FCC Report (NFC)

Applicant:	Magtek Incorporated
Address of Applicant:	1710 Apollo Court, seal beach, California 90740, United States
Manufacturer/Factory:	Magtek Incorporated
Address of Manufacturer/Factory:	1710 Apollo Court, seal beach, California 90740, United States

Equipment Under Test (EUT)

Product Name:	tDynamo
Model No.:	21079821
Trade Mark:	MAGTEK
FCC ID:	U73-21079821A0
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.225
Date of sample receipt:	April 25, 2018
Date of Test:	April 26, 2018-May 10, 2018
Date of report issued:	May 11, 2018
Test Result :	PASS *

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

Authorized Signature:

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*May 11, 2018*	*Original*

Prepared By: Bill. Yuan ***Date:*** *May 11, 2018*

Project Engineer

Check By: Andy. Wu ***Date:*** *May 11, 2018*

Reviewer

3 Contents

Page

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Field Strength of Fundamental Emissions and Mask Measurement	15.225(a)(b)(c)	Pass
Radiated Emission	15.225(d)&15.209	Pass
20dB Emission Bandwidth	15.225&15.215	Pass
Frequency Stability Measurement	15.225(e)	Pass

Remark:

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	tDynamo
Model No.:	21079821
Serial No.:	B3B858E
Test sample(s) ID:	GTS201803000228-1
Sample(s) Status	Engineered sample
Hardware:	V08A
Software:	1000003858
Operation Frequency:	13.56MHz
Channel Number:	1
Modulation:	ASK
Antenna type:	Integral Antenna
Antenna gain:	2.0dBi(Max)
Power supply:	Battery: DC 3.7V, 760mAh DC 5.0V USB charge

5.2 Test mode

Transmitter mode	Keep the EUT in continuously transmitting.

Pre-test mode.

GTS has verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	53.78	54.50	54.35

Final Test Mode:

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”: Y axis (see the test setup photo)

5.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 381383**

Global United Technology Services 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 files. Registration 381383, January 08, 2018.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC Approval
Emerson Network Power	USB Charger	A1299	N/A	FCC DoC

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 28 2017	June 27 2018
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 28 2017	June 27 2018
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2017	June 27 2018
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Coaxial Cable	GTS	N/A	GTS213	June 28 2017	June 27 2018
8	Coaxial Cable	GTS	N/A	GTS211	June 28 2017	June 27 2018
9	Coaxial cable	GTS	N/A	GTS210	June 28 2017	June 27 2018
10	Coaxial Cable	GTS	N/A	GTS212	June 28 2017	June 27 2018
11	Amplifier (100kHz-3GHz)	HP	8347A	GTS204	June 28 2017	June 27 2018
12	Loop Antenna	Zhinan	ZN30900A	GTS215	June. 28 2017	June. 27 2018

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2014	May.15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 28 2017	June. 27 2018
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 28 2017	June. 27 2018
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 28 2017	June. 27 2018
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June 28 2017	June 27 2018
2	Thermo meter	KTJ	TA328	GTS233	June 28 2017	June 27 2018

7 Test results and Measurement Data

7.1 Antenna requirement:

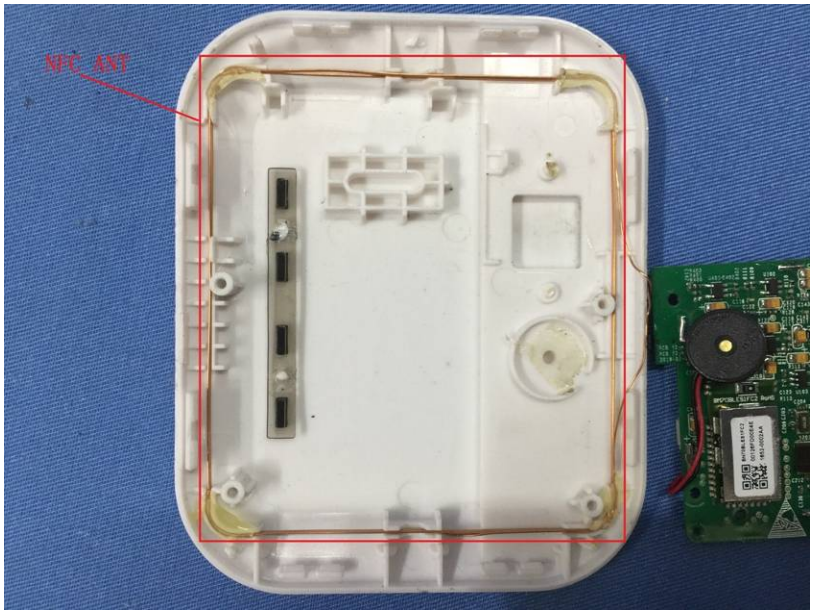
Standard requirement:	FCC Part15 C Section 15.203

15.203 requirement:

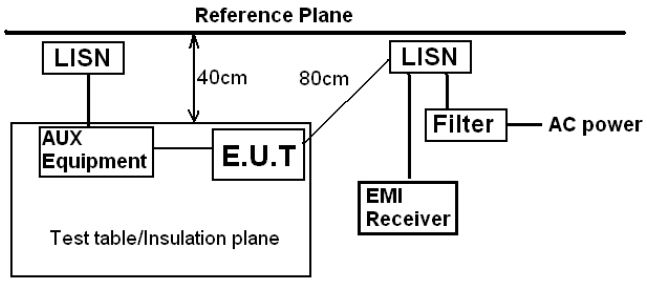
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit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

E.U.T Antenna:

The antenna is integral antenna, the best case gain of the antenna is 2.0dBi

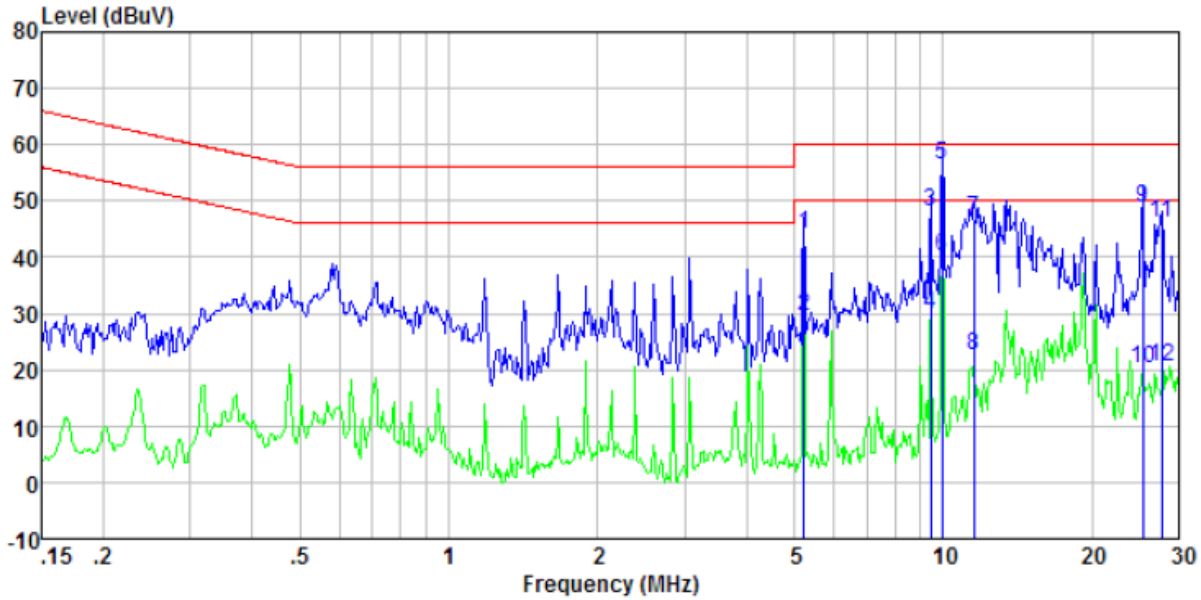


7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 * Decreases with the logarithm of the frequency.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

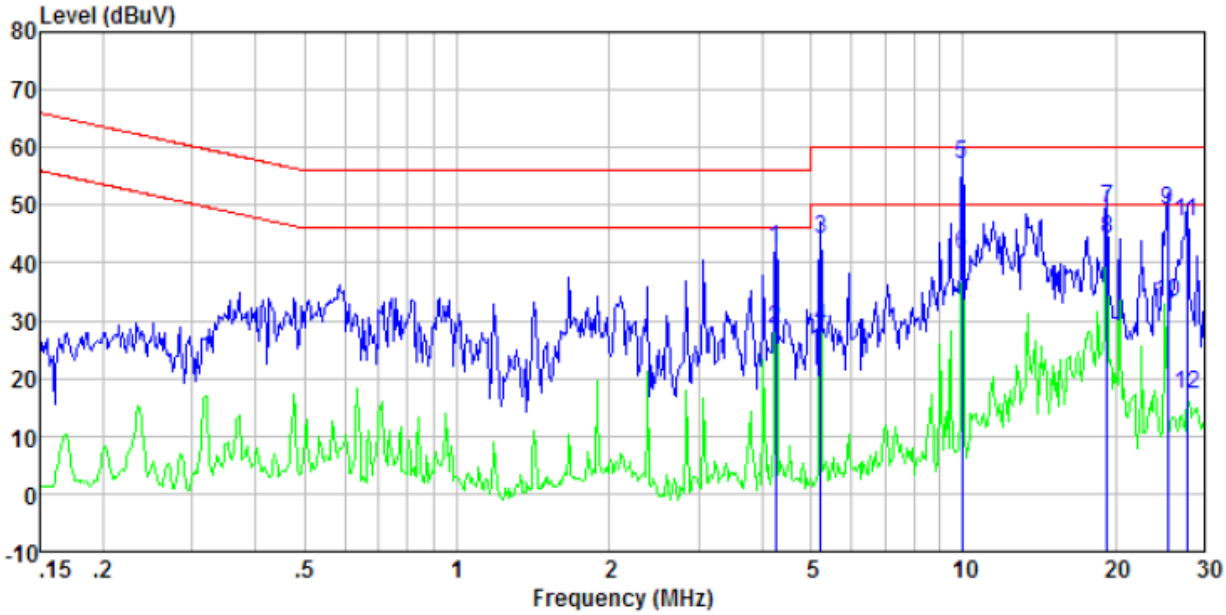
Measurement data:

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
5.22	43.69	0.21	0.15	44.05	60.00	-15.95	QP
5.22	28.99	0.21	0.15	29.35	50.00	-20.65	Average
9.45	47.54	0.29	0.19	48.02	60.00	-11.98	QP
9.45	29.28	0.29	0.19	29.76	50.00	-20.24	Average
9.97	56.02	0.29	0.19	56.50	60.00	-3.50	QP
9.97	39.77	0.29	0.19	40.25	50.00	-9.75	Average
11.56	46.13	0.36	0.20	46.69	60.00	-13.31	QP
11.56	21.97	0.36	0.20	22.53	50.00	-27.47	Average
25.32	47.33	1.14	0.23	48.70	60.00	-11.30	QP
25.32	18.96	1.14	0.23	20.33	50.00	-29.67	Average
27.71	44.86	0.91	0.24	46.01	60.00	-13.99	QP
27.71	19.30	0.91	0.24	20.45	50.00	-29.55	Average

Neutral:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
4.27	42.18	0.14	0.15	42.47	56.00	-13.53	QP
4.27	28.25	0.14	0.15	28.54	46.00	-17.46	Average
5.22	43.84	0.15	0.15	44.14	60.00	-15.86	QP
5.22	28.66	0.15	0.15	28.96	50.00	-21.04	Average
9.97	56.63	0.24	0.19	57.06	60.00	-2.94	QP
9.97	41.19	0.24	0.19	41.62	50.00	-8.38	Average
19.22	48.76	0.48	0.22	49.46	60.00	-10.54	QP
19.22	43.54	0.48	0.22	44.24	50.00	-5.76	Average
25.32	47.98	1.04	0.23	49.25	60.00	-10.75	QP
25.32	31.91	1.04	0.23	33.18	50.00	-16.82	Average
27.71	45.88	0.84	0.24	46.96	60.00	-13.04	QP
27.71	16.21	0.84	0.24	17.29	50.00	-32.71	Average

Notes:

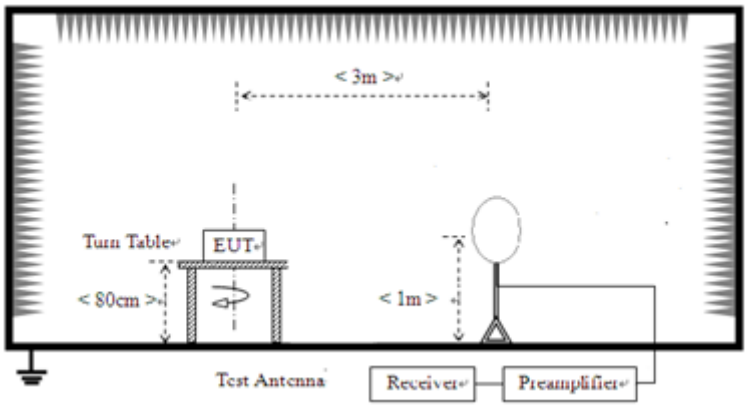
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

7.3 Field Strength of Fundamental Emissions and Mask Measurement

Test Requirement:	FCC Part15 C Section 15.225(a)(b)(c)
Test Method:	ANSI C63.10:2013
Test site:	Measurement Distance: 3m
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=Auto
limit:	

Frequency (MHz)	Field Strength (microvolts/meter) at 30m	Field Strength (dBuV/m) at 3m
1.705~13.110	30	69.5
13.110~13.410	106	80.5
13.410~13.553	334	90.5
13.553~13.567	15848	124.0
13.567~13.710	334	90.5
13.710~14.010	106	80.5
14.010~30.000	30	69.5

Test setup:



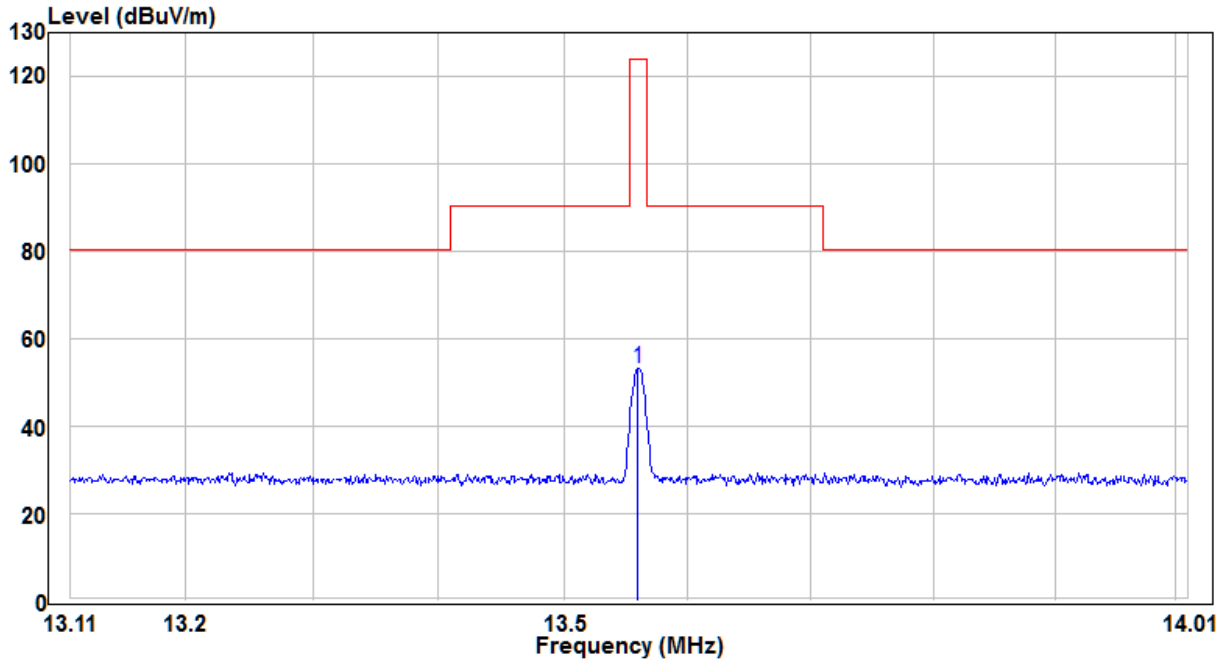
Test Procedure:

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT, the turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure QP reading.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum

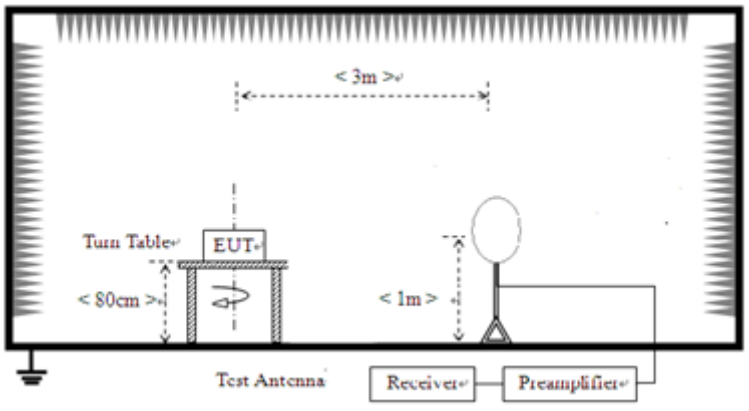
	value. 6. Compliance with the spectrum mask is tested using a spectrum analyzer with RB set to a 1KHz for the band 13.553~13.567MHz.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

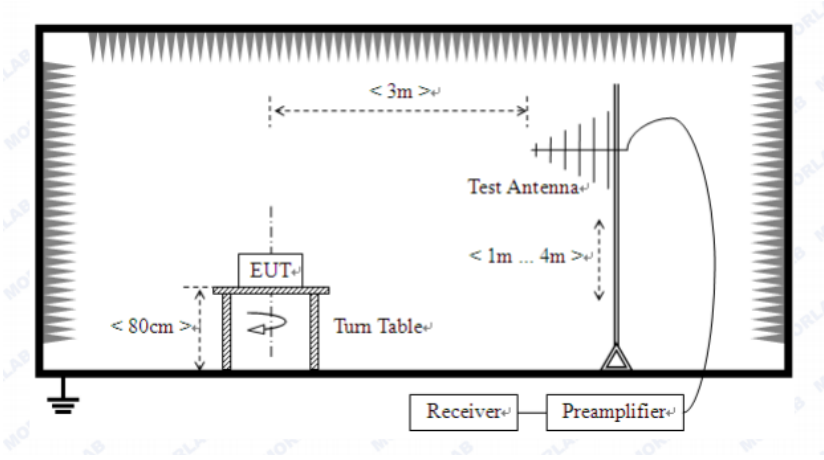
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
13.56	29.29	24.70	0.51	54.50	124.00	-69.50	QP



7.4 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.225(d) and 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9KHz to 1000MHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>9kHz-150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>300Hz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>10kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>All out of band emissions appearing in a restricted band as specified in Section 15.225 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.
<table>
<tr><th>Frequency (MHz)</th><th>Field strength (micorvolts/meter)</th><th>Measurement distance (meters)</th></tr>
<tr><td>0.009~0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490~1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705~30</td><td>30</td><td>30</td></tr>
<tr><td>30~88</td><td>100</td><td>3</td></tr>
<tr><td>88~216</td><td>150</td><td>3</td></tr>
<tr><td>216~960</td><td>200</td><td>3</td></tr>
<tr><td>960~1000</td><td>500</td><td>3</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>Below 30MHz
 

Above 30MHz</td></tr>
</table>

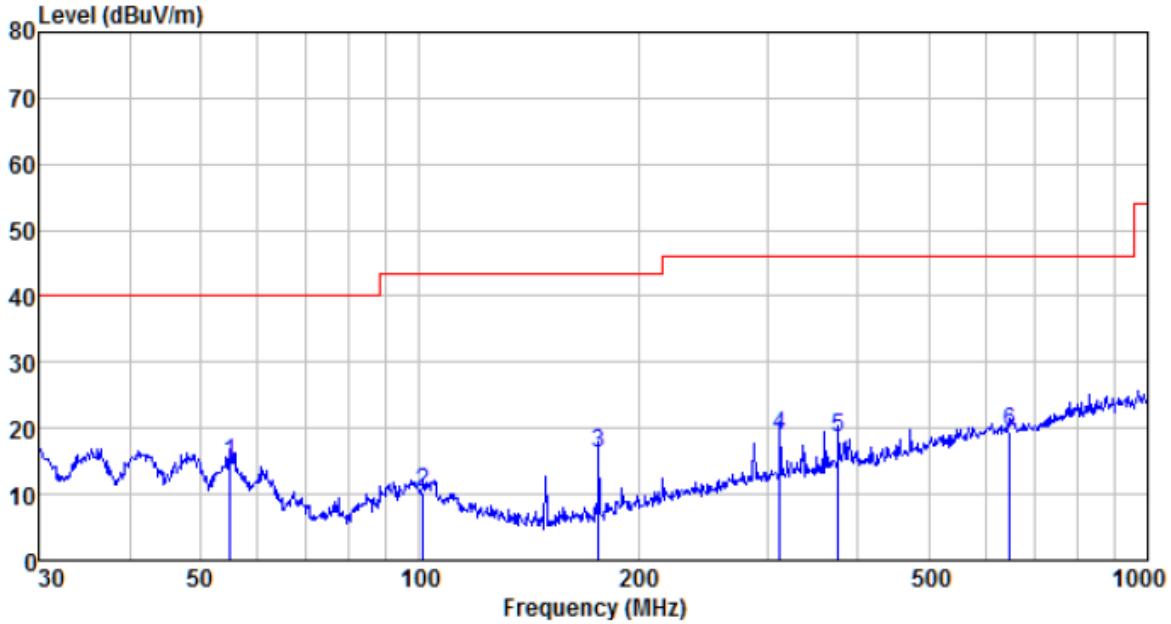
	
Test Procedure:	1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable. 2. Power on the EUT, the turntable was rotated by 360 degrees to determine the position of the highest radiation. 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization. 4. For each suspected emissions, the antenna tower was scan (from 1M to 4M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading. 5. Set the test-receiver system to Peak or CISPR quasi-peak detect function with specified bandwidth under maximum hold mode. 6. When the radiated emissions limits are expressed in terms of the average value of the emissions and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. 7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

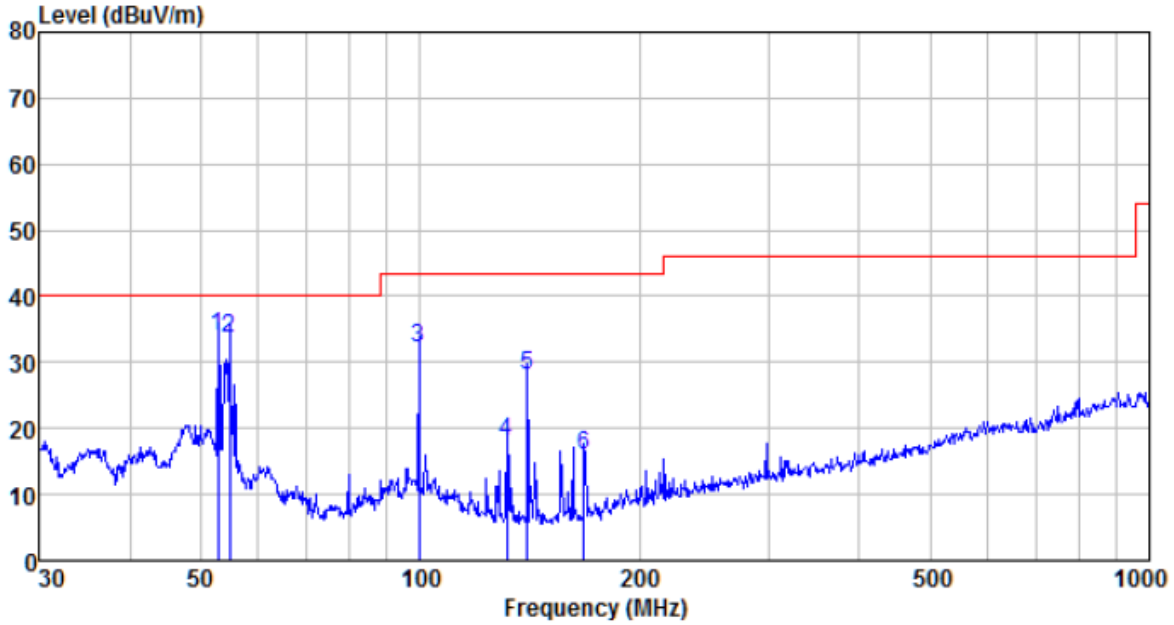
30MHz to 1GHz

Horizontal:



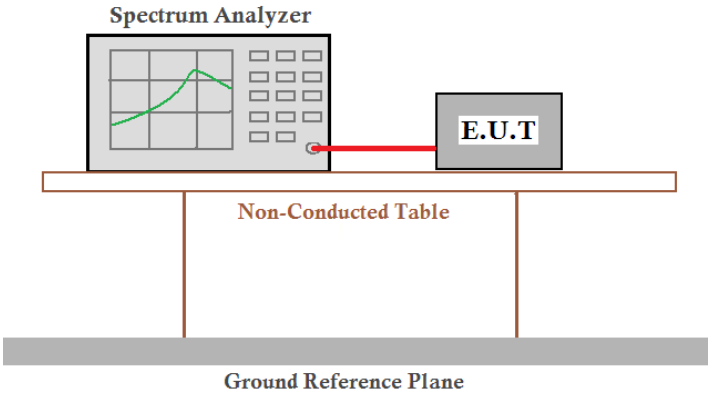
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
55.027	38.40	11.78	0.82	36.25	14.75	40.00	-25.25	QP
101.289	33.89	12.04	1.20	36.73	10.40	43.50	-33.10	QP
176.269	42.88	8.77	1.72	37.22	16.15	43.50	-27.35	QP
312.179	40.04	13.85	2.42	37.43	18.88	46.00	-27.12	QP
375.939	38.29	14.94	2.75	37.50	18.48	46.00	-27.52	QP
647.386	33.65	19.55	3.91	37.58	19.53	46.00	-26.47	QP

Vertical:



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
52.760	57.37	12.00	0.80	36.22	33.95	40.00	-6.05	QP
54.835	57.34	11.80	0.82	36.25	33.71	40.00	-6.29	QP
99.528	55.49	12.13	1.19	36.72	32.09	43.50	-11.41	QP
131.297	45.33	8.06	1.44	36.96	17.87	43.50	-25.63	QP
140.342	56.01	7.40	1.51	37.02	27.90	43.50	-15.60	QP
167.824	42.85	8.46	1.67	37.18	15.80	43.50	-27.70	QP

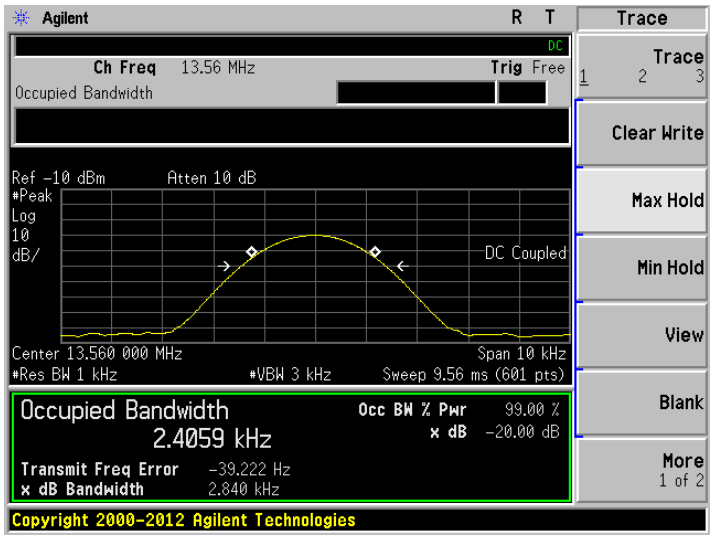
7.5 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.225 and 15.215
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

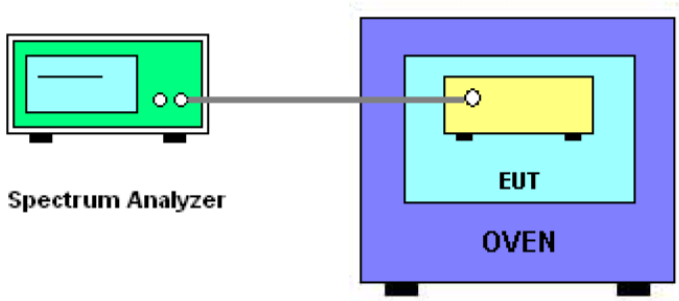
Measurement Data

Test frequency (MHz)	20dB bandwidth (KHz)	Result
13.56	2.840	Pass

Test plot as follows:



7.6 Frequency Stability Measurement

Test Requirement:	FCC Part15 C Section 15.225 (e)
Test Method:	ANSI C63.10: 2013
Receiver setup:	RBW=1KHz, VBW=1KHz, Sweep time=Auto
Limit:	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, 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.
Test setup:	
Test Procedure:	1. The transmitter output (antenna port) was connected to the spectrum analyzer. 2. EUT have transmitted absence of modulation signal and fixed channelize 3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. 4. Set RBW=1KHz, VBW=1KHz with peak detector and maxhold settings. 5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc x10^6 ppm and the limit is less than ±100ppm. 6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value 7. Extreme temperature rule is -20℃ ~50℃
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

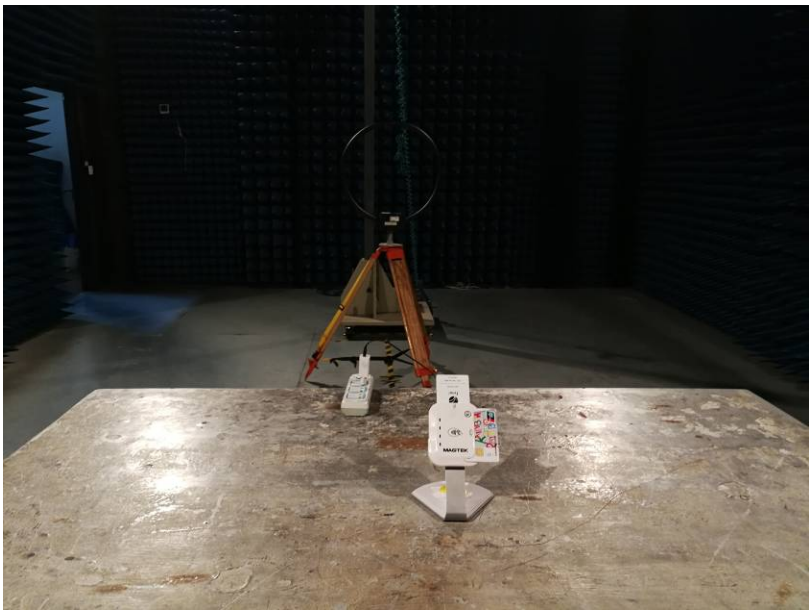
Measurement data:

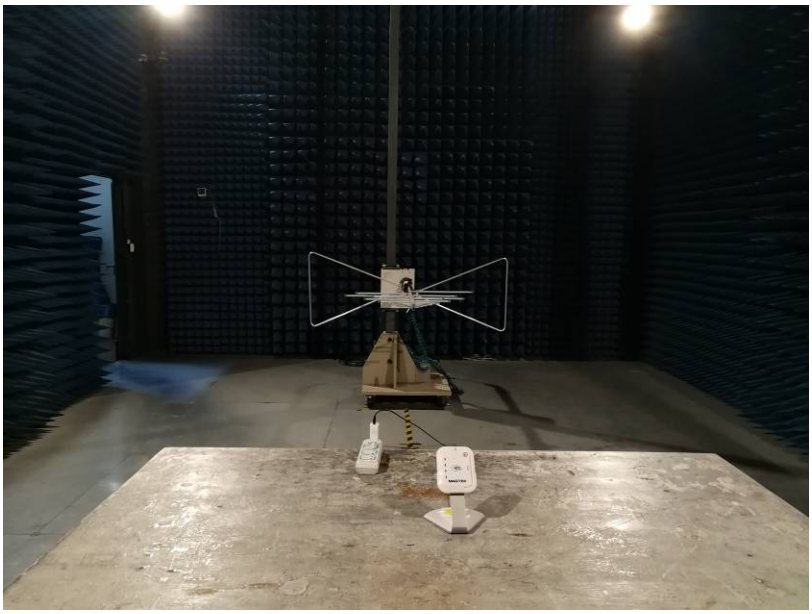
Reference Frequency: 13.56MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit	Result
		Hz	%		
3.7	-20	55	0.00041%	+/- 0.01%	Pass
	-10	59	0.00044%		
	0	51	0.00038%		
	10	63	0.00047%		
	20	65	0.00048%		
	30	78	0.00058%		
	40	58	0.00043%		
	50	77	0.00057%		

Reference Frequency: 13.56MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit	Result
		Hz	ppm		
20	3.145	59	0.00044%	+/- 0.01%	Pass
	3.7	78	0.00058%		
	4.255	65	0.00048%		

8 Test Setup Photo

Radiated Emission





Conducted Emission

9 EUT Constructional Details

Reference to the test report No. : GTS201803000228F01

------ End ------