

## FCC Test Report

**Report No.:** RF180515D12A

**FCC ID:** NRIRS420900

**Test Model:** ON-LRD-209S

**Series Model:** ON-LRD-20(W)(X)(Y)(Z)  
(where (W)(X)(Y)(Z) may be A-Z, 0-9 or blank)

**Received Date:** Apr. 18, 2019

**Test Date:** Apr. 22 to Oct. 7, 2019

**Issued Date:** Oct. 8, 2019

**Applicant:** IR-TEC International Ltd.

**Address:** 6 Rong An Road, Luzhu Taoyuan 33852, TAIWAN

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

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

**FCC Registration /  
Designation Number:** 198487 / TW2021



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### Release Control Record

Issue No.	Description	Date Issued
RF180515D12A	Original release.	Oct. 8, 2019

## 1 Certificate of Conformity

**Product:** Line Voltage OS-NET Sensor

**Brand:** IR-TEC

**Test Model:** ON-LRD-209S

**Series Model:** ON-LRD-20(W)(X)(Y)(Z)  
(where (W)(X)(Y)(Z) may be A-Z, 0-9 or blank)

**Sample Status:** Engineering sample

**Applicant:** IR-TEC International Ltd.

**Test Date:** Apr. 22 to Oct. 7, 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 :**

*Annie Chang*

**Date:** Oct. 8, 2019

Annie Chang / Senior Specialist

**Approved by :**

*Rex Lai*

**Date:** Oct. 8, 2019

Rex Lai / Associate Technical Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.99dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is MHF 3 not a standard connector.

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

### 2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.42 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Line Voltage OS-NET Sensor
Brand	IR-TEC
Test Model	ON-LRD-209S
Series Model	ON-LRD-20(W)(X)(Y)(Z) (where (W)(X)(Y)(Z) may be A-Z, 0-9 or blank)
Model Difference	Marketing Differentiation
Status of EUT	Engineering sample
Power Supply Rating	120-277Vac, 50/60Hz
Modulation Type	O-QPSK
Transfer Rate	250Kbps
Operating Frequency	2405 ~ 2480MHz
Number of Channel	16
Output Power	4.159mW
Antenna Type	Refer to note as below
Antenna Connector	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. This report is issued as a supplementary report to BV CPS report no. RF180515D12. The difference compared with original report is as follows, therefore the EUT is re-tested in this report.

- ✧ Add a new PIFA antenna with 1.05dBi gain
- ✧ Correct the connector type from I-PEX 3 to MHF 3

Therefore this report is prepared for FCC class II permissive change.

2. The EUT used antennas listed as below: (additional as shaded area)

Antenna	Antenna Type	Antenna Connector	Gain (dBi)	Remark
A	PIFA	I-PEX 3	4.2	Original
B	PIFA	MHF 3	1.05	Additional

3. All models are listed as follows:

<b>Model Nomenclature</b>										
♦ ON-LRD-20(W)(X)(Y)(Z) (where (W)(X)(Y)(Z) may be A-Z, 0-9 or blank)										
<b>For example:</b>										
Model	ON	-	LRD	-	2	0	9	S	F	A
	1		2		3	4	5	6	7	8
1. 2.	Category:		ON-LRD = OS-NET Sensor							
3.	Housing Type:		2 = Cylinder shape housing							
4.	Control Type:		0= Direct Wiring Connection 1= Terminal Block Connection							
5.	Specification:		2 = Relay output 9 = Hybrid Switching output							
6.	Sensor:		S = With Ambient Light Sensor built-in N = Without Ambient Light Sensor							
7.	Installation Method:		C = Junction Box E = Fixture External F = Fixture Integrated S = Ceiling Surface R = Ceiling Recess W = Wet Location P= Wet Fixture External other=Different Method							
8.	Photo Lens Type:		May be A-Z							

4. 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

16 channels are provided to this EUT:

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
11	2405MHz	19	2445MHz
12	2410MHz	20	2450MHz
13	2415MHz	21	2455MHz
14	2420MHz	22	2460MHz
15	2425MHz	23	2465MHz
16	2430MHz	24	2470MHz
17	2435MHz	25	2475MHz
18	2440MHz	26	2480MHz

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE<1G	APCM	
-	√	√	√	-

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement  
 RE<1G: Radiated Emission below 1GHz  
 APCM: Antenna Port Conducted Measurement

**NOTE:** The EUT had been pre-tested on the positioned of face up & face down mode. The worst case was found when positioned on face up mode.

#### **Radiated Emission Test (Above 1GHz):**

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
-	11 to 26	11, 18, 26	O-QPSK	250

#### **Radiated Emission Test (Below 1GHz):**

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
-	11 to 26	11	O-QPSK	250

#### **Antenna Port Conducted Measurement:**

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
-	11 to 26	11, 18, 26	O-QPSK	250

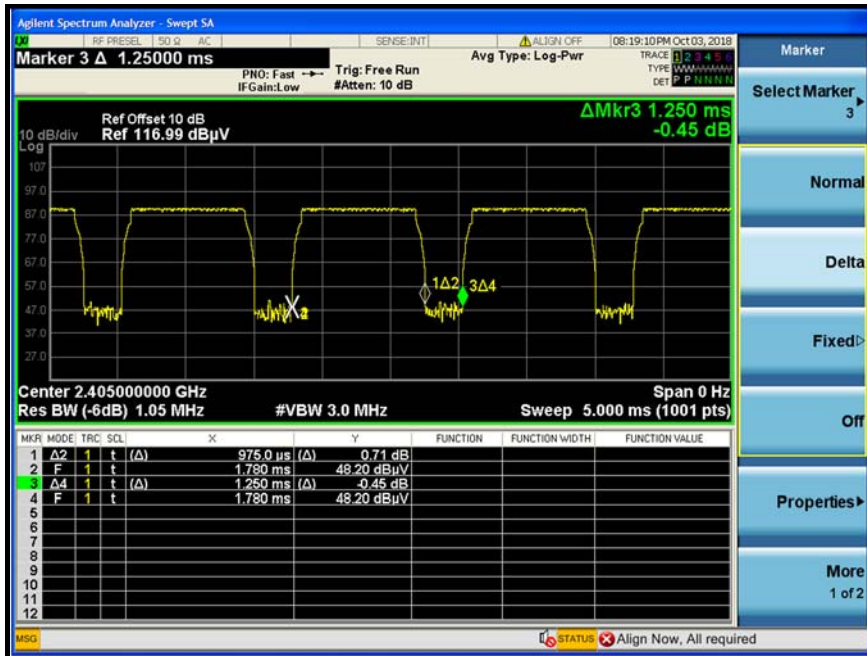
#### **Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested By
RE $\geq$ 1G	26deg. C, 77%RH	120Vac, 60Hz	Ian Chang
RE<1G	25deg. C, 76%RH	120Vac, 60Hz	Dalen Dai
APCM	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee

### 3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%

Duty cycle =  $0.945/1.250 = 0.756$ , Duty factor =  $10 * \log(1/0.756) = 1.22$



### 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.

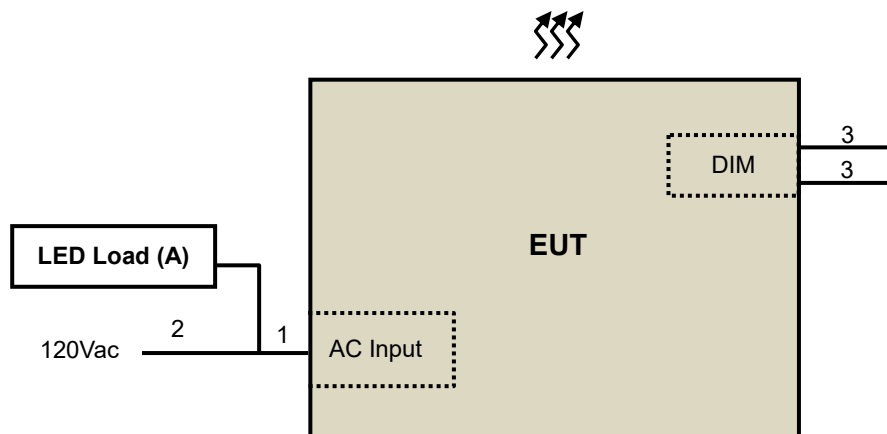
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	LED Load	N/A	N/A	N/A	N/A	Supplied by client

Note: 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 power cable	1	1.4	N	0	Supplied by client
2.	AC power cable	1	1.8	N	0	Provided by Lab
3.	DIM cable	2	0.4	N	0	Supplied by client

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 v05r02**  
**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 or 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

Below 1GHz test:

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
HP Preamplifier	8447D	2432A03504	Feb. 20, 2019	Feb. 19, 2020
HP Preamplifier	8449B	3008A01201	Feb. 21, 2019	Feb. 20, 2020
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 20, 2019	Feb. 19, 2020
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 05, 2019	Mar. 04, 2020
Schwarzbeck Antenna	VULB 9168	139	Nov. 26, 2018	Nov. 25, 2019
Schwarzbeck Antenna	VHBA 9123	480	May 19, 2017	May 18, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 25, 2018	Nov. 24, 2019
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 25, 2018	Nov. 24, 2019
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Aug. 13, 2018	Aug. 12, 2019
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Aug. 13, 2018	Aug. 12, 2019
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 4, 2018	Jun. 3, 2019
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Aug. 3, 2018	Aug. 2, 2019
Loop Antenna EMCI	LPA600	270	Aug. 11, 2017	Aug. 10, 2019
EMCO Horn Antenna	3115	00028257	Nov. 25, 2018	Nov. 24, 2019
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. The test was performed in Chamber No. 6.
  4. Tested Date: Apr. 22, 2019

Above 1GHz test:

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
HP Preamplifier	8447D	2432A03504	Feb. 20, 2019	Feb. 19, 2020
HP Preamplifier	8449B	3008A01201	Feb. 21, 2019	Feb. 20, 2020
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 20, 2019	Feb. 19, 2020
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 05, 2019	Mar. 04, 2020
Schwarzbeck Antenna	VULB 9168	139	Nov. 26, 2018	Nov. 25, 2019
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 25, 2018	Nov. 24, 2019
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 25, 2018	Nov. 24, 2019
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 10, 2019	Jul. 9, 2020
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6 m	Jul. 10, 2019	Jul. 9, 2020
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 11, 2019	Jun. 10, 2020
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 30, 2019	Jul. 29, 2020
EMCO Horn Antenna	3115	00028257	Nov. 25, 2018	Nov. 24, 2019
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. The test was performed in Chamber No. 6.
  4. Tested Date: Sep. 25, 2019

#### 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:** 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 detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

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.

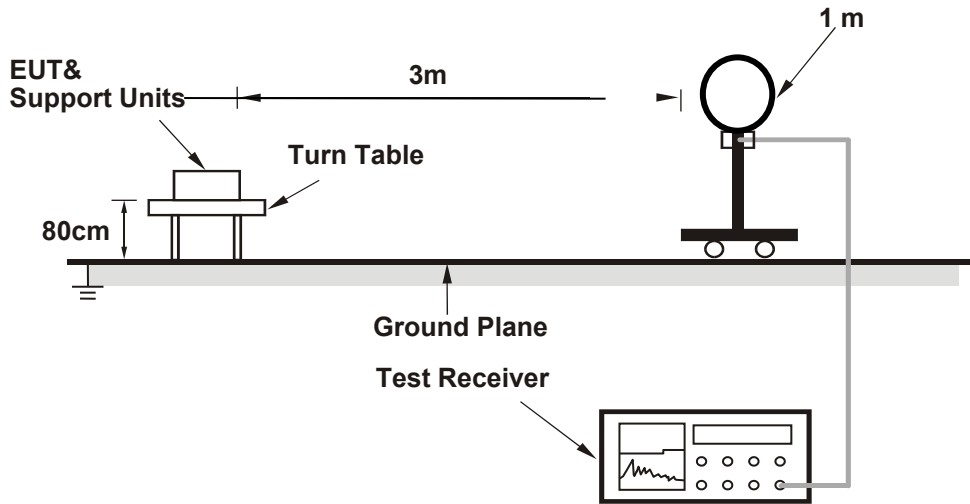
#### 4.1.4 Deviation from Test Standard

No deviation.

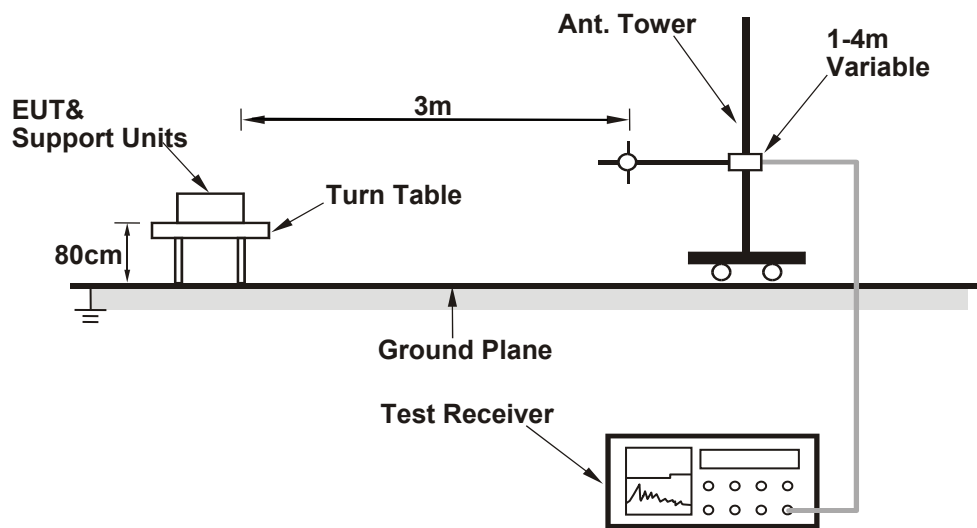


#### 4.1.5 Test Setup

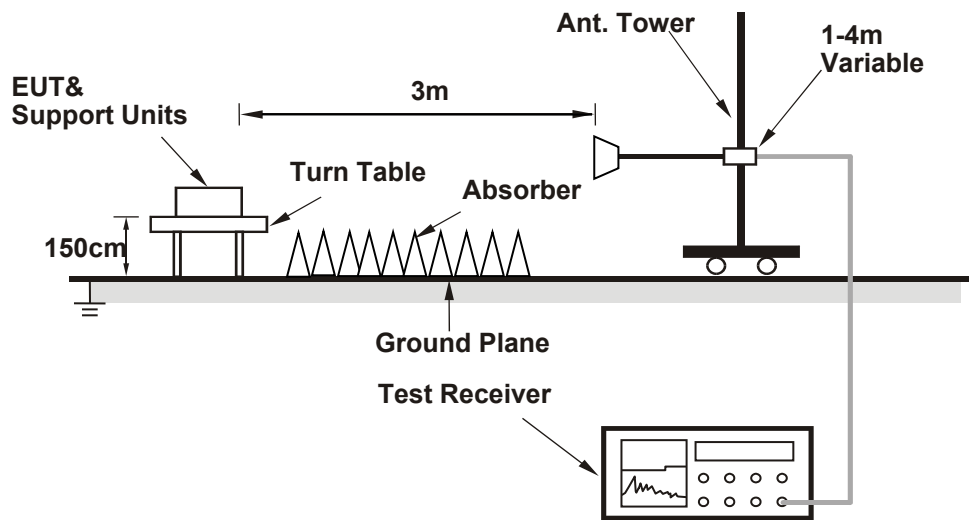
##### For Radiated emission below 30MHz



##### 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 :

<b>CHANNEL</b>	TX Channel 11	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.66 PK	74.00	-18.34	1.84 H	9	55.08	0.58
2	2390.00	42.10 AV	54.00	-11.90	1.84 H	9	41.52	0.58
3	*2405.00	99.54 PK			1.84 H	9	98.91	0.63
4	*2405.00	96.06 AV			1.84 H	9	95.43	0.63
5	4810.00	60.96 PK	74.00	-13.04	1.50 H	330	52.67	8.29
6	4810.00	51.98 AV	54.00	-2.02	1.50 H	330	43.69	8.29
7	#7215.00	59.06 PK	74.00	-14.94	1.32 H	17	45.89	13.17
8	#7215.00	48.21 AV	54.00	-5.79	1.32 H	17	35.04	13.17

#### 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	53.74 PK	74.00	-20.26	1.20 V	104	53.16	0.58
2	2390.00	40.31 AV	54.00	-13.69	1.20 V	104	39.73	0.58
3	*2405.00	94.03 PK			1.20 V	104	93.40	0.63
4	*2405.00	90.49 AV			1.20 V	104	89.86	0.63
5	4810.00	59.08 PK	74.00	-14.92	1.88 V	287	50.79	8.29
6	4810.00	50.16 AV	54.00	-3.84	1.88 V	287	41.87	8.29
7	#7215.00	56.62 PK	74.00	-17.38	1.01 V	346	43.45	13.17
8	#7215.00	45.27 AV	54.00	-8.73	1.01 V	346	32.10	13.17

#### 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.

<b>CHANNEL</b>	TX Channel 18	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	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	99.37 PK			1.91 H	12	98.64	0.73
2	*2440.00	96.11 AV			1.91 H	12	95.38	0.73
3	4880.00	60.29 PK	74.00	-13.71	2.72 H	311	51.63	8.66
4	4880.00	51.45 AV	54.00	-2.55	2.72 H	311	42.79	8.66
5	7320.00	60.60 PK	74.00	-13.40	1.20 H	19	47.13	13.47
6	7320.00	50.25 AV	54.00	-3.75	1.20 H	19	36.78	13.47

**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	93.88 PK			1.19 V	110	93.15	0.73
2	*2440.00	89.99 AV			1.19 V	110	89.26	0.73
3	4880.00	57.92 PK	74.00	-16.08	1.50 V	309	49.26	8.66
4	4880.00	48.91 AV	54.00	-5.09	1.50 V	309	40.25	8.66
5	7320.00	57.39 PK	74.00	-16.61	1.63 V	68	43.92	13.47
6	7320.00	46.12 AV	54.00	-7.88	1.63 V	68	32.65	13.47

**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.

<b>CHANNEL</b>	TX Channel 26	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	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	94.83 PK			1.44 H	2	93.91	0.92
2	*2480.00	91.52 AV			1.44 H	2	90.60	0.92
3	2483.50	64.54 PK	74.00	-9.46	1.44 H	2	63.58	0.96
<b>4</b>	<b>2483.50</b>	<b>53.01 AV</b>	<b>54.00</b>	<b>-0.99</b>	<b>1.44 H</b>	<b>2</b>	<b>52.05</b>	<b>0.96</b>
5	4960.00	57.66 PK	74.00	-16.34	1.81 H	6	48.97	8.69
6	4960.00	48.79 AV	54.00	-5.21	1.81 H	6	40.10	8.69
7	7440.00	57.41 PK	74.00	-16.59	2.31 H	21	43.69	13.72
8	7440.00	47.70 AV	54.00	-6.30	2.31 H	21	33.98	13.72

**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	89.71 PK			1.26 V	98	88.79	0.92
2	*2480.00	86.55 AV			1.26 V	98	85.63	0.92
3	2483.50	60.39 PK	74.00	-13.61	1.26 V	98	59.43	0.96
4	2483.50	49.51 AV	54.00	-4.49	1.26 V	98	48.55	0.96
5	4960.00	52.95 PK	74.00	-21.05	2.91 V	24	44.26	8.69
6	4960.00	43.18 AV	54.00	-10.82	2.91 V	24	34.49	8.69
7	7440.00	53.75 PK	74.00	-20.25	1.44 V	336	40.03	13.72
8	7440.00	41.78 AV	54.00	-12.22	1.44 V	336	28.06	13.72

**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.

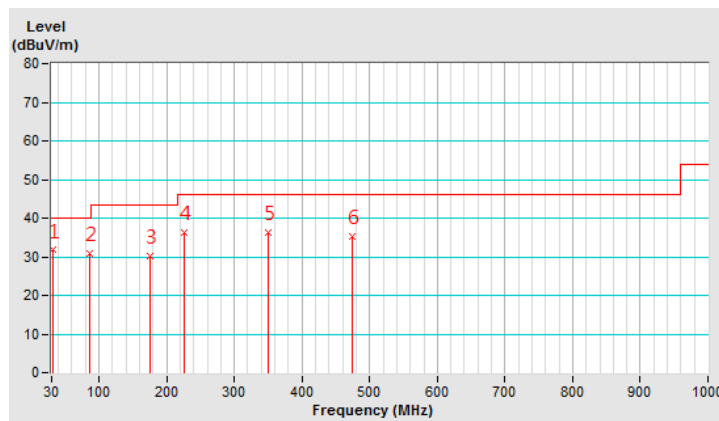
**Below 1GHz Worst-Case Data**

<b>CHANNEL</b>	TX Channel 11	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	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	31.60	31.75 QP	40.00	-8.25	1.64 H	351	40.53	-8.78
2	85.73	30.94 QP	40.00	-9.06	1.32 H	38	43.24	-12.30
3	175.01	30.26 QP	43.50	-13.24	1.98 H	71	37.78	-7.52
4	225.02	36.21 QP	46.00	-9.79	1.44 H	76	44.90	-8.69
5	350.00	36.37 QP	46.00	-9.63	1.78 H	166	40.66	-4.29
6	475.04	35.35 QP	46.00	-10.65	2.02 H	347	36.97	-1.62

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



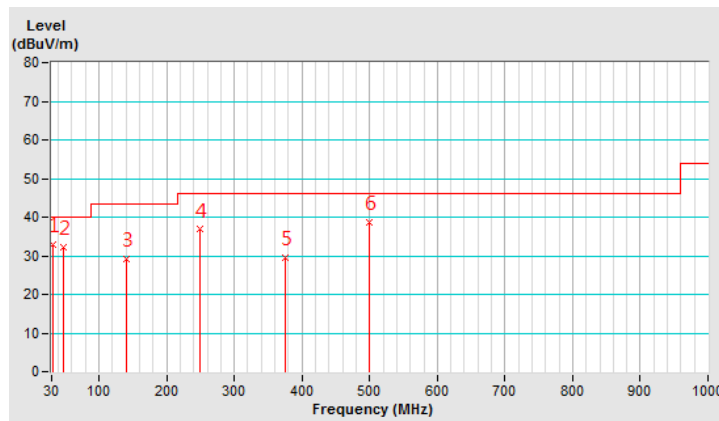
<b>CHANNEL</b>	TX Channel 11	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9kHz ~ 1GHz		

**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	31.60	32.83 QP	40.00	-7.17	1.82 V	335	41.61	-8.78
2	47.99	32.25 QP	40.00	-7.75	2.17 V	55	39.33	-7.08
3	141.21	29.29 QP	43.50	-14.21	1.53 V	360	36.55	-7.26
4	250.00	36.84 QP	46.00	-9.16	1.66 V	184	43.79	-6.95
5	375.03	29.54 QP	46.00	-16.46	1.91 V	74	33.24	-3.70
6	500.01	38.75 QP	46.00	-7.25	1.33 V	23	40.02	-1.27

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

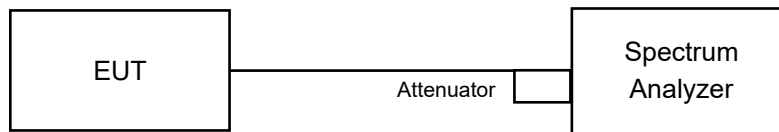


## 4.2 6dB Bandwidth Measurement

### 4.2.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

### 4.2.2 Test Setup



### 4.2.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2019	Sep. 22, 2020

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. Tested Date: Oct. 7, 2019

### 4.2.4 Test Procedure

- a. Set resolution bandwidth (RBW) = 100kHz
- b. Set the video bandwidth (VBW)  $\geq 3 \times$  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

### 4.2.5 Deviation from Test Standard

No deviation.

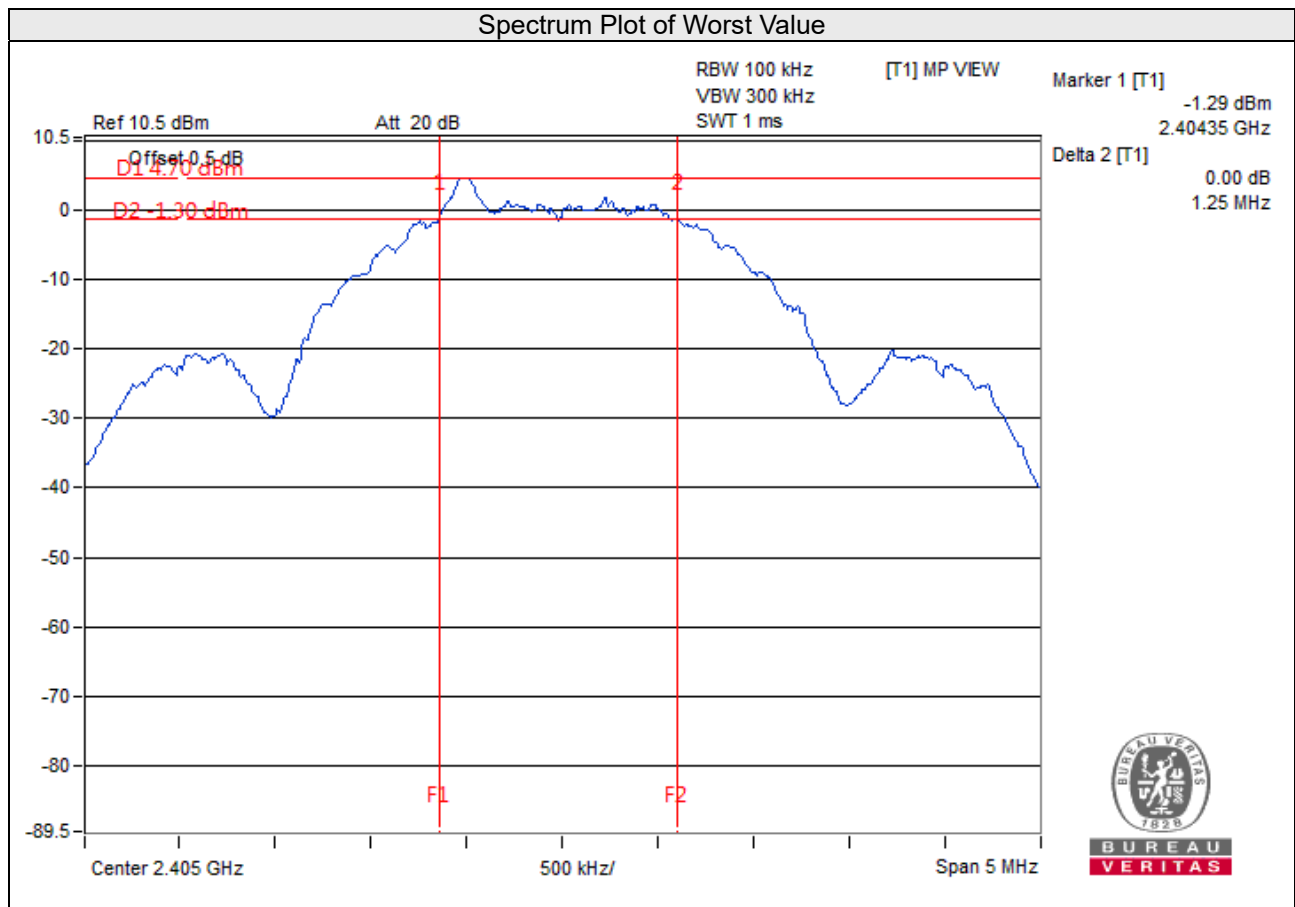
### 4.2.6 EUT Operating Conditions

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



#### 4.2.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
11	2405	1.25	0.5	PASS
18	2440	1.34	0.5	PASS
26	2480	1.48	0.5	PASS

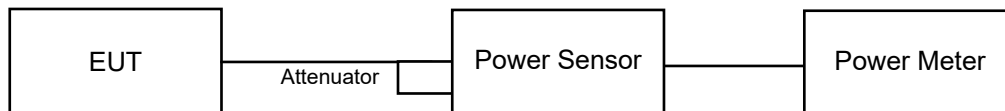


### 4.3 Conducted Output Power Measurement

#### 4.3.1 Limits of Conducted Output Power Measurement

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

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Anritsu Power Sensor	MA2411B	0738404	Apr. 16, 2019	Apr. 15, 2020
Anritsu Power Meter	ML2495A	0842014	Apr. 16, 2019	Apr. 15, 2020

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. Tested Date: Oct. 7, 2019

#### 4.3.4 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.

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

Same as Item 4.2.6.

#### 4.3.7 Test Results

##### FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
11	2405	4.055	6.08	30	Pass
18	2440	<b>4.159</b>	6.19	30	Pass
26	2480	1.811	2.58	30	Pass

##### FOR AVERAGE POWER

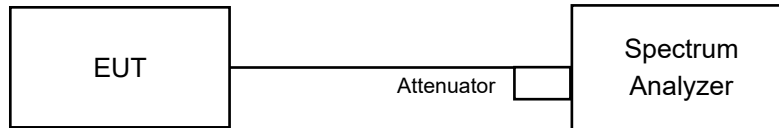
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
11	2405	3.882	5.89
18	2440	3.963	5.98
26	2480	1.782	2.51

#### 4.4 Power Spectral Density Measurement

##### 4.4.1 Limits of Power Spectral Density Measurement

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

##### 4.4.2 Test Setup



##### 4.4.3 Test Instruments

Refer to section 4.2.2 to get information of above instrument.

##### 4.4.4 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:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set the VBW  $\geq 3 \times \text{RBW}$ .
- 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.

##### 4.4.5 Deviation from Test Standard

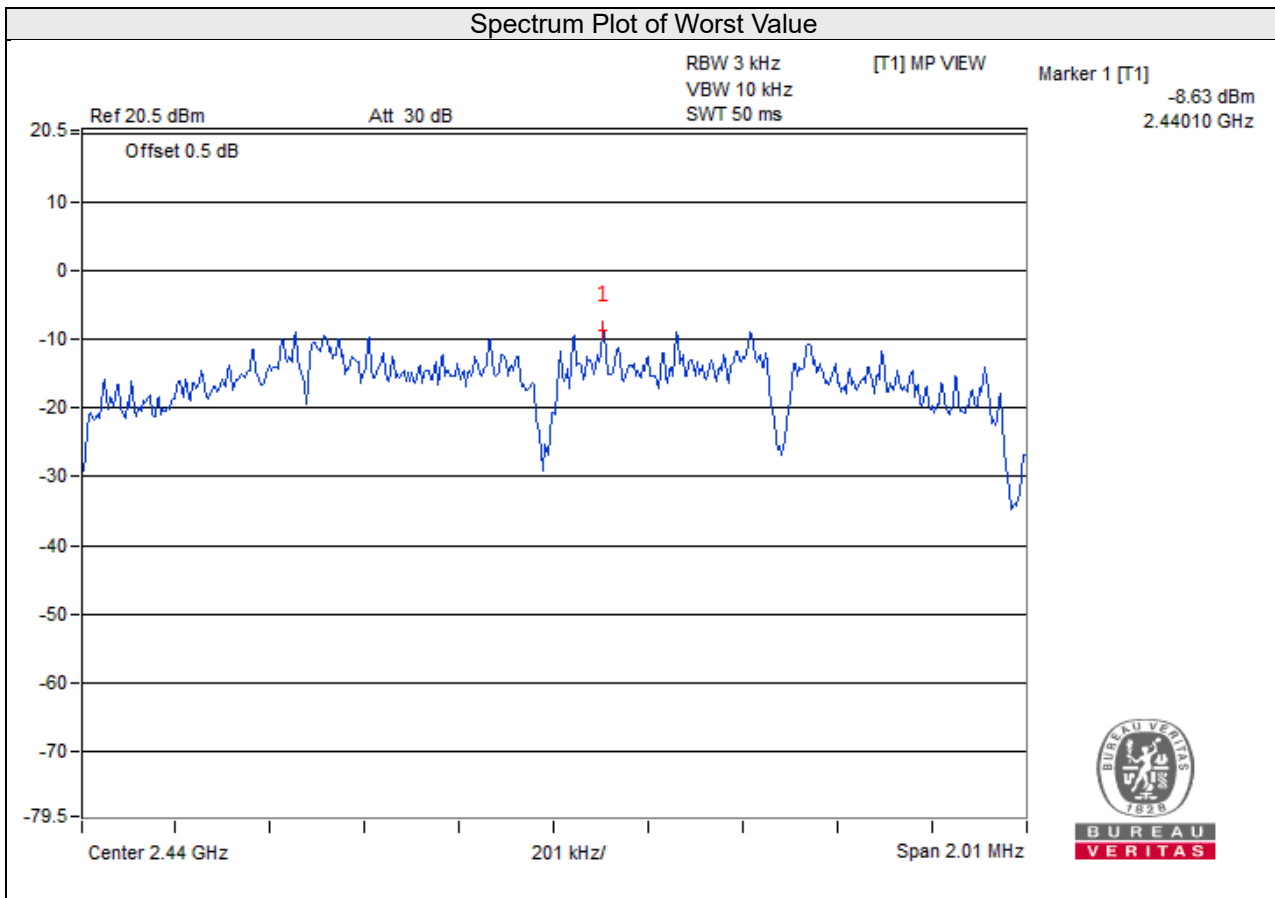
No deviation.

##### 4.4.6 EUT Operating Condition

Same as Item 4.2.6

#### 4.4.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
11	2405	-8.68	8	Pass
18	2440	-8.63	8	Pass
26	2480	-11.99	8	Pass

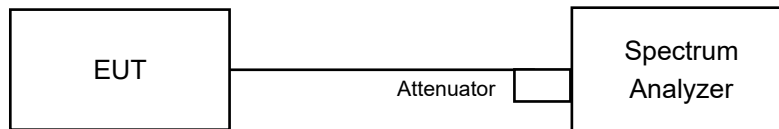


## 4.5 Conducted Out of Band Emission Measurement

### 4.5.1 Limits of Conducted Out of Band Emission Measurement

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

### 4.5.2 Test Setup



### 4.5.3 Test Instruments

Refer to section 4.2.2 to get information of above instrument.

### 4.5.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  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 OOB

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  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.

### 4.5.5 Deviation from Test Standard

No deviation.

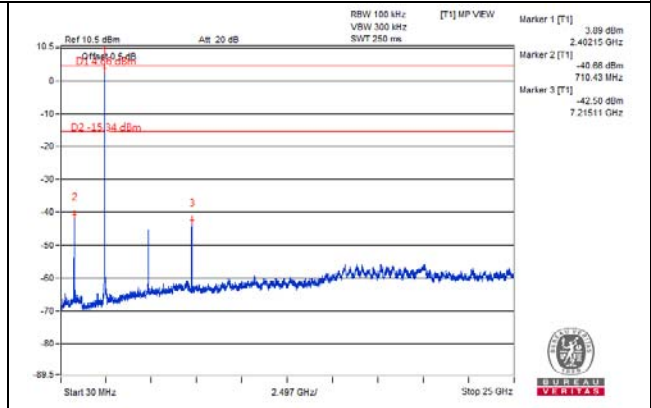
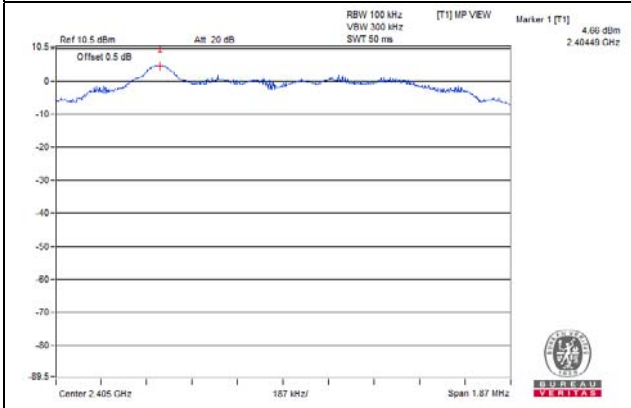
### 4.5.6 EUT Operating Condition

Same as Item 4.2.6

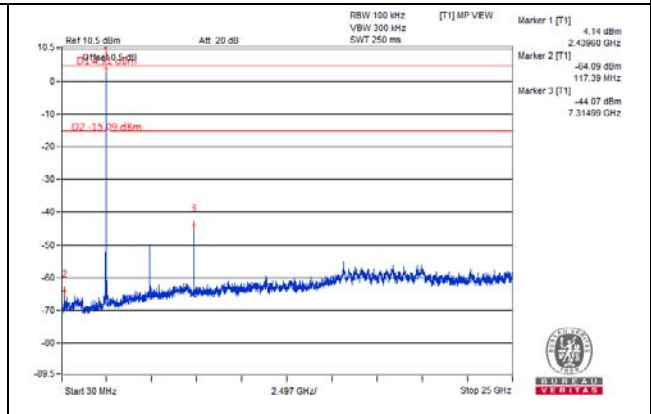
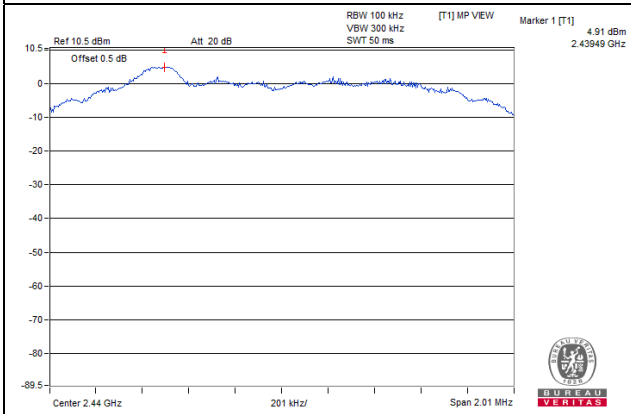
### 4.5.7 Test Results

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.

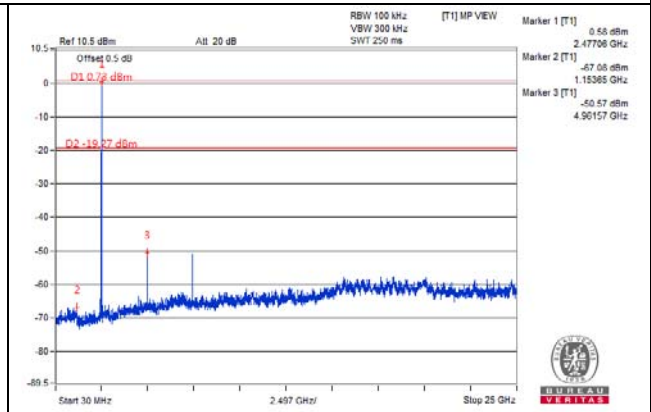
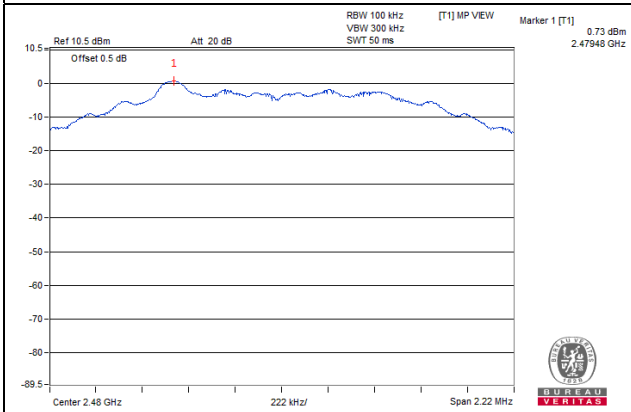
### CH 11



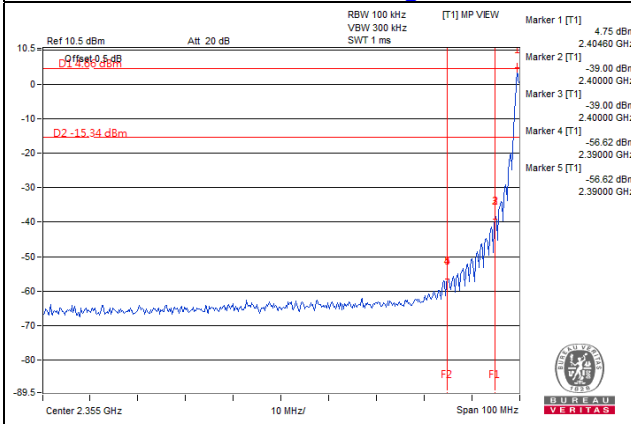
### CH 18



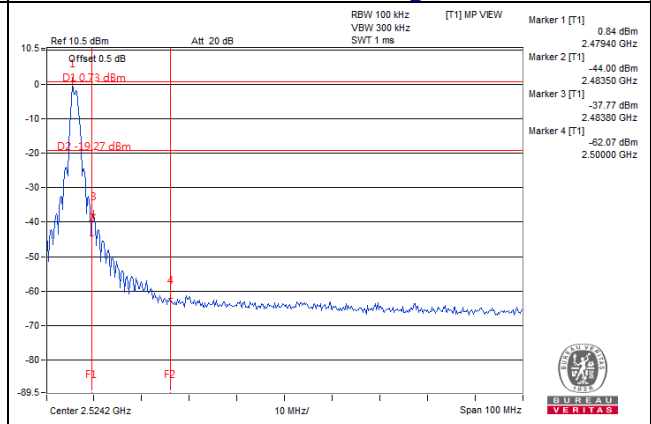
### CH 26



### CH 11 Band edge



### CH 26 Band edge



## 5 Pictures of Test Arrangements

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



## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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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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