# Test Report FCC Part15 Subpart E

Product Name: CGO2-GB

Model No. : CGO2-GB

FCC ID : 2ACS5-CGO2-GB

IC 11554B-CGO2GB

Applicant: Yuneec Technology Co., Limited

Address: 2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun

Tong, Hong Kong

Date of Receipt: Aug. 21, 2014

Test Date : Aug. 21, 2014~Nov. 11, 2014

Issued Date : Nov. 12, 2014

Report No. : 1480491R-RF-US-P06V01

Report Version: V1.0



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 of the equipment and evaluated measurement uncertainty herein.

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# **Test Report Certification**

Issued Date: Nov. 12, 2014

Report No. : 1480491R-RF-US-P09V01

# QuieTek

Product Name : CGO2-GB

Applicant : Yuneec Technology Co., Limited

Address : 2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun

Tong, Hong Kong

Manufacturer : Good Power Technology Co., Ltd.

Address : No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu

215324, China

Model No. : CGO2-GB

EUT Voltage : DC: 5V
Brand Name : Yuneec

Applicable Standard : FCC CFR Title 47 Part 15 Subpart E: 2014

RSS-210 Issue 8, December 2010

ANSI C63.4: 2009; KDB 789033 D02 New Rules v01

Test Result : Complied

Performed Location : Suzhou EMC Laboratory

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Development Zone., Suzhou, China

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FCC Registration Number: 800392; IC Lab Code: 4075B

Reviewed By : Reviewed By : Preum Cas

Approved By :



#### **Laboratory Information**

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C. : BSMI, NCC, TAF

Germany : TUV Rheinland

Norway : Nemko, DNV

USA : FCC

Japan : VCCI

China : CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : <a href="http://www.quietek.com/tw/ctg/cts/accreditations.htm">http://www.quietek.com/tw/ctg/cts/accreditations.htm</a>
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <a href="http://www.quietek.com/">http://www.quietek.com/</a>

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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#### **Suzhou Testing Laboratory:**

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**History of This Test Report** 

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1480491R-RF-US-P09V01	V1.0	Initial Issued Report	Nov. 12, 2014



# 1. General Information

# 1.1. EUT Description

Product Name	CGO2-GB
Brand Name	Yuneec
Model No.	CGO2-GB
EUT Voltage	DC 5V
Frequency Range	802.11a: 5745~5825MHz
Channel Number	802.11a: 5
Type of Modulation	802.11a: OFDM
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps
Channel Control	Auto
Antenna Delivery	1*Tx + 1*Rx
Peak Antenna Gain	0 dBi

802.11a(20MHz) Working Frequency of Each Channel:							
Channel Frequency Channel Frequency Channel Frequency Channel Frequency							Frequency
149	5745 MHz	153	5765 MHz	157	5785 MHz	161	5805 MHz
165 5825 MHz N/A N/A N/A N/A N/A N/A							

# **Duty Cycle**

Test Mode	Duty Cycle
802.11a	98%



# 1.2. Mode of Operation

QuieTek has verified the construction and function in typical 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 by 802.11a

#### Note:

1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

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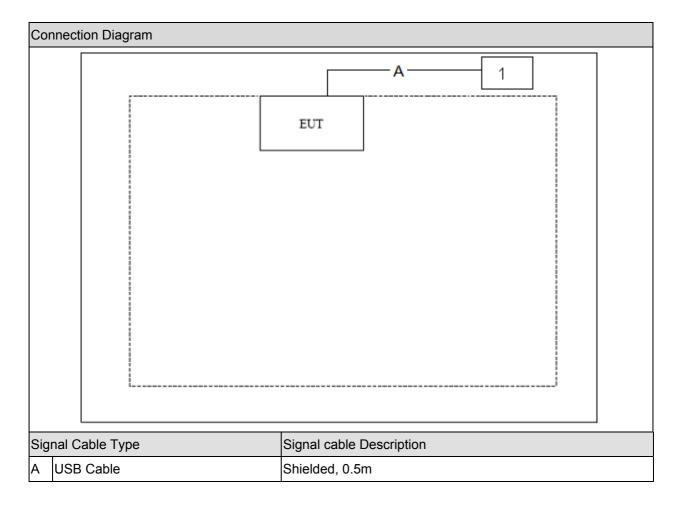
# 1.3. Tested System Details

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

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	DC power supply	IDRC	CD-035-020PR	977272	N/A



# 1.4. Configuration of Tested System





# 1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Run the RF test software "UltraEdit", and set the test mode and channel, then press OK to start

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# 2. Technical Test

# 2.1. Summary of Test Result

$\boxtimes$	No deviations from the test standards
	Deviations from the test standards as below description:

Performed Test Item	em Normative References		Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart E: 2014	No	No
	Section 15.207		
Radiated Emission	FCC CFR Title 47 Part 15 Subpart E: 2014	Yes	No
	Section 15.209		
	RSS-210 Issue 8 December 2010		
	Section 2.7 Table 2 and Table 3		
6dB&99% Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart E: 2014	Yes	No
	Section 15.407(a)(5)&(e)		
	RSS-210 A9.2(4)		
Power Output	FCC CFR Title 47 Part 15 Subpart E: 2014	Yes	No
	Section 15.407(a)(3)		
	RSS-210 A9.2(4)		
Peak Power Spectral Density	FCC CFR Title 47 Part 15 Subpart E: 2014	Yes	No
	Section 15.407(a)(3)		
	RSS-210 A9.2(4)		
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart E: 2014	Yes	No
	Section 15.205, 15.407(b)(4)		
	RSS-210 A9.2(4)		
Frequency Stability	FCC CFR Title 47 Part 15 Subpart E: 2014	Yes	No
	Section 15.407(g)		

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# 2.2. Test Environment

Items	Required (IEC 68-1)	Actual	
Temperature (°C)	15-35	21	
Humidity (%RH)	25-75	50	
Barometric pressure (mbar)	860-1060	950-1000	

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## 3. Conducted Emission

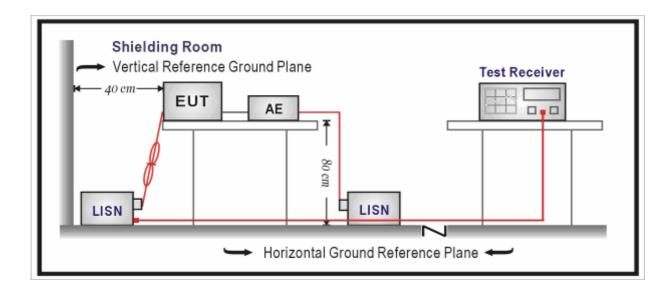
# 3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100726	2015.03.28
Two-Line V-Network	R&S	ENV216	100043	2015.03.28
Two-Line V-Network	R&S	ENV216	100044	2015.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2015.03.01
50ohm Termination	SHX	TF2	07081401	2015.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2015.01.08

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

# 3.2. Test Setup





#### 3.3. 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.

#### 3.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

#### 3.5. Uncertainty

The measurement uncertainty is defined as  $\pm$  2.02 dB



# 3.6. Test Result

EUT is battery powered, test is not applicable.

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# 4. Radiated Emission

# 4.1. Test Equipment

#### Radiated Emission / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.17
Bilog Chainenna	Teseq GmbH	CBL6112D	27611	2015.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity				
Meter	Zhicheng	ZC1-2	AC2-TH	2015.01.08

#### Radiated Emission / AC-5

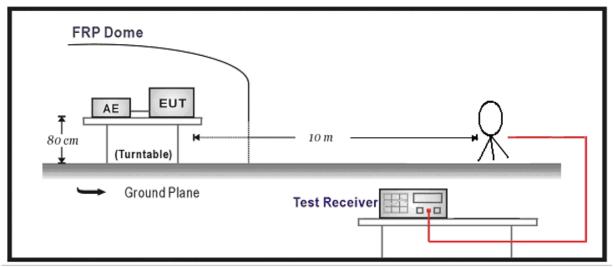
Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2015.03.28
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.05
Preamplifier	QuieTek	AP-040G	CHM-0906001	2015.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2015.01.21
Broad-Band Horn				
Antenna	Schwarzbeck	BBHA9170	294	2015.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2015.06.09
Temperature/Humidity				
Meter	Zhichen	ZC1-2	AC5-TH	2015.01.08

Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

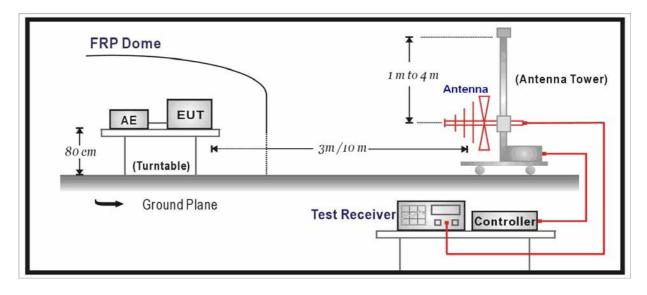


# 4.2. Test Setup

Below 30MHz Test Setup:

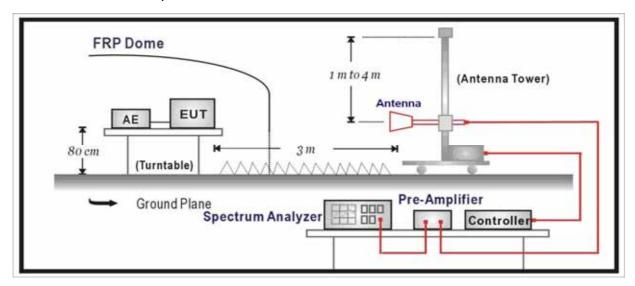


# Below 1GHz Test Setup:





#### Above 1GHz Test Setup:



#### 4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209						
Frequency (MHz)	Distance (m)	Level (dBuV/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 Chainenna 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)

## 4.4. Test Procedure

The EUT was setup according to ANSI C63.4 2009 & KDB 789033.

The EUT is placed on a turn table which is 0.8 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 Chainenna to the EUT was 3 meters.

The Chainenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Chainenna. In order to find



the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

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

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Chainenna will be bended down a little (as horn Chainenna has the narrow beamwidth) in order to keeping the Chainenna in the "cone of radiation" of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to KDB 789033D02 Section II G.4/5/6, for the average unwanted emission measurements above 1GHz, use KDB 789033D02 Section II G. 6(c) Method AD (Average Detection).

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth & method set as:

RBW = 100kHz, VBW = 300kHz, Detector: CISPR QP (30MHz~1GHz) RBW = 1MHz, VBW = 3MHz, Detector: Peak (>1GHz for PK)

RBW = 1MHz, VBW = 3MHz, Detector: RMS

Use power average type, perform a trace average of at least 100 traces. (>1GHz for AV)

#### 4.5. Uncertainty

The measurement uncertainty above 1G is defined as  $\pm$  3.9 dB below 1G is defined as  $\pm$  3.8 dB



## 4.6. Test Result

Mode1: Transmit by 802.11a

СН	Antenna	Frequency	Reading	Factor	Measure	Limit	Margin	Detector
		(MHz)	Level	(dB)	Level	(dBuV/m)	(dB)	
			(dBuV/m)		(dBuV/m)			
	Н	11490.0	29.5	14.6	44.1	54(Note3)	-9.9	PK
149	Н	17235.0	22.8	23.6	46.4	54(Note3)	-7.6	PK
149	V	11490.0	29.1	14.6	43.7	54(Note3)	-10.3	PK
	V	17235.0	23.0	23.4	46.4	54(Note3)	-7.6	PK
	Н	11570.0	29.1	14.7	43.8	54(Note3)	-10.2	PK
157	Н	17355.0	23.1	23.4	46.5	54(Note3)	-7.5	PK
157	V	11570.0	28.8	14.7	43.5	54(Note3)	-10.5	PK
	V	17355.0	23.8	23.3	47.1	54(Note3)	-6.9	PK
	Н	11650.0	28.9	14.7	43.6	54(Note3)	-10.4	PK
165	Н	17475.0	22.2	23.2	45.4	54(Note3)	-8.6	PK
103	V	11650.0	29.5	14.7	44.2	54(Note3)	-9.8	PK
	V	17475.0	22.9	23.1	46.0	54(Note3)	-8.0	PK

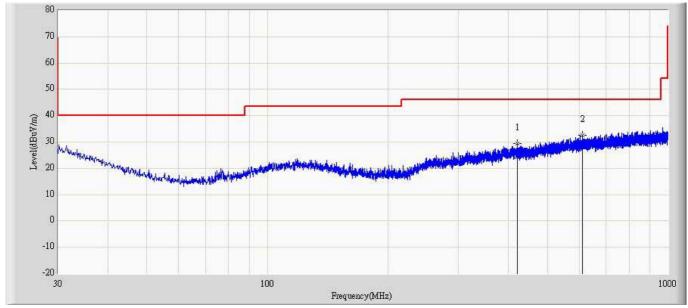
Note: 1. Measure Level = Reading Level + Factor.

- 2. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.
- 3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.



# The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2014/07/22 - 21:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Horizontal
EUT: CGO2-GB	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 149 by 802.11a	·

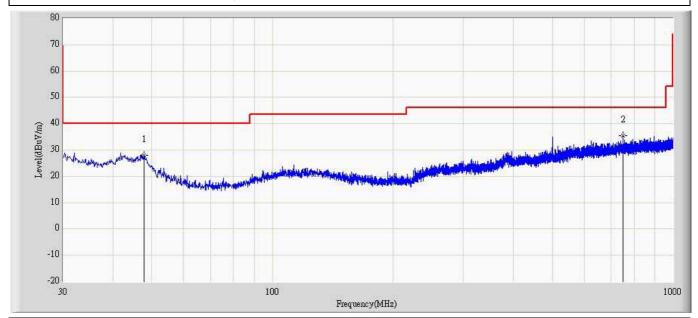


No	Mark	Frequency	Measure Level	Reading Level	Over Limit	Limit	Factor	Туре
		(MHz)	(dBuV/m)	(dBuV)	(dB)	(dBuV/m)	(dB)	
1		421.152	29.464	4.989	-16.536	46.000	24.475	QP
2	*	611.151	32.651	5.470	-13.349	46.000	27.181	QP



Site: AC2	Time: 2014/07/22 - 21:49				
Limit: FCC_Part15.209_RE(3m)	Margin: 0				
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Vertical				
EUT: CGO2-GB	Power: AC 120V/60Hz				
Note: Mode1: Transmit at channel 140 hy 202 11a					

Note: Mode1: Transmit at channel 149 by 802.11a



No	Mark	Frequency	Measure Level	Reading Level	Over Limit	Limit	Factor	Туре
		(MHz)	(dBuV/m)	(dBuV)	(dB)	(dBuV/m)	(dB)	
1		47.702	28.085	12.957	-11.915	40.000	15.127	QP
2	*	749.982	35.415	6.767	-10.585	46.000	28.648	QP



# 5. Occupied Bandwidth

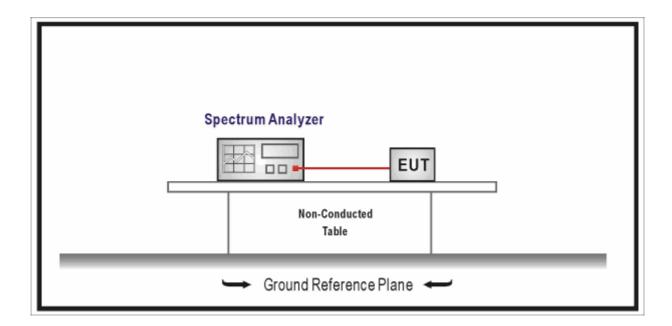
# 5.1. Test Equipment

Occupied Bandwidth / TR-8

Instrument	Manufacturer	Туре No.	Serial No.	Cali. Due Date	
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07	
Temperature/Humidity	zhicheng	ZC1-2	TR8-TH	2015.04.09	
Meter	Zilicheng	201-2	110-111	2015.04.09	

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

# 5.2. Test Setup



#### 5.3. Limit

According to 15.407(e)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.



#### 5.4. Test Procedure

The EUT was tested according to KDB 789033 Section II C2&D for compliance to FCC 47CFR 15.407 requirements.

#### **Emission Bandwidth**

- Use a RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency.
- Set span = 1.5 times to 5.0 times the OBW.
- Set RBW = 1 % to 5 % of the OBW.
- Set VBW ≥ 3 · RBW.
- Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- Use the 99 % power bandwidth function of the instrument (if available).
- If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

## 5.5. Uncertainty

The measurement uncertainty is defined as  $\pm$  1 kHz

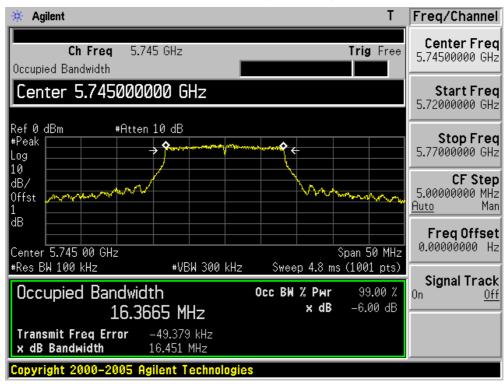


#### 5.6. Test Result

Product	:	CGO2-GB
Test Item	:	6dB & 99% Occupied Bandwidth
Test Mode	:	Mode 1: Transmit by 802.11a

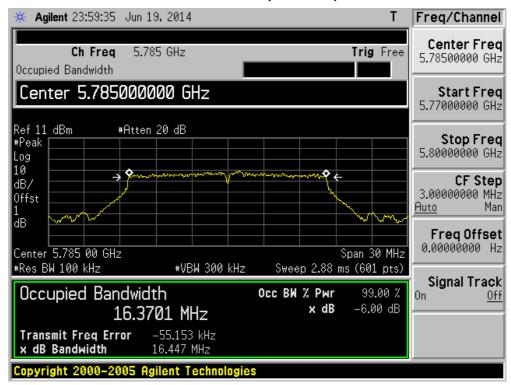
Channel No.	Frequency	6dB Bandwidth	99% Bandwidth	Limit	Result
	(MHz)	(kHz)	(kHz)	(kHz)	
149	5745	16451.0	16366.5	>500	Pass
157	5785	16447.0	16370.1	>500	Pass
165	5825	16434.0	16362.7	>500	Pass

## Channel 149 (5745MHz)

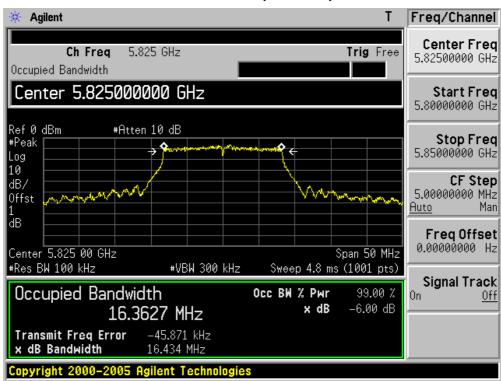




## Channel 157 (5785MHz)



#### Channel 165 (5825MHz)





#### 6. Power Output

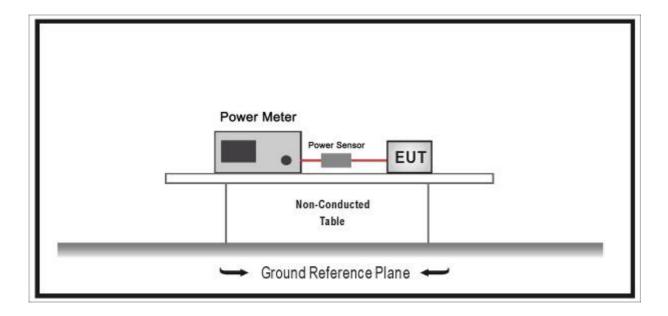
# 6.1. Test Equipment

Power Output / TR-8

Instrument	Manufacturer	Туре No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
Temperature/Humidity	zhiohona	ZC1-2	TR8-TH	2015.04.09
Meter	zhicheng			

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

#### 6.2. Test Setup



# 6.3. Limit

#### According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing



high gain directional antennas are used exclusively for fixed, point-to-point operations

According to 15.407(a)(4)

The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

According to RSS-210 A9.2(4)

The maximum conducted output power shall not exceed 1.0 W or 17 + 10  $\log_{10}$  B, dBm, whichever power is less. The maximum e.i.r.p. shall not exceed 4.0 W or 23 + 10  $\log_{10}$  B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

#### 6.4. Test Procedure

The EUT was tested according to KDB 789033 Section II E3(a) for compliance to FCC 47CFR 15.407 requirements.

- a) Method PM (Measurement using an RF average power meter):
- (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.
- (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (iv) Adjust the measurement in dBm by adding  $10 \log(1/x)$  where x is the duty cycle (e.g.,  $10 \log(1/0.25)$ ) if the duty cycle is 25 percent).

Use the wideband power meter to test RMS power and record the result.

# 6.5. Uncertainty

The measurement uncertainty is defined as  $\pm$  1.27 dB



# 6.6. Test Result

Power output test was verified over all data rates 6/9/12/18/24/36/48/54Mbps, and the 6Mbps was the worst case and data was recorded in the result.

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Product	:	CGO2-GB
Test Item	:	Power Output
Test Site	• •	TR-8
Test Mode	:	Mode 1: Transmit by 802.11a

# Output Power Results For FCC

Channel No.	Frequency (MHz)	Meas Power (dBm)	Power Limit(dBm)	Power Margin(dBm)	Result
149	5745	11.23	30.00	-18.77	Pass
157	5785	11.32	30.00	-18.68	Pass
165	5825	10.98	30.00	-19.02	Pass

# Output Power Results For IC

#### Limit:

Channel No.		00% Counied	Power Limit	Power	e.i.r.p Limit	Power
	Frequency (MHz)	99% Occupied Bandwidth	of 17 + 10	limit of 1W	of 23 + 10	limit of 4W
			log <sub>10</sub> B	(dBm)	log <sub>10</sub> B	(dBm)
		(MHz)	(dBm)		(dBm)	
149	5745	16.3665	29.13	<del>30</del>	35.13	<del>36</del>
157	5785	16.3701	29.14	<del>30</del>	35.14	<del>36</del>
165	5825	16.3627	29.13	<del>30</del>	35.13	<del>36</del>

Channel No.	Frequency	Meas. Power	IC Power	e.i.r.p Power	IC e.i.r.p	Result
	(MHz)	(dBm)	Limit	(dBm)	Limit(dBm)	
			(dBm)			
149	5745	11.23	29.13	11.23	35.13	Pass
157	5785	11.32	29.14	11.32	35.14	Pass
165	5825	10.98	29.13	10.98	35.13	Pass

Note: e.i.r.p Power = Meas. Power + Antenna gain.



## 7. Peak Power Spectral Density

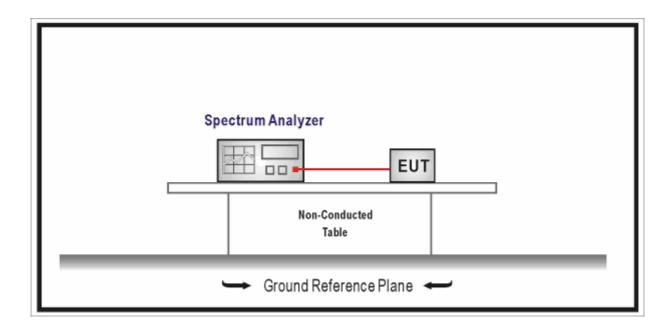
# 7.1. Test Equipment

Peak Power Spectral Density / TR-8

Instrument	Manufacturer	Туре No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
Temperature/Humidity	zhichong	ZC1-2	TR8-TH	2015.04.09
Meter	zhicheng			

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

# 7.2. Test Setup



#### **7.3.** Limit

According to 15.407(a)(3)

In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

According to RSS-210 A9.2(4)

The power spectral density shall not exceed 17 dBm in any 1.0 MHz band.



#### 7.4. Test Procedure

According to KDB 789033D02: section F

- 1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method.
- 2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
- 3. The result is the Maximum PSD over 1 MHz reference bandwidth.

# 7.5. Uncertainty

The measurement uncertainty is defined as  $\pm$  1.27 dB



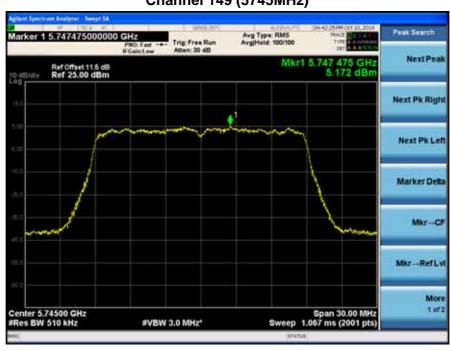
# 7.6. Test Result

Product	:	CGO2-GB
Test Item	• •	Peak Power Spectral Density
Test Site	• •	TR-8
Test Mode	:	Mode 1: Transmit by 802.11a

# For FCC part

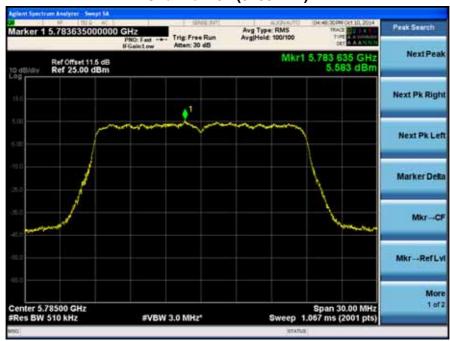
Channel No.	Frequency (MHz)	Measurement PPSD (dBm/500kHz)	Total PPSD (dBm/500kHz)	Limit (dBm/500kHz)	Result
149	5745	5.172	5.172	30	Pass
157	5785	5.583	5.583	30	Pass
165	5825	5.042	5.042	30	Pass

#### Channel 149 (5745MHz)





## Channel 157 (5785MHz)



## Channel 165 (5825MHz)





# For IC part

Channel No.	Frequency	Measurement PPSD	Total PPSD	Limit	Result
	(MHz)	(dBm/1MHz)	(dBm/1MHz)	(dBm/1MHz)	
149	5745	4.106	4.106	17	Pass
157	5785	4.897	4.897	17	Pass
165	5825	4.414	4.414	17	Pass

# Channel 149 (5745MHz)

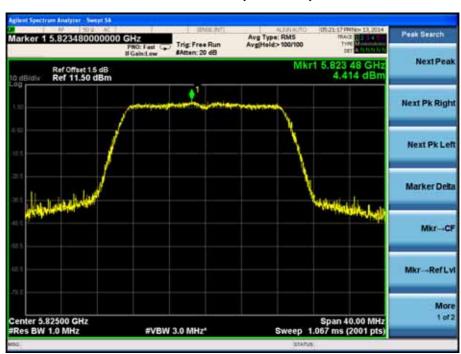




### **Channel 157 (5785MHz)**



## **Channel 165 (5825MHz)**





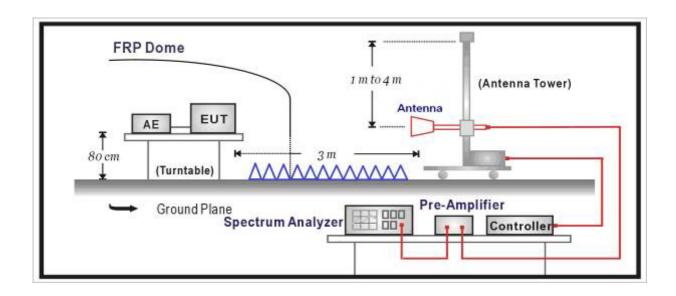
## 8. Radiated Emission Band Edge

## 8.1. Test Equipment

⊠Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2015.03.28
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2015.10.15
DRG Horn	ETS-Lindgren	3117	00123988	2015.01.07
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2015.06.09
Temperature/Humidity				
Meter	Zhichen	ZC1-2	AC5-TH	2015.01.08

## 8.2. Test Setup



#### 8.3. Limit

#### For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).



MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 <b>-</b> 410	4.5 - 5.15
<sup>1</sup> 0.495 <b>-</b> 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )

## For 15.407(b) & RSS-210 A9.2(4) requirement:

• For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

Operating Frequency Band (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength at 3m (dBuV/m)
5150 - 5250	-27	68.3
5250 - 5350	-27	68.3
5470 - 5725	-27	68.3
5705 5005	-27 [Note(1)]	68.3
5725 - 5825	-17 [Note(2)]	78.3

Note(1): Outsitde the frequency range 5715 - 5835MHz.

Note(2): Within the frequency range from the band edge to 10MHz below or above the band edge, 5715 – 5725MHz and 5825 - 5835MHz.



#### 8.4. Test Procedure

The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

The EUT is placed on a turn table which is 0.8 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 from 1 meter to 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 C63.4: 2009 on radiated measurement.

Note: When doing emission measurement above 1GHz, the horn Chainenna will be bended down a little (as horn Chainenna has the narrow beamwidth) in order to keeping the Chainenna in the "cone of radiation" of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

According to KDB 789033 D02: section G3 d) (ii)

- (ii) Integration Method
- For maximum emissions measurements, follow the procedures described in section II.G.5., "Procedures for Unwanted Maximum Emissions Measurements above 1000 MHz", except for the following changes:
- ∘ Set RBW = 100 kHz
- ∘ Set VBW ≥ 3 · RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured. CAUTION: You must ensure that the spectrum analyzer or EMI receiver is set for peak-detection and max-hold for this measurement.
- For average emissions measurements, follow the procedures described in section II.G.6., "Procedures for Average Unwanted Emissions Measurements above 1000 MHz", except for the following changes:
- Set RBW = 100 kHz
- Set VBW ≥ 3 · RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

#### 8.5. Uncertainty

The measurement uncertainty above 1GHz is defined as ± 3.9 dB



#### 8.6. Test Result

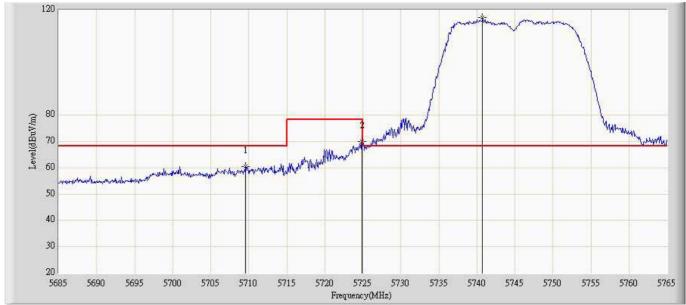
For band edge points:

Peak detector: RBW = 100kHz, VBW = 300kHz, detector = peak, sweep time = auto;

power integration across 1MHz.

Average detector: RBW = 100kHz, VBW = 300kHz, detector = RMS, sweep time = auto.

Site: AC5	Time: 2014/09/26 - 18:46
Limit: 15.407 band4	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: CGO2-GB	Power: AC 120V/60Hz
Note: Mode 1 Transmit at CH5745 by 11a	•



No	Fla	Ма	Frequency	Measure	Reading Level	Over Limit	Limit	Factor	Туре
	g	rk	(MHz)	Level	(dBuV)	(dB)	(dBuV/m)		
				(dBuV/m)					
1			5709.560	60.649	16.487	-7.651	68.300	44.161	PK
2			5724.920	70.019	25.832	-8.281	78.300	44.187	PK
3		*	5740.760	117.240	73.022	48.940	68.300	44.218	PK



Site: AC5	Time: 2014/09/26 - 23:24
Limit: 15.407 band4	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: CGO2-GB	Power: AC 120V/60Hz
Note: Mode 1 Transmit at CH5745 by 11a	



No	Fla	Ма	Frequency	Measure	Reading Level	Over Limit	Limit	Factor	Туре
	g	rk	(MHz)	Level	(dBuV)	(dB)	(dBuV/m)		
				(dBuV/m)					
1			5713.240	64.947	20.779	-3.353	68.300	44.167	PK
2			5724.600	73.659	29.472	-4.641	78.300	44.187	PK
3		*	5746.840	118.968	74.734	50.668	68.300	44.234	PK



### 9. Frequency Stability

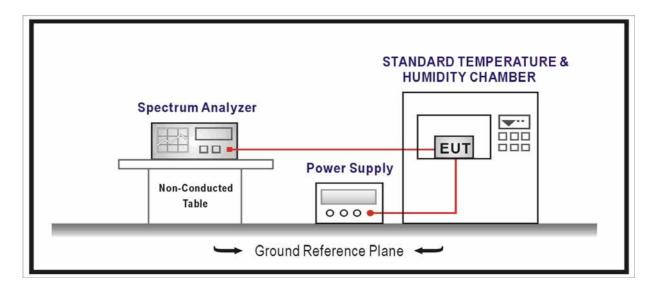
# 9.1. Test Equipment

Frequency Stability / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date	
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07	
AC Power Supply	IDRC	CF-500TP	979422	2015.09.16	
DC Power Supply	IDRC	CD-035-020PR	977272	2015.09.16	
Programmable	Gaoyu	TH-1P-B	WIT-05121302	2015.01.07	
Temperature &					
Humidity Chamber					
Temperature/Humidity	-highen a	ZC1-2	TR8-TH	2015.04.09	
Meter	zhicheng	201-2	IKO-IH		

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

## 9.2. Test Setup



#### 9.3. Limit

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.



#### 9.4. Test Procedure

#### **Frequency Stability Under Temperature Variations:**

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

#### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to  $20^{\circ}$ C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

#### 9.5. Uncertainty

The measurement uncertainty is defined as  $\pm$  100 Hz



## 9.6. Test Result

Product		CGO2-GB
Test Item	•••	Frequency Stability
Test Site		TR-8
Test Mode		Carrier Transmit

Operating	Temp			Frequency Tol	erance (ppm)		
Frequency	(℃)	\	0 mii	nutes	2 mir	2 minutes	
		Voltage (DC)	Operation Frequency(M Hz)	Measure Level(ppm)	Operation Frequency(M Hz)	Measure Level(ppm)	
		5.75	5745.013	2.30	5745.012	2.12	
	0	5	5745.011	1.91	5745.01	1.81	
		4.25	5745.012	2.02	5745.012	2.02	
		5.75	5745.013	2.19	5745.013	2.21	
	10	5	5745.01	1.81	5745.011	1.83	
		4.25	5745.012	2.00	5745.012	2.04	
		5.75	5745.012	2.12	5745.013	2.21	
149	20	5	5745.011	1.91	5745.011	1.85	
		4.25	5745.012	2.02	5745.012	2.00	
	30	5.75	5745.013	2.21	5745.012	2.11	
		5	5745.011	1.85	5745.011	1.85	
		4.25	5745.012	2.05	5745.012	2.05	
	40	5.75	5745.013	2.25	5745.013	2.21	
		5	5745.013	2.19	5745.011	1.85	
		4.25	5745.012	2.02	5745.012	2.00	
	0	5.75	5785.013	2.21	5785.013	2.26	
		5	5785.011	1.86	5785.011	1.85	
		4.25	5785.012	2.11	5785.012	2.04	
		5.75	5785.013	2.23	5785.013	2.18	
	10	5	5785.011	1.86	5785.011	1.86	
157		4.25	5785.012	2.04	5785.016	2.72	
157		5.75	5785.013	2.26	5785.012	2.02	
	20	5	5785.011	1.85	5785.015	2.52	
		4.25	5785.012	2.05	5785.011	1.86	
		5.75	5785.013	2.18	5785.012	2.12	
	30	5	5785.015	2.52	5785.013	2.23	
		4.25	5785.012	2.09	5785.011	1.83	

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		5.75	5785.013	2.25	5785.012	2.02
	40	5	5785.011	1.83	5785.013	2.25
		4.25	5785.015	2.54	5785.011	1.85
		5.75	5825.013	2.23	5825.012	2.04
	0	5	5825.011	1.86	5825.013	2.18
		4.25	5825.012	2.04	5825.011	1.86
		5.75	5825.013	2.26	5825.016	2.72
	10	5	5825.011	1.85	5825.012	2.02
		4.25	5825.012	2.05	5825.015	2.52
		5.75	5825.013	2.18	5825.011	1.86
165	20	5	5825.015	2.52	5825.012	2.12
		4.25	5825.012	2.09	5825.013	2.23
		5.75	5825.013	2.25	5825.011	1.83
	30	5	5825.011	1.83	5825.012	2.02
		4.25	5825.015	2.54	5825.013	2.25
		5.75	5825.013	2.21	5825.011	1.85
	40	5	5825.011	1.86	5825.013	2.26
		4.25	5825.012	2.11	5825.011	1.85

Operating	Temp		Frequency Tolerance (ppm)				
Frequency	(℃)	Valtage	5 mir	nutes	10 minutes		
		Voltage (AC)	Operation Frequency(M Hz)	Measure Level(ppm)	Operation Frequency(M Hz)	Measure Level(ppm)	
		5.75	5745.012	2.07	5745.01	1.81	
	0	5	5745.013	2.23	5745.011	1.98	
		4.25	5745.01	1.81	5745.012	2.12	
		5.75	5745.015	2.52	5745.01	1.81	
	10	5	5745.013	2.23	5745.012	2.02	
		4.25	5745.01	1.81	5745.013	2.21	
149	20	5.75	5745.011	1.98	5745.011	1.83	
		5	5745.012	2.12	5745.012	2.04	
		4.25	5745.01	1.81	5745.013	2.21	
		5.75	5745.012	2.02	5745.011	1.85	
	30	5	5745.013	2.21	5745.012	2.00	
		4.25	5745.011	1.83	5745.012	2.11	
	40	5.75	5745.012	2.04	5745.011	1.85	

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	1		1	T	1	
		5	5745.013	2.21	5745.012	2.05
		4.25	5745.011	1.85	5745.013	2.30
		5.75	5785.012	2.01	5785.011	1.92
	0	5	5785.012	2.11	5785.012	2.01
		4.25	5785.011	1.83	5785.013	2.20
		5.75	5785.012	2.06	5785.011	1.82
	10	5	5785.013	2.30	5785.012	2.01
		4.25	5785.011	1.92	5785.012	2.13
		5.75	5785.012	2.01	5785.011	1.92
157	20	5	5785.013	2.20	5785.012	2.01
		4.25	5785.011	1.82	5785.013	2.21
		5.75	5785.012	2.01	5785.011	1.83
	30	5	5785.012	2.13	5785.012	2.04
		4.25	5785.011	1.92	5785.013	2.25
		5.75	5785.012	2.01	5785.013	2.20
	40	5	5785.013	2.21	5785.012	2.02
		4.25	5785.011	1.83	5785.013	2.20
		5.75	5825.012	2.04	5825.011	1.84
	0	5	5825.013	2.23	5825.012	2.08
		4.25	5825.013	2.20	5825.013	2.20
		5.75	5825.012	2.01	5825.011	1.84
	10	5	5825.013	2.18	5825.012	2.01
		4.25	5825.011	1.84	5825.013	2.23
		5.75	5825.012	2.08	5825.011	1.82
165	20	5	5825.013	2.20	5825.012	2.03
		4.25	5825.011	1.84	5825.013	2.16
		5.75	5825.012	2.01	5825.015	2.49
	30	5	5825.013	2.23	5825.012	2.06
		4.25	5825.011	1.82	5825.013	2.21
		5.75	5825.012	2.03	5825.011	1.80
	40	5	5825.013	2.16	5825.015	2.52
		4.25	5825.015	2.49	5825.013	2.23



## 10. Receiver Spurious Emission for Industry Canada RSS-Gen Requirement

## 10.1. Test Equipment

#### Radiated Emission / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.17
Bilog Chainenna	Teseq GmbH	CBL6112D	27611	2015.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity				
Meter	Zhicheng	ZC1-2	AC2-TH	2015.01.08

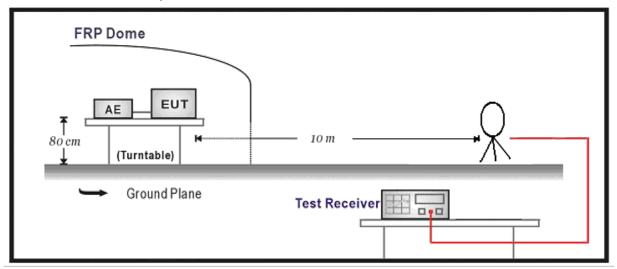
#### Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2015.03.28
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.05
Preamplifier	QuieTek	AP-040G	CHM-0906001	2015.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2015.01.21
Broad-Band Horn				
Antenna	Schwarzbeck	BBHA9170	294	2015.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2015.06.09
Temperature/Humidity				
Meter	Zhichen	ZC1-2	AC5-TH	2015.01.08

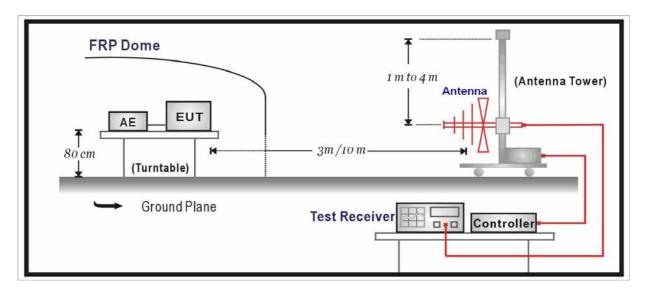


## 10.2. Test Setup

#### Below 30MHz Test Setup:

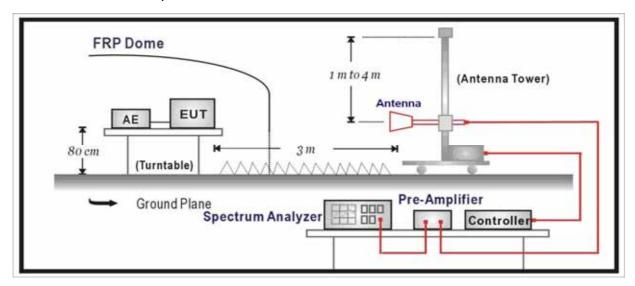


## Below 1GHz Test Setup:





#### Above 1GHz Test Setup:



#### 10.3. Limit

FCC Part 15 Subpart B Paragraph 15.109						
Frequency (MHz)	Distance (m)	Level (dBuV/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  $(dBuV/m) = 20 \log E$  field strength (uV/m)

#### 10.4. Test Procedure

According to ANSI C63.10: 2009.

The EUT is placed on a turn table which is 0.8 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 from 1 meter to 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 C63.4: 2009 on radiated measurement.

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

The frequency range from 9kHz to10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the "cone of radiation" of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

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# 10.5. Uncertainty

The measurement uncertainty above 1G is defined as  $\pm$  3.9 dB below 1G is defined as  $\pm$  3.8 dB

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#### 10.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms; Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

Mode 1: Receive

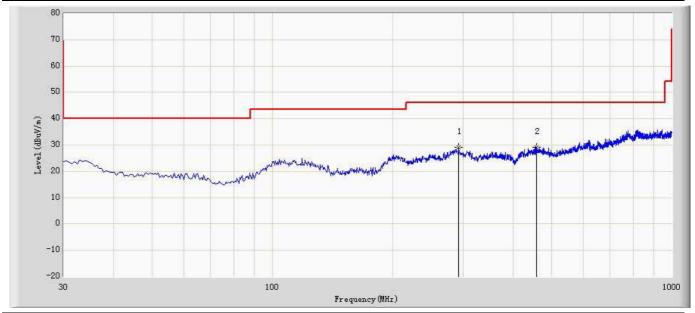
СН	Antenna	Frequency	Reading	Factor	Measure	Limit	Margin	Detector
		(MHz)	Level	(dB)	Level	(dBuV/m)	(dB)	
			(dBuV/m)		(dBuV/m)			
	Н	3405.5	50.5	-9.5	41.0	54(Note)	-13.0	PK
149	Н	6695.0	45.7	-3.1	42.6	54(Note)	-11.4	PK
149	V	3091.0	49.7	-10.0	39.7	54(Note)	-14.3	PK
	V	6661.0	44.7	-3.2	41.5	54(Note)	-12.5	PK
	Н	3354.5	50.0	-9.4	40.6	54(Note)	-13.4	PK
157	Н	6151.0	46.2	-4.5	41.7	54(Note)	-12.3	PK
137	V	3397.0	49.8	-9.4	40.4	54(Note)	-13.6	PK
	V	5046.0	47.0	-6.9	40.1	54(Note)	-13.9	PK
	Н	3201.5	49.8	-9.4	40.4	54(Note)	-13.6	PK
165	Н	7664.0	43.3	-0.6	42.7	54(Note)	-11.3	PK
165	V	3108.0	49.8	-10.0	39.8	54(Note)	-14.2	PK
	V	6695.0	46.4	-3.2	43.2	54(Note)	-10.8	PK

Note: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.



## The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2014/11/9 - 10:41			
Limit: FCC_Part15.109_RE(3m)	Margin: 0			
Probe: CBL6112D_(30-2000MHz)	Polarity: Vertical			
EUT: CGO2-GB	Power: DC 5V			
Note: Mode: Receive at channel 5745 by 802.11a				

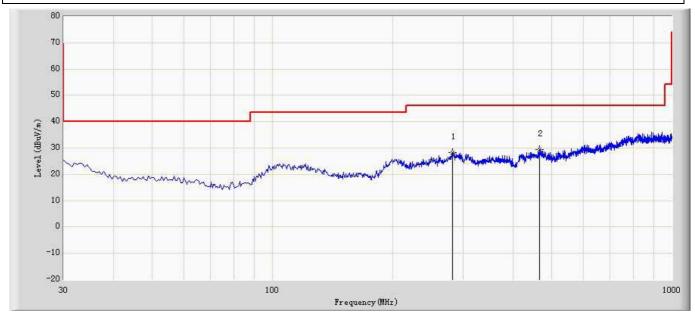


No	Mark	Frequency	Measure Level	Reading Level	Over Limit	Limit	Factor	Туре
		(MHz)	(dBuV/m)	(dBuV)	(dB)	(dBuV/m)	(dB)	
1		292.870	29.228	2.544	-16.772	46.000	26.684	QP
2	*	457.285	29.266	1.578	-16.734	46.000	27.688	QP



Site: AC2	Time: 2014/11/9 - 10:43			
Limit: FCC_Part15.109_RE(3m)	Margin: 0			
Probe: CBL6112D_(30-2000MHz)	Polarity: Vertical			
EUT: CGO2-GB	Power: DC 5V			
Note: Mode: Pagaiya at channel 5745 by 902 11a				

Note: Mode: Receive at channel 5745 by 802.11a



No	Mark	Frequency	Measure Level	Reading Level	Over Limit	Limit	Factor	Туре
		(MHz)	(dBuV/m)	(dBuV)	(dB)	(dBuV/m)	(dB)	
1		281.715	28.253	1.557	-17.747	46.000	26.696	QP
2	*	466.500	29.321	1.126	-16.679	46.000	28.195	QP

 The End	