



Nemko Test Report: 37863RUS1

Applicant: Traxxas
1100 Klein Road
Plano, Texas 75074
USA

Equipment Under Test: SA-09181
(E.U.T.)

FCC Identifier: XVE-SA09181

In Accordance With: **FCC Part 15, Subpart C, 15.247 and
Industry Canada, RSS-210, Issue 7**
Digital Transmission System Transmitter

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


TESTED BY:



David Light, Senior Wireless Engineer

DATE 03 November
: 2009

**APPROVED
BY:**



DATE 07 November
: 2009

Number of Pages: 42

Table of Contents

SECTION 1.	SUMMARY OF TEST RESULTS	3
SECTION 2.	EQUIPMENT UNDER TEST (E.U.T.)	5
SECTION 3.	OCCUPIED BANDWIDTH	7
SECTION 4.	MAXIMUM PEAK OUTPUT POWER	12
SECTION 5	SPURIOUS EMISSIONS (CONDUCTED)	16
SECTION 6.	RADIATED EMISSIONS	21
SECTION 7.	PEAK POWER SPECTRAL DENSITY	24
SECTION 8.	RECEIVER SPURIOUS EMISSIONS	28
SECTION 9.	TEST EQUIPMENT LIST	31
ANNEX A -	TEST DETAILS	32
ANNEX B -	TEST DIAGRAMS	40

Section 1. Summary of Test Results

Manufacturer: Traxxas

Model No.: SA-09181

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 C, Paragraph 15.247 and Industry Canada RSS-210, Issue 7 for Digital Transmission Systems. Radiated tests were conducted in 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 and Industry Canada.



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".



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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a) / RSS-Gen 7.2.2	NA
Minimum 6 dB Bandwidth	15.247(a)(2) / RSS-210 A8.2(a)	Complies
Maximum Peak Power Output	15.247(b)(3) / Rss-210 A8.4(4)	Complies
Spurious Emissions (Antenna Conducted)	15.247(d) / RSS-210 A8.5	Complies
Spurious Emissions (Radiated)	15.247(d)/15.209(a) / RSS-210 A8.5	Complies
Peak Power Spectral Density	15.247(e) / RSS-210 A8.2(b)	Complies
Receiver Spurious Emissions	RSS-Gen 7.2.3	Complies

Footnotes:

The device is powered by 4 AA batteries.

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

General Equipment Information

Frequency Band (MHz):

902-928

2400-2483.5

5725-5850

☐☒☐

Operating Frequency of Test Sample: 2407 to 2454 MHz

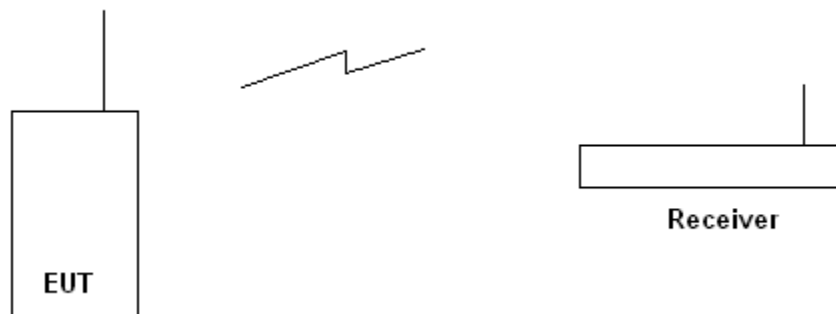
User Frequency Adjustment:

Software controlled

Description of EUT

The SA-09181 transceiver is used in Traxxas remote controls for radio controlled toys.

System Diagram



Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth

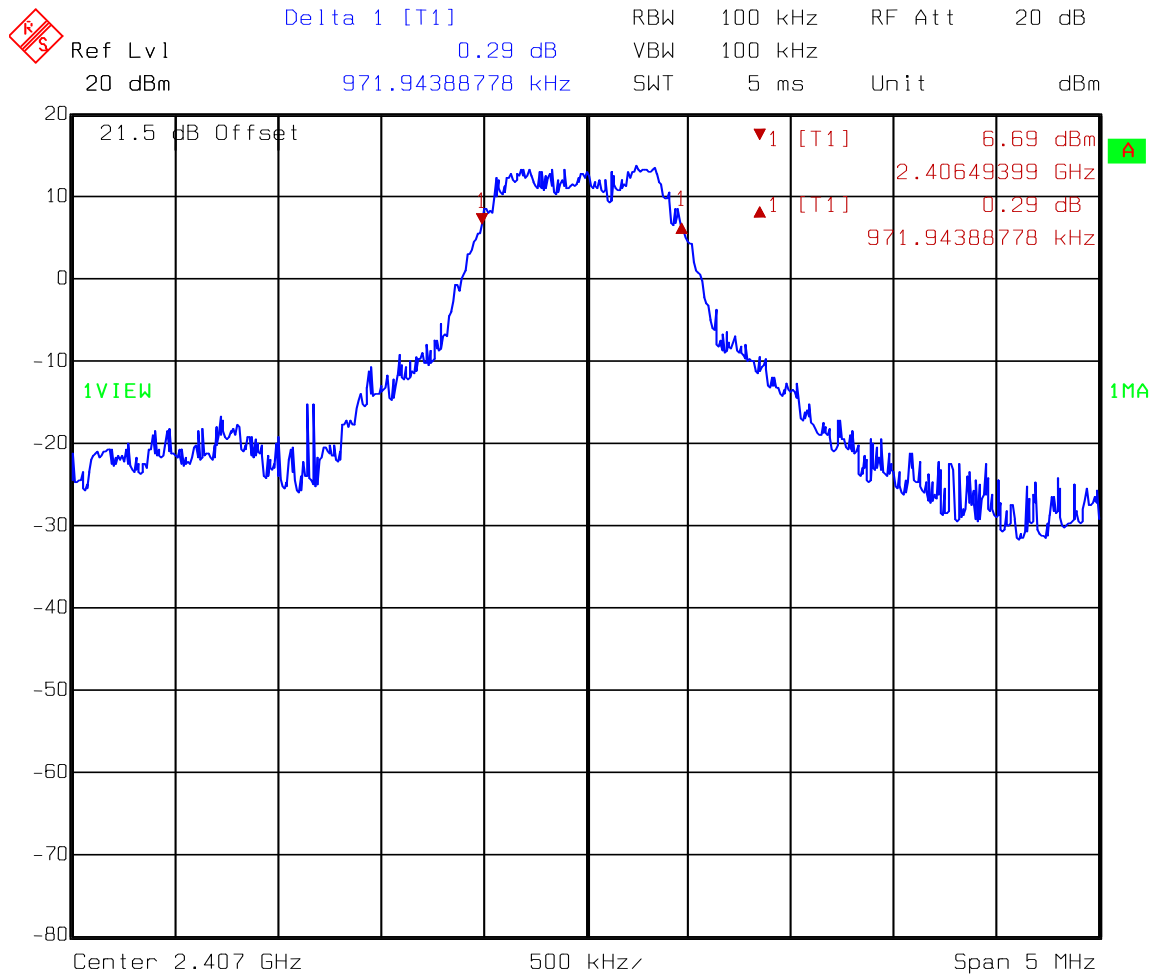
PARA. NO.: 15.247(a)(2) / A8.2(a)

TESTED BY: David Light

DATE: 02 November 2009

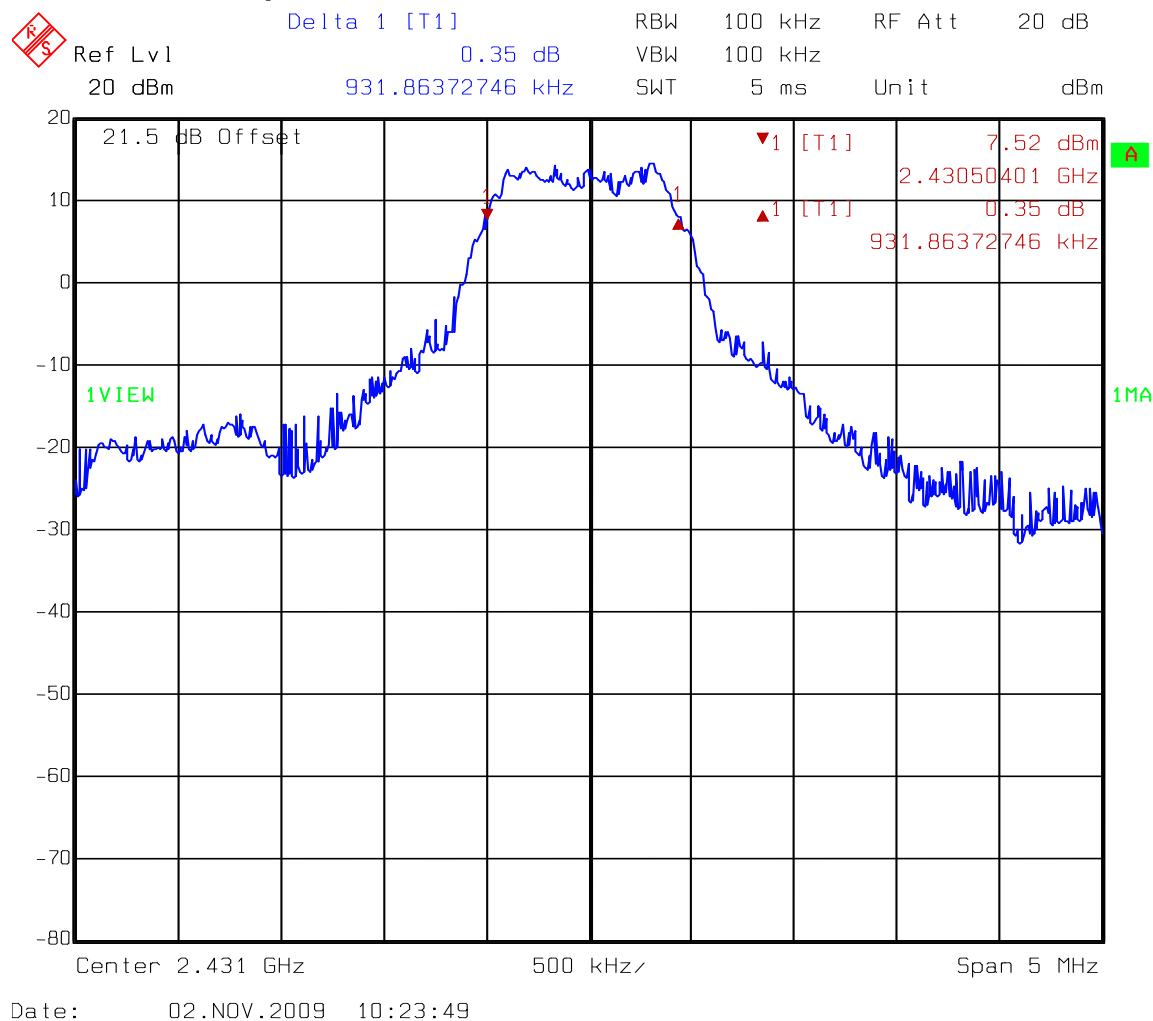
Test Results: Complies.**Measurement Data:** See 6 dB BW plot
Measured 6 dB bandwidth: 972 kHz**Test Conditions:** 35 %RH
22 °C**Measurement Uncertainty:** $\pm 1 \times 10^{-7}$ ppm**Test Equipment Used:** 1036-1082-1472

Test Data – Occupied Bandwidth

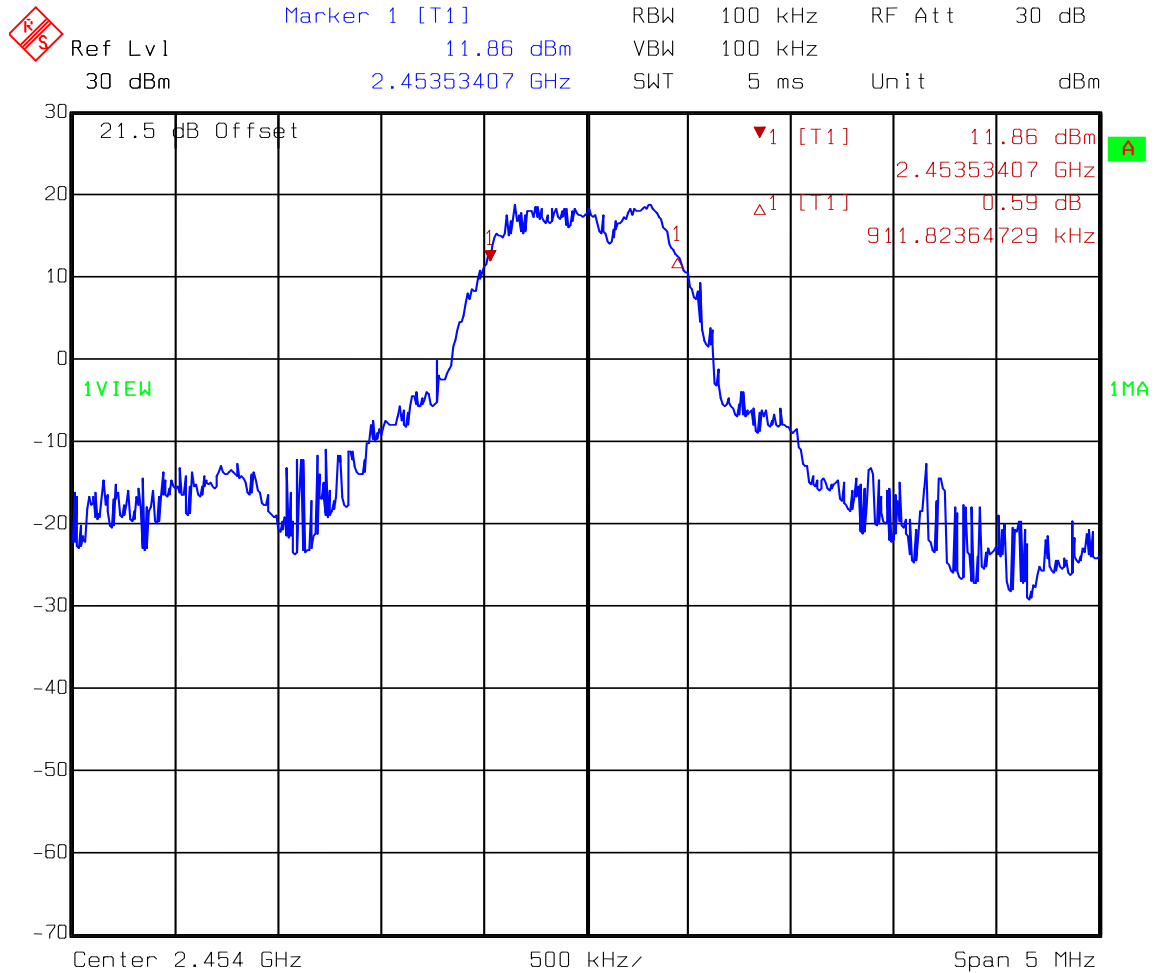


Date: 02.NOV.2009 10:43:15

Test Data – Occupied Bandwidth

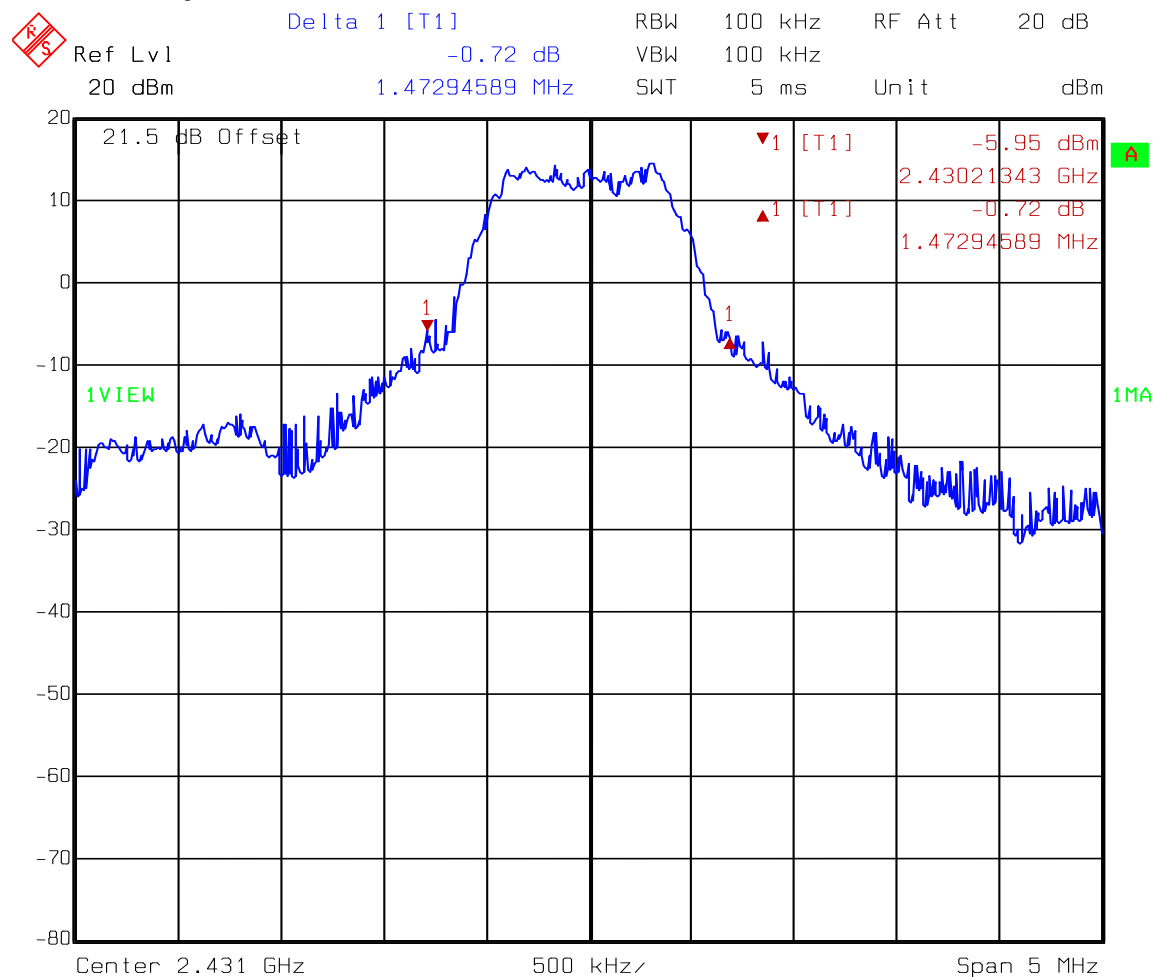


Test Data – Occupied Bandwidth



Date: 02.NOV.2009 09:56:23

20 dB Occupied Bandwidth for IC



Date: 02.NOV.2009 10:25:03

Section 4. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(3) / A8.4(4)
TESTED BY: David Light	DATE: 02 November 2009

Test Results: Complies.

Measurement Data: Refer to attached data

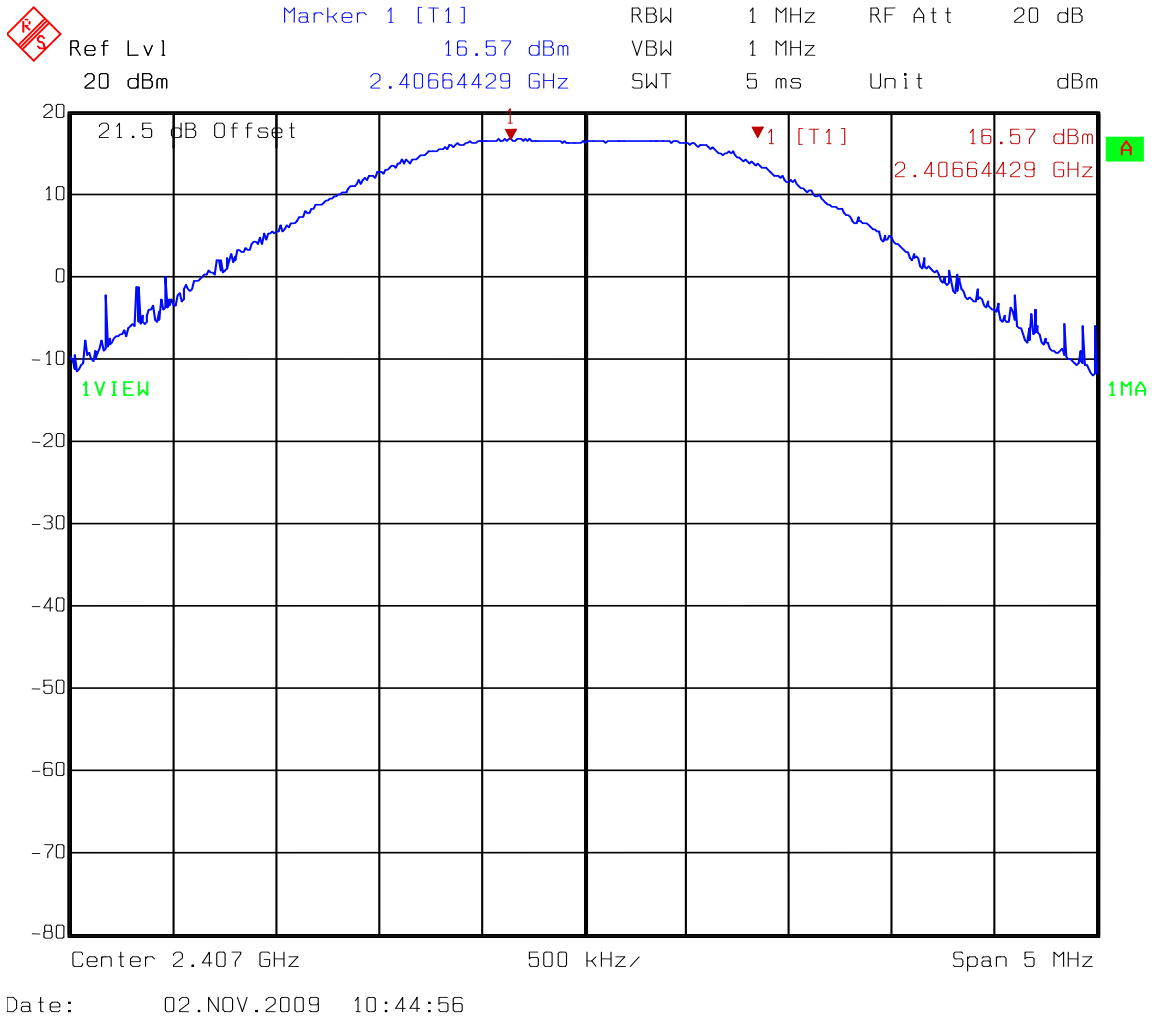
Test Conditions: 35 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

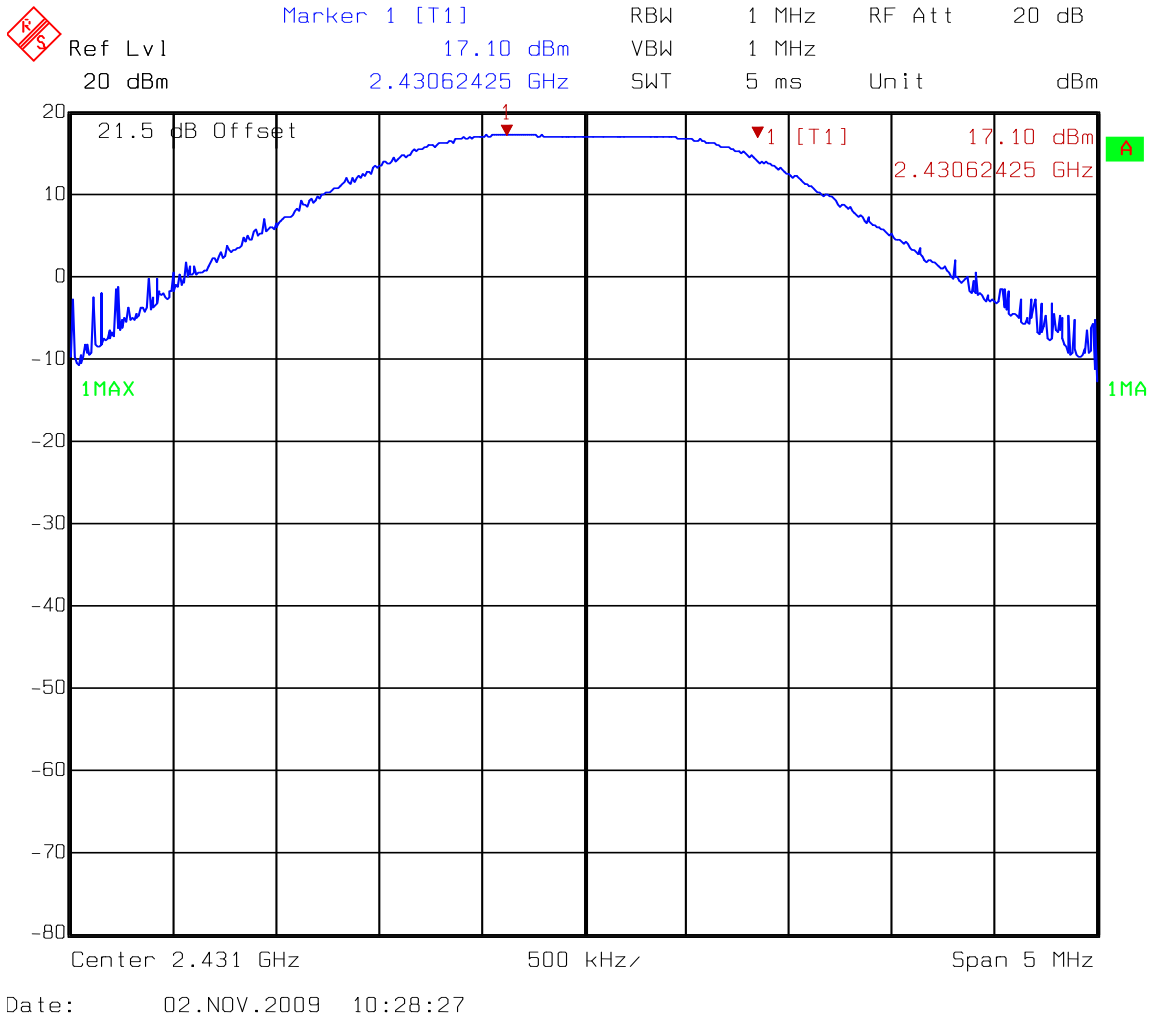
Test Equipment Used: 1036-1082-1472

- ☐ 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.

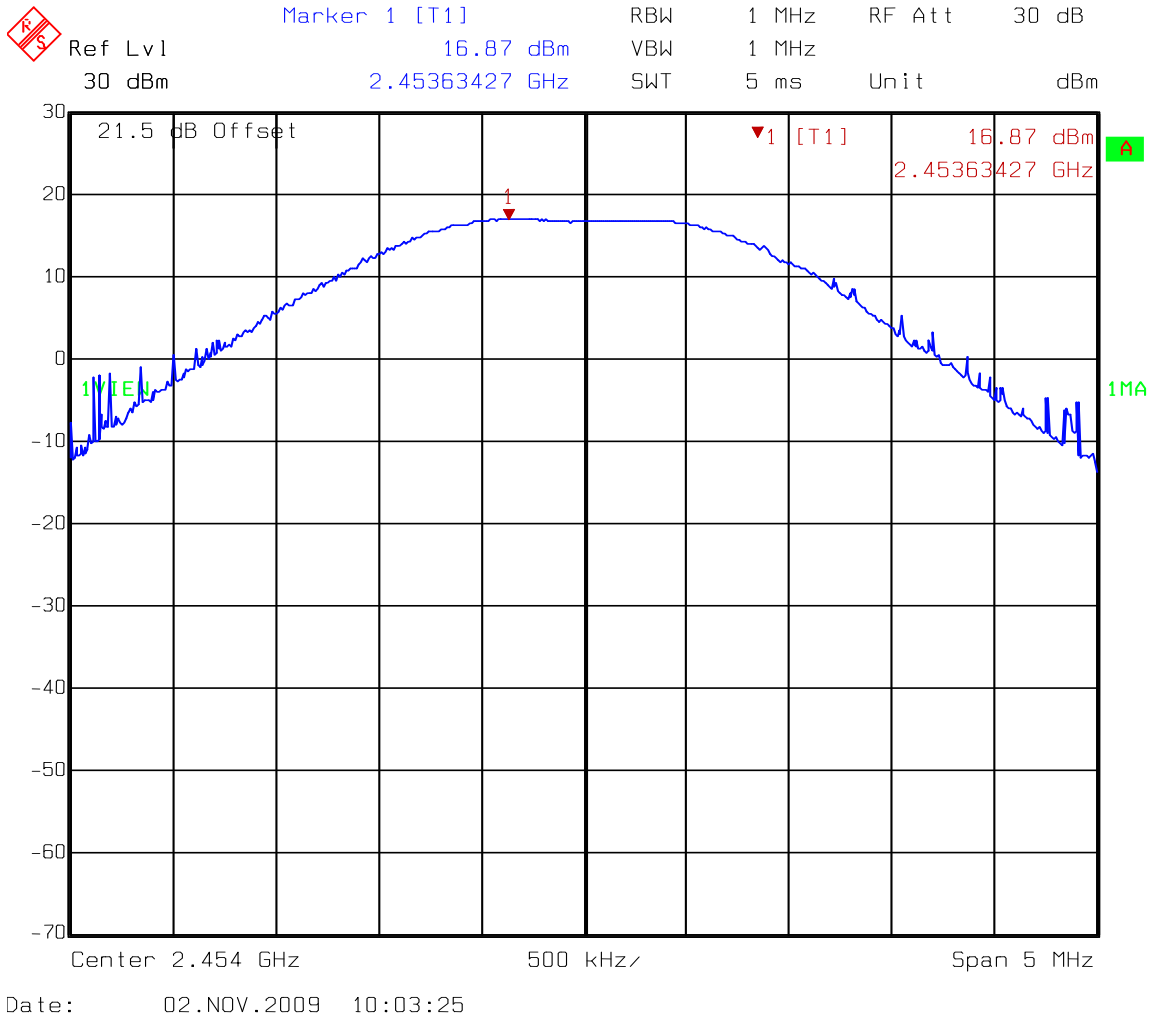
Test Data – Peak Power



Test Data – Peak Power



Test Data – Peak Power



Section 5 Spurious Emissions (Conducted)

NAME OF TEST: Spurious Emissions (Conducted)	PARA. NO.: 15.247 (d) / A8.5
TESTED BY: David Light	DATE: 02 November 2009

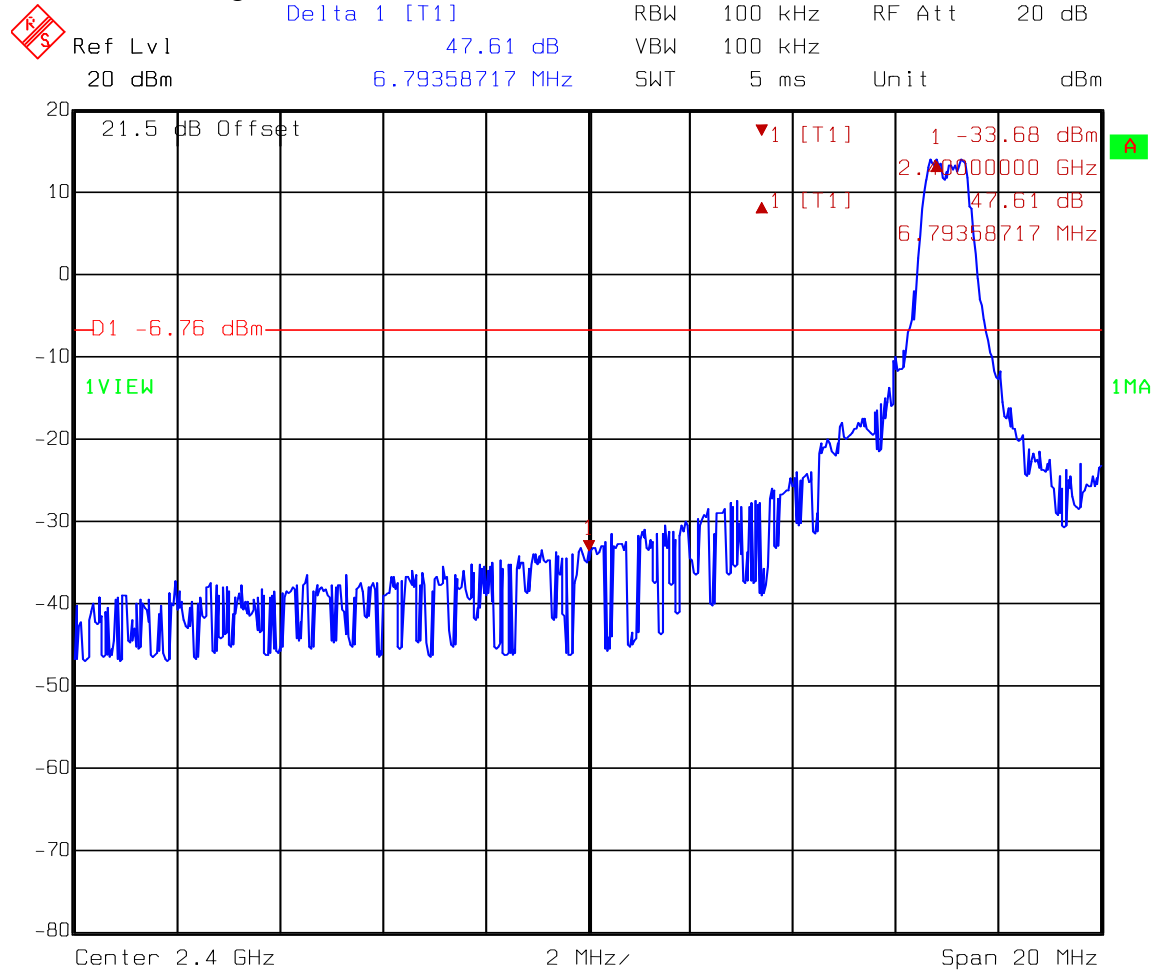
Test Results: Complies.

Measurement Data: See attached plots.

Test Conditions: 35 %RH
 22 °C

Measurement Uncertainty: +/-1.7 dB

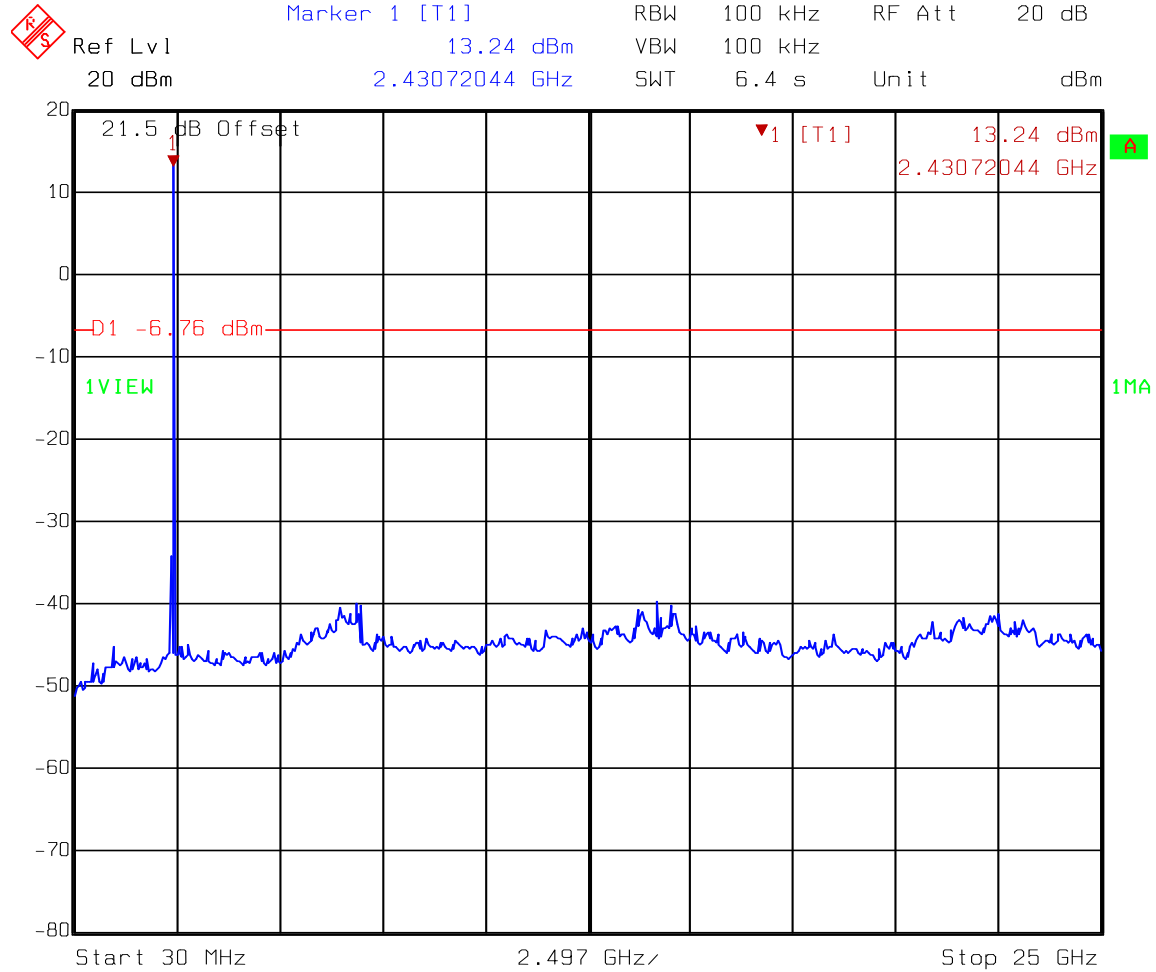
Test Equipment Used: 1036-1082-1472

Test Data – Spurious Emissions at Antenna Terminals**Lower Band Edge**

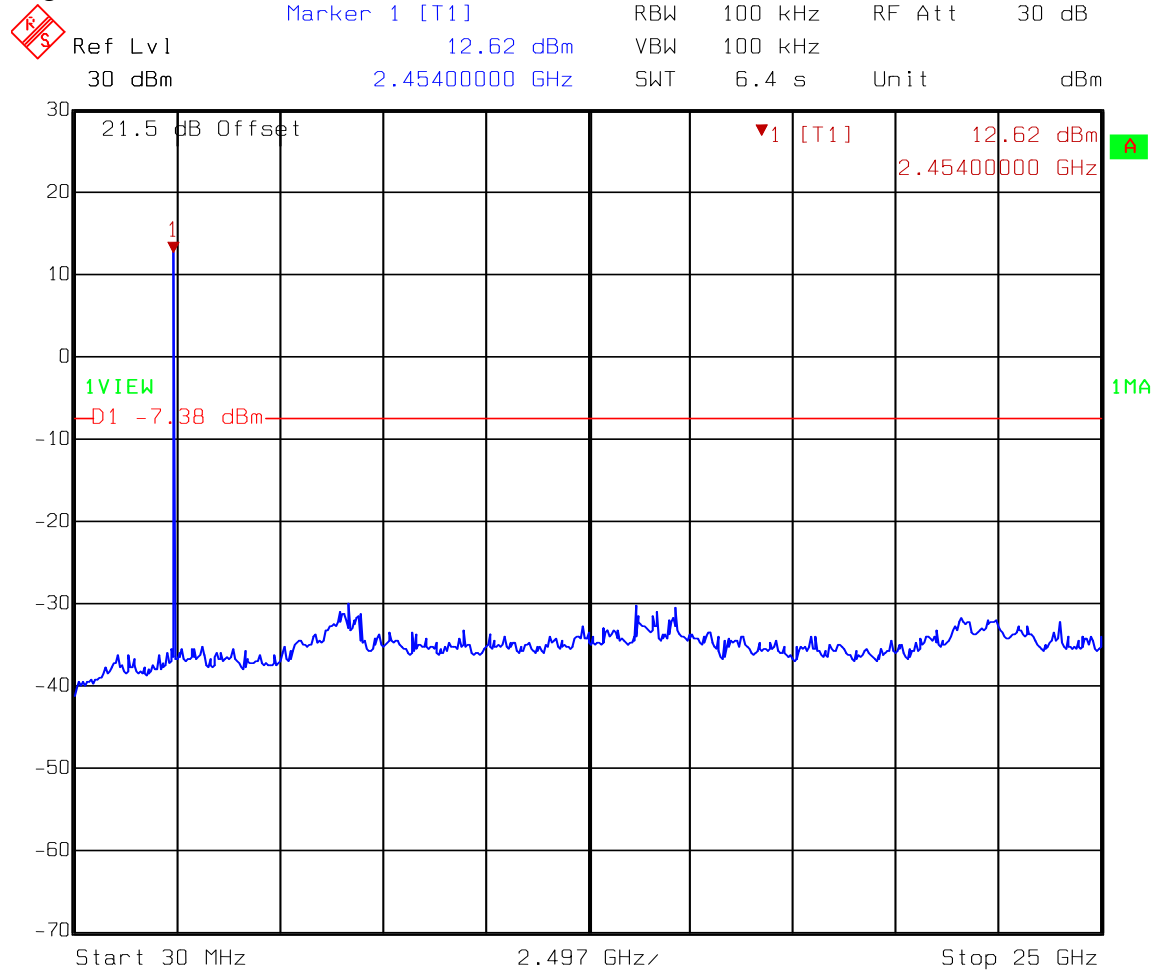
Date: 02.NOV.2009 10:39:36

Test Data – Spurious Emissions at Antenna Terminals**Low Channel**

Date: 02.NOV.2009 10:52:52

Test Data – Spurious Emissions at Antenna Terminals**Mid Channel**

Date: 02.NOV.2009 10:37:50

Test Data – Spurious Emissions at Antenna Terminals**High Channel**

Date: 02.NOV.2009 10:12:24

Section 6. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.247 (d)
TESTED BY: David Light	DATE: 02 November 2009

Test Results: Complies.

Measurement Data: See attached table.

Test Conditions: 35 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

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

Notes:

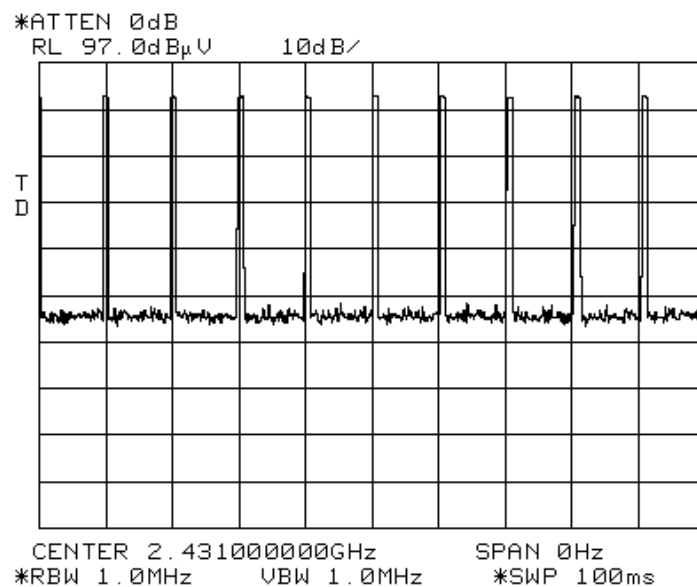
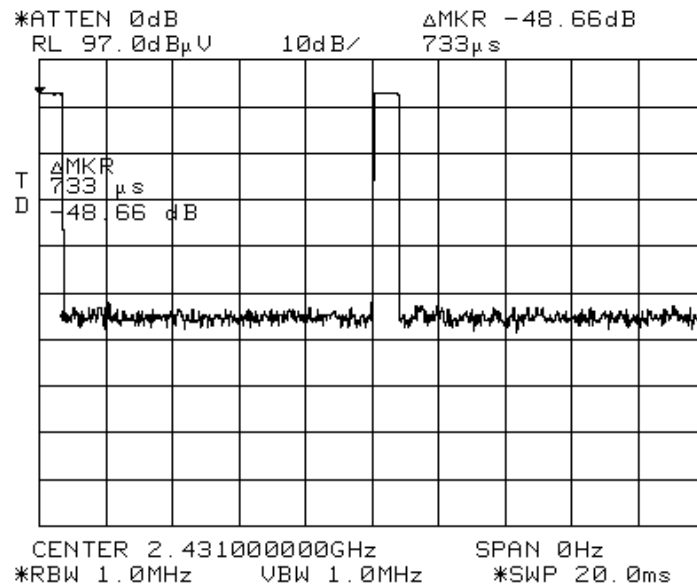
- ☒ For handheld devices, the EUT was tested on three orthogonal axis'
- ☒ The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- ☒ The device was tested on three channels per 15.31(l).
- ☒ No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o). Band edge data is presented below.

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz

Radiated Emissions

Freq Rdng		AF	Pre-Amp	Cable	Cable	Corrected Reading	Spec Margin		Polar
MHz	dBμV	Duty Cycle dB	Gain Loss dB	Loss dB	Loss dB		dBμV/m	dB	Ant
2483.5	39.3	+29.0	-0.0	+0.8	+2.3	71.4	74.0	-2.6	Vert
Peak		+0.0							
2483.5	39.3	+29.0	-0.0	+0.8	+2.3	48.7	54.0	-5.3	Vert
Average		-22.7							
2483.5	33.8	+29.0	-0.0	+0.8	+2.3	65.9	74.0	-8.1	Horiz
Peak		+0.0							
2483.5	33.8	+29.0	-0.0	+0.8	+2.3	43.2	54.0	-10.8	Horiz
Average		-22.7							

Corrected reading = Rdng + AF + Duty Cycle + Cable Loss + Pre-Amp Gain

Duty Cycle Calculation

Duty Cycle correction = $20 \log (\text{Ton}/100 \text{ mS})$
 $20 \log (7.33/100) = -22.7 \text{ dB}$

Section 7. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(e)/A8.2(b)
TESTED BY: David Light	DATE: 02 November 2009

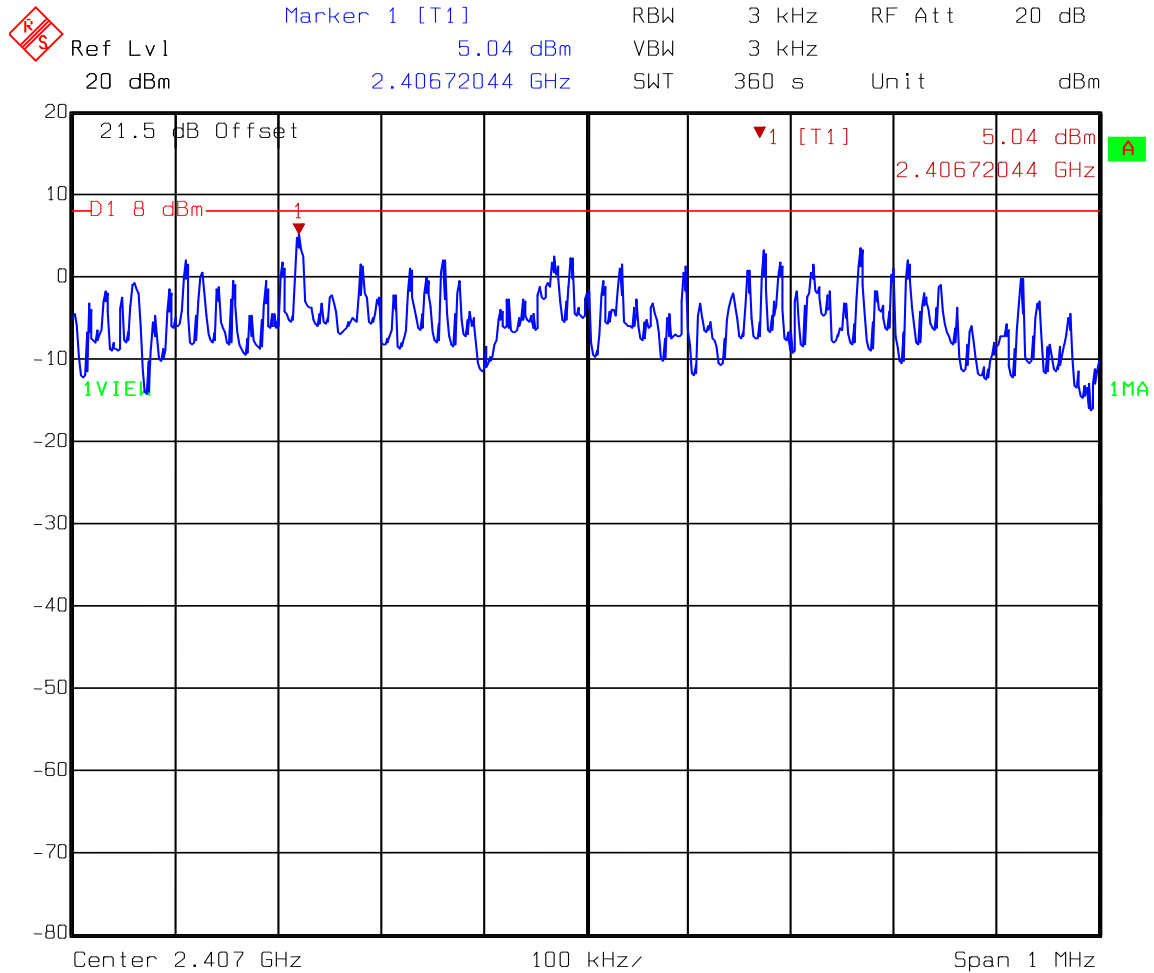
Test Results: Complies.

Measurement Data: See attached data.

Test Conditions: 35 %RH
22 °C

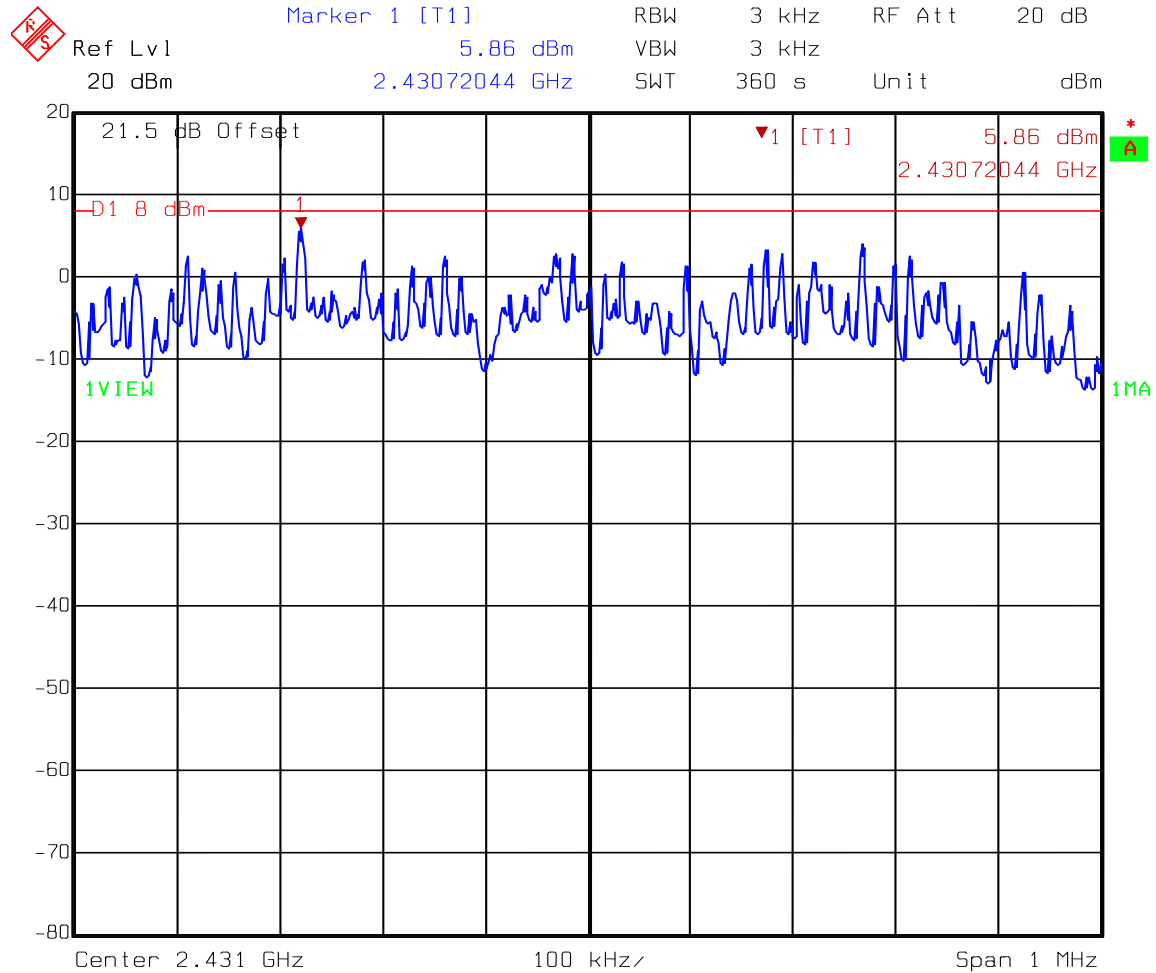
Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082-1472

Peak Power Spectral Density

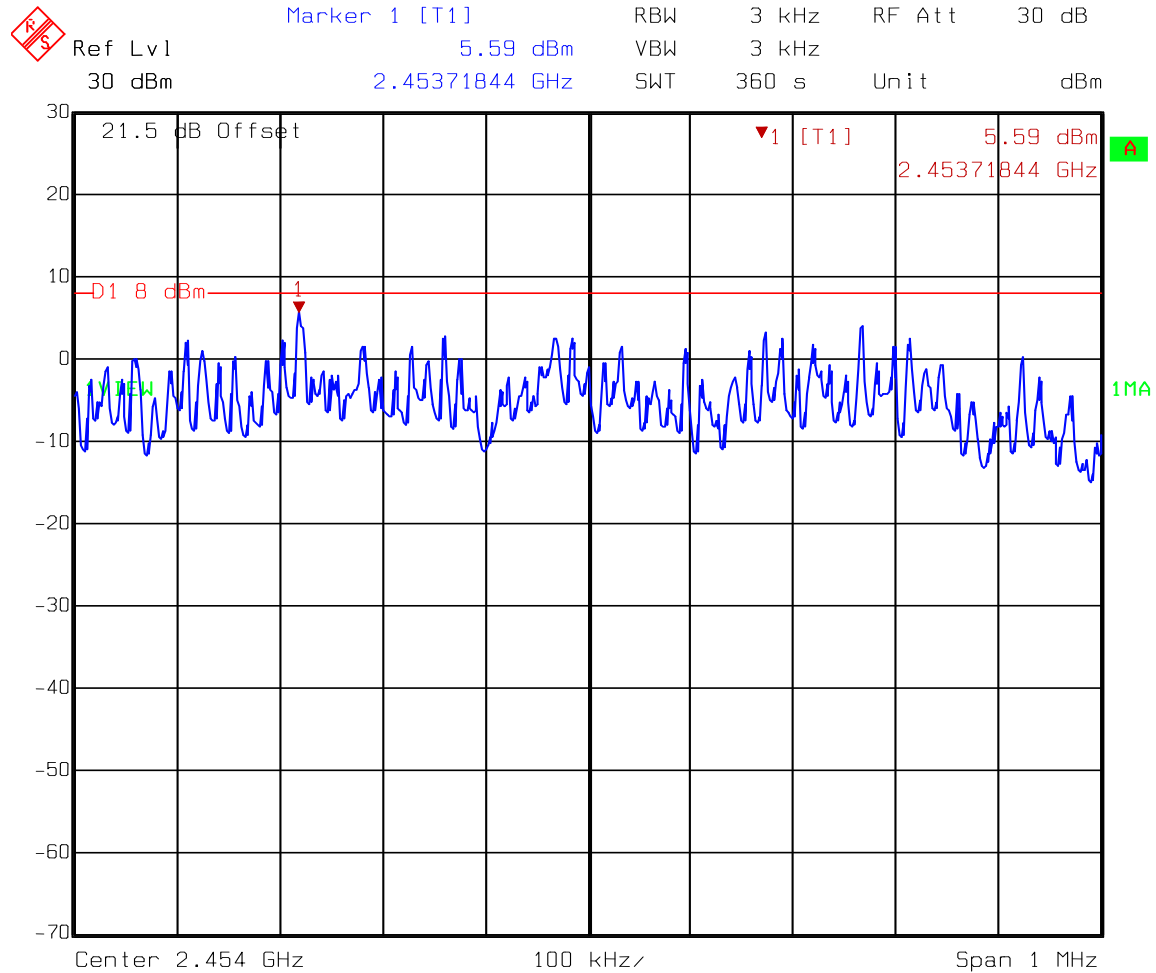
Date: 02.NOV.2009 10:51:37

Peak Power Spectral Density



Date: 02.NOV.2009 10:36:03

Peak Power Spectral Density



Date: 02.NOV.2009 10:10:33

Section 8. Receiver Spurious Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 02 November 2009

Test Results: Complies.

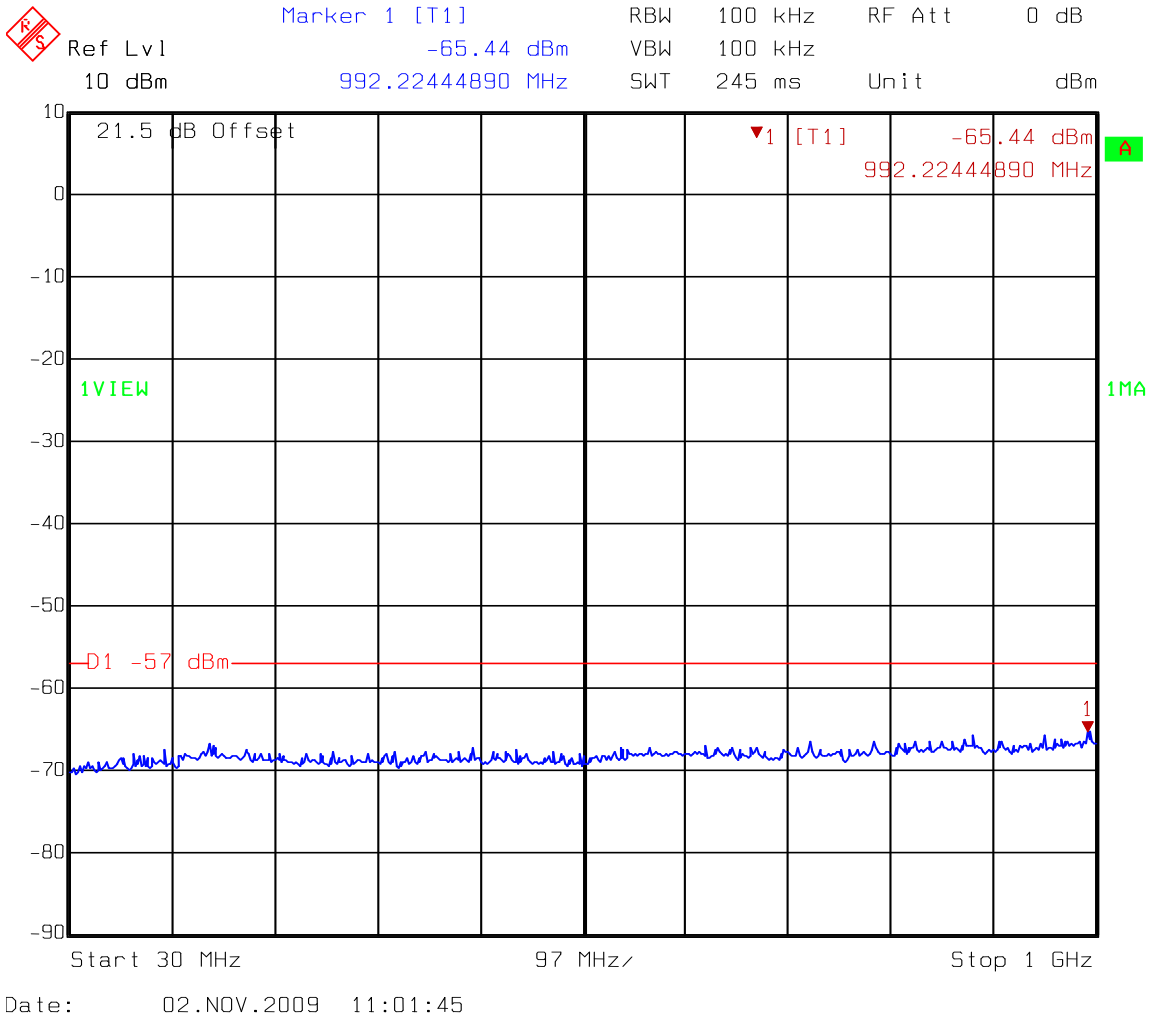
Measurement Data: See attached plots.

Test Conditions: 35 %RH
22 °C

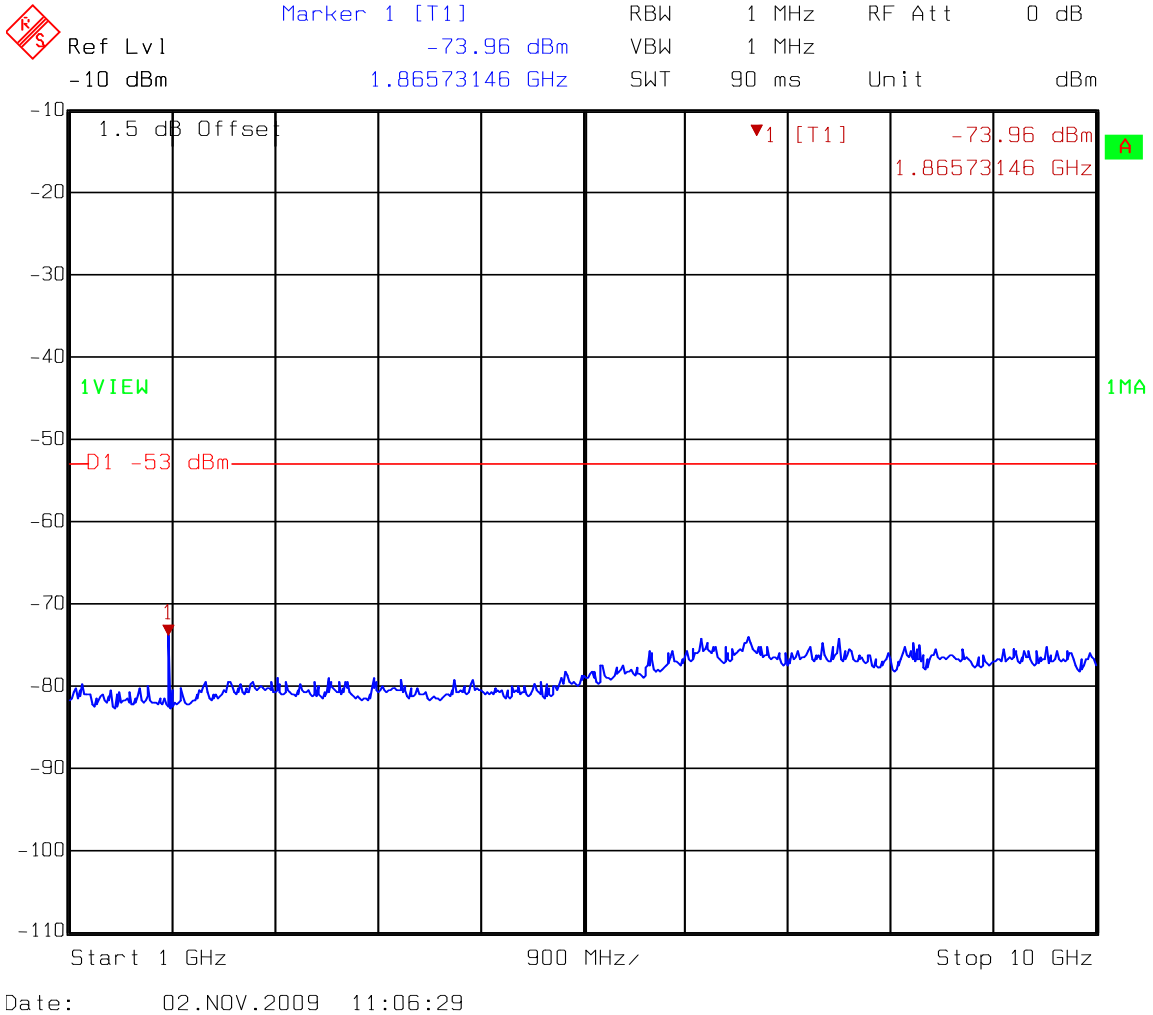
Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082-1472

Test Data – Receiver Spurious Emissions



Test Data – Receiver Spurious Emissions



Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	01/19/09	01/20/11
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1480	Bilog Antenna	Schaffner-Chase CBL6111C	2572	10/17/09	10/17/10
1484	Cable	Storm PR90-010-072	N/A	06/23/09	06/23/10
1485	Cable	Storm PR90-010-216	N/A	06/23/09	06/23/10
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/27/09	02/28/11
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	06/23/09	06/23/10
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/28/09	05/28/10
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/09	08/31/11

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: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
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Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

NAME OF TEST: Maximum Peak Output Power

PARA. NO.: 15.247(b)(3)

Minimum Standard: The maximum peak output power shall not exceed 1 watt.

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

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Substitution Antenna Method for Integral Antennas:

The peak field strength of the carrier is measured in a worst-case configuration with a RBW > 5 times the occupied bandwidth of the transmitted waveform. For cases where the RBW of the test instrument is not sufficient, the power is measured using a peak power meter instead of the spectrum analyzer.

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 15.247(a)(2)

Minimum Standard:

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW = VBW = 100 kHz.

Span: Sufficient to display 6 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Spurious Emissions(conducted)

PARA. NO.: 15.247(d)

Minimum Standard:

In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Radiated Spurious Emissions

PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

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		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Transmitter Power Density

PARA. NO.: 15.247(d)

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

RBW: 3 kHz

VBW: >3 kHz

Span: => measured 6 dB bandwidth

Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is $1500/3 = 500$ sec.

LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing ≤ 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

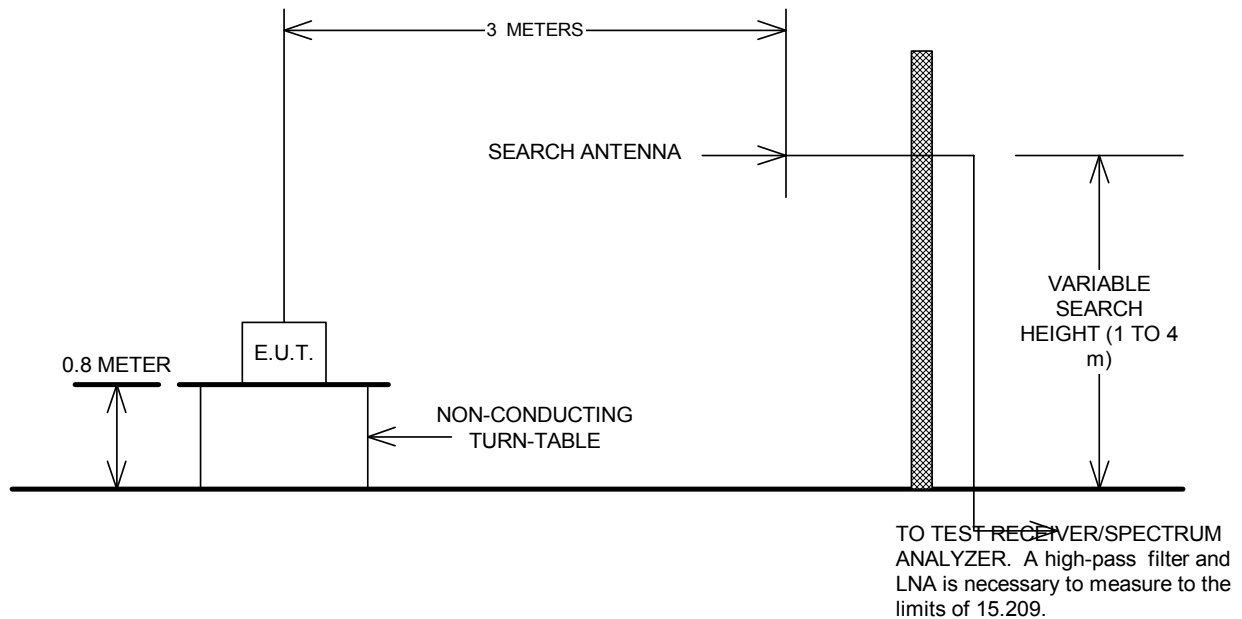
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

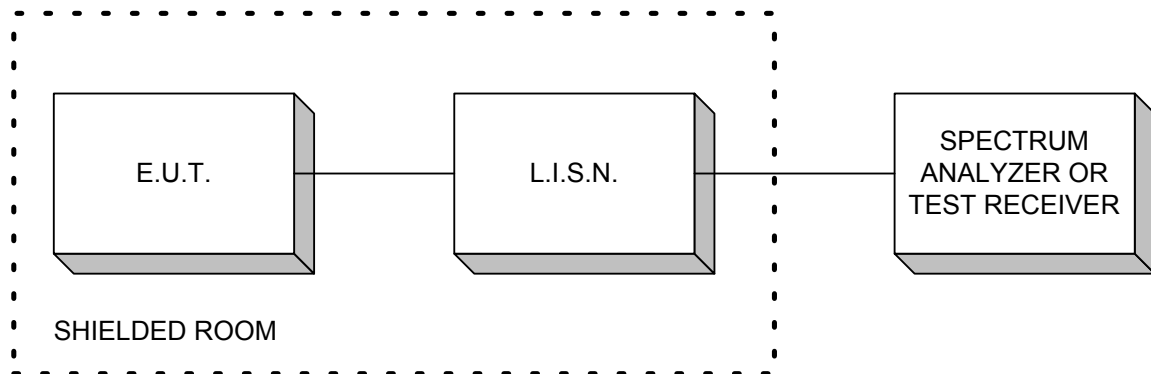
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

ANNEX B - TEST DIAGRAMS

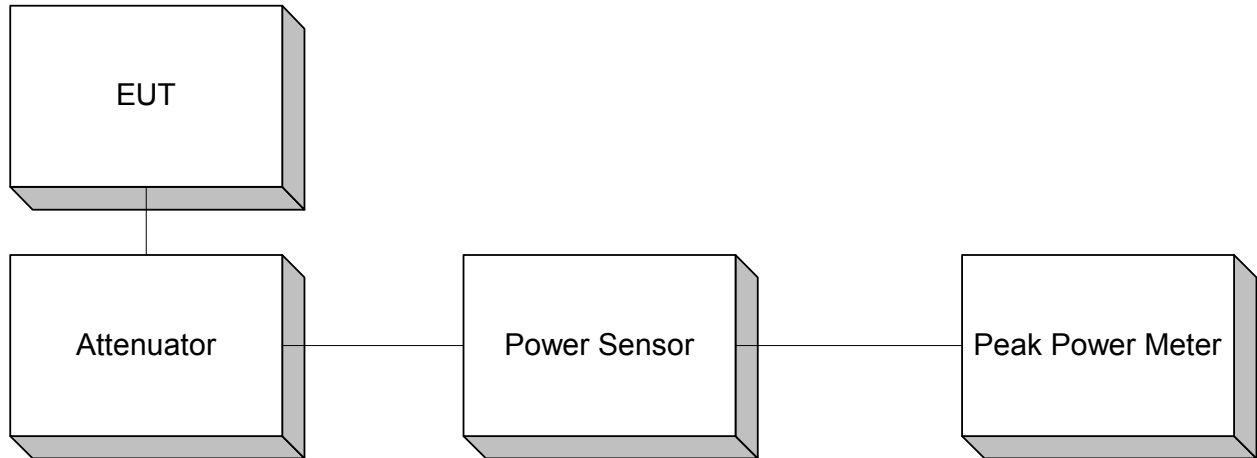
Test Site For Radiated Emissions



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)**

