FCC Test Report (BT-LE)

Report No.:	RF180803E05A-3
FCC ID:	YAW529027
Test Model:	PVS6
Received Date:	Oct. 04, 2018
Test Date:	Oct. 25 to 30, 2018
Issued Date:	Dec. 10, 2018
Applicant:	SunPower Corporation
Address:	1414 Harbour Way South Suite 1901, Richmond, CA 94804, USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location :	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF180803E05A-3	Original release.	Dec. 10, 2018

1 Certificate of Conformity

Product:	SunPower Monitoring System with PVS6
Brand:	SUNPOWER
Test Model:	PVS6
Sample Status:	ENGINEERING SAMPLE
Applicant:	SunPower Corporation
Test Date:	Oct. 25 to 30, 2018
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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Dec. 10, 2018

Claire Kuan / Specialist

Approved by : _____ , **Date:** Dec. 10, 2018

May Chen / Manager

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 -4.54dB at 4.45703MHz.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.7dB at 247.52MHz.
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	Antenna connector is I-PEX not a standard connector.

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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.53 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	6GHz ~ 18GHz	4.98 dB
	18GHz ~ 40GHz	5.19 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

Product	SunPower Monitoring System with PVS6
Brand	SUNPOWER
Test Model	PVS6
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	AC100-240V, 0.75A , 50/60Hz
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 2Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	**LE 1M:** 5.26mW **LE 2M:** 4.966mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Hole Plugs x 2 Bracket
Data Cable Supplied	Ethernet cable (Unshielded, 1.5m)

Note:

1. There are WLAN, Bluetooth, Zigbee and WWAN technology used for the EUT. The EUT has four radios as following table:

Radio 1	Radio 2	Radio 3	Radio 4
WLAN (2.4GHz+5GHz)	Zigbee	BT	WWAN (LTE+GSM)

2. Simultaneously transmission condition.

Condition	Technology			
1	WLAN(2.4GHz)	BT	Zigbee	WWAN
2	WLAN(5GHz)	BT	Zigbee	WWAN
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.				

3. The EUT needs to be supplied from an Internal power supply, the information is as below table:

Brand	Model No.	Spec.
WLAN WELL	IRM-30-12	AC Input: 100-240V, 0.75A , 50/60Hz DC Output: 12V, 2.5A

4. The antennas provided to the EUT, please refer to the following table:

WLAN							
Ant No.	Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector type
1	Chain 0 (Including BT)	airgain	65-031-212002B	2.2	2.4~2.4835	PCB	I-PEX
				3.8	5.15~5.25		
				4.2	5.725~5.85		
2	Chain 1 (WLAN use only)	airgain	65-031-212003B	4.2	2.4~2.4835	PCB	I-PEX
				4.1	5.15~5.25		
				4.8	5.725~5.85		

Zigbee						
Ant No.	Brand	Model	Antenna Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector type
3	airgain	65-031-212004B	4.8	2.4~2.4835	PCB	I-PEX

LTE						
Ant No.	Brand	Model	Antenna Gain (dBi)	Frequency rang (MHz)	Antenna type	Connector type
4	airgain	65-031-212001B	2.7	1920~1980	PCB	I-PEX
				1850~1910		
				1710~1785		
				1710~1755		
				824 ~ 849		
				880~915		
				698~716		
				777~787		
				815 ~ 830		
				830 ~ 845		
				832 ~ 862		
				814 ~ 849		
				703 ~ 748		
				1880 ~ 1920		

5. The power setting are list as below:

Modulation Mode	Frequency (MHz)	Power Setting	Frequency (MHz)	Power Setting	Frequency (MHz)	Power Setting
LE 1M	2402	Default	2440	Default	2480	Default
LE 2M	2402	Default	2440	Default	2480	Default

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

3.2 Description of Test Modes

40 channels are provided for BT-LE mode:

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≥1G	RE<1G	PLC	APCM	
1	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1
0 to 39	0, 19, 39	GFSK	2

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	19	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	19	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1
0 to 39	0, 19, 39	GFSK	2

Test Condition:

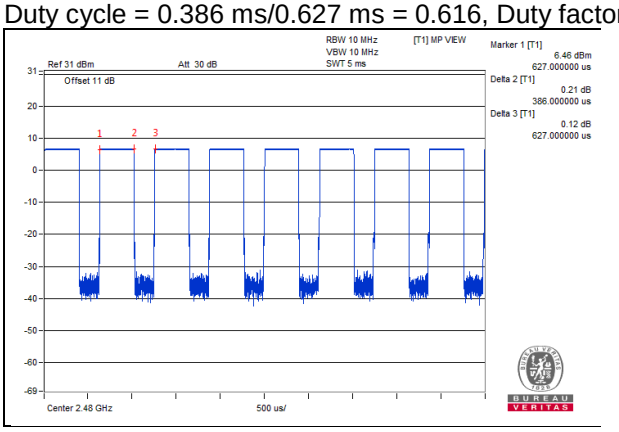
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	22deg. C, 66%RH	120Vac, 60Hz	Frank Chuang
RE<1G	23deg. C, 67%RH	120Vac, 60Hz	Frank Chuang
PLC	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

LE 1M

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

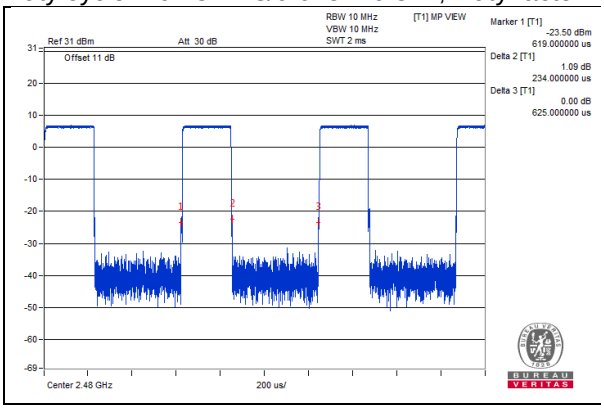
Duty cycle = 0.386 ms/0.627 ms = 0.616, Duty factor = 10 * log(1/0.616) = 2.11



LE 2M

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

Duty cycle = 0.234 ms/0.625 = 0.374, Duty factor = 10 * log(1/0.374) = 4.27



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.	iPod	Apple	MC749TA/A	CC4DMFJUDFDM	NA	Provided by Lab
B.	Laptop	Lenovo	81A4	YD02YN22	NA	Provided by Lab

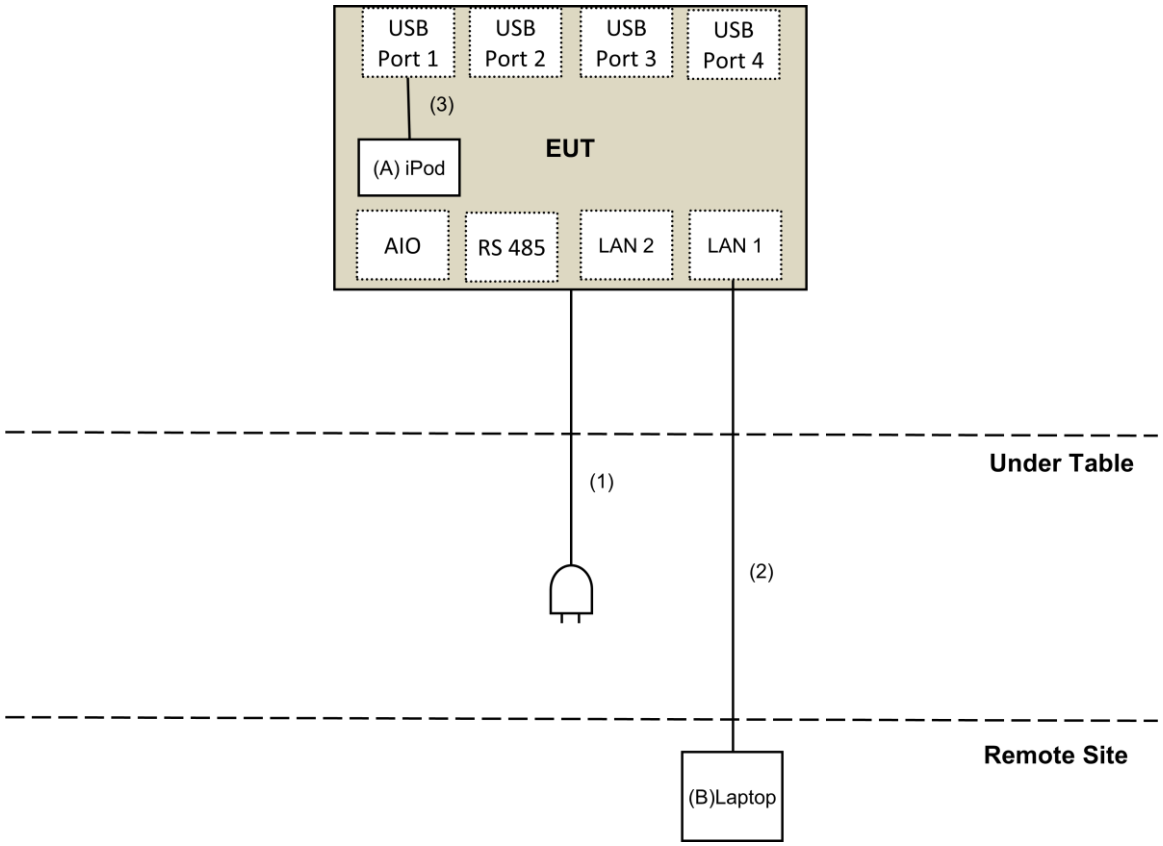
Note:

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.	AC Cable	1	1.8	No	0	Supplied by client
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	USB Cable	1	0.1	Yes	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	July 12, 2018	July 11, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001	Jan. 15, 2018	Jan. 14, 2019
RF Cable	NA	LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 05, 2018	May 04, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-3-1	Mar. 20, 2018	Mar. 19, 2019
RF Cable	8D	966-3-2	Mar. 20, 2018	Mar. 19, 2019
RF Cable	8D	966-3-3	Mar. 20, 2018	Mar. 19, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200	160922	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-2000	150317	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-5000	150322	Jan. 29, 2018	Jan. 28, 2019
Spectrum Analyzer Keysight	N9030A	MY54490679	July 23, 2018	July 22, 2019
Pre-Amplifier EMCI	EMC184045SE	980386	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	EMC102-KM-KM-1200	160924	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 20, 2018	June 19, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Oct. 25 to 30, 2018

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:

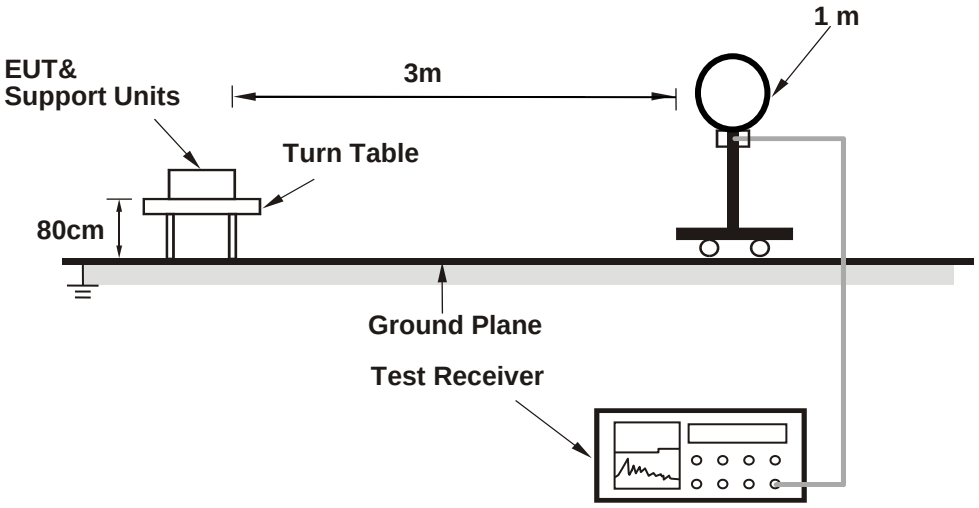
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

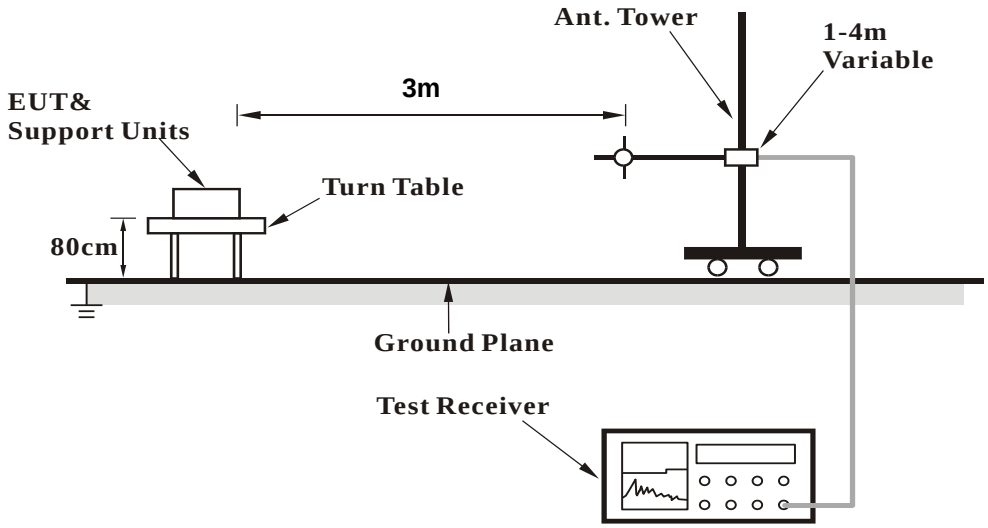
No deviation.

4.1.5 Test Setup

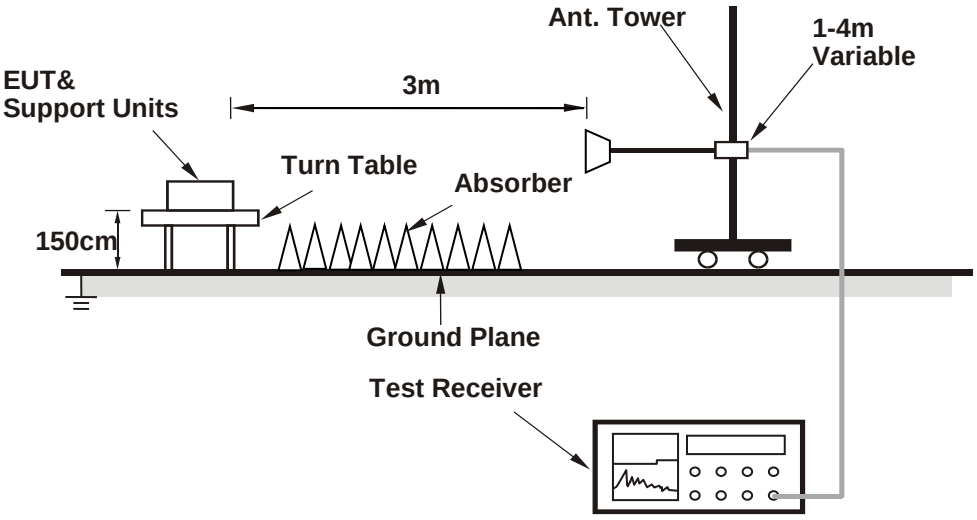
For Radiated emission below 30MHz



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

a. Placed the EUT on the testing table.
b. Controlling software (SSH PASTE pvs6_WiFi+Zigbee+BT+BLE+RB SOP.docx command) has been activated to set the EUT on specific status.

4.1.7 Test Results

LE 1M

Above 1GHz Data:

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

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	58.1 PK	74.0	-15.9	1.47 H	224	60.8	-2.7
2	2390.00	47.4 AV	54.0	-6.6	1.47 H	224	50.1	-2.7
3	*2402.00	96.6 PK			1.47 H	224	99.3	-2.7
4	*2402.00	95.3 AV			1.47 H	224	98.0	-2.7
5	4804.00	42.2 PK	74.0	-31.8	1.51 H	225	40.6	1.6
6	4804.00	30.1 AV	54.0	-23.9	1.51 H	225	28.5	1.6
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	59.2 PK	74.0	-14.8	1.29 V	123	61.9	-2.7
2	2390.00	48.5 AV	54.0	-5.5	1.29 V	123	51.2	-2.7
3	*2402.00	106.1 PK			1.29 V	123	108.8	-2.7
4	*2402.00	105.1 AV			1.29 V	123	107.8	-2.7
5	4804.00	43.0 PK	74.0	-31.0	3.18 V	239	41.4	1.6
6	4804.00	31.2 AV	54.0	-22.8	3.18 V	239	29.6	1.6

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	96.7 PK			1.44 H	211	99.7	-3.0
2	*2440.00	95.6 AV			1.44 H	211	98.6	-3.0
3	3904.00	42.9 PK	74.0	-31.1	2.29 H	175	42.9	0.0
4	3904.00	38.0 AV	54.0	-16.0	2.29 H	175	38.0	0.0
5	4880.00	42.0 PK	74.0	-32.0	1.54 H	217	40.3	1.7
6	4880.00	30.2 AV	54.0	-23.8	1.54 H	217	28.5	1.7
7	7320.00	48.9 PK	74.0	-25.1	1.97 H	102	41.1	7.8
8	7320.00	36.7 AV	54.0	-17.3	1.97 H	102	28.9	7.8
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	106.3 PK			1.34 V	113	109.3	-3.0
2	*2440.00	105.4 AV			1.34 V	113	108.4	-3.0
3	3904.00	47.3 PK	74.0	-26.7	1.99 V	360	47.3	0.0
4	3904.00	44.8 AV	54.0	-9.2	1.99 V	360	44.8	0.0
5	4880.00	43.3 PK	74.0	-30.7	3.17 V	255	41.6	1.7
6	4880.00	31.6 AV	54.0	-22.4	3.17 V	255	29.9	1.7
7	7320.00	49.4 PK	74.0	-24.6	1.33 V	78	41.6	7.8
8	7320.00	37.1 AV	54.0	-16.9	1.33 V	78	29.3	7.8

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. 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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	96.6 PK			1.39 H	207	99.6	-3.0
2	*2480.00	95.2 AV			1.39 H	207	98.2	-3.0
3	2483.50	58.3 PK	74.0	-15.7	1.39 H	207	61.3	-3.0
4	2483.50	46.9 AV	54.0	-7.1	1.39 H	207	49.9	-3.0
5	4960.00	41.9 PK	74.0	-32.1	1.60 H	204	40.0	1.9
6	4960.00	30.0 AV	54.0	-24.0	1.60 H	204	28.1	1.9
7	7440.00	49.0 PK	74.0	-25.0	2.03 H	90	41.1	7.9
8	7440.00	36.9 AV	54.0	-17.1	2.03 H	90	29.0	7.9
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	*2480.00	105.9 PK			1.31 V	107	108.9	-3.0
2	*2480.00	105.2 AV			1.31 V	107	108.2	-3.0
3	2483.50	59.1 PK	74.0	-14.9	1.31 V	107	62.1	-3.0
4	2483.50	48.1 AV	54.0	-5.9	1.31 V	107	51.1	-3.0
5	4960.00	43.4 PK	74.0	-30.6	3.11 V	263	41.5	1.9
6	4960.00	32.0 AV	54.0	-22.0	3.11 V	263	30.1	1.9
7	7440.00	49.0 PK	74.0	-25.0	1.28 V	76	41.1	7.9
8	7440.00	36.9 AV	54.0	-17.1	1.28 V	76	29.0	7.9

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.

LE 2M

Above 1GHz Data:

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

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	58.2 PK	74.0	-15.8	1.44 H	218	60.9	-2.7
2	2390.00	45.2 AV	54.0	-8.8	1.44 H	218	47.9	-2.7
3	*2402.00	96.9 PK			1.44 H	218	99.6	-2.7
4	*2402.00	93.9 AV			1.44 H	218	96.6	-2.7
5	4804.00	42.4 PK	74.0	-31.6	1.53 H	204	40.8	1.6
6	4804.00	30.3 AV	54.0	-23.7	1.53 H	204	28.7	1.6
7	#7206.00	49.4 PK	74.0	-24.6	1.94 H	94	41.4	8.0
8	#7206.00	37.2 AV	54.0	-16.8	1.94 H	94	29.2	8.0
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	1.70 V	110	62.0	-2.7
2	2390.00	46.4 AV	54.0	-7.6	1.70 V	110	49.1	-2.7
3	*2402.00	106.2 PK			1.70 V	110	108.9	-2.7
4	*2402.00	103.2 AV			1.70 V	110	105.9	-2.7
5	4804.00	43.2 PK	74.0	-30.8	3.18 V	273	41.6	1.6
6	4804.00	31.5 AV	54.0	-22.5	3.18 V	273	29.9	1.6
7	#7206.00	48.7 PK	74.0	-25.3	1.24 V	75	40.7	8.0
8	#7206.00	36.6 AV	54.0	-17.4	1.24 V	75	28.6	8.0

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

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	96.7 PK			1.45 H	212	99.7	-3.0
2	*2440.00	93.8 AV			1.45 H	212	96.8	-3.0
3	3904.00	43.1 PK	74.0	-30.9	2.33 H	186	43.1	0.0
4	3904.00	38.1 AV	54.0	-15.9	2.33 H	186	38.1	0.0
5	4880.00	42.5 PK	74.0	-31.5	1.59 H	205	40.8	1.7
6	4880.00	30.7 AV	54.0	-23.3	1.59 H	205	29.0	1.7
7	7320.00	49.0 PK	74.0	-25.0	1.93 H	96	41.2	7.8
8	7320.00	36.7 AV	54.0	-17.3	1.93 H	96	28.9	7.8
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	105.7 PK			1.64 V	117	108.7	-3.0
2	*2440.00	102.9 AV			1.64 V	117	105.9	-3.0
3	3904.00	47.7 PK	74.0	-26.3	1.96 V	360	47.7	0.0
4	3904.00	45.3 AV	54.0	-8.7	1.96 V	360	45.3	0.0
5	4880.00	43.0 PK	74.0	-31.0	3.17 V	262	41.3	1.7
6	4880.00	31.4 AV	54.0	-22.6	3.17 V	262	29.7	1.7
7	7320.00	48.8 PK	74.0	-25.2	1.27 V	76	41.0	7.8
8	7320.00	36.7 AV	54.0	-17.3	1.27 V	76	28.9	7.8

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. 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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	96.9 PK			1.48 H	204	99.9	-3.0
2	*2480.00	94.1 AV			1.48 H	204	97.1	-3.0
3	2483.50	57.9 PK	74.0	-16.1	1.48 H	204	60.9	-3.0
4	2483.50	45.0 AV	54.0	-9.0	1.48 H	204	48.0	-3.0
5	4948.00	42.0 PK	74.0	-32.0	1.61 H	217	40.1	1.9
6	4948.00	30.2 AV	54.0	-23.8	1.61 H	217	28.3	1.9
7	7422.00	49.3 PK	74.0	-24.7	1.88 H	107	41.3	8.0
8	7422.00	37.1 AV	54.0	-16.9	1.88 H	107	29.1	8.0
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	105.4 PK			1.67 V	121	108.4	-3.0
2	*2480.00	102.6 AV			1.67 V	121	105.6	-3.0
3	2483.50	58.7 PK	74.0	-15.3	1.67 V	121	61.7	-3.0
4	2483.50	46.2 AV	54.0	-7.8	1.67 V	121	49.2	-3.0
5	4948.00	43.3 PK	74.0	-30.7	3.17 V	256	41.4	1.9
6	4948.00	31.6 AV	54.0	-22.4	3.17 V	256	29.7	1.9
7	7422.00	48.8 PK	74.0	-25.2	1.32 V	61	40.8	8.0
8	7422.00	36.7 AV	54.0	-17.3	1.32 V	61	28.7	8.0

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

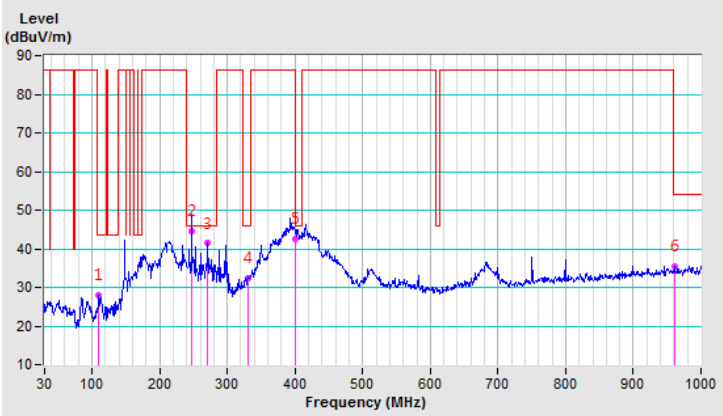
Below 1GHz Data:

CHANNEL	TX Channel 19	**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	110.15	27.9 QP	43.5	-15.6	1.00 H	202	38.4	-10.5
2	247.52	44.7 QP	46.0	-1.3	1.50 H	132	53.8	-9.1
3	270.66	41.4 QP	46.0	-4.6	1.50 H	315	49.4	-8.0
4	330.63	32.4 QP	46.0	-13.6	1.50 H	360	38.2	-5.8
5	400.84	42.6 QP	46.0	-3.4	1.00 H	136	47.1	-4.5
6	962.15	35.4 QP	54.0	-18.6	1.00 H	168	29.7	5.7

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 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.
5. Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must also comply with the radiated emission limits specified in FCC 15.209(a), the other emission shall be at least 20 dB below fundamental.

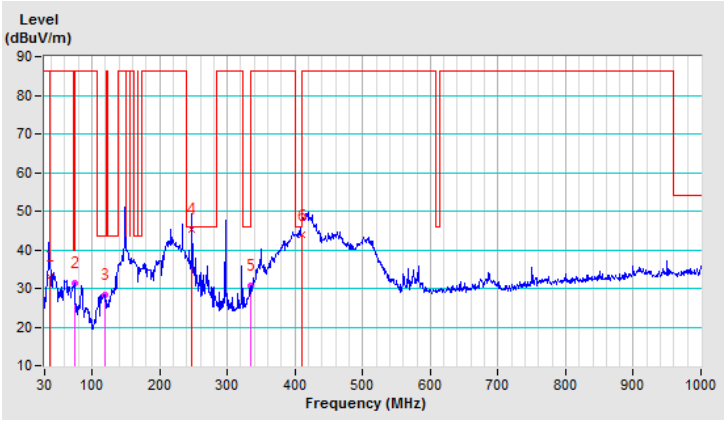


CHANNEL	TX Channel 19	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	37.50	33.1 QP	40.0	-6.9	1.50 V	22	41.8	-8.7
2	73.99	31.3 QP	40.0	-8.7	1.00 V	223	42.3	-11.0
3	118.68	28.4 QP	43.5	-15.1	1.50 V	121	38.2	-9.8
4	247.52	45.3 QP	46.0	-0.7	1.00 V	70	54.4	-9.1
5	333.80	30.7 QP	46.0	-15.3	1.00 V	344	36.5	-5.8
6	410.00	43.8 QP	46.0	-2.2	1.00 V	263	48.1	-4.3

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. Margin value = Emission Level – Limit value
4. 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.
5. Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must also comply with the radiated emission limits specified in FCC 15.209(a), the other emission shall be at least 20 dB below fundamental.



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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Nov. 01, 2017	Oct. 31, 2018
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Nov. 15, 2017	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 04, 2018	June 03, 2019
50 ohms Terminator	N/A	EMC-04	Nov. 01, 2017	Oct. 31, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 16, 2018	Mar. 15, 2019
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Oct. 26, 2018

4.2.3 Test Procedures

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

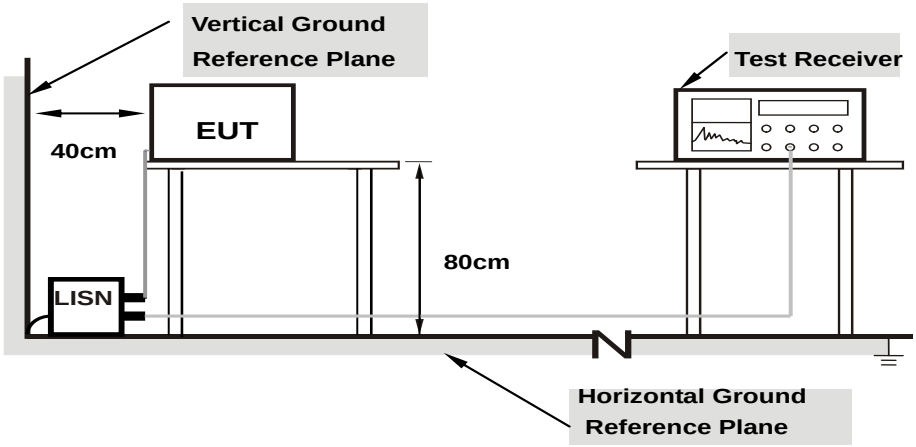
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

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 4.1.6.

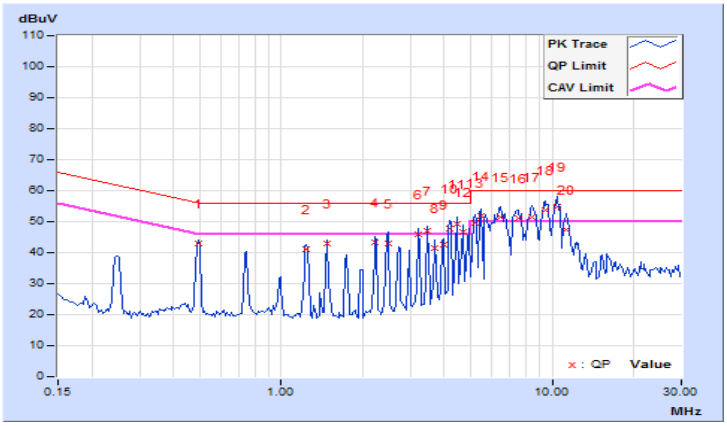
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.49580	10.08	32.82	31.04	42.90	41.12	56.07	46.07	-13.17	-4.95
2	1.23438	10.12	31.16	26.40	41.28	36.52	56.00	46.00	-14.72	-9.48
3	1.48438	10.13	32.73	25.85	42.86	35.98	56.00	46.00	-13.14	-10.02
4	2.22656	10.17	33.29	25.68	43.46	35.85	56.00	46.00	-12.54	-10.15
5	2.48047	10.18	32.95	24.75	43.13	34.93	56.00	46.00	-12.87	-11.07
6	3.19531	10.21	35.68	27.09	45.89	37.30	56.00	46.00	-10.11	-8.70
7	3.44531	10.23	36.73	28.12	46.96	38.35	56.00	46.00	-9.04	-7.65
8	3.70703	10.24	31.07	22.20	41.31	32.44	56.00	46.00	-14.69	-13.56
9	3.98828	10.25	32.41	20.22	42.66	30.47	56.00	46.00	-13.34	-15.53
10	4.17578	10.26	37.51	27.37	47.77	37.63	56.00	46.00	-8.23	-8.37
11	4.43359	10.27	38.83	29.17	49.10	39.44	56.00	46.00	-6.90	-6.56
12	4.67188	10.28	36.25	26.35	46.53	36.63	56.00	46.00	-9.47	-9.37
13	5.17188	10.30	39.16	29.82	49.46	40.12	60.00	50.00	-10.54	-9.88
14	5.48047	10.32	41.36	29.24	51.68	39.56	60.00	50.00	-8.32	-10.44
15	6.47266	10.37	41.03	29.11	51.40	39.48	60.00	50.00	-8.60	-10.52
16	7.46875	10.41	40.78	27.82	51.19	38.23	60.00	50.00	-8.81	-11.77
17	8.41797	10.46	40.86	31.77	51.32	42.23	60.00	50.00	-8.68	-7.77
18	9.46484	10.51	43.32	31.27	53.83	41.78	60.00	50.00	-6.17	-8.22
19	10.39844	10.55	44.22	34.85	54.77	45.40	60.00	50.00	-5.23	-4.60
20	11.33594	10.60	36.87	26.36	47.47	36.96	60.00	50.00	-12.53	-13.04

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.

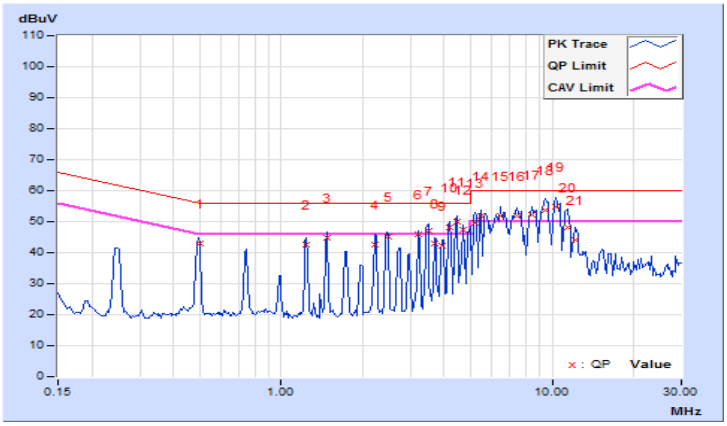


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.50000	9.97	33.12	26.33	43.09	36.30	56.00	46.00	-12.91	-9.70
2	1.24219	10.00	32.53	26.22	42.53	36.22	56.00	46.00	-13.47	-9.78
3	1.47266	10.01	34.73	27.82	44.74	37.83	56.00	46.00	-11.26	-8.17
4	2.22266	10.05	32.72	25.67	42.77	35.72	56.00	46.00	-13.23	-10.28
5	2.48828	10.06	35.08	24.95	45.14	35.01	56.00	46.00	-10.86	-10.99
6	3.19531	10.09	35.66	27.37	45.75	37.46	56.00	46.00	-10.25	-8.54
7	3.48828	10.10	36.96	25.28	47.06	35.38	56.00	46.00	-8.94	-10.62
8	3.69141	10.11	32.91	23.90	43.02	34.01	56.00	46.00	-12.98	-11.99
9	3.93359	10.12	32.09	23.24	42.21	33.36	56.00	46.00	-13.79	-12.64
10	4.18359	10.13	37.96	29.24	48.09	39.37	56.00	46.00	-7.91	-6.63
11	**4.45703**	**10.14**	**39.73**	**31.32**	**49.87**	**41.46**	**56.00**	**46.00**	**-6.13**	**-4.54**
12	4.67578	10.15	37.38	27.75	47.53	37.90	56.00	46.00	-8.47	-8.10
13	5.20313	10.17	39.32	30.22	49.49	40.39	60.00	50.00	-10.51	-9.61
14	5.48047	10.18	41.80	29.86	51.98	40.04	60.00	50.00	-8.02	-9.96
15	6.43750	10.23	41.51	32.56	51.74	42.79	60.00	50.00	-8.26	-7.21
16	7.42578	10.27	41.59	32.42	51.86	42.69	60.00	50.00	-8.14	-7.31
17	8.47266	10.31	41.86	29.07	52.17	39.38	60.00	50.00	-7.83	-10.62
18	9.45703	10.36	43.34	31.15	53.70	41.51	60.00	50.00	-6.30	-8.49
19	10.33594	10.40	44.34	34.55	54.74	44.95	60.00	50.00	-5.26	-5.05
20	11.40234	10.45	37.57	28.65	48.02	39.10	60.00	50.00	-11.98	-10.90
21	12.19922	10.49	33.42	25.02	43.91	35.51	60.00	50.00	-16.09	-14.49

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.

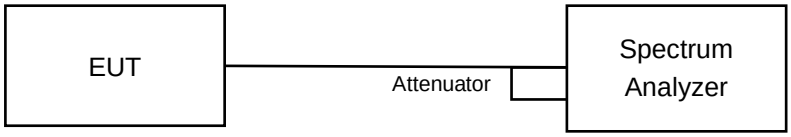


4.3 6dB Bandwidth Measurement

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

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

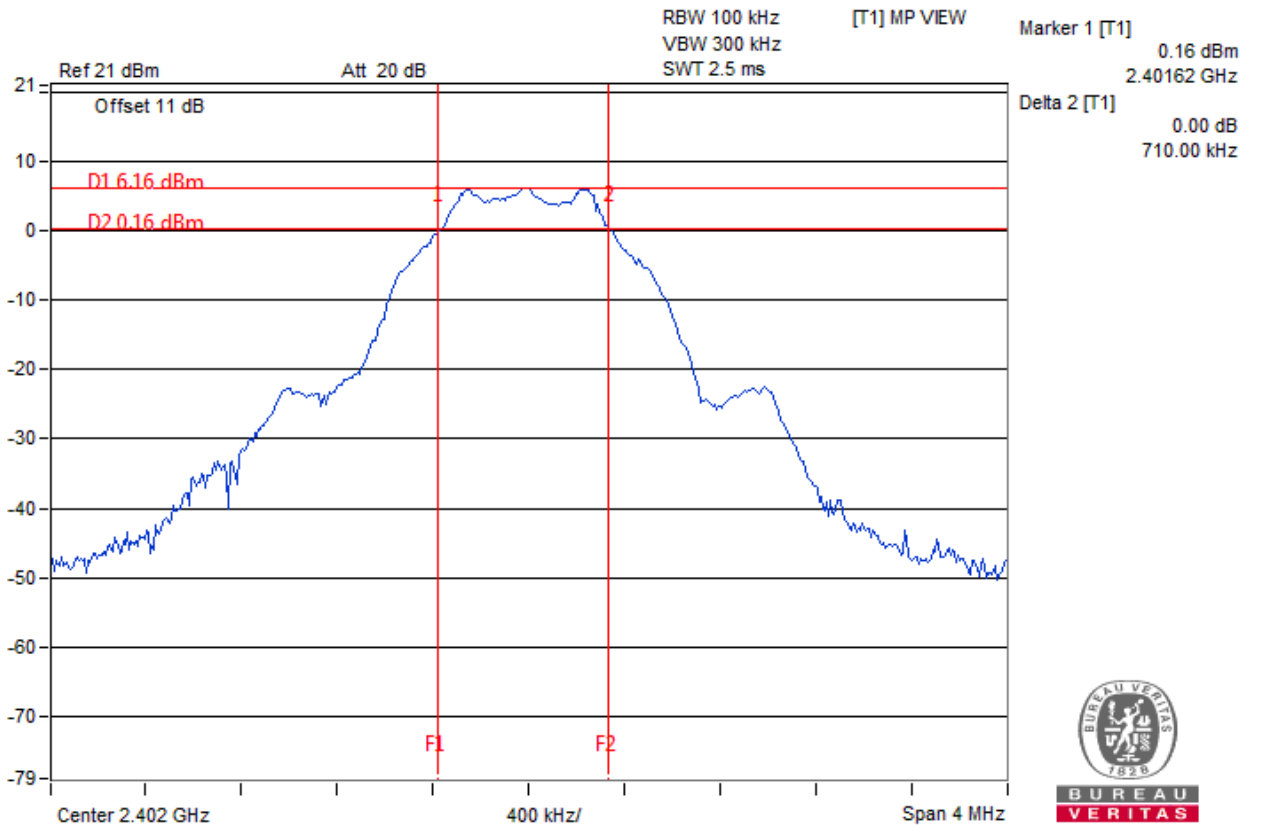
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

LE 1M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.71	0.5	Pass
19	2440	0.71	0.5	Pass
39	2480	0.71	0.5	Pass

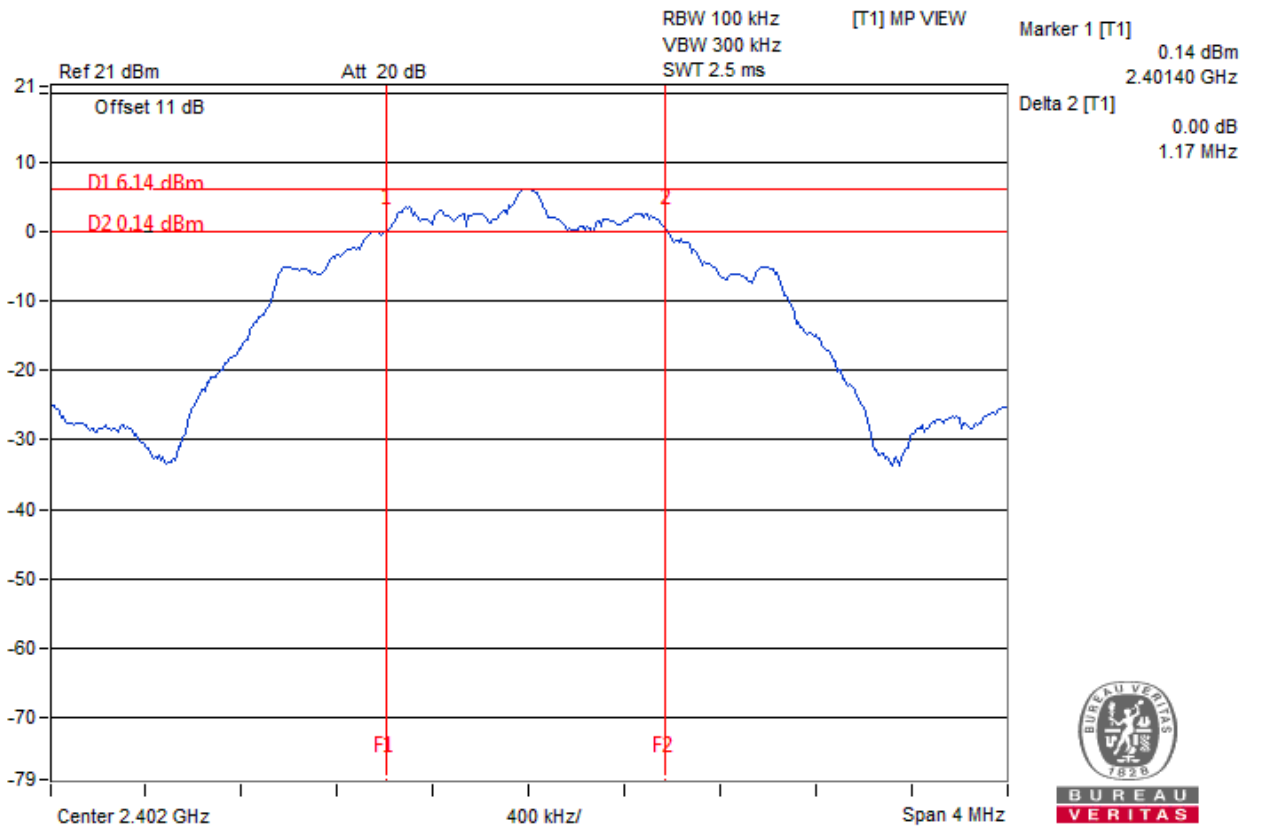
Spectrum Plot of Worst Value
CH 0



LE 2M

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.17	0.5	Pass
19	2440	1.18	0.5	Pass
39	2480	1.18	0.5	Pass

Spectrum Plot of Worst Value
CH 0



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.

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

LE 1M

FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	5.164	7.13	30	Pass
19	2440	5.26	7.21	30	Pass
39	2480	4.842	6.85	30	Pass

FOR AVERAGE POWER - reference only

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.819	6.83
19	2440	4.898	6.90
39	2480	4.446	6.48

LE2M

FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	4.966	6.96	30	Pass
19	2440	4.797	6.81	30	Pass
39	2480	4.385	6.42	30	Pass

FOR AVERAGE POWER - reference only

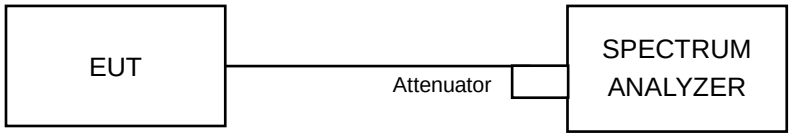
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	4.508	6.54
19	2440	4.592	6.62
39	2480	4.198	6.23

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 3kHz.

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

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

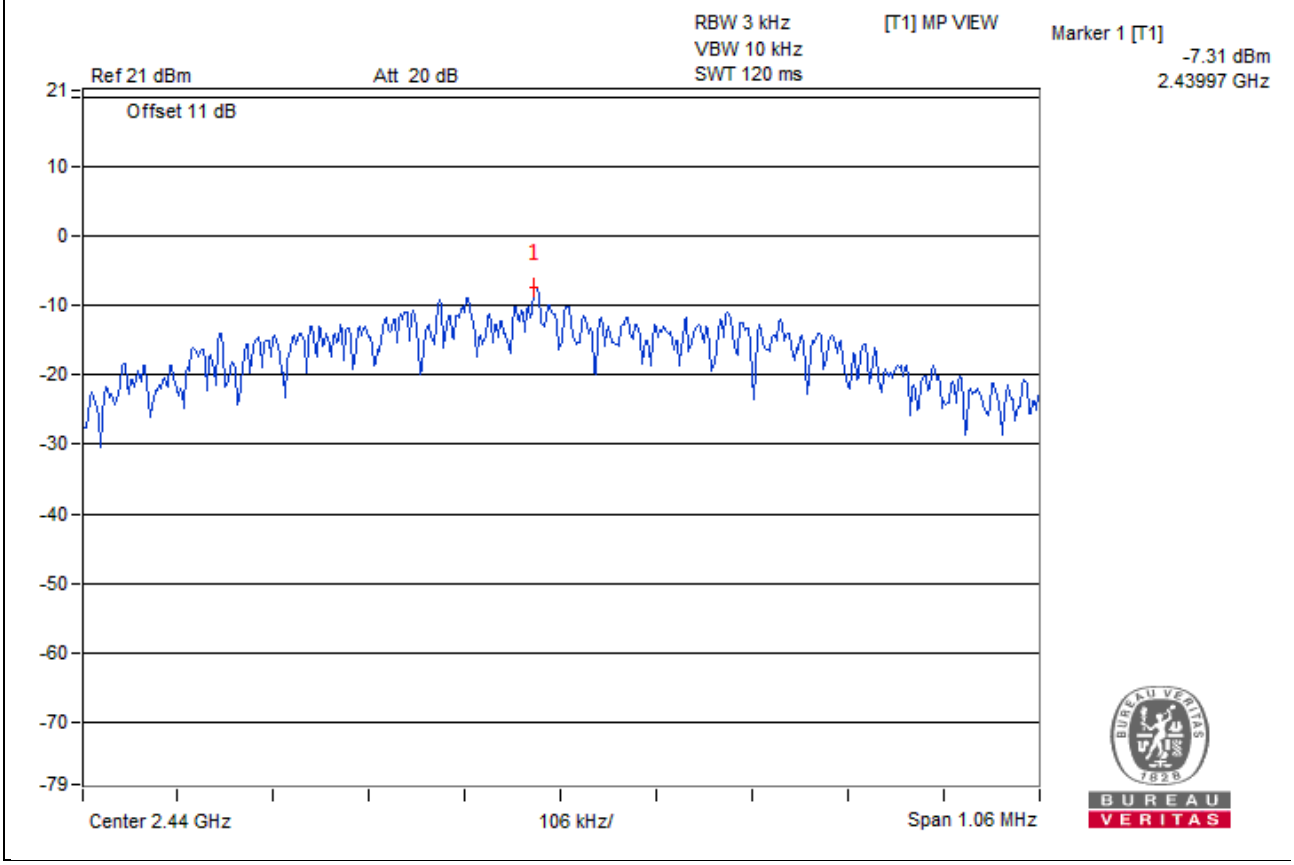
Same as Item 4.3.6.

4.5.7 Test Results

LE 1M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-7.59	8	Pass
19	2440	-7.31	8	Pass
39	2480	-7.69	8	Pass

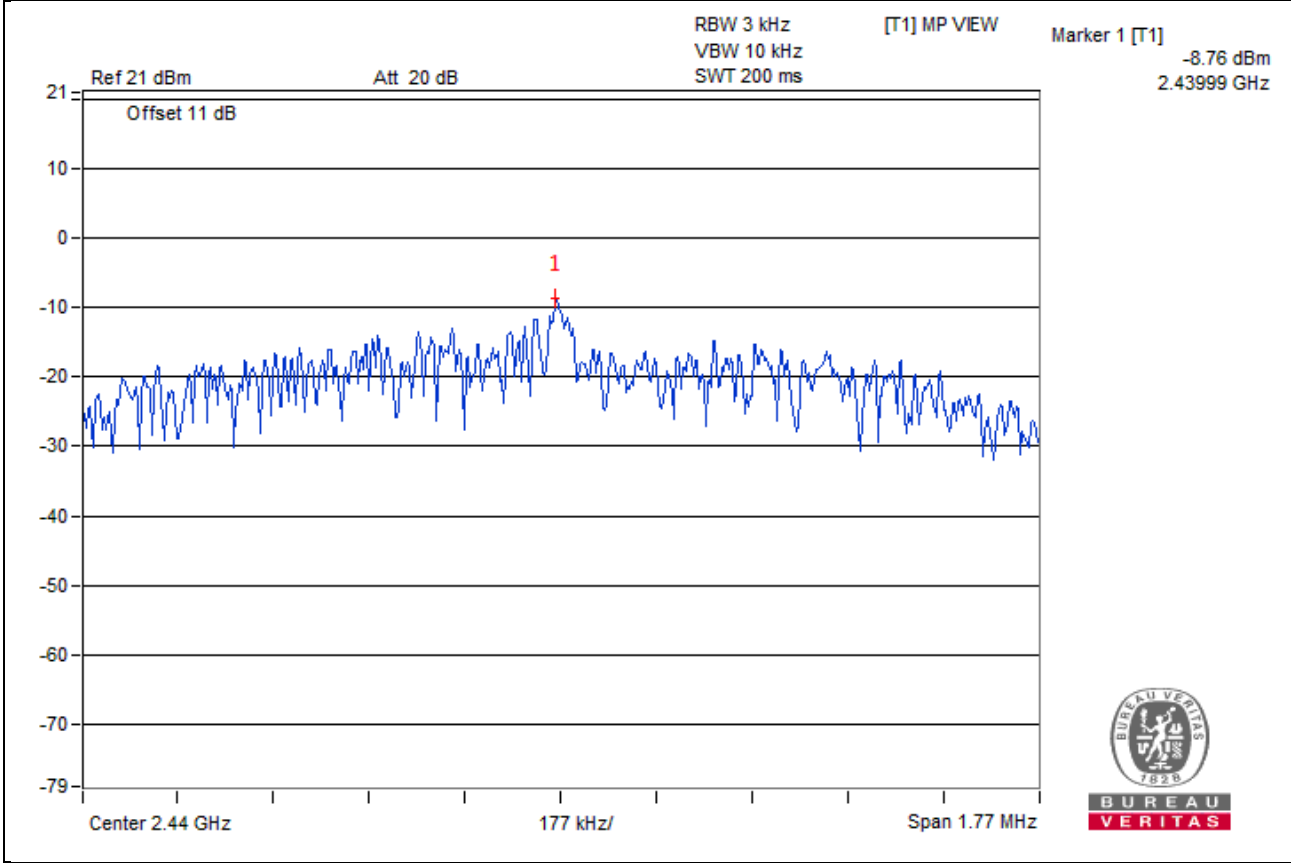
Spectrum Plot of Worst Value
CH19



LE 2M

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-9.00	8	Pass
19	2440	-8.76	8	Pass
39	2480	-9.46	8	Pass

Spectrum Plot of Worst Value
CH19

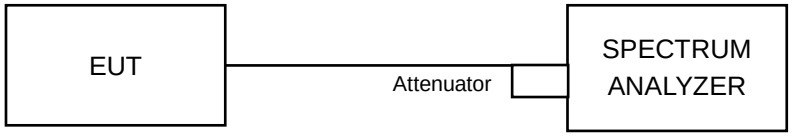


4.6 Conducted Out of Band Emission Measurement

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

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

MEASUREMENT PROCEDURE OOBE

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

4.6.5 Deviation from Test Standard

No deviation.

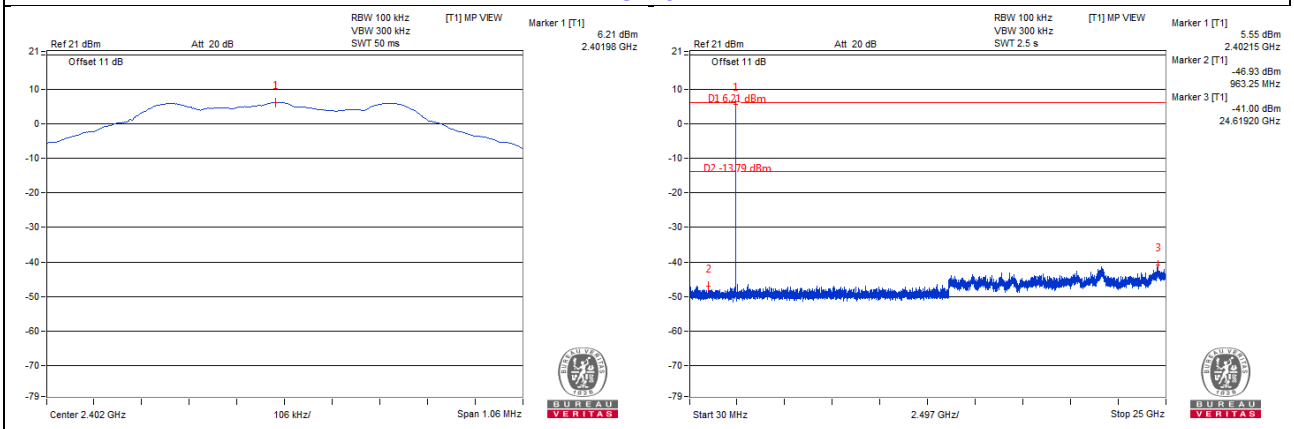
4.6.6 EUT Operating Condition

Same as Item 4.3.6.

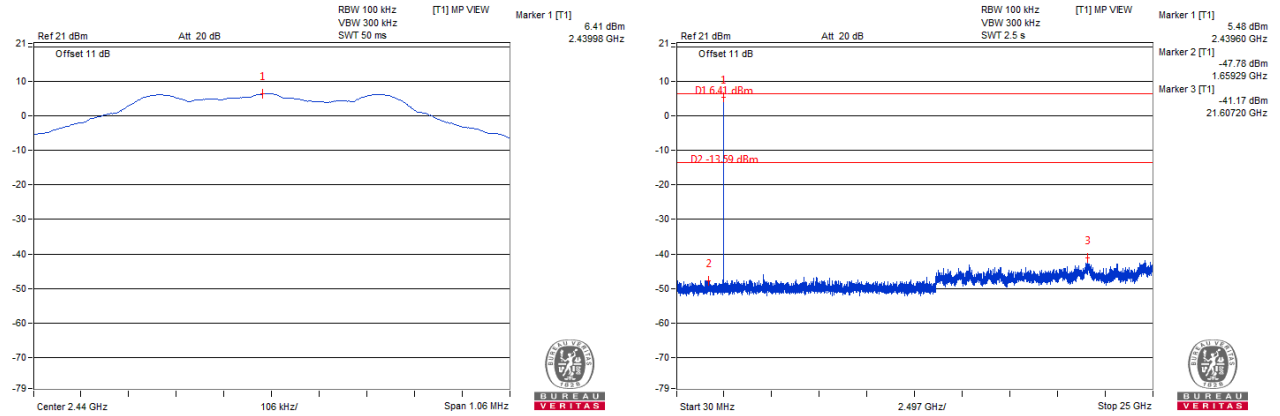
4.6.7 Test Results

LE 1M

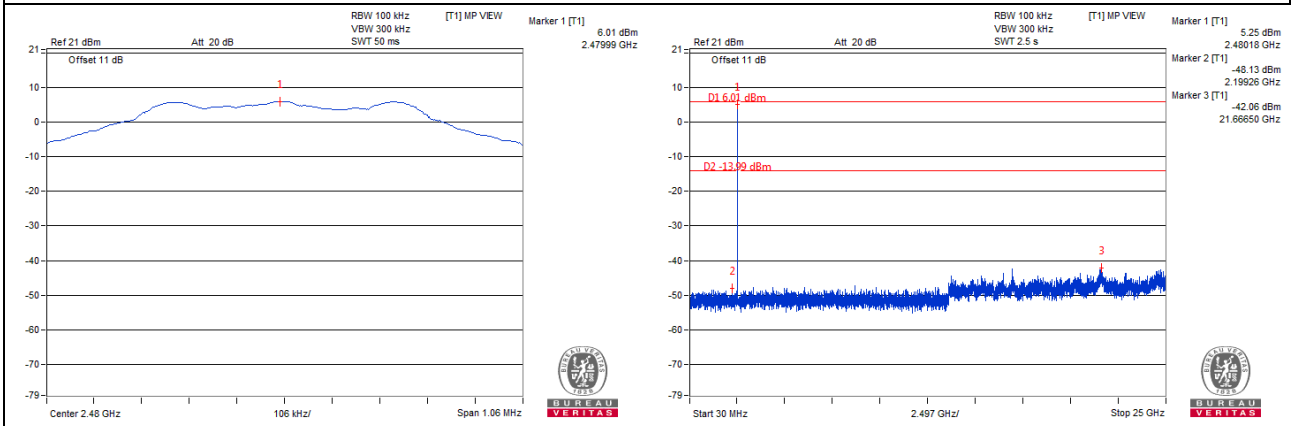
CH 0



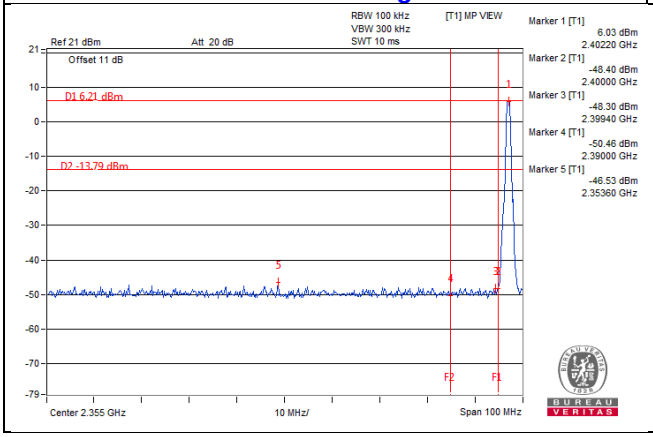
CH 19



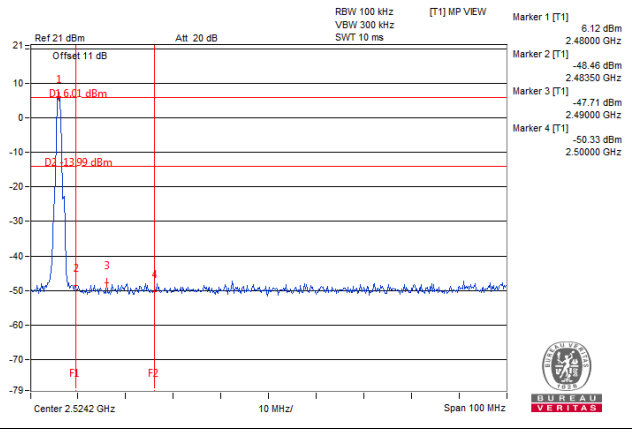
CH 39



CH 0 Band edge

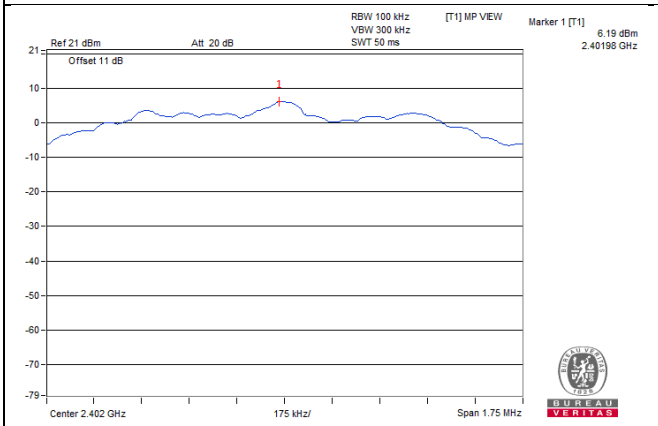


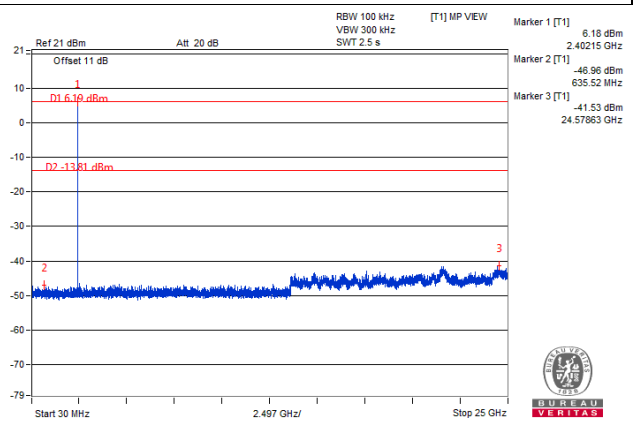
CH 39 Band edge



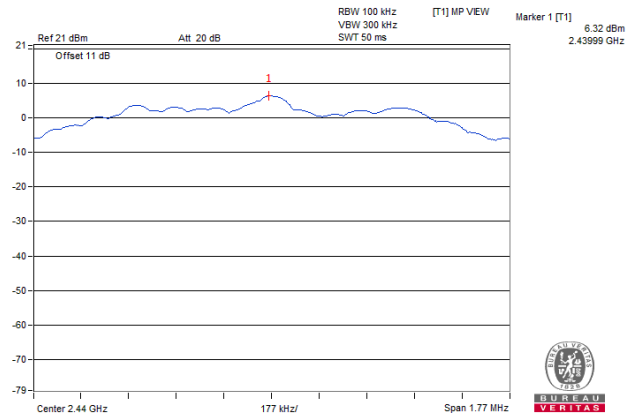
LE 2M

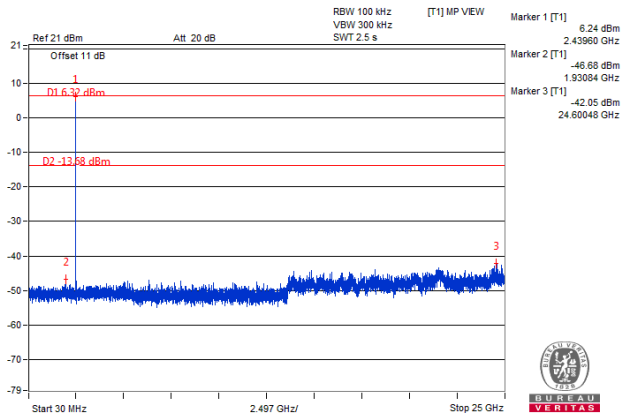
CH 0



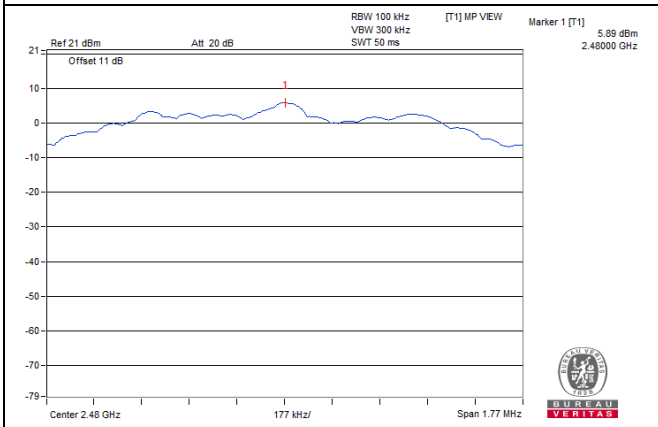


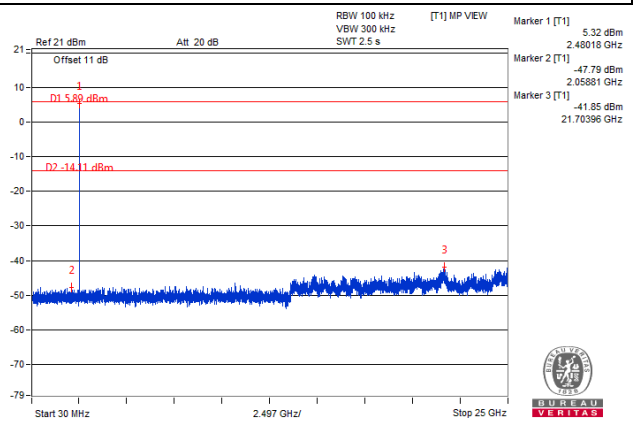
CH 19



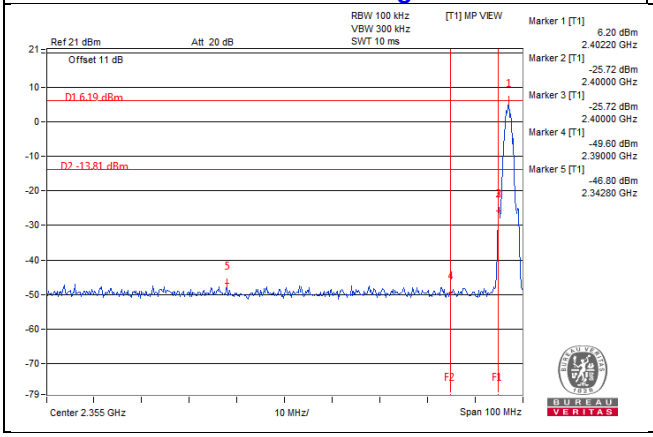


CH 39

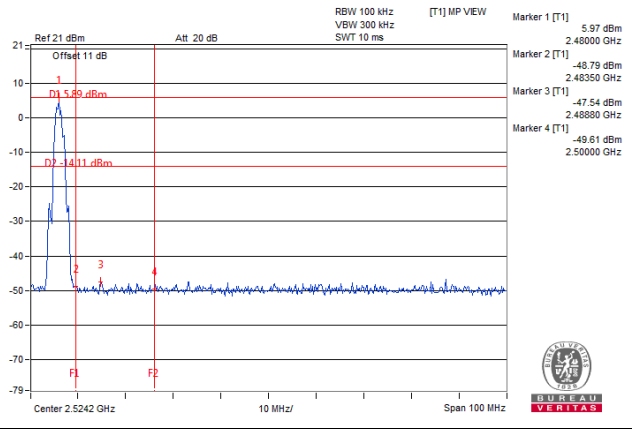




CH 0 Band edge



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 according to ISO/IEC 17025.

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

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

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