

TEST REPORT

Product : smart card
Trade mark : N/A
Model/Type reference : SC2EM-3791500,SC2EM-3791500A
Serial Number : N/A
Report Number : EED32O805437
FCC ID : 2A5DHSC2EM-3791500
Date of Issue : Jun. 15, 2022
Test Standards : 47 CFR Part 15 Subpart C
Test result : PASS

Prepared for:

FinDreams Technology Company Limited
NO.3001-3009, Hengping Road, Pingshan New District,
Shenzhen, Guangdong, P.R.China

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
Shenzhen, Guangdong, China
TEL: +86-755-3368 3668
FAX: +86-755-3368 3385

Compiled By:

Frazer Li

Reviewed by:

Tom Chen

Frazer Li

Tom Chen

Approved by:

Aaron Ma

Date:

Jun. 15, 2022

Aaron Ma

Check No.:3452200422



1 Version

Version No.	Date	Description
00	Jun. 15, 2022	Original

2 Contents

	Page
1 VERSION.....	2
2 CONTENTS.....	3
3 TEST SUMMARY.....	4
4 GENERAL INFORMATION.....	5
4.1 CLIENT INFORMATION.....	5
4.2 GENERAL DESCRIPTION OF E.U.T.....	5
4.3 TEST ENVIRONMENT & TEST MODE.....	5
4.4 DESCRIPTION OF SUPPORT UNITS.....	6
4.5 TEST LOCATION.....	6
4.6 DEVIATION FROM STANDARDS.....	6
4.7 ABNORMALITIES FROM STANDARD CONDITIONS.....	6
4.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER.....	6
4.9 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2).....	6
4.10 EQUIPMENT LIST.....	7
5 TEST RESULT AND MEASUREMENT DATA.....	8
5.1 ANTENNA REQUIREMENT.....	8
5.2 ELECTRIC FIELD STRENGTH OF FUNDAMENTAL AND OUTSIDE THE ALLOCATED BANDS.....	9
5.3 RADIATED EMISSIONS.....	12
5.4 FREQUENCY STABILITY.....	18
5.5 20dB OCCUPIED BANDWIDTH.....	20
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP.....	21
APPENDIX 2 PHOTOGRAPHS OF EUT.....	22

3 Test Summary

Test Item	FCC Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	ANSI C63.10 2013	Pass
Conducted Emission (150KHz to 30MHz)	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	N/A
Electric Field Strength of Fundamental and Outside the Allocated bands	47 CFR Part 15, Subpart C Section 15.225(a)/(b)/(c)	ANSI C63.10 2013	Pass
Radiated Emission	47 CFR Part 15, Subpart C Section 15.225(d)/15.209	ANSI C63.10 2013	Pass
Frequency Tolerance	47 CFR Part 15, Subpart C Section 15.225(e)	ANSI C63.10 2013	Pass
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.215	ANSI C63.10 2013	Pass

Remark:

N/A:The product is powered by DC 5.0V.

Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

Model No.: SC2EM-3791500,SC2EM-3791500A

Only the model SC2EM-3791500 was tested,Their electrical circuit design, layout, components used and internal wiring are identical, Only the model No. is different.

4 General Information

4.1 Client Information

Applicant:	FinDreams Technology Company Limited
Address of Applicant:	NO.3001-3009, Hengping Road, Pingshan New District, Shenzhen, Guangdong, P.R.China
Manufacturer:	FinDreams Technology Company Limited
Address of Manufacturer:	NO.3001-3009, Hengping Road, Pingshan New District, Shenzhen, Guangdong, P.R.China
Factory:	Electric Appliance Factory
Address of Factory:	No.1, West Qinling Avenue, Science and Technology Industrial Park, Caotang Town, High-tech Zone, Xi'an

4.2 General Description of E.U.T.

Product Name:	smart card
Model No.(EUT):	SC2EM-3791500,SC2EM-3791500A
Test Model No:	SC2EM-3791500
Trade Mark:	N/A
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Operation Frequency:	13.56MHz
Modulation Type:	BPSK&ASK
Antenna Type:	coil antenna
Antenna Gain:	0dBi
Power Supply:	DC 5.0V
Test voltage:	DC 5.0V
Sample Received Date:	Apr. 20, 2022
Sample tested Date:	Apr. 20, 2022 to May 11, 2022

4.3 Test Environment & Test Mode

Operating Environment:	
Radiated Emissions:	
Temperature:	20.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
Test Mode:	
Test mode:	Keep EUT working in continuous transmitting mode with 100% duty cycle.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

1) Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
---	---	---	---	---

4.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

4.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	3.3dB (9kHz-30MHz)
		4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

4.10 Equipment List

Conducted disturbance Test					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Receiver	R&S	ESCI	100435	04-14-2022	03-31-2023
LISN	R&S	ENV216	100098	03-03-2022	02-28-2023

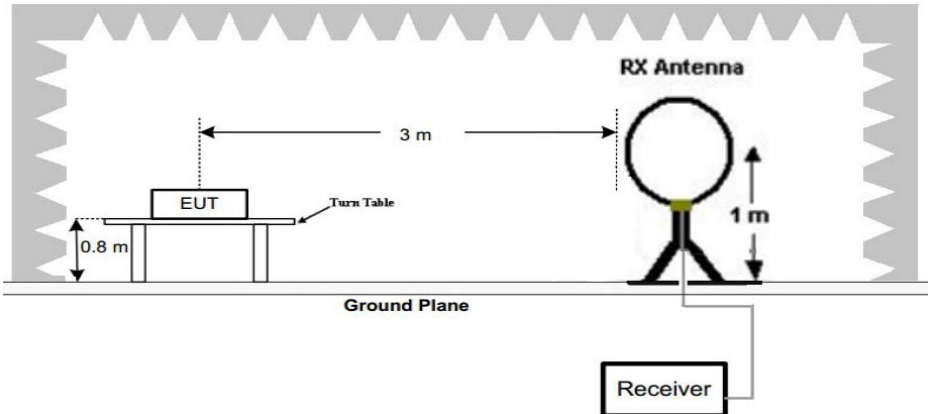
3M Semi/full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	05-21-2021	05-22-2022
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-17-2021	04-16-2024
Receiver	R&S	ESCI7	100938-003	10-15-2021	10-13-2022
Spectrum Analyzer	R&S	FSV40	101200	08-26-2021	08-25-2022
Spectrum Analyzer	R&S	FSP40	100416	04-28-2022	03-31-2023
Multi device Controller	maturio	NCD/070/107 11112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	06-24-2021	06-23-2022
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---

5 Test Result and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part15 C Section 15.203
15.203 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, 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.
EUT Antenna:	
The antenna is coil antenna.The best case gain of the antenna is 0dBi.	

5.2 Electric Field Strength of Fundamental and Outside the Allocated bands

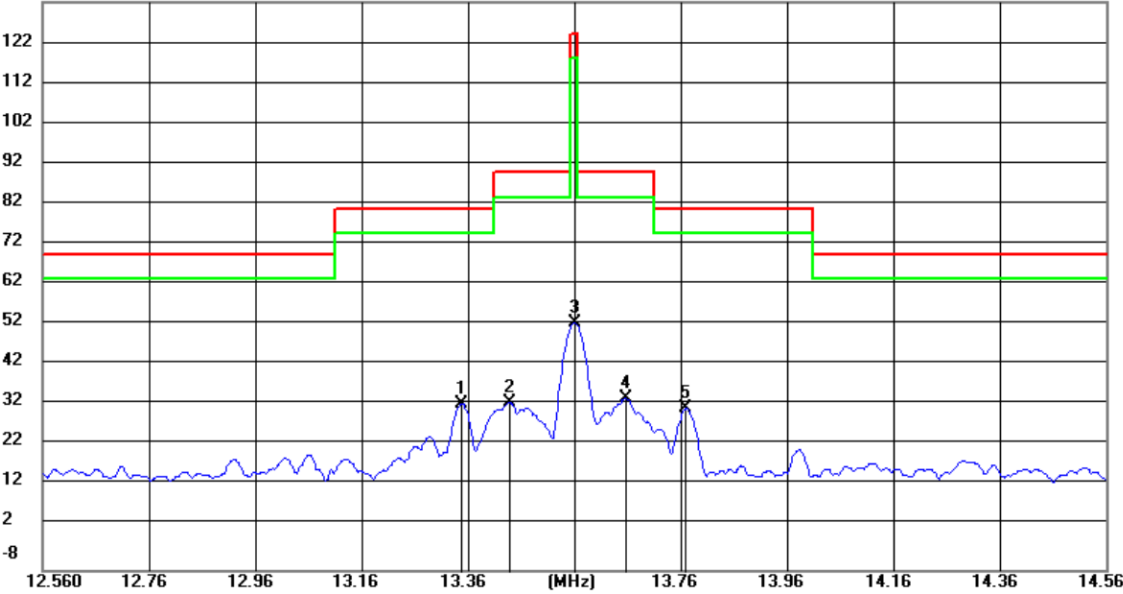
Test Requirement:	47 CFR Part 15, Subpart C Section 15.225(a)/(b)/(c)				
Test Method:	ANSI C63.10: 2013				
Test Site:	3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
Limit:	Frequency Range(MHz)	E-field Strength Limit @ 30 m (µV/m)		E-field Strength Limit @ 3 m (dBµV/m)	
	13.560 ± 0.007	15848		124	
	13.410 to 13.553 13.567 to 13.710	334		90	
	13.110 to 13.410 13.710 to 14.010	106		81	
	Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula: Extrapolation(dB)=40log ₁₀ (Measurement Distance/Specification Distance)				
Test Setup:	 Figure 1. Below 30MHz				
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified then testing could be stopped and the peak values of the EUT				

	would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Mode:	Transmitting with ASK modulation.
Test Result:	Pass

Measurement Data

X axis positioning

132.0 dBuV/m



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	13.3480	12.95	20.35	33.30	81.00	-47.70	peak		
2		13.4380	13.06	20.35	33.41	90.00	-56.59	peak		
3		13.5600	32.76	20.35	53.11	124.00	-70.89	peak		
4		13.6560	14.12	20.35	34.47	90.00	-55.53	peak		
5		13.7700	11.66	20.35	32.01	81.00	-48.99	peak		

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic

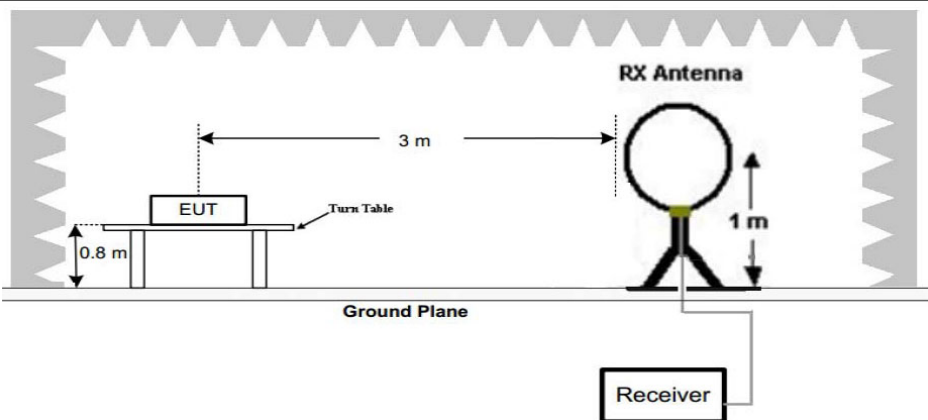
equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

5.3 Radiated Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.225(d),				
Test Method:	ANSI C63.10: 2013				
Test Site:	3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Peak	100 kHz	300kHz	Peak
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m) @ 3 m	Remark	
	0.009MHz-0.490MHz	2400/F(kHz) @300m	128.5-93.8	Quasi-peak	
	0.490MHz-1.705MHz	24000/F(kHz) @30m	73.8-63	Quasi-peak	
	1.705MHz-30MHz	30 @30m	70	Quasi-peak	
	30MHz-88MHz	100 @3m	40.0	Quasi-peak	
	88MHz-216MHz	150 @3m	43.5	Quasi-peak	
	216MHz-960MHz	200 @3m	46.0	Quasi-peak	
	960MHz-1GHz	500 @3m	54.0	Quasi-peak	
Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula: Extrapolation(dB)=40log ₁₀ (Measurement Distance/Specification Distance)					
Test Setup:					
	Figure 1. Below 30MHz				

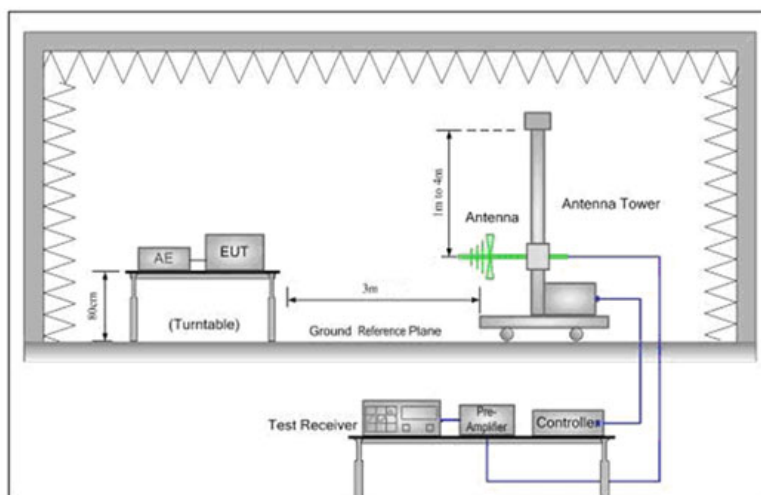


Figure 2. 30MHz to 1GHz

Test Procedure:

5. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
6. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
7. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
8. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Test Mode:

Transmitting with ASK modulation.

Test Result:

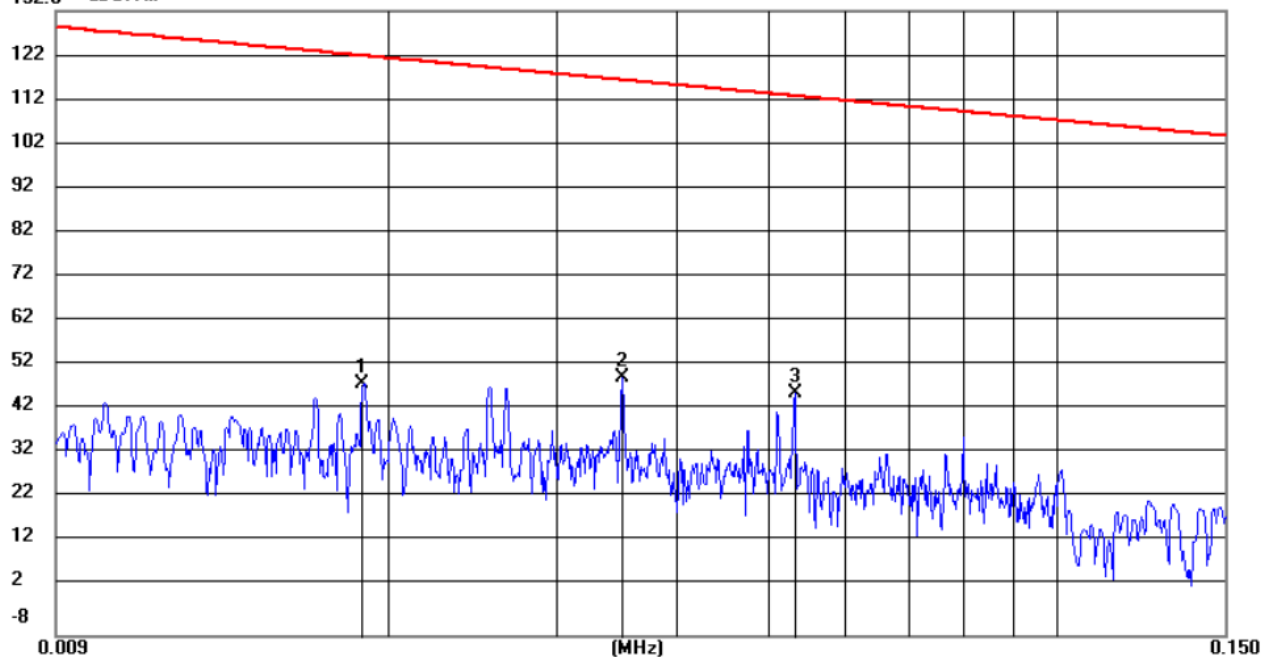
Pass

Measurement Data

X axis positioning

9kHz – 150kHz:

132.0 dBuV/m



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		0.0188	27.60	20.85	48.45	121.95	-73.50	peak		
2		0.0351	29.10	20.76	49.86	116.56	-66.70	peak		
3	*	0.0532	25.83	20.71	46.54	112.97	-66.43	peak		

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

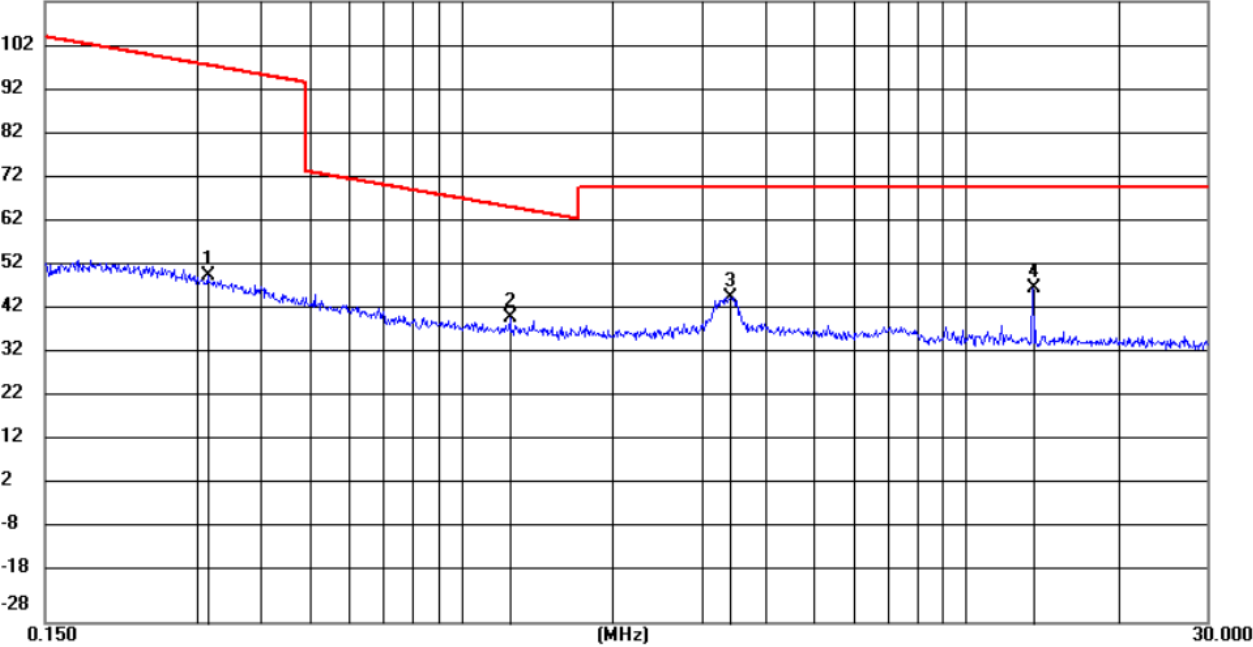
Level = Read Level + Factor,

Over Limit=Level-Limit Line.

X axis positioning

150KHz-30MHz:

112.0 dBuV/m



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1		0.3149	29.22	20.99	50.21	97.63	-47.42	peak	
2		1.2488	20.25	20.47	40.72	65.70	-24.98	peak	
3		3.4174	24.93	20.41	45.34	70.00	-24.66	peak	
4	*	13.5509	27.08	20.50	47.58	70.00	-22.42	peak	

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

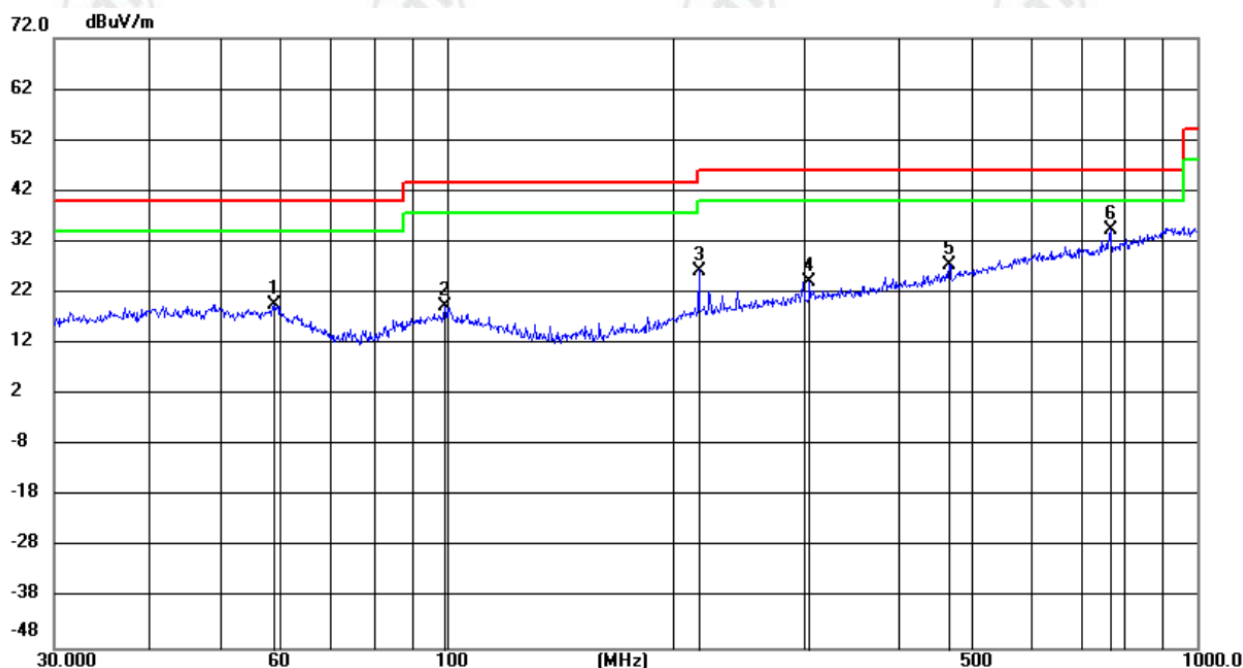
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

30MHz-1GHz

Horizontal



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	Comment
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1		59.0251	6.00	13.64	19.64	40.00	-20.36	peak	200	5
2		99.5281	5.30	13.99	19.29	43.50	-24.21	peak	200	5
3		216.7828	12.04	14.36	26.40	46.00	-19.60	peak	100	14
4		304.6099	6.89	17.35	24.24	46.00	-21.76	peak	100	325
5		467.2349	6.60	20.84	27.44	46.00	-18.56	peak	100	355
6	*	766.0571	8.51	25.83	34.34	46.00	-11.66	peak	100	60

Remark:

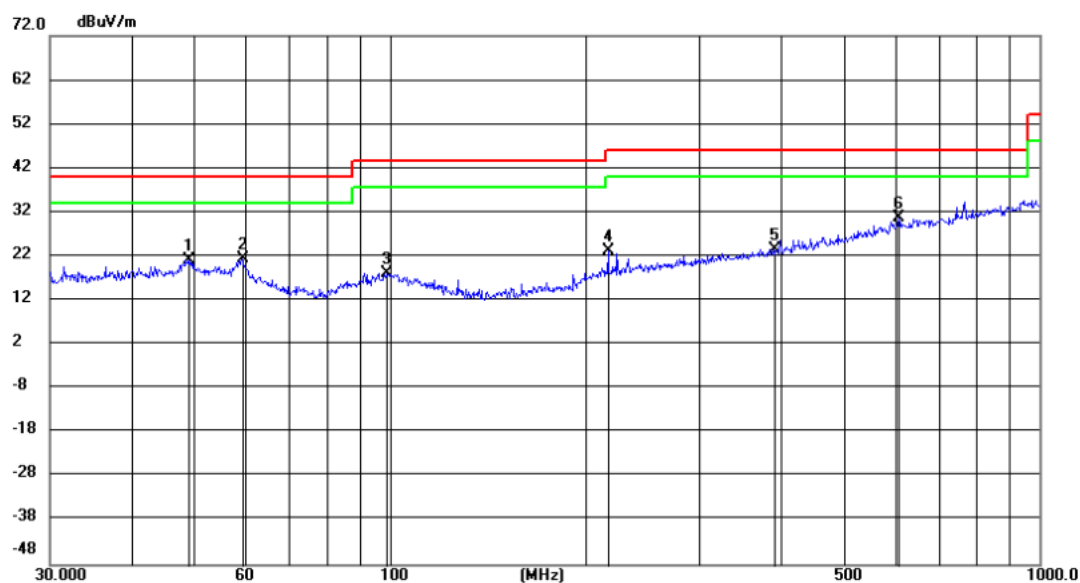
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree	Comment
1		49.1865	6.79	14.29	21.08	40.00	-18.92	peak	100	356
2		59.2325	7.75	13.62	21.37	40.00	-18.63	peak	100	227
3		98.8326	4.37	13.89	18.26	43.50	-25.24	peak	100	265
4		216.7828	8.84	14.36	23.20	46.00	-22.80	peak	100	5
5		389.3549	4.48	19.16	23.64	46.00	-22.36	peak	200	317
6	*	607.7867	6.66	24.08	30.74	46.00	-15.26	peak	100	227

Remark:

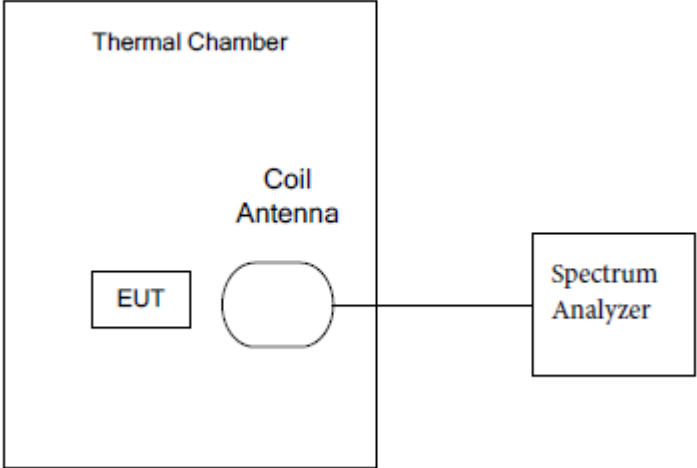
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

5.4 Frequency Stability

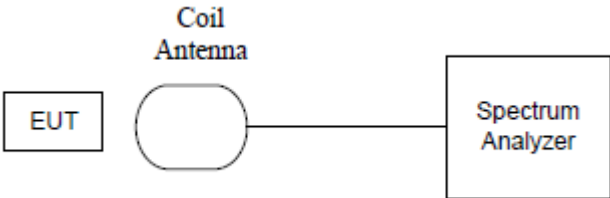
Test Requirement:	47 CFR Part 15 C Section 15.225(e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 The diagram illustrates the test setup. A large rectangular box labeled 'Thermal Chamber' contains two components: a smaller rectangle labeled 'EUT' and an oval labeled 'Coil Antenna'. A line connects the 'Coil Antenna' to a rectangle labeled 'Spectrum Analyzer' located outside the thermal chamber.
Frequency Range:	Operation within the band 13.110-14.010 MHz
Requirements:	The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
Method of Measurement:	The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.
Test Result:	The unit does meet the FCC Part 15 C Section 15.225(e) requirements.

Test Frequency: 13.56MHz			Temperature:20°C	
Supply Voltage (V) DC	Test Result (MHz)	Deviation (kHz)	Limit ±0.01% (kHz)	Result
4.25	13.55985	-0.15	1.3560	Pass
5.00	13.55935	-0.65	1.3560	Pass
5.75	13.55913	-0.87	1.3560	Pass

Test Frequency: 13.56MHz			Normal Voltage:3.7Vdc	
Temperature (°C)	Test Result (MHz)	Deviation (kHz)	Limit ±0.01% (kHz)	Result
-20	13.55934	-0.66	1.3560	Pass
-10	13.55914	-0.86	1.3560	
0	13.55960	-0.4	1.3560	
10	13.55986	-0.14	1.3560	
20	13.55971	-0.29	1.3560	
30	13.55908	-0.92	1.3560	
40	13.55924	-0.76	1.3560	
50	13.55906	-0.94	1.3560	

Note: Deviation (KHz) = (Test Result-13.56MHz)*1000

5.5 20dB Occupied Bandwidth

Test Requirement:	47 CFR Part 15 C Section 15.215 (C)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Frequency Range:	Operation within the band 13.110 – 14.010 MHz
Requirements:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through §15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.
Limit:	For 13.56 MHz the permitted frequency band is 14kHz, so the limit is 11.2 kHz.

Test Data:

20dB bandwidth (kHz)	FL (MHz)	FH (MHz)	Limit(MHz)	Result
1.44	13.559262	13.560622	13.110 – 14.010	Pass

Test plot as follows:

