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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

Rotronics Systems Limited

MiWi Module - FRZ200-1000

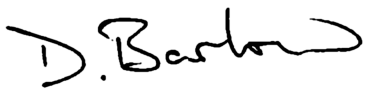
dated

24th October 2012

Document History

Issue	Date	Affected page(s)	Description of modifications	Revised by	Approved by
1	09/11/12		Initial release		
2	03/01/13		Added appendix A	DS	DB

Based on report template:
v090319

Equipment Under Test (EUT):	MiWi Module - FRZ200-1000
Test Commissioned by:	Rotronics Systems Limited Unit 5 Riverside Park Farnham Surrey GU9 7UG
Representative:	Bob Head
Test Started:	16th October 2012
Test Completed:	22nd October 2012
Test Engineer:	Dave Smith
Date of Report:	24th October 2012
Written by: Dave Smith	Checked by: Derek Barlow
Signature: 	Signature: 
Date: 24th October 2012	Date: 9th November 2012

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

RSS-210 Issue 8	*Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment*

In particular, the rules of FCC part 15.249 and the rules of RSS-210 A2.9 were applied.

Emissions Test Results Summary

CFR 47 **PASS**

Test	Port	Method	Limit	PASS/FAIL	*Notes*
Conducted Emissions	ac power	ANSI C63.4:2003	15.207	PASS	
Radiated Emissions		ANSI C63.4:2003	15.249 & 15.209	PASS	

specs_fccv100412

RSS-210 **PASS**

Test	Port	Method	Limit	PASS/FAIL	*Notes*
Radiated Emissions		ANSI C63.4:2003	RSS-210 A2.9	PASS	

Contents

1 EUT Details

1.1 General

The EUT was MiWi Module. The module is a transceiver operating at 915MHz.

The module is intended to be incorporated in a number of products manufactured by Rotronics. The module is either powered from:

- o an internal battery

or

- o the host product (which could be powered from the ac power network).

To ensure compliance is not dependent on any screening provided by the host, tests were performed on a pcb outside of a plastic case. Radiated tests were performed with the unit powered from an internal battery and with typical length cables attached. Power line conducted emissions were performed with the module powered from a "Repeater Battery" pcb which was, in turn, powered via an ac to dc PSU.

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	Rotronics	MiWi Module FRZ200-1000	EUT		
2	Rotronics	SRPT100-1100	Repeater Battery PCB		
3	Stontronics	DSA-24CA-12	12V PSU		

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.

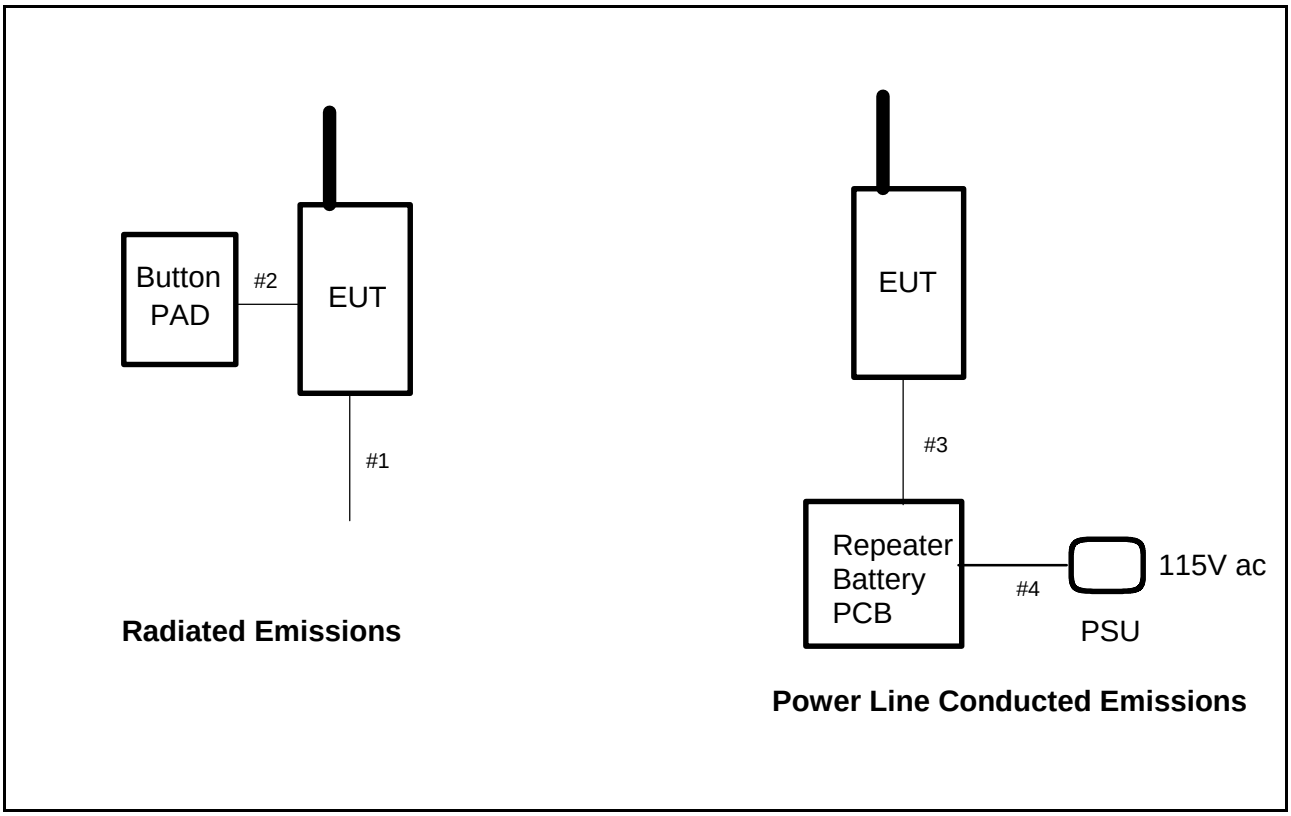
Mod No:	Details	Implemented for
1	Output level set to 15dB below maximum level.	

1.3 EUT Operating Modes

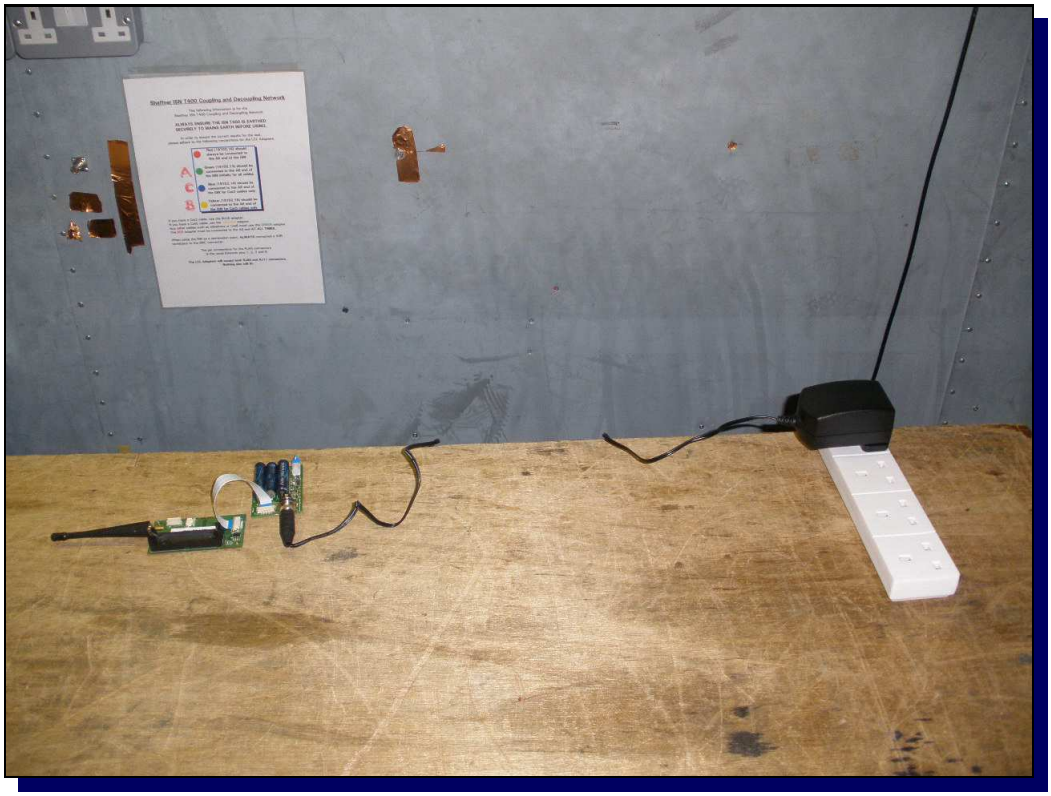
The EUT was tested in the following operating mode or modes. Generally, operating modes are chosen that will exercise the functions of the EUT as fully as possible and in a manner likely to produce maximum emission levels or susceptibility. Individual test result sheets reference the operating mode of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

Operating Mode	Details
1	Transmitting at 915MHz. Three 6msec pulses repeated every second.

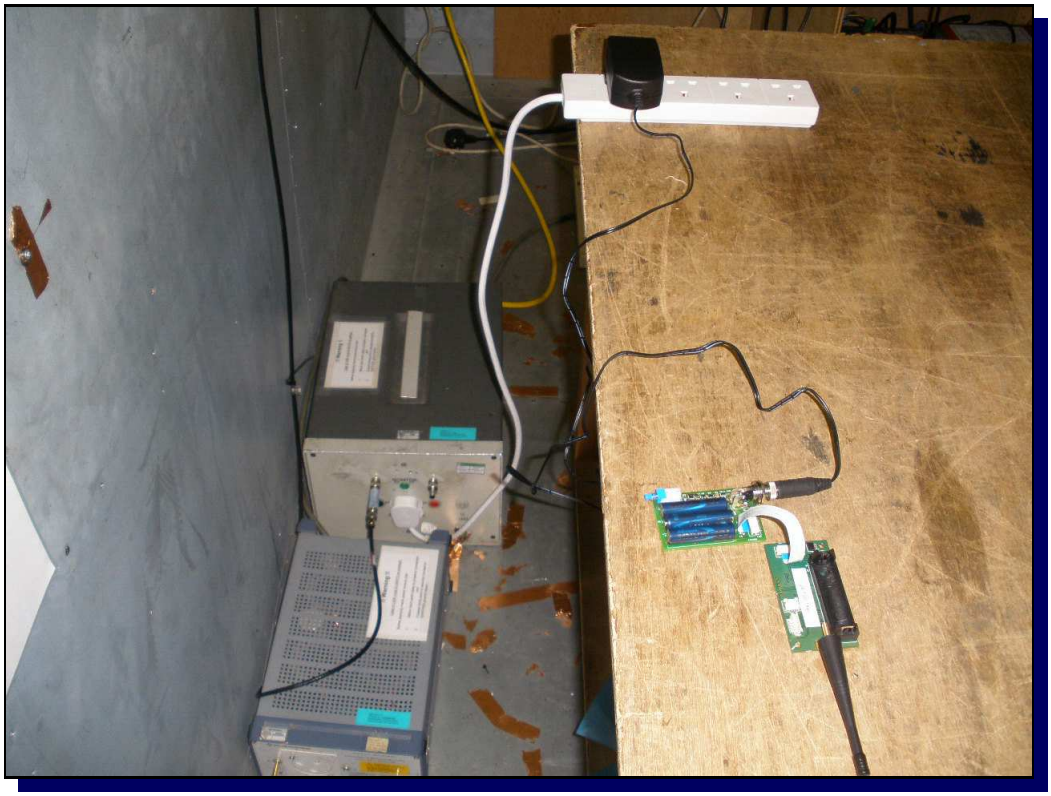
Figure 1 General Arrangement of EUT and Peripherals



	Description	Type	Length	Notes
#1	Flat cable - unterminated	Unscreened	0.2m	
#2	Flat cable - to button	Unscreened	0.05m	
#3	Flat cable - to Repeater Battery PCB	Unscreened	0.1m	
#4	DC power cable	Unscreened	1.2m	

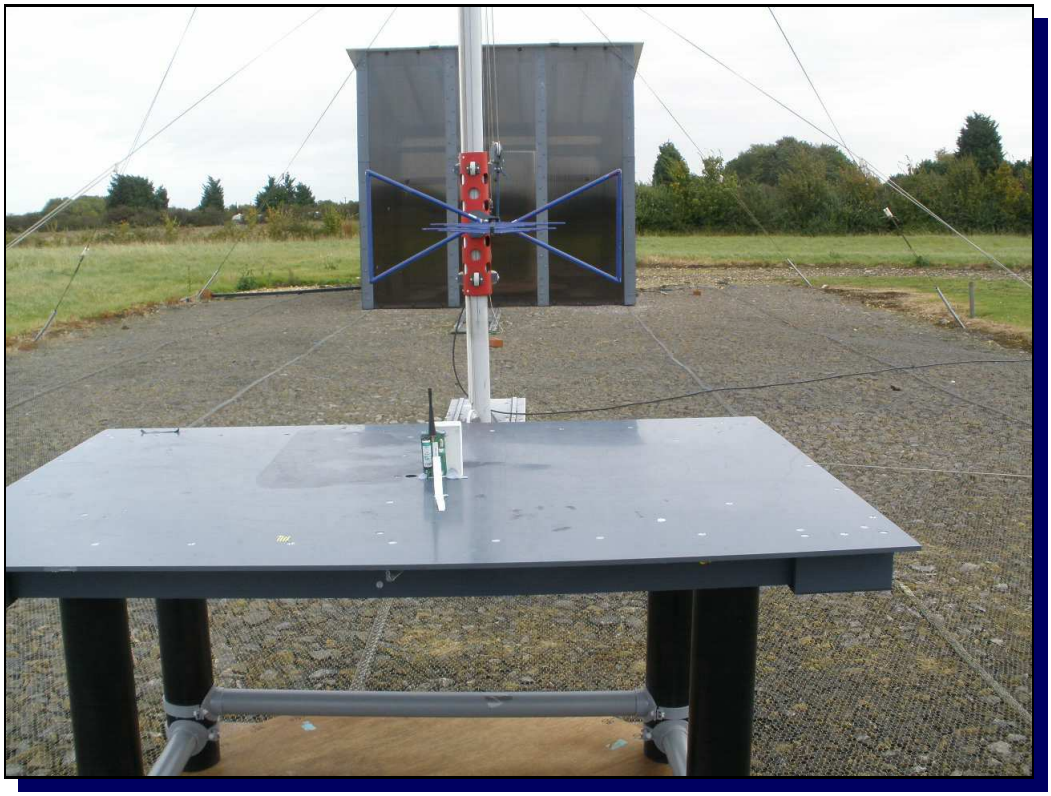


Photograph 1 Conducted Emissions - Front

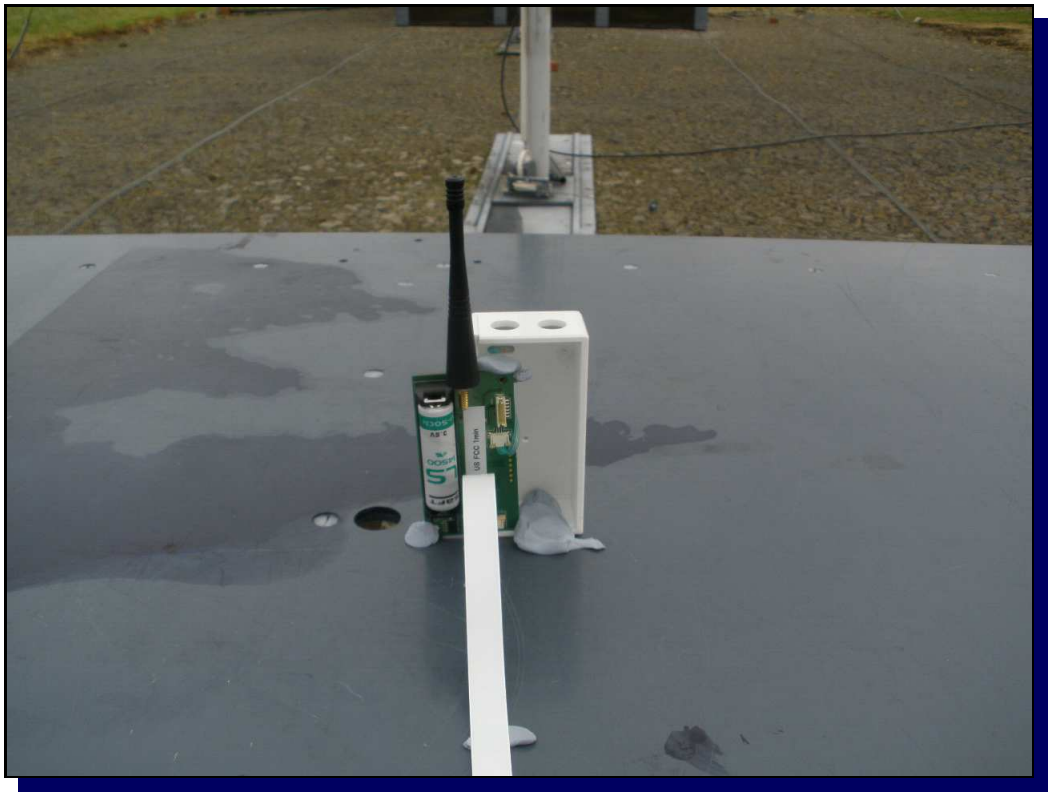


Photograph 2 Conducted Emissions - Back

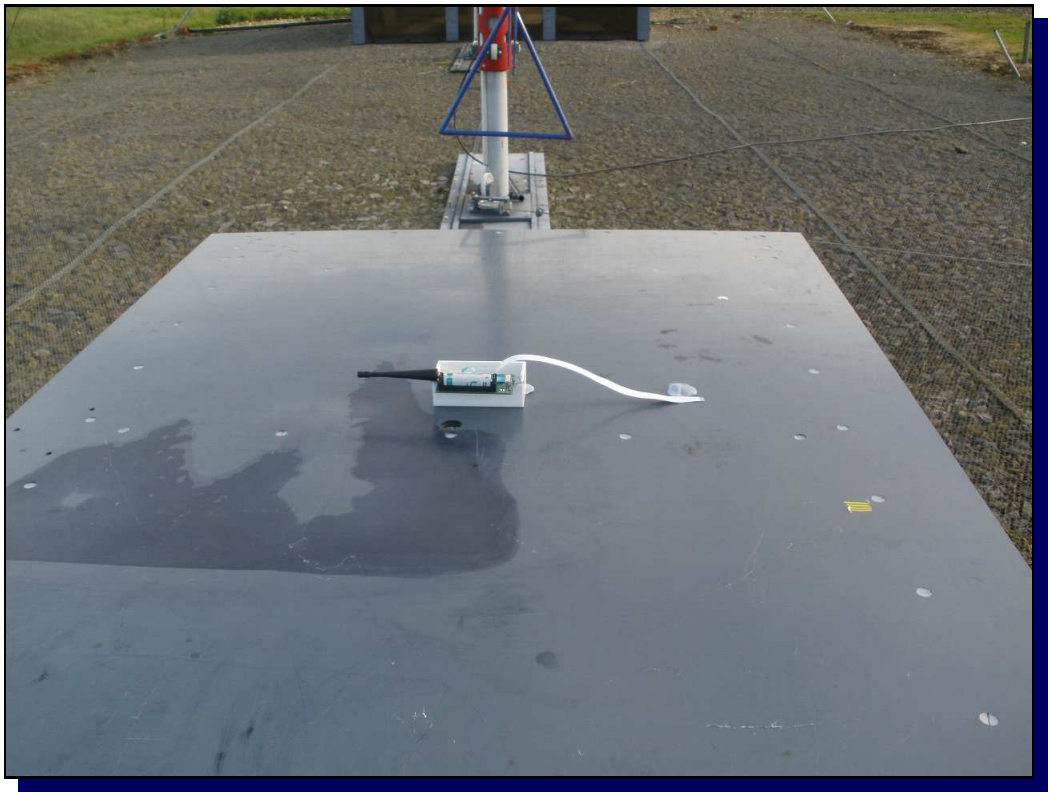
Photograph 3 Radiated Emissions - Upright, Front



Photograph 4 Radiated Emissions - Upright, Back



Photograph 5 Radiated Emissions - Upright, Close-up



Photograph 6 Radiated Emissions - Flat

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	Last Cal	Cal Period
A23	EMCO 3115 DR Guide (1-18GHz)	9507-4525	31/01/2012	1 year
A24	Chase X-wing Bilog CBL6144 26MHz-3GHz	27590	18/11/2011	1 year
A5	Chase Bilog CBL6111A	1760	31/01/2012	1 year
L1	EMCO 3825/2 LISN	1358	16/02/2012	1 year
PRE13	LUCIX 10M-6G pre-amp	13	26/06/2012	1 year
PRE9	LUCIX 100M-20G pre-amp	09	26/06/2012	1 year
R10	Narda PMM 9010 Receiver (10Hz-30MHz)	595WX11003	01/02/2012	1 year
R4	R&S ESVS10	843744/002	16/12/2011	1 year
R8	Agilent E7405A Spectrum Analyser	MY44212494	24/09/2012	1 year
R9	Agilent E7405A Spectrum Analyser	MY45110758	21/11/2011	1 year
RFF22	High Pass Filter - 1.35GHz (10GHz) MicroTronics HPM13017	033	08/02/2012	1 year

3 Test Methods

3.1 Conducted Emissions - ac power

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.

Bench top EUTs and peripheral equipment are normally placed on a 0.8m high non-conducting bench, positioned 0.4m from one of the metallic walls of a screened room. Floor standing EUTs are normally placed 0.1m above the metallic floor of the screened room. Mains leads are bundled so as not to exceed 1m.

The EUT is powered using a 50ohm/50uH Line Impedance Stabilisation Network (LISN). Peripherals are powered using a second a 50ohm/50uH LISN. These LISNs are bonded to the screened room floor.

With the correct supply voltage applied to the EUT scans are performed on both the live and neutral line outputs of the LISN using quasi-peak detection over the specified frequency range. The results of these scans are shown in the plots section at the end of the report.

Significant emissions identified by the scans are measured and the results tabulated. The table of results is shown in the conducted emissions results section.

Final Level (dBuV)	=	Receiver Reading (dBuV)	+	Combined Cable & Attenuator Correction Factor (dB)

Example: if @ 191kHz receiver reading = 45.8dBuV and the combined correction factor = 10dB

Final Level = 45.8 + 10.0 = 55.8 dBuV

3.2 Radiated Emissions

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 EUT cables were manipulated in an attempt to produce maximum emissions. 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. 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.

Tabulated results show levels based on the following calculation:

Field Strength (dBuV) = receiver reading (dBuV) + CF (dB/m)

CF is the correction factor for the antenna and cable.

For example:

if at 114MHz receiver reading was 17.9 dBuV, combined correction factor = 13.1 (dB/m).

Total field strength = 17.9 + 13.1 = 31.0 dBuV/m.

4 Test Results

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

4.1 Conducted Emissions (Power) - Results

Factor Set 1: L1_12A AB002_CBL005_CBL039_12A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R10 L1

Conducted Emissions (Power)

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 22/10/2012 *Test Eng:* Dave Smith
Ports: ac power
Test: ANSI C63.4:2003 using limits of 15.207
Ports:
Test: using limits of

Plot	Op Mode	Mod State	Line (L/N)	Fact Set	Freq. MHz	Det qp/ av	Rec. Level dBuV	Corr'n Factor dB	Total Level dBuV	Limit 15.207 dBuV	Margin 15.207 dB	Notes
1	1	1	L	1	0.220	qp	30.8	10.0	40.8	62.8	22.1	
1	1	1	L	1	0.220	av	22.3	10.0	32.3	52.8	20.6	
1	1	1	L	1	0.290	qp	15.8	10.0	25.8	60.5	34.7	
1	1	1	L	1	0.290	av	7.6	10.0	17.6	50.5	32.9	
1	1	1	L	1	13.400	qp	17.3	10.3	27.6	60.0	32.4	
1	1	1	L	1	13.400	av	15.5	10.3	25.9	50.0	24.1	
2	1	1	N	1	0.220	qp	30.3	10.0	40.3	62.8	22.5	
2	1	1	N	1	0.220	av	21.5	10.0	31.5	52.8	21.3	
2	1	1	N	1	0.290	qp	21.4	10.0	31.4	60.5	29.1	
2	1	1	N	1	0.290	av	18.6	10.0	28.6	50.5	21.9	
2	1	1	N	1	13.400	qp	17.1	10.3	27.5	60.0	32.5	
2	1	1	N	1	13.400	av	15.9	10.3	26.2	50.0	23.8	

Results	**Minimum Margin**	**20.6 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in plots 1 and 2.

4.2 Radiated Emissions Results - Carrier

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R4 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/10/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.249
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.249 dBuV/m	Margin 15.249 dB	Notes
3	1	1	3	1	915.000	V	57.5	29.9		87.4	94.0	6.6	#1
3	1	1	3	1	915.000	H	53.7	29.9		83.6	94.0	10.4	#1
3	1	1	3	1	915.000	V	53.0	29.9		82.9	94.0	11.1	#2
3	1	1	3	1	915.000	H	61.0	29.9		90.9	94.0	3.1	#2

Results **Minimum Margin** **3.1 dB**
PASS/FAIL **PASS**

Notes	Comments and Observations
	Results of scans shown in plot 3. RF level in software set to -15dB relative to maximum output.
#1	Upright
#2	Flat
	Measurements made with 120kHz bw QP detector.
	Note: the limits of FCC part 15.249 are the same as the limits of RSS-210 A2.9.

4.3 Radiated Emissions Results - Spurious Below 1GHz

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R4 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/10/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.249 & 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
4	1	1	3	1	213.900	V	-3.0	11.1		8.1	43.5	35.4	
4	1	1	3	1	213.900	H	5.6	11.1		16.7	43.5	26.8	
4	1	1	3	1	244.000	V	-1.0	14.0		13.0	46.0	33.0	
4	1	1	3	1	244.000	H	5.3	14.0		19.3	46.0	26.7	
4	1	1	3	1	245.400	V	-3.0	14.3		11.3	46.0	34.7	
4	1	1	3	1	245.400	H	2.0	14.3		16.3	46.0	29.7	
4	1	1	3	1	251.900	V	-2.1	15.3		13.2	46.0	32.8	
4	1	1	3	1	251.900	H	-1.2	15.3		14.1	46.0	31.9	
5	1	1	3	1	845.000	V	-1.5	29.1		27.6	46.0	18.4	
5	1	1	3	1	845.000	H	1.5	29.1		30.6	46.0	15.4	
5	1	1	3	1	855.000	V	6.2	29.3		35.5	46.0	10.5	
5	1	1	3	1	855.000	H	12.2	29.3		41.5	46.0	4.5	
5	1	1	3	1	908.000	V	-2.2	29.8		27.6	46.0	18.4	
5	1	1	3	1	908.000	H	0.1	29.8		29.9	46.0	16.1	
5	1	1	3	1	928.000	V	-1.7	30.6		28.9	46.0	17.1	
5	1	1	3	1	928.000	H	-2.3	30.6		28.3	46.0	17.7	
5	1	1	3	1	935.000	V	6.0	31.3		37.3	46.0	8.7	
5	1	1	3	1	935.000	H	7.3	31.3		38.6	46.0	7.4	
5	1	1	3	1	975.000	V	0.5	31.5		32.0	54.0	22.0	
5	1	1	3	1	975.000	H	11.8	31.5		43.3	54.0	10.7	

Results	**Minimum Margin**	**4.5 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in plots 4 and 5. Measurements made with 120kHz QP detector. Limits of 15.209 are shown since none of these emissions are harmonics of the fundamental. These limits are equivalent to the RSS-GEN general limits.

4.4 Radiated Emissions Results - Spurious Above 1GHz

Factor Set 1: A23_3m_ 12A PRE13_12A RFF22_12A CBL059_CBL018_CBL065_CBL060_10A
Factor Set 2: A23_3m_ 12A PRE9_12A RFF22_12A CBL049_11A
Factor Set 3: - - - -
Test Equipment: R9 A23 PRE9 PRE13 RFF22

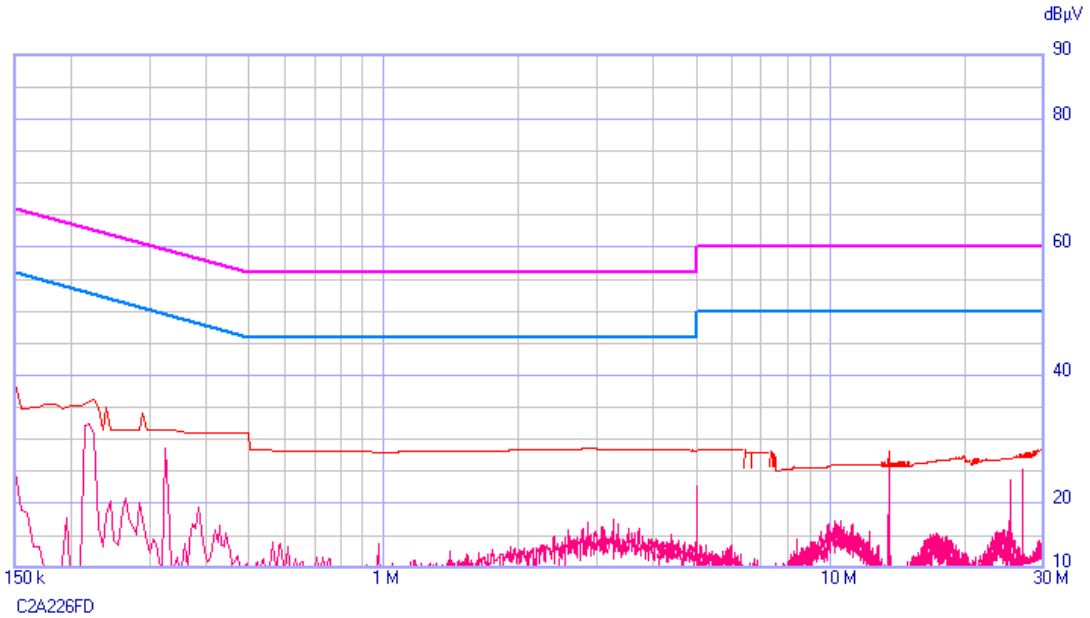
Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/10/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.249
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.249 dBuV/m	Margin 15.249 dB	Notes
	Peak readings:												
6	1	1	3	1	1830.000	V	56.7	-1.6		55.1	74.0	18.9	U
6	1	1	3	1	1830.000	H	58.6	-1.6		57.0	74.0	17.0	U
6	1	1	3	1	1830.000	V	58.1	-1.6		56.6	74.0	17.4	F
6	1	1	3	1	1830.000	H	55.9	-1.6		54.3	74.0	19.7	F
7	1	1	3	2	2745.000	V	56.6	-7.8		48.8	74.0	25.2	U
7	1	1	3	2	2745.000	H	60.6	-7.8		52.8	74.0	21.2	U
7	1	1	3	2	2745.000	V	55.0	-7.8		47.2	74.0	26.8	F
7	1	1	3	2	2745.000	H	52.7	-7.8		44.9	74.0	29.1	F
	Readings adjusted for average based on 6msec pulse in any 100msec:												
6	1	1	3	1	1830.000	V	56.7	-1.6	-24.3	30.8	54.0	23.2	U
6	1	1	3	1	1830.000	H	58.6	-1.6	-24.3	32.7	54.0	21.3	U
6	1	1	3	1	1830.000	V	58.1	-1.6	-24.3	32.3	54.0	21.7	F
6	1	1	3	1	1830.000	H	55.9	-1.6	-24.3	30.0	54.0	24.0	F
7	1	1	3	2	2745.000	V	56.6	-7.8	-24.3	24.5	54.0	29.5	U
7	1	1	3	2	2745.000	H	60.6	-7.8	-24.3	28.5	54.0	25.5	U
7	1	1	3	2	2745.000	V	55.0	-7.8	-24.3	22.9	54.0	31.1	F
7	1	1	3	2	2745.000	H	52.7	-7.8	-24.3	20.6	54.0	33.4	F

Results	**Minimum Margin**	**17.0 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in plots 6 to 8. Prescans were performed at a distance of 1.5m. Final measurements shown above were performed at 3m. Peak measurements were made (with 1MHz rbw). Peak measurements must not be more than 20dB above the limits of part 15.249. Average measurements were calculated based on the maximum duty cycle in any 100msec period. These calculations are shown in plots 9 and 10 and the additional correction is shown as the 2nd correction factor in this table.
Note	U = Upright, F = Flat



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q A pwr_B_QP Margin 5 dB	20 ms	9 kHz	10	OFF	ON	...	...
2	0.15	0.151	500 Hz	P pwr_B_Avg Margin 0 dB	1.9 ms	9 kHz	10	OFF	ON	...	...

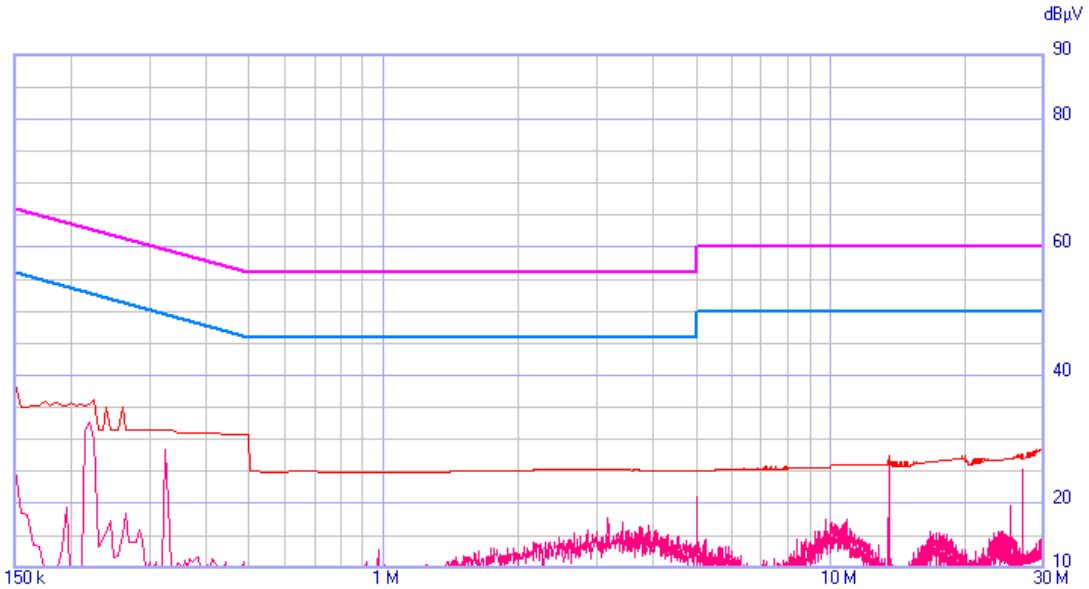
Ancillary = General
Limits:
pwr_B_QP
pwr_B_Avg
Factors:
L1
AB002_CBL005_CBL039
QPeak
Avg

PLOT 1 Conducted Emissions - Live

Company:	Rotronics	Product:	MiWi
Date:	22 Oct 12	Test Engineer:	Dave Smith
Test:	ANSI C63.4	Limit:	FCC (B)

Notes:
115V. Transmitting once per second.
Measured on ac power port of PSU which supplies power to Repeater battery PCB

Line:	Live	Attenuator:	10dB PAD	Operating Mode:	1 (Tx)
Detector:	QuasiPeak			Mod. State:	1
LISN:	EMCO	Filename:	C2A22715.png		



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (5 kHz)	P Q A pwr_B_QP Margin 5 dB	20 ms	9 kHz	10	OFF	ON	...	...
2	0.15	0.151	500 Hz	P pwr_B_Avg Margin 0 dB	1.9 ms	9 kHz	10	OFF	ON	...	...

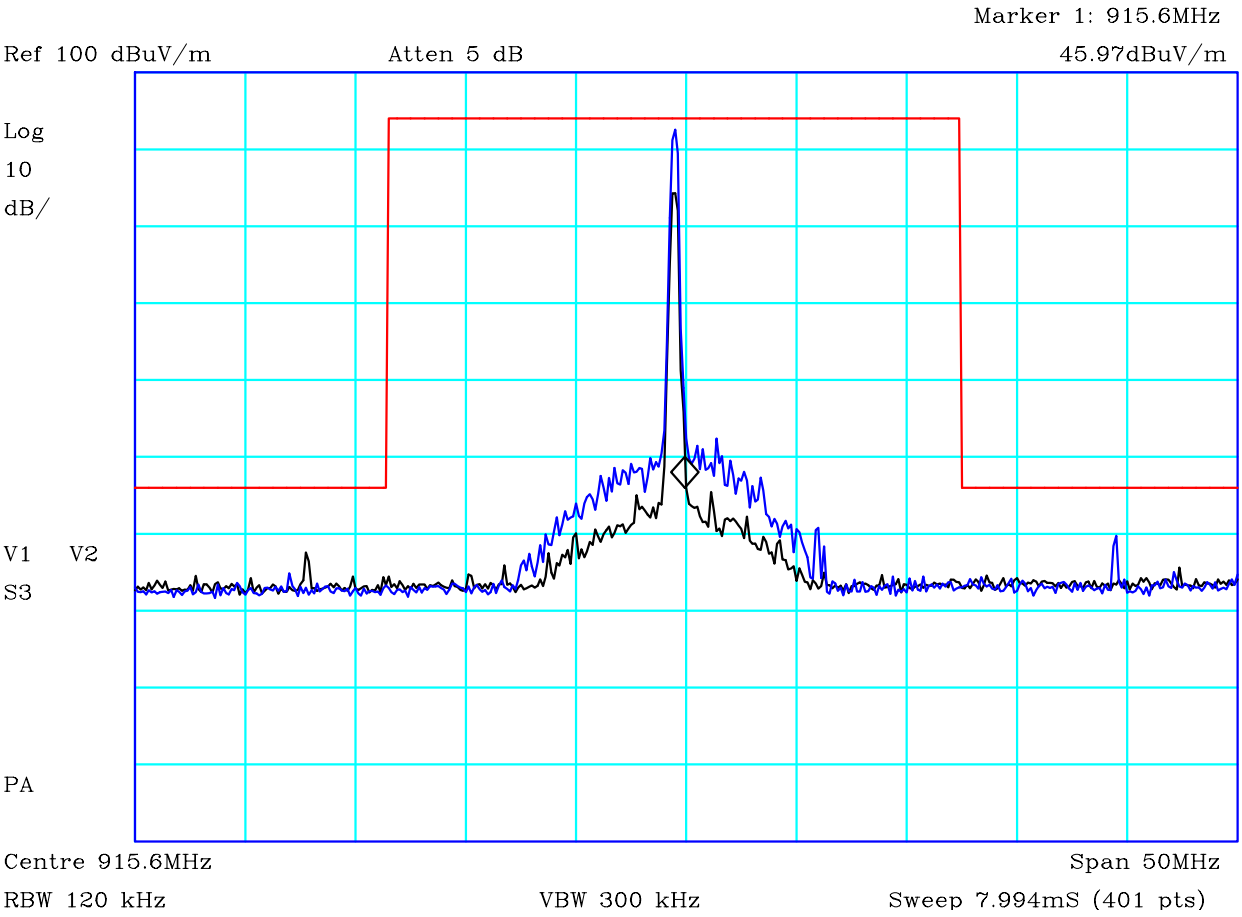
Ancillary = General
Limits:
pwr_B_QP
pwr_B_Avg
Factors:
L1
AB002_CBL005_CBL039
QPeak
Avg

PLOT 2 Conducted Emissions - Neutral

Company:	Rotronics	Product:	MiWi
Date:	22 Oct 12	Test Engineer:	Dave Smith
Test:	ANSI C63.4	Limit:	FCC (B)

Notes:
115V. Transmitting once per second.
Measured on ac power port of PSU which supplies power to Repeater battery PCB

Line:	Live	Attenuator:	10dB PAD	Operating Mode:	1 (Tx)
Detector:	QuasiPeak			Mod. State:	1
LISN:	EMCO	Filename:	C2A22716.png		



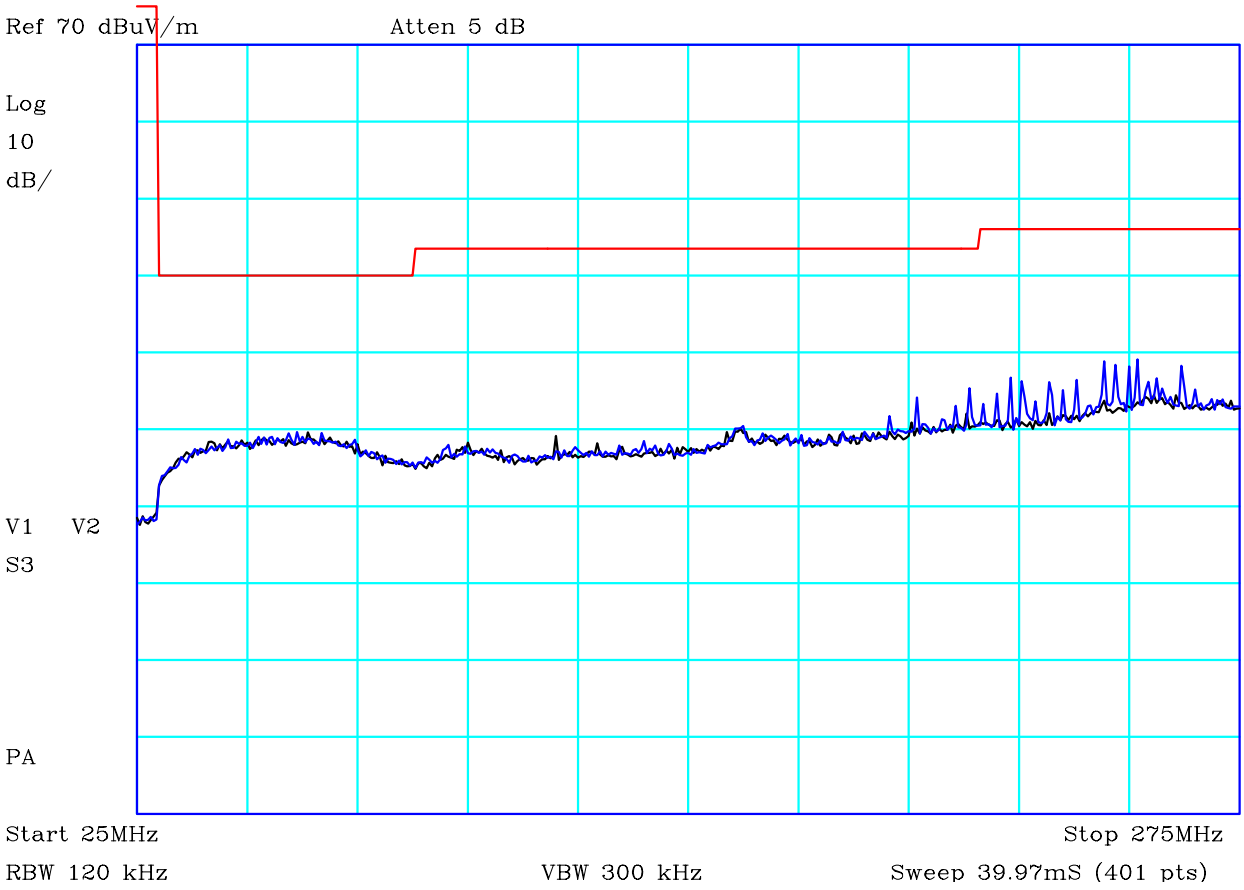
CF1:A24_3m_120807 CF2:CBL059_CBL018_CBL065_CBL060_100806

PLOT 3 Radiated Emissions - Near Carrier

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Maximum of both flat and upright.

Facility:	Anech_2	Height	1.5m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2916528		



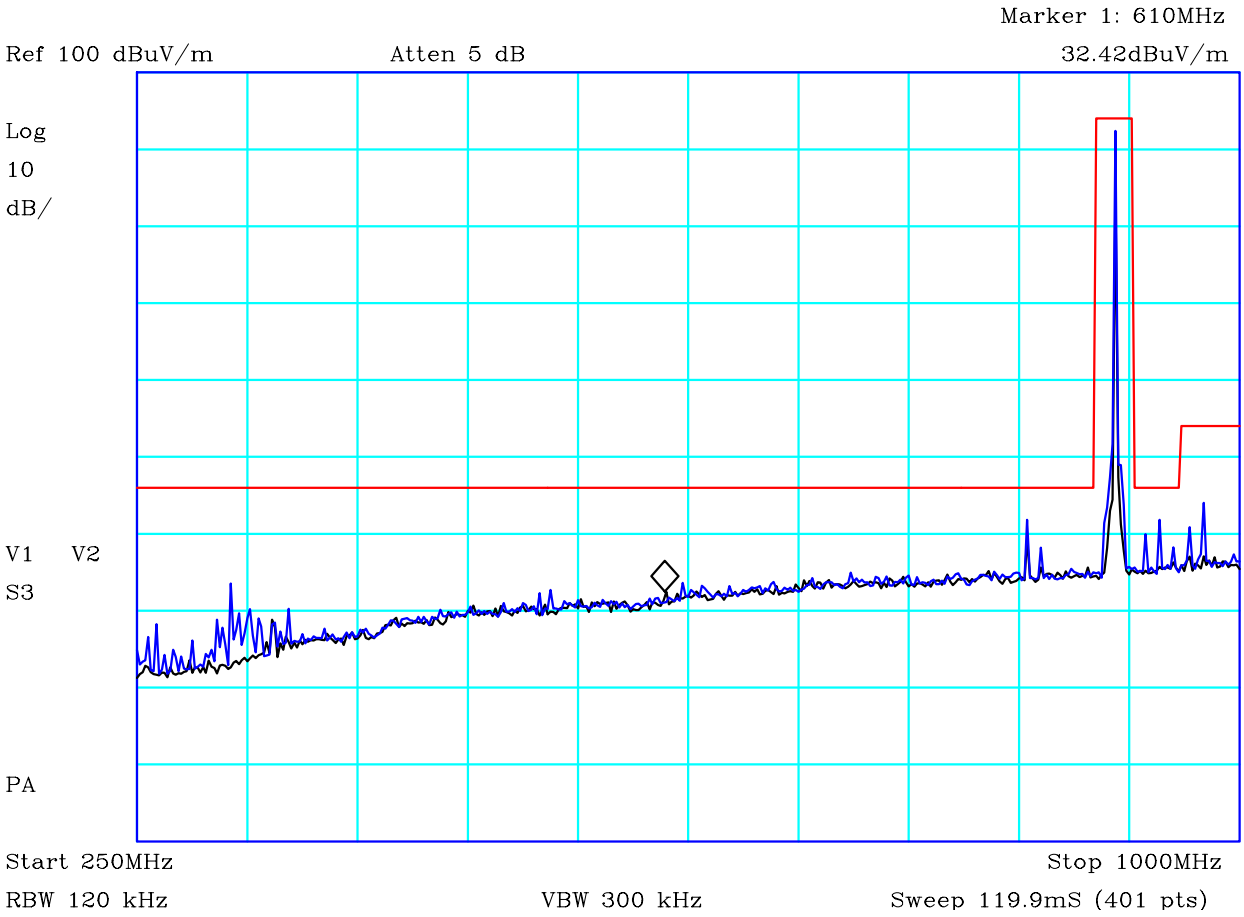
CF1:A24_3m_120807 CF2:CBL059_CBL018_CBL065_CBL060_100806

PLOT 4 Radiated Emissions - 25MHz to 275MHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Maximum of both flat and upright.

cility:	Anech_2	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H29164F4		



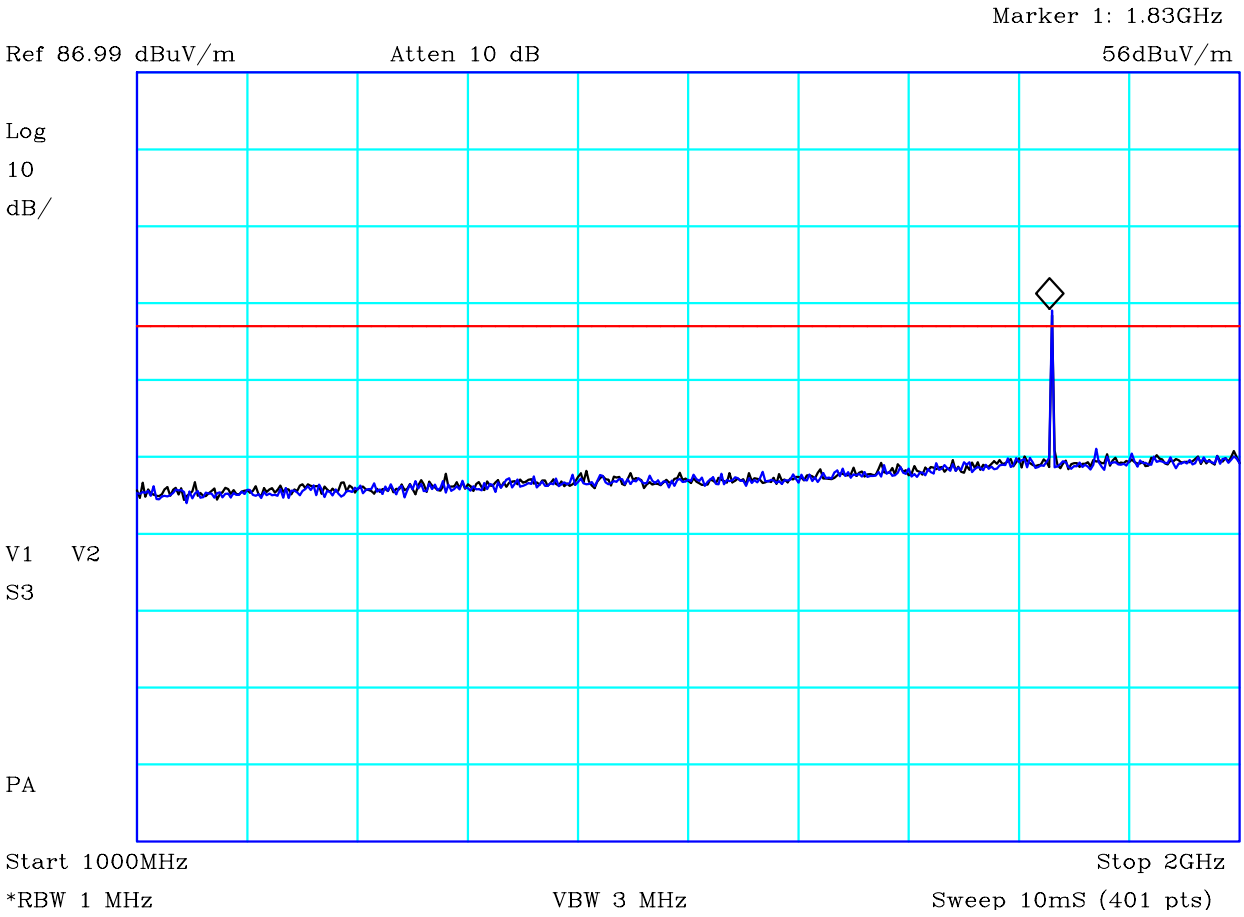
CF1:A24_3m_120807 CF2:CBL059_CBL018_CBL065_CBL060_100806

PLOT 5 Radiated Emissions - 250MHz to 1GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Maximum of both flat and upright.
Repeat

Facility:	Anech_2	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2916545		



CF1:A23_3m_120820 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:PRE13_120627

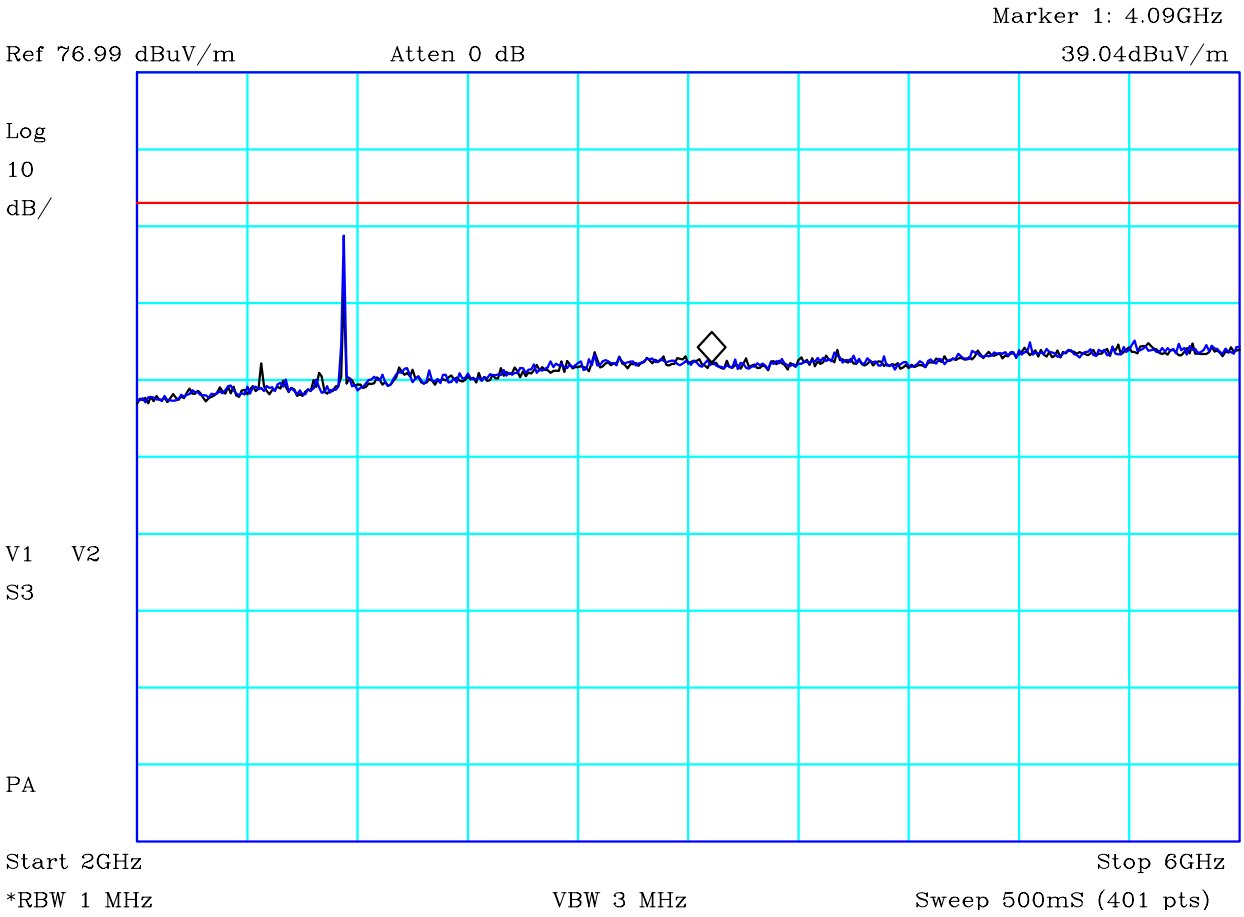
PLOT 6 Radiated Emissions - 1GHz to 2GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Maximum of both flat and upright.

Note: This plot shows peak measurements with an average limit.

Facility:	Anech_2	Height	1.5m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H29165D6		



CF1:A23_3m_120820 CF2:CBL049_110107 CF3:PRE9_120627 CF4:RFF22_120716

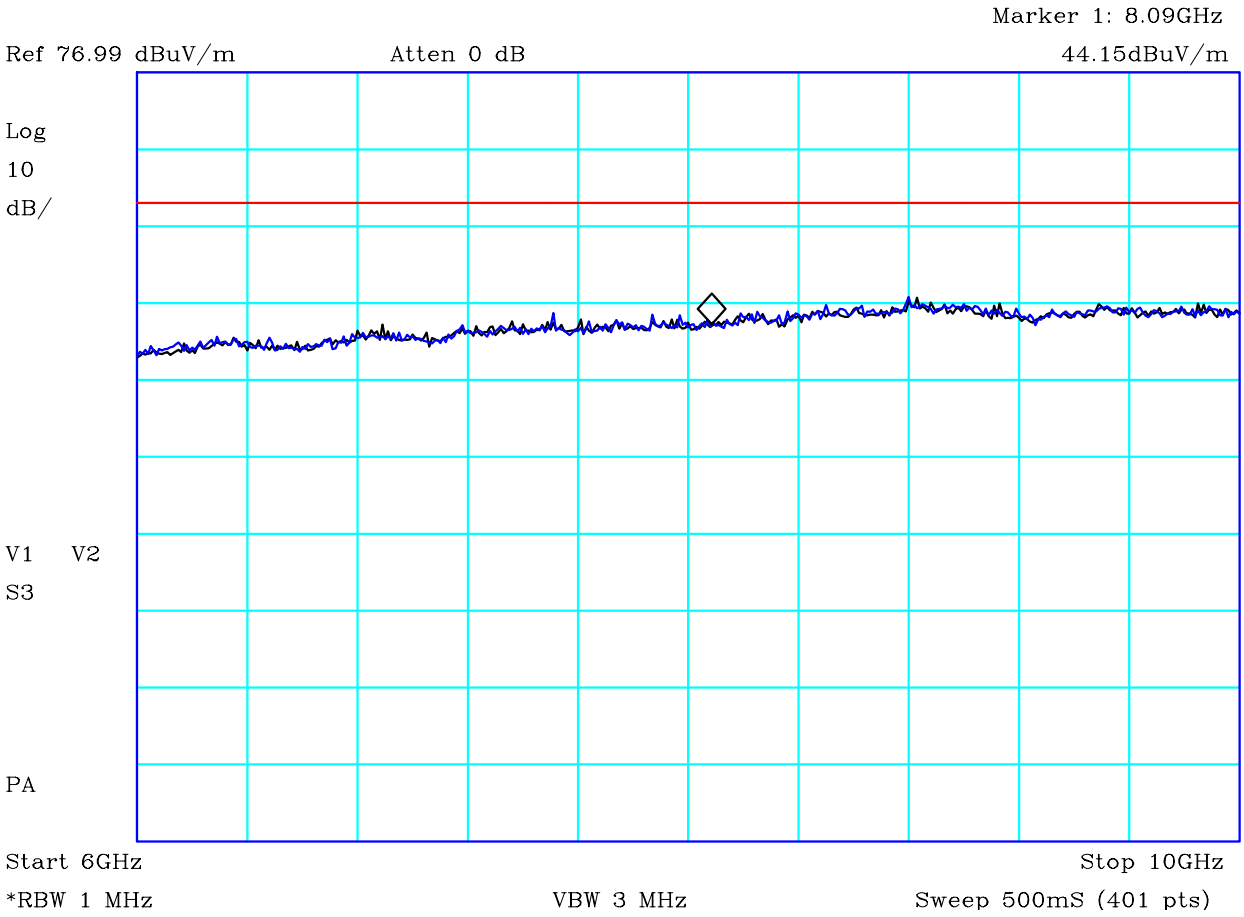
PLOT 7 Radiated Emissions - 2GHz to 6GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Maximum of both flat and upright.

Note: This plot shows peak measurements with an average limit.

Facility:	Anech_2	Height	1.1m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H29166AD		



CF1:A23_3m_120820 CF2:CBL049_110107 CF3:PRE9_120627 CF4:RFF22_120716

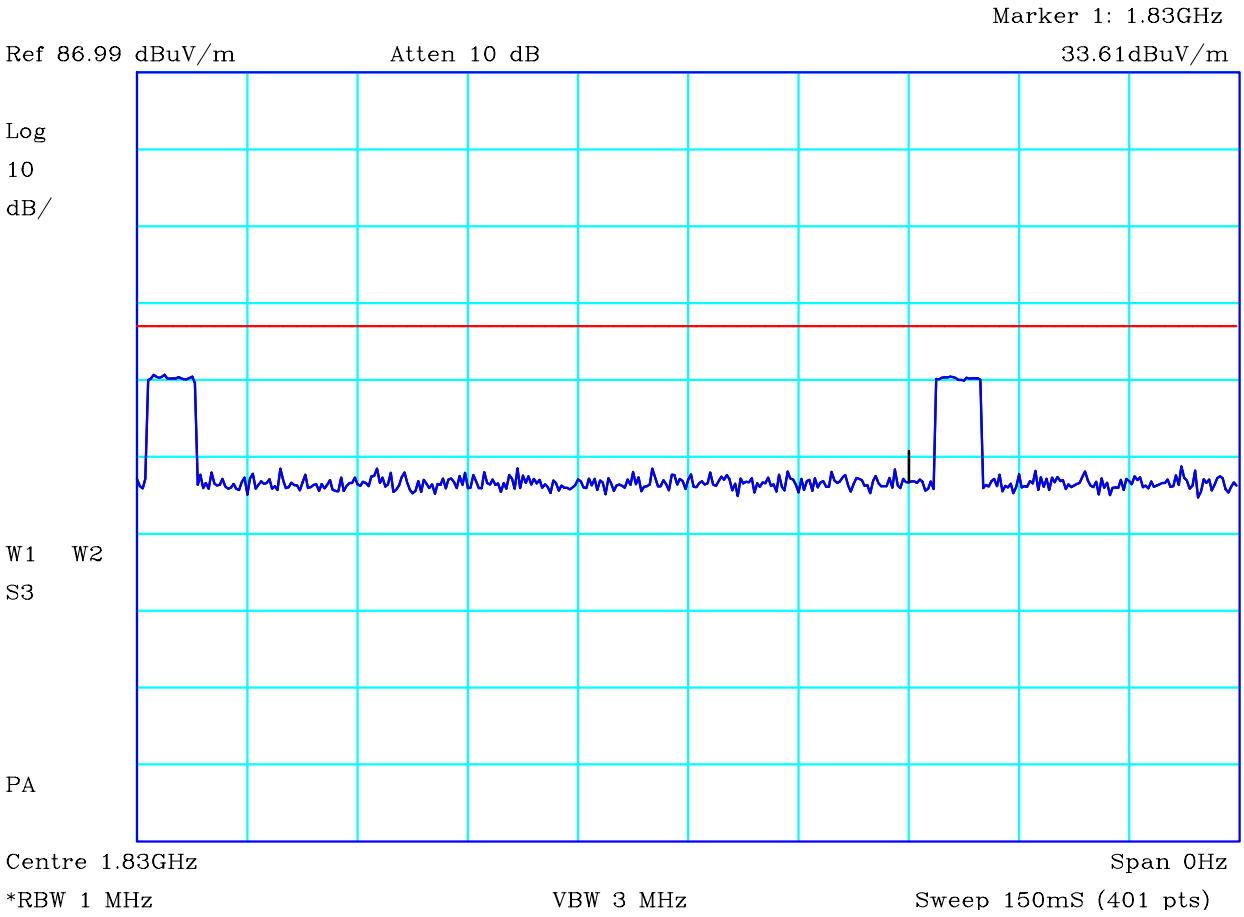
PLOT 8 Radiated Emissions - 6GHz to 10GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Maximum of both flat and upright.

Note: This plot shows peak measurements with an average limit.

Facility:	Anech_2	Height	1.1m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H29166BB		



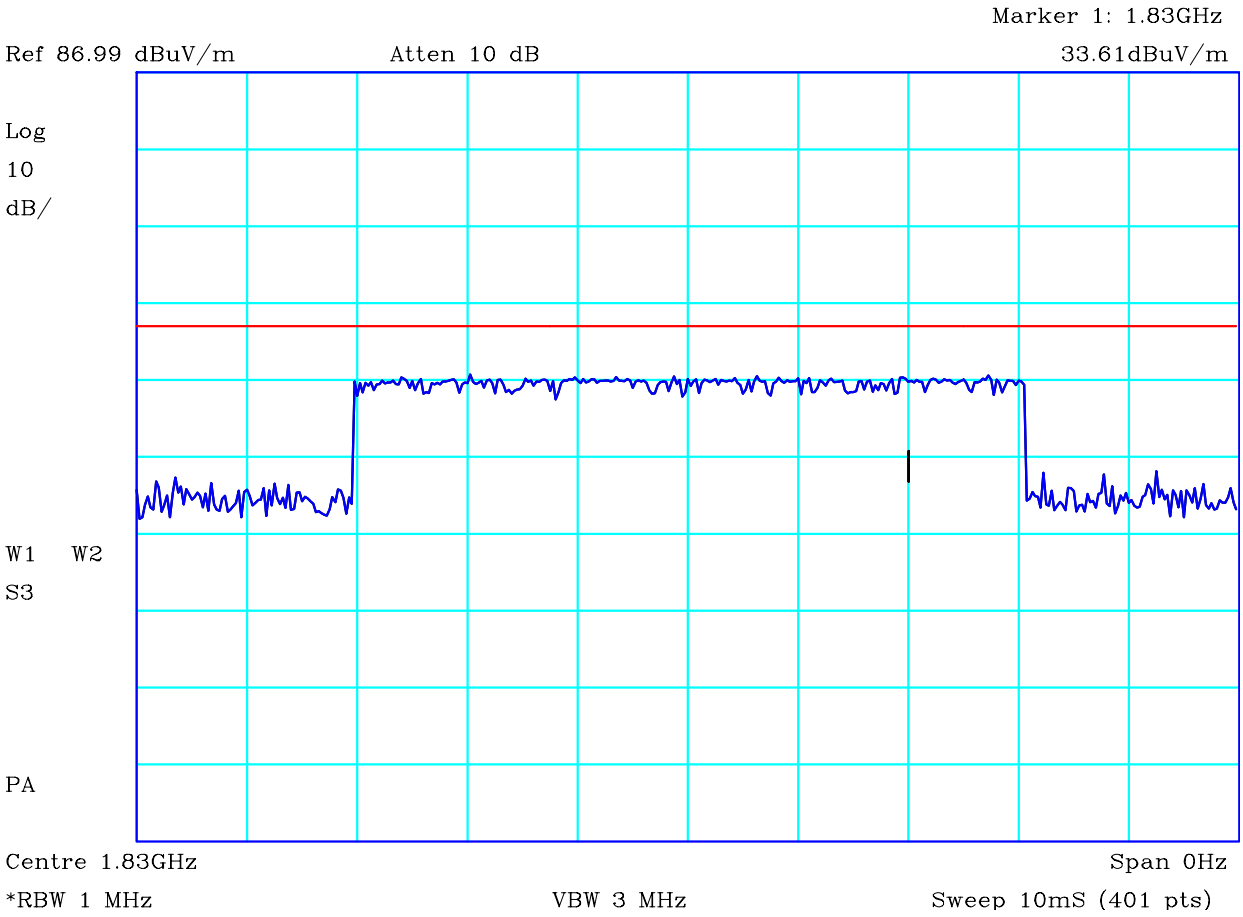
CF1:A23_3m_120820 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:PRE13_120627

PLOT 9 Radiated Emissions - Pulse Repetition

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Repetition = 108msec

Facility:	Anech_2	Mode:	1 (Tx)
		Modification State:	1
	File: H2916579		



CF1:A23_3m_120820 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:PRE13_120627

PLOT 10 Radiated Emissions - Pulse Width

Company:	Rotronics	Product:	MiWi Transmitter
Date:	16/10/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

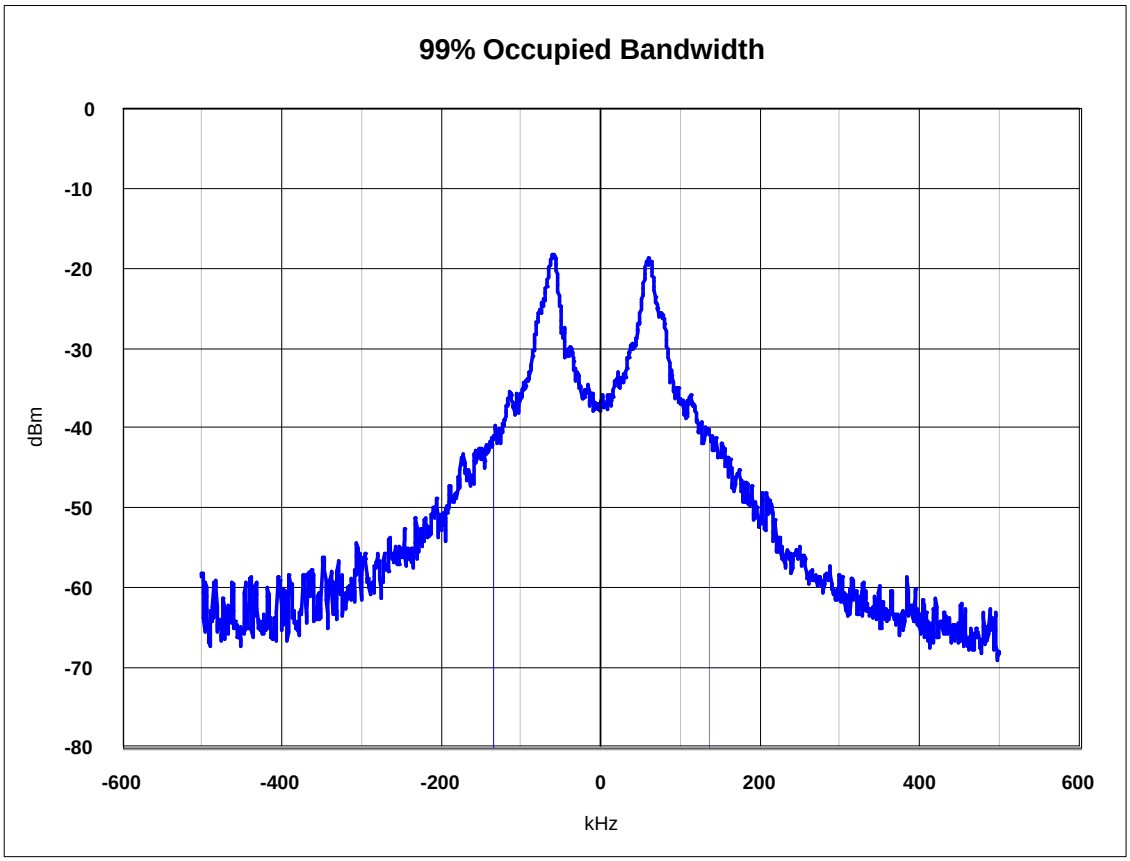
Pulse width: 6.1msec

Duty cycle in any 100msec period = 6.1/100

Duty cycle = 0.061

Maxiumum correction for duty cycle for average measurements = 20 * log (0.61) = -24.3dB

Facility:	Anech_2	Mode:	1 (Tx)
		Modification State:	1
	File: H291657A		



Company:	Rotronics	Test Eng:	DS
Product:	MiWi	Mod State:	1
Date:	22/10/2012	Analyser:	R8
Mode:	915MHz Tx (mode 1)		

Centre Frequency:	915.0475 MHz	RBW:	Mode: Peak
Span	1000 kHz	VBW	

99% Occupied bandwidth **270.14 kHz**

PLOT 11 99% Occupied Bandwidth

Appendix A

This appendix includes additional results showing measurements of the radio module incorporated into the following final products:

- o Controller
- o Repeater
- o Data Transceiver

It also includes radiated emissions measurements below 30MHz.

5 Appendix A Details

5.1 General

The main body of this report provides results for MiWi Module measured as a standalone module. Because the Module does not have a screening can over the RF circuitry it is intended to seek "Limited Modular" approval on the basis that the module will only be used in a limited number of products. This appendix provides measurement results for the Module housed in each of the intended final products:

- o Controller
- o Repeater
- o Data Transceiver

Unless stated elsewhere, all details provided in the main body of the report (e.g. tests standards, methods etc.) apply for this Appendix. The same modification states (i.e. modification state 1 with level set -15dB below maximum) and operating modes were used.

Because the MiWi Module includes a 10MHz crystal, this appendix also includes radiated emissions results below 30MHz.

The results in this Appendix show all measurements were compliant with the requirements identified on page 3 of the main body of this report.

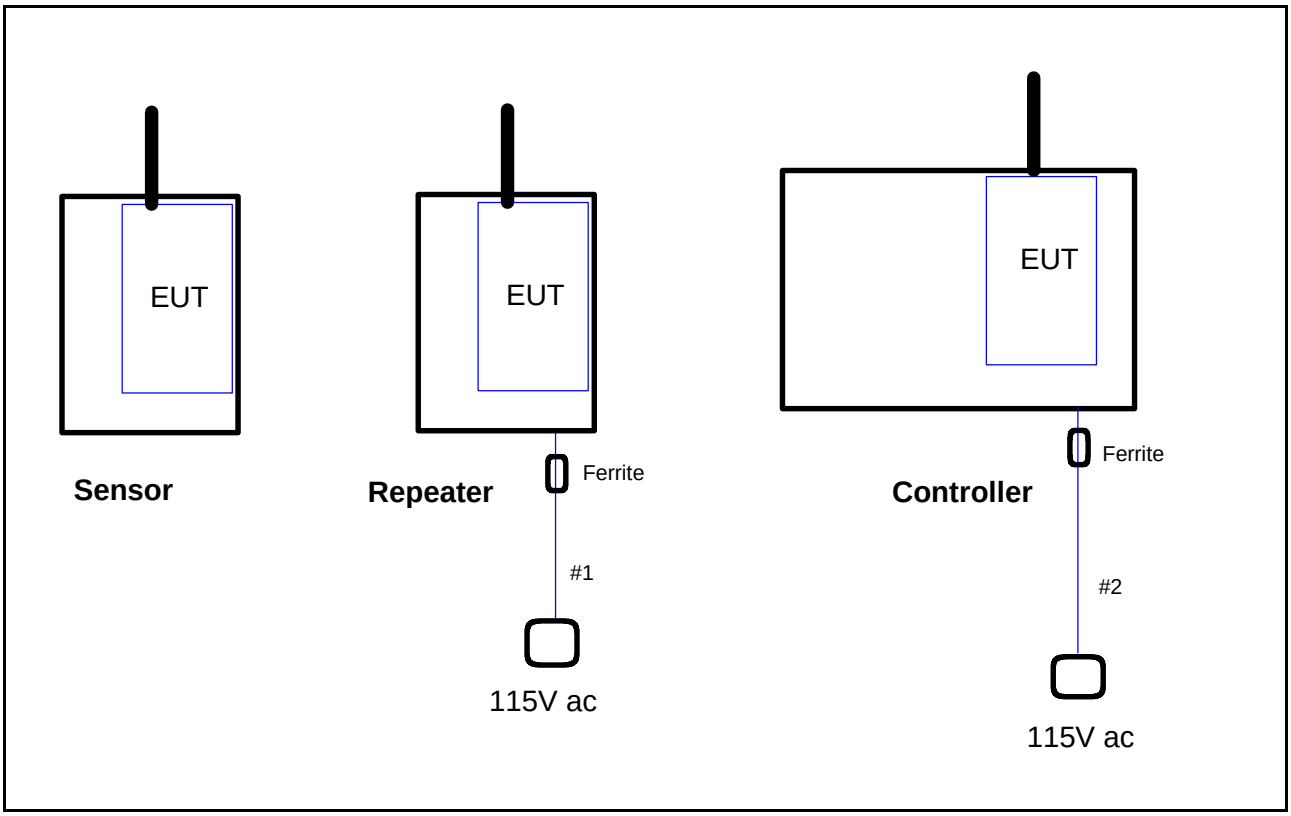
Details of the EUT and associated peripherals used during the tests in this Appendix are listed below. Figure 2 shows the interconnections between the EUT and peripherals.

Item	Manufacturer	Model	Description	Serial No:	Notes
1	Rotronics	GENII/FRZ/200/A	Remote Data Transceiver		
2	Rotronics	GENII/SRPT/200	Repeater		
3	Stontronics	DSA-24CA-12	12V PSU		#1
4	Rotronics	WARP GENII/ WARP/200	Controller		
5	Ideal Power	HK_HP-A15	15V PSU		#2

#1 The power supply was presented for testing with a Wurth 742 711 31 ferrite fitted near the DC connector. This ferrite remained in place for all of the tests.

#2 The power supply was presented for testing with a Wurth 742 712 21 ferrite fitted near the DC connector. This ferrite remained in place for all of the tests.

Figure 2 General Arrangement of EUT and Peripherals



	Description	Type	Length	Notes
#1	DC power cable	Unscreened	1.2m	
#2	DC power cable	Unscreened	1.2m	

6 Test Equipment (used for measurements recorded in Appendix A)

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	Last Cal	Cal Period
A15	Chase X-wing Bilog CBL6140 20MHz-2GHz	1047	30/10/2012	1 year
A19	EMCO 3115 DR Guide (1-18GHz)	2431	23/01/2012	1 year
A23	EMCO 3115 DR Guide (1-18GHz)	9507-4525	31/01/2012	1 year
A5	Chase Bilog CBL6111A	1760	31/01/2012	1 year
A9	EMCO 6502 Loop	2139	14/12/2012	1 year
L1	EMCO 3825/2 LISN	1358	16/02/2012	1 year
PRE10	LUCIX 100M-20G pre-amp	10	26/06/2012	1 year
PRE14	LUCIX 10M-6G pre-amp	14	26/06/2012	1 year
R10	Narda PMM 9010 Receiver (10Hz-30MHz)	595WX11003	01/02/2012	1 year
R4	R&S ESVS10	843744/002	16/12/2011	1 year
R8	Agilent E7405A Spectrum Analyser	MY44212494	24/09/2012	1 year
R9	Agilent E7405A Spectrum Analyser	MY45110758	21/11/2011	1 year
RFF22	High Pass Filter - 1.35GHz (10GHz) MicroTronics HPM13017	033	08/02/2012	1 year

7 Test Methods

Unless described below, all methods were as described in the main body of the report.

7.1 Radiated Emissions below 30MHz

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 using a 60cm diameter active loop antenna. The antenna is 1m above the ground plane. During these scans the EUT and peripherals are rotated through 360°. The loop antenna was rotated through 90° to give measurements with the antenna both perpendicular to and parallel with the axis between antenna and EUT.

Significant emissions identified by the scans are measured on an open area test site at the appropriate test distance.

Tabulated results show levels based on the following calculation:

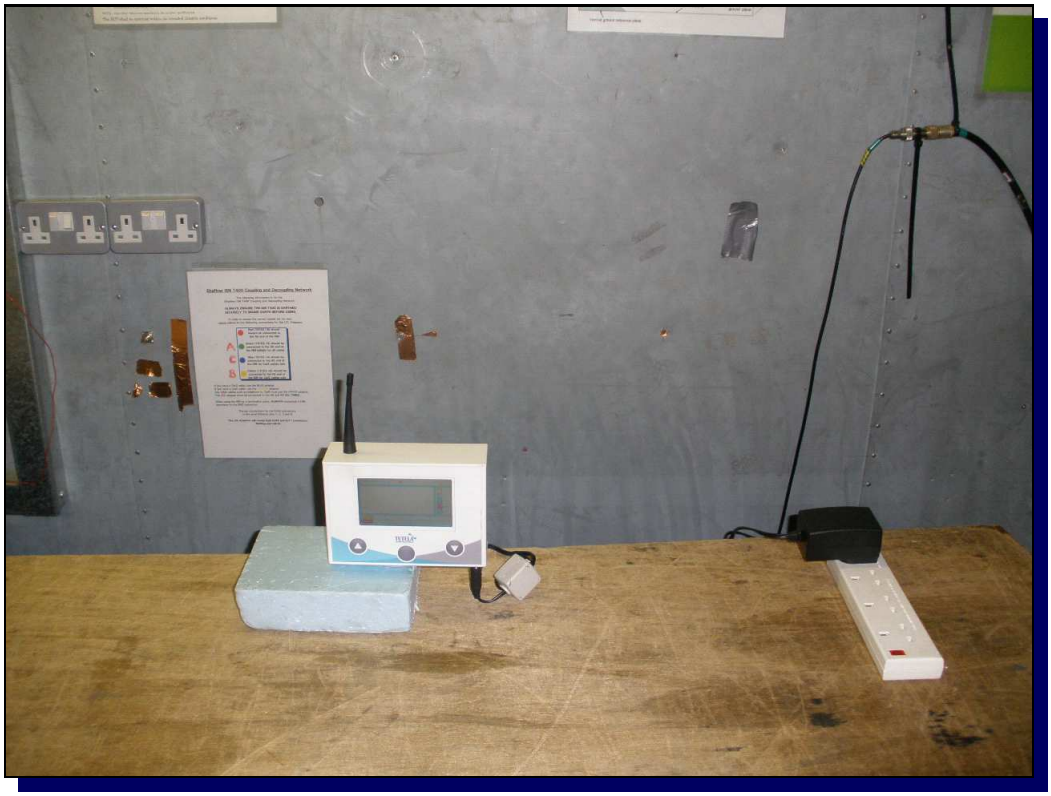
Field Strength (dBuV) = receiver reading (dBuV) + CF (dB/m)

CF is the correction factor for the antenna and cable.

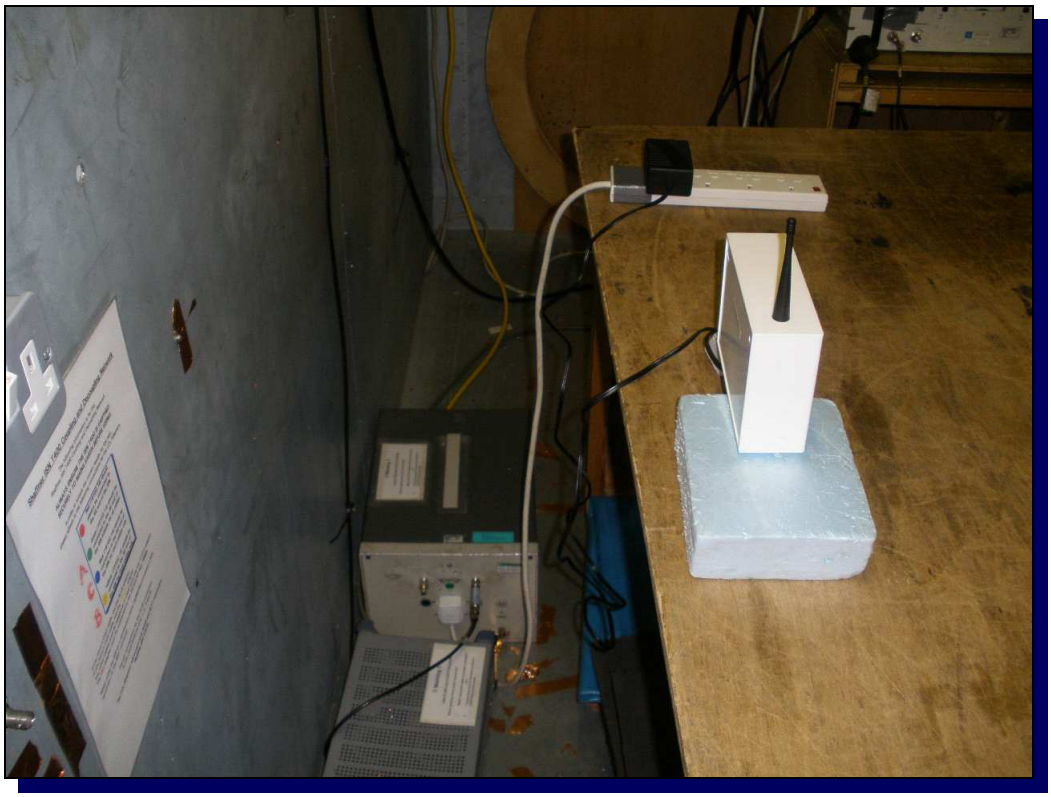
For example:

if at 20 MHz receiver reading was 40 dBuV, combined correction factor = 10.2 (dB/m).

Total field strength = 40 + 10.2 = 50.2 dBuV/m.

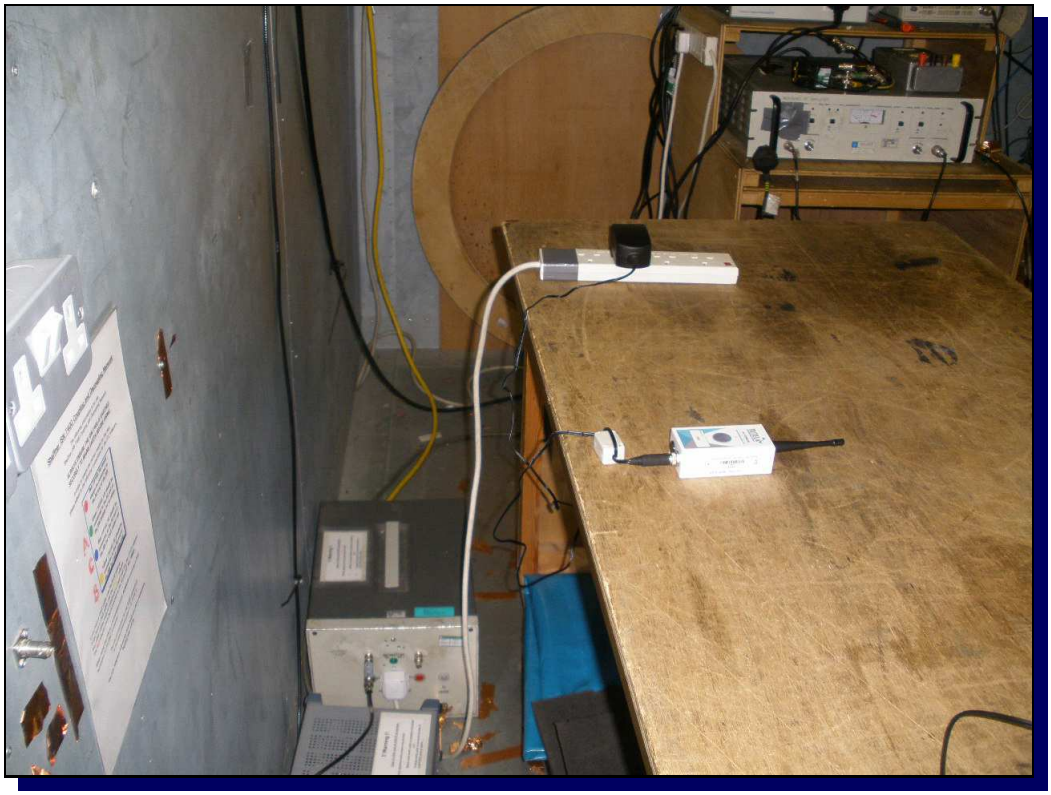


Photograph 7 Conducted Emissions - Controller - Front

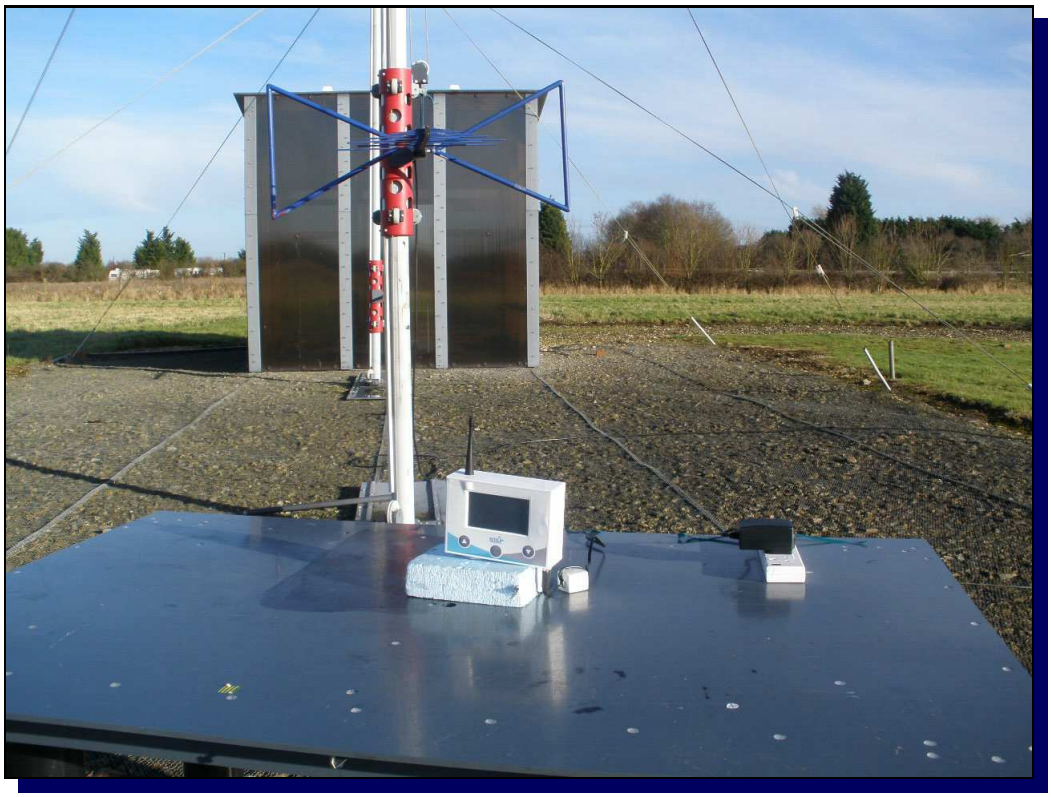


Photograph 8 Conducted Emissions - Controller - Back

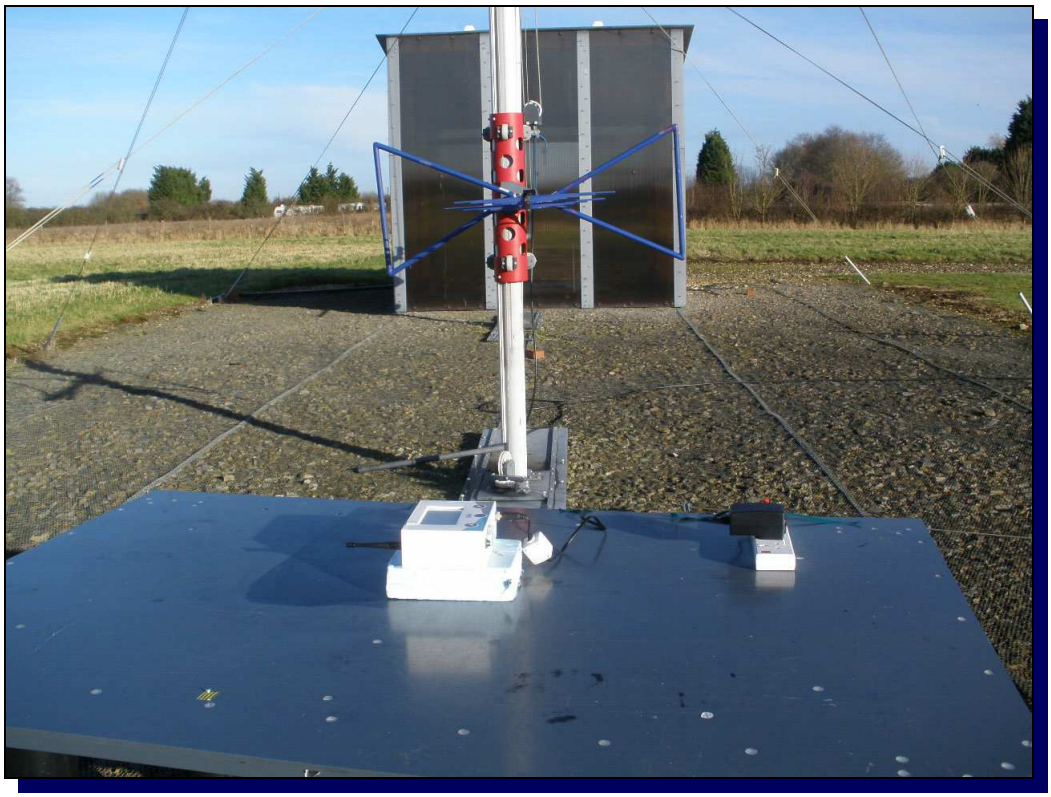
Photograph 9 Conducted Emissions - Repeater - Front



Photograph 10 Conducted Emissions - Repeater - Back

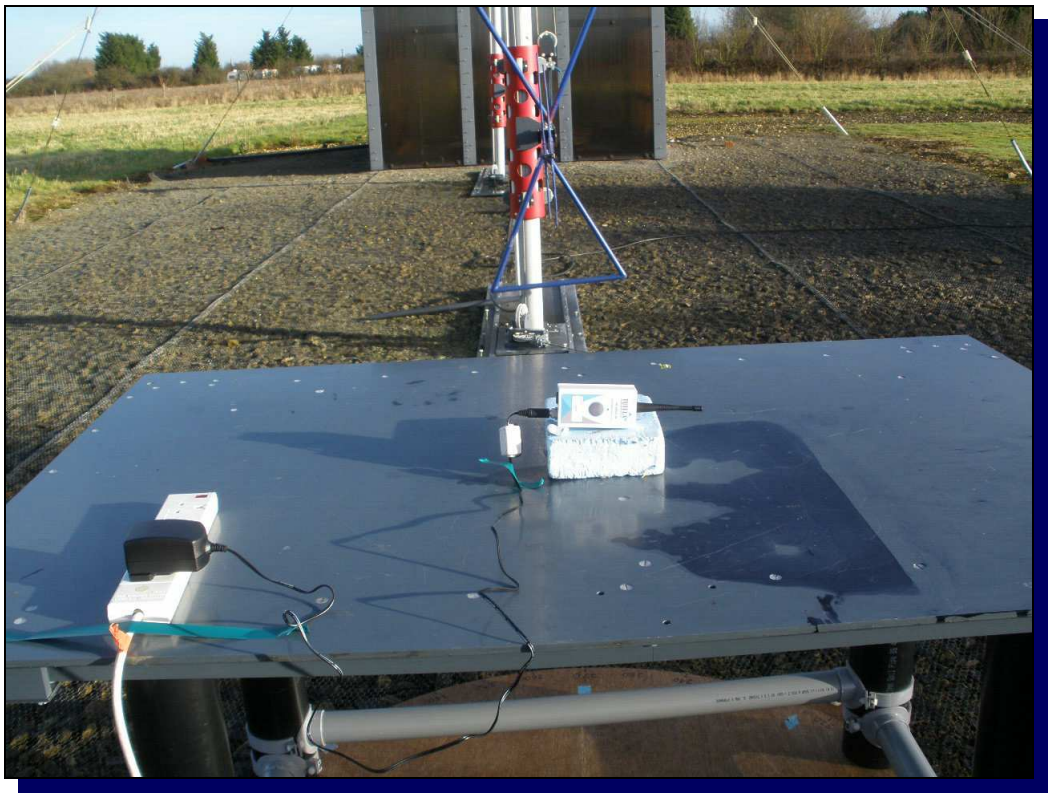


Photograph 11 Radiated Emissions - Controller - Upright

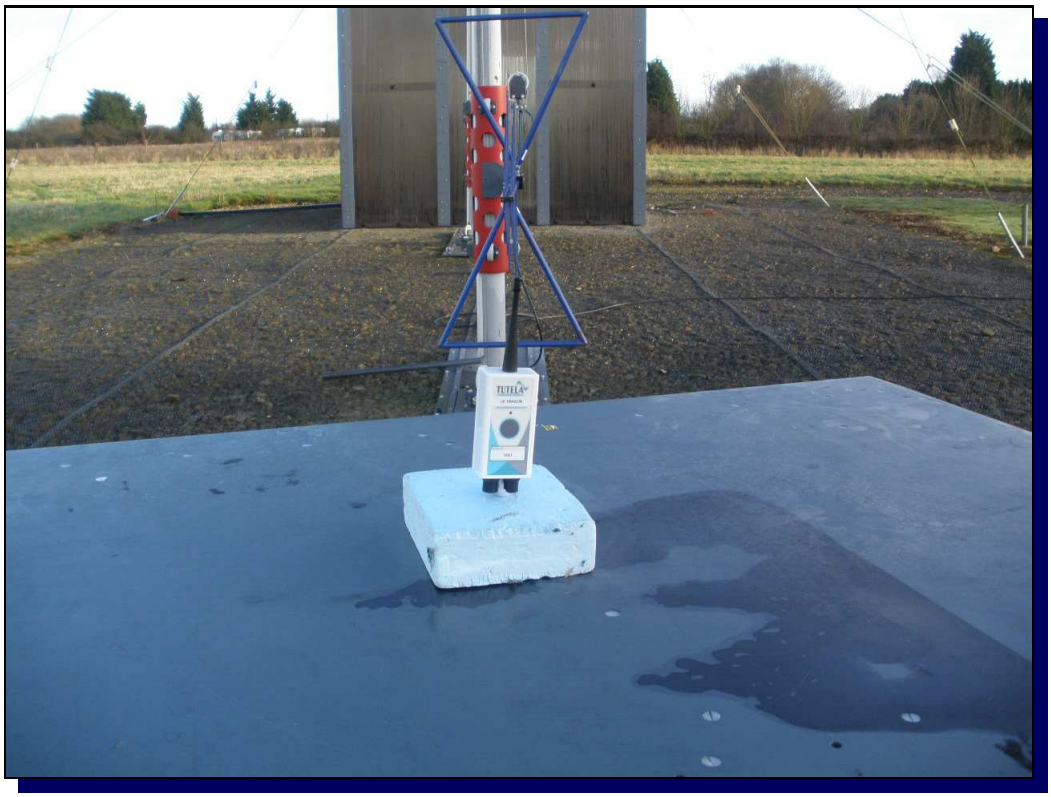


Photograph 12 Radiated Emissions - Controller - Flat

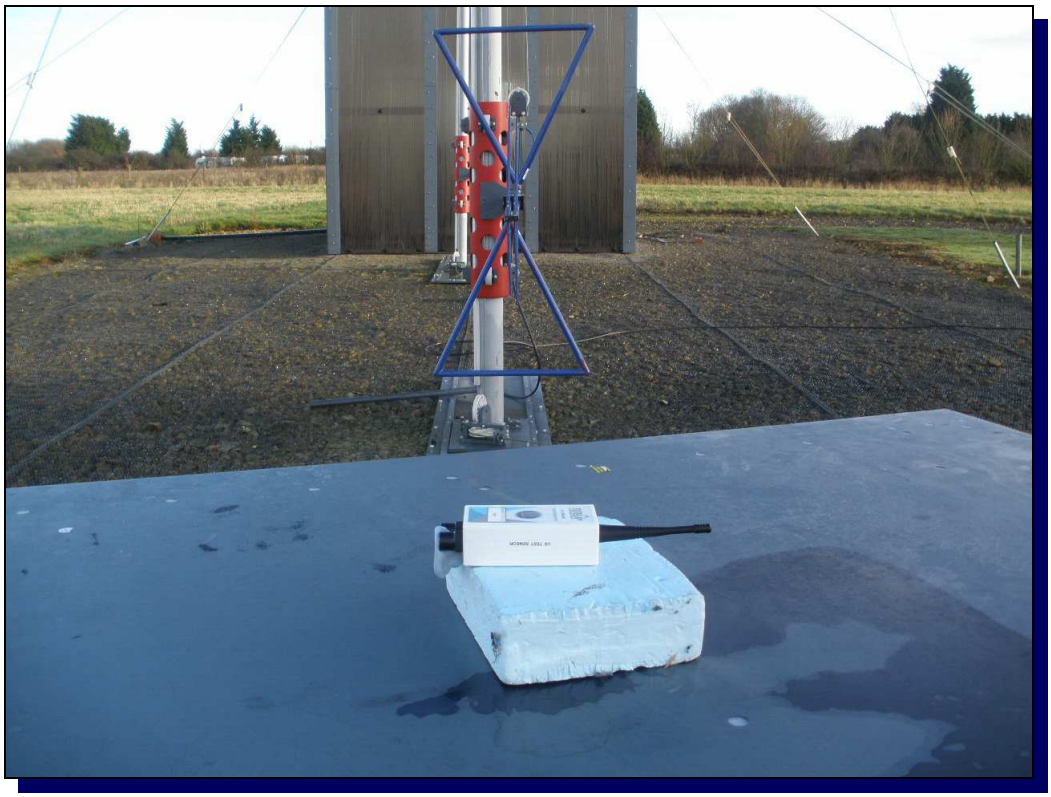
Photograph 13 Radiated Emissions - Repeater - Upright



Photograph 14 Radiated Emissions - Repeater - Flat

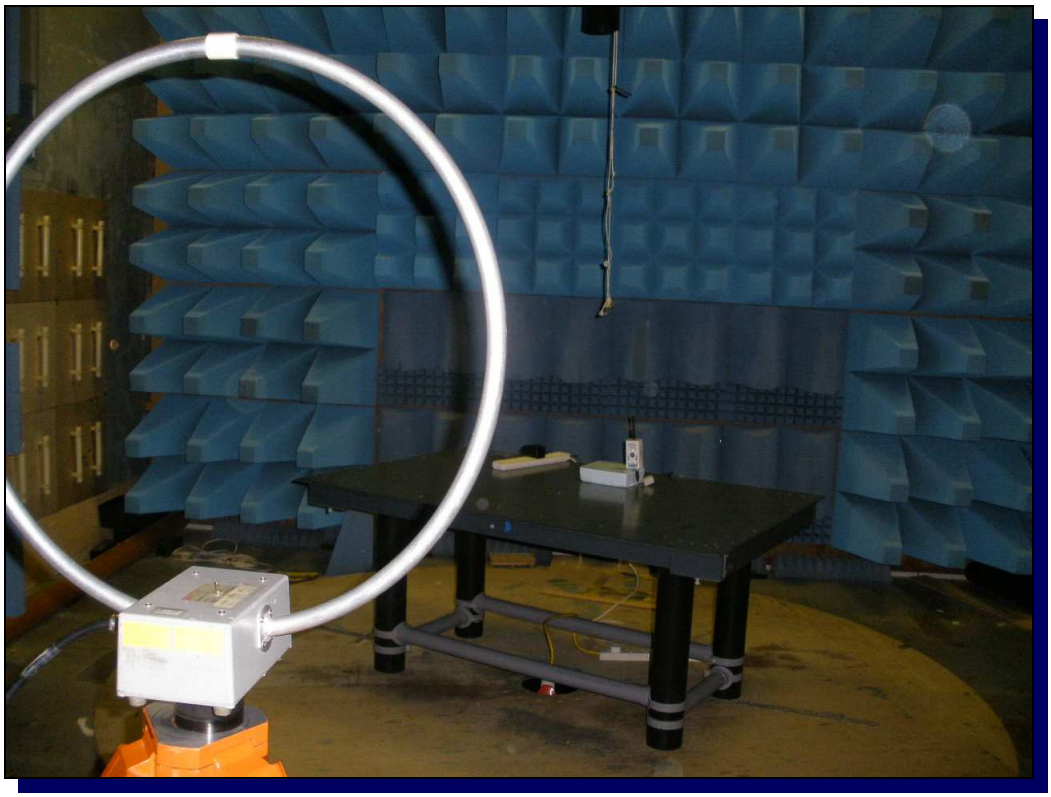


Photograph 15 Radiated Emissions - Data Transceiver - Upright

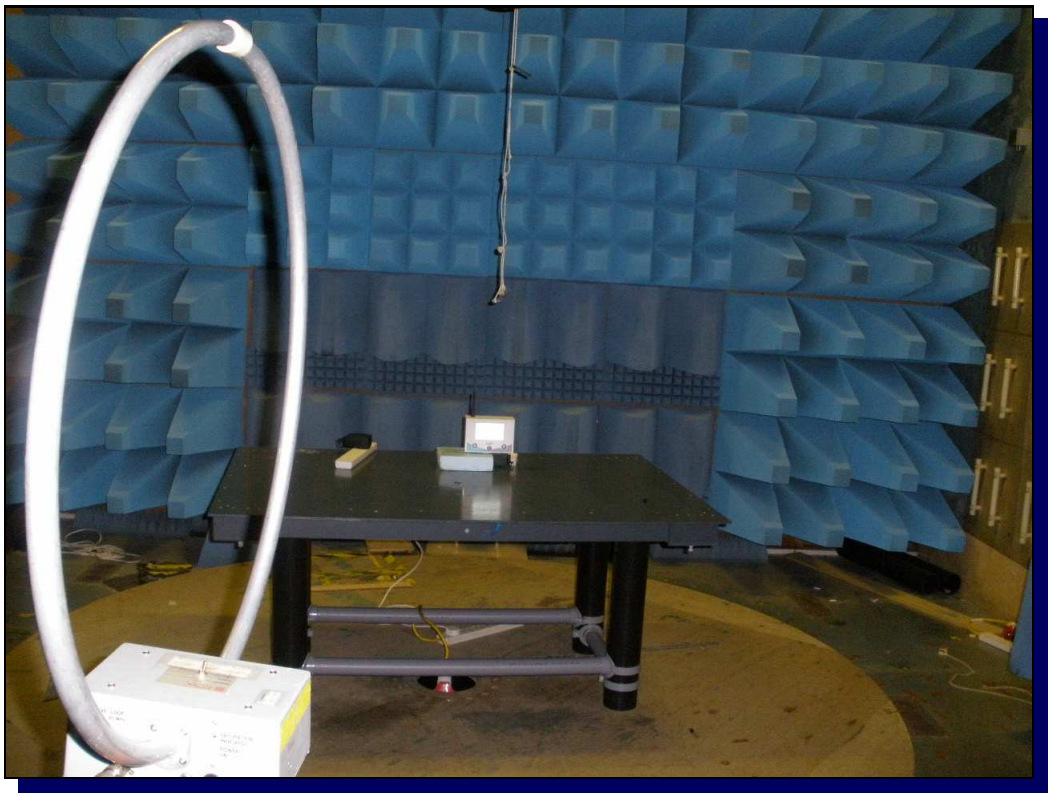


Photograph 16 Radiated Emissions - Data Transceiver - Flat

Photograph 17 Radiated Emissions - Below 30MHz - Data Transceiver



Photograph 18 Radiated Emissions - Below 30MHz - Repeater



Photograph 19 Radiated Emissions - Below 30MHz - Controller

8 Appendix A: Test Results

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

8.1 Conducted Emissions (Power) - Results - Controller

Factor Set 1: L1_12A AB002_CBL005_CBL039_12A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R10 L1

Conducted Emissions (Power)

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 31/12/2012 *Test Eng:* Dave Smith
Ports: ac power
Test: ANSI C63.4:2003 using limits of 15.207
Ports:
Test: using limits of

Plot	Op Mode	Mod State	Line (L/N)	Fact Set	Freq. MHz	Det qp/ av	Rec. Level dBuV	Corr'n Factor dB	Total Level dBuV	Limit 15.207 dBuV	Margin 15.207 dB	Notes
1	Tx	1	L	1	0.160	qp	37.5	10.0	47.5	65.5	17.9	
1	Tx	1	L	1	0.160	av	18.0	10.0	28.0	55.5	27.4	
1	Tx	1	L	1	0.355	qp	30.5	10.0	40.5	58.8	18.3	
1	Tx	1	L	1	0.355	av	24.4	10.0	34.4	48.8	14.5	
1	Tx	1	N	1	0.160	qp	35.0	10.0	45.0	65.5	20.5	
1	Tx	1	N	1	0.160	av	21.6	10.0	31.6	55.5	23.9	
1	Tx	1	N	1	0.200	qp	31.0	10.0	41.0	63.6	22.6	
1	Tx	1	N	1	0.200	av	18.5	10.0	28.5	53.6	25.1	

Results	**Minimum Margin**	**14.5 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in plots 12 and 13. Controller.

8.2 Conducted Emissions (Power) - Results - Repeater

Factor Set 1: L1_12A AB002_CBL005_CBL039_12A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R10 L1

Conducted Emissions (Power)

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 31/12/2012 *Test Eng:* Dave Smith
Ports: ac power
Test: ANSI C63.4:2003 using limits of 15.207
Ports:
Test: using limits of

Plot	Op Mode	Mod State	Line (L/N)	Fact Set	Freq. MHz	Det qp/ av	Rec. Level dBuV	Corr'n Factor dB	Total Level dBuV	Limit 15.209 dBuV	Margin 15.209 dB	Notes
1	Tx	1	L	1	0.170	qp	24.8	10.0	34.8	65.0	30.1	
1	Tx	1	L	1	0.170	av	-1.7	10.0	8.3	55.0	46.6	
1	Tx	1	N	1	0.175	qp	25.5	10.0	35.5	64.7	29.2	
1	Tx	1	N	1	0.175	av	-1.7	10.0	8.3	54.7	46.4	

Results	**Minimum Margin**	**29.2 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in plots 14 and 15. Repeater

8.3 Radiated Emissions Results - Below 30MHz

Factor Set 1:	A9_HI_V_09C CBL002_CBL069_10A - -
Factor Set 2:	- - - -
Factor Set 3:	- - - -
Test Equipment:	R8 A9

Radiated Emissions

Company:	Rotronics Systems Limited	*Product:*	MiWi Module - FRZ200-1000
Date:	21/12/12	*Test Eng:*	Dave Smith
Ports:			
Test:	ANSI C63.4:2003	using limits of	15.209
Ports:			
Test:	ANSI C63.4:2003	using limits of	RSS-210 A2.9

Notes	Comments and Observations

The lowest clock or signal used on the radio module is a crystal operating at 10MHz. Radiated emissions below 30MHz were therefore performed between 5MHz and 30MHz.

The results of scans over this frequency range for the three devices are shown in plots 16, 23 and 30.

The plots show the specified 30m limit extrapolated for a 3m distance using the default value of 40dB/decade.

Results of scans show no emissions within 40dB of the limit.

As all emissions were more than 20dB below the limit no specific frequency measurements are tabulated.

PASS - more than 20dB below limit.

8.4 Radiated Emissions Results - Data Transceiver - Carrier and Band Edges

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R8 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/12/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.249 & 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
19	Tx	1	3	1	908.000	V	8.6	29.8		38.4	46.0	7.6	
19	Tx	1	3	1	908.000	H	8.6	29.8		38.4	46.0	7.6	
19	Tx	1	3	1	928.000	V	8.7	30.6		39.3	46.0	6.7	
19	Tx	1	3	1	928.000	H	8.6	30.6		39.2	46.0	6.8	
19	Tx	1	3	1	915.000	V	60.0	29.9		89.9	94.0	4.1	#1
19	Tx	1	3	1	915.000	H	48.6	29.9		78.5	94.0	15.5	#1
19	Tx	1	3	1	915.000	V	48.5	29.9		78.4	94.0	15.6	#2
19	Tx	1	3	1	915.000	H	60.0	29.9		89.9	94.0	4.1	#2

Results	**Minimum Margin**	**4.1 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Data Transceiver: Results of scans shown in plot 19.
	RF level in software set to -15dB relative to maximum output.
#1	Upright
#2	Flat
	Measurements made with 120kHz bw QP detector.
	Note: the limits of FCC part 15.249 are the same as the limits of RSS-210 A2.9.

8.5 Radiated Emissions Results - Repeater - Carrier and Band Edges

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R8 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/12/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.249 & 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit FCC_B dBuV/m	Margin FCC_B dB	Notes
26	Tx	1	3	1	908.000	V	8.8	29.8		38.6	46.0	7.4	
26	Tx	1	3	1	908.000	H	8.8	29.8		38.6	46.0	7.4	
26	Tx	1	3	1	928.000	V	8.8	30.6		39.4	46.0	6.6	
26	Tx	1	3	1	928.000	H	8.8	30.6		39.4	46.0	6.6	
26	Tx	1	3	1	915.000	V	58.3	29.9		88.2	94.0	5.8	#1
26	Tx	1	3	1	915.000	H	48.7	29.9		78.6	94.0	15.4	#1
26	Tx	1	3	1	915.000	V	49.1	29.9		79.0	94.0	15.0	#2
26	Tx	1	3	1	915.000	H	58.4	29.9		88.3	94.0	5.7	#2

Results	**Minimum Margin**	**5.7 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Repeater: Results of scans shown in plot 26.
	RF level in software set to -15dB relative to maximum output.
#1	Upright
#2	Flat
	Measurements made with 120kHz bw QP detector.
	Note: the limits of FCC part 15.249 are the same as the limits of RSS-210 A2.9.

8.6 Radiated Emissions Results - Controller - Carrier and Band Edges

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R8 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/12/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.249 & 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.249 dBuV/m	Margin 15.249 dB	Notes
33	Tx	1	3	1	908.000	V	8.9	29.8		38.7	46.0	7.3	
33	Tx	1	3	1	908.000	H	8.8	29.8		38.6	46.0	7.4	
33	Tx	1	3	1	928.000	V	8.8	30.6		39.4	46.0	6.6	
33	Tx	1	3	1	928.000	H	8.7	30.6		39.3	46.0	6.7	
33	Tx	1	3	1	915.000	V	57.9	29.9		87.8	94.0	6.2	#1
33	Tx	1	3	1	915.000	H	49.1	29.9		79.0	94.0	15.0	#1
33	Tx	1	3	1	915.000	V	49.2	29.9		79.1	94.0	14.9	#2
33	Tx	1	3	1	915.000	H	55.7	29.9		85.6	94.0	8.4	#2

Results	**Minimum Margin**	**6.2 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Controller: Results of scans shown in plot 33.
	RF level in software set to -15dB relative to maximum output.
#1	Upright
#2	Flat
	Measurements made with 120kHz bw QP detector.
	Note: the limits of FCC part 15.249 are the same as the limits of RSS-210 A2.9.

8.7 Radiated Emissions Results - Data Transceiver - Spurious Below 1GHz

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R4 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 03/01/2013 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
18	Tx	1	3	1	835.000	V	4.8	28.6		33.4	46.0	12.6	
18	Tx	1	3	1	835.000	H	7.9	28.6		36.5	46.0	9.5	
18	Tx	1	3	1	855.000	V	11.4	29.3		40.7	46.0	5.3	
18	Tx	1	3	1	855.000	H	11.5	29.3		40.8	46.0	5.2	
18	Tx	1	3	1	865.000	V	8.7	29.4		38.1	46.0	7.9	
18	Tx	1	3	1	865.000	H	9.5	29.4		38.9	46.0	7.1	
18	Tx	1	3	1	935.000	V	4.3	31.3		35.6	46.0	10.4	
18	Tx	1	3	1	935.000	H	7.0	31.3		38.3	46.0	7.7	
18	Tx	1	3	1	965.000	V	7.0	31.5		38.5	54.0	15.5	
18	Tx	1	3	1	965.000	H	6.6	31.5		38.1	54.0	15.9	

Results	**Minimum Margin**	**5.2 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Data Transceiver. Results of scans shown in plots 17 and 18. Measurements made with 120kHz QP detector. Limits of 15.209 are shown since none of these emissions are harmonics of the fundamental. These limits are equivalent to the RSS-GEN general limits.

8.8 Radiated Emissions Results - Repeater - Spurious Below 1GHz

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R4 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 03/01/2013 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
25	Tx	1	3	1	439.460	V	5.9	20.5		26.4	46.0	19.6	
25	Tx	1	3	1	439.460	H	2.0	20.5		22.5	46.0	23.5	
25	Tx	1	3	1	427.550	V	3.4	20.4		23.8	46.0	22.2	
25	Tx	1	3	1	427.550	H	2.1	20.4		22.5	46.0	23.5	
25	Tx	1	3	1	835.000	V	8.4	28.6		37.0	46.0	9.0	
25	Tx	1	3	1	835.000	H	10.1	28.6		38.7	46.0	7.3	
25	Tx	1	3	1	855.000	V	9.2	29.3		38.5	46.0	7.5	
25	Tx	1	3	1	855.000	H	11.0	29.3		40.3	46.0	5.7	
25	Tx	1	3	1	865.000	V	10.7	29.4		40.1	46.0	5.9	
25	Tx	1	3	1	865.000	H	12.2	29.4		41.6	46.0	4.4	
25	Tx	1	3	1	935.000	V	5.2	31.3		36.5	46.0	9.5	
25	Tx	1	3	1	935.000	H	6.9	31.3		38.2	46.0	7.8	
25	Tx	1	3	1	965.000	V	8.9	31.5		40.4	54.0	13.6	
25	Tx	1	3	1	965.000	H	9.4	31.5		40.9	54.0	13.1	

Results	**Minimum Margin**	**4.4 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Repeater. Results of scans shown in plots 24 and 25. Measurements made with 120kHz QP detector. Limits of 15.209 are shown since none of these emissions are harmonics of the fundamental. These limits are equivalent to the RSS-GEN general limits.

8.9 Radiated Emissions Results - Controller - Spurious Below 1GHz

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R8 A5

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 16/12/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
32	Tx	1	3	1	254.660	V	21.1	15.6		36.7	46.0	9.3	
32	Tx	1	3	1	254.660	H	20.3	15.6		35.9	46.0	10.1	
32	Tx	1	3	1	306.000	V	25.2	16.3		41.5	46.0	4.5	
32	Tx	1	3	1	306.000	H	25.9	16.3		42.2	46.0	3.8	
32	Tx	1	3	1	360.000	V	21.2	17.8		39.0	46.0	7.0	
32	Tx	1	3	1	360.000	H	20.4	17.8		38.2	46.0	7.8	
32	Tx	1	3	1	369.000	V	17.6	18.2		35.8	46.0	10.2	
32	Tx	1	3	1	369.000	H	9.6	18.2		27.8	46.0	18.2	
32	Tx	1	3	1	423.000	V	21.3	20.4		41.7	46.0	4.3	
32	Tx	1	3	1	423.000	H	19.6	20.4		40.0	46.0	6.0	
32	Tx	1	3	1	585.000	V	17.2	24.3		41.5	46.0	4.5	
32	Tx	1	3	1	585.000	H	20.1	24.3		44.4	46.0	1.6	
32	Tx	1	3	1	603.000	V	14.2	24.6		38.8	46.0	7.2	
32	Tx	1	3	1	603.000	H	18.2	24.6		42.8	46.0	3.2	
32	Tx	1	3	1	819.000	V	11.3	28.2		39.5	46.0	6.5	
32	Tx	1	3	1	819.000	H	9.0	28.2		37.2	46.0	8.8	
32	Tx	1	3	1	855.000	V	14.3	29.3		43.6	46.0	2.4	
32	Tx	1	3	1	855.000	H	4.2	29.3		33.5	46.0	12.5	

Results	**Minimum Margin**	**1.6 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Controller. Results of scans shown in plots 31 and 32. Measurements made with 120kHz QP detector. Limits of 15.209 are shown since none of these emissions are harmonics of the fundamental. These limits are equivalent to the RSS-GEN general limits.

8.10 Radiated Emissions Results - Data Transceiver - Spurious Above 1GHz

Factor Set 1: A19_3m_12B PRE14_12A RFF22_12A CBL002_CBL003_09C 1 m cable
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9 A19 PRE10 PRE14 RFF22

Radiated Emissions

Company: Rotronics Systems Limited *Product:* MiWi Module - FRZ200-1000
Date: 21/12/2012 *Test Eng:* Dave Smith
Ports:
Test: ANSI C63.4:2003 using limits of 15.209
Ports:
Test: ANSI C63.4:2003 using limits of RSS-210 A2.9

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
	Peak readings:												
20	Tx	1	3	1	1830.000	V	60.6	-2.3		58.3	74.0	15.7	U
20	Tx	1	3	1	1830.000	H	55.7	-2.3		53.4	74.0	20.6	U
20	Tx	1	3	1	1830.000	V	54.5	-2.3		52.2	74.0	21.8	F
20	Tx	1	3	1	1830.000	H	53.4	-2.3		51.1	74.0	22.9	F
21	Tx	1	3	1	2745.000	V	46.7	1.0		47.7	74.0	26.3	U
21	Tx	1	3	1	2745.000	H	49.1	1.0		50.1	74.0	23.9	U
21	Tx	1	3	1	2745.000	V	46.6	1.0		47.6	74.0	26.4	F
21	Tx	1	3	1	2745.000	H	54.0	1.0		54.9	74.0	19.1	F
	Readings adjusted for average based on 6msec pulse in any 100msec:												
20	Tx	1	3	1	1830.000	V	60.6	-2.3	-24.3	34.0	54.0	20.0	U
20	Tx	1	3	1	1830.000	H	55.7	-2.3	-24.3	29.1	54.0	24.9	U
20	Tx	1	3	1	1830.000	V	54.5	-2.3	-24.3	27.9	54.0	26.1	F
20	Tx	1	3	1	1830.000	H	53.4	-2.3	-24.3	26.8	54.0	27.2	F
21	Tx	1	3	1	2745.000	V	46.7	1.0	-24.3	23.4	54.0	30.6	U
21	Tx	1	3	1	2745.000	H	49.1	1.0	-24.3	25.8	54.0	28.2	U
21	Tx	1	3	1	2745.000	V	46.6	1.0	-24.3	23.3	54.0	30.7	F
21	Tx	1	3	1	2745.000	H	54.0	1.0	-24.3	30.6	54.0	23.4	F

Results	**Minimum Margin**	**15.7 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Data Transceiver. Results of scans shown in plots 20 to 22. Prescans were performed at a distance of 1.5m. Final measurements shown above were performed at 3m. Peak measurements were made (with 1MHz rbw). Peak measurements must not be more than 20dB above the limits of part 15.249. Average measurements were calculated based on the maximum duty cycle in any 100msec period. These calculations are shown in plots 9 and 10 and the additional correction is shown as the 2nd correction factor in this table.

8.11 Radiated Emissions Results - Repeater - Spurious Above 1GHz

Factor Set 1:	A19_3m_12B PRE14_12A RFF22_12A CBL002_CBL003_09C	1 m cable
Factor Set 2:	- - - -	
Factor Set 3:	- - - -	
Test Equipment:	R9 A19 PRE10 PRE14 RFF22	

Radiated Emissions

Company:	Rotronics Systems Limited	*Product:*	MiWi Module - FRZ200-1000
Date:	21/12/2012	*Test Eng:*	Dave Smith
Ports:			
Test:	ANSI C63.4:2003 using limits of	15.209	
Ports:			
Test:	ANSI C63.4:2003 using limits of	RSS-210 A2.9	

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
	Peak readings:												
27	Tx	1	3	1	1830.000	V	63.7	-2.3		61.3	74.0	12.7	U
27	Tx	1	3	1	1830.000	H	56.1	-2.3		53.8	74.0	20.2	U
27	Tx	1	3	1	1830.000	V	53.0	-2.3		50.7	74.0	23.3	F
27	Tx	1	3	1	1830.000	H	59.5	-2.3		57.1	74.0	16.9	F
28	Tx	1	3	1	2745.000	V	48.5	1.0		49.5	74.0	24.5	U
28	Tx	1	3	1	2745.000	H	49.2	1.0		50.1	74.0	23.9	U
28	Tx	1	3	1	2745.000	V	46.8	1.0		47.8	74.0	26.2	F
28	Tx	1	3	1	2745.000	H	56.7	1.0		57.6	74.0	16.4	F
	Readings adjusted for average based on 6msec pulse in any 100msec:												
27	Tx	1	3	1	1830.000	V	63.7	-2.3	-24.3	37.0	54.0	17.0	U
27	Tx	1	3	1	1830.000	H	56.1	-2.3	-24.3	29.5	54.0	24.5	U
27	Tx	1	3	1	1830.000	V	53.0	-2.3	-24.3	26.4	54.0	27.6	F
27	Tx	1	3	1	1830.000	H	59.5	-2.3	-24.3	32.8	54.0	21.2	F
28	Tx	1	3	1	2745.000	V	48.5	1.0	-24.3	25.2	54.0	28.8	U
28	Tx	1	3	1	2745.000	H	49.2	1.0	-24.3	25.8	54.0	28.2	U
28	Tx	1	3	1	2745.000	V	46.8	1.0	-24.3	23.5	54.0	30.5	F
28	Tx	1	3	1	2745.000	H	56.7	1.0	-24.3	33.3	54.0	20.7	F

Results	**Minimum Margin**	**12.7 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Repeater. Results of scans shown in plots 27 to 29. Prescans were performed at a distance of 1.5m. Final measurements shown above were performed at 3m. Peak measurements were made (with 1MHz rbw). Peak measurements must not be more than 20dB above the limits of part 15.249. Average measurements were calculated based on the maximum duty cycle in any 100msec period. These calculations are shown in plots 9 and 10 and the additional correction is shown as the 2nd correction factor in this table.

8.12 Radiated Emissions Results - Controller - Spurious Above 1GHz

Factor Set 1:	A19_3m_12B PRE14_12A RFF22_12A CBL002_CBL003_09C	1 m cable
Factor Set 2:	- - - -	
Factor Set 3:	- - - -	
Test Equipment:	R9 A19 PRE10 PRE14 RFF22	

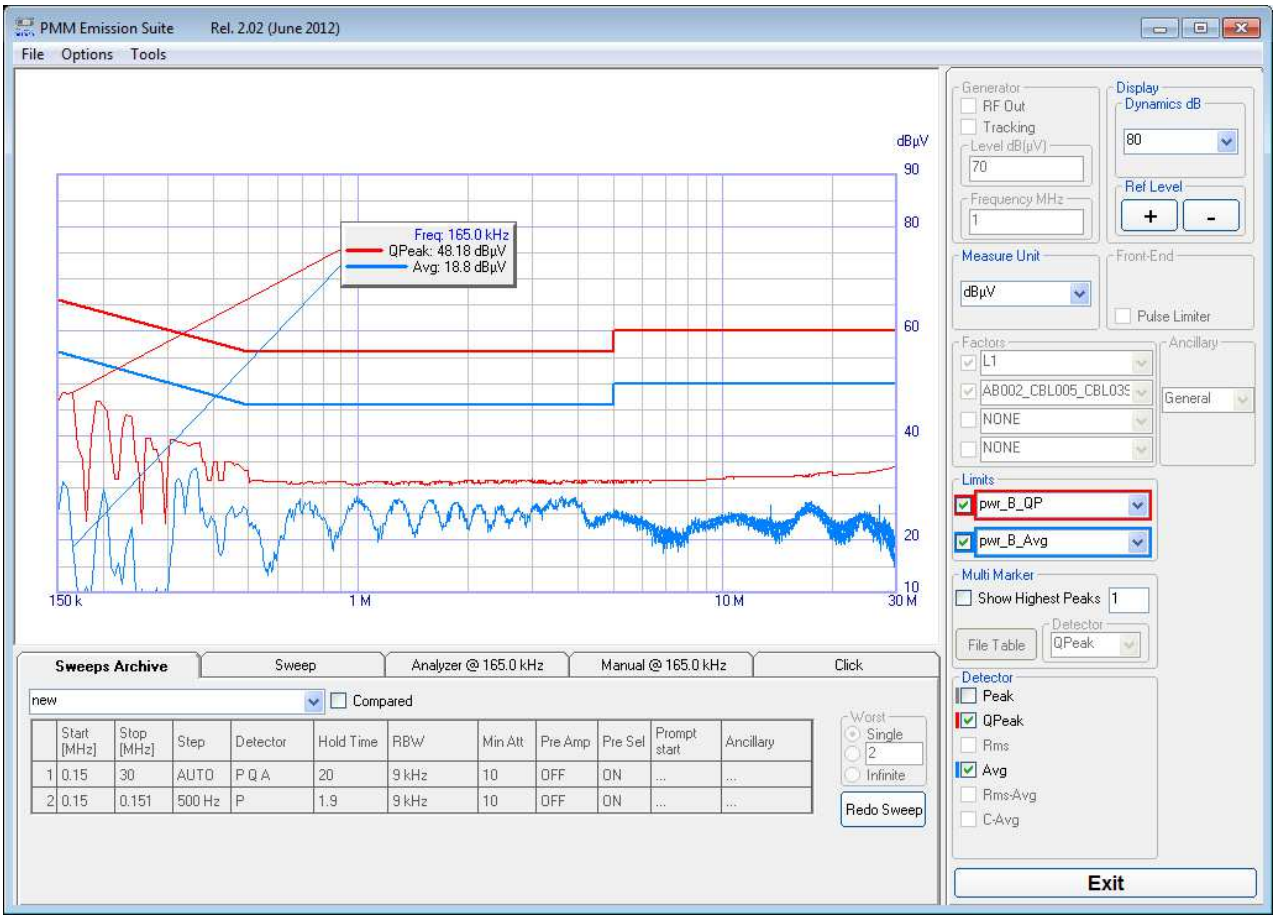
Radiated Emissions

Company:	Rotronics Systems Limited	*Product:*	MiWi Module - FRZ200-1000
Date:	21/12/2012	*Test Eng:*	Dave Smith
Ports:			
Test:	ANSI C63.4:2003 using limits of	15.209	
Ports:			
Test:	ANSI C63.4:2003 using limits of	RSS-210 A2.9	

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit 15.209 dBuV/m	Margin 15.209 dB	Notes
	Peak readings:												
34	Tx	1	3	1	1830.000	V	57.5	-2.3		55.2	74.0	18.8	U
34	Tx	1	3	1	1830.000	H	49.7	-2.3		47.4	74.0	26.6	U
34	Tx	1	3	1	1830.000	V	52.7	-2.3		50.4	74.0	23.6	F
34	Tx	1	3	1	1830.000	H	53.3	-2.3		51.0	74.0	23.0	F
35	Tx	1	3	1	2745.000	V	45.9	1.0		46.9	74.0	27.1	U
35	Tx	1	3	1	2745.000	H	45.6	1.0		46.5	74.0	27.5	U
35	Tx	1	3	1	2745.000	V	44.8	1.0		45.8	74.0	28.2	F
35	Tx	1	3	1	2745.000	H	51.3	1.0		52.3	74.0	21.7	F
	Readings adjusted for average based on 6msec pulse in any 100msec:												
34	Tx	1	3	1	1830.000	V	57.5	-2.3	-24.3	30.9	54.0	23.1	U
34	Tx	1	3	1	1830.000	H	49.7	-2.3	-24.3	23.1	54.0	30.9	U
34	Tx	1	3	1	1830.000	V	52.7	-2.3	-24.3	26.1	54.0	27.9	F
34	Tx	1	3	1	1830.000	H	53.3	-2.3	-24.3	26.7	54.0	27.3	F
35	Tx	1	3	1	2745.000	V	45.9	1.0	-24.3	22.6	54.0	31.4	U
35	Tx	1	3	1	2745.000	H	45.6	1.0	-24.3	22.2	54.0	31.8	U
35	Tx	1	3	1	2745.000	V	44.8	1.0	-24.3	21.5	54.0	32.5	F
35	Tx	1	3	1	2745.000	H	51.3	1.0	-24.3	28.0	54.0	26.0	F

Results	**Minimum Margin**	**18.8**	**dB**
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Controller. Results of scans shown in plots 34 to 36. Prescans were performed at a distance of 1.5m. Final measurements shown above were performed at 3m. Peak measurements were made (with 1MHz rbw). Peak measurements must not be more than 20dB above the limits of part 15.249. Average measurements were calculated based on the maximum duty cycle in any 100msec period. These calculations are shown in plots 9 and 10 and the additional correction is shown as the 2nd correction factor in this table.

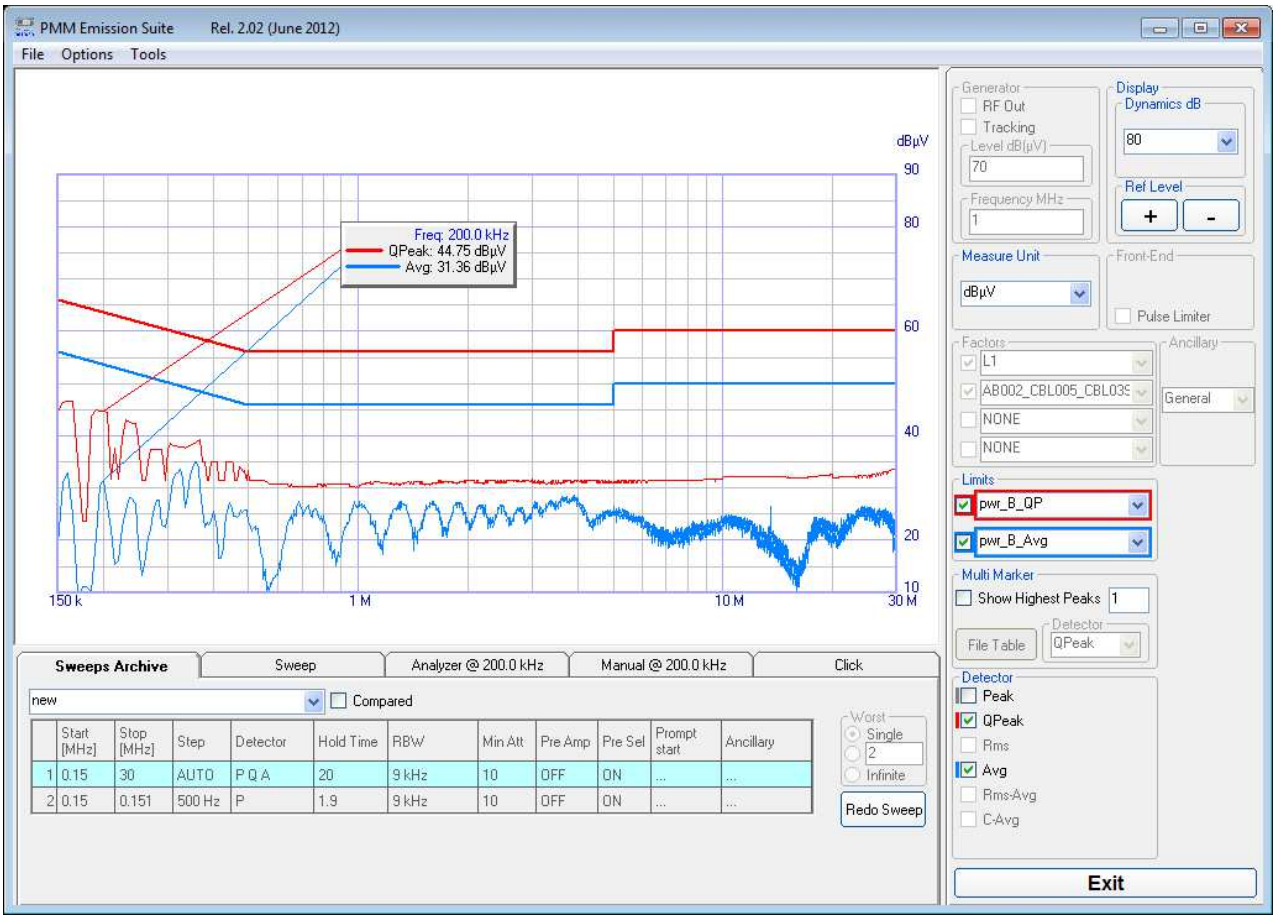


PLOT 12 Conducted Emissions - Controller - Live

Company:	Rotronics	Product:	MiWi
Date:	31 Dec 12	Test Engineer:	Dave Smith
Test:	FCC Part 15	Limit:	FCC (B) QP + Avg

Notes:
Controller
115V. Transmitting once per second.

Line:	Live	Attenuator:	10dB PAD	Operating Mode:	Tx
Detector:	Quasi/Avg			Mod. State:	1
LISN:	EMCO	Filename:	C2C3148D.png		

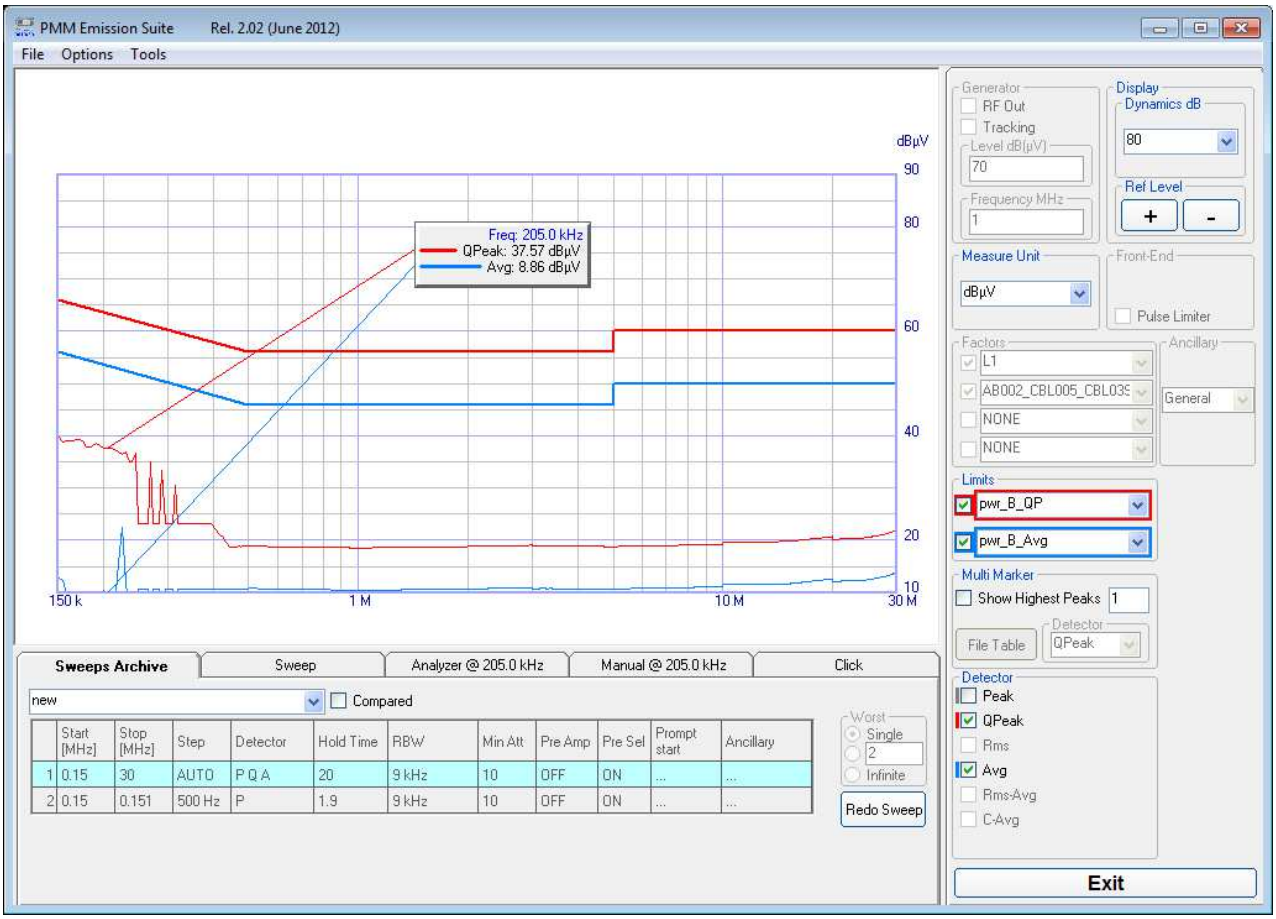


PLOT 13 Conducted Emissions - Controller - Neutral

Company:	Rotronics	Product:	MiWi
Date:	31 Dec 12	Test Engineer:	Dave Smith
Test:	FCC Part 15	Limit:	FCC (B) QP + Avg

Notes:
Controller
115V. Transmitting once per second.

Line:	Neutral	Attenuator:	10dB PAD	Operating Mode:	Tx
Detector:	Quasi/Avg			Mod. State:	1
LISN:	EMCO	Filename:	C2C314A0.png		

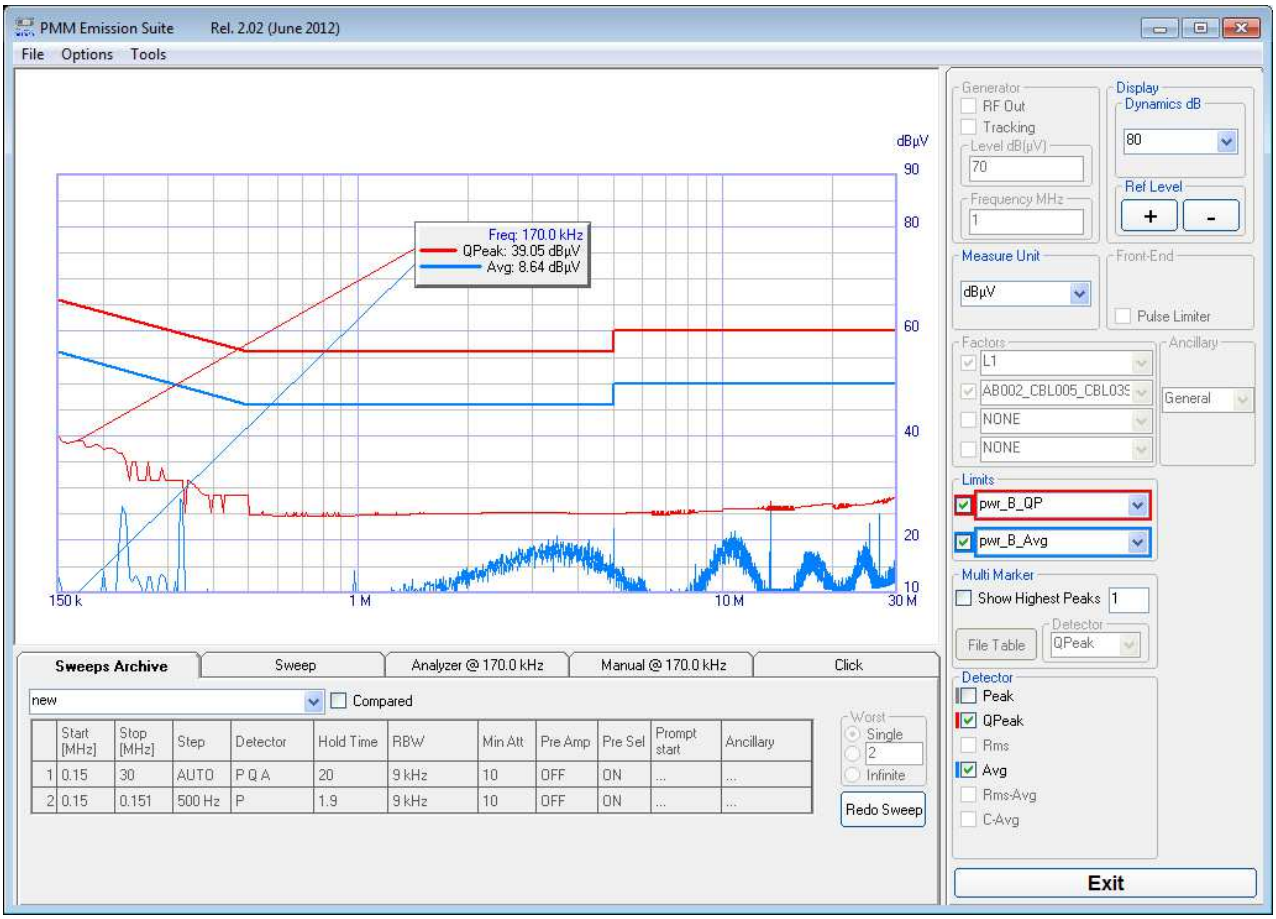


PLOT 14 Conducted Emissions - Repeater - Neutral

Company:	Rotronics	Product:	MiWi
Date:	31 Dec 12	Test Engineer:	Dave Smith
Test:	FCC Part 15	Limit:	FCC (B) QP + Avg

Notes:
Repeater
115V. Transmitting once per second.

Line:	Neutral	Attenuator:	10dB PAD	Operating Mode:	Tx
Detector:	Quasi/Avg			Mod. State:	1
LISN:	EMCO	Filename:	C2C314BF.png		

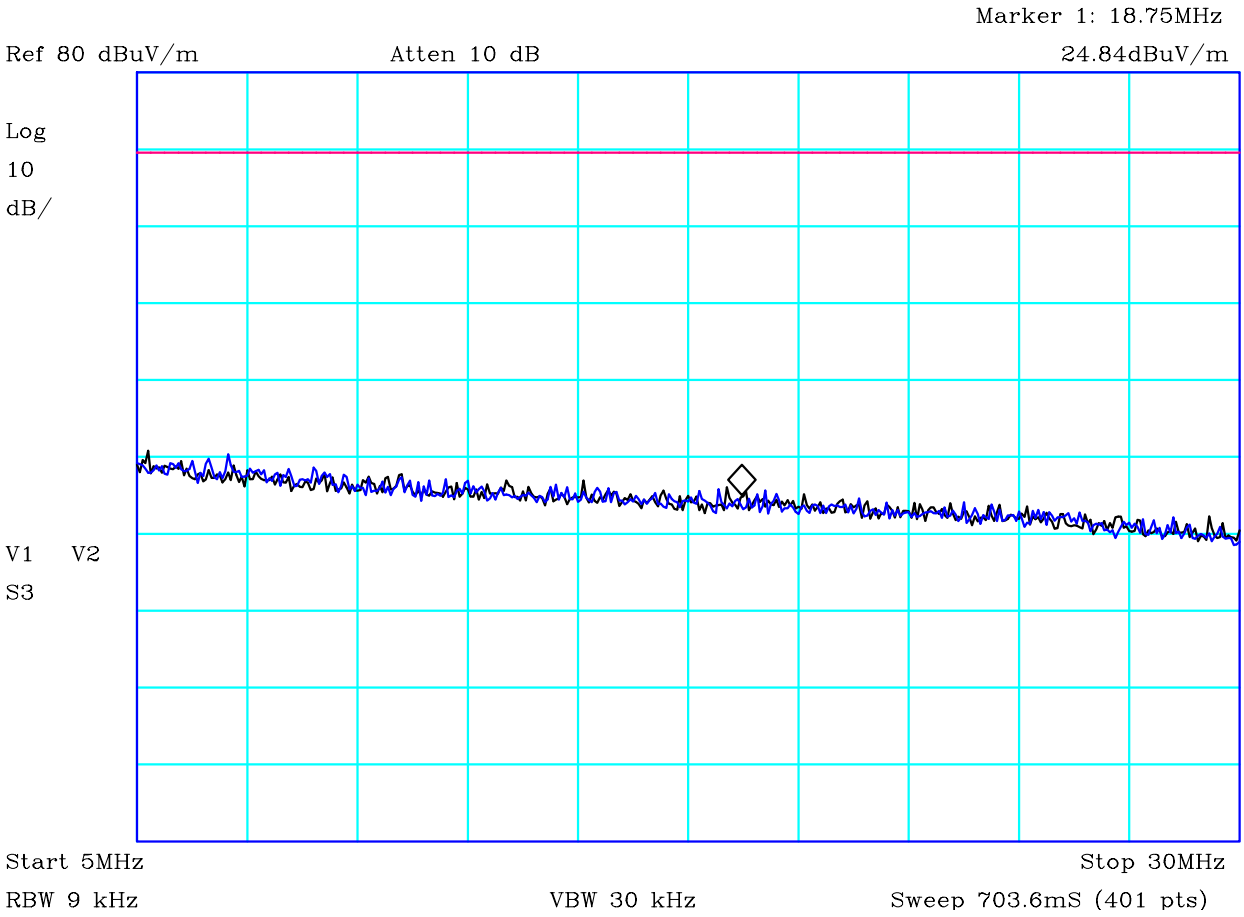


PLOT 15 Conducted Emissions - Repeater - Live

Company:	Rotronics	Product:	MiWi
Date:	31 Dec 12	Test Engineer:	Dave Smith
Test:	FCC Part 15	Limit:	FCC (B) QP + Avg

Notes:
Repeater
115V. Transmitting once per second.

Line:	Live	Attenuator:	10dB PAD	Operating Mode:	Tx
Detector:	Quasi/Avg			Mod. State:	1
LISN:	EMCO	Filename:	C2C314D0.png		



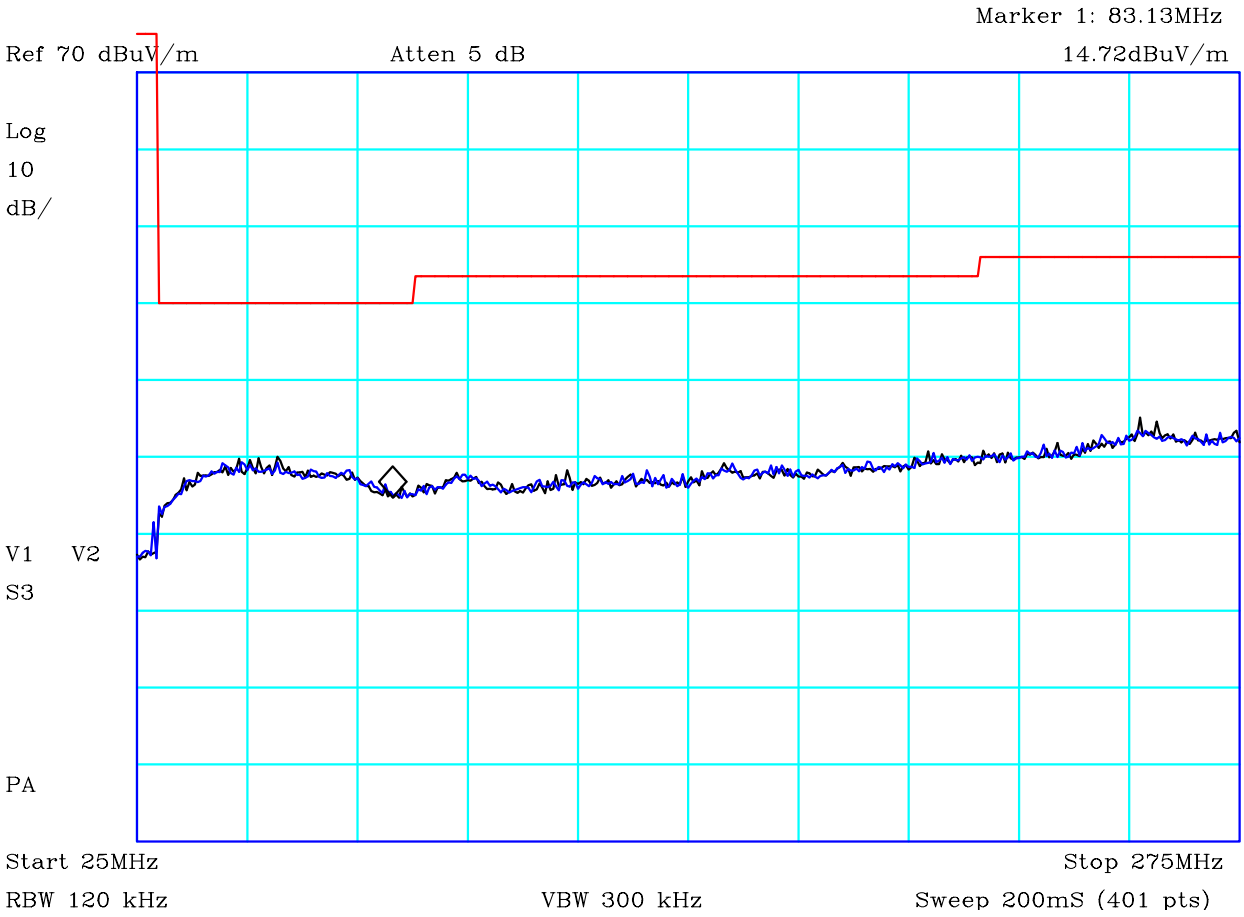
CF1:A9_HI_V_090306 CF2:CBL002_CBL069_100809

PLOT 16 Radiated Emissions - Data Transceiver - 5MHz to 30MHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	Part 15.209	Limit2:	
Limit3:		Limit4:	

Black:orthagonal, Blue: parallel
Data Transceiver
Limits extrapolated using 40dB/decade for 3m distance.

Facility:	Anech_1	Height	1m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B2180D		



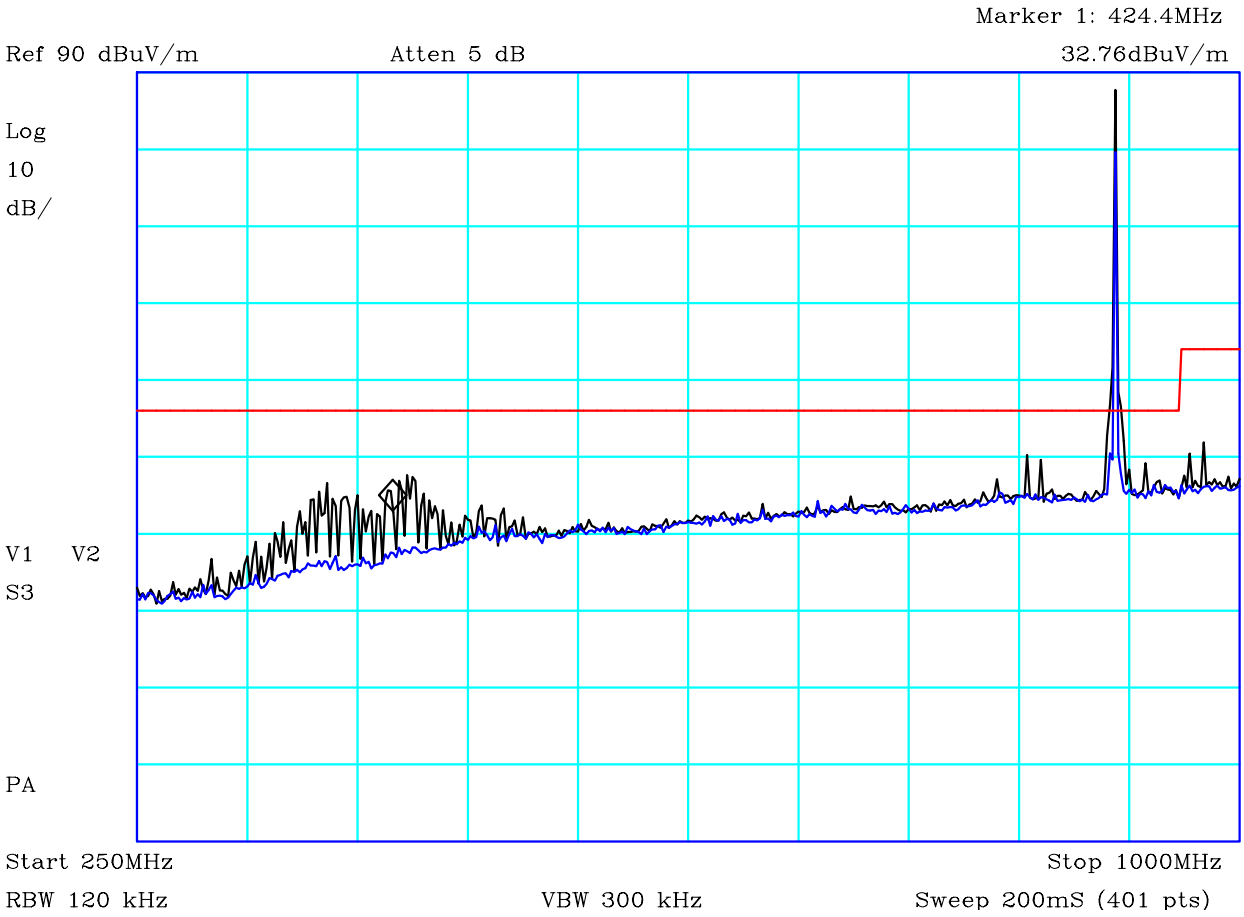
CF1:A15_120112 CF2:CBL002_CBL069_100809

PLOT 17 Radiated Emissions - Data Transceiver - 25MHz to 275MHz

Company:	Rotronics	Product:	MiWi
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: Vertical, Blue: Horizontal
Data Transceiver

Facility:	Anech_1	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B14564		



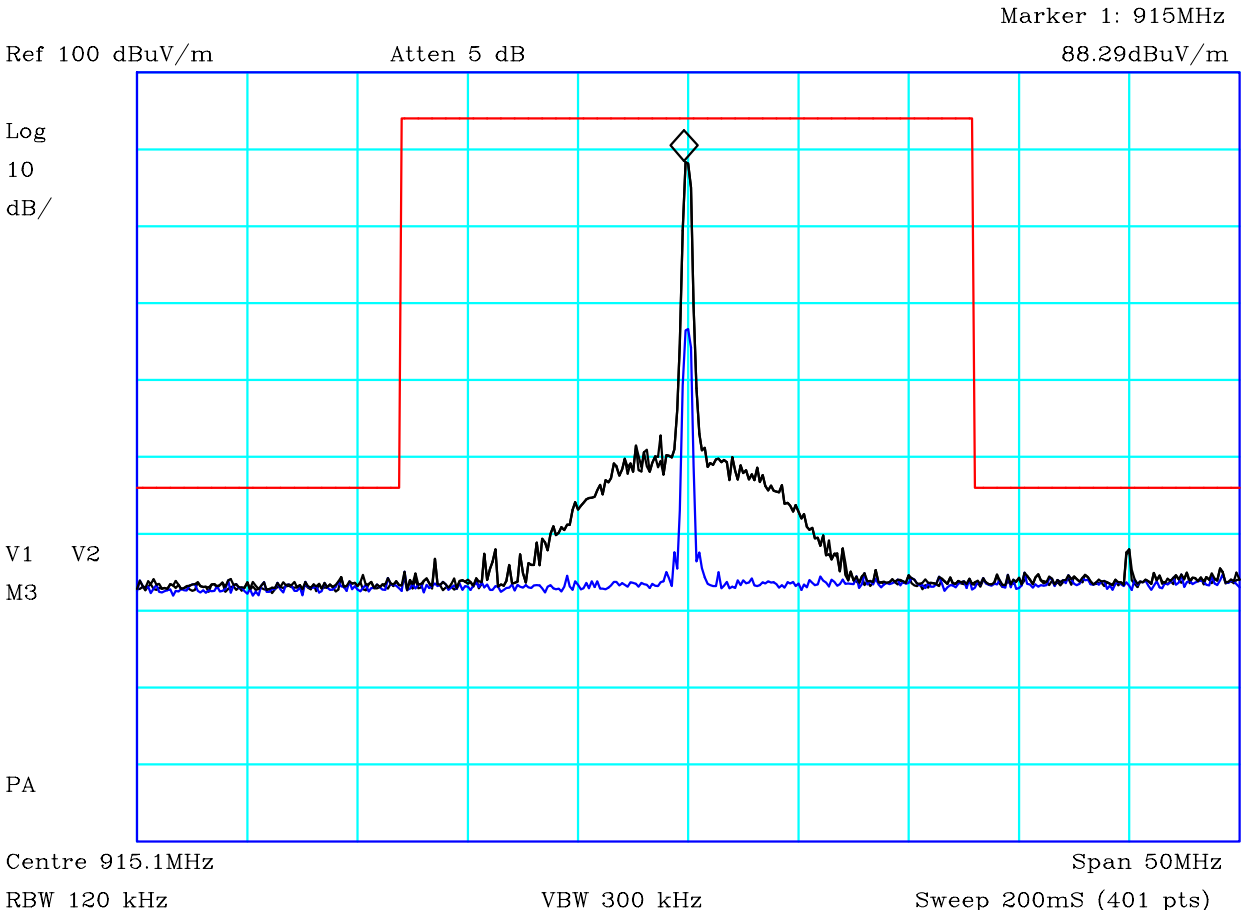
CF1:A15_120112 CF2:CBL002_CBL069_100809

PLOT 18 Radiated Emissions - Data Transceiver - 250MHz to 1GHz

Company:	Rotronics	Product:	MiWi
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: Vertical, Blue: Horizontal
Data Transceiver

Facility:	Anech_1	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B14561		



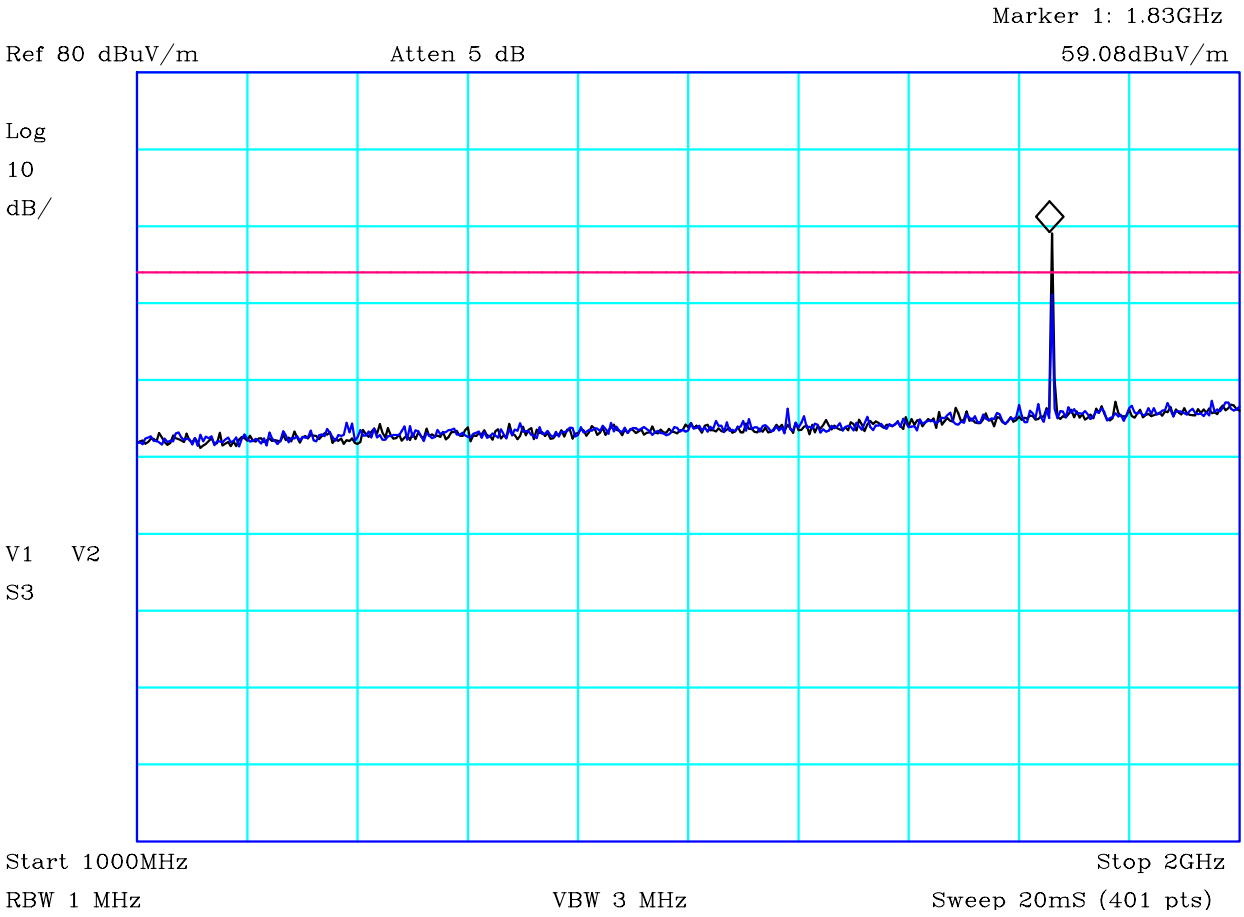
CF1:A15_120112 CF2:CBL002_CBL003_090306

PLOT 19 Radiated Emissions - Data Transceiver - Band Edges

Company:	Rotronics	Product:	MiWi Transmitter
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Data Transceiver

Facility:	Anech_1	Height	1.5m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B1457C		



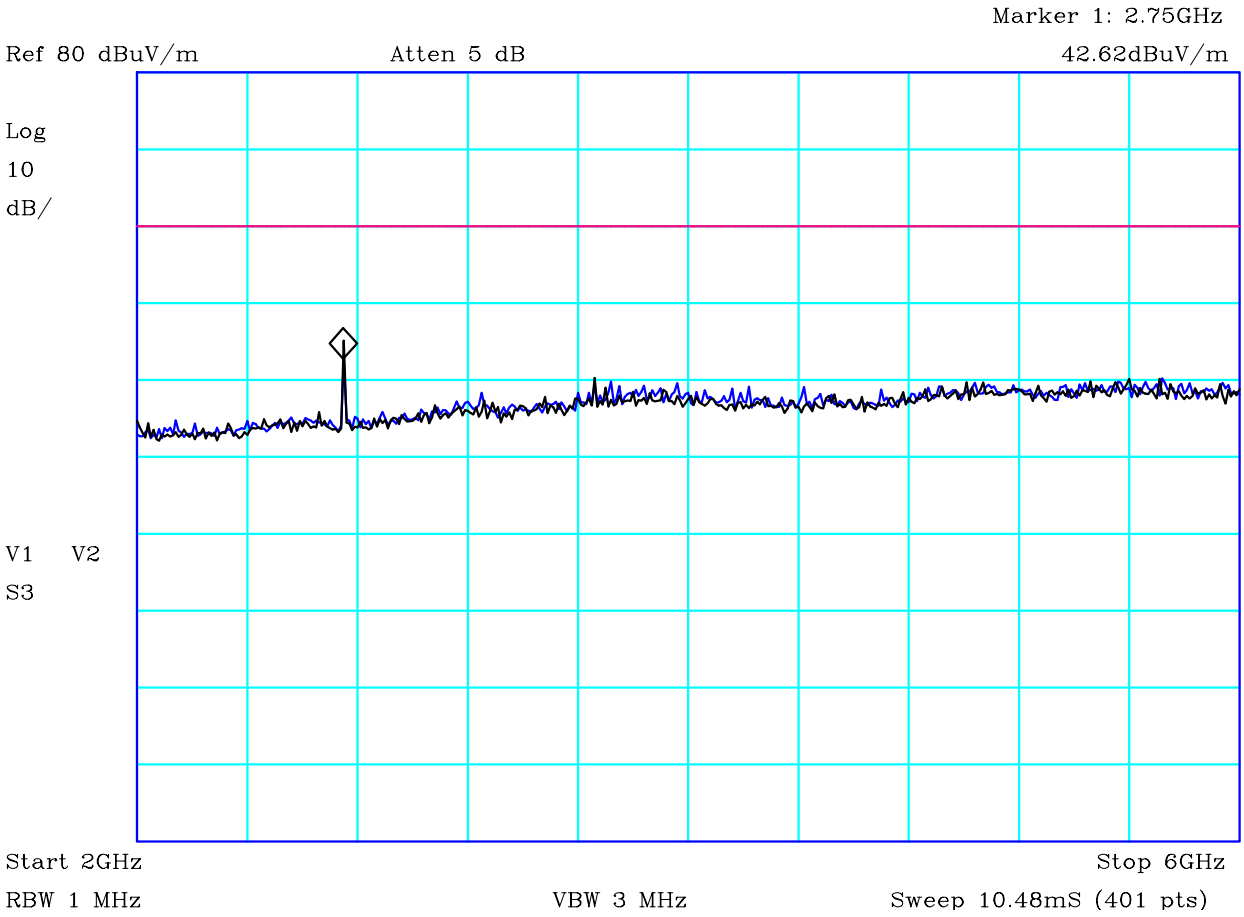
CF1:A19_3m_120807 CF2:CBL002_CBL069_100809 CF3:PRE14_120627

PLOT 20 Radiated Emissions - Data Transceiver - 1GHz to 2GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Data Transceiver.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H30014D9		



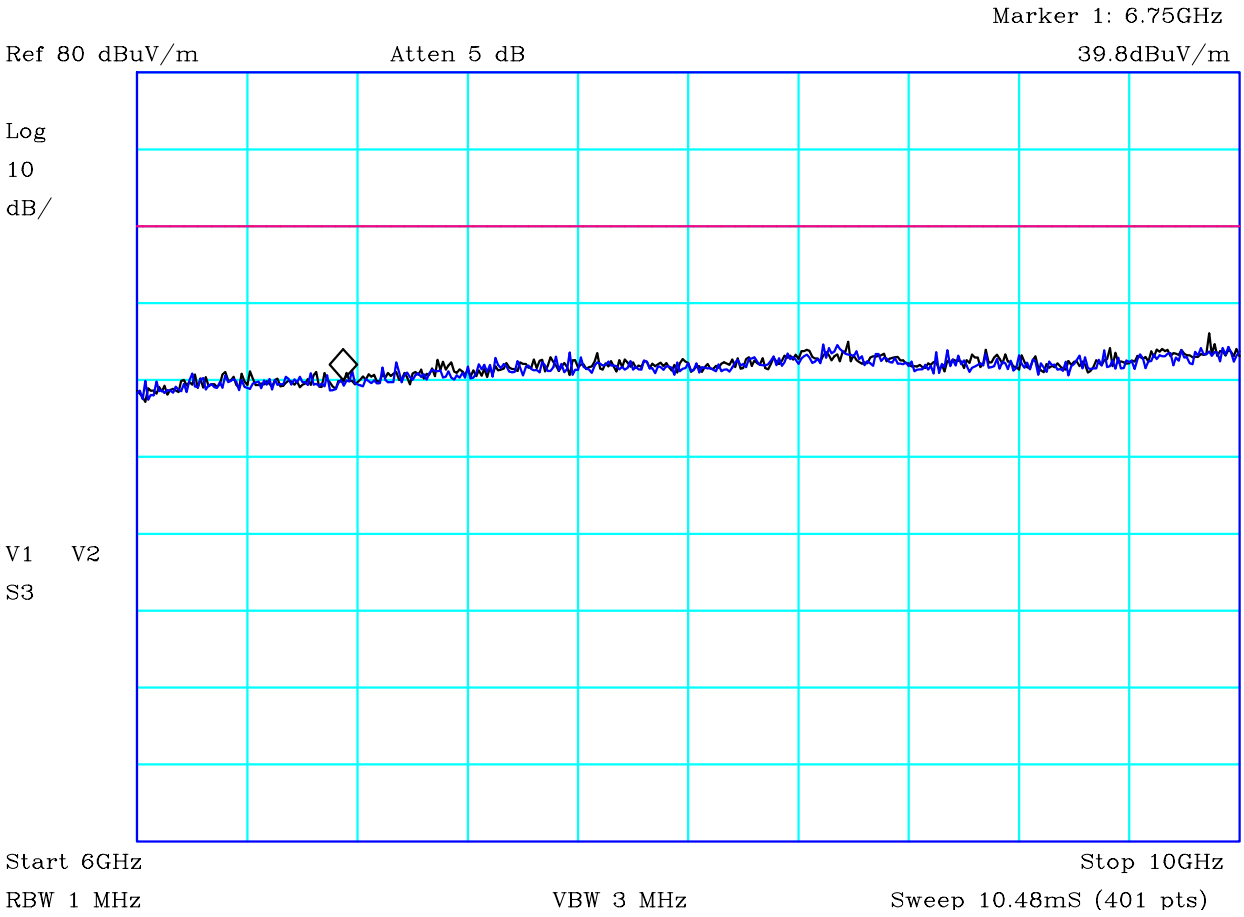
CF1:A19_3m_120807 CF2:CBL071 CF3:PRE10_120627 CF4:RFF22_120716

PLOT 21 Radiated Emissions - Data Transceiver - 2GHz to 6GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Data Transceiver

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B21795		



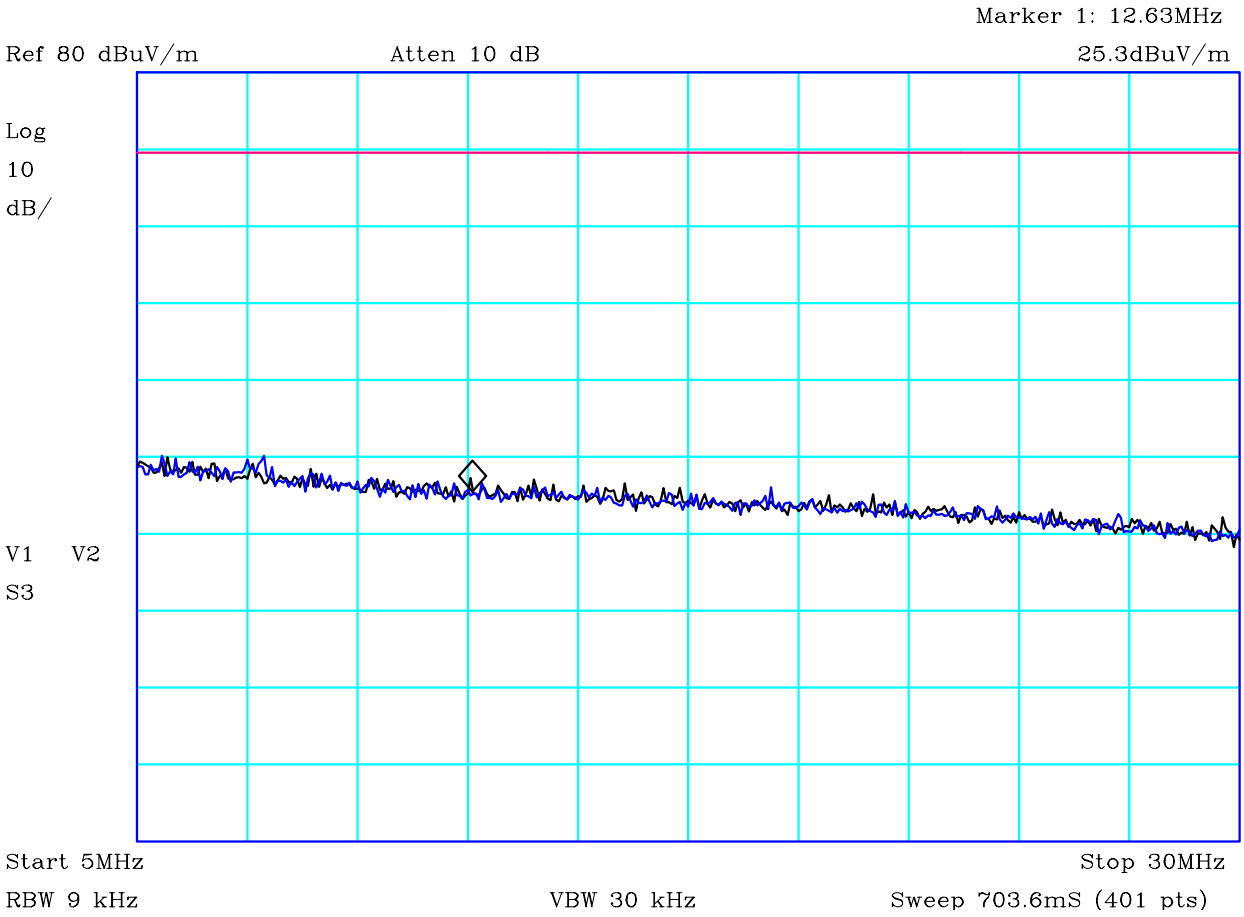
CF1:A19_3m_120807 CF2:CBL071 CF3:PRE10_120627 CF4:RFF22_120716

PLOT 22 Radiated Emissions - Data Transceiver - 6GHz to 10GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Data Transceiver

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B2179B		



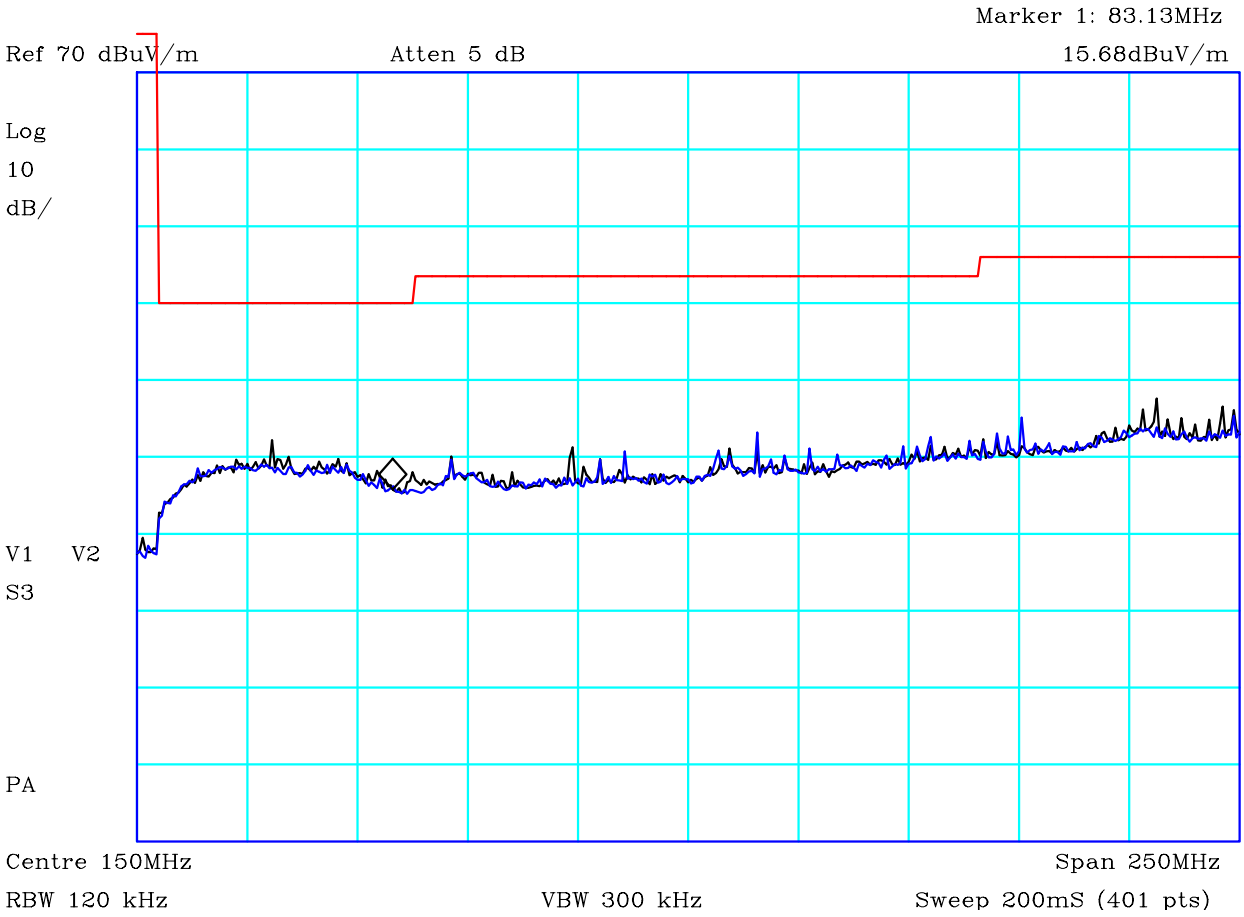
CF1:A9_HI_V_090306 CF2:CBL002_CBL069_100809

PLOT 23 Radiated Emissions - Repeater - 5MHz to 30MHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	Part 15.209	Limit2:	
Limit3:		Limit4:	

Black:orthagonal, Blue: parallel
Repeater
Limits extrapolated using 40dB/decade for 3m distance.

Facility:	Anech_1	Height	1m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B217EE		



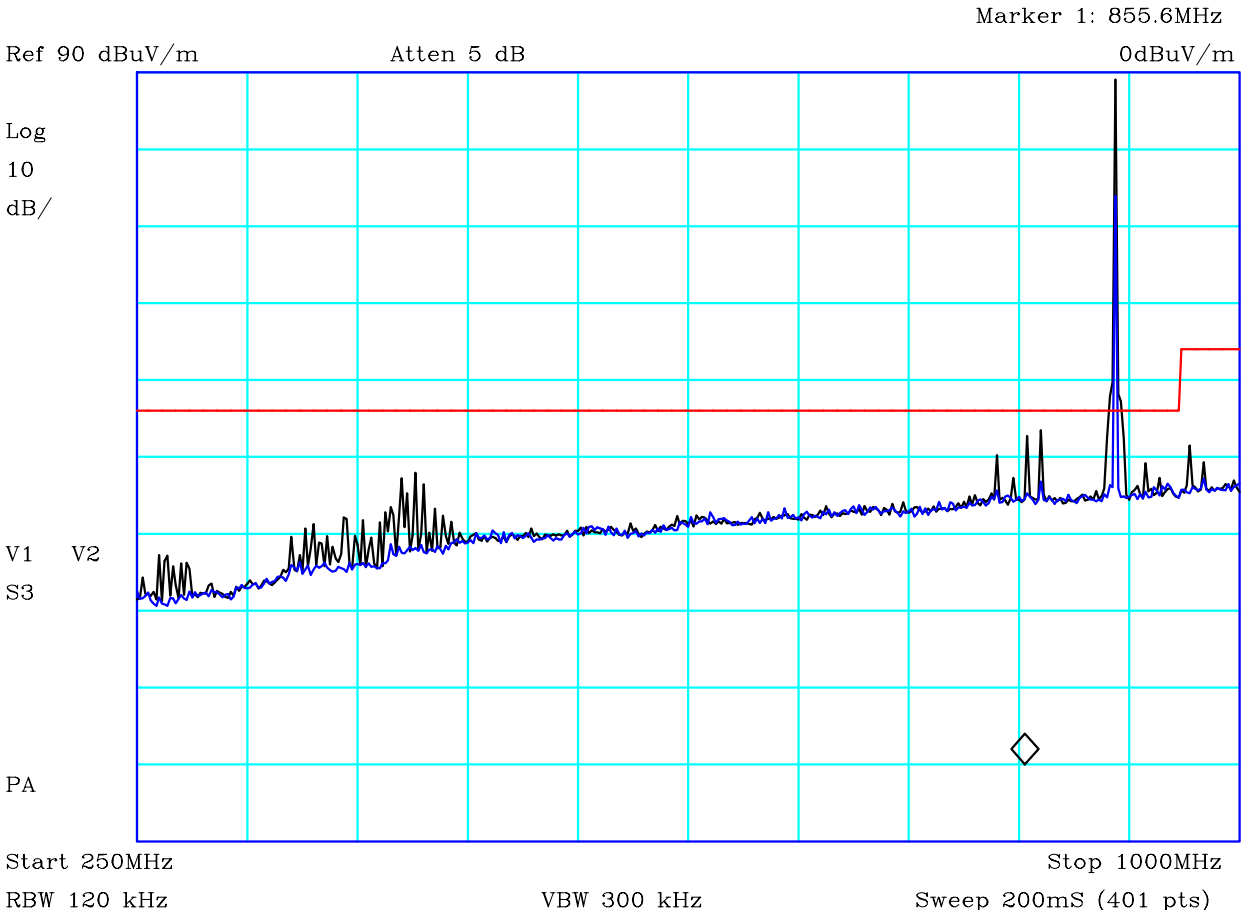
CF1:A15_120112 CF2:CBL002_CBL069_100809

PLOT 24 Radiated Emissions - Repeater - 25MHz to 275MHz

Company:	Rotronics	Product:	MiWi
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: Vertical, Blue: Horizontal
Repeater

Facility:	Anech_1	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B14548		



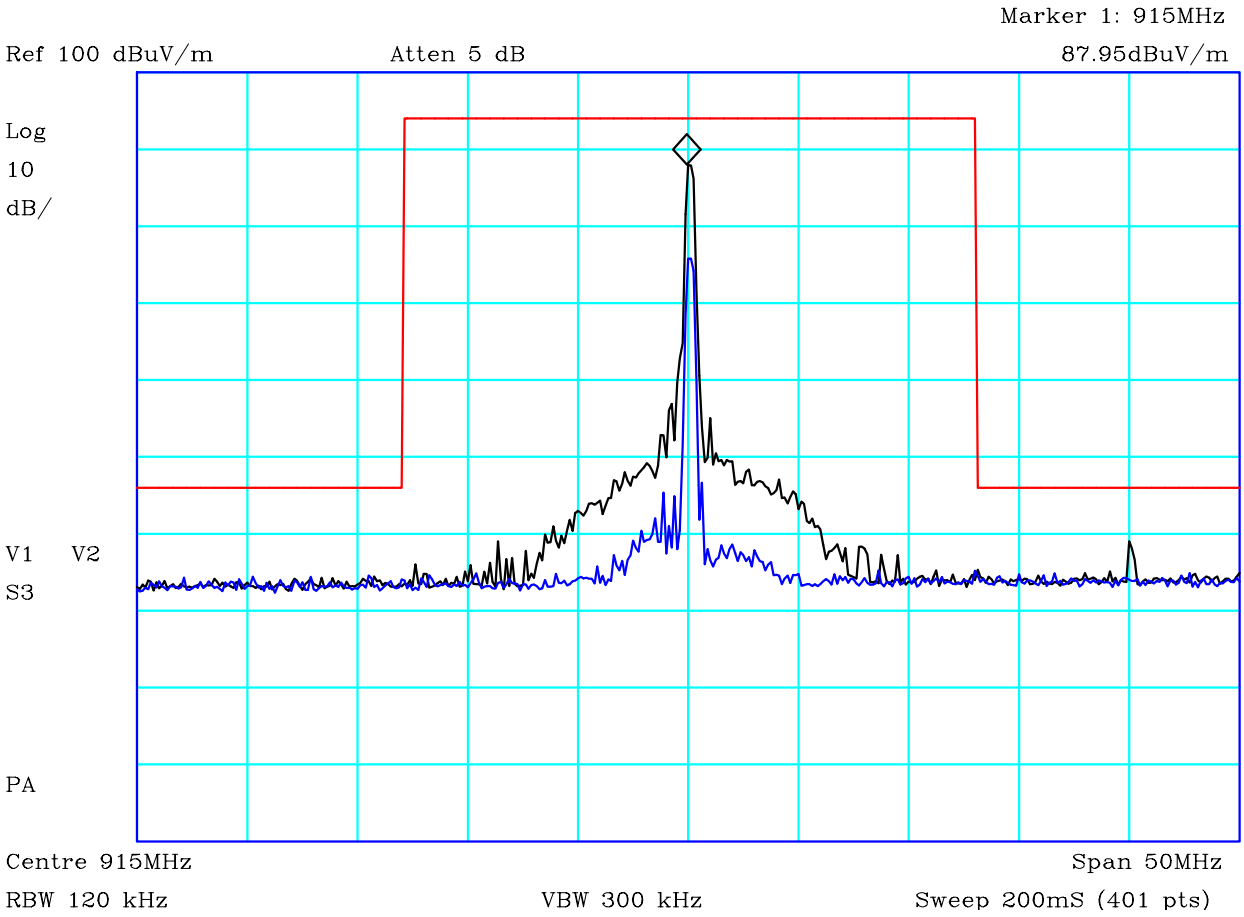
CF1:A15_120112 CF2:CBL002_CBL069_100809

PLOT 25 Radiated Emissions - Repeater - 250MHz to 1GHz

Company:	Rotronics	Product:	MiWi
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: Vertical, Blue: Horizontal
Repeater

Facility:	Anech_1	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B14540		



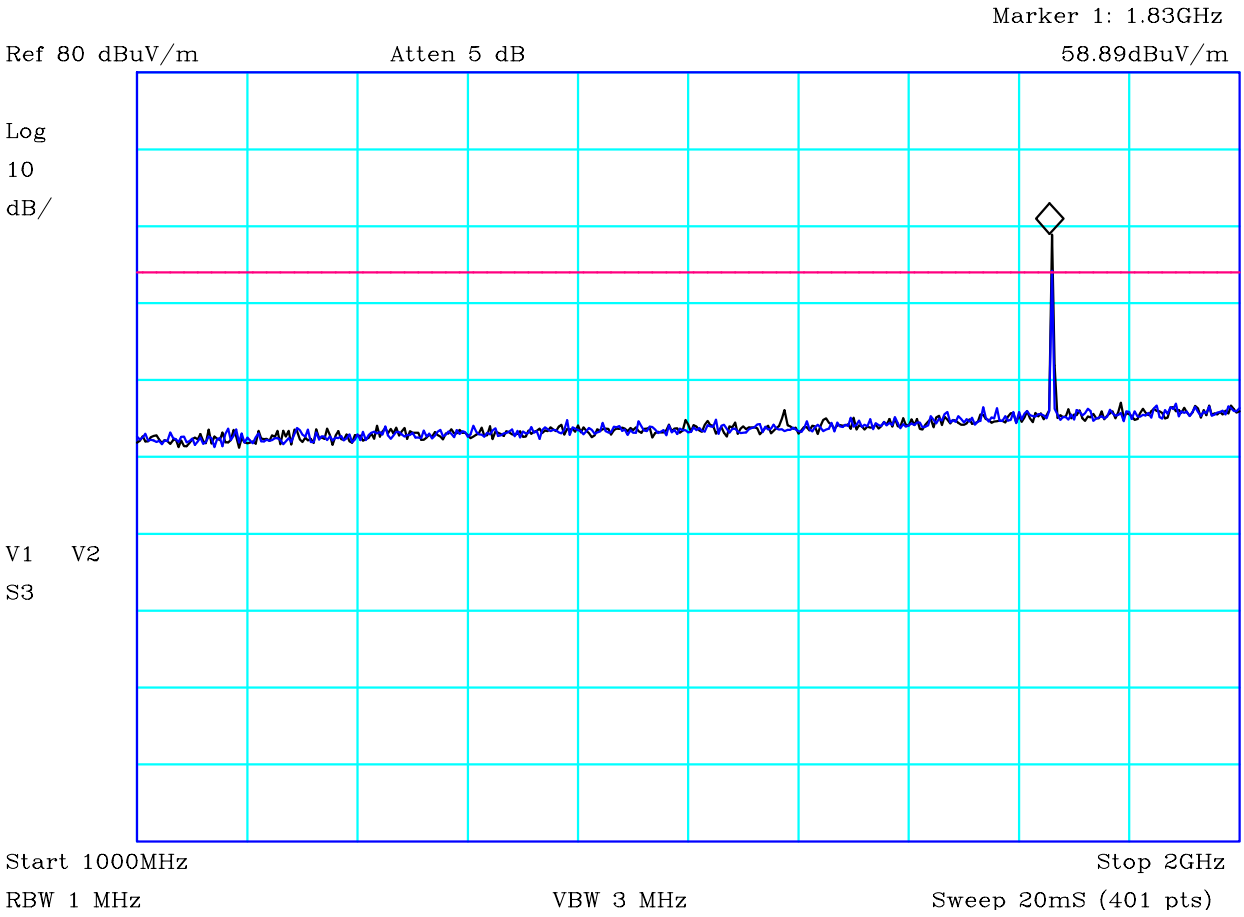
CF1:A15_120112 CF2:CBL002_CBL003_090306

PLOT 26 Radiated Emissions - Repeater - Band Edges

Company:	Rotronics	Product:	MiWi Transmitter
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Repeater

Facility:	Anech_1	Height	1.5m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B14598		



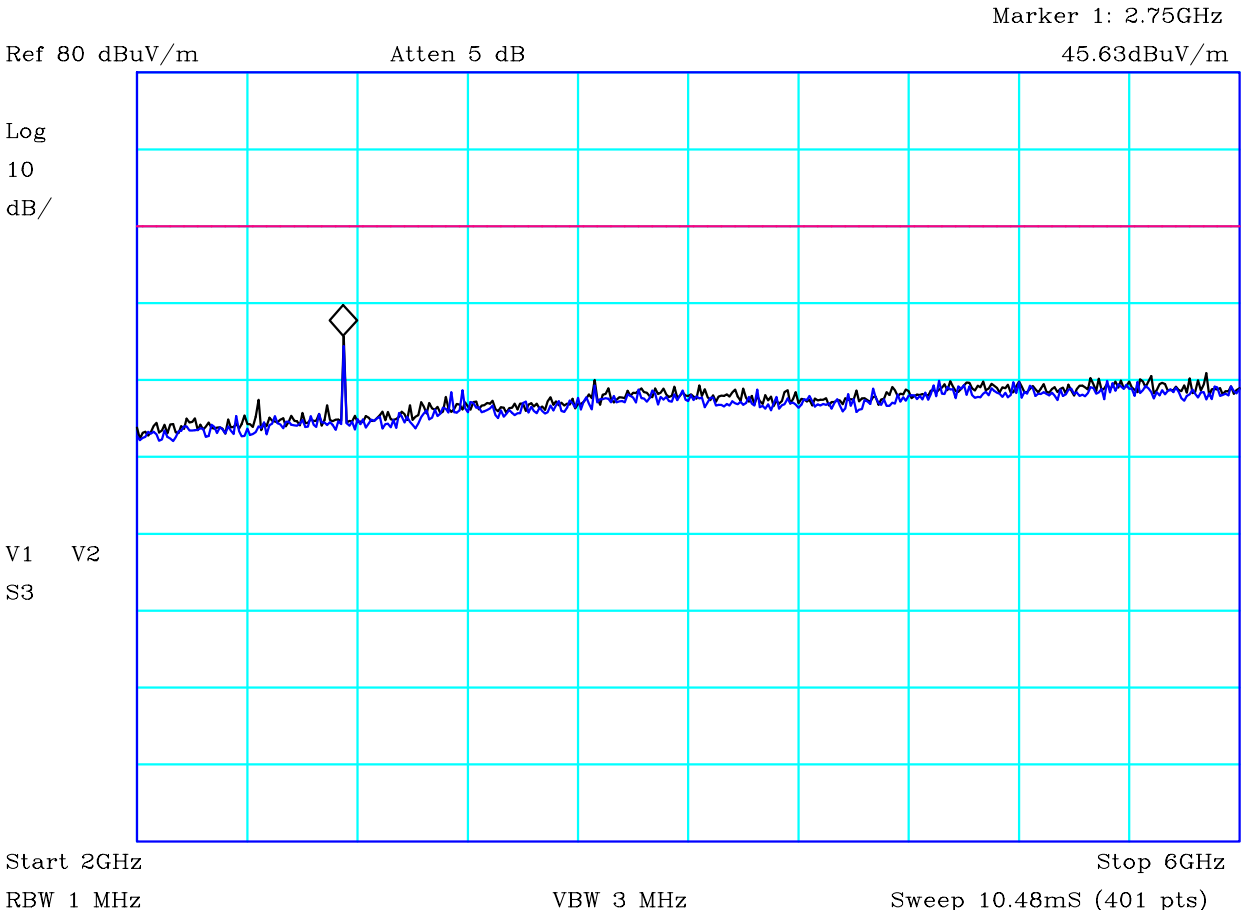
CF1:A19_3m_120807 CF2:CBL002_CBL069_100809 CF3:PRE14_120627

PLOT 27 Radiated Emissions - Repeater - 1GHz to 2GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Repeater.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H30014DB		



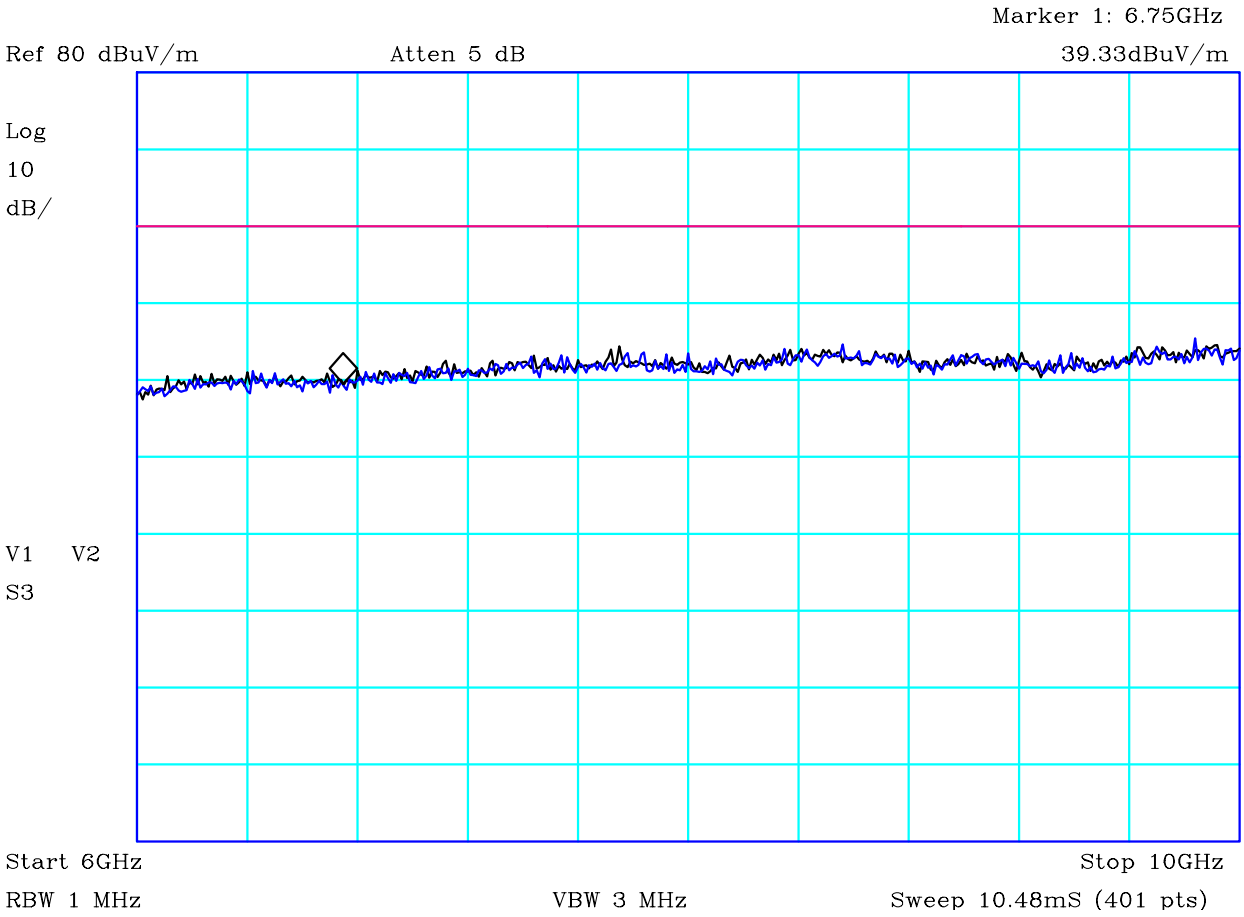
CF1:A19_3m_120807 CF2:CBL071 CF3:PRE10_120627 CF4:RFF22_120716

PLOT 28 Radiated Emissions - Repeater - 2GHz to 6GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Repeater.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B21772		



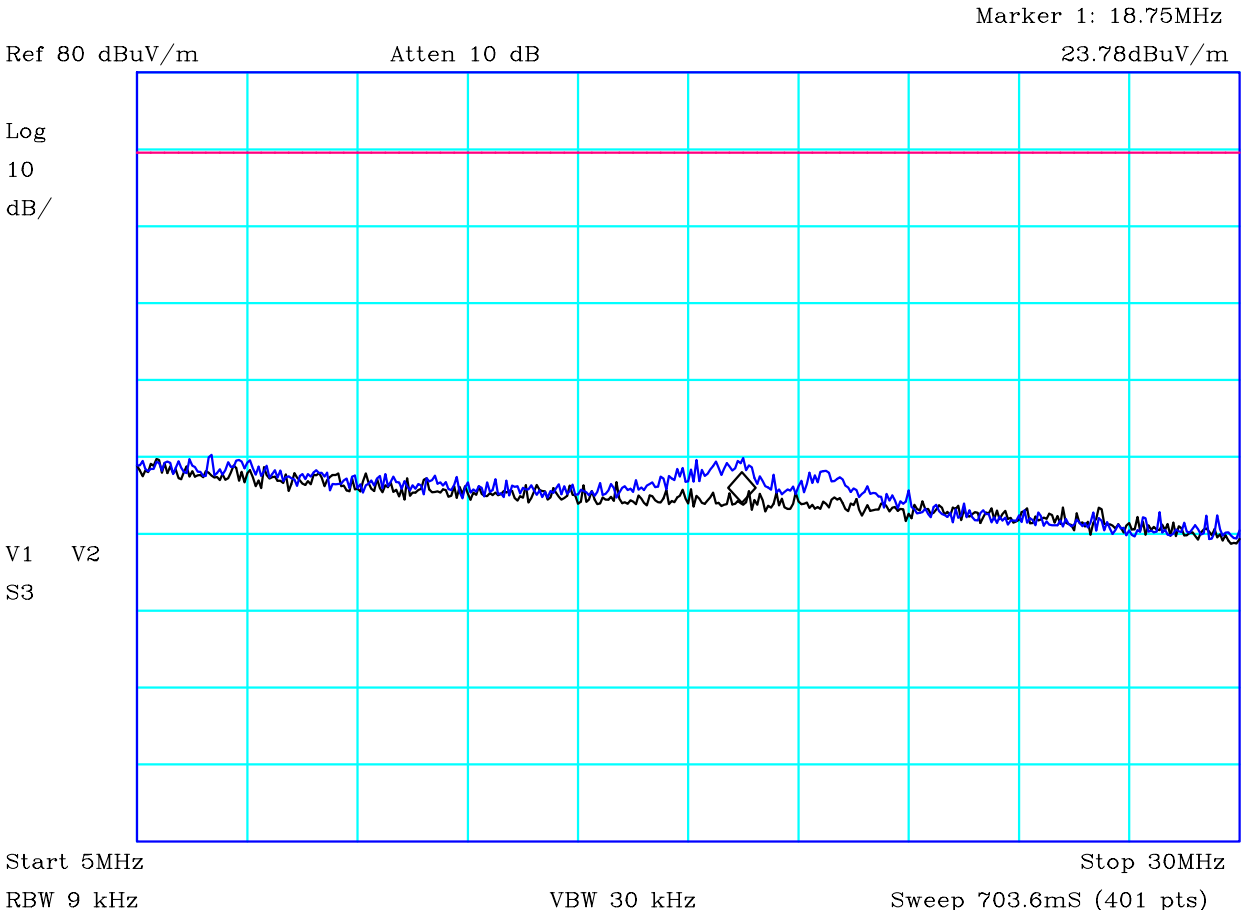
CF1:A19_3m_120807 CF2:CBL071 CF3:PRE10_120627 CF4:RFF22_120716

PLOT 29 Radiated Emissions - Repeater - 6GHz to 10GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Repeater.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B21781		



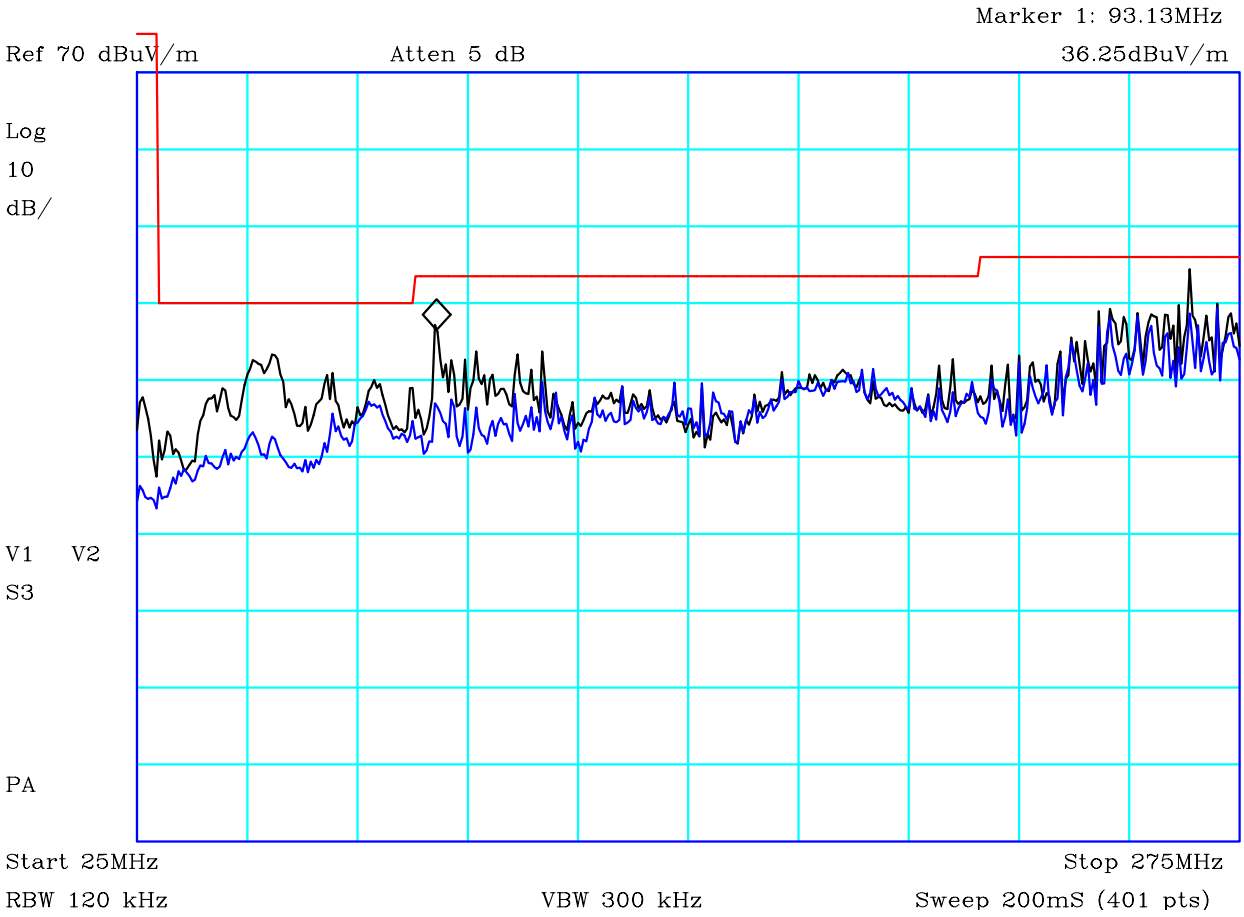
CF1:A9_HI_V_090306 CF2:CBL002_CBL069_100809

PLOT 30 Radiated Emissions - Controller - 5MHz to 30MHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	Part 15.209	Limit2:	
Limit3:		Limit4:	

Black:orthagonal, Blue: parallel
Controller
Limits extrapolated using 40dB/decade for 3m distance.

Facility:	Anech_1	Height	1m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B217FC		



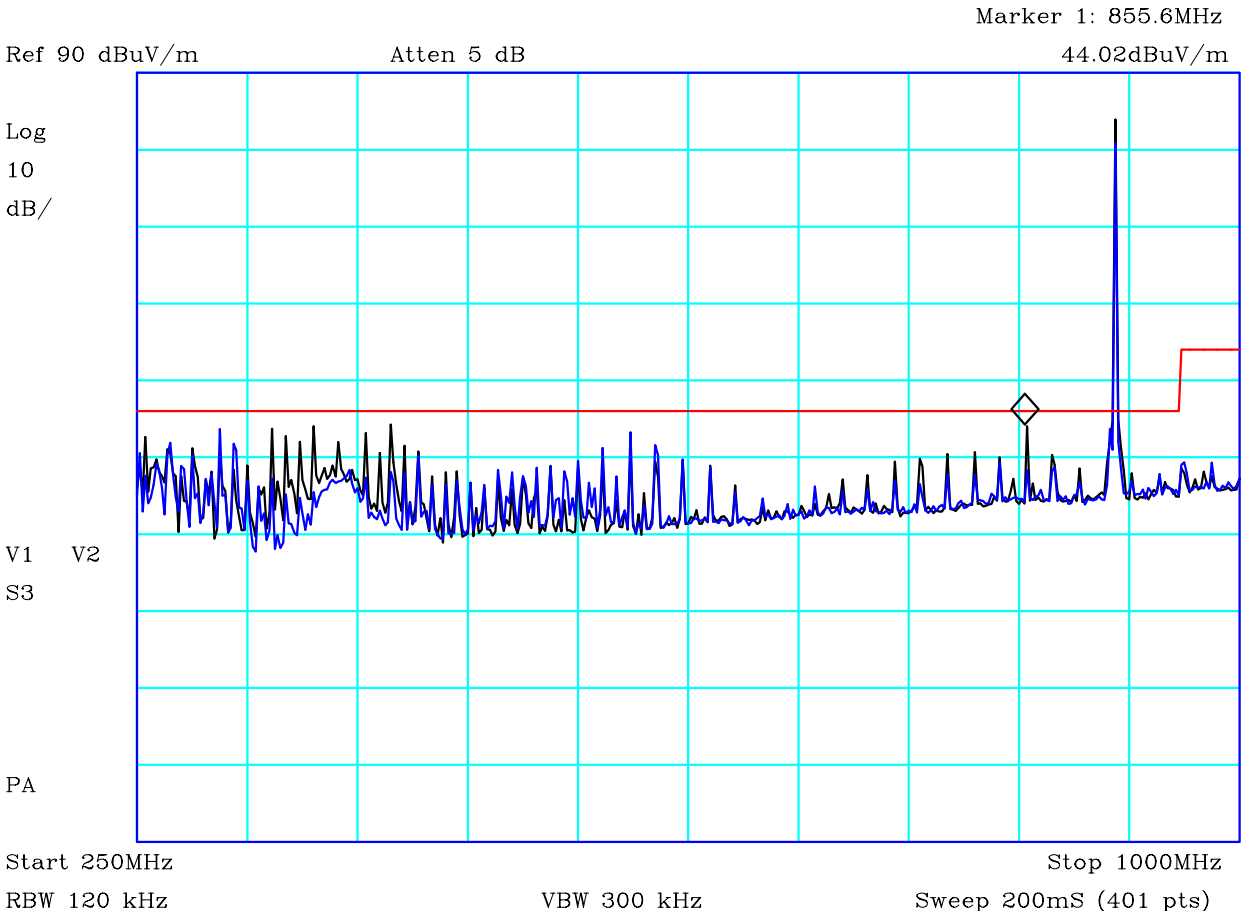
CF1:A15_120112 CF2:CBL002_CBL069_100809

PLOT 31 Radiated Emissions - Controller - 25MHz to 275MHz

Company:	Rotronics	Product:	MiWi
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: Vertical, Blue: Horizontal
Controller. Ferrite on DC cable

Facility:	Anech_1	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B14527		



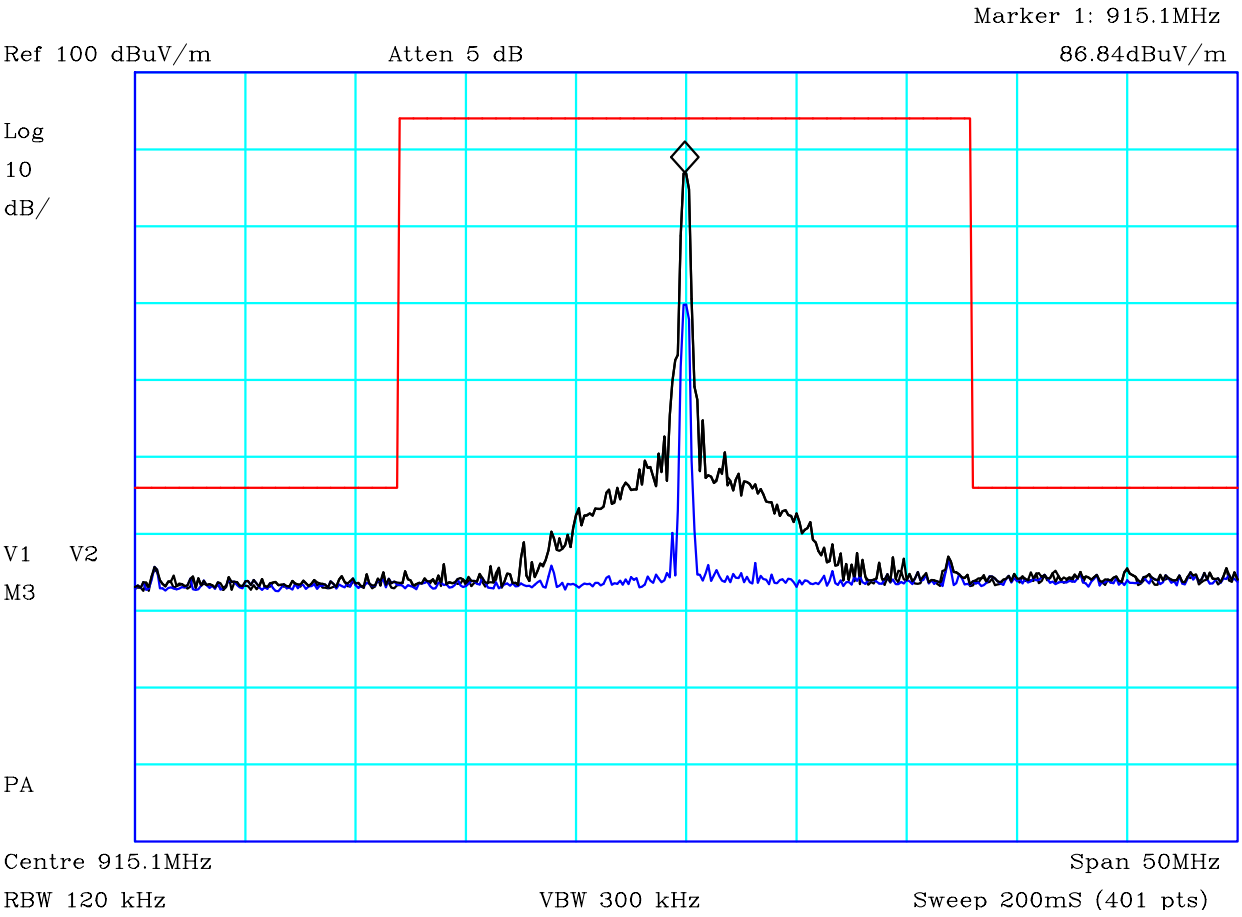
CF1:A15_120112 CF2:CBL002_CBL069_100809

PLOT 32 Radiated Emissions - Controller - 250MHz to 1GHz

Company:	Rotronics	Product:	MiWi
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: Vertical, Blue: Horizontal
Controller. Ferrite on DC cable

Facility:	Anech_1	Height	1m,1.5m,2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B1451D		



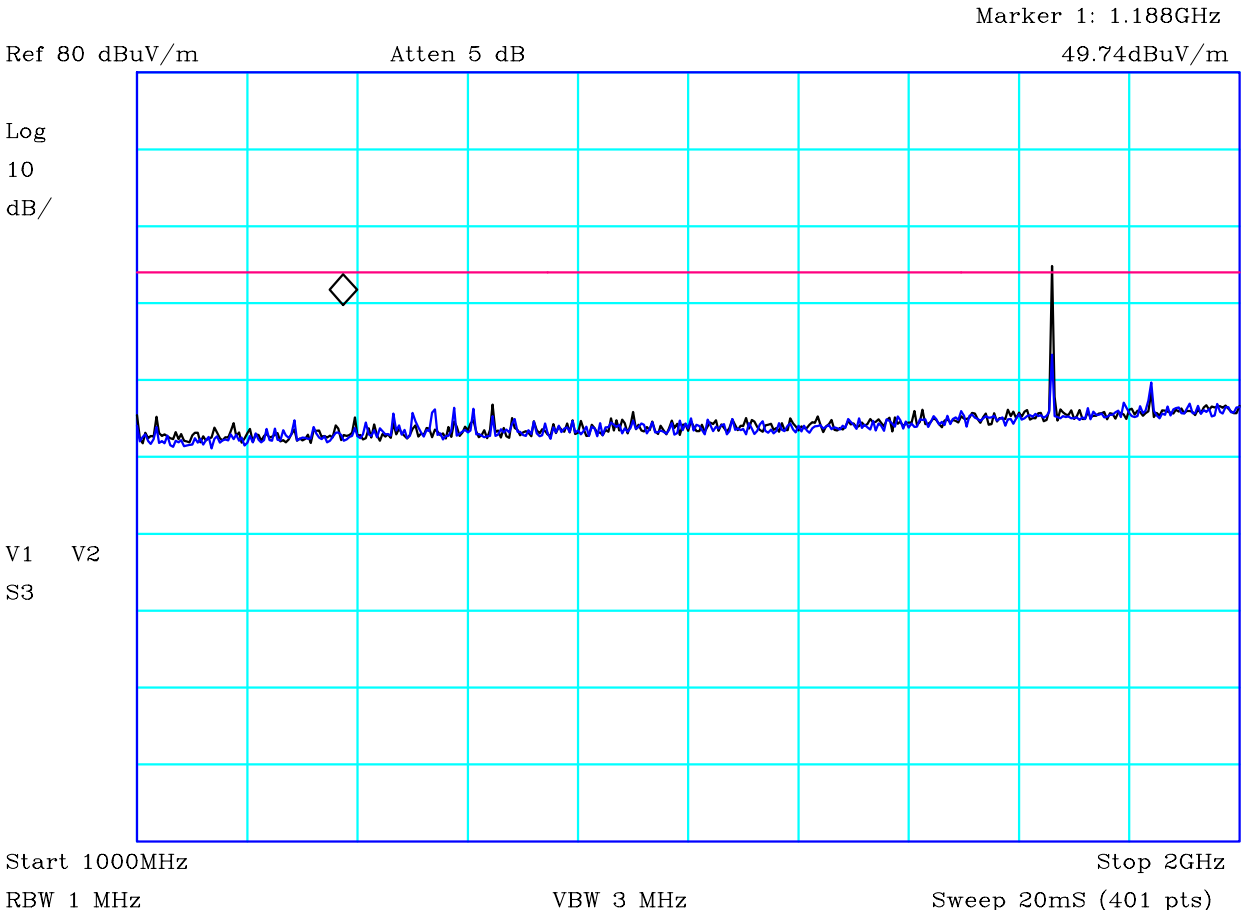
CF1:A15_120112 CF2:CBL002_CBL003_090306

PLOT 33 Radiated Emissions - Controller - Band Edges

Company:	Rotronics	Product:	MiWi Transmitter
Date:	14/12/2012	Test Eng:	Dave Smith
Method:	Ansi C63.4	Method:	
Limit1:(RED)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Controller

Facility:	Anech_1	Height	1.5m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B1458A		



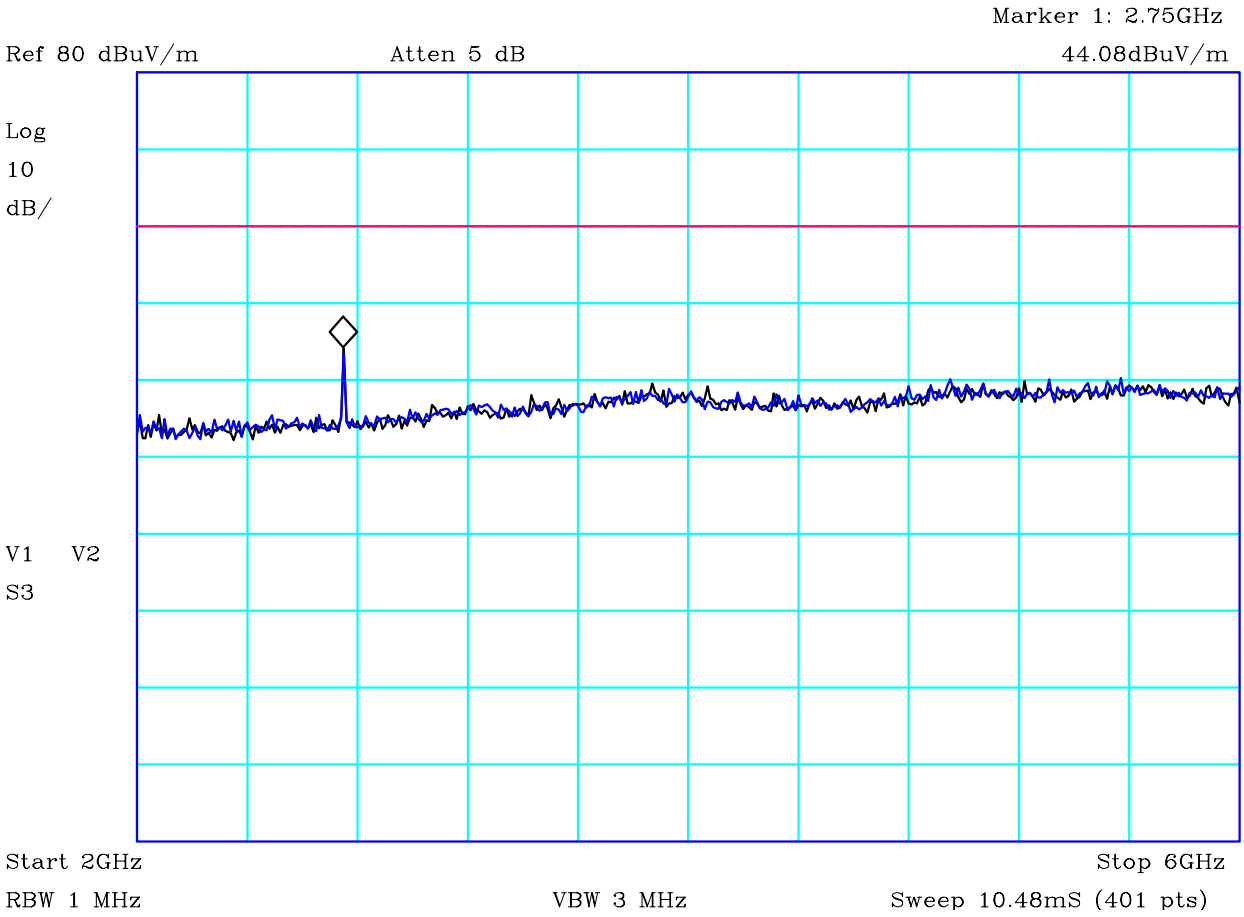
CF1:A19_3m_120807 CF2:CBL002_CBL069_100809 CF3:PRE14_120627

PLOT 34 Radiated Emissions - Controller - 1GHz to 2GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Controller with ferrite on DC cable.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	3m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H30014D7		



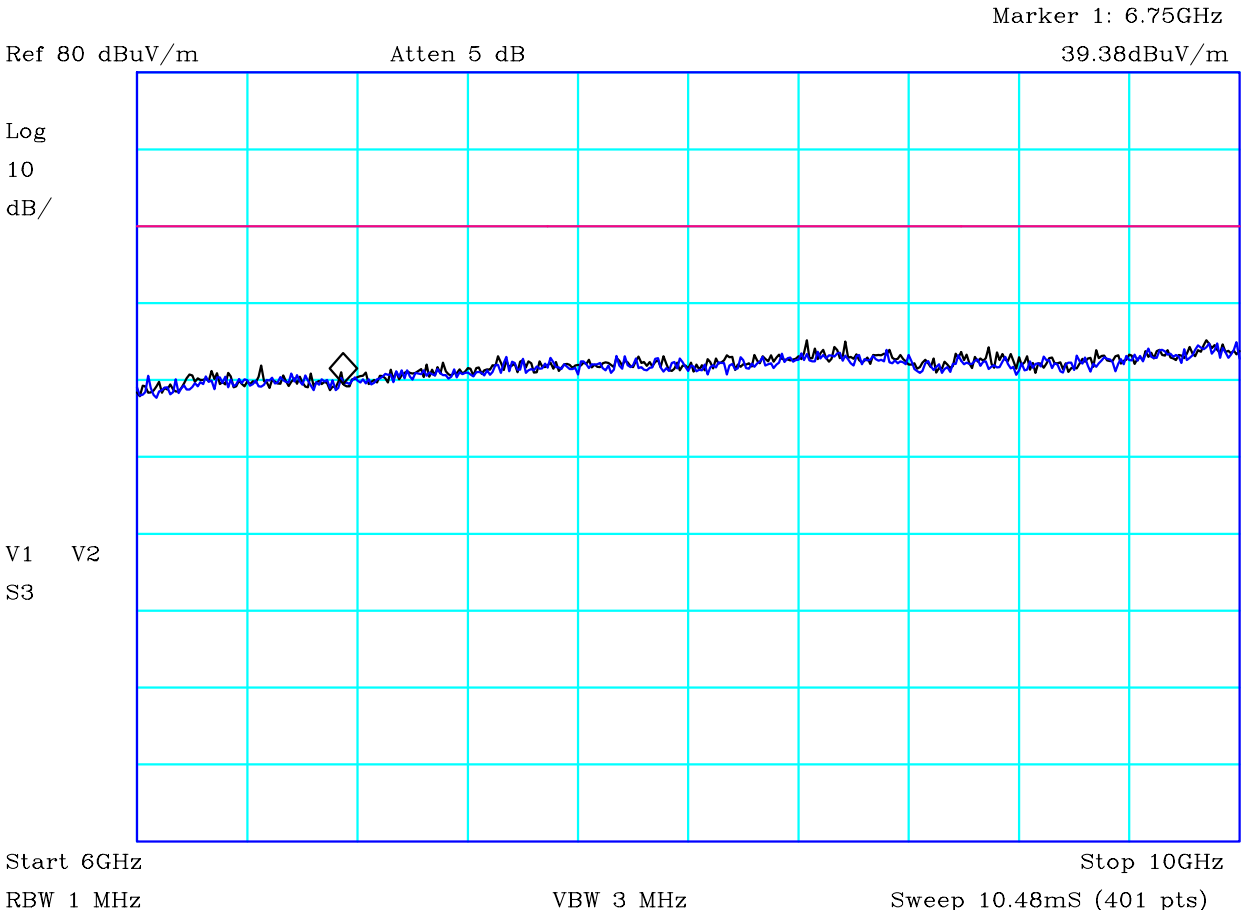
CF1:A19_3m_120807 CF2:CBL071 CF3:PRE10_120627 CF4:RFF22_120716

PLOT 35 Radiated Emissions - Controller - 2GHz to 6GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Controller.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B21787		



CF1:A19_3m_120807 CF2:CBL071 CF3:PRE10_120627 CF4:RFF22_120716

PLOT 36 Radiated Emissions - Controller - 6GHz to 10GHz

Company:	Rotronics	Product:	MiWi Transmitter
Date:	21/12/2012	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Black: vertical, Blue: Horizontal
Controller.

Facility:	Anech_1	Height	1.2m	Mode:	1 (Tx)
Distance	1.5m	Polarisation	V+H	Modification State:	1
Angle	0-360	File:	H2B2178B		