FCC Test Report

Report No.:	RF150923D10
FCC ID:	2AEFTAW313T
Test Model:	AW313T
Received Date:	Sep. 23, 2015
Test Date:	Sep. 25 ~ Oct. 30, 2015
Issued Date:	Nov. 6, 2015
Applicant:	AVerMedia Technologies Inc.
Address:	NO.135, Jian 1st Rd., Zhonghe Dist, New Taipei City, Taiwan (R.O.C.)
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF150923D10	Original release.	Nov. 6, 2015

1 Certificate of Conformity

Product:	Smart Microphone
Brand:	AVerMedia
Test Model:	AW313T
Sample Status:	Engineering sample
Applicant:	AVerMedia Technologies Inc.
Test Date:	Sep. 25 ~ Oct. 30, 2015
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2009

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Annie Chang , **Date:** Nov. 6, 2015

Annie Chang / Senior Specialist

Approved by : Rex. Lai , **Date:** Nov. 6, 2015

Rex Lai / Assistant Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is is -8.16dB at 3.28906 MHz
15.247(a)(1)(iii)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.205 & 209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -9.9dB at 924.29MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -10.0dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE: If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.43 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	4.00 dB
Radiated Emissions above 1 GHz	1GHz ~ 40GHz	3.36 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Smart Microphone
Brand	AVerMedia
Test Model	AW313T
Status of EUT	Engineering sample
Power Supply Rating	Adapter or Battery (DC 5V)
Modulation Type	shaped-8FSK modulation
Modulation Technology	FHSS
Transfer Rate	5Mbps
Operating Frequency	2406 ~ 2474MHz
Number of Channel	18
Output Power	7.870mW
Antenna Type	PCB antenna with 0.46dBi gain
Antenna Connector	N/A
Accessory Device	Adapter
Data Cable Supplied	1.5m Shielded USB cable 1.8m Shielded Audio cable (3.5mm) 1.5m Shielded Audio cable (RCA to 3.5mm) 1.3m Shielded Microphone cable

Note:

1. The EUT uses following adapters:

Item	Brand	Model No.	Rating
Adapter 1	APD	WA-10L05RU	AC I/P: 100-240V, 50-60Hz, 0.5A DC O/P: 5V, 2A
Adapter 2	APD	WB-10E05R	AC I/P: 100-240V, 50-60Hz, 0.4A DC O/P: 5V, 2A

After pre-tested above power source, the **Adapter 1** was the worst case, therefore, only its test data was recorded in this report.

2. The EUT was pre-tested with the following modes:
   - ✧ Operating + Charging Mode (EUT with Adapter 1)
   - ✧ Operating + Charging Mode (EUT with Adapter 2)
   - ✧ Operating Mode (EUT only)

   The worst emission level was found when the EUT tested under **Operating + Charging Mode (EUT with Adapter 1).**

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 Description of Test Modes

18 channels are provided for EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)
4	2406	40	2442
8	2410	44	2446
12	2414	48	2450
16	2418	52	2454
20	2422	56	2458
24	2426	60	2462
28	2430	64	2466
32	2434	68	2470
36	2438	72	2474

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Adapter 1
B	-	-	-	√	With System
C	-	-	-	√	Adapter 2

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
A	4 to 72	4, 36, 72	FHSS	shaped-8FSK

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
A	4 to 72	72	FHSS	shaped-8FSK

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
A	4 to 72	72	FHSS	shaped-8FSK
B	4 to 72	72	FHSS	shaped-8FSK
C	4 to 72	72	FHSS	shaped-8FSK

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
A	4 to 72	4, 36, 72	FHSS	shaped-8FSK

Test Condition:

APPLICABLE TO	EUT CONFIGURE MODE	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	A	28deg. C, 69%RH	120Vac, 60Hz	Aaron You
RE<1G	A	28deg. C, 69%RH	120Vac, 60Hz	Aaron You
PLC	A	23deg. C, 74%RH	120Vac, 60Hz	Aaron You
	B	28deg. C, 72%RH	120Vac, 60Hz (System)	Chin-wen Wang
	C	24deg. C, 71%RH	120Vac, 60Hz	Aaron You
APCM	A	25deg. C, 60%RH	120Vac, 60Hz	Saxon Lee

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Cell Phone	HTC	PJ46100	HT261W101910	NM8PJ46100	Provided by Lab
B.	AC Adapter	APD	WA-10L05RU	N/A	N/A	Supplied by client
C.	Smart Microphone	AVerMedia	AW310R	N/A	N/A	Supplied by client
D.	EARPHONE	PHILIPS	SBC HL145	N/A	N/A	Provided by Lab
E.	AC Adapter	APD	WA-10L05RU	N/A	N/A	Supplied by client
F.	PERSONAL COMPUTER	DELL	VOSTRO 470	5VBJYBX	FCC DoC Approved	Supplied by client
G.	LCD MONITOR	DELL	U2410	CN082WXD728720C C10NL	FCC DoC Approved	Provided by Lab
H.	USB Keyboard	BTC	5200U	G09302046360	E5XKB5122U	Provided by Lab
I.	USB Mouse	Microsoft	1113	9170515896665	FCC DoC Approved	Provided by Lab
J.	USB 2.0 Hard Disk	BUFFALO	HD-LBU2	55519210500014	FCC DoC Approved	Provided by Lab
K.	USB PRINTER	LEXMARK	Z33	03331652893	FCC DoC Approved	Provided by Lab

Note:

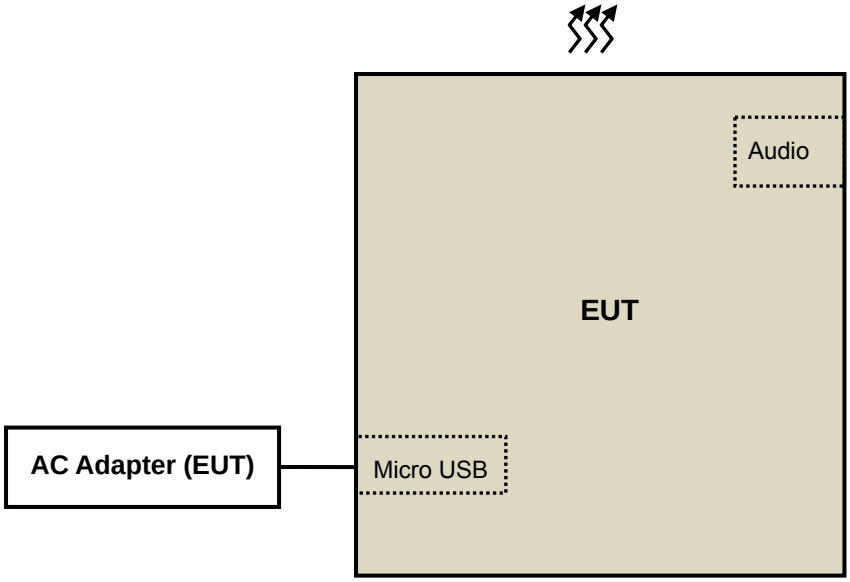
1. All power cords of the above support units are non-shielded (1.8m).
2. Items C~E acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Audio cable	1	1.8	N	0	Provided by Lab
2.	USB cable	1	1.5	Y	0	Supplied by client
3.	Audiocable	1	1.8	N	0	Provided by Lab
4.	USB cable	1	1.0	Y	0	Supplied by client
5.	D-Sub cable	1	1.8	Y	2	Provided by Lab
6.	USB cable	1	1.5	Y	0	Provided by Lab
7.	USB cable	1	1.8	Y	1	Provided by Lab
8.	USB cable	1	1.8	Y	0	Provided by Lab
9.	USB cable	1	1.8	Y	0	Provided by Lab

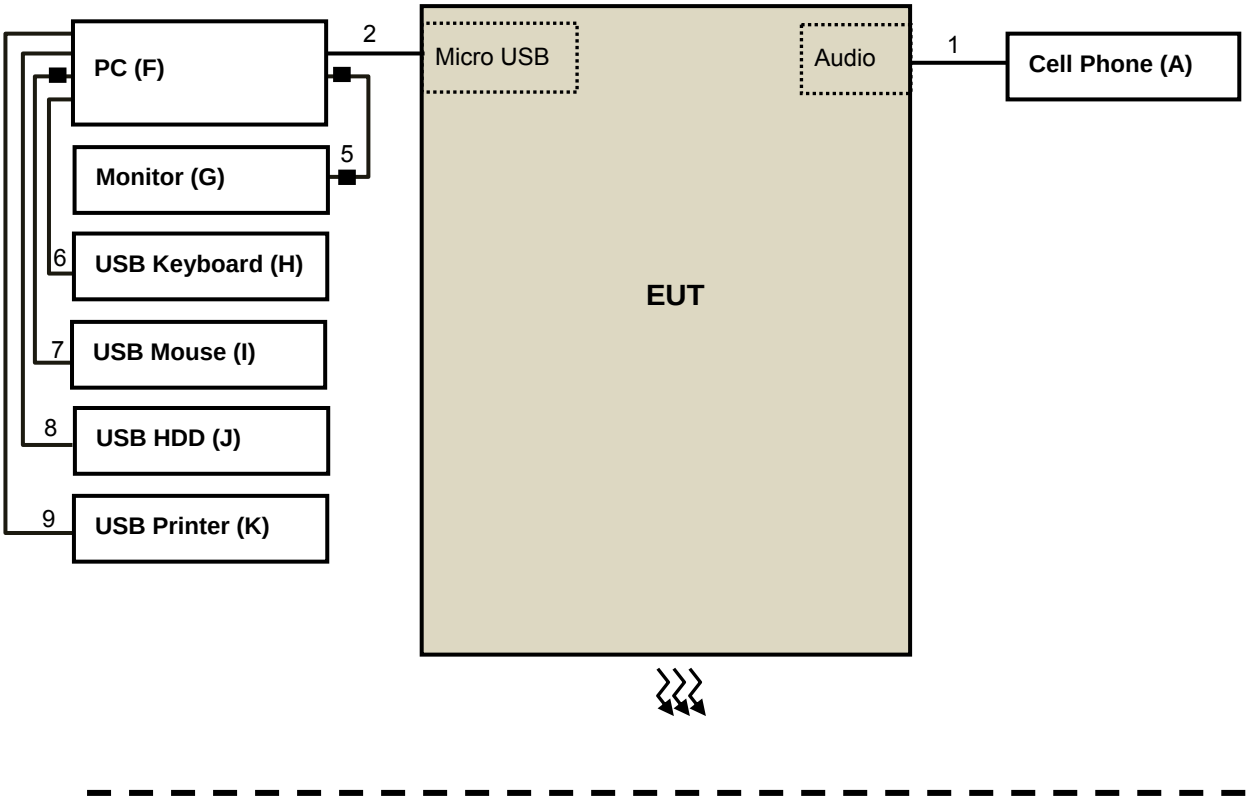
Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test

For Mode A & C:



For Mode B:


PC (F)
2
Micro USB
Audio
1
Cell Phone (A)
Monitor (G)
5
6
USB Keyboard (H)
EUT
7
USB Mouse (I)
8
USB HDD (J)
9
USB Printer (K)
Remote site
Earphone (D)
3
Smart Microphone (C)
4
AC Adapter (E)

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)
FCC Public Notice DA 00-705
ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 26, 2015	Feb. 25, 2016
HP Preamplifier	8449B	3008A01201	Feb. 26, 2015	Feb. 25, 2016
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 01, 2015	Feb. 28, 2016
Agilent Spectrum	E4446A	MY51100050	Oct. 24, 2014	Oct. 23, 2015
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 20, 2015	Jan. 19, 2016
Schwarzbeck Antenna	VULB 9168	139	Feb. 04, 2015	Feb. 03, 2016
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2015	May 28, 2017
Schwarzbeck Horn Antenna	BBHA-9170	212	Feb. 09, 2015	Feb. 08, 2016
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Feb. 10, 2015	Feb. 09, 2016
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.4	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF104	CABLE-CH6	Aug. 15, 2015	Aug. 14, 2016
SUHNER RF cable With 3dB PAD	SF102	Cable-CH8-3.6m	Aug. 15, 2015	Aug. 14, 2016
EMCO Horn Antenna	3115	00028257	Feb. 05, 2015	Feb. 04, 2016
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2015	Sep. 22, 2016
Anritsu Power Sensor	MA2411B	0738404	Apr. 21, 2015	Apr. 20, 2016
Anritsu Power Meter	ML2495A	0842014	Apr. 21, 2015	Apr. 20, 2016

NOTE: 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.
4. The Industry Canada Reference No. IC 7450E-6.
5. The FCC Site Registration No. is 447212.

4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. 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.

d. 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.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note:

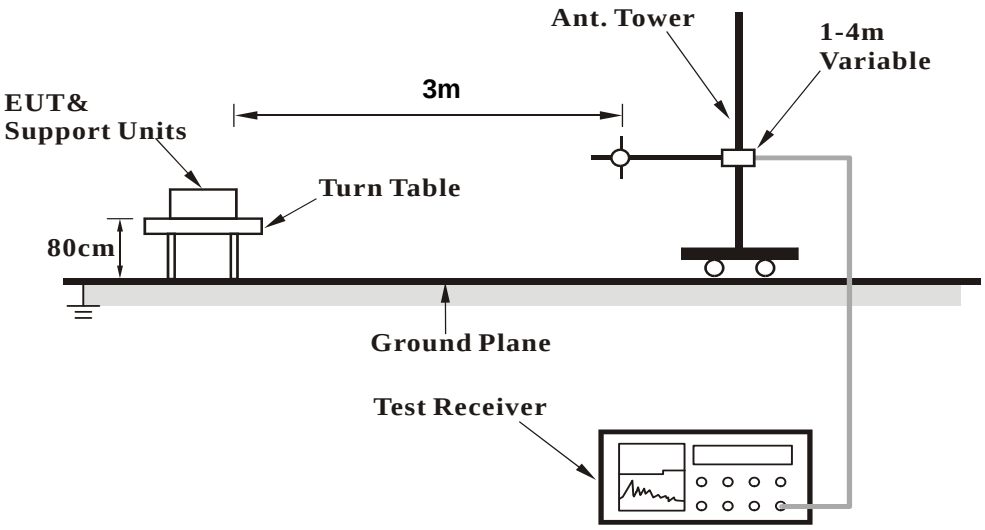
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

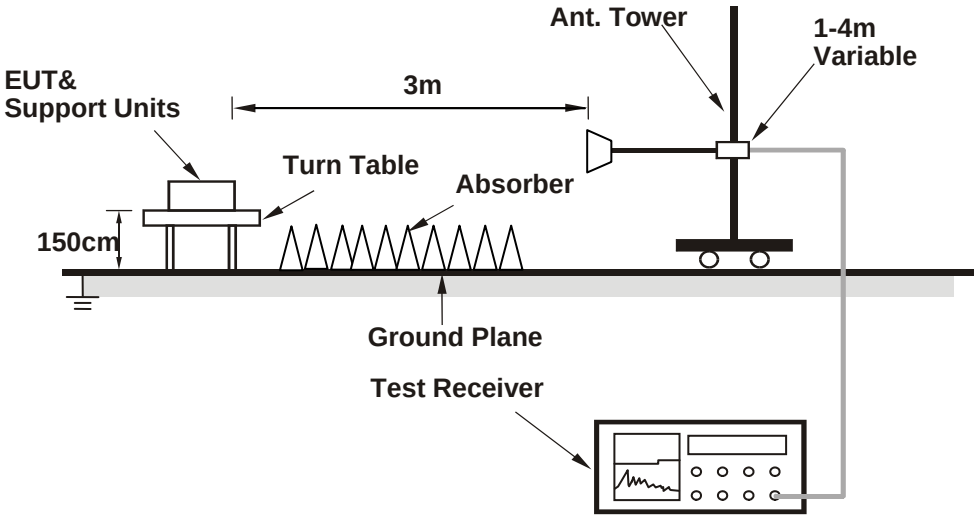
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

Mode A:

a. Connected the EUT to adapter via USB cable.
b. Set the EUT under transmission condition continuously at specific channel frequency.

Mode B:

a. Connected the EUT to PC.
b. Checked if the EUT and the Smart Microphone (kept in a remote area) were set at the same channel.
c. Set the EUT and the Smart Microphone (kept in a remote area) under transmitting condition at specific channel continuously.
d. Set the EUT under charging condition.
e. EUT received audio messages from cell phone then EUT sent Audio messages to Smart Microphone (kept in a remote area) via wireless transmission.
f. PC sent "H" messages to monitor then displayed these messages on its screen.
g. PC read and wrote messages from/to HDD and ext. USB HDD.
h. PC sent messages to printer then the printer printed them out.
i. Repeated steps e-h.

4.1.7 Test Results

ABOVE 1GHz DATA：

CHANNEL	TX Channel 4	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.1 PK	74.0	-16.9	2.27 H	128	56.55	0.52
2	2390.00	42.7 AV	54.0	-11.3	2.27 H	128	42.15	0.52
3	#2400.00	57.7 PK	74.0	-16.4	2.27 H	128	57.06	0.59
4	#2400.00	42.9 AV	54.0	-11.1	2.27 H	128	42.27	0.59
5	*2406.00	108.0 PK			2.27 H	128	107.34	0.62
6	*2406.00	46.4 AV			2.27 H	128	45.79	0.62
7	4812.00	55.1 PK	74.0	-18.9	1.49 H	256	47.27	7.80
8	4812.00	36.8 AV	54.0	-17.2	1.49 H	256	28.98	7.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.6 PK	74.0	-18.5	3.06 V	184	55.03	0.52
2	2390.00	41.8 AV	54.0	-12.3	3.06 V	184	41.23	0.52
3	#2400.00	55.8 PK	74.0	-18.2	3.06 V	184	55.17	0.59
4	#2400.00	41.9 AV	54.0	-12.2	3.06 V	184	41.26	0.59
5	*2406.00	103.9 PK			3.06 V	184	103.24	0.62
6	*2406.00	45.5 AV			3.06 V	184	44.91	0.62
7	4812.00	53.9 PK	74.0	-20.1	2.52 V	176	46.12	7.80
8	4812.00	35.8 AV	54.0	-18.2	2.52 V	176	27.99	7.80

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2438.00	106.6 PK			2.20 H	120	105.79	0.77
2	*2438.00	44.9 AV			2.20 H	120	44.17	0.77
3	4876.00	53.5 PK	74.0	-20.5	1.73 H	226	45.55	7.93
4	4876.00	36.2 AV	54.0	-17.8	1.73 H	226	28.31	7.93
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2438.00	102.2 PK			2.99 V	169	101.42	0.77
2	*2438.00	43.6 AV			2.99 V	169	42.78	0.77
3	4876.00	53.2 PK	74.0	-20.8	1.80 V	16	45.27	7.93
4	4876.00	35.3 AV	54.0	-18.7	1.80 V	16	27.40	7.93

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	TX Channel 72	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2474.00	107.8 PK			1.97 H	200	106.83	0.93
2	*2474.00	46.8 AV			1.97 H	200	45.87	0.93
3	2483.50	62.0 PK	74.0	-12.0	1.97 H	200	61.06	0.98
4	**2483.50**	**44.1 AV**	**54.0**	**-10.0**	**1.97 H**	**200**	**43.07**	**0.98**
5	4948.00	54.4 PK	74.0	-19.6	1.63 H	237	46.20	8.17
6	4948.00	36.7 AV	54.0	-17.3	1.63 H	237	28.55	8.17
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2474.00	101.3 PK			2.64 V	290	100.38	0.93
2	*2474.00	44.5 AV			2.64 V	290	43.55	0.93
3	2483.50	56.3 PK	74.0	-17.8	2.64 V	290	55.27	0.98
4	2483.50	42.8 AV	54.0	-11.2	2.64 V	290	41.82	0.98
5	4948.00	53.3 PK	74.0	-20.7	1.76 V	163	45.17	8.17
6	4948.00	35.7 AV	54.0	-18.3	1.76 V	163	27.50	8.17

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 72	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	40.28	21.3 QP	40.0	-18.7	4.00 H	206	30.77	-9.46
2	120.74	22.7 QP	43.5	-20.8	4.00 H	348	33.77	-11.08
3	482.21	27.9 QP	46.0	-18.1	2.78 H	119	31.00	-3.09
4	592.76	29.8 QP	46.0	-16.2	1.66 H	287	30.44	-0.60
5	760.12	32.7 QP	46.0	-13.4	1.35 H	94	30.44	2.21
6	**924.29**	**36.1 QP**	**46.0**	**-9.9**	**1.00 H**	**71**	**31.16**	**4.93**
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	40.48	27.7 QP	40.0	-12.4	1.48 V	172	37.06	-9.41
2	124.09	23.6 QP	43.5	-20.0	1.00 V	334	34.05	-10.50
3	399.08	24.6 QP	46.0	-21.4	2.07 V	234	29.41	-4.82
4	501.03	27.5 QP	46.0	-18.5	2.29 V	343	30.15	-2.61
5	791.11	32.0 QP	46.0	-14.0	2.64 V	186	29.54	2.50
6	982.49	35.3 QP	54.0	-18.7	1.88 V	106	29.38	5.94

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100276	Apr. 01, 2015	Mar. 31, 2016
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	Apr. 27, 2015	Apr. 26, 2016
LISN With Adapter (for EUT)	AD10	C10Ada-002	Apr. 27, 2015	Apr. 26, 2016
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 25, 2014	Nov. 24, 2015
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 06, 2015	May 05, 2016
Software	Cond_V7.3.7	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 17, 2015	Feb. 16, 2016
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 19, 2015	May 18, 2016
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 20, 2014	Nov. 19, 2015
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 20, 2014	Nov. 19, 2015

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 10.
3. The VCCI Site Registration No. C-1852.
4. Tested Date: Sep. 25 ~ Oct. 26, 2015

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

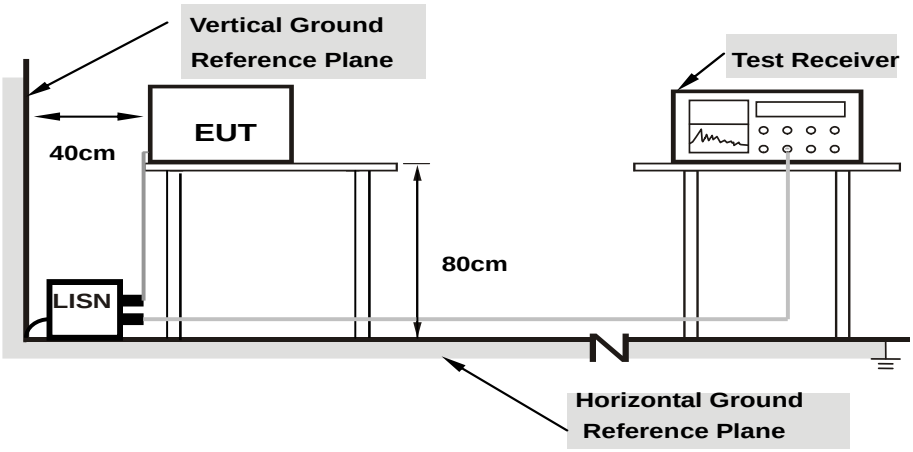
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation From Test Standard

No deviation.

4.2.5 Test Setup



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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Condition

Same as 4.1.6.

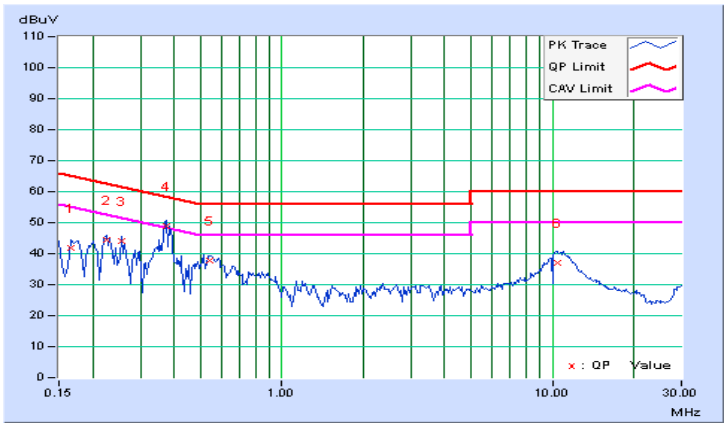
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	Mode A		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.67	32.31	21.52	41.98	31.19	65.18	55.18	-23.19	-23.98
2	0.22422	9.68	34.68	23.28	44.36	32.96	62.66	52.66	-18.30	-19.70
3	0.25547	9.68	34.38	23.83	44.06	33.51	61.58	51.58	-17.51	-18.06
4	0.37528	9.69	39.10	26.73	48.79	36.42	58.38	48.38	-9.59	-11.96
5	0.54453	9.71	28.24	17.04	37.95	26.75	56.00	46.00	-18.05	-19.25
6	10.48438	10.07	27.01	17.25	37.08	27.32	60.00	50.00	-22.92	-22.68

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

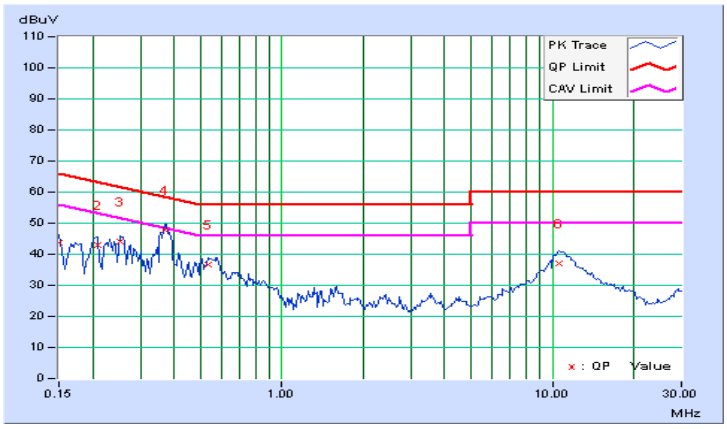


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	Mode A		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15001	9.72	34.15	22.03	43.87	31.75	66.00	56.00	-22.13	-24.25
2	0.20859	9.73	33.22	18.70	42.95	28.43	63.26	53.26	-20.31	-24.83
3	0.25156	9.73	34.52	21.98	44.25	31.71	61.71	51.71	-17.45	-19.99
4	0.36875	9.74	38.10	25.45	47.84	35.19	58.53	48.53	-10.69	-13.34
5	0.53281	9.75	26.78	15.07	36.53	24.82	56.00	46.00	-19.47	-21.18
6	10.58594	10.12	26.87	16.49	36.99	26.61	60.00	50.00	-23.01	-23.39

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

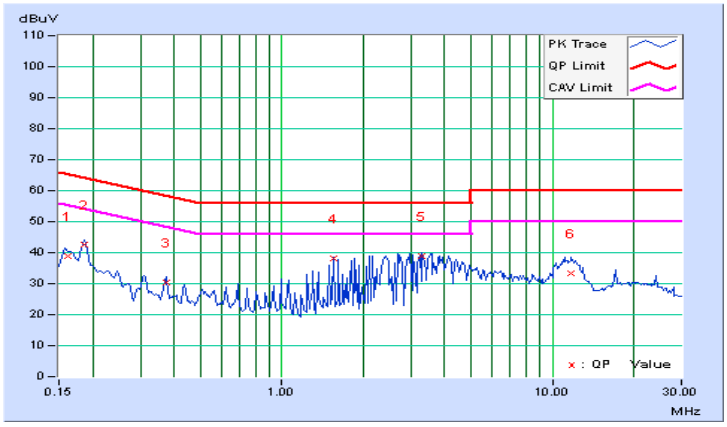


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	Mode B		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16163	9.67	29.04	26.68	38.71	36.35	65.38	55.38	-26.67	-19.03
2	0.18516	9.67	32.74	30.97	42.41	40.64	64.25	54.25	-21.84	-13.61
3	0.37266	9.67	20.57	17.69	30.24	27.36	58.44	48.44	-28.20	-21.08
4	1.55206	9.71	28.28	27.52	37.99	37.23	56.00	46.00	-18.01	-8.77
5	**3.28906**	**9.75**	**29.31**	**28.09**	**39.06**	**37.84**	**56.00**	**46.00**	**-16.94**	**-8.16**
6	11.72792	9.88	23.45	20.03	33.33	29.91	60.00	50.00	-26.67	-20.09

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

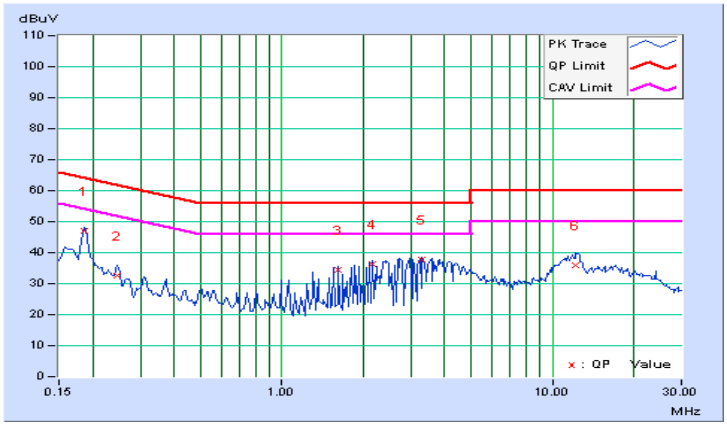


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	Mode B		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18644	9.71	37.19	36.08	46.90	45.79	64.19	54.19	-17.30	-8.41
2	0.24766	9.71	22.83	19.60	32.54	29.31	61.84	51.84	-29.30	-22.53
3	1.61328	9.74	24.60	24.34	34.34	34.08	56.00	46.00	-21.66	-11.92
4	2.17188	9.76	26.62	26.29	36.38	36.05	56.00	46.00	-19.62	-9.95
5	3.28906	9.79	27.82	27.38	37.61	37.17	56.00	46.00	-18.39	-8.83
6	12.22351	9.93	25.89	21.54	35.82	31.47	60.00	50.00	-24.18	-18.53

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

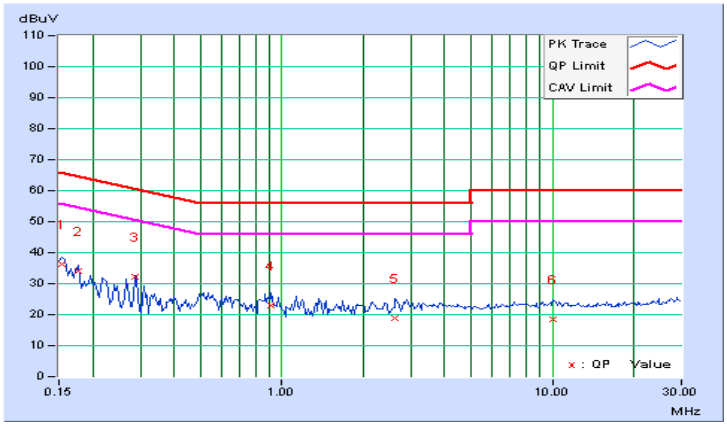


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	Mode C		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.67	26.70	14.49	36.37	24.16	65.79	55.79	-29.42	-31.63
2	0.17734	9.68	24.49	13.35	34.17	23.03	64.61	54.61	-30.44	-31.58
3	0.28672	9.68	22.50	16.49	32.18	26.17	60.62	50.62	-28.43	-24.44
4	0.91563	9.76	13.03	5.17	22.79	14.93	56.00	46.00	-33.21	-31.07
5	2.62500	9.88	8.97	3.11	18.85	12.99	56.00	46.00	-37.15	-33.01
6	10.08203	10.07	8.50	3.12	18.57	13.19	60.00	50.00	-41.43	-36.81

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

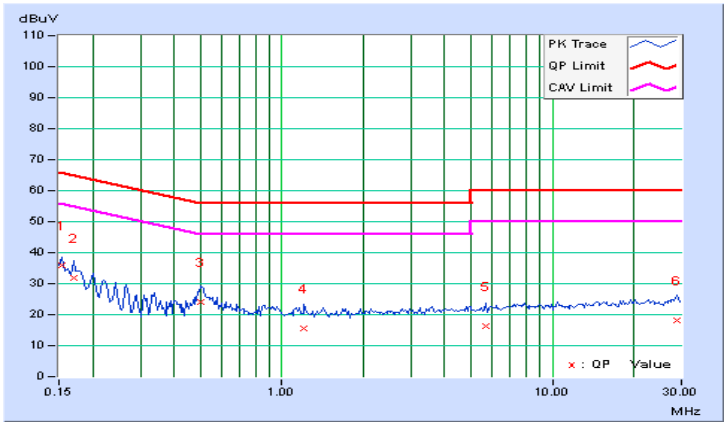


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	Mode C		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15392	9.72	26.12	13.33	35.84	23.05	65.79	55.79	-29.94	-32.73
2	0.16953	9.72	22.30	7.68	32.02	17.40	64.98	54.98	-32.96	-37.58
3	0.50156	9.75	14.28	4.02	24.03	13.77	56.00	46.00	-31.97	-32.23
4	1.20313	9.80	5.78	4.18	15.58	13.98	56.00	46.00	-40.42	-32.02
5	5.67969	10.02	6.11	5.36	16.13	15.38	60.00	50.00	-43.87	-34.62
6	28.82422	10.39	7.87	5.19	18.26	15.58	60.00	50.00	-41.74	-34.42

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

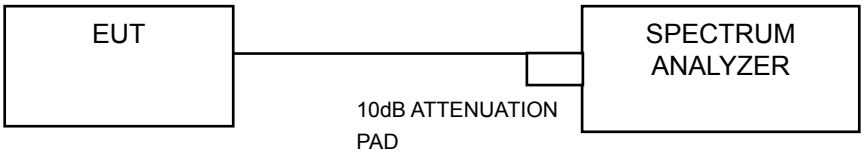


4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

At least 15 channels frequencies, and should be equally spaced.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.

d. Set the SA on View mode and then plot the result on SA screen.

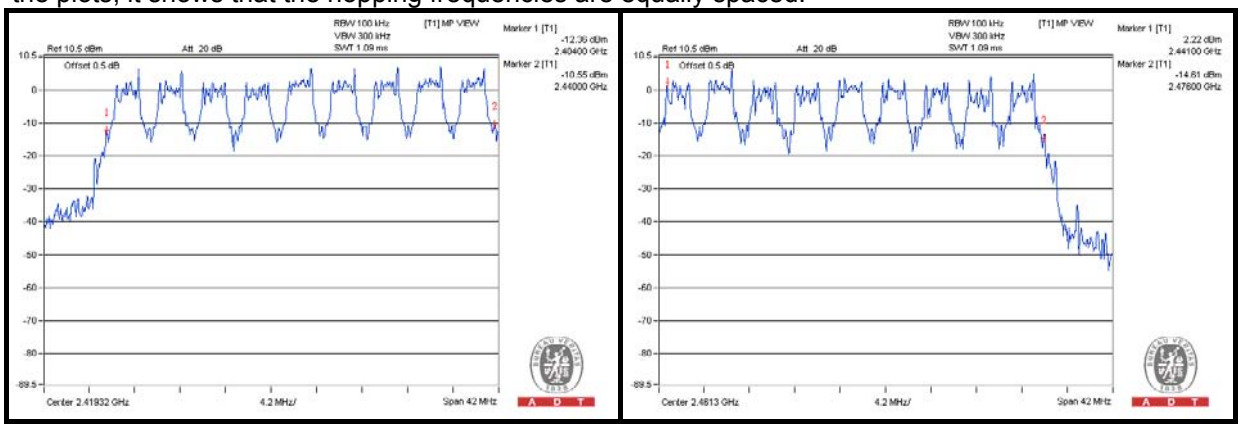
e. Repeat above procedures until all frequencies measured were complete.

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 Test Results

There are 18 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

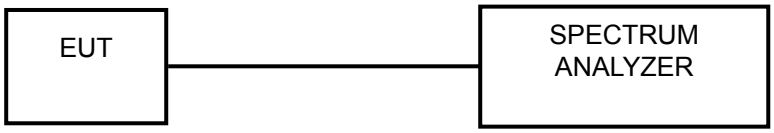


4.4 Dwell Time on Each Channel

4.4.1 Limits of Dwell Time on Each Channel Measurement

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

.

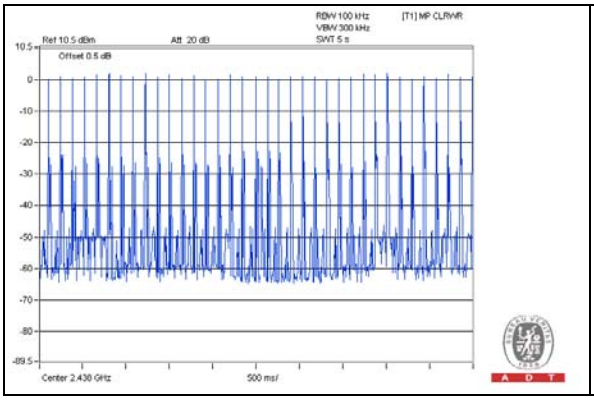
4.4.5 Deviation from Test Standard

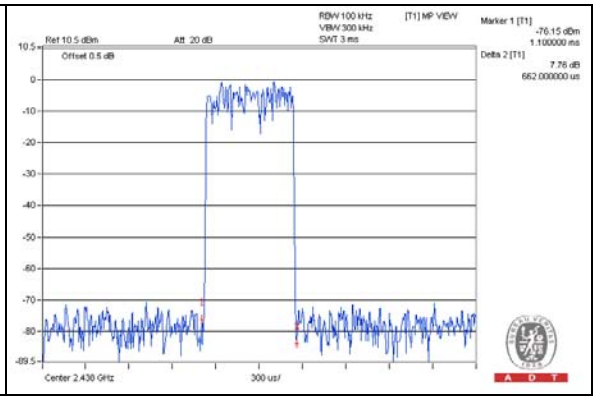
No deviation.

4.4.6 Test Results

Number of transmission in a 7.2 (18Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
36 (times / 5 sec) * 1.44 = 51.84 times	0.662	34.318	400

NOTE: Test plots of the transmitting time slot are shown on as below.



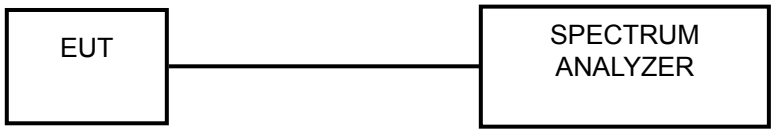


4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

4.5.5 Deviation from Test Standard

No deviation.

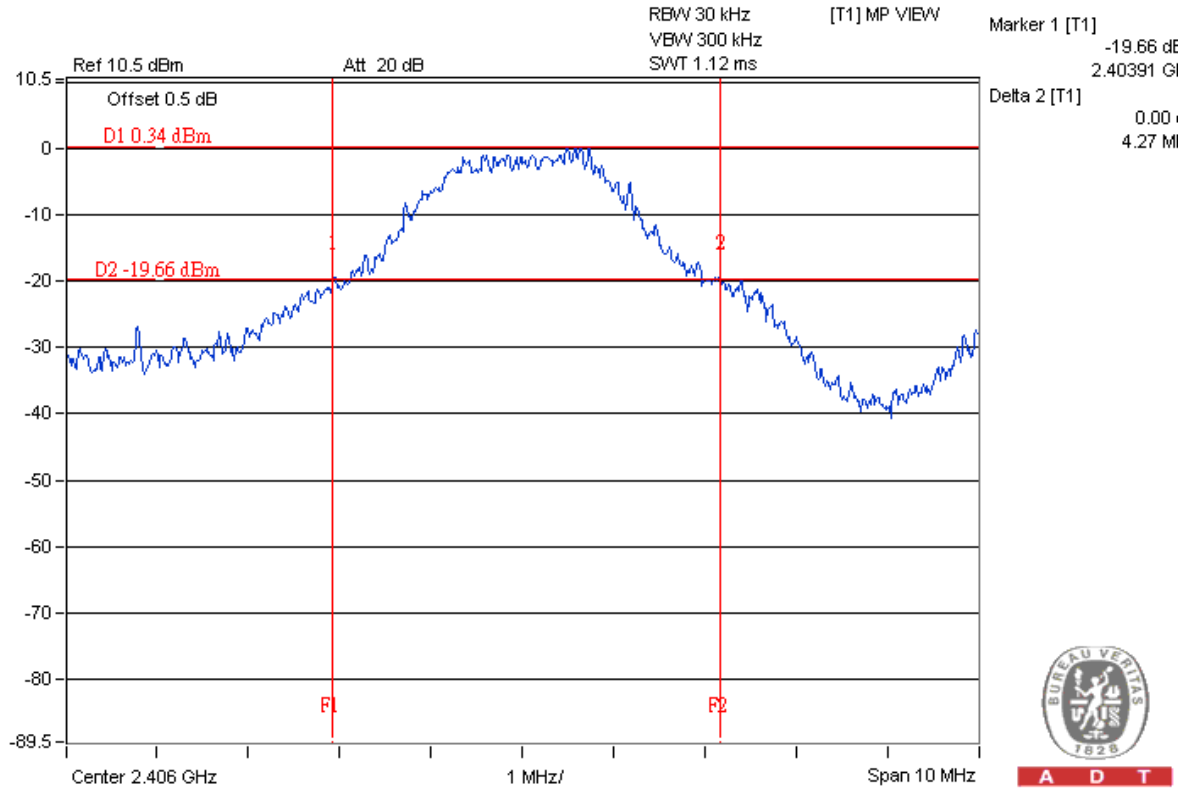
4.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
4	2406	4.27
36	2438	4.08
72	2474	4.05

Spectrum Plot of Worst Value

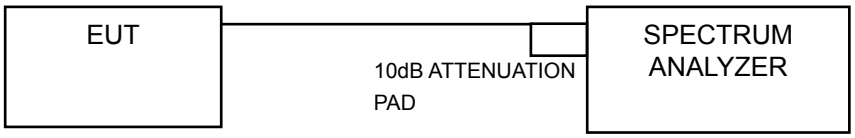


4.6 Hopping Channel Separation

4.6.1 Limits of Hopping Channel Separation Measurement

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

Measurement Procedure REF

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.

c. By using the MaxHold function record the separation of two adjacent channels.

d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

4.6.5 Deviation From Test Standard

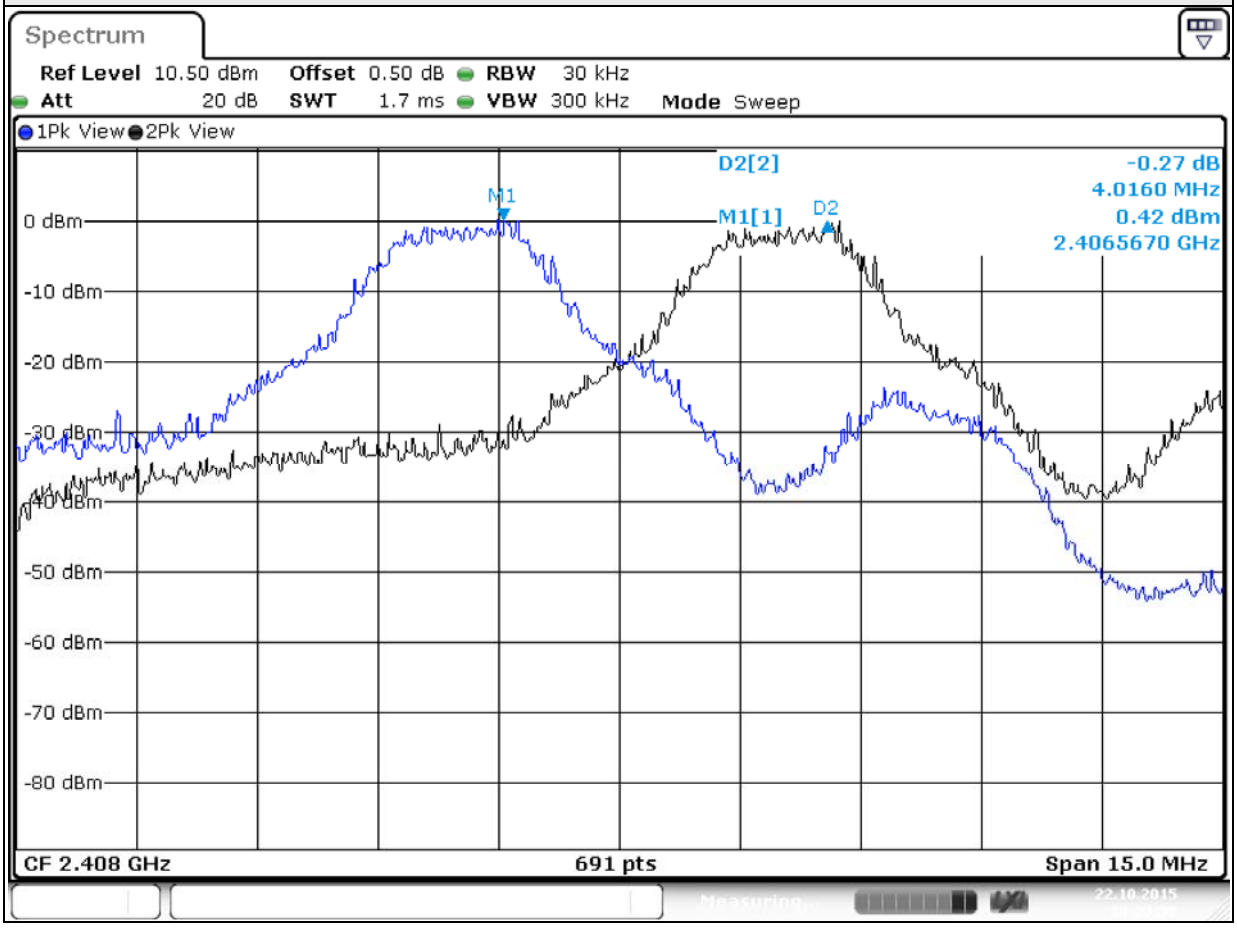
No deviation.

4.6.6 Test Results

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
4	2406	4.01	4.27	2.85	Pass
36	2438	4.01	4.08	2.72	Pass
72	2474	4.00	4.05	2.7	Pass

NOTE: The minimum limit is two-third 20dB bandwidth.

Spectrum Plot of Worst Value

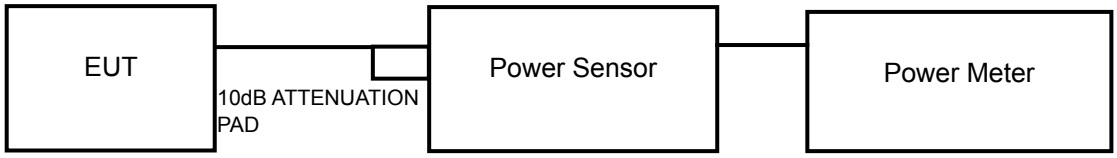


4.7 Maximum Output Power

4.7.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

A peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the peak power level.

4.7.5 Deviation fromTest Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

Channel	Frequency (MHZ)	Output Power (mW)	Output Power (dBm)	Power Limit (mW)	Pass / Fail
4	2406	6.067	7.83	125	Pass
36	2438	6.934	8.41	125	Pass
72	2474	**7.870**	8.96	125	Pass

4.8 Conducted Out of Band Emission Measurement

4.8.1 Limits Of Conducted Out Of Band Emission Measurement

Below –20dB of the highest emission level of operating band (in 100kHz RBW).

4.8.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 Deviation From Test Standard

No deviation.

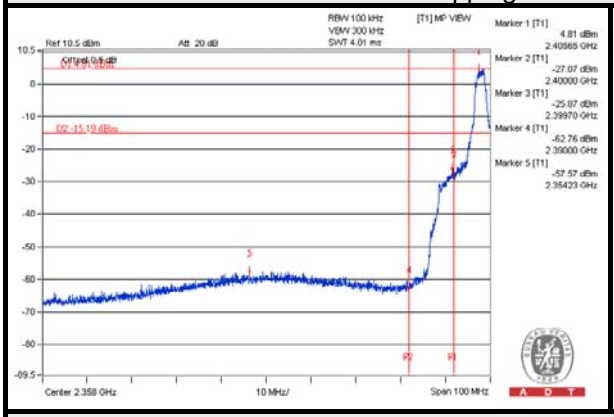
4.8.5 Eut Operating Condition

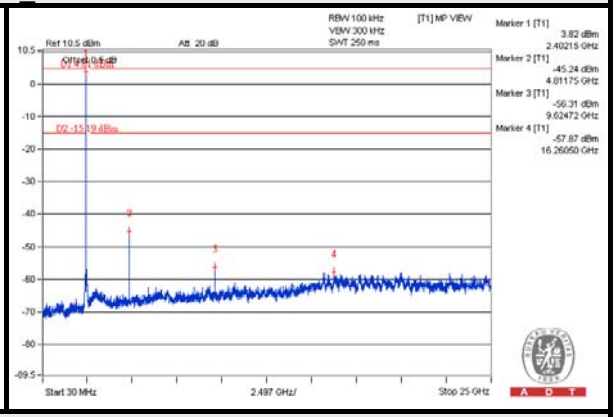
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 Test Results

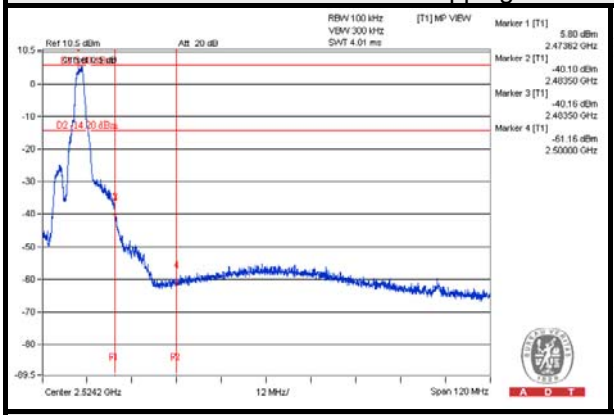
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

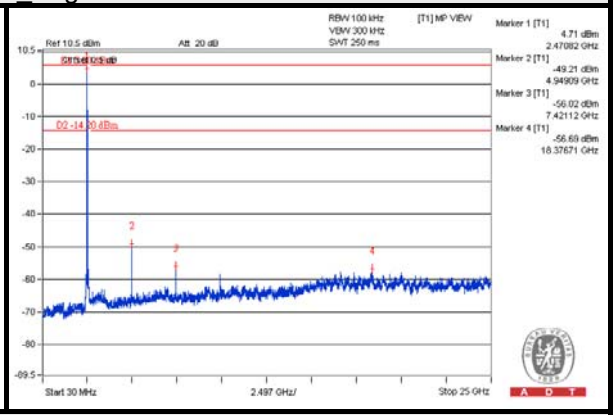
Hopping disabled_ Low Channel



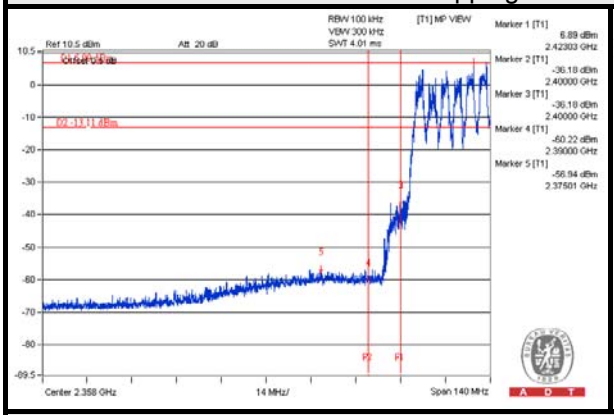


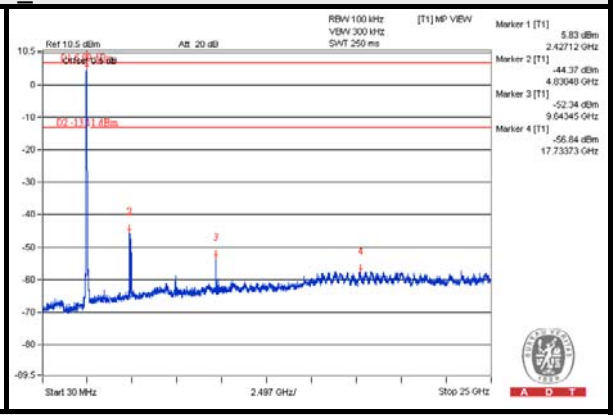
Hopping disabled_ High Channel



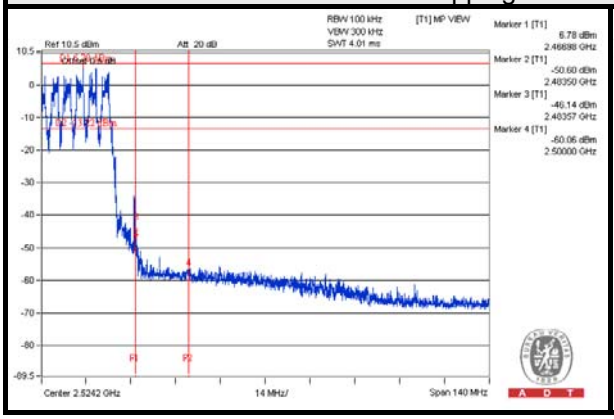


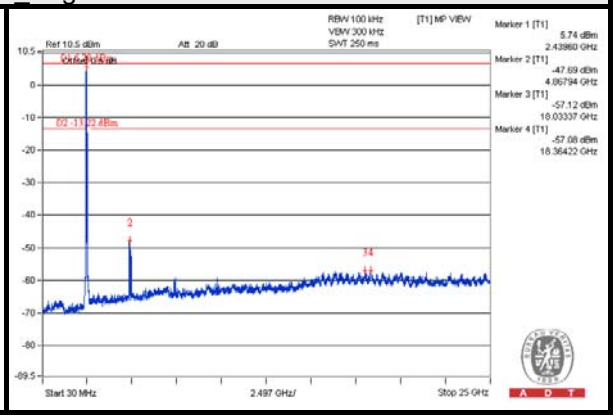
Hopping enabled_ Low Channel





Hopping enabled_ High Channel





5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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