

FCC Test Report

Report No.: RF180227D08

FCC ID: PRDRX0K

Test Model: HSA-A001D

Received Date: Feb. 27, 2018

Test Date: Mar. 8 ~ 15, 2018

Issued Date: Mar. 19, 2018

Applicant: Acrox Technologies Co., Ltd

Address: 4F., No. 89, Minshan St., Neihu Dist., Taipei City 114, 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.)

**FCC Registration /
Designation Number:** 198487 / TW2021



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information	6
3.1 General Description of EUT	6
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
4 Test Types and Results	10
4.1 Radiated Emission and Bandedge Measurement	10
4.1.1 Limits of Radiated Emission and Bandedge Measurement	10
4.1.2 Test Instruments	11
4.1.3 Test Procedures	12
4.1.4 Deviation from Test Standard	12
4.1.5 Test Setup	13
4.1.6 EUT Operating Conditions	14
4.1.7 Test Results	15
4.2 Conducted Emission Measurement	20
4.2.1 Limits of Conducted Emission Measurement	20
4.2.2 Test Instruments	20
4.2.3 Test Procedures	21
4.2.4 Deviation from Test Standard	21
4.2.5 Test Setup	21
4.2.6 EUT Operating Conditions	21
4.2.7 Test Results	22
4.3 Channel Bandwidth	24
4.3.1 Test Setup	24
4.3.2 Test Instruments	24
4.3.3 Test Procedure	24
4.3.4 Deviation from Test Standard	24
4.3.5 EUT Operating Condition	24
4.3.6 Test Results	25
5 Pictures of Test Arrangements	26
Appendix – Information on the Testing Laboratories	27

Release Control Record

Issue No.	Description	Date Issued
RF180227D08	Original release.	Mar. 19, 2018

1 Certificate of Conformity

Product: RF receiver dongle

Brand: hp

Test Model: HSA-A001D

Sample Status: Engineering sample

Applicant: Acrox Technologies Co., Ltd

Test Date: Mar. 8 ~ 15, 2018

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.249)
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 RF characteristics under the conditions specified in this report.

Prepared by : Jessica Cheng , **Date:** Mar. 19, 2018
Jessica Cheng / Senior Specialist

Approved by : Rex Lai , **Date:** Mar. 19, 2018
Rex Lai / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -6.41dB at 0.54063MHz.
15.215	Channel Bandwidth Measurement	PASS	Meet the requirement.
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -1.35dB at 2400.00MHz.
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	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.77 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1000MHz	5.54 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.48 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	RF receiver dongle
Brand	hp
Test Model	HSA-A001D
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	GFSK
Operating Frequency	2408MHz ~2474MHz
Number of Channel	34
Antenna Type	Printed antenna with -1.55dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

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

34 channels are provided to this EUT:

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

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 & Bandedge Measurement

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
-	1 to 34	1, 17, 34	GFSK

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
-	1 to 34	1	GFSK

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
-	1 to 34	1	GFSK

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
-	1 to 34	1, 17, 34	GFSK

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	19deg. C, 79%RH	120Vac, 60Hz (System)	James Wei
RE<1G	19deg. C, 79%RH	120Vac, 60Hz (System)	James Wei
PLC	27deg. C, 73%RH	120Vac, 60Hz (System)	James Wei
APCM	25deg. C, 76%RH	120Vac, 60Hz (System)	Saxon Lee

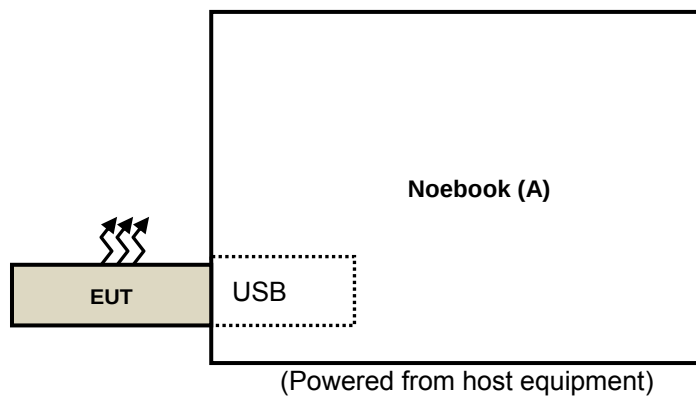
3.3 Description of Support Units

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.	Notebook PC	ASUS	PU401L	E9NXBC002007372	FCC DoC Approved	Provided by Lab

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

3.3.1 Configuration of System under Test



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 (15.249)

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

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

NOTE:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = $20 \log$ Emission level (uV/m).
- 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. 21, 2018	Feb. 20, 2019
HP Preamplifier	8449B	3008A01201	Feb. 22, 2018	Feb. 21, 2019
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 21, 2018	Feb. 20, 2019
Agilent TEST RECEIVER	N9038A	MY51210129	Feb. 6, 2018	Feb. 5, 2019
Schwarzbeck Antenna	VULB 9168	139	Nov. 29, 2017	Nov. 28, 2018
Schwarzbeck Antenna	VHBA 9123	480	May 19, 2017	May 18, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Dec. 1, 2017	Nov. 30, 2018
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Dec. 1, 2017	Nov. 30, 2018
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF104	CABLE-CH6	Aug. 14, 2017	Aug. 13, 2018
SUHNER RF cable With 3dB PAD	SF102	Cable-CH8-3.6m	Aug. 14, 2017	Aug. 13, 2018
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	May 31, 2017	May 30, 2018
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 26, 2017	Jul. 25, 2018
Loop Antenna EMCI	LPA600	270	Aug. 11, 2017	Aug. 10, 2019
EMCO Horn Antenna	3115	00028257	Nov. 30, 2017	Nov. 29, 2018
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 29, 2017	Sep. 28, 2018
Anritsu Power Sensor	MA2411B	0738404	Apr. 24, 2017	Apr. 23, 2018
Anritsu Power Meter	ML2495A	0842014	Apr. 24, 2017	Apr. 23, 2018

- 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.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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:

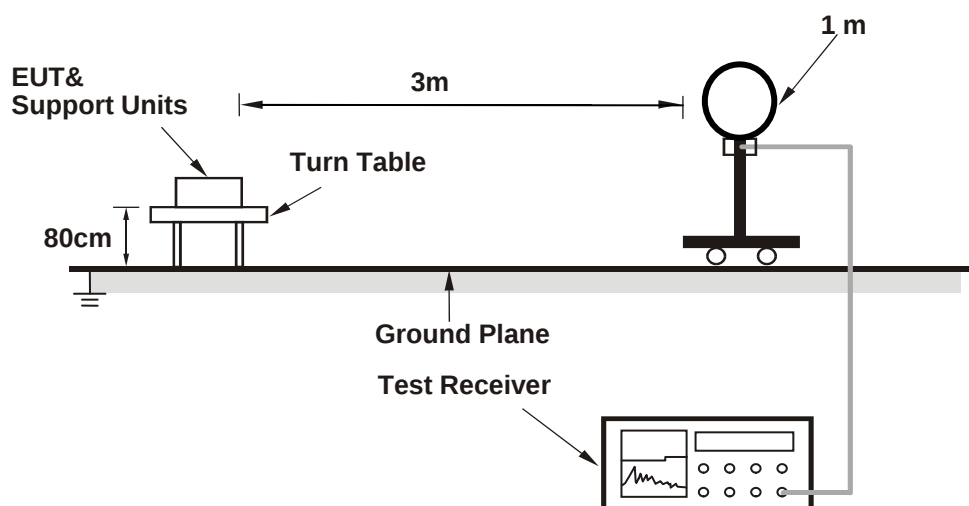
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

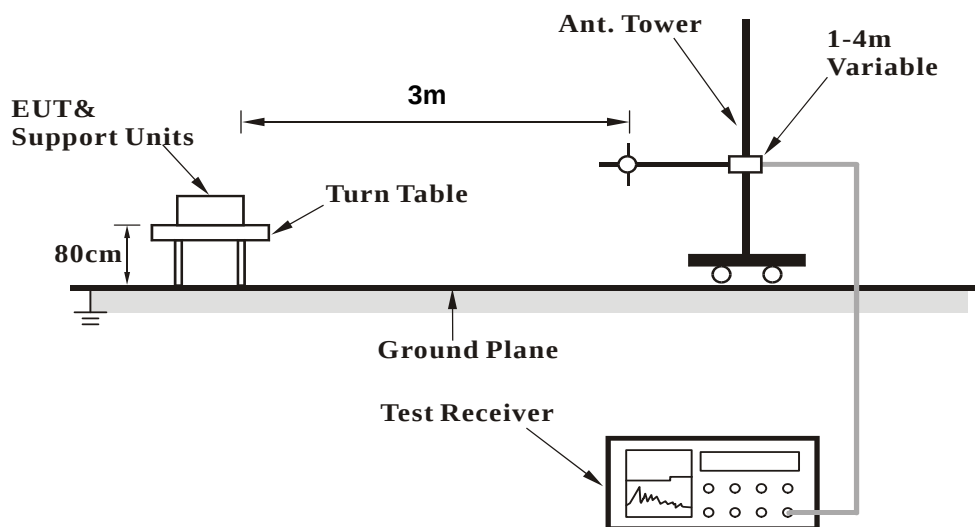
No deviation.

4.1.5 Test Setup

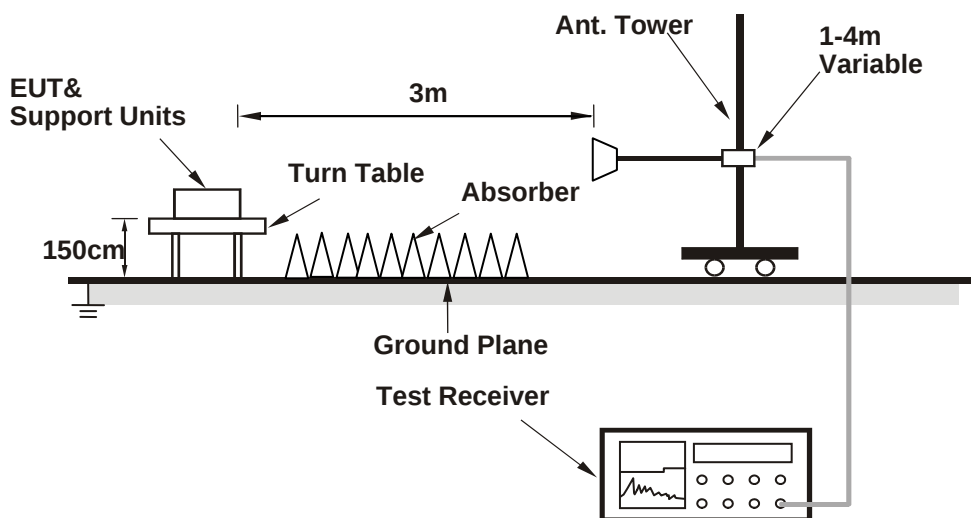
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

ABOVE 1GHz DATA

CHANNEL	TX Channel 1	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	61.62 PK	74.00	-12.38	1.00 H	74	64.00	-2.38
2	2390.00	45.87 AV	54.00	-8.13	1.00 H	74	48.25	-2.38
3	2400.00	72.65 PK	74.00	-1.35	1.00 H	74	75.10	-2.45
4	2400.00	41.17 AV	54.00	-12.83	1.00 H	74	43.62	-2.45
5	*2408.00	92.25 PK	114.00	-21.75	1.00 H	74	94.74	-2.49
6	*2408.00	85.94 AV	94.00	-8.06	1.00 H	74	88.43	-2.49
7	4816.00	42.65 PK	74.00	-31.35	1.00 H	28	39.33	3.32
8	4816.00	36.34 AV	54.00	-17.66	1.00 H	28	33.02	3.32
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	56.73 PK	74.00	-17.27	1.42 V	251	59.11	-2.38
2	2390.00	42.49 AV	54.00	-11.51	1.42 V	251	44.87	-2.38
3	2400.00	65.63 PK	74.00	-8.37	1.42 V	251	68.08	-2.45
4	2400.00	38.87 AV	54.00	-15.13	1.42 V	251	41.32	-2.45
5	*2408.00	85.01 PK	114.00	-28.99	1.42 V	251	87.50	-2.49
6	*2408.00	78.70 AV	94.00	-15.30	1.42 V	251	81.19	-2.49
7	4816.00	40.64 PK	74.00	-33.36	1.00 V	105	37.32	3.32
8	4816.00	34.33 AV	54.00	-19.67	1.00 V	105	31.01	3.32

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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(3.8841 \text{ ms} / 8.029 \text{ ms}) = -6.31 \text{ dB}$$
Please see page 18 for plotted duty.

CHANNEL	TX Channel 17	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	91.91 PK	114.00	-22.09	1.00 H	65	94.56	-2.65
2	*2440.00	85.60 AV	94.00	-8.40	1.00 H	65	88.25	-2.65
3	4880.00	42.54 PK	74.00	-31.46	1.00 H	22	39.21	3.33
4	4880.00	36.23 AV	54.00	-17.77	1.00 H	22	32.90	3.33
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	84.77 PK	114.00	-29.23	1.44 V	255	87.42	-2.65
2	*2440.00	78.46 AV	94.00	-15.54	1.44 V	255	81.11	-2.65
3	4880.00	40.54 PK	74.00	-33.46	1.00 V	119	37.21	3.33
4	4880.00	35.23 AV	54.00	-18.77	1.00 V	119	31.90	3.33

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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(3.8841 \text{ ms} / 8.029 \text{ ms}) = -6.31 \text{ dB}$$
 Please see page 18 for plotted duty.

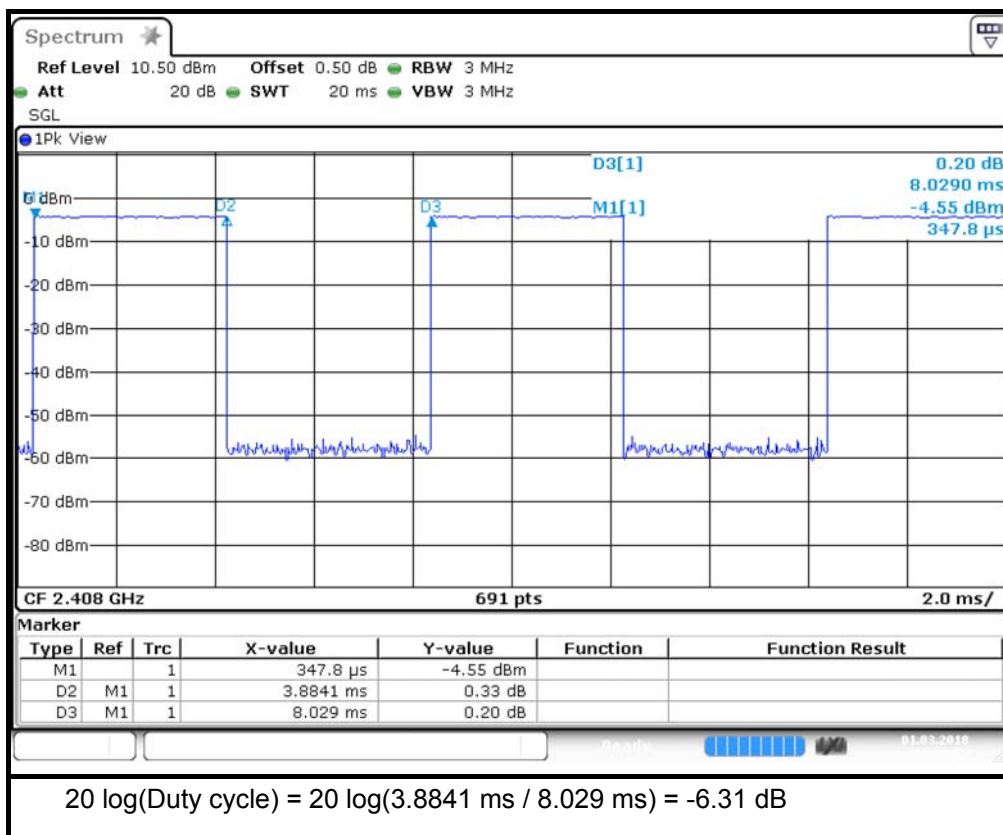
CHANNEL	TX Channel 34	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2474.00	91.09 PK	114.00	-22.91	1.00 H	66	93.46	-2.37
2	*2474.00	84.78 AV	94.00	-9.22	1.00 H	66	87.15	-2.37
3	2483.50	63.83 PK	74.00	-10.17	1.00 H	66	66.07	-2.24
4	2483.50	44.68 AV	54.00	-9.32	1.00 H	66	46.92	-2.24
5	4948.00	41.99 PK	74.00	-32.01	1.00 H	22	38.82	3.17
6	4948.00	35.68 AV	54.00	-18.32	1.00 H	22	32.51	3.17
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	84.05 PK	114.00	-29.95	1.44 V	243	86.42	-2.37
2	*2474.00	77.74 AV	94.00	-16.26	1.44 V	243	80.11	-2.37
3	2483.50	58.05 PK	74.00	-15.95	1.44 V	243	60.29	-2.24
4	2483.50	39.59 AV	54.00	-14.41	1.44 V	243	41.83	-2.24
5	4948.00	39.99 PK	74.00	-34.01	1.00 V	114	36.82	3.17
6	4948.00	33.68 AV	54.00	-20.32	1.00 V	114	30.51	3.17

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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(3.8841 \text{ ms} / 8.029 \text{ ms}) = -6.31 \text{ dB}$$
 Please see page 18 for plotted duty.



BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 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	51.92	20.75 QP	40.00	-19.25	3.00 H	304	27.84	-7.09
2	84.85	17.56 QP	40.00	-22.44	2.00 H	3	29.99	-12.43
3	529.50	29.05 QP	46.00	-16.95	3.00 H	309	29.50	-0.45
4	660.06	30.99 QP	46.00	-15.01	3.00 H	0	28.77	2.22
5	855.23	34.90 QP	46.00	-11.10	2.00 H	360	29.39	5.51
6	946.75	35.53 QP	46.00	-10.47	2.00 H	82	28.78	6.75
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	52.02	23.34 QP	40.00	-16.66	1.00 V	299	30.44	-7.10
2	118.37	21.86 QP	43.50	-21.64	1.00 V	93	31.44	-9.58
3	472.08	31.56 QP	46.00	-14.44	1.00 V	38	33.17	-1.61
4	590.27	30.13 QP	46.00	-15.87	1.00 V	0	29.05	1.08
5	825.50	34.70 QP	46.00	-11.30	1.00 V	278	29.46	5.24
6	931.86	35.90 QP	46.00	-10.10	1.00 V	0	29.14	6.76

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	100290	Dec. 19, 2017	Dec. 18, 2018
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 6, 2017	Dec. 5, 2018
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 6, 2017	Dec. 5, 2018
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Nov. 03, 2017	Nov. 02, 2018
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 9, 2017	May 8, 2018
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C09.01	Feb. 21, 2018	Feb. 20, 2019
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 18, 2017	May 17, 2018
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 14, 2017	Nov. 13, 2018
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 14, 2017	Nov. 13, 2018

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. 9.

4.2.3 Test Procedures

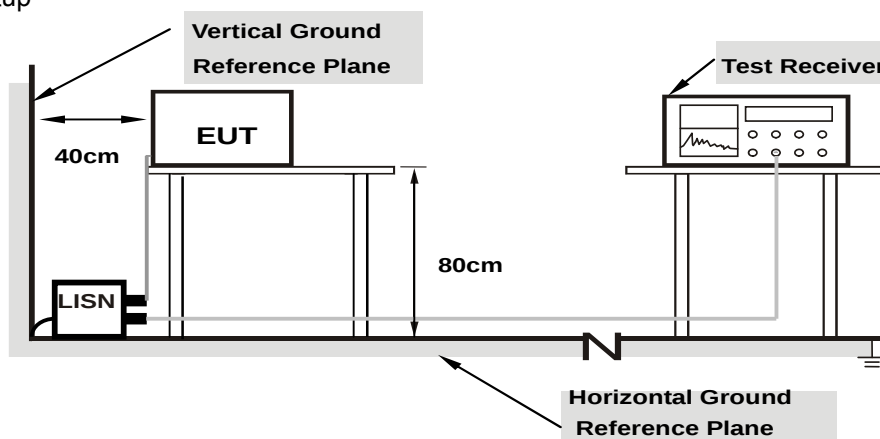
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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: 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: 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 item 4.1.6.

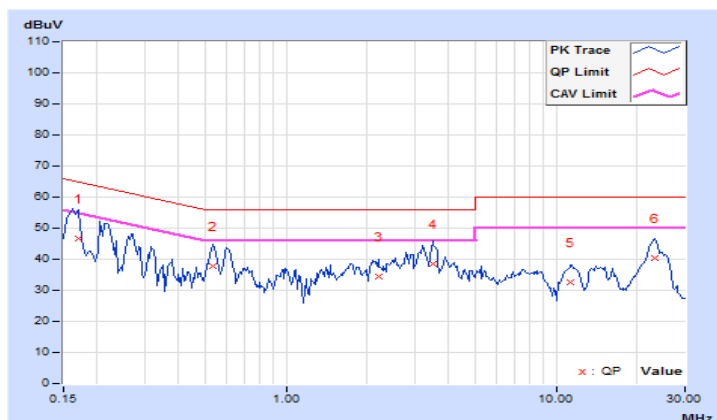
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)
-----------------	----------------	-------------------	--------------------------------

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	0.16953	10.11	36.57	30.04	46.68	40.15	64.98	54.98	-18.30	-14.83
2	0.53281	10.17	27.58	21.61	37.75	31.78	56.00	46.00	-18.25	-14.22
3	2.19922	10.33	24.26	18.53	34.59	28.86	56.00	46.00	-21.41	-17.14
4	3.48438	10.43	27.97	20.41	38.40	30.84	56.00	46.00	-17.60	-15.16
5	11.30469	10.73	21.77	17.01	32.50	27.74	60.00	50.00	-27.50	-22.26
6	23.24609	11.12	29.37	24.69	40.49	35.81	60.00	50.00	-19.51	-14.19

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

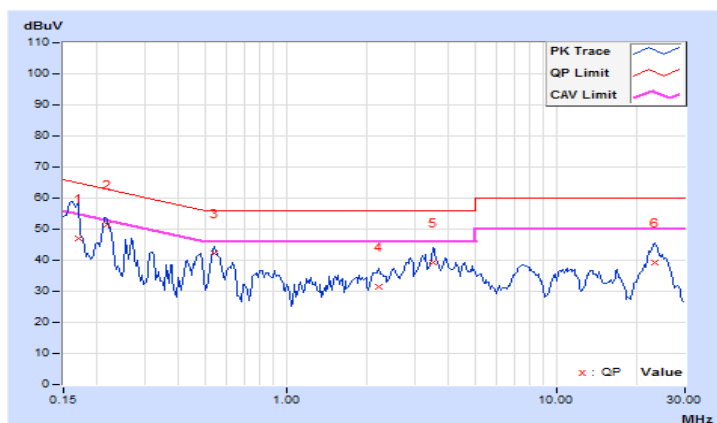


Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)
-----------------	----------------	-------------------	--------------------------------

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	0.16955	10.13	36.73	23.60	46.86	33.73	64.98	54.98	-18.12	-21.25
2	0.21641	10.14	41.23	34.23	51.37	44.37	62.96	52.96	-11.59	-8.59
3	0.54063	10.19	31.91	29.40	42.10	39.59	56.00	46.00	-13.90	-6.41
4	2.20313	10.35	21.30	14.86	31.65	25.21	56.00	46.00	-24.35	-20.79
5	3.48047	10.45	28.82	19.71	39.27	30.16	56.00	46.00	-16.73	-15.84
6	23.15234	10.79	28.43	23.53	39.22	34.32	60.00	50.00	-20.78	-15.68

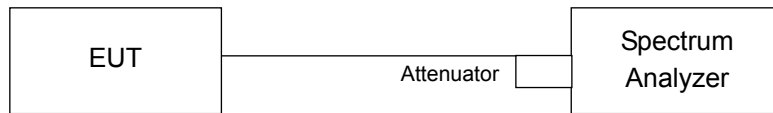
Remarks:

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



4.3 Channel Bandwidth

4.3.1 Test Setup



4.3.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.3 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.3.4 Deviation from Test Standard

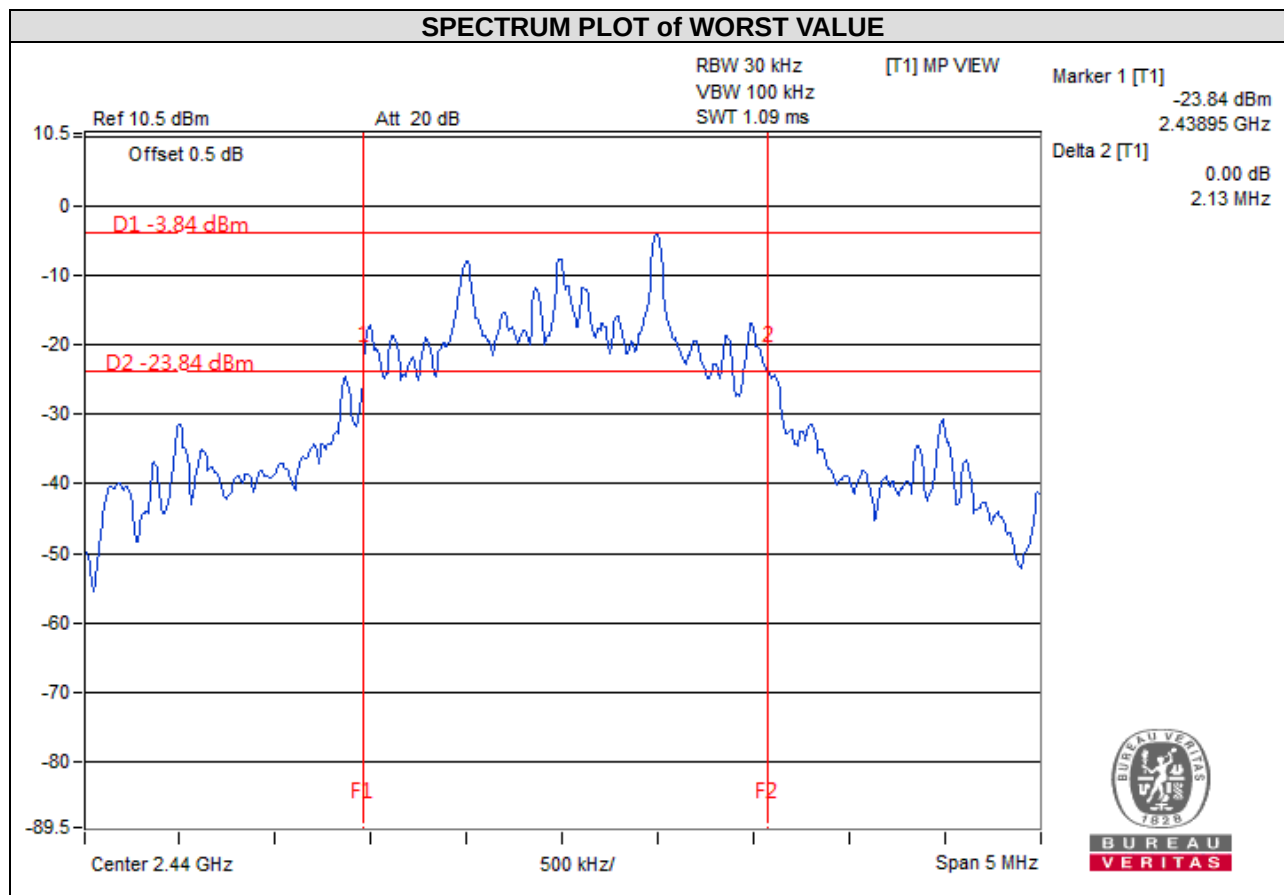
No deviation.

4.3.5 EUT Operating Condition

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

4.3.6 Test Results

CHANNEL	FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
1	2408	2.11
17	2440	2.13
34	2474	2.10



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: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---