Exegin Technologies Limited
Q53
ZigBee Gateway

Transmitter Intentional Radiator
Intentional Test Report of Measurements per standards:

Industry Canada:	**RSS-Gen_Iss 2 and RSS-210_Iss7**
FCC:	**47CFR Part 15/C 07-10-08**
	Sections 15.209 and 15.247

Testing body: **Tranzeo EMC Labs Inc.**
19473 Fraser Way
Pitt Meadows
BC, Canada
V3Y 2V4

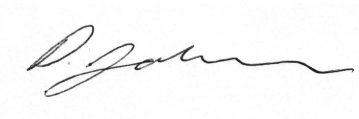
Client: **Exegin Technologies Ltd.**
401-2071 Kingsway Ave.
Port Coquitlam
British Columbia, Canada
V3C 6N2

Contact: **Fred Fierling**
Email: **fff@exegin.com**
Phone: **604-468-3636**

Project Number: **EXE010925**
Revision 2.0
September 01, 2009

Type of test: Testing of electromagnetic disturbances characteristics

Date of test: July 13, 2009 to July 28, 2009



EMC Manager: Bruce Balston EMC Engineer: David Johanson

Revision History

Rev: 0.0 04Aug2009 Original Draft

Rev: 1.0 04Aug2009 Final Release

Rev: 2.0 01Sep2009 Modified Address and email; Final Release

Table of Contents

Section 1 General Information

EUT Description and Setup

Manufacturer	Exegin Technologies Limited
Product Name	ZigBee Gateway
FCC ID:	VD4Q53
IC No.:	7162A-Q53
Model No.	Q53
Serial No.	ENG01
Product Software/Firmware Revision	N/A

Auxiliary Equipment

5Vdc Power Adapter	Manufacturer: Condor
	Input: AC 100-240Vac 47-63Hz
	Output: 5 Vdc, 0.3A
	Model: 3A-061WP05
48Vdc Power Over Ethernet Power Adapter – Power on data pair	Manufacturer: Cisco
	Input: AC 100-240Vac 50-60Hz
	Output: 48 Vdc
	Model: CP-PWR-INJ
48Vdc Power Over Ethernet Power Adapter – Power on spare pair	Manufacturer: Allied Telesis
	Input: AC 100-240Vac 50-60Hz
	Output: 48 Vdc
	Model: AT-6101G
Monitoring Access point Power Over Ethernet Power Adapter	Manufacturer: Exegin
	Model: Q53
PC	Manufacturer: Compaq
	Serial Number: clone
	Operating System: Windows XP Home Edition SP3
	Application Software: SecureCRT

Related Test Reports

Digital Circuitry Emissions Verification	EXE0109025_Rev1.0.pdf
EN 300 328 Compliance Report	EXE0109025_CE_Rev1.0.pdf

Cabling

Description	Connectors	Length	Shielding	Ferrites
5V Power Cord	8mm Barrel	0.5Meter	None	None
Cat5e Ethernet	RJ-45	1Meter	None	None

Operational Description

The Q53 (EUT) is an electronic device that has a custom designed 2.4-2.4835GHz Transceiver using the ZigBee communication protocol to create a proprietary mesh network for PC's and other Ethernet compatible devices.

EUT Setup and Testing Configuration

For the purpose of compliance testing, the EUT was powered using the 5Vdc AC Power Adapter since it was verified during prescan's that this was the worst-case scenario. The EUT was tested in various modes of operation as well as Continuous Transmit mode of operation, depending on the test. For the Continuous Transmit mode of operation, the EUT was in constant communications with the Computer. The Computer was used to setup the EUT into various modes of transmission by adjusting the transmit channels of the 2.4GHz Transceivers.

The EUT was tested in the following modes of operation:

- Continuous Transmit operation was used for Radiated Spurious and AC Mains Conducted Emissions. The 2.4GHz transmitter was set to the highest power level and was tested on the Lowest, Middle and Highest frequency channels to ensure compliance.
- Quiescent mode of operation was used to verify the digital circuitry emissions. These tests were done with the transmitters turned OFF. We were not able to disable the receiver function.

EUT Modifications

No modifications were necessary for this unit to comply with the standards noted in the "Standards used to ensure Compliance" section listed below.

Test Facilities

Tranzeo EMC Labs
19473 Fraser Way
Pitt Meadows, BC V3Y 2V4
Canada

Phone: (604) 460-6002
Fax: (604) 460-6005

FCC registration number: 960532
Industry Canada Number: 5238A

Test Equipment List

Emissions OATS

Manufacturer	Model	Description	Serial No.	Cal Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/R
Sunol Sciences	Custom	Mast Motor	TREML0001	N/R
Sunol Sciences	JB3	Antenna 20MHz-3GHz	A042004	07-Dec-2009
AH Systems	SAS-562B	Loop Antenna 10kHz-30MHz	#252	02-Feb-2011
Com-Power	LI-115	LISN	241037	11-Feb-2011
Thurlby Thandar	AC1000	Low Distortion Power Source	317113	01-Jul-2011
Thurlby Thandar	HA1600	Power and Harmonics Analyzer	318801	01-Jul-2011
Rohde & Schwarz	ESCI	EMI Receiver	100123	06-Jun-2009

Emissions Chamber

Manufacturer	Model	Description	Serial No.	Cal Due Date
ETS Lindgren	S201	5M Chamber 40GHz	1030	N/R
ETS Lindgren	Custom	Mast with Motor	N/R	N/R
ETS Lindgren	Custom	Turntable	N/R	N/R
Sunol Sciences	JB3	Antenna 20MHz-3GHz	A120106	28-Oct-2010
Sunol Sciences	DRH-118	Antenna 1-18GHz	A050905	04-Dec-2009
AH Systems	PAM0118	Pre-Amp 0.1-18GHz	189	04-Dec-2009
Com-Power	LI-115	LISN	241036	11-Feb-2011
Rohde & Schwarz	ESU	EMI Receiver	100011	29-Mar-2010
Rohde & Schwarz	PSA	EMI Receiver	100012	11-May-2010
		Temperature Chamber		

Standards used to ensure Compliance

Canada

Industry Canada (IC) RSS-Gen Issue 2 and RSS-210 Issue 7.

United States

Federal Communications Commission (FCC) CFR Title 47 Part 15/C
Section 15.209; Section 15.249

Test Results

The EUT complies with the above “Standards used to ensure Compliance”. Refer to the other test reports for results on the Digital Circutry results.

Report of Measurements Test Procedure

Radiation Interference:

The measurement was made per ANSI C63.4-2003, CISPR 22:2008 and CISPR 16 equipment and procedures as appropriate, using a Rohde and Schwartz ESCI and ESU EMI Receiver with the appropriate antennas. The Receiver is calibrated in dB above a microvolt (dBµV) at the output of the antenna. The resolution bandwidth (RBW) was 120kHz with an appropriate sweep speed and video bandwidth for frequencies 30MHz to 1GHz. The RBW was 9kHz for frequencies 150kHz to 30MHz. The RBW was 1MHz for frequencies above 1GHz. When an emission was found, the table was rotated to produce the maximum, signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were measured. The final Measurement was performed using an Average Detector for frequencies 150kHz to 30MHz and for frequencies above 1GHz. A Quasi-Peak detector was used for frequencies 30MHz to 1GHz.

The EUT was placed in a horizontal orientation, laying flat, on top of a table 80 cm high with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.m side). The table used for radiated measurements is capable of continuous rotation.
When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m and a final measurement was performed using the appropriate RBW and Detector.

The fundamental frequencies of the transmitters were measured on an Open Air Test Site (OATS) at 3meters, using the appropriate antenna, on a tabletop 0.8meters above the horizontal ground-plane as required. The Spurious Emissions were measured on the OATS at 3meters and if required due to low field strength, at 1meter up to 3GHz. If the levels were unreadable the Spurious Emissions were then measured in a 5meter semi-anechoic chamber at 3meters and 1meter up to 25GHz to ensure compliance.

Formula of Conversion Factors:

The EUT was pre-scanned and measured at the required distance. The field strength (FS) at 10m was established by adding the meter reading of the EMI Receiver (which is set to read in units of dBµV) to the antenna correction factor (ACF) supplied by the antenna calibration laboratory and then added the Cable Loss (CL) as measured at our facility. The antenna and cable correction factors are stated in terms of dB.

Example:

Freq (MHz)	Meter Reading	+ACF	+CL	= FS
330	20 dBµV	+10.36 dB	+0.5	= 30.86 dBµV/m @ 10m

Where the field strength was too low to get an accurate reading at the required distance, the Antenna was moved closer to 3 or 1 meter. The resulting measurement was distance corrected for 10 meters by using the formula:
(measured distance result) – (20Log(measured distance/required distance)) = (10 meter result)

Example for a 3meter measurement:
3 meter result + distance correction = 10 meter result
54.5 dBµV + -10.45dB = 44.05 dBµV

As per 15.31(f)(2), for the measurements of frequencies below 30 MHz, Limit Line was distance corrected by 40dB/Decade for 30 or 3 meters by using the formula:
Where Required Measurement Distance is 300m and actual measurement distance was 3m –
(300m limit line) + 40dB (for measurement at 30m) + 40dB (for measurement at 3m)= (3 meter limit line)

Example for a 3meter measurement for 125kHz:
300 meter requirement + distance correction = 3 meter result
20 log (2400/125) + 40dB +40dB = 20Log(19.2) +40dB +40dB = 105.67 dBµV

Occupied Bandwidth:

The measurements were made with the spectrum analyzer's RBW, VBW and the span was set as shown on the appropriate plot.

AC Mains Power Conducted Interference:

The equipment and procedures used was ANSI C63.4-2003, CISPR 22:2008 and CISPR 16 as appropriate using a 50µH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 9kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30MHz. The measurement was performed on an Open Air Test Site at 0.8meters and 0.4 meters above the horizontal ground-plane as required.

ANSI C63.4-2003 Section 10.1 Measurement procedures:

The EUT was placed on a non-conducting table 0.8meters above the ground plane with the EUT located in the center of the table. The EUT was placed at 3meters distance from the antenna in the vertical orientation. When an emission was found, the table was rotated and the Antenna was pivoted and elevated to produce the maximum signal strength. The emission was also evaluated with the antenna in the Horizontal position at 1meter height above the ground plane and the table rotated to produce the maximum signal strength. The EUT was evaluated in 3 orthogonal planes. The frequency was scanned from 9.0kHz to 18.0 GHz.

Bandwidth 6.0dB:

The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=1 MHz and the video bandwidth (VBW) =3 MHz and the span set as shown on plot.

Power Output:

The RF power output was measured at the antenna feed point using a peak power meter setting built in to the ESU EMC Receiver.

Antenna Conducted Emissions:

The RBW=100 kHz, VBW=300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Section 2 Report of Measurements of Transmitter per Test Standards

Testing was performed pursuant to FCC 47CFR Part 15/C Section 15.247 and IC RSS-210 Annex 8 Radiated emissions were performed at 3meters on a 10meter Open Air Test Site or at 3meters in a 5meter Semi-Anechoic Chamber.

Test	Standard	Description	Result
AC Mains Conducted Emissions	15.207 RSS-GEN(7.2.2)	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0MHz range.	Complies
Radiated Emissions	15.209 RSS-210 (2.6) and (A8.5)	The radiated emissions are measured in the 30-18000MHz range	Complies
Antenna Requirement	15.203 RSS-GEN(7.1.4)	Replaceable Antenna must use a unique connector	Complies
Occupied Bandwidth	15.247(a)(2) RSS-210 (A8.2)(a)	Bandwidth Plot shall be submitted	Complies
Peak Power	15.247(b)(3) RSS-210 (A8.4)(4)	Peak Power shall be measured	Complies
Spurious Emissions at Antenna Terminal	15.247(d) RSS-210 (A8.5)	Spurious Peaks shall be measured	Complies
Bandedge	15.247(d) RSS-210 (2.6)	Bandedge Plot shall be submitted. 50dBc or 54dBuV in restricted bands	Complies
Power Spectral Density	15.247(e) RSS-210 (A8.2)(b)	Power Spectral Density Plots must be submitted	Complies
Frequency Stablity	15.215(c) RSS-210 (2.1)	Frequency Stability results are to be recorded	Complies

AC Mains Conducted Emission Testing

DATE: July 15, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart B Section 15.107

TEST VOLTAGE: 120Vac 60Hz, 5 and 48Vdc adapters

TESTED BY: David Johanson

TEST CONDITIONS: Indoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	**Conducted Limit (dBµV)**	
	Quasi-Peak	**Average**
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50
Note 1 The lower limit shall apply at the transition frequencies Note 2 The limit decreases linearly with the logarithm of the frequency in the reange 0.15 MHz to 0.50 MHz		

TEST SETUP: The EUT was connected to the AC Mains Conducted Emissions LISN apparatus. The equipment was operated and tested using 120Vac 60Hz powering the 5Vdc and POE adapters connected to the RJ-45 Connector while in continuous transmission mode of operation. Since the POE devices can provide power in two methods, both methods were also tested.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 9kHz RBW, CISPR Average detector.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

EMISSIONS DATA: Data for Transmitters ON is being reported. See Tables 1-6 and Plots 1-6 in Appendix B for corresponding data.

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Radiated Emission Testing

DATE: July 13, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart C Sections 15.205 and 15.209
IC RSS-210 Sections 2.6 and Appendix A Section 8.5

TEST VOLTAGE: 120Vac 60Hz , 5Vdc adapters

TESTED BY: David Johanson

TEST CONDITIONS: Outdoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD:

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	dBµV/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

MEASUREMENT METHOD: The equipment was set up on the 10meter Open Air Test Site. Tests were performed at 3 meters. The required Measured Field Strength was modified to compensate as per procedures for short range as documented above in the "Report of Measurements Test Procedures" section. All cables used were as supplied with the product. Any cable over 1 meter in length were bundled at 1 meter and retained from the floor. A typical application was tested.

The transmitters was ON and set for continuous transmission for this test. See the above "EUT Setup and Testing Configuration" section.

DEVICE DESCRIPTIONS: As described in the above EUT Description Section.

EMISSIONS DATA: See Table A in Appendix B for corresponding data. Some power supply noise was found near 51MHz. The only emissions detected were from the digital circuitry. No other narrow band emissions were detectable up to the fundamental frequency of the transmitter.

OBSERVATIONS: The EUT performed as expected. Since some emissions were detectable in the FM radio frequency band, the product was rescanned at 3meter in our 5meter Semi-Anechoic chamber to verify that there were no emissions of concern hidden by ambient emissions. The rescan showed that there were no detectable problems.

PERFORMANCE: All emissions .

Antenna Requirements

DATE: July 15, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart C Section 15.203
IC RSS-310 Section 7.1.4

APPLICABLE REGULATIONS : - "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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited."… "the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."

RESULT : This unit meets this requirement. The antenna is a 2.4GHz ¼ Wave Length Omni-Directional Dipole whip antenna that uses a "Reverse SMA" connector. It is normally sold with the unit and installed at the site by the end-user. "Replacement Antennas" can only be ordered from the factory. The only antenna that has been tested and approved for use with this product is

Manufacturer: Pulse Engineering Inc.
Model: W1030
Gain: = 2.0dBi
Impedance = 50Ohm
Bandwidth = 100MHz

Additionally, the user manual contains the following information:

This device has been designed to operate with the antennas listed below, and having a maximum gain of [2] dB. Antennas not included in this list or having a gain greater than [2] dB are strictly prohibited for use with this device. The required antenna impedance is [50] ohms.

Occupied Bandwidth

DATE: July 21, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart C Section 15.247(a)(2)
IC RSS-210 Appendix A Section (8.2)(a)

TEST VOLTAGE: 120Vac 60Hz, 5 and 48Vdc adapters

TESTED BY: David Johanson

TEST CONDITIONS: Indoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD: using a RBW = 100kHz, the 6dB bandwidth must be greater than 500kHz.

TEST SETUP: The EUT Antenna port was connected directly to the EMI Receiver and the emissions were measured. The equipment was operated and tested using 120Vac 60Hz powering the 5Vdc adapter. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels were measured.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 100kHz RBW, Average detector. All data produced is using the EMI Receivers built-in measurement tools.

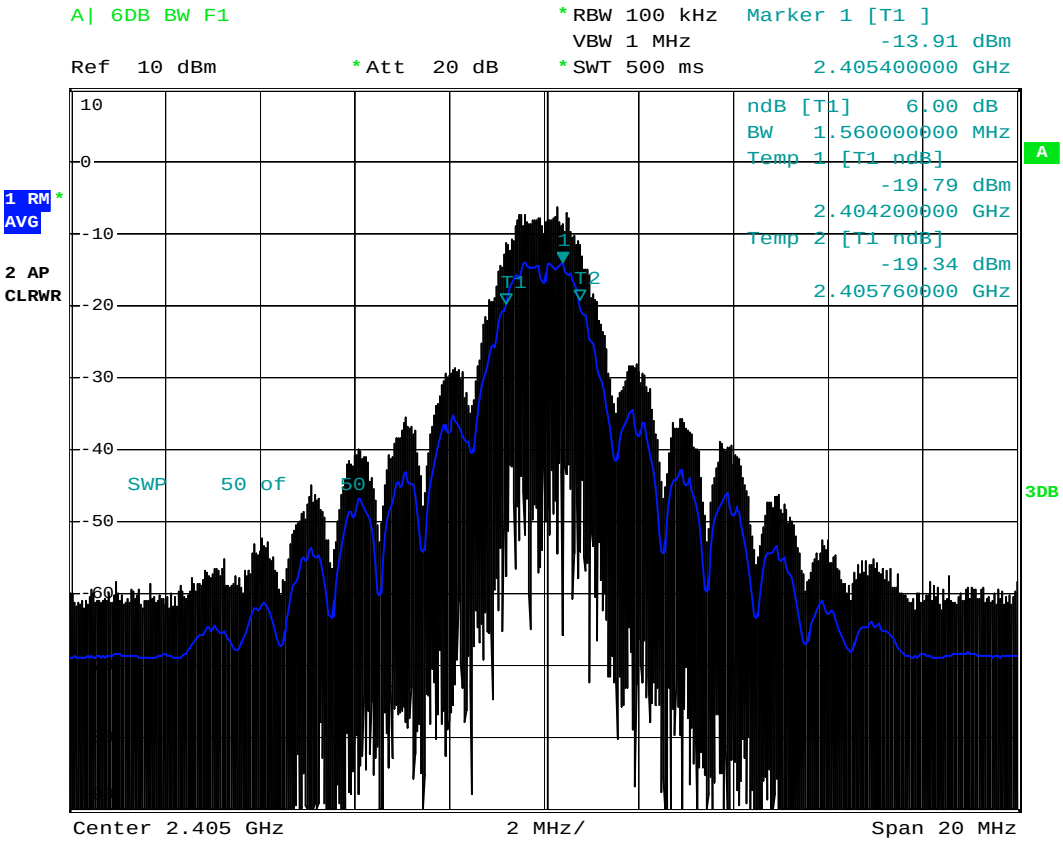
DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

EMISSIONS DATA:

Frequency (MHz)	6dB Bandwidth (MHz)
2405	1.56
2445	1.56
2480	1.6

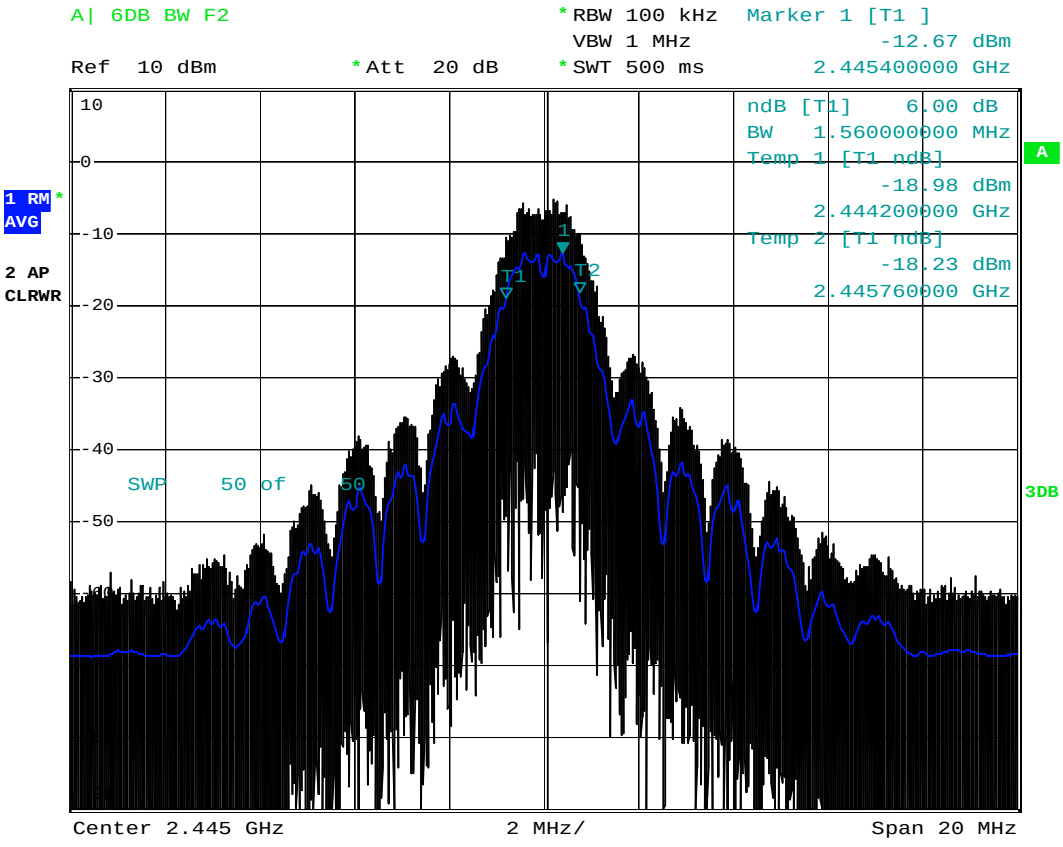
OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.



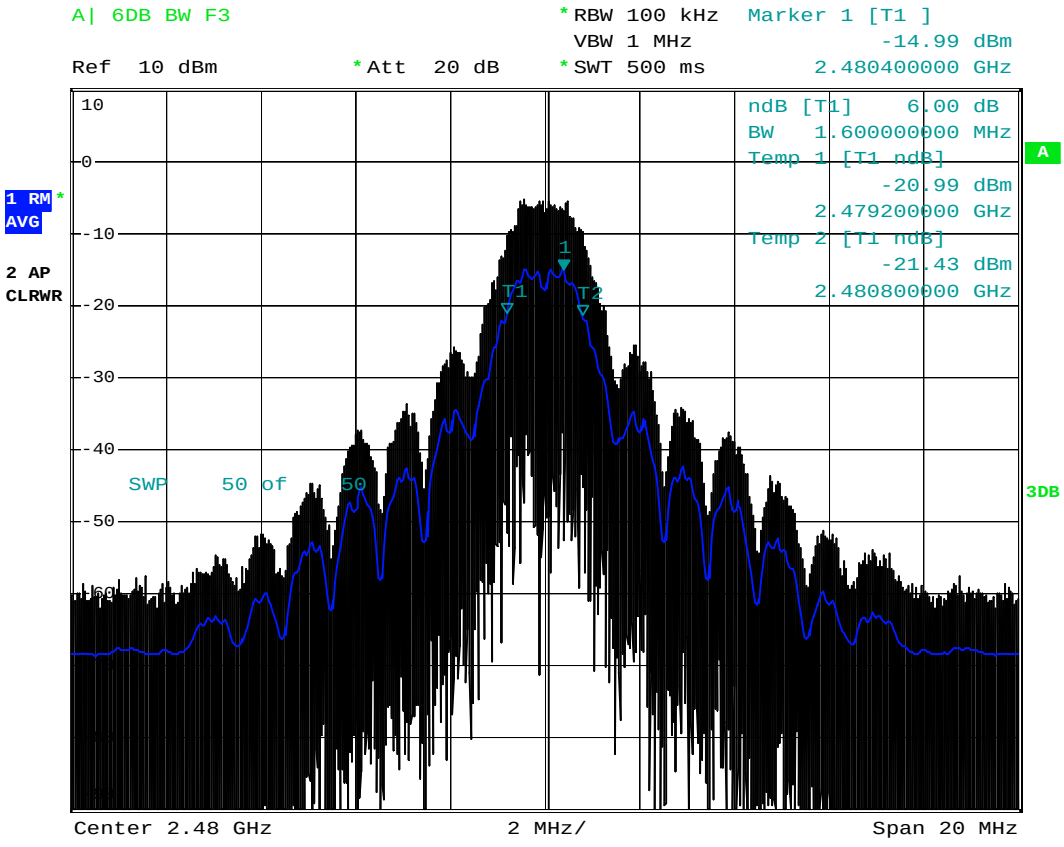
Date: 21.JUL.2009 17:44:32

6dB Bandwidth Plot – Lowest Channel – 2.405GHz



Date: 21.JUL.2009 17:47:09

6dB Bandwidth Plot – Middle Channel – 2.445GHz



Date: 21.JUL.2009 17:48:30

6dB Bandwidth Plot – Highest Channel – 2.480GHz

Peak Power Emissions

DATE: July 21, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart C Section 15.247(b)(3)
IC RSS-210 Appendix A Section (8.4)(4)

TEST VOLTAGE: 120Vac 60Hz, 5Vdc adapter

TESTED BY: Bruce Balston

TEST CONDITIONS: Indoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

TEST SETUP: The EUT Antenna port was connected directly to the EMI Receiver and the emissions were measured. The equipment was operated and tested using 120Vac 60Hz powering the 5Vdc adapter. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels were measured.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 100kHz RBW, Average detector. All data produced is using the EMI Receivers built-in Power Meter.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

EMISSIONS DATA:

Frequency	Power Meter Measurement	Power Meter Measurement
(MHz)	(dBm)	(W)
2405	-3.36	0.00046
2445	-2.24	0.00059
2480	-1.33	0.00073

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Spurious Emissions at Antenna Terminal

DATE:	July 21, 2009
TEST STANDARD:	FCC CFR47, Part 15, Subpart C Section 15.247(d) IC RSS-210 Appendix A Section (8.5)
TEST VOLTAGE:	120Vac 60Hz, 5Vdc adapter
TESTED BY:	Bruce Balston
TEST CONDITIONS:	Indoor, Temperature and Humidity: 25°C, 62%
MINIMUM STANDARD:	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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. 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) (see § 15.205(c)).
TEST SETUP:	The EUT Antenna port was connected directly to the EMI Receiver and the emissions were measured. The equipment was operated and tested using 120Vac 60Hz powering the 5Vdc adapter. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels were measured.
MEASUREMENT METHOD:	Measurements were made using an EMI Receiver with 100kHz RBW, Average detector.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup Section.

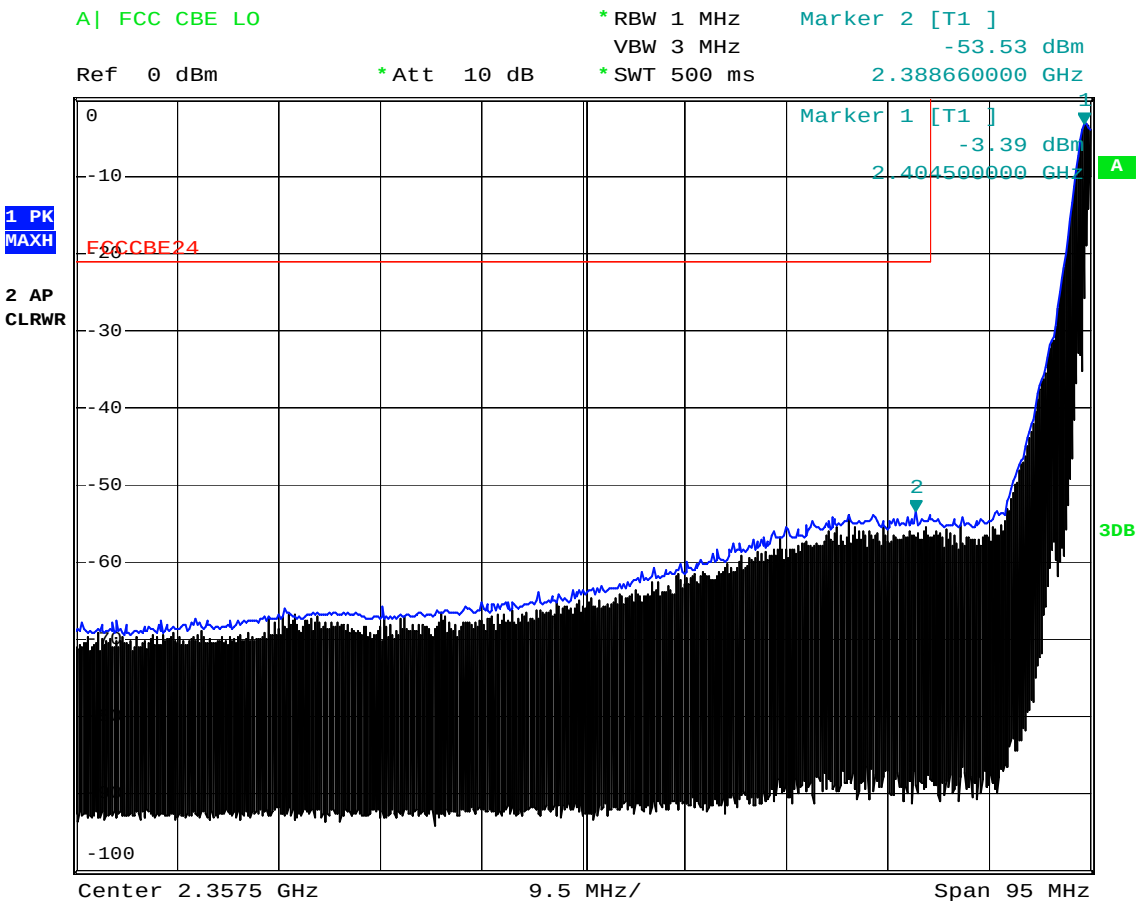
EMISSIONS DATA: Conducted Emissions

Fund Frequency	Frequency.	Corrected Measurement	Delta Limit
(MHz)	(MHz)	(dBm)	(dBc)
2405	2405.500	-3.36	
2405	667.290	-69.20	65.84
2405	1335.250	-78.45	75.09
2405	4809.225	-50.39	47.03
2405	5221.175	-76.46	73.10
2405	7216.513	-60.89	57.53
2445	2444.500	-2.24	
2445	706.3325	-68.34	66.10
2445	1105.500	-77.98	75.74
2445	4889.313	-50.72	48.48
2445	5211.350	-76.37	74.13
2445	7335.712	-58.27	56.03
2480	2480.500	-1.33	
2480	741.373	-66.91	65.58
2480	1919.250	-78.24	76.91
2480	4961.338	-44.02	42.71
2480	5180.038	-76.44	75.11
2480	7440.944	-53.30	52.01

EMISSIONS DATA: Radiated Emissions in Restricted Bands at 3m

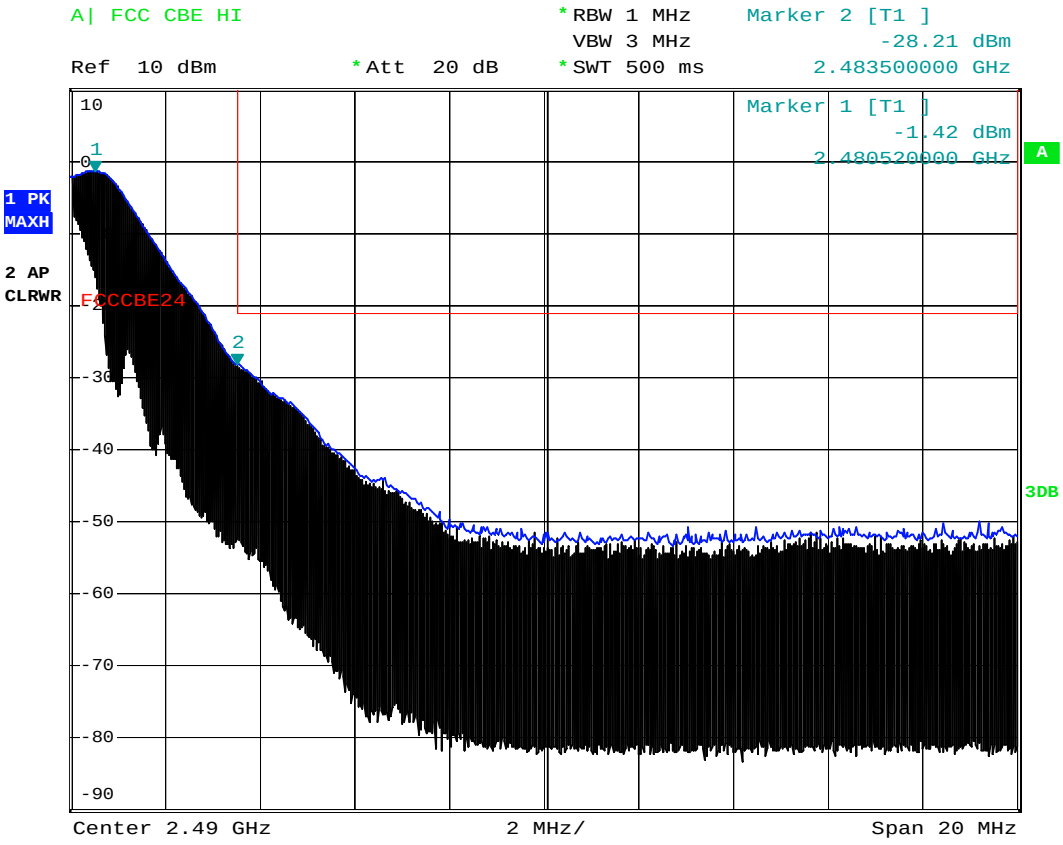
Fund Frequency	Frequency.	Peak Measurement	ERP Corrected Measurement for 3m	Avg Limit	Peak Limit	Delta Peak Limit
(MHz)	(MHz)	(dBm)	(dBuV)	(dBuV)	(dBuV)	(dB)
2405	1335.250	-78.45	21.01	54	74	52.99
2405	4809.225	-50.39	49.07	54	74	24.93
2445	1105.500	-77.98	21.48	54	74	52.52
2445	4889.313	-50.72	48.74	54	74	25.26
2445	7335.712	-58.27	41.19	54	74	32.81
2480	4961.338	-44.02	55.44	54	74	18.56
2480	7440.944	-56.14	43.32	54	74	30.68

BAND EDGE PLOTS



Date: 21.JUL.2009 23:06:37

Band Edge Low Channel



Date: 21.JUL.2009 23:09:15

Band Edge Low Channel

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Power Spectral Density

DATE: July 22, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart C Section 15.247(e)
IC RSS-210 Appendix A Section (8.2)(b)

TEST VOLTAGE: 120Vac 60Hz, 5Vdc adapter

TESTED BY: Bruce Balston

TEST CONDITIONS: Indoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD: For digitally modulated systems, the 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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

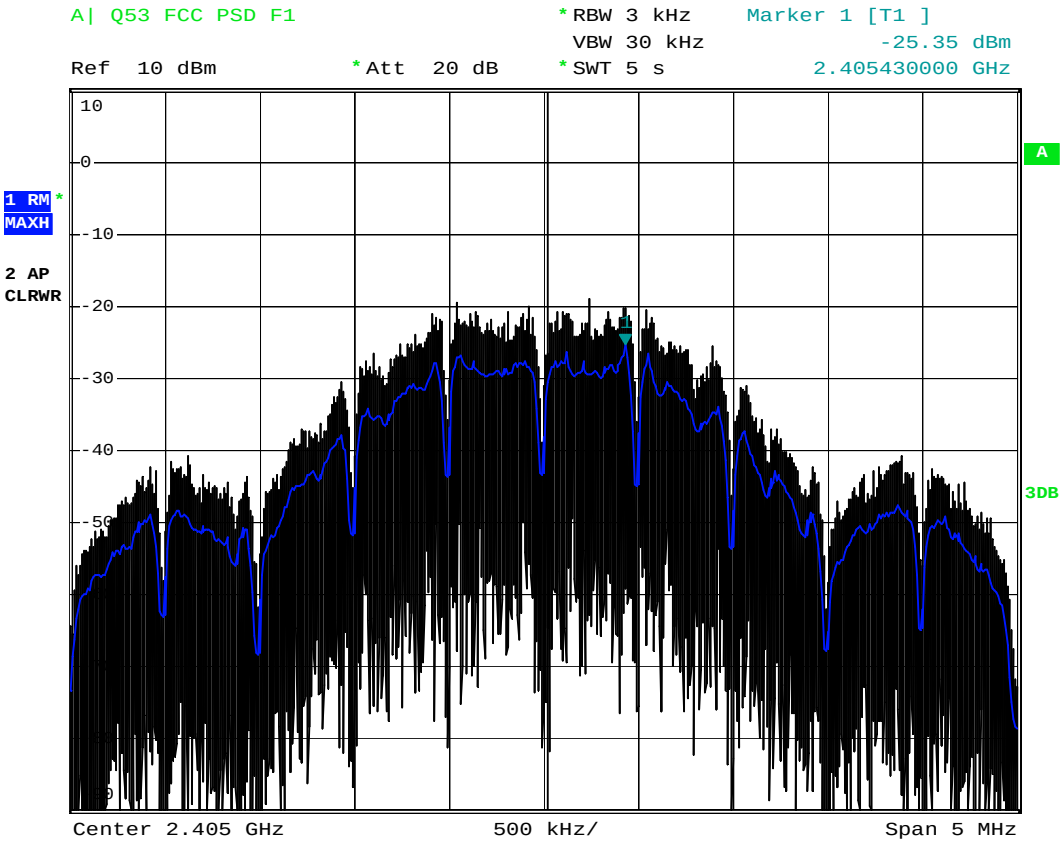
TEST SETUP: The EUT Antenna port was connected directly to the EMI Receiver and the emissions were measured. The equipment was operated and tested using 120Vac 60Hz powering the 5Vdc adapter. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels were measured.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 3kHz RBW, Average detector.

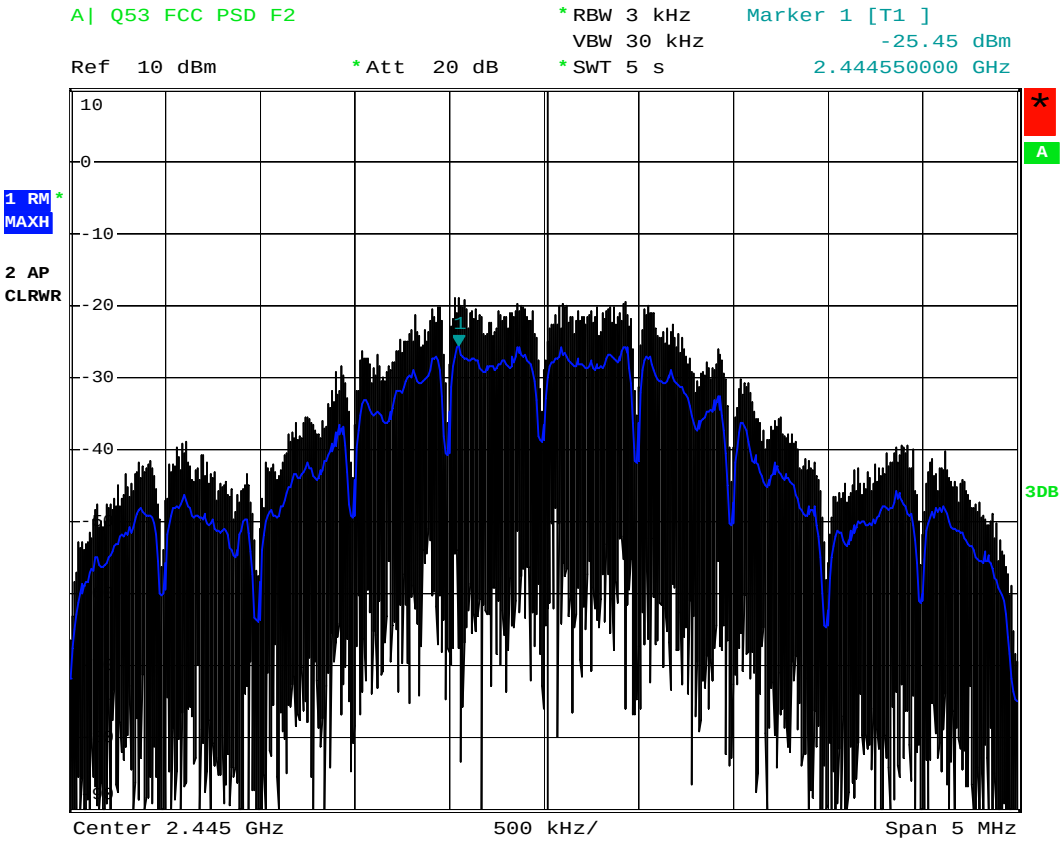
EMISSIONS DATA:

Frequency	PSD Measurement
(MHz)	(dBm)
2405	-25.35
2445	-25.45
2480	-25.46

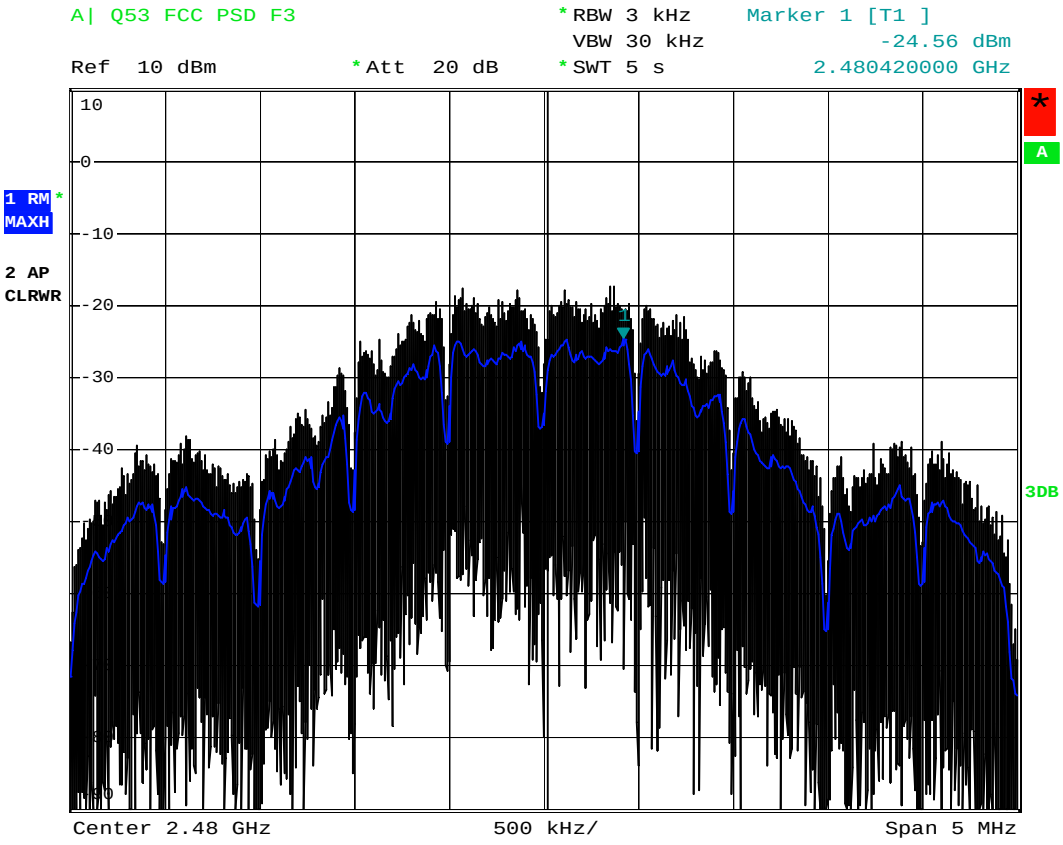
See the following Plots



Date: 21.JUL.2009 18:20:36



Date: 21.JUL.2009 18:21:48



Date: 21.JUL.2009 18:22:58

OBSERVATIONS: The highest level detected is –24.35dBm.
The EUT performed as expected.

PERFORMANCE: Complies.

Frequency Stability

DATE: July 27, 2009

TEST STANDARD: FCC CFR47, Part 15, Subpart C Section 15.215(c)(3)
IC RSS-210 Appendix A Section (2.1)

TEST VOLTAGE: 120Vac 60Hz, 5Vdc adapter

TESTED BY: Bruce Balston

TEST CONDITIONS: Indoor, Temperature and Humidity: 25°C, 62%

MINIMUM STANDARD: …."The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage."…

TEST SETUP: The EUT Antenna port was connected directly to the EMI Receiver and the emissions were measured. The equipment was operated and tested using 120Vac 60Hz powering the 5Vdc adapter. The Transmitter was set for Continuous transmission. The lowest, middle and highest channels were measured for each variation in Temperature and Voltage.

MEASUREMENT METHOD: Measurements were made using an EMI Receiver with 100kHz RBW, Peak detector.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup Section.

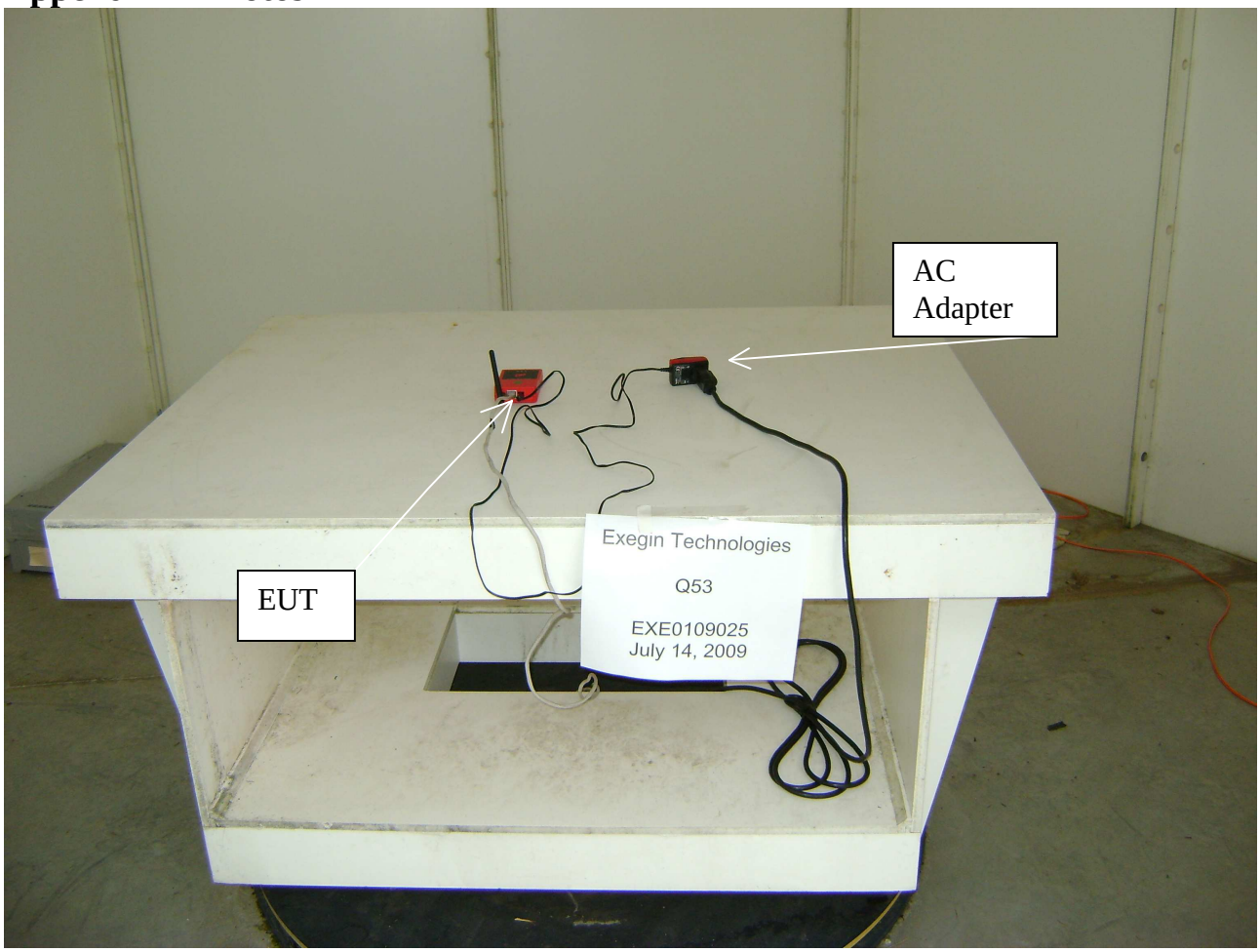
EMISSIONS DATA:

Temperature	Voltage/Frequency	Channel Frequency	Frequency Range 20dB BW Measured
(°C)	(Vac/Hz)	(GHz)	(GHz)
-10	108Vac 60Hz	2405	2.4025 to 24075
+40	108Vac 60Hz	2405	2.4025 to 24075
-10	132Vac 60Hz	2405	2.4025 to 24075
40	132Vac 60Hz	2405	2.4025 to 24075
-10	108Vac 60Hz	2480	2.4775 to 24825
+40	108Vac 60Hz	2480	2.4775 to 24825
-10	132Vac 60Hz	2480	2.4775 to 24825
40	132Vac 60Hz	2480	2.4775 to 24825

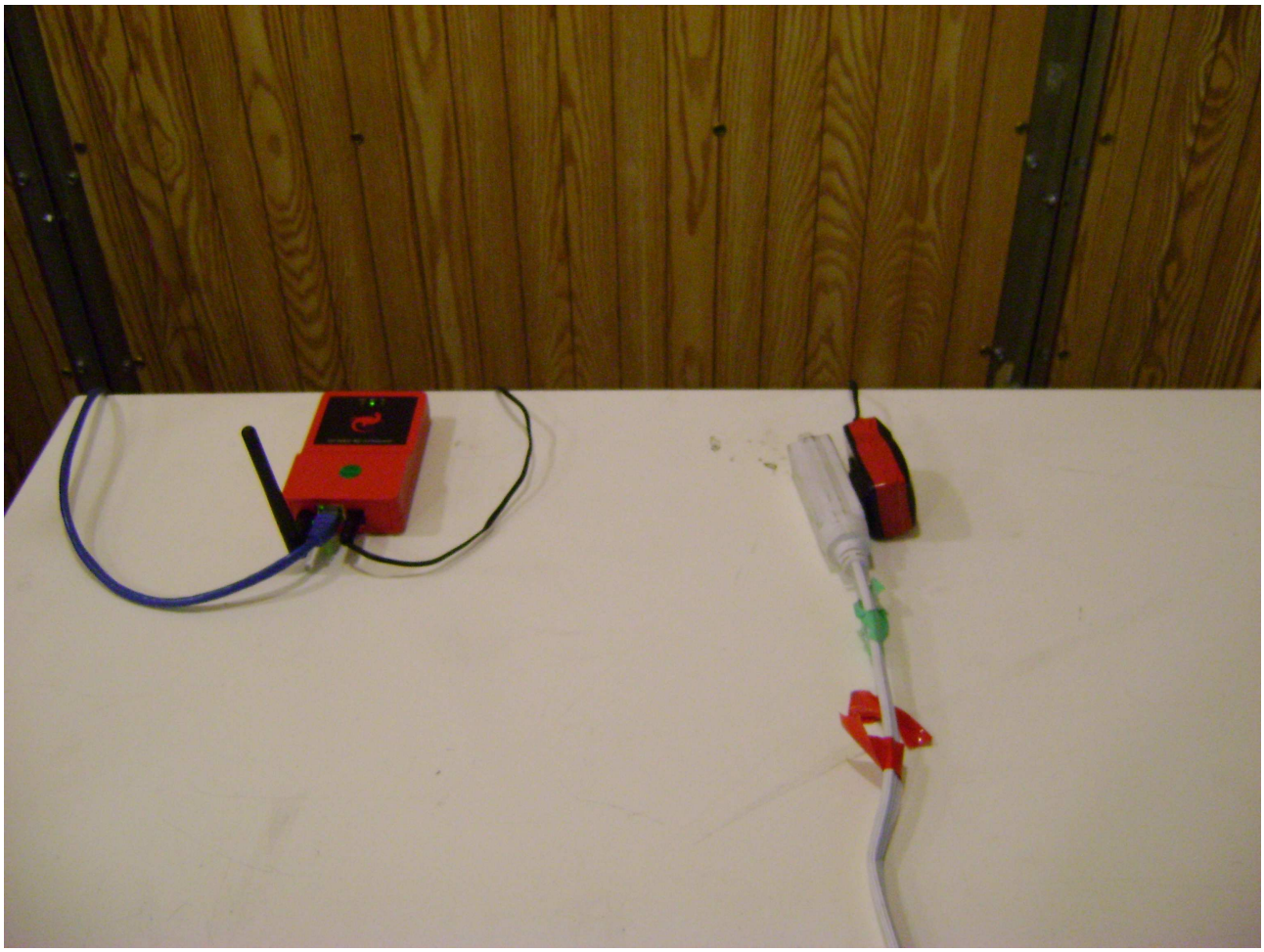
OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Appendix A Photos



Radiated Emissions Test Setup



Conducted Emissions Test Setup

Appendix B Measurement Data and Plots

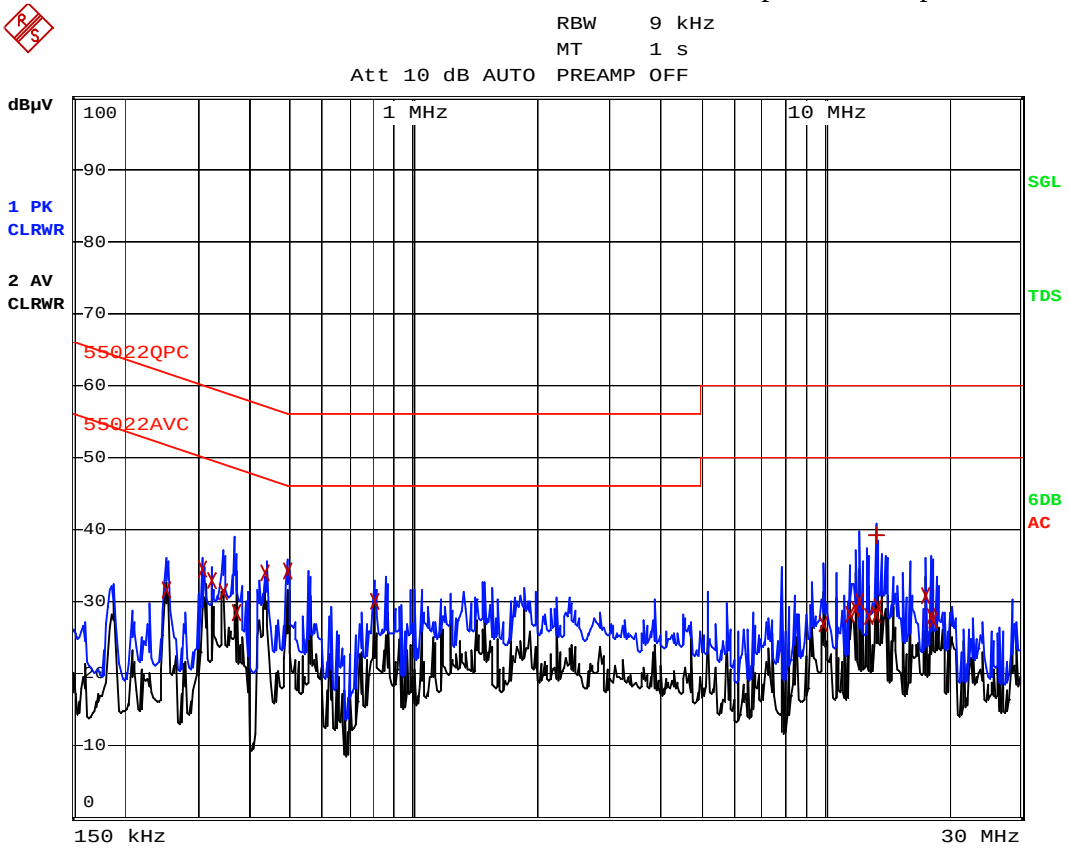
AC Mains Conducted Emissions

Criteria: FCC/IC/CE Class B

Table 1: Line –Transmitter ON, 120Vac 60Hz, Condor Adapter 5Vdc Option

Frequency (MHz)	Corrected Average Measurement (dBuV)	Average Limit Line Delta (dB)
0.494	34.24	-11.85
0.434	33.98	-13.19
0.310	34.46	-15.50
0.806	29.96	-16.03
0.322	32.96	-16.69
0.342	31.34	-17.81

Plot 1: Line – Transmitter ON, 120Vac 60Hz, Condor Adapter 5Vdc Option

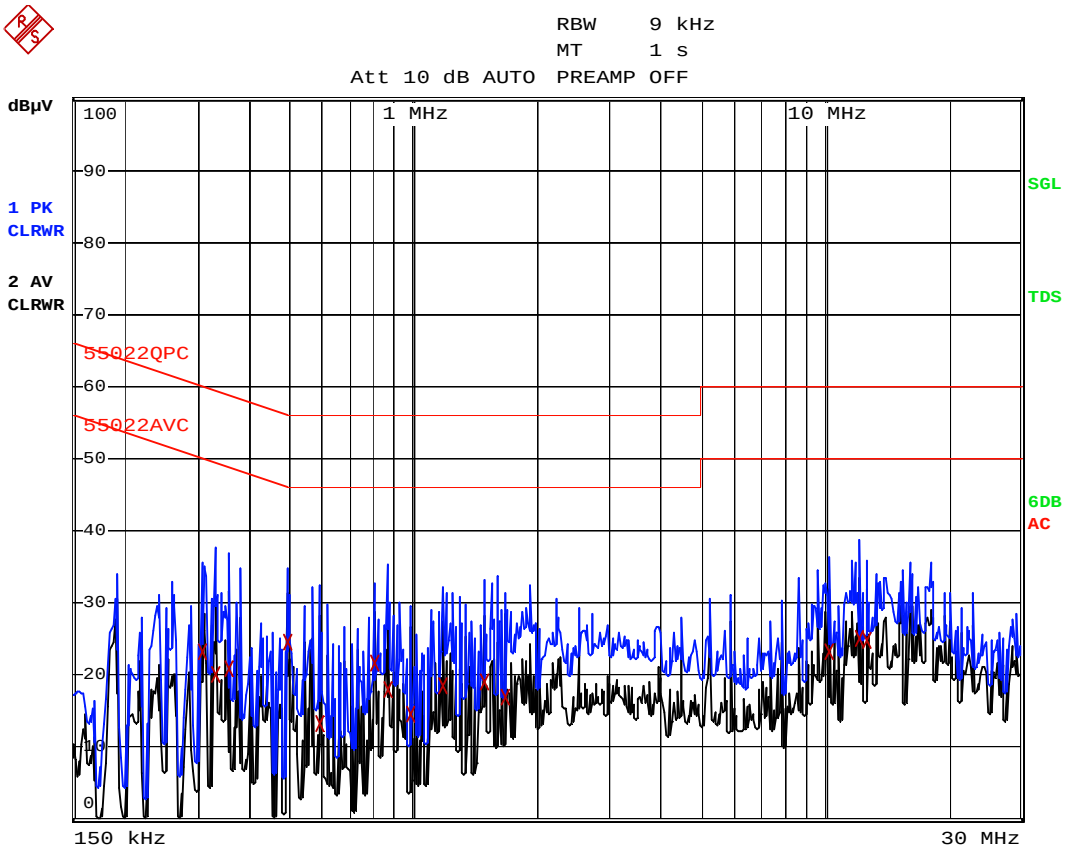


Date: 15.JUL.2009 17:37:50

Table 2: Neutral – Transmitter ON, 120Vac 60Hz, Condor Adapter 5Vdc Option

Frequency (MHz)	Corrected Average Measurement (dBuV)	Average Limit Line Delta (dB)
0.494	24.53	-21.56
0.802	21.78	-24.22
12.198	25.09	-24.90
12.746	24.73	-25.26
10.242	23.35	-26.64
0.306	23.10	-26.97

Plot 2: Neutral – Transmitter ON, 120Vac 60Hz, Condor Adapter 5Vdc Option

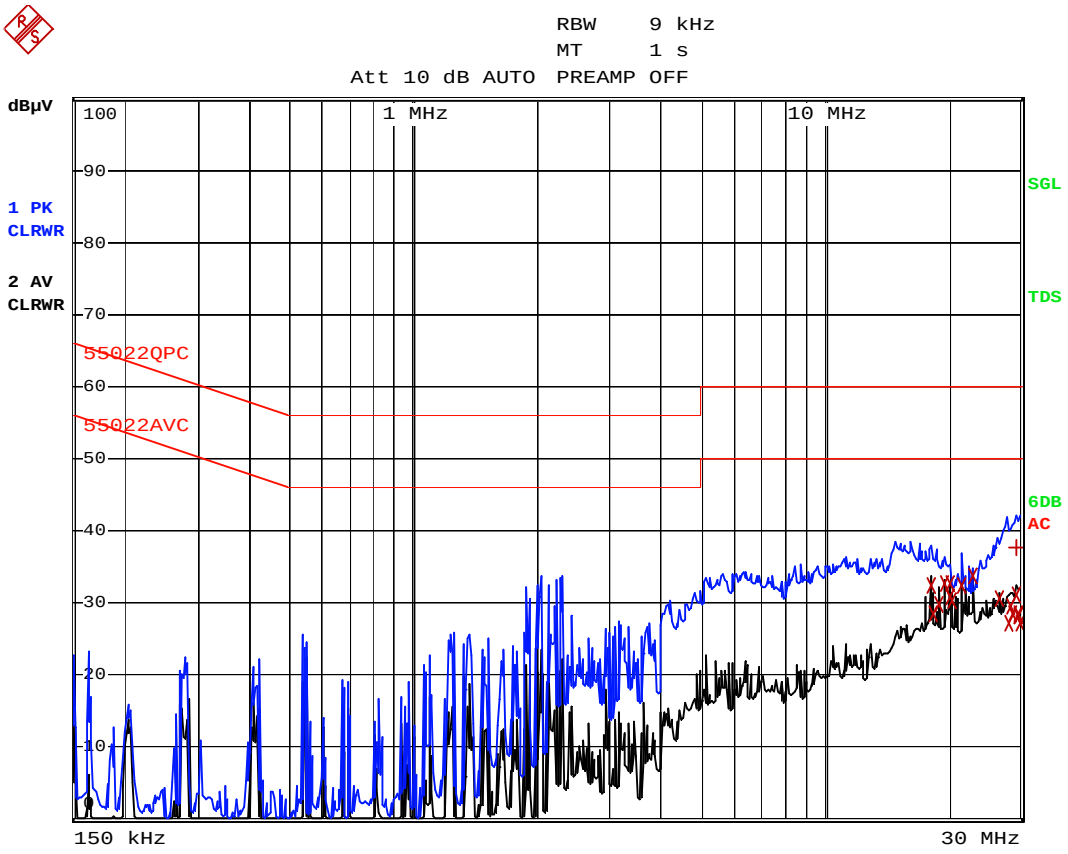


Date: 15.JUL.2009 13:26:32

Table 3: Line – Transmitter ON, 120Vac 60Hz, Cisco POE Option

Frequency (MHz)	Corrected Average Measurement (dBuV)	Average Limit Line Delta (dB)
23.13	33.71	-16.28
19.71	32.69	-17.30
20.262	32.68	-17.31
21.666	32.38	-17.61
18.246	32.36	-17.63
29.238	31.17	-18.82

Plot 3: Line – Transmitter ON, 120Vac 60Hz, Cisco POE Option



Date: 15.JUL.2009 14:24:28

Table 4: Neutral – Transmitter ON, 120Vac 60Hz, Cisco POE Option

Frequency (MHz)	Corrected Average Measurement (dBuV)	Average Limit Line Delta (dB)
23.13	34.18	-15.81
21.666	32.69	-17.30
20.262	32.20	-17.80
19.710	32.08	-17.91
26.490	31.27	-18.72
18.246	31.19	-18.80

Plot 4: Neutral – Transmitter ON, 120Vac 60Hz, Cisco POE Option

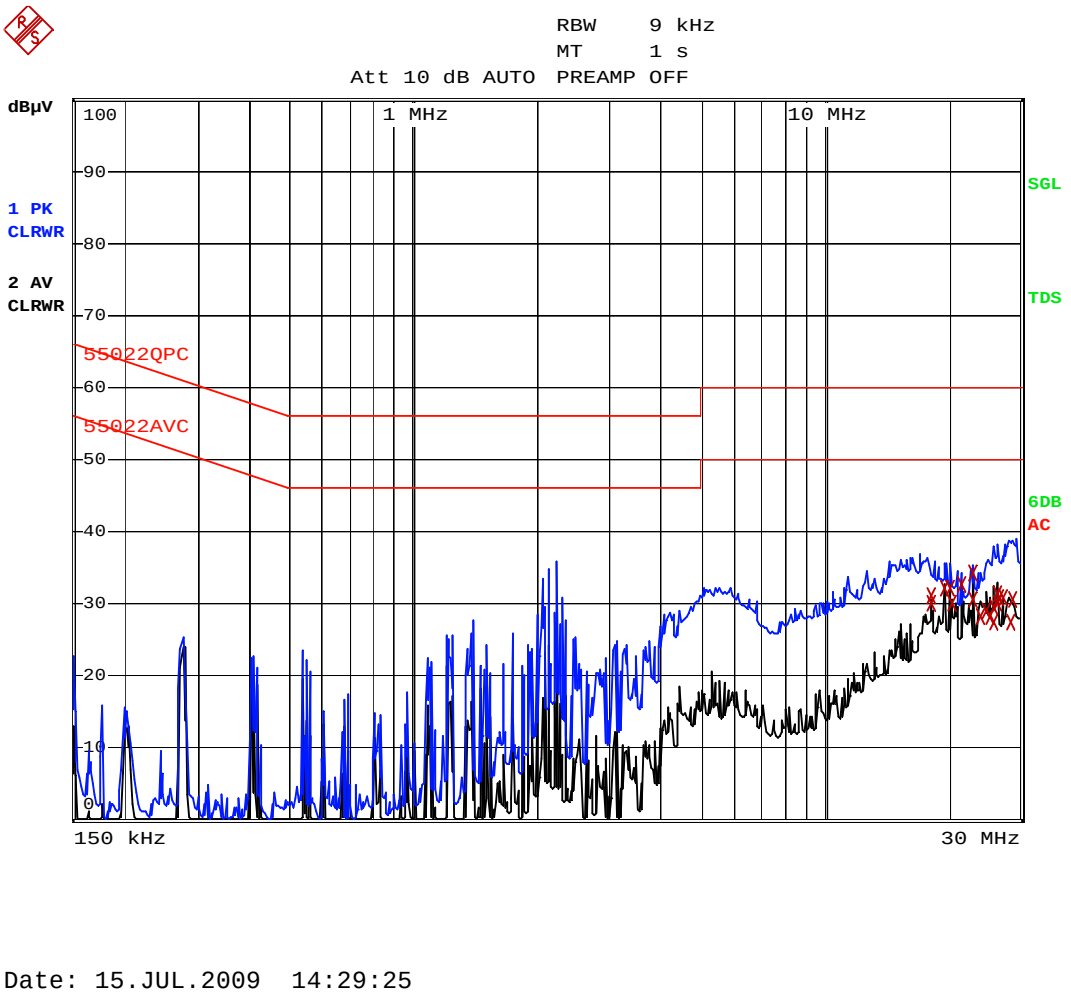
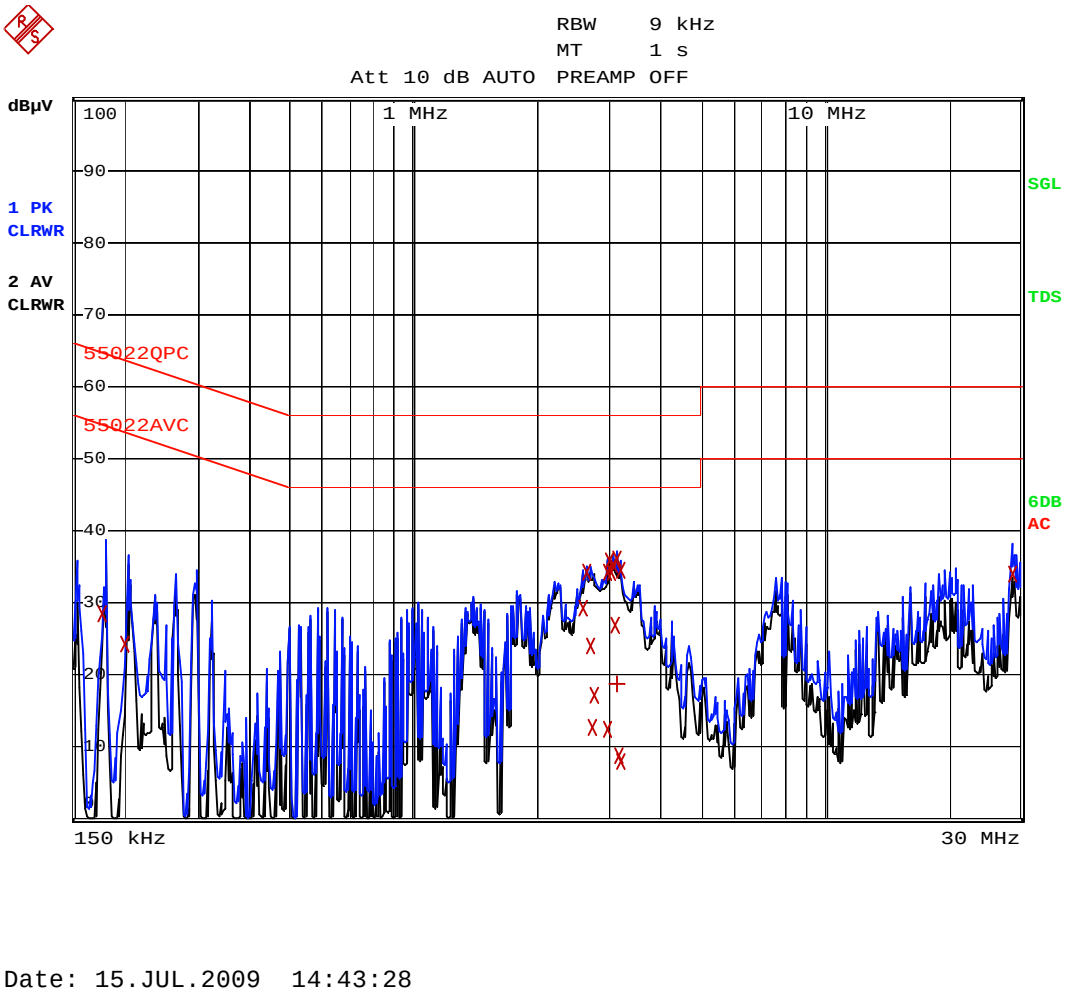


Table 5: Line – Transmitter ON, 120Vac 60Hz, Allied Telesis POE Option

Frequency (MHz)	Corrected Average Measurement (dBuV)	Average Limit Line Delta (dB)
3.134	35.96	-10.03
3.018	35.83	-10.16
3.074	35.20	-10.79
3.194	34.50	-11.49
3.046	34.22	-11.77
2.638	34.13	-11.86

Plot 5: Line – Transmitter ON, 120Vac 60Hz, Allied Telesis POE Option



Date: 15.JUL.2009 14:43:28

Table 6: Neutral – Transmitter ON, 120Vac 60Hz, Allied Telesis POE Option

Frequency (MHz)	Corrected Average Measurement (dBuV)	Average Limit Line Delta (dB)
2.794	35.65	-10.35
2.854	35.46	-10.53
3.298	35.36	-10.63
3.210	35.13	-10.86
2.822	35.06	-10.93
2.762	34.99	-11.00

Plot 6: Neutral – Transmitter ON, 120Vac 60Hz, Allied Telesis POE Option