

Test Report

Industry Canada RSS-Gen Issue 4/RSS-210 Issue 8
FCC Part15 Subpart C

Product Name : Smart Home Hub
Model No. : Z315, Z313, Z312, Z311
FCC ID : XVGZ31X

Applicant : Amino Communications Ltd
Address : Buckingway Business Park, Anderson Road, Swavesey,
Cambridge CB24 4UQ, Cambridge UK

Date of Receipt : Nov. 25, 2014
Test Date : Dec. 23, 2014~ Jan. 10, 2015
Issued Date : Apr. 24, 2015
Report No. : 14B0556R-RF-CE-P05V01
Report Version : V1.1



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date : Apr. 24, 2015

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Manufacturer : Amino Communications Ltd

Address : Buckingway Business Park, Anderson Road, Swavesey,
Cambridge CB24 4UQ, Cambridge UK

Model No. : Z315, Z313, Z312, Z311

FCC ID : XVGZ31X

EUT Voltage : DC: 5V

Brand Name : Amino

Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2014
ANSI C63.4: 2009; KDB 558074 D01 v03r02
Industry Canada RSS-Gen Issue 4/RSS-210 Issue 8

Test Result : Complied

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Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC, TAF
Germany	:	TUV Rheinland
Norway	:	Nemko, DNV
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :
<http://www.quietek.com/>

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
14B0556R-RF-US-P05V01	V1.0	Initial Issued Report	Feb. 11, 2015
14B0556R-RF-US-P05V01	V1.1	Fixed some errors at page 14 and 40.	Apr. 24, 2015

1. General Information

1.1. EUT Description

Product Name	Smart Home Hub
Brand Name	Amino
Model No.	Z315, Z313, Z312, Z311
EUT Voltage	DC:5V
Frequency Range	2405~2480 MHz
Channel Number	16
Type of Modulation	QPSK
Data Rate	250kbps
Channel Control	Auto
Antenna Delivery	1 identical Antennas
Antenna Type	PCB Antenna
Peak Antenna Gain	1.5dBi for 2.4GHz
Components	
Adapter	Brand Name: Huntkey M/N: HKA01202020-2F Input: AC100V-240V~50/60Hz 0.5A Output: 5.0V, 2.0A

Note: The difference of the four models as show bellow:

Model No.	Description
Z315	1 X Zigbee Home Automation 1 x internal USB Wi-Fi Rechargeable Battery No internal USB 3G/LTE modem Loudspeaker (fitted but not supported functionally in this issue) Alarm (fitted but not supported functionally in this issue)
Z313	1 X Zigbee Home Automation 1 x internal USB Wi-Fi Rechargeable Battery No internal USB 3G/LTE modem No Loudspeaker No Alarm
Z312	1 X Zigbee Home Automation Rechargeable Battery

	No internal USB WiFi No internal USB 3G/LTE No Loudspeaker No Alarm
Z311	1 x Zigbee Home Automation No Rechargeable Battery No internal USB WiFi No internal USB 3G/LTE No Loudspeaker No Alarm

For 2.4GHz Band: Total 15 channels

Working Frequency of Each Channel:					
Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2405	6	2435	12	2465
1	2410	7	2440	13	2470
2	2415	8	2445	14	2475
3	2420	9	2450	15	2480
4	2425	10	2455	N/A	N/A
5	2430	11	2460	N/A	N/A

Duty Cycle

Duty Cycle=99%

1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: 2.4GHz Transmit

Note:

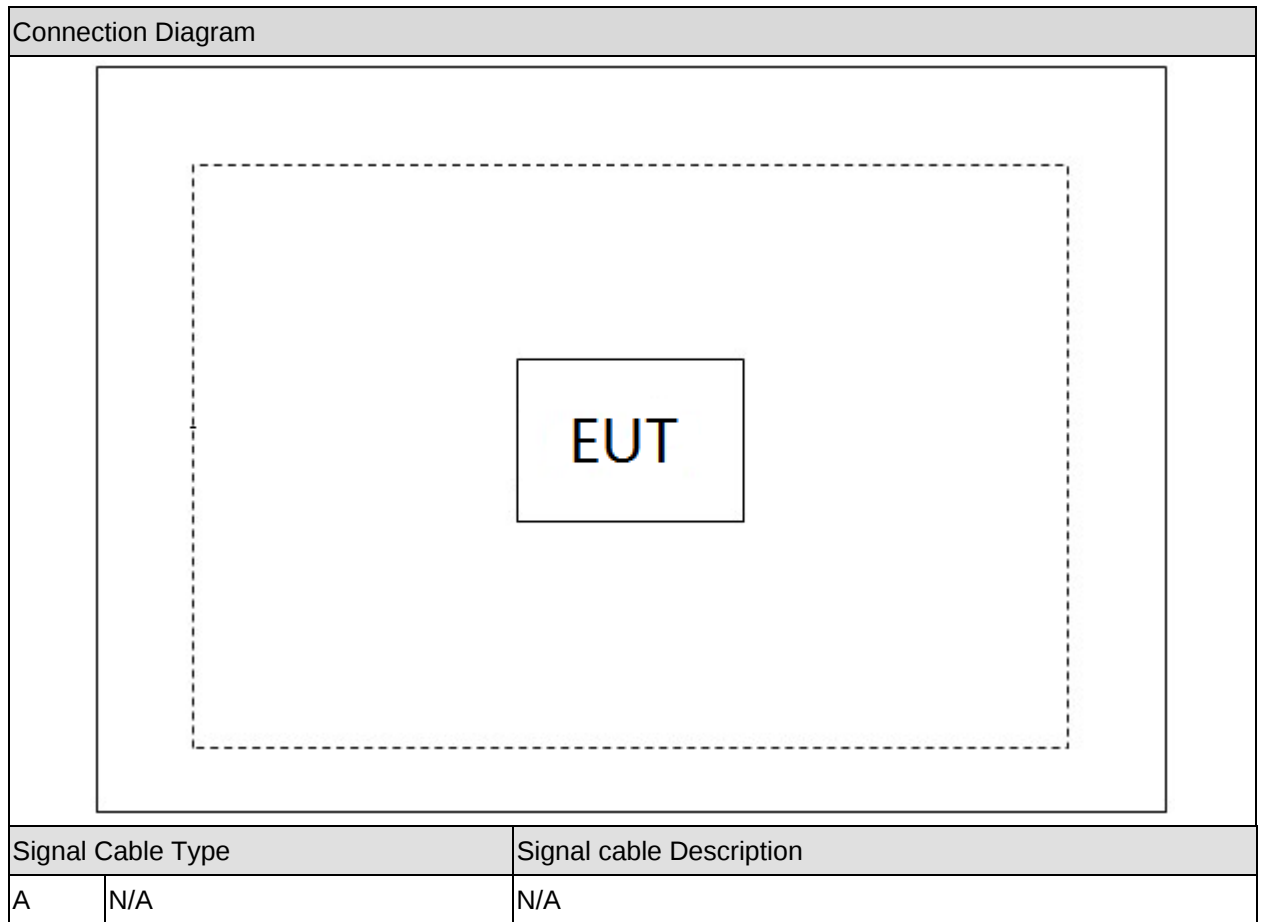
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	N/A	N/A	N/A	N/A	N/A

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Execute some commands on the PC provided by applicant.
4	Set the test mode and channel, then press OK to start continue transmit or receive.

2. Technical Test

2.1. Summary of Test Result

- ☒ No deviations from the test standards
☐ Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.209 RSS-Gen Issue 4 November 2014 Section 6.13 and Section 7.1.2	Yes	No
RF Antenna Conducted Spurious	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(d) RSS-210 Issue 8 December 2010 Section A8.5	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2014 15.247(d) RSS-210 Issue 8 December 2010 Section A8.5	Yes	No
Operation Frequency Range of 20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2014 15.215(c)	Yes	No
Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(a)(2) RSS-210 Issue 8 December 2010 Section A8.2(a)	Yes	No
Power Output	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(b)(3) RSS-210 Issue 8 December 2010 Section A8.4(4)	Yes	No
Power Spectral Density	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(e) RSS-210 Issue 8 December 2010 Section A8.2(b)	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

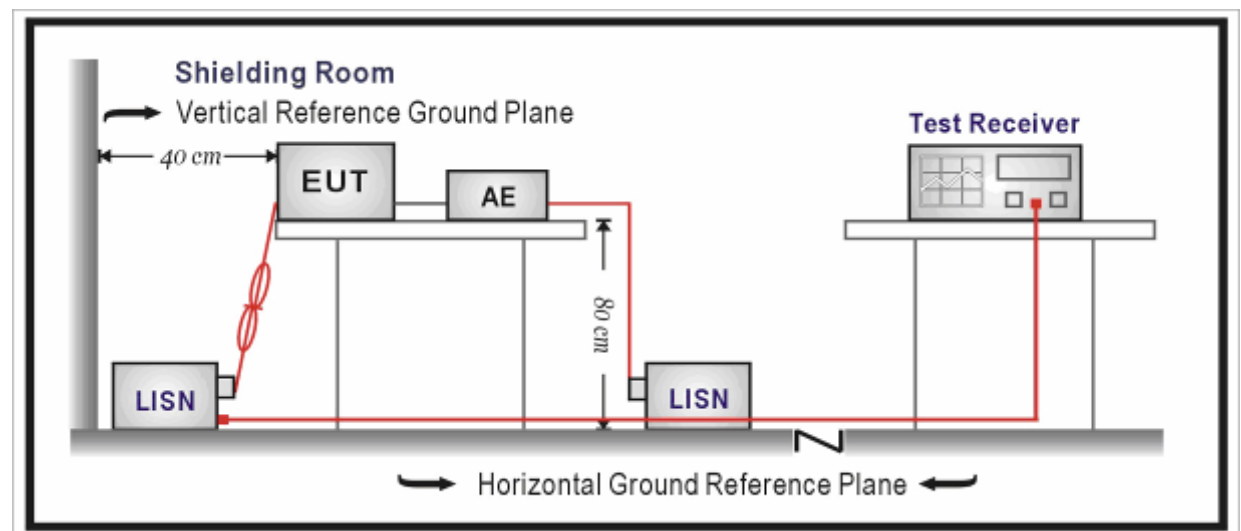
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2015.03.28
Two-Line V-Network	R&S	ENV216	100043	2015.03.28
Two-Line V-Network	R&S	ENV216	100044	2015.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2015.03.01
50ohm Termination	SHX	TF2	07081401	2015.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2016.01.08

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

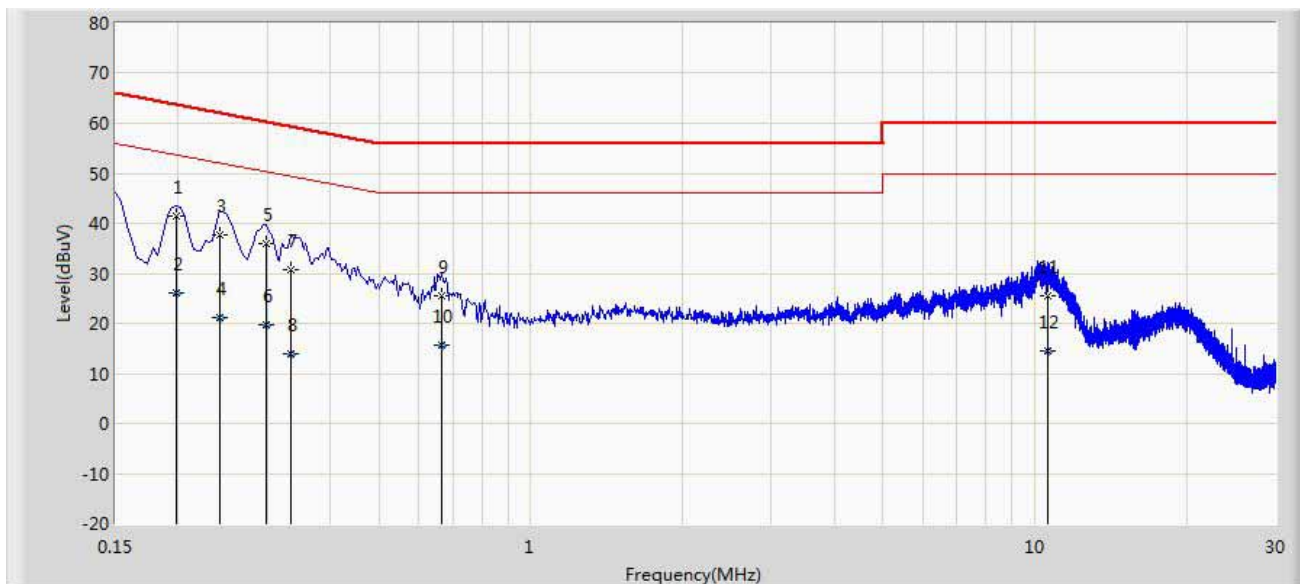
The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

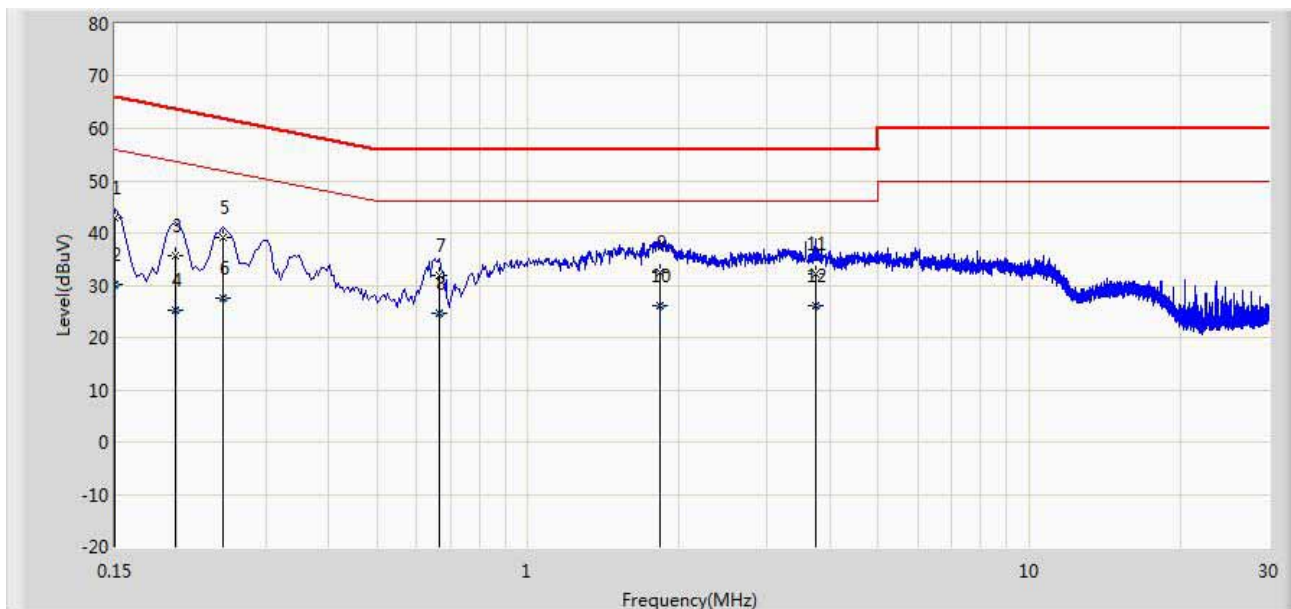
3.6. Test Result

Site: TR1	Time: 2015/01/07 - 11:15
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: Smart Home Hub	Power: AC 120V/60Hz



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.198	41.349	31.490	-22.345	63.694	9.860	QP
2		0.198	26.021	16.161	-27.673	53.694	9.860	AV
3		0.242	37.826	27.960	-24.201	62.027	9.866	QP
4		0.242	21.229	11.363	-30.798	52.027	9.866	AV
5		0.298	36.068	26.195	-24.230	60.298	9.874	QP
6		0.298	19.725	9.851	-30.574	50.298	9.874	AV
7		0.334	30.650	20.772	-28.701	59.351	9.878	QP
8		0.334	13.911	4.033	-35.440	49.351	9.878	AV
9		0.666	25.446	15.594	-30.554	56.000	9.852	QP
10		0.666	15.522	5.671	-30.478	46.000	9.852	AV
11		10.578	25.514	15.498	-34.486	60.000	10.016	QP
12		10.578	14.542	4.526	-35.458	50.000	10.016	AV

Site: TR1	Time: 2015/01/07 - 11:20
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: Smart Home Hub	Power: AC 120V/60Hz



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.150	43.003	33.156	-22.997	66.000	9.848	QP
2		0.150	30.010	20.162	-25.990	56.000	9.848	AV
3		0.198	35.604	25.745	-28.090	63.694	9.860	QP
4		0.198	25.357	15.497	-28.337	53.694	9.860	AV
5		0.246	39.163	29.296	-22.728	61.891	9.867	QP
6		0.246	27.406	17.539	-24.485	51.891	9.867	AV
7		0.666	31.983	22.131	-24.017	56.000	9.852	QP
8		0.666	24.569	14.717	-21.431	46.000	9.852	AV
9		1.830	32.581	22.791	-23.419	56.000	9.790	QP
10		1.830	25.951	16.162	-20.049	46.000	9.790	AV
11		3.754	32.229	22.395	-23.771	56.000	9.833	QP
12	*	3.754	26.068	16.234	-19.932	46.000	9.833	AV

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.25
Bilog Chainenna	Teseq GmbH	CBL6112D	27611	2015.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.08

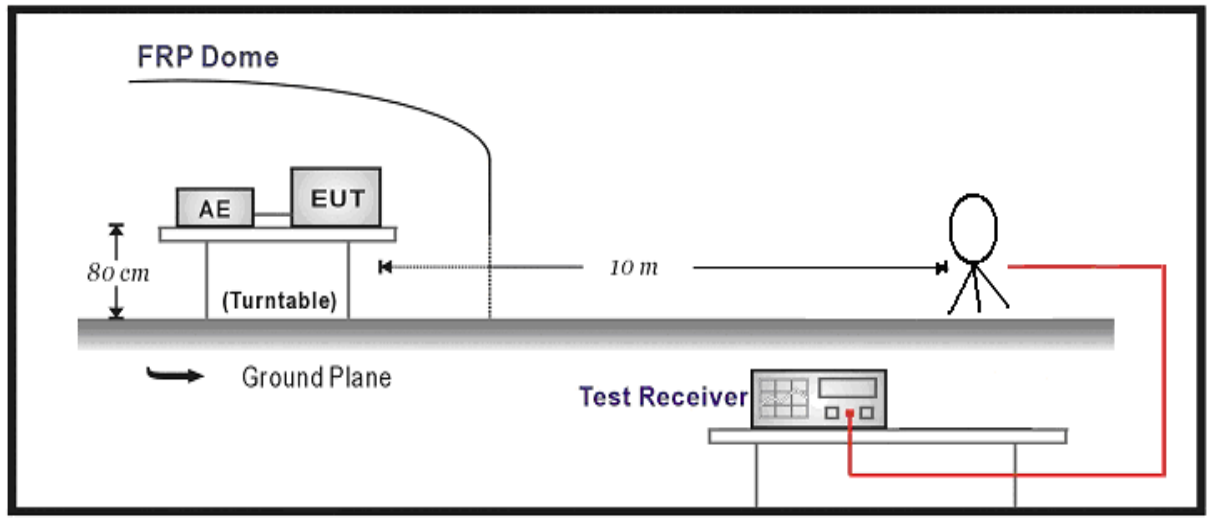
Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2015.03.28
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.05.12
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.05.03
DRG Horn	ETS-Lindgren	3117	00123988	2015.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.01.07
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.04.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2015.06.09
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2016.01.08

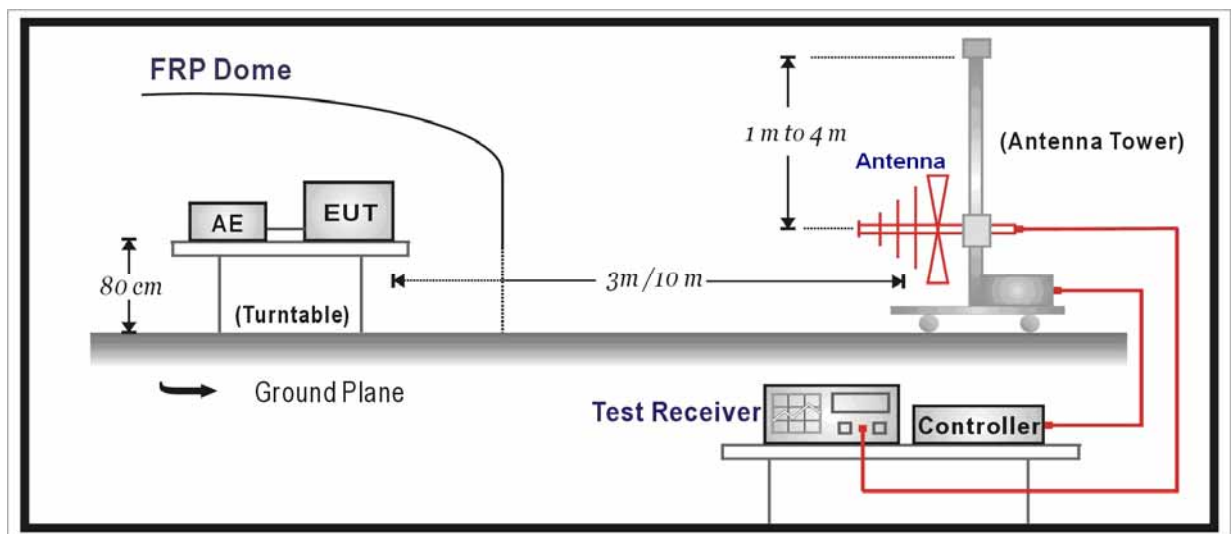
Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup

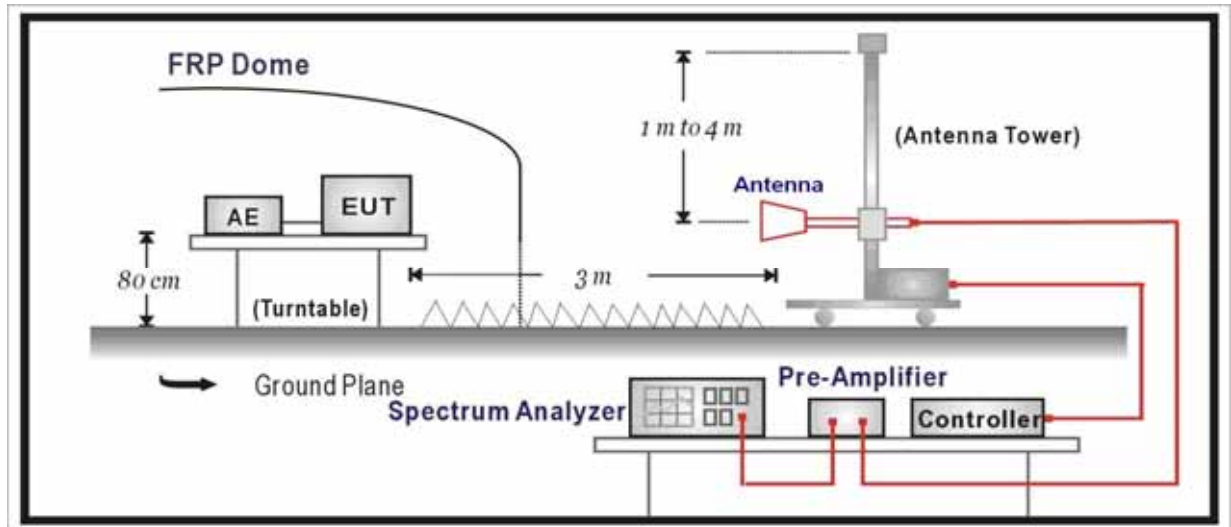
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument Antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2009 and tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The Antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This

is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB
below 1G is defined as ± 3.8 dB

4.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

Mode1

CH (MHz)	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2405	H	4810	38.5	6.7	45.3	54(note3)	-8.7	PK
	H	7215	38.5	9.0	47.5	54(note3)	-6.5	PK
	H	9620	33.0	10.4	43.4	54(note3)	-10.6	PK
	V	4810	34.8	6.7	41.6	54(note3)	-12.4	PK
	V	7215	33.8	9.0	42.8	54(note3)	-11.2	PK
	V	9620	31.8	10.4	42.2	54(note3)	-11.8	PK
2440	H	4880	35.4	6.9	42.3	54(note3)	-11.7	PK
	H	7320	33.4	9.1	42.5	54(note3)	-11.5	PK
	H	9760	31.8	10.6	42.4	54(note3)	-11.6	PK
	V	4880	34.6	6.9	41.5	54(note3)	-12.5	PK
	V	7320	32.4	9.1	41.5	54(note3)	-12.5	PK
	V	9760	32.7	10.6	43.3	54(note3)	-10.7	PK
2480	H	4960	35.3	7.0	42.3	54(note3)	-11.7	PK
	H	7440	33.3	9.2	42.5	54(note3)	-11.5	PK
	H	9920	31.5	10.9	42.4	54(note3)	-11.6	PK
	V	4960	33.8	7.0	40.8	54(note3)	-13.2	PK
	V	7440	31.9	9.2	41.1	54(note3)	-12.9	PK
	V	9920	31.9	10.9	42.9	54(note3)	-11.1	PK

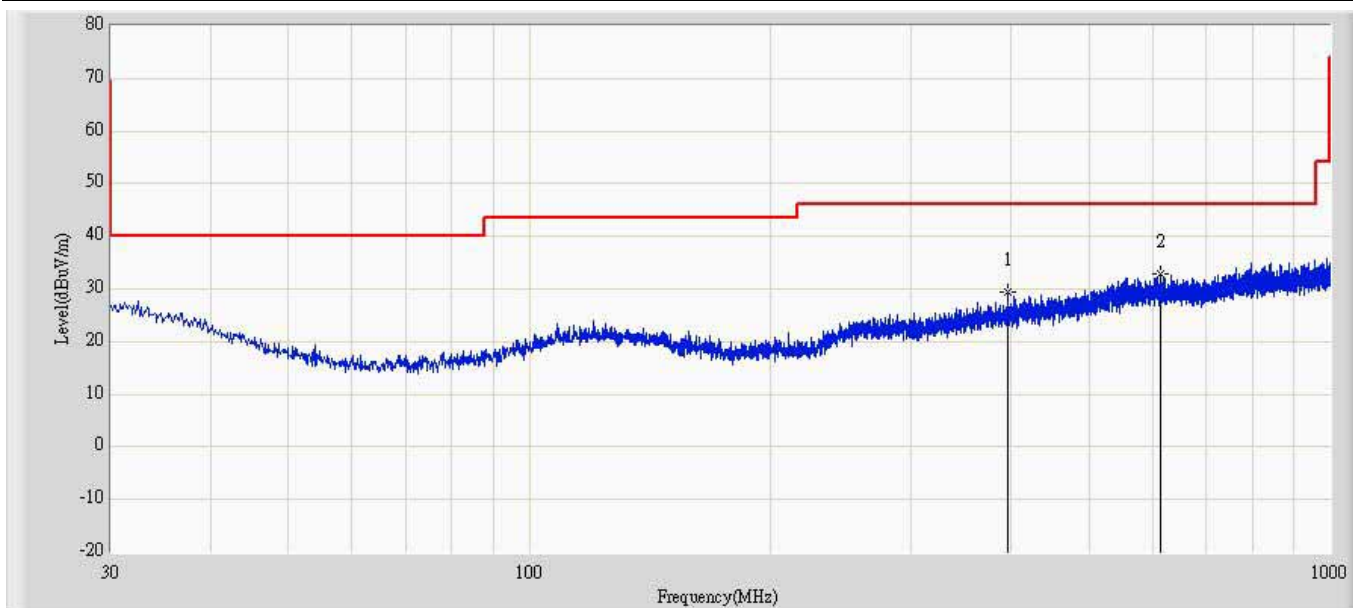
Note: 1. Measure Level = Reading Level + Factor.

2. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

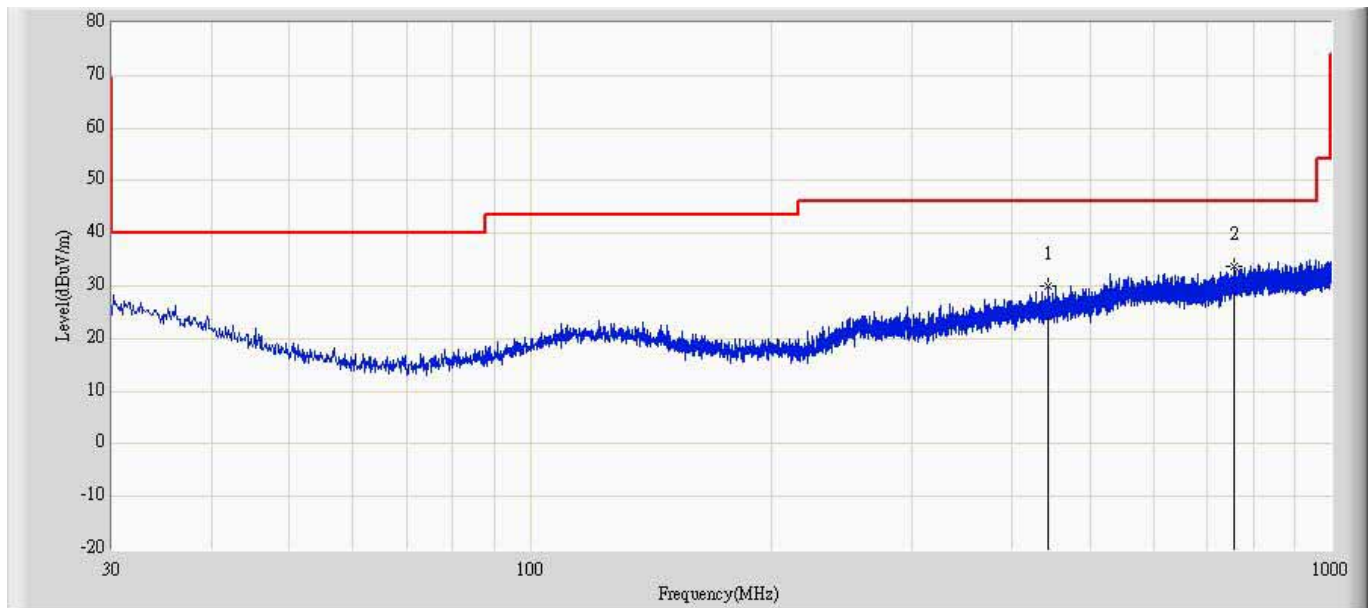
The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2015/01/07 - 09:11
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27613(30-1000MHz)	Polarity: Horizontal
EUT: Smart Home Hub	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2405MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			396.418	29.441	5.630	-16.559	46.000	23.811	QP
2		*	615.638	32.960	5.285	-13.040	46.000	27.675	QP

Site: AC2	Time: 2015/01/07 - 09:12
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27613(30-1000MHz)	Polarity: Vertical
EUT: Smart Home Hub	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2405MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			442.735	30.030	5.498	-15.970	46.000	24.532	QP
2		*	755.924	33.758	5.000	-12.242	46.000	28.757	QP

5. RF Antenna Conducted Spurious

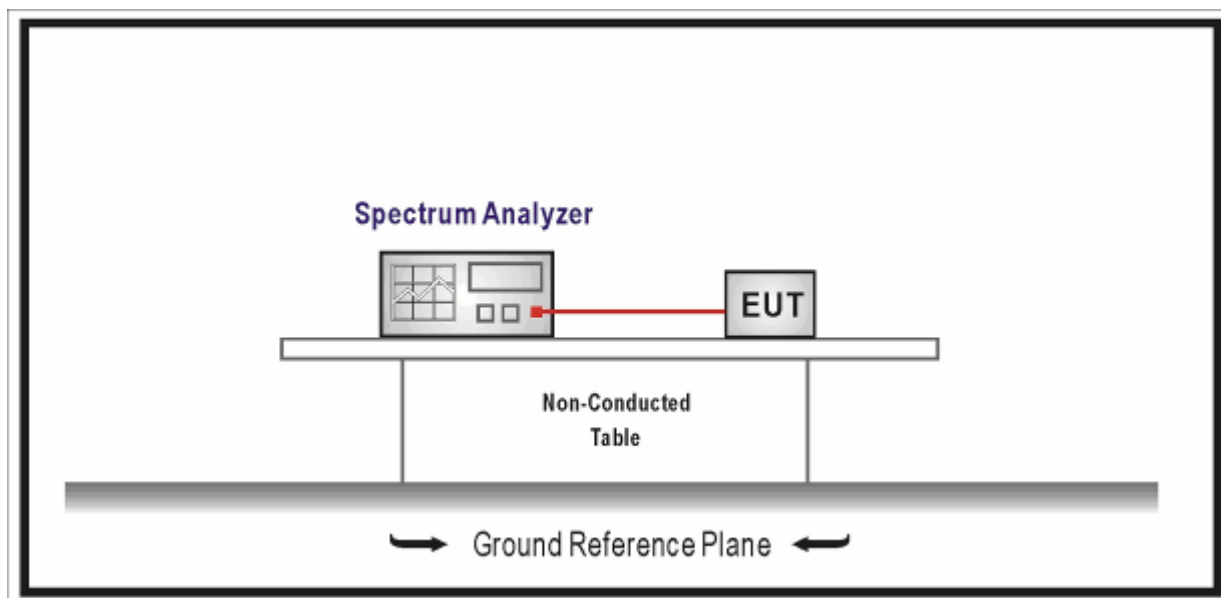
5.1. Test Equipment

RF Antenna Conducted Spurious / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.05.12
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.4. Test Procedure

The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

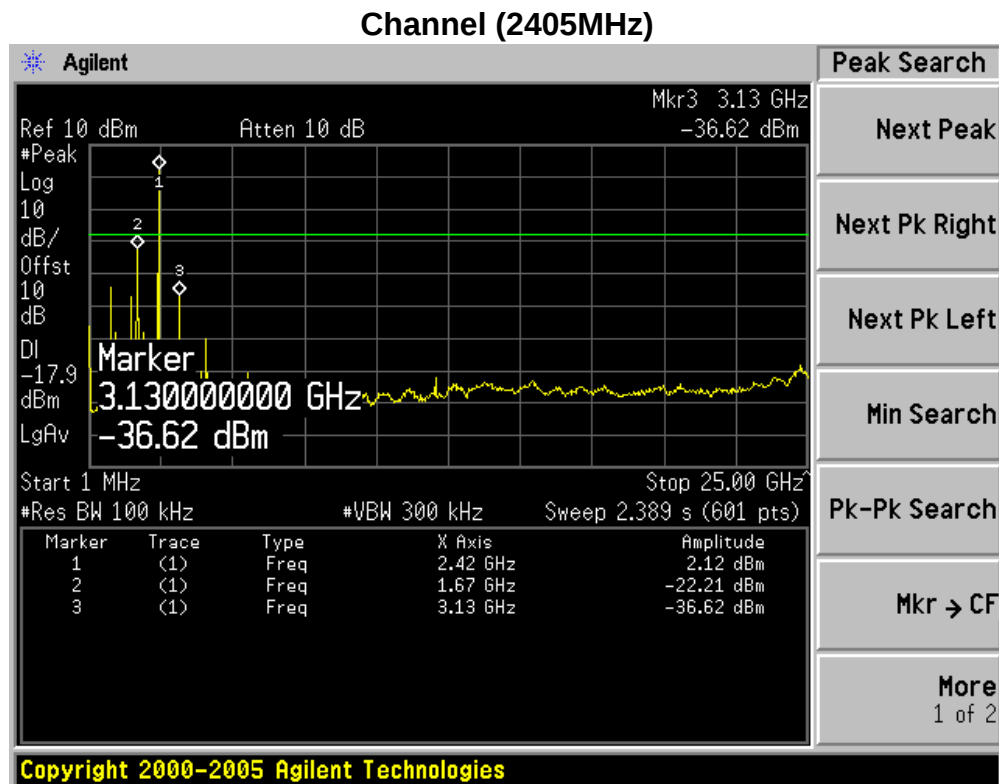
Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.5. Uncertainty

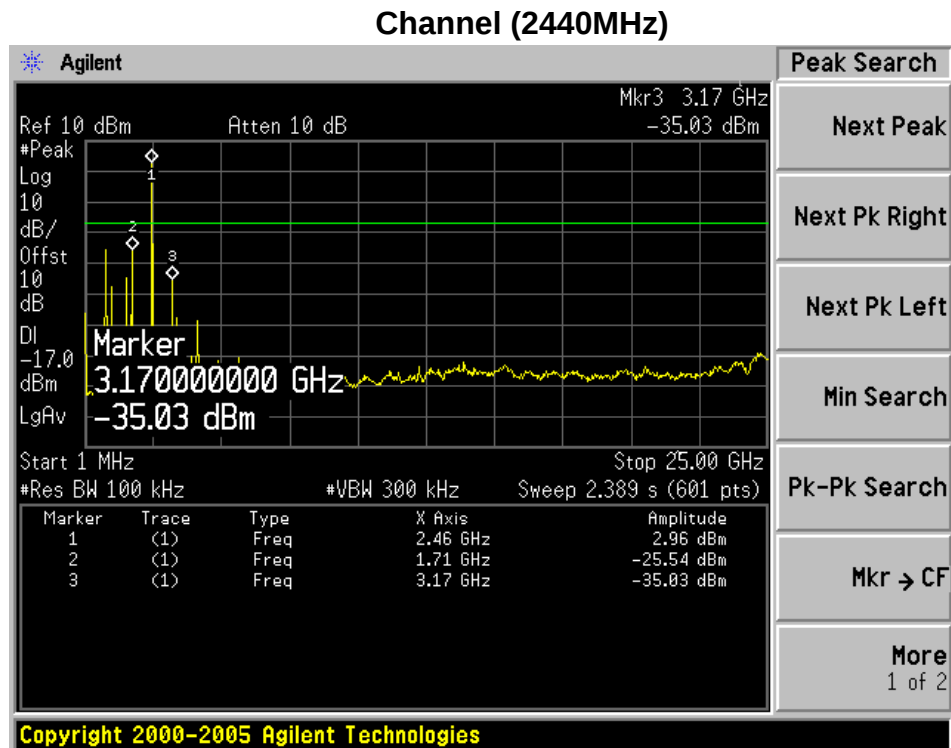
The measurement uncertainty is defined as ± 1.27 dB

5.6. Test Result

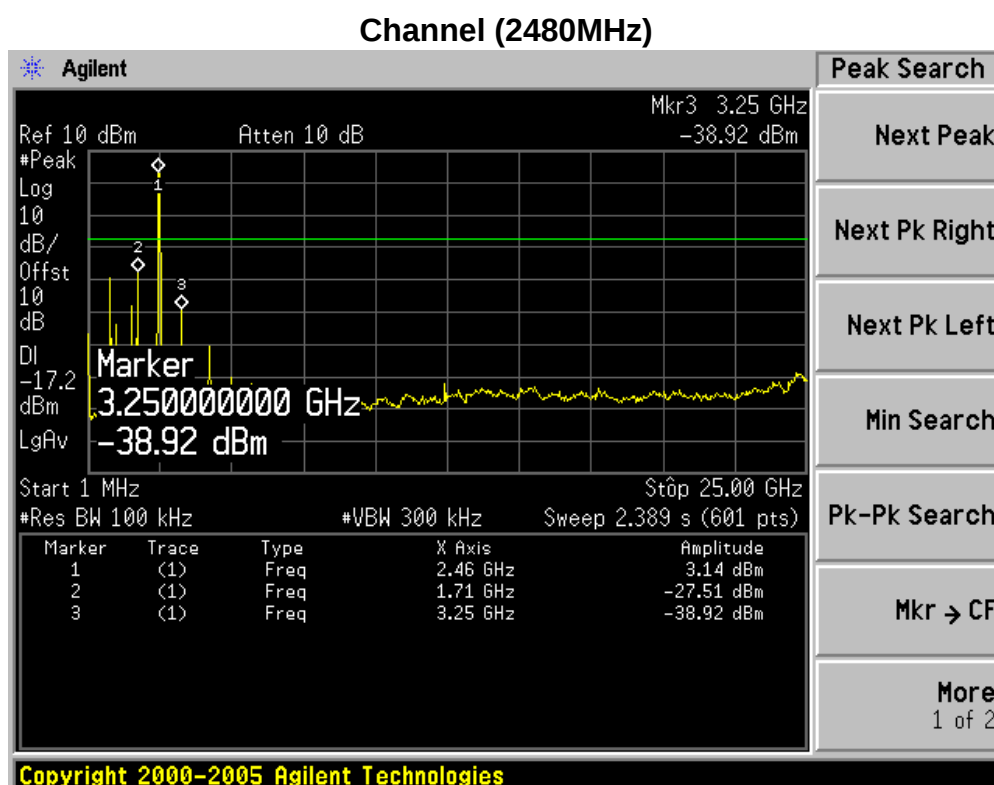
Product	:	Smart Home Hub
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit



Note: The above test pattern is synthesized by multiple of the frequency range.



Note: The above test pattern is synthesized by multiple of the frequency range.



Note: The above test pattern is synthesized by multiple of the frequency range.

6. Radiated Emission Band Edge

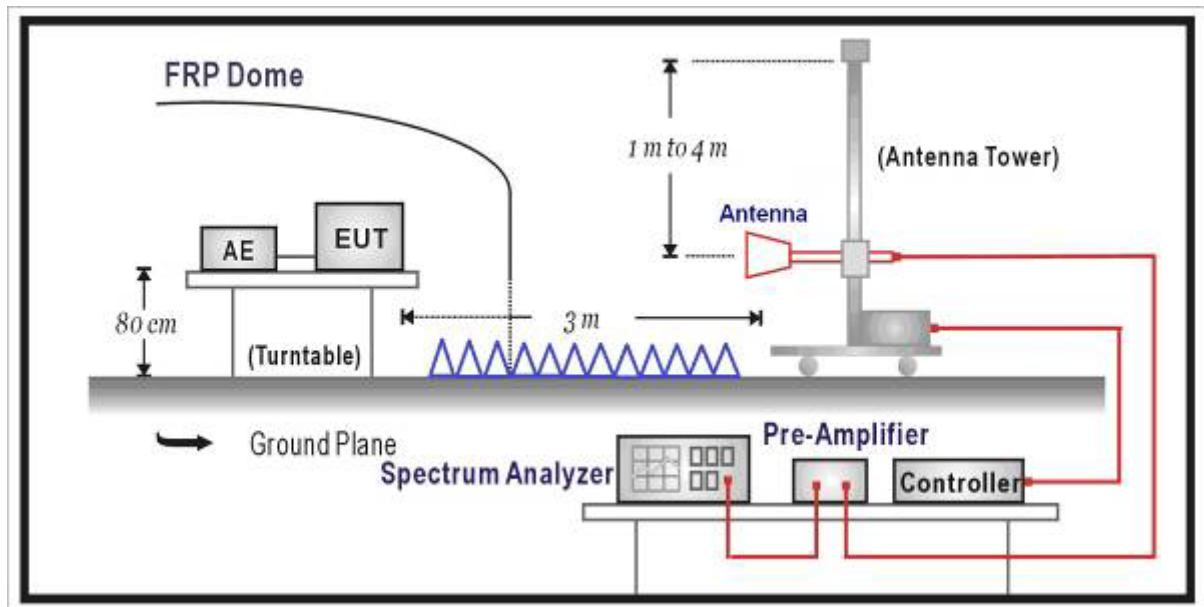
6.1. Test Equipment

☒ Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2015.03.28
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2015.10.15
DRG Horn	ETS-Lindgren	3117	00123988	2015.05.12
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2015.06.09
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2016.01.08

Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.4. Test Procedure

Since the EUT can be set to transmit continuously (Duty cycle >98%), use KDB 558074 Section 12.2.5.1 to perform band edge test for average value.

If the EUT can be configured or modified to transmit continuously (duty cycle $\geq$ 98 percent) then the average emission levels shall be measured using the following method (with EUT transmitting continuously).

- a) RBW = 1 MHz (unless otherwise specified).
 - b) VBW $\geq$ 3 x RBW.
 - c) Detector = RMS, if span/(# of points in sweep) $\leq$ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
 - d) Averaging type = power (i.e., RMS).
 - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
 - 2) Some instruments require linear display mode in order to use linear voltage averaging.
- Log or dB averaging shall not be used.

- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces.

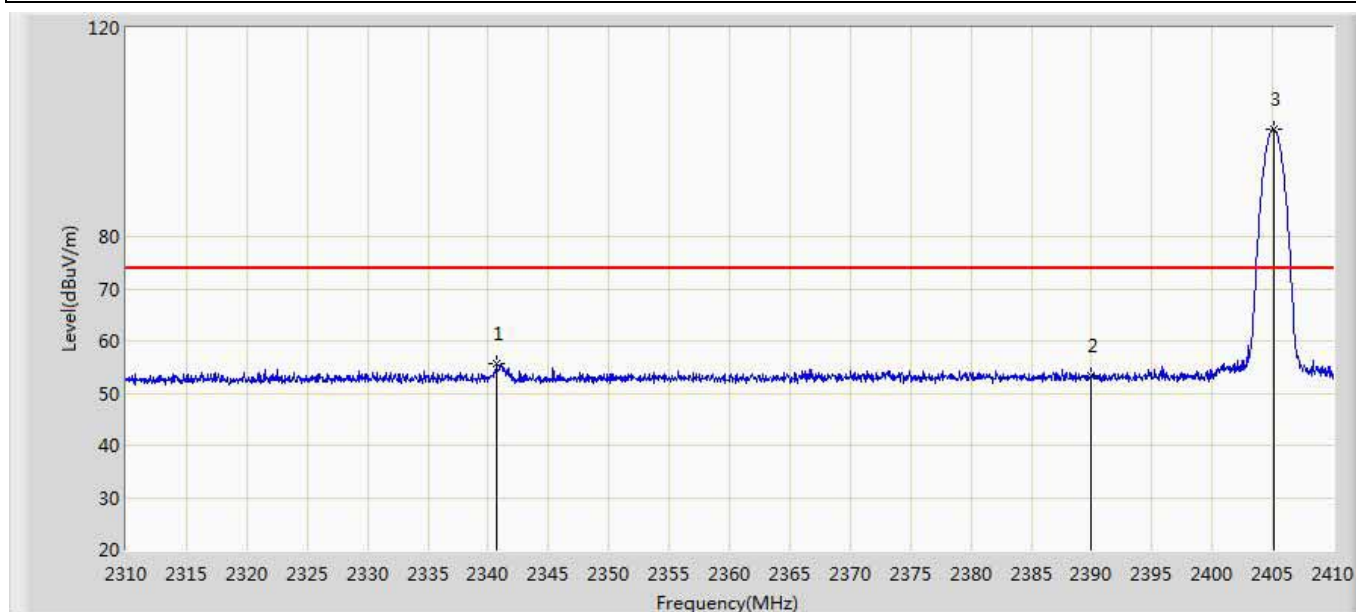
6.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

6.6. Test Result

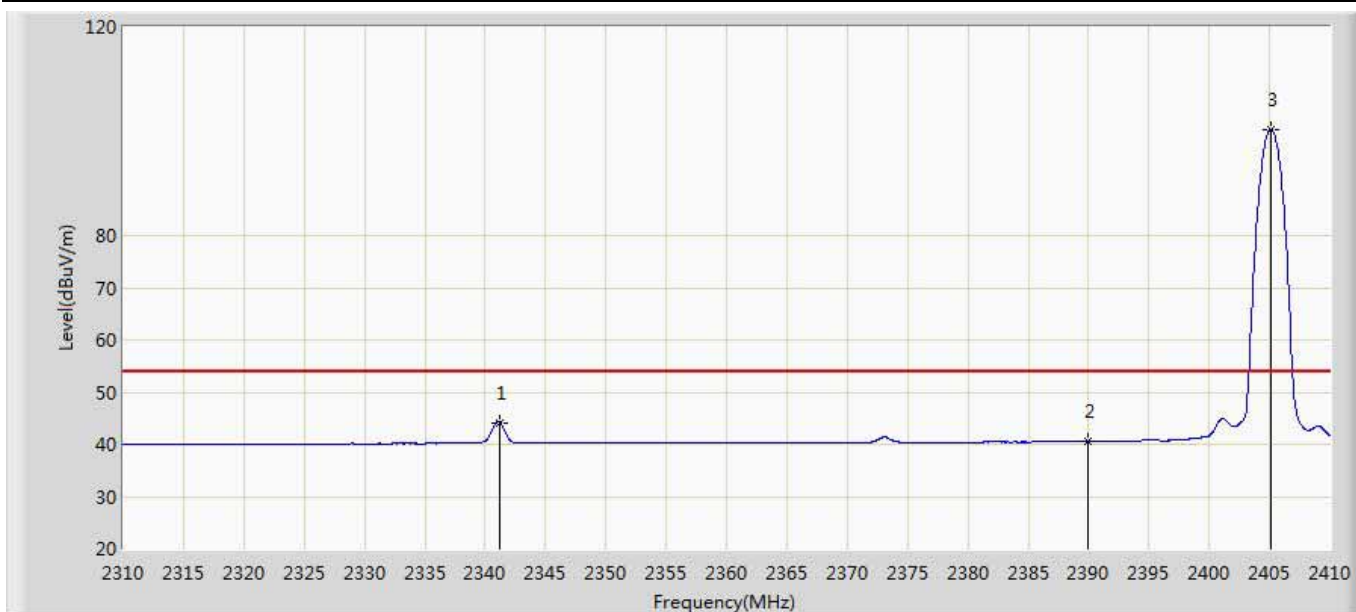
Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

Site: AC5	Time: 2015/01/08 - 13:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2405MHz	



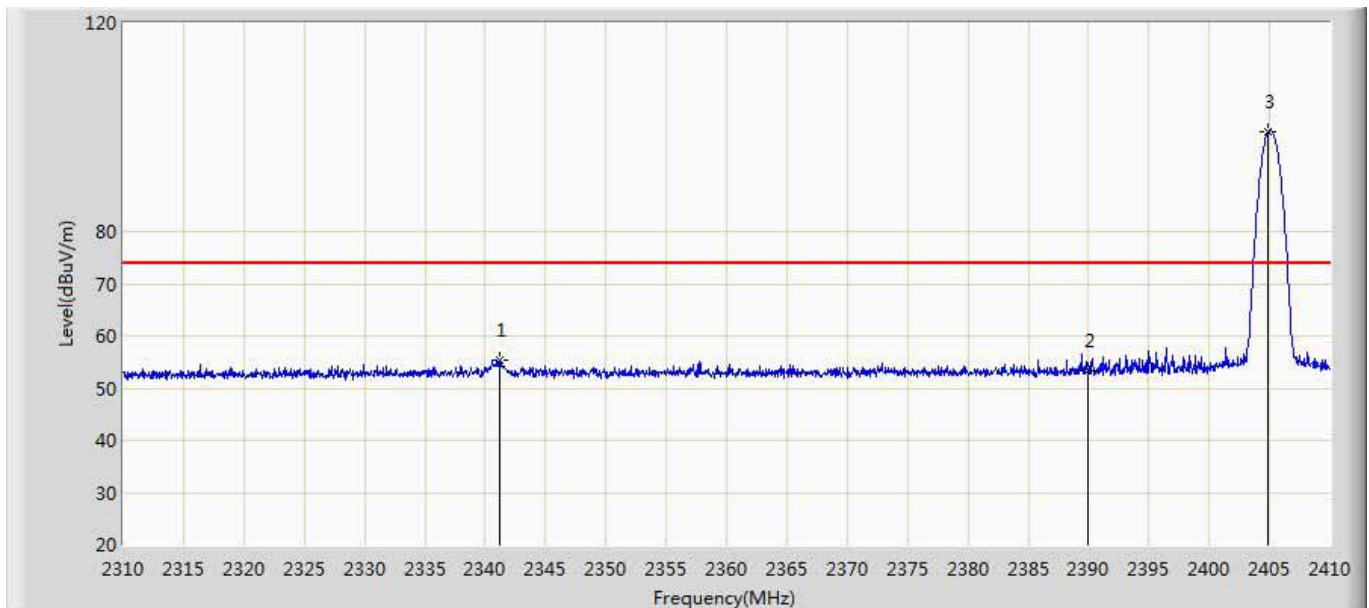
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2340.700	55.588	19.783	-18.412	74.000	35.805	PK
2		2390.000	53.224	17.188	-20.776	74.000	36.037	PK
3	*	2405.100	100.541	64.435	N/A	N/A	36.106	PK

Site: AC5	Time: 2015/01/08 - 13:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2405MHz	



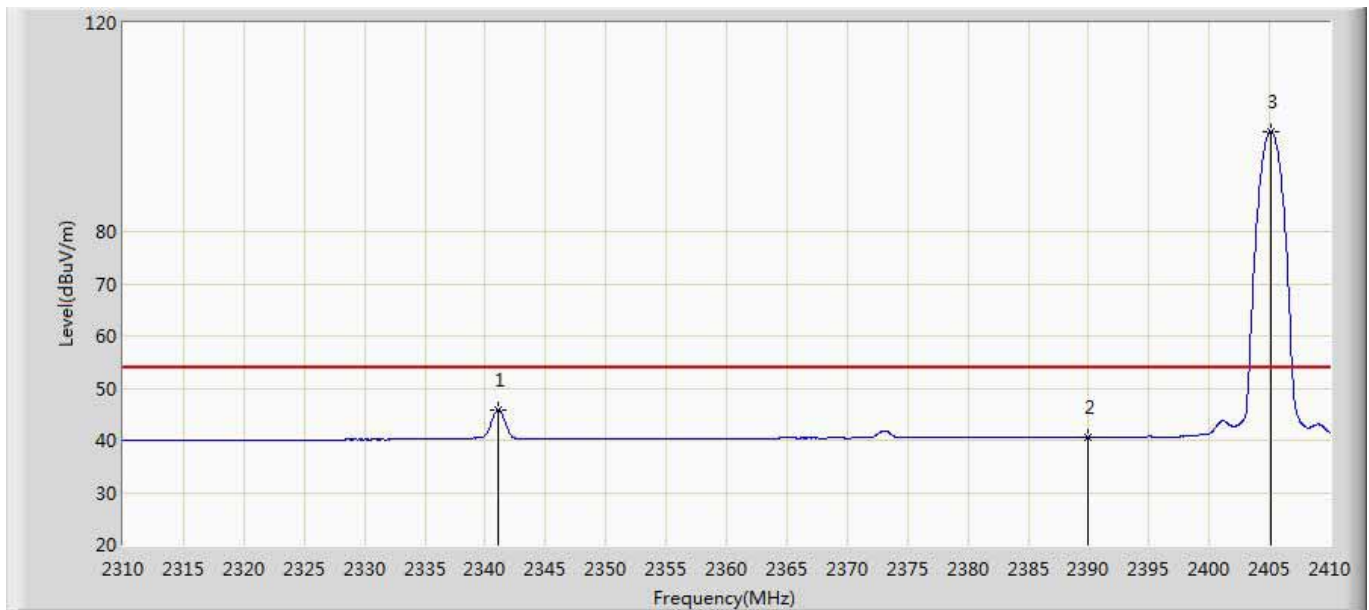
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2341.250	44.088	8.281	-9.912	54.000	35.808	AV
2		2390.000	40.517	4.481	-13.483	54.000	36.037	AV
3	*	2405.100	100.310	64.204	N/A	N/A	36.106	AV

Site: AC5	Time: 2015/01/08 - 13:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2405MHz	



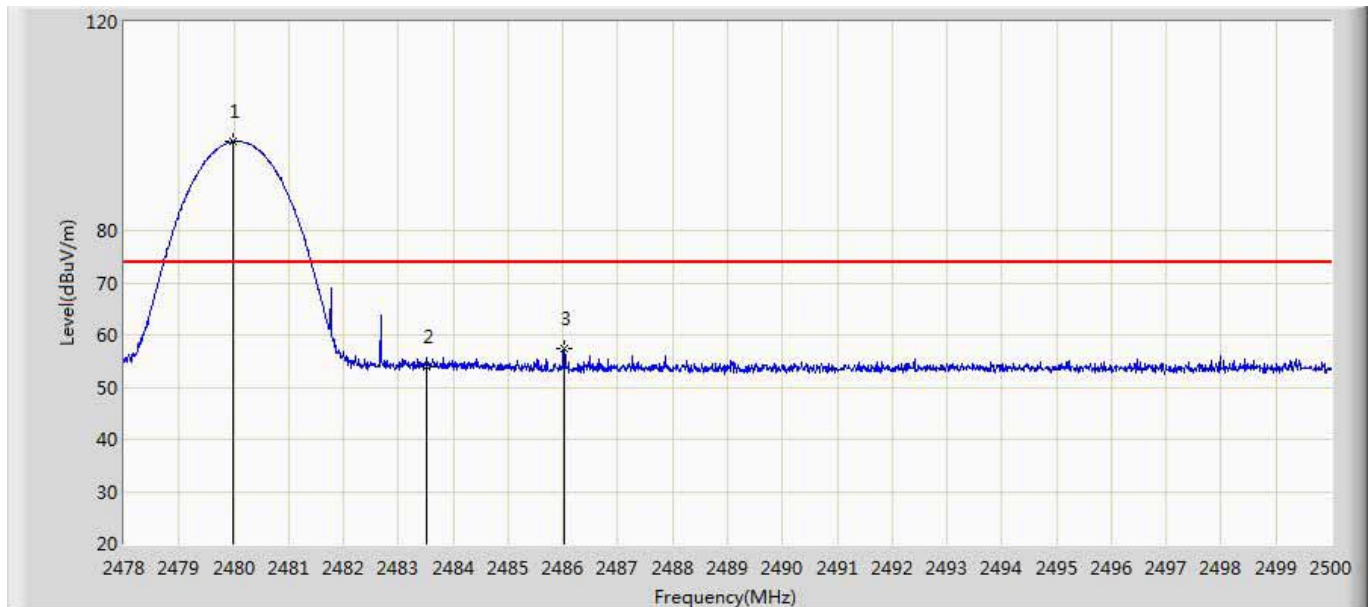
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2341.250	55.296	19.489	-18.704	74.000	35.808	PK
2		2390.000	53.378	17.342	-20.622	74.000	36.037	PK
3	*	2404.900	99.125	63.020	N/A	N/A	36.105	PK

Site: AC5	Time: 2015/01/08 - 13:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2405MHz	



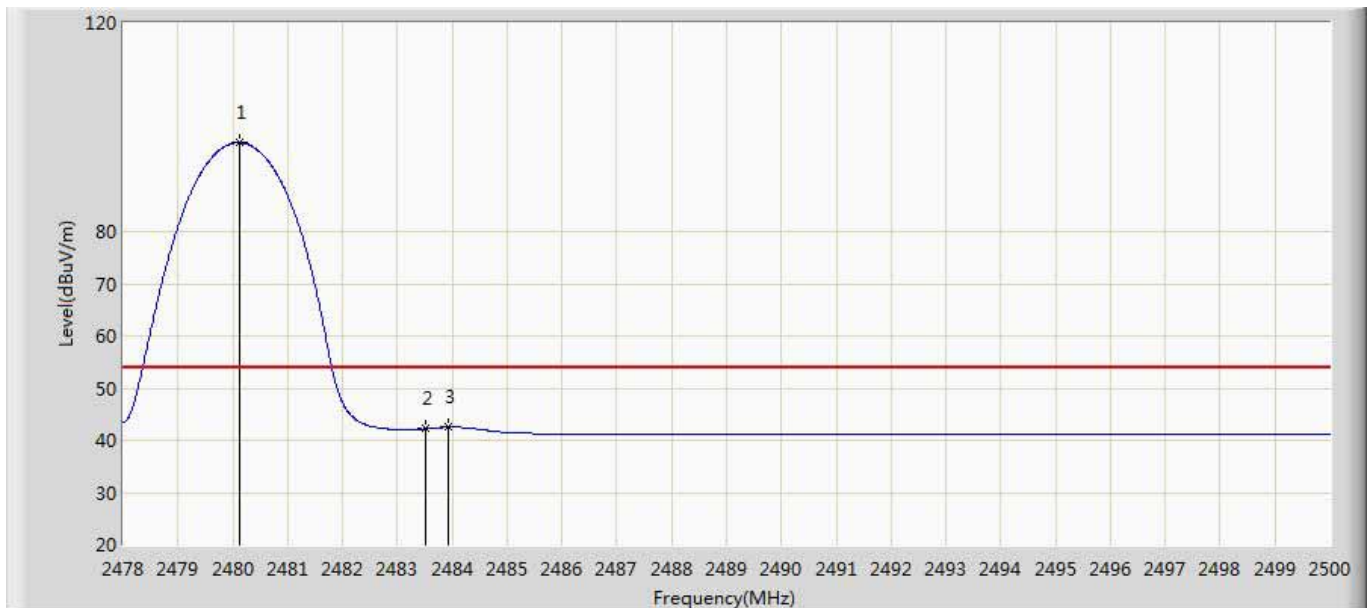
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2341.100	45.727	9.920	-8.273	54.000	35.806	AV
2		2390.000	40.567	4.531	-13.433	54.000	36.037	AV
3	*	2405.100	99.206	63.100	N/A	N/A	36.106	AV

Site: AC5	Time: 2015/01/08 - 14:01
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2480MHz	



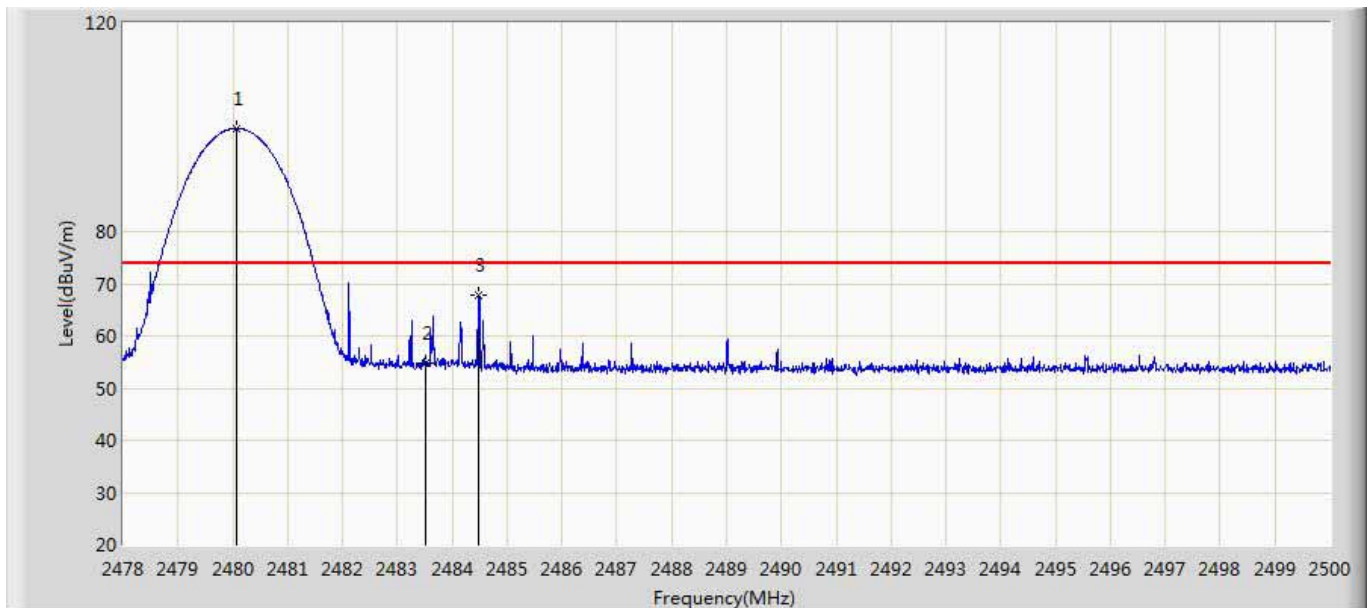
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.980	97.000	60.551	N/A	N/A	36.449	PK
2		2483.500	53.883	17.418	-20.117	74.000	36.465	PK
3		2486.019	57.431	20.954	-16.569	74.000	36.477	PK

Site: AC5	Time: 2015/01/08 - 14:03
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2480MHz	



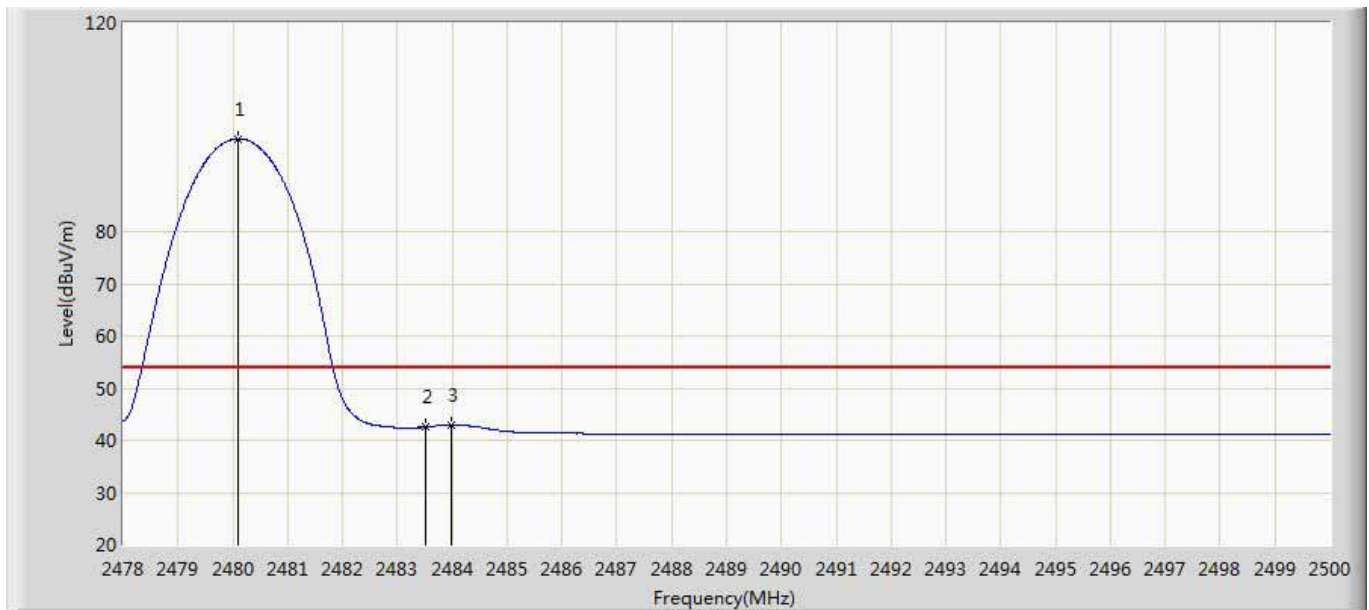
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.123	97.024	60.574	N/A	N/A	36.450	AV
2		2483.500	42.190	5.725	-11.810	54.000	36.465	AV
3		2483.940	42.546	6.079	-11.454	54.000	36.467	AV

Site: AC5	Time: 2015/01/08 - 14:03
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.057	99.728	63.279	N/A	N/A	36.450	PK
2		2483.500	54.927	18.462	-19.073	74.000	36.465	PK
3		2484.468	67.848	31.378	-6.152	74.000	36.470	PK

Site: AC5	Time: 2015/01/08 - 14:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
UT: Smart Home Hub	Power: DC 5V
Note: Mode1: Transmit at channel 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.090	97.811	61.361	N/A	N/A	36.450	AV
2		2483.500	42.535	6.070	-11.465	54.000	36.465	AV
3		2483.984	43.041	6.573	-10.959	54.000	36.467	AV

7. Operation Frequency Range of 20dB Bandwidth

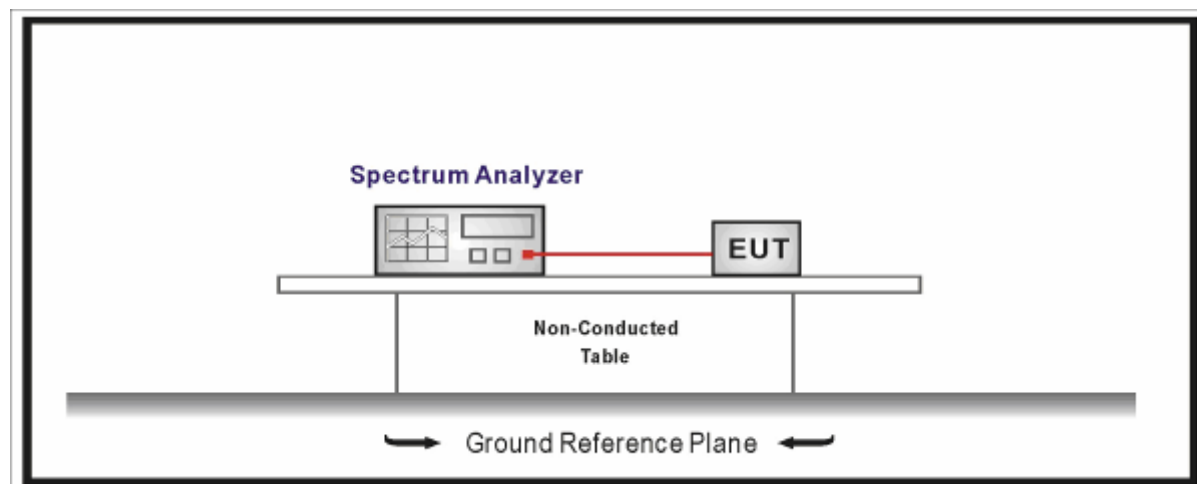
7.1. Test Equipment

Operation Frequency Range of 20dB Bandwidth / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.05.12
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

20 dB bandwidth of the emission is contained within the operation frequency band.

7.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2009; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements. The 20dB bandwidth test is using KDB 558074 Section 8.1 option 1 method.

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.

- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.
- h) Remark the 20dB down frequency point and make sure this is within the operating frequency band.

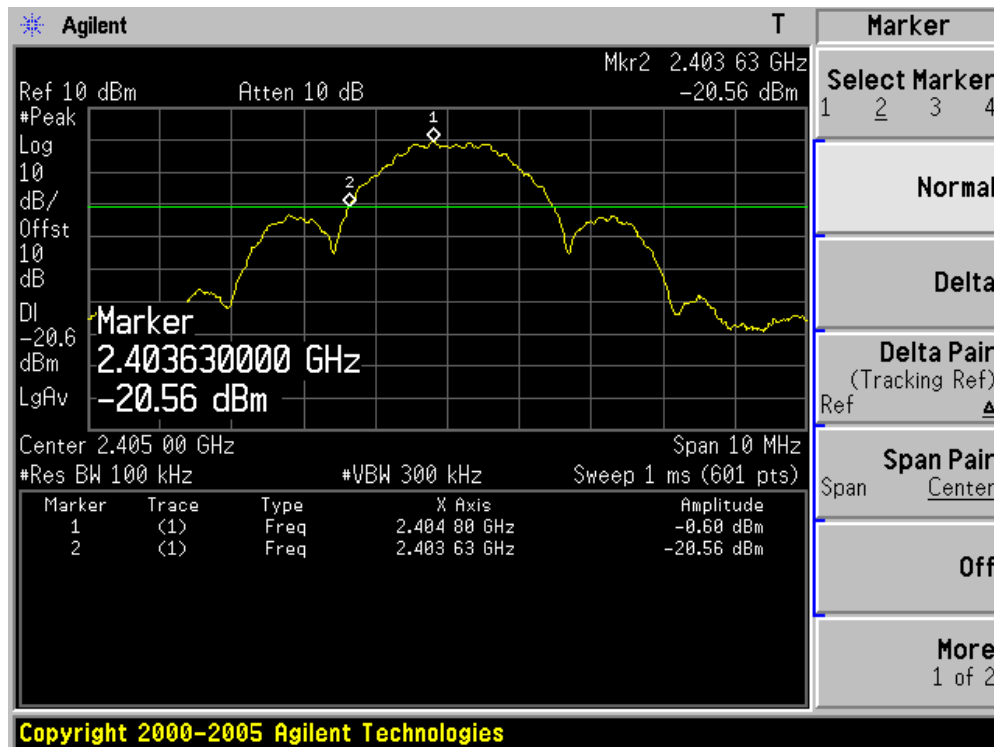
7.5. Uncertainty

The measurement uncertainty is defined as ± 1 kHz

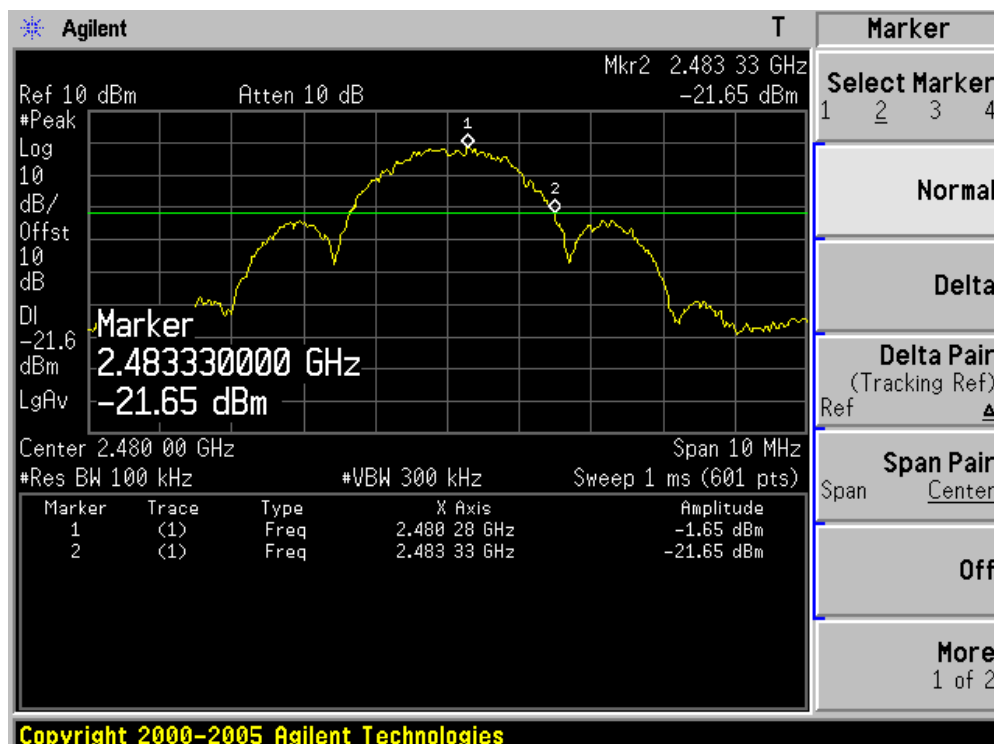
7.6. Test Result

Product	:	Smart Home Hub
Test Item	:	Operation Frequency Range of 20dB Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit

2405MHz



2480MHz



8. Occupied Bandwidth

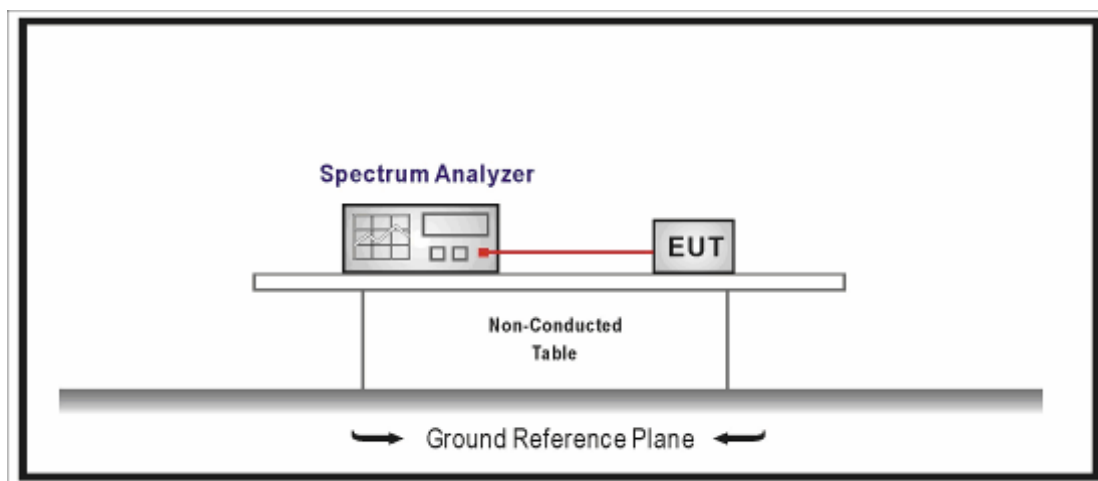
8.1. Test Equipment

Occupied Bandwidth / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.05.12
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

8.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2009; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements. The 6dB bandwidth test is using KDB 558074 Section 8.1 option 1 method.

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.

- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

8.5. Uncertainty

The measurement uncertainty is defined as ± 1 kHz

8.6. Test Result

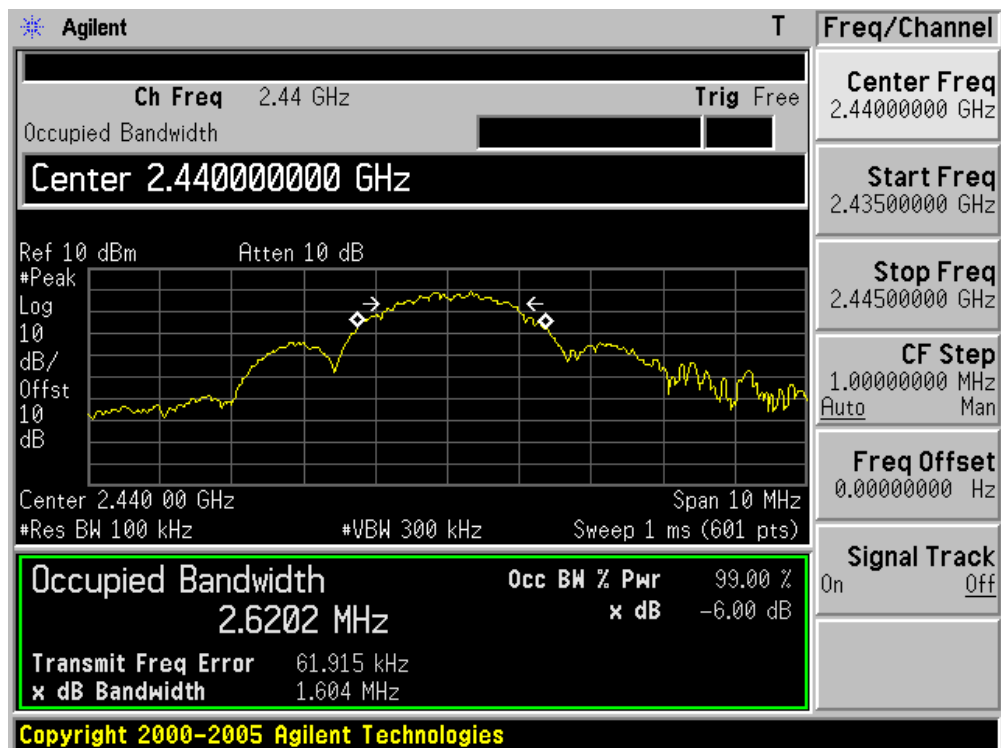
Product	:	Smart Home Hub
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit

Frequency (MHz)	6dB Occupied Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
2405	1613.0	2593.7	500	Pass
2440	1604.0	2620.2	500	Pass
2480	1625.0	2583.5	500	Pass

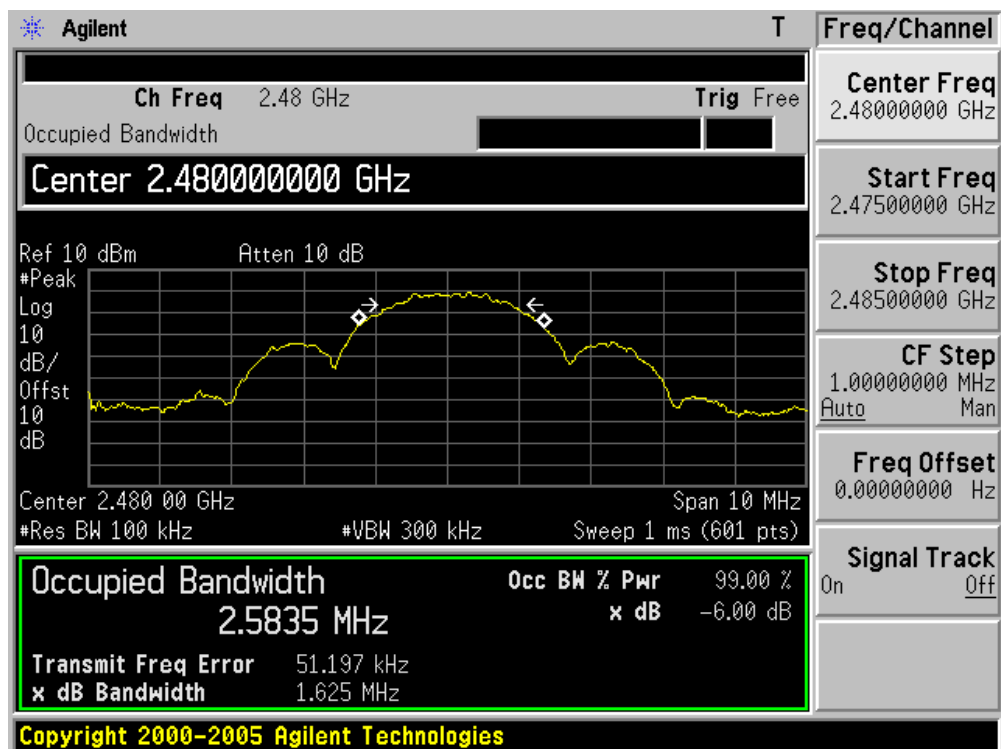
2405MHz



2440MHz



2480MHz



9. Power Output

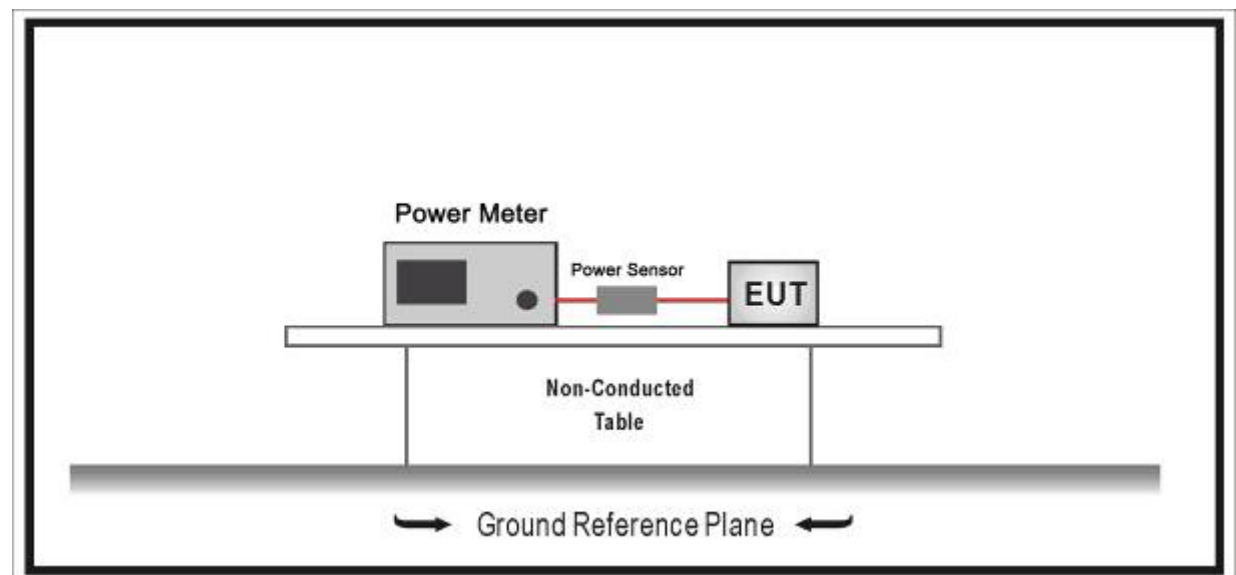
9.1. Test Equipment

Power Output / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Wideband Peak Power Meter	Anritsu	ML2495A	0905006	2015.10.29
Power Sensor	Anritsu	MA2411B	0846014	2015.10.29
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. Limit

The maximum peak power shall be less 1 Watt (30dBm).

Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

9.4. Test Procedure

The EUT was tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 D01 DTS Meas Guidance v03r02 section 9.1.2 PKPM1 Peak power meter method.

1. Power meter and sensor's minimum video bandwidth is 50MHz, larger than zigbee bandwidth;
2. Fast responding diode sensors respond immediately to changes in power level to reduce total test time.
3. Use peak detector to test.

Use the broadband peak RF power meter to test peak power and record the result.

9.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

9.6. Test Result

Product	:	Smart Home Hub
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit

Frequency (MHz)	Power Output Value (dBm)	Peak Power Output Value (dBm)	Limit (dBm)	Result
2405	7.65	7.65	30	Pass
2440	7.62	7.62	30	Pass
2480	7.30	7.30	30	Pass

10. Power Spectral Density

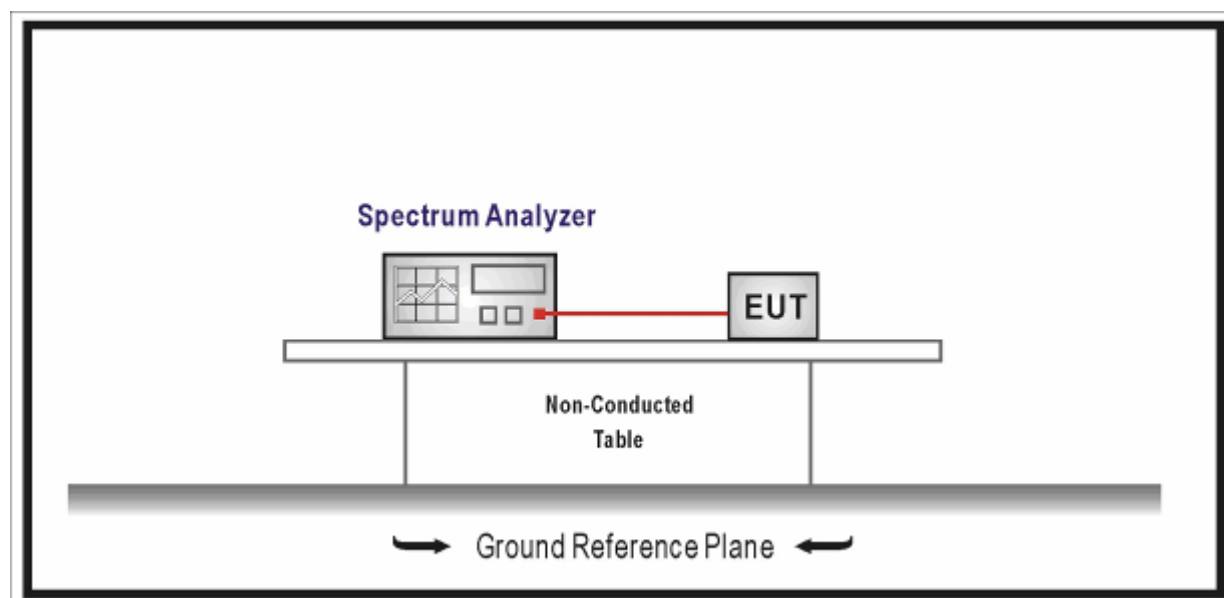
10.1. Test Equipment

Power Spectral Density / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.05.12
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

10.2. Test Setup



10.3. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiated to the Antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

10.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2009; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. (Actually we use 3kHz RBW)
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the band.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

10.5. Uncertainty

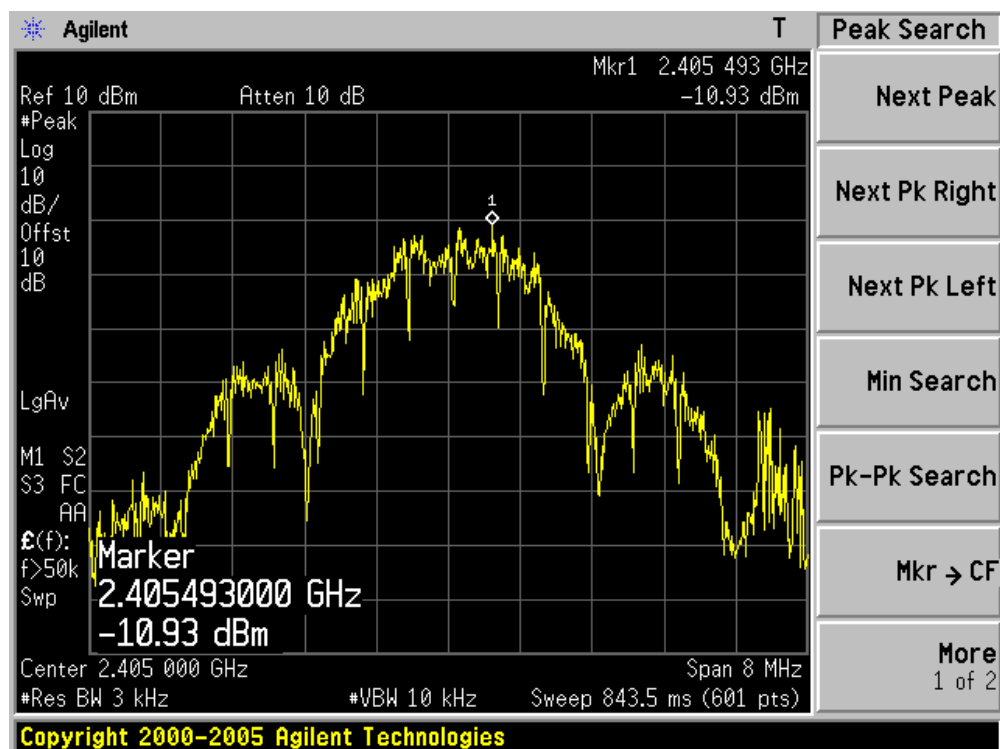
The measurement uncertainty is defined as $\pm 1.27 \text{ dB}$

10.6. Test Result

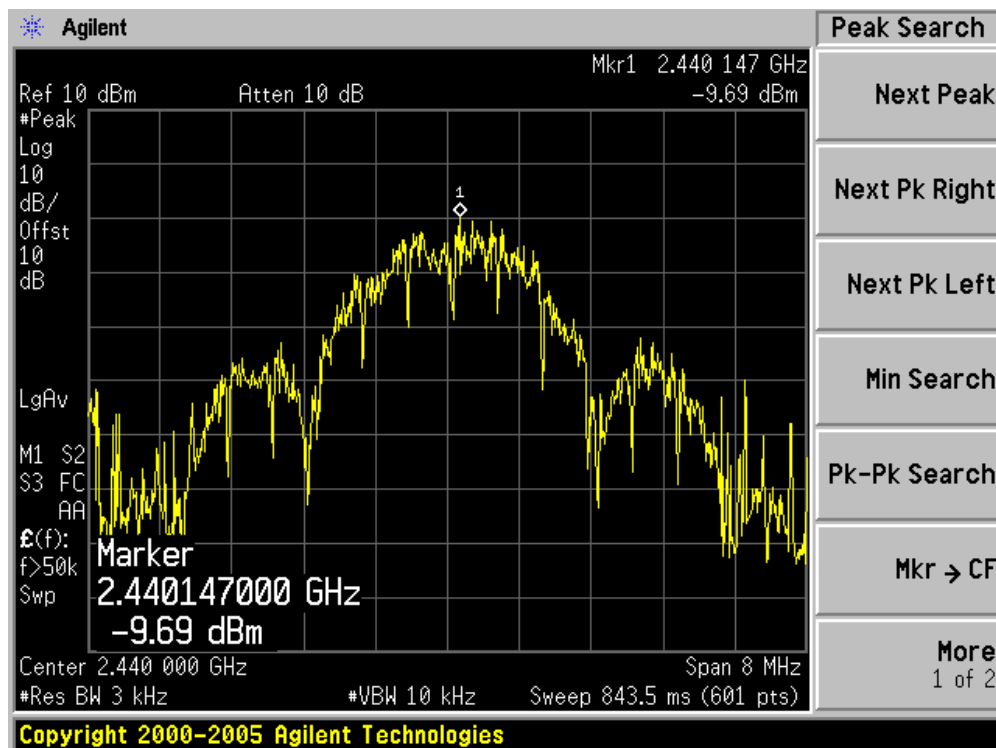
Product	:	Smart Home Hub
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit

Frequency (MHz)	Measurement PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Result
2405	-10.93	-10.93	8	Pass
2440	-9.69	-9.69	8	Pass
2480	-9.66	-9.66	8	Pass

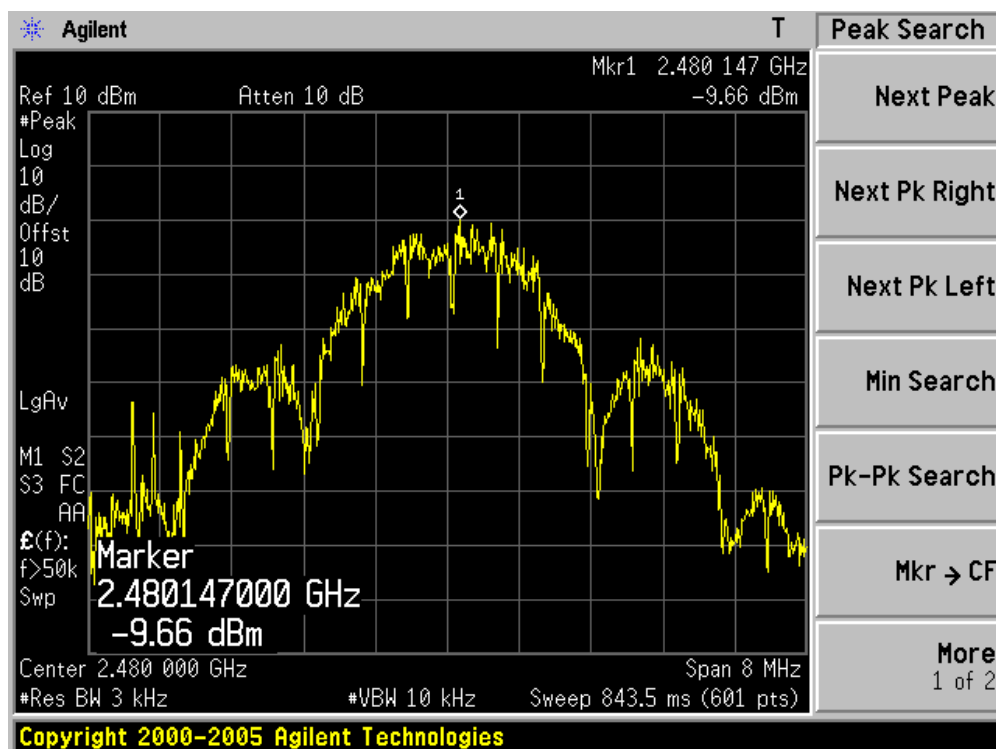
2405MHz



2440MHz



2480MHz



The End