

## FCC Test Report

**Report No.:** RF150707C20

**FCC ID:** RYYEYSGJN

**Test Model:** EYSGJN

**Received Date:** Jul. 07, 2015

**Test Date:** Jul. 09 ~ Aug. 06, 2015

**Issued Date:** Aug. 07, 2015

**Applicant:** TAIYO YUDEN CO., LTD.

**Address:** 8-1, Sakae-cho, Takasaki-shi, Gunma, 370-8522, Japan

**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.

**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)



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## Table of Contents

<b>Release Control Record</b>	<b>4</b>
<b>1 Certificate of Conformity</b>	<b>5</b>
<b>2 Summary of Test Results</b>	<b>6</b>
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
<b>3 General Information</b>	<b>7</b>
3.1 General Description of EUT	7
3.2 Description of Test Modes	7
3.2.1 Test Mode Applicability and Tested Channel Detail	8
3.3 Description of Support Units	9
3.3.1 Configuration of System under Test	9
3.4 General Description of Applied Standards	9
<b>4 Test Types and Results</b>	<b>11</b>
4.1 Radiated Emission and Bandedge Measurement	11
4.1.1 Limits of Radiated Emission and Bandedge Measurement	11
4.1.2 Test Instruments	12
4.1.3 Test Procedures	13
4.1.4 Deviation from Test Standard	13
4.1.5 Test Set Up	14
4.1.6 EUT Operating Conditions	14
4.1.7 Test Results	15
4.2 Conducted Emission Measurement	19
4.2.1 Limits of Conducted Emission Measurement	19
4.2.2 Test Instruments	19
4.2.3 Test Procedures	20
4.2.4 Deviation from Test Standard	20
4.2.5 Test Setup	20
4.2.6 EUT Operating Conditions	20
4.2.7 Test Results	21
4.3 6dB Bandwidth Measurement	23
4.3.1 Limits of 6dB Bandwidth Measurement	23
4.3.2 Test Setup	23
4.3.3 Test Instruments	23
4.3.4 Test Procedure	23
4.3.5 Deviation from Test Standard	23
4.3.6 EUT Operating Conditions	23
4.3.7 Test Result	24
4.4 Conducted Output Power Measurement	25
4.4.1 Limits of Conducted Output Power Measurement	25
4.4.2 Test Setup	25
4.4.3 Test Instruments	25
4.4.4 Test Procedures	25
4.4.5 Deviation from Test Standard	25
4.4.6 EUT Operating Conditions	25
4.4.7 Test Results	25
4.5 Power Spectral Density Measurement	26
4.5.1 Limits of Power Spectral Density Measurement	26
4.5.2 Test Setup	26
4.5.3 Test Instruments	26
4.5.4 Test Procedure	26
4.5.5 Deviation from Test Standard	26
4.5.6 EUT Operating Condition	26

4.5.7 Test Results .....	27
4.6 Conducted Out of Band Emission Measurement.....	28
4.6.1 Limits of Conducted Out of Band Emission Measurement.....	28
4.6.2 Test Setup.....	28
4.6.3 Test Instruments .....	28
4.6.4 Test Procedure .....	28
4.6.5 Deviation from Test Standard .....	28
4.6.6 EUT Operating Condition .....	28
4.6.7 Test Results .....	28
<b>5 Pictures of Test Arrangements.....</b>	<b>30</b>
<b>Appendix – Information on the Testing Laboratories .....</b>	<b>31</b>



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### Release Control Record

Issue No.	Description	Date Issued
RF150707C20	Original release	Aug. 07, 2015

## 1 Certificate of Conformity

**Product:** Wireless Module

**Brand:** TAIYO YUDEN

**Test Model:** EYSGJN

**Sample Status:** Engineering Sample

**Applicant:** TAIYO YUDEN CO., LTD.

**Test Date:** Jul. 09 ~ Aug. 06, 2015

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2013

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 :** Sunt Lee , **Date:** Aug. 07, 2015  
Sunt Lee / Specialist

**Approved by :** Ken Liu , **Date:** Aug. 07, 2015  
Ken Liu / Senior 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 -35.18dB at 0.15391MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -5.7dB at 254.99MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

### 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) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Wireless Module
Brand	TAIYO YUDEN
Test Model	EYSGJN
Sample Status	Engineering Sample
Power Supply Rating	3Vdc (host equipment)
Modulation Type	GFSK
Transfer Rate	1Mbps
Operating Frequency	2402MHz~2480MHz
Number of Channel	40
Channel Spacing	2MHz
Output Power	2.455mW
Antenna Type	PCB antenna with -1.5dBi gain
Antenna Connector	NA
Accessory Device	NA
Data Cable Supplied	NA

#### 3.2 Description of Test Modes

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where RE $\geq$ 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 Type	Date Rate (Mbps)
-	0 to 39	0, 19, 39	GFSK	1

#### 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 Type	Date Rate (Mbps)
-	0 to 39	0	GFSK	1

#### 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 Type	Date Rate (Mbps)
-	0 to 39	0	GFSK	1

#### 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 Type	Date Rate (Mbps)
-	0 to 39	0, 19, 39	GFSK	1



#### Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 69% RH	3Vdc	Chris Lin
RE<1G	25 deg. C, 69% RH	3Vdc	Chris Lin
PLC	18 deg. C, 70% RH	3Vdc	Nick Hsu
APCM	25 deg. C, 60% RH	3Vdc	Leo Tsai

### 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.

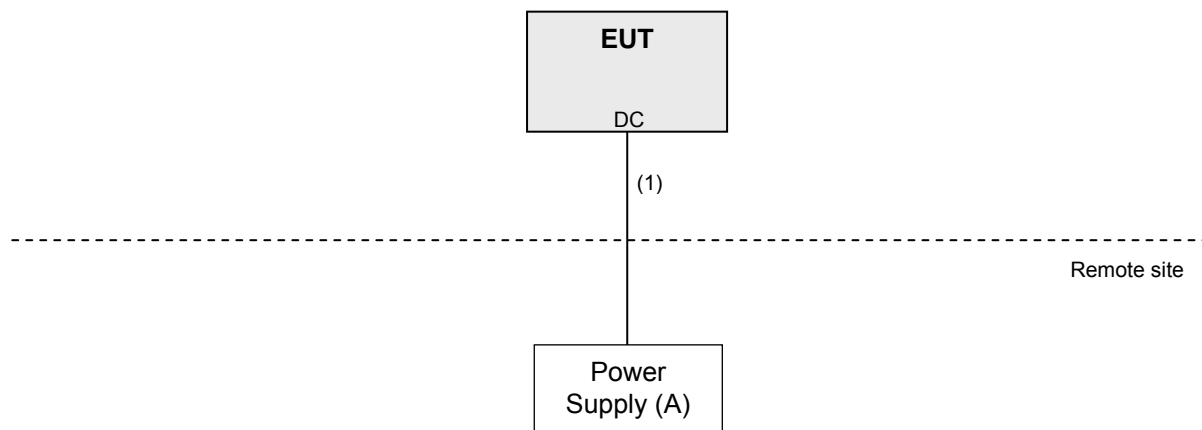
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Power Supply	Topward	6603D	700637	NA	-
B.	Adapter	Bestec	BPA0801WW	NA	NA	I/P: 100-240Vac, 50/60Hz, 1A O/P: 3.3Vdc, 2500mA

Note: All power cords of the above support units are non-shielded (1.8m).

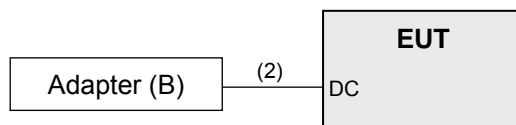
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC	1	1.2	N	0	-
2.	DC	1	1.8	N	0	Attached on adapter

#### 3.3.1 Configuration of System under Test

Radiated emission:



Conducted emission:



### 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)**

**558074 D01 DTS Meas Guidance v03r02**

ANSI C63.10:2013

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 06, 2014	Oct. 05, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 08, 2015	Jul. 07, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 06, 2015	Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01960	Aug. 09, 2014	Aug. 08, 2015
Preamplifier Agilent	8447D	2944A10631	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Aug. 09, 2014	Aug. 08, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021703	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 26, 2014	Jul. 25, 2015
Power Sensor	MA2411B	0738171	Jul. 26, 2014	Jul. 25, 2015

- Note: 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 HwaYa Chamber 4.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 460141.
5. The IC Site Registration No. is IC7450F-4.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) 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 and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

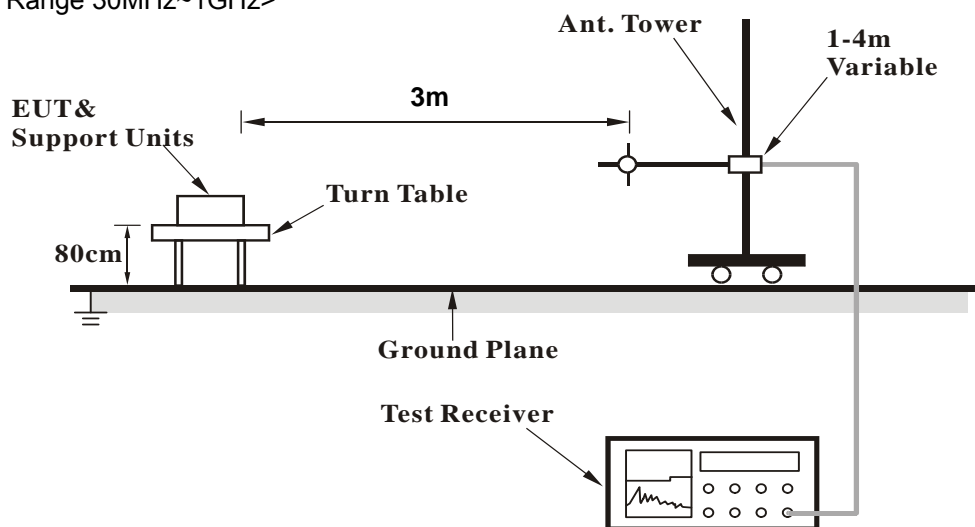
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ( $10 \log(1/\text{duty cycle})$ ).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

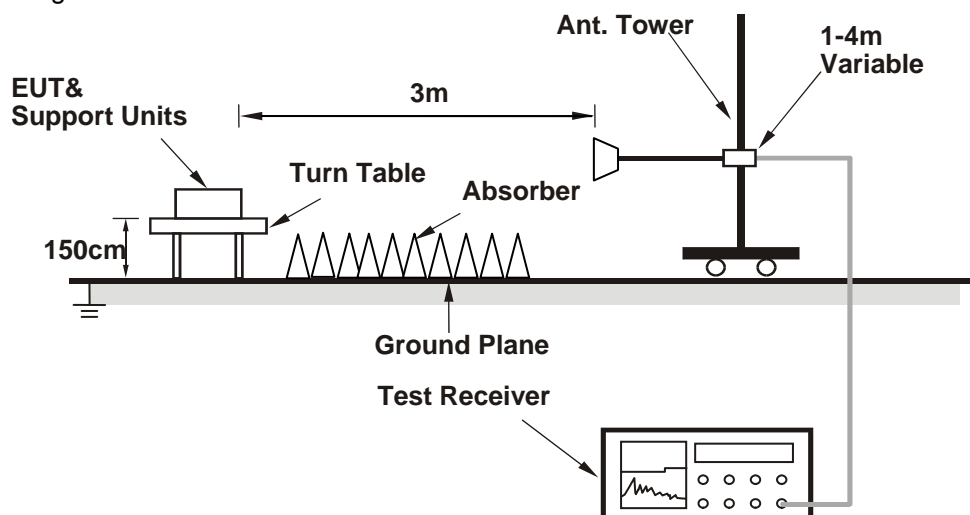
No deviation.

#### 4.1.5 Test Set Up

<Frequency Range 30MHz~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

- Set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

##### Above 1GHz Data

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	55.7 PK	74.0	-18.3	1.00 H	181	23.60	32.10
2	2390.00	44.4 AV	54.0	-9.6	1.00 H	181	12.30	32.10
3	*2402.00	84.4 PK			1.00 H	181	52.20	32.20
4	*2402.00	82.5 AV			1.00 H	181	50.30	32.20
5	4804.00	47.9 PK	74.0	-26.1	1.17 H	123	42.60	5.30
6	4804.00	35.7 AV	54.0	-18.3	1.17 H	123	30.40	5.30
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	55.9 PK	74.0	-18.1	1.00 V	120	23.80	32.10
2	2390.00	44.6 AV	54.0	-9.4	1.00 V	120	12.50	32.10
3	*2402.00	82.3 PK			1.00 V	120	50.10	32.20
4	*2402.00	79.2 AV			1.00 V	120	47.00	32.20
5	4804.00	47.9 PK	74.0	-26.1	1.25 V	74	42.60	5.30
6	4804.00	34.7 AV	54.0	-19.3	1.25 V	74	29.40	5.30

##### 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 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2440.00	84.5 PK			2.40 H	180	52.30	32.20
2	*2440.00	83.2 AV			2.40 H	180	51.00	32.20
3	4880.00	47.2 PK	74.0	-26.8	1.47 H	85	42.00	5.20
4	4880.00	35.6 AV	54.0	-18.4	1.47 H	85	30.40	5.20
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	*2440.00	80.2 PK			1.25 V	151	48.00	32.20
2	*2440.00	78.6 AV			1.25 V	151	46.40	32.20
3	4880.00	47.8 PK	74.0	-26.2	1.15 V	74	42.60	5.20
4	4880.00	35.1 AV	54.0	-18.9	1.15 V	74	29.90	5.20

#### 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 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2480.00	82.7 PK			1.00 H	176	50.40	32.30
2	*2480.00	79.6 AV			1.00 H	176	47.30	32.30
3	2483.50	56.0 PK	74.0	-18.0	1.00 H	176	23.70	32.30
4	2483.50	44.9 AV	54.0	-9.1	1.00 H	176	12.60	32.30
5	4960.00	48.6 PK	74.0	-25.4	1.47 H	125	43.00	5.60
6	4960.00	34.5 AV	54.0	-19.5	1.47 H	125	28.90	5.60
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	*2480.00	81.4 PK			1.04 V	155	49.10	32.30
2	*2480.00	78.0 AV			1.04 V	155	45.70	32.30
3	2483.50	57.0 PK	74.0	-17.0	1.04 V	155	24.70	32.30
4	2483.50	44.9 AV	54.0	-9.1	1.04 V	155	12.60	32.30
5	4960.00	48.6 PK	74.0	-25.4	1.47 V	87	43.00	5.60
6	4960.00	35.7 AV	54.0	-18.3	1.47 V	87	30.10	5.60

#### 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 0	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	121.10	27.5 QP	43.5	-16.0	2.00 H	113	43.70	-16.20
2	<b>254.99</b>	<b>40.3 QP</b>	<b>46.0</b>	<b>-5.7</b>	<b>1.01 H</b>	<b>24</b>	<b>54.60</b>	<b>-14.30</b>
3	307.38	40.1 QP	46.0	-5.9	1.01 H	12	52.50	-12.40
4	379.17	35.4 QP	46.0	-10.6	1.01 H	356	46.50	-11.10
5	528.58	36.9 QP	46.0	-9.1	1.51 H	170	45.40	-8.50
6	697.40	36.1 QP	46.0	-9.9	1.26 H	319	41.50	-5.40
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	59.01	33.7 QP	40.0	-6.3	1.00 V	234	48.10	-14.40
2	198.71	35.5 QP	43.5	-8.0	1.24 V	87	52.10	-16.60
3	431.56	33.2 QP	46.0	-12.8	1.00 V	141	43.20	-10.00
4	528.58	35.6 QP	46.0	-10.4	1.00 V	201	44.10	-8.50
5	672.17	33.4 QP	46.0	-12.6	1.00 V	50	39.10	-5.70
6	815.76	31.5 QP	46.0	-14.5	1.24 V	195	34.20	-2.70

## 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
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

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 HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-2040.

### 4.2.3 Test Procedures

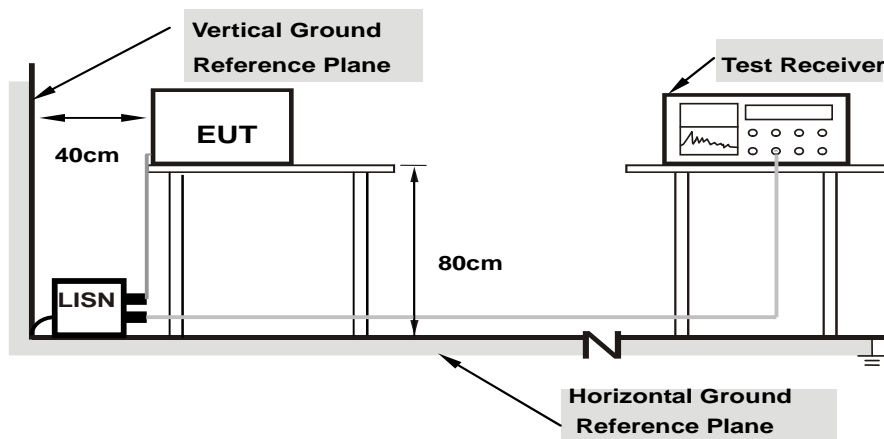
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

### 4.2.4 Deviation from Test Standard

No deviation.

### 4.2.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

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

### 4.2.6 EUT Operating Conditions

Same as 4.1.6.

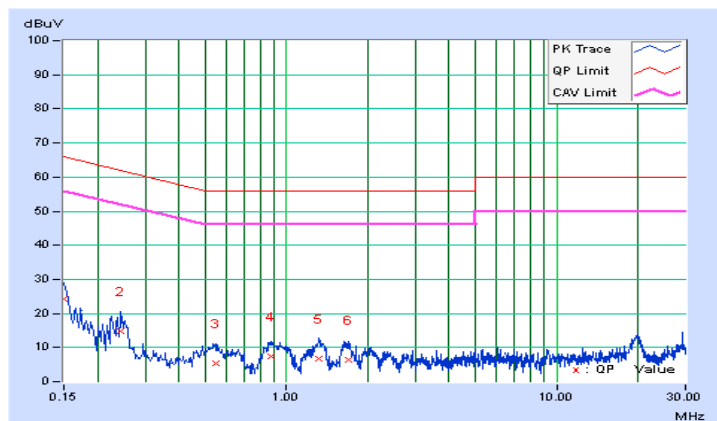
#### 4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	24.12	20.05	24.17	20.10	66.00	56.00	-41.83	-35.90
2	0.24384	0.06	14.79	8.00	14.85	8.06	61.96	51.96	-47.11	-43.90
3	0.54518	0.06	5.38	3.75	5.44	3.81	56.00	46.00	-50.56	-42.19
4	0.87372	0.08	7.36	4.78	7.44	4.86	56.00	46.00	-48.56	-41.14
5	1.32300	0.09	6.77	5.10	6.86	5.19	56.00	46.00	-49.14	-40.81
6	1.70171	0.11	6.35	4.09	6.46	4.20	56.00	46.00	-49.54	-41.80

#### 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.

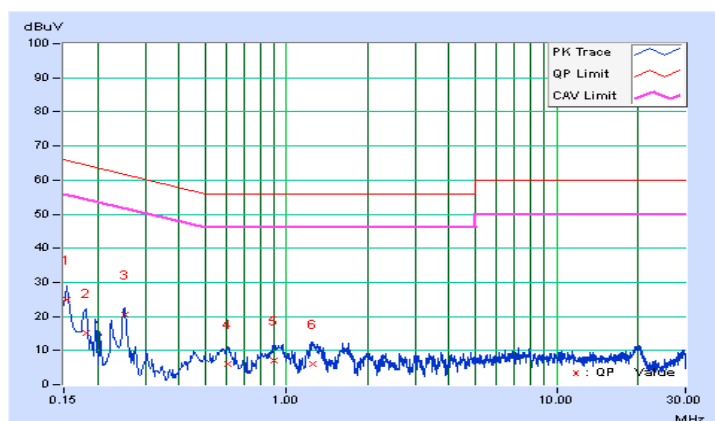


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.05	24.70	20.56	24.75	20.61	65.79	55.79	-41.04	-35.18
2	0.18075	0.05	15.15	7.31	15.20	7.36	64.45	54.45	-49.25	-47.09
3	0.25125	0.05	20.53	15.85	20.58	15.90	61.72	51.72	-41.13	-35.81
4	0.60737	0.07	6.14	3.92	6.21	3.99	56.00	46.00	-49.79	-42.01
5	0.90463	0.08	6.97	4.31	7.05	4.39	56.00	46.00	-48.95	-41.61
6	1.24871	0.09	6.06	3.81	6.15	3.90	56.00	46.00	-49.85	-42.10

#### 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.

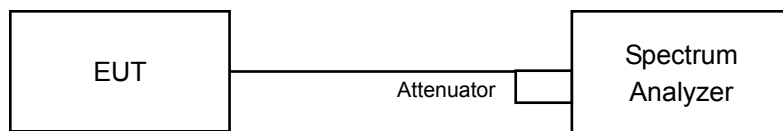


### 4.3 6dB Bandwidth Measurement

#### 4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

#### 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

558074 D01 DTS Meas Guidance v03r02 section 8.1

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

#### 4.3.5 Deviation from Test Standard

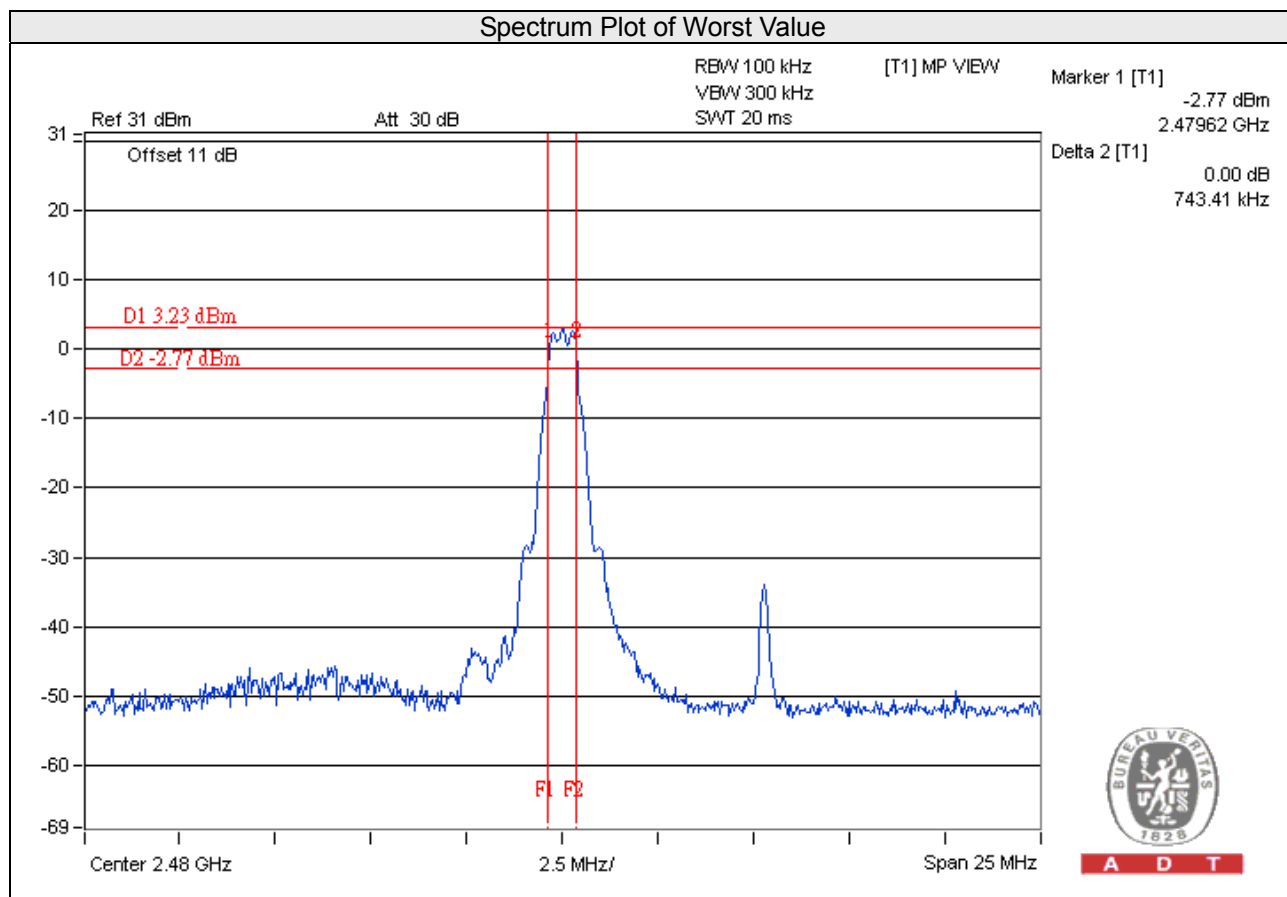
No deviation.

#### 4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.3.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.74	0.5	Pass
19	2440	0.74	0.5	Pass
39	2480	0.74	0.5	Pass



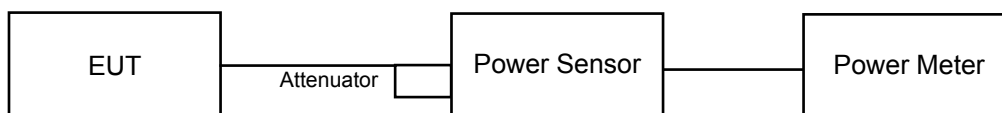


#### 4.4 Conducted Output Power Measurement

##### 4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

##### 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

558074 D01 DTS Meas Guidance v03r02 section 9.2.3.2

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor and set the detector to PEAK. Record the power level.

##### 4.4.5 Deviation from Test Standard

No deviation.

##### 4.4.6 EUT Operating Conditions

Same as item 4.3.6.

##### 4.4.7 Test Results

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	<b>2.455</b>	3.90	30	Pass
19	2440	2.427	3.85	30	Pass
39	2480	2.188	3.40	30	Pass

## **4.5 Power Spectral Density Measurement**

### **4.5.1 Limits of Power Spectral Density Measurement**

The Maximum of Power Spectral Density Measurement is 8dBm.

### **4.5.2 Test Setup**

Same as item 4.3.2

### **4.5.3 Test Instruments**

Refer to section 4.1.2 to get information of above instrument.

### **4.5.4 Test Procedure**

558074 D01 DTS Meas Guidance v03r02 section 10.3

- 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:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- 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 RBW.

### **4.5.5 Deviation from Test Standard**

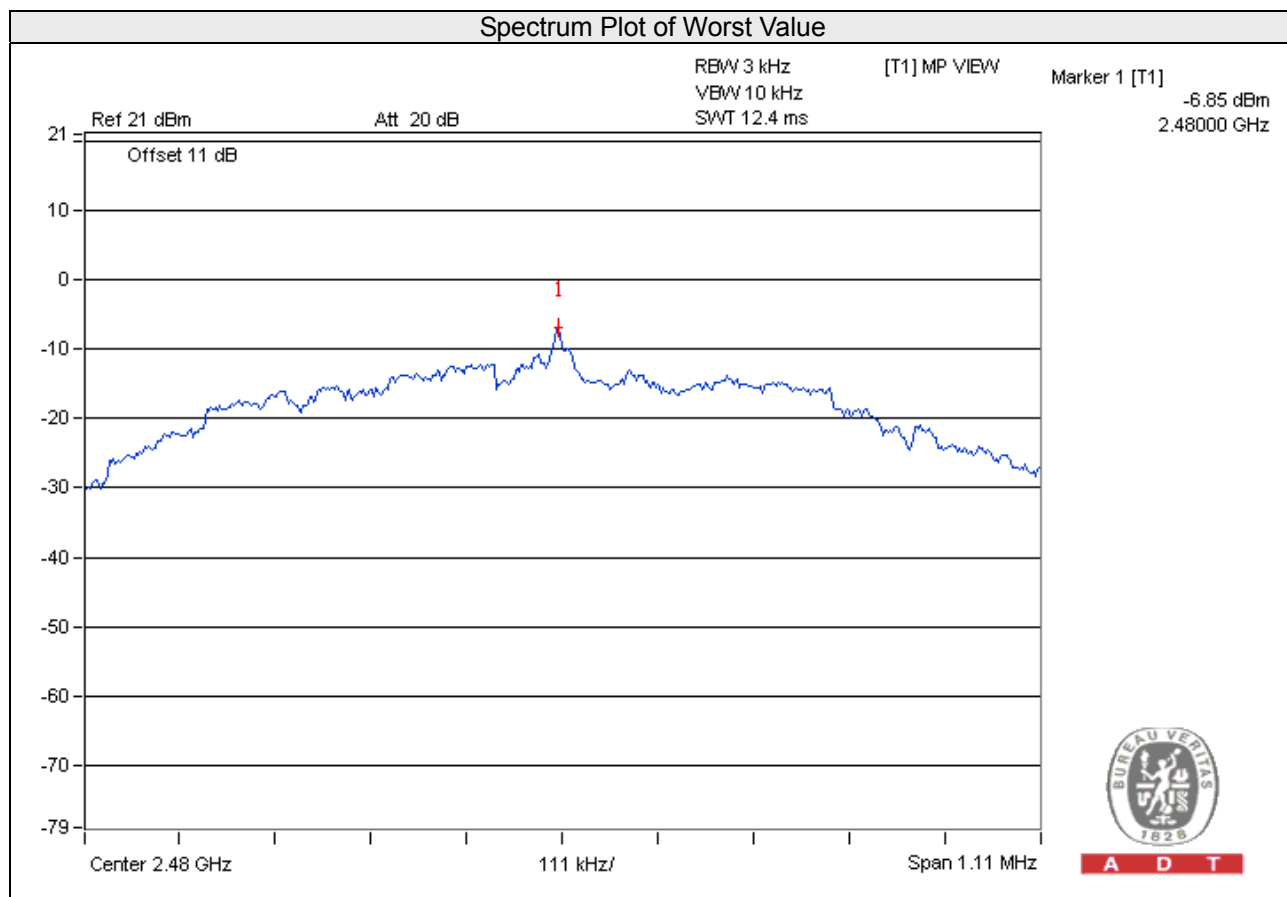
No deviation.

### **4.5.6 EUT Operating Condition**

Same as item 4.3.6

#### 4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
0	2402	-8.87	8	Pass
19	2440	-7.41	8	Pass
39	2480	-6.85	8	Pass



## **4.6 Conducted Out of Band Emission Measurement**

### **4.6.1 Limits of Conducted Out of Band Emission Measurement**

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### **4.6.2 Test Setup**

Same as item 4.3.2

### **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**

558074 D01 DTS Meas Guidance v03r02 section 11.2

- a. Set the RBW = 100 kHz.
- b. Set the VBW  $\geq$  300 kHz.
- c. Detector = peak.
- d. Sweep time = auto couple.
- e. Trace mode = max hold.
- f. Allow trace to fully stabilize.
- g. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### **Measurement Procedure OOBE**

558074 D01 DTS Meas Guidance v03r02 section 11.3

- a. Set RBW = 100 kHz.
- b. Set VBW  $\geq$  300 kHz.
- c. Detector = peak.
- d. Sweep = auto couple.
- e. Trace Mode = max hold.
- f. Allow trace to fully stabilize.
- g. Use the peak marker function to determine the maximum amplitude level.

### **4.6.5 Deviation from Test Standard**

No deviation.

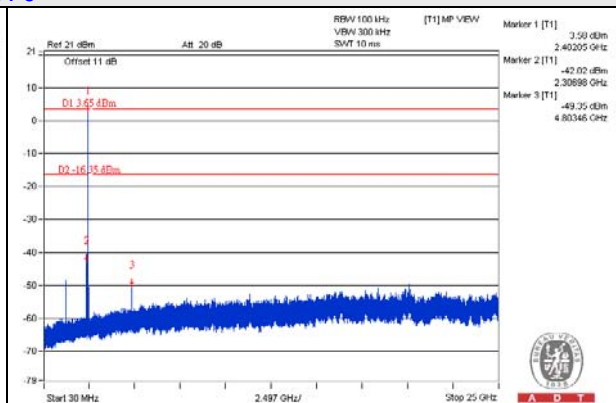
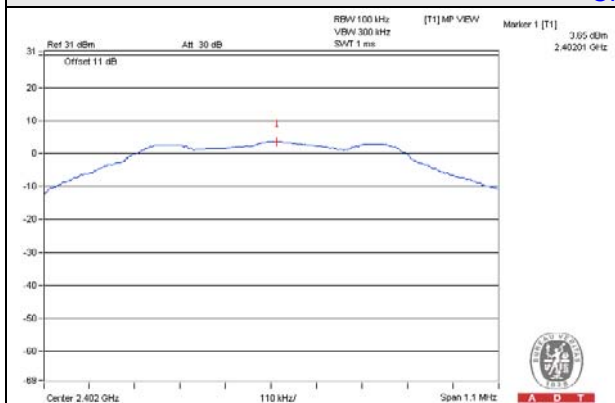
### **4.6.6 EUT Operating Condition**

Same as item 4.3.6

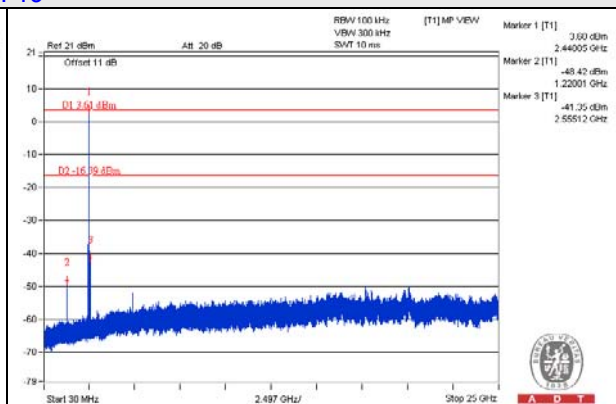
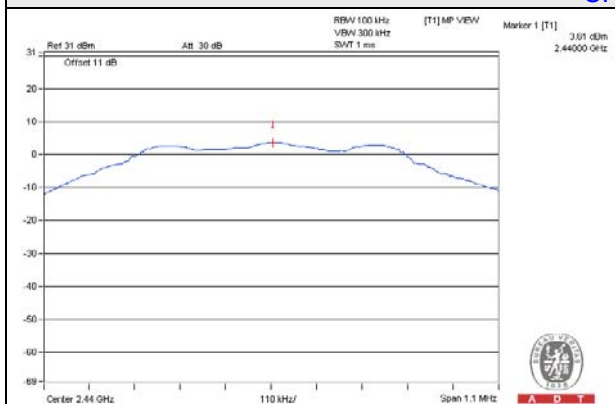
### **4.6.7 Test Results**

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

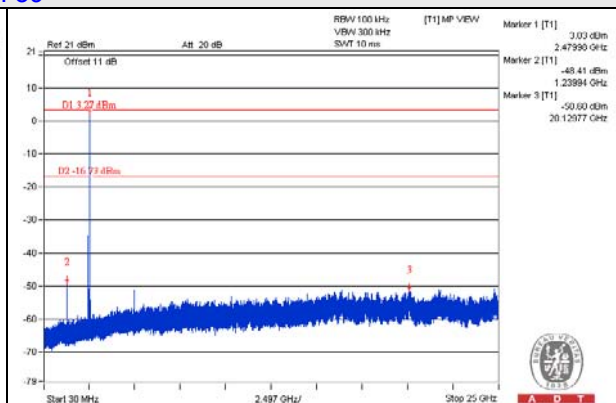
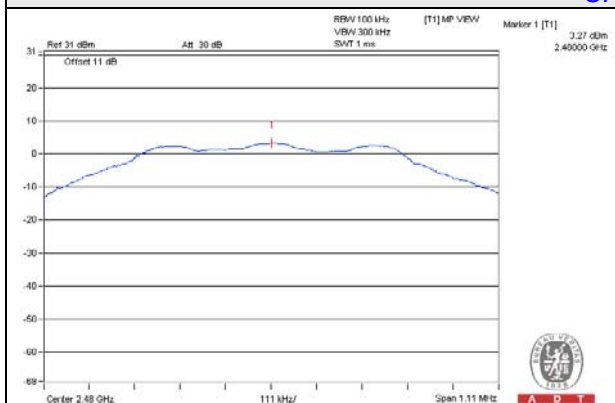
### CH 0



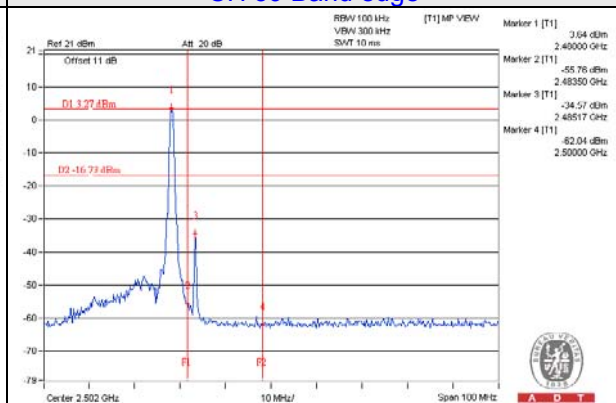
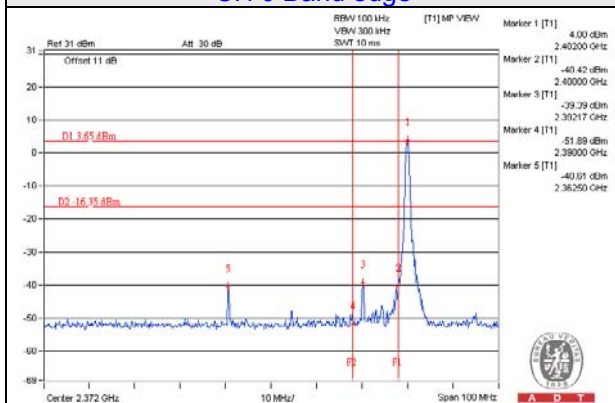
### CH 19



### CH 39



### CH 0 Band edge



### CH 39 Band edge

## 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:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Lab**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

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

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