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REPORT ON ELECTROMAGNETIC COMPATIBILITY TESTS

Performed at:
TWENTY PENCE TEST SITE

**Twenty Pence Road,
Cottenham,
Cambridge
U.K.
CB24 8PS**

on

Quatro Electronics Ltd

PIR

dated

17th September 2009

Document History

Issue	Date	Affected page(s)	Description of modifications	Revised by	Approved by
1	17/09/09		Initial release		

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Equipment Under Test (EUT):

PIR

Test Commissioned by:

Quatro Electronics Ltd
Quatro House
School Lane
Lytham
FY8 5NL

Representative:

Dave Smith

Test Started:

4th September 2009

Test Completed:

4th September 2009

Test Engineer:

Dave Smith

Date of Report:

17th September 2009

Written by: Dave Smith

Checked by: Derek Barlow

Signature:



Signature:



Date: 17th September 2009

Date: 17th September 2009

dB Technology can only report on the specific unit(s) tested at its site. The responsibility for extrapolating this data to a product line lies solely with the manufacturer.

Test Standards Applied

CFR 47 : 2008

Code of Federal Regulations: Pt 15 Subpart C - Radio Frequency Devices - Intentional Radiators

In particular, the rules of CFR 47 part 15.231 were applied.

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Emissions Test Results Summary

CFR 47 : 2008

Test	Port	Method	Limit	PASS/FAIL	PASS	Notes
Conducted Emissions	ac power	ANSI C63.4:2003	15.207	N/A		#1
Periodic Operation			15.231(a)	See Notes		#2
Radiated Emissions		ANSI C63.4:2003	15.231(b)	PASS		
Bandwidth		ANSI C63.4:2003	15.231(c)	PASS		

specs_fccv090511

#1 Test not required because EUT is battery operated and does not have any connection to the mains.
 #2 See information contained in manufacturer's operational description..

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1 EUT Details

1.1 General

The EUT was a PIR detector with a 434.475MHz intentional transmitter. The transmitter is intended for periodic operation and was therefore tested to FCC part 15.231.

Details of the EUT and associated peripherals used during the tests are listed below. Figure 1 shows the interconnections between the EUT and peripherals.

Item	Manufacturer	Model	Description	Serial No:	Notes
1	Quatro Electronics	PIR	PIR detector	1003062	

1.2 Modifications to EUT and Peripherals

Details of any modifications that were required to achieve compliance are listed below. The modification numbers are referred to in the results sections as appropriate.

Mod No:	Details	Implemented for
0	Product as of start of testing. This unit had a 23dB attenuator on the pcb between the transmitter module and the antenna.	

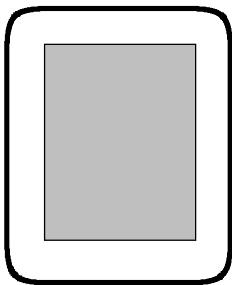
1.3 EUT Operating Modes

The EUT was tested in the following operating mode or modes. Generally, operating modes are chosen that will exercise the functions of the EUT as fully as possible and in a manner likely to produce maximum emission levels or susceptibility. Individual test result sheets reference the operating mode of the EUT.

Operating Mode	Details
1	Continually transmitting data with 2 second on period and 2 second off period. This is not the normally duty cycle of the transmitter - it was a mode used to aid testing. In normal operation the transmitter is continuously on for a duration of more than 100msec and so no additional reduction in levels could be made by calculating an average based on duty cycle.

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Figure 1 General Arrangement of EUT and Peripherals



Eut had an integral antenna and no external cables

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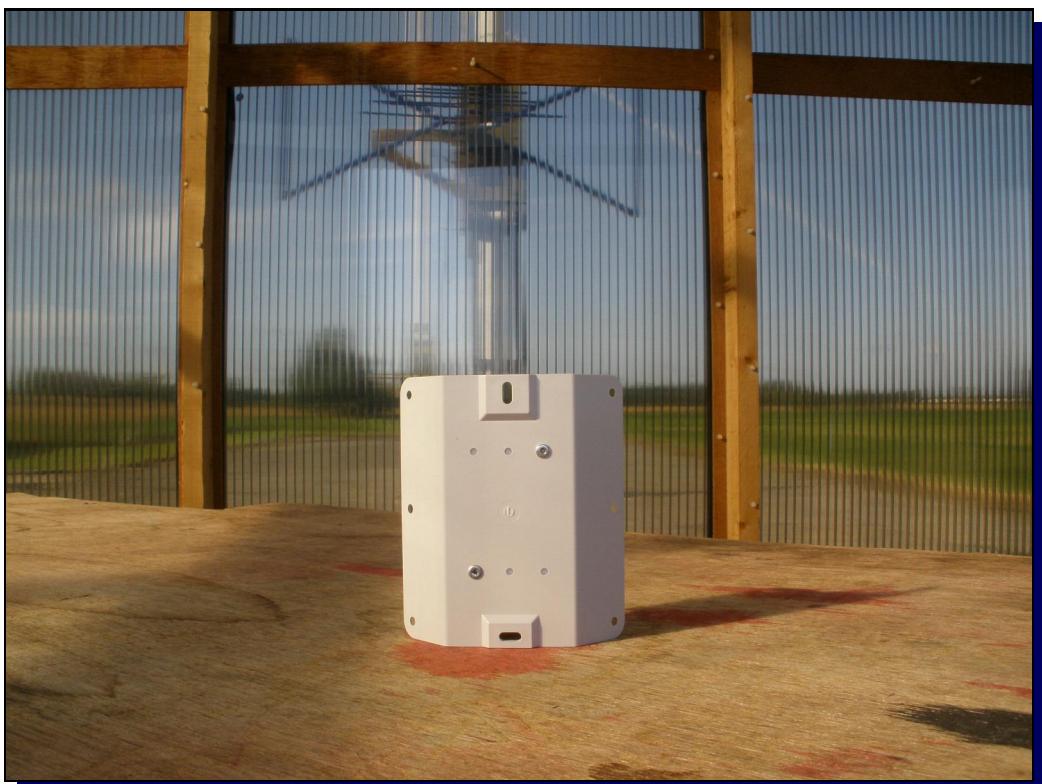
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Photograph 1 EUT - Front



Photograph 2 EUT - Back

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2 Test Equipment

The test equipment used during the tests was one or more of the items listed below. Individual test result sheets indicate which items were used.

Ref No:	Details	Serial Number
A12	Chase Bilog CBL6111A	1012
A19	EMCO 3115 DR Guide (1-18GHz)	2431
A5	Chase Bilog CBL6111A	1760
PRE7	LUCIX 0.1GHz to 20GHz	24485
R8	Agilent E7405A Spectrum Analyser	MY44212494
R9	Agilent E7405A Spectrum Analyser	MY45110758

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3 Test Methods

3.1 Radiated Emissions

This section describes the general method of performing this test. The specific method used and any deviations from this general method are listed in the appropriate results section.

Initial scans are performed in a semi-anechoic screened room at a distance of 3m. Scans are performed over the frequency range specified in the test standard with the antenna both horizontally and vertically polarised. During these scans the EUT and peripherals are rotated through 360°. Bench top EUTs are placed on a non-conducting bench at a height of 0.8m above the ground plane. Floor standing EUTs are placed 0.1m above the ground plane. The results of the scans are shown in the plots included at the end of the report.

Significant emissions identified by the scans are measured on an open area test site at the appropriate test distance using a CISPR16 quasi-peak receiver. Maximised readings are obtained by rotating the EUT through 360° and adjusting the height of the antenna from 1m to 4m. Measurements are made with the antenna both horizontally and vertically polarised and the results tabulated.

4 Test Results

The following sections contain tabulated test results. Plots of various scans are included at the back of this section.

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4.1 Intermittent Operation Information - 15.231(a)

The operation of the transmitter is controlled by a microprocessor. information how the microprocessor ensures that the rules for periodic operation are met are contained in the separate operational description supplied by the manufacturer.

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4.2 Radiated Emissions Results - Below 1GHz - 15.231(b)

Factor Set 1:	A12_FS_07A	-	-	CSET005_07A	25 m cable
Factor Set 2:	-	-	-	-	-
Factor Set 3:	-	-	-	-	-
Test Equipment:	R8 A12 CSET005				

Radiated Emissions

Company: Quatro Electronics Ltd Product: PIR Date: 04/09/2009 Test Eng: Dave Smith Ports: Test: ANSI C63.4:2003 using limits of 15.231(b)															
Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor 1/m	Corr'n Factor dB	Total Level dBuV/m	Limit FCC dBuV/m	Margin FCC dB	Notes		
1	0	3	1	1	434.475	V	57.2	20.3		77.5	80.8	3.4			
1	0	3	1	1	434.475	H	55.4	20.3		75.7	80.8	5.2			
1	0	3	1	1	868.950	V	5.4	29.0		34.4	60.8	26.5			
1	0	3	1	1	868.950	H	4.5	29.0		33.5	60.8	27.4			
Results Minimum Margin PASS/FAIL							3.4	dB							
Notes	Comments and Observations														
	Results of scans shown in plots 1 and 2. All measurements are peak measurements with 120kHz detector. Limit shown is average limit. Since all peak measurements are below the average limit there is no requirement to perform average measurements.														

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4.3 Radiated Emissions Results - Above 1GHz - 15.231(b)

Factor Set 1:	A19_3m_07A	7_CBL051_CBL053_	-	-
Factor Set 2:	-	-	-	-
Factor Set 3:	-	-	-	-
Test Equipment:	R9	A19	PRE7	

Radiated Emissions

Company: Quatro Electronics Ltd Date: 04/09/2009 Ports: Test: ANSI C63.4:2003 using limits of							Product: PIR Test Eng: Dave Smith Ports: Test: using limits of						
Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor 1/m	Corr'n Factor dB	Total Level dBuV/m	Limit FCC dBuV/m	Margin FCC dB	Notes
	1	0	3	1	2606.850	V	58.1	-11.1		47.0	60.8	13.8	
	1	0	3	1	2606.850	H	56.7	-11.1		45.6	60.8	15.2	
	1	0	3	1	3041.325	V	53.0	-10.0		43.0	60.8	17.8	
	1	0	3	1	3041.325	H	59.2	-10.0		49.1	60.8	11.7	
	1	0	3	1	3475.800	V	62.2	-9.2		53.0	60.8	7.8	
	1	0	3	1	3475.800	H	59.4	-9.2		50.2	60.8	10.6	
	1	0	3	1	3910.275	V	59.9	-7.8		52.1	60.8	8.7	
	1	0	3	1	3910.275	H	58.0	-7.8		50.1	60.8	10.7	
	1	0	3	1	4344.750	V	58.5	-7.5		51.0	60.8	9.8	
	1	0	3	1	4344.750	H	59.6	-7.5		52.1	60.8	8.7	
Results Minimum Margin PASS/FAIL							7.8						
Notes	Comments and Observations												
	Results of scans shown in plots 3 and 4. All measurements are peak measurements with 1MHz RBW and 1MHz VBW. Limit shown is average limit. Since all peak measurements are below the average limit there is no requirement to perform average measurements.												

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4.4 Radiated Emissions Results - At Band Edges - 15.231(b)

Factor Set 1:	A5_FS_07B	-	-	CSET002_07A	1 m cable
Factor Set 2:	-	-	-	-	-
Factor Set 3:	-	-	-	-	-
Test Equipment: R8 A5 CSET002					

Radiated Emissions

Company:	Quatro Electronics Ltd	Product:	PIR		
Date:	04/09/2009	Test Eng:	Dave Smith		
Ports:					
Test:	ANSI C63.4:2003	using limits of			
Ports:					
Test:	using limits of				
Notes	Comments and Observations				
	<p>The band edges were assumed to be at the maximum permitted occupied band limits i.e. +/- 0.125% above and below the operating frequency.</p> <p>Plot 5 shows emissions measurements over this band. This plot shows transient emissions produced when the transmitter turns on. These emissions were captured because a peak detector was employed along with a "maximum hold" on the spectrum analyser. The plot is a maximum hold of a large number of sweeps.</p> <p>To establish that these transients were not an issue, quasi peak measurements were made at the nominal band edge points.</p> <p>The results are as follows:</p> <p>Carrier level at 434.475MHz = 77.4 dBuV/m</p> <p>Bandwidth may be up to 0.0025 * carrier frequency: = 1.09 MHz</p> <p>At the band edges calculated on that basis:</p> $\begin{array}{llll} 433.932 \text{ MHz} & = & 29.3 \text{ dBuV/m} & = -48.1 \text{ dBc} \\ 435.018 \text{ MHz} & = & 31.2 \text{ dBuV/m} & = -46.2 \text{ dBc} \end{array}$ <p>The emissions levels at the nominal band edge are more than 20dB below the carrier when using a quasi peak detector and are therefore compliant.</p> <p>PASS</p>				

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4.5 Bandwidth - 15.231(c)

Factor Set 1:	A5_FS_07B	-	-	CSET002_07A	1 m cable
Factor Set 2:	-	-	-	-	-
Factor Set 3:	-	-	-	-	-
Test Equipment: R8 A5 CSET002					

Radiated Emissions

Company:	Quattro Electronics Ltd	Product:	PIR
Date:	04/09/2009	Test Eng:	Dave Smith
Ports:			
Test:	ANSI C63.4:2003 using limits of 15.231(c)		
Ports:			
Test:	using limits of		
Notes	Comments and Observations		
	<p>The bandwidth must not exceed 0.25% of operating frequency.</p> <p>In this case, as the operating frequency is 434.475MHz, the maximum allowable bandwidth is 1.09MHz</p> <p>Plot 6 shows emissions measurements over this band.</p> <p>The bandwidth is defined at points 20dB down from the carrier.</p> <p>From plot 6 it can be determined that</p> <p>-20dBc point to left of carrier = 434.453 MHz</p> <p>-20dBc point to right of carrier = 434.496 MHz</p> <p>Bandwidth = 43kHz</p> <p>This is significantly below the maximum permitted of 1.09MHz.</p> <p>PASS</p>		

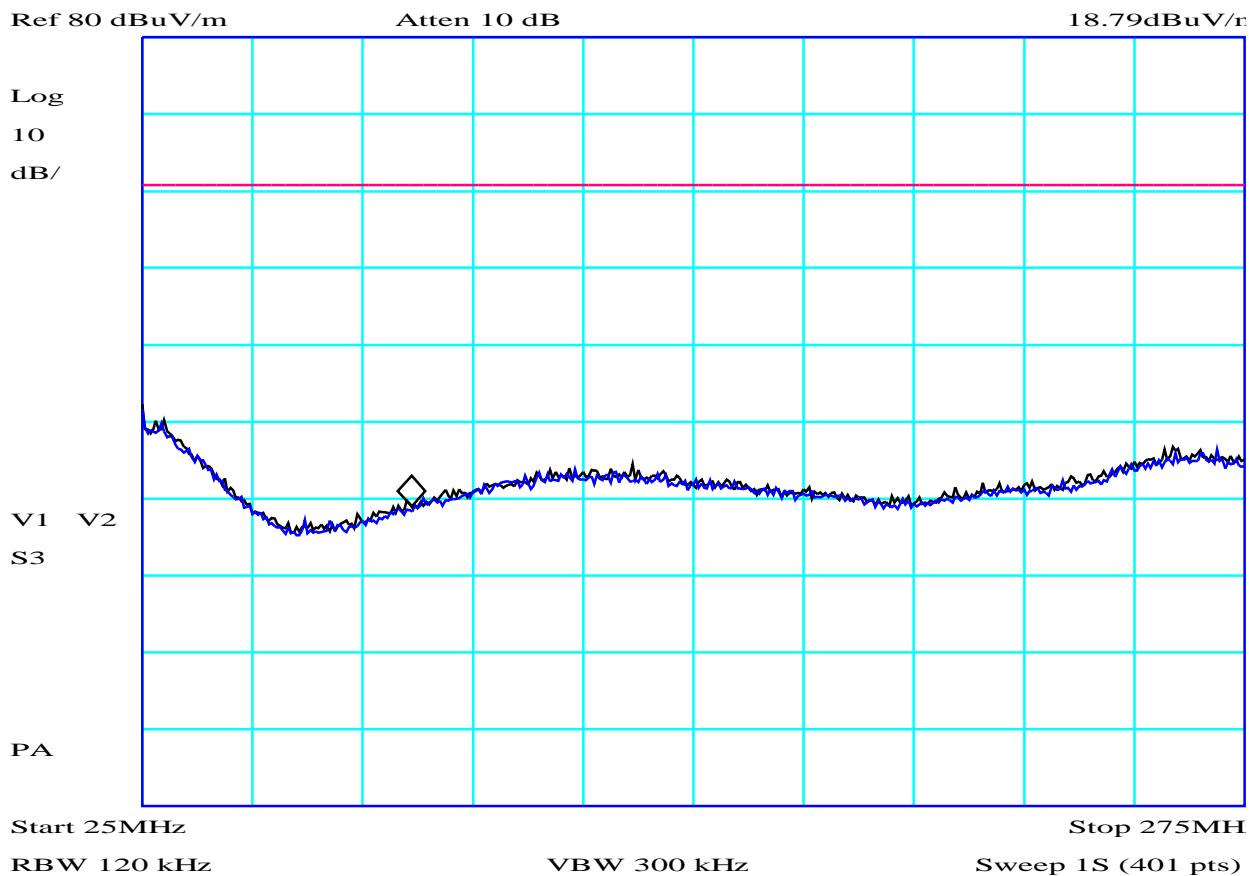
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Test No: T3142	

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Marker 1: 86.25MHz



CF1:A5_FS_090306 CF2:CBL002_CBL003_090306

PLOT 1 Radiated Emissions - 25MHz to 275MHz

Company:	Quattro	Product:	PIR
Date:	04/09/09	Test Eng:	Dave Smith
Method:	C63.4	Method:	
Limit1:(VIO)	Harmonics - 15.231(b)	Limit2:	
Limit3:		Limit4:	
1003062			
Black: vertical Blue: Horizontal			
Facility:	Anech_1	Height	1m
Distance	3m	Polarisation	V+H
Angle	0-360	File:	H98046A5
Mode:	1	Modification State:	0

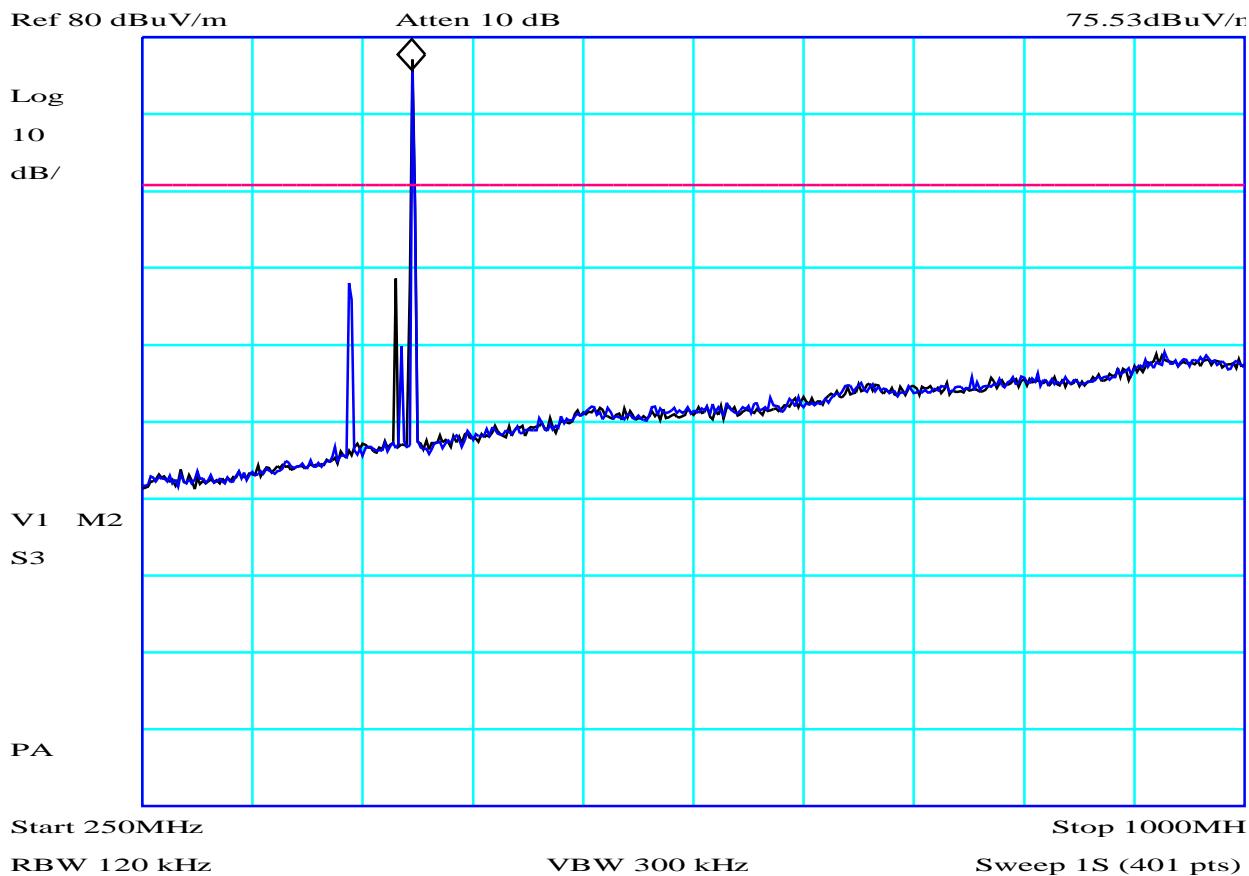
	Report No: R2671 Issue No: 1
Test No: T3142	

FCC ID: XL8PIR1501

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Marker 1: 433.8MHz



CF1:A5_FS_090306 CF2:CBL002_CBL003_090306

PLOT 2 Radiated Emissions - 250MHz to 1GHz

Company:	Quatro	Product:	PIR
Date:	04/09/09	Test Eng:	Dave Smith
Method:	C63.4	Method:	
Limit1:(VIO)	Harmonics - 15.231(b)	Limit2:	
Limit3:		Limit4:	

1003062

Black: vertical
Blue: Horizontal

Emissions below the carrier were transients with low quasi peak level.

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H980469F		

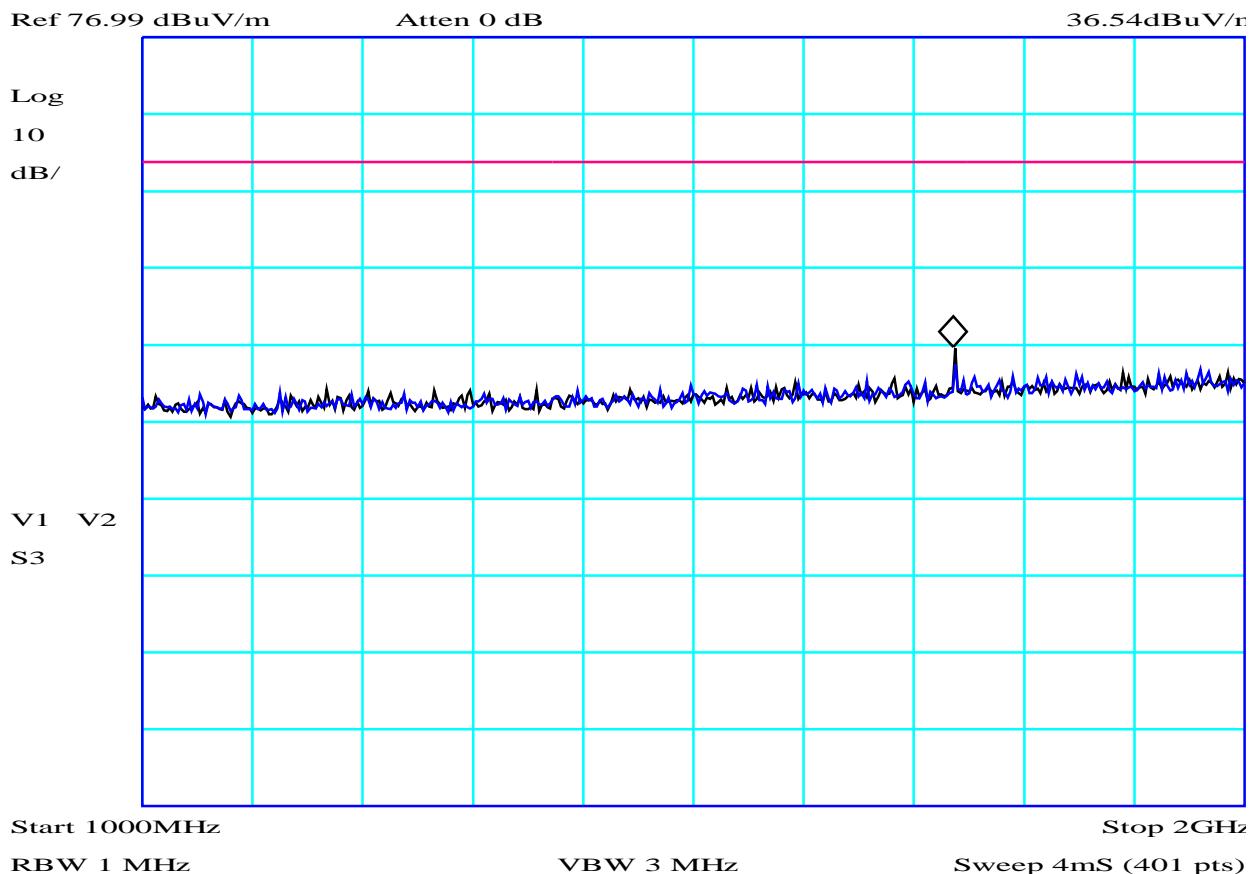
	Report No: R2671 Issue No: 1
Test No: T3142	

FCC ID: XL8PIR1501

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Marker 1: 1.738GHz



CF1:A19_3m_090306 CF2:CBL002_CBL003_090306 CF3:PRE7_090306

PLOT 3 Radiated Emissions - 1GHz to 2GHz

Company:	Quattro	Product:	PIR
Date:	04/09/09	Test Eng:	Dave Smith
Method:	C63.4	Method:	
Limit1:(VIO)	Harmonics - 15.231(b)	Limit2:	
Limit3:		Limit4:	
1003062			
Black: vertical Blue: Horizontal			
Facility:	Anech_1	Height	1m
Distance	3m	Polarisation	V+H
Angle	0-360	File:	H980470C
Mode:	1	Modification State:	0

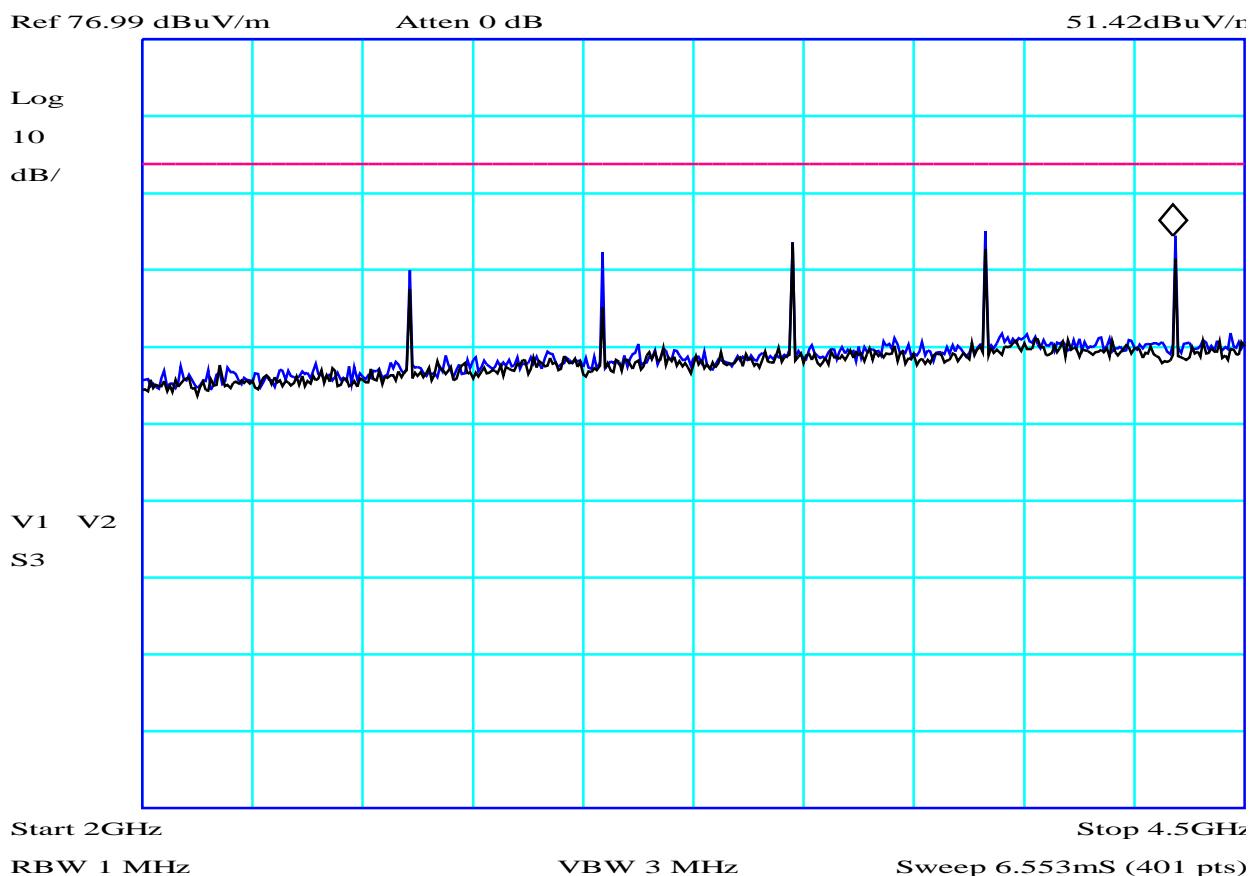
	Report No: R2671 Issue No: 1
Test No: T3142	

FCC ID: XL8PIR1501

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Marker 1: 4.344GHz



CF1:A19_3m_090306 CF2:PRE7_CBL051_CBL053_090306

PLOT 4 Radiated Emissions - 2GHz to 4.5GHz

Company:	Quattro	Product:	PIR
Date:	04/09/09	Test Eng:	Dave Smith
Method:	C63.4	Method:	
Limit1:(VIO)	Harmonics - 15.231(b)	Limit2:	
Limit3:		Limit4:	
1003062			
Black: vertical Blue: Horizontal			
Facility:	Anech_1	Height	1m
Distance	3m	Polarisation	V+H
Angle	0-360	File:	H9804738
Mode:	1	Modification State:	0

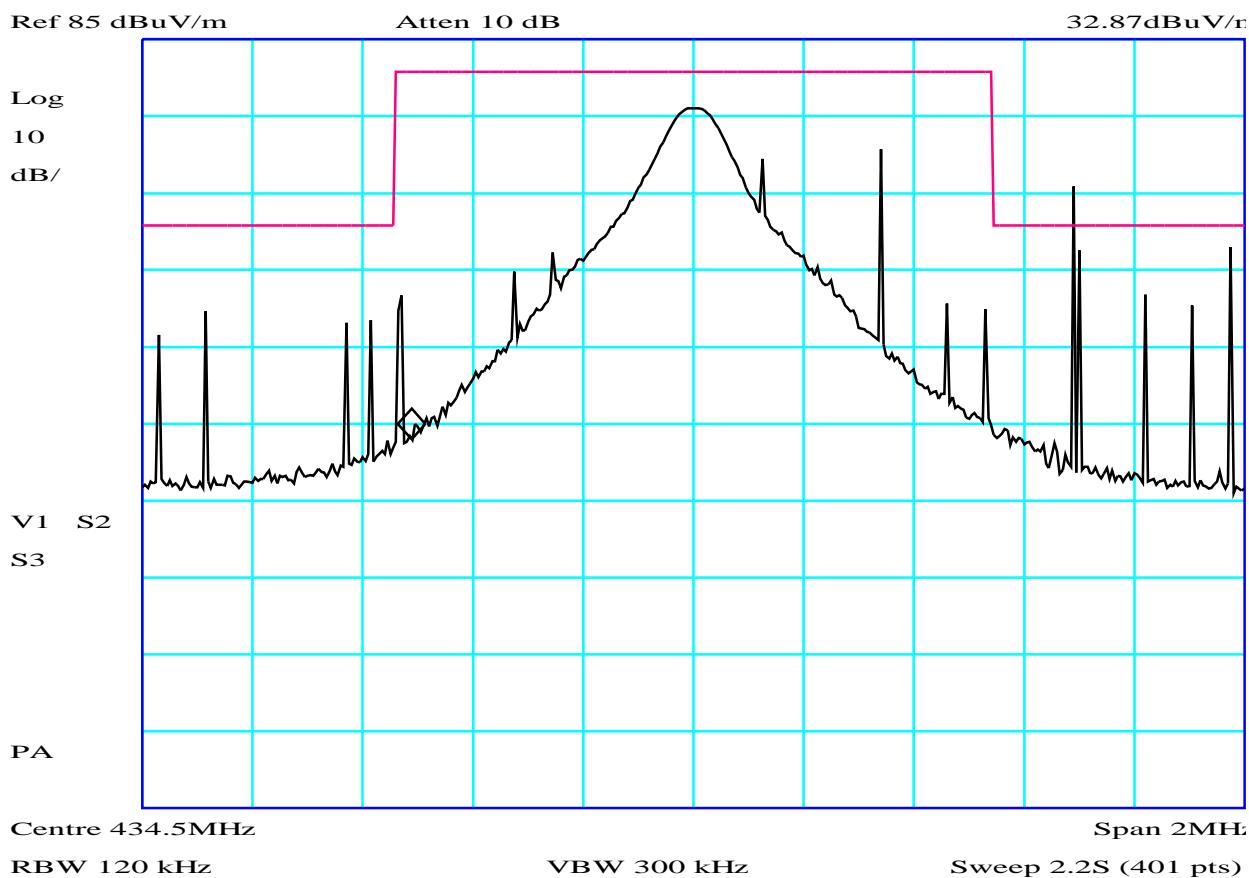
	Report No: R2671 Issue No: 1
Test No: T3142	

FCC ID: XL8PIR1501

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Marker 1: 434MHz



PLOT 5 Radiated Emissions at Band Edges

Company:	Quatro	Product:	PIR
Date:	04/09/09	Test Eng:	Dave Smith
Method:	C63.4	Method:	
Limit1:(VIO)	Harmonics - 15.231(b)	Limit2:	
Limit3:		Limit4:	

1003062
Black: vertical
Blue: Horizontal

The band edges were assumed to be the maximum occupied band limits i.e. width = 0.25% of operating frequency. The limit shown is the carrier limit within the allowed occupied band (carrier +/- 0.125%) and the spurious limit outside of this band.

"Spikes" were transients when transmitter turns on. The quasi peaks levels of these transients were very low - see tabulated results for "Radiated Emissions at Band Edges".

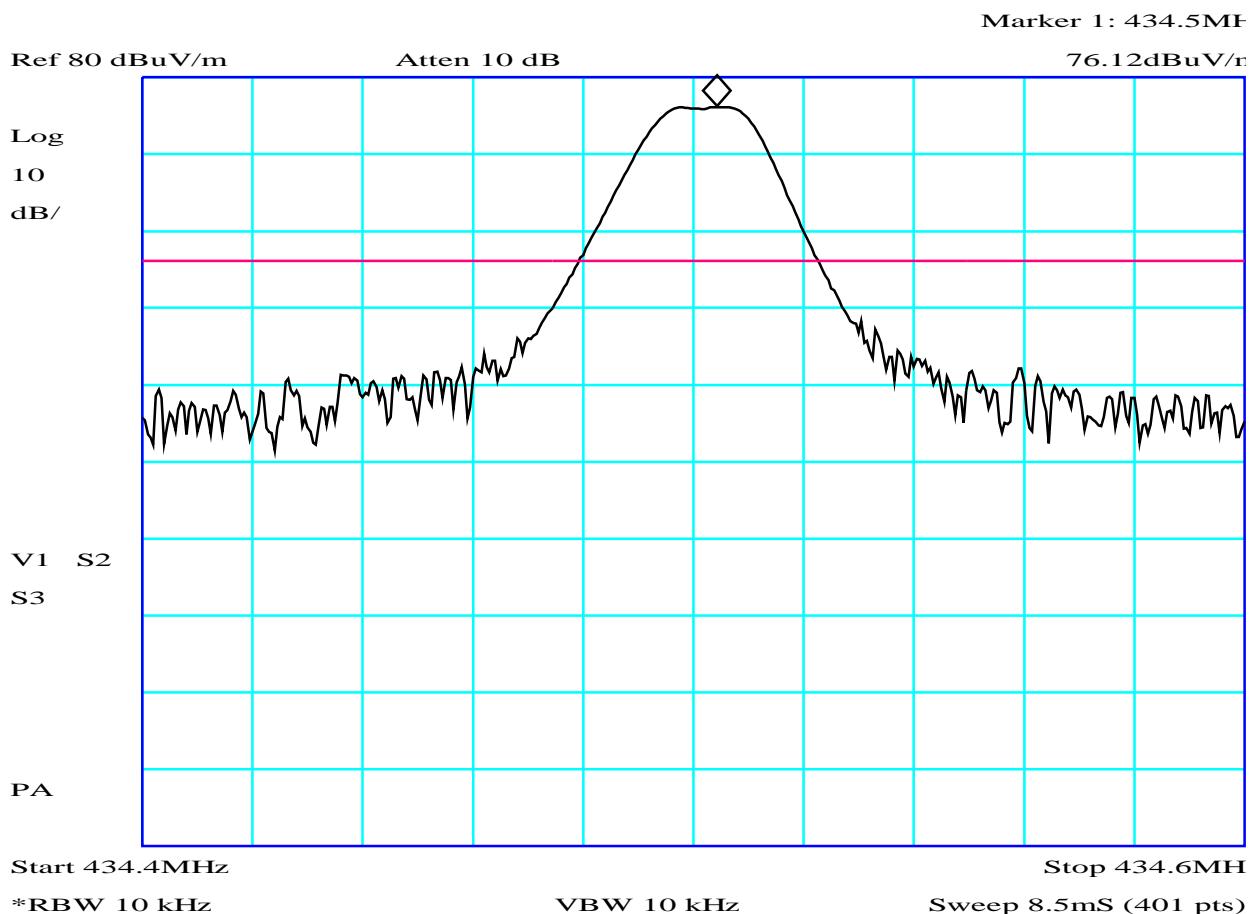
Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V	Modification State:	0
Angle	0-360	File:	H98046E0		

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CF1:A5_FS_090306 CF2:CBL002_CBL003_090306

PLOT 6 Bandwidth Plot

Company:	Quatro	Product:	PIR
Date:	04/09/09	Test Eng:	Dave Smith
Method:		Method:	
Limit1:(VIO)	-20dBc	Limit2:	
Limit3:		Limit4:	
1003062			
peak = 76.12 dBuV/m			
56.12dBuV/m to left of peak = 434.4535MHz			
56.12dBuV/m to right of peak = 434.4965MHz			
Occupied bandwidth = 43kHz			
Limit = 1.086MHz			
Facility:	Anech_1	Height	1m
Distance	3m	Polarisation	V
Angle	Front	File:	H98096C4
Mode:	1	Modification State:	0