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Report No.: 1506RSU01503
Report Version: V01
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MEASUREMENT REPORT

FCC Part 15B

FCC ID: SFK-WF96A

APPLICANT: CIG Shanghai Co., Ltd.,

Application Type: Certification

Product: WF-96A 802.11ac 2x2 5G CPE

Model No.: WF-196A

FCC Classification: FCC Class B Digital Device (JBP)

FCC Rule Part(s): FCC Part 15 Subpart B

Test Procedure(s): ANSI C63.4: 2014

Test Date: July 25 ~ 30, 2014

Reviewed By :
(Robin Wu)

Approved By :
(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 C63.4-2014. Test results reported herein relate only to the item(s) tested.

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Revision History

Report No.	Version	Description	Issue Date
1506RSU01503	Rev. 01	Initial report	08-04-2015

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§2.1033 General Information

Applicant:	CIG Shanghai Co., Ltd.,
Applicant Address:	F/5, 8 Building No.2388 Chenhang Road, Minhang District, Shanghai
Manufacturer:	CIG Shanghai Co., Ltd.,
Manufacturer Address:	F/5, 8 Building No.2388 Chenhang Road, Minhang District, Shanghai
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 FCC Registration No.:	809388
Model No.:	WF-96A
FCC ID:	SFK-WF96A
Test Device Serial No.:	N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
FCC Classification:	FCC Class B Digital Device (JBP)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



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	WF-96A 802.11ac 2x2 5G CPE
Model No.	WF-96A
Frequency Range	For 5.0GHz Band: For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5775MHz
Type of Modulation	802.11 a/n/ac: OFDM

2.2. Description of Support Units

The EUT has been tested with associated equipment below:

Description	Manufacturer	Model No.
POE	Supply by MRT	PD-3501G/AC

2.3. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	Tx Paths	Max Peak Gain (dBi)	Beam Forming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
PCB Antenna	5	2	16	19	16	19

Note:

1. Transmit at 5GHz support two antennas.
2. The EUT supports Beam Forming mode & CDD Mode.

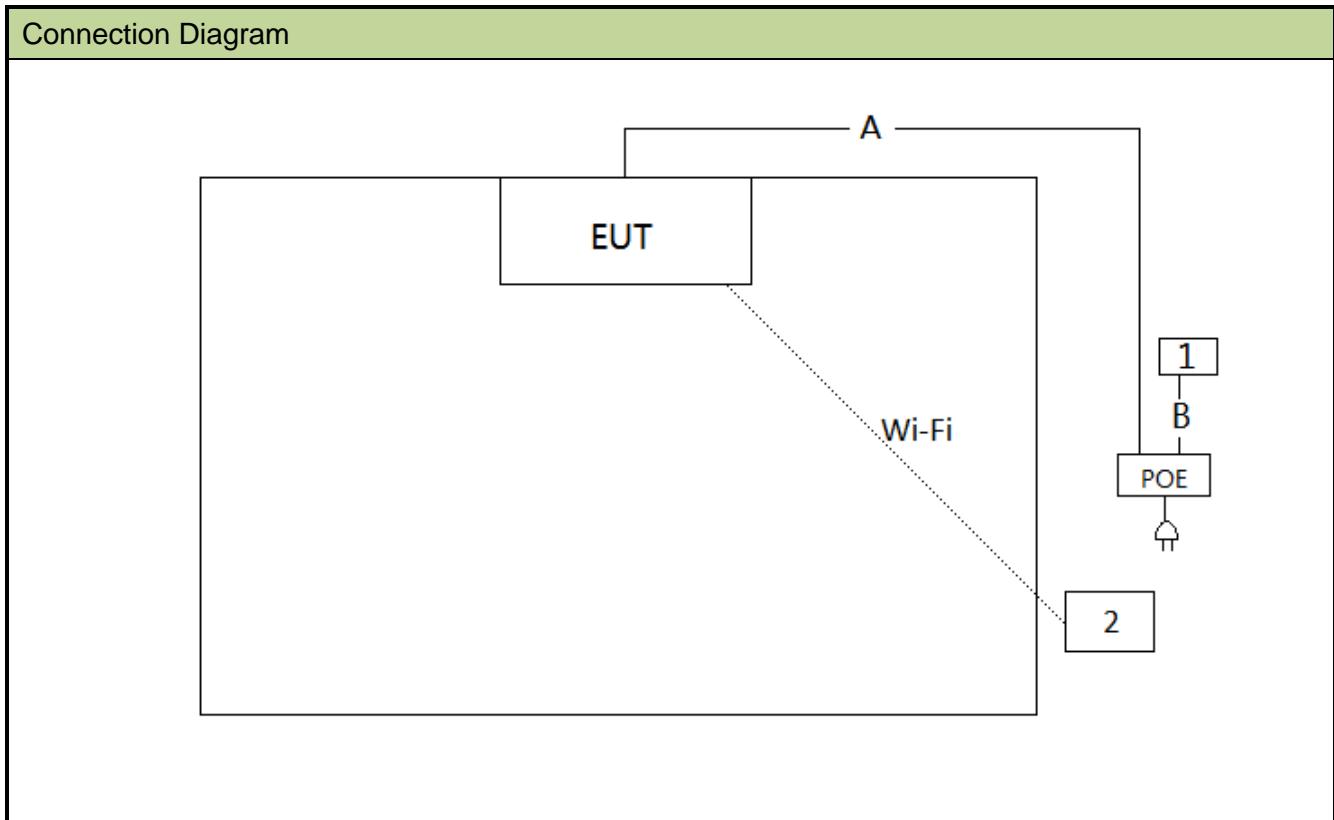
2.4. Device Capabilities

This device contains the following capabilities:

5GHz (UNII Devices)

2.5. Test Configuration

The WF-96A 802.11ac 2x2 5G CPE FCC ID: SFK-WF96A was tested per the guidance FCC Part 15 Subpart B: 2013 and ANSI C63.4: 2014 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.



Signal Cable Type		Signal cable Description		
A	LAN Cable	Non-shielding, >10m		
B	LAN Cable	Non-shielding, 2m		
Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Lenovo	E430c	MP-4CFX213/10	Non-Shielded, 1.8m
2	Lenovo	X201	3626AM3	Non-Shielded, 1.8m

2.6. Test Software

Not applicable.

2.7. EMI Suppression Device(s)/Modifications

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

2.8. 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.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2014) was used in the measurement of the **WF-96A 802.11ac 2x2 5G CPE** **FCC ID: SFK-WF96A**.

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. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to 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 150 kHz to 30 MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9 kHz. 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 resolution, clock or data exchange speed, scrolling H pattern to the EUT and/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 are used for final measurements on the same test site. Line conducted emissions test results are shown in Section 6.2.

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 1GHz 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. An 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 30 MHz 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 30 MHz, 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, mode of operation, 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 beam-width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2015/11/07
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06114	1 year	2015/11/20

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2015/10/09
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Preamplifier	Agilent	83017A	MRTSUE06020	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06115	1 year	2015/11/20

Software	Version	Function
e3	V8.3.5	EMI Test Software

5. 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% ($U=2U_{c(y)}$): 150kHz~30MHz: 3.5dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): Horizontal: 30MHz~1GHz: 4.07dB 1GHz~18GHz: 4.16 dB Vertical: 30MHz~1GHz: 4.18 dB 1GHz~18GHz: 4.76 dB

6. TEST RESULT

6.1. Summary

Product Name: WF-96A 802.11ac 2x2 5G CPE
FCC ID: SFK-WF96A
FCC Classification: FCC Class B Digital Device (JBP)
Test Mode: Communication

FCC Part Section(s)	Test Description	Test Result
15.107	Conducted Emissions	Pass
15.109	Radiated Emissions	Pass

6.2. Conducted Emission Measurement

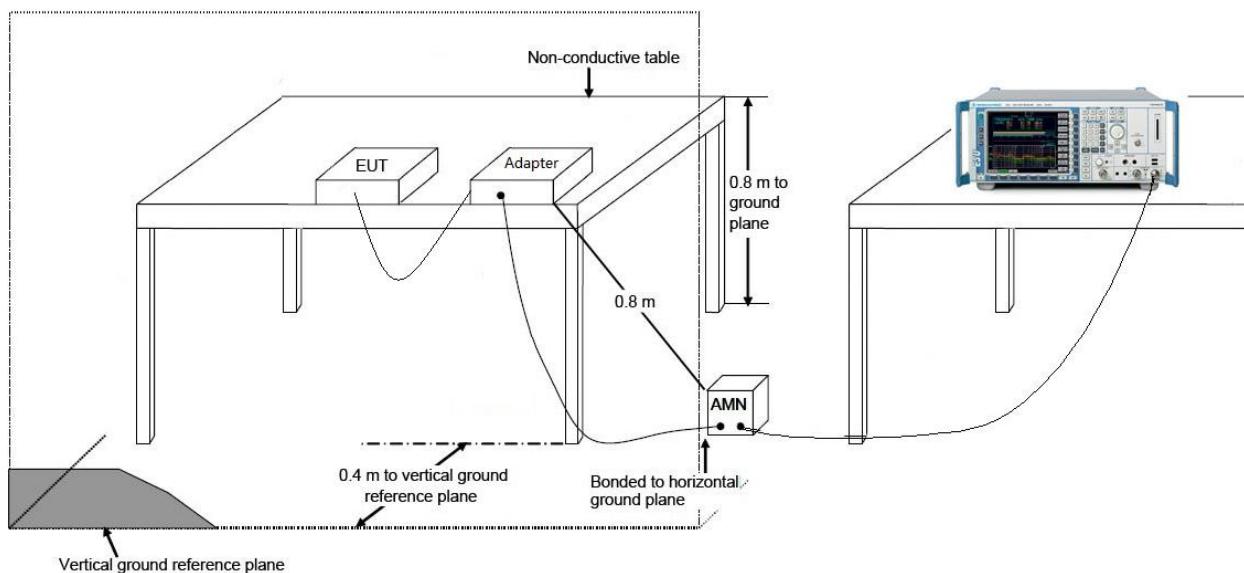
6.2.1. Test Limit

FCC Part 15.107 Limits		
Frequency (MHz)	QP (dB μ V)	AV (dB μ V)
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.

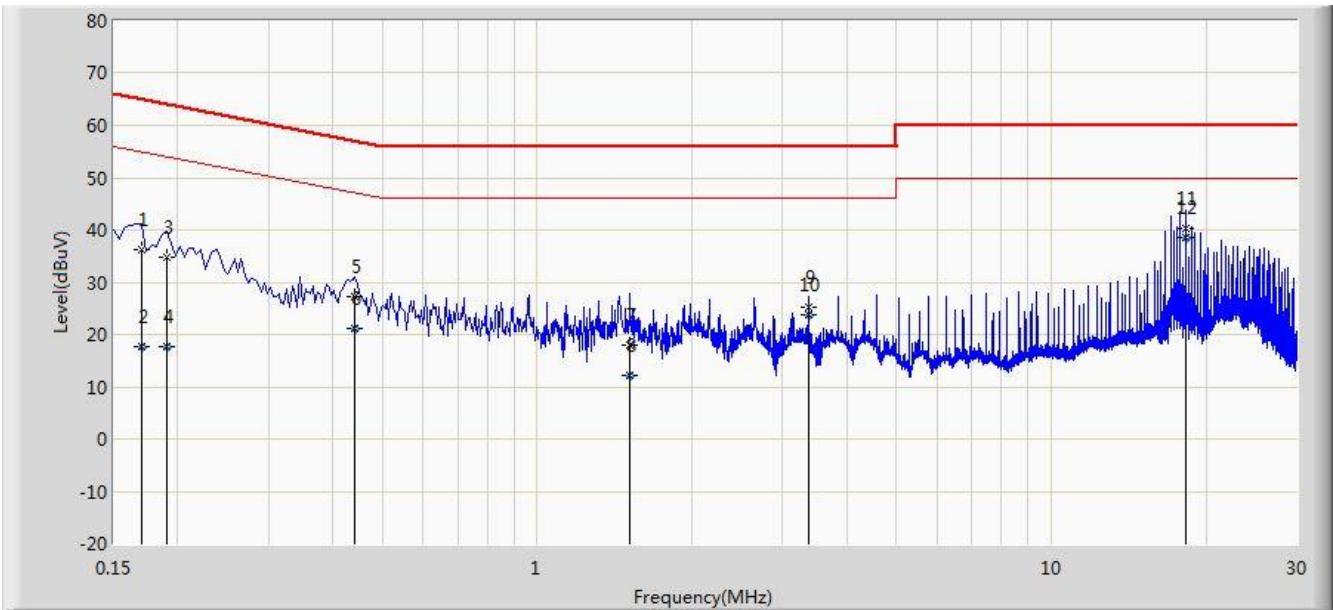
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.2.2. Test Setup



6.2.3. Test Result of Conducted Emissions

Site: SR2	Time: 2015/07/29 - 16:54
Limit: FCC_Part15.107_CE_ClassB	Engineer: Roy Cheng
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: WF-96A 802.11ac 2x2 5G CPE	Power: AC 120V/60Hz
Test Mode: Communication With Notebook	

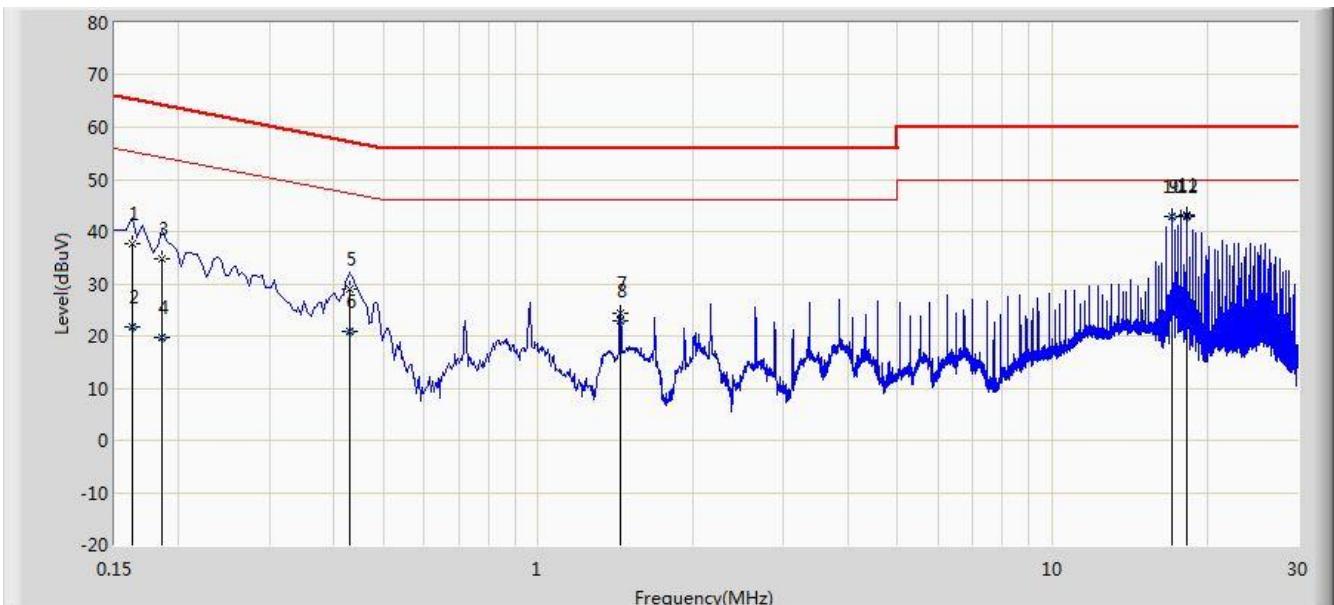


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V)	Factor (dB)	Type
1			0.170	36.179	26.101	-28.782	64.960	10.078	QP
2			0.170	17.560	7.483	-37.400	54.960	10.078	AV
3			0.190	34.822	24.793	-29.215	64.037	10.029	QP
4			0.190	17.705	7.676	-36.331	54.037	10.029	AV
5			0.442	27.182	17.062	-29.842	57.024	10.120	QP
6			0.442	21.278	11.159	-25.746	47.024	10.120	AV
7			1.514	17.856	7.969	-38.144	56.000	9.888	QP
8			1.514	12.051	2.163	-33.949	46.000	9.888	AV
9			3.366	25.178	15.281	-30.822	56.000	9.897	QP
10			3.366	23.819	13.922	-22.181	46.000	9.897	AV
11			18.274	40.165	30.064	-19.835	60.000	10.101	QP
12	*		18.274	38.519	28.418	-11.481	50.000	10.101	AV

Note: Measure Level (dB μ V) = Reading Level (dB μ V) + Factor (dB)

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

Site: SR2	Time: 2015/07/29 - 17:00
Limit: FCC_Part15.107_CE_ClassB	Engineer: Roy Cheng
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: WF-96A 802.11ac 2x2 5G CPE	Power: AC 120V/60Hz
Test Mode: Communication With Notebook	



No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V)	Factor (dB)	Type
1			0.162	37.559	27.481	-27.802	65.361	10.078	QP
2			0.162	21.632	11.553	-33.729	55.361	10.078	AV
3			0.186	34.746	24.711	-29.467	64.213	10.035	QP
4			0.186	19.834	9.799	-34.379	54.213	10.035	AV
5			0.430	28.933	18.798	-28.320	57.253	10.135	QP
6			0.430	20.783	10.648	-26.470	47.253	10.135	AV
7			1.442	24.455	14.562	-31.545	56.000	9.892	QP
8			1.442	22.947	13.055	-23.053	46.000	9.892	AV
9			17.078	43.033	32.908	-16.967	60.000	10.126	QP
10	*		17.078	42.907	32.781	-7.093	50.000	10.126	AV
11			18.278	43.123	32.985	-16.877	60.000	10.138	QP
12			18.278	42.838	32.700	-7.162	50.000	10.138	AV

Note: Measure Level (dB μ V) = Reading Level (dB μ V) + Factor (dB)

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

6.3. Radiated Emission Measurement

6.3.1. Test Limit

FCC Part 15.109 Limits		
Frequency (MHz)	Distance (m)	Level (dB μ V/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

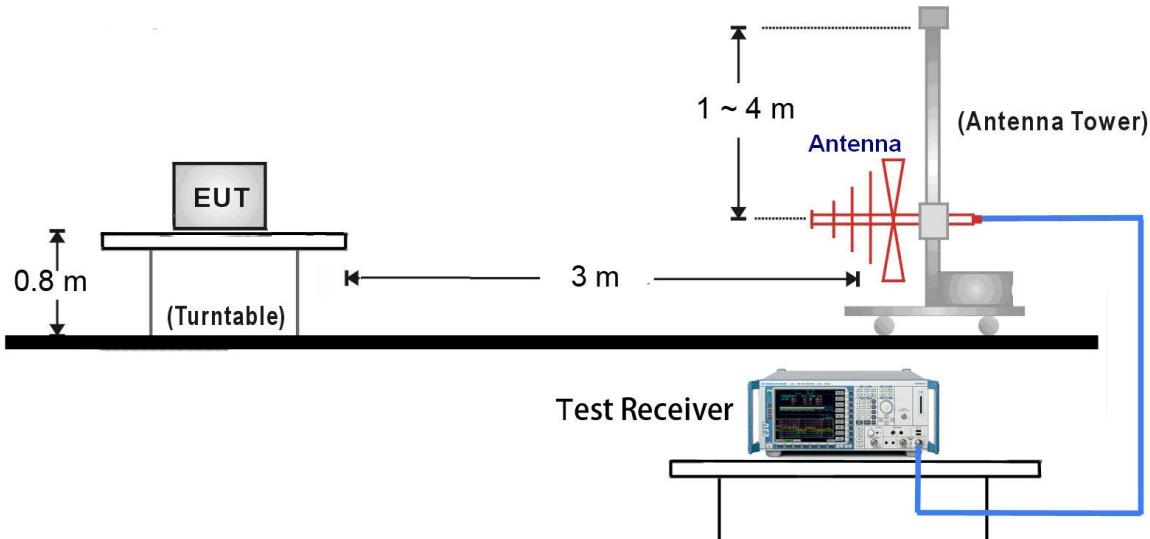
Note 1: The lower limit shall apply at the transition frequency.

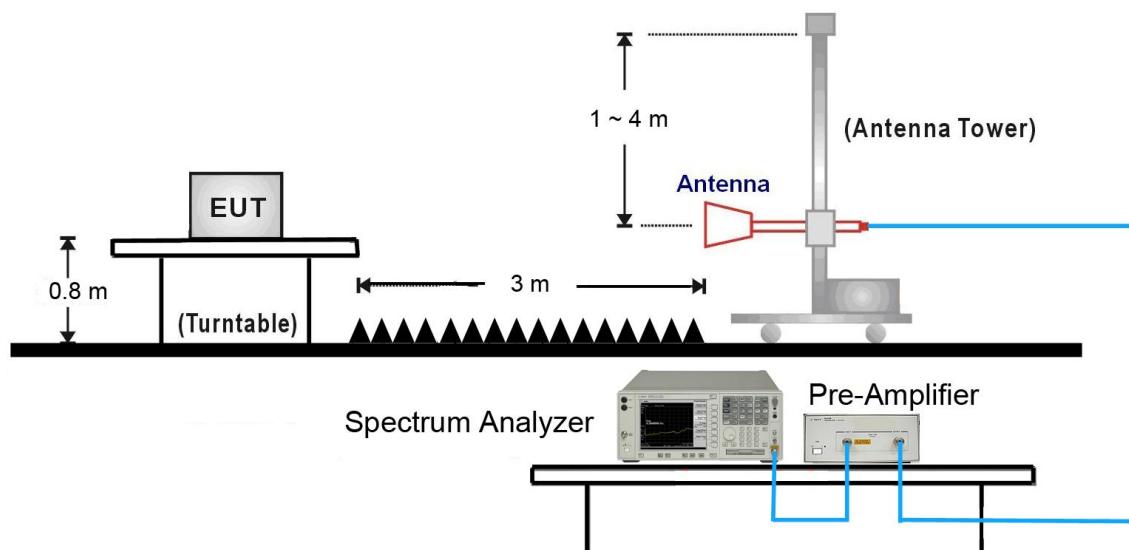
Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dB μ V/m) = 20 log E field strength (uV/m)

6.3.2. Test Setup

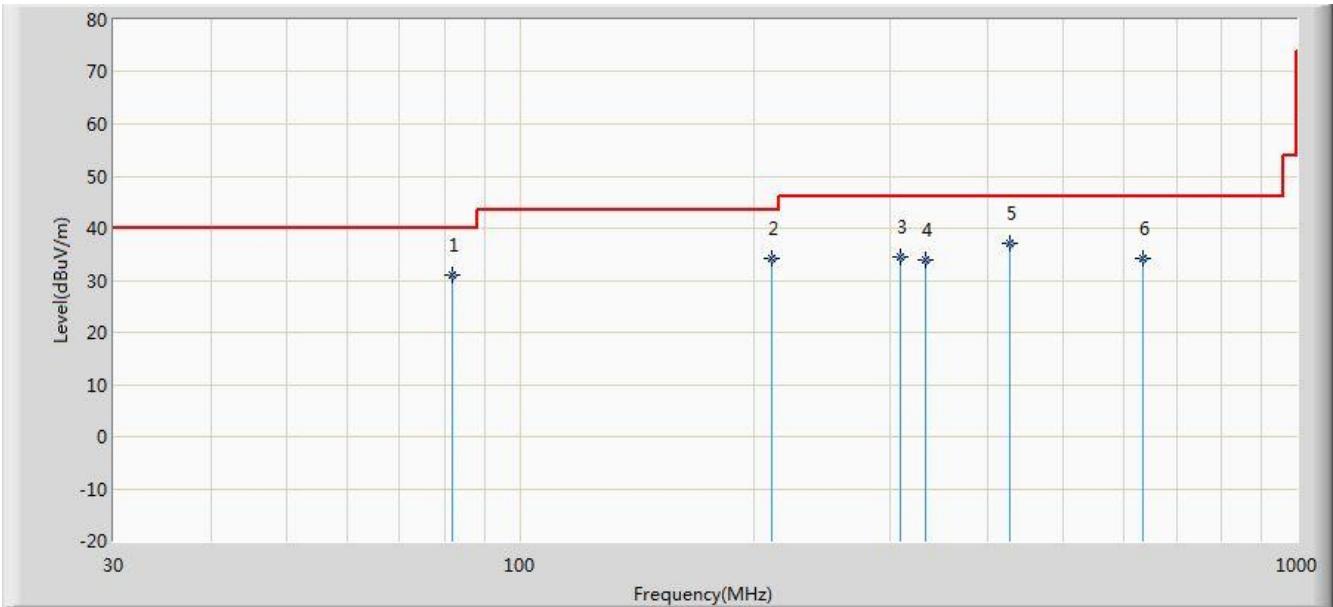
30MHz ~ 1GHz Test Setup:



1GHz ~18GHz Test Setup:

6.3.3. Test Result of Radiated Emissions

Site: AC1	Time: 2015/07/29 - 16:21
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: WF-96A 802.11ac 2x2 5G CPE	Power: AC 120V/60Hz
Test Mode: Communication With Notebook	

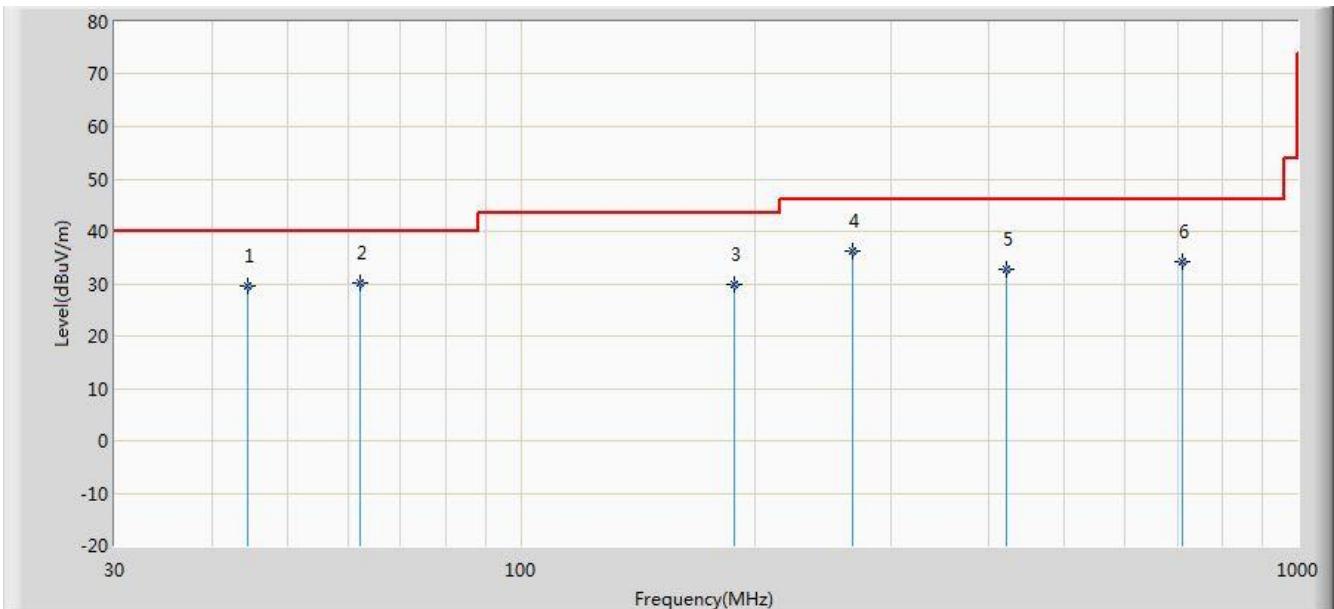


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1			81.895	30.926	21.300	-9.074	40.000	9.626	QP
2			210.905	34.305	21.900	-9.195	43.500	12.405	QP
3			308.390	34.412	19.700	-11.588	46.000	14.712	QP
4			333.125	33.807	18.400	-12.193	46.000	15.406	QP
5		*	427.700	37.138	20.100	-8.862	46.000	17.038	QP
6			633.340	34.147	13.800	-11.853	46.000	20.347	QP

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

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

Site: AC1	Time: 2015/07/29 - 16:23
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: WF-96A 802.11ac 2x2 5G CPE	Power: AC 120V/60Hz
Test Mode: Communication With Notebook	

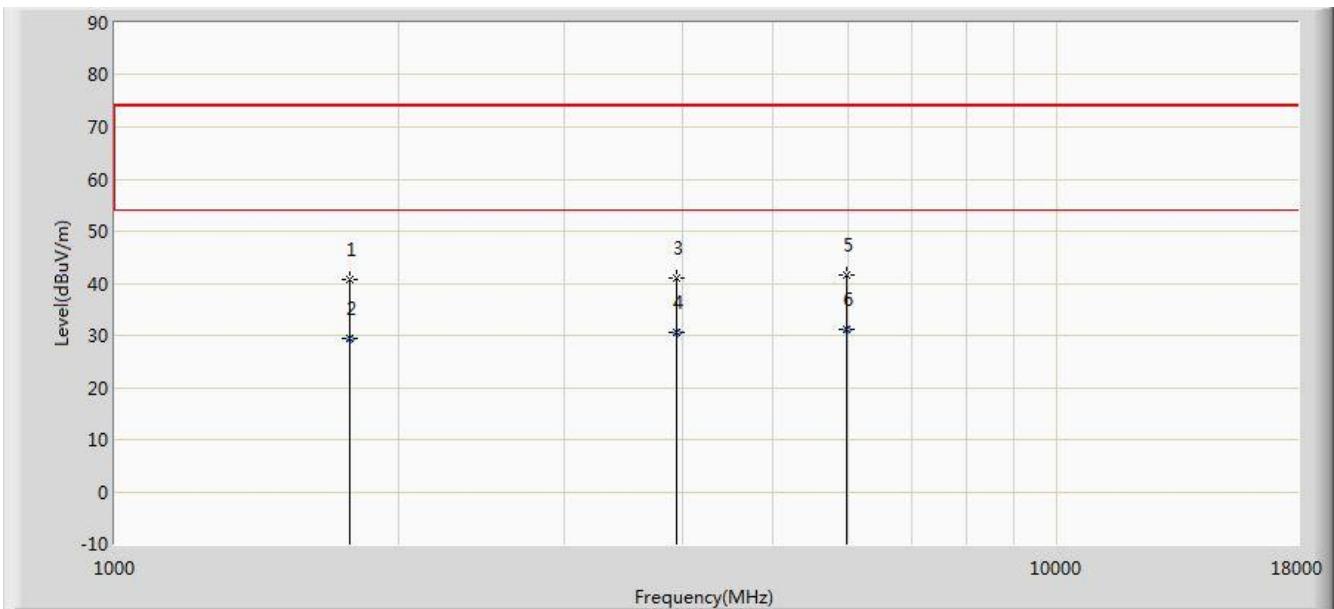


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			44.550	29.507	14.800	-10.493	40.000	14.707	QP
2			62.010	30.205	16.700	-9.795	40.000	13.505	QP
3			188.110	29.803	18.200	-13.697	43.500	11.603	QP
4	*		267.650	36.368	22.400	-9.632	46.000	13.968	QP
5			420.910	32.753	15.800	-13.247	46.000	16.953	QP
6			709.970	34.215	12.600	-11.785	46.000	21.615	QP

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

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

Site: AC1	Time: 2015/07/29 - 16:11
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: WF-96A 802.11ac 2x2 5G CPE	Power: AC 120V/60Hz
Test Mode: Communication With Notebook	

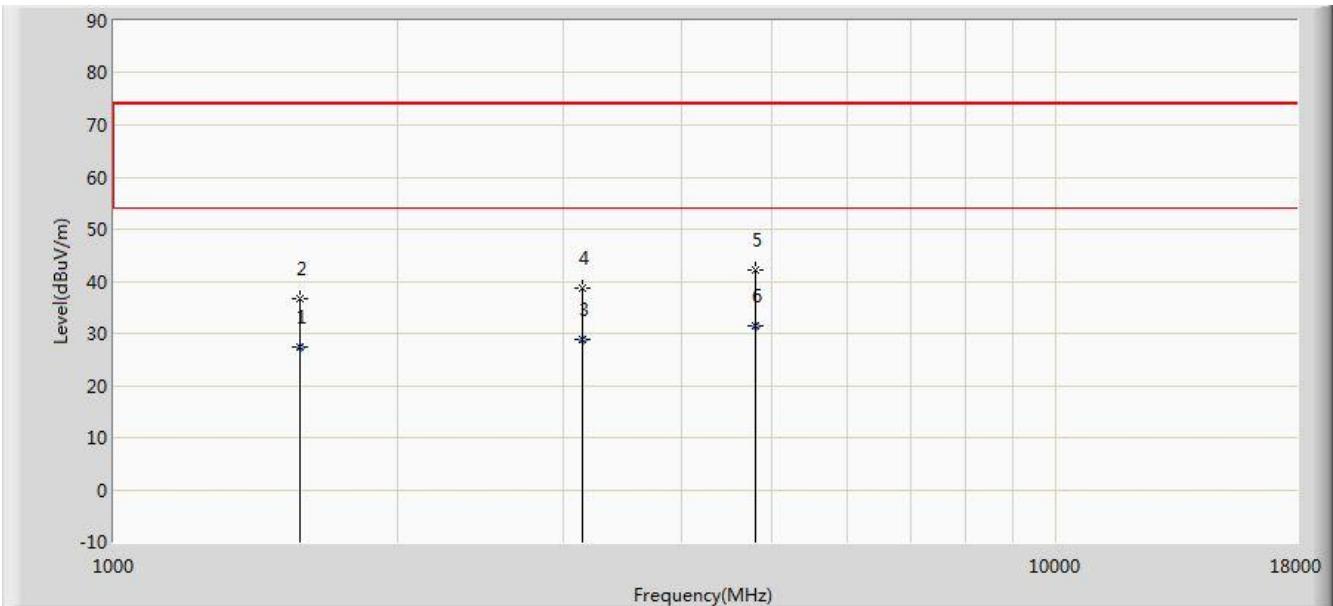


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			1777.500	40.688	47.770	-33.312	74.000	-7.082	PK
2			1777.552	29.418	36.500	-24.582	54.000	-7.082	AV
3			3945.000	41.143	40.865	-32.857	74.000	0.279	PK
4			3945.265	30.533	30.254	-23.467	54.000	0.279	AV
5			5985.000	41.700	37.426	-32.300	74.000	4.273	PK
6		*	5985.265	31.097	26.824	-22.903	54.000	4.273	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

Site: AC1	Time: 2015/07/29 - 16:12
Limit: FCC_Part15.109_RE(3m)_Class B	Engineer: Milo Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: WF-96A 802.11ac 2x2 5G CPE	Power: AC 120V/60Hz
Test Mode: Communication With Notebook	



No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1			1577.254	27.473	35.154	-26.527	54.000	-7.681	AV
2			1577.500	36.578	44.259	-37.422	74.000	-7.681	PK
3			3147.254	28.708	30.250	-25.292	54.000	-1.542	AV
4			3147.500	38.632	40.173	-35.368	74.000	-1.541	PK
5			4802.500	42.112	39.415	-31.888	74.000	2.697	PK
6	*	*	4802.524	31.551	28.854	-22.449	54.000	2.697	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

7. CONCLUSION

The data collected relate only the item(s) tested and show that the **WF-96A 802.11ac 2x2 5G CPE**

FCC ID: SFK-WF96A has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules.

The End