APPENDIX A

EUT Software Settings During Testing

Final Power Settings

LO, MID HI Channels and worst case data rates/modulations to comply with Radiated Spurious, Conducted Power and bandedge compliance. The TX power settings are the power level entered in the ART Software to set the output power of the radio.

FCC15.407

5GHz Omni (11 dBi)
Freq: 5275MHz, 5300MHz, 5325MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 17.5, 17, 16.5
802.11n: 13MCSHT20 2S,TX power setting= 17.5, 17, 16.5

Freq: 5280MHz, 5300MHz, 5320MHz.
BW= 20MHz
802.11a: 9 Mbps, TX power= 18, 18, 17.5
802.11n: 6.5MCS HT20 1S, TX power= 18, 18, 17.5

Freq = 5470-5725MHz
5495MHz, 5590MHz, 5705MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 17, 18, 18
802.11n: 13MCSHT20 2S, TX power setting= 17, 18, 17.5

Freq: 5500MHz, 5590MHz, 5700MHz.
BW= 20MHz
802.11a: 9 Mbps, TX power setting= 17, 18, 16.5
802.11n: 6.5MCS HT20 1S, TX power setting= 16.5, 18, 16.5

5GHz Panel (18 dBi)
5250-5350MHz
Freq: 5275MHz, 5300MHz, 5325MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 10.,10.,9.5
802.11n: 13MCSHT20 2S,TX power setting= 10.,10.,9.5

Freq: 5280MHz, 5300MHz, 5320MHz.
BW= 20MHz
802.11a: 9 Mbps, TX power setting 9.11.10.5
802.11n: 6.5MCS HT20 1S, TX power setting= 11.5, 11, 10.5
5470-5725MHz

Freq: 5495MHz, 5590MHz, 5705MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 10.5, 11, 11
802.11n: 13MCS HT20 2S,TX power setting= 10.5, 11, 11

Freq: 5500MHz, 5590MHz, 5700MHz.
BW= 20MHz
802.11a: 24 Mbps, TX power setting= 12, 13, 12.5
802.11n: 6.5MCS HT20 1S, TX power setting= 12, 13.5, 11

5GHz Sector (20 dBi)
5250-5350MHz
Freq: 5275MHz, 5300MHz, 5325MHz.

BW = 10 MHz
802.11a: 24Mbps, TX power= 8.5,8,7.5
802.11n: 13MCSHT20 2S,TX power= 8.5,8,7.5

Freq: 5280MHz, 5300MHz, 5320MHz.
BW= 20MHz
802.11a: 9 Mbps, TX power= 10,9,8.5
802.11n: 6.5MCS HT20 1S, TX power= 9.5,9,8.5

5470-5725MHz
Freq: 5495MHz, 5590MHz, 5705MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 8.5,10,10
802.11n: 13MCS HT20 2S, TX power setting = 8.5,10,10

Freq: 5500MHz, 5590MHz, 5700MHz.
BW= 20MHz
802.11a: 24 Mbps, TX power setting= 10, 11, 10.5
802.11n: 6.5MCS HT20 1S, TX power setting= 10, 11.5, 8.5 *(lowered to pass bandedge)*

5GHz Tri-Sector (17dBi)
Freq: 5275MHz, 5300MHz, 5325MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 11,11,10.5
802.11n: 13MCSHT20 2S,TX power setting = 11,11,10.5

Freq: 5280MHz, 5300MHz, 5320MHz.
BW= 20MHz
802.11a: 9 Mbps, TX power setting= 12.5,12,11.5
802.11n: 6.5MCS HT20 1S, TX power setting= 12, 12,11.5

Freq: 5495MHz, 5590MHz, 5705MHz.
BW = 10 MHz
802.11a: 24Mbps, TX power setting= 11.5,12,12
802.11n: 13MCS HT20 2S,TX power setting= 11.5,12,12

Freq: 5500MHz, 5590MHz, 5700MHz.
BW= 20MHz
802.11a: 24 Mbps, TX powe setting= 13, 14, 14.5
802.11n: 6.5MCS HT20 1S, TX power setting= 13, 14.5, 14.5

APPENDIX B

DATE(S) OF TESTING: April 24, 2013

Standard / Specification: FCC Part 15 Subpart C

Description	Test Procedure/Method	Results
Radiated Spurious Emissions	FCC Part 15 Subpart C	Pass

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
Purpose of new testing 4/24/2013: 1). To show the new case design of the EUT performs as well as the original case design. 2). The second purpose of the appendix is to show the new 17dB Sector antenna designed for Digital Path does not have worst antenna performance than the original 17dB Sector antenna the full testing was completed with.
Verifying the antenna design was done by looking at the 2nd, 3rd and 4th harmonics of the worst case spurious emissions of the original 17dBi Sector antenna. The worst case spurious emissions of the original 17dB Sector antenna were found at the following frequency and settings. Transmitting Operation Frequency= 5785MHz Channel Width=10MHz ART setting = 15.5 Modulation= 24Mbps
For the original antenna, the 4th harmonic was the only spurious signal seen. The 2nd and 3rd harmonics for the original antenna were system noise floor. The 2nd, 3rd and 4th harmonics were all looked at with the new antenna design to ensure the antenna does not radiate these harmonics. The Modifications to Unit required for the FCC 15.109 testing were still installed. For the new antenna, the 2nd, 3rd and 4th harmonic were all noise floor. The 2nd and 3rd harmonics peak noise floor readings were similar to those initially taken with the original antenna. The 4th harmonic peak noise floor readings are at least 6dB lower than the reading from the original antenna. These results validate the new 17dB Sector antenna.
Modifications to Unit: Add 2 ferrites (Steward 28A 2024-0A0), one on the RJ45 power cable with one pass through and another on the RJ45 power and data cables together at the EUT with one pass through.

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

5GHz Sector (17dBi)
Manuf: Digital Path
Model: G5RL102X
Serial: ENG1

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Laptop Power Supply
Manuf: HP
Model: 608428-002
Serial: F12941126327228

Power Supply
Manuf: Condor
Model: STD-2427P
Serial: None

Laptop
Manuf: HP
Model: ProBook 6565b
Serial: 5CB13637ZF

Radiated Spurious Emissions

Test Data Sheets

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Digital Path**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **92682** Date: 4/24/2013
Test Type: **Radiated Scan** Time: 16:11:02
Equipment: **5GHz Sector (17dBi)** Sequence#: 6
Manufacturer: Digital Path Tested By: Hieu Song Nguyenpham
Model: G5RL102X
S/N: ENG1

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02668	Spectrum Analyzer	E4446A	2/22/2013	2/22/2015
T1	AN03114	Preamp	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T2	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/21/2012	3/21/2014
T4	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
T5	ANP05843	Cable	32022-2-29094K-48TC	8/7/2012	8/7/2014
T6	AN01417	High Pass Filter	84300-80039	2/9/2012	2/9/2014

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
5GHz Sector (17dBi)*	Digital Path	G5RL102X	ENG1

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Power Supply	HP	608428-002	F12941126327228
Laptop	HP	ProBook 6565b	5CB13637ZF
Power Supply	Condor	STD-2427P	None

Test Conditions / Notes:

Radiated Spurious Emission

Temperature: 20. 8°C
Humidity: 40 %
Atmospheric Pressure: 100.9 kPa
High Clock: 500MHz
Software: ART software

Mode: TX

Transmitting Operation Frequency= 5785MHz

Channel Width=10MHz
ART setting = 15.5
Modulation= 24Mbps

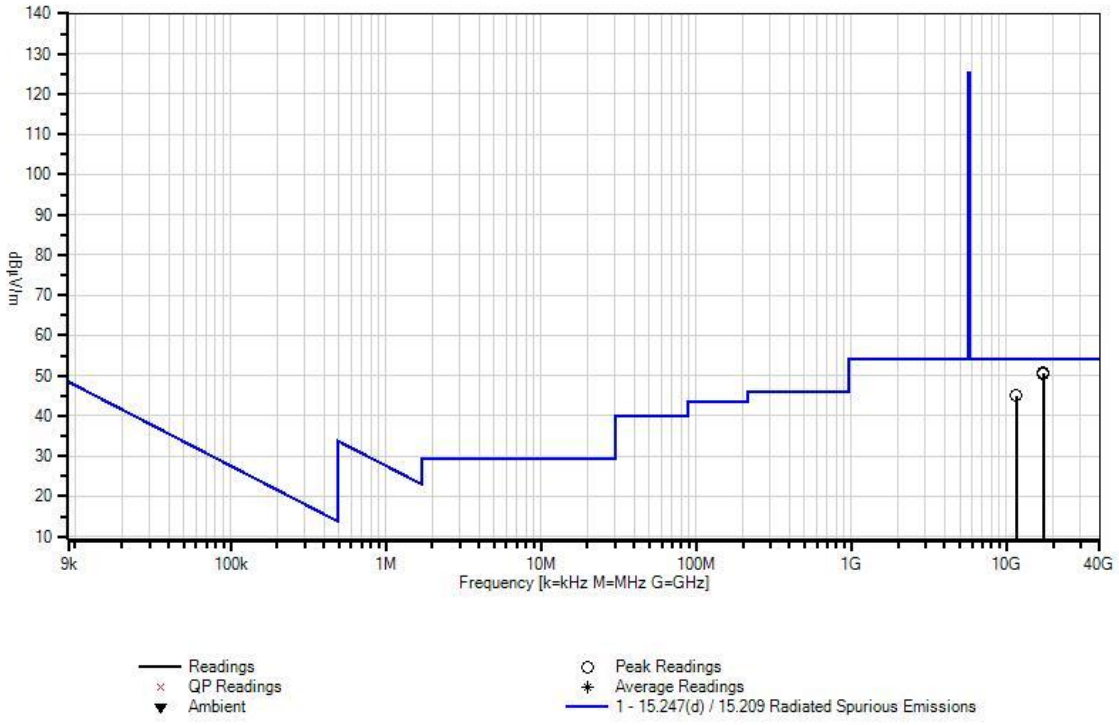
Note: ar9160 chip w/ 17db sectors & aluminum case model # G5RL102X takes off the plastic in the front and put 2 ferrite (Steward 28A 2024-0A0): one is on the RJ 45 power cable with one pass through at around one foot from the EUT and another one is on RJ 45 power and data cables with one pass through at the EUT.

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	17355.000 M	50.1	-57.7 +2.6	+43.2 +0.8	+3.0	+8.7	+0.0	50.7	54.0	-3.3	Vert
									Third Harmonic. Noise Floor only		
2	17355.000 M	49.7	-57.7 +2.6	+43.2 +0.8	+3.0	+8.7	+0.0	50.3	54.0	-3.7	Horiz
									Third Harmonic. Nothing shows up. Noise Floor		
3	11569.500 M	51.5	-56.2 +2.1	+39.1 +0.0	+2.4	+6.2	+0.0	45.1	54.0	-8.9	Vert
									Second Harmonic. Noise floor		
4	11569.500 M	51.5	-56.2 +2.1	+39.1 +0.0	+2.4	+6.2	+0.0	45.1	54.0	-8.9	Horiz
									Second Harmonic. Noise floor		

CKC Laboratories, Inc Date: 4/24/2013 Time: 16:11:02 Digital Path WO#: 92682
Test Distance: 3 Meters Sequence#: 6



Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Digital Path**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **92682** Date: 4/24/2013
Test Type: **Radiated Scan** Time: 16:52:09
Equipment: **5GHz Sector (17dBi)** Sequence#: 7
Manufacturer: Digital Path Tested By: Hieu Song Nguyenpham
Model: G5RL102X
S/N: ENG1

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02668	Spectrum Analyzer	E4446A	2/22/2013	2/22/2015
T1	AN02694	Horn Antenna-ANSI C63.5 Antenna Factors (dB)	AMFW-5F-18002650-20-10P	2/4/2013	2/4/2015
T2	ANP00929	Cable	various	2/16/2012	2/16/2014
T3	ANP05843	Cable	32022-2-29094K-48TC	8/7/2012	8/7/2014
T4	ANP06127	Cable	32022-29094K-29094K-132TC	9/7/2011	9/7/2013

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
5GHz Sector (17dBi)*	Digital Path	G5RL102X	ENG1

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Power Supply	HP	608428-002	F12941126327228
Laptop	HP	ProBook 6565b	5CB13637ZF
Power Supply	Condor	STD-2427P	None

Test Conditions / Notes:

Radiated Spurious Emission

Temperature: 20.8°C
Humidity: 40 %
Atmospheric Pressure: 100.9 kPa
High Clock: 500MHz
Software: ART software

Mode: TX

Transmitting Operation Frequency= 5785MHz

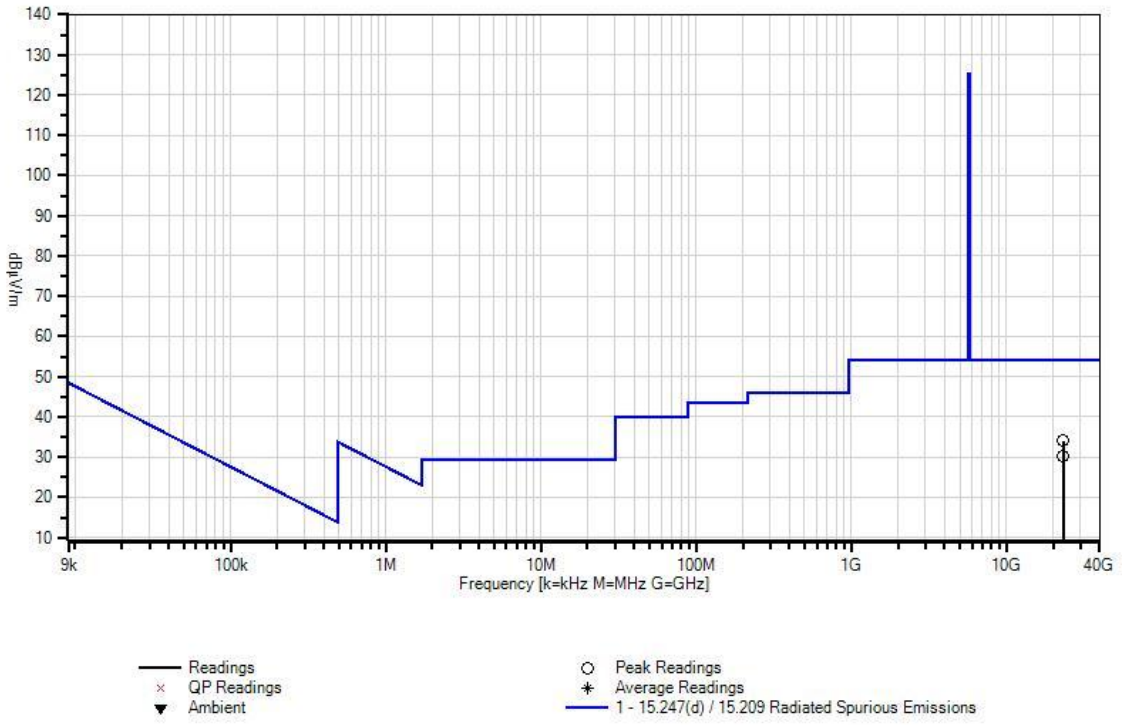
Channel Width=10MHz
ART setting = 15.5
Modulation= 24Mbps
Note: ar9160 chip w/ 17db sectors & aluminum case model # G5RL102X takes off the plastic in the front and put 2 ferrite (Steward 28A 2024-0A0): one is on the RJ 45 power cable with one pass through at around one foot from the EUT and another one is on RJ 45 power and data cables with one pass through at the EUT.

Ext Attn: 0 dB

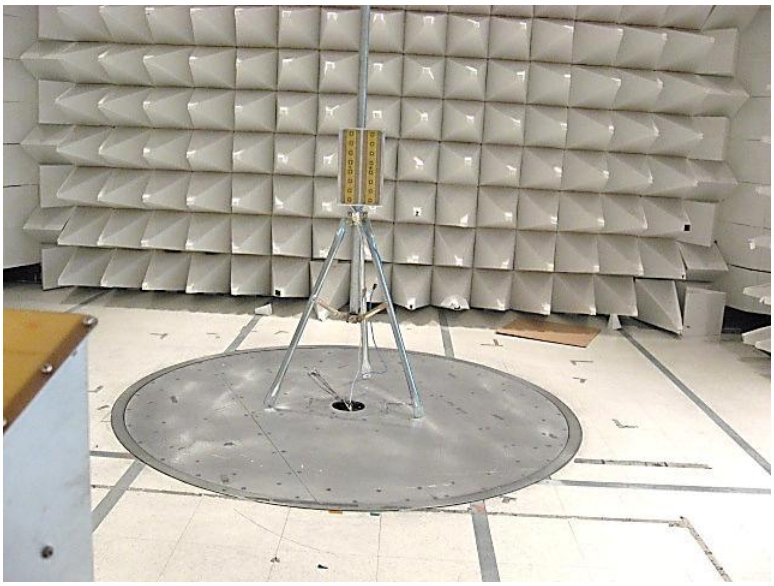
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	23140.000 M	41.7	-17.8	+2.9	+2.9	+4.3	+0.0	34.0	54.0	-20.0	Vert
									The Fourth Harmonic. Noise Floor only		
2	23140.000 M	37.8	-17.8	+2.9	+2.9	+4.3	+0.0	30.1	54.0	-23.9	Horiz
									The Fourth Harmonic. Noise Floor only		

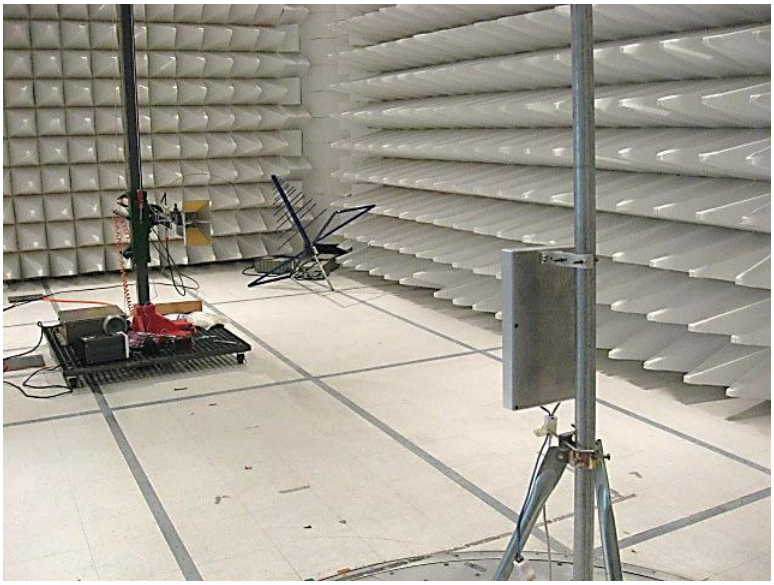
CKC Laboratories, Inc Date: 4/24/2013 Time: 16:52:09 Digital Path WO#: 92682
Test Distance: 3 Meters Sequence#: 7



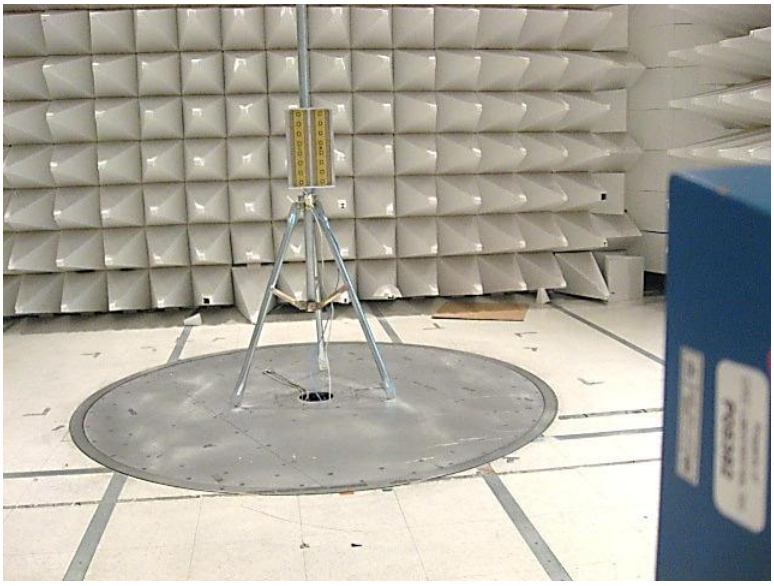
Test Setup Photos



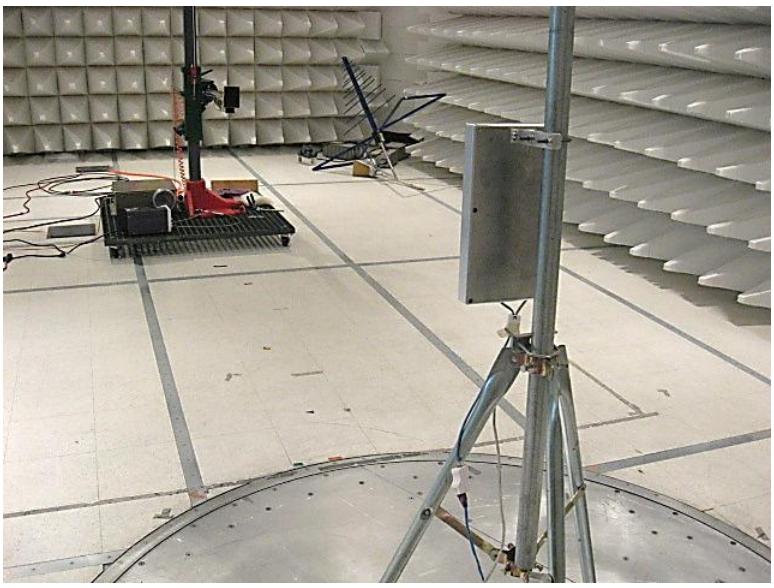
Radiated Spurious, Second and Third Harmonic



Radiated Spurious, Second and Third Harmonic



Radiated Spurious, Fourth Harmonic



Radiated Spurious, Fourth Harmonic

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.