MEASUREMENT REPORT
FCC PART 15.249

FCC ID:	2ACH2-UFT
APPLICANT:	Universe Future Technology Co., Ltd.
Application Type:	Certification
Product:	UF Gateway
Model No.:	ZWG2000AG
Serial Model No.:	ZWG2100XX, ZWG3000XX, ZWG3100XX, ZWG4000XX, ZWG4100XX, ZWG5000XX, ZWG5100XX, ZWG6000XX, ZWG6100XX, ZWG7000XX, ZWG7100XX, ZWG8000XX, ZWG8100XX
FCC Classification:	Low Power Communication Device Transmitter (DXX)
FCC Rule Part(s):	Part 15.249
Test Procedure(s):	ANSI C63.10-2009
Test Date:	May 29 ~ June 01, 2014

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2009. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date
1405RSU02401	Rev. 01	Initial report	06-05-2014

CONTENTS

Description Page

§2.1033 General Information

Applicant:	Universe Future Technology Co., Ltd.
Applicant Address:	Room 1903, Building C, Shahe Holidy Plaza, Nanshan, Shenzhen, China
Manufacturer:	Universe Future Technology Co., Ltd.
Manufacturer Address:	Room 1903, Building C, Shahe Holidy Plaza, Nanshan, Shenzhen, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part 15.249
Model No.:	ZWG2000AG
Serial Model No.:	ZWG2100XX, ZWG3000XX, ZWG3100XX, ZWG4000XX, ZWG4100XX, ZWG5000XX, ZWG5100XX, ZWG6000XX, ZWG6100XX, ZWG7000XX, ZWG7100XX, ZWG8000XX, ZWG8100XX
FCC ID:	2ACH2-UFT
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Low Power Communication Device Transmitter (DXX)
Date(s) of Test:	May 29 ~ June 01, 2014
Test Report S/N:	1405RSU02401

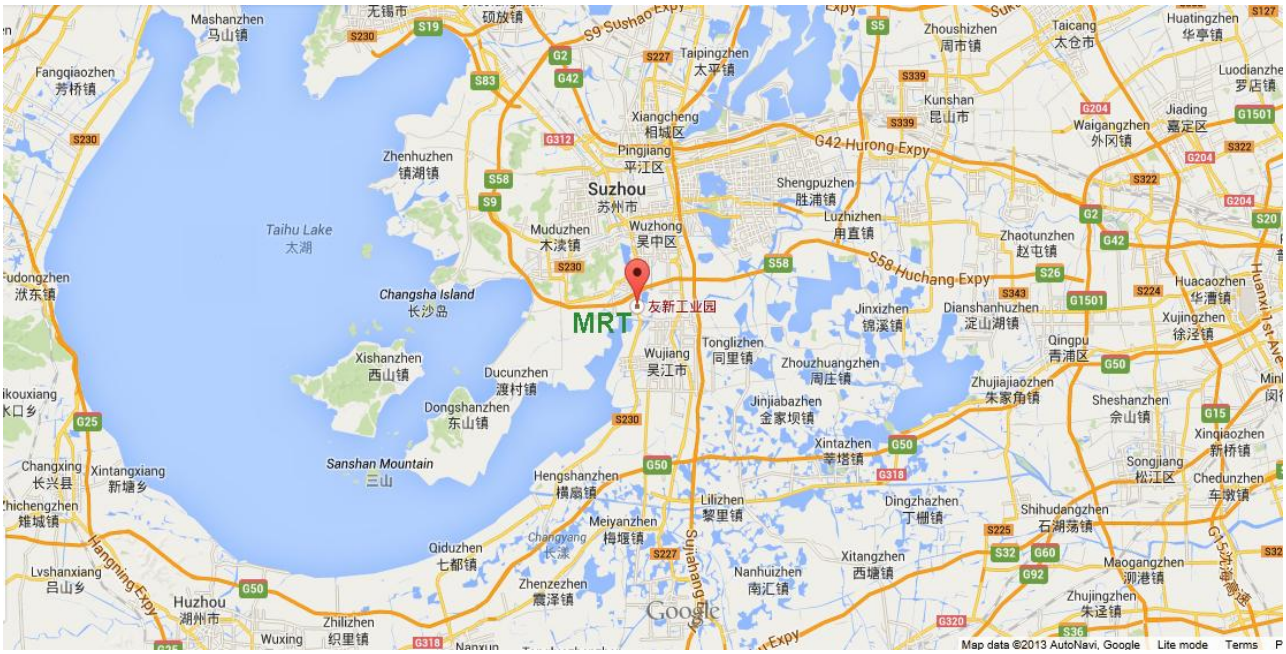
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	UF Gateway
Model No.	ZWG2000AG
Working Frequency	908.4 MHz
Type of Modulation	FSK
Antenna Type	Dipole Antenna
Antenna Gain	2.0dBi

2.2. Mode of Operation

All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit

2.3. Test Configuration

The **UF Gateway FCC ID: 2ACH2-UFT** was tested as described in this report is in compliance with the requirements limits of FCC Rules Part 15.207,15.209, 15.215 and 15.249. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.5. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

2.6. Test Software

The test unit set it at frequency under test by pressing the button on its right side.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009), and the requirements provided in FCC 15.207, 15.209, 15.215 and 15.249 were performed in the report of the **UF Gateway FCC ID: 2ACH2-UFT.**
Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.
The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.
An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2009 at Clause 4.3.
Line conducted emissions test results are shown in Section 7.2.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GH absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB BeamWidth of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The **UF Gateway** has an inverted connector to an external antenna.

Conclusion:

The **UF Gateway FCC ID: 2ACH2-UFT** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATA

Conducted Emissions

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	1 year	2014/11/08
Two-Line V-Network	R&S	ENV216	101683	1 year	2014/11/08
Two-Line V-Network	R&S	ENV216	101684	1 year	2014/11/08
Temperature/ Meter Humidity	Anymetre	TH101B	SR2-01	1 year	2014/11/15

Radiated Emission

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY5144016A	1 year	2015/01/04
Preamplifier	MRT	AP01G18	1310002	1 year	2014/12/14
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2014/11/24
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	1 year	2014/11/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2014/11/24
Broadband Horn Antenna	Schwarzbeck	BBHA9170	9170-549	1 year	2014/12/11
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	1 year	2014/11/15

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	1 year	2014/11/08
Power Sensor	Agilent	U2021XA	MY52450003	1 year	2014/12/14
Temperature/Humidity Meter	Anymetre	TH101B	TR3-01	1 year	2014/11/15

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: ± 3.46dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: ± 4.18dB 1GHz ~ 40GHz: ± 4.76dB

7. TEST RESULT

7.1. Summary

Company Name: **Universe Future Technology Co., Ltd.**

FCC ID: **2ACH2-UFT**

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.2
15.209 15.249	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.3
15.215(c)	Band Edge / Out-of-Band Emissions	≥ 20dBc(Peak)	Conducted	Pass	Section 7.4

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. Conducted Emission

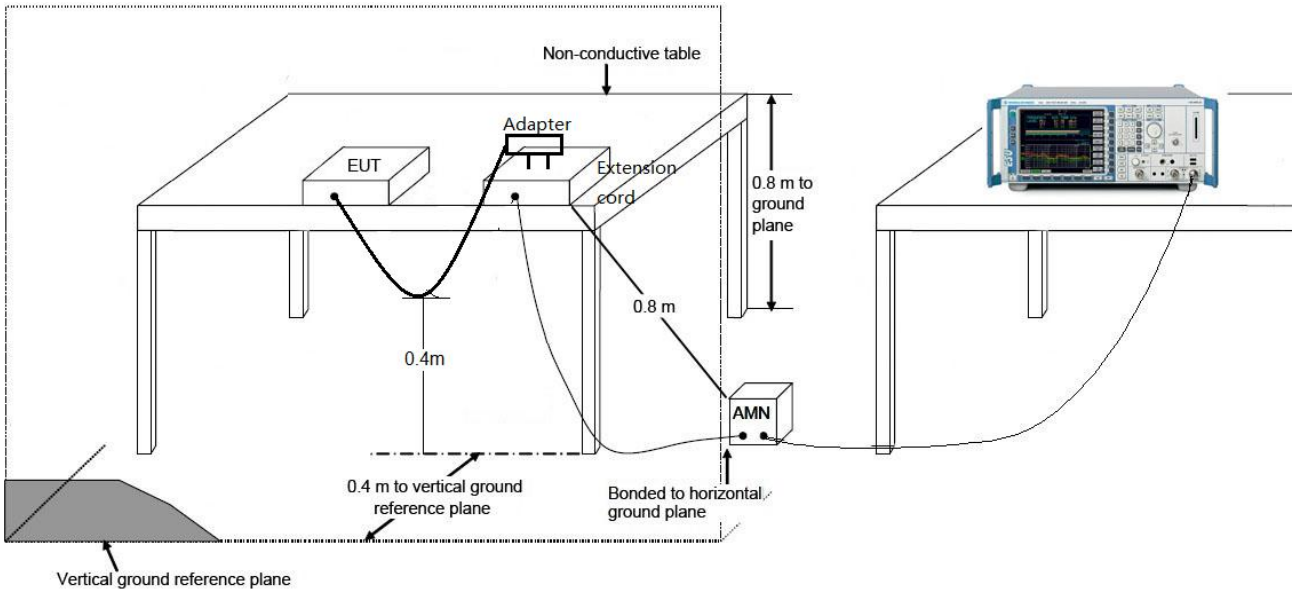
7.2.1. Test Limit

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

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

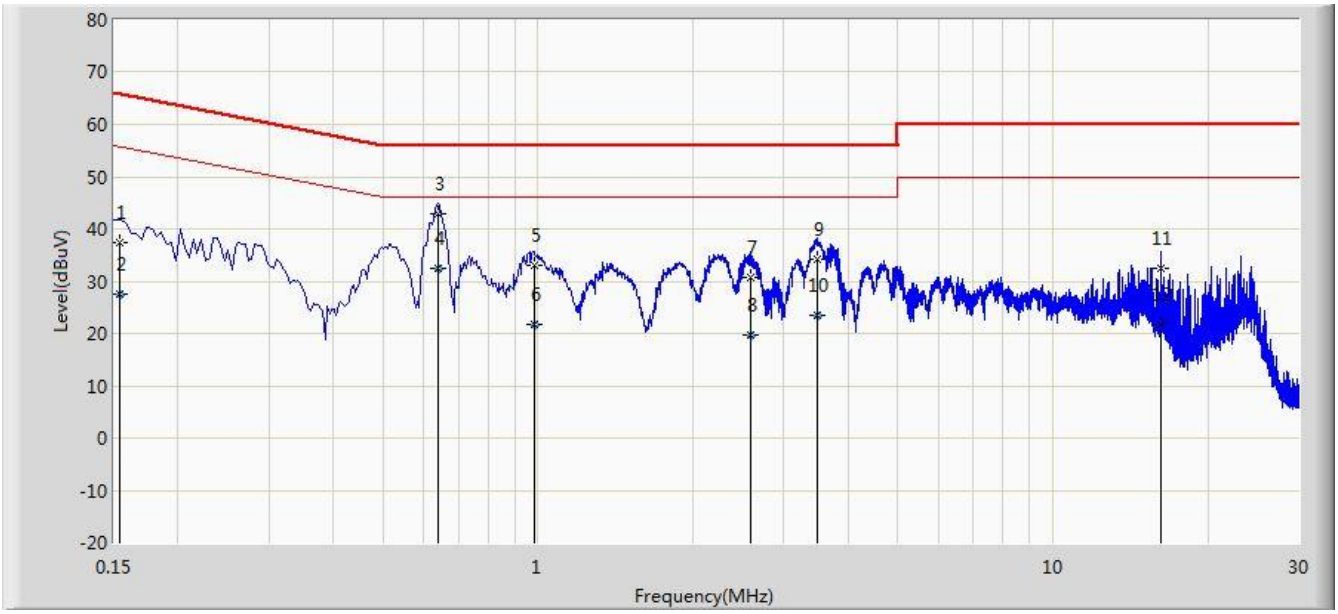
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

7.2.2. Test Setup



7.2.3. Test Result

Engineer: Milo Li	
Site: SR2	Time: 2014/05/28 - 21:36
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: UF Gateway	Power: AC 120V/60Hz
Note: Normal Operation	

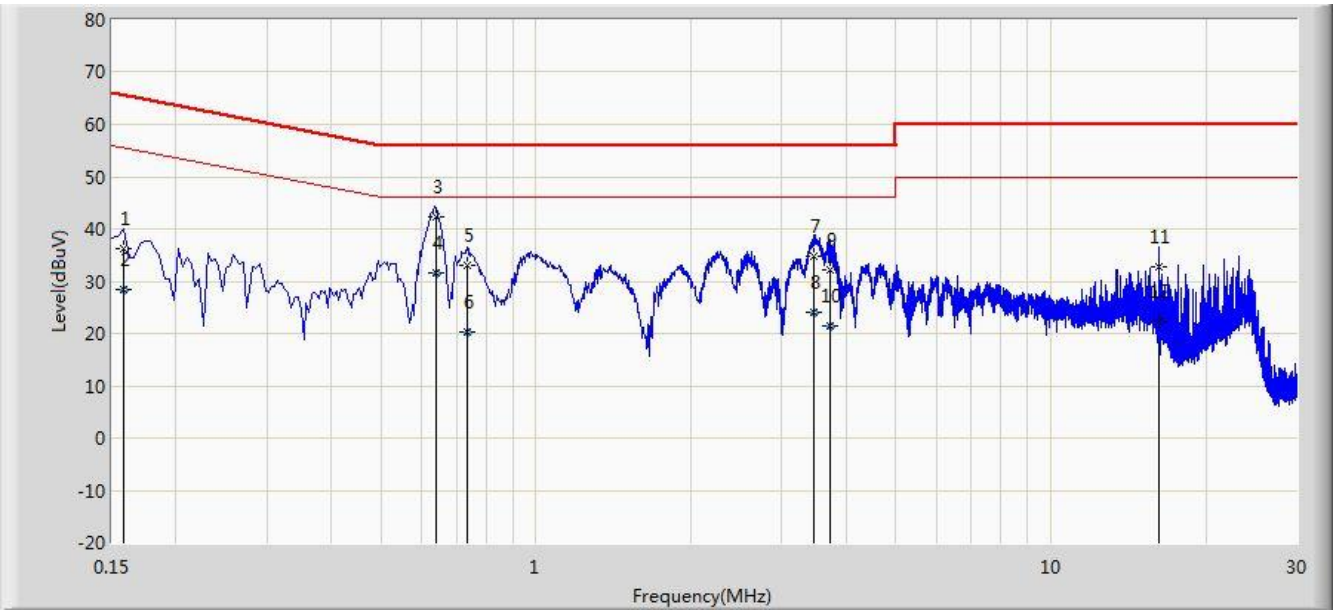


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor	Type
1			0.154	37.341	26.602	-28.440	65.781	10.740	QP
2			0.154	27.502	16.762	-28.280	55.781	10.740	AV
3		*	0.638	42.953	32.859	-13.047	56.000	10.095	QP
4			0.638	32.420	22.325	-13.580	46.000	10.095	AV
5			0.982	32.945	23.028	-23.055	56.000	9.917	QP
6			0.982	21.732	11.814	-24.268	46.000	9.917	AV
7			2.582	30.628	20.775	-25.372	56.000	9.853	QP
8			2.582	19.581	9.727	-26.419	46.000	9.853	AV
9			3.490	34.261	24.354	-21.739	56.000	9.907	QP
10			3.490	23.616	13.709	-22.384	46.000	9.907	AV
11			16.166	32.329	22.254	-27.671	60.000	10.075	QP
12			16.166	21.877	11.803	-28.123	50.000	10.075	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Engineer: Milo Li	
Site: SR2	Time: 2014/05/28 - 21:44
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: UF Gateway	Power: AC 120V/60Hz
Note: Normal Operation	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor	Type
1			0.158	36.366	26.077	-29.202	65.568	10.290	QP
2			0.158	28.382	18.092	-27.187	55.568	10.290	AV
3		*	0.638	42.415	32.305	-13.585	56.000	10.110	QP
4			0.638	31.594	21.484	-14.406	46.000	10.110	AV
5			0.734	32.998	22.943	-23.002	56.000	10.056	QP
6			0.734	20.332	10.276	-25.668	46.000	10.056	AV
7			3.458	34.656	24.745	-21.344	56.000	9.911	QP
8			3.458	24.040	14.129	-21.960	46.000	9.911	AV
9			3.734	32.202	22.242	-23.798	56.000	9.960	QP
10			3.734	21.437	11.477	-24.563	46.000	9.960	AV
11			16.226	32.751	22.632	-27.249	60.000	10.120	QP
12			16.226	22.438	12.319	-27.562	50.000	10.120	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

7.3. Radiated Emission

7.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (uV/m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-80	100**	3
80-216	150**	3
216-960	200**	3
Above 960	500	3

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

Note 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.

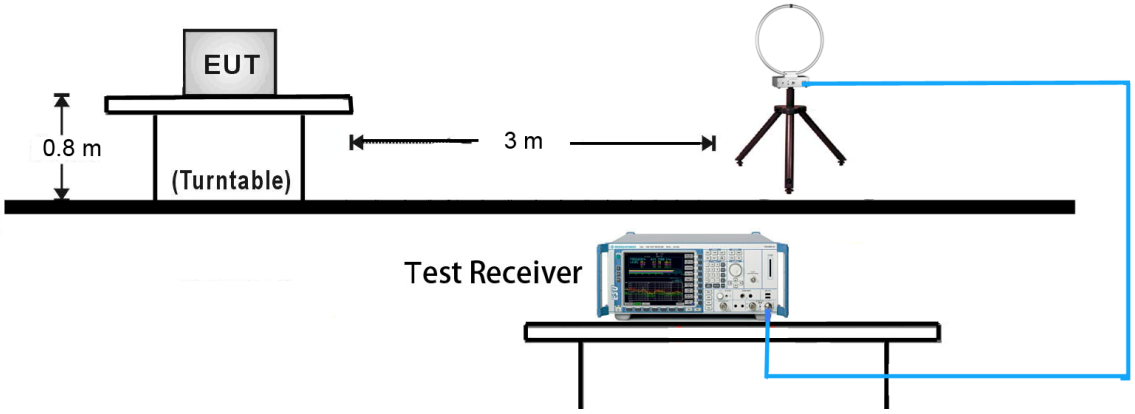
Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m).

FCC Part 15 Subpart C Paragraph 15.249		
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
24.0-24.25(GHz)	250	2500

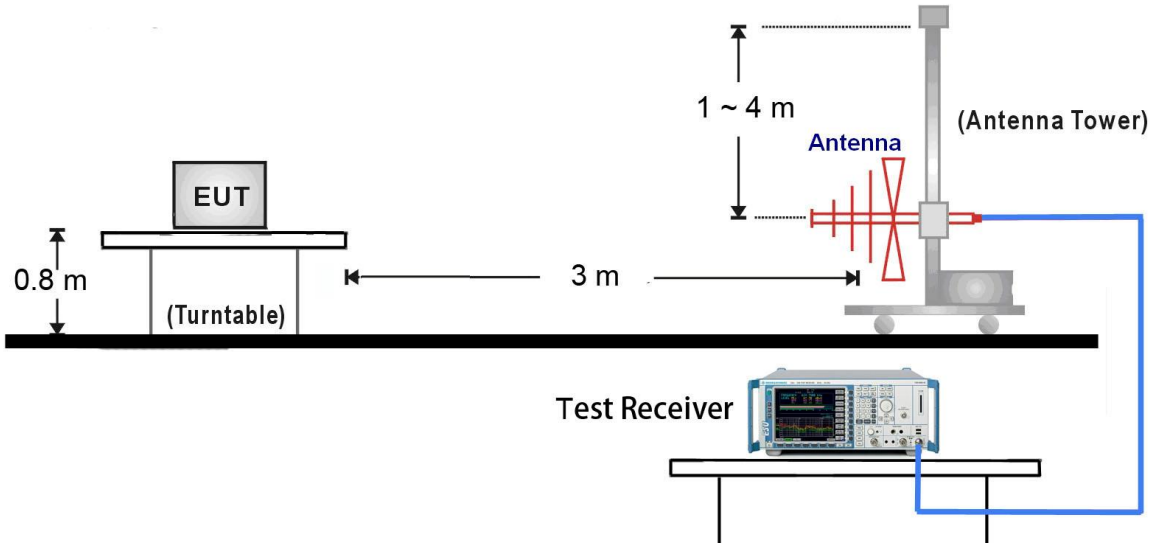
FCC Part 15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

7.3.2. Test Setup

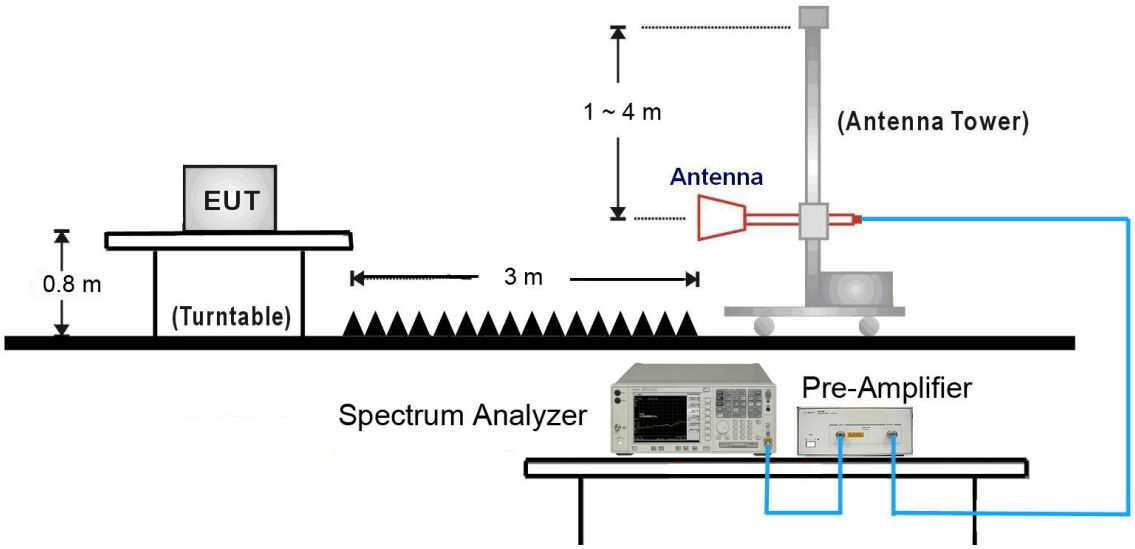
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 10GHz Test Setup:



7.3.3. Test Result

Test Mode:	Transmission	Test Site:	AC1
Test Channel:	00	Test Engineer:	Milo Li
Remark:	Fundamental Radiated Emission		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
908.4	55.55	23.37	78.92	114.0	-35.08	Peak	Horizontal
	54.35	23.37	77.72	94.0	-16.28	AV	Horizontal
	49.30	23.37	72.67	114.0	-41.33	Peak	Vertical
	47.80	23.37	71.17	94.0	-22.83	AV	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Test Mode:	Transmission	Test Site:	AC1
Test Channel:	00	Test Engineer:	Milo Li
Remark:	**Harmonic** Radiated Emission		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1816.8	44.71	-7.28	37.43	74	-36.57	PK	Horizontal
1816.8	29.45	-7.28	22.17	54	-31.83	AV	Horizontal
1816.8	44.17	-7.28	36.89	74	-37.11	PK	Vertical
1816.7	30.21	-7.28	22.93	54	-31.07	AV	Vertical
2725.2	43.39	-3.14	40.25	74	-33.75	PK	Horizontal
2725.2	30.59	-3.14	27.45	54	-26.55	AV	Horizontal
2725.2	42.82	-3.14	39.68	74	-34.32	PK	Vertical
2725.2	29.56	-3.14	26.42	54	-27.58	AV	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre Amplifier Gain (dB)

Test Mode:	Transmission	Test Site:	AC1
Test Channel:	00	Test Engineer:	Roy Cheng
Remark:	**The worst case of General Radiated Emission**		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
171.5	31.40	10.02	41.42	43.5	-2.08	QP	Horizontal
152.2	24.40	9.25	33.65	43.5	-9.85	QP	Vertical
336.5	25.50	15.11	40.61	46.0	-5.39	QP	Horizontal
171.4	26.70	10.02	36.72	43.5	-6.78	QP	Vertical
2258.0	44.95	-3.92	41.03	74.0	-32.97	PK	Horizontal
2198.5	45.10	-4.13	40.97	74.0	-33.03	PK	Vertical
5462.5	42.92	2.74	45.66	74.0	-28.34	PK	Horizontal
4332.0	42.93	0.59	43.52	74.0	-30.48	PK	Vertical

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre Amplifier Gain (dB)

Note 2: The test trace is same as the ambient noise (the test frequency range: 9kHz ~ 30MHz), therefore no data appear in the report.

7.4. Band-edge Compliance of RF Conducted Emissions

7.4.1. Test Limit

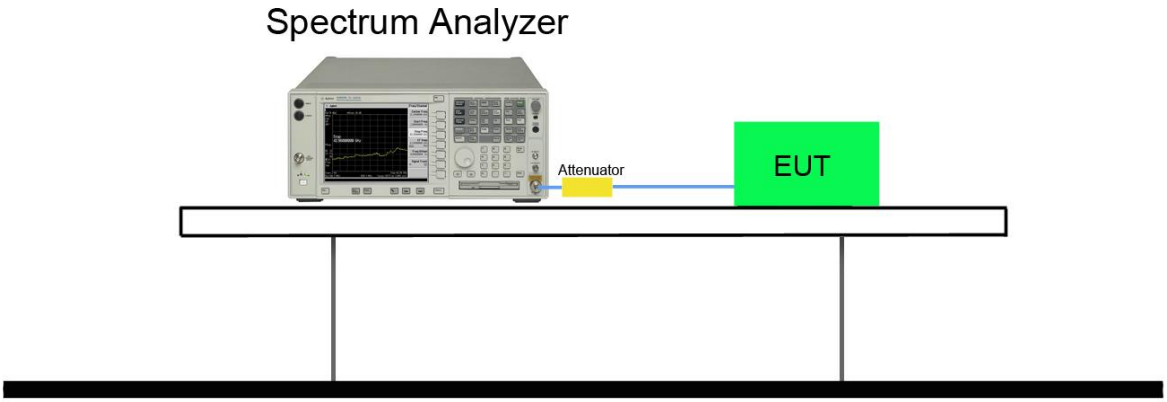
FCC Part 15.215 (c), Intentional radiators operating under the alternative provisions to the general emission limits as contained in 15.217 through 15.257 and in Subpart E of FCC part 15, must be designed to ensure that 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

7.4.2. Test Procedure

Use the following spectrum analyzer settings:

1. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
2. RBW ≧ 1% of the span
3. VBW ≧ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold
7. Allow the trace to stabilize. Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.
8. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

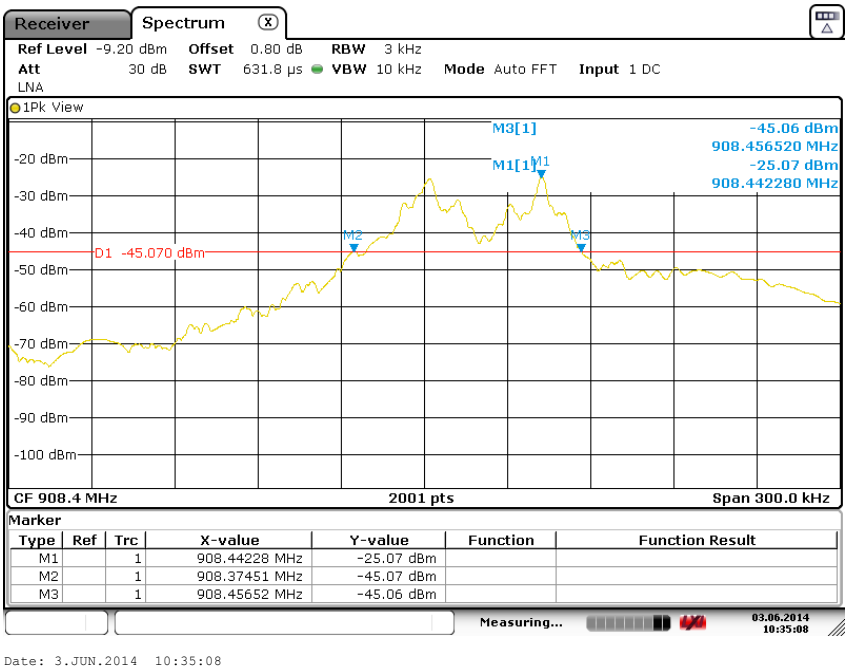
7.4.3. Test Setup



7.4.4. Test Result

Product:	UF Gateway	Test Site:	AC1
Test Channel:	00	Test Engineer:	Milo Li
Test Item:	**Band-edge Compliance of RF Conducted Emissions for FCC Part15.215**		

Band-edge Compliance of RF Conducted Emissions
Channel 00 (908.4MHz)



8. CONCLUSION

The data collected relate only the item(s) tested and show that the **UF Gateway FCC ID:**

2ACH2-UFT is in compliance with Part 15C of the FCC Rules.

The End