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TEST REPORT

**Windcave CHU200TL Rel C
Integrated Payment Terminal**

tested to the

**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

Windcave Ltd

A handwritten signature in black ink, appearing to read "Andrew Cutler".

This test report is issued with the authority of:

Andrew Cutler - General Manager



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 **Windcave CHU200TL Release C Integrated Payment Terminal** 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 February 28th, 2025 and March 21st, 2025 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 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.

Any corrections or erasures in this report are detailed in the revision table below.

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 with no deviations being applied.

Report Revision Table

Version	Change Made	Date
250202.3	Initial Issue	17 th April 2025

4. CLIENT INFORMATION

Company Name	Windcave Ltd
Address	33 Wilkinson Rd, Ellerslie
State	Auckland 1060
Country	New Zealand
Contact	Mark England

5. DESCRIPTION OF TEST SAMPLE

Brand Name	Windcave	
Product	Integrated Payment Terminal	
Model Number	CHU200TL Release C	
Manufacturer	Windcave Limited	
Country of Origin	New Zealand	
Serial Number(s)	EMC LAB #1	S/N: 3424490112
	EMC LAB #2	S/N: 3424490118
Firmware version	V3.0.0.2	
Antenna type and gain	The NFC antenna is a 2-turn loop antenna around the perimeter of the LCD with gain of zero.	
Rated supply voltage	12 Vdc representative power supply powered at 120 Vac	
Modulation description	ASK	
Highest clock frequency	12 MHz crystal CPU with 168 MHz internal PLL 500 MHz MIPI DSI	
Operating frequency	13.560 MHz	
FCC ID	2AC2O-CHU200TLRC	

Product Description:

The device tested is a payment terminal for fixed and mobile retail environments that contains a NFC module that transmits on 13.560 MHz.

EMC LAB #1 was used for all testing with EMC LAB #2 being provided as a spare.

The device was powered at 12 Vdc using a representative AC power supply at 120 Vac.

The device was operated using a Notebook computer that was running supplied software that continuously operated the payment terminal.

This device does not contain a Bluetooth / WiFi module or a Cellular modem.

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.

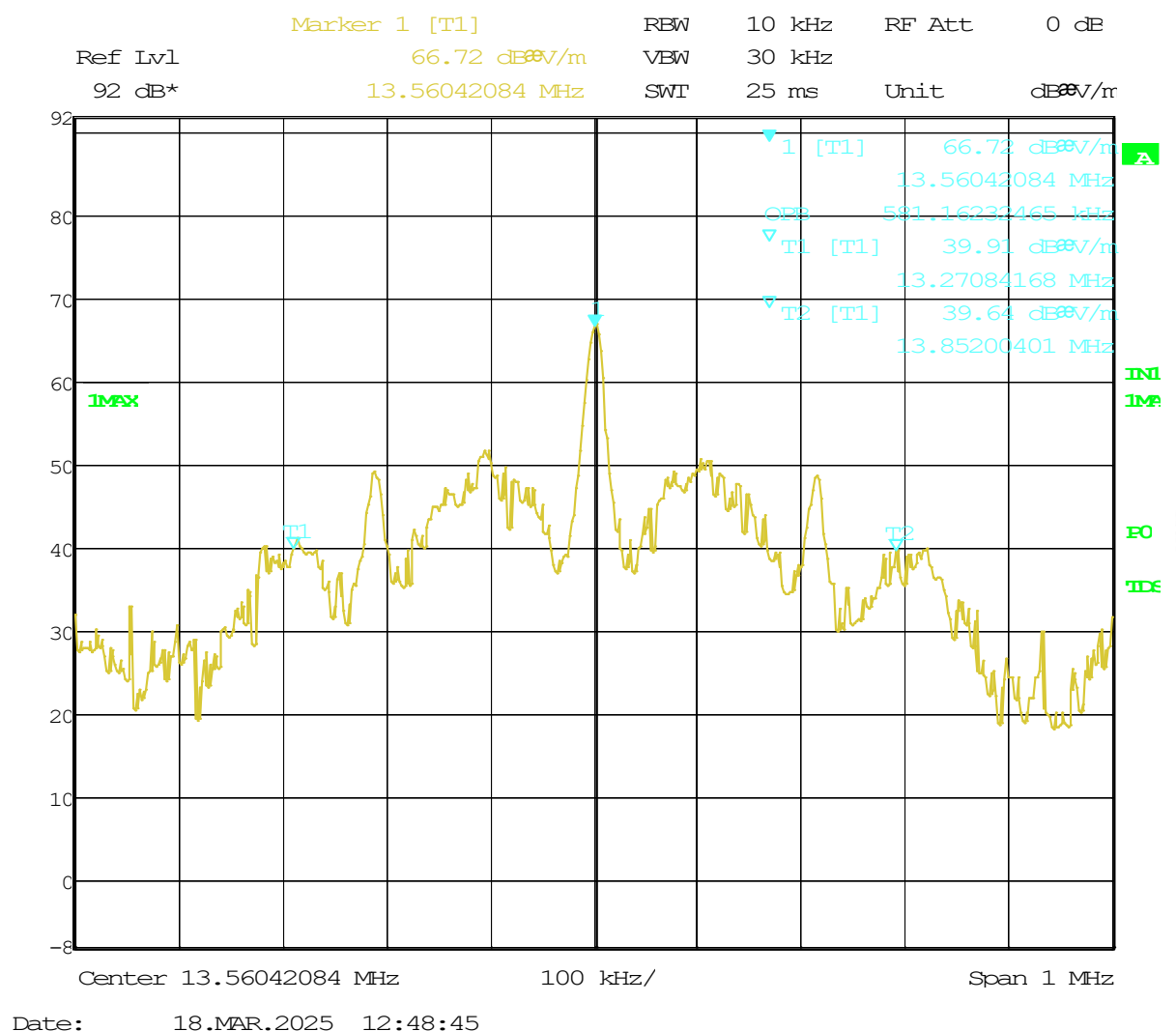
Section 15.205: Restricted bands of operation.

The 13.560 MHz device will fall into the band of 13.110 – 14.010 MHz that is covered by Section 15.225.

Measurements were made using a spectrum analyser with the 99% power points being determined.

Measurements were made using a span of 1 MHz with a resolution bandwidth of 10 kHz and a video bandwidth of 30 kHz.

A worst case modulation bandwidth of 584.162 kHz was measured.



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 on March 3rd 2025.

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 powered the device under test via the USB to UART interface device.

The NFC Card Reader operates at 13.560 MHz.

Testing was carried out when the NFC Card Reader was operating normally with the internal antenna connected while continuously reading a card was that placed close to the reader.

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.

Initially a conducted emissions pre scan is carried out using a Peak detector (red trace) and an Average detector (green trace).

Worst case measurements are then made on the highest pre-scan emission levels on a limited number of frequencies using a Quasi Peak detector and an Average detectors with the results of both the phase and neutral lines being recorded in the results table.

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.

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.

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

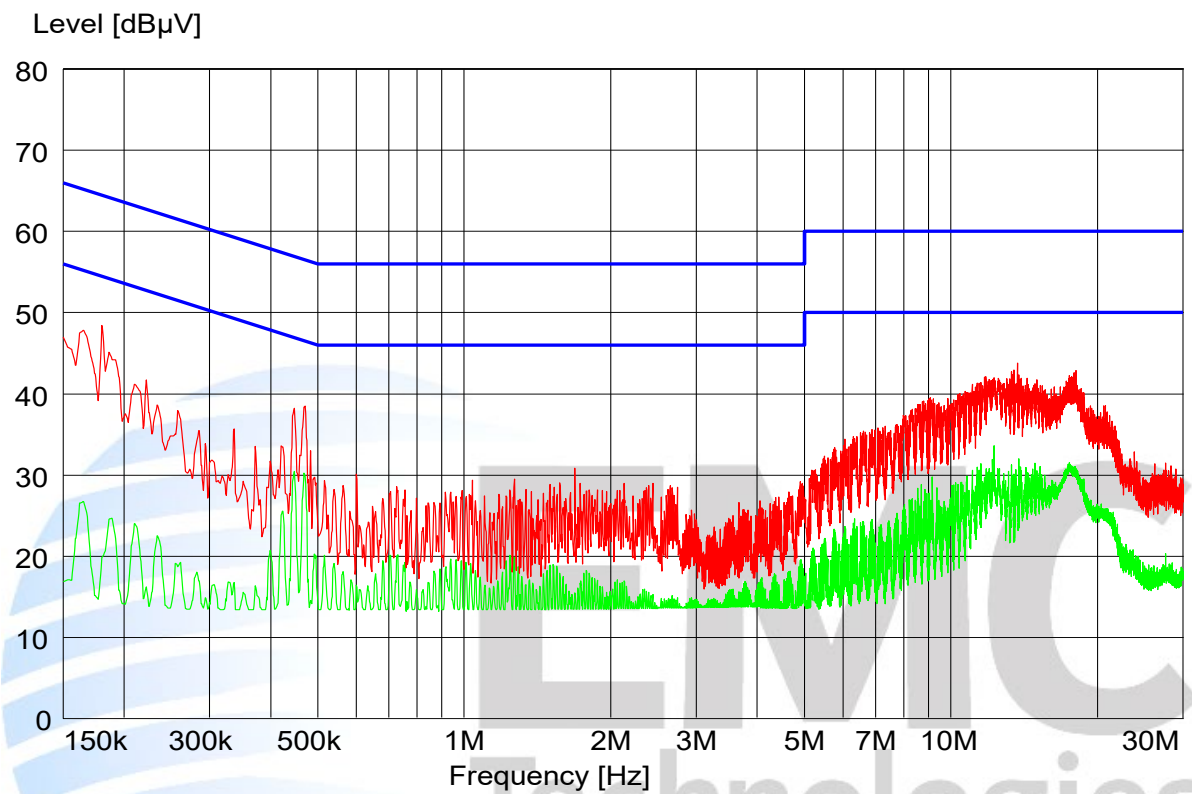
Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- AC Mains port (0.15-30 MHz) $\pm$ 2.8 dB

Conducted Emissions – AC Input Power Port

Setup:	Device tested when powered at 120 Vac 60 Hz when operating in Emissions mode.		
Peak ---	Average --	Quasi Peak X	Average +



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions observed within 15 dB of limits					

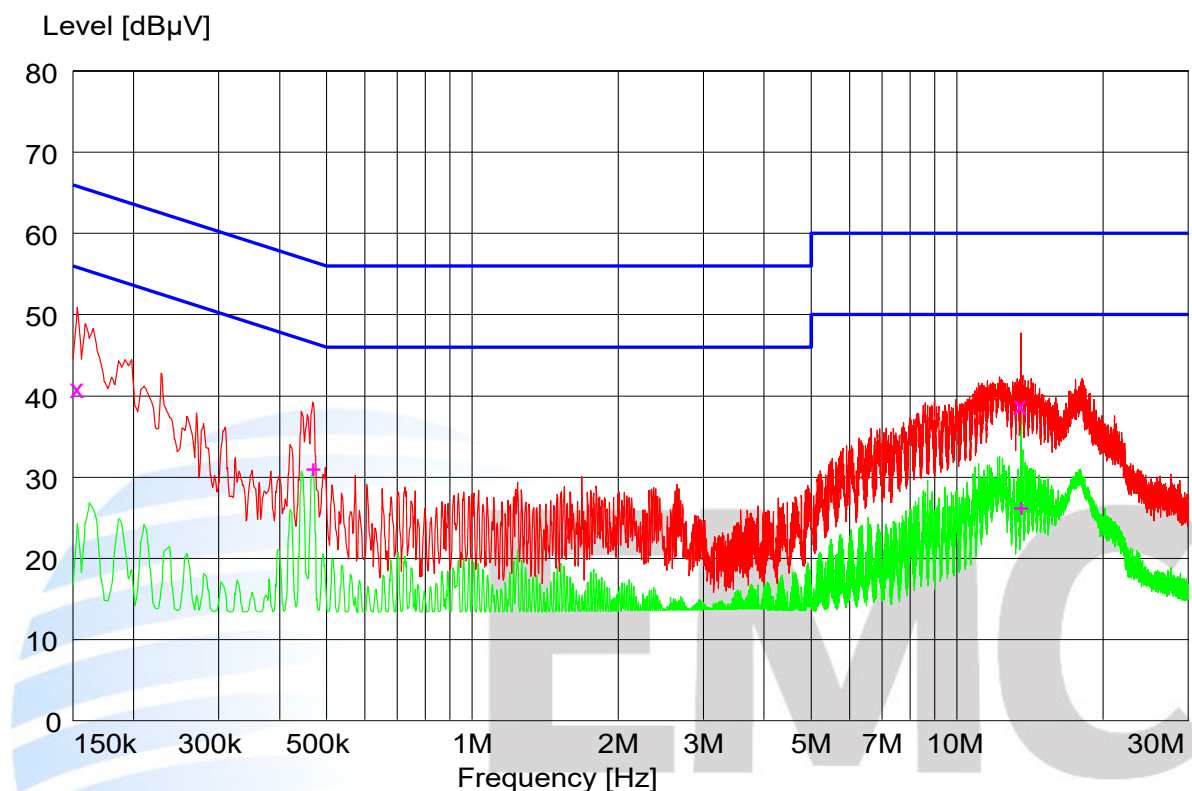
Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions observed within 15 dB of limits					

Conducted Emissions – AC Input Power Port

Setup: Device tested when powered at 120 Vac when operating in NFC mode.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Phase
0.153000	41.20	65.9	24.7	N
13.565000	39.10	60.0	20.9	L1

Final Average Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Phase
0.468000	31.20	46.6	15.4	N
13.565000	26.40	50.0	23.6	L1

Section 15.209: Radiated emission limits, general requirements

Radiated emission testing was carried out over the frequency range of 10 kHz to 2000 MHz as the device contains a 13.560 MHz NFC transceiver and a digital device that has a highest frequency in use that is 159 MHz.

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

The device was tested when placed in the centre of the test table 0.8 m above the test site ground plane.

The device was powered using a representative AC power supply that was powered at 120 Vac.

The tablet and USB to serial adaptor were placed to the right of the device.

The serial adaptor was attached via a 1 m Ethernet type cable that was inserted in the serial and charging port of the device.

The device was activated and it operated continuously using the Windcave emissions exercise program.

A payment card was placed in the card slot and a NFC card placed on the device screen.

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 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 and 12500 MHz measurements were made at a distance of 3 metres in both vertical and horizontal antenna polarisations.

A Quasi Peak detector with a 120 kHz bandwidth was used between 30 and 1000 MHz.

A Peak detector and an Average detector, with a bandwidth of 1 MHz, were used between 1000 – 2000 MHz.

During the test a number of ambient emissions were identified a list of which can be provided upon request.

The emission level is determined in field strength by taking the following into consideration:
Level (dB μ V/m) = Receiver Reading (dB μ V) + Antenna Factor (dB/m) + Coax Loss (dB)

For example, if an emission of 30 dB μ V was observed at 30 MHz:
45.5 dB μ V/m = 30.0 dB μ V + 14 dB/m + 1.5 dB

Section 15.209: Below 30 MHz spurious emission measurements

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
27.120	10.5	48.6	38.1	Pass

The NFC device was transmitting continuously on 13.560 MHz

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.

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.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (10 kHz – 30 MHz) ± 4.8 dB

Section 15.209: Spurious Emissions (above 30 MHz)

Measurements between 30 – 2000 MHz have been made at a distance of 3 metres.

The limits as described in Section 15.209 have been applied.

Frequency (MHz)	Vertical (dB μ V/m)	Horizontal (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result	Antenna Polarisation
33.400	20.2		40.0	19.8	Pass	Vertical
40.680	31.8	25.9	40.0	8.2	Pass	Vertical
67.800	35.3	29.0	40.0	4.7	Pass	Vertical
73.320	21.1		40.0	18.9	Pass	Vertical
76.120	26.2		40.0	13.8	Pass	Vertical
122.040	22.1	25.3	43.5	18.2	Pass	Horizontal
149.160		32.4	43.5	11.1	Pass	Horizontal
176.280		29.1	43.5	14.4	Pass	Horizontal
207.440		24.7	43.5	18.8	Pass	Horizontal
339.000		31.1	46.0	14.9	Pass	Horizontal

No further emissions were detected within 15 dB of the limit when measurements were made between 30 – 2000 MHz using both vertical and horizontal polarisations.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

Free radiation tests (30 – 2000 MHz) $\pm$ 4.1 dB

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).

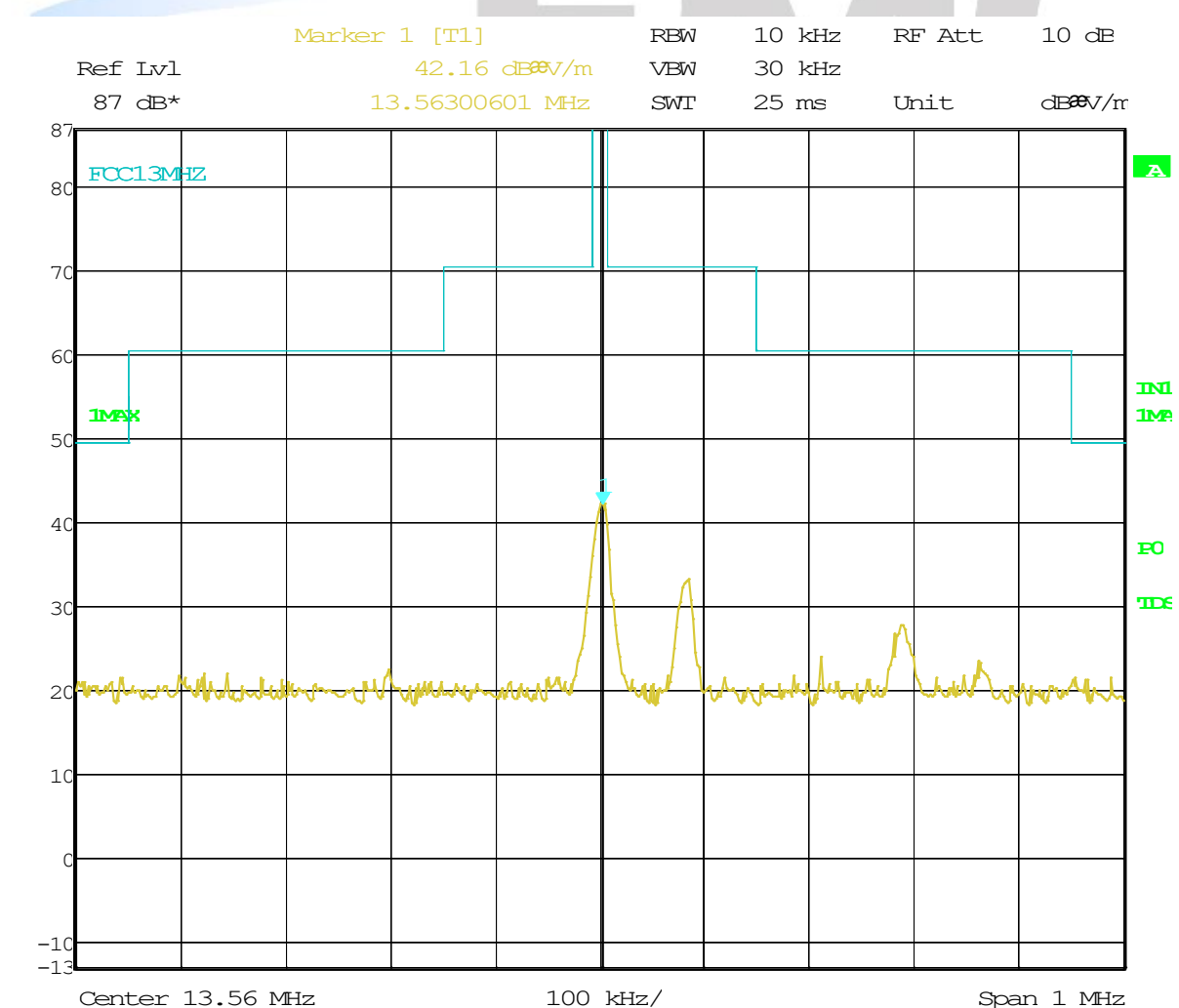
The limit at 30 m at 13.560 MHz is 15,848 uV/m or 84.0 dBuV/m.

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

The 12 Vdc supply to the device was varied by +/- 15% to determine whether a change in field strength would occur.

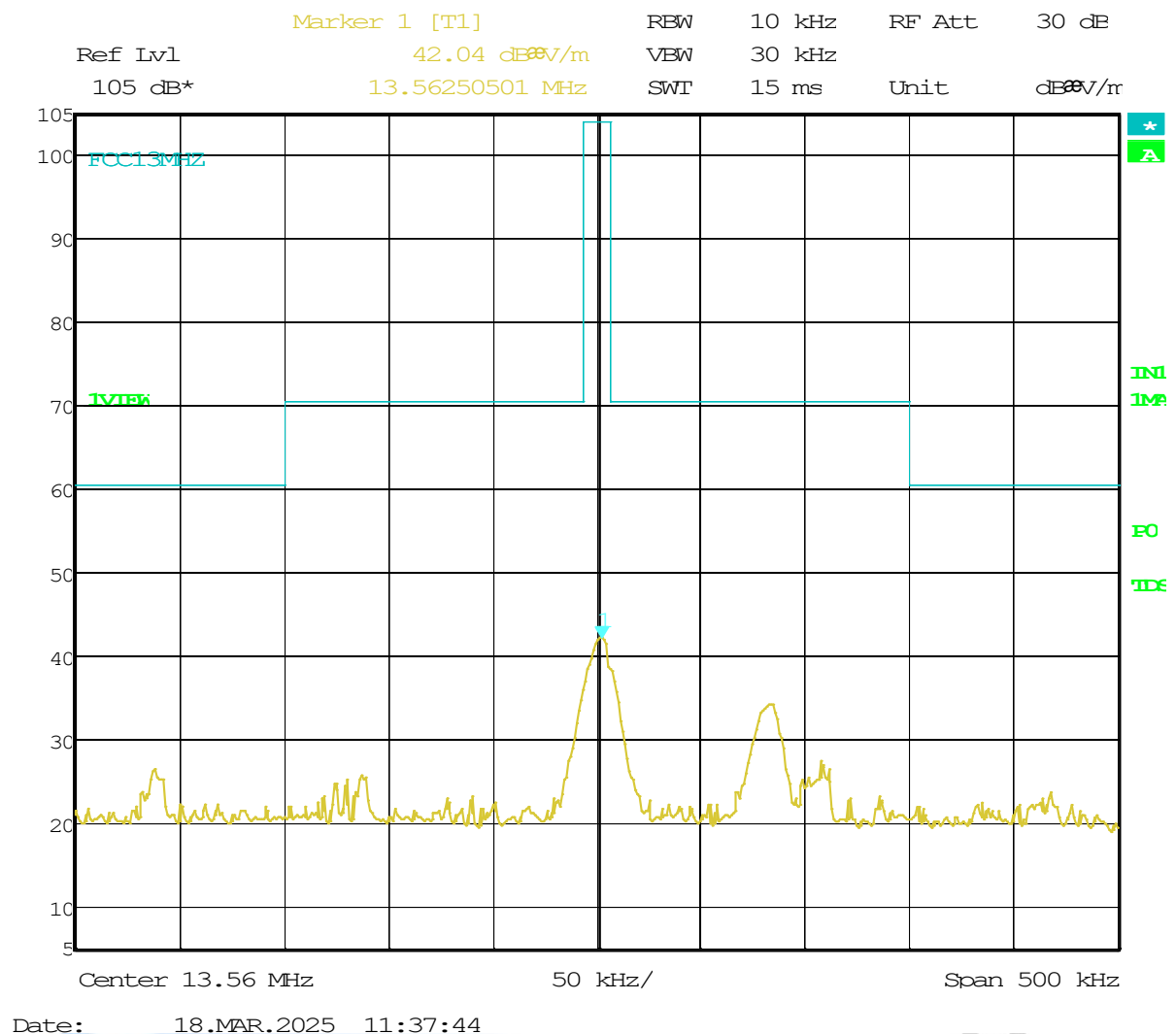
Voltage (Vdc)	Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10.8	13.560	42.0	103.1	61.1
12.0	13.560	42.0	103.1	61.1
13.8	13.560	42.0	103.1	61.1

Spectrum analyser plot showing the carrier and modulation peaks within +/- 1000 kHz.



Date: 18.MAR.2025 11:33:36

Spectrum analyser plot showing the carrier and modulation peaks within +/- 500 kHz



Measurements were made at the test site therefore several ambient emissions can be observed in the supplied plots.

These emissions were investigated and confirmed to be ambient emissions.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (100 kHz – 30 MHz) $\pm$ 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 +/- 1356 Hz.

Temperature (°C)	Frequency (MHz)	Difference (Hz)
50.0	13.560 015	+15
40.0	13.559 992	-8
30.0	13.559 991	-9
20.0	13.560 001	+1
10.0	13.560 005	+5
0.0	13.560 510	+10
-10.0	13.560 499	-1
-20.0	13.560 054	+54

As a worst case scenario the 24 Vdc supply to the device was varied by +/- 15% at 20 degrees C (ambient).

Voltage (Vdc)	Frequency (MHz)	Difference (Hz)
20.4	13.560 001	+1
24.0	13.560 001	+1
27.6	13.560 001	+1

The frequency tolerance above has been calculated by subtracting the Measured Frequency from the Nominal Frequency (13.560 MHz).

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:
Frequency tolerance $\pm$ 50 Hz

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Period
Aerial Contoller	EMCO	1090	9112-1062	RFS 3710	N/A	N/A
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	N/A	N/A
Loop Antenna	EMCO	6502	9003-2485	3798	24 Jun 2025	3 years
Biconical Antenna	Schwarzbeck	BBA 9106	9124-420 + 04272023E	3802	02 May 2026	3 years
Heliac cable	Andrews	L6PNM-RPD	22869	Oats Cable	22 Oct 2025	1 year
Log Periodic	Schwarzbeck	VUSLP 9111	9111-113 + 04272023D	EMC4026	02 May 2026	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	20 Jun 2025	3 years
Mains Network	Rohde & Schwarz	ESH2-Z5	881362/034	3805	11 Mar 2025	2 years
Receiver	R & S	ESIB-40	100295	EMC4030	30 May 2026	2 years
Receiver	ESHS 10	828404/005	3728	03 Dec 2026	04 Dec 2024	2 years
Spectrum Analyzer	Keysight	N9038A	MY57290153	EMC4033	21 Nov 2024	1 year
Software	R & S	ESK 1 - 140	-	-	N/A	N/A
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	N/A	N/A
VHF Balun	Schwarzbeck	VHBB9124	9124-420 + 04272023E	3801	02 May 2026	3 years
Thermal chamber	Contherm	M180F	86025	N/A	N/A	N/A
Thermometer	DSIR	RT200	35	EMC4029	9 April 2028	5 years
Voltage Variac	Powertek	SRV-5	RFS3800	-	-	N/A

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.

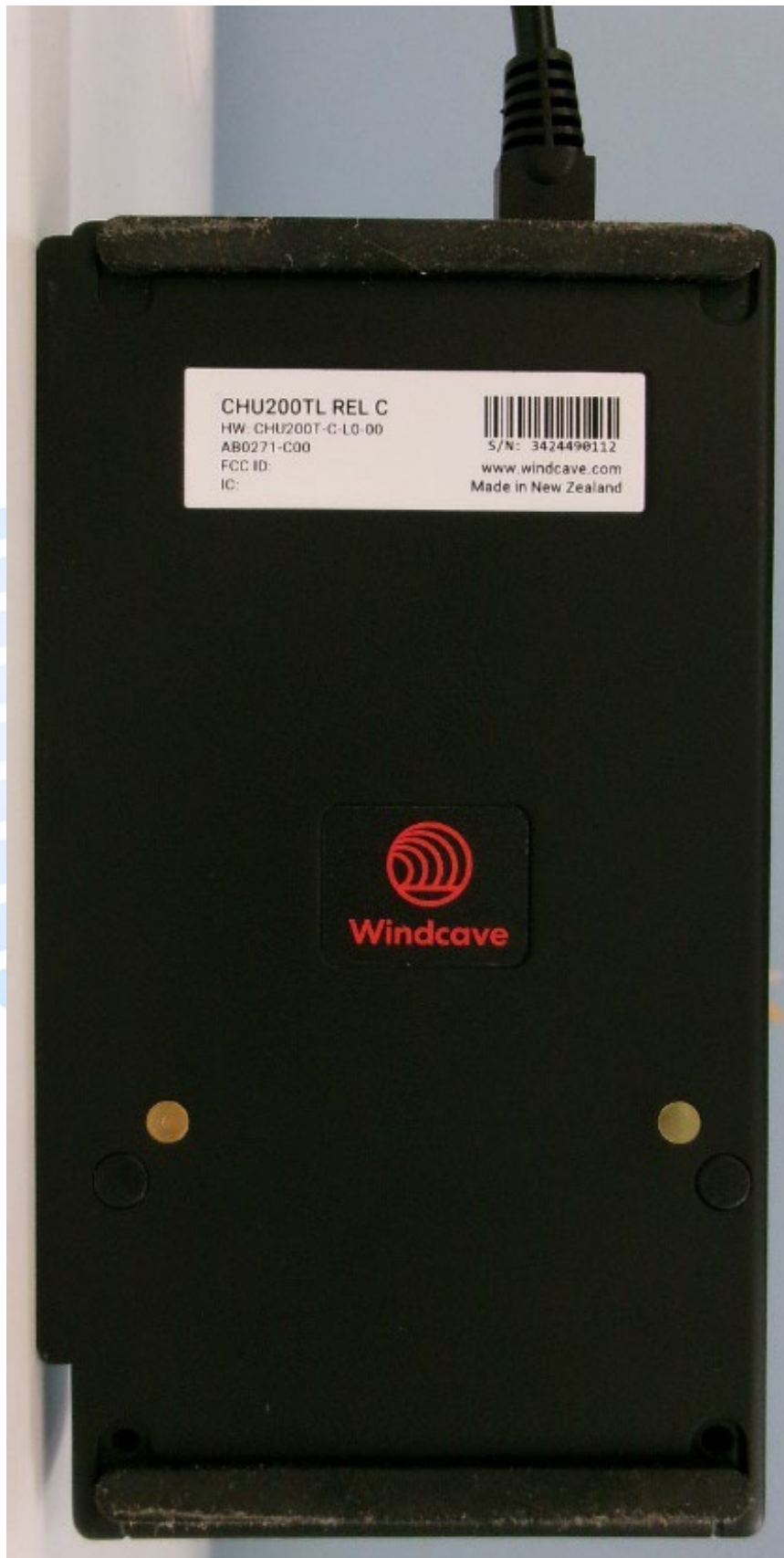
This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden).

Further details can be supplied on request

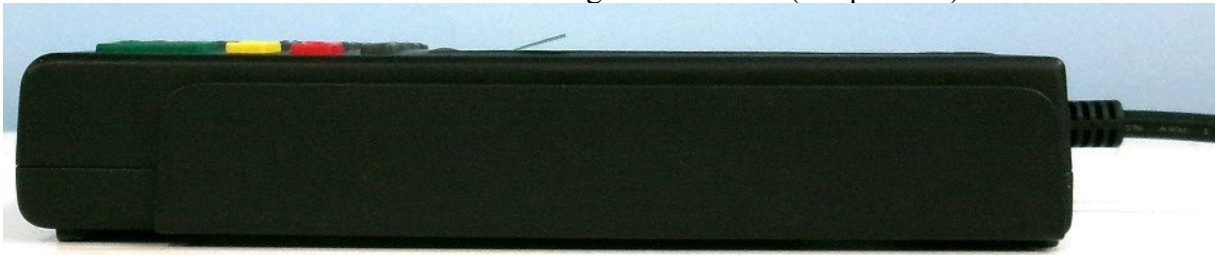
9. PHOTOGRAPHS

CHU200TL Release C Top & Bottom Orientation

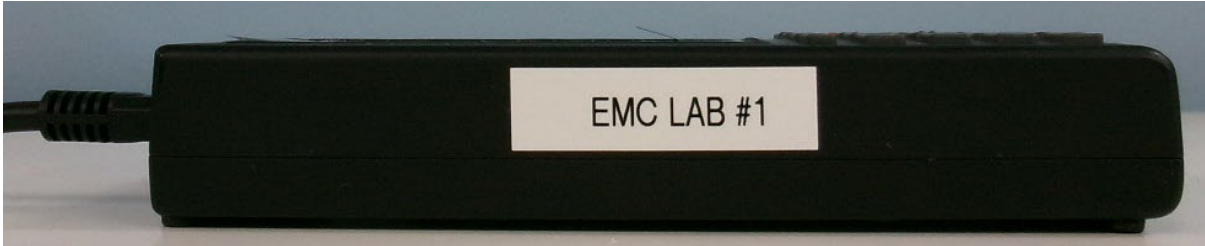




CHU200TL Release C Right Orientation (Swipe Card)



CHU200TL Release C Left Orientation



CHU200TL Release C Front Orientation (Card Slot)



CHU200TL Release C Rear Orientation



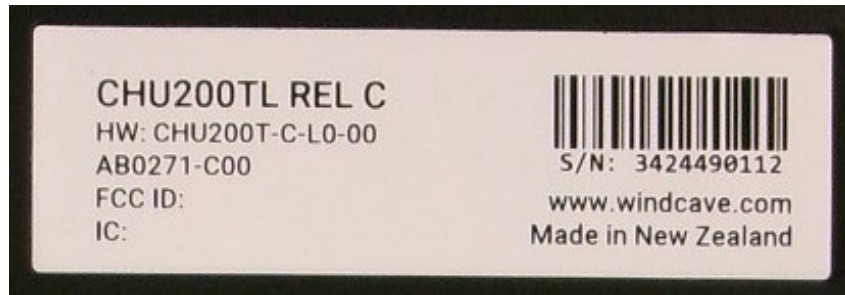
CHU200TL Release C with Test Cards



CHU200TL Release C Power Adaptor



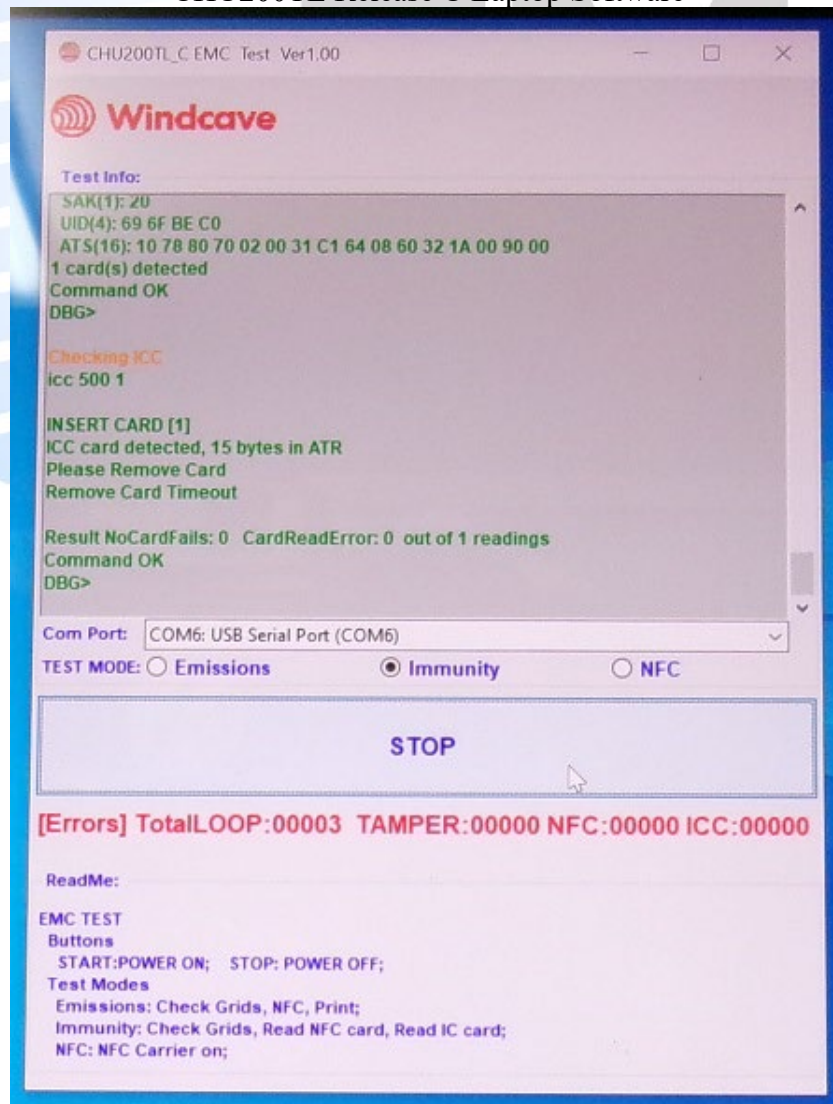
CHU200TL Release C Unit #1 Label



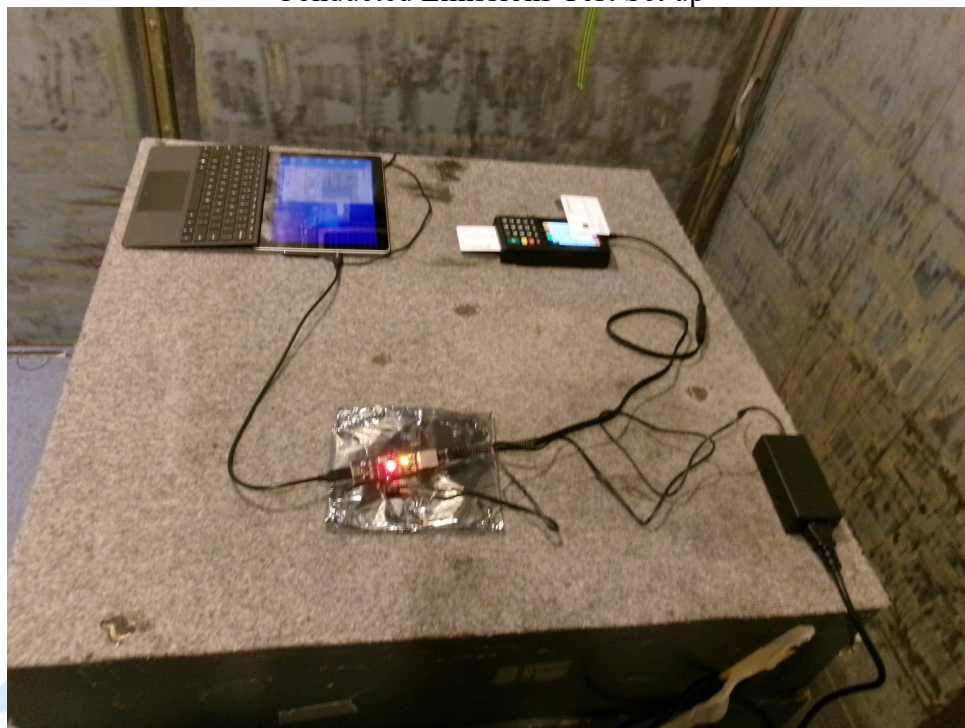
CHU200TL Release C Unit #2 Label



CHU200TL Release C Laptop Software



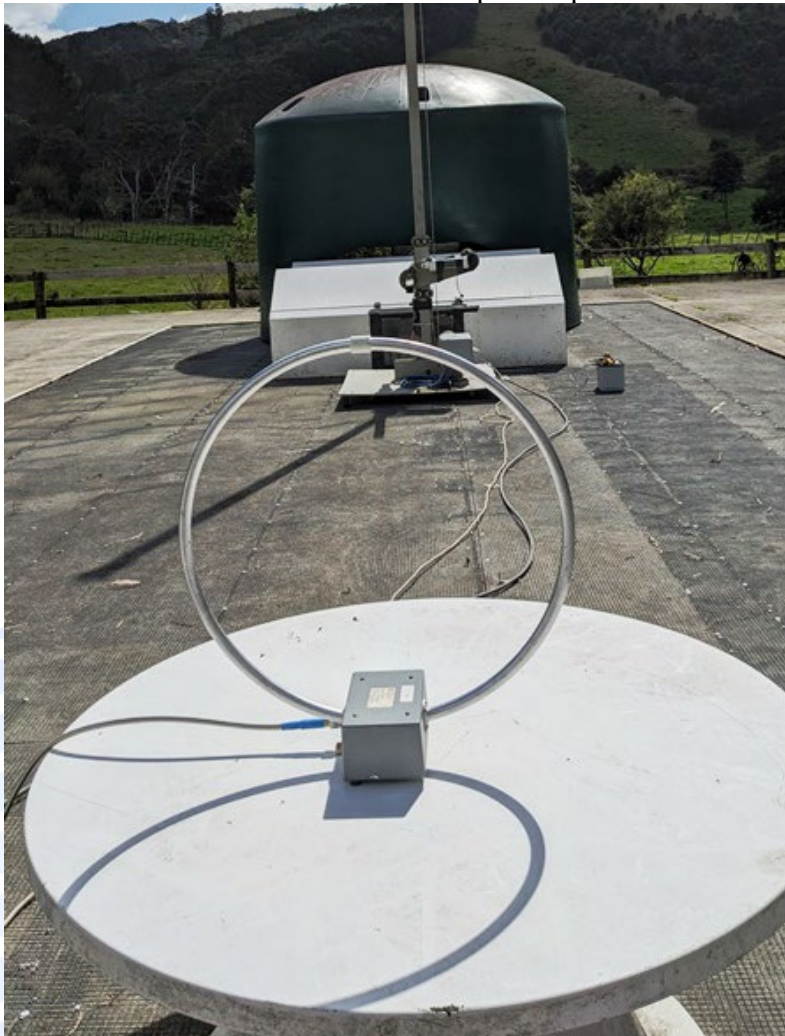
Conducted Emissions Test Set up



Radiated Emissions Test Setup



Radiated Emissions Test Setup - Loop Antenna



Radiated Emissions Test Setup - Biconical Antenna



Radiated Emissions Test Setup - Log Periodic Antenna



Radiated Emissions Test Setup - Horn Antenna

