

## FCC Test Report (Z-wave)

**Report No.:** RF160322E08-3

**FCC ID:** 2ABTEG2100

**Test Model:** Fios-G2100

**Received Date:** Mar. 22, 2016

**Test Date:** June 21 to July 06, 2016

**Issued Date:** Aug. 16, 2016

**Applicant:** Verizon Online LLC

**Address:** 1300 I Street NW, Room 400W, Washington, District of Columbia, 20005  
United State

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

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan R.O.C.

**Test Location (1):** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan R.O.C.

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.



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### Release Control Record

Issue No.	Description	Date Issued
RF160322E08-3	Original release.	Aug. 16, 2016

## 1 Certificate of Conformity

**Product:** Fios-G2100

**Brand:** Verizon

**Test Model:** Fios-G2100

**Sample Status:** R&D SAMPLE

**Applicant:** Verizon Online LLC

**Test Date:** June 21 to July 06, 2016

**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:**

Aug. 16, 2016

Claire Kuan / Specialist

**Approved by :**



**Date:**

Aug. 16, 2016

May Chen / 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	PASS	Meet the requirement of limit. Minimum passing margin is -8.35dB at 24.00000MHz.
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 -1.0dB at 908.4MHz, 908.42MHz and 916.00MHz.

### 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) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.19 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.43 dB
	6GHz ~ 18GHz	3.49 dB
	18GHz ~ 40GHz	4.11 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (Z-Wave)

Product	Fios-G2100
Brand	Verizon
Test Model	Fios-G2100
Status of EUT	R&D SAMPLE
Power Supply Rating	DC 19V from Adapter
Modulation Type	FSK
Transfer Rate	9.6/40/100Kbit/s
Operating Frequency	908.4 ~ 916MHz
Number of Channel	3
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	NA

Note:

1. Simultaneously transmission condition.

Condition	Technology				
1	WLAN (2.4GHz)	WLAN (5GHz)	Zigbee	Z-wave	DECT 6.0

**Note:** The emission of the simultaneous operation has been evaluated and no non-compliance was found.

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

WLAN						
5GHz						
Antenna No.	Transmitter Circuit	Antenna Gain(dBi) Including cable loss	Frequency range (MHz ~ MHz)	Antenna Type	Connector Type	Cable Length (mm)
1	Chain (0)	4.37	5150~5250	PCB	i-pex(MHF)	40
		4.92	5250~5350			
		4.23	5470~5725			
		4.23	5725~5850			
2	Chain (1)	4.13	5150~5250	PCB	i-pex(MHF)	40
		4.06	5250~5350			
		4.03	5470~5725			
		4.03	5725~5850			
3	Chain (2)	3.01	5150~5250	PCB	i-pex(MHF)	42
		3.72	5250~5350			
		4.79	5470~5725			
		4.71	5725~5850			
4	Chain (3)	3.87	5150~5250	PCB	i-pex(MHF)	135
		4.26	5250~5350			
		4.61	5470~5725			
		4.3	5725~5850			
2.4GHz						
Antenna No.	Transmitter Circuit	Antenna Gain(dBi) Including cable loss	Frequency range (MHz ~ MHz)	Antenna Type	Connector Type	Cable Length (mm)
5	Chain (0)	3.9	2400~2483.5	PCB	i-pex(MHF)	55
6	Chain (1)	5.1				35
7	Chain (2)	3.95				70
8	Chain (3)	3.51				130
DECT						
Antenna No.	Antenna Gain(dBi)		Frequency range (MHz ~ MHz)	Antenna Type	Connector Type	
9	5.46		1920~1930	Embedded	NA	
10	5.46		1920~1930	Embedded	NA	
Z-wave						
Antenna No.	Antenna Gain(dBi)		Frequency range (MHz ~ MHz)	Antenna Type	Connector Type	
11	1.02		908~916	On Board Printed	NA	
Zigbee						
Antenna No.	Antenna Gain(dBi)		Frequency range (MHz ~ MHz)	Antenna Type	Connector Type	
12	4.23		2400~2483.5	On Board Printed	NA	
Note 1. For WLAN 2.4GHz will fix transmission on Chain (0), Chain (1) and Chain (2).						

Note 1. For WLAN 2.4GHz will fix transmission on Chain (0), Chain (1) and Chain (2).

3. The EUT must be supplied with a adapter as following table:

Brand	Model No.	Spec.	Remark
Verizon	ADP-57AR A	Input: 105-125Vac, 1.5A, 60Hz AC input cable: Unshielded, 3ft Output: 19Vdc, 3.0A DC output cable: Unshielded, 1.8m	DELTA

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

3 channels are provided to this EUT:

Channel	Frequency	Channel	Frequency
1	908.42	3	916
2	908.4		



### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	
-	√	√	√	-

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement  
 RE<1G: Radiated Emission below 1GHz  
 PLC: Power Line Conducted Emission

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

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 3	1, 2, 3	FSK

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

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 3	3	FSK

#### **Power Line Conducted Emission Test:**

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 3	3	FSK

#### **Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	26deg. C, 66%RH	120Vac, 60Hz	Tim Ho
RE<1G	26deg. C, 66%RH	120Vac, 60Hz	Tim Ho
PLC	24deg. C, 62%RH	120Vac, 60Hz	JyunChun Lin

### 3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

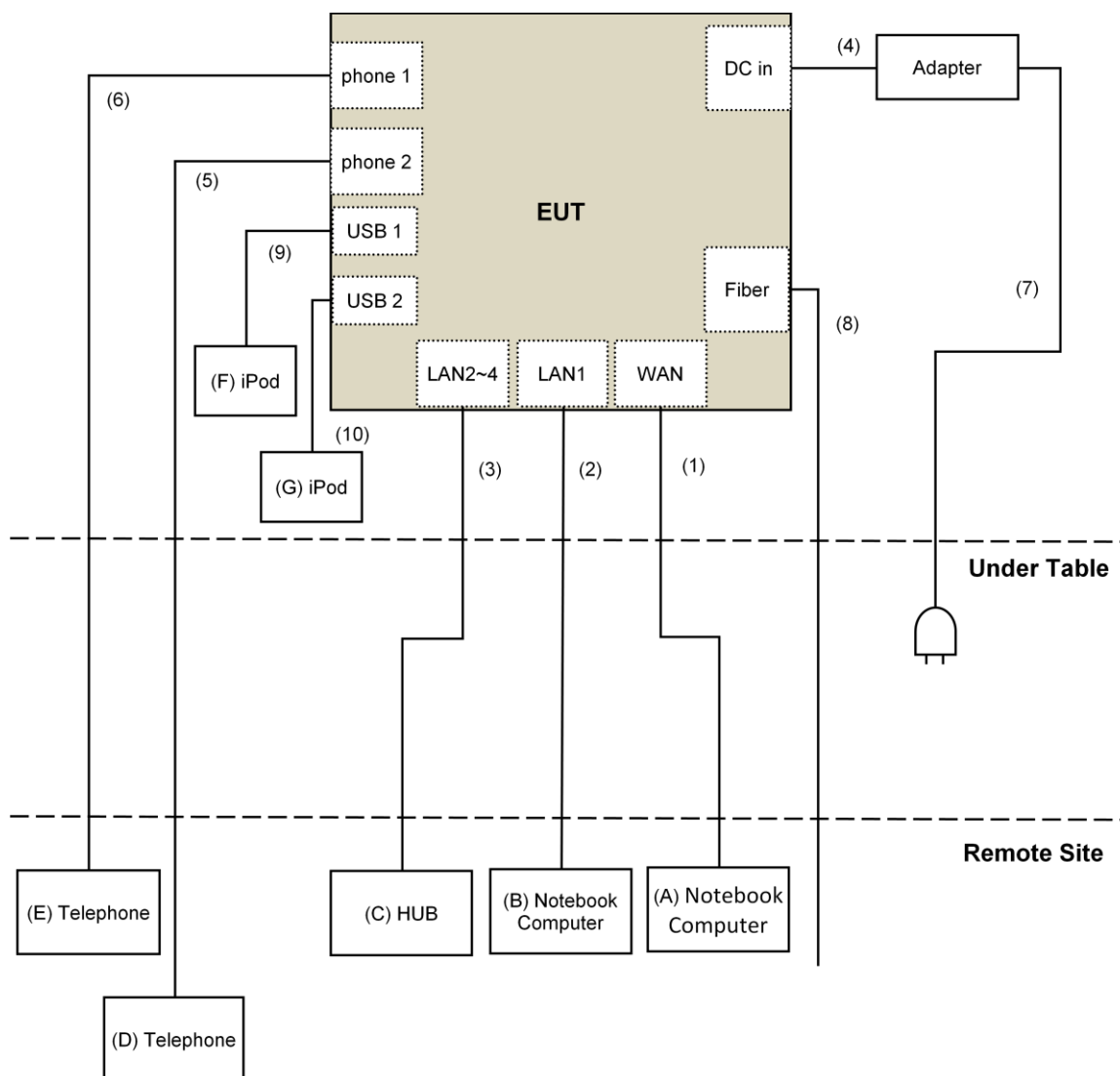
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook Computer	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
B.	Notebook Computer	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab
D.	Telephone	DAISHO	DS-03	NA	NA	Provided by Lab
E.	Telephone	ROMEO	TE-812	97280903	NA	Provided by Lab
F.	iPod	Apple	MC749TA/A	CC4DMFJUDFDM	NA	Provided by Lab
G.	iPod	Apple	MC749TA/A	CC4DN25WDFDM	NA	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45	1	10	No	0	Provided by Lab
2.	RJ-45	1	10	No	0	Provided by Lab
3.	RJ-45	3	10	No	0	Provided by Lab
4.	DC	1	1.8	No	0	Supplied by client
5.	RJ-11	1	10	No	0	Provided by Lab
6.	RJ-11	1	10	No	0	Provided by Lab
7.	AC	1	3ft	No	0	Provided by Lab
8.	Fiber	1	10	No	0	Provided by Lab
9.	USB	1	0.1	Yes	0	Provided by Lab
10.	USB	1	0.1	Yes	0	Provided by Lab

### 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 (15.249)**

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
Test Receiver Agilent	N9038A	MY54450088	July 24, 2015	July 23, 2016
Pre-Amplifier <sup>(*)</sup> EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna <sup>(*)</sup> Electro-Metrics	EM-6879	264	Dec. 16, 2014	Dec. 15, 2016
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 11, 2015	Nov. 10, 2016
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Jan. 04, 2016	Jan. 03, 2017
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 02, 2016	Apr. 01, 2017
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Jan. 19, 2016	Jan. 18, 2017
Pre-Amplifier Agilent	8449B	3008A01922	Sep. 19, 2015	Sep. 18, 2016
RF Cable	EMC104-SM-SM-2000 EMC104-SM-SM-5000 EMC104-SM-SM-5000	150318 150323 150324	Mar. 30, 2016	Mar. 29, 2017
Pre-Amplifier EMCI	EMC184045	980143	Jan. 15, 2016	Jan. 14, 2017
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Jan. 08, 2016	Jan. 07, 2017
RF Cable	SUCOFLEX 102	36432/2 36441/2	Jan. 16, 2016	Jan. 15, 2017
Software	ADT_Radiated_V8.7.07	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Spectrum Analyzer R&S	FSP40	100060	May 11, 2016	May 10, 2017
Power meter Anritsu	ML2495A	1014008	May 05, 2016	May 04, 2017
Power sensor Anritsu	MA2411B	0917122	May 05, 2016	May 04, 2017

#### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. \*The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Loop antenna was used for all emissions below 30 MHz.
4. The test was performed in 966 Chamber No. 4.
5. The FCC Site Registration No. is 292998
6. The CANADA Site Registration No. is 20331-2
7. Tested Date: June 21 to July 06, 2016

#### 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:**

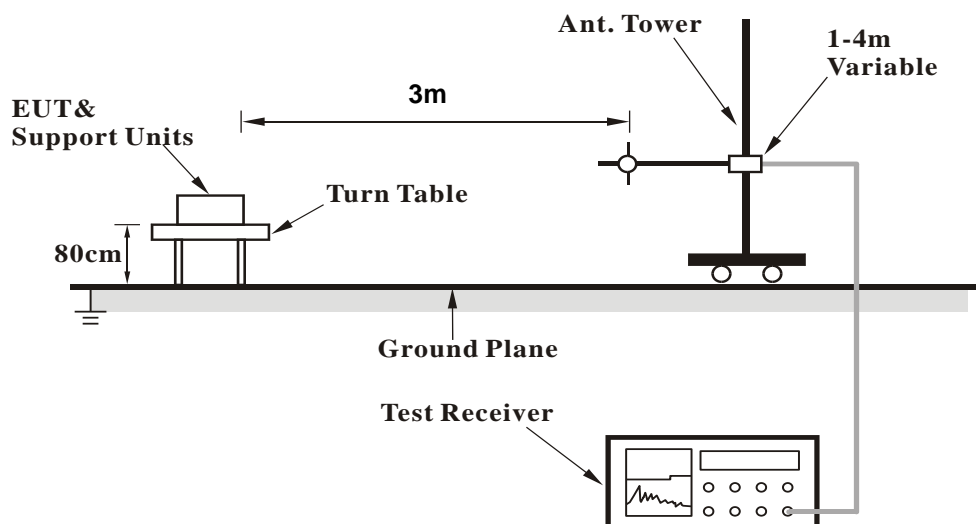
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

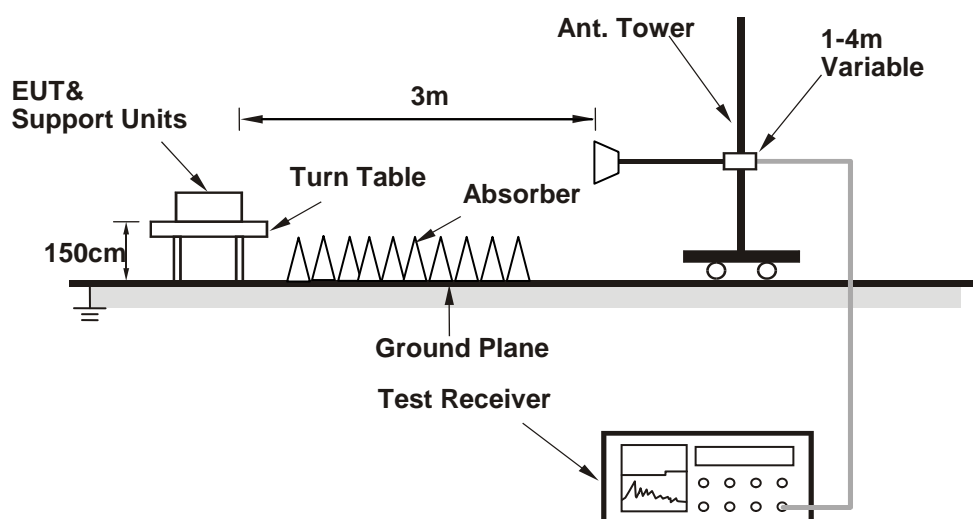
No deviation.

#### 4.1.5 Test Setup

##### <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

1. Connect the EUT with the Notebook Computer which is placed on remote site.
2. Controlling software (Telnet paste Z-Wave.txt command) has been activated to set the EUT on specific status.



#### 4.1.7 Test Results

##### Above 1GHz Data :

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 10GHz		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	#1816.84	45.4 PK	74.0	-28.6	1.40 H	346	53.1	-7.7
2	#1816.84	31.4 AV	54.0	-22.6	1.40 H	346	39.1	-7.7
3	2725.26	46.1 PK	74.0	-27.9	1.42 H	322	50.5	-4.4
4	2725.26	32.0 AV	54.0	-22.0	1.42 H	322	36.4	-4.4
5	3633.68	46.8 PK	74.0	-27.2	1.43 H	73	49.5	-2.7
6	3633.68	33.9 AV	54.0	-20.1	1.43 H	73	36.6	-2.7
7	4542.10	50.4 PK	74.0	-23.6	1.56 H	106	50.4	0.0
8	4542.10	39.2 AV	54.0	-14.8	1.56 H	106	39.2	0.0
9	5450.52	55.2 PK	74.0	-18.8	1.96 H	200	52.9	2.3
10	5450.52	45.2 AV	54.0	-8.8	1.96 H	200	42.9	2.3
11	#6358.94	57.1 PK	74.0	-16.9	2.26 H	275	52.7	4.4
12	#6358.94	46.4 AV	54.0	-7.6	2.26 H	275	42.0	4.4
13	7267.36	55.8 PK	74.0	-18.2	1.98 H	179	48.1	7.7
14	7267.36	45.4 AV	54.0	-8.6	1.98 H	179	37.7	7.7
15	8175.78	56.8 PK	74.0	-17.2	2.20 H	269	48.1	8.7
16	8175.78	46.2 AV	54.0	-7.8	2.20 H	269	37.5	8.7
17	9084.20	59.2 PK	74.0	-14.8	1.75 H	99	50.1	9.1
18	9084.20	46.8 AV	54.0	-7.2	1.75 H	99	37.7	9.1
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	#1816.84	45.4 PK	74.0	-28.6	1.53 V	225	53.1	-7.7
2	#1816.84	32.3 AV	54.0	-21.7	1.53 V	225	40.0	-7.7
3	2725.26	45.3 PK	74.0	-28.7	1.53 V	237	49.7	-4.4
4	2725.26	32.1 AV	54.0	-21.9	1.53 V	237	36.5	-4.4
5	3633.68	46.1 PK	74.0	-27.9	1.34 V	360	48.8	-2.7
6	3633.68	33.4 AV	54.0	-20.6	1.34 V	360	36.1	-2.7
7	4542.10	52.5 PK	74.0	-21.5	1.60 V	360	52.5	0.0
8	4542.10	39.5 AV	54.0	-14.5	1.60 V	360	39.5	0.0
9	5450.52	55.4 PK	74.0	-18.6	1.18 V	218	53.1	2.3
10	5450.52	43.6 AV	54.0	-10.4	1.18 V	218	41.3	2.3
11	#6358.94	58.2 PK	74.0	-15.8	1.89 V	104	53.8	4.4
12	#6358.94	45.2 AV	54.0	-8.8	1.89 V	104	40.8	4.4
13	7267.36	56.0 PK	74.0	-18.0	1.15 V	203	48.3	7.7
14	7267.36	44.4 AV	54.0	-9.6	1.15 V	203	36.7	7.7
15	8175.78	58.4 PK	74.0	-15.6	1.84 V	101	49.7	8.7
16	8175.78	45.4 AV	54.0	-8.6	1.84 V	101	36.7	8.7
17	9084.20	58.7 PK	74.0	-15.3	1.63 V	356	49.6	9.1
18	9084.20	46.7 AV	54.0	-7.3	1.63 V	356	37.6	9.1

**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 radiated frequency is out of the restricted band.

<b>CHANNEL</b>	TX Channel 2	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 10GHz		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	#1816.80	45.5 PK	74.0	-28.5	1.40 H	348	53.2	-7.7
2	#1816.80	31.7 AV	54.0	-22.3	1.40 H	348	39.4	-7.7
3	2725.20	45.3 PK	74.0	-28.7	1.38 H	337	49.7	-4.4
4	2725.20	31.6 AV	54.0	-22.4	1.38 H	337	36.0	-4.4
5	3633.60	47.2 PK	74.0	-26.8	1.40 H	67	49.9	-2.7
6	3633.60	34.2 AV	54.0	-19.8	1.40 H	67	36.9	-2.7
7	4542.00	50.0 PK	74.0	-24.0	1.51 H	105	50.0	0.0
8	4542.00	38.7 AV	54.0	-15.3	1.51 H	105	38.7	0.0
9	5450.40	55.8 PK	74.0	-18.2	1.91 H	174	53.5	2.3
10	5450.40	45.3 AV	54.0	-8.7	1.91 H	174	43.0	2.3
11	#6358.80	57.7 PK	74.0	-16.3	2.27 H	270	53.3	4.4
12	#6358.80	46.6 AV	54.0	-7.4	2.27 H	270	42.2	4.4
13	7267.20	55.4 PK	74.0	-18.6	1.95 H	186	47.7	7.7
14	7267.20	45.1 AV	54.0	-8.9	1.95 H	186	37.4	7.7
15	8175.60	57.4 PK	74.0	-16.6	2.25 H	273	48.7	8.7
16	8175.60	46.6 AV	54.0	-7.4	2.25 H	273	37.9	8.7
17	9084.00	59.6 PK	74.0	-14.4	1.74 H	107	50.5	9.1
18	9084.00	47.3 AV	54.0	-6.7	1.74 H	107	38.2	9.1
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	#1816.80	45.8 PK	74.0	-28.2	1.51 V	247	53.5	-7.7
2	#1816.80	32.6 AV	54.0	-21.4	1.51 V	247	40.3	-7.7
3	2725.20	45.4 PK	74.0	-28.6	1.57 V	240	49.8	-4.4
4	2725.20	32.1 AV	54.0	-21.9	1.57 V	240	36.5	-4.4
5	3633.60	45.8 PK	74.0	-28.2	1.28 V	360	48.5	-2.7
6	3633.60	33.2 AV	54.0	-20.8	1.28 V	360	35.9	-2.7
7	4542.00	53.1 PK	74.0	-20.9	1.56 V	360	53.1	0.0
8	4542.00	40.0 AV	54.0	-14.0	1.56 V	360	40.0	0.0
9	5450.40	55.7 PK	74.0	-18.3	1.27 V	213	53.4	2.3
10	5450.40	43.7 AV	54.0	-10.3	1.27 V	213	41.4	2.3
11	#6358.80	59.0 PK	74.0	-15.0	1.91 V	118	54.6	4.4
12	#6358.80	45.7 AV	54.0	-8.3	1.91 V	118	41.3	4.4
13	7267.20	55.7 PK	74.0	-18.3	1.21 V	214	48.0	7.7
14	7267.20	44.0 AV	54.0	-10.0	1.21 V	214	36.3	7.7
15	8175.60	58.8 PK	74.0	-15.2	1.90 V	114	50.1	8.7
16	8175.60	45.6 AV	54.0	-8.4	1.90 V	114	36.9	8.7
17	9084.00	58.1 PK	74.0	-15.9	1.64 V	350	49.0	9.1
18	9084.00	46.3 AV	54.0	-7.7	1.64 V	350	37.2	9.1

**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 radiated frequency is out of the restricted band.

<b>CHANNEL</b>	TX Channel 3	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 10GHz		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	#1832.00	45.6 PK	74.0	-28.4	1.44 H	337	53.3	-7.7
2	#1832.00	32.1 AV	54.0	-21.9	1.44 H	337	39.8	-7.7
3	2748.00	45.7 PK	74.0	-28.3	1.42 H	324	50.1	-4.4
4	2748.00	31.8 AV	54.0	-22.2	1.42 H	324	36.2	-4.4
5	3664.00	46.4 PK	74.0	-27.6	1.37 H	65	48.9	-2.5
6	3664.00	33.6 AV	54.0	-20.4	1.37 H	65	36.1	-2.5
7	4580.00	50.1 PK	74.0	-23.9	1.60 H	0	50.0	0.1
8	4580.00	38.9 AV	54.0	-15.1	1.60 H	0	38.8	0.1
9	#5496.00	54.9 PK	74.0	-19.1	1.99 H	186	52.6	2.3
10	#5496.00	44.8 AV	54.0	-9.2	1.99 H	186	42.5	2.3
11	#6412.00	57.5 PK	74.0	-16.5	2.24 H	281	52.9	4.6
12	#6412.00	46.4 AV	54.0	-7.6	2.24 H	281	41.8	4.6
13	7328.00	55.9 PK	74.0	-18.1	1.94 H	194	48.2	7.7
14	7328.00	45.7 AV	54.0	-8.3	1.94 H	194	38.0	7.7
15	8244.00	57.6 PK	74.0	-16.4	2.16 H	274	48.9	8.7
16	8244.00	46.7 AV	54.0	-7.3	2.16 H	274	38.0	8.7
17	9160.00	58.6 PK	74.0	-15.4	1.77 H	100	49.6	9.0
18	9160.00	46.3 AV	54.0	-7.7	1.77 H	100	37.3	9.0

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#1832.00	45.3 PK	74.0	-28.7	1.54 V	241	53.0	-7.7
2	#1832.00	32.2 AV	54.0	-21.8	1.54 V	241	39.9	-7.7
3	2748.00	45.7 PK	74.0	-28.3	1.56 V	236	50.1	-4.4
4	2748.00	32.2 AV	54.0	-21.8	1.56 V	236	36.6	-4.4
5	3664.00	46.5 PK	74.0	-27.5	1.37 V	348	49.0	-2.5
6	3664.00	33.6 AV	54.0	-20.4	1.37 V	348	36.1	-2.5
7	4580.00	52.7 PK	74.0	-21.3	1.55 V	360	52.6	0.1
8	4580.00	39.9 AV	54.0	-14.1	1.55 V	360	39.8	0.1
9	#5496.00	56.0 PK	74.0	-18.0	1.17 V	227	53.7	2.3
10	#5496.00	44.5 AV	54.0	-9.5	1.17 V	227	42.2	2.3
11	#6412.00	58.6 PK	74.0	-15.4	1.84 V	112	54.0	4.6
12	#6412.00	45.5 AV	54.0	-8.5	1.84 V	112	40.9	4.6
13	7328.00	56.2 PK	74.0	-17.8	1.14 V	198	48.5	7.7
14	7328.00	44.7 AV	54.0	-9.3	1.14 V	198	37.0	7.7
15	8244.00	57.9 PK	74.0	-16.1	1.82 V	113	49.2	8.7
16	8244.00	45.1 AV	54.0	-8.9	1.82 V	113	36.4	8.7
17	9160.00	58.5 PK	74.0	-15.5	1.60 V	360	49.5	9.0
18	9160.00	46.2 AV	54.0	-7.8	1.60 V	360	37.2	9.0

**REMARKS:**

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

#### Below 1GHz Data:

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	Below 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	41.40	34.9 QP	40.0	-5.1	1.25 H	88	15.9	19.0
2	250.00	40.8 QP	46.0	-5.2	1.65 H	57	50.8	-10.0
3	625.10	40.5 QP	46.0	-5.5	1.66 H	99	40.6	-0.1
4	750.11	41.6 QP	46.0	-4.4	1.98 H	77	39.7	1.9
5	902.00	24.5 QP	46.0	-21.5	1.42 H	340	-6.7	31.3
6	*908.42	92.5 QP	94.0	-1.5	1.42 H	340	61.0	31.5
7	928.00	25.5 QP	46.0	-20.5	1.42 H	340	-6.3	31.7
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	83.70	36.2 QP	40.0	-3.8	1.99 V	74	50.4	-14.2
2	108.77	34.6 QP	43.5	-8.9	2.64 V	70	46.2	-11.6
3	250.06	38.1 QP	46.0	-7.9	1.65 V	24	48.1	-10.0
4	375.04	39.2 QP	46.0	-6.8	2.31 V	12	45.2	-6.0
5	902.00	25.5 QP	46.0	-20.5	1.00 V	131	-5.8	31.3
6	*908.42	93.9 QP	94.0	-0.1	1.00 V	131	62.4	31.5
7	928.00	34.8 QP	46.0	-11.2	1.00 V	131	3.0	31.7

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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 2	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	Below 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	40.10	35.3 QP	40.0	-4.7	1.10 H	47	16.4	18.9
2	250.10	41.2 QP	46.0	-4.8	1.24 H	77	51.2	-10.0
3	624.78	40.1 QP	46.0	-5.9	1.65 H	99	40.2	-0.1
4	750.10	41.2 QP	46.0	-4.8	2.45 H	145	39.3	1.9
5	902.00	24.0 QP	46.0	-22.0	1.42 H	340	-7.3	31.3
6	*908.40	92.1 QP	94.0	-1.9	1.42 H	340	60.6	31.5
7	928.00	24.9 QP	46.0	-21.1	1.42 H	340	-6.8	31.7
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	84.70	35.9 QP	40.0	-4.1	2.44 V	54	50.2	-14.3
2	108.70	35.2 QP	43.5	-8.3	2.65 V	301	46.8	-11.6
3	250.01	39.2 QP	46.0	-6.8	3.02 V	88	49.2	-10.0
4	500.09	42.8 QP	46.0	-3.2	1.34 V	94	45.6	-2.8
5	902.00	24.8 QP	46.0	-21.3	1.00 V	131	-6.5	31.3
6	*908.40	93.9 QP	94.0	-0.1	1.00 V	131	62.4	31.5
7	928.00	31.0 QP	46.0	-15.0	1.00 V	131	-0.7	31.7

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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 3	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	Below 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	40.60	35.6 QP	40.0	-4.4	1.85 H	77	16.7	18.9
2	250.01	41.6 QP	46.0	-4.4	1.65 H	89	51.6	-10.0
3	625.10	40.4 QP	46.0	-5.6	1.44 H	32	40.5	-0.1
4	750.02	41.8 QP	46.0	-4.2	1.47 H	97	39.9	1.9
5	902.00	24.5 QP	46.0	-21.5	1.42 H	340	-6.7	31.3
6	*916.00	92.3 QP	94.0	-1.7	1.42 H	340	60.7	31.6
7	928.00	25.5 QP	46.0	-20.5	1.42 H	340	-6.3	31.7
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	84.52	35.1 QP	40.0	-4.9	2.48 V	68	49.4	-14.3
2	108.76	34.5 QP	43.5	-9.0	2.87 V	67	46.1	-11.6
3	250.10	38.1 QP	46.0	-7.9	2.55 V	64	48.1	-10.0
4	375.11	39.1 QP	46.0	-6.9	3.01 V	52	45.1	-6.0
5	902.00	24.6 QP	46.0	-21.4	1.00 V	131	-6.7	31.3
6	*916.00	93.9 QP	94.0	-0.1	1.00 V	131	62.3	31.6
7	928.00	39.1 QP	46.0	-6.9	1.00 V	131	7.4	31.7

**REMARKS:**

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



## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 23, 2015	Oct. 22, 2016
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 28, 2015	Oct. 27, 2016
RF Cable	5D-FB	COACAB-002	Mar. 04, 2016	Mar. 03, 2017
10 dB PAD Mini-Circuits	HAT-10+	CONATT-004	Jun. 20, 2016	Jun. 19, 2017
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

**Note:**

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 1.
3. Tested Date: June 21, 2016

#### 4.2.3 Test Procedures

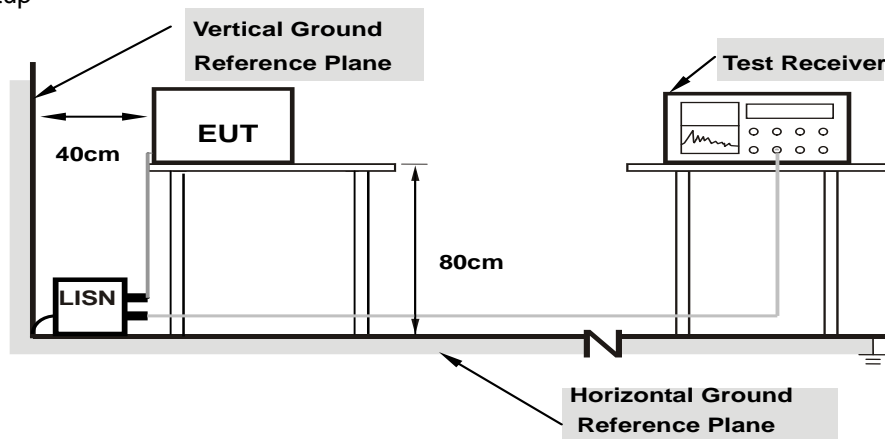
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

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

#### 4.2.6 EUT Operating Conditions

Same as 4.1.6.

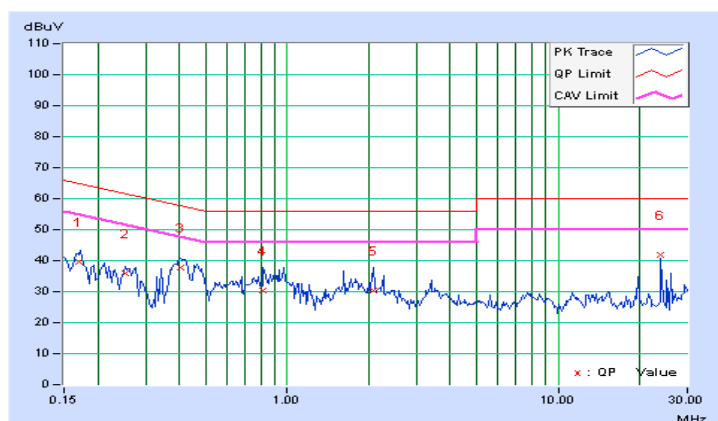
#### 4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16956	10.21	29.44	16.55	39.65	26.76	64.98	54.98	-25.33	-28.22
2	0.25156	10.22	25.71	19.25	35.93	29.47	61.71	51.71	-25.78	-22.24
3	0.40391	10.22	27.71	14.63	37.93	24.85	57.77	47.77	-19.84	-22.92
4	0.81797	10.25	20.22	8.04	30.47	18.29	56.00	46.00	-25.53	-27.71
5	2.07422	10.31	20.10	13.52	30.41	23.83	56.00	46.00	-25.59	-22.17
6	24.00000	11.43	30.28	29.81	41.71	41.24	60.00	50.00	-18.29	-8.76
7	18.30469	10.97	26.68	21.06	37.65	32.03	60.00	50.00	-22.35	-17.97

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

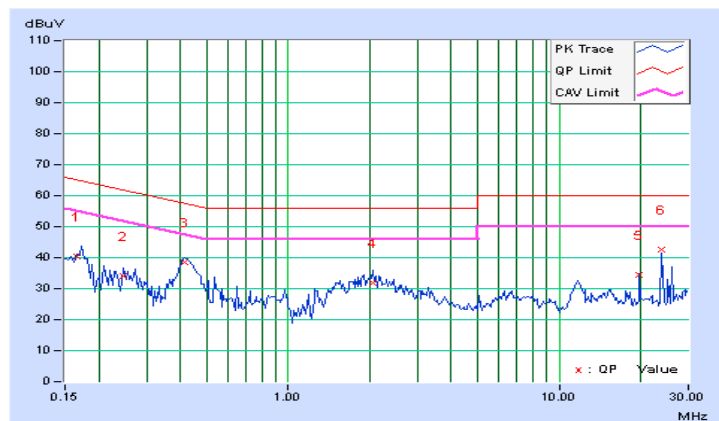


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16706	10.20	30.09	15.29	40.29	25.49	65.11	55.11	-24.82	-29.62
2	0.24766	10.21	23.79	15.26	34.00	25.47	61.84	51.84	-27.84	-26.37
3	0.41487	10.20	28.27	22.35	38.47	32.55	57.55	47.55	-19.08	-15.00
4	2.05469	10.29	21.55	15.49	31.84	25.78	56.00	46.00	-24.16	-20.22
5	19.80628	11.11	23.20	22.12	34.31	33.23	60.00	50.00	-25.69	-16.77
6	24.00000	11.13	31.39	30.52	42.52	41.65	60.00	50.00	-17.48	-8.35

**Remarks:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



## 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:

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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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