

# FCC 47 CFR PART 15 SUBPART C CERTIFICATION TEST REPORT

**FOR** 

**Home Center** 

**MODEL NUMBER: FGHC2** 

FCC ID: 2AA9MHC2

**REPORT NUMBER: 10044158A** 

ISSUE DATE: December 18, 2013

Prepared for
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# **Revision History**

	Issue		
Rev.	Date	Revisions	Revised By
	12/18/13	Initial Issue	M.Ferrer

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Fibar Group sp. z.o.o

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**EUT DESCRIPTION:** Home Center

HC<sub>2</sub> MODEL:

**SERIAL NUMBER:** Prototype

**DATE TESTED:** September 12, 2013 – December 4, 2013

#### APPLICABLE STANDARDS

**STANDARD TEST RESULTS** 

CFR 47 Part 15 Subpart C Part 15.249 **Pass** INDUSTRY CANADA RSS-210 Issue 8 Annex A2.9 Pass

INDUSTRY CANADA RSS-GEN Issue 3 Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

Tested By:

**BART MUCHA** WiSE STAFF ENGINEER

UL Verification Services Inc.

MICHAEL FERRER WiSE Project Lead

UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062, USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0.

## 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

#### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

## 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus: (MU shows 10m, but Emissions were extrapolated to 3m)

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94
RF Power	dB	Power Meter	0.45dB

Uncertainty figures are valid to a confidence level of 95%.

# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT contains a 908MHz transceiver. It is AC powered. The home center utilizes Z-wave technologies to communicate with other devices for home automation.

The radio is manufactured by Fibar Group

## 5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output quasi-peak E-field as follows: Data from section 7.2

Frequency Range	Mode	Output PK E-field Strength
(MHz)		(dBuV/m)
908	TX	93.45

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an external dipole antenna. It uses RP-SMA connection and has gain 2.15dBi

## 5.4. WORST-CASE CONFIGURATION AND MODE

The EUT was set in worst axis as found in preliminary testing.

# 5.5. DESCRIPTION OF TEST SETUP

# **SUPPORT EQUIPMENT**

Use	Product Type	Manufacturer	Model	Comments						
EUT	Home Center	Fibar	HC2	None						
EUT	Power Supply	-	KSAH1200400T1M3	None						
AE Router Linksys E2000 None										
Note: EU	Note: EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)									

# **I/O CABLES**

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	_	_	None
1	DC input	AC	N	N	None
2	Ethernet	Ю	Y	N	None

Note:

AC = AC Power Port

DC = DC Power Port

N/E = Non-Electrical

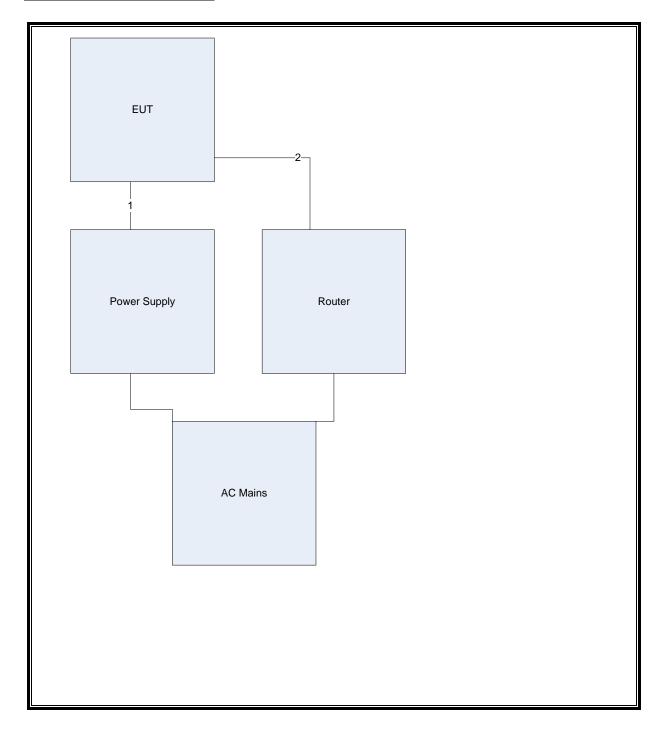
I/O = Signal Input or Output Port (Not Involved in Process Control)

TP = Telecommunication Ports

## **TEST SETUP**

The EUT is programmed for continuous TX mode.

# **SETUP DIAGRAM FOR TESTS**



# **6. TEST AND MEASUREMENT EQUIPMENT**

The following test and measurement equipment was utilized for the tests documented in this report:

	Test Equipment List										
Description	Manufacturer	Model	Asset	Cal Date	Cal Due						
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20121227	20131231						
Bicon Antenna	Chase	VBA6106A	EMC4078	20130213	20140228						
Log-P Antenna	Chase	UPA6109	EMC4258	20121015	20131030						
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20121226	20131231						
Antenna Array	UL	BOMS	EMC4276	20111227	20131231						
Spectrum Analyzer	Agilient	N9030A	EMC4360	20121226	20131226						
Near Field Antenna	EMCO	-	-	-	-						
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20121230	20131230						
LISN	Solar	8602-50-TS-50-N	EMC4052	20130115	20140116						
LISN	Solar	8602-50-TS-50-N	EMC4064	20130115	20140116						

Log-P Antenna was used during testing in September before cal due date.

# 7. TEST RESULTS

# 7.1.1. 99%, 20dB BANDWIDTH

## **LIMITS**

None; for reporting purposes only.

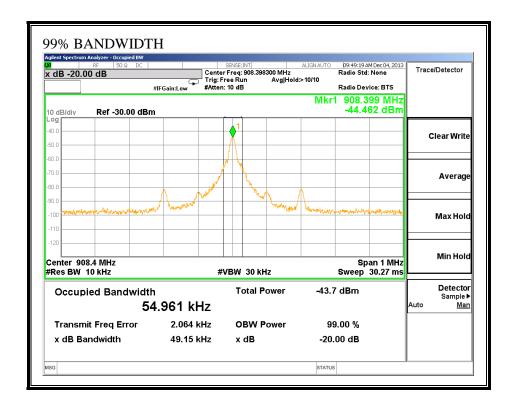
## **TEST PROCEDURE**

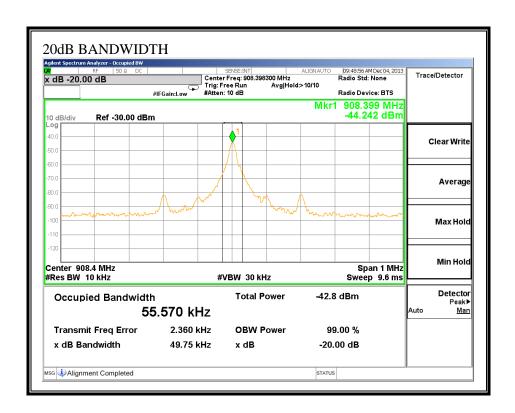
The transmitter output is connected to the spectrum analyzer. The RBW is set to 10kHz bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth and 20dB function is utilized.

## **RESULTS**

Channel	Frequency
	(kHz)
99%	54.96
20dB	49.75

# 99% BANDWIDTH





## 7.2. RADIATED EMISSIONS

## **TEST PROCEDURE**

**ANSI C63.4** 

## **LIMIT**

IC RSS-210, A2.9 FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

## Limit is 3m

Fundamental frequency	Field strength of fundamental (millivolts/ meter)	Field strength of harmonics (microvolts/ meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measure- ment dis- tance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 ***	3
88-216	150 **	3
216-960	200 ***	3
Above 960	500	3

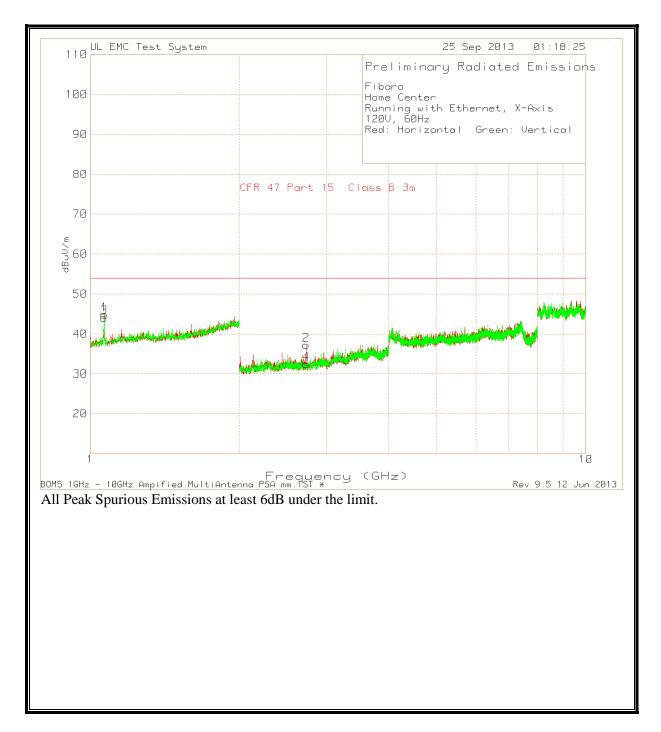
<sup>\*\*</sup> Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

# **RESULTS**

Fibro											
Home Cent	er										
Running wi	th Etherne	t									
Fundament	tals										
TX 908MHz											
Test Frequency	Meter Reading		Antenna Factor	Cable	Corrected Reading dB(uVolts/	94dBuV	Margin	Azimuth	Height		
(MHz)	(dBuV)	Detector	dB/m	Factor dB		C63 Limit	_		[cm]	Polarity	Notes
908.396	60.45	QP	23	10	93.45	94	-0.55	318	101	Н	1
908.396	55.79	QP	23	10	88.79	94	-5.21	9	177	V	1
908.3944	59.27	QP	23	10	92.27	94	-1.73	323	102	Н	2
908.3944	56.58	QP	23	10	89.58	94	-4.42	4	171	V	2
908.3944	58.2	QP	23	10	91.2	94	-2.8	327	102	Н	3
908.3944	52.3	QP	23	10	85.3	94	-8.7	13	175	V	3
Notes:											
1 - X-Axis											
2 - Y-Axis											
3 - Z-Axis											
QP - Quasi-	Peak dete	ctor									

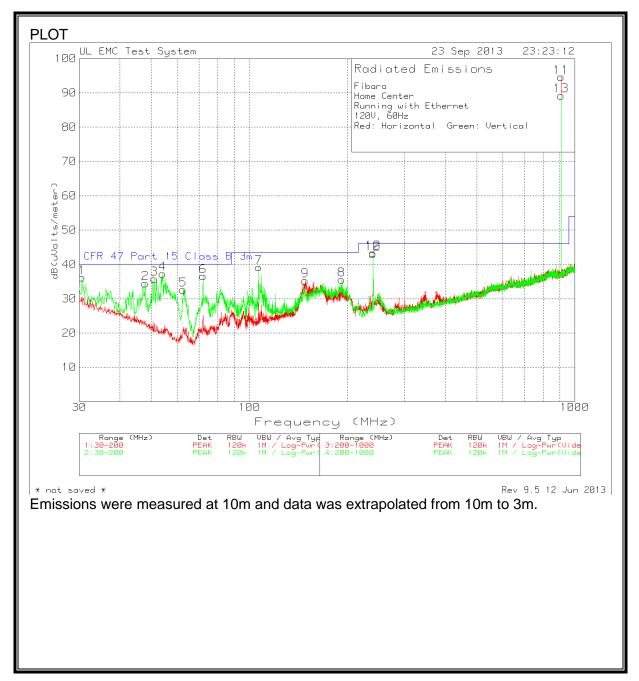
Measurements for above data were measured at 3m.

## 7.2.1. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



# 7.2.2. WORST-CASE BELOW 1 GHz

## **SPURIOUS EMISSIONS 30 TO 1000 MHz**



Fibaro												
Home Cent	er											
Running wi	th Ethernet											
120V, 60Hz												
Red: Horizo	ntal Green:	Vertical										
							Corrected	CFR 47				
	Test	Meter		Antenna	Cable		Reading	Part 15				
Marker	Frequency	Reading(		Factor	Factor	10m to	dB(uVolts/	Class B	Margin	Azimuth	Height	
No.	(MHz)	dBuV)	Detector	dB/m	(dB)	3m (dB)	meter)	3m	(dB)	[Degs]	[cm]	Polarity
9		-		14.6					` '	0-360	400	
1				17.6						0-360	99	
2				11						0-360	99	
3				9.6						0-360	99	
4				8.4						0-360	249	
5				6.4						0-360	400	
6				6.2						0-360	400	
								-				
7	106.7166			11.6						0-360	99	
8				15.9						0-360	99	
10				11.8						0-360	299	
11				23						0-360	100	
12	239.9734			11.8						0-360	299	
13	908.5943	80.47	PK	23	-24.8	10.5	89.17	46.02	43.15	0-360	299	V
Fibaro												
Home Cent	er											
Running wi	th Ethernet											
120V, 60Hz												
•	ntal Green:	Vertical										
						Corrected						
T	11-1		A	Cabla		Corrected	CED 47 D					
Test	Meter			Cable	10		CFR 47 Part		A =:	114:44		
Frequency	_	D-4	Factor	Factor	10m to		15 Class B	Margin		Height	Dala ::	
(MHz)	(dBuV)	Detector	-	(dB)	3m (dB)	/meter)	3m	(dB)	[Degs]	[cm]	Polarity	
30.6117	35.22		17.6									
47.7965	41.98	-	11		10.5							
51.0638	42.22		9.6	-30		32.32				150		
54.1761	46.1		8.4							299		
62.504692	43.83		6.4					_	358	236		
72.008	48.62	-	6.2	-29.9						396		
106.7075	46.96	QP	11.6	-29.8	10.5	39.26	43.52	-4.26	55	100	V	
240.0029	47.54	QP	11.8	-26.6	10.5	43.24	46.02	-2.78	186	332	Н	
240.0029	47.05	QP	11.8	-26.6	10.5	42.75	46.02	-3.27	37	299	V	
PK - Peak do	etector											
	Peak detecti	or										
-, -,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		-										

Emissions were measured at 10m and data was extrapolated from 10m to 3m.

# 8. AC MAINS LINE CONDUCTED EMISSIONS

# **LIMITS**

§15.207 (a) IC RSS-GEN, Section 7.2.2

Frequency of emission	Conducted Limit (dBμV)							
(MHz)	Quasi-peak	Average						
0.15 to 0.50	66 to 56*	56 to 46*						
0.50 to 5	56	46						
5 to 30	60	50						
* Decreases with the logarithm of the frequency.								

#### **TEST PROCEDURE**

**ANSI C63.4** 

## **RESULTS**

No non-compliance noted:

#### **WORST EMISSIONS**

Manufacturer:Fibaro Model#Home Center Mode:Running Voltage:120Vac60Hz RED:Line L1, GREEN:Neutral N

No. Frequency [MHz]	Meter Reading	Factor [dB]	Factor [dB]	Readin	g (dB(uVol	lts))					6
	- 1MHz							======			====
	39.87dBuV PK	.1		54.27	79					-	
Tine - I1 1 -	30MHz										
	39.84dBuV PK	.1		50.94	73	60	60	50 .94	-		
3 11.10853	40.3dBuV PK	. 2	11	51.5	73	60	60	50		_	
4 11.91258	40.73dBuV PK		Margin [dB]			-8.5 60	-8.5 60		_		
5 12.35082	38.53dBuV PK		Margin [dB]			-7.87	-7.87 60				
			Margin [dB]		-23.07	-10.07	-10.07	07	-		
6 20.44199	37.77dBuV PK		11.5 Margin [dB]			60 -10.63	60 -10.63	63	_		
7 20.58686	37.73dBuV PK		11.5 Margin [dB]			60 -10.67	60 -10.67			-	
Tino - T2 15	- 1MHz										
	40.51dBuV PK	.1		55.01	79	66	65.79			-	
Tine - I.2 1 -	30MHz										
	39.5dBuV PK	.2		50.7	73	60	60	50 .7	-	-	
10 11.48882	40.47dBuV PK	.2	11 Margin [dB]	51.67	73		60	50	-		
11 12.09005	39.73dBuV PK	.2	11	50.93	73	60	60	50	_	_	
12 20.21019	37.78dBuV PK		Margin [dB] 11.4		-22.07 73	-9.07 60			- - -	-	
13 20 83677	38.4dBuV PK		Margin [dB]			-10.42	-10.42 60				
20.00077	SS. Tabav III		Margin [dB]							-	
	R 22/11 Group 1										

LIMIT 1: CISPR 22/11 Group 1 Class A QP LIMIT 2: CISPR 22/11 Group 1 Class A AV LIMIT 3: CISPR 22/11 Group 1 Class B QP LIMIT 4: CISPR 22/11 Group 1 Class B AV LIMIT 5: NONE

LIMIT 5: NONE LIMIT 6: NONE

Manufacturer:Fibaro Model#Home Center Mode:Running Voltage:120Vac60Hz RED:Line L1, GREEN:Neutral N

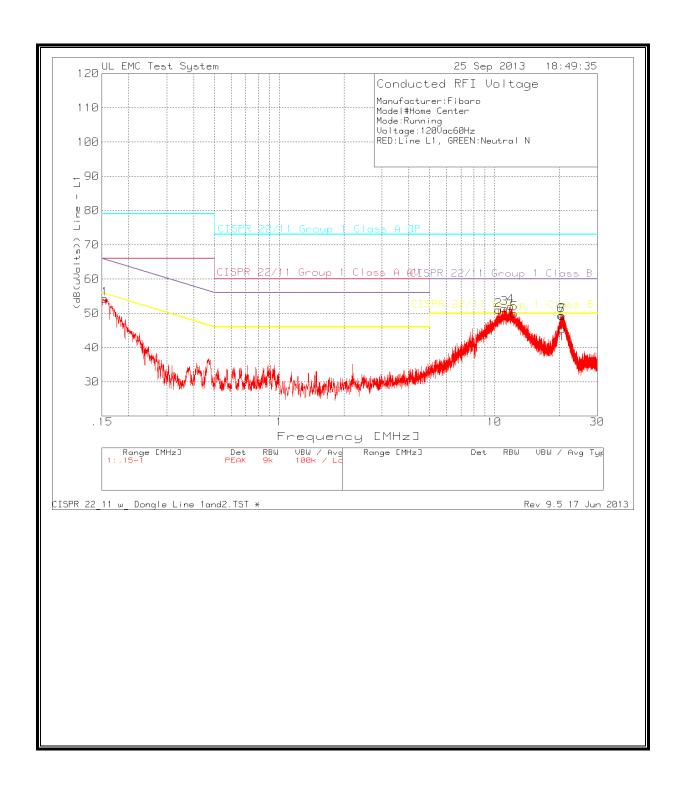
Frequency [MHz]	a Meter Reading	Ι	Factor [dB]	Factor [dB]	Reading	g(dB(uVolt	ts))				5
Line - L1		====		======	======		=======		=======		
	11.78dBuV A	v .1	1 14	. 3	26.18	79	66	65.71	55.71	_	_
			Margi	n (dB):		-52.82	-39.82	-39.53	-29.53	-	-
Line - L1 1											
10.456	27.47dBuV A	v .1				73	60		50		-
									-11.43	-	-
11.1012	28.29dBuV A	v .2				73	60	60	50	-	-
						-33.51	-20.51		-10.51	-	-
11.9169	28.07dBuV A	v .4			39.47		60	60	50	-	-
						-33.53			-10.53		-
12.359	27.5dBuV Av	. 3			38.9	73	60	60	50	-	-
						-34.1		-21.1		-	-
20.4377	27.02dBuV A	v .1					60	60	50	-	-
				n (dB):		-34.38			-11.38	-	-
20.5884	26.92dBuV A	v .1				73	60	60	50	-	-
			Margi	n (dB):		-34.48	-21.48	-21.48	-11.48	-	-
Line - L2 .											
.15405	11.96dBuV A	v .1									-
			Margi	n (dB):		-52.54	-39.54	-39.32	-29.32	-	-
Line - L2 1											
10.3005	27.26dBuV A	v .2				73	60	60	50	-	-
						-34.54			-11.54		-
11.4964	28.85dBuV A	v .2					60	60	50		-
						-32.95		-19.95		-	-
12.0912	28.19dBuV A	v .2					60	60	50	-	-
				n (dB):		-33.61	-20.61		-10.61		-
20.2085	26.53dBuV A	v .4	4 11	. 4		73	60	60	50	-	-
				n (dB):		-34.67			-11.67		-
20.8384	26.63dBuV A	v .4				73	60	60	50	-	-
			Margi	n (dB):		-34.47	-21.47	-21.47	-11.47	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

PK - Peak detector QP - Quasi-Peak detector Av - average detection

LIMIT 1: CISPR 22/11 Group 1 Class A QP LIMIT 2: CISPR 22/11 Group 1 Class A AV LIMIT 3: CISPR 22/11 Group 1 Class B QP LIMIT 4: CISPR 22/11 Group 1 Class B AV

# **LINE 1 RESULTS**



# **LINE 2 RESULTS**

