Measurement of RF Emissions from a Metrom Rail STN112 Docking Station

For	Metrom Rail 1125 Mitchell Court Crystal Lake, IL 60014
P.O. Number	2056
Date Tested	May 7, 2016 and May 8, 2016
Test Personnel	Mark Longinotti
Test Specification	FCC "Code of Federal Regulations" Title 47 Part15, Subpart C, §15.209 Industry Canada RSS-Gen

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REVISION HISTORY

Revision	Date	Description
—	23 June 2016	Initial release

Measurement of RF Emissions from a Metrom Rail Docking Station, Model No. STN112

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of the RF emissions measurements performed on a Metrom Rail Docking Station, M/N: STN112, Serial Number: None Assigned, hereinafter referred to as the Equipment Under Test (EUT). The EUT was designed to transmit at approximately 13.56MHz. The EUT was manufactured and submitted for testing by Metrom Rail located in Crystal Lake, IL.

1.2. Purpose

The test series was performed to determine if the EUT meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 207 and 209 for Intentional Radiators. Testing was performed in accordance with ANSI C63.10-2013 and ANSI C63.4-2014.

The test series was also performed to determine if the EUT meets the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification RSS-Gen Section 8.8 and Section 8.9 for transmitters. Testing was performed in accordance with ANSI C63.10-2013 and ANSI C63-4-2014.

1.3. Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4. EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by The American Association for Laboratory Accreditation (A2LA). A2LA Certificate Number: 1786-01.

1.5. Laboratory Conditions

The temperature at the time of the test was 23^{o}C and the relative humidity was 31%.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 2015
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- ANSI C63.4-2014, “American National Standard for Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz”
- ANSI C63.10-2013, "American National Standard for Methods of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- Industry Canada Radio Standards Specification, RSS-Gen, “General Requirements for Compliance of Radio Apparatus”, Issue 4, November 2014
- Federal Communications Commission Office of Engineering Technology Laboratory Division, AC Power-Line Conducted Emissions Frequently Asked Questions, June 3, 2015 (KDB 174176)

3. EUT Setup and Operation

3.1. General Description

The EUT is a Metrom Rail Docking Station, Model No. STN112. A block diagram of the EUT setup is shown as Figure 1. A photograph of the EUT is shown as Figure 2.

3.1.1. Power Input

The EUT obtained 12VDC through two (2) each, 1.8m-long power leads from the output of a CUI Inc. AC Adapter, M/N: SWI12-12-N-P5. The AC Adapter was powered with 120V, 60Hz power.

3.1.2. Peripheral Equipment

No peripheral equipment was submitted with the EUT.

3.1.3. Signal Input/Output Leads

No signal leads were submitted with the EUT.

3.1.4. Grounding

The EUT was not grounded during testing.

3.2. Software

For all tests the EUT had Firmware Version1.0.0 loaded onto the device to provide correct load characteristics.

3.3. Operational Mode

For all tests, the EUT was placed on an 80cm high non-conductive stand. The EUT was energized. The EUT was programmed so that upon power up, it would begin transmitting 13.56MHz.

3.4. EUT Modifications

No modifications were required for compliance.

4. Test Facility and Test Instrumentation

4.1. Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

4.2. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1.

Conducted and radiated emission tests were performed with an EMI receiver utilizing the bandwidths and detectors specified by the FCC.

4.3. Calibration Traceability

Test equipment is maintained and calibrated on a regular basis with a calibration interval no greater than two years. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.4. Measurement Uncertainty

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

The measurement uncertainty for these tests is presented below:

Conducted Emissions Measurements		
Combined Standard Uncertainty	1.06	-1.06
Expanded Uncertainty (95% confidence)	2.12	-2.12

Radiated Emissions Measurements		
Combined Standard Uncertainty	2.09	-2.09
Expanded Uncertainty (95% confidence)	4.19	-4.19

5. TEST PROCEDURES

5.1. Powerline Conducted Emissions

5.1.1.Requirements

Per FCC 15.207(a), all radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table:

Frequency MHz	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 - 5	56	46
5 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

5.1.2.Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

a) The EUT was operated in the Transmitting at 13.56MHz mode.

b) Measurements were first made on the 120V, 60Hz high line of the CUI Inc. AC Adapter, M/N: SWI12-12-N-P5.

c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.

d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.

e) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of

the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)

f) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB)

g) Steps (c) through (f) were repeated on the 120V, 60Hz return line of the CUI Inc. AC Adapter, M/N: SWI12-12-N-P5.

h) Steps (b) through (g) were repeated with the EUT operated in the Transmitter Off mode.

5.1.3. Results

The plots of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line of the CUI Inc. AC Adapter, M/N: SWI12-12-N-P5 with the EUT operated in the Transmitting at 13.56MHz mode are shown on pages 18 and 20. The tabular quasi-peak and average results from each input power line of the CUI Inc. AC Adapter, M/N: SWI12-12-N-P5 with the EUT operated in the Transmitting at 13.56MHz mode, are shown on pages 17 and 19. The power line conducted emissions at 13.563MHz exceeded the average limits of FCC 15.207(a). This is the transmit frequency of the Near Field Communications (NFC) installed in the EUT. Per FCC KDB 174176, Question 5, for intentional radiators operating below 30MHz:

“For a device with a permanent or detachable antenna operating at or below 30 MHz, the FCC will accept measurements performed with a suitable dummy load in lieu of the antenna under the following conditions: (1) perform the AC power-line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network which simulates the antenna in the fundamental frequency band.”

However, a sample with a dummy load was not provided. So instead, a 2nd powerline conducted emissions tests was run with the NFC turned off to show that the emissions at 13.563MHz were from the NFC and not from the digital device portion of the EUT.

The plots of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line of the CUI Inc. AC Adapter, M/N: SWI12-12-N-P5 with the EUT operated in the Transmitter Off mode are shown on pages 22 and 24. The tabular quasi-peak and average results from each input power line of the CUI Inc. AC Adapter, M/N: SWI12-12-N-P5 with the EUT operated in the Transmitter Off mode, are shown on pages 21 and 23. All power line conducted emissions measured from the EUT were within the specification limits. The emissions level closest to the limit (worst case) occurred at 405kHz. The emissions level at this frequency was 16.9dB within the limit. A photograph of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 2.

5.2. Radiated Measurements

5.2.1. Requirements

The EUT must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.209.

Section 15.209 states that the emissions from an intentional radiator shall not exceed the field strength limits specified below:

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 -216	150	3
216 -960	200	3
Above 960	500	3

In the emission table above, the tighter limit applies at the band edge.

The emissions limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz, and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

5.2.2.Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Below 30MHz:

A preliminary radiated emissions test was performed to determine the emission characteristics of the EUT. For the preliminary test, an active loop measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 150kHz to 30MHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 150kHz to 30MHz using an active loop antenna. The field strength of the fundamental of the transmitter was measured using an average detector with a 200Hz resolution bandwidth. All spurious emissions were measured and recorded using a quasi-peak detector with a 9kHz bandwidth.

To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

1) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
2) The active loop antenna was placed at a height of 1 meter.
3) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
4) With the loop antenna in the vertical polarization, the loop antenna was rotated through 360 degrees.

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total. (Per 15.231(f)(2), at frequencies below 30MHz, measurements may be made at a distance closer than that specified. When performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The

Base 10 Antilog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = Antilog [(FS (dBuV/m))/20]

Above 30MHz:

The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 30MHz to 200MHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted. The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

1) Measurements from 30MHz to 200MHz were made using a quasi-peak detector and a broadband bilog antenna.

2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

    a) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

    b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

    c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

5.2.3.Results

The preliminary plots, with the EUT transmitting at 13.56MHz, are presented on data pages 25 through 28. The plots are presented for reference only, and are not used to determine compliance. The final radiated levels, with the EUT transmitting at 13.56MHz, are presented on data pages 29 and 30. As can be seen from the data, all emissions measured from the EUT were within the specification limits. The emissions level closet to the limit (worst case) occurred at 13.564MHz. The emissions level, at this frequency, was 3.0dB within the limit. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown in Figures 3 and 4.

6. OTHER TEST CONDITIONS

6.1. Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated. The test series was witnessed by Metrom Rail personnel.

6.2. Disposition of the EUT

The EUT and all associated equipment were returned to Metrom Rail upon completion of the tests.

7. CONCLUSIONS

It was determined that the Metrom Rail Docking Station, Model No. STN112, Serial No. None Assigned, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 207 and 209 for Intentional Radiators, when tested per ANSI C63.10-2013 and ANSI C63-4-2014.

It was also determined that the Metrom Rail Docking Station, Model No. STN112, Serial No. None Assigned, did fully meet the conducted and radiated emission requirements of the Industry Canada RSS-Gen, Sections 8.8 and 8.9 for transmitters, when tested per ANSI C63.10-2013 and ANSI C63-4-2014.

8. CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUT at the test date. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST or any agency of the Federal Government.

9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
NLS0	24" ACTIVE LOOP ANTENNA	EMCO	6502	89979	10KHZ-30MHZ	7/7/2014	7/7/2016
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	3/23/2016	3/23/2017
PLF2	CISPR16 50UH LISN	ELITE	CISPR16/70A	002	.15-30MHz	5/20/2016	5/20/2017
PLF4	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	5/16/2016	5/16/2017
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	0.009-6500MHZ	2/22/2016	2/22/2017
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	2/22/2016	2/22/2017
RBA1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100146	20HZ-26.5GHZ	2/12/2016	2/12/2017
T1EE	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	BN2321	DC-18GHZ	6/13/2016	6/13/2018

I/O: Initial Only
N/A: Not Applicable
Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

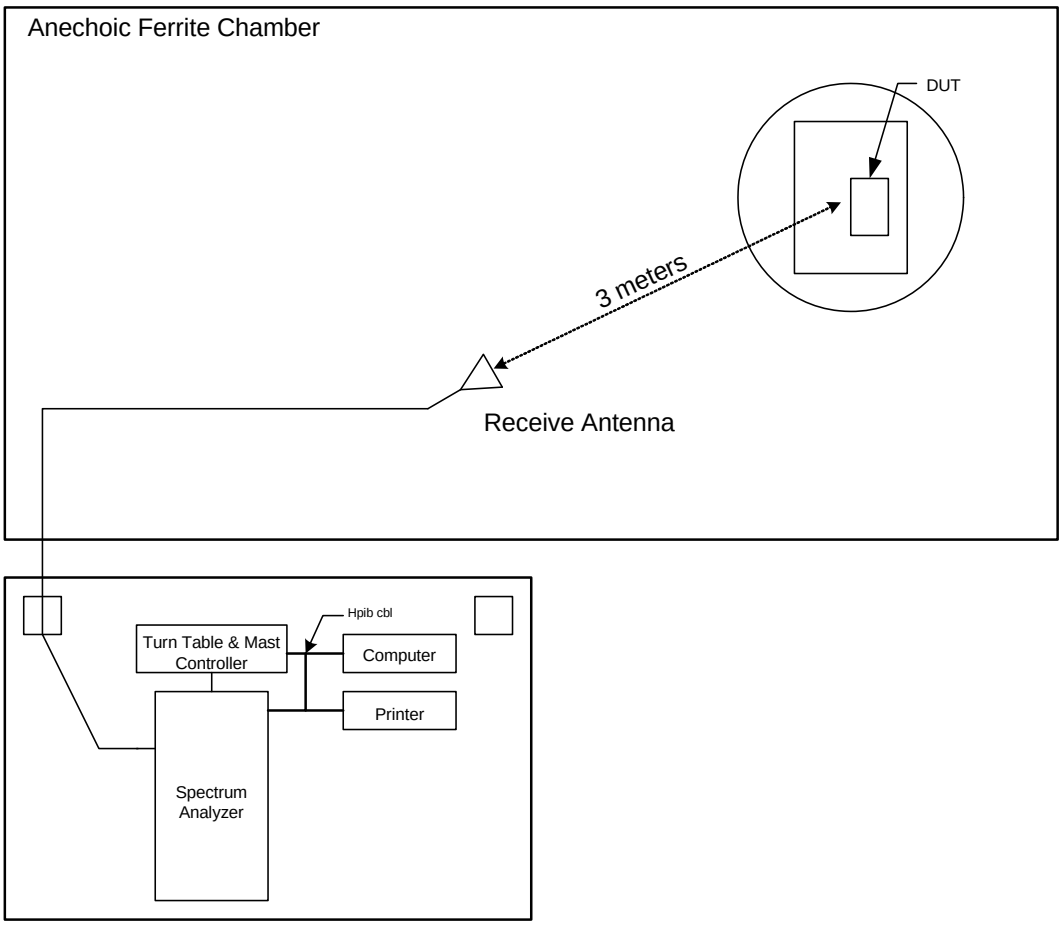
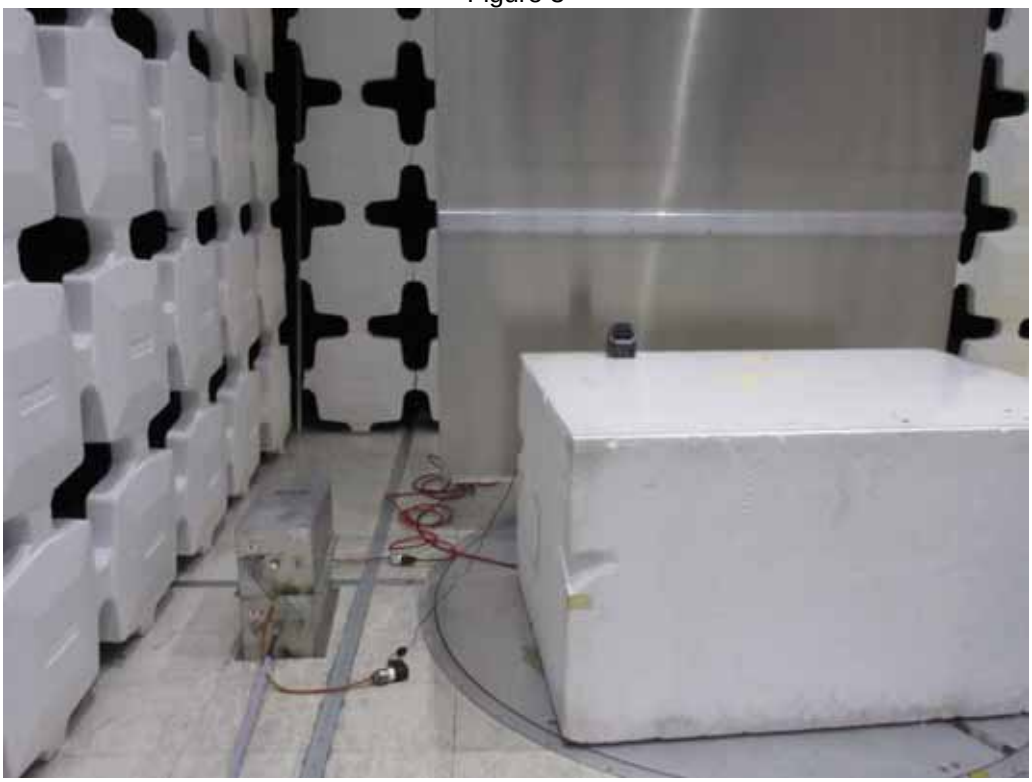


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

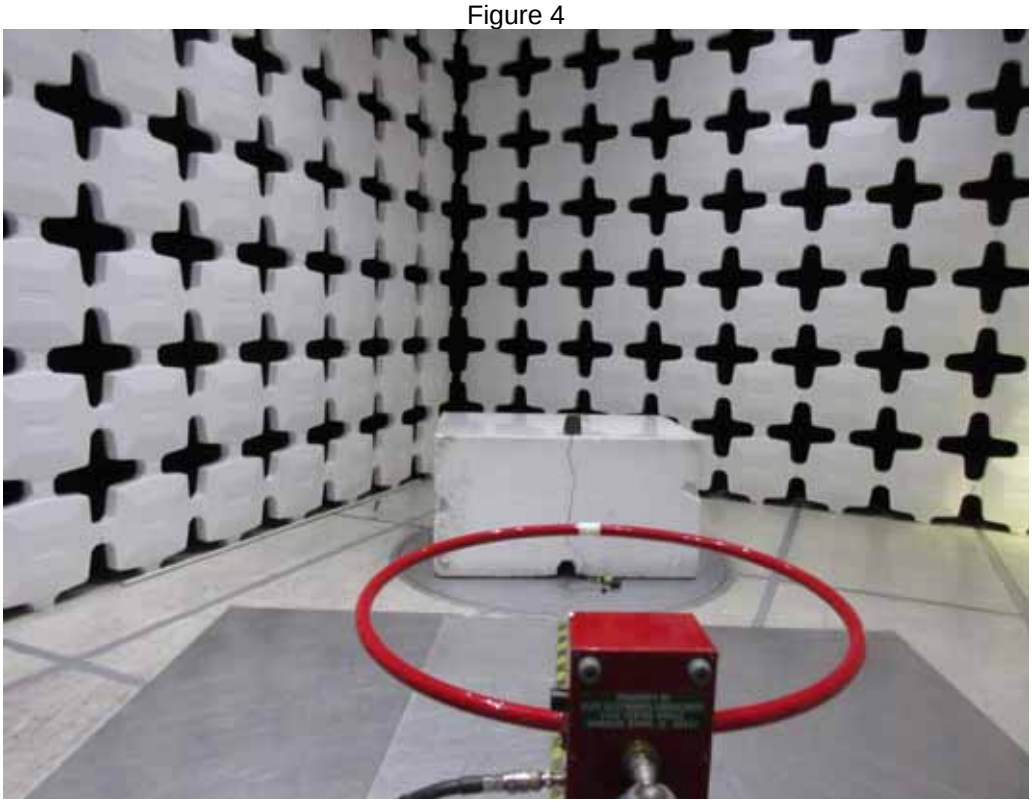
Photograph of the EUT

Figure 3

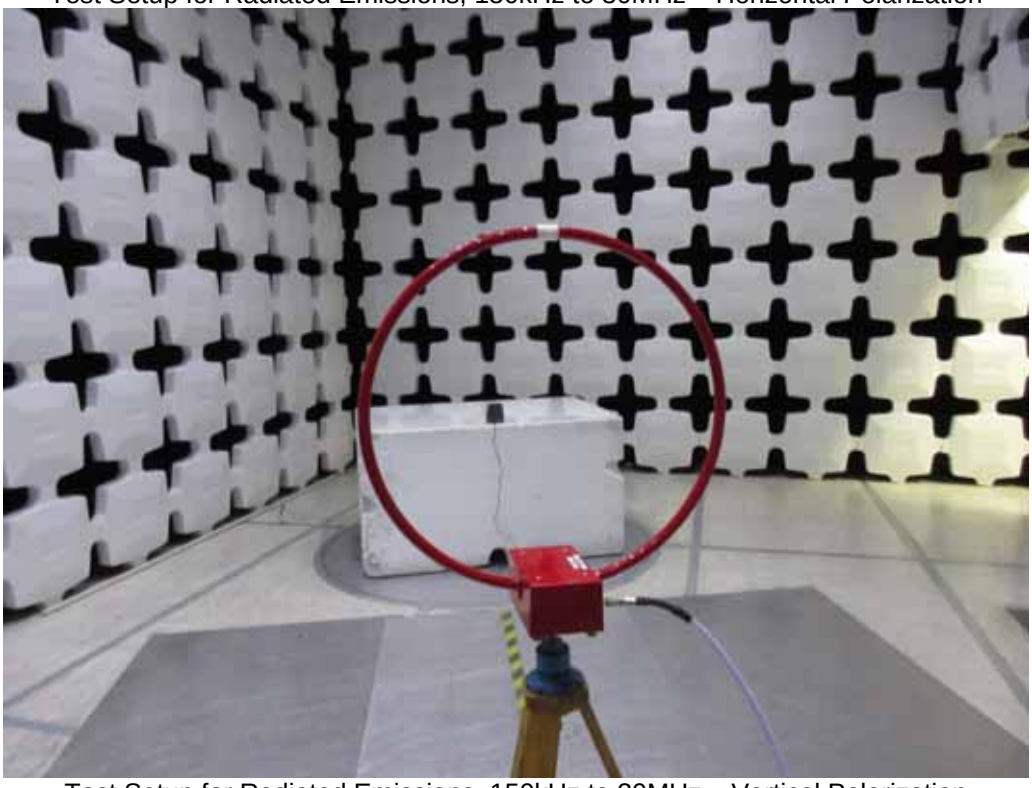


Test Setup for Radiated Emissions, 150kHz to 30MHz – Horizontal Polarization

Figure 4

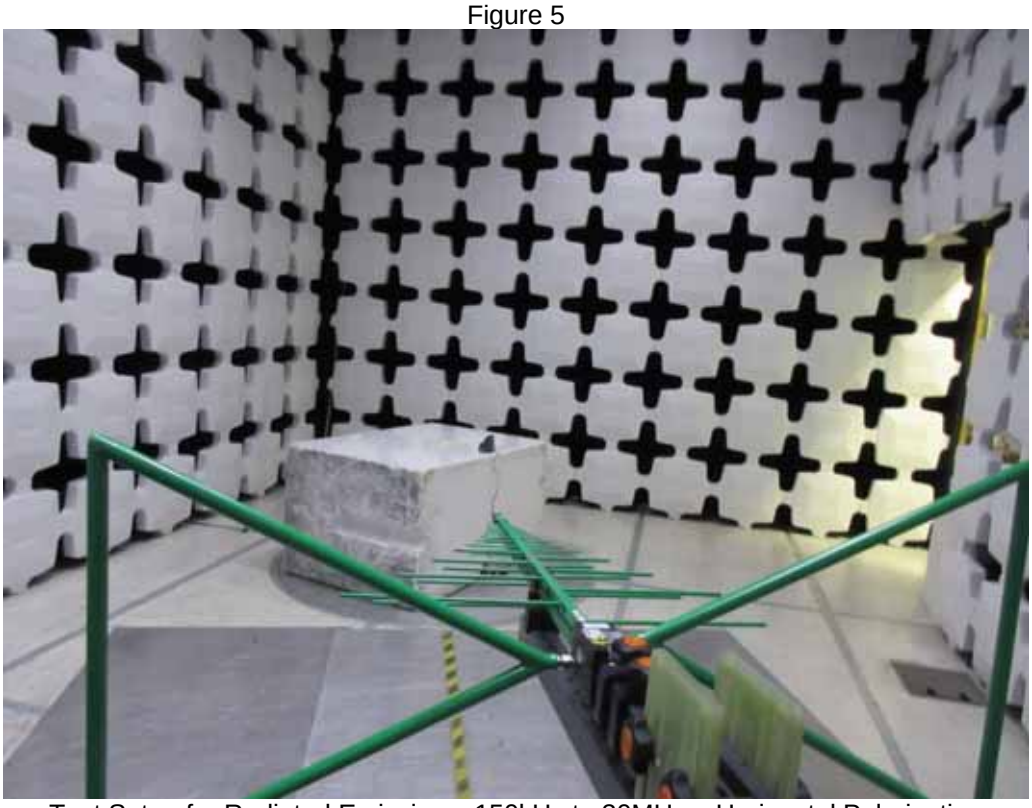


Test Setup for Radiated Emissions, 150kHz to 30MHz – Horizontal Polarization



Test Setup for Radiated Emissions, 150kHz to 30MHz – Vertical Polarization

Figure 5



Test Setup for Radiated Emissions, 150kHz to 30MHz – Horizontal Polarization

Test Setup for Radiated Emissions, 150kHz to 30MHz – Vertical Polarization

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC ON
Line Tested	:	115V, 60Hz HIGH
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:10:41 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 6 dB margin below limit

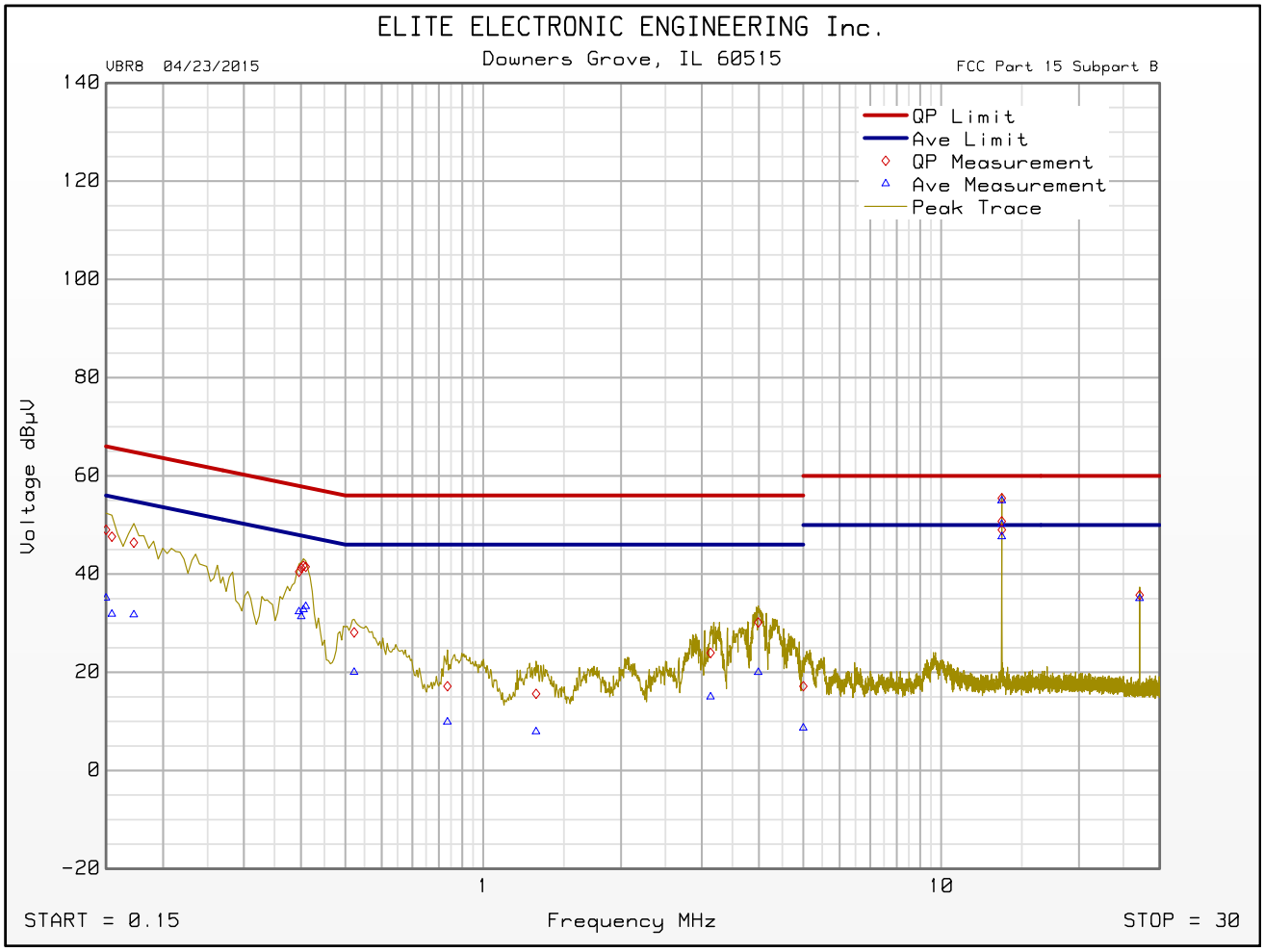
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	49.0	66.0		35.2	56.0	
0.405	41.7	57.8		32.8	47.8	
0.523	28.1	56.0		20.0	46.0	
0.835	17.2	56.0		9.9	46.0	
1.304	15.6	56.0		7.9	46.0	
3.137	24.0	56.0		15.0	46.0	
3.986	30.2	56.0		20.0	46.0	
5.000	17.2	56.0		8.7	46.0	
13.563	55.4	60.0		55.0	50.0	Yes
27.127	35.7	60.0		35.0	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC ON
Line Tested	:	115V, 60Hz HIGH
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:10:41 PM



Emissions Meet QP Limit
Emissions Exceed Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC ON
Line Tested	:	115V, 60Hz RETURN
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:17:02 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 6 dB margin below limit

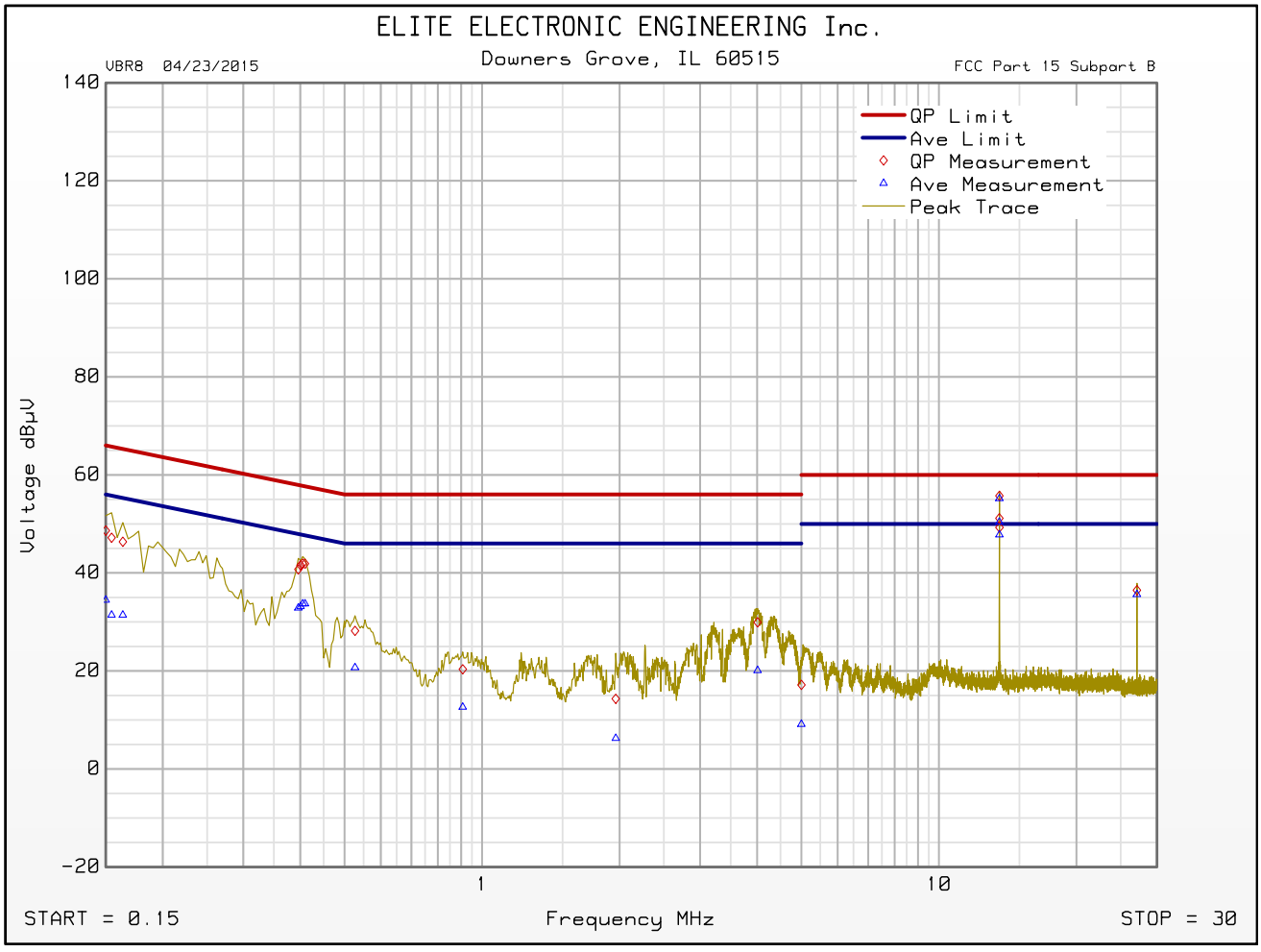
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	48.6	66.0		34.5	56.0	
0.410	41.9	57.7		33.7	47.7	
0.527	28.2	56.0		20.7	46.0	
0.907	20.3	56.0		12.6	46.0	
1.961	14.3	56.0		6.3	46.0	
4.009	29.9	56.0		20.1	46.0	
5.000	17.2	56.0		9.1	46.0	
13.563	55.7	60.0		55.2	50.0	Yes
27.127	36.5	60.0		35.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC ON
Line Tested	:	115V, 60Hz RETURN
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:17:02 PM



Emissions Meet QP Limit
Emissions Exceed Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC OFF
Line Tested	:	115V, 60Hz HIGH
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:28:52 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 6 dB margin below limit

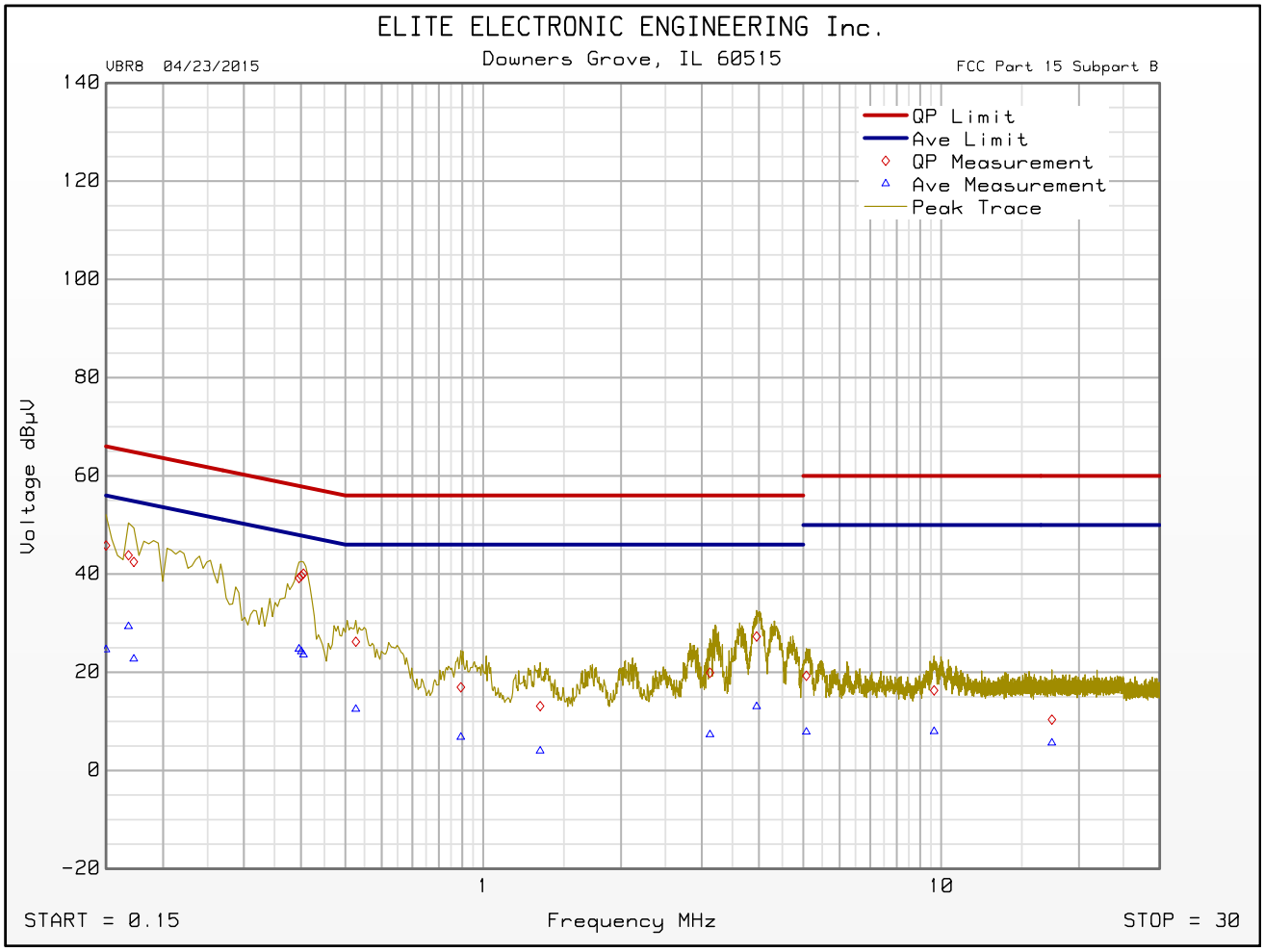
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	45.8	66.0		24.6	56.0	
0.405	40.1	57.8		23.6	47.8	
0.527	26.2	56.0		12.5	46.0	
0.894	17.0	56.0		6.8	46.0	
1.331	13.1	56.0		4.0	46.0	
3.128	19.9	56.0		7.3	46.0	
3.955	27.3	56.0		13.0	46.0	
5.077	19.3	60.0		7.9	50.0	
9.653	16.3	60.0		8.0	50.0	
17.452	10.4	60.0		5.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC OFF
Line Tested	:	115V, 60Hz HIGH
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:28:52 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC OFF
Line Tested	:	115V, 60Hz RETURN
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:22:48 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 6 dB margin below limit

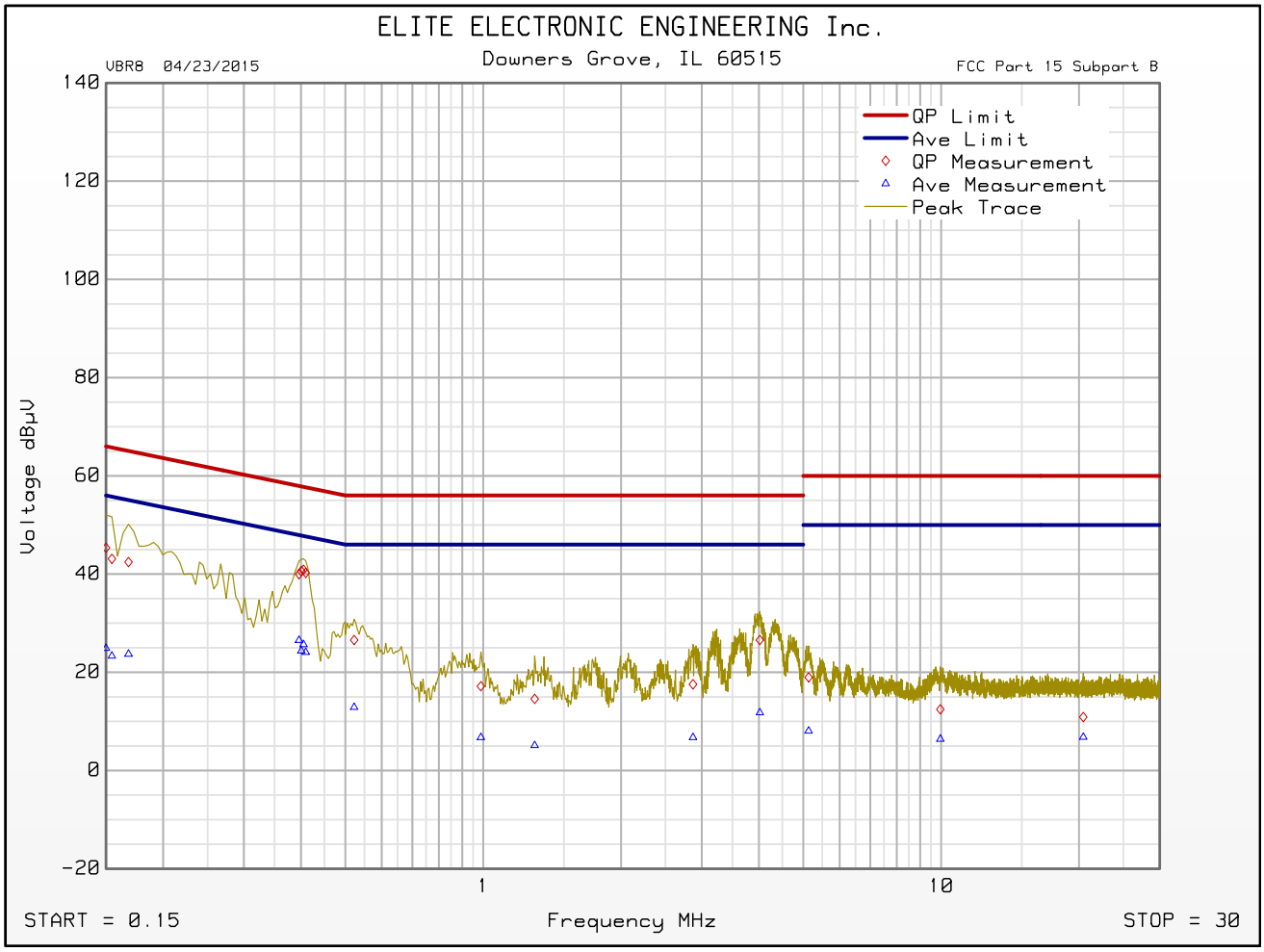
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	45.4	66.0		24.9	56.0	
0.405	40.9	57.8		25.7	47.8	
0.523	26.6	56.0		12.9	46.0	
0.988	17.2	56.0		6.7	46.0	
1.295	14.6	56.0		5.1	46.0	
2.871	17.6	56.0		6.7	46.0	
4.018	26.6	56.0		11.8	46.0	
5.135	19.0	60.0		8.1	50.0	
9.959	12.5	60.0		6.4	50.0	
20.431	10.9	60.0		6.8	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

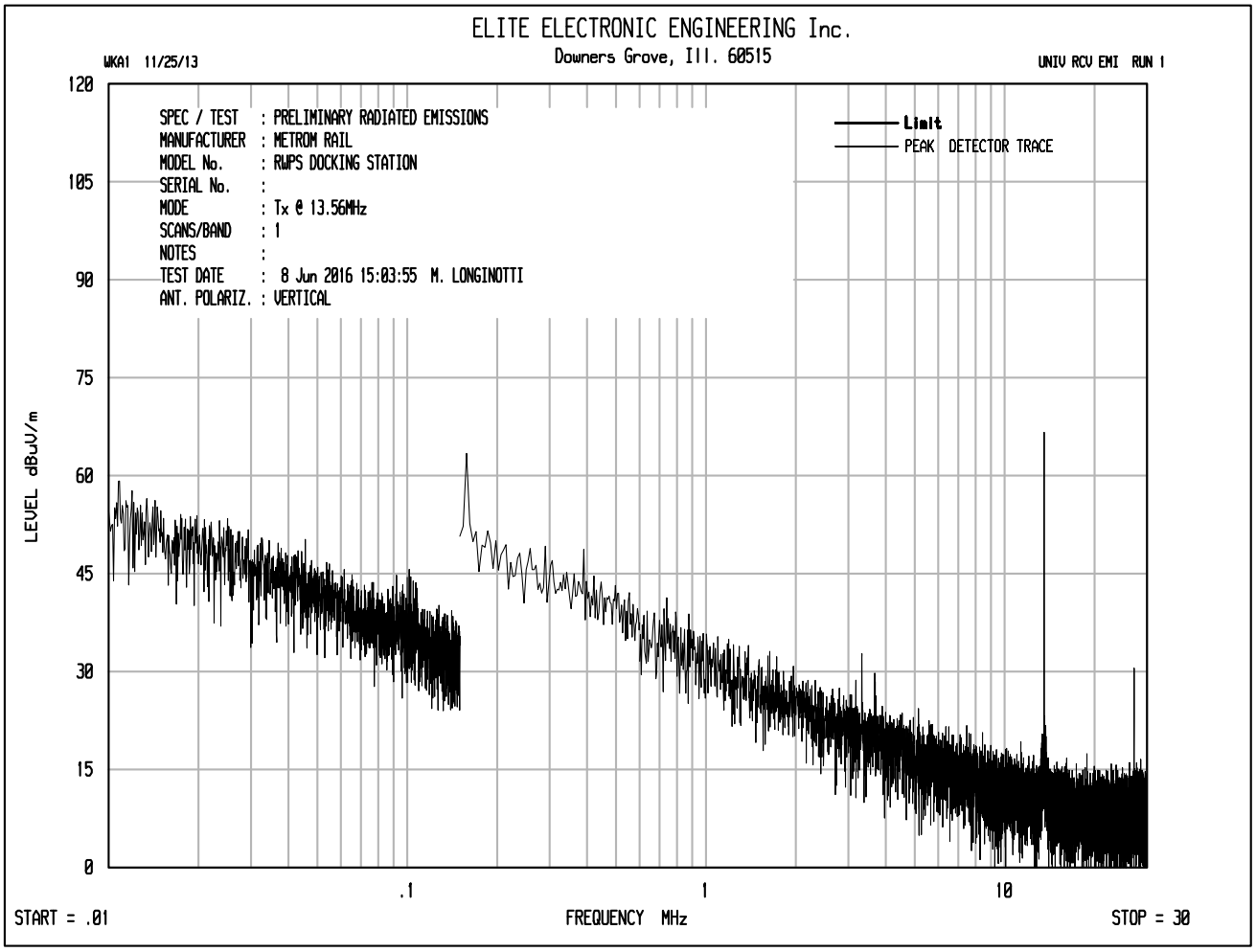
Cumulative Data

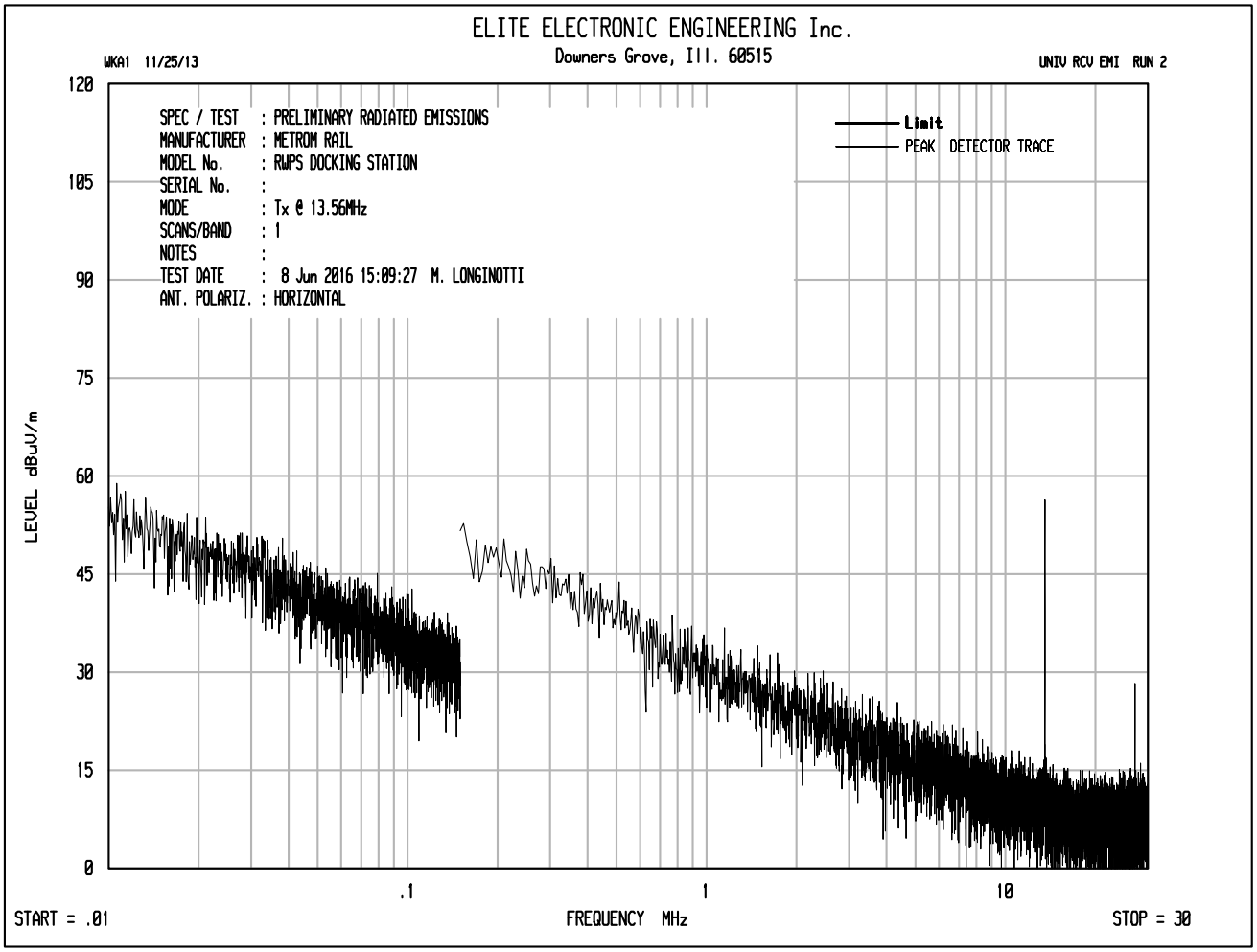
VBR8 04/23/2015

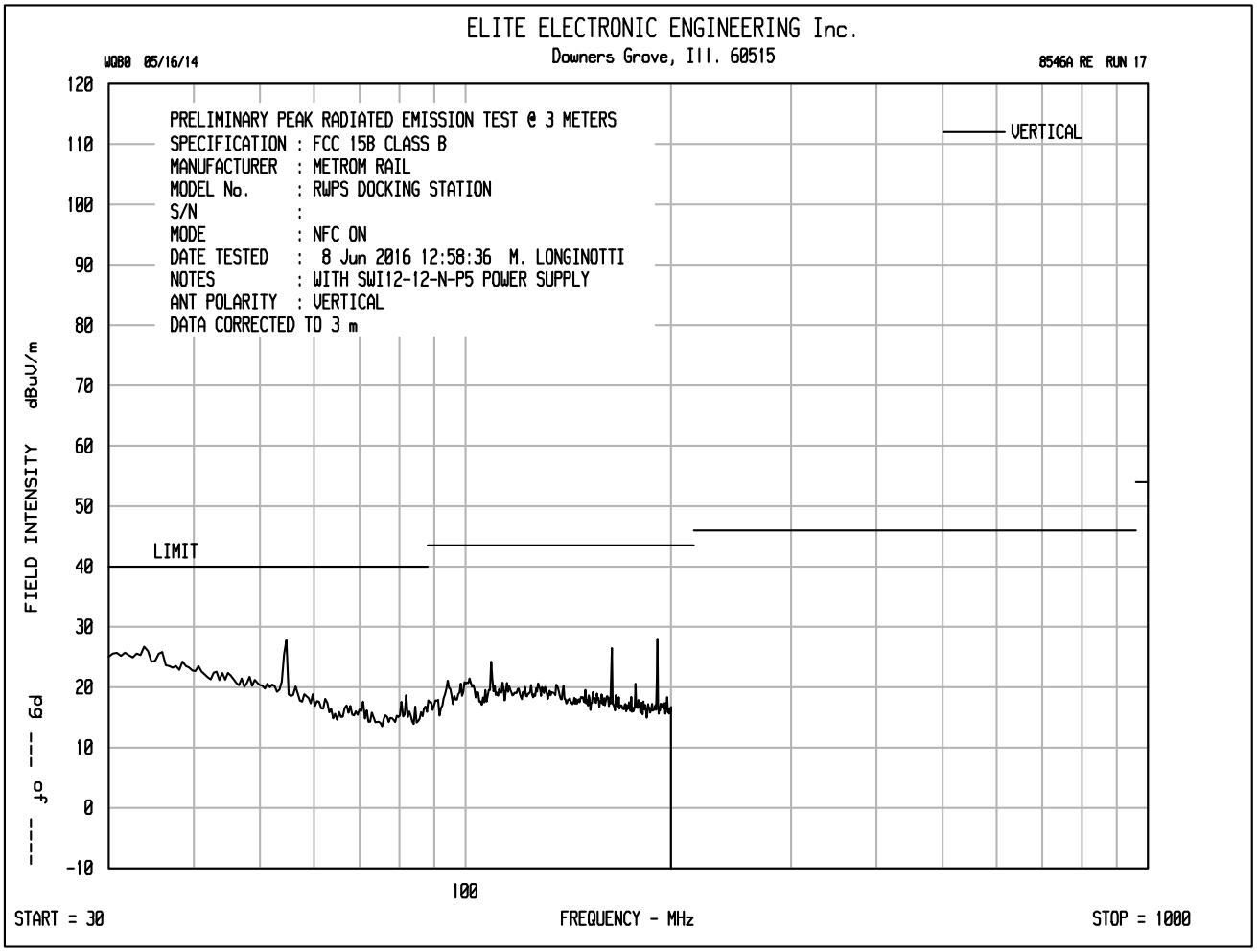
Manufacturer	:	METROM RAIL
Model	:	RWPS DOCKING STATION
DUT Revision	:	
Serial Number	:	
DUT Mode	:	NFC OFF
Line Tested	:	115V, 60Hz RETURN
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-6
Notes	:	TESTED WITH CUI AC ADAPTER SWI12-12-N-P5
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Jun 08, 2016 02:22:48 PM

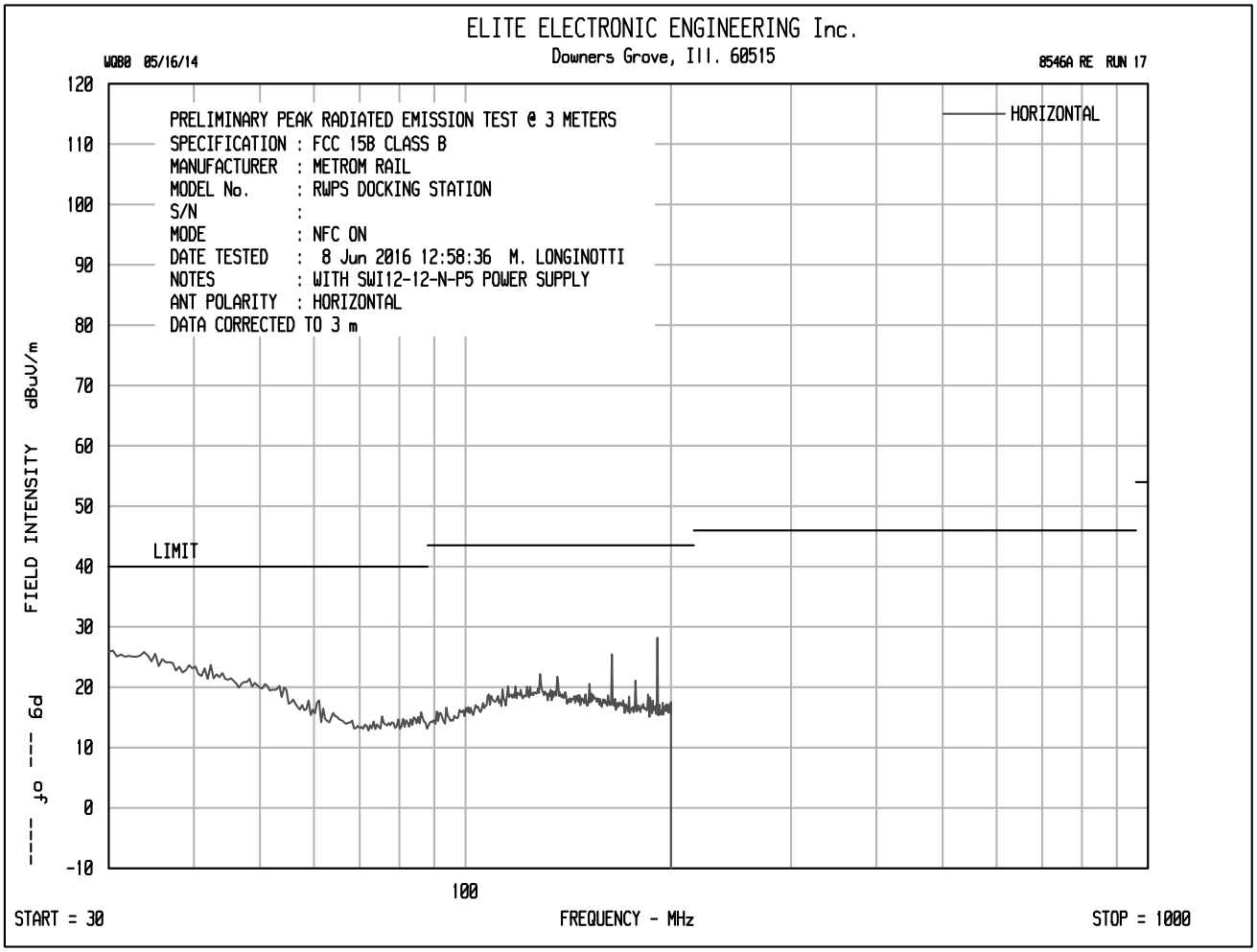


Emissions Meet QP Limit
Emissions Meet Ave Limit


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 1
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : METROM RAIL
MODEL No. : RWPS DOCKING STATION
SERIAL No. :
MODE : Tx @ 13.56MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 8 Jun 2016 15:03:55 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 11/25/13
UNIV RCV EMI RUN 2
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : METROM RAIL
MODEL No. : RWPS DOCKING STATION
SERIAL No. :
MODE : Tx @ 13.56MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 8 Jun 2016 15:09:27 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQB8 05/16/14
8546A RE RUN 17
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : METROM RAIL
MODEL No. : RWPS DOCKING STATION
S/N :
MODE : NFC ON
DATE TESTED : 8 Jun 2016 12:58:36 M. LONGINOTTI
NOTES : WITH SWI12-12-N-P5 POWER SUPPLY
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- uo --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQB8 05/16/14
8546A RE RUN 17
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : METROM RAIL
MODEL No. : RWPS DOCKING STATION
S/N :
MODE : NFC ON
DATE TESTED : 8 Jun 2016 12:58:36 M. LONGINOTTI
NOTES : WITH SWI12-12-N-P5 POWER SUPPLY
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- uo --- 6d
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000

Manufacturer : Metrom Rail
EUT : Docking Station
Model No. : STN112
Serial No. : None Assigned
Test Specification : FCC 15.209
Test Mode : Transmitting at 13.56MHz
Test Date : May 11, 2016
Test Distance : 3 meters

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
13.564	H	45.8		0.2	10.6	0.0	-40.0	16.6	6.8	30.0	30.0	-12.9
13.564	V	55.7		0.2	10.6	0.0	-40.0	26.5	21.2	30.0	30.0	-3.0
27.128	H	1.6		0.3	9.0	0.0	-40.0	-29.1	0.0	30.0	30.0	-58.7
27.128	V	2.1		0.3	9.0	0.0	-40.0	-28.6	0.0	30.0	30.0	-58.2

Checked By: MARK E. LONGINOTTI

Mark E. Longinotti

ETR No. 8546A
DATA SHEET TEST NO. 17

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : METROM RAIL
MODEL NO. : RWPS DOCKING STATION
SERIAL NO. :
TEST MODE : NFC ON
NOTES : WITH SWI12-12-N-P5 POWER SUPPLY
TEST DATE : 8 Jun 2016 12:58:36
TEST DISTANCE : 3 m

FREQUENCY	QP READING	ANT FAC	CBL FAC	EXT ATTN	DIST FAC	TOTAL	QP LIMIT	AZ	ANT HT	ANT POL
MHz	dBuV	dB	dB	dB	dB	dBuV/m	dBuV/m	deg	cm	
33.12	-5.9	23.8	.4	0.0	0.0	18.2	40.0	315	200	V
53.65	-1.5	17.4	.4	0.0	0.0	16.3	40.0	45	120	H
54.24	9.3	17.0	.4	0.0	0.0	26.6	40.0	45	120	V
81.36	1.3	12.9	.4	0.0	0.0	14.5	40.0	180	200	V
108.49	4.5	16.8	.4	0.0	0.0	21.7	43.5	0	120	V
129.82	-7.9	18.3	.5	0.0	0.0	10.9	43.5	0	120	H
135.79	-7.6	17.8	.5	0.0	0.0	10.7	43.5	0	200	V
162.74	9.5	16.0	.6	0.0	0.0	26.2	43.5	0	120	V
162.74	1.3	16.0	.6	0.0	0.0	17.9	43.5	90	200	V
170.51	-7.6	15.6	.7	0.0	0.0	8.7	43.5	90	120	H
176.30	4.2	15.4	.7	0.0	0.0	20.3	43.5	135	200	H
189.86	.2	15.1	.7	0.0	0.0	16.0	43.5	45	200	V
189.86	11.5	15.1	.7	0.0	0.0	27.3	43.5	135	120	H

QP TESTS WERE PREMATURELY ABORTED

tested by: MARK E. LONGINOTTI
M. LONGINOTTI