HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
SAN 136-1, AMI-RI , BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA
TEL : +82 31 639 8518 FAX : +82 31 639 8525

TEST REPORT (15C)

Manufacture;
AXESSTEL INC.

6480 Weathers Place Suite 300 San Diego, CA 92121

Date of Issue: February 14. 2007
Test Report No.: HCT-F07-0201
Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.

FCC ID : PH7MV420
MODEL : MV420

EUT Type:	**Wireless Gateway-Pre Production**
Tx Frequency:	**2412-2462 MHz(DSSS/OFDM)**
Rx Frequency:	**2412-2462 MHz(DSSS/OFDM)**
Max. RF Output Power:	**0.044 W Wi-Fi 802.11b(16.47 dBm)/**
(Conducted)	**0.018 W Wi-Fi 802.11g(12.42 dBm)**
Trade Name/Model(s)/:	**AXESSTEL /MV420**
FCC Classification:	**Licensed Non-Broadcast station Transmitter-TNB**
Rule Part(s):	**Part 15.247**
Equipment Class:	**DSS-Part15 Spread Spectrum Transmitter.**
Standard(s):	**Part 15 Subpart B, C**
Type Antenna:	**Sleeve dipole antenna**

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Report prepared by
: Kyoung Hee Yoon
Test engineer of EMC Tech.Part

Approved by
: Sang Jun Lee
Manager of EMC Tech.Part

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MEASUREMENT REPORT

1. Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	**AXESSTEL INC.**
Address:	**6480 Weathers Place Suite 300 San Diego, CA 92121**

- **Equipment Class**: DSS-Part15 Spread Spectrum Transmitter.
- **FCC ID :** PH7MV420
- **EUT Type**: Wireless Gateway-Pre Production
- **Model(s):** MV420
- **Supply Voltage:** 3.3 V ±10% DC
- **Rule Part(s):** FCC Part 15 Subpart C
- **Test Procedure(s):** ANSI C63.4 (2003)
- **Dates of Tests:** January 11. 2007 ~ January 13. 2007
- **Place of Tests:**
  254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO,467-701,KOREA

2. INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSIC63.4-2003) was used in determining radiated and conducted emissions emanating from **AXESSTEL INC. Wireless Gateway-Pre Production. FCC ID: PH7MV420**

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 05,2006 (Confirmation Number: EA90661)

3. PRODUCT INFORMATION

3.1 Equipment Description

Equipment Under Test (EUT) is **AXESSTEL INC. Wireless Gateway-Pre Production.**
Model : MV420, FCC ID: PH7MV420

Wireless LAN:

- Form Factor: Mini PCI Type 3A
- Frequency band:
  - B/G Mode: 2400~2483.5 MHz (for US, Canada, ETSI, and Japan)
    2471~2497 MHz (for Japan)
- Channel Spacing:
  - B/G Mode: 5MHz
- Modulation:
  - B Mode: DSSS with DBPSK, DQPSK, and CCK
  - G Mode: OFDM with BPSK, QPSK, QAM, and 64QAM
    DSSS with DBPSK, DQPSK, and CCK
- Host interface: Mini PCI V1.0
- Channels Support:
  - B/G Mode: US/Canada: 11 (1~11)
    ETSI: 13 (1~13)
    France: 4 (10~13)
    Japan: 14 (1~14) for 11b mode
    Japan: 13(1~13) for 11g mode
- Supply Voltage: 3.3V±10% DC
- Current Consumption:
  - B Mode: Cont. Tx: 410mA(typ.)~430mA(max) <17dBm output>
    Cont. Rx: 310mA(typ.)~ 330mA(max)
  - G Mode: Cont. Tx: 430mA(typ.)~ 450mA(max) <16dBm output>
    Cont. Rx: 310mA(typ.)~ 330mA(max)
- Radio Power: (measured power tolerance is +1.5/-1.5 dBm at production)
  - B Mode: +17dBm @ 1&2Mbps
    +17dBm @ 5.5&11Mbps
  - G Mode: +16dBm @ 6Mbps
    +12dBm @ 54Mbps
- Sensitivity:
  (PER<10% at PSDU length of 1000 bytes)

Sensitivity	Condition	MIN	TYP	MAX	UNITS
11g	6Mbps	-88	-87	-82	dBm
	9Mbps	-86	-85	-81	
	12Mbps	-85	-84	-79	
	18Mbps	-83	-82	-77	
	24Mbps	-79	-78	-74	
	36Mbps	-77	-76	-70	
	48Mbps	-73	-72	-66	
	54Mbps	-71	-70	-65	
11b	1Mbps	-95	-94	-76	dBm
	2Mbps	-92	-91	-76	
	5.5Mbps	-91	-90	-76	
	11Mbps	-87	-88	-76	

4. Description of Tests(Conducted)

4.1 Powerline Conducted RFI (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.
The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was remeasured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the center with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached.

RFI CONDUCTED	CISPR 22 CLASS B Limits dB(uV)	
Freq. Range	CISPR 22 Quasi-Peak	CISPR 22 Average
150kHz - 0.5MHz	66-56**	56-46**
0.5MHz - 5MHz	56	46
5MHz - 30MHz	60	50
**Limits decreases linearly with the logarithm of frequency		

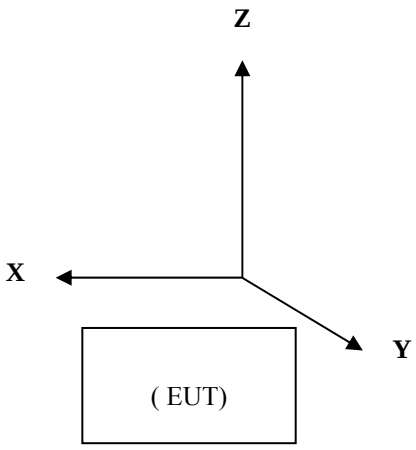
Table 1. RFI Conducted Limits

5. Configuration of Test system

5.1 Line Conducted Test : EUT was connected to LISN, all other supporting equipment were connected to another LISN.
Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4/2003 7.2.3 to determine the worse operating conditions.

5.2 Radiated Emission Test : preliminary Radiated Emissions tests were conducted using the procedure in ANSI C63.4/2003 8.3.1.1 to determine the worse operating condition. Final Radiated Emission tests were conducted at 3 meter open area test site.

[Configuration of Tested System]



6. Test Equipment Configuration

6.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
Wireless Gateway-Pre Production	AXESSTEL INC.	MV420	PH7MV420	N/A
Adaptor	Sunlin Electronics	SR858	-	EUT

6.2 Cable Description

		Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
Wireless Gateway-Pre Production (EUT)	LAN	N/A	N	1.8(D)
	USB 1	N/A	Y	1.2(D)
	Car-kit	N/A	N	2.5(D)
	DC-In	N/A	N	1.5(D)
	Power	N	N/A	1.8(P)
NoteBook	LAN	N/A	N	1.8(D)
	USB 1	N/A	Y	1.2(D)
	USB 2	N/A	Y	1.8(D)
	DC-In	N/A	N	1.5(D)
	Power	N	N	1.8(P)

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

6.3 Noise Suppression Parts on Cable. (I/O CABLE)

		Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
Wireless Gateway-Pre Production (EUT)	LAN	N	N/A	N	N/A
	USB 1	N	N/A	Y	Both
	Car-kit	Y	END	Y	Both
Notebook	LAN	N	N/A	N	N/A
	USB 1	N	N/A	Y	Both
	USB 2	N	N/A	Y	Both

7. LINE-CONDUCTED TEST DATA

[Standby Mode-802.11b(worst-case)]

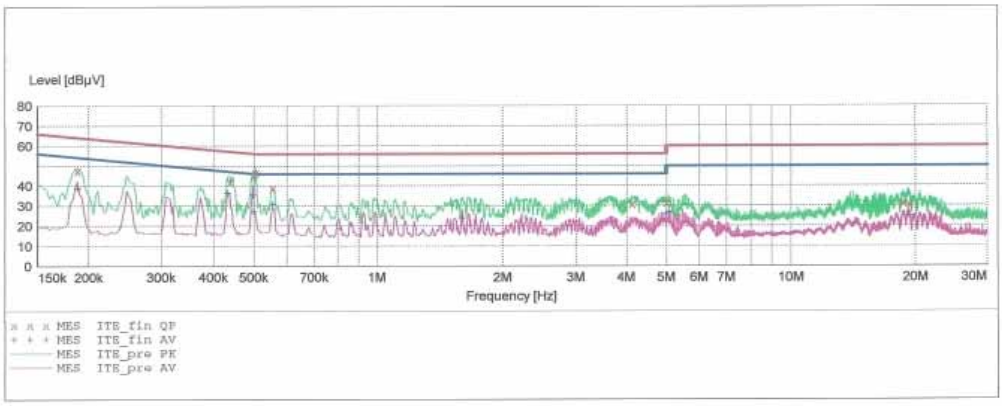
HCT

EMC TEST LAB.

```
EUT:                    MV420
Manufacturer:           AXESSTEL INC.
Operating Condition:    NORMAL
Test Site:              SHIELD ROOM
Operator:               KH, YOON
Test Specification:     CISPR 22 CLASS B
Comment:                H
```

SCAN TABLE: "CISPR 22 Voltage"

Short Description:			CISPR 22 Voltage			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ITE_fin QP"

1/11/2007 6:08PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.187600	47.50	10.1	64	16.7	---	---
0.437600	42.00	10.1	57	15.1	---	---
0.500000	45.40	10.1	56	10.6	---	---
0.505000	46.60	10.1	56	9.4	---	---
0.555000	38.90	10.1	56	17.1	---	---
4.130000	30.90	10.3	56	25.1	---	---
5.000000	31.40	10.3	56	24.6	---	---
18.665000	31.50	10.5	60	28.5	---	---
19.315000	30.50	10.5	60	29.5	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

1/11/2007 6:08PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.187600	39.10	10.1	54	15.1	---	---
0.432600	36.60	10.1	47	10.6	---	---
0.497600	35.60	10.1	46	10.4	---	---
0.500000	27.40	10.1	46	18.6	---	---
0.555000	31.10	10.1	46	14.9	---	---
1.600000	24.10	10.2	46	21.9	---	---
5.000000	26.00	10.3	46	20.0	---	---
5.065000	27.10	10.3	50	22.9	---	---
19.275000	25.20	10.5	50	24.8	---	---

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HCT

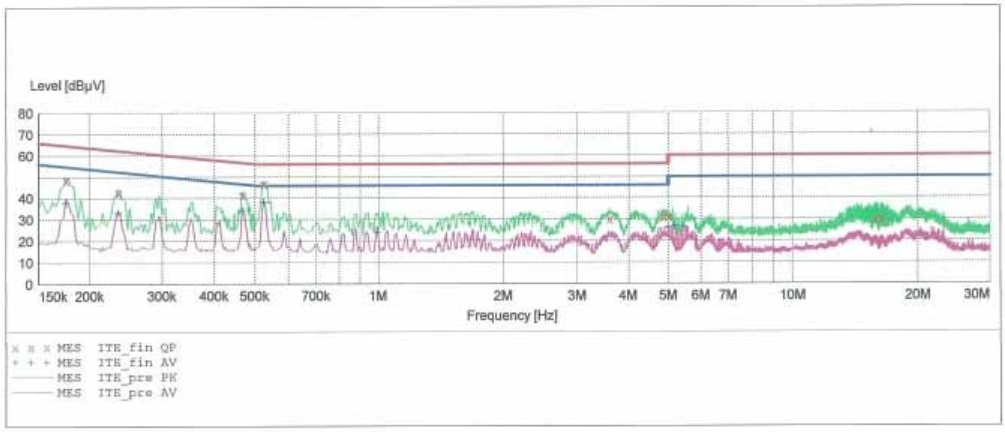
EMC TEST LAB.

EUT: MV420
Manufacturer: AXESSTEL INC.
Operating Condition: NORMAL
Test Site: SHIELD ROOM
Operator: KH, YOON
Test Specification: CISPR 22 CLASS B
Comment: N

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ITE_fin QP"

1/11/2007 6:11PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.175100	48.50	10.1	65	16.2	---	---
0.235100	42.60	10.1	62	19.7	---	---
0.467600	41.60	10.1	57	14.9	---	---
0.525000	46.60	10.1	56	9.4	---	---
3.595000	30.00	10.2	56	26.0	---	---
4.865000	30.90	10.3	56	25.1	---	---
5.000000	31.30	10.3	56	24.7	---	---
15.800000	29.80	10.5	60	30.2	---	---
16.370000	29.70	10.5	60	30.3	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

1/11/2007 6:11PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.175100	38.20	10.1	55	16.5	---	---
0.235100	33.30	10.1	52	19.0	---	---
0.467600	34.60	10.1	47	12.0	---	---
0.525000	38.50	10.1	46	7.5	---	---
0.990000	24.30	10.1	46	21.7	---	---
5.000000	26.20	10.3	46	19.8	---	---
5.000000	26.30	10.3	46	19.7	---	---
5.200000	27.10	10.3	50	22.9	---	---
5.465000	26.60	10.3	50	23.4	---	---

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[Data Mode-802.11b with 11 Mbps(worst-case)]

HCT

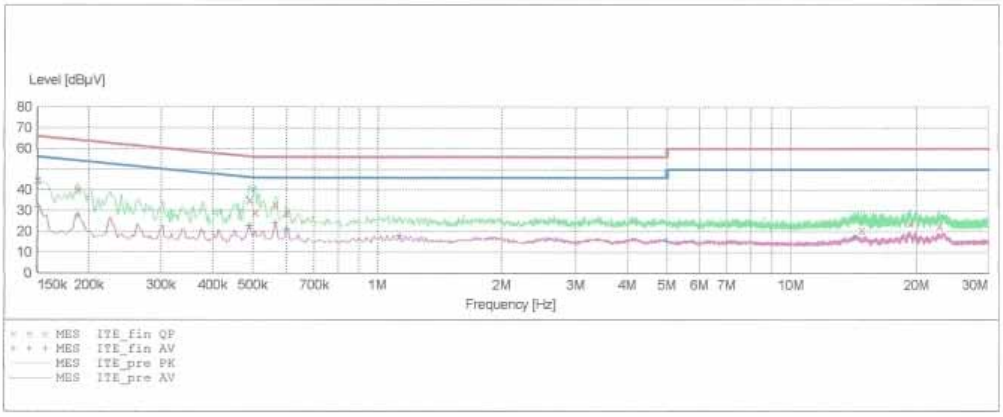
EMC TEST LAB.

```
EUT:                  MV420
Manufacturer:         AXESSTEL
Operating Condition:  NORMAL MODE (CALL MODE)
Test Site:            SHIELD ROOM
Operator:             KH, YOON
Test Specification:   CISPR 22 CLASS B
Comment:              H
```

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ITE_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150100	44.90	10.1	66	21.1	---	---
0.187600	40.20	10.1	64	23.9	---	---
0.490100	35.50	10.1	56	20.6	---	---
0.505000	29.30	10.1	56	26.7	---	---
0.565000	33.10	10.1	56	22.9	---	---
0.600000	28.80	10.2	56	27.2	---	---
14.740000	20.80	10.5	60	39.2	---	---
19.265000	24.40	10.5	60	35.6	---	---
22.760000	23.00	10.6	60	37.0	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

2/13/2007 1:29PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150100	31.70	10.1	56	24.3	---	---
0.187600	28.00	10.1	54	26.2	---	---
0.490100	22.90	10.1	46	23.2	---	---
0.565000	24.20	10.1	46	21.8	---	---
0.600000	21.20	10.2	46	24.8	---	---
1.130000	18.10	10.1	46	27.9	---	---
5.000000	15.40	10.3	46	30.6	---	---
14.170000	17.40	10.5	50	32.6	---	---
19.870000	16.60	10.5	50	33.4	---	---

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HCT

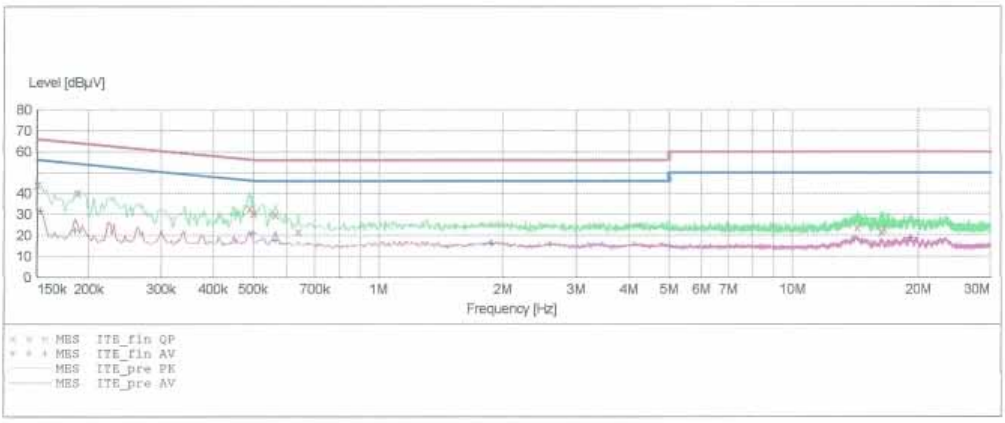
EMC TEST LAB.

```
EUT:                  MV420
Manufacturer:         AXESSTEL
Operating Condition:  NORMAL MODE (CALL MODE)
Test Site:            SHIELD ROOM
Operator:             KH, YOON
Test Specification:   CISPR 22 CLASS B
Comment:              N
```

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ITE_fin QP"

2/13/2007 1:25PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150100	44.30	10.1	66	21.7	---	---
0.187600	40.00	10.1	64	24.2	---	---
0.490100	33.20	10.1	56	22.9	---	---
0.500000	30.50	10.1	56	25.5	---	---
0.565000	30.10	10.1	56	25.9	---	---
0.640000	22.00	10.2	56	34.0	---	---
14.260000	24.10	10.5	60	35.9	---	---
16.340000	22.00	10.5	60	38.0	---	---
16.515000	23.10	10.5	60	36.9	---	---

MEASUREMENT RESULT: "ITE_fin AV"

2/13/2007 1:25PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.152600	32.00	10.1	56	23.8	---	---
0.185100	22.50	10.1	54	31.8	---	---
0.500000	21.20	10.1	46	24.8	---	---
0.565000	17.60	10.1	46	28.4	---	---
1.880000	16.50	10.3	46	29.5	---	---
2.600000	15.80	10.3	46	30.2	---	---
5.000000	15.20	10.3	46	30.8	---	---
14.085000	18.40	10.5	50	31.6	---	---
19.170000	19.20	10.5	50	30.8	---	---

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8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6 dB BANDWIDTH

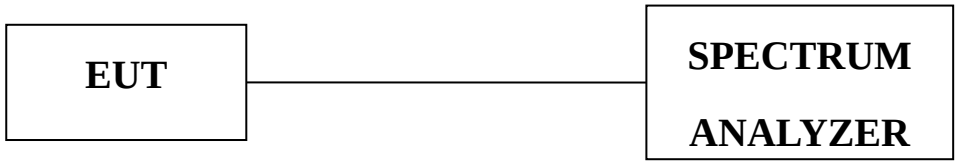
LIMITS

§15.247(a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

TEST SETUP



RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	2630	500	2130
Middle	2437	6680	500	6180
High	2462	3190	500	2690

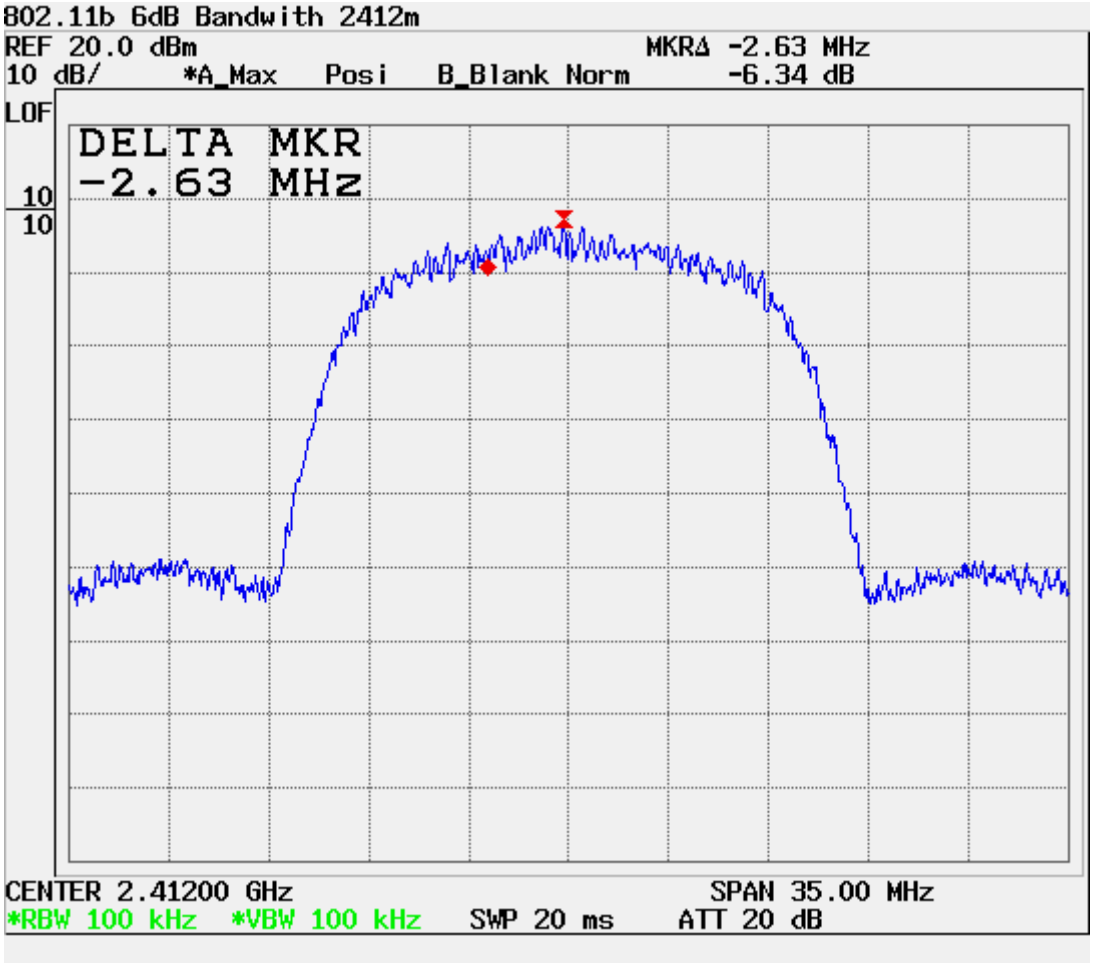
802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2462	875000	500	874500
Middle	2437	1440	500	940
High	2412	1440	500	940

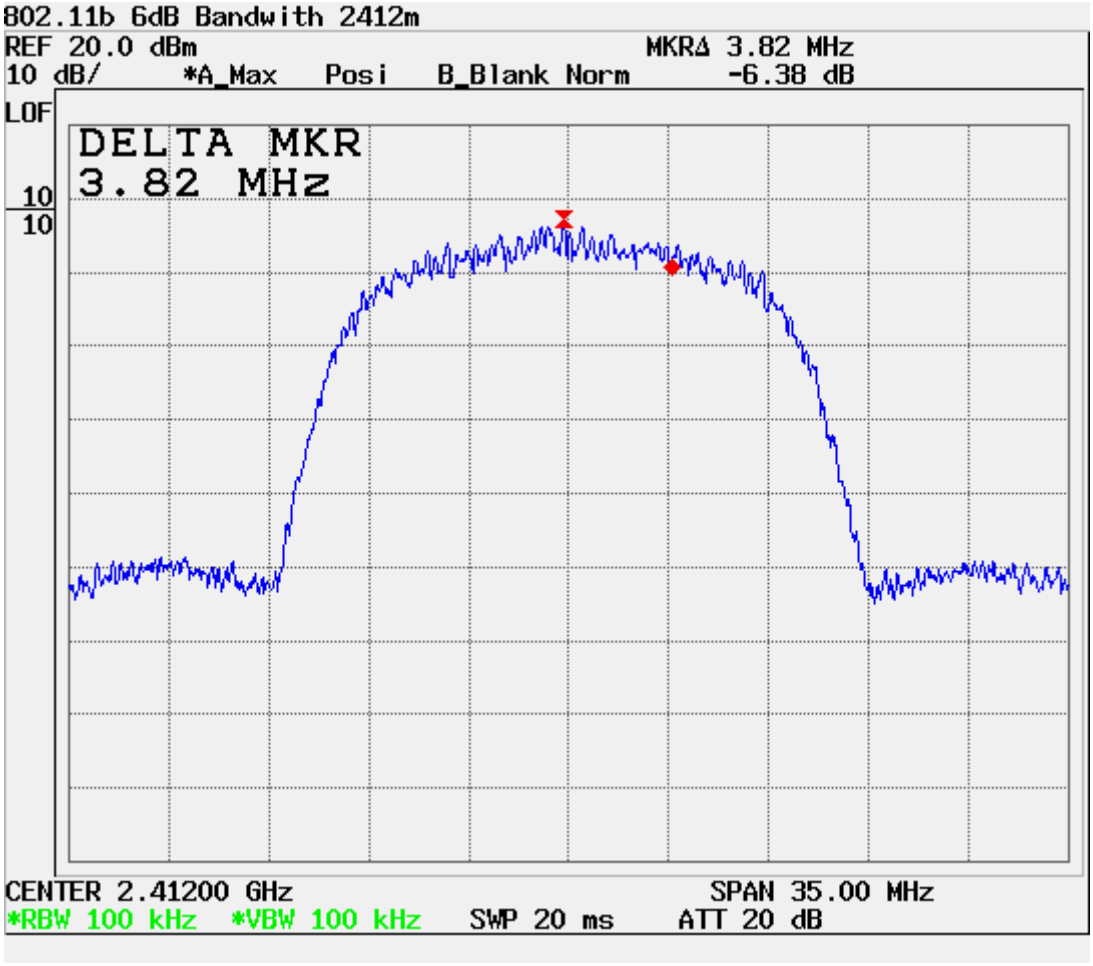
8.2 6 dB BANDWIDTH

[802.11b]

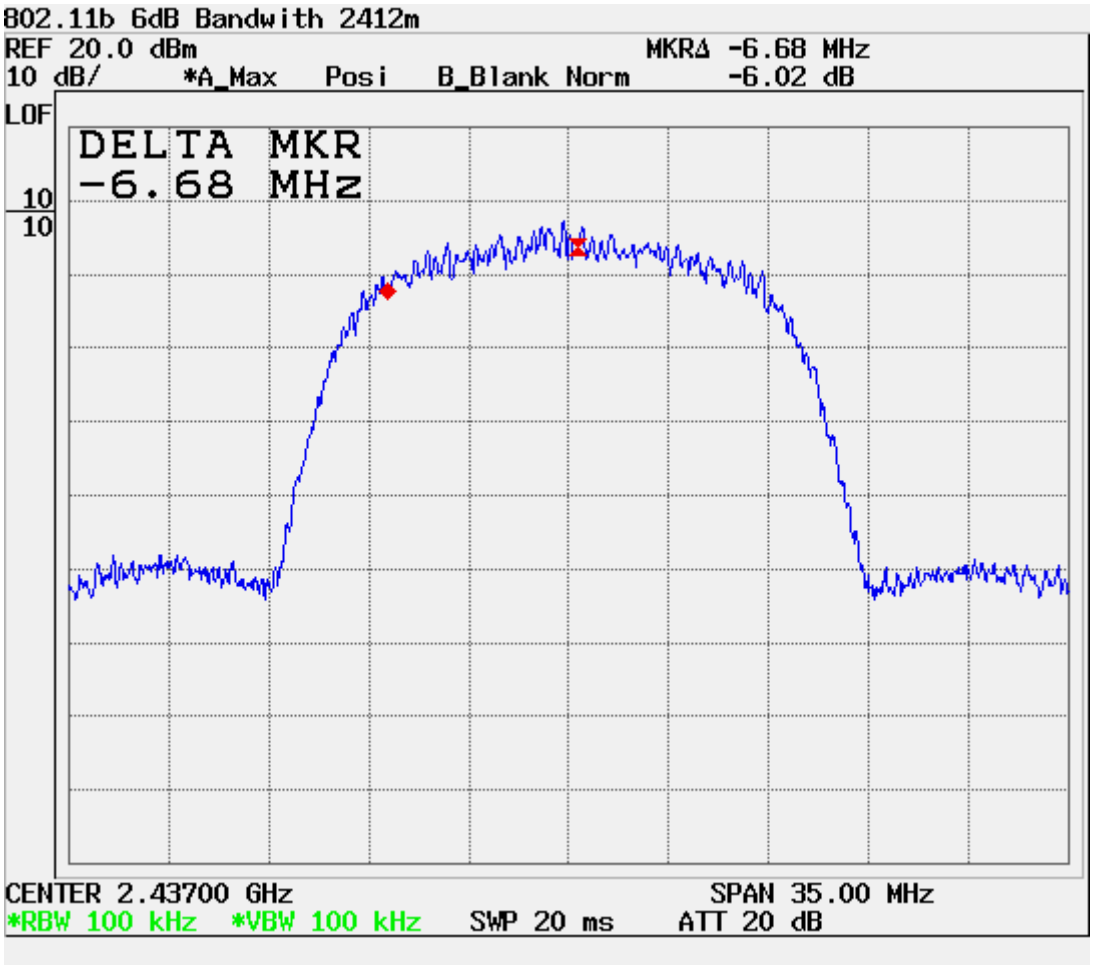
a. 6dB BANDWIDTH LOW (Left)



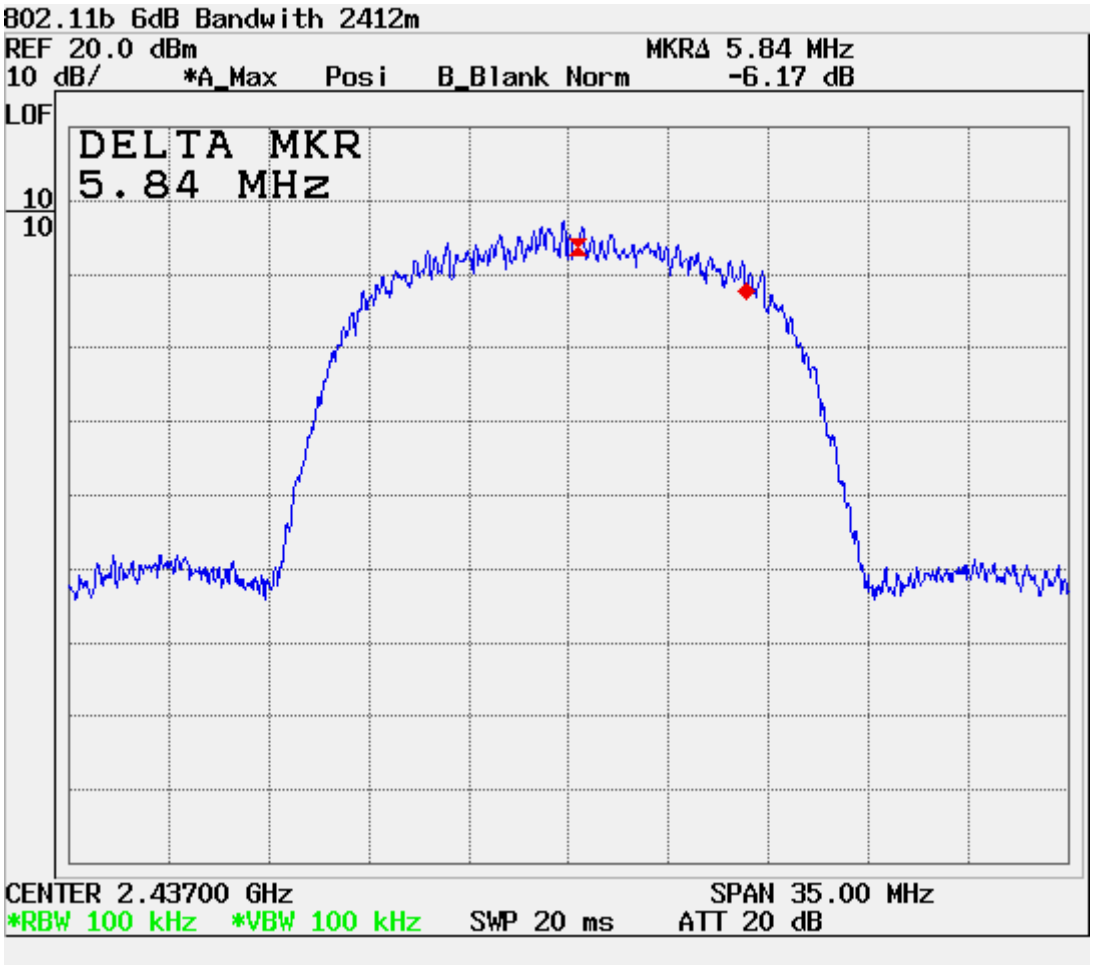
b. 6dB BANDWIDTH LOW (Right)



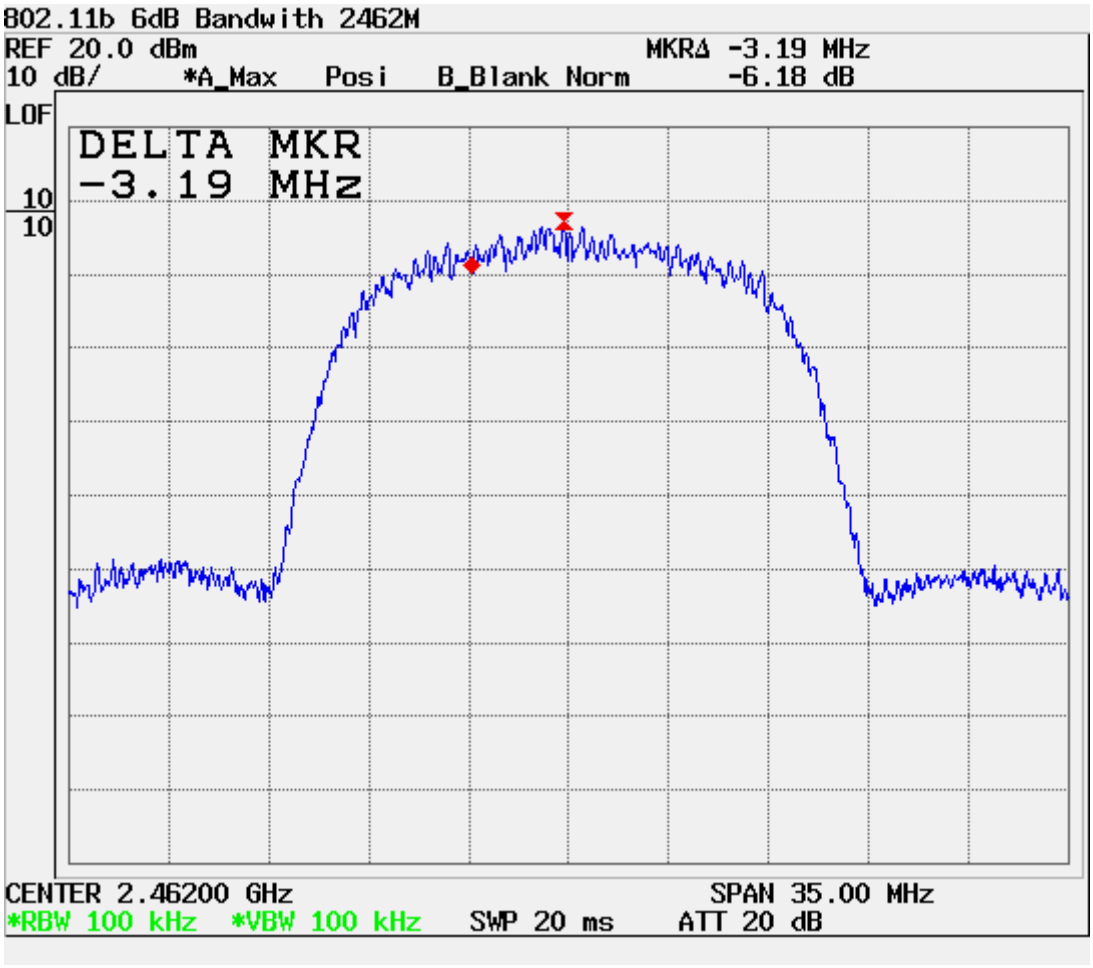
c. 6dB BANDWIDTH MIDDLE (Left)



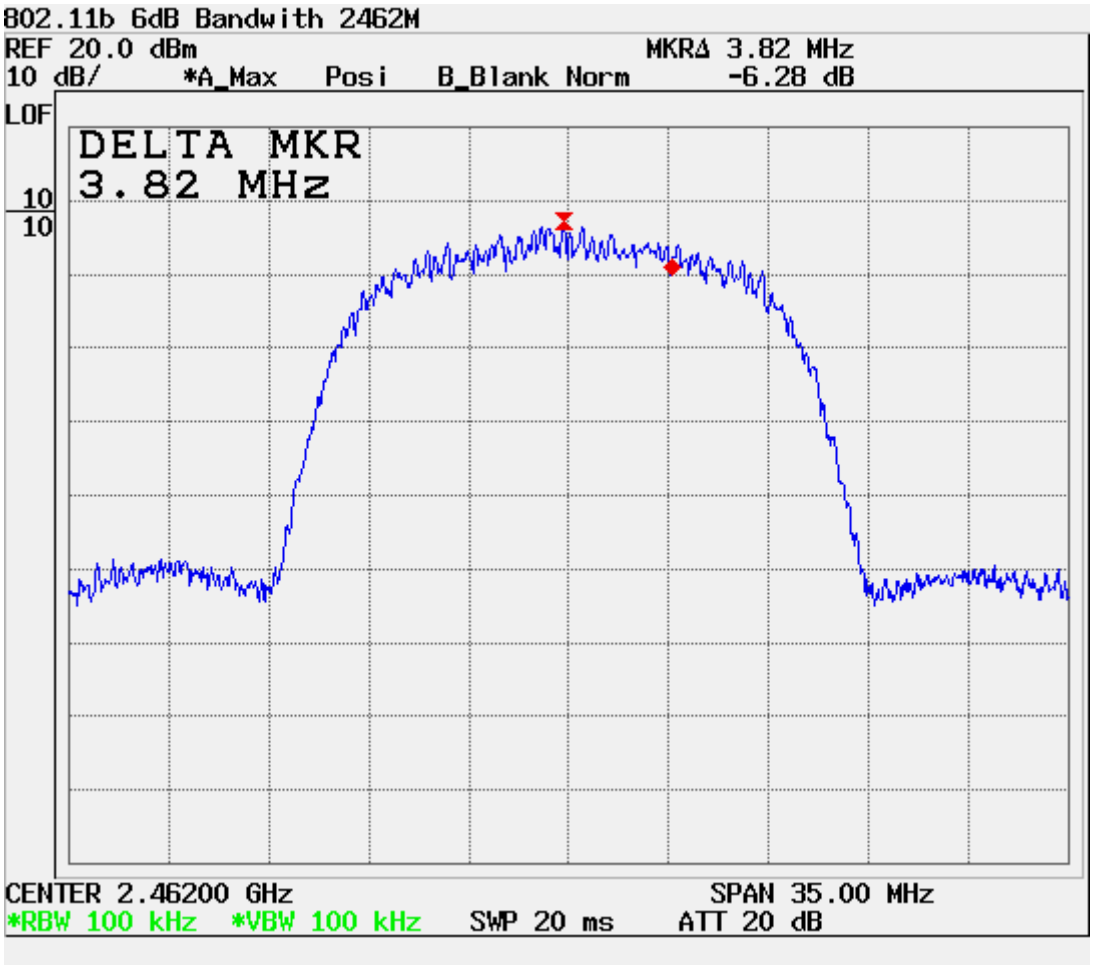
d. 6dB BANDWIDTH MIDDLE (Right)



e. 6dB BANDWIDTH HIGH (Left)

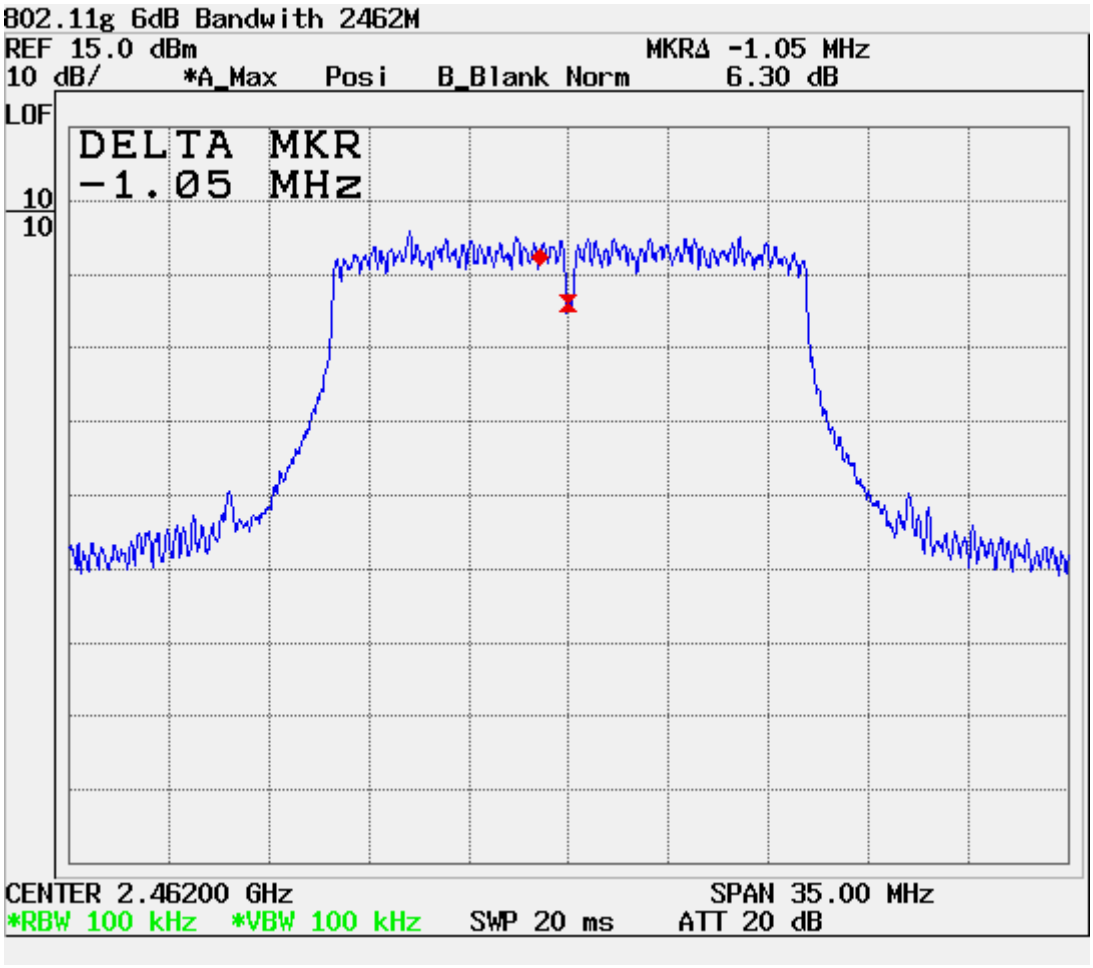


f. 6dB BANDWIDTH HIGH (Right)

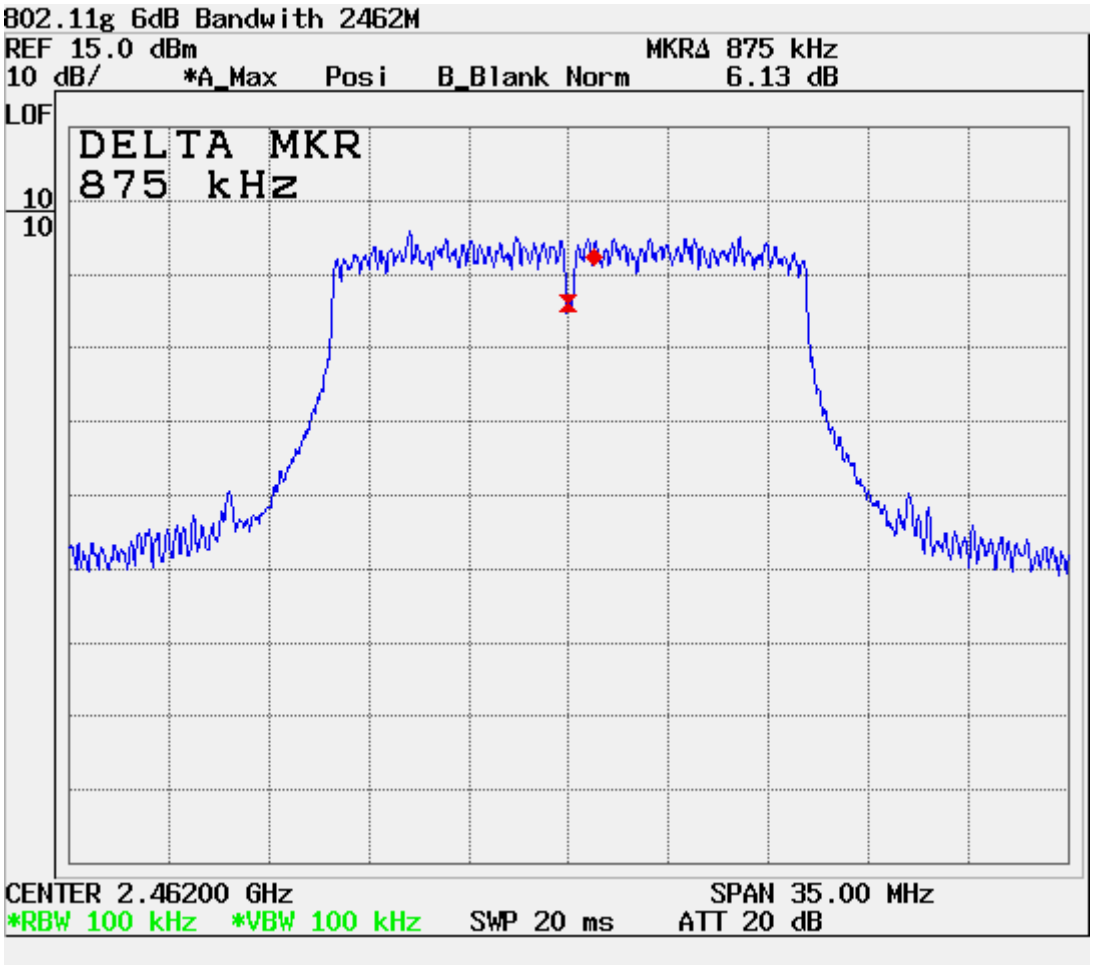


[802.11g]

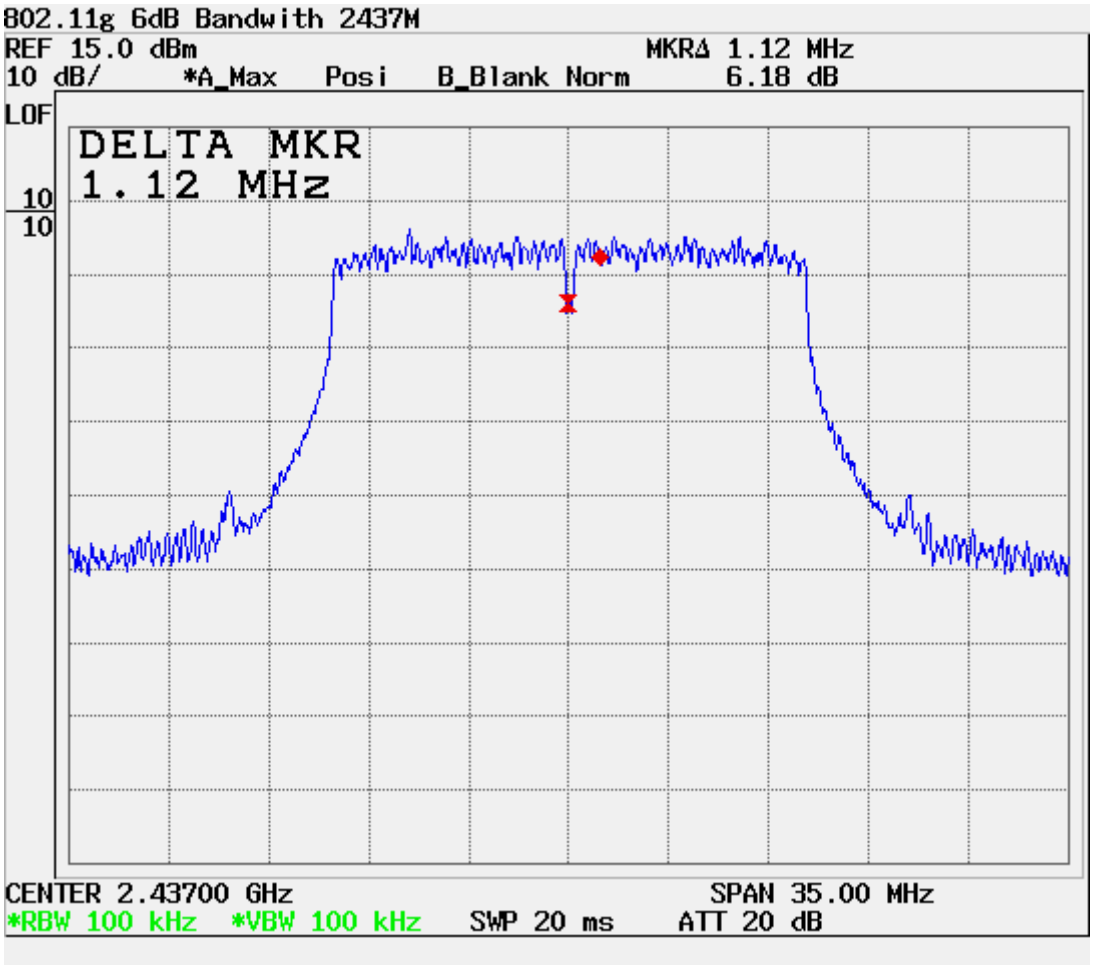
a. 6dB BANDWIDTH LOW(Left)



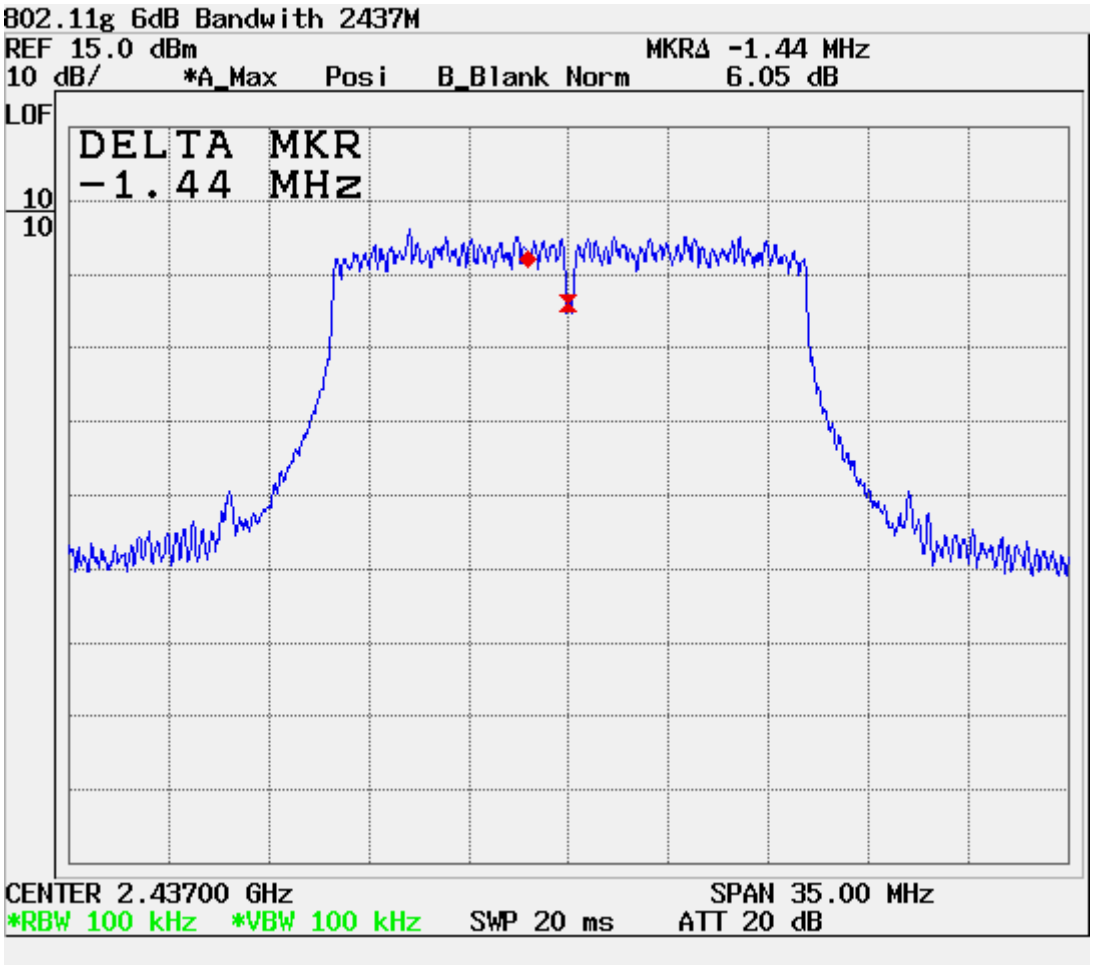
b. 6dB BANDWIDTH LOW(Right)



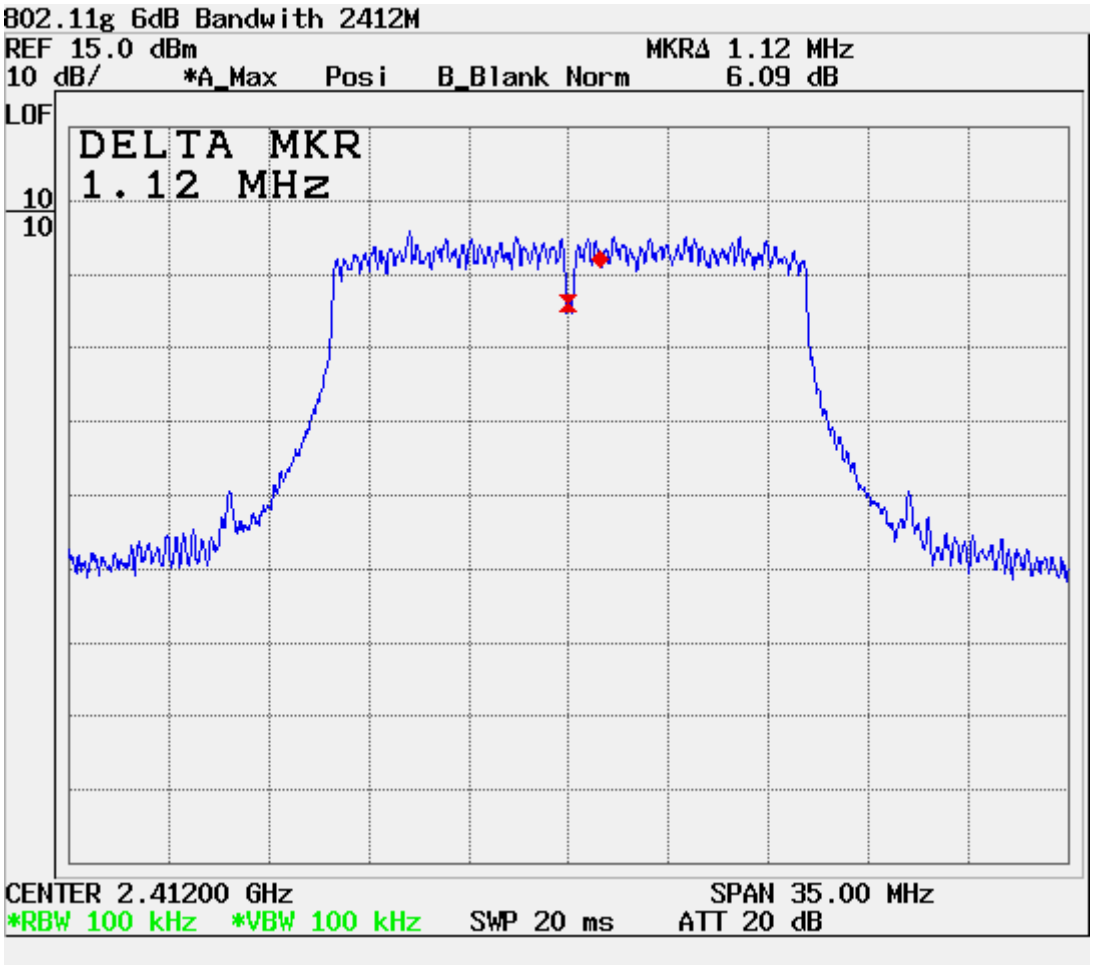
c. 6dB BANDWIDTH MIDDLE(Right)



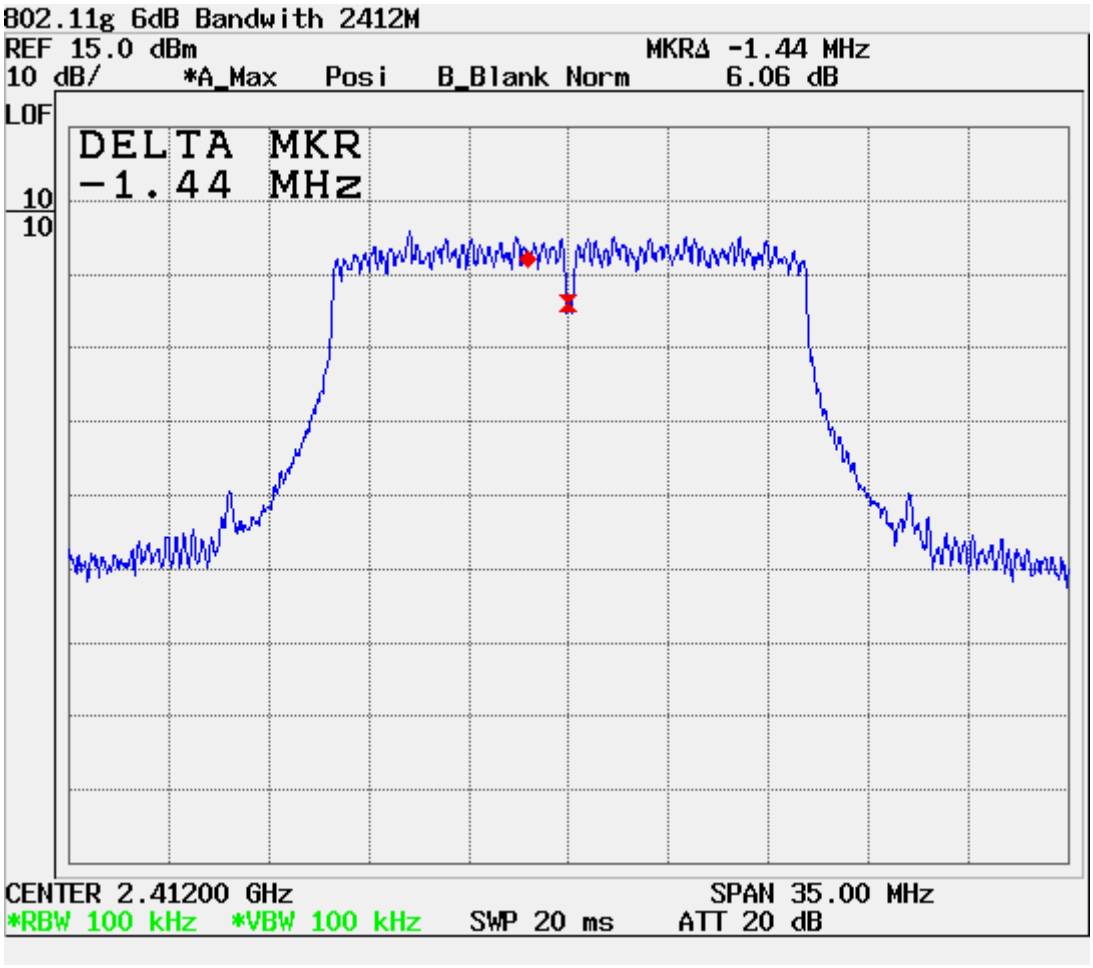
d. 6dB BANDWIDTH MIDDLE(Left)



e. 6dB BANDWIDTH HIGH(Right)



f. 6dB BANDWIDTH HIGH(Left)



9. 99% BANDWIDTH

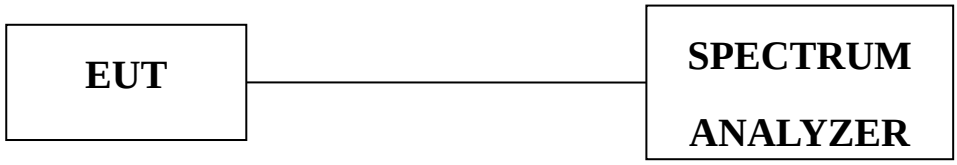
LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99% bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

TEST SETUP



RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.26
Middle	2437	15.26
High	2462	15.26

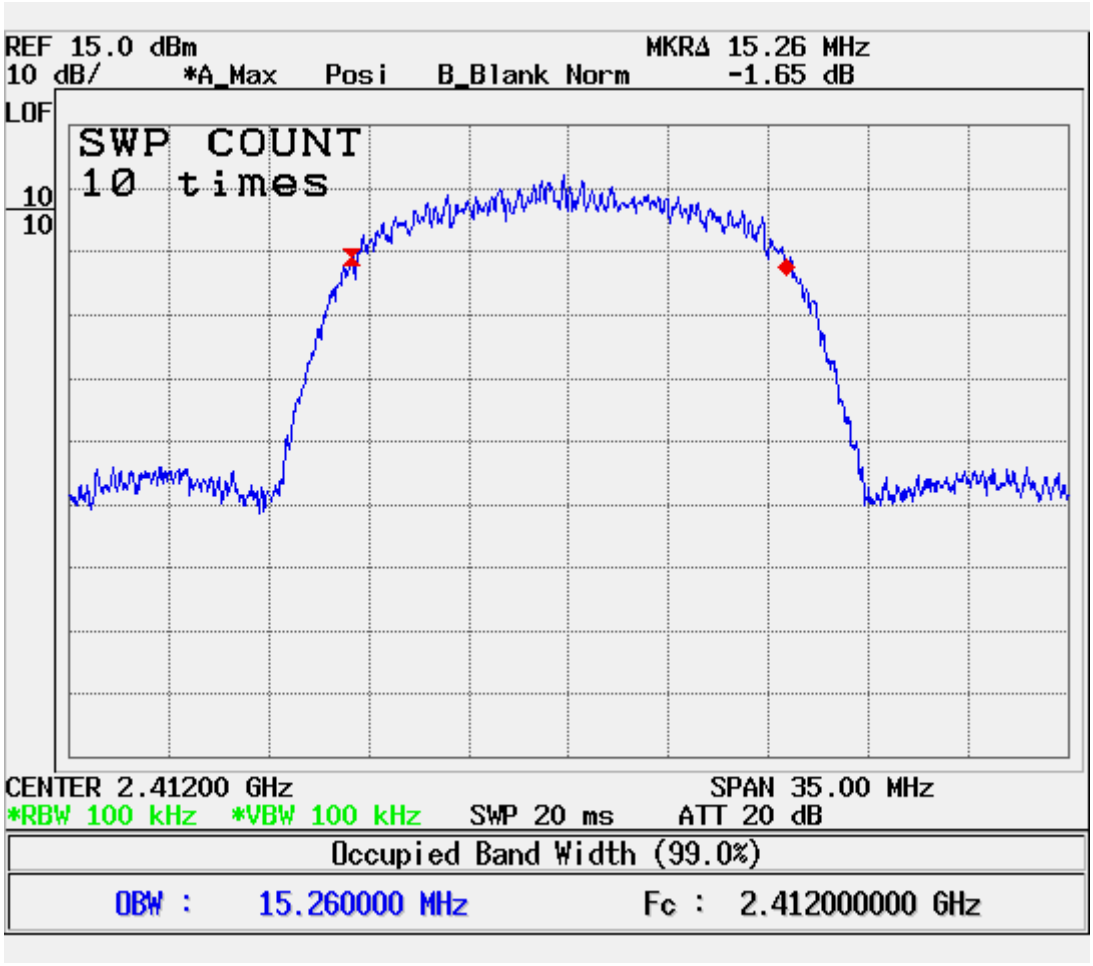
802.11g Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.41
Middle	2437	16.41
High	2462	16.41

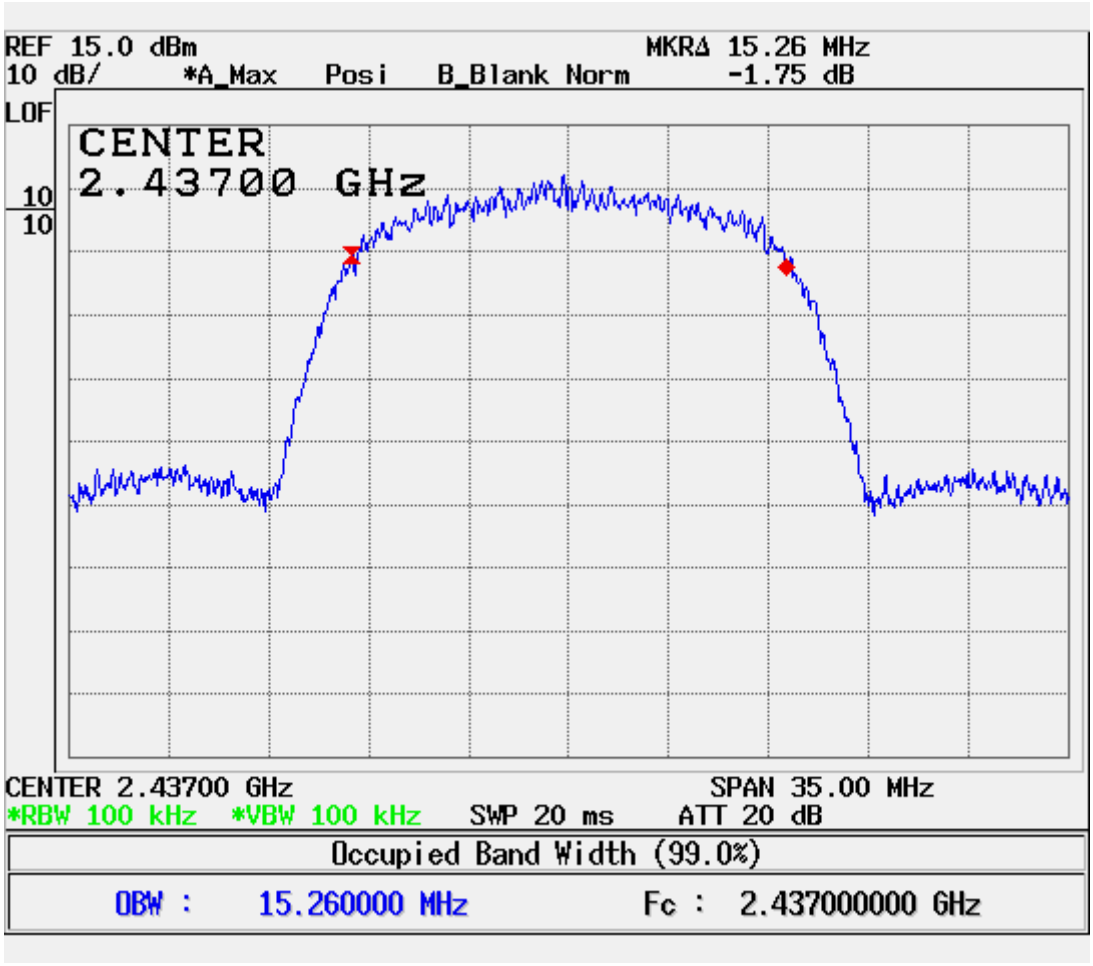
9.1 99% BANDWIDTH

[802.11b]

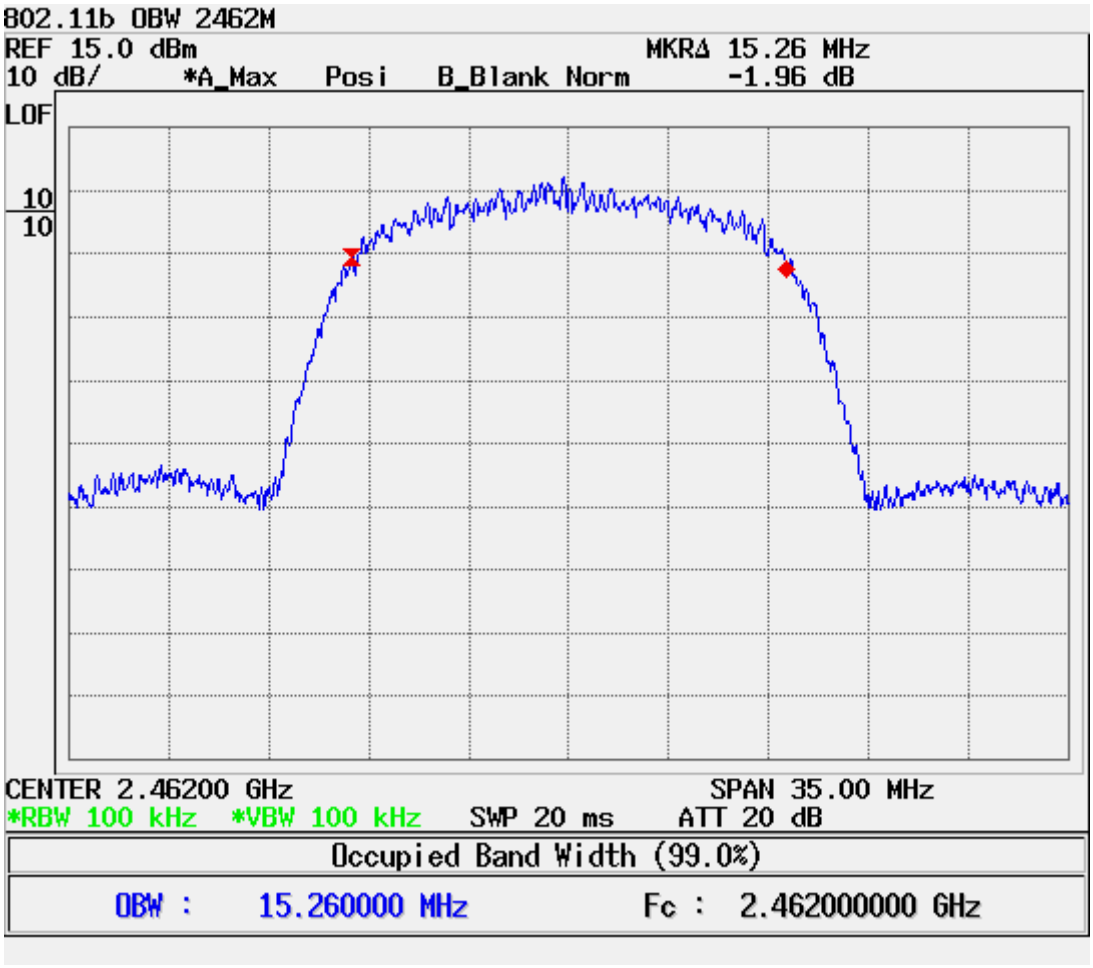
a. 99% BANDWIDTH LOW CH



b. 99% BANDWIDTH MIDDLE CH

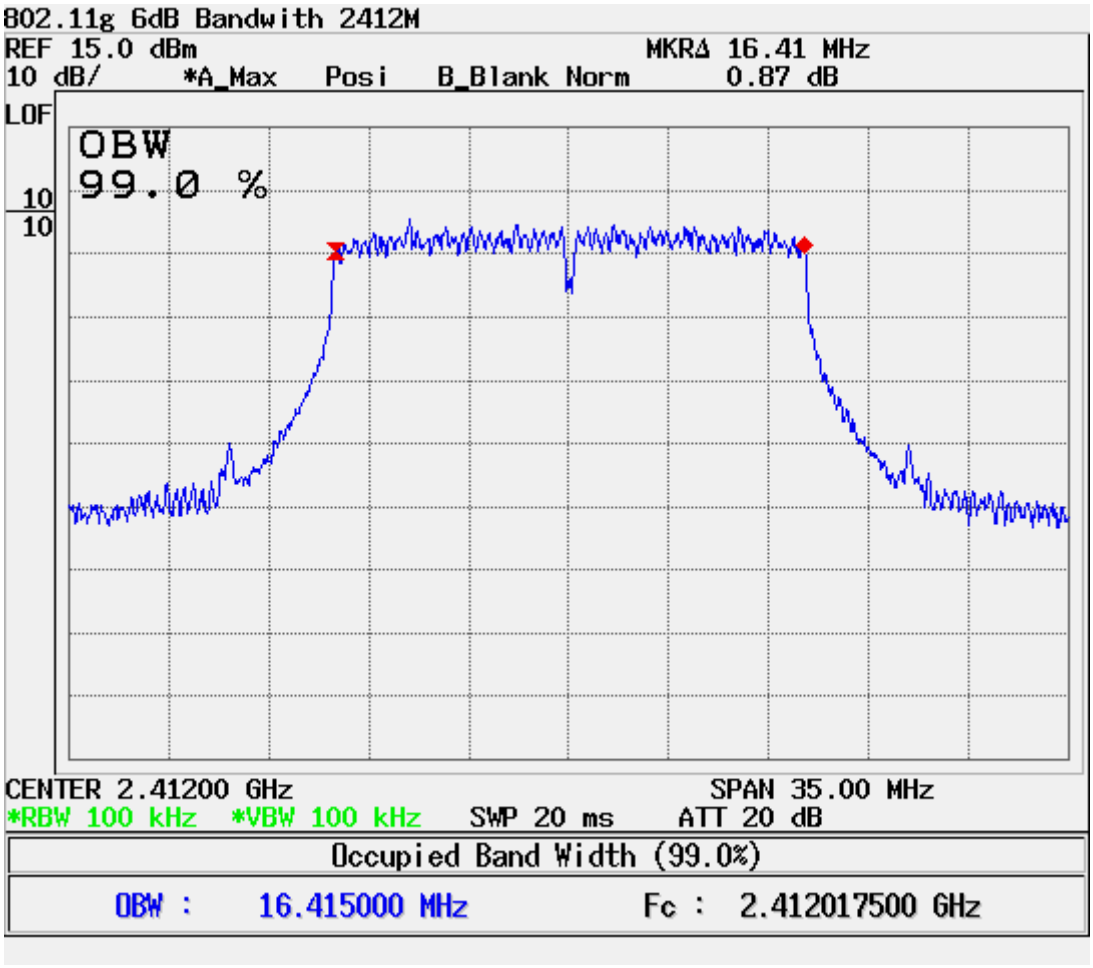


c. 99% BANDWIDTH HIGH CH

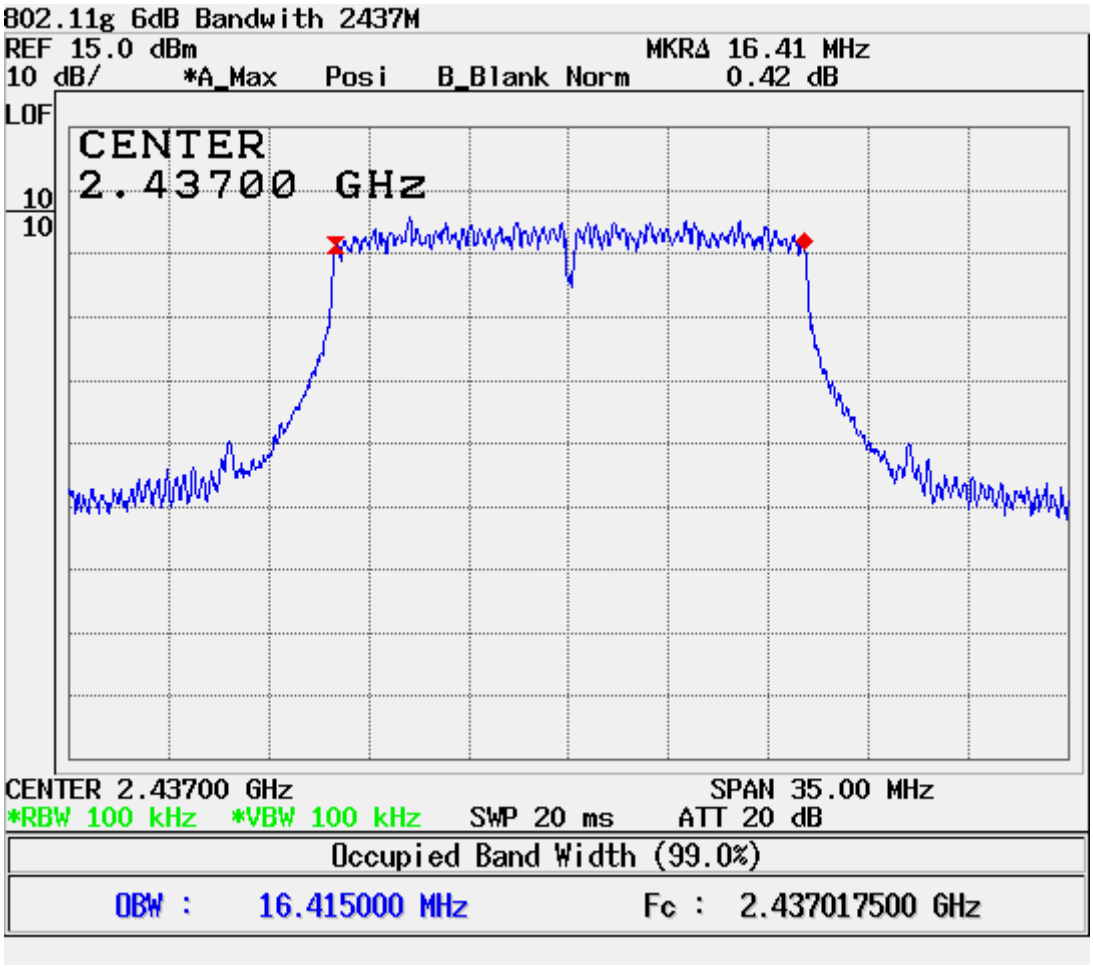


[802.11g]

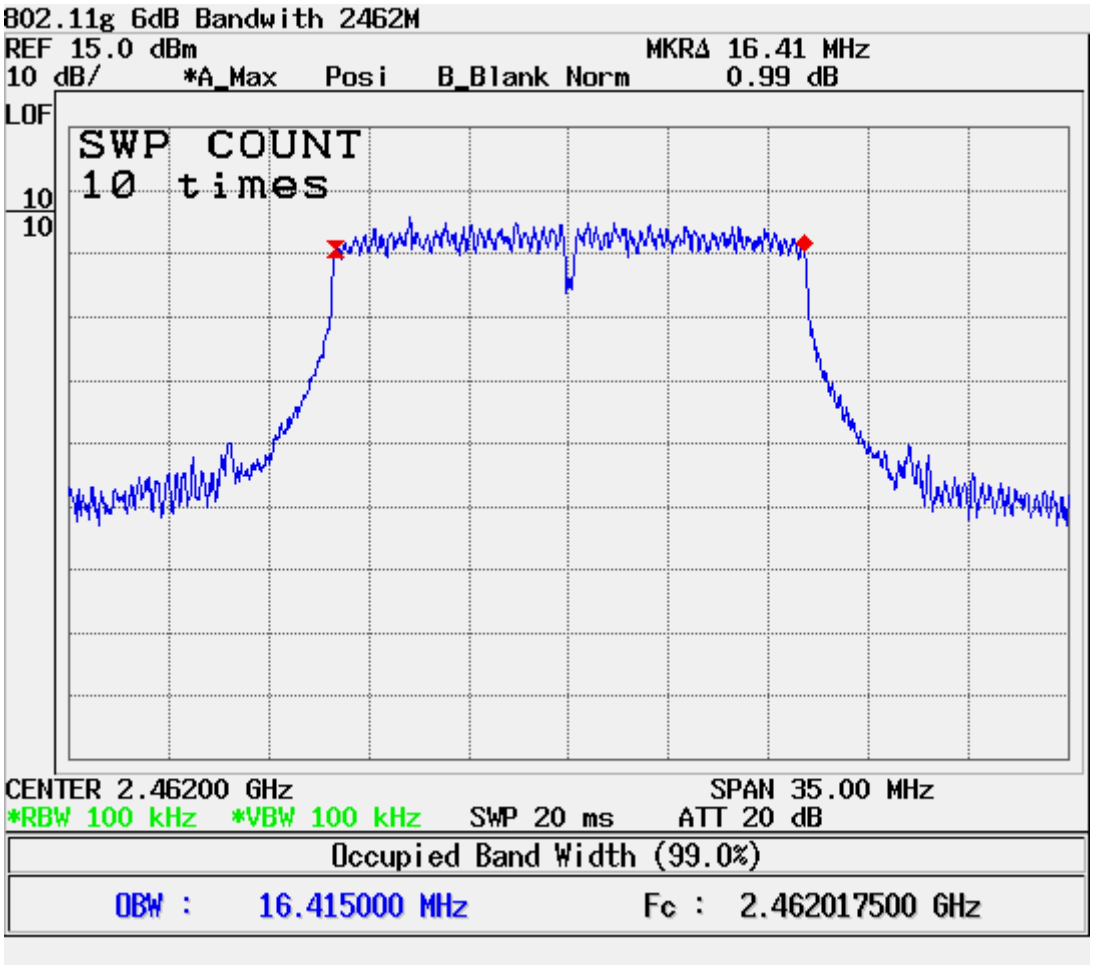
a. 99% BANDWIDTH LOW CH



b. 99% BANDWIDTH MIDDLE CH



c. 99% BANDWIDTH HIGH CH



10. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands: 1 watt.

§15.247(b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or(b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 1.5 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

TEST SETUP

802.11b Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	19.09	30	-10.91
Middle	2437	19.27	30	-10.73
High	2462	19.17	30	-10.83

802.11g Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	21.27	30	-8.73
Middle	2437	21.31	30	-8.69
High	2462	21.09	30	-8.91

10.1 OUTPUT POWER

[802.11b]

a. PEAK POWER LOW CH

b. PEAK POWER MIDDLE CH

c.PEAK POWER HIGH CH

[802.11g]

a. PEAK POWER LOW CH

b. PEAK POWER MIDDLE CH

c.PEAK POWER HIGH CH

11. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)			Power density (mW/cm^2)	Averaging time (min utes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0……	614	63	*(100)	6
3.0-30……	1842/f	4.89/f	*($900/f^2$)	6
30-300……	61.4	0.163	1.0	6
300-1500……	……....	……....	f/300	6
1500-100.000……	……....	……....	5	6
(B) Limits for General Population/Uncontrolled Exposures				
0.3-1.34……	614	1.63	*(100)	30
1.34-30……	824/f	2.19/f	*($180/f^2$)	30

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30-300……..……	27.5	0.073	0.2	30
300-1500……	……....	……....	f/1500	30
1500-100.000……	……....	……....	1.0	30

f=frequency in MHz

*=Plane-wave equivalent power density

Note 1 TO TABLE 1: Occupational/controlled limits apply in situation's in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure.

Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occu-pational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CACULATIONS

Given

E=√(30 * P * G)/d

and

S=E ^ 2 / 3770

where

E=Field Strength in Volts/meter

P=Power in Watts

G=Numeric antenna gain

d=Distance in meters

S=Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

d=√((30 * P * G) / (3770 * S))

Changing to units of Power to mW and Distance to cm, using:

P(mW)=P(W)/1000and

d(cm)=100 * d(m)

yields

d=100 * √((30 * (P/1000) * G) / (3770 * S))

d=0.282 * √ (P * G / S)

where

d=distance in cm

P=Power in mW

G=Numeric antenna gain

S=Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P(mW)= 10^ (P(dBm)/10)and

G(numeric)=10^(G(dBi)/10)

yields

d=0.282 * 10 ^ ((P+G)/20)/ √S

where

d=MPE distance in cm

P=Power in dBm

G=Antenna Gain in dBi

S=Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Minimum Separation Distance(cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density Limit (mW/cm^2)	Power Density At 20cm (mW/cm^2)
IEEE 802.11b	**20**	**16.47**	**1.5**	**1.0**	**0.01246**
IEEE 802.11g	**20**	**12.46**	**1.5**	**1.0**	**0.00495**

Remark: For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density world be larger.

12. AVERAGE POWER

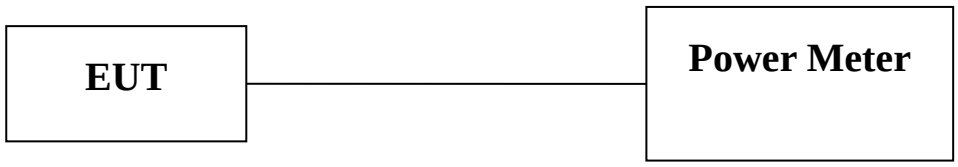
AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST SETUP



RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.4dB (including 10 dB pad and 1.4dB cable) was entered as an offset in the power meter to allow for direct reading of power.

[802.11b]

a. Average POWER LOW CH

b. Average POWER MIDDLE CH

c. AverageK POWER HIGH CH

[802.11g]

a. Average POWER LOW CH

b. Average POWER MIDDLE CH

c. AverageK POWER HIGH CH

13. PEAK POWER SPECTRAL DENSITY

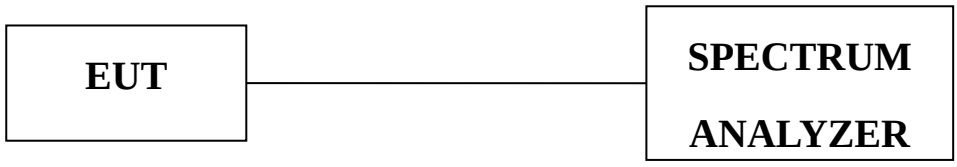
LIMIT

§15.247 (b) For direct sequence systems, the peak 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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW=3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

TEST SETUP



RESULT

No non-compliance note:

802.11b Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.68	8	-13.68
Middle	2437	-5.61	8	-13.61
High	2462	-5.56	8	-13.56

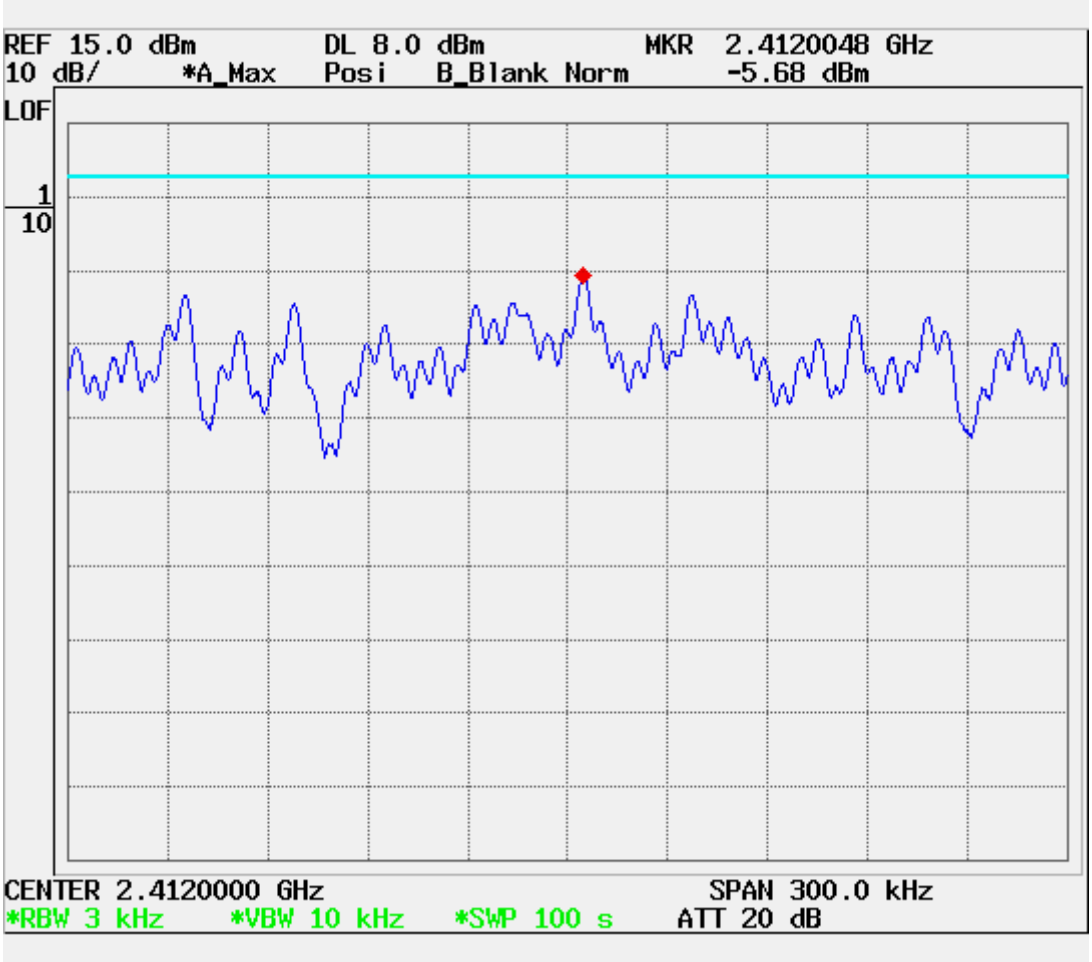
802.11g Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-17.13	8	-25.13
Middle	2437	-16.8	8	-24.8
High	2462	-16.67	8	-24.67

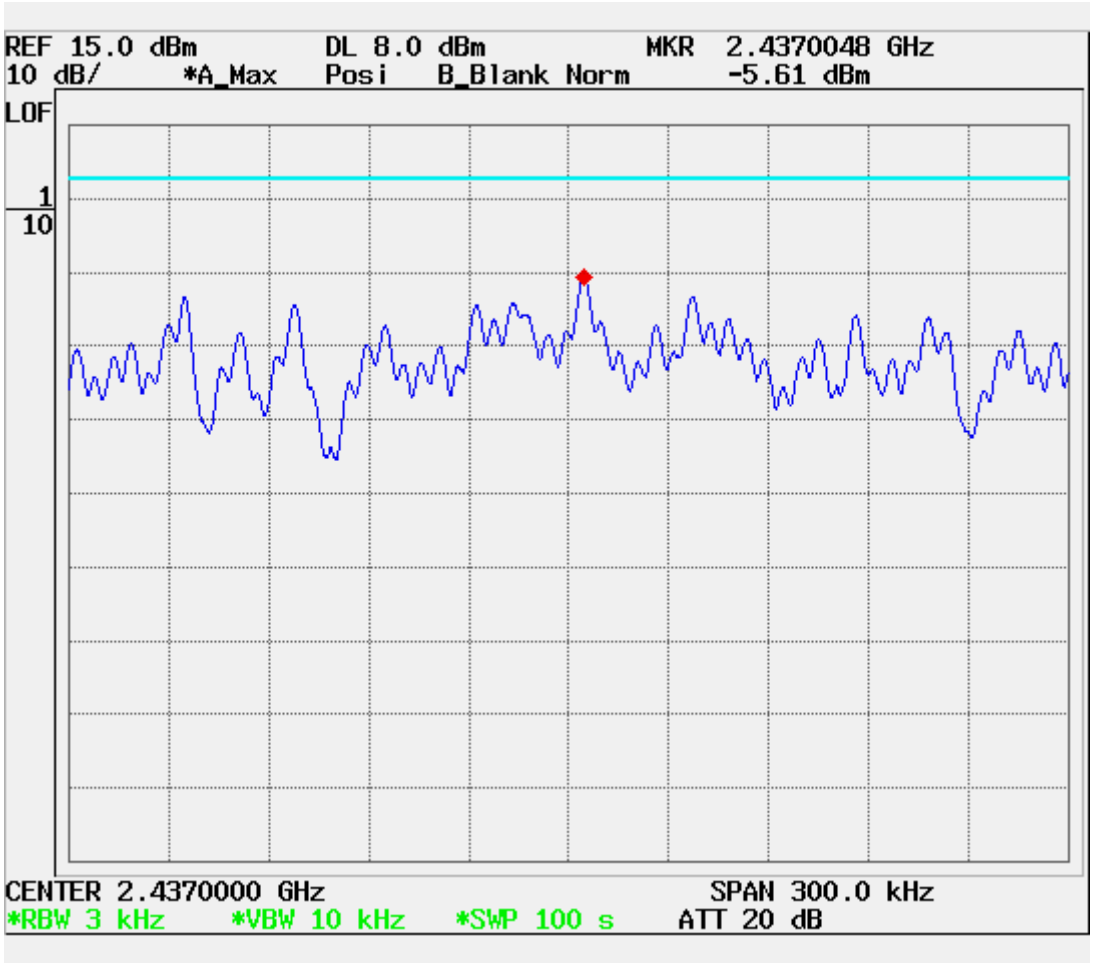
13.1 PEAK POWER SPECTRAL DENSITY

[802.11b]

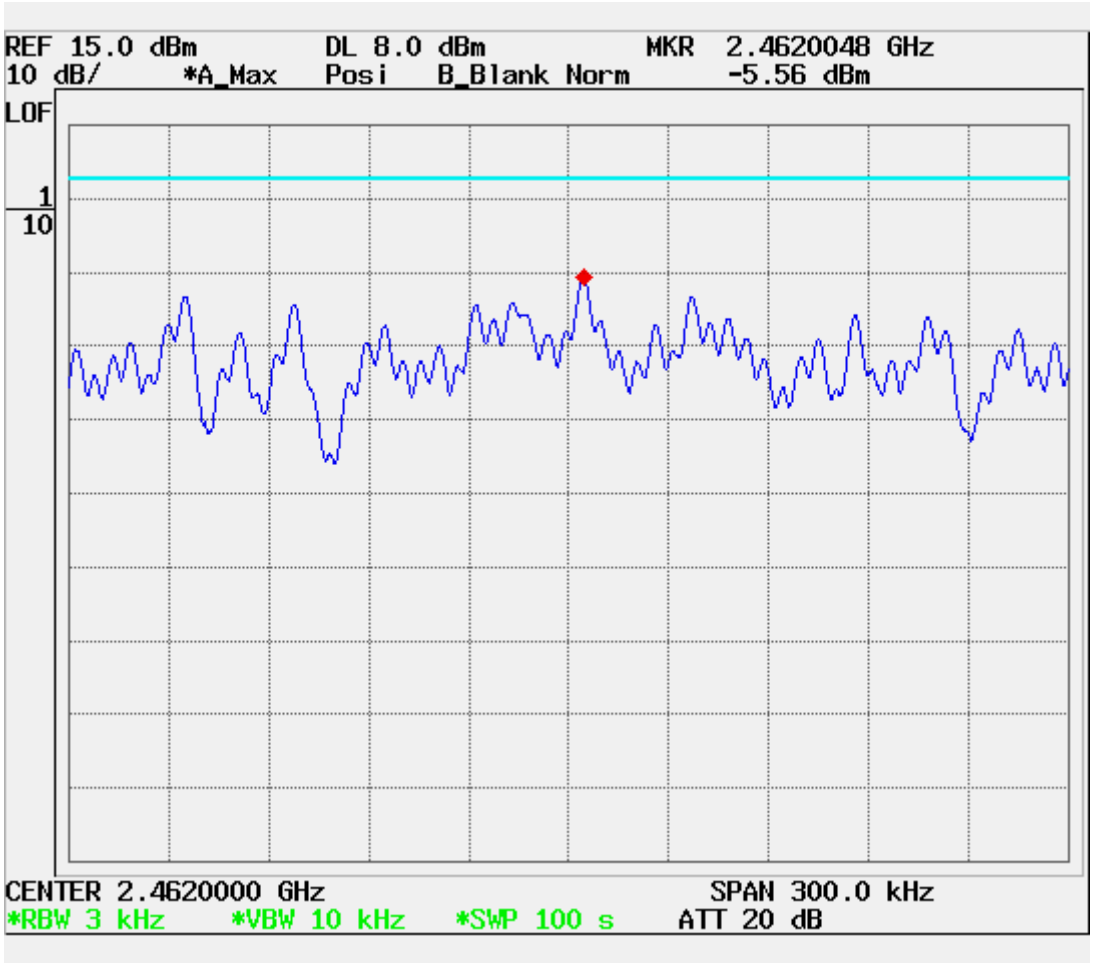
a. PPSD LOW CH



b. PPSD MIDDLE CH

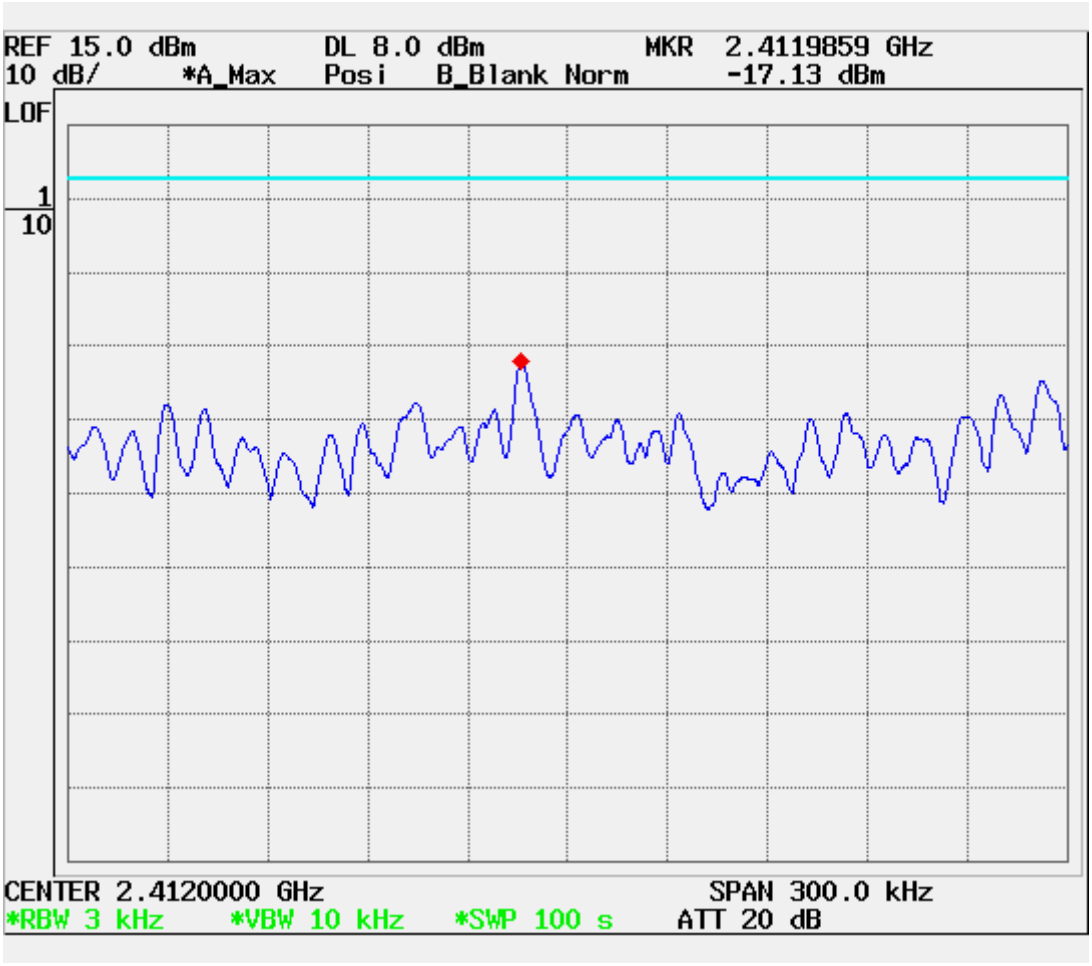


c. PPSD HIGH CH

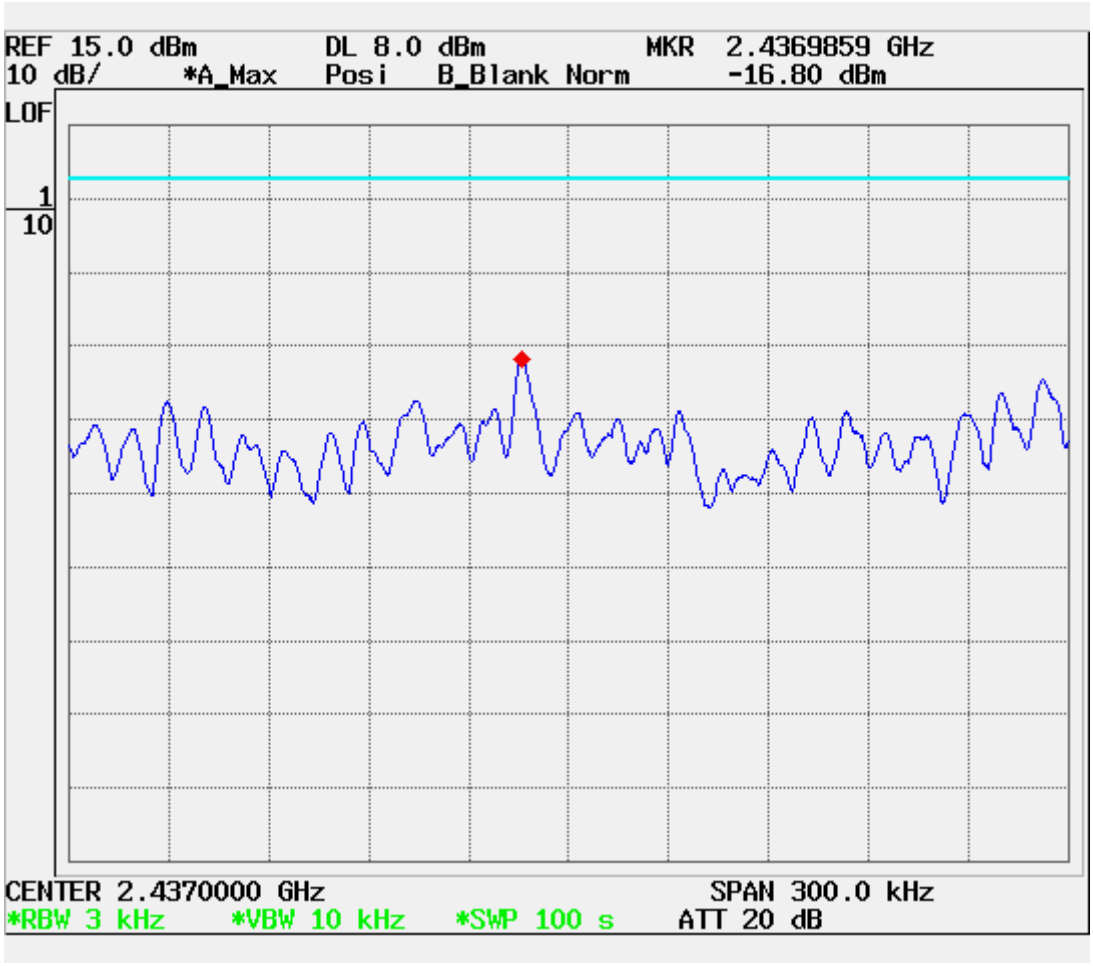


[802.11g]

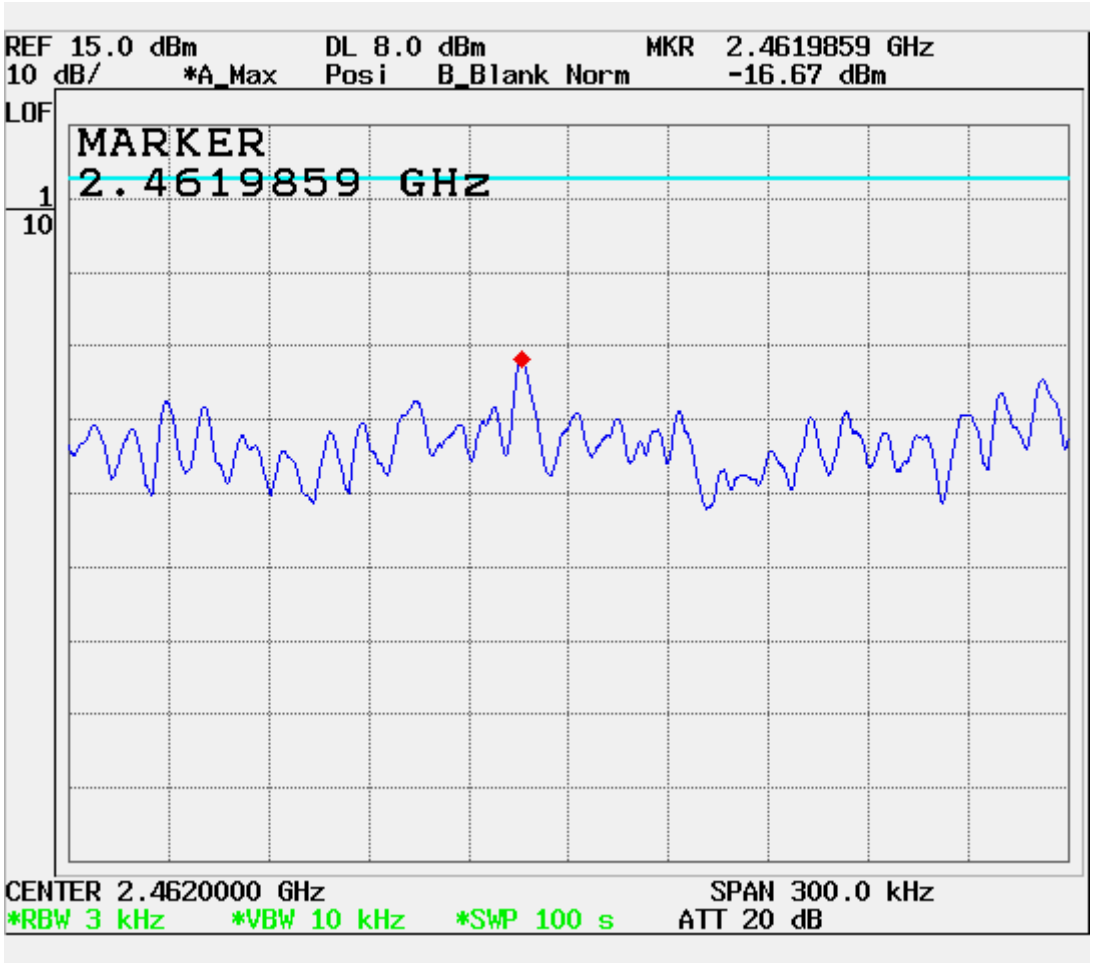
a. PPSD LOW CH



b. PPSD MIDDLE CH



c. PPSD HIGH CH



14. CONDUCTED SPURIOUS EMISSIONS

LIMIT

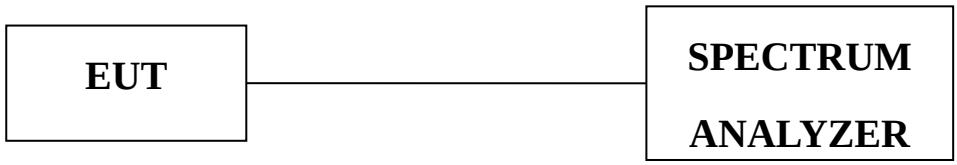
§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§ 15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowst, middle, and highest channels.

TEST SETUP



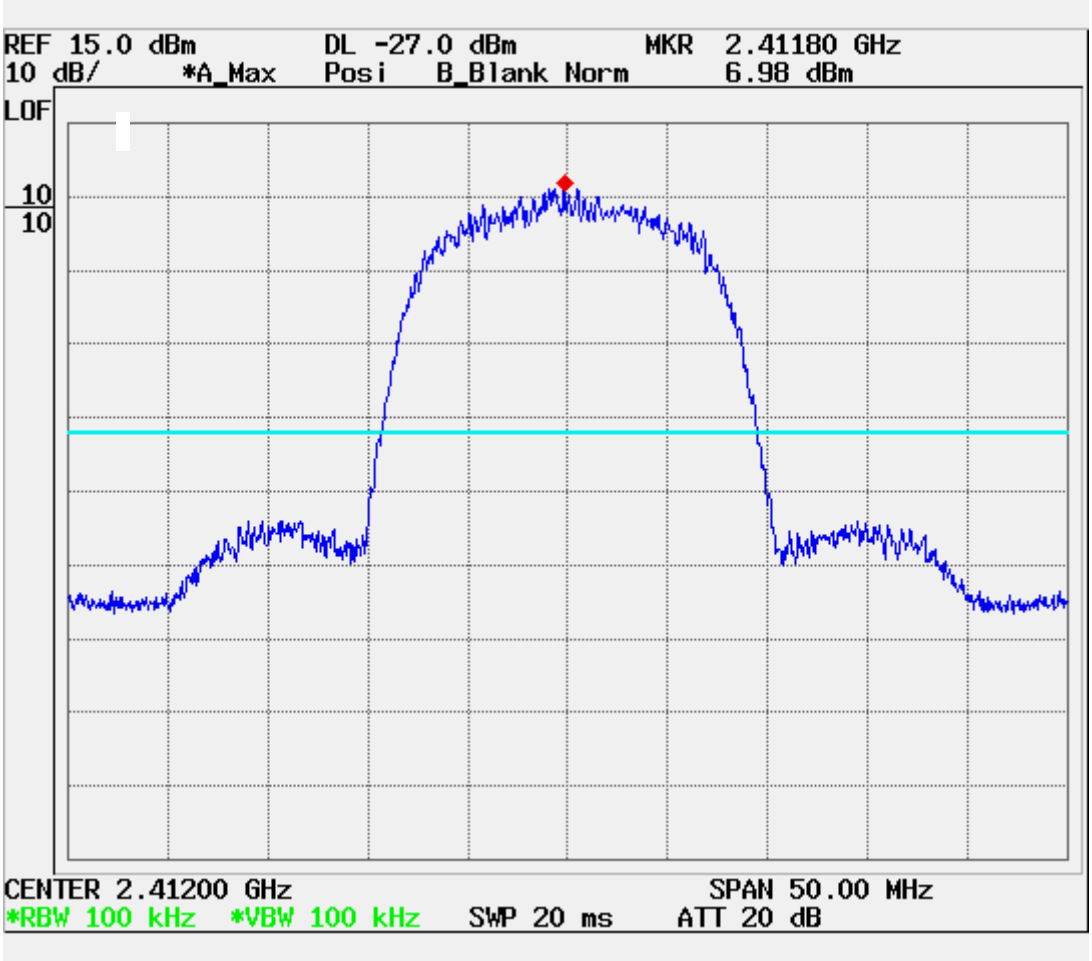
RESULTS

No non-compliance noted:

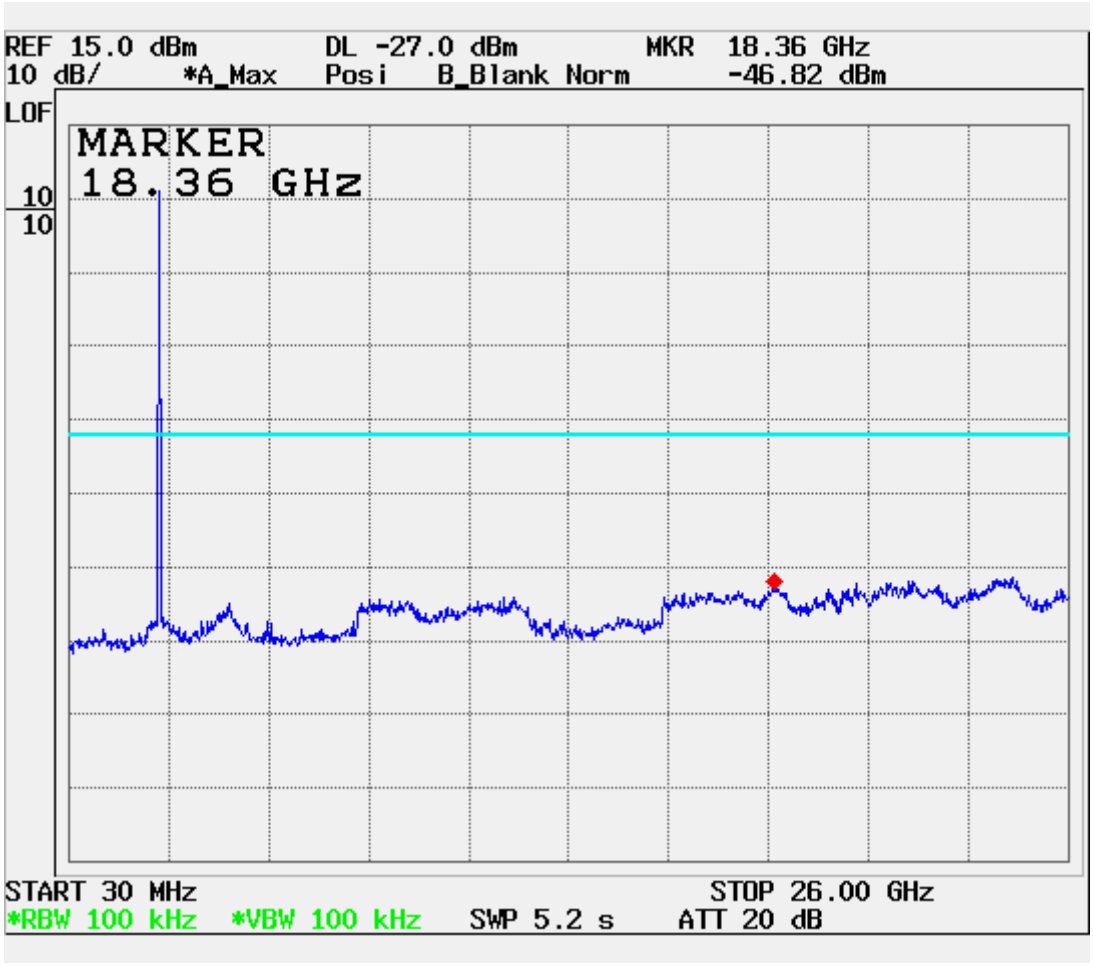
14.1 SPURIOUS EMISSIONS, LOW CHANNEL

[802.11b]

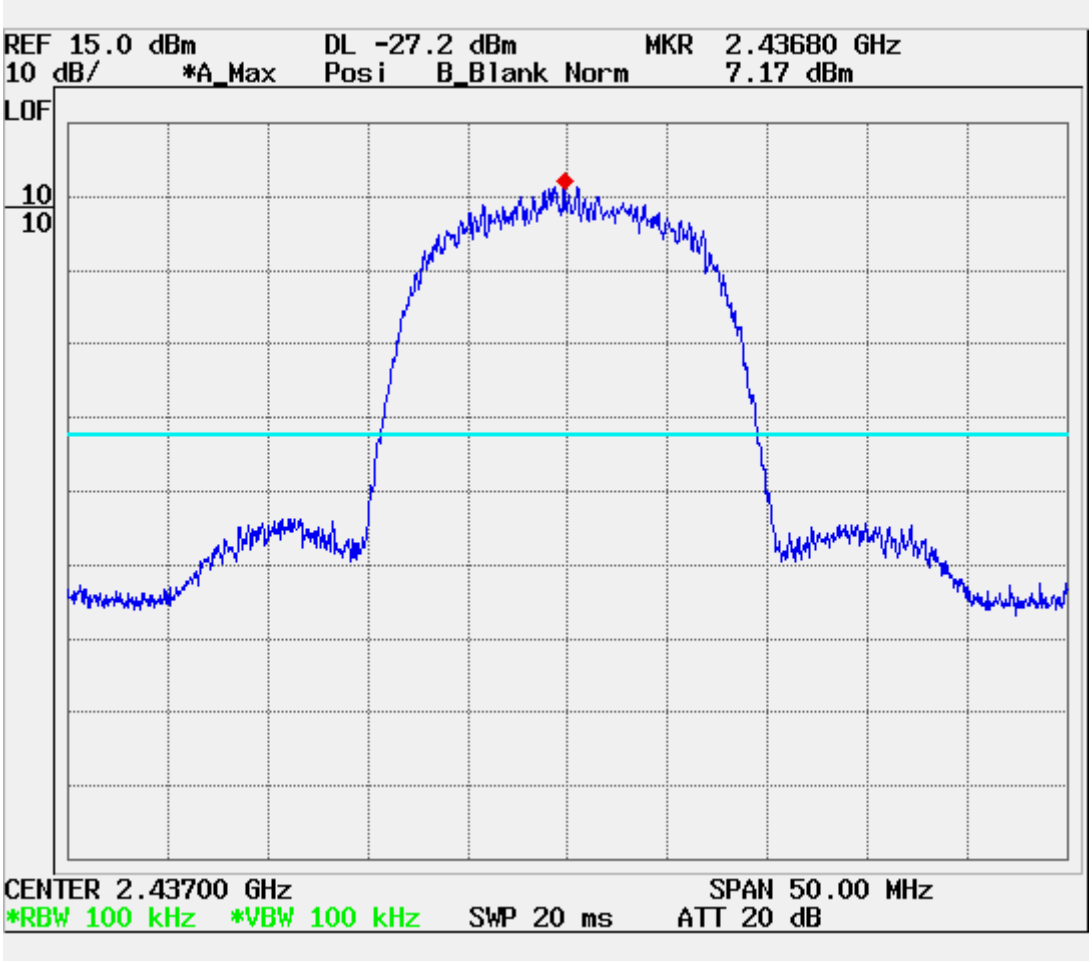
a. LOW CH BANDEDGE



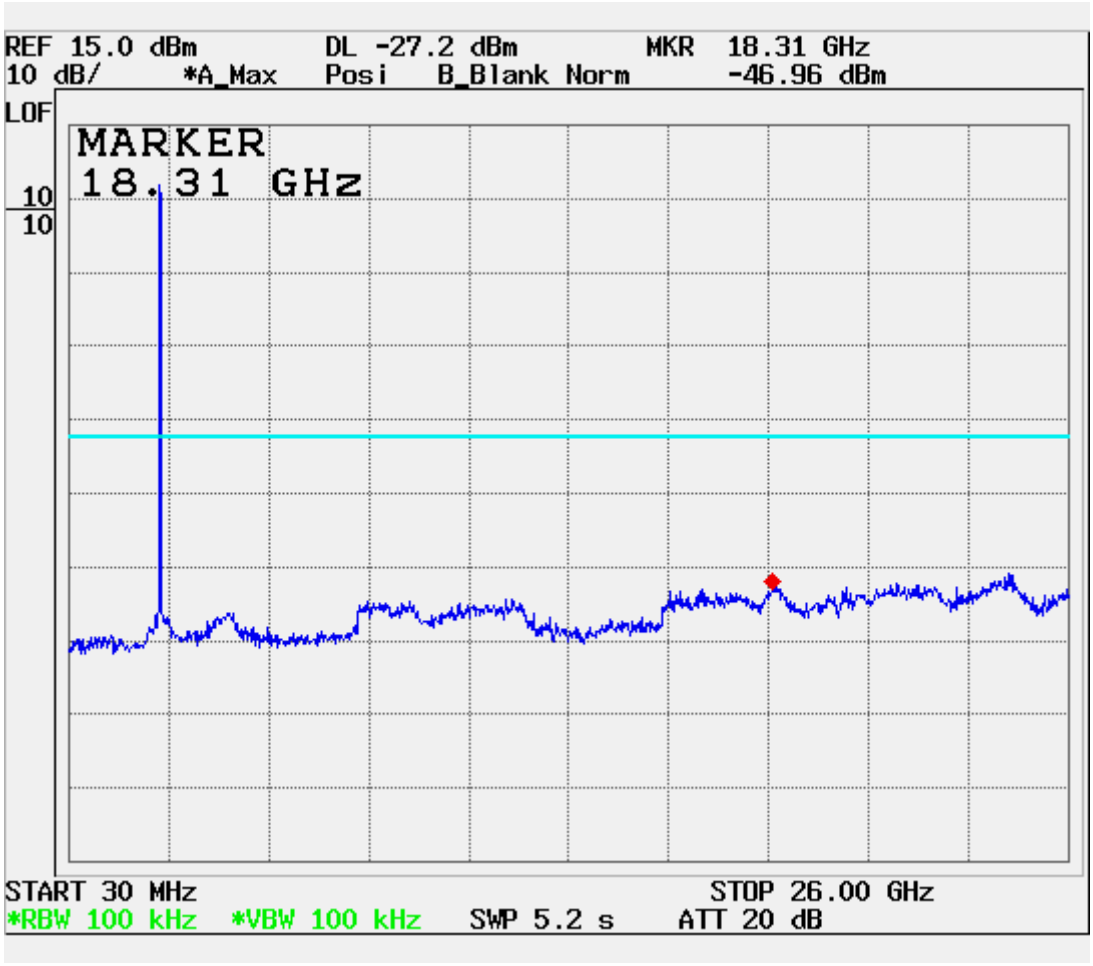
b. LOW CH SPURIOUS



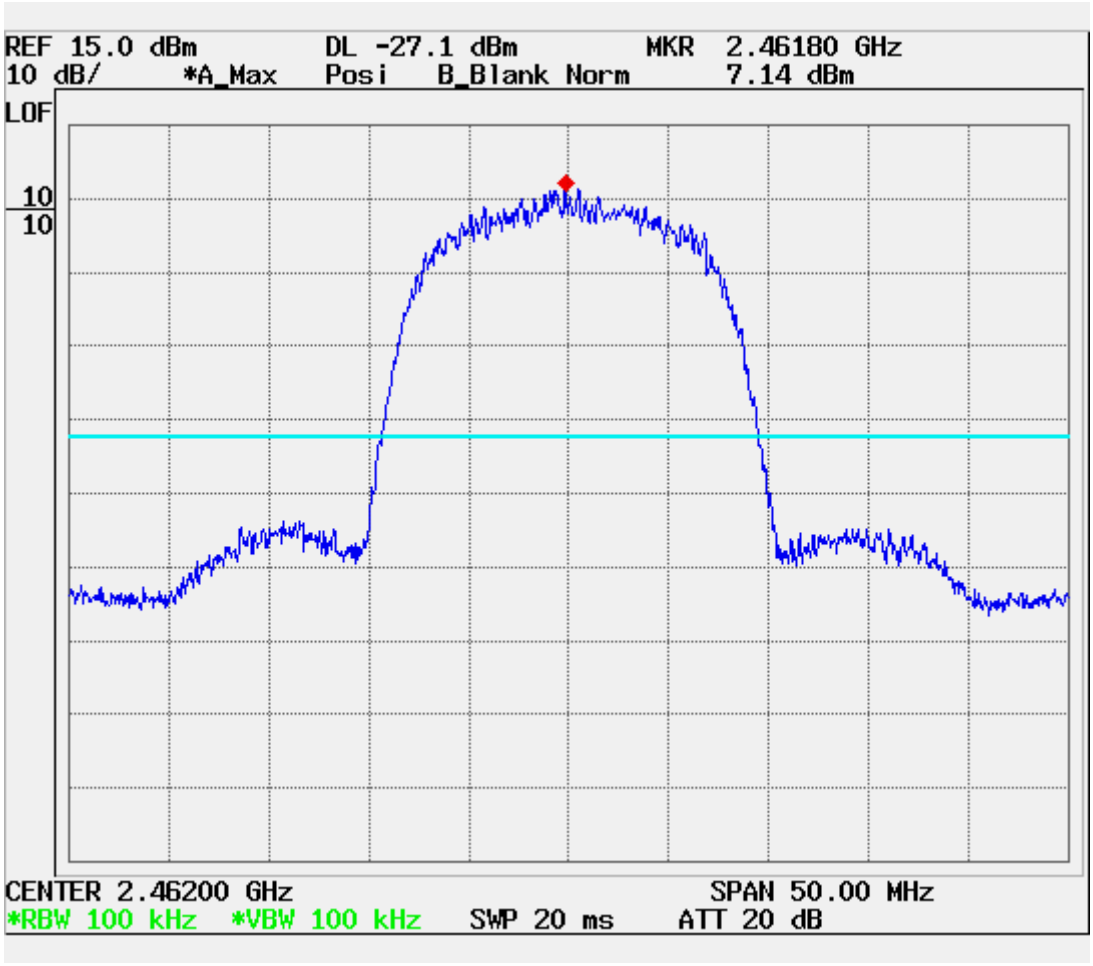
c. MIDDLE CH REFERENCE



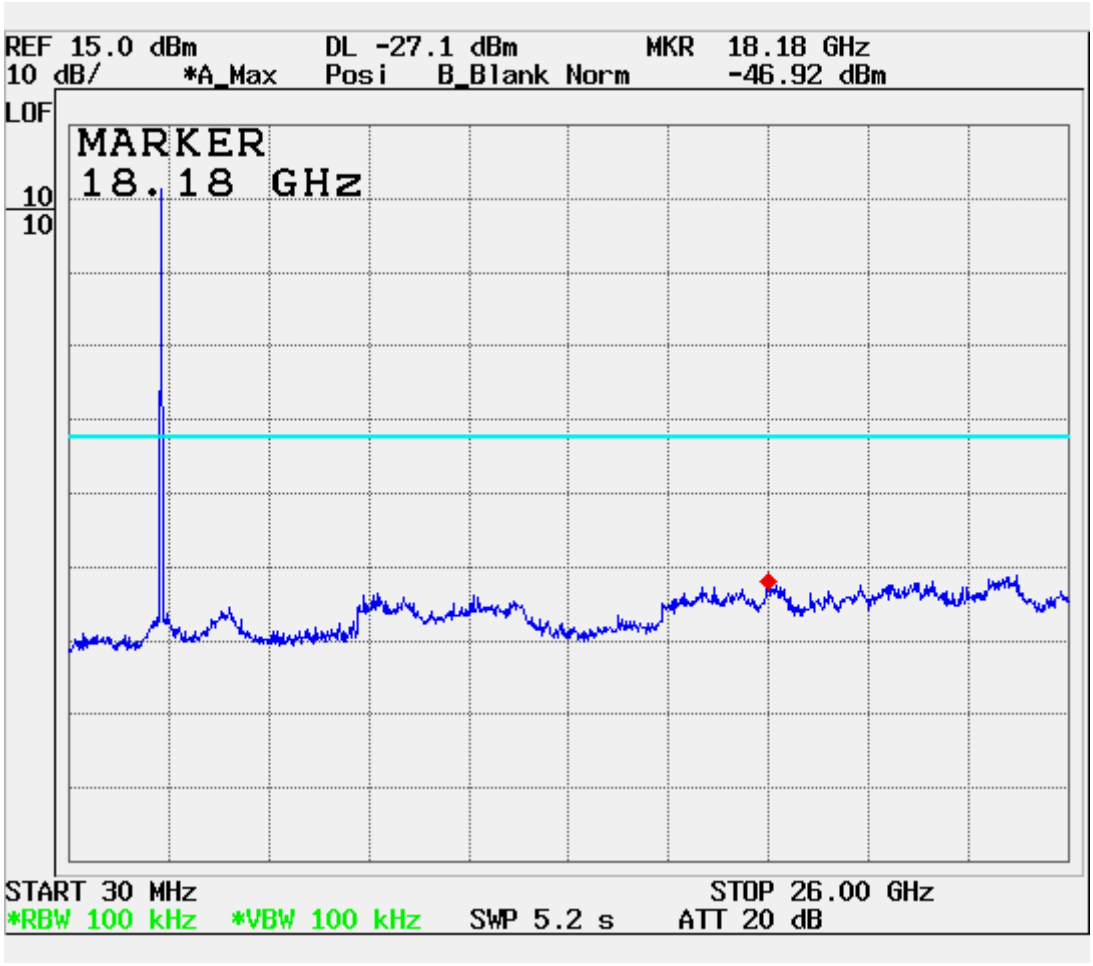
d. MIDDLE CH SPURIOUS



e. HIGH CH BANDEDGE

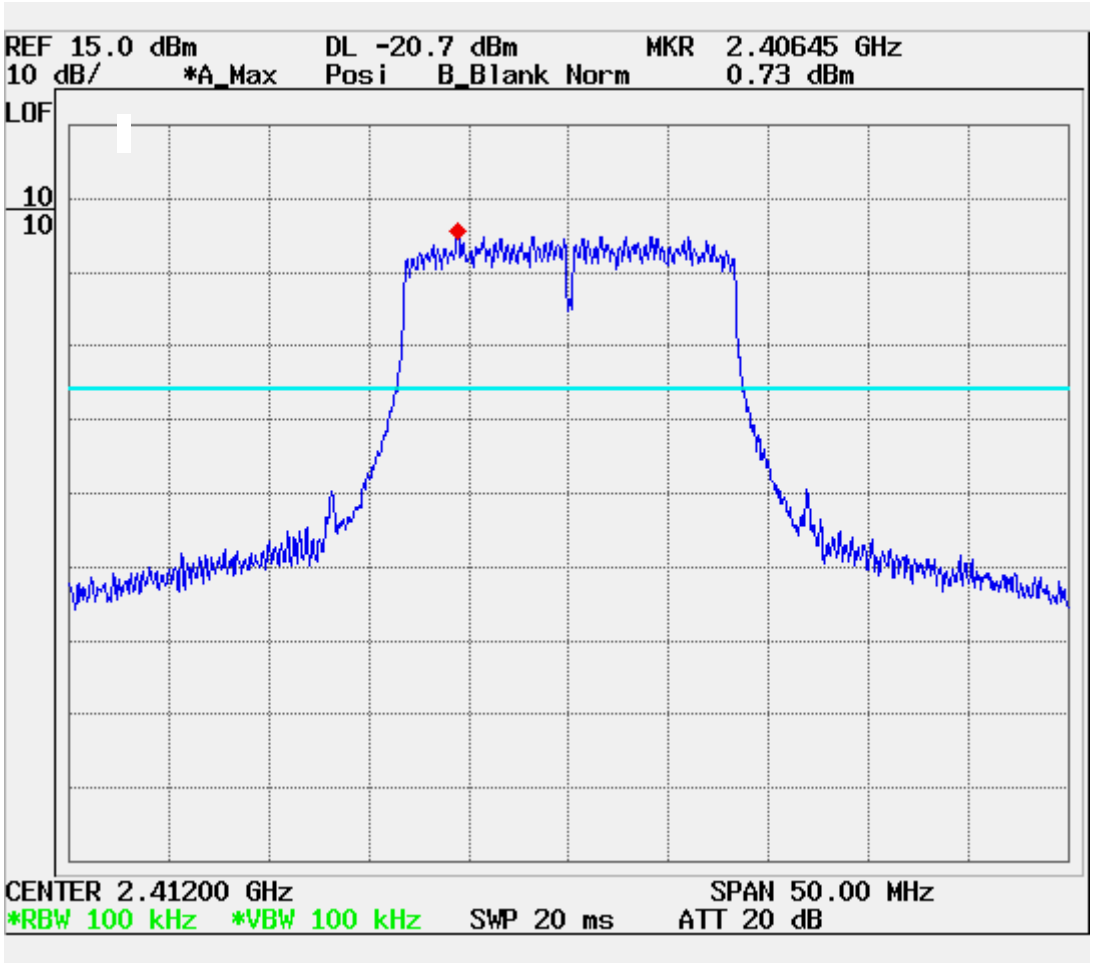


f. HIGH CH SPURIOUS

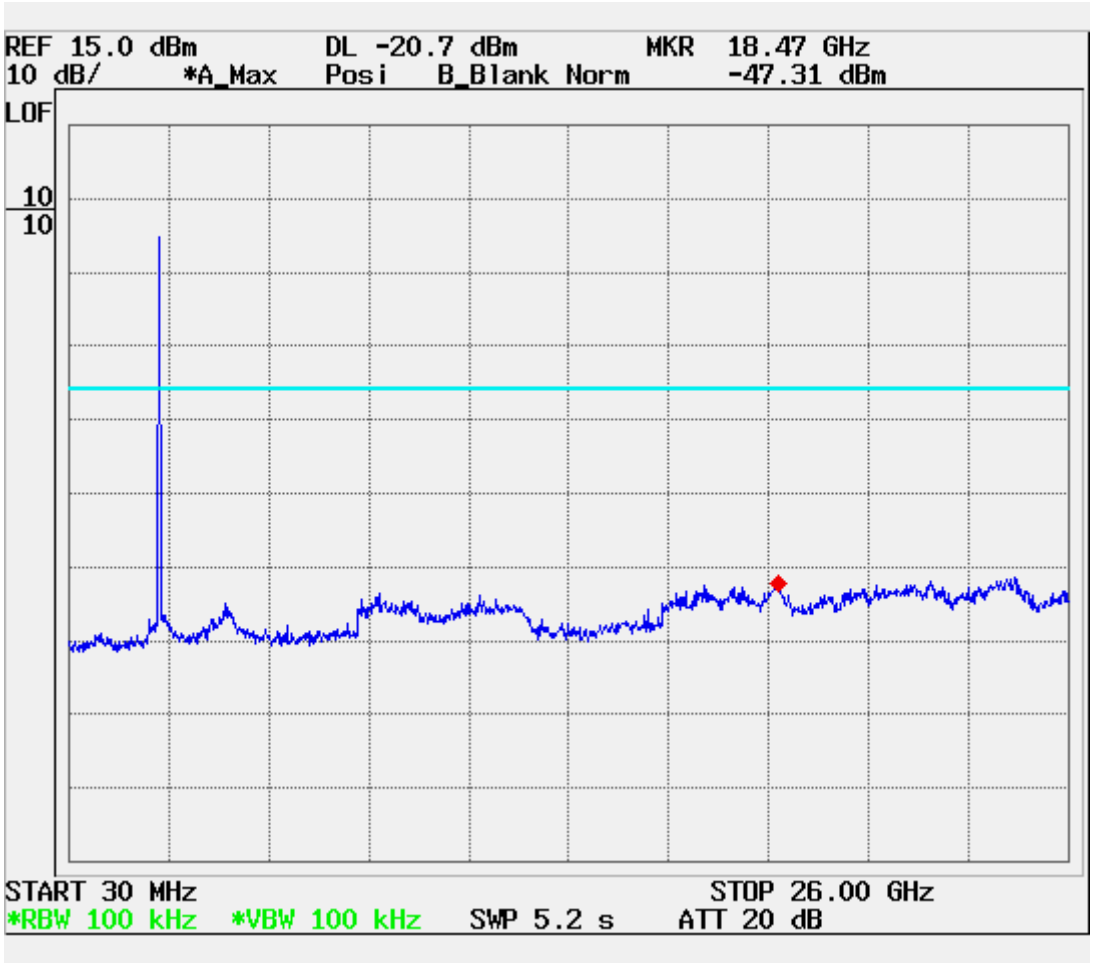


[802.11g]

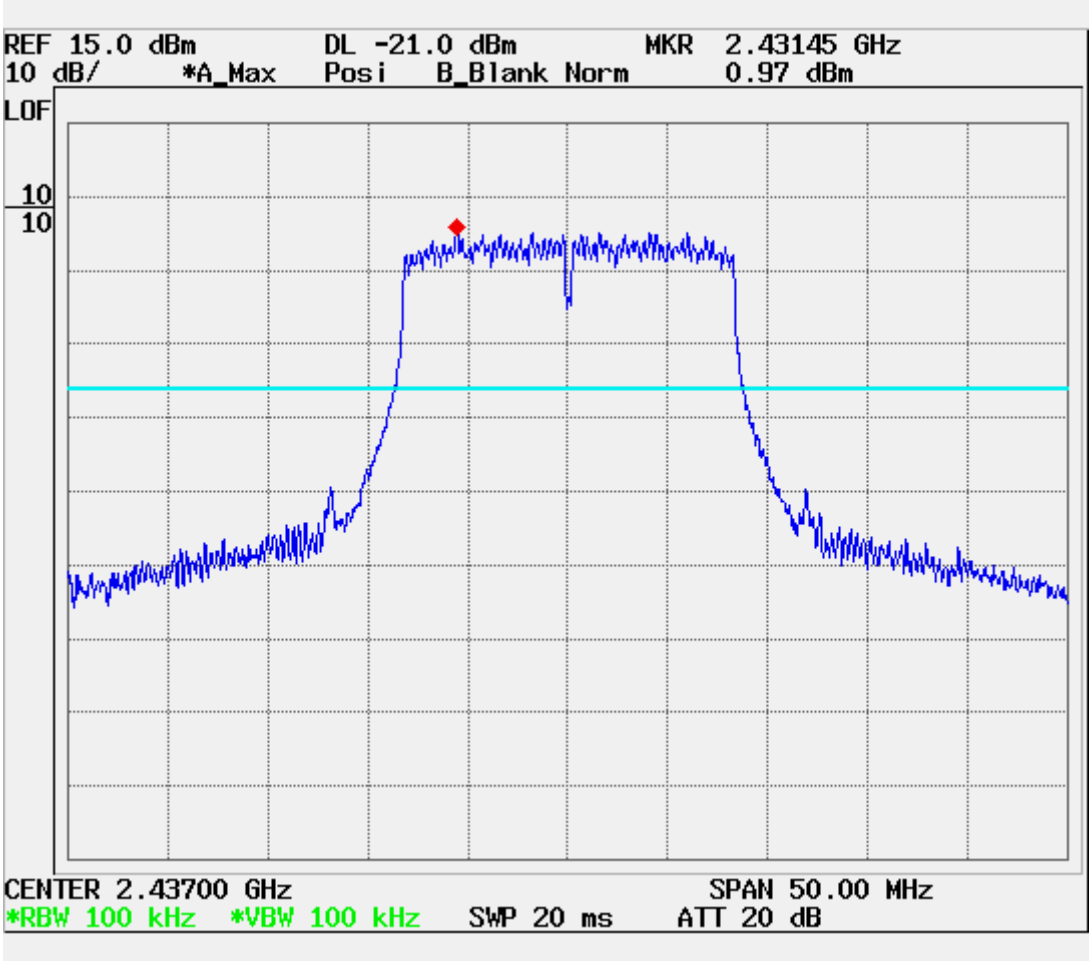
a. LOW CH BANDEDGE



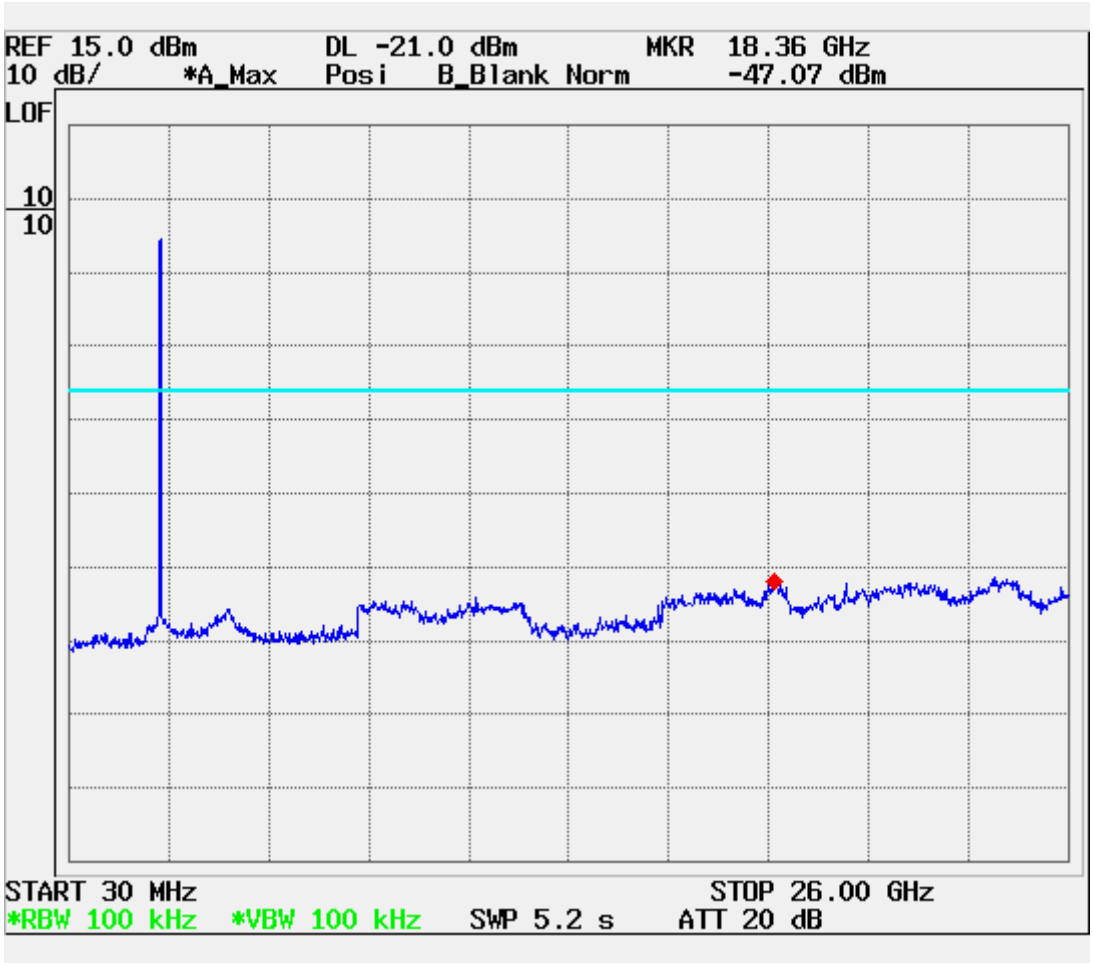
b. LOW CH SPURIOUS



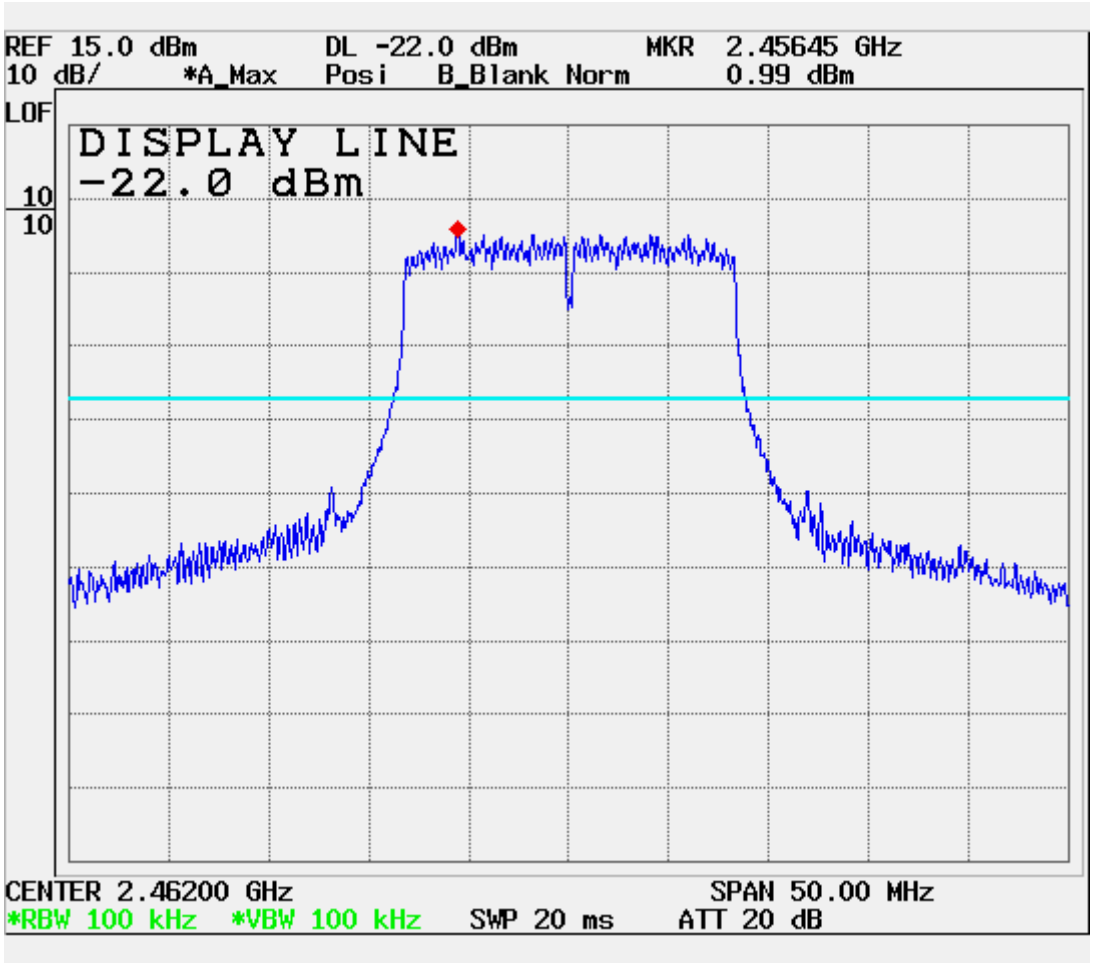
c. MIDDLE CH REFERENCE



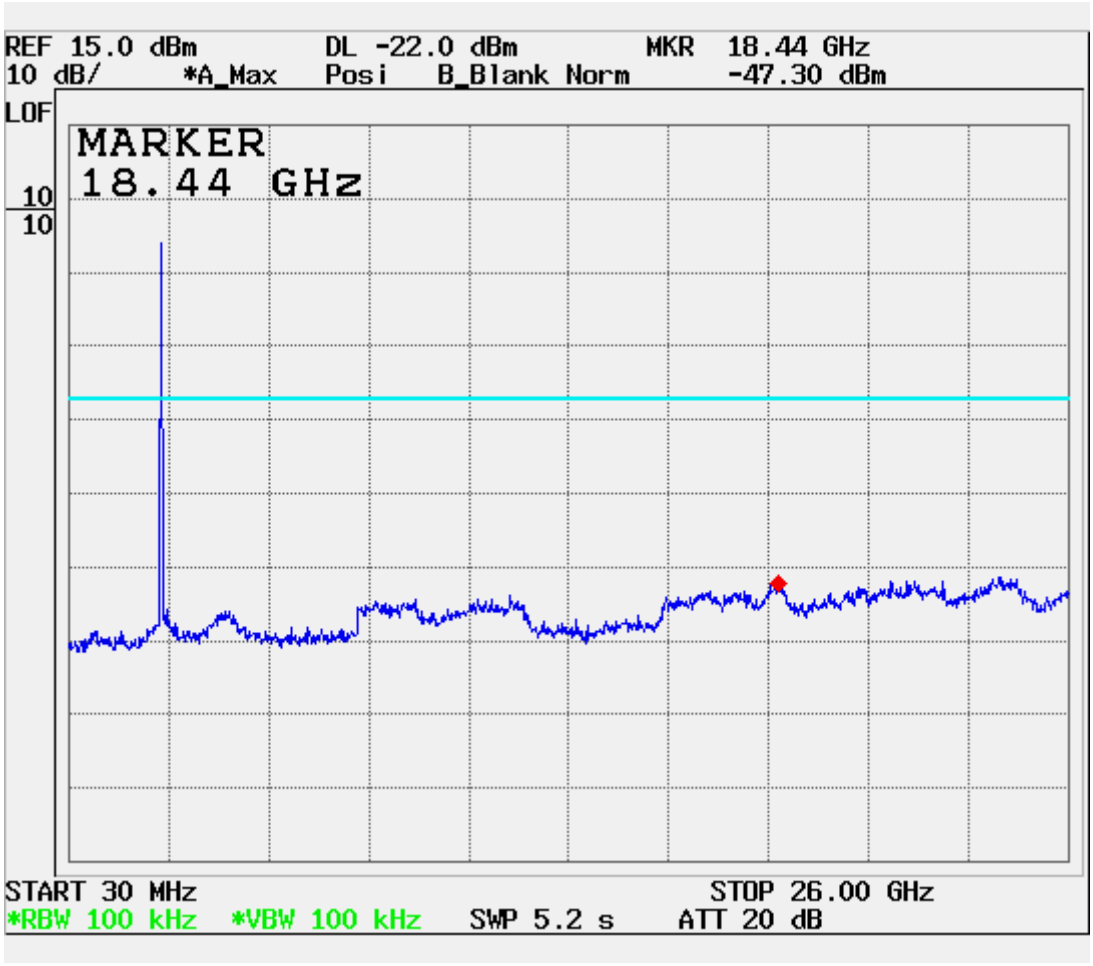
d. MIDDLE CH SPURIOUS



e. HIGH CH BANDEDGE



f. HIGH CH SPURIOUS



15. FCC PART 15.247 REQUIREMENTS

15.1 BAND EDGES MEASUREMENT

LIMITS

According to §15.247(d), in and 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK : RBW=VBW=1MHz/ Sweep=AUTO
   (b) AVERAGE : RBW=1MHz/ VBW=10Hz/ Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

LIMITS

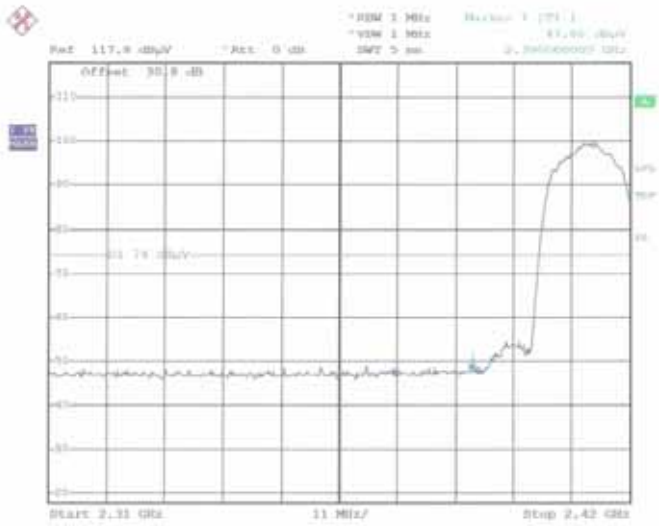
Refer to attach spectrum analyzer data chart.

16. Antenna Disturbance Test Data

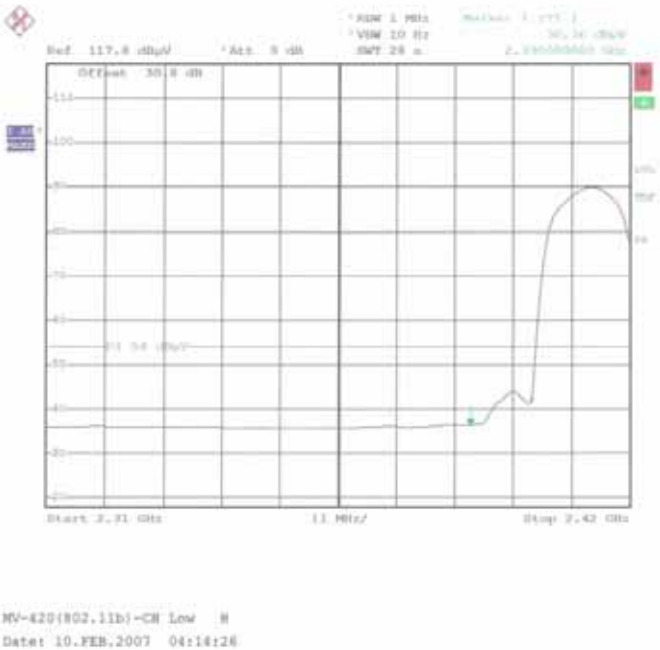
16.1 Band Edges (CH 11) low

[802.11b]

a. Detector mode : Peak **Polarity : Horizontal**

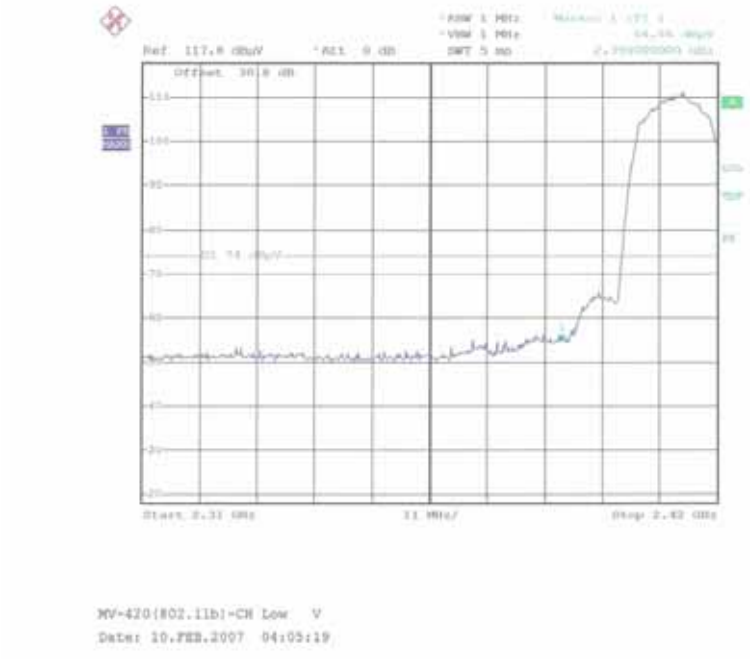


b. Detector mode : Average **Polarity : Horizontal**

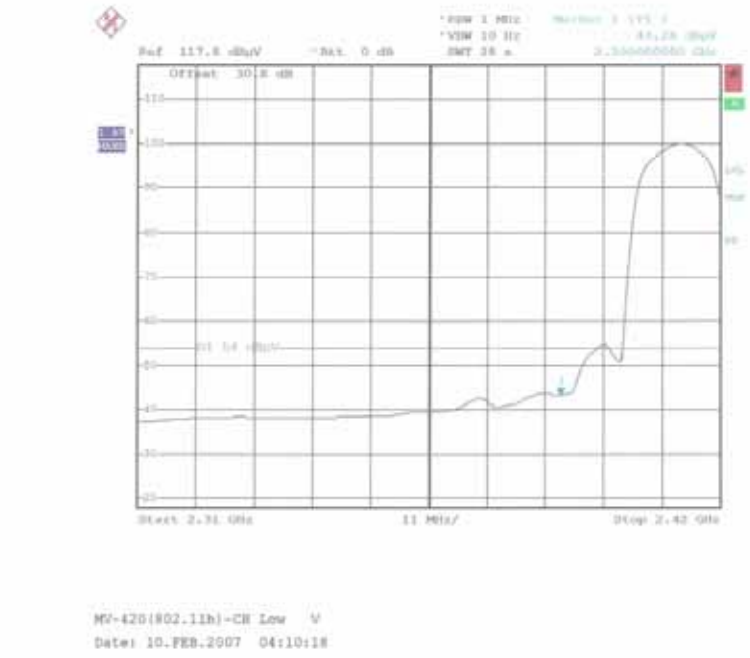


Band Edges (CH 11) low

c. Detector mode : Peak **Polarity : Vertical**

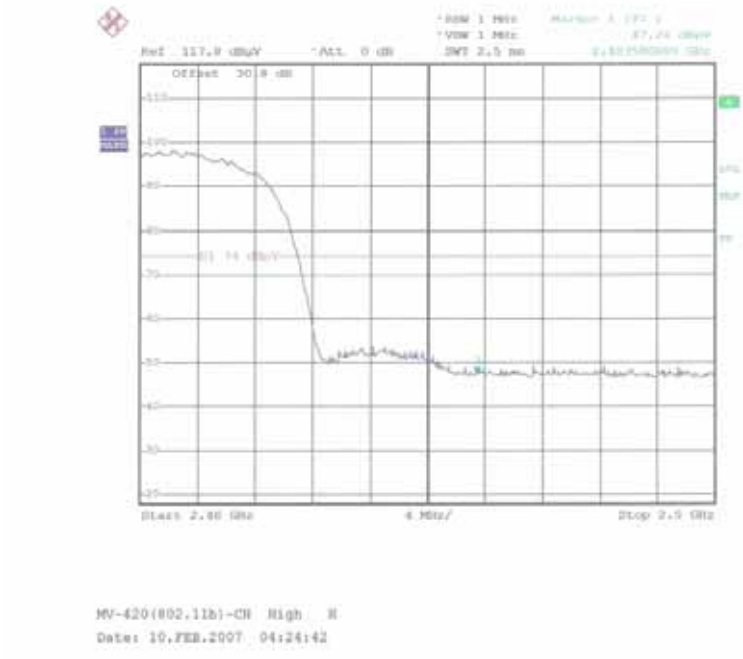


d. Detector mode : Average **Polarity : Vertical**

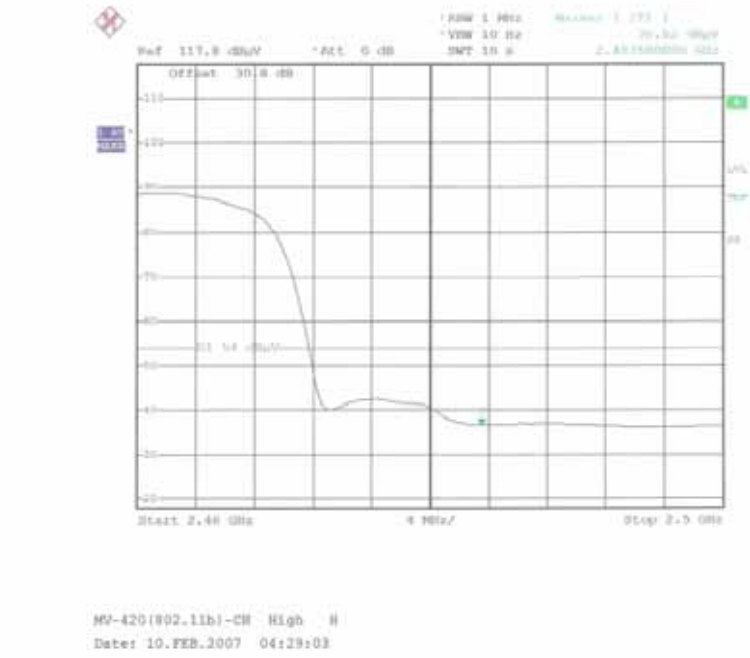


Band Edges (CH 26) High

e. Detector mode : Peak **Polarity : Horizontal**

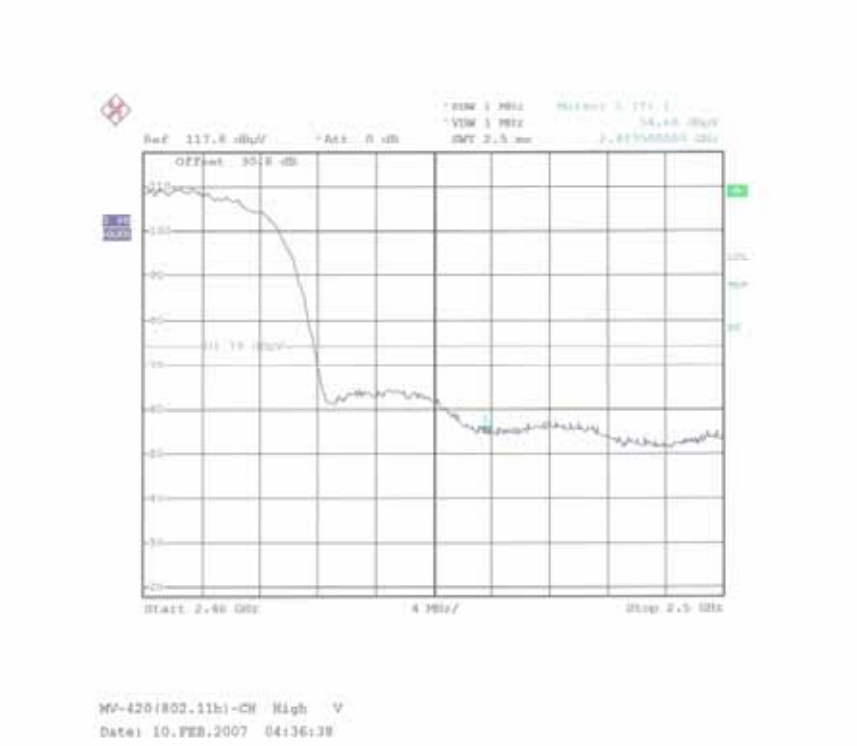


f. Detector mode : Average **Polarity : Horizontal**

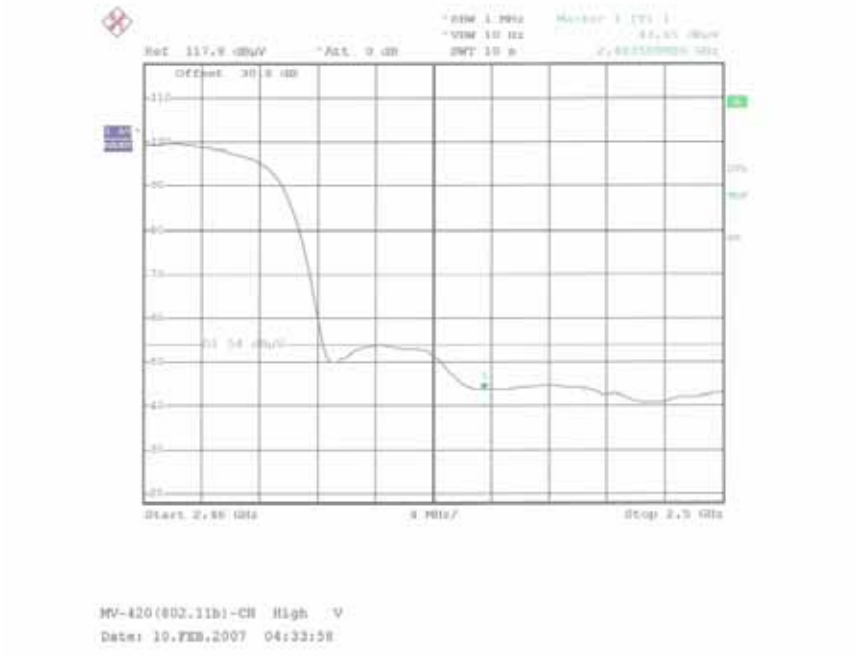


Band Edges (CH 26) High

g. Detector mode : Peak **Polarity : Vertical**



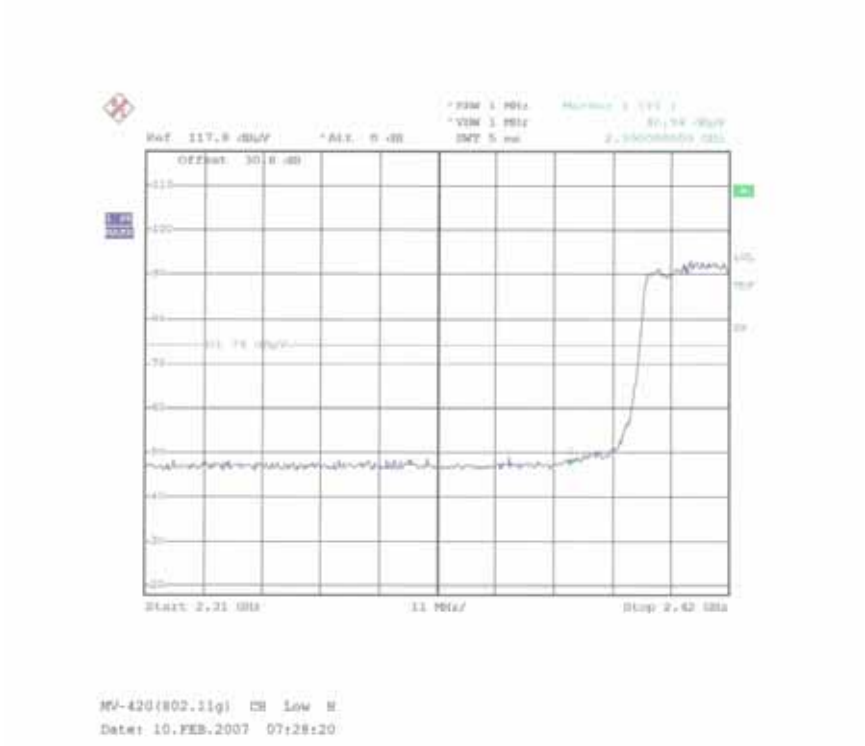
h. Detector mode : Average **Polarity : Vertical**



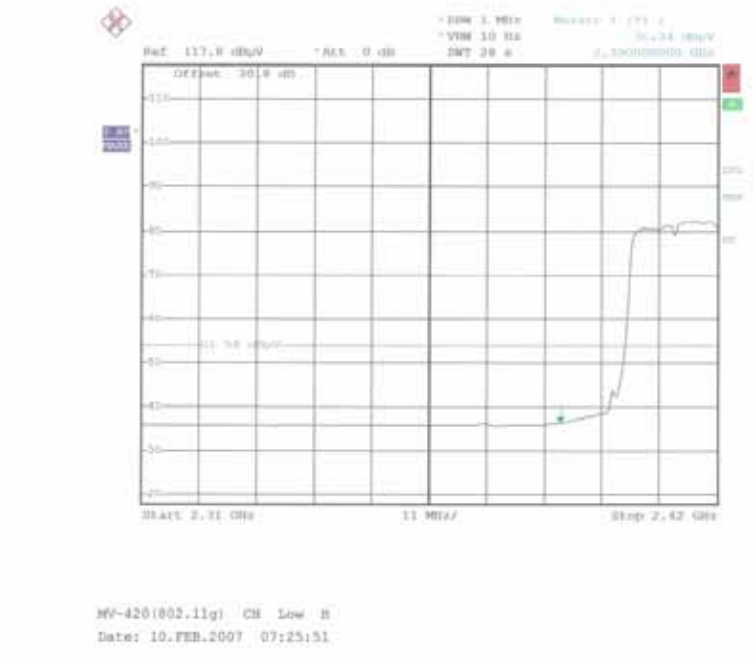
[802.11g]

16.1 Band Edges (CH 11) low

a. Detector mode : Peak **Polarity : Horizontal**

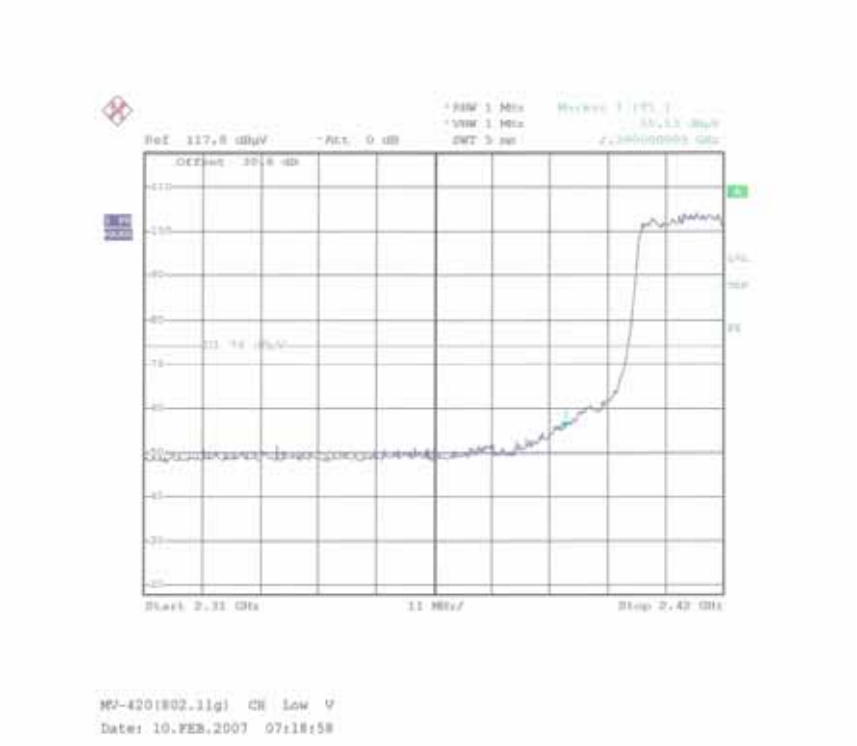


b. Detector mode : Average **Polarity : Horizontal**

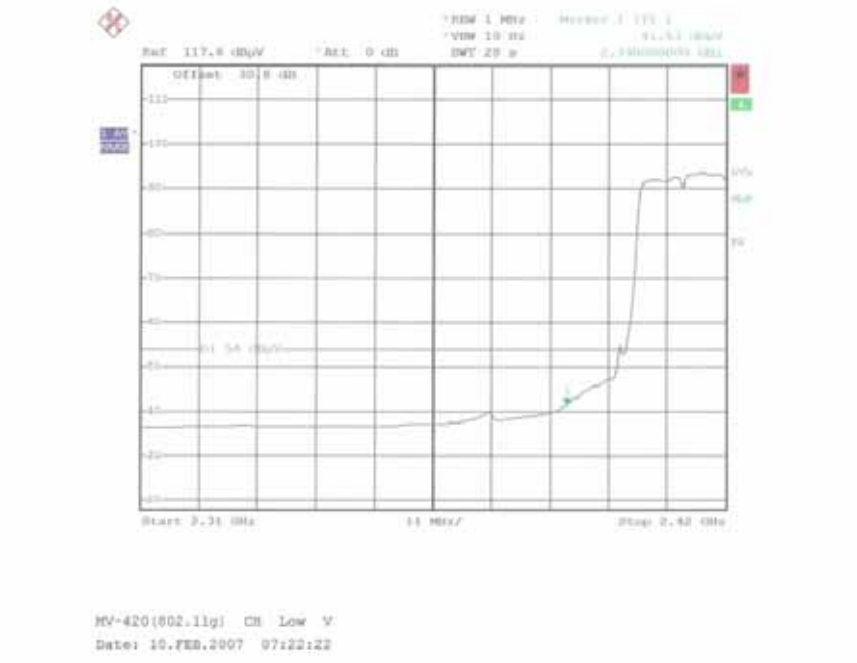


Band Edges (CH 11) low

c. Detector mode : Peak **Polarity : Vertical**

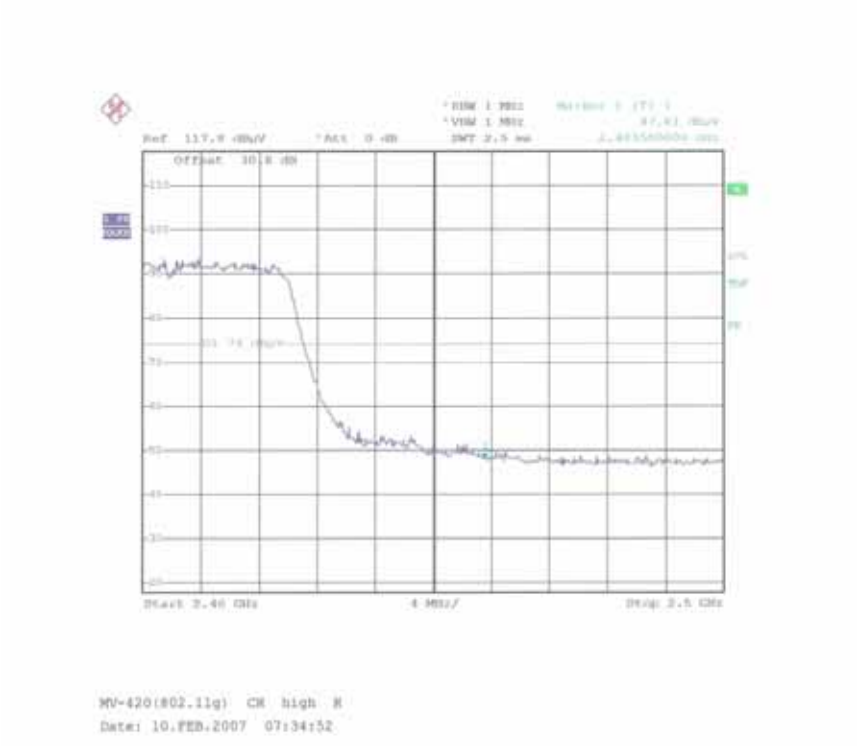


d. Detector mode : Average **Polarity : Vertical**

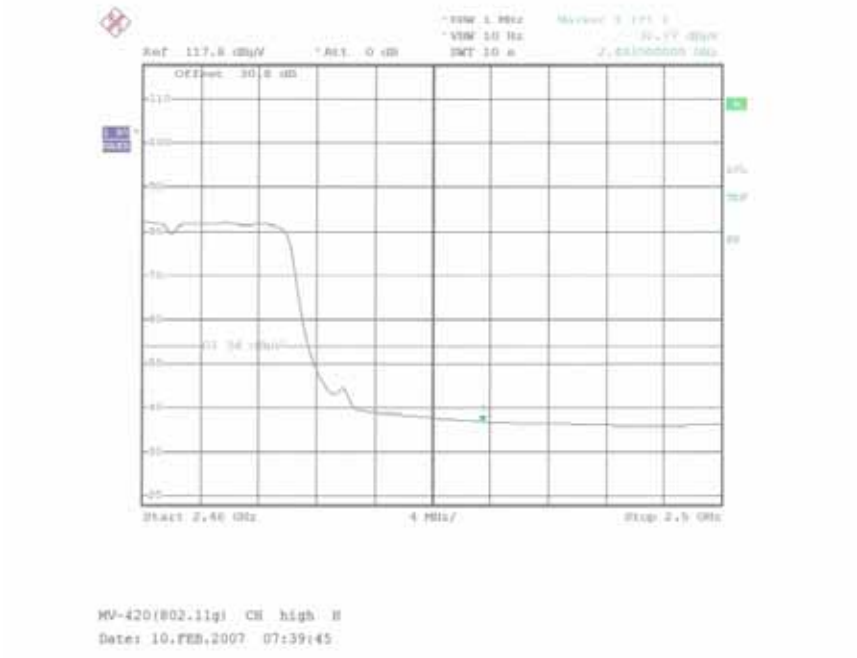


Band Edges (CH 26) High

e. Detector mode : Peak **Polarity : Horizontal**

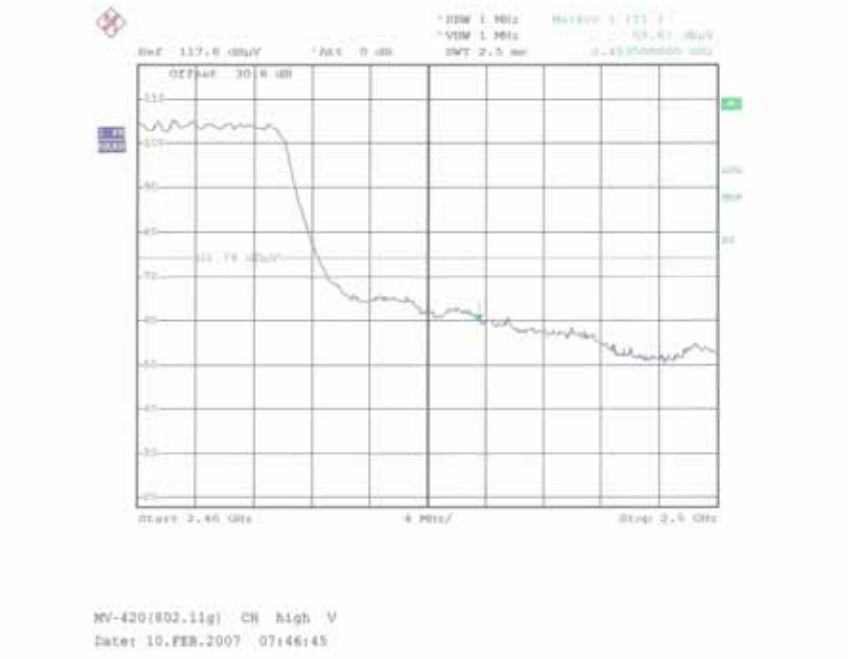


f. Detector mode : Average **Polarity : Horizontal**

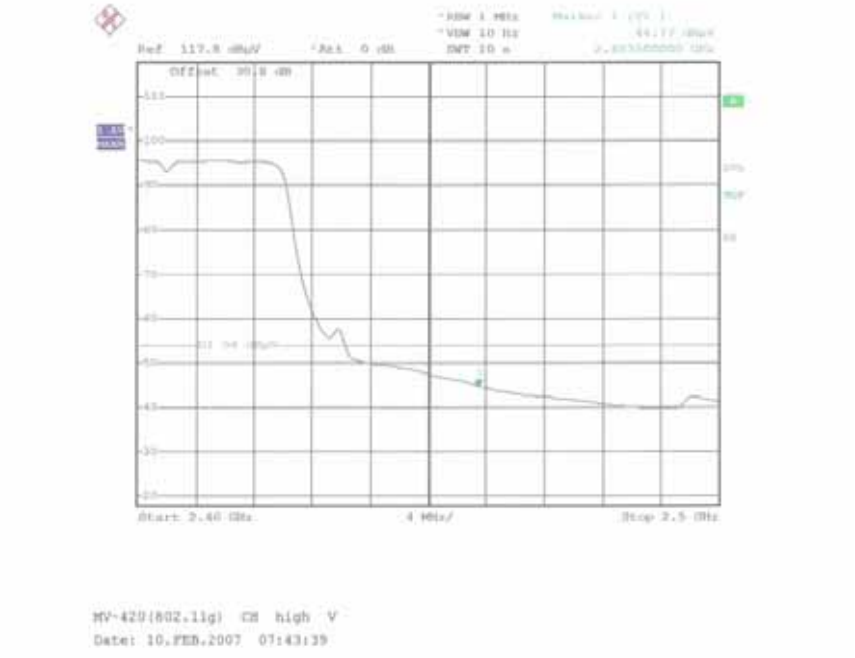


Band Edges (CH 26) High

g. Detector mode : Peak **Polarity : Vertical**



h. Detector mode : Average **Polarity : Vertical**



17. SPURIOUS EMISSIONS

17.1 Radiated Emissions

LIMITS

1. 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 (μV/m)	Measurement Distance (m)
0.009-0.490 MHz	2400/F (kHz)	300
0.490-1.705 MHz	24000/F (kHz)	30
1.705-30.00 MHz	30	30
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500*	3

Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

2. In the above emission table, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
0.009-0.490 MHz	2400/F (kHz)	-
0.490-1.705 MHz	24000/F (kHz)	-
1.705-30.00 MHz	30	-
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Table 2

18. RADIATED TEST DATA

WORST-CASE RADIATED EMISSION BELOW 1GHz

[Standby mode(worst-case)]

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
74.0	24.0	9.1	1.9	V	35.0	40.0	5.0
100.0	24.4	9.3	2.3	V	36.0	43.5	7.5
192.0	18.0	9.9	3.1	V	31.0	43.5	12.5
297.0	20.1	12.6	4.0	V	36.7	46.0	9.3
302.0	23.7	12.7	4.0	V	40.4	46.0	5.6
336.0	16.3	13.5	4.2	H	34.0	46.0	12.0

NOTES:

1. All emission were investigated and the worst-case emissions are reported.
2. The EUT was tested up to the 10th harmonic(25.0GHz) and no significant emission was found.
3. Above 1 GHz the limit is 500 μV/m at 3 meters radiated.

[Data mode-802.11b with 11 Mbps(worst-case)]

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
57.0	22.2	11.8	1.7	V	35.7	40.0	4.3
98.0	20.1	9.0	2.3	V	31.4	43.5	12.1
125.0	19.9	11.5	2.6	V	34.0	43.5	9.5
192.0	18.4	9.9	3.1	V	31.4	43.5	12.1
243.0	18.6	10.9	3.5	V	33.0	46.0	13.0
302.0	14.5	12.7	4.0	H	31.2	46.0	14.8

Radiated Measurements at 3-meters.

NOTES:

1. All emission were investigated and the worst-case emissions are reported.
2. The EUT was tested up to the 10th harmonic(25.0GHz) and no significant emission was found.
3. Above 1 GHz the limit is 500 μV/m at 3 meters radiated.

TRANSMITTER RADIATED EMISSION ABOVE 1GHz

[802.11b with 11 Mbps (worst-case)]

	Frequency MHz	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (Peak) dB	Margin (Average) dB
Low	4820.0	V	51.63	39.03	-2.64	48.99	36.39	74.0	54.0	25.01	17.61
	7220.0	V	39.94	32.53	3.06	43.0	35.59	74.0	54.0	31.00	18.41
Middle	4874.0	V	51.63	40.00	-2.65	48.98	37.35	74.0	54.0	25.02	16.65
	7311.0	V	40.00	33.00	3.08	43.08	36.08	74.0	54.0	30.92	17.92
High	4924.0	V	51.00	48.50	-2.65	48.35	45.85	74.0	54.0	25.65	8.15
	7386.0	V	39.00	32.00	3.08	42.08	35.08	74.0	54.0	31.92	18.92

[802.11g with 54 Mbps(worst-case)]

	Frequency MHz	Ant. Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (Peak) dB	Margin (Average) dB
Low	4820.0	V	50.0	37.5	-2.64	47.36	34.86	74.0	54.0	26.64	19.14
	7220.0	V	38.0	30.0	3.06	53.06	33.06	74.0	54.0	20.94	20.94
Middle	4874.0	V	50.2	37.8	-2.65	47.35	35.15	74.0	54.0	26.65	18.85
	7311.0	V	38.1	30.2	3.08	53.08	33.28	74.0	54.0	20.92	20.72
High	4924.0	V	48.0	36.5	-2.65	47.35	33.85	74.0	54.0	26.65	20.15
	7386.0	V	36.0	30.6	3.08	53.08	33.68	74.0	54.0	20.92	20.32

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported(Page7).
2. The radiated limits are listed on Table 2 (Page 7).
3. Correction Factor = Amp factor-antenna Factor – cable Loss
4. No Radiation emission above 7.5 GHz

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 10Hz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

19. ANTENNA REQUIREMENTS

1.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, 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.
And according FCC 47 FCR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

1.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used for this product is 1/4 λ Sleeve Dipole antenna. The temporary antenna connector is SMA connector and the peak Gain of this antenna is only 1.5 dBi.

20. Test Equipment

Manufacturer	Model / Equipment	Calibration Date	Cal Interval	Calibration Due	Serial No.
Rohde & Schwarz	ESI40/ EMI Test Receiver	11/06/2006	Annual	11/06/2007	831564103
Rohde & Schwarz	ESCI/ EMI Test Receiver	08/24/ 2006	Annual	08/24/ 2007	100033
Rohde & Schwarz	ESH2-Z5/ LISN	04/26/2006	Annual	04/26/2007	861741/013
EMCO	703125/ LISN	04/26/2006	Annual	04/26/2007	1357
Schwarzbeck	VULB 9160/ TRILOG Antenna	04/17/2006	Annual	04/17/2007	9160-3150
HD	MA240/ Antenna Position Tower	N/A	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	N/A	114
Voltech	PM 3300/ Power Analyzer	03/22/2006	Annual	03/22/2007	AK06/8896
Voltech	IEC 555/ Reference Network Impedance	N/A	N/A	N/A	IC0618898
PACIFIC	Magnetic Module/ AC Power Source	N/A	N/A	N/A	212
PACIFIC	360-AMX/ AC Power Source	12/28/2006	Annual	12/28/2007	212
HD GmbH	HD 100/ Controller	N/A	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	N/A	12
Rohde & Schwarz	ESH3-Z2/ PULSE LIMITER	10/30/2006	Annual	10/30/2007	375.8810.352
MITEQ	AMF-6D-001180-35-209/ AMP	04/26/2006	Annual	04/26/2007	567624
Schwarzbeck	BBHA 9120D/ Horn Antenna	03/30/2006	Annual	03/30/2007	147
Rohde & Schwarz	HFH2-Z2/Loop Antenna	01/10/2007	Annual	01/10/2008	881056/070
ADVANTEST	R3273/Spectrum Analyzer	06/15/2006	Annual	06/15/2007	J004821
Agilent	E4416A /Power Meter	01/22/2007	Annual	01/22/2008	GB41291412
Weinschel	2/Attenuator	01/24/2007	Annual	01/24/2008	BR0554
Wainwright Instrument	WHF3.3/18G-10EF /Hh Pass Filter	06/28/2006	Annual	06/28/2007	1

21. Test Software Used

The EUT should be on continuous transmitting mode.

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

The device under test was operated during the measurement under following conditions:

■ The EUT was operating the Maximum power