

FCC Test Report

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FCC ID: C3K1730

Test Model: 1730

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Applicant: Microsoft Corporation

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Release Control Record

Issue No.	Description	Date Issued
RF150623C25	Original release.	Jul. 01, 2015

1 Certificate of Conformity

Product: Wireless Mouse

Brand: Microsoft®

Test Model: 1730

Sample Status: Engineering sample

Applicant: Microsoft Corporation

Test Date: May 18 ~ Jun. 15, 2015

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013 2009

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 : Ivy Lin , **Date:** Jul. 01, 2015
Ivy Lin / Specialist

Approved by : Ken Liu , **Date:** Jul. 01, 2015
Ken Liu / Senior 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	N/A	Without AC power port of the EUT
15.205 & 209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.2dB at 7440.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -5.9dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

N/A: Not applicable

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	Expended Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 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	Wireless Mouse
Brand	Microsoft®
Test Model	1730
Status of EUT	Engineering sample
Power Supply Rating	1.5Vdc (Battery)
Modulation Type	GFSK
Transfer Rate	1Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Output Power	1.429mW
Antenna Type	PCB Antenna with 4.5dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The following samples are provided for final test.

Sample	Serial No.
1	EV1-132
2	EV1-137
3	EV1-139
4	EV1-145

2. 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 to this EUT:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	-	-	Note 2	√	Serial No.: EV1-132
B	√	√	Note 2	-	Serial No.: EV1-137
C	√	√	Note 2	-	Serial No.: EV1-139
D	√	√	Note 2	-	Serial No.: EV1-145

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

NOTE:

1. "-" means no effect.
2. No need to concern of Conducted Emission due to the EUT is powered by battery.

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 (Mbps)
B, C, D	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 TYPE	DATA RATE (Mbps)
B, C, D	0 to 39	0	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.

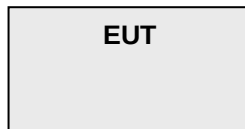
EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
A	0 to 39	0, 19, 39	GFSK	1

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	25deg. C, 65%RH	1.5Vdc	Ted Chang
RE<1G	25deg. C, 65%RH	1.5Vdc	Ted Chang
APCM	25deg. C, 60%RH	1.5Vdc	Nick Chen

3.3 Description of Support Units

The EUT has been tested as an independent unit.

3.3.1 Configuration of System under Test**3.4 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)
558074 D01 DTS Meas Guidance v03r03
ANSI C63.10-2013 2009

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	ESCS30	100289	Dec. 01, 2014	Nov. 30, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Mar. 30, 2015	Mar. 29, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Feb. 06, 2015	Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2014	Aug. 08, 2015
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	248780/4 309222/4 274092/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable Worken	8D-FB	Cable-CH9-01	Aug. 11, 2014	Aug. 10, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 26, 2014	Jul. 25, 2015
Power Sensor	MA2411B	0738171	Jul. 26, 2014	Jul. 25, 2015

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 215374.
5. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:

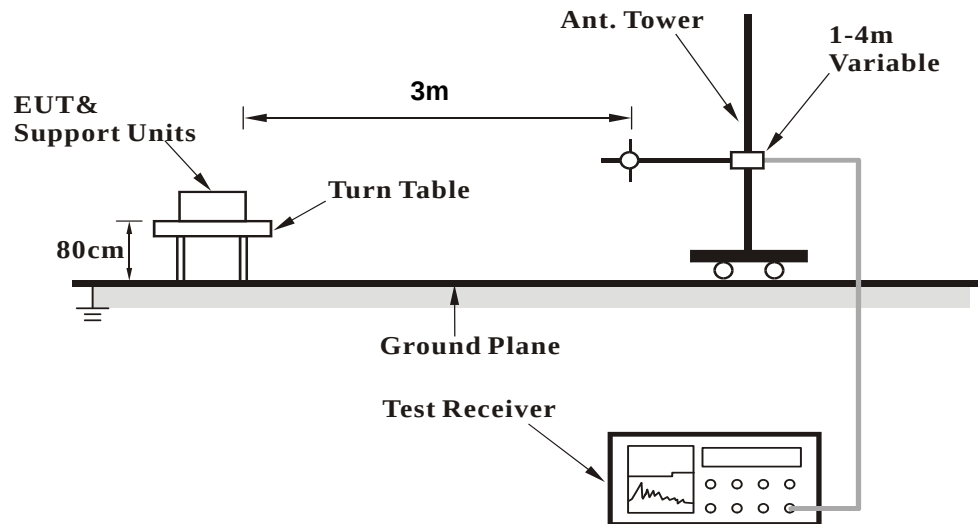
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

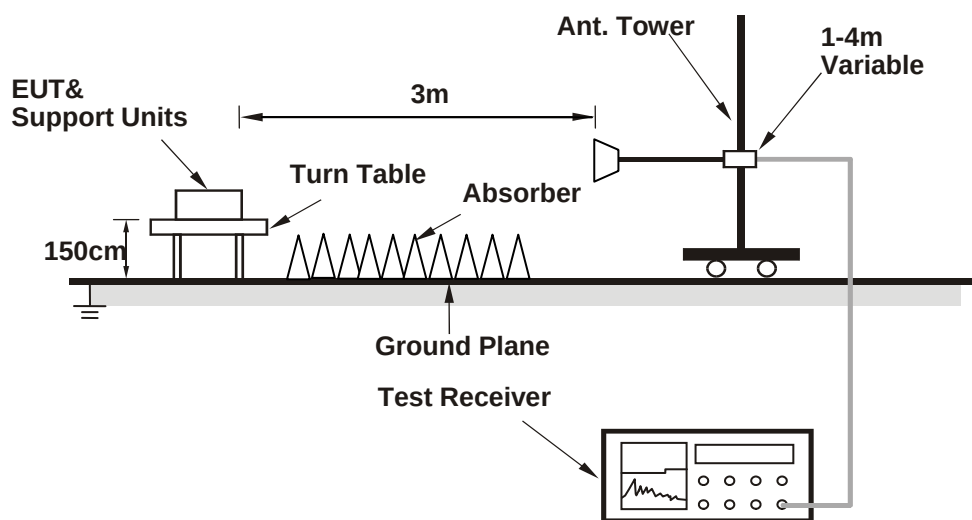
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data :

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	62.5 PK	74.0	-11.5	1.27 H	206	29.50	33.00
2	2390.00	46.4 AV	54.0	-7.6	1.27 H	206	13.40	33.00
3	*2402.00	96.4 PK			1.27 H	206	63.40	33.00
4	*2402.00	95.2 AV			1.27 H	206	62.20	33.00
5	4804.00	52.1 PK	74.0	-21.9	1.44 H	216	50.30	1.80
6	4804.00	44.8 AV	54.0	-9.2	1.44 H	216	43.00	1.80
7	#7206.00	61.2 PK	76.4	-15.2	1.07 H	64	52.60	8.60
8	#7206.00	48.1 AV	75.2	-27.1	1.07 H	64	39.50	8.60
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	60.1 PK	74.0	-13.9	1.00 V	285	27.10	33.00
2	2390.00	46.3 AV	54.0	-7.7	1.00 V	285	13.30	33.00
3	*2402.00	95.0 PK			1.00 V	285	62.00	33.00
4	*2402.00	94.5 AV			1.00 V	285	61.50	33.00
5	4804.00	55.2 PK	74.0	-18.8	1.77 V	45	53.40	1.80
6	4804.00	48.9 AV	54.0	-5.1	1.77 V	45	47.10	1.80
7	#7206.00	63.1 PK	75.0	-11.9	1.00 V	122	54.50	8.60
8	#7206.00	50.0 AV	74.5	-24.5	1.00 V	122	41.40	8.60

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)
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	97.1 PK			1.07 H	312	63.80	33.30
2	*2440.00	95.8 AV			1.07 H	312	62.50	33.30
3	4880.00	52.0 PK	74.0	-22.0	1.12 H	316	50.10	1.90
4	4880.00	43.1 AV	54.0	-10.9	1.12 H	316	41.20	1.90
5	7320.00	58.3 PK	74.0	-15.7	1.17 H	75	50.00	8.30
6	7320.00	49.3 AV	54.0	-4.7	1.17 H	75	41.00	8.30
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	94.7 PK			1.00 V	191	61.40	33.30
2	*2440.00	93.6 AV			1.00 V	191	60.30	33.30
3	4880.00	53.6 PK	74.0	-20.4	1.00 V	75	51.70	1.90
4	4880.00	46.8 AV	54.0	-7.2	1.00 V	75	44.90	1.90
5	7320.00	60.2 PK	74.0	-13.8	1.09 V	108	51.90	8.30
6	7320.00	50.1 AV	54.0	-3.9	1.09 V	108	41.80	8.30

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	97.6 PK			1.23 H	223	64.20	33.40
2	*2480.00	97.6 AV			1.23 H	223	64.20	33.40
3	2483.50	64.9 PK	74.0	-9.1	1.23 H	223	31.50	33.40
4	2483.50	47.6 AV	54.0	-6.4	1.23 H	223	14.20	33.40
5	4960.00	50.5 PK	74.0	-23.5	1.00 H	314	48.30	2.20
6	4960.00	41.8 AV	54.0	-12.2	1.00 H	314	39.60	2.20
7	7440.00	59.3 PK	74.0	-14.7	1.08 H	76	50.90	8.40
8	7440.00	50.3 AV	54.0	-3.7	1.08 H	76	41.90	8.40
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	93.4 PK			1.12 V	184	60.00	33.40
2	*2480.00	92.1 AV			1.12 V	184	58.70	33.40
3	2483.50	62.0 PK	74.0	-12.0	1.12 V	184	28.60	33.40
4	2483.50	47.0 AV	54.0	-7.0	1.12 V	184	13.60	33.40
5	4960.00	53.3 PK	74.0	-20.7	1.45 V	56	51.10	2.20
6	4960.00	46.1 AV	54.0	-7.9	1.45 V	56	43.90	2.20
7	7440.00	58.2 PK	74.0	-15.8	1.10 V	226	49.80	8.40
8	7440.00	48.4 AV	54.0	-5.6	1.10 V	226	40.00	8.40

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 C

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	62.2 PK	74.0	-11.8	1.10 H	208	29.20	33.00
2	2390.00	46.1 AV	54.0	-7.9	1.10 H	208	13.10	33.00
3	*2402.00	96.8 PK			1.10 H	208	63.80	33.00
4	*2402.00	95.5 AV			1.10 H	208	62.50	33.00
5	4804.00	51.3 PK	74.0	-22.7	1.00 H	214	50.10	1.20
6	4804.00	43.8 AV	54.0	-10.2	1.00 H	214	42.60	1.20
7	#7206.00	58.0 PK	76.8	-18.8	1.92 H	46	50.20	7.80
8	#7206.00	48.3 AV	75.5	-27.2	1.92 H	46	40.50	7.80
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	1.02 V	273	26.30	33.00
2	2390.00	46.5 AV	54.0	-7.5	1.02 V	273	13.50	33.00
3	*2402.00	93.1 PK			1.02 V	273	60.10	33.00
4	*2402.00	92.3 AV			1.02 V	273	59.30	33.00
5	4804.00	51.8 PK	74.0	-22.2	1.00 V	63	50.60	1.20
6	4804.00	45.2 AV	54.0	-8.8	1.00 V	63	44.00	1.20
7	#7206.00	59.5 PK	73.1	-13.6	1.01 V	329	51.70	7.80
8	#7206.00	50.0 AV	72.3	-22.3	1.01 V	329	42.20	7.80

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.

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	96.0 PK			1.07 H	205	62.70	33.30
2	*2440.00	94.6 AV			1.07 H	205	61.30	33.30
3	4880.00	50.6 PK	74.0	-23.4	1.29 H	210	49.20	1.40
4	4880.00	41.6 AV	54.0	-12.4	1.29 H	210	40.20	1.40
5	7320.00	57.9 PK	74.0	-16.1	1.84 H	46	50.30	7.60
6	7320.00	49.3 AV	54.0	-4.7	1.84 H	46	41.70	7.60
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	92.3 PK			1.00 V	292	59.00	33.30
2	*2440.00	91.3 AV			1.00 V	292	58.00	33.30
3	4880.00	51.2 PK	74.0	-22.8	1.45 V	69	49.80	1.40
4	4880.00	44.0 AV	54.0	-10.0	1.45 V	69	42.60	1.40
5	7320.00	59.1 PK	74.0	-14.9	1.00 V	263	51.50	7.60
6	7320.00	50.6 AV	54.0	-3.4	1.00 V	263	43.00	7.60

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	96.7 PK			1.04 H	299	63.30	33.40
2	*2480.00	95.5 AV			1.04 H	299	62.10	33.40
3	2483.50	64.5 PK	74.0	-9.5	1.04 H	299	31.10	33.40
4	2483.50	48.1 AV	54.0	-5.9	1.04 H	299	14.70	33.40
5	4960.00	49.6 PK	74.0	-24.4	1.16 H	205	48.00	1.60
6	4960.00	40.3 AV	54.0	-13.7	1.16 H	205	38.70	1.60
7	7440.00	60.2 PK	74.0	-13.8	1.33 H	54	52.20	8.00
8	7440.00	51.4 AV	54.0	-2.6	1.33 H	54	43.40	8.00
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	92.6 PK			1.12 V	290	59.20	33.40
2	*2480.00	91.4 AV			1.12 V	290	58.00	33.40
3	2483.50	61.8 PK	74.0	-12.2	1.12 V	290	28.40	33.40
4	2483.50	47.4 AV	54.0	-6.6	1.12 V	290	14.00	33.40
5	4960.00	51.7 PK	74.0	-22.3	1.68 V	13	50.10	1.60
6	4960.00	43.2 AV	54.0	-10.8	1.68 V	13	41.60	1.60
7	7440.00	61.1 PK	74.0	-12.9	1.00 V	226	53.10	8.00
8	7440.00	52.8 AV	54.0	-1.2	1.00 V	226	44.80	8.00

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 D

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	61.7 PK	74.0	-12.3	1.61 H	216	28.70	33.00
2	2390.00	45.8 AV	54.0	-8.2	1.61 H	216	12.80	33.00
3	*2402.00	96.5 PK			1.61 H	216	63.50	33.00
4	*2402.00	95.2 AV			1.61 H	216	62.20	33.00
5	4804.00	53.7 PK	74.0	-20.3	1.07 H	211	51.90	1.80
6	4804.00	46.6 AV	54.0	-7.4	1.07 H	211	44.80	1.80
7	#7206.00	60.2 PK	76.5	-16.3	1.00 H	71	51.60	8.60
8	#7206.00	50.7 AV	75.2	-24.5	1.00 H	71	42.10	8.60
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	59.8 PK	74.0	-14.2	1.00 V	271	26.80	33.00
2	2390.00	46.0 AV	54.0	-8.0	1.00 V	271	13.00	33.00
3	*2402.00	93.3 PK			1.00 V	271	60.30	33.00
4	*2402.00	92.2 AV			1.00 V	271	59.20	33.00
5	4804.00	54.4 PK	74.0	-19.6	1.67 V	53	52.60	1.80
6	4804.00	47.8 AV	54.0	-6.2	1.67 V	53	46.00	1.80
7	#7206.00	60.3 PK	73.3	-13.0	1.00 V	124	51.70	8.60
8	#7206.00	51.5 AV	72.2	-20.7	1.00 V	124	42.90	8.60

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " * ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.

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	95.5 PK			1.06 H	209	62.20	33.30
2	*2440.00	95.2 AV			1.06 H	209	61.90	33.30
3	4880.00	52.6 PK	74.0	-21.4	1.19 H	205	50.70	1.90
4	4880.00	48.1 AV	54.0	-5.9	1.19 H	205	46.20	1.90
5	7320.00	59.3 PK	74.0	-14.7	1.28 H	68	51.00	8.30
6	7320.00	50.0 AV	54.0	-4.0	1.28 H	68	41.70	8.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	98.7 PK			1.00 V	192	65.40	33.30
2	*2440.00	98.4 AV			1.00 V	192	65.10	33.30
3	4880.00	51.5 PK	74.0	-22.5	1.56 V	57	49.60	1.90
4	4880.00	47.0 AV	54.0	-7.0	1.56 V	57	45.10	1.90
5	7320.00	59.5 PK	74.0	-14.5	1.00 V	302	51.20	8.30
6	7320.00	52.1 AV	54.0	-1.9	1.00 V	302	43.80	8.30

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	97.3 PK			1.07 H	210	63.90	33.40
2	*2480.00	96.0 AV			1.07 H	210	62.60	33.40
3	2483.50	65.7 PK	74.0	-8.3	1.07 H	210	32.30	33.40
4	2483.50	47.4 AV	54.0	-6.6	1.07 H	210	14.00	33.40
5	4960.00	50.3 PK	74.0	-23.7	1.00 H	316	48.10	2.20
6	4960.00	42.1 AV	54.0	-11.9	1.00 H	316	39.90	2.20
7	7440.00	59.5 PK	74.0	-14.5	1.11 H	77	51.10	8.40
8	7440.00	50.2 AV	54.0	-3.8	1.11 H	77	41.80	8.40

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	94.2 PK			1.00 V	274	60.80	33.40
2	*2480.00	93.5 AV			1.00 V	274	60.10	33.40
3	2483.50	62.8 PK	74.0	-11.2	1.00 V	274	29.40	33.40
4	2483.50	47.0 AV	54.0	-7.0	1.00 V	274	13.60	33.40
5	4960.00	53.9 PK	74.0	-20.1	1.43 V	57	51.70	2.20
6	4960.00	46.4 AV	54.0	-7.6	1.43 V	57	44.20	2.20
7	7440.00	58.9 PK	74.0	-15.1	1.00 V	226	50.50	8.40
8	7440.00	50.2 AV	54.0	-3.8	1.00 V	226	41.80	8.40

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:

Test Mode B

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	59.10	16.9 QP	40.0	-23.1	1.00 H	107	31.60	-14.70
2	154.16	17.5 QP	43.5	-26.0	1.24 H	15	31.40	-13.90
3	338.46	21.5 QP	46.0	-24.5	1.00 H	301	33.20	-11.70
4	629.46	26.7 QP	46.0	-19.3	2.00 H	90	32.40	-5.70
5	710.94	28.8 QP	46.0	-17.2	1.49 H	252	33.50	-4.70
6	924.34	30.2 QP	46.0	-15.8	2.00 H	15	30.90	-0.70

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	31.94	23.6 QP	40.0	-16.4	1.51 V	110	39.70	-16.10
2	107.60	22.5 QP	43.5	-21.0	1.01 V	228	40.10	-17.60
3	189.08	24.4 QP	43.5	-19.1	1.25 V	245	40.70	-16.30
4	297.72	23.0 QP	46.0	-23.0	1.25 V	246	35.70	-12.70
5	604.24	26.0 QP	46.0	-20.0	1.51 V	15	32.20	-6.20
6	901.06	31.1 QP	46.0	-14.9	1.51 V	146	32.40	-1.30

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

Test Mode C

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	53.28	16.3 QP	40.0	-23.7	1.00 H	137	30.50	-14.20
2	156.10	16.3 QP	43.5	-27.2	1.25 H	72	30.20	-13.90
3	350.10	19.6 QP	46.0	-26.4	1.49 H	249	31.20	-11.60
4	458.74	21.7 QP	46.0	-24.3	1.25 H	49	30.90	-9.20
5	615.88	26.4 QP	46.0	-19.6	2.00 H	99	32.40	-6.00
6	780.78	28.8 QP	46.0	-17.2	1.00 H	201	31.80	-3.00
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	33.88	26.2 QP	40.0	-13.8	1.00 V	181	42.00	-15.80
2	107.60	21.4 QP	43.5	-22.1	2.00 V	234	39.00	-17.60
3	134.76	22.5 QP	43.5	-21.0	1.50 V	208	37.50	-15.00
4	295.78	22.6 QP	46.0	-23.4	2.00 V	304	35.30	-12.70
5	604.24	24.5 QP	46.0	-21.5	1.24 V	186	30.70	-6.20
6	802.12	28.7 QP	46.0	-17.3	1.24 V	179	31.50	-2.80

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

Test Mode D

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	64.92	15.2 QP	40.0	-24.8	1.25 H	229	30.50	-15.30
2	158.04	16.8 QP	43.5	-26.7	2.00 H	131	30.60	-13.80
3	295.78	17.7 QP	46.0	-28.3	2.00 H	49	30.40	-12.70
4	365.62	19.7 QP	46.0	-26.3	1.00 H	135	31.10	-11.40
5	619.76	26.3 QP	46.0	-19.7	1.50 H	90	32.20	-5.90
6	767.20	27.1 QP	46.0	-18.9	1.00 H	291	30.00	-2.90
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	33.88	17.8 QP	40.0	-22.2	1.00 V	327	33.60	-15.80
2	189.08	22.0 QP	43.5	-21.5	2.00 V	352	38.30	-16.30
3	241.46	21.7 QP	46.0	-24.3	1.25 V	352	36.50	-14.80
4	295.78	22.2 QP	46.0	-23.8	1.00 V	19	34.90	-12.70
5	619.76	24.9 QP	46.0	-21.1	2.00 V	324	30.80	-5.90
6	899.12	29.2 QP	46.0	-16.8	1.49 V	74	30.50	-1.30

REMARKS:

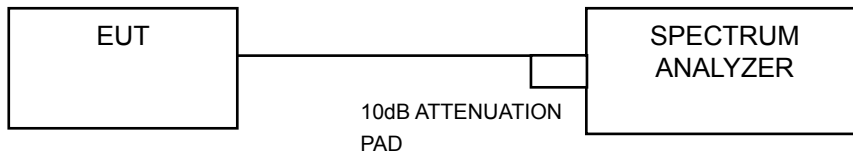
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

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

Refer to section 4.1.2 to get information of above instrument.

4.2.4 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

4.2.5 Deviation from Test Standard

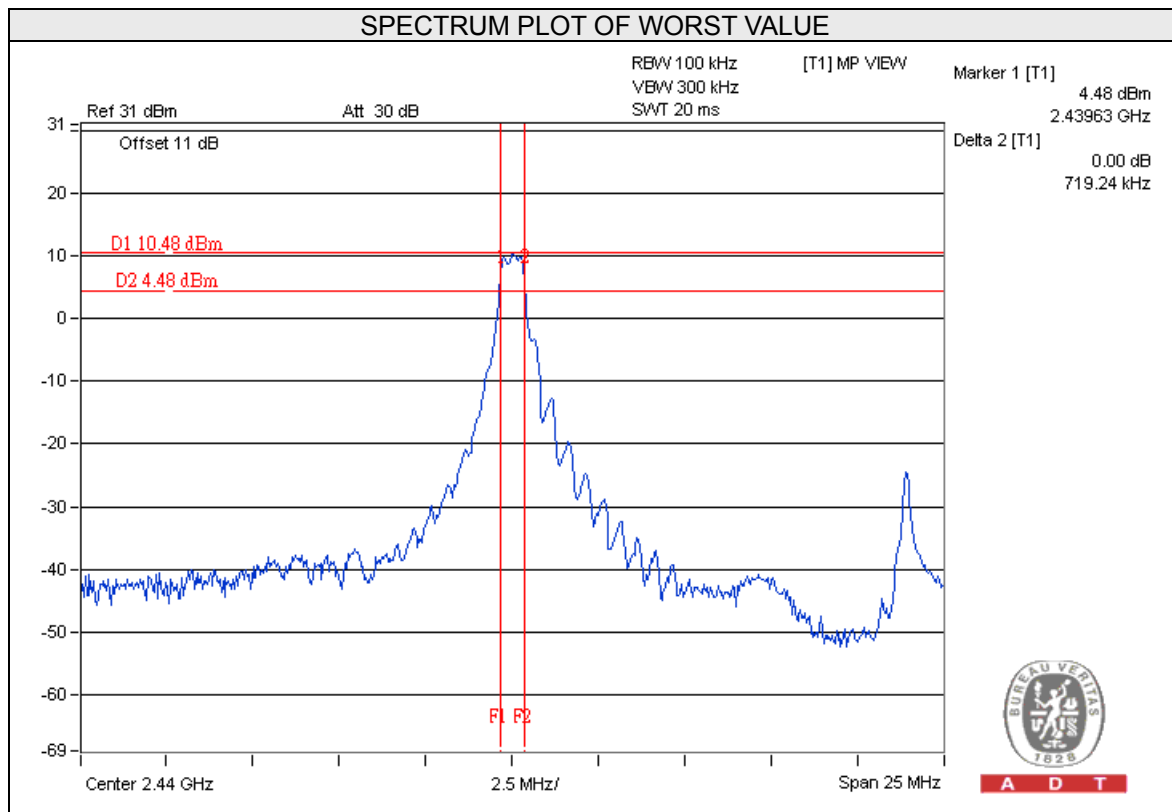
No deviation.

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
0	2402	0.70	0.5	PASS
19	2440	0.72	0.5	PASS
39	2480	0.72	0.5	PASS

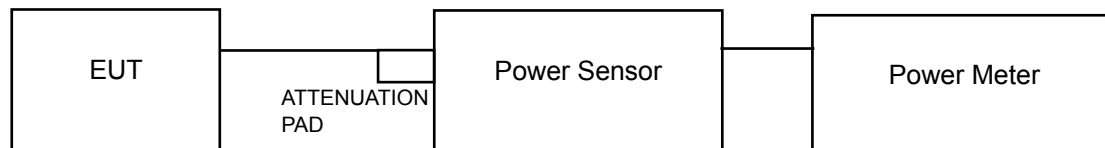


4.3 Conducted Output Power Measurement

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

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

A peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the power level.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.3.6.

4.3.7 Test Results

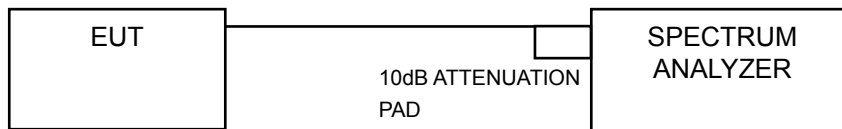
CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS/FAIL
0	2402	1.429	1.55	30	PASS
19	2440	1.191	0.76	30	PASS
39	2480	0.962	-0.17	30	PASS

4.4 Power Spectral Density Measurement

4.4.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

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 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.

4.4.5 Deviation from Test Standard

No deviation.

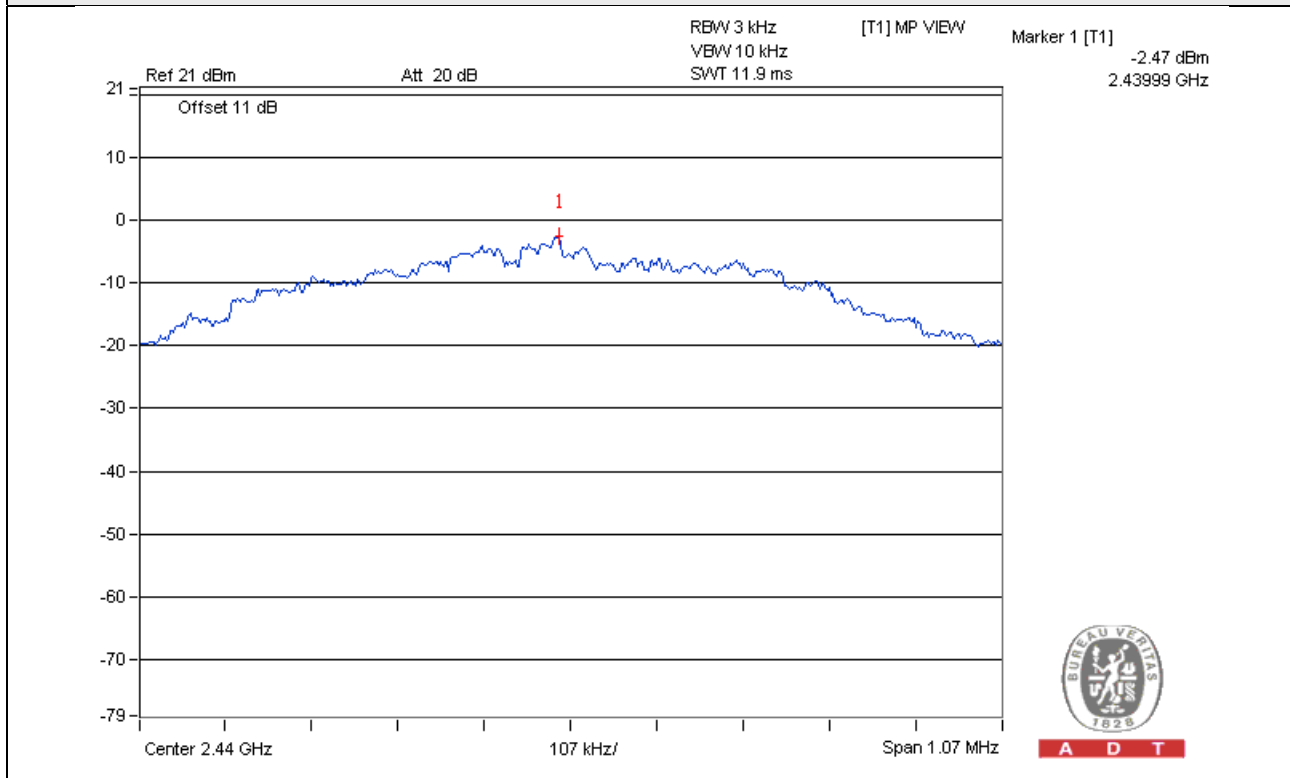
4.4.6 EUT Operating Condition

Same as Item 4.3.6

4.4.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-2.89	8	PASS
19	2440	-2.47	8	PASS
39	2480	-4.31	8	PASS

SPECTRUM PLOT OF WORST VALUE

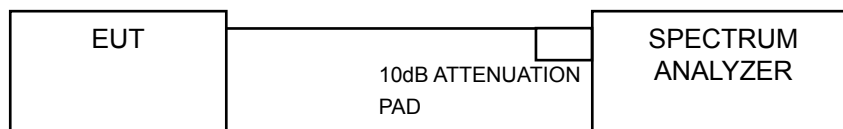


4.5 Conducted Out of Band Emission Measurement

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 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz .
2. Set the VBW $\geq 300\text{ kHz}$.
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 $\geq 300\text{ kHz}$.
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.

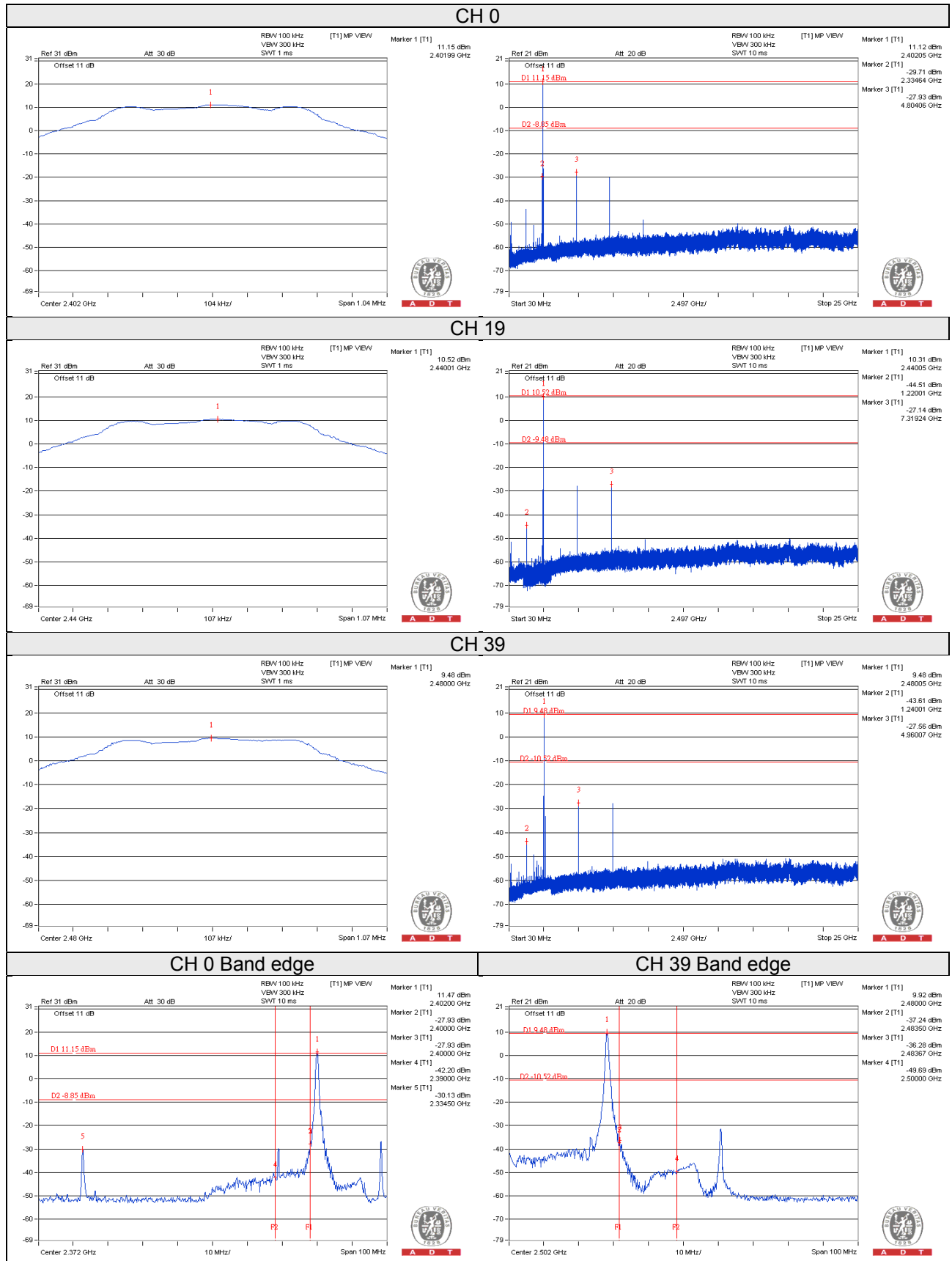
4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Result



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 accredited and approved 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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