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TEST REPORT

IZON AFC-V2
Automatic Fraction Collector

tested to the specification

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart C – Intentional Radiators

Section 15.225
Operation within the band 13.110 -14.010 MHz

for

Izon Science Limited

This test report is issued with the authority of:

Andrew Cutler - General Manager

ACCREDITED IANZ TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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1. STATEMENT OF COMPLIANCE

The **IZON AFC-V2 Automatic Fraction Collector** complies with FCC Part 15 Subpart C Section 15.225 as an Intentional Radiator when the methods as described in ANSI C63.10 - 2020 are applied.

2. RESULTS SUMMARY

The results from testing carried out between 24th September 2024 and the 7th November 2024 are detailed in the following table:

Clause	Parameter	Result
15.201	Equipment authorisation requirement	Certification required
15.203	Antenna requirement	Complies. Antenna internal to the device.
15.204	External PA and antenna modifications	Not applicable. No external devices.
15.205	Restricted bands of operation	Complies. Device transmits on a nominal frequency of 13.560 MHz.
15.207	Conducted limits	Complies.
15.209	Radiated emission limits - Emissions < 30 MHz	Complies.
15.209	Radiated emission limits – Emissions > 30 MHz	Complies.
15.225	Radiated emission limits - Fundamental	Complies.
15.225	Frequency stability	Complies.

3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

All testing was carried out as per the standard in the worst-case configuration, in consultation with the client, with no deviations being applied.

Report Revision Table

Version	Change Made	Date
240314.3	Initial report issue	25th November 2024

4. CLIENT INFORMATION

Company Name	Izon Science Limited
Address	2 Show Place Addington
City	Christchurch 8024
Country	New Zealand
Contact	Jules van der Voorn

5. DESCRIPTION OF TEST SAMPLE

Brand Name	IZON
Model Number	AFC-V2
Product	Automatic Fraction Collector
Manufacturer	Izon Science Limited
Country of Origin	New Zealand
Serial number	AFC-V2-0133
FCC ID	2BNOU-IZAFCV2

The device tested is an Automated Fraction Collector, for use in a laboratory environment.

It automates extracellular vesicle (EV) isolation across a range of samples.

The Device Under Test contains a 13.560 MHz NFC module for identification of proprietary qEV Columns during testing.

The device was powered from a client provided 120 VAC to 12 VDC power supply.

During testing the unit was operating a compliance test routine on a loop.

As part of the test routine the NFC reader evaluated the attached qEV Column.

Tetsing has been performed to certify the NFC module.

6. SETUPS AND PROCEDURES

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart C.

Methods and Procedures

The measurement methods and procedures as described in ANSI C63.10 - 2020 were used.

Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device.

Section 15.203: Antenna requirement

The device has a permanently attached internal 13.560 MHz antenna.

Result: Complies.

Section 15.204: External radio frequency power amplifiers and antenna modifications

It is NOT possible to attach an external power amplifier to this transmitter.

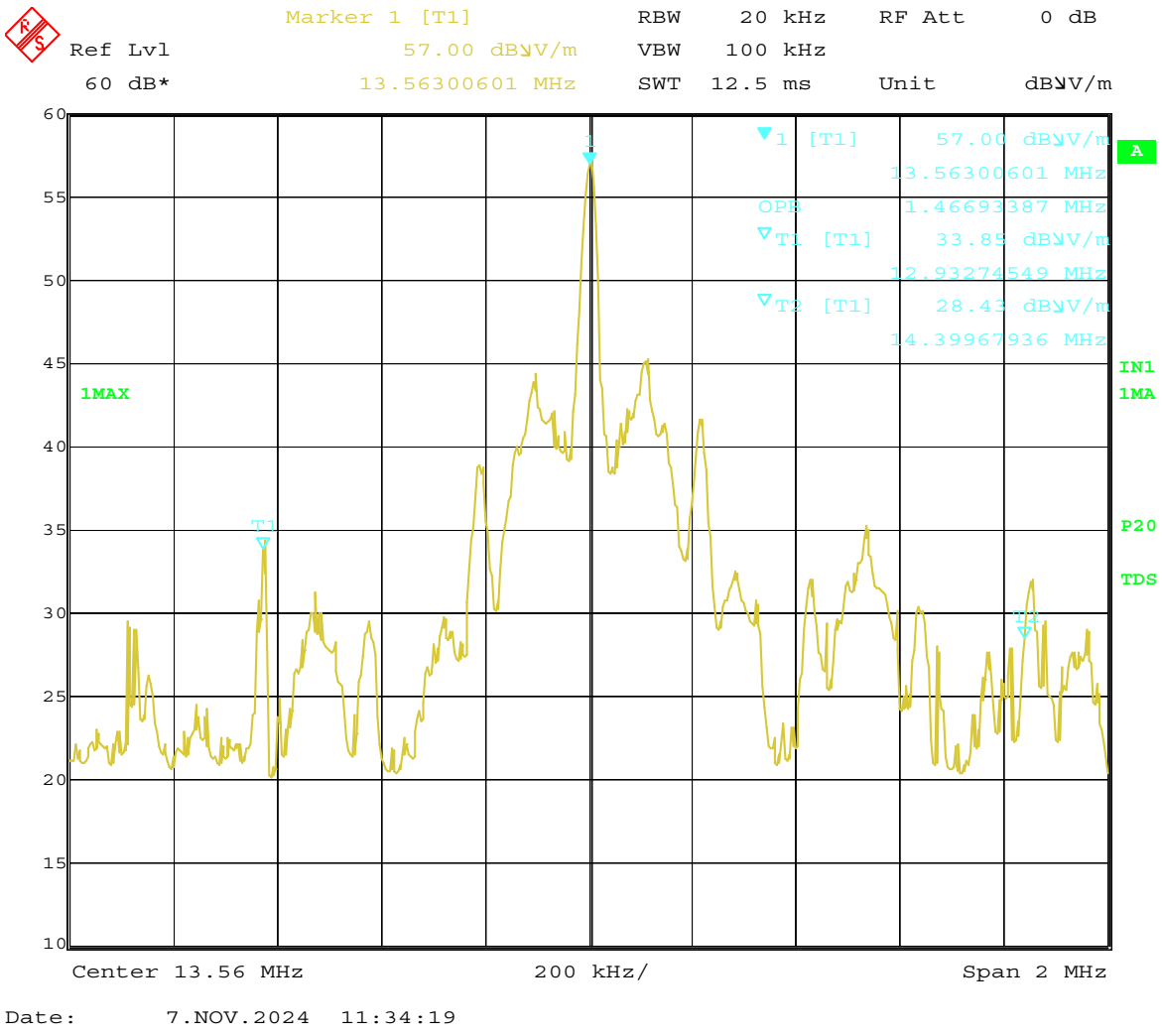
Result: Complies.

Section 15.205: Restricted bands of operation

The device transmits on a nominal frequency of 13.560 MHz.

13.560 MHz transmissions would fall into the 13.110 – 14.010 MHz band that is covered by Section 15.225.

The modulation bandwidth of this device has been measured to be 1466.934 kHz which can be seen in the plot below.



Result: Complies.

Section 15.207: Conducted emissions testing

Conducted Emissions testing was carried out over the frequency range of 150 kHz to 30 MHz which was carried out at the laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room

As it is possible for this device to be directly or indirectly connected to the Public AC mains supply testing was carried out using a representative AC power supply system that was powered at 120 VAC 60 Hz which supplied 12 VDC to the device in order to test it.

The device has NFC (Near Field Communications) which operates at 13.560 MHz.

Initially testing was carried out when the NFC transmitter was connected to its antenna and was operating while periodically reading a qEV Column that was inserted into the holder for normal operation.

A second test was carried out when the NFC transmitter powered but not transmitting.

The device was placed on top of the emissions table, which is 0.8 m x 0.8 m, 80 cm above the screened room floor which acts as the horizontal ground plane.

In addition the device was positioned 40 cm away from the screened room wall which acts as the vertical ground plane.

The artificial mains network was bonded to the screened room floor. At all times the device was kept more than 80 cm from the artificial mains network.

The supplied plot is combined plot showing the worst case quasi peak and average results of both the phase and neutral lines to the representative AC power supply.

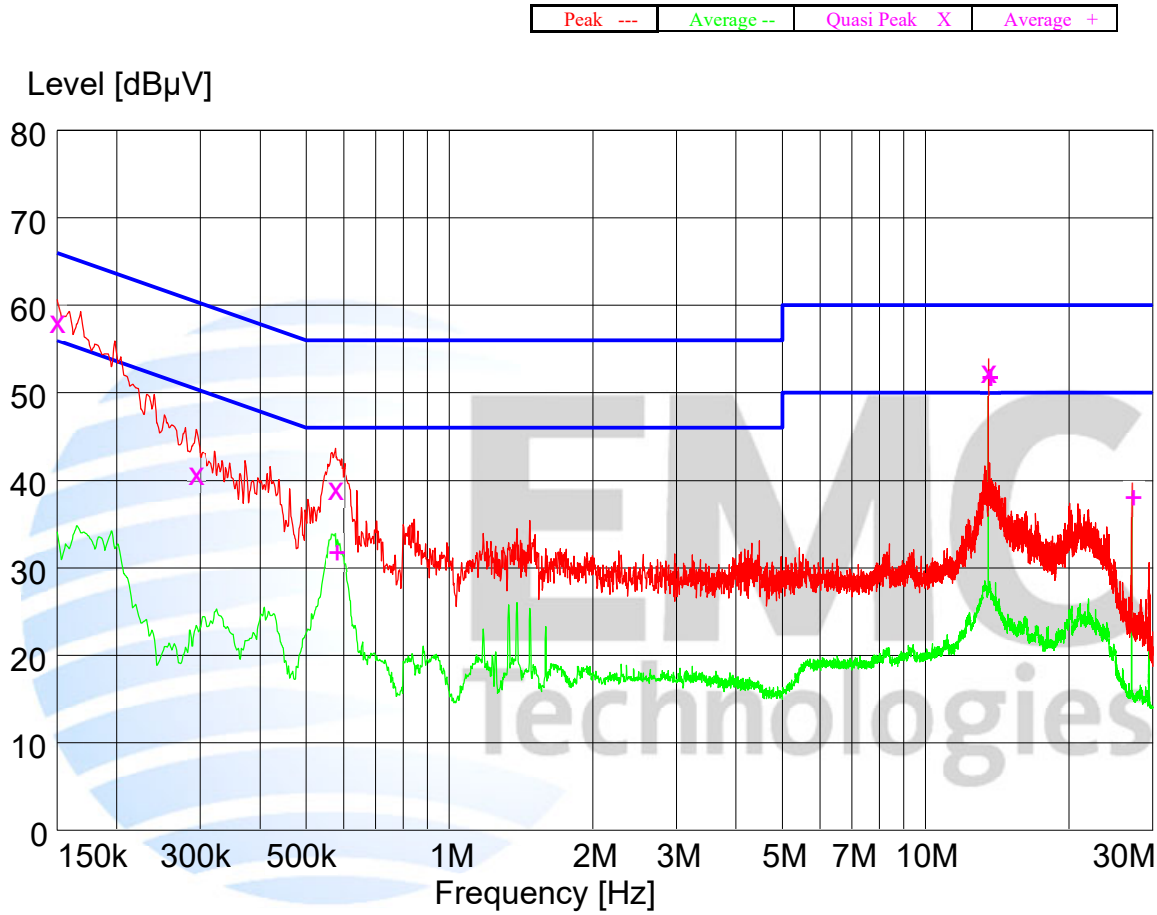
When either the Peak or Average detector pre scan emissions appear to be over the Quasi Peak or Average limit line each peak is individually checked and confirmed to be below the applicable limit.

Quasi peak and average detectors have been used with resolution bandwidths of 9 kHz.

Result: Complies
Measurement uncertainty with a confidence interval of 95% is:
- AC Mains port (0.15-30 MHz) ± 2.8 dB

Conducted Emissions – AC Input Power Port

Setup:	Device tested when powered using 12 VDC representative power supply, powered from 120 VAC, 60 Hz supply. NFC active. Test routine continuously active.		
Temperature:	23.5	**Humidity:**	53%



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Comments
0.150000	58.70	66.0	7.3	N	
0.294000	41.30	60.4	19.1	N	
0.576000	39.50	56.0	16.5	N	
13.560500	52.90	60.0	7.1	L1	*NFC*

Final Average Measurements

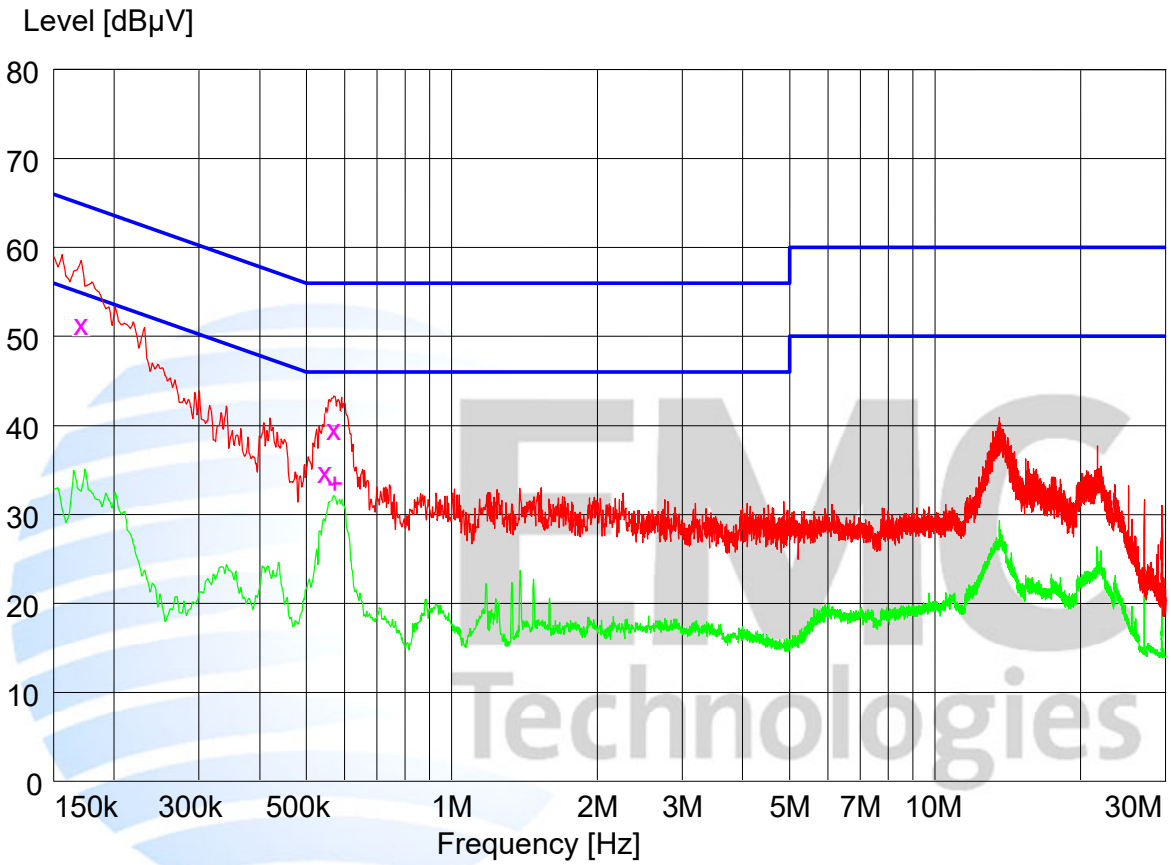
Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Comments
0.576000	32.20	46.9	13.8	N	
13.560500	52.30	50.0	-2.3	L1	*NFC*
27.119000	38.50	50.0	11.5	N	

Conducted Emissions – AC Input Power Port

Setup:	Device tested when powered using 12 VDC representative power supply, powered from 120 VAC, 60 Hz supply. NFC inactive (Dummy load) Test routine continuously active.

Temperature:	21.5	**Humidity:**	53%

Peak ---	Average --	Quasi Peak X	Average +



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase
0.171000	51.70	65.0	13.2	L1
0.546000	35.10	56.0	20.9	N
0.570000	39.80	56.0	16.2	L1

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase
0.570000	33.80	46.0	12.2	N

Section 15.209: Radiated emission limits, general requirements

Radiated emission testing was carried out over the frequency range of 30 MHz to 1000 MHz as the device contains a 13.560 MHz NFC transceiver that evaluates proprietary qEV Columns during operation.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

Testing was carried out using a representative AC power supply at 120 VAC that supplied 12.0 VDC to the device under test.

A custom programme was run on the device under test which continuously ran through a cycle of test operations to fully exercise the device.

The device was transmitting continuously on 13.560 MHz with a qEV Column located in the test position for the NFC to read.

Correct operations were indicated by an indication on the screen of the device.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

Below 30 MHz a magnetic loop is used with the centre of the loop being 1 metre above the ground with measurements being made using a quasi peak detector at a distance of 10 metres.

Between 30 - 1000 MHz the emission is measured in both vertical and horizontal antenna polarisations at a distance of 3 metres using a Quasi Peak detector with a 120 kHz bandwidth is used.

The emission level was determined in field strength by taking the following into consideration:

Level (dBµV/m) = Receiver Reading (dBµV) + Antenna Factor (dB/m) + Coax Loss (dB)

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB
- Free radiation tests (30 – 1000 MHz) ± 4.1 dB

Section 15.209: 13.560 MHz transmitter below 30 MHz spurious emission measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
27.120	16.6	48.6	32.0	Pass

The device was transmitting continuously on 13.560 MHz with a NFC qEV Column being placed close to the NFC reader which was periodically read by the card reader.

Magnetic loop measurements were made at a distance of 10 metres.

Measurement receiver with a quasi peak detector with a 9 kHz bandwidth was used.

The 30 metre limit has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2).

The limit at 27.120 MHz when measured at 30 metres is 30 uV/m or 29.54 dBuV/m.

Therefore the scaled limit at 10 metres will be 48.6 dBuV/m.

The spurious emission observed does not exceed the level of the fundamental emission.

No other low frequency spurious emissions were detected from the device when measurements were attempted from 10 kHz - 30.0 MHz

Result: Complies.

Section 15.209: Spurious Emissions (above 30 MHz)

Measurements between 30 – 1000 MHz have been made at a distance of 3 metres.

A receiver with a quasi peak detector with a 120 kHz bandwidth was used between 30 – 2000 MHz.

The limits as described in Section 15.209 have been applied.

The following emissions were determined to be due to the NFC transmitter of the device

Frequency (MHz)	Vertical (dBµV/m)	Horizontal (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Polarisation	Result
108.480	32.5	-	43.5	11.0	Pass	Vertical
271.200	29.4	-	46.0	16.6	Pass	Vertical
325.440	33.8	-	46.0	12.2	Pass	Vertical

No further emissions related to the NFC were detected within 20 dB of the limit when the measurements were made between 30 - 1000 MHz using both vertical and horizontal polarisations.

Result: Complies.

Section 15.225: Fundamental emission:

Measurements were made using a magnetic loop antenna and a receiver with a quasi peak detector using a 9 kHz bandwidth.

Measurements were made at a distance of 10 metres with the limit being determined by using the extrapolation factor of 40 dB per decade limit, as detailed in section 15.31 f (2).

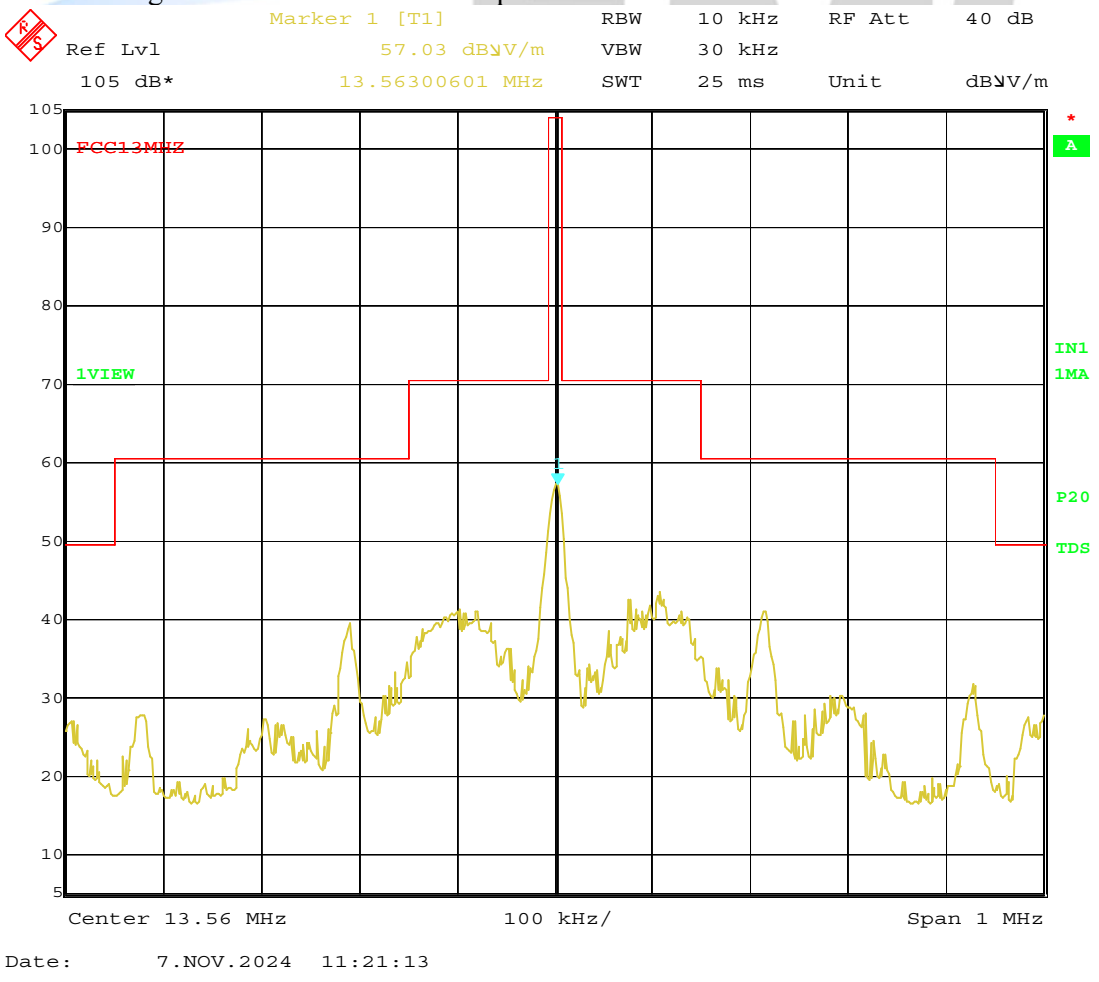
The limit at 30 m at 13.560 MHz is 15,848 uV/m or 84.0 dBuV/m.

Applying the extrapolation factor of 40 dB/ per decade, the limit at 10 m is 103.1 dBuV/m.

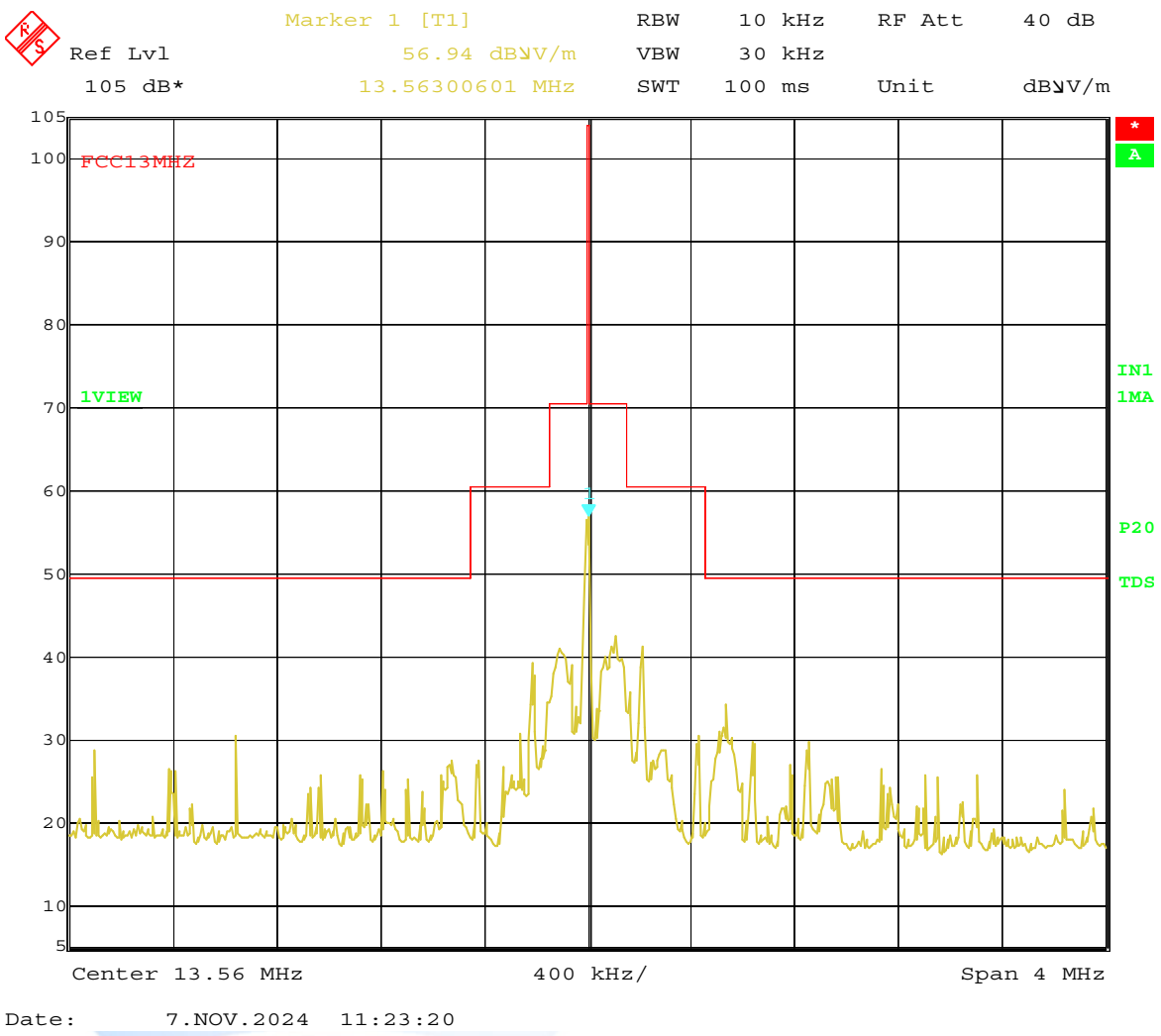
Testing was also carried out to determine whether a variation in the supply voltage would cause a significant change in field strength with the 12.0 Vdc supply to the device being varied by +/- 15% between 10.2 Vdc and 13.8 Vdc.

Voltage (Vdc)	Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10.2	13.560	57.0	103.1	46.1
12.0	13.560	57.0	103.1	46.1
13.8	13.560	57.0	103.1	46.1

Plot showing the carrier and modulation peaks within +/- 500 kHz of the carrier.



Plot showing the carrier and modulation peaks within +/- 2 MHz of the carrier.



Measurements were made at the open area test site with a number of ambient emissions being observed but under the FCC part 15 limits.

Result: Complies.
Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

Section 15.225: Frequency tolerance:

The frequency tolerance of the carrier is required to be +/- 0.01% of operating frequency when the temperature is varied between -20 degrees C and +50 degrees C.

The device operates nominally on 13.560 MHz which gives a frequency tolerance of +/- 1,356.0 Hz.

Temperature (°C)	Frequency (MHz)	Difference (Hz)
50.0	13.559 610	-390
40.0	13.559 610	-390
30.0	13.559 610	-390
20.0	13.559 610	-390
10.0	13.559 610	-390
0.0	13.559 660	-340
-10.0	13.559 700	-300
-20.0	13.559 700	-300

The device normally operates at 12 Vdc.

The DC supply was varied by +/- 15% at an ambient temperature of 20 degrees C.

Voltage (Vdc)	Frequency (MHz)	Difference (Hz)
10.2	13.559 610	-390
12.0	13.559 610	-390
13.8	13.559 610	-390

Result: Complies.
Measurement uncertainty with a confidence interval of 95% is:
Frequency tolerance ± 50 Hz

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Period
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	N/a
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	N/a
VHF Balun	Schwarzbeck	VHA 9103	11042021A	3696	23 May 2025	3.5 years
Biconical Antenna	Schwarzbeck	BBA 9106	11042021A	3697	23 May 2025	3.5 years
Horn Antenna	EMCO	3116	9511-4629	E1526	3 March 2025	3 years
Log Periodic	Schwarzbeck	VUSLP 9111B	112+11042021B	4025	16 May 2025	3.5 years
Loop Antenna	EMCO	6502	9003-2485	3798	7 March 2025	3 years
Mains Network	R & S	ESH2-Z5	881362/001	3805	11 March 2025	2 years
Receiver	R & S	ESHS 10	828404/005	3728	04 Dec 2024	2 years
Receiver	R & S	ESIB 40	100295	4030	30 May 2026	2 years
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	N/a
Heliax cable	Andrews	L6PNM-RPD	22869	Oats Cable	22 Dec 2024	1 year
Power Supply	APT	7008	4170003	-	Not applic	N/a
Thermal chamber	Contherm	M180F	86025	N/a	N/a	N/a
Thermometer	DSIR	RT200	35	EMC4029	21 April 2027	5 years

All test equipment was within calibration at the time of testing.

8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd designation as a FCC Accredited Laboratory by International Accreditation New Zealand, designation number: NZ0002 under the APEC TEL MRA.

All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

International Accreditation New Zealand has International Laboratory Accreditation Council (ILAC) Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies.

This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden).

Further details can be supplied on request.

9. PHOTOGRAPHS

Sample (LEDs on)

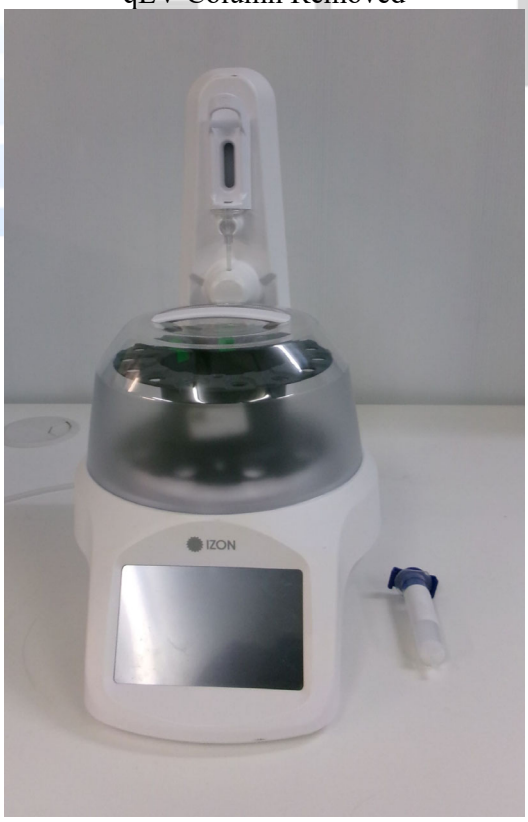
Main Screen

qEV Column Installed

Front – Power Off

Carousel & Cover Removed

qEV Column Removed

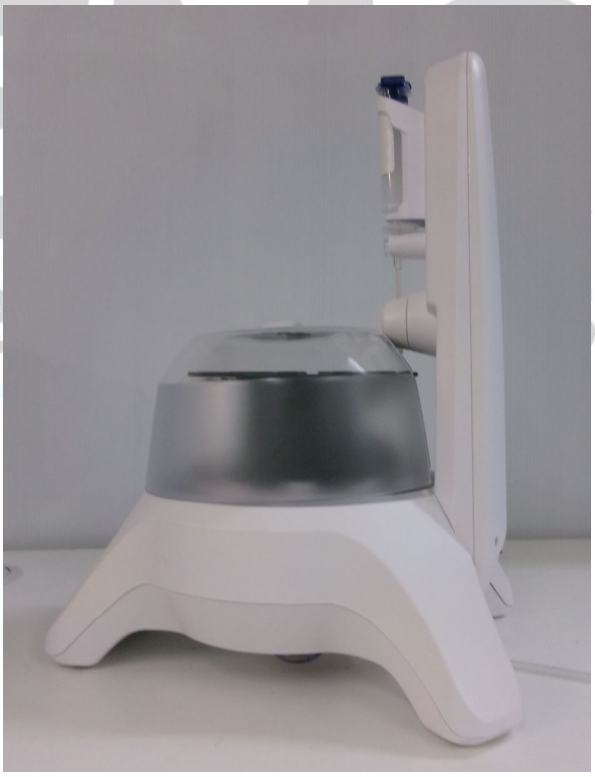


Close Up – qEV Column Removed

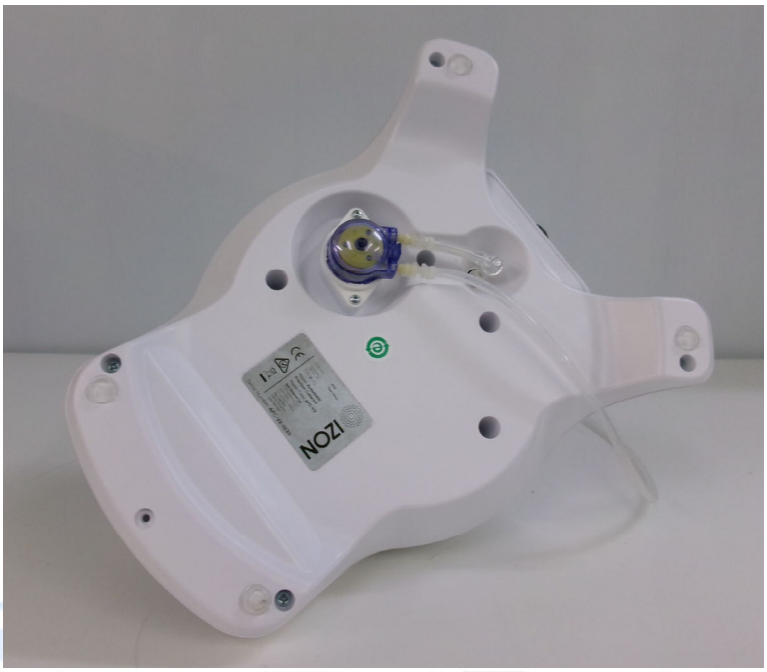
Rear

Close Up – Rear Ports

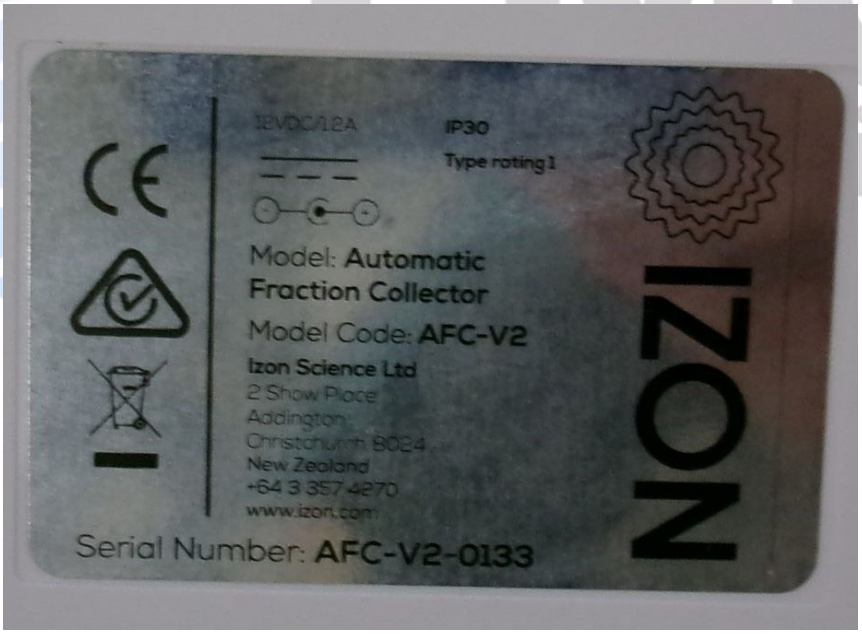
Side Views



Base



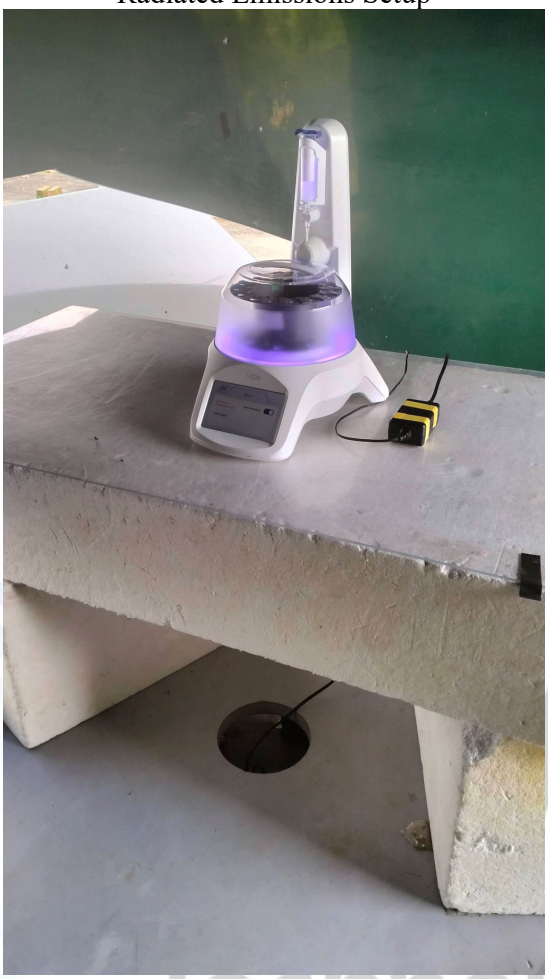
Label

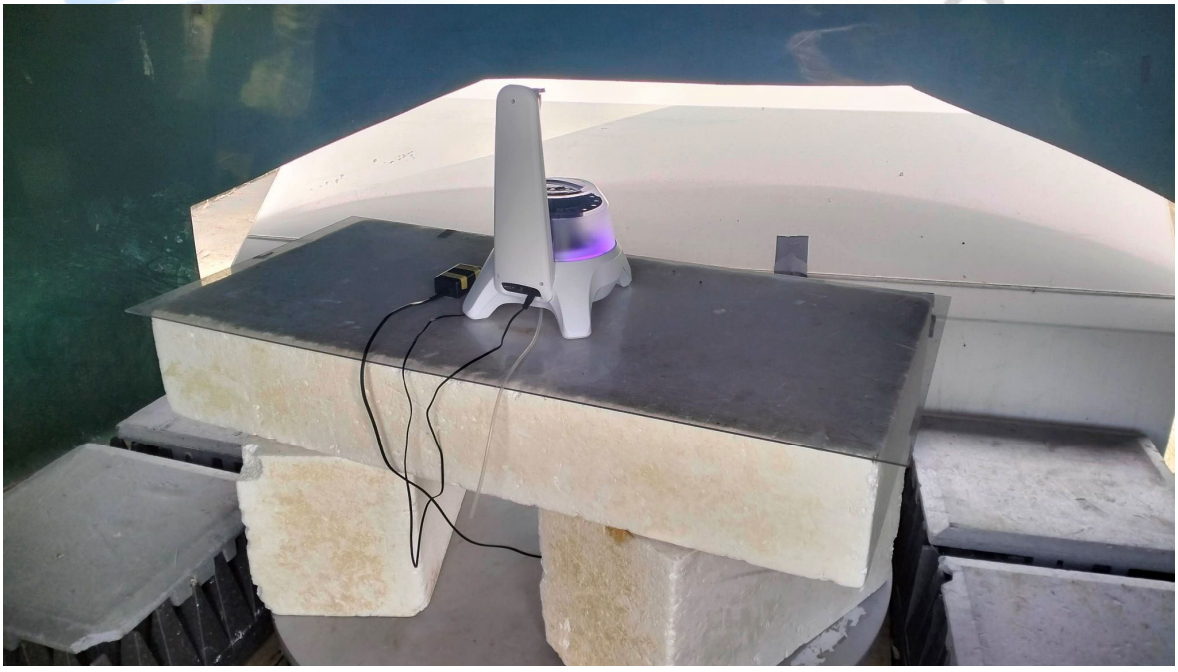


Conducted Emissions Setup

Conducted Emissions Setup - Side View

Radiated Emissions Setup





Test Site Photos