



Global Product Certification
EMC-EMF Safety Approvals

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**EMI TEST REPORT
for
CERTIFICATION to
FCC PART 15.231 & RSS-210**

FCC ID: WMSBETXSA
Industry Canada ID: 6693A-BETXSA

Test Sample: Optical Smoke Alarm
Model: BE1283
Tested for: Bellman & Symfon AB

Report Number: M120624_Certification

Issue Date: 24th October 2012

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.



Accreditation No. 5292

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EMI TEST REPORT FOR CERTIFICATION
to
FCC Part 15.231 & RSS-210

EMC Technologies Report No. M120624_Certification

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CONTENTS

1.0	INTRODUCTION
2.0	GENERAL INFORMATION
3.0	CONDUCTED EMI MEASUREMENTS
4.0	RADIATED EMI MEASUREMENTS
5.0	BANDWIDTH MEASUREMENTS
6.0	ANTENNA REQUIREMENT
7.0	COMPLIANCE STATEMENT
8.0	MEASUREMENT UNCERTAINTIES
APPENDIX A	MEASUREMENT INSTRUMENT
APPENDIX B	GRAPHS of EMI MEASUREMENTS
APPENDIX C	BANDWIDTH PLOT
ATTACHMENT 1	EXTERNAL PHOTOGRAPHS
ATTACHMENT 2	INTERNAL PHOTOGRAPHS
ATTACHMENT 3	TEST SETUP PHOTOGRAPHS
ATTACHMENT 4	LABEL
ATTACHMENT 5	USER MANUAL
CONFIDENTIAL 1	OPERATIONAL DESCRIPTION
CONFIDENTIAL 2	BLOCK DIAGRAM
CONFIDENTIAL 3	SCHEMATICS



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EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15.231 & RSS-210

Report Number: M120624_Certification

Test Sample: Optical Smoke Alarm
Model: BE1283
Manufacturer: Home Watch Ltd – Hong Kong

FCC ID: WMSBETXSA
Industry Canada ID: 6693A-BETXSA
Equipment Type: Intentional Radiator

Tested for: Bellman & Symfon AB
Address: Sodra Langebergsgatan 30
421 32 Vastra Frolunda, Sweden
Phone: +46 31 68 28 20
Fax: +46 31 68 28 90
Contact: Peter Jungvid
Email: jko@bellman.se

Test Standards: FCC Part 15, Subpart C – Intentional Radiators
FCC Part 15.231: Periodic operation in the band 40.66-40.70 MHz
and above 70 MHz
ANSI C63.4 – 2009

RSS-210 Issue 8 - Licence-Exempt RadioCommunication Apparatus
(All Frequency Bands): Category I Equipment
Annex 1: Momentarily Operated Devices and Remote Control
RSS-GEN Issue 3 - General Requirements and Information for the
Certification of Radiocommunication Equipment

Test Dates: 2nd to 10th October 2012

Test Engineer: Chieu Huynh

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*



Authorised Signatory: Chieu Huynh
Senior EMC Engineer
EMC Technologies Pty Ltd



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EMI TEST REPORT FOR CERTIFICATION to FCC PART 15.231 & RSS-210

1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on the Optical Smoke Alarm, Model: BE1283.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart C:	Rules for intentional radiators (particularly section 15.231)
Section 15.203:	Antenna requirements
Section 15.205:	Restricted bands of operation
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.231:	Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.231.

The test sample also complied with the Industry Canada RSS-210 issue 8 - Licence-Exempt Radiocommunication Apparatus (All Frequency Bands) Category I Equipment, Annex 1

1.1 Summary of Results

FCC Part 15, Subpart C Clauses	IC RSS-210 and RSS-Gen Clauses	Test Performed	Result
15.203	RSS-Gen (7.1.4)	Antenna Requirement	Not Applicable
15.205	RSS-Gen (7.2.2)	Operation in Restricted Band	Complied
15.207	RSS-Gen (7.2.4)	Conducted Emissions	Not Applicable
15.209	RSS-Gen (7.2.5)	Radiated Emissions	Complied
15.231 (e)	A1.1 Table B	Field Strength Emissions	Complied
15.231 (c)	A1.1.3	Bandwidth	Complied



The measurement procedure used was in accordance with ANSI C63.4-2009. The instrumentation conformed to the requirements of ANSI C63.2-1996.

1.2 EUT – Voltage Power Conditions

EUT is battery powered (9V).

1.3 Modifications by EMC Technologies

No modifications were required.

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2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Product Details

Test Sample:	Optical Smoke Alarm
Model:	BE1283
Transmitting Frequency:	433.9 MHz and 434.3 MHz
Input Supply:	9V Battery
Manufacturer:	Home Watch Ltd – Hong Kong
Equipment Type:	Intentional Radiator

2.2 Test Sample Description

An optical smoke alarm consists of a smoke detection chamber, a test button, a radio key switch and a radio transmitter for 433.9 MHz and 434.3 MHz.

2.3 Test Sample Configuration

The test sample was configured in transmitting mode.

A 433.9 MHz is an on/off keying and a 434.3 MHz is a frequency shift keying.

2.4 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2009. Radiated emissions tests were performed at a distance of 3 metres from the EUT.

2.5 Test Facility

2.5.1 General

EMC Technologies Pty Ltd is listed by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies is listed as an FCC part 47CFR2.948 test lab and may perform the testing required under Parts 15 and 18 – **FCC Registration Number 90560**

EMC Technologies Pty Ltd has also been accredited as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 & 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001.**

EMC Technologies has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional) - **Industry Canada number 3569B.**

Measurements were performed at EMC Technologies' laboratory in Keilor Park, Victoria Australia.



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2.5.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

“FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E).”

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of emissions, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

2.6 Units of Measurements

Radiated Emissions

Measurements are reported in units of dB relative to one microvolt per metre (dB μ V/m).

2.7 Test Equipment Calibration

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI). All equipment calibration is traceable to Australia national standards at the National Measurements Institute. The reference antenna calibration was performed by NMI and the working antennas (loop and biconilog) calibrated by the EMC Technologies. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in the Measurement Instrument Details.

3.0 CONDUCTED EMISSION MEASUREMENTS

Not applicable, as EUT is battery powered.



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4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.231(e), 15.205(a) and 15.209(a).

The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the PC Controller through the IEEE.488 Interface Bus Card Adaptor. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. A calibrated loop antenna was used for measurements between 9 kHz to 30 MHz. A calibrated Biconilog antenna was used for measurements between 30 MHz to 4344 MHz.

The Receiver bandwidth was set to 6.0 dB.

The following bandwidth settings were used:

Frequency band 9 kHz – 30 MHz: RBW = 9 kHz and VBW = 30 kHz

Frequency band 30 MHz – 1000 MHz: RBW = 120 kHz and VBW = 300 kHz

Above 1 GHz: RBW = 1 MHz and VBW = 1 MHz (peak measurements)

Above 1 GHz: RBW = 1 MHz and VBW = 10 Hz (average measurements)

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. Each significant peak was then investigated and maximised with the Quasi-Peak detector. The measurement data for each frequency range was automatically corrected by the software for cable losses, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisations.

4.2 Plotting of Measurement Data for Radiated Emissions

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges over the range 30-1000 MHz.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. For radiated EMI, each numbered peak is listed as a frequency, peak field strength, quasi-peak field strength and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.



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4.3 Calculation of Peak and Average Field Strength

The peak field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

$$E = V + AF - G + L \quad \text{Where:}$$

- E** = Radiated Peak Field Strength in dB μ V/m.
- V** = EMI Receiver Voltage in dB μ V. (measured value)
- AF** = Antenna Factor in dB(m⁻¹). (stored as a data array)
- G** = Preamplifier Gain in dB. (stored as a data array)
- L** = Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

- **Example Peak Field Strength Calculation**

Assuming a receiver reading of 34.0 dB μ V is obtained at 90 MHz, the Antenna Factor at that frequency is 9.2 dB. The cable loss is 1.9 dB while the preamplifier gain is 20 dB. The resulting Field Strength is therefore as follows:

$$34.0 + 9.2 + 1.9 - 20 = 25.1 \text{ dB}\mu\text{V/m}$$

4.4 Results - Fundamental and Spurious (9 kHz to 4344 MHz)

Testing was performed with new battery fitted and rotated around 3 orthogonal planes. Worst-case results are reported.

Frequency MHz	Polarity	Peak Measured dB μ V/m	Average Measured dB μ V/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Δ \pm dB
434.34	Horizontal	72.5	72.4	92.9	72.9	-0.5*
434.34	Vertical	72.0	71.8	92.9	72.9	-1.1*
433.93	Horizontal	72.4	62.3	92.9	72.9	-10.6
433.93	Vertical	71.6	61.4	92.9	72.9	-11.5

*This result falls within the laboratory's measurement uncertainty. Refer to Section 8.0.

The highest radiated fundamental field strength emission complied with FCC limit by a margin of 0.5 dB. Refer to Appendix B1 to B4.

Harmonics and spurious emissions from 9 kHz to the 10th harmonic of both fundamentals were 20 dB or more below the limits.

5.0 BANDWIDTH MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 15.231(c).

The bandwidth of the emission shall be no wider than 0.25% of the centre frequency.

Tx Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result	Bandwidth Plot
433.9	35	93	< 1085	Complied	Appendix C1
434.3	83.2	68	< 1085	Complied	Appendix C2



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6.0 ANTENNA REQUIREMENT

Testing to the requirements of FCC Part 15.203 was not applicable as this intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

7.0 COMPLIANCE STATEMENT

The Optical Smoke Alarm, Model: BE1283, tested on behalf of Bellman & Symfon AB, **complied** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.231 – Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz.

The test sample also complied with the Industry Canada RSS-210 issue 8 - Licence-Exempt Radiocommunication Apparatus (All Frequency Bands) Category I Equipment, Annex 1

Results were as follows:

FCC Part 15, Subpart C Clauses	IC RSS-210 and RSS-Gen Clauses	Test Performed	Result
15.203	RSS-Gen (7.1.4)	Antenna Requirement	Not Applicable
15.205	RSS-Gen (7.2.2)	Operation in Restricted Band	Complied
15.207	RSS-Gen (7.2.4)	Conducted Emissions	Not Applicable
15.209	RSS-Gen (7.2.5)	Radiated Emissions	Complied
15.231 (e)	A1.1 Table B	Field Strength Emissions	Complied
15.231 (c)	A1.1.3	Bandwidth	Complied

8.0 UNCERTAINTIES

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Radiated Emissions:	9 kHz to 30 MHz	±4.1 dB
	30 MHz to 300 MHz	±5.1 dB
	300 MHz to 1000 MHz	±4.7 dB
	1 GHz to 18 GHz	±4.6 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.



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APPENDIX A MEASUREMENT INSTRUMENT

EQUIPMENT TYPE	MANUFACTURER, MODEL NUMBER and SERIAL NUMBER	CALIBRATION DUE DD/MM/YYYY
EMI RECEIVER	HP 8546A Sn: 3520A00249 (R-017)	10/11/2012
ANTENNAS	EMCO 6502 LOOP ANTENNA 9 kHz – 30 MHz Sn: 2021	19/11/2012
	Sunol Sciences Corp (USA) JB6 Biconilog 30 MHz - 6 GHz Sn: A012312	02/02/2013



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APPENDIX B1 GRAPHS of EMI MEASUREMENTS

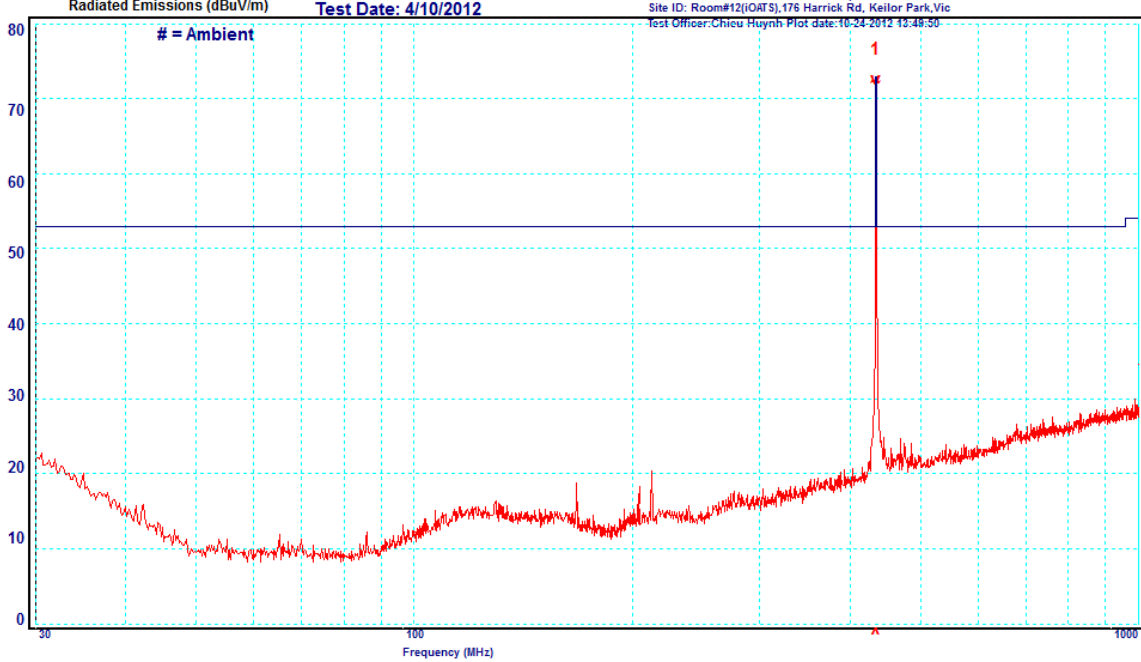
Tx: 433.9 MHz – Vertical Polarity

Bellman & Symfon
Smoke Alarm
433.9MHz
Vertical Polarisation

Limit1: FCC231(e) FCC PART 15.231(e) Tx Average Limits For 434MHz @ 3mtrs

Job No: m120624 Graph No. 1
Test Date: 4/10/2012

Trace 2: Vertical Emissions
r:\fmebl\2012\Jun\M120624\M120624R\GraphV.bmp
L:A3630213 c1:C4210113 c2:C4370213 p:NONE a:NONE
Site ID: Room#12(IOTS),176 Harrick Rd., Keilor Park, Vic
Test Officer: Chieu Huynh Plot date: 10-24-2012 13:49:50



Peak	Frequency MHz	Peak Level Measured dB μ V/m	Average Level Measured dBuV/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Δ \pm dB
1	433.93	71.6	61.4	92.9	72.9	-11.5



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APPENDIX B2 GRAPHS of EMI MEASUREMENTS

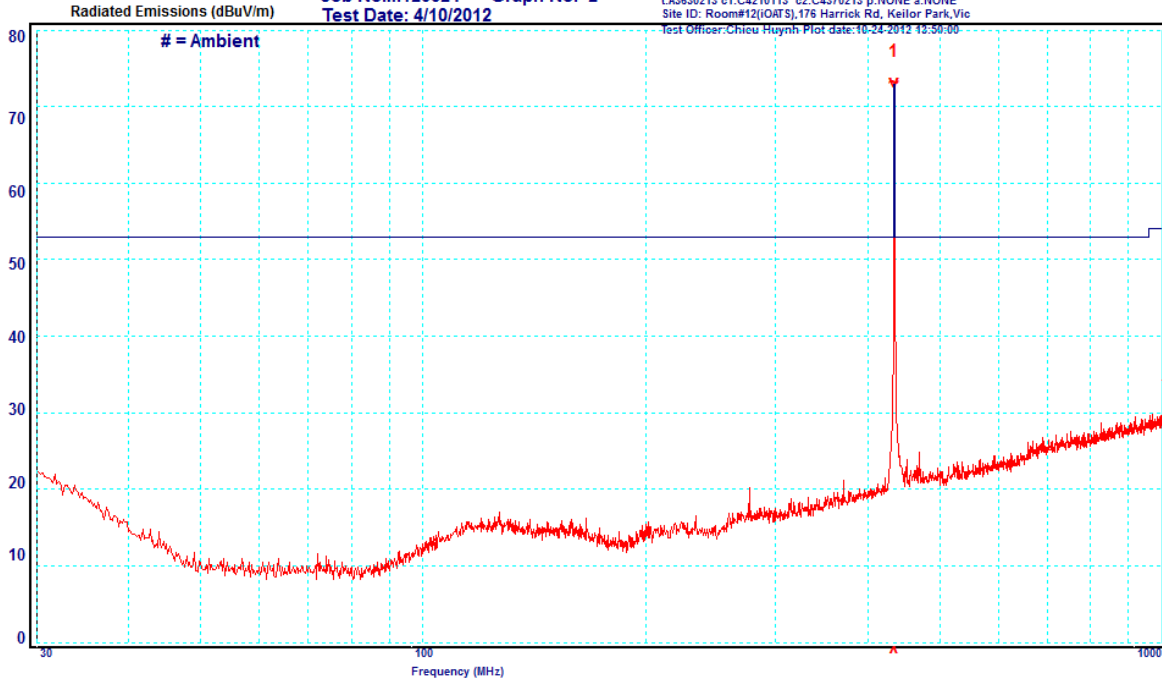
Tx: 433.9 MHz – Horizontal Polarity

Bellman & Symfon
Smoke Alarm
433.9MHz
Horizontal Polarisation

Limit1: FCC231(e) FCC PART 15.231(e) Tx Average Limits For 434MHz @ 3mtrs

Job No:m120624 Graph No. 2
Test Date: 4/10/2012

Trace 2: Horizontal Emissions
R:\FMELB\2012\JUN\120624\M120624R\GraphH.bmp
L:A3630213 c1:C4210113 c2:C4370213 p:NONE a:NONE
Site ID: Room#12(IQATS),176 Harrick Rd, Keilor Park,Vic
Test Officer:Chieu Huynh Plot date:10-24-2012 13:50:00



Peak	Frequency MHz	Peak Level Measured dB μ V/m	Average Level Measured dBuV/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Δ \pm dB
1	433.93	72.4	62.3	92.9	72.9	-10.6



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APPENDIX B3 GRAPHS of EMI MEASUREMENTS

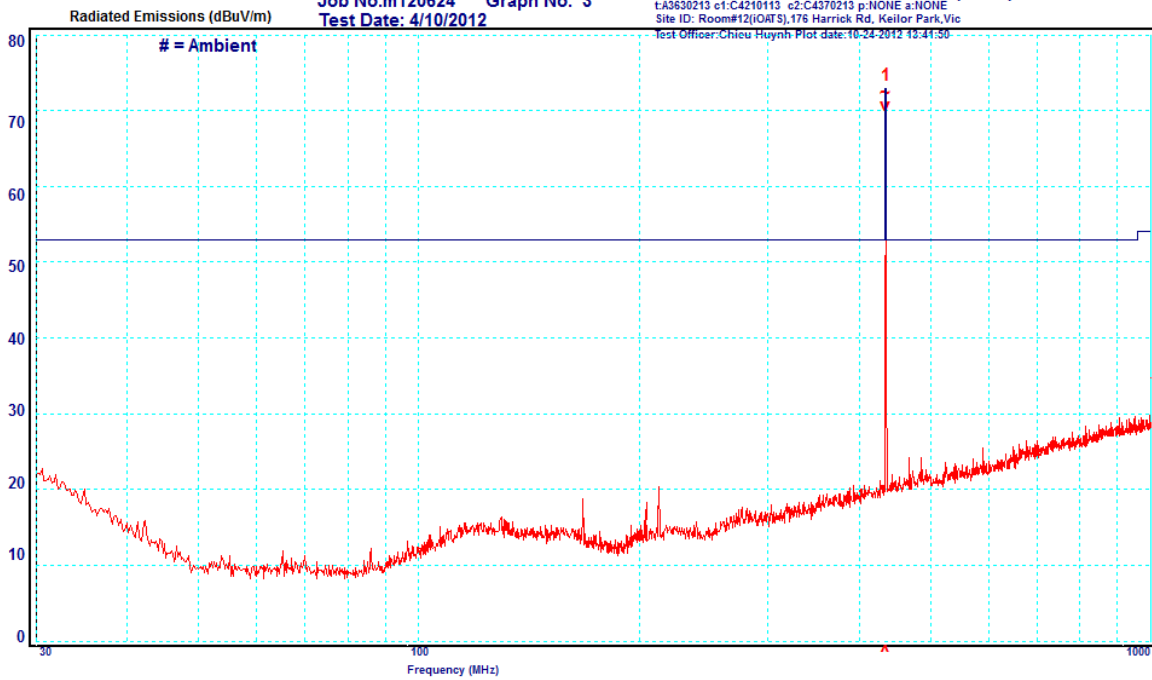
Tx: 434.3 MHz – Vertical Polarity

**Bellman & Symfon
Smoke Alarm
434.3MHz
Vertical Polarisation**

Limit1: FCC231(e) FCC PART 15.231(e) Tx Average Limits For 434MHz @ 3mtrs

**Job No:m120624 Graph No. 3
Test Date: 4/10/2012**

Trace 2: Vertical Emissions
R:\F\MELB\2012\JUN\M120624\M120624R\GraphV.bmp
c:\A3630213 c1:C4210113 c2:C4370213 p:NONE a:NONE
Site ID: Room#12(IQATS),176 Harrick Rd, Keilor Park,Vic
Test Officer:Chieu Huynh Plot date:10-24-2012 13:41:50



Peak	Frequency MHz	Peak Level Measured dB μ V/m	Average Level Measured dBuV/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Δ \pm dB
1	434.34	72.0	71.8	92.9	72.9	-1.1



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APPENDIX B4 GRAPHS of EMI MEASUREMENTS

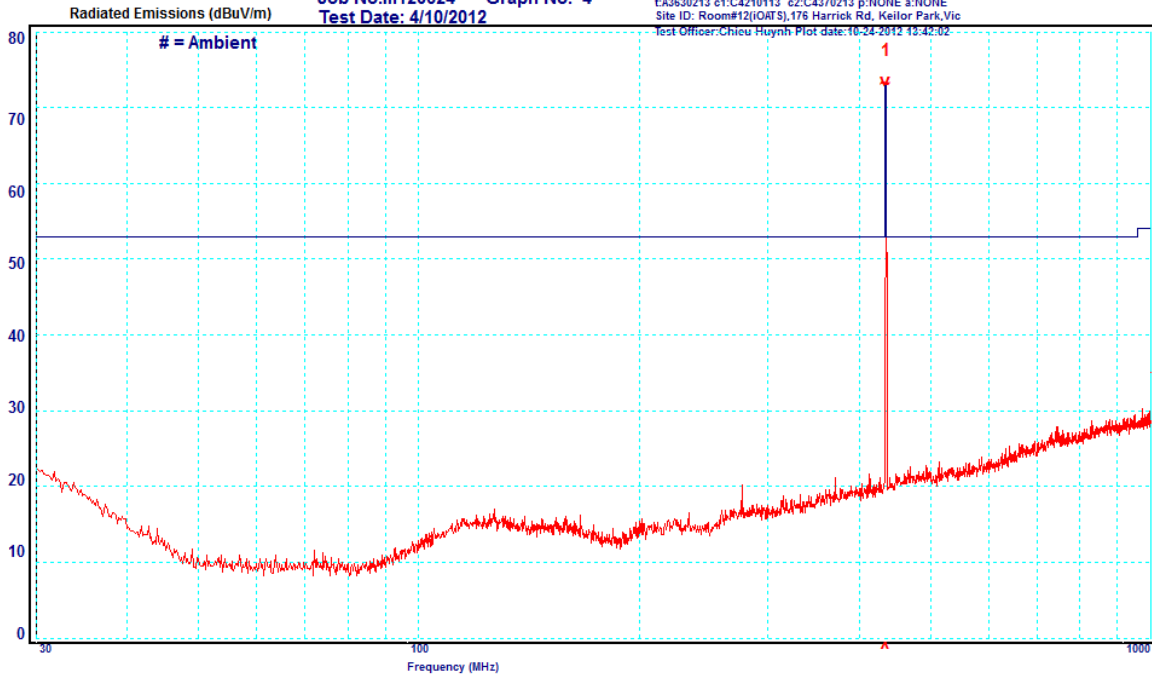
Tx: 434.3 MHz – Horizontal Polarity

**Bellman & Symfon
Smoke Alarm
434.3MHz
Horizontal Polarisation**

Limit1: FCC231(e) FCC PART 15.231(e) Tx Average Limits For 434MHz @ 3mtrs

**Job No:m120624 Graph No. 4
Test Date: 4/10/2012**

Trace 2: Horizontal Emissions
r:\fme\bl2012\Jun\M120624\M120624R\GraphH.bmp
t:A5830213 c1:C4210113 c2:C4370213 p:NONE a:NONE
Site ID: Room#12(IATS),176 Harrick Rd, Keilor Park,Vic
Test Officer:Chieu Huynh Plot date:10-24-2012 13:42:02



Peak	Frequency MHz	Peak Level Measured dB μ V/m	Average Level Measured dBuV/m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Δ \pm dB
1	434.34	72.5	72.4	92.9	72.9	-0.5

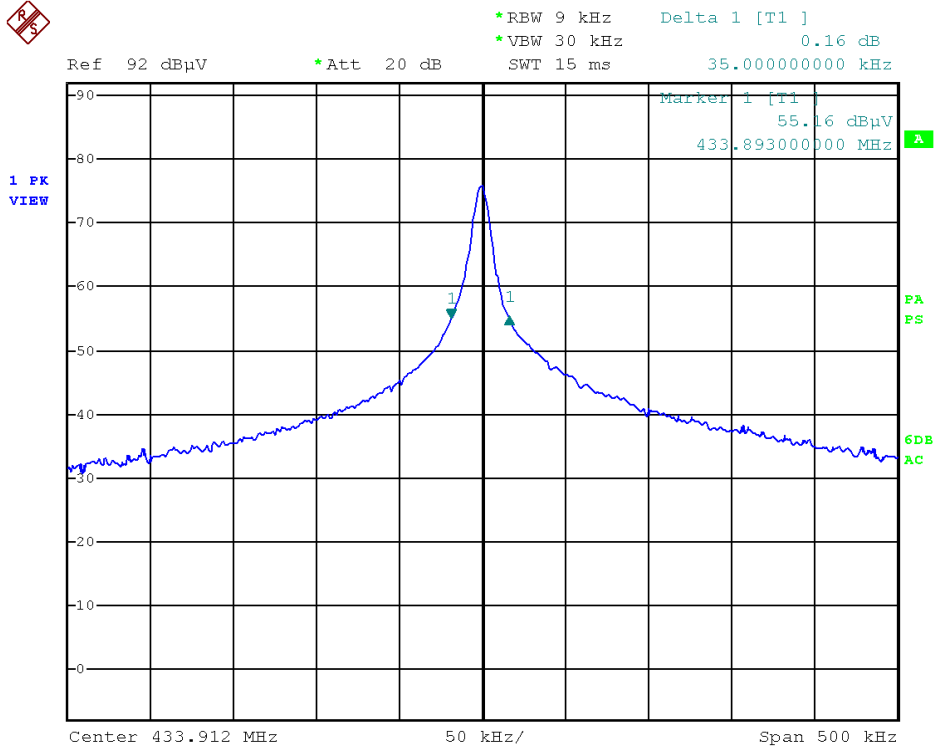


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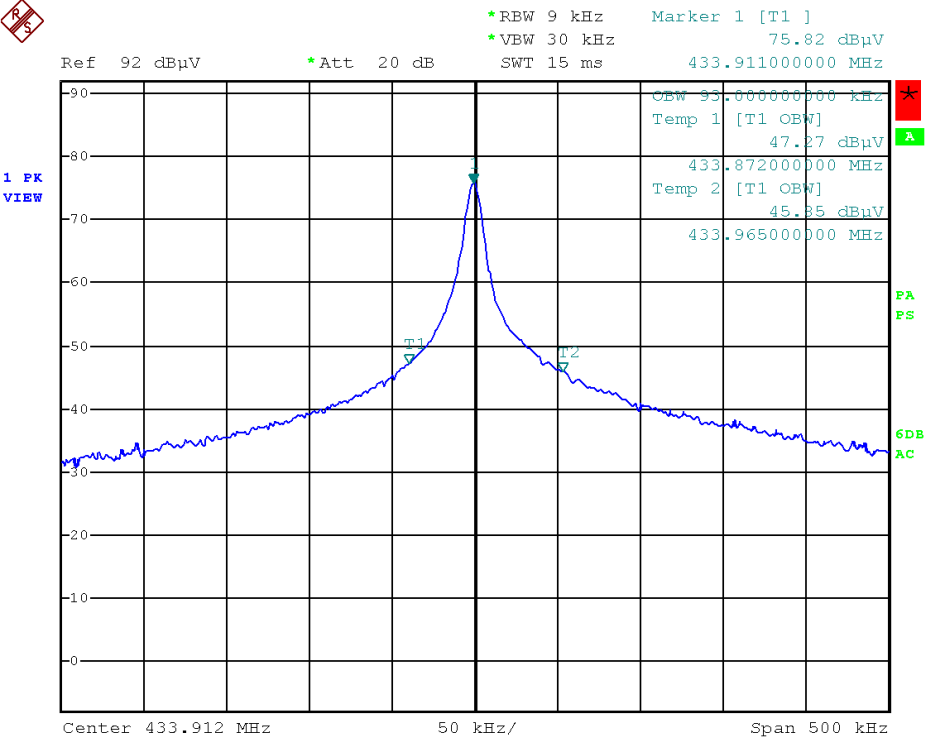
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APPENDIX C1 BANDWIDTH PLOT - Tx: 433.9 MHz

20dB BW



99% BW

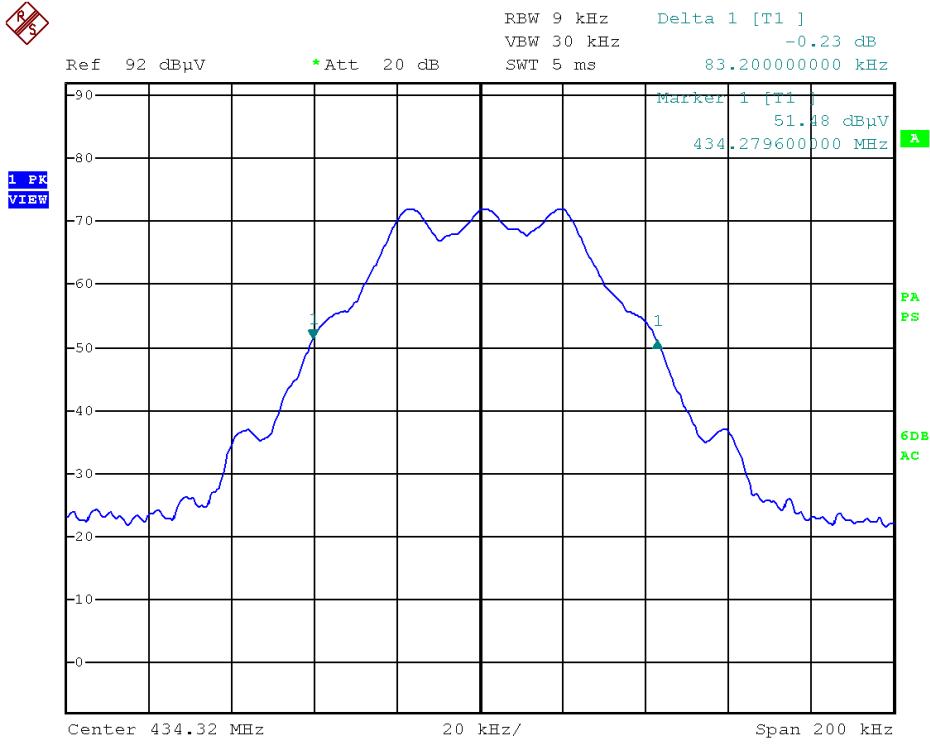


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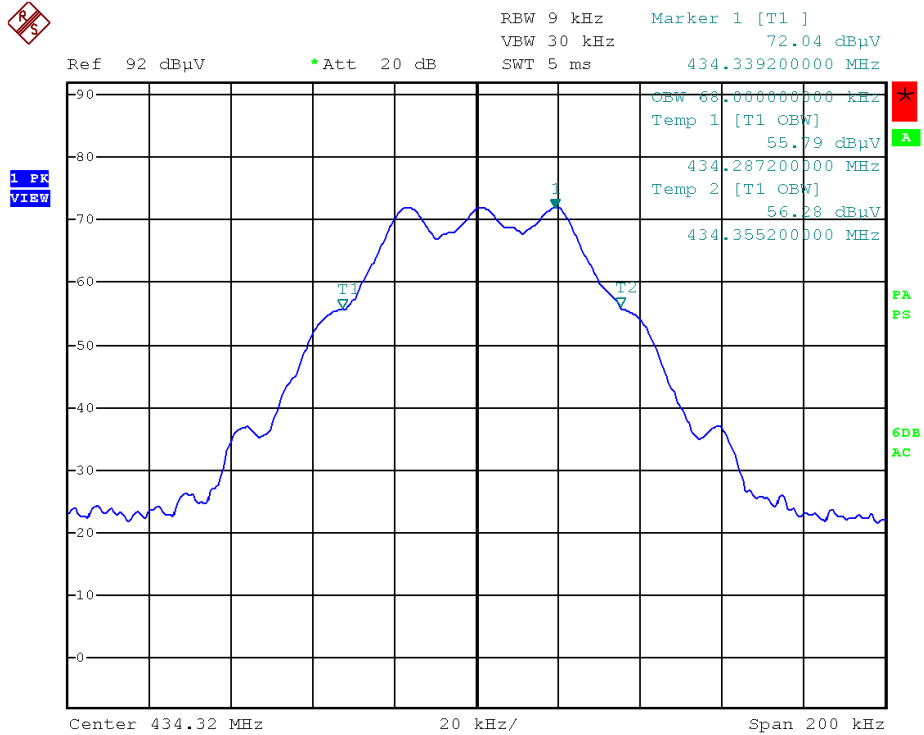
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APPENDIX C2 BANDWIDTH PLOT - Tx: 434.3 MHz

20dB BW



99% BW



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