FCC Test Report

Report No.:	RF150713D13
FCC ID:	C3K1738
Test Model:	1738
Received Date:	Jun. 28, 2015
Test Date:	Jun. 28 ~ Jul. 13, 2015
Issued Date:	Jul. 17, 2015
Applicant:	MICROSOFT CORPORATION
Address:	ONE MICROSOFT WAY REDMOND, WA 98052-6399, U.S.A
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

Table of Contents

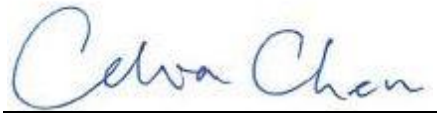
Release Control Record

Issue No.	Description	Date Issued
RF150713D13	Original release.	Jul. 17, 2015

1 Certificate of Conformity

Product:	Wireless keyboard
Brand:	Microsoft®
Test Model:	1738
Sample Status:	Engineering sample
Applicant:	MICROSOFT CORPORATION
Test Date:	Jun. 28 ~ Jul. 13, 2015
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.249) 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:** Jul. 17, 2015

(Celia Chen / Senior Specialist)

Approved by :  **, Date:** Jul. 17, 2015

(Rex Lai / Assistant Manager)

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	N/A	Power supply is 3.0Vdc from batteries
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -8.3dB at 2483.50MHz.

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) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	4.00 dB
Radiated Emissions above 1 GHz	Above 1GHz	3.36 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless keyboard
Brand	Microsoft®
Test Model	1738
Status of EUT	Engineering sample
Power Supply Rating	3Vdc from batteries
Modulation Type	GFSK
Operating Frequency	2403MHz ~ 2480MHz
Number of Channel	24
Antenna Type	PCB antenna with 1.39dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The EUT is a Wireless keyboard.
2. The EUT has serial samples, which are defined as their serial numbers as follows:

Model No.	Serial No.
1738	EV1 333, EV1 338, EV1 339, EV1 350

3. 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

24 channels are provided to this EUT:

Channel Group	Channel	Frequency (MHz)	Channel Group	Channel	Frequency (MHz)
Subset A	0	2403	Subset D	12	2405
	1	2419		13	2425
	2	2478		14	2444
	3	2468		15	2452
Subset B	4	2429	Subset E	16	2423
	5	2450		17	2446
	6	2470		18	2456
	7	2480		19	2474
Subset C	8	2421	Subset F	20	2417
	9	2431		21	2427
	10	2472		22	2448
	11	2454		23	2476

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	FT	
-	√	√	Note	√	-

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

NOTE: No need to concern of Conducted Emission due to the EUT is powered by batteries

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	SERIAL NO.
-	0 to 23	0, 14, 7	GFSK	EV1 333
-	0 to 23	0, 14, 7	GFSK	EV1 338
-	0 to 23	0, 14, 7	GFSK	EV1 339

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	SERIAL NO.
-	0 to 23	0	GFSK	EV1 333
-	0 to 23	0	GFSK	EV1 338
-	0 to 23	0	GFSK	EV1 339

Frequency Tolerance:

☒ 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	SERIAL NO.
-	0 to 23	0, 14, 7	GFSK	EV1 350

Test Condition:

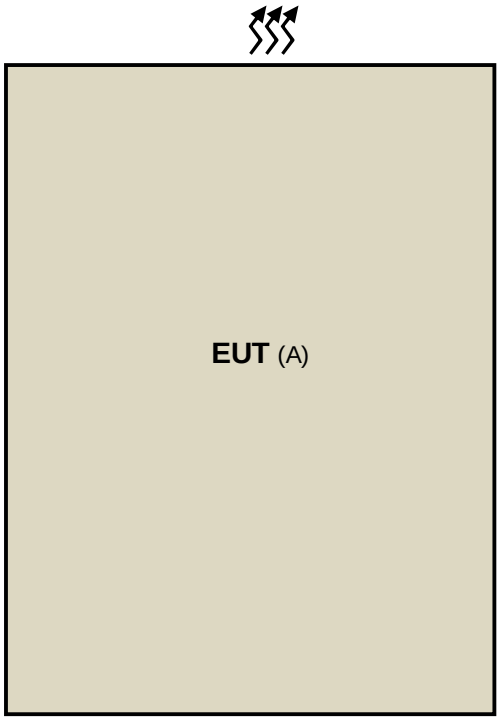
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	27deg. C, 69%RH	3Vdc	Aaron You
RE<1G	28deg. C, 70%RH	3Vdc	Aaron You
FT	24deg. C, 75%RH	3Vdc	Saxon Lee

3.3 Description of Support Units

The EUT has been tested as an independent unit together without any necessary accessory or support unit.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	EUT	Microsoft®	1738	EV1 338, EV1 350, EV1 339, EV1 333	-	-

3.3.1 Configuration of System under Test



(Powered from batteries)

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 (15.249)
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

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

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
HP Preamplifier	8447D	2432A03504	Feb. 26, 2015	Feb. 25, 2016
HP Preamplifier	8449B	3008A01201	Feb. 26, 2015	Feb. 25, 2016
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 01, 2015	Feb. 28, 2016
Agilent Spectrum	E4446A	MY51100050	Oct. 24, 2014	Oct. 23, 2015
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 20, 2015	Jan. 19, 2016
Schwarzbeck Antenna	VULB 9168	139	Feb. 04, 2015	Feb. 03, 2016
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2015	May 28, 2017
Schwarzbeck Horn Antenna	BBHA-9170	212	Feb. 09, 2015	Feb. 08, 2016
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Feb. 10, 2015	Feb. 09, 2016
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
SUHNER RF cable	SF104	CABLE-CH6	Aug. 15, 2014	Aug. 14, 2015
SUHNER RF cable	SF102	Cable-CH8-3.6m	Aug. 15, 2014	Aug. 14, 2015
EMCO Horn Antenna	3115	00028257	Feb. 05, 2015	Feb. 04, 2016
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 29, 2014	Sep. 28, 2015
Anritsu Power Sensor	MA2411B	0738404	Apr. 21, 2015	Apr. 20, 2016
Anritsu Power Meter	ML2495A	0842014	Apr. 21, 2015	Apr. 20, 2016

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. The Industry Canada Reference No. IC 7450E-6.
5. The FCC Site Registration No. is 447212.

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:

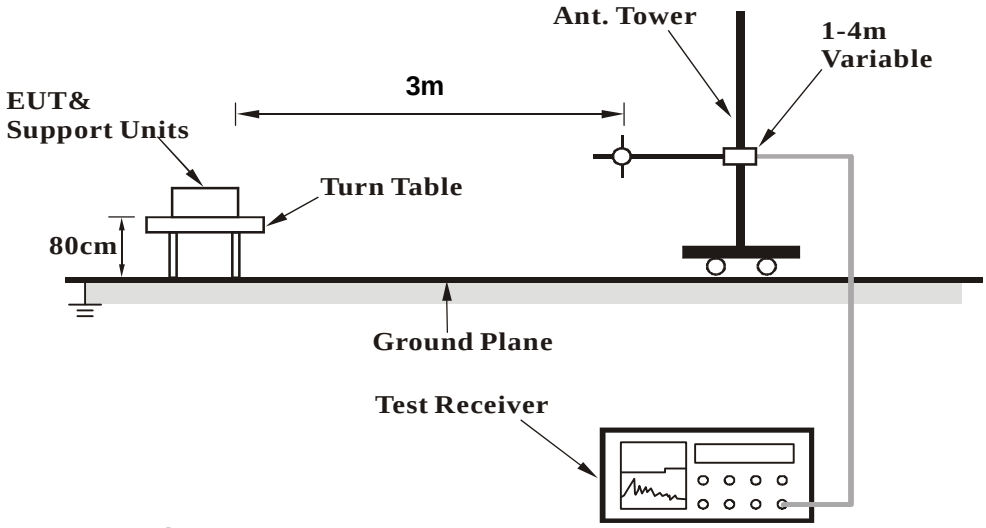
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

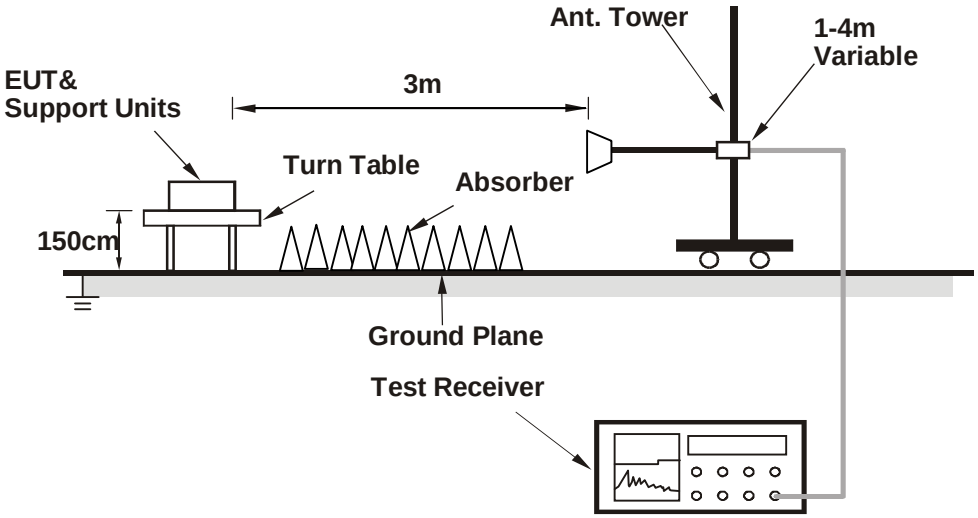
No deviation.

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

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

4.1.7 Test Results

Above 1GHz Data (For Fundamental, Harmonics)：

CHANNEL	TX Channel 0	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 333		

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	*2403.00	93.9 PK	114.0	-20.1	1.45 H	259	98.45	-4.56
2	*2403.00	60.7 AV	94.0	-33.3	1.45 H	259	65.23	-4.56
3	4806.00	46.6 PK	74.0	-27.4	1.75 H	160	44.74	1.85
4	4806.00	13.4 AV	54.0	-40.6	1.75 H	160	11.52	1.85
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	*2403.00	82.7 PK	114.0	-31.3	2.28 V	280	87.26	-4.56
2	*2403.00	49.5 AV	94.0	-44.5	2.28 V	280	54.04	-4.56
3	4806.00	46.3 PK	74.0	-27.7	1.00 V	73	44.48	1.85
4	4806.00	13.1 AV	54.0	-40.9	1.00 V	73	11.26	1.85

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 average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.173 ms / 7.927 ms) = -33.2 dB
   Please see page 19 for plotted duty.

CHANNEL	TX Channel 14	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 333		

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	*2444.00	94.6 PK	114.0	-19.4	1.38 H	266	99.03	-4.39
2	*2444.00	61.4 AV	94.0	-32.6	1.38 H	266	65.81	-4.39
3	4888.00	46.2 PK	74.0	-27.8	1.74 H	195	44.28	1.96
4	4888.00	13.0 AV	54.0	-41.0	1.74 H	195	11.06	1.96
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	*2444.00	84.6 PK	114.0	-29.4	2.24 V	284	88.95	-4.39
2	*2444.00	51.3 AV	94.0	-42.7	2.24 V	284	55.73	-4.39
3	4888.00	47.4 PK	74.0	-26.6	1.19 V	63	45.42	1.96
4	4888.00	14.2 AV	54.0	-39.8	1.19 V	63	12.20	1.96

REMARKS:

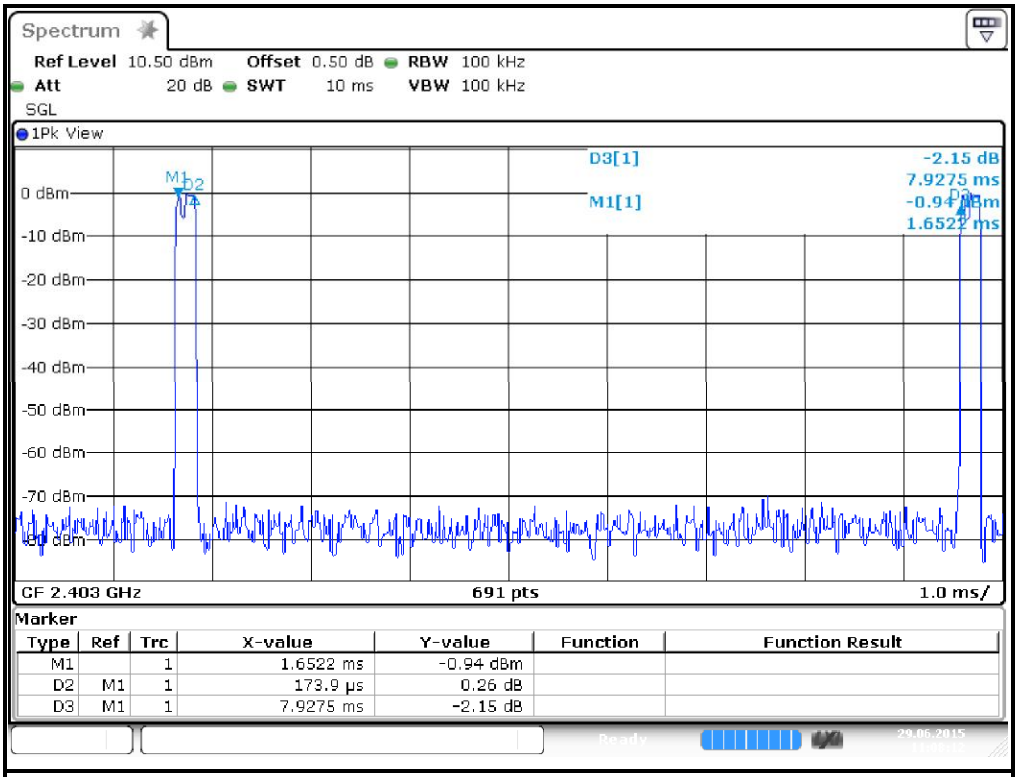
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.173 ms / 7.927 ms) = -33.2 dB
   Please see page 19 for plotted duty.

CHANNEL	TX Channel 7	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 333		

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	95.3 PK	114.0	-18.7	1.79 H	173	99.56	-4.25
2	*2480.00	62.1 AV	94.0	-31.9	1.79 H	173	66.34	-4.25
3	4960.00	46.8 PK	74.0	-27.2	1.80 H	200	44.73	2.08
4	4960.00	13.6 AV	54.0	-40.4	1.80 H	200	11.51	2.08
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	87.3 PK	114.0	-26.7	2.42 V	278	91.51	-4.25
2	*2480.00	54.0 AV	94.0	-40.0	2.42 V	278	58.29	-4.25
3	4960.00	47.6 PK	74.0	-26.4	1.12 V	53	45.50	2.08
4	4960.00	14.4 AV	54.0	-39.6	1.12 V	53	12.28	2.08

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 average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.173 ms / 7.927 ms) = -33.2 dB
   Please see page 19 for plotted duty.



20 log (Duty cycle) = 20 log (0.173 ms / 7.927 ms) = -33.2 dB

ABOVE 1GHz DATA (For Spurious Emission) :

CHANNEL	TX Channel 0	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 333		

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	53.9 PK	74.0	-20.1	1.45 H	259	58.53	-4.65
2	2390.00	37.1 AV	54.0	-16.9	1.45 H	259	41.74	-4.65
3	2400.00	45.7 PK	74.0	-28.3	1.45 H	259	50.29	-4.58
4	2400.00	12.5 AV	54.0	-41.5	1.45 H	259	17.07	-4.58
5	2748.00	40.6 PK	74.0	-33.4	1.15 H	254	43.98	-3.42
6	2748.00	26.8 AV	54.0	-27.2	1.15 H	254	30.22	-3.42
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	50.7 PK	74.0	-23.3	2.28 V	280	55.34	-4.65
2	2390.00	36.1 AV	54.0	-17.9	2.28 V	280	40.76	-4.65
3	2400.00	41.4 PK	74.0	-32.6	2.28 V	280	46.02	-4.58
4	2400.00	8.2 AV	54.0	-45.8	2.28 V	280	12.80	-4.58
5	2748.00	39.5 PK	74.0	-34.5	1.12 V	263	42.94	-3.42
6	2748.00	26.7 AV	54.0	-27.3	1.12 V	263	30.11	-3.42

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

CHANNEL	TX Channel 14	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 333		

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	2795.00	40.9 PK	74.0	-33.1	1.10 H	108	44.28	-3.34
2	2795.00	27.7 AV	54.0	-26.3	1.10 H	108	31.04	-3.34
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	2795.00	39.2 PK	74.0	-34.8	1.16 V	277	42.53	-3.34
2	2795.00	26.8 AV	54.0	-27.2	1.16 V	277	30.15	-3.34

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

CHANNEL	TX Channel 7	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 333		

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	**2483.50**	**65.8 PK**	**74.0**	**-8.3**	**1.79 H**	**173**	**69.97**	**-4.22**
2	2483.50	32.5 AV	54.0	-21.5	1.79 H	173	36.75	-4.22
3	2836.00	41.4 PK	74.0	-32.6	1.18 H	120	44.58	-3.16
4	2836.00	28.1 AV	54.0	-25.9	1.18 H	120	31.27	-3.16
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	2483.50	57.8 PK	74.0	-16.2	2.42 V	278	62.04	-4.22
2	2483.50	24.6 AV	54.0	-29.4	2.42 V	278	28.82	-4.22
3	2836.00	39.9 PK	74.0	-34.1	1.00 V	281	43.02	-3.16
4	2836.00	27.1 AV	54.0	-26.9	1.00 V	281	30.27	-3.16

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

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 338		

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	2748.00	40.8 PK	74.0	-33.2	1.03 H	274	44.21	-3.42
2	2748.00	27.6 AV	54.0	-26.4	1.03 H	274	31.05	-3.42
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	2748.00	39.4 PK	74.0	-34.6	1.32 V	253	42.83	-3.42
2	2748.00	26.8 AV	54.0	-27.2	1.32 V	253	30.20	-3.42

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

CHANNEL	TX Channel 14	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 338		

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	2795.00	40.7 PK	74.0	-33.4	1.30 H	268	43.99	-3.34
2	2795.00	27.7 AV	54.0	-26.3	1.30 H	268	31.01	-3.34
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	2795.00	39.4 PK	74.0	-34.7	1.00 V	287	42.69	-3.34
2	2795.00	26.9 AV	54.0	-27.1	1.00 V	287	30.27	-3.34

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

CHANNEL	TX Channel 7	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 338		

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	2836.00	41.5 PK	74.0	-32.5	1.21 H	120	44.62	-3.16
2	2836.00	28.4 AV	54.0	-25.6	1.21 H	120	31.54	-3.16
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	2836.00	40.0 PK	74.0	-34.0	1.00 V	280	43.15	-3.16
2	2836.00	27.5 AV	54.0	-26.5	1.00 V	280	30.66	-3.16

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

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 339		

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	2748.00	40.5 PK	74.0	-33.5	1.44 H	270	43.89	-3.42
2	2748.00	27.6 AV	54.0	-26.5	1.44 H	270	30.97	-3.42
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	2748.00	39.2 PK	74.0	-34.8	1.15 V	273	42.58	-3.42
2	2748.00	26.8 AV	54.0	-27.3	1.15 V	273	30.17	-3.42

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

CHANNEL	TX Channel 14	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 339		

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	2795.00	39.9 PK	74.0	-34.1	1.24 H	230	43.20	-3.34
2	2795.00	27.7 AV	54.0	-26.3	1.24 H	230	31.07	-3.34
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	2795.00	39.7 PK	74.0	-34.4	1.00 V	285	42.99	-3.34
2	2795.00	27.1 AV	54.0	-26.9	1.00 V	285	30.41	-3.34

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

CHANNEL	TX Channel 7	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		
SERIAL NO.	EV1 339		

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	2836.00	41.0 PK	74.0	-33.0	1.00 H	229	44.17	-3.16
2	2836.00	28.3 AV	54.0	-25.7	1.00 H	229	31.42	-3.16
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	2836.00	39.7 PK	74.0	-34.3	1.12 V	290	42.86	-3.16
2	2836.00	27.3 AV	54.0	-26.7	1.12 V	290	30.50	-3.16

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

BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 0	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
SERIAL NO.	EV1 333		

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	43.92	15.5 QP	40.0	-24.5	4.00 H	360	29.48	-14.00
2	168.86	15.7 QP	43.5	-27.8	4.00 H	280	29.41	-13.73
3	288.02	23.1 QP	46.0	-22.9	2.83 H	182	35.72	-12.61
4	535.18	22.5 QP	46.0	-23.5	1.65 H	84	30.43	-7.89
5	884.91	28.1 QP	46.0	-17.9	1.00 H	54	30.25	-2.12
6	982.64	30.2 QP	54.0	-23.8	1.00 H	77	30.47	-0.24
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	**53.55**	**25.7 QP**	**40.0**	**-14.3**	**1.09 V**	**131**	**39.34**	**-13.64**
2	117.88	16.3 QP	43.5	-27.2	1.00 V	200	32.74	-16.46
3	156.59	15.6 QP	43.5	-27.9	1.00 V	196	29.23	-13.62
4	525.23	21.6 QP	46.0	-24.4	2.23 V	346	29.64	-8.03
5	751.87	25.9 QP	46.0	-20.1	2.80 V	141	29.81	-3.87
6	843.49	27.7 QP	46.0	-18.3	2.49 V	0	30.17	-2.45

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

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
SERIAL NO.	EV1 338		

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	38.85	15.5 QP	40.0	-24.6	4.00 H	303	30.06	-14.61
2	160.03	14.5 QP	43.5	-29.0	4.00 H	11	28.02	-13.54
3	288.02	22.5 QP	46.0	-23.5	3.55 H	178	35.07	-12.61
4	628.54	23.9 QP	46.0	-22.2	1.61 H	238	29.67	-5.82
5	839.71	27.6 QP	46.0	-18.5	1.00 H	266	29.98	-2.43
6	937.43	28.9 QP	46.0	-17.1	1.00 H	345	30.03	-1.14
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	53.63	25.5 QP	40.0	-14.5	1.54 V	296	39.13	-13.63
2	117.78	17.3 QP	43.5	-26.2	1.00 V	138	33.79	-16.48
3	320.03	17.1 QP	46.0	-28.9	1.10 V	219	28.81	-11.75
4	589.59	23.7 QP	46.0	-22.4	2.65 V	138	30.27	-6.62
5	828.07	26.6 QP	46.0	-19.4	2.44 V	308	29.19	-2.57
6	983.02	28.6 QP	54.0	-25.4	2.17 V	66	28.83	-0.24

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

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
SERIAL NO.	EV1 339		

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	38.92	15.8 QP	40.0	-24.2	4.00 H	336	30.44	-14.60
2	167.06	15.1 QP	43.5	-28.4	4.00 H	275	28.73	-13.66
3	288.02	22.8 QP	46.0	-23.2	3.87 H	182	35.45	-12.61
4	634.89	23.3 QP	46.0	-22.7	1.64 H	124	29.09	-5.78
5	823.12	27.1 QP	46.0	-18.9	1.00 H	357	29.75	-2.63
6	917.21	28.4 QP	46.0	-17.6	1.00 H	40	29.68	-1.26
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	53.57	23.4 QP	40.0	-16.6	1.34 V	204	37.06	-13.64
2	117.93	18.4 QP	43.5	-25.1	1.00 V	281	34.83	-16.45
3	303.44	19.9 QP	46.0	-26.1	1.17 V	70	32.01	-12.14
4	507.43	21.0 QP	46.0	-25.0	2.03 V	281	29.26	-8.29
5	744.89	26.2 QP	46.0	-19.8	2.47 V	360	30.13	-3.95
6	978.71	29.2 QP	54.0	-24.8	1.88 V	158	29.41	-0.25

REMARKS:

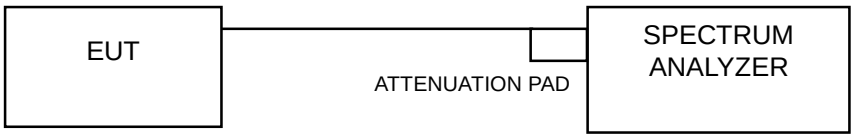
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Frequency Tolerance Measurement

4.2.1 Limits of Frequency Tolerance Measurement

Limit : ±0.001%

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

The frequency tolerance of the carrier signal shall be maintained within ±0.001% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.2.5 Deviation from Test Standard

No deviation

4.2.6 EUT Operating Condition

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 Results

SERIAL NO.: EV1 350

CH 0

TEST CONDITION			Carrier Frequency (MHz)	Frequency Drift (kHz)	Frequency error (%)
Tnom(℃)	+20	Vnom(V)	2402.9729	0.00	0.00000%
Tmin(℃)	-20	Vmin(V)	2402.9824	9.50	0.00040%
		Vmax(V)	2402.9820	9.10	0.00038%
Tmax(℃)	+55	Vmin(V)	2402.9725	-0.40	-0.00002%
		Vmax(V)	2402.9729	0.00	0.00000%
Limit : ±0.001%					

CH 14

TEST CONDITION			Carrier Frequency (MHz)	Frequency Drift (kHz)	Frequency error (%)
Tnom(℃)	+20	Vnom(V)	2443.9721	0.00	0.00000%
Tmin(℃)	-20	Vmin(V)	2443.9820	9.90	0.00041%
		Vmax(V)	2443.9822	10.10	0.00041%
Tmax(℃)	+55	Vmin(V)	2443.9721	0.00	0.00000%
		Vmax(V)	2443.9724	0.30	0.00001%
Limit : ±0.001%					

CH 7

TEST CONDITION			Carrier Frequency (MHz)	Frequency Drift (kHz)	Frequency error (%)
Tnom(℃)	+20	Vnom(V)	2479.9717	0.00	0.00000%
Tmin(℃)	-20	Vmin(V)	2479.9820	10.30	0.00042%
		Vmax(V)	2479.9816	9.90	0.00040%
Tmax(℃)	+55	Vmin(V)	2479.9713	-0.40	-0.00002%
		Vmax(V)	2479.9713	-0.40	-0.00002%
Limit : ±0.001%					

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.

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

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---