Element Materials Technology Denver-Longmont A.K.A. NTS Labs, LLC Test Report for Electromagnetic Interference (EMI) Testing of the Smartmatic PCOS

Prepared For
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Revision History

Rev.	Description	Issue Date
0	Initial Release	05/22/2025

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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Electromagnetic Interference (EMI) test program at Element Materials Technology Denver-Longmont (hereafter referred to as "Element"). The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements defined in the test specification.

2.0 References

The following references listed below form a part of this document to the extent specified herein.

- Test Specification: FCC Part 15. Class B
- Pro V&V, Inc Purchase Order 2025-002,2025-008 dated 02/18/2025,04/01/2025
- Element Quotation OP0670061 dated 02/17/2025
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories,* dated 11/2017

3.0 Product Selection and Description

Pro V&V, Inc selected and provided the following test sample(s) to be used as the Equipment Under Test.

Table 3.0-1: Product Identification – Equipment Under Test (EUT)

Item	Qty.	Name/Description	Part Number	Serial Number
1	1	Smartmatic PCOS	813	GESA481A01000163

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2017. Certification of calibration is on file subject to inspection by authorized personnel.

4.2 Measurement Uncertainties

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of CISPR and therefore no adjustment of the data for measurement uncertainty is required.

Table 4.2-1: Measurement Uncertainties (Emissions)

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Conducted Emissions	dBuA	150kHz to 30MHz	.+/- 3.75 dB
Radiated Emissions	dBuV/m	30MHz to 1GHz	.+/- 6.32 dB
		1GHz to 6GHz	.+/- 9.59 dB
		6GHz to 18GHz	.+/- 7.58 dB
		18GHz to 40GHz	.+/- 6.08 dB

5.0 Test Description and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	Radiated Emissions	FCC Part 15. Class B	Longmont	03/24/2025	813	GESA481A01000163	Passed
5.2	Conducted Emissions	FCC Part 15. Class B	Longmont	03/24/2025	813	GESA481A01000163	Passed

The decision rule for Test Results was based on the Test Specification used for testing.

5.1 Radiated Emissions

5.1.1 Test Procedure

The EUT was tested in accordance with FCC Part 15. Class B.

5.1.2 Test Result

The EUT passed the defined requirements.

5.1.3 Test Datasheets

Element Materials Technology

Radiated Emissions, FCC Part 15, Class B

Standard Referenced:	FCC Part 15, Class B	Date:	3/24/2025
Temperature:	24˚C	Humidity: 14%	Pressure: 833 mb
Input Voltage:	120Vac, 60Hz	Pretest & Linearity Check:	Pass
Configuration of Unit:	Scanning Ballots	Sweep Time Check:	Yes
Test Engineer / Technician:	Mike Tidquist		

Date	Time	Log Entries	Initials	Result
3/24/25	0730-0800	Pretest verification completed	MT	Complete
	1030-1200	Radiated Emissions, 30 MHz – 1 GHz. FCC Part 15. Class B. 120 VAC / 60 Hz (4.1.2.9)	MT	Pass

Element Materials Technology			
Radiated Emissions, FCC Part 15, Class B			
Standard Referenced:	FCC Part 15, Class B	Date:	3/24/2025
Temperature:	24˚C Humidity: 14%	Pressure:	833 mb
Input Voltage:	120Vac, 60Hz	Pretest & Linearity Check:	Pass
Configuration of Unit:	Scanning Ballots	Sweep Time Check:	Yes
Test Engineer / Technician:	Mike Tidquist		

"Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:

PK = Peak Measurement: RBW is 120kHz, VBW is 3 MHz
QP = Quasi-Peak Measurement: RBW is 120kHz, VBW is 3 MHz, and QP Detection is ENABLED
AV = Video Average Measurement: RBW is 1 MHz, VBW is 10 Hz

The "field strength" (FS) emissions level is attained by adding the received amplitude measured (RA), Antenna factor (AF), and cable factor (CF) minus the amplifier gain (AG). FS = RA + AF + CF – AG .Final measurements are made with the Azimuth, Polarity, Height, and EUT Cables positioned for maximum radiation. If applicable, cables positions are noted in the test log. (Sample Calculation: 49.6 dBuV + 11.4 dB/m – 28.8 dB (CF/AG) = 32.2 dBuV/m. Important Note: This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)

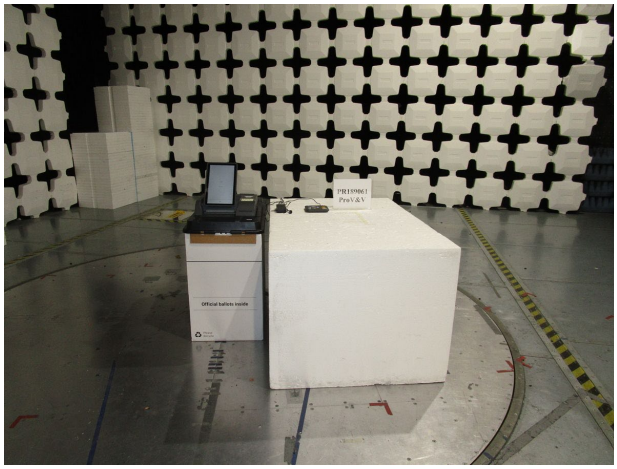
The "Azm/Pol/Hgt" indicates the turn-table azimuth, the antenna polarity, and the antenna height where the maximum emissions level was measured.

The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.

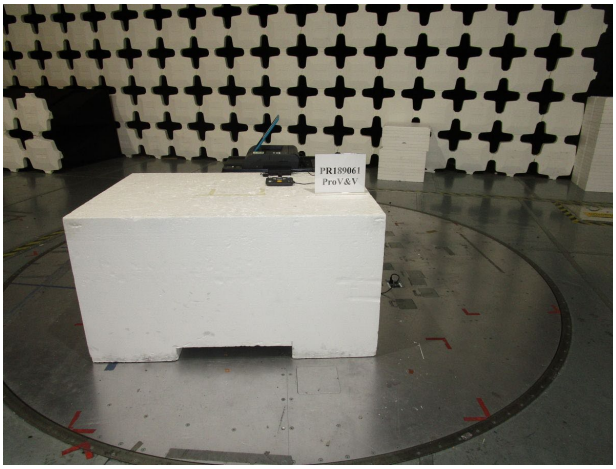
The PRESCAN is a peak measurement and is performed with the RBW set to 120 kHz, VBW set to 3 MHz (30 MHz to 1 GHz), and the RBW set to 1 MHz, VBW set to 3MHz (> 1 GHz)

The Antenna setup for >1GHz should match the setup that was used to meet SVSWR requirements. Refer to the SVSWR report storred in the calibration records for the chamber being used.

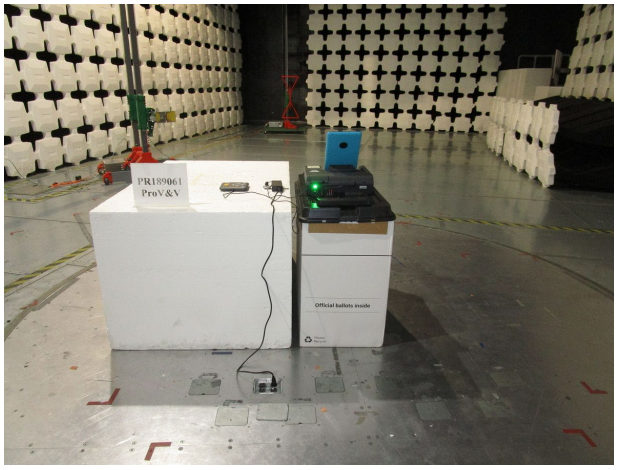
5.1.4 Test Photographs



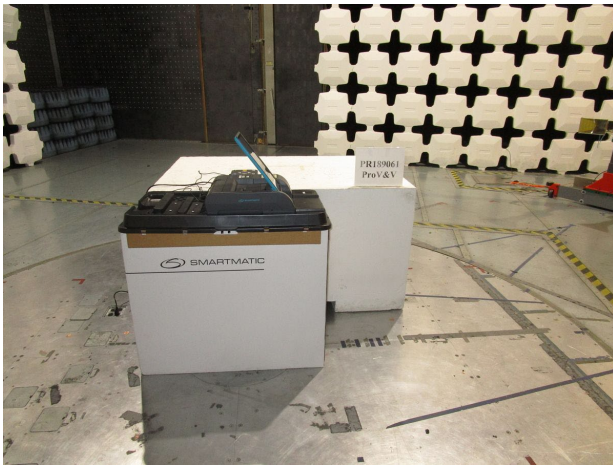
Radiated Emissions 30MHz - 1GHz Front



Radiated Emissions 30MHz - 1GHz Right

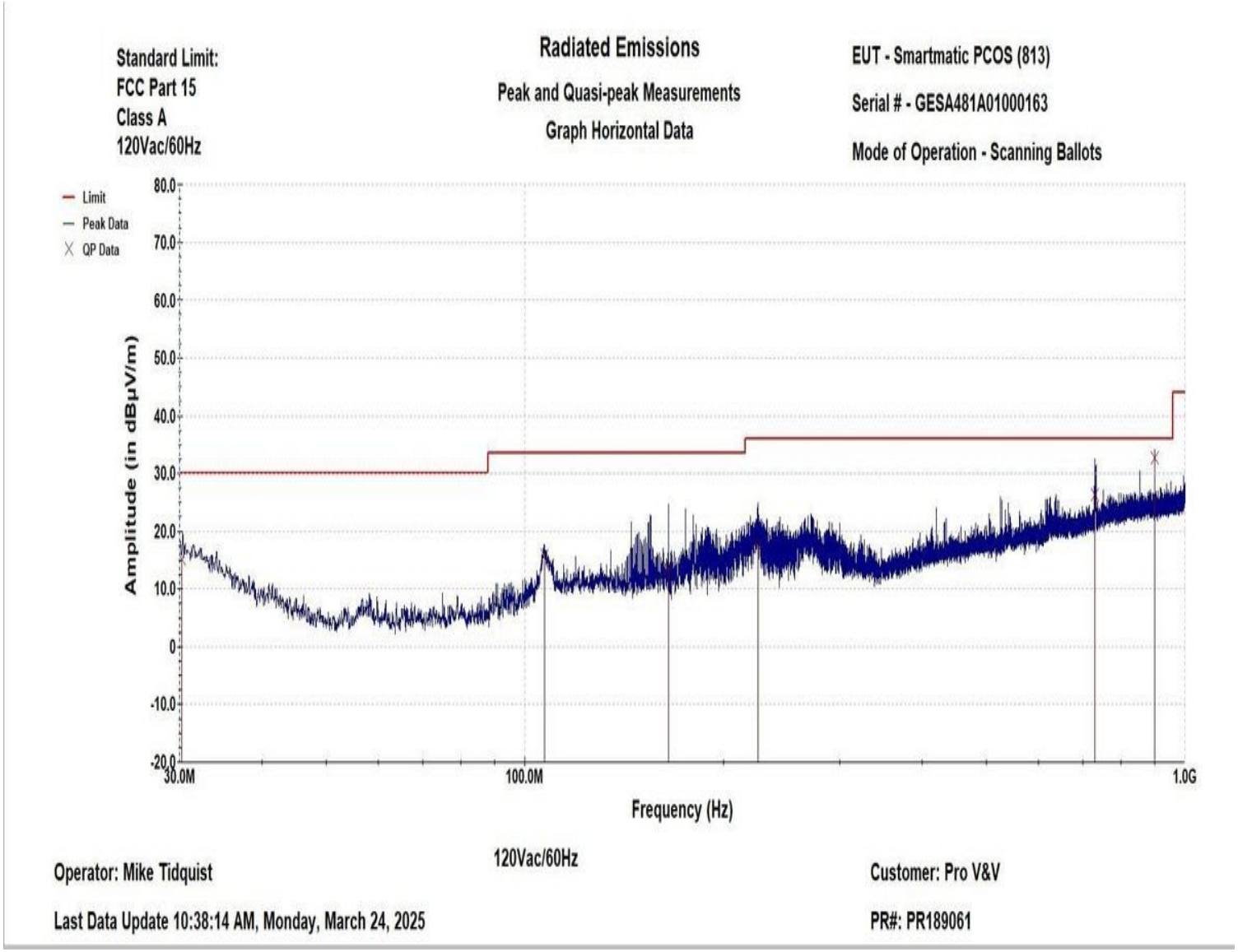


Radiated Emissions 30MHz - 1GHz Back



Radiated Emissions 30MHz - 1GHz Left

5.1.5 Test Data



PR189061 RE 30MHz - 1GHz Horizontal Data Graph

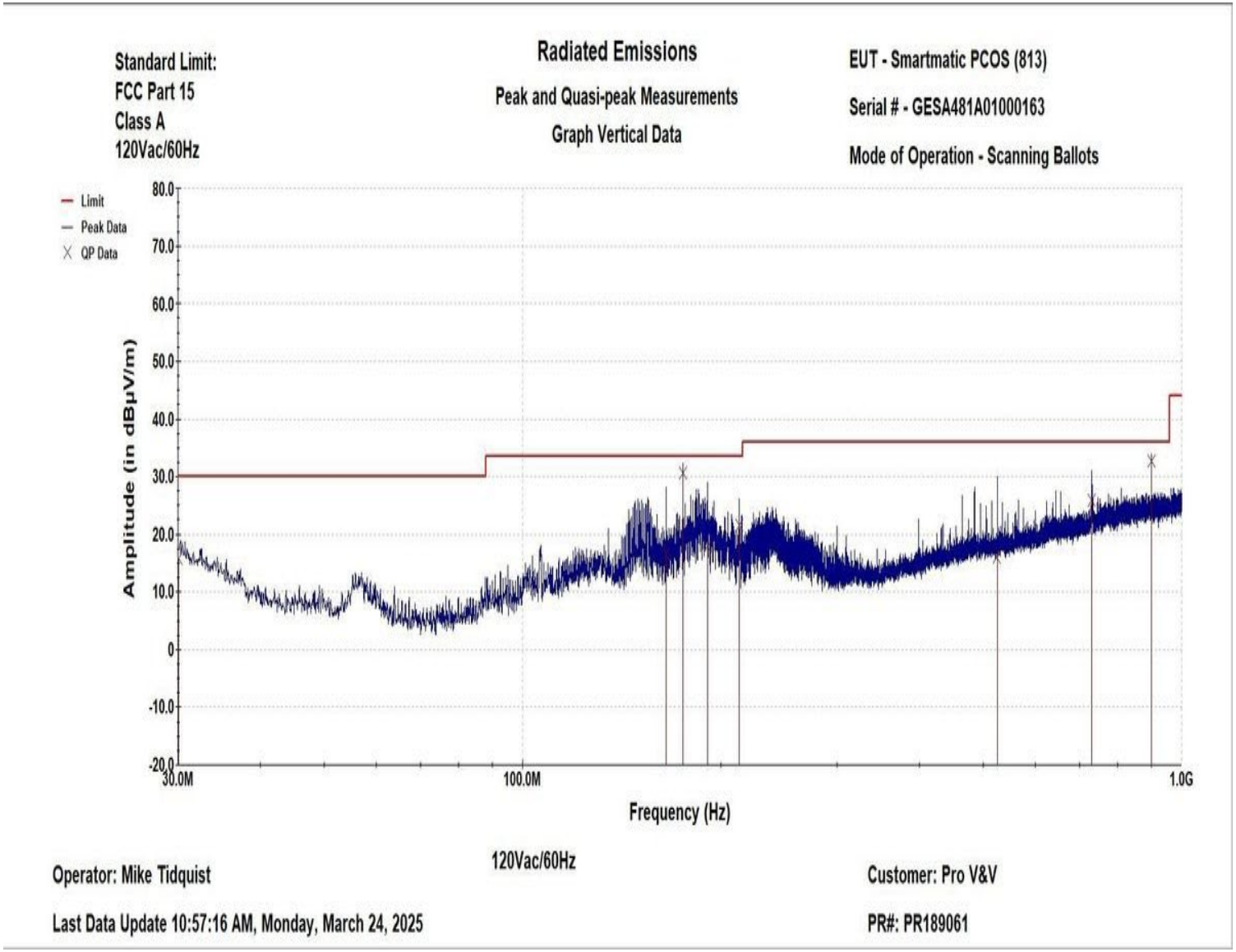
Radiated Emissions
Quasi-peak Measurements
Table: Horizontal Quasi-peaks below 1 GHz

Operator: Mike Tidquist

EUT: Smartmatic PCOS (813)
PR#: PR189061
Customer: Pro V&V

Frequency (MHz)	QP (in dBuV)	Delta QP to Limit (in dBuV)	Height (in cm)	Azimuth (in Degrees)
30.209 MHz	15.202	-14.798	387	216
107.091 MHz	15.848	-17.672	142	209
164.845 MHz	13.511	-20.009	326	303
225.431 MHz	17.454	-18.566	270	209
730.692 MHz	26.322	-9.698	297	0
900.080 MHz	32.626	-3.394	179	74
Standard Limit:				
FCC Part 15				
Class A				
120Vac/60Hz				

PR189061 RE 30MHz - 1GHz Horizontal Quasi Peak Data Table



PR189061 RE 30MHz - 1GHz Vertical Data Graph

Radiated Emissions
Quasi-peak Measurements
Table: Vertical Quasi-peaks below 1 GHz

Operator: Mike Tidquist

EUT: Smartmatic PCOS (813)
PR#: PR189061
Customer: Pro V&V

Frequency (MHz)	QP (in dBuV)	Delta QP to Limit (in dBuV)	Height (in cm)	Azimuth (in Degrees)
30.060 MHz	15.894	-14.106	110	187
165.085 MHz	16.535	-16.985	131	9
174.990 MHz	30.643	-2.877	148	317
190.685 MHz	17.832	-15.688	105	205
213.174 MHz	21.526	-11.994	140	190
524.753 MHz	16.070	-19.950	105	63
730.975 MHz	25.758	-10.262	274	256
900.080 MHz	32.630	-3.390	316	83
Standard Limit:				
FCC Part 15				
Class A				
120Vac/60Hz				

PR189061 RE 30MHz - 1GHz Vertical Quasi Peak Data Table

5.1.6 Test Equipment List

Table 5.1-1: Radiated Emissions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059431	Controller (System)	Sunol Sciences	SC110V	NCR	NCR
WC059439	Meter (Digital Multimeter)	Fluke	85	08/16/2024	08/16/2025
WC059452	Generator (Signal)	Com-Power	CGO - 505	08/27/2014	NCR
WC059739	Antenna (Biconilog)	Sunol Sciences	JB1	05/18/2021	05/11/2025
WC072198	Controller (Antenna)	Sunol Sciences	SC99V	NCR	NCR
WC076859	Receiver	Rohde & Schwarz	ESW44	01/24/2025	01/24/2026
WC076870	Cable (Test)	Pasternack Enterprises	RF Coaxial Cable (20 meters)	07/24/2024	07/24/2026
WC076923	Cable (Test)	Teledyne-taber	RF Coaxial Cable (2 meters)	07/09/2024	07/10/2026
WC076928	Cable (Test)	Teledyne-taber	RF Coaxial Cable (1 meter)	07/09/2024	07/09/2026
WC078465	Amplifier (Pre/RF/Low Noise)	Pasternack Enterprises	PE15A1013	10/05/2023	10/05/2025
WC078470	Software	ETS-Lindgren	C47213	NCR	NCR
WC078486	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025

Calibration Abbreviations
CAL: Calibration
NCR: No Calibration Required

5.2 Conducted Emissions

5.2.1 Test Procedure

The EUT was tested in accordance with FCC Part 15. Class B.

5.2.2 Test Result

The EUT passed the defined requirements.

5.2.3 Test Datasheets

Element Materials Technology

Conducted Emissions, FCC Part 15, Class B

Standard Referenced:	FCC Part 15, Class B	Date:	3/24/2025
Temperature:	24˚C Humidity: 14%	Pressure:	833 mb
Input Voltage:	120Vac/60Hz	LISN Bonding:	1.1 mΩ
Configuration of Unit:	Normal Operation	Sweep Time Check:	Yes
Test Engineer:	Mike Tidquist		

Date	Time	Log Entries	Initials	Result
3/24/25	0800-0900	Initial Product Setup Time Pretest verification and ambient scans	MT	Complete
	0900-1000	Conducted Emissions, 150 kHz – 30 MHz. FCC Part 15. Class B. 120 VAC / 60 Hz (4.1.2.9)	MT	Pass

Element Materials Technology			
Conducted Emissions, FCC Part 15, Class B			
Standard Referenced:	FCC Part 15, Class B	Date:	3/24/2025
Temperature:	24˚C Humidity: 14%	Pressure:	833 mb
Input Voltage:	120Vac/60Hz	LISN Bonding:	1.1 mΩ
Configuration of Unit:	Normal Operation	Sweep Time Check:	Yes
Test Engineer:	Mike Tidquist		

"Type" refers to the type of measurement performed. The type of measurement made is based on the requirements of the particular standard:

PK = Peak Measurement: RBW is 9 kHz, VBW is 3 MHz
QP = Quasi-Peak Measurement: RBW is 9 kHz, VBW is 3 MHz, and QP Detection is ENABLED
AV = Video Average Measurement: RBW is 9 kHz, VBW is 10 Hz

The "CE Level" is attained by adding the conducted amplitude measured (CA), Attenuation Cal factor (ACF), cable factor (CF) plus the LISN Cal Factor (LCF). CE Level = CA + ACF + CF + LCF . If applicable, cables positions are noted in the test log. (Sample Calculation: - 7.5 dBuV + 20.2 dB + 1.5 dB + 23.8 dB= 38 dBuV. **Important Note:** This is a sample calculation only for the purpose of demonstration, and does not reflect data in this report.)

The "TestPoint" indicates which AC or DC input power line or which I/O cable the measurement was made on.

The "Margin" is with reference to the emissions limit. A positive number indicates that the emission measurement is below the limit. A negative number indicates that the emission measurement exceeds the limit.

5.2.4 Test Photographs

Conducted Emissions Front1

Conducted Emissions Right

Conducted Emissions Back

Conducted Emissions Left

5.2.5 Test Data

Conducted Emissions
Average Data Table

Operator: Mike Tidquist
09:40:40 AM, Monday, March 24, 2025

EUT: Smartmatic PCOS
PR#: PR189061
Client: Pro V&V

Frequency (MHz)	Amplitude (in dBµV)	Average Limit (in dBµV)	Delta to Average Limit (in dB)
150.75 KHz	37.01	55.98	-18.97
218.22 KHz	22.57	54.05	-31.48
427.14 KHz	16.16	48.08	-31.93
522.52 KHz	14.25	46.00	-31.75
1.92 MHz	11.93	46.00	-34.07
23.97 MHz	33.23	50.00	-16.77
AC LINE 1			
120Vac/60Hz			

PR189061 Conducted Emissions Average Data Table Line 1

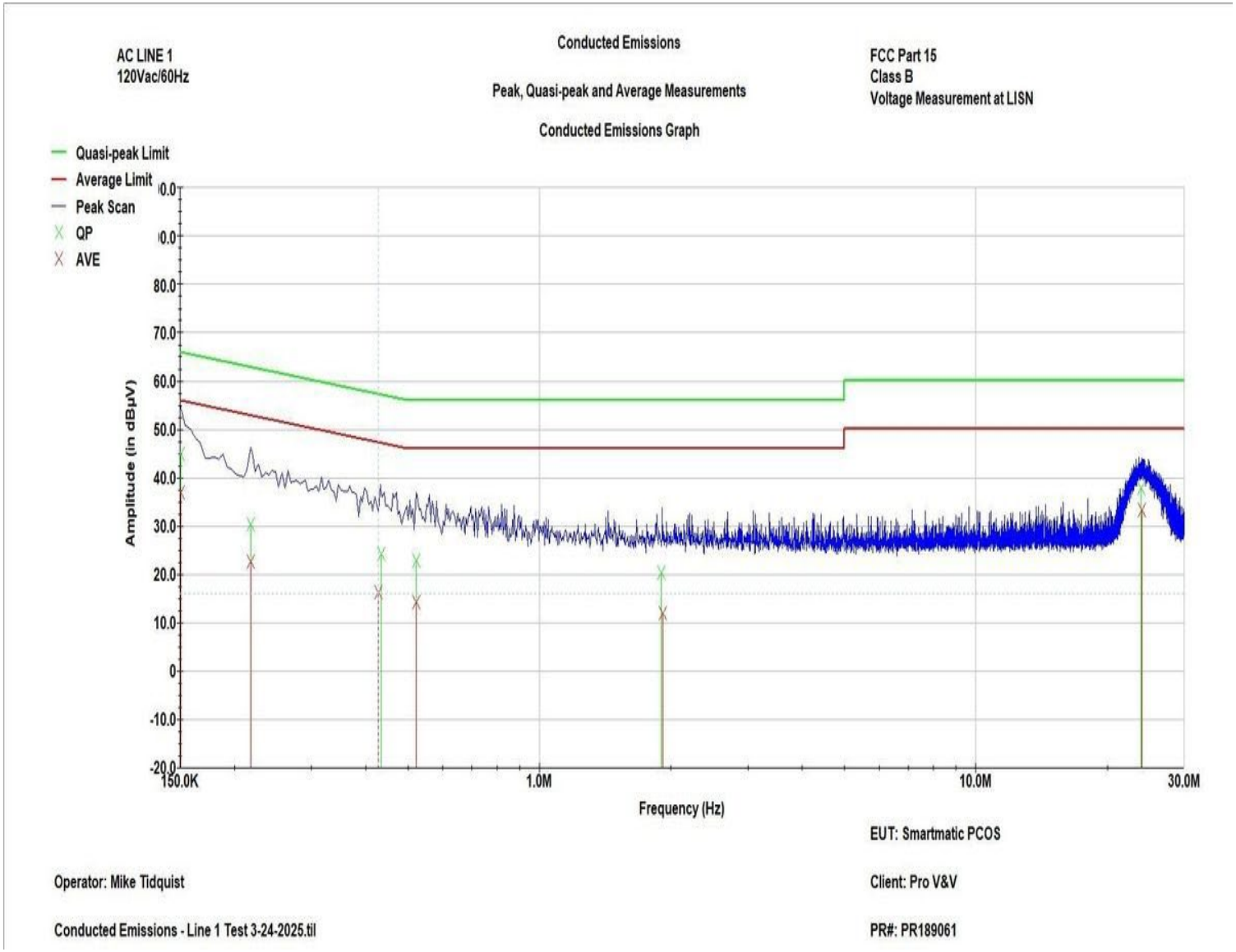
Conducted Emissions
Average Data Table

Operator: Mike Tidquist
09:53:33 AM, Monday, March 24, 2025

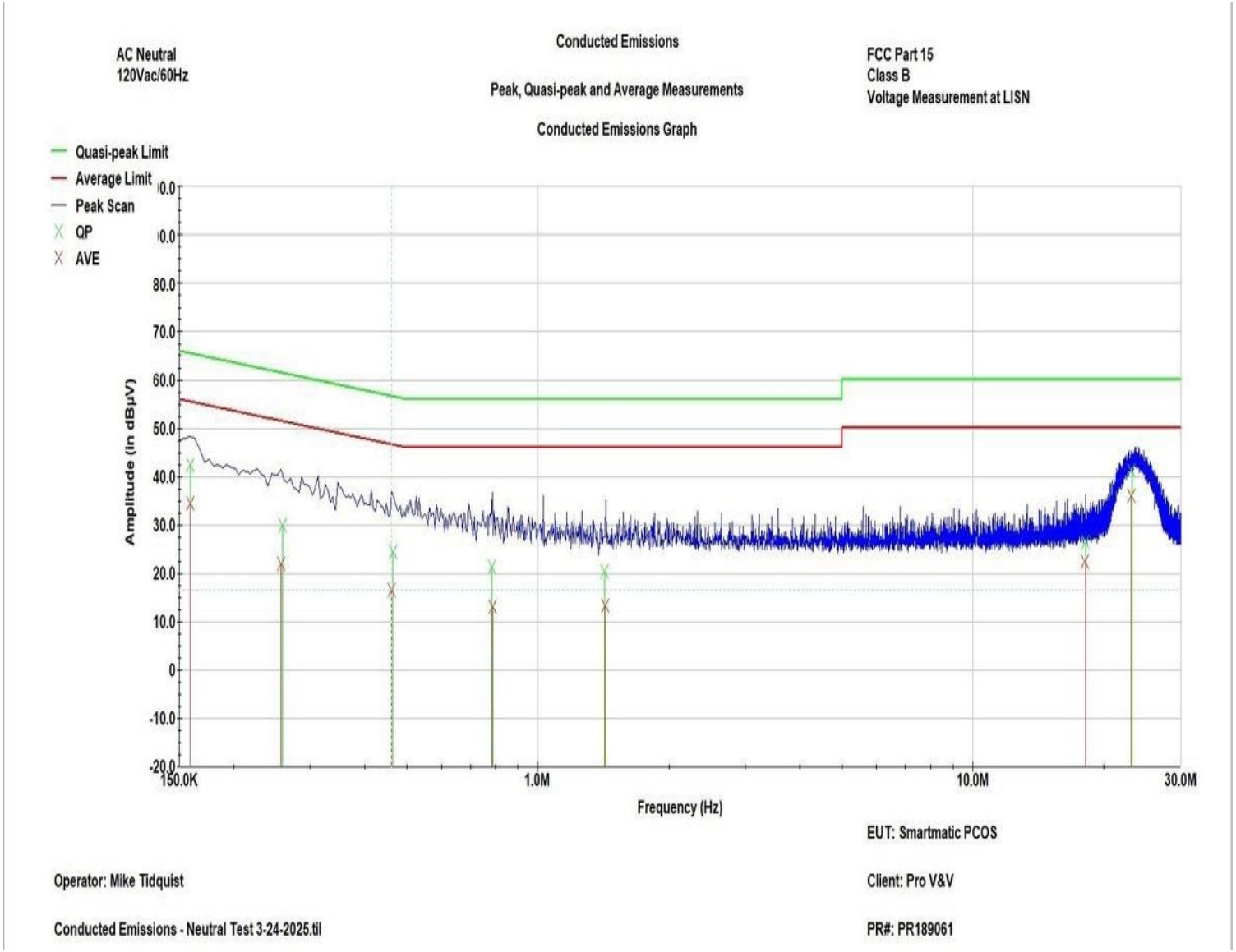
EUT: Smartmatic PCOS
PR#: PR189061
Client: Pro V&V

Frequency (MHz)	Amplitude (in dBµV)	Average Limit (in dBµV)	Delta to Average Limit (in dB)
158.52 KHz	34.39	55.76	-21.37
256.29 KHz	21.94	52.96	-31.03
461.17 KHz	16.48	47.11	-30.63
786.52 KHz	13.14	46.00	-32.86
1.43 MHz	13.36	46.00	-32.64
18.10 MHz	22.43	50.00	-27.57
23.08 MHz	36.06	50.00	-13.94
AC Neutral			
120Vac/60Hz			

PR189061 Conducted Emissions Average Data Table Neutral



PR189061 Conducted Emissions Data Graph Line 1



PR189061 Conducted Emissions Data Graph Neutral

Conducted Emissions
Quasi-Peak Data Table

Operator: Mike Tidquist
09:38:45 AM, Monday, March 24, 2025

EUT: Smartmatic PCOS
PR#: PR189061
Client: Pro V&V

Frequency (MHz)	Amplitude (in dBµV)	Quasi-peak Limit (in dBµV)	Delta to Quasi-peak Limit (in dB)
150.75 KHz	44.92	65.98	-21.06
218.22 KHz	30.44	64.05	-33.61
433.68 KHz	24.17	57.89	-33.73
520.98 KHz	22.96	56.00	-33.04
1.90 MHz	20.30	56.00	-35.70
23.90 MHz	37.91	60.00	-22.09
AC LINE 1			
120Vac/60Hz			

PR189061 Conducted Emissions Quasi Peak Data Table Line 1

Conducted Emissions
Quasi-Peak Data Table

Operator: Mike Tidquist
09:51:09 AM, Monday, March 24, 2025

EUT: Smartmatic PCOS
PR#: PR189061
Client: Pro V&V

Frequency (MHz)	Amplitude (in dBµV)	Quasi-peak Limit (in dBµV)	Delta to Quasi-peak Limit (in dB)
158.52 KHz	42.29	65.76	-23.46
258.54 KHz	29.78	62.90	-33.12
463.42 KHz	24.38	57.05	-32.67
784.26 KHz	21.31	56.00	-34.69
1.42 MHz	20.39	56.00	-35.61
18.11 MHz	26.39	60.00	-33.61
23.15 MHz	41.30	60.00	-18.70
AC Neutral			
120Vac/60Hz			

PR189061 Conducted Emissions Quasi Peak Data Table Neutral

5.2.6 Test Equipment List

Table 5.2-1: Conducted Emissions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059736	Chamber (EMI, Semi-Anechoic)10 Meter	CIR Enterprises	10M1	02/12/2024	02/12/2026
WC059439	Meter (Digital Multimeter)	Fluke	85	08/16/2024	08/16/2025
WC059729	Power Supply (AC)	Pacific Power Source	TMX 140	NCR	NCR
WC059822	Receiver	Keysight Technologies	N9038A	09/17/2024	09/17/2025
WC076847	Network (LISN)	Solar Electronics	8012-50-R-25-BNC	10/10/2024	10/31/2025
WC078470	Software	ETS-Lindgren	C47213	NCR	NCR
WC078471	Cable (Test)	National Technical Systems	BNC Coaxial Cable	09/20/2023	09/20/2025
WC078486	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	08/12/2024	08/31/2025
WC080794	Generator (Title)	Com-Power	CP-CGC-510E	NCR	NCR
WC084270	Attenuator (Coaxial)	Pasternack Enterprises	PE7002-6	09/20/2023	09/20/2026

Calibration Abbreviations
CAL: Calibration
NCR: No Calibration Required

End of Test Report