FCC Test Report

Product Name	Gateway
Model No.	PSC05
FCC ID.	RHHPSC05

Applicant	Philio Technology Corporation
Address	8F.,No.653-2,Zhongzheng Rd., Xinzhuang Dist., New Taipei City 24257,Taiwan(R.O.C)

Date of Receipt	Jun. 24, 2016
Issued Date	Aug. 19, 2016
Report No.	1660528R-RFUSP15V00
Version	V1.0

Testing Laboratory
3023

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

Test Report

Issued Date: Aug. 19, 2016
Report No. : 1660528R-RFUSP15V00

Product Name	Gateway
Applicant	Philio Technology Corporation
Address	8F.,No.653-2,Zhongzheng Rd., Xinzhuang Dist., New Taipei City 24257,Taiwan(R.O.C)
Manufacturer	Philio Technology Corporation
Model No.	PSC05
FCC ID.	RHHPSC05
EUT Rated Voltage	DC 5V by USB
EUT Test Voltage	DC 5V by USB
Trade Name	
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2015 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Jinn Chen
(Senior Adm. Specialist / Jinn Chen)

Tested By : Bill Lin
(Engineer / Bill Lin)

Approved By :
(Director / Vincent Lin)

TABLE OF CONTENTS

Description Page

1. GENERAL INFORMATION 4
   - 1.1. EUT Description 4
   - 1.2. Operation Description 4
   - 1.3. Tested System Details 5
   - 1.4. Configuration of Test System 5
   - 1.5. EUT Exercise Software 5
   - 1.6. Test Facility 6
2. Conducted Emission 7
   - 2.1. Test Equipment 7
   - 2.2. Test Setup 7
   - 2.3. Limits 8
   - 2.4. Test Procedure 8
   - 2.5. Uncertainty 8
   - 2.6. Test Result of Conducted Emission 9
3. Radiated Emission 11
   - 3.1. Test Equipment 11
   - 3.2. Test Setup 12
   - 3.3. Limits 13
   - 3.4. Test Procedure 14
   - 3.5. Uncertainty 14
   - 3.6. Test Result of Radiated Emission 15
4. Band Edge 23
   - 4.1. Test Equipment 23
   - 4.2. Test Setup 23
   - 4.3. Limit 24
   - 4.4. Test Procedure 24
   - 4.5. Uncertainty 24
   - 4.6. Test Result of Band Edge 25
5. Duty Cycle 31
   - 5.1. Test Equipment 31
   - 5.2. Test Setup 31
   - 5.3. Uncertainty 31
   - 5.4. Test Result of Duty Cycle 32
6. EMI Reduction Method During Compliance Testing 33

Attachment 1: EUT Test Photographs
Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Gateway
Trade Name	
FCC ID.	RHHPSC05
Model No.	PSC05
Frequency Range	908.4MHz
Type of Modulation	FSK
Number of Channels	2
Channel Control	Auto
Antenna Type	Monopole
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Philio	ANT-011	0dBi for 908-909MHz

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1:	908.4MHz	Channel 2:	916MHz		

Note:

1. The EUT is a Gateway with a built-in Z-Wave transceiver module.
2. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit

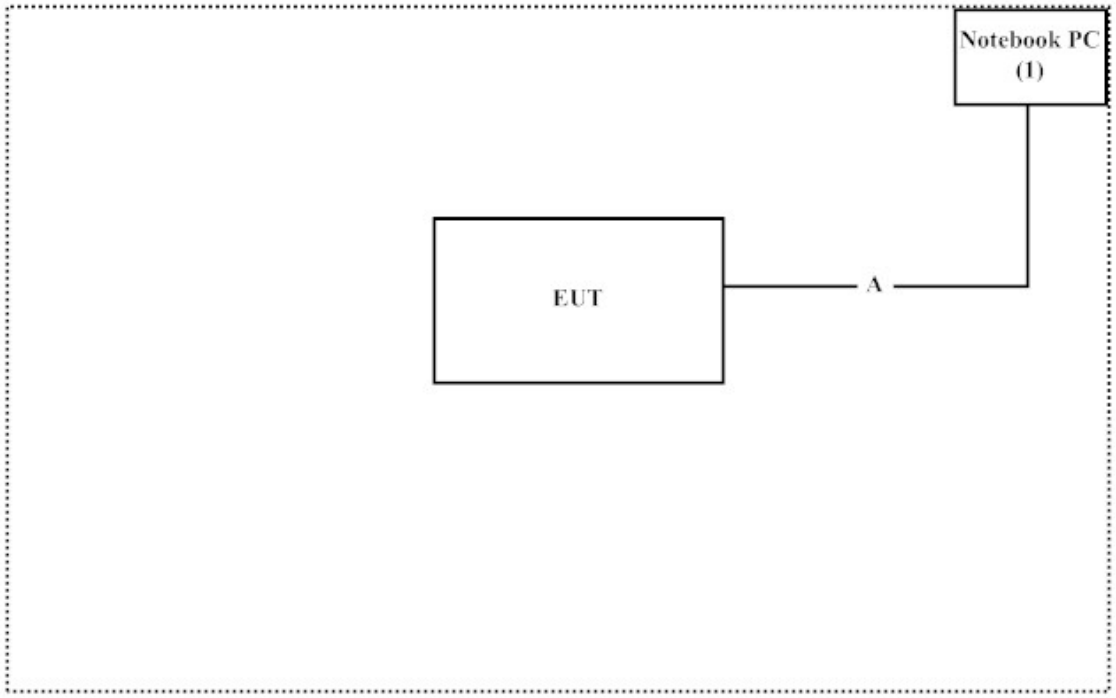
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	Latitude E5440	FS9TK32	Non-Shielded, 0.8m

Signal Cable Type		Signal cable Description
A	LAN Cable	Non-Shielded, 1.8m

1.4. Configuration of Test System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in section 1.4.
(2) Execute “Tera Term V4.73” on the Notebook.
(3) Starts the continuous transmit.
(4) Verify that the EUT works correctly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : http://www.quietek.com/chinese/about/certificates.aspx?bval=5
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Site Name: Quietek Corporation

Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Conducted Emission

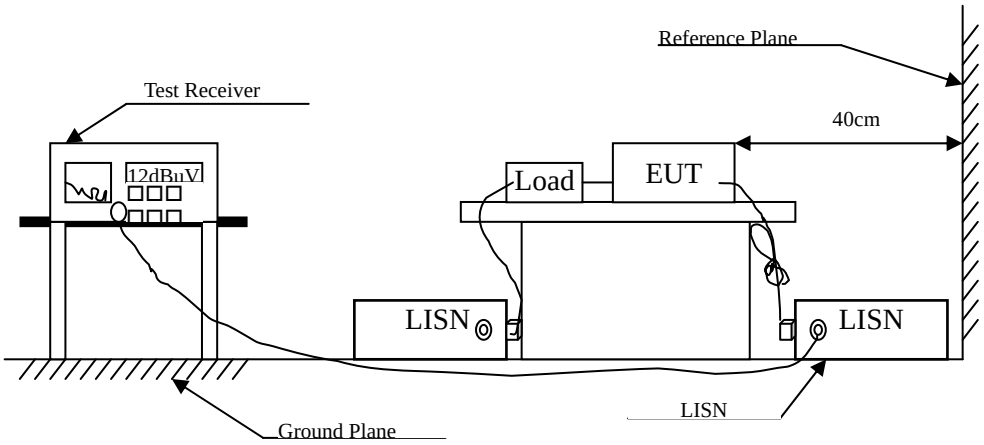
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Due Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2015	Sep., 2016	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2016	Feb., 2017	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2016	Feb., 2017	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2016	Mar, 2017	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2016	Feb., 2017	
	No.1 Shielded Room					

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by “X” are used to measure the final test results.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : Gateway
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 1: Transmit

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.154	9.707	42.240	51.947	-13.939	65.886
0.351	9.707	31.755	41.462	-18.795	60.257
0.600	9.739	25.312	35.051	-20.949	56.000
2.300	9.807	15.680	25.487	-30.513	56.000
11.200	10.026	16.135	26.161	-33.839	60.000
20.100	10.135	20.415	30.550	-29.450	60.000
Average					
0.154	9.707	23.207	32.913	-22.973	55.886
0.351	9.707	16.134	25.841	-24.416	50.257
0.600	9.739	13.534	23.273	-22.727	46.000
2.300	9.807	4.632	14.439	-31.561	46.000
11.200	10.026	7.980	18.006	-31.994	50.000
20.100	10.135	14.413	24.548	-25.452	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Gateway
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 1: Transmit

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
Line 2					
Quasi-Peak					
0.154	9.698	44.426	54.123	-11.763	65.886
0.291	9.697	34.326	44.023	-17.948	61.971
0.480	9.725	28.265	37.990	-18.581	56.571
2.285	9.807	24.706	34.513	-21.487	56.000
11.585	10.030	16.587	26.617	-33.383	60.000
24.885	10.211	21.934	32.145	-27.855	60.000
Average					
0.154	9.698	24.360	34.057	-21.829	55.886
0.291	9.697	22.490	32.187	-19.784	51.971
0.480	9.725	12.440	22.165	-24.406	46.571
2.285	9.807	15.241	25.048	-20.952	46.000
11.585	10.030	10.023	20.053	-29.947	50.000
24.885	10.211	15.436	25.647	-24.353	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ “ means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Radiated Emission

3.1. Test Equipment

The following test equipments are used during the radiated emission test:

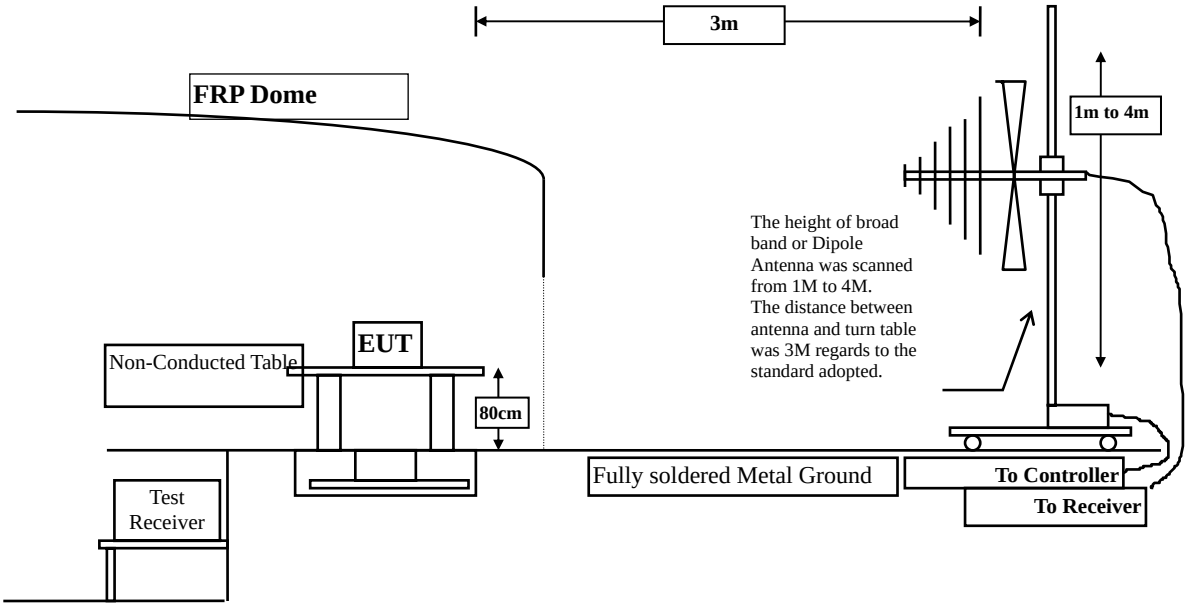
Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2015	Sep, 2016
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun, 2016	Jun, 2017
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun, 2016	Jun, 2017
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun, 2016	Jun, 2017
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun, 2016	Jun, 2017

Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct, 2015	Oct, 2016
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar, 2016	Mar, 2017
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan, 2016	Jan, 2017
	X	Horn Antenna	TRC	AH-0801/95051	Aug, 2016	Aug, 2017
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan, 2016	Jan, 2017
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul, 2016	Jul, 2017
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul, 2016	Jul, 2017

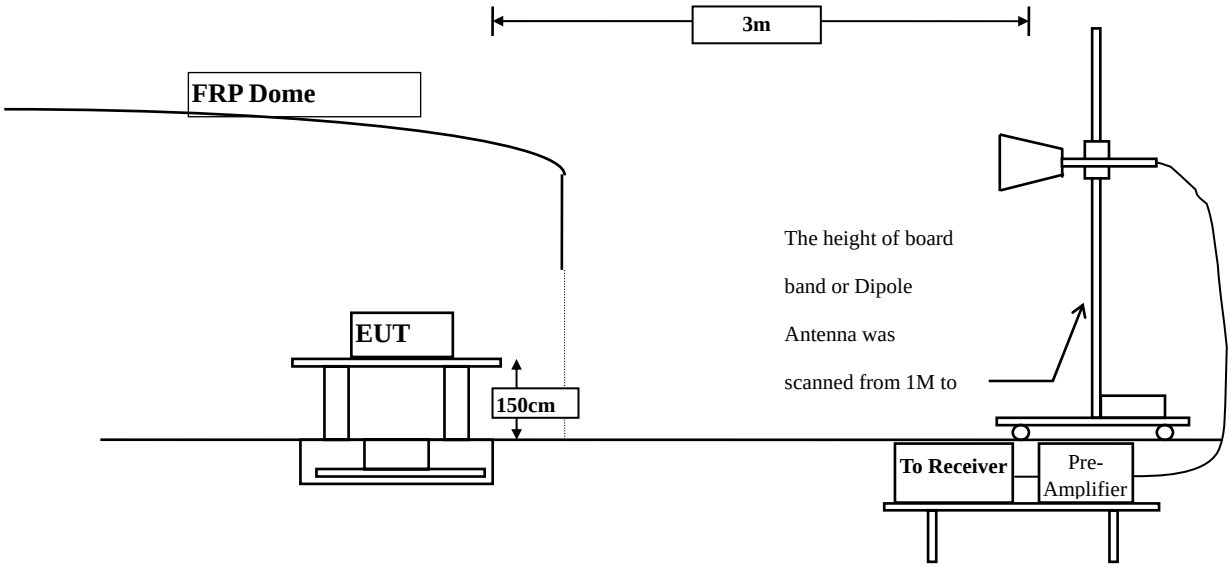
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

3.2. Test Setup

Below 1GHz



Above 1GHz



3.3. Limits

➢ **Fundamental and Harmonics Emission Limits**

FCC Part 15 Subpart C Paragraph 15.249 Limits				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dBuV/m @3m)	(uV/m @3m)	(dBuV/m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

3.5. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (X-axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
908.400	0.519	86.240	86.759	-7.241	94.000
916.000	0.601	85.540	86.141	-7.859	94.000
Vertical					
Peak Detector:					
908.400	0.519	87.300	87.819	-6.181	94.000
916.000	0.601	85.230	85.831	-8.169	94.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (Y-axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
908.400	0.519	89.110	89.629	-4.371	94.000
916.000	0.601	88.360	88.961	-5.039	94.000
Vertical					
Average Detector:					
908.400	0.519	85.280	85.799	-8.201	94.000
916.000	0.601	85.390	85.991	-8.009	94.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (Z-axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
908.400	0.519	84.310	84.829	-9.171	94.000
916.000	0.601	83.700	84.301	-9.699	94.000
Vertical					
Peak Detector:					
908.400	0.519	85.720	86.239	-7.761	94.000
916.000	0.601	83.940	84.541	-9.459	94.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (908.4MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
1816.800	-8.008	48.380	40.371	-33.629	74.000
2725.200	-5.721	56.810	51.089	-22.911	74.000
3633.600	-4.874	53.030	48.155	-25.845	74.000
4542.000	-3.791	61.570	57.779	-16.221	74.000
5450.400	-2.782	47.130	44.349	-29.651	74.000
6358.800	-1.178	54.540	53.361	-20.639	74.000
7267.200	-0.580	48.650	48.070	-25.930	74.000
8175.600	-0.007	48.490	48.483	-25.517	74.000
9084.000	1.000	45.500	46.500	-27.500	74.000
Vertical					
Peak Detector:					
1816.800	-8.008	47.100	39.091	-34.909	74.000
2725.200	-5.721	48.470	42.749	-31.251	74.000
3633.600	-4.874	51.540	46.665	-27.335	74.000
4542.000	-3.791	61.890	58.099	-15.901	74.000
5450.400	-2.782	47.320	44.539	-29.461	74.000
6358.800	-1.178	51.510	50.331	-23.669	74.000
7267.200	-0.580	47.040	46.460	-27.540	74.000
8175.600	-0.007	46.070	46.063	-27.937	74.000
9084.000	1.000	45.830	46.830	-27.170	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (908.4MHz)

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
1816.800	40.371	-20.000	20.371	-33.629	54.000
2725.200	51.089	-20.000	31.089	-22.911	54.000
3633.600	48.155	-20.000	28.155	-25.845	54.000
4542.000	57.779	-20.000	37.779	-16.221	54.000
5450.400	44.349	-20.000	24.349	-29.651	54.000
6358.800	53.361	-20.000	33.361	-20.639	54.000
7267.200	48.070	-20.000	28.070	-25.930	54.000
8175.600	48.483	-20.000	28.483	-25.517	54.000
9084.000	46.500	-20.000	26.500	-27.500	54.000
Vertical					
Average Detector:					
1816.800	39.091	-20.000	19.091	-34.909	54.000
2725.200	42.749	-20.000	22.749	-31.251	54.000
3633.600	46.665	-20.000	26.665	-27.335	54.000
4542.000	58.099	-20.000	38.099	-15.901	54.000
5450.400	44.539	-20.000	24.539	-29.461	54.000
6358.800	50.331	-20.000	30.331	-23.669	54.000
7267.200	46.460	-20.000	26.460	-27.540	54.000
8175.600	46.063	-20.000	26.063	-27.937	54.000
9084.000	46.830	-20.000	26.830	-27.170	54.000

Note:

1. AVG Measurement=Peak Measurement - Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (916MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
1832.000	-7.905	47.740	39.835	-34.165	74.000
2748.000	-5.701	56.490	50.789	-23.211	74.000
3664.000	-4.835	52.980	48.145	-25.855	74.000
4580.000	-3.781	61.250	57.469	-16.531	74.000
5496.000	-2.761	47.580	44.820	-29.180	74.000
6412.000	-1.103	50.930	49.828	-24.172	74.000
7328.000	-0.549	49.530	48.981	-25.019	74.000
8244.000	0.075	48.010	48.085	-25.915	74.000
9160.000	1.067	45.520	46.587	-27.413	74.000
Vertical					
Peak Detector:					
1832.000	-7.905	47.980	40.075	-33.925	74.000
2748.000	-5.701	46.220	40.519	-33.481	74.000
3664.000	-4.835	51.660	46.825	-27.175	74.000
4580.000	-3.781	60.810	57.029	-16.971	74.000
5496.000	-2.761	47.080	44.320	-29.680	74.000
6412.000	-1.103	52.050	50.948	-23.052	74.000
7328.000	-0.549	52.370	51.821	-22.179	74.000
8244.000	0.075	47.050	47.125	-26.875	74.000
9160.000	1.067	45.580	46.647	-27.353	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gateway
Test Item : Fundamental Radiated Emission
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (916MHz)

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
1816.800	39.835	-20.000	19.835	-34.165	54.000
2725.200	50.789	-20.000	30.789	-23.211	54.000
3633.600	48.145	-20.000	28.145	-25.855	54.000
4542.000	57.469	-20.000	37.469	-16.531	54.000
5450.400	44.820	-20.000	24.820	-29.180	54.000
6358.800	49.828	-20.000	29.828	-24.172	54.000
7267.200	48.981	-20.000	28.981	-25.019	54.000
8175.600	48.085	-20.000	28.085	-25.915	54.000
9084.000	46.587	-20.000	26.587	-27.413	54.000
Vertical					
Average Detector:					
1816.800	40.075	-20.000	20.075	-33.925	54.000
2725.200	40.519	-20.000	20.519	-33.481	54.000
3633.600	46.825	-20.000	26.825	-27.175	54.000
4542.000	57.029	-20.000	37.029	-16.971	54.000
5450.400	44.320	-20.000	24.320	-29.680	54.000
6358.800	50.948	-20.000	30.948	-23.052	54.000
7267.200	51.821	-20.000	31.821	-22.179	54.000
8175.600	47.125	-20.000	27.125	-26.875	54.000
9084.000	46.647	-20.000	26.647	-27.353	54.000

Note:

1. AVG Measurement=Peak Measurement - Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gateway
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
173.391	-11.480	44.800	33.320	-10.180	43.500
398.319	-7.832	44.631	36.799	-9.201	46.000
579.667	-4.170	42.907	38.737	-7.263	46.000
813.029	-0.863	42.469	41.607	-4.393	46.000
845.362	-0.346	41.999	41.653	-4.347	46.000
1000.000	1.620	44.169	45.789	-8.211	54.000
Vertical					
162.145	-10.754	30.823	20.069	-23.431	43.500
464.391	-6.399	30.053	23.654	-22.346	46.000
638.710	-3.323	30.537	27.214	-18.786	46.000
813.029	-0.863	33.684	32.822	-13.178	46.000
845.362	-0.346	32.958	32.612	-13.388	46.000
981.725	1.386	30.169	31.554	-22.446	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. Band Edge

4.1. Test Equipment

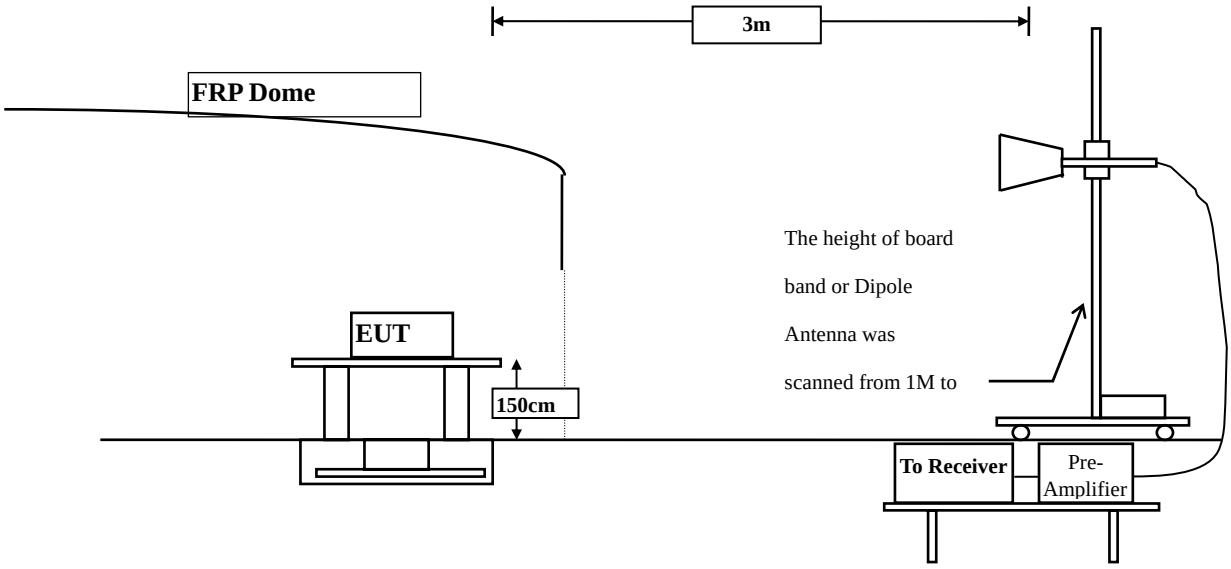
The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Last Cal.
☒CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct, 2015	Oct, 2016
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar, 2016	Mar, 2017
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan, 2016	Jan, 2017
	X	Horn Antenna	TRC	AH-0801/95051	Aug, 2016	Aug, 2017
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan, 2016	Jan, 2017
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul, 2016	Jul, 2017
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul, 2016	Jul, 2017

Note: 1. All equipments are calibrated every one year.

2. The test equipments marked by "X" are used to measure the final test results.

4.2. Test Setup



4.3. Limit

Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

4.4. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.
The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

4.5. Uncertainty

± 4.08 dB above 1GHz
± 4.22 dB below 1GHz

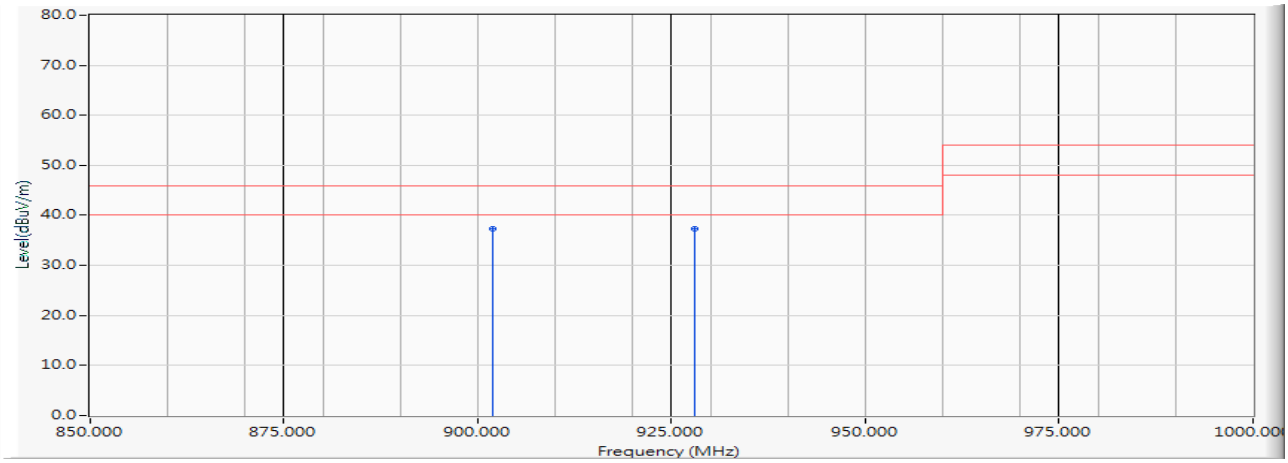
4.6. Test Result of Band Edge

Product : Gateway
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (908.4MHz)

RF Radiated Measurement (Horizontal):

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	6.040	31.260	37.299	46.000	Pass
02(Quasi-Peak)	928.000	6.052	31.220	37.272	46.000	Pass

Figure Channel 01: Horizontal (Quasi-Peak)



Note:

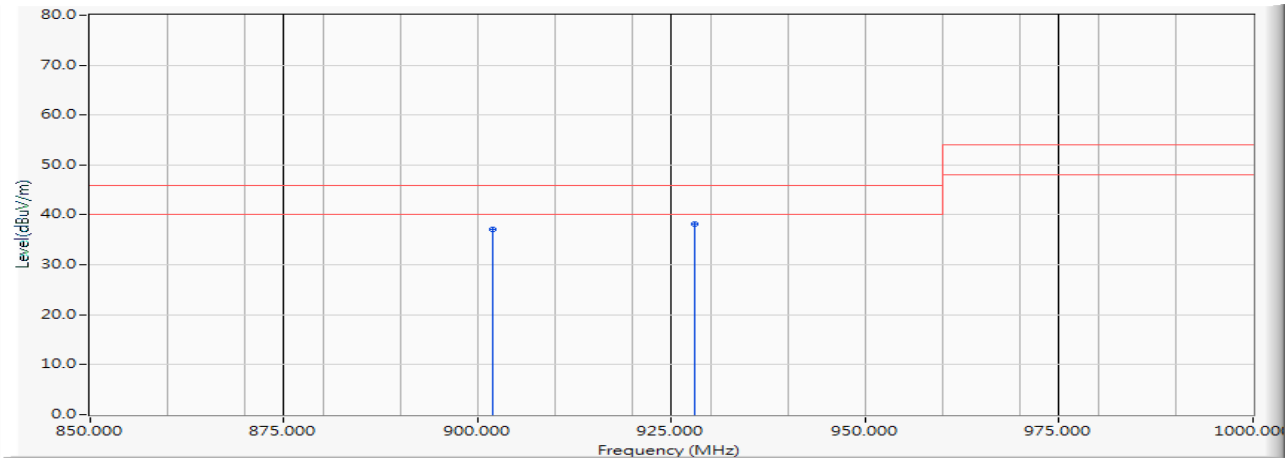
1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : Gateway
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (908.4MHz)

RF Radiated Measurement (Vertical):

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	6.040	31.120	37.159	46.000	Pass
02(Quasi-Peak)	928.000	6.052	32.160	38.212	46.000	Pass

Figure Channel 01: Vertical (Quasi-Peak)



Note:

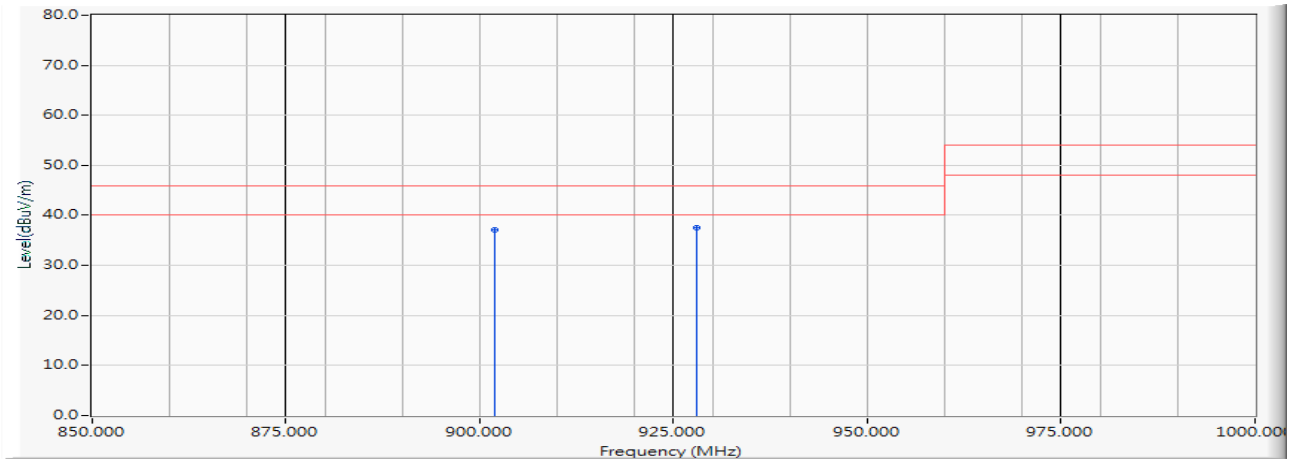
1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : Gateway
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (916MHz)

RF Radiated Measurement (Horizontal):

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	6.040	31.080	37.119	46.000	Pass
02(Quasi-Peak)	928.000	6.052	31.490	37.542	46.000	Pass

Figure Channel 01: Horizontal (Quasi-Peak)



Note:

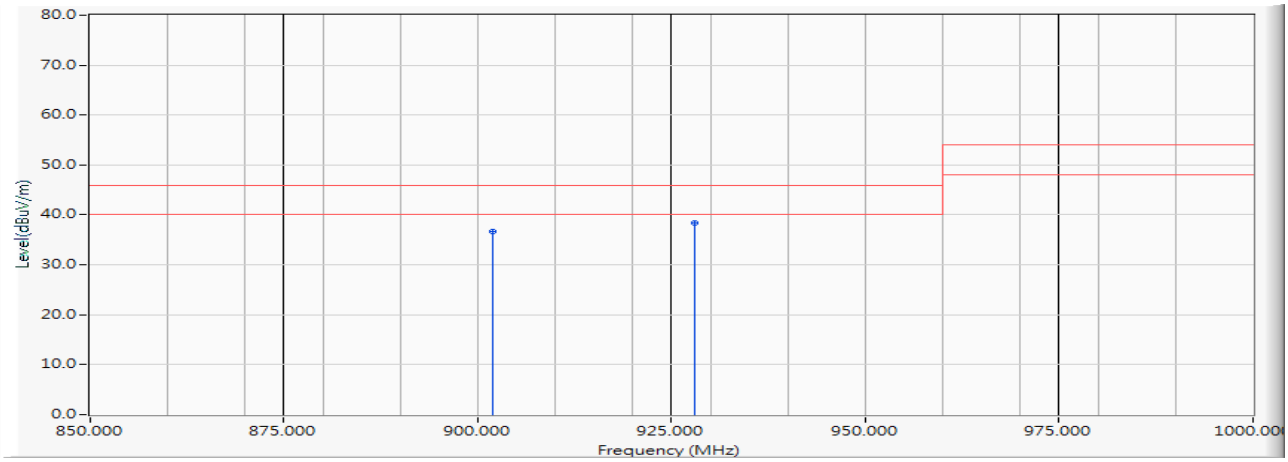
1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : Gateway
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (916MHz)

RF Radiated Measurement (Vertical):

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	6.040	30.640	36.679	46.000	Pass
02(Quasi-Peak)	928.000	6.052	32.290	38.342	46.000	Pass

Figure Channel 01: Vertical (Quasi-Peak)



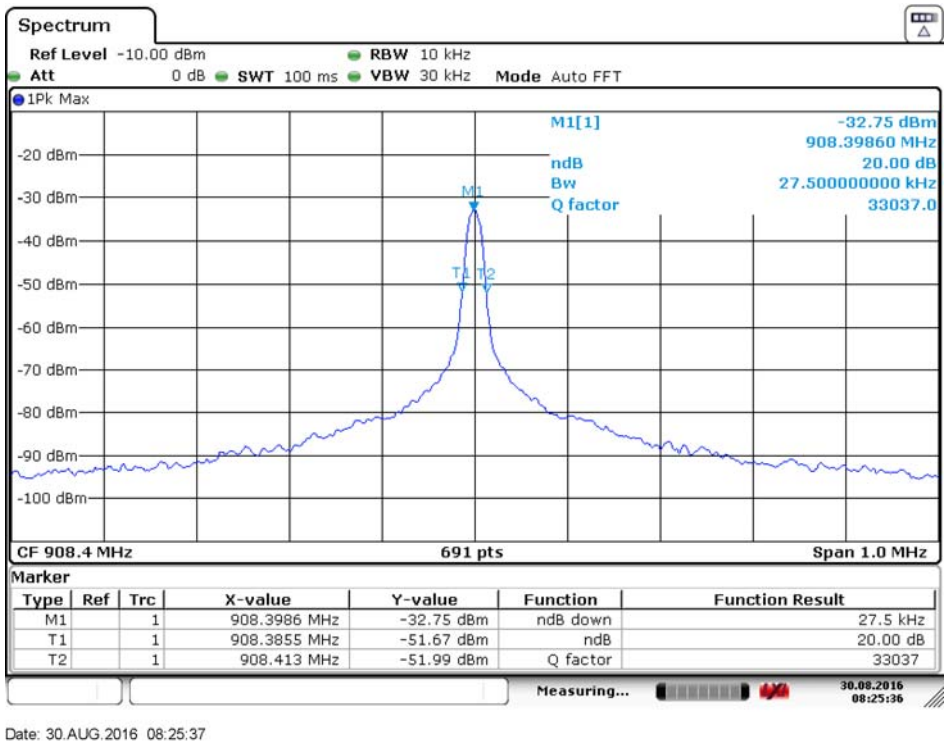
Note:

1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : Gateway
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (908.4MHz)

Test Frequency (MHz)	Measurement Level (20dB BW) (MHz)	Limit (MHz)	Result
908.4	908.3855	＞902	PASS

NOTE: Accordance with 15.215 requirement.

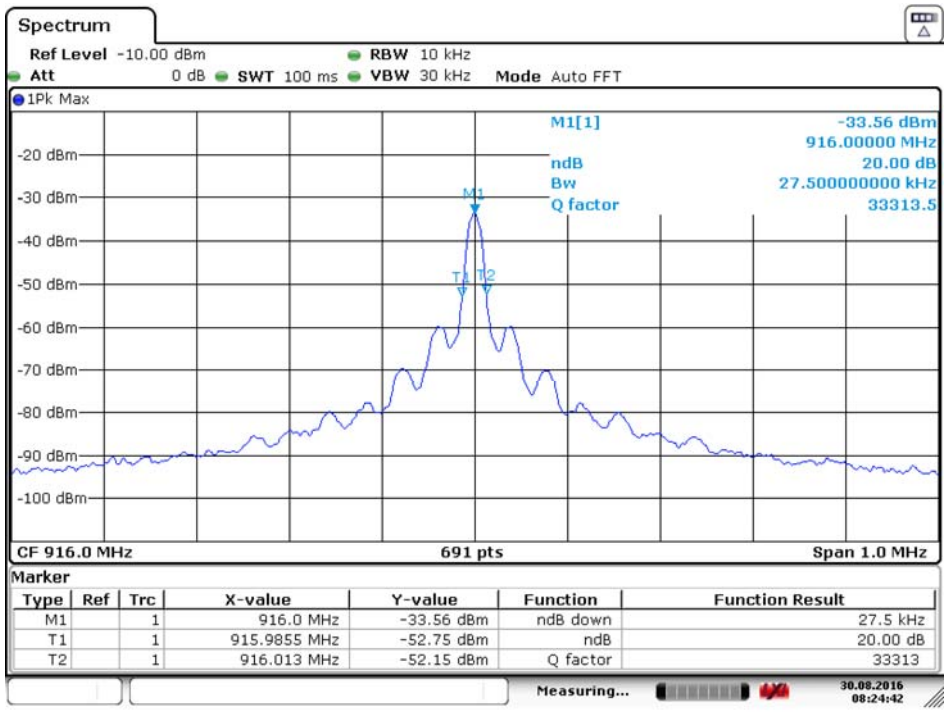


Date: 30.AUG.2016 08:25:37

Product : Gateway
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (916.2MHz)

Test Frequency (MHz)	Measurement Level (20dB BW) (MHz)	Limit (MHz)	Result
916.2	916.013	＜928	PASS

NOTE: Accordance with 15.215 requirement.



Date: 30.AUG.2016 08:24:43

5. Duty Cycle

5.1. Test Equipment

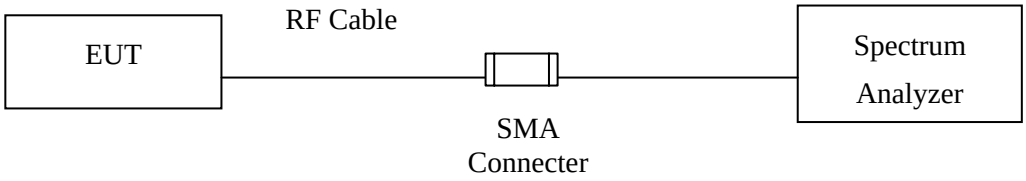
The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Last Cal.
X	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2016	Jun, 2017
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2016	Jun, 2017
	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016	Apr., 2017

Note: 1. All equipments are calibrated every one year.

2. The test equipments marked by "X" are used to measure the final test results.

5.2. Test Setup

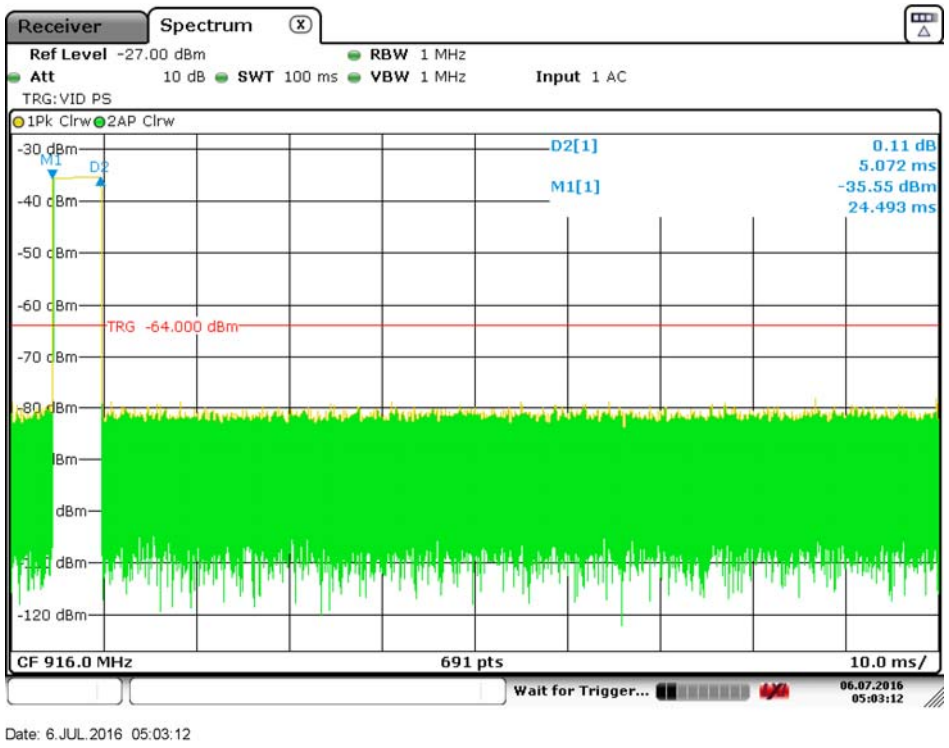


5.3. Uncertainty

± 2.31ms

5.4. Test Result of Duty Cycle

Product : Gateway
Test Item : Duty Cycle Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit



Time on of 100ms= 5.072 ms

Duty Cycle= 5.072ms / 100ms= 0.05072

Duty Cycle correction factor= 20 LOG 0.05072= -25.896 dB

Duty Cycle correction factor	**-25.896**	**dB**

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.