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January 24, 2019

Premier Dental Products Company
1710 Romano Dr
Plymouth Meeting, Pennsylvania 19462

Dear Tiffany Barthol,

Enclosed is the EMC test report for limited compliance testing of the Premier Dental Products Company, AeroPro™ Cordless Prophy System, for Class A device, tested to the requirements of Title 47 of the CFR, Ch. 1 Part 18 Subpart B for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely,

Joel Huna
Documentation Department
MET Laboratories, Inc.

Reference: (\Premier Dental Products Company\EMC96765-FCC18 Rev. 2)

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Electromagnetic Compatibility Test Report

for

**Premier Dental Products Company
AeroPro™ Cordless Propy System**

Tested under

**Title 47 of the CFR, Part 18 Subpart B
for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices**

MET Report: EMC96765-FCC18 Rev. 2

January 24, 2019

Bradley Jones
Test Engineer, EMC Lab

Joel Huna
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the applicable limits. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Title 47 of the CFR, Part 18, Subpart B for a Class A Digital Device under normal use and maintenance.

John Mason
Director, Electromagnetic Compatibility Lab



Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	August 24, 2018	Initial Issue.
1	November 14, 2018	TCB Corrections.
2	January 24, 2019	TCB Corrections.



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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
d	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
ESD	Electrostatic Discharge
EUT	Equipment Under Test
f	Frequency
CISPR	Comite International Special des Perturbations Radioelectriques (International Special Committee on Radio Interference)
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μF	microfarad
μs	microseconds
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
V/m	Volts per meter
VCP	Vertical Coupling Plane

Table 1: List of Abbreviations

1.0 Testing Summary

The following tests specified below were performed with the following results.

Reference and Test Description	Results	Comments
Title 47 of the CFR, Part 18 Subpart B - 18.309 (a) Conducted Emission Limits for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices	Compliant	Measured emissions were within applicable limits.
Title 47 of the CFR, Part 18 Subpart B - 18.305 (b) Radiated Emission Limits for Industrial, Scientific, and Medical (ISM) Equipment, Ultrasonic Devices	Compliant	Measured emissions were within applicable limits.

Table 2: Testing Summary



2.0 Equipment Configuration

2.1 Overview

MET Laboratories, Inc. was contracted by Premier Dental Products Company to perform testing on the AeroPro™ Cordless Prophylaxis System, under Premier Dental Products Company purchase order number 7396.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Premier Dental Products Company, AeroPro™ Cordless Prophylaxis System.

In accordance with §2.955(a) (3), the following data is presented in support of the verification of the Premier Dental Products Company, AeroPro™ Cordless Prophylaxis System. Premier Dental Products Company should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the AeroPro™ Cordless Prophylaxis System has been **permanently** discontinued, as per §2.955(b).

The results obtained relate only to the item(s) tested.

Model(s) Tested:	AeroPro™ Cordless Prophylaxis System
Model(s) Covered:	AeroPro™ Cordless Prophylaxis System
FCC ID:	2AQ77-2018-AP
Primary Power as Tested:	120 VAC 50 – 60 Hz
Equipment Emissions Class:	A
Highest Clock Frequency:	24 MHz
Evaluated by:	Bradley Jones
Report Date:	January 24, 2019

Table 3. EUT Overview



2.2 Test Site

All testing was performed at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

MET Laboratories is a ISO/IEC 17025 accredited site by A2LA, Baltimore #0591.01.

Radiated Emissions measurements were performed in a semi-anechoic chamber. In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

2.3 Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Table 4. Uncertainty Calculations Summary

2.4 Description of Test Sample

The AeroPro™ Cordless Prophylaxis System, Equipment Under Test (EUT) hereafter, is a prescription only, high performance cordless prophylaxis handpiece with a centralized control button for use with disposable prophylaxis angles to perform cleaning and polishing procedures on teeth.



2.5 Equipment Configuration

The EUT was set up as outlined in Figure 1. All equipment incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
1	Motor Component	N/A	N/A	5500520	M000013 8364
2	Outer Sheath	N/A	N/A	5500520	S0000138 384
3	Direct current powered battery charging station	N/A	N/A	5500540	
4	AC power adapter	N/A	RHD20W120100 U	5500541	

Table 5. Equipment Configuration

2.6 Support Equipment

Support equipment was not necessary for the operation and monitoring of this EUT.

2.7 Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Patient Coupled Port? (Y/N)	Termination Box ID & Port Name
1	AC Adapter	2468 20AWG straight	1	74.2mm	74.2m m	No	No	Continuous 100- 240V/50-60 Hz
2.	Charging Station	Induction Charging Coil inductance 10uH	1	N/A	N/A	No	No	Transmitting input voltage 12 VDC Receive module output voltage - 5VDC Receive output 5V/400- 500mA

Table 6. Ports and Cabling Information

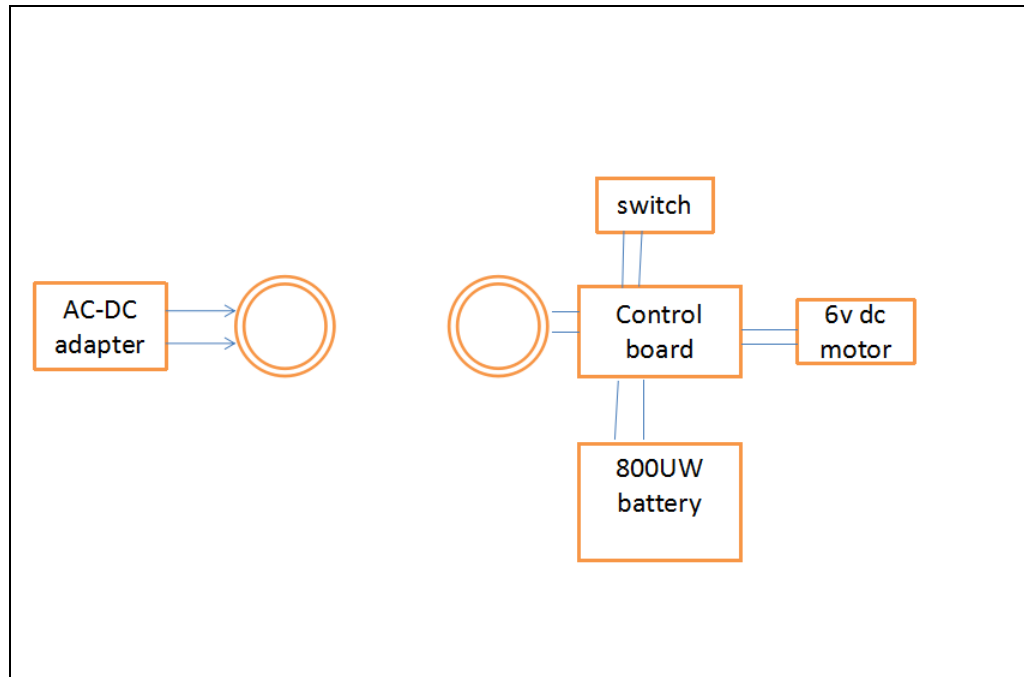
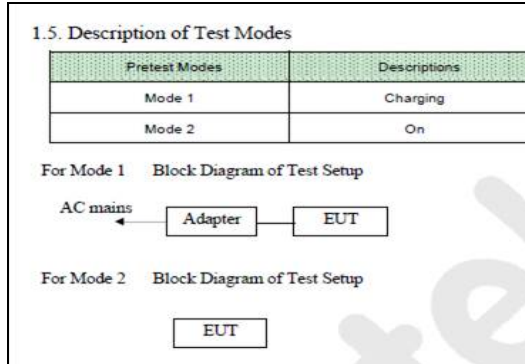






Figure 1. Block Diagram of Test Configuration

2.8 Mode of Operation


This section describes how the EUT is simulating normal operation.



Charging Mode: When the battery is low, AeroPro handpiece requires charging. During charging, the AeroPro handpiece must be placed into the charging station. While in the charging station, the LED battery lights will display the charging status. Table below illustrates the configuration of LED lights corresponding to the charging mode.

Outer Module LED	Signal	Schematic Illustration
Flashing Red Light 	Low charge	
Solid red stays on, 1 yellow, and 3 green lights are blinking in sequence 	Charging	
Five Solid Lights: 1 red, 1 yellow, 3 green 	Charging complete/ Operational	

Polishing Mode “On Mode”: AeroPro™ Cordless Prophy System used with Disposable Prophy Angles (DPAs) for the purpose of prophylaxis polishing. A Li-ion battery powered electric motor drives the rotation and controls the rotation speeds of the handpiece. AeroPro™ operates in 3 speeds, as per table below. ON/OFF/MODE Button controls speed of the unit.

Function	Action/Mode	SPEED	Schematic Illustration
OFF	OFF	0 rpm	
ON	To load paste	Low: 500 rpm	
	To Polish	Medium: 1500 rpm	
		High: 2800 rpm	



During polishing, the device has the capability to work in two settings: 2-speed and 3-speed:

Speeds	2-Speed Mode (default setting)	3-Speed Mode
Low	500 rpm	500 rpm
Med	-	1500 rpm
High	2800 rpm	2800 rpm
The optional Speed Modes allow the operator to go from slow to high speed with one button touch (default setting) or, if a greater range of speeds is preferred, the 3 Speed Mode can be selected by following the "Change Speed Mode" instructions in Directions for Use.		

2.9 Method of Monitoring EUT Operation

TEST	Pass/Fail Criteria
Radiated Immunity	Charging Mode: Pass: Handpiece is in the charging station and the battery voltage is increasing (battery is being charged). LED lights are on and displaying the charge level of the battery. Fail: Battery is not charging and /or LED lights are not on while the handpiece is in the charging station.
Conducted Immunity	
Surge	
EFTB	
VDI	
MI	Polishing Mode: Pass: AeroPro™ operates two speed modes (2-speed and 3-speed, as per table above). Motor turns without disturbance, Low, Medium and High speeds are maintained respectively. Motor can be turned On and OFF by pressing On/OFF/MODE button. Fail: AeroPro™ is unable to switch between speeds, or maintain a selected rotation speed.
ESD	

Required Dwell Time for each Immunity Test for Radiated Immunity and Conducted Immunity: 1 sec

- Note: The assumed dwell time is on the quote. If a different time is declared here, the scope must be re-evaluated.

Alarm Limit Settings (if applicable, please provide a rationale for the settings chosen): N/A

2.10 Modifications

2.10.1 Modifications to the EUT

No modifications were made to the EUT.

2.10.2 Modifications to the Test Standard

No modifications were made to the test standard.



2.11 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Premier Dental Products Company upon completion of testing.

2.12 Test Software Used

Conducted Emissions - Trace Data Grabber version 01/26/2016

Radiated Emissions- EMC-REG-TDS-11, Radiated Emissions Prescan.xls version 06/29/11



3.0 Electromagnetic Compatibility Emission Criteria

3.1 Conducted Emission Limits

Test Requirement(s): **18.307** For the following equipment, when designed to be connected to the public utility (AC) power line the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies shall not exceed the limits in the following tables. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal using a 50 μ H/50 Ohms Line Impedance Stabilization Network (LISN).

(b) All other part 18 consumer devices:

Frequency of Emission (MHz)	18.307(a) ISM Conducted Limits (dB μ V)	
	Quasi-Peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
Note 1 — The lower limit shall apply at the transition frequencies.		
Note 2 — *The limit decreases linearly with the logarithm if the frequency in the range 0.05 MHz to 0.5 MHz.		

Table 7. Conducted Limits for ISM (Ultrasonic Equipment) calculated from FCC Part 18 Section 18.307(a)

18.311 The measurement techniques which will be used by the FCC to determine compliance with the technical requirements of this part are set out in FCC Measurement Procedure MP-5, “Methods of Measurements of Radio Noise Emissions from ISM equipment”. Although the procedures in MP-5 are not mandated, manufacturers are encouraged to follow the same techniques which will be used by the FCC.

Test Procedure:

The EUT was setup on a wooden table, 80cm above the ground plane. The method of testing, test conditions, and test procedures of CISPR 22 were used. The EUT was powered through a 50 Ω /50 μ H LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 20 dB of the limit, six highest peaks were re-measured using a quasi-peak and average detector.



Environmental Conditions for Conducted Emissions	
Ambient Temperature (°C)	22
Relative Humidity (%)	55

Test Results: The EUT was **compliant** with the of this section. Measured emissions were within applicable limits.

Test Technician(s): Bradley Jones

Test Date(s): July 9, 2018

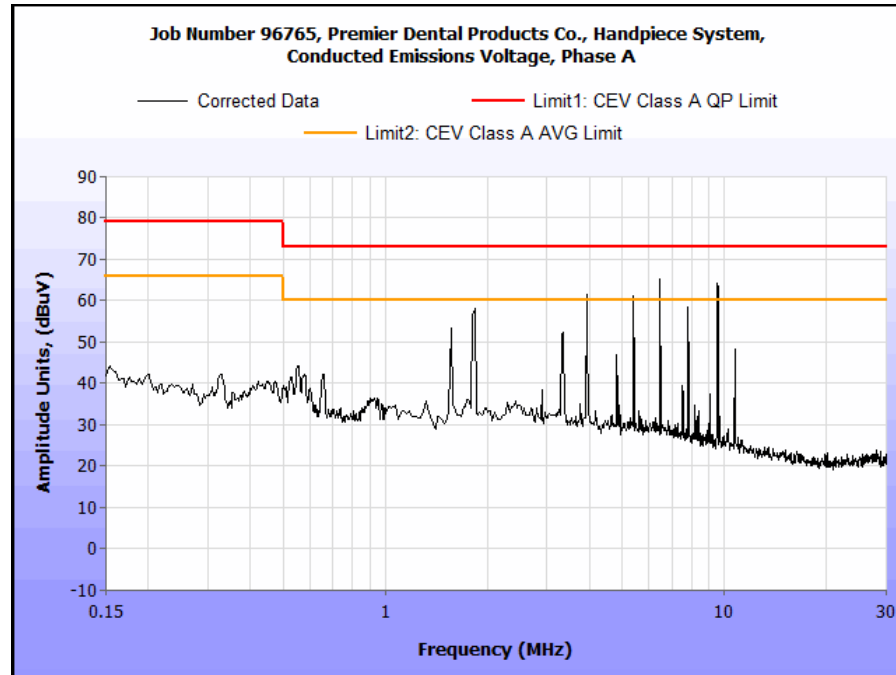
Conducted Emissions at the Mains Terminal Test Data:

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
1.817	61.12	0	61.12	73	-11.88	35.13	0	35.13	60	-24.87
3.927	61.73	0	61.73	73	-11.27	35.5	0	35.5	60	-24.5
5.383	60.75	0	60.75	73	-12.25	34.14	0	34.14	60	-25.86
6.46	63.36	0	63.36	73	-9.64	35.83	0	35.83	60	-24.17
7.818	57.64	0	57.64	73	-15.36	30.66	0	30.66	60	-29.34
9.555	58.99	0.07	59.06	73	-13.94	32.51	0.07	32.58	60	-27.42

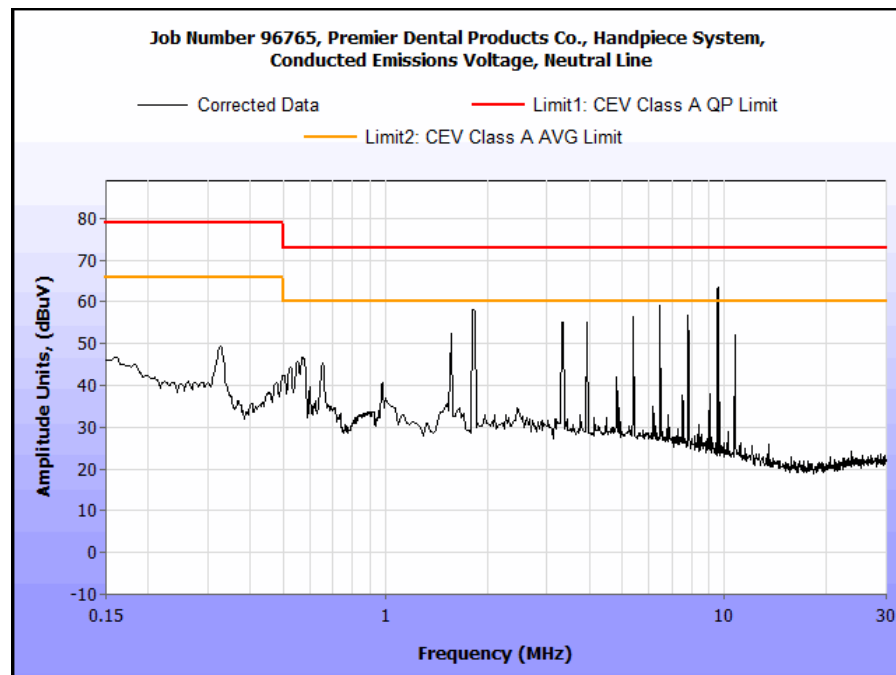
Table 8: Conducted Emissions at the Mains Terminal (120 VAC/60 Hz) Phase Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
1.817	55.12	0	55.12	73	-17.88	28.06	0	28.06	60	-31.94
3.323	46.83	0	46.83	73	-26.17	23.99	0	23.99	60	-36.01
3.927	54.09	0	54.09	73	-18.91	27.27	0	27.27	60	-32.73
6.46	59.28	0	59.28	73	-13.72	28.49	0	28.49	60	-31.51
7.818	52.48	0	52.48	73	-20.52	23.17	0	23.17	60	-36.83
9.555	58.94	0.07	59.01	73	-13.99	29.52	0.07	29.59	60	-30.41

Table 9: Conducted Emissions at the Mains Terminal (120 VAC/60 Hz) Neutral Test Results



Plots 1. Conducted Emissions at the Mains Terminal Test Data – Line Plot



Plots 2. Conducted Emissions at the Mains Terminal Test Data – Neutral Plot



Photograph 1: Conducted Emissions at the Mains Terminal Test Setup



3.2 Radiated Emission: Limits of Electromagnetic Radiation Disturbance

Test Method: ANSI C63.4- American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Test Standard: Title 47 of the Code of Federal Regulations (CFR), Part 18 Subpart C

Test Requirement(s): 18.305 Field strength limits:
(a) ISM equipment operating on a frequency specified in § 18.301 is permitted unlimited radiated energy in the band specified for that frequency.
(b) The field strength levels of emissions which lie outside the bands specified in § 18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 $25 \times \text{SQRT}(\text{power}/500)$	300 ¹ 300
	Any non-ISM frequency	Below 500 500 or more	15 $15 \times \text{SQRT}(\text{power}/500)$	300 ¹ 300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 (²)	1,600 (²)
Medical diathermy	Any ISM frequency Any non-ISM frequency	Any Any	25 15	300 300
Ultrasonic	Below 490 kHz	Below 500 500 or more	$2,400/F(\text{kHz})$ $2,400/F(\text{kHz}) \times \text{SQRT}(\text{power}/500)$	300 ³ 300
	490 to 1,600 kHz Above 1,600 kHz	Any Any	$24,000/F(\text{kHz})$ 15	30 30
Induction cooking ranges	Below 90 kHz On or above 90 kHz	Any Any	1,500 300	⁴ 30 ⁴ 30

¹ Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

² Reduced to the greatest extent possible.

³ Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.

⁴ Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.



18.311 The measurement techniques which will be used by the FCC to determine compliance with the technical requirements of this part are set out in FCC Measurement Procedure MP-5, "Methods of Measurements of Radio Noise Emissions from ISM equipment". Although the procedures in MP-5 are not mandated, manufacturers are encouraged to follow the same techniques which will be used by the FCC.

Test Procedures:

The EUT was placed on a non-metallic table, 80 cm above the ground plane (See Photograph 2 - 5) inside a semi-anechoic chamber. Measurements were made with a loop antenna.

Radiated Emission measurements were made in accordance with the general procedures of ANSI C63.4: 2014 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz" as well as the procedures delineated in FCC Measurement Procedure MP-5, "Methods of Measurements of Radio Noise Emissions from ISM equipment".

For each point of measurement, the turntable was rotated and the positions of the interface cables were varied in order to find the maximum radiated emissions.

Measurements were made at 1.2m. A roll-off correction factor was calculated and applied to this measurement.

Environmental Conditions for Radiated Emissions	
Ambient Temperature (°C)	22
Relative Humidity (%)	55

Test Results:

The EUT was **compliant** with the requirements of this section. Measured emissions were within applicable limits.

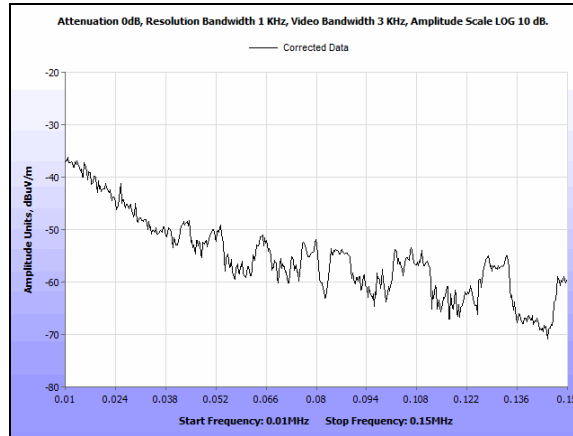
Test Technician(s):

Bradley Jones

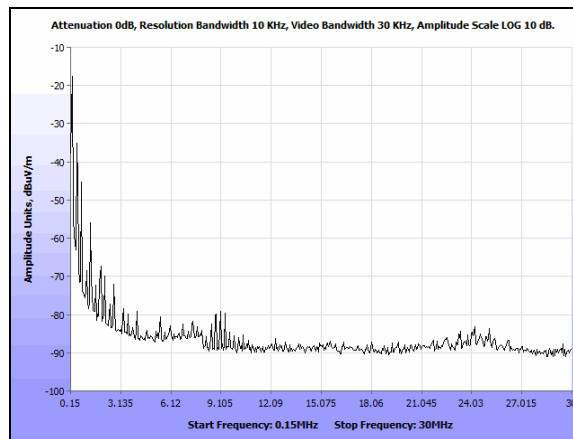
Test Date(s):

August 17, 2018

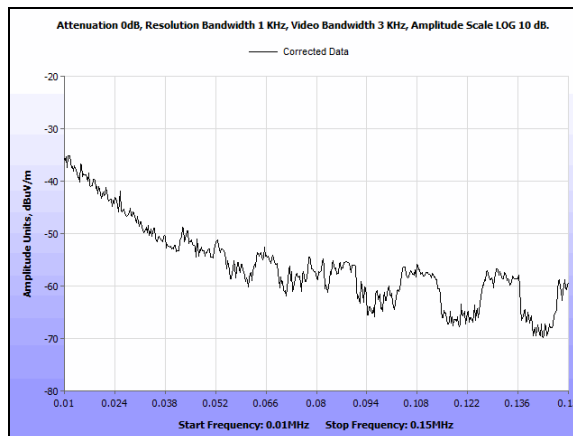
Radiated Emissions Limits Test Results:



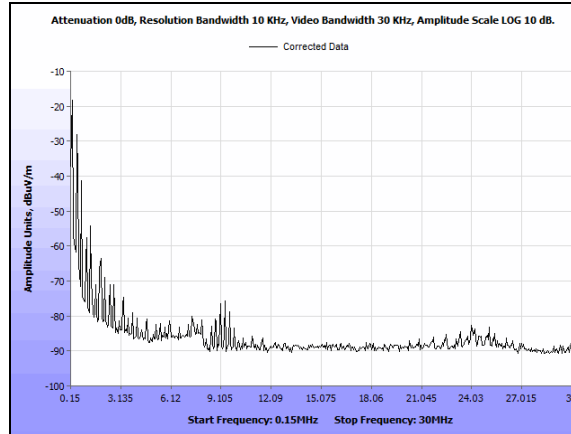
Plots 3. Radiated Emission – Brush Charging (10 – 150 kHz) Plot



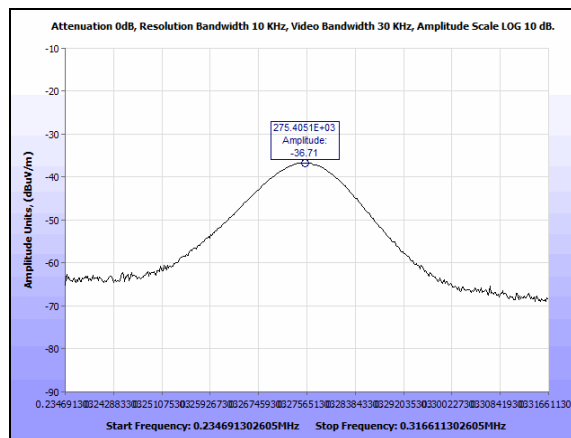
Plots 4. Radiated Emission – Brush Charging (150 kHz – 30 MHz) Plot



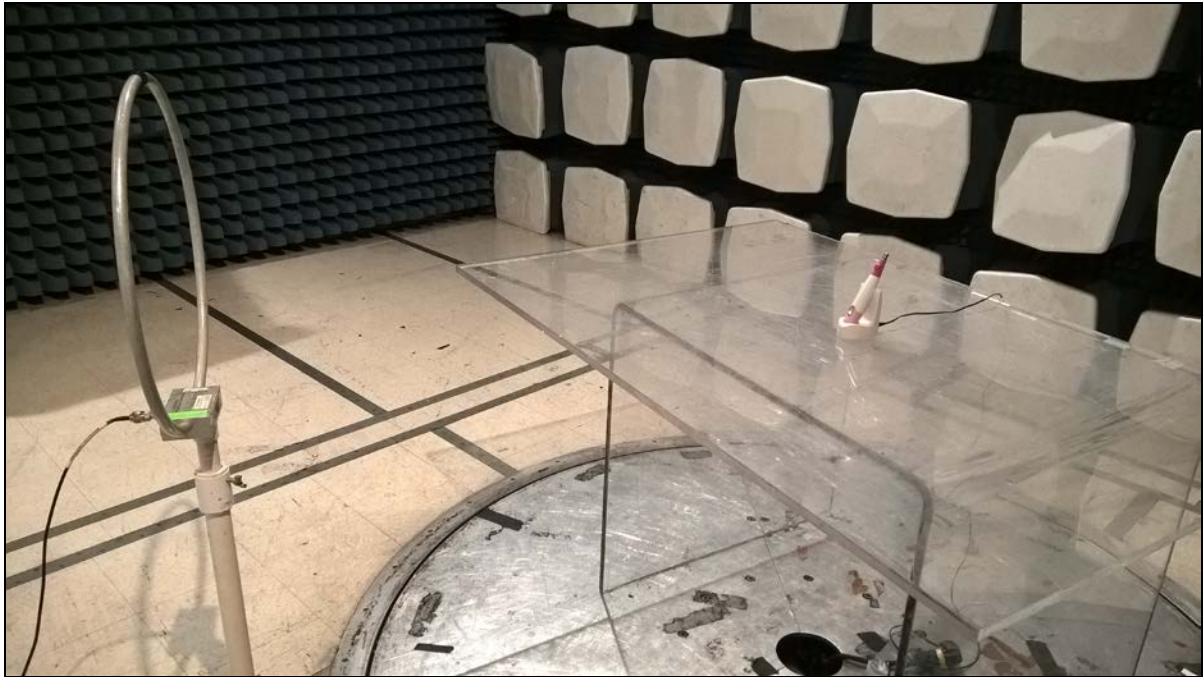
Plots 5. Radiated Emission – Brush Not Charging – (10 kHz – 150 kHz) Plot



Plots 6. Radiated Emission – Brush Not Charging (150 kHz – 30 MHz) Plot



Plots 7. Radiated Emission – Fundamental 275 kHz Plot



Photograph 2: Radiated Emission, Test Setup, Part 18



4.0 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Test Name: Conducted Emissions (AC Power)				Test Date(s): July 9, 2018	
MET Asset #	Nomenclature	Manufacturer	Model	Last Cal Date	Cal Due Date
1T8818	Spectrum Analyzer	Agilent Technologies	E4407B	06/4/2018	06/4/2019
1T4563	LISN (10 AMP)	Solar Electronics Company	9322-50-R-10-BNC	03/13/2017	09/13/2018
Test Name: Radiated Emissions				Test Date(s): August 17, 2018	
MET Asset #	Nomenclature	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4800	Antenna, Loop	EMCO	6512	04/12/2017	10/12/2018
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	12/07/2016	12/07/2018
1T4300A	SEMI-ANECHOIC CHAMBER # 1 (FCC)	EMC TEST SYSTEMS	NONE	01/31/2016	01/31/2019
Note: Functionally verified test equipment is verified using calibrated instrumentation at the time of testing.					

Table 10: Test Equipment List