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CERTIFICATION TEST REPORT

Manufacturer: Deister Electronic GmbH
11 Hermann Bahlsen Str
Barsinghausen 30890 GERMANY

Applicant: Deister Electronics USA, Inc.
8576 Wellington Road
Manassas, Virginia 20109 USA

Product Name: RHX2 doorLoxx Read Head (Prox)

Product Description: Digital Locking System Read Head. Reads common (920.8 MHz) Proximity Credentials and determines right of access.

Operating Voltage/Frequency: Battery-Operated (3VDC)

Model: RHX2

FCC ID: IXLRHX

Testing Commenced: April 20, 2020

Testing Ended: July 6, 2020

Summary of Test Results: **In Compliance**

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- ❖ **FCC Part 15 Subpart C, Section 15.249**
- ❖ **FCC Part 15 Subpart C, Section 15.215(c) – Additional provisions to the general radiated emission limitations**
- ❖ **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**



Order Number: F2P23173

Applicant: Deister Electronics USA, Inc.

Model: RHX2

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to the 2013 version of ANSI C63.10 and recommended FCC procedure of measurement for devices operating under Section 15.249. A list of the measurement equipment can be found in Section 6.



1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of k=2. The Uncertainty for a laboratory is referred to as *U_{lab}*. For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the *U_{cispr}* values to determine if a specific margin is required to deem compliance.

U_{lab}

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

U_{cispr}

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If *U_{lab}* is less than or equal to *U_{cispr}*, then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If *U_{lab}* is greater than *U_{cispr}* in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by (*U_{lab}* – *U_{cispr}*), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by (*U_{lab}* – *U_{cispr}*), exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.



1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2P23173-03E	First Issue	July 7, 2020	K. Littell



2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
-20dB Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
Field Strength of Emissions	CFR 47 Part 15.249(a)(d)	Complies
Conducted Emissions	CFR 47 Part 15.207(a)	N/A
Variation of the Input Power	CFR 47 Part 15.231(e)	Complies*

**Requirements of 15.31(e) were met by using new batteries.*

Modifications Made to the Equipment
None



3 TABLE OF MEASURED RESULTS

Test	920.8 MHz
Field Strength of Fundamental	73.5 dB μ V/m, 4.7 mV/m
Limit for Fundamental	94 dB μ V/m, 50 mV/m
-20dB Occupied Bandwidth	0.128 MHz

The -20dB bandwidth of the emission shall be contained within the frequency band designated in the rule section under which the equipment is operated.



4 ENGINEERING STATEMENT

This report has been prepared on behalf of Deister Electronics USA, Inc. to provide documentation for the testing described herein. This equipment has been tested and found to comply with part 15.249 of the FCC Rules using ANSI C63.10 2013 standard. The test results found in this test report relate only to the items tested.



5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: **RHX2 doorLoxx Read Head (Prox)**

Model: RHX2

Serial No.: Apr. 3, 2020 testing, S01; July 6, 2020 testing, Test3

FCC ID: IXLRHX

5.2 Trade Name:

Deister Electronics USA Inc.

5.3 Power Supply:

Battery-Operated

5.4 Applicable Rules:

CFR 47, Part 15.249

5.5 Equipment Category:

DXT

5.6 Antenna:

0dBi Gain Integral Antenna

5.7 Accessories:

N/A

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

EUT was set to continuously transmit on the single frequency of 920.8 MHz. Firmware: L83x_DLD_125kHz_920MHz_PN9.

**6 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	Jan. 3, 2021
Temp/Hum. Recorder	CL261	Extech	445814	04	Feb. 12, 2021
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Oct. 21, 2020
Low Loss Cable Set	--	Pasternack	PE3C0666-252 / PE3C066-50CM	None Spec.	Aug. 31, 2020
Antenna, Bilog	CL211	Sunol Sciences, Inc.	JB1	A021017	Oct. 3, 2020
Horn Antenna	CL098	Emco	3115	9809-5580	Jan. 31, 2021
Preamplifier	CL153	Agilent	83006-69007	MY39500791	Aug. 5, 2020
Amplifier w/Monopole & 18" Loop	CL163-Loop	AH Systems, Inc.	EHA-52B	100	July 24, 2020
Software:	Tile Version 3.4.B.3		Software Verified: Apr. 20, 2020		
Software:	EMC 32, Version 8.53.0		Software Verified: Apr. 20, 2020		



7 FCC PART 15.215(e), OCCUPIED BANDWIDTH

7.1 Requirements:

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the -20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

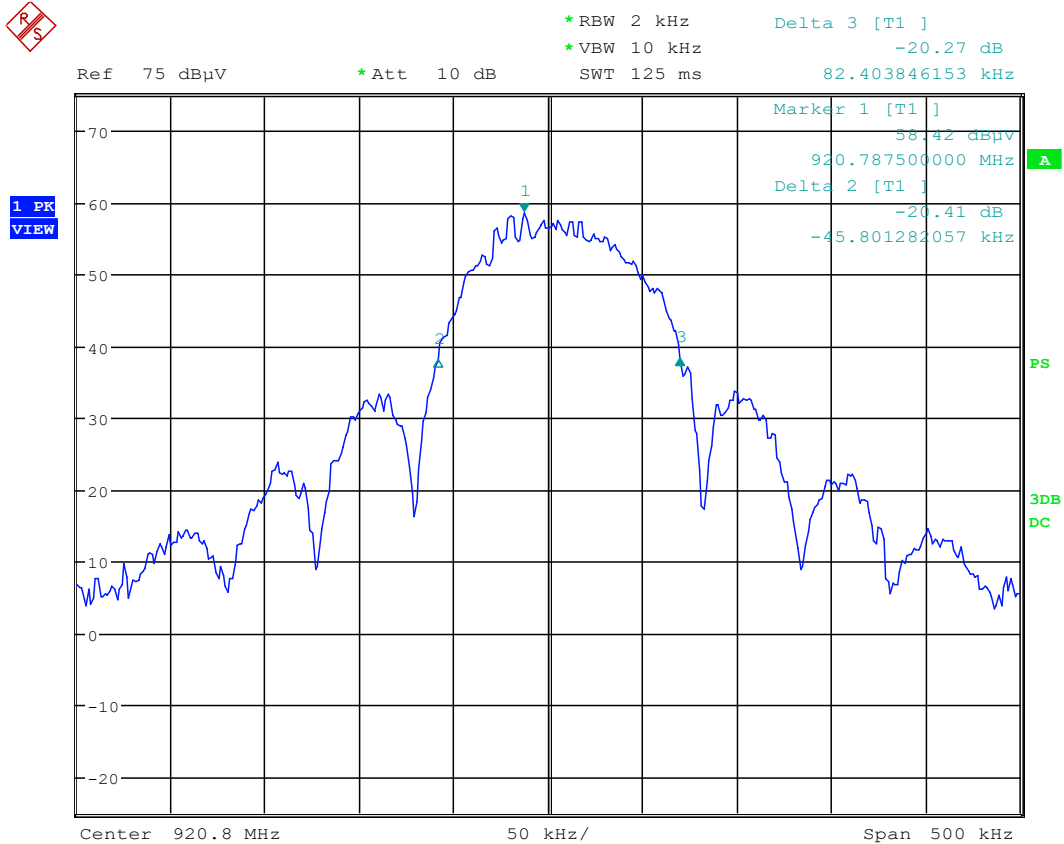
Bandwidth measurements were made at the 920.8 MHz frequency. The bandwidth was measured using the marker delta method.



7.2 Occupied Bandwidth Test Data

Test Date(s):	July 6, 2020	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.215(c)	Air Temperature:	23.9°C
		Relative Humidity:	38%

920.8 MHz: -20dB



Date: 6.JUL.2020 16:27:10



8 FCC PART 15.249(a)(d) – FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

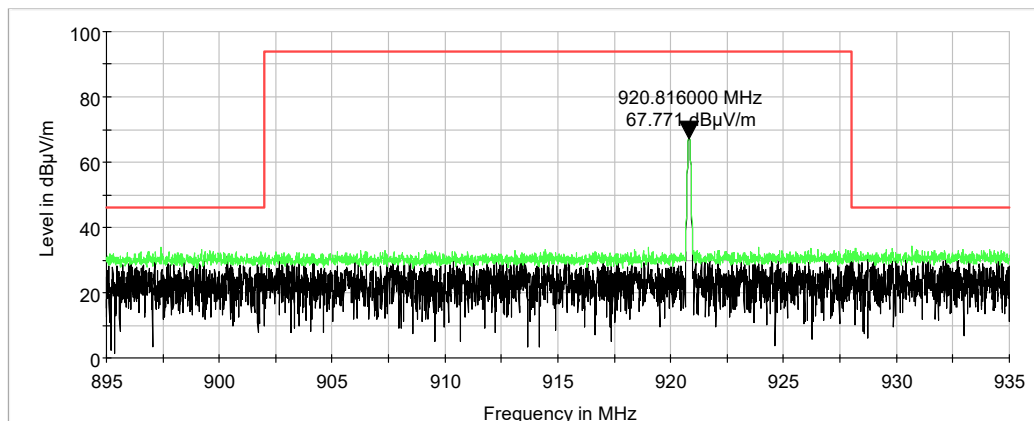
NOTE: During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions.



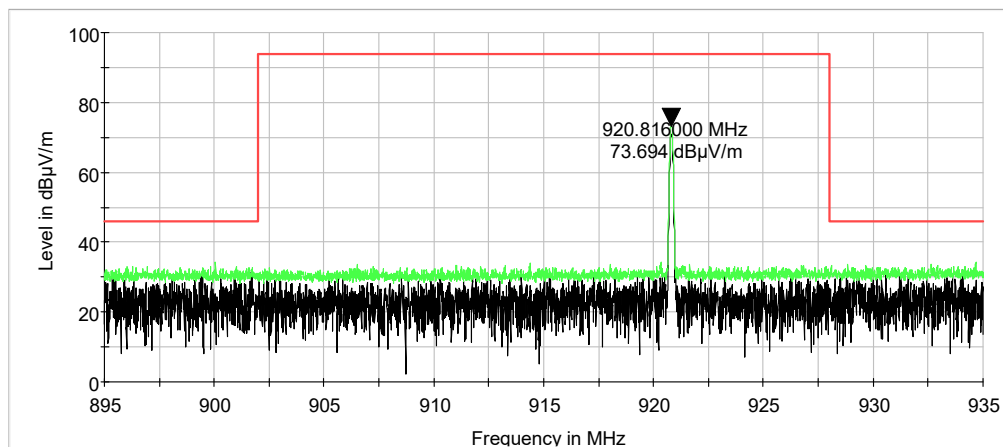
8.1 Test Data - Field Strength of Emissions from Intentional Radiators

Test Date(s):	Apr. 20, 2020	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(a)	Air Temperature:	23.3°C
		Relative Humidity:	23%

Characterization Scan, In Band, Vertical



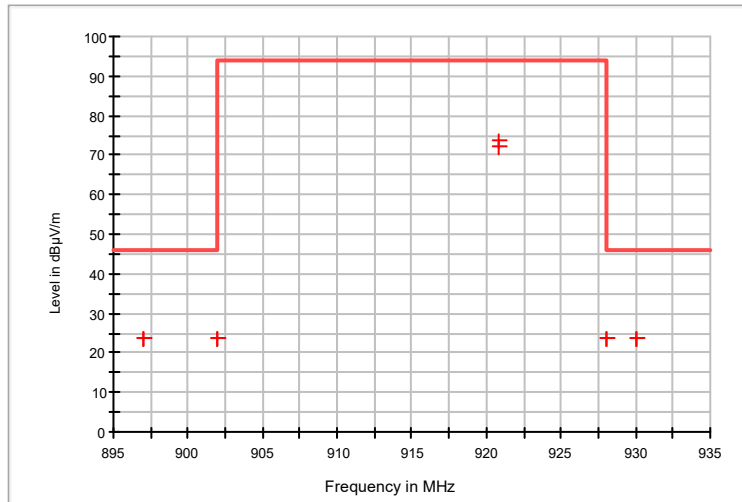
Characterization Scan, In Band, Horizontal





Band Edge Measurements

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dB μ V)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
897.000000	V	122.00	0.00	11.5	12.3	23.80	46.0	-22.2
897.000000	H	100.00	51.00	11.5	12.3	23.80	46.0	-22.2
902.000000	H	100.00	51.00	11.7	12.2	23.90	46.0	-22.1
902.000000	V	122.00	0.00	11.7	12.2	23.90	46.0	-22.1
920.800000	V	122.00	0.00	59.6	12.4	72.00	94.0	-22.0
920.800000	H	100.00	51.00	61.1	12.4	73.50	94.0	-20.5
928.000000	V	122.00	0.00	10.8	12.7	23.50	46.0	-22.5
928.000000	H	100.00	51.00	10.8	12.7	23.50	46.0	-22.5
930.000000	V	122.00	0.00	10.9	12.7	23.60	46.0	-22.4
930.000000	H	100.00	51.00	10.9	12.7	23.60	46.0	-22.4





8.2 Test Data – Spurious Emissions

Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

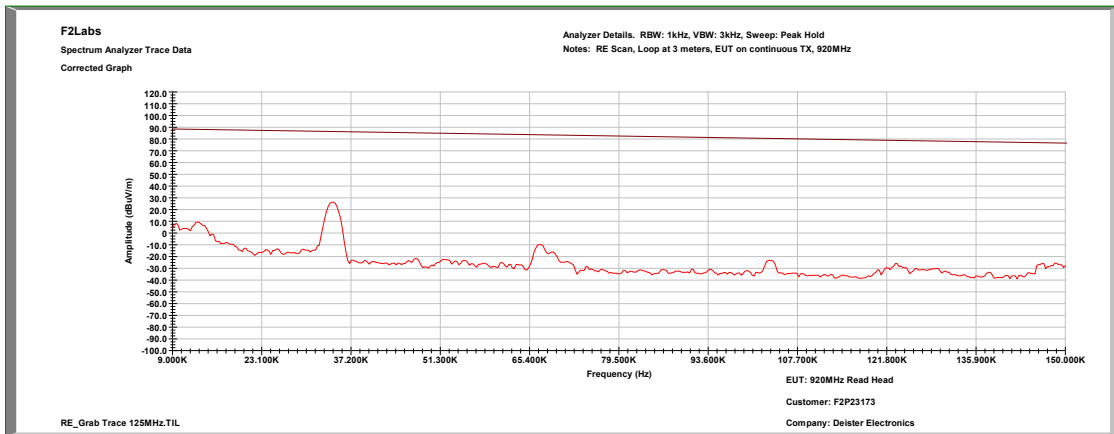
At least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. Frequencies below 1 GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Frequencies were scanned from 9kHz to 13 GHz and the highest emissions are listed below.

In the following plots, the black line indicates ambient noise and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below. The following graphs represent scans at the 920.8 MHz frequency.

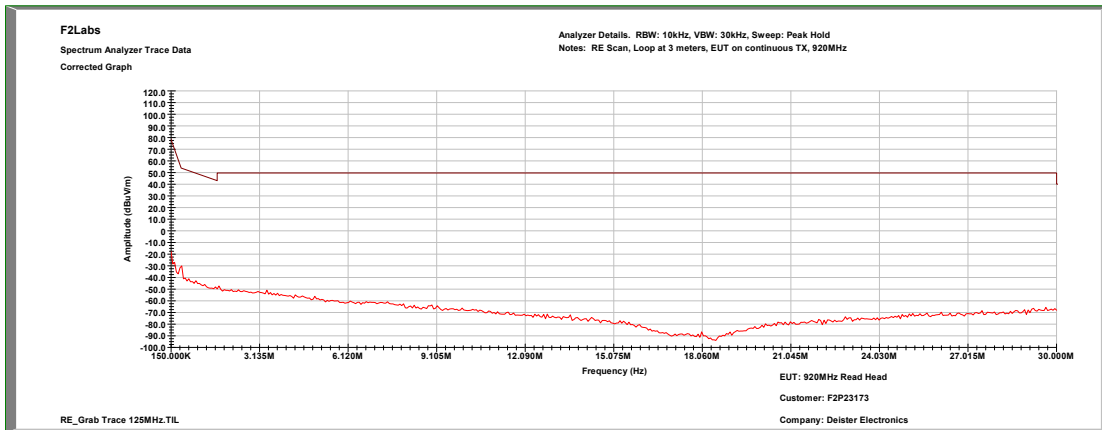


Test Date(s):	Apr. 20, 2020	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(d) / Part 15.209	Air Temperature:	21.7°C
		Relative Humidity:	25%

Characterization Scan, 0.009 MHz to 0.15 MHz (Loop)

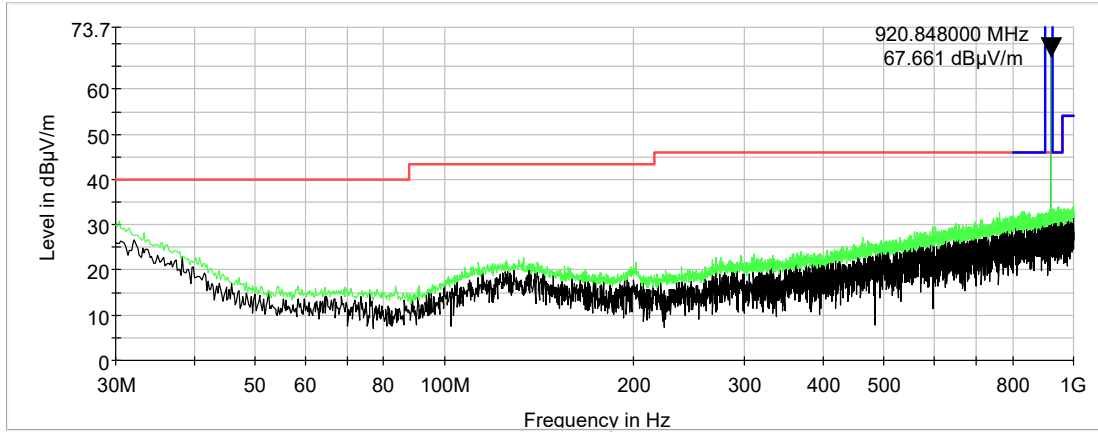


Characterization Scan, 0.15 MHz to 30 MHz (Loop)

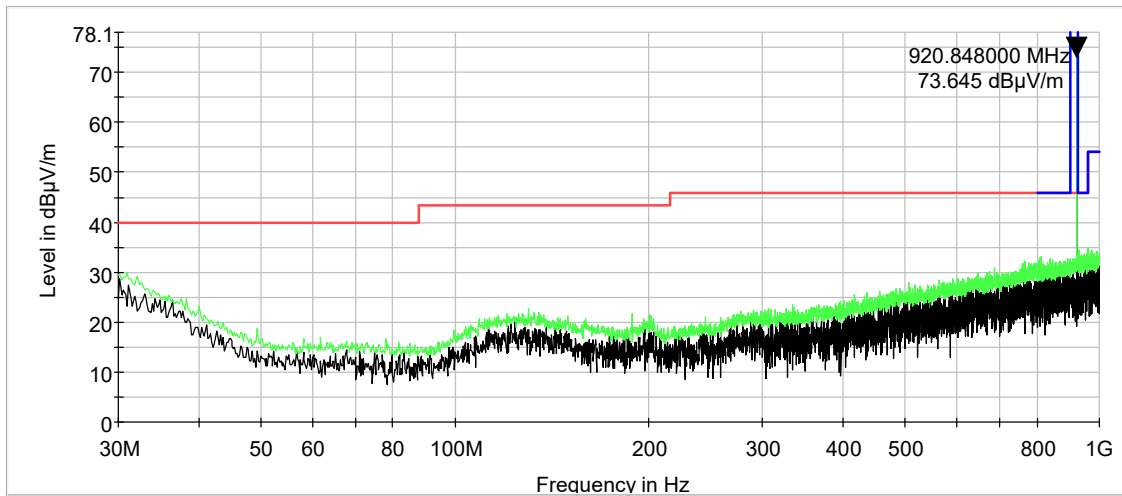




Characterization Scan, 30 MHz to 1000 MHz, Vertical

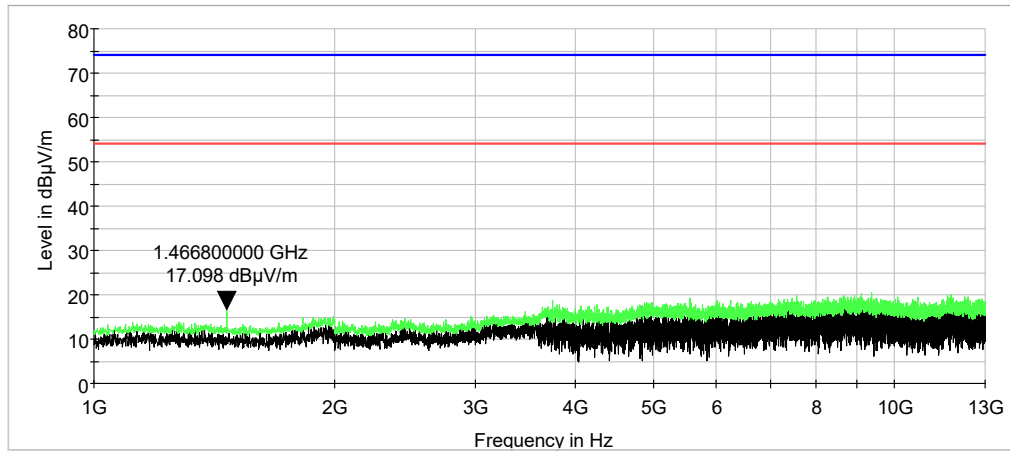


Characterization Scan, 30 MHz to 1000 MHz, Horizontal

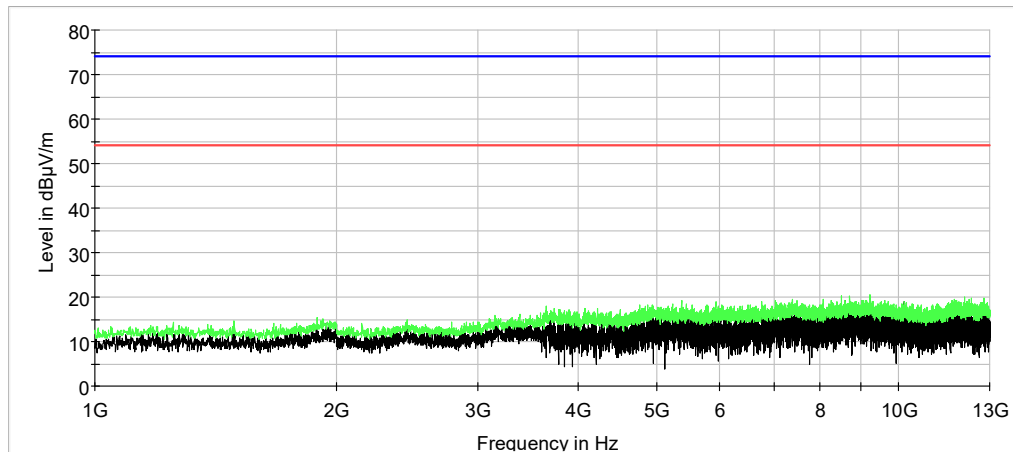




Characterization Scan, 1 GHz to 13 GHz, Vertical



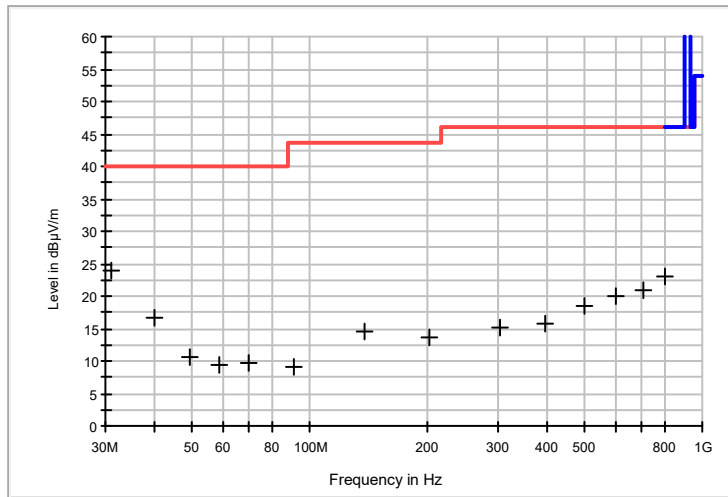
Characterization Scan, 1 GHz to 13 GHz, Horizontal





Measurements

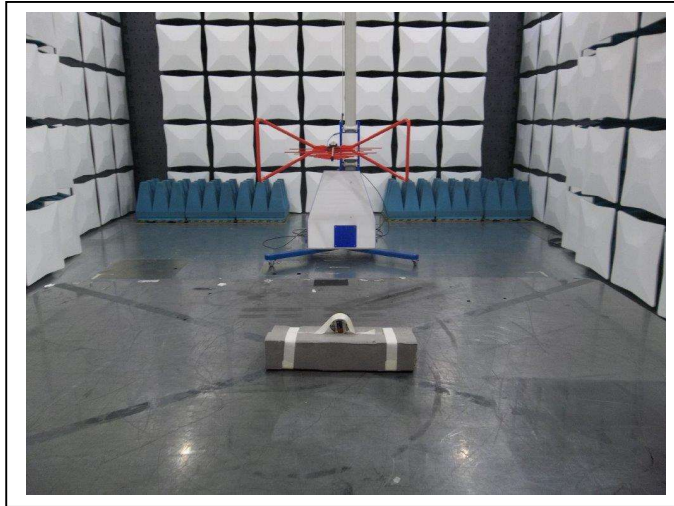
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.960000	V	100.00	0.00	17.4	6.4	23.80	40.0	-16.2
40.080000	H	100.00	0.00	17.2	-0.5	16.70	40.0	-23.3
49.200000	H	100.00	0.00	16.5	-6.0	10.50	40.0	-29.5
58.520000	V	100.00	0.00	16.4	-7.1	9.30	40.0	-30.7
69.760000	H	100.00	0.00	16.1	-6.4	9.70	40.0	-30.3
91.120000	V	100.00	0.00	15.7	-6.5	9.20	43.5	-34.3
137.680000	V	100.00	0.00	14.8	-0.2	14.60	43.5	-28.9
201.680000	V	100.00	0.00	13.8	-0.1	13.70	43.5	-29.8
305.080000	H	100.00	0.00	13.4	1.7	15.10	46.0	-30.9
397.040000	V	100.00	0.00	11.9	3.8	15.70	46.0	-30.3
503.360000	H	100.00	0.00	11.9	6.6	18.50	46.0	-27.5
604.440000	V	100.00	0.00	11.8	8.1	19.90	46.0	-26.1
706.280000	H	100.00	0.00	11.4	9.5	20.90	46.0	-25.1
801.520000	V	100.00	0.00	12.0	11.0	23.00	46.0	-23.0





9 PHOTOGRAPHS

**Occupied Bandwidth, Field Strength of Emissions;
Radiated Spurious, 30 MHz to 1000 MHz**



Radiated Spurious, Less Than 30 MHz





Radiated Spurious, Greater than 1 GHz

