CFR 47 FCC Part 15.247

TEST REPORT

Product： **Industrial IEEE 802.11a/b/g Dual-RF AP/Bridge/Client**

Trade Name： MOXA

Model Number： AWK-5222

FCC ID： SLE-AWK-5222

Prepared for

MOXA Inc.

Fl.4, No.135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, R.O.C.

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Prepared by

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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 IEEE 802.11a/b/g Dual-RF AP/Bridge/Client

Model No.: AWK-5222

Tested Power Supply: DC 12V

Date of Final Test: May 06, 2009

Configuration of Measurements and Standards Used :

FCC Rules and Regulations Part 15 Subpart C

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: 2009/06/05

Project Engineer: Anya Lee Approved: Jerry Liu

1 General Information

1.1 Description of Equipment Under Test

Product	:	Industrial IEEE 802.11a/b/g Dual-RF AP/Bridge/Client
Model Number	:	AWK-5222
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	:	2412MHz ~ 2462MHz
Channel Number	:	Refer to section 1.2
Type of Modulation	:	DSSS; OFDM
Antenna description	:	This device uses Dipole antenna.

Antenna Gain	:	2dBi
Connector type	:	SMA-Male-RP

Sample Receive date	:	Apr. 23, 2009
Date of Test	:	Apr. 23 ~ May 06, 2009
Additional Description	:	1.) The EUT is **Industrial IEEE 802.11a/b/g Dual-RF AP/Bridge/Client**. 2.) The test model is "**AWK-5222**" and included in this report. 3.) It contains two RF modules which are identical. 4.) Both module can transmit individual or simultaneously. 5.) The operating frequencies of this product are 2412-2462MHz and 5180-5240MHz. 6.) For more detail specification about EUT, please refer to the user's manual.

1.2 Table for Carrier Frequencies

802.11b/ 802.11g

CH No.	1	2	3	4	5	6	7	8	9	10	11
CF (MHz)	2412	2417	2422	2427	2432	2437	2442	2447	2452	2457	2462

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
  Member No.: 1349
  Registration No. (Conducted Room): C-1094
  Registration No. (Conducted Room): T-1562
  Registration No. (OATS 1): R-1040
  Registration No. (OATS 2): R-1041
- Industry Canada (IC)
  OUR FILE: 46405-4437 Submission: 130946
  Registration No. (OATS 1): 4437A-1
  Registration No. (OATS 2): 4437A-2
  Registration No. (OATS 3): 4437A-3
  Registration No. (OATS 4): 4437A-4
- 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
- Taiwan Accreditation Foundation (TAF)
  Accreditation No.: 1113
- TüV NORD
  Certificate No: TNTW0801R-01

1.4 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP30	100002	2009/12/10
Preamplifier	Agilent	8449B	3008A01434	2010/04/01
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 9120	9120D-583	2011/02/09
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

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	RF Radiated spurious emission test	§15.205, 15.209	Pass
3	RF Conducted spurious emission	§15.247	Pass
4	Maximum Peak output power test	§15.247(b)	Pass
5	Power test of Data Rate	§15.247(b)	Pass
6	6dB Bandwidth	§15.247(a)(2)	Pass
7	Power spectral density	§15.247(e)	Pass
8	Emission on the Band Edge	§15.247(d)	Pass
9	AC Power Line Conducted Emission test	§15.247(b)	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 arrive limit requirement, thus we evaluate the EUT pass the specified test.

2 RF Radiated spurious emission test

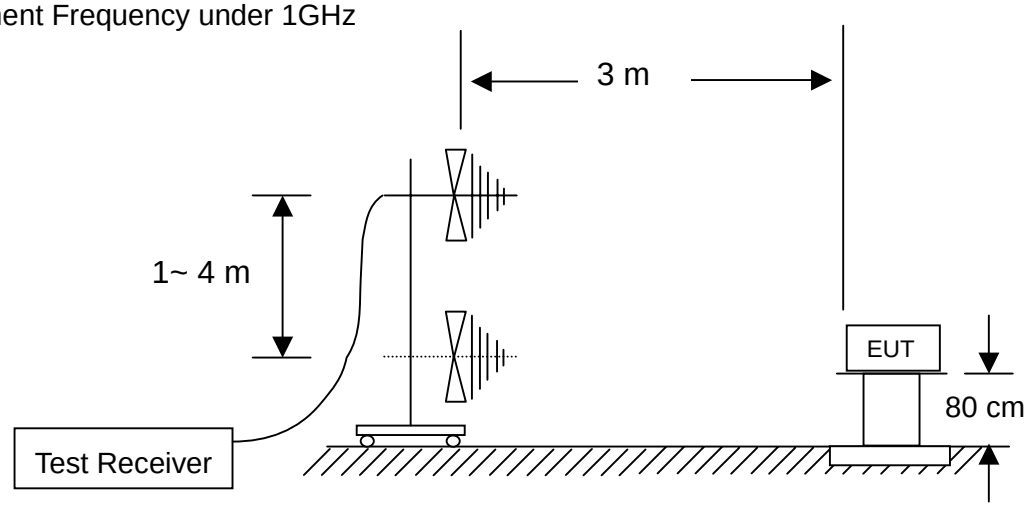
2.1 Limit

For intentional radiator, the radiated emission shall comply with §15.209(a).
For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

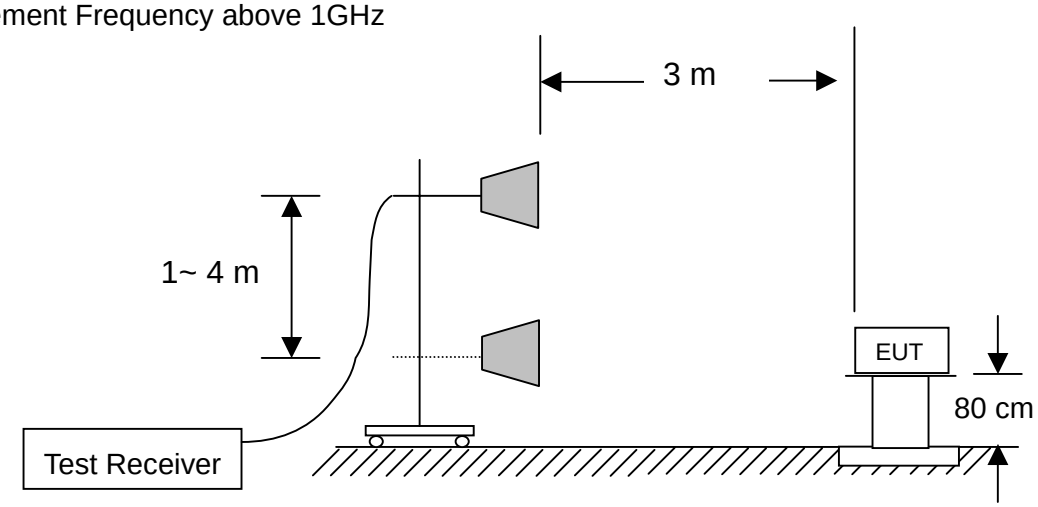
Frequency (MHz)	Field strength dB(μV/m)	Measurement distance (meters)
1.705~30.0	29.5	30
30 ~ 88	40	3
88~216	43.5	3
216~960	46	3
Above 960	54	3

2.2 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



2.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
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.

2.4 Test Result

PASS.
The final test data is shown on as following pages.

Radiated spurious emission

Test Environment

Ambient temperature ： 28.0℃

Relative humidity ： 33%

Radiated Emission below 1GHz

After verifying RF modular A, B and Dual Transmit mode, the worst case is Dual Transmit mode.

Worst case: 802.11b CH1								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
333.312	H	62.58	32.93	15.59	45.24	46.00	-0.76	QP
366.654	H	62.44	33.37	16.53	45.60	46.00	-0.40	QP
399.996	H	58.56	33.80	17.58	42.34	46.00	-3.66	QP
433.312	H	58.54	34.20	18.17	42.51	46.00	-3.49	QP
500.032	H	57.18	34.40	19.26	42.04	46.00	-3.96	QP
766.620	H	53.17	32.27	22.77	43.67	46.00	-2.33	QP
333.344	V	55.09	32.93	15.59	37.75	43.50	-5.75	QP
366.664	V	57.95	33.37	16.53	41.11	46.00	-4.89	QP
400.004	V	52.26	33.80	17.58	36.04	43.50	-7.46	QP
433.328	V	51.82	34.20	18.17	35.79	46.00	-10.21	QP
499.984	V	58.28	34.40	19.26	43.14	46.00	-2.86	QP
766.608	V	50.95	32.27	22.77	41.45	46.00	-4.55	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

After verifying RF modular A, B and Dual Transmit mode, the worst case is Dual Transmit mode.

802.11b CH1								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
4824	H	48.93	36.30	37.50	50.13	74	-23.87	PK
4824	H	33.78	36.30	37.50	34.98	54	-19.02	AV
7236	H	47.40	36.55	42.94	53.79	74	-20.21	PK
7236	H	34.68	36.55	42.94	41.07	54	-12.93	AV
9648	H	46.58	36.93	46.04	55.69	74	-18.31	PK
9648	H	33.93	36.93	46.04	43.04	54	-10.96	AV
*12060	H	40.32	36.44	49.09	52.97	54	-1.03	PK
*14472	H	53.10	61.11	52.04	44.03	54	-9.97	PK
*16884	H	52.44	60.35	49.31	41.40	54	-12.60	PK
*19296	H	52.19	59.61	43.70	36.28	54	-17.72	PK
*21708	H	54.37	57.48	44.57	41.46	54	-12.54	PK
*24120	H	56.24	53.54	45.80	48.50	54	-5.50	PK
4824	V	56.35	36.30	37.50	57.55	74	-16.45	PK
4824	V	39.30	36.30	37.50	40.50	54	-13.50	AV
7236	V	54.86	36.55	42.94	61.25	74	-12.75	PK
7236	V	42.19	36.55	42.94	48.58	54	-5.42	AV
9648	V	51.76	36.93	46.04	60.87	74	-13.13	PK
9648	V	39.77	36.93	46.04	48.88	54	-5.12	AV
*12060	V	40.12	36.44	49.09	52.77	54	-1.23	PK
*14472	V	53.31	61.11	52.04	44.24	54	-9.76	PK
*16884	V	52.37	60.35	49.31	41.33	54	-12.67	PK
*19296	V	53.22	59.61	43.70	37.31	54	-16.69	PK
*21708	V	54.94	57.48	44.57	42.03	54	-11.97	PK
*24120	V	55.67	53.54	45.80	47.93	54	-6.07	PK

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

802.11b CH6								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
4874	H	51.19	36.30	37.59	52.48	74	-21.52	PK
4874	H	33.93	36.30	37.59	35.22	54	-18.78	AV
7311	H	47.31	36.56	43.12	53.87	74	-20.13	PK
7311	H	34.27	36.56	43.12	40.83	54	-13.17	AV
9748	H	45.93	36.95	46.15	55.13	74	-18.87	PK
9748	H	31.73	36.95	46.15	40.93	54	-13.07	AV
*12185	H	42.78	36.41	46.17	52.54	54	-1.46	PK
*14622	H	53.14	60.81	51.51	43.84	54	-10.16	PK
*17059	H	52.36	59.98	50.37	42.75	54	-11.25	PK
*19496	H	54.28	60.06	43.70	37.92	54	-16.08	PK
*21933	H	53.94	57.73	44.44	40.65	54	-13.35	PK
*24370	H	57.41	54.06	45.80	49.15	54	-4.85	PK
4874	V	54.40	36.30	37.59	55.69	74	-18.31	PK
4874	V	37.96	36.30	37.59	39.25	54	-14.75	AV
7311	V	52.61	36.56	43.12	59.17	74	-14.83	PK
7311	V	39.55	36.56	43.12	46.11	54	-7.89	AV
9748	V	48.03	36.95	46.15	57.23	74	-16.77	PK
9748	V	33.79	36.95	46.15	42.99	54	-11.01	AV
*12185	V	40.11	36.31	48.07	51.87	54	-2.13	PK
*14622	V	53.24	60.81	51.51	43.94	54	-10.06	PK
*17059	V	52.33	59.98	50.37	42.72	54	-11.28	PK
*19496	V	52.64	60.06	43.70	36.28	54	-17.72	PK
*21933	V	55.10	57.73	44.44	41.81	54	-12.19	PK
*24370	V	56.17	54.06	45.80	47.91	54	-6.09	PK

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

802.11b CH11								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
4924	H	51.71	36.30	37.67	53.08	74	-20.92	PK
4924	H	33.30	36.30	37.67	34.67	54	-19.33	AV
7386	H	47.77	36.58	43.29	54.48	74	-19.52	PK
7386	H	34.67	36.58	43.29	41.38	54	-12.62	AV
9848	H	47.59	36.97	46.26	56.88	74	-17.12	PK
9848	H	32.38	36.97	46.26	41.67	54	-12.33	PK
*12310	H	40.36	36.19	48.04	52.21	54	-1.79	PK
*14772	H	54.36	60.29	50.67	44.74	54	-9.26	PK
*17234	H	52.64	60.13	52.05	44.56	54	-9.44	PK
*19696	H	52.74	59.55	43.54	36.73	54	-17.27	PK
*22158	H	55.94	57.17	44.43	43.20	54	-10.80	PK
*24620	H	55.47	54.15	45.82	47.14	54	-6.86	PK
4924	V	55.13	36.30	37.67	56.50	74	-17.50	PK
4924	V	37.11	36.30	37.67	38.48	54	-15.52	AV
7386	V	53.23	36.58	43.29	59.94	74	-14.06	PK
7386	V	40.71	36.58	43.29	47.42	54	-6.58	AV
9848	V	52.55	36.97	46.26	61.84	74	-12.16	PK
9848	V	33.15	36.97	46.26	42.44	54	-11.56	PK
*12310	V	40.14	36.19	48.04	51.99	54	-2.01	PK
*14772	V	54.00	60.29	50.67	44.38	54	-9.62	PK
*17234	V	52.35	60.13	52.05	44.27	54	-9.73	PK
*19696	V	53.04	59.55	43.54	37.03	54	-16.97	PK
*22158	V	55.49	57.17	44.43	42.75	54	-11.25	PK
*24620	V	56.03	54.15	45.82	47.70	54	-6.30	PK

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

802.11g CH1								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
4824	H	45.22	36.30	37.50	46.42	54	-7.58	PK
*7236	H	45.72	36.55	42.94	52.11	54	-1.89	PK
*9648	H	43.25	36.93	46.04	52.36	54	-1.64	PK
*12060	H	40.39	36.44	49.09	53.04	54	-0.96	PK
*14472	H	53.54	61.11	52.04	44.47	54	-9.53	PK
*16884	H	53.04	60.35	49.31	42.00	54	-12.00	PK
*19296	H	52.69	59.61	43.70	36.78	54	-17.22	PK
*21708	H	54.39	57.48	44.57	41.48	54	-12.52	PK
*24120	H	56.36	53.54	45.80	48.62	54	-5.38	PK
4824	V	46.28	36.30	37.50	47.48	54	-6.52	PK
*7236	V	46.30	36.55	42.94	52.69	54	-1.31	PK
*9648	V	43.35	36.93	46.04	52.46	54	-1.54	PK
*12060	V	40.14	36.44	49.09	52.79	54	-1.21	PK
*14472	V	53.66	61.11	52.04	44.59	54	-9.41	PK
*16884	V	53.17	60.35	49.31	42.13	54	-11.87	PK
*19296	V	52.94	59.61	43.70	37.03	54	-16.97	PK
*21708	V	54.41	57.48	44.57	41.50	54	-12.50	PK
*24120	V	56.53	53.54	45.80	48.79	54	-5.21	PK

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

802.11g CH6								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
4874	H	45.32	36.30	37.59	46.61	54	-7.39	PK
*7311	H	45.68	36.56	43.12	52.24	54	-1.76	PK
*9748	H	43.29	36.95	46.15	52.49	54	-1.51	PK
*12185	H	42.65	36.41	46.17	52.41	54	-1.59	PK
*14622	H	53.07	60.81	51.51	43.77	54	-10.23	PK
*17059	H	52.65	59.98	50.37	43.04	54	-10.96	PK
*19496	H	54.29	60.06	43.70	37.93	54	-16.07	PK
*21933	H	53.47	57.73	44.44	40.18	54	-13.82	PK
*24370	H	57.69	54.06	45.80	49.43	54	-4.57	PK
4874	V	46.30	36.30	37.59	47.59	54	-6.41	PK
*7311	V	45.92	36.56	43.12	52.48	54	-1.52	PK
*9748	V	43.10	36.95	46.15	52.30	54	-1.70	PK
*12185	V	42.61	36.41	46.17	52.37	54	-1.63	PK
*14622	V	53.01	60.81	51.51	43.71	54	-10.29	PK
*17059	V	53.20	59.98	50.37	43.59	54	-10.41	PK
*19496	V	54.36	60.06	43.70	38.00	54	-16.00	PK
*21933	V	53.95	57.73	44.44	40.66	54	-13.34	PK
*24370	V	57.69	54.06	45.80	49.43	54	-4.57	PK

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

802.11g CH11								
Frequency (MHz)	Antenna Polarization	Reading (dB μV)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μV/m)	Limits (dB μV/m)	Margin (dB)	Det. Mode
4924	H	45.03	36.30	37.67	46.40	54	-7.60	PK
*7386	H	45.20	36.58	43.29	51.91	54	-2.09	PK
*9848	H	43.37	36.97	46.26	52.66	54	-1.34	PK
*12310	H	40.33	36.19	48.04	52.18	54	-1.82	PK
*14772	H	54.21	60.29	50.67	44.59	54	-9.41	PK
*17234	H	52.39	60.13	52.05	44.31	54	-9.69	PK
*19696	H	52.76	59.55	43.54	36.75	54	-17.25	PK
*22158	H	56.02	57.17	44.43	43.28	54	-10.72	PK
*24620	H	55.64	54.15	45.82	47.31	54	-6.69	PK
4924	V	46.47	36.30	37.67	47.84	54	-6.16	PK
*7386	V	45.41	36.58	43.29	52.12	54	-1.88	PK
*9848	V	43.14	36.97	46.26	52.43	54	-1.57	PK
*12310	V	40.36	36.19	48.04	52.21	54	-1.79	PK
*14772	V	54.33	60.29	50.67	44.71	54	-9.29	PK
*17234	V	52.38	60.13	52.05	44.30	54	-9.70	PK
*19696	V	52.79	59.55	43.54	36.78	54	-17.22	PK
*22158	V	56.03	57.17	44.43	43.29	54	-10.71	PK
*24620	V	55.69	54.15	45.82	47.36	54	-6.64	PK

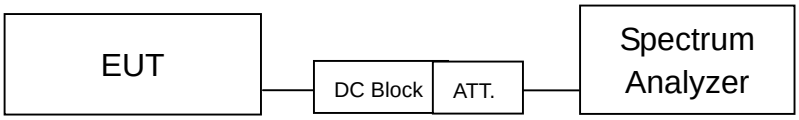
Remark ： Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss
* Mark indicated background noise level.

3 RF Conducted spurious emission

3.1 Limit

According to 15.247(d) requirement：
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

3.2 Configuration of Measurement



3.3 Test Procedure

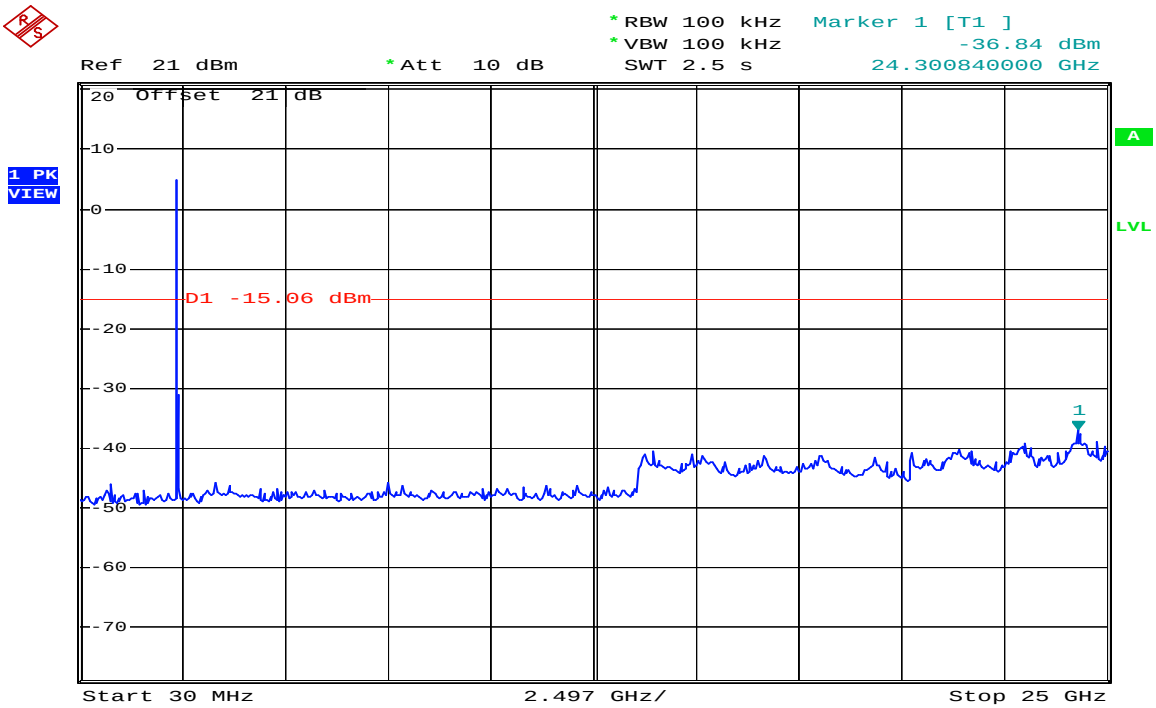
The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
The measurements were performed from 30MHz to 40GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limit for each channel.

3.4 Test Result

PASS.
The final test data is shown on as following pages.

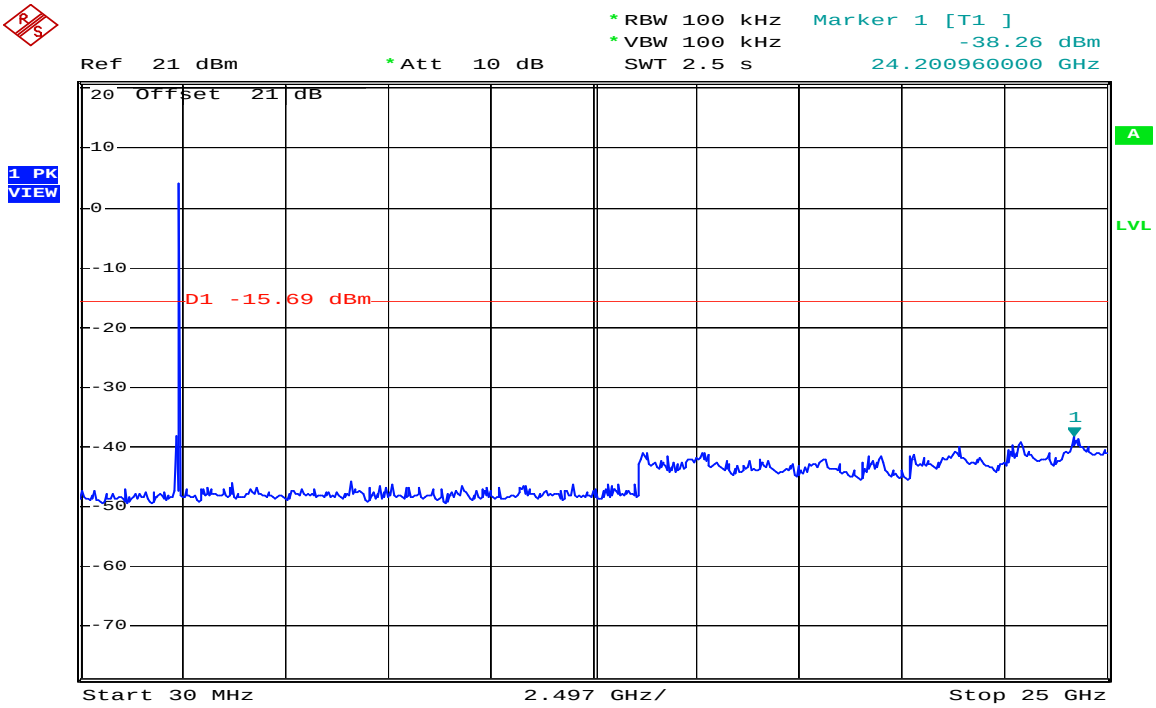
Conducted spurious emission

802.11b CH1 2412MHz (Module A)



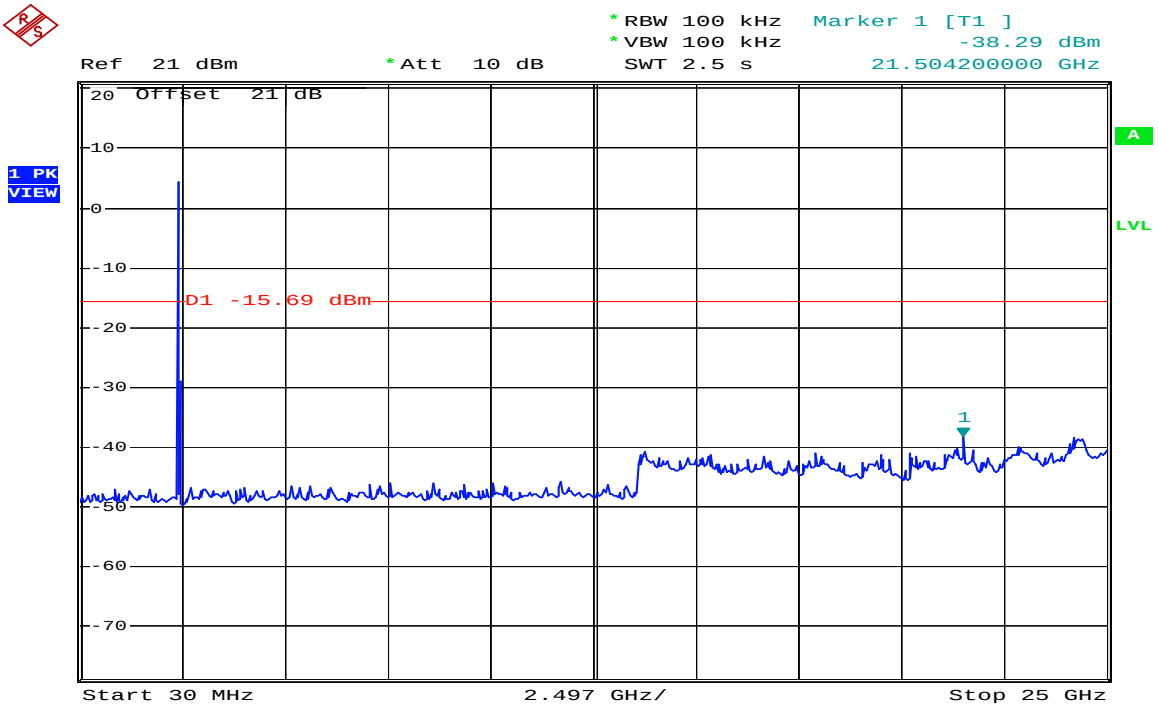
Comment: 802.11b Conducted Spurious 2412MHz
Date: 28.APR.2009 17:50:59

802.11b CH6 2437MHz (Module A)



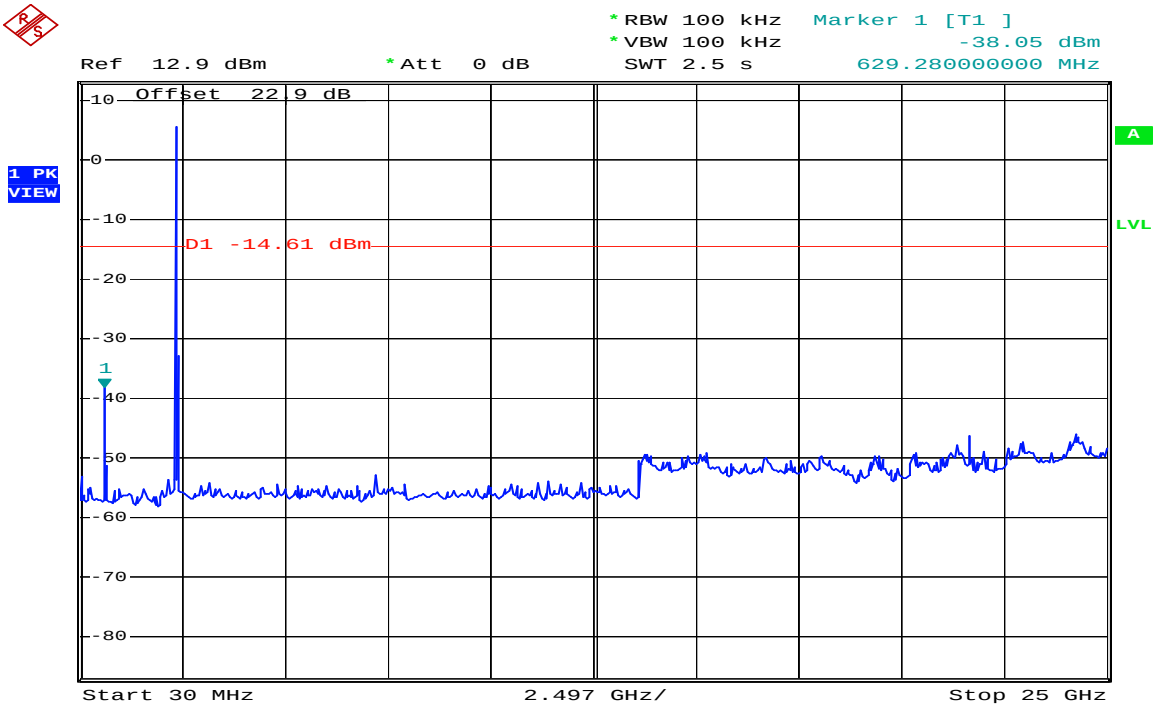
Comment: 802.11b Conducted Spurious 2437MHz
Date: 28.APR.2009 17:47:20

802.11b CH11 2462MHz (Module A)



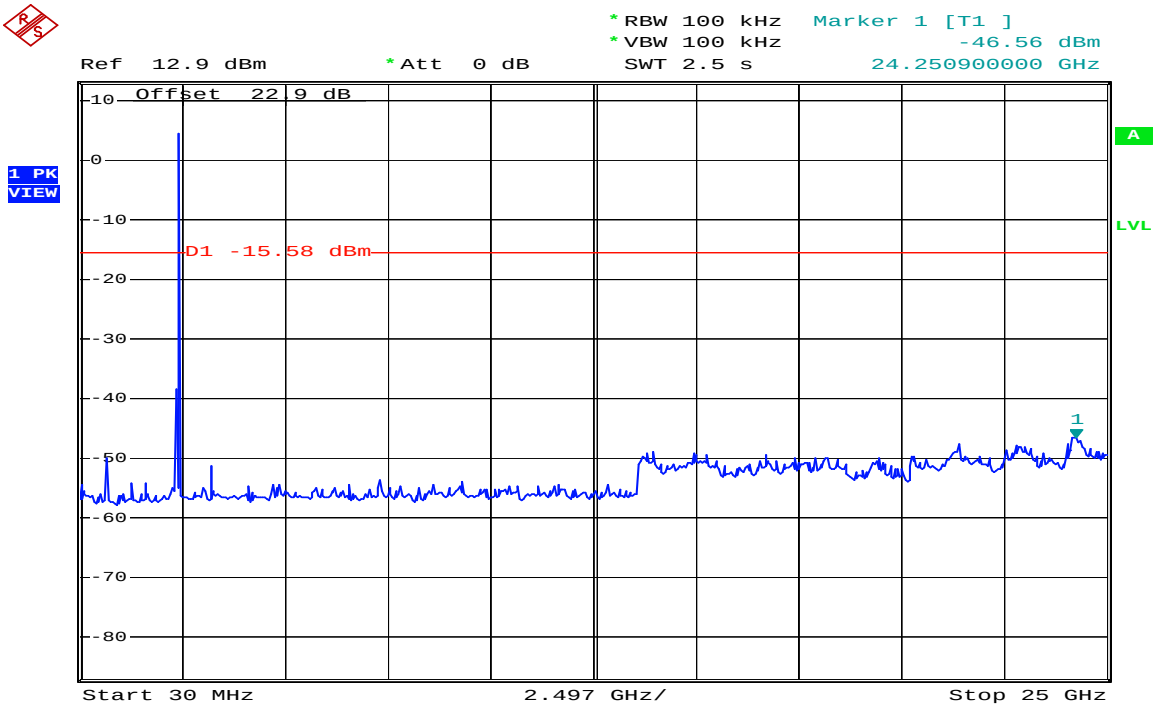
Comment: 802.11b Conducted Spurious 2462MHz
Date: 28.APR.2009 17:45:57

802.11b CH1 2412MHz (Module B)



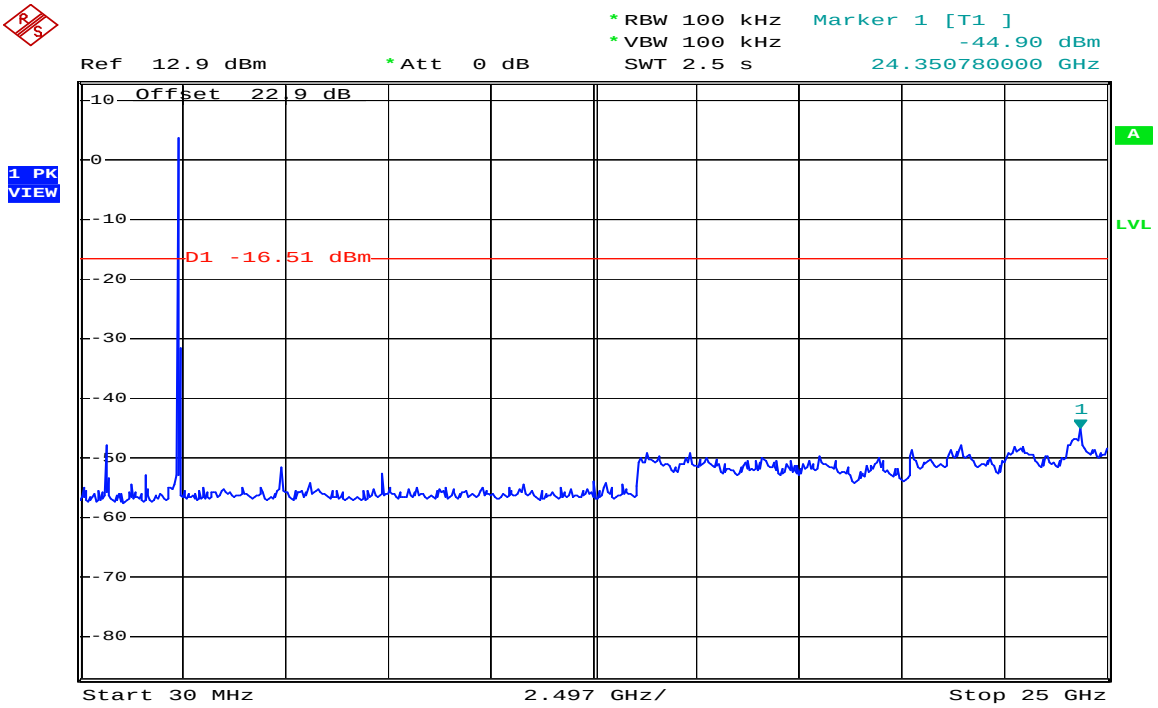
Comment: 802.11b Conducted Spurious 2412MHz
Date: 28.APR.2009 17:49:52

802.11b CH6 2437MHz (Module B)



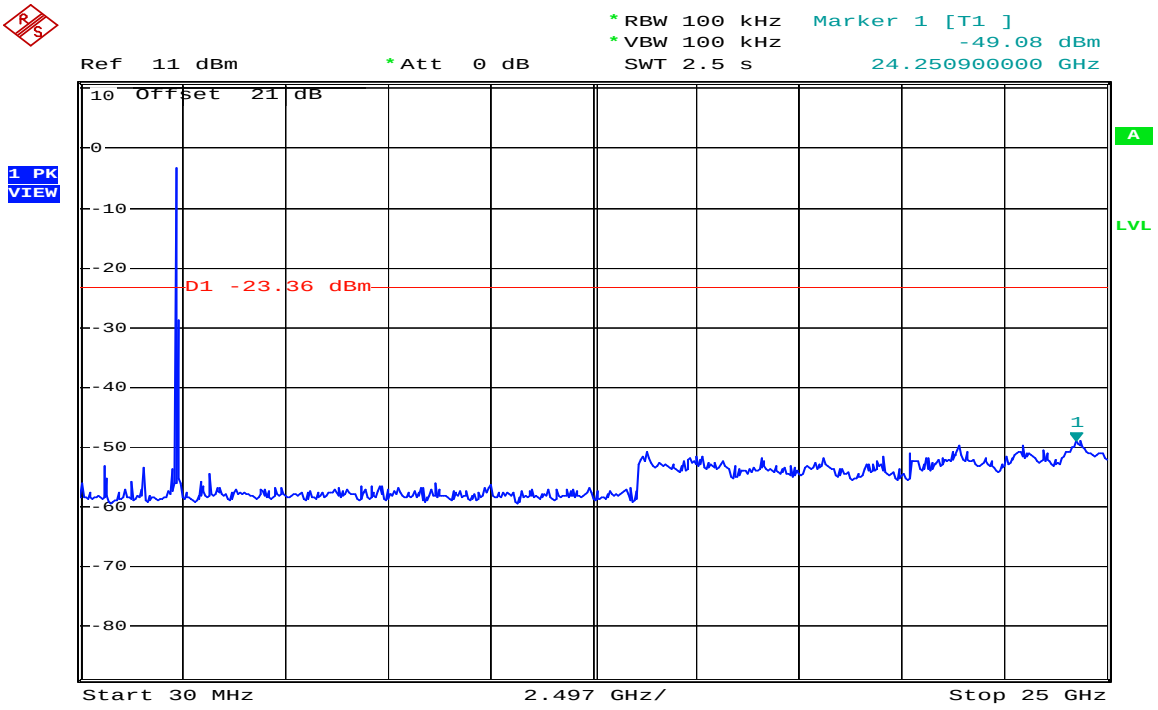
Comment: 802.11b Conducted Spurious 2437MHz
Date: 28.APR.2009 17:48:32

802.11b CH11 2462MHz (Module B)



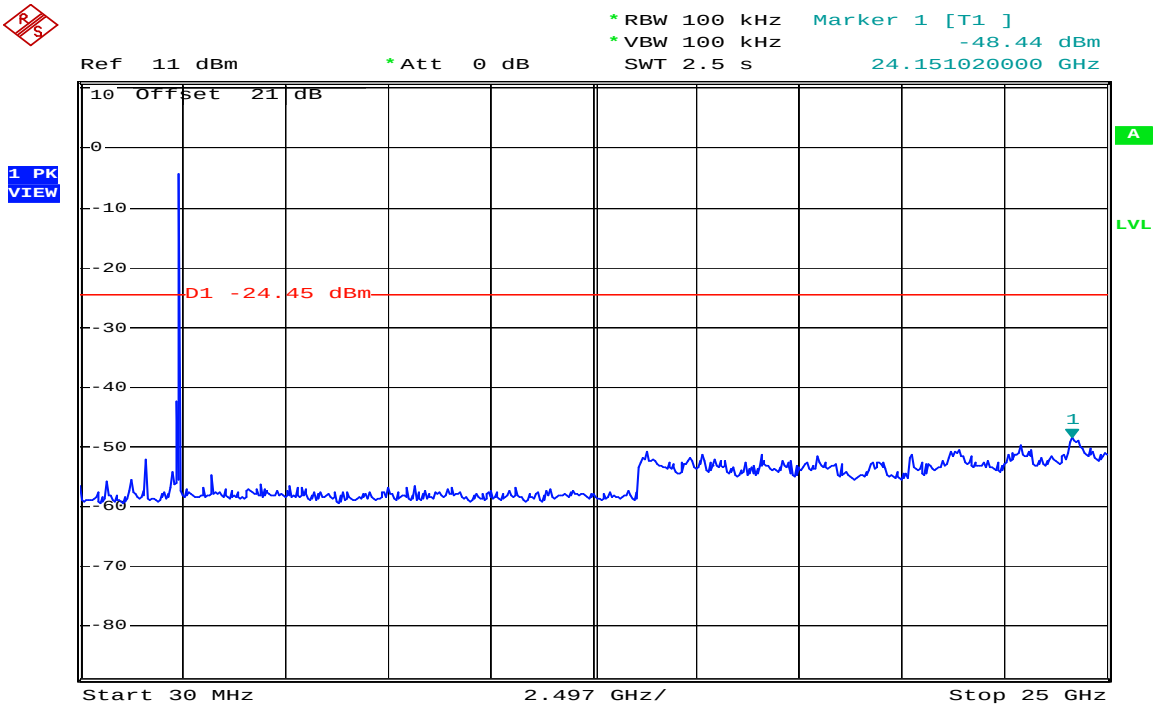
Comment: 802.11b Conducted Spurious 2462MHz
Date: 28.APR.2009 17:42:24

802.11g CH1 2412MHz (Module A)



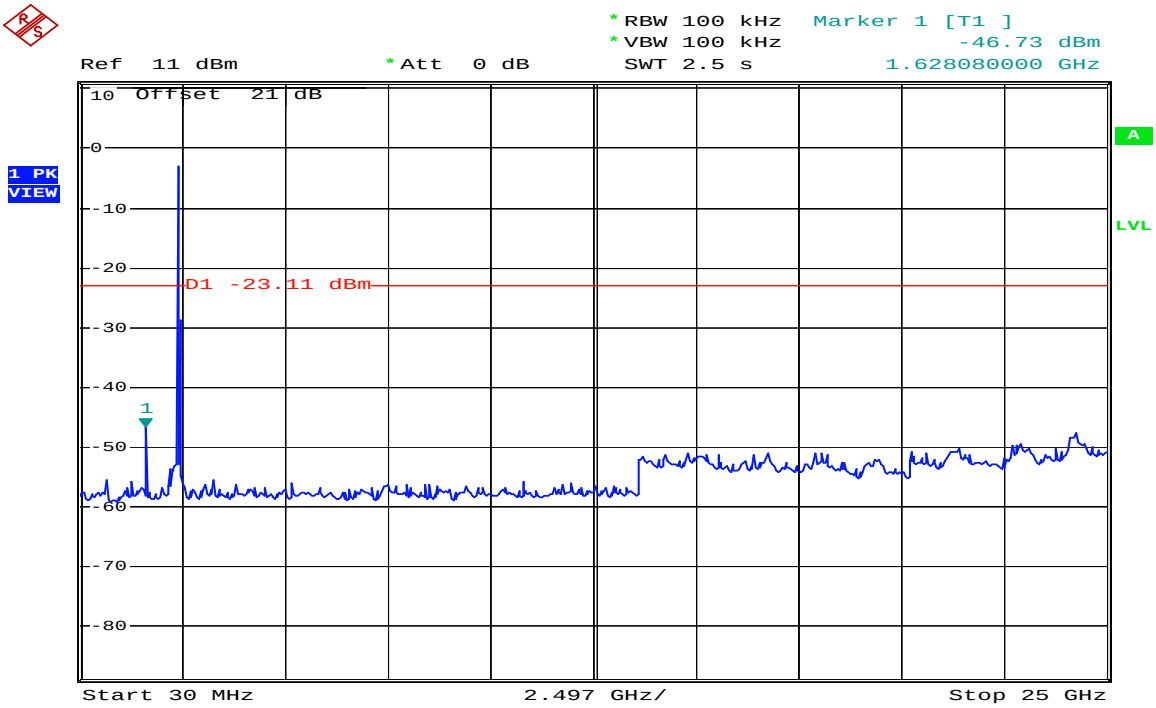
Comment: 802.11g Conducted Spurious 2412MHz
Date: 29.APR.2009 09:11:25

802.11g CH6 2437MHz (Module A)



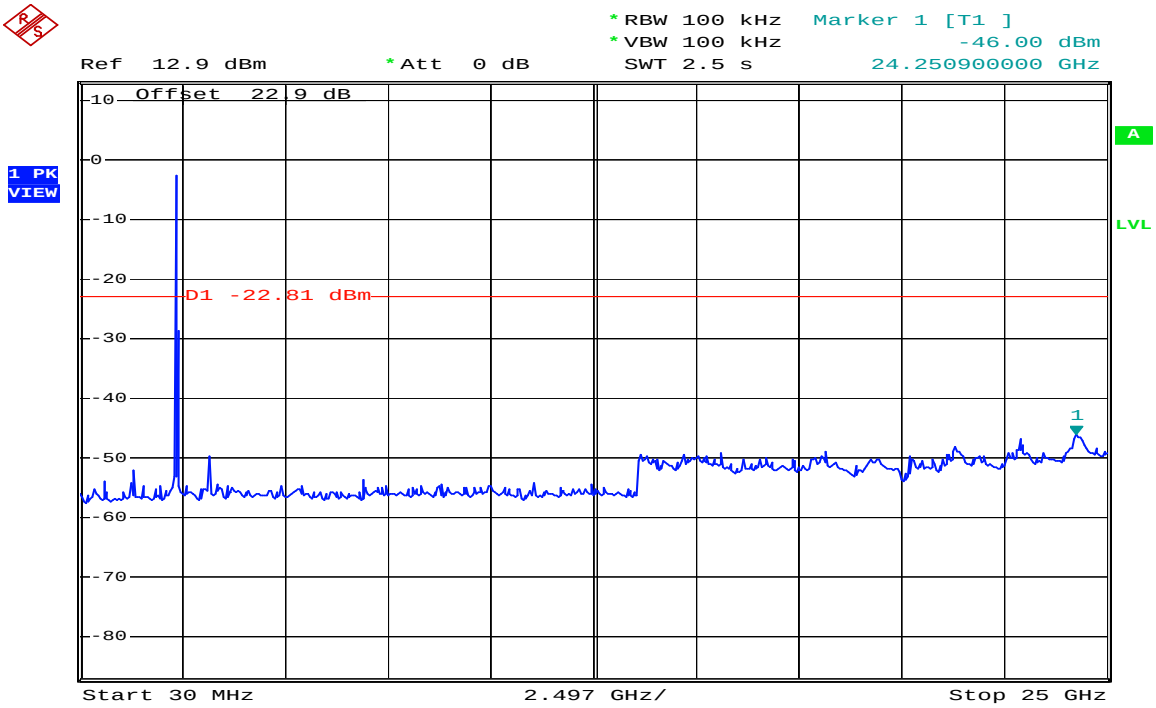
Comment: 802.11g Conducted Spurious 2437MHz
Date: 29.APR.2009 09:14:37

802.11g CH11 2462MHz (Module A)



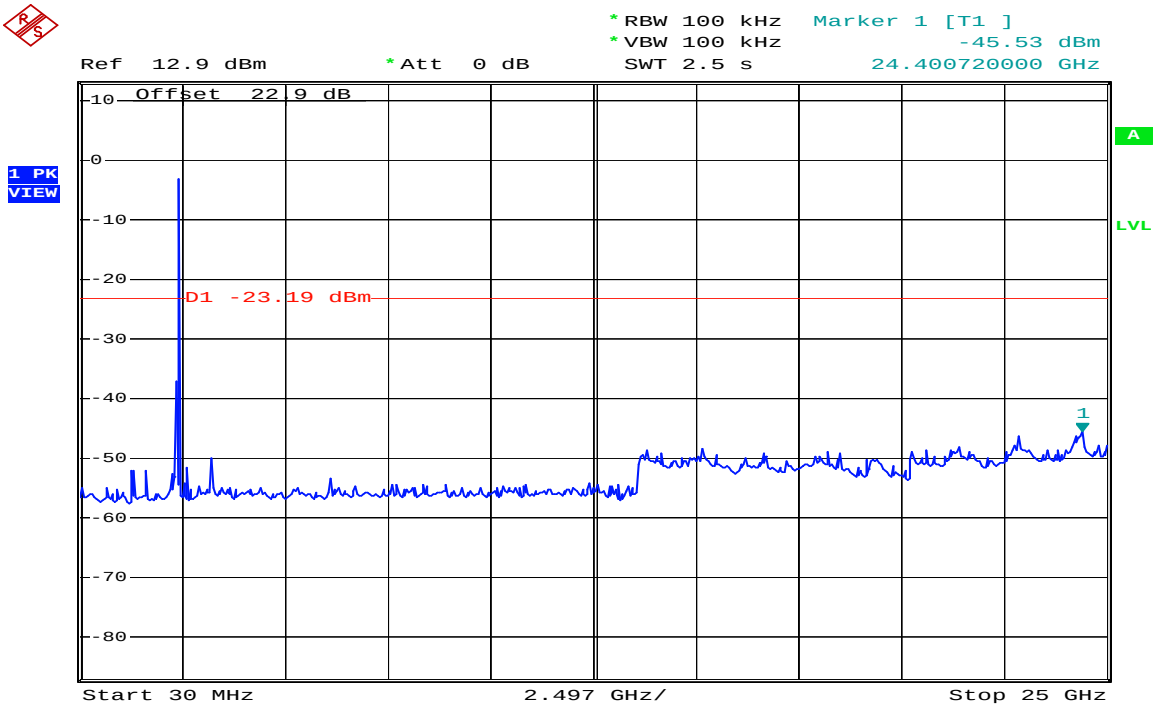
Comment: 802.11g Conducted Spurious 2462MHz
Date: 29.APR.2009 09:15:49

802.11g CH1 2412MHz (Module B)



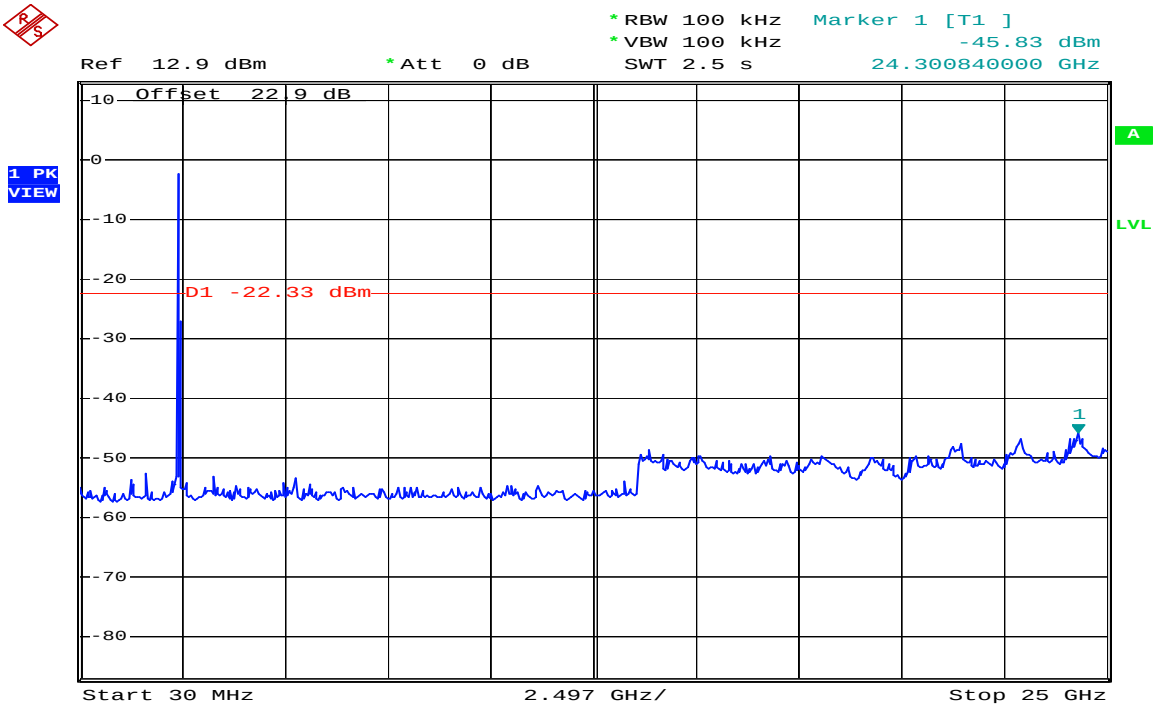
Comment: 802.11g Conducted Spurious 2412MHz
Date: 29.APR.2009 09:12:20

802.11g CH6 2437MHz (Module B)



Comment: 802.11g Conducted Spurious 2437MHz
Date: 29.APR.2009 09:13:29

802.11g CH11 2462MHz (Module B)



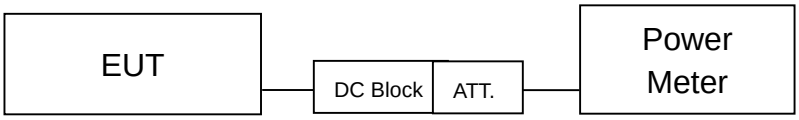
Comment: 802.11g Conducted Spurious 2462MHz
Date: 29.APR.2009 09:16:37

4 Maximum Peak output power test

4.1 Limit

According to FCC Part15.247 (b)(3) requirement：
For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: The maximum conducted output power shall be less than 1Watt.

4.2 Configuration of Measurement



4.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
For FCC §15.247(b) the power output was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Peak output power was read directly from power meter. The test was performed at 3 channels (lowest, middle and highest).

4.4 Test Result

PASS.
The final test data is shown on as following pages.

Maximum output power

Mode：802.11b								
CH	Freq. (MHz)	Maximum transmit power				Total Power (dBm)	Limit (dBm)	Margin (dB)
		(dBm)		(watts)				
		Module A	Module B	Module A	Module B			
1	2412	19.33	19.70	0.0857	0.0933	22.53	30	-7.47
6	2437	19.25	19.39	0.0841	0.0869	22.33	30	-7.67
11	2462	19.03	19.24	0.0800	0.0839	22.15	30	-7.85

Mode：802.11g								
CH	Freq. (MHz)	Maximum transmit power				Total Power (dBm)	Limit (dBm)	Margin (dB)
		(dBm)		(watts)				
		Module A	Module B	Module A	Module B			
1	2412	20.87	21.22	0.1222	0.1324	24.06	30	-5.94
6	2437	20.92	21.10	0.1236	0.1288	24.02	30	-5.98
11	2462	21.10	20.90	0.1288	0.1230	24.01	30	-5.99

5 Power test of Data Rate

Module A

Mode	Bandwidth (MHz)	Channel	Data Rate	Output Power	
				(dBm)	(watts)
802.11b	20	6	1	19.05	0.0804
			5.5	18.71	0.0743
			11	19.25	0.0841
802.11g	20	6	6	20.92	0.1236
			36	20.69	0.1172
			54	20.54	0.1132
802.11a	20	40	6	12.72	0.0187
			36	12.69	0.0186
			54	12.65	0.0184

Module B

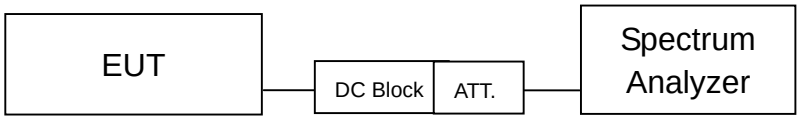
Mode	Bandwidth (MHz)	Channel	Data Rate	Output Power	
				(dBm)	(watts)
802.11b	20	6	1	19.36	0.0863
			5.5	19.03	0.0800
			11	19.39	0.0869
802.11g	20	6	6	21.10	0.1288
			36	21.03	0.1268
			54	20.95	0.1245
802.11a	20	40	6	13.41	0.0219
			36	13.27	0.0212
			54	13.24	0.0211

6 6dB Bandwidth

6.1 Limit

According to FCC Part15.247 (a)(2) requirement：
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

6.2 Configuration of Measurement



6.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
The minimum 6dB bandwidth was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set ≧RBW, and the SPAN>>RBW.
The test was performed at 3 channels (lowest, middle and highest).

6.4 Test Result

PASS.
The final test data is shown on as following pages.

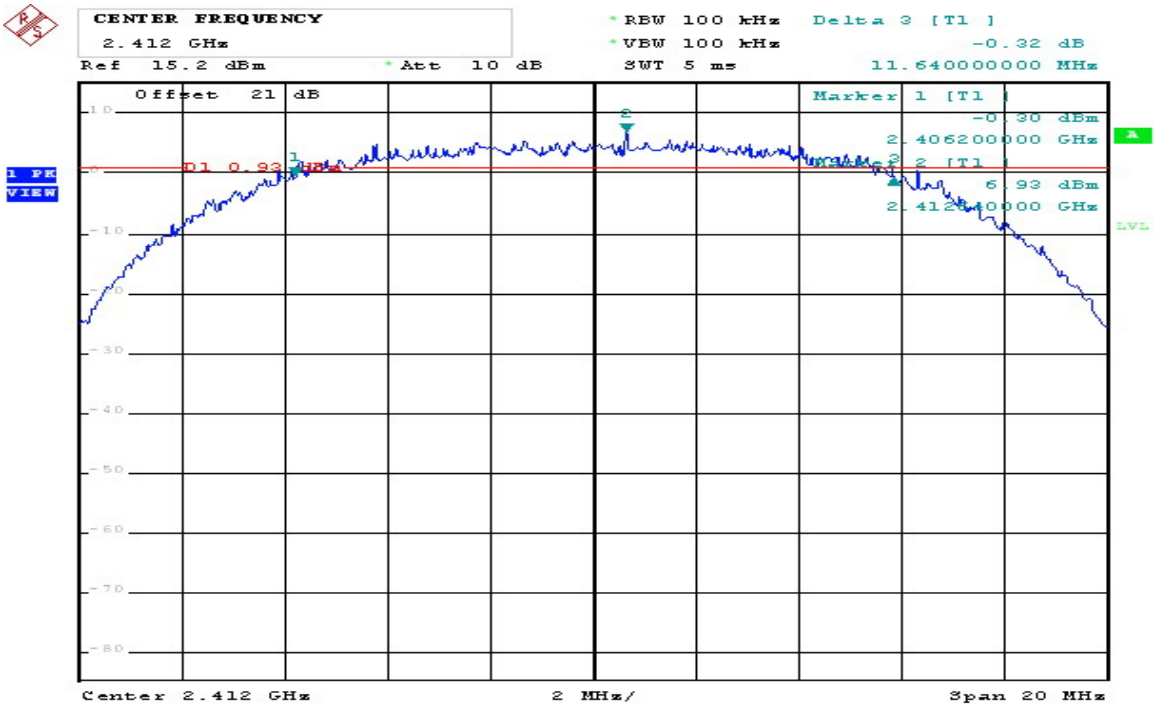
6dB bandwidth

Test Mode：802.11b				
CH No.	Freq. (MHz)	6dB Bandwidth (MHz)		Limit (kHz)
		Module A	Module B	
1	2412	11.64	11.44	>500
6	2437	11.40	10.76	>500
11	2462	12.20	11.12	>500

Test Mode：802.11g				
CH No.	Freq. (MHz)	6dB Bandwidth (MHz)		Limit (kHz)
		Module A	Module B	
1	2412	16.48	16.44	>500
6	2437	16.48	16.52	>500
11	2462	16.48	16.48	>500

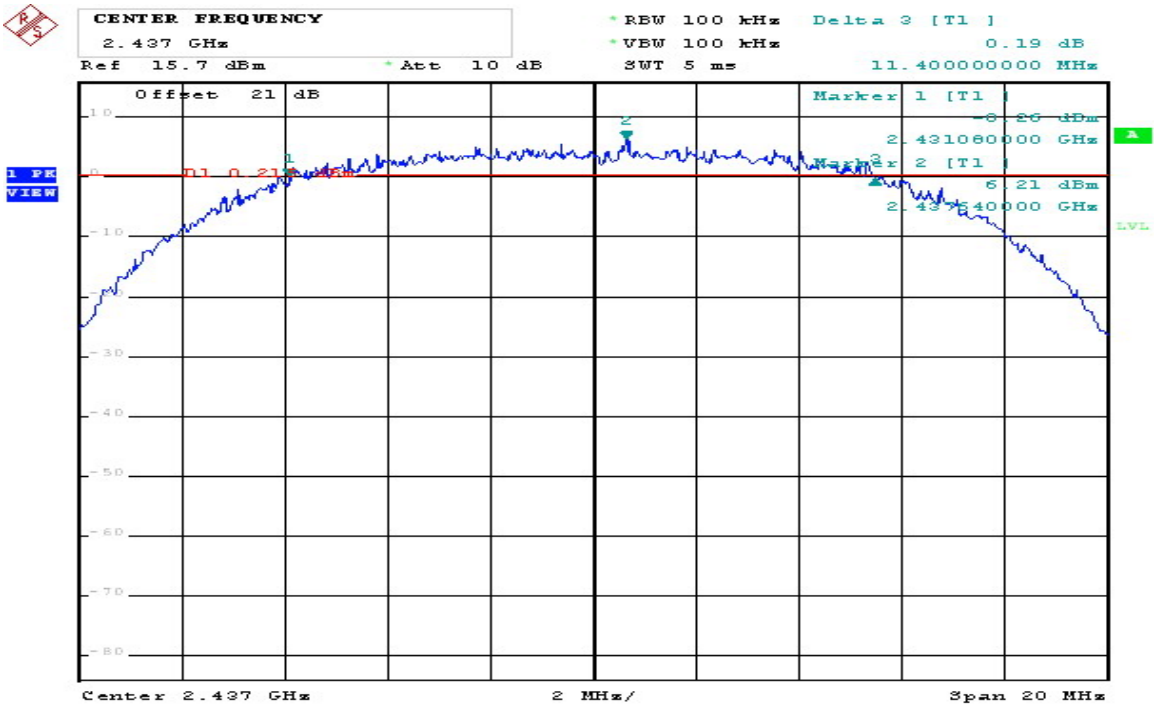
6dB Bandwidth

802.11b CH1 2412MHz (Module A)



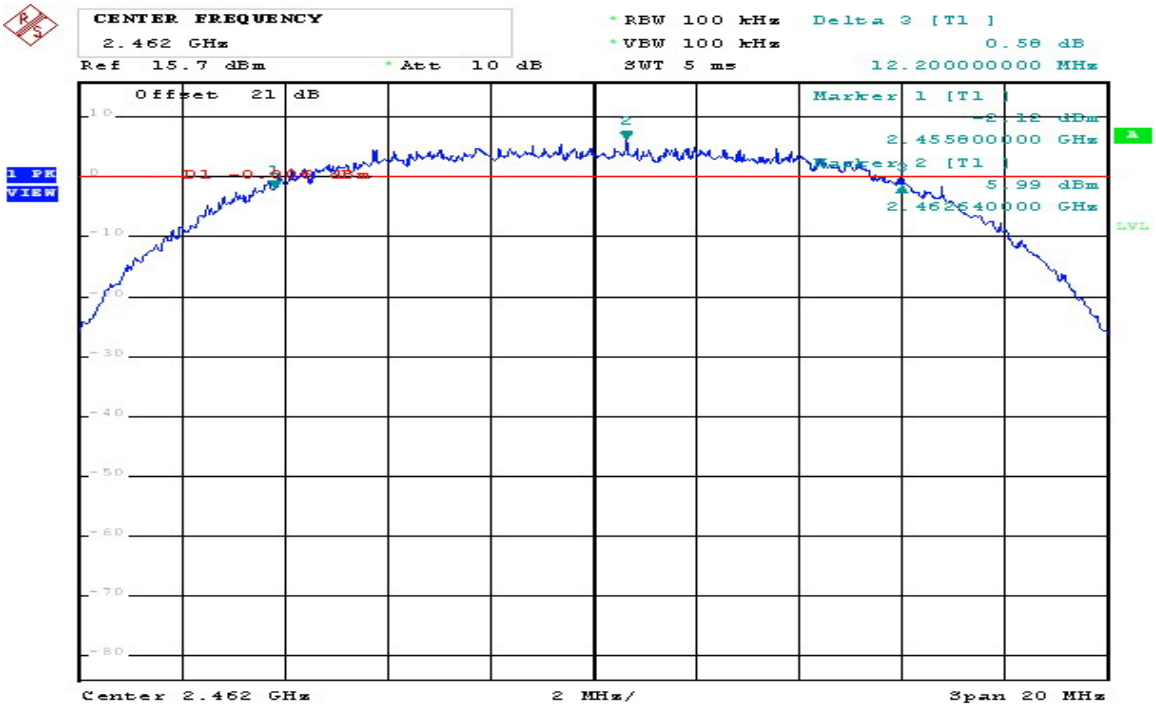
Comment: 802.11b 2412MHz
Date: 28.APR.2009 17:25:18

802.11b CH6 2437MHz (Module A)



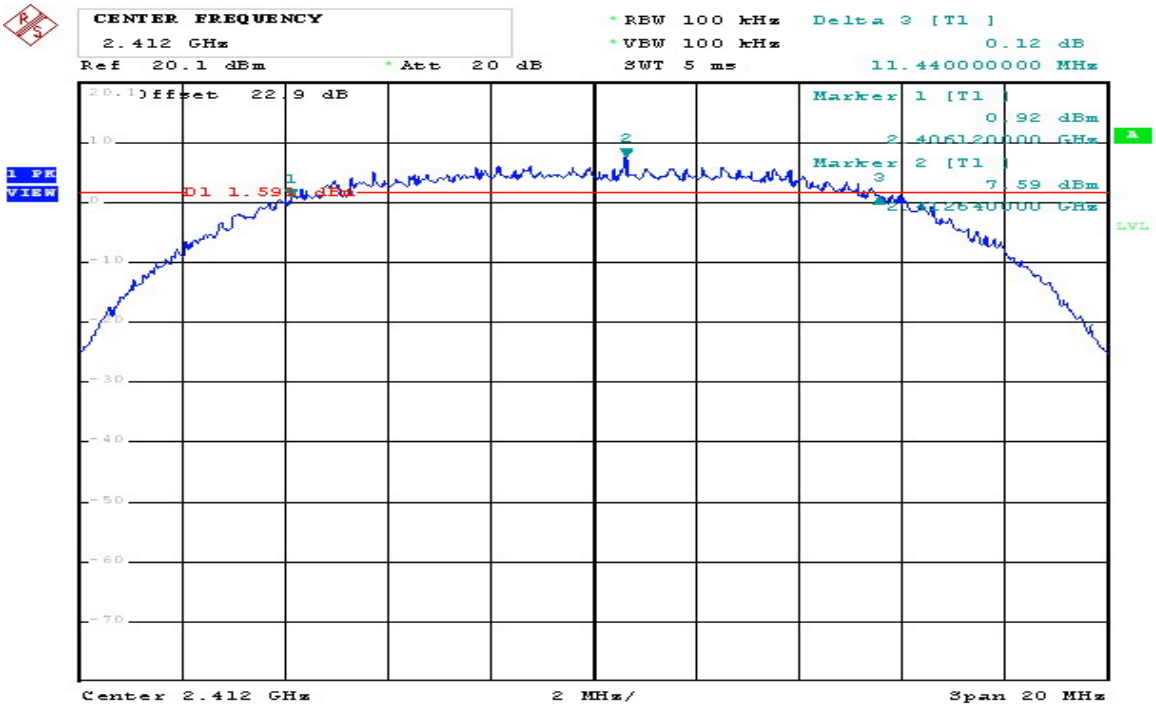
Comment: 802.11b 2437MHz
Date: 28.APR.2009 17:29:41

802.11b CH11 2462MHz (Module A)



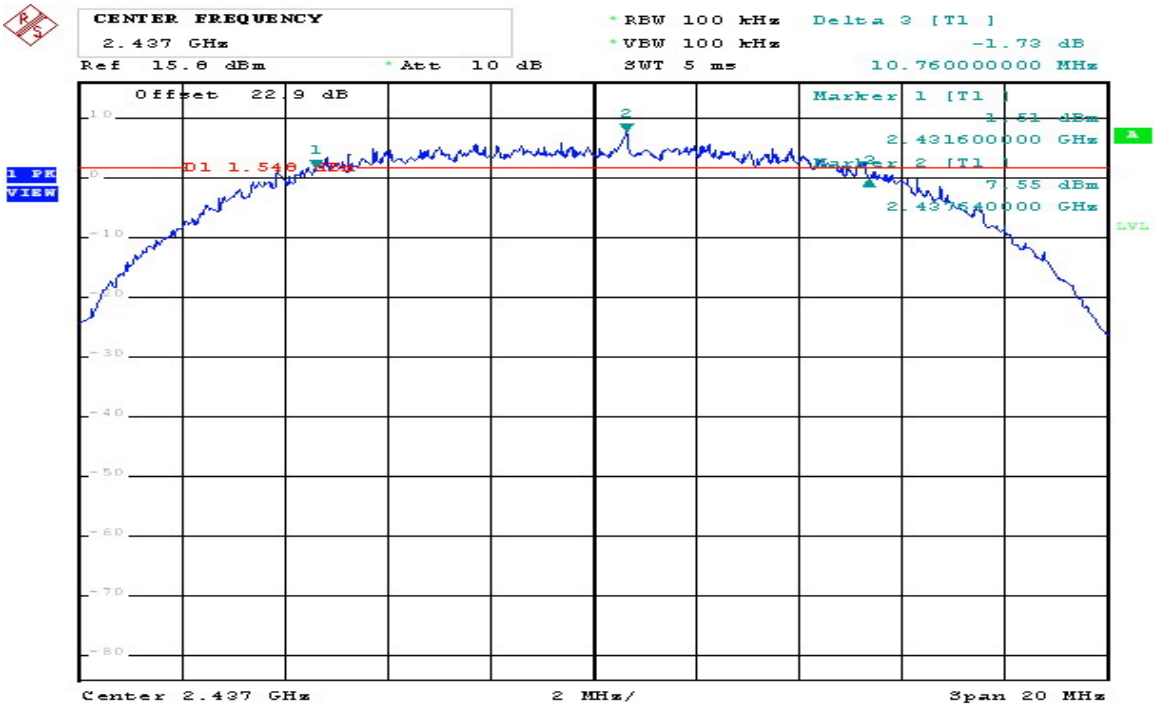
Comment: 802.11b 2462MHz
Date: 28.APR.2009 17:34:06

802.11b CH1 2412MHz (Module B)



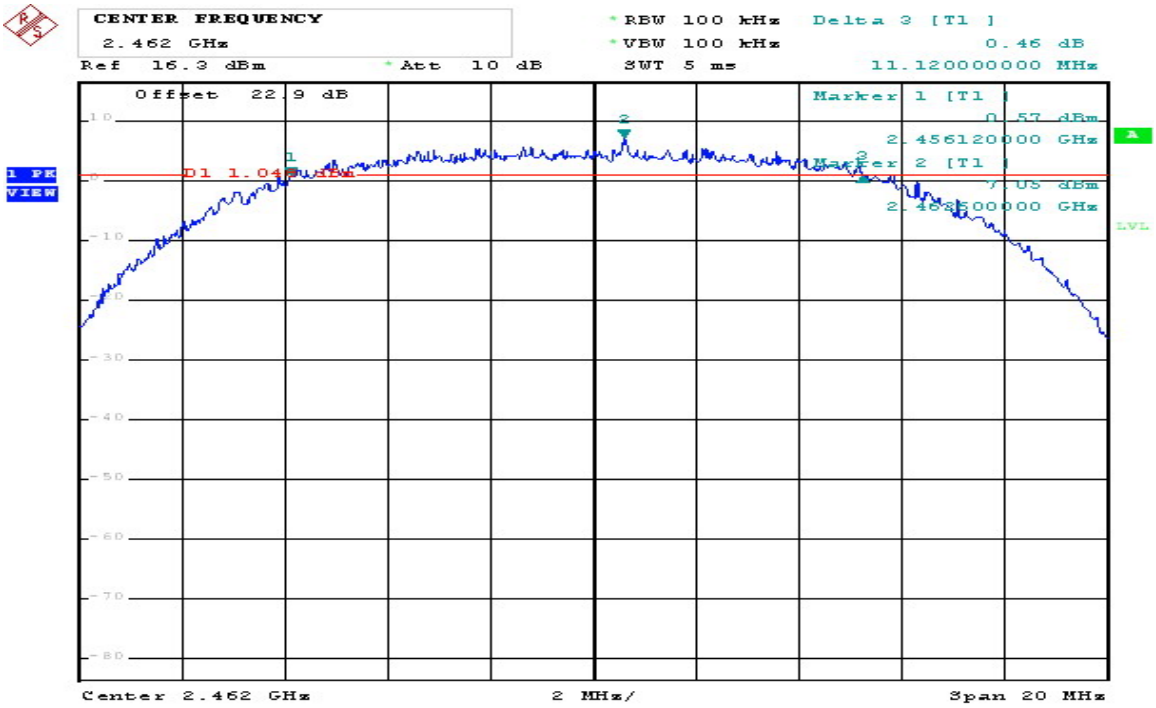
Comment: 802.11b 2412MHz
Date: 28.APR.2009 17:27:02

802.11b CH6 2437MHz (Module B)



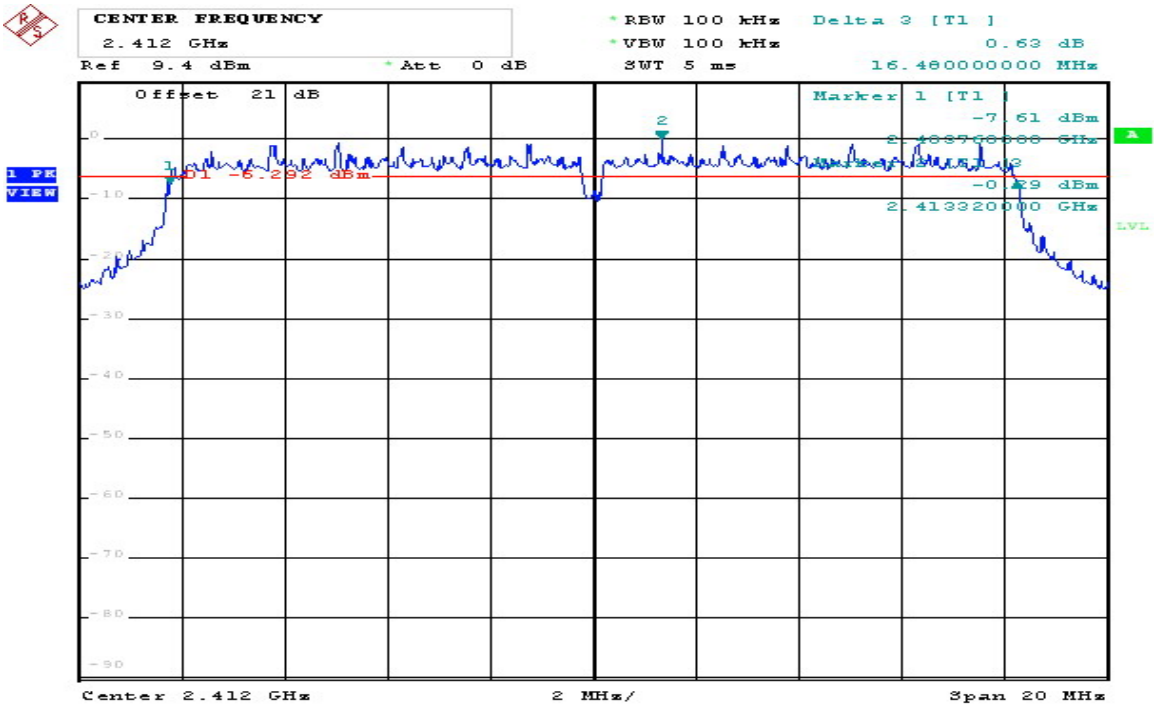
Comment: 802.11b 2437MHz
Date: 28.APR.2009 17:31:25

802.11b CH11 2462MHz (Module B)



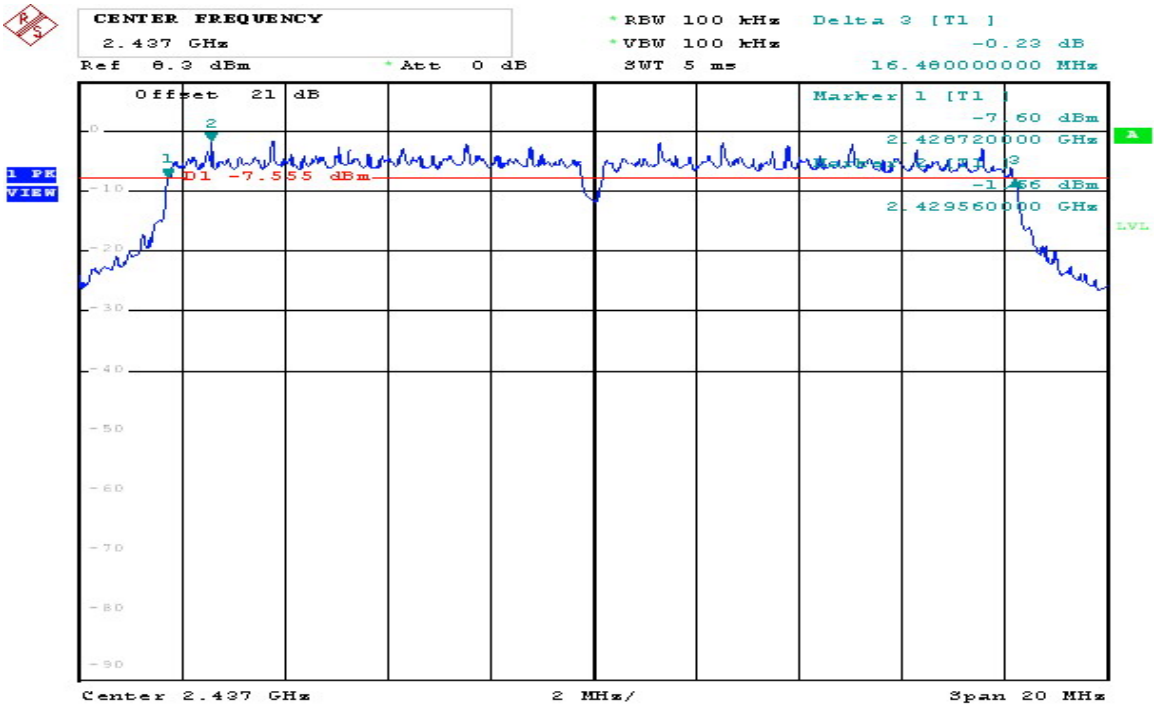
Comment: 802.11b 2462MHz
Date: 28.APR.2009 17:35:50

802.11g CH1 2412MHz (Module A)



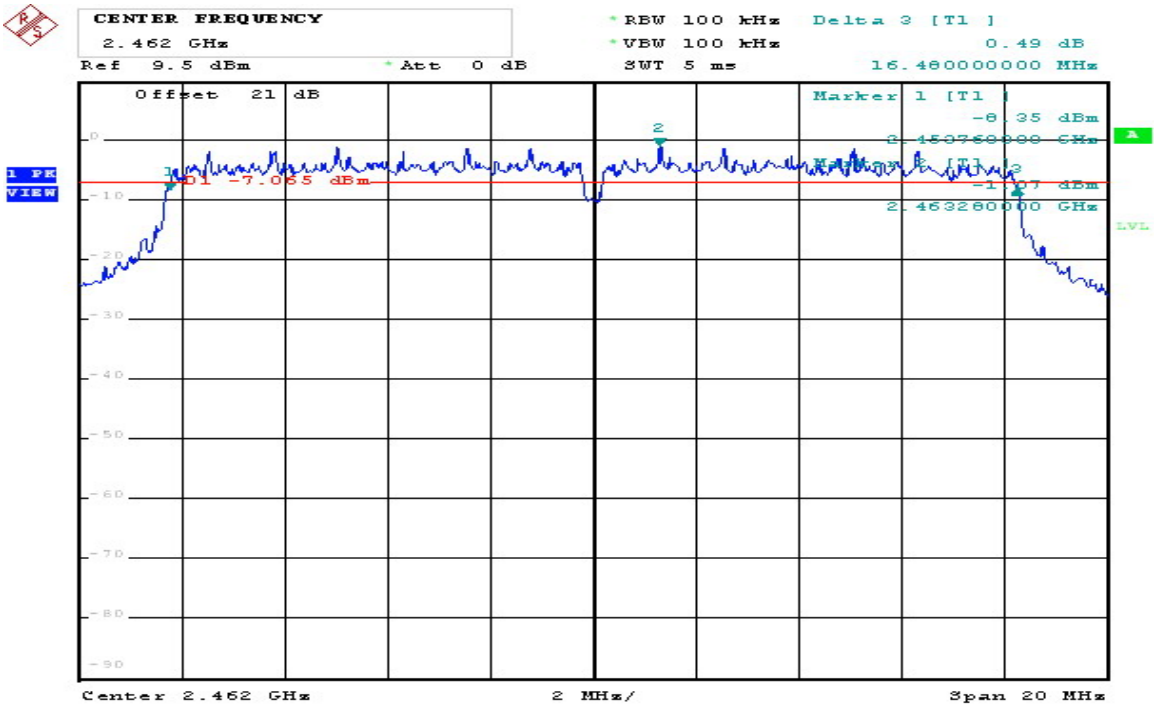
Comment: 802.11g 2412MHz
Date: 28.APR.2009 17:19:11

802.11g CH6 2437MHz (Module A)



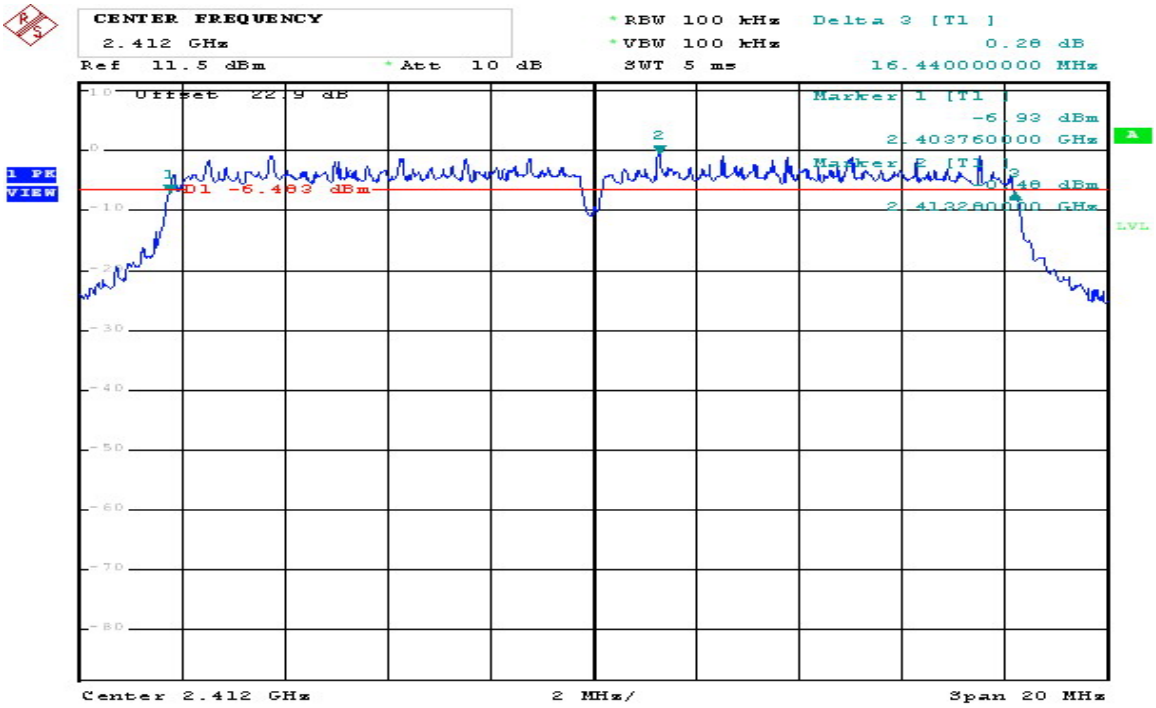
Comment: 802.11g 2437MHz
Date: 28.APR.2009 17:15:03

802.11g CH11 2462MHz (Module A)



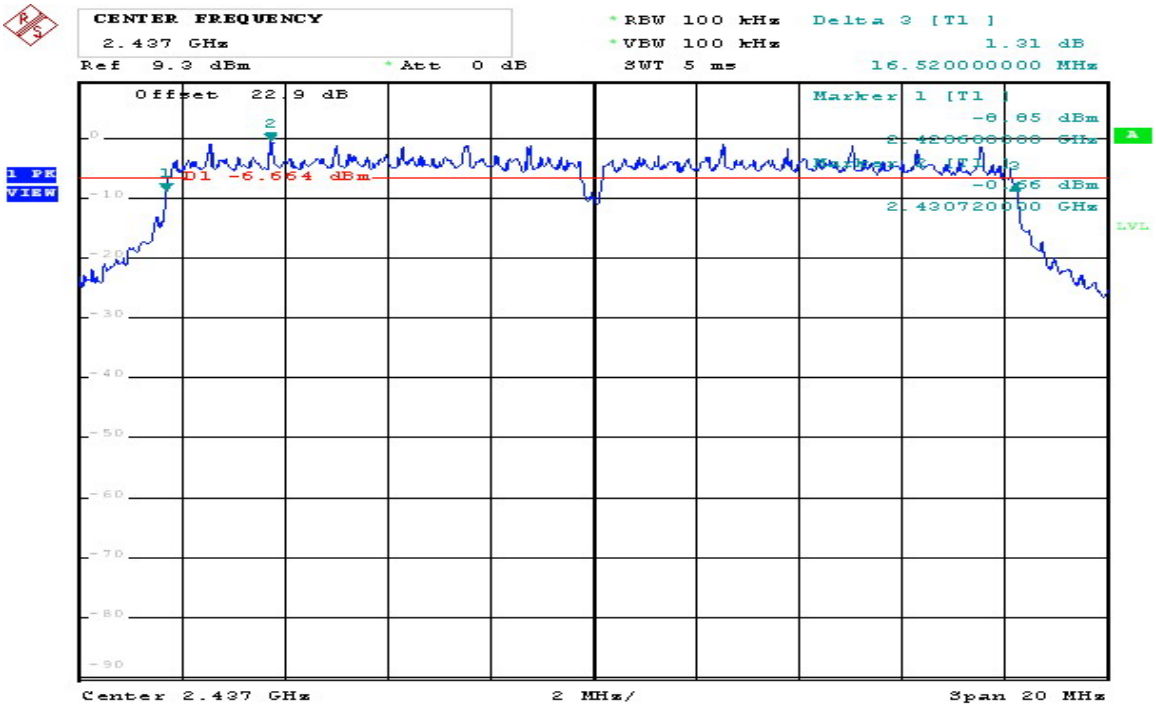
Comment: 802.11g 2462MHz
Date: 28.APR.2009 17:10:30

802.11g CH1 2412MHz (Module B)



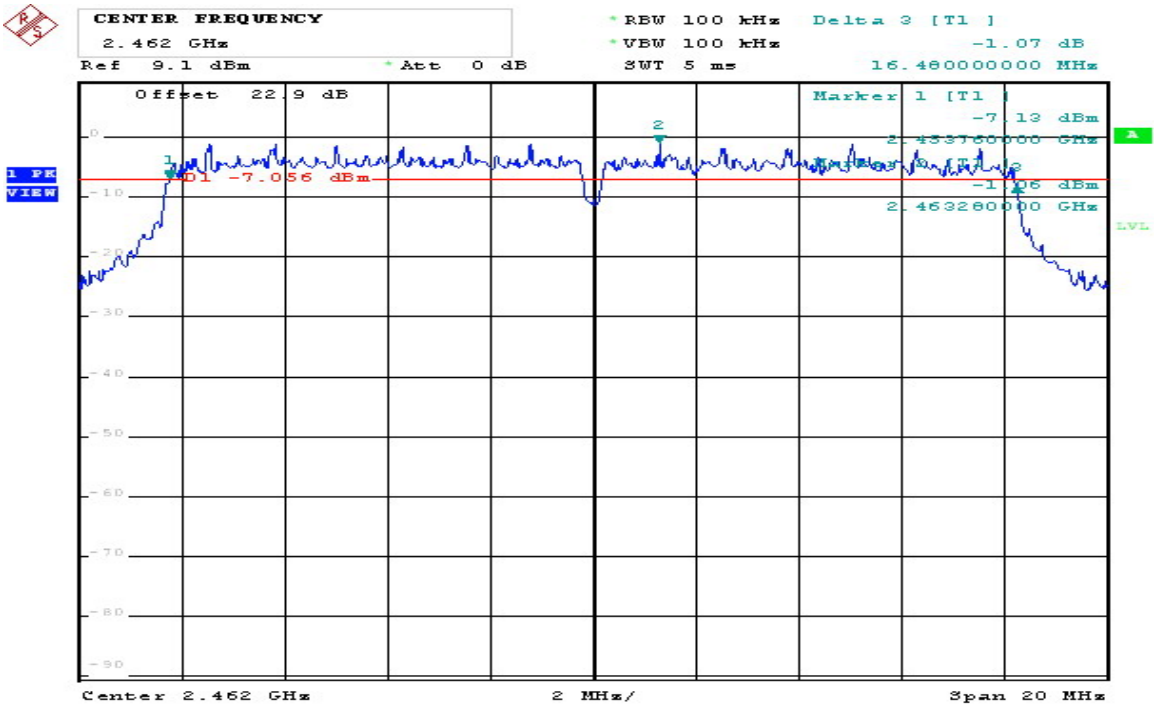
Comment: 802.11g 2412MHz
Date: 28.APR.2009 17:20:55

802.11g CH6 2437MHz (Module B)



Comment: 802.11g 2437MHz
Date: 28.APR.2009 17:16:44

802.11g CH11 2462MHz (Module B)



Comment: 802.11g 2462MHz
Date: 28.APR.2009 17:12:08

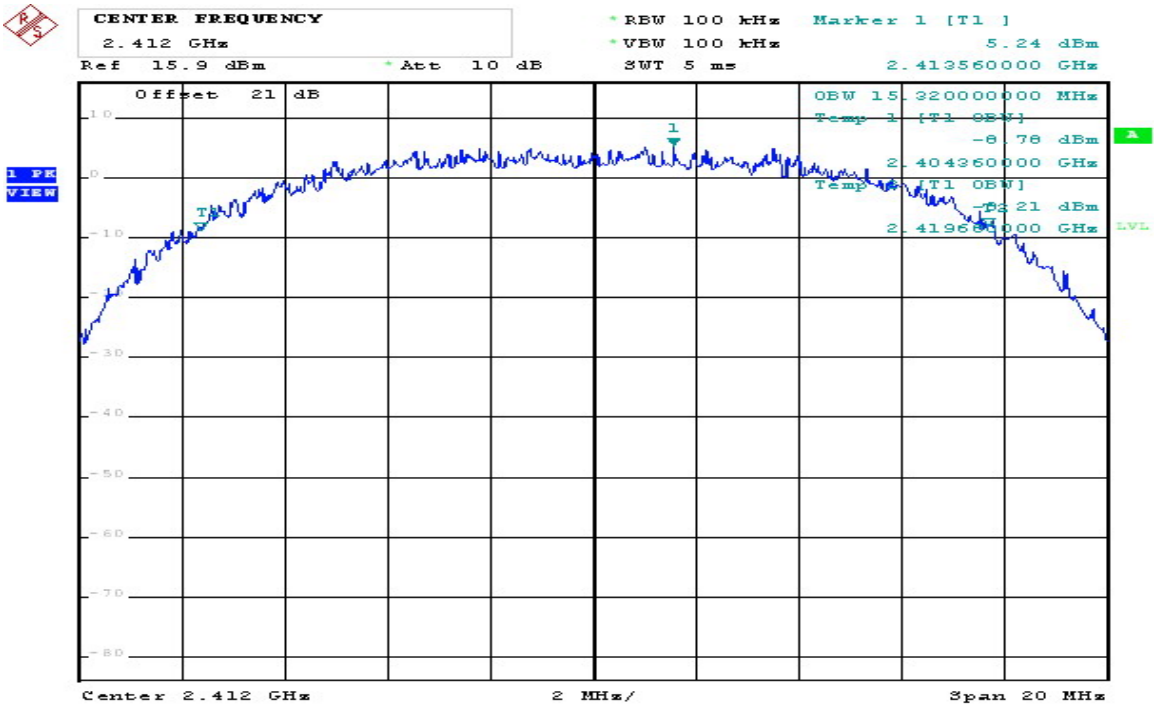
99%Occupied bandwidth

Test Mode：802.11b			
CH No.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Module A	Module B
1	2412	15.32	15.36
6	2437	15.40	15.44
11	2462	15.36	15.36

Test Mode：802.11g			
CH No.	Freq. (MHz)	Occupied Bandwidth (MHz)	
		Module A	Module B
1	2412	16.52	16.52
6	2437	16.52	16.48
11	2462	16.52	16.52

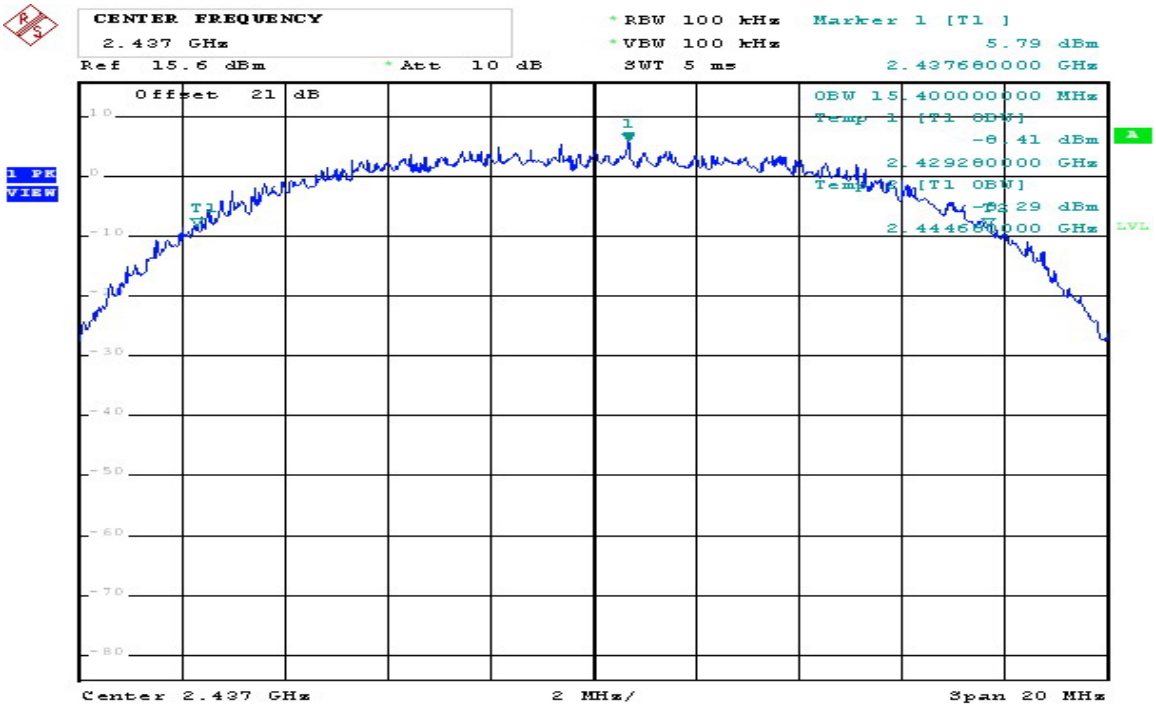
99%Occupied bandwidth

802.11b CH1 2412MHz (Module A)



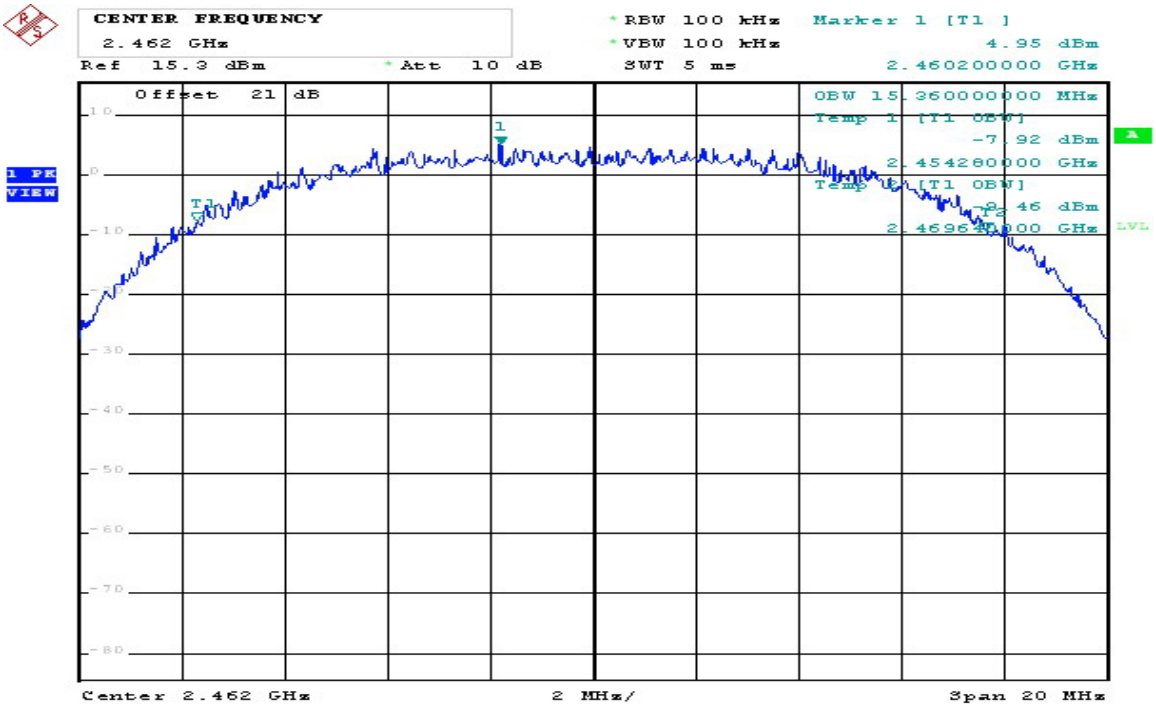
Comment: 802.11b 2412MHz
Date: 28.APR.2009 17:26:31

802.11b CH6 2437MHz (Module A)



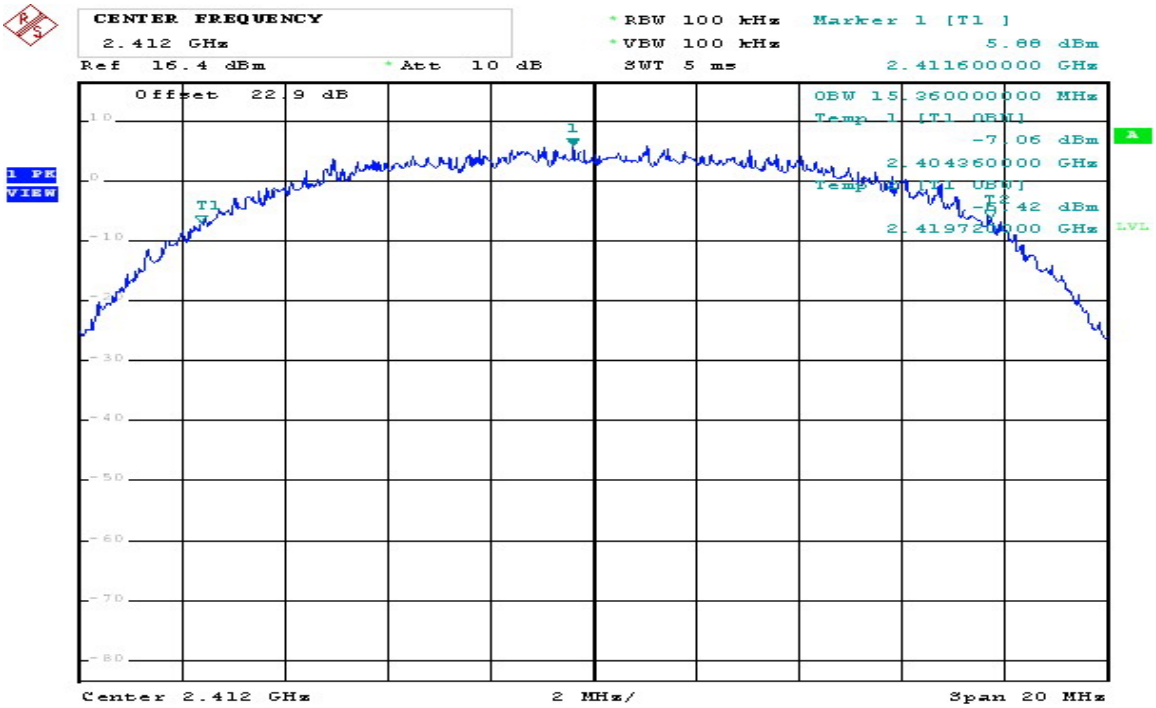
Comment: 802.11b 2437MHz
Date: 28.APR.2009 17:30:55

802.11b CH11 2462MHz (Module A)



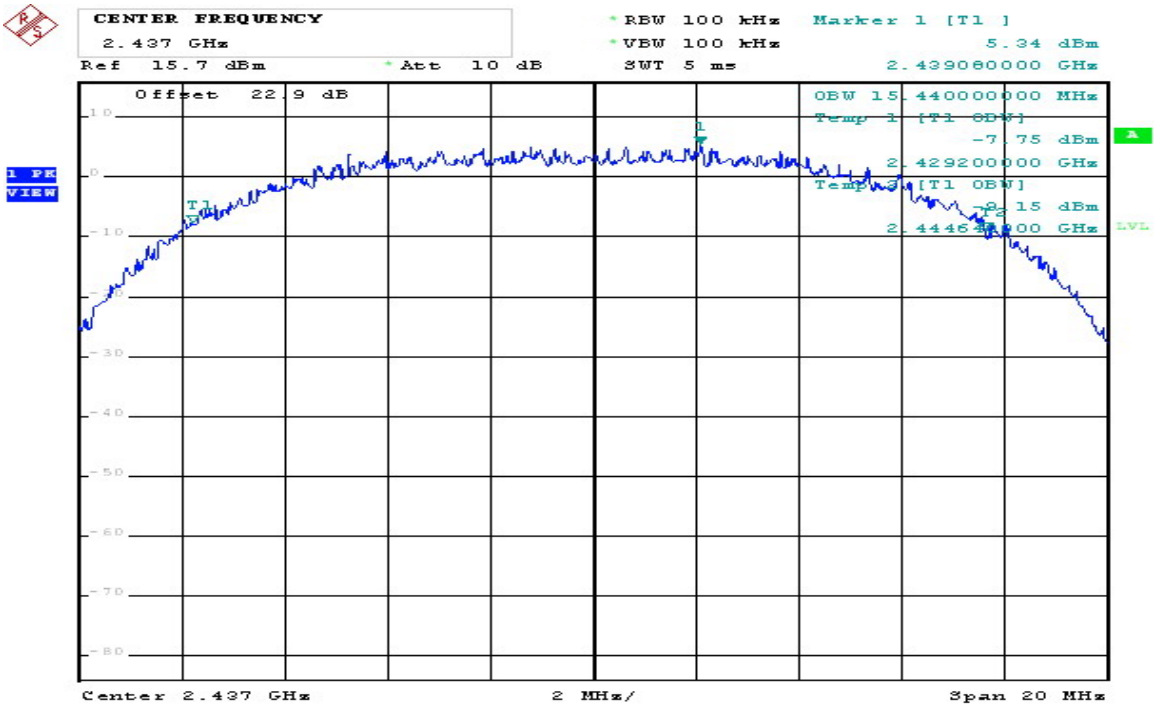
Comment: 802.11b 2462MHz
Date: 28.APR.2009 17:35:20

802.11b CH1 2412MHz (Module B)



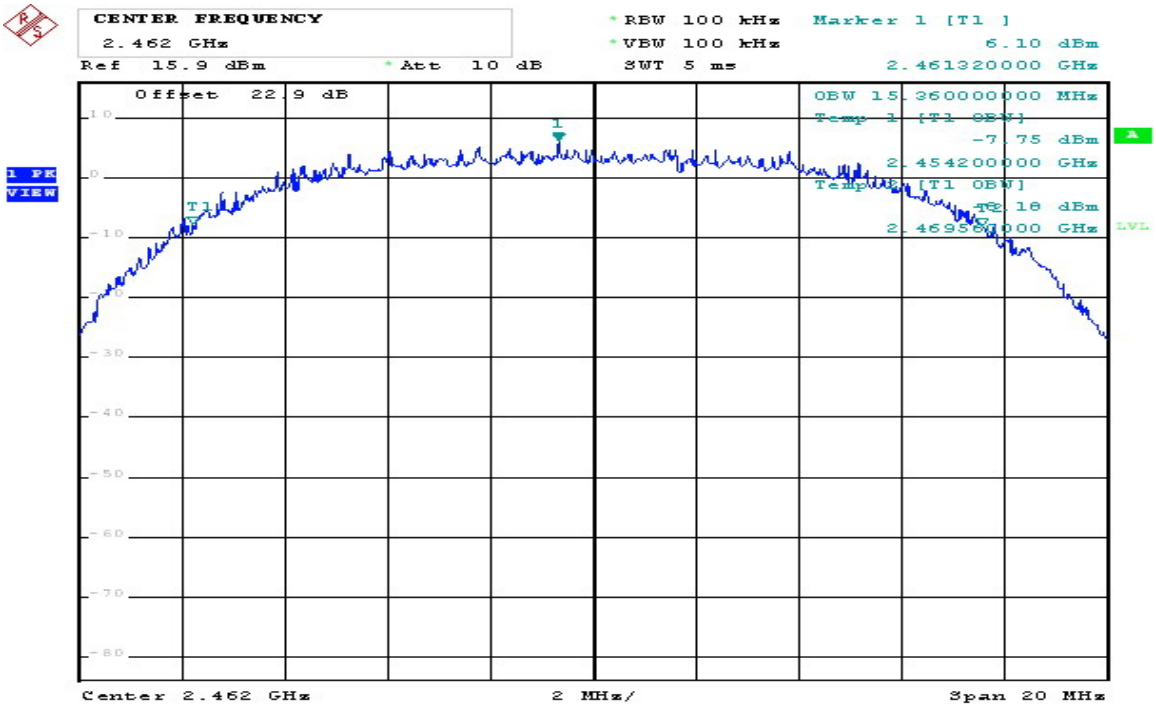
Comment: 802.11b 2412MHz
Date: 28.APR.2009 17:28:16

802.11b CH6 2437MHz (Module B)



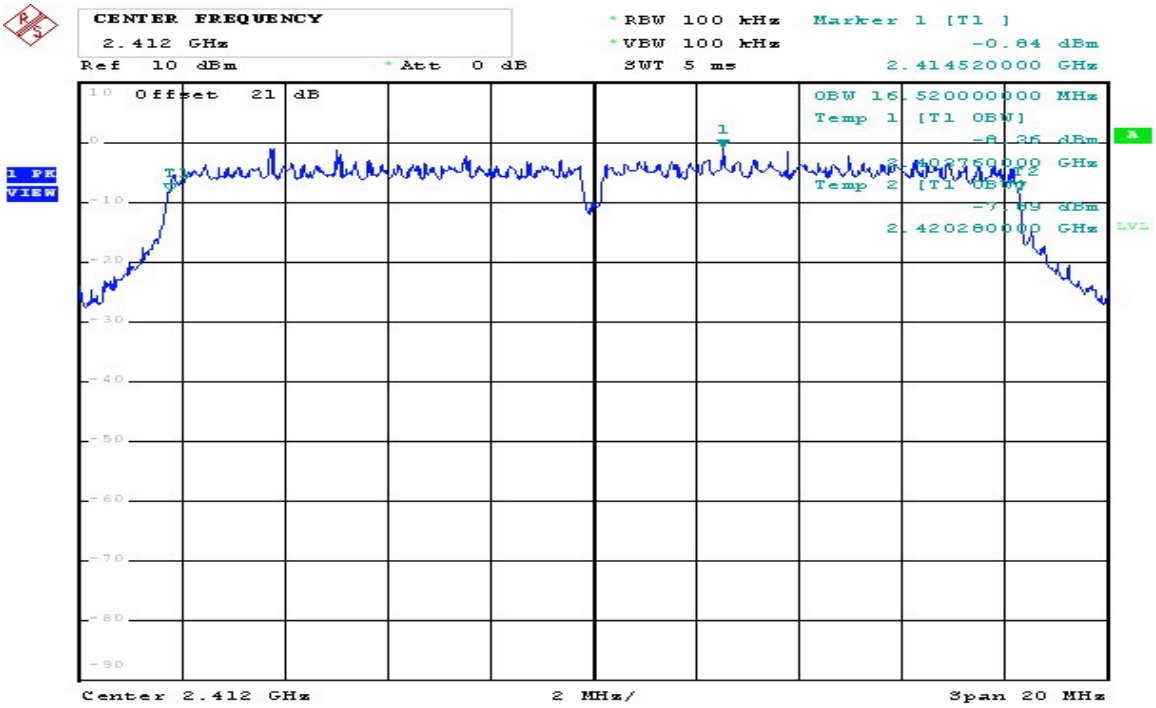
Comment: 802.11b 2437MHz
Date: 28.APR.2009 17:32:37

802.11b CH11 2462MHz (Module B)



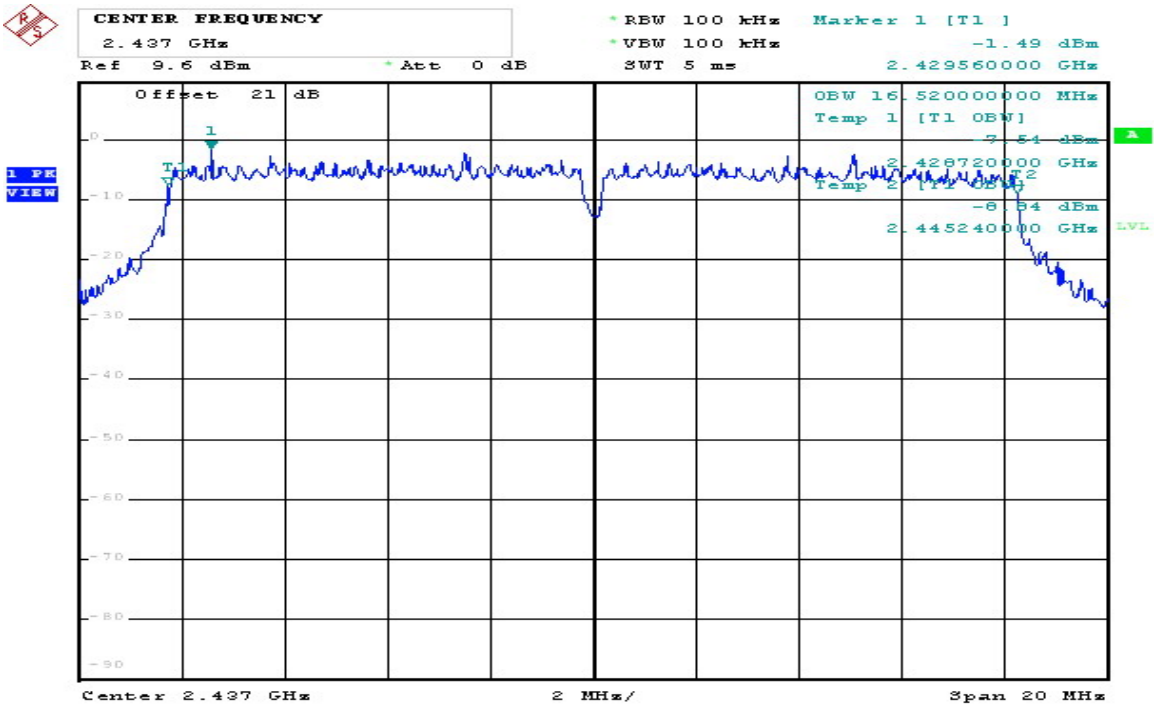
Comment: 802.11b 2462MHz
Date: 28.APR.2009 17:37:02

802.11g CH1 2412MHz (Module A)



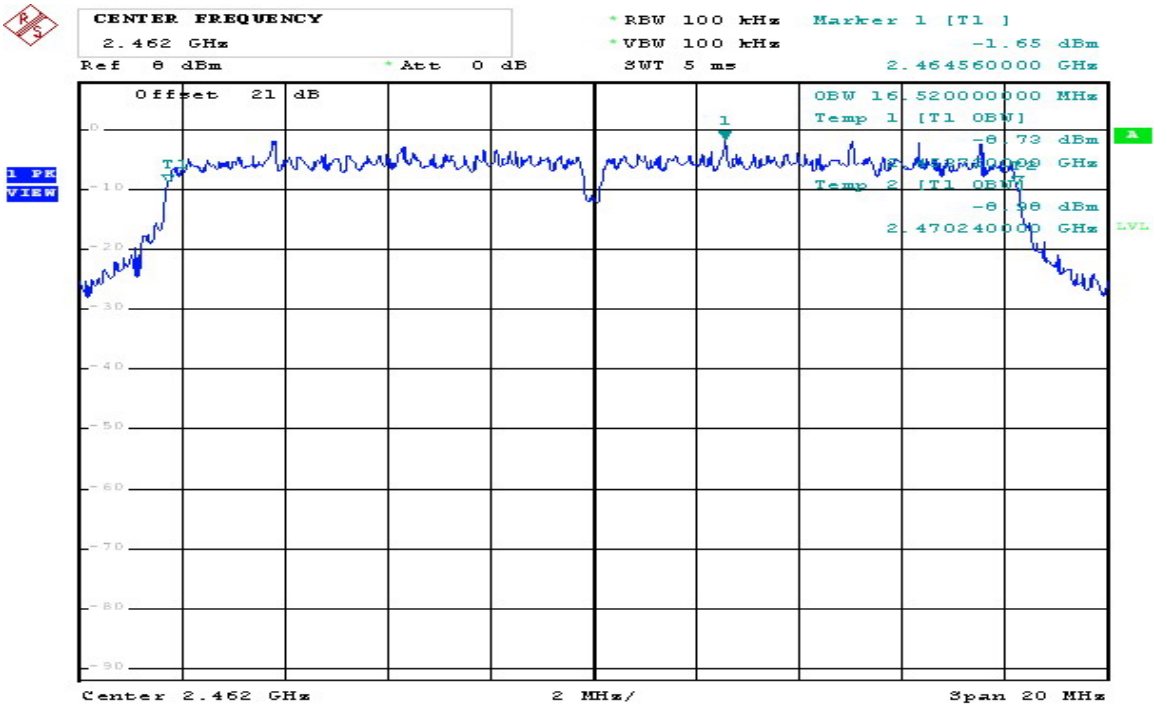
Comment: 802.11g 2412MHz
Date: 28.APR.2009 17:20:25

802.11g CH6 2437MHz (Module A)



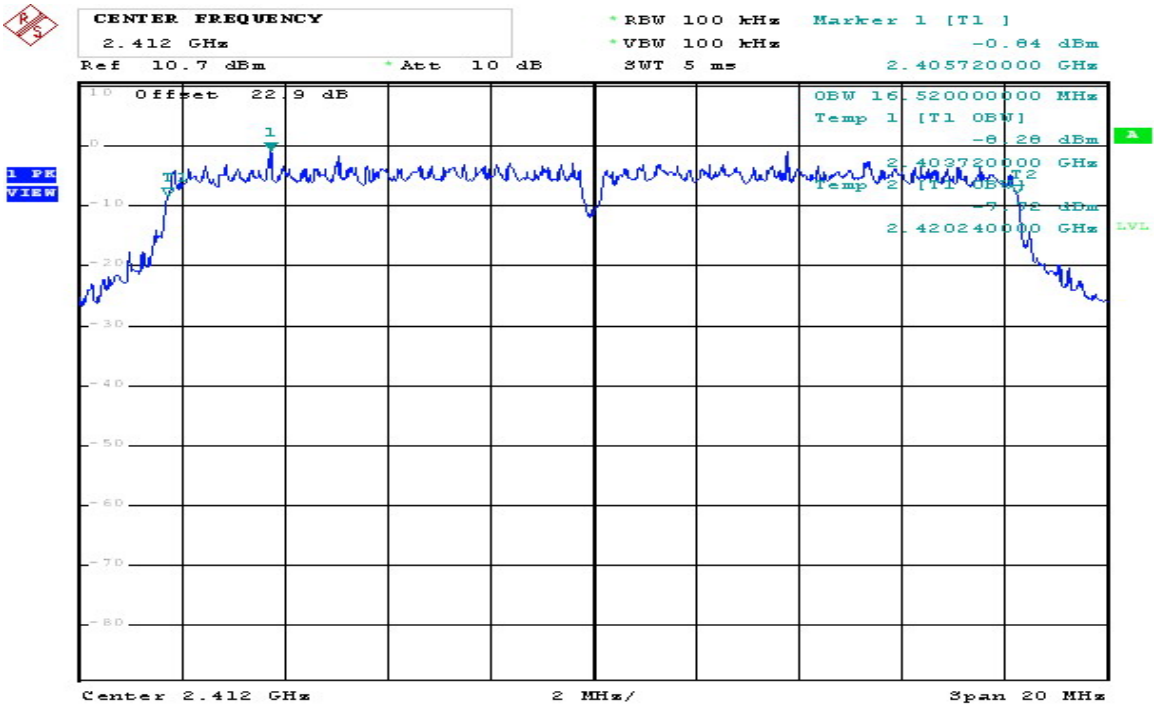
Comment: 802.11g 2437MHz
Date: 28.APR.2009 17:16:15

802.11g CH11 2462MHz (Module A)



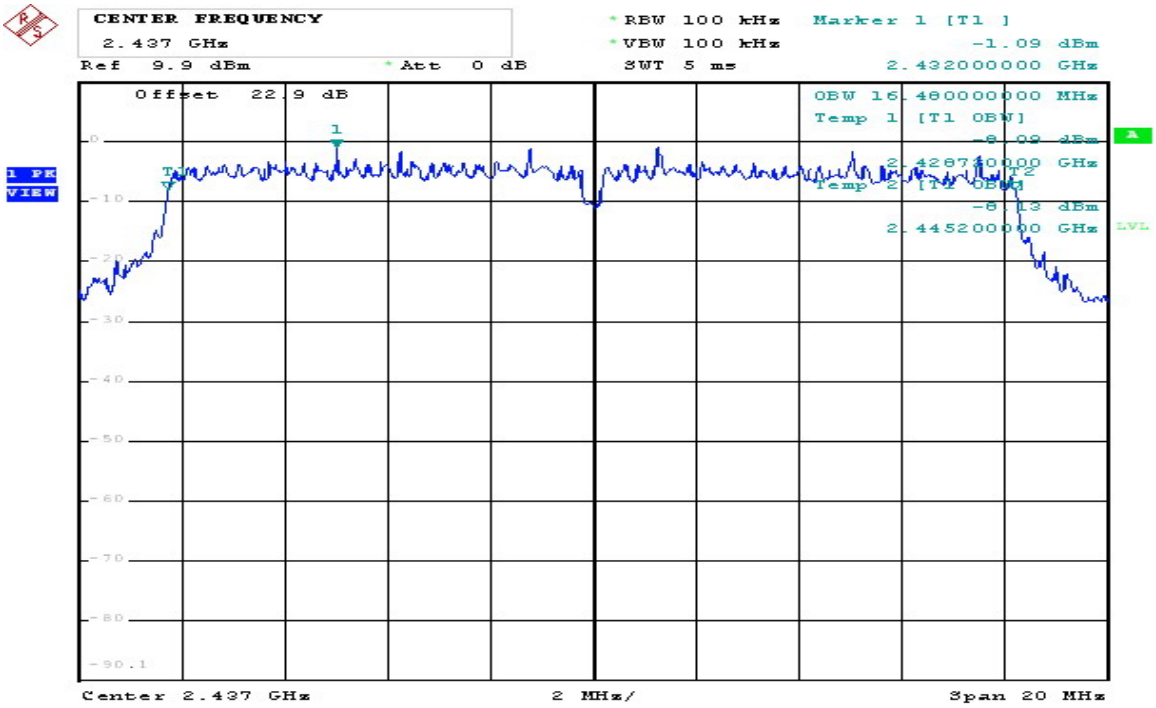
Comment: 802.11g 2462MHz
Date: 28.APR.2009 17:11:40

802.11g CH1 2412MHz (Module B)



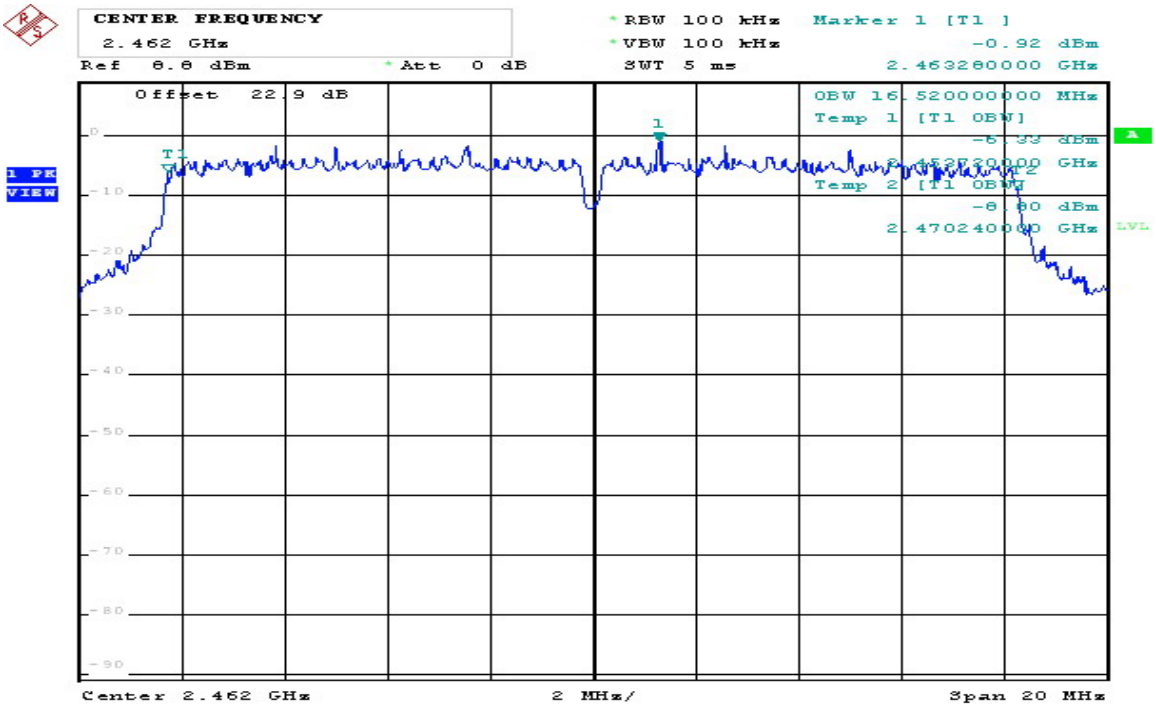
Comment: 802.11g 2412MHz
Date: 28.APR.2009 17:22:06

802.11g CH6 2437MHz (Module B)



Comment: 802.11g 2437MHz
Date: 28.APR.2009 17:17:55

802.11g CH11 2462MHz (Module B)



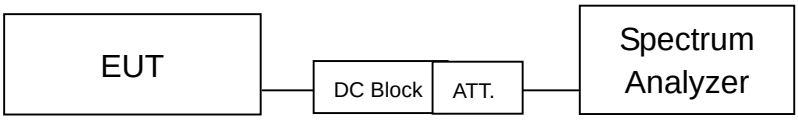
Comment: 802.11g 2462MHz
Date: 28.APR.2009 17:13:18

7 Power spectral density

7.1 Limit

According to FCC Part15.247 (e) requirement：
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.2 Configuration of Measurement



7.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
The power spectrum density was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, video bandwidth set at 10kHz, span of 1.5MHz, and sweep time set at 500 seconds. Power Density was read directly correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest).

7.4 Test Result

PASS.
The final test data is shown on as following pages.

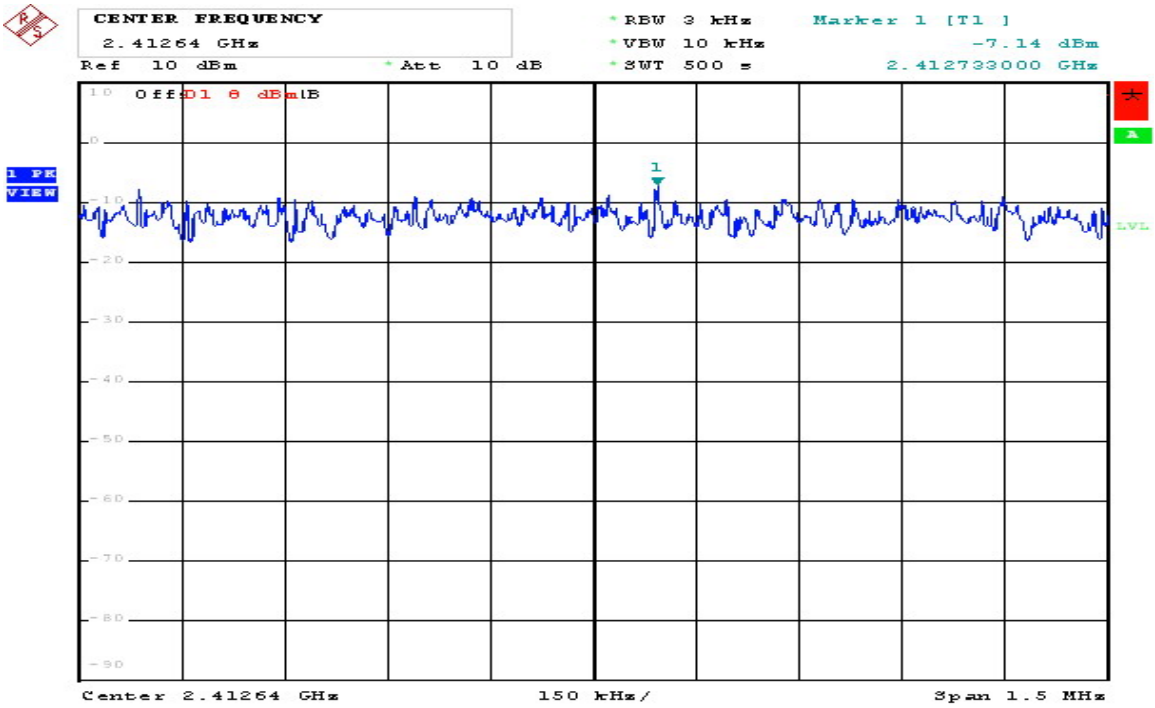
Power spectral density

802.11b						
CH	Freq. (MHz)	Power Spectral Density (dBm)		Total Spectral Density (dBm)	Limit (dBm)	Margin (dB)
		Module A	Module B			
1	2412	-7.14	-7.85	-4.47	8	-12.47
6	2437	-5.13	-8.16	-3.38	8	-11.38
11	2462	-8.41	-8.35	-5.37	8	-13.37

802.11g						
CH	Freq. (MHz)	Power Spectral Density (dBm)		Total Spectral Density (dBm)	Limit (dBm)	Margin (dB)
		Module A	Module B			
1	2412	-12.97	-13.12	-10.03	8	-18.03
6	2437	-13.93	-14.13	-11.02	8	-19.02
11	2462	-13.56	-13.99	-10.76	8	-18.76

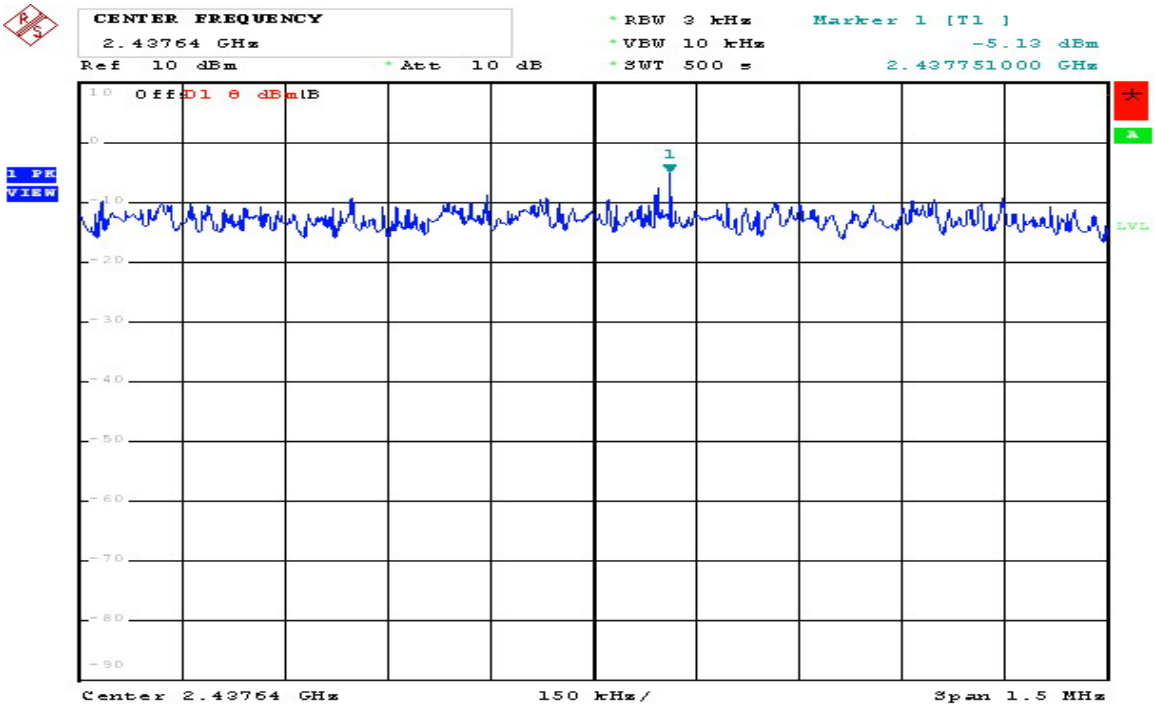
Power spectral density

802.11b CH1 2412MHz (Module A)



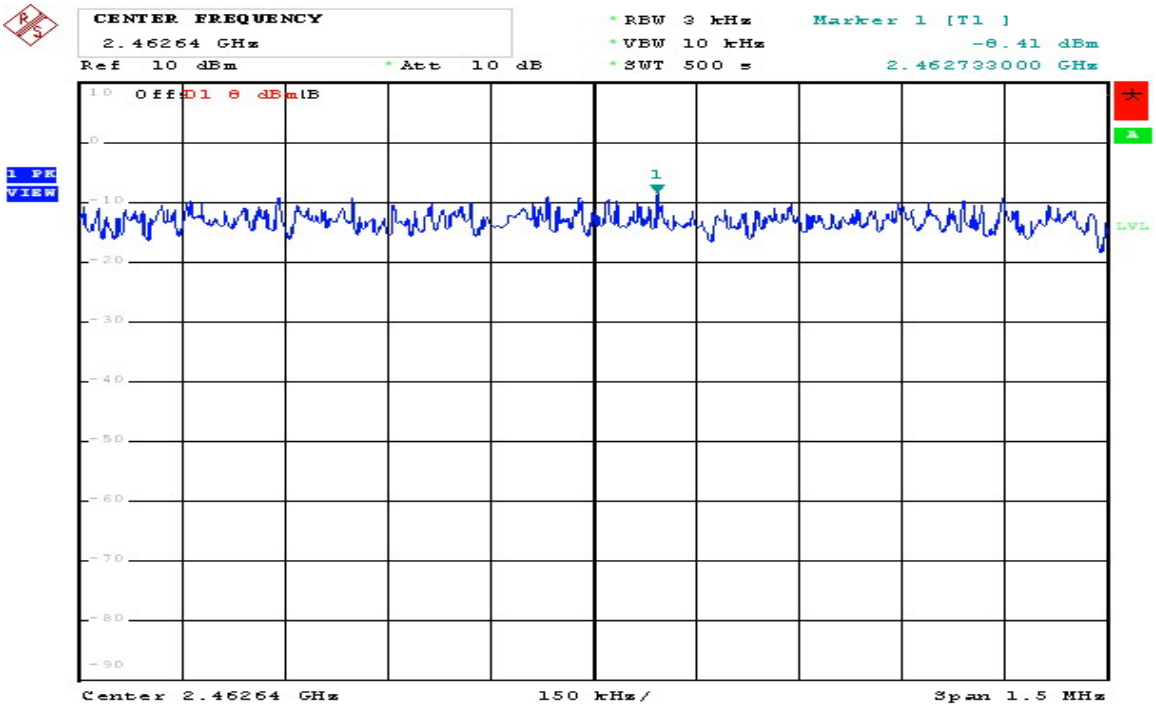
Comment: 802.11b 2412MHz
Date: 28.APR.2009 17:26:11

802.11b CH6 2437MHz (Module A)



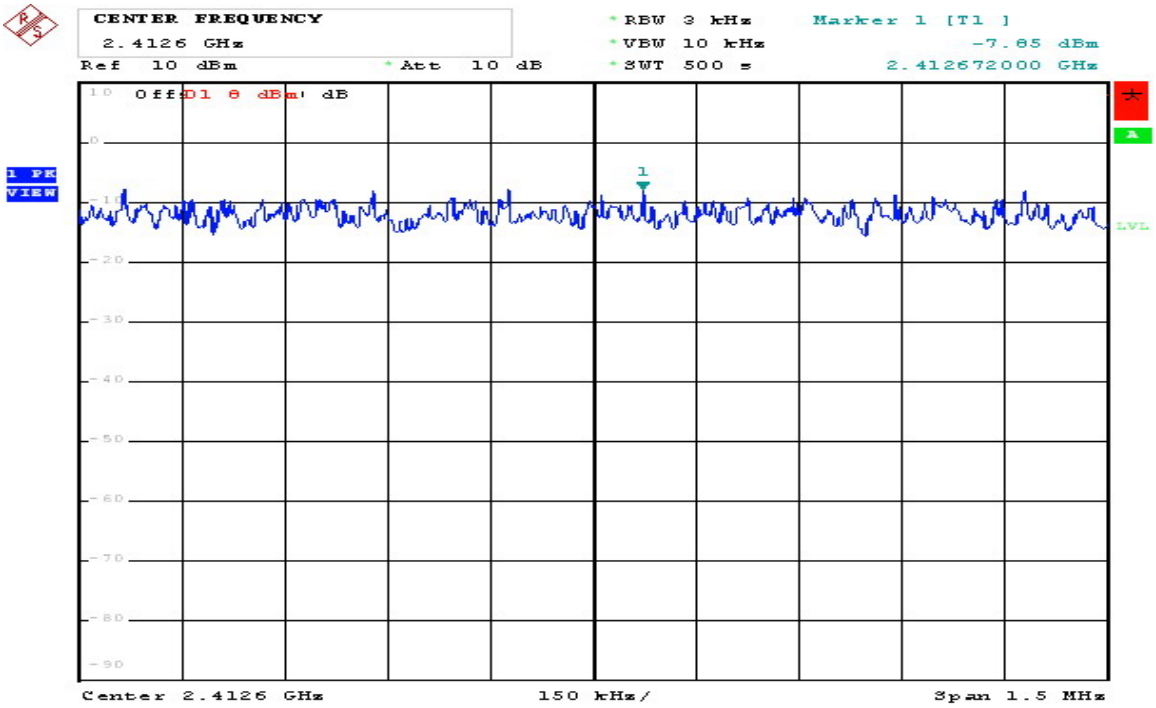
Comment: 802.11b 2437MHz
Date: 28.APR.2009 17:30:34

802.11b CH11 2462MHz (Module A)



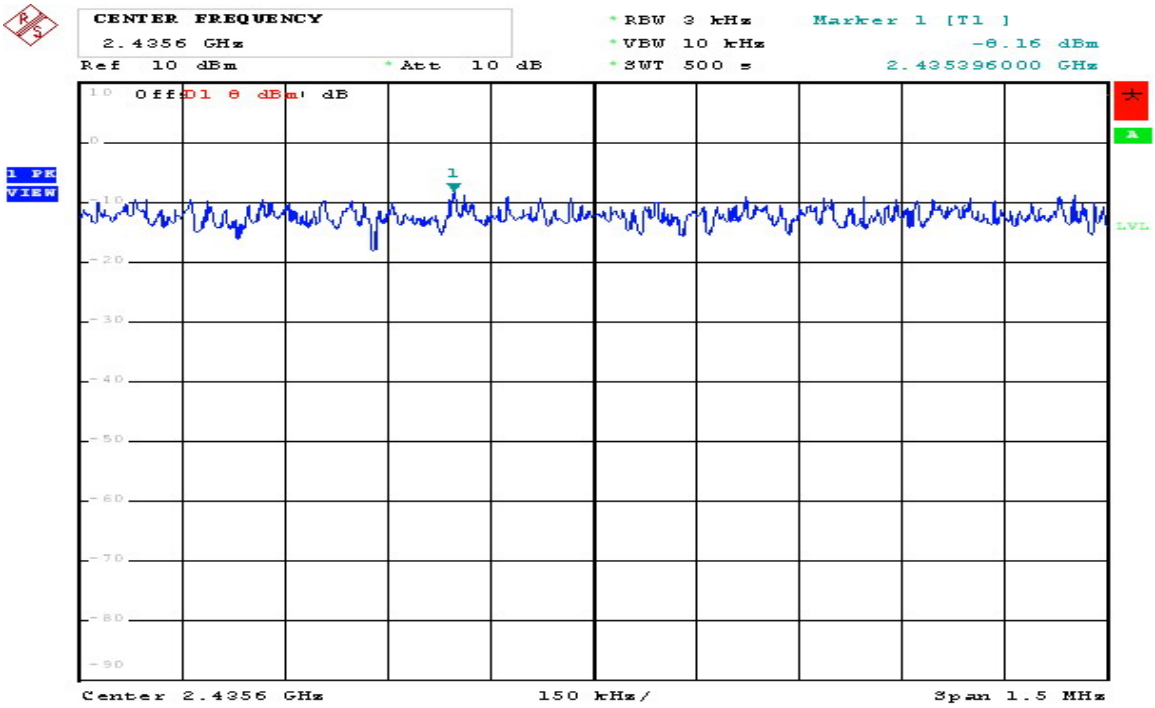
Comment: 802.11b 2462MHz
Date: 28.APR.2009 17:34:59

802.11g CH1 2412MHz (Module B)



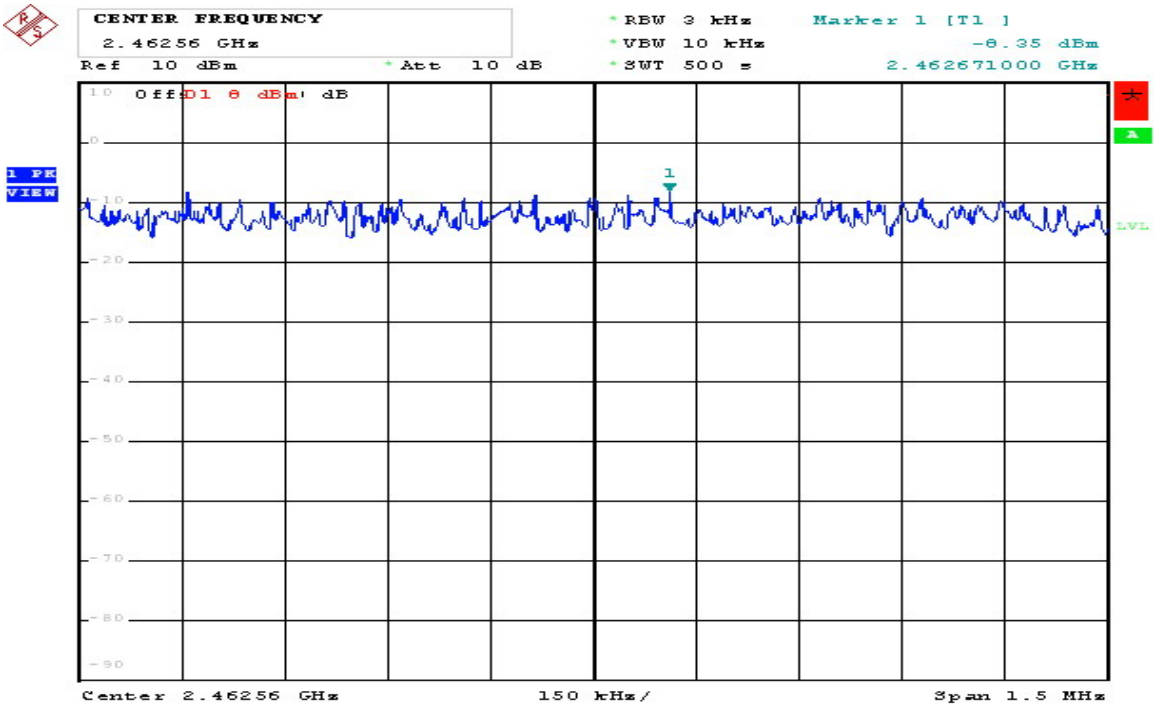
Comment: 802.11b 2412MHz
Date: 28.APR.2009 17:27:55

802.11g CH6 2437MHz (Module B)



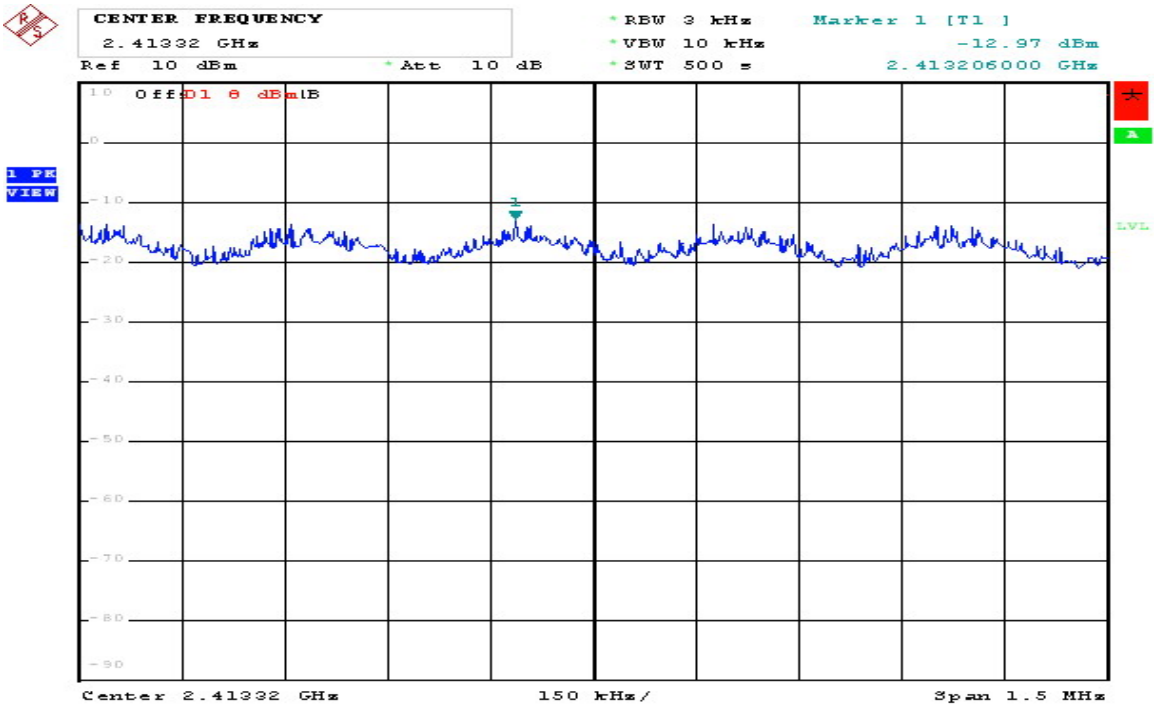
Comment: 802.11b 2437MHz
Date: 28.APR.2009 17:32:16

802.11g CH11 2462MHz (Module B)



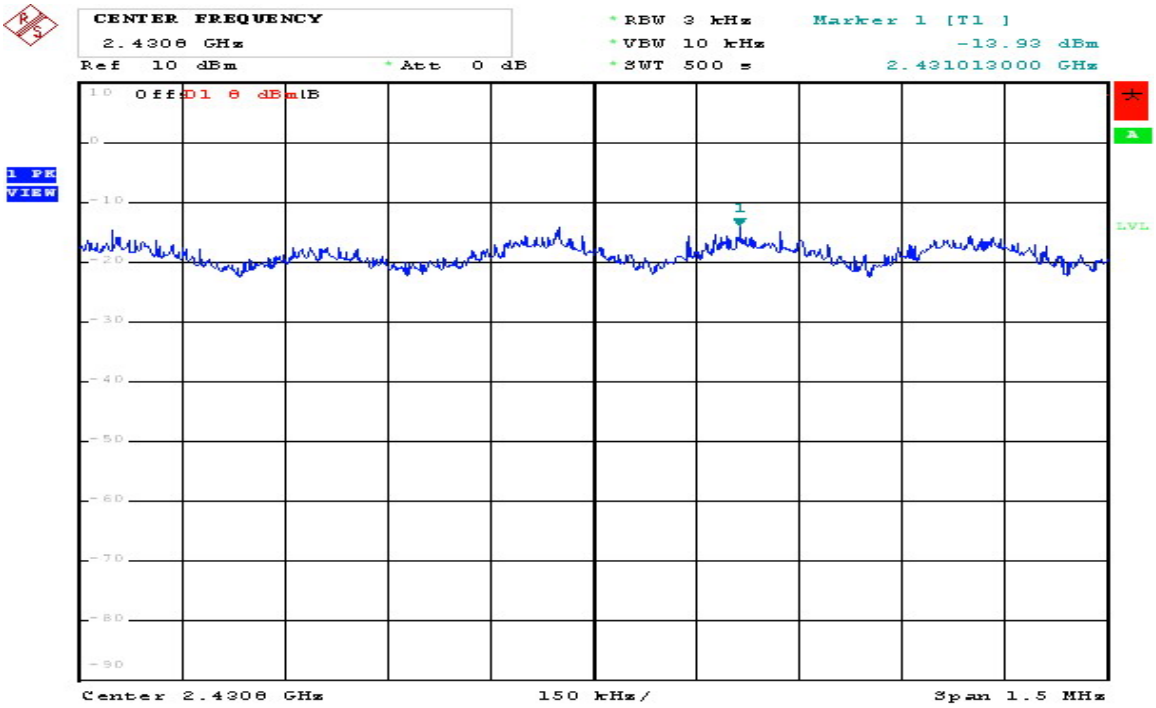
Comment: 802.11b 2462MHz
Date: 28.APR.2009 17:36:42

802.11g CH1 2412MHz (Module A)



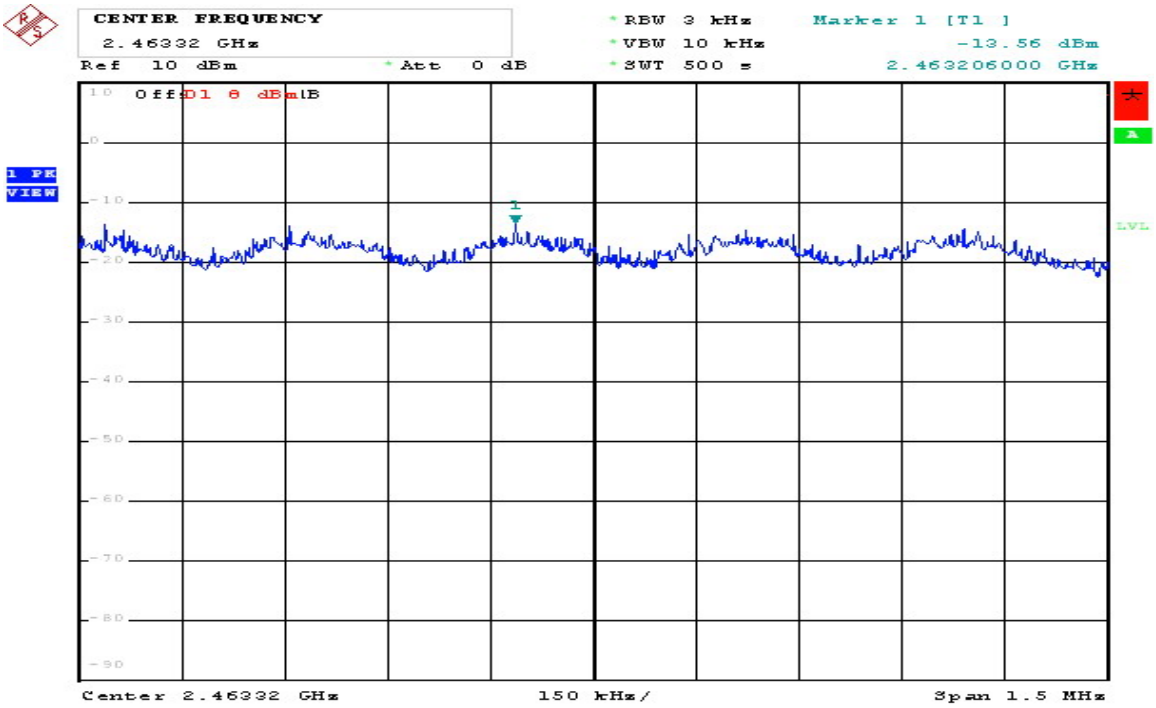
Comment: 802.11g 2412MHz
Date: 28.APR.2009 17:20:05

802.11g CH6 2437MHz (Module A)



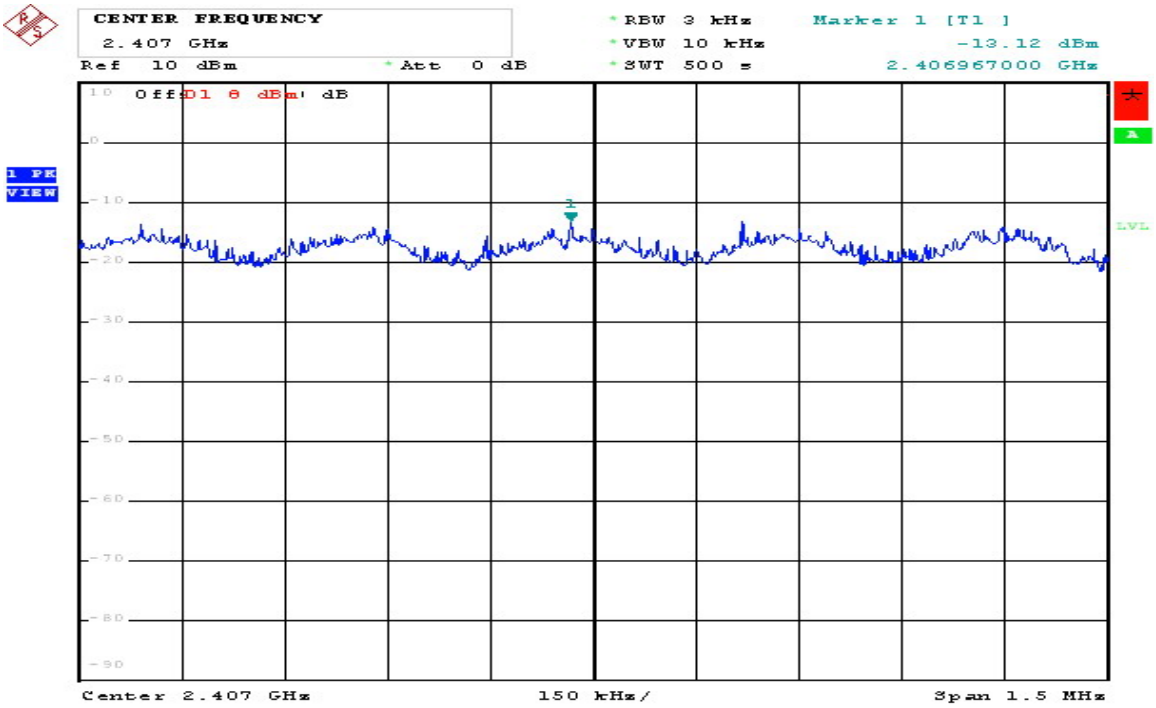
Comment: 802.11g 2437MHz
Date: 28.APR.2009 17:15:56

802.11g CH11 2462MHz (Module A)



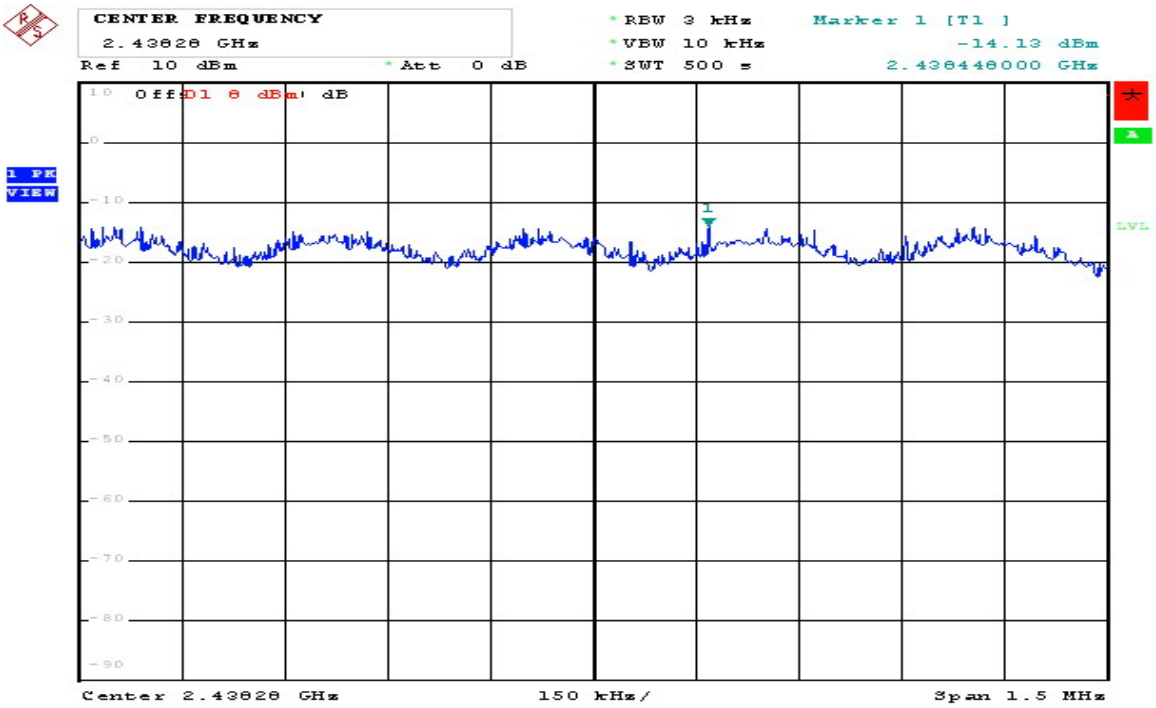
Comment: 802.11g 2462MHz
Date: 28.APR.2009 17:11:21

802.11g CH1 2412MHz (Module B)



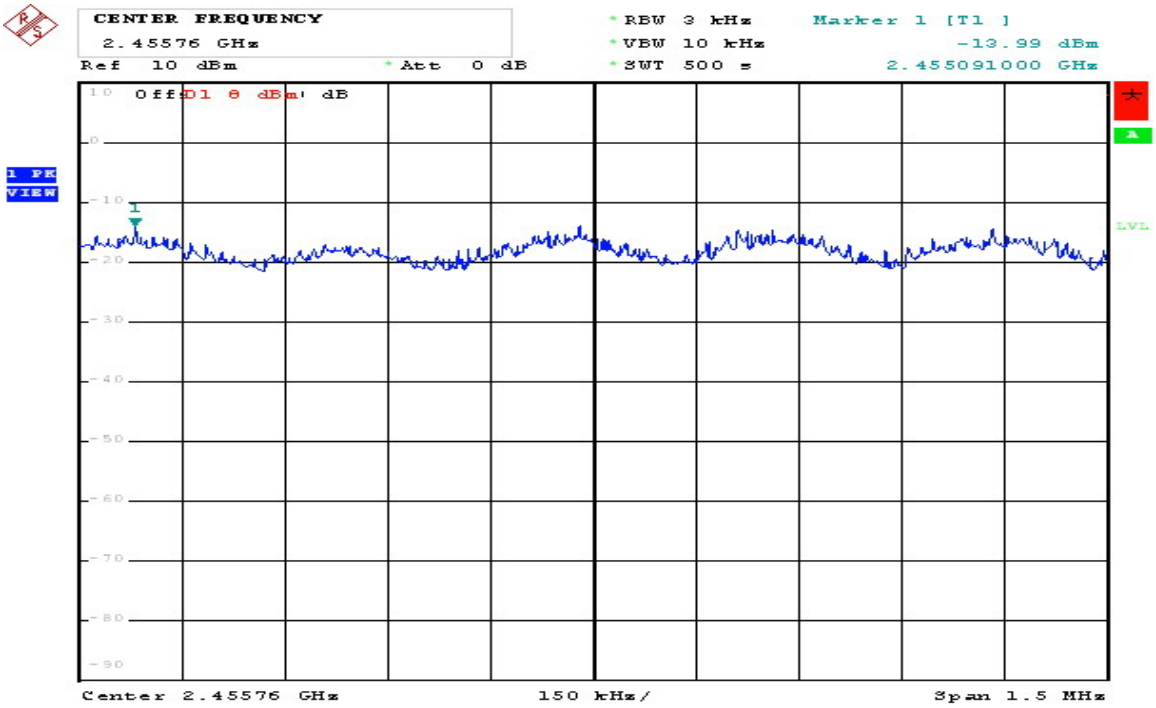
Comment: 802.11g 2412MHz
Date: 28.APR.2009 17:21:45

802.11g CH6 2437MHz (Module B)



Comment: 802.11g 2437MHz
Date: 28.APR.2009 17:17:35

802.11g CH11 2462MHz (Module B)



Comment: 802.11g 2462MHz
Date: 28.APR.2009 17:12:59

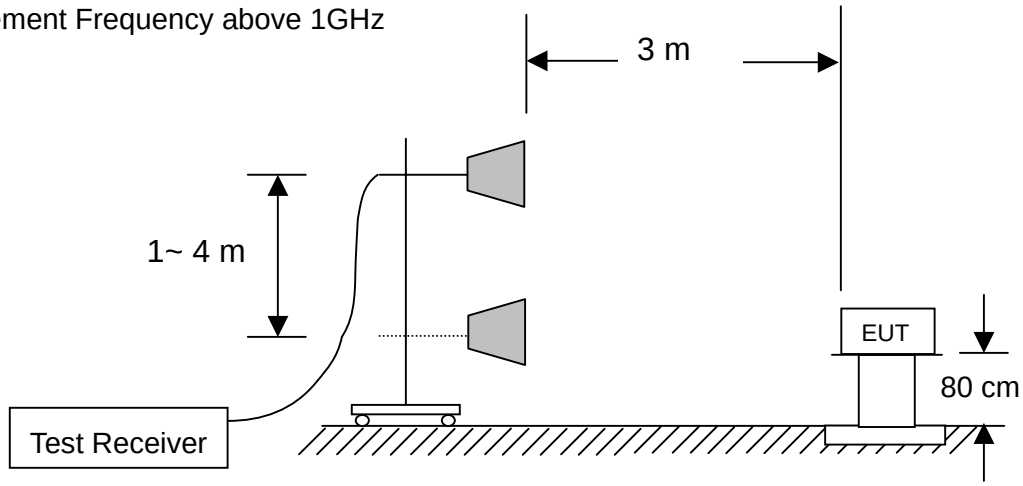
8 Emission on the Band Edge test

8.1 Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

8.2 Configuration of Measurement

Measurement Frequency above 1GHz



8.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.
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 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.

8.4 Test Result

PASS.
The final test data is shown on as following pages.

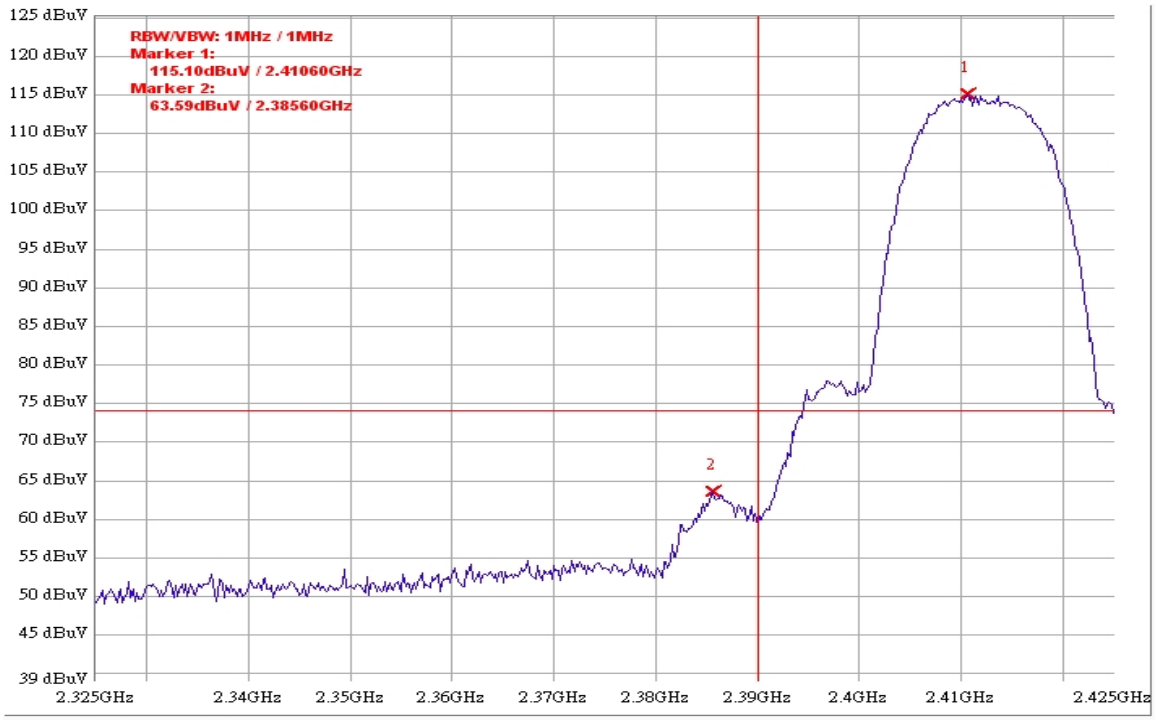
Band edge

After verifying RF modular A, B and Dual Transmit mode, the worst case is Dual Transmit mode.

802.11b					
CH	**Restrict Freq. Band (MHz)**	**Detector Mode**	**Maximum level (dB μV/m)**	**Limit (dBm)**	**Margin (dB)**
1	2310~2390	PK	63.59	74	-10.41
		AV	51.59	54	-2.41
11	2483.5~2500	PK	58.18	74	-15.82
		AV	46.79	54	-7.21

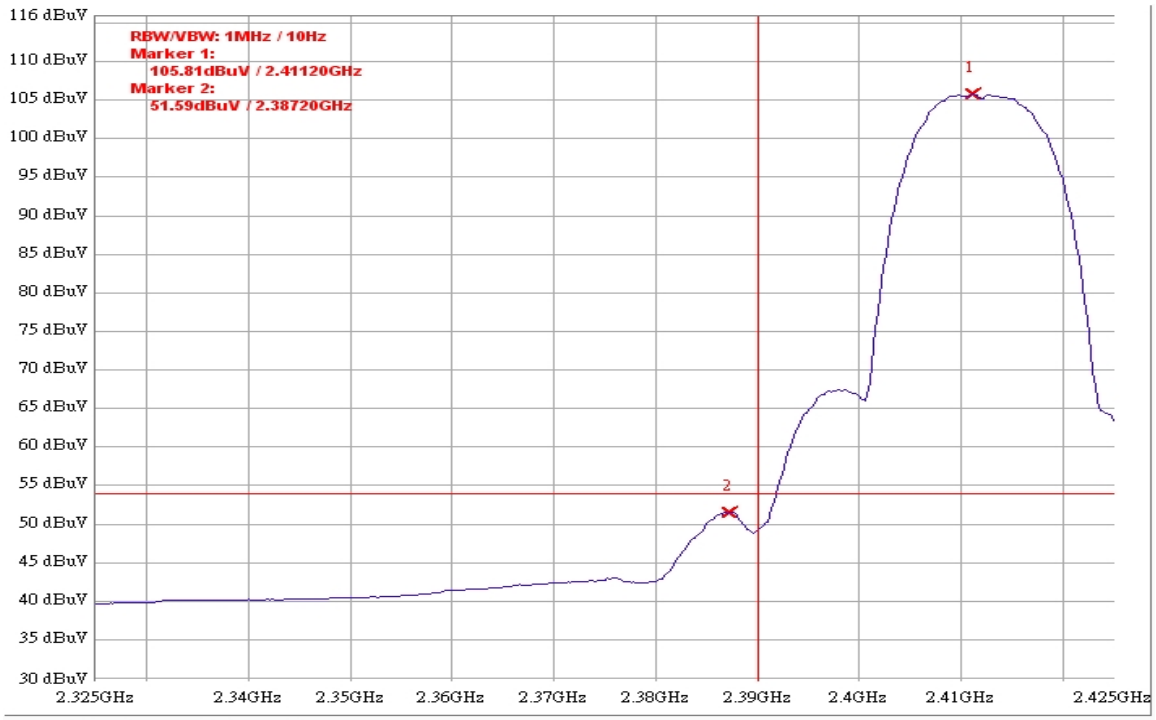
802.11g					
CH	**Restrict Freq. Band (MHz)**	**Detector Mode**	**Maximum level (dB μV/m)**	**Limit (dBm)**	**Margin (dB)**
1	2310~2390	PK	68.18	74	-5.82
		AV	49.87	54	-4.13
11	2483.5~2500	PK	67.02	74	-6.98
		AV	48.64	54	-5.36

802.11b CH1 2412MHz PK



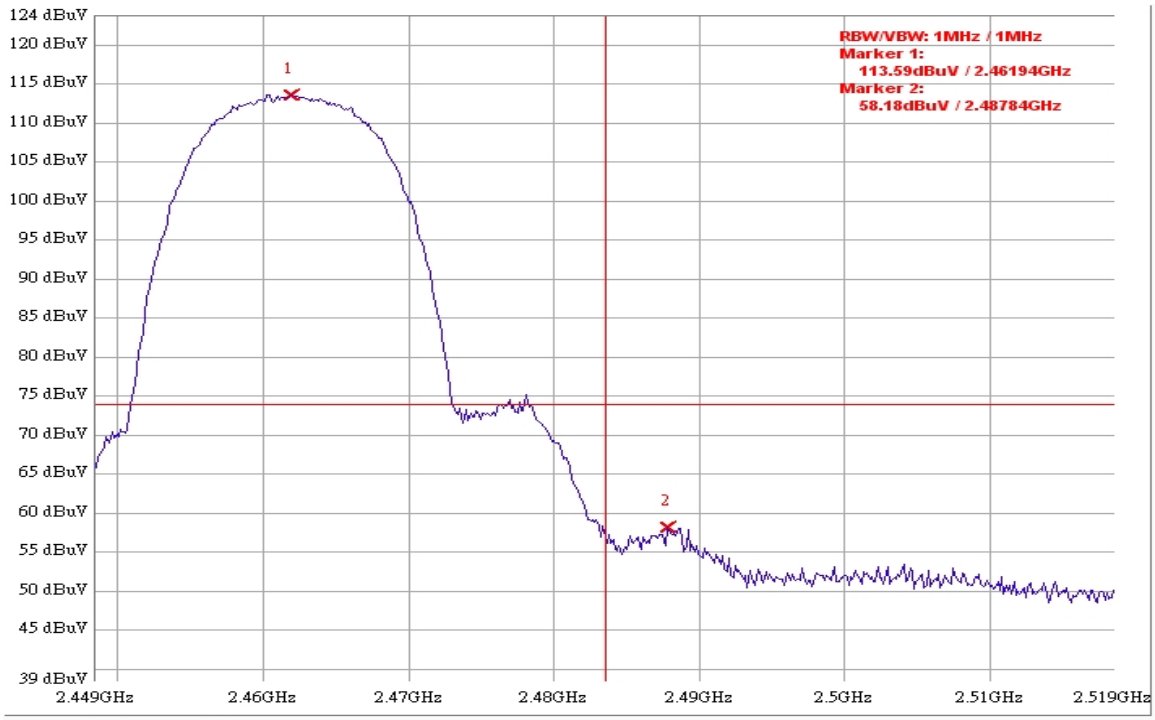
Band Edge_802.11b_2412MHz_PK

802.11b CH1 2412MHz AV

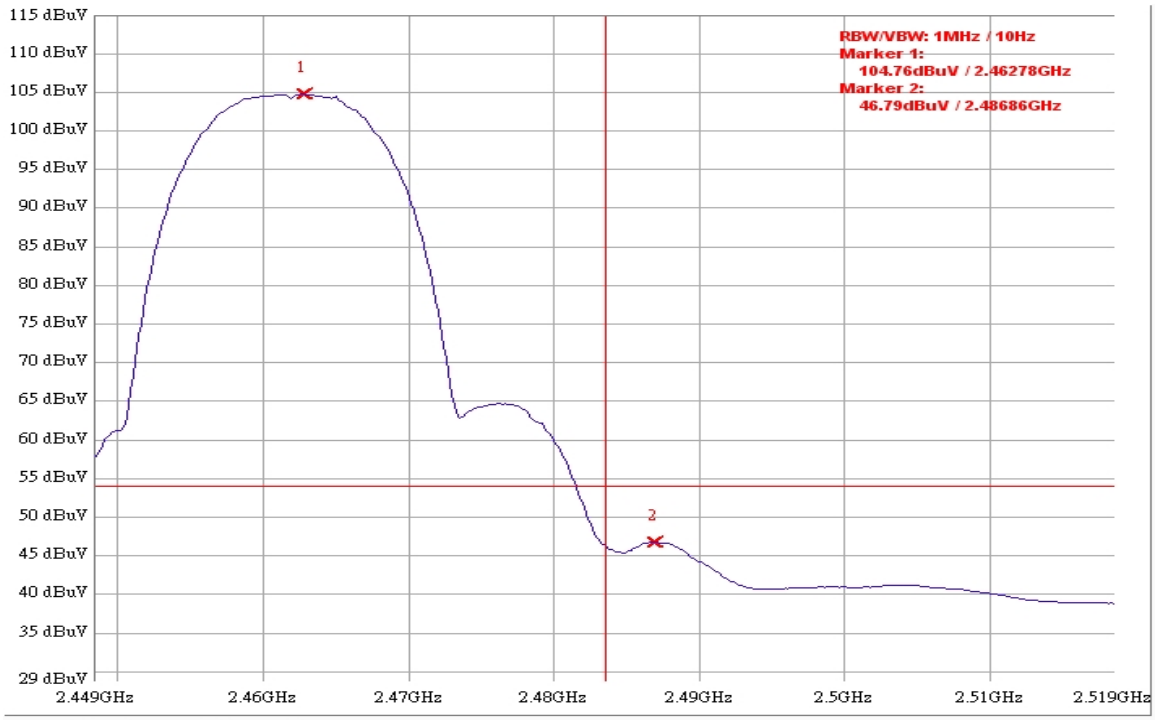


Band Edge_802.11b_2412MHz_AV

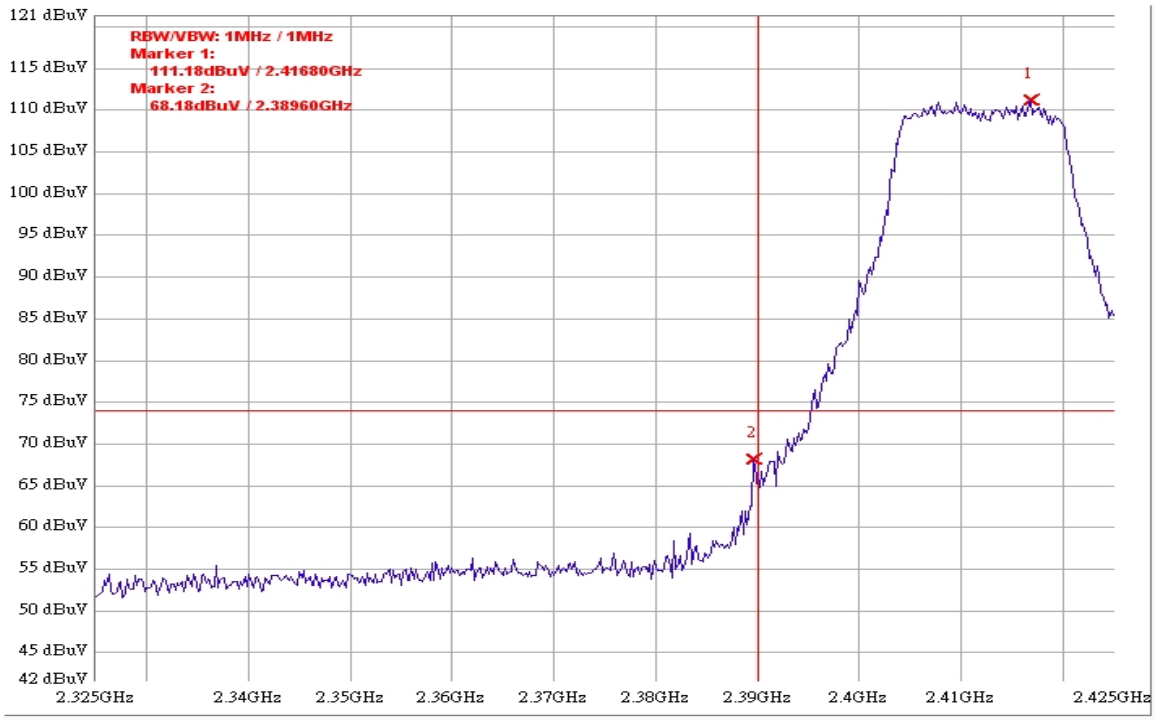
802.11b CH11 2462MHz PK



802.11b CH11 2462MHz AV

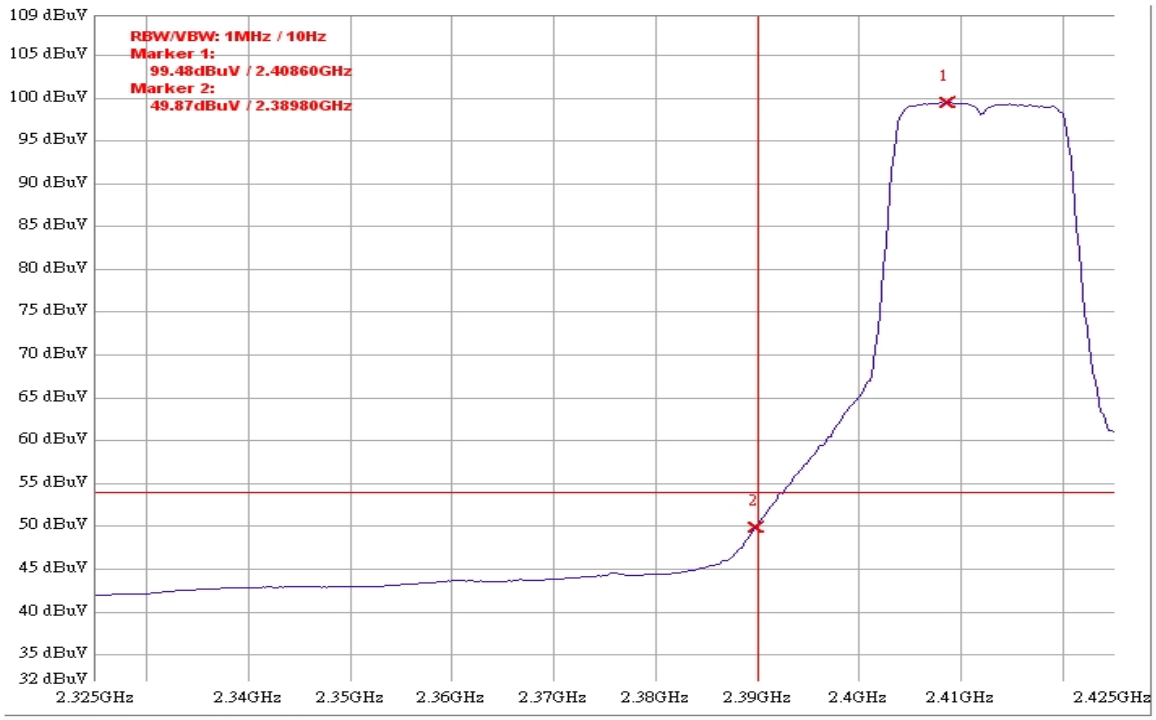


802.11g CH1 2412MHz PK



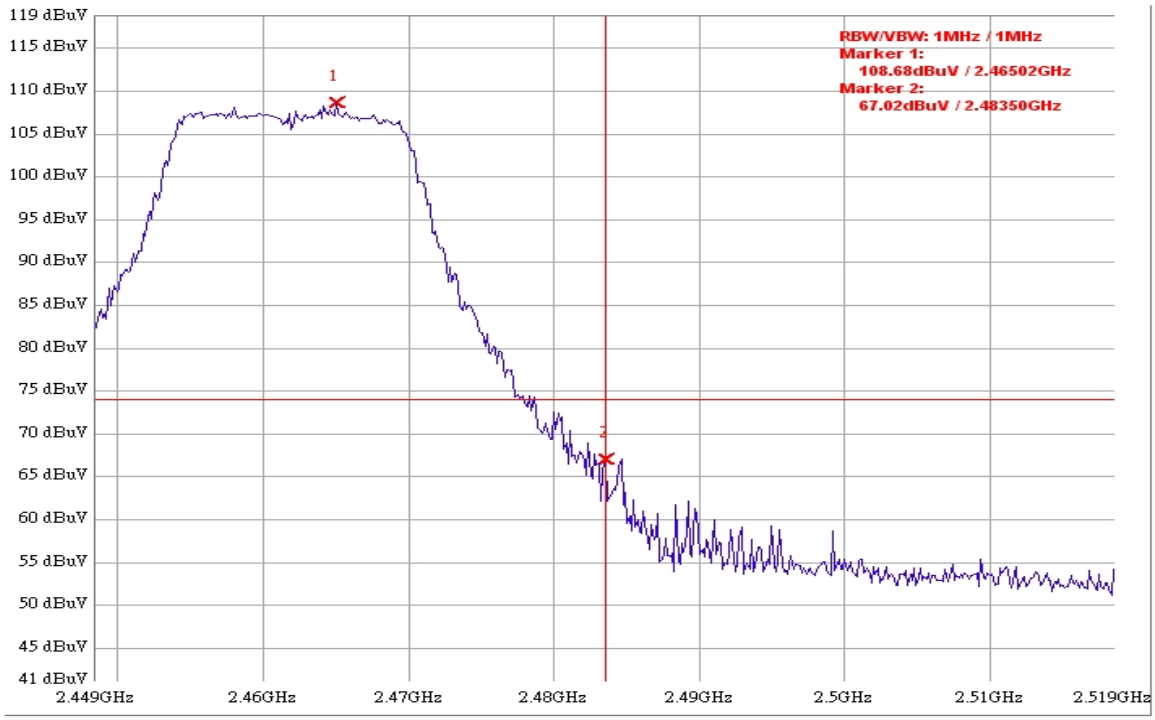
Band Edge_802.11g_2412MHz_PK

802.11g CH1 2412MHz AV



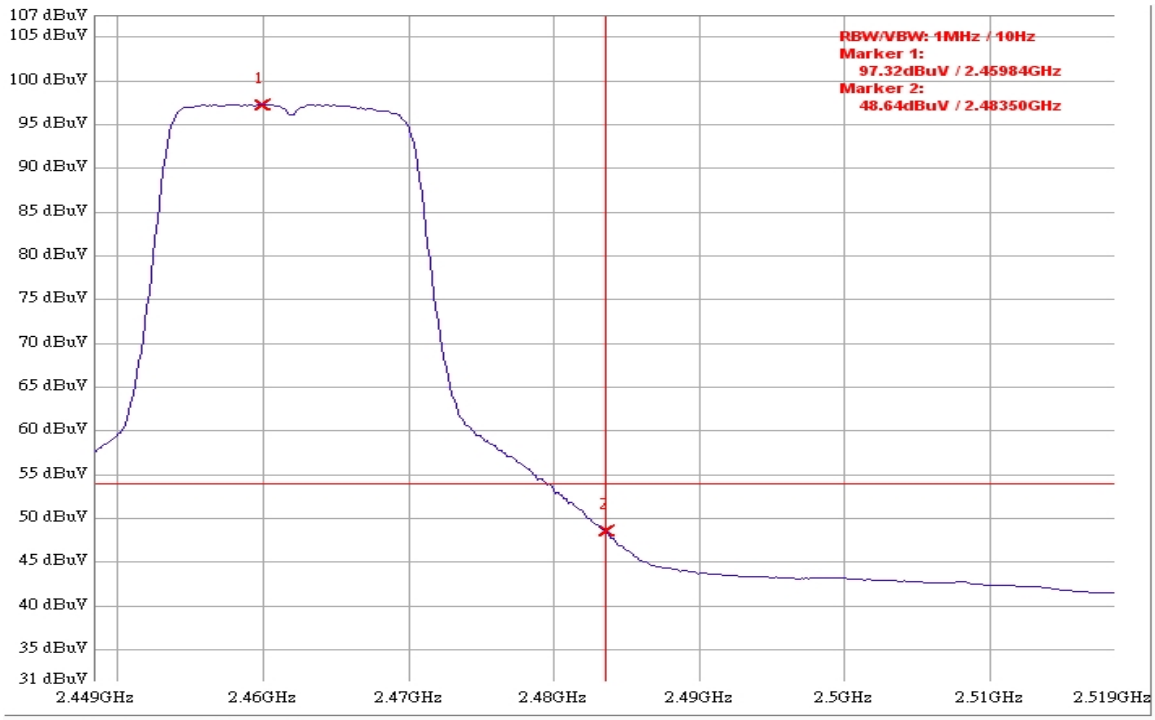
Band Edge_802.11g_2412MHz_AV

802.11g CH11 2462MHz PK



Band Edge_802.11g_2462MHz_PK

802.11g CH11 2462MHz AV



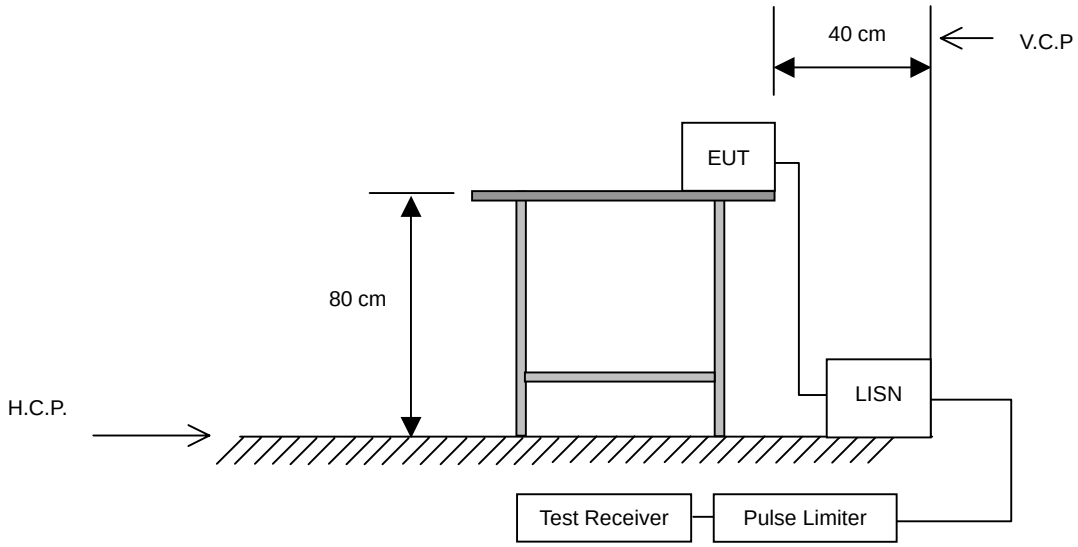
Band Edge_802.11g_2462MHz_AV

9 AC Power Line Conducted Emission test

9.1 Limit

Frequency (MHz)	Quasi-Peak (dB μV)	Average (dB μV)
0.15 to 0.5	66 to 56	56 to 46
> 0.5 to 5	56	46
> 5 to 30	60	50
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

9.2 Configuration of Measurement



9.3 Test Procedures

The EUT was setup to ANSI C63.4, 2003; tested to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

1) The EUT was placed 80cm height above ground on a non-conductive table and vertical conducting plane located 40cm to the rear of the EUT.
2) The EUT was connected to the main power through Line Impedance Stabilization Networks (LISN). This setup provided a 50ohm/50mH coupling impedance for the measuring equipment. The auxiliary equipment will place in secondary LISN.
3) Both sides (Line and Neutral) of AC 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 C63.4/2003 on conducted measurement.

9.4 Test Result

PASS.

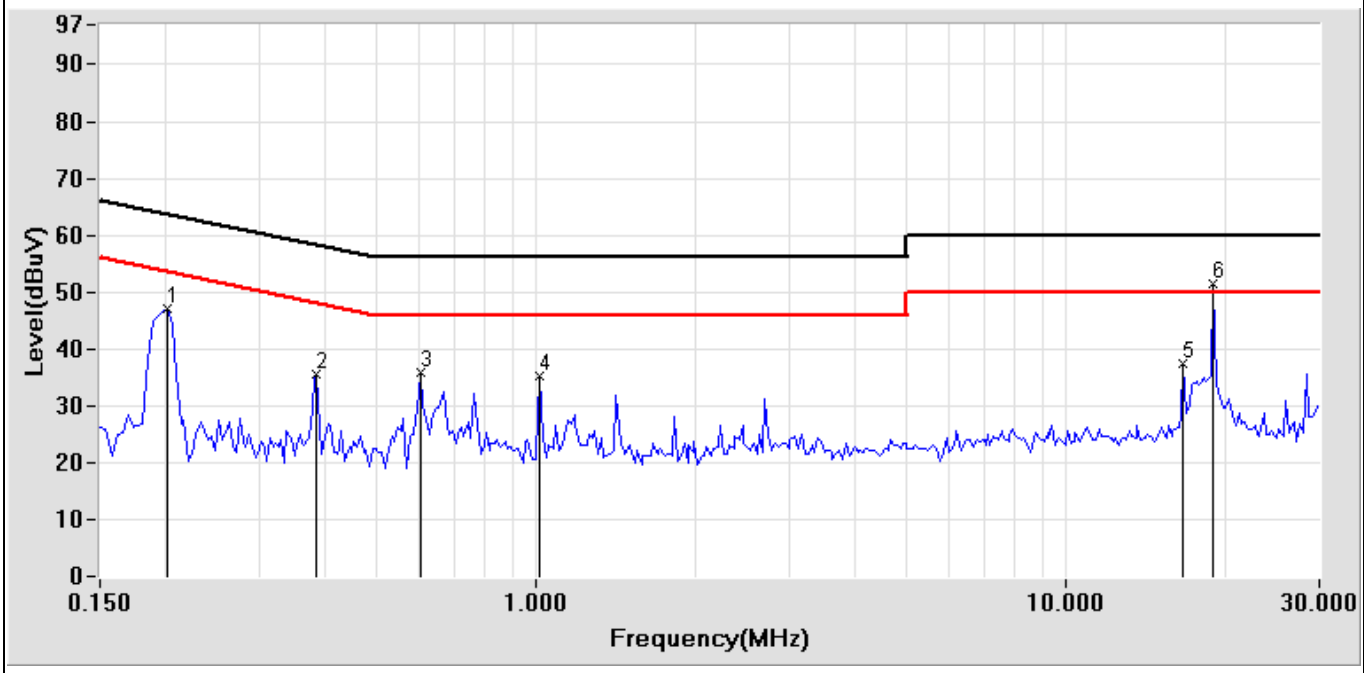
The final test data is shown on as following pages.

Power Line Conducted Test Data

EUT: Industrial IEEE 802.11a/b/g Dual-RF AP/Bridge/Client	POLARITY: Line
CLIENT: MOXA	DISTANCE:
MODEL: AWK-5222	Serial No.:
RATING: DC 12V	FILE/DATA#: MOXA.emi/61
Temperature: 25.0 ℃	OPERATOR: Terry
Humidity: 68 %	TEST SITE: Conduction1

Frequency	Factor	Meter Reading (dBµV)		Emission Level (dBµV)		Limits (dBµV)		Margin (dB)	
(MHz)	(dB)	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.201	0.15	45.70	46.22	45.85	46.37	63.57	53.57	-17.72	-7.20
0.384	0.17	34.23	34.15	34.40	34.32	58.19	48.19	-23.79	-13.87
0.603	0.11	34.80	34.27	34.91	34.38	56.00	46.00	-21.09	-11.62
1.009	0.12	34.61	34.68	34.73	34.80	56.00	46.00	-21.27	-11.20
16.541	0.74	36.68	34.20	37.42	34.94	60.00	50.00	-22.58	-15.06
18.912	0.81	49.90	49.00	50.71	49.81	60.00	50.00	-9.29	-0.19

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



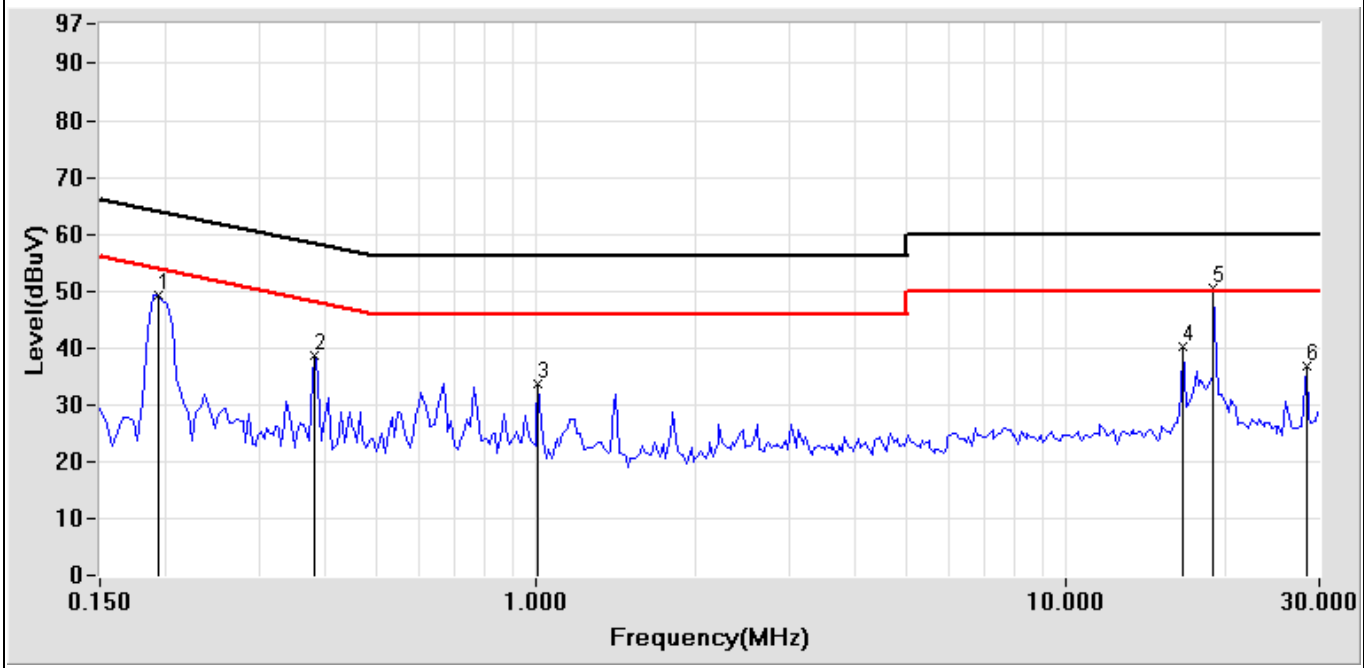
Test Mode: Working Mode

Power Line Conducted Test Data

EUT: Industrial IEEE 802.11a/b/g Dual-RF AP/Bridge/Client	POLARITY: Neutral
CLIENT: MOXA	DISTANCE:
MODEL: AWK-5222	Serial No.:
RATING: DC 12V	FILE/DATA#: MOXA.emi/60
Temperature: 25.0 ℃	OPERATOR: Terry
Humidity: 68 %	TEST SITE: Conduction1

Frequency	Factor	Meter Reading (dBµV)		Emission Level (dBµV)		Limits (dBµV)		Margin (dB)	
(MHz)	(dB)	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.193	0.16	48.20	48.10	48.36	48.26	63.91	53.91	-15.55	-5.65
0.380	0.18	37.43	37.40	37.61	37.58	58.28	48.28	-20.67	-10.70
1.005	0.13	32.17	31.99	32.30	32.12	56.00	46.00	-23.70	-13.88
16.552	0.84	38.40	34.94	39.24	35.78	60.00	50.00	-20.76	-14.22
18.892	0.92	49.10	48.30	50.02	49.22	60.00	50.00	-9.98	-0.78
28.373	1.16	34.41	31.09	35.57	32.25	60.00	50.00	-24.43	-17.75

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



Test Mode: Working Mode