TEST REPORT

of

FCC Part 15 Subpart C §15.247

FCC ID: 2AF4XAPPBOT-RILEY

Equipment Under Test	:	HOME CAMERA
Model Name	:	APPBOT-RILEY
Applicant	:	VARRAM SYSTEM Co., Ltd.
Manufacturer	:	VARRAM SYSTEM Co., Ltd.
Date of Test(s)	:	2016.04.11 ~ 2016.04.22
Date of Issue	:	2016.05.18

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

Tested By: **Jinhyoung Cho** **Date:** **2016.05.18**

Approved By: **Hyunchae You** **Date:** **2016.05.18**

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.

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1.2. Details of Applicant

Applicant : VARRAM SYSTEM Co., Ltd.
Address : 2Floors, Dadong, 55-1, Techno 11-ro, Yuseong-gu, Daejeon, Korea
Contact Person : Jung, Ju-Yong
Phone No. : + 82 70 8797 8920

1.3. Description of EUT

Kind of Product	HOME CAMERA
Model Name	APPBOT-RILEY
Approved Module Name	FN-8126EU (FCC ID: 2AATLFN-8126EU)
Power Supply	DC 3.6 V (used by rechargeable battery)
Frequency Range	2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20) 2 422 ㎒ ~ 2 452 ㎒ (11n_HT40)
Modulation Technique	DSSS, OFDM
Number of Channels	11 channels (11b/g/n_HT20) 7 channels (11n_HT40)
Antenna Type	PCB antenna
Antenna Gain	0 ㏈i
H/W Version	ABR-HW_V1.0
S/W Version	ABR-SW_V1.0

1.4. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Jul. 13, 2015	Annual	Jul. 13, 2016
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 24, 2015	Annual	Sep. 24, 2016
Attenuator	MCLI	FAS-12-10	3	Jun. 09, 2015	Annual	Jun. 09, 2016
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-6SS	4	Jun. 23, 2015	Annual	Jun. 23, 2016
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	15	Jun. 23, 2015	Annual	Jun. 23, 2016
Low Pass Filter	Mini-Circuits	NLP-1200+	V8979400903-2	Feb. 29, 2016	Annual	Feb. 29, 2017
Power Sensor	R&S	NRP-Z81	100669	Feb. 29, 2016	Annual	Feb. 29, 2017
DC Power Supply	Agilent	U8002A	MY53150029	Jun. 22, 2015	Annual	Jun. 22, 2016
Preamplifier	H.P.	8447F	2944A03909	Aug. 27, 2015	Annual	Aug. 27, 2016
Preamplifier	R&S	SCU-18	10117	Apr. 07, 2016	Annual	Apr. 07, 2017
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 07, 2015	Annual	May 07, 2016
Loop Antenna	R&S	HFH2-Z2	100118	Jun. 04, 2015	Biennial	Jun. 04, 2017
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	396	Jun. 18, 2015	Biennial	Jun. 18, 2017
Horn Antenna	R&S	HF906	100326	Feb. 01, 2016	Biennial	Feb. 01, 2018
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA9170	BBHA9170431	May 15, 2014	Biennial	May 15, 2016
Antenna Master	INN-CO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Test Receiver	R&S	ESU26	100109	Mar. 07, 2016	Annual	Mar. 07, 2017
Test Receiver	R&S	ESCI 7	100911	Dec. 22, 2015	Annual	Dec. 22, 2016
Artificial Mains Networks	R & S	ESH2-Z5	100280	2017.06.25	Annual	2017.03.25
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Shield Room	SY Corporation	L × W × H (6.5 m × 3.5 m × 3.5 m)	N/A	N.C.R.	N/A	N.C.R.

1.5. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part15 Subpart C		
Standard section	**Test Item(s)**	**Result**
15.205(a) 15.209 15.247(d)	Transmitter Radiated Spurious Emissions	Complied
15.247(b)(3)	Maximum Peak Conducted Output Power	Complied
15.207	Transmitter AC Power Line Conducted Emission	Complied

Remark;
The original certified module (FCC ID: 2AATLFN-8126EU) installed in this device affects RF conducted test and it remains same as original certified.

1.6. Test Procedure(s)

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and the guidance provided in KDB 558074_v03r05 were used in the measurement of the DUT.

1.7. Sample calculation

Where relevant, the following sample calculation is provided:

1.7.1. Conducted test

Offset value (㏈) = Attenuator (㏈) + Cable loss (㏈)

1.7.2. Radiation test

Field strength level (㏈㎶/m) = Measured level (㏈㎶) + Antenna factor (㏈) + Cable loss (㏈) - amplifier gain(㏈)

1.8. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009735	2016.04.22	Initial
1	F690501/RF-RTL009735-1	2016.05.18	Added approved module name and remark

1.9. Duty Cycle of EUT

Regarding to KDB558074 v03r04, 6.0, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below
Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value, Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100.

Mode	Data Rate (Mbps)							
11b	**1**	**2**	**5.5**	**11**				
Duty Cycle (%)	100	100	100	100				
Correction factor (dB)	0.00	0.00	0.00	0.00				
11g	**6**	**9**	**12**	**18**	**24**	**36**	**48**	**54**
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11n_HT20	**MCS0**	**MCS1**	**MCS2**	**MCS3**	**MCS4**	**MCS5**	**MCS6**	**MCS7**
Duty Cycle (%)	100	100	100	100	100	100	100	100
Correction factor (dB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Remark:

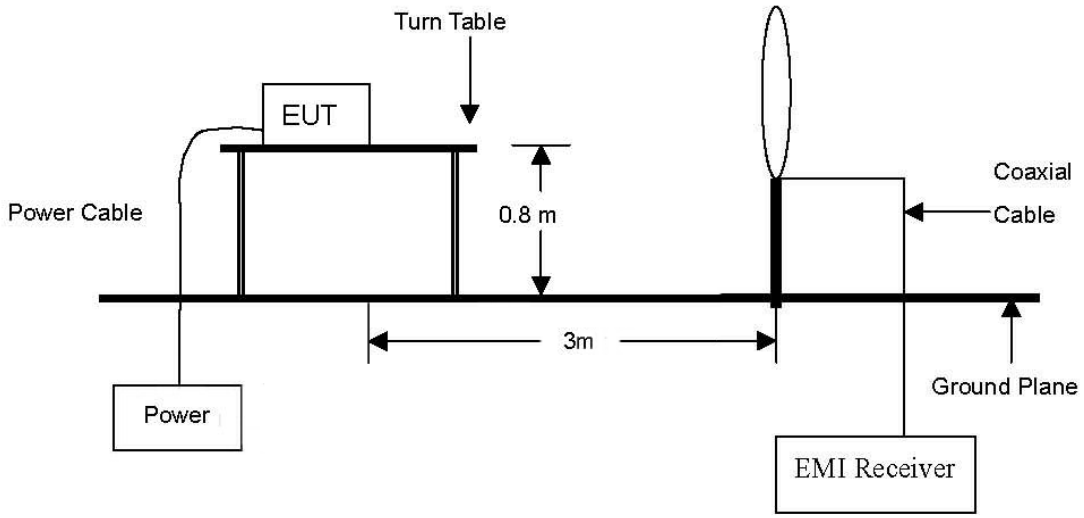
1. As measured duty cycles of EUT, all of mode and data rate keep constant period and are converted to log scale (power averaging) to compensate correction factor to result of average test items.
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = 10 log (1 / Duty cycle)

2. Transmitter Radiated Spurious Emissions

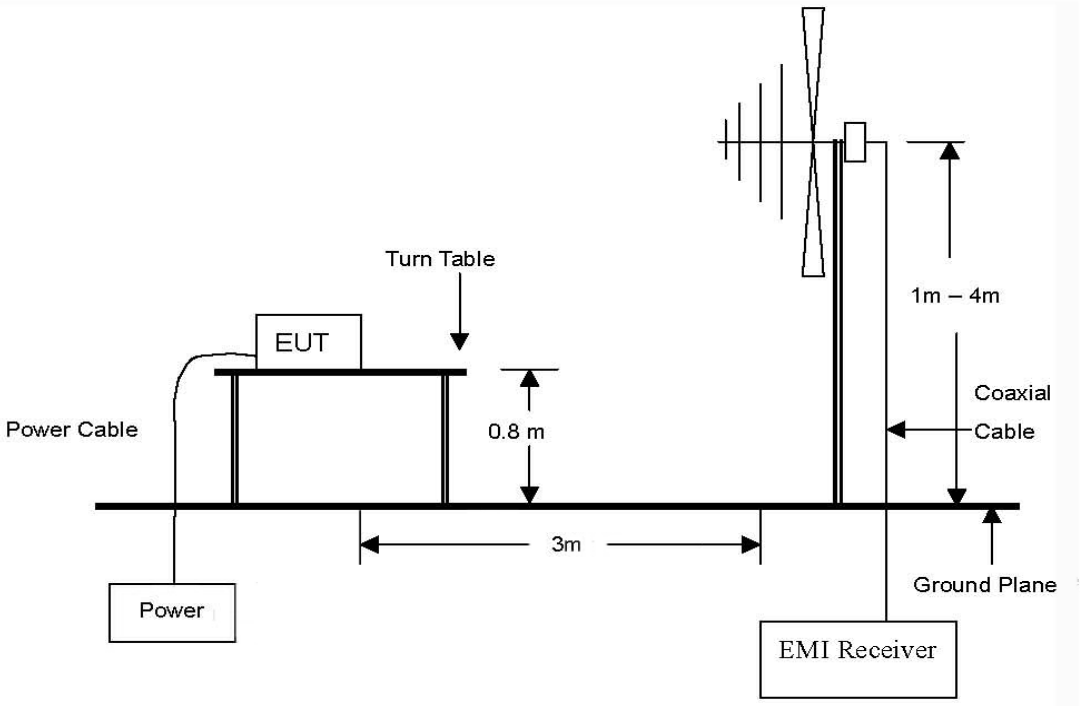
2.1. Test Setup

2.1.1. Transmitter Radiated Spurious Emissions

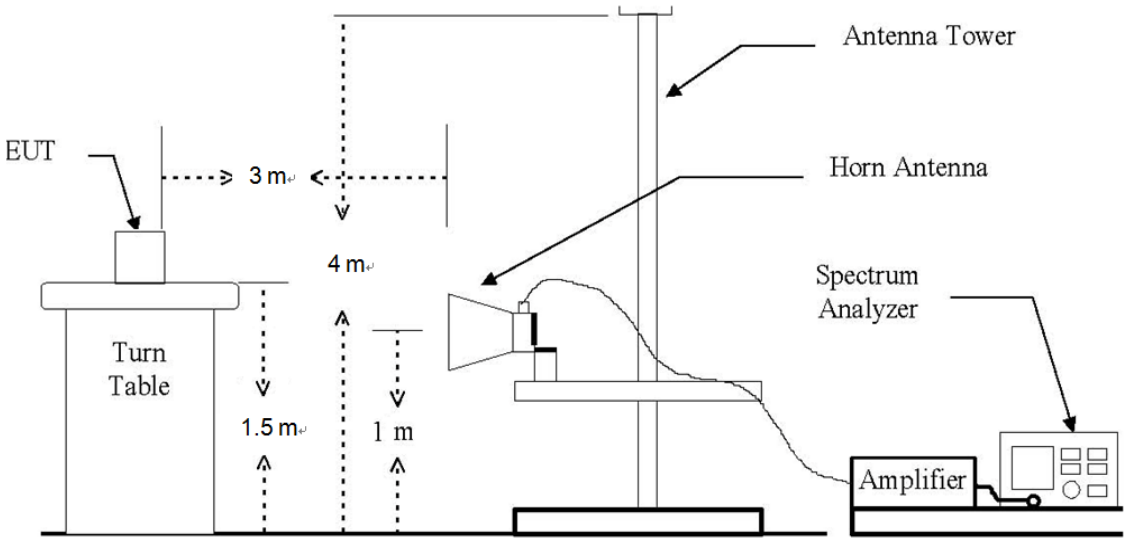
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated form 1 ㎓ to the 10th harmonic of the highest fundamental frequency or 40 ㎓, whichever is lower.



2.2. Limit

According to §15.247(d), in any 100 ㎑ 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 ㏈ below that in the 100 ㎑ 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table：

Frequency (㎒)	Distance (Meters)	Field Strength (㏈㎶/m)	Field Strength (㎶/m)
0.009 – 0.490	300	20 log (2 400/F(㎑))	2 400/F(㎑)
0.490 – 1.705	30	20 log (24 000/F(㎑))	24 000/F(㎑)
1.705 – 30.0	30	29.54	30
30 - 88	3	40.0	100**
88 – 216	3	43.5	150**
216 – 960	3	46.0	200**
Above 960	3	54.0	500

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates in section 11.0 & 12.0 of KDB 558074_v03r05 and ANSI C63.10-2009.

Remark:
Testing for radiated emissions above 1 ㎓ was performed with the EUT elevated at 1.5 m instead of 0.8 m. 1.5 m is the required height in ANSI C63.10:2013 as referenced by RSS-Gen issue 4. This test height has been permitted by FCC as discussed in FCC-TCB conference call in December 2014.

2.3.1. Test Procedures for emission below 30 ㎒

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum Hold Mode.

2.3.2. Test Procedures for emission from above 30 ㎒

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site below 1 ㎓ and 1.5 meters above the ground at a 3 meter anechoic chamber test site above 1 ㎓. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a bi-log antenna, a horn antenna and its height 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE;

All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

1. Unwanted Emissions into Non-Restricted Frequency Bands

- The Reference Level Measurement refer to section 11.2
Set analyzer center frequency to DTS channel center frequency, SPAN ≥ 1.5 times the DTS bandwidth, the RBW = 100 ㎑ and VBW ≥ 3 x RBW, Detector = Peak, Sweep time = Auto couple, Trace = Max hold.

- Unwanted Emissions Level Measurement refer to section 11.3
Set the center frequency and span to encompass frequency range to be measured, the RBW = 100 ㎑ and VBW ≥ 3 x RBW, Detector = Peak, Sweep time = Auto couple, Trace = Max hold.

2. Unwanted Emissions into Restricted Frequency Bands

- Peak Power measurement procedure refer to section 12.2.4
Set RBW = as specified in Table 1, VBW ≥ 3 x RBW, Detector = Peak, Sweep time = auto, Trace = Max hold.

Table 1- RBW as a function of frequency

Frequency	RBW
9 – 150 ㎑	200 – 300 ㎐
0.15 – 30 ㎒	9 – 10 ㎑
30 – 1 000 ㎒	100 – 120 ㎑
>1 000 ㎒	1 ㎒

-Average Power measurements procedure refer to section 12.2.5.1
The EUT shall be configured to operate at the maximum achievable duty cycle.
Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.
Set RBW = 1 ㎒, VBW ≥ 3 x RBW, Detector = RMS, if span / (# of points in sweep) ≤ (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.

Averaging type = power (i.e., RMS).
As an alternative the detector and averaging type may be set for linear voltage averaging.
Some instruments require linear display mode in order to use linear voltage averaging. Log or ㏈ averaging shall not be used. Sweep time = auto, Perform a trace average of at least 100 traces.

3. Definition of DUT Axis.
Definition of the test orthogonal plan for EUT was described in the test setup photo.
The test orthogonal plan of EUT is **X-axis** during radiation test.

2.4. Test Results

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

2.4.1. Radiated Spurious Emission below 1 000 ㎒

The frequency spectrum from 9 ㎑ to 1 000 ㎒ was investigated. All reading values are peak values.

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
478.99	34.50	Peak	V	18.11	-25.93	26.68	46.00	19.32
739.15	34.30	Peak	V	22.29	-25.37	31.22	46.00	14.78
Above 800.00	Not detected	-	-	-	-	-	-	-

Remark:

1. Spurious emissions for all channels were investigated and almost the same below 1 ㎓.
2. Reported spurious emissions are in **11b / 1Mbps / High channel** as worst case among other modes.
3. Radiated spurious emission measurement as below.
   (Actual = Reading + Antenna Factor + Amp + CL)
4. According to §15.31(o), emission levels are not report much lower than the limits by over 20 ㏈.

2.4.2. Radiated Spurious Emission above 1 000 ㎒

The frequency spectrum above 1 000 ㎒ was investigated. All reading values are peak and average values.

DSSS : 802.11b(1 Mbps)

Low Channel (2 412 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 310.00	25.91	Peak	H	28.07	5.35	59.33	74.00	14.67
*2 310.00	14.76	Average	H	28.07	5.35	48.18	54.00	5.82
*2 316.06	26.29	Peak	H	28.07	5.34	59.70	74.00	14.30
*2 489.43	15.43	Average	H	28.25	5.46	49.14	54.00	4.86
*2 390.00	24.00	Peak	H	28.15	5.38	57.53	74.00	16.47
*2 390.00	15.27	Average	H	28.15	5.38	48.80	54.00	5.20

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 824.14	47.73	Peak	V	32.71	-29.81	50.63	74.00	23.37
*4 824.14	42.96	Average	V	32.71	-29.81	45.86	54.00	8.14
Above 4 900.00	Not detected	-	-	-	-	-	-	-

Middle Channel (2 437 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 874.10	48.29	Peak	V	32.84	-29.50	51.63	74.00	22.37
*4 874.20	44.73	Average	V	32.84	-29.50	48.07	54.00	5.93
Above 4 900.00	Not detected	-	-	-	-	-	-	-

High Channel (2 462 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 483.50	25.48	Peak	H	28.24	5.44	59.16	74.00	14.84
*2 483.50	14.83	Average	H	28.24	5.44	48.51	54.00	5.49
*2 486.04	27.15	Peak	H	28.25	5.45	60.85	74.00	13.15
*2 485.13	15.99	Average	H	28.24	5.45	49.68	54.00	4.32
*2 500.00	24.80	Peak	H	28.26	5.49	58.55	74.00	15.45
*2 500.00	15.49	Average	H	28.26	5.49	49.24	54.00	4.76

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 924.25	46.48	Peak	V	32.98	-29.67	49.79	74.00	24.21
*4 924.12	41.67	Average	V	32.98	-29.67	44.98	54.00	9.02
Above 5 000.00	Not detected	-	-	-	-	-	-	-

OFDM: 802.11g(6 Mbps)

Low Channel (2 412 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 310.00	24.09	Peak	H	28.07	5.35	57.51	74.00	16.49
*2 310.00	14.54	Average	H	28.07	5.35	47.96	54.00	6.04
*2 382.61	26.98	Peak	H	28.14	5.37	60.49	74.00	13.51
*2 389.65	16.31	Average	H	28.15	5.38	49.84	54.00	4.16
*2 390.00	26.46	Peak	H	28.15	5.38	59.99	74.00	14.01
*2 390.00	14.57	Average	H	28.15	5.38	48.10	54.00	5.90

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 824.54	46.15	Peak	V	32.71	-29.81	49.05	74.00	24.95
*4 824.18	38.91	Average	V	32.71	-29.81	41.81	54.00	12.19
Above 4 900.00	Not detected	-	-	-	-	-	-	-

Middle Channel (2 437 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 874.35	47.33	Peak	V	32.84	-29.50	50.67	74.00	23.33
*4 874.05	40.14	Average	V	32.84	-29.50	43.48	54.00	10.52
Above 4 900.00	Not detected	-	-	-	-	-	-	-

High Channel (2 462 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 483.50	28.48	Peak	H	28.24	5.44	62.16	74.00	11.84
*2 483.50	16.38	Average	H	28.24	5.44	50.06	54.00	3.94
*2 484.10	29.75	Peak	H	28.24	5.45	63.44	74.00	10.56
*2 485.68	16.69	Average	H	28.25	5.45	50.39	54.00	3.61
*2 500.00	25.64	Peak	H	28.26	5.49	59.39	74.00	14.61
*2 500.00	15.29	Average	H	28.26	5.49	49.04	54.00	4.96

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 924.30	46.04	Peak	V	32.98	-29.67	49.35	74.00	24.65
*4 914.15	38.64	Average	V	32.95	-29.61	41.98	54.00	12.02
Above 5 000.00	Not detected	-	-	-	-	-	-	-

OFDM: 802.11n_HT20(MCS0)

Low Channel (2 412 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 310.00	23.74	Peak	H	28.07	5.35	57.16	74.00	16.84
*2 310.00	14.37	Average	H	28.07	5.35	47.79	54.00	6.21
*2 389.54	28.86	Peak	H	28.15	5.38	62.39	74.00	11.61
*2 389.43	16.68	Average	H	28.15	5.38	50.21	54.00	3.79
*2 390.00	27.64	Peak	H	28.15	5.38	61.17	74.00	12.83
*2 390.00	16.68	Average	H	28.15	5.38	50.21	54.00	3.79

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 824.02	45.78	Peak	V	32.71	-29.81	48.68	74.00	25.32
*4 824.16	38.85	Average	V	32.71	-29.81	41.75	54.00	12.25
Above 4 900.00	Not detected	-	-	-	-	-	-	-

Middle Channel (2 437 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 873.83	47.53	Peak	V	32.84	-29.50	50.87	74.00	23.13
*4 874.10	40.38	Average	V	32.84	-29.50	43.72	54.00	10.28
Above 4 900.00	Not detected	-	-	-	-	-	-	-

High Channel (2 462 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 483.50	27.54	Peak	H	28.24	5.44	61.22	74.00	12.78
*2 483.50	16.29	Average	H	28.24	5.44	49.97	54.00	4.03
*2 486.07	29.48	Peak	H	28.25	5.45	63.18	74.00	10.82
*2 484.74	16.61	Average	H	28.24	5.45	50.30	54.00	3.70
*2 500.00	26.14	Peak	H	28.26	5.49	59.89	74.00	14.11
*2 500.00	15.61	Average	H	28.26	5.49	49.36	54.00	4.64

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 923.97	46.01	Peak	V	32.98	-29.67	49.32	74.00	24.68
*4 924.15	38.47	Average	V	32.98	-29.67	41.78	54.00	12.22
Above 5 000.00	Not detected	-	-	-	-	-	-	-

OFDM: 802.11n_HT40(MCS0)

Low Channel (2 422 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 310.00	23.92	Peak	H	28.07	5.35	57.34	74.00	16.66
*2 310.00	14.52	Average	H	28.07	5.35	47.94	54.00	6.06
*2 389.32	28.62	Peak	H	28.15	5.38	62.15	74.00	11.85
*2 389.98	16.73	Average	H	28.15	5.38	50.26	54.00	3.74
*2 390.00	26.71	Peak	H	28.15	5.38	60.24	74.00	13.76
*2 390.00	16.73	Average	H	28.15	5.38	50.26	54.00	3.74

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 844.25	46.68	Peak	V	32.76	-29.85	49.59	74.00	24.41
*4 844.12	40.58	Average	V	32.76	-29.85	43.49	54.00	10.51
Above 4 900.00	Not detected	-	-	-	-	-	-	-

Middle Channel (2 437 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 874.15	46.35	Peak	V	32.84	-29.50	49.69	74.00	24.31
*4 874.04	40.85	Average	V	32.84	-29.50	44.19	54.00	9.81
Above 4 900.00	Not detected	-	-	-	-	-	-	-

High Channel (2 452 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*2 483.50	27.52	Peak	H	28.24	5.44	61.20	74.00	12.80
*2 483.50	16.59	Average	H	28.24	5.44	50.27	54.00	3.73
*2 483.59	28.31	Peak	H	28.24	5.44	61.99	74.00	12.01
*2 483.55	17.32	Average	H	28.24	5.44	51.00	54.00	3.00
*2 500.00	25.51	Peak	H	28.26	5.49	59.26	74.00	14.74
*2 500.00	15.86	Average	H	28.26	5.49	49.61	54.00	4.39

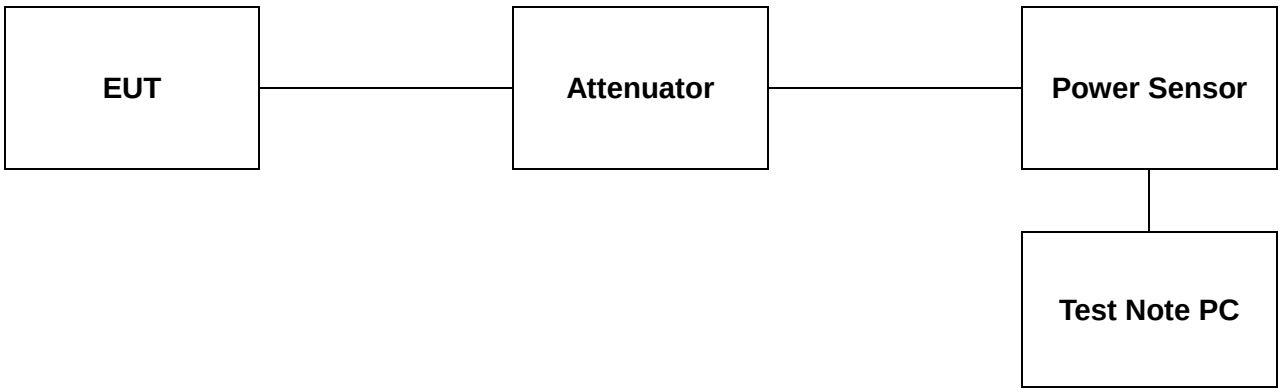
Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
*4 924.07	44.93	Peak	V	32.98	-29.67	48.24	74.00	25.76
*4 924.13	38.45	Average	V	32.98	-29.67	41.76	54.00	12.24
Above 5 000.00	Not detected	-	-	-	-	-	-	-

Remarks:

1. "*" means the restricted band.
2. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
3. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
4. Actual = Reading + AF + AMP + CL or Reading + AF + CL.
5. According to § 15.31(o), Emission levels are not reported much lower than the limits by over 20 ㏈.

3. Maximum Peak Conducted Output Power

3.1. Test Setup



3.2. Limit

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 ㎒, 2 400 ~ 2 483.5 ㎒, and 5 725 ~ 5 850 ㎒ band : 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antennas with directional gains that do not exceed 6 ㏈i. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 ㏈i are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in ㏈ that the directional gain of the antenna exceeds 6 ㏈i.

3.3. Test Procedure

The test follows section 9.1.2 of FCC KDB Publication 558074 v03r05.

- Peak power meter method

-The maximum peak conducted output power can be measured using a broad band 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.

Test program: (S/W name : R&S Power Viewer, Version : 3.2.0)

1. Initially overall offset for attenuator and cable loss is measured per frequency.
2. Measured offset is inserted in test program in advance of measurement for output power.
3. Power for each frequency (channel) and data rate of device is investigated as final result.
4. Final result reported on this section from R&S power viewer program includes with several factors and test program shows only final result.

3.4. Test Results

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Mode	Channel	Frequency (㎒)	Data Rate (Mbps)	Attenuator + Cable offset (㏈)	Peak Power Result (㏈m)
DSSS (802.11b)	Low	2 412	1	21.51	13.50
			2		13.45
			5.5		10.84
			11		13.68
	Middle	2 437	1	21.53	13.89
			2		14.02
			5.5		14.08
			11		14.00
	High	2 462	1	21.51	**14.27**
			2		11.70
			5.5		14.16
			11		14.14
OFDM (802.11g)	Low	2 412	6	21.51	**13.76**
			9		13.42
			12		13.26
			18		11.47
			24		12.56
			36		11.74
			48		10.25
			54		10.43
	Middle	2 437	6	21.53	13.56
			9		12.75
			12		13.35
			18		11.38
			24		12.41
			36		11.86
			48		10.35
			54		10.98
	High	2 462	6	21.51	13.68
			9		12.98
			12		13.12
			18		11.14
			24		11.77
			36		11.75
			48		10.27
			54		11.01

Mode	Channel	Frequency (㎒)	Data rate	Attenuator + Cable offset (㏈)	Peak Power Result (㏈m)
OFDM (802.11n_HT20)	Low	2 412	MCS0	21.51	12.99
			MCS1		13.43
			MCS2		13.20
			MCS3		11.65
			MCS4		13.03
			MCS5		10.98
			MCS6		11.01
			MCS7		8.69
	Middle	2 437	MCS0	21.53	11.81
			MCS1		13.15
			MCS2		**13.91**
			MCS3		12.05
			MCS4		12.34
			MCS5		11.35
			MCS6		11.52
			MCS7		8.95
	High	2 462	MCS0	21.51	13.25
			MCS1		12.89
			MCS2		13.66
			MCS3		11.72
			MCS4		11.99
			MCS5		11.12
			MCS6		11.23
			MCS7		8.80

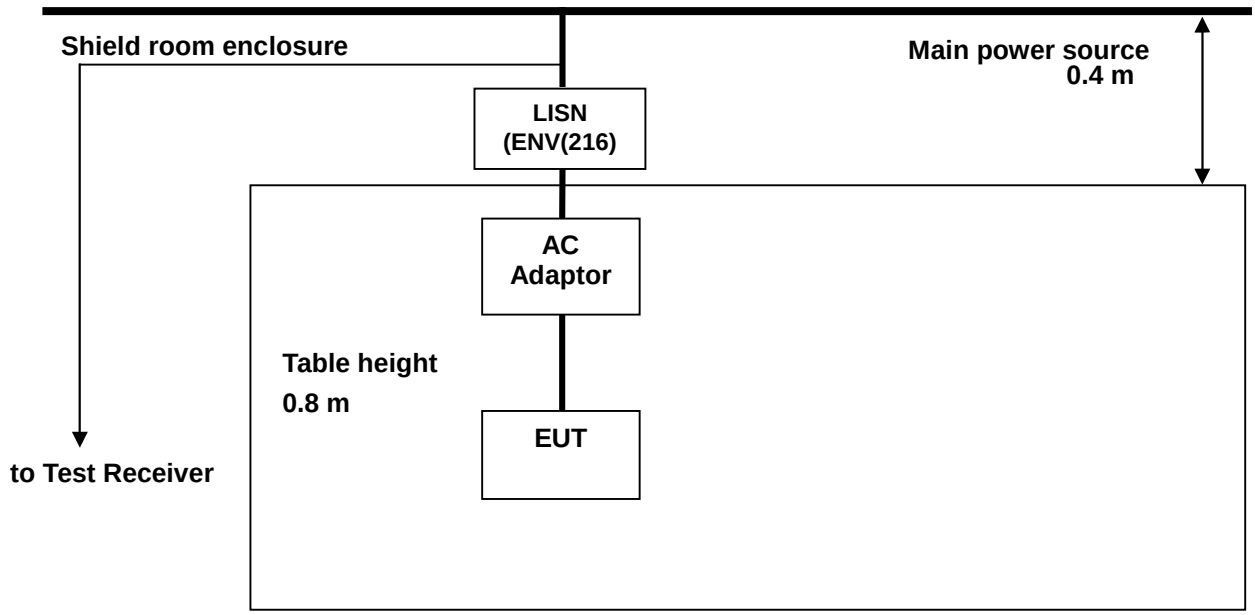
Mode	Channel	Frequency (㎒)	Data rate	Attenuator + Cable offset (㏈)	Peak Power Result (㏈m)
OFDM (802.11n_HT40)	Low	2 422	MCS0	21.51	12.65
			MCS1		12.22
			MCS2		12.19
			MCS3		12.59
			MCS4		11.77
			MCS5		11.28
			MCS6		8.98
			MCS7		7.62
	Middle	2 437	MCS0	21.53	**12.80**
			MCS1		12.42
			MCS2		12.43
			MCS3		12.56
			MCS4		11.82
			MCS5		11.53
			MCS6		9.10
			MCS7		7.85
	High	2 452	MCS0	21.51	12.75
			MCS1		12.08
			MCS2		12.26
			MCS3		12.38
			MCS4		11.12
			MCS5		11.31
			MCS6		9.04
			MCS7		7.53

Remark:

Attenuator and cable offset was compensated in test program (R&S Power Viewer) before measuring.

4. Transmitter AC Power Line Conducted Emission

4.1. Test Setup



4.2. Limit

According to §15.207(a) for an intentional radiator 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 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50 ㎛H /50 ohm line impedance stabilization network(LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency of Emission (㎒)	Conducted limit (dB㎶)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

* Decreases with the logarithm of the frequency.

4.3. Test Procedures

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.
AC line conducted emissions from the EUT were measured according to the dictates of ANSI C63.10-2009

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. The excess power cable between the EUT and the LISN was bundled. All connecting cables of EUT were moved to find the maximum emission.

4.4. Test Results

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Frequency range : 0.15 ㎒ – 30 ㎒
Measured Bandwidth : 9 ㎑

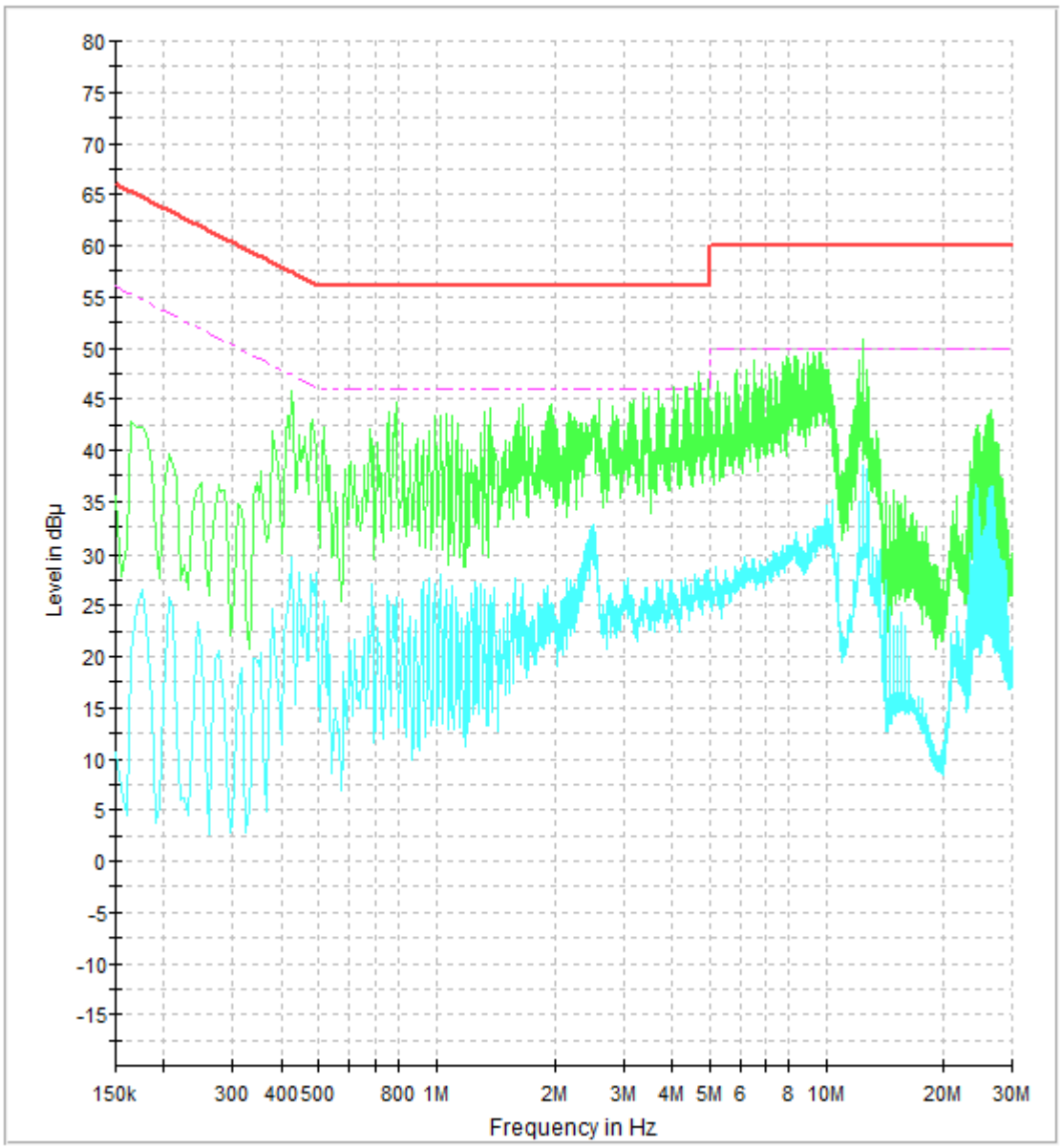
FREQ.	LEVEL(dBμV)		LINE	LIMIT(dBμV)		MARGIN(dB)	
(㎒)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.42	37.50	27.40	N	57.45	47.45	19.95	20.05
4.70	37.10	26.00	N	56.00	46.00	18.90	20.00
6.51	38.60	28.80	N	60.00	50.00	21.40	21.20
8.98	39.60	30.60	N	60.00	50.00	20.40	19.40
12.42	44.40	39.30	N	60.00	50.00	15.60	10.70
0.48	47.50	38.00	H	56.34	46.34	8.84	8.34
3.79	41.40	31.10	H	56.00	46.00	14.60	14.90
9.66	45.60	36.40	H	60.00	50.00	14.40	13.60
12.07	47.20	38.40	H	60.00	50.00	12.80	11.60
12.42	49.60	42.80	H	60.00	50.00	10.40	7.20

Remark;

1. Line (H): Hot, Line (N): Neutral
2. All modes of operation were investigated and the worst-case emissions were reported using 11b Mode, 1Mbps, High channel.
3. Traces shown in plot mad using a peak detector and average detector
4. The limit for Class B device(s) from 150 ㎑ to 30 ㎒ are specified in Section of the Title 47 CFR.
5. Deviations to the Specifications: None.

Plots of Conducted Power line

Test mode: (Neutral)



Test mode: (Hot)