FCC & IC TEST REPORT

On Behalf of

By TechDesign SL

FCC ID: 2ARQ3-MTA42222

Door control system

Model No.: MTA 42222, MTA 42294

Prepared for	:	By TechDesign SL
Address	:	Calle Tomas Edison 5, Arganda del Rey, Madrid, Spain

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
Address	:	Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

Report Number	:	T1881527 03
Date of Receipt	:	September 25, 2018
Date of Test	:	September 25, 2018 – November 13, 2018
Date of Report	:	November 13, 2018
Version Number	:	REV0

Contents

TEST REPORT DECLARATION

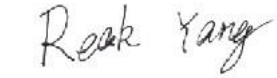
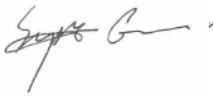
Applicant	:	By TechDesign SL
Address	:	Calle Tomas Edison 5, Arganda del Rey, Madrid, Spain
Manufacturer	:	By TechDesign SL
Address	:	Calle Tomas Edison 5, Arganda del Rey, Madrid, Spain
EUT Description	:	Door control system
	(A) Model No.	: MTA 42222, MTA 42294
	(B) Trademark	: by

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.225: 2017
ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the RSS-310 limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests. After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....…..:	Reak Yang Project Engineer	
Approved by (name + signature)…....:	Simple Guan Project Manager	
Date of issue…… ……..:	November 13, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	November 13, 2018	Initial released Issue	Simple Guan

1. General Information

1.1. Description of Device (EUT)

Description	:	The product is built with Bluetooth module and 13.56MHz module.
Model Name	:	Door control system
Model No.	:	MTA 42222, MTA 42294
DIFF	:	Both models are the same, except the appearance color, the results in this report belong to model MTA 42222.
Trade mark	:	by
Power supply	:	DC 24V from Host
Radio Technology	:	RFID
Operation frequency	:	13.56MHz
Channel No.		1 Channel
Modulation	:	ASK
Antenna Type	:	PCB Antenna.
Software Version	:	1.1.0.0
Hardware Version	:	V1
Product Size	:	Length: 11.3cm Width: 11.3cm Height: 6.5cm

1.2. Accessories of Device (EUT)

Accessories1 : /
Manufacturer : /
Model : /

1.3. Ancillary Equipment Details

No.	Description	Manufacturer	Model	Serial Number	Certification or sDOC
1	POWER SUPPLY	TP-LINK	HKI-D06-500	N/A	N/A
2	POE SWITCH	TP-LINK	POE31004P	N/A	N/A
3	Door control system(Host)	By TechDesign SL	MTA42209	N/A	sDOC

1.4. Test Lab Information

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961
Designation Number: CN1236

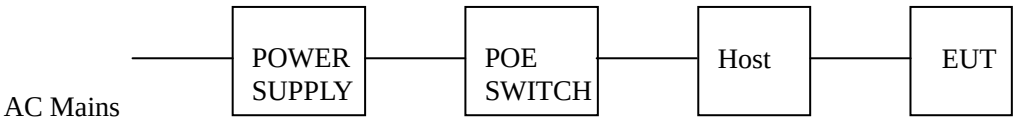
July 25, 2017 Certificated by IC
Registration Number: 12135A

2. Summary of test

2.1. Summary of test result

Description of Test Item	Standard	Results
Occupied bandwidth and 20dB Bandwidth	PART 15.215	PASS
Radiated Emission (9KHz-1GHz)	PART 15.225(a)(b)(c)(d)	PASS
Power Line Conducted Emissions (150KHz-30MHz)	PART 15.207	PASS
Frequency stability	PART 15.225(e)	PASS
Antenna Requirement	Section 15.203	PASS

2.2. Block Diagram



2.3. Test mode

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
1	CH1	13.56
Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.		

2.4. Additional instructions

Hardware operating method (Used for test) from client

Mode	Special Hardware operating is used. The Hardware operating method is provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.		
Power level setup by client			
Mode	Channel	Frequency (MHz)	Soft Set
ASK	Low	13.56	TX level is set as defaults value.

2.5. Test Conditions

Temperature range	21-25℃
Humidity range	40-75%
Pressure range	86-106kPa

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

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10-8
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.7. Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal. Due day
Filter	KANGMAI	ZLPF-LDC-1000- 1959	1209002075	2018.09.21	2019.09.20
RF Cable	Resenberger	Cable 4	N/A	2018.09.21	2019.09.20
Signal Analyzer	Agilent	N9020A	MY499100060	2018.09.11	2019.09.10
Amplifier	HP	HP8347A	2834A00455	2018.09.21	2019.09.20
Filter	WAINWRIGHT	WHKX1.0G/15G- 10SS	SN40	2018.09.21	2019.09.20
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2018.09.21	2019.09.20
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2018.04.13	2020.04.12
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2016.07.21	2020.07.20
RF Cable	Resenberger	Cable 1	N/A	2018.09.21	2019.09.20
RF Cable	Resenberger	Cable 2	N/A	2018.09.21	2019.09.20
RF Cable	Resenberger	Cable 3	N/A	2018.09.21	2019.09.20
Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018.09.26	2020.09.25
Attenuator	HP	8494B	DC-18G	2018.09.21	2019.09.20
20dB Attenuator	ICPROBING	IATS1	82347	2018.09.21	2019.09.20

3. Occupied bandwidth and 20dB Bandwidth

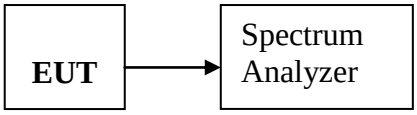
3.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in RSS-Gen & FCC part 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, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

3.2. Test Procedure

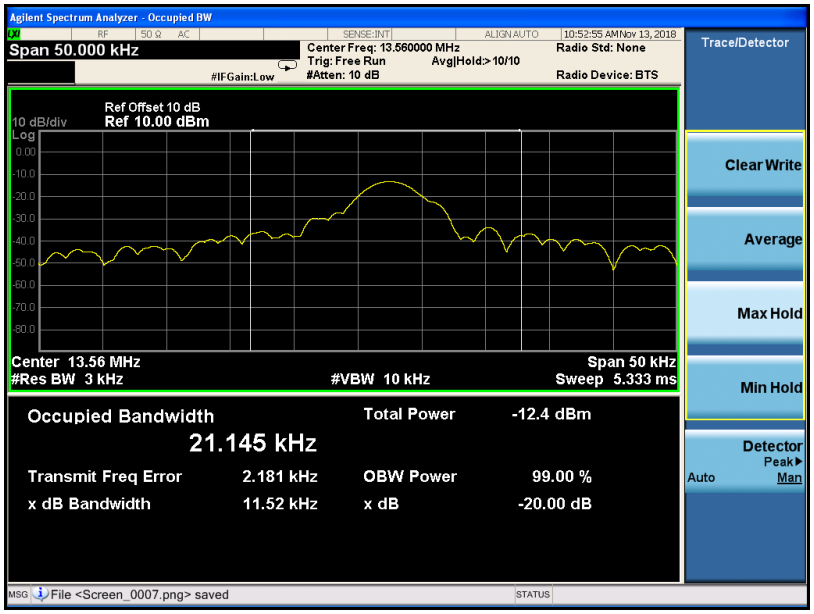
The transmitter output was directly connected to a spectrum analyzer with a 50Ω cable. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3KHz RBW and 10kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

3.3. Test Setup



3.4. Test Result

Mode	Freq (MHz)	20dB Bandwidth (KHz)	99% Bandwidth	Limit (kHz)	Conclusion
Tx Mode	13.56	11.52	21.145	/	PASS



4. Radiated emissions

4.1. Limit

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note:

a) The tighter limit applies at the band edges.
For example: F.S limit at 88MHz is 100uV/m

b) If measurement is made at 3m distance, then F.S Limit at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d2/d1)^2$.
For example:
F.S Limit at 30m(d2) distance is 30uV/m(L_{d2}), then F.S Limit at 3m(d1) distance is
L_{d1} = 30uV/m * $(30/3)^2$ = 100 * 30uV/m = 69.54 dBuV/m

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

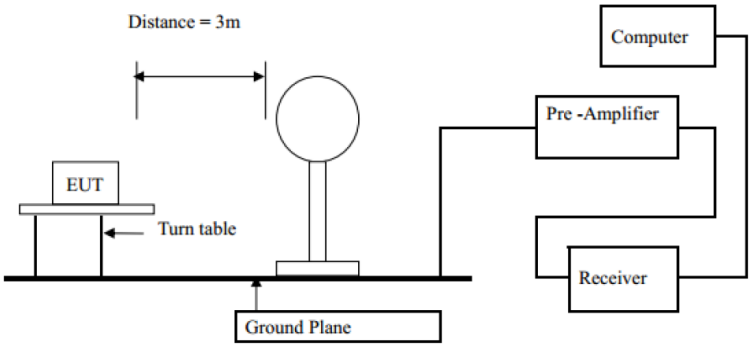
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

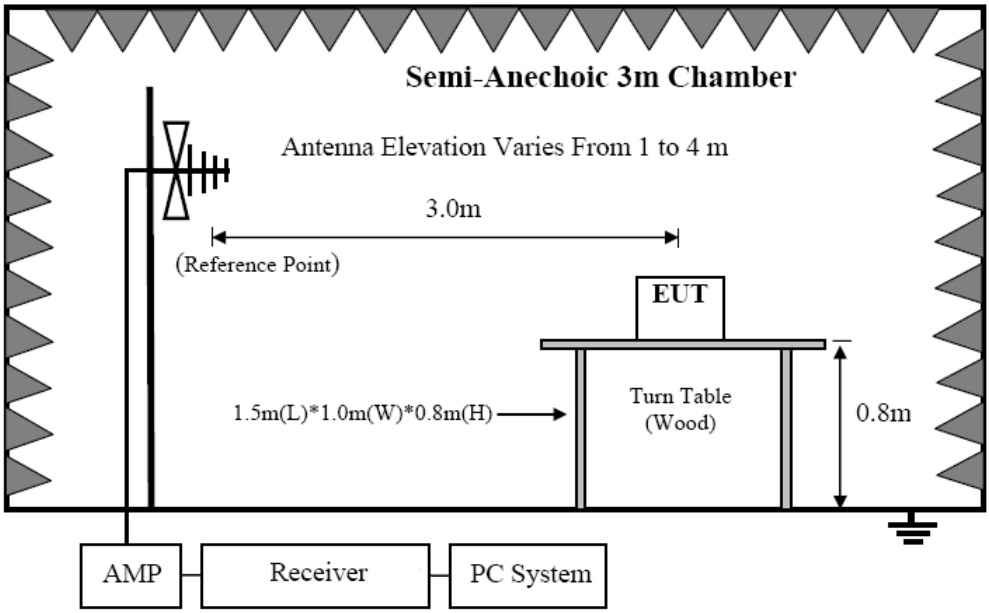
(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

4.2. Block Diagram of Test setup

In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



In 3m Anechoic Chamber Test Setup Diagram for frequency 30MHz-1GHz



4.3. Test Procedure

Procedure of Preliminary Test

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 4.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.

Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.

The antenna was placed at 3 meter away from the EUT as stated in ANSI C63.10:2013. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Receiver quickly scanned from 9KHz to 30MHz and 30MHz to 1GHz The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in clause 2.4 were scanned during the preliminary test:

After the preliminary scan, we found the test mode producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.

The Receiver scanned from9KHz to 30MHz and 30MHz to 1GHz. Emissions were scanned and

measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 200Hz for 9 KHz to 150 KHz measure, 10 KHz for 150 KHz to 30MHz measure and 120 KHz for 30 MHz to 1GHz measure .

4.4. Test Result

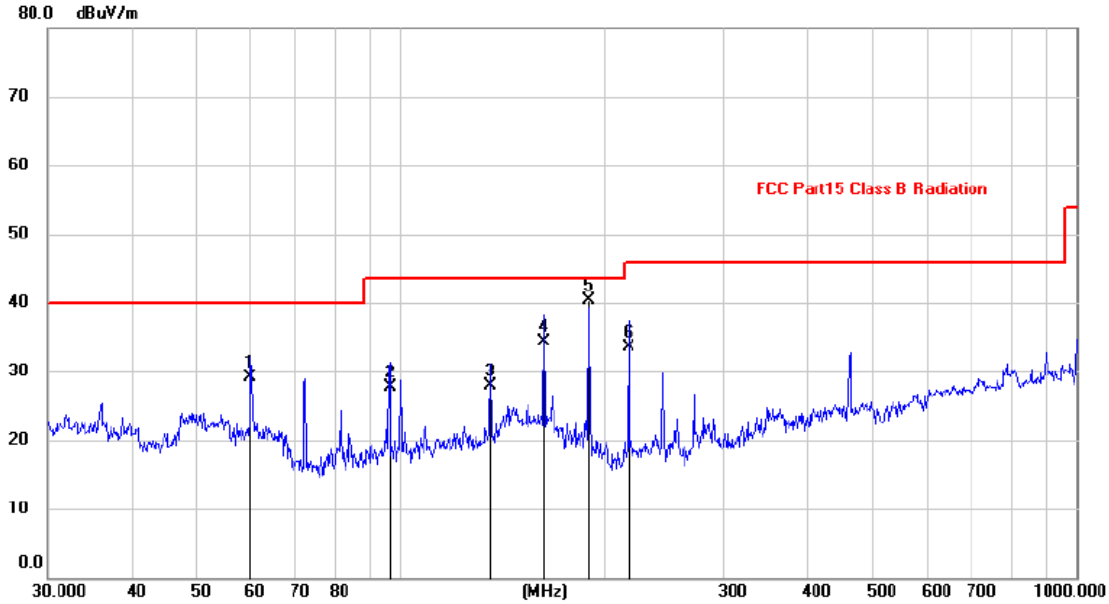
PASS. (See below detailed test result)

Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

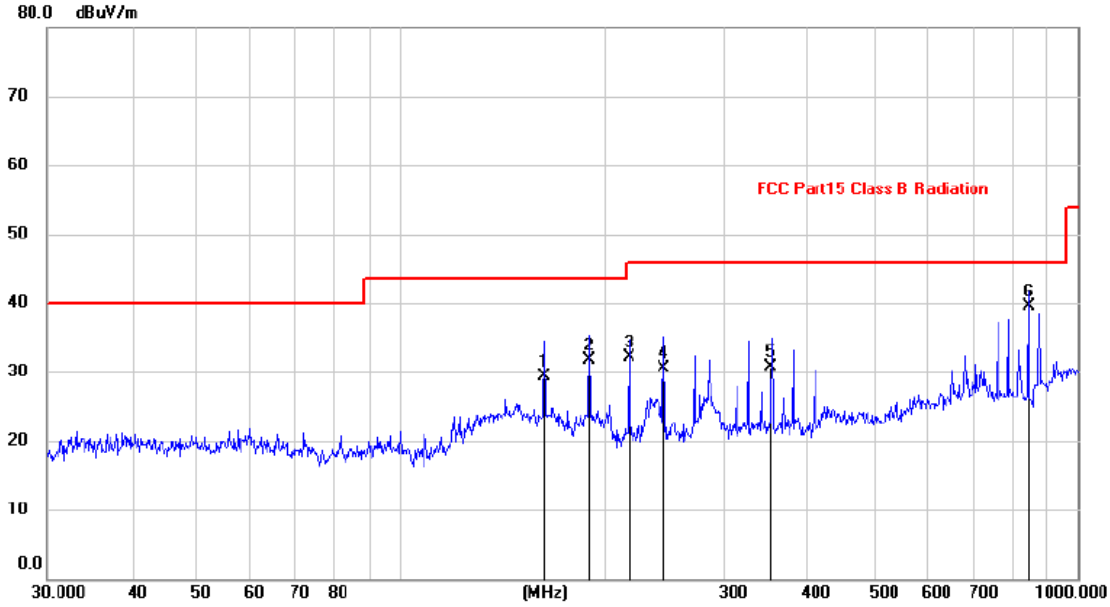
Temperature：	26 ℃	Relative Humidity：	58%
Pressure：	1010hPa	Phase :	Vertical
Test Voltage：	DC 24V From Host with POE supply		
Test Mode：	13.56MHz		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		59.8588	16.02	13.00	29.02	40.00	-10.98	QP	300	360	
2		96.4360	17.32	10.31	27.63	43.50	-15.87	QP	300	0	
3		135.9821	14.30	13.59	27.89	43.50	-15.61	QP	300	0	
4		163.1817	19.96	14.32	34.28	43.50	-9.22	QP	300	360	
5	*	189.7385	29.29	10.96	40.25	43.50	-3.25	QP	300	0	
6		216.7828	22.41	11.11	33.52	46.00	-12.48	QP	300	360	

Note:1. *:Maximum data; x:Over limit; I:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature：	26 ℃	Relative Humidity：	58%
Pressure：	1010hPa	Phase :	Horizontal
Test Voltage：	DC 24V From Host with POE supply		
Test Mode：	13.56MHz		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		163.1818	15.06	14.32	29.38	43.50	-14.12	QP	100	0	
2		189.7385	20.69	10.96	31.65	43.50	-11.85	QP	100	0	
3		216.7828	20.91	11.11	32.02	46.00	-13.98	QP	100	0	
4		244.2321	18.50	12.01	30.51	46.00	-15.49	QP	100	0	
5		352.9433	16.23	14.44	30.67	46.00	-15.33	QP	100	360	
6	*	845.0878	16.92	22.68	39.60	46.00	-6.40	QP	100	0	

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Field Strength Emissions Result

Temperature	26°C	**Relative Humidity**	58%
Pressure	960hPa	**Distance**	3m
Test Mode	TX		

Freq. (MHz)	Position H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Margin (dBuV/m)
13.560	H	Peak	64.88	-13.94	50.94	124	-73.06
13.560	H	AV	55.92	-13.94	41.98	104	-62.02
13.110	H	Peak	53.72	-13.94	39.78	80.5	-40.72
13.410	H	Peak	54.27	-13.94	40.33	90.5	-50.17
13.553	H	Peak	52.57	-13.94	38.63	90.5	-51.87
13.567	H	Peak	48.56	-13.93	34.63	90.5	-55.87
13.710	H	Peak	47.03	-13.93	33.10	80.5	-47.40
14.010	H	Peak	47.77	-13.93	33.84	80.5	-46.66
Freq. (MHz)	**Position H/V**	**Detector Mode (PK/QP)**	**Reading (dBuV)**	**Factor (dB)**	**Actual FS (dBuV/m)**	**Limits 3m (dBuV/m)**	**Margin (dBuV/m)**
13.560	V	Peak	58.92	-13.94	44.98	124	-79.02
13.560	V	AV	51.08	-13.94	37.14	104	-66.86
13.110	V	Peak	52.06	-13.94	38.12	80.5	-42.38
13.410	V	Peak	51.53	-13.94	37.59	90.5	-52.91
13.553	V	Peak	49.94	-13.94	36.00	90.5	-54.50
13.567	V	Peak	47.21	-13.93	33.28	90.5	-57.22
13.710	V	Peak	45.25	-13.93	31.32	80.5	-49.18
14.010	V	Peak	45.45	-13.93	31.52	80.5	-48.98

Note:

1: 30m to 3m correction factor calculation:

40*Log(30m/3m)=40

2: --Means other frequency and mode comply with standard requirements and at least have 20dB margin.

3: Correct Factor=Cable Loss+ Antenna Factor- Amplifier Gain

Measurement Result=Reading + Correct Factor

Margin=Measurement Result-Limit

5. Frequency stability

5.1. Test limit

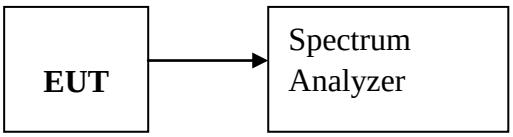
Please refer section RSS-Gen & 15.225e.

Regulation 15.225(e) The frequency tolerance of the carrier signal shall be maintained within +/-0.01%(±100 ppm) 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.

5.2. Test Procedure

The following equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.3. Test Setup



5.4. Test Results

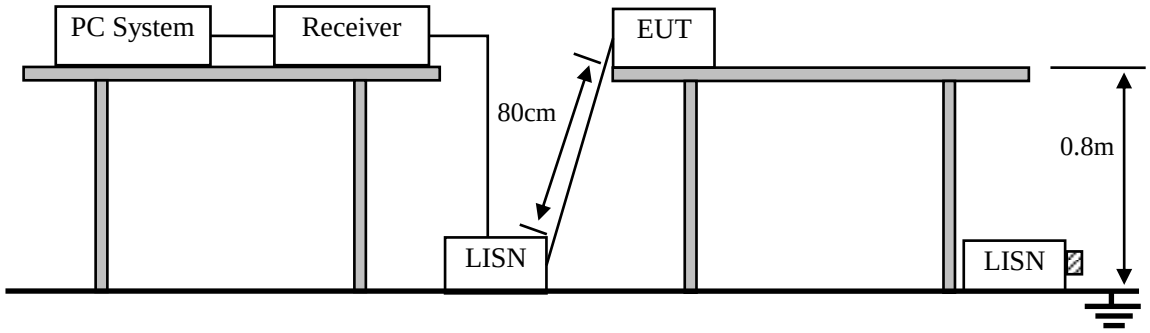
PASS.

Detailed information please see the following page.

Assigned Frequency(MHz): 13.56MHz				
Voltage	Temperature	Measured Frequency (MHz)	Frequency stability (MHz)	Limit
Low DC 20.4V	+20℃	13.560908	0.000908	±100 ppm ±0.001356MHz
Normal DC 24V	-20℃	13.560887	0.000887	
	-10℃	13.560895	0.000895	
	0℃	13.560065	0.000065	
	+10℃	13.560181	0.000181	
	+20℃	13.560668	0.000668	
	+30℃	13.560309	0.000309	
	+40℃	13.560099	0.000099	
	+50℃	13.560806	0.000806	
High DC 27.6V	+20℃	13.560611	0.000611	

6. Power Line Conducted Emissions

6.1. Block Diagram of Test Setup



:50Ω Terminator

6.2. Limit

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

Notes: 1. * Decreasing linearly with logarithm of frequency.

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

6.3. Test Procedure

(1) The EUT was placed on a non-metallic table, 80cm above the ground plane.

(2) Setup the EUT and simulator as shown in 10.1

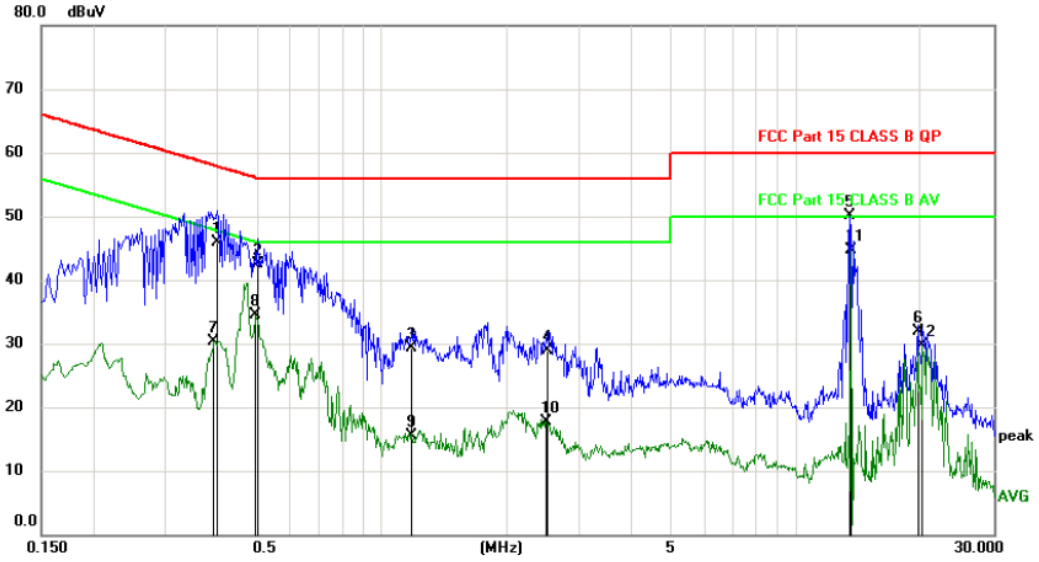
(3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N1), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C64.10:2013 on conducted Emission test.

(4) The bandwidth of test receiver is set at 10KHz.

(5) The frequency range from 150 KHz to 30MHz is checked.

6.4. Test Result

Temperature：	24 ℃	Relative Humidity：	57%
Pressure：	1010hPa	Phase :	N
Test Voltage：	DC 24V From Host with POE supply		
Test Mode：	13.56MHz		

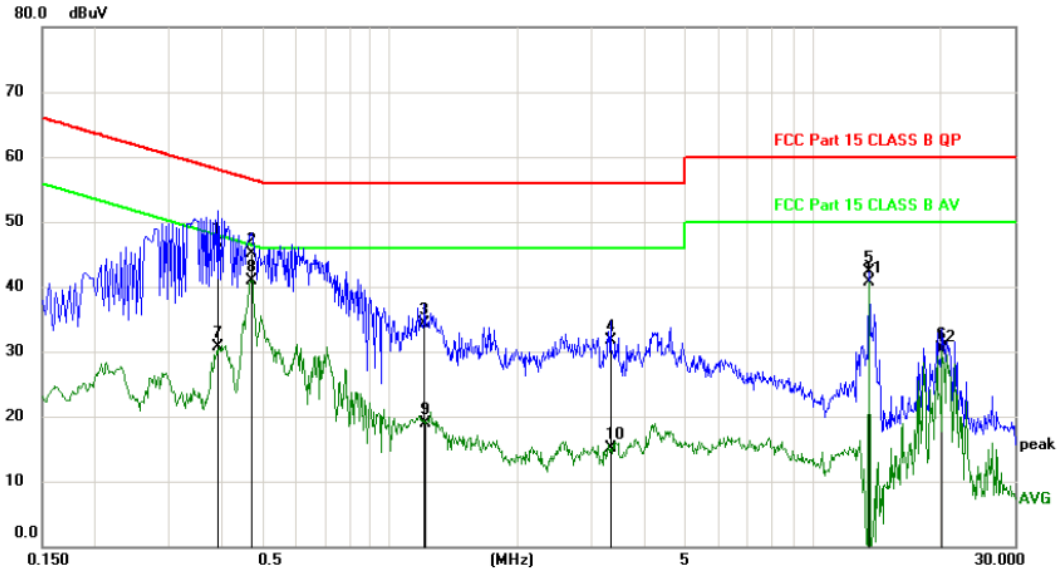


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3990	36.28	9.70	45.98	57.87	-11.89	QP	
2		0.5010	32.86	9.71	42.57	56.00	-13.43	QP	
3		1.1814	19.43	9.79	29.22	56.00	-26.78	QP	
4		2.5078	19.01	9.94	28.95	56.00	-27.05	QP	
5		13.4190	39.66	10.35	50.01	60.00	-9.99	QP	
6		19.7130	21.39	10.46	31.85	60.00	-28.15	QP	
7		0.3930	20.65	9.70	30.35	48.00	-17.65	AVG	
8		0.4949	24.70	9.71	34.41	46.09	-11.68	AVG	
9		1.1814	5.63	9.79	15.42	46.00	-30.58	AVG	
10		2.4929	7.70	9.93	17.63	46.00	-28.37	AVG	
11	*	13.5660	34.35	10.35	44.70	50.00	-5.30	AVG	
12		20.2620	19.21	10.47	29.68	50.00	-20.32	AVG	

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

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Temperature：	24 ℃	Relative Humidity：	57%
Pressure：	1010hPa	Phase :	L
Test Voltage：	DC 24V From Host with POE supply		
Test Mode：	13.56MHz		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3930	37.06	9.70	46.76	58.00	-11.24	QP	
2		0.4707	35.49	9.71	45.20	56.50	-11.30	QP	
3		1.2056	24.52	9.79	34.31	56.00	-21.69	QP	
4		3.3210	21.67	10.02	31.69	56.00	-24.31	QP	
5		13.5600	31.89	10.35	42.24	60.00	-17.76	QP	
6		20.2620	19.96	10.47	30.43	60.00	-29.57	QP	
7		0.3933	21.01	9.70	30.71	47.99	-17.28	AVG	
8	*	0.4707	31.21	9.71	40.92	46.50	-5.58	AVG	
9		1.2116	9.12	9.79	18.91	46.00	-27.09	AVG	
10		3.3420	5.00	10.02	15.02	46.00	-30.98	AVG	
11		13.5600	30.40	10.35	40.75	50.00	-9.25	AVG	
12		20.2620	19.72	10.47	30.19	50.00	-19.81	AVG	

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

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Remark: All modes and channels have been tested and only listed RF mode that is worst data

7. Antenna Requirements

7.1. Limit

For intentional device, according to RSS-Gen Section 6.8 and FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.209, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.2. Antenna Connected Construction

The antenna is PCB antenna and no consideration of replacement. Please see EUT photo for details.

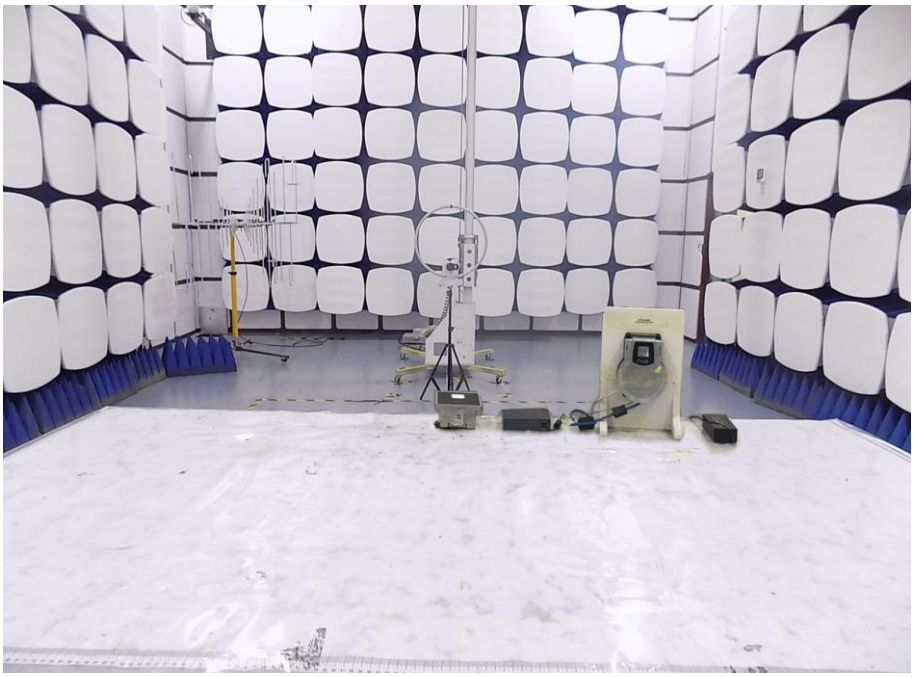
7.3. Results

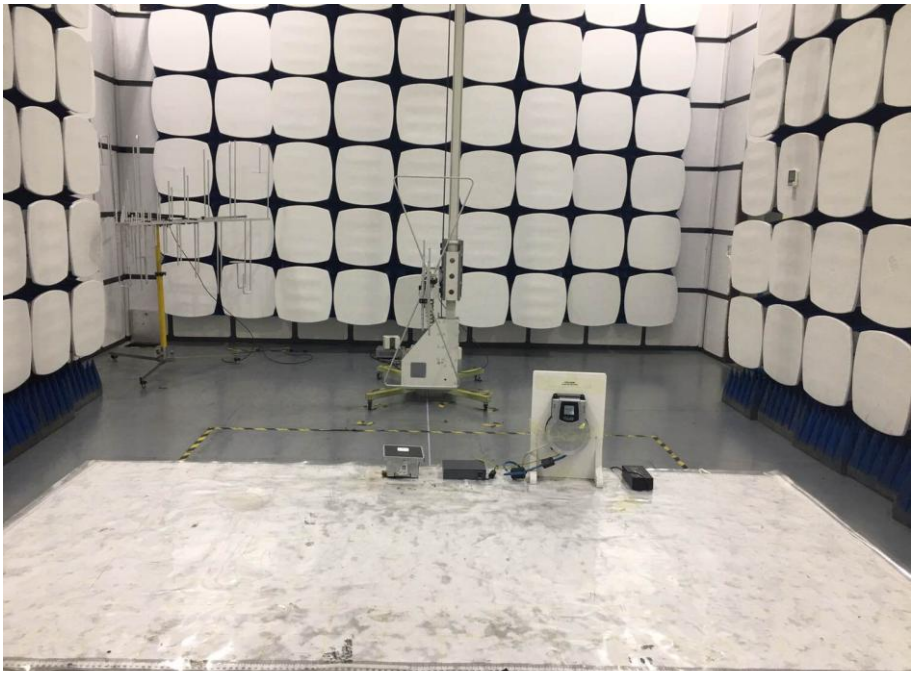
The EUT antenna is PCB Antenna. It complies with the standard requirement.

8. Test setup photo

8.1. Photos of Conducted emission

8.2. Photos of Radiated emission





9. Photos of EUT

Please refer to the report T1881527 02.

----END OF REPORT----