EMC Bayswater Pty Ltd

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EMC COMPLIANCE REPORT
FCC Certification Test Report
In accordance with:
CFR47 FCC Part 15, Subpart B (Class A)

Pertronic Industries Limited

F220-2S	Fire Alarm Panel
F220-FFANN	Local Annunciator
NET2-FFANN	NET2 Annunciator
MPS-PI	Pull Station

F220 Pertronic Fire Alarm System

FCC ID: 2BAMRF220-2S

REPORT: E2405-1792-1 Rev1
DATE: September, 2024

This report replaces the previously issued report E2405-1792-1.
Please refer to section 2 of this report for details of any previously issued reports.

Accreditation Number: 18553
Accredited for compliance with ISO/IEC 17025 – Testing

Certificate of Compliance
Certification EMC Compliance Report
EMC Bayswater Test Report: E2405-1792-1 Rev1
Issue Date: September, 2024

System:	F220 Pertronic Fire Alarm System
Model:	F220-2S
Serial:	Not stated
FCC ID:	2BAMRF220-2S
Variant:	F220-2L (refer to EMC Bayswater test report E2405-1792-2)
Subsystems:	F220-2S Fire Alarm Panel F220-FFANN Local Annunciator NET2-FFANN NET2 Annunciator MPS-PI Pull Station
Customer Details:	Mr. John Brook Pertronic Industries Limited 17 Eastern Hutt Road Wingate, Wellington, 5019, New Zealand Phone No: +64 4 567 3229 e-mail: John.Brook@pertronic.co.nz
Test Specification:	CFR47 FCC Part 15, Subpart B (Class A)
Results Summary:	Radiated Emissions – CFR47 FCC Part 15, section 15.109 ***Complied (Class A)*** Conducted Emissions – CFR47 FCC Part 15, section 15.107 ***Complied (Class A)*** Radiated Emissions – CFR 47 FCC Part 15, section 15.209* ***Complied*** **9kHz to 30MHz Radiated Emissions testing was performed at customer's request.*
Test Date(s):	29th & 30th of July, 2024
Test House (Issued By):	EMC Bayswater Pty Ltd 18/88 Merrindale Drive Croydon South Victoria, 3136, Australia FCC Accredited Test Firm Registration number: 527798 Phone No: +61 3 9761 5888 e-mail: sales@emcbayswater.com.au Fax No: +61 3 8761 6547 Web: www.emcbayswater.com.au

This is to certify that the necessary measurements were made by EMC Bayswater Pty Ltd, and that the Pertronic Industries Limited, F220 Pertronic Fire Alarm System (Serial No: Not stated), consisting of a F220-2S Fire Alarm Panel, F220-FFANN Local Annunciator, NET2-FFANN NET2 Annunciator and MPS-PI Pull Station, has been tested in accordance with the requirements contained in the appropriate commission regulations.

Prepared & tested by:	Approved by:	
		11/09/2024 16:23
Fabio D'Amico (EMC Test Engineer)	Neville Liyanapatabendige (Manager)	Date

FCC Certification Test Report
for
Pertronic Industries Limited

Contents

1. Introduction

Electromagnetic Compatibility (EMC) tests were performed on a Pertronic Industries Limited, F220 Pertronic Fire Alarm System (Serial No: Not stated), consisting of a F220-2S Fire Alarm Panel, F220-FFANN Local Annunciator, NET2-FFANN NET2 Annunciator and MPS-PI Pull Station, in accordance with the requirements of Title 47 of the standard CFR47 FCC Part 15, Subpart B (Class A).

2. Test Report Revision History

ISSUE	DATE	Description	AUTHORISED BY
E2405-1792-1	31-08-2024	Original	Neville Liyanapatabendige (Manager)
E2405-1792-1 Rev1	11-09-2024	As per the customer's request P4RL, 7351, and M501M subsystems are listed as support equipment. The EUT configuration block diagram has been removed and the EUT photographs have been updated as per the customer's request.	Neville Liyanapatabendige (Manager)

3. Report Information

EMC Bayswater Pty Ltd reports apply only to the specific samples tested under the stated test conditions. All samples tested were in good operating condition throughout the entire test program unless otherwise stated. EMC Bayswater Pty Ltd does not in any way guarantee the later performance of the product/equipment. It is the manufacturer's responsibility to ensure that additional production units of the tested model are manufactured with identical electrical and mechanical components. EMC Bayswater Pty Ltd shall have no liability for any deductions, inference or generalisations drawn by the clients or others from EMC Bayswater Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Bayswater Pty Ltd. This report shall not be reproduced except in full (with the exception of the certificate on page 2) without the written approval of EMC Bayswater Pty Ltd. This document may be altered or revised by EMC Bayswater Pty Ltd personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by EMC Bayswater Pty Ltd will nullify the document.

4. Summary of Results

The EUT complied with the CFR47 FCC Part 15, Subpart B, Class A, Conducted (section 15.107) and Radiated Emissions (section 15.109) requirements. Worst-case emissions are tabled as follows:

Test	Result
Radiated Emissions (Horizontal Antenna Polarisation)	Complied with quasi-peak limit by 2.8dB+
	Complied with peak limit by >20dB
	Complied with average limit by >20dB
Radiated Emissions (Vertical Antenna Polarisation)	Complied with quasi-peak limit by 2.5dB+
	Complied with peak limit by >20dB
	Complied with average limit by 14.9dB
Conducted Emissions (Active Line)	Complied with quasi-peak limit by 23.1dB
	Complied with average limit by 32.8dB
Conducted Emissions (Neutral Line)	Complied with quasi-peak limit by 22.0dB
	Complied with average limit by 31.1dB
Radiated Emissions FCC Part 15.209 (9kHz to 30MHz)	Complied with quasi-peak limit by 35.4dB

+Refer to relevant section for statement of Measurement Uncertainty

Table 1: Summary of test results

5. Product Sample, Configuration & Modifications

5.1. Product Sample Details

The EUT (Equipment Under Test), as supplied by the client, is described as follows:

Product:	F220 Pertronic Fire Alarm System	
Subsystems:	F220-2S	Fire Alarm Panel
	F220-FFANN	Local Annunciator
	NET2-FFANN	NET2 Annunciator
	MPS-PI	Pull Station
Variant:	F220-2L (refer to EMC Bayswater test report E2405-1792-2)	
Serial No:	Not stated	
Firmware:	V9.00.00	
Software:	N/A	
Power Specifications:	Primary: 100-132V AC, 50-60 Hz single phase AC mains input Secondary: 24VDC via 2 x 12VDC SLA batteries	
Dimensions:	350 mm W x 144 mm D x 630 mm H	
Weight:	17kg	
EUT Type:	Wall-mounted, tested as table-top equipment for emissions	
Orientation:	The EUT is typically used in one orientation only	

(Customer supplied product information)

5.2. Product description

The EUT (Equipment Under Test) has been described by the customer as follows:

"The Pertronic F220 is a modular, expandable, intelligent addressable, automatic fire alarm system designed for medium to large building applications.
An F220 system comprises:

• An F220-2S or an F220-2L with these internal devices:
- Peripherals F220MAIN-UL, F220LCD-UL. (Note that none of these boards qualifies as a CPU board according to the definition in CFR 47 Part 15, 15.3(bb) because there is no user programming facility.)
- An internal peripheral/subassembly power supply PSA-150 (for the F220-2S) or PSA-200 (for the F220-2L). (These peripheral/subassembly power supplies include a CCON5-UL or CCON7-UL, respectively, charger controller peripheral board.)
- An ACTERM-UL subassembly board (which is not a peripheral).
- Any of these optional internal peripherals: NET2CARD-UL, F220AP2LDB-UL.
- Optional, internal subassemblies: FIBNET-MM-ST-UL, FIBNET-SM-ST-UL, EXTEMPS-1200-UL.

• These optional external peripherals manufactured or OEMed by Pertronic Industries Limited, in variable quantities up to the limits specified in the F220 Technical Manual:
- F220-FFANN local full annunciator;
- NET2-FFANN network full annunciator;
- MPS-PI pullstation.

• Optional, third-party, external peripherals, in variable quantities, up to the limits specified in the F220 Technical Manual, of which the following are examples:
- NAC devices: Gentex P4RL audible & visual appliance and similar devices;

- Detector devices: System Sensor 7351 and similar devices;
- Module devices: System Sensor M501M and similar devices;"

(Customer supplied product description information)

The highest frequency generated or used in the device or on which the device operates or tunes as specified by the customer is 456MHz.

The EUT has been identified as class A digital device by the customer.

The following or similar warning shall be included in the instructions for use:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

5.3. Support Equipment

Support Equipment: 1	Description:	Sounder + Strober
	Manufacturer:	System Sensor
	Model:	P4RL
	Serial number:	Not stated
Support Equipment: 2	Description:	Detector
	Manufacturer:	System Sensor
	Model:	7351
	Serial number:	Not stated
Support Equipment: 3	Description:	Monitor Module
	Manufacturer:	System Sensor
	Model:	M501M
	Serial number:	223500217941

5.4. Product operating modes

The EUT was tested in a combination trouble/alarm state. Refer to section 5.7 of the test plan for further information.

5.5. Product operating mode for testing

The EUT was tested in a combination trouble/alarm state. Refer to section 5.7 of the test plan for further information.

5.6. EUT Configuration

The EUT was either configured by the customer or configured using the customer's instructions as per section 5.4 of the test plan. The EUT was tested with an AC input of 110VAC, 60Hz for all testing.

The local annunciator enclosure and Net2 annunciator enclosure were connected to the chamber ground-plane (earthed).

5.7. Ports, Cables and Terminations

Please refer to Section 4.4, Table 3 of the test plan for information regarding the EUT ports, cables and terminations used during testing.

5.8. Modifications

EMC Bayswater Pty Ltd did not modify the EUT.

6. Test Facility & Equipment

6.1. Test Facility

Conducted Emissions measurements were performed inside a shielded chamber at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

Radiated Emissions measurements were taken in the indoor Open Area Test Site (iOATS) facility at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

EMC Bayswater Pty Ltd's FCC Accredited Test Firm Registration number: 527798.
EMC Bayswater Pty Ltd's FCC Accredited Test Firm Designation number: AU0004

6.2. Test Equipment

Refer to Appendix A for the measurement instrument list.

7. Referenced Standards

CFR47 FCC Part 15, Subpart B

CFR47 FCC Part 15, Subpart C, 15.209

ANSI C63.4 - 2014
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.10 - 2013
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

8. Referenced Documents

Test Plan
F220-2S_F220-2L FCC Class A Test Plan V1.2 (Aug-23-2024).

9. Radiated Emissions – FCC Part 15.109

9.1. Test Procedure

Radiated Emissions were measured 3 metres away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive table, at a height of 0.8m above the ground plane.

In the frequency range of 30MHz to 1GHz, a Biconilog antenna was used. For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 4 different fixed height positions and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 120 kHz and a video bandwidth of 300 kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emissions was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and varying the height of the antenna between 1 and 4 metres to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 120 kHz.

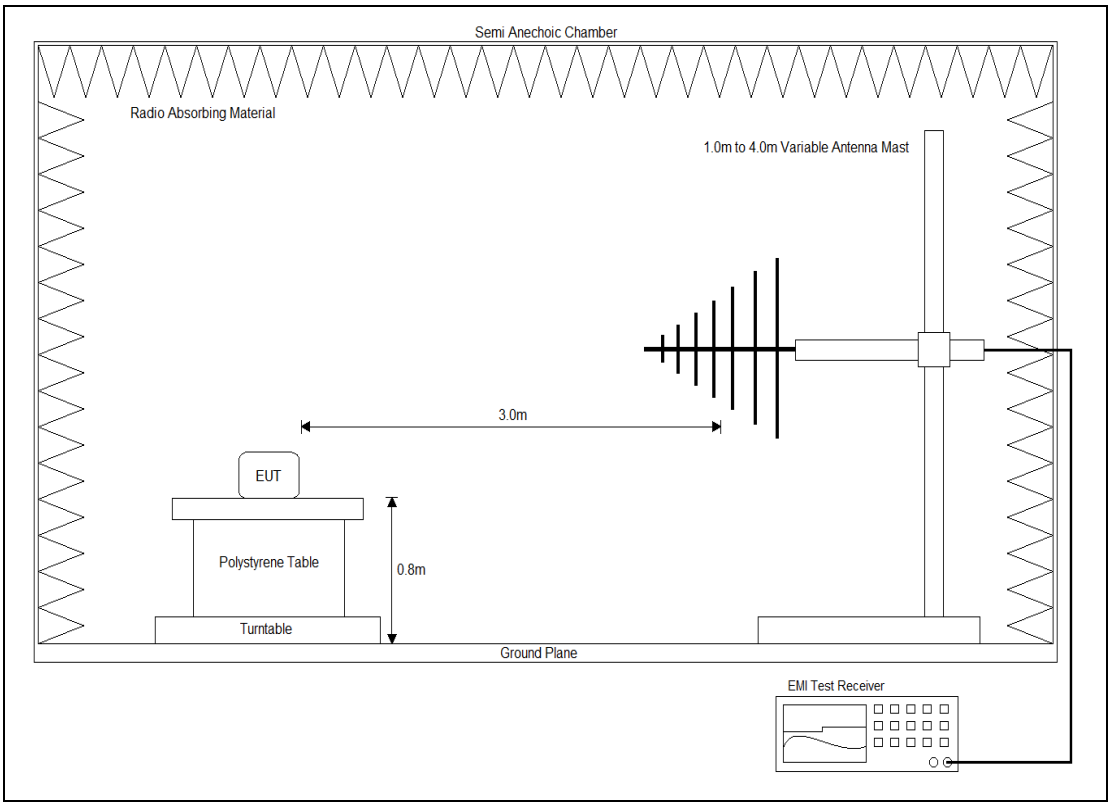

Figure 1: Test setup – 30MHz to 1GHz

In the frequency range 1.0GHz to 26.5GHz a Horn antenna was used and an area of 3m x 3m was covered between the antenna and the EUT using RF absorbing material with a rated attenuation more than 20dB over the frequency range. In the frequency range 26.5GHz to 40.0GHz a Horn antenna was used and an area of 1m x 3m was covered between the antenna and the EUT using RF absorbing material with a rated attenuation more than 20dB over the frequency range. The height of the horn antenna was varied using the antenna bore-sighting technique and the turntable slowly rotated to maximise the emissions. For both horizontal and vertical antenna polarizations, the Peak and Average preview measurements were performed with a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz. Peak and average emissions that exceeded the applicable limit or were close to the applicable limit were investigated further. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and the antenna height varied (if applicable, using the antenna bore-sighting technique) to find the worst-case emission arrangement. Peak and CISPR Average measurements were then performed using a measuring time of no less than 15 seconds, the maximum emission level in the observed duration was recorded as the final result. The final peak and CISPR Average measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 1 MHz. Peak and Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line with the EUT rotation and antenna height varied (if applicable, using the antenna bore-sighting technique) to produce the highest emission.

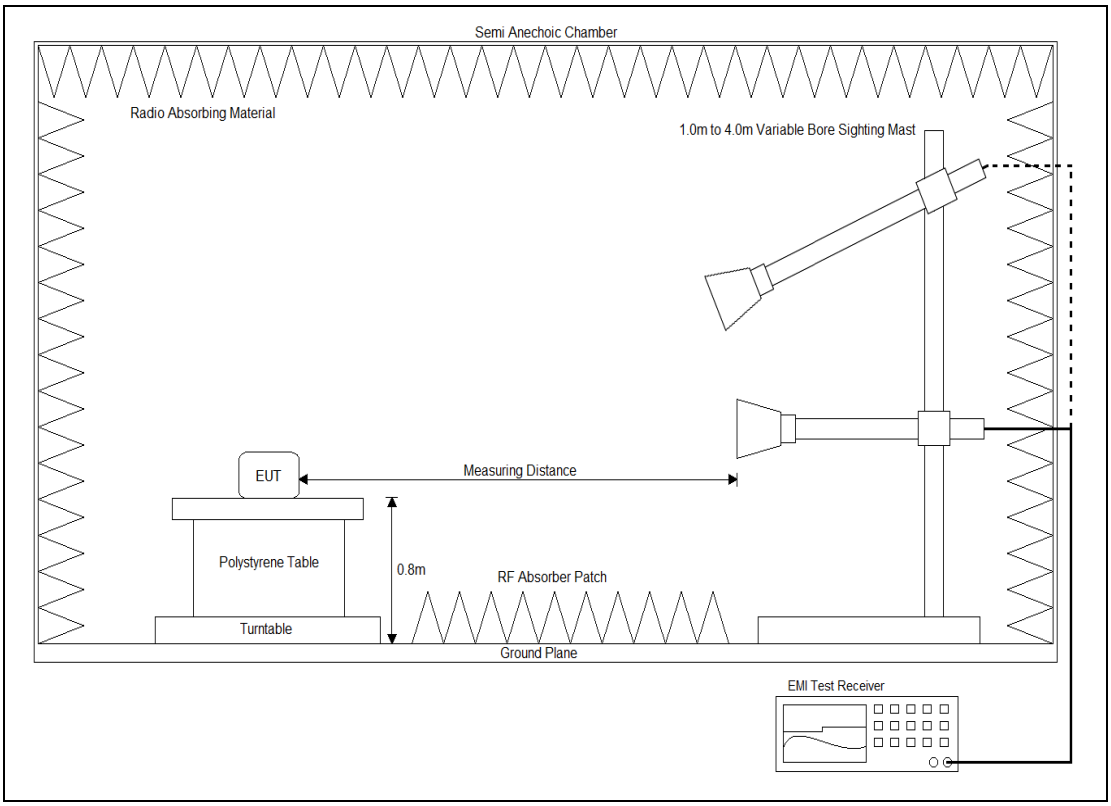

Figure 2: Test setup – above 1GHz

Horn	Frequency (GHz)	Degrees	Measuring Distance (m)	Illumination (m)	Measuring Distance (m)	Illumination (m)
EMCO 3115	1 to 2	55.00	3	3.12	1	1.04
	2 to 4	50.00	3	2.80	1	0.93
	4 to 6	34.00	3	1.83	1	0.61
AH SAS-584	5.8 to 8.2	30.00	3	1.61	1	0.54
AH SAS-585	8.2 to 12.4	30.00	3	1.61	1	0.54
AH SAS-586	12.4 to 18	30.00	3	1.61	1	0.54
AH SAS 587	18 to 26.5	30.00	3	1.61	1	0.54
AH SAS 588	26.5 to 40	31.00	3	1.66	1	0.55

Table 2: Worst case Maximum size of measuring envelope for Horn antennas

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

(Refer to photographs 1 & 2 in Annex C for views of the test configuration)

9.2. Limits

The EUT shall meet the limits in the following table:

Frequency Range (MHz)	Measuring distance	Limits (dBµV/m)	
		Quasi-Peak	
30 to 88	3m	49.5	
88 to 216	3m	54.0	
216 to 960	3m	56.9	
960 to 1000	3m	60.0	
Frequency Range (GHz)	**Measuring distance**	**Limits (dBµV/m)**	
		Average	**Peak**
1.0 to 26.5	3m	60.0	80.0
26.5 to 40.0	1m	69.5	89.5
NOTE The lower limit shall apply at the transition frequency.			

Table 3: Limits for Radiated Emissions of Class A equipment

9.3. Test Results

Radiated Emissions measurements are tabulated below. For below 1GHz measurements, Quasi-peak measurements were performed at spot frequencies where the peak emission was close to, or exceeded the applicable limit line. For above 1GHz measurements, Peak or CISPR Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line.

(Refer to graphs 1 to 4 in Appendix C)

Frequency (MHz)	Result Quasi-peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Delta limit (dB)
191.990	48.9	54.0	-5.1
319.982	54.1	56.9	**-2.8*+**
400.007	53.9	56.9	-3.0+
424.984	53.6	56.9	-3.3+
474.988	51.4	56.9	-5.5
625.047	50.1	56.9	-6.8

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 4: Radiated Emissions – Horizontal Antenna Polarisation (30MHz to 1GHz)

Peak Measurements				Average Measurements			
Frequency (MHz)	Result (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)	Frequency (MHz)	Result (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)
Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				Average emissions were not above the measurements system noise floor or at least 20dB below the limit			

Table 5: Radiated Emissions – Horizontal Antenna Polarisation (1GHz to 2GHz)

Frequency (MHz)	Result Quasi-peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Delta limit (dB)
39.555	47.0	49.5	**-2.5*+**
50.322	36.6	49.5	-12.9
50.661	37.7	49.5	-11.8
76.803	36.1	49.5	-13.4
448.022	54.2	56.9	-2.7+
511.993	51.6	56.9	-5.3

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 6: Radiated Emissions – Vertical Antenna Polarisation (30MHz to 1GHz)

Peak Measurements				Average Measurements			
Frequency (MHz)	Result (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)	Frequency (MHz)	Result (dBµV/m)	Limit (dBµV/m)	Delta Limit (dB)
Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				1023.920	45.1	60.0	**-14.9***
				1151.840	40.3	60.0	-19.7

**Worst-case emissions*

Table 7: Radiated Emissions – Vertical Antenna Polarisation (1GHz to 2GHz)

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
30MHz to 1GHz	±4.65dB
1GHz to 6GHz	±4.83dB
6GHz to 18GHz	±4.49dB
18GHz to 26.5GHz	±4.45dB
26.5GHz to 40GHz	±4.44dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without taking into account measurement uncertainty. However, the measurement uncertainty shall appear in the test report.

Climatic Conditions	
Temperature:	12 to 13°C
Humidity:	55 to 56%
Atmospheric pressure:	1013.6 to 1031.1hPa

Table 8: Climatic conditions

Calculation: The above results are based upon the following calculation:

$$E = V_{QP/PK/AV} + AF - G_{Amp} + L_C$$

Where:

E = E-field in dBμV/m
$V_{QP/PK/AV}$ = Measured Voltage (Quasi Peak, Peak or Average) in dBμV
AF = Antenna Factor in dB(/m)
L_C = Cable and attenuator Loss in dB
G_{Amp} = Pre Amplifier Voltage Gain in dB

Example calculation:

$E = V_{QP} + AF - G_{Amp} + L_C$
$E = 30dB\mu V + 12dB/m - 0dB + 2.3dB$
$E = 44.3\ dB\mu V/m$

Notes: All Radiated Emissions measured were below the Class A limits.

The EUT was not classified as a composite system (does not contain an intentional radiator combined with an unintentional radiator). Therefore, the upper frequency range was determined as per CFR47 FCC Part 15, Subpart B, section 15.33(b)(1).

If the highest frequency generated or used within the device or on which the device operates or tunes is between 108MHz and 500MHz, the upper frequency of measurement range should be 2000MHz.

The highest frequency of the EUT as specified by the customer is 456MHz as such measurements up to 2GHz were taken.

Assessment: The EUT complied with the Radiated Emissions requirements of CFR47 FCC Part 15, Subpart B (Class A) section 15.109.

10. Conducted Emissions - FCC Part 15.107

10.1. Test Procedure

The EUT was positioned 0.4m from the vertical ground reference plane (chamber wall) and 0.8m above a horizontal ground reference plane (chamber floor) with the mains cable connected to the power port of a LISN, located 0.8 metres away. The measuring port of the LISN was connected to the measuring receiver. In order to avoid unwanted ambient signals, power to the LISN was supplied via power line filters fitted to the shielded enclosure wall.

The mains flexible cord provided by the manufacturer is required to be 1m long for these measurements. If the manufacturer supplies a non-removable power lead, in excess of 1m, the cable in excess of 1m is folded at the centre into a bundle no longer than 0.4m in length.

Preview scan measurements were performed using a peak and an average detector of the EMI receiver with a resolution bandwidth of 9 kHz. The scan measurements frequency step size of the EMI receiver was set to less than half of the resolution bandwidth. The final quasi-peak and CISPR average measurements were performed at spot frequencies where the preview peak or average emission was close to, or exceeded the applicable limit line with a receiver bandwidth of 6dB and a resolution bandwidth of 9 kHz. The final measurements were performed using a measuring time of no less than 15 seconds.

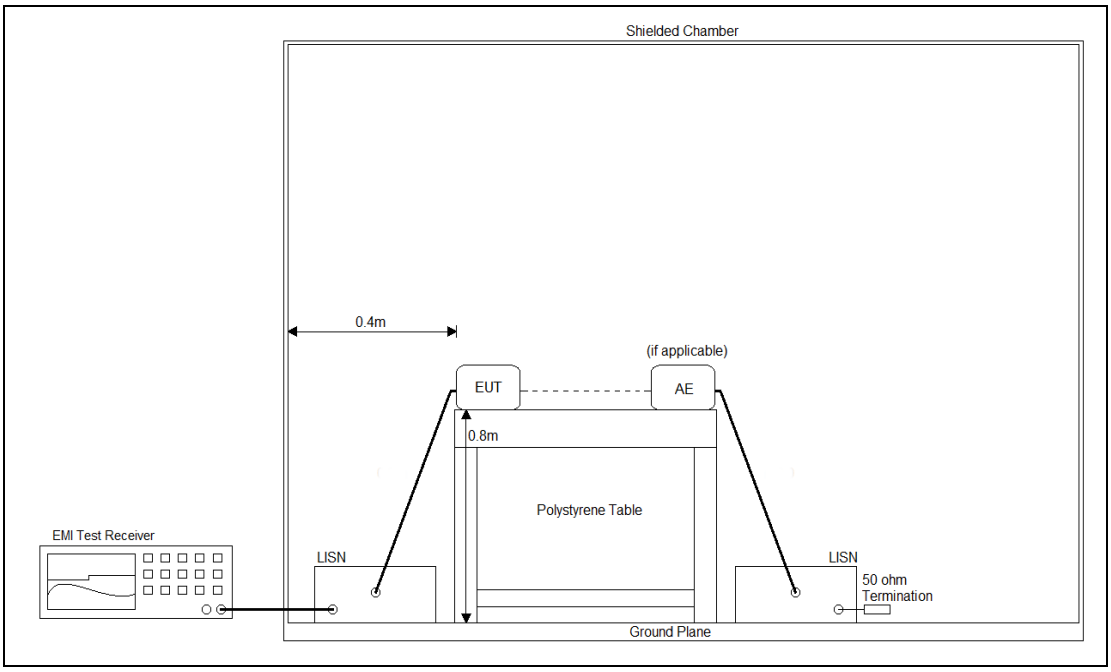

Figure 3: Test setup

Both the active and neutral lines were measured, in turn. Plots of the accumulated measurement data for both active and neutral terminals, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

(Refer to photograph 3 in Annex C for a view of the test configuration)

10.2.Limits

The EUT shall meet the limits in the following table:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	79	66
0.5 to 30	73	60
NOTE 1 The lower limit shall apply at the transition frequencies.		

Table 9: Limits for Conducted Emissions at the mains ports of Class A equipment

10.3.Test Results

Conducted Emissions measurements are tabulated below. Quasi-peak or CISPR Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line.

(Refer to graphs 5 & 6 in Appendix C)

Quasi - Peak Measurements				Average Measurements			
Frequency (MHz)	Result (dBµV)	Limit (dBµV)	Delta Limit (dB)	Frequency (MHz)	Result (dBµV)	Limit (dBµV)	Delta Limit (dB)
25.082	49.6	73.0	-23.4	10.962	26.0	60.0	-34.0
25.094	49.9	73.0	**-23.1***	12.970	25.7	60.0	-34.3
25.414	49.4	73.0	-23.6	24.842	24.6	60.0	-35.4
25.434	49.3	73.0	-23.7	25.042	26.6	60.0	-33.4
25.466	47.7	73.0	-25.3	25.094	27.2	60.0	**-32.8***
25.606	40.6	73.0	-32.4	25.414	25.3	60.0	-34.7

** Worst-case emissions*

Table 10: Conducted Emissions – Active Line

Quasi - Peak Measurements				Average Measurements			
Frequency (MHz)	Result (dBµV)	Limit (dBµV)	Delta Limit (dB)	Frequency (MHz)	Result (dBµV)	Limit (dBµV)	Delta Limit (dB)
25.014	49.9	73.0	-23.1	0.206		66.0	**-31.1***
25.126	51.0	73.0	**-22.0***	10.818	26.7	60.0	-33.3
25.138	50.3	73.0	-22.7	11.118	26.2	60.0	-33.8
25.166	50.3	73.0	-22.7	24.750	26.2	60.0	-33.8
25.198	50.6	73.0	-22.4	24.954	27.3	60.0	-32.7
25.522	47.8	73.0	-25.2	25.158	27.7	60.0	-32.3

** Worst-case emissions*

Table 11: Conducted Emissions – Neutral Line

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
0.15MHz to 30MHz	±2.88dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%. The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without taking into account measurement uncertainty. However, the measurement uncertainty shall appear in the test report.

Climatic Conditions	
Temperature:	18°C
Humidity:	58%
Atmospheric pressure:	1028.2 to 1028.5hPa

Table 12: Climatic conditions

Calculation: The above results are based upon the following calculation:

$V = V_{QP/AV} + VLISN + L_C + L_T$

Where:

V = Corrected Voltage Amplitude in dBµV

$V_{QP/AV}$ = Measured Voltage (Quasi Peak or Average) in dBµV

$VLISN$ = Line Impedance Stabilization Network Factor in dB

L_C = Cable/attenuator Loss in dB

L_T = Transient Protection Network Loss in dB

Example calculation:

$V = V_{QP} + VLISN + L_C + L_T$

V = 15 dBµV + 10.1dB + 11.5dB + 10.1dB

V = 46.7 dBµV

Notes: Conducted Emissions measurements were below the Class A limit.

Assessment: The EUT complied with the Conducted Emissions requirements of CFR47 FCC Part 15, Subpart B (Class A) section 15.107.

11. Radiated Emissions - FCC Part 15.209

11.1. Test Procedure

The Radiated Emissions were performed in accordance with the CFR 47 FCC Part 15, section 15.209.

Radiated Emissions were measured 3 metres (from 9kHz to 30MHz) away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive support at a height of 0.8m above the ground plane.

In the frequency range of 9kHz to 30MHz, an Active loop antenna was used. For X, Y and Z antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 1m fixed height, and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 200Hz (9kHz to 150kHz), 9kHz (150kHz to 30MHz) and a video bandwidth of 30kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emission was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 200 Hz (9kHz to 150kHz) and 9kHz (150kHz to 30MHz).

Plots of the accumulated measurement data for X, Y and Z antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

(Refer to photograph 4 in Annex C for a view of the test configuration)

11.2. Limits

As per section 15.209 (Radiated emissions, general requirements) the EUT is required to meet the limits that permit the highest field strength of the two sections in the following table:

Frequency Range (MHz)	Limits at 3m (dBμV/m)
0.009 to 0.490	128.5 to 93.8
0.490 to 1.705	73.8 to 62.9
1.705 to 30.0	69.5
30.0 to 88	40.0
88.0 to 216.0	43.5
216.0 to 960.0	46.0
Above 960	54.0
NOTE: The lower limit shall apply at the transition frequency.	

Note 1: as per CFR FCC Part 15 section15.209 (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Note 2: as per CFR FCC Part 15.35 (b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

Table 13: Limits for Radiated Spurious Emissions at distance of 3m

11.3. Test Results

Radiated Emissions measurements are tabulated below. For below 1GHz measurements, Quasi-peak measurements were performed at spot frequencies where the peak emission was close to, or exceeded the applicable limit line.

(Refer to graphs 7 to 9 in Appendix C)

Antenna Orientation	Frequency (MHz)	Result Quasi-peak (dBμV/m)	Limit Quasi-peak (dBμV/m)	Delta limit (dB)
X	17.227	24.8	69.5	-44.7
	25.540	18.0	69.5	-51.5
Y	24.633	32.5	69.5	-37.0
	25.120	34.1	69.5	**-35.4***
Z	25.302	23.4	69.5	-46.1
	25.382	23.9	69.5	-45.6

**Worst-case emission*

Table 14: Radiated Spurious Emissions – 9kHz to 30MHz

The measurement uncertainty was calculated at ±4.3dB for 9kHz to 30MHz measurements, ±4.7dB for 30MHz to 1GHz measurements and ±5.3dB for measurements above 1GHz. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	12 to 13°C
Humidity:	55 to 56%
Atmospheric pressure:	1013.6 to 1031.1hPa

Table 15: Climatic conditions

Calculation: The above results are based upon the following calculation:

$$E = V_{QP/PK/AV} + AF - G_{Amp} + L_C$$

Where:

E = E-field in dBμV/m
$V_{QP/PK/AV}$ = Measured Voltage (Quasi Peak, Peak or Average) in dBμV
AF = Antenna Factor in dB(/m)
L_C = Cable and attenuator Loss in dB
G_{Amp} = Pre-Amplifier Voltage Gain in dB

Example calculation:

$E = V_{PK} + AF - G_{Amp} + L_C$
E = 30dBμV + 12dB/m - 0dB + 2.3dB
E = 44.3 dBμV/m

Notes: All Peak Radiated Emission measurements were below the general requirements limit by at least 20dB.

The customer requested testing in the frequency range of 9kHz to 30MHz only.

Assessment: The EUT complied with the 9kHz to 30MHz Radiated Emissions requirements of CFR 47 FCC Part 15, section 15.209.

12. Conclusion

The Pertronic Industries Limited, F220 Pertronic Fire Alarm System (Serial No: Not stated), consisting of a F220-2S Fire Alarm Panel, F220-FFANN Local Annunciator, NET2-FFANN NET2 Annunciator and MPS-PI Pull Station, complied with the requirements of CFR47 FCC Part 15, Subpart B (Class A)**,** sections 15.107, 15.109 and CFR47 FCC Part 15, Subpart C, 15.209 (9kHz to 30MHz).

Appendix A – Test Equipment

Inv.	Equipment	Make	Model No.	Serial No.	Calibration		
					Interval	Due	Type
Conducted Emissions							
0954	Analyser, EMI Receiver	Rohde+Schwarz	ESCI 3	100196	1 year	Sep-24	E
1244	LISN, Single Phase, 50uH/50Ω	Teseq	NNB 51	47414	2 years	May-26	E
1148	Cable, Coax, Sucoflex 104PA	Huber + Suhner	84287047	MY059/4PA	1 year	Jan-25	I
1149	Cable, Coax, Sucoflex 104PA	Huber + Suhner	84287049	MY053/4PA	1 year	Jan-25	I
1245	Hygrometer, Temp, Humidity	Thomas Scientific	6066N53	181037386	1 year	Dec-24	I
0441	ENCLOSURE, Shielded, No 5	RFI Industries	TC800-20	933	N/A	N/A	V
SW007	EMC Measurement Software	Rohde & Schwarz	EMC 32	Version 8.54.0	N/A	N/A	N/A
Radiated Emissions – 9kHz to 2GHz							
1217	Analyser, EMI Receiver	Rohde & Schwarz	ESU40	100182	1 year	Jun-25	E
0932	Controller, Position	Sunol Sciences	SC104V-3	081006-1	N/A	N/A	V
0933	Turntable	Sunol Sciences	SM46C	081006-2	N/A	N/A	V
0934	Mast, Antenna	Sunol Sciences	TLT2	081006-5	N/A	N/A	V
0935	Antenna, Biconilog	Sunol Sciences	JB5	A071106	2 years	May-25	E
0024	Antenna, Active Loop	EMCO	6502	2620	2 years	Feb-26	I
0633	Antenna, Double Ridge Horn	EMCO	3115	9712-5369	3 years	Aug-27	I
0718	ATTENUATOR, 6dB	JFW	50FPE-006	-	1 year	Jan-25	I
0559	Pre-amp, Microwave, 18GHz	Miteq	AFS8	605305	1 year	May-25	I
0989	Cable, Coax, Sucoflex 104A	Huber+Suhner	44454/4A	C357	1 year	Jan-25	I
1145	Cable, Coax, Sucoflex 104PA	Huber + Suhner	84279564	MY056/4PA	1 year	Jan-25	I
1238	Cable, Coax, Sucoflex 126 E	Huber + Suhner	10422876	8000495/126E	1 year	Jan-25	I
1155	Hygrometer, Temp, Humidity	DigiTech	QM7312	-	1 year	Jul-25	I
0666	Enclosure, Semi-Anechoic, No 1	RFI Industries	S800 iOATS	1229	3 years	Aug-25	I
SW007	EMC Measurement Software	Rohde & Schwarz	EMC 32	Version 8.53.0	N/A	N/A	N/A

V: Verification of operation against an internal reference
I: Internal calibration against a traceable standard
E: External calibration by a NATA or MRA equivalent endorsed facility
N/A: Not Applicable

Appendix B – Photographs

Annex	Number	Photograph Description
A	1	EUT – F220-2S Alarm Panel – External views
	2	
	3	
	4	
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	10	EUT – MPS-PI Pull Station – External views
	11	
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	19	EUT – NET2-FFANN (NET2 Annunciator) – External views
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	EUT – F220-FFANN (Local Annunciator) – External views
	29	
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	37	Support Equipment – System Sensor P4RL Sounder+Strober NAC1 Device – External views
	38	
	39	Support Equipment – 7351 Detector – External views
	40	
	41	
	42	Support Equipment – M501MAP Module – External views

Photograph list continued on the following page

Annex	Number	Photograph Description
B	1	EUT – F220-2S Alarm Panel – Internal views
	2	
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	42	
	43	EUT – MPS-PI Pull Station – Internal views
	44	
	45	EUT – NET2-FFANN (NET2 Annunciator) – Internal views
	46	
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	48	
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	51	

Photograph list continued on the following page

Annex	Number	Photograph Description
B	52	EUT – F220-FFANN (Local Annunciator) – Internal views
	53	
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	58	
	59	
	60	Support Equipment – System Sensor P4RL Sounder+Strober NAC1 Device – Internal views
	61	
	62	
	63	Support Equipment – M501MAP Module – Internal views
C	1	Radiated Emissions – Test configuration – 30MHz to 1GHz
	2	Radiated Emissions – Test configuration – 1GHz to 6GHz
	3	Conducted Emissions – Test configuration
	4	Radiated Emissions – Test configuration – 9kHz to 30MHz

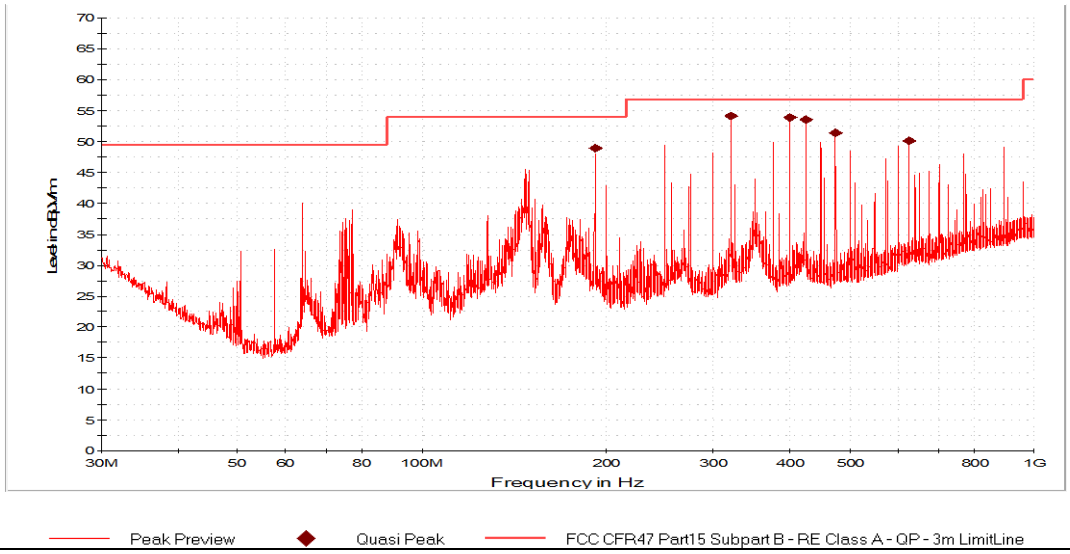
Appendix C – Measurement Graphs

No.	Test	Graph Description
1	Radiated Emissions	Horizontal Antenna Polarisation – 30MHz to 1GHz
2		Horizontal Antenna Polarisation – 1GHz to 2GHz
3		Vertical Antenna Polarisation – 30MHz to 1GHz
4		Vertical Antenna Polarisation – 1GHz to 2GHz
5	Conducted Emissions	Active Line
6		Neutral Line
7	Radiated Emissions FCC Part 15.209	X Antenna Polarisation – 9kHz to 30MHz
8		Y Antenna Polarisation – 9kHz to 30MHz
9		Z Antenna Polarisation – 9kHz to 30MHz

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B (Class A) - Radiated Emissions
Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Horizontal Antenna Polarisation – 30MHz to 1000MHz

Job Number: E2405-1792-1 Rev1
Test Engineer: FD

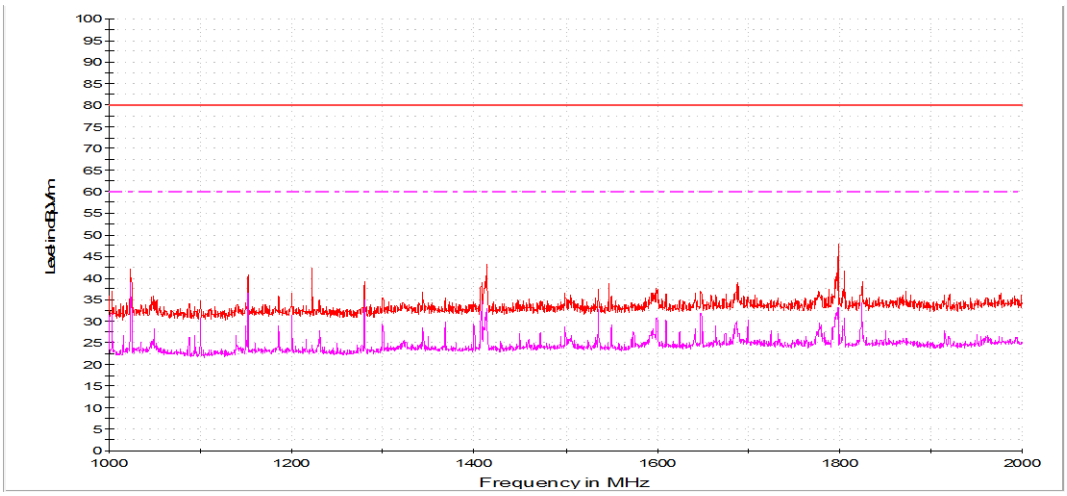


Graph 1

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B (Class A) - Radiated Emissions
Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Horizontal Antenna Polarisation – 1GHz to 2GHz

Job Number: E2405-1792-1 Rev1
Test Engineer: FD

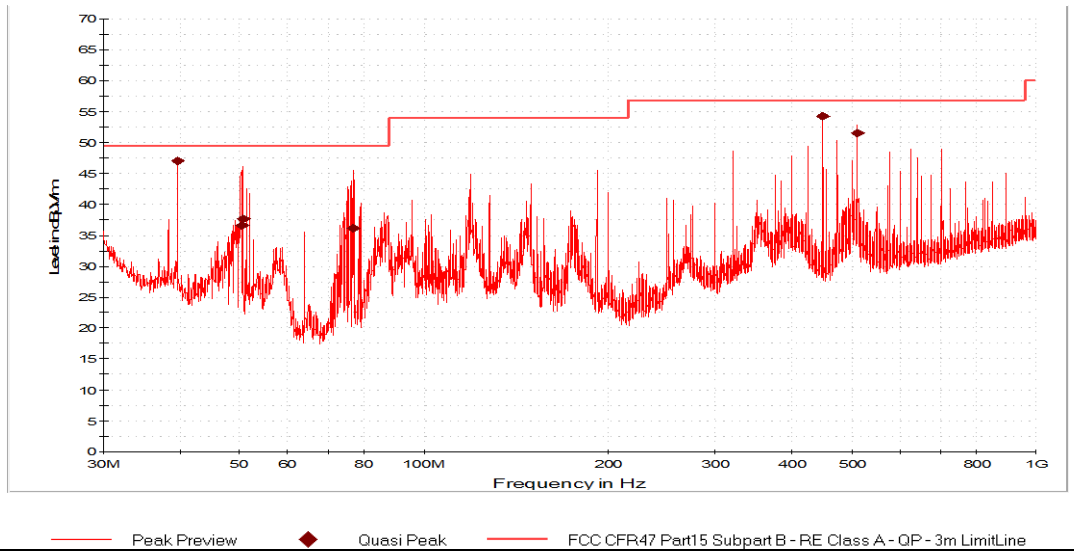


Graph 2

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B (Class A) - Radiated Emissions
Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Vertical Antenna Polarisation – 30MHz to 1000MHz

Job Number:	E2405-1792-1 Rev1
Test Engineer:	FD

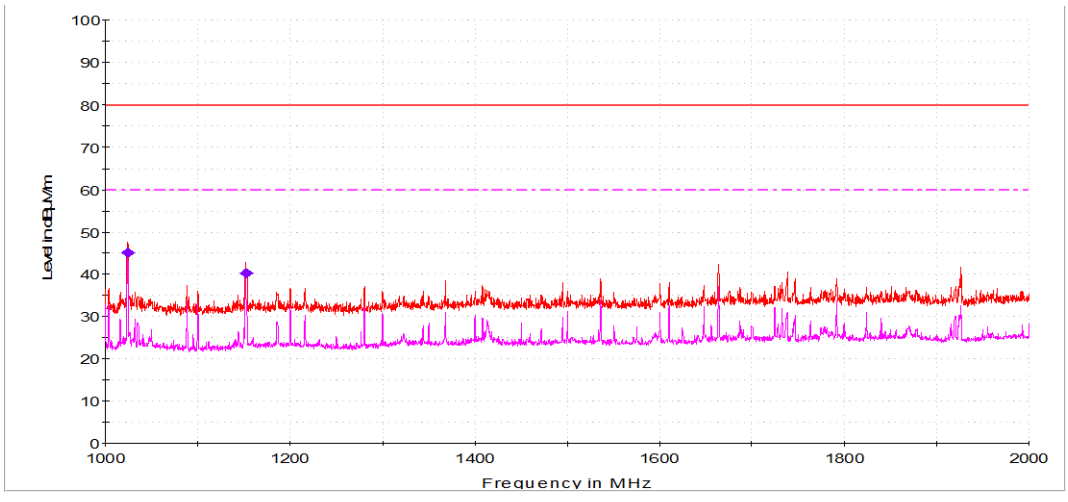


Graph 3

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B (Class A) - Radiated Emissions
Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Vertical Antenna Polarisation – 1GHz to 2GHz

Job Number:	E2405-1792-1 Rev1
Test Engineer:	FD

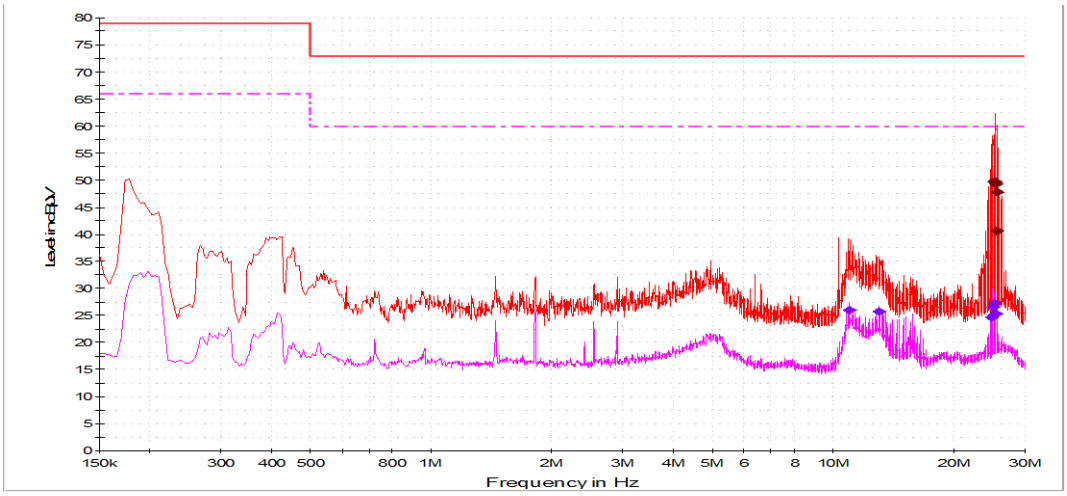


Graph 4

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B (Class A) - Conducted Emissions
Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Active Line

Job Number: E2405-1792-1 Rev1
Test Engineer: FD

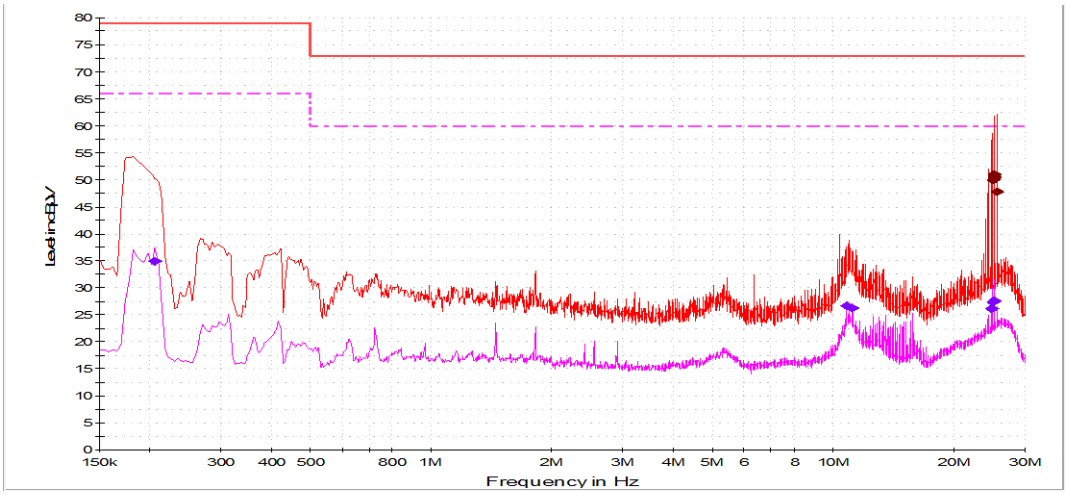


Graph 5

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart B (Class A) - Conducted Emissions
Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Neutral Line

Job Number: E2405-1792-1 Rev1
Test Engineer: FD



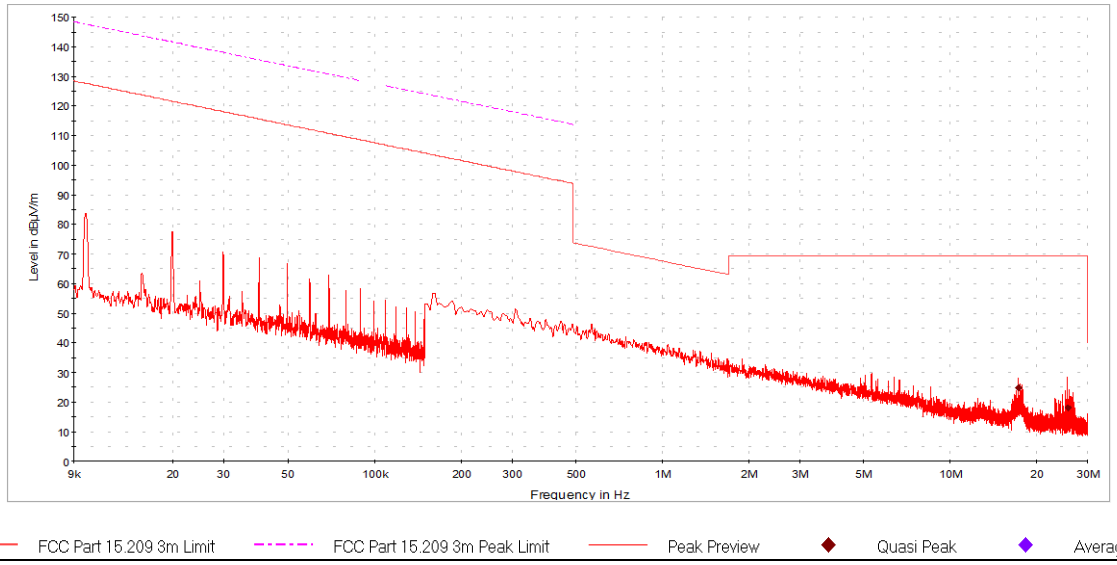
Graph 6

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, 15.209 – Radiated Emissions

Pertronic Industries Limited - F220 Pertronic Fire Alarm System
X Antenna Polarisation – 9kHz to 30MHz

Job Number: E2405-1792-1 Rev1
Test Engineer: FD



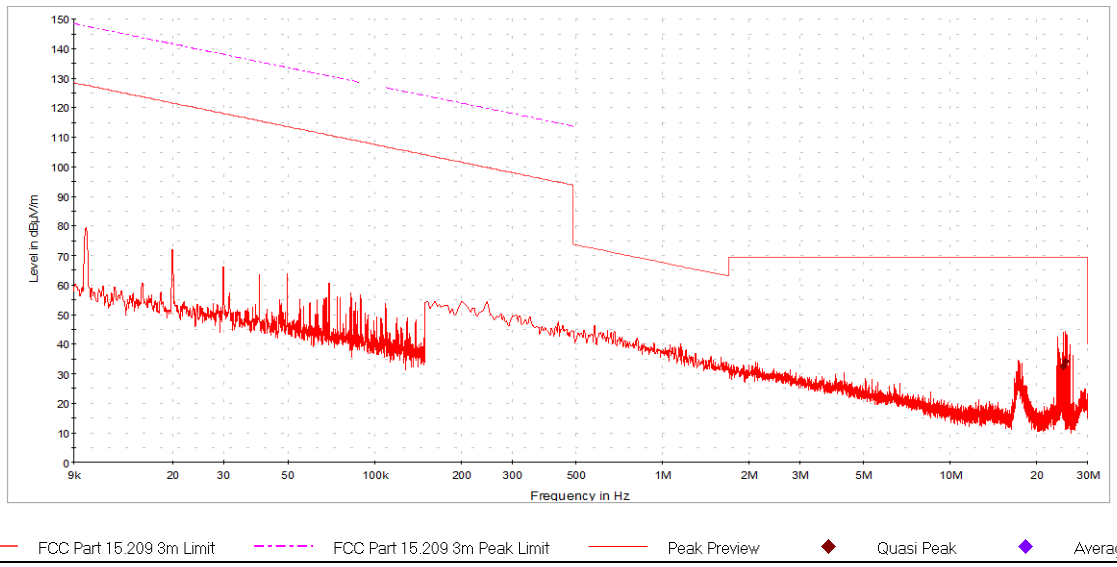
Graph 7

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, 15.209 – Radiated Emissions

Pertronic Industries Limited - F220 Pertronic Fire Alarm System
Y Antenna Polarisation – 9kHz to 30MHz

Job Number: E2405-1792-1 Rev1
Test Engineer: FD



Graph 8

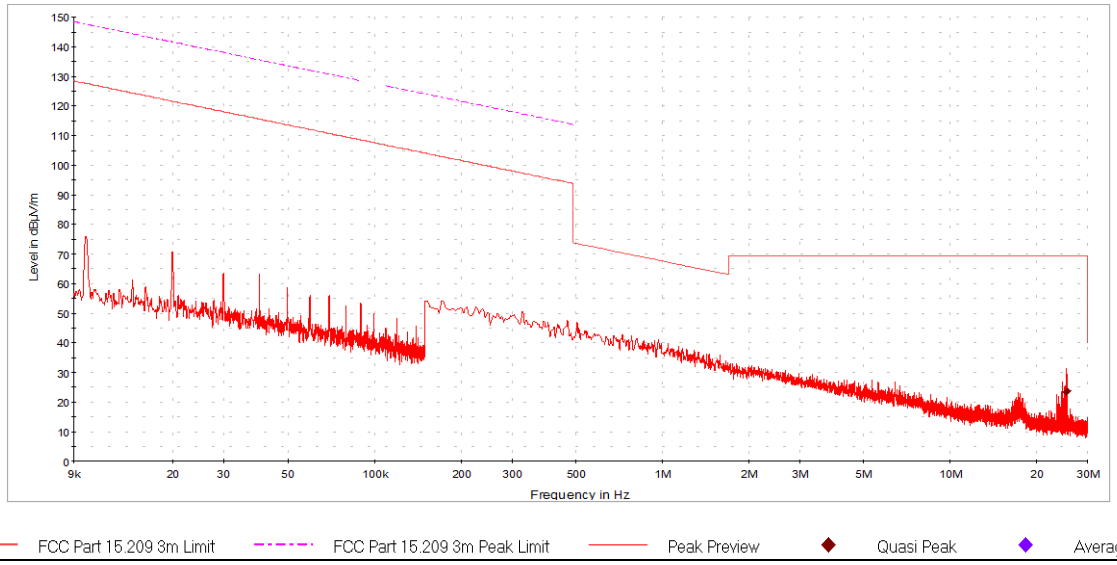
EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, 15.209 – Radiated Emissions

Pertronic Industries Limited - F220 Pertronic Fire Alarm System

Z Antenna Polarisation – 9kHz to 30MHz

Job Number:	E2405-1792-1 Rev1
Test Engineer:	FD



Graph 9

Appendix D – Customer Declaration of Responsible Party

PERTRONIC INDUSTRIES LTD

Advanced Automatic Fire Detection Systems - Design and Manufacture

Pertronic Industries Limited
17 Eastern Hutt Rd
Wingate
P.O. Box 35-063
Naenae 5041
WELLINGTON
Telephone: +64 4 567-3229
https://pertronic.co.nz
NZBN: 9429040846637

Date: 1 August 2024

Declaration of Responsible Party

We (Responsible party) of **Pertronic Industries Limited**
17 Eastern Hutt Road, Wingate, New Zealand 5019,
PO Box 35-063, Naenae, New Zealand, 5041,

hereby declare as per FCC KDB 896810 D01 SDoC v02 that:

John Charles Brook

is acting as the representative of the responsible party with the authority to act on behalf of the responsible party.

Signed by: DR Percy

Name: David Robert Percy

Position: Managing Director

Date signed: 1st August 2024