Intertek ETL SEMKO

TEST REPORT

Report Number: 3086097MIN-001
Project Number: 3086097
November 30, 2005

Evaluation of the
802.11b/g Radio, CVX-Server
FCC ID: S3ICVX-SERVER

to
FCC Part 2
FCC Part 15, Subpart C, Section 15.247

For
Kontron Mobile Computing

Test Performed by:	Test Authorized by:
Intertek	Kontron Mobile Computing
7250 Hudson Blvd. Suite 100	7631 Anagram Drive
Oakdale, MN 55128	Eden Prairie, MN 55344-7015

Prepared by: _____ Date: November 30, 2005
Norman Shpilsher

Reviewed by: _____ Date: November 30, 2005
Uri Spector

CONTENTS

1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the *Kontron 802.11b/g PC Radio Model: CVX-Server* for Certification under FCC Part 15, Subpart C.
There are no other simultaneous applications.
The Receiver portion will be verified under Declaration of Conformity.

1.2 Product Description

The *CVX-Server Transmitter* is a radio provides a wireless Ethernet communication. The *CVX-Server Transmitter* is a Digitally Modulated Intentional Radiator operating at 13 channels within 2400 - 2483.5MHz frequency band under **CFR 47:2004**, Section 15.247. The intended use of the *CVX-Server Transmitter* is to generate a RF signal, deliver the signal directly or through external amplifier to the antenna in order to communicate with the remote radios. The *CVX-Server Transmitter* is a mobile system, which includes CVX-Server with built-in 802.11b/g radio (ASKEY WiFi IEEE802.11b/g card, model WLL3091). The *CVX-Server Transmitter* RF Output port connected to the antenna located on vehicle external bodywork; two types of antennas can be used with the *CVX-Server Transmitter*. The *CVX-Server Transmitter* is powered at 12VDC or 120VAC/60Hz through the Power Adapter. In order to demonstrate compliance with FCC regulations the *CVX-Server Transmitter* has been tested for radiated spurious emissions for both applicable antennas.

Antennas:

Two Antennas have been tested with *CVX-Server Transmitter* in order to demonstrate compliance with FCC requirements.

Type	Manufacturer	Manufacturer's p/n	Gain (dBi)	Connector	Cable
2400-2500MHz NMO Whip	Radiall/Larsen	NMO5E2400BKTNC	5	PR-TNC	17' RG-58/U
2400-2500MHz Omni WiFi	RadioLabs	2.4mobile-7	7.8	PR-TNC	5'

Sample Submitted: November 16, 2005
Test Work Started: November 21, 2005
Test Work Completed: November 29, 2005

1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-2003. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on March 2003 submitted to FCC. Please reference the site registration number: 90706, dated April 18, 2003.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

N/A

2.2 EUT Setup

For simplicity of testing, the transmitter was run to transmit continuously and tested at 2412, 2447, and 2472MHz. It was determined that the maximum emissions produced in 802.11b mode at 11Mbs data transmitting rate, therefore tests were performed at above mode in order to demonstrate transmitter compliance with FCC Part 15.247; for Peak Output Power measurements the transmitter was run continuously in CW mode.

2.3 EUT Exercising Software

The Atheros Radio Test (ART) software (art.exe application, Revision 5.2 Build #10) was running on the CVX-Server computer over the Windows 2000 Professional operating system. The Test software allowed change channels from 2412MHz to 2472MHz with incremental frequency of 5MHz.

2.4 Special Accessories

There are no special accessories necessary for compliance of these products.

2.5 Equipment Modification

No modifications were installed during the testing.

2.6 Support Equipment List and Description

The following computer peripherals were connected to the computer during antenna conducted emissions tests:

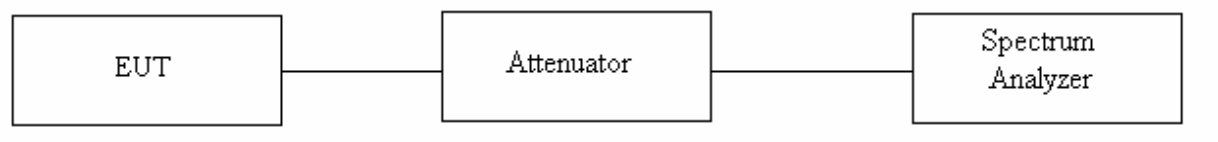
300-0139 Microtouch ENVOY LCD Display
Texas Industrial Peripheral iKey USB Keyboard
Wheel Optical USB 1.1A Mouse, p/n X08-70400
EA10953, Kahlon p/n 263337, 100-240VAC, 50-60Hz / 18-24VDC Power Adapter

For Radiated Spurious Emissions testing also the transmitting antennas (see Section 1.2) and non-terminated Ethernet and Audio cables were connected to the appropriate ports of the EUT.

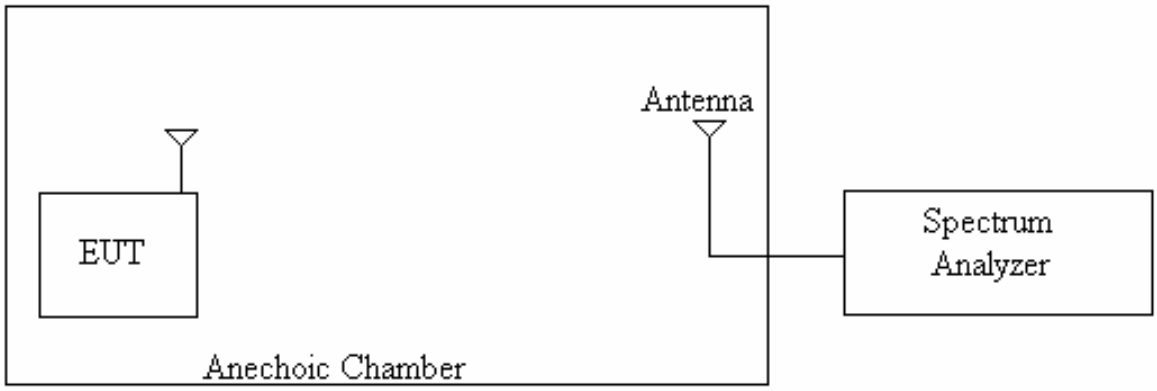
2.7 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.
The EUT was powered at 12VDC from the Power Adapter

Measurements at Antenna Terminal



Field Strength Measurements



3.0 TEST RESULTS

Data is included for the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements includes the following:

47 CFR 15.247(b)(3)	Maximum Peak Output Power, with Antenna Compliance, and RF Exposure Calculations
47 CFR 15.247(a)(2)	6dB Bandwidth
47 CFR 15.247(d)	Band Edge Compliance
47 CFR 15.247(d)	Spurious RF Conducted Emissions
47 CFR 15.247(e)	Peak Power Spectral Density
47 CFR 15.247(d) 15.205, 15.209	Radiated Spurious Emissions
47 CFR 15.207	Conducted Emissions

3.1 Maximum Peak Output Power, FCC 15.247(b)(3)

Maximum Peak Output Power measurements were made at the low, center, and high frequency channels (2712, 2747, and 2472MHz).

The Peak Power Output for the device was measured at the maximum power transmission level in CW mode with 3MHz resolution bandwidth and 10MHz video bandwidth.

The Maximum Peak Output Power was measured of 23.85dBm, or 242.66mW.

Table 3-1-1 and Graphs from 3-1-1 to 3-1-3 below show the Maximum Peak Output Power.

Maximum Peak Output Power **Date:** 11-21-2005

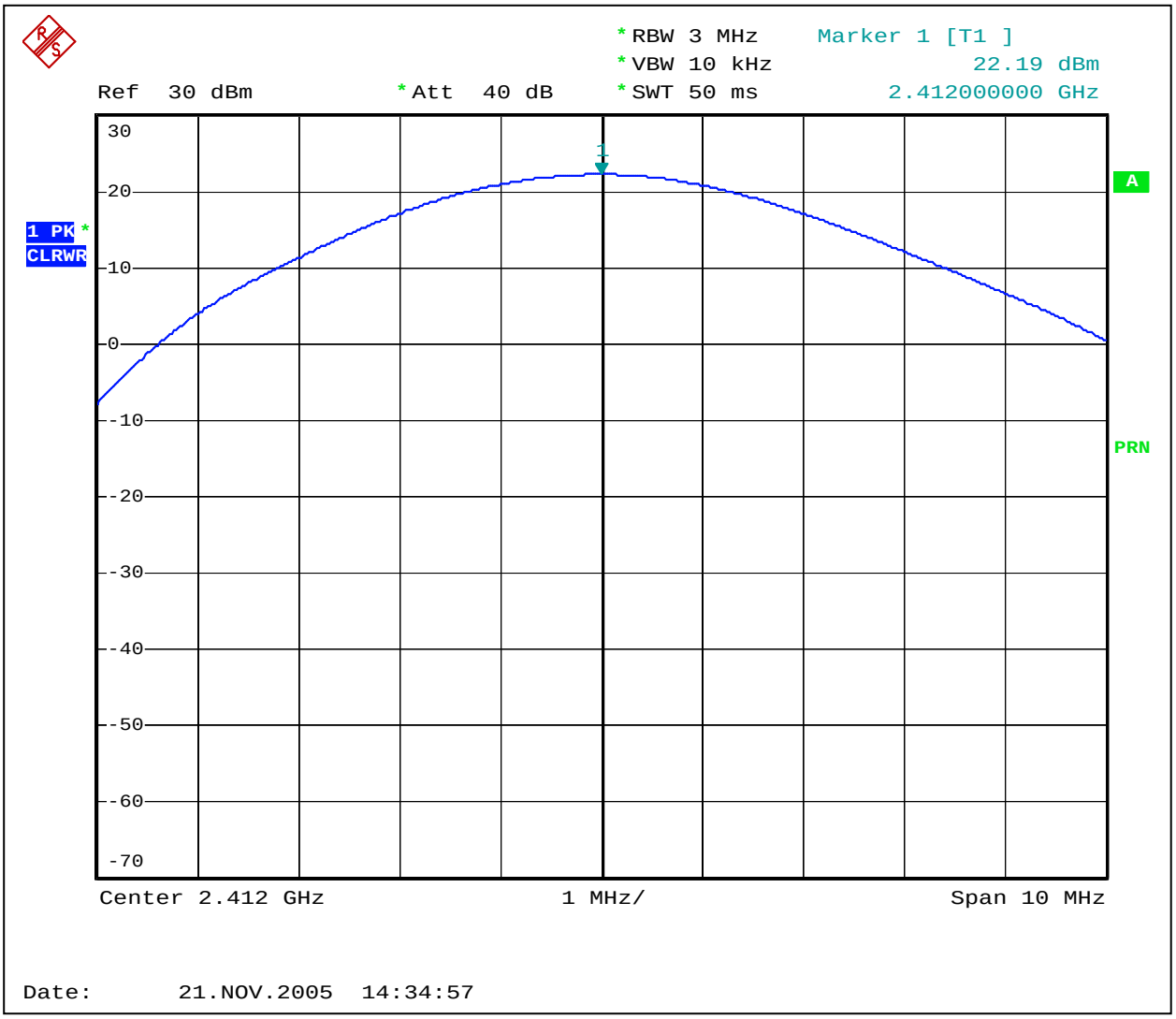
Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info.: The EUT antenna terminal was connected to the Spectrum Analyzer
Standard: FCC Part 15.247(b)(3)

Table # 3-1-1

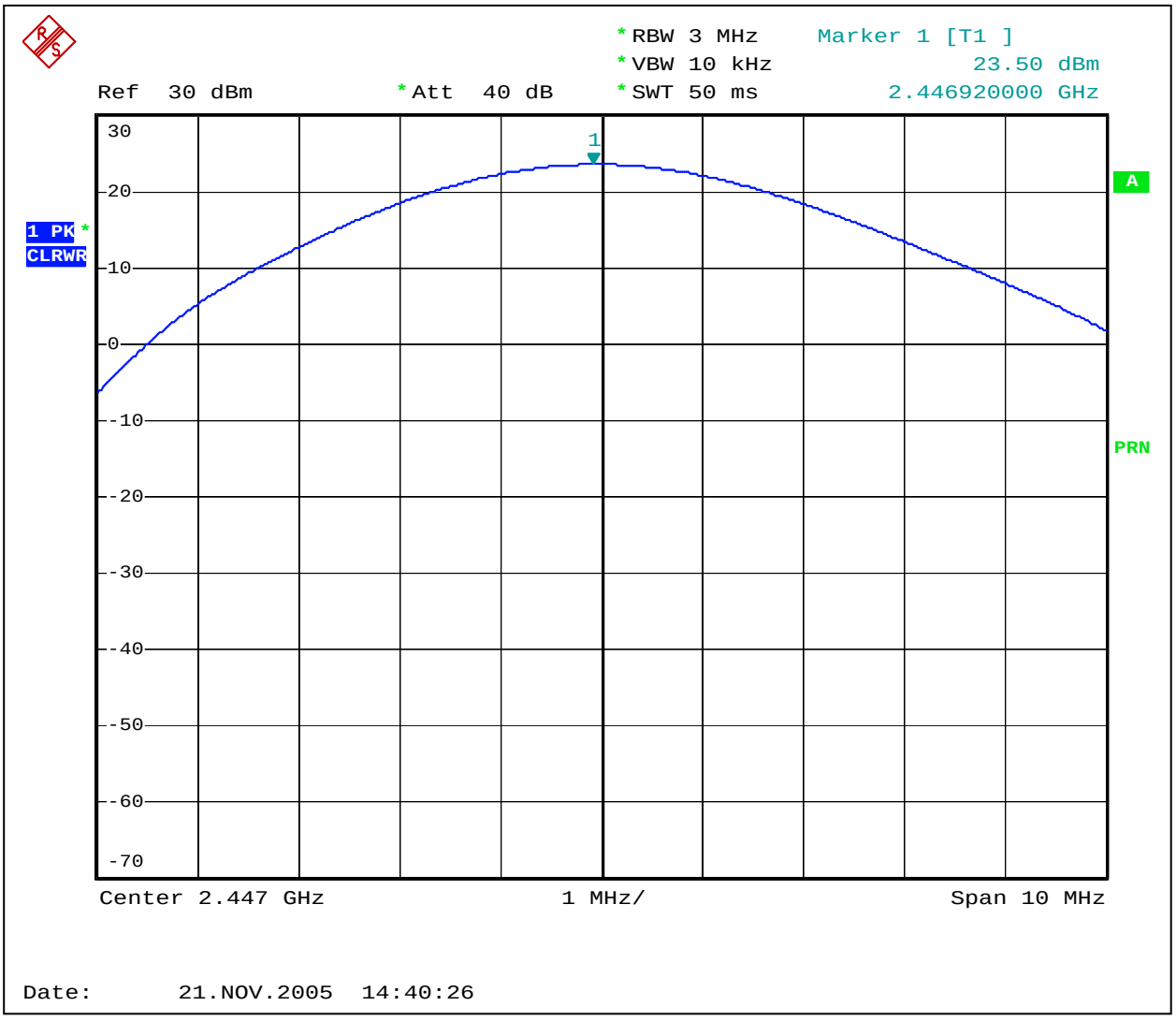
Output Freq. MHz	Measured Power dBm	Cable loss dB	Maximum Peak Output Power dBm	Maximum Peak Output Power mW
No Amplifier				
2412	22.19	0.35	22.54	179.47
2447	23.50	0.35	23.85	242.66
2472	20.75	0.35	21.10	128.82

Note:

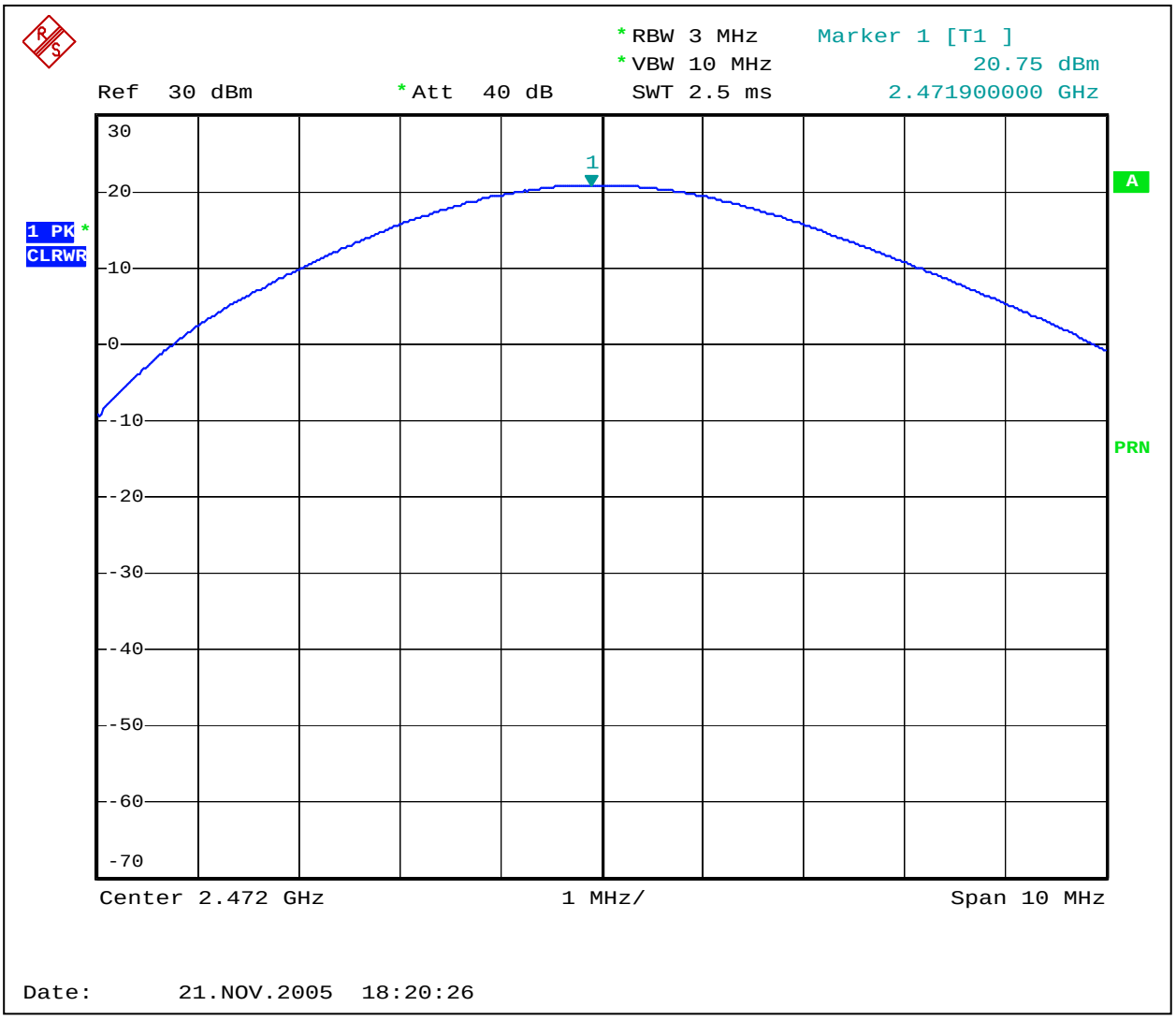
Graph # 3-1-1
Maximum Peak Output Power, 2712MHz Channel



Graph # 3-1-2
Maximum Peak Output Power, 2747MHz Channel



Graph # 3-1-3
Maximum Peak Output Power, 2772MHz Channel



3.1.1 Antennas Compliance with Output Power, FCC 15.247(b)(4), 15.247(c)

The compliance of the Output Power limits for all tested antennas with the measured Maximum Peak Output Power (see Table 3-1-1) was calculated for both applicable antennas (see Table 3-1-2 below). Both antennas were found in compliance with the EUT.

Maximum Peak Output Power **Date:** 11-21-2005

Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info.: Fixed Installation, Point-to-Point Operation
Standard: FCC Part 15.247(b)(4), 15.247(c)

Table # 3-1-2

Antenna	Antenna Part No.	Antenna Gain dBi	Measured Power dBm	Maximum Peak Output Power dBm	Margin dB
Radiall/Larsen	NMO5E2400BKTNC	5	23.85	30.0	-6.2
RadioLabs	2.4mobile-7	7.8	23.85	28.2	-4.4

Note: 1. Measured Power is shown in the Table 3-1-1
2. The Maximum Peak Output Power is reduced by 1dB for every 1dB that the directional gain of the Antenna exceeded 6dBi

3.1.2 RF Exposure Calculation, FCC 1.1307, 15.247(i)

The RF Exposure calculations are based on manufacturer specification that minimum distance from the antenna to operator (user) is 20cm.
The RF Exposure can be calculated according to equation from OET Bulletin 65, Edition 97-01:

$S = PG/4*pi*R^2$,

Where: S is Limits for Maximum Permissive Exposure (MPE) (mW/ cm^2),
P is Maximum Peak Power to Antenna (mW),
G is Antenna Gain (numerical gain),
R is Distance to the antenna radiation center (cm), must be below 20cm (FCC2.1091)

$S = 1mW/ cm^2$ according to FCC1.1310,
P = 23.85dBm = 242.66mW,
G = 7.8dBi = 6.03 (numerical gain),
R is calculated and =10.8cm, within 20 cm.

Note: Calculations were made excluding the antenna cable loss, therefore any cables can be used with antennas described in the Section 1.2.

3.2 6dB Bandwidth, FCC 15.247(a)(2)

The 6dB Bandwidth measurements were made at the low, center, and high frequency channels (2712, 2747, and 2472MHz).

The 6dB Bandwidth was measured at the maximum power transmission condition at 11mbps data transmission rate and with 100kHz resolution bandwidth and video bandwidth.

The 6dB Bandwidth was measured from 10.0 to 11.1MHz (the minimum allowed bandwidth is 0.5MHz).

Table 3-2-1 and Graphs from 3-2-1 to 3-2-3 show the 6dB Bandwidth

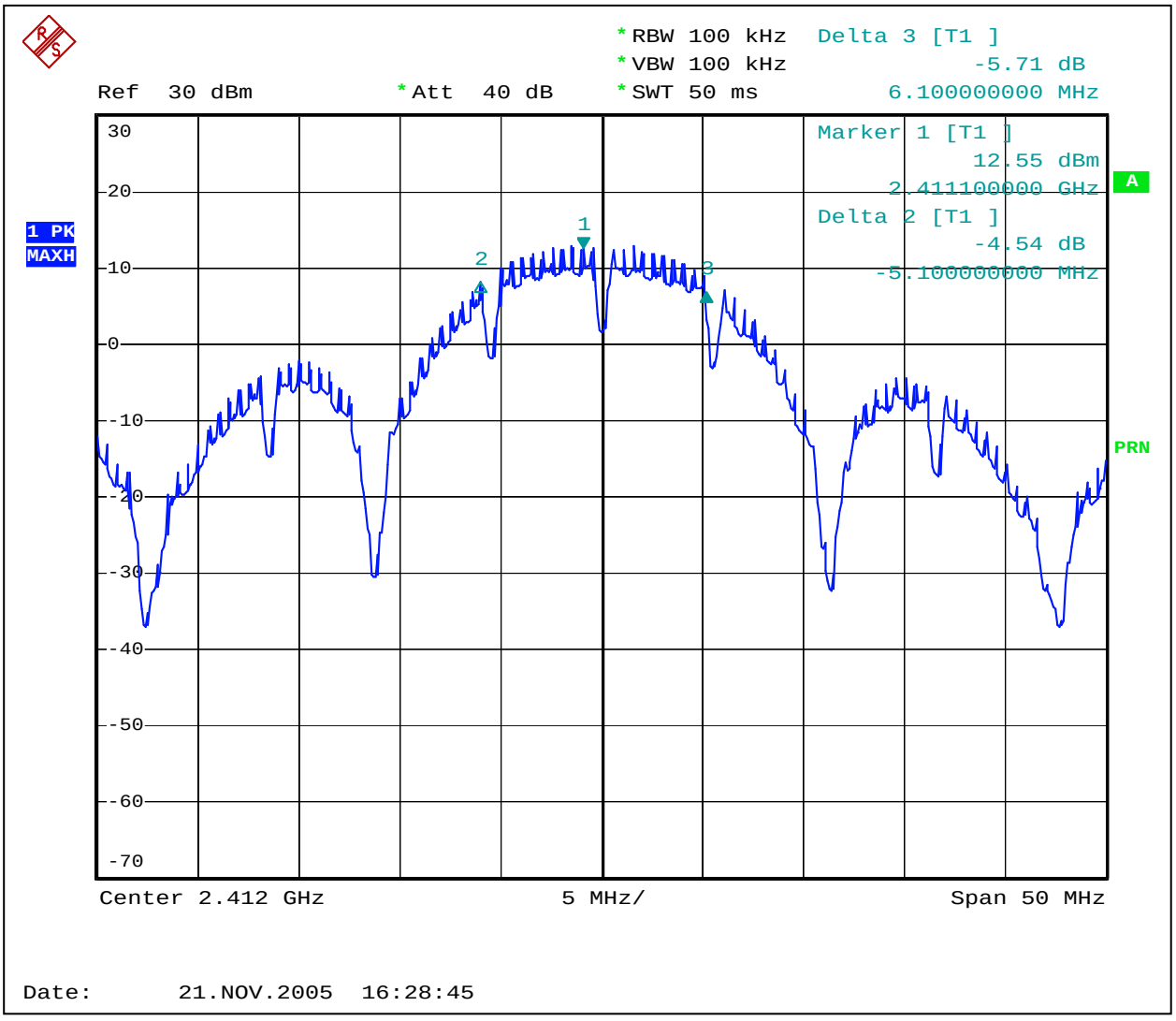
6dB Bandwidth **Date:** 11-21-2005

Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info.: The EUT antenna terminal was connected to the Spectrum Analyzer
Standard: FCC Part 15.247(a)(2)

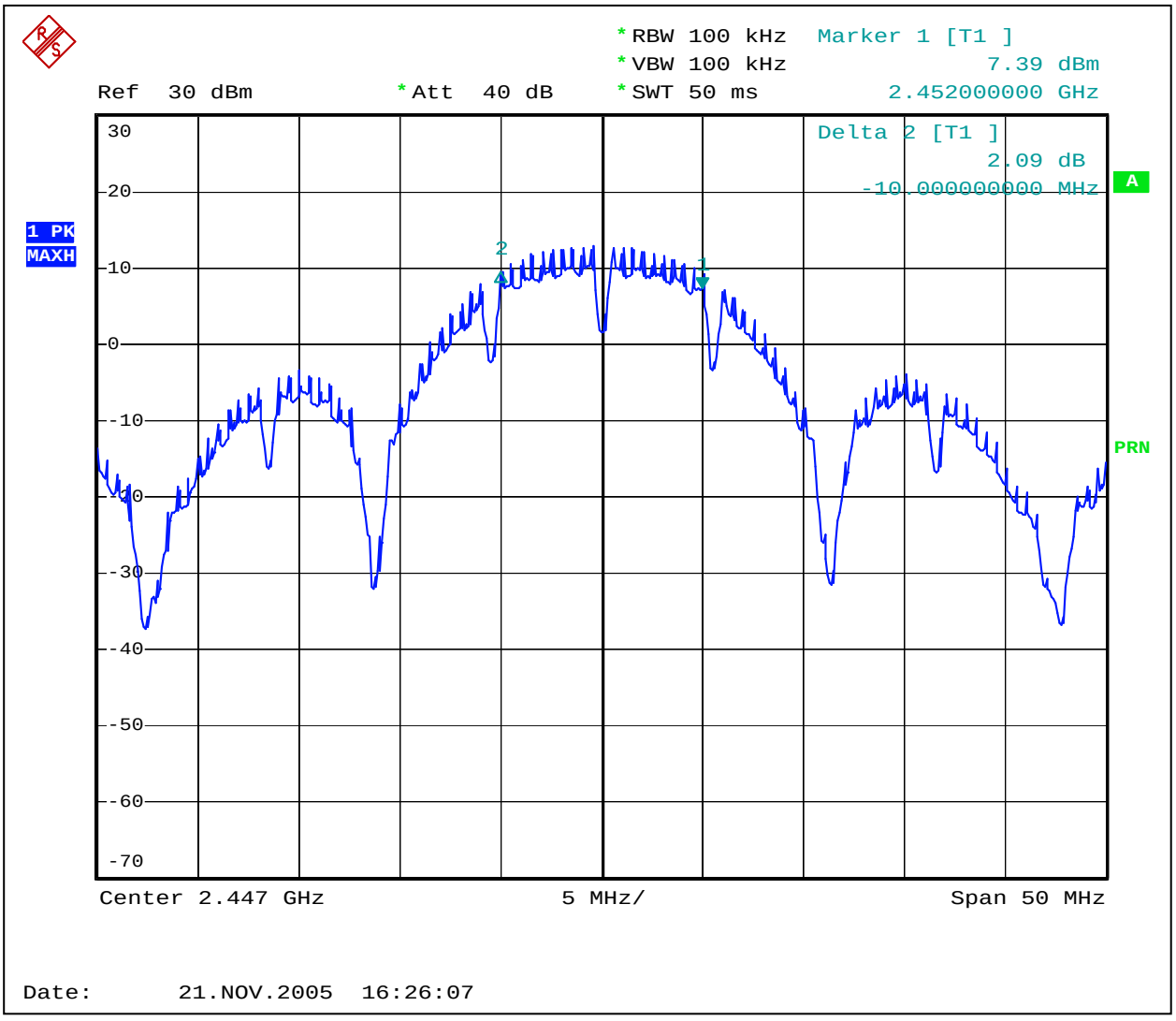
Table # 3-2-1

Output Freq. MHz	Measured 6dB Bandwidth MHz	Minimum 6dB Bandwidth MHz	Result	Comments
2412	11.10	0.50	Pass	
2447	10.00	0.50	Pass	
2472	10.60	0.50	Pass	

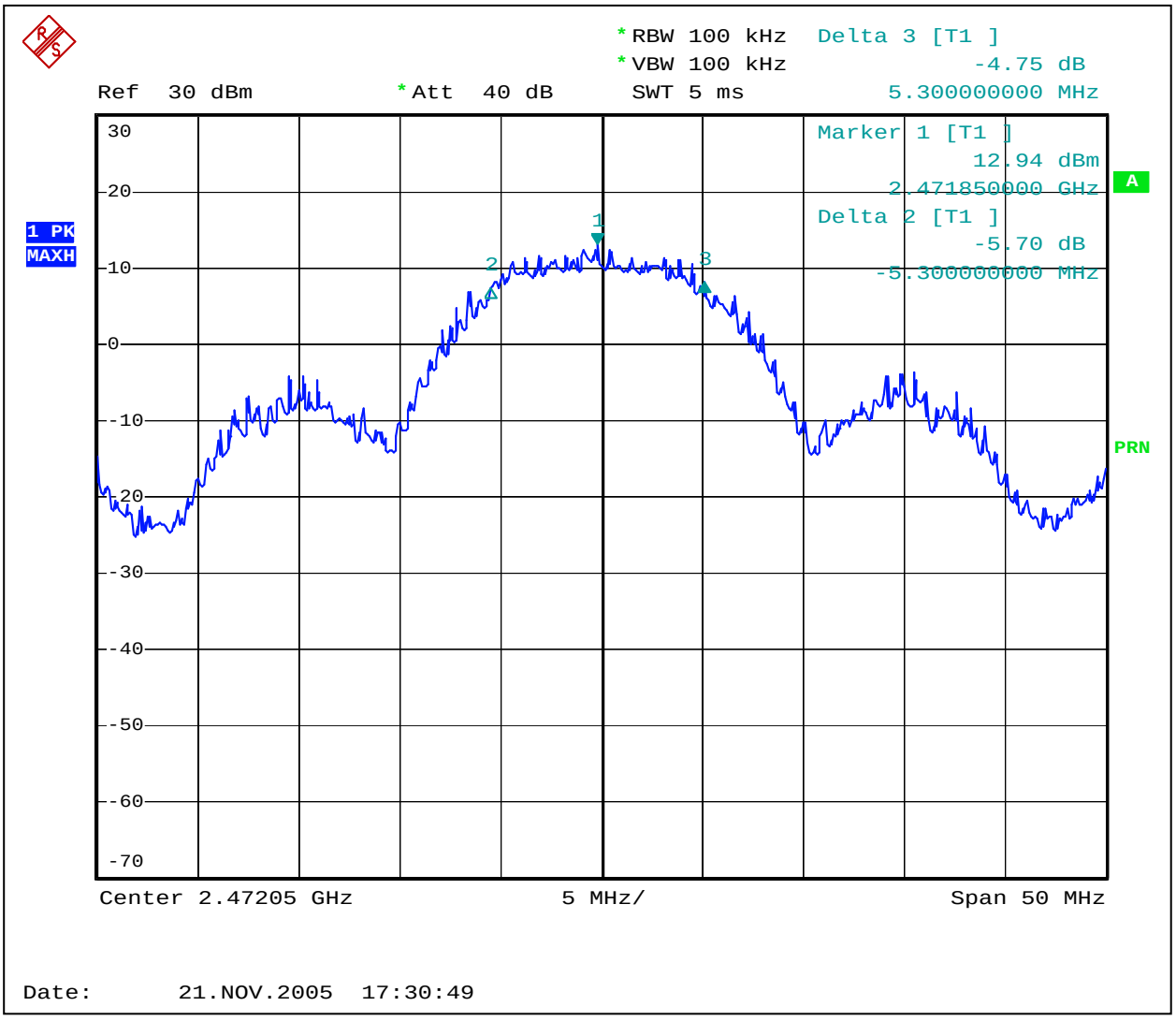
Graph # 3-2-1
6dB Bandwidth, 2712MHz Channel



Graph # 3-2-2
6dB Bandwidth, 2747MHz Channel



Graph # 3-2-3
6dB Bandwidth, 2772MHz Channel



3.3 Band Edge Compliance, FCC 15.247(d)

Left and right band-edge compliance measurements were made at the low and high frequency channels (2712 and 2472MHz) for band-edge frequencies of 2400.0 and 2483.5MHz respectively.

The Band-Edge Emissions Attenuation was measured at the maximum power transmission condition at 11mbps data transmission rate and with 100kHz resolution bandwidth and video bandwidth.

The minimum Attenuation was measured of 22.4dB (the minimum allowed is 20dB).
The Band-Edge Emissions Attenuation was calculated using the Channel output power and spurious emissions at band-edges of 2400.0 and 2483.5MHz respectively.

Table 3-3-1 and Graphs 3-3-1 and 3-3-2 show the band-edge emissions attenuation at the antenna terminal.

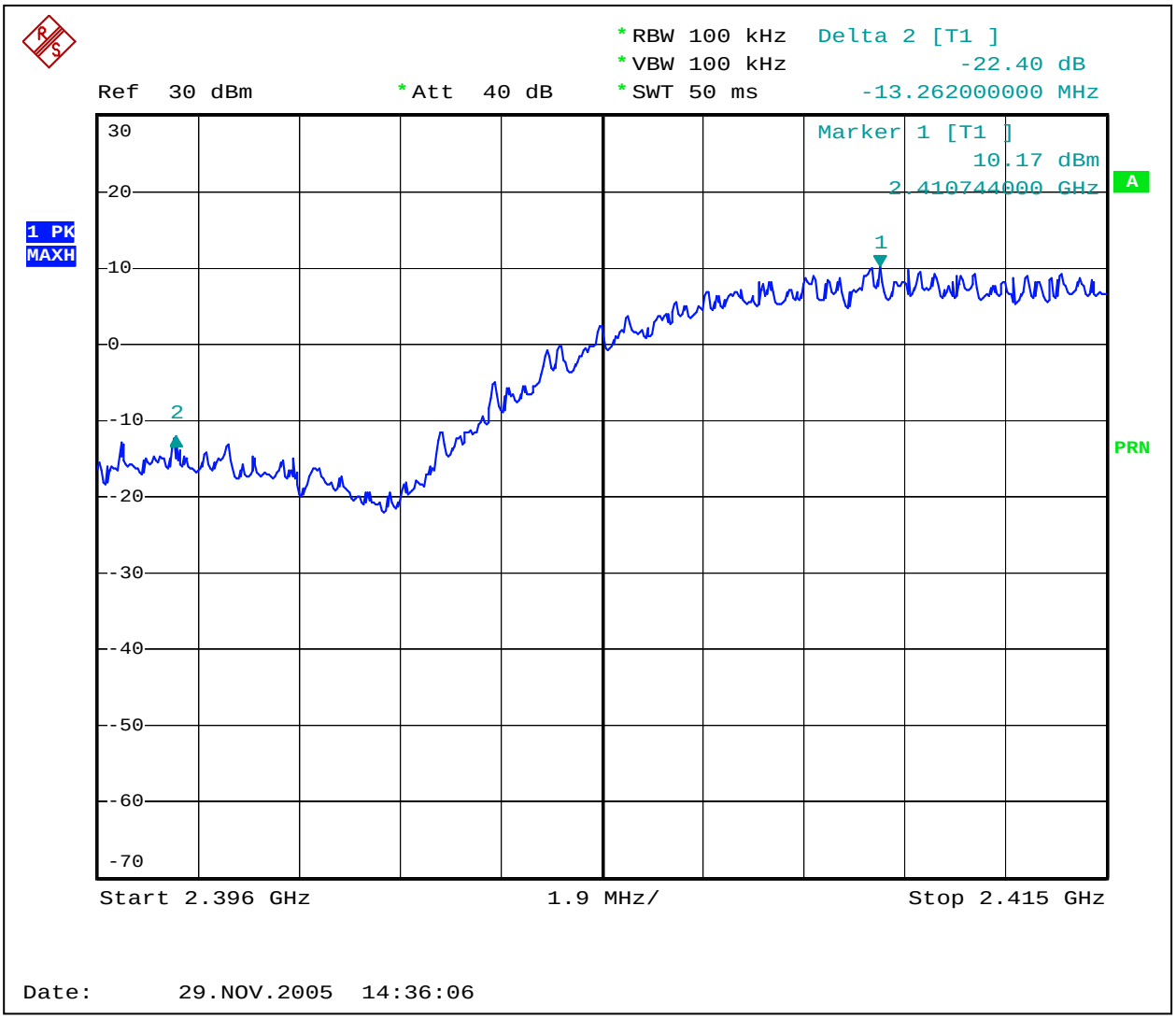
Band Edge Spurious Emissions at Antenna Terminal **Date:** 11-21-2005

Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info: The EUT antenna terminal was connected to the Spectrum Analyzer
Standard: FCC Part 15.247(d)

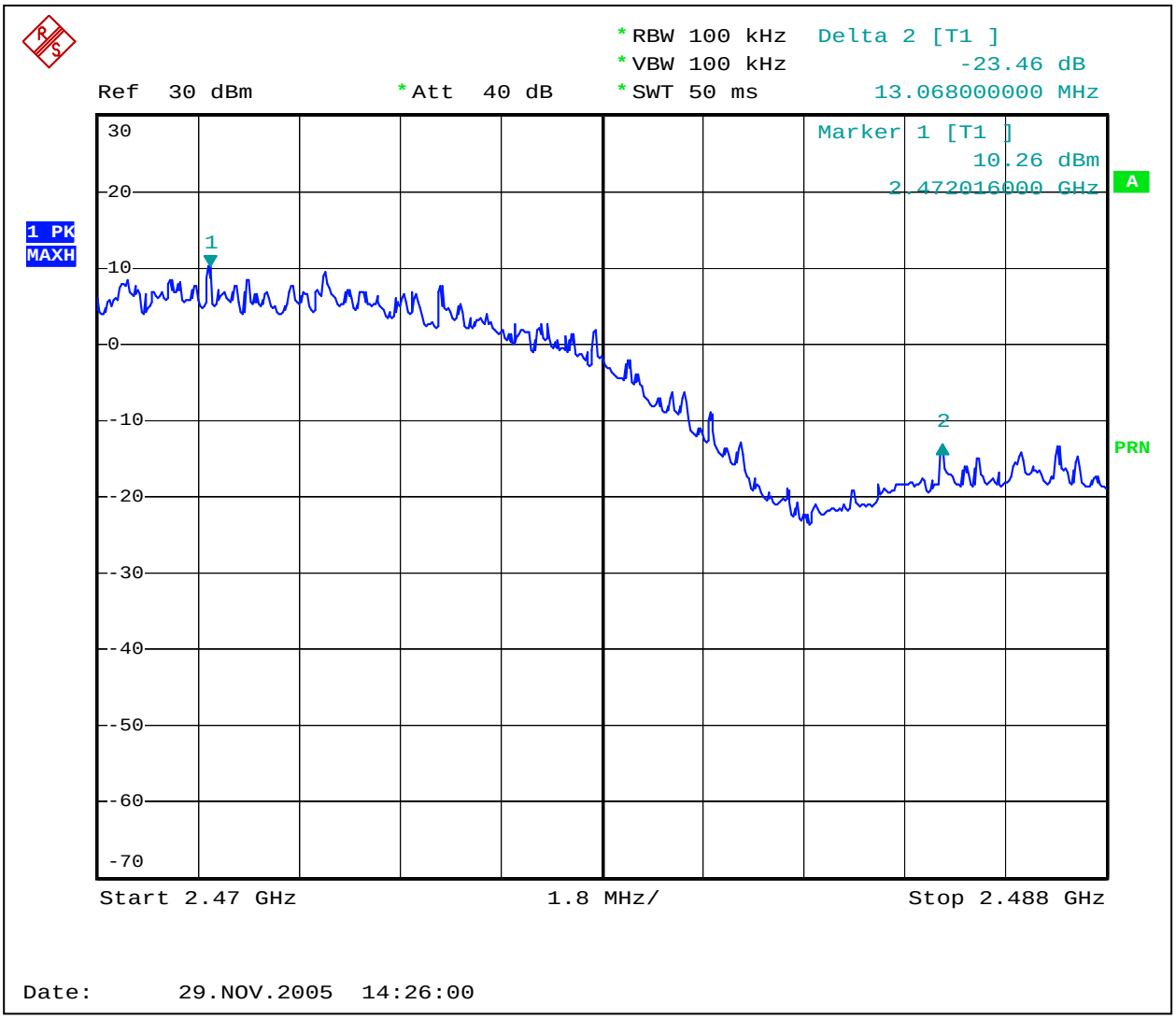
Table # 3-3-1

Channel MHz	Edge Freq. MHz	Channel Max. Power dBuV	Measured Atten. dB	Minimum Atten. dB	Margin
2412	2400.00	10.2	22.4	20.0	-2.4
2472	2483.50	10.3	23.5	20.0	-3.5

Graph # 3-3-1
Band Edge Emissions at 2400MHz, 2712MHz Channel



Graph # 3-3-2
Band Edge Emissions at 2400MHz, 2772MHz Channel



3.4 Spurious RF Antenna Conducted Emissions, FCC 15.247(d)

Spurious RF Antenna Conducted Emissions was measured at the low, center, and high frequency channels (2712, 2747, and 2472MHz).

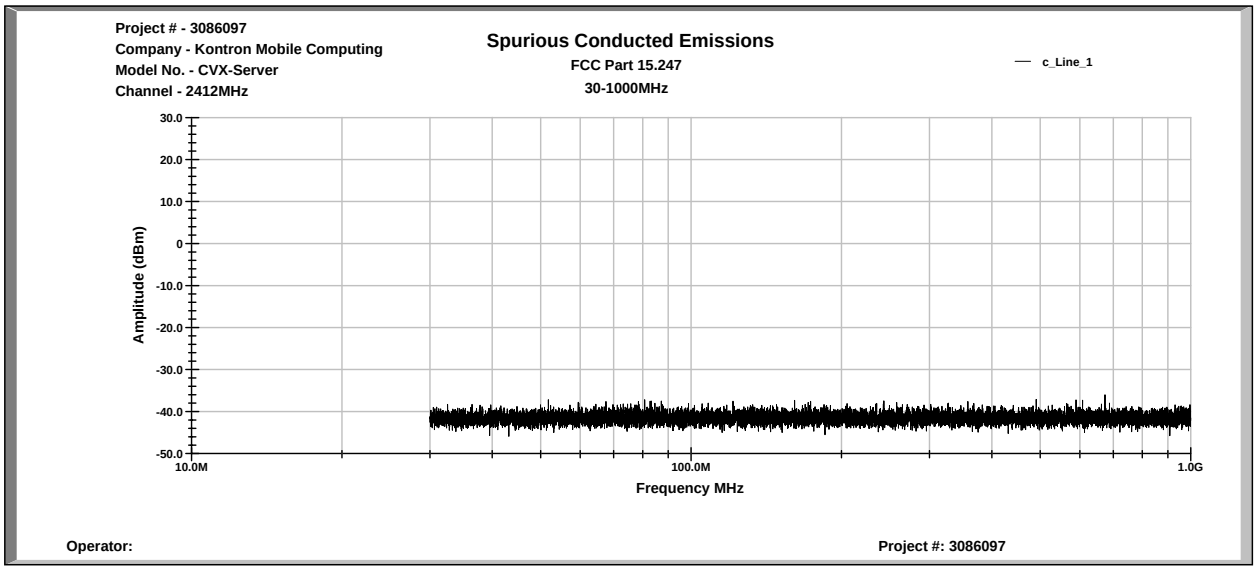
The Spurious RF Conducted Emissions was measured at the EUT antenna terminal at the maximum power in frequency range from 30MHz to 26GHz and with 100kHz resolution bandwidth and video bandwidth.

No Spurious Emissions above assigned limits (20dB below fundamental frequency) were observed.

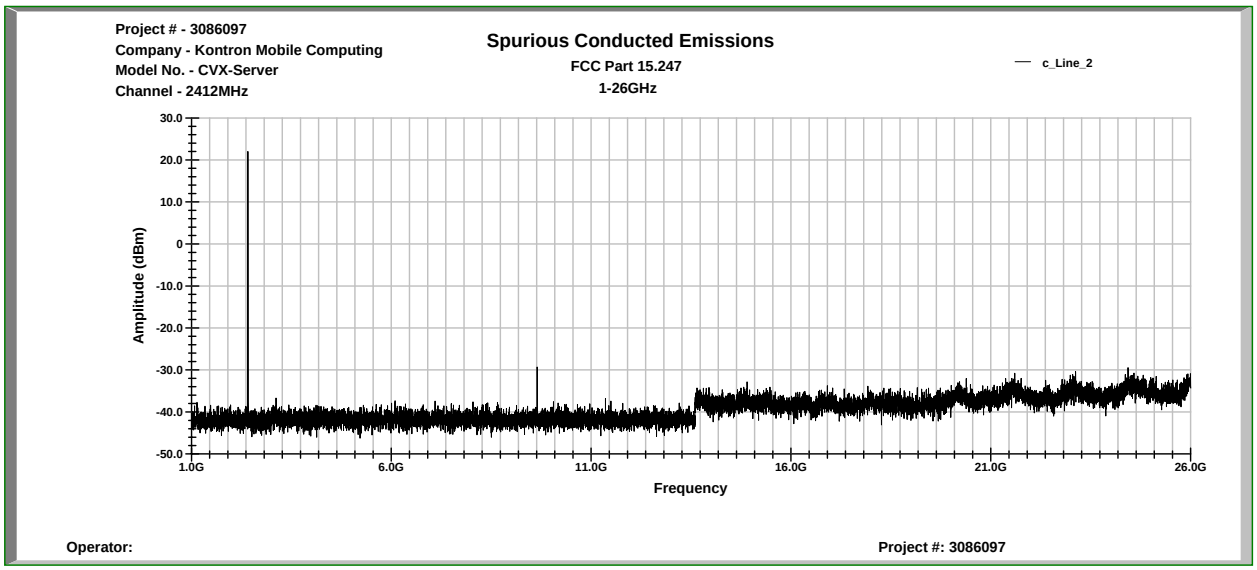
Graphs from 3-4-1 to 3-4-3 show the Spurious RF Antenna Conducted Emissions.

Graph # 3-4-1
Spurious Emissions at Antenna Terminal, 2712MHz Channel

From 30MHz to 1GHz

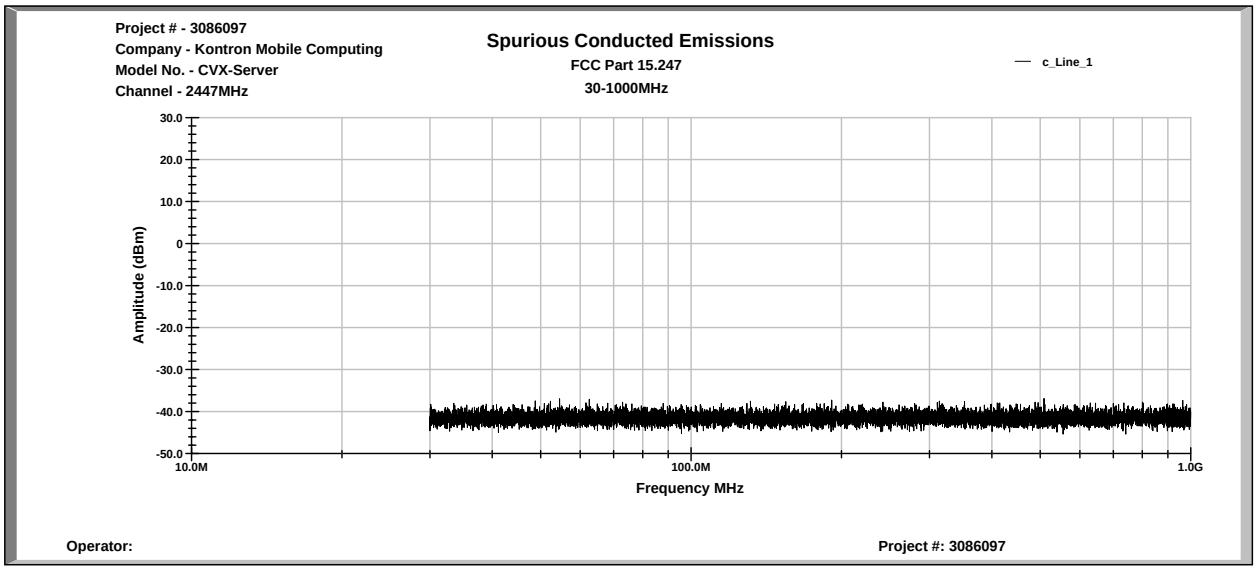


From 1 to 26GHz

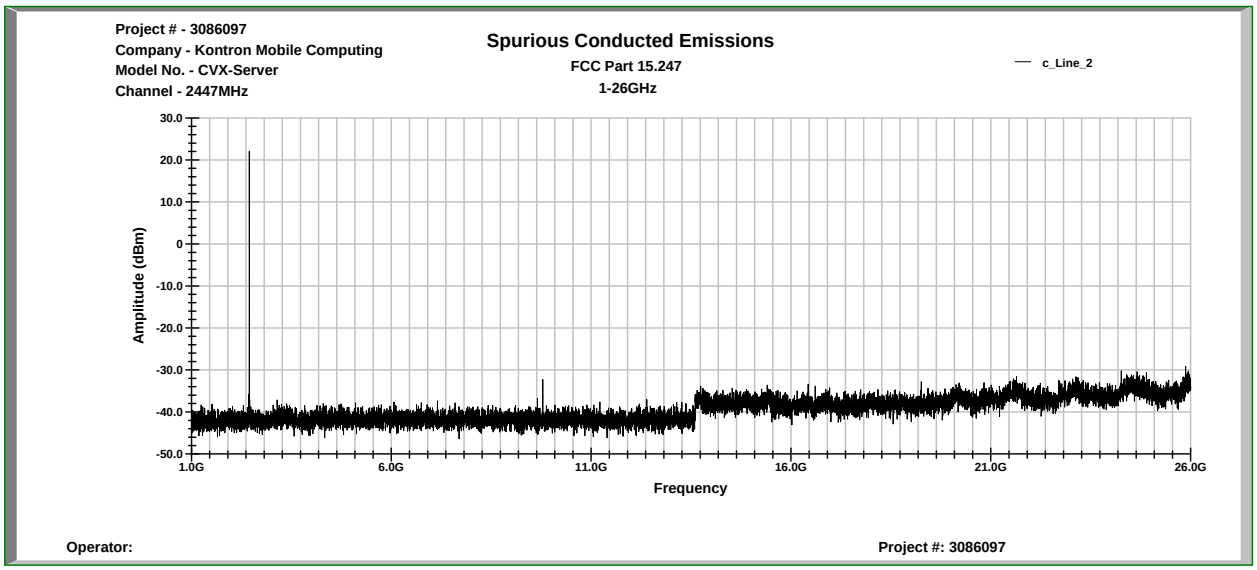


Graph # 3-4-2
Spurious Emissions at Antenna Terminal, 2747MHz Channel

From 30MHz to 1GHz

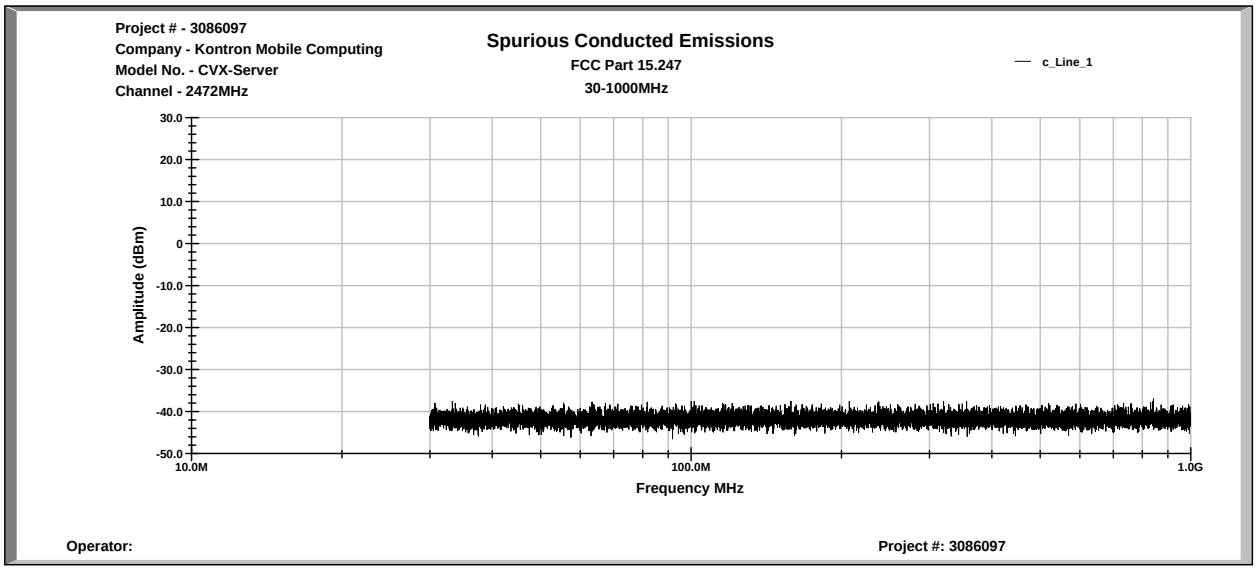


From 1 to 26GHz

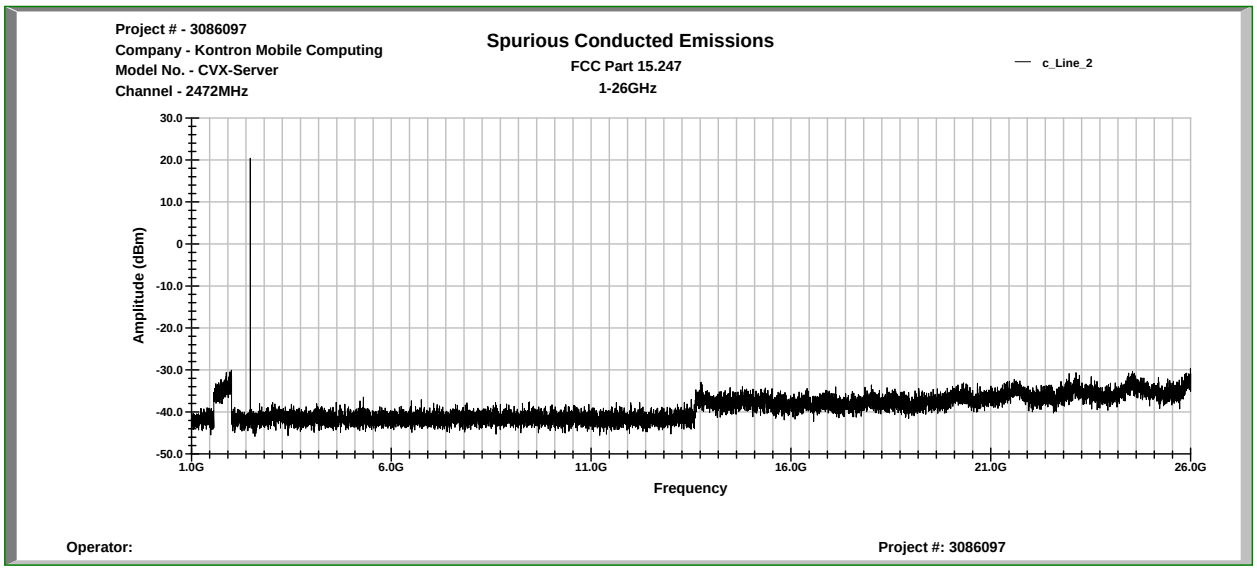


Graph # 3-4-3
Spurious Emissions at Antenna Terminal, 2772MHz Channel

From 30MHz to 1GHz



From 1 to 26GHz



3.5 Peak Power Spectral Density, FCC 15.247(e)

Peak Power Spectral Density measurements were made at the low, center, and high frequency channels (2712, 2747, and 2472MHz).

The Peak Power Spectral Density for the device was measured at the maximum power transmission condition at 11mbps data transmission rate and with 3kHz resolution bandwidth and 10kHz video bandwidth.

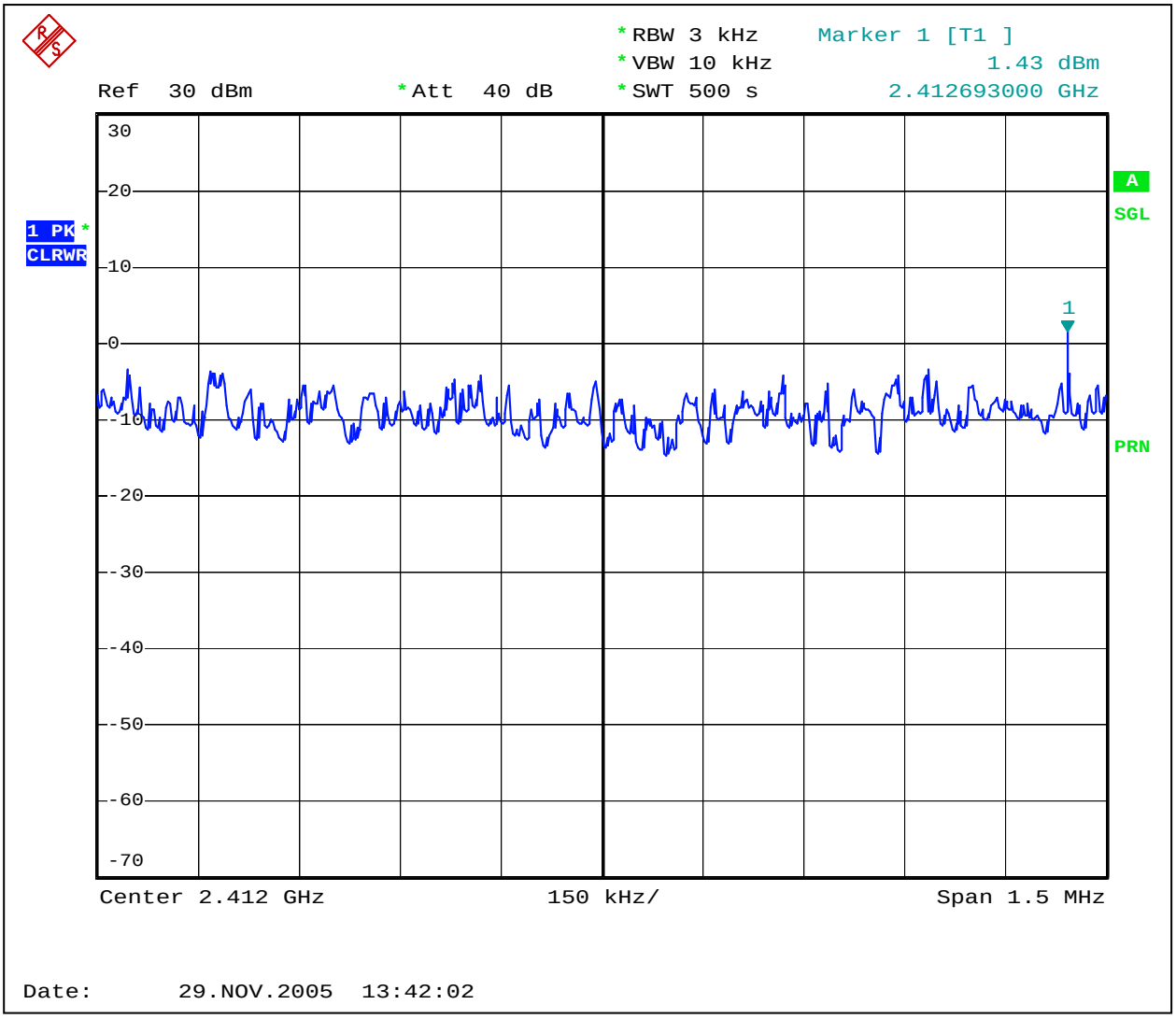
Peak Power Spectral Density limits calculation
According to the FCC 15.247(e), the Maximum Peak Power Spectral Density is 8dBm in any 3kHz band.

Limits = 8dBm – Cable Loss = 8dBm – 0.35dB = 7.65dBm

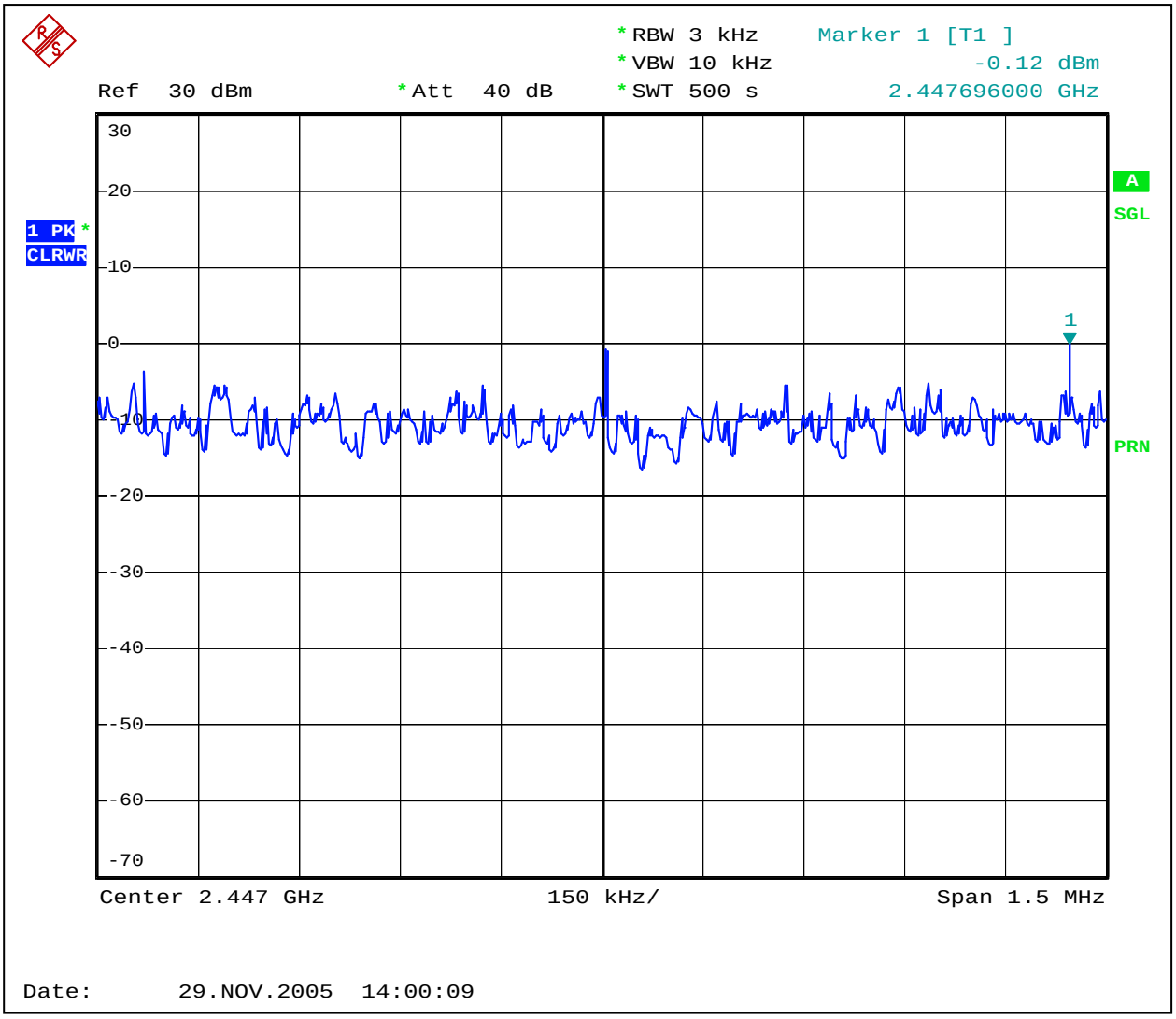
The maximum measured Peak Power Spectral Density is 3.57dBm and is within assigned limits.

Graphs from 3-5-1 to 3-5-3 show the Peak Power Spectral Density.

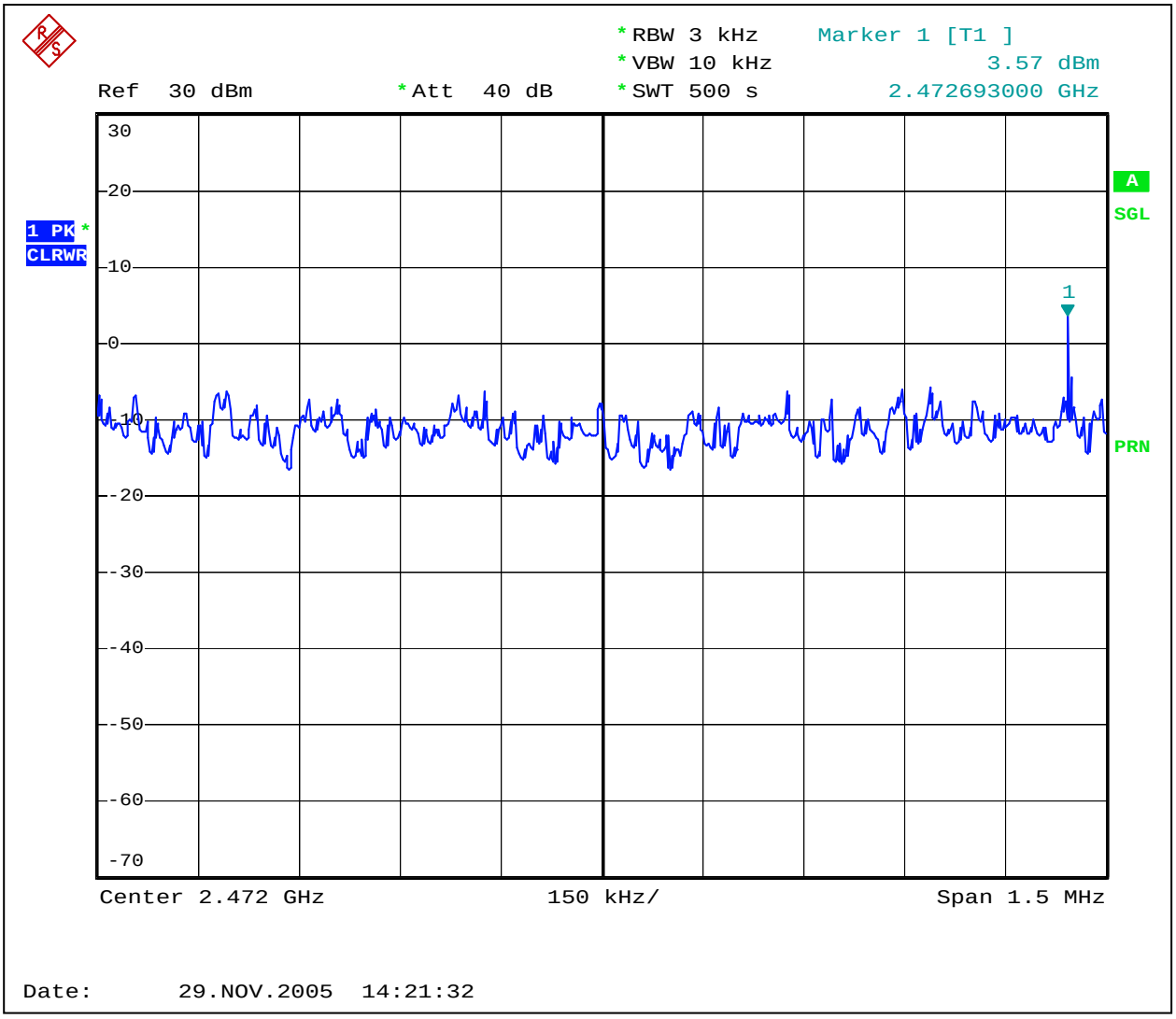
Graph # 3-5-1
Peak Power Spectral Density, 2712MHz Channel
Limits: 7.65dBm



Graph # 3-5-2
Peak Power Spectral Density, 2747MHz Channel
Limits: 7.65dBm



Graph # 3-5-3
Peak Power Spectral Density, 2772MHz Channel
Limits: 7.65dBm



3.6 Spurious Radiated Emissions, FCC 15.247(d), 15.205, 15.209

Field Strength of Spurious Radiated Emissions measurements were measured in the frequency range up to 25GHz (10th harmonic) at the low, center, and high frequency channels (2712, 2747, and 2472MHz) for two types of antenna.

The Spurious Radiated Emissions measurements were measured at the maximum power transmission condition and with 120kHz resolution bandwidth and 300kHz video bandwidth for measurements below 1GHz, and with 1MHz resolution bandwidth and video bandwidth for measurements above 1GHz.

No emissions above ambient was found above 4th harmonics.
No transmitter spurious emissions were detected in frequency range from 30MHz to 1GHz.

The maximum peak of Field Strength of Spurious Emissions was measured 13.9dB below limits.
The maximum average of Field Strength of Spurious Emissions was measured 9.2dB below limits.

The Tables 3-6-1 and 3-6-2 show the Peak and Average Field Strength of Spurious Emissions in the Restricted Bands of Operation according to FCC 15.205, therefore emissions at 4th Harmonic are not shown in the Table.

The Graphs 3-6-1 to 3-6-6 show the Field Strength Harmonics Emissions from 4 to 13.5GHz.
The Graphs 3-6-7 to 3-6-12 show the Field Strength Harmonics Emissions from 1 to 2GHz.
The Graphs 3-6-13 (stand by / receiving mode) and 3-6-14 (transmitting mode) demonstrate no transmitter spurious emissions in frequency range from 30MHz to 1GHz.

Radiated Spurious Emissions: Peak Readings 11-23-2005

Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info: Anenna Factor (Ant. Factor) includes Antenna Factor, Cable Loss with RF Filter attenuation
Standard: FCC Part 15.247(c), 15.205, 15.209
Test Site: Anechoic Chamber, 3m measurement distance
Note: The table shows the worst case radiated emissions, Readings were taken with RBW and VBW 1M
No emissions above the floor noise were detected at 5th and higher harmonics.
Emissions at 4th harmonics are not shown in the Table as located outside of restricted band (per F

Table # 3-6-1

Frequency MHz	Antenna Polarity	Antenna Hts(cm)	Reading dBuV	Ant. Factor dB/m	Pre-Amp Gain (dB)	Total at 3m dBuV/m	Limit dBuV/m	Margin dB
NM05E2400BKTNC Antenna								
2712MHz Channel								
4825.00	V	148	44.4	37.5	25.5	56.4	74.0	-17.6
7238.00	V	142	40.7	41.4	25.9	56.1	74.0	-17.9
4825.00	H	114	38.3	37.5	25.5	50.3	74.0	-23.7
7238.00	H	109	38.4	41.4	25.9	53.8	74.0	-20.2
2747MHz Channel								
4897.00	V	148	40.9	37.6	25.7	52.9	74.0	-21.1
7344.00	V	142	44.1	41.7	25.8	60.1	74.0	-13.9
4897.00	H	114	37.6	37.6	25.7	49.6	74.0	-24.4
7344.00	H	109	38.1	41.7	25.8	54.0	74.0	-20.0
2772MHz Channel								
4946.00	V	148	41.5	37.7	25.8	53.5	74.0	-20.5
7416.00	V	142	42.9	41.9	25.6	59.2	74.0	-14.8
4946.00	H	114	38.7	37.7	25.8	50.6	74.0	-23.4
7420.00	H	109	39.2	41.9	25.6	55.5	74.0	-18.5
2.4mobile-7 Antenna								
2712MHz Channel								
4825.00	V	154	43.0	37.5	25.5	55.0	74.0	-19.0
7238.00	V	139	40.7	41.4	25.9	56.2	74.0	-17.8
4825.00	H	122	37.3	37.5	25.5	49.3	74.0	-24.7
7238.00	H	118	36.4	41.4	25.9	51.8	74.0	-22.2
2747MHz Channel								
1648.10	V	127	27.4	31.5	0.0	58.9	74.0	-15.1
4897.00	V	154	41.4	37.6	25.7	53.4	74.0	-20.6
7344.00	V	139	43.7	41.7	25.8	59.6	74.0	-14.4
4897.00	H	122	40.6	37.6	25.7	52.5	74.0	-21.5
7344.00	H	118	38.7	41.7	25.8	54.7	74.0	-19.3
2772MHz Channel								
4946.00	V	154	42.2	37.7	25.8	54.1	74.0	-19.9
7420.00	V	139	42.1	41.9	25.6	58.3	74.0	-15.7
4946.00	H	122	40.2	37.7	25.8	52.1	74.0	-21.9
7416.00	H	118	36.9	41.9	25.6	53.2	74.0	-20.8

Radiated Spurious Emissions: Average Readings 11-23-2005

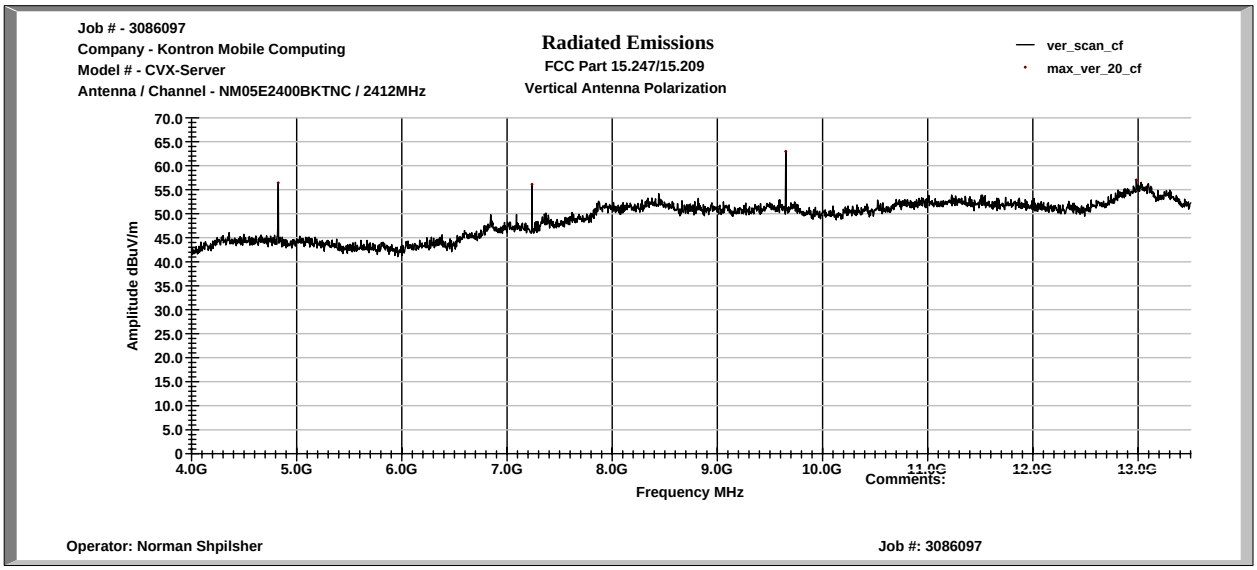
Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info: Anenna Factor (Ant. Factor) includes Antenna Factor, Cable Loss with RF Filter attenuation
Standard: FCC Part 15.247(c), 15.205, 15.209
Test Site: Anechoic Chamber, 3m measurement distance
Note: The table shows the worst case radiated emissions, Readings were taken with RBW 1MHz and Vl
No emissions above the floor noise were detected at 5th and higher harmonics.
Emissions at 4th harmonics are not shown in the Table as located outside of restricted band (per F

Table # 3-6-2

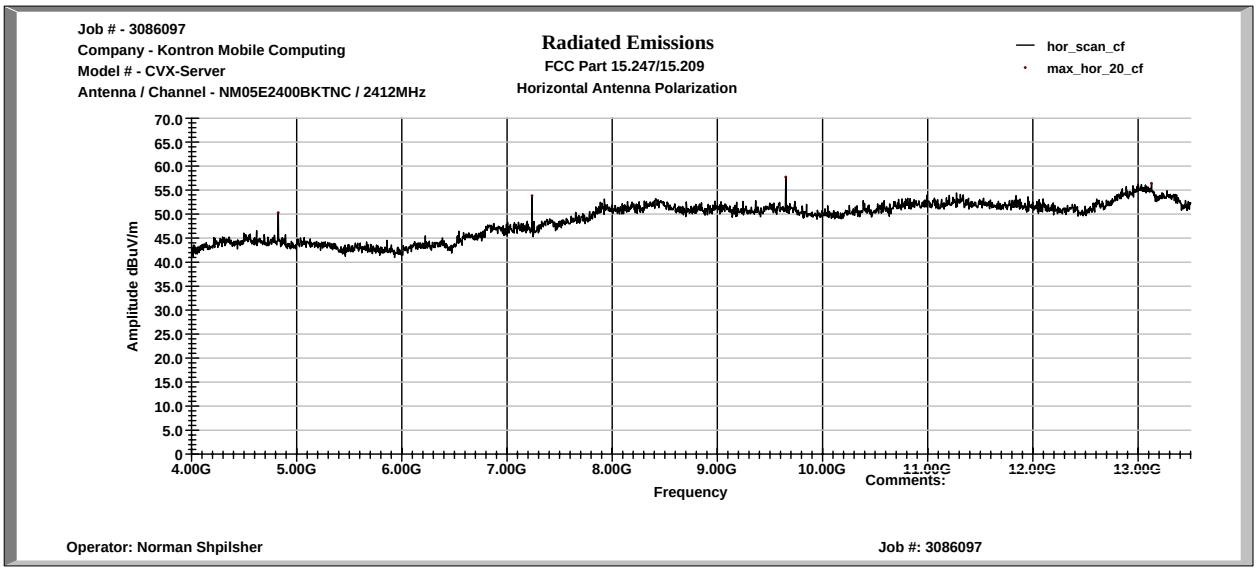
Frequency	Antenna		Reading	Ant. Factor	Pre-Amp	Total at 3m	Limit	Margin
MHz	Polarity	Hts(cm)	dBuV	dB/m	Gain (dB)	dBuV/m	dBuV/m	dB
NM05E2400BKTNC Antenna								
2712MHz Channel								
4825.00	V	148	27.2	37.5	25.5	39.2	54.0	-14.8
7238.00	V	142	27.9	41.4	25.9	43.3	54.0	-10.7
4825.00	H	114	25.4	37.5	25.5	37.4	54.0	-16.6
7238.00	H	109	26.8	41.4	25.9	42.2	54.0	-11.8
2747MHz Channel								
4897.00	V	148	28.3	37.6	25.7	40.3	54.0	-13.7
7344.00	V	142	28.9	41.7	25.8	44.8	54.0	-9.2
4897.00	H	114	25.4	37.6	25.7	37.4	54.0	-16.6
7344.00	H	109	25.9	41.7	25.8	41.8	54.0	-12.2
2772MHz Channel								
4946.00	V	148	26.8	37.7	25.8	38.8	54.0	-15.2
7416.00	V	142	27.8	41.9	25.6	44.1	54.0	-9.9
4946.00	H	114	25.3	37.7	25.8	37.3	54.0	-16.7
7420.00	H	109	26.4	41.9	25.6	42.7	54.0	-11.3
2.4mobile-7 Antenna								
2712MHz Channel								
4825.00	V	154	27.1	37.5	25.5	39.1	54.0	-14.9
7238.00	V	139	28.6	41.4	25.9	44.0	54.0	-10.0
4825.00	H	122	26.4	37.5	25.5	38.4	54.0	-15.6
7238.00	H	118	27.3	41.4	25.9	42.7	54.0	-11.3
2747MHz Channel								
1648.10	V	127	14.7	31.5	0.0	46.2	54.0	-7.8
4897.00	V	154	27.5	37.6	25.7	39.5	54.0	-14.5
7344.00	V	139	28.9	41.7	25.8	44.8	54.0	-9.2
4897.00	H	122	26.3	37.6	25.7	38.3	54.0	-15.7
7344.00	H	118	27.4	41.7	25.8	43.3	54.0	-10.7
2772MHz Channel								
4946.00	V	154	27.0	37.7	25.8	39.0	54.0	-15.0
7420.00	V	139	28.4	41.9	25.6	44.7	54.0	-9.3
4946.00	H	122	26.5	37.7	25.8	38.5	54.0	-15.5
7416.00	H	118	27.1	41.9	25.6	43.4	54.0	-10.6

Graph # 3-6-1
Radiated Emissions from 4 to 13.5GHz, 2712MHz Channel, NM05E2400BKTNC Antenna

Vertical Antenna Polarization



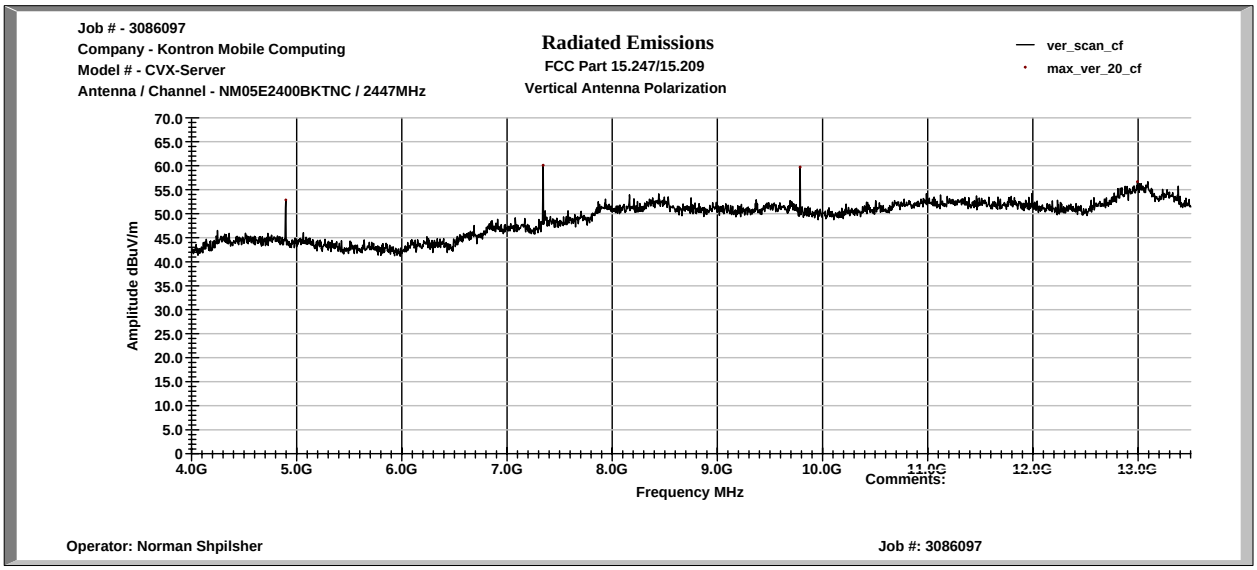
Horizontal Antenna Polarization



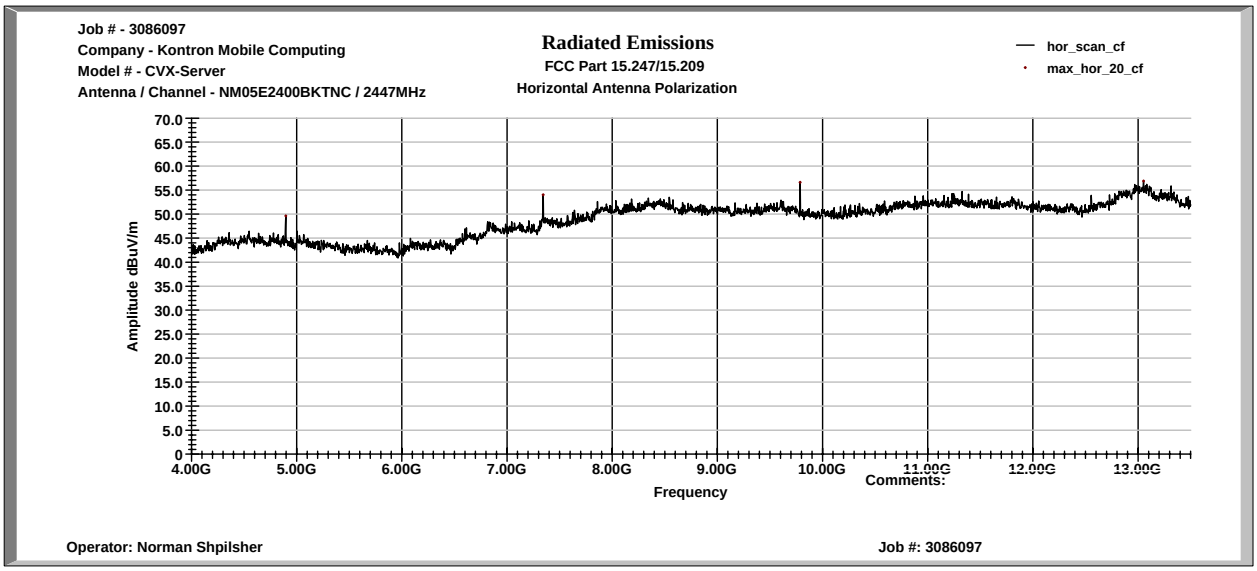
Graph # 3-6-2

Radiated Emissions from 4 to 13.5GHz, 2747MHz Channel, NM05E2400BKTNC Antenna

Vertical Antenna Polarization

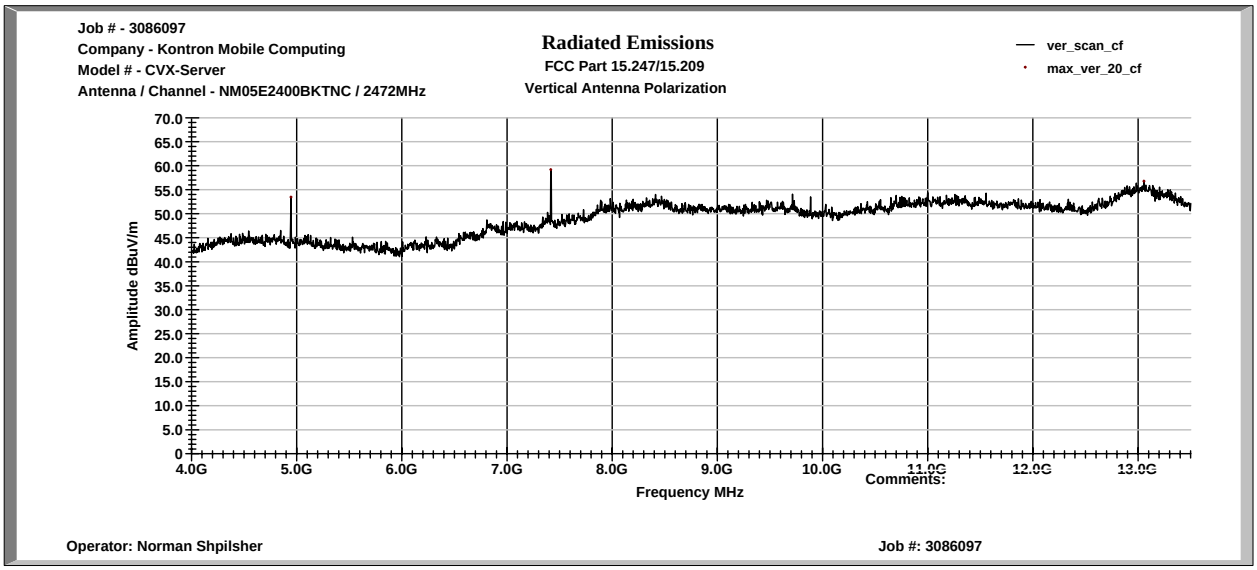


Horizontal Antenna Polarization

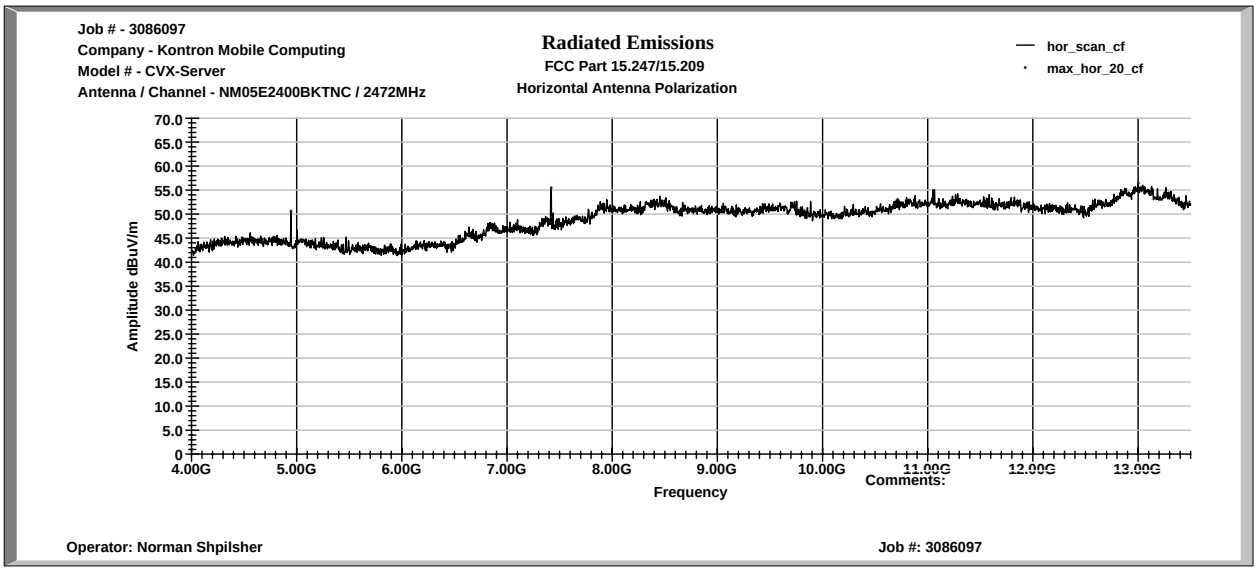


Graph # 3-6-3
Radiated Emissions from 4 to 13.5GHz, 2772MHz Channel, NM05E2400BKTNC Antenna

Vertical Antenna Polarization

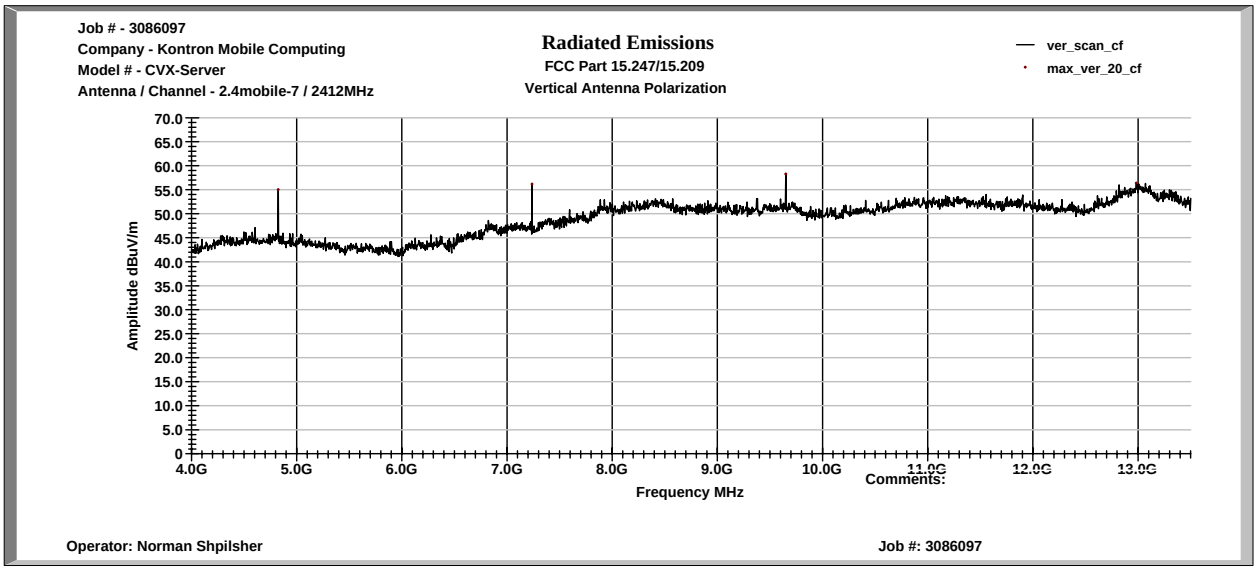


Horizontal Antenna Polarization

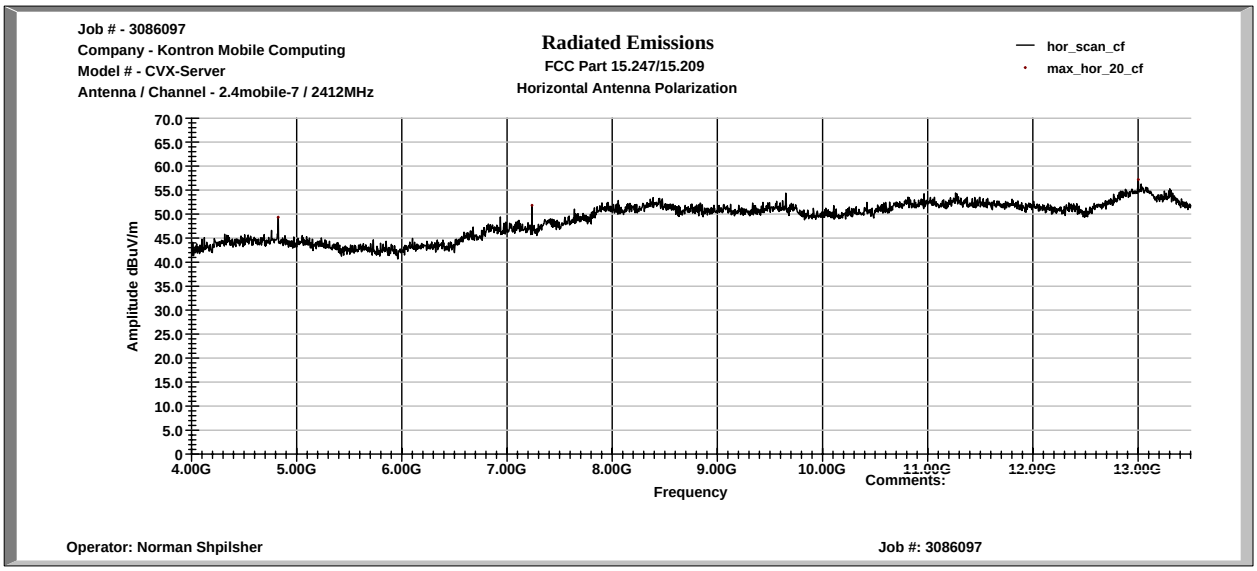


Graph # 3-6-4
Radiated Emissions from 4 to 13.5GHz, 2712MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization

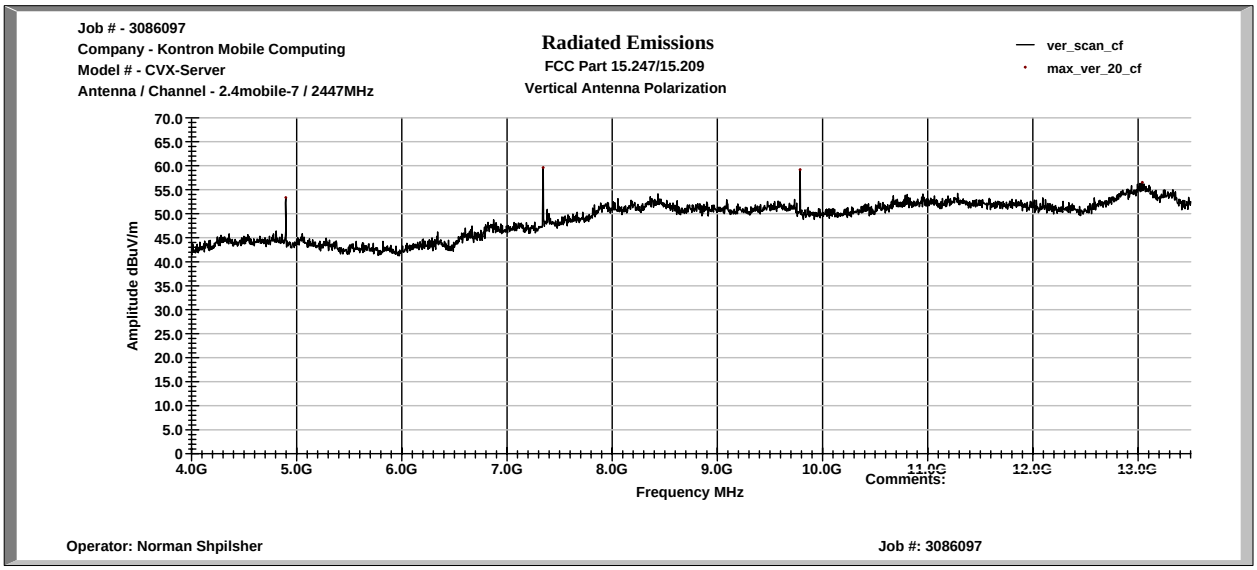


Horizontal Antenna Polarization

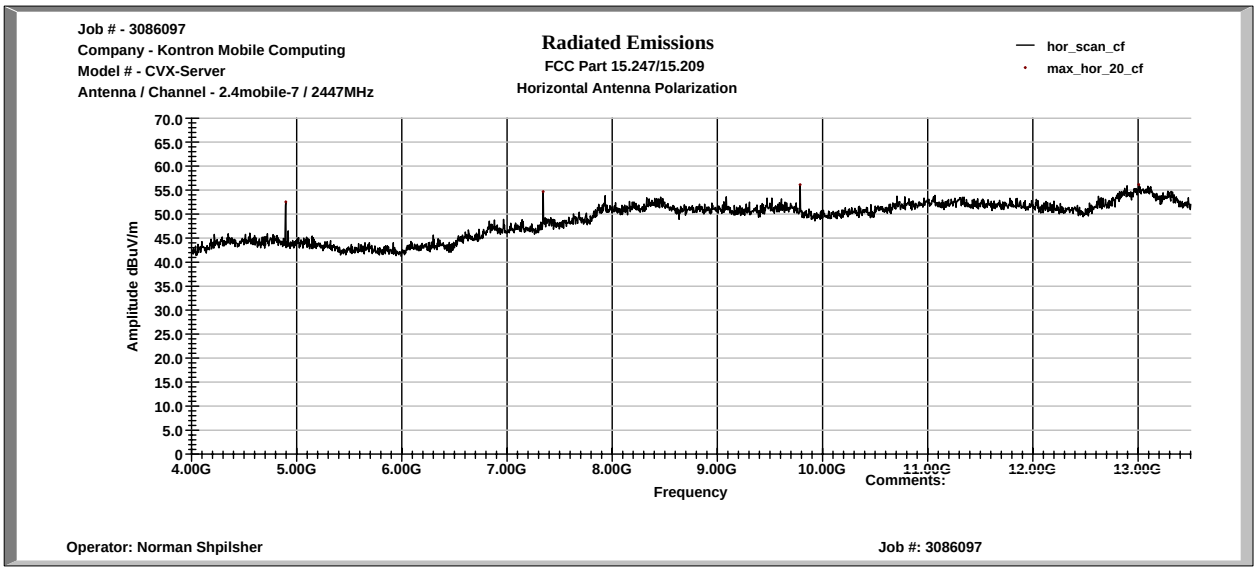


Graph # 3-6-5
Radiated Emissions from 4 to 13.5GHz, 2747MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization

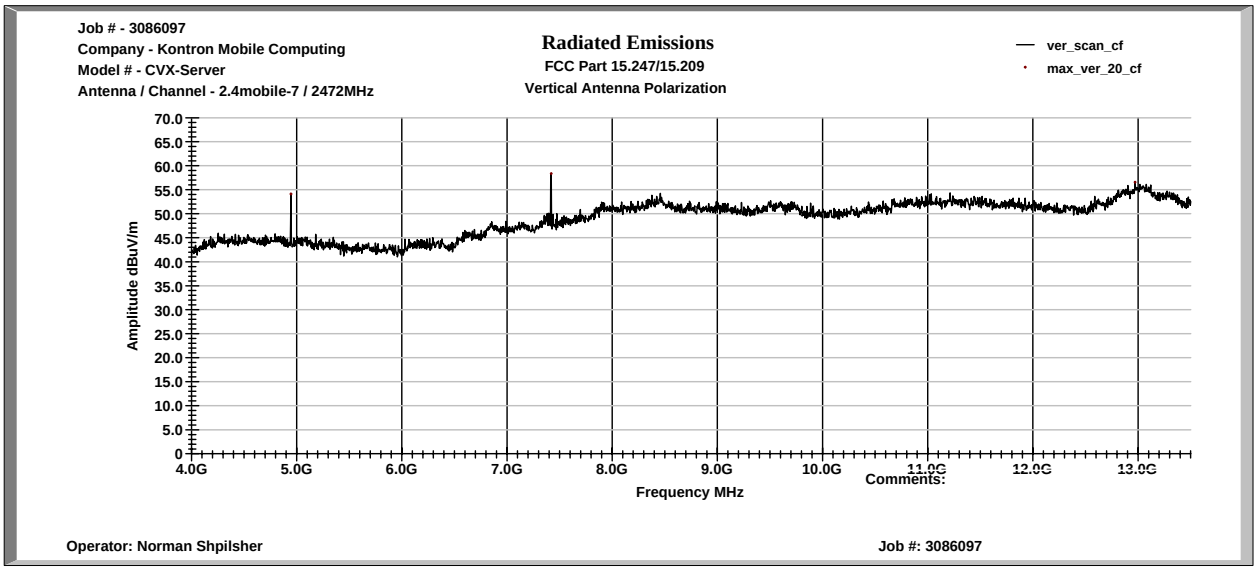


Horizontal Antenna Polarization

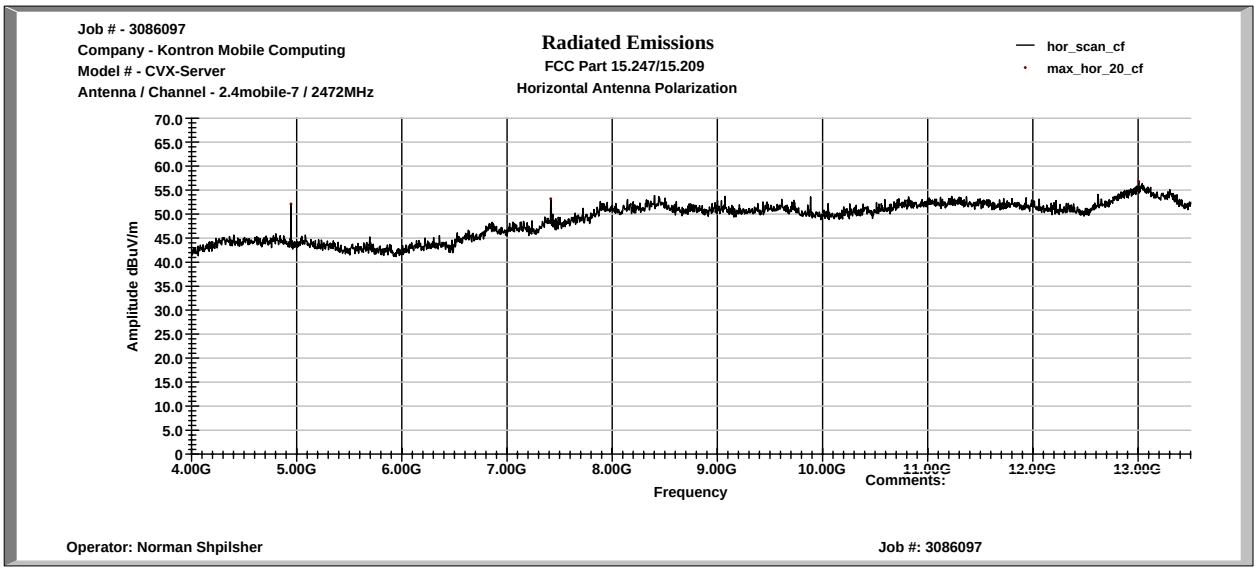


Graph # 3-6-6
Radiated Emissions from 4 to 13.5GHz, 2772MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization

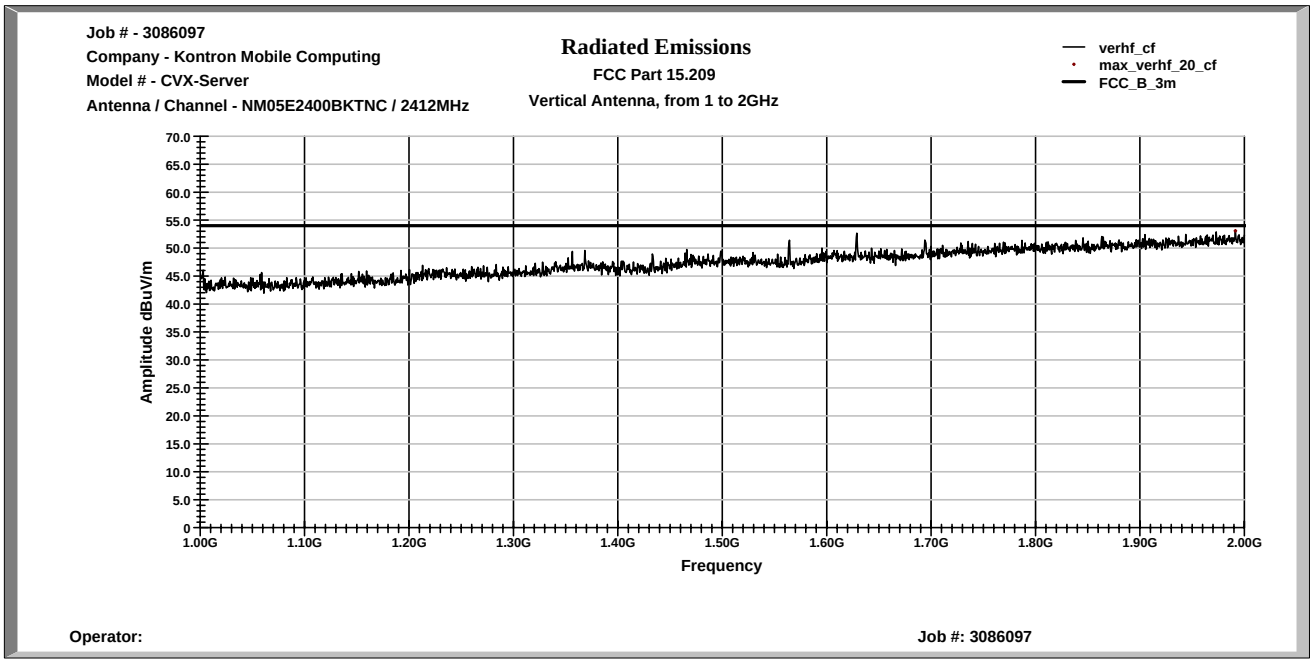


Horizontal Antenna Polarization

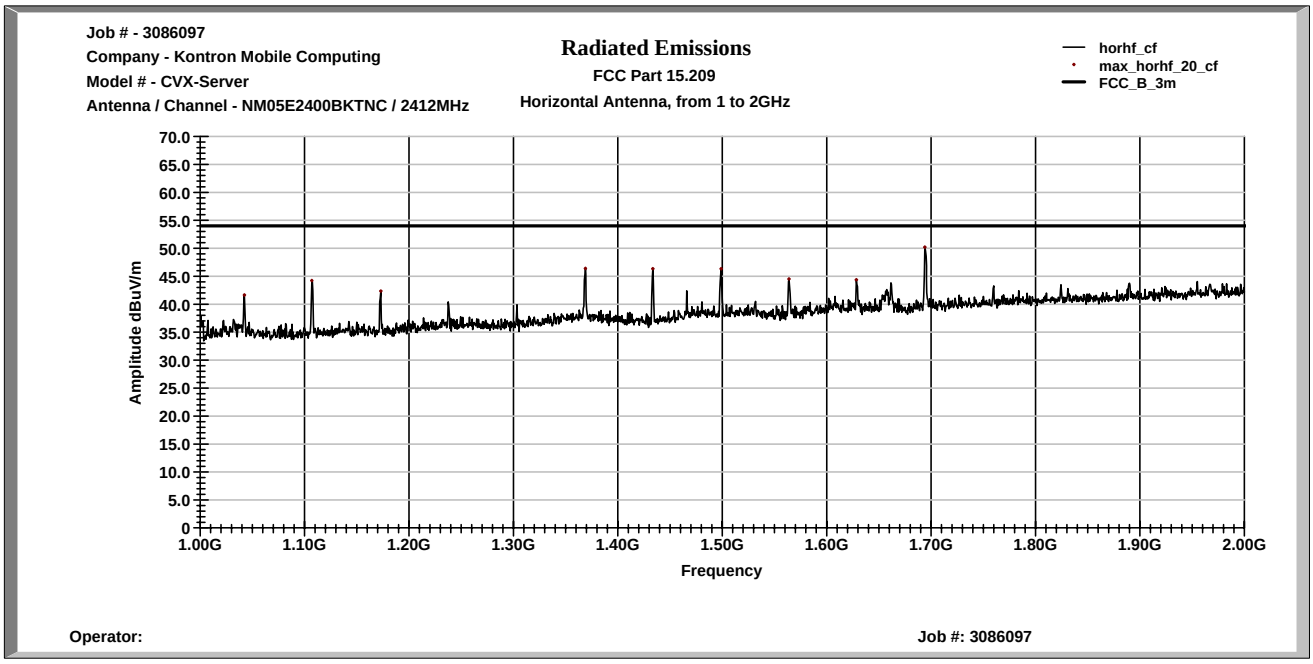


Graph # 3-6-7
Radiated Emissions from 1 to 2GHz, 2712MHz Channel, NM05E2400BKTNC Antenna

Vertical Antenna Polarization

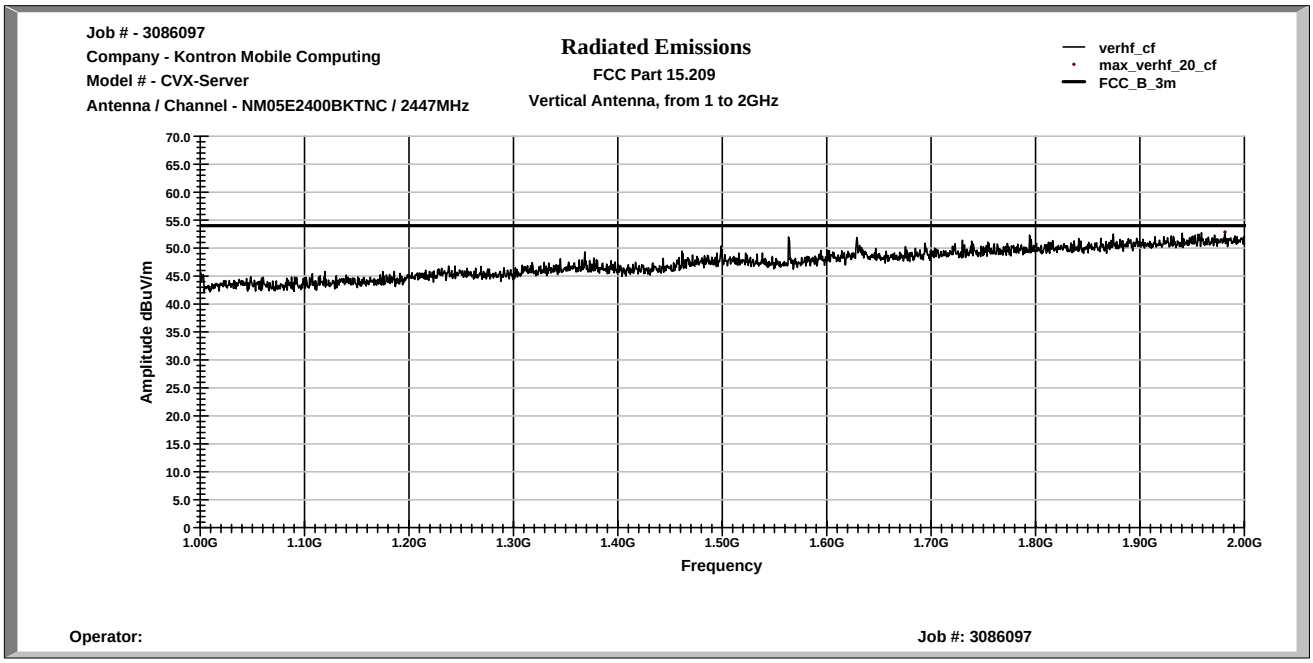


Horizontal Antenna Polarization

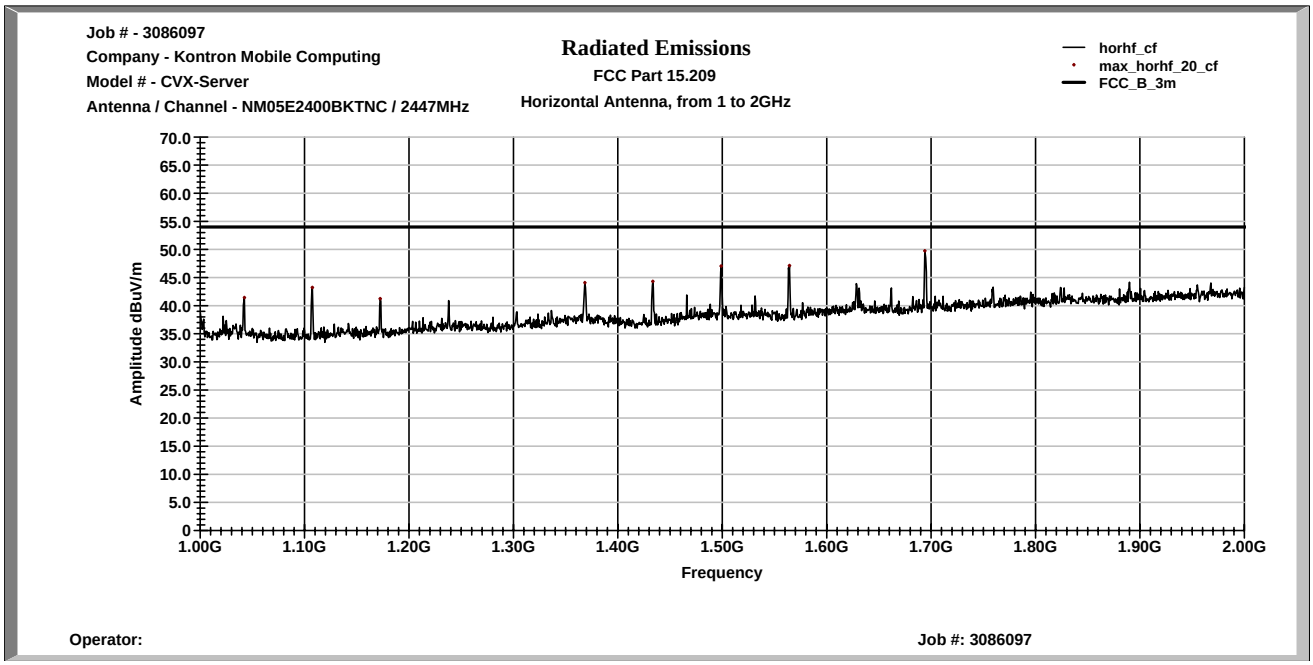


Graph # 3-6-8
Radiated Emissions from 1 to 2GHz, 2747MHz Channel, NM05E2400BKTNC Antenna

Vertical Antenna Polarization

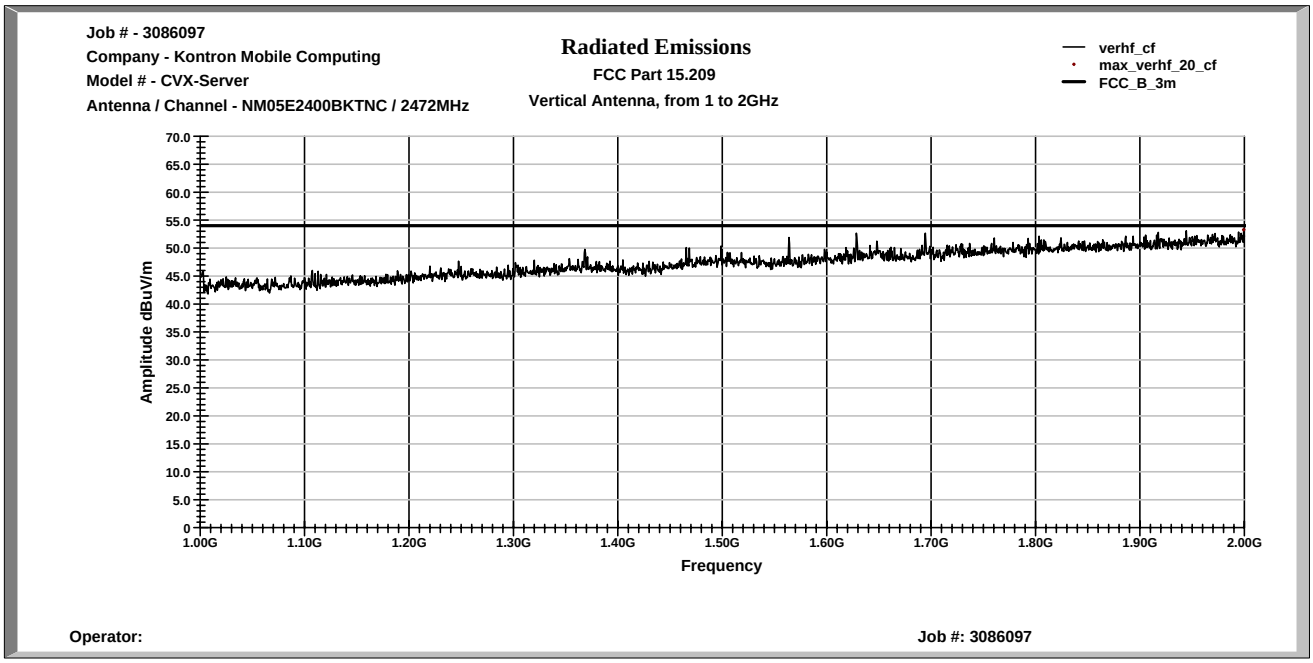


Horizontal Antenna Polarization

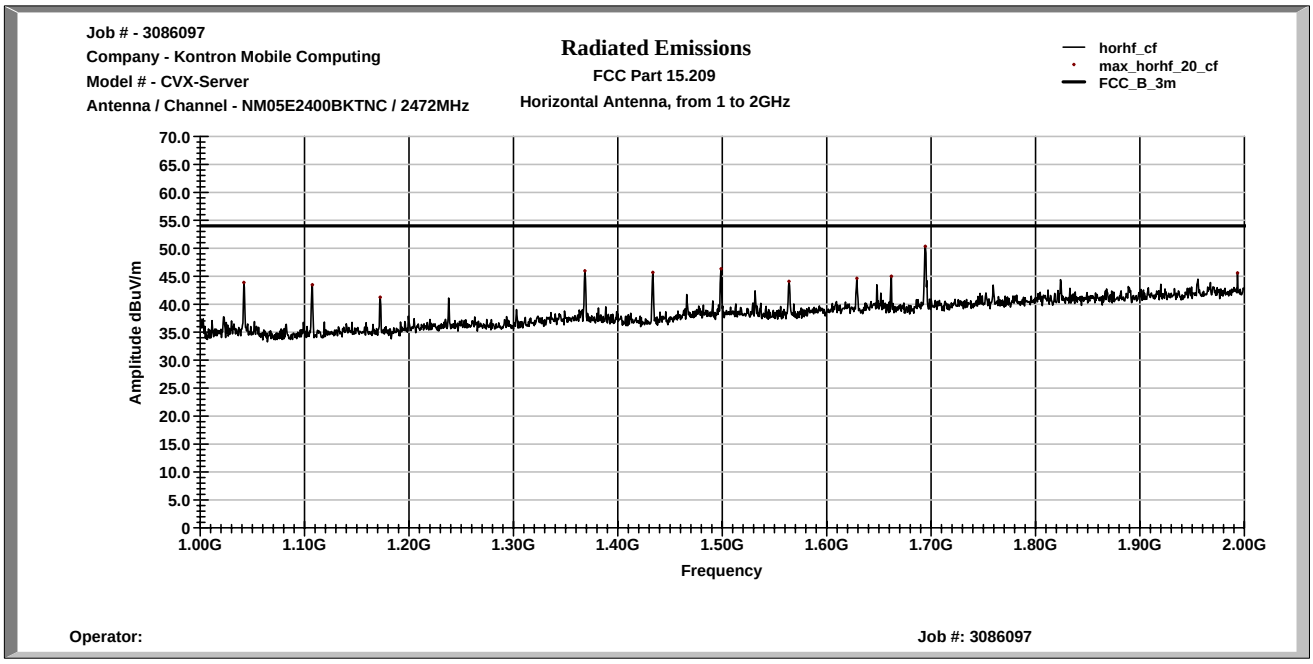


Graph # 3-6-9
Radiated Emissions from 1 to 2GHz, 2772MHz Channel, NM05E2400BKTNC Antenna

Vertical Antenna Polarization

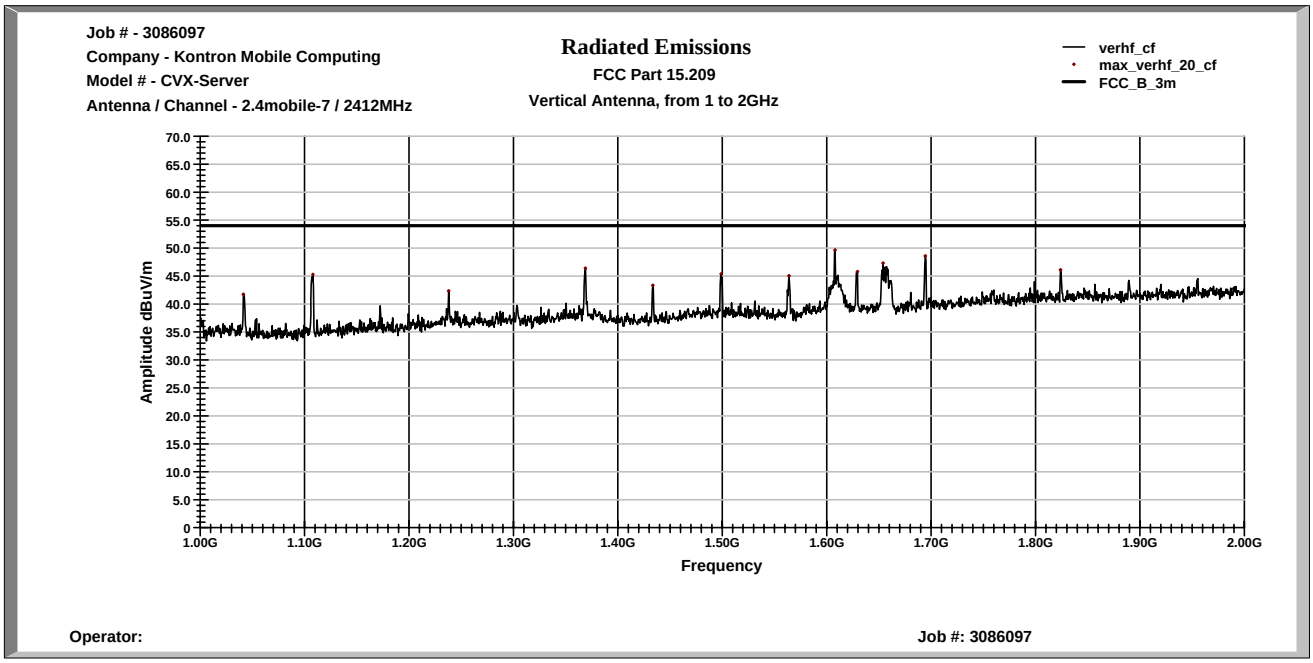


Horizontal Antenna Polarization

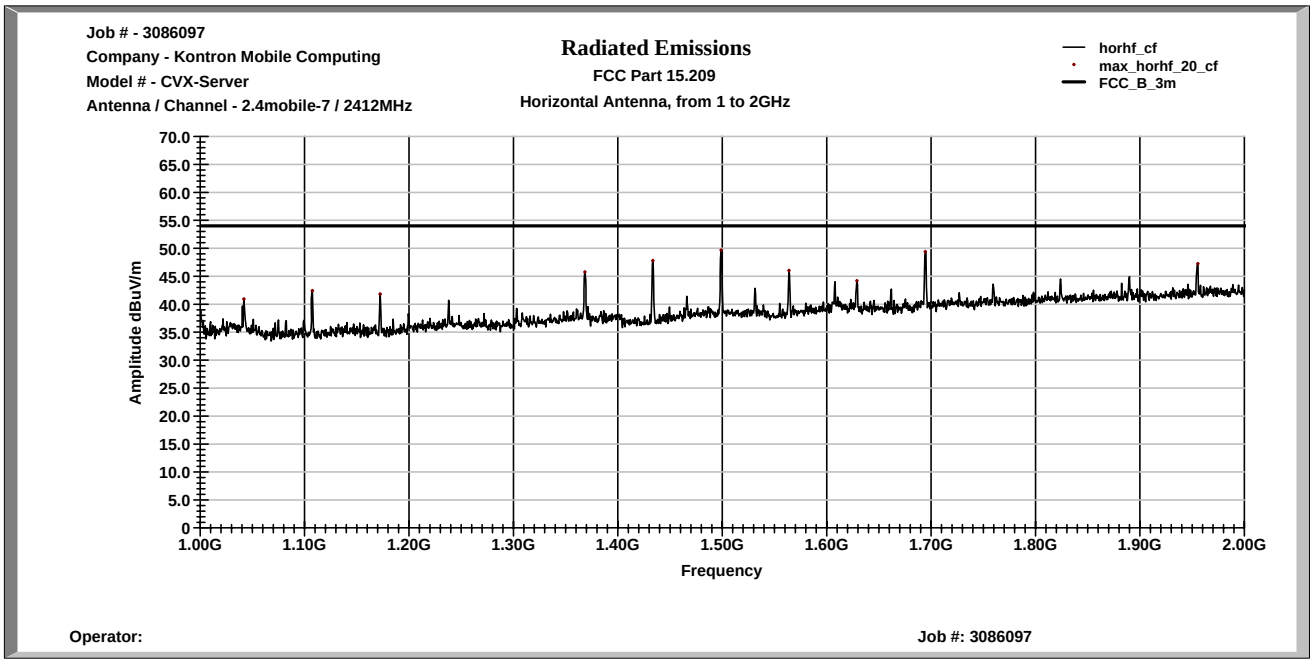


Graph # 3-6-10
Radiated Emissions from 1 to 2GHz, 2712MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization

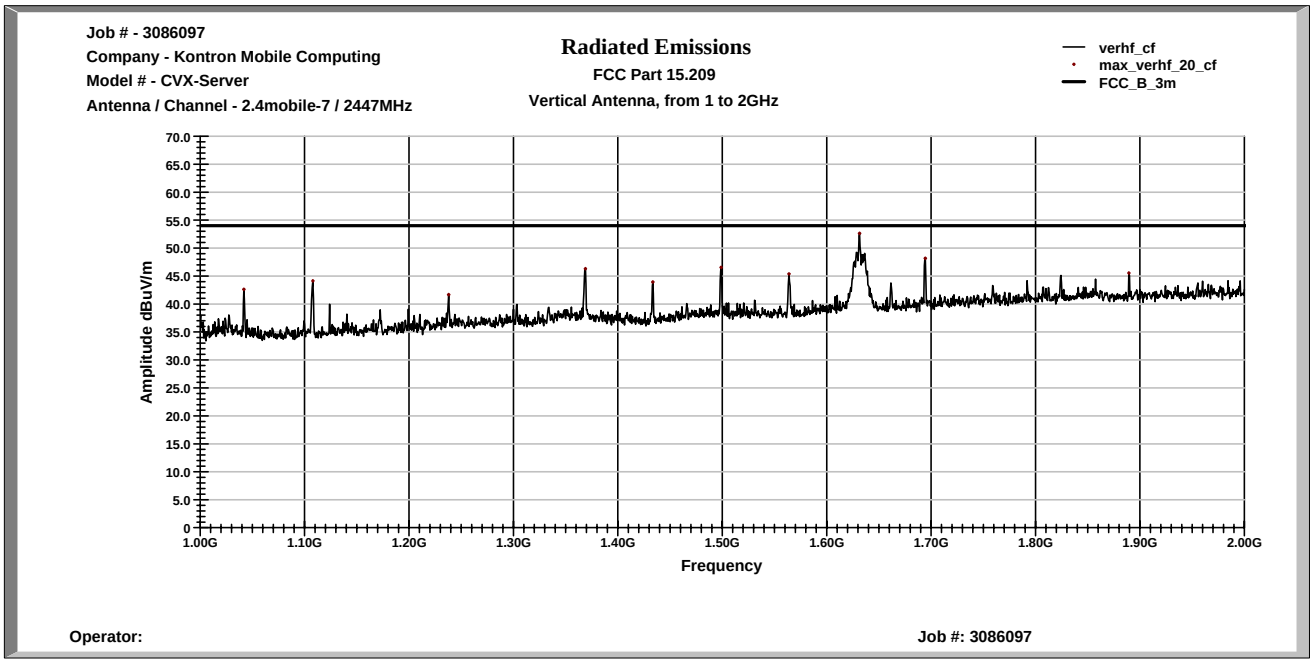


Horizontal Antenna Polarization

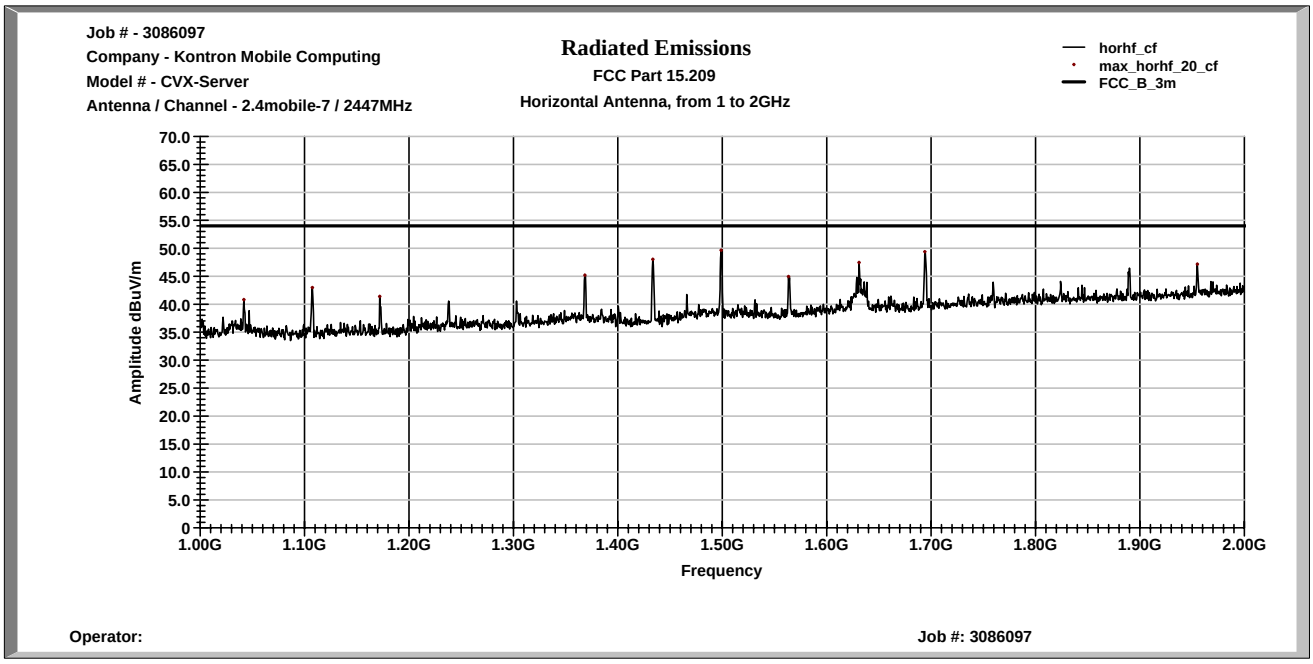


Graph # 3-6-11
Radiated Emissions from 1 to 2GHz, 2747MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization

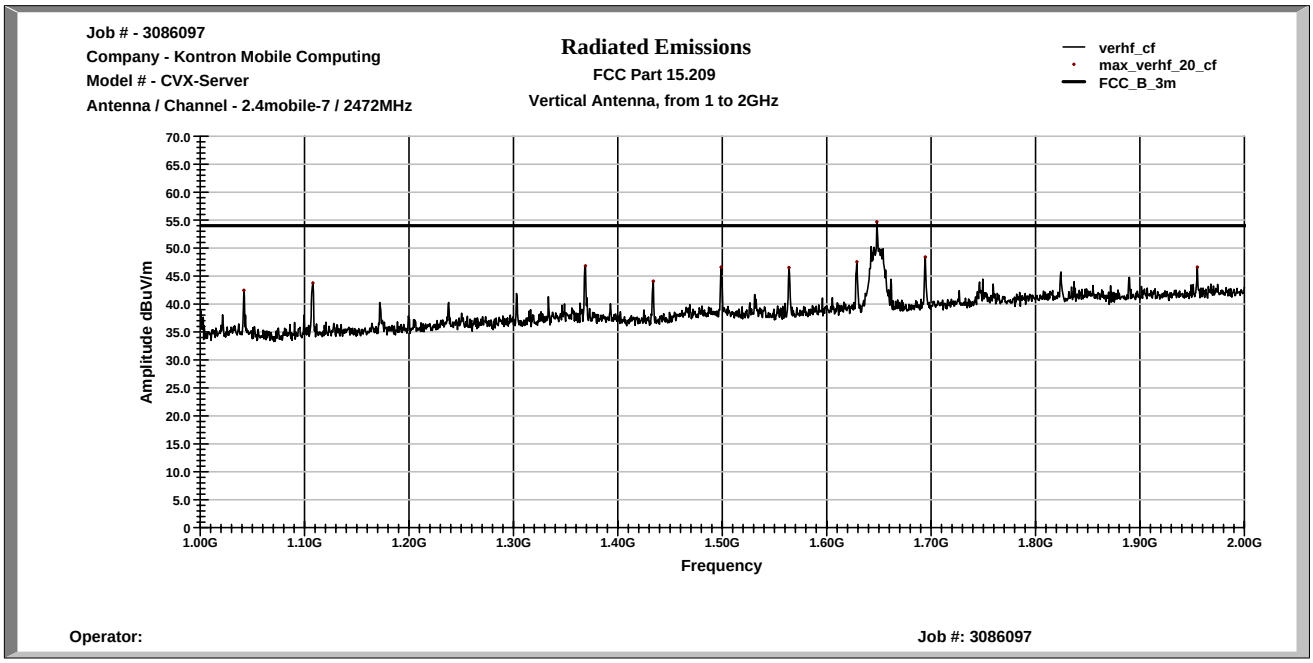


Horizontal Antenna Polarization

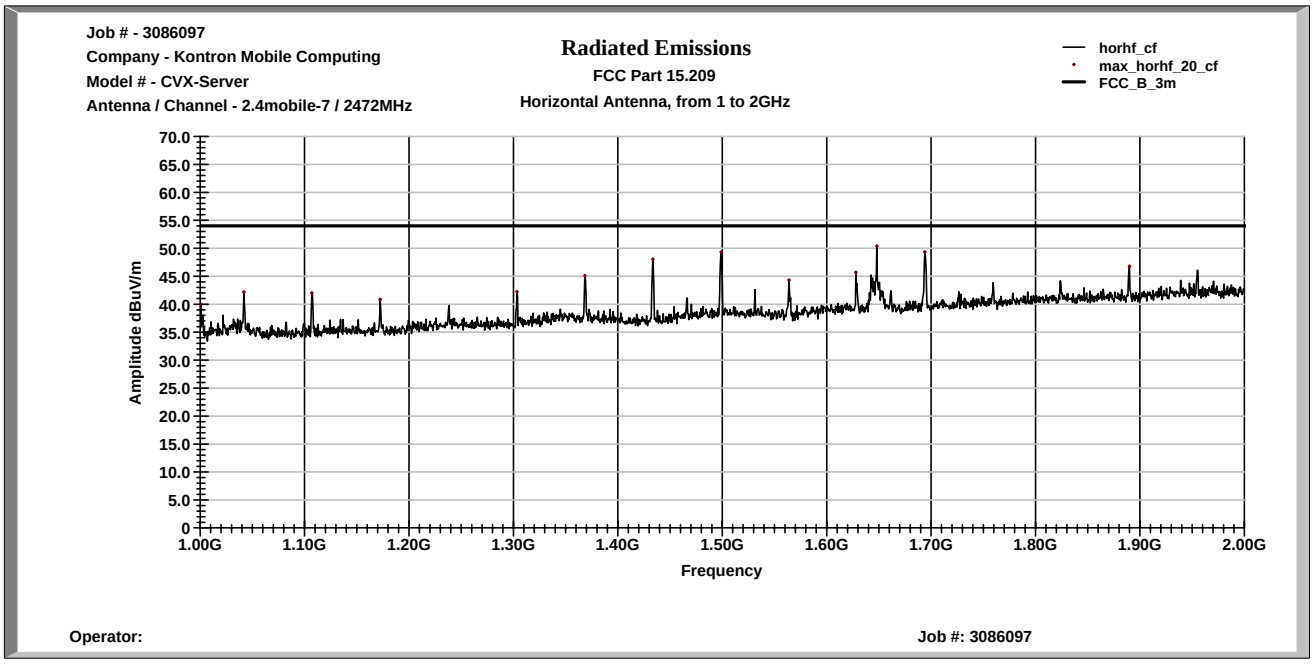


Graph # 3-6-12
Radiated Emissions from 1 to 2GHz, 2772MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization

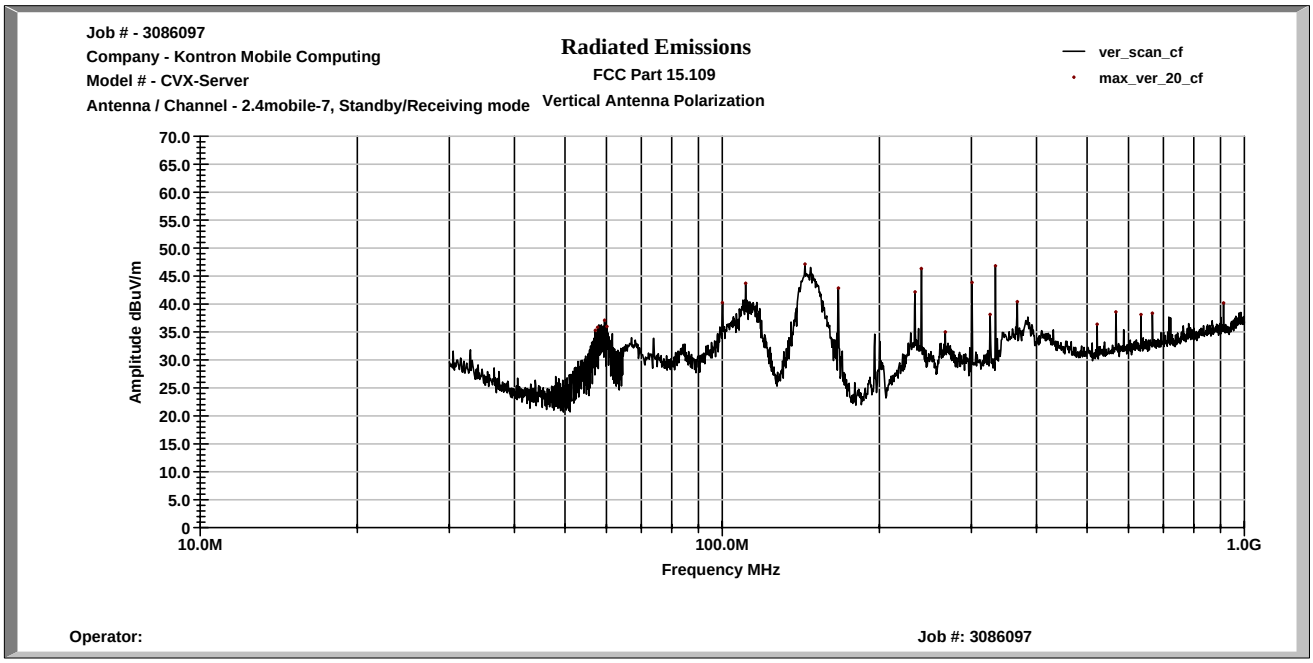


Horizontal Antenna Polarization

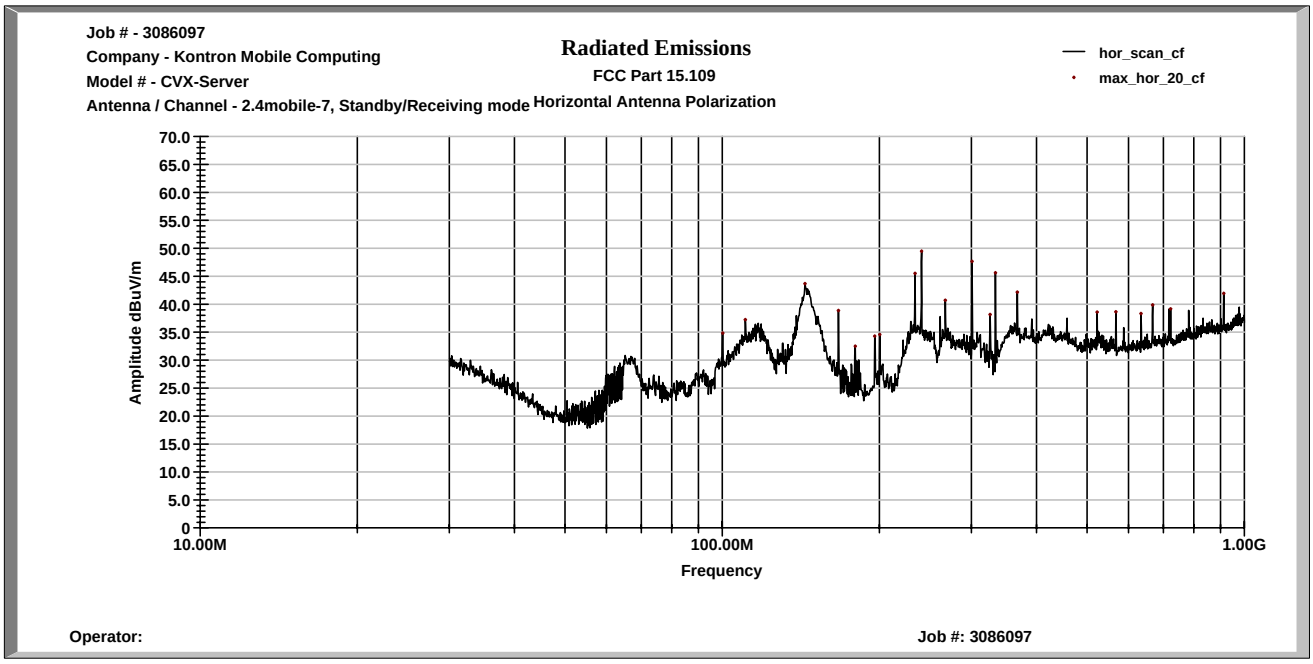


Graph # 3-6-13
Radiated Emissions from 30MHz to 1GHz, Standby/Receiving Mode, 2.4mobile-7 Antenna

Vertical Antenna Polarization

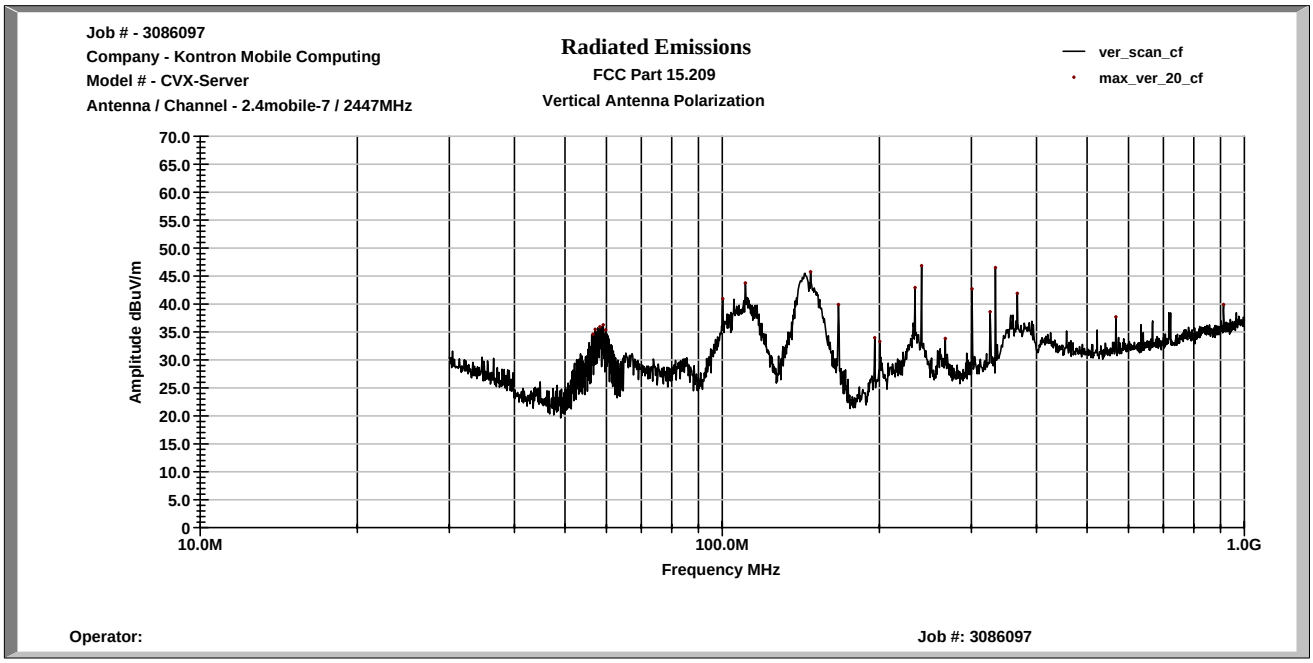


Horizontal Antenna Polarization

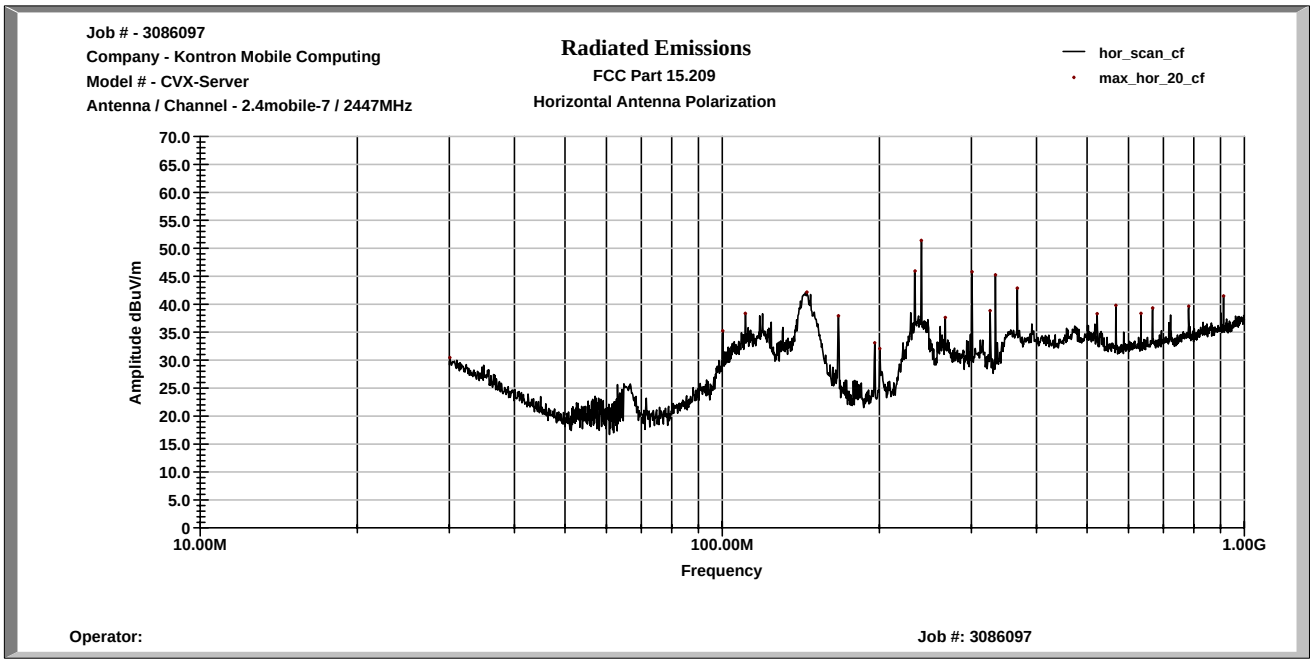


Graph # 3-6-14
Radiated Emissions from 30MHz to 1GHz, 2747MHz Channel, 2.4mobile-7 Antenna

Vertical Antenna Polarization



Horizontal Antenna Polarization



3.7 Line Conducted Emissions, FCC 15.207

Line Conducted Emissions testing was performed in frequency range from 150kHz to 30MHz.

The maximum peak of emissions was measured 13.9dB below Quasi-peak limits and 3.9dB below average limits

The Table 3-7-1and Graph 3-7-1 show the Line Conducted Emissions.

Conducted Emissions From 150kHz to 30MHz **Date:** 11-29-2005

Company: Kontron Mobile Computing
Model: CVX-Server
Test Engineer: Norman Shpilsher
Special Info: Transmitting mode at 11Mbps rate
Temp/RH 23°C/32%
Standard: FCC Part 15.207
Note: The table shows the worst case conducted emissions
Measurements were taken using a Peak detector

Table # 3-7-1

Line 1

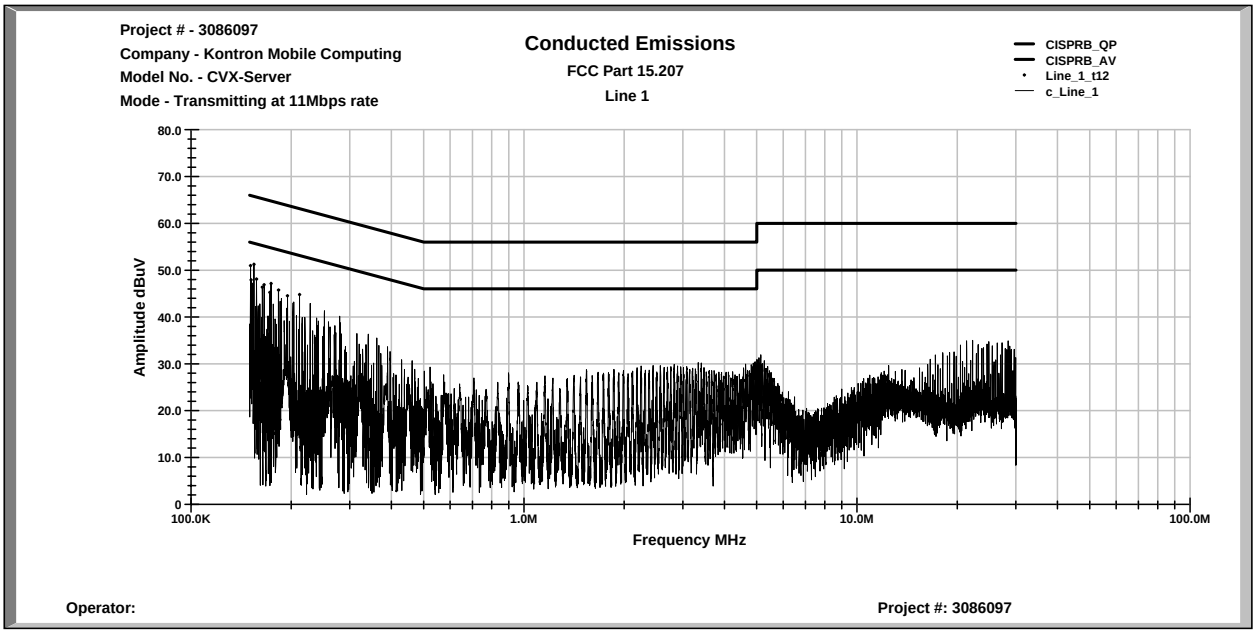
Frequency	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
150.87 KHz	50.960	66.0	56.0	-15.0	-5.0
151.55 KHz	47.930	65.9	55.9	-18.0	-8.0
152.82 KHz	46.940	65.9	55.9	-18.9	-8.9
154.56 KHz	51.240	65.8	55.8	-14.5	-4.5
157.38 KHz	48.100	65.6	55.6	-17.5	-7.5
163.88 KHz	46.370	65.3	55.3	-18.9	-8.9
165.83 KHz	46.880	65.2	55.2	-18.3	-8.3
172.43 KHz	45.250	64.8	54.8	-19.6	-9.6
173.98 KHz	47.150	64.8	54.8	-17.6	-7.6
183.21 KHz	45.750	64.3	54.3	-18.6	-8.6
194.83 KHz	44.530	63.8	53.8	-19.3	-9.3
211.82 KHz	44.780	63.1	53.1	-18.4	-8.4

Line 2

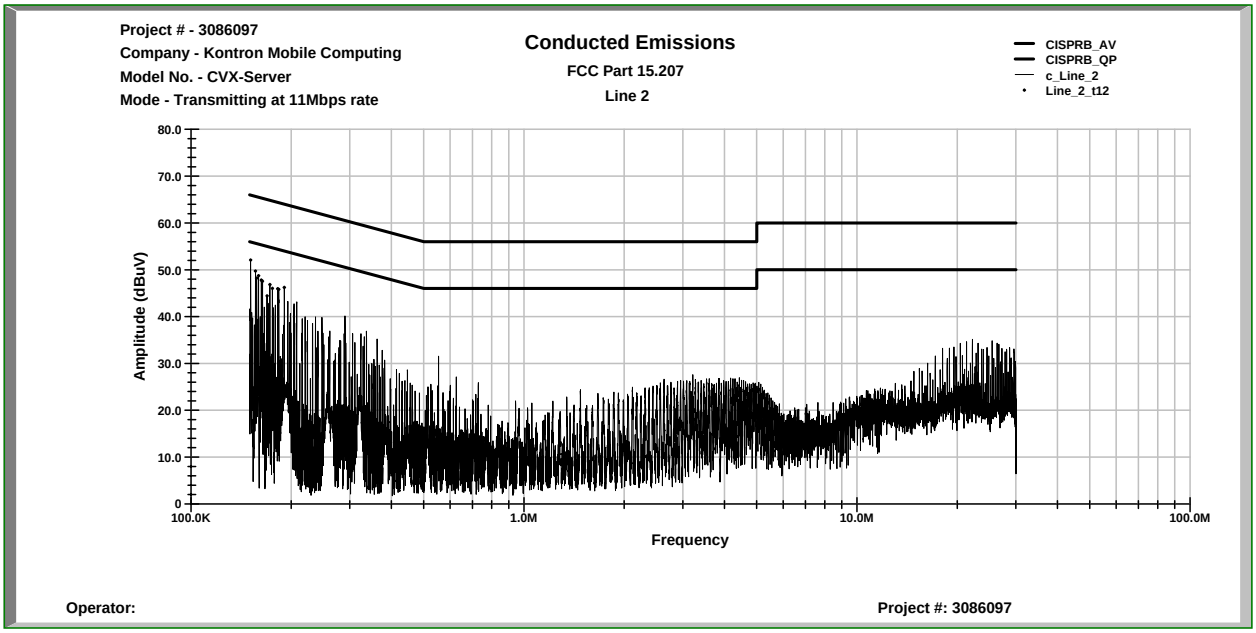
Frequency	Peak dBμV	QP Limit dBmV	AVG Limit dBmV	QP Margin dB	AVG Margin dB
150.97 KHz	52.080	66.0	56.0	-13.9	-3.9
156.21 KHz	49.710	65.7	55.7	-16.0	-6.0
157.48 KHz	48.210	65.6	55.6	-17.4	-7.4
159.52 KHz	48.730	65.5	55.5	-16.8	-6.8
162.72 KHz	47.790	65.3	55.3	-17.5	-7.5
163.98 KHz	47.550	65.3	55.3	-17.7	-7.7
169.23 KHz	44.410	65.0	55.0	-20.6	-10.6
172.53 KHz	46.840	64.8	54.8	-18.0	-8.0
175.63 KHz	46.010	64.7	54.7	-18.7	-8.7
182.14 KHz	45.940	64.4	54.4	-18.5	-8.5
183.5 KHz	45.820	64.3	54.3	-18.5	-8.5
190.67 KHz	46.220	64.0	54.0	-17.8	-7.8

Graph # 3-7-1
Conducted Emissions

Line 1



Line 2



3.8 Test Procedure

Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz.
The radiated emissions were maximized by configuring the EUT through its placement in three orthogonal axes (for hand-held devices), by 360 degrees rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the Field Strength Calculation is shown in Section 3.9.

Antenna Terminal Conducted Emissions Measurements

The Antenna Terminal Conducted Emissions Measurements were obtained with the transmitter antenna terminal directly connected to the spectrum analyzer input.
The emissions level is calculated from the measured power level adding cable loss (attenuation) between the EUT Antenna Terminal and the Analyzer input.

Power Line Conducted Emissions

For conducted emissions testing, the equipment is moved to an insulating platform over the ground plane, and the EUT is powered from a LISN. Both sides of the AC line are measured and the results are compared to the applicable limits. Measurements are taken using CISPR quasi-peak and average detectors when the peak readings approach or exceed the average limit. Only quasi-peak readings are taken when the emissions from the EUT meet the average limit as measured with the quasi-peak detector.

3.9 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(m^{-1})
AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μV) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μV/m).

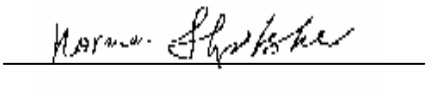
RA = 48.1 dB(μV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(μV/m)

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Norman Shpilsher
Sr. EMC Engineer
Intertek ETL SEMKO

Signature



Date: November 30, 2005

4.0 TEST EQUIPMENT

Receivers/Spectrum Analyzers and Test Software

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3325A00106	10/05	10/06	X
HP85460A RF Filter Section	3330A00109	10/05	10/06	X
HP85462A Receiver RF Section	3549A00306	01/05	01/06	
HP85460A RF Filter Section	3448A00276	01/05	01/06	
Rohde & Schwarz FSP 40 Spectrum Analyzer	100024	08/05	08/06	X
Advantest R3271A Spectrum Analyzer	55050084	08/05	08/06	
Agilent E7402A Spectrum Analyzer	MY44212200	09/05	09/06	
TILE! Instrument Control System	Ver. 3.4 H.1	N/A	N/A	X

Antennas/ Pre-Amplifiers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	01/05	01/06	X
Schaffner-Chase Bicono-Log Antenna	2630	08/05	08/06	
EMCO Horn Antenna 3115	9507-4513	12/04	12/05	X
EMCO Horn Antenna 3115	6579	01/05	01/06	
CompPower PA-122 Pre-Amplifier	02116	10/05	10/065	X
HP 83017A Pre-Amplifier	3123A00475	11/04	11/05	X
Reactel 7HS-4G-S12 SN02-1 Filter	0223	01/05	01/06	X

Artificial Mains Networks/Absorbing Clamps

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
FCC LISN-2	316	04/05	04/06	X
FCC-LISN-50-25-2	2014	05/05	05/06	