


National Technical Systems Test Report for Electromagnetic Interference (EMI) Testing of the Poll Place Scanner (DS300)

Prepared For


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Performed By

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Revision History

Rev.	Description	Issue Date
0	Initial Release	05/17/2022
1	Test data replaced with testing performed on 4/5/2022 and 4/8/2022.	05/18/2022
2	Removed other EUTs from Test Log.	05/18/2022

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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. The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements listed in Section 2.0.

2.0 References

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

- Test Specification: FCC Part 15
- Pro V&V, Inc. Purchase Order(s) 2022-008, dated 03/15/2022
- National Technical Systems (NTS) Quote(s) OP0594543, dated 09/07/2021
- ISO/IEC 17025:2017€ *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/1/2017

3.0 Product Selection and Description

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

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

Item	Qty.	Name/Description	Serial Number
1	1	DS300	DS3021420011

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 ANSI/NCSL Z540-1 and 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

Measurement Type	Measurement Unit	Frequency Range
Conducted Emissions	dBuV or dBuA	150 kHz – 30 MHz
Radiated Electric Field	dBuV/m	30-1,000 MHz
		1,000-6,000 MHz



5.0 Test Descriptions and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Model #	Serial #	Test Result
5.1	Radiated Emissions	FCC Part 15	Longmont	04/05/2022	DS300	DS3021420011	Complies
5.2	Conducted Emissions	FCC Part 15	Longmont	04/08/2022	DS300	DS3021420011	Complies

5.1 Radiated Emissions

5.1.1 Test Procedure

FCC Part 15

5.1.2 Test Result

The DS300 was subjected to the Radiated Emissions Test per FCC Part 15. No anomalies were noted as a result of the testing.

5.1.3 Test Datasheets



National Technical Systems				
Radiated Emissions, FCC Part 15, Class B				
Standard Referenced: FCC Part 15, Class B		Date: 4/5/2022		
Temperature: _____	°22C	Humidity: 20%	Pressure: _____	819 mb
Input Voltage: 120Vac, 60Hz		Configuration of Unit: Processing Ballots, DS300		
Test Engineer: Mike Tidquist				
Date	Time	Log Entries	Initials	Result
4/5/22	0800-1000	Radiated Emissions 30MHz - 1GHz, 120Vac/60Hz, FCC Part 15 Class B	MT	Pass



National Technical Systems	
Radiated Emissions, FCC Part 15, Class B	
Standard Referenced: FCC Part 15, Class B	Date: 4/5/2022
Temperature: 22C Humidity: 20%	Pressure: 819 mb
Input Voltage: 120Vac, 60Hz	
Configuration of Unit: Processing Ballots, DS300	
Test Engineer: Mike Tidquist	

The 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: $49.6 \text{ dBuV} + 11.4 \text{ dB/m} - 28.8 \text{ dB (CF/AG)} = 32.2 \text{ dBuV/m}$. 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)

5.1.4 Test Photographs**Radiated Emissions – Front****Radiated Emissions - Back**

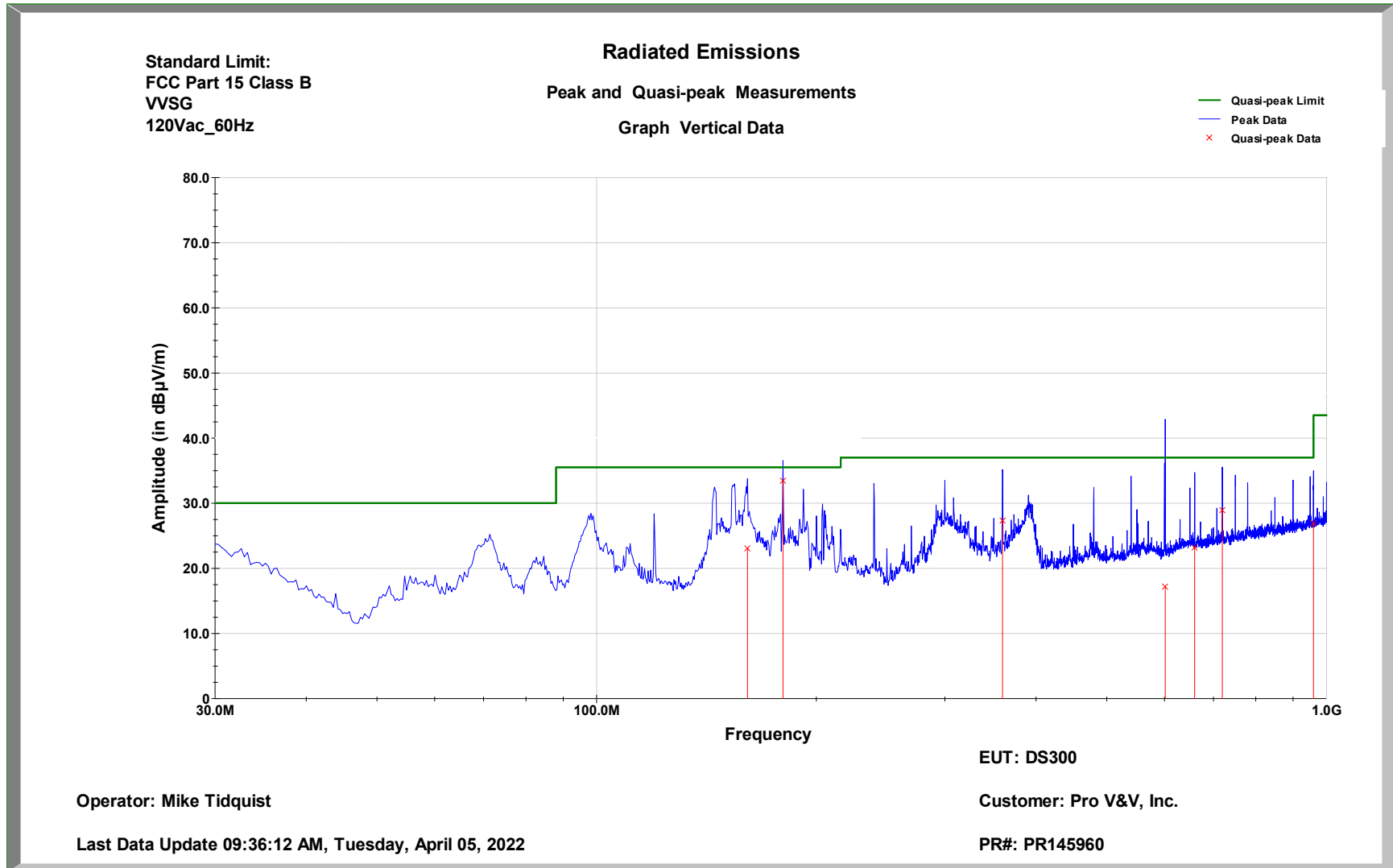


Radiated Emissions – Left



Radiated Emissions - Right

5.1.5 Test Data





Radiated Emissions
Quasi-peak Measurements

Table: Vertical Quasi-peaks below 1 GHz

Operator: Mike Tidquist EUT: DS300

PR#: PR145960

Customer: Pri Inc.

Frequency	Amplitude	Quasi-peak Limit	Delta to Limit	EUT Azimuth	Antenna Height
MHz	in dB μ V/m	in dB μ V/m	in dB	in degrees	in cm
160.95	23.1	35.5	-12.4	247	224
180.03	33.4	35.5	-2.1	44	102
359.8	27.3	37	-9.7	322	385
601.33	17.2	37	-19.8	193	100
659.85	23.2	37	-13.8	146	238
719.99	28.9	37	-8.1	0	165
960	26.9	37	-10.1	36	153

Standard Limit:

FCC Part 15 Class B

VVSG



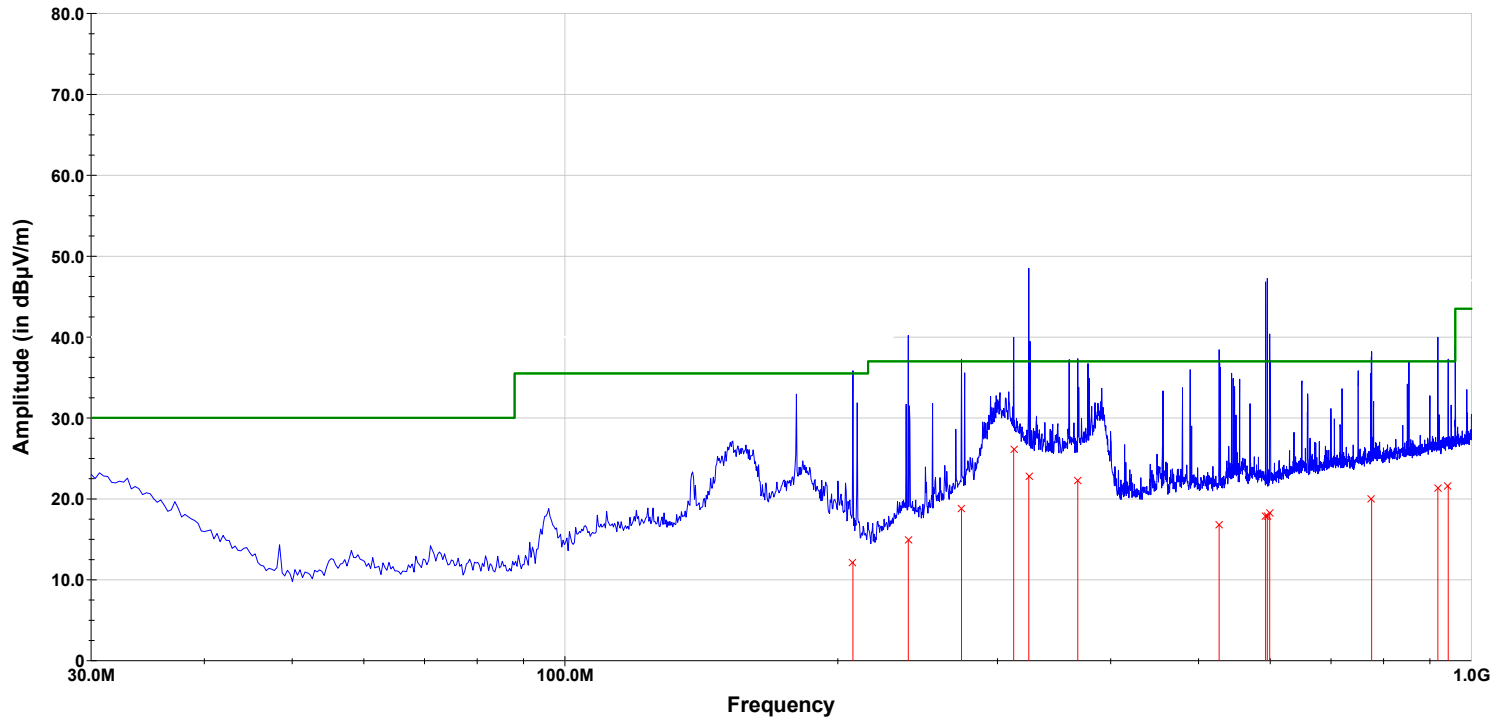
Standard Limit:
FCC Part 15 Class B
VSG
120Vac_60Hz

Radiated Emissions

Peak and Quasi-peak Measurements

Graph Horizontal Data

- Quasi-Peak Limit
- Peak Data
- × Quasi-Peak Data



EUT: DS300

Customer: Pro V&V, Inc.

Operator: Mike Tidquist

Last Data Update 09:10:10 AM, Tuesday, April 05, 2022

PR#: PR145960



Radiated Emissions
Quasi-peak Measurements

Table: Horizontal Quasi-peaks below 1 GHz

Operator: Mike TidquistEUT: DS300

PR#: PR145960

Customer: Pro V&V Inc.

Frequency	Amplitude	Quasi-peak Limit	Delta to Limit	EUT Azimuth	Antenna Height
MHz	in dB μ V/m	in dB μ V/m	in dB	in degrees	in cm
207.83	12.1	35.5	-23.4	288	400
239.19	14.9	37	-22.1	153	400
273.79	18.7	37	-18.3	277	263
312.59	26.1	37	-10.9	264	333
324.88	22.8	37	-14.2	187	221
367.88	22.2	37	-14.8	104	181
526.96	16.7	37	-20.3	224	100
592.92	17.9	37	-19.1	220	153
595.51	17.8	37	-19.2	141	123
599.07	18.3	37	-18.7	139	100
776.25	20	37	-17	292	315
918.52	21.3	37	-15.7	120	375
942.77	21.6	37	-15.4	116	374

Standard Limit:
FCC Part 15 Class B
VWSG



5.1.6 Test Equipment List

Table 5.1-1: Radiated Emissions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059421	Chamber (EMI, Anechoic)OTA	CIR Enterprises	CH 2	04/26/2022	04/26/2024
WC059737	Door (Chamber)	Universal Shielding	NA	10/10/2018	NCR
WC059822	Receiver	Keysight Technologies	N9038A	10/08/2021	10/08/2022
WC070276	Antenna (Biconical)	Sunol Sciences	JB1	09/21/2021	09/21/2023
WC078465	Amplifier (Pre/RF/Low Noise)	Pasternack Enterprises	PE15A1013	06/02/2021	06/02/2022
WC078489	TBD	Extech Instruments	Datalogger 42270	06/14/2021	06/14/2022

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.2 Conducted Emissions

5.2.1 Test Procedure

FCC Part 15

5.2.2 Test Result

The DS300 was subjected to the Conducted Emissions Test per FCC Part 15. No anomalies were noted as a result of the testing.

5.2.3 Test Datasheets



National Technical Systems				
Conducted Emissions, FCC Part 15, Class A				
Standard Referenced: <u>FCC Part 15, Class A</u>		Date: <u>4/8/2022</u>		
Temperature: <u>23C</u>	Humidity: <u>10%</u>	Pressure: <u>844 mb</u>		
Input Voltage: <u>120Vac, 60Hz</u>	LISN Bonding: <u>1.1mOhms</u>			
Configuration of Unit: <u>Normal Operation, Config 3 DS300</u>				
Test Engineer: <u>Mike Tidquist</u>				
Date	Time	Log Entries	Initials	Result
4/8/22	1230-1330	Conducted Emissions, 150kHz - 30MHz, 120Vac/60Hz, Config. 3 DS300	MT	Pass



National Technical Systems	
Conducted Emissions, FCC Part 15, Class A	
Standard Referenced: FCC Part 15, Class A	Date: 4/8/2022
Temperature: <u> </u> °23C Humidity: <u> </u> 10%	Pressure: <u> </u> 844 mb
Input Voltage: <u> </u> 120Vac, 60Hz	LISN Bonding: <u> </u> 1.1mOhms
Configuration of Unit: Normal Operation, Config 3 DS300	
Test Engineer: <u> </u> 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 "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: $49.6 \text{ dBuV} + 11.4 \text{ dB/m} - 28.8 \text{ dB (CF/AG)} = 32.2 \text{ dBuV/m}$. **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.

The PRESCAN is a peak measurement and is performed with the RBW set to 9 kHz, and the VBW set to 3 MHz

5.2.4 Test Photographs



Conducted Emissions – Front



Conducted Emissions – Back

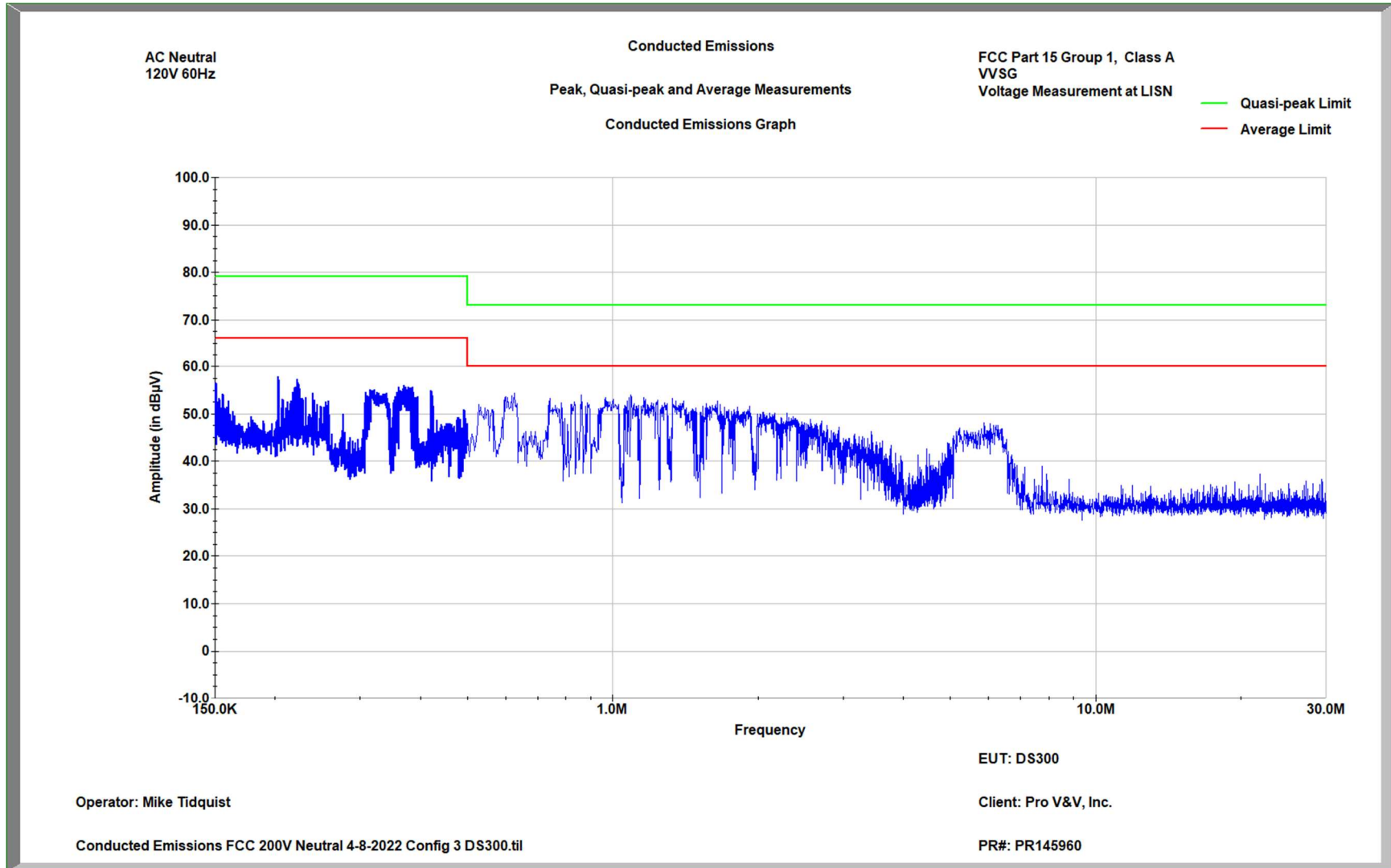


Conducted Emissions – Left



Conducted Emissions - Right

5.2.5 Test Data





Conducted Emissions
Average Measurements
Average Data Table

Operator: Mike Tidquist EUT: DS300
R#: PR145960
Friday April 08 2022 Client Inc.

Frequency Amplitude Quasi-peak Delta to Q Average Lir Delta to Average Limit

MHz	in dBμV	in dBμV	in dB	in dBμV	in dB
0.15	28.46	79	-50.54	66	-37.54
0.21	33.6	79	-45.4	66	-32.4
0.22	33.55	79	-45.45	66	-32.45
0.36	34.22	79	-44.78	66	-31.78
0.61	30.91	73	-42.09	60	-29.09
0.88	32.7	73	-40.3	60	-27.3
1.31	26.53	73	-46.47	60	-33.47
6.11	30.02	73	-42.98	60	-29.98

AC Neutral
120V 60Hz



Conducted Emissions

Peak Data

Peak Data Table

Operator: Mike Tidquist EUT: DS300

PR#: PR145960

Friday April 08 2022 Client Inc.

Frequency Amplitude Quasi-peak Delta to Q_L Average Lir Delta to Average Limit

MHz	in dBμV	in dBμV	in dB	in dBμV	in dB
0.15	56.59	79	-22.41	66	-9.41
0.2	57.83	79	-21.17	66	-8.17
0.2	55.76	79	-23.24	66	-10.24
0.2	57.13	79	-21.87	66	-8.87
0.22	57.31	79	-21.69	66	-8.69
0.22	56.46	79	-22.54	66	-9.54
0.22	56.14	79	-22.86	66	-9.86
0.37	56.06	79	-22.94	66	-9.94
0.37	55.68	79	-23.32	66	-10.32
0.63	54.4	73	-18.6	60	-5.6
0.74	53.27	73	-19.73	60	-6.73
0.86	53.93	73	-19.07	60	-6.07
0.97	53.43	73	-19.57	60	-6.57
1.08	53.46	73	-19.54	60	-6.54
1.09	54.01	73	-18.99	60	-5.99
1.16	53.36	73	-19.64	60	-6.64
1.24	52.86	73	-20.14	60	-7.14
1.33	53.32	73	-19.68	60	-6.68
5.01	42.95	73	-30.05	60	-17.05
5.05	44.72	73	-28.28	60	-15.28
5.22	47	73	-26	60	-13
5.88	48.04	73	-24.96	60	-11.96
6.05	47.86	73	-25.14	60	-12.14
6.29	47.64	73	-25.36	60	-12.36
6.6	42.13	73	-30.87	60	-17.87
6.7	41.28	73	-31.72	60	-18.72
6.72	40.45	73	-32.55	60	-19.55

AC Neutral
120V 60Hz



Conducted Emissions

Quasi-peak Data

Quasi-peak Data Table

Operator: Mike Tidquist EUT: DS300

PR#: PR145960

Friday April 08 2022 Client Inc.

Frequency Amplitude Quasi-peak Delta to Q Average Lir Delta to Average Limit

MHz	in dBμV	in dBμV	in dB	in dBμV	in dB
0.15	49.75	79	-29.25	66	-16.25
0.21	47.65	79	-31.35	66	-18.35
0.22	53.5	79	-25.5	66	-12.5
0.37	51.74	79	-27.26	66	-14.26
0.61	50.2	73	-22.8	60	-9.8
0.83	47.65	73	-25.35	60	-12.35
1.37	49.57	73	-23.43	60	-10.43
5.85	43.49	73	-29.51	60	-16.51

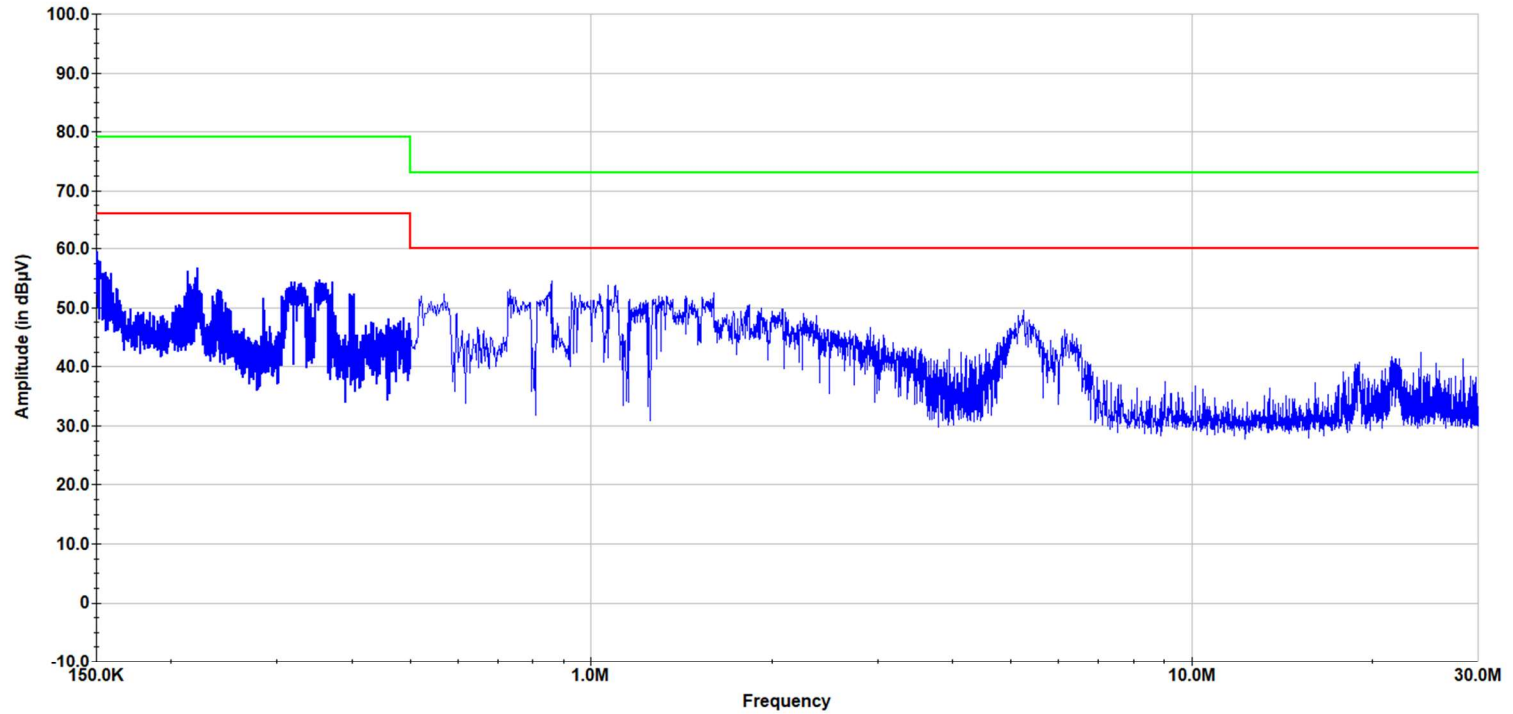
AC Neutral
120V 60Hz

AC L1
120V 60Hz

Conducted Emissions
Peak, Quasi-peak and Average Measurements
Conducted Emissions Graph

FCC Part 15 Group 1, Class A
VVSG
Voltage Measurement at LISN

— Quasi-peak Limit
— Average Limit



EUT: DS300

Operator: Mike Tidquist

Client: Pro V&V, Inc.

Conducted Emissions FCC 200V L1 4-8-2022 Config 3 DS300.til

PR#: PR145960



Conducted Emissions
Average Measurements
Average Data Table

Operator: Mike Tidquist EUT: DS300
R#: PR145960
Friday April 08 2022 Client Inc.

Frequency Amplitude Quasi-peak Delta to Q_L Average Lir Delta to Average Limit

MHz	in dB μ V	in dB μ V	in dB	in dB μ V	in dB
0.15	32.46	79	-46.54	66	-33.54
0.22	33.13	79	-45.87	66	-32.87
0.34	33.95	79	-45.05	66	-32.05
1.1	31.02	73	-41.98	60	-28.98
5.28	29.4	73	-43.6	60	-30.6
6.18	26.23	73	-46.77	60	-33.77
19.62	20.01	73	-52.99	60	-39.99
21.2	24.02	73	-48.98	60	-35.98

AC L1
120V 60Hz



Conducted Emissions

Peak Data

Peak Data Table

Operator: Mike Tidquist EUT: DS300

PR#: PR145960

Friday April 08 2022 Client Inc.

Frequency Amplitude Quasi-peak Delta to Q_L Average Lir Delta to Average Limit

MHz	in dBμV	in dBμV	in dB	in dBμV	in dB
0.15	59.46	79	-19.54	66	-6.54
0.15	56.39	79	-22.61	66	-9.61
0.15	57.94	79	-21.06	66	-8.06
0.15	57.8	79	-21.2	66	-8.2
0.15	57.83	79	-21.17	66	-8.17
0.15	55.87	79	-23.13	66	-10.13
0.16	55.96	79	-23.04	66	-10.04
0.21	56.14	79	-22.86	66	-9.86
0.22	56.66	79	-22.34	66	-9.34
0.57	52.24	73	-20.76	60	-7.76
0.73	53.1	73	-19.9	60	-6.9
0.86	53.9	73	-19.1	60	-6.1
0.86	54.49	73	-18.51	60	-5.51
0.93	52.51	73	-20.49	60	-7.49
1.03	52.41	73	-20.59	60	-7.59
1.07	53.71	73	-19.29	60	-6.29
1.1	53.7	73	-19.3	60	-6.3
1.6	52.42	73	-20.58	60	-7.58
5.25	49.52	73	-23.48	60	-10.48
5.36	47.93	73	-25.07	60	-12.07
5.66	44.11	73	-28.89	60	-15.89
5.84	44.51	73	-28.49	60	-15.49
5.94	42.85	73	-30.15	60	-17.15
6.09	45.22	73	-27.78	60	-14.78
6.15	46.21	73	-26.79	60	-13.79
6.54	43.79	73	-29.21	60	-16.21
24.05	42.35	73	-30.65	60	-17.65

AC L1
 120V 60Hz



Conducted Emissions

Quasi-peak Data

Quasi-peak Data Table

Operator: Mike Tidquist EUT: DS300

PR#: PR145960

Friday April 08 2022 Client Inc.

Frequency Amplitude Quasi-peak Delta to Q Average Lir Delta to Average Limit

MHz	in dB μ V	in dB μ V	in dB	in dB μ V	in dB
0.15	50.64	79	-28.36	66	-15.36
0.22	49.3	79	-29.7	66	-16.7
0.34	48.76	79	-30.24	66	-17.24
1.15	49.45	73	-23.55	60	-10.55
5.35	43.63	73	-29.37	60	-16.37
6.24	40.33	73	-32.67	60	-19.67
18.77	34.04	73	-38.96	60	-25.96
21.53	34.46	73	-38.54	60	-25.54

AC L1

120V 60Hz



5.2.6 Test Equipment List

Table 5.2-1: Conducted Emissions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059421	Chamber (EMI, Anechoic)OTA	CIR Enterprises	CH 2	04/26/2022	04/26/2024
WC059439	Meter (Digital Multimeter)	Fluke	85	07/30/2021	07/30/2022
WC059822	Receiver	Keysight Technologies	N9038A	10/08/2021	10/08/2022
WC076847	Network (LISN)	Solar Electronics	8012-50-R-25-BNC	11/04/2021	11/04/2022
WC078488	TBD	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

6.0 Test Log

10m Emissions

Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
---		April 4, 2022 0800-0830	Initial Product Setup Time		0.5	Complete	MT
RE		April 5, 2022 0800-1000	Radiated Emissions, 30MHz – 1GHz 120Vac/60Hz Config #3, DS300, S/N: DS3021420011		2.0	Pass	MT
CE		April 8, 2022 1230-1330	Conducted Emissions, 150kHz – 30MHz FCC Part 15, Class B VVSG 120Vac/60Hz. Config #3, DS300, S/N: DS3021420011		1.0	Pass	MT



End of Test Report