FCC Radio Test Report

FCC ID:2AQ5C-15642

Original Grant

Report No.	:	TB-FCC184666
Applicant	:	Hypercel Corporation
Equipment Under Test (EUT)		
EUT Name	:	Gravity Wireless Fast Charge Mount
Model No.	:	15642
Series Model No.	:	14110
Brand Name	:	HYPERGEAR
Sample ID	:	TBBJ-20211109-05_#1
Receipt Date	:	2021-11-11
Test Date	:	2021-11-11 to 2021-12-16
Issue Date	:	2021-12-16
Standards	:	FCC Part 15, Subpart C(15.209)
Test Method	:	ANSI C63.10: 2013
Conclusions	:	**PASS**

In the configuration tested, the EUT complied with the standards specified above,

Test/Witness Engineer	:	Camille Li
Engineer Supervisor	:	Ivan Su
Engineer Manager	:	Ray Lai

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, China
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Contents

Revision History

Report No.	Version	Description	Issued Date
TB-FCC184666	Rev.01	Initial issue of report	2021-12-16

1. General Information about EUT

1.1 Client Information

Applicant	:	Hypercel Corporation
Address	:	28385 Constellation Rd., Valencia, CA 91355 U.S.A
Manufacturer	:	Shenzhen Hypercel Technology Co., Ltd.
Address	:	Room 1705, Esun Creative Technology Building, No. 22 Jiaan South Rd., Baoan District, Shenzhen City 518101, China

1.2 General Description of EUT (Equipment Under Test)

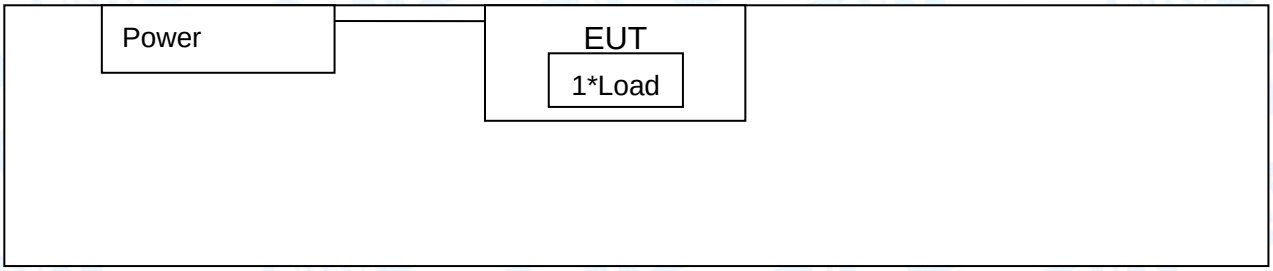
EUT Name	:	Gravity Wireless Fast Charge Mount	
Model(s)	:	15642, 14110	
Model Difference	:	All PCB boards and circuit diagrams are the same, the only difference is that different model names.	
Product Description	:	Operation Frequency:	110KHz-205KHz
		Modulation Type:	ASK
		Antenna:	Coil Antenna
Power Rating	:	Input: 5V/2A,9V/2A,9V/3A,12V/1.5A Wireless Charge Output: 15W Max	
Software Version	:	N/A	
Hardware Version	:	N/A	
Connecting I/O Port(S)	:	Please refer to the User's Manual	

Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.3 Block Diagram Showing the Configuration of System Tested

Charging + TX Mode



1.4 Description of Support Units

Equipment Information				
Name	**Model**	**S/N**	**Manufacturer**	**Used "√"**
Load	-------	-------	-------	√

1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

Pretest Mode	
Final Test Mode	**Description**
Mode 1	Power + EUT + Full load
Mode 2	Power + EUT + Half load
Mode 3	Power + EUT + Empty load
For Radiated Test	
Final Test Mode	**Description**
Mode 1	Power + EUT + Full load
For Bandwidth Test	
Final Test Mode	**Description**
Mode 1	Power + EUT + Full load

Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.
According to ANSI C63.10 standards, All test modes were pre-tested, but we only recorded the worst case in this report.

(2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.

(3) The EUT is considered a portable unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version	N/A
Frequency	110-205KHz

1.7 Measurement Uncertainty

The reported uncertainty of measurement y ± U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U_{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.50 dB ±3.10 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.50 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB

1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025：2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01. FCC Accredited Test Site Number: 854351.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A.

2. Test Summary

FCC Part 15 Subpart C(15.209)			
Standard Section	**Test Item**	**Judgment**	**Remark**
15.203	Antenna Requirement	PASS	N/A
15.207(a)	Conducted Emission	N/A	N/A
15.209(a)(f)	Radiated emissions	PASS	N/A
15.215	Bandwidth	PASS	N/A
Note: N/A is an abbreviation for Not Applicable.			

3. Test Software

Test Item	Test Software	Manufacturer	Version No.
Conducted Emission	EZ-EMC	EZ	CDI-03A2
Radiation Emission	EZ-EMC	EZ	FA-03A2RE

4. Test Equipment

Conducted Emission Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Due Date**
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 02, 2021	Jul. 01, 2022
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 02, 2021	Jul. 01, 2022
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 02, 2021	Jul. 01, 2022
LISN	Rohde & Schwarz	ENV216	101131	Jul. 02, 2021	Jul. 01, 2022
Radiation Emission Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 02, 2021	Jul. 01, 2022
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 02, 2021	Jul. 01, 2022
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.01, 2020	Feb. 28, 2022
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.01, 2020	Feb. 28, 2022
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 06, 2021	Jul. 05, 2022
Pre-amplifier	Sonoma	310N	185903	Feb. 25, 2021	Feb. 24, 2022
Pre-amplifier	HP	8449B	3008A00849	Feb. 25, 2021	Feb. 24, 2022
Cable	HUBER+SUHNER	100	SUCOFLEX	Feb. 25, 2021	Feb. 24, 2022
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Antenna Conducted Emission					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 02, 2021	Jul. 01, 2022
Spectrum Analyzer	Rohde & Schwarz	ESPI	100010/007	Jul. 02, 2021	Jul. 01, 2022
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Sep. 10, 2021	Sep. 09, 2022
Vector Signal Generator	Agilent	N5182A	MY50141294	Sep. 10, 2021	Sep. 09, 2022
Analog Signal Generator	Agilent	N5181A	MY50141953	Sep. 10, 2021	Sep. 09, 2022
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO26	Sep. 10, 2021	Sep. 09, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO29	Sep. 10, 2021	Sep. 09, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO31	Sep. 10, 2021	Sep. 09, 2022
	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO33	Sep. 10, 2021	Sep. 09, 2022

5. Conducted Emission Test

5.1 Test Standard and Limit

5.1.1Test Standard

FCC Part 15.207

5.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

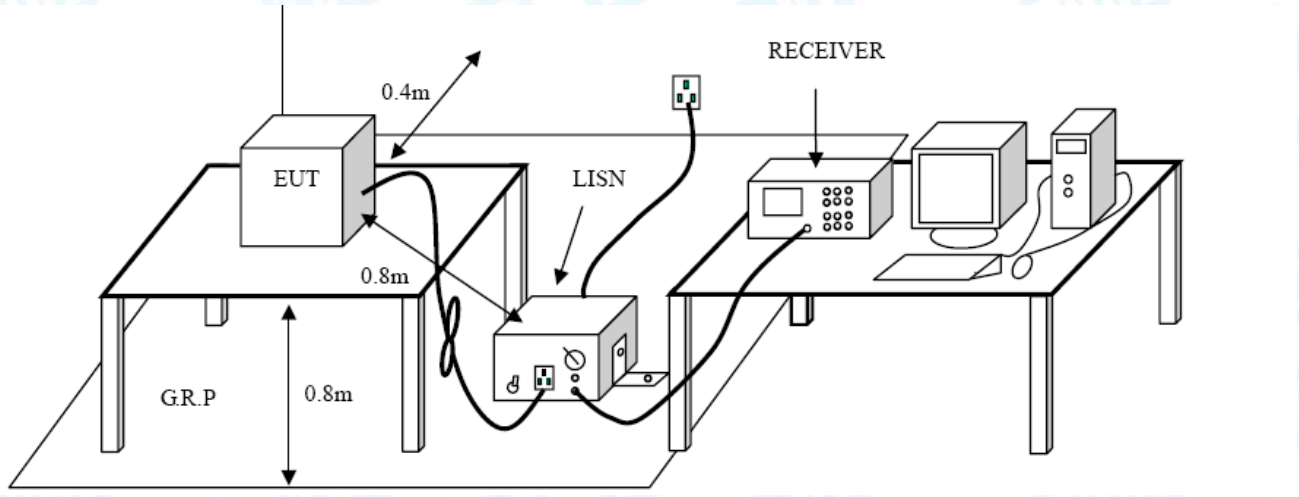
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.2 Test Setup



5.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.

5.4 Deviation From Test Standard

No deviation

5.5 EUT Operating Mode

Please refer to the description of test mode.

5.6 Test Data

N/A

6. Radiated Emission Test

6.1 Test Standard and Limit

6.1.1 Test Standard

FCC Part 15.209(a)(f)

6.1.2 Test Limit

Radiated Emission Limits (9 kHz~1000 MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.		

Radiated Emission Limit (Above 1000MHz)

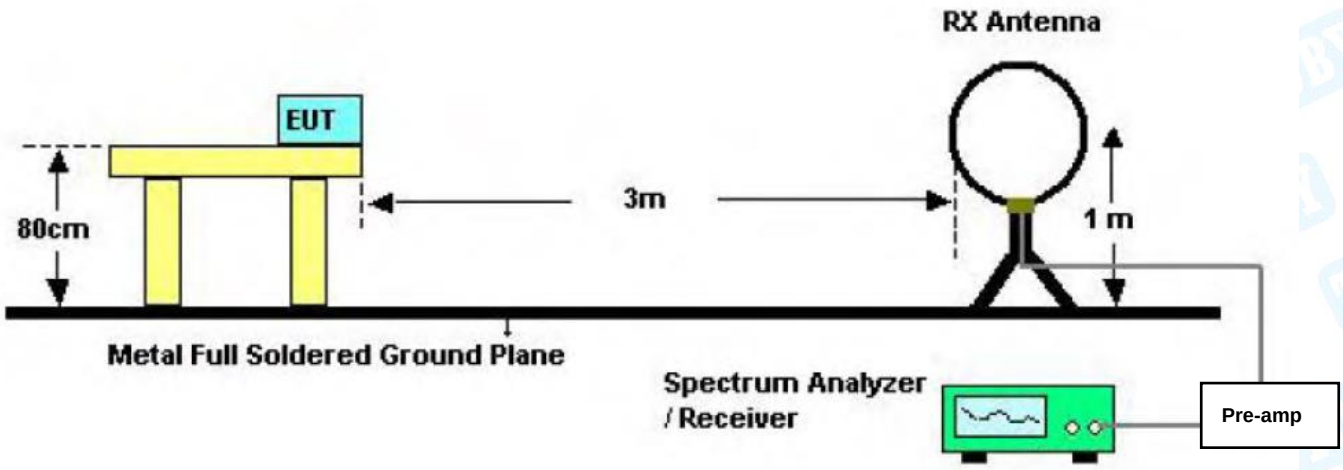
Frequency (MHz)	Distance of 3m (dBuV/m)	
	Peak	Average
Above 1000	74	54

Note:

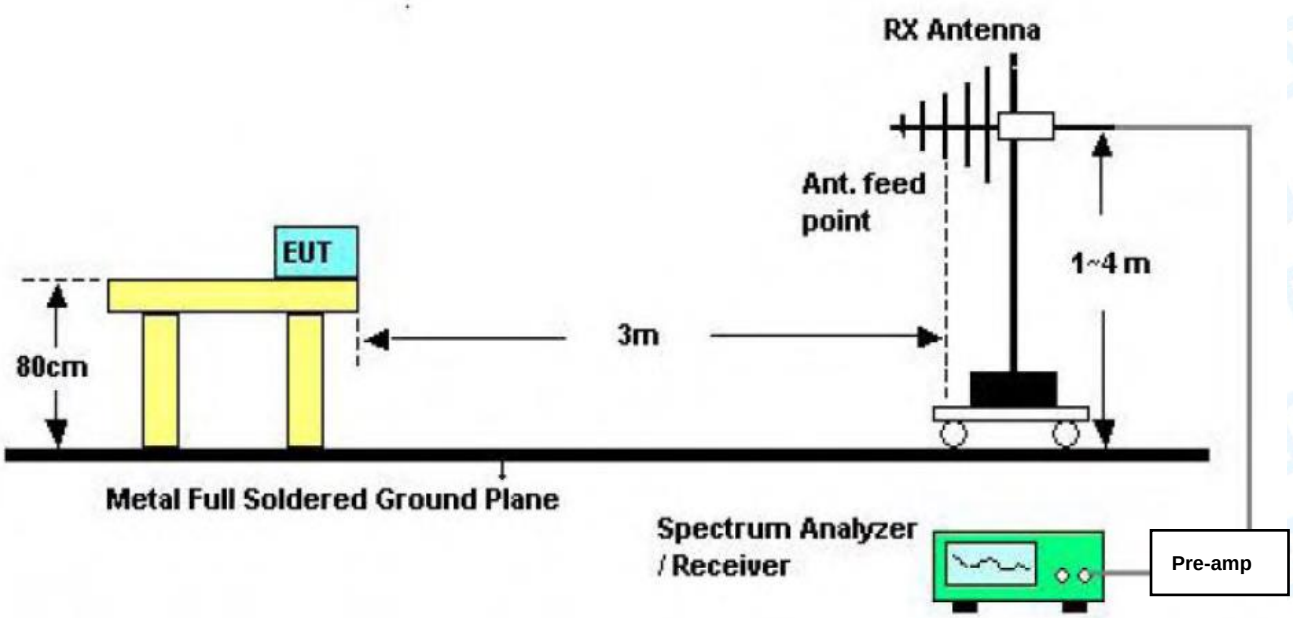
(1) The tighter limit applies at the band edges.

(2) Emission Level(dBuV/m)=20log Emission Level(uV/m)

6.2 Test Setup



Below 30MHz Test Setup



Below 1000MHz Test Setup

6.3 Test Procedure

(1) Measurements at frequency 9KHz~30MHz and Below 1GHz. The EUT was placed on a rotating 0.8m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The table was rotated 360 degrees to determine the position of the highest radiation.

(2) 9KHz~30MHz the test antenna 1m away from the ground, Both 0° and 90° antenna are set to make measurement.
Below 1GHz the test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.

(3) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

(4) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.

(5) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.

(6) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

(7) For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW= 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold,
Sweep- auto couple.
For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW= 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold,
Sweep- auto couple

(8) For the actual test configuration, please see the test setup photo.

6.4 Deviation From Test Standard

No deviation

6.5 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

6.6 Test Data

Please refer to the Attachment A.

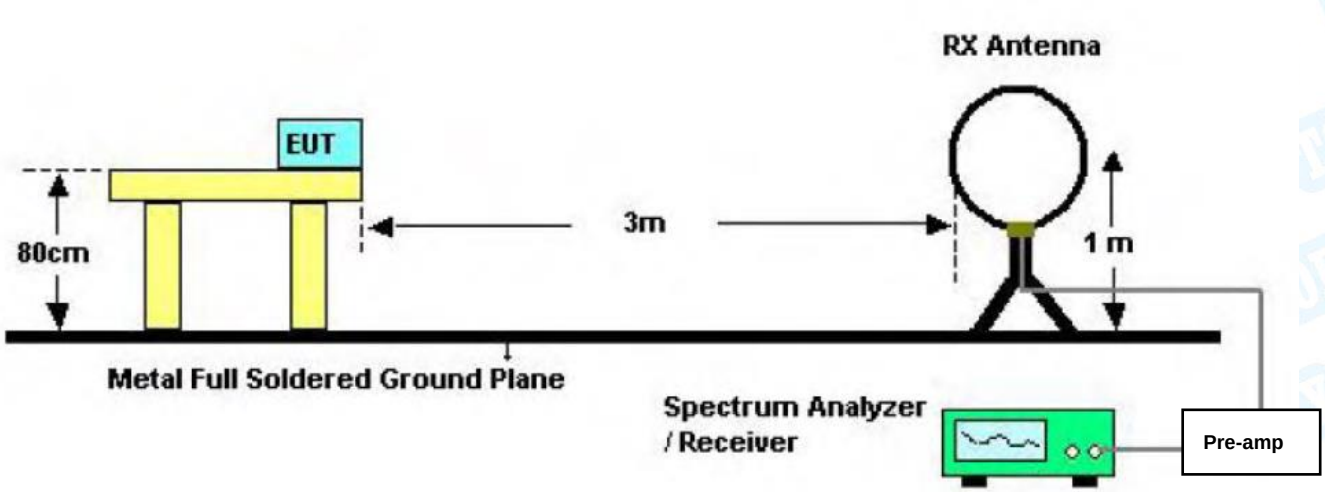
7. Bandwidth Measurement

7.1 Test Standard and Limit

7.1.1 Test Standard

FCC Part 15.215

7.2 Test Setup



7.3 Test Procedure

1. The transmitter shall be operated at its maximum carrier power measured under normal test conditions;
2. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
3. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

7.4 Deviation From Test Standard

No deviation

7.5 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

7.6 Test Data

Please refer to the Attachment B.

8. Antenna Requirement

8.1 Standard Requirement

8.1.1 Standard

FCC Part 15.203

8.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

8.2 Deviation From Test Standard

No deviation

8.3 Antenna Connected Construction

The antenna is Coil Antenna, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

8.4 Result

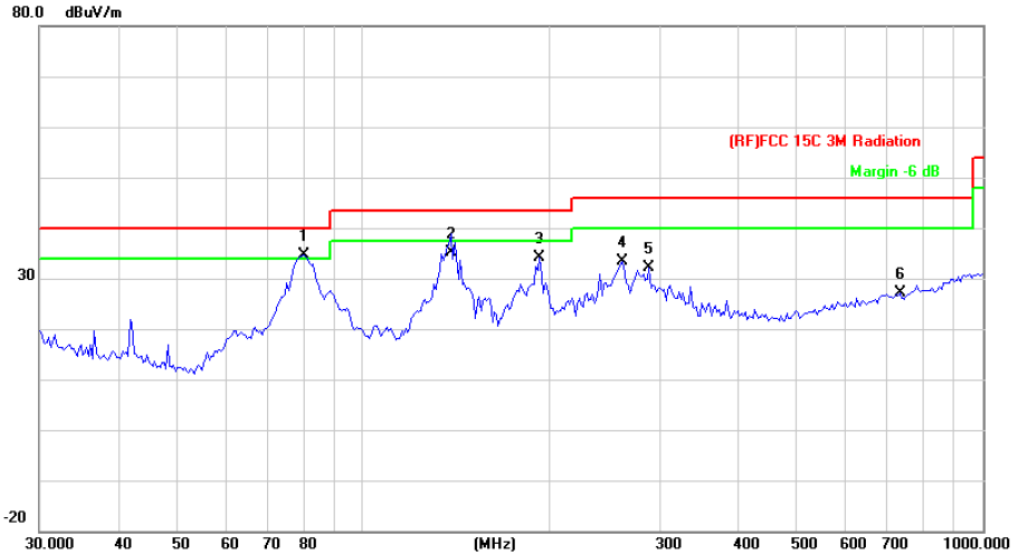
The EUT antenna is a Coil Antenna. It complies with the standard requirement.

Antenna Type
☒Permanent attached antenna
☐Unique connector antenna
☐Professional installation antenna

Attachment A-- Radiated Emission Test Data

30MHz~1GHz

Temperature:	23.5℃	**Relative Humidity:**	46%
Test Voltage:	DC 24V		
Ant. Pol.	Horizontal		
Test Mode:	Mode 1		
Remark:	Only worse case is reported		

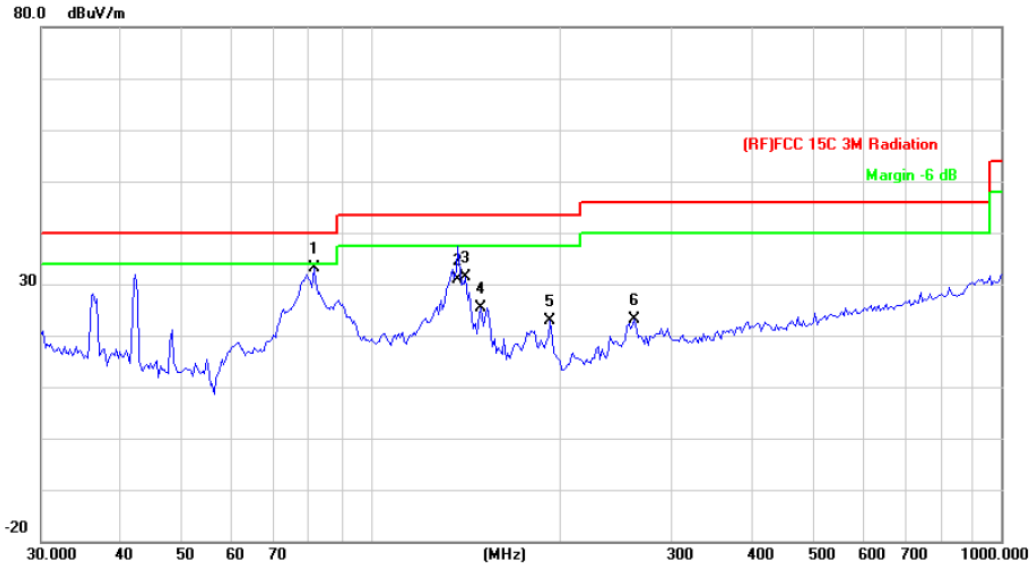


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	80.0806	57.31	-22.66	34.65	40.00	-5.35	peak
2		138.3873	57.81	-22.61	35.20	43.50	-8.30	QP
3		192.4186	54.02	-19.99	34.03	43.50	-9.47	peak
4		261.9753	50.52	-17.06	33.46	46.00	-12.54	peak
5		289.0021	48.69	-16.52	32.17	46.00	-13.83	peak
6		734.4913	33.80	-6.62	27.18	46.00	-18.82	peak

*:Maximum data x:Over limit !:over margin

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak (dBμV/m)-Limit QPK(dBμV/m)

Temperature:	23.5℃	Relative Humidity:	46%
Test Voltage:	DC 24V		
Ant. Pol.	Vertical		
Test Mode:	Mode 1		
Remark:	Only worse case is reported		



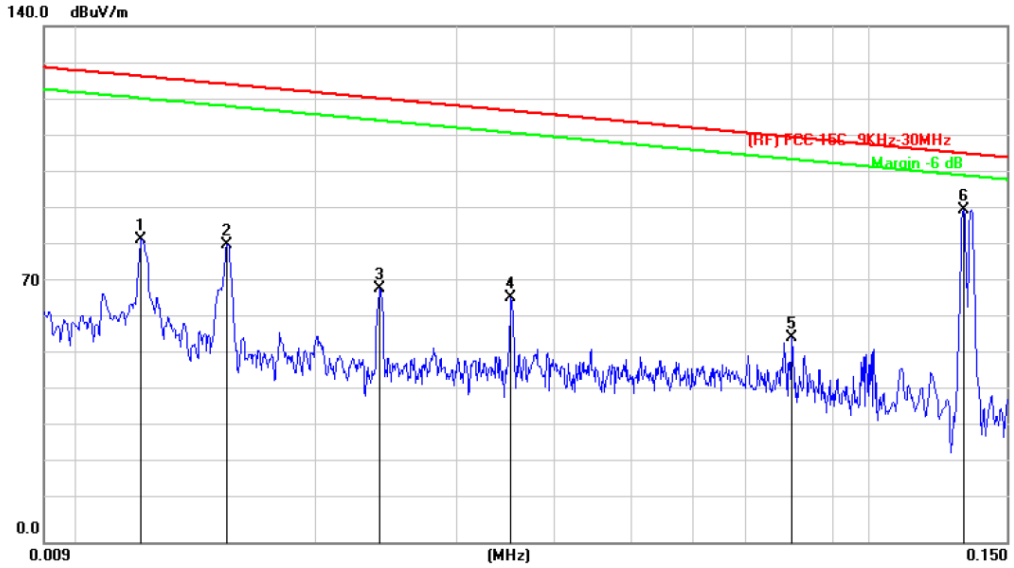
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	81.2117	55.81	-22.59	33.22	40.00	-6.78	peak
2		137.4202	53.61	-22.61	31.00	43.50	-12.50	QP
3		141.3298	53.96	-22.49	31.47	43.50	-12.03	peak
4		149.4857	47.12	-21.62	25.50	43.50	-18.00	peak
5		192.4186	42.79	-19.99	22.80	43.50	-20.70	peak
6		261.9753	40.15	-17.06	23.09	46.00	-22.91	peak

*:Maximum data x:Over limit !:over margin

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak (dBμV/m)-Limit QPK(dBμV/m)

9KMz-30MHz

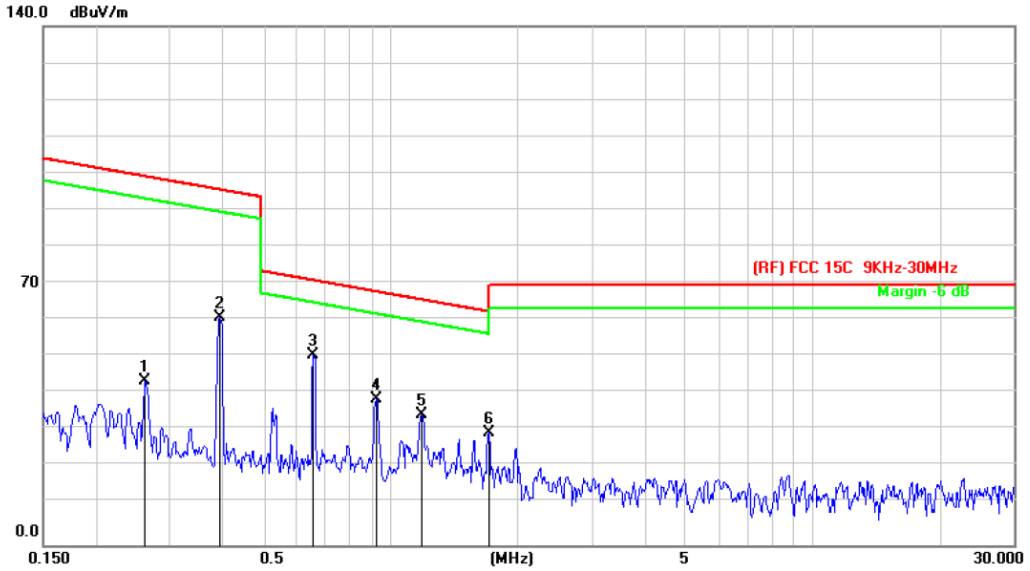
Temperature:	23.6℃	**Relative Humidity:**	45%
Test Voltage:	DC 24V		
Ant. Pol.	Ant. 0°		
Test Mode:	Mode 1		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		0.0120	91.14	-9.04	82.10	126.39	-44.29	peak
2		0.0154	89.91	-9.09	80.82	124.21	-43.39	peak
3		0.0240	77.91	-9.22	68.69	120.34	-51.65	peak
4		0.0352	75.66	-9.40	66.26	116.99	-50.73	peak
5		0.0801	64.94	-9.49	55.45	109.81	-54.36	peak
6	*	0.1322	95.56	-5.42	90.14	105.44	-15.30	peak

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak/AVG(dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak/AVG (dBμV/m)-Limit QPK/AVG(dBμV/m)

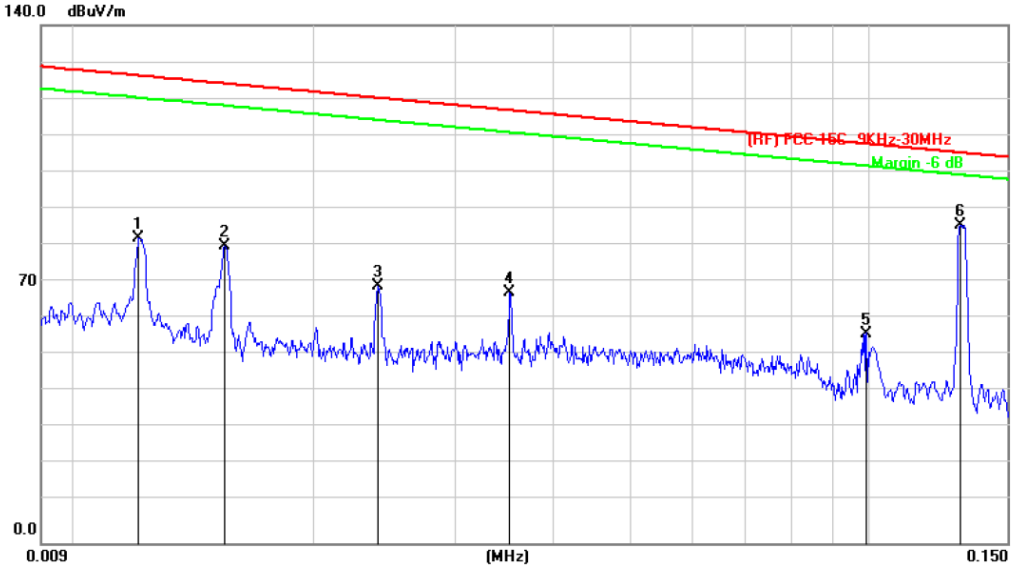
Temperature:	23.6℃	**Relative Humidity:**	45%
Test Voltage:	DC 24V		
Ant. Pol.	Ant. 0°		
Test Mode:	Mode 1		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		0.2615	53.70	-9.54	44.16	99.48	-55.32	peak
2		0.3933	71.90	-10.55	61.35	95.92	-34.57	peak
3	*	0.6543	62.45	-11.32	51.13	71.45	-20.32	peak
4		0.9233	51.04	-11.64	39.40	68.41	-29.01	peak
5		1.1844	46.78	-11.73	35.05	66.21	-31.16	peak
6		1.7071	41.93	-11.82	30.11	70.00	-39.89	peak

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak/AVG(dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak/AVG (dBμV/m)-Limit QPK/AVG(dBμV/m)

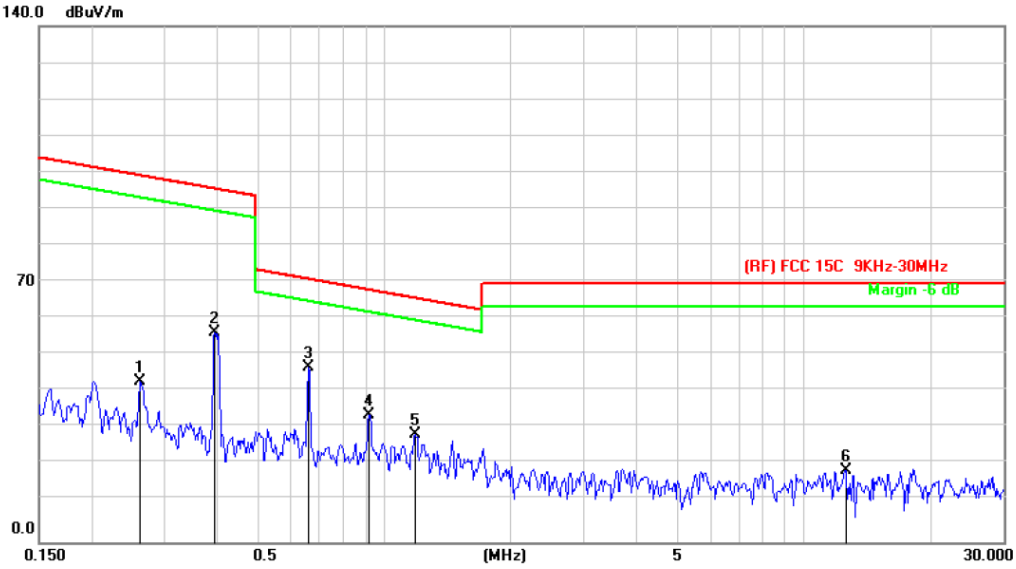
Temperature:	23.6℃	**Relative Humidity:**	45%
Test Voltage:	DC 24V		
Ant. Pol.	Ant. 90°		
Test Mode:	Mode 1		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		0.0120	91.40	-9.04	82.36	126.39	-44.03	peak
2		0.0154	89.48	-9.09	80.39	124.21	-43.82	peak
3		0.0240	78.55	-9.22	69.33	120.34	-51.01	peak
4		0.0352	76.97	-9.40	67.57	116.99	-49.42	peak
5		0.0995	66.22	-9.52	56.70	107.92	-51.22	peak
6	*	0.1307	91.38	-5.33	86.05	105.54	-19.49	peak

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak/AVG(dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak/AVG (dBμV/m)-Limit QPK/AVG(dBμV/m)

Temperature:	23.6℃	**Relative Humidity:**	45%
Test Voltage:	DC 24V		
Ant. Pol.	Ant. 90°		
Test Mode:	Mode 1		
Remark:	N/A		

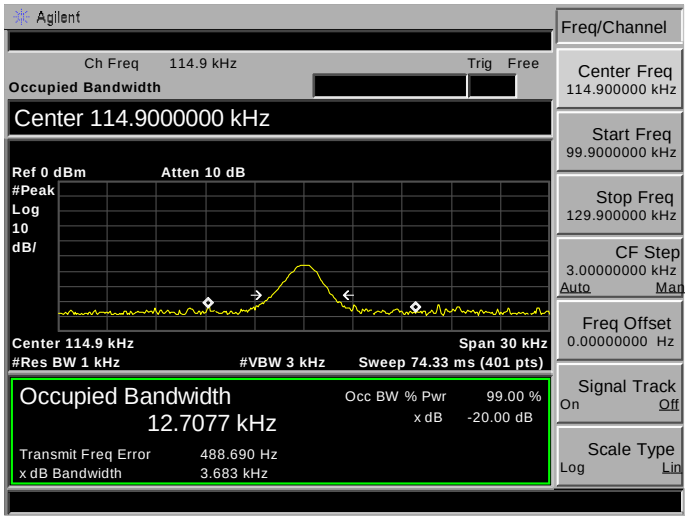


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		0.2615	53.26	-9.54	43.72	99.48	-55.76	peak
2		0.3933	67.41	-10.55	56.86	95.92	-39.06	peak
3	*	0.6578	58.67	-11.32	47.35	71.40	-24.05	peak
4		0.9184	45.97	-11.64	34.33	68.46	-34.13	peak
5		1.1844	40.91	-11.73	29.18	66.21	-37.03	peak
6		12.5156	31.45	-12.04	19.41	70.00	-50.59	peak

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak/AVG(dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak/AVG (dBμV/m)-Limit QPK/AVG(dBμV/m)

Attachment B-- Bandwidth Measurement Data

Frequency (KHz)	20 dBc Bandwidth (kHz)	99% OBW (kHz)	Result
114.9	3.683	12.7077	PASS



-----END OF REPORT------