



TEST REPORT

For

Applicant : Playjam Ltd.

Address : 4th Floor 41-42, Eastcastle Street, London, London W1W 8DU,
N.T., Hong Kong

Product Name : Playjam Console

Model Name : PJGC002

Brand Name : Playjam

FCC ID : 2AATXPJGC002

IC : 11079A-PJGC002

Report No. : MTE/SAL/A15010090

Date of Issue : Apr. 21, 2015

Issued by : Most Technology Service Co., Ltd.

Address : No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park,
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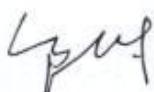
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VERIFICATION OF CONFORMITY

EUT: Playjam Console
Brand Name: Playjam
Model Number: PJGC002
FCC ID: 2AATXPJGC002
IC: 11079A-PJGC002
Applicant: Playjam Ltd.
4th Floor 41-42, Eastcastle Street, London, London W1W 8DU,
N.T., Hong Kong
Manufacturer: Playjam Ltd.
4th Floor 41-42, Eastcastle Street, London, London W1W 8DU,
N.T., Hong Kong
Technical Standards: 47 CFR Part 15 Subpart E
RSS-210 Issue 8
File Number: MTE/SAL/F14060703
Date of test: Mar. 12-Apr.19, 2015
Deviation: None
Condition of Test
Sample: Normal
Test Result: PASS

The above equipment was tested by Most Technology Service Co., Ltd. for compliance with the requirements set forth in FCC rules and the Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment and the level of the immunity endurance of the equipment are within the compliance requirements. The test results of this report relate only to the tested sample identified in this report.

Tested by (+ signature):


Sophia Liu Mar. 11, 2015

Review by (+ signature):


Henry Chen Mar. 12, Apr.19, 2015

Approved by (+
signature):


Yvette Zhou(Manager) Apr. 21, 2015

1. GENERAL INFORMATION

1.1 Product Information

Product	Playjam Console	
Brand Name	Playjam	
Model Number	PJGC002	
Series Model Name:	N/A	
Series Model Difference description:	N/A	
Power Supply	DC 5V by AC adapter 100-240V, 50/60Hz	
Frequency Range	5150 MHz ~ 5250 MHz, 5725 MHz ~ 5850 MHz	
Modulation Technique	OFDM	
Modulation Type:	BPSK, QPSK, 16QAM, 64QAM	
Channel Number	5150 MHz ~ 5250 MHz: 802.11 a Mode: 4 channels 802.11 an 20M Mode: 4 channels	5725 MHz ~ 5850 MHz: 802.11 a Mode: 5 channels 802.11 an 20M Mode: 5 channels
Antenna Type	Internal PCB Antenna, 4.58dBi	
Temperature Range	-20°C ~ +50°C	

NOTE:

1. For a more detailed features description about the EUT, please refer to User's Manual.

1.2 Objective

The objective of the report is to perform tests according to RSS-210 Issue 8, RSS-102 Issue 4 and RSS-Gen Issue 4 for the EUT IC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices
2	RSS-210 Issue 8	Low-power Licence-exempt Radio communication Devices (All Frequency Bands): Category I Equipment
3	RSS-Gen Issue 4	General Requirements and Information for the Certification of Radio communication Equipment
4	RSS-102 Issue 4	Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
5	KDB 789033	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E

1.3 Test Standards and Results

No.	Section	Test Items	Result	Date of Test
1	15.203	Antenna Requirement	--	2015-03-11
2	15.407(f), RSS-210	RF Exposure	PASS	2015-03-11
3	--	Duty Cycle	PASS	2015-03-11
4	15.207&15.407(b), RSS-210	Conducted Emission	PASS	2015-03-11
5	15.407(a)(5), RSS-210	26dB Bandwidth	PASS	2015-03-11
6	15.407(e)(only for 5.725-5.85GHz), RSS-210	6dB Bandwidth	PASS	2015-03-11
7	15.407(a), RSS-210	Maximum Conducted Output Power	PASS	2015-03-11
8	15.407(a), RSS-210	Power Spectral Density	PASS	2015-03-11
9	15.205&15.209&15.407(b) RSS-210	Radiated Spurious Emission and Band Edge	PASS	2015-04-19
10	15.407(b), RSS-210	Conducted Spurious Emission	PASS	2015-03-11

Note: 1. The test result judgment is decided by the limit of measurement standard
2. The information of measurement uncertainty is available upon the customer's request.

1.4 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

2. TEST METHODOLOGY

2.1 TEST FACILITY

Test Site: Most Technology Service Co., Ltd

Location: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park, Nanshan, Shenzhen, Guangdong, China

Description: There is one 3m semi-anechoic an area test sites and two line conducted labs for final test. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014 and CISPR 16 requirements.

The FCC Registration Number is **490827**. The **IC** Registration Number is **7103A-1**.

Site Filing: The site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046.

Instrument All measuring equipment is in accord with ANSI C63.4:2014 and CISPR 16

Tolerance: requirements that meet industry regulatory agency and accreditation agency requirement.

Ground Plane: Two conductive reference ground planes were used during the Line Conducted Emission, one in vertical and the other in horizontal. The dimensions of these ground planes are as below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden test table on where the EUT and the support equipment were placed during test. The horizontal ground plane projected 50 cm beyond the footprint of the EUT system and distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal conductive ground plane extended at least 1m beyond the periphery of the EUT and the largest measuring antenna, and covered the entire area between the EUT and the antenna.

2.2 GENERAL TEST PROCEDURES

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4:2014.

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4:2014, Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

3. SETUP OF EQUIPMENT UNDER TEST

3.1 SETUP CONFIGURATION OF EUT

See test setup photographs for the actual connections between EUT and support equipment.

3.2 SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	Serial No.	Data Cable	Power Cable
Notebook	Lenovo	E425	R9-KZL4B	1.6m Un-shielded	1.8m Un-shielded

Remark:

All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3.3 TEST EQUIPMENT LIST

Instrumentation: The following list contains equipment used at Most for testing. The equipment conforms to the CISPR 16-1 / ANSI C63.2 Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10 kHz to 1.0 GHz or above.

No.	Equipment	Manufacturer	Model No.	S/N	Calibration date	Calibration Interval
1	Test Receiver	Rohde & Schwarz	ESCI	100492	2015/03/10	1 Year
2	L.I.S.N.	Rohde & Schwarz	ENV216	100093	2015/03/10	1 Year
3	Coaxial Switch	Anritsu Corp	MP59B	6200283933	2015/03/10	1 Year
4	Terminator	Hubersuhner	50Ω	No.1	2015/03/10	1 Year
5	RF Cable	SchwarzBeck	N/A	No.1	2015/03/10	1 Year
6	Test Receiver	Rohde & Schwarz	ESPI	101202	2015/03/10	1 Year
7	Bilog Antenna	Sunol	JB3	A121206	2015/03/10	1 Year
8	Horn Antenna	SCHWARZBECK	BBHA9120D	756	2015/03/10	1 Year
9	Horn Antenna	Penn Engineering	9034	8376	2015/03/10	1 Year
10	Cable	Resenberger	N/A	NO.1	2015/03/10	1 Year
11	Cable	SchwarzBeck	N/A	NO.2	2015/03/10	1 Year
12	Cable	SchwarzBeck	N/A	NO.3	2015/03/10	1 Year
13	DC Power Filter	DuoJi	DL2×30B	N/A	2015/03/10	1 Year
14	Single Phase Power Line Filter	DuoJi	FNF 202B30	N/A	2015/03/10	1 Year
15	3 Phase Power Line Filter	DuoJi	FNF 402B30	N/A	2015/03/10	1 Year
16	Test Receiver	Rohde & Schwarz	ESCI	100492	2015/03/10	1 Year
17	Absorbing Clamp	Luthi	MDS21	3635	2015/03/10	1 Year
18	Coaxial Switch	Anritsu Corp	MP59B	6200283933	2015/03/10	1 Year
19	AC Power Source	Kikusui	AC40MA	LM003232	2015/03/10	1 Year
20	Test Analyzer	Kikusui	KHA1000	LM003720	2015/03/10	1 Year
21	Line Impedence Network	Kikusui	LIN40MA-PCR-L	LM002352	2015/03/10	1 Year
22	ESD Tester	Kikusui	KES4021	LM003537	2015/03/10	1 Year
23	EMCPRO System	EM Test	UCS-500-M4	V0648102026	2015/03/10	1 Year
24	Signal Generator	IFR	2032	203002/100	2015/03/10	1 Year
25	Amplifier	A&R	150W1000	301584	2015/03/10	1 Year
26	CDN	FCC	FCC-801-M2-25	47	2015/03/10	1 Year
27	CDN	FCC	FCC-801-M3-25	107	2015/03/10	1 Year
28	EM Injection Clamp	FCC	F-203I-23mm	403	2015/03/10	1 Year
29	RF Cable	MIYAZAKI	N/A	No.1/No.2	2015/03/10	1 Year
30	Universal Radio Communication Tester	ROHDE&SCHWARZ	CMU200	0304789	2015/03/10	1 Year
31	Telecommunication Antenna	European Antennas	PSA 75301R/170	0304213	2015/03/10	1 Year
32	Telecommunication Test Equipment	R&S	CMU200	N/A	2015/03/10	1 Year
33	8 Loop Antenna	ARA	PLA-1030/B	1029	2015/03/10	1 Year
34	Spectrum Analyzer	Agilent	E7405A	US44210471	2015/03/10	1 Year
35	Spectrum Analyzer	Agilent	E4446A	MY44020154	2015/03/10	1 Year

NOTE: Equipments listed above have been calibrated and are in the period of validation.

4. 47 CFR Part 15E, RSS-210 Requirements

4.1 ANTENNA REQUIREMENT

4.1.1 Applicable Standard

According to FCC § 15.203, each applicant for equipment certification must provide a list of all antenna types that may be used with the transmitter, indicating the maximum permissible antenna gain (in dBi). An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

According to RSS-Gen Clause 8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna

4.1.2 Evaluation Criteria

- (a) Antenna must be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.1.3 Result: Compliance.

The EUT has one integral antenna arrangement, which was permanently attached and the antenna gain is 4.58 dBi, fulfill the requirement of this section.

4.2 RF EXPOSURE

4.2.1 Applicable Standard

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;
According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

4.2.2 Result:

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance(cm)	Power Density (mW/cm²)	MPE Limit (mW/cm²)
	(dBi)	(numeric)	(dBm)	(mW)			
5785	4.58	2.87	10.23	10.54	20	0.006	1

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

4.3 Duty Cycle

4.3.1 Measurement:

Measurement Parameter	
Detector:	Peak
Sweep Time:	Auto
Resolution Bandwidth:	10MHz
Video Bandwidth:	10MHz
Span:	Zero
Trace-Mode:	Video trigger/view/single sweep

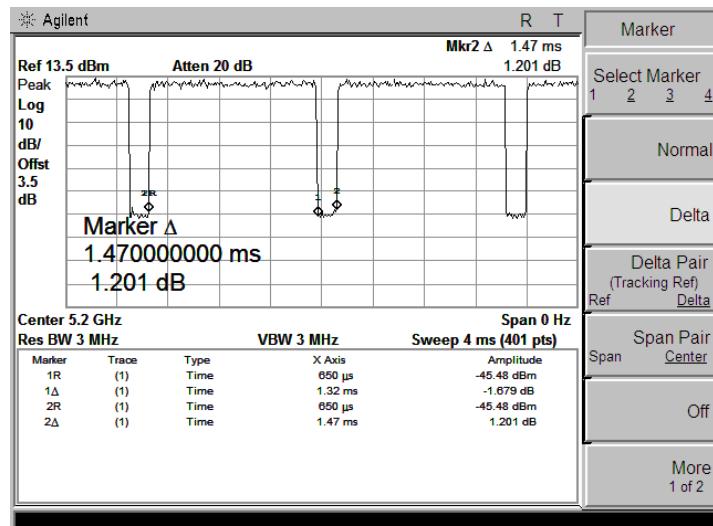
4.3.2 Results:

Mode	Duty cycle	Correction Factor
802.11 a	0.90	0.43
802.11 an 20M	0.90	0.46

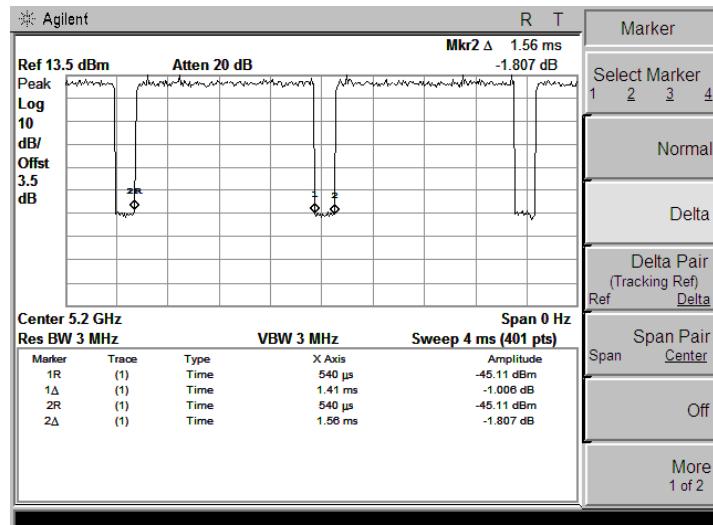
Note: Correction Factor=10Log (1/Duty Cycle)

Please refer the following pages.

Duty Cycle



802.11 an 20M



802.11 a

4.4 AC Power Line Conducted Emission

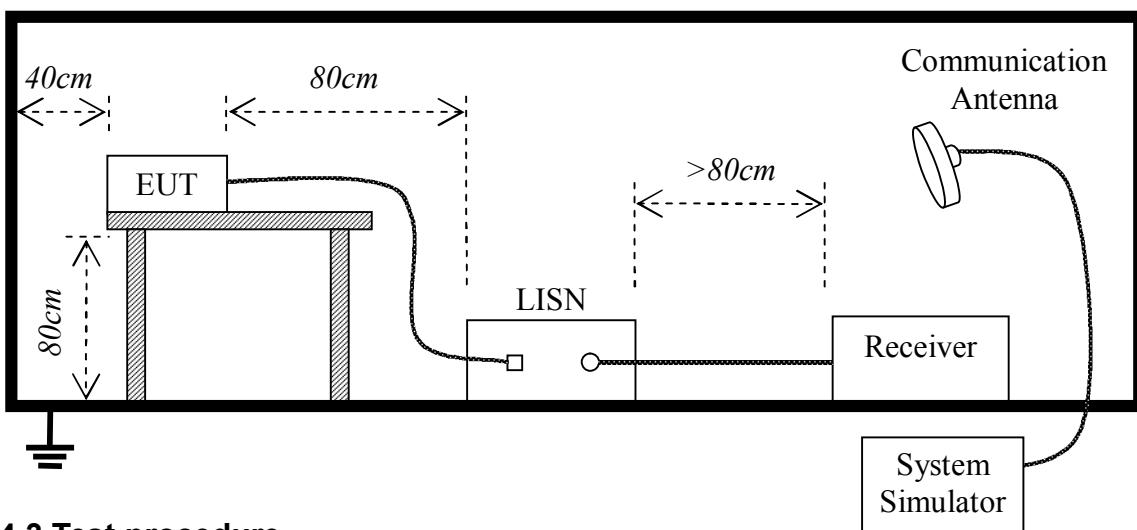
4.4.1 Requirement

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the and 150 kHz-30 MHz, shall not exceed the limits in the following table:

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

****Note:** 1. the lower limit shall apply at the band edges.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

4.4.2 Block Diagram of Test Setup



4.4.3 Test procedure

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.
4. The bandwidth of test receiver (ESCI) set at 9 KHz.
5. All data was recorded in the Quasi-peak and average detection mode.

4.4.4 Test Result

Pass

Note: All test modes are performed, only the worst case is recorded in this report.
Please refer the following pages.

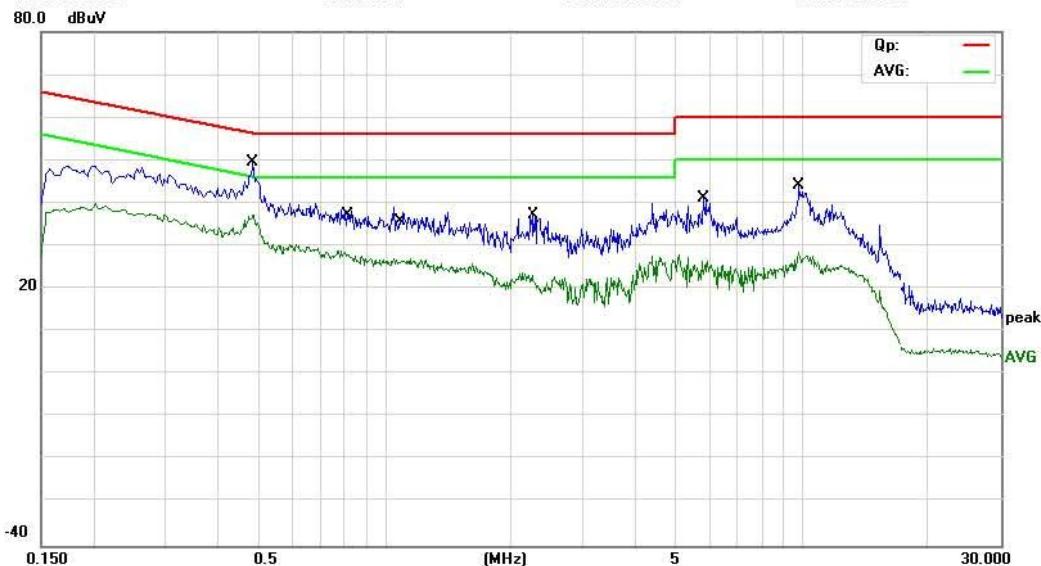
Conducted Emission Measurement

File: PJGC002

Data: #34

Date: 15/03/11/

Time: 12:08:09



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.4883	35.42	10.08	45.50	56.20	-10.70	QP	
2	*	0.4883	28.94	10.08	39.02	46.20	-7.18	AVG	
3		0.8190	23.47	10.00	33.47	56.00	-22.53	QP	
4		0.8190	17.68	10.00	27.68	46.00	-18.32	AVG	
5		1.0926	22.45	9.91	32.36	56.00	-23.64	QP	
6		1.0926	16.66	9.91	26.57	46.00	-19.43	AVG	
7		2.2647	19.06	9.26	28.32	56.00	-27.68	QP	
8		2.2647	11.19	9.26	20.45	46.00	-25.55	AVG	
9		5.7986	18.79	11.52	30.31	60.00	-29.69	QP	
10		5.7986	9.03	11.52	20.55	50.00	-29.45	AVG	
11		9.7528	24.72	9.15	33.87	60.00	-26.13	QP	
12		9.7528	14.73	9.15	23.88	50.00	-26.12	AVG	

*:Maximum data x:Over limit !:over margin

Engineer Signature: Jidegan

Conducted Emission Measurement

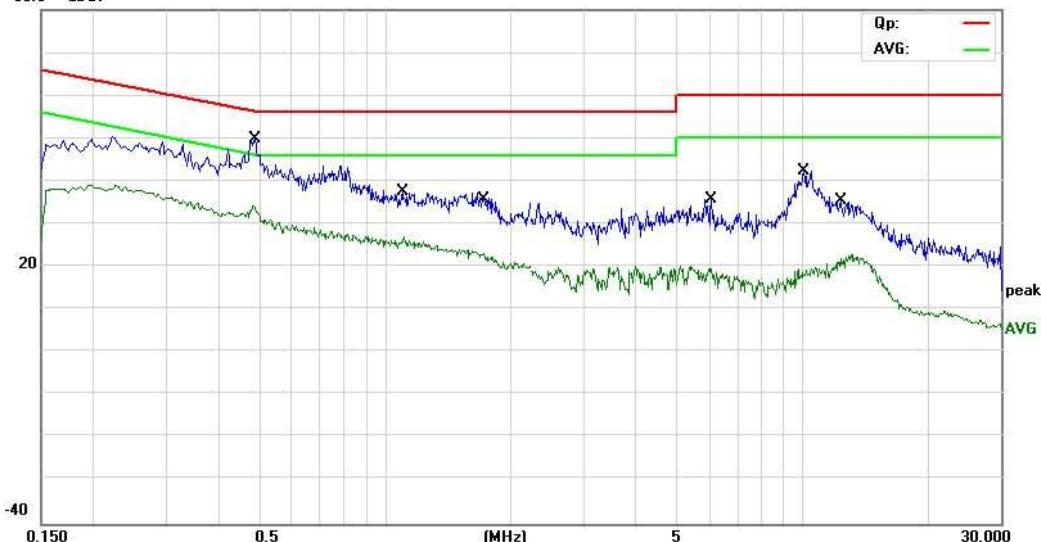
File: PJGC002

Data: #35

Date: 15/03/11/

Time: 12/16/36

80.0 dBuV



Site MOST #1

Phase: **L1**

Temperature: 24.8

Limit: FCC Part15 B Class B QP

Power: DC 5V by Adapter

Humidity: 54 %

EUT: Playjam Console

M/N: PJGC002

Mode: 802.11a

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over		Comment
							Detector		
1		0.4882	33.10	10.08	43.18	56.20	-13.02	QP	
2	*	0.4882	26.76	10.08	36.84	46.20	-9.36	AVG	
3		1.0935	21.10	9.91	31.01	56.00	-24.99	QP	
4		1.0935	15.57	9.91	25.48	46.00	-20.52	AVG	
5		1.7087	18.86	9.29	28.15	56.00	-27.85	QP	
6		1.7087	13.47	9.29	22.76	46.00	-23.24	AVG	
7		6.1175	11.63	11.33	22.96	60.00	-37.04	QP	
8		6.1175	4.90	11.33	16.23	50.00	-33.77	AVG	
9		10.0262	21.55	9.00	30.55	60.00	-29.45	QP	
10		10.0262	6.39	9.00	15.39	50.00	-34.61	AVG	
11		12.3908	17.05	9.00	26.05	60.00	-33.95	QP	
12		12.3908	9.09	9.00	18.09	50.00	-31.91	AVG	

*:Maximum data x:Over limit !:Over margin

Engineer Signature: Jidegan

4.5 26dB Emission Bandwidth

4.5.1 Test Requirement

Measurement of the 26dB bandwidth of the modulated signal.

4.5.2 Test Procedure

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW \geq RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. 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%.

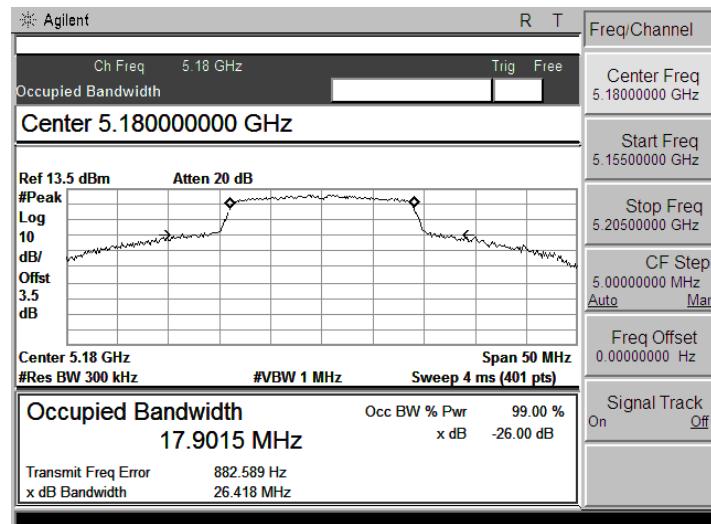
4.5.3 Test Result

Test Item:	26dB Emission Bandwidth	Temperature :	23°C
Test Engineer:	Kang	Relative Humidity :	65%

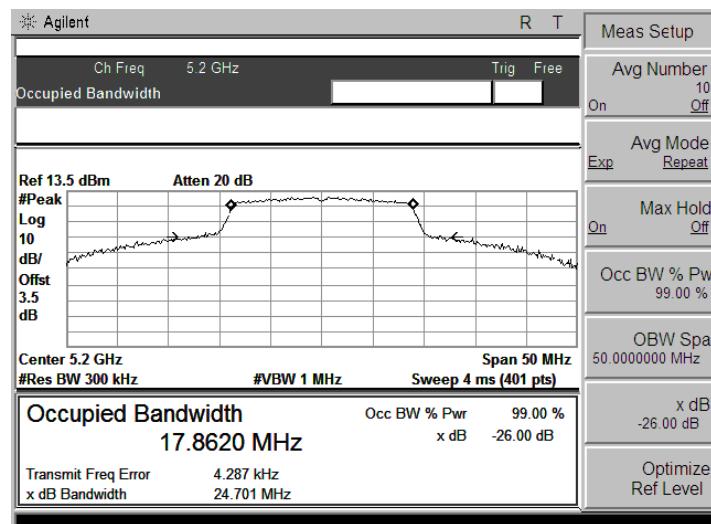
Mode	Channel	Frequency (MHz)	26dB Bandwidth(MHz)
802.11 an 20M (5150-5250MHz)	Low	5180	26.418
	Middle	5200	24.701
	High	5240	26.559
802.11 a (5150-5250MHz)	Low	5180	25.544
	Middle	5200	24.451
	High	5240	24.261
802.11 an 20M (5725-5850MHz)	Low	5745	23.820
	Middle	5785	24.567
	High	5825	28.914
802.11 a (5725-5850MHz)	Low	5745	25.223
	Middle	5785	25.257
	High	5825	27.748

Please refer the following pages.

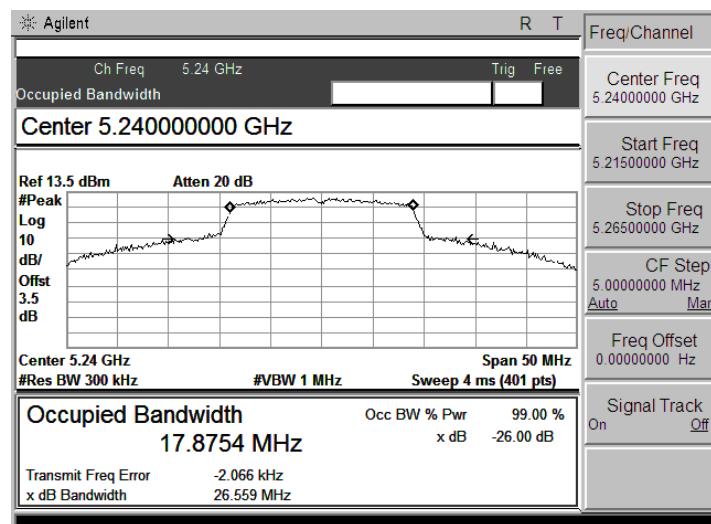
802.11 an 20M mode



5180 MHz

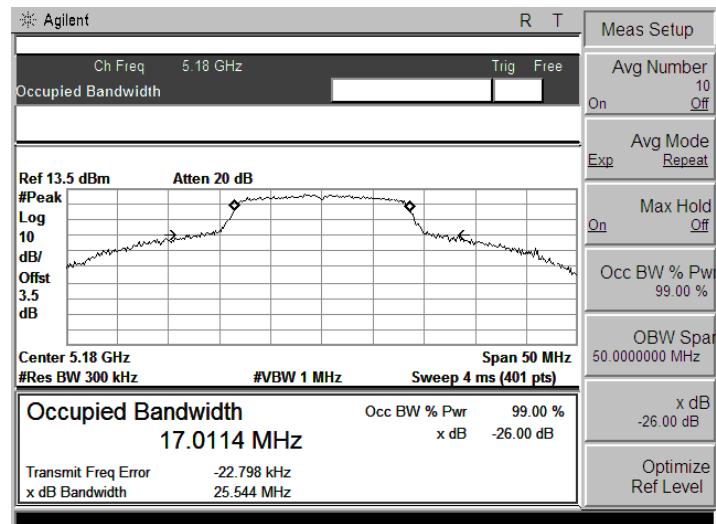


5200 MHz

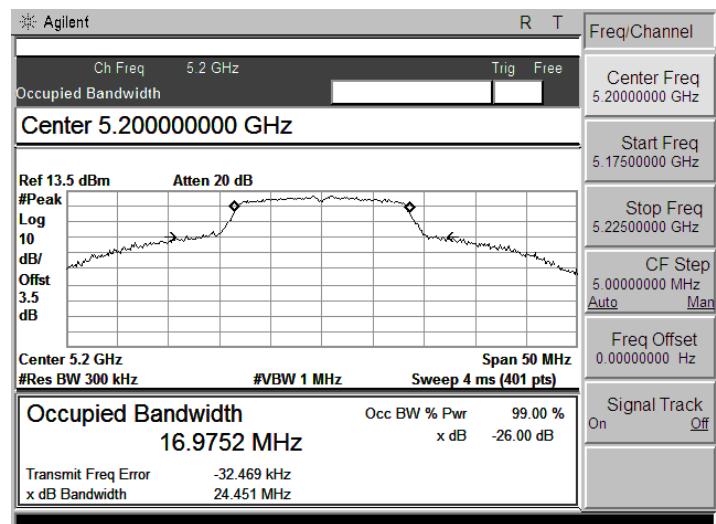


5240 MHz

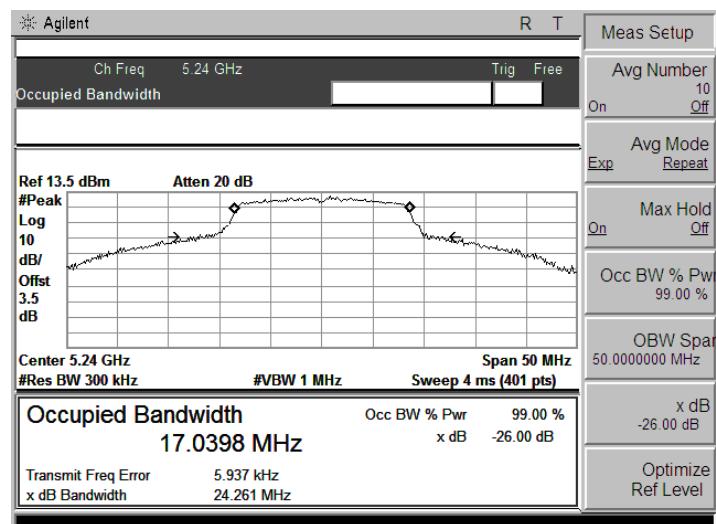
802.11 a mode



5180 MHz

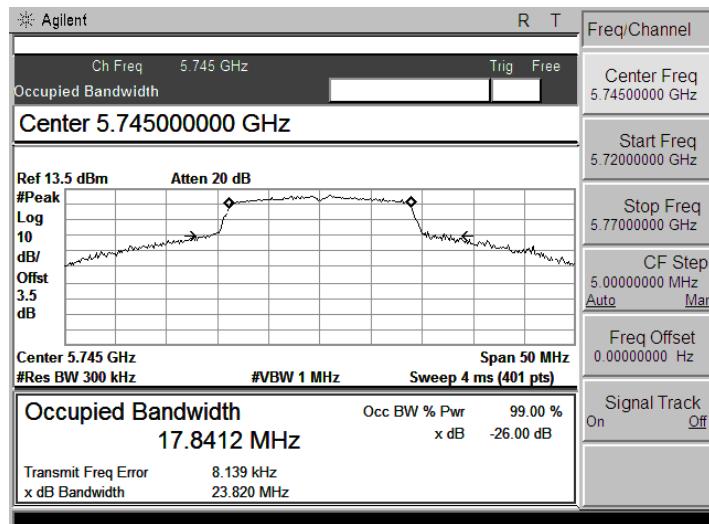


5200 MHz

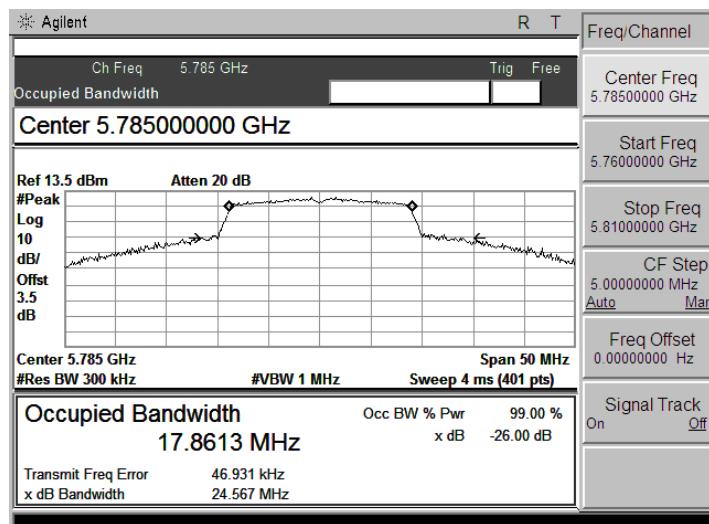


5240 MHz

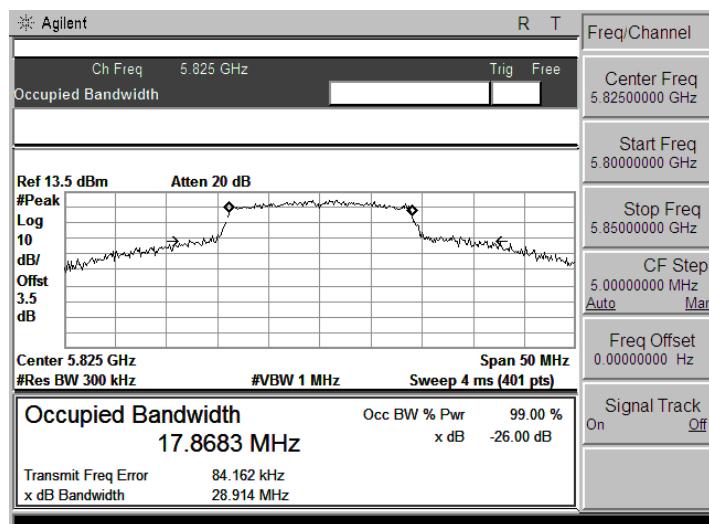
802.11 an 20M mode



5745 MHz

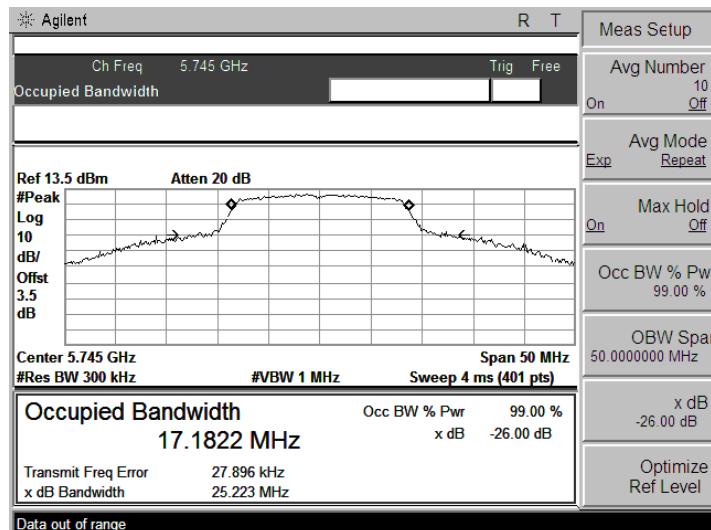


5785 MHz

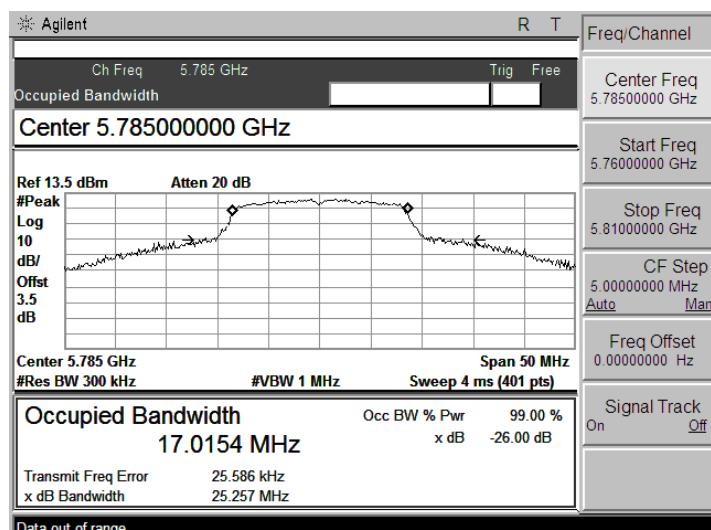


5825 MHz

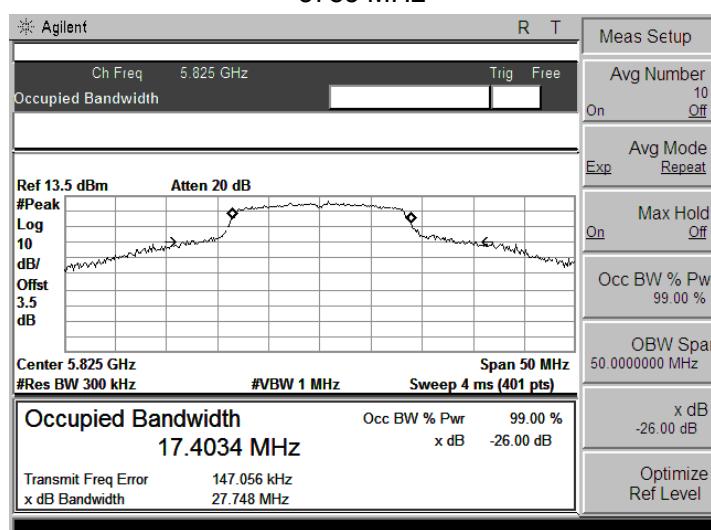
802.11 a mode



5745 MHz



5785 MHz



5825 MHz

4.6 6dB Emission Bandwidth

4.6.1 Test Requirement

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

4.6.2 Test Procedure

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW \geq RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 6 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%.

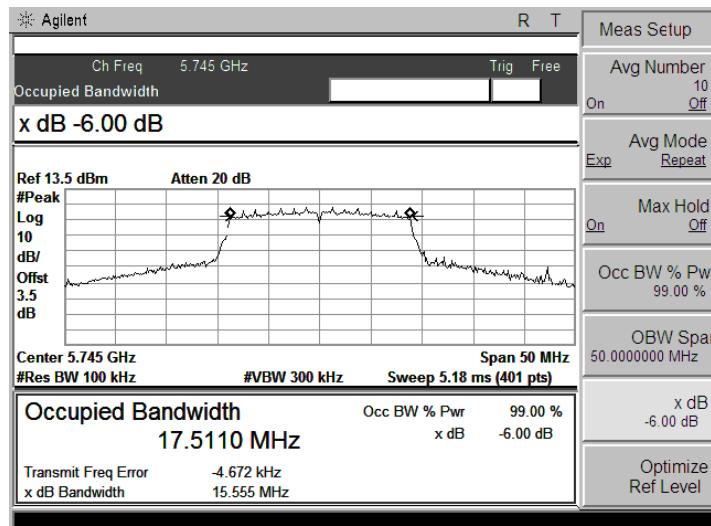
4.6.3 Test Result

Test Item:	6dB Emission Bandwidth	Temperature :	23°C
Test Engineer:	Kang	Relative Humidity :	65%

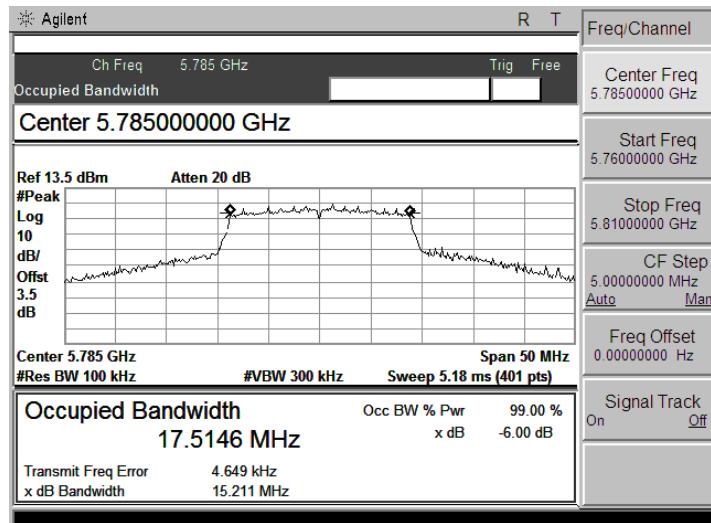
Mode	Channel	Frequency (MHz)	6dB Bandwidth(MHz)	Limit(KHz)
802.11 an 20M (5725-5850MHz)	Low	5745	15.555	\geq 500
	Middle	5785	15.211	\geq 500
	High	5825	16.029	\geq 500
802.11 a (5725-5850MHz)	Low	5745	14.821	\geq 500
	Middle	5785	15.483	\geq 500
	High	5825	15.808	\geq 500

Please refer the following pages.

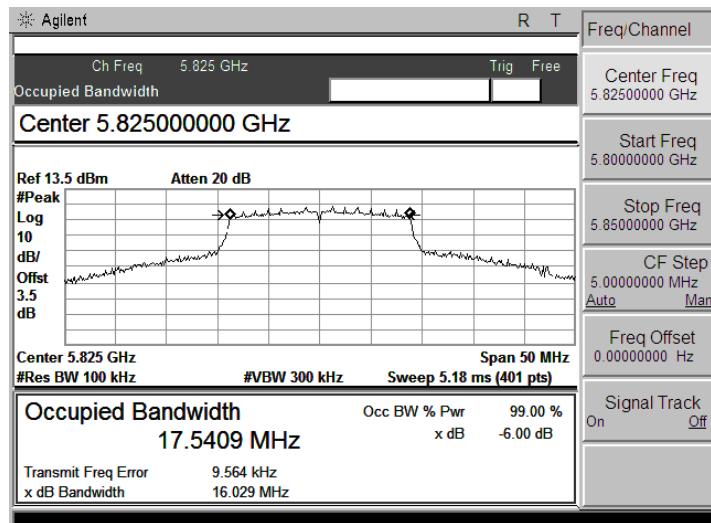
802.11 an 20M mode



5745 MHz

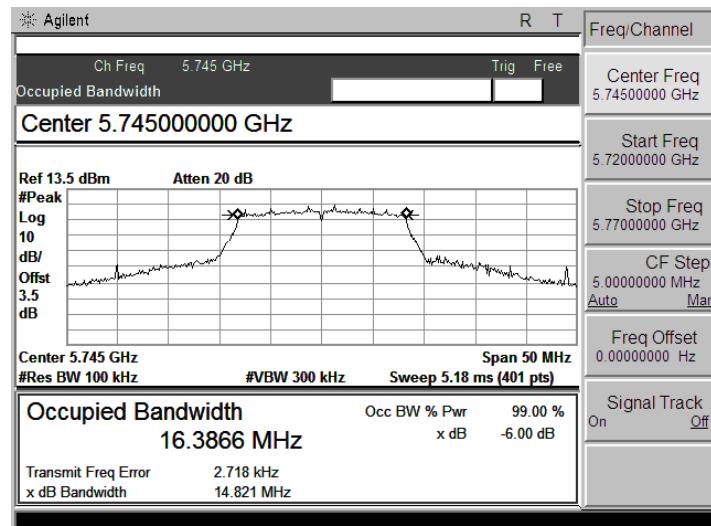


5785 MHz

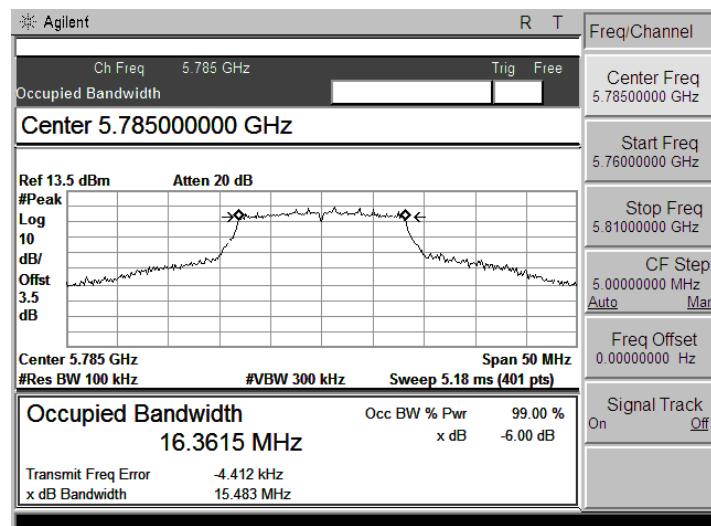


5825 MHz

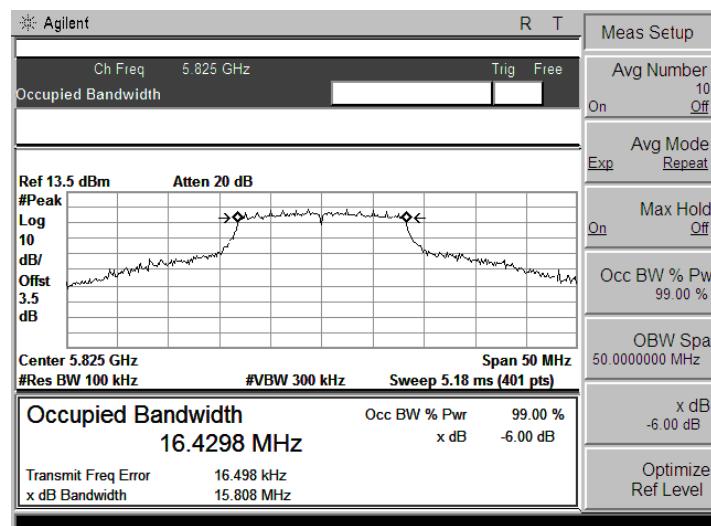
802.11 a mode



5745 MHz



5785 MHz



5825 MHz

4.7 MAXIMUM CONDUCTED OUTPUT POWER

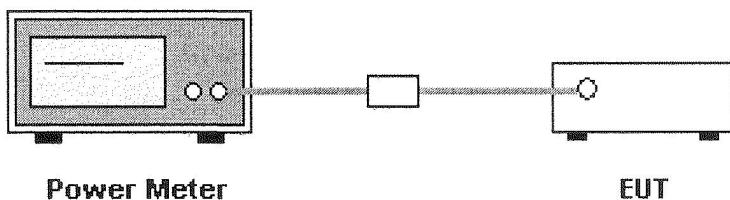
4.7.1 LIMIT

According to §15.407(a),

1. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz.
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 6dBi are used, both the maximum transmit power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.7.2 Block Diagram of Test Setup



4.7.3 Test Procedure

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01. Method PM (Measurement using an RF average power meter):

1. Measurement is performed using an RF average power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, $10 \log(1/x)$, where x is the duty cycle.

4.7.4 Test Result

Test Item:	Max Output Power	Temperature :	23°C
Test Engineer:	Kang	Relative Humidity :	65%

4.8 POWER SPECTRAL DENSITY TEST

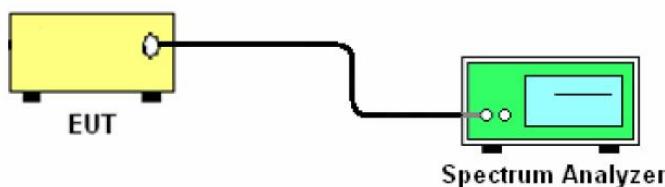
4.8.1 LIMIT

According to §15.407(a),

1. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
3. For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6dBi are used, both the maximum transmit power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.8.2 Block Diagram of Test Setup



4.8.3 Test Procedure

1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
 - Measure the duty cycle.
 - Set span to encompass the entire emission bandwidth (EBW) of the signal.
 - Set RBW = 1 MHz.
 - Set VBW ≥ 3 MHz.
 - Number of points in sweep ≥ 2 Span / RBW.
 - Sweep time = auto.
 - Detector = RMS
 - Trace average at least 100 traces in power averaging mode.
 - Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add $10 \log(1/0.25) = 6$ dB if the duty cycle is 25 percent.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

4.8.4 Test Result

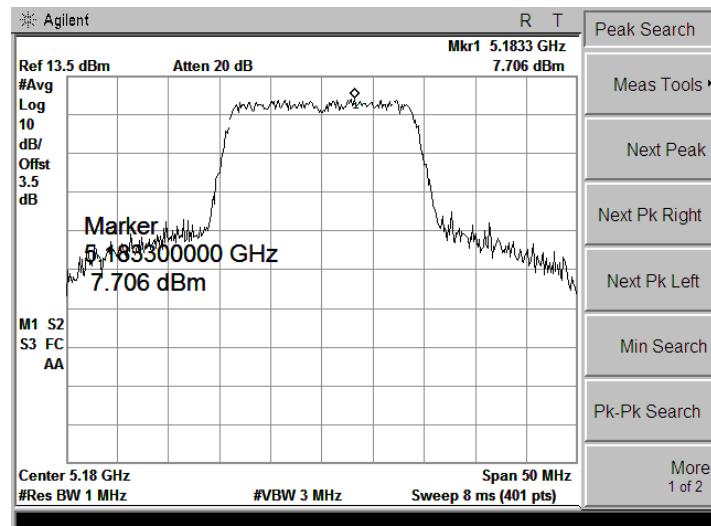
Test Item:	PSD TEST	Temperature :	23°C
Test Engineer:	Kang	Relative Humidity :	65%

Mode	Channel	Frequency (MHz)	Duty Factor(dB)	Average PSD	Total PPSD	Limit ed	Result
				(dBm/MHz)	(dBm/MHz)		
802.11 an 20M (5150-5250MHz)	Low	5180	0.46	7.706	8.166	17	PASS
	Middle	5200	0.46	8.092	8.552	17	PASS
	High	5240	0.46	8.306	8.766	17	PASS
802.11 a (5150-5250MHz)	Low	5180	0.43	8.318	8.748	17	PASS
	Middle	5200	0.43	7.378	7.808	17	PASS
	High	5240	0.43	7.417	7.847	17	PASS

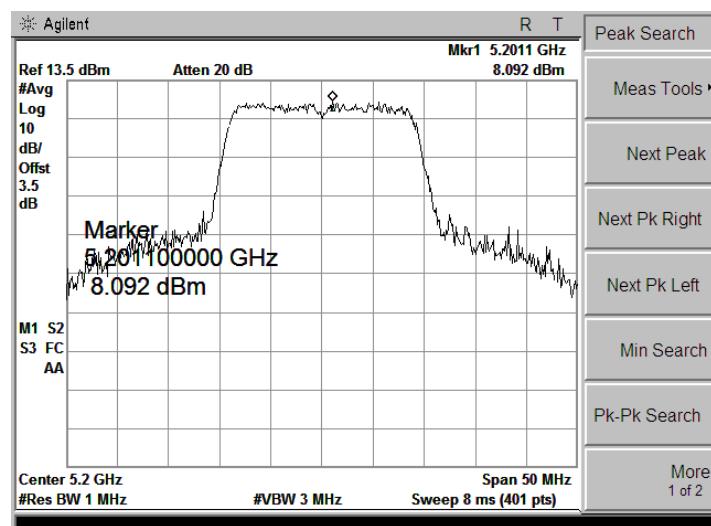
Mode	Channel	Frequency (MHz)	Factor(dB)	Average PSD	Total PPSD	Limit ed	Result
				(dBm/300KHz)	(dBm/300KHz)		
802.11 an 20M (5725-5850MHz)	Low	5745	2.66	6.520	9.18	30	PASS
	Middle	5785	2.66	7.665	10.325	30	PASS
	High	5825	2.66	8.508	11.168	30	PASS
802.11 a (5725-5850MHz)	Low	5745	2.63	7.648	10.278	30	PASS
	Middle	5785	2.63	7.673	10.303	30	PASS
	High	5825	2.63	8.736	11.366	30	PASS
Remark:	1: Factor= duty cycle+10log(500KHz/RBW); RBW=300KHz						

Please refer the following pages.

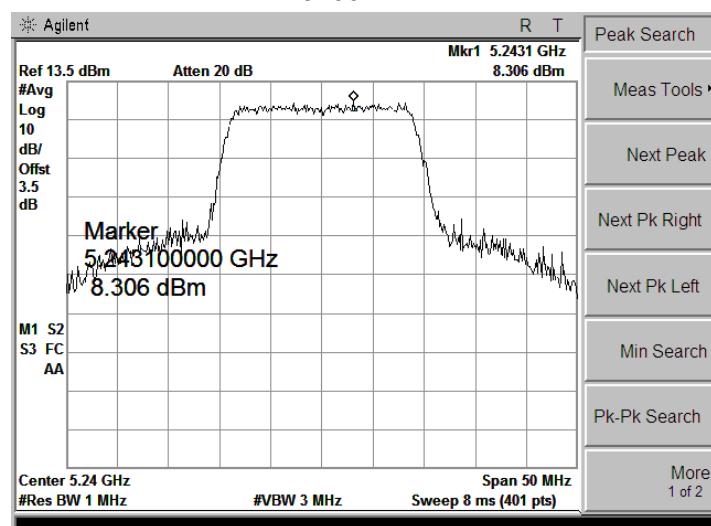
802.11 an 20M mode



5180 MHz

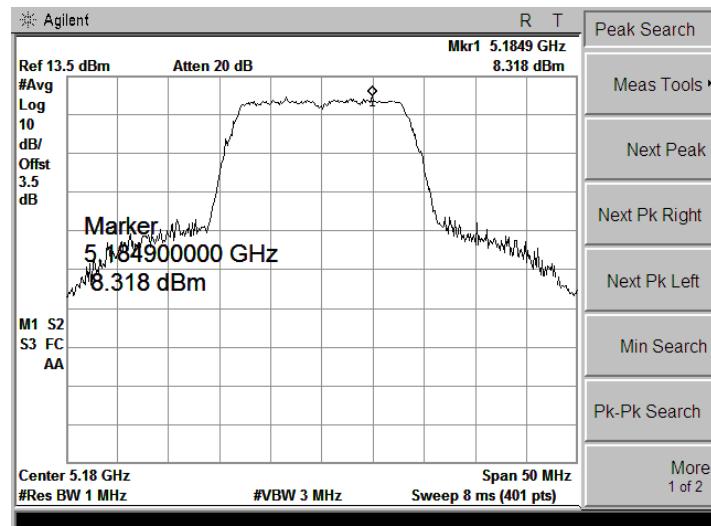


5200 MHz

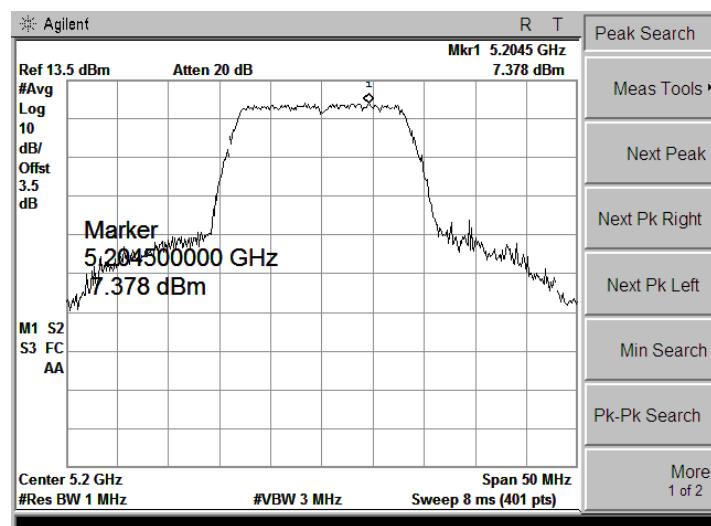


5240 MHz

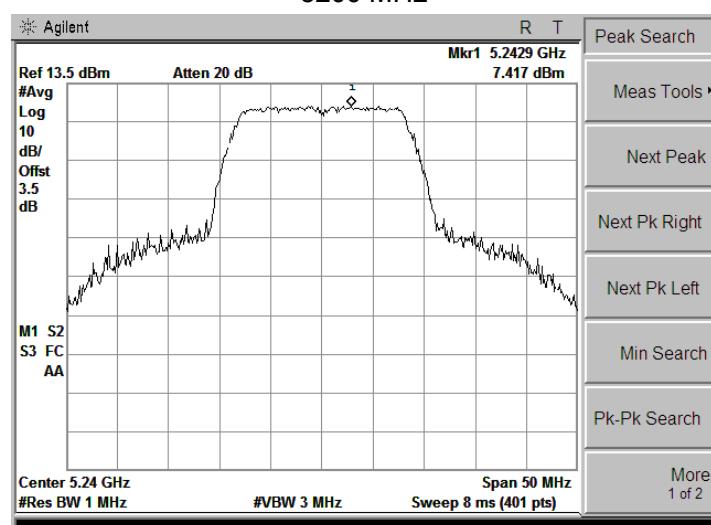
802.11 a mode



5180 MHz

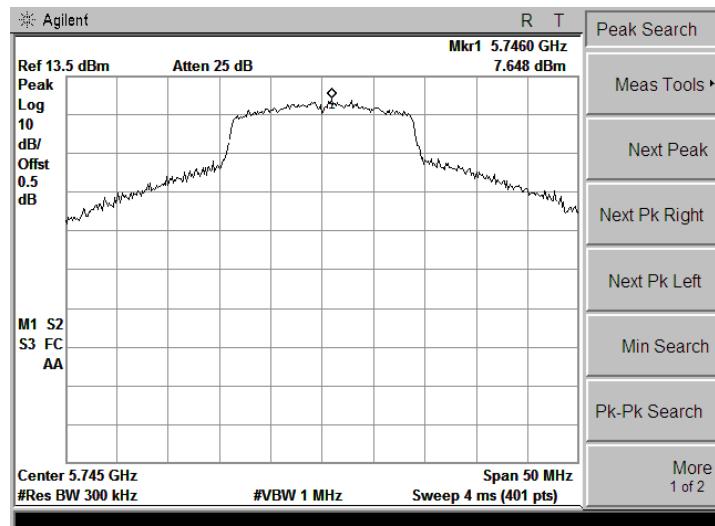


5200 MHz

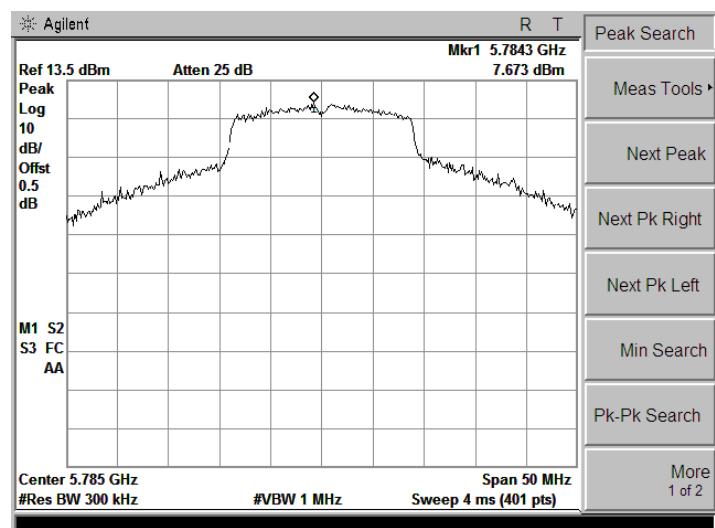


5240 MHz

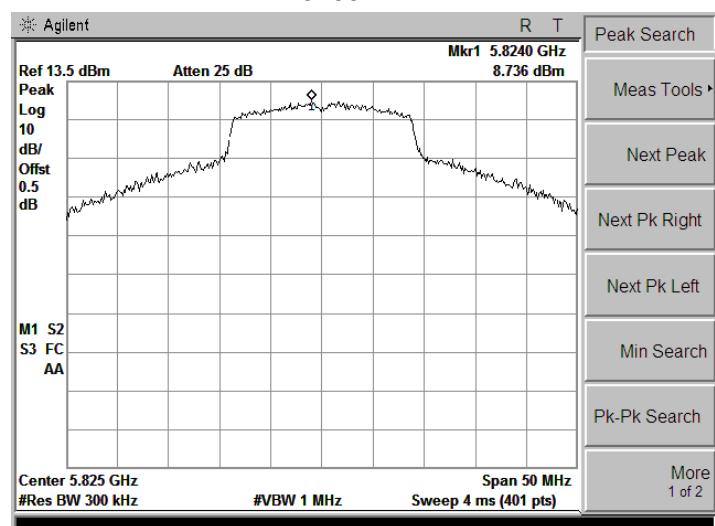
802.11 an 20M mode



5745 MHz

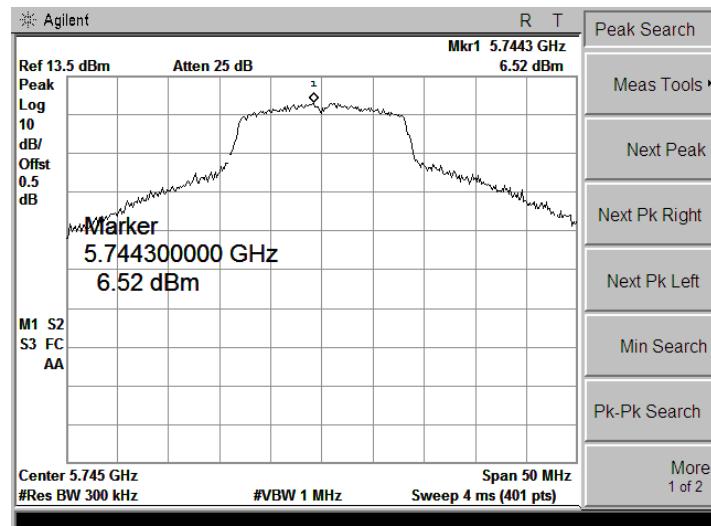


5785 MHz

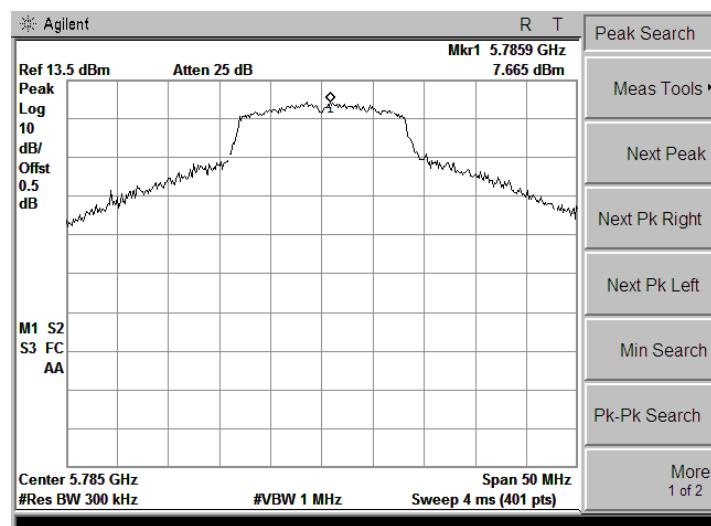


5825 MHz

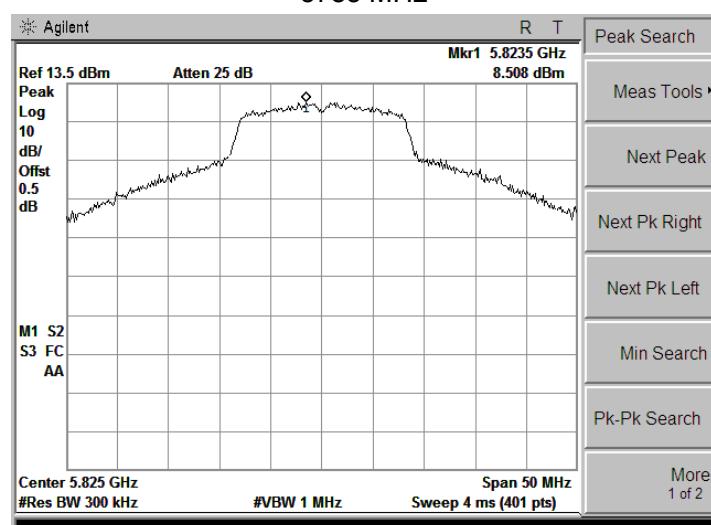
802.11 a mode



5745 MHz



5785 MHz



5825 MHz

4.9 Radiated Emission and Band Edges

4.9.1 Requirement

According to §15.407(b),

1. The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
2. When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.
3. According to FCC section 15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Test Distance (m)	Field Strength ($\text{dB}\mu\text{V/m}$ at 3-meter)
0.009 - 0.490	$2400/F(\text{kHz})$	300	
0.490 - 1.705	$24000/F(\text{kHz})$	30	
1.705-30	30	30	
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Note:

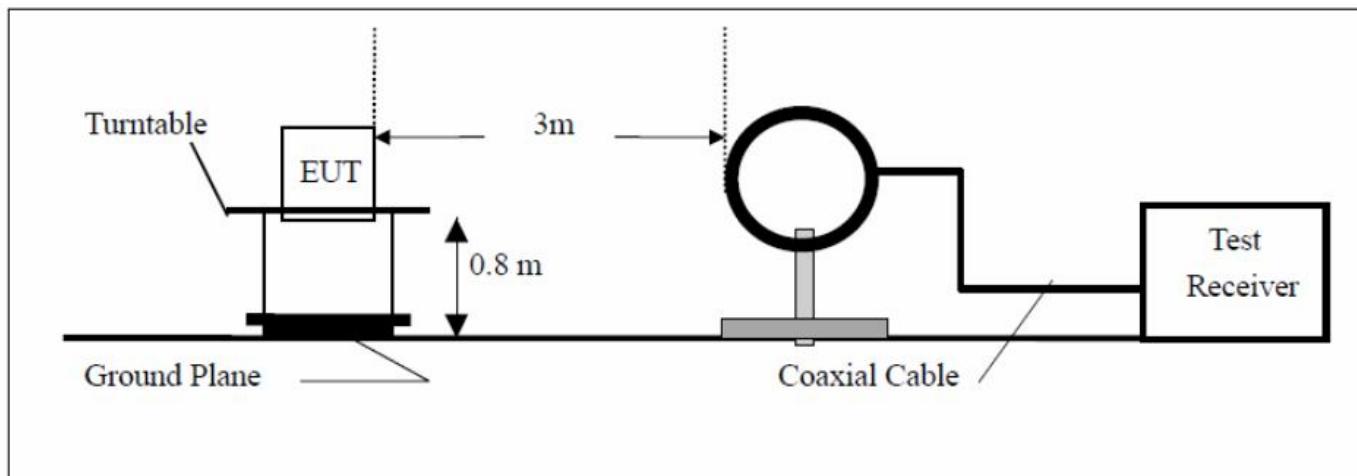
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dB μ V/m@3m (AV) and 74dB μ V/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in RSS-Gen Cl.8.10, also should comply with the radiated emission limits specified in RSS-Gen Cl.8.9 (above table)

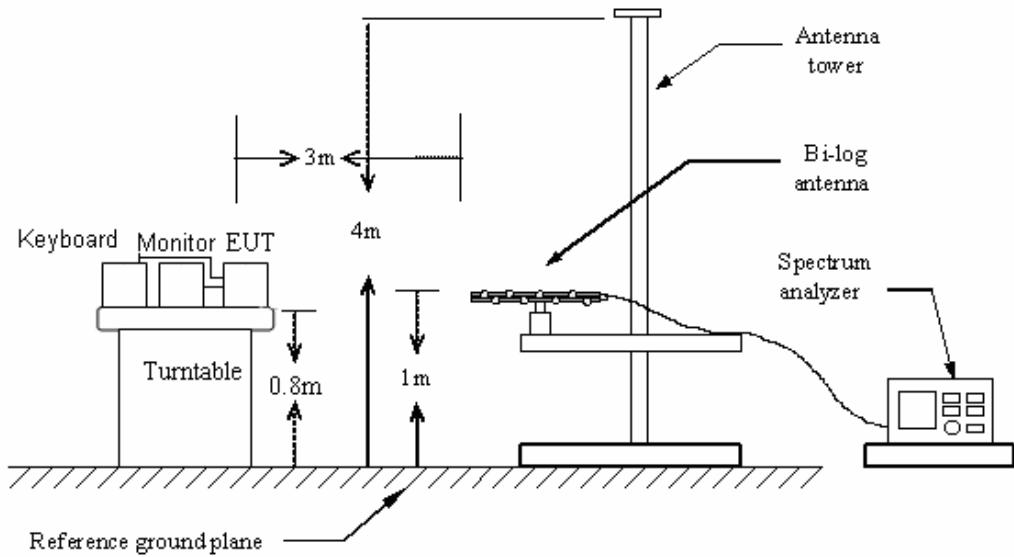
4.9.2 Test Configuration

Test Setup:

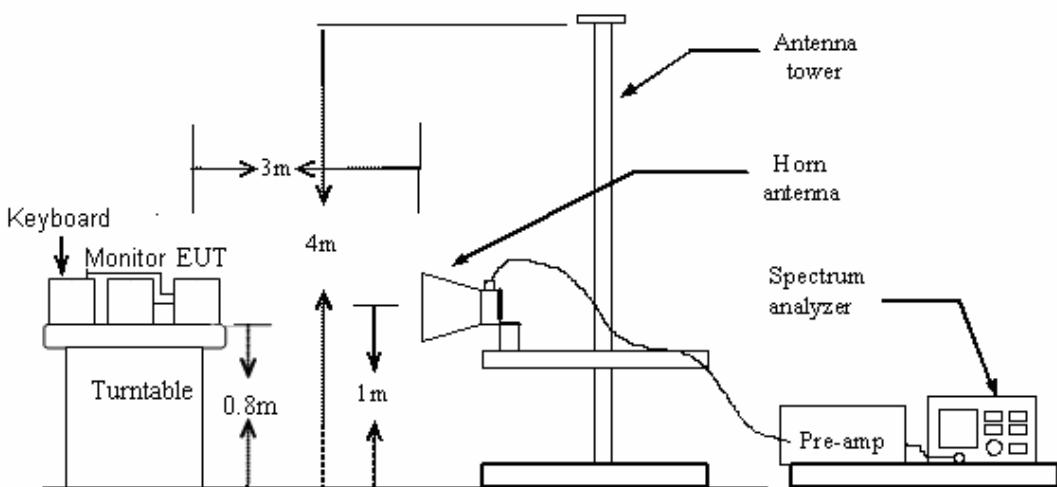
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



4.9.3 Test Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

5. Set the spectrum analyzer in the following setting as:

Below 1GHz: PEAK: RBW=100 kHz / VBW=300 kHz / Sweep=AUTO QP: RBW=120 kHz / Sweep=AUTO

Above 1GHz: (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b)AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

4.9.4 Test Result

Pass

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which is worse case.
1. Pre-scan 802.11a and 802.11an(20M) mode, found the 802.11a is worse case.

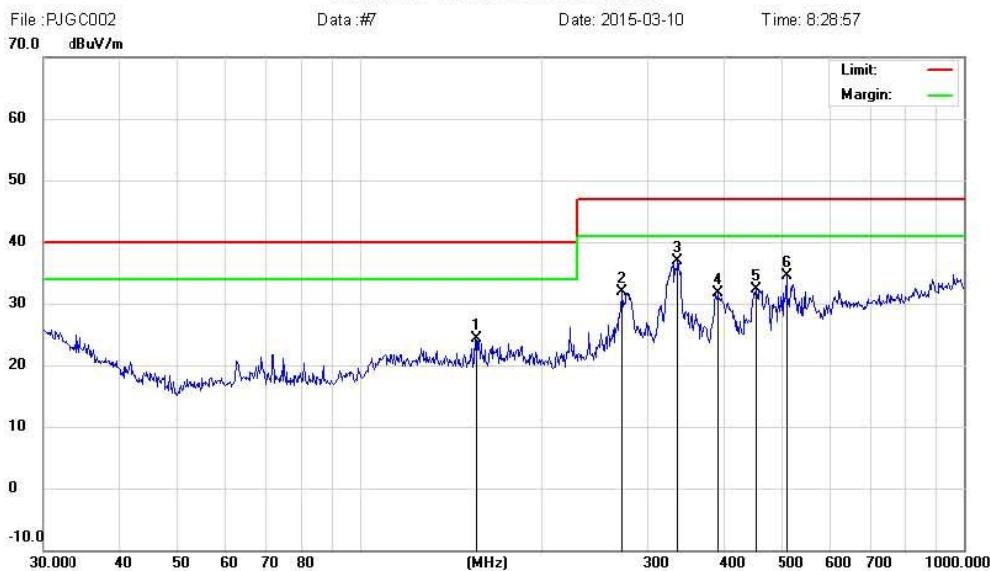
Please refer the following pages.

Test Item: Radiated Emission(below 1GHz) **Test data:** 2015.03.10
Operation Mode: 802.11 a **Temperature:** 26°C
Tested by: John **Humidity:** 50 % RH



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
 Guangdong, China
 Tel: 0755-86026850 Fax: 0755-26013350

Radiated Emission Measurement



Site Chamber #1

Polarization: **Horizontal**

Temperature: 26

Limit: EN 55022 Class B 3M Radiation

Power: DC 5.0V by Adapter

Humidity: 50 %

EUT: Playjam Stick

Distance:

M/N: PJGC002

Mode: 802.11a-CH1

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table		
			Level	Factor	ment					Degree	Comment
			MHz	dBuV	dB	dBuV/m	dB	Detector	cm	degree	Comment
1		155.9099	7.40	16.97	24.37	40.00	-15.63	QP			
2		272.2776	12.92	19.01	31.93	47.00	-15.07	QP			
3	*	336.0350	19.76	17.06	36.82	47.00	-10.18	QP			
4		390.7225	13.37	18.33	31.70	47.00	-15.30	QP			
5		452.7197	12.16	20.18	32.34	47.00	-14.66	QP			
6		510.0435	13.03	21.50	34.53	47.00	-12.47	QP			

*:Maximum data x:Over limit !:over margin

Engineer Signature: John

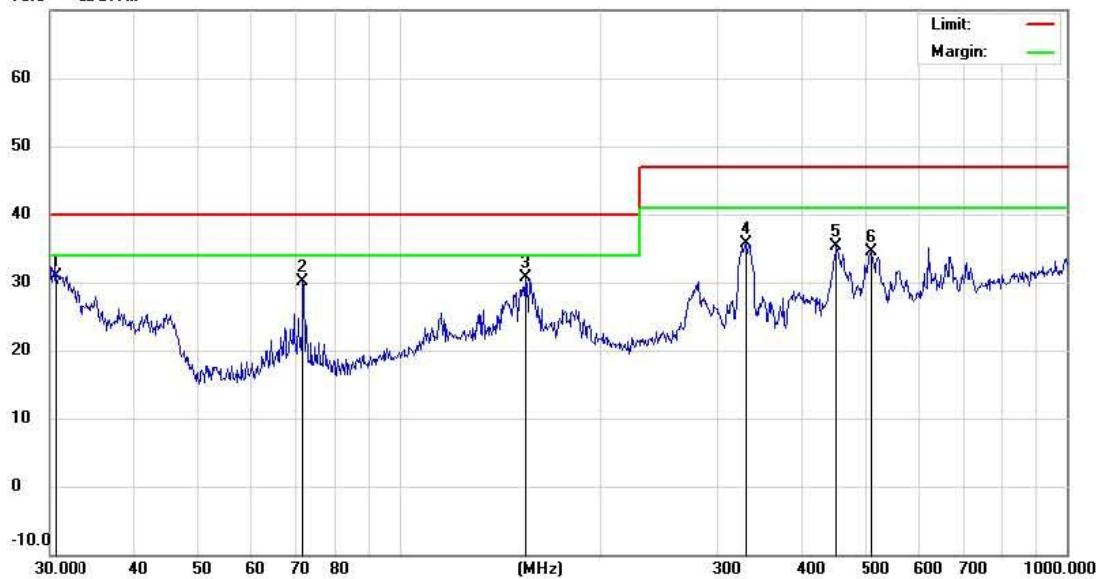
Radiated Emission Measurement

File : PJGC002
 70.0 dBuV/m

Data : #8

Date: 2015-03-10

Time: 8:39:37



Site: Chamber #1

Polarization: **Vertical**

Temperature: 26

Limit: EN 55022 Class B 3M Radiation

Power: DC 5.0V by Adapter

Humidity: 50 %

EUT: Playjam Stick

Distance:

M/N: PJGC002

Mode: 802.11a-CH1

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	Degree
			Level	Factor	ment					
		MHz	dBuV	dB	dBuV/m	dB	Detector	cm	degree	Comment
1	*	30.6378	8.21	22.74	30.95	40.00	-9.05	QP		
2		71.8320	18.40	11.64	30.04	40.00	-9.96	QP		
3		154.8204	13.78	16.89	30.67	40.00	-9.33	QP		
4		330.1948	18.72	17.00	35.72	47.00	-11.28	QP		
5		451.1350	15.09	20.13	35.22	47.00	-11.78	QP		
6		510.0435	12.98	21.50	34.48	47.00	-12.52	QP		

*:Maximum data x:Over limit l:over margin

Engineer Signature: John

Test Item: Radiated Emission(Above 1GHz) **Test data:** 2015.03.19
Operation Mode: 802.11 a
 (5150-5250MHz) **Temperature:** 24.3°C
Tested by: John **Humidity:** 54.8 % RH

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1060.23	H	66.56	57.12	-9.32	57.24	47.80	74.00	54.00	-6.20
1060.23	V	58.74	42.49	-9.32	49.42	33.17	74.00	54.00	-20.83
1960.23	H	62.34	50.01	-9.58	52.76	40.43	74.00	54.00	-13.57
1960.23	V	56.21	43.48	-9.58	46.63	33.90	74.00	54.00	-20.10
5980.14	H	53.34	41.01	-2.76	50.58	38.25	74.00	54.00	-15.75
5980.14	V	46.51	34.24	-2.76	43.75	31.48	74.00	54.00	-22.52
8741.04	H	41.31	30.75	-1.10	40.21	29.65	74.00	54.00	-24.35
8741.04	V	35.42	25.11	-1.10	34.32	24.01	74.00	54.00	-29.99
13240.57	H	40.05	29.51	3.02	43.07	32.53	74.00	54.00	-21.47
13240.57	V	34.77	24.78	3.02	37.79	27.80	74.00	54.00	-26.20
N/A									>20

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
 - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.

Test Item: Radiated Emission(Above 1GHz) **Test data:** 2015.03.19
Operation Mode: 802.11 a
 (5725-5850MHz) **Temperature:** 24.3°C
Tested by: John **Humidity:** 54.8 % RH

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1061.27	H	65.79	54.10	-9.32	56.47	44.78	74.00	54.00	-9.22
1061.27	V	58.13	47.75	-9.32	48.81	38.43	74.00	54.00	-15.57
1959.34	H	60.02	52.95	-9.58	50.44	43.37	74.00	54.00	-10.63
1959.34	V	51.89	43.11	-9.58	42.31	33.53	74.00	54.00	-20.47
2511.65	H	53.45	45.76	-8.43	45.02	37.33	74.00	54.00	-16.67
2511.65	V	44.71	38.30	-8.43	36.28	29.87	74.00	54.00	-24.13
8632.14	H	41.25	30.15	-1.10	40.15	29.05	74.00	54.00	-24.95
8632.14	V	34.94	26.77	-9.58	25.36	17.19	74.00	54.00	-36.81
14320.36	H	40.77	29.12	3.90	44.67	33.02	74.00	54.00	-20.98
14320.36	V	34.56	25.61	3.90	38.46	29.51	74.00	54.00	-24.49
N/A									>20

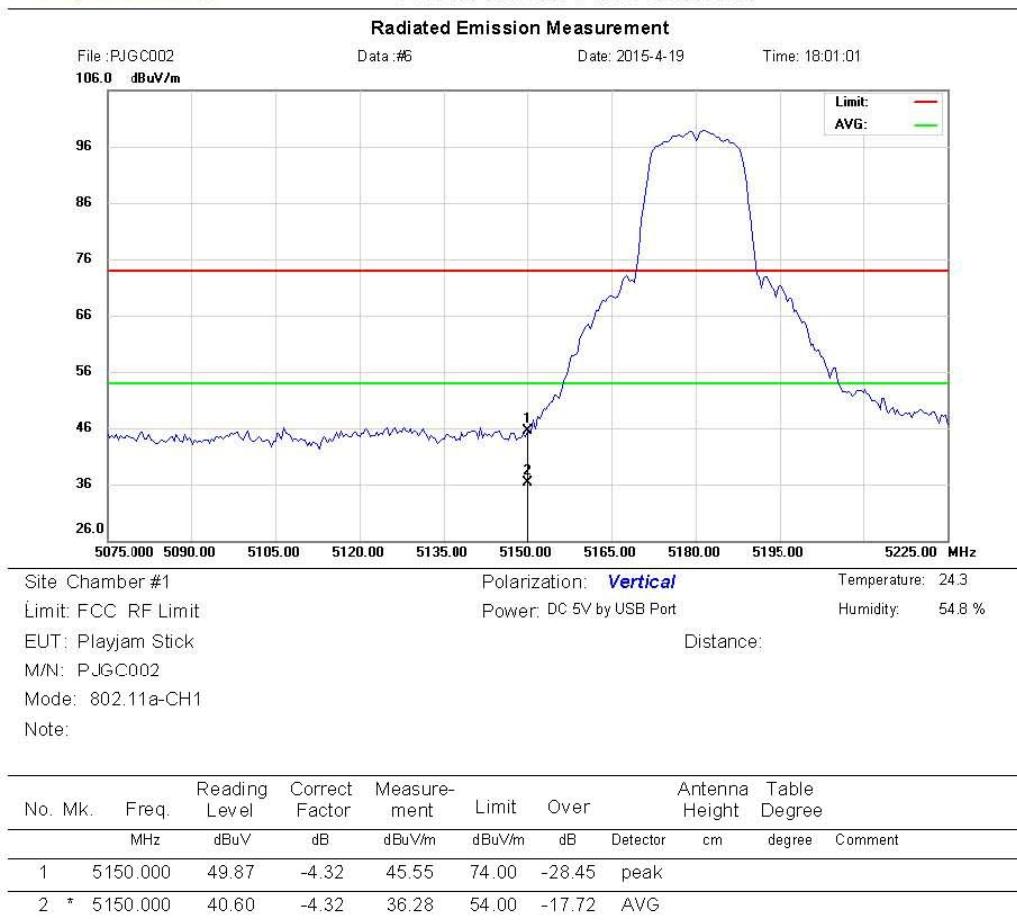
Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
 - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.

Test Item: Band edge **Test data:** 2015.04.19
Operation Mode: 802.11 a (5150-5250MHz) **Temperature:** 24.3°C
Tested by: John **Humidity:** 54.8 % RH



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
 Guangdong, China
 Tel: 0755-86026850 Fax: 0755-26013350



*: Maximum data x:Over limit l:over margin

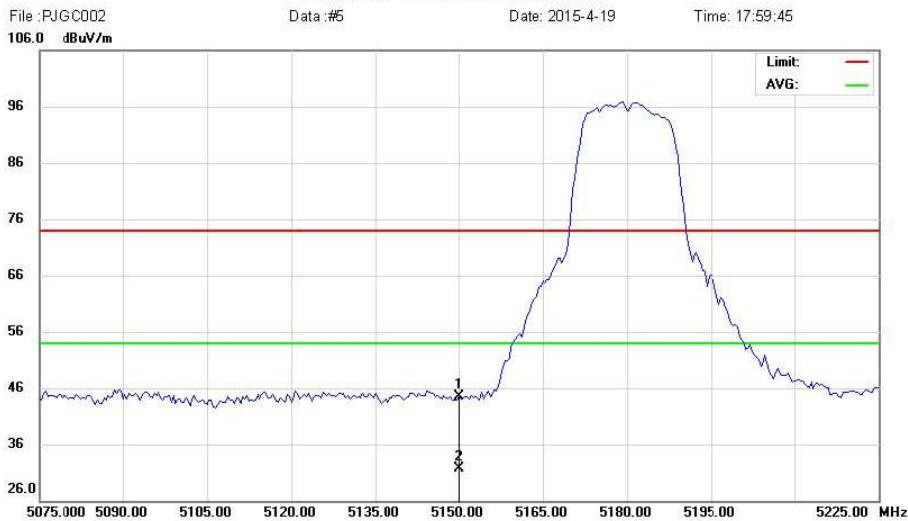
Engineer Signature:

Test Item: Band edge 2015.04.19
Operation Mode: 802.11 a 24.3°C
Tested by: John 54.8 % RH



Address: No.5 Langshan 2nd Rd., North Hi-Tech Industrial park
 Guangdong, China
 Tel: 0755-86026850 Fax: 0755-26013350

Radiated Emission Measurement



Site: Chamber #1 Polarization: **Horizontal** Temperature: 24.3
 Limit: FCC RF Limit Power: DC 5V by USB Port Humidity: 54.8 %
 EUT: Playjam Stick Distance:
 M/N: PJGC002
 Mode: 802.11a-CH1
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		5150.000	48.80	-4.32	44.48	74.00	-29.52	peak		
2	*	5150.000	36.10	-4.32	31.78	54.00	-22.22	AVG		

*:Maximum data x:Over limit l:over margin

Engineer Signature:

Radiated Emission Measurement

File: PJGC002 Data: #22 Date: 2015-4-19 Time: 18:27:55
 106.0 dBuV/m



Site Chamber #1 Polarization: **Vertical** Temperature: 24.5
 Limit: FCC RF Limit Power: DC 5V by USB Port Humidity: 51.7 %
 EUT: Playjam Stick Distance: 3m
 M/N: PJGC002
 Mode: 802.11a-CH4
 Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
			Level	Factor	ment					
		MHz	dBuV	dB	dBuV/m	dB	Detector	cm	degree	Comment
1		5350.000	48.00	-4.44	43.56	74.00	-30.44	peak		
2	*	5350.000	38.20	-4.44	33.76	54.00	-20.24	AVG		

*:Maximum data x:Over limit !:over margin

Engineer Signature:

Radiated Emission Measurement

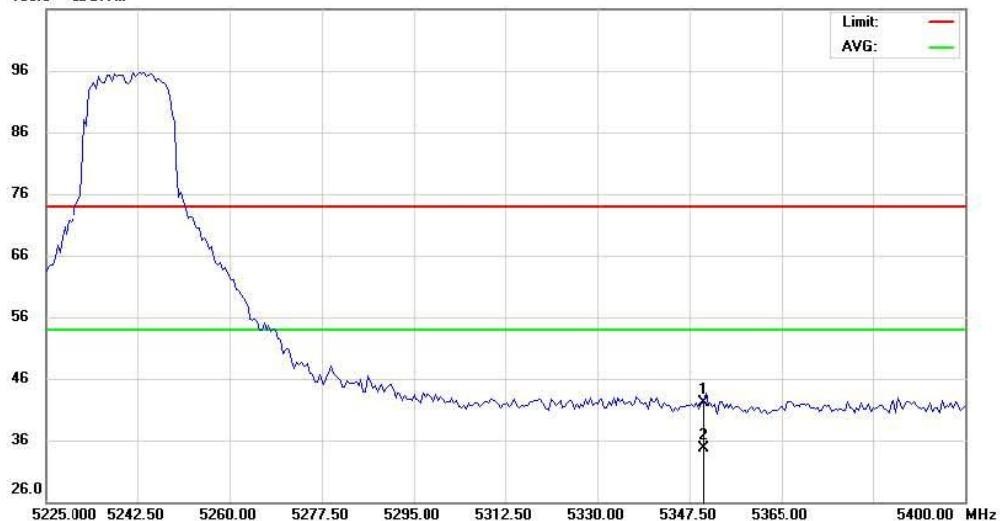
File: PJGC002

Data: #21

Date: 2015-4-19

Time: 18:17:21

106.0 dB_{uV/m}



Site Chamber #1

Polarization: **Horizontal**

Temperature: 24.5

Limit: FCC RF Limit

Power: DC 5V by USB Port

Humidity: 51.7 %

EUT: Playjam Stick

Distance: 3m

M/N: PJGC002

Mode: 802.11a-CH4

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB	Detector	cm	Degree
1		5350.000	46.50	-4.44	42.06	74.00	-31.94	peak	
2	*	5350.000	39.10	-4.44	34.66	54.00	-19.34	AVG	

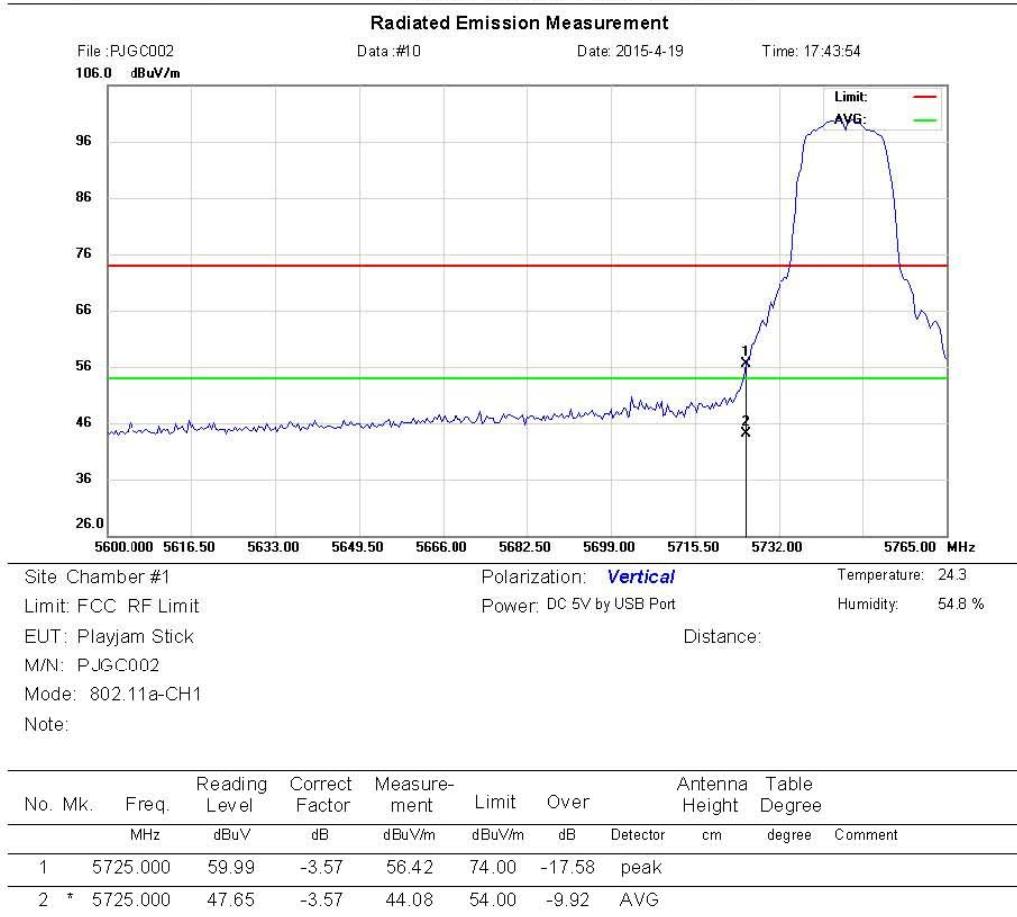
*:Maximum data x:Over limit !:over margin

Engineer Signature:

Operation Mode: 802.11 a
 (5725-5850MHz) **Test Date:** 2015.04.19
Temperature: 23°C **Tested by:** John
Humidity: 56 % RH **Polarity:** Ver. / Hor.



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
 Guangdong, China
 Tel: 0755-86026850 Fax: 0755-26013350



*:Maximum data x:Over limit l:over margin

Engineer Signature:

Radiated Emission Measurement

File: PJGC002

Data: #9

Date: 2015-4-19

Time: 17:32:35

106.0 dB_{uV/m}



Site: Chamber #1

Polarization: **Horizontal**

Temperature: 24.3

Limit: FCC RF Limit

Power: DC 5V by USB Port

Humidity: 54.8 %

EUT: Playjam Stick

Distance:

M/N: PJGC002

Mode: 802.11a-CH1

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
			Level	Factor	ment					Degree
		MHz	dB _{uV}	dB	dB _{uV/m}	dB	Detector	cm	degree	Comment
1		5725.000	58.52	-3.57	54.95	74.00	-19.05	peak		
2	*	5725.000	49.20	-3.57	45.63	54.00	-8.37	AVG		

*:Maximum data x:Over limit !:over margin

Engineer Signature:

Radiated Emission Measurement

File: PJGC002
 106.0 dBuV/m

Data: #12

Date: 2015-4-19

Time: 18:08:06



Site: Chamber #1

Polarization: **Vertical**

Temperature: 24.3

Limit: FCC RF Limit

Power: DC 5V by USB Port

Humidity: 54.8 %

EUT: Playjam Stick

Distance:

M/N: PJGC002

Mode: 802.11a-CH5

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
			Level	Factor	ment			Height	Degree	
		MHz	dBuV	dB	dBuV/m	dB	Detector	cm	degree	Comment
1		5850.000	57.37	-2.98	54.39	74.00	-19.61	peak		
2	*	5850.000	46.20	-2.98	43.22	54.00	-10.78	AVG		

*:Maximum data x:Over limit l:over margin

Engineer Signature:

Radiated Emission Measurement

File: PJGC002

Data: #11

Date: 2015-4-19

Time: 17:56:35

106.0 dBuV/m



Site: Chamber #1

Polarization: **Horizontal**

Temperature: 24.3

Limit: FCC RF Limit

Power: DC 5V by USB Port

Humidity: 54.8 %

EUT: Playjam Stick

Distance:

M/N: PJGC002

Mode: 802.11a-CH5

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree
								Detector	Comment
1	*	5850.000	60.32	-2.98	57.34	74.00	-16.66	peak	
2	*	5850.000	48.60	-2.98	45.62	54.00	-8.38	AVG	

*:Maximum data x:Over limit l:over margin

Engineer Signature:

4.10 Conducted Spurious Emissions

4.10.1 Test Requirement

According to §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) 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 e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

4.10.3 Test Result

Not applicable

Remark: According to KDB 789033, Section G.2.C, out-of-band emission reference to section 4.9 (Radiated Emission and Band Edges) is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.