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Emissions Testing of Wander Monitor

in accordance with FCC Part 15, Subpart C (2006)

Test Personnel: L. Wang

Prepared for: Firetec Health & Safety Ltd.
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1.0 Introduction

1.1 SCOPE

The purpose of this report is to present the findings and results of compliance testing performed in accordance with CFR Title 47 FCC Part 15, Subpart C, Intentional Radiators.

1.2 Applicant

This test report has been prepared for Firetec Health & Safety Ltd (1227884 Alberta Ltd), located in Edmonton, Alberta, Canada.

1.3 Applicability

All test procedures, limits, and results defined in this document apply to the Firetec Health & Safety Ltd. Wander Monitor unit, referred to herein as the Equipment Under Test (EUT).

The results contained in this report relate only to the item tested.

This report does not imply product endorsement by NVLAP or the Canadian or US governments.

1.4 Test Sample Description

The test sample provided for testing was a Wander Monitor:

Product Name:	Wander Monitor
Model Number:	WMT-001
Serial Number:	E029
Cables:	N/A
Power Requirements:	6 VDC battery
Peripheral Equipment:	N/A

More detailed information is provided by Firetec Health & Safety Ltd. in Appendix A.

1.5 General Test Conditions and Assumptions

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

The EUT uses two 3V Lithium cells (CR2032) as a power supply. The cell open circuit voltage was checked before each sequence of tests, and the cells replaced with fresh ones if the voltage fell below 3.0 volts.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

Environmental conditions are recorded for each test.

1.6 Scope of Testing

Testing was performed in accordance with FCC Part 15 Subpart C (2006), and ANSI C63.4 (2004).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above.

1.6.2 TEST SAMPLE CONFIGURATION & MODIFICATIONS

For all radiated emissions testing, the EUT was placed on an 80 cm high wooden table centred on the flush-mounted turntable.
During pre-testing, emissions from the EUT were observed when mounted with the PCB aligned in three mutually perpendicular planes. The axis giving the highest third harmonic emissions was the orientation used during compliance testing.
The photographs attached portray the EUT setup used.

The EUT met the requirements without modifications.

2.0 Abbreviations

AP -Average Peak
CE -Conducted Emissions
E -Field - Electric Field
H -Field - Magnetic Field
N/T -Not Tested
N/A -Not Applicable
PK -Peak
QP -Quasi Peak
RE -Radiated Emissions

3.0 Measurement Uncertainty

The factors contributing to uncertainty of measurement are identified and calculated in accordance with UKAS (United Kingdom Accreditation Service) document “Lab 12, The expression of uncertainty in testing” Edition 1, October 2000, as based on the ISO “Guide to the Expression of Uncertainty in Measurement” 1993.

Amplitude, Radiated Emissions:	± 4.01 dB
Amplitude, Conducted Emissions:	± 3.25 dB
Frequency:	± 1 kHz

4.0 Test Conclusion

STATEMENT OF COMPLIANCE

The client equipment referred to in this report was found to comply with the requirements as stated below.

The EUT was subjected to the following tests. Compliance status is reported as **PASS** or **FAIL**. Test conditions that are not applicable to the EUT are marked **n/a**. If testing was not performed at this time, the appropriate field is marked **n/t**.

The following table summarizes the test results in terms of the specification and class or level applicable, the test sample identification, and the EUT configuration.

TEST CASE	TEST TYPE	SECTION	TEST SAMPLE	CONFIGURATION	RESULT
§4.1	Conducted Emissions at AC lines	FCC Part 15.107 & 15.207	Wander Monitor	See § 1.6.2	**n/a**
§4.2	Conducted Emissions at Antenna Port	FCC Part 15.231	Wander Monitor	See § 1.6.2	**n/a**
§4.3a	Radiated Emissions (Rx Mode)	FCC Part 15.109	Wander Monitor	See § 1.6.2	**n/a**
§4.3b	Radiated Emissions (Tx Mode)	FCC Parts 15.205 & 15.209	Wander Monitor	See § 1.6.2	**PASS**
§4.3c	Radiated Emissions (Tx Mode)	FCC Parts 15.209 & 15.231	Wander Monitor	See § 1.6.2	**PASS**

4.1 Conducted Emissions On AC Power Lines (Part 15.107)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Test Date: n/a	Product:
Test Result, Wander Monitor: **Not Applicable**	
The Wander Monitor was not tested for Conducted Emissions. This is a 6V DC battery powered device. The power source is provided by the end user, not Firetec Health & Safety Ltd. There is no connection to the AC mains.	

4.2 Conducted Emissions Measured at Antenna Port (Part 15.231)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Test Date: n/a	Product:
Test Result, Wander Monitor: **Not Applicable** **Antenna is integral to the circuit board**	

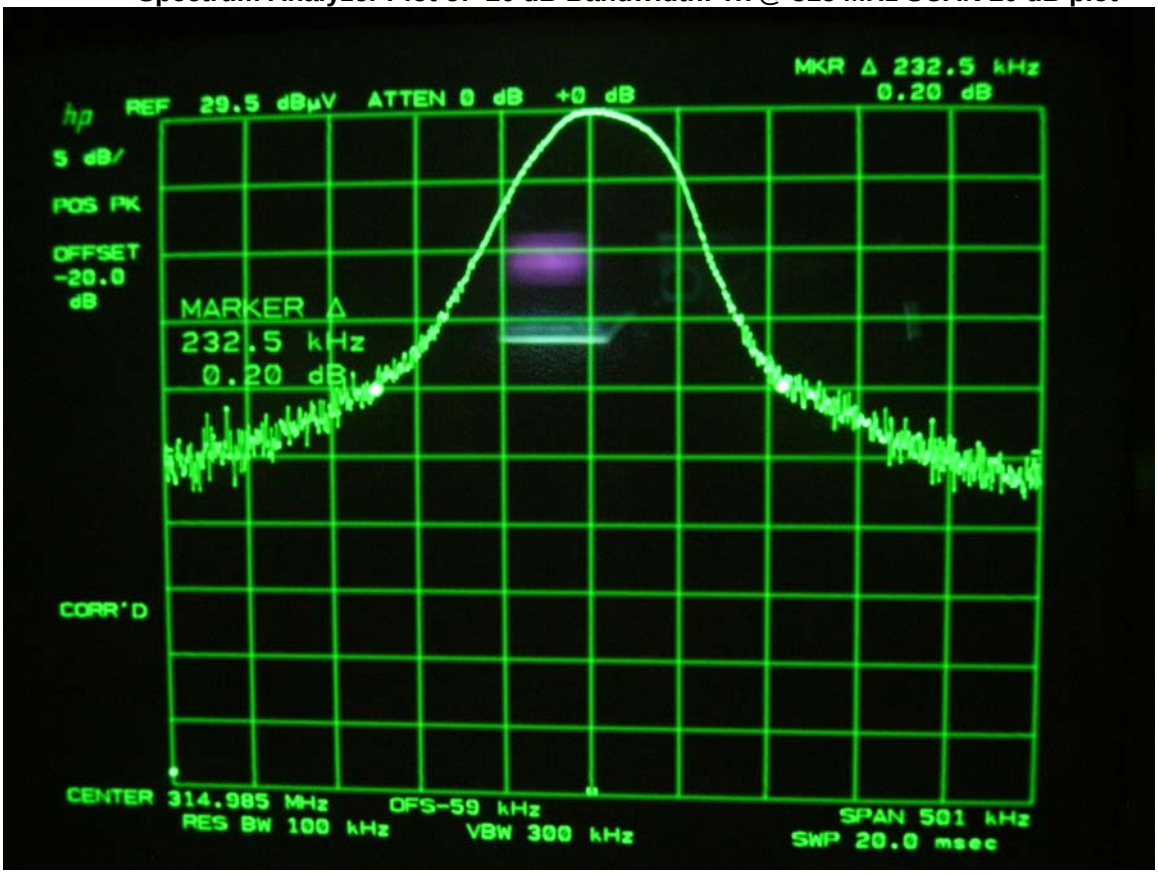
EIRP of Carrier = -33.53 dBm

§ 15.231(a)	Application	Permitted
§ 15.231(a)(1)	Manual 5-second timeout	See “RF information about the EUT as supplied by the manufacturer” in §4.3c
§ 15.231(a)(2)	Automatic 5-second timeout	Shutoff time = See “RF information about the EUT as supplied by the manufacturer” in §4.3c
§ 15.231(a)(3)	Periodic polling less than 2 s/hr	Tx duration = See “RF information about the EUT as supplied by the manufacturer” in §4.3c
§ 15.231(a)(4)	Emergency alarm operation	The actual unit complies to the provisions of 47cfr15.231(a)(2) transmitter activated automatically shall cease within 5 seconds after activation, except when configured and employed to protect “safety of life” under 47cfe15.23 (a)(4), where it operates during the “pendancy of the alarm condition”. The WMT may also transmit supervision transmissions, as allowed under 47cfr 15.231 (a)(3).

§ 15.231(c)	OBW ≤ 0.25 % **f**c	0.25% of 315Mhz = 787.5 KHz WMT is 232.5KHz worst case
§ 15.231(d)	Frequency Stability	n/a not specified for this type of device

§ 15.231(b) or (e)	Spurious ≤ -20 dB **f**c	Should be 20dB below carrier or below General Emission limit. Frequencies of interest are identified in the following tabular data. See also § 4.3b & § 4.3c
§ 15.231(b)(1)	Radiated Emissions @ 3 m	See § 4.3b & § 4.3c
§ 15.231(b)(2)	Quasi-Peak	See § 4.3b & § 4.3c
§ 15.231(b)(3)	15.209 General Limits	See § 4.3b & § 4.3c

Spectrum Analyzer Plot of -20 dB Bandwidth: Tx @ 315 MHz SCAN 20 dB plot



4.3 Radiated Emissions including Restricted Bands of Operation

Radiated Emissions Data:

The emissions data is presented in tabular form, showing the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value(s) of up to 4 limits at the frequency measured, and the margin between the result and the limit(s).

For example:

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit dB[uVolts/meter]	Margin [dB]:
94.0036	37.1 qp	2.2	8.5	47.8	54	-6.2
Azimuth: 156	Height:113	Vert				⇓

⇓		The applicable Limit
Test Frequency [MHz]	94.0036	Test Frequency f = 94.0036 MHz
Meter Reading [dB (μV)]	37.1 qp	The reading with Quasi-Peak detector
Gain/Loss Factor [dB]	2.2	Net correction for preamp gain & cable loss
Transducer Factor [dB]	8.5	Correction for antenna loss
Level [dB (μVolts)]	47.8	Corrected value for field strength
Azimuth:	156	The turntable was 156 degrees CW from facing the antenna
Height:	113	The antenna was 113 cm above the ground
Limit:	54	The value of Limit 1 at 94.0036 MHz
Margin [dB]	-6.2	The field strength is 6.2 dB below Limit 1

Meter Reading in dBμV + Gain/Loss Factor in dB + Transducer Factor in dB = Corrected Field Strength

Note: When a preamp is used, the resulting gain is compensated.

4.3a Receive Mode (Part 15.109)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: L. Wang Test Date: 29 May 2007	Product: Wander Monitor

Test Result, Wander Monitor: **N/A**

Receive Mode N/A (no receive function)

Objectives/Criteria The Radiated E-Field emissions produced by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed the limits for the specifications as stated.	Specification: FCC Part 15.109

Frequency [MHz]	Class A QP @ 3m	Class B QP @ 3m
30 – 88	49.54	40.00
88 – 216	53.98	43.52
216 – 960	56.90	46.02
above 960	60.00	53.98

Horizontal:

Frequency [MHz]	Field Strength [dBμV/m]	Delta [dB from limit]

Vertical:

Frequency [MHz]	Field Strength [dBμV/m]	Delta [dB from limit]

N/A (no receive function)

4.3b Transmit Mode (Part 15.205 & 15.209)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: L. Wang Date: 29 May 2007	Product: Wander Monitor
Test Result, Wander Monitor: **PASS**	
Objectives/Criteria The Radiated E-Field emissions produced by EUT, measured at a distance of 3m, shall not exceed these limits within the restricted bands of operation. Any emissions lying outside these bands shall be at least 20 dB down from the level of the fundamental. Attenuation below the limits of 15.209 is not required. Note: See the table below for the Restricted Bands of Operation per Part 15.205	Specification: FCC Part 15.209 Frequency [MHz] — Limit (QP @ 3m) [dBμV/m] .009 – 0.490 — 88.5 – 53.8 .490 – 1.7 — 53.8 – 43 1.7 – 30 — 49.50 30 – 88 — 40.00 88 – 216 — 43.52 216 – 960 — 46.02 above 960 — 53.98

Restricted Bands of Operation per Part 15.205:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.0900000 – 0.1100000	8.2910000 - 8.2940000	16.804250 - 16.804750	162.01250 - 167.17000 *	1660.0000 – 1710.0000	3.6000000 – 4.4000000	14.470000 – 14.500000
0.4950000 - 0.5050000 *	8.3620000 - 8.3660000	25.500000 - 25.670000	167.72000 - 173.20000 *	1718.8000 – 1722.2000	4.5000000 – 5.1500000	15.350000 – 16.200000
2.1735000 - 2.1905000	8.3762500 - 8.3867500	37.500000 - 38.250000	240.00000 – 285.00000	2200.0000 – 2300.0000	5.3500000 – 5.4600000	17.700000 – 21.400000
4.1250000 - 4.1280000	8.4142500 - 8.4147500	73.000000 - 74.600000	322.00000 - 335.40000	2310.0000 – 2390.0000	7.2500000 – 7.7500000	22.010000 – 23.120000
4.1772500 - 4.1777500	12.290000 - 12.293000	74.800000 - 75.200000	399.90000 – 410.00000	2483.5000 – 2500.0000 *	8.0250000 – 8.5000000	23.600000 – 24.000000
4.2072500 - 4.2077500	12.519750 - 12.520250	108.00000 - 121.94000 **	608.00000 – 614.00000	2655.0000 – 2900.0000	9.0000000 – 9.2000000	31.200000 – 31.800000
5.6770000 - 5.6830000	12.576750 - 12.577250	123.00000 - 138.00000 **	960.00000 – 1240.0000 ***	3260..0000 – 3267.0000	9.3000000 – 9.5000000	36.430000 – 36.500000
6.2150000 - 6.2180000	13.360000 - 13.410000	149.90000 - 150.05000 *	1300.0000 – 1427.0000 ***	3332.0000 – 3339.0000	10.600000 – 12.700000	Above 38.600000
6.2677500 - 6.2682500	16.420000 - 16.423000	156.52475-156.52525	1435.0000 – 1626.5000	3345.8000 – 3358.0000	13.250000 – 13.400000	
6.3117500 - 6.3122500	16.694750 - 16.695250	156.70000 - 156.90000	1645.5000 – 1646.5000	3500.0000 – 3600.0000 ****		

* US only ** Canada 108 – 138 MHz *** Canada 960 – 1427 MHz **** Canada only

Radiated Emissions Data:

Harmonics of the 315MHz fundamental that fall into the restricted bands from the table above.

nominal f_c (MHz)	**f** (MHz)	Field Strength (dBμV/m) Average	Limit (dBμV/m) Average	Delta (dB)	Antenna Polarization	Antenna Height (cm)	Azimuth (Degrees)
315	1575	51.70	53.98	-2.28	H	102	144
315	2205	39.02	53.98	-14.96	H	99	153
315	2835	<25	53.98	<-29			

4.3c Transmit Mode (Part 15.209 & 15.231)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: L. Wang Date: 29 May 2007	Product: Wander Monitor
Test Result, Wander Monitor: **PASS**	

Objectives/Criteria

For emissions lying outside the restricted bands of operation in 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the limits show in the table to the right. The limits on the field strength of the spurious emissions in the table to the right are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Sec. 15.209, whichever limit permits a higher field strength.

Specification: FCC Part 15.231

Fundamental Frequency [MHz]	Field Strength of Fundamental [microvolts/ meter]	Field Strength of Spurious [microvolts/ meter]
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 *	125 to 375 *
174-260	3,750	375
260-470	3,750 to 12,500 *	375 to 1,250 *
Above 470	12,500	1,250

The allowed peak levels for the above from 47cfr15.231(b), for the 260 - 470 MHz band are linear interpolations.

Field strength for the fundamental of 315 MHz is interpolated as
(315-260)/(470-260) * (12500-3750) + 3750 = 6041.

Fundamental is limited to 6041uV/m @3m,
or 20log(6041uV/m) = 75.6dBuV

Spurious signals are limited to 604.1uV/m @ 3m,
or 20log(604.1uV/m) = 55.6dBuV when measured using a quasi-peak detector.

Where peak levels are measured, they can be adjusted by -3.22dB to allow for the worst case duty cycle, and give average levels (see manufacturers explanation below)

4.3c RF information about the EUT as supplied by the manufacturer:

The WMT transmits at 315MHz using OOK modulation, with a symbol rate of 2500 bps (400us bit times). The WMT has a microcontroller with a built in 8MHz 1% oscillator and a sensing ASIC clock at 32.768 KHz.

Data frames start with a start bit '1', followed by 12 or 36 bits where a '0' is transmitted as '011' and a '1' is transmitted as '001'.

The sample unit has special firmware to enable it to transmit once a second, to make testing easier. The actual unit complies to the provisions of 47cfr15.231(a)(2) “A transmitter activated automatically shall cease transmission within 5 seconds after activation” except when configured and employed to protect "safety of life" under 47cfr15.231(a)(4), where it operates during the "pendancy of the alarm condition". The WMT may also transmit supervision transmissions, as allowed under 47cfr15.231(a)(3). (See Figure 1 in Appendix B)

The allowed peak levels for the above from 47cfr15.231(b), for the 260 - 470 MHz band are linear interpolations:
Field strength is interpolated as: (315-260)/(470-260) * (12500-3750) + 3750 = 6041 uV/m.
The fundamental is limited to 6041uV/m @ 3m, or 20log(6041uV/m) = 75.6 dBuV
The harmonics are limited to 604.1uV/m @ 3m, or 20log(604.1uV/m) = 55.6 dBuV.

As per 47cfr15.231(b)(2) the transmitter shall comply via average values of measured emissions, or a CISPR quasi-peak detector.

For the former, using ANSI method, the worst case duty cycle over 100ms can be calculated for 36 bits as (36 x 3 + 1) x 400us = 43.6ms where at most 2/3 bit times are ON, followed by 4 milliseconds where the WMT does not transmit (it is turning on its LED).
The worst case window fits over 2 and part of a third frame, giving 92ms * (2/3) = 61.3ms on out of 100ms, or 20log(0.613) = -4.25dB.
(See Figures 2 and 3 in Appendix B)

For 12 bits, the calculation is (12 x 3 + 1) x 400 = 14.4ms, plus the 4ms transmitter off / LED on times. The worst case window fits over 5 and part of a sixth frame, giving 80ms * (2/3) = 53.3ms ON out of 100ms, or 20log(0.533) = -5.47dB.

The microcontroller extends one of the 400us pulses in either a '001' or '011' sequence by 100us, to compensate for the start up time of the SAW based transmitter.
Should a unit start transmitting instantaneously, it is possible that instead of transmitting for 800us total bit time out of 1200us (2/3 as above), it would transmit 900us out of 1200us (3/4). using this to adjust the worst case duty cycles above gives:
92ms * (3/4) = 69ms out of 100ms, or 20log(.69) = -3.22dB
80ms * (3/4) = 60ms out of 100ms, or 20log(.60) = -4.44dB.

So, where peak levels are measured, they can be adjusted by -3.22dB to allow for the worst case duty cycle, and give average levels.

Firetec Health & Safety Ltd.
Wander Monitor
Sample 2
Project# f05e3821 15 V

Range: 30 - 1000MHz

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/ meter]	Limit dB[uVolts/ meter]	Margin [dB]:
315.0473 Azimuth: 201	44.12 qp Height:132	3.6 Horz	14.1	61.82	75.6	-13.78
630.1074 Azimuth: 150	19.55 qp Height:134	5.4 Horz	19.4	44.35	55.6	-11.25
945.1068 Azimuth: 161	12.15 qp Height:191	6.8 Horz	22.79	41.74	55.6	-13.86
315.0437 Azimuth: 280	42.5 qp Height:158	3.6 Vert	13.5	59.6	75.6	-16.0
630.0961 Azimuth: 344	13.72 qp Height:99	5.4 Vert	18.6	37.72	55.6	-17.88
945.1527 Azimuth: 102	26.31 qp Height:110	6.8 Vert	21.89	55.0	55.6	-0.6

LIMIT: FCC Part 15.231 75.6 dB[uVolts / meter] Fundamental
55.6 dB[uVolts / meter] Spurious
FCC Part 15.205 & 15.209 53.98 dB[uVolts / meter] in Restricted Bands

qp - Quasi-Peak detector

Firetec Health & Safety Ltd.
Wander Monitor
Sample 2
Project# f05e3821 15 V

Range: 1000 - 2000MHz

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts / meter] pk	Level dB[uVolts / meter] ave *	Limit dB[uVolts / meter]	Margin [dB]:
1260.534 Azimuth: 158	64.08 pk Height:242	-35.57 Horz	24.85	53.36	50.14	55.6	-5.46
1575.532 Azimuth: 144	64.48 pk Height:102	-38.55 Horz	25.77	51.7	48.48	53.98	-5.50
1890.868 Azimuth: 129	62.52 pk Height:104	-37.3 Horz	27.15	52.37	49.15	55.6	-6.45
1259.604 Azimuth: 260	64.41 pk Height:111	-35.61 Vert	24.86	53.66	50.44	55.6	-5.46
1575.073 Azimuth: 45	63.74 pk Height:105	-38.57 Vert	25.76	50.93	47.71	53.98	- 6.27
1890.14 Azimuth: 231	63.43 pk Height:104	-37.3 Vert	27.11	53.24	50.02	55.6	-5.58

LIMIT: FCC Part 15.231 55.6 dB[uVolts / meter] Spurious
FCC Part 15.205 & 15.209 53.98 dB[uVolts / meter] in Restricted Bands

pk - Peak detector

* Ave level result allows for Duty cycle. (See “RF information about the EUT as supplied by the manufacturer”)

Firetec Health & Safety Ltd.
Wander Monitor
Sample 2
Project# f05e3821 15 V

Range: 2000 - 5000MHz

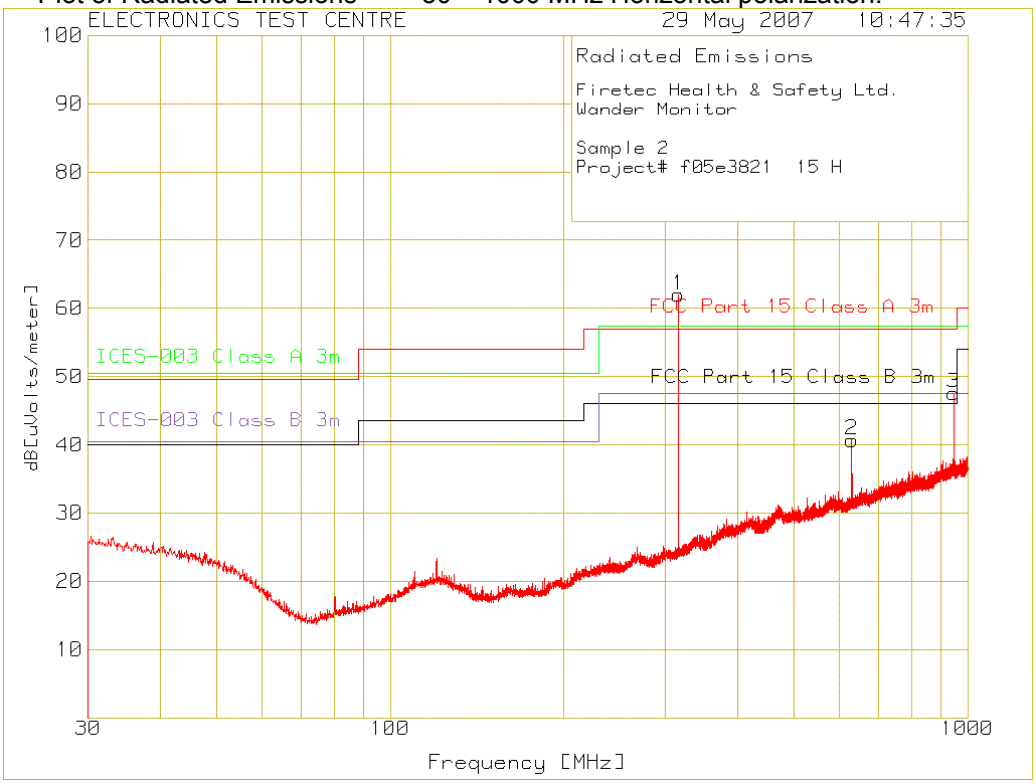
Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts / meter] pk	Level dB[uVolts / meter] ave*	Limit dB[uVolts / meter]	Margin [dB]:
2206.086 Azimuth: 153	46.84 pk Height:99	-35.89 Horz	28.07	39.02	35.8	53.98	-18.18
3465.384 Azimuth: 188	44.54 pk Height:168	-33.77 Horz	31.22	41.99	38.77	55.6	-16.83
2204.765 Azimuth: 183	46.67 pk Height:118	-35.89 Vert	28.01	38.79	35.57	53.98	-18.41
3464.926 Azimuth: 192	44.37 pk Height:99	-33.78 Vert	31.21	41.8	38.58	55.6	-17.02

LIMIT: FCC Part 15.231 55.6 dB[uVolts / meter] Spurious
FCC Part 15.205 53.98 dB[uVolts / meter] In Restricted Bands

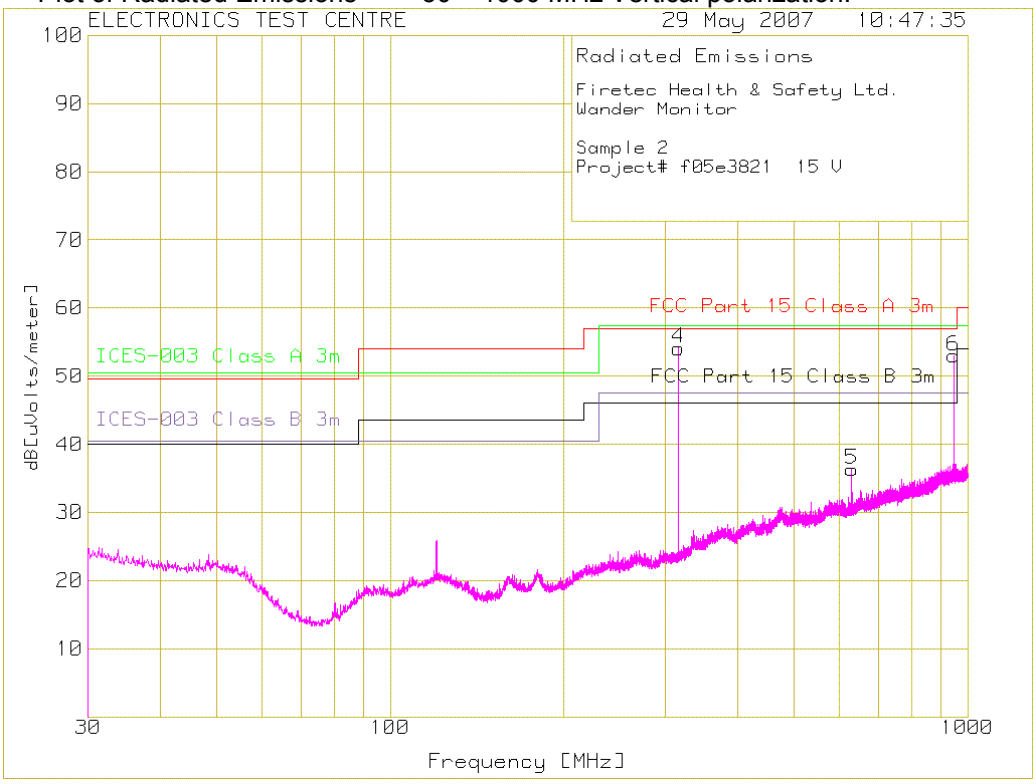
pk - Peak detector

* Ave level result allows for Duty cycle. (See “RF information about the EUT as supplied by the manufacturer”)

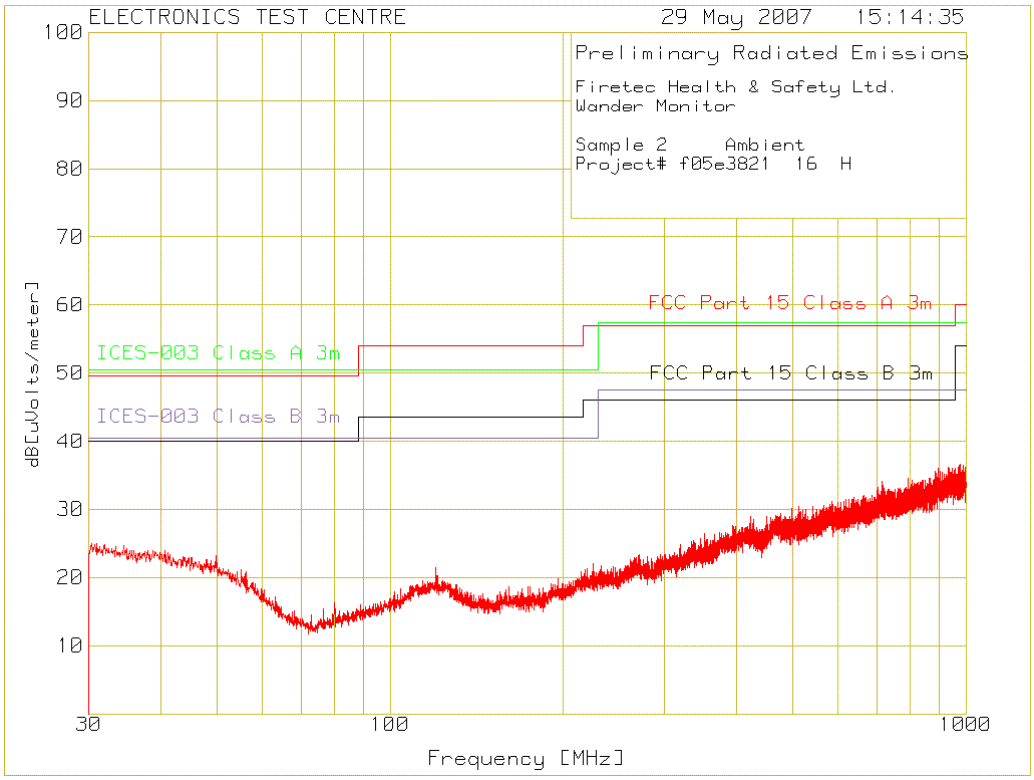
Plot of Radiated Emissions 30 – 1000 MHz Horizontal polarization:



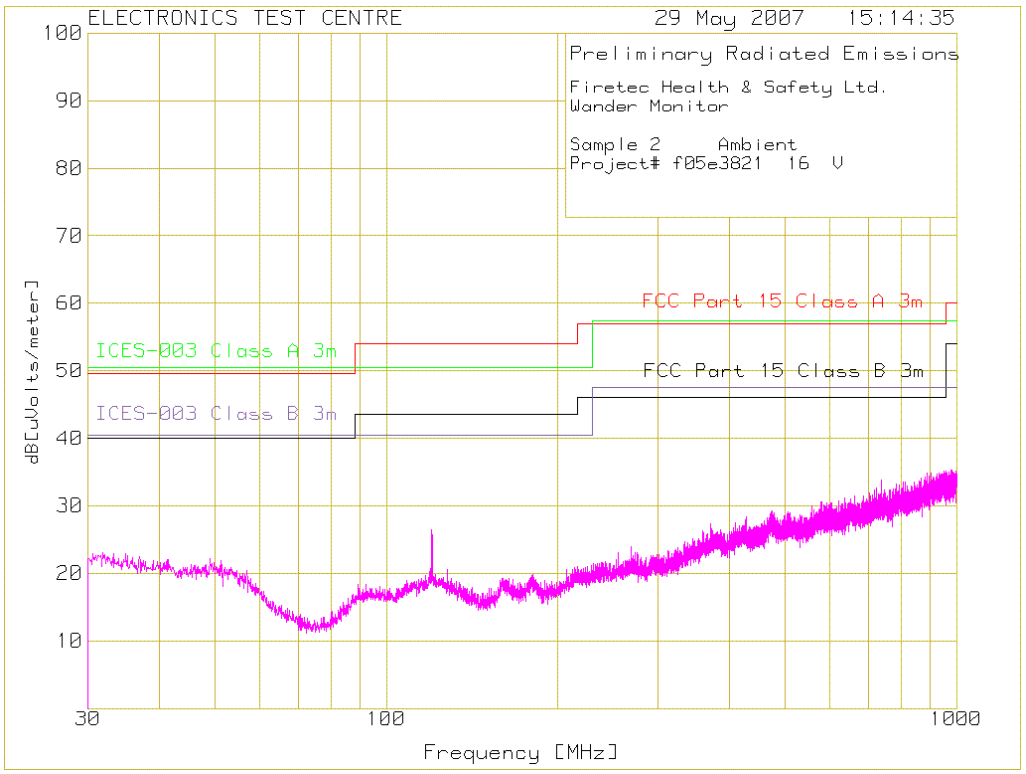
Plot of Radiated Emissions 30 – 1000 MHz Vertical polarization:



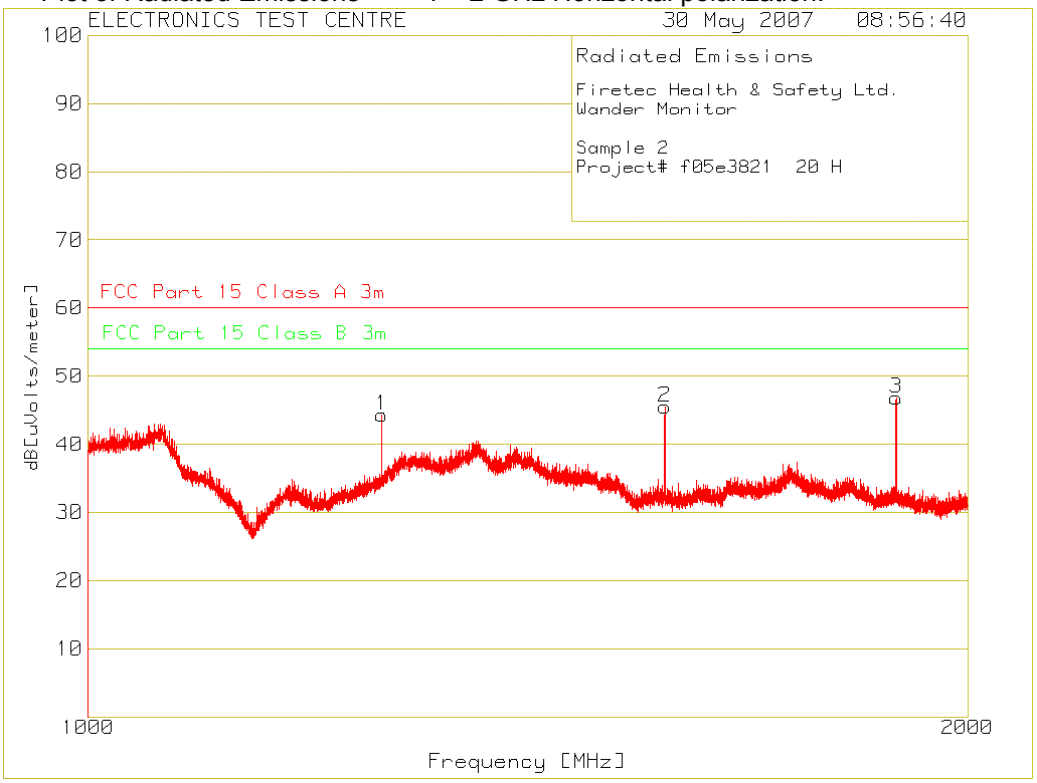
Plot of Radiated Emissions Test Chamber Ambient:
(measurement noise floor) 30 – 1000 MHz:



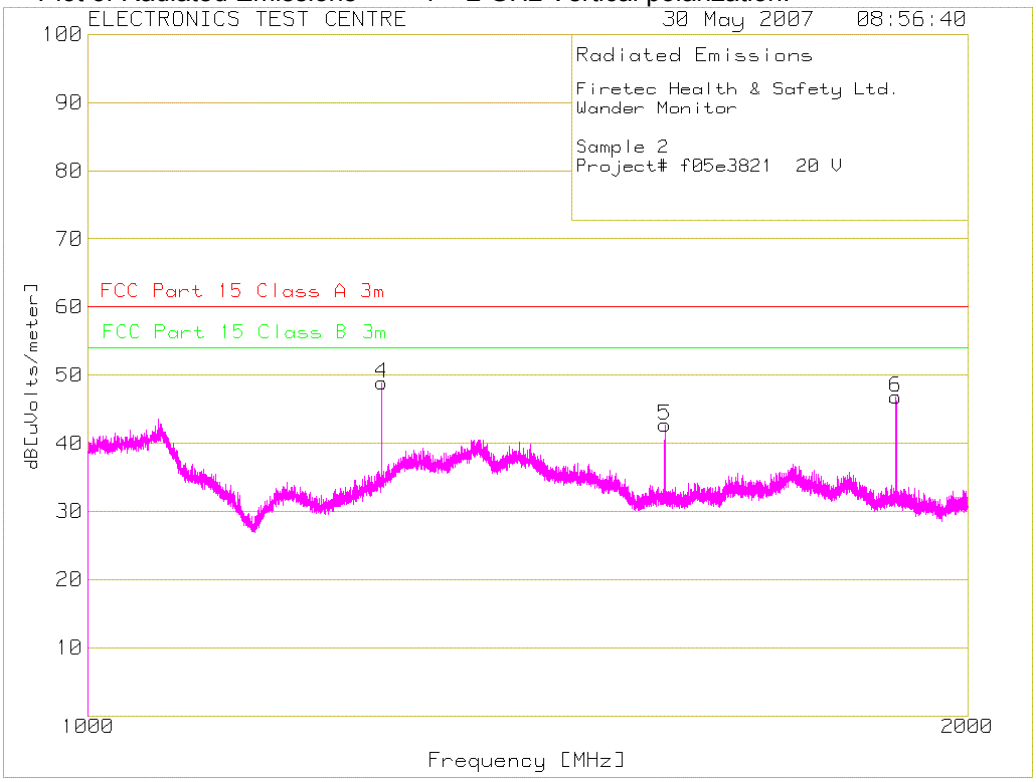
Plot of Radiated Emissions Test Chamber Ambient:
(measurement noise floor) 30 – 1000 MHz:



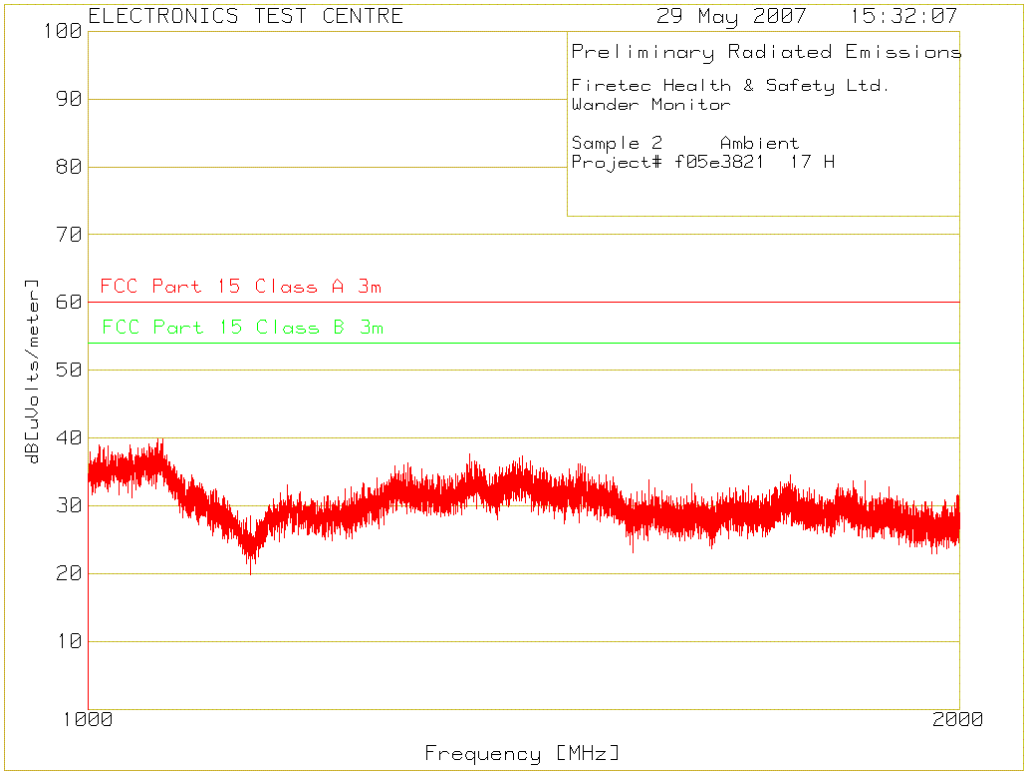
Plot of Radiated Emissions 1 – 2 GHz Horizontal polarization:



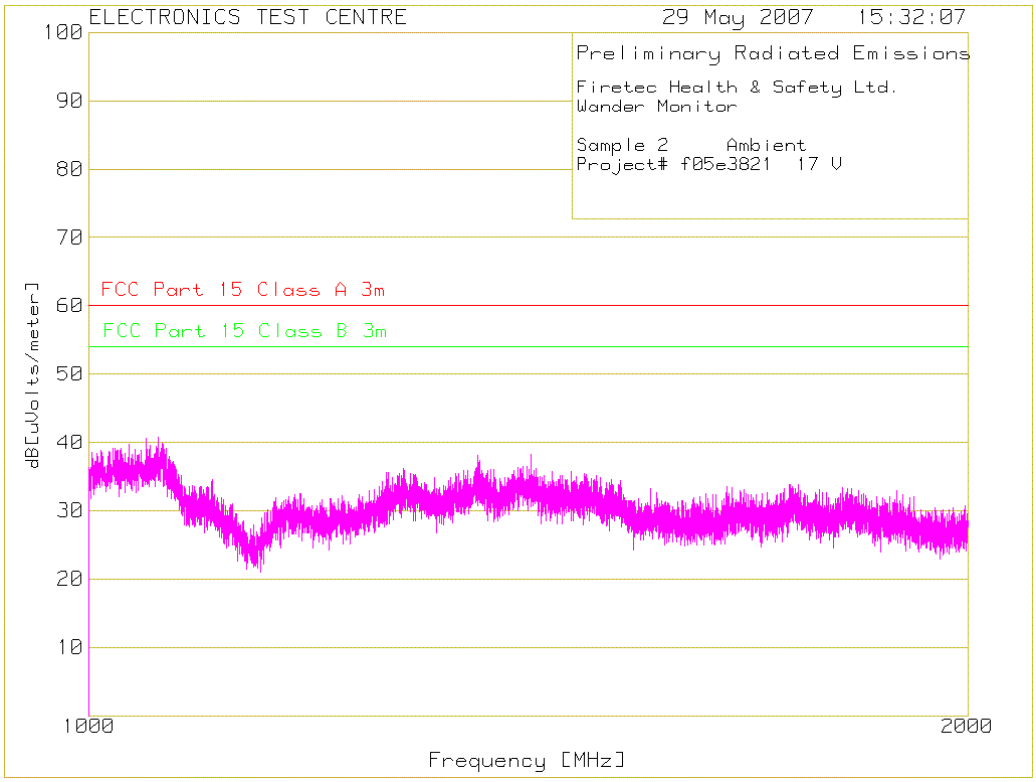
Plot of Radiated Emissions 1 – 2 GHz Vertical polarization:



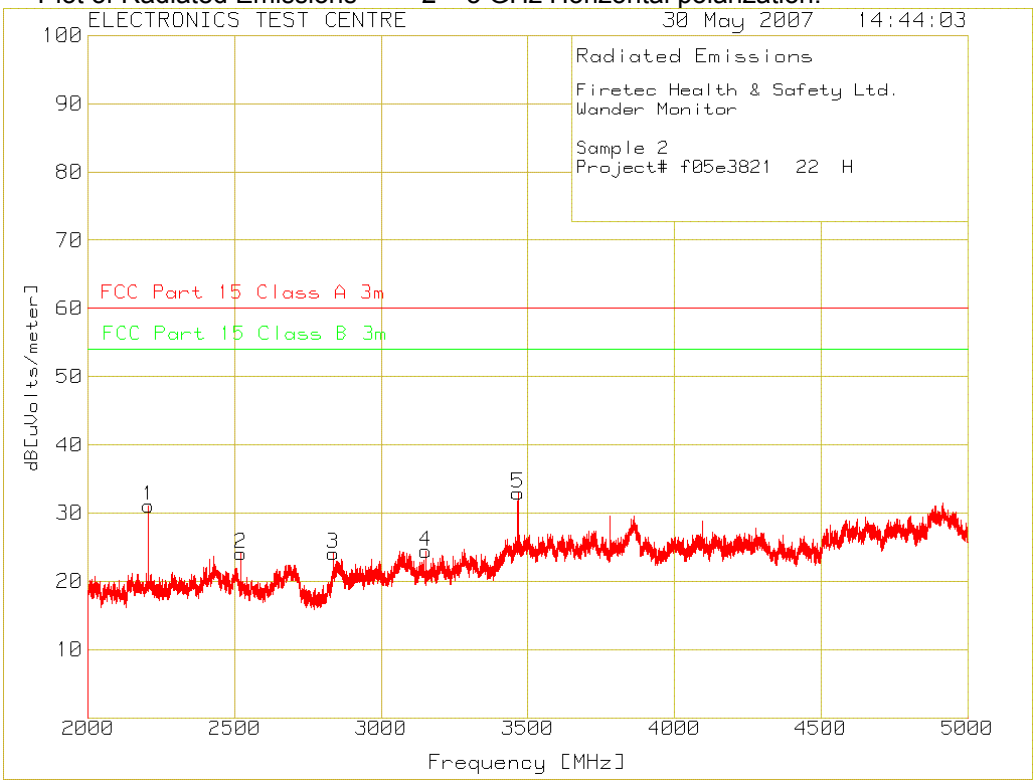
Plot of Radiated Emissions Test Chamber Ambient: (measurement noise floor):1-2GHz



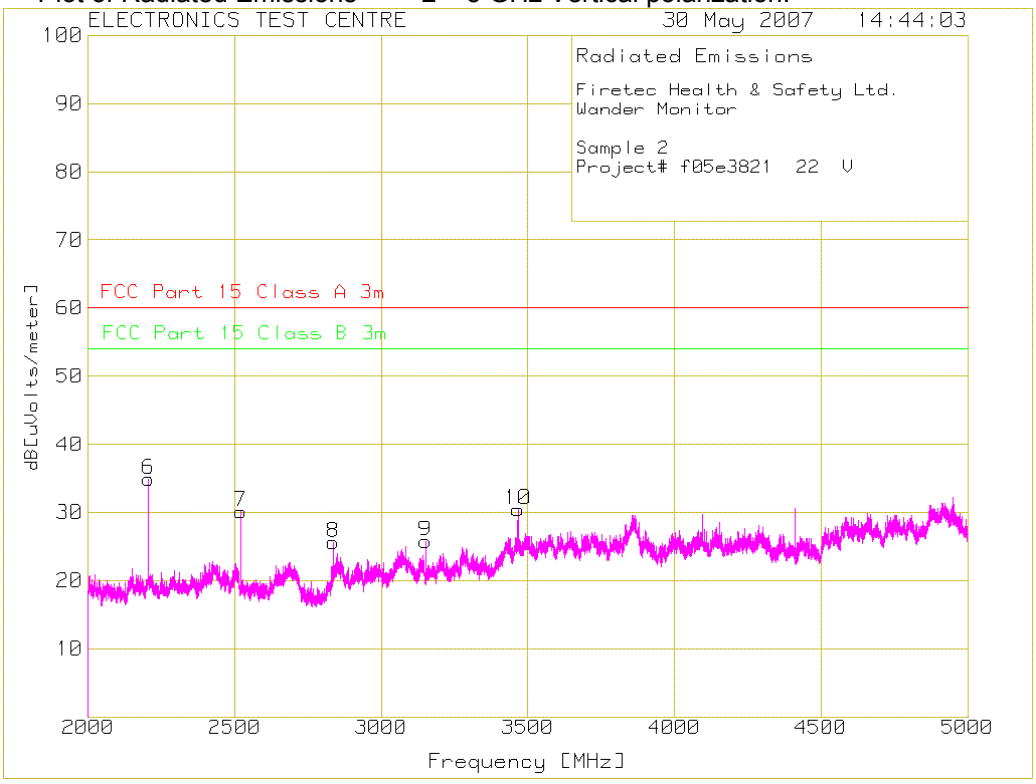
Plot of Radiated Emissions Test Chamber Ambient: (measurement noise floor):1-2GHz



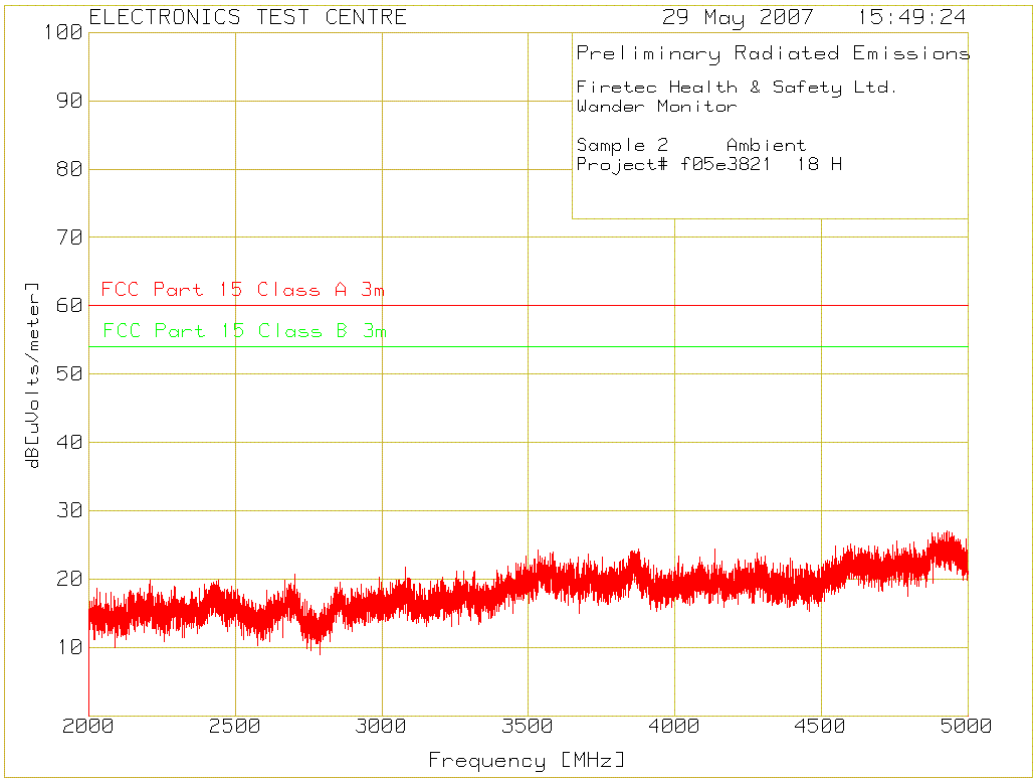
Plot of Radiated Emissions 2 – 5 GHz Horizontal polarization:



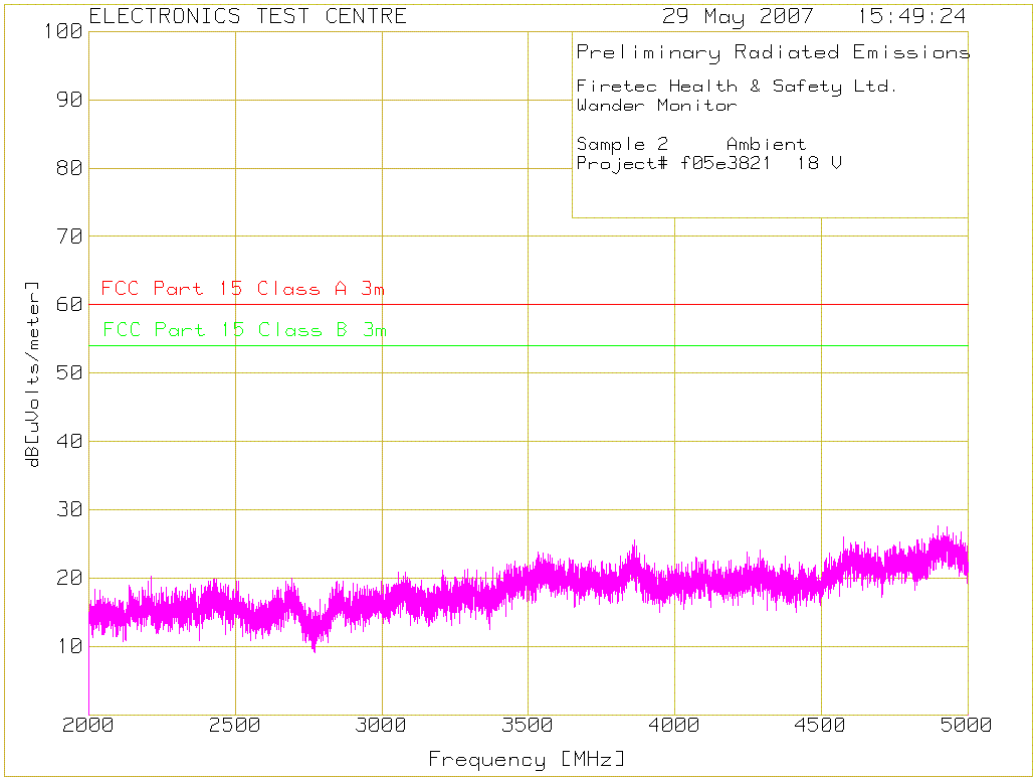
Plot of Radiated Emissions 2 – 5 GHz Vertical polarization:



Plot of Radiated Emissions Test Chamber Ambient: (measurement noise floor):2-5GHz



Plot of Radiated Emissions Test Chamber Ambient: (measurement noise floor):2-5GHz



5.0 Test Facility

5.1 Location

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Airdrie, Alberta, Canada.

The RF Anechoic Chamber (RFAC) is identified as Chamber 1, located in the main building complex at the Electronics Test Centre. Its usable working space measures 10.6 m long x 7.3 m wide x 6.5 m high.

This test site is listed with the FCC under Registration Number 99541. Measurements taken at this site are accepted by Industry Canada per file number IC 2046-1.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in two shielded vestibules located at the side of the main room. Cables are routed through bulkhead panels between the rooms as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

5.2 Grounding Plan

The EUT was located on a wooden table 80 cm above the ground plane. In accordance with Firetec Health & Safety Ltd. specifications, the EUT was not grounded.

5.3 Power

The Wander Monitor is a portable battery powered device which does not require AC power.

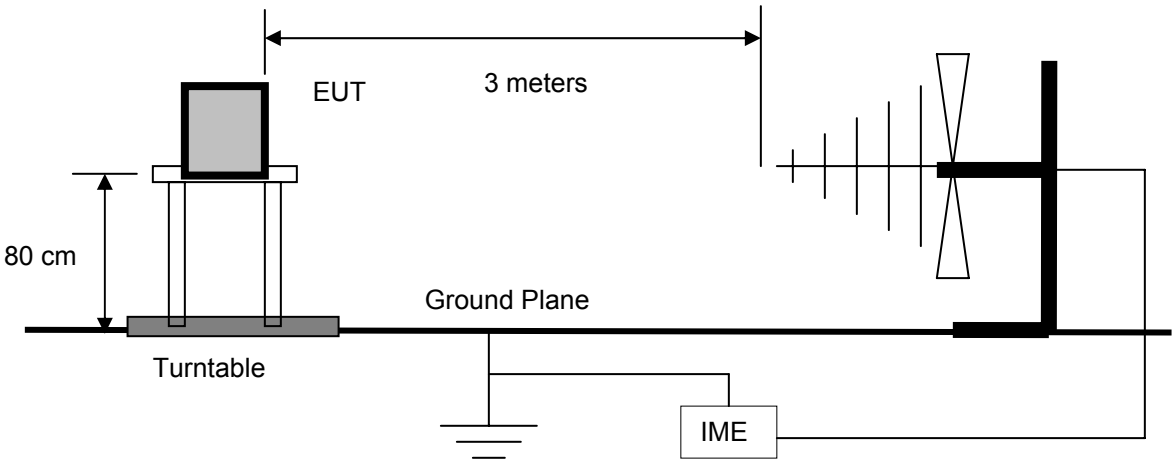
5.4 Emissions Profile

Ambient conducted and radiated electromagnetic emission profiles were generated throughout the tests and are included in the test data.

5.5 Test Configuration

5.5.1 Tabletop Equipment

The following diagram illustrates the configuration of the EUT test and measurement equipment for Radiated Emissions Testing of tabletop equipment.



6.0 Test Equipment

Testing was performed with equipment selected from the following list.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Due
Active Monopole	EMCO	3301B	9764	13 June 2008
Biconilog Antenna	ARA	LPB-2520/A	4318	5 January 2009
DC Power Supply	HP 6012B	2428A-00206	9016	30 July 2007
DRG Horn	EMCO	3106	9699	23 June 2008
DRG Horn	Tensor	4106	9576	4 January 2009
DRG Horn	EMCO	3115	9588	5 January 2009
Inverter (single phase)	California Instruments	5000iX	4378	6 September 2007
Log-periodic Array	EMCO	3147	20721	18 January 2009
Measurement System Software	Underwriters Laboratories	Version 6.0	4443	n/a
Quasi-Peak Adapter	Hewlett Packard	85650A	4411	4 May 2008
RF Preselector	Hewlett Packard	85685A	9563	30 Apr. 2008
Spectrum Analyzer & Display	Hewlett Packard	8566B & 85662	9168	7 September 2007

Appendix A Wander Monitor Test Sample Description

(from data provided by Firetec Health & Safety Ltd.)

Quotation Number:	F05q109a	Project Number::	F05e3821
Company Name :	Firetec Health & Safety Ltd.	Contact Name:	Vern Houle
Address :	#204 9074 – 51 Ave	Phone :	(780) 463-9490
	Edmonton, AB	Fax :	(780) 463-6074
	T6E 5X4	E-mail :	vern@firetecsys.com
Product Name: WanderCOMM		# of units to be tested : 1	
Part/Model #: WMT-001		Serial # E029:	

Product Application	**Designated Marketplaces**		
Commercial ☒	Canada ☒	Other ☐	
Military ☐	United States of America ☒	_____ ☐	
	European Union ☐	_____ ☐	

GENERAL INFORMATION REQUIRED FOR ALL PRODUCTS

Dimensions (L x W x H)	Weight: _0.075_ kg	Engineering Evaluation?
5 cm dia x 2 cm thick		**YES** ☐ **NO (compliance test only)** ☒

If compliance testing, to what standards?	FCC/RSS 210		
Regulatory Submission for?	none ☐ FCC ☒ Industry Canada ☒	ETC to do the submission?	YES ☒ NO ☐

Power Requirements: **AC** ☐	Voltage: _____VAC	# of AC phases: ___	current: ____ Amps	frequency: ____ Hz
DC ☒	Voltage: __6__VDC (2 x CR2032 batteries)		current: ____ Amps	

Product Intended Application	Prevention of egress by wandering patients
Product Deployment Environments	Assisted living and long term care facilities
Peripheral support and/or Monitoring Equipment to Monitor and Operate the Product (to be supplied by client):	WMC (door controller) and WML (loop controller)
List of internally generated frequencies: Crystal / Oscillator / Switcher / LO	32.768 KHz 315 MHz
Brief Functional description of Product including System Block Diagram (Attach a Separate sheet, if required)	Unit transmits a signal when excited by a loop at a protected door, if wearer is not allowed through the door, the door will lock.

WIRELESS PRODUCT INFORMATION

Type of Radio Device (check all applicable Equipment Configurations)

Intentional transmitter ☒	Receiver ☐	Transceiver ☐

Type of Radio Operating License

Unlicensed Personal Communication x	Unlicensed National Information Infrastructure ☐	Ultra-Wideband Operation ☐	Licensed ☐

Type of Modulation of Radio Device		
CDMA ☐	TDMA ☐	Other OOK
Spread Spectrum Technology ☐	Direct sequencer ☐	Frequency hopper ☐
Transmitter Power Output **: <1mW**	Emission Designator **: P1D**	
Information on Radio Frequencies		
Transmitter Operating Frequency(s) & Bandwidth	**315 MHz / 7.8 KHz**	
Information on Antenna(s)		
Is the antenna removable? **YES** ☐ **NO** x	Antenna Connector Type **: Integral to PCB**	Number of Antennas **: 1**
Radio Transmission Type		
Continuous ☐	Intermittent **x**	

Appendix B Wander Monitor Demodulated Waveform Plots

The plots below were taken using an antenna and power detector, with the DC output of the detector being recorded by a storage oscilloscope. The Wander Monitor (with production firmware) was manually triggered.

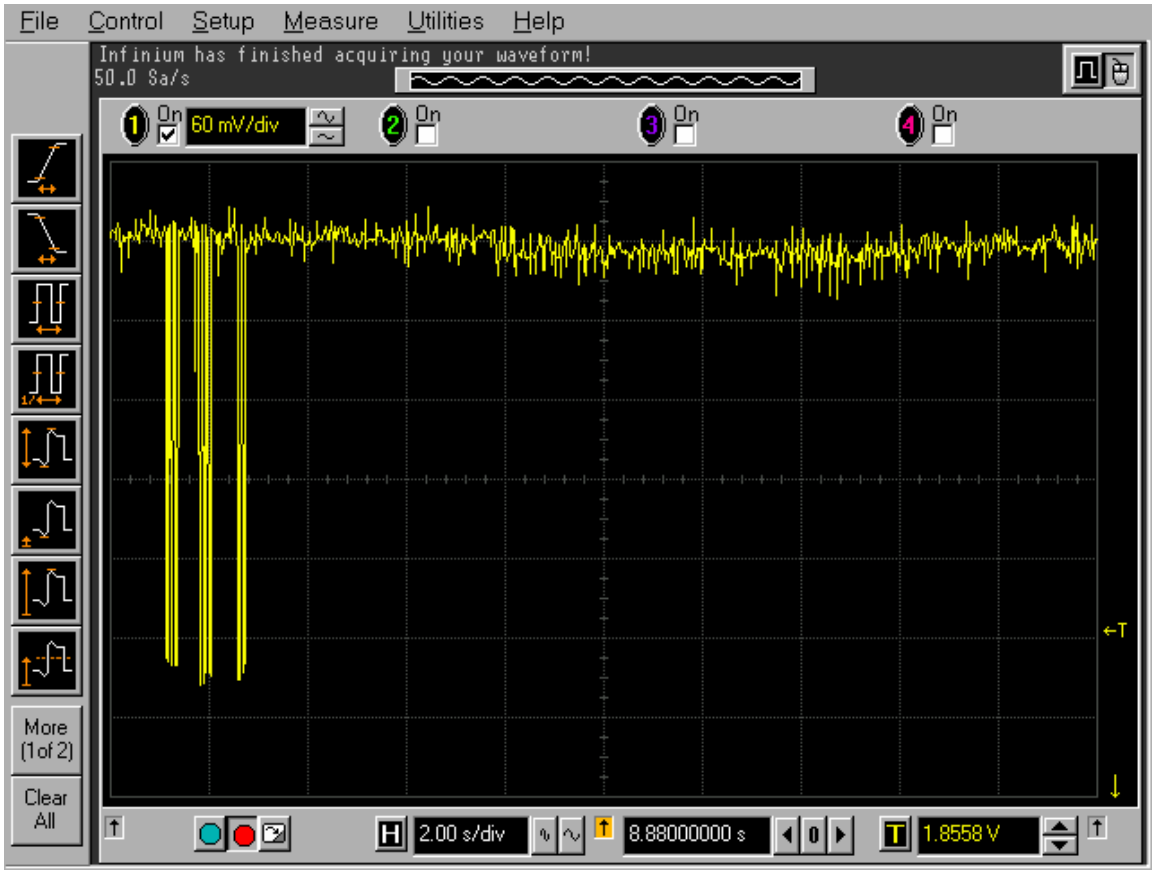


Figure 1 showing turn-off within 5 seconds.
(Waveform is inverted)

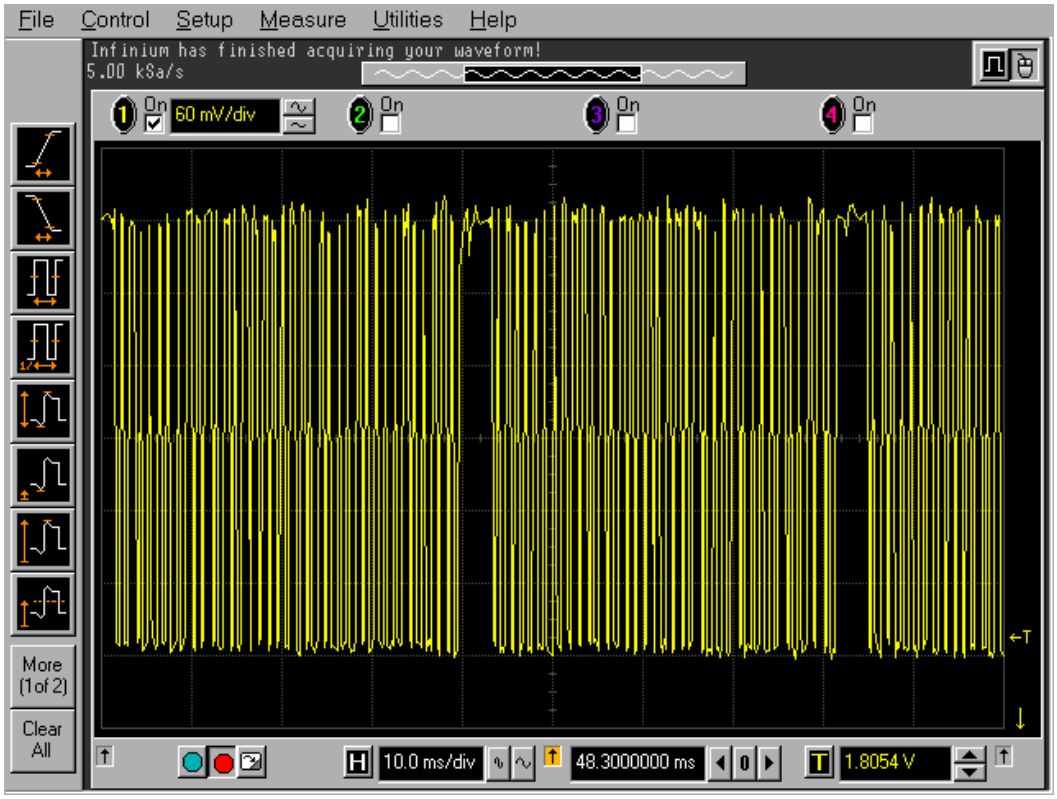


Figure 2 showing 100 mSec window of bit pattern
(Waveform is inverted)

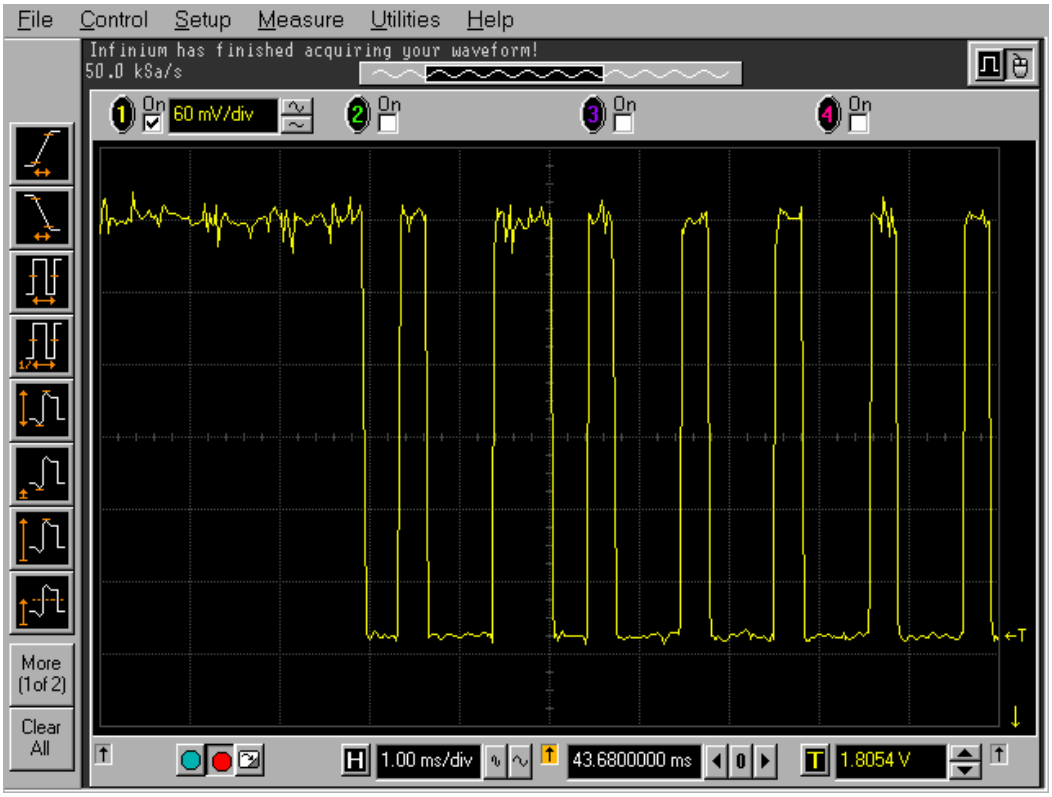


Figure 3 showing 400 µSec bit length
(Waveform is inverted)