

# CFR 47 FCC Part 15.407

## TEST REPORT

Product : **Industrial 802.11a/b/g AP/Client**

Trade Name : MOXA

Model Number : AWK-4121

FCC ID : SLE-AWK-4121

Prepared for

**MOXA Inc.**

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**Remark :**

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The test results in the report only to the tested sample.

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## Statement of Compliance

**Applicant:** MOXA Inc.  
**Manufacturer:** MOXA Inc.  
**Product:** Industrial 802.11a/b/g AP/Client  
**Model No.:** AWK-4121  
**Tested Power Supply:** DC 12~24V  
**Date of Final Test:** Feb. 13, 2009

**Configuration of Measurements and Standards Used :**

FCC Rules and Regulations Part 15 Subpart E

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

- Note:** 1. The result of the testing report relate only to the item tested.  
2. The testing report shall not be reproduced expect in full, without the written approval of IETC

Report Issued: 2009/02/16

Project Engineer: *Anya Lee*  
Anya Lee

Approved: *Jerry Liu*  
Jerry Liu

# 1 General Information

## 1.1 Description of Equipment Under Test

- Product** : Industrial 802.11a/b/g AP/Client
- Model Number** : AWK-4121
- Applicant** : **MOXA Inc.**  
Fl.4, No.135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, R.O.C.
- Manufacturer** : **MOXA Inc.**  
Fl.4, No.135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, R.O.C.
- Operating Frequency** : 5180MHz ~ 5240MHz
- Channel Number** : Refer to section 1.2
- Type of Modulation** : OFDM
- Antenna Description** : The product contains 3 sets of antenna. Two sets antenna only support 2.4GHz band the other antenna contain dual band (2.4GHz and 5GHz). Those antenna information as below.

Model No.	Frequency Band	Antenna Type	Antenna Gain	Connector Type
ANT-WDB-ANM-0609	2.4GHz / 5GHz	Dipole	6dBi / 9dBi	N-Male
ANT-WSB-ANM-05 Black	2.4GHz	Dipole	5dBi	N-Male
ANT-WSB-ANM-05 Black 2.4G	2.4GHz	Dipole	5dBi	N-Male

When the device equipped with single band antenna (2.4GHz band only), then the 5GHz band function will be disabled.

- Sample Receive date** : Dec. 17, 2008
- Date of Test** : Dec. 17, 2008 ~ Feb. 13, 2008
- Additional Description** : 1.) The EUT is **Industrial 802.11a/b/g AP/Client**.  
2.) The test model is “**AWK-4121**” and included in this report.  
3.) For more detail specification about EUT, please refer to the user’s manual.

## Product Specifications

### WLAN

#### Standards:

IEEE 802.11a/b/g for Wireless LAN  
IEEE 802.3u for 10/100BaseT(X)  
IEEE 802.3af for Power-over-Ethernet  
IEEE 802.1D for Spanning Tree Protocol  
IEEE 802.1w for Rapid STP

#### Modulation:

802.11b: DBPSK, DQPSK, CCK  
802.11g: OFDM with BPSK, QPSK, 16QAM, 64QAM  
802.11a: OFDM with BPSK, QPSK, 16QAM, 64QAM  
OFDM @ 54 Mbps, CCK @ 11/5.5 Mbps, DQPSK @ 2 Mbps,  
DBSK @ 1 Mbps

#### Operating Channels:

US: 2.412 to 2.462 GHz (11 channels)  
5.15 to 5.25 GHz (4 channels)  
EU: 2.412 to 2.472 GHz (13 channels)  
5.15 to 5.25 GHz (4 channels)  
JP: 2.412 to 2.472 GHz (13 channels, OFDM)  
2.412 to 2.484 GHz (14 channels, CCK)  
5.15 to 5.25 GHz (4 channels for W52)

#### Security:

64-bit and 128-bit WEP and WPA/WPA2 (TKIP, AES and IEEE802.1X, EAP-TLS/  
TTLS/PEAP, EAP-PAP/CHAP/MSCHAP/MSCHAPv2)

#### Data Rates:

802.11b: 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps  
802.11a/g: 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps,  
48 Mbps, 54 Mbps

#### TX Transmit Power:

802.11b: 1 to 11 Mbps: Typ. 18 dBm (+/- 1.5 dBm)  
802.11g: 6 to 24 Mbps: Typ. 18 dBm (+/- 1.5 dBm);  
36 to 48 Mbps: Typ. 16 dBm (+/- 1.5 dBm);  
54 Mbps: Typ. 15 dBm (+/- 1.5 dBm)  
802.11a: 6 to 24 Mbps: Typ. 16 dBm (+/- 1.5 dBm);  
36 to 48 Mbps: Typ. 14 dBm (+/- 1.5 dBm);  
54 Mbps: Typ. 13dBm (+/- 1.5 dBm)

#### RX Sensitivity:

802.11b: -92 dBm @ 1 Mbps; -90 dBm @ 2 Mbps;  
-88 dBm @ 5.5 Mbps; -84 dBm @ 11 Mbps  
802.11g: -87 dBm @ 6 Mbps; -86 dBm @ 9 Mbps;  
-85 dBm @ 12 Mbps; -82 dBm @ 18 Mbps;  
-80 dBm @ 24 Mbps; -76 dBm @ 36 Mbps;  
-72 dBm @ 48 Mbps; -70 dBm @ 54 Mbps  
802.11a: -87 dBm @ 6 Mbps; -86 dBm @ 9 Mbps;  
-85 dBm @ 12 Mbps; -82 dBm @ 18 Mbps;  
-80 dBm @ 24 Mbps; -76 dBm @ 36 Mbps;  
-72 dBm @ 48 Mbps; -70 dBm @ 54 Mbps

## 1.2 Table for Carrier Frequencies

### 802.11a

CH No.	36	40	44	48
CF (MHz)	5180	5200	5220	5240

### 1.3 Test Facility

- Site Description** : ☑RF Test Room    ☑OATS 2
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Site 1, 2 Location** : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang, Taipei County, Taiwan, R.O.C.
- Site 3, 4 Location** : No. 12, Ruei-Shu Valley, Ruei-Ping Tsun, Lin-Kou Hsiang, Taipei County, Taiwan, R.O.C.
- Site Filing** :
  - Federal Communication Commissions – USA  
Registration No.: 96399 (OATS 1 & 2)  
Registration No.: 518958 (OATS 3 & 4)  
Designation No.: TW1020
  - Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan  
Registration No. (Conducted Room): C-1094  
Registration No. (Conducted Room): T-271  
Registration No. (OATS 1): R-1040  
Registration No. (OATS 2): R-1041
  - Industry Canada (IC)  
Submission: 113543
  - Japan Electrical Safety & Environment Technology Laboratories (JET)  
Registration No.: 04S03-01
- Site Accreditation** :
  - Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.  
Accreditation No.:  
SL2-IN-E-0026 for CNS13438 / CISPR22  
SL2-R1-E-0026 for CNS13439 / CISPR13  
SL2-R2-E-0026 for CNS13439 / CISPR13  
SL2-A1-E-0026 for CNS13783-1 / CISPR14-1
  - TÜV NORD  
Certificate No: TNTW0801R
  - Taiwan Accreditation Foundation (TAF)  
Accreditation No.: 1113





## 1.4 Test Equipment

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Next Cal. Date</b>
Spectrum Analyzer	R&S	FSP30	100002	2009/12/10
Spectrum Analyzer	Agilent	8564EC	4046A00331	2009/04/11
Preamplifier	Agilent	8449B	3008A01434	2009/03/31
Preamplifier	Agilent	83050A	3950A00225	2009/08/10
Preamplifier	SCHAFFNER	CA30100	2	2009/10/20
Horn Antenna	COM-POWER	AH-118	10081	2010/05/12
Horn Antenna	Schwarzbeck	BBHA 9170	213	2010/06/08
Wide Bandwidth Sensor	Anritsu	MA2491A	728133	2009/10/16
Power Meter	Anritsu	ML2495A	736010	2009/10/16
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2009/05/14
Signal Generator	Agilent	E8254A	US41140164	2009/05/21
MULTI UE TESTER	JRC	NJZ-2000	ET00184	2009/12/22

Note: The above equipments are within the valid calibration period.

### 1.5 Summary of Measurement

Report Clause	Test Parameter	Reference Document CFR47 Part15	Results
2	26dB Bandwidth	§15.407 (a)	Pass
3	Peak output power test	§15.407 (a)	Pass
4	Power test of Data Rate	§15.407 (a)	Pass
5	Power Spectrum Density test	§15.407 (a)	Pass
6	Peak excursion to average ratio test	§15.407(a)(6)	Pass
7	Radiated spurious emission test	§15.407(b), 15.209, 15.205	Pass
8	Band edge test	§15.209, 15.205	Pass
9	RF antenna conducted spurious emission test	§15.407(b)	Pass
10	AC Power Line Conducted Emission test	§15.407(b)(6), 15.207	Pass

## 1.6 Justification

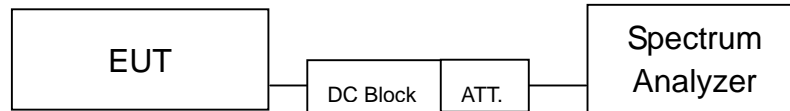
The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of the frequency band were all reach limit requirement, thus we evaluate the EUT pass the specified test.

## 2 26dB bandwidth

### 2.1 Limits

No regulation limit, for reference purpose.

### 2.2 Configuration of Measurement



### 2.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to UNII test procedure of Oct 2002 DA 02-2138 for compliance to FCC 47CFR 15.407 requirements.

### 2.4 Test Result

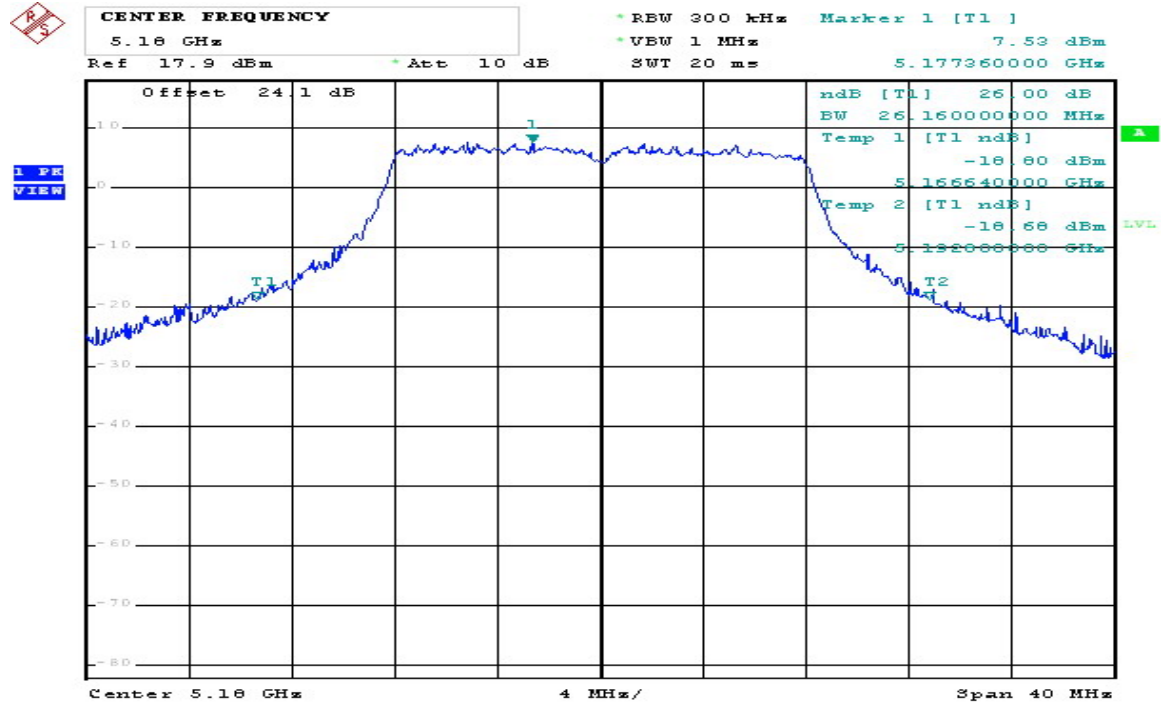
The final test data is shown on as following pages.

## 26dB Bandwidth

<b>Test Mode : 802.11a</b>		
<b>Test CH</b>		<b>26dB Bandwidth (MHz)</b>
<b>CH No.</b>	<b>Freq. (MHz)</b>	
36	5180	26.16
44	5220	25.44
48	5240	25.52

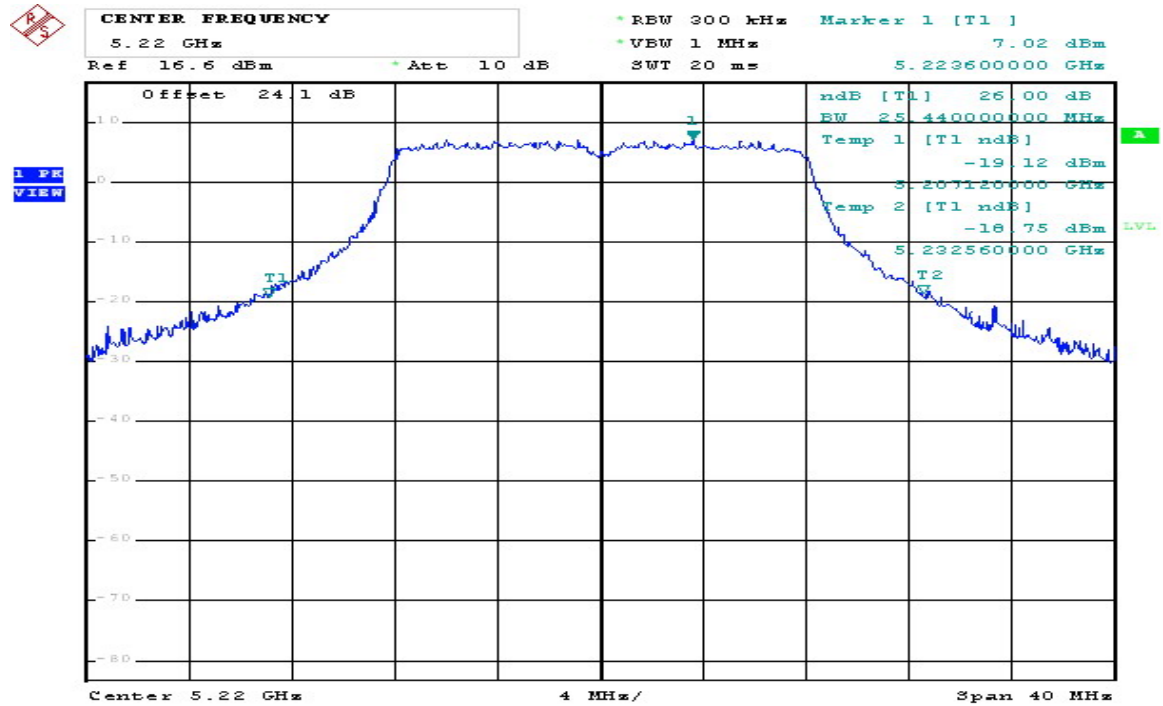
# 26dB Bandwidth

## 802.11a CH36 5180MHz



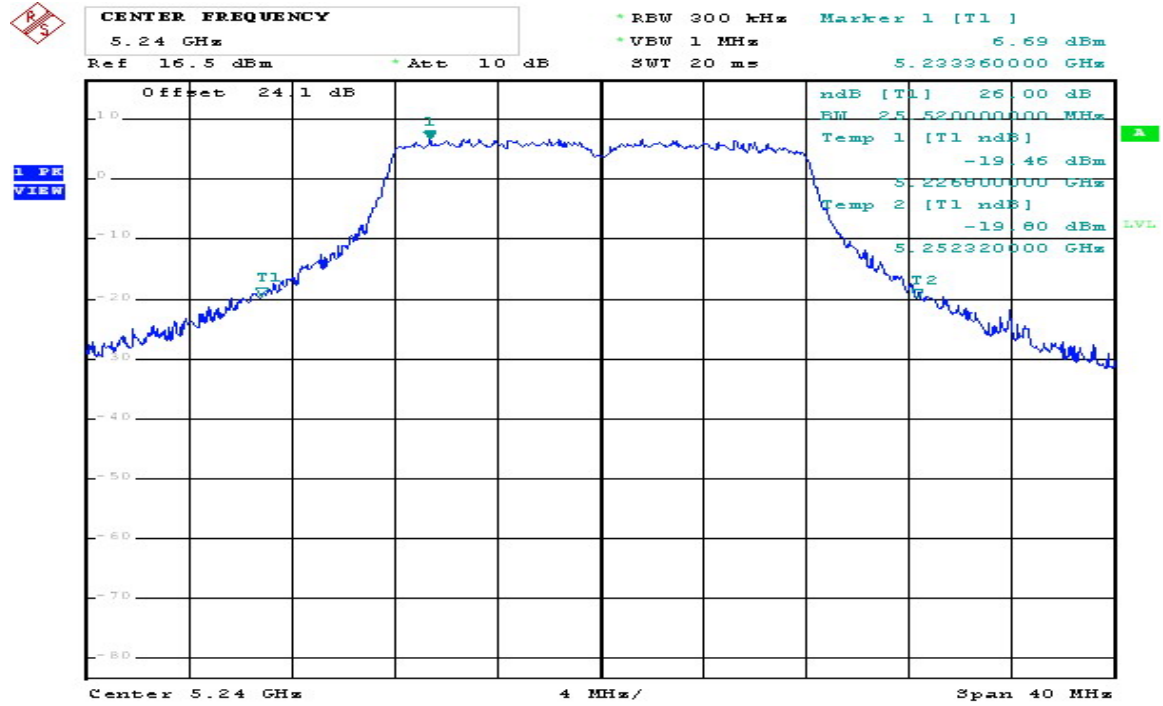
Comment: 802.11a 5180MHz  
Date: 19.DEC.2008 09:49:41

## 802.11a CH44 5220MHz



Comment: 802.11a 5220MHz  
Date: 19.DEC.2008 09:53:06

### 802.11a CH48 5240MHz



Comment: 802.11a 5240MHz  
 Date: 19.DEC.2008 09:56:35

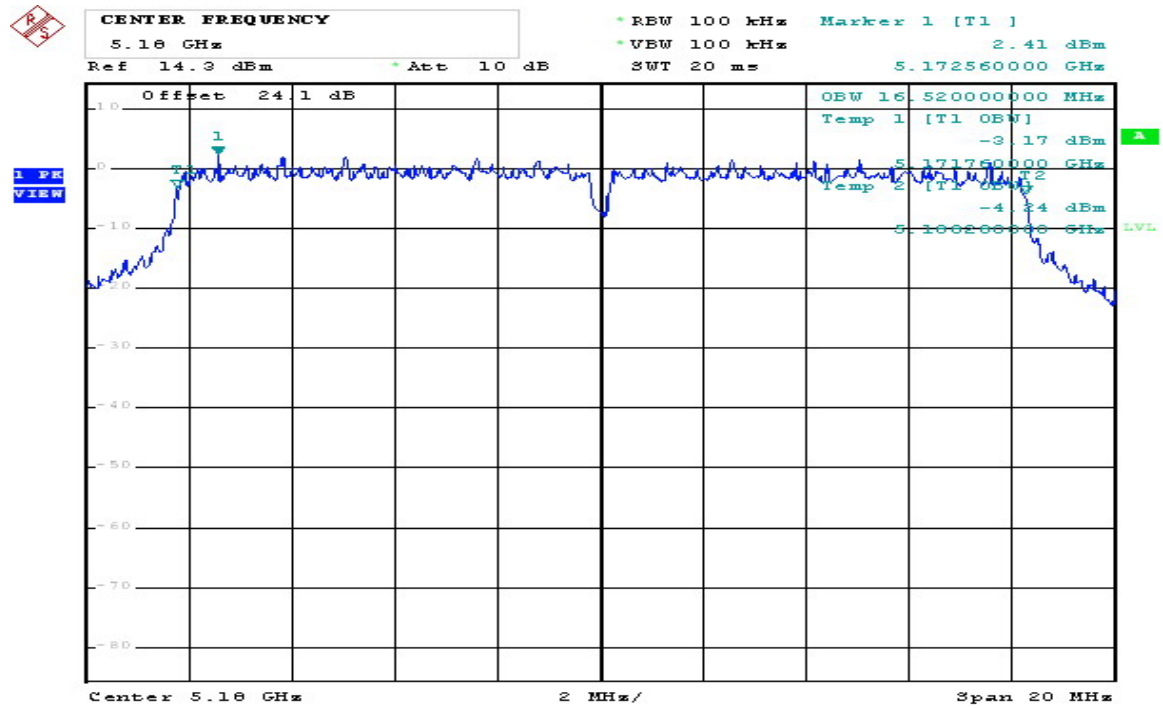
## 99% Occupied bandwidth

<b>Test Mode : 802.11a</b>		
<b>Test CH</b>		<b>Occupied Bandwidth (MHz)</b>
<b>CH No.</b>	<b>Freq. (MHz)</b>	
36	5180	16.52
44	5220	16.52
48	5240	16.48



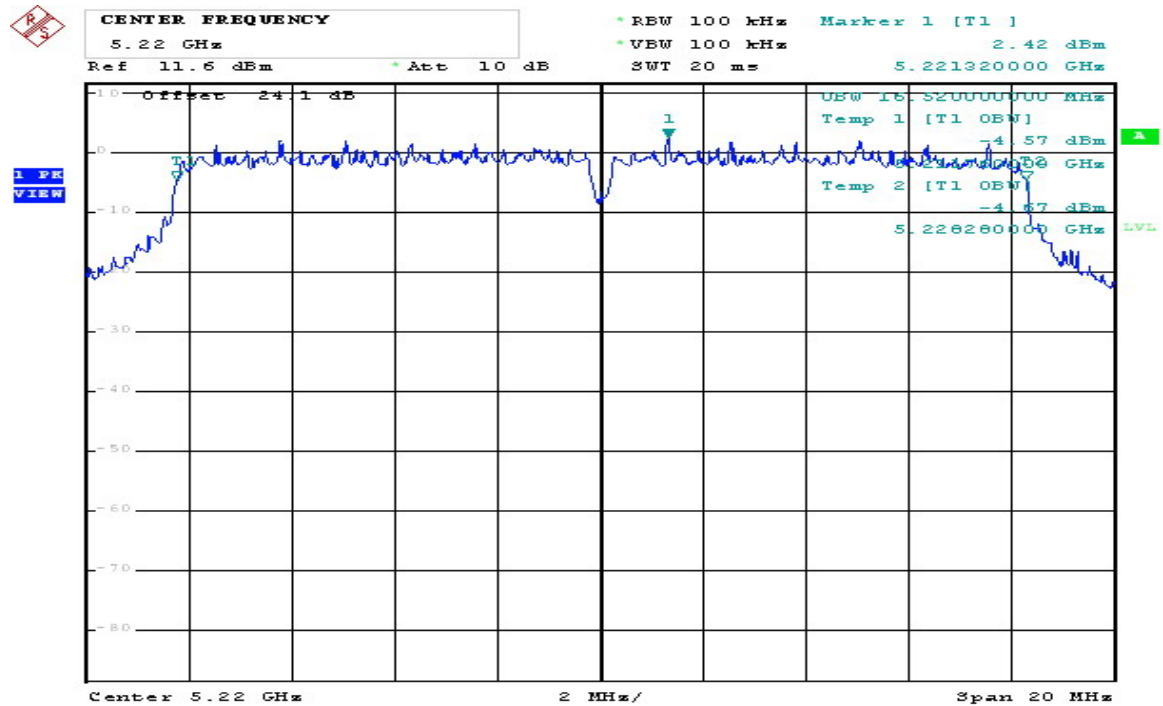
# 99% Occupied bandwidth

## 802.11a CH36 5180MHz



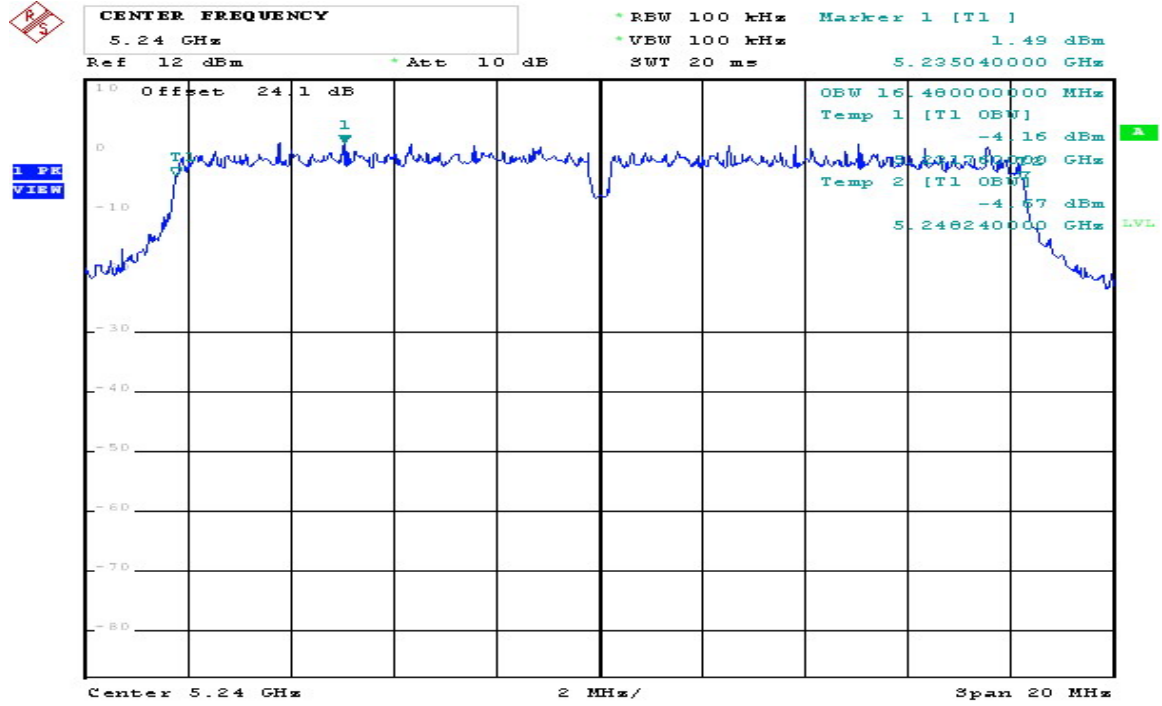
Comment: 802.11a 5180MHz  
Date: 19.DEC.2008 09:52:05

## 802.11a CH44 5220MHz



Comment: 802.11a 5220MHz  
Date: 19.DEC.2008 09:55:26

### 802.11a CH48 5240MHz



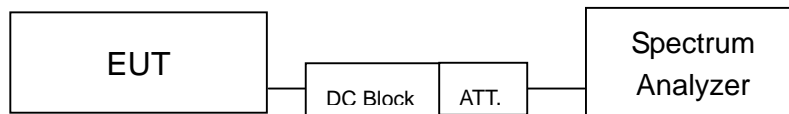
Comment: 802.11a 5240MHz  
Date: 19.DEC.2008 09:58:56

### 3 Peak output power test

#### 3.1 Limits

Operating Frequency (MHz)	Output power limit
5150~5250	< 50mW (17dBm) or 4dBm+10logB
5250~5350, 5470~5725	< 250mW (24dBm) or 11dBm+10logB
5725~5825	< 1W (30dBm) or 17dBm+10logB

#### 3.2 Configuration of Measurement



#### 3.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to UNII test procedure of Oct 2002 DA 02-2138 for compliance to FCC 47CFR 15.407 requirements.

#### 3.4 Test Result

**PASS.**

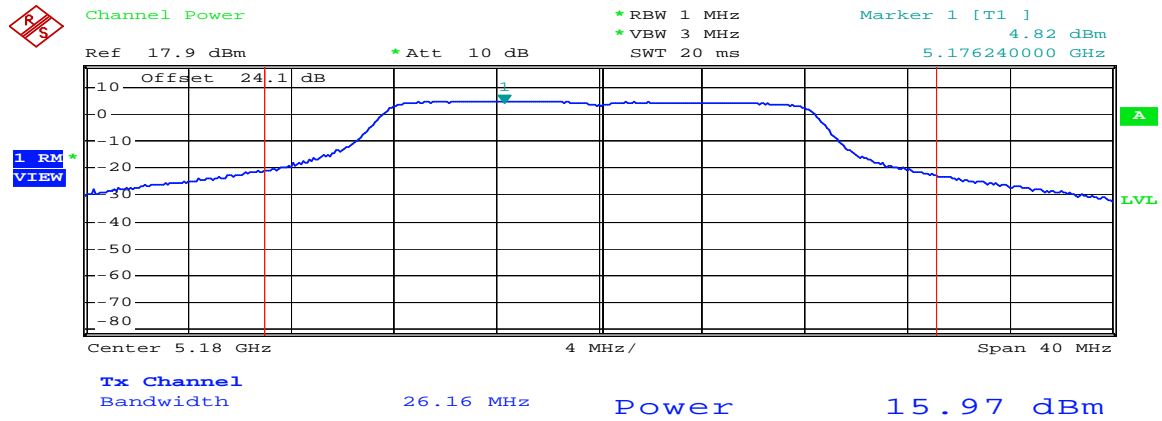
The final test data is shown on as following pages.

## Maximum output power

Mode : 802.11 a						
CH	Frq. MHz	Temp. (°C)	Maximum transmit power		Limit (dBm)	Margin (dB)
			(dBm)	(watts)		
36	5180	26	15.97	0.0395	17	-1.03
44	5220	26	15.72	0.0373	17	-1.28
48	5240	26	15.54	0.0358	17	-1.46

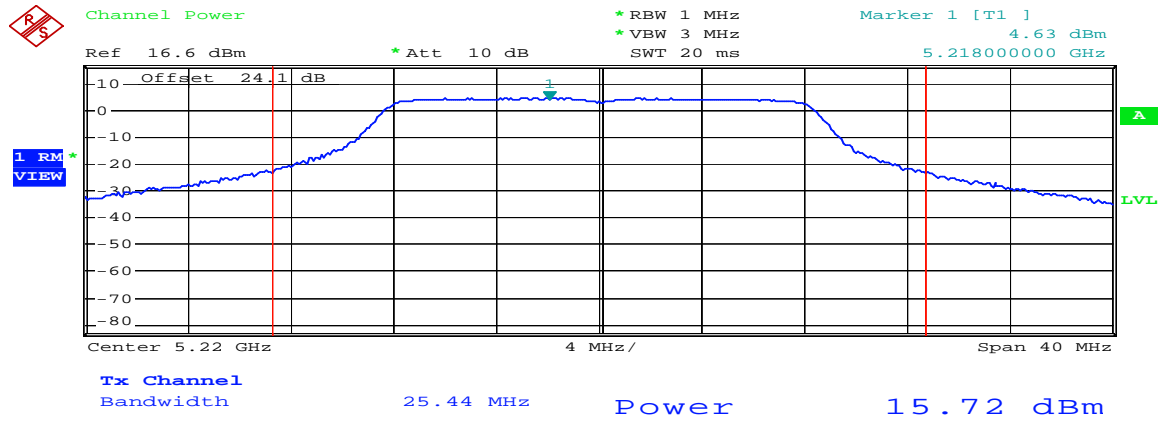
# Peak output power test

## 802.11a CH36 5180MHz



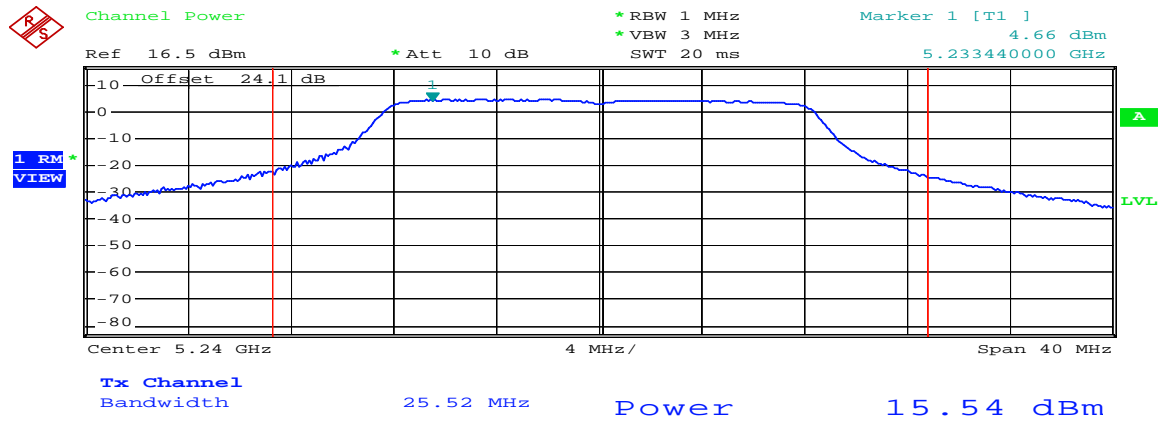
Comment: 802.11a 5180MHz Limit:16.989700  
Date: 19.DEC.2008 09:50:49

## 802.11 a CH44 5220MHz



Comment: 802.11a 5220MHz Limit:16.989700  
Date: 19.DEC.2008 09:54:14

### 802.11 a CH48 5240MHz



Comment: 802.11a 5240MHz Limit:16.989700  
Date: 19.DEC.2008 09:57:43

#### 4 Power test of Data Rate

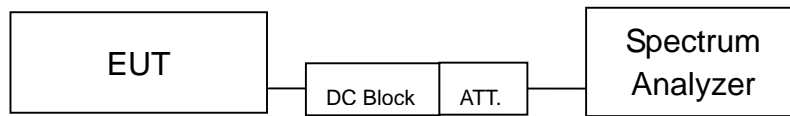
Mode	Bandwidth (MHz)	Channel	Data Rate	Output Power	
				(dBm)	(watts)
802.11b	20	6	1	18.77	0.0753
			5.5	18.67	0.0736
			11	18.88	0.0773
802.11g	20	6	6	22.06	0.1607
			36	22.04	0.1600
			54	21.64	0.1459
802.11a	20	44	6	15.72	0.0373
			36	15.66	0.0368
			54	15.37	0.0344

## 5 Power Spectrum Density test

### 5.1 Limits

Operating Frequency (MHz)	Power density limit
5150~5250	< 4dBm/MHz
5250~5350, 5470~5725	< 11dBm/MHz
5725~5825	< 17dBm/MHz

### 5.2 Configuration of Measurement



### 5.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to UNII test procedure of Oct 2002 DA 02-2138 for compliance to FCC 47CFR 15.407 requirements.

### 5.4 Test Result

**PASS.**

The final test data is shown on as following pages.

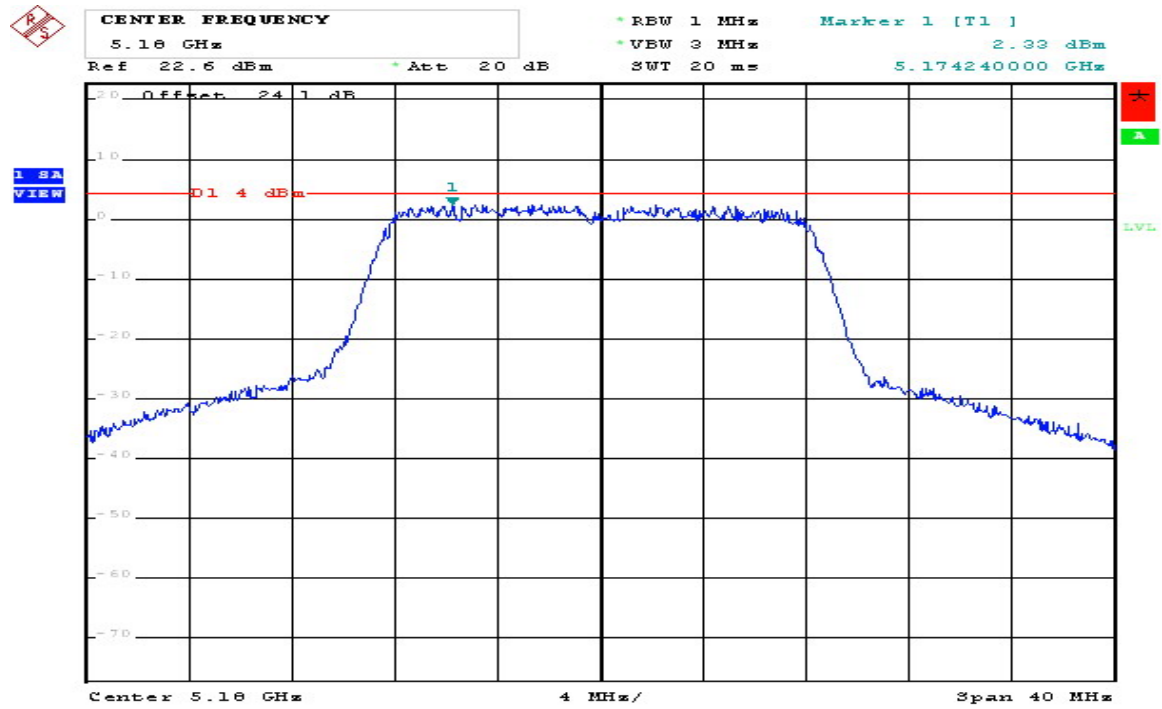


## Power spectral density

<b>802.11a</b>					
<b>CH</b>	<b>Freq.</b>	<b>Temp. (°C)</b>	<b>Power Spectral Density (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
36	5180	26	2.33	4	-1.67
44	5220	26	2.28	4	-1.72
48	5240	26	2.21	4	-1.79

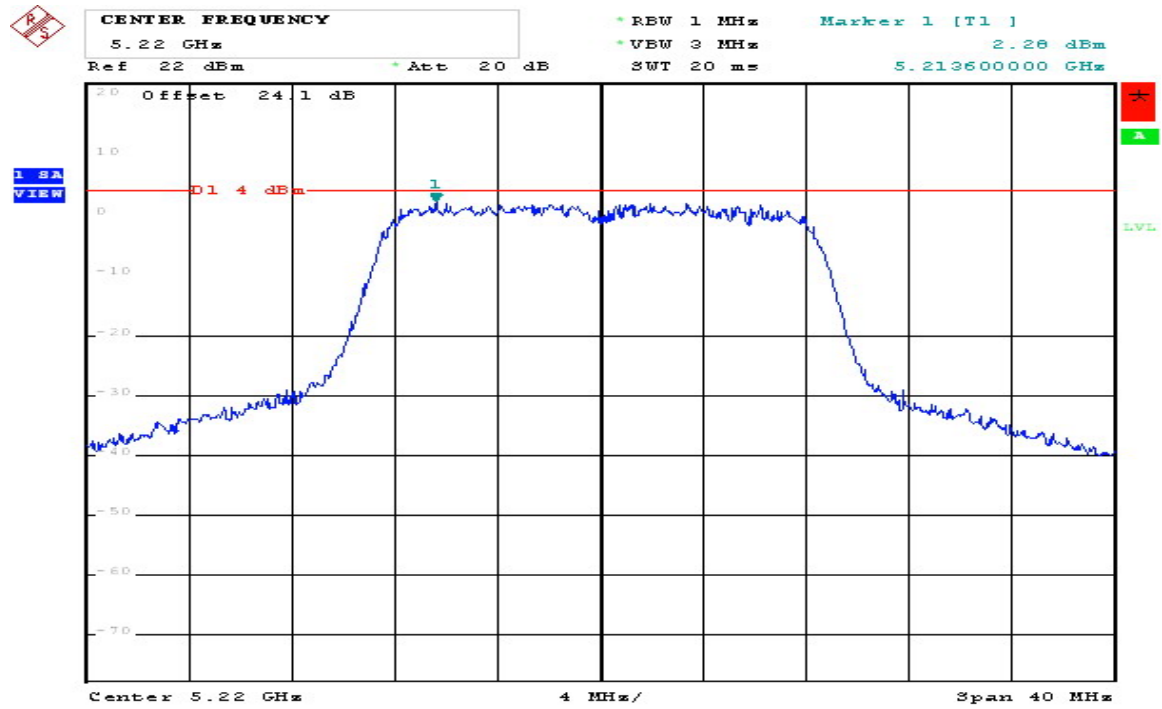
# Power spectral density

## 802.11a CH36 5180MHz



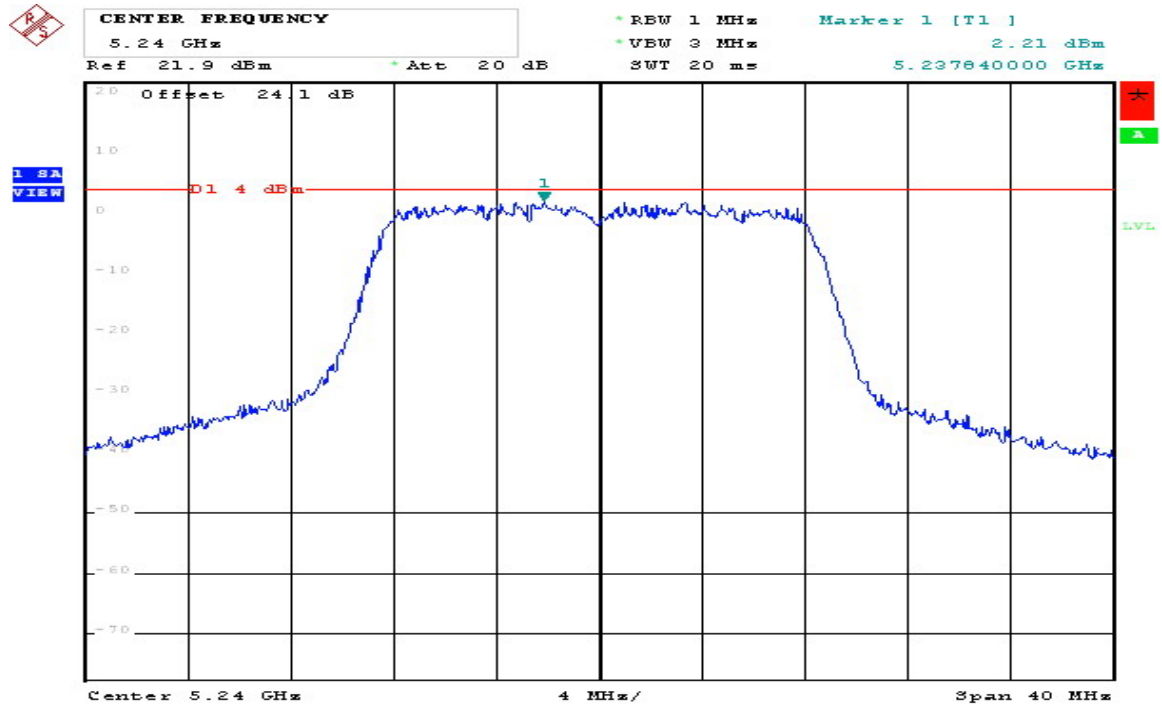
Comment: 802.11a 5180MHz  
Date: 19.DEC.2008 09:51:44

## 802.11a CH44 5220MHz



Comment: 802.11a 5220MHz  
Date: 19.DEC.2008 09:55:07

### 802.11a CH48 5240MHz



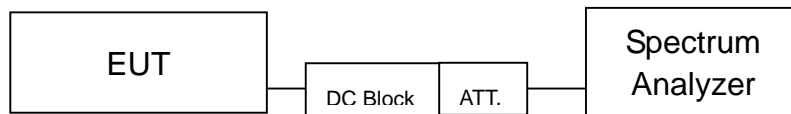
Comment: 802.11a 5240MHz  
Date: 19.DEC.2008 09:58:37

## 6 Peak excursion to average ratio test

### 6.1 Limits

Operating Frequency (MHz)	Peak excursion to average ratio limit
5150~5250	<13dB
5250~5350	<13dB
5725~5825	<13dB

### 6.2 Configuration of Measurement



### 6.3 Test Procedure

Peak excursion to average ratio was measured from the antenna port of the EUT. Using a 50ohm spectrum analyzer with the RBW=VBW=1MHz for peak measurement and RBW=1MHz, VBW=10kHz for average measurement. Peak excursion to average ratio was read directly.

### 6.4 Test Result

**PASS.**

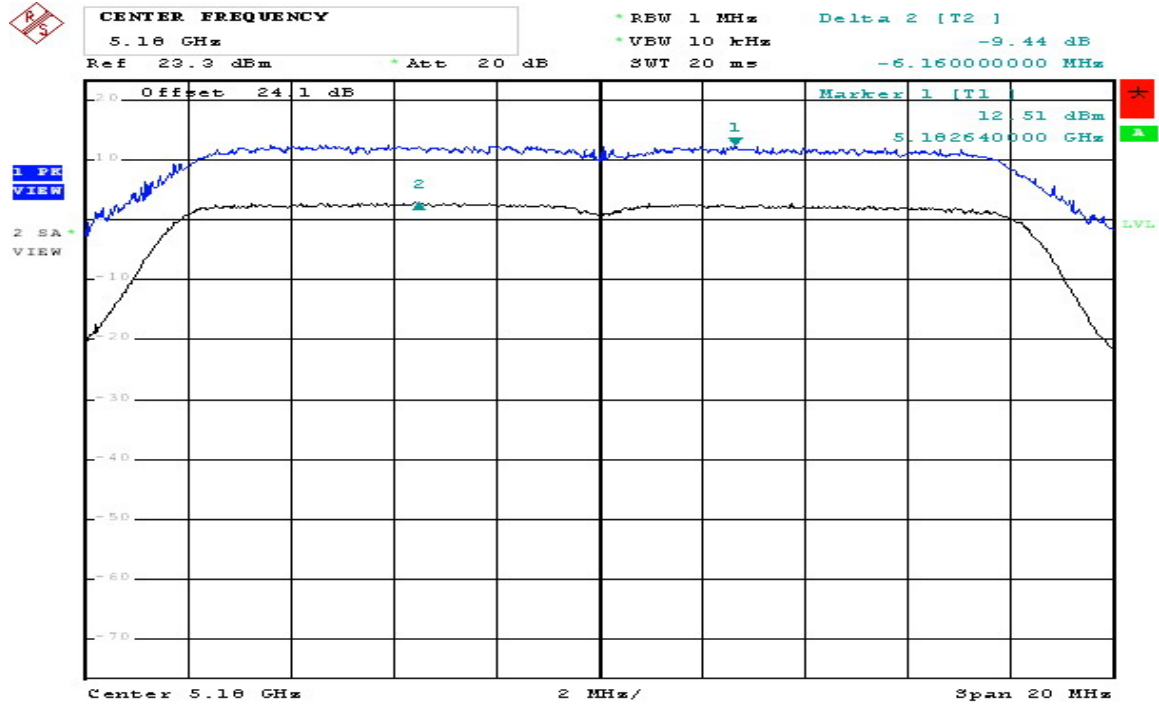
The final test data is shown on as following pages.

### Peak excursion to Average ratio

Test Mode : 802.11a			
Test CH		PK excursion to Avg. ratio (dB)	Limit (dB)
CH No.	Freq. (MHz)		
36	5180	9.44	13
44	5220	10.04	13
48	5240	9.91	13

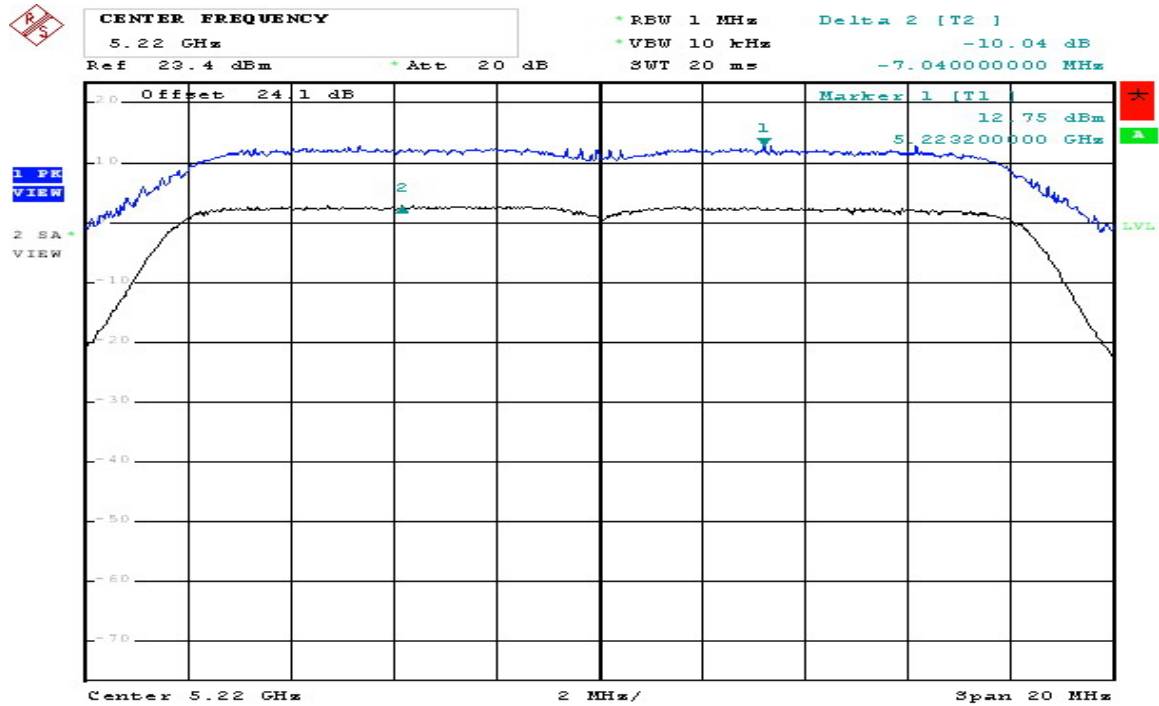
# Peak excursion to Average ratio

## 802.11a CH36 5180MHz PK to AV Ratio



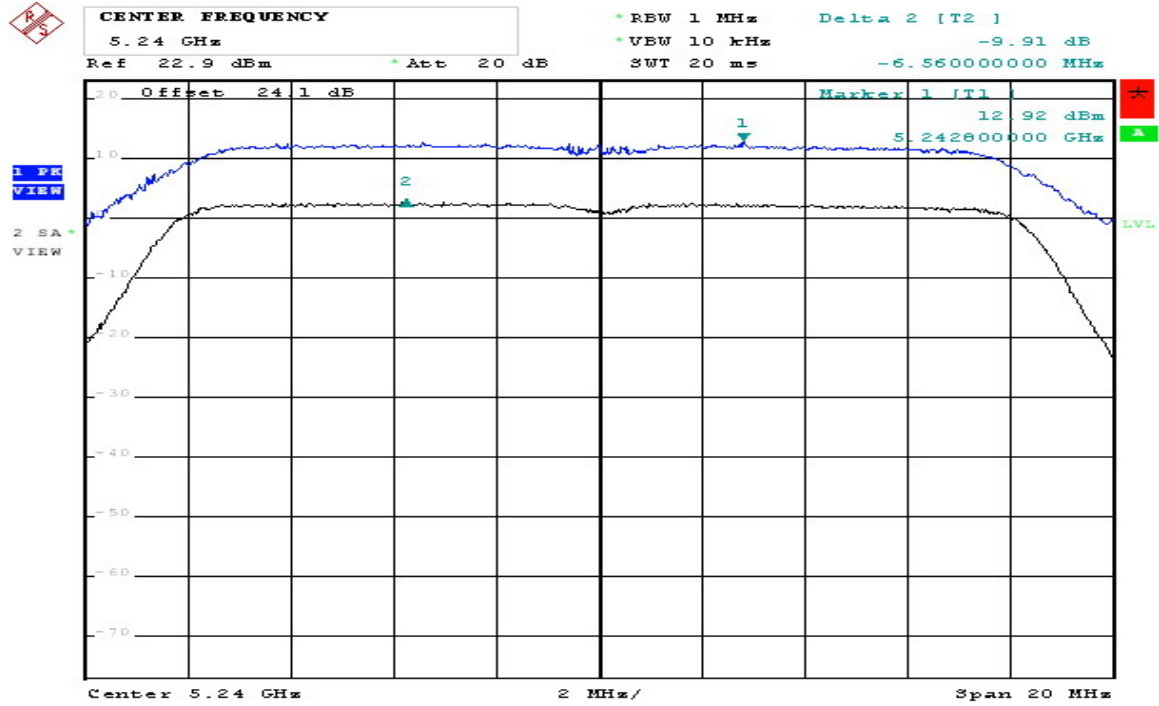
Comment: 802.11a 5180MHz  
Date: 19.DEC.2008 10:03:28

## 802.11a CH44 5220MHz PK to AV Ratio



Comment: 802.11a 5220MHz  
Date: 19.DEC.2008 10:04:43

### 802.11a CH48 5240MHz PK to AV Ratio



Comment: 802.11a 5240MHz  
Date: 19.DEC.2008 09:58:12

## 7 Radiated spurious emission test

### 7.1 Limits

According to FCC 15.407(b)(1) requirement, the radiated emission shall comply with the following limits.

Operating Frequency (MHz)	Limit of Spurious Emissions	
	dBm / MHz EIRP	dB( $\mu$ V/m) @3m
5150~5250	-27	68.3
5250~5350	-27	68.3
5725~5825	-27	68.3
	-17 (on $\pm$ 10MHz range of Subscriber transmit channel block)	78.3

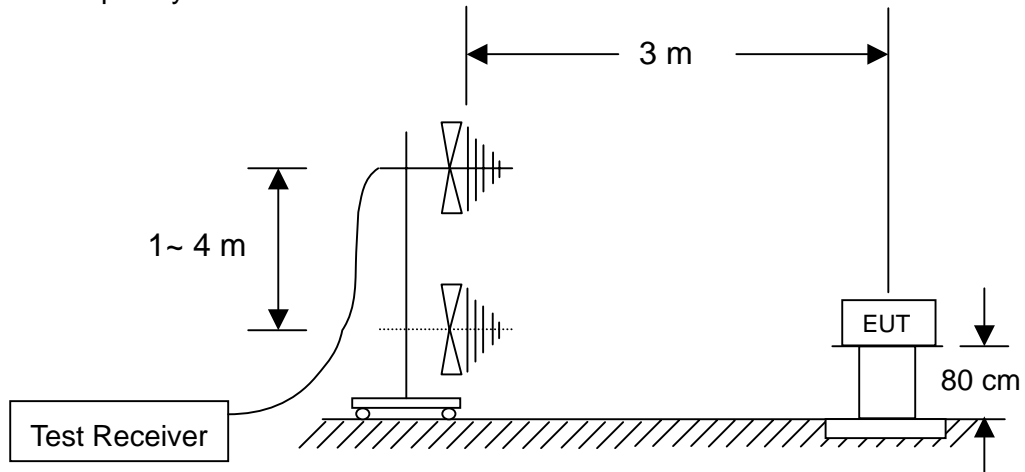
The radiated emission shall comply with §15.209(a).

Frequency (MHz)	Field strength dB( $\mu$ V/m)	Measurement distance (meters)
1.705~30.0	29.5	30
30 ~ 88	40	3
88~216	43.5	3
216~960	46	3
Above 960	54	3

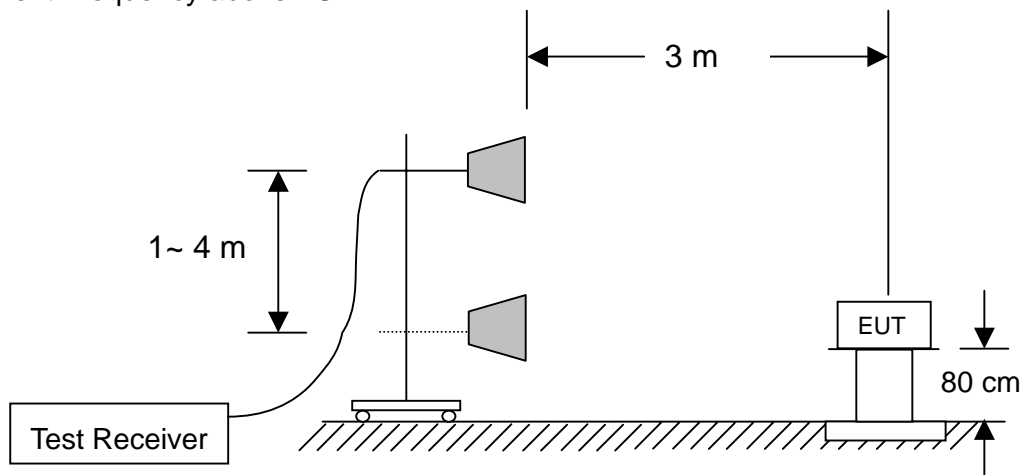


## 7.2 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



## 7.3 Test Procedure

Radiated emission measurements were performed from 30MHz to 40GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz for frequencies above 1GHz.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

## 7.4 Test Result

**PASS.**

The final test data is shown on as following pages.

## Radiated spurious emission

### Test Environment

Ambient temperature : 26.0°C  
 Relative humidity : 45%

### Radiated Emission below 1GHz

After verifying 802.11a (CH36 / CH44 / CH48), the worse case determine by 802.11a CH36, the data will present on report.

Worst case: 802.11a CH36 5180MHz								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
330.020	H	56.31	32.90	15.52	38.93	46.00	-7.07	QP
560.014	H	51.46	34.19	20.36	37.63	46.00	-8.37	QP
660.008	H	55.07	33.40	21.80	43.47	46.00	-2.53	QP
758.996	H	49.17	32.39	22.69	39.47	46.00	-6.53	QP
330.016	V	56.61	32.90	15.52	39.23	46.00	-6.77	QP
660.000	V	56.17	33.40	21.80	44.57	46.00	-1.43	QP
693.000	V	54.01	33.04	22.22	43.19	46.00	-2.81	QP
758.996	V	53.17	32.39	22.69	43.47	46.00	-2.53	QP

Remark : Corrected Level = Reading + Correction Factor – Preamp  
 Correction Factor = Antenna Factor + Cable Loss

The present spurious only show those points are above noise level and the frequency range test from 30MHz to 1GHz.

## Radiated spurious emission

### Radiated Emission above 1GHz

802.11a CH36								
Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Preamp (dB)	Corrected Factor (dB/m)	Corrected Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Det. Mode
10360	H	57.20	36.67	47.30	67.83	88.3	-20.47	PK
10360	H	42.17	36.67	47.30	52.80	68.3	-15.50	AV
15540	H	48.95	36.62	48.88	61.21	74.0	-12.79	PK
15540	H	35.53	36.62	48.88	47.79	54.0	-6.21	AV
*20720	H	55.90	59.23	43.83	40.50	54.0	-13.50	PK
*25900	H	56.12	51.79	46.44	50.77	54.0	-3.23	PK
*31080	H	43.85	51.25	47.88	40.48	54.0	-13.52	PK
*36260	H	52.84	51.25	49.46	51.05	54.0	-2.95	PK
10360	V	62.61	36.67	47.30	73.24	88.3	-15.06	PK
10360	V	47.69	36.67	47.30	58.32	68.3	-9.98	AV
15540	V	49.84	36.62	48.88	62.10	74.0	-11.90	PK
15540	V	35.60	36.62	48.88	47.86	54.0	-6.14	AV
*20720	V	58.22	59.23	43.83	42.82	54.0	-11.18	PK
*25900	V	56.42	51.79	46.44	51.07	54.0	-2.93	PK
*31080	V	46.33	51.25	47.88	42.96	54.0	-11.04	PK
*36260	V	54.14	51.25	49.46	52.35	54.0	-1.65	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp

Correction Factor = Antenna Factor + Cable Loss

\* Mark indicated background noise level.

<b>802.11a CH44</b>								
Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Preamp (dB)	Corrected Factor (dB/m)	Corrected Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Det. Mode
10440	H	56.11	36.57	47.51	67.05	88.3	-21.25	PK
10440	H	41.91	36.57	47.51	52.85	68.3	-15.45	AV
15660	H	48.80	36.70	48.64	60.74	74.0	-13.26	PK
15660	H	35.56	36.70	48.64	47.50	54.0	-6.50	AV
*20880	H	52.56	59.02	44.06	37.60	54.0	-16.40	PK
*26100	H	54.27	51.25	46.38	49.40	54.0	-4.60	PK
*31320	H	51.68	51.25	47.84	48.27	54.0	-5.73	PK
*36540	H	53.54	51.25	49.76	52.05	54.0	-1.95	PK
10440	V	61.99	36.57	47.51	72.93	88.3	-15.37	PK
10440	V	48.04	36.57	47.51	58.98	68.3	-9.32	AV
15660	V	49.49	36.70	48.64	61.43	74.0	-12.57	PK
15660	V	35.53	36.70	48.64	47.47	54.0	-6.53	AV
*20880	V	55.47	59.02	44.06	40.51	54.0	-13.49	PK
*26100	V	54.79	51.25	46.38	49.92	54.0	-4.08	PK
*31320	V	52.07	51.25	47.84	48.66	54.0	-5.34	PK
*36540	V	53.84	51.25	49.76	52.35	54.0	-1.65	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp  
 Correction Factor = Antenna Factor + Cable Loss  
 \* Mark indicated background noise level.

<b>802.11a CH48</b>								
Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Preamp (dB)	Corrected Factor (dB/m)	Corrected Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Det. Mode
10480	H	55.02	36.52	47.60	66.10	88.3	-22.20	PK
10480	H	40.31	36.52	47.60	51.39	68.3	-16.91	AV
15720	H	49.02	36.73	48.53	60.82	74.0	-13.18	PK
15720	H	35.55	36.73	48.53	47.35	54.0	-6.65	AV
*20960	H	55.14	51.79	46.44	49.79	54.0	-4.21	PK
*26200	H	54.57	51.25	46.36	49.68	54.0	-4.32	PK
*31440	H	52.10	51.25	47.81	48.66	54.0	-5.34	PK
*36680	H	53.99	51.25	49.62	52.36	54.0	-1.64	PK
10480	V	61.72	36.52	47.60	72.80	88.3	-15.50	PK
10480	V	46.21	36.52	47.60	57.29	68.3	-11.01	AV
15720	V	49.28	36.73	48.53	61.08	74.0	-12.92	PK
15720	V	35.59	36.73	48.53	47.39	54.0	-6.61	AV
*20960	V	56.98	51.79	46.44	51.63	54.0	-2.37	PK
*26200	V	55.06	51.25	46.36	50.17	54.0	-3.83	PK
*31440	V	52.79	51.25	47.81	49.35	54.0	-4.65	PK
*36680	V	54.05	51.25	49.62	52.42	54.0	-1.58	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp  
 Correction Factor = Antenna Factor + Cable Loss  
 \* Mark indicated background noise level.

## 8 Band edge test

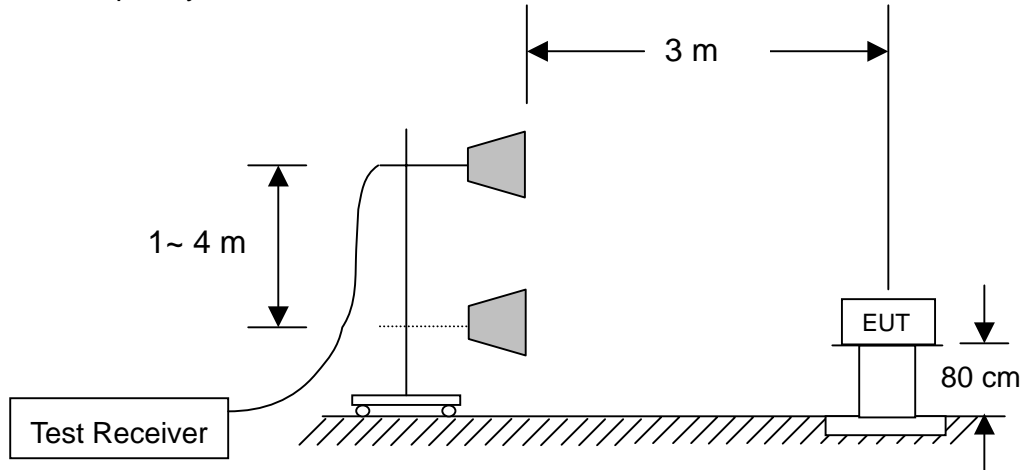
### 8.1 Limit

According to FCC Part 15.205 requirement :

Any radiated emission in the restricted bands shall be complied with the limits in 15.209.

### 8.2 Configuration of Measurement

Measurement Frequency above 1GHz



### 8.3 Test Procedure

Set RBW =1M, VBW= RBW for peak, and VBW=10Hz for average.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to present worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

### 8.4 Test Result

**PASS.**

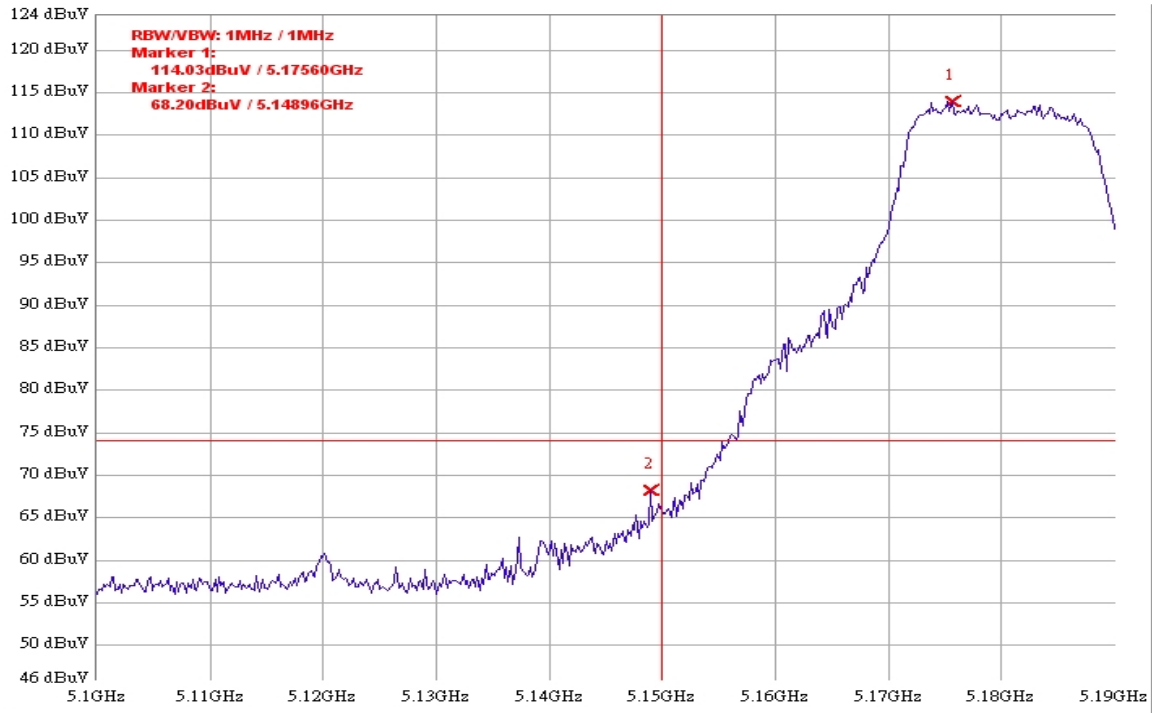
The final test data is shown on as following pages.

### Band edge test

802.11a					
CH	Restricted Band (MHz)	Maximum Level (dB $\mu$ V/m)	Limit (dBm)	Margin (dB)	Detector Mode
36	4500~5150	70.29	74	-3.71	PK
		53.39	54	-0.61	AV

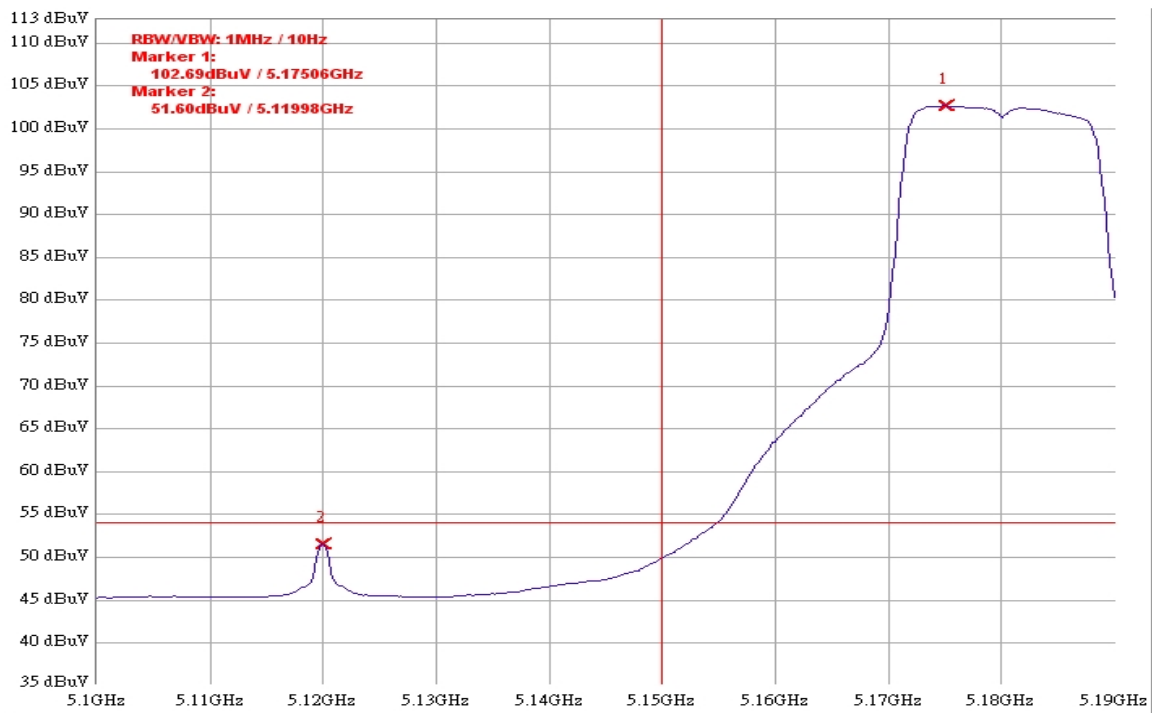
### Band edge test

#### 802.11a CH36 5180MHz PK



Band Edge\_802.11a\_5180MHz\_PK

#### 802.11a CH36 5180MHz AV



Band Edge\_802.11a\_5180MHz\_AV

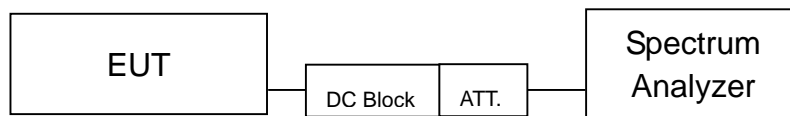


## 9 RF antenna conducted spurious emission test

### 9.1 Limits

Operating Frequency (MHz)	Limit (dBm / MHz EIRP)
5150~5250	-27
5250~5350	-27
5725~5825	-27 (Subscriber transmit channel block -17dBm/MHz on $\pm 10$ MHz range)

### 9.2 Configuration of Measurement



### 9.3 Test Procedure

The measurements were performed from 30MHz to 10th harmonic or 40GHz. RF antenna conducted per 15.407(b) was measured from the EUT antenna port.

### 9.4 Test Result

**PASS.**

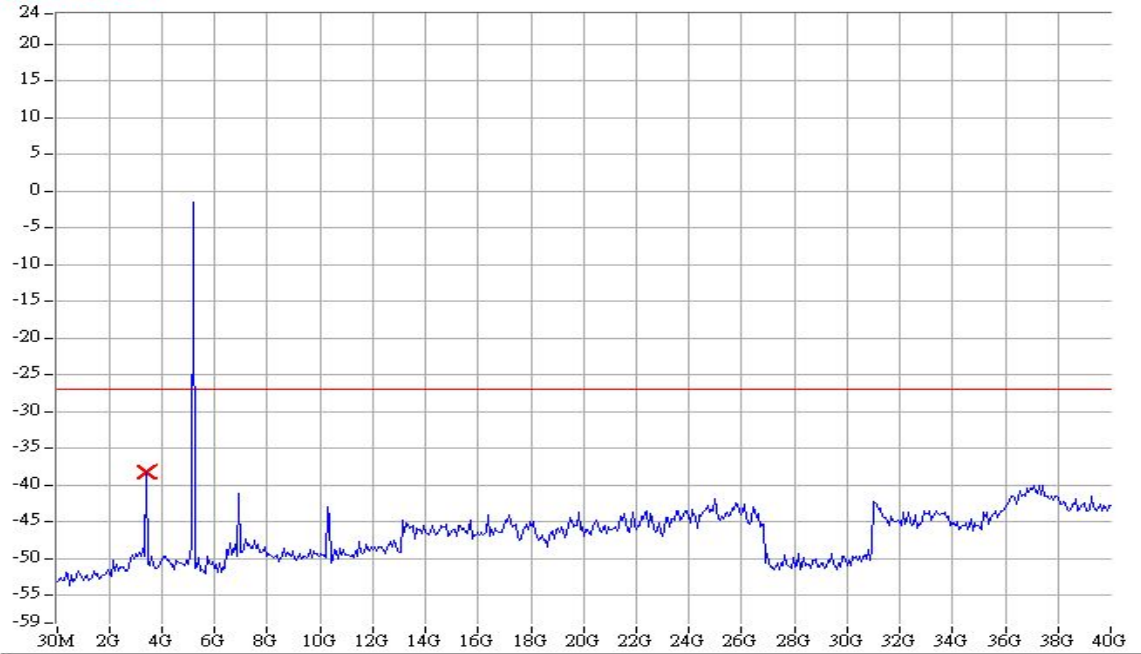
The final test data is shown on as following pages.

# Conducted spurious emission

## 802.11a CH36 5180MHz

RBW / YBW : 100.00k/100.00k  
RL OFFSET : 24.00dB SWP : 10s  
Limit : -27.00dBm

MKR -38.23dBm  
3.427450GHz



## 802.11a CH44 5220MHz

RBW / YBW : 100.00k/100.00k  
RL OFFSET : 24.00dB SWP : 10s  
Limit : -27.00dBm

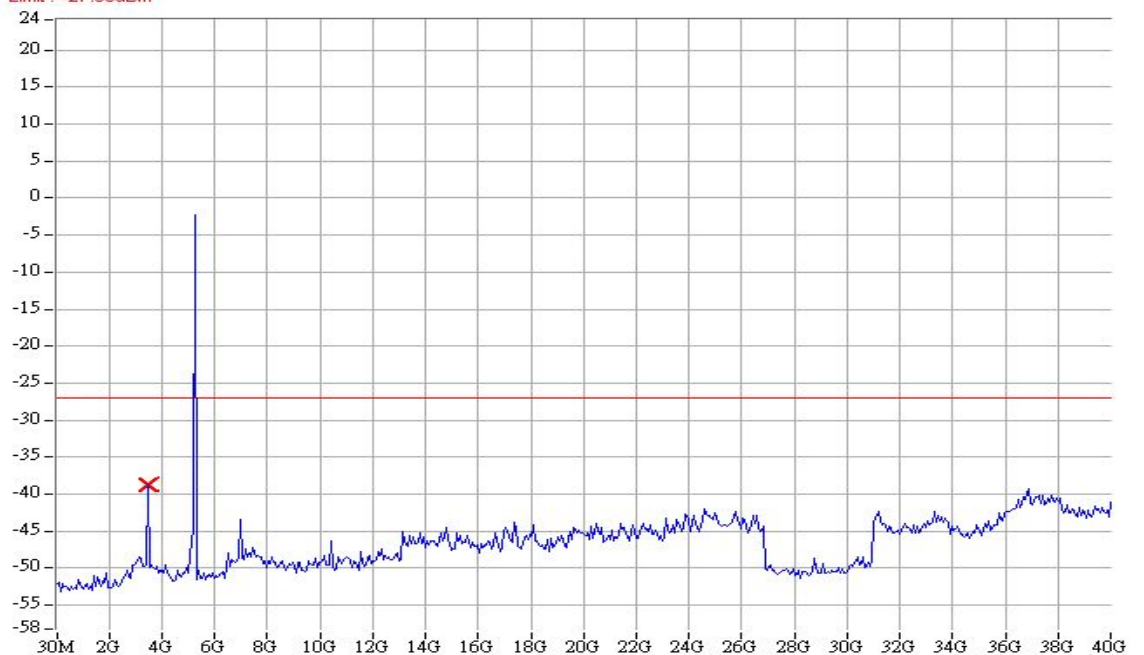
MKR -38.57dBm  
3.494067GHz



### 802.11 a CH48 5240MHz

RBW / YBW : 100.00k/100.00k  
RL OFFSET : 24.00dB SWP : 10s  
Limit : -27.00dBm

MKR -38.73dBm  
3.494067GHz



802.11a Conducted Spurious 5240MHz

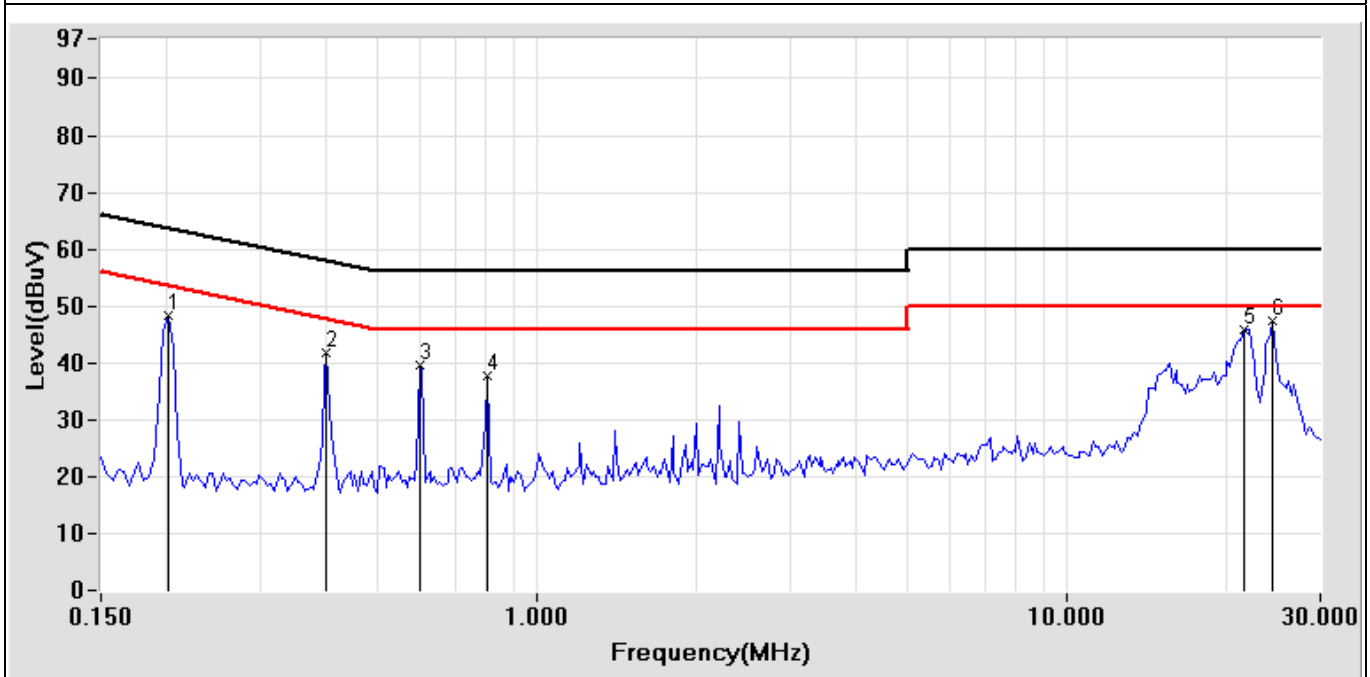


## Power Line Conducted Test Data

EUT: Industrial 802.11a/b/g AP/Client CLIENT: MOXA MODEL: AWK-4121 RATING: DC 12V (worst case) Temperature: 17.0 °C Humidity: 47 %	POLARITY: Line DISTANCE: Serial No.: FILE/DATA#: MOXA.emi/53 OPERATOR: Terry TEST SITE: Conduction1
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Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.201	0.15	48.20	48.13	48.35	48.28	63.57	53.57	-15.22	-5.29
0.400	0.15	41.30	41.22	41.45	41.37	57.85	47.85	-16.40	-6.48
0.599	0.15	40.00	39.80	40.15	39.95	56.00	46.00	-15.85	-6.05
0.802	0.17	37.00	36.92	37.17	37.09	56.00	46.00	-18.83	-8.91
21.576	0.96	40.65	31.20	41.61	32.16	60.00	50.00	-18.39	-17.84
24.298	1.03	45.23	44.27	46.26	45.30	60.00	50.00	-13.74	-4.70

Remark:  
 1. All readings are Quasi-Peak and Average values.  
 2. Factor = Insertion Loss + Cable Loss.



Test Mode: Working Mode

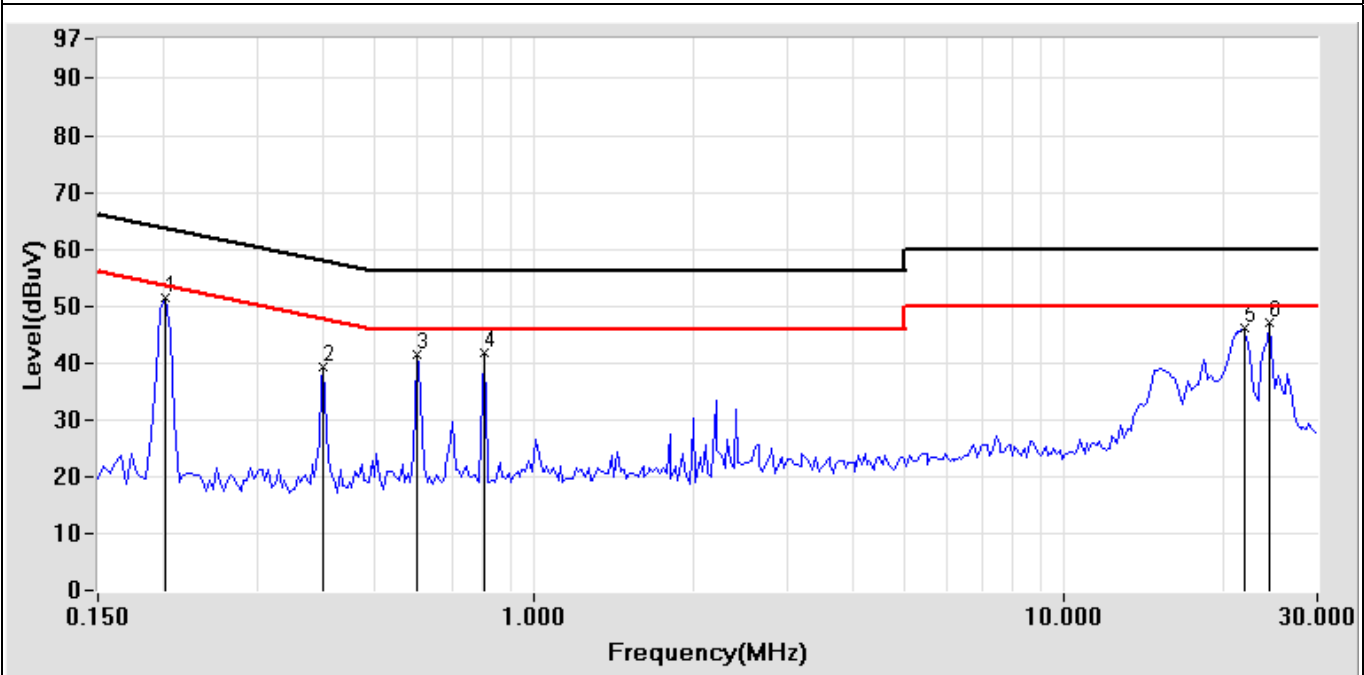
## Power Line Conducted Test Data

EUT: Industrial 802.11a/b/g AP/Client CLIENT: MOXA MODEL: AWK-4121 RATING: DC 12V (worst case) Temperature: 17.0 °C Humidity: 47 %	POLARITY: Neutral DISTANCE: Serial No.: FILE/DATA#: MOXA.emi/52 OPERATOR: Terry TEST SITE: Conduction1
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Frequency (MHz)	Factor (dB)	Meter Reading (dBµV)		Emission Level (dBµV)		Limits (dBµV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.201	0.16	50.60	50.55	50.76	50.71	63.57	53.57	-12.81	-2.86
0.400	0.16	38.60	38.59	38.76	38.75	57.85	47.85	-19.09	-9.10
0.599	0.16	41.40	41.30	41.56	41.46	56.00	46.00	-14.44	-4.54
0.802	0.18	41.50	41.40	41.68	41.58	56.00	46.00	-14.32	-4.42
21.795	1.10	40.21	30.59	41.31	31.69	60.00	50.00	-18.69	-18.31
24.298	1.17	45.12	44.18	46.29	45.35	60.00	50.00	-13.71	-4.65

**Remark:**

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Working Mode