

FCC Test Report

Report No.: RF170821D07

FCC ID: OHQ-IRSRF05H

Test Model: RF-05H

Received Date: Aug. 21, 2017

Test Date: Sep. 18 ~ Oct. 12, 2017

Issued Date: Oct. 13, 2017

Applicant: HABOOK Information Technology Inc.

Address: 8F., No.149, Sec. 3, Xinyi Rd., Da'an Dist., Taipei City 106, Taiwan

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.)



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Release Control Record

Issue No.	Description	Date Issued
RF170821D07	Original release.	Oct. 13, 2017

1 Certificate of Conformity

Product: IRS – Interactive Response System

Brand: IRS

Test Model: RF-05H

Sample Status: Engineering sample

Applicant: HABOOK Information Technology Inc.

Test Date: Sep. 18 ~ Oct. 12, 2017

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 EMC characteristics under the conditions specified in this report.

Prepared by :



Date:

Oct. 13, 2017

Jessica Cheng / Senior Specialist

Approved by :



Date:

Oct. 13, 2017

Rex Lai / Assistant 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 -12.62dB at 27.64844MHz.
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 -1.61dB at 2433.00MHz.

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	IRS – Interactive Response System
Brand	IRS
Test Model	RF-05H
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	GFSK
Operating Frequency	2432.999908MHz ~ 2480.988190MHz
Number of Channel	241
Antenna Type	PCB IFA antenna with 3.3dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The EUT is an IRS – Interactive Response System.
2. 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

241 channels are provided to this EUT:

CH	FREQ. (MHz)	CH	FREQ. (MHz)	CH	FREQ. (MHz)	CH	FREQ. (MHz)
0	2432.999908	38	2440.598053	76	2448.196198	114	2455.794342
1	2433.199860	39	2440.798005	77	2448.396149	115	2455.994294
2	2433.399811	40	2440.997956	78	2448.596100	116	2456.194245
3	2433.599762	41	2441.197907	79	2448.796051	117	2456.394196
4	2433.799714	42	2441.397858	80	2448.996003	118	2456.594147
5	2433.999665	43	2441.597809	81	2449.195954	119	2456.794098
6	2434.199616	44	2441.797760	82	2449.395905	120	2456.994049
7	2434.399567	45	2441.997712	83	2449.595856	121	2457.194001
8	2434.599518	46	2442.197663	84	2449.795807	122	2457.393952
9	2434.799469	47	2442.397614	85	2449.995758	123	2457.593903
10	2434.999421	48	2442.597565	86	2450.195710	124	2457.793854
11	2435.199372	49	2442.797516	87	2450.395661	125	2457.993805
12	2435.399323	50	2442.997467	88	2450.595612	126	2458.193757
13	2435.599274	51	2443.197419	89	2450.795563	127	2458.393708
14	2435.799225	52	2443.397370	90	2450.995514	128	2458.593659
15	2435.999176	53	2443.597321	91	2451.195465	129	2458.793610
16	2436.199128	54	2443.797272	92	2451.395417	130	2458.993561
17	2436.399079	55	2443.997223	93	2451.595368	131	2459.193512
18	2436.599030	56	2444.197174	94	2451.795319	132	2459.393464
19	2436.798981	57	2444.397126	95	2451.995270	133	2459.593415
20	2436.998932	58	2444.597077	96	2452.195221	134	2459.793366
21	2437.198883	59	2444.797028	97	2452.395173	135	2459.993317
22	2437.398835	60	2444.996979	98	2452.595124	136	2460.193268
23	2437.598786	61	2445.196930	99	2452.795075	137	2460.393219
24	2437.798737	62	2445.396881	100	2452.995026	138	2460.593171
25	2437.998688	63	2445.596833	101	2453.194977	139	2460.793122
26	2438.198639	64	2445.796784	102	2453.394928	140	2460.993073
27	2438.398590	65	2445.996735	103	2453.594880	141	2461.193024
28	2438.598542	66	2446.196686	104	2453.794831	142	2461.392975
29	2438.798493	67	2446.396637	105	2453.994782	143	2461.592926
30	2438.998444	68	2446.596589	106	2454.194733	144	2461.792878
31	2439.198395	69	2446.796540	107	2454.394684	145	2461.992829
32	2439.398346	70	2446.996491	108	2454.594635	146	2462.192780
33	2439.598298	71	2447.196442	109	2454.794587	147	2462.392731
34	2439.798249	72	2447.396393	110	2454.994538	148	2462.592682
35	2439.998200	73	2447.596344	111	2455.194489	149	2462.792633
36	2440.198151	74	2447.796296	112	2455.394440	150	2462.992585
37	2440.398102	75	2447.996247	113	2455.594391	151	2463.192536

CH	FREQ. (MHz)	CH	FREQ. (MHz)	CH	FREQ. (MHz)	CH	FREQ. (MHz)
152	2463.392487	177	2468.391266	202	2473.390046	227	2478.388825
153	2463.592438	178	2468.591217	203	2473.589997	228	2478.588776
154	2463.792389	179	2468.791169	204	2473.789948	229	2478.788727
155	2463.992340	180	2468.991120	205	2473.989899	230	2478.988678
156	2464.192292	181	2469.191071	206	2474.189850	231	2479.188630
157	2464.392243	182	2469.391022	207	2474.389801	232	2479.388581
158	2464.592194	183	2469.590973	208	2474.589753	233	2479.588532
159	2464.792145	184	2469.790924	209	2474.789704	234	2479.788483
160	2464.992096	185	2469.990876	210	2474.989655	235	2479.988434
161	2465.192048	186	2470.190827	211	2475.189606	236	2480.188385
162	2465.391999	187	2470.390778	212	2475.389557	237	2480.388337
163	2465.591950	188	2470.590729	213	2475.589508	238	2480.588288
164	2465.791901	189	2470.790680	214	2475.789460	239	2480.788239
165	2465.991852	190	2470.990632	215	2475.989411	240	2480.988190
166	2466.191803	191	2471.190583	216	2476.189362		
167	2466.391755	192	2471.390534	217	2476.389313		
168	2466.591706	193	2471.590485	218	2476.589264		
169	2466.791657	194	2471.790436	219	2476.789215		
170	2466.991608	195	2471.990387	220	2476.989167		
171	2467.191559	196	2472.190339	221	2477.189118		
172	2467.391510	197	2472.390290	222	2477.389069		
173	2467.591462	198	2472.590241	223	2477.589020		
174	2467.791413	199	2472.790192	224	2477.788971		
175	2467.991364	200	2472.990143	225	2477.988923		
176	2468.191315	201	2473.190094	226	2478.188874		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE ³ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE³1G**: 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
-	0 to 240	0, 120, 240	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
-	0 to 240	0	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
-	0 to 240	0	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
-	0 to 240	0, 120, 240	GFSK

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE³1G	29deg. C, 65%RH	120Vac, 60Hz (System)	Ian Chang
RE<1G	29deg. C, 65%RH	120Vac, 60Hz (System)	Ian Chang
PLC	25deg. C, 75%RH	120Vac, 60Hz(System)	Ian Chang
APCM	25deg. C, 76%RH	120Vac, 60Hz(System)	Saxon Lee

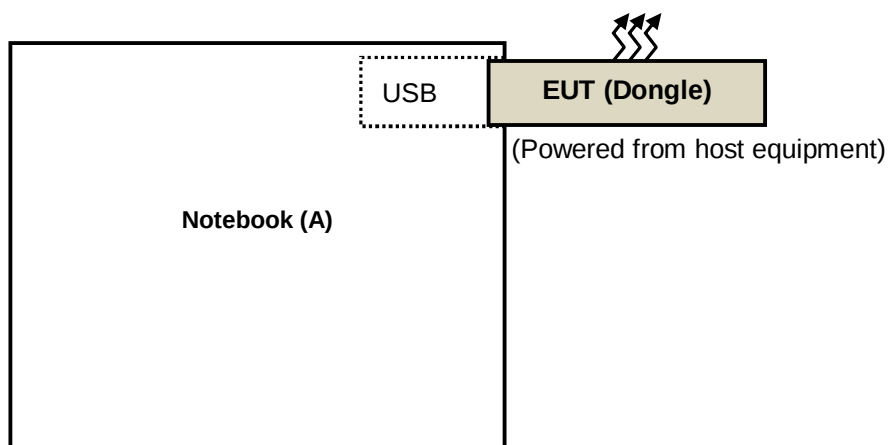
3.3 Description of Support Units

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.

NOTE: The EUT 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

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:

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. 21, 2017	Feb. 20, 2018
HP Preamplifier	8449B	3008A01201	Feb. 22, 2017	Feb. 21, 2018
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 21, 2017	Feb. 20, 2018
Agilent TEST RECEIVER	N9038A	MY51210129	Feb. 8, 2017	Feb. 7, 2018
Schwarzbeck Antenna	VULB 9168	139	Dec. 13, 2016	Dec. 12, 2017
Schwarzbeck Antenna	VHBA 9123	480	May 19, 2017	May 18, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Dec. 30, 2016	Dec. 29, 2017
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Dec. 27, 2016	Dec. 26, 2017
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 TESEQ	HLA 6121	45745	May 19, 2017	May 18, 2018
EMCO Horn Antenna	3115	00028257	Dec. 15, 2016	Dec. 14, 2017
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
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.
 5. The FCC Designation Number is TW2021.

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:

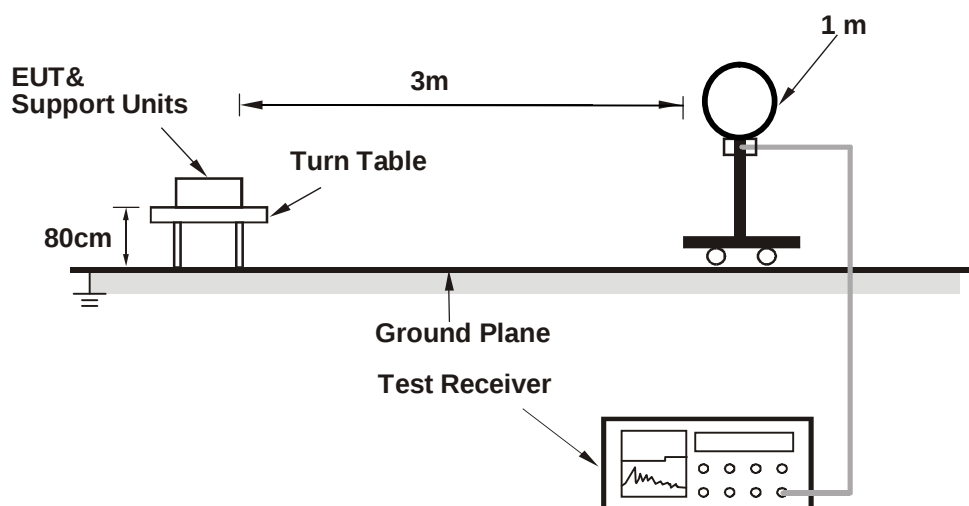
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

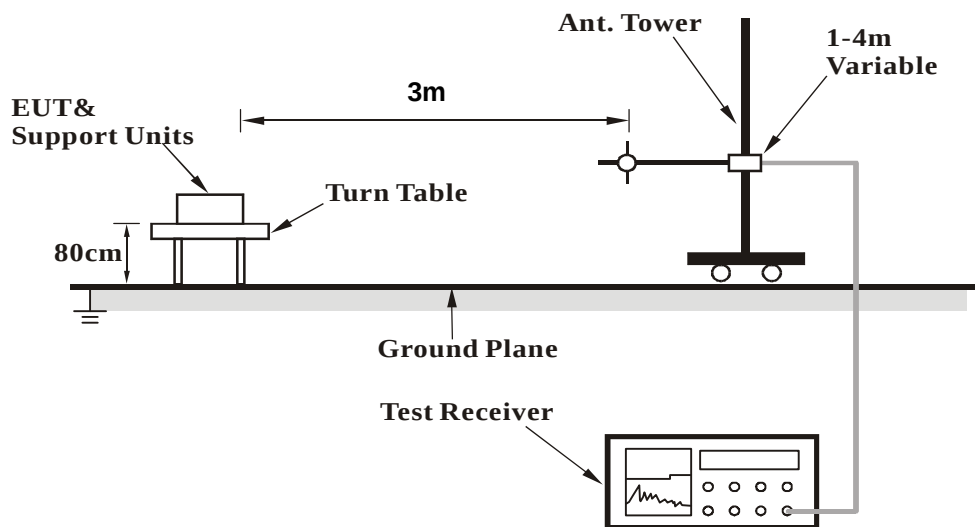
No deviation.

4.1.5 Test Setup

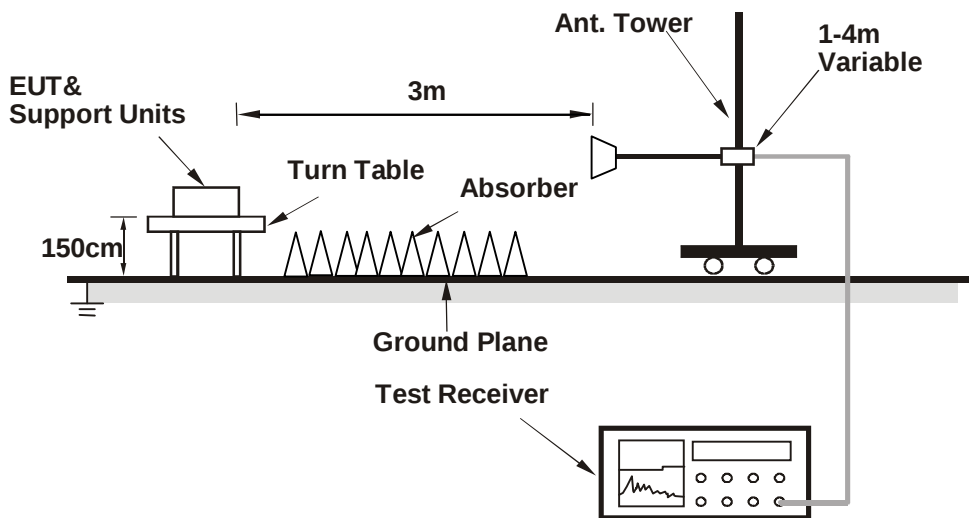
For Radiated emission below 30MHz



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

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

4.1.7 Test Results

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	52.73 PK	74.00	-21.27	1.43 H	123	55.04	-2.31
2	2390.00	38.85 AV	54.00	-15.15	1.43 H	123	41.16	-2.31
3	2400.00	53.86 PK	74.00	-20.14	1.43 H	123	56.11	-2.25
4	2400.00	39.95 AV	54.00	-14.05	1.43 H	123	42.20	-2.25
5	*2432.99	92.83 PK	114.00	-21.17	1.43 H	123	94.86	-2.03
6	*2432.99	92.39 AV	94.00	-1.61	1.43 H	123	94.42	-2.03
7	4865.98	47.75 PK	74.00	-26.25	1.52 H	138	43.52	4.23
8	4865.98	41.88 AV	54.00	-12.12	1.52 H	138	37.65	4.23
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	52.42 PK	74.00	-21.58	3.74 V	216	54.73	-2.31
2	2390.00	38.47 AV	54.00	-15.53	3.74 V	216	40.78	-2.31
3	2400.00	52.92 PK	74.00	-21.08	3.74 V	216	55.17	-2.25
4	2400.00	38.73 AV	54.00	-15.27	3.74 V	216	40.98	-2.25
5	*2432.99	86.83 PK	114.00	-27.17	3.74 V	216	88.86	-2.03
6	*2432.99	85.65 AV	94.00	-8.35	3.74 V	216	87.68	-2.03
7	4865.98	45.24 PK	74.00	-28.76	1.53 V	21	41.01	4.23
8	4865.98	36.88 AV	54.00	-17.12	1.53 V	21	32.65	4.23

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 120	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	*2456.99	92.24 PK	114.00	-21.76	1.11 H	131	94.11	-1.87
2	*2456.99	91.89 AV	94.00	-2.11	1.11 H	131	93.76	-1.87
3	4913.98	47.41 PK	74.00	-26.59	1.28 H	155	43.12	4.29
4	4913.98	41.72 AV	54.00	-12.28	1.28 H	155	37.43	4.29
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	*2456.99	87.25 PK	114.00	-26.75	1.25 V	135	89.12	-1.87
2	*2456.99	86.10 AV	94.00	-7.90	1.25 V	135	87.97	-1.87
3	4913.98	45.37 PK	74.00	-28.63	1.50 V	51	41.08	4.29
4	4913.98	36.83 AV	54.00	-17.17	1.50 V	51	32.54	4.29

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 240	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	*2480.98	92.23 PK	114.00	-21.77	1.23 H	123	93.96	-1.73
2	*2480.98	91.83 AV	94.00	-2.17	1.23 H	123	93.56	-1.73
3	2483.50	56.78 PK	74.00	-17.22	1.23 H	123	58.49	-1.71
4	2483.50	44.68 AV	54.00	-9.32	1.23 H	123	46.39	-1.71
5	4961.78	48.14 PK	74.00	-25.86	1.42 H	187	43.82	4.32
6	4961.78	42.16 AV	54.00	-11.84	1.42 H	187	37.84	4.32
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	*2480.98	87.00 PK	114.00	-27.00	3.81 V	211	88.73	-1.73
2	*2480.98	85.93 AV	94.00	-8.07	3.81 V	211	87.66	-1.73
3	2483.50	55.58 PK	74.00	-18.42	3.81 V	211	57.29	-1.71
4	2483.50	43.18 AV	54.00	-10.82	3.81 V	211	44.89	-1.71
5	4961.78	45.60 PK	74.00	-28.40	1.49 V	257	41.28	4.32
6	4961.78	37.13 AV	54.00	-16.87	1.49 V	254	32.81	4.32

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.

BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 0	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	50.37	18.02 QP	40.00	-21.98	1.12 H	36	26.86	-8.84
2	151.25	17.30 QP	43.50	-26.20	2.57 H	146	26.33	-9.03
3	272.50	18.69 QP	46.00	-27.31	3.84 H	312	26.98	-8.29
4	478.14	24.44 QP	46.00	-21.56	1.25 H	346	27.90	-3.46
5	726.46	30.25 QP	46.00	-15.75	1.76 H	233	28.58	1.67
6	915.61	34.07 QP	46.00	-11.93	1.17 H	32	28.96	5.11
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	67.00	23.66 QP	40.00	-16.34	1.61 V	33	34.58	-10.92
2	166.00	19.63 QP	43.50	-23.87	2.11 V	277	28.77	-9.14
3	264.57	17.27 QP	46.00	-28.73	1.68 V	333	25.97	-8.70
4	456.45	24.07 QP	46.00	-21.93	1.29 V	287	27.93	-3.86
5	616.46	29.20 QP	46.00	-16.80	1.76 V	233	29.48	-0.28
6	815.78	35.34 QP	46.00	-10.66	1.59 V	328	31.85	3.49

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. The emission levels were very low against the limit of frequency range 9kHz~30MHz.

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. 10, 2017	Apr. 09, 2018
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	May 22, 2017	May 21, 2018
LISN With Adapter (for EUT)	AD10	C10Ada-002	May 22, 2017	May 21, 2018
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 23, 2016	Nov. 22, 2017
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-C10.01	Feb. 14, 2017	Feb. 13, 2018
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 18, 2017	May 17, 2018
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 8, 2016	Nov. 7, 2017
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 8, 2016	Nov. 7, 2017

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. The FCC Designation Number is TW1078.

4.2.3 Test Procedures

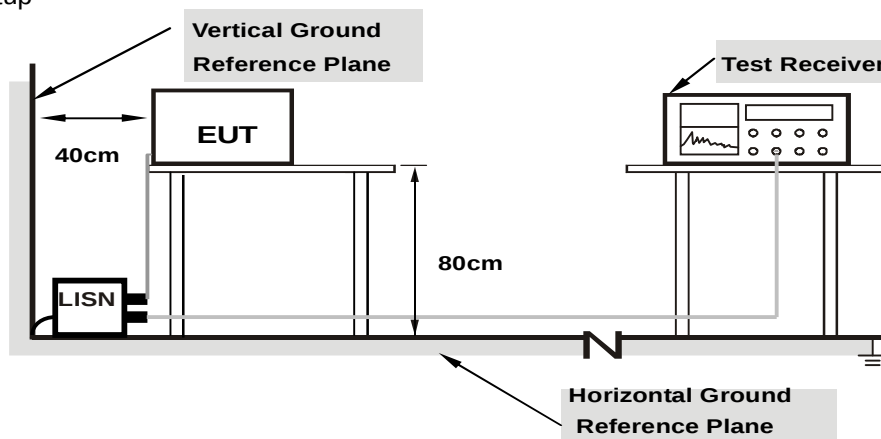
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

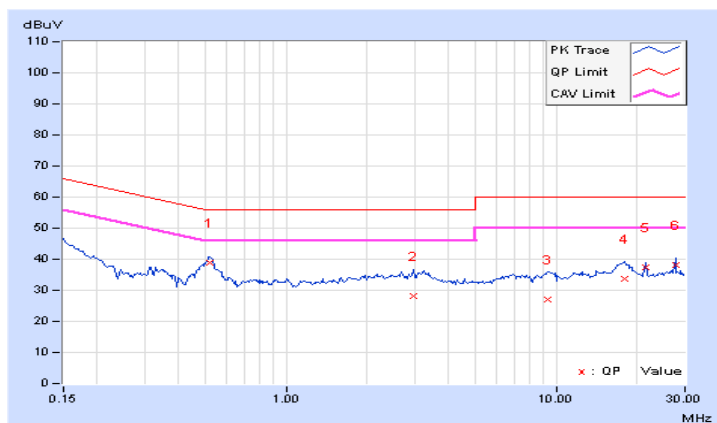
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)
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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	0.52109	9.67	29.17	23.00	38.84	32.67	56.00	46.00	-17.16	-13.33
2	2.97266	9.79	18.46	12.12	28.25	21.91	56.00	46.00	-27.75	-24.09
3	9.29688	9.92	17.12	12.02	27.04	21.94	60.00	50.00	-32.96	-28.06
4	17.88281	9.98	23.61	21.11	33.59	31.09	60.00	50.00	-26.41	-18.91
5	21.50391	10.02	27.29	27.01	37.31	37.03	60.00	50.00	-22.69	-12.97
6	27.64844	10.12	27.85	27.26	37.97	37.38	60.00	50.00	-22.03	-12.62

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

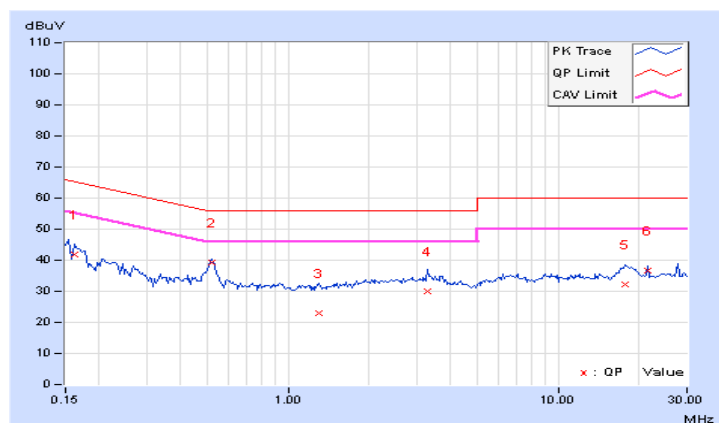


Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.67	32.18	18.52	41.85	28.19	65.38	55.38	-23.53	-27.19
2	0.52109	9.69	29.49	23.08	39.18	32.77	56.00	46.00	-16.82	-13.23
3	1.29688	9.72	13.17	6.61	22.89	16.33	56.00	46.00	-33.11	-29.67
4	3.26953	9.82	20.36	13.03	30.18	22.85	56.00	46.00	-25.82	-23.15
5	17.66406	10.03	22.14	20.33	32.17	30.36	60.00	50.00	-27.83	-19.64
6	21.50391	10.07	26.65	26.14	36.72	36.21	60.00	50.00	-23.28	-13.79

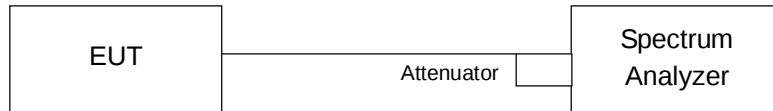
Remarks:

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

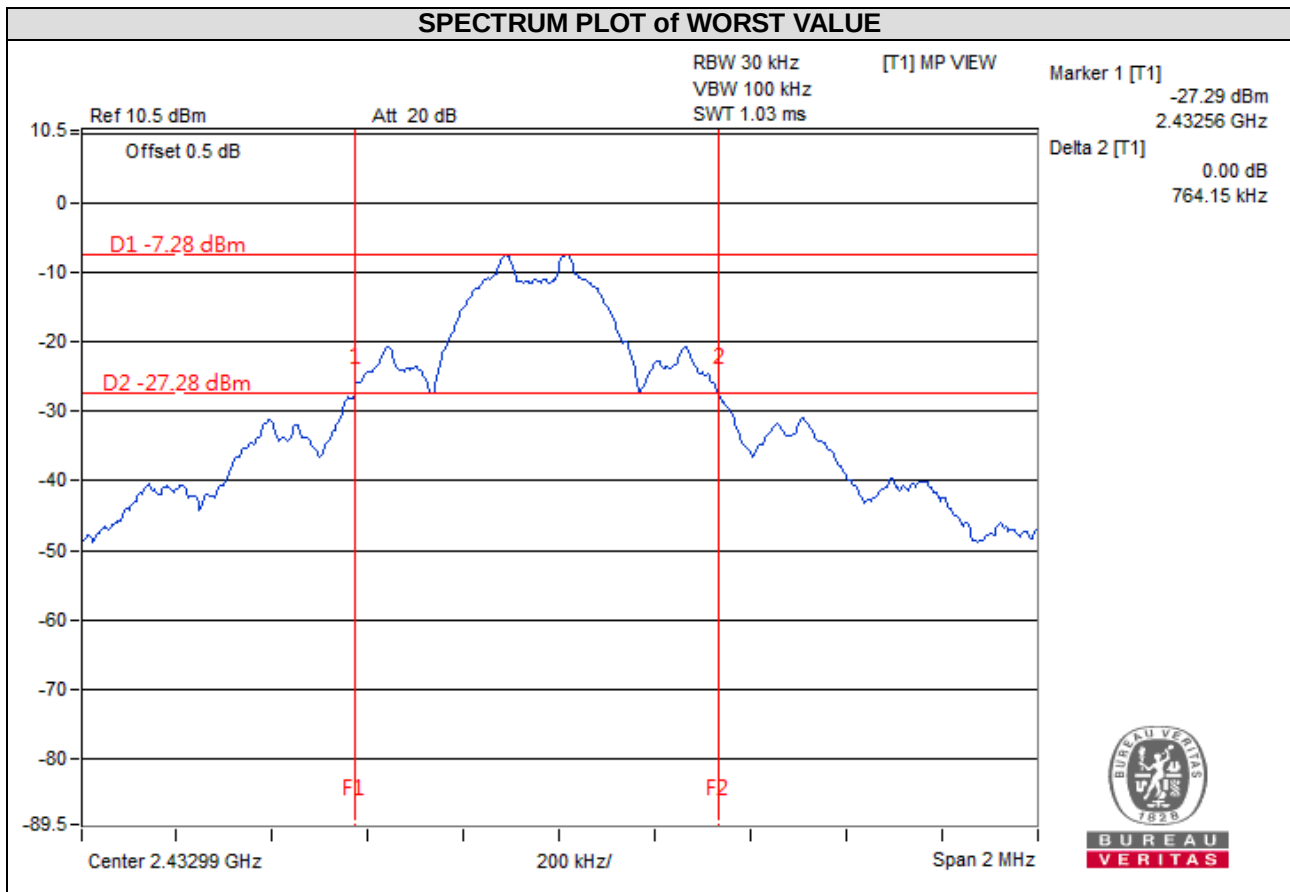
No deviation.

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)
0	2432.999908	0.764
120	2456.994049	0.736
240	2480.988190	0.740



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

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Hsin Chu EMC/RF/Telecom Lab

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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.

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