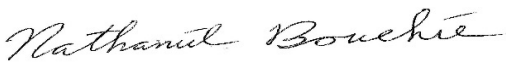
Engineering Test Report No. 2203379-03 Rev A	
Report Date	December 8, 2022
Manufacturer Name	Helios Engineering
Manufacturer Address	15926 University Oak San Antonio, TX 78249
Product Name Brand/Model No.	RCDGM07-01
Date Received	November 17, 2022
Test Dates	November 17, 2022 – November 30, 2022
Specifications	EN 12895 EN 61326-1 EN 60945 EN 55035 EN 301 489-1/17
Laboratory	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515
Signature	
Tested by	Nathaniel Bouchie
Signature	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894
PO Number	PO08

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the EN 12895 and RED Test Specification(s) test specifications. The data presented in this test report pertains to the EUT on the test dates specified. Any electrical or mechanical modifications 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.

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1. Report Revision History

Revision	Date	Description
–	12 DEC 2022	Initial Release of Engineering Test Report No. 2203379-03
A	20 JAN 2023 by Nathaniel Bouchie	– Throughout Report: Changed the Engineering Test Report No. 2203379-03 Rev A. – Section 21: Updated Radiated Emissions data with new results. – Section 22: Updated Conducted Emissions data with new results.

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on a RCD Touch Screen Display/Controller (hereinafter referred to as the Equipment Under Test (EUT)).

The EUT was identified as follows:

EUT Identification	
Product Description	RCD Touch Screen Display/Controller
Model/Part No.	RCDGM07-01
S/N	303010
Software/Firmware Version	Kirkstone DT Overlay QT Browser (dotcom fixed)
Size of EUT	7.25 in x 4.75 in x 1.75 in
Number of Interconnection Wires	18
Type of Interconnection Wires	12AWG Power, I/O, Fiber Optic
Highest Internal Frequency of the EUT:	2480MHz

The EUT listed above was used throughout the test series.

3. Power Input

The EUT obtained 12VDC power via two 12AWG, 1-foot wires during emissions tests.

The EUT obtained 24VDC power via two 12AWG, 1-foot wires during immunity tests.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
Load Box	N/A	N/A
Support Laptop	N/A	H2R9P32
Load Box (Replacement)	N/A	N/A
Bluetooth Speaker	N/A	41.42.41.96.4A.4F

6. Interconnect Leads

The following interconnect cables were submitted with the test item:

Item	Description
14 Pin Harness	Connects EUT to Load Box
COM Fiber Optic	Connects EUT to Support Laptop
RS485 Fiber Optic	Connects EUT to Support Laptop

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

The EMC tests were performed with the EUT operating in one or more of the test modes described below.

See the specific test section for the applicable test modes.

8.1. Tx Standby

This mode was achieved by applying 12VDC to the EUT with the support equipment attached. The support equipment software was used to turn on the following settings on the EUT:

- Output 1
- Output 2
- Buzzer at 100% volume and 2837MHz

8.2. BLE and WiFi Connected

The support equipment software was used to turn on the following settings on the EUT:

- Output 1
- Output 2
- Buzzer at 100% volume and 2837MHz
- BLE and WiFi Connected

9. Test Specifications

The tests were performed to selected portions of, and in accordance with the following test specifications:

Reference Number	Title of Standard	Year	Amendments/ Version	Listed in Official Journal
EN 12895	Industrial Trucks – Electromagnetic Compatibility	2015	A1:2019	Yes
EN 61326-1	Electrical equipment for measurement, control, and laboratory use – EMC requirements – Part 1: General requirements	2013	Ed 2.0	Yes
EN 60945	Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results	2002	A1:2008	Yes
EN 55032	Electromagnetic compatibility of multimedia equipment – Emission requirements	2015	A11:2020	Yes
EN 55035	Electromagnetic compatibility of multimedia equipment - Immunity requirements	2017	A11:2020	Yes
EN 301 489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements	2011	V1.9.2	Yes
EN 301 489-17	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonized Standard for ElectroMagnetic Compatibility	2020	V3.2.4	No
IEC 61000-4-2	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	2008	Ed 2.0	No
IEC 61000-4-3	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field immunity test	2020	Ed 4.0	No
IEC 61000-4-4	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	2014	Ed 3.0	No

IEC 61000-4-5	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	2017	Ed 3.1	No
IEC 61000-4-6	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	2013	Ed 4.0	No
IEC 61000-4-8	Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test	2009	Ed 2.0	No

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Helios Engineering and used in conjunction with the specifications listed in section 9 of this document.

11. Deviation, Additions to, or Exclusions from Test Specifications

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

12. Laboratory Conditions

Ambient Parameters	Value
Temperature	21.9°C
Relative Humidity	22%
Atmospheric Pressure	1021.4mb

13. Summary

The following EMC tests were performed, and the results are shown below:

Test Description	Test Method	Results
RF Radiated Emissions Test	EN 55032	Conforms
RF Conducted Emissions Test (DC Power Ports)	EN 55032	Conforms
Radiated Immunity Test Details	EN 61000-4-3	Conforms
Electrostatic Discharge (ESD) Test	EN 61000-4-2	Conforms
RF Common Mode Test	EN 61000-4-6	Conforms

14. Immunity Monitoring

The EUT was monitored visually, by camera if needed, for any change in state; more specifically, any flickering, dimming or unexpected change in state. Support software was also used to monitor the EUT for any undesirable change in state.

15. Immunity Criteria

The EUT shall adhere to the following performance criteria as stated in the EN 301 489 Standard:

Performance criteria for continuous phenomena applied to transmitters and receivers:

During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test, the EUT shall not unintentionally transmit or change its actual operating state and stored data. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for transient phenomena applied to transmitters and receivers:

After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for voltage interruption applied to transmitters and receivers:

- In the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena shall apply.
- In the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator.
- No unintentional responses shall occur at the end of the test.
- In the event of loss of function(s) or in the event of loss of user stored data, this fact shall be recorded in the test report.

16. Sample Calculations

For Powerline Conducted Emissions:

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).

For Antenna Port Conducted Emissions:

The resultant power level (PL) is a summation in decibels (dB) of the receiver meter reading (MTR), the cable loss factor (CF) and any external attenuation (EA).

Formula 1: PL (dBm) = MTR (dBm) + CF (dB) + EA (dB).

For Radiated Emissions:

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]

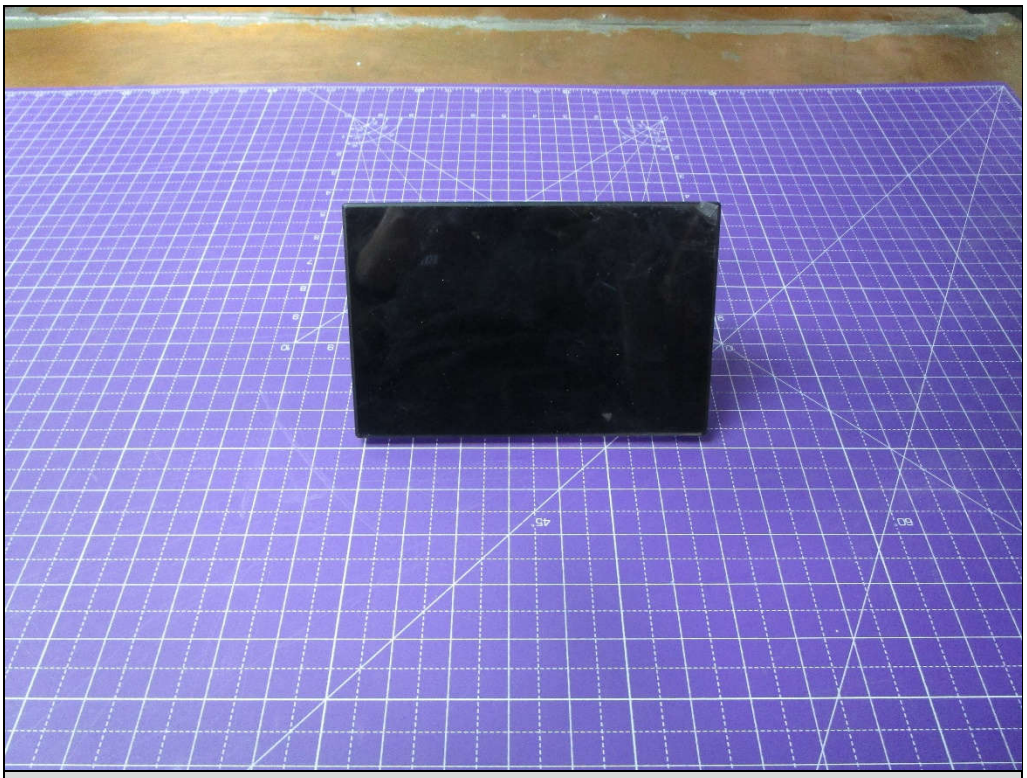
17. Statement of Conformity

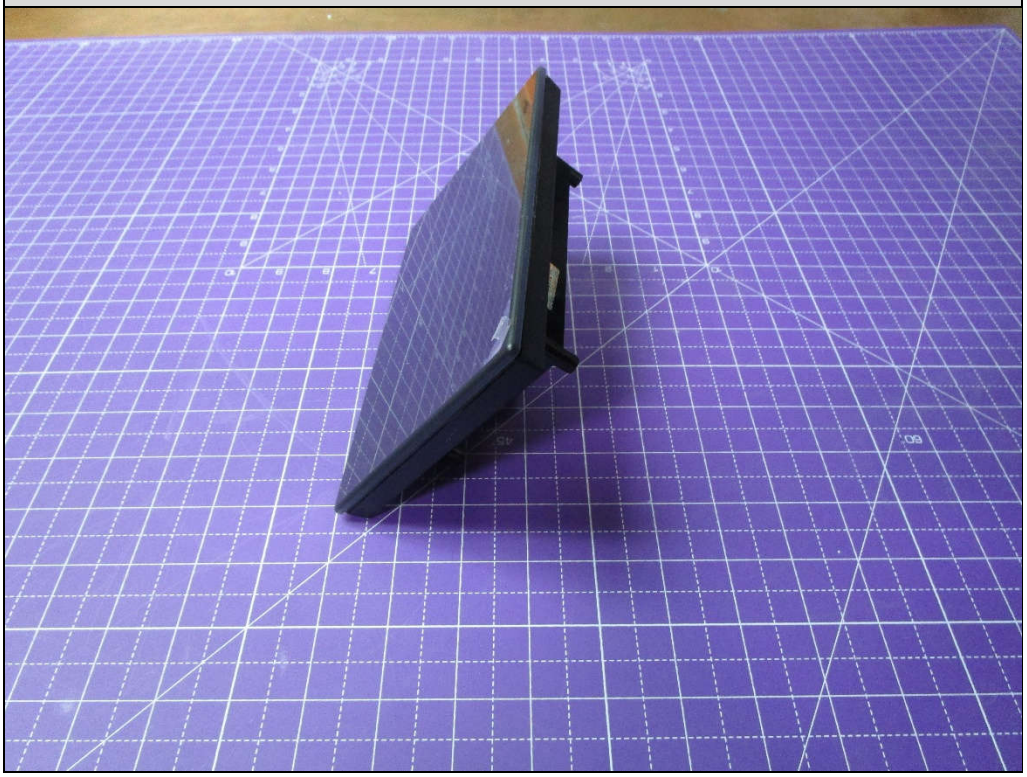
The Helios Engineering RCD Touch Screen Display/Controller, Model No.RCDGM07-01, Serial No. 303010, did fully conform to the selected requirements of the EN 12895, EN 61326-1, EN 60945, EN 55035, and EN 301 489-1/17 specifications.

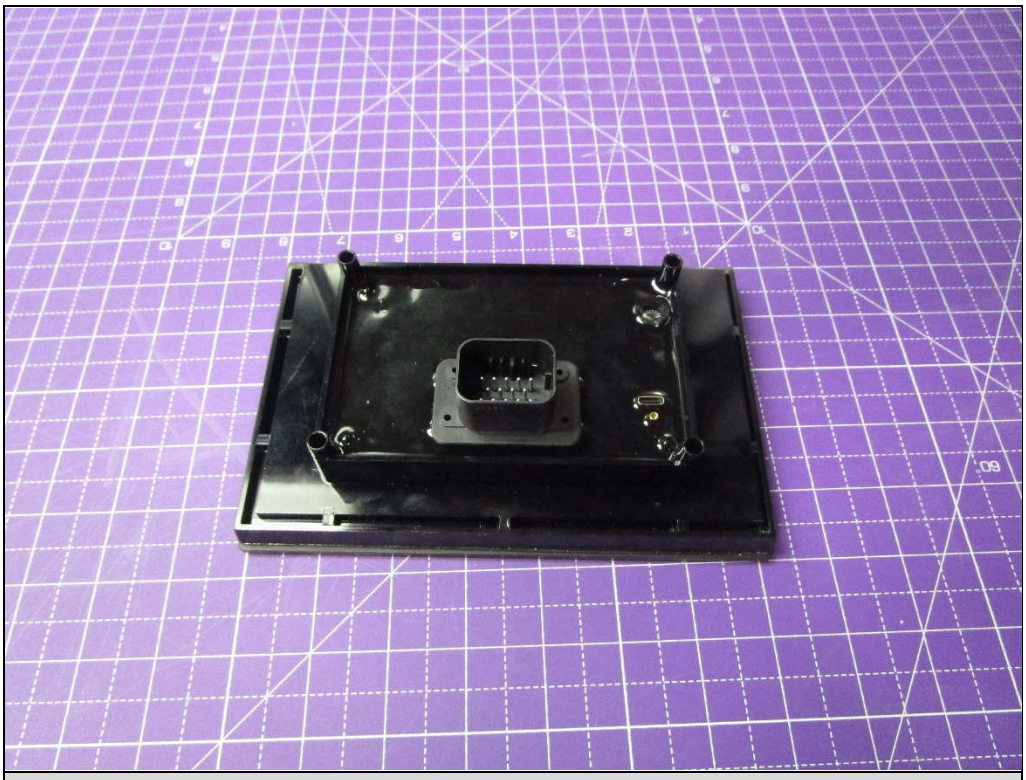
18. Certification

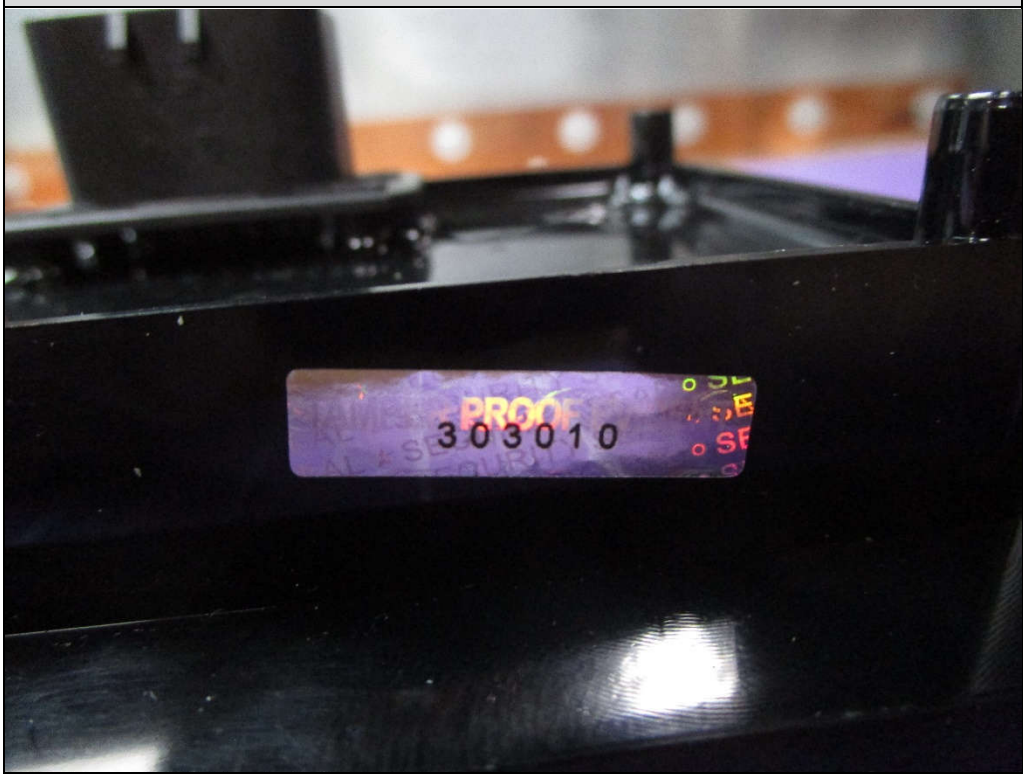
Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications listed in section 9 of this document. The data presented in this test report pertains to the EUT on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

19. Photographs of EUT





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303010

20. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
ACV0	BROADBAND POWER AMPLIFIER	AMPLIFIER RESEARCH	75A220	17806	0.01-220MHZ	NOTE 1	
APW14	PREAMPLIFIER	PLANAR	PE2-35-120-5R0-10-12-SFF	PL22671	1-20GHz	9/21/2022	9/21/2023
AWF4	RF POWER AMPLIFIER	OPHIR	5295FE	1001	.7-6GHZ	NOTE 1	
AWG2	AMPLIFIER	TESEQ	CBA400M-260	T44874	.01-400MHZ	CNR	
CDW6	DESKTOP COMPUTER	ELITE	PENTIUM 4	007	3.8 GHZ	N/A	
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
CDZ4	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GBN9	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 02	61400238	9KHZ-2.080GHZ	2/28/2022	2/28/2023
GRE0	SIGNAL GENERATOR	AGILENT TECHNOLOGIES	E4438C	MY42083127	250KHZ-6GHZ	3/7/2022	3/7/2023
MEA3	MICRO-OHM METER	KEITHLEY	580	772667	10UOHM-200KOHM	6/6/2022	6/6/2023
MPE2	DUAL POWER METER	HEWLETT PACKARD	E4419B	US38470135	0.1MHZ-50GHZ	2/18/2022	2/18/2023
MPI2	POWER SENSOR	KEYSIGHT	E9304A	MY55420009	9KHZ-6GHZ	5/13/2022	5/13/2024
NSA7	LOG PERIODIC ANTENNA	AMPLIFIER RESEARCH	AT1080	14239	80-1000MHZ	NOTE 1	
NSDS1	UNIVERSAL SPHERICAL DIPOLE SOURCE	AET	USDS-H	AET-1116		NOTE 1	
NTA2	BILOG ANTENNA	TESEQ	6112D	28040	25-1000MHz	5/19/2022	5/19/2024
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	10/26/2022	10/26/2024
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/27/2022	4/27/2024
PCC1	CURRENT PROBE	ELECTRO-METRICS	PCL-25	203	0.001-100MHZ	11/17/2022	11/17/2023
PIE4	CURRENT INJECTION PROBE	TEGAM INC.	95236-1	12028	10KHZ-100MHZ	NOTE 1	
PLF2	CISPR16 50UH LISN	ELITE	CISPR16/70A	002	.15-30MHz	4/5/2022	4/5/2023
PLF4	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	4/5/2022	4/5/2023
R17A	ROOM 17	ELITE	17	17	---	8/1/2022	8/1/2023
R21F	3M ANECHOIC CHAMBER NSA	EMC TEST SYSTEMS	3M ANECHOIC		30MHZ-18GHZ	3/30/2022	3/30/2023
R29F	3M ANECHOIC CHAMBER NSA	EMC TEST SYSTEMS	3M ANECHOIC		30MHZ-18GHZ	3/25/2022	3/25/2023
RBC0	ESCI EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI	100340	9KHZ-3GHZ	9/14/2022	9/14/2023
RBC1	ESCI EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI	100341	9KHZ-3GHZ	9/14/2022	9/14/2023
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/31/2022	3/31/2023
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	4/7/2022	4/7/2023
REZ16	ISOTROPIC PROBE	NARDA	EP602	511WX60702	10KHZ-8GHz	1/11/2021	1/11/2023
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
TTC0	30 DB ATTENUATOR 50W	WEINSCHEL	47-30-43	AZ0513	0-18GHZ	1/13/2022	1/13/2024

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required
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.

Equipment list continued

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
VBR8	CISPR EN FCC CE VOLTAGE.exe					N/A	
VBV2	CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	---	---	N/A	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
WOJ0	SOFTWARE, BSI61000-4-3 RS	ELITE	BSI_610004_3_RS	1	80-2000MHZ	I/O	
WOJ1	IEC_61000_4_6_CI	ELITE					
XDR4	DUAL DIRECTIONAL COUPLER (50DB)	AMPLIFIER RESEARCH	DC2600	1007850-501	0.01-100MHZ(600W)100-250MHZ(300W)	7/26/2022	7/26/2023
XDR6	DUAL DIRECTIONAL COUPLER (50DB)	AMPLIFIER RESEARCH	DC2035A	0341867	.01-250MHZ (3500W)	12/28/2021	12/28/2022
XFA2	RF CURRENT CAL. FIXTURE	EATON	95241-1	12753	0.01-450MHZ	4/13/2022	4/13/2023
XLK8	100W 50 OHM TERMINATION	JFW INDUSTRIES	50T-032-1.0	009	DC-1GHZ	1/26/2021	1/26/2023
XLT4	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	1/5/2022	1/5/2024
XPQ4	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000-O/O	1	4.8-20GHZ	9/7/2021	9/7/2023
XRL1	DISCHARGE NETWORK (470K x 2)	ELITE	470k	002	---	1/18/2022	1/18/2024
XRL2	DISCHARGE NETWORK (470K x 2)	ELITE	470k	003	---	7/27/2022	7/27/2024
XTR5	ESD SIMULATOR	NOISEKEN	ESS-S3011	ESS15Y2246	---	3/24/2022	3/24/2023
XTRAC	ESD GUN	NOISEKEN	GT-30RA	ESS1920509	---	4/4/2022	4/4/2023

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required

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.

21. RF Radiated Emissions Test

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	Tx Standby

Information	
Setup Format	Tabletop
Height of Support	N/a
Type of Test Site	Semi-anechoic chamber
Test site used	Room 21
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Highest Internal Frequency of the EUT:	2480MHz
Highest Measurement Frequency:	6GHz
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

EN 12895 Requirements	
The field strength of radiated emissions at a distance of 10 meters shall not exceed the following values:	
Frequency of Emission (MHz)	Quasi-peak Limit (dBµV/m)
30 to 75 75 to 400* 400 to 1000	34 34 to 45 45

*The limits increase linearly with the logarithm of the frequency in the range 75MHz to 400MHz.

EN 60945 Requirements	
The field strength of radiated emissions at a distance of 3 meters shall not exceed the following values:	
Frequency of Emission (MHz)	Quasi-peak Limit (dBµV/m)
0.15 to 0.3* 0.3 to 30** 30 to 156 156 to 165 165 to 1000 1000 to 2000	80 to 52 52 to 34 54 24 54 54

*The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.3MHz.
**The limits decrease linearly with the logarithm of the frequency in the range 0.3MHz to 30MHz.

CISPR 32 Class A Requirements			
The field strength of radiated emissions at a distance of 3 meters shall not exceed the following values:			
Frequency of Emission (MHz)	Peak Limit (dBµV/m)	Quasi-peak Limit (dBµV/m)	Average Limit (dBµV/m)
30 to 230	---	50	---
230 to 1000	---	57	---
1000 to 6000	80	---	60

Measurement Uncertainty		
Measurement Type	U_{lab}	U_{CISPR}
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3 dB	6.3 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1 dB	5.2 dB

U_{lab} = Determined for Elite Electronic Engineering, Inc.
U_{CISPR} = From CISPR 16-4-2 Table 1

Procedures

Since a quasi-peak detector and an average detector requires a long integration times, it is not practical to automatically sweep through the quasi-peak and average levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector or average detector.

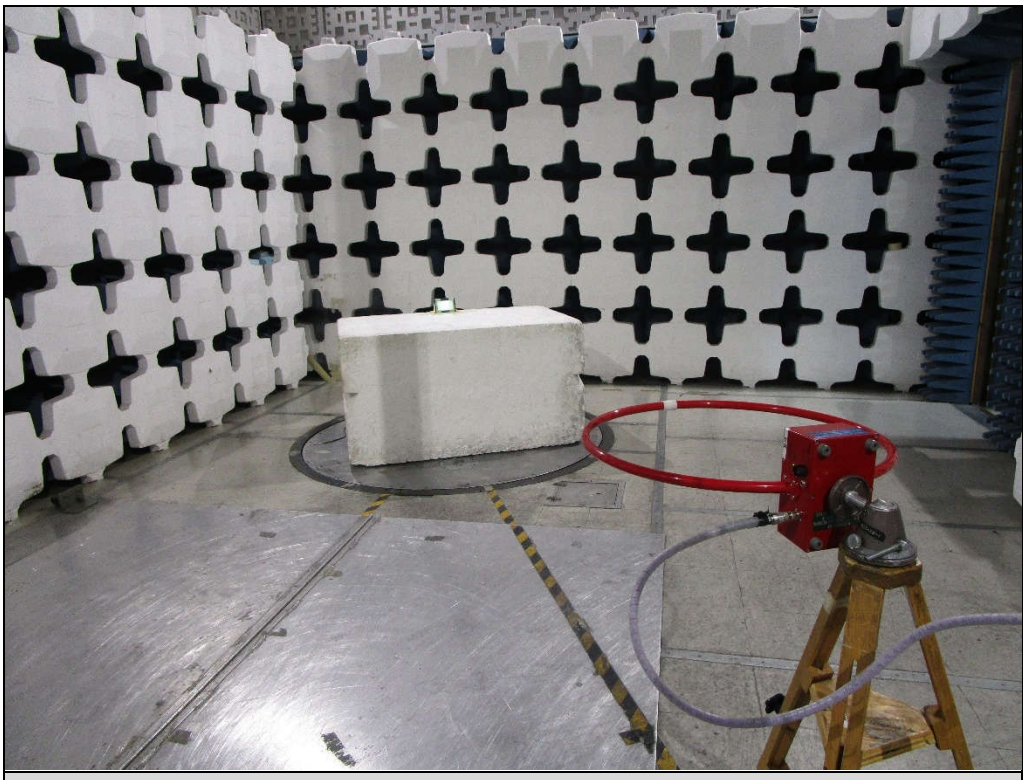
The EUT and all peripheral equipment were placed on an 80cm high non-conductive stand. The broadband measuring antenna was positioned at a 3-meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The frequency range from 1GHz to 6GHz was investigated using a peak detector function with the double ridged waveguide 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.

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

1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide 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 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.
   d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

Test Setup for Radiated Emissions: 150kHz to 30MHz, X-axis Polarization

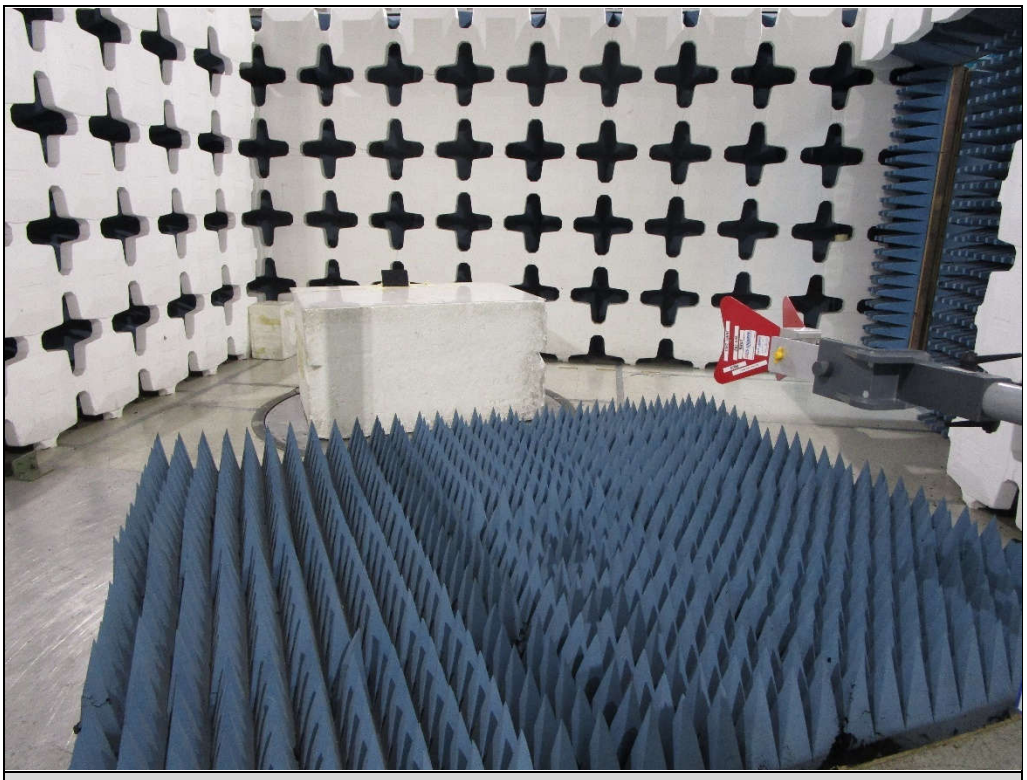
Test Setup for Radiated Emissions: 150kHz to 30MHz, Y-axis Polarization



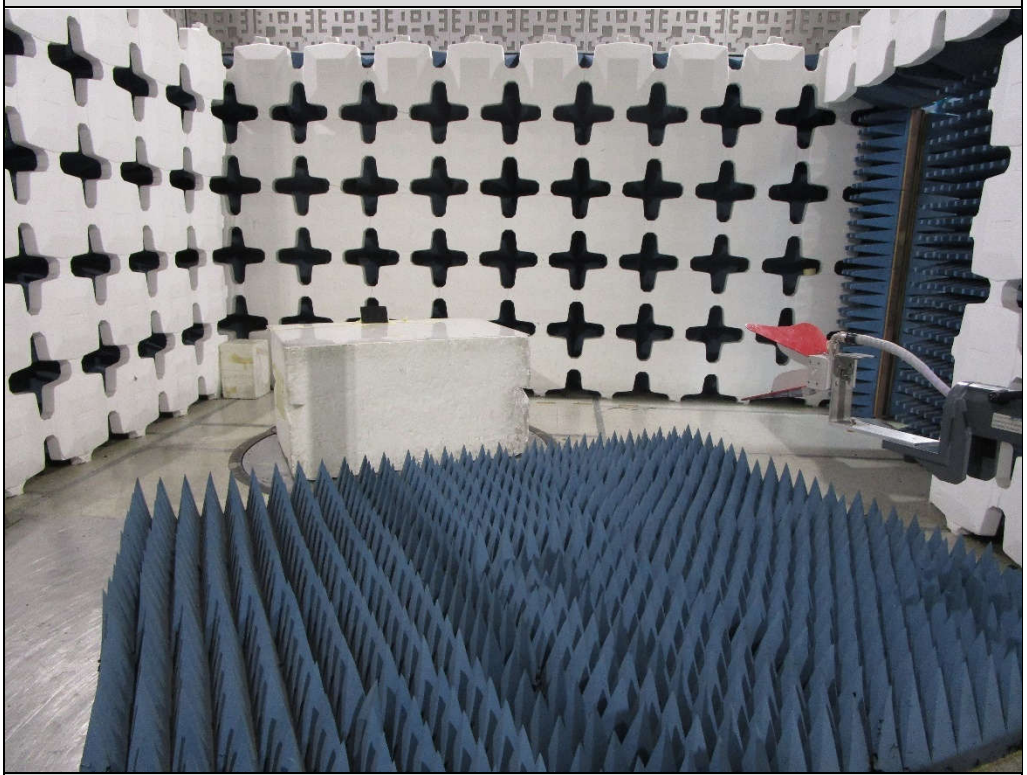
Test Setup for Radiated Emissions: 150kHz to 30MHz, Z-axis Polarization

Test Setup for Radiated Emissions: 30MHz to 1GHz, Horizontal Polarization

Test Setup for Radiated Emissions: 30MHz to 1GHz, Vertical Polarization



Test Setup for Radiated Emissions: Above 1GHz, Horizontal Polarization



Test Setup for Radiated Emissions: Above 1GHz, Vertical Polarization

EN 12895 :2015
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

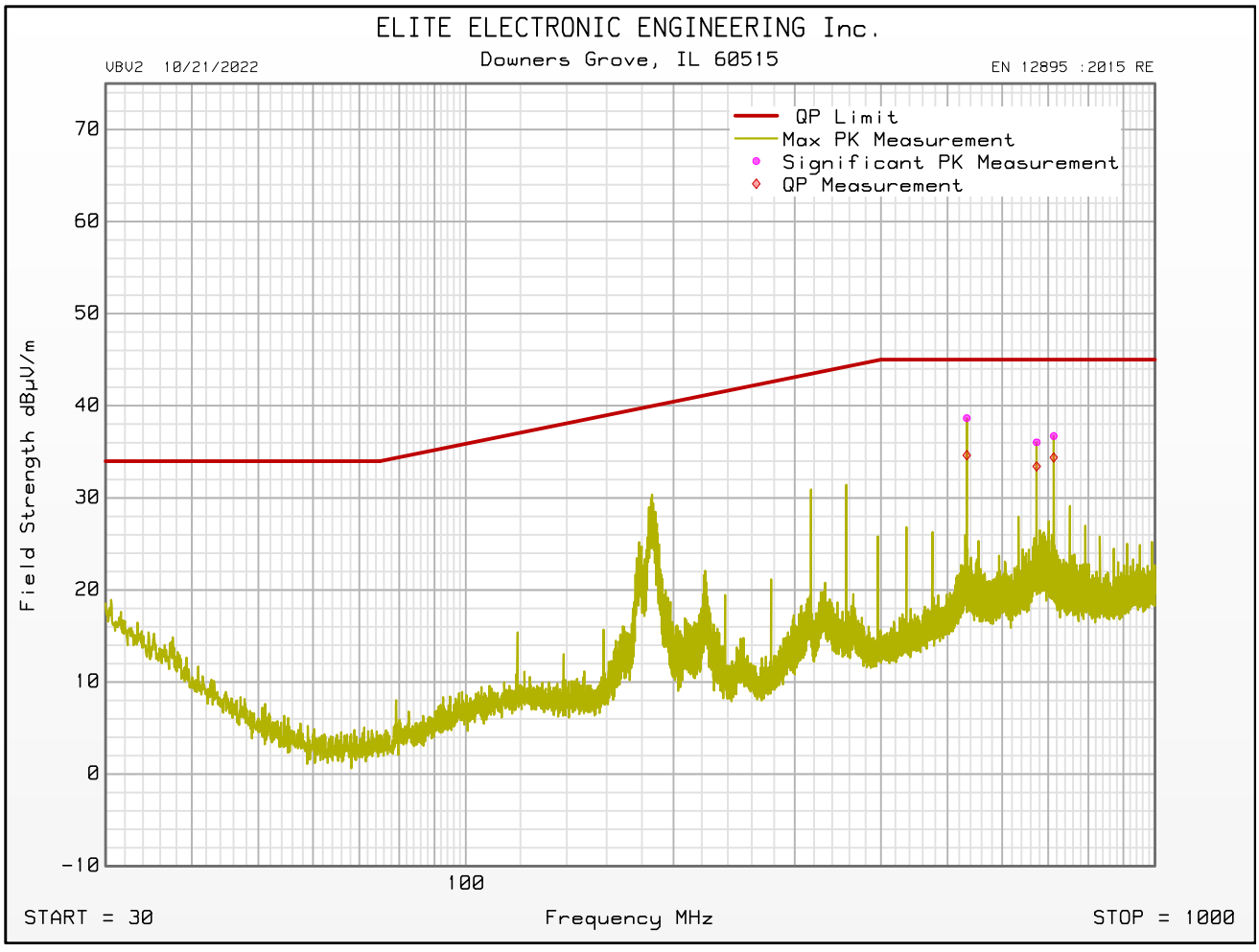
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303010
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Nov 22, 2022 12:58:49 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
37.560	13.4	8.9	20.6	0.0	0.5	-10.5	24.0	19.6	34.0	-14.4	Vertical	120	270	
38.280	14.2	9.4	20.2	0.0	0.5	-10.5	24.5	19.7	34.0	-14.3	Vertical	120	135	
44.040	8.8	2.2	17.5	0.0	0.5	-10.5	16.3	9.7	34.0	-24.3	Vertical	120	180	
57.060	18.5	14.4	12.9	0.0	0.5	-10.5	21.4	17.3	34.0	-16.7	Vertical	120	135	
57.720	17.8	13.5	12.8	0.0	0.5	-10.5	20.6	16.3	34.0	-17.7	Vertical	120	45	
79.200	21.3	17.4	13.2	0.0	0.5	-10.5	24.5	20.7	34.4	-13.7	Vertical	200	0	
118.800	13.1	10.2	18.2	0.0	0.6	-10.5	21.4	18.5	37.0	-18.5	Vertical	120	90	
148.500	19.2	5.0	17.0	0.0	0.8	-10.5	26.5	12.3	38.5	-26.2	Vertical	120	0	
158.400	14.5	9.6	17.2	0.0	0.8	-10.5	22.1	17.2	38.9	-21.8	Vertical	120	45	
178.140	20.8	13.1	15.5	0.0	0.9	-10.5	26.8	19.1	39.7	-20.6	Vertical	120	0	
186.780	28.0	21.5	15.2	0.0	1.0	-10.5	33.7	27.3	40.0	-12.7	Vertical	120	0	
201.960	16.5	7.1	15.4	0.0	1.0	-10.5	22.5	13.1	40.5	-27.4	Vertical	120	0	
316.800	21.9	20.0	19.5	0.0	1.1	-10.5	32.0	30.2	43.5	-13.3	Vertical	340	90	
533.020	22.8	18.8	24.8	0.0	1.5	-10.5	38.7	34.6	45.0	-10.4	Horizontal	200	135	
533.200	21.3	11.0	24.8	0.0	1.5	-10.5	37.2	26.9	45.0	-18.1	Vertical	120	135	
673.180	20.0	17.4	24.8	0.0	1.7	-10.5	36.0	33.4	45.0	-11.6	Horizontal	120	180	
712.780	20.1	17.8	25.3	0.0	1.8	-10.5	36.7	34.4	45.0	-10.6	Horizontal	120	180	
752.380	13.0	10.0	25.8	0.0	1.9	-10.5	30.2	27.3	45.0	-17.7	Vertical	200	180	

EN 12895 :2015
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

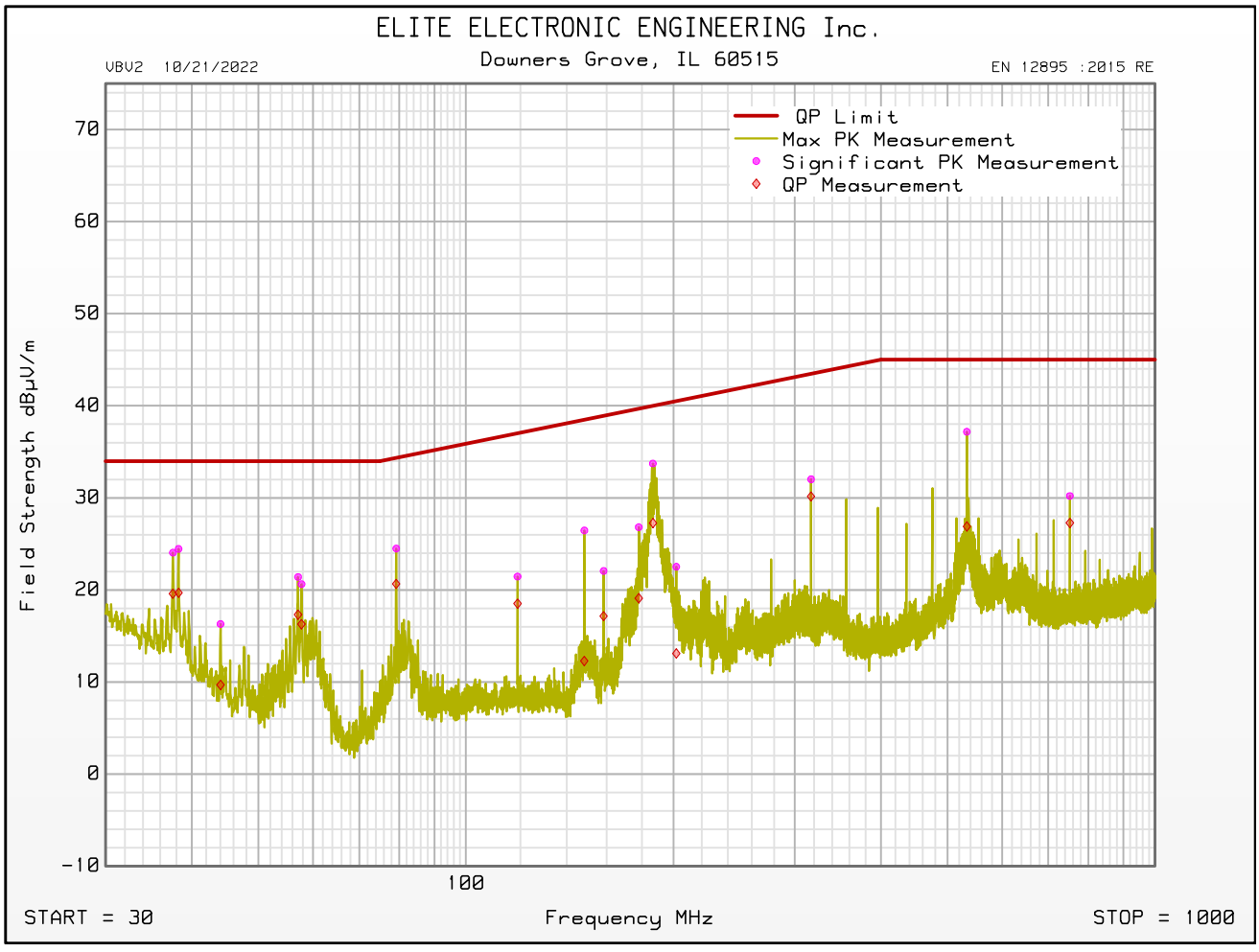
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303010
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Nov 22, 2022 12:58:49 PM



EN 12895 :2015
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303010
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Nov 22, 2022 12:58:49 PM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

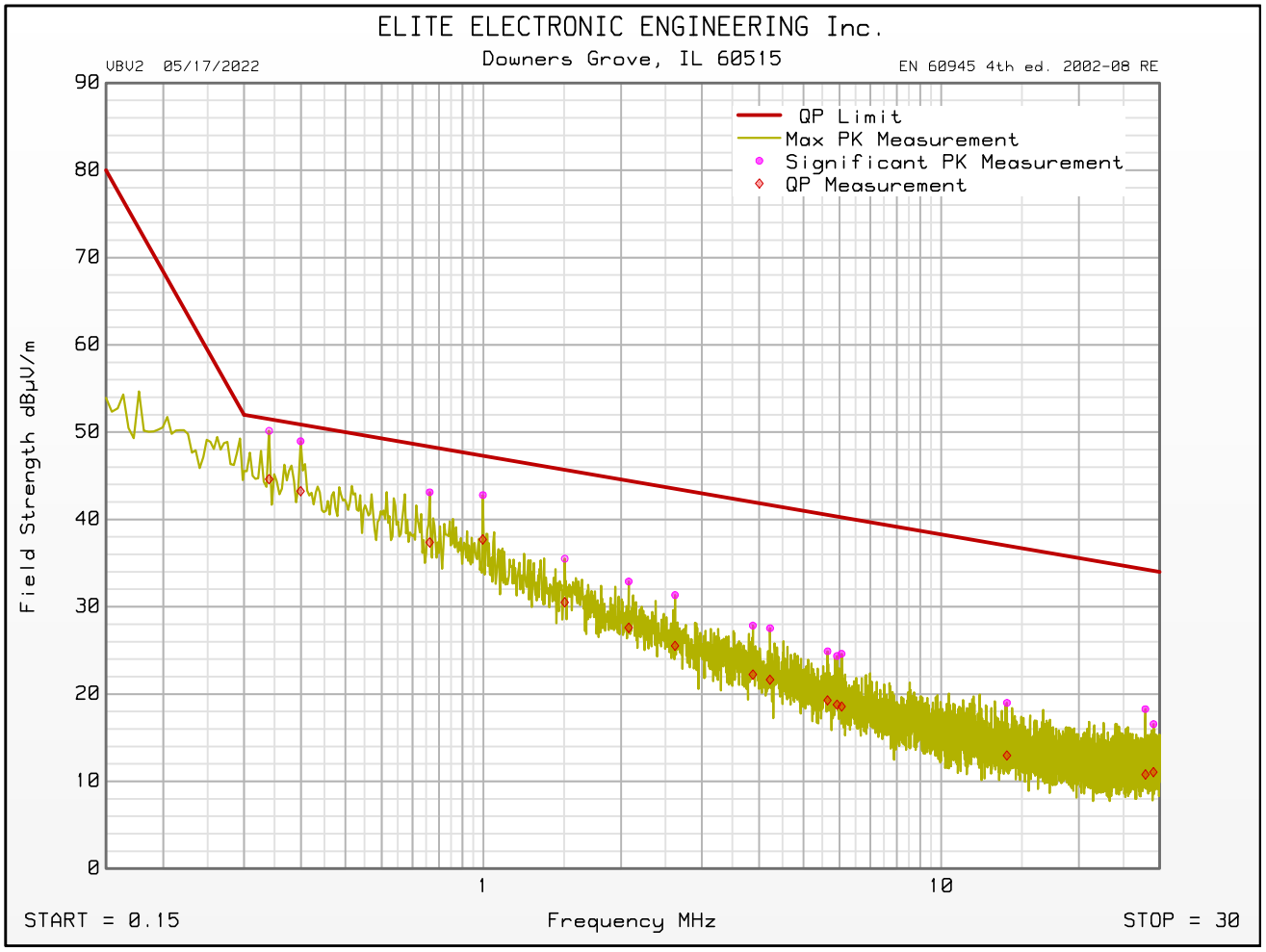
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Jan 03, 2023 10:50:03 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Orient	Azim °	Excessive QP Level
0.341	39.4	33.8	10.8	0.0	0.0	0.0	50.1	44.6	51.5	-6.9	X	180	
0.399	38.2	32.5	10.8	0.0	0.0	0.0	49.0	43.2	50.9	-7.6	X	90	
0.764	32.3	26.6	10.8	0.0	0.0	0.0	43.1	37.4	48.3	-11.0	X	180	
0.998	32.0	26.9	10.8	0.0	0.0	0.0	42.8	37.7	47.3	-9.6	X	45	
1.506	24.7	19.7	10.8	0.0	0.0	0.0	35.5	30.5	45.7	-15.2	X	45	
2.078	22.0	16.8	10.8	0.0	0.0	0.0	32.9	27.6	44.4	-16.8	X	0	
2.622	20.5	14.7	10.9	0.0	0.0	0.0	31.3	25.5	43.5	-18.0	X	0	
3.878	17.0	11.3	10.9	0.0	0.0	0.0	27.8	22.2	42.0	-19.8	X	90	
4.229	16.6	10.8	10.9	0.0	0.0	0.0	27.5	21.6	41.7	-20.0	X	225	
5.646	14.0	8.4	10.9	0.0	0.0	0.0	24.9	19.3	40.5	-21.3	X	315	
5.921	13.5	7.9	10.9	0.0	0.0	0.0	24.3	18.8	40.3	-21.6	X	225	
6.060	13.7	7.7	10.9	0.0	0.0	0.0	24.6	18.6	40.3	-21.7	X	270	
13.917	8.2	2.2	10.6	0.0	0.2	0.0	19.0	13.0	37.0	-24.0	X	135	
27.921	9.2	1.7	8.7	0.0	0.4	0.0	18.3	10.8	34.3	-23.5	X	315	
29.078	7.7	2.2	8.5	0.0	0.4	0.0	16.6	11.1	34.1	-23.1	X	270	

EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Orientation	:	X-Axis
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Jan 03, 2023 10:50:03 AM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

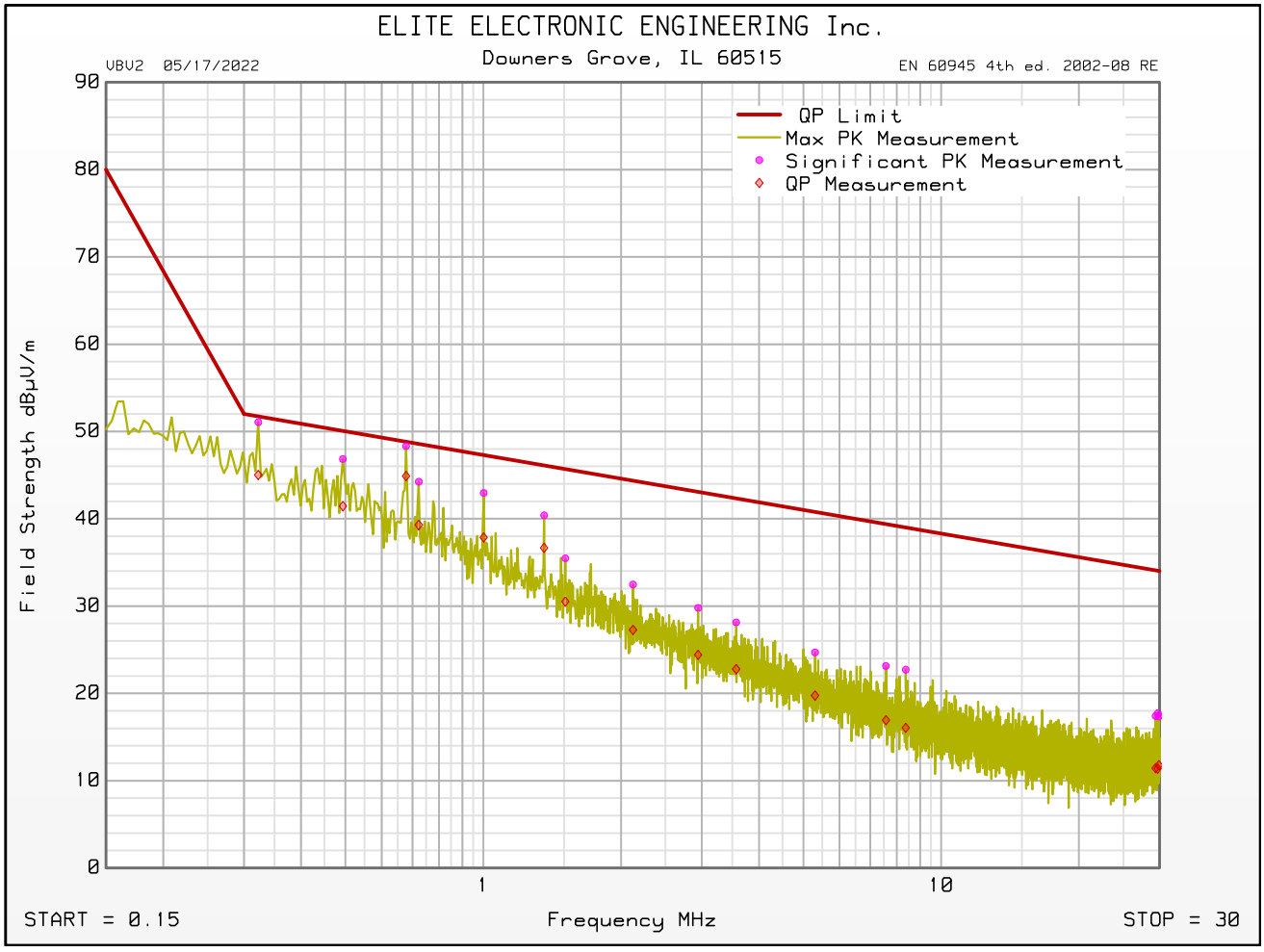
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Jan 03, 2023 10:17:35 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Orient	Azim °	Excessive QP Level
0.323	40.3	34.2	10.8	0.0	0.0	0.0	51.1	45.0	51.7	-6.7	X	315	
0.494	36.1	30.7	10.8	0.0	0.0	0.0	46.8	41.5	50.1	-8.6	X	135	
0.678	37.6	34.1	10.8	0.0	0.0	0.0	48.3	44.9	48.8	-3.9	X	180	
0.723	33.5	28.5	10.8	0.0	0.0	0.0	44.2	39.3	48.6	-9.3	X	0	
1.002	32.2	27.1	10.8	0.0	0.0	0.0	43.0	37.9	47.3	-9.4	X	45	
1.358	29.6	25.9	10.8	0.0	0.0	0.0	40.4	36.7	46.1	-9.4	X	180	
1.511	24.7	19.7	10.8	0.0	0.0	0.0	35.5	30.5	45.7	-15.2	X	0	
2.123	21.6	16.4	10.8	0.0	0.0	0.0	32.5	27.3	44.4	-17.1	X	225	
2.946	18.9	13.6	10.9	0.0	0.0	0.0	29.8	24.4	43.1	-18.6	X	315	
3.567	17.3	11.9	10.9	0.0	0.0	0.0	28.1	22.8	42.3	-19.5	X	315	
5.304	13.8	8.8	10.9	0.0	0.0	0.0	24.7	19.7	40.8	-21.0	X	315	
7.577	12.3	6.1	10.9	0.0	0.0	0.0	23.1	16.9	39.4	-22.4	X	225	
8.369	11.9	5.2	10.9	0.0	0.0	0.0	22.7	16.1	39.0	-22.9	X	315	
29.397	8.6	2.7	8.4	0.0	0.4	0.0	17.4	11.4	34.1	-22.6	X	135	
29.721	9.0	2.7	8.3	0.0	0.4	0.0	17.7	11.4	34.0	-22.7	X	315	
29.879	8.7	3.1	8.3	0.0	0.4	0.0	17.4	11.8	34.0	-22.2	X	315	

EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Antenna Orientation	:	X-Axis
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Jan 03, 2023 10:17:35 AM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Jan 03, 2023 10:45:21 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Orient	Azim °	Excessive QP Level
0.300	40.6	34.9	10.8	0.0	0.0	0.0	51.4	45.6	52.0	-6.4	Y	0	
0.516	35.4	30.2	10.8	0.0	0.0	0.0	46.1	41.0	49.9	-8.9	Y	270	
0.557	35.4	29.7	10.8	0.0	0.0	0.0	46.2	40.4	49.6	-9.2	Y	315	
0.669	35.4	30.1	10.8	0.0	0.0	0.0	46.2	40.9	48.9	-8.0	Y	270	
1.835	23.8	17.8	10.8	0.0	0.0	0.0	34.6	28.6	44.9	-16.3	Y	90	
2.010	22.6	17.0	10.8	0.0	0.0	0.0	33.4	27.8	44.6	-16.7	Y	180	
2.366	21.8	15.6	10.8	0.0	0.0	0.0	32.6	26.5	43.9	-17.4	Y	180	
3.369	18.0	12.5	10.9	0.0	0.0	0.0	28.9	23.4	42.5	-19.2	Y	135	
4.008	16.7	11.0	10.9	0.0	0.0	0.0	27.6	21.9	41.9	-20.0	Y	135	
5.408	14.8	8.6	10.9	0.0	0.0	0.0	25.7	19.6	40.7	-21.1	Y	180	
6.236	13.2	7.6	10.9	0.0	0.0	0.0	24.1	18.5	40.1	-21.7	Y	270	
6.812	12.9	6.7	10.9	0.0	0.0	0.0	23.8	17.6	39.8	-22.2	Y	135	
15.749	8.9	1.6	10.5	0.0	0.2	0.0	19.6	12.3	36.5	-24.2	Y	135	
15.969	8.1	1.5	10.4	0.0	0.3	0.0	18.8	12.2	36.5	-24.3	Y	45	
28.574	8.3	2.1	8.6	0.0	0.4	0.0	17.2	11.0	34.2	-23.2	Y	90	

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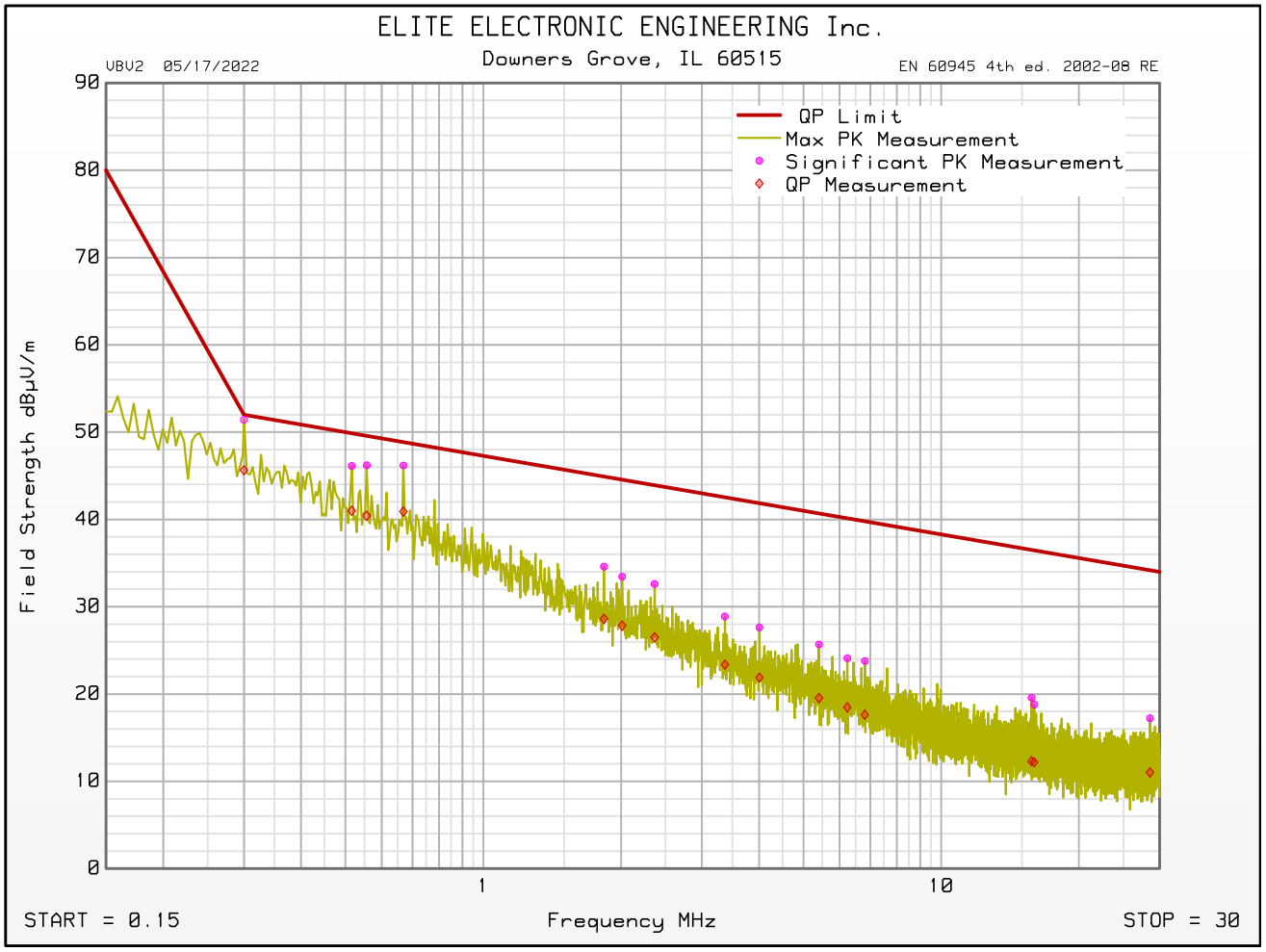
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Orientation	:	Y-Axis
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Jan 03, 2023 10:45:21 AM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

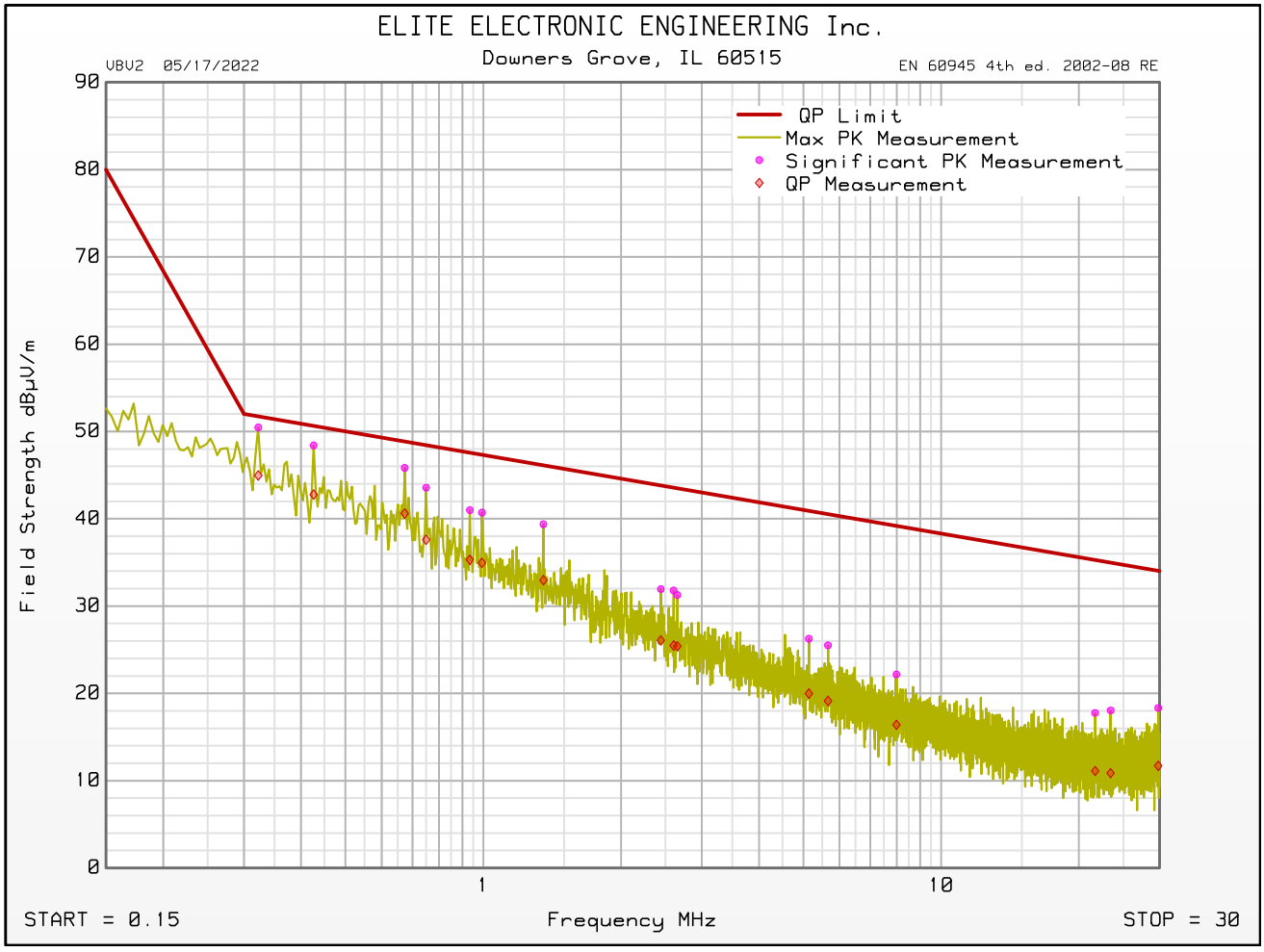
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Jan 03, 2023 10:22:45 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Orient	Azim °	Excessive QP Level
0.323	39.7	34.2	10.8	0.0	0.0	0.0	50.5	45.0	51.7	-6.8	Y	0	
0.426	37.6	32.0	10.8	0.0	0.0	0.0	48.4	42.8	50.6	-7.9	Y	90	
0.674	35.1	29.8	10.8	0.0	0.0	0.0	45.8	40.6	48.8	-8.2	Y	135	
0.750	32.8	26.8	10.8	0.0	0.0	0.0	43.6	37.6	48.4	-10.8	Y	225	
0.935	30.2	24.5	10.8	0.0	0.0	0.0	41.0	35.3	47.6	-12.3	Y	225	
0.993	29.9	24.2	10.8	0.0	0.0	0.0	40.7	35.0	47.3	-12.4	Y	270	
1.353	28.6	22.2	10.8	0.0	0.0	0.0	39.4	33.0	46.1	-13.1	Y	135	
2.442	21.1	15.2	10.8	0.0	0.0	0.0	31.9	26.1	43.8	-17.7	Y	0	
2.604	20.9	14.6	10.9	0.0	0.0	0.0	31.8	25.5	43.6	-18.1	Y	315	
2.654	20.4	14.6	10.9	0.0	0.0	0.0	31.3	25.4	43.5	-18.1	Y	45	
5.142	15.4	9.1	10.9	0.0	0.0	0.0	26.3	20.0	40.9	-20.9	Y	135	
5.660	14.6	8.2	10.9	0.0	0.0	0.0	25.5	19.1	40.5	-21.4	Y	225	
7.986	11.3	5.5	10.9	0.0	0.0	0.0	22.2	16.4	39.2	-22.8	Y	135	
21.689	7.6	0.9	9.8	0.0	0.4	0.0	17.8	11.1	35.3	-24.1	Y	90	
23.448	8.1	0.9	9.5	0.0	0.4	0.0	18.0	10.9	35.0	-24.1	Y	315	
29.789	9.6	3.0	8.3	0.0	0.4	0.0	18.3	11.7	34.0	-22.3	Y	270	

EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Antenna Orientation	:	Y-Axis
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Jan 03, 2023 10:22:45 AM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Jan 03, 2023 10:37:56 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Orient	Azim °	Excessive QP Level
0.299	41.3	34.9	10.8	0.0	0.0	0.0	52.1	45.6	52.2	-6.6	Z	315	
0.467	36.8	31.2	10.8	0.0	0.0	0.0	47.6	41.9	50.3	-8.4	Z	180	
0.719	34.4	29.4	10.8	0.0	0.0	0.0	45.2	40.1	48.6	-8.4	Z	225	
0.998	32.2	26.8	10.8	0.0	0.0	0.0	43.0	37.6	47.3	-9.7	Z	45	
1.178	27.8	22.2	10.8	0.0	0.0	0.0	38.6	33.0	46.7	-13.7	Z	135	
1.817	23.9	18.0	10.8	0.0	0.0	0.0	34.8	28.8	45.0	-16.1	Z	315	
2.195	21.8	16.2	10.8	0.0	0.0	0.0	32.6	27.1	44.2	-17.1	Z	315	
2.514	21.8	14.9	10.9	0.0	0.0	0.0	32.7	25.7	43.7	-18.0	Z	180	
3.158	19.9	13.1	10.9	0.0	0.0	0.0	30.7	24.0	42.8	-18.8	Z	135	
5.610	14.6	8.4	10.9	0.0	0.0	0.0	25.5	19.3	40.6	-21.3	Z	225	
5.642	13.6	8.2	10.9	0.0	0.0	0.0	24.5	19.1	40.5	-21.4	Z	135	
5.993	13.7	7.8	10.9	0.0	0.0	0.0	24.6	18.7	40.3	-21.6	Z	315	
24.938	7.0	1.2	9.3	0.0	0.4	0.0	16.7	10.9	34.7	-23.8	Z	225	
29.492	8.3	2.4	8.4	0.0	0.4	0.0	17.1	11.1	34.1	-22.9	Z	225	
29.735	8.2	2.4	8.3	0.0	0.4	0.0	16.9	11.1	34.0	-23.0	Z	270	

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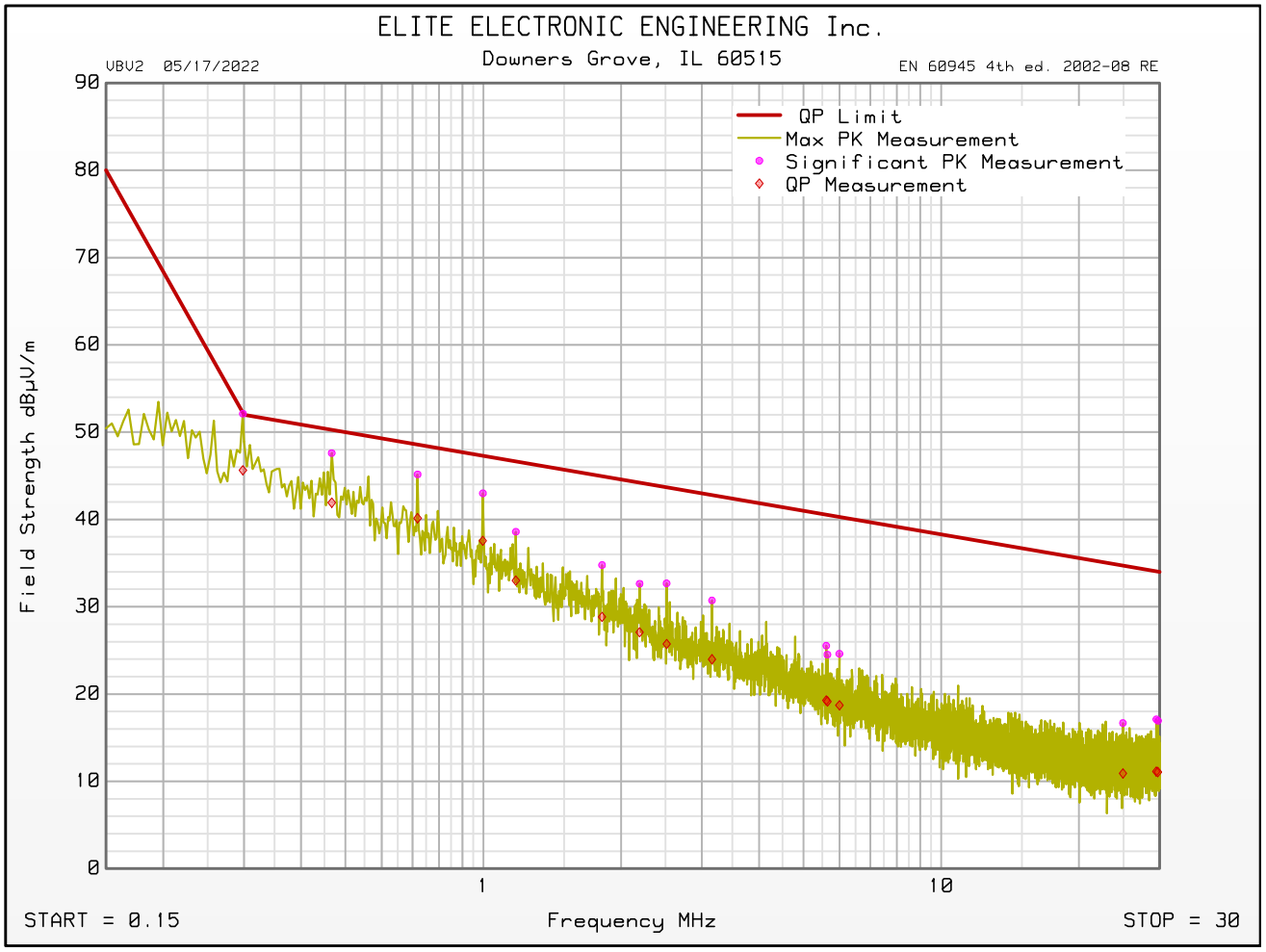
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Orientation	:	Z-Axis
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Jan 03, 2023 10:37:56 AM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Jan 03, 2023 10:33:40 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Orient	Azim °	Excessive QP Level
0.294	41.0	34.9	10.8	0.0	0.0	0.0	51.7	45.7	52.8	-7.1	Z	45	
0.669	36.2	30.5	10.8	0.0	0.0	0.0	47.0	41.3	48.9	-7.6	Z	225	
1.529	25.4	19.7	10.8	0.0	0.0	0.0	36.2	30.5	45.6	-15.2	Z	315	
1.929	23.0	17.5	10.8	0.0	0.0	0.0	33.8	28.3	44.7	-16.4	Z	270	
2.064	22.6	16.8	10.8	0.0	0.0	0.0	33.5	27.6	44.5	-16.9	Z	45	
2.186	22.5	16.3	10.8	0.0	0.0	0.0	33.3	27.2	44.2	-17.1	Z	315	
2.388	21.0	15.4	10.8	0.0	0.0	0.0	31.9	26.3	43.9	-17.6	Z	225	
2.649	20.6	14.5	10.9	0.0	0.0	0.0	31.4	25.4	43.5	-18.1	Z	90	
5.246	14.3	8.7	10.9	0.0	0.0	0.0	25.2	19.6	40.8	-21.2	Z	135	
5.669	13.9	8.3	10.9	0.0	0.0	0.0	24.8	19.2	40.5	-21.3	Z	135	
6.362	12.2	7.2	10.9	0.0	0.0	0.0	23.1	18.1	40.1	-21.9	Z	180	
28.479	13.2	8.1	8.6	0.0	0.4	0.0	22.1	17.0	34.2	-17.2	Z	315	
29.154	13.6	9.7	8.4	0.0	0.4	0.0	22.5	18.5	34.1	-15.6	Z	180	
29.829	10.8	4.7	8.3	0.0	0.4	0.0	19.4	13.4	34.0	-20.6	Z	270	

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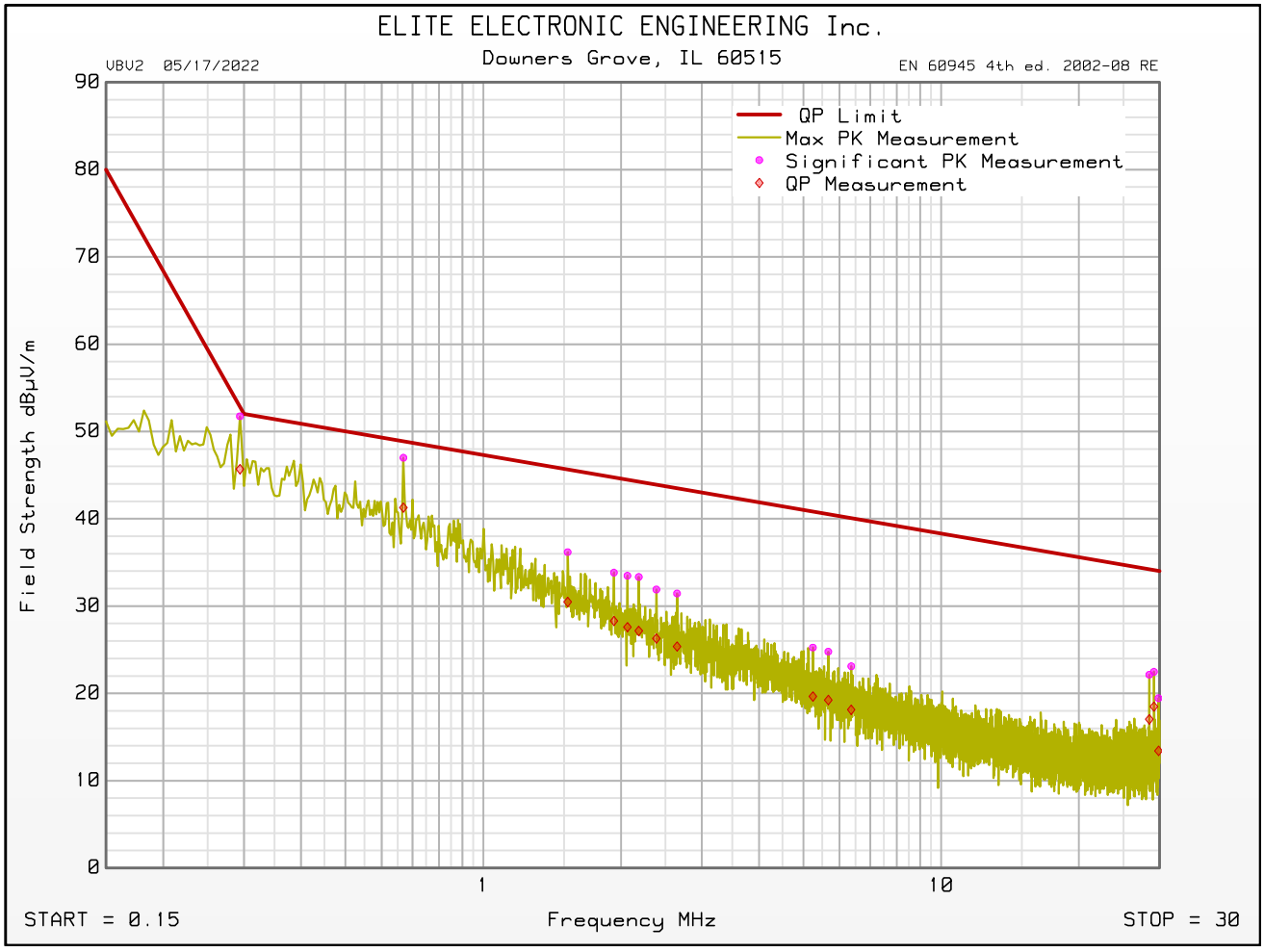
Radiated RF Emissions Test

SW ID/Rev: VBV2 05/17/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Antenna Orientation	:	Z-Axis
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz (Freq. Range <30MHz)
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Jan 03, 2023 10:33:40 AM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Dec 28, 2022 02:08:26 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
30.000	5.7	-4.9	25.0	0.0	0.5	0.0	31.2	20.6	54.0	-33.4	Horizontal	340	225	
93.600	3.2	-7.7	15.8	0.0	0.5	0.0	19.5	8.6	54.0	-45.4	Vertical	340	45	
121.680	2.8	-7.6	18.3	0.0	0.6	0.0	21.7	11.3	54.0	-42.7	Vertical	340	45	
285.900	3.8	-7.4	18.8	0.0	1.0	0.0	23.6	12.5	54.0	-41.5	Horizontal	200	180	
534.540	4.0	-7.4	24.8	0.0	1.5	0.0	30.3	18.9	54.0	-35.1	Horizontal	200	45	
945.320	3.6	-7.4	27.0	0.0	2.0	0.0	32.6	21.6	54.0	-32.4	Vertical	340	180	

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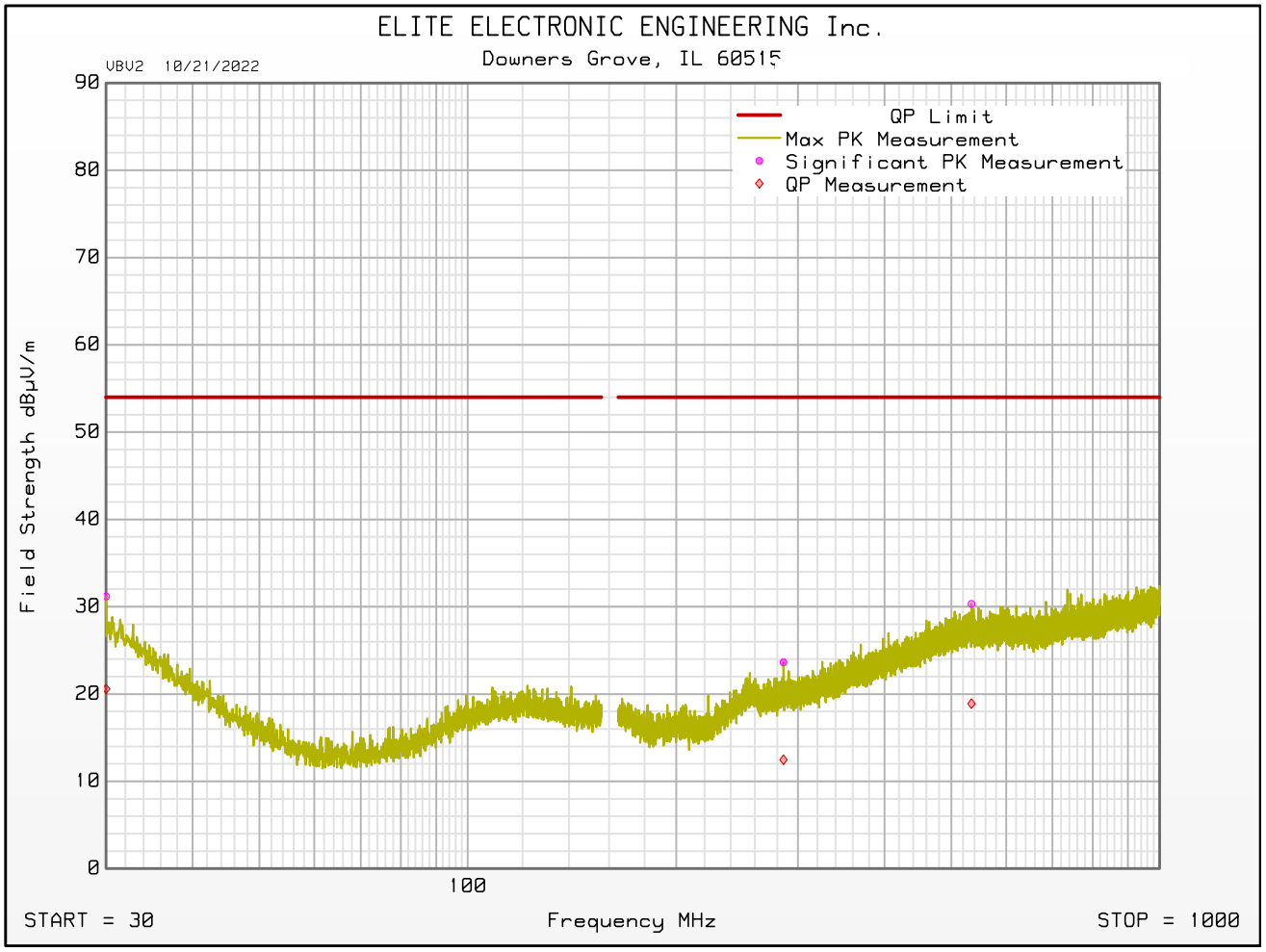
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

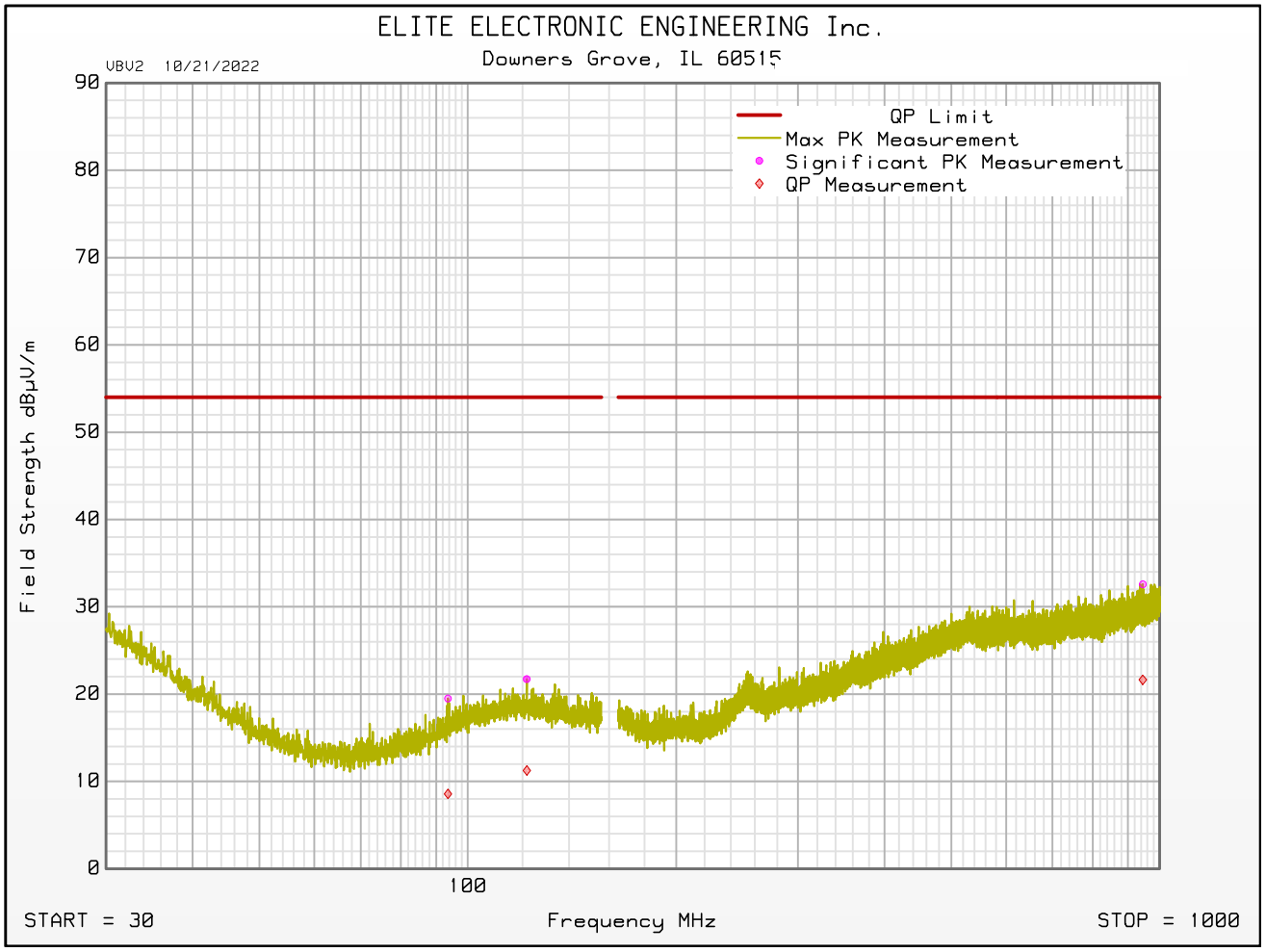
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Dec 28, 2022 02:08:26 PM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Dec 28, 2022 02:08:26 PM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 01:21:57 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
30.720	5.2	-5.3	24.5	0.0	0.5	0.0	30.3	19.8	54.0	-34.2	Horizontal	200	180	
44.760	12.9	7.9	17.1	0.0	0.5	0.0	30.5	25.5	54.0	-28.5	Vertical	120	180	
59.400	16.0	13.6	12.5	0.0	0.5	0.0	29.0	26.6	54.0	-27.4	Vertical	200	45	
80.940	6.8	0.4	13.4	0.0	0.5	0.0	20.7	14.3	54.0	-39.7	Vertical	200	315	
118.800	14.9	11.5	18.2	0.0	0.6	0.0	33.7	30.3	54.0	-23.7	Vertical	120	180	
148.500	20.7	15.5	17.0	0.0	0.8	0.0	38.5	33.3	54.0	-20.7	Vertical	120	225	
152.520	11.9	3.0	17.1	0.0	0.8	0.0	29.8	20.9	54.0	-33.1	Vertical	120	270	
178.200	25.1	23.7	15.5	0.0	0.9	0.0	41.6	40.1	54.0	-13.9	Vertical	120	270	
237.600	22.1	19.6	17.0	0.0	1.0	0.0	40.2	37.7	54.0	-16.3	Vertical	120	45	
297.000	15.3	11.9	19.1	0.0	1.0	0.0	35.4	32.0	54.0	-22.0	Vertical	340	135	
531.060	20.4	13.0	24.8	0.0	1.5	0.0	46.8	39.3	54.0	-14.7	Vertical	200	225	
532.560	21.1	9.9	24.8	0.0	1.5	0.0	47.5	36.2	54.0	-17.8	Vertical	340	270	
533.880	20.9	13.2	24.8	0.0	1.5	0.0	47.3	39.5	54.0	-14.5	Horizontal	200	225	
950.360	7.4	1.2	27.0	0.0	2.0	0.0	36.5	30.3	54.0	-23.7	Horizontal	340	180	

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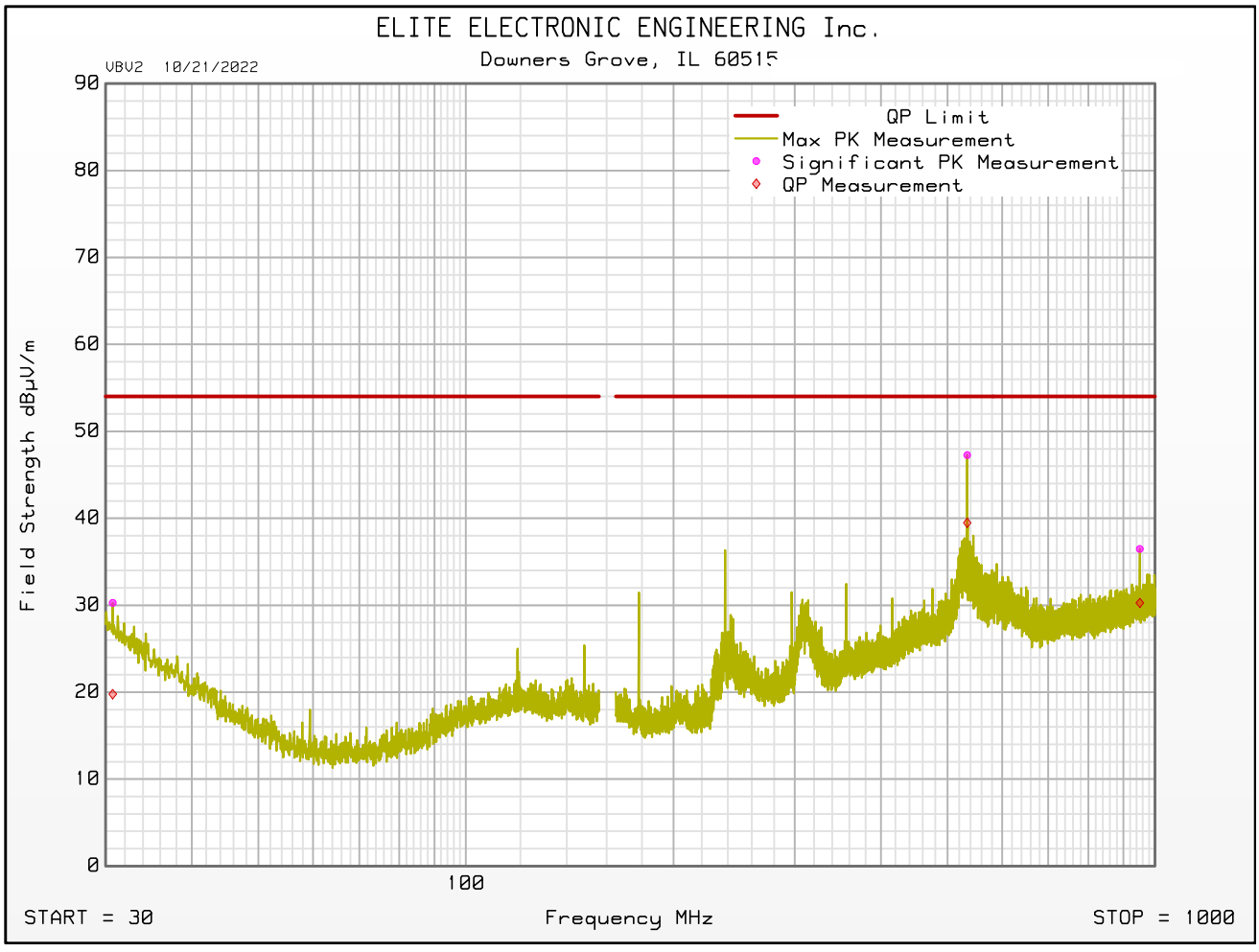
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 01:21:57 PM



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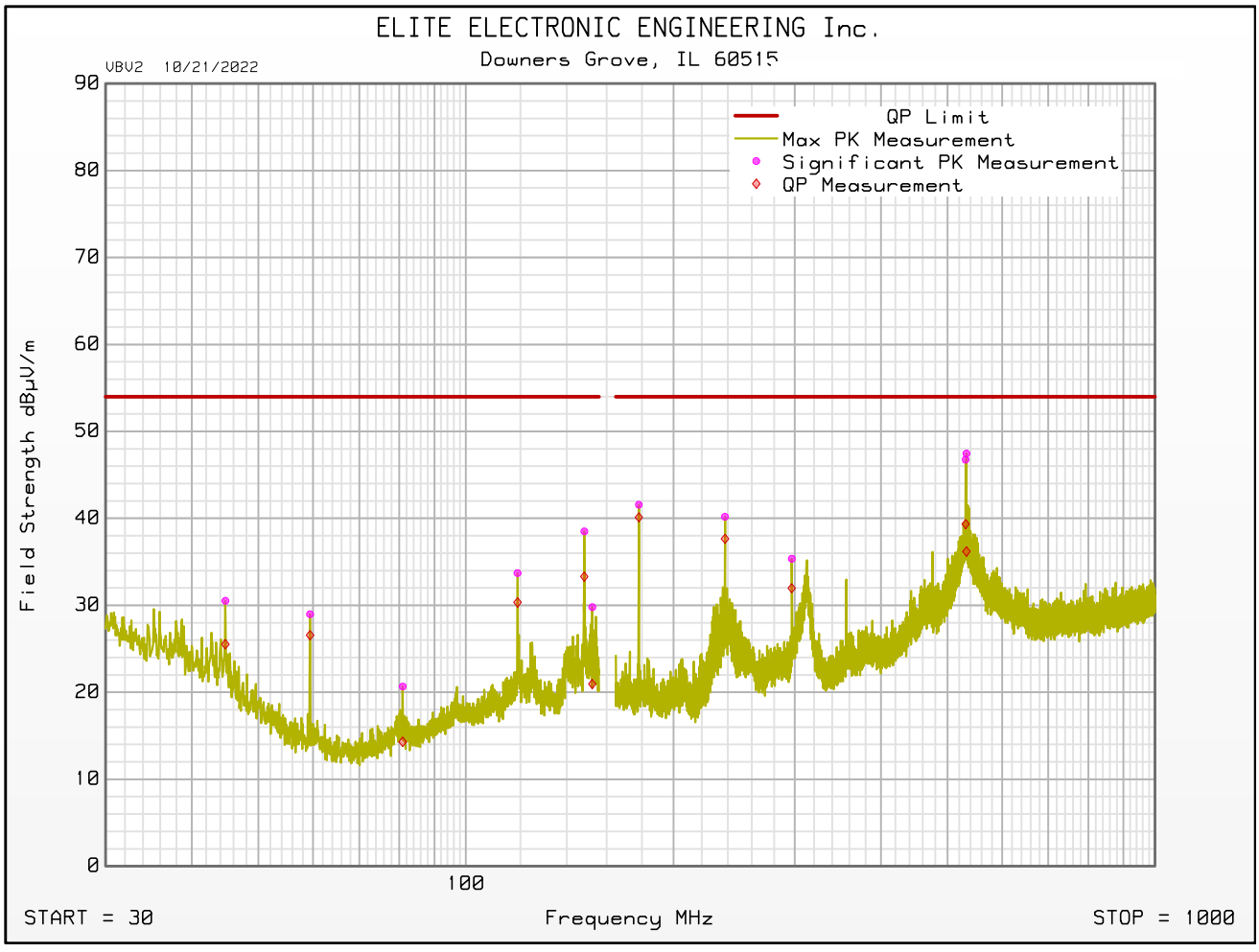
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 01:21:57 PM



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Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Dec 28, 2022 01:48:34 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
157.152	-9.6	-21.6	17.2	0.0	0.8	0.0	8.4	-3.5	24.0	-27.5	Vertical	200	0	
158.750	-9.1	-21.6	17.2	0.0	0.8	0.0	8.9	-3.5	24.0	-27.5	Horizontal	340	0	
159.011	-8.7	-21.6	17.2	0.0	0.8	0.0	9.3	-3.5	24.0	-27.5	Vertical	200	90	
160.716	-8.7	-21.2	17.2	0.0	0.8	0.0	9.3	-3.2	24.0	-27.2	Vertical	200	90	
161.985	-9.1	-21.3	17.1	0.0	0.8	0.0	8.8	-3.4	24.0	-27.4	Vertical	120	45	
164.235	-8.5	-21.5	16.8	0.0	0.9	0.0	9.2	-3.8	24.0	-27.8	Vertical	340	90	

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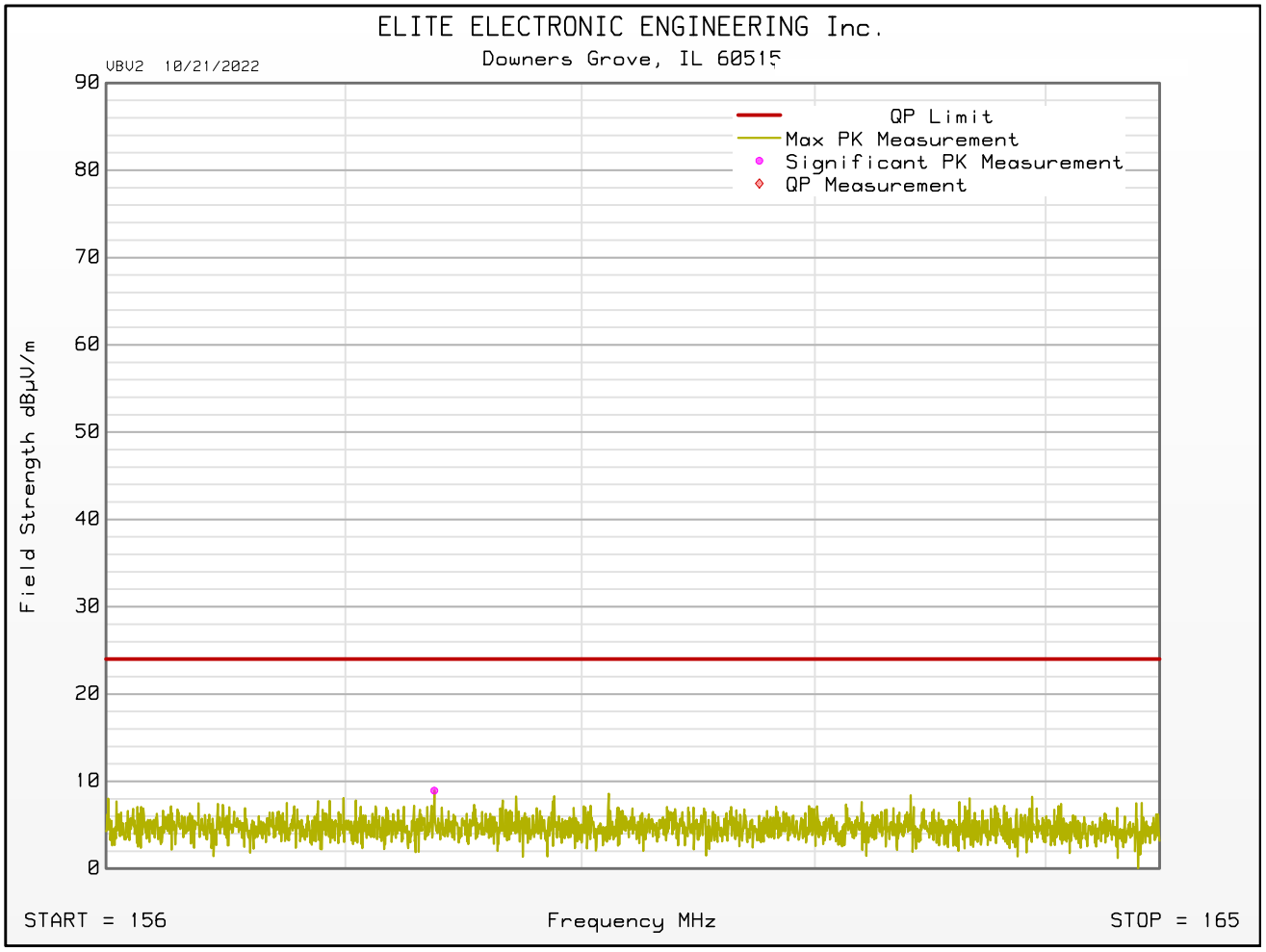
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Dec 28, 2022 01:48:34 PM



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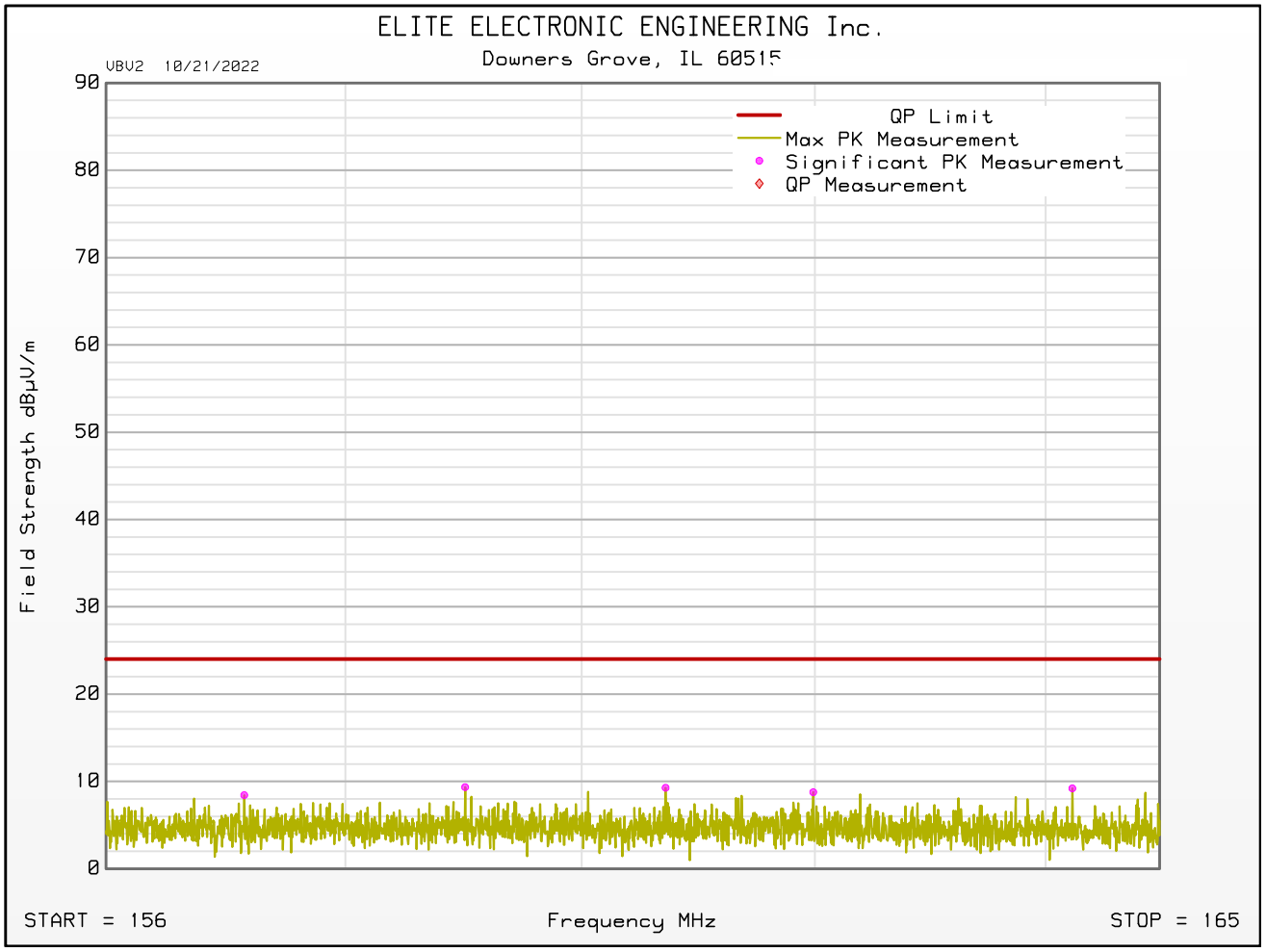
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Mode	:	Ambient
Test Date	:	Dec 28, 2022 01:48:34 PM



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Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 01:34:43 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
156.333	-3.9	-12.5	17.2	0.0	0.8	0.0	14.1	5.5	24.0	-18.5	Vertical	120	315	
156.599	-2.2	-9.6	17.2	0.0	0.8	0.0	15.8	8.5	24.0	-15.5	Vertical	120	225	
157.404	-3.8	-11.9	17.2	0.0	0.8	0.0	14.2	6.1	24.0	-17.9	Vertical	120	0	
157.535	-1.1	-8.8	17.2	0.0	0.8	0.0	16.9	9.2	24.0	-14.8	Vertical	120	180	
157.620	-3.4	-13.7	17.2	0.0	0.8	0.0	14.6	4.4	24.0	-19.6	Vertical	120	270	
158.471	-3.3	-11.5	17.2	0.0	0.8	0.0	14.7	6.5	24.0	-17.5	Vertical	120	225	
159.317	-3.7	-11.7	17.2	0.0	0.8	0.0	14.4	6.3	24.0	-17.7	Vertical	120	180	
160.014	-4.7	-14.2	17.2	0.0	0.8	0.0	13.4	3.8	24.0	-20.2	Vertical	120	0	
160.653	-4.2	-12.7	17.2	0.0	0.8	0.0	13.8	5.4	24.0	-18.6	Vertical	120	135	
161.324	-3.4	-12.9	17.1	0.0	0.8	0.0	14.6	5.1	24.0	-18.9	Vertical	120	180	
161.774	2.5	-5.8	17.1	0.0	0.8	0.0	20.5	12.1	24.0	-11.9	Vertical	120	225	
161.949	-4.0	-11.4	17.1	0.0	0.8	0.0	13.9	6.5	24.0	-17.5	Vertical	120	225	
163.011	-3.1	-12.1	17.0	0.0	0.9	0.0	14.7	5.7	24.0	-18.3	Vertical	120	0	
163.412	-1.8	-10.5	16.9	0.0	0.9	0.0	16.0	7.3	24.0	-16.7	Vertical	120	270	
163.592	-4.0	-11.6	16.9	0.0	0.9	0.0	13.8	6.1	24.0	-17.9	Vertical	120	225	
164.082	-4.6	-12.6	16.8	0.0	0.9	0.0	13.1	5.1	24.0	-18.9	Vertical	120	315	
164.996	3.7	1.0	16.8	0.0	0.9	0.0	21.3	18.6	24.0	-5.4	Vertical	120	225	

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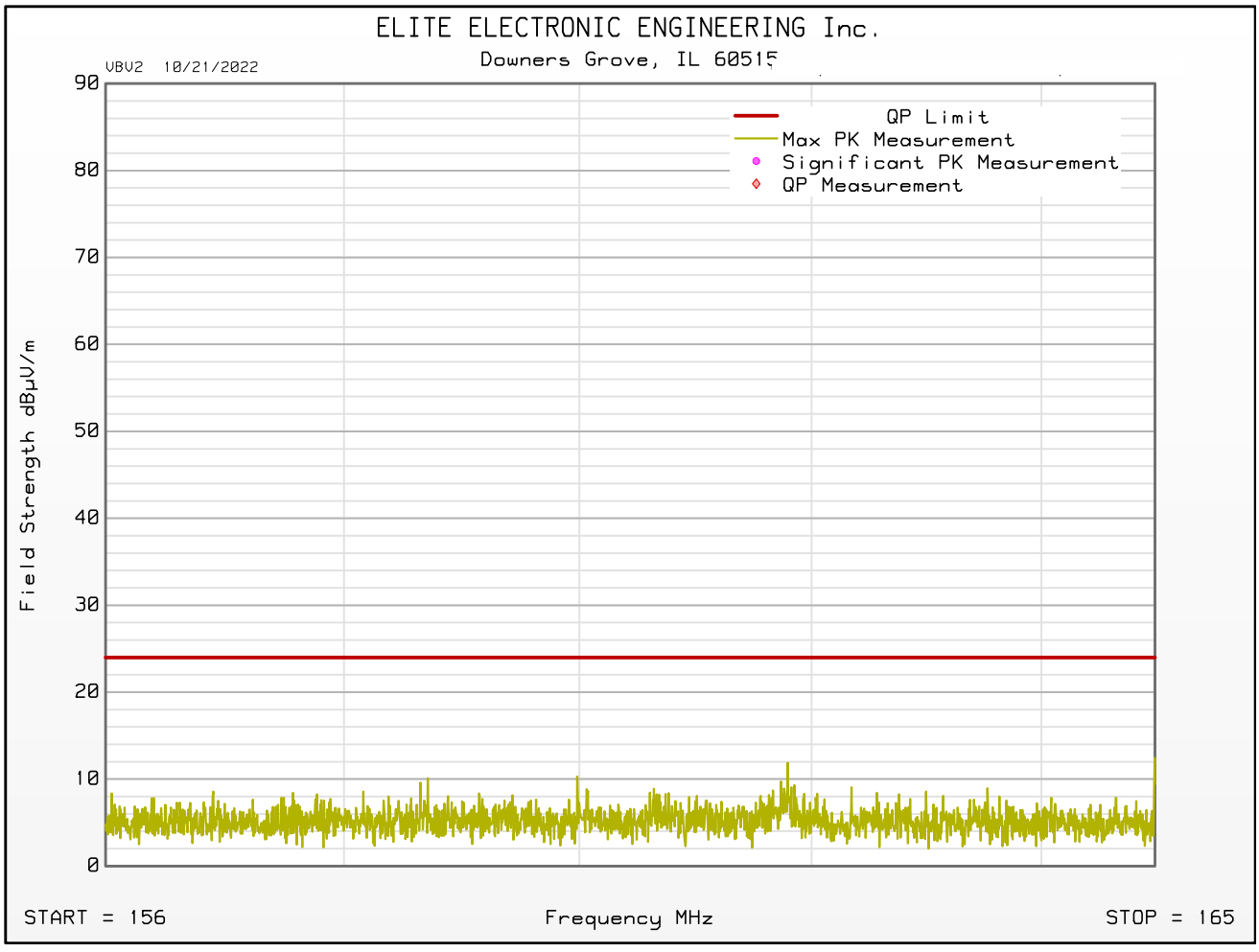
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 01:34:43 PM



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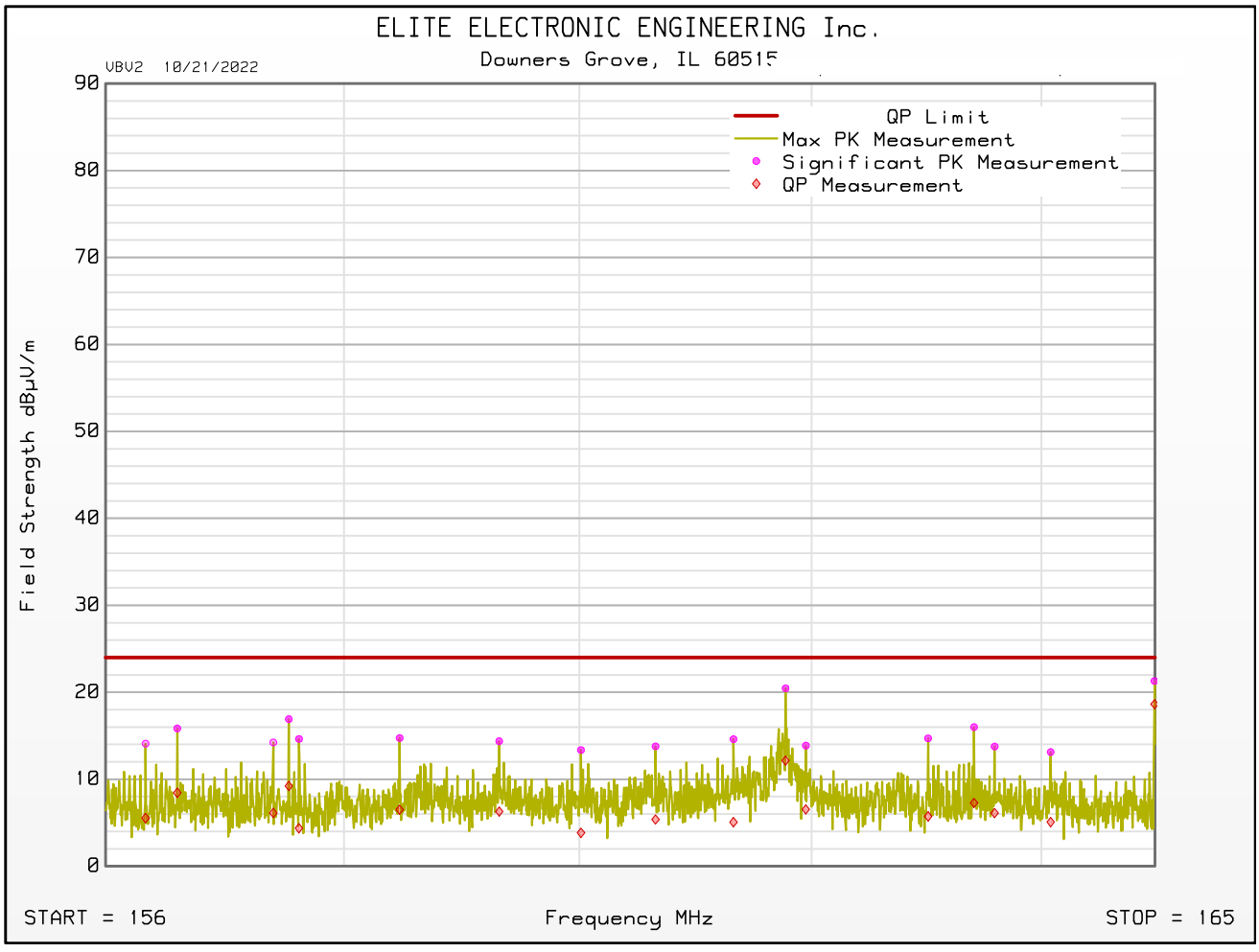
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	9 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 01:34:43 PM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 04:18:10 PM

Freq MHz	Peak Mtr Rdg dBuV	Average Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Average Level
1064.000	53.6	37.4	29.2	-42.6	2.1	0.0	42.3	26.1	54.0	-27.9	Horizontal	120	180	
1180.000	50.3	36.5	29.8	-42.3	2.2	0.0	40.1	26.3	54.0	-27.7	Horizontal	200	270	
1313.500	50.1	36.6	29.6	-42.0	2.4	0.0	40.0	26.5	54.0	-27.5	Horizontal	200	225	
1572.500	57.8	38.9	29.2	-41.8	2.7	0.0	47.8	29.0	54.0	-25.0	Horizontal	200	180	
1592.000	66.0	44.4	29.3	-41.8	2.7	0.0	56.2	34.5	54.0	-19.5	Horizontal	120	180	
1744.500	59.0	35.2	30.6	-41.6	2.8	0.0	50.9	27.0	54.0	-27.0	Horizontal	200	315	
1753.000	61.9	35.2	30.7	-41.6	2.8	0.0	53.9	27.2	54.0	-26.8	Horizontal	200	315	
1888.500	55.0	36.1	31.9	-41.3	2.9	0.0	48.5	29.6	54.0	-24.4	Horizontal	340	315	
1895.000	58.3	35.4	32.0	-41.3	2.9	0.0	51.9	29.0	54.0	-25.0	Horizontal	340	315	
1899.500	53.6	35.6	32.1	-41.3	2.9	0.0	47.3	29.3	54.0	-24.7	Vertical	120	180	

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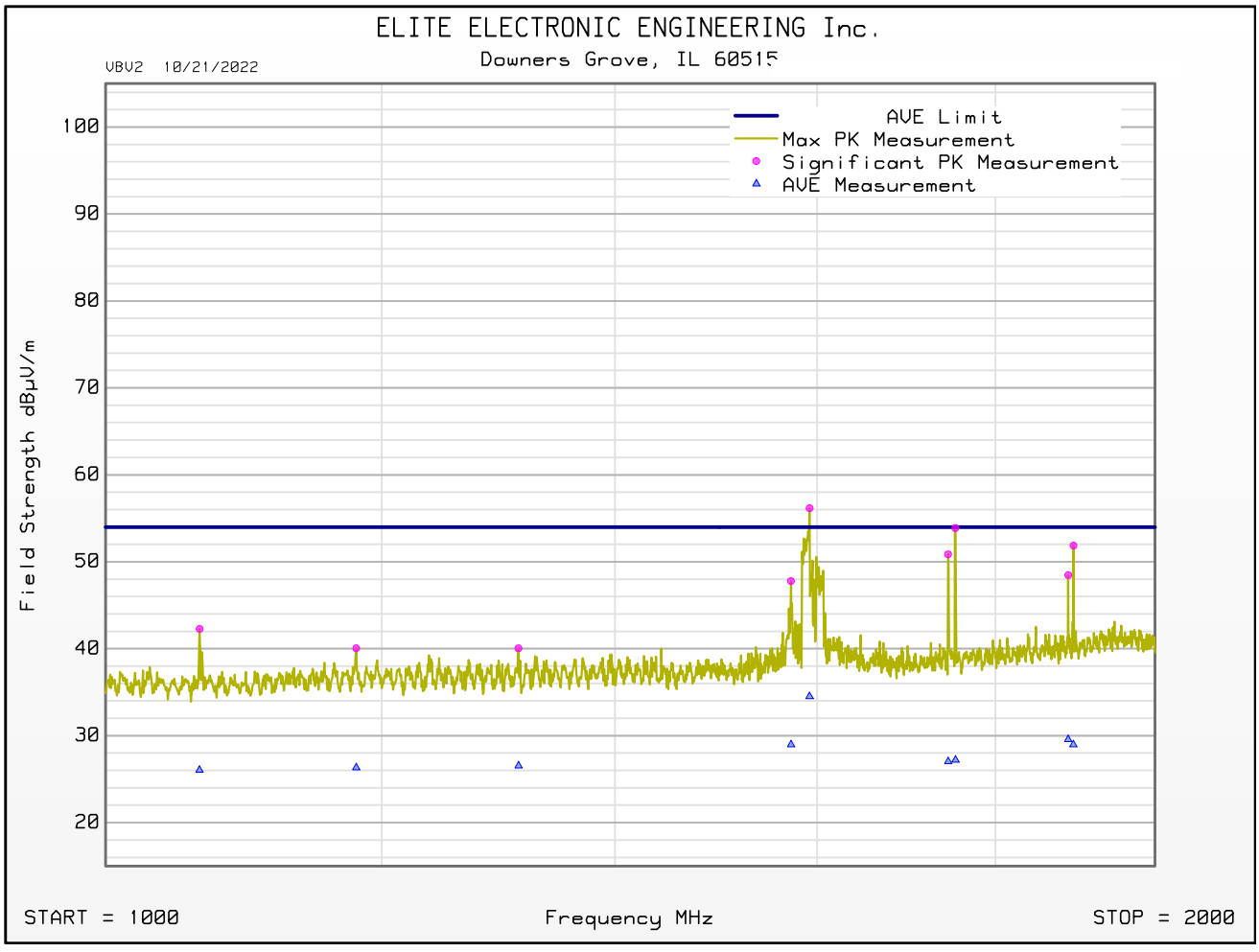
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

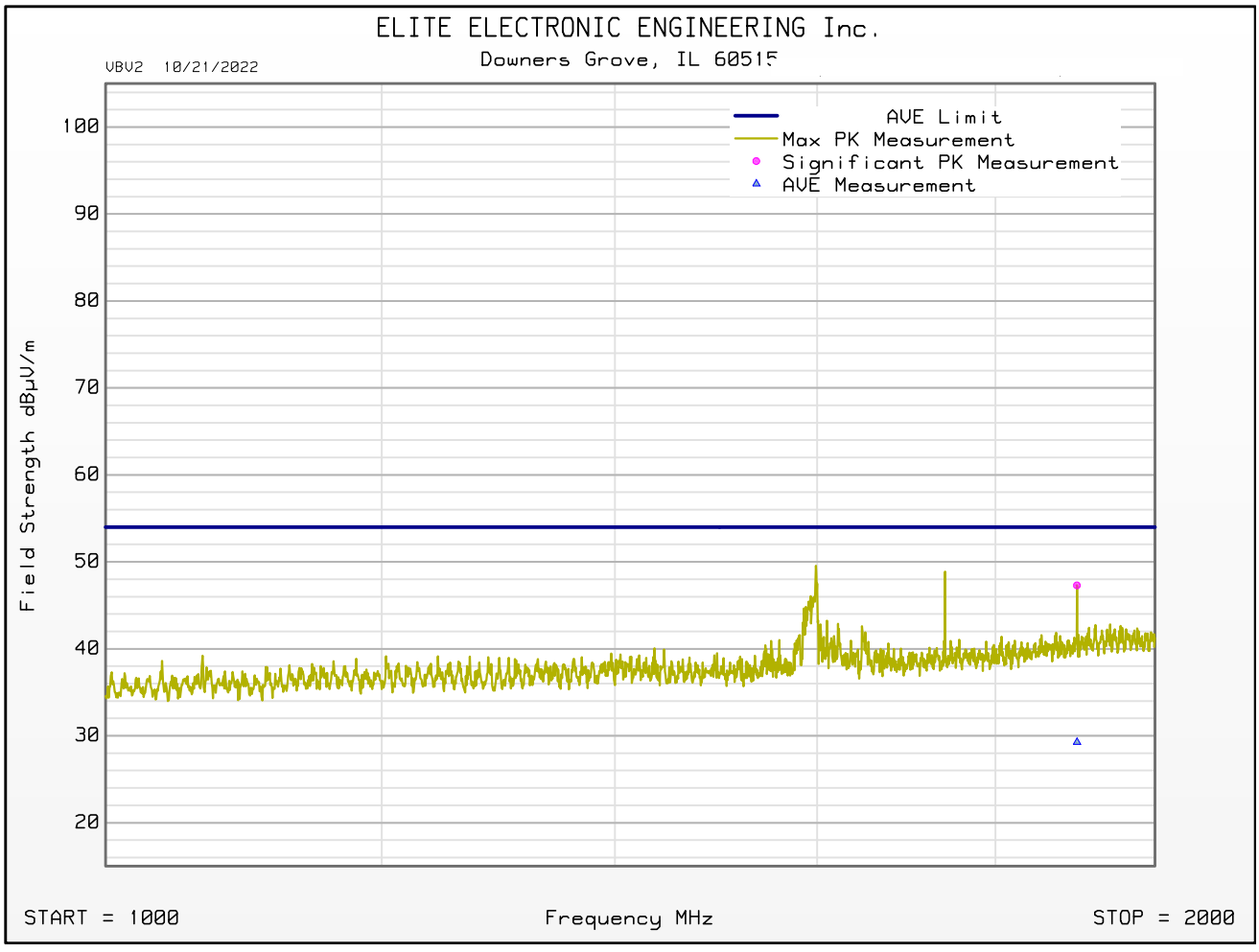
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 04:18:10 PM



EN 60945 4th ed. 2002-08
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 04:18:10 PM



CISPR 32 Ed. 2.1 2019-10 Class A
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

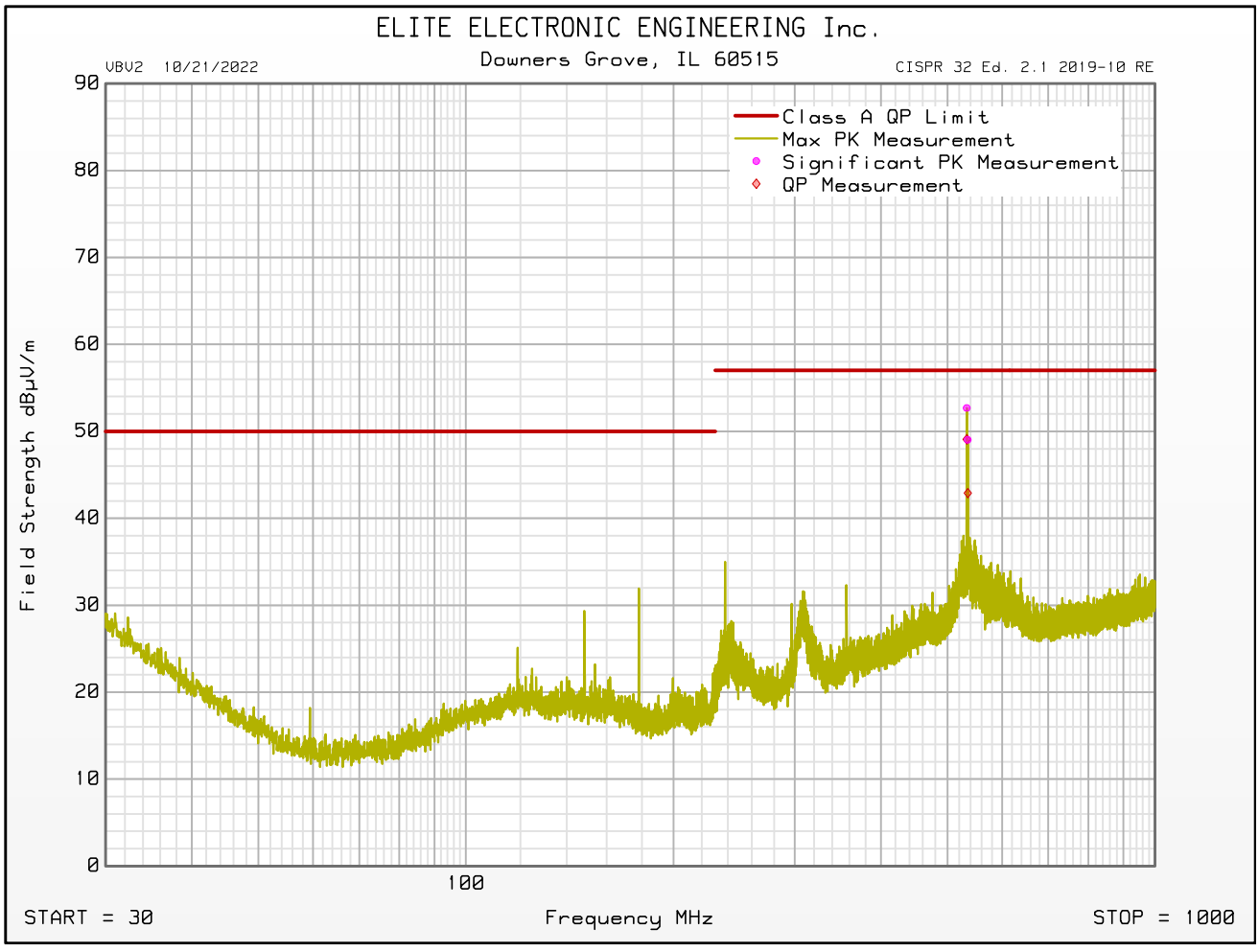
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 02:30:08 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
35.280	9.5	3.3	21.9	0.0	0.5	0.0	31.9	25.6	50.0	-24.4	Vertical	120	135	
44.760	12.2	6.7	17.1	0.0	0.5	0.0	29.8	24.3	50.0	-25.7	Vertical	200	180	
59.400	15.9	13.6	12.5	0.0	0.5	0.0	28.9	26.6	50.0	-23.4	Vertical	120	45	
80.040	8.4	-1.2	13.3	0.0	0.5	0.0	22.1	12.6	50.0	-37.4	Vertical	120	225	
118.800	14.8	11.6	18.2	0.0	0.6	0.0	33.6	30.4	50.0	-19.6	Vertical	120	180	
148.500	20.4	15.4	17.0	0.0	0.8	0.0	38.1	33.1	50.0	-16.9	Vertical	120	135	
154.260	16.2	8.9	17.2	0.0	0.8	0.0	34.2	26.9	50.0	-23.1	Vertical	120	270	
178.200	25.0	23.6	15.5	0.0	0.9	0.0	41.5	40.0	50.0	-10.0	Vertical	120	270	
198.000	19.8	0.3	15.4	0.0	1.0	0.0	36.2	16.7	50.0	-33.3	Vertical	120	225	
237.620	22.7	19.8	17.0	0.0	1.0	0.0	40.7	37.8	57.0	-19.2	Vertical	120	45	
531.140	21.6	15.9	24.8	0.0	1.5	0.0	47.9	42.2	57.0	-14.8	Vertical	120	315	
533.000	26.4	22.8	24.8	0.0	1.5	0.0	52.7	49.1	57.0	-7.9	Horizontal	340	270	
534.800	22.7	16.6	24.8	0.0	1.5	0.0	49.0	42.9	57.0	-14.1	Horizontal	200	225	
998.700	4.8	-6.1	27.5	0.0	2.0	0.0	34.3	23.4	57.0	-33.6	Vertical	340	135	

CISPR 32 Ed. 2.1 2019-10 Class A
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

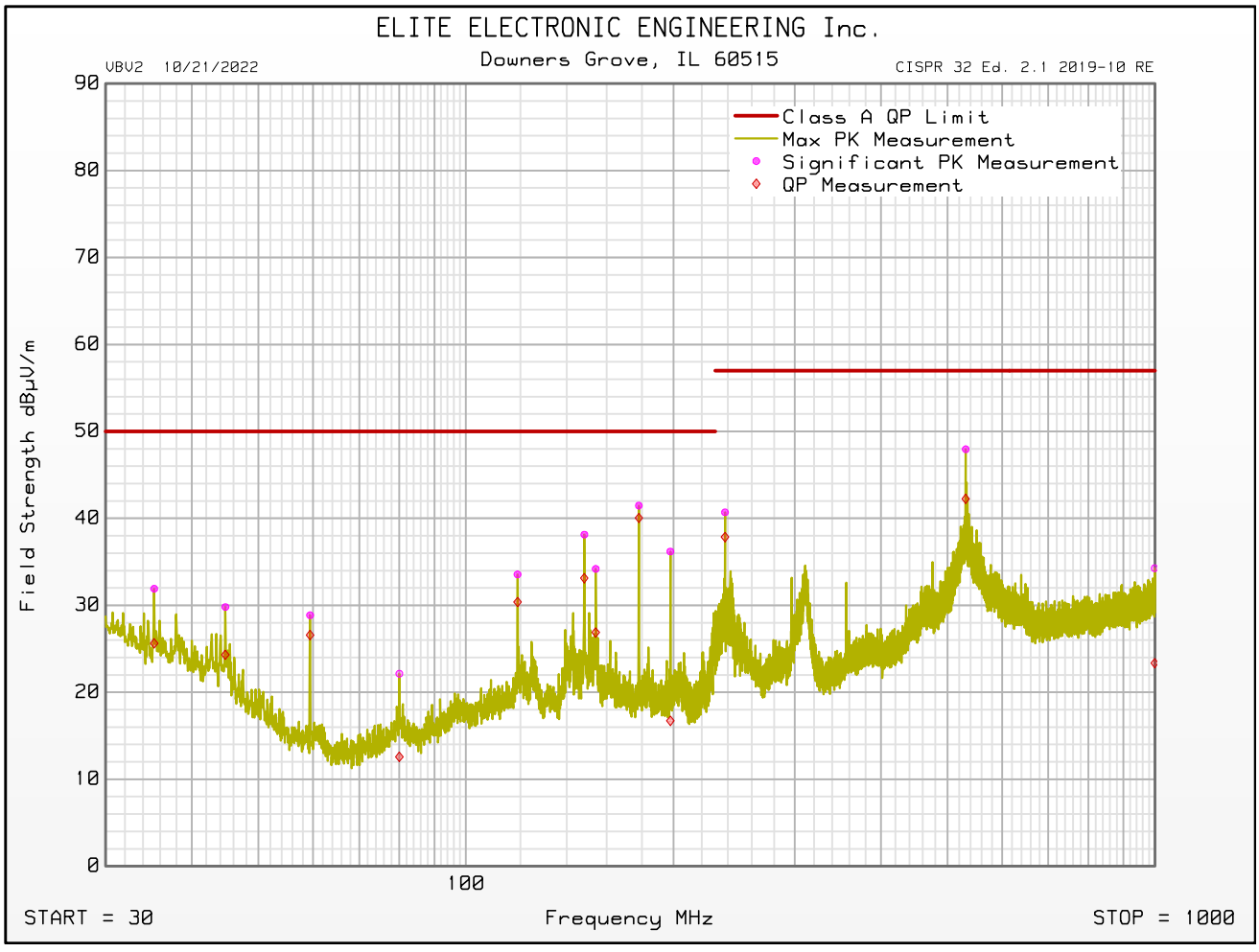
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 02:30:08 PM



CISPR 32 Ed. 2.1 2019-10 Class A
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 02:30:08 PM



CISPR 32 Ed. 2.1 2019-10 Class A
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 04:04:39 PM

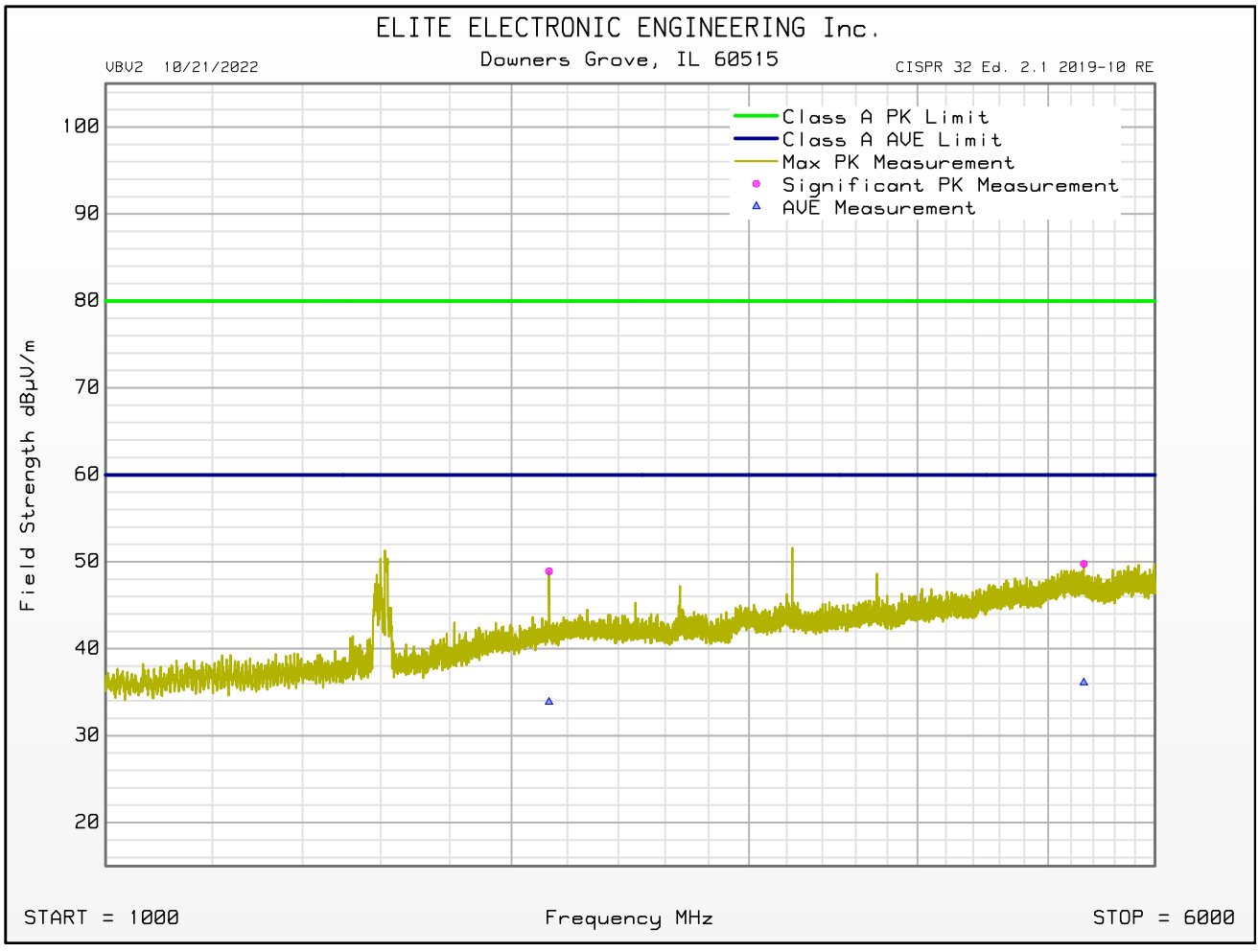
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
1304.000	50.0	29.5	-42.0	2.4	0.0	39.9	80.0	-40.1	Vertical	340	90	
1599.000	67.4	29.3	-41.8	2.7	0.0	57.6	80.0	-22.4	Vertical	120	180	
2132.000	53.8	33.2	-41.3	3.1	0.0	48.9	80.0	-31.1	Horizontal	200	180	
2666.500	63.3	33.3	-41.3	3.6	0.0	58.9	80.0	-21.1	Vertical	200	180	
2669.500	56.1	33.3	-41.3	3.6	0.0	51.7	80.0	-28.3	Vertical	200	180	
3229.500	55.9	34.1	-40.8	4.0	0.0	53.3	80.0	-26.7	Vertical	120	180	
3731.000	53.0	34.5	-40.5	4.4	0.0	51.4	80.0	-28.6	Vertical	200	225	
5313.000	47.5	37.4	-40.4	5.2	0.0	49.8	80.0	-30.2	Horizontal	200	225	

Freq MHz	Average Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Average Level
1304.000	36.5	29.5	-42.0	2.4	0.0	26.4	60.0	-33.6	Vertical	340	90	
1599.000	46.8	29.3	-41.8	2.7	0.0	37.0	60.0	-23.0	Vertical	120	180	
2132.000	38.8	33.2	-41.3	3.1	0.0	33.9	60.0	-26.1	Horizontal	200	180	
2666.500	39.0	33.3	-41.3	3.6	0.0	34.6	60.0	-25.4	Vertical	200	180	
2669.500	37.8	33.3	-41.3	3.6	0.0	33.4	60.0	-26.6	Vertical	200	180	
3229.500	51.7	34.1	-40.8	4.0	0.0	49.1	60.0	-10.9	Vertical	120	180	
3731.000	35.0	34.5	-40.5	4.4	0.0	33.3	60.0	-26.7	Vertical	200	225	
5313.000	33.9	37.4	-40.4	5.2	0.0	36.1	60.0	-23.9	Horizontal	200	225	

CISPR 32 Ed. 2.1 2019-10 Class A
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

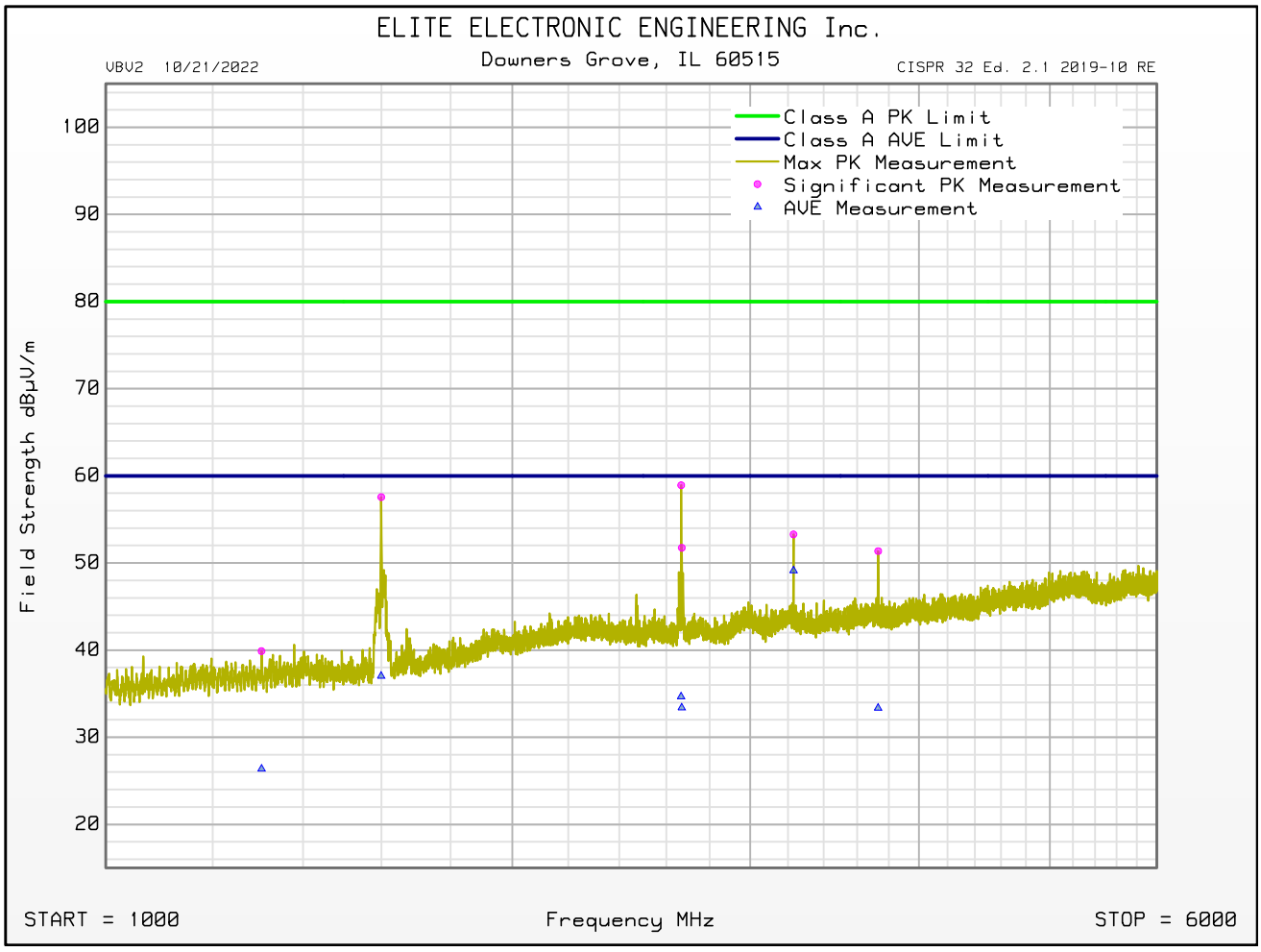
Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 04:04:39 PM



CISPR 32 Ed. 2.1 2019-10 Class A
Radiated RF Emissions Test

SW ID/Rev: VBV2 10/21/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
Serial Number	:	303009
DUT Mode	:	Tx Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	N. Bouchie
Test Date	:	Dec 28, 2022 04:04:39 PM



22. RF Conducted Emissions Test (DC Power Ports)

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	Tx Standby

Information	
Setup Format	Tabletop
Height of Support	N/a
Type of Test Site	Semi-anechoic
Test site used	Room 21
Note	None

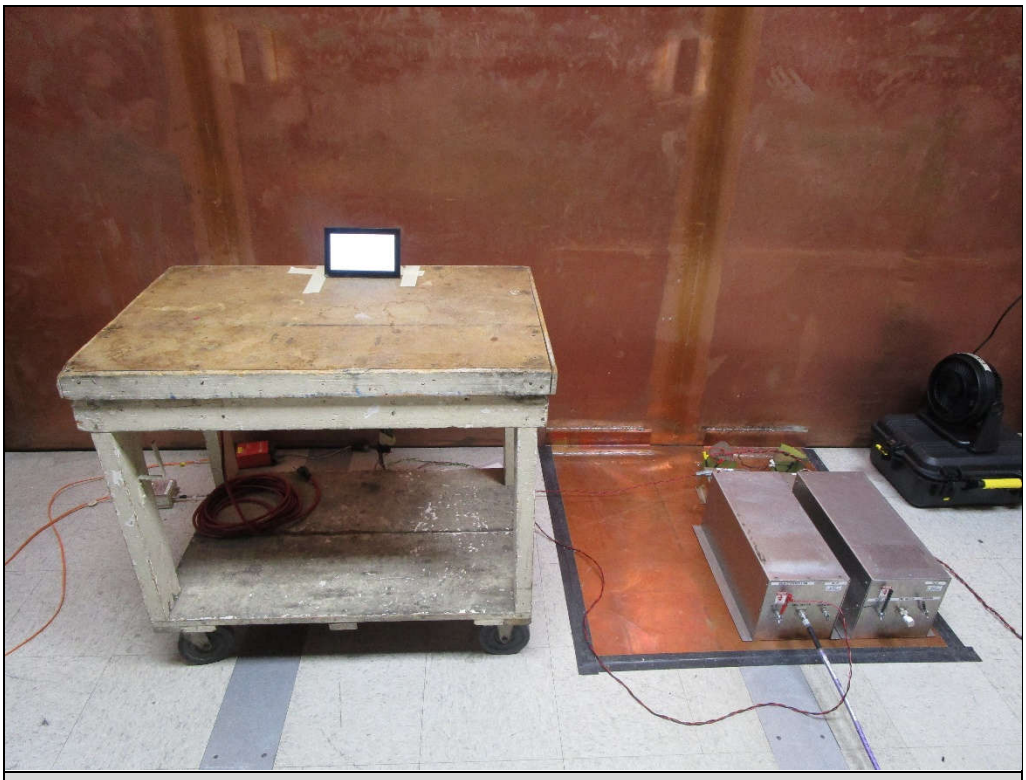
Requirements	
Frequency of Emission (MHz)	Quasi-peak Limit (dBµV)
0.01 to 0.15*	96-50
0.15 to 0.35**	60-50
0.35 to 30	50

*The limits decrease linearly with the logarithm of the frequency in the range 0.01MHz to 0.15 MHz.
**The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.35 MHz.

Measurement Uncertainty		
Measurement Type	U_{lab}	U_{CISPR}
Conducted disturbance (150kHz – 30MHz)	2.7dB	3.4dB

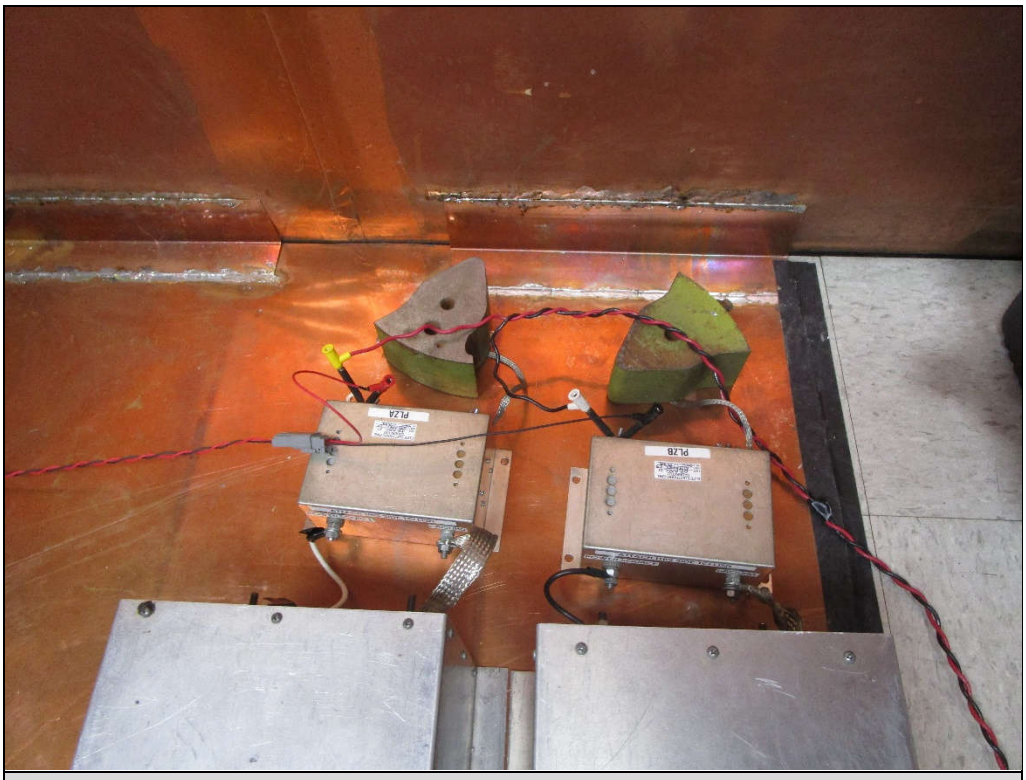
U_{lab} = Determined for Elite Electronic Engineering, Inc.
U_{CISPR} = From CISPR 16-4-2 Table 1

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. 1) The EUT was operated in the Tx Standby mode. 2) Measurements were first made on the Voltage high line. 3) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands. 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector. 5) 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.) 6) Steps (4) and (5) 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. 7) Steps (3) through (6) were repeated on the Voltage return line.

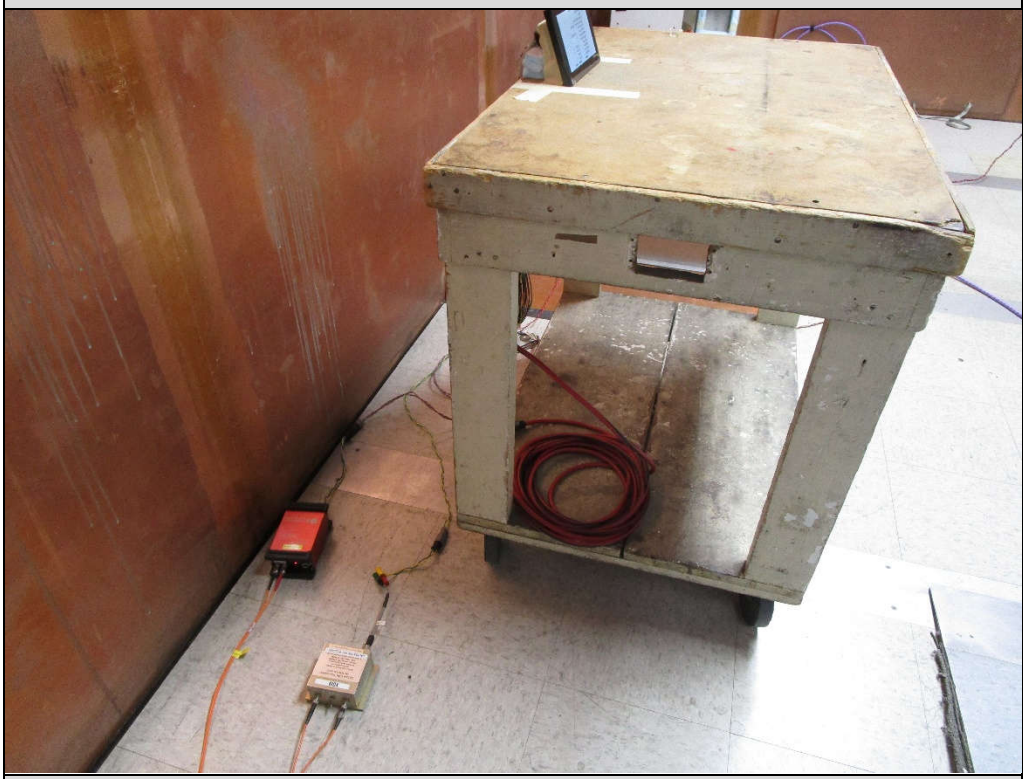


Test Setup for RF Conducted Emissions (DC Ports)

Test Setup for RF Conducted Emissions (DC Ports)



Test Setup for RF Conducted Emissions (DC Ports)



Test Setup for RF Conducted Emissions (DC Ports)

EN 60945 4th ed. 2002-08 Conducted Emissions Test

Significant Emissions Data

VBR8 09/07/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
DUT Revision	:	
Serial Number	:	303009
DUT Mode	:	Tx Standby
Line Tested	:	High PLZ3
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
Limit	:	EMC Class B
Test Date	:	Jan 03, 2023 02:11:31 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

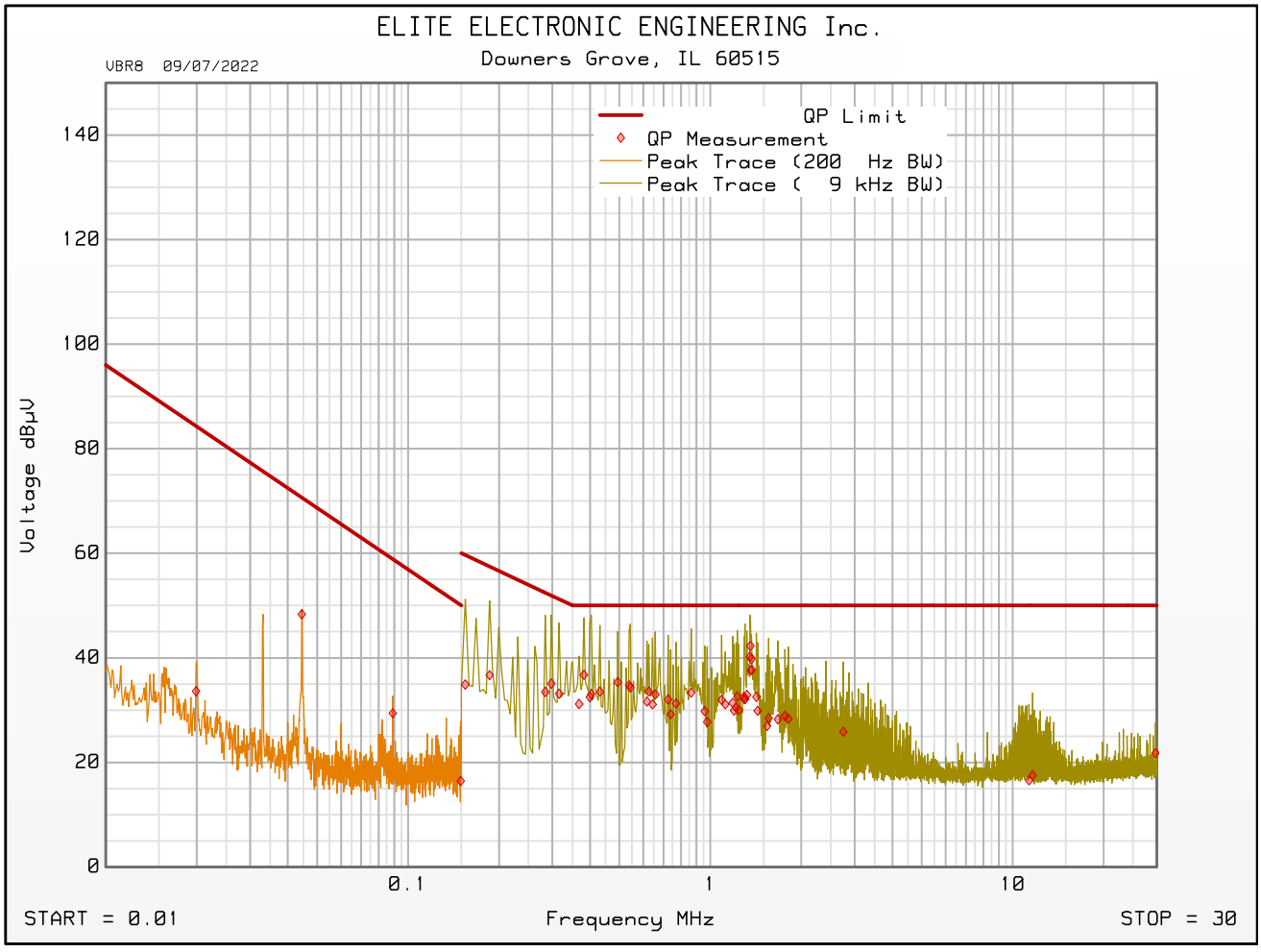
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions
0.020	33.6	84.3	
0.045	48.3	70.6	
0.089	29.4	58.9	
0.149	16.4	50.1	
0.186	36.7	57.5	
0.298	35.1	51.9	
0.382	36.7	50.0	
0.626	33.6	50.0	
1.357	42.3	50.0	
2.753	25.9	50.0	
11.333	16.6	50.0	
11.649	17.5	50.0	
29.703	21.8	50.0	

EN 60945 4th ed. 2002-08 Conducted Emissions Test

Cumulative Data

VBR8 09/07/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
DUT Revision	:	
Serial Number	:	303009
DUT Mode	:	Tx Standby
Line Tested	:	High PLZ3
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
Limit	:	EMC Class B
Test Date	:	Jan 03, 2023 02:11:31 PM



Emissions Meet QP Limit

EN 60945 4th ed. 2002-08 Conducted Emissions Test

Significant Emissions Data

VBR8 09/07/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
DUT Revision	:	
Serial Number	:	303009
DUT Mode	:	Tx Standby
Line Tested	:	Neutral PLZ2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
Limit	:	EMC Class B
Test Date	:	Jan 03, 2023 02:21:10 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

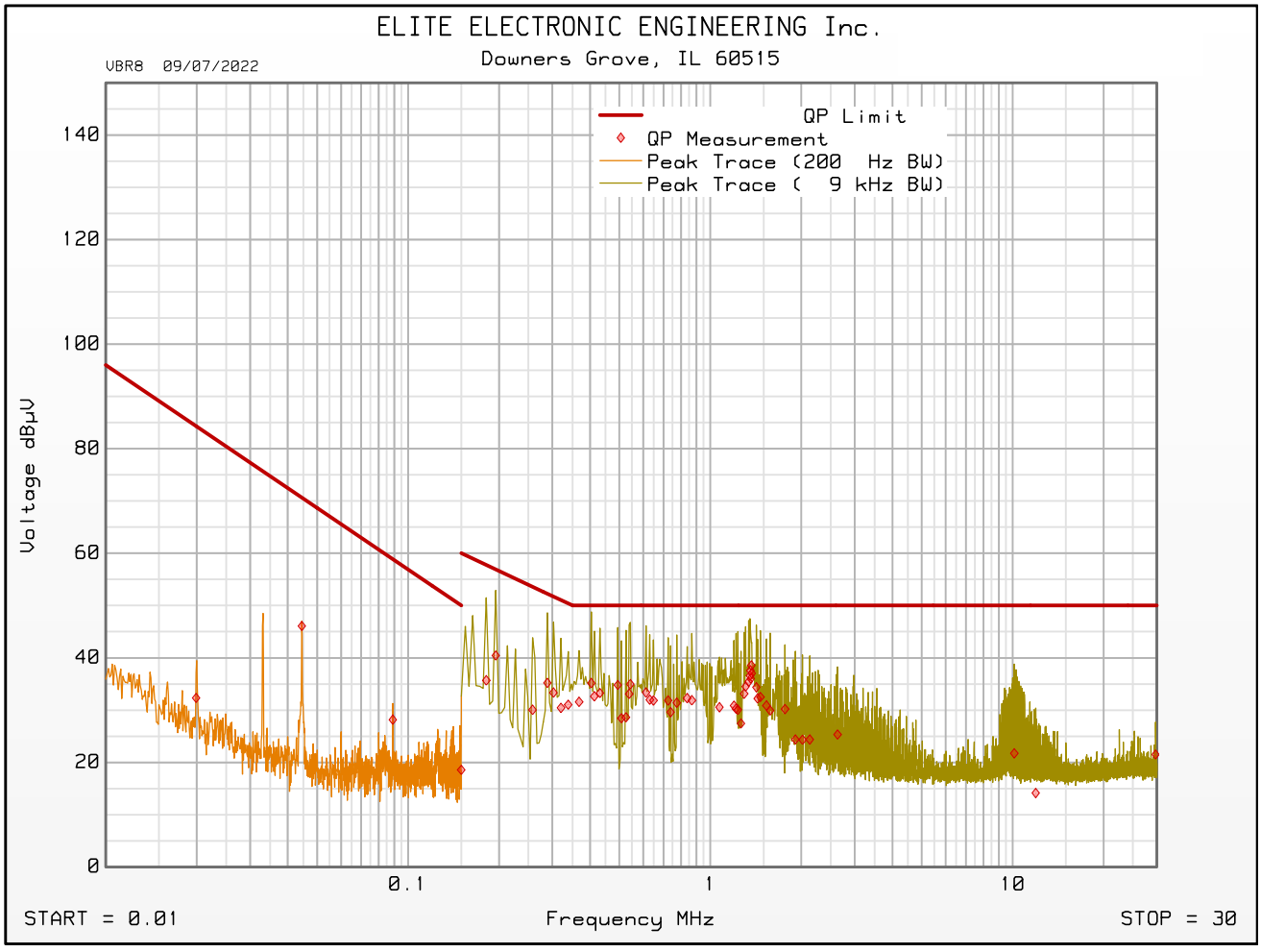
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions
0.020	32.3	84.3	
0.045	46.1	70.6	
0.089	28.2	58.9	
0.150	18.6	50.0	
0.195	40.4	56.9	
0.289	35.2	52.3	
0.404	35.2	50.0	
0.613	33.4	50.0	
1.366	38.5	50.0	
2.636	25.3	50.0	
10.127	21.7	50.0	
11.924	14.1	50.0	
29.712	21.5	50.0	

EN 60945 4th ed. 2002-08 Conducted Emissions Test

Cumulative Data

VBR8 09/07/2022

Manufacturer	:	Helios Engineering
Model	:	RCDGM07-01
DUT Revision	:	
Serial Number	:	303009
DUT Mode	:	Tx Standby
Line Tested	:	Neutral PLZ2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	N. Bouchie
Limit	:	EMC Class B
Test Date	:	Jan 03, 2023 02:21:10 PM



Emissions Meet QP Limit

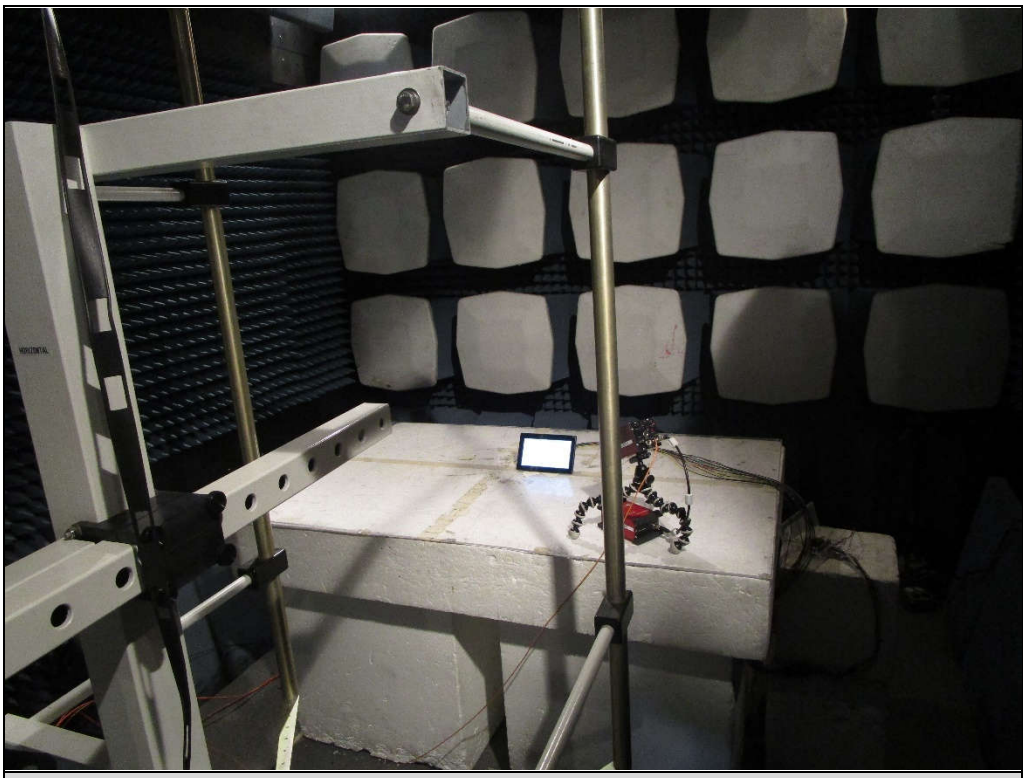
23. Radiated Immunity Test Details

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected

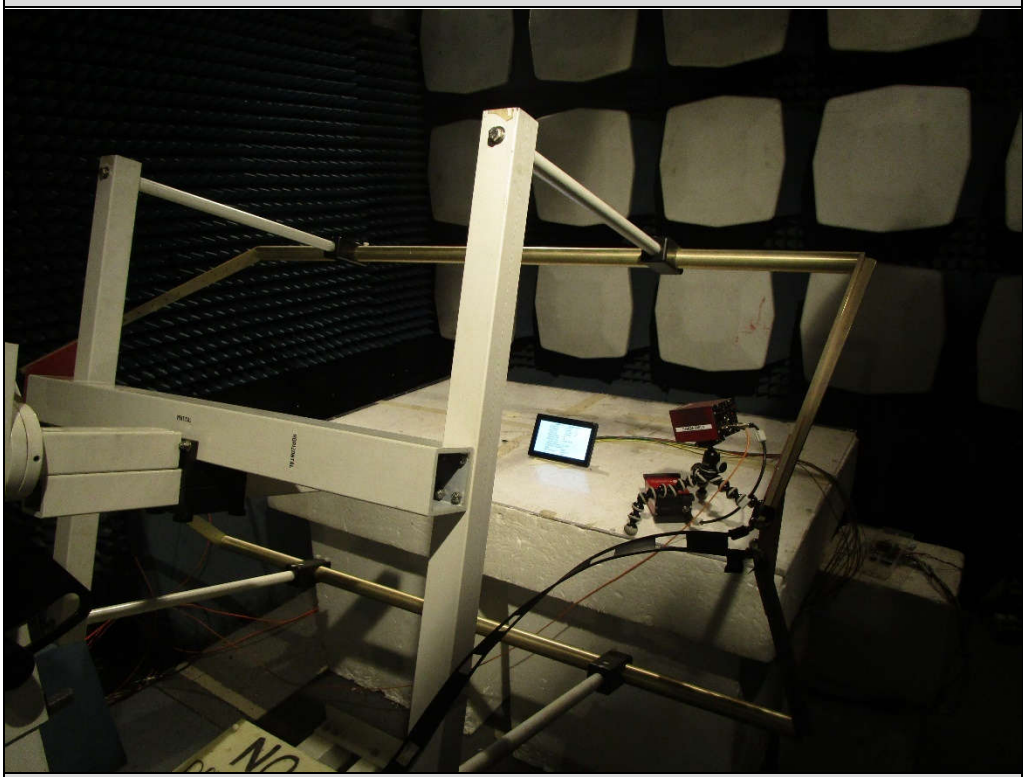
Information	
Setup Format	Tabletop
Height of Support	N/a
Type of Test Site	Semi-anechoic
Position of Radiating Antennas	3m – Log periodic Antenna 2.5m – Double-ridge Waveguide
Type of Antennas Used	Below 1GHz: Log periodic (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Uniform Field Area	1.5 m 1.5 m square
Partial Illumination Used	No
Number of Interconnection Wires	18
Type of Interconnection Wires	12AWG Power, I/O, Fiber Optic
Frequency Step Sizes	1%
Notes	None

Requirements	
Frequency of Test Signal (MHz)	Field Strength (V/m)
27 to 80	10
80 to 1000	10
1000 to 2700	3
2700 to 6000	3

Procedures
The test item is placed on an 80cm high non-conductive table. The test item was arranged so that the front of the test item was coincident with the uniform field area established during the calibration process. The test item was operated in the Tx Standby mode. The transmit antennas and cables, used to establish the uniform field, were set up in the same configuration as they were during the calibration process for vertical polarization. (a) The forward power determined during the calibration process was adjusted to achieve the required field intensity level and applied to the field generating antenna. The frequency steps are 1% of the preceding frequency. The dwell time at each frequency was longer than the time required to exercise the test item but never less than 0.5 seconds. (b) The entire frequency range was incrementally swept with the signal 80% modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to switch test equipment when necessary. (c) If a response occurs, at the specified level, the response is recorded. The low and high frequencies of the range over which the response occurs at the specified level are also noted. The applied level is then reduced, and the frequency simultaneously adjusted to determine points at which responses occur at applied levels less than the requirements. The levels and frequencies of these points are recorded. (d) Steps (a) through (c) were repeated with the transmitting antenna positioned with horizontal polarization. (e) Steps (a) through (d) were repeated with the right, back and left side of the test item coincident with the uniform area established during the calibration process.



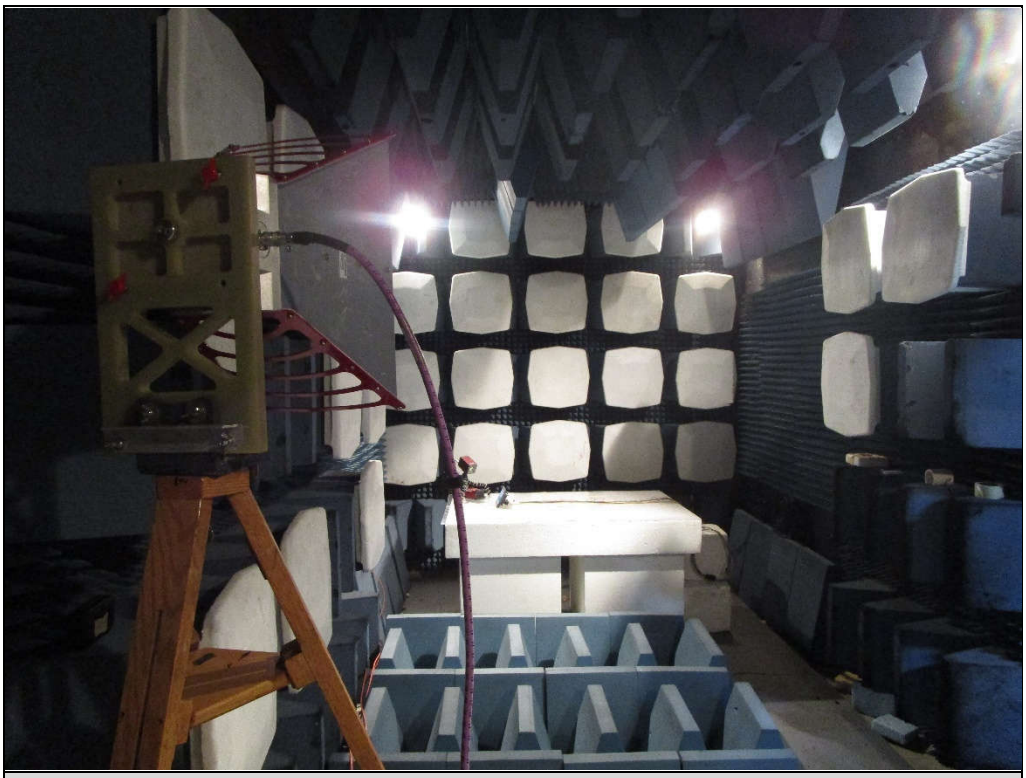
Test Setup for Radiated Immunity: 27MHz to 80MHz, Horizontal Polarization



Test Setup for Radiated Immunity: 27MHz to 80MHz, Vertical Polarization

Test Setup for Radiated Immunity: 80MHz to 1GHz, Horizontal Polarization

Test Setup for Radiated Immunity: 80MHz to 1GHz, Vertical Polarization



Test Setup for Radiated Immunity: Above 1GHz, Horizontal Polarization

Test Setup for Radiated Immunity: Above 1GHz, Vertical Polarization

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected
Date Tested	November 17, 2022

Frequency (MHz)	Antenna Polarization	Modulation	Applied Level (V/m)	Threshold Level (V/m)	Required Performance Criterion	Meets Performance Criterion? (Y/N)	Notes
Side Tested: Front (0 degrees)							
27 – 1000	Vertical	1kHz AM @ 80%	10	---	Note*	Y	---
27 – 1000	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Right (90 degrees)							
27 – 1000	Vertical	1kHz AM @ 80%	10	---	*	Y	---
27 – 1000	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Back (180 degrees)							
27 – 1000	Vertical	1kHz AM @ 80%	10	---	*	Y	---
27 – 1000	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Left (270 degrees)							
27 – 1000	Vertical	1kHz AM @ 80%	10	---	*	Y	---
27 – 1000	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Front (0 degrees)							
1000 - 6000	Vertical	1kHz AM @ 80%	3	---	*	Y	---
1000 - 6000	Horizontal	1kHz AM @ 80%	3	---	*	Y	---
Side Tested: Right (90 degrees)							
1000 - 6000	Vertical	1kHz AM @ 80%	3	---	*	Y	---
1000 - 6000	Horizontal	1kHz AM @ 80%	3	---	*	Y	---
Side Tested: Back (180 degrees)							
1000 - 6000	Vertical	1kHz AM @ 80%	3	---	*	Y	---
1000 - 6000	Horizontal	1kHz AM @ 80%	3	---	*	Y	---
Side Tested: Left (270 degrees)							
1000 - 6000	Vertical	1kHz AM @ 80%	3	---	*	Y	---
1000 - 6000	Horizontal	1kHz AM @ 80%	3	---	*	Y	---

*Performance criteria for continuous phenomena applied to transmitters and receivers

The EUT conforms

Tested by: Nathaniel Bouchie

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected
Date Tested	November 17, 2022

Frequency (MHz)	Antenna Polarization	Modulation	Applied Level (V/m)	Threshold Level (V/m)	Required Performance Criterion	Meets Performance Criterion? (Y/N)	Notes
Side Tested: Front (0 degrees)							
Spot[1]	Vertical	1kHz AM @ 80%	10	---	Note*	Y	---
Spot[1]	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Right (90 degrees)							
Spot[1]	Vertical	1kHz AM @ 80%	10	---	*	Y	---
Spot[1]	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Back (180 degrees)							
Spot[1]	Vertical	1kHz AM @ 80%	10	---	*	Y	---
Spot[1]	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Left (270 degrees)							
Spot[1]	Vertical	1kHz AM @ 80%	10	---	*	Y	---
Spot[1]	Horizontal	1kHz AM @ 80%	10	---	*	Y	---
Side Tested: Front (0 degrees)							
Spot[2]	Vertical	1kHz AM @ 80%	3	---	*	Y	---
Spot[2]	Horizontal	1kHz AM @ 80%	3	---	*	Y	---
Side Tested: Right (90 degrees)							
Spot[2]	Vertical	1kHz AM @ 80%	3	---	*	Y	---
Spot[2]	Horizontal	1kHz AM @ 80%	3	---	*	Y	---
Side Tested: Back (180 degrees)							
Spot[2]	Vertical	1kHz AM @ 80%	3	---	*	Y	---
Spot[2]	Horizontal	1kHz AM @ 80%	3	---	*	Y	---
Side Tested: Left (270 degrees)							
Spot[2]	Vertical	1kHz AM @ 80%	3	---	*	Y	---
Spot[2]	Horizontal	1kHz AM @ 80%	3	---	*	Y	---

[1]800MHz and 900MHz
[2]1800MHz, 2600MHz, 3500MHz and 5000MHz

*Performance criteria for continuous phenomena applied to transmitters and receivers

The EUT conforms

Tested by: Nathaniel Bouchie

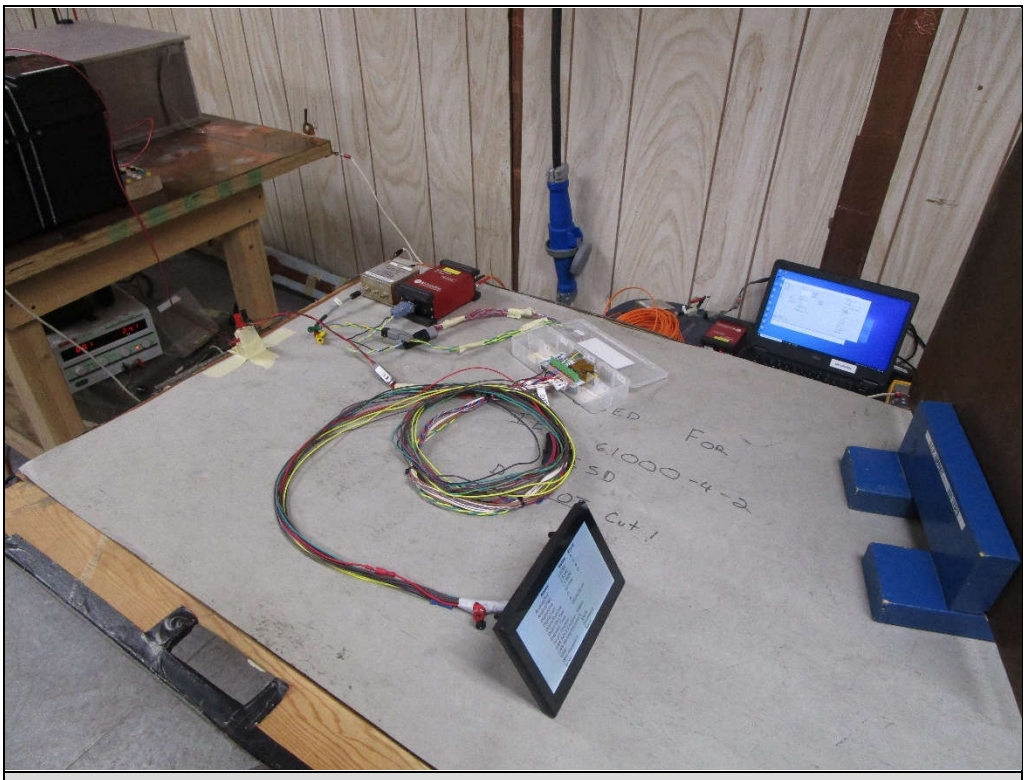
24. Electrostatic Discharge (ESD) Test

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected

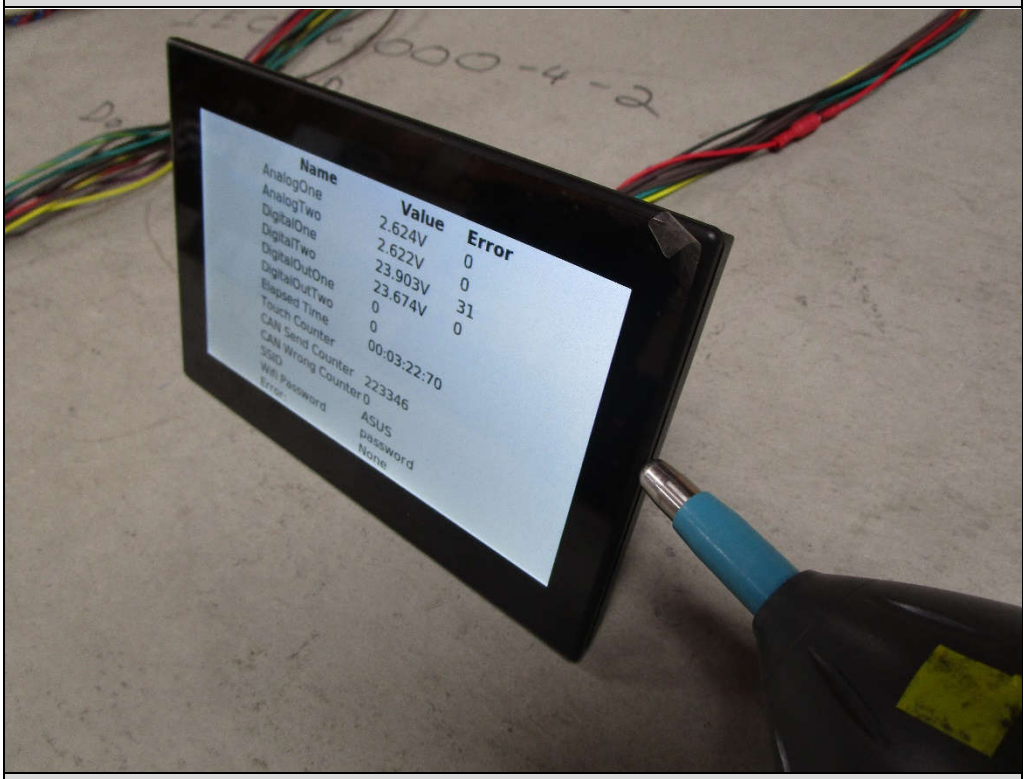
Test Conditions			
Test Parameters	Requirements	During Test	Comments
Discharge Network	150pF / 330Ω	150pF / 330Ω	---
Ambient Temperature	15C-35C	24	---
Relative Humidity	30%-60%	37	---
Air Pressure	860mbar-1060mbar	1021.4	---
Setup Format	Tabletop		---

Requirements		
Level	Air Discharge	Contact Discharge
1	2kV	NA
2	4kV	NA
3	8kV	6kV

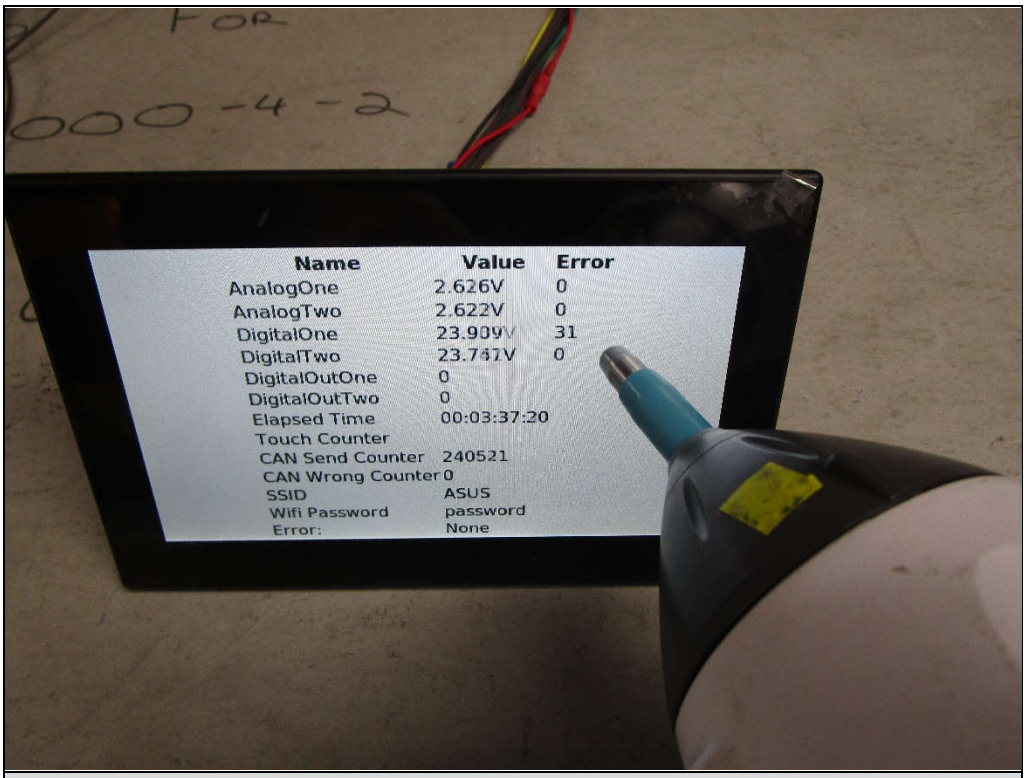
Procedures
Contact Discharge Method – Indirect Application The test item was operated in the BLE and WiFi Connected mode. (b) The ESD simulator charge voltage was set to 6 kV. (c) At locations 10 cm from each side of the test item, the tip of the contact discharge electrode was positioned vertically, touched to the horizontal coupling plane and the discharge was initiated. (d) Ten (10) discharges were applied at each location at a 1 pulse per second repetition rate. (e) The test item was continuously monitored for a response. (f) Steps (a) through (e) were repeated with the polarity of the discharges reversed. (h) Steps (c) through (f) were repeated except step (c) was performed as follows: The vertical coupling plane was positioned at locations 10 cm from each side of the test item, the tip of the contact discharge electrode was positioned to the center of one vertical edge, touched to the vertical coupling plane and the discharge was initiated. Contact Discharge Method – Direct Application The test item was operated in the BLE and WiFi Connected mode. (b) The ESD simulator charge voltage was set to 6 kV. (c) At all conductive surfaces, the tip of the contact discharge electrode were touched to the test item and the discharge was initiated. (d) Ten (10) discharges were applied at each location at a 1 pulse per second repetition rate. (e) The test item was continuously monitored for a response. (f) Steps (a) through (e) were repeated with the polarity of the discharges reversed. Air Discharge Method – Direct Application The test item was operated in the BLE and WiFi Connected mode. (b) The ESD simulator charge voltage was set to 2 kV. (c) At insulated surfaces, the tip of the discharge electrode was placed near the surface of the test item and the discharge was allowed to discharge at a rate of 20 pps. (d) The test item was continuously monitored for a response. (e) At locations where responses were noted, the discharge rate was reduced to 1 pulse per second. Ten (10) discharges were applied at each location at the 1 pulse per second repetition rate. (f) Steps (a) through (e) were repeated with the polarity of the discharges reversed. (g) Steps (c) through (f) were repeated with the ESD simulator charge voltage set to 4kV. (h) Steps (c) through (f) were repeated with the ESD simulator charge voltage set to 8 kV.



Test Setup for Electrostatic Discharge (ESD)



Test Setup for Electrostatic Discharge (ESD)



Test Setup for Electrostatic Discharge (ESD)

Test Setup for Electrostatic Discharge (ESD)

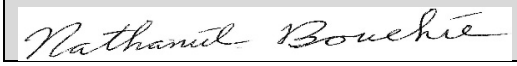
Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected
Date Tested	November 28, 2022

Test Point	Voltage Level (kV)	Pulse Polarity	Number Applied	Repetition Rate (pps)	Required Performance Criterion	Meets Performance Criterion? (Y/N)	Notes
Method: Contact Discharge – Indirect Application							
HCP, Front	6 kV	+/-	10	1	B	Y	---
HCP, Back	6 kV	+/-	10	1	B	Y	---
HCP, Left	6 kV	+/-	10	1	B	Y	---
HCP, Right	6 kV	+/-	10	1	B	Y	---
VCP, Front	6 kV	+/-	10	1	B	Y	---
VCP, Back	6 kV	+/-	10	1	B	Y	---
VCP, Left	6 kV	+/-	10	1	B	Y	---
VCP, Right	6 kV	+/-	10	1	B	Y	---
Method: Contact Discharge – Direct Application							
N/a	6 kV	+/-	10	1	B	Y	---
Method: Air Discharge							
LED Screen Q1	2/4/8 kV	+/-	10	1	B	Y	---
LED Screen Q2	2/4/8 kV	+/-	10	1	B	Y	---
LED Screen Q3	2/4/8 kV	+/-	10	1	B	Y	---
LED Screen Q4	2/4/8 kV	+/-	10	1	B	Y	---
Top Seam	2/4/8 kV	+/-	10	1	B	Y	---
Right Seam	2/4/8 kV	+/-	10	1	B	Y	---
Left Seam	2/4/8 kV	+/-	10	1	B	Y	---
Back Seam	2/4/8 kV	+/-	10	1	B	Y	---

HCP - Horizontal Coupling Plane
VCP - Vertical Coupling Plane

The EUT conforms

Tested by: Nathaniel Bouchie



25. RF Common Mode Test

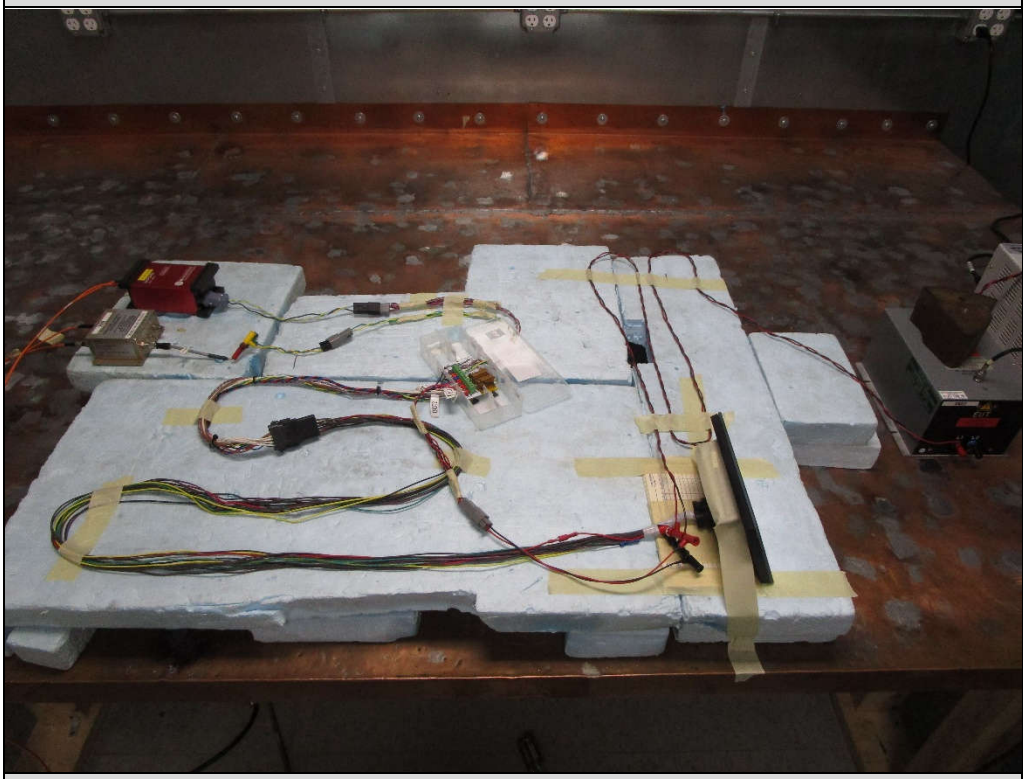
Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected

Information	
Type of Test	Laboratory
Test level (power leads)	2 (3 for Spot Frequencies)
Test level (signal leads)	2 (3 for Spot Frequencies)
Coupling method	CDN Current Probe
Ports Tested – CDN Method	DC Mains
Ports Tested – Current Probe Method	Entire Bundle

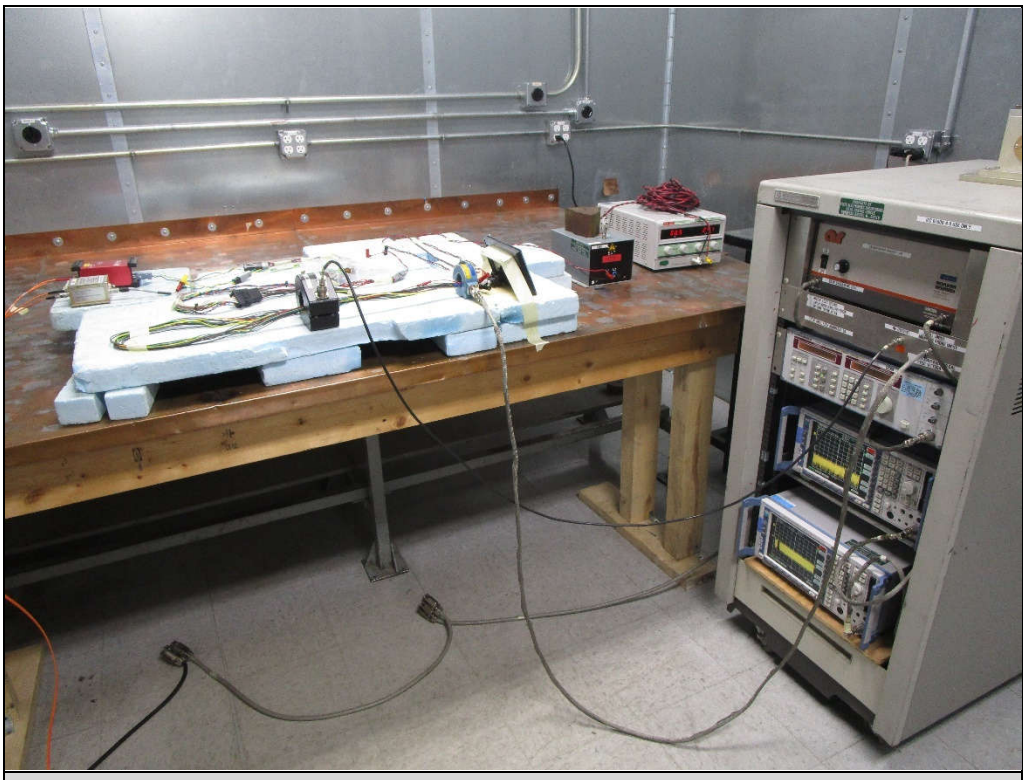
Requirements		
Level	Applied Level (V_{rms})	Applied Level (dBµV)
2	3	129.5
3	10	140

Procedures
Power Lines A signal generator output was amplified and connected to the RF Input of the Coupling/Decoupling Network (CDN). A computer system, used to control the signal generator, adjusted the output of the signal generator until the required levels were achieved. The power cable of the EUT was connected to the output of the CDN. The frequency range was swept from 150kHz to 80MHz using the signal levels established during the calibration process, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave, pausing to adjust the RF signal level as necessary. The frequency was swept incrementally with the step size of 1% of the preceding frequency value. The dwell time at each frequency was not less than the time necessary for the EUT to be exercised and to respond but was not less than 0.5 second. The EUT was continuously monitored for a response. Interconnect Cables A signal generator output was amplified and connected to the RF Input of the current injection probe. A computer system, used to control the signal generator, adjusted the output of the signal generator until the required levels were achieved. The current injection probe was clamped around the interconnect cable(s). The frequency range was swept from 150kHz to 80MHz using the signal levels established during the calibration process, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave, pausing to adjust the RF signal level as necessary. The frequency was swept incrementally with the step size of 1% of the preceding frequency value. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond but shall not be less than 0.5 seconds. The EUT was continuously monitored for a response.

Test Setup for RF Common Mode – Power Leads



Test Setup for RF Common Mode – Power Leads



Test Setup for RF Common Mode – Signal Leads

Test Setup for RF Common Mode – Signal Leads

Manufacturer	Helios Engineering
Product	RCD Touch Screen Display/Controller
Model	RCDGM07-01
Serial No	303010
Mode	BLE and WiFi Connected
Date Tested	November 28, 2022

Frequency (MHz)	Applied Level (Vrms)	Threshold Level (V_{rms})	Modulation	Required Performance Criterion	Meets Performance Criterion? (Y/N)	Notes
Input Power – CDN Method						
0.15 – 80	3	---	1kHz AM @ 80%	A	Y	---
0.15 – 80	3	---	400Hz AM @ 80%	A	Y	---
Interconnect Cables – Current Probe Method						
0.15 – 80	3	---	1kHz AM @ 80%	A	Y	---
0.15 – 80	3	---	400Hz AM @ 80%	A	Y	---

Performance Criterion A – Performance criteria for continuous phenomena applied to transmitters and receivers

The EUT conforms

Tested by: Nathaniel Bouchie

Frequency (MHz)	Applied Level (Vrms)	Threshold Level (Vrms)	Modulation	Required Performance Criterion	Meets Performance Criterion? (Y/N)	Notes
Input Power – CDN Method						
Spot[1]	10	---	1kHz AM @ 80%	A	Y	---
Interconnect Cables – Current Probe Method						
Spot[1]	10	---	1kHz AM @ 80%	A	Y	---

[1]60945 Spot Frequencies – 2 MHz, 3 MHz, 4 MHz, 6.2MHz, 8.2MHz, 12.6MHz, 16.5MHz, 18.8MHz, 22MHz and 25MHz

Performance Criterion A – Performance criteria for continuous phenomena applied to transmitters and receivers

The EUT conforms

Tested by: Nathaniel Bouchie

26. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

Valid To: June 30, 2023 Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:	Test Method(s) [1]:
Transient Immunity	ISO 7637-2 (including emissions); ISO 7637-3; ISO 16750-2:2012, Sections 4.6.3 and 4.6.4; CS-11979, Section 6.4; CS.00054, Section 5.9; EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222); GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12; ECE Regulation 10.06 Annex 10
Electrostatic Discharge (ESD)	ISO 10605 (2001, 2008); CS-11979 Section 7.0; CS.00054, Section 5.10; EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13; GMW 3097 Section 3.6
Conducted Emissions	CISPR 25 (2002, 2008), Sections 6.2 and 6.3; CISPR 25 (2016), Sections 6.3 and 6.4; CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2; GMW 3097, Section 3.3.2; EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)
Radiated Emissions Anechoic	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CS-11979, Section 5.3; CS.00054, Section 5.6.3; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310);

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

Test Technology:	Test Method(s) [1]:
Vehicle Radiated Emissions	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI)	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112); ECE Regulation 10.06 Annex 9
Radiated Immunity Anechoic *(Including Radar Pulse)*	ISO 11452-2; ISO 11452-5; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21; ECE Regulation 10.06 Annex 9
Radiated Immunity Magnetic Field	ISO 11452-8
Radiated Immunity Reverb	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Vehicle Product Specific EMC Standards	EN 14982; EN ISO 13309; ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
Electrical Loads	ISO 16750-2
Emissions Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; CISPR 16-2-1 (2008); CISPR 16-2-1; KS C 9814-1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KS C 9832; KN 32; ECE Regulation 10.06 Annex 7 (Broadband) ECE Regulation 10.06 Annex 8 (Narrowband) ECE Regulation 10.06 Annex 14 (Conducted)

Test Technology:	Test Method(s) [1]:
Emissions (cont'd)	
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124
Current Harmonics	IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; ECE Regulation 10.06 Annex 12
Immunity	
Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; KS C 9610-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; KS C 9610-4-3; IEEE C37.90.2 2004
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011); IEC 61000-4-4 (1995) + A1(2000) + A2(2001); KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008); IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4; KS C 9610-4-4; ECE Regulation 10.06 Annex 15
Surge	IEC 61000-4-5 (1995) + A1(2000); IEC 61000-4-5, Ed 1.1 (2005-11); EN 61000-4-5 (1995) + A1(2001); KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5; KS C 9610-4-5; IEEE C37.90.1 2012; IEEE STD C62.41.2 2002; ECE Regulation 10.06 Annex 16

Test Technology:	Test Method(s) [1]:
Immunity (cont'd)	
Conducted Immunity	IEC 61000-4-6 (1996) + A1(2000); IEC 61000-4-6, Ed 2.0 (2006-05); IEC 61000-4-6 Ed. 3.0 (2008); KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6; EN 61000-4-6; KN 61000-4-6; KS C 9610-4-6
Power Frequency Magnetic Field Immunity (*Down to 3 A/m*)	IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009); EN 61000-4-8 (1994) + A1(2000); KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8; KS C 9610-4-8
Voltage Dips, Short Interrupts, and Line Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11; KS C 9610-4-11
Ring Wave	IEC 61000-4-12, Ed. 2 (2006-09); EN 61000-4-12:2006; IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12; IEEE STD C62.41.2 2002
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2; EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3; EN 55015; EN 60730-1; EN 60945; IEC 60533; EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35; KS C 9835; IEC 60601-1-2; JIS T0601-1-2
TxRx EMC Requirements	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19; EN 301 489-20

Test Technology:	Test Method(s) [1]:
European Radio Test Standards	ETSI EN 300 086-1; ETSI EN 300 086-2; ETSI EN 300 113-1; ETSI EN 300 113-2; ETSI EN 300 220-1; ETSI EN 300 220-2; ETSI EN 300 220-3-1; ETSI EN 300 220-3-2; ETSI EN 300 330-1; ETSI EN 300 330-2; ETSI EN 300 440-1; ETSI EN 300 440-2; ETSI EN 300 422-1; ETSI EN 300 422-2; ETSI EN 300 328; ETSI EN 301 893; ETSI EN 301 511; ETSI EN 301 908-1; ETSI EN 908-2; ETSI EN 908-13; ETSI EN 303 413; ETSI EN 302 502; EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4
Canadian Radio Tests	RSS-102 (RF Exposure Evaluation [MEAS]); RSS-102 (Nerve Stimulation [MEAS]) (5Hz to 400kHz); SPR-002; RSS-111; RSS-112; RSS-117; RSS-119; RSS-123; RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-191; RSS-192; RSS-194; RSS-195; RSS-196; RSS-197; RSS-199; RSS-210; RSS-211; RSS-213; RSS-215; RSS-216; RSS-220; RSS-222; RSS-236; RSS-238; RSS-243; RSS-244; RSS-247; RSS-248; RSS-251; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN
Mexico Radio Tests	IFT-008-2015; NOM-208-SCFI-2016
Japan Radio Tests	Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18
Taiwan Radio Tests	LP-0002 (July 15, 2020)
Australia/New Zealand Radio Tests	AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)
Hong Kong Radio Tests	HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073
Korean Radio Test Standards	KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52; KS X 3124; KS X 3125; KS X 3130; KS X 3126; KS X 3129
Vietnam Radio Test Standards	QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT; QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT; QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT; QCVN 112:2017/BTTTT; QCVN 117:2020//BTTTT
Vietnam EMC Test Standards	QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT; QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT

Test Technology:	Test Method(s) [1]:
Unlicensed Radio Frequency Devices *(3 Meter Semi-Anechoic Room)*	47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H (using ANSI C63.10:2013, ANSI C63.17:2013 and FCC KDB 905462 D02 (v02))
Licensed Radio Service Equipment	47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E, ANSI C63.26:2015)
OTA (Over the Air) Performance GSM, GPRS, EGPRS UMTS (W-CDMA) LTE including CAT M1 A-GPS for UMTS/GSM LTS A-GPS, A-GLONASS, SIB8/SIB16 Large Device/Laptop/Tablet Testing Integrated Device Testing WiFi 802.11 a/b/g/n/a	CTIA Test Plan for Wireless Device Over-the-Air Performance (Method for Measurement for Radiated Power and Receiver Performance) V3.8.2; CTIA Test Plan for RF Performance Evaluation of WiFi Mobile Converged Devices V2.1.0
Electrical Measurements and Simulation	
AC Voltage / Current	
(1mV to 5kV) 60 Hz	FAA AC 150/5345-10H
(0.1V to 250V) up to 500 MHz	FAA AC 150/5345-43J
(1µA to 150A) 60 Hz	FAA AC 150/5345-44K
DC Voltage / Current	FAA AC 150/5345-46E
(1mV to 15 kV) / (1µA to 10A)	FAA AC 150/5345-47C
Power Factor / Efficiency / Crest Factor	FAA EB 67D
(Power to 30kW)	
Resistance	
(1mΩ to 4000MΩ)	
Surge	
(Up to 10 kV / 5 kA) (Combination Wave and Ring Wave)	

On the following products and materials:

Telecommunications Terminal Equipment (TTE), Radio Equipment, Network Equipment, Information Technology Equipment (ITE), Automotive Electronic Equipment, Automotive Hybrid Electronic Devices, Maritime Navigation and Radio Communication Equipment and Systems, Vehicles, Boats and Internal Combustion Engine Driven Devices, Automotive, Aviation, and General Lighting Products, Medical Electrical Equipment, Motors, Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment, Household Appliances, Electric Tools, Low-voltage Switchgear and Control gear, Programmable Controllers, Electrical Equipment for Measurement, Control and Laboratory Use, Base Materials, Power and Data Transmission Cables and Connectors

[1] When the date, edition, version, etc. is not identified in the scope of accreditation, laboratories may use the version that immediately precedes the current version for a period of one year from the date of publication of the standard measurement method, per part C., Section 1 of A2LA *R101 - General Requirements- Accreditation of ISO-IEC 17025 Laboratories*.

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	40000
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
U-NII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	40000
BPL Intentional Radiators Part 15G	ANSI C63.10:2013	40000
White Space Device Intentional Radiators Part 15H	ANSI C63.10:2013	40000
Commercial Mobile Services (FCC Licensed Radio Service Equipment) Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
General Mobile Radio Services (FCC Licensed Radio Service Equipment) Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97, and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment) Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Maritime and Aviation Radio Services		
Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
Microwave and Millimeter Bands Radio Services		
Parts 25, 30, 74, 90 (above 3 GHz), 97 (above 3 GHz), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Broadcast Radio Services		
Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Signal Boosters		
Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

[2] Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

Accredited Laboratory

A2LA has accredited

ELITE ELECTRONIC ENGINEERING INC.

Downers Grove, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 19th day of May 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.