MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313

July 17, 2004

AEPTEC Microsystems
700 King Farm Blvd. Suite 600
Rockville, MD 20850

Dear Mr. Frank Li,

Enclosed is the EMC test report for compliance testing of the AEPTEC Microsystems, 3e-531AP, tested to the requirements of Title 47 of the CFR, Part 15 Subpart C Subsection 15.247 for Intentional Radiators and FCC Declaration of Conformity under CFR, Part 15, Subpart B For a Class A Unintentional Radiator.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Christina M. Karlhoff
Documentation Department

Reference: (\AEPTEC Microsystems\ 3e-531AP \ EMC15263-FCC247)

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Electromagnetic Compatibility Criteria
Test Report

For the

AEPTEC Microsystems
3e-531AP

Tested under

FCC Certification Rules
Title 47 of the CFR, Part 15, Subpart C for Intentional Radiators
And FCC Declaration of Conformity under CFR, Part 15, Subpart B
For a Class A Unintentional Radiator

MET Report: 15263-FCC247

July 17, 2004

Prepared For:

AEPTEC Microsystems
700 King Farm Blvd. Suite 600
Rockville, MD 20850

Prepared By:
MET Laboratories, Inc.
Baltimore, MD 21230

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For a Class A Unintentional Radiator

L. Leonard Knight
Electromagnetic Compatibility Lab

Christina M. Karlhoff
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 15, Subsection 15.247 of the FCC Rules under normal use and maintenance.

Liming Xu
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
	July 17, 2004	Initial Issue.

Table of Contents

All references to section numbers are taken directly from the standard/specification used. Only sections requiring testing or evaluation are included.

List of Tables

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci **B**els
dBμA	**D**eci-**B**els above one **micro A**mp
dBμV	**D**eci-**B**els above one **micro V**olt
dBμA/m	**D**eci-**B**els above one **micro A**mp **per m**eter
dBμV/m	**D**eci-**B**els above one **micro V**olt **per m**eter
DC	**D**irect **C**urrent
DCF	**D**istance **C**orrection **F**actor
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
H	Magnetic Field
GHz	**G**iga **H**ert**z**
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo **V**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**H**ertz
μH	**micro H**enry
μF	**micro F**arad
μs	**micro s**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
V/m	**V**olts **per m**eter

1. Requirements Summary

Reference	Description	IR Type (Requirement)		Compliance
		FHSS	DSS	
Title 47 of the CFR, Part 15, Subpart C, §15.203	Antenna Requirement	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.205	Emissions at Restricted Band	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.207(a);	Electromagnetic Compatibility - Conducted Emissions for Intentional Radiators	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.209(a); §15.247(a) and (b)	Electromagnetic Compatibility - Radiated Emissions for Intentional Radiators	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.247(a)	Bandwidth & Band Edge	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.247(b)	Output Power and RF Exposure	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.247(c)	Spurious Emissions - Radiated and RF Conducted	N/A	✓	Complies
Title 47 of the CFR, Part 15, Subpart C, §15.247(d)	Power Spectral Density	N/A	✓	Complies

Table 1 Requirements Summary of EMC Part 15.247 ComplianceTesting

NOTE: Spread spectrum systems are sharing these bands on a noninterference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of part 18 of this chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U. S. Government operations in the 902-928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

2. Equipment Configuration

2.1. Overview

An EMC evaluation to determine compliance of the AEPTEC Microsystems 3e-531AP with the requirements of Part 15, Subpart C, §15.247 was performed. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the AEPTEC Microsystems 3e-531AP. AEPTEC Microsystems should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the 3e-531AP has been **permanently** discontinued.

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, §15.247, in accordance with AEPTEC Microsystems, purchase order number 04-0457. All tests were conducted using measurement procedure ANSI C63.4-1992.

Type of Submission/Rule:	Part 15.247 Original Filing
Model(s) Tested:	3e-531AP
Model(s) Covered:	3e-531AP
EUT Specifications:	**Primary Power:** 120 AC
	FCC ID QVT-531AP
	Equipment Code: DTS
	RF Power Output: 0.119 Watts Conducted
	Equipment Frequency Range: 2.412 GHz - 2.462 GHz
Analysis:	The results obtained relate only to the item(s) tested.
Evaluated by:	Liming Xu
Report Date:	July 17, 2004

2.2. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave.. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a semi-anechoic chamber. In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories. In accordance with §2.948(d), MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program (Lab Code: 100273-0).

2.3. Description of Test Sample

The 3e-531AP, Equipment Under Test (EUT) for the remainder of this document, is powered from a 120V AV supply.

IEEE 802.11b Wireless Access point and Wireless bridge. It can be powered either by AC power or with IEEE802.3af PoE DC injector.

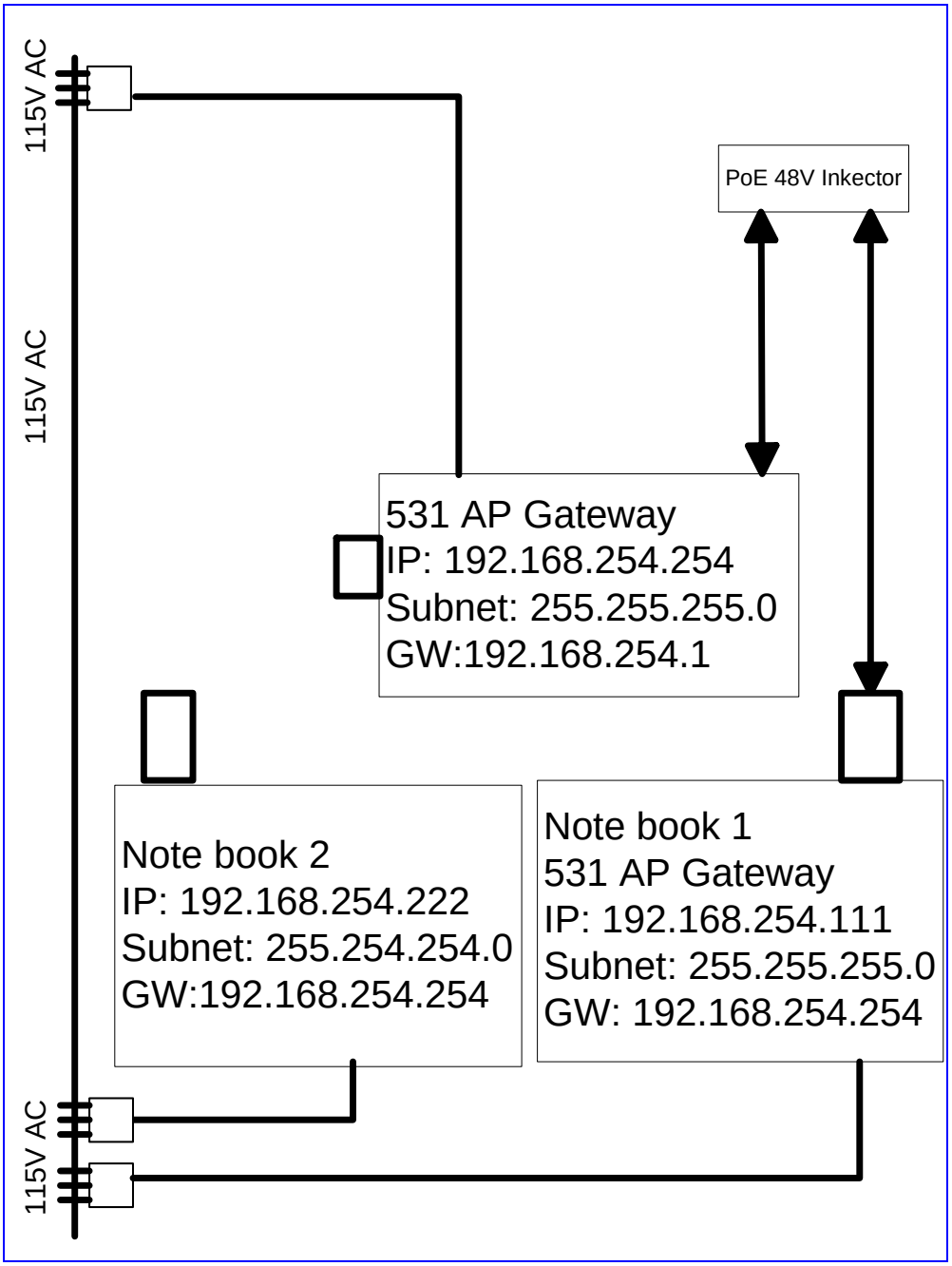


Figure 1. Block Diagram of Test Configuration

2.4. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Name / Description	Model Number	Part Number	Serial Number	Revision
Wireless AP and bridge	3e-531AP	3e-531AP	32000514-001	None Listed

Table 2. Equipment Configuration

2.5. Support Equipment

No support equipment was necessary for the operation and testing of the AEPTEC Microsystems 3e-531AP. All support equipment supplied is listed in the following Support Equipment List.

2.6. Mode of Operation

The EUT simulated normal operation through data up link from a WAN (wide are network) port.

2.7. Method of Monitoring EUT Operation

The cessation of PC data link indicated the wireless AP or bridge was not functioning.

2.8. Modifications

2.8.1. Modifications to EUT

No modifications were made to the EUT.

2.8.2. Modifications to Test Standard

No modifications were made to the test standard.

2.9. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to AEPTEC Microsystems upon completion of testing.

3. Electromagnetic Compatibility Criteria for Intentional Radiators

3.1. Antenna Requirement

Test Requirement: **§ 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT complied with the requirement(s) of this section.

The EUT as tested meets the criteria of this rule by virtue of having a permanently attached external antenna professionally installed onto the EUT and is not accessible by the user.

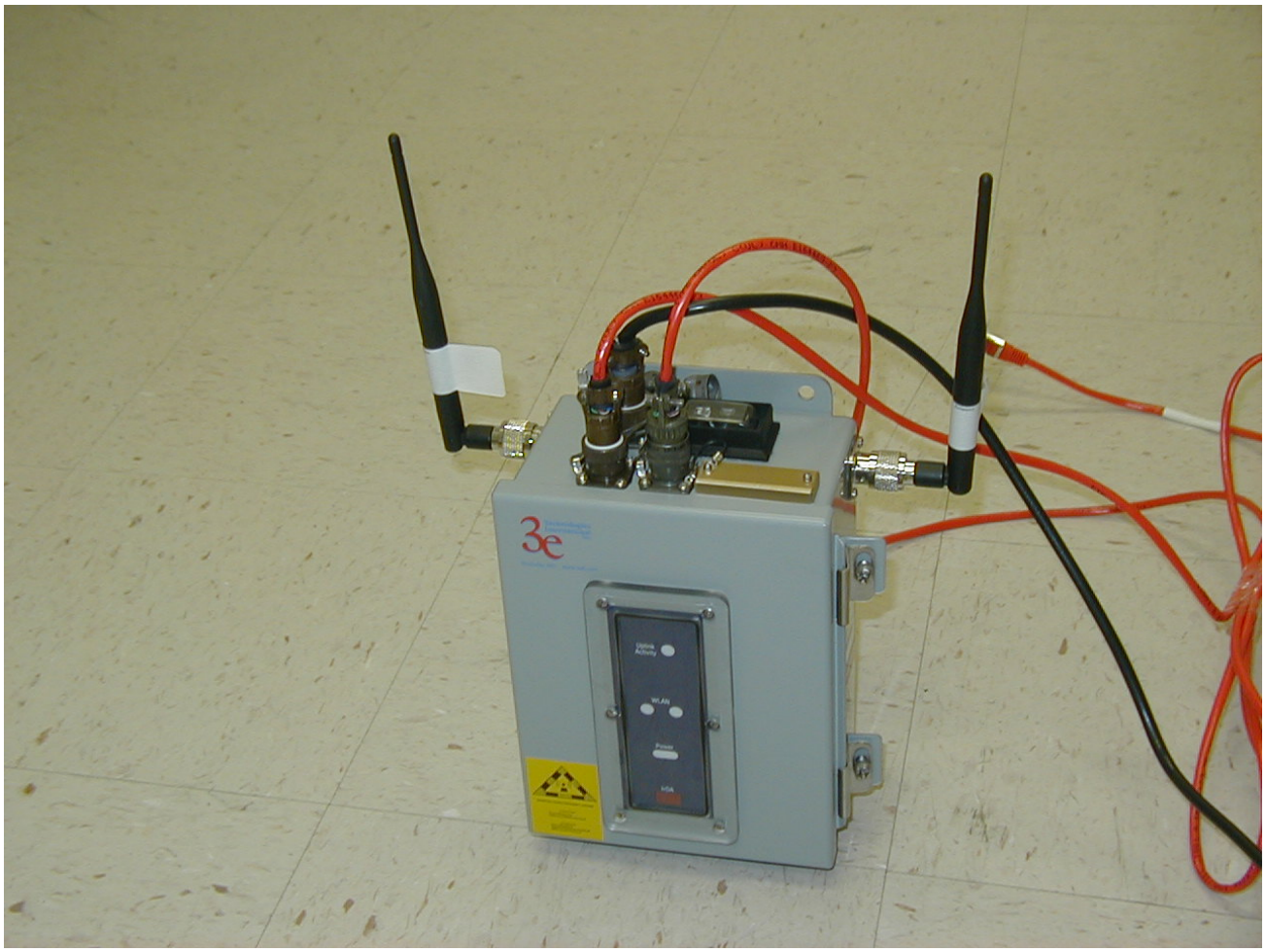
Type of Antenna:_External Dipole

Gain of Antenna: 5 dBi

Test Engineer(s): Liming Xu

Test Date(s): 4/08/2004

Antenna Requirement Test Setup



Photograph 1. EUT with Antenna Connected

3.2. Conducted limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment 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 Table 3. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device 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 Table 3. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

15.207(a), Except as shown in paragraphs (b) and (c) of this section*, charging, AC adapters or battery eliminators 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 Table 3, as measured using a 50 μH/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 frequencies ranges.

Note: *Testing is applicable except to carrier current systems operating as intentional radiators on frequencies below 30 MHz, containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver, or 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 *15.207 (b)*, or for an intentional radiator that is designed to be connected to the public utility (AC) power line*15.207 (c)*.

Frequency range (MHz)	Class A Conducted Limits (dBμV)		*Class B Conducted Limits (dBμV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz. * -- Limits per Subsection 15.207(a).				

Table 3. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Procedure: The EUT was installed placed on a 0.8 m high wooden table inside a shielded enclosure (See Figure Photograph 1). The EUT was situated such that the back of the EUT was 0.4 m from one wall of the shielded enclosure, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 µH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-1992 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.45 MHz to 30 MHz using a 50 Ω/50 µH LISN as the input transducer to an EMC/field intensity meter. The tests were conducted in a RF-shielded enclosure.

Results: The EUT complied with the requirement(s) of this section.

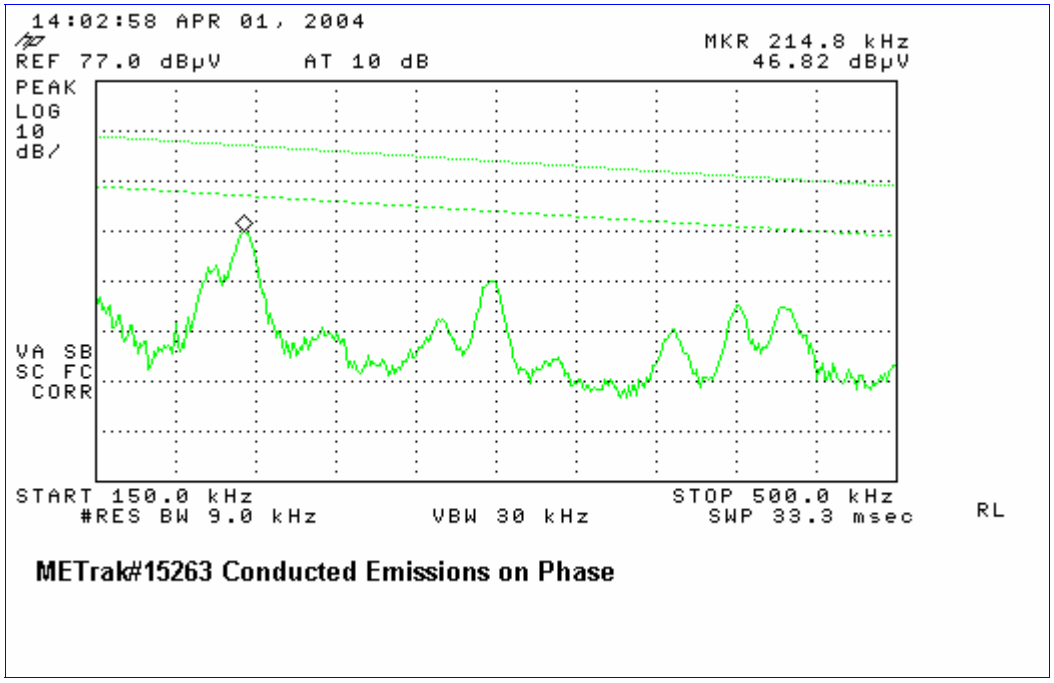
Test Engineer(s): Chad Beattie

Test Date(s): 04/01/2004

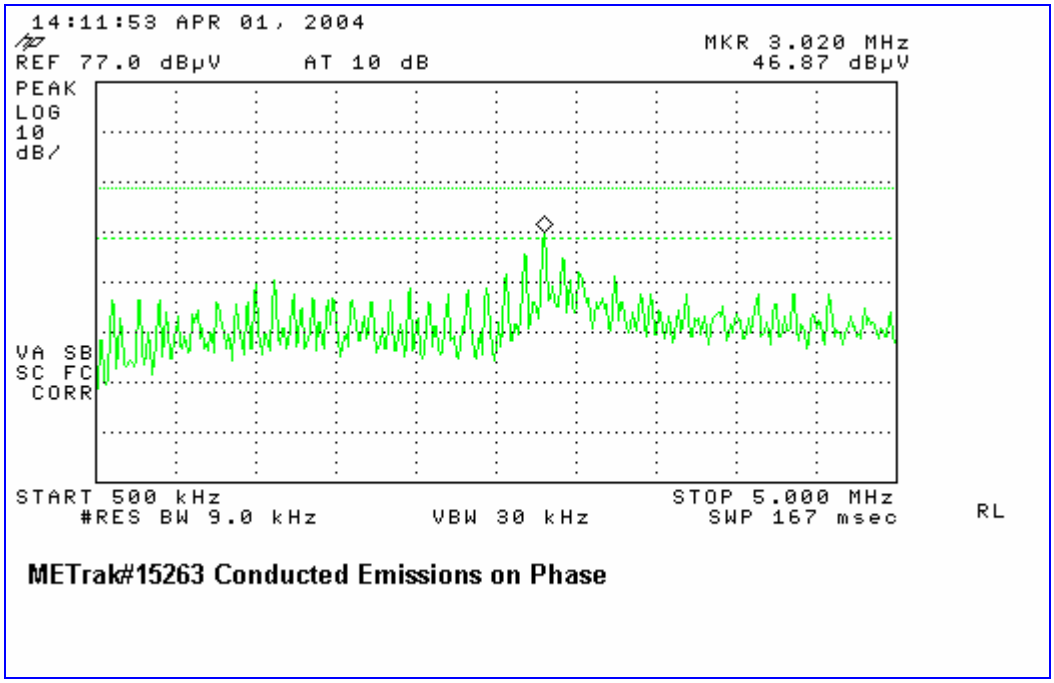
Conducted Limits Test Results

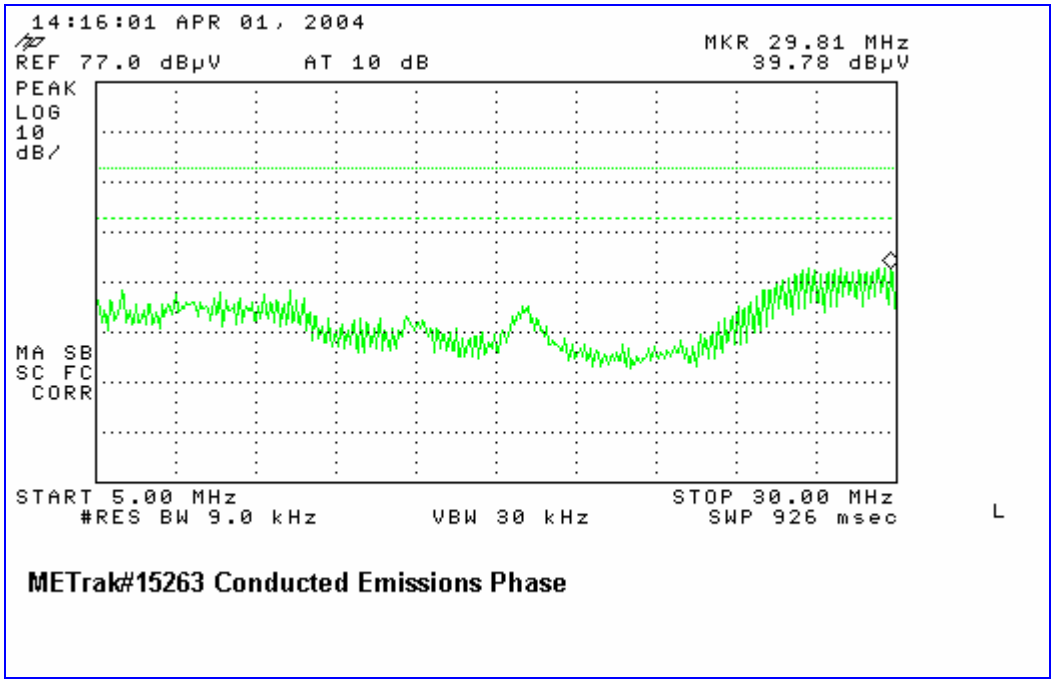
15.207 (a) Conducted Emissions - Voltage, Worst Case Emissions, AC Power, Phase Line,

Frequency (MHz)	Quasi-Peak Amplitude (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dBµV)	Average Amplitude (dBµV)	Average Limit (dBµV)	Average Margin (dBµV)
0.200	46.80	63.60	-16.80	35.40	53.60	-18.20
0.323	37.07	59.63	-22.56	37.07	49.63	-12.56
0.431	32.30	57.24	-24.94	32.30	47.24	-14.94
1.501	37.30	56.00	-18.70	29.70	46.00	-16.30
3.020	46.90	56.00	-9.10	30.40	46.00	-15.60
4.415	34.60	56.00	-21.40	34.60	46.00	-11.40
7.500	35.50	60.00	-24.50	35.50	50.00	-14.50
15.060	30.50	60.00	-29.50	30.50	50.00	-19.50
18.440	33.80	60.00	-26.20	33.80	50.00	-16.20
29.810	39.80	60.00	-20.20	39.80	50.00	-10.20



METrak#15263 Conducted Emissions on Phase



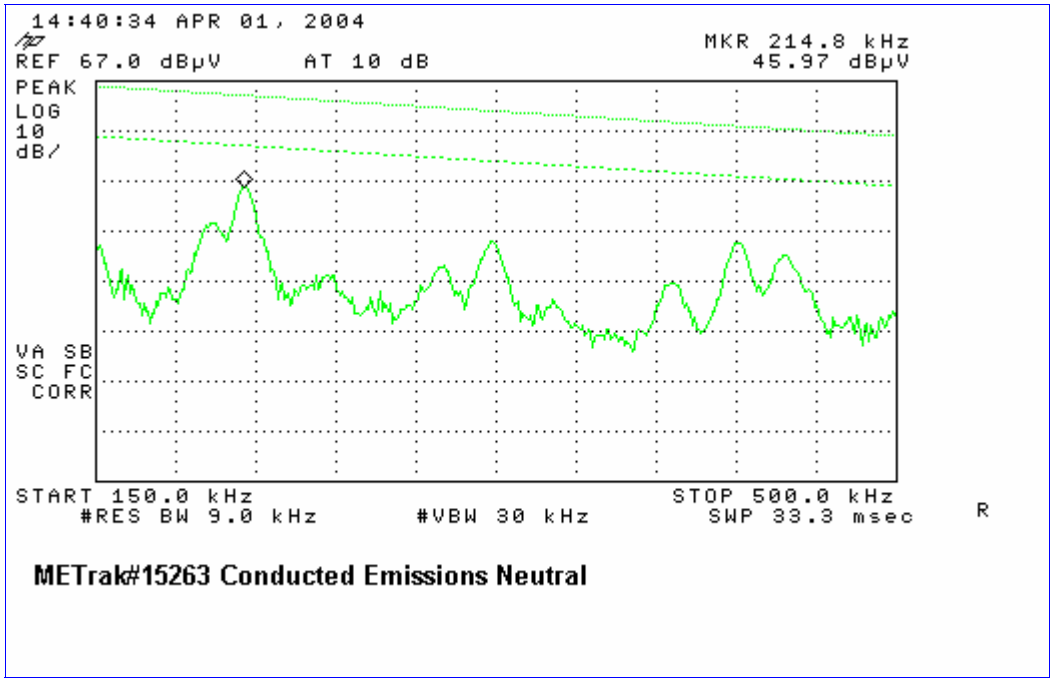


Conducted Emission Limits, Phase Line Plots

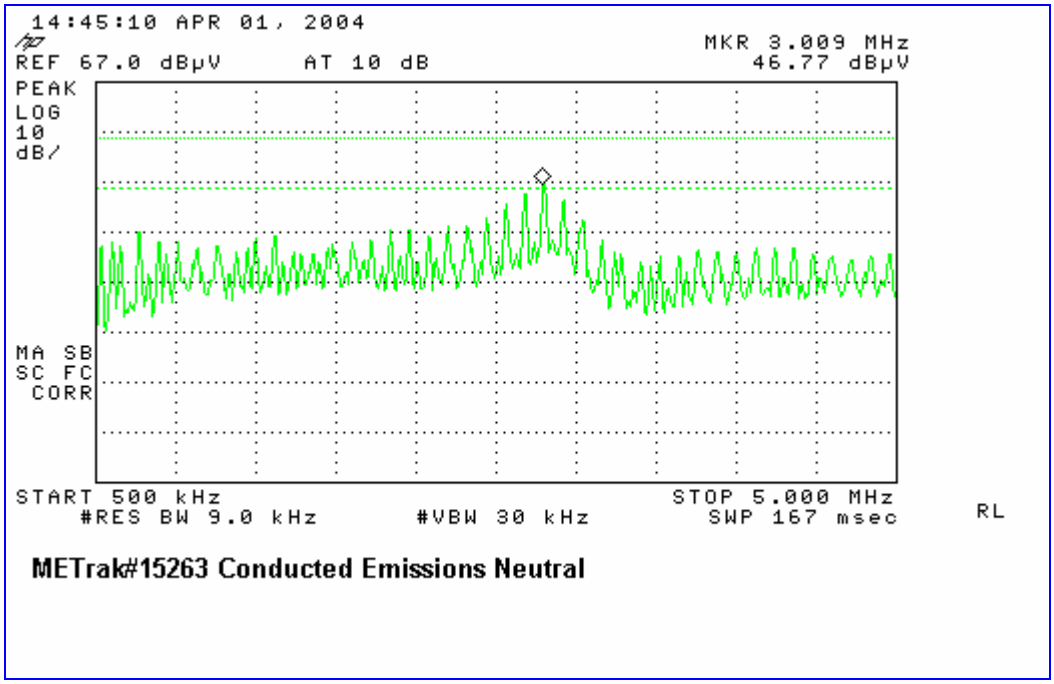
Conducted Limits Test Results

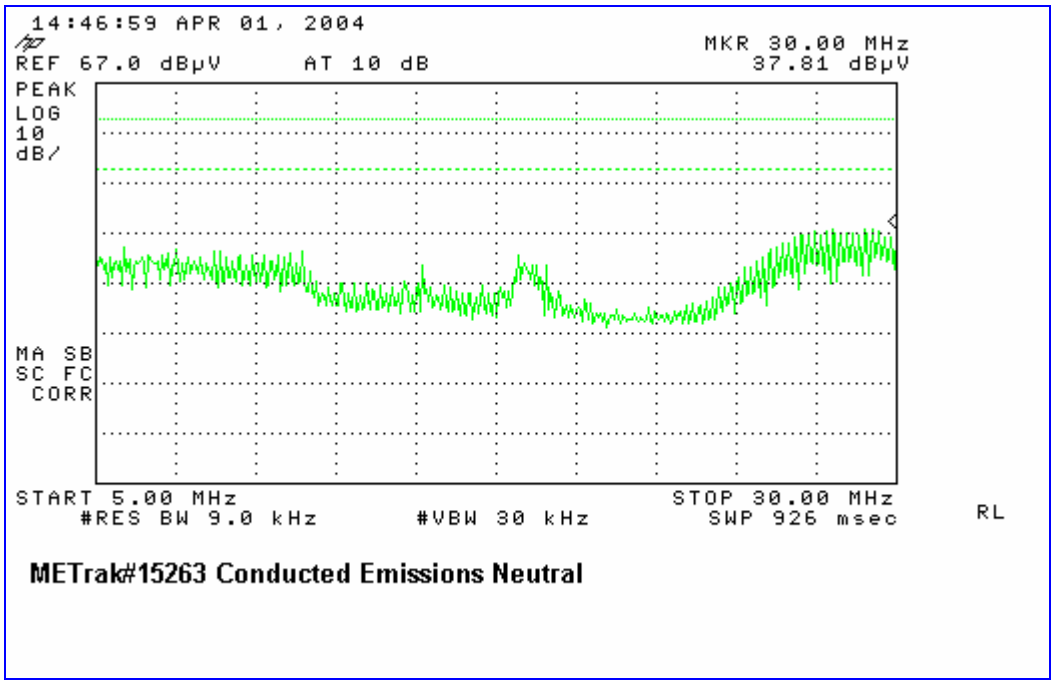
15.207 (a) Conducted Emissions - Voltage, Worst Case Emissions, AC Power, Neutral Line,

Frequency (MHz)	Quasi-Peak Amplitude (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dBµV)	Average Amplitude (dBµV)	Average Limit (dBµV)	Average Margin (dBµV)
0.200	46.00	63.60	-17.60	37.00	53.60	-16.60
0.323	34.60	59.63	-25.03	34.60	49.63	-15.03
0.431	34.50	57.24	-22.74	34.50	47.24	-12.74
1.501	36.50	56.00	-19.50	30.10	46.00	-15.90
3.020	44.40	56.00	-11.60	34.90	46.00	-11.10
4.415	33.70	56.00	-22.30	33.70	46.00	-12.30
7.500	33.90	60.00	-26.10	33.90	50.00	-16.10
15.060	30.90	60.00	-29.10	30.90	50.00	-19.10
18.440	32.20	60.00	-27.80	32.20	50.00	-17.80
28.250	38.20	60.00	-21.80	38.20	50.00	-11.80



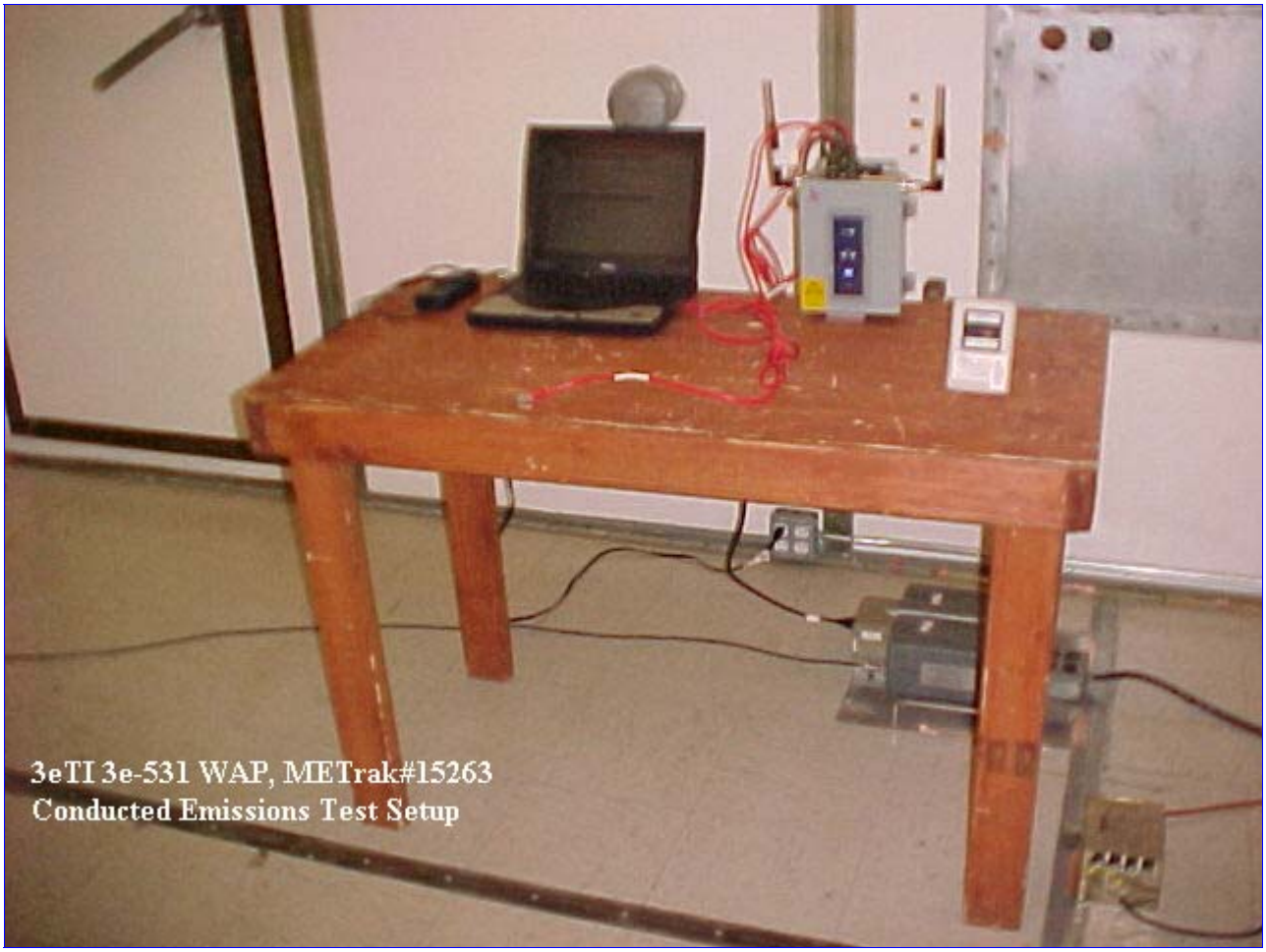
METrak#15263 Conducted Emissions Neutral





Conducted Emission Limits, Neutral Line Plots

Conducted Limits Test Setup



Photograph 1 Conducted Limits, Test Setup

3.3. Unintentional Radiated Emission Limits

Test Requirement(s):

15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 4.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 4.

Frequency (MHz)	Field Strength (dBµV/m)	
	§ 15.109 (b), Class A Limit (dBµV) @ 10m	§ 15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 4. Radiated Emissions Limits calculated from FCC Part 15 Subpart B, 15.109 (a) (b)

Test Procedure:

The EUT was installed placed on a 0.8 m high wooden table (See Photograph 2). Various antennas were placed near the EUT and measurements were taken of the field strengths and frequencies. For final radiated measurements, the EUT was placed in in a semi-anechoic chamber, and located 1 m and 3 m from an adjustable antenna mast. For pre-scanning, the spectrum analyzer scanned the frequency range from 30 MHz to 1 GHz to obtain an emission profile of the EUT. For each point of measurement, the turntable was rotated, and the antenna height was varied between 1 m and 4 m, in order to find the maximum radiated emissions. Measurements above 30 MHz were taken using this technique with the antenna in two polarizations: horizontal and vertical.

Unless otherwise specified, measurements between 30 MHz and 1 GHz were made using a quasi-peak detector with a 120 kHz bandwidth. For measurements above 1 GHz, a 1 MHz detector was used with either a "peak" detector or an "average" detector. In general, all radiated emissions above 1 GHz measurements were made with the peak detector unless otherwise noted.

Test Results: The EUT complies with the requirement(s) of this Section.

Test Engineer(s): Jeffrey Hazen

Test Date(s): 04/05/2004

Unintentional Radiated Emission Limits

Radiated Emissions Limits Test Results, 15.209 (a) Class A

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna Height (m)	Uncorrected Amplitude (dBuv)	ACF (dB) (+)	Cable Loss (dB) (+)	DCF (dB) (-)	Corrected Amplitude (dBuv)	Limit (dBuv)	Margin (dB)
34.120	154.7	H	3.33	10.54	7.12	1.36	10.46	8.56	39.00	-30.44
34.120	281.6	V	1.00	19.47	6.92	1.36	10.46	17.29	39.00	-21.71
48.000	178.5	H	3.77	13.81	9.42	1.56	10.46	14.33	39.00	-24.67
48.000	275.6	V	1.00	24.11	8.34	1.56	10.46	23.55	39.00	-15.45
144.020	90.9	H	1.31	18.18	7.88	2.60	10.46	18.20	43.50	-25.30
144.020	34.7	V	1.00	19.44	7.80	2.60	10.46	19.38	43.50	-24.12
192.000	13.9	H	1.10	28.27	10.00	2.94	10.46	30.75	43.50	-12.75
192.000	330.8	V	1.56	27.68	9.72	2.94	10.46	29.88	43.50	-13.62
367.500	0	H	1.97	29.77	14.70	3.99	10.46	38.00	46.40	-8.40
367.500	58.1	V	1.00	32.46	15.00	3.99	10.46	40.99	46.40	-5.41
384.000 *	179	H	1.78	34.83	15.24	4.07	10.46	43.68	46.40	-2.72
384.000 *	40.3	V	1.00	36.72	14.62	4.07	10.46	44.95	46.40	-1.45
868.800	133.3	H	1.10	20.09	21.98	5.54	10.46	37.14	46.40	-9.26
868.800	0	V	1.00	10.67	21.40	5.54	10.46	27.15	46.40	-19.25

Notes: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3dB below the specification limit. We recommend that every emission measured, have at least a 3dB margin to allow for deviations in the emission characteristics that may occur during the production process.

The EUT was tested at 3 m.

Test Engineer(s): Jeffrey Hazen

Test Date(s): 04/05/2004

Unintentional Radiated Emission Limits

Photograph 2. Radiated Emission Limits, Test Setup

3.4. Intentional Radiated Emission Limits

Test Requirement(s): **§ 15.205 (a)** Except as shown in paragraph (d) of **15.205 Restricted bands of operation**, only spurious emissions are permitted in any of the frequency bands specified in Table 5:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505 (Note 1)	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
6.215–6.218	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	(Note 2)
13.36–13.41.			
Note 1: Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz. Note 2: Above 38.6			

Table 5. Radiated Emissions Limits from FCC Part 15, § 15.205

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209.

§ 15.209 (a): Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 6.

Frequency (MHz)	§ 15.209(a),Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00*
88 - 216	43.50*
216 - 960	46.00*
Above 960	54.00
* -- Except perimeter protection systems operating under 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 Subpart.	

Table 6. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedure:

The EUT was installed placed on a 0.8 m high wooden table located in a shielded enclosure (See Photograph 2). Various antennas were placed near the EUT and measurements were taken of the field strengths and frequencies. For final radiated measurements, the EUT was placed in a semi-anechoic chamber, and located 1 m and 3 m from an adjustable antenna mast. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst case orientation for maximum emissions. For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth. For frequencies above 1 GHz, peak measurements were made with a resolution bandwidth of 1 MHz and a video bandwidth of 1MHz and average measurements were made with RBW = 1MHz and VBW = 10 Hz.

For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

In accordance with §15.35(b) the limit on the radio frequency emissions as measured using instrumentation with a peak detector function shall be 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

The EUT was scanned up to the 10^{th} harmonic of the carrier (up to 2.5GHz).

Test Results:

The EUT complied with the requirement(s) of this section. See Radiated Emissions data in following pages.

Intentional Radiated Emission Limits Test Results, 15.247(c); 15.209(a) and 15.205

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna Height (m)	Amplitude (dBuv) @3 m	ACF (dB) (+)	Cable Loss (dB) (-)	DCF 3 m to 10 m (dB) (-)	Corrected Amplitude @ 10 m (dBuv)	Class A Limit @ 10 m (dBuv)	Margin (dB)
34.120	154.7	H	3.33	10.54	7.12	1.36	10.46	8.56	39.00	-30.44
34.120	281.6	V	1.00	19.47	6.92	1.36	10.46	17.29	39.00	-21.71
48.000	178.5	H	3.77	13.81	9.42	1.56	10.46	14.33	39.00	-24.67
48.000	275.6	V	1.00	24.11	8.34	1.56	10.46	23.55	39.00	-15.45
144.020	90.9	H	1.31	18.18	7.88	2.60	10.46	18.20	43.50	-25.30
144.020	34.7	V	1.00	19.44	7.80	2.60	10.46	19.38	43.50	-24.12
192.000	13.9	H	1.10	28.27	10.00	2.94	10.46	30.75	43.50	-12.75
192.000	330.8	V	1.56	27.68	9.72	2.94	10.46	29.88	43.50	-13.62
367.500	0	H	1.97	29.77	14.70	3.99	10.46	38.00	46.40	-8.40
367.500	58.1	V	1.00	32.46	15.00	3.99	10.46	40.99	46.40	-5.41
384.000 *	179	H	1.78	34.83	15.24	4.07	10.46	43.68	46.40	-2.72
384.000 *	40.3	V	1.00	36.72	14.62	4.07	10.46	44.95	46.40	-1.45
868.800	133.3	H	1.10	20.09	21.98	5.54	10.46	37.14	46.40	-9.26
868.800	0	V	1.00	10.67	21.40	5.54	10.46	27.15	46.40	-19.25

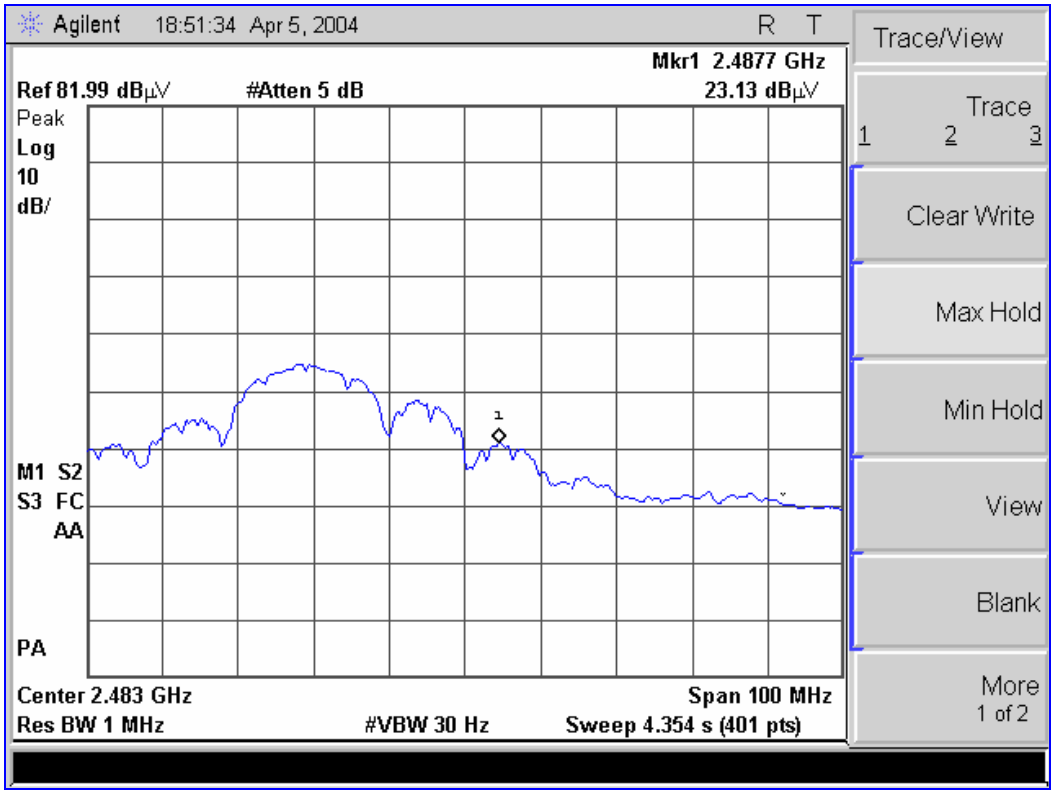
Notes: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3dB below the specification limit. We recommend that every emission measured, have at least a 3dB margin to allow for deviations in the emission characteristics that may occur during the production process.

EUT was Scanned up to the 10th harmonic of the carrier (up to 2.5GHz).

Remarks: The EUT complied with the requirement(s) of 15.247(c); 15.209(a) and 15.205.

Test Engineer(s): Jeffrey Hazen

Test Date(s): 04/05/2004



Power level 7 = 20.75 dBm (Conducted PEP)

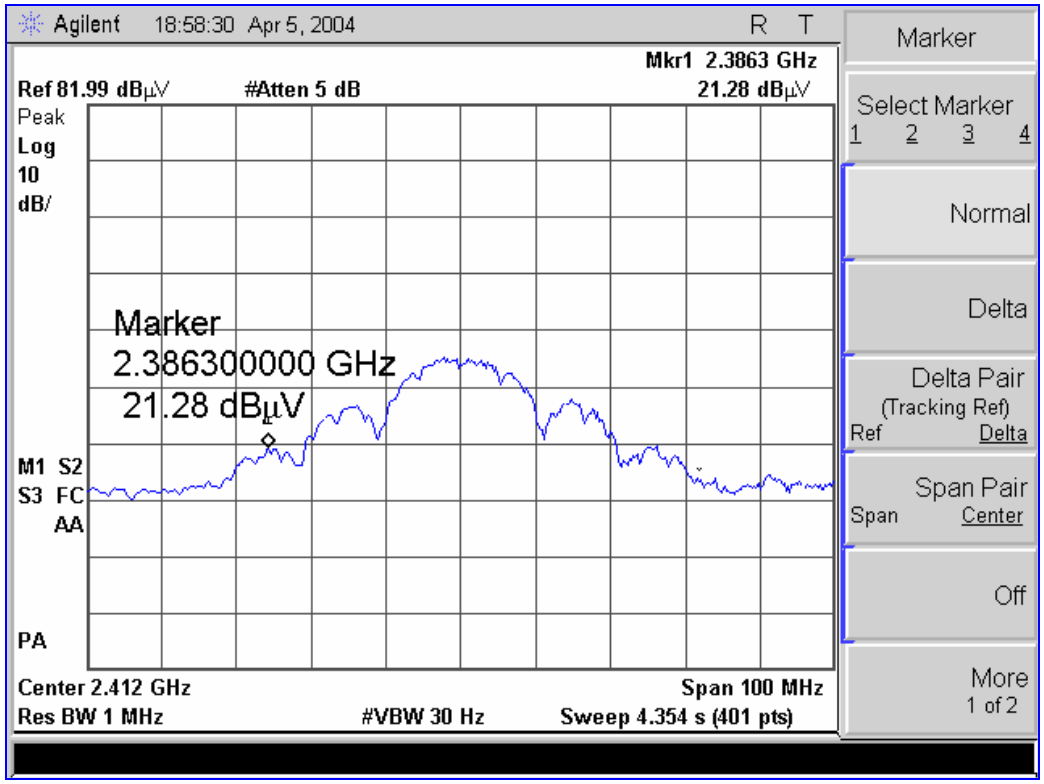
Radiated emissions at restricted band : 2.483 GHz.

(23.13 + 27.88) dBuv = 51.01 dBuV/m @ 3 meters
*27.88 dB is antenna factor @ 2.483 GHz
*FCC limit: 54 dBuV/m @ 3 meters

Remarks: The EUT complied with the requirement(s) of 15.247(c); 15.209(a) and 15.205.

Test Engineer(s): Liming Xu

Test Date(s): April 5, 2004



Power level 7 = 20.75 dBm (Conducted PEP)

Radiated emissions at restricted band : 2.390 GHz.

(21.28 + 27.75) dBuv = 49.03 dBuV/m @ 3 meters
*27.75 dB is antenna factor @ 2.390 GHz
*FCC limit: 54 dBuV/m @ 3 meters

Equipment Frequency Range: 2.412 GHz - 2.462 GHz (Center frequency)

Remarks: The EUT complied with the requirement(s) of 15.247(c); 15.209(a) and 15.205. The EUT complied with the requirement(s) of the section 15.33 (See plots in pages 20 and 21).

Test Engineer(s): Liming Xu

Test Date(s): April 5, 2004

Bandwidth & Band Edge Requirements

Test Requirements: **§ 15.247(a):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. For DTS, the minimum 6dB bandwidth shall be at least 500 kHz. For frequency hopping systems, the EUT shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Procedure: The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW> RBW. The 6dB bandwidth was measured and recorded.

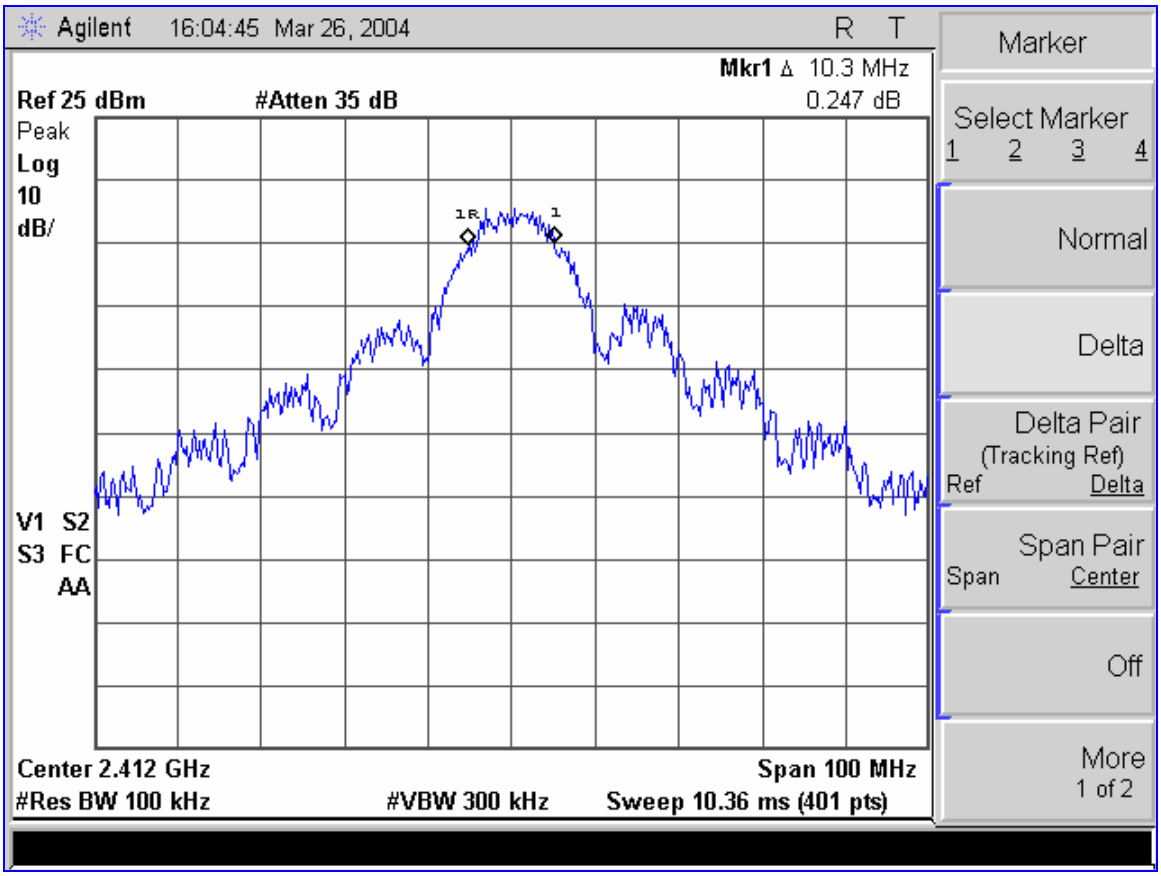
Test Results The EUT complied with the requirement(s) of this section.

Test Engineer: Liming Xu

Test Date: 3/26/2004

Bandwidth & Band Edge Requirements

Test Results: 6 dB BW = 10.3 MHz (more than 500KHz)



Test Engineer: Liming Xu

Test Date: 3/26/2004

Output Power and RF Exposure

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

.

Systems operating in the 2400– 2483.5 MHz band may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

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. The maximum peak output power of the intentional radiator shall not exceed the following: For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt

RF Exposure Requirements - §15.247(b)(5); §1.1307(b)(1): Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Procedure: The transmitter output was connected to the RF power meter through an attenuator.

Test Results: The EUT complied with the requirement(s) of this section.

Conducted Peak Output Power = 0.119 W. @ Channel #1 (2.412GHz)
Conducted Peak Output Power = 0.070 W. @ Channel #5 (2.432GHz)
Conducted Peak Output Power = 0.040 W. @ Channel #11 (2.462GHz)

The peak output power was measured from the wide band power meter and sensor.

Test Engineer: Liming Xu

Test Date: 4/1/2004

3.5. RF Exposure

Test Requirements: **§15.247(b)(5); §1.1307(b)(1)**

Test Specification: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Results: The EUT complied with the requirement(s) of this section.
EUT is a mobile device
EUT meets the requirements of these sections as proven through MPE calculation

The MPE calculation for EUT @ 20cm
Based on the highest P = 119 mW and G = 3.2 dBi

$Pd = PG/ 4pi*R^2 = (119 \times 3.2)/12.566* (20)^2$
$= (380.8)/12.56637x 400= 380.8 / 5026.55$
$= 0.076 \ mW/cm^2$

where:
*Pd = power density in mW/cm^2
* G = Antenna numeric gain (3.2); Log G = g/10 (g = 5).
* P = Conducted RF power to antenna (119 mW).
* R = Minimum allowable distance.(20 cm)

*The power density Pd = 0.076 mW/cm^2 is less than 1 mW/cm^2 (listed MPE limit)
*The SAR evaluation is not needed (this is a mobile device)
* The EUT(antenna) must be 0.2 meters away from the General Population.

Test Engineer(s): Liming Xu

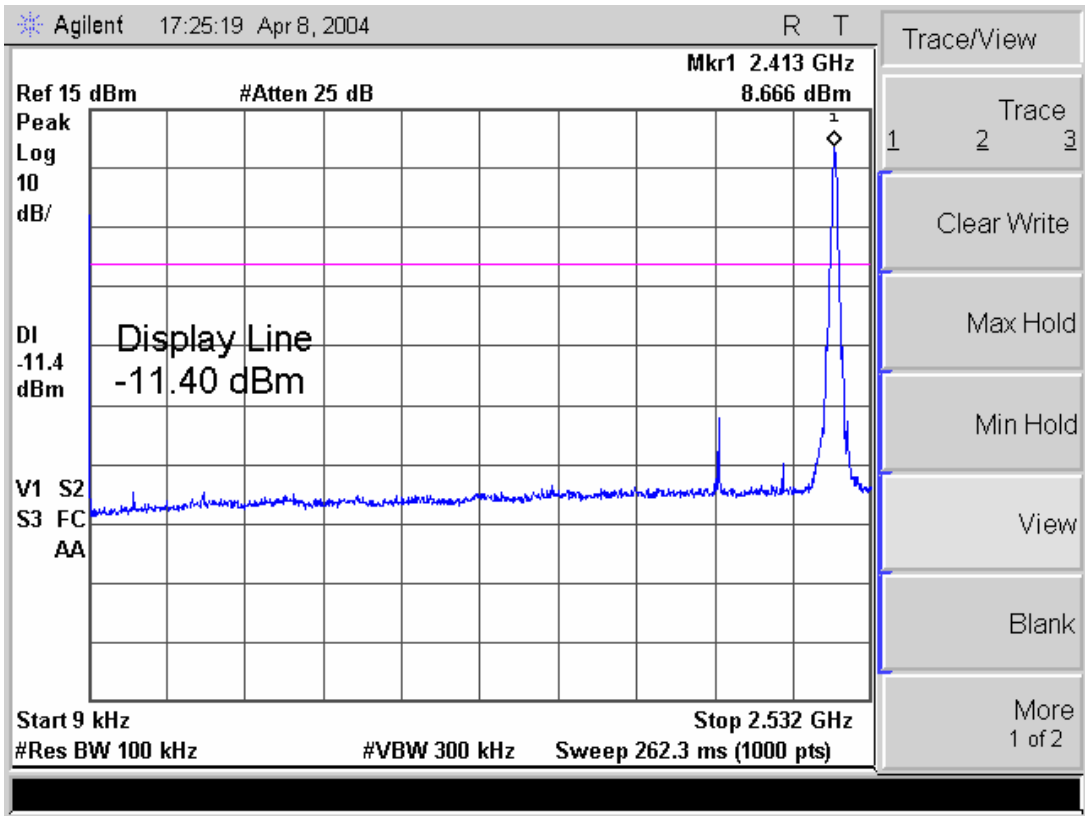
Test Date(s): July 17, 2004

3.6. Spurious Emissions Requirements –RF Conducted

Test Requirements: **§15.247(c):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. 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).

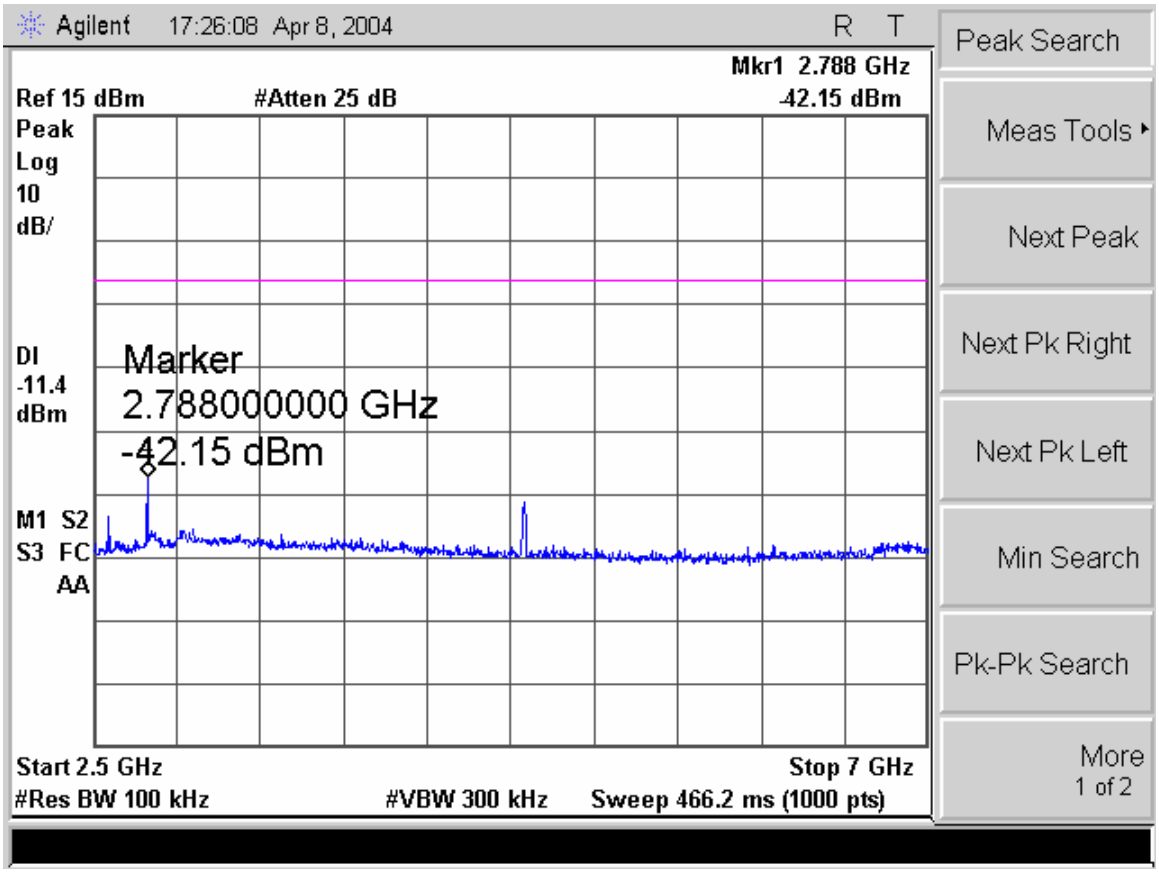
Test Procedure: For RF Conducted Emissions, the transmit output connected to the analyzer through the attenuator. RBW = 100kHz, VBW $\geq$ RBW. (Scan through 10^{th} harmonic)

Test Results: The EUT complied with the requirement(s) of this section The RF Conducted Emissions was determined from plots on the following pages.



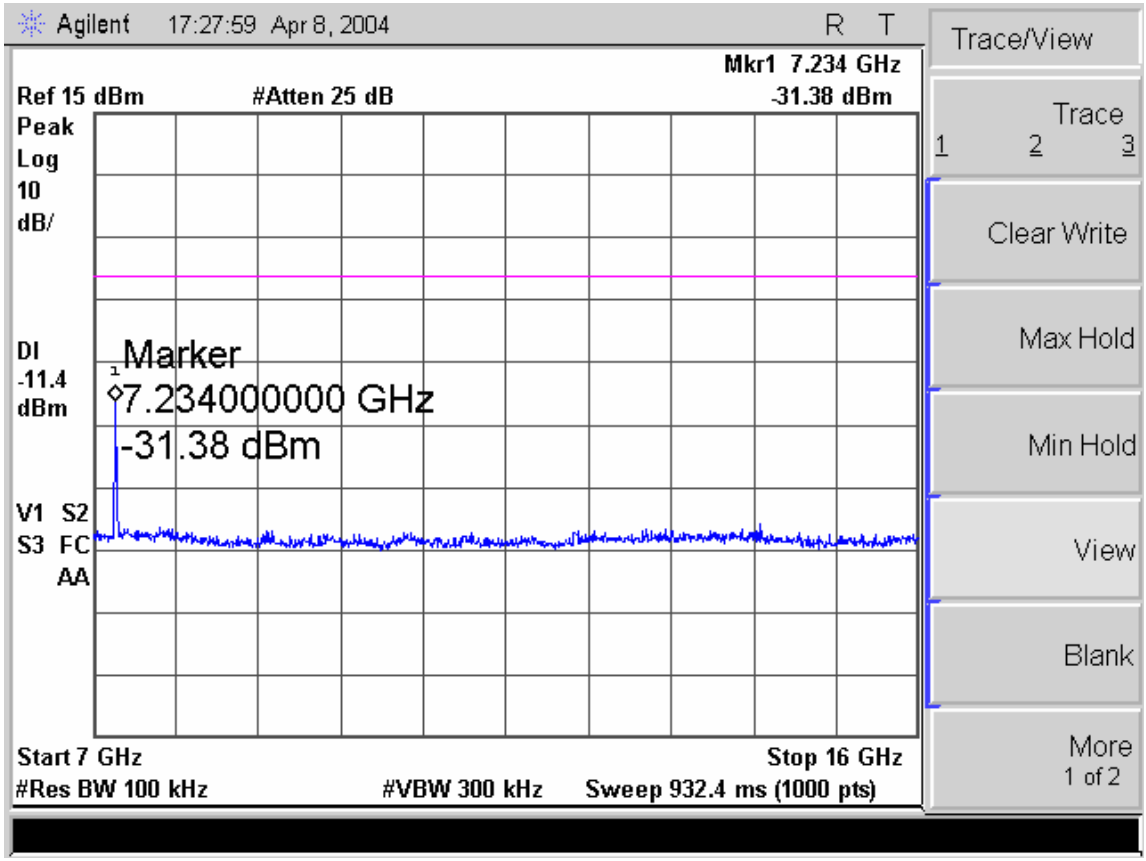
Test Engineer: Liming Xu

Test Date: April 8, 2004



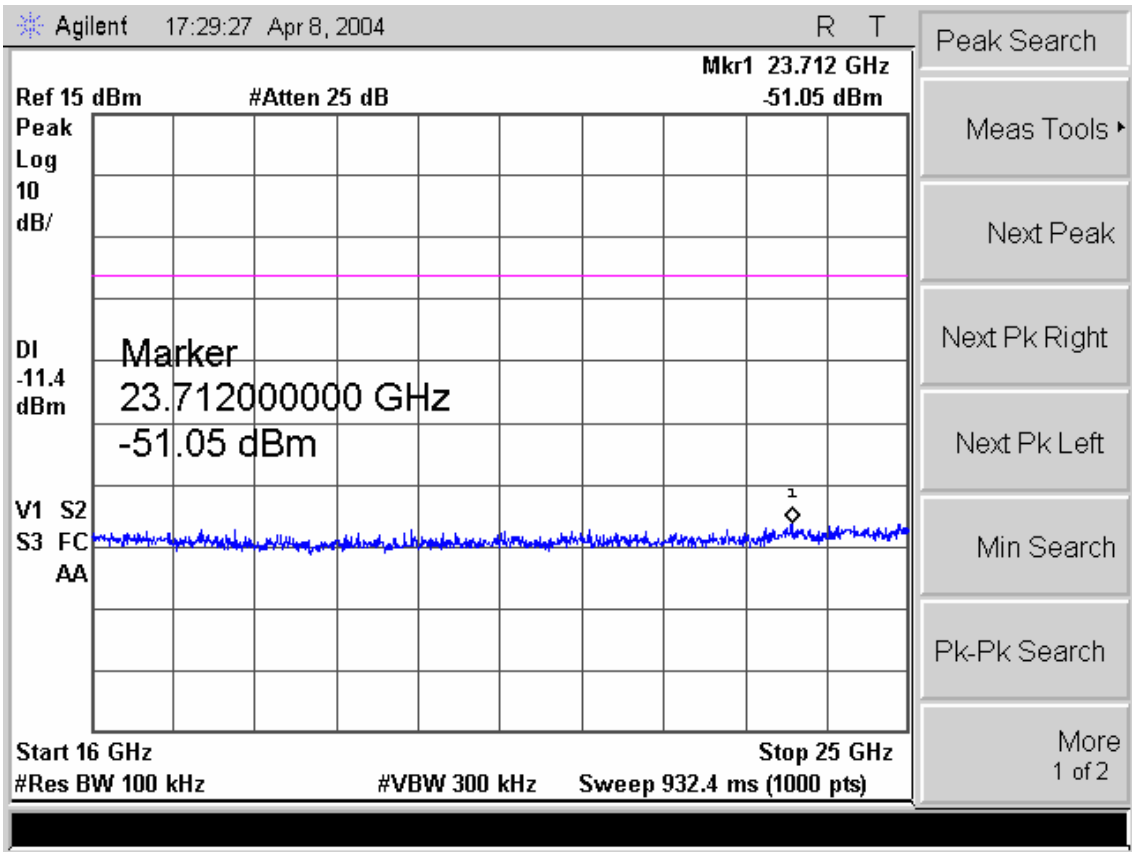
Test Engineer: Liming Xu

Test Date: April 8, 2004



Test Engineer: Liming Xu

Test Date: April 8, 2004



Test Engineer: Liming Xu

Test Date: April 8, 2004

Power Spectral Density

Test Requirements: **§15.247(d):** For digitally modulated 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 was connected to the spectrum analyzer through an attenuator.

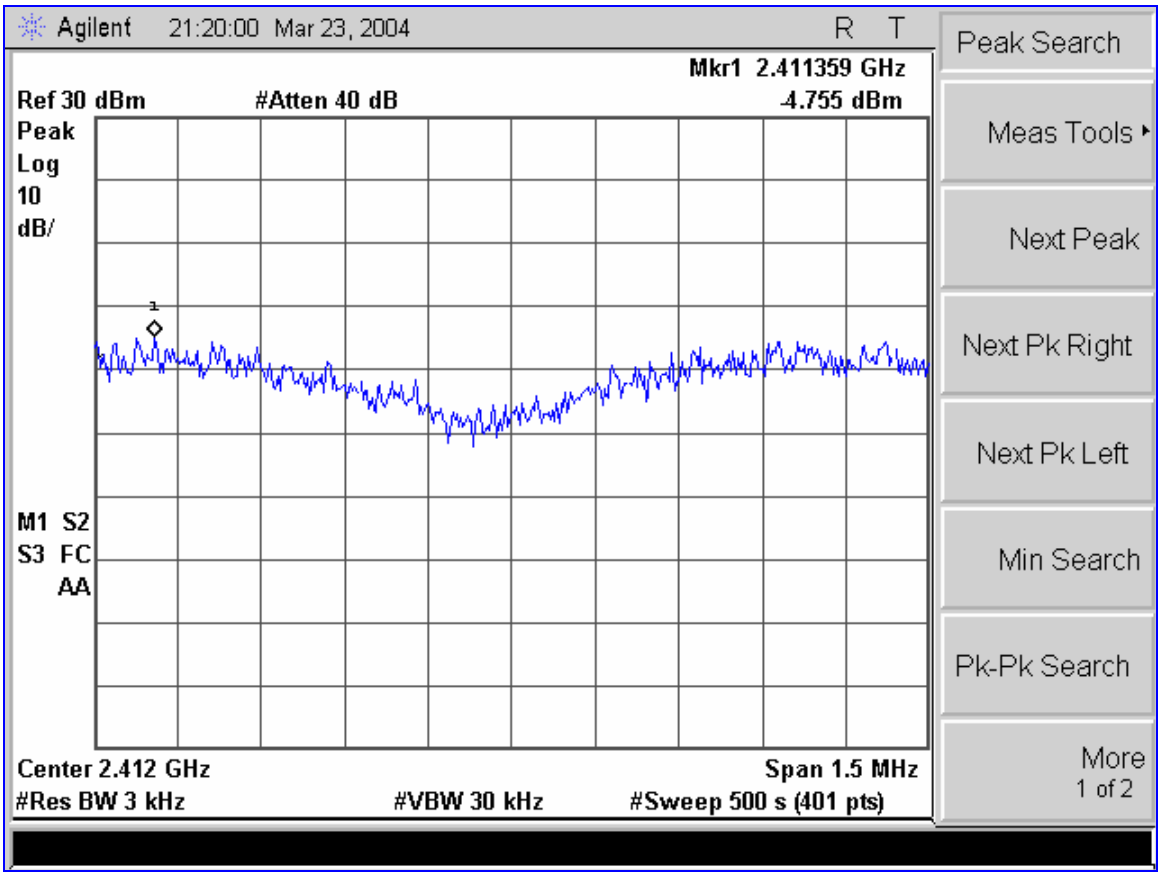
RBW = 3kHz, VBW > RBW

Sweep = Span/3kHz

Test Results: Equipment complies with requirement(s) of this section. The power spectral density was determined from plot on the following page.

Power Spectral Density Test Results

Power spectral density = -4.755dBm (< 8 dBm / 3 KHz)



Test Engineer: Liming Xu

Test Date: May 23, 2004

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

Test Equipment for Unintentional Radiator (15.107, 15.109)

Test Name: Conducted Emissions					**Test Date(s): 04/01/2004**
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
RENTAL	SPECTRUM ANALYZER	HEWLETT PACKARD	8593E	10/03/2003	10/03/2004
1T2947	LISN	SOLAR	8028-50-TS-24-BNC	09/22/2003	09/22/2004
1T2948	LISN	SOLAR	8028-50-TS-24-BNC	09/22/2003	09/22/2004
1T4342	THERMO HYGROMETER	CONTROL COMPANY	11-661-7D	08/22/2002	08/22/2004
Test Name: Radiated Emissions					**Test Date(s): 04/05/2004**
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1T4300	SHIELD ROOM 1	EMC TEST SYSTEMS	NONE	05/03/2003	05/03/2004
1T4302	EMI RECEIVER	HEWLETT PACKARD	85462A	10/16/2003	10/16/2004
1T4303	ANTENNA; BILOG	SCHAFNER - CHASE EMC	CBL6140A	04/09/2003	04/09/2004

Test Equipments for intentional radiator (15.247)

MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1T4300	SHIELD ROOM 1	EMC TEST SYSTEMS	NONE	05/03/2003	05/03/2004
1T4303	ANTENNA; BILOG	SCHAFNER - CHASE EMC	CBL6140A	04/09/2003	04/09/2004
1T4272	LOOP ANTENNA	EMCO	8512	11/25/2003	11/25/2004
1T4351	SPECTRUM ANALYZER	AGILENT	E 7405A	08/21/2003	08/21/2004
1T4404	WIDEBAND PEAK POWER SENSOR	ANRITSU	MA2471A	04/08/2004	04/08/2005
1T4403	WIDEBAND PEAK POWER METER	ANRITSU	ML2488A	04/08/2004	08/24/2005
1T2511	HORN ANTENNA	EMCO	3115	07/18/2003	07/18/2004
1T4302	EMI RECEIVER	HEWLETT PACKARD	8546A	10/16/2003	10/16/2004

4. Compliance Information

4.1. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

4.2. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.