



Nemko Test Report: 45643RUS1Rev3

Applicant: Automated Media Services, Inc.
110 Commerce Drive
Allendale, NJ 07401
USA

FCC ID. YF8-58034

Equipment Under Test: 32-5803 / 32-5804 802.11bg Transceiver
(E.U.T.)

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Digital Transmission System Transmitter

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

TESTED BY: 

David Light, Senior Wireless Engineer

DATE: 20 May 2010

APPROVED BY: 

Tom Tidwell, Telecom Direct

DATE: 10 June 2010

Number of Pages: 32

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Section 1. Summary of Test Results

Manufacturer: Automated Media Services, Inc.

Model No.: 32-5803 / 32-5804

Serial No.: None

Model differences: Models are identical board layout except for the length of the “tail section” that connects to adapter. Please refer to separate photo exhibit. Both models were evaluated and it was determined that the results were substantially identical. The worst-case results are presented in this report.

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 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.



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)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	Complies
Maximum Peak Power Output	15.247(b)(3)	Complies
Spurious Emissions (Antenna Conducted)	15.247(d)	Not tested ¹
Spurious Emissions (Restricted Bands)	15.247(d)/15.209(a)	Complies
Peak Power Spectral Density	15.247(e)	Complies

Footnotes:

¹The device has an integral antenna. All tests were performed radiated.

Nemko USA, Inc.

EQUIPMENT: 32-5803/32-5804

FCC PART 15, SUBPART C

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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: 2412 to 2462 MHz

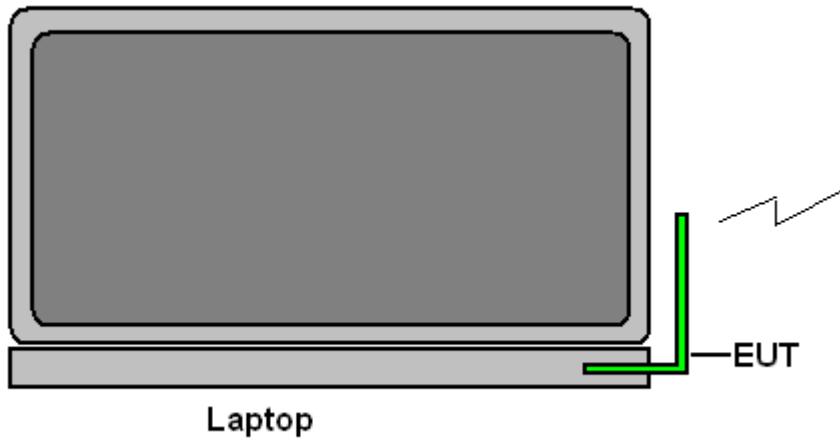
Channel Spacing: 5 MHz

User Frequency Adjustment: Software controlled

Description of EUT

The 5803/5804 modules provide bidirectional communications using 802.11 b/g communications. They connect to a PC or microprocessor via a standard SDIO connection. The modules are based on a muRata LBWA18HEPZ module.

Models are identical board layout except for the length of the “tail section” that connects to adapter. Please refer to separate photo exhibit. Both models were evaluated and it was determined that the results were substantially identical. The worst-case results are presented in this report.

System Diagram

Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: David Light	DATE: 12 May 2010

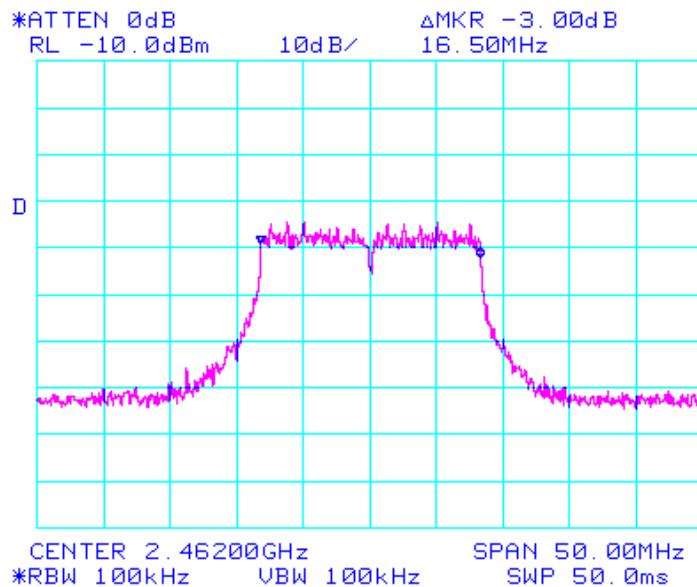
Test Results: Complies.**Measurement Data:** See 6 dB BW plot
Measured 6 dB bandwidth: 10.83 MHz min.**Test Conditions:** 38 %RH
22 °C**Measurement Uncertainty:** $\pm 1 \times 10^{-7}$ ppm**Test Equipment Used:** 1464-1484-1485-993

Test Data – Occupied Bandwidth

6 dB BW

Channel 11

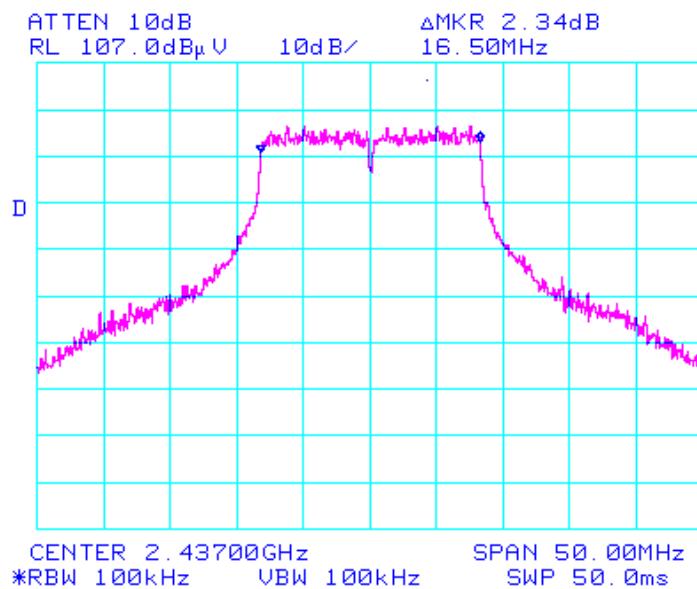
802.11g



6 dB BW

Channel 6

802.11g

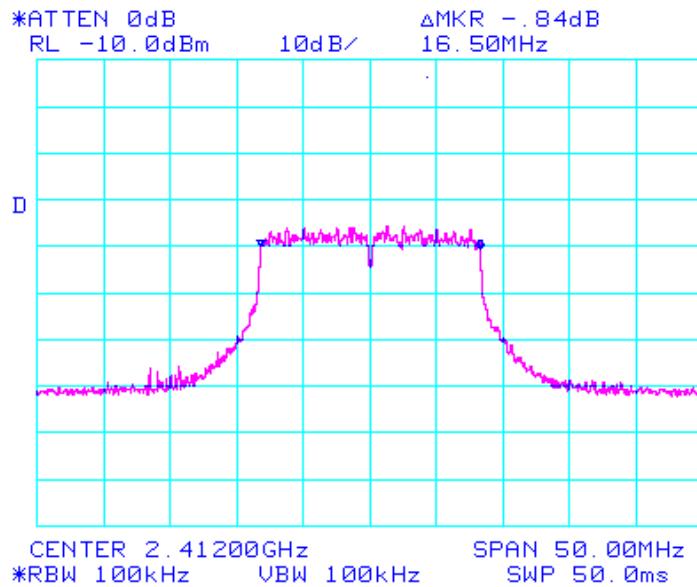


Test Data – Occupied Bandwidth

6 dB BW

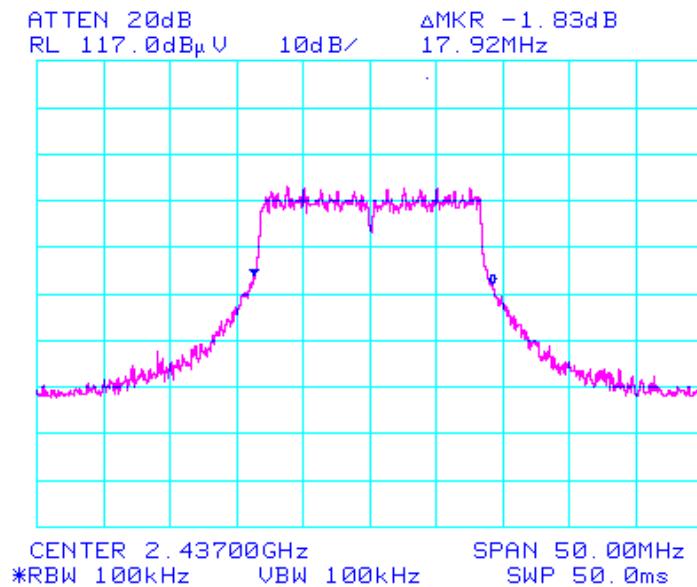
802.11g

Channel 1



20 dB BW

802.11g

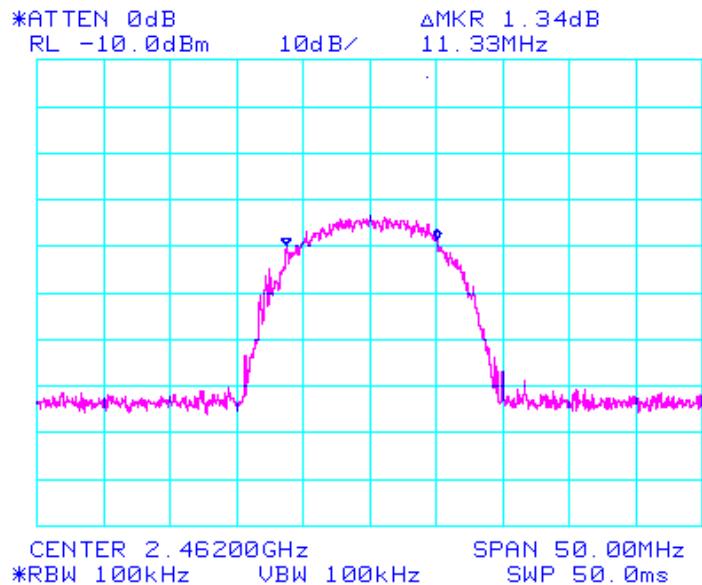


Test Data – Occupied Bandwidth

6 dB BW

Channel 11

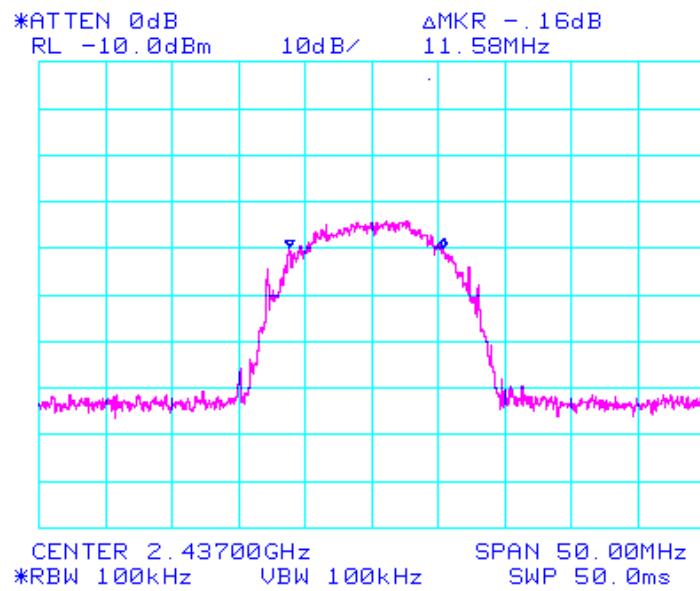
802.11b



6 dB BW

Channel 6

802.11b

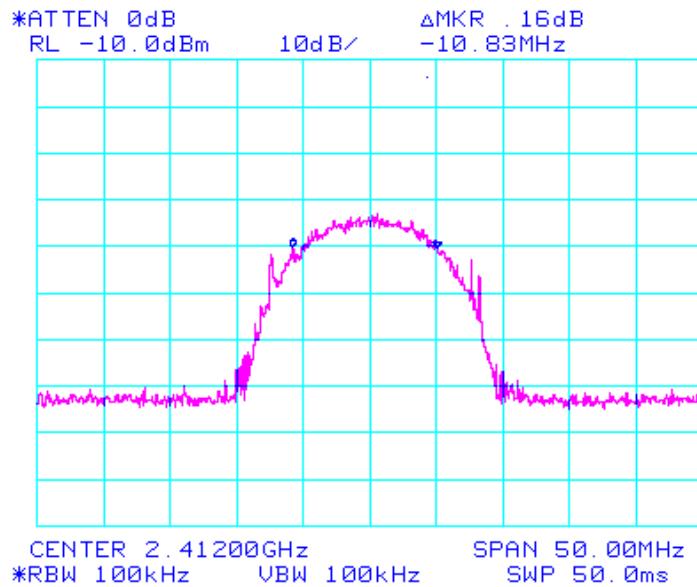


Test Data – Occupied Bandwidth

6 dB BW

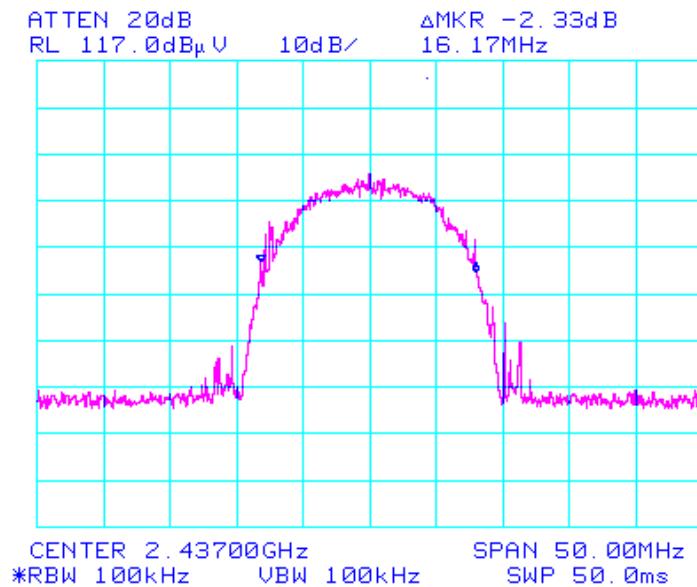
802.11b

Channel 1



20 dB BW

802.11b



Section 4. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(3)
TESTED BY: David Light	DATE: 12 May 2010

Test Results: Complies.**Measurement Data:** Refer to attached data**Test Conditions:** 38 %RH
22 °C**Measurement Uncertainty:** +/-1.7 dB**Test Equipment Used:** 1464-1484-1485-993

- 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

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Comments
									Peak Power - 802.11g
2462	-27.5	9.3		0	7.8	17.1	36.0	-18.8600	
2437	-26.8	10.0		0	7.8	17.8	36.0	-18.1600	
2412	-27.2	9.6		0	7.8	17.4	36.0	-18.5600	
									Peak Power - 802.11b
2462	-24.5	12.3		0	7.8	20.1	36.0	-15.8600	
2437	-22.9	13.9		0	7.8	21.7	36.0	-14.2600	
2412	-25.3	11.5		0	7.8	19.3	36.0	-16.6600	

Maximum peak conducted power equals 30 dBm (1 Watt) based on manufacturer's stated maximum antenna gain of -8.3 dBi.

RBW = VBW = 1 MHz

Peak detector

Measurement was made using the channel power feature on the spectrum analyzer. Power was integrated across 17 MHz for the 802.11g mode and 12 MHz for the 802.11b mode.

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EQUIPMENT: 32-5803/32-5804

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Section 5 Spurious Emissions

NAME OF TEST: Spurious Emissions	PARA. NO.: 15.247 (d)
TESTED BY: David Light	DATE: 12 May 2010

Test Results: Complies.

Measurement Data: See attached plots.

Test Conditions: 38 %RH
22 °C

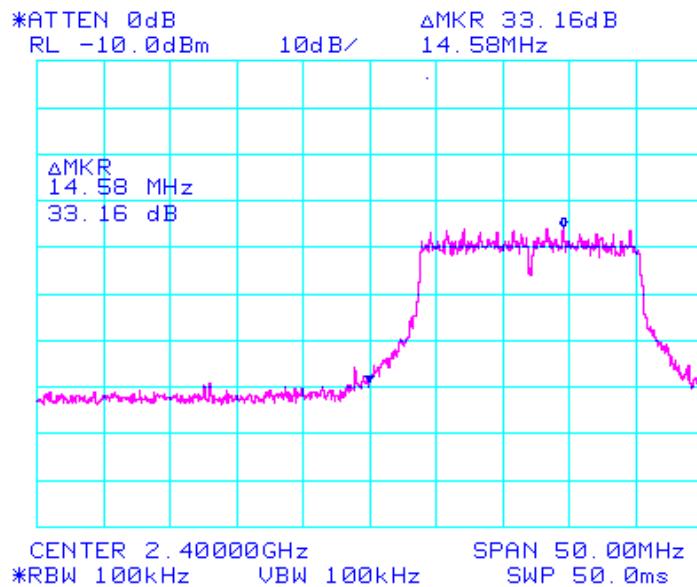
Measurement Uncertainty: +/-1.7 dB

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

Test Data – Spurious Emissions at Antenna Terminals

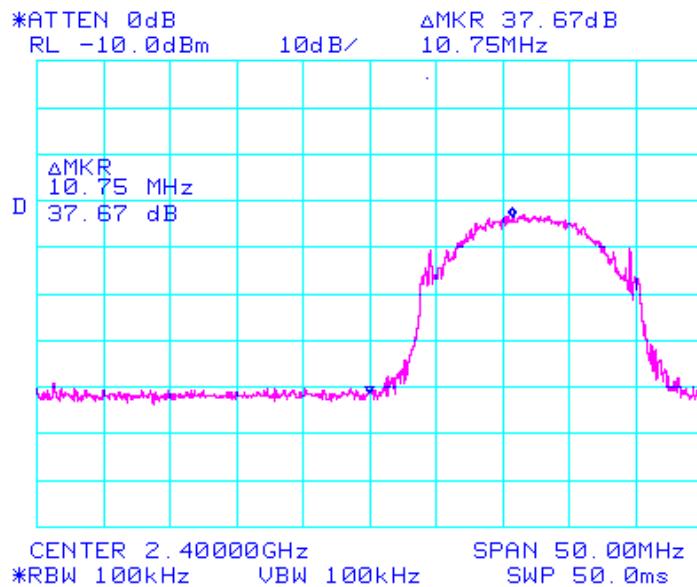
Lower Band Edge

802.11g



Peak detector

802.11b



Peak detector

Test Data – Spurious Emissions at Antenna Terminals

#	Freq MHz	Rdng dB μ V	Cable	Cable	Pre-A	Horn	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	2483.5 Peak	58.8	+0.8	+2.3	-32.9	+29.0	+0.0	58.0	74.0 802.11g	-16.0	Horiz
2	2483.5 Ave	38.6	+0.8	+2.3	-32.9	+29.0	+0.0	37.8	54.0 802.11g	-16.2	Horiz
3	2483.5 Peak	57.2	+0.8	+2.3	-32.9	+29.0	+0.0	56.4	74.0 802.11g	-17.6	Vert
4	2483.5 Ave	34.0	+0.8	+2.3	-32.9	+29.0	+0.0	33.2	54.0 802.11g	-20.8	Vert
5	2483.5 Peak	57.3	+0.8	+2.3	-32.9	+29.0	+0.0	56.5	74.0 802.11b	-17.5	Horiz
6	2483.5 Ave	48.3	+0.8	+2.3	-32.9	+29.0	+0.0	47.5	54.0 802.11b	-6.5	Horiz
7	2483.5 Peak	56.1	+0.8	+2.3	-32.9	+29.0	+0.0	55.3	74.0 802.11b	-18.7	Vert
8	2483.5 Ave	46.9	+0.8	+2.3	-32.9	+29.0	+0.0	46.1	54.0 802.11b	-7.9	Vert

No spurious emissions were detected above the noise floor which was at least 20 dB below the specification limit. Upper band edge data is presented.

The spectrum was searched from 30 MHz to 25 GHz.

Peak readings: RBW = VBW = 1 MHz Peak detector

Average readings: RBW = 1 MHz VBW = 1 kHz Peak detector

Nemko USA, Inc.

EQUIPMENT: 32-5803/32-5804

FCC PART 15, SUBPART C

Digital Transmission Systems

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Section 6. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(e)
TESTED BY: David Light	DATE: 12 May 2010

Test Results: Complies.

Measurement Data: See attached data..

Test Conditions: 38 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1464-1484-1485-993

Peak Power Spectral Density

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Comments
									Density - 802.11g
2462	-60.3	-23.5		0	7.8	-15.7	8.0	-23.6600	
2437	-58.7	-21.9		0	7.8	-14.1	8.0	-22.0600	
2412	-56.5	-19.7		0	7.8	-11.9	8.0	-19.8600	
									Density 802.11b
2462	-53.5	-16.7		0	7.8	-8.9	8.0	-16.8600	
2437	-54.6	-17.8		0	7.8	-10.0	8.0	-17.9600	
2412	-54.8	-18.0		0	7.8	-10.2	8.0	-18.1600	

The peak power density was measured using a substitution method to determine the equivalent isotropic radiated power of the maximized signal and subtracting the manufacturer's stated antenna gain.

Maximum peak spectral density equals -0.6 dBm (0.87 mW) based on manufacturer's stated maximum antenna gain of -8.3 dBi.

Measured peak power density = -8.9 dBm eirp -(-8.3 dBi) = -0.6 dBm.

RBW = VBW = 3 kHz

Span = 6 MHz

Sweep time = 2000 seconds

Peak detector

Nemko USA, Inc.

EQUIPMENT: 32-5803/32-5804

FCC PART 15, SUBPART C

Digital Transmission Systems

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Section 7. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 13 May 2010

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

Test Data – Powerline Conducted Emissions

Operator: David Light

01:30:20 PM, Thursday, May 13, 2010

Line 1

Frequency	FCC B	FCC B	AVG	AVG	QP	QP
MHz	QP LIMIT	AVG LIMIT	Meas	Margin	Meas	Margin
191.54 KHz	64.813	54.813	32.518	-22.296	47.318	-17.496
13.857 MHz	60	50	20.389	-29.611	34.364	-25.636
15.537 MHz	60	50	26.846	-23.154	38.551	-21.449
15.538 MHz	60	50	28.522	-21.478	37.662	-22.338
16.174 MHz	60	50	32.944	-17.056	44.147	-15.853
16.227 MHz	60	50	32.967	-17.033	42.899	-17.101
16.312 MHz	60	50	33.292	-16.708	44.522	-15.478
16.803 MHz	60	50	32.892	-17.108	43.412	-16.588
16.916 MHz	60	50	30.349	-19.651	43.857	-16.143

Line 2

Frequency	FCC B	FCC B	AVG	AVG	QP	QP
MHz	QP Limit	AVG Limit	Meas	Margin	Meas	Margin
186.91 KHz	64.945	54.945	33.872	-21.073	47.105	-17.841

Conducted Emissions

Tx channel 6

The spectrum was searched from 150 kHz to 30 MHz. All emissions are reported.

Section 8. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
674	Limiter	Hewlett Packard	11947A	3107A02200	30-Sep-2009	30-Sep-2010
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	09-Sep-2009	09-Sep-2011
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	23-Jun-2009	23-Jun-2010
1119	Cable, 0.6m	Nemko USA, Inc.	RG214		29-Sep-2009	29-Sep-2010
1188	LISN	EMCO	3825/2	1214	23-Sep-2009	23-Sep-2010
1464	Spectrum Analyzer	Hewlett Packard	8563E	3551A04428	27-Feb-2009	27-Feb-2011
1480	Antenna, Bilog	Schaffner-Chase	CBL6111C	2572	18-Jan-2010	18-Jan-2011
1484	Cable	Storm	PR90-010-072		23-Jun-2009	23-Jun-2010
1485	Cable	Storm	PR90-010-216		23-Jun-2009	23-Jun-2010
791	PreAmp	Nemko, USA			03-Aug-2009	03-Aug-2010
1504	Spectrum Analyzer	Hewlett-Packard	8566B	1950A00400	23-Mar-2010	23-Mar-2011

Nemko USA, Inc.

EQUIPMENT: 32-5803/32-5804

FCC PART 15, SUBPART C

Digital Transmission Systems

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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.

Nemko USA, Inc.

EQUIPMENT: 32-5803/32-5804

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NAME OF TEST: Occupied Bandwidth

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

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 (μ 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 (μ 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

Nemko USA, Inc.

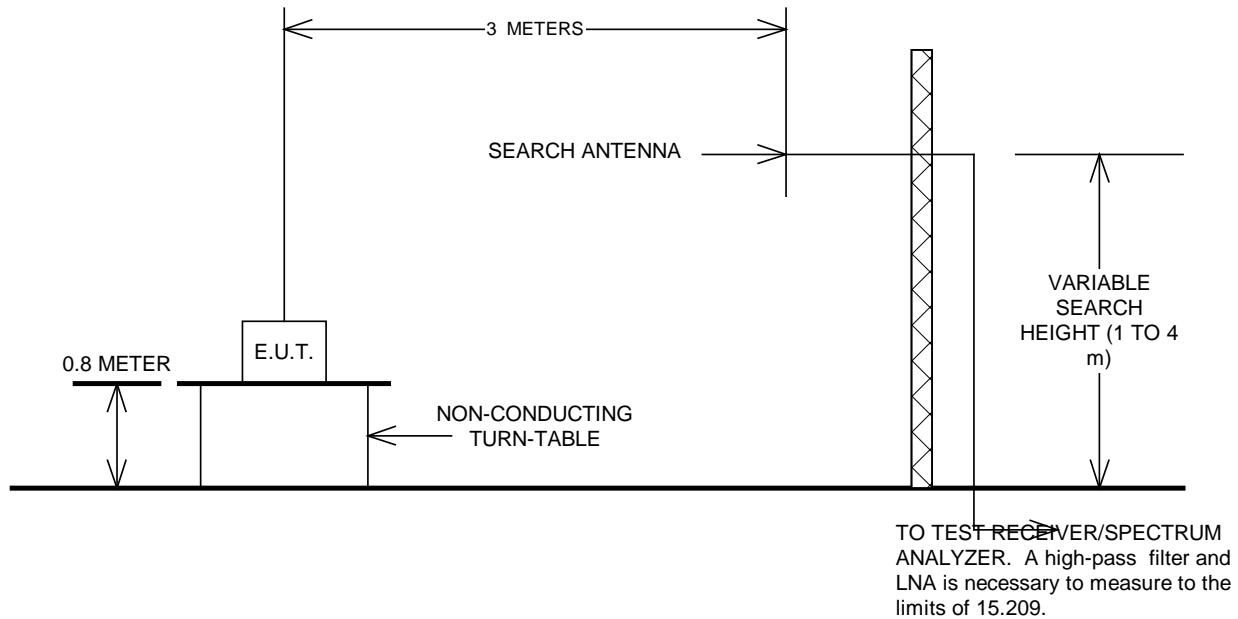
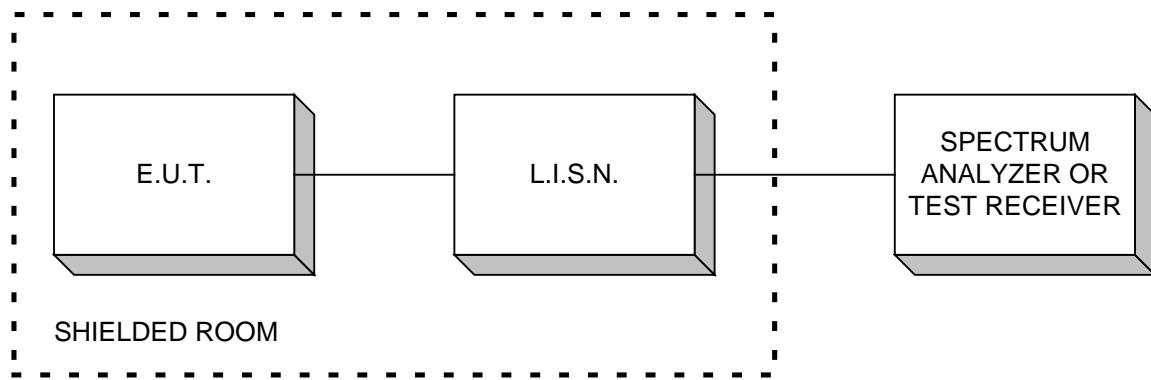
EQUIPMENT: 32-5803/32-5804

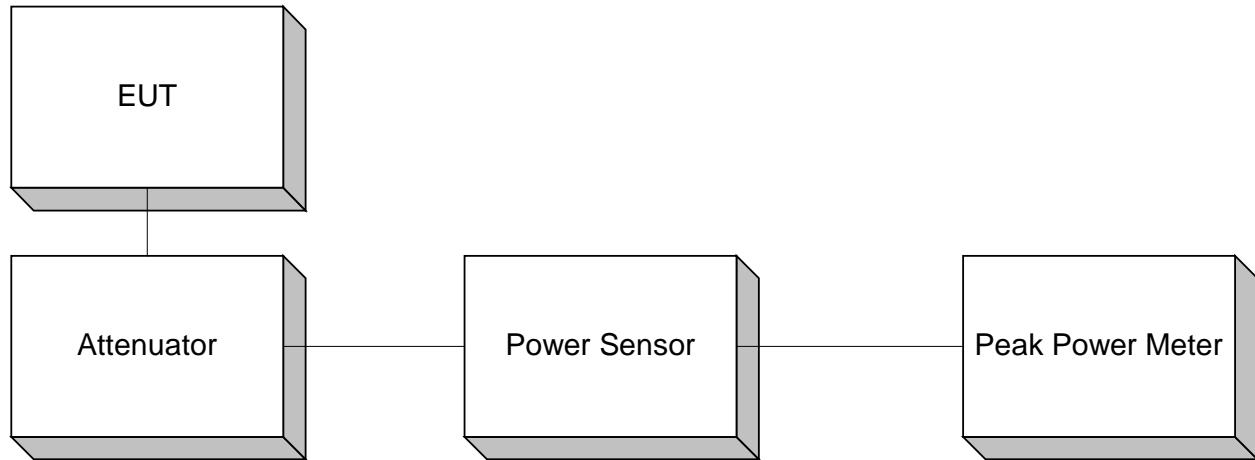
FCC PART 15, SUBPART C

Digital Transmission Systems

Test Report No.: 45643RUS1Rev3

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)**