

FCC Test Report

(Bluetooth LE_DTS)

Report No.: RF191225C12-1

FCC ID: QOQ-GM220P

Test Model: MGM220P22A

Series Model: BGM220P22A, BGX220P22A (refer to item 3.1 for more details)

Received Date: Dec. 25, 2019

Test Date: Feb. 12 ~ Mar. 16, 2020

Issued Date: Mar. 18, 2020

Applicant: Silicon Laboratories Finland Oy

Address: Alberga Business Park - Bldg D/Floor 5, Bertel Jungin aukio 3, 02600
ESPOO, FINLAND

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

FCC Registration / 788550 / TW0003
Designation Number:



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. This report should 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	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	8
3.2.1 Test Mode Applicability and Tested Channel Detail	9
3.1 Duty Cycle of Test Signal	10
3.2 Description of Support Units	11
3.2.1 Configuration of System under Test	11
3.3 General Description of Applied Standards and References	11
4 Test Types and Results	12
4.1 Radiated Emission and Bandedge Measurement.....	12
4.1.1 Limits of Radiated Emission and Bandedge Measurement	12
4.1.2 Test Instruments	13
4.1.3 Test Procedures.....	14
4.1.4 Deviation from Test Standard	14
4.1.5 Test Setup.....	15
4.1.6 EUT Operating Conditions.....	16
4.1.7 Test Results	17
4.2 Conducted Emission Measurement	27
4.2.1 Limits of Conducted Emission Measurement	27
4.2.2 Test Instruments	27
4.2.3 Test Procedures.....	28
4.2.4 Deviation from Test Standard	28
4.2.5 Test Setup.....	28
4.2.6 EUT Operating Conditions.....	28
4.2.7 Test Results	29
4.3 6dB Bandwidth Measurement.....	31
4.3.1 Limits of 6dB Bandwidth Measurement.....	31
4.3.2 Test Setup.....	31
4.3.3 Test Instruments	31
4.3.4 Test Procedure	31
4.3.5 Deviation from Test Standard	31
4.3.6 EUT Operating Conditions.....	31
4.3.7 Test Result.....	32
4.4 Conducted Output Power Measurement.....	33
4.4.1 Limits of Conducted Output Power Measurement	33
4.4.2 Test Setup.....	33
4.4.3 Test Instruments	33
4.4.4 Test Procedures.....	33
4.4.5 Deviation from Test Standard	33
4.4.6 EUT Operating Conditions.....	33
4.4.7 Test Results	34
4.5 Power Spectral Density Measurement.....	35
4.5.1 Limits of Power Spectral Density Measurement.....	35
4.5.2 Test Setup.....	35
4.5.3 Test Instruments	35
4.5.4 Test Procedure	35
4.5.5 Deviation from Test Standard	35

4.5.6 EUT Operating Condition	35
4.5.7 Test Results	36
4.6 Conducted Out of Band Emission Measurement.....	37
4.6.1 Limits of Conducted Out of Band Emission Measurement.....	37
4.6.2 Test Setup.....	37
4.6.3 Test Instruments	37
4.6.4 Test Procedure	37
4.6.5 Deviation from Test Standard	37
4.6.6 EUT Operating Condition	37
4.6.7 Test Results	37
5 Pictures of Test Arrangements.....	41
Appendix – Information of the Testing Laboratories	42

Release Control Record

Issue No.	Description	Date Issued
RF191225C12-1	Original release.	Mar. 18, 2020

1 Certificate of Conformity

Product: Zigbee and Bluetooth Low Energy wireless radio modules (Refer to item 3.1 for the more details)

Brand: Silicon Labs

Test Model: MGM220P22A

Series Model: BGM220P22A, BGX220P22A (refer to item 3.1 for more details)

Sample Status: Engineering sample fully representing the production model

Applicant: Silicon Laboratories Finland Oy

Test Date: Feb. 12 ~ Mar. 16, 2020

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

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

Prepared by : Polly Chien , **Date:** Mar. 18, 2020
Polly Chien / Specialist

Approved by : Bruce Chen , **Date:** Mar. 18, 2020
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -15.07dB at 0.43400MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.9dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Zigbee and Bluetooth Low Energy wireless radio modules (Refer to note)
Brand	Silicon Labs
Test Model	MGM220P22A
Series Model	BGM220P22A, BGX220P22A
Model Difference	Refer to note
Sample Status	Engineering sample fully representing the production model
Power Supply Rating	3Vdc from host equipment
Modulation Type	GFSK
Transfer Rate	1Mbps, 2Mbps
Operating Frequency	2402~2480MHz
Number of Channel	40
Output Power	LE 1M: 8.128mW LE 2M: 8.091mW
Antenna Type	Refer to Note
Antenna Connector	NA
Accessory Device	NA
Cable Supplied	NA

Note:

1. All models are listed as below. Model MGM220P22A is the representative for final test.

Product	Zigbee and Bluetooth Low Energy wireless radio modules	Bluetooth Low Energy wireless radio modules
Model	MGM220P22A	BGM220P22A and BGX220P22A
Spec.	Zigbee and/or BLE and/or SRD	BLE and/or SRD
Antenna Type	On board ceramic chip antenna with 1.86dBi of gain	
Hardware	Hardware-wise the modules are identical. These are fully internally regulated and shielded PCB modules with a single integral ceramic chip antenna. There are no separate variants with an RF pin or a connector for using external antennas.	
RF max TX power	8.2 dBm	8.2 dBm
Model differences	The only difference in these modules concern the factory software configuration defining which wireless protocol are allowed: - The MGM220P22A can run Zigbee and/or BLE and/or SRD - The BGM220P22A can run BLE and/or SRD - The BGX220P22A is identical to the BGM220P22A, but with another name for marketing differentiation	

*SRD = Short Range Device.

2. The EUT is capable of running the Zigbee and Bluetooth Low Energy protocols, and an additional custom protocol. However, in no circumstance the module will transmit using two or more protocols at the same time.
3. Spurious emission of the simultaneous operation (Zigbee, DTS, Hopping and SRD) has been evaluated and no non-compliance was found.

3. The power setting is list as below.

Test Mode	LE 1M	Test Mode	LE 2M
CH 0	82	CH 1	82
CH 1	82	CH 19	82
CH 19	82	CH 38	82
CH 38	82		
CH 39	82		

3.2 Description of Test Modes

40 channels are provided to this EUT:

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

* That the channels 2402MHz, 2426MHz, and 2480MHz are used for primary advertising only, and these advertisement packets are never being sent over the 2M PHY, meaning that when testing band edges the 2M PHY should not be taken into account with the upper and lower channels.

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 Z-plane.

Radiated Emission Test (Above 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	0 to 39	0, 1, 19, 38, 39	GFSK	1.0
-	0 to 39	1, 19, 38	GFSK	2.0

Radiated Emission Test (Below 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	0 to 39	0	GFSK	1.0

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	0 to 39	0	GFSK	1.0

Antenna Port Conducted Measurement:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	0 to 39	0, 1, 19, 38, 39	GFSK	1.0
-	0 to 39	1, 19, 38	GFSK	2.0

Test Condition:

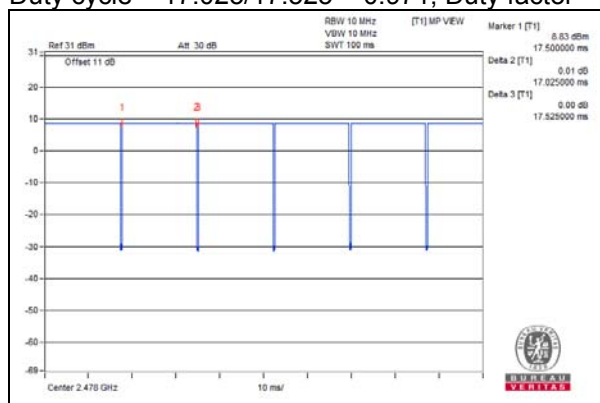
Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE≥1G	22 deg. C, 66% RH	120Vac, 60Hz	Greg Lin
RE<1G	22 deg. C, 66% RH	120Vac, 60Hz	Greg Lin
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Greg Lin
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Jisyong Wang

3.1 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

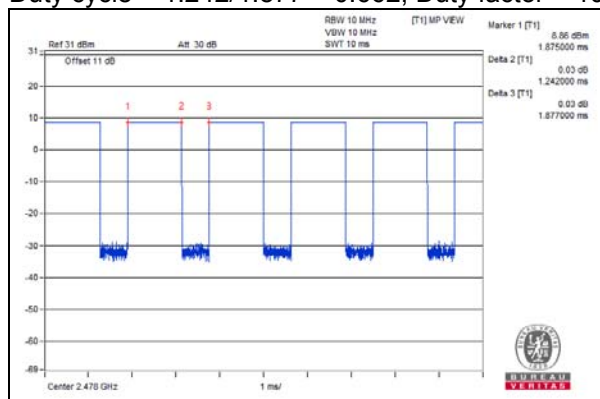
LE 1M:

Duty cycle = 17.025/17.525 = 0.971, Duty factor = $10 * \log(1/0.971) = 0.13$



LE 2M:

Duty cycle = 1.242/1.877 = 0.662, Duty factor = $10 * \log(1/0.662) = 1.79$



3.2 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.

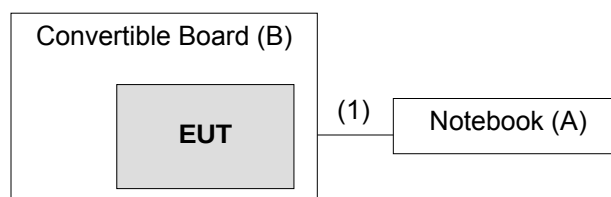
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	Lenovo	81A4	YD02TWF5	FCC DoC Approved	-
B.	Convertible Board	NA	NA	NA	NA	Provided by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	1	Y	0	-

3.2.1 Configuration of System under Test



3.3 General Description of Applied Standards and References

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

Test standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 04, 2019	Jun. 03, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 19, 2019	Feb. 18, 2020
			Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jul. 11, 2019	Jul. 10, 2020
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY551900 04/MY55190007/MY552 10005	Jul. 15, 2019	Jul. 14, 2020

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.

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. 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. 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:

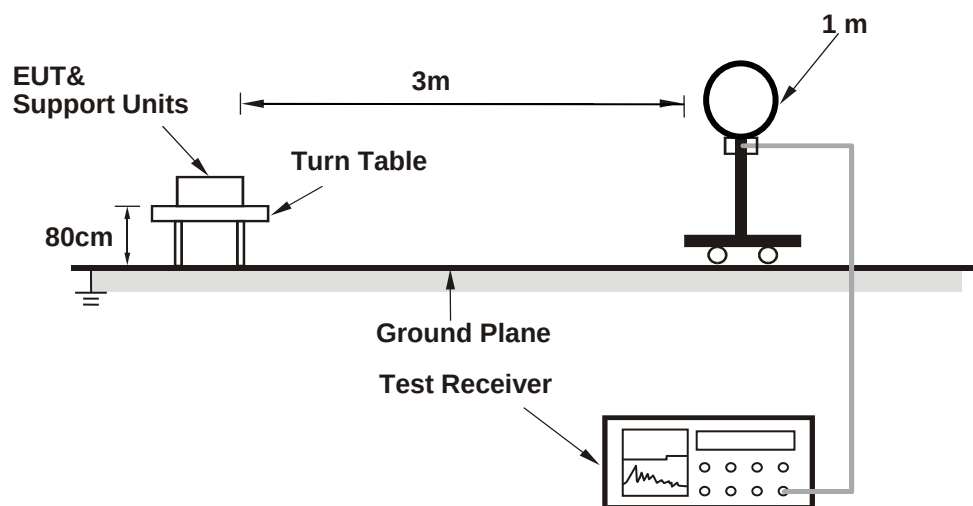
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 3 x RBW (Duty cycle $\geq$ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

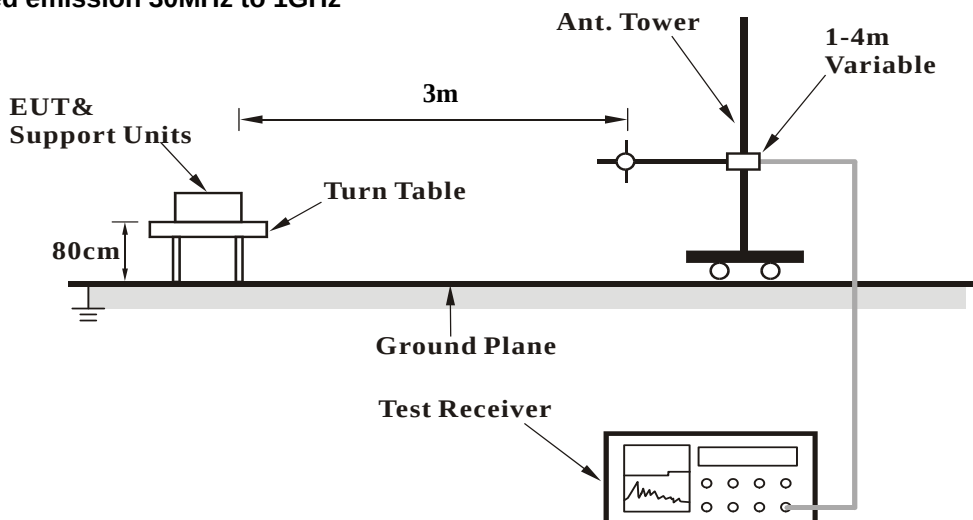
No deviation.

4.1.5 Test Setup

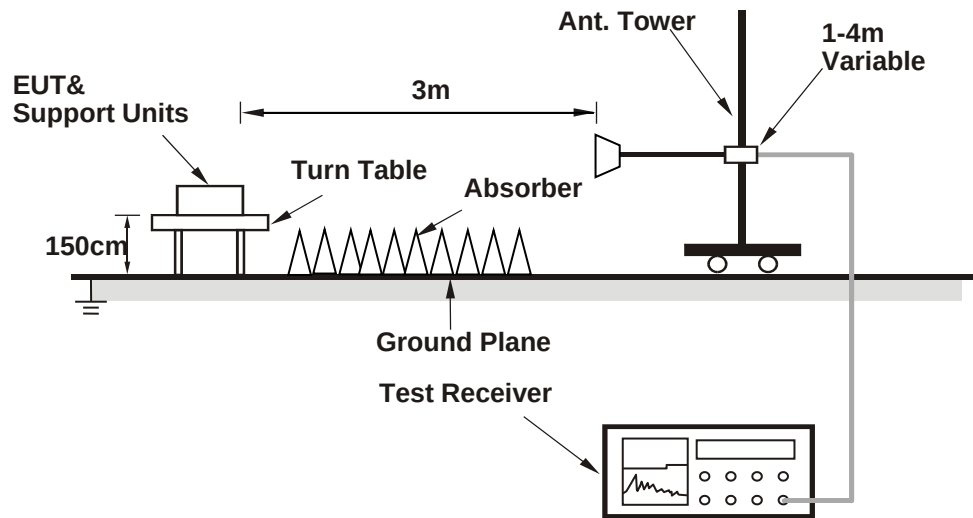
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a USB cable and ran a test program (CMD) to enable EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

4.1.7 Test Results

Above 1GHz Data:

LE 1M:

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.4 PK	74.0	-18.6	1.53 H	352	24.2	31.2
2	2390.00	43.7 AV	54.0	-10.3	1.53 H	352	12.5	31.2
3	*2402.00	104.3 PK			1.60 H	359	73.2	31.1
4	*2402.00	102.7 AV			1.60 H	359	71.6	31.1
5	4804.00	43.3 PK	74.0	-30.7	1.13 H	336	41.2	2.1
6	4804.00	29.6 AV	54.0	-24.4	1.13 H	336	27.5	2.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.0 PK	74.0	-19.0	1.15 V	297	23.8	31.2
2	2390.00	43.1 AV	54.0	-10.9	1.15 V	297	11.9	31.2
3	*2402.00	98.5 PK			1.03 V	303	67.4	31.1
4	*2402.00	97.0 AV			1.03 V	303	65.9	31.1
5	4804.00	42.7 PK	74.0	-31.3	1.76 V	209	40.6	2.1
6	4804.00	29.3 AV	54.0	-24.7	1.76 V	209	27.2	2.1

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 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	55.4 PK	74.0	-18.6	1.53 H	350	24.2	31.2
2	2390.00	43.5 AV	54.0	-10.5	1.53 H	350	12.3	31.2
3	*2404.00	104.1 PK			1.61 H	358	73.0	31.1
4	*2404.00	102.7 AV			1.61 H	358	71.6	31.1
5	4808.00	43.3 PK	74.0	-30.7	1.04 H	342	41.2	2.1
6	4808.00	29.7 AV	54.0	-24.3	1.04 H	342	27.6	2.1
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	54.9 PK	74.0	-19.1	1.05 V	291	23.7	31.2
2	2390.00	43.0 AV	54.0	-11.0	1.05 V	291	11.8	31.2
3	*2404.00	98.6 PK			1.01 V	296	67.5	31.1
4	*2404.00	97.1 AV			1.01 V	296	66.0	31.1
5	4808.00	42.5 PK	74.0	-31.5	1.83 V	212	40.4	2.1
6	4808.00	29.4 AV	54.0	-24.6	1.83 V	212	27.3	2.1

Remarks:

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

CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	104.4 PK			1.59 H	4	73.3	31.1
2	*2440.00	102.9 AV			1.59 H	4	71.8	31.1
3	4880.00	42.9 PK	74.0	-31.1	1.12 H	346	41.0	1.9
4	4880.00	29.4 AV	54.0	-24.6	1.12 H	346	27.5	1.9
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	98.7 PK			1.06 V	297	67.6	31.1
2	*2440.00	97.2 AV			1.06 V	297	66.1	31.1
3	4880.00	42.1 PK	74.0	-31.9	1.73 V	203	40.2	1.9
4	4880.00	29.0 AV	54.0	-25.0	1.73 V	203	27.1	1.9

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 38	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	*2478.00	103.8 PK			1.56 H	352	72.7	31.1
2	*2478.00	102.3 AV			1.56 H	352	71.2	31.1
3	2483.50	56.5 PK	74.0	-17.5	1.51 H	342	25.3	31.2
4	2483.50	44.5 AV	54.0	-9.5	1.51 H	342	13.3	31.2
5	4956.00	42.8 PK	74.0	-31.2	1.46 H	339	40.7	2.1
6	4956.00	29.4 AV	54.0	-24.6	1.46 H	339	27.3	2.1
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	*2478.00	98.2 PK			1.04 V	301	67.1	31.1
2	*2478.00	96.7 AV			1.04 V	301	65.6	31.1
3	2483.50	55.5 PK	74.0	-18.5	1.12 V	291	24.3	31.2
4	2483.50	43.4 AV	54.0	-10.6	1.12 V	291	12.2	31.2
5	4956.00	42.3 PK	74.0	-31.7	1.83 V	216	40.2	2.1
6	4956.00	29.2 AV	54.0	-24.8	1.83 V	216	27.1	2.1

Remarks:

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

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	103.5 PK			1.51 H	352	72.4	31.1
2	*2480.00	102.0 AV			1.51 H	352	70.9	31.1
3	2483.50	60.3 PK	74.0	-13.7	1.48 H	359	29.1	31.2
4	2483.50	49.1 AV	54.0	-4.9	1.48 H	359	17.9	31.2
5	4960.00	43.5 PK	74.0	-30.5	1.09 H	334	41.3	2.2
6	4960.00	29.6 AV	54.0	-24.4	1.09 H	334	27.4	2.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	97.9 PK			1.00 V	304	66.8	31.1
2	*2480.00	96.4 AV			1.00 V	304	65.3	31.1
3	2483.50	57.1 PK	74.0	-16.9	1.07 V	293	25.9	31.2
4	2483.50	44.6 AV	54.0	-9.4	1.07 V	293	13.4	31.2
5	4960.00	42.4 PK	74.0	-31.6	1.79 V	204	40.2	2.2
6	4960.00	29.0 AV	54.0	-25.0	1.79 V	204	26.8	2.2

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.

LE 2M:

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	56.3 PK	74.0	-17.7	1.52 H	351	25.1	31.2
2	2390.00	43.9 AV	54.0	-10.1	1.52 H	351	12.7	31.2
3	*2404.00	104.1 PK			1.59 H	359	73.0	31.1
4	*2404.00	100.9 AV			1.59 H	359	69.8	31.1
5	4808.00	43.4 PK	74.0	-30.6	1.12 H	348	41.3	2.1
6	4808.00	29.6 AV	54.0	-24.4	1.12 H	348	27.5	2.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.4 PK	74.0	-18.6	1.01 V	295	24.2	31.2
2	2390.00	43.2 AV	54.0	-10.8	1.01 V	295	12.0	31.2
3	*2404.00	98.5 PK			1.05 V	303	67.4	31.1
4	*2404.00	95.3 AV			1.05 V	303	64.2	31.1
5	4808.00	42.4 PK	74.0	-31.6	1.69 V	202	40.3	2.1
6	4808.00	29.2 AV	54.0	-24.8	1.69 V	202	27.1	2.1

Remarks:

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

CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	103.9 PK			1.57 H	3	72.8	31.1
2	*2440.00	101.4 AV			1.57 H	3	70.3	31.1
3	4880.00	43.3 PK	74.0	-30.7	1.16 H	338	41.4	1.9
4	4880.00	29.5 AV	54.0	-24.5	1.16 H	338	27.6	1.9
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	98.3 PK			1.12 V	298	67.2	31.1
2	*2440.00	95.7 AV			1.12 V	298	64.6	31.1
3	4880.00	42.3 PK	74.0	-31.7	1.82 V	218	40.4	1.9
4	4880.00	28.9 AV	54.0	-25.1	1.82 V	218	27.0	1.9

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 38	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	*2478.00	104.0 PK			1.46 H	354	72.9	31.1
2	*2478.00	101.5 AV			1.46 H	354	70.4	31.1
3	2483.50	60.6 PK	74.0	-13.4	1.52 H	356	29.4	31.2
4	2483.50	48.9 AV	54.0	-5.1	1.52 H	356	17.7	31.2
5	4956.00	43.3 PK	74.0	-30.7	1.15 H	347	41.2	2.1
6	4956.00	29.5 AV	54.0	-24.5	1.15 H	347	27.4	2.1
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	*2478.00	98.4 PK			1.07 V	300	67.3	31.1
2	*2478.00	95.9 AV			1.07 V	300	64.8	31.1
3	2483.50	57.0 PK	74.0	-17.0	1.14 V	293	25.8	31.2
4	2483.50	44.4 AV	54.0	-9.6	1.14 V	293	13.2	31.2
5	4956.00	42.6 PK	74.0	-31.4	1.72 V	210	40.5	2.1
6	4956.00	29.1 AV	54.0	-24.9	1.72 V	210	27.0	2.1

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:

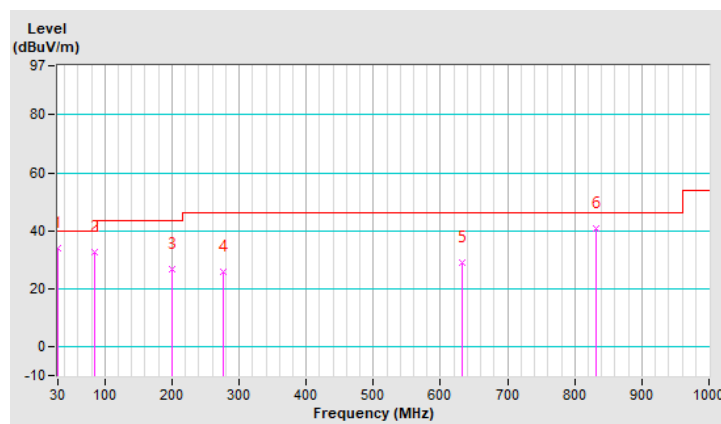
LE 1M

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	30.00	34.0 QP	40.0	-6.0	1.00 H	171	45.3	-11.3
2	84.32	32.4 QP	40.0	-7.6	1.25 H	184	47.1	-14.7
3	200.72	26.9 QP	43.5	-16.6	1.50 H	310	39.0	-12.1
4	276.38	25.7 QP	46.0	-20.3	1.50 H	201	34.2	-8.5
5	631.40	28.8 QP	46.0	-17.2	1.50 H	198	30.2	-1.4
6	831.22	40.6 QP	46.0	-5.4	1.00 H	137	38.7	1.9

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

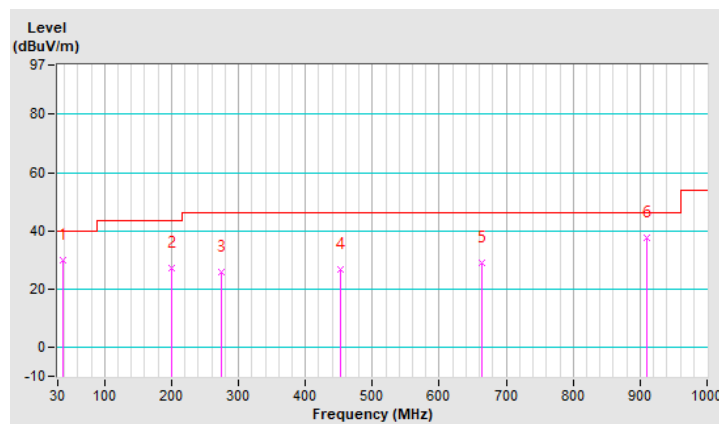


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	37.76	30.0 QP	40.0	-10.0	1.25 V	180	40.7	-10.7
2	200.72	27.2 QP	43.5	-16.3	1.00 V	76	39.3	-12.1
3	274.44	25.7 QP	46.0	-20.3	1.50 V	115	34.3	-8.6
4	452.92	26.6 QP	46.0	-19.4	1.00 V	37	30.9	-4.3
5	663.41	29.2 QP	46.0	-16.8	1.50 V	225	30.2	-1.0
6	909.79	37.7 QP	46.0	-8.3	1.25 V	180	33.9	3.8

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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

Tested date: Feb. 12, 2020

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 22, 2019	Aug. 21, 2020
Software ADT	BV ADT_Conc_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-12040.

4. Test date: Feb. 12, 2020

4.2.3 Test Procedures

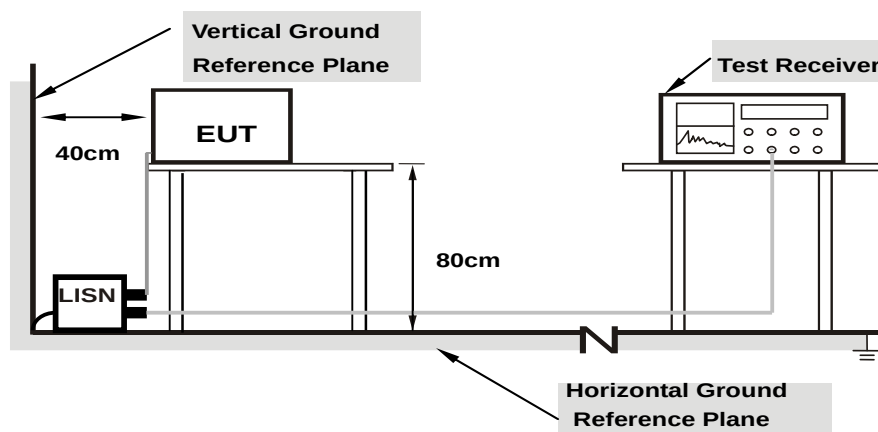
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Conditions

Same as item 4.1.6.

4.2.7 Test Results

Worst-case data:

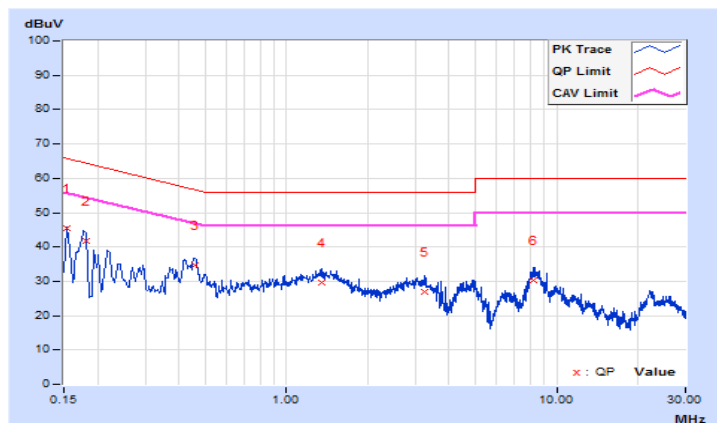
LE 1M

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	9.67	35.76	20.82	45.43	30.49	65.78	55.78	-20.35	-25.29
2	0.18200	9.66	32.13	18.80	41.79	28.46	64.39	54.39	-22.60	-25.93
3	0.45596	9.69	24.96	18.11	34.65	27.80	56.77	46.77	-22.12	-18.97
4	1.35400	9.75	20.00	15.75	29.75	25.50	56.00	46.00	-26.25	-20.50
5	3.24200	9.82	17.10	11.73	26.92	21.55	56.00	46.00	-29.08	-24.45
6	8.25400	9.90	20.43	15.10	30.33	25.00	60.00	50.00	-29.67	-25.00

Remarks:

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

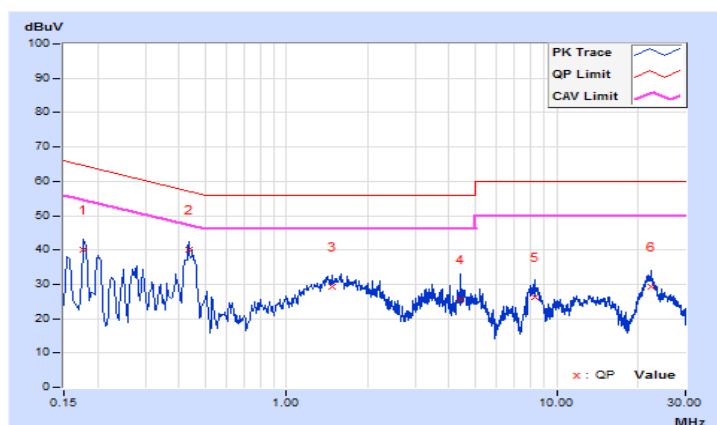


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17800	9.64	30.36	15.33	40.00	24.97	64.58	54.58	-24.58	-29.61
2	0.43400	9.66	30.36	22.45	40.02	32.11	57.18	47.18	-17.16	-15.07
3	1.47400	9.72	19.67	14.96	29.39	24.68	56.00	46.00	-26.61	-21.32
4	4.42200	9.82	15.87	7.38	25.69	17.20	56.00	46.00	-30.31	-28.80
5	8.28200	9.88	16.32	9.11	26.20	18.99	60.00	50.00	-33.80	-31.01
6	22.43800	10.07	19.08	14.40	29.15	24.47	60.00	50.00	-30.85	-25.53

Remarks:

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

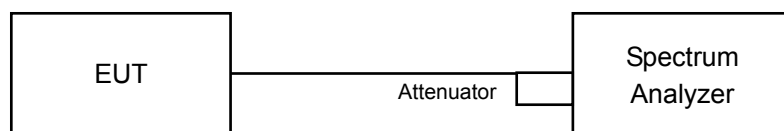


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

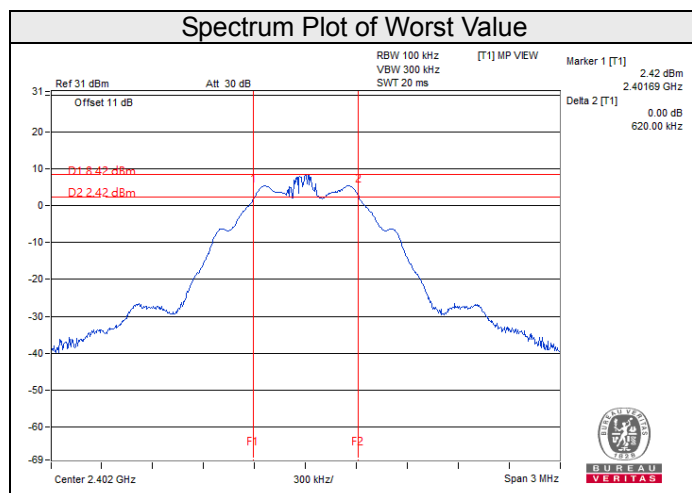
4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

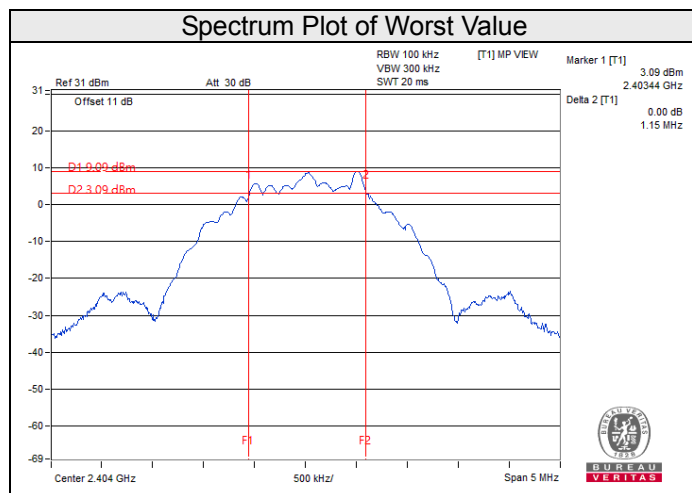
LE 1M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.62	0.5	Pass
1	2404	0.62	0.5	Pass
19	2440	0.62	0.5	Pass
38	2478	0.62	0.5	Pass
39	2480	0.62	0.5	Pass



LE 2M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2404	1.15	0.5	Pass
19	2440	1.15	0.5	Pass
38	2478	1.15	0.5	Pass

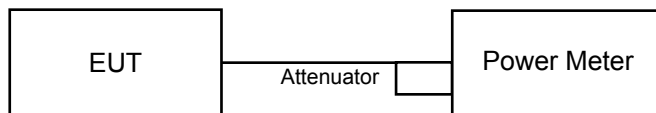


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

For Peak Power

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.

For Average Power

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.3.6.

4.4.7 Test Results

For Peak Power

LE 1M

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	8.128	9.10	30	Pass
1	2404	8.072	9.07	30	Pass
19	2440	7.998	9.03	30	Pass
38	2478	7.907	8.98	30	Pass
39	2480	7.870	8.96	30	Pass

LE 2M

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2404	8.091	9.08	30	Pass
19	2440	7.962	9.01	30	Pass
38	2478	7.852	8.95	30	Pass

For Average Power

LE 1M

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	7.621	8.82
1	2404	7.586	8.80
19	2440	7.499	8.75
38	2478	7.379	8.68
39	2480	7.534	8.77

LE 2M

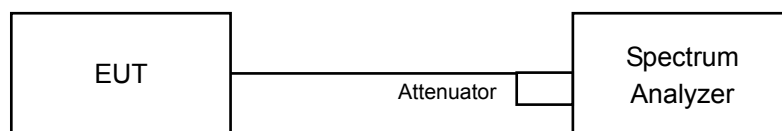
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2404	7.551	8.78
19	2440	7.447	8.72
38	2478	7.328	8.65

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

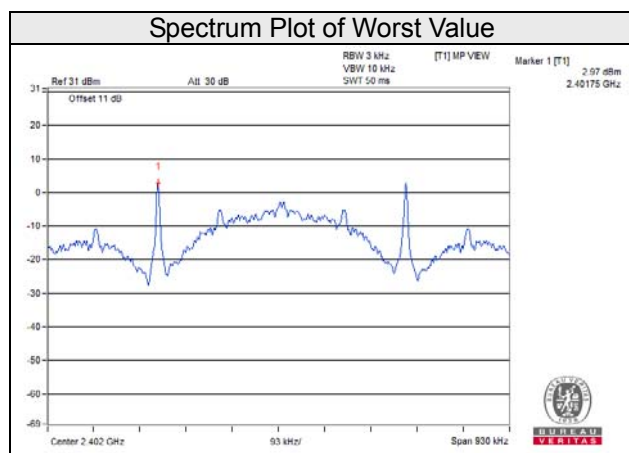
4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

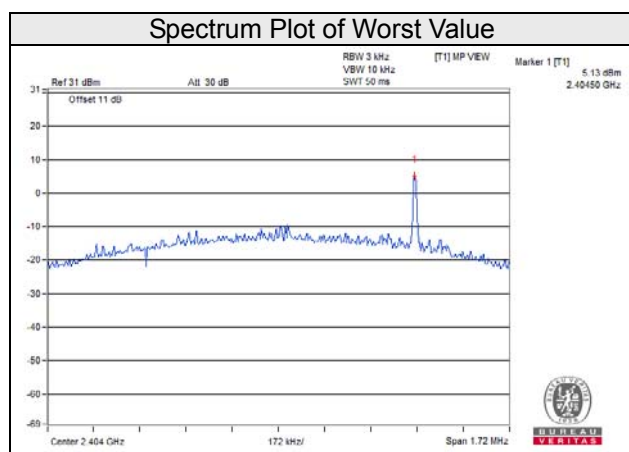
LE 1M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	2402	2.97	8	Pass
1	2404	2.97	8	Pass
19	2440	2.77	8	Pass
38	2478	2.50	8	Pass
39	2480	2.51	8	Pass



LE 2M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2404	5.13	8	Pass
19	2440	4.98	8	Pass
38	2478	4.75	8	Pass

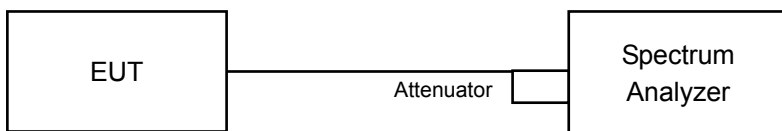


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

Measurement Procedure REF

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

Measurement Procedure OOBE

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

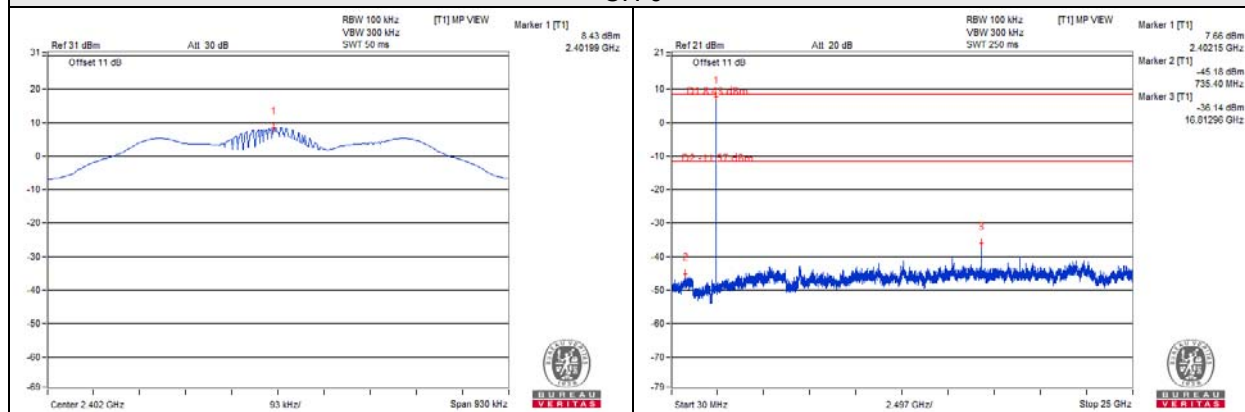
Same as item 4.3.6

4.6.7 Test Results

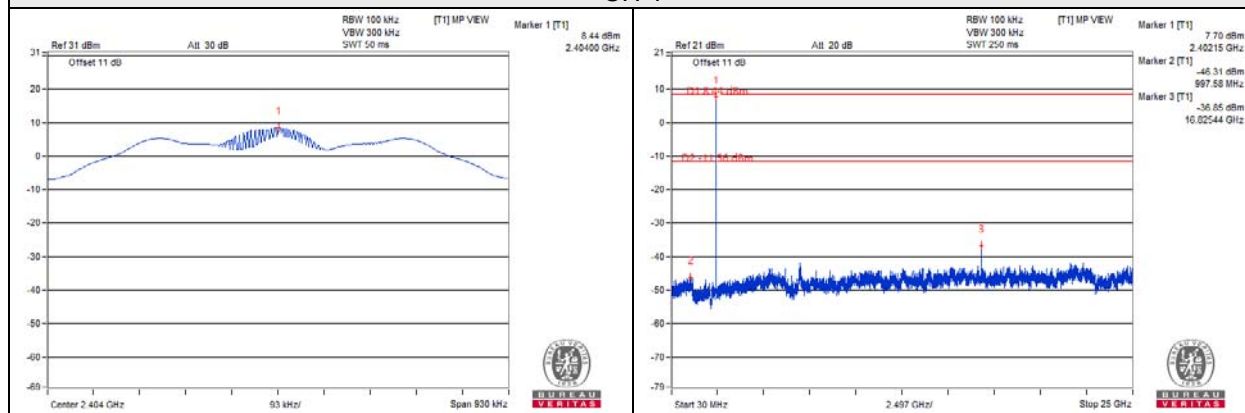
The spectrum plots are attached on the following pages. B1 line indicates the highest level, and B2 line indicates the 20dB offset below B1. It shows compliance with the requirement.

LE 1M

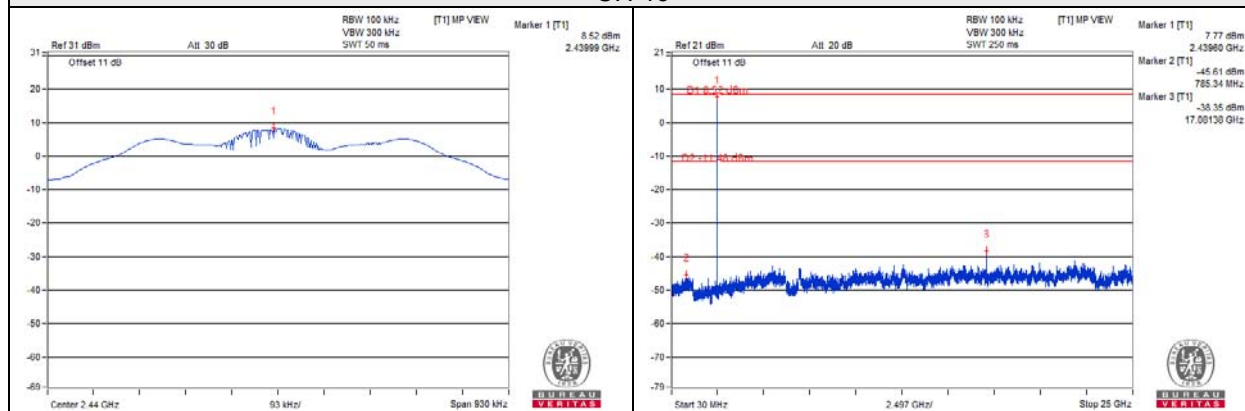
CH 0



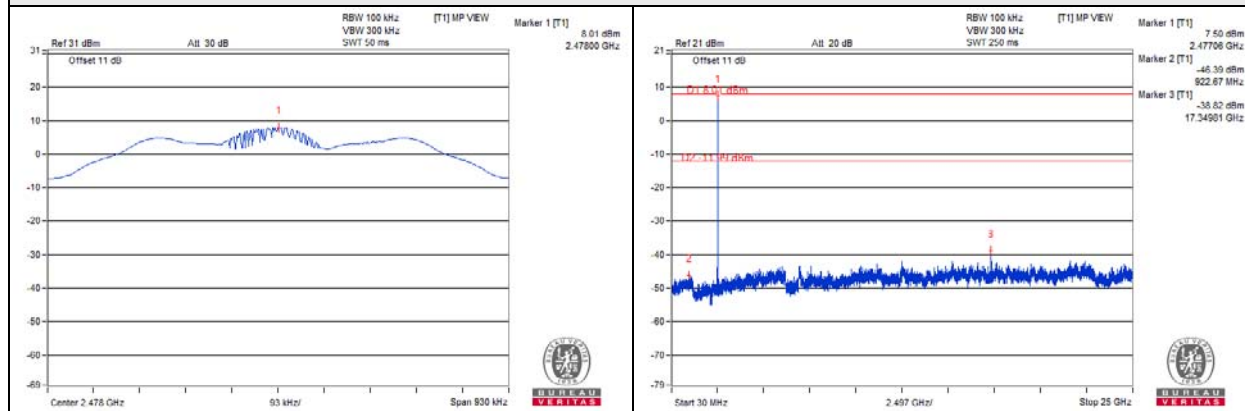
CH 1



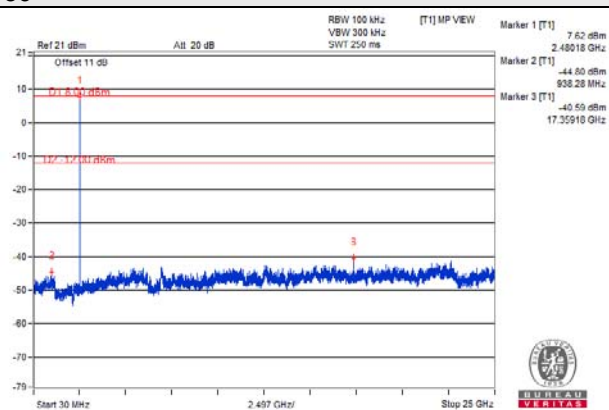
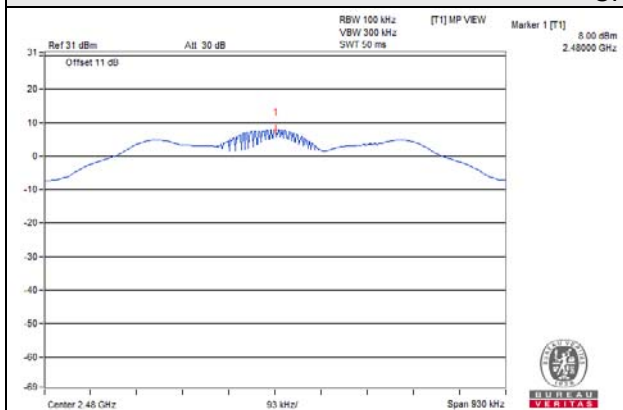
CH 19



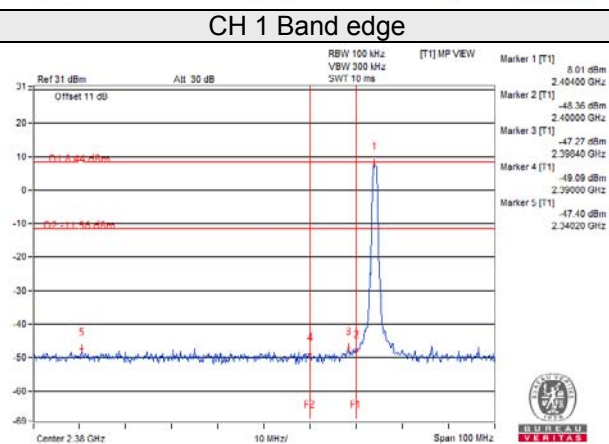
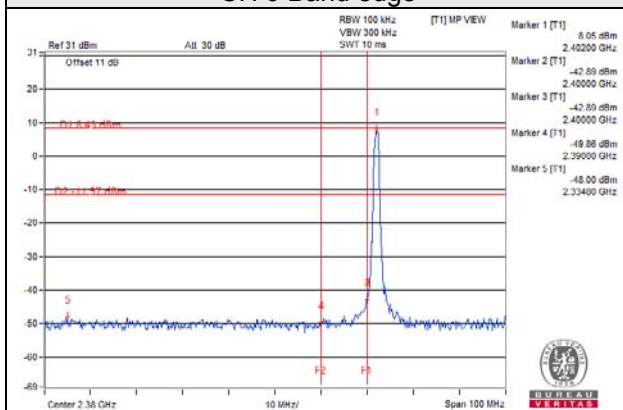
CH 38



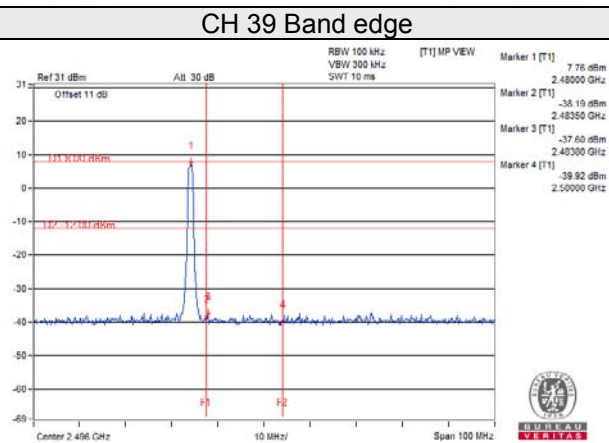
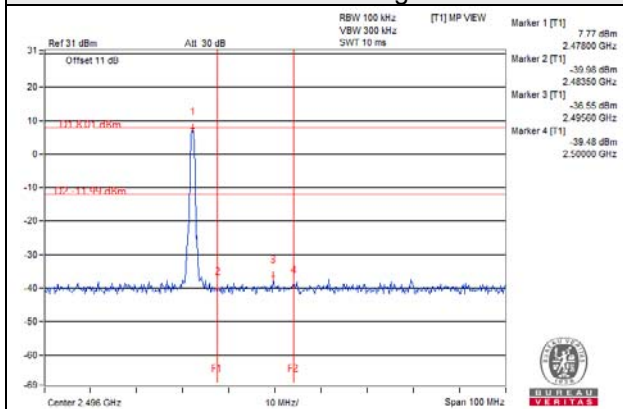
CH 39



CH 0 Band edge

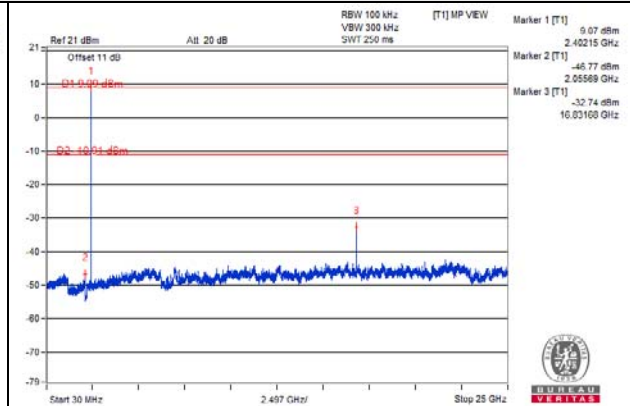
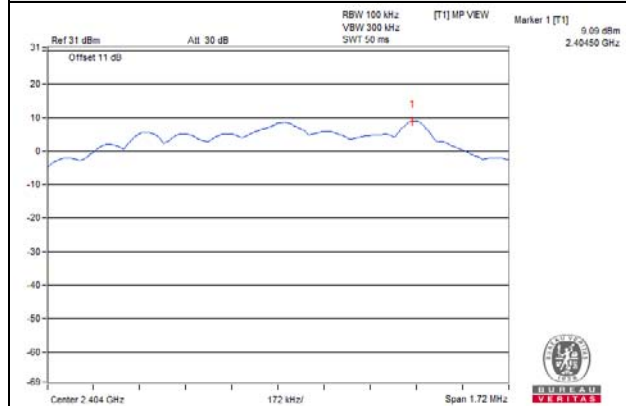


CH 38 Band edge

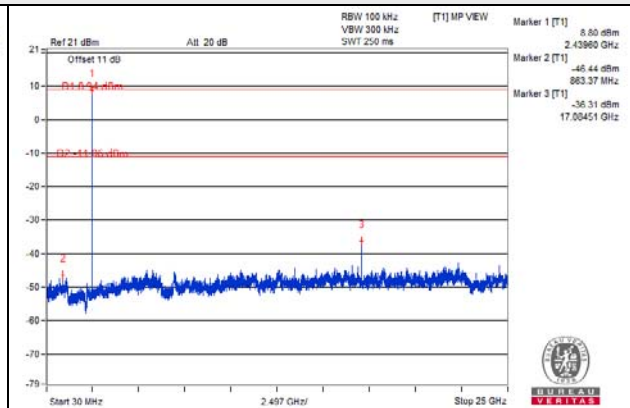
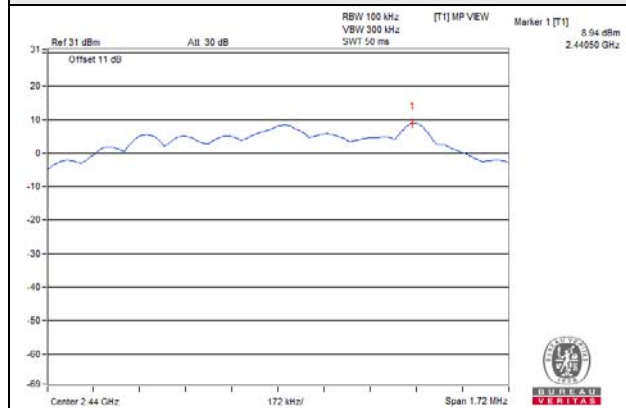


LE 2M

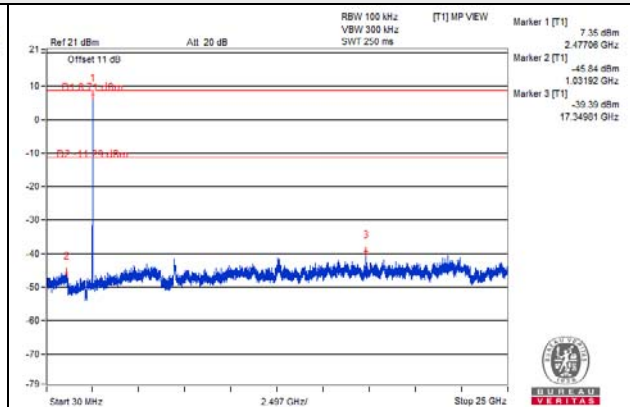
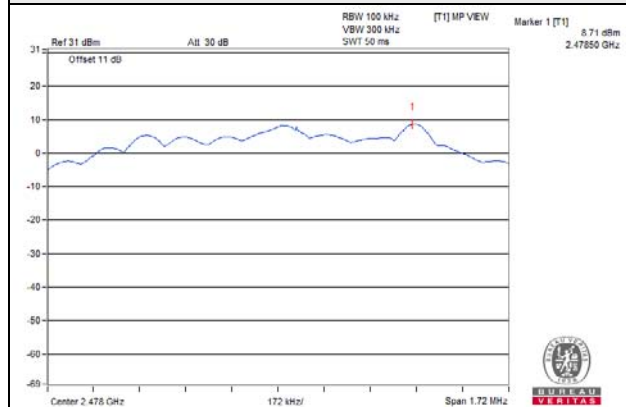
CH 1



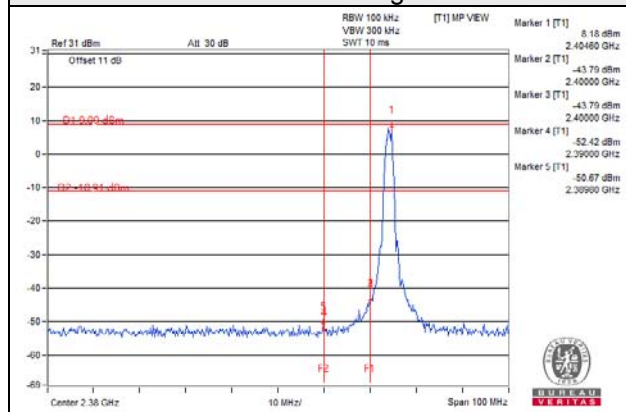
CH 19



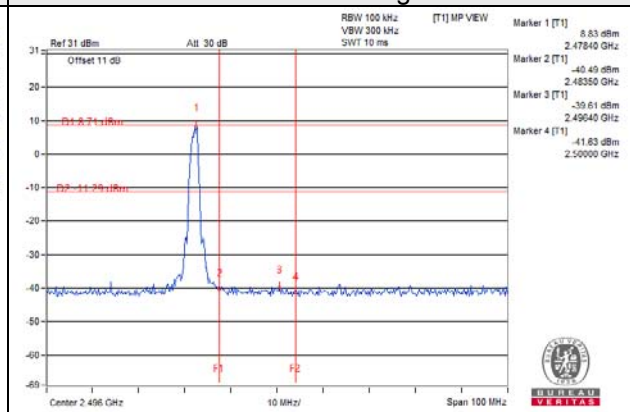
CH 38



CH 1 Band edge



CH 38 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information of 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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

Lin Kou 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

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 ---