RADIO TEST REPORT

Product	:	Smart Gateway
Model Name	:	SHC301
FCC ID	:	2AQJEGC01
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	May 28, 2018
Test Date	:	May 29, 2018 ~ July 12, 2018
Issued Date	:	September 17, 2018
Applicant	:	GalaThings Technology Inc. 9F.-6, NO.65, Gaotie 7th Rd., Zhubei City,Hsinchu County 302, Taiwan (R.O.C.)
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

REVISION HISTORY

Original Test Report No.: 4788408771-US-R0-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4788408771-US-R0-V0	Sep. 17, 2018	-	Initial issue

Table Of Contents

1. Attestation of Test Results 4

2. Summary of Test Results 5

3. Test Methodology 6

4. Facilities and Accreditation 6

5. Measurement Uncertainty 7

6. Equipment under Test 8

6.1. Description of EUT 8
6.2. Channel List 9
6.3. Test Condition 9
6.4. Description Of Available Antennas 9
6.5. Operating Mode and Worst Case of EUT 10
6.6. Duty cycle 11

7. Test Equipment 12

8. Description of Test Setup 14

9. Test Results 15

9.1. 6 dB Bandwidth 15
9.2. Conducted output power 17
9.3. Power Spectral Density 19
9.4. Conducted Out of Band Emission 21
9.5. Radiated Spurious Emission 24
9.6. AC Power Line Conducted Emission 33

Appendix I Radiated Band Edge Measurement 39

1. Attestation of Test Results

APPLICANT:	GalaThings Technology Inc. 9F.-6, NO.65, Gaotie 7th Rd., Zhubei City,Hsinchu County 302, Taiwan (R.O.C.)
MANUFACTURER	WHA YU INDUSTRIAL CO., LTD No.326,Sec 2,Kung Tao 5 Road,Hsin Chu City,Taiwan
EUT DESCRIPTION:	Smart Gateway
BRAND:	Mercu
MODEL:	SHC301
SAMPLE STAGE:	Identical Prototype
DATE of TESTED:	May 29, 2018 ~ July 12, 2018

APPLICABLE STANDARDS

STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Evelyn Lee Date : September 17, 2018
Project Handler

Approve By:

John Cheng Date : September 17, 2018
Project Engineer

2. Summary of Test Results

Summary of Test Results		
FCC Clause	**Test Items**	**Result**
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)	Conducted Output Power	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

Note:
1. For FCC Clause 15.247(d), the Radiated Band Edge test plots were recorded in Appendix I.

3. Test Methodology

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB558074 D01 DTS Meas Guidance v04, KDB414788 D01 Radiated Test Site v01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

5. Measurement Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	2.6
RF Conducted	9 kHz - 40GHz	2	1.0
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	2.4
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.5
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	5.0

6. Equipment under Test

6.1. Description of EUT

Product	Smart Gateway
Brand Name	Mercu
Model Name	SHC301
Operating Frequency	2402MHz ~ 2480MHz
Modulation	GFSK
Transfer Rate	Up to 1 Mbps
Number of Channel	40
Maximum Output Power	-3.07 dBm
Normal Voltage	5Vdc (adapter or host equipment)
Hardware Version	N/A
Software Version	N/A

Note:

1. The EUT contains following accessory devices Product Brand Model Description USB Cable

Product	Brand	Model	Description
AC Adapter	PHIHONG	PSAF10A-050Q	I/P: 100-240Vac, 280mA, O/P: 5Vdc, 2000mA
AC Adapter	FLYPOWER	PS10I050K2000UU	I/P: 100-240Vac, 350mA, 50/60Hz O/P: 5Vdc, 2000mA
USB Cable	N/A	N/A	3 meter, non-shielded cable

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Channel List

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

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Tested by
Antenna Port Conducted Measurement	SR4	26°C / 60%RH	120 Vac / 60 Hz	Wayne Chen
Radiated Spurious Emission	966-2	22°C / 55%RH	120 Vac / 60 Hz	Wayne Chen
AC power Line Conducted Emission	SR1	26°C / 54%RH	120 Vac / 60 Hz	Wayne Chen

FCC Test Firm Registration Number: 498077

6.4. Description Of Available Antennas

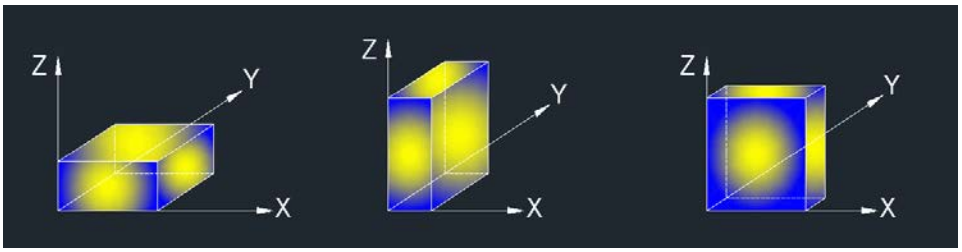
Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
Chain(0)	M.gear	C1920-510002-A(SRF2017850)	PCB	2.9

6.5. Operating Mode and Worst Case of EUT

Test item	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	GFSK	0 to 39	0,19,39	1.0
Radiated Emissions (Below 1GHz)	GFSK	0 to 39	19	1.0
AC Power Line Conducted Emission	GFSK	0 to 39	19	1.0
Antenna Port Conducted Measurement	GFSK	0 to 39	0,19,39	1.0

Note:
1. 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).
2. For below 1 GHz radiated emission and AC power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case.

3. X axis, Y axis, Z axis positions:



The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that X axis was worst-case . Therefore, all final radiated testing was performed with the EUT in X axis.

6.6. Duty cycle

Duty cycle = 405.1/624.1 = 0.649, Duty factor = 10 * log(1/0.649) = 1.878

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070821	Nov. 28, 2017	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 7, 2017	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	VULB 9168-773 & AT-N0539	Feb. 12, 2018	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	BBHA 9120D-01686	Jan. 23, 2018	1 year
Horn Antenna(18-40 GHz)	Schwarzbeck	BBHA 9170	BBHA9170750	Jan.12, 2018	1 year
Preamplifier (30-1000 MHz)	EMCI	RMC330E	980404	Jan. 9, 2018	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980407	Jan. 10, 2018	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980408	Mar. 13, 2018	1 year
RF Cable (9 KHz~18 GHz)	UltraPhase & EMC Instrument	A1K50-UP0358-A1K50-1500&EMC106-NM-SM-2500/8000	170111-3&170104/170223	Feb. 1, 2018	1 year
RF Cable (18 GHz~40 GHz)	UltraPhase	K1K50-UP0264-K1K50-500/2500/4000	170214-3/170214-3/170214-1	Feb. 1, 2018	1 year

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 20, 2017	1 year
Power meter	Anrisu	MA2411B	1531202	Dec. 14, 2017	1 year
Power sensor	Anrisu	ML2495A	1645002	Dec. 14, 2017	1 year
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 28, 2017	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Aug. 2, 2017	1 year
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	July 31, 2017	1 year
Cables	Huber+Suhner	RG 214/U	FCC-BCICF-4_RF	Feb. 1, 2018	1 year

UL Software		
Description	**Name**	**Version**
Radiated measurement	EMC-RI	1.0.0.0
Conducted measurement	Keysight.TestSystem	1.0.0.0
AC power Line Conducted Emission	EZ_EMC	1.1.4.2

8. Description of Test Setup

Support Equipment

Item	Equipment	Brand Name	Model Name	P/N
N/A	N/A	N/A	N/A	N/A

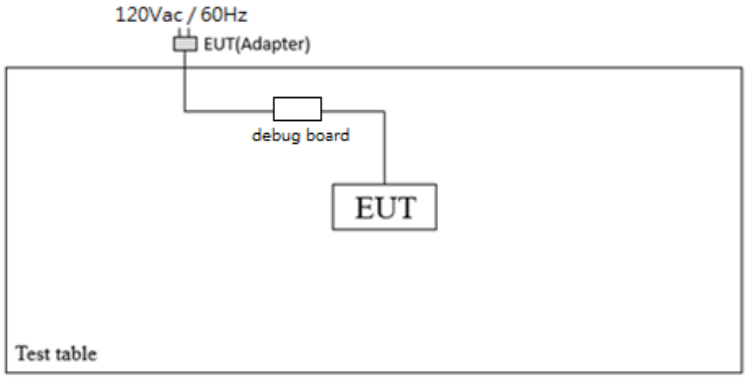
Accessory

Item	Accessory	Brand Name	Model Name	Description
N/A	N/A	N/A	N/A	N/A

Test Setup

The EUT was worked in engineering mode to transmit signal.

Setup Diagram for Test



9. Test Results

9.1. 6 dB Bandwidth

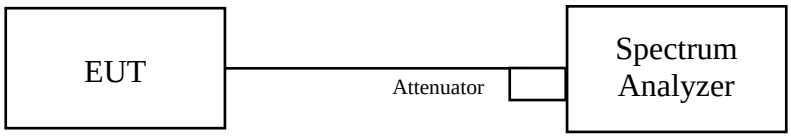
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. 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

Test Setup



Test Data

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
0	2402	0.669	≧ 500	Pass
19	2440	0.669	≧ 500	Pass
39	2480	0.666	≧ 500	Pass

Spectrum Plot of Worst Value

9.2. Conducted output power

Requirements

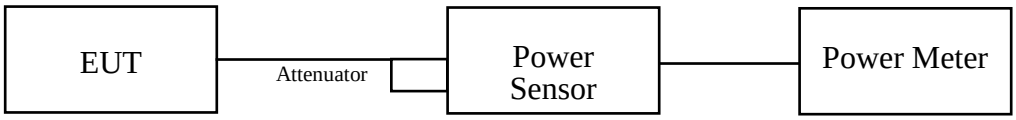
For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Test Procedure

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. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value..

Test Setup



Test Data

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	0.44	-3.56	30	Pass
19	2440	0.49	-3.14	30	Pass
39	2480	0.49	-3.07	30	Pass

9.3. Power Spectral Density

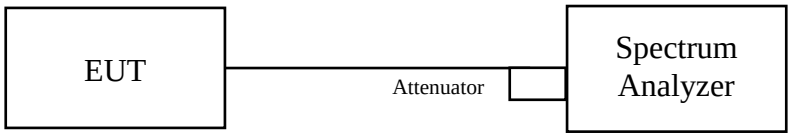
Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

Test procedure

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 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × 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.

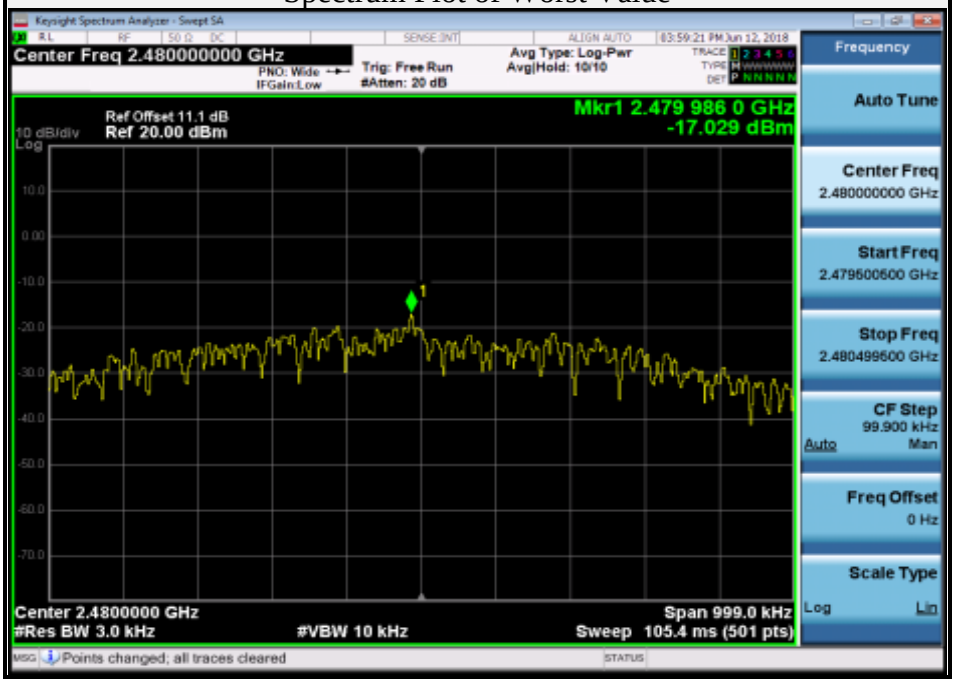
Test Setup



Test Data

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-17.665	8	Pass
19	2440	-17.099	8	Pass
39	2480	-17.029	8	Pass

Spectrum Plot of Worst Value



9.4. Conducted Out of Band Emission

Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209 (a) is not required.

Test procedure

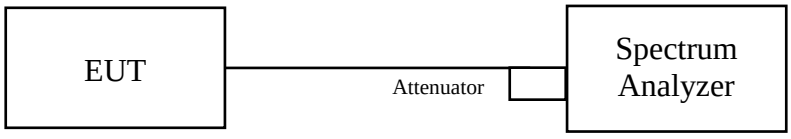
Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE

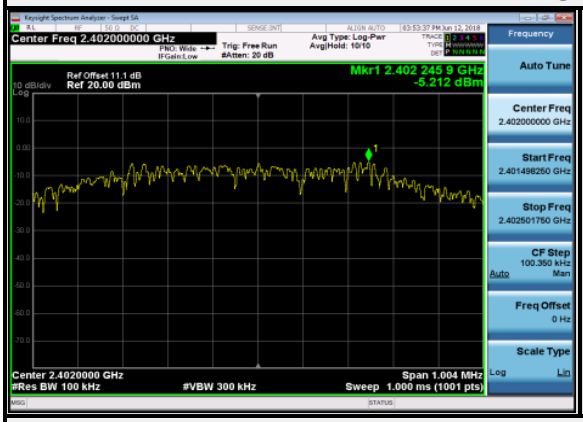
1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

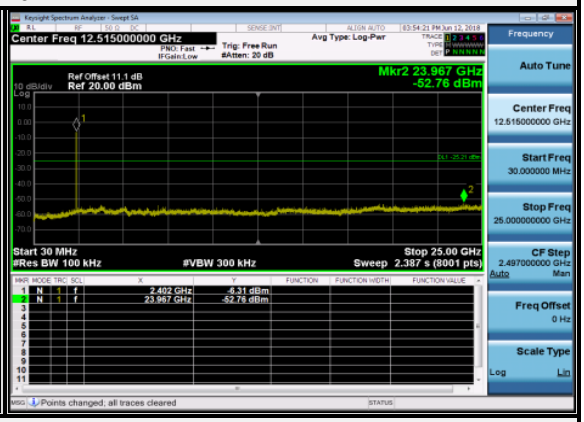
Test Setup



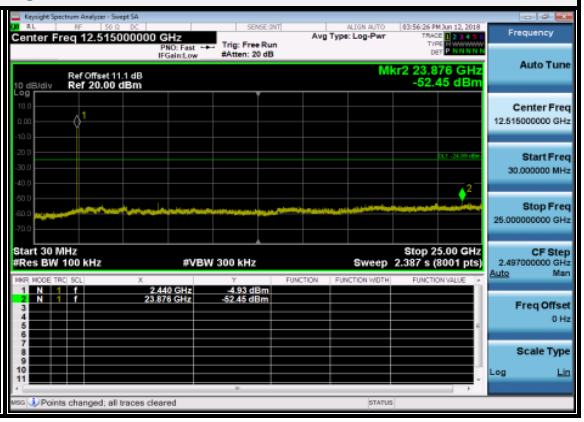
Test Data

Ch 0

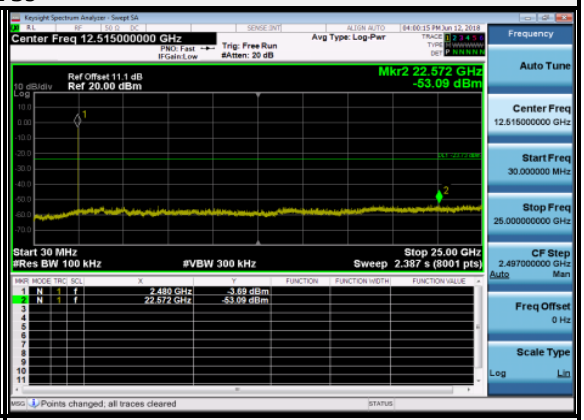




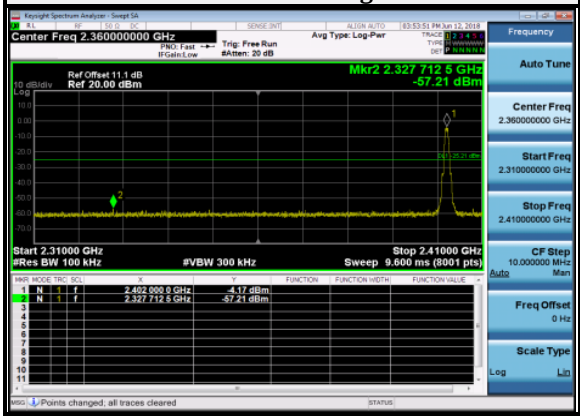
Ch 19



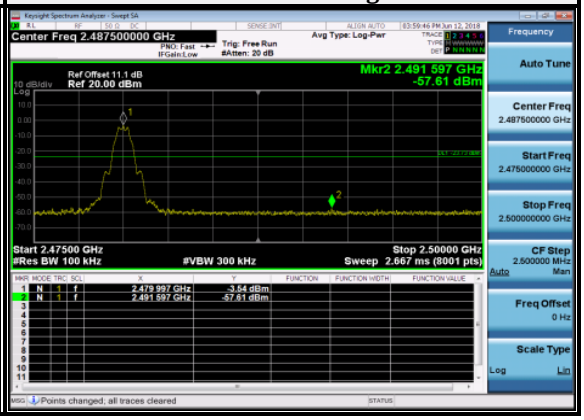
Ch 39



Ch 0 Band Edge



Ch 39 Band Edge



9.5. Radiated Spurious Emission

Requirements

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:

Frequency(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.

Test Procedures

[For 9 kHz ~ 30 MHz]

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. Parallel, perpendicular, and ground-parallel orientations 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. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

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

[For above 30 MHz]

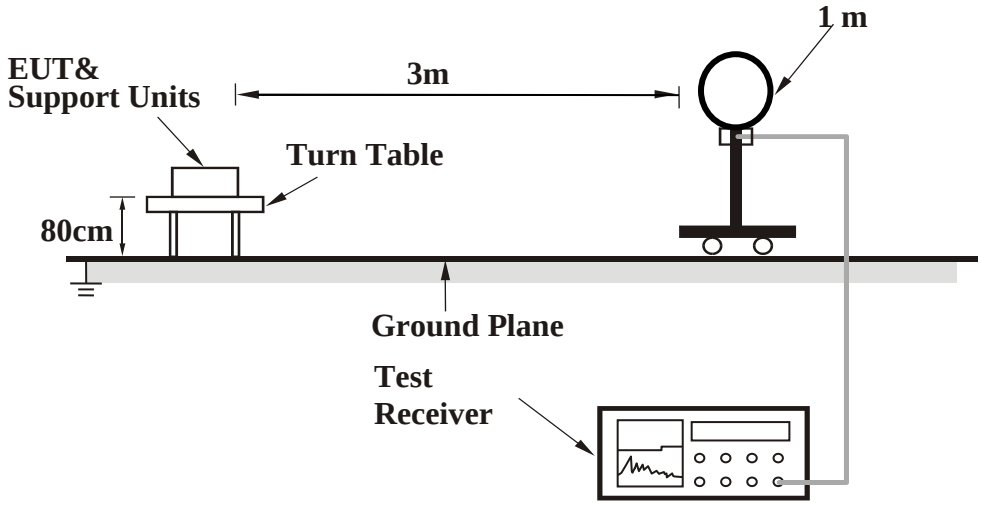
a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving 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. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
f. The test-receiver system was set to peak and average detects 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:

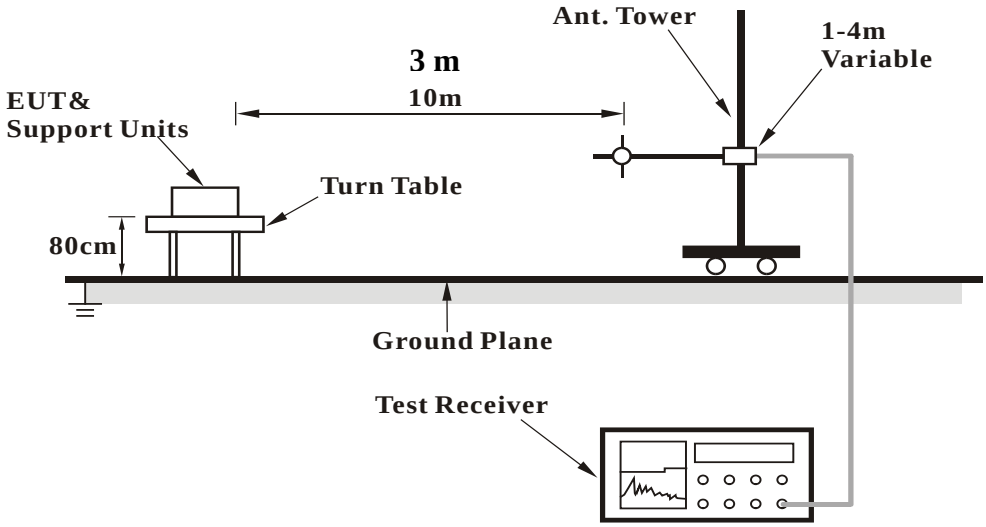
a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
d. All modes of operation were investigated and the worst-case emissions are reported.

Test Setup

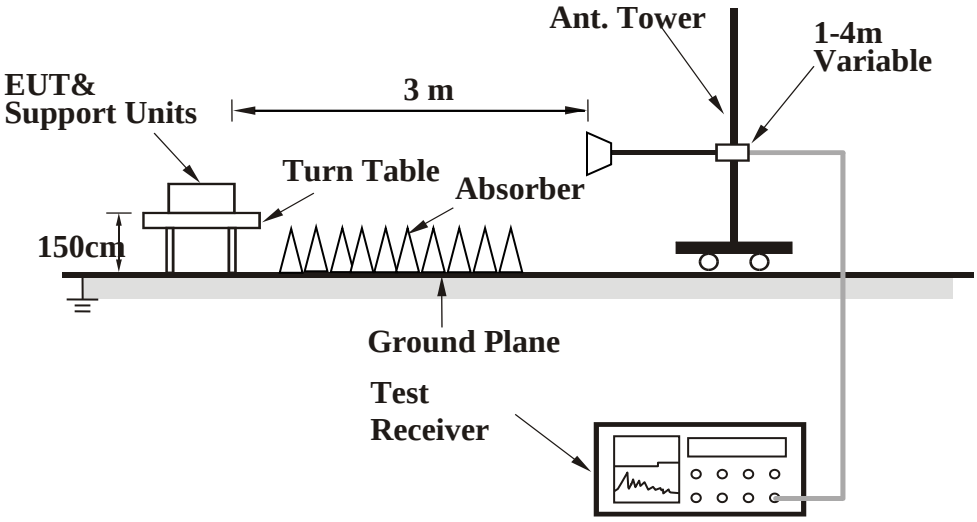
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



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

Test Data

Above 1GHz Data :

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	1 GHz ~ 25 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
1	2390.000	48.91	-8.47	40.44	74.00	-33.56	peak
@2	2401.767	89.17	-8.48	80.69	-	-	peak
3	2390.000	37.94	-8.47	29.47	54.00	-24.53	AVG
@4	2401.993	88.15	-8.47	79.68	-	-	AVG
5	4804.000	48.72	-4.39	44.33	74.00	-29.67	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
1	2390.000	47.96	-8.47	39.49	74.00	-34.51	peak
@2	2401.727	93.46	-8.48	84.98	-	-	peak
3	2390.000	37.81	-8.47	29.34	54.00	-24.66	AVG
@4	2402.020	92.56	-8.47	84.09	-	-	AVG
5	4804.000	48.78	-4.39	44.39	74.00	-29.61	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 19	**Frequency Range**	1 GHz ~ 25 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
1	2390.000	48.49	-8.47	40.02	74.00	-33.98	peak
@2	2440.207	89.11	-8.50	80.61	-	-	peak
3	2483.500	48.70	-8.55	40.15	74.00	-33.85	peak
4	2390.000	37.26	-8.47	28.79	54.00	-25.21	AVG
@5	2440.047	87.77	-8.50	79.27	-	-	AVG
6	2483.500	38.05	-8.55	29.50	54.00	-24.50	AVG
7	4880.000	46.54	-4.23	42.31	74.00	-31.69	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
1	2390.000	48.55	-8.47	40.08	74.00	-33.92	peak
@2	2440.240	93.36	-8.50	84.86	-	-	peak
3	2483.500	49.17	-8.55	40.62	74.00	-33.38	peak
4	2390.000	37.26	-8.47	28.79	54.00	-25.21	AVG
@5	2440.007	92.57	-8.50	84.07	-	-	AVG
6	2483.500	37.75	-8.55	29.20	54.00	-24.80	AVG
7	4880.000	47.22	-4.23	42.99	74.00	-31.01	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	1 GHz ~ 25 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@1	2479.760	89.45	-8.53	80.92	-	-	peak
2	2483.500	48.42	-8.55	39.87	74.00	-34.13	peak
@3	2480.007	88.70	-8.53	80.17	-	-	AVG
4	2483.500	37.86	-8.55	29.31	54.00	-24.69	AVG
5	4960.000	46.59	-4.04	42.55	74.00	-31.45	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@1	2480.233	92.78	-8.54	84.24	-	-	peak
2	2483.500	49.06	-8.55	40.51	74.00	-33.49	peak
@3	2480.053	91.83	-8.53	83.30	-	-	AVG
4	2483.500	37.48	-8.55	28.93	54.00	-25.07	AVG
5	4960.000	46.30	-4.04	42.26	74.00	-31.74	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

Below 1GHz Data：

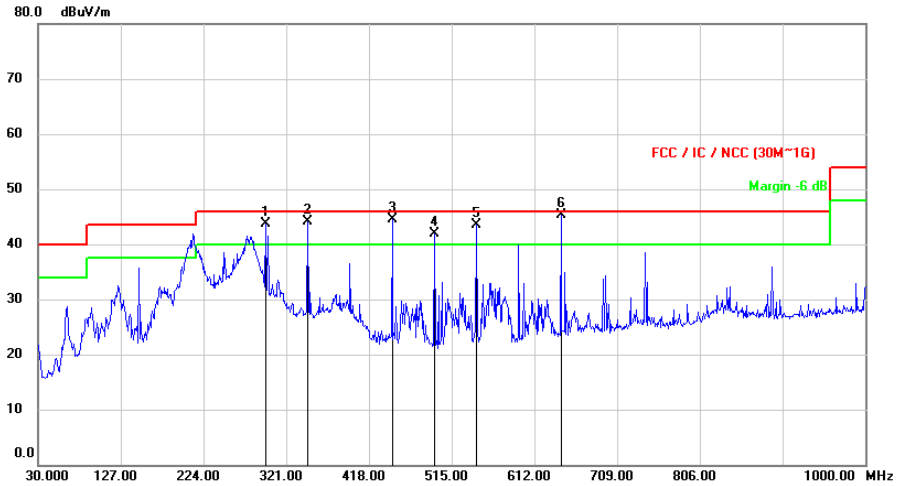
9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

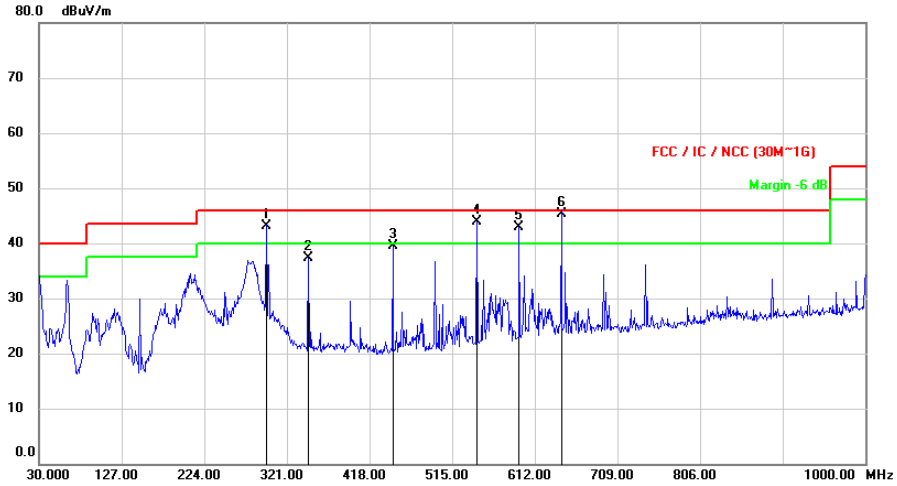
30 MHz ~ 1 GHz Data:

EUT Test Condition		Measurement Detail	
Channel	Channel 19	**Frequency Range**	30 MHz ~ 1 GHz

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
1	296.9763	58.28	-14.53	43.75	46.00	-2.25	peak
2	346.4786	57.65	-13.46	44.19	46.00	-1.81	peak
3	445.4833	55.19	-10.74	44.45	46.00	-1.55	peak
4	494.9857	51.92	-9.92	42.00	46.00	-4.00	peak
5	544.4880	52.53	-8.94	43.59	46.00	-2.41	peak
6	643.4927	52.12	-6.86	45.26	46.00	-0.74	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
No.	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
1	296.9763	57.73	-14.53	43.20	46.00	-2.80	peak
2	346.4786	50.71	-13.46	37.25	46.00	-8.75	peak
3	445.4833	50.29	-10.74	39.55	46.00	-6.45	peak
4	544.4880	52.88	-8.94	43.94	46.00	-2.06	peak
5	593.9903	50.60	-7.60	43.00	46.00	-3.00	peak
6	643.4927	52.26	-6.86	45.40	46.00	-0.60	QP

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

9.6. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

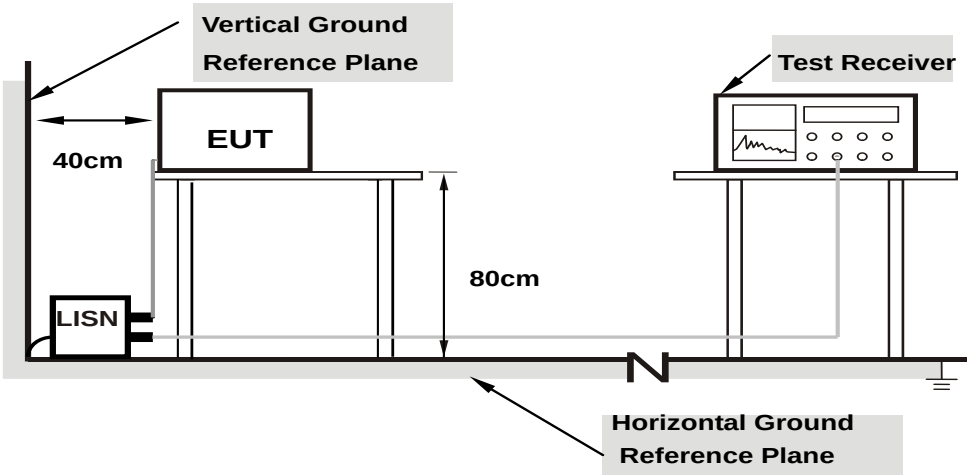
Note:
1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

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

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

Test Setup



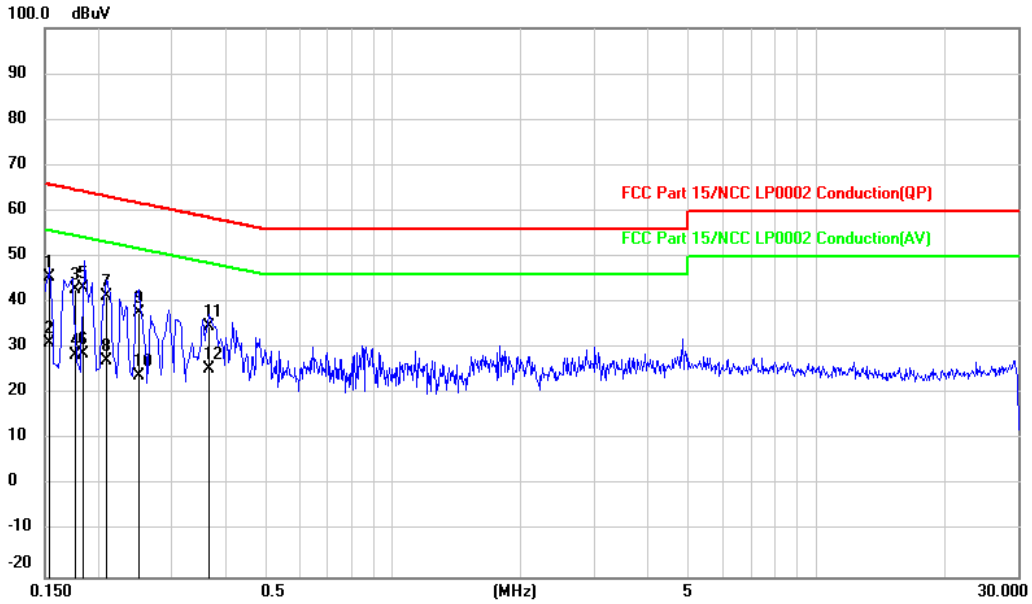
Note: 1.Support units were connected to second LISN.

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

Test Data

EUT Test Condition		Measurement Detail	
Channel	19	**Frequency Range**	150 kHz ~ 30 MHz

Phase of Power：Line (L)

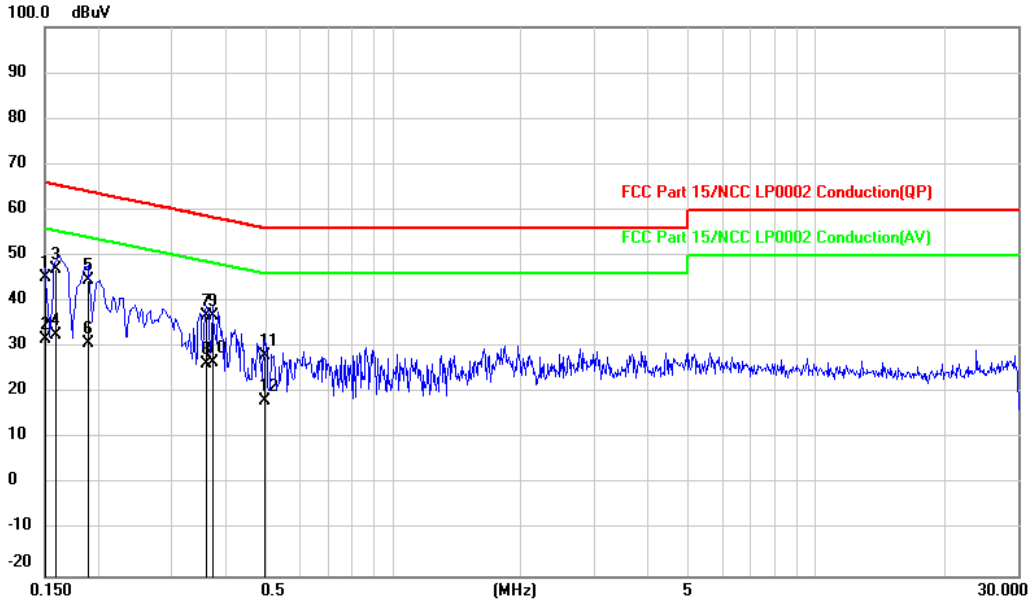


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1532	26.12	19.57	45.69	65.82	-20.13	QP
2	0.1532	11.68	19.57	31.25	55.82	-24.57	AVG
3	0.1774	23.16	19.57	42.73	64.61	-21.88	QP
4	0.1774	8.97	19.57	28.54	54.61	-26.07	AVG
5	0.1836	23.57	19.58	43.15	64.32	-21.17	QP
6	0.1836	9.18	19.58	28.76	54.32	-25.56	AVG
7	0.2104	21.68	19.58	41.26	63.19	-21.93	QP
8	0.2104	7.81	19.58	27.39	53.19	-25.80	AVG
9	0.2513	18.10	19.59	37.69	61.71	-24.02	QP
10	0.2513	4.32	19.59	23.91	51.71	-27.80	AVG
11	0.3639	15.11	19.60	34.71	58.64	-23.93	QP
12	0.3639	5.77	19.60	25.37	48.64	-23.27	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

Phase of Power：Neutral (N)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1507	25.71	19.59	45.30	65.96	-20.66	QP
2	0.1507	12.22	19.59	31.81	55.96	-24.15	AVG
3	0.1584	27.51	19.59	47.10	65.55	-18.45	QP
4	0.1584	13.16	19.59	32.75	55.55	-22.80	AVG
5	0.1896	24.94	19.59	44.53	64.05	-19.52	QP
6	0.1896	11.32	19.59	30.91	54.05	-23.14	AVG
7	0.3626	17.30	19.62	36.92	58.67	-21.75	QP
8	0.3626	6.64	19.62	26.26	48.67	-22.41	AVG
9	0.3754	17.13	19.62	36.75	58.38	-21.63	QP
10	0.3754	6.92	19.62	26.54	48.38	-21.84	AVG
11	0.4962	8.52	19.61	28.13	56.06	-27.93	QP
12	0.4962	-1.30	19.61	18.31	46.06	-27.75	AVG

Remarks:

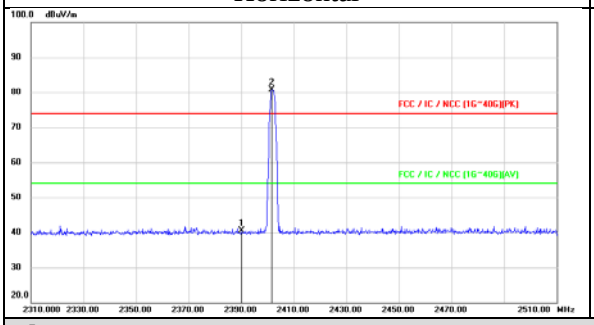
1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

Appendix I Radiated Band Edge Measurement

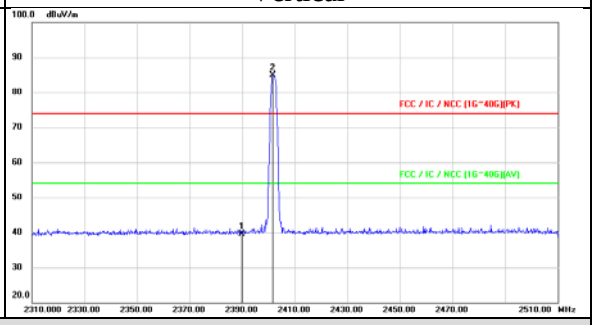
Peak

Ch0

Horizontal

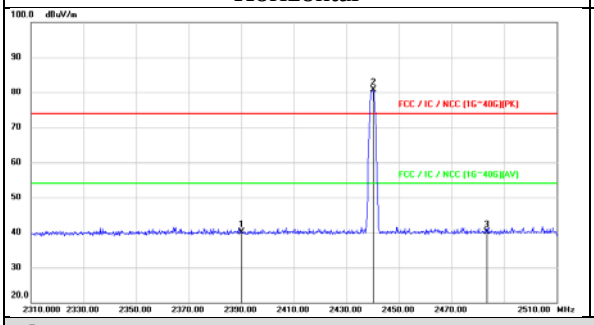


Vertical

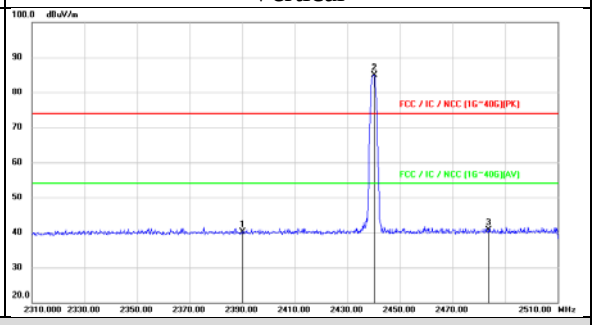


Ch19

Horizontal

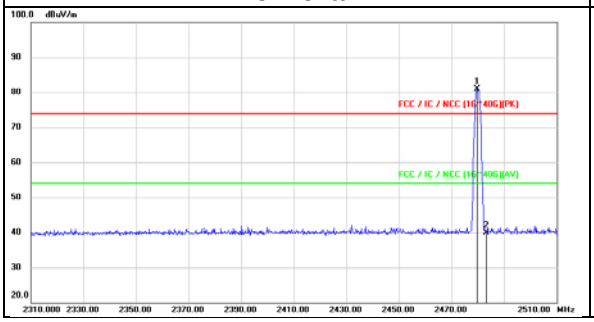


Vertical

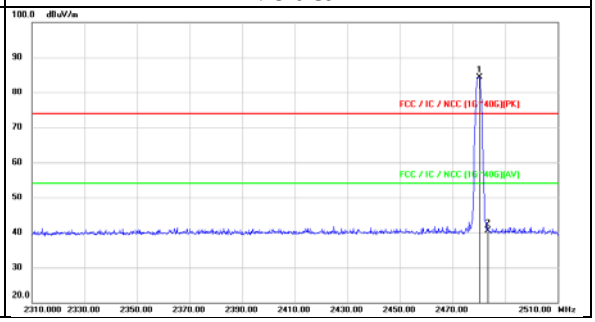


Ch39

Horizontal



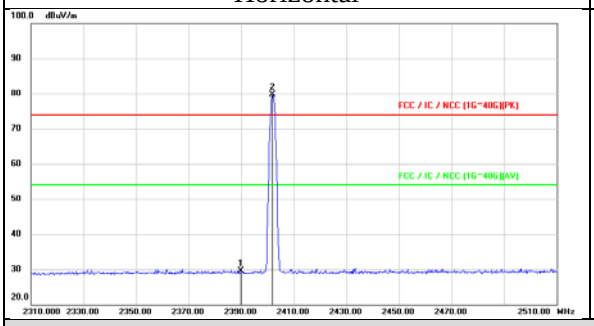
Vertical



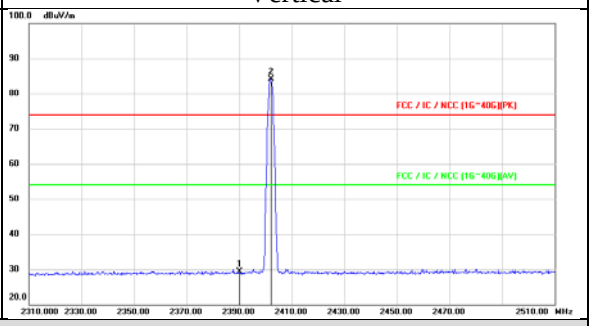
Average

Ch0

Horizontal

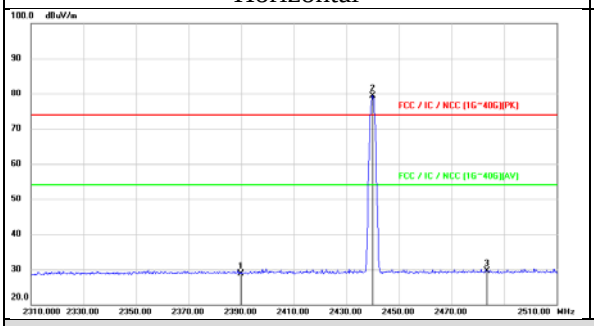


Vertical

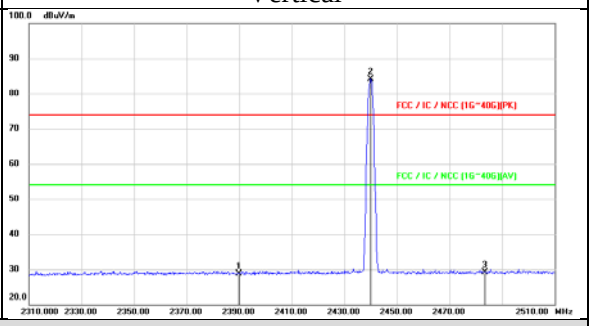


Ch19

Horizontal

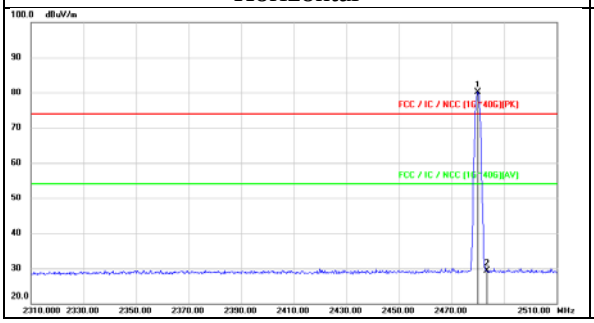
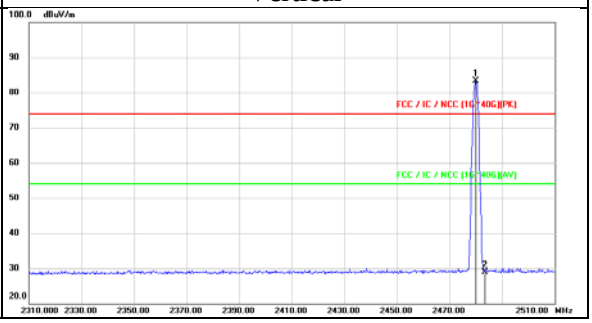


Vertical



Ch39

Horizontal



Vertical