

TEST REPORT

Applicant: Shenzhen Biotrace Co., Limited

Address of Applicant: Room 324, Building A, YifangtiandiloT Park, Gushu 2nd Rd. BaoAn District, Shenzhen, China

Manufacturer/ Factory: Shenzhen Biotrace Co., Limited

Address of Manufacturer/ Factory: Room 324, Building A, YifangtiandiloT Park, Gushu 2nd Rd. BaoAn District, Shenzhen, China

Equipment Under Test (EUT)

Product Name: LF Microchip Reader

Model No.: SG001, RT15T

FCC ID: 2BFQ7-SG001

Applicable standards: FCC CFR Title 47 Part 15 Subpart C

Date of sample receipt: January 25, 2024

Date of Test: January 25, 2024-June 24, 2024

Date of report issued: June 24, 2024

Test Result : PASS

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

Authorized Signature:



Robinson Luo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	June 24, 2024	Original

Prepared By:

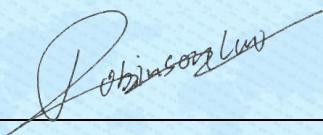


Date:

June 24, 2024

Project Engineer

Check By:



Date:

June 24, 2024

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Radiated Emission	15.209	Pass
20dB Bandwidth	15.215	Pass

Remark:

1. 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	3.1dB	(1)
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(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:	LF Microchip Reader
Model No.:	SG001, RT15T
Test Model No.:	SG001

Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits.

The differences are appearance color and model name for commercial purpose.

S/N:	N/A
Test sample(s) ID:	GTS2024010311-1
Sample(s) Status	Engineered sample
Operation Frequency:	134.2kHz
Channel Number:	1
Modulation:	ASK
Antenna type:	Integral Antenna
Antenna Gain:	0dBi
Power supply:	DC 3.7V, 800mAh for Li-ion battery

Remark:

1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

5.2 Test mode

Transmitter mode	Keep the EUT in continuously transmitting.
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5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

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

- **FCC —Registration No.: 381383**

Designation Number: CN5029

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.

- **ISED —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing.

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.8 Description of Support Units

None

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	June 22, 2024	June 23, 2025
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	April 13, 2024	April 12, 2025
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 13, 2024	April 12, 2025
8	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 13, 2023	Nov.12, 2024
9	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 13, 2024	April 12, 2025
10	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 13, 2024	April 12, 2025
11	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 29, 2023	Oct. 28, 2024
12	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 29, 2023	Oct. 28, 2024
13	FSV-Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	April 13, 2024	April 12, 2025
14	Amplifier	/	LNA-1000-30S	GTS650	April 13, 2024	April 12, 2025
15	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS692	Nov. 08, 2023	Nov.07, 2024
16	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	April 13, 2024	April 12, 2025
17	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 18, 2024	April 17, 2025
18	RE cable 1	GTS	N/A	GTS675	July 31. 2023	July 30. 2024
19	RE cable 2	GTS	N/A	GTS676	July 31. 2023	July 30. 2024
20	RE cable 3	GTS	N/A	GTS677	July 31. 2023	July 30. 2024
21	RE cable 4	GTS	N/A	GTS678	July 31. 2023	July 30. 2024
22	RE cable 5	GTS	N/A	GTS679	July 31. 2023	July 30. 2024
23	RE cable 6	GTS	N/A	GTS680	July 31. 2023	July 30. 2024
24	RE cable 7	GTS	N/A	GTS681	July 31. 2023	July 30. 2024
25	RE cable 8	GTS	N/A	GTS682	July 31. 2023	July 30. 2024

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 13, 2024	April 12, 2025
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 13, 2024	April 12, 2025
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 13, 2024	April 12, 2025
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 13, 2024	April 12, 2025
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 13, 2024	April 12, 2025
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 13, 2024	April 12, 2025
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 13, 2024	April 12, 2025
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 13, 2024	April 12, 2025
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 18, 2024	April 17, 2025

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	July 12, 2022	July 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 13, 2024	April 12, 2025
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	April 13, 2024	April 12, 2025
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Thermo meter	JINCHUANG	GSP-8A	GTS642	April 18, 2024	April 17, 2025
7	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 13, 2024	April 12, 2025
8	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 13, 2024	April 12, 2025
9	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 13, 2024	April 12, 2025
10	Antenna end assembly	Weinschel	1870A	GTS560	April 13, 2024	April 12, 2025
11	LISN	SCHWARZBECK	NSLK 8127	GTS711	July 12, 2022	July 11, 2027

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	KUMAO	SF132	GTS647	April 18, 2024	April 17, 2025

7 Test results and Measurement Data

7.1 Antenna requirement:

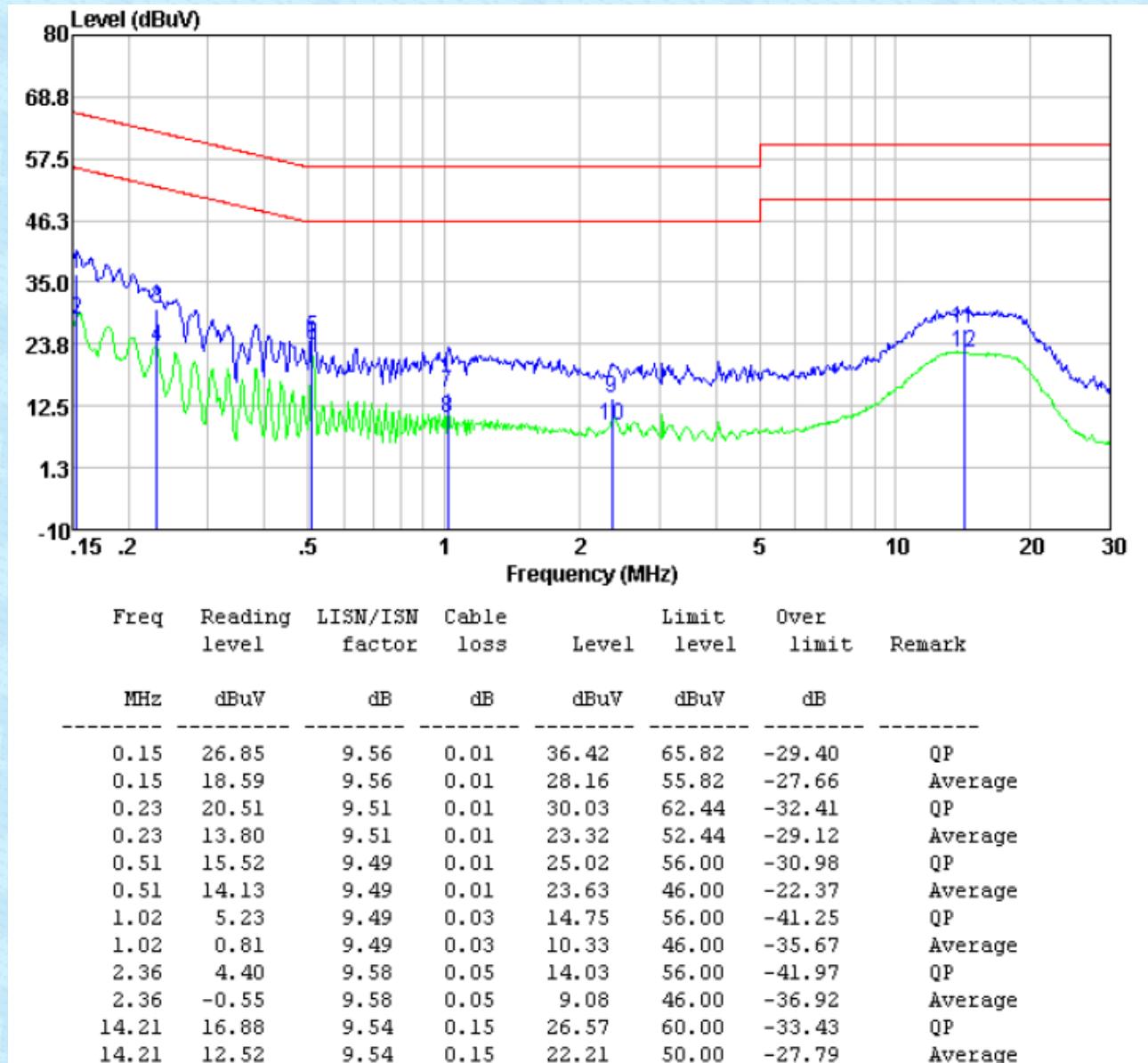
Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling 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.	
EUT Antenna:	
The antenna is Internal Antenna, reference to the appendix II for details	

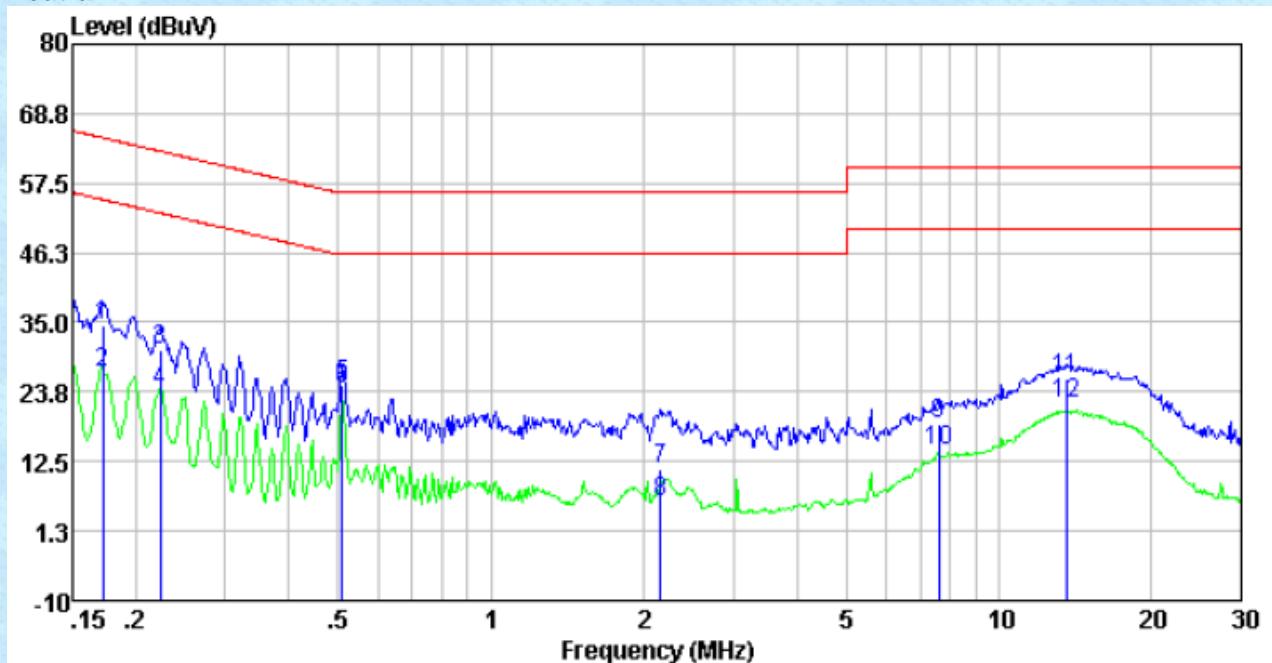
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	150KHz to 30MHz					
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:	<p>Reference Plane</p> <p>40cm</p> <p>40cm</p> <p>80cm</p> <p>40cm</p> <p>AC power</p> <p>EMI Receiver</p> <p>Filter</p> <p>LISN</p> <p>E.U.T</p> <p>AUX Equipment</p> <p>LISN</p> <p>Test table/Insulation plane</p> <p>Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>					
Test procedure:	<ol style="list-style-type: none"> 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 environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Line:



Neutral:


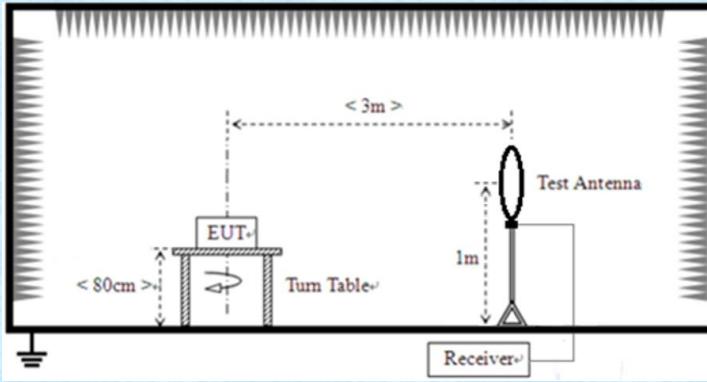
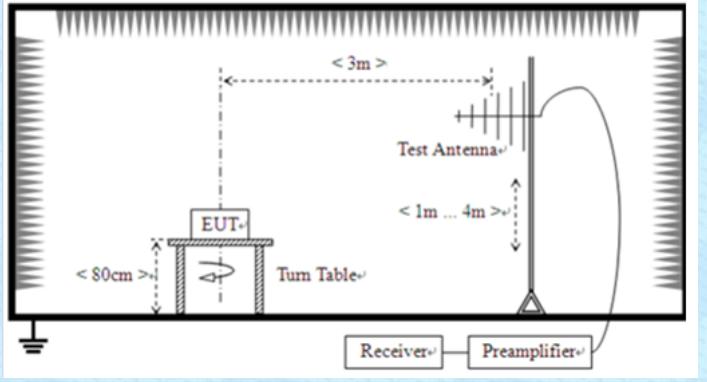
Freq MHz	Reading level dBuV	LISN/ISN factor dB	Cable loss dB	Limit		Over limit dB	Remark
				Level dBuV	level dBuV		
0.17	25.06	9.55	0.01	34.62	64.86	-30.24	QP
0.17	17.25	9.55	0.01	26.81	54.86	-28.05	Average
0.22	20.91	9.56	0.01	30.48	62.70	-32.22	QP
0.22	14.38	9.56	0.01	23.95	52.70	-28.75	Average
0.51	15.18	9.57	0.01	24.76	56.00	-31.24	QP
0.51	14.60	9.57	0.01	24.18	46.00	-21.82	Average
2.16	1.54	9.55	0.05	11.14	56.00	-44.86	QP
2.16	-3.79	9.55	0.05	5.81	46.00	-40.19	Average
7.61	8.84	9.53	0.09	18.46	60.00	-41.54	QP
7.61	4.52	9.53	0.09	14.14	50.00	-35.86	Average
13.55	16.24	9.63	0.15	26.02	60.00	-33.98	QP
13.55	12.10	9.63	0.15	21.88	50.00	-28.12	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.
Final Level = Receiver Read level + LISN Factor + Cable Loss

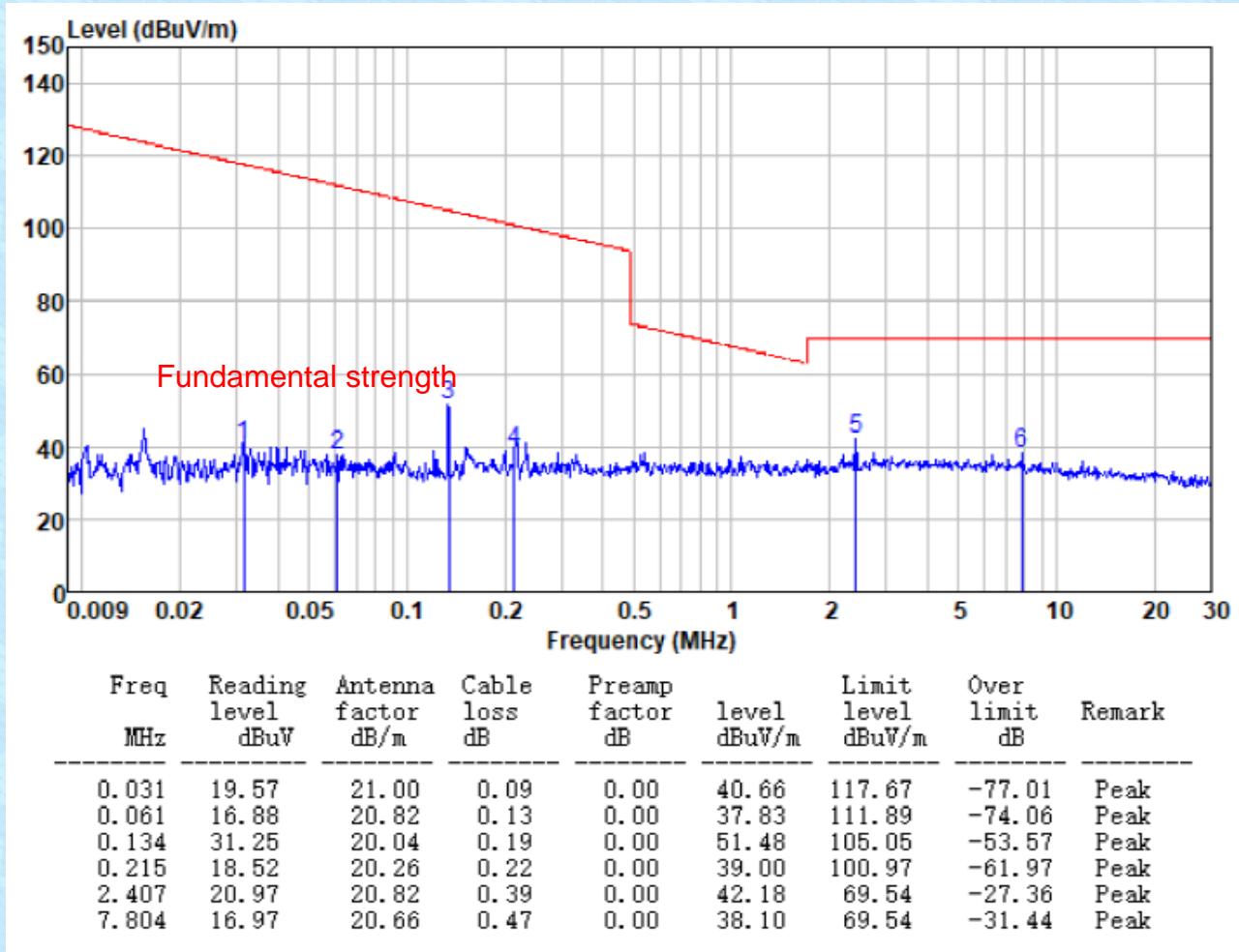
7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209																																								
Test Method:	ANSI C63.10:2013																																								
Test Frequency Range:	9kHz to 1GHz																																								
Test site:	Measurement Distance: 3m																																								
Receiver setup:	Frequency	Detector	RBW	VBW	Remark																																				
	9kHz - 30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak Value																																				
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value																																				
	Above 1GHz	Peak	1MHz	3MHz	Peak Value																																				
		AV	1MHz	10Hz	Average Value																																				
	Remark: For the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission test in these three bands are based on measurements employing an average detector.																																								
Limit: (Spurious Emissions)	Limits for frequency below 30MHz <table border="1"> <tr> <td>Frequency</td><td>Limit (uV/m)</td><td>Measurement Distance(m)</td><td>Remark</td></tr> <tr> <td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td><td>Quasi-peak Value</td></tr> <tr> <td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td><td>Quasi-peak Value</td></tr> <tr> <td>1.705-30</td><td>30</td><td>30</td><td>Quasi-peak Value</td></tr> </table> Limits for frequency Above 30MHz <table border="1"> <tr> <td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr> <tr> <td>30MHz-88MHz</td><td>40.00</td><td>Quasi-peak Value</td></tr> <tr> <td>88MHz-216MHz</td><td>43.50</td><td>Quasi-peak Value</td></tr> <tr> <td>216MHz-960MHz</td><td>46.00</td><td>Quasi-peak Value</td></tr> <tr> <td>960MHz-1GHz</td><td>54.00</td><td>Quasi-peak Value</td></tr> <tr> <td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average Value</td></tr> <tr> <td>74.00</td><td>Peak Value</td></tr> </table>					Frequency	Limit (uV/m)	Measurement Distance(m)	Remark	0.009-0.490	2400/F(kHz)	300	Quasi-peak Value	0.490-1.705	24000/F(kHz)	30	Quasi-peak Value	1.705-30	30	30	Quasi-peak Value	Frequency	Limit (dBuV/m @3m)	Remark	30MHz-88MHz	40.00	Quasi-peak Value	88MHz-216MHz	43.50	Quasi-peak Value	216MHz-960MHz	46.00	Quasi-peak Value	960MHz-1GHz	54.00	Quasi-peak Value	Above 1GHz	54.00	Average Value	74.00	Peak Value
Frequency	Limit (uV/m)	Measurement Distance(m)	Remark																																						
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960MHz-1GHz	54.00	Quasi-peak Value																																							
Above 1GHz	54.00	Average Value																																							
	74.00	Peak Value																																							
	Remark: 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.																																								
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. 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 and the rota 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 																																								

	<p>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.</p> <p>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.</p>
Test setup:	<p>Below 30MHz</p>  <p>30MHz ~ 1000MHz</p> 
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details. Only show the worst cas (Charging with 10W wireless charging load).
Test environment:	Temp.: 25 °C Humid.: 52% Press.: 1012mbar
Test voltage:	AC 120V, 60Hz
Test results:	Pass

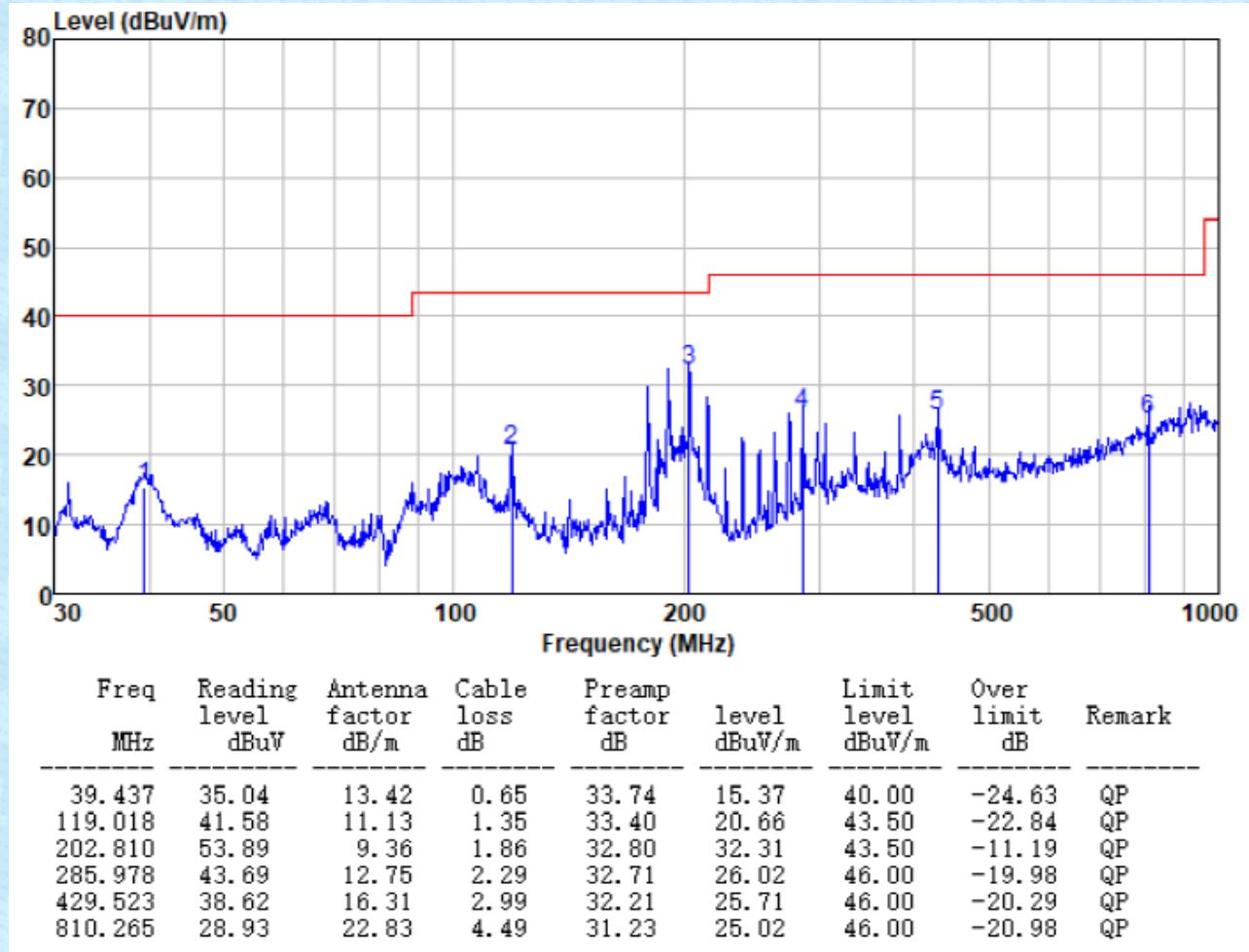
Measurement data:

■ 9kHz~30MHz

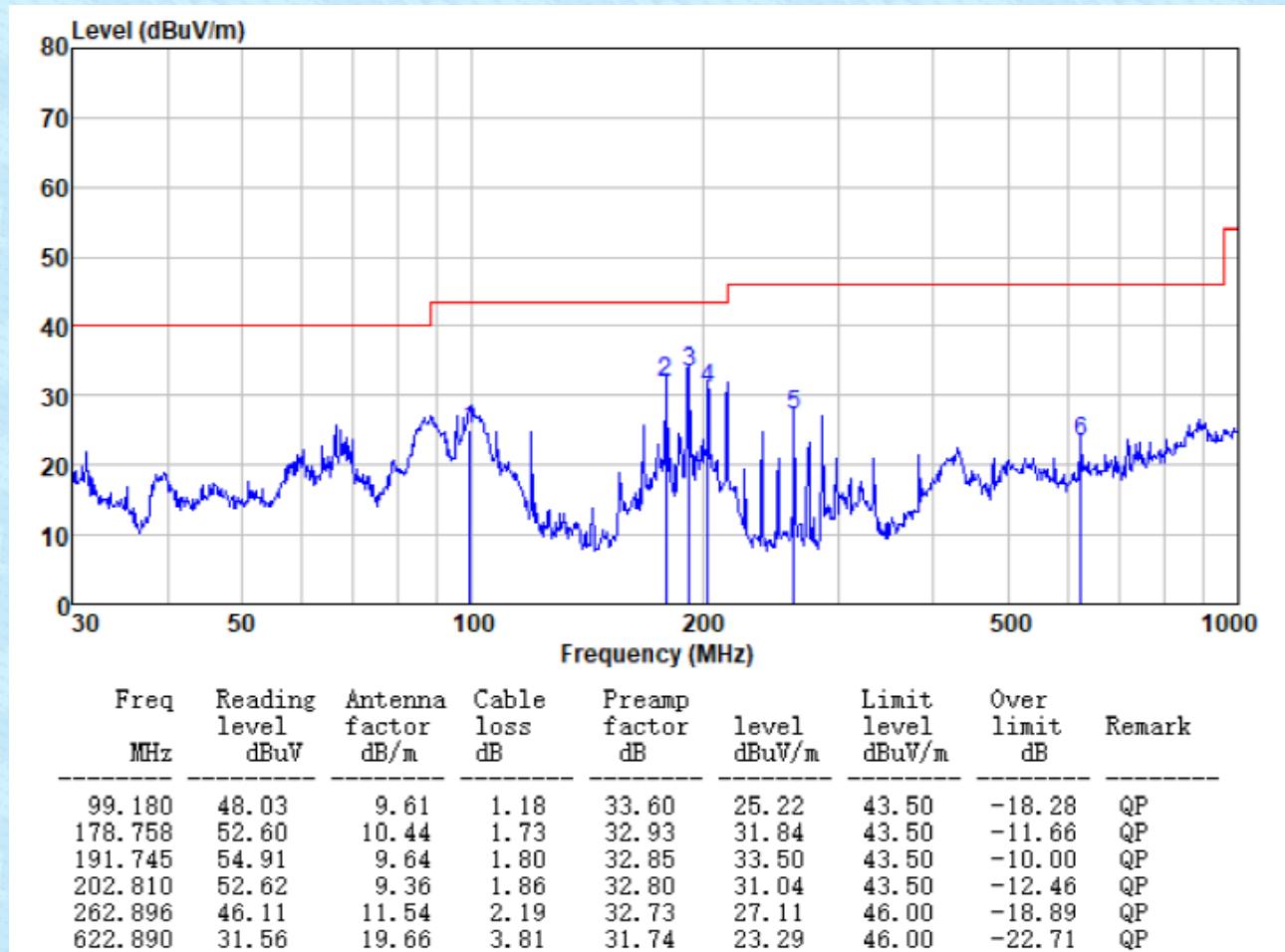


■ 30MHz~1GHz

Horizontal:



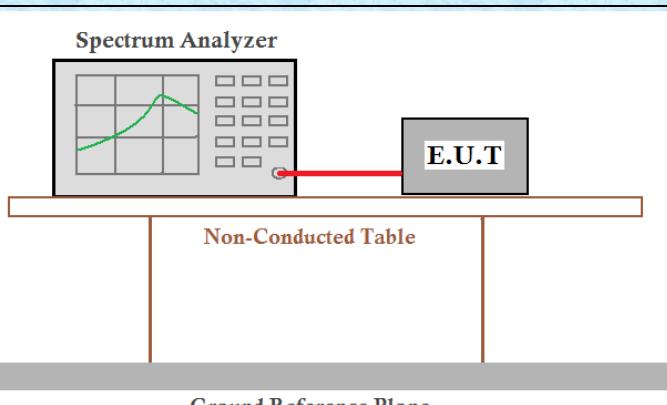
Vertical:



Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

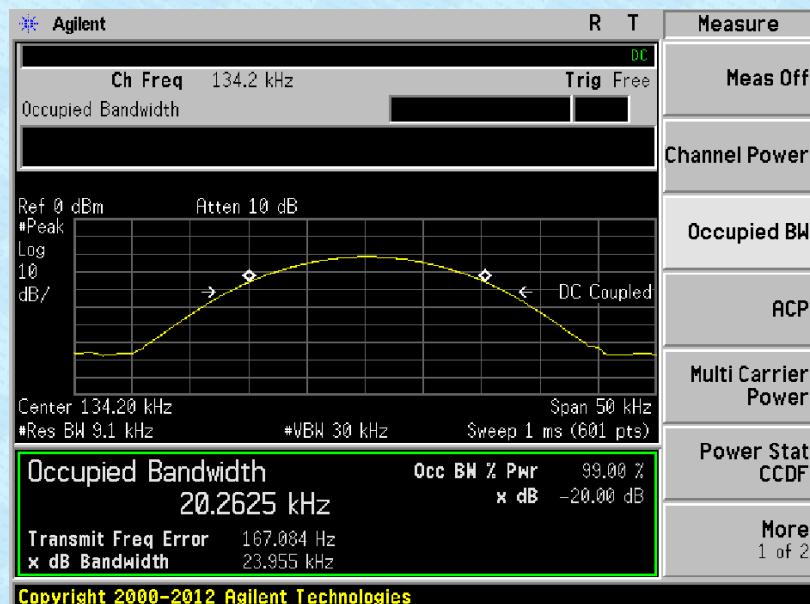
7.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10:2013
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 (kHz)	20dB bandwidth(KHz)	Result
134.2	23.955	Pass

Test plot as follows:



8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

----- End -----