

FCC/IC- TEST REPORTReport Number : **7088818001170-00** Date of Issue: October 31, 2018Model : 9290019684Product Type : 9290019684Product Description : Hue ConnectFCC ID : 2AGBW9290019684XIC : 20812-9684XApplicant : Philips Lighting(China) Investment Co.,Ltd.Address : Building 9, Lane 888, Tian Lin Road, Min Hang District Shangha,
P.R.C.Production Facility : Philips Lighting(China) Investment Co.,Ltd.Address : Building 9, Lane 888, Tian Lin Road, Min Hang District Shangha,
P.R.C.Test Result : ☒ **Positive** ☐ **Negative**Total pages including
Appendices : 40

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
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Fax: +86 21 6140 8600

Test Site 2

Company name: MRT Technology (Suzhou) Co., Ltd.
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Economic Development Zone, Suzhou, China
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IC Registration No.: 11384A-1
Telephone: +86-512-66308358
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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product: Hue Connect

Model no.: 9290019684

FCC ID: 2AGBW9290019684X

IC: 20812-9684X

Options and accessories: NA

Input Rated Voltage DC 24V
Extreme Voltage DC 21.6V, DC 26.4V

RF Transmission Frequency: 2405MHz ~ 2480MHz

No. of Operated Channel: 5

Channel list:

Operation Frequency each of channel	
Channel	Frequency
11	2405MHz
15	2425MHz
20	2450MHz
25	2475MHz
26	2480MHz

Radio technology: Zigbee

Modulation: 16-ary orthogonal modulation, O-QPSK PHY

Data speed: 250kbps MAX

Hardware version: HW V2.X

Software version: SW V2.X

Antenna Type: Integrated

Antenna Gain: 1.77dBi

Description of the EUT: The Equipment Under Test (EUT) is a Zigbee Module, the TX and RX frequency range is 2405MHz-2480MHz.



4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB558074 D01 DTS Measurement Guidance v04 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C & RSS-210 Issue 2						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207 RSS-Gen [8.8]	Conducted emission AC power port	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247 (b) (1) RSS-247 [5.4(4)]	Conducted peak output power	11	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1)	20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)	Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(e) RSS-247 [5.2]	Power spectral density	12	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(2) RSS-247 [5.2]	6dB bandwidth and 99% Occupied Bandwidth	14	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) RSS-247 [5.5]	Spurious RF conducted emissions	16	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209 RSS-247 [5.5]	Spurious radiated emissions and Band edge for transmitter	20	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203	Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A – Not Applicable.

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

E.U.T Antenna: The Zigbee module antenna is an integrated PCB antenna, the best-case gain of the antenna is 1.77 dBi.

The antenna of the **Hue Connect**, is permanently attached.

There are no provisions for connection to an external antenna.

Conclusion: The EUT unit complies with the requirement of §15.203.

Note 2: All modes of operation were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AGBW9290019684X, IC: 20812-9684X complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-247 Issue 2.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: September 29, 2018

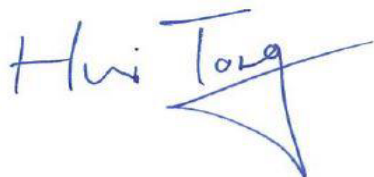
Testing Start Date: September 30, 2018

Testing End Date: October 31, 2018

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:

Prepared by:



Hui TONG
Review Engineer

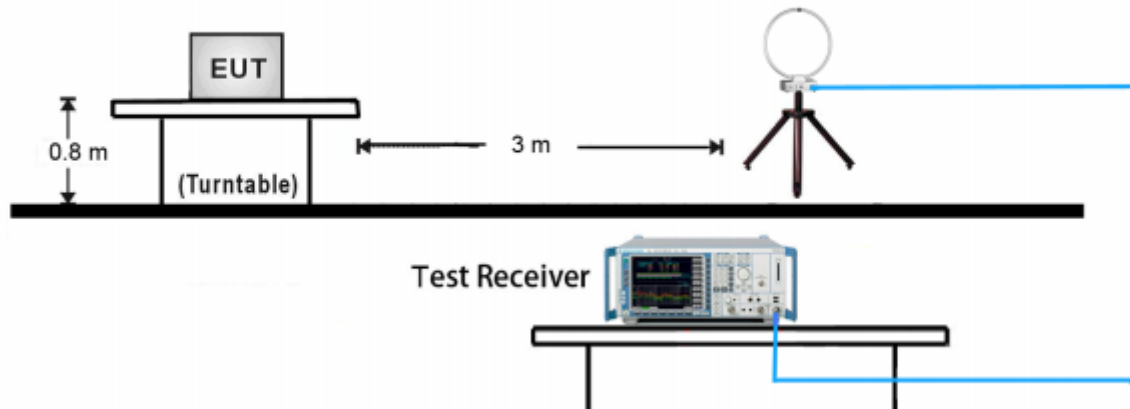


Jiayi XU
Project Engineer

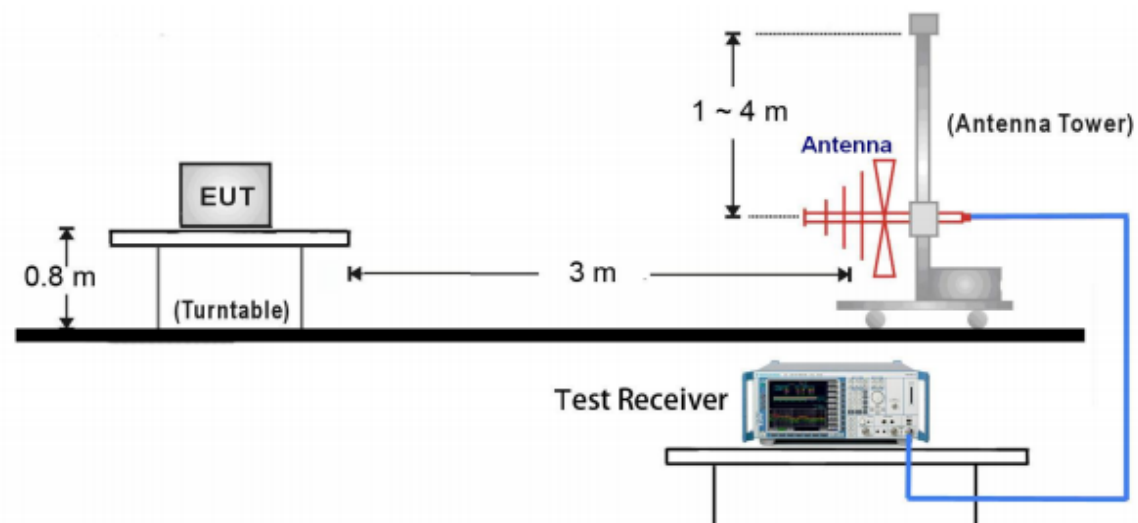
7 Test Setups

7.1 Radiated test setups

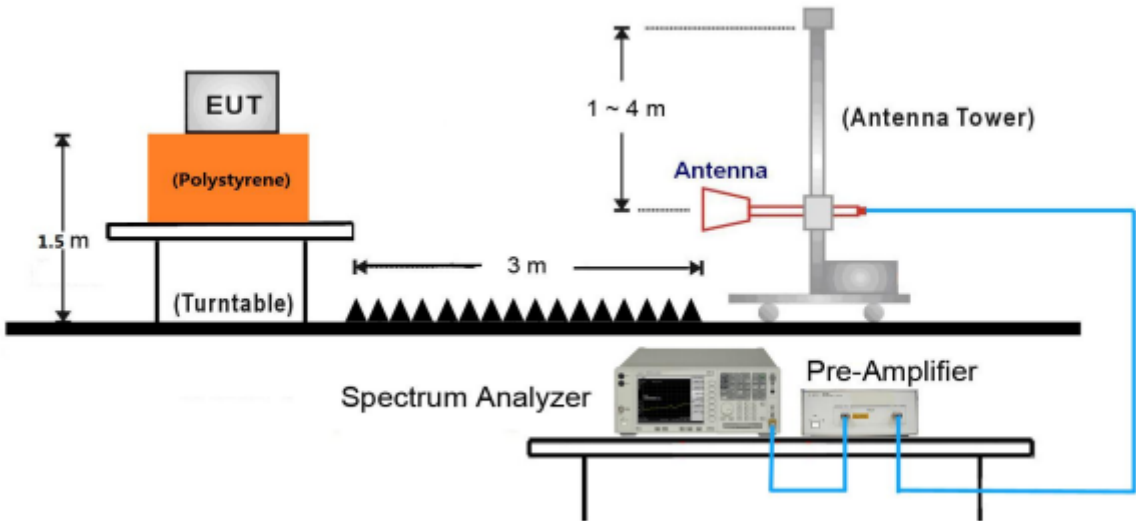
9kHz ~ 30MHz Test Setup:



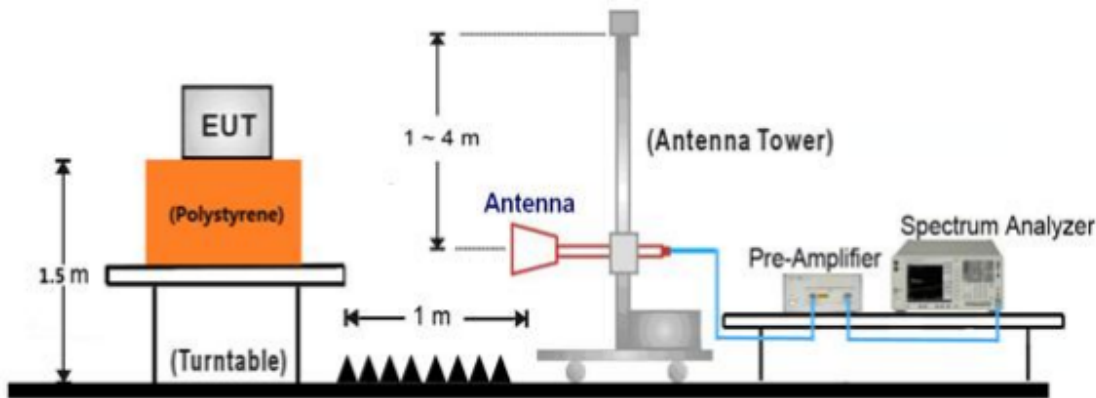
30MHz ~ 1GHz Test Setup:



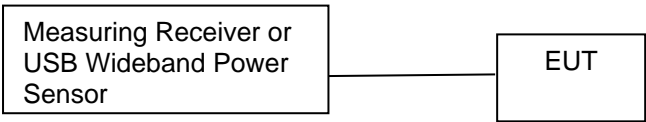
1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)
Notebook	Lenovo	X240

Test channel & mode:

The Hue Connect was configured using a proprietary communication interface provided by the client. The interface allows channel control required to support the evaluation.

Test software	HueApprobationTool.exe
---------------	------------------------

Test mode	Channel	Frequency (MHz)
Tx	11	2405
Tx	20	2450
Tx	26	2480

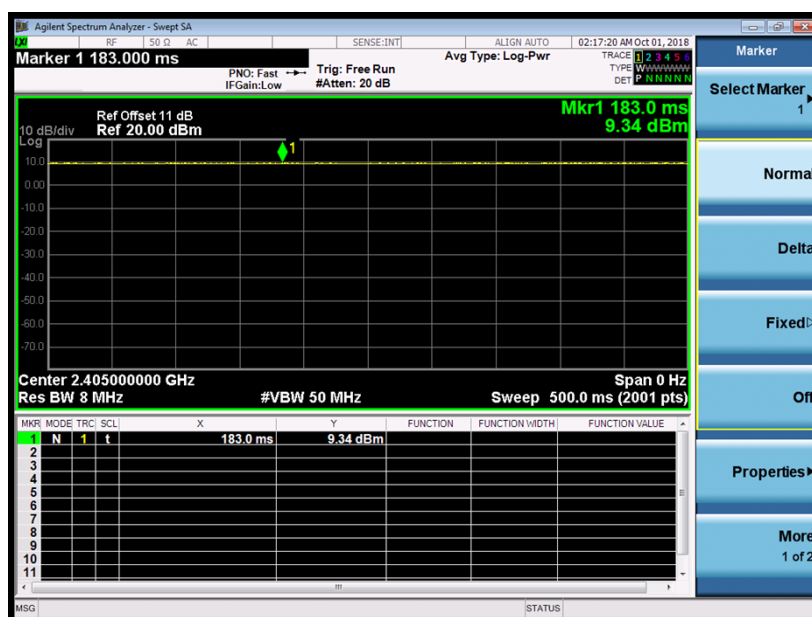
Device Capabilities

This device contains the following capabilities:

ZigBee Module Device.

Note: The maximum achievable duty cycles was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of KDB 558074 D01v04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
O-QPSK	100%



9 Technical Requirement

9.1 Conducted peak output power

Test Method

KDB 558074 D01 v04 – Section 9.1.3 PKPM1 – Peak Power Method

9.1.3 PKPM1 Peak-reading power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

Model	Ch.	Freq. (MHz)	Peak Power (dBm)	Limit (dBm)
O-QPSK	11	2405	9.26	30
	20	2450	8.96	30
	26	2480	8.39	30

9.2 6dB bandwidth and 99% Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.
3. Allow the trace to stabilize, record the 6 dB Bandwidth value.

Limit

Limit [kHz]

≥ 500

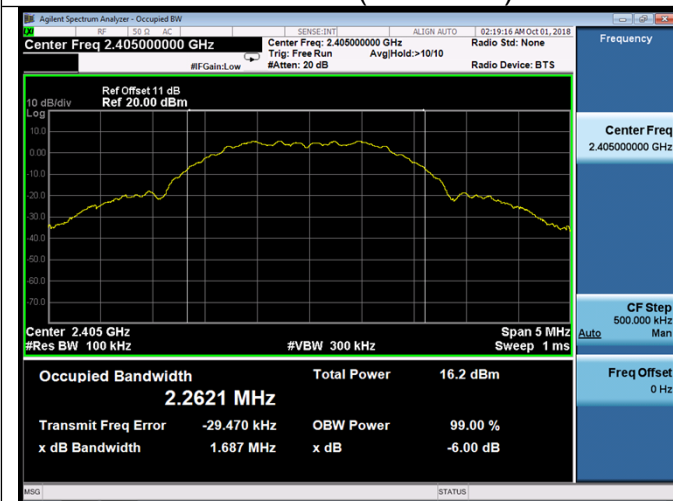
Test result

Test Mode	Channel No.	Freq. (MHz)	6db Bandwidth (MHz)	Limit (MHz)	Result
O-QPSK	11	2405	1.687	≥ 0.5	Pass
	20	2450	1.667	≥ 0.5	Pass
	26	2480	1.659	≥ 0.5	Pass

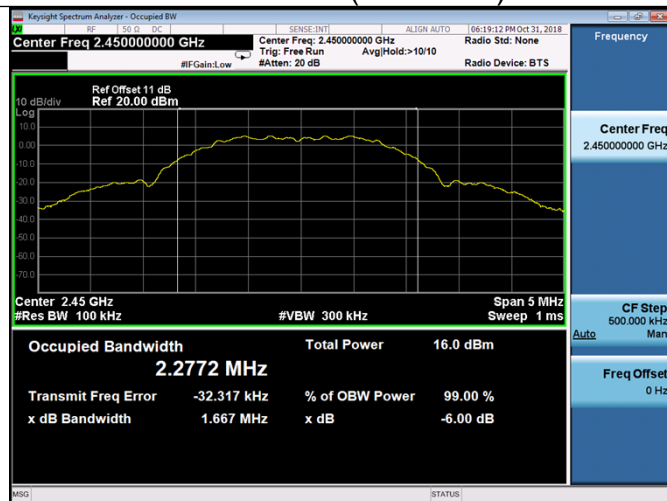
Test Mode	Channel No.	Freq. (MHz)	99% Bandwidth (MHz)	Limit	Result
O-QPSK	11	2405	2.2621	NA	NA
	20	2450	2.2772		
	26	2480	2.2776		

Zigbee O-QPSK 6dB Bandwidth & 99% Occupied Bandwidth

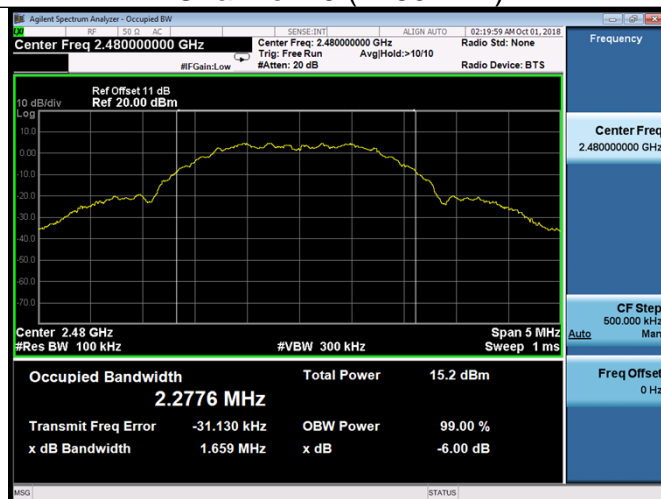
Channel 11 (2405MHz)



Channel 20 (2450MHz)



Channel 26 (2480MHz)



9.3 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW \geq 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]

≤ 8

Test result

Test Mode	Channel No.	Freq. (MHz)	PKPSD (dBm / 10kHz)	Limit (dBm/3kHz)	Result
O-QPSK	11	2405	-5.733	≤ 8	Pass
	20	2450	-5,989	≤ 8	Pass
	26	2480	-6.699	≤ 8	Pass

Zigbee O-QPSK PKPSD

Channel 11 (2405MHz)



Channel 20 (2450MHz)



Channel 26 (2480MHz)



9.4 Conducted Band Edge and Out-of-Band Emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

Test Mode	Channel No.	Freq. (MHz)	Limit	Result
O-QPSK	11	2405	20dBc	Pass
	20	2450	20dBc	Pass
	26	2480	20dBc	Pass



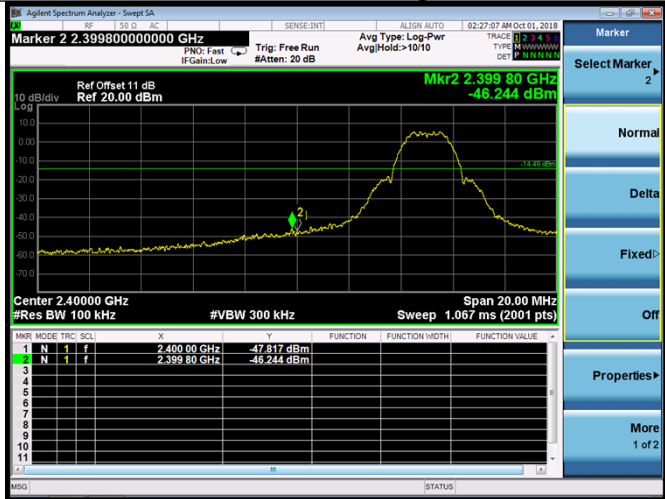
China

Spurious RF conducted emissions

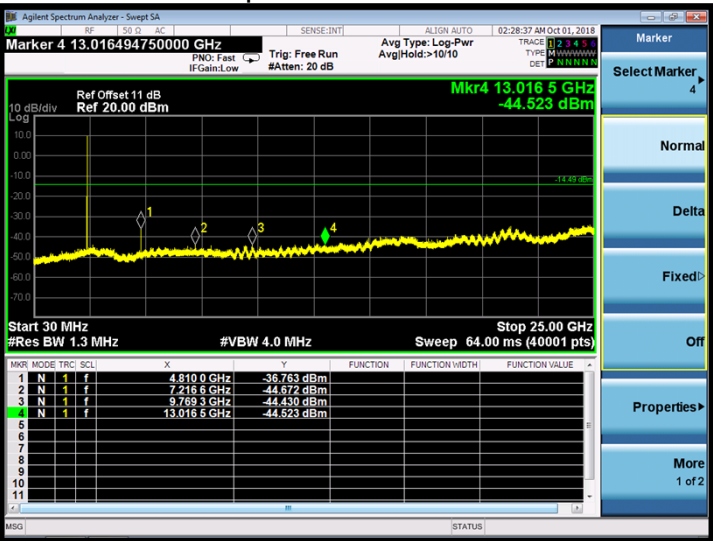
Zigbee O-QPSK Out-of-Band Emissions
Channel 11 (2405MHz)

100kHz PSD reference Level

Low Band Edge



Spurious Emission





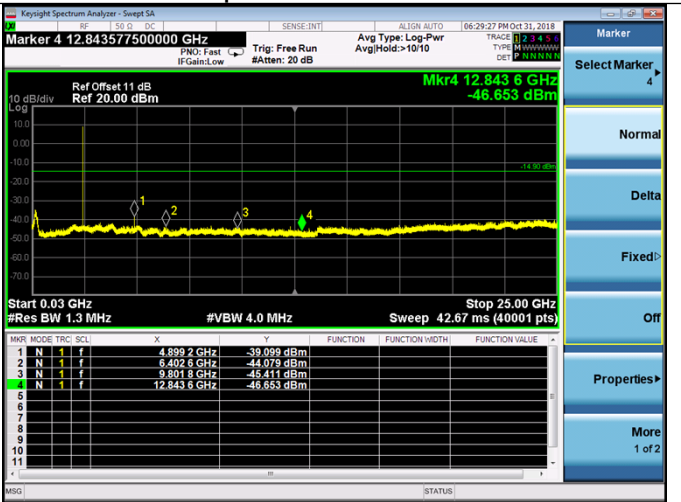
China

Channel 20 (2450MHz)

100kHz PSD reference Level

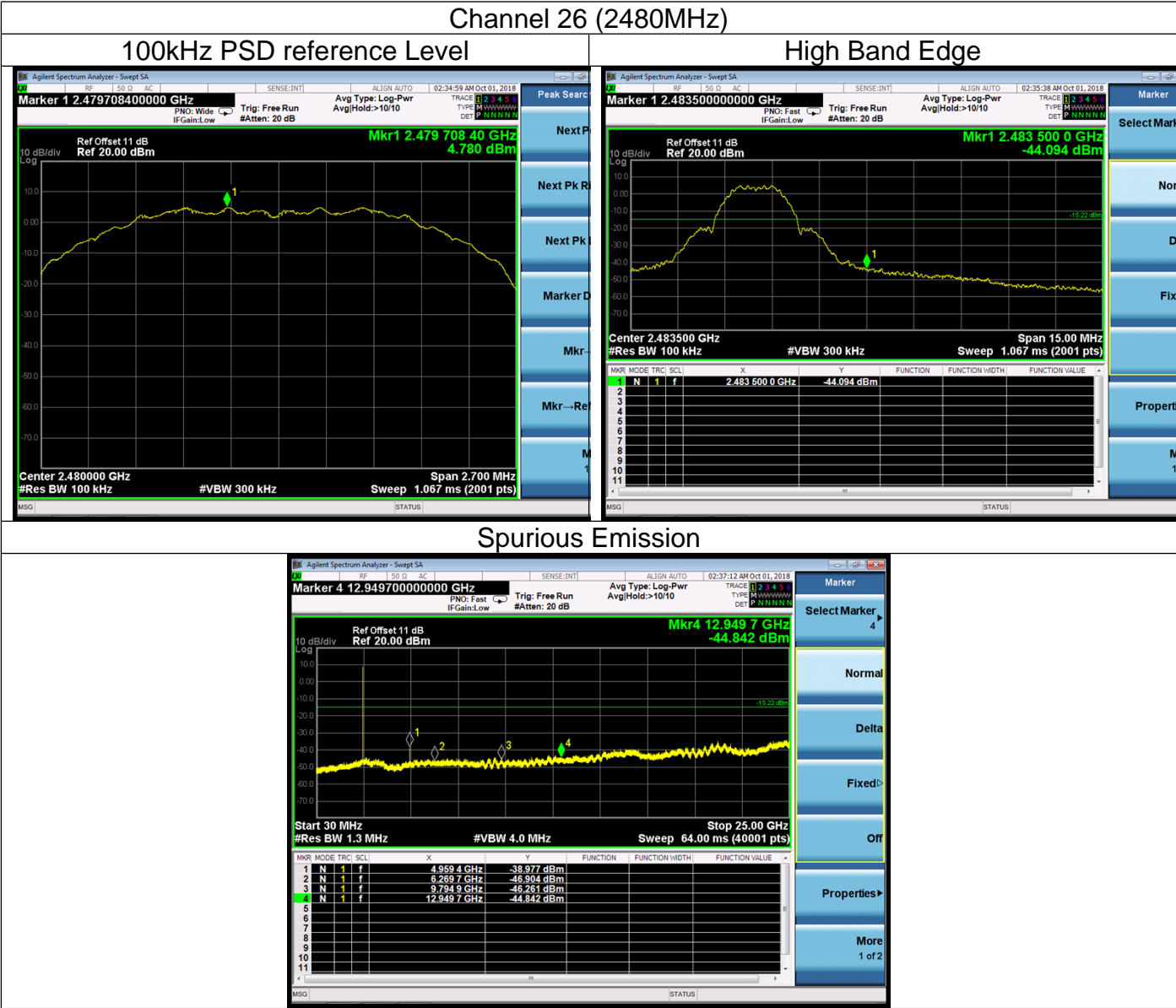


Spurious Emission





China



9.5 Spurious radiated emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW \geq RBW for peak measurement and VBW = 10Hz for average measurement,
Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW \geq RBW for peak measurement, Sweep = auto, Detector function = peak,
Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

LIMITS OF RADIATED EMISSION MEASUREMENT (Frequency Range 9kHz-1000MHz)

Frequency MHz	Field Strength uV/m	Measured Distance Meters
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency MHz	Field Strength (dBuV/m) (at 3M) PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20logEmission level (uV/m).

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Remark 1: There are the ambient noise within frequency range 9kHz ~ 30MHz and 18GHz ~ 25GHz, the permissible value is not show in the report.

Remark 2: Average measurement was not performed if peak level lower than average limit.

Remark 3: Other frequency was 20dB below limit line with 1-18GHz, there is not show in the report.

Test Result

Test mode: Zigbee O-QPSK							
Channel 11 (2405MHz)							
Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
7536.5	35.2	12.9	48.1	74.0	-25.9	Peak	Horizontal
8293.0	35.5	12.7	48.2	74.0	-25.8	Peak	Horizontal
8854.0	35.0	13.4	48.4	85.7	-37.3	Peak	Horizontal
9942.0	33.9	16.8	50.7	85.7	-35.0	Peak	Horizontal
4808.0	38.7	5.9	44.6	74.0	-29.4	Peak	Vertical
7562.0	36.3	12.9	49.2	74.0	-24.8	Peak	Vertical
8769.0	35.7	13.2	48.9	85.7	-36.8	Peak	Vertical
9857.0	32.9	16.7	49.6	85.7	-36.1	Peak	Vertical

Test mode: Zigbee O-QPSK							
Channel 20 (2450MHz)							
Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
4896.5	40.2	6.0	46.2	74.0	-27.8	Peak	Horizontal
7350.0	40.3	12.9	53.2	74.0	-20.8	Peak	Horizontal
9798.5	35.8	16.8	52.6	74.0	-21.4	Peak	Horizontal
4900.0	36.1	6.0	42.1	74.0	-31.9	Peak	Vertical
7350.5	37.2	12.6	49.8	74.0	-24.2	Peak	Vertical
9801.0	34.9	16.8	51.7	74.0	-22.3	Peak	Vertical

Test mode: Zigbee O-QPSK							
Channel 25 (2475MHz)							
Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
4952.5	45.0	6.1	51.1	74.0	-22.9	Peak	Horizontal
4960.3	34.5	6.1	40.6	54.0	-13.4	Peak	Horizontal
7434.5	37.0	12.8	49.8	74.0	-24.2	Peak	Horizontal
8777.5	34.8	13.2	48.0	84.3	-36.3	Peak	Horizontal
9933.5	34.6	16.7	51.3	84.3	-33.0	Peak	Vertical
4952.5	42.7	6.1	48.8	74.0	-25.2	Peak	Vertical
7468.5	35.2	12.9	48.1	74.0	-25.9	Peak	Vertical
8692.5	35.5	13.0	48.5	84.3	-35.8	Peak	Vertical

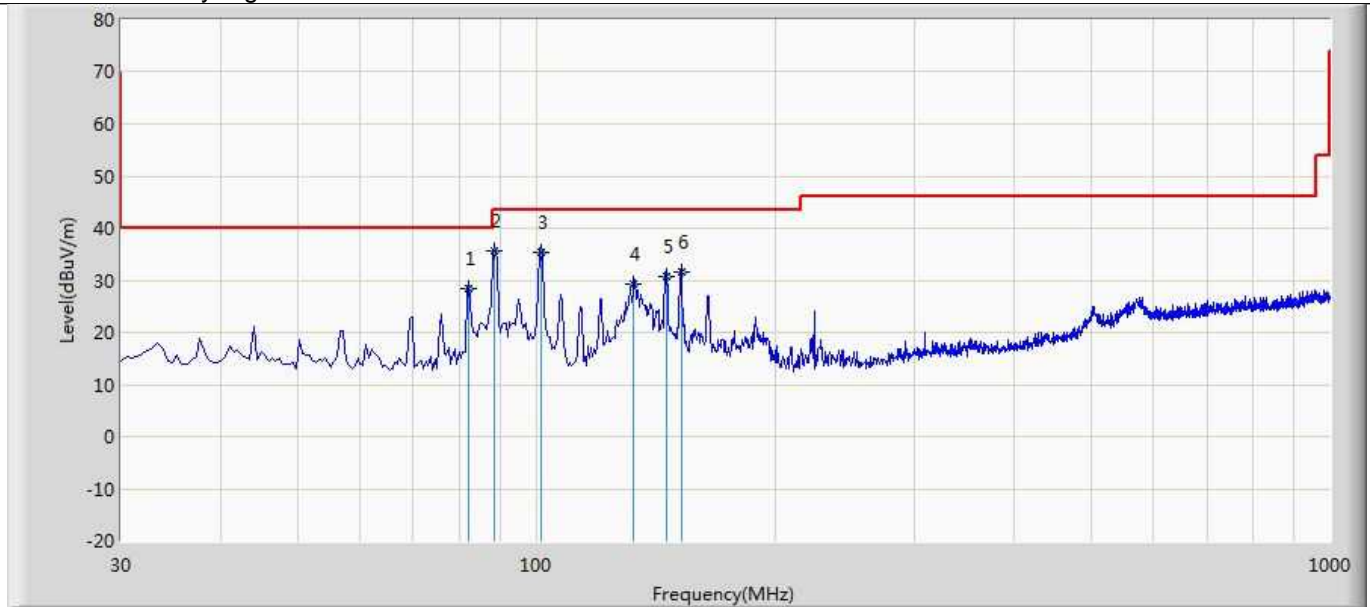
Test mode: Zigbee O-QPSK							
Channel 26 (2480MHz)							
Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/M)	Margin (dB)	Detector	Polarization
4960.8	36.3	6.1	42.4	54.0	-11.6	Peak	Horizontal
4961.0	47.2	6.1	53.3	74.0	-20.7	Peak	Horizontal
7477.0	37.2	12.9	50.1	74.0	-23.9	Peak	Horizontal
8735.0	35.8	13.0	48.8	85.2	-36.4	Peak	Horizontal
9950.5	35.7	16.7	52.4	85.2	-32.8	Peak	Vertical
4960.5	32.7	6.1	38.8	54.0	-15.2	Peak	Vertical
4961.0	43.7	6.1	49.8	74.0	-24.2	Peak	Vertical
7451.5	36.0	12.9	48.9	74.0	-25.1	Peak	Vertical

Remark:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

The worst case of Radiated Emission below 1GHz:

Site: AC1	Time: 2018/09/30 - 21:20
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2405MHz	

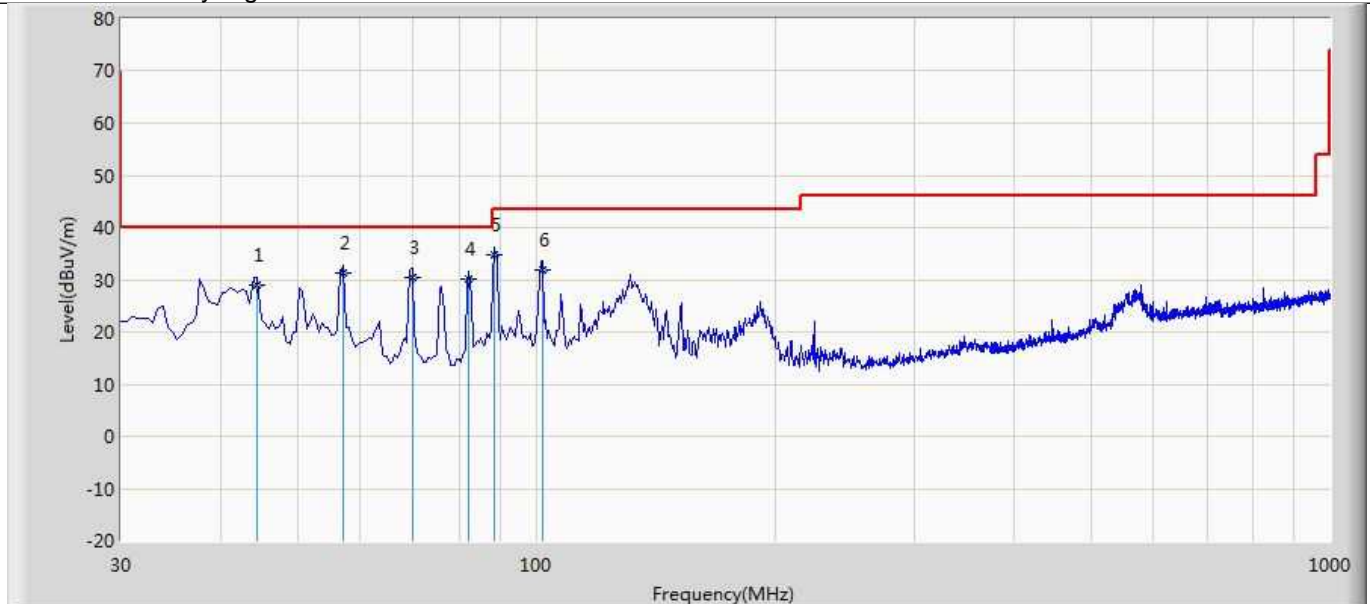


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			82.380	28.431	18.273	-11.569	40.000	10.158	QP
2		*	88.685	35.689	25.406	-7.811	43.500	10.283	QP
3			101.295	35.381	24.182	-8.119	43.500	11.198	QP
4			132.820	29.252	15.204	-14.248	43.500	14.048	QP
5			145.915	30.729	15.729	-12.771	43.500	15.000	QP
6			152.220	31.561	16.273	-11.939	43.500	15.288	QP

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 21:20
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2405MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			44.550	29.000	14.672	-11.000	40.000	14.328	QP
2			57.160	31.201	17.532	-8.799	40.000	13.669	QP
3			69.770	30.576	18.937	-9.424	40.000	11.639	QP
4			82.380	30.211	20.053	-9.789	40.000	10.158	QP
5		*	88.685	34.819	24.536	-8.681	43.500	10.283	QP
6			101.780	31.995	20.746	-11.505	43.500	11.249	QP

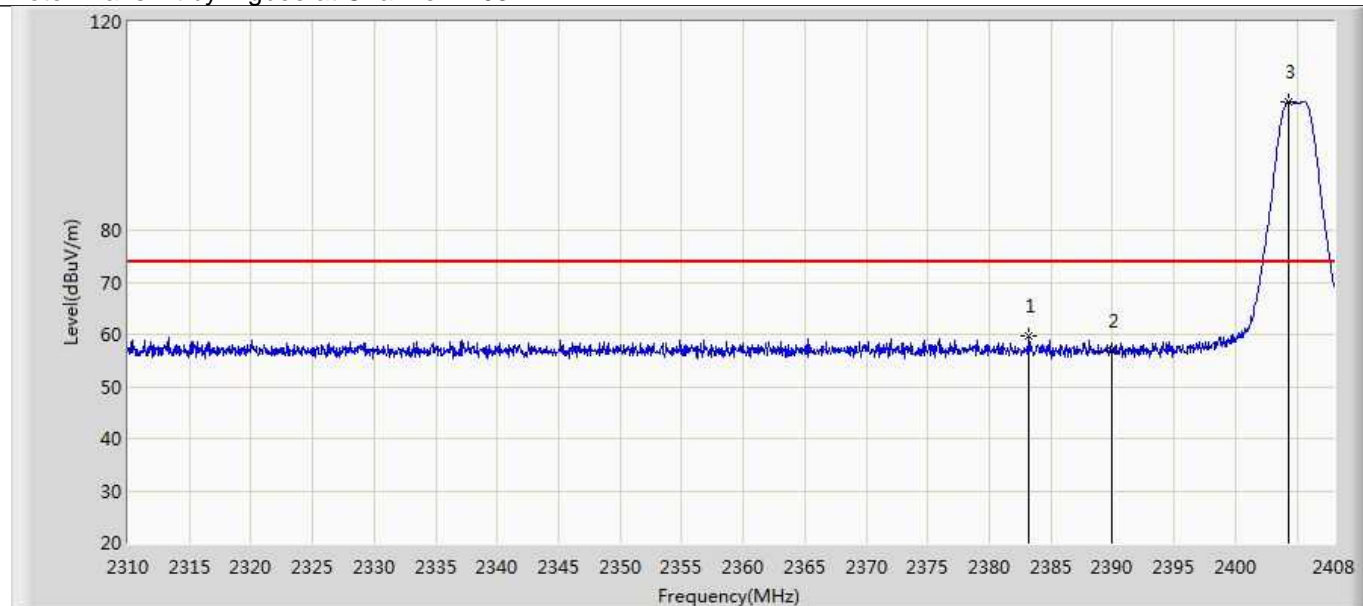
Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Radiated Restricted Band Edge Measurement

Test Result:

Site: AC1	Time: 2018/09/30 - 19:54
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2405MHz	

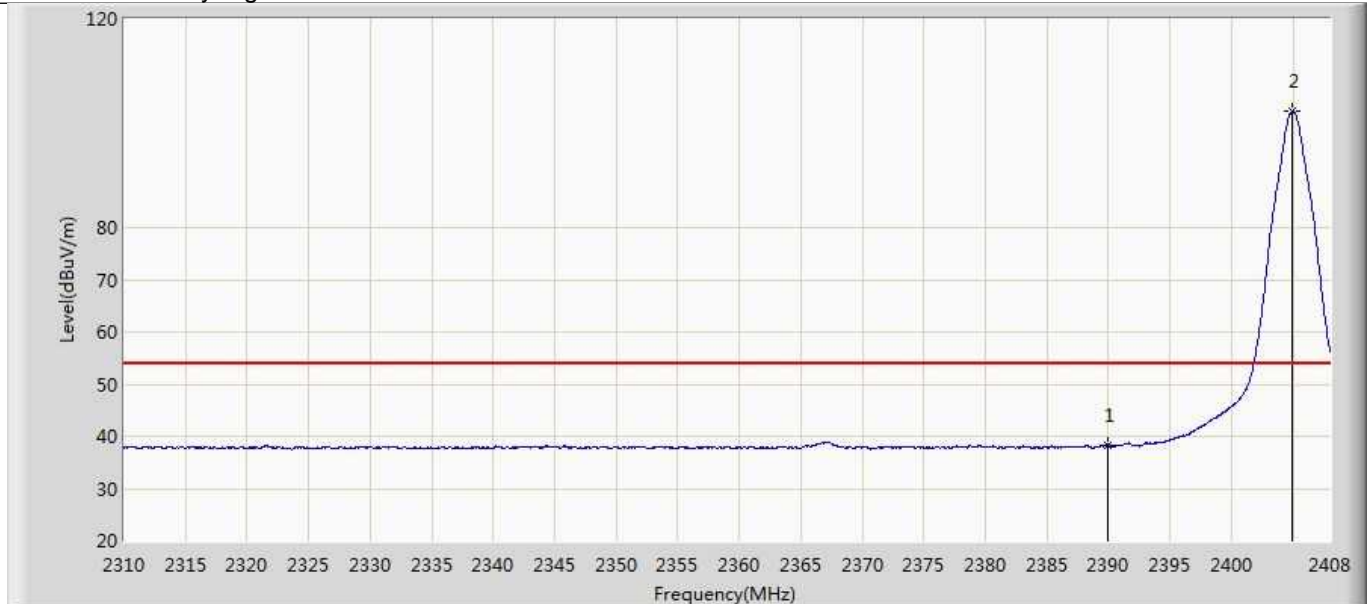


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2383.206	59.718	27.382	-14.282	74.000	32.336	PK
2			2390.000	56.910	24.583	-17.090	74.000	32.327	PK
3		*	2404.374	104.741	72.442	N/A	N/A	32.300	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:02
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2405MHz	

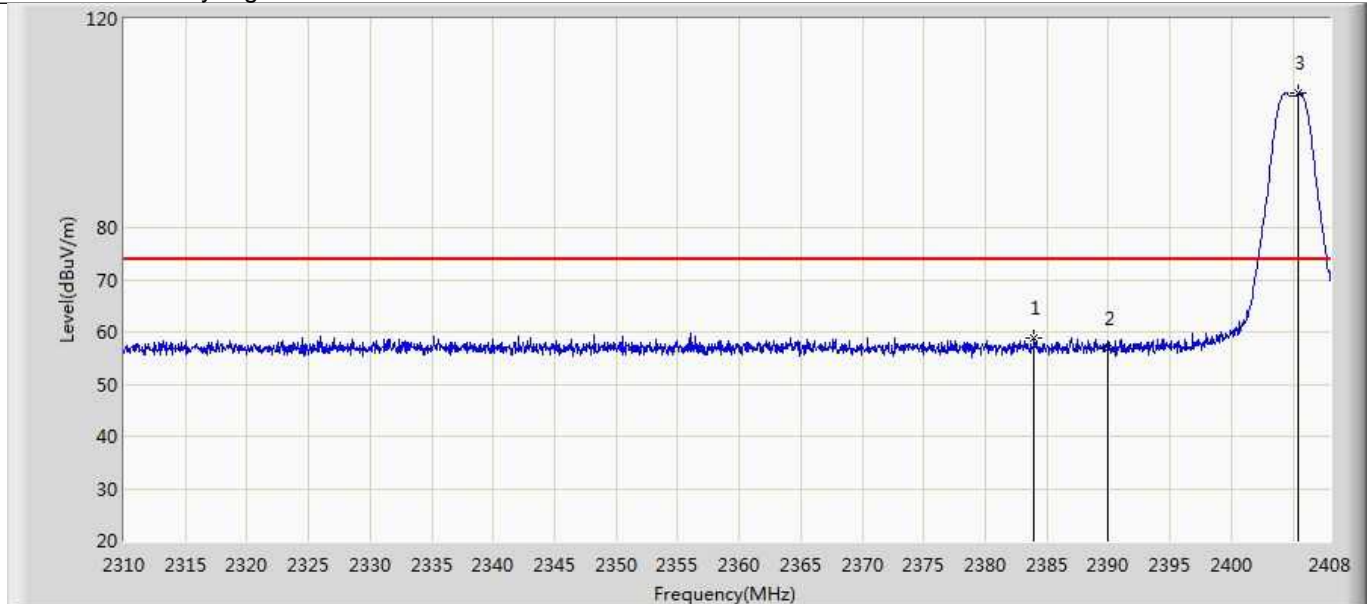


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	38.229	5.902	-15.771	54.000	32.327	AV
2		*	2404.962	102.197	69.899	N/A	N/A	32.298	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:03
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2405MHz	

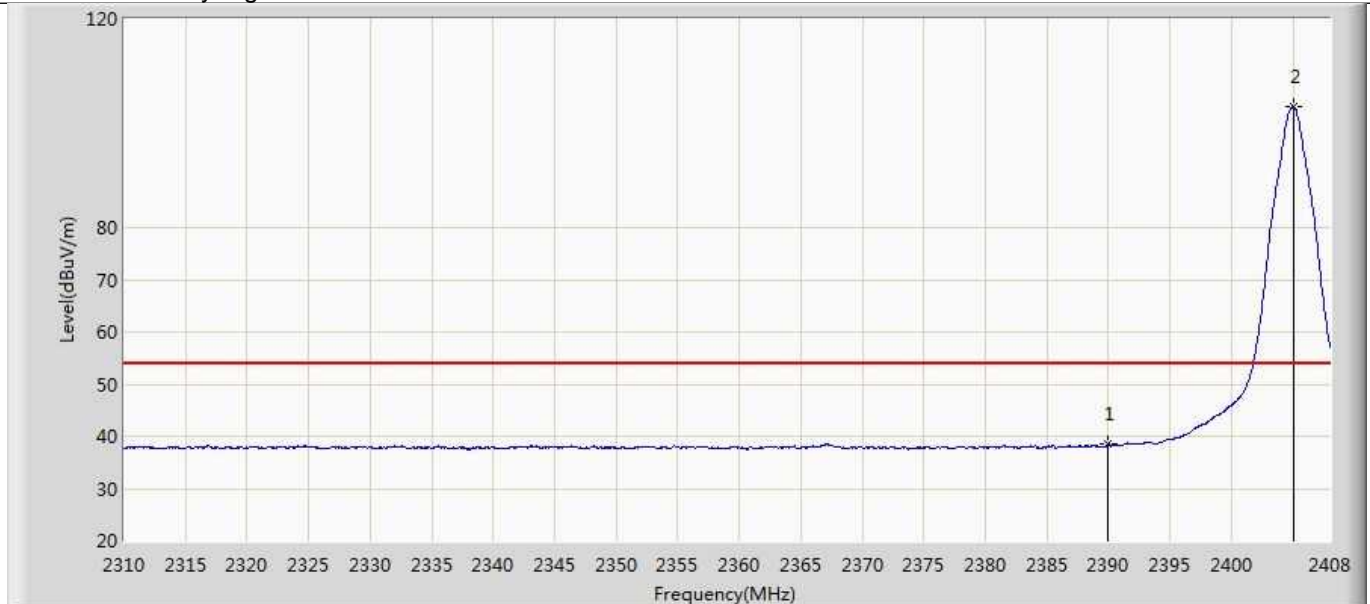


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2383.990	58.826	26.491	-15.174	74.000	32.335	PK
2			2390.000	56.898	24.571	-17.102	74.000	32.327	PK
3		*	2405.452	105.702	73.405	N/A	N/A	32.297	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:05
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2405MHz	

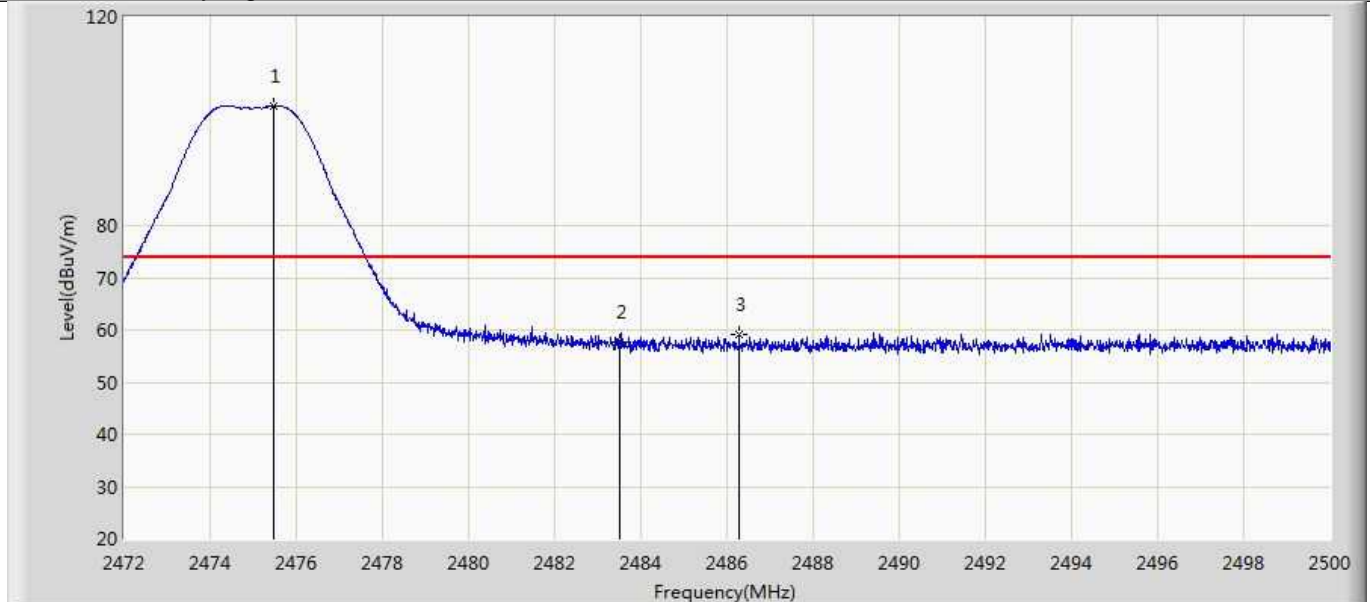


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	38.416	6.089	-15.584	54.000	32.327	AV
2		*	2405.011	103.116	70.818	N/A	N/A	32.298	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:06
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2475MHz	

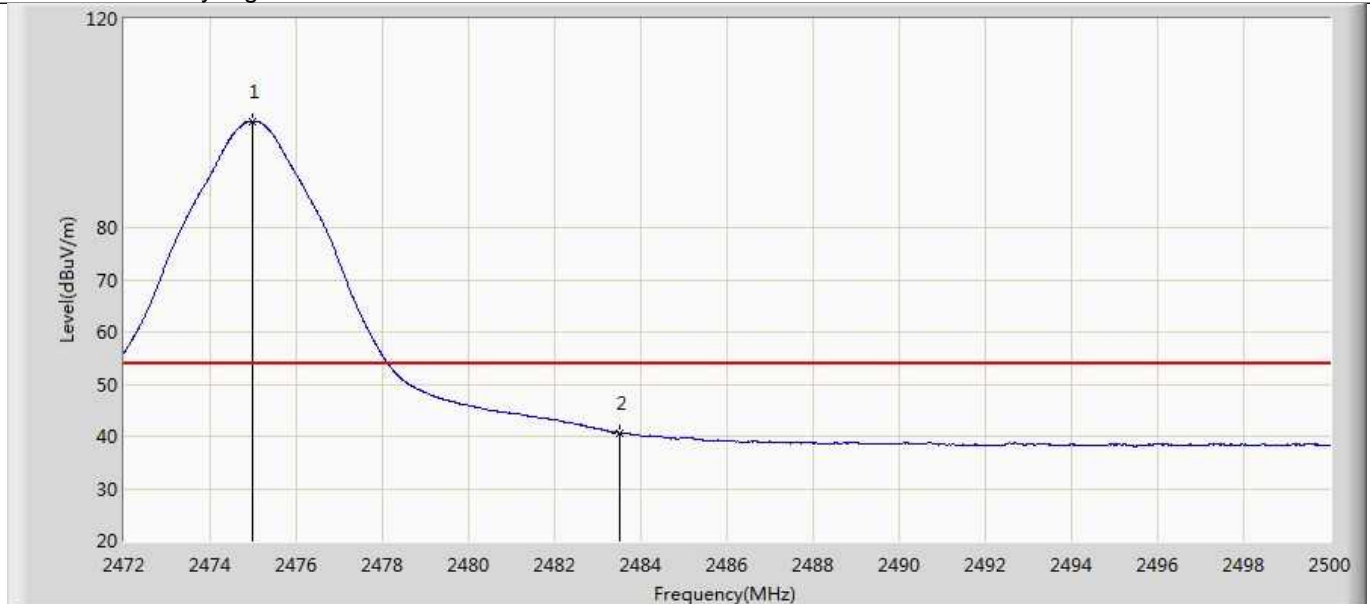


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.472	102.932	70.619	N/A	N/A	32.313	PK
2			2483.500	57.598	25.259	-16.402	74.000	32.340	PK
3			2486.280	59.082	26.732	-14.918	74.000	32.350	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:08
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2475MHz	

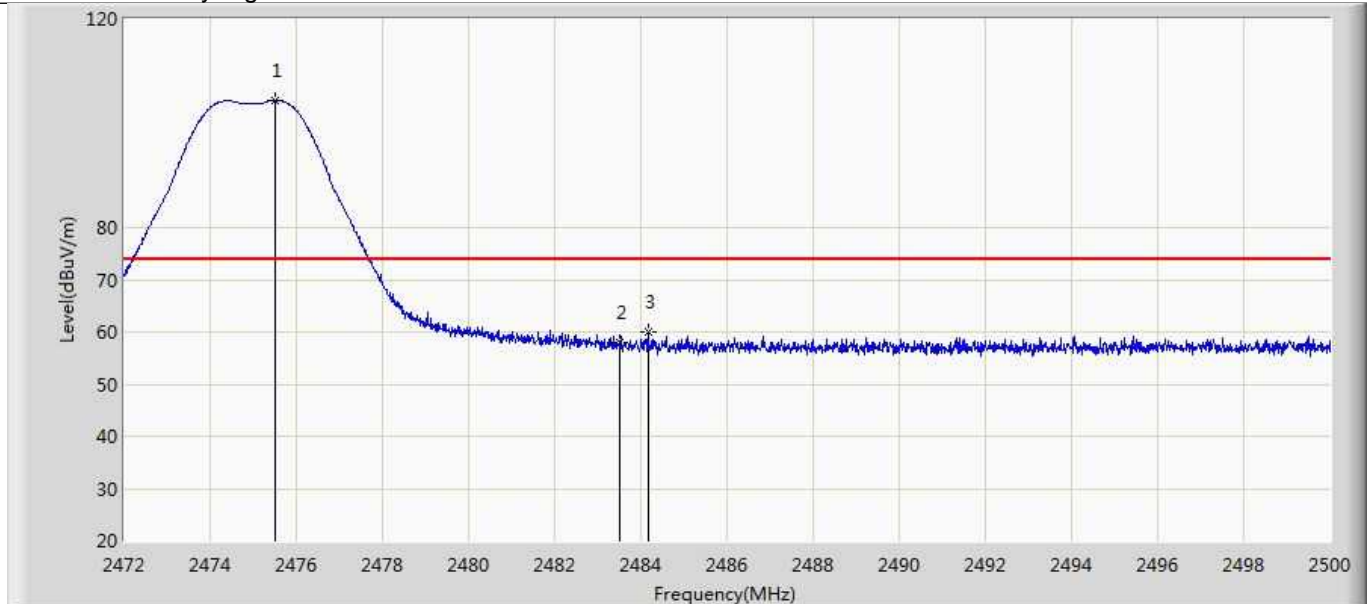


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2474.996	100.398	68.087	N/A	N/A	32.311	AV
2			2483.500	40.716	8.377	-13.284	54.000	32.340	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:09
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2475MHz	

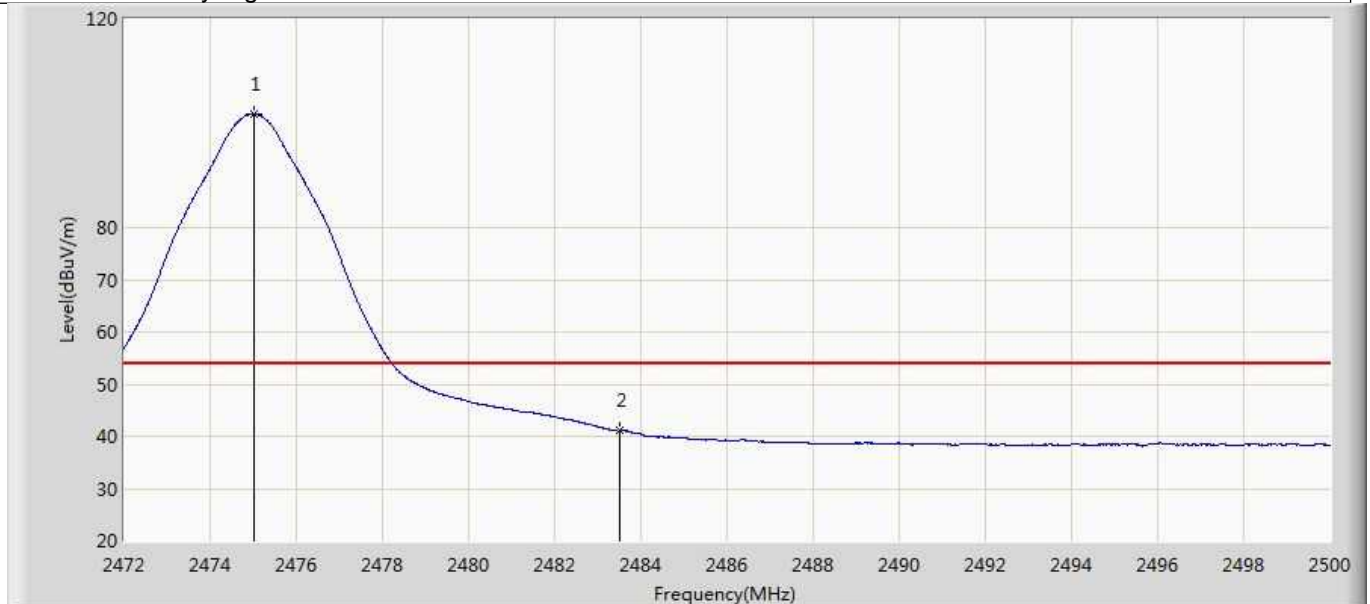


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.500	104.333	72.020	N/A	N/A	32.313	PK
2			2483.500	57.980	25.641	-16.020	74.000	32.340	PK
3			2484.166	60.073	27.731	-13.927	74.000	32.342	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:10
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2475MHz	

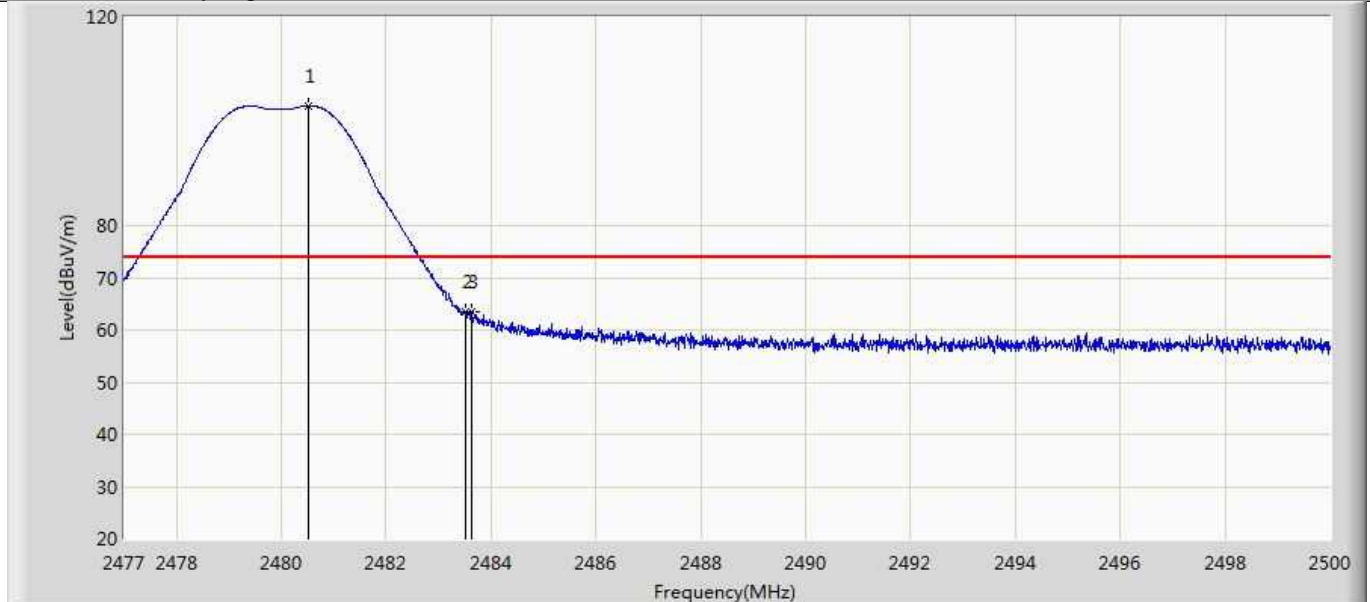


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.010	101.747	69.436	N/A	N/A	32.311	AV
2			2483.500	41.096	8.757	-12.904	54.000	32.340	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:11
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2480MHz	

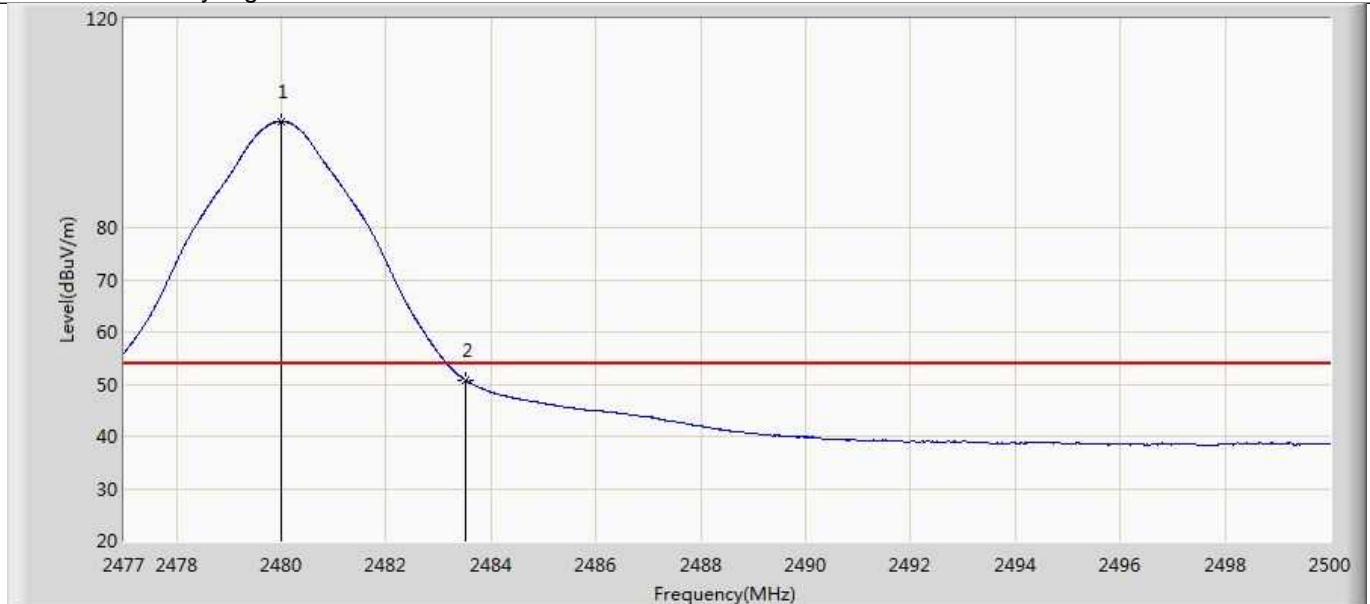


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.519	102.911	70.584	N/A	N/A	32.327	PK
2			2483.500	63.442	31.103	-10.558	74.000	32.340	PK
3			2483.624	63.480	31.140	-10.520	74.000	32.340	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:13
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2480MHz	

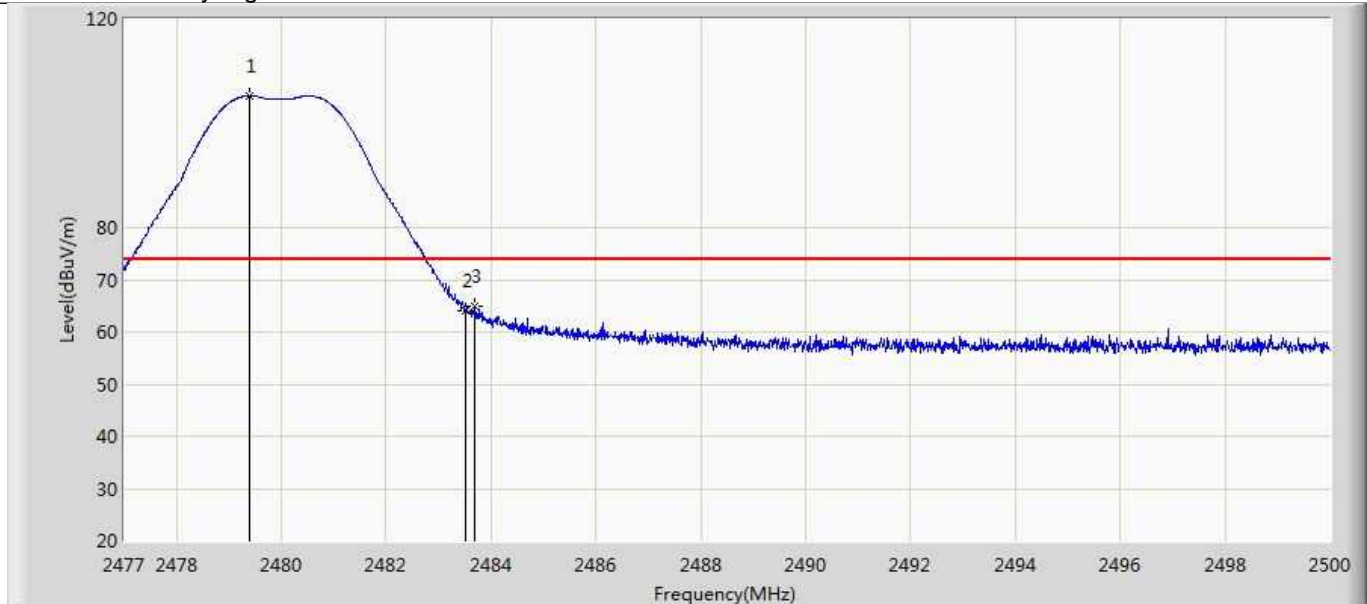


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.990	100.291	67.966	N/A	N/A	32.325	AV
2			2483.500	50.867	18.528	-3.133	54.000	32.340	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:14
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2480MHz	

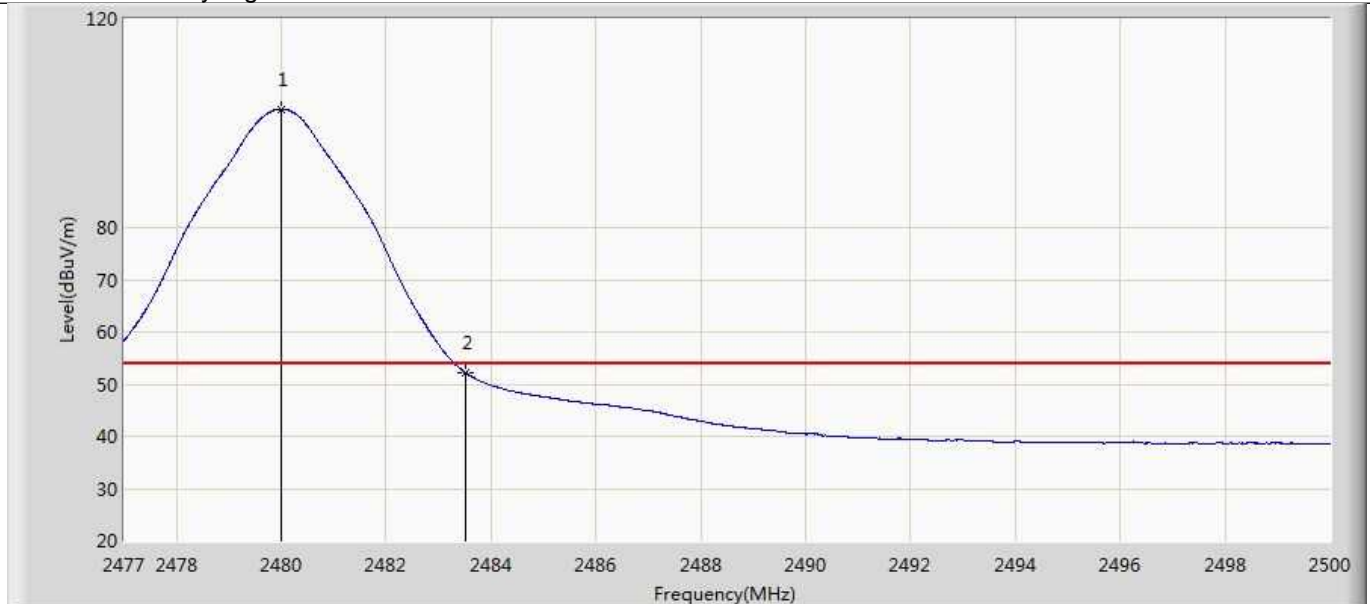


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.404	105.166	72.843	N/A	N/A	32.323	PK
2			2483.500	64.117	31.778	-9.883	74.000	32.340	PK
3			2483.681	64.923	32.583	-9.077	74.000	32.340	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/30 - 20:15
Limit: FCC_Part15.209_RE(3m)	Engineer: Jone Zhang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Hue Connect	Power: DC 24V
Note: Transmit by Zigbee at Channel 2480MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.001	102.645	70.320	N/A	N/A	32.325	AV
2			2483.500	52.299	19.960	-1.701	54.000	32.340	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

10 Test Equipment List

List of Test Instruments Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2019-8-6
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2019-8-6
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	848	2021-6-10
	Horn Antenna	Rohde & Schwarz	HF907	102393	2021-4-1
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2019-8-6
	3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-10
CE	EMI Test Receiver	Rohde & Schwarz	ESR 3	101907	2019-8-6
	LISN	Rohde & Schwarz	ENV4200	100224	2019-8-6
	LISN	Rohde & Schwarz	ENV216	101924	2019-8-6

Test Site2

Radiated Emissions – AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2019/5/22
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2019/3/19
Active Loop Antenna	Schwarzbeck	FMZB 1519B	MRTTWA00002	1 year	2019/4/24
Broadband Horn antenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2019/4/24
Breitband Hornantenna	Schwarzbeck	BBHA 9170	MRTTWA00004	1 year	2019/4/23
Broadband Amplifier	Schwarzbeck	BBV 9721	MRTTWA00006	1 year	2019/4/23
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2019/4/23
Cable	HUBERSUHNER	SF106	MRTTWA00010	1 year	2019/5/18
Cable	Rosnol	K1K50-UP0264- K1K50-4M	MRTTWA00012	1 year	2019/7/30

Conducted Test Equipment – SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/7/30
USB Wideband Power Sensor	KEYSIGHT	U2021XA	MRTTWA00015	1 year	2019/3/20

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Conducted Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Test Site1

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, $\pm 2.73\text{dB}$
Radiated Disturbance	30MHz to 1GHz, $\pm 5.03\text{dB}$ (Horizontal) $\pm 5.11\text{dB}$ (Vertical) 1GHz to 18GHz, $\pm 5.15\text{dB}$ (Horizontal) $\pm 5.12\text{dB}$ (Vertical) 18GHz to 25GHz, $\pm 4.76\text{dB}$

Test Site2

AC Conducted Emission Measurement - SR2

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

150kHz~30MHz: 3.46dB

Radiated Emission Measurement – AC1

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

9kHz ~ 1GHz: 4.18dB

1GHz ~ 25GHz: 4.76dB

THE END