Nemko Test Report: 65847RUS2

Applicant: AMX
3000 Research Drive
Richardson, TX 75082
USA

Equipment Under Test: (E.U.T.) MVP-9000i

In Accordance With: **FCC Part 15, Subpart E, 15.407 and Industry Canada, RSS-210, Issue 8, Annex 9**
Unlicensed National Infrastructure Devices

Tested By: Nemko USA, Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

TESTED BY: _____ **DATE:** **18 January 2011**
David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** **19 May 2011**
Tom Tidwell, Telecom Direct

Number of Pages: 40

Table of Contents

Section 1. Summary of Test Results

Manufacturer: AMX

Model No.: MVP-9000i

Variants: MVP-9000i-GW (White Plastics) MVP-9000i-GB (Black Plastics)

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart E, Paragraph 15.407 and Industry Canada RSS-210, Issue 8, Annex 9 for Unlicensed National Infrastructure Devices. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

☒	New Submission	☒	Production Unit
☐	Class II Permissive Change	☐	Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP Lab Code 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a)/RSS-Gen 7.2.4	Complies
26 dB Bandwidth	15.407(a)(1)/)/A9.2(1)	Complies
Maximum Peak Power Output	15.407(a)(1)/A9.2(1)	Complies
Peak Power Spectral Density (PPSD)	15.407(a)(1)/A9.2(1)	Complies
Peak Excursion	15.407(a)(6)/A9.4(2)	Complies
Unwanted Emissions	15.407(b)(1)/A9.2(1)	Complies
Unwanted Emissions (Restricted Bands)	15.407(b)(7)/RSS-Gen 7.2.2	Complies
Receiver Spurious Emissions	RSS-Gen 6.1	Complies

Footnotes:

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Band (MHz): 5.15 to 5.25 GHz

Operating Frequency of Test Sample: 5.18 to 5.24 MHz

User Frequency Adjustment: Software controlled

Description of EUT

The AMX MVP-9000i-XX Modero Wireless Touch Panel is a mobile device that communicates with a NetLinx Master via a standard 802.11a/b/g Wireless Access Point.

Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: FCC 15.407(a)(1) RSS-210, A9.2(1)
TESTED BY: David Light	DATE: 15 December 2010

Test Results: Complies.

Measurement Data: See 26 dB BW plot
Measured 26 dB bandwidth: 22.8 MHz

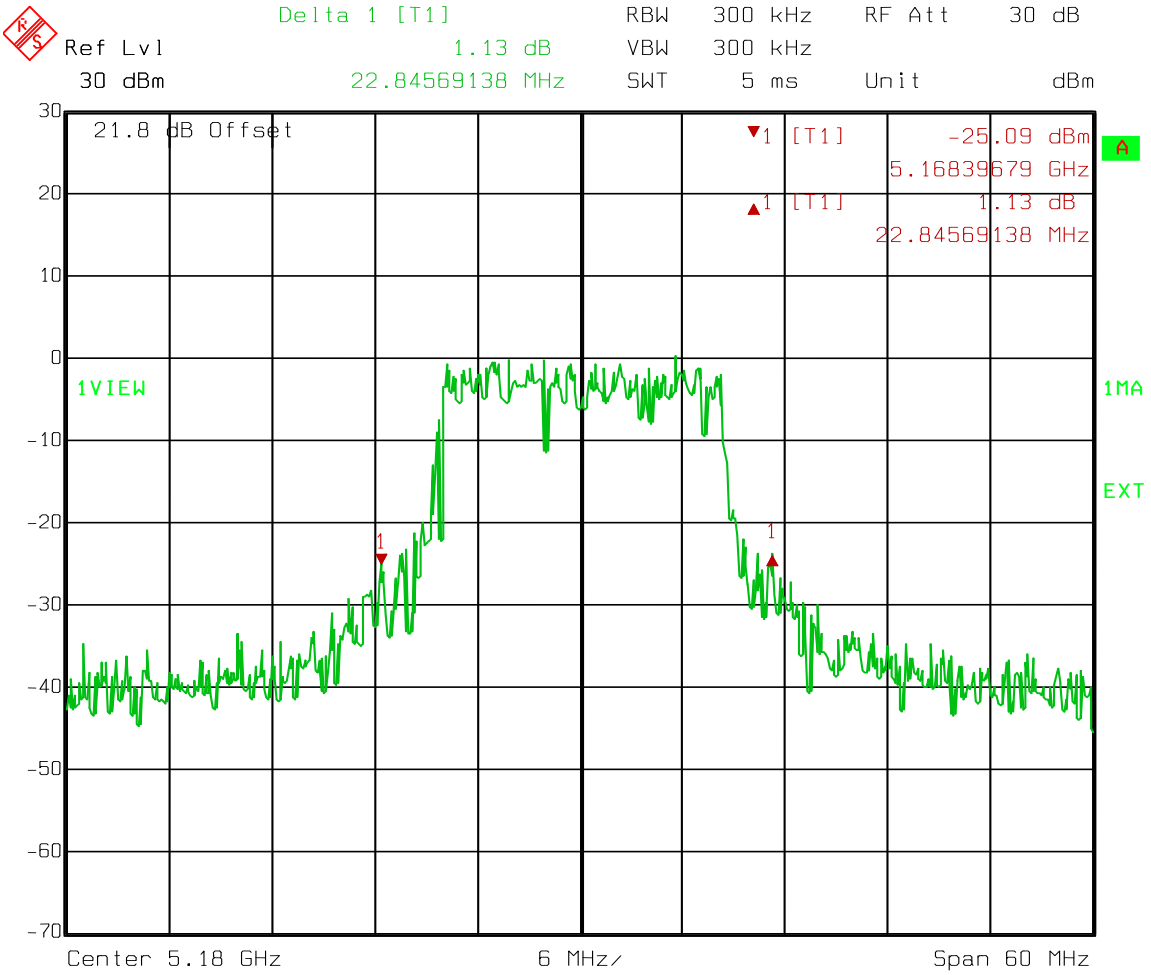
Test Conditions: 50 %RH
23 °C

Measurement Uncertainty: +/-1x10^{-7} ppm

Test Equipment Used: 1036-1082-1472

Test Data – Occupied Bandwidth

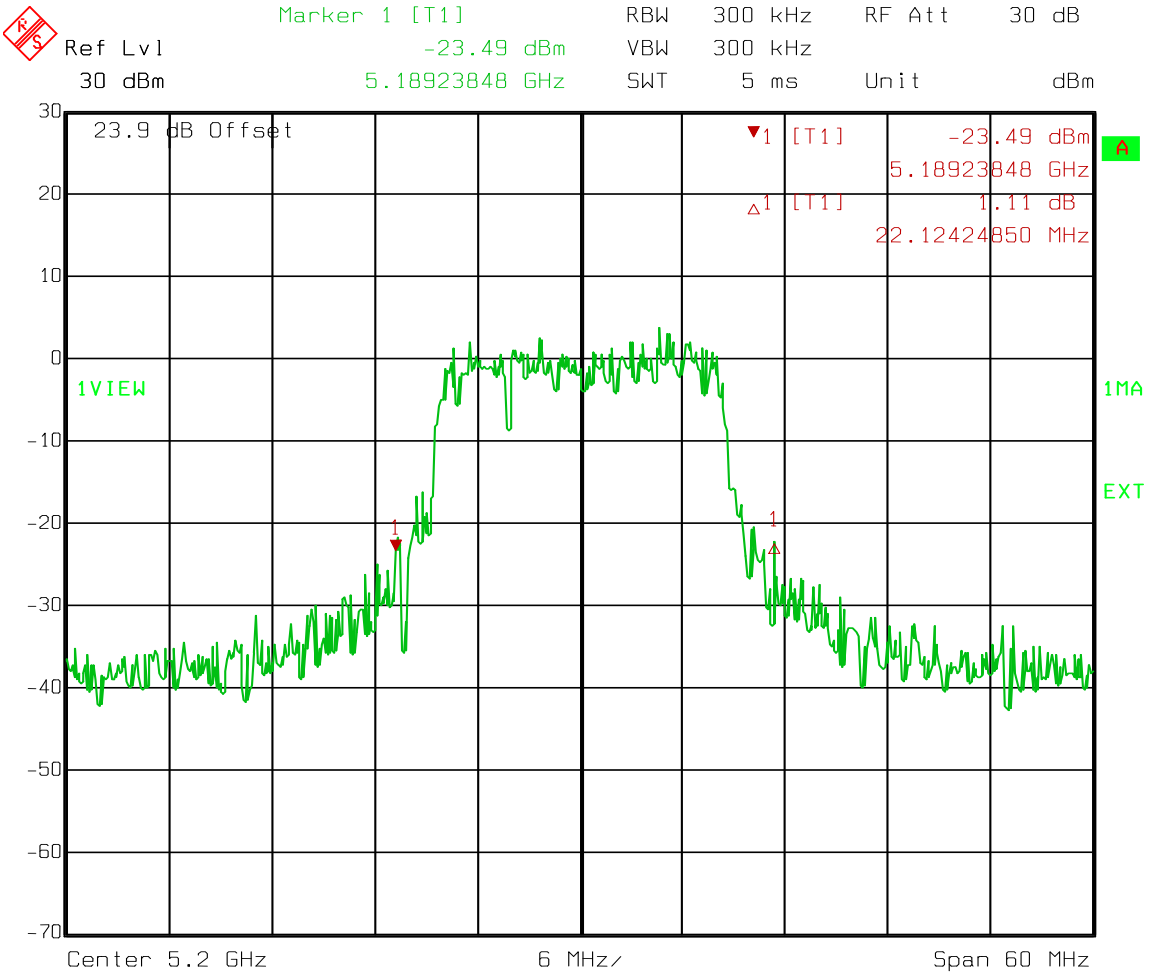
Lowest channel
26 dB Bandwidth



Test Data – Occupied Bandwidth

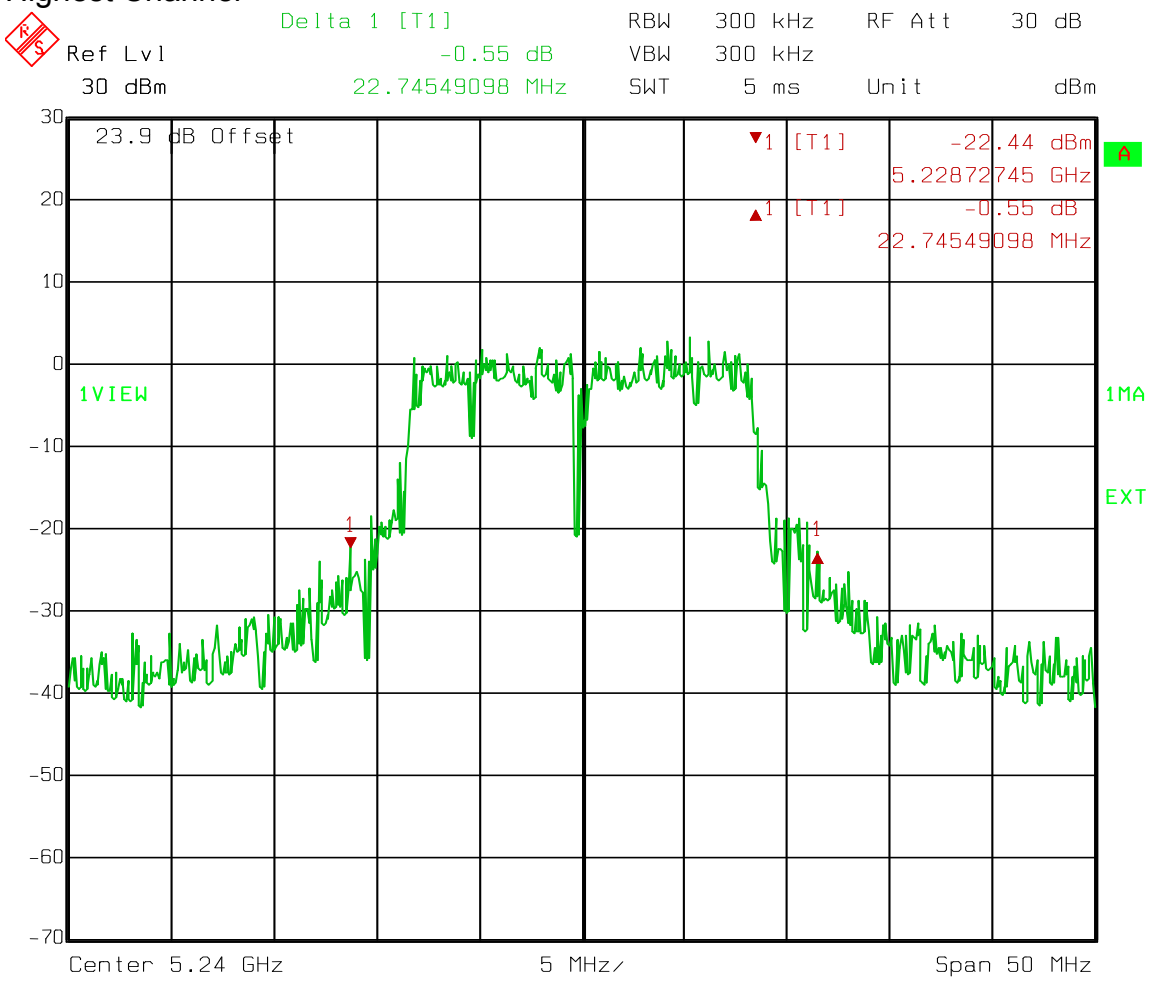
Mid Channel

26 dB Bandwidth



Test Data – Occupied Bandwidth

26 dB Bandwidth
Highest Channel



Section 4. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	FCC PARA. NO.: 15.407(a)(1) RSS-210, A8.4(4)
TESTED BY: David Light	DATE: 13 December 2010

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Power Output (dBm)	Power Output (mW)
5180	18.1	64.6
5200	19.2	83.2
5240	19.0	79.4

Test Conditions: 50 %RH
23 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082-1472

☒ This device was tested at +/- 15% input power per 15.31(e), with no variation in output power.

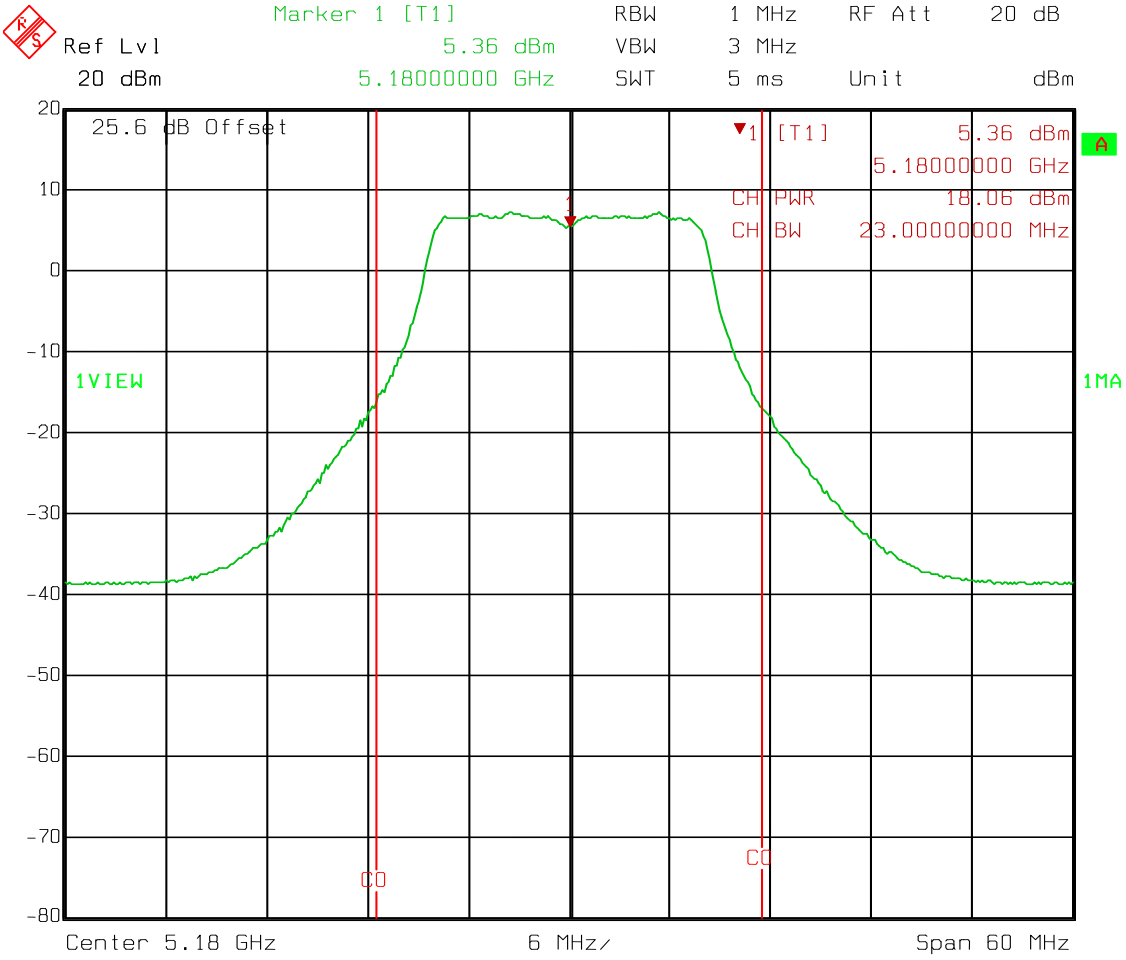
☐ For battery powered equipment, the device was tested with a fresh battery per 15.31(e).

☒ The device was tested on three channels per 15.31(l).

☐ This test was performed radiated.

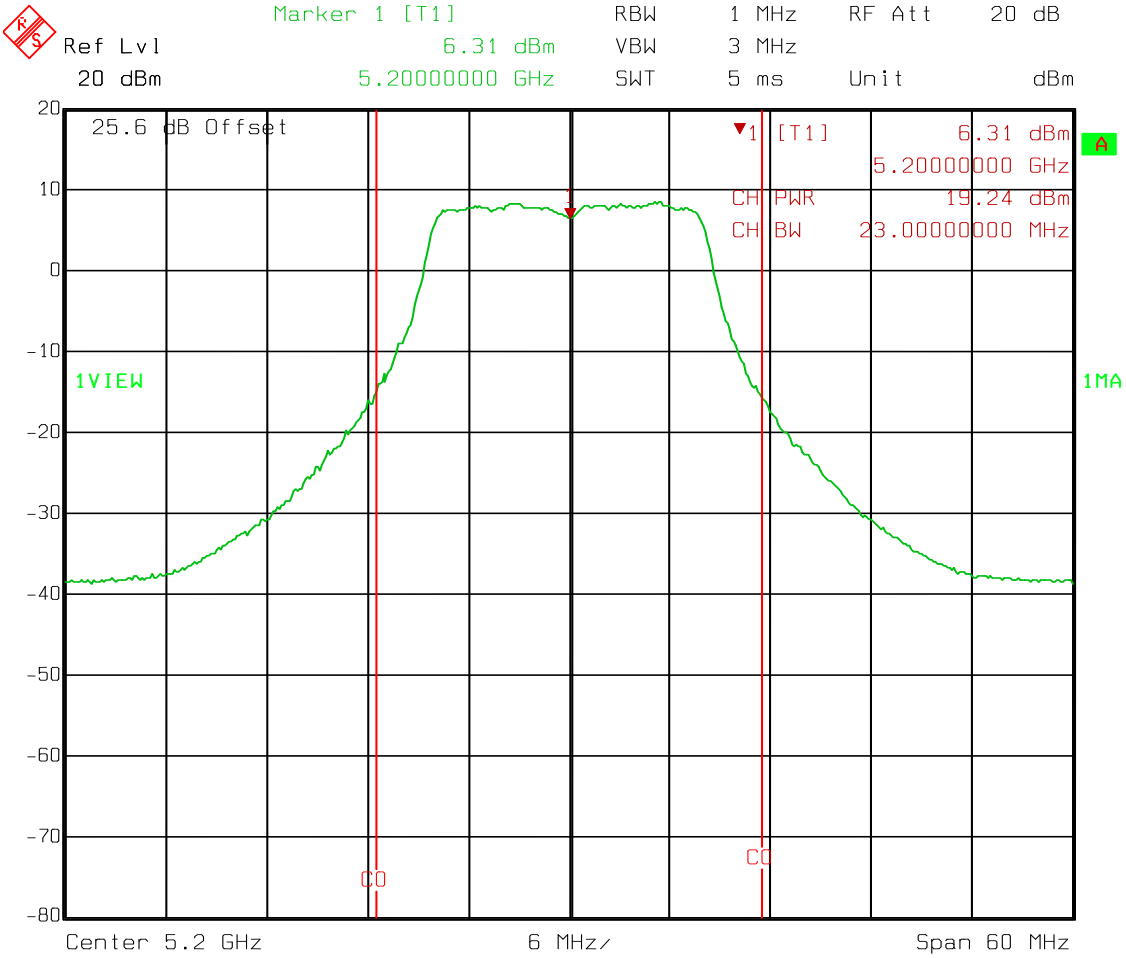
Test Data – Peak power Output

Lowest channel



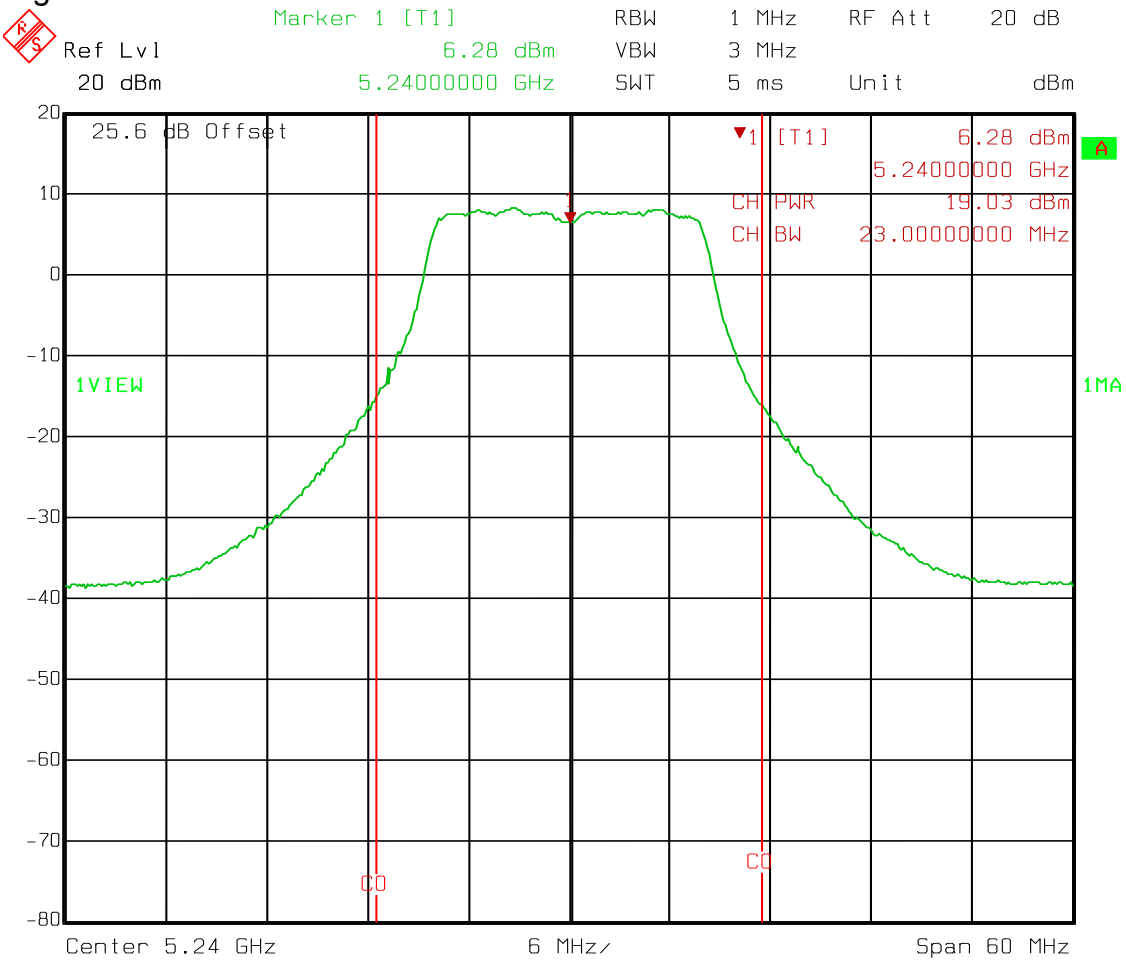
Test Data – Peak power Output

Mid Channel



Test Data – Peak power Output

Highest Channel



Test Data – Average RF Power

802.11a Lower				
Freq	Channel	Data Rate	Antenna	Power
5180	36	6	1	12.92
5200	40	6	1	12.97
5220	44	6	1	13.01
5240	48	6	1	13.01
5180	36	6	2	12.89
5200	40	6	2	12.95
5220	44	6	2	13.00
5240	48	6	2	13.07

These measurements were made with an averaging power meter for comparison with SAR data submitted as separate exhibit.

Test equipment used: 2071-2072

Section 5 Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: FCC 15.407(a)(1) RSS-210, A9.2(1)
TESTED BY: David Light	DATE: 15 December 2010

Test Results: Complies.

Measurement Data: See attached plots.

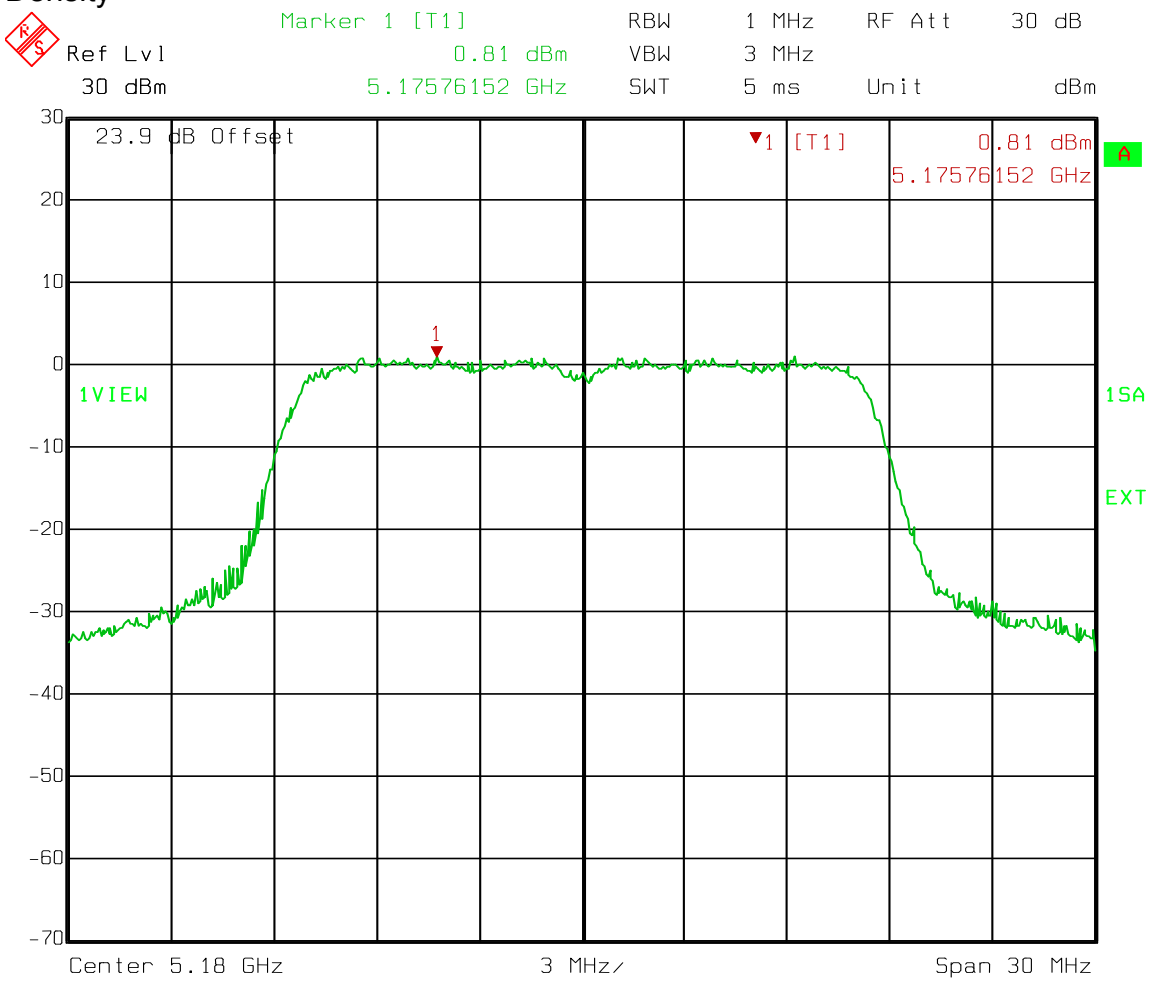
Test Conditions: 50 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082-1472

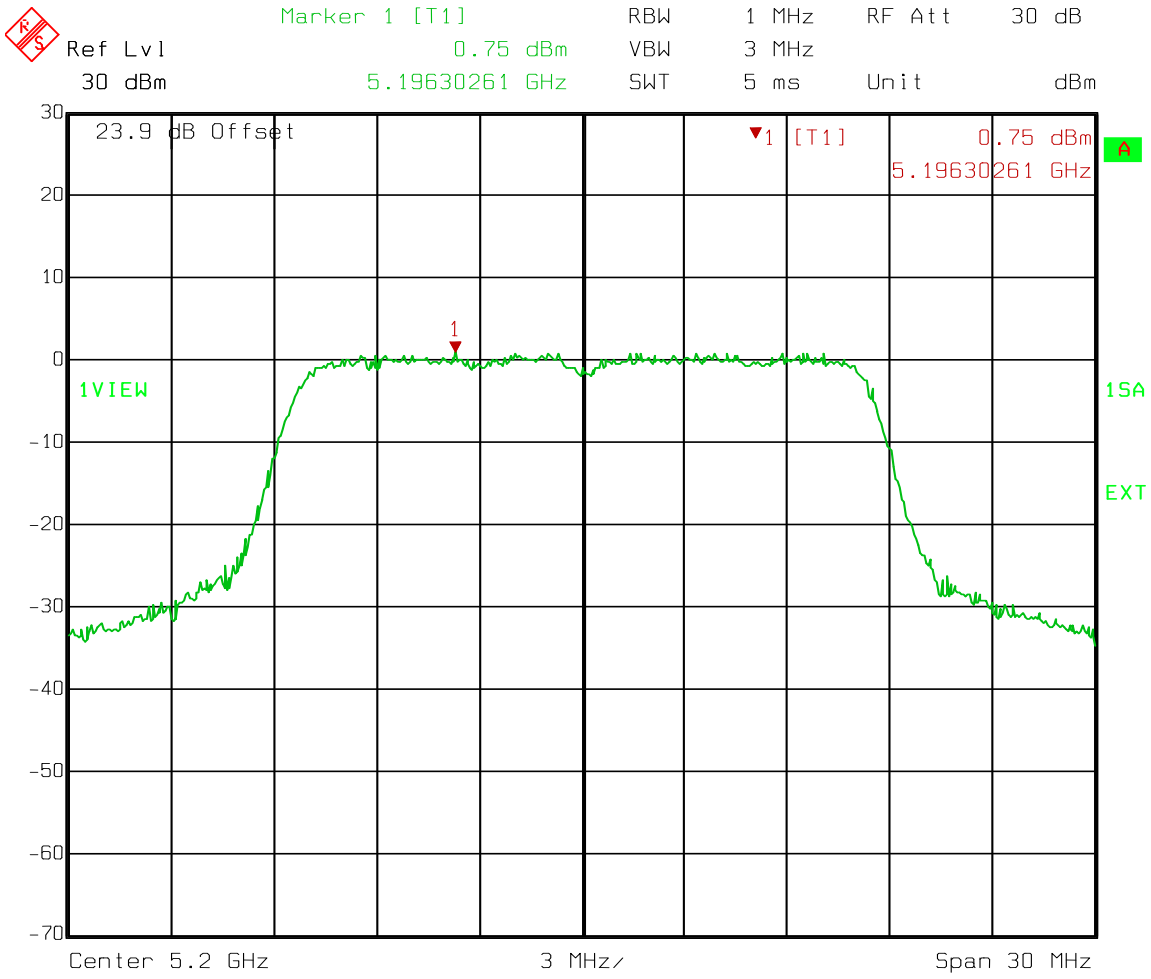
Test Data – PPSD

Lowest channel
Density



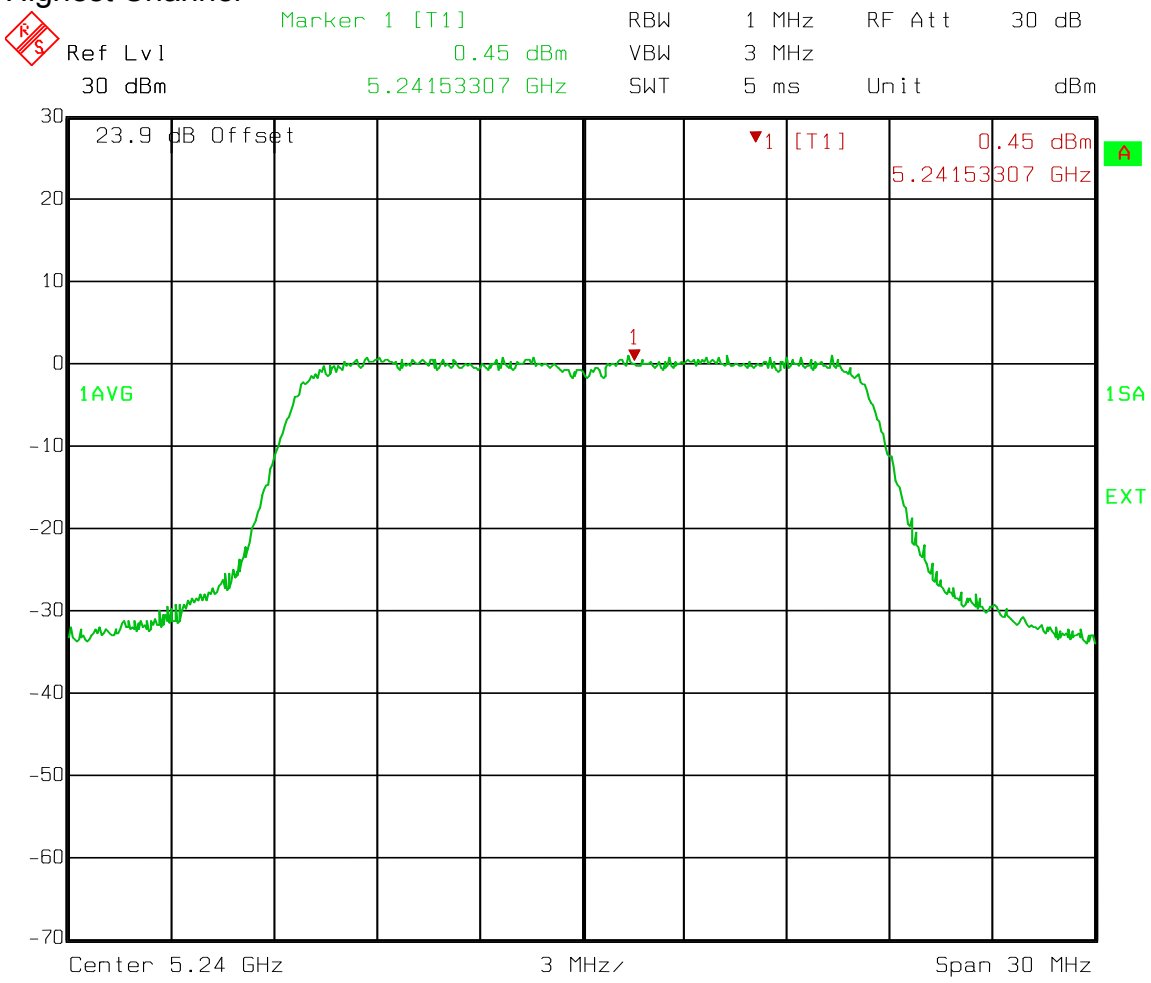
Test Data – PPSD

Mid Channel



Test Data – PPSD

Highest Channel



Section 6. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: FCC 15.247 (d) RSS-Gen, 7.2.2
TESTED BY: David Light	DATE: 15 December 2010

Test Results: Complies.

Measurement Data: See attached table.

Test Conditions: 45 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1464-1484-1485-993-1480-1016-791

Notes:

☒ For handheld devices, the EUT was tested on three orthogonal axis'

☒ The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33

☒ The device was tested on three channels per 15.31(l).

☒ No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o).

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz (Peak)
RBW= 1 MHz VBW=10Hz (Average)

Section 7. Peak Excursion

NAME OF TEST: Peak Excursion	PARA. NO.: FCC 15.407(a)(6) RSS-210, A9.4(2)
TESTED BY: David Light	DATE: 15 December 2010

Test Results: Complies.

Measurement Data: See attached data..

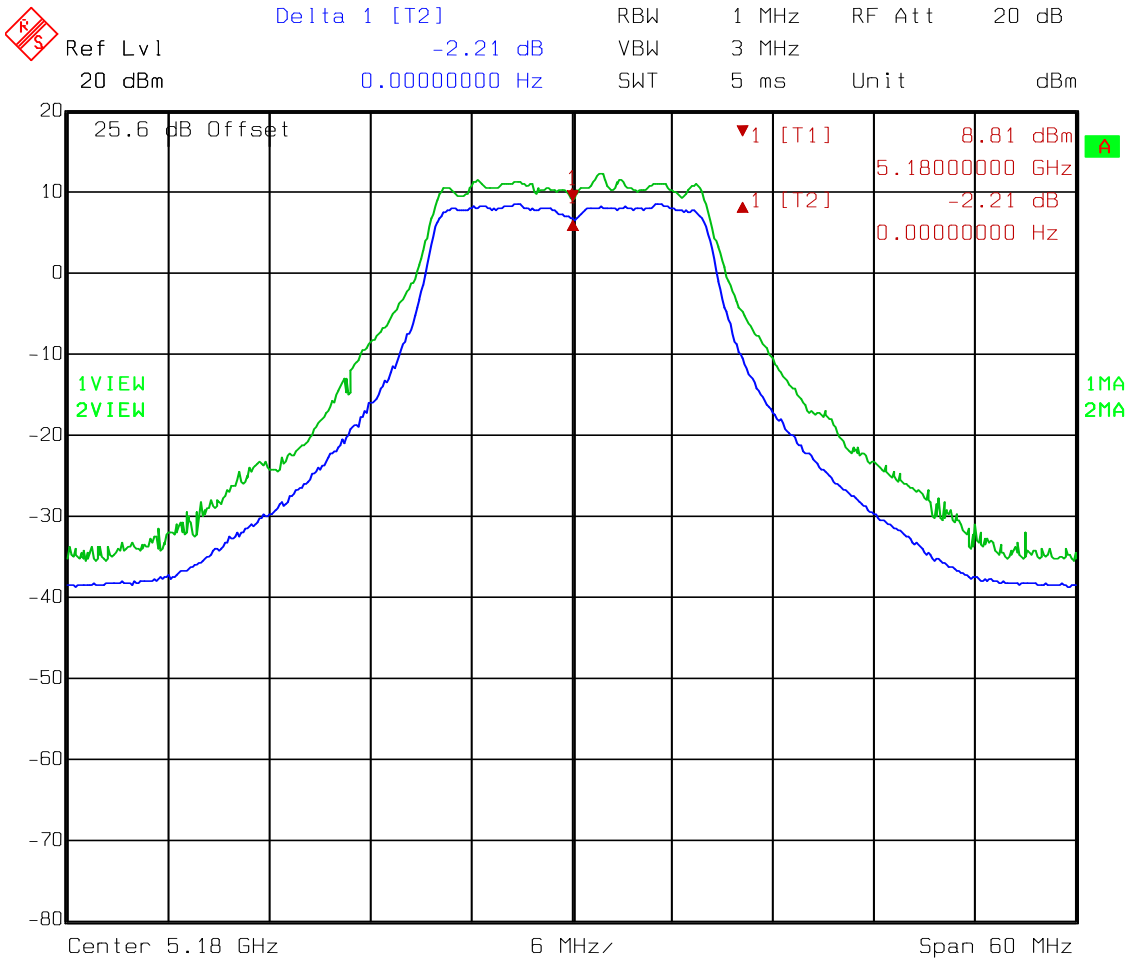
Test Conditions: 53 %RH
21 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082-1472

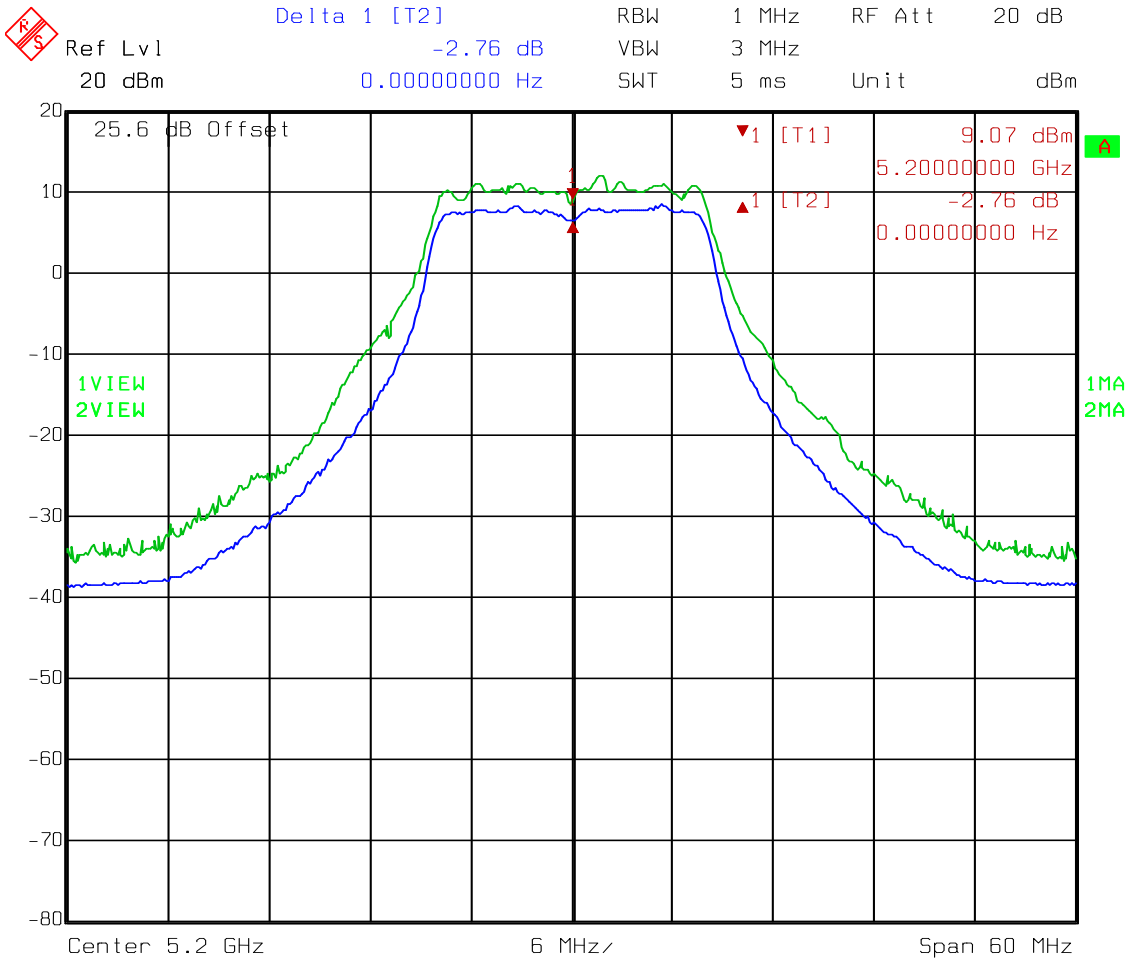
Peak Excursion

Lowest channel



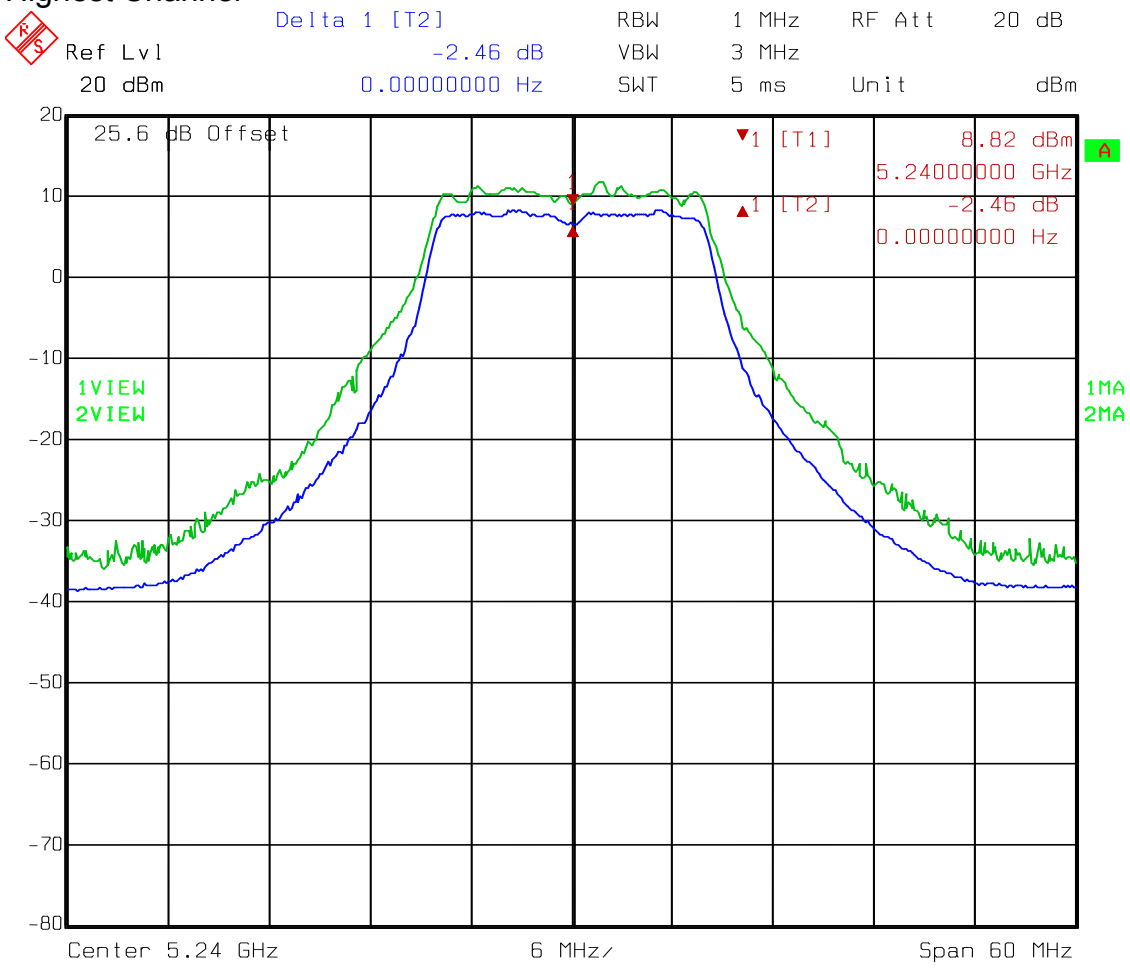
Peak Excursion

Mid channel



Peak Excursion

Highest Channel



Section 8. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a) RSS-Gen, 7.2.4
TESTED BY: David Light	DATE:16 December 2010

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

Test Equipment Used: 1659-1188-758-1485-674

Test Data – Powerline Conducted Emissions

Line 1

Frequency	FCCB	FCCB	AVG	AVG	QP	QP
kHz	QP LIMIT	AVG LIMIT	Meas	Margin	Meas	Margin
150.83	65.976	55.976	29.163	-26.814	44.139	-21.837
162.49	65.643	55.643	43.497	-12.146	56.830	-8.813
166.67	65.524	55.524	44.972	-10.552	58.733	-6.791
162.49	65.643	55.643	43.497	-12.146	56.830	-8.813
150.83	65.976	55.976	29.163	-26.814	44.139	-21.837

Line 2

Frequency	FCCB	FCCB	AVG	AVG	QP	QP
kHz	QP Limit	AVG Limit	Meas	Margin	Meas	Margin
166.67	65.524	55.524	45.597	-9.927	59.250	-6.273
169.16	65.453	55.453	45.250	-10.202	58.878	-6.575
166.67	65.524	55.524	45.597	-9.927	59.250	-6.273

Section 9. Receiver Emissions

NAME OF TEST: Receiver Emissions	PARA. NO.: RSS-Gen, 6.1
TESTED BY: David Light	DATE:17 December 2010

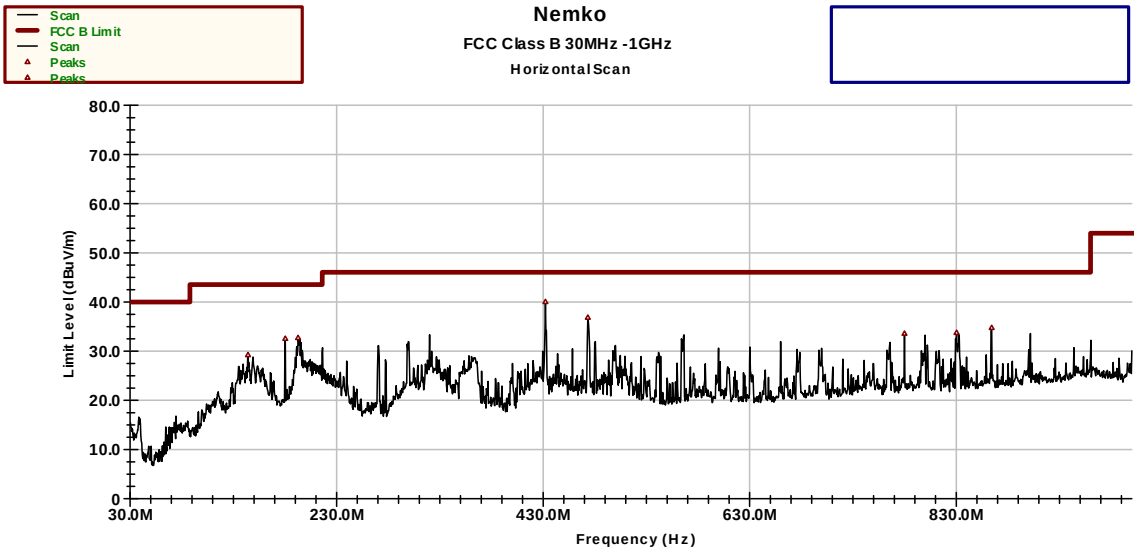
Test Results: Complies.

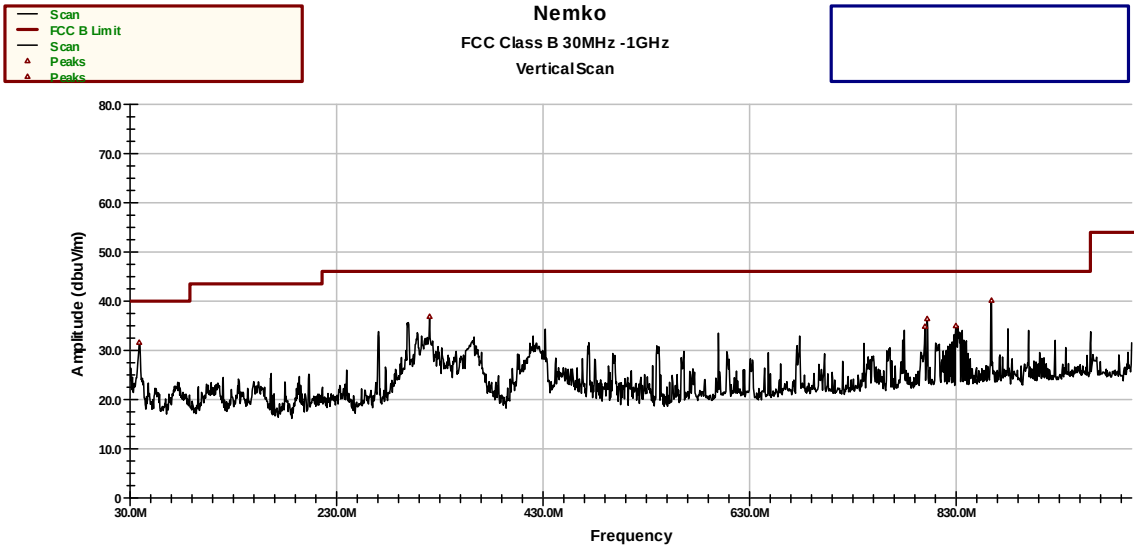
Test Data: Refer to attached data. The worst case emission was 40.2 dBµV/m at 864.2 MHz in the vertical polarity. This is 5.8 dB below the specification limit.

Measurement Uncertainty: +/- 1.7 dB

Test Equipment Used: 1036-1484-1485-1016-993-1480-791

Test Data – Receiver Spurious Emissions





The spectrum was searched from 30 MHz to the 5th harmonic of the carrier. All emissions above 1000 MHz were 20 dB or more below the specification limit.

<1000 MHz: RBW/VBW = 100 kHz Peak detector
>1000 MHz: RBW/VBW = 1 MHz Peak detector

Section 10. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
674	Limiter	Hewlett Packard	11947A	3107A02200	26-Oct-2010	26-Oct-2011
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	09-Sep-2009	09-Sep-2011
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	19-Jun-2010	19-Jun-2011
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	19-Jan-2009	19-Jan-2011
1082	Cable	Astrolab	32027-2-29094-72TC		N/R	
1188	LISN	EMCO	3825/2	1214	25-Oct-2010	25-Oct-2011
1472	Attenuator,	Omni Spectra	20600-20db		N/R	
1480	Antenna, Bilog	Schaffner-Chase	CBL6111C	2572	18-Jan-2010	18-Jan-2011
1484	Cable	Storm	PR90-010-072		19-Jun-2010	19-Jun-2011
1485	Cable	Storm	PR90-010-216		19-Jun-2010	19-Jun-2011
1659	Spectrum Analyzer	Rohde & Schwartz	FSP	973353	27-Sep-2010	27-Sep-2012
791	PreAmp	Nemko, USA			08-Mar-2010	08-Mar-2011
2071	Power Sensor	Agilent	E9304A	MY41495174	12-Oct-2010	12-Oct-2011
2072	Power Meter	Hewlett Packard	E4418B	GB39401848	23-Sep-2010	23-Sep-2011

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions PARA. NO.: 15.207(a)

Minimum Standard: §15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Conducted Emission (MHz)	Limit (dBmV) Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Maximum Peak Output Power	PARA. NO.: 15.407(a)(1)

Minimum Standard: For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Method: **FCC DA 02-2138**

In the following, "T" is the transmission pulse duration over which the transmitter is on and transmitting at its maximum power control level.
Measurements are performed with a spectrum analyzer. Three methods are provided to accommodate measurement limitations of the spectrum analyzer depending on signal parameters. Set resolution bandwidth (RBW) = 1 MHz. Set span to encompass the entire emission bandwidth (EBW) of the signal. Use automatic setting for analyzer sweep time (except in Method #2). Check the sweep time to determine which procedure to use.

- If sweep time □ T, use Method #1 -- spectral trace averaging -- and sum the power across the band. Note that the hardware operation may be modified to extend the transmission time to achieve this condition for test purposes. (Method #1 may be used only if it results in averaging over intervals during which the transmitter is operating at its maximum power control level; intervals during which the transmitter is off or is transmitting at a reduced power level must not be included in the average.)
- If sweep time > T, then the choice of measurement procedure will depend on the EBW of the signal.
  - ◊ If EBW □ largest available RBW on the analyzer, use Method #2--zero-span mode with trace averaging--and find the temporal peak. (Method #2 may be used only if it results in averaging over intervals during which the transmitter is operating at its maximum power control level; intervals during which the transmitter is off or is transmitting at a reduced power level must not be included in the average.)
  - ◊ If EBW □ largest available RBW, use Method #3--video averaging with max hold--and sum power across the band.

Method #1:

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW □ 3 MHz.
- Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode
- Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run".
- Trace average 100 traces in power averaging mode.
- Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

Method #2:

- Set zero span mode. Set center frequency to the midpoint between the -26 dB points of the signal.
- Set RBW □ EBW.
- Set VBW □ 3 RBW. [If VBW □ 3 RBW is not available, use highest available VBW, but VBW must be □ RBW]
- Set sweep time = T
- Use sample detector mode.
- Use a video trigger with the trigger level set to enable triggering only on full power pulses.
- Trace average 100 traces in power averaging mode.
- Find the peak of the resulting average trace.

Method #3:

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set sweep trigger to "free run".
- Set RBW = 1 MHz. Set VBW □ 1/T
- Use linear display mode.
- Use sample detector mode if bin width (i.e., span/number of points in spectrum) < 0.5 RBW. Otherwise use peak detector mode.
- Set max hold.
- Allow max hold to run for 60 seconds.
- Compute power by integrating the spectrum across the 26 dB EBW or apply a bandwidth correction factor of 10 log(EBW/1 MHz) to the spectral peak of the

emission. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.407(a)(1)

Minimum Standard: Not specified.

Method Of Measurement: **FCC DA 02-2138**

Emission bandwidth "B" MHz.

- Use a RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW
- Use a peak detector.
- Do not use the Max Hold function. Rather, use the view button to capture the emission.
- Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

NAME OF TEST: Unwanted Emissions	PARA. NO.: 15.407(b)

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

The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

The provisions of §15.205 apply to intentional radiators operating under this section.

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.407(a)(1)

Minimum Standard: The peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Method Of Measurement: **FCC DA 02-2138**

This is an antenna conducted measurement using a spectrum analyzer. Method #2 provides the most accurate implementation of the rule; however, equipment limitations may preclude its use for short pulses. Method #1 is also acceptable to show compliance; it may overestimate the PPSD, but is easier to implement than method #2, and must be used when the conditions of method #2 cannot be achieved.

Method 1:

Use peak detector mode and max hold. Set RBW= 1MHz* and VBW > 1 MHz. The PPSD is the highest level found across the emission in any 1-MHz band.

Method 2:

Use sample detector and power averaging (not video averaging) mode. Set RBW= 1 MHz*, VBW > 1 MHz. The PPSD is the highest level found across the emission in any 1-MHz band after 100 sweeps of averaging. This method is permitted only if the transmission pulse or sequence of pulses remains at maximum transmit power throughout each of the 100 sweeps of averaging and that the interval between pulses is not included in any of the sweeps (e.g., 100 sweeps should occur during one transmission, or each sweep gated to occur during a transmission).

* When the emission bandwidth is less than 1 MHz, use a measurement bandwidth equal to the emission bandwidth, in accordance with Section 15.407(a)5.
* It is permissible to use a resolution bandwidth less than the measurement bandwidth provided the measured power is integrated to show total power over the measurement bandwidth. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the measurement band edges or by summing power levels in each band in linear power terms.

NAME OF TEST: Peak Excursion	PARA. NO.: 15.407(a)(6)

Minimum Standard: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Method of Measurement: **FCC DA 02-2138**

Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be □ 13 dB for all frequencies across the emission bandwidth. Submit a plot.

1st Trace:

- Set RBW = 1 MHz, VBW □ 3 MHz with peak detector and max-hold settings.

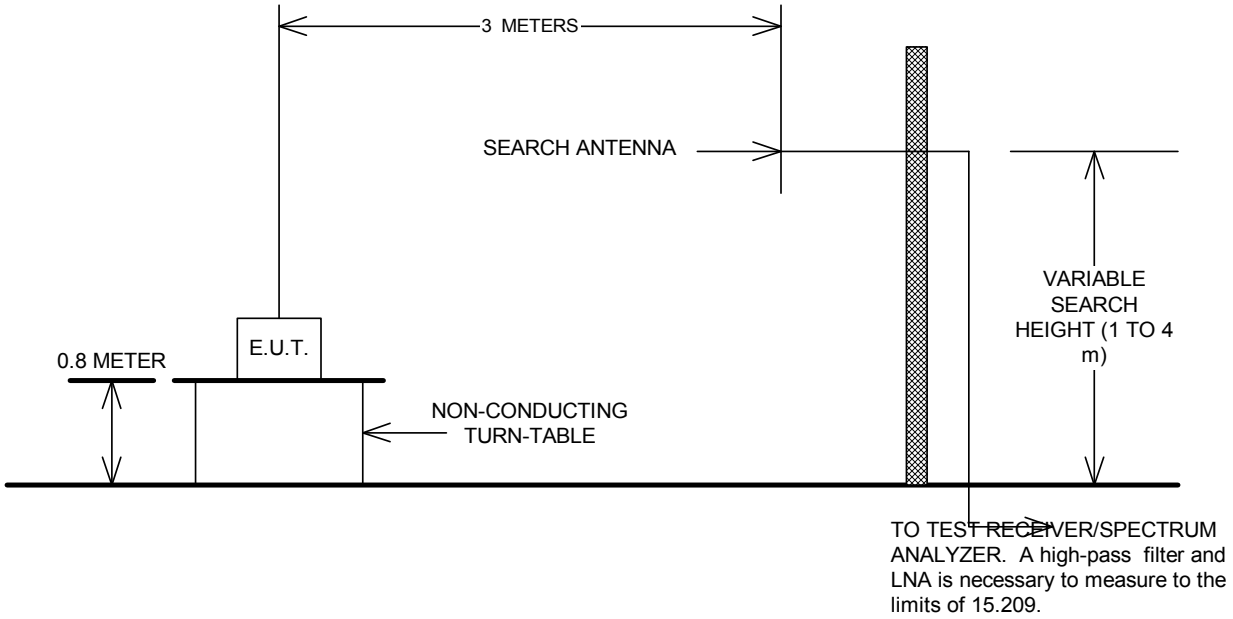
2nd Trace:

- If Method #1 was used for the peak conducted transmit output power test, then create the 2nd trace using the settings described in Method #1.

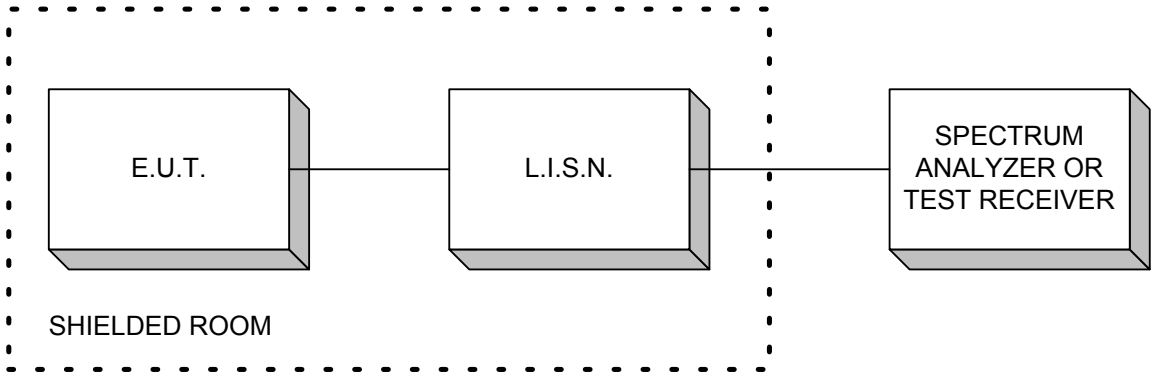
- If Methods #2 or #3 were used for the peak conducted transmit power test, then create the 2nd trace using the setting described in Method #3.

ANNEX B - TEST DIAGRAMS

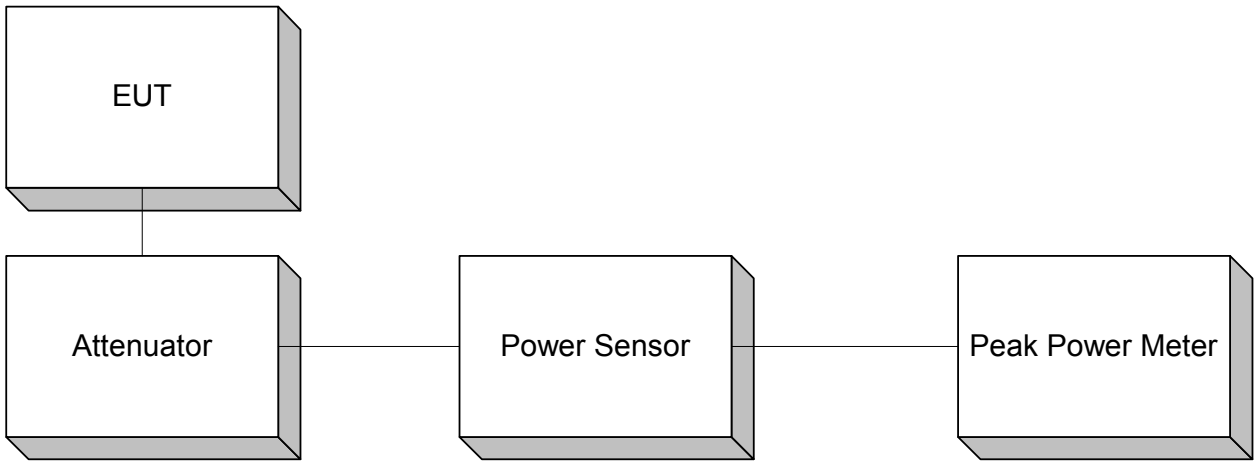
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



Note: A spectrum analyzer may be substituted for Peak Power Meter given that the measurement bandwidth is sufficient to capture the 60 dB bandwidth of the transmitter.

Minimum 6 dB Bandwidth
Peak Power Spectral Density
Spurious Emissions (conducted)