

FCC Test Report

Report No.: RF180828C26-4

FCC ID: RYK-WUBT236ACNBT

Test Model: WUBT-236ACN(BT) [M4W], WUBT-236ACN(BT) [PU]

Series Model: WUBT-236ACN(BT) [P4W], WUBT-236ACN(BT) [MU]

Received Date: Aug. 28, 2018

Test Date: Dec. 05, 2018 ~ Jan. 14, 2019

Issued Date: Jan. 17, 2019

Applicant: SparkLAN Communications, Inc.

Address: 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan (R.O.C.)

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

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

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

FCC Registration / Designation Number: 788550 / TW0003



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 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
3.3 Duty Cycle of Test Signal	10
3.4 Description of Support Units	11
3.4.1 Configuration of System under Test	11
3.5 General Description of Applied Standards	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	15
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.....	33
4.3.1 Limits of 6dB Bandwidth Measurement.....	33
4.3.2 Test Setup.....	33
4.3.3 Test Instruments	33
4.3.4 Test Procedure	33
4.3.5 Deviation from Test Standard	33
4.3.6 EUT Operating Conditions.....	33
4.3.7 Test Result.....	34
4.4 Conducted Output Power Measurement.....	35
4.4.1 Limits of Conducted Output Power Measurement	35
4.4.2 Test Setup.....	35
4.4.3 Test Instruments	35
4.4.4 Test Procedures.....	35
4.4.5 Deviation from Test Standard	35
4.4.6 EUT Operating Conditions.....	35
4.4.7 Test Results	35
4.5 Power Spectral Density Measurement.....	36
4.5.1 Limits of Power Spectral Density Measurement	36
4.5.2 Test Setup.....	36
4.5.3 Test Instruments	36
4.5.4 Test Procedure	36
4.5.5 Deviation from Test Standard	36
4.5.6 EUT Operating Condition	36

4.5.7 Test Results	37
4.6 Conducted Out of Band Emission Measurement.....	38
4.6.1 Limits of Conducted Out of Band Emission Measurement	38
4.6.2 Test Setup.....	38
4.6.3 Test Instruments	38
4.6.4 Test Procedure	38
4.6.5 Deviation from Test Standard	38
4.6.6 EUT Operating Condition	38
4.6.7 Test Results	38
5 Pictures of Test Arrangements.....	40
Appendix – Information on the Testing Laboratories	41

Release Control Record

Issue No.	Description	Date Issued
RF180828C26-4	Original release	Jan. 17, 2019

1 Certificate of Conformity

Product: 802.11ac/a/b/g/n 2T2R Wi-Fi + Bluetooth 4.2 USB Module

Brand: SparkLAN

Test Model: WUBT-236ACN(BT) [M4W], WUBT-236ACN(BT) [PU]

Series Model: WUBT-236ACN(BT) [P4W], WUBT-236ACN(BT) [MU]

Sample Status: R&D sample

Applicant: SparkLAN Communications, Inc.

Test Date: Dec. 05, 2018 ~ Jan. 14, 2019

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 : Pettie Chen , **Date:** Jan. 17, 2019
Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Jan. 17, 2019
Bruce Chen / 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 -12.11dB at 0.44297MHz
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.1dB at 45.45MHz.
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	For Dipole antenna: Antenna connectors are IPEX MHF I at modular side & RP-SMA (M) at antenna side not standard connector.. For Printed antenna: No antenna connector is used.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 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	802.11ac/a/b/g/n 2T2R Wi-Fi + Bluetooth 4.2 USB Module
Brand	SparkLAN
Test Model	WUBT-236ACN(BT) [M4W], WUBT-236ACN(BT) [PU]
Series Model	WUBT-236ACN(BT) [P4W], WUBT-236ACN(BT) [MU]
Model Difference	Refer to Note
Sample Status	R&D sample
Power Supply Rating	5Vdc (host)
Modulation Type	GFSK
Transfer Rate	1Mbps
Operating Frequency	2402~2480MHz
Number of Channel	40
Channel Spacing	2MHz
Output Power	2.506mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Antenna, 0.15m shielded antenna cable without core
Cable Supplied	NA

Note:

1. All models are listed as below.

Model name	Description
WUBT-236ACN(BT) [M4W]	802.11ac/a/b/g/n 2T2R Wi-Fi + BT USB Module(4-Pin Wafer + IPEX)
WUBT-236ACN(BT) [P4W]	802.11ac/a/b/g/n 2T2R Wi-Fi + BT USB Module(4-Pin Wafer + Printed Ant)
WUBT-236ACN(BT) [MU]	802.11ac/a/b/g/n 2T2R Wi-Fi + BT USB Module (USB Type A + IPEX)
WUBT-236ACN(BT) [PU]	802.11ac/a/b/g/n 2T2R Wi-Fi + BT USB Module (USB Type A + Printed Ant)

* Model: WUBT-236ACN(BT) [M4W], WUBT-236ACN(BT) [PU] are for the final tests.

2. The EUT uses following antennas.

For EUT Model: WUBT-236ACN(BT) [M4W], WUBT-236ACN(BT) [MU]

No.	Transmitter Circuit	Brand	Model	Antenna Type	2.4G gain with cable loss (dBi)	5G gain with cable loss (dBi)	Connector Type
1	Chain(0) Chain(1)	Sparklan	AD-301N	Dipole	4.4	B1&2: 5.2 B3&4: 5.8	IPEX MHF I at modular side & RP-SMA (M) at antenna side
2	Chain(0) Chain(1)	Sparklan	AD-103AG	Dipole	2.02	B1&2: 1.93 B3&4: 2.03	
3	Chain(0) Chain(1)	Sparklan	AD-305N	Dipole	5.0	5.0	
4	Chain(0) Chain(1)	Sparklan	AD-303N	Dipole	3.0	3.0	
5	Chain(0) Chain(1)	Sparklan	AD-302N	Dipole	3.0	2.0	

For EUT Model: WUBT-236ACN(BT) [P4W], WUBT-236ACN(BT) [PU]

Antenna Type	Printed					
Antenna Connector	NA					
Gain (dBi)	Frequency (MHz)					
	2400	2450	2500	5150	5550	5825
Ant. 1	2.5	3.2	2.8	3.3	3.7	4.2
Ant. 2	3.2	2.9	2.7	3.1	3.5	4.0

* The 5dBi with 2.4GHz max. gain is chosen for final tests.

3. 2.4GHz & 5GHz technologies cannot transmit at same time.

WLAN & BT technologies cannot transmit at same time

3.2 Description of Test Modes

40 channels are provided for EUT:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT with Dipole antenna
B	√	√	√	-	EUT with Printed antenna

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:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane (For Test Mode A), Y-plane (For Test Mode B)**.

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)	Remark
A, B	0 to 39	0, 19, 39	GFSK	1	-

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)	Remark
A, B	0 to 39	39	GFSK	1	-

Power Line Conducted Emission Test:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)	Remark
A, B	0 to 39	39	GFSK	1	-

Antenna Port Conducted Measurement:

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

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

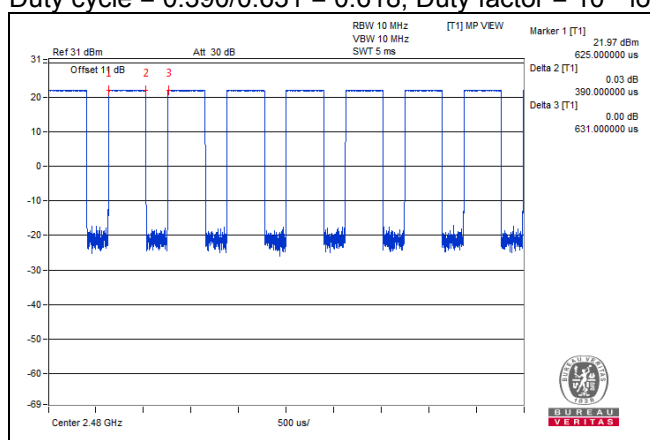
Test Condition:

Applicable to	Environmental Conditions	Input Power (system)	Tested by
RE \geq 1G	22deg. C, 66%RH 23deg. C, 66%RH	120Vac, 60Hz	Adair Peng Willy Cheng
RE<1G	22deg. C, 66%RH	120Vac, 60Hz	Adair Peng
PLC	22deg. C, 66%RH 23deg. C, 66%RH	120Vac, 60Hz	Noah Chang Willy Cheng
APCM	25deg. C, 60%RH	120Vac, 60Hz	Alan Wu

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%, duty factor is required.

Duty cycle = $0.390/0.631 = 0.618$, Duty factor = $10 * \log(1/0.618) = 2.09$



3.4 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	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Convertible Board	NA	NA	NA	NA	-

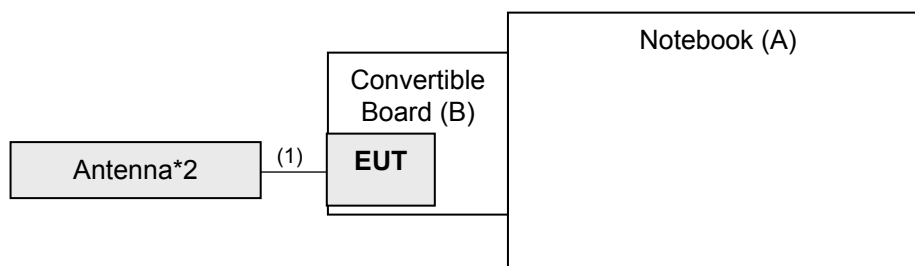
Note:

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

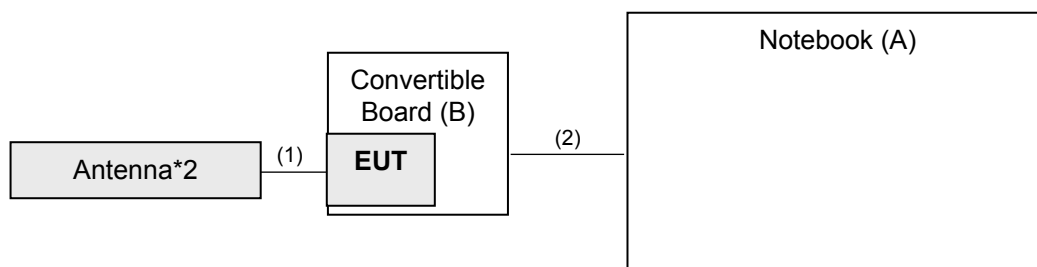
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Antenna cable	2	0.15	Y	0	Provided by manufacturer
2.	USB cable	1	1.0	Y	0	-

3.4.1 Configuration of System under Test

Test Mode A



Test Mode B



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 15.247 Meas Guidance v05

ANSI C63.10:2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2018	Nov. 21, 2019
HORN Antenna SCHWARZBECK	9120D	209	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna EMCI	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 03, 2018	Apr. 02, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Meter (Including Power Sensor) KEYSIGHT	U2021XA	MY55050005/MY5519 0004/MY55190007/MY 55210005	Jul. 17, 2018	Jul. 16, 2019

- 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 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC 7450F-3.

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:

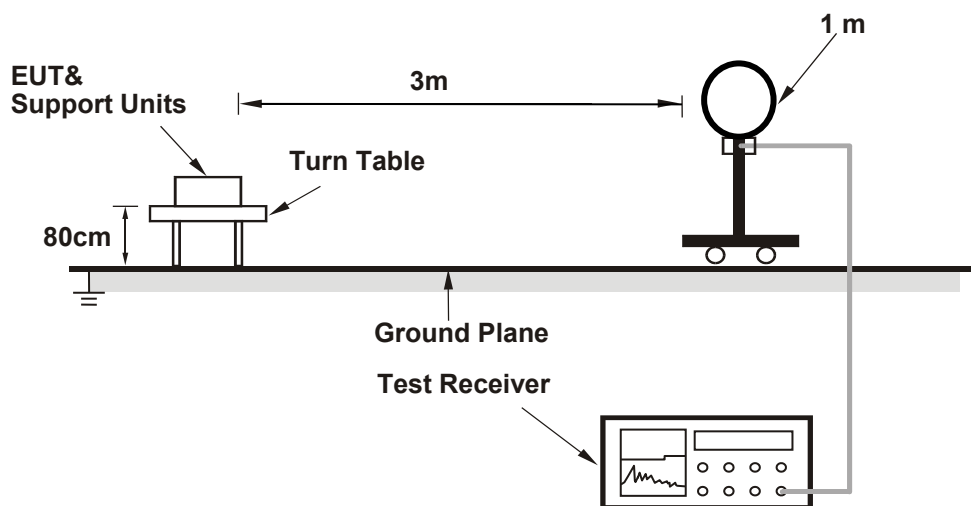
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (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

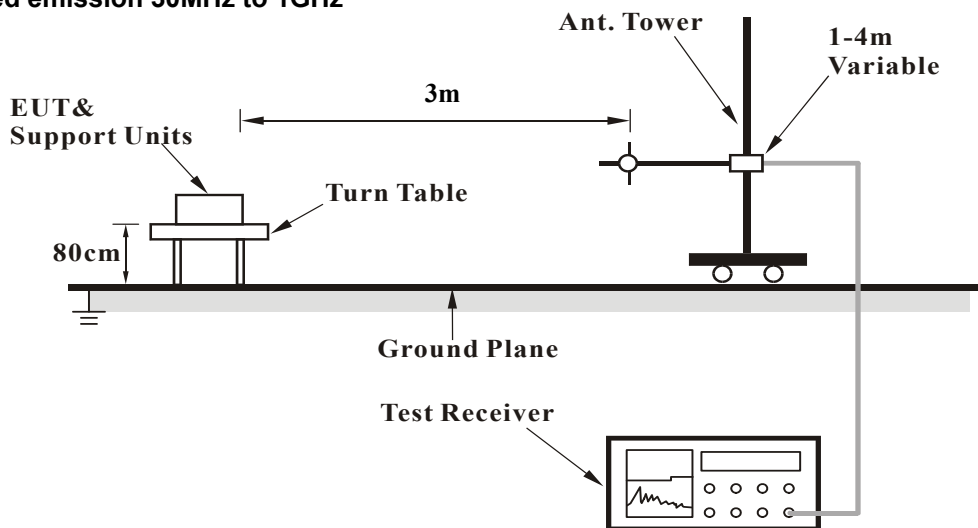
No deviation.

4.1.5 Test Setup

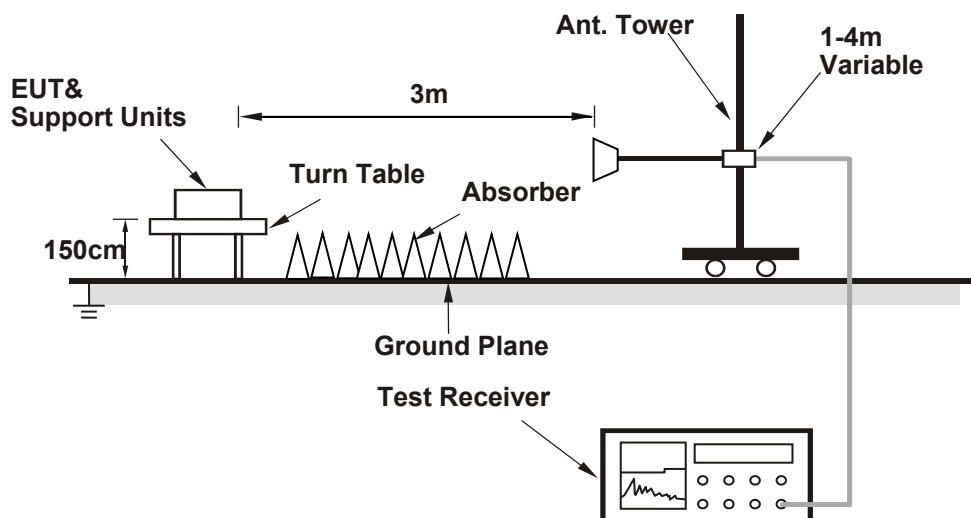
For Radiated emission below 30MHz



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

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

4.1.7 Test Results

Above 1GHz data:

Test Mode A

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	59.8 PK	74.0	-14.2	1.99 H	183	26.8	33.0
2	2390.00	48.0 AV	54.0	-6.0	1.99 H	183	15.0	33.0
3	*2402.00	87.1 PK			2.10 H	180	54.2	32.9
4	*2402.00	85.6 AV			2.10 H	180	52.7	32.9
5	4804.00	47.0 PK	74.0	-27.0	1.17 H	165	43.5	3.5
6	4804.00	35.8 AV	54.0	-18.2	1.17 H	165	32.3	3.5
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	59.9 PK	74.0	-14.1	1.69 V	99	26.9	33.0
2	2390.00	48.2 AV	54.0	-5.8	1.69 V	99	15.2	33.0
3	*2402.00	102.4 PK			1.53 V	76	69.5	32.9
4	*2402.00	100.8 AV			1.53 V	76	67.9	32.9
5	4804.00	48.4 PK	74.0	-25.6	3.42 V	94	44.9	3.5
6	4804.00	39.7 AV	54.0	-14.3	3.42 V	94	36.2	3.5

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	90.2 PK			2.00 H	183	57.3	32.9
2	*2440.00	88.6 AV			2.00 H	183	55.7	32.9
3	4880.00	47.8 PK	74.0	-26.2	1.21 H	163	44.5	3.3
4	4880.00	36.8 AV	54.0	-17.2	1.21 H	163	33.5	3.3
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	105.5 PK			1.70 V	172	72.6	32.9
2	*2440.00	103.7 AV			1.70 V	172	70.8	32.9
3	4880.00	49.3 PK	74.0	-24.7	3.46 V	92	46.0	3.3
4	4880.00	40.7 AV	54.0	-13.3	3.46 V	92	37.4	3.3

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	89.6 PK			2.09 H	181	56.9	32.7
2	*2480.00	87.9 AV			2.09 H	181	55.2	32.7
3	2483.50	59.7 PK	74.0	-14.3	1.91 H	172	27.0	32.7
4	2483.50	48.0 AV	54.0	-6.0	1.91 H	172	15.3	32.7
5	4960.00	47.8 PK	74.0	-26.2	1.11 H	164	44.4	3.4
6	4960.00	35.7 AV	54.0	-18.3	1.11 H	164	32.3	3.4
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	104.9 PK			1.65 V	172	72.2	32.7
2	*2480.00	103.1 AV			1.65 V	172	70.4	32.7
3	2483.50	59.2 PK	74.0	-14.8	1.77 V	160	26.5	32.7
4	2483.50	48.3 AV	54.0	-5.7	1.77 V	160	15.6	32.7
5	4960.00	49.2 PK	74.0	-24.8	3.44 V	92	45.8	3.4
6	4960.00	39.7 AV	54.0	-14.3	3.44 V	92	36.3	3.4

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.

Test Mode B

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	60.3 PK	74.0	-13.7	1.32 H	187	27.3	33.0
2	2390.00	47.9 AV	54.0	-6.1	1.32 H	187	14.9	33.0
3	*2402.00	99.6 PK			1.45 H	200	66.7	32.9
4	*2402.00	97.8 AV			1.45 H	200	64.9	32.9
5	4804.00	46.3 PK	74.0	-27.7	2.27 H	212	42.8	3.5
6	4804.00	33.2 AV	54.0	-20.8	2.27 H	212	29.7	3.5
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	59.3 PK	74.0	-14.7	1.35 V	162	26.3	33.0
2	2390.00	47.9 AV	54.0	-6.1	1.35 V	162	14.9	33.0
3	*2402.00	97.7 PK			1.20 V	175	64.8	32.9
4	*2402.00	96.0 AV			1.20 V	175	63.1	32.9
5	4804.00	46.7 PK	74.0	-27.3	1.96 V	251	43.2	3.5
6	4804.00	33.0 AV	54.0	-21.0	1.96 V	251	29.5	3.5

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	99.9 PK			1.01 H	208	67.0	32.9
2	*2440.00	98.1 AV			1.01 H	208	65.2	32.9
3	4880.00	47.4 PK	74.0	-26.6	2.26 H	138	44.1	3.3
4	4880.00	34.3 AV	54.0	-19.7	2.26 H	138	31.0	3.3
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	97.5 PK			1.00 V	84	64.6	32.9
2	*2440.00	95.7 AV			1.00 V	84	62.8	32.9
3	4880.00	47.8 PK	74.0	-26.2	2.23 V	141	44.5	3.3
4	4880.00	34.5 AV	54.0	-19.5	2.23 V	141	31.2	3.3

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	101.6 PK			1.00 H	211	68.9	32.7
2	*2480.00	99.9 AV			1.00 H	211	67.2	32.7
3	2483.50	59.3 PK	74.0	-14.7	1.05 H	218	26.6	32.7
4	2483.50	48.0 AV	54.0	-6.0	1.05 H	218	15.3	32.7
5	4960.00	47.7 PK	74.0	-26.3	2.22 H	156	44.3	3.4
6	4960.00	34.7 AV	54.0	-19.3	2.22 H	156	31.3	3.4
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	97.7 PK			1.02 V	117	65.0	32.7
2	*2480.00	96.0 AV			1.02 V	117	63.3	32.7
3	2483.50	60.0 PK	74.0	-14.0	1.21 V	157	27.3	32.7
4	2483.50	47.6 AV	54.0	-6.4	1.21 V	157	14.9	32.7
5	4960.00	48.0 PK	74.0	-26.0	2.17 V	185	44.6	3.4
6	4960.00	34.8 AV	54.0	-19.2	2.17 V	185	31.4	3.4

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:

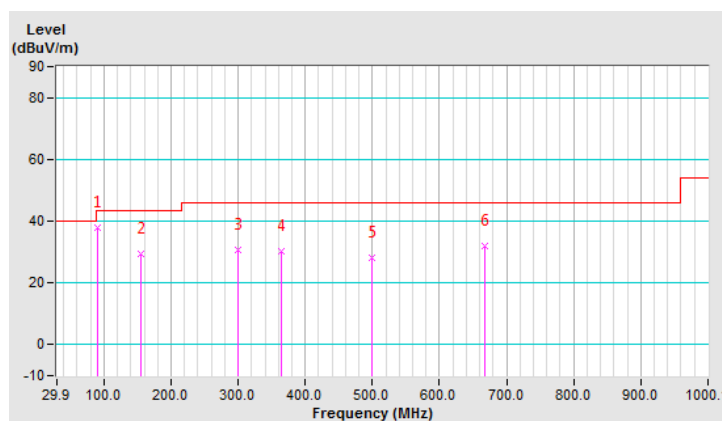
Test Mode A

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
CHANNEL	TX Channel 39		

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	90.54	37.8 QP	43.5	-5.7	2.00 H	98	52.4	-14.6
2	155.84	29.3 QP	43.5	-14.2	1.50 H	108	38.4	-9.1
3	298.88	30.8 QP	46.0	-15.2	1.50 H	163	38.3	-7.5
4	364.18	30.3 QP	46.0	-15.7	2.00 H	172	36.6	-6.3
5	499.45	28.0 QP	46.0	-18.0	2.00 H	165	31.6	-3.6
6	667.37	31.8 QP	46.0	-14.2	1.50 H	205	32.2	-0.4

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

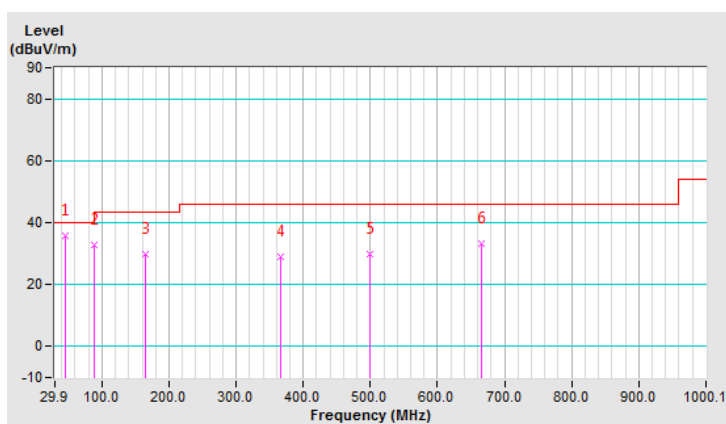


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
CHANNEL	TX Channel 39		

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	45.45	35.9 QP	40.0	-4.1	1.00 V	6	45.7	-9.8
2	88.98	32.8 QP	43.5	-10.7	1.00 V	149	47.4	-14.6
3	165.17	30.0 QP	43.5	-13.5	1.00 V	222	39.2	-9.2
4	367.29	28.9 QP	46.0	-17.1	1.00 V	6	35.1	-6.2
5	499.45	30.0 QP	46.0	-16.0	1.00 V	259	33.6	-3.6
6	665.82	33.1 QP	46.0	-12.9	1.00 V	231	33.5	-0.4

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



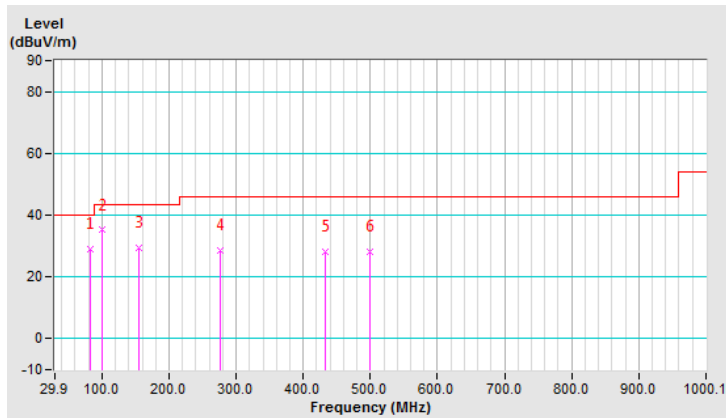
Test Mode B

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
CHANNEL	TX Channel 39		

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	82.76	29.0 QP	40.0	-11.0	2.00 H	108	43.3	-14.3
2	99.87	35.1 QP	43.5	-8.4	2.00 H	119	48.7	-13.6
3	155.84	29.3 QP	43.5	-14.2	1.50 H	108	38.4	-9.1
4	277.11	28.5 QP	46.0	-17.5	1.00 H	180	36.5	-8.0
5	432.60	28.1 QP	46.0	-17.9	1.00 H	214	32.6	-4.5
6	499.45	28.0 QP	46.0	-18.0	2.00 H	165	31.6	-3.6

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

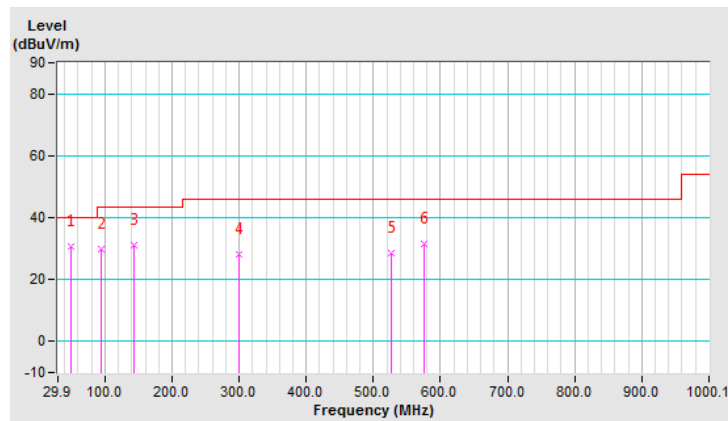


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
CHANNEL	TX Channel 39		

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	50.11	30.8 QP	40.0	-9.2	2.00 V	50	40.5	-9.7
2	93.65	30.0 QP	43.5	-13.5	1.49 V	163	44.4	-14.4
3	143.40	31.2 QP	43.5	-12.3	1.00 V	111	40.6	-9.4
4	298.88	28.0 QP	46.0	-18.0	1.50 V	151	35.5	-7.5
5	525.88	28.7 QP	46.0	-17.3	1.00 V	203	31.9	-3.2
6	575.64	31.6 QP	46.0	-14.4	1.50 V	189	33.6	-2.0

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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Sep. 03, 2018	Sep. 02, 2019
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
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-2040.

4.2.3 Test Procedures

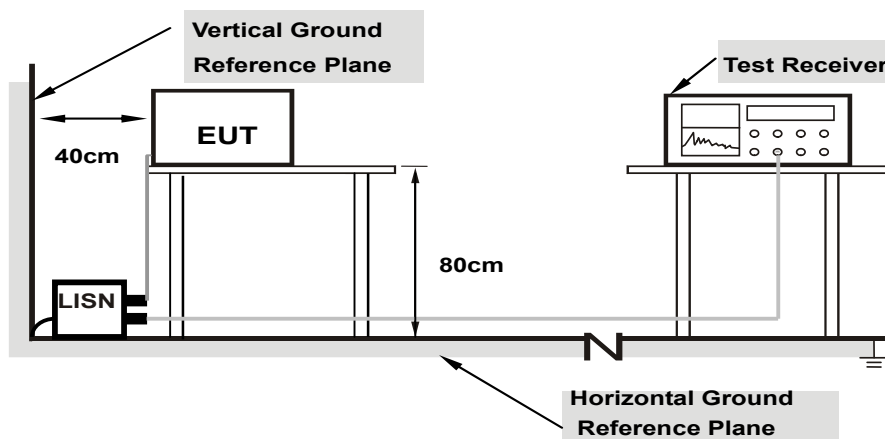
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

Note: 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:

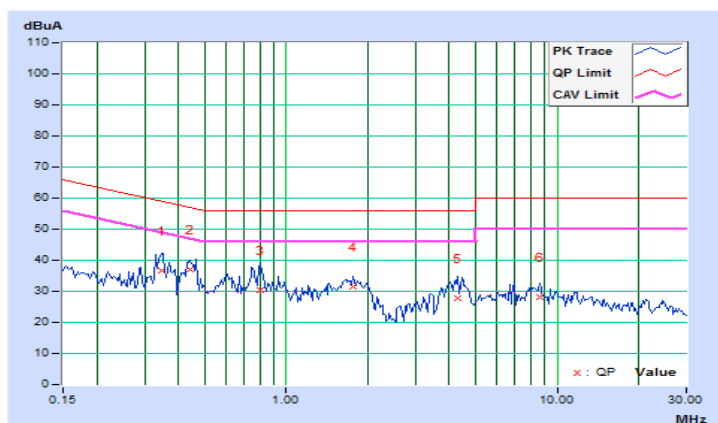
Test Mode A

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 39		

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	0.34531	9.74	26.82	22.83	36.56	32.57	59.07	49.07	-22.51	-16.50
2	0.44297	9.74	27.42	25.16	37.16	34.90	57.01	47.01	-19.85	-12.11
3	0.79844	9.70	20.85	15.72	30.55	25.42	56.00	46.00	-25.45	-20.58
4	1.75781	9.73	21.88	19.18	31.61	28.91	56.00	46.00	-24.39	-17.09
5	4.28125	9.79	17.94	11.47	27.73	21.26	56.00	46.00	-28.27	-24.74
6	8.62109	9.86	18.40	12.63	28.26	22.49	60.00	50.00	-31.74	-27.51

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.

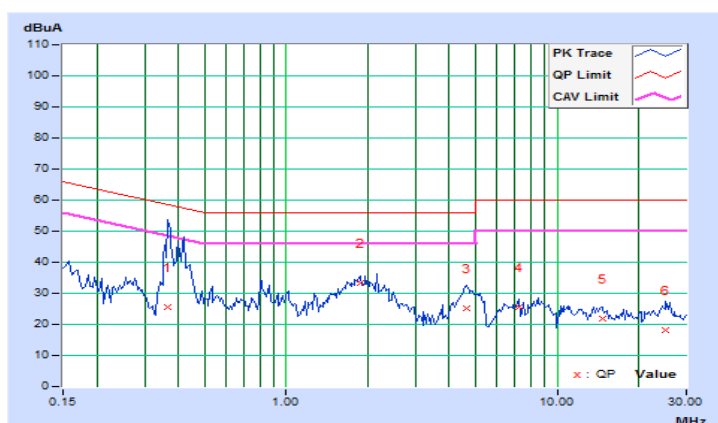


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 39		

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	0.36484	9.75	15.68	10.17	25.43	19.92	58.62	48.62	-33.19	-28.70
2	1.89063	9.73	23.42	19.87	33.15	29.60	56.00	46.00	-22.85	-16.40
3	4.60938	9.82	15.31	8.42	25.13	18.24	56.00	46.00	-30.87	-27.76
4	7.22656	9.86	15.73	8.06	25.59	17.92	60.00	50.00	-34.41	-32.08
5	14.64453	10.00	12.01	6.13	22.01	16.13	60.00	50.00	-37.99	-33.87
6	25.10156	10.10	7.96	3.66	18.06	13.76	60.00	50.00	-41.94	-36.24

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.



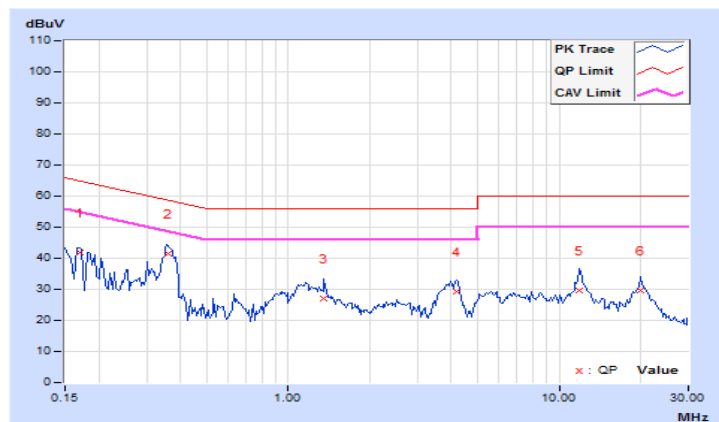
Test Mode B

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 39		

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	0.16953	9.67	32.11	16.29	41.78	25.96	64.98	54.98	-23.20	-29.02
2	0.36094	9.66	31.67	24.09	41.33	33.75	58.71	48.71	-17.38	-14.96
3	1.35938	9.66	17.24	10.82	26.90	20.48	56.00	46.00	-29.10	-25.52
4	4.18359	9.73	19.44	11.21	29.17	20.94	56.00	46.00	-26.83	-25.06
5	11.92188	9.86	19.94	10.61	29.80	20.47	60.00	50.00	-30.20	-29.53
6	20.02344	9.91	19.73	13.93	29.64	23.84	60.00	50.00	-30.36	-26.16

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.

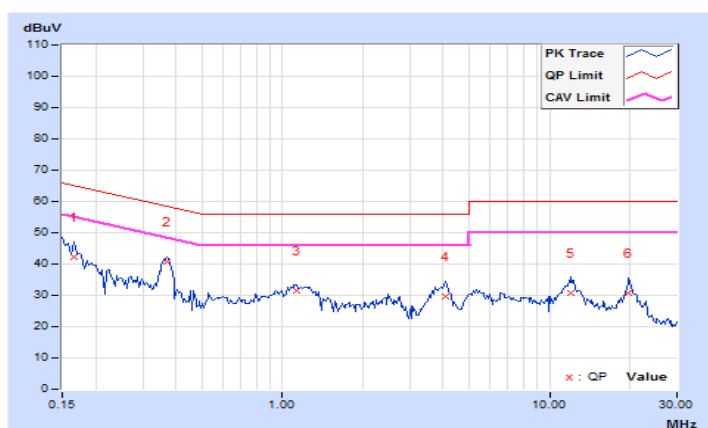


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 39		

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	0.16562	9.68	32.52	16.40	42.20	26.08	65.18	55.18	-22.98	-29.10
2	0.36875	9.67	31.21	23.84	40.88	33.51	58.53	48.53	-17.65	-15.02
3	1.13281	9.65	21.96	15.47	31.61	25.12	56.00	46.00	-24.39	-20.88
4	4.07422	9.73	20.04	12.76	29.77	22.49	56.00	46.00	-26.23	-23.51
5	12.09375	9.89	20.85	13.23	30.74	23.12	60.00	50.00	-29.26	-26.88
6	19.75781	10.01	20.73	16.85	30.74	26.86	60.00	50.00	-29.26	-23.14

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.

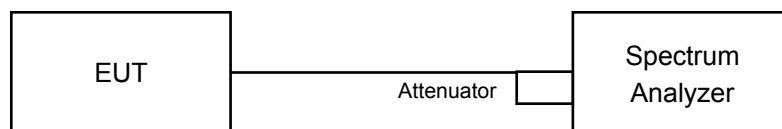


4.3 6dB Bandwidth Measurement

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

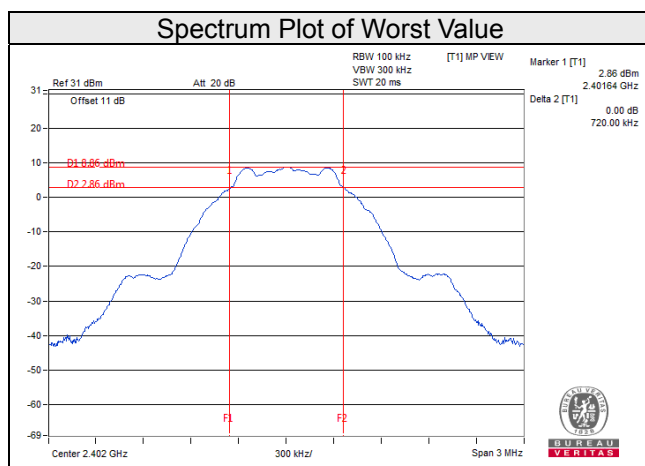
No deviation.

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

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.72	0.5	Pass
19	2440	0.73	0.5	Pass
39	2480	0.73	0.5	Pass

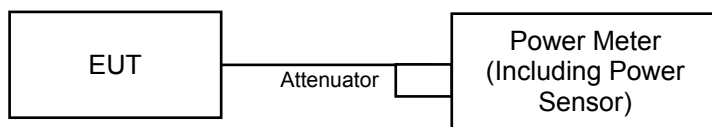


4.4 Conducted Output Power Measurement

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

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.3.6.

4.4.7 Test Results

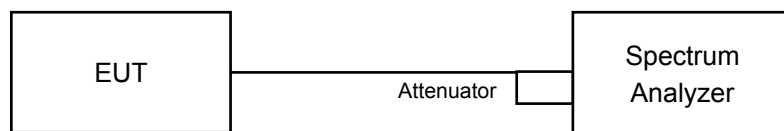
Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	2.265	3.55	30	Pass
19	2440	2.427	3.85	30	Pass
39	2480	2.506	3.99	30	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm 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

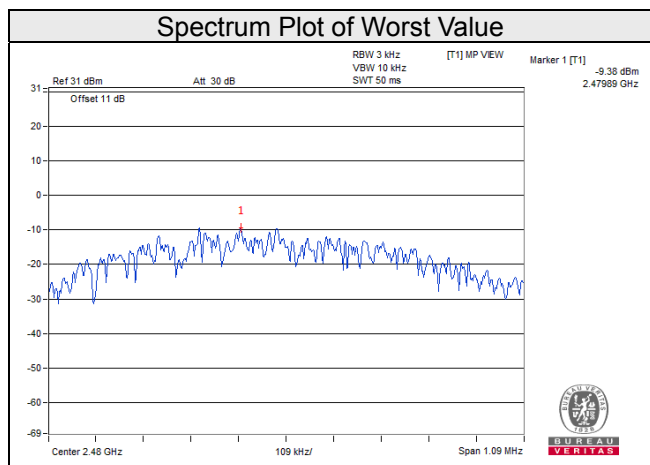
No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
0	2402	-11.05	8	Pass
19	2440	-10.05	8	Pass
39	2480	-9.38	8	Pass

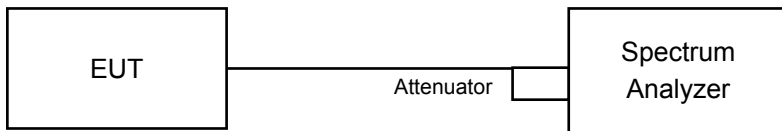


4.6 Conducted Out of Band Emission Measurement

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 OOB

- 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.

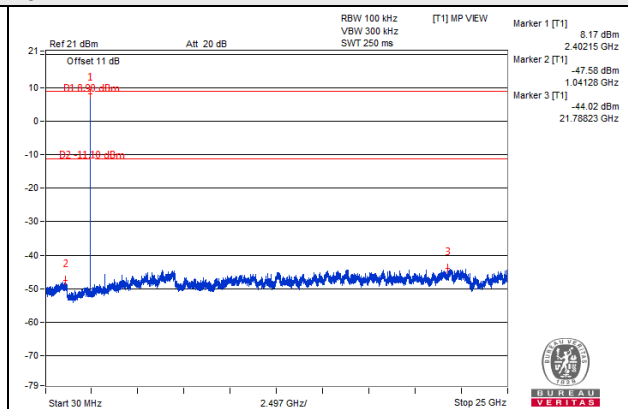
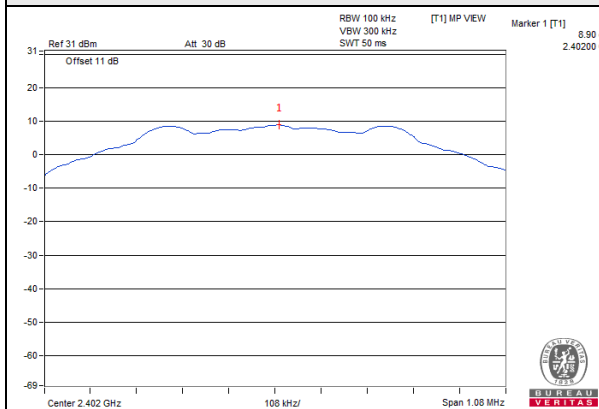
4.6.6 EUT Operating Condition

Same as item 4.3.6

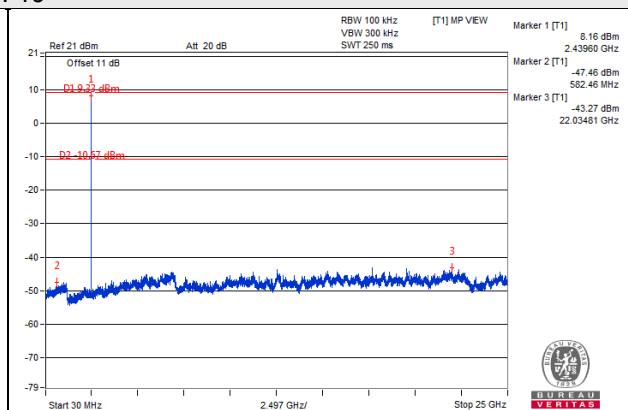
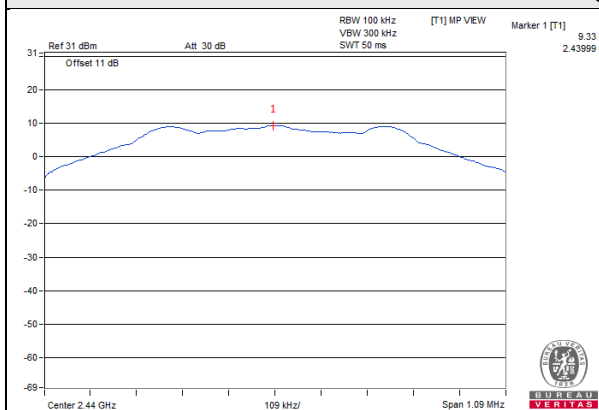
4.6.7 Test Results

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

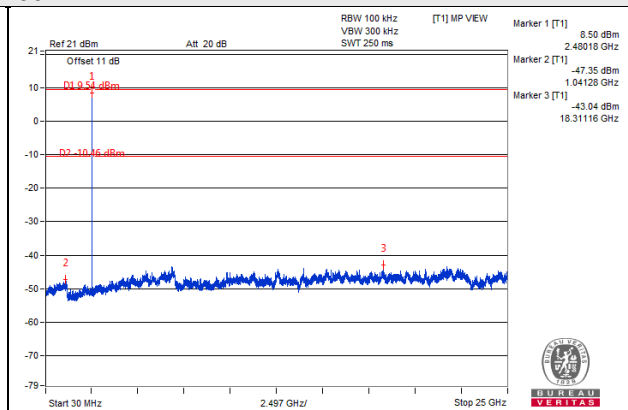
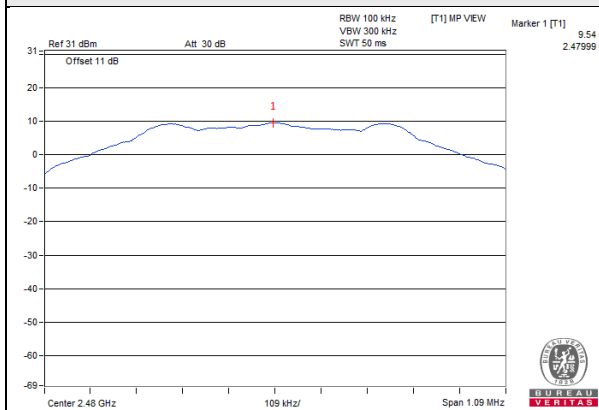
CH 0



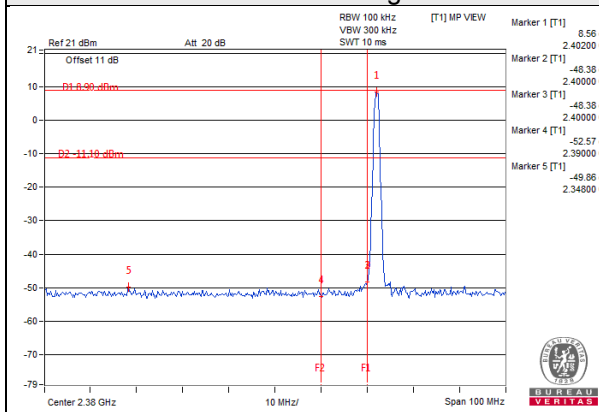
CH 19



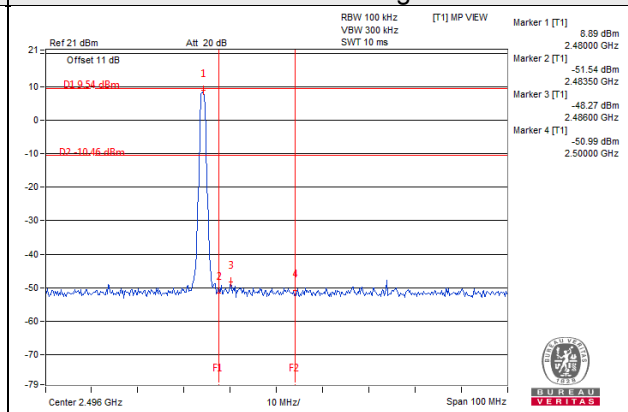
CH 39



CH 0 Band edge



CH 39 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are 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:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety

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 ---