



Shenzhen Huaxia Testing Technology Co., Ltd

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Test Report

Report No. : CQASZ20181200012E-02

Applicant: Shenzhen Hesibond IOT Technology Corp., Ltd.

Address of Applicant: Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China

Manufacturer: Shenzhen Hesibond IOT Technology Corp., Ltd.

Address of Manufacturer: Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China

Equipment Under Test (EUT):

Product: IOT Lock

All Model No.: 2ASI7-LKF-05-BRW

Brand Name: 

FCC ID: 2ASI7-LKF-05-BRW

Standards: 47 CFR Part 15, Subpart C

Date of Test: 2018-12-06 to 2019-04-19

Date of Issue: 2019-04-19

Test Result : PASS*

Tested By:

Tiny You

(Tiny You)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai

(Jack Ai)



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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20181200012E-02	Rev.01	Initial report	2019-04-19

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	6
4.4 DESCRIPTION OF SUPPORT UNITS	6
4.5 STATEMENT OF THE MEASUREMENT UNCERTAINTY	7
4.6 TEST LOCATION	8
4.7 TEST FACILITY	8
4.8 EQUIPMENT LIST	9
5 TEST RESULT AND MEASUREMENT DATA	10
5.1 ANTENNA REQUIREMENT	10
5.2 ELECTRIC FIELD STRENGTH OF FUNDAMENTAL AND OUTSIDE THE ALLOCATED BANDS	11
5.3 RADIATED EMISSIONS	14
5.4 FREQUENCY TOLERANCE	19
5.5 OCCUPIED BANDWIDTH	21
6 PHOTOGRAPHS - EUT TEST SETUP	23
6.1 RADIATED EMISSION	23
7 PHOTOGRAPHS - EUT CONSTRUCTION DETAILS	24

3 Test Summary

Test Item	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 Section 6.2	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 Section 6.9.2	Pass
Radiated Emission	47 CFR Part 15, Subpart C Section 15.225(d)/15.209	ANSI C63.10 2013 Section 6.4	Pass
Frequency Tolerance	47 CFR Part 15, Subpart C Section 15.225(e)	ANSI C63.10 2013 Section 6.4&6.5	Pass
Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.215	ANSI C63.10 2013 Section 6.8	Pass

N/A: Not Applicable, the EUT was working by battery.

4 General Information

4.1 Client Information

Applicant:	Shenzhen Hesibond IOT Technology Corp., Ltd.
Address of Applicant:	Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Hesibond IOT Technology Corp., Ltd.
Address of Manufacturer:	Room 418, 4th Floor, Shenyi Industrial Building, Nanshan Avenue, Nanshan Street, Nanshan District, Shenzhen, China

4.2 General Description of E.U.T.

Product Name:	IOT Lock
Model No.:	2ASI7-LKF-05-BRW
Trade Mark:	
Hardware Version:	V501
Software Version:	2.4G-MKZB3X-V1.1
Operation Frequency:	13.56MHz
Modulation Type:	ASK
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Antenna Type:	PCB antenna
Antenna Gain:	0dBi
Power Supply:	DC1.5 X 4AA

4.3 Test Environment

Temperature:	20.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
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.

Description	Manufacturer	Model No.	Remark	FCC certification
/	/	/	/	/

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	±5.12dB	(1)
2	Radiated Emission (Above 1GHz)	±4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	±3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8°C	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.6 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.7 Test Facility

- A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- FCC Registration No.: 522263**

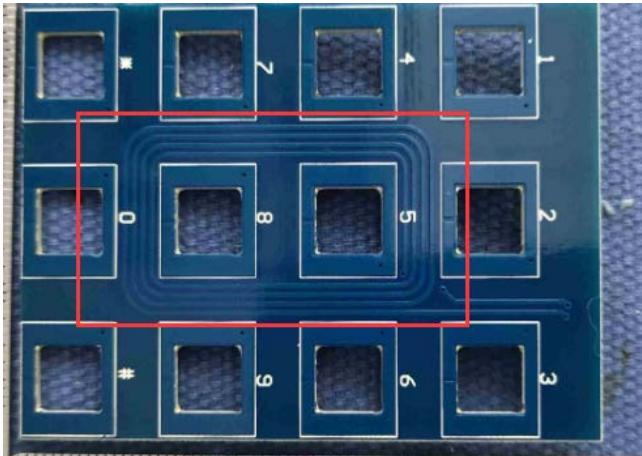
Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.8 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2018/9/26	2019/9/25
Spectrum analyzer	R&S	FSU26	CQA-038	2018/10/28	2019/10/27
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/9/26	2019/9/25
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2018/11/2	2019/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2018/10/28	2020/10/27
Bilog Antenna	R&S	HL562	CQA-011	2018/9/26	2020/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2018/9/26	2019/9/25
EMI Test Receiver	R&S	ESPI3	CQA-013	2018/9/26	2019/9/25
LISN	R&S	ENV216	CQA-003	2018/11/5	2019/11/4
Coaxial cable	CQA	N/A	CQA-C009	2018/9/26	2019/9/25
high-low temperature chamber	Auchno	OJN-9606	CQA-CB2	2018/9/26	2019/9/25
DC power	KEYSIGHT	E3631A	CQA-028	2018/9/26	2019/9/25

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 integrated on the main PCB and no consideration of replacement.

5.2 Electric Field Strength of Fundamental and Outside the Allocated bands

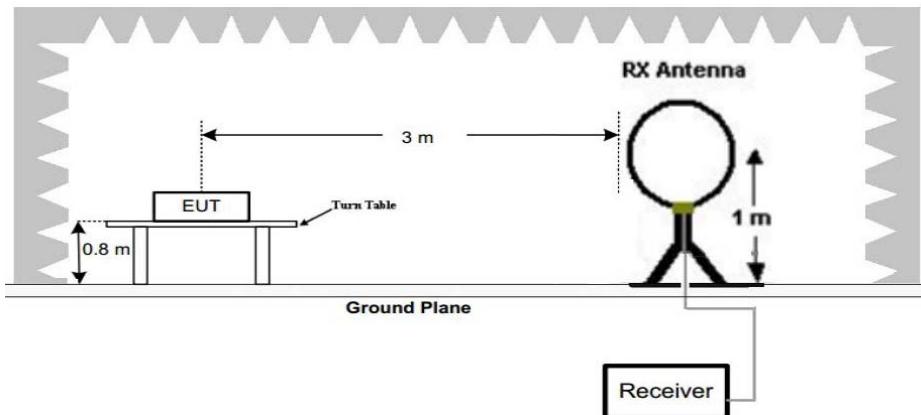
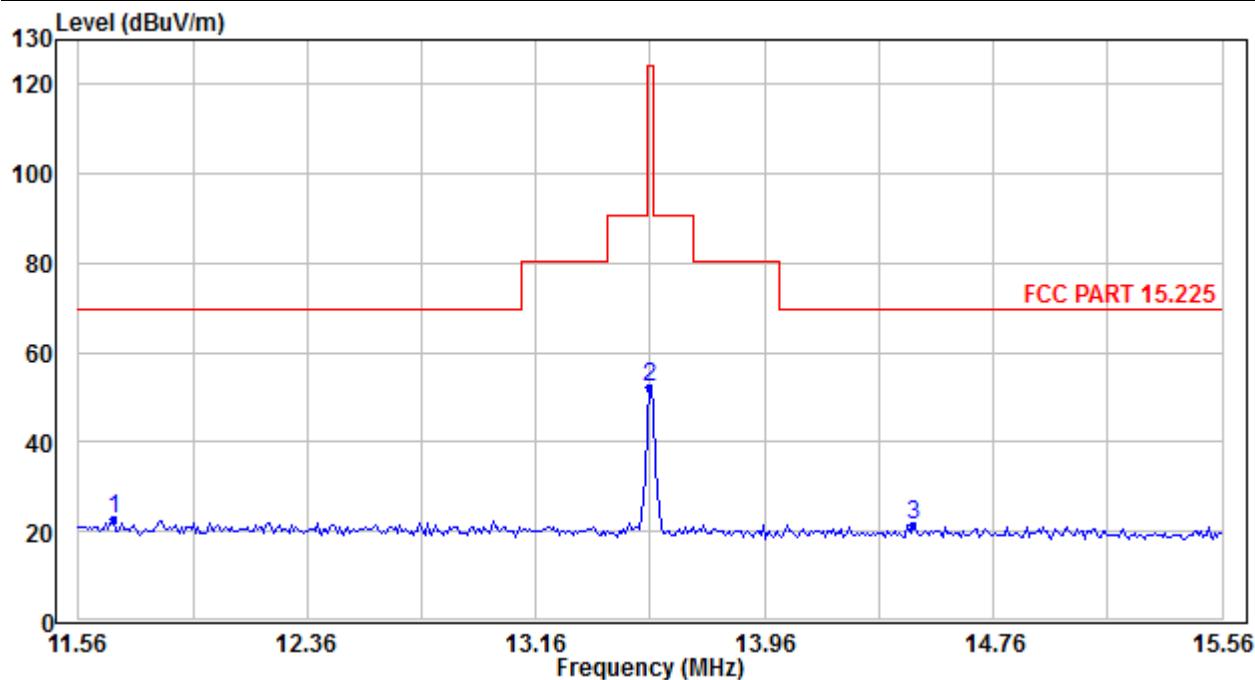
Test Requirement:	47 CFR Part 15, Subpart C Section 15.225(a)/(b)/(c)								
Test Method:	ANSI C63.10: 2013								
Test Site:	3m (Semi-Anechoic Chamber)								
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark				
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak				
	0.009MHz-0.090MHz	Average	10kHz	30kHz	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 (μ V/m)		E-field Strength Limit @ 3 m (dB μ V/m)					
	13.560 \pm 0.007	15848		124					
	13.410 to 13.553	334		90					
	13.567 to 13.710								
	13.110 to 13.410	106		81					
<p>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: $\square \square$</p> <p>Extrapolation(dB)=40log₁₀(Measurement Distance/Specification Distance)</p>									
Test Setup:									
Test Procedure:	<ol style="list-style-type: none"> 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. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 								

Figure 1. Below 30MHz

	<ol style="list-style-type: none">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

Fundamental frequency	Detector	Result (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)
		at 3 meter	at 30 meter	at 3 meter	at 30 meter	
12.56 MHz	Peak	52.40	12.40	124	84	-71.60


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.

5.3 Radiated Emissions

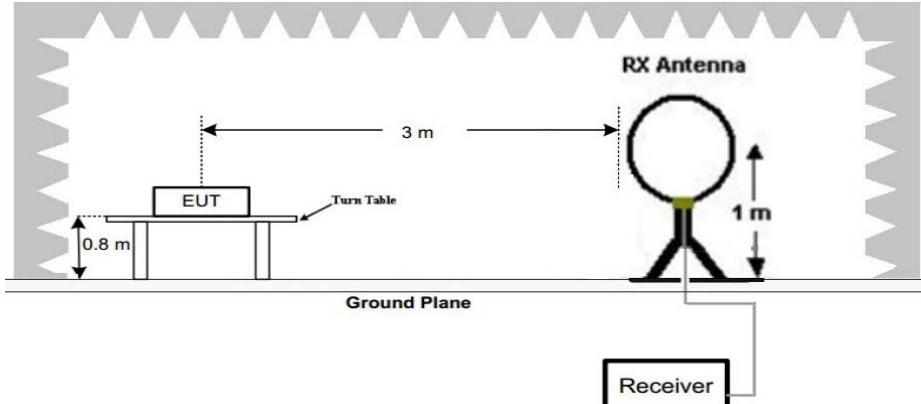
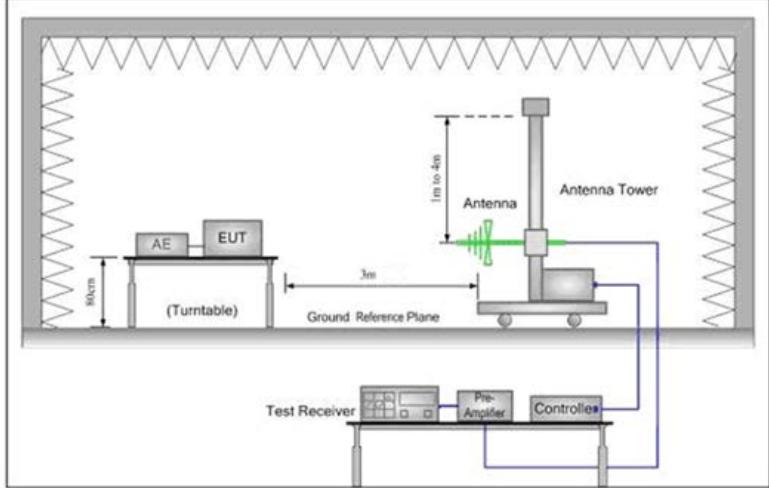
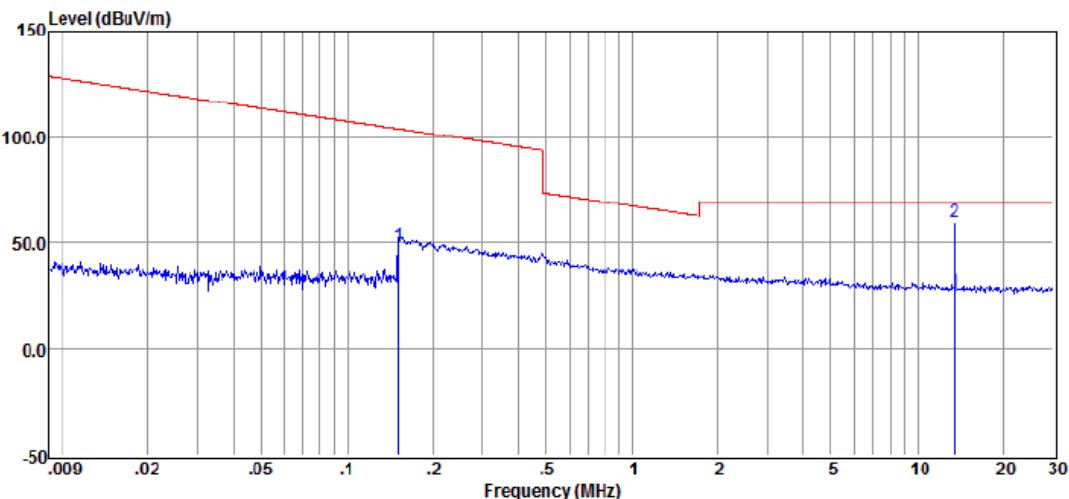
Test Requirement:	47 CFR Part 15C Section 15.209 and 15.225(d)					
Test Method:	ANSI C63.10: 2013					
Test Site:	3m (Semi-Anechoic Chamber)					
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark	
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak	
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average	
	0.090MHz-0.110MHz	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		129-94	Quasi-peak	
	0.490MHz-1.705MHz	24000/F(kHz) @30m		74-63	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	
	<p>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: $\square \square$</p> <p>Extrapolation(dB)=40log₁₀(Measurement Distance/Specification Distance)</p>					
Test Setup:						

Figure 1. Below 30MHz

	
Test Procedure:	<ol style="list-style-type: none"> 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

9kHz - 30MHz:



Item	Freq. (MHz)	Read Level (dB μ V)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector
(Mark)									
1	0.15	28.55	20.00	0.00	0.10	48.65	103.99	-55.34	QP
2	0.49	24.69	19.80	0.00	0.10	44.59	73.80	-29.21	QP
3	0.59	22.23	19.68	0.00	0.10	42.01	72.17	-30.16	QP
4	1.01	18.83	19.30	0.00	0.10	38.23	67.53	-29.30	QP
5	1.32	16.62	19.34	0.00	0.10	36.06	65.21	-29.15	QP
6	13.56	40.18	19.30	0.00	0.34	59.82	Fundamental signal		QP

Remark:

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

equation with a sample calculation is as follows:

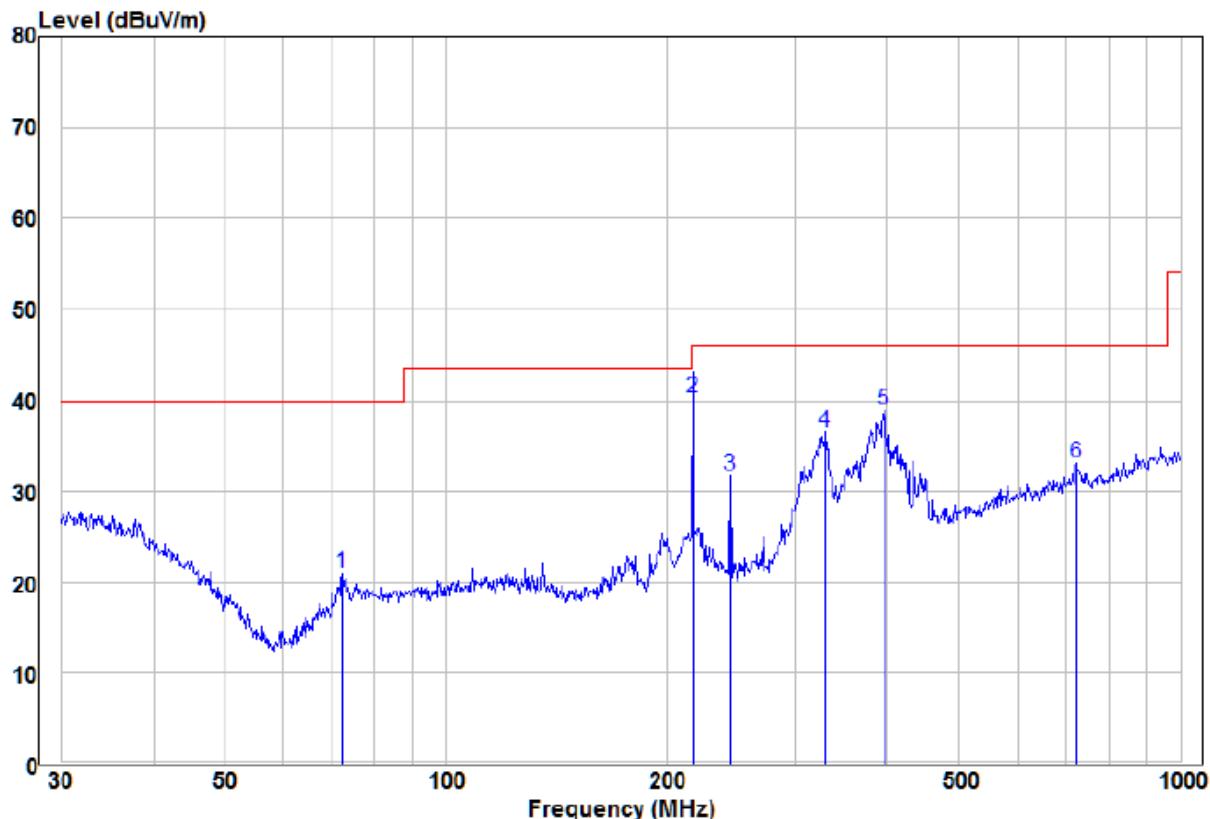
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

30MHz-1GHz

Horizontal



Freq	Read		Limit	Over	Pol/Phase		
	Level	Factor					
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	72.34	12.32	8.66	20.98	40.00	-19.02	Peak HORIZONTAL
2 pp	216.78	29.20	11.04	40.24	46.00	-5.76 QP	HORIZONTAL
3	244.23	20.14	11.64	31.78	46.00	-14.22	Peak HORIZONTAL
4	329.04	22.41	14.05	36.46	46.00	-9.54	Peak HORIZONTAL
5 pk	394.85	22.95	15.94	38.89	46.00	-7.11	Peak HORIZONTAL
6	721.73	11.93	21.13	33.06	46.00	-12.94	Peak HORIZONTAL

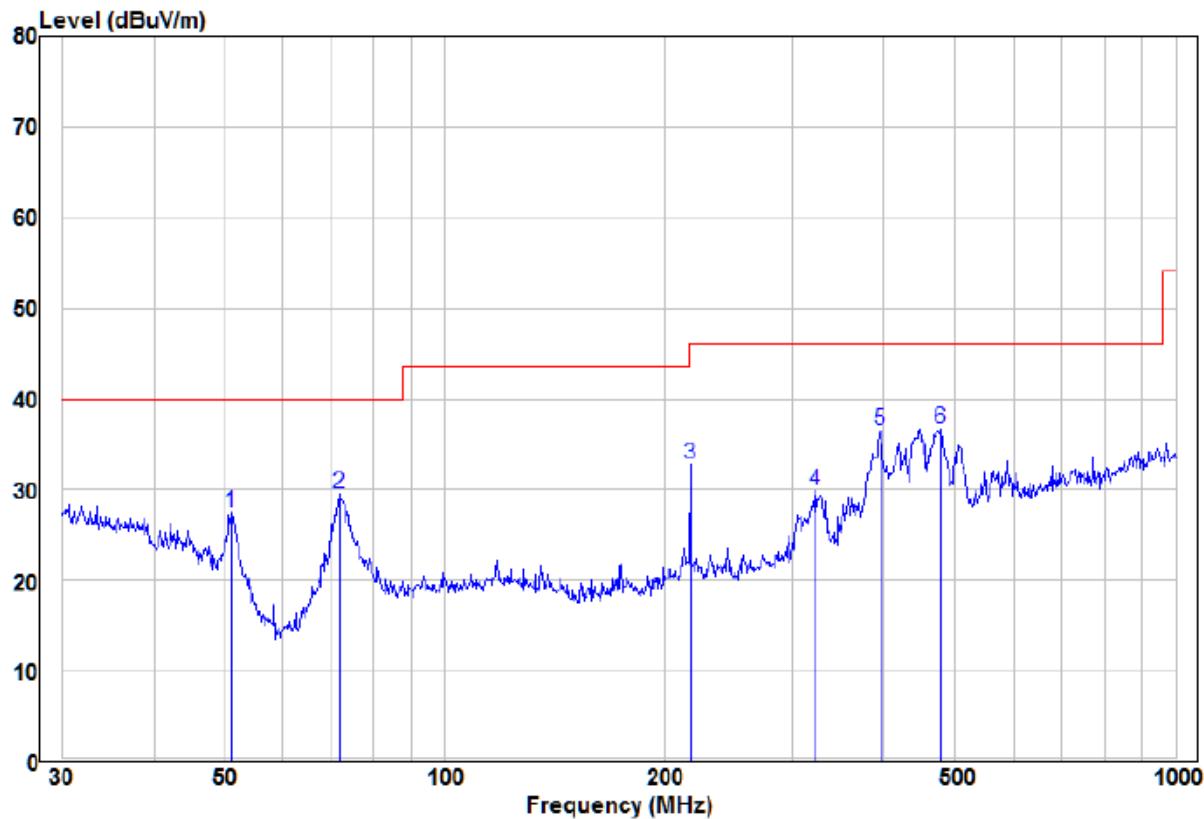
Remark:

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



Freq	Read		Limit	Over	Remark	Pol/Phase	
	Level	Factor					
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	51.12	19.18	8.21	27.39	40.00	-12.61	Peak VERTICAL
2	71.83	20.93	8.53	29.46	40.00	-10.54	Peak VERTICAL
3	216.78	21.67	11.04	32.71	46.00	-13.29	Peak VERTICAL
4	322.19	15.92	13.90	29.82	46.00	-16.18	Peak VERTICAL
5	394.85	20.55	15.94	36.49	46.00	-9.51	Peak VERTICAL
6 pp	477.17	19.16	17.53	36.69	46.00	-9.31	Peak VERTICAL

Remark:

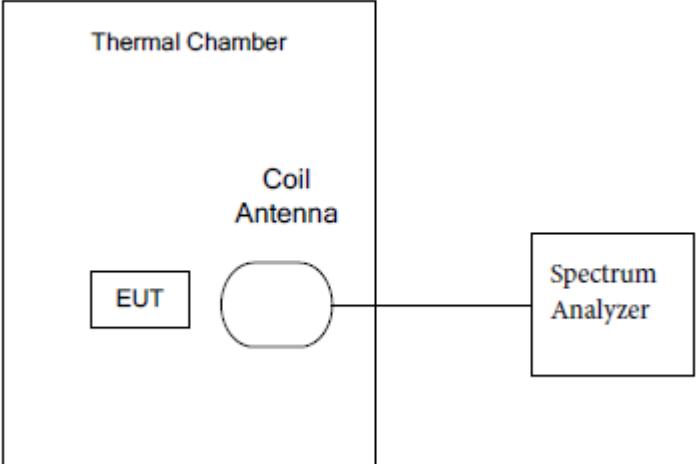
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

5.4 Frequency Tolerance

Test Requirement:	47 CFR Part 15 C Section 15.225(e)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Frequency Range:	Operation within the band 13.110-14.010 MHz
Requirements:	The frequency tolerance of the carrier signal shall be maintained within +/- 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.

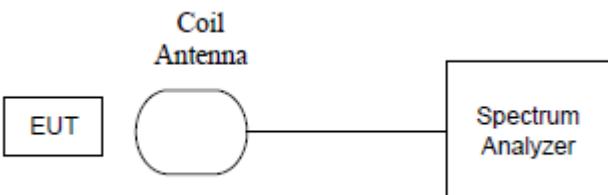


Test Frequency: 13.56MHz			Temperature:20°C	
Supply Voltage (V) DC	Test Result (MHz)	Deviation (kHz)	Limit ±0.01% (kHz)	Result
6	13.5612861	1.286	1.3560	Pass
6.6	13.5612861	1.286	1.3560	Pass
5.4	13.5612861	1.286	1.3560	Pass

Test Frequency: 13.56MHz			Normal Voltage:DC6V	
Temperature (°C)	Test Result (MHz)	Deviation (kHz)	Limit ±0.01% (kHz)	Result
-20	13.5612800	1.2800	1.3560	Pass
-10	13.5612861	1.2861	1.3560	
0	13.5612857	1.2857	1.3560	
10	13.5612842	1.2842	1.3560	
20	13.5612856	1.2856	1.3560	
30	13.5612853	1.2853	1.3560	
40	13.5612852	1.2852	1.3560	
50	13.5612840	1.2840	1.3560	

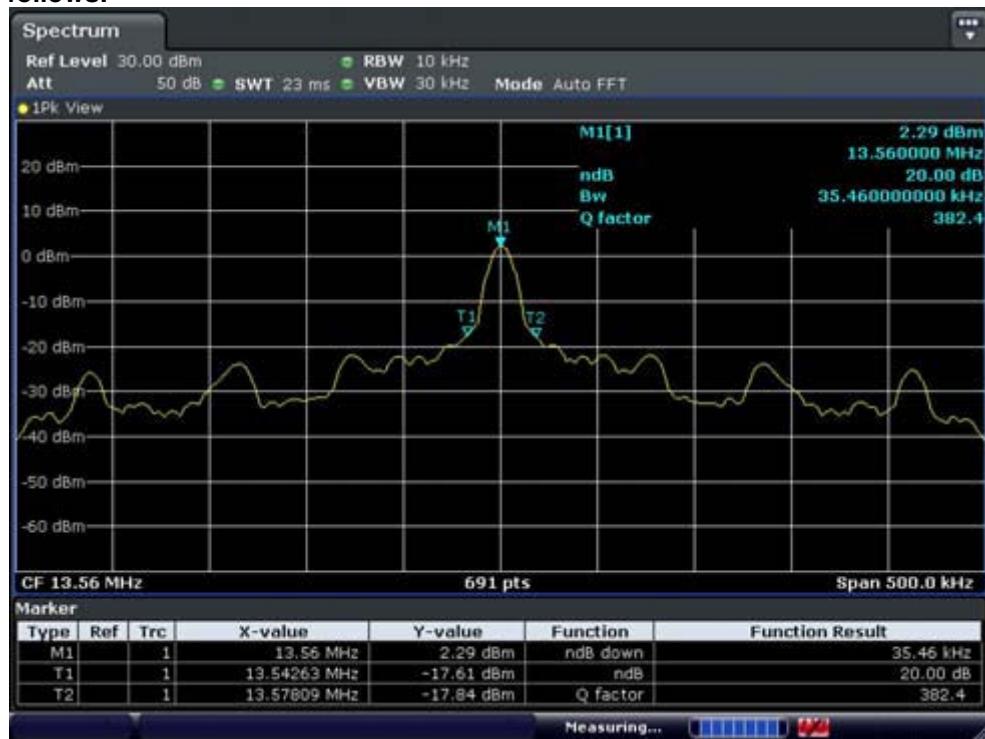
Note: Deviation (KHz) = (Test Result-13.56MHz)*1000

5.5 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
31.258	13.54263	13.57809	13.110 – 14.010	Pass

Test plot as follows:

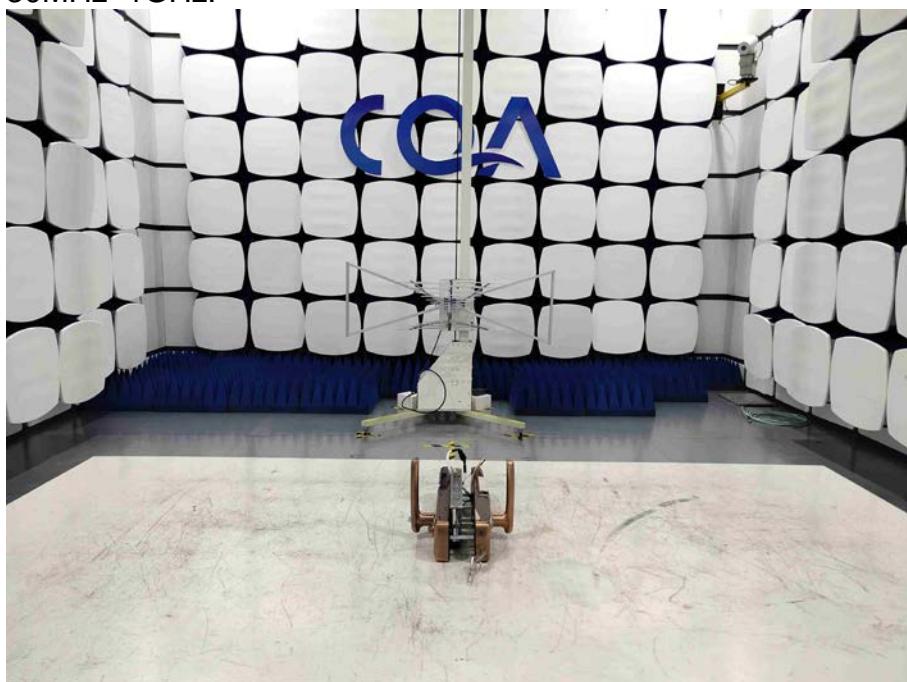
6 Photographs - EUT Test Setup

6.1 Radiated Emission

9KHz~30MHz:



30MHz~1GHz:



7 Photographs - EUT Construction Details

Refer to Photographs of EUT Constructional Details for CQASZ20181200012E-01

The End