



Engineering summary report

REP0026405SRFEMC

Date of issue: February 24, 2023

Applicant:

Pro V & V

Product:

FreedomVote Tablet

Model:

FVT-B 2003-10520 REV A

Lab and test locations

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Tested by	Rodel Resolme, EMC Test Engineer

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

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Section 1 Equipment under test (EUT) details

1.1 Applicant

Company name	Pro V & V
Address	6705 Odyssey Drive, Suite C
City	Huntsville
State	AL
Postal/Zip code	35806
Country	United States

1.2 EUT information

Product name	FreedomVote Tablet
Model	FVT-B 2003-10520 REV A
Variants	N/A
Serial number	UVS217250
Part number	N/A
Power requirements	120 VAC, 60Hz
Description/theory of operation	Continuous Print Diagnostic Mode
Operational frequencies	Not provided
Software details	FVT_2.2.3-25

1.3 EUT setup details

Table 1.3-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number	Rev.
13.3 in Touchscreen Tablet	Android Tablet	ENVUW	N/A	
82.5mm Thermal Printer	Star	TSP743IIU-24	N/A	
Barcode Reader	Newland	FM420/FM430	N/A	
USB Hub	D-Link	DUB-H4	N/A	
Battery	RRC Power Solutions	RRC2040-2	N/A	

Table 1.3-2: EUT interface ports

Description	Qty.
Headphones (3.5mm stereo jack)	1
Binary Input Jack Note: This jack connects to optional Binary Input Devices using a 3.5mm stereo	1

Table 1.3-3: Support equipment

Description	Brand name	Model/Part number	Serial number	Rev.
N/A				

Table 1.3-4: Inter-connection cables

Cable description	From	To	Length (m)
Keypad	USB Hub inside FVT	Keypad	< 2m

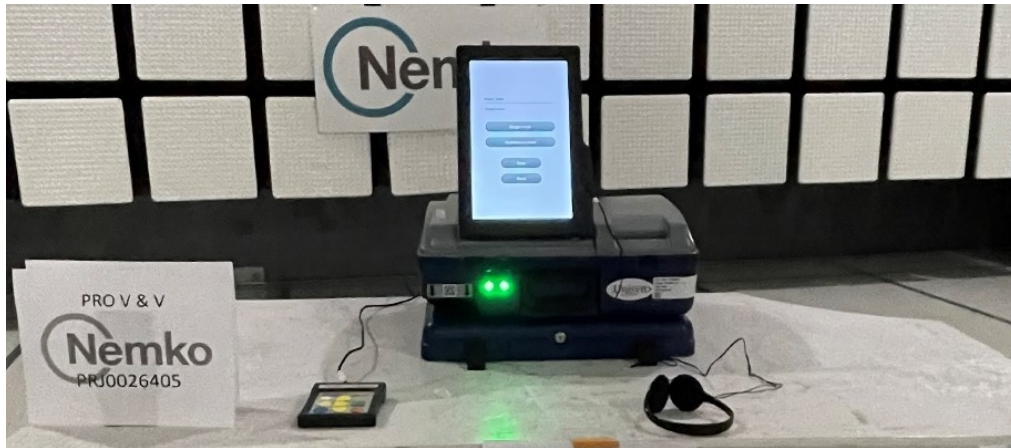


Figure 1.3-1: Test setup diagram

Section 2 Emissions testing data

2.1 Radiated emissions

2.1.1 Test summary

Verdict	Pass
Test date	January 10, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☐ 10m semi anechoic chamber ☒ 3m semi anechoic chamber ☐ Other:

2.1.2 Setup details

Port under test	Enclosure port
EUT power input during test	120Vac 60Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:
Measuring distance	☐ 10m ☒ 3m ☐ Other:

Note: unit #212 tested

2.1.3 Test data

Full Spectrum

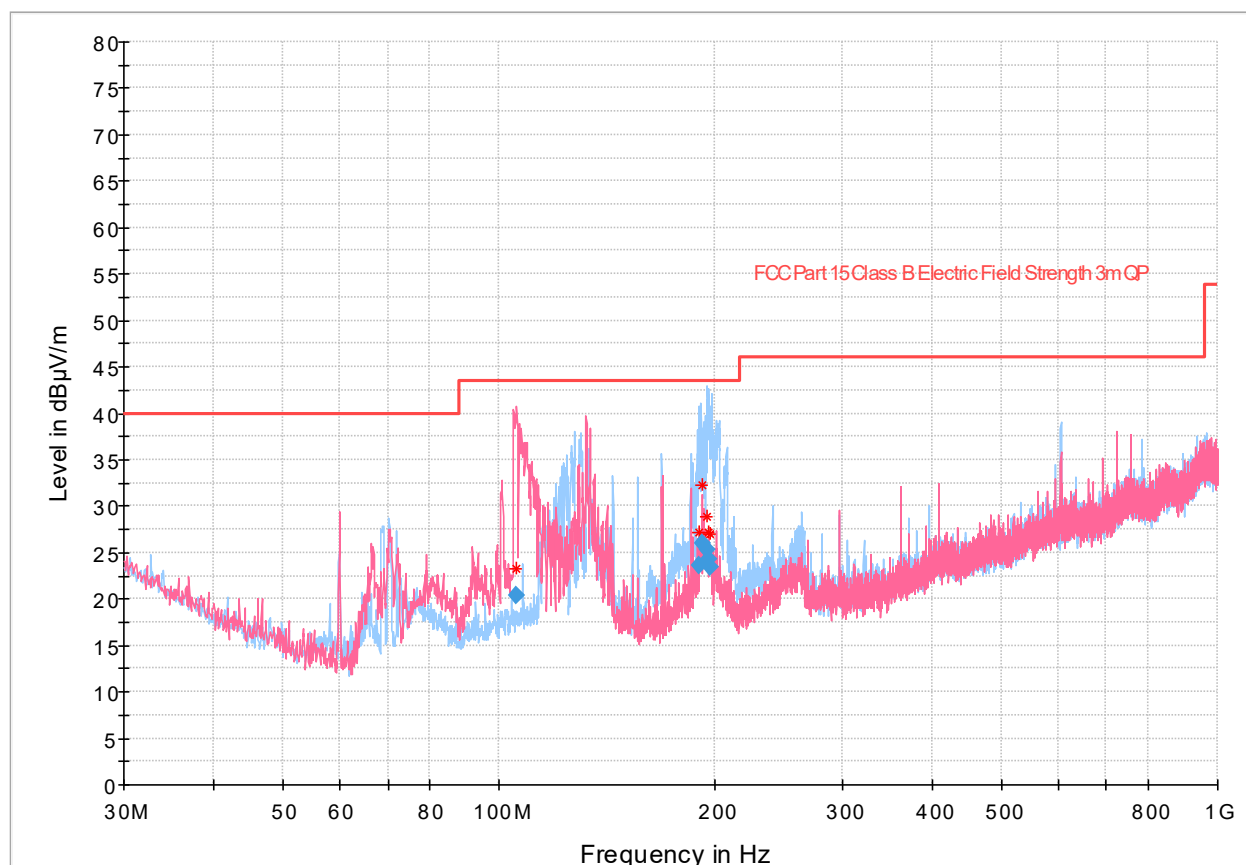


Figure 2.1-1: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 2.1-1: Radiated emissions results

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
105.657000	20.40	43.50	23.10	5000.0	120.000	98.0	V	139.0	17.8
189.876000	23.60	43.50	19.90	5000.0	120.000	141.0	H	253.0	16.0
191.777000	25.94	43.50	17.56	5000.0	120.000	136.0	H	79.0	16.0
194.377000	25.27	43.50	18.23	5000.0	120.000	168.0	H	43.0	16.0
195.633000	24.27	43.50	19.23	5000.0	120.000	142.0	H	139.0	16.1
196.665000	23.50	43.50	20.00	5000.0	120.000	191.0	H	43.0	16.1

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

2.1.4 Setup photos



Figure 2.1-2: Radiated emissions setup photo below 1 GHz

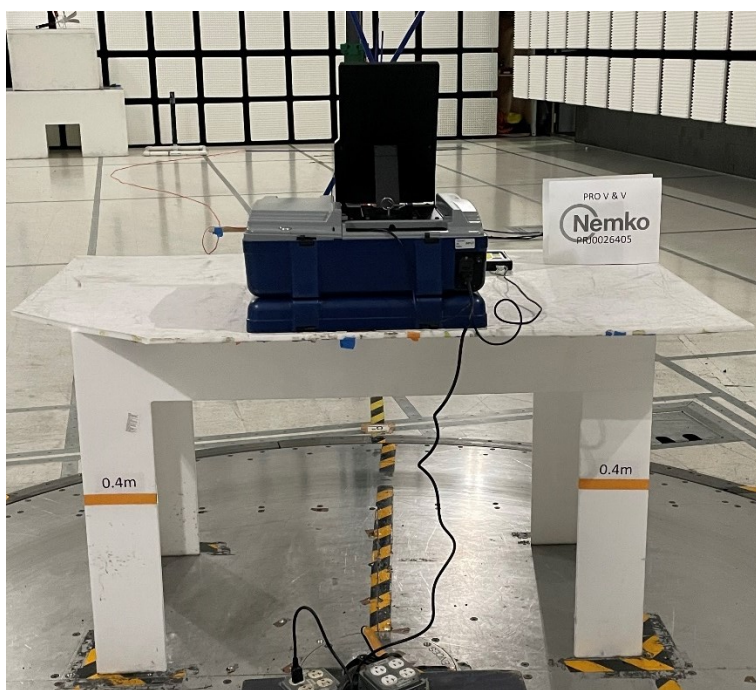


Figure 2.1-3: Radiated emissions setup photo below 1 GHz

2.2 Conducted emissions from AC mains ports

2.2.1 Test summary

Verdict	Pass
Test date	January 10, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ Ground plane ☒ Other:

2.2.2 Setup details

Port under test – Coupling device	AC mains – Artificial Mains Network (AMN)
EUT power input during test	120Vac 60Hz
EUT setup configuration	☒ Table-top ☐ Floor standing ☐ Other:

Note: unit #212 tested

2.2.3 Test data

Full Spectrum

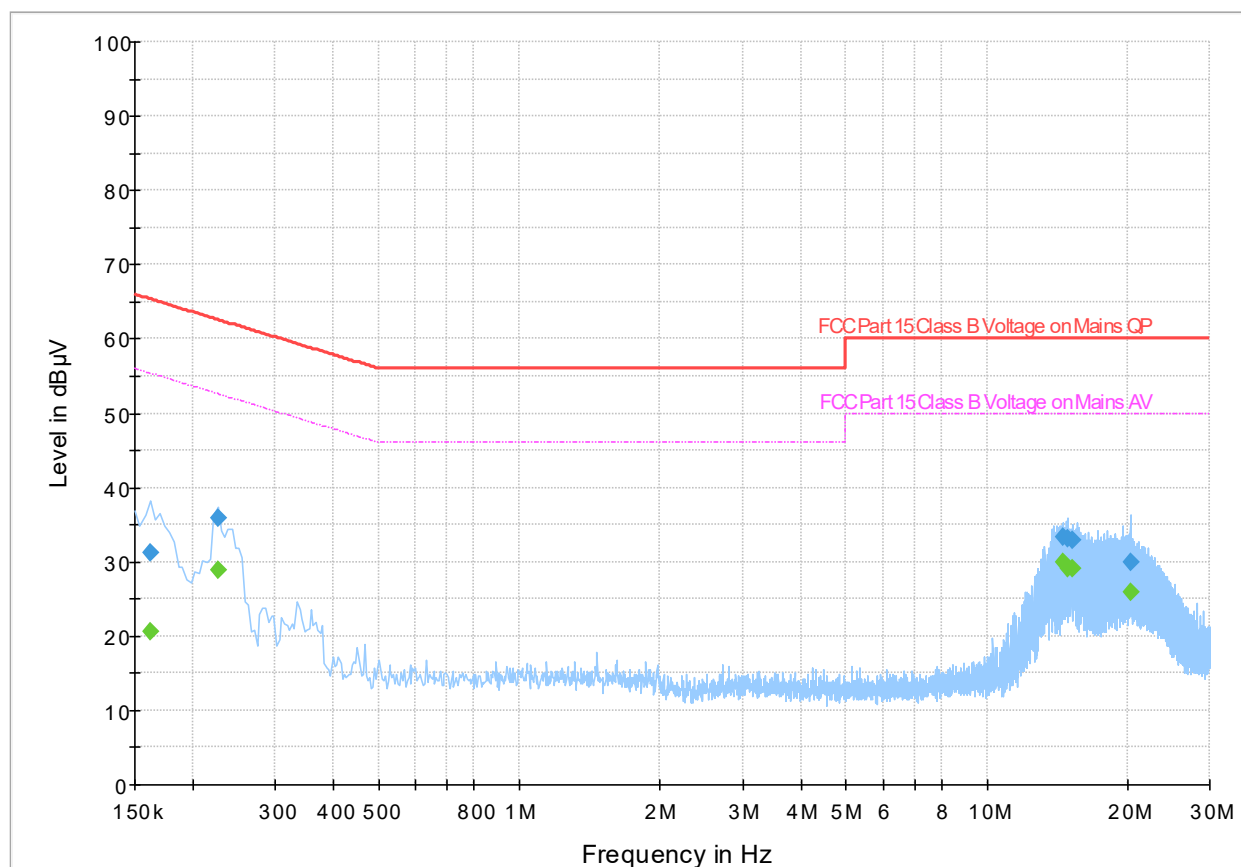


Figure 2.2-1: Conducted emissions at mains port spectral plot (150 kHz - 30 MHz)

Table 2.2-1: Conducted emissions at mains port results

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
-----------------	------------------	-----------------	--------------	-------------	-----------------	-----------------	------	--------	------------

0.162000	---	20.64	55.36	34.72	5000.0	9.000	N	ON	19.7
0.162000	31.23	---	65.36	34.13	5000.0	9.000	N	ON	19.7
0.226000	---	28.85	52.60	23.75	5000.0	9.000	N	ON	19.6
0.226000	35.86	---	62.60	26.74	5000.0	9.000	N	ON	19.6
14.590000	---	30.01	50.00	19.99	5000.0	9.000	L1	ON	20.3
14.590000	33.38	---	60.00	26.62	5000.0	9.000	L1	ON	20.3
14.934000	33.12	---	60.00	26.88	5000.0	9.000	L1	ON	20.3
14.934000	---	29.11	50.00	20.89	5000.0	9.000	L1	ON	20.3
15.286000	32.80	---	60.00	27.20	5000.0	9.000	L1	ON	20.3
15.286000	---	29.11	50.00	20.89	5000.0	9.000	L1	ON	20.3
20.270000	---	25.81	50.00	24.19	5000.0	9.000	N	ON	20.3
20.270000	29.95	---	60.00	30.05	5000.0	9.000	N	ON	20.3

Notes:

¹ Result (dBμV) = receiver analyzer value (dBμV) + correction factor (dB).

² Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

2.2.4 Setup photos

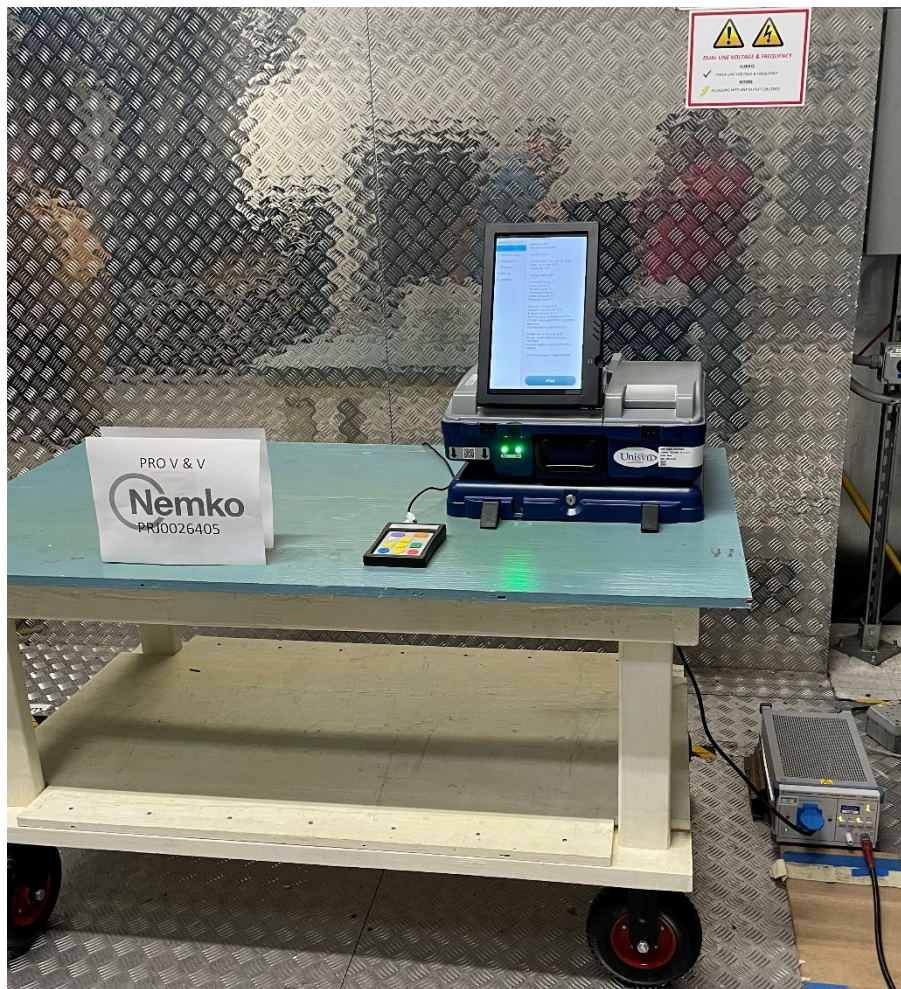


Figure 2.2-2: Conducted emissions from AC mains power ports setup photo

Section 3 Immunity testing data

3.1 Electrostatic discharge

3.1.1 Test summary

Verdict	Pass
Test date	February 22, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ ESD room ☐ Other:

3.1.2 Test data

Table 3.1-1: Electrostatic discharge results

EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz
ESD repetition rate:	1 pulse per second
Discharges:	10 contact discharges and 10 air discharges at each polarity

Contact discharge	Test voltage ($\pm$ kV)	Comments
Please refer to "ESD test location points" photos of this section	8	No degradation
Indirect discharge	Test voltage ($\pm$ kV)	Comments
HCP (all sides)	8	No degradation
VCP (all sides)	8	No degradation
Air discharge	Test voltage ($\pm$ kV)	Comments
Please refer to "ESD test location points" photos of this section	2, 4, 8, 15	No degradation

Notes: Unit #250 tested

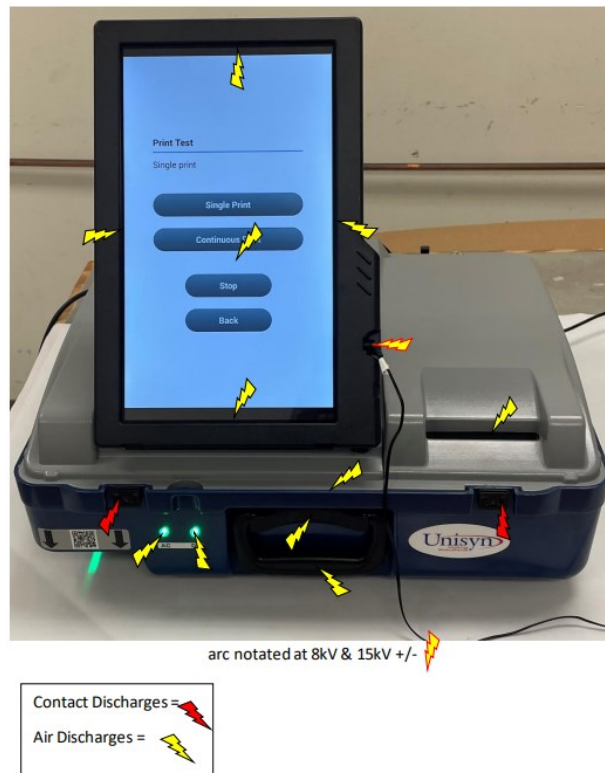


Figure 3.1-1: Electrostatic discharge test points

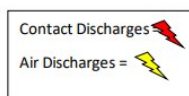
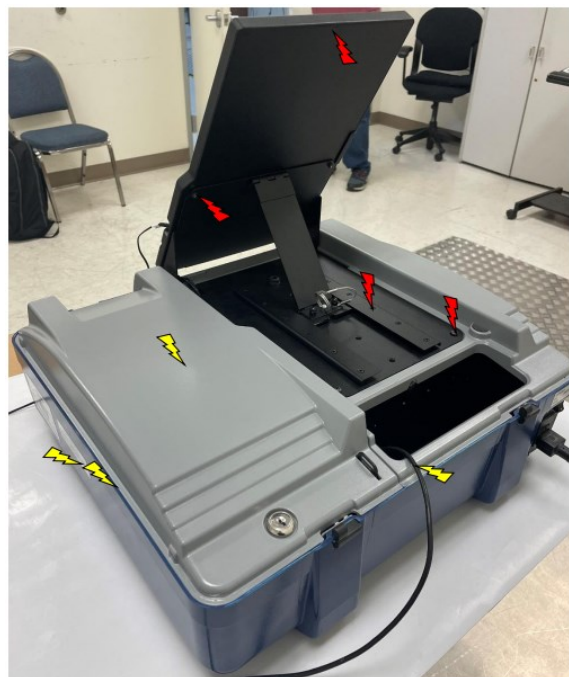


Figure 3.1-2: Electrostatic discharge test points



arc notated at 8kV & 15kV +/-

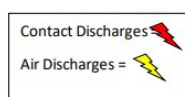


Figure 3.1-3: Electrostatic discharge test points



Figure 3.1-4: Electrostatic discharge test points

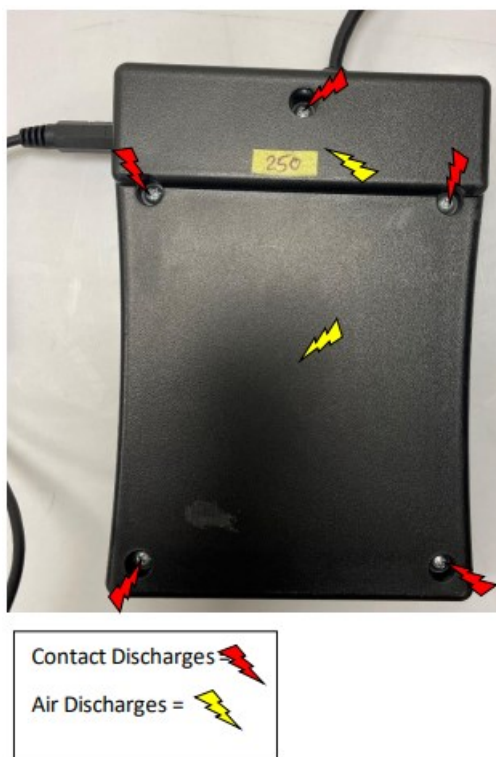


Figure 3.1-5: Electrostatic discharge test points



Figure 3.1-6: Electrostatic discharge test points

3.1.3 Setup photos



Figure 3.1-7: Electrostatic discharge setup

3.2 Continuous RF electromagnetic field disturbances

3.2.1 Test summary

Verdict	Pass
Test date	January 11, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ RFI room ☐ Other:

3.2.2 Test data

Table 3.2-1: Swept frequency – Continuous RF Electromagnetic Field Disturbances results

Step size increment	1 %
Dwell time ¹	3 s
Antenna polarization	Vertical and Horizontal
Modulation	Continuous wave signal amplitude modulated with 80 % depth with a 1 kHz sine wave
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz
EUT position facing antenna	Front side, back side, left side, and right side

Frequency range (MHz)	Test level (V/m)	Comments
80MHz to 1000MHz	10	No degradation

Notes: ¹The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.

² Unit #211 tested

3.2.3 Setup photos

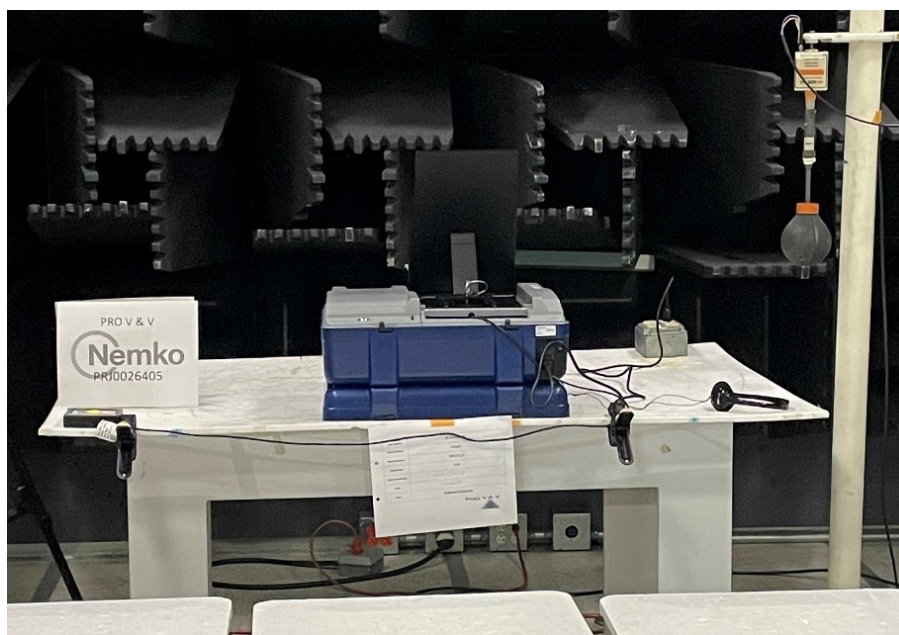


Figure 3.2-1: Continuous RF electromagnetic field disturbance setup

3.3 Electrical fast transients / burst

3.3.1 Test summary

Verdict	Pass
Test date	January 11, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ Ground plane ☐ Other:

3.3.2 Test data

Table 3.3-1: Electrical fast transients / burst results

Wave shape	$T_r/T_h = 5 / 50$ ns (T_r = rise time, T_h = duration)
Repetition frequency:	100 kHz
Burst duration	15 ms
Burst period	300 ms
Test duration	60 s
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:

EUT power input during test

Test port	Test voltage ($\pm$ kV)	Comments
AC mains power ^{1 and 2}	2	No degradation

Notes: ¹ Transient applied asynchronously (with relation to power supply)
² The test voltage is applied simultaneously between a ground reference plane and all of the power supply terminals and the protective or functional earth port on the EUT cabinet
³ The test voltage is applied via capacitive coupling clamp
⁴ Unit #212 tested

3.3.3 Setup photos



Figure 3.3-1: Electrical fast transients / burst setup (AC mains)

3.4 Surges

3.4.1 Test summary

Verdict	Pass
Test date	January 11, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ Ground plane ☐ Other:

3.4.2 Test data

Table 3.4-1: Surges results- AC mains power ports

Open circuit voltage (T ₁ / T ₂)	1.2 / 50 μ s (T ₁ = front time, T ₂ = time to half value)
Short circuit current (T ₁ / T ₂)	8 / 20 μ s (T ₁ = front time, T ₂ = time to half value)
Surge pulse interval	60 s
Number of pulses	5 positive and 5 negative
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz

Test port	Coupling	Test voltage ($\pm$ kV)	Comments
AC mains power	Phase to neutral	2	No degradation
	Phase to ground	2	No degradation
	Neutral to ground	2	No degradation

Notes: Unit #212 tested

3.4.3 Setup photos



Figure 3.4-1: Surge setup

3.5 Continuous induced RF disturbances

3.5.1 Test summary

Verdict	Pass
Test date	January 12, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ Ground plane ☐ Other:

3.5.2 Test data

Table 3.5-1: Continuous induced RF disturbances results

Frequency range ^{4 and 5}	150kHz to 80MHz
Signal level	10Vrms
Step size increment	1 %
Dwell time ¹	1 s
Modulation	Continuous wave signal amplitude modulated with 80 % depth with a 1 kHz sine wave
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz

Ports investigated	Coupling method	50 Ω termination point	Comments
AC Mains	CDN	CDN	No degradation

Notes: ¹The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.

² The test level decreases linearly with the logarithm of the frequency in the range 10 MHz to 30 MHz

³. Unit #212 tested

3.5.3 Setup photos



Figure 3.5-1: Continuous RF electromagnetic field disturbance setup

3.6 Power frequency magnetic field

3.6.1 Test summary

Verdict	Pass
Test date	January 18, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ Ground plane ☐ Other:

3.6.2 Test data

Table 3.6-1: Power frequency magnetic field results

Assessment time	5 minutes at each loop polarization
Signal frequency	50 Hz
Magnetic field test level	30A/m
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60H

Loop polarization	Comments
Vertical (aligned with AC power line)	No degradation
Vertical (perpendicular to AC power line)	No degradation
Horizontal	No degradation

Notes: The EUT was arranged and connected to satisfy its functional requirement and was placed at the center of the coil system (immersion method). For physically large products that cannot be completely submerged in the magnetic field; only the sensitive devices (such as CRT monitors if they are the only sensitive parts) are tested.

Unit #212 tested.

3.6.3 Setup photos



Figure 3.6-1: Power frequency magnetic field setup

3.7 Voltage dips and voltage interruptions

3.7.1 Test summary

Verdict	Pass
Test date	January 13, 2023
Test engineer	Rodel Resolme, EMC Test Engineer
Test location	☒ Ground plane ☐ Other:

3.7.2 Test data

Table 3.7-1: Voltage dips results

Variation / dip repetition	Sequence of three dips / interruptions with an interval of 10 seconds between each test
Voltage change degree of the voltage waveform	0 and 180 / 90 and 270
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz

Test port	Residual voltage (%)	Cycles	Comments
AC mains power	70	0.6	No degradation
	40	6	No degradation
	40	1	No degradation

Notes: Unit #212 tested.

Table 3.7-2: Voltage interruptions results

Variation / dip repetition	Sequence of three dips / interruptions with an interval of 10 seconds between each test
Voltage change degree of the voltage waveform	0 and 180 / 90 and 270
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz

Test port	Residual voltage (%)	Cycles	Comments
AC mains power	0	300	No degradation

Notes: Unit #212 tested.

Table 3.7-3: Voltage interruptions (inc./red. Of Nom. Voltage) results

Variation / dip repetition	7.5% and reductions of 12.5% of nominal specified power for 3 hours each level
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:
EUT power input during test	120Vac 60Hz

Test port	Electric power increases of 7.5% & reductions of 12.5% of nom. voltage (%)	Time	Comments
AC mains power	129 & 105	3 hours each level	No degradation

Notes: Unit #212 tested.

Table 3.7-4: Voltage interruptions (Surge of +/- 15% line variation of nominal line voltage) results

Variation / dip repetition	Surge of +/- 15% of nominal line voltage	
EUT setup configuration:	☒ Table-top ☐ Floor standing ☐ Other:	
EUT power input during test	120Vac 60Hz	
Test port	Surge of +/- 15% line variation of nom. voltage (%)	Comments
AC mains power	138 & 102	No degradation

Notes: Unit #212 tested.

3.7.3 Setup photos



Figure 3.7-1: Voltage dips and voltage interruptions setup

End of test report