.843	Pass
	Adjacency Channel	2479			

Test Plots

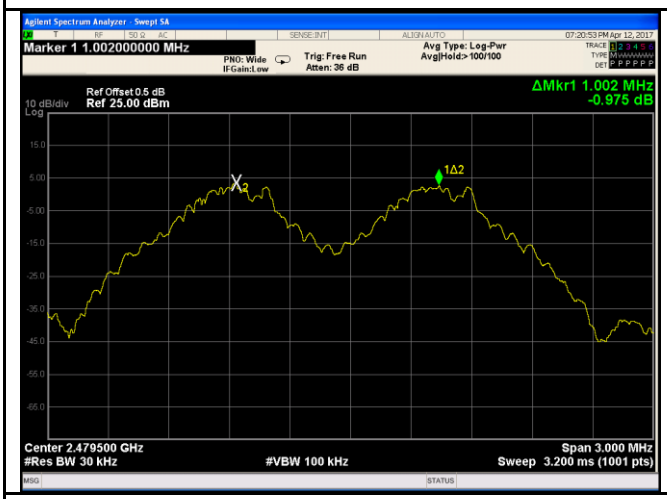
Channel Separation measurement result



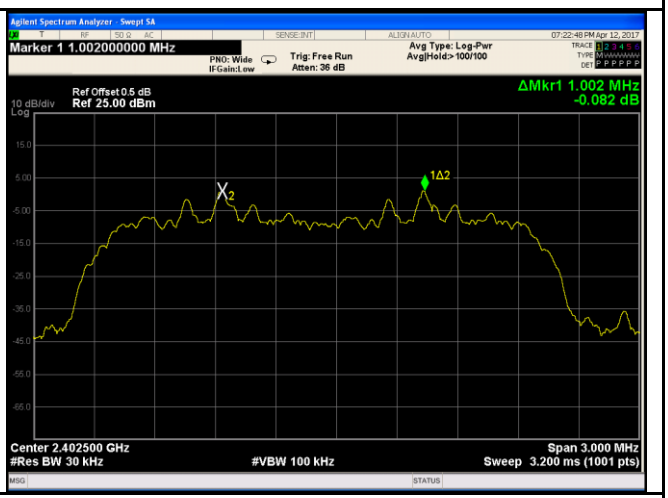
GFSK - Low Channel



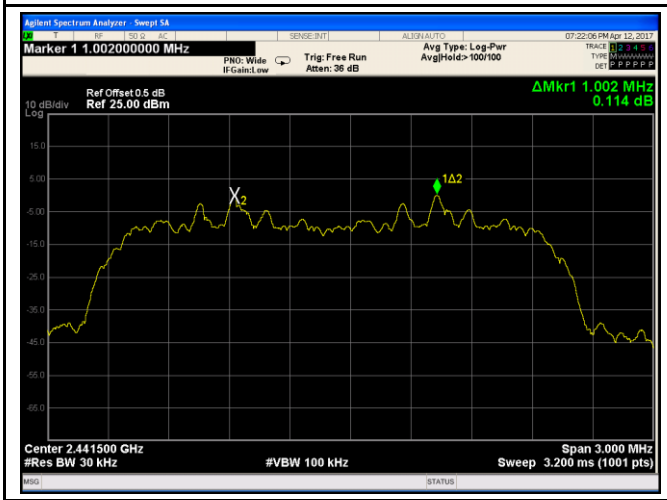
GFSK - Middle Channel



GFSK - High Channel

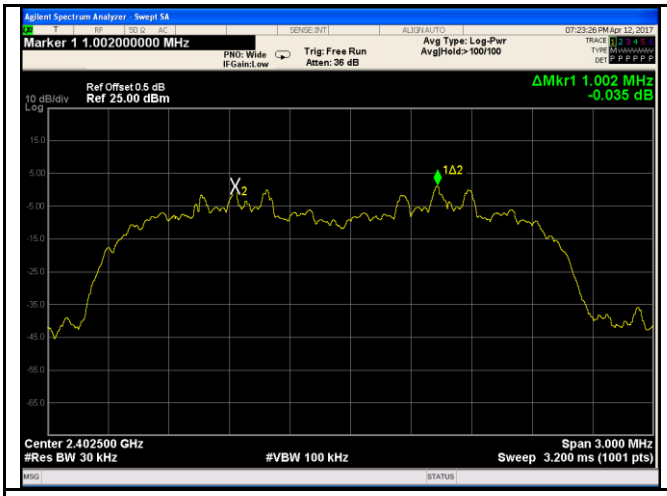


π /4 DPSK - Low Channel

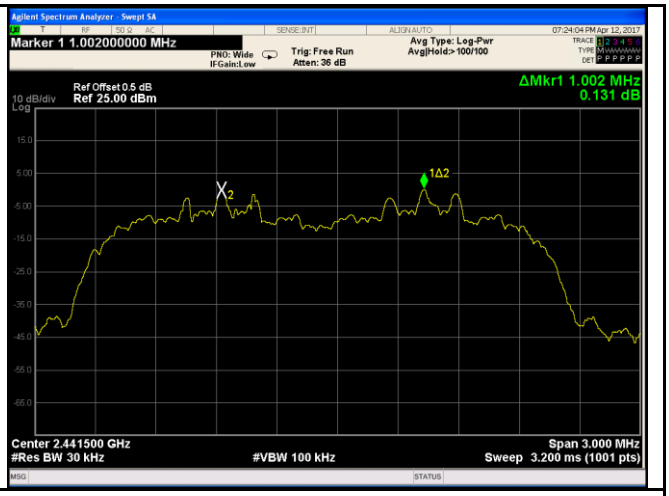


π /4 DQPSK - Middle Channel

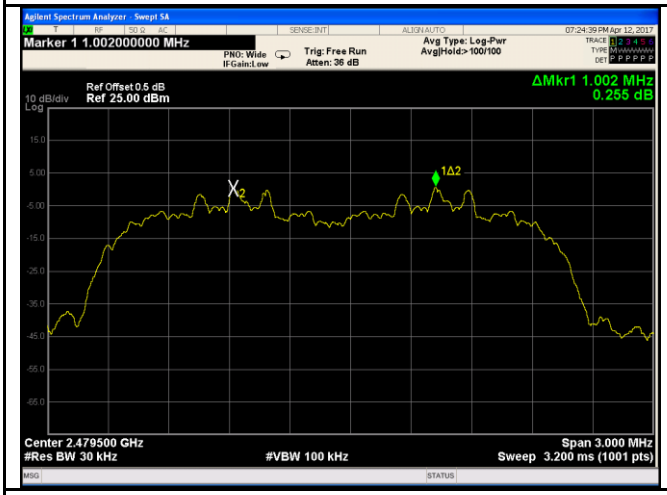
π /4 DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel

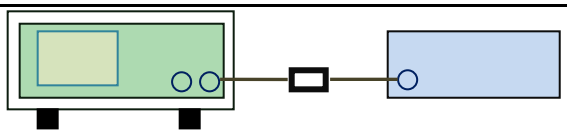


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	23 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	April 12, 2017
Tested By :	Loren Luo

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

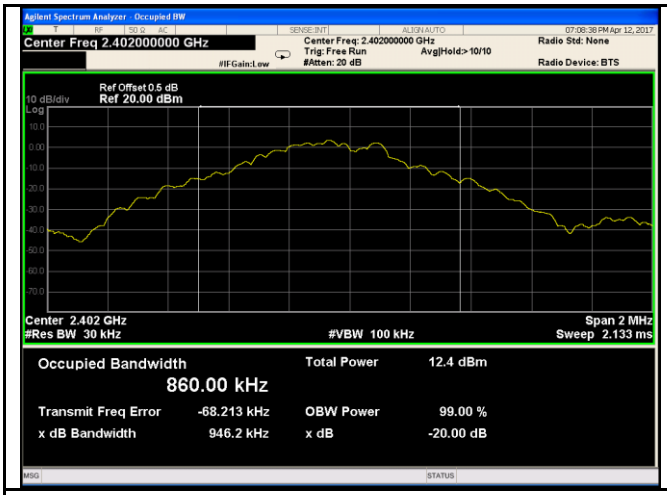
Test Plot ☑ Yes (See below) ☐ N/A

Measurement result

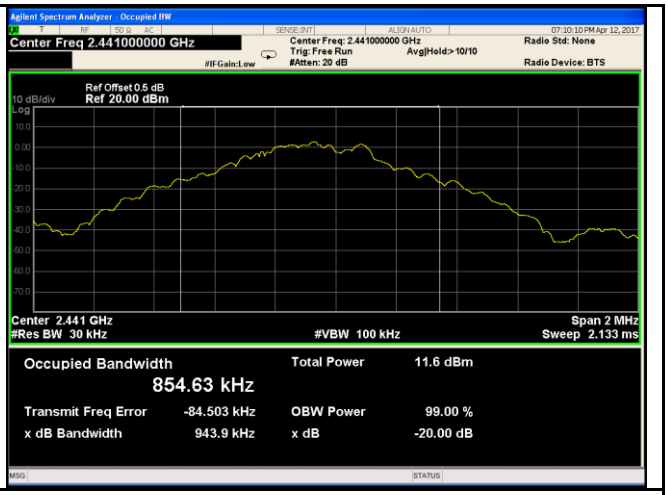
Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.9462	0.8600
	Mid	2441	0.9439	0.8546
	High	2480	0.9445	0.8533
π /4 DQPSK	Low	2402	1.259	1.1712
	Mid	2441	1.253	1.1685
	High	2480	1.256	1.1686
8-DPSK	Low	2402	1.278	1.1579
	Mid	2441	1.262	1.1553
	High	2480	1.264	1.1579

Test Plots

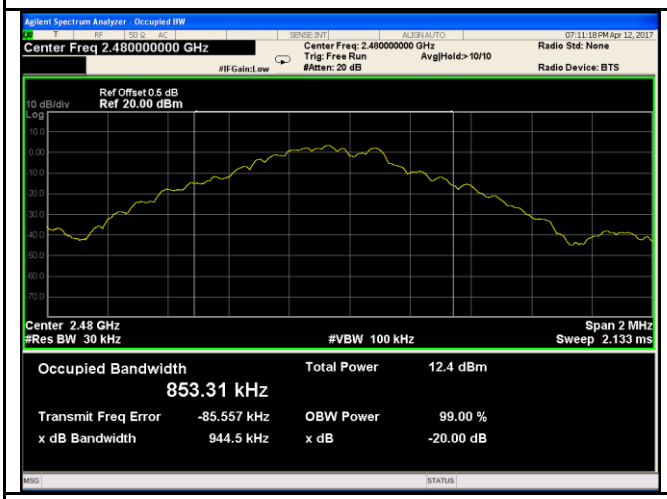
20dB Bandwidth measurement result



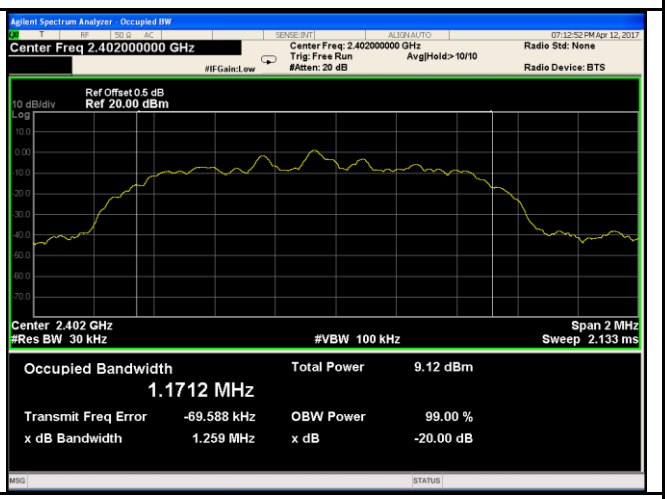
GFSK - Low Channel



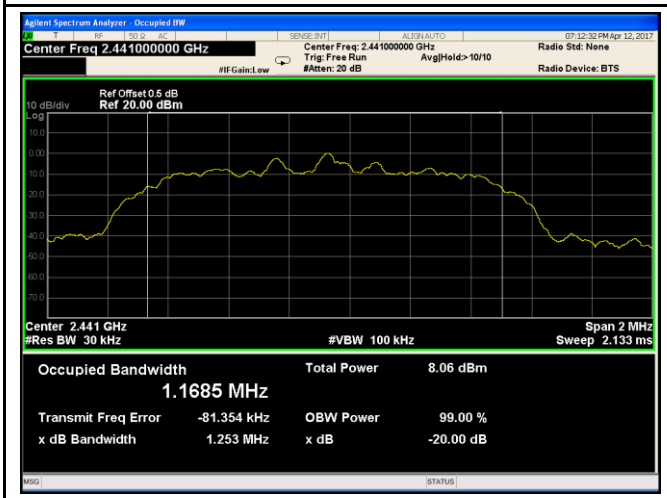
GFSK - Middle Channel



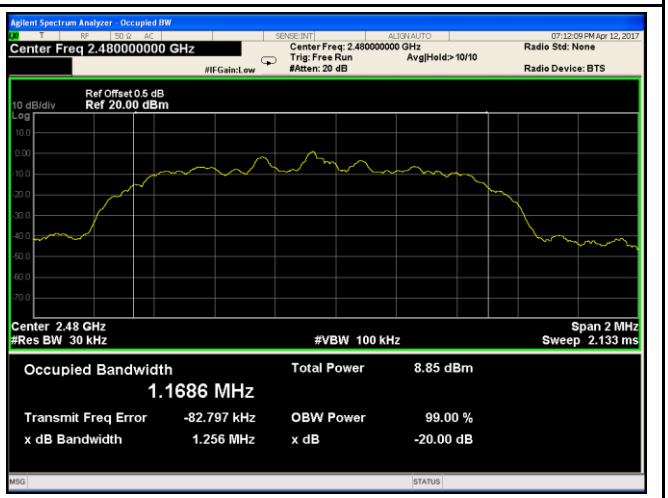
GFSK - High Channel



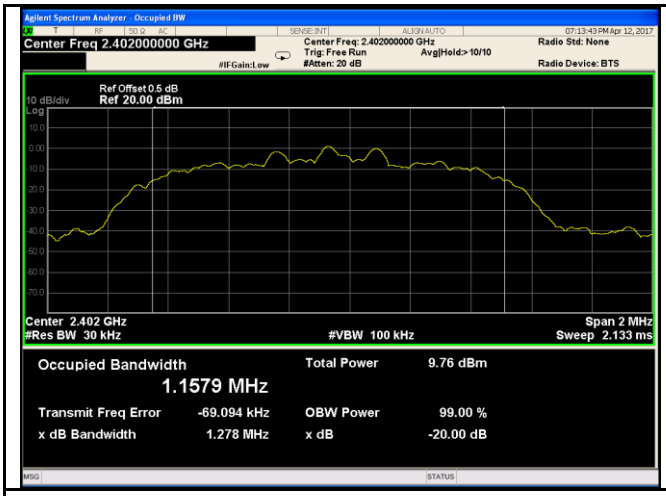
π /4 DPSK - Low Channel



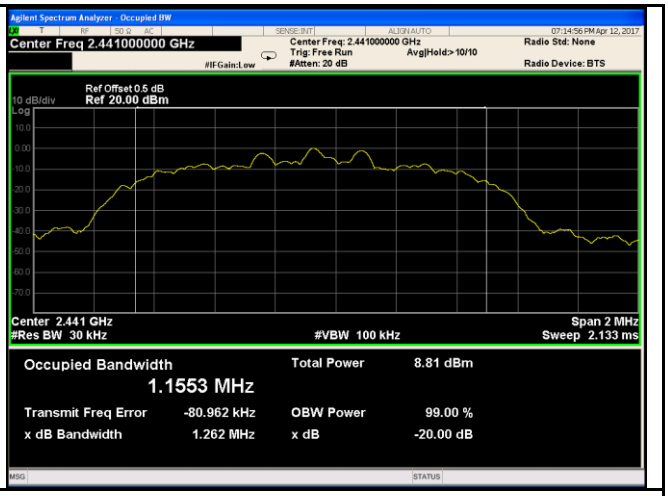
π /4 DQPSK - Middle Channel



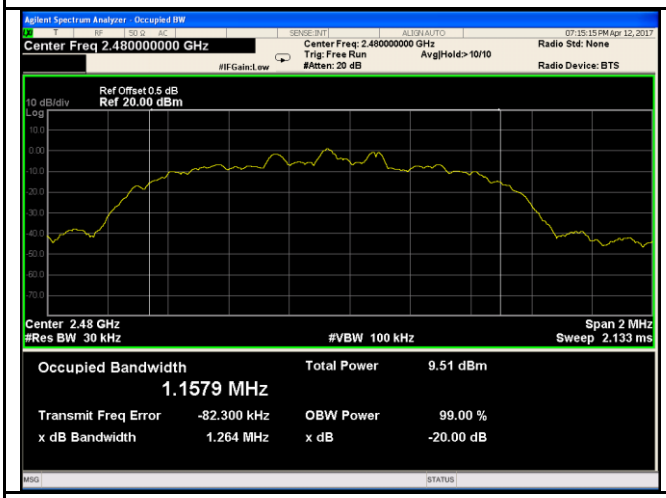
π /4 DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel

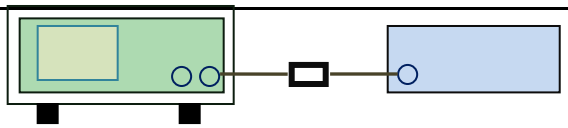


8DPSK - High Channel

6.4 Peak Output Power

Temperature	23 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	April 12, 2017
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3)	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)	DTS in 902-928MHz, 2400-2483.5MHz: ≤ 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

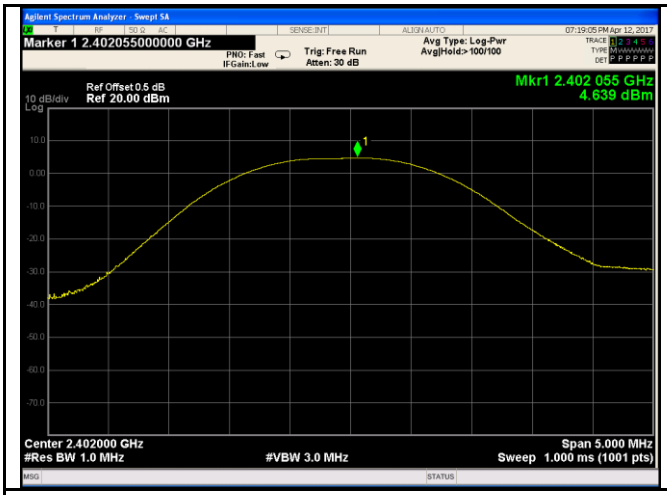
Test Plot ☑ Yes (See below) ☐ N/A

Peak Output Power measurement result

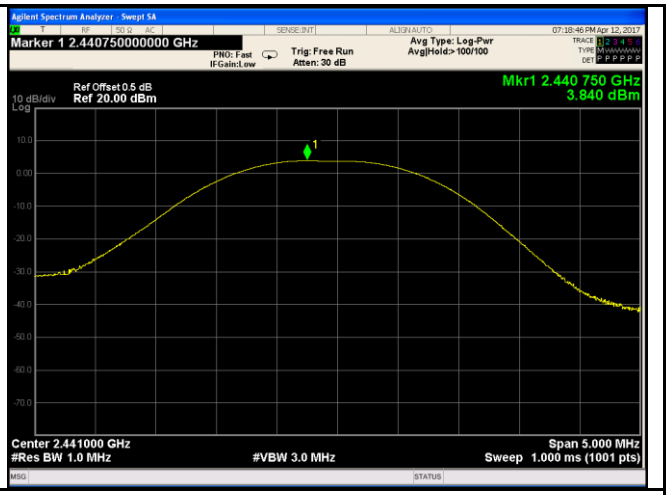
Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	4.639	1000	Pass
		Mid	2441	3.840	1000	Pass
		High	2480	1.640	1000	Pass
	π /4 DQPSK	Low	2402	2.984	125	Pass
		Mid	2441	1.800	125	Pass
		High	2480	2.864	125	Pass
	8-DPSK	Low	2402	3.198	125	Pass
		Mid	2441	2.282	125	Pass
		High	2480	3.267	125	Pass

Test Plots

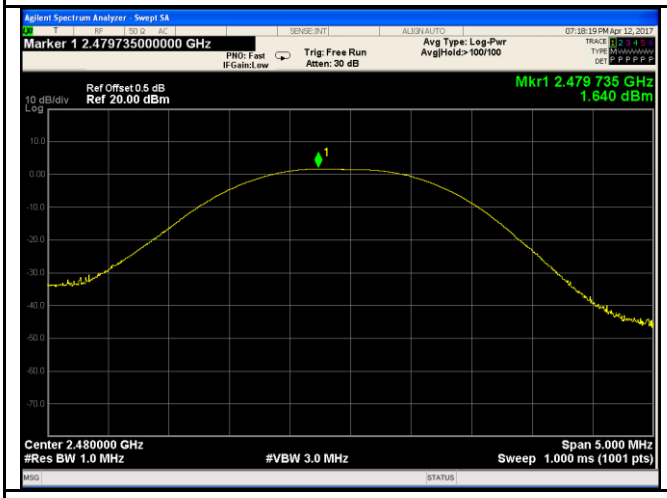
Output Power measurement result



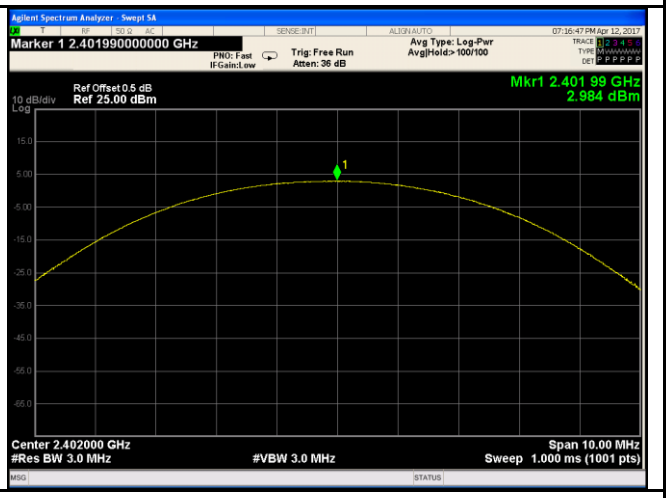
GFSK Output power - Low CH 2402



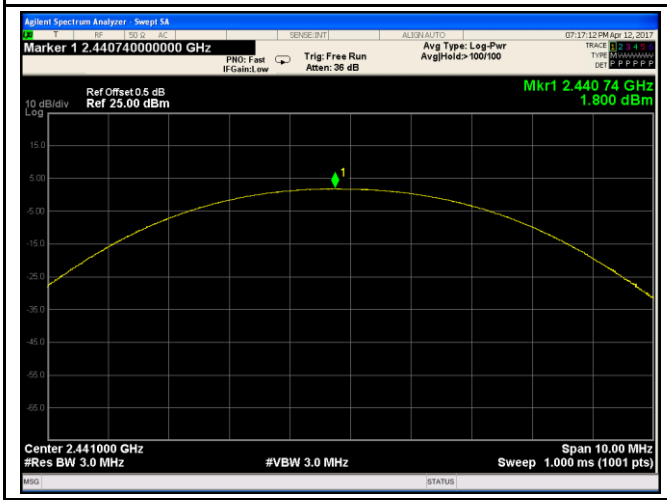
GFSK Output power - Mid CH 2441



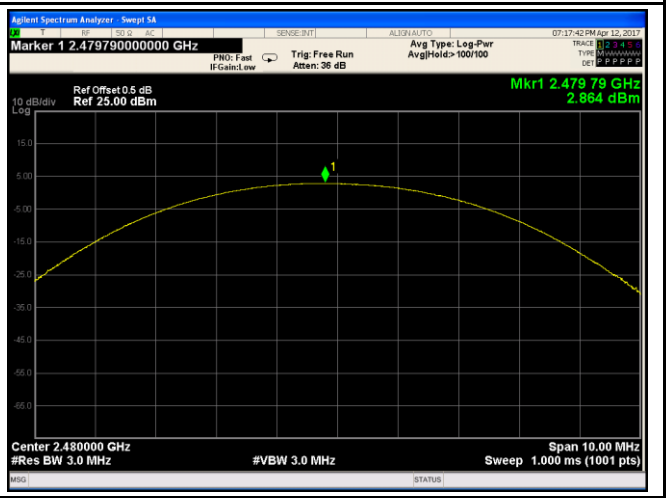
GFSK Output power - High CH 2480



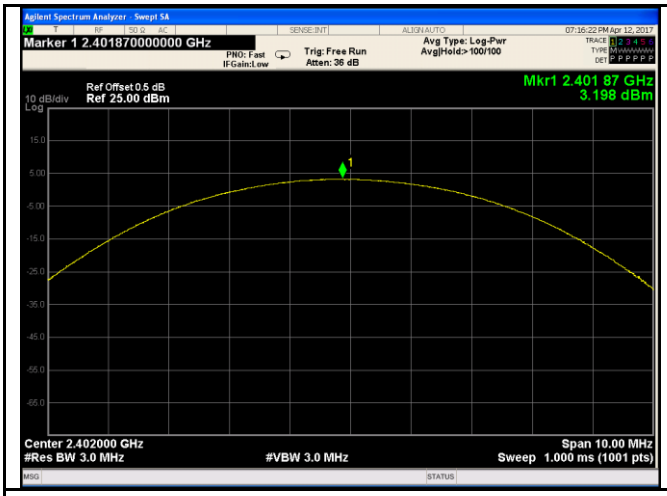
π /4 DQPSK Output power - Low CH 2402



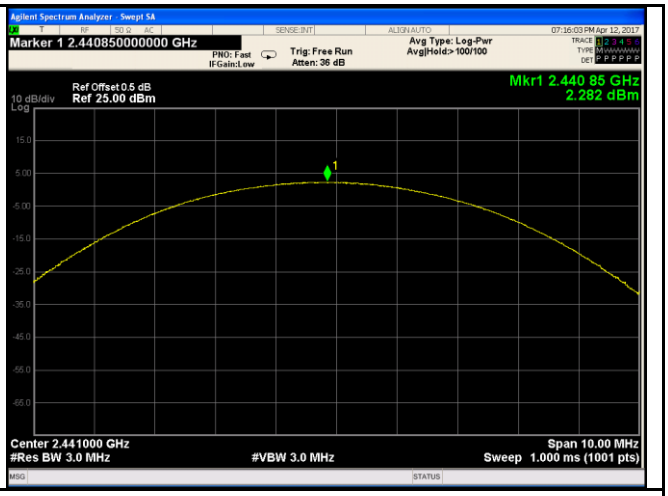
π /4 DQPSK Output power - Mid CH 2441



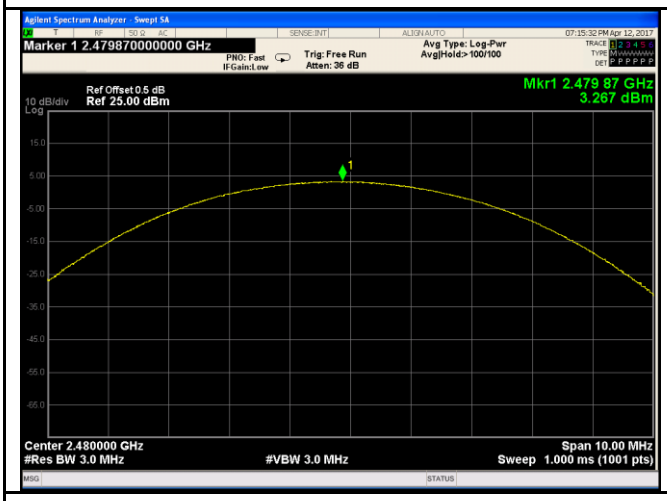
π /4 DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

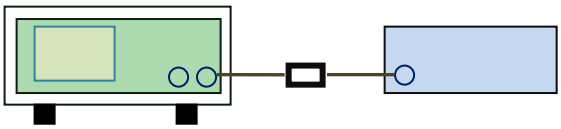


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	23 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	April 12, 2017
Tested By :	Loren Luo

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

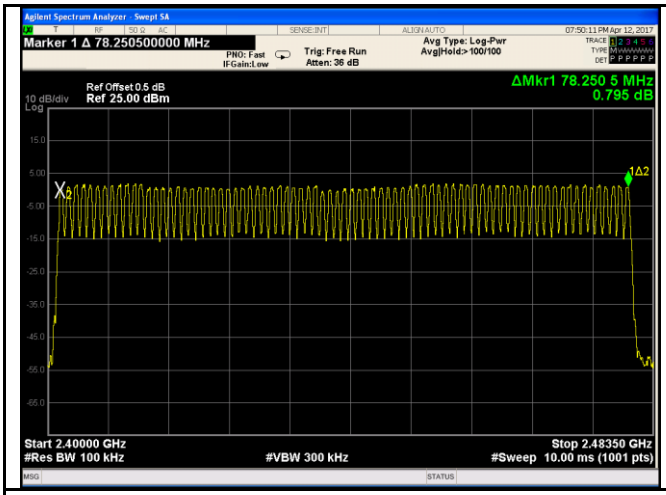
Test Plot ☑ Yes (See below) ☐ N/A

Number of Hopping Channel measurement result

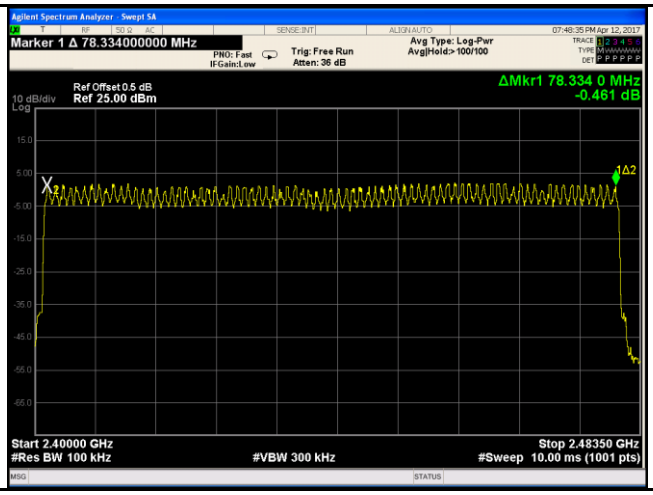
Type	Modulation	Frequency Range	Number of Hopping Channel	Limit
Number of Hopping Channel	GFSK	2400-2483.5	79	15
	π /4 DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

Test Plots

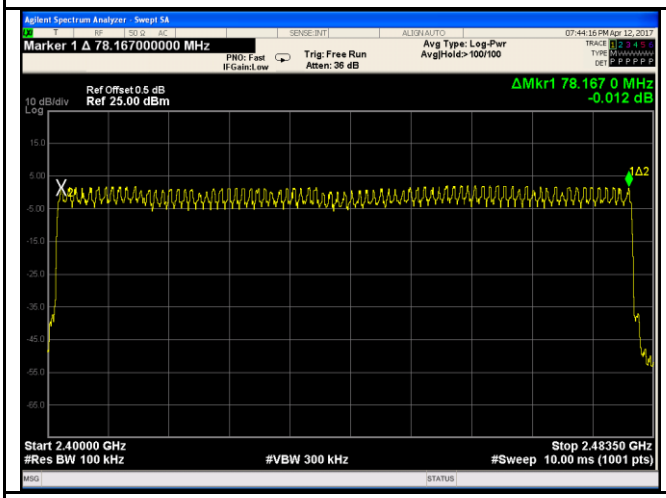
Number of Hopping Channels measurement result



GFSK



π /4DQPSK

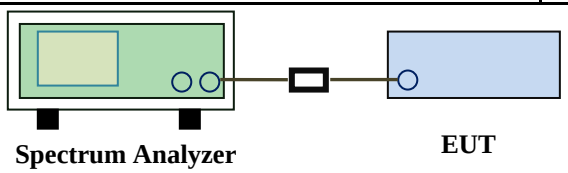


8DPSK

6.6 Time of Occupancy (Dwell Time)

Temperature	23 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	April 12, 2017
Tested By :	Loren Luo

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 - use the marker-delta function to determine the dwell time		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

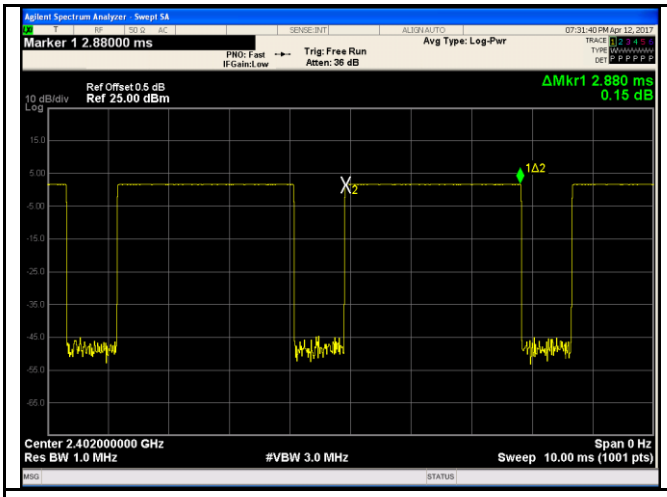
Test Plot ☑ Yes (See below) ☐ N/A

Dwell Time measurement result

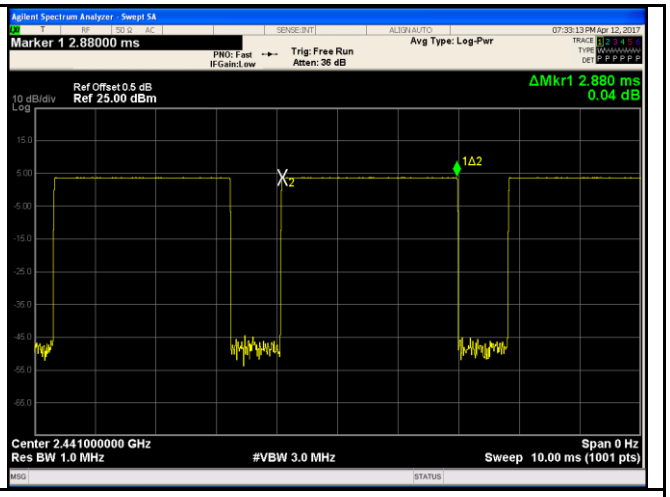
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.880	307.200	400	Pass
		Mid	2.880	307.200	400	Pass
		High	2.880	307.200	400	Pass
	π /4 DQPSK	Low	2.880	307.200	400	Pass
		Mid	2.890	308.267	400	Pass
		High	2.890	308.267	400	Pass
	8-DPSK	Low	2.890	308.267	400	Pass
		Mid	2.870	306.133	400	Pass
		High	2.900	309.333	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

Test Plots

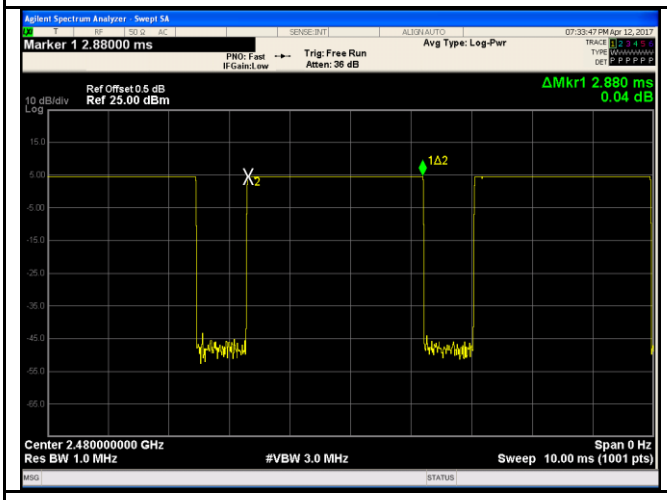
Dwell Time measurement result



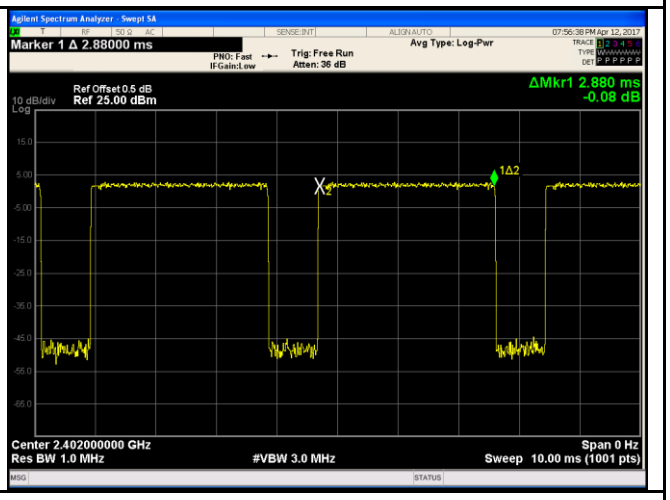
GFSK - Low CH 2402



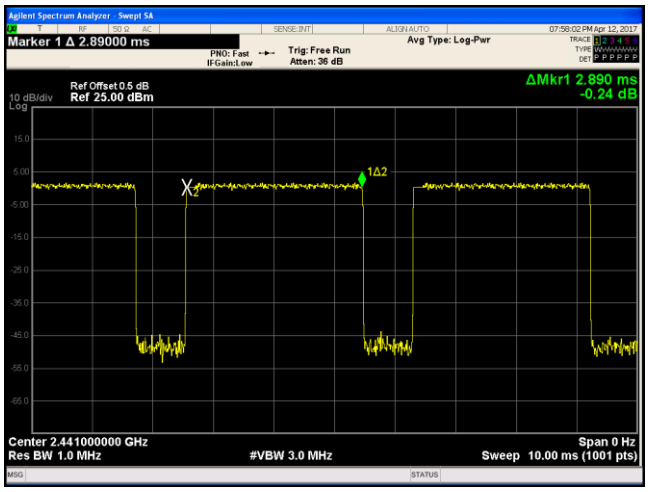
GFSK - Mid CH 2441



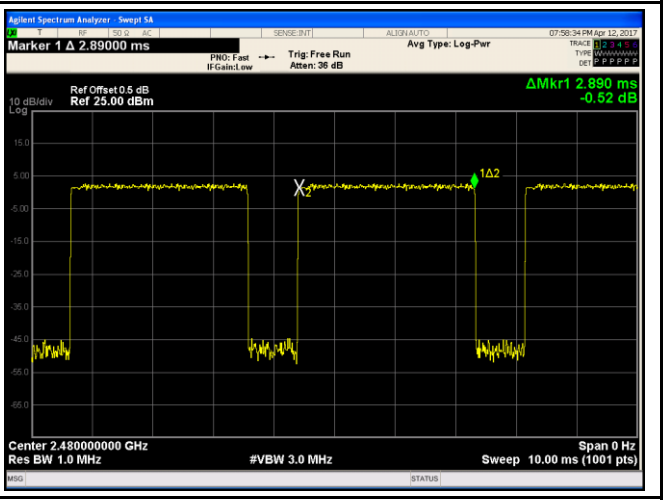
GFDK - High CH 2480



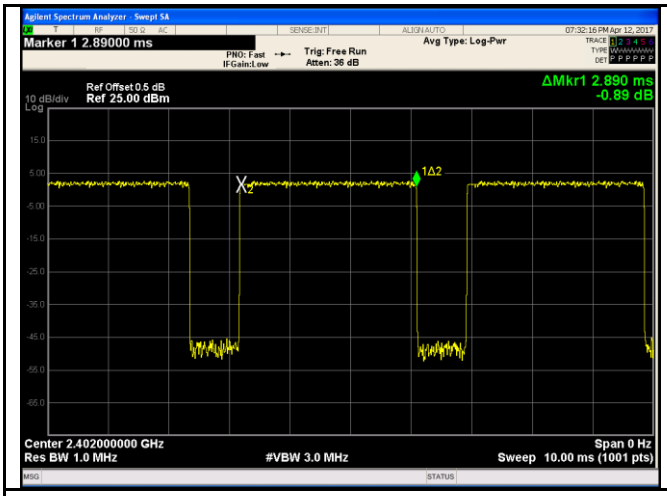
π /4 DQPSK - Low CH 2402



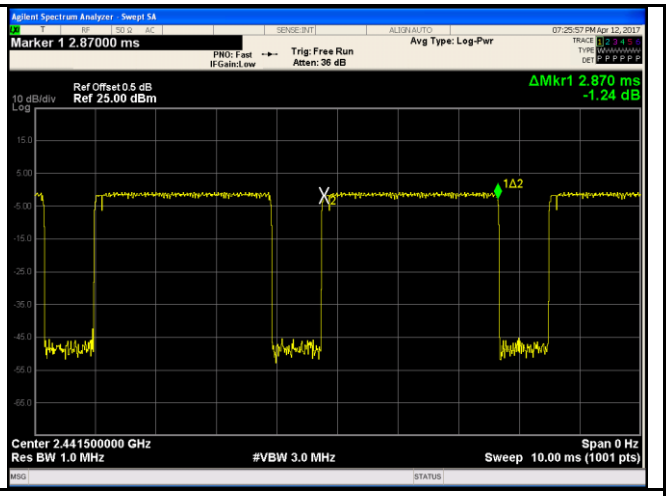
π /4 DQPSK - Mid CH 2441



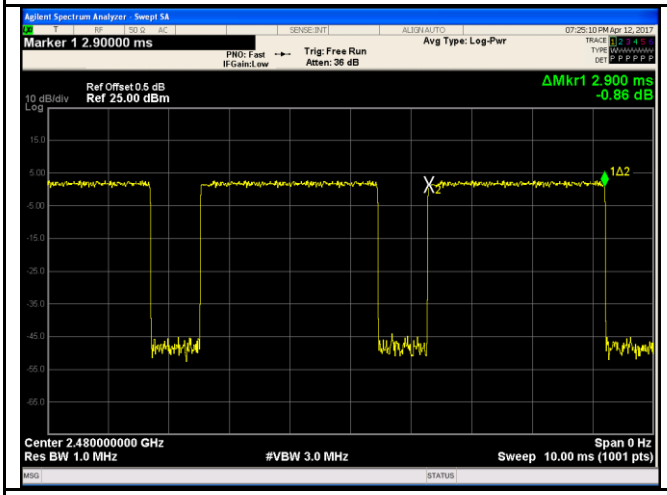
π /4 DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441

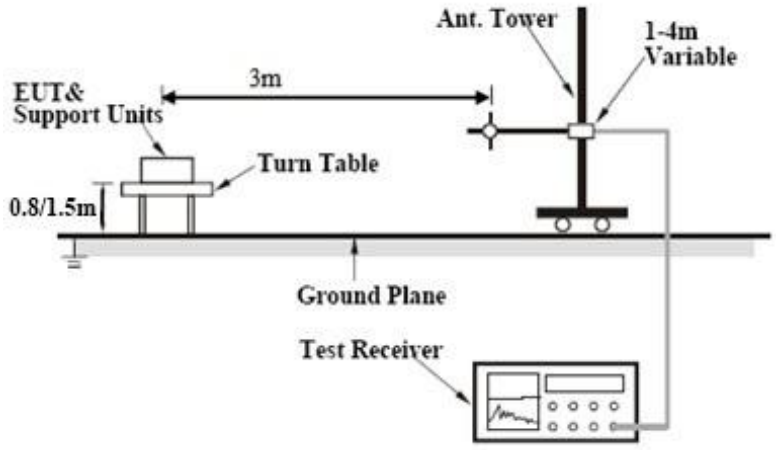


8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	22 °C
Relative Humidity	55%
Atmospheric Pressure	1013mbar
Test date :	April 13, 2017
Tested By :	Loren Luo

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,		

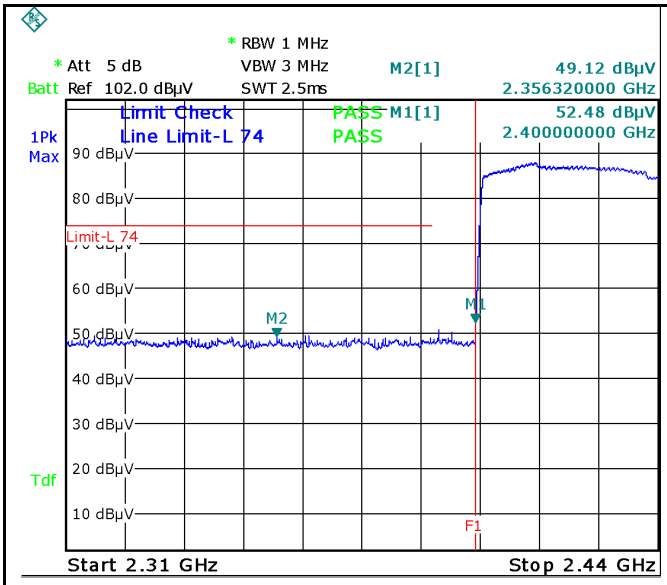
	and make sure the instrument is operated in its linear range. - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth 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 Mode:

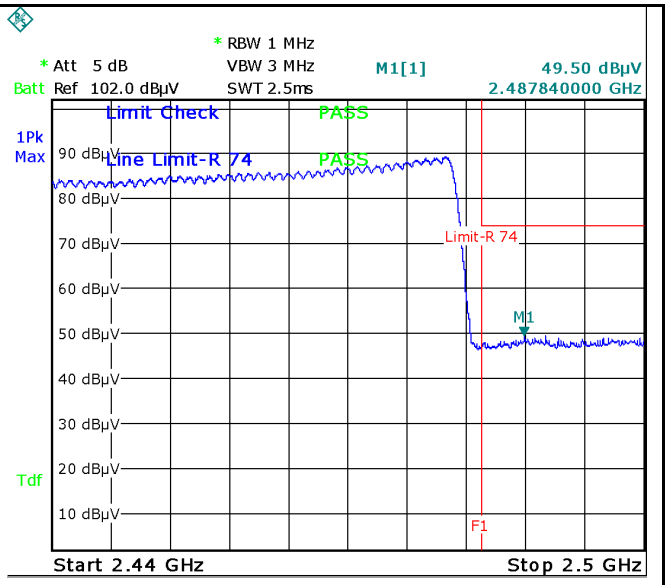


GFSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

Note: (no need if PK value less than the AV limit)

GFSK-Hopping Left Side-AV

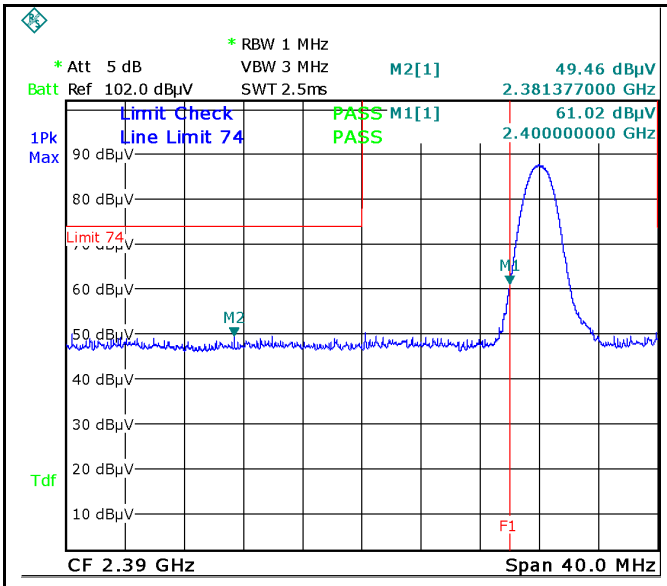


GFSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

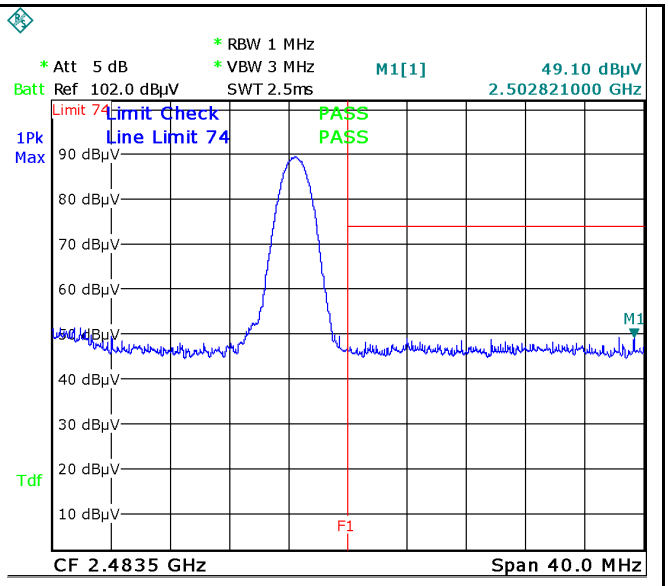
Note: (no need if PK value less than the AV limit)

GFSK-Hopping Right Side-AV



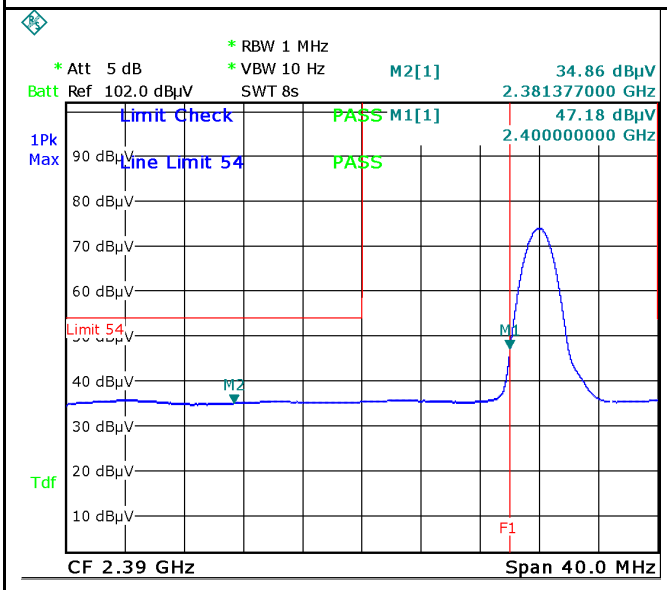
GFSK-Left Side-PK

Note: F1 is frequency 2400MHz



GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

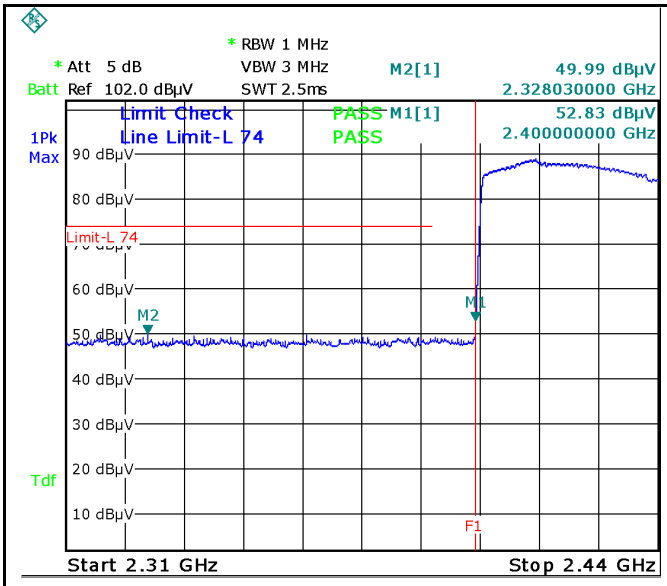


GFSK-Left Side-AV

Note: (no need if PK value less than the AV limit)

GFSK-Right Side-AV

π /4 DQPSK Mode:

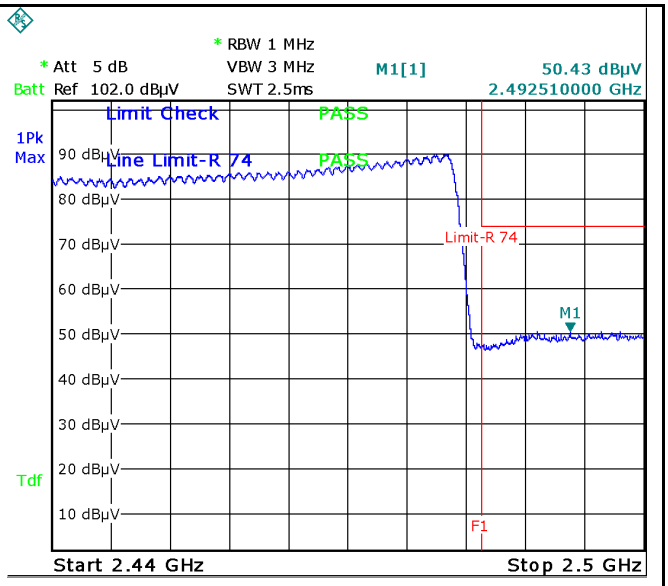


π /4 DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

Note: (no need if PK value less than the AV limit)

π /4 DQPSK-Hopping Left-AV

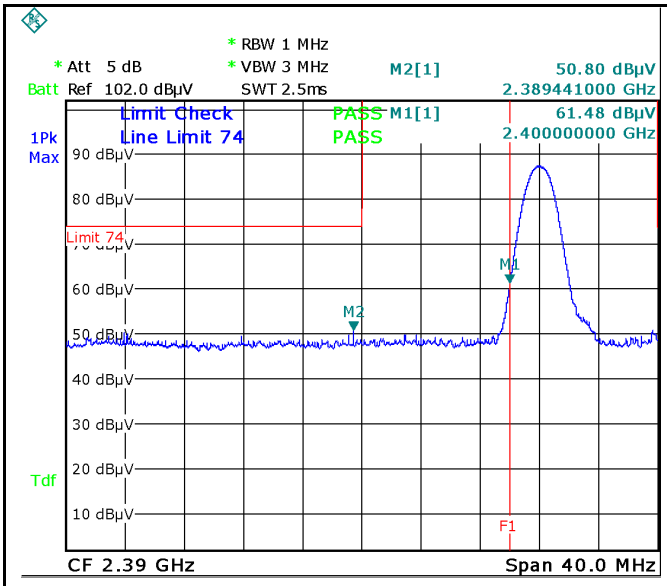


π /4 DQPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

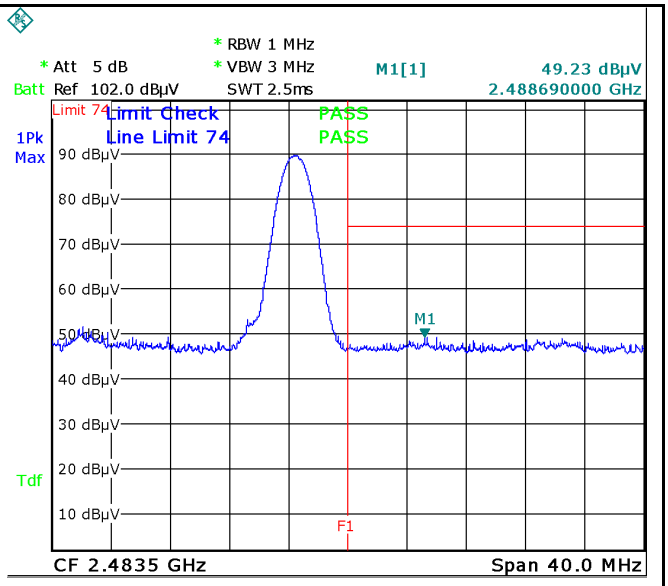
Note: (no need if PK value less than the AV limit)

π /4 DQPSK-Hopping Right-AV



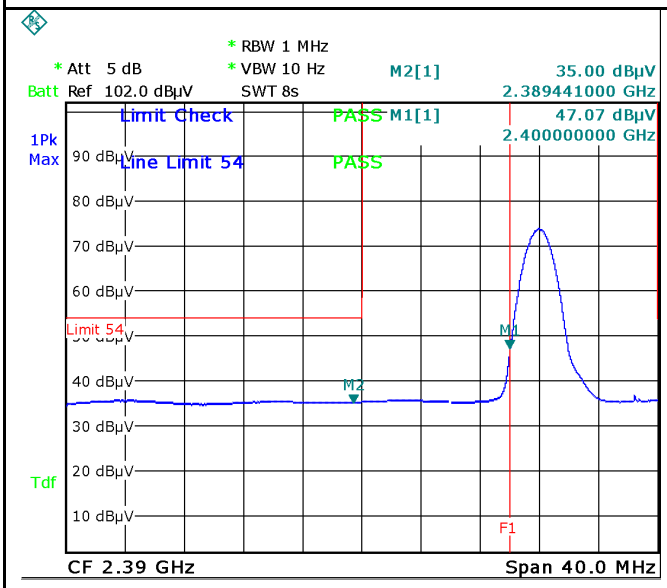
π /4 DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz



π /4 DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

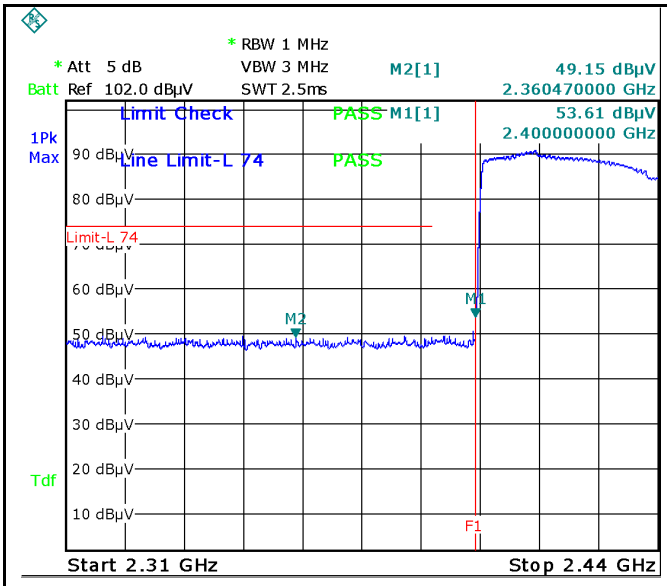


π /4 DQPSK-Left Side-AV

Note: (no need if PK value less than the AV limit)

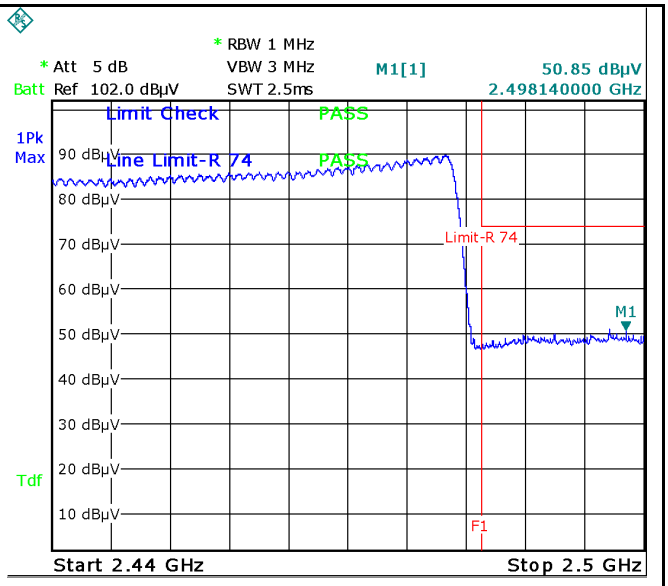
π /4 DQPSK-Right Side-AV

8-DPSK Mode:



8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

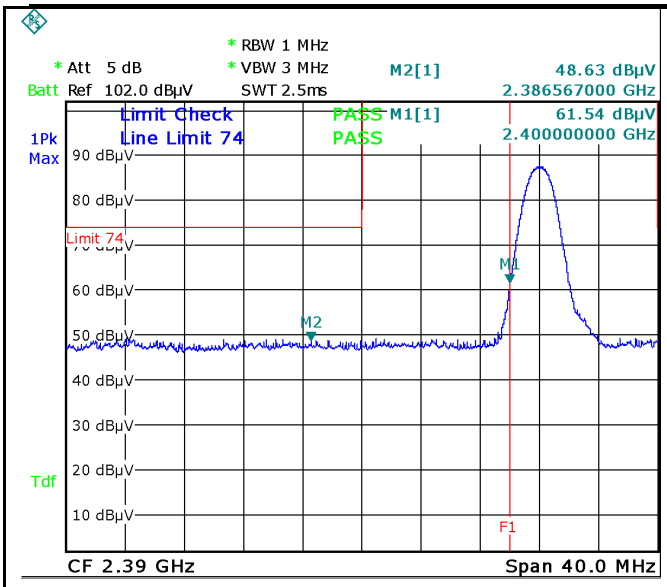
Note: F1 is frequency 2483.5MHz

Note: (no need if PK value less than the AV limit)

8DPSK-Hopping Left-AV

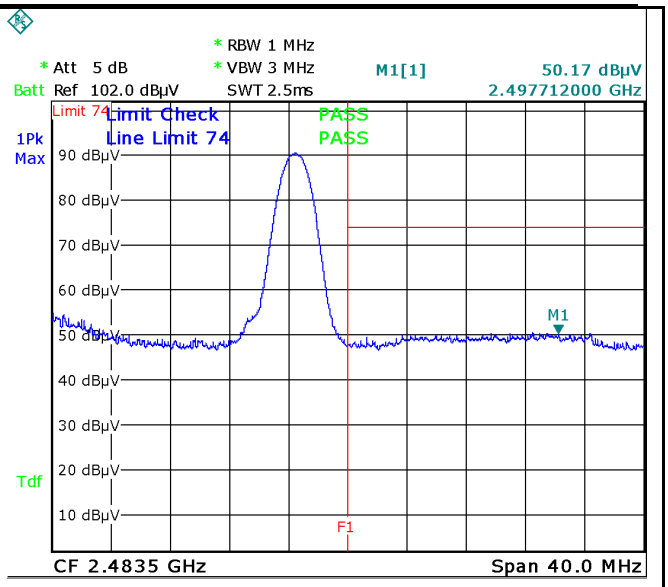
Note: (no need if PK value less than the AV limit)

8DPSK-Hopping Right-AV



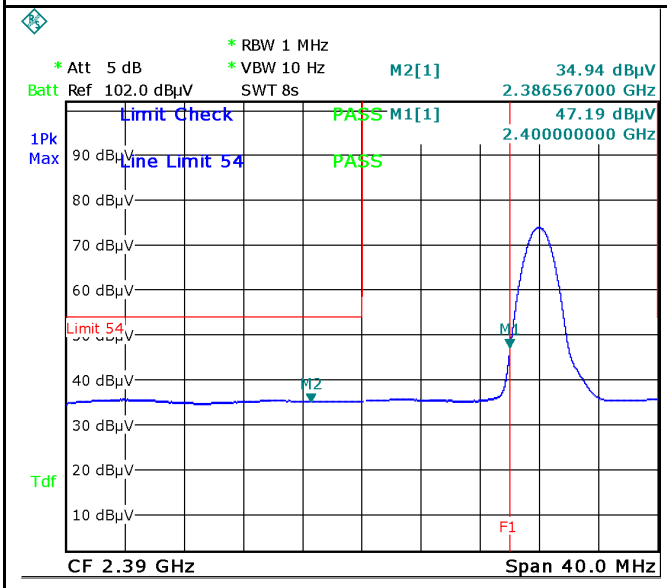
8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



8DPSK-Left Side-AV

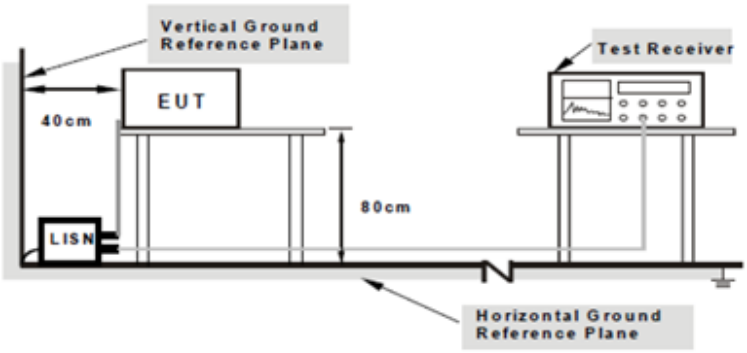
Note: (no need if PK value less than the AV limit)

8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

Temperature	24 °C
Relative Humidity	59%
Atmospheric Pressure	1007mbar
Test date :	April 07, 2017
Tested By :	Loren Luo

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207, RSS210 (A8.1)</td><td>a)</td><td>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.
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 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></td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

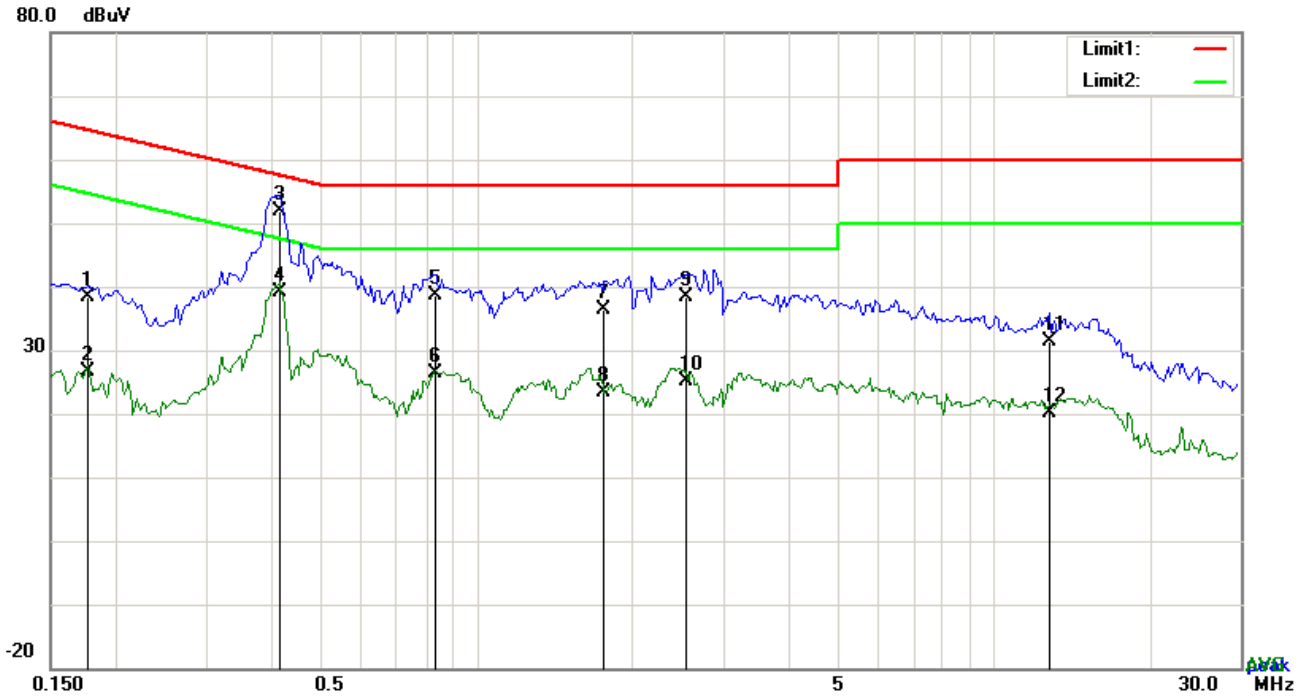
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of 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 50W/50mH 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</td></tr>
</table>

	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

Test Mode:	Bluetooth Mode

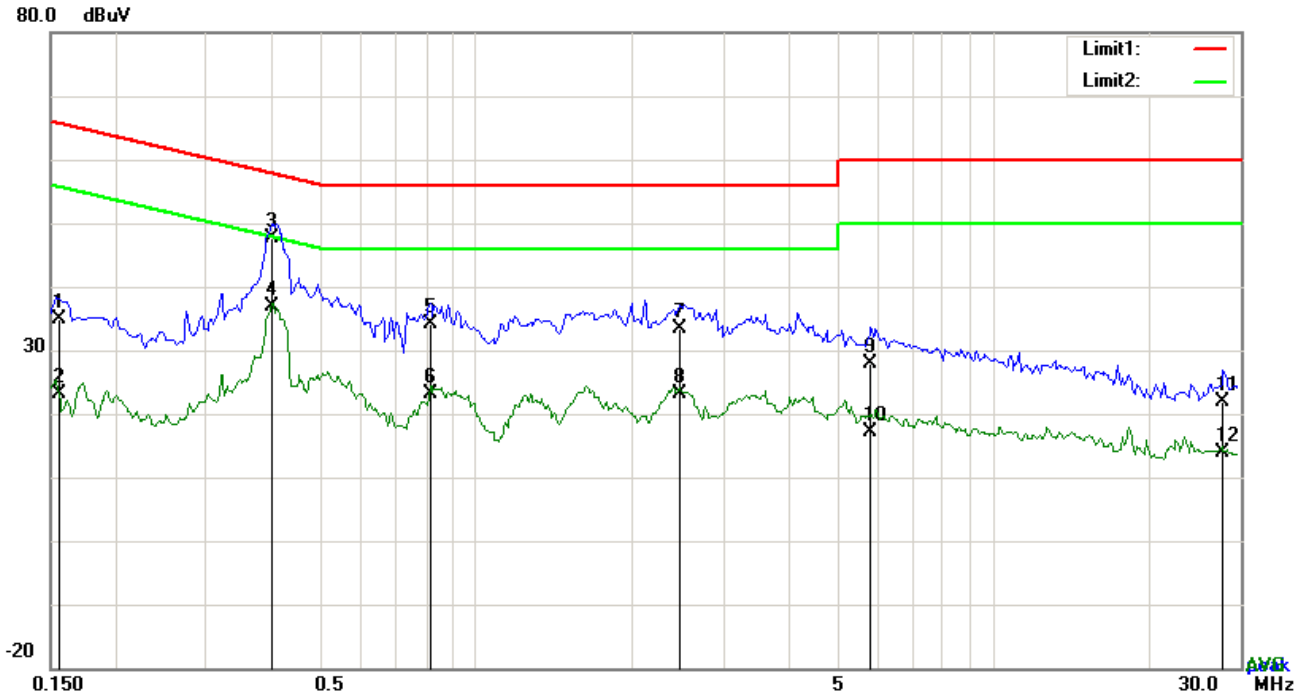


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1773	28.34	QP	10.03	38.37	64.61	-26.24
2	L1	0.1773	16.68	AVG	10.03	26.71	54.61	-27.90
3	L1	0.4152	41.91	QP	10.03	51.94	57.54	-5.60
4	L1	0.4152	29.06	AVG	10.03	39.09	47.54	-8.45
5	L1	0.8325	28.54	QP	10.03	38.57	56.00	-17.43
6	L1	0.8325	16.40	AVG	10.03	26.43	46.00	-19.57
7	L1	1.7685	26.39	QP	10.04	36.43	56.00	-19.57
8	L1	1.7685	13.32	AVG	10.04	23.36	46.00	-22.64
9	L1	2.5524	28.45	QP	10.05	38.50	56.00	-17.50
10	L1	2.5524	15.16	AVG	10.05	25.21	46.00	-20.79
11	L1	12.8358	21.14	QP	10.19	31.33	60.00	-28.67
12	L1	12.8358	9.91	AVG	10.19	20.10	50.00	-29.90

Test Mode:	Bluetooth Mode

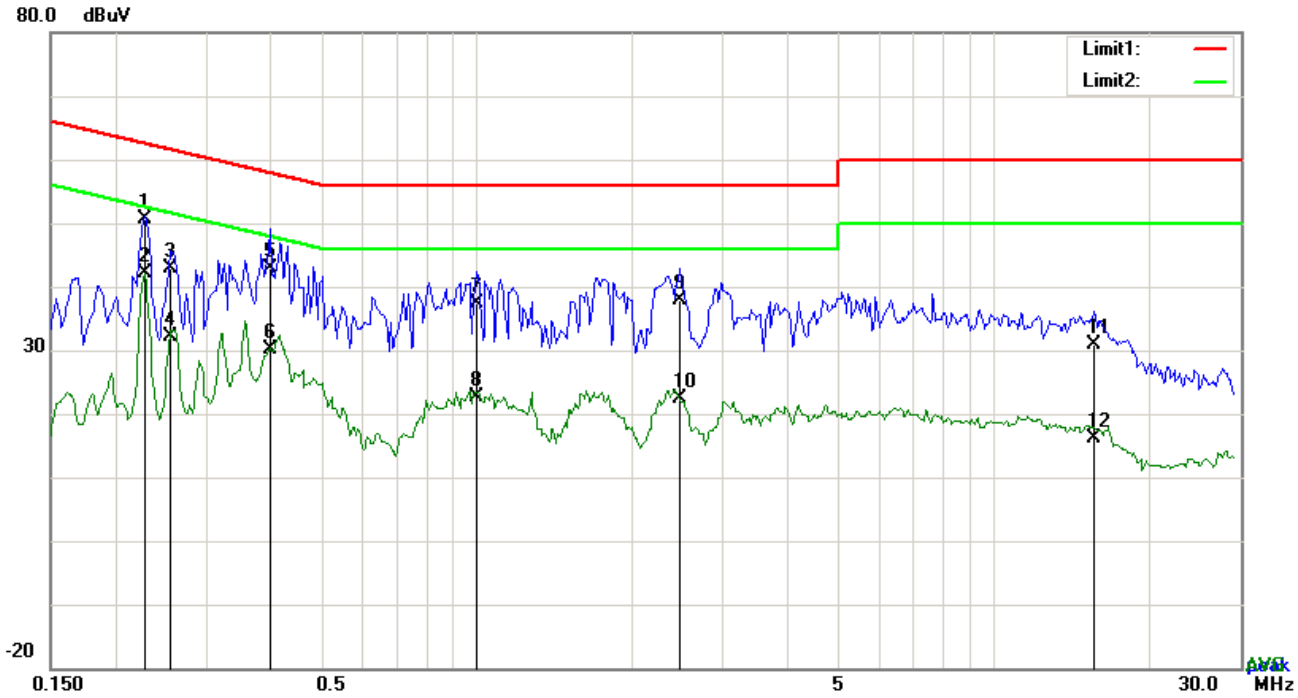


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.1557	24.88	QP	10.02	34.90	65.69	-30.79
2	N	0.1557	13.04	AVG	10.02	23.06	55.69	-32.63
3	N	0.4035	37.60	QP	10.02	47.62	57.78	-10.16
4	N	0.4035	26.97	AVG	10.02	36.99	47.78	-10.79
5	N	0.8169	24.00	QP	10.03	34.03	56.00	-21.97
6	N	0.8169	13.14	AVG	10.03	23.17	46.00	-22.83
7	N	2.4666	23.41	QP	10.04	33.45	56.00	-22.55
8	N	2.4666	13.05	AVG	10.04	23.09	46.00	-22.91
9	N	5.8041	17.74	QP	10.08	27.82	60.00	-32.18
10	N	5.8041	7.14	AVG	10.08	17.22	50.00	-32.78
11	N	27.7806	11.62	QP	10.38	22.00	60.00	-38.00
12	N	27.7806	3.51	AVG	10.38	13.89	50.00	-36.11

Test Mode:	Bluetooth Mode

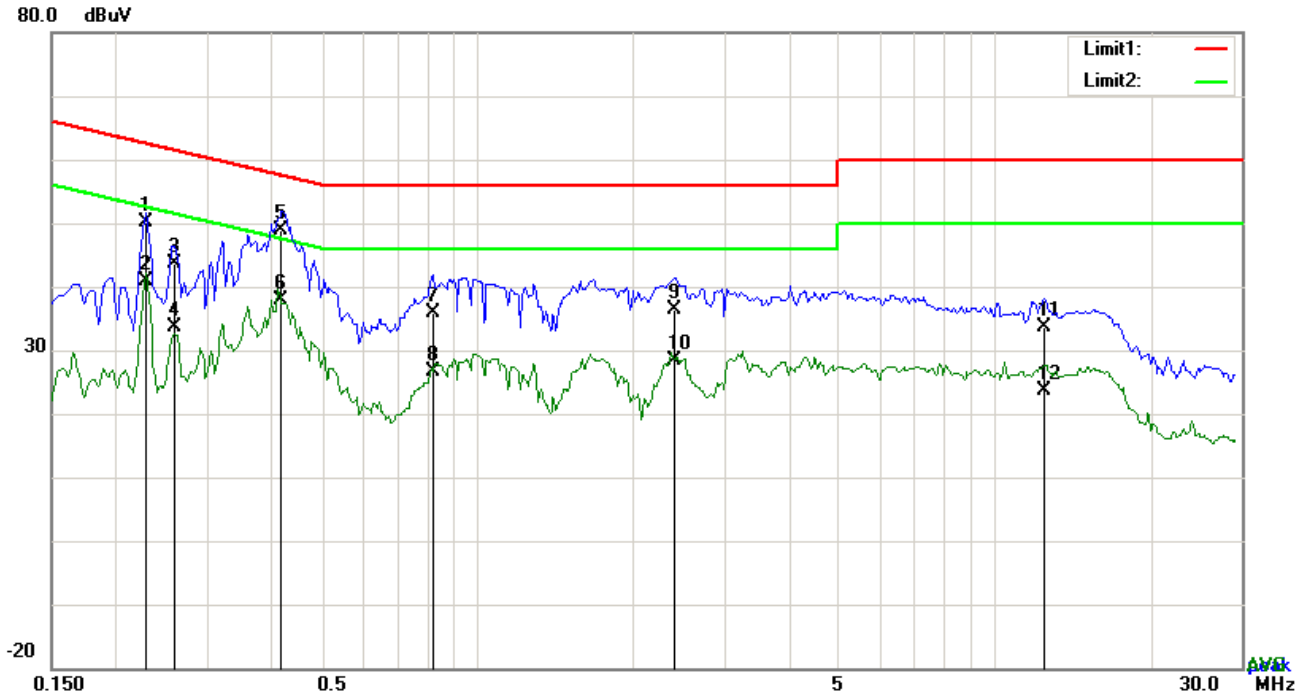


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.2280	40.64	QP	10.03	50.67	62.52	-11.85
2	L1	0.2280	32.01	AVG	10.03	42.04	52.52	-10.48
3	L1	0.2553	32.79	QP	10.03	42.82	61.58	-18.76
4	L1	0.2553	22.09	AVG	10.03	32.12	51.58	-19.46
5	L1	0.3996	32.77	QP	10.03	42.80	57.86	-15.06
6	L1	0.3996	20.14	AVG	10.03	30.17	47.86	-17.69
7	L1	1.0041	27.47	QP	10.03	37.50	56.00	-18.50
8	L1	1.0041	12.55	AVG	10.03	22.58	46.00	-23.42
9	L1	2.4666	27.76	QP	10.05	37.81	56.00	-18.19
10	L1	2.4666	12.28	AVG	10.05	22.33	46.00	-23.67
11	L1	15.6750	20.57	QP	10.24	30.81	60.00	-29.19
12	L1	15.6750	5.81	AVG	10.24	16.05	50.00	-33.95

Test Mode:	Bluetooth Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.2280	40.23	QP	10.02	50.25	62.52	-12.27
2	N	0.2280	30.74	AVG	10.02	40.76	52.52	-11.76
3	N	0.2592	33.69	QP	10.02	43.71	61.46	-17.75
4	N	0.2592	23.51	AVG	10.02	33.53	51.46	-17.93
5	N	0.4191	38.94	QP	10.02	48.96	57.47	-8.51
6	N	0.4191	27.75	AVG	10.02	37.77	47.47	-9.70
7	N	0.8208	25.82	QP	10.03	35.85	56.00	-20.15
8	N	0.8208	16.56	AVG	10.03	26.59	46.00	-19.41
9	N	2.4003	26.31	QP	10.04	36.35	56.00	-19.65
10	N	2.4003	18.27	AVG	10.04	28.31	46.00	-17.69
11	N	12.4809	23.51	QP	10.17	33.68	60.00	-26.32
12	N	12.4809	13.36	AVG	10.17	23.53	50.00	-26.47

6.9 Radiated Emissions & Restricted Band

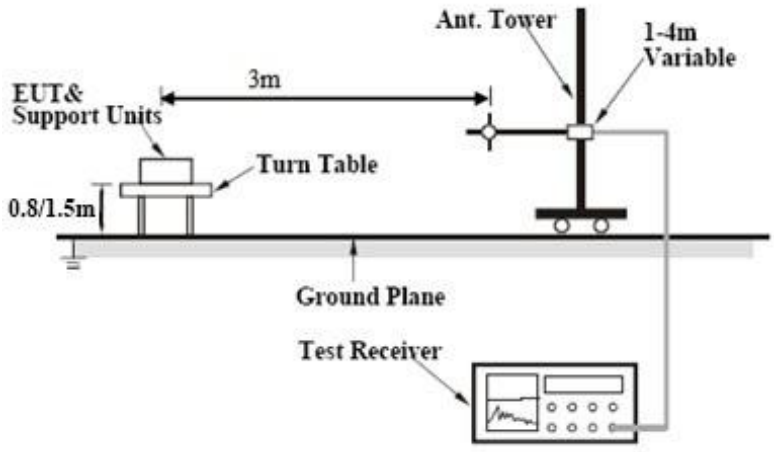
Temperature	24 °C
Relative Humidity	59%
Atmospheric Pressure	1007mbar
Test date :	April 07, 2017
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.205, §15.209, §15.247(d)	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	☑

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

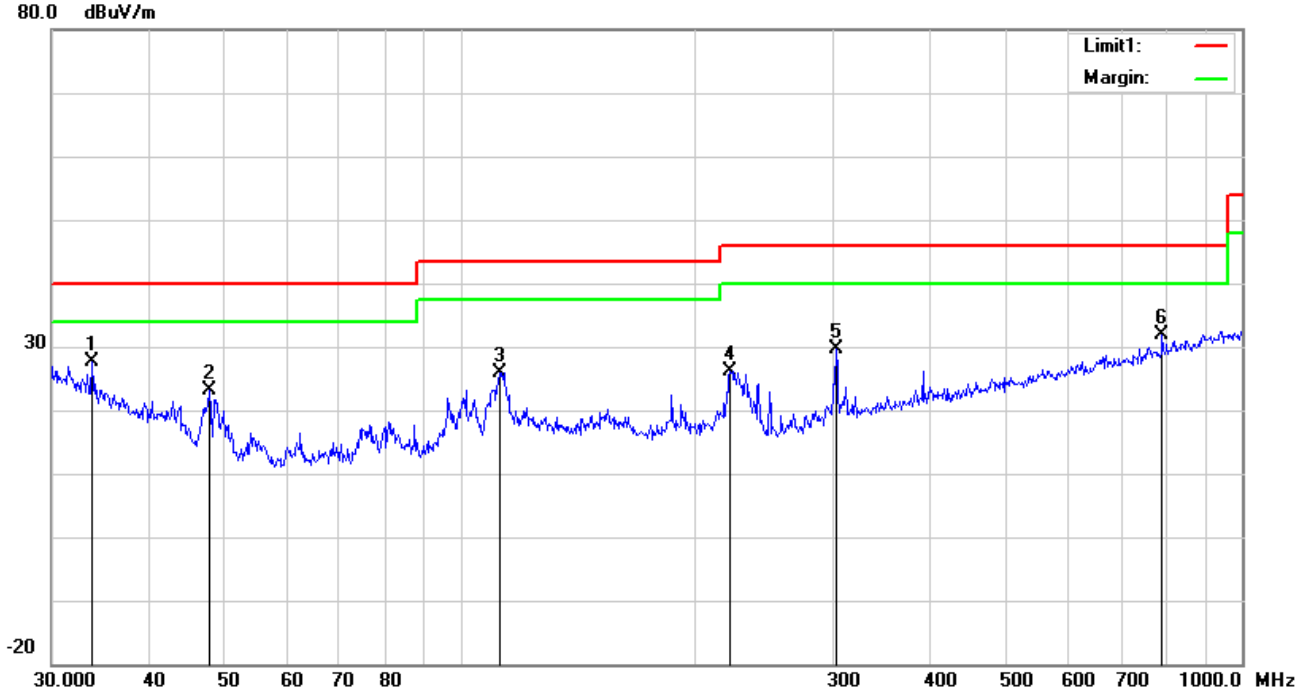
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Low Channel: 8-DFSK Mode

Test Mode:	Bluetooth Mode (Worst Case)

Below 1GHz

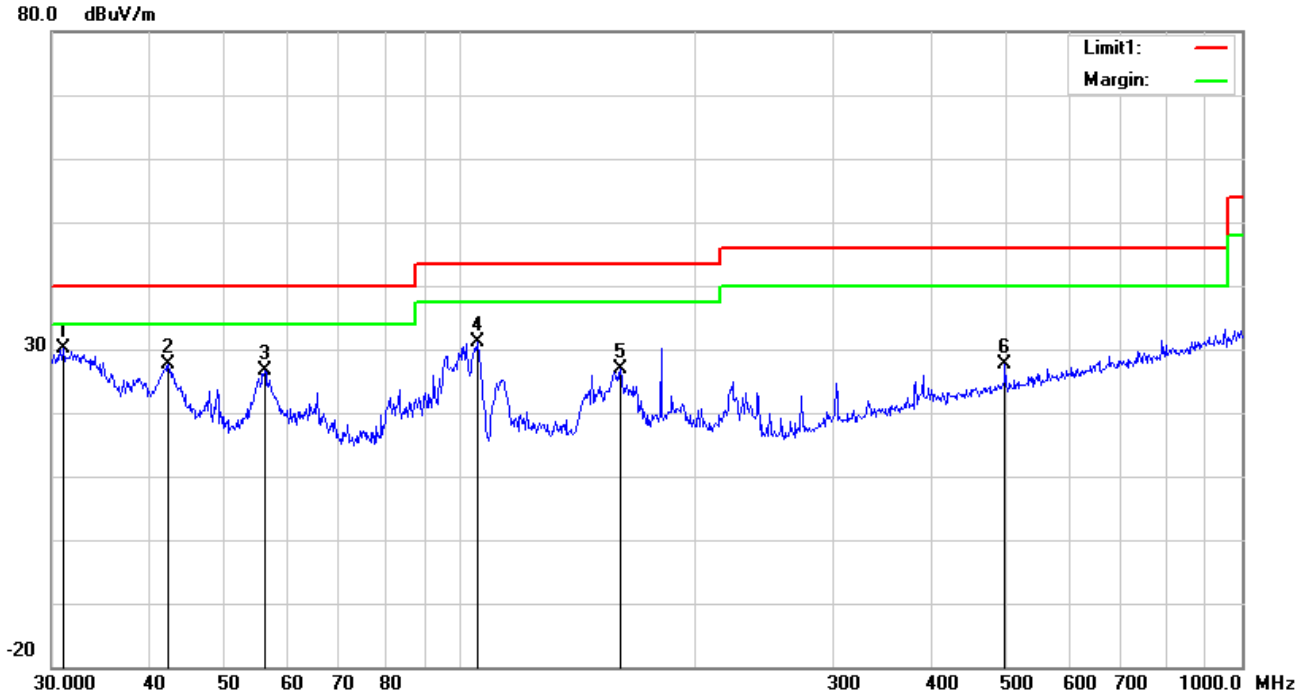


Test Data

Horizontal Polarity Plot @3m

No.	P/L	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	H	33.7986	30.75	peak	18.48	22.26	0.73	27.70	40.00	-12.30	100	162
2	H	47.8260	35.37	peak	9.36	22.34	0.78	23.17	40.00	-16.83	100	235
3	H	112.1305	34.53	peak	12.52	22.34	1.17	25.88	43.50	-17.62	100	4
4	H	221.3921	35.14	peak	11.80	22.34	1.61	26.21	46.00	-19.79	200	356
5	H	302.4812	36.53	peak	13.65	22.28	1.80	29.70	46.00	-16.30	100	259
6	H	790.6188	28.92	peak	21.29	21.17	2.94	31.98	46.00	-14.02	100	70

Below 1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	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	V	31.0706	31.12	peak	20.58	22.27	0.65	30.08	40.00	-9.92	100	344
2	V	42.3022	36.85	peak	12.38	22.28	0.77	27.72	40.00	-12.28	200	41
3	V	56.1974	40.50	peak	7.72	22.40	0.77	26.59	40.00	-13.41	100	242
4	V	105.2718	40.93	peak	11.32	22.33	1.15	31.07	43.50	-12.43	100	160
5	V	160.3457	35.31	peak	12.57	22.27	1.39	27.00	43.50	-16.50	100	111
6	V	497.6765	29.43	peak	17.65	21.81	2.41	27.68	46.00	-18.32	100	70

Above 1GHz

Test Mode:	Bluetooth Mode

Low Channel: GFSK Mode (Worst Case) (2402 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4804	39.56	AV	V	33.67	6.86	32.66	47.43	54	-6.57
4804	39.44	AV	H	33.67	6.86	32.66	47.31	54	-6.69
4804	48.72	PK	V	33.67	6.86	32.66	56.59	74	-17.41
4804	45.75	PK	H	33.67	6.86	32.66	53.62	74	-20.38
17803	24.16	AV	V	45.03	11.21	32.38	48.02	54	-5.98
17803	24.82	AV	H	45.03	11.21	32.38	48.68	54	-5.32
17803	39.85	PK	V	45.03	11.21	32.38	63.71	74	-10.29
17803	42.29	PK	H	45.03	11.21	32.38	66.15	74	-7.85

Middle Channel: GFSK Mode (Worst Case) (2441 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4882	39.05	AV	V	33.71	6.95	32.74	46.97	54	-7.03
4882	39.18	AV	H	33.71	6.95	32.74	47.1	54	-6.9
4882	49.08	PK	V	33.71	6.95	32.74	57	74	-17
4882	47.29	PK	H	33.71	6.95	32.74	55.21	74	-18.79
17817	24.65	AV	V	45.15	11.18	32.41	48.57	54	-5.43
17817	23.06	AV	H	45.15	11.18	32.41	46.98	54	-7.02
17817	40.97	PK	V	45.15	11.18	32.41	64.89	74	-9.11
17817	40.81	PK	H	45.15	11.18	32.41	64.73	74	-9.27

High Channel: 8-DFSK Mode (Worst Case) (2480 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	37.68	AV	V	33.9	6.76	32.74	45.6	54	-8.4
4960	38.05	AV	H	33.9	6.76	32.74	45.97	54	-8.03
4960	48.43	PK	V	33.9	6.76	32.74	56.35	74	-17.65
4960	46.84	PK	H	33.9	6.76	32.74	54.76	74	-19.24
17825	23.4	AV	V	45.22	11.35	32.38	47.59	54	-6.41
17825	24.15	AV	H	45.22	11.35	32.38	48.34	54	-5.66
17825	41.8	PK	V	45.22	11.35	32.38	65.99	74	-8.01
17825	40.67	PK	H	45.22	11.35	32.38	64.86	74	-9.14

Note:

*1, The testing has been conformed to 10*2480MHz=24,800MHz*
2, All other emissions more than 30 dB below the limit
3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/16/2016	09/15/2017	☑
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	☑
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	☑
LISN	ISN T800	34373	09/24/2016	09/23/2017	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	☑
Transient Limiter	LIT-153	531118	08/31/2016	08/30/2017	☑
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	☑
Power Splitter	1#	1#	08/31/2016	08/30/2017	☑
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	☑
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/31/2016	08/30/2017	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	☑
Universal Radio Communication Tester	CMU200	121393	09/24/2016	09/23/2017	☑

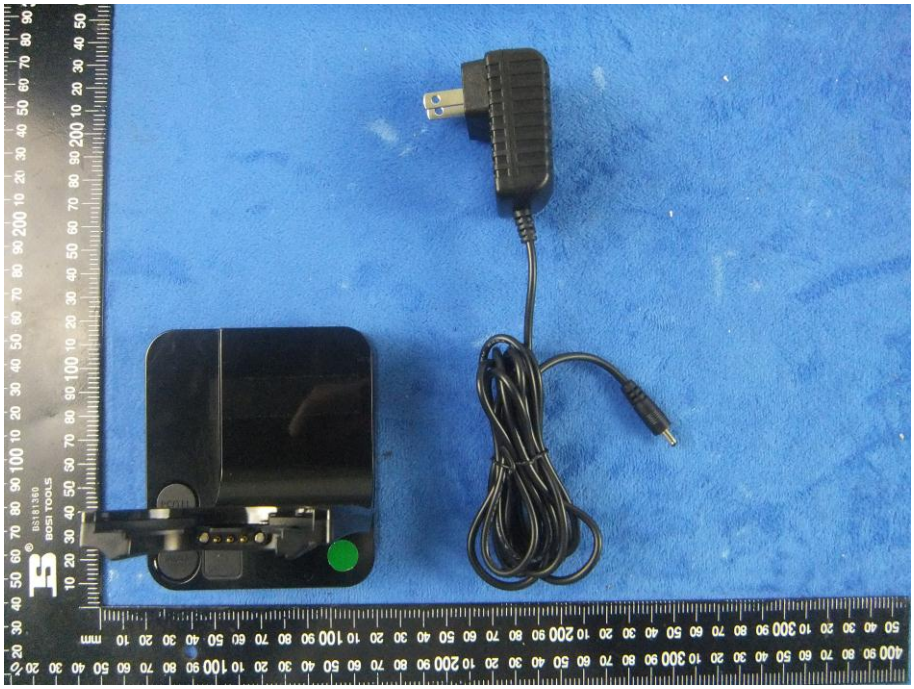
Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

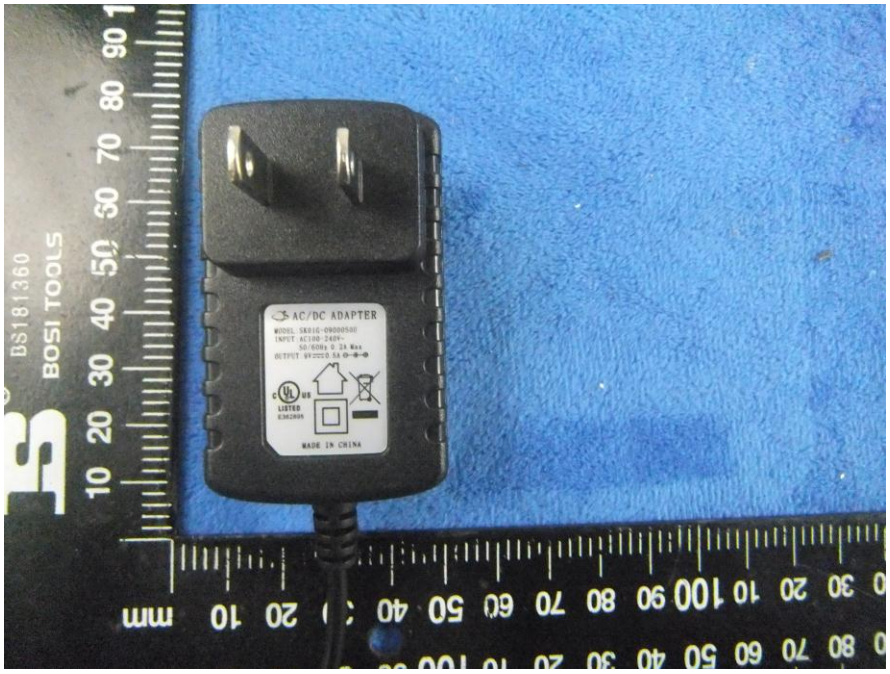
Whole Package View 1(Adapter 1) FP

Adapter 1 - Front View

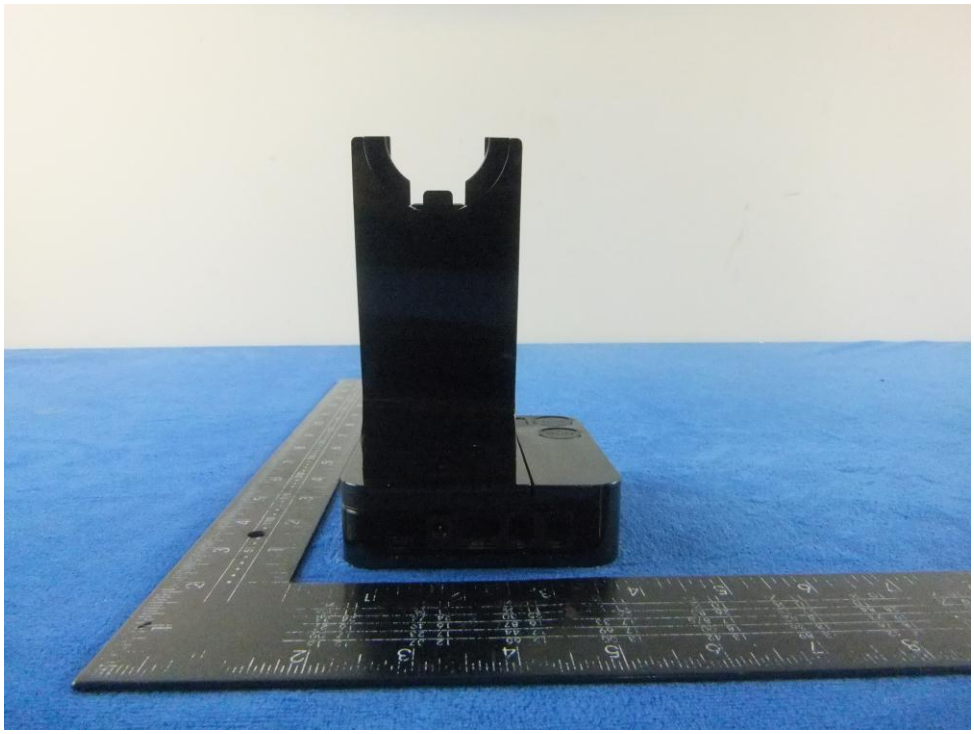
Whole Package View 1(Adapter 2) FP



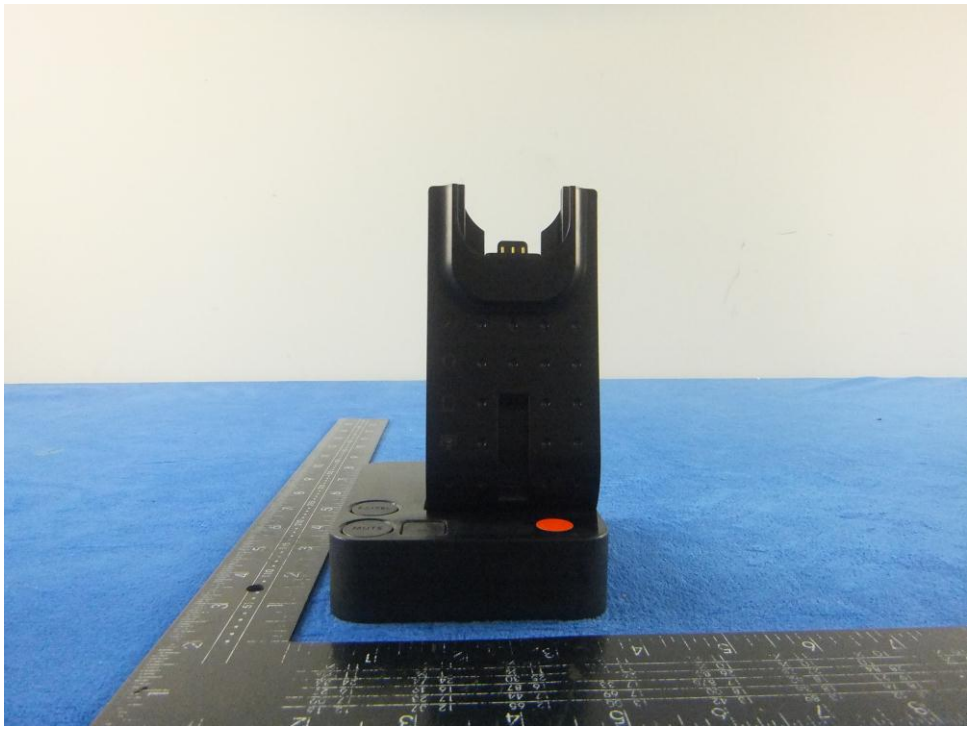
Adapter 2- Front View



EUT - Front View FP

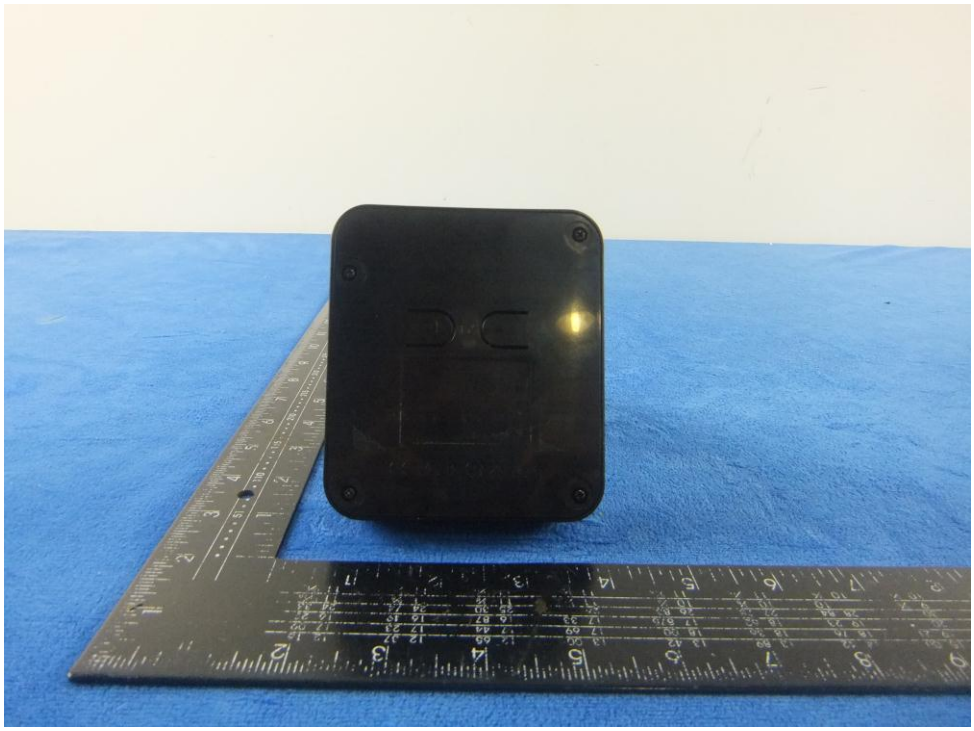


EUT - Rear View FP

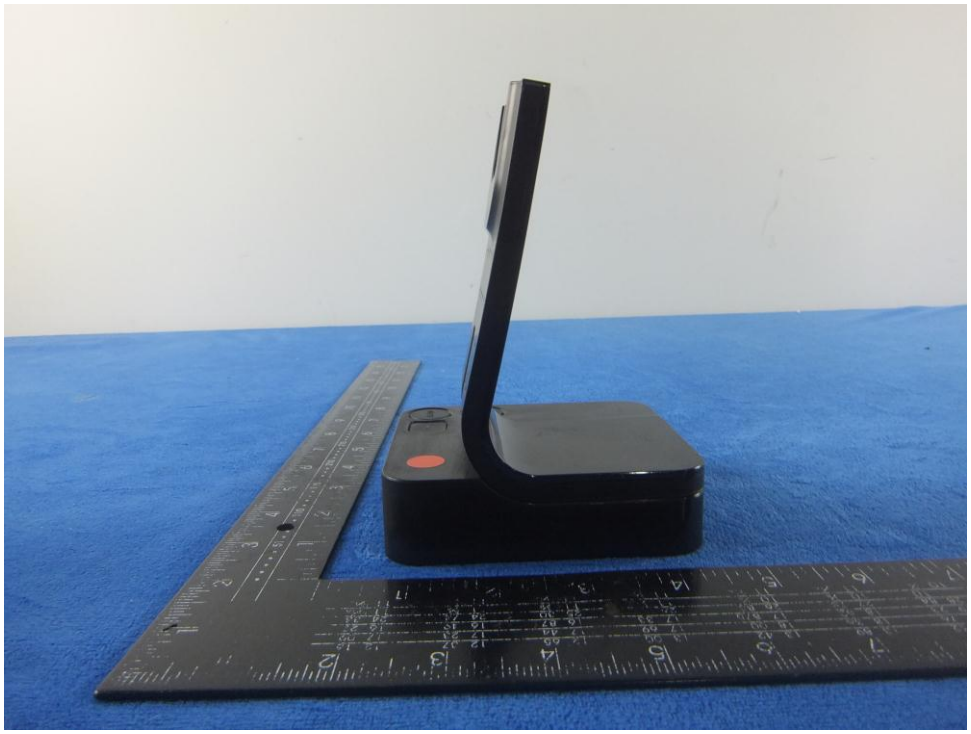


EUT - Top View FP

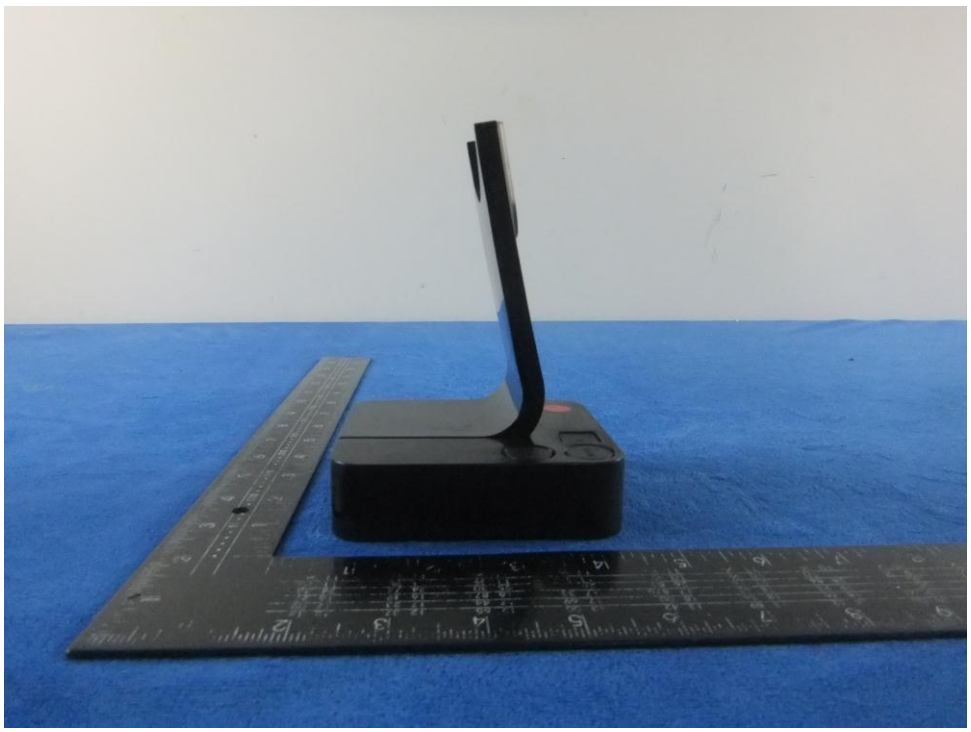
EUT - Bottom View FP



EUT - Left View FP

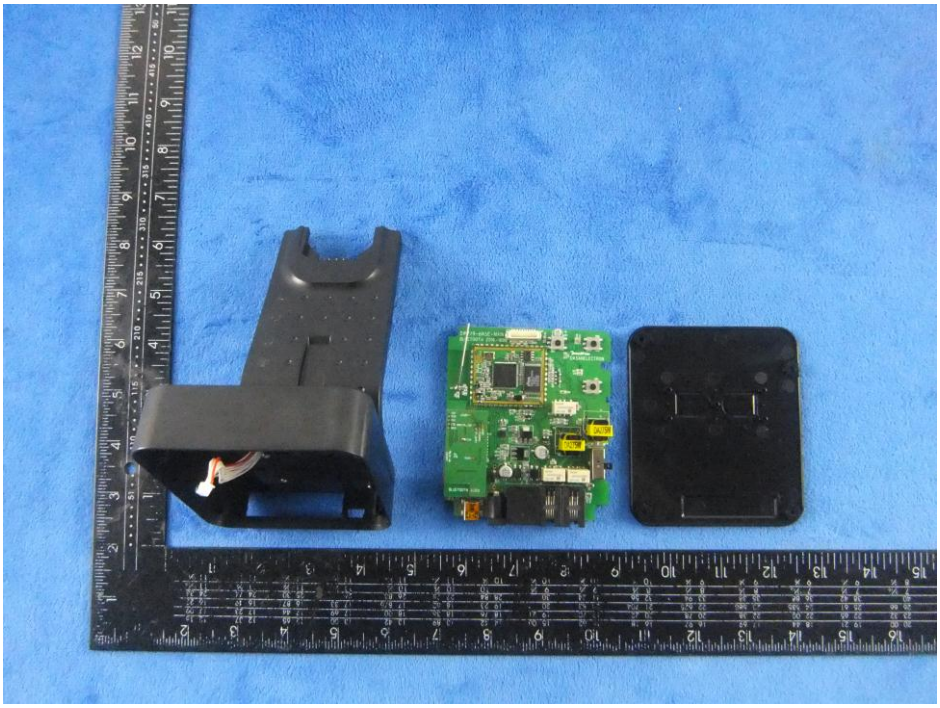


EUT - Right View FP

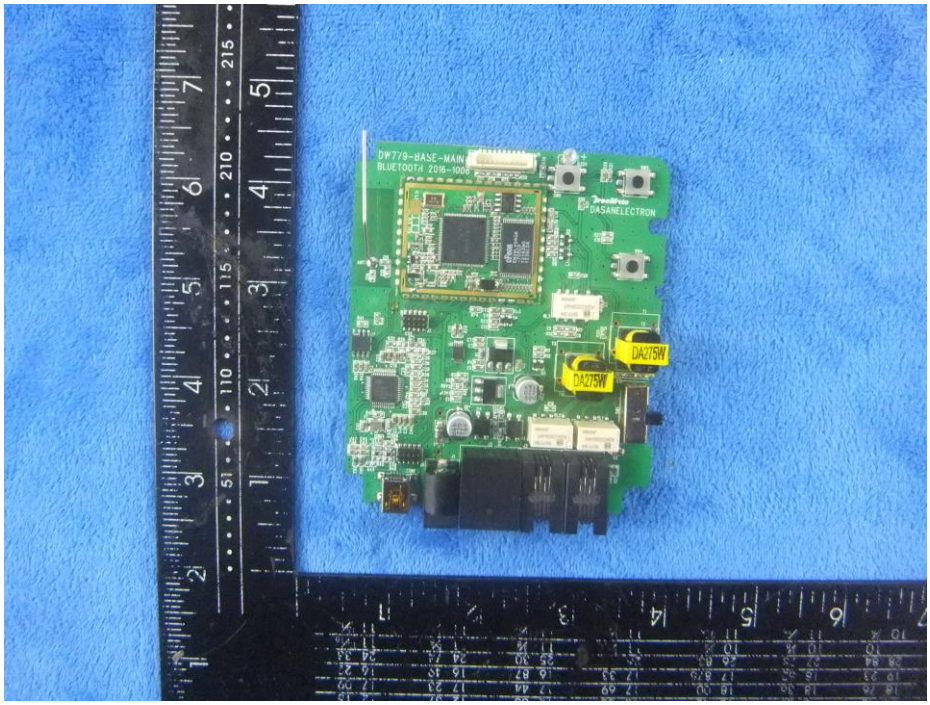


Annex B.ii. Photograph: EUT Internal Photo

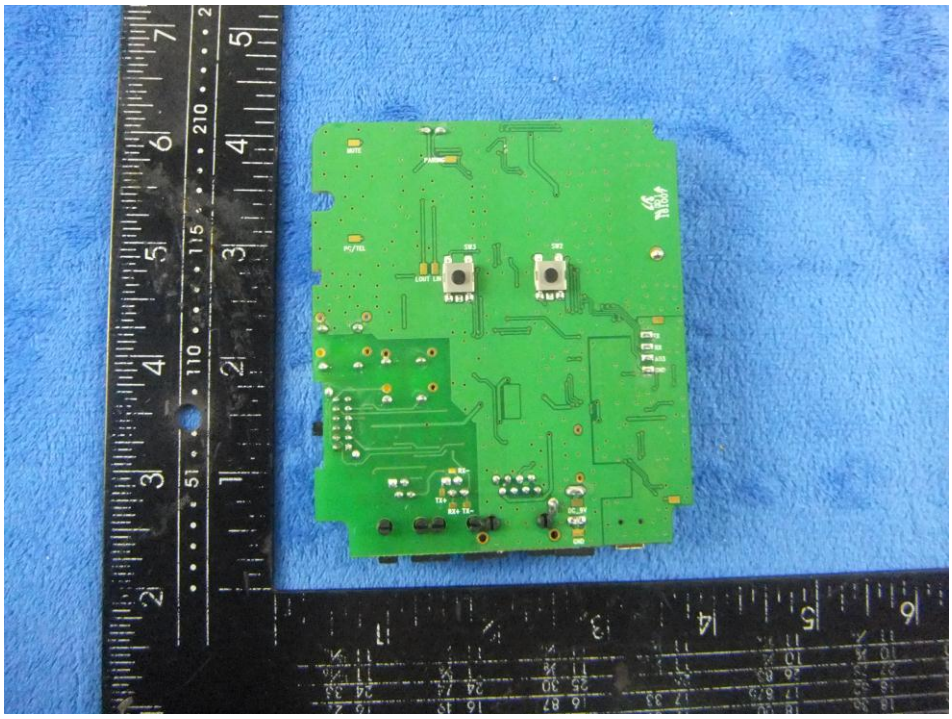
EUT – Uncover View FP



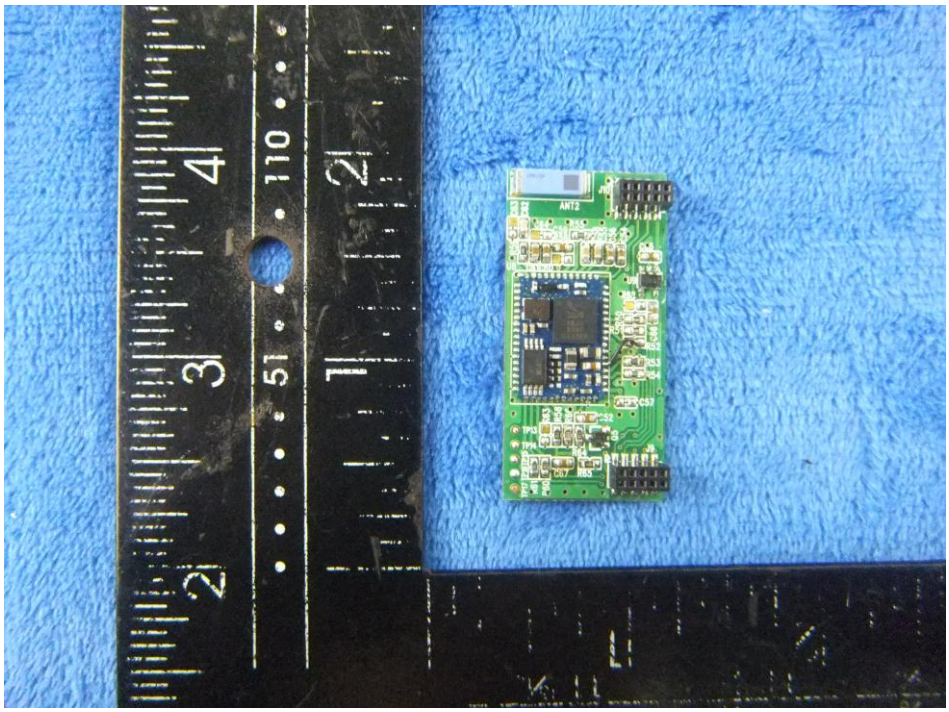
EUT – Mainboard Front View FP



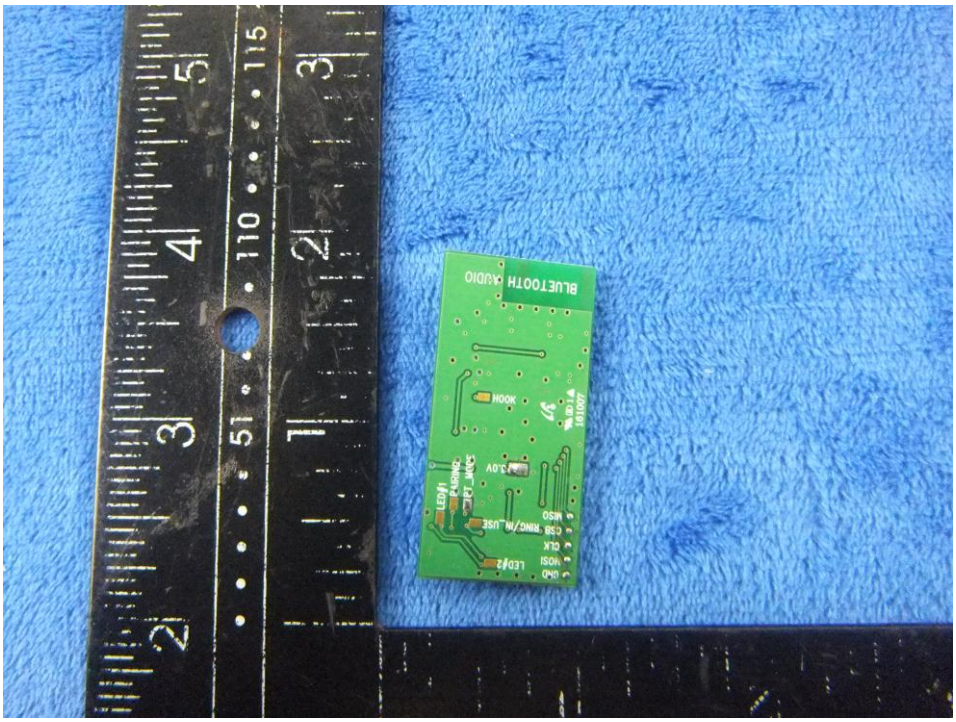
EUT – Mainboard Rear View FP



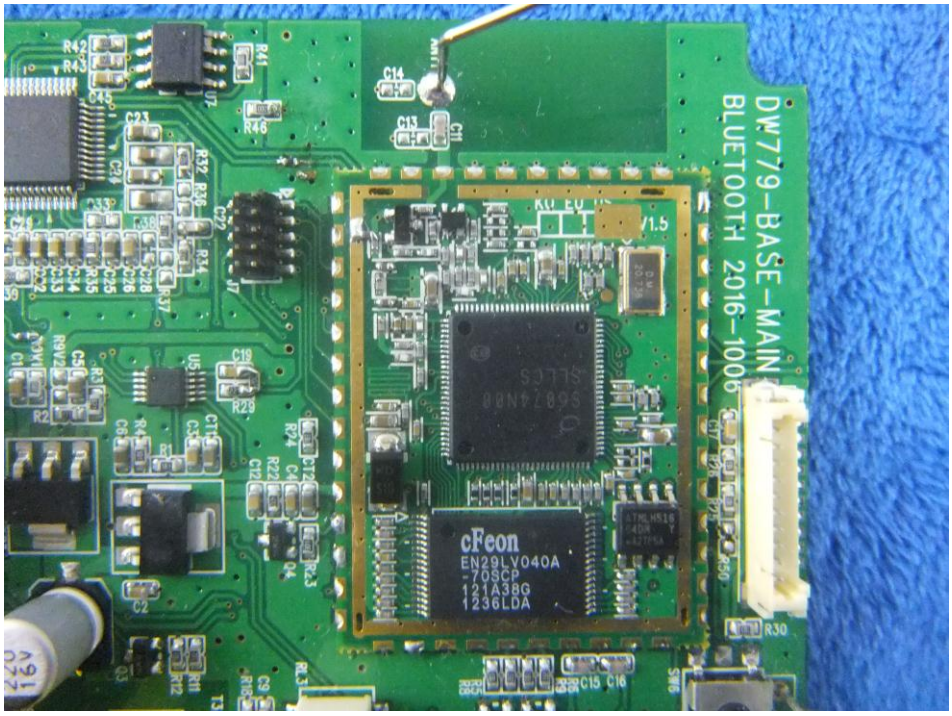
EUT – Subplat Front View FP



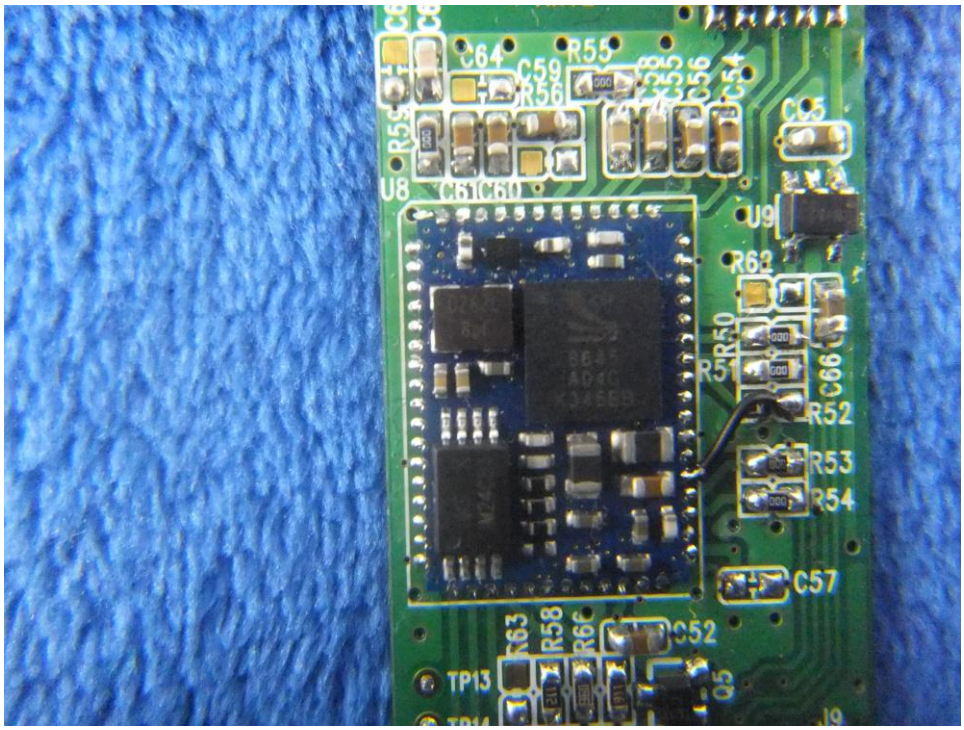
EUT – Subplat Rear View FP



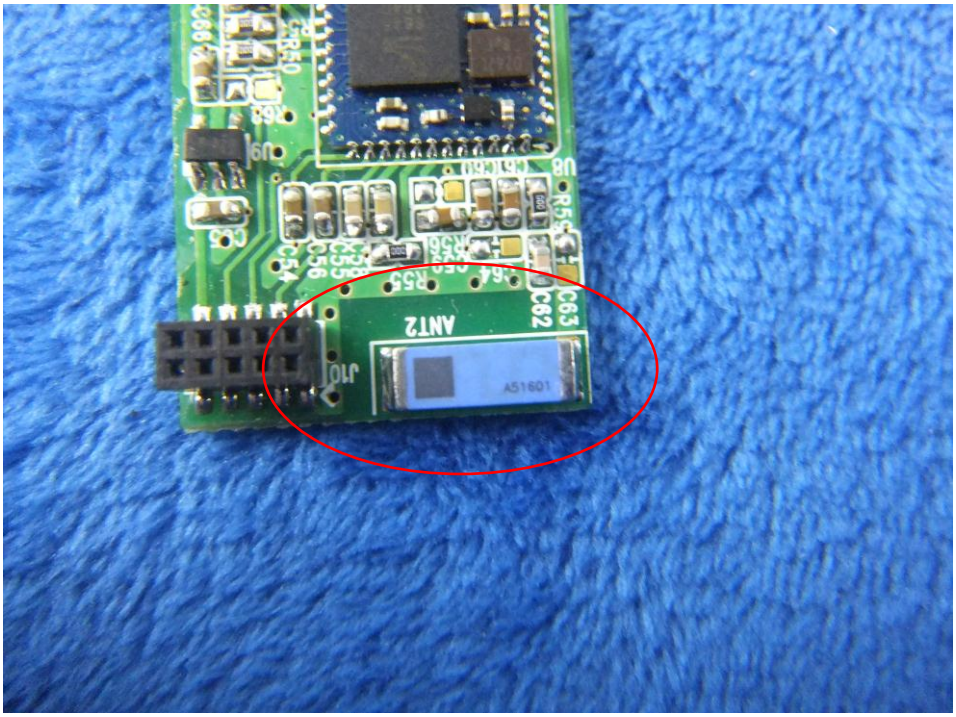
IC VIEW (Mainboard) FP



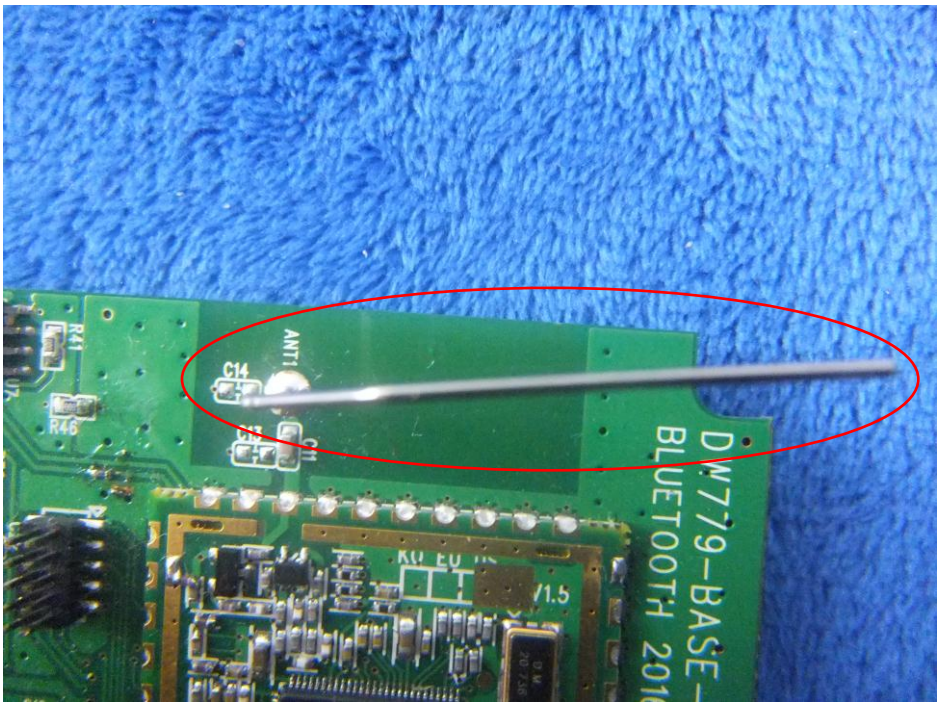
IC VIEW(Subplat) FP



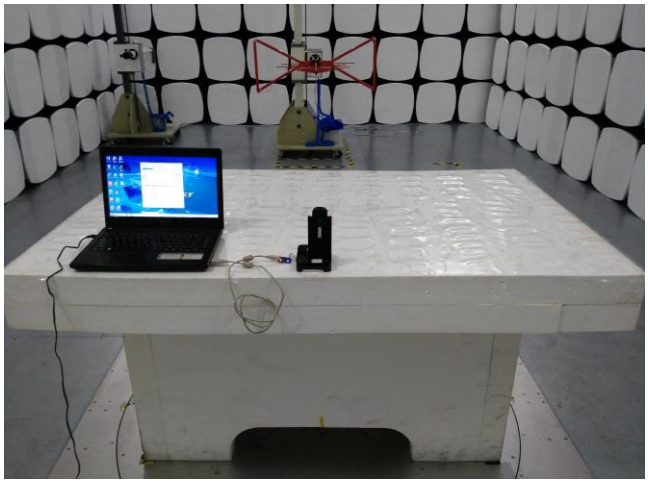
BT antenna view FP



Antenna View FP



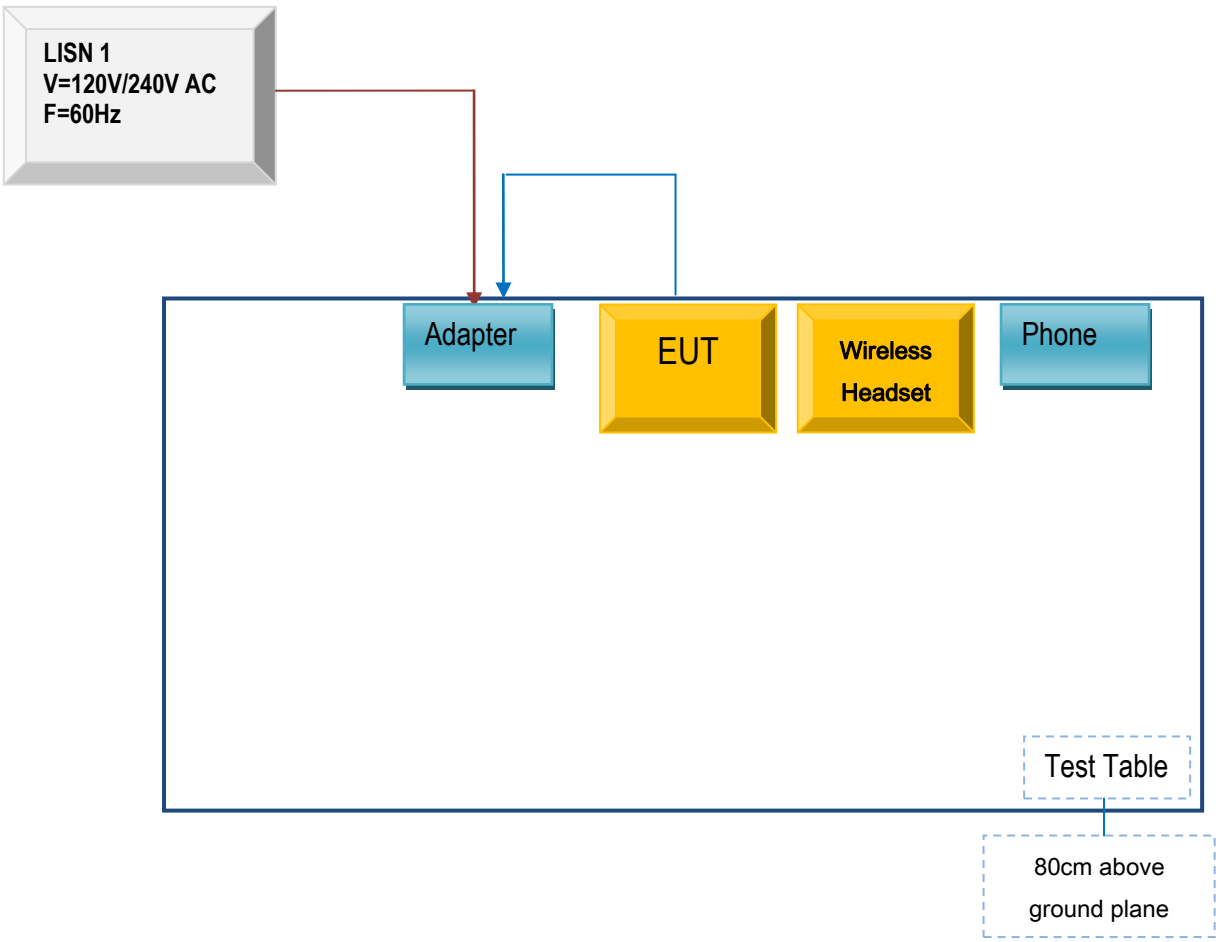
Annex B.iii. Photograph: Test Setup Photo

	
Conducted Emissions Test Setup Front View	Conducted Emissions Test Setup Side View
	
Radiated Spurious Emissions Test Setup Below 1GHz	Radiated Spurious Emissions Test Setup Above 1GHz

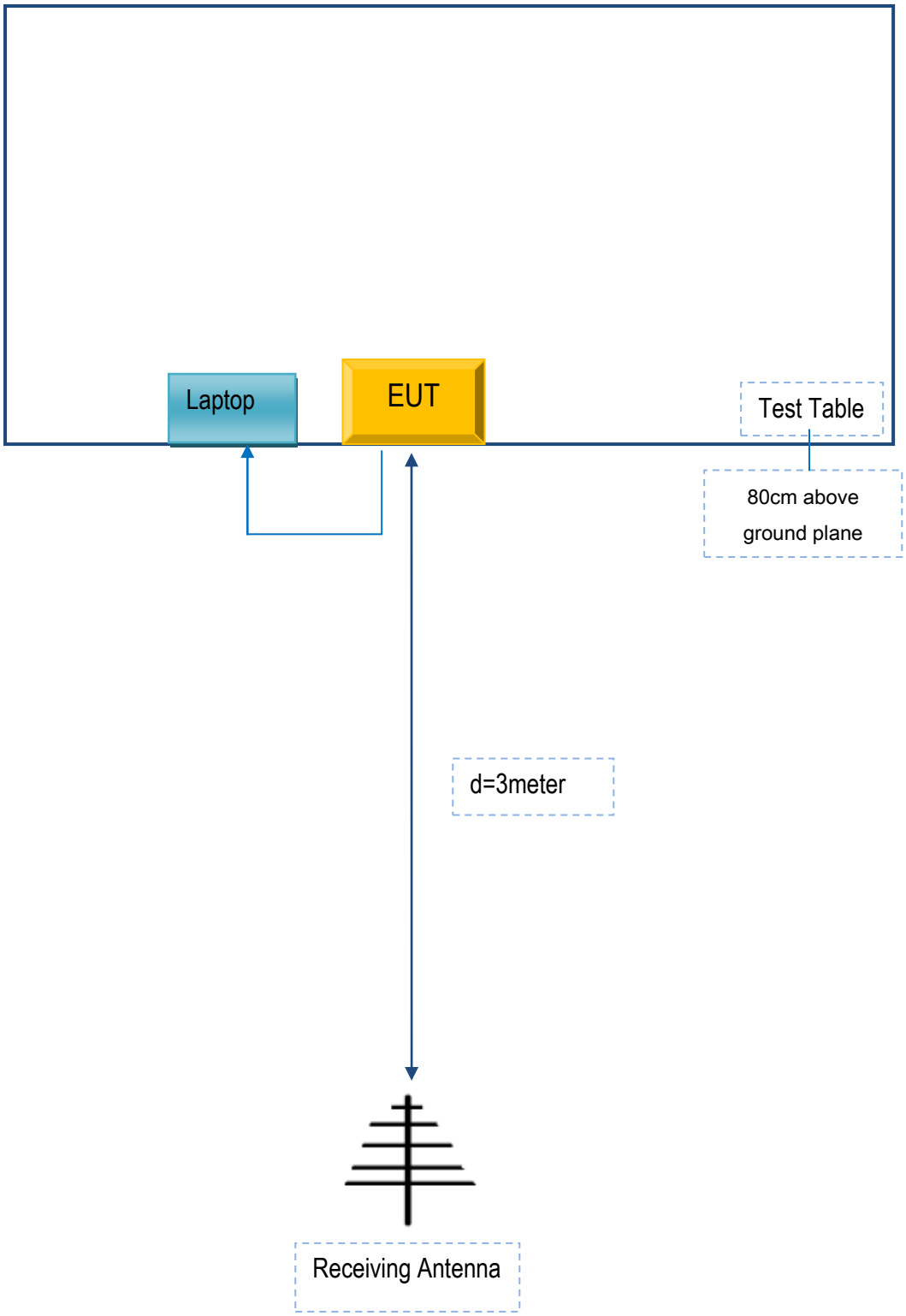
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

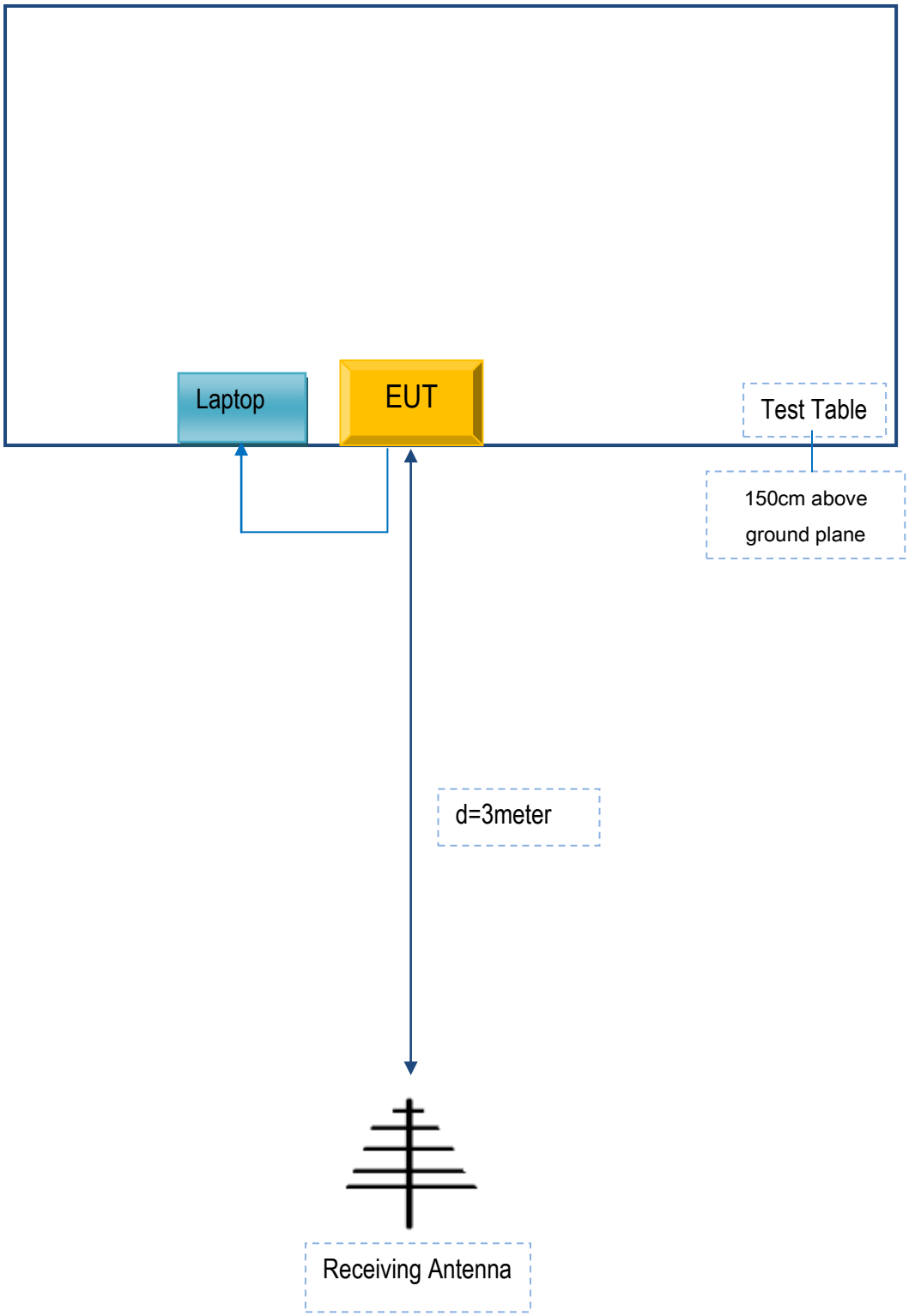
Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions （Below 1GHz）.



Block Configuration Diagram for Radiated Emissions （Above 1GHz）.



Annex C. il. 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
DASAN ELECTRON CO., LTD.	Adapter	DW-779U	SA036
DASAN ELECTRON CO., LTD.	Phone	SM-C5000	B4048
DASAN ELECTRON CO., LTD.	Laptop	E40	LR-1EHRX

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	SA036

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

Please see the attachment

Annex E. DECLARATION OF SIMILARITY

DASAN ELECTRON

Date: 2017. 10. 13.

SUBJECT: Declaration of differences in tested devices

To Whom It May Concern:

We, DASAN ELECTRON CO.,LTD, declares that there is no difference between DW-779U and DW-779UB for the DECT RF part.

The difference between DW-779U and DW-779UB is as below.

1. Only DW-779UB has a Bluetooth module
Except listings above, the others are all the same as DW-779U.

DW-779UB, X400P-UB, FSPW2016MUB and HSW100UB are exactly same in Hardware and Software.
DW-779U, DW-779,X400P-U,X400, FSPW2015MU, FSPW2015M and HSW100U are exactly same in Hardware and Software.

Sincerely,
Kyung Ryong, Hong / Director