



588 West Jindu Road, Songjiang District, Shanghai, China

Telephone: +86 (0) 21 6191 5666
Fax: +86 (0) 21 6191 5655
ee.shanghai@sgs.com

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TEST REPORT

Application No. : SHEM1210001442RF
Applicant: Beijing Landwell Electron Technology Co.,LTD
Manufacturer: Beijing Landwell Electron Technology Co.,LTD
FCC ID: Q65LW19990824
Fundamental Frequency : 125KHz
Equipment Under Test (EUT):
Product Name: Data Collector
Model No.(EUT): L-3000
Add Model No. L-9000; L-7000; L-2000; L-2000P; L-2000PF; L-3000E; L-3000EF; L-7000E; L-7000EF; L-9000P; L-9000PF; LW-01; LW-12; LW-24; LW-48; LW-110; LW-120; LW-150; LW-02; i-keybox12; i-keybox24; i-keybox48; i-keybox96; i-keybox120; i-keybox150
Standards: FCC PART 15 SUBPART C, Section 15.209
Date of Receipt: October 10, 2012
Date of Test: October 12, 2012 to October 17, 2012
Date of Issue: October 20, 2012
Test Result : **PASS ***

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

Jim Xu
E&E Section Head
SGS-CSTC(Shanghai) Co., Ltd.

Neil Zhang
E&E Project Engineer
SGS-CSTC(Shanghai) Co., Ltd.

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2 Test Summary

TEST ITEM	FCC REFERANCE	RESULT
Field Strength of Fundamental and Radiated Emission	15.209	Pass
Power Line Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Compliance

Noted: “-” means not require in the rules.



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4 General Information

4.1 Client Information

Applicant:	Beijing Landwell Electron Technology Co.,LTD
Address of Applicant:	Room 811,Ganglu Mansion,Jia 6 Huguang Street, Wangjing, Chaoyang,Beijing
Manufacturer:	Beijing Landwell Electron Technology Co.,LTD
Address of Manufacturer:	Room 811,Ganglu Mansion,Jia 6 Huguang Street, Wangjing, Chaoyang,Beijing
Factory:	Beijing Landwell Electron Technology Co.,LTD
Address of Factory:	Room 811,Ganglu Mansion,Jia 6 Huguang Street, Wangjing, Chaoyang,Beijing

4.2 Details of E.U.T.

Product Name:	Data Collector
Model No.(EUT):	L-3000
Add Model No.	L-9000; L-7000; L-2000; L-2000P; L-2000PF; L-3000E; L-3000EF; L-7000E; L-7000EF; L-9000P; L-9000PF; LW-01; LW-12; LW-24; LW-48; LW-110; LW-120; LW-150; LW-02; i-keybox12; i-keybox24; i-keybox48; i-keybox96; i-keybox120; i-keybox150
Antenna Type:	Inside Antenna
Battery Power Supply:	3.6V DC
Adapter Supply:	N/A
Frequency:	125KHz
Modulation Type:	ASK

4.3 Description of Support Units

Name	Model No.	Remark
N/A	N/A	N/A

4.4 Test Location

Tests were performed at:

1.SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

No.588 West Jindu Road, Songjiang District, Shanghai, China. 201612.

Tel: +86 21 6191 5666 Fax: +86 21 6191 5655

2. AUDIX Technology (Shanghai) Co., Ltd.

3&4 F, #34, Building, No.680, GuiPing Road, Caohejing Hi-Tech Park, Shanghai, China 200233



4.5 Other Information Requested by the Customer

None.

4.6 Test Facility

The test facility SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2014-07-26.

- **FCC – Registration No.: 402683**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2015-02-22.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A. Expiry Date: 2014-09-20.

Test Confidential level of AUDIX Technology (Shanghai) Co., Ltd. is recognized, certified, or accredited by the following organizations

- **NVLAP – Lab Code: 200371-0**

AUDIX Technology (Shanghai) Co., Ltd. is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200371-0. Effective through March 31, 2013.

- **FCC – Registration No.: 91789**

AUDIX Technology (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 91789, Expiry Date: 2015-03-16.



4.7 Test Instruments

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	EMI test receiver	Rohde & Schwarz	ESU40	100109	2012-6-4	2013-6-3
2	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-679	2012-6-4	2013-6-3
3	Horn Antenna	Rohde & Schwarz	HF906	100284	2012-3-12	2013-3-10
4	ANTENNA	SCHWARZBECK	VULB9168	9168-313	2012-6-4	2013-6-3
5	Ultra broadband antenna	Rohde & Schwarz	HL562	100227	2012-10-8	2013-10-7
6	Atmosphere pressure meter	Shanghai ZhongXuan Electronic Co;Ltd	BY-2009P	--	2012-10-14	2013-10-15
7	CLAMP METER	FLUKE	316	86080010	2012-4-22	2013-4-20
8	Thermo-Hygrometer	ZHICHEN	ZC1-2	01050033	2012-10-14	2013-10-15
9	High-low temperature cabinet	Shanghai YuanZhen	GW2050	--	2012-09-05	2013-09-03
11	Tunable Notch Filter	Wainwright instruments GmbH	WRCT1800.0/2000.0-0.2/40-5SSK	11	2012-6-16	2013-6-15
12	Tunable Notch Filter	Wainwright instruments GmbH	WRCT800.0/80.0-0.2/40-5SSK	9	2012-5-7	2013-5-6
13	High pass Filter	FSCW	HP 12/2800-5AA2	19A45-02	2012-5-5	2013-5-4
14	Low noise amplifier	TESEQ	LNA6900	70133	2012-6-4	2013-6-3
15	EMI test receiver	Rohde & Schwarz	ESCS30	100086	2012-4-8	2013-4-7

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16	Line impedance stabilization network	SCHWARZBECK	NSLK8127	8127-490	2012-05-07	2013-05-06
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Audix Below 30MHz Radiated Emission Test Equipment:

*Test Equipment	Loop Antenna	<input checked="" type="checkbox"/> Schaffner HLA6120 (S/N: <u>1193</u>)	Cal: <u>2012.5.3</u>
	Spectrum Analyzer	<input checked="" type="checkbox"/> Agilent E7405A(S/N: <u>MY45106600</u>)	Cal: <u>2012.3.22</u>
	Test Receiver	<input checked="" type="checkbox"/> R&S ESHS10 (S/N: <u>830223/007</u>)	Cal: <u>2012.3.22</u>

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4.8 E.U.T. Operation

Input voltage: Battert 3.6V DC

Operating Environment:

Temperature: 24.0 °C

Humidity: 50 % RH

Atmospheric Pressure: 1012 mbar

EUT Operation:

The EUT and the Support equipment are configured to create an operating communication link under RFID status.



4.9 Test Procedure & Measurement Data

4.9.1 Field Strength of Fundamental and Radiated Spurious Emission

Test Requirement:	FCC §15.209
Test date:	Oct. 13, 2012
Standard Applicable	ANSI C63.10:2009

Test Procedures:

1. Test Procedures for emission from 9 kHz to 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.

c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.

d. The test-receiver system was set to Peak and Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

2. Test Procedures for emission from 30 MHz to 1000 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

For the EUT is portable device, rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower.

During performing radiated emission above 1 GHz, the EUT was set 1 meter away from the interference-receiving antenna.

c. The antenna is a broadband antenna, and its 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.

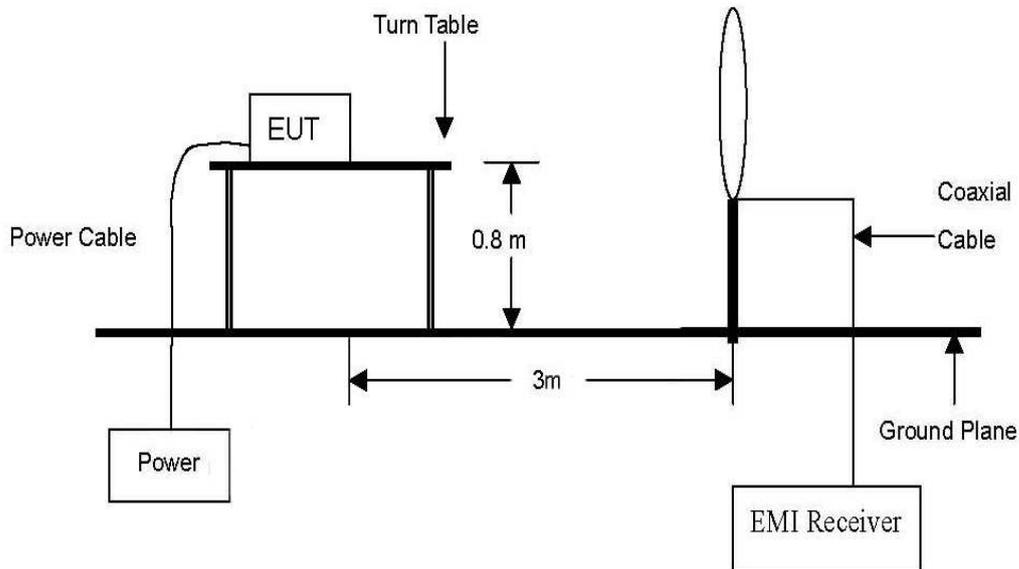
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

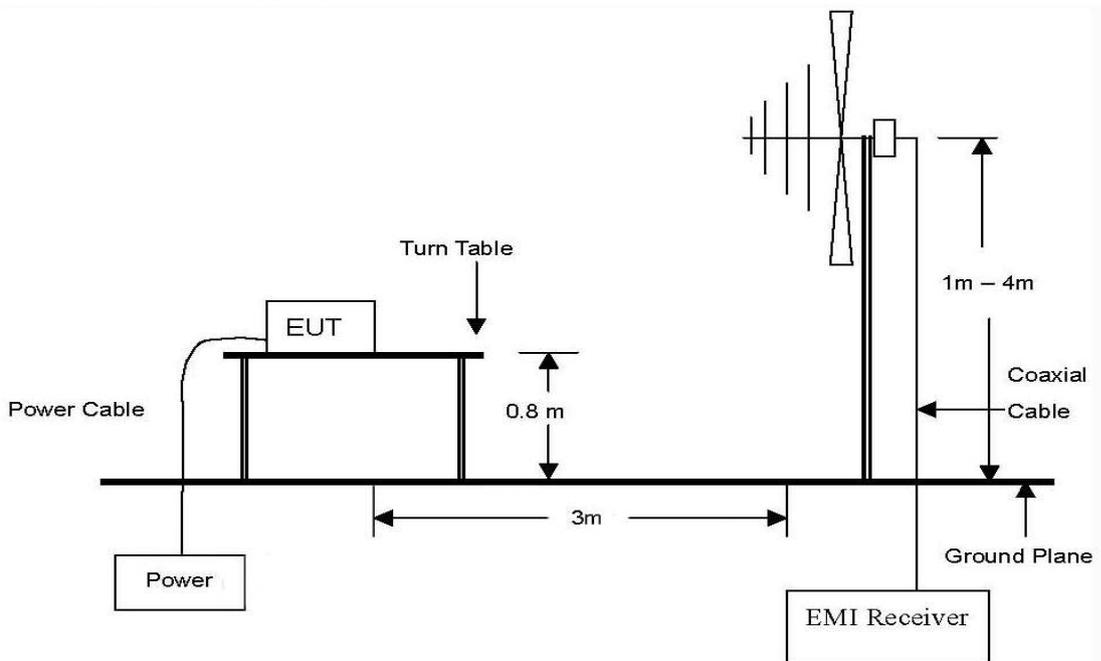
f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

EUT Setup:

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.





Measurement Result

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

For the EUT is portable device, rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Radiated Emissions			Ant	Correction Factors	Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Ant.(dB/m)	Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
0.125	33.69	QP	H	21.02	54.71	105.67	-50.96
0.125	34.73	QP	V	21.02	55.75	105.67	-49.92

Remark:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. Margin value = Emission level – Limit value.

The measured field strength was extrapolated to distance 300 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned}
 &24000/125\text{kHz} = 192 \text{ uV/m} \quad 300\text{m} \\
 &= 25.67 \text{ dBuV/m} \quad 300\text{m} \\
 &= 25.67 + 20\log(300/3)^2 \quad 3\text{m} \\
 &= 105.67 \text{ dBuV/m}
 \end{aligned}$$



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9kHz~30MHz Spurious Emissions

For the EUT is portable device, rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Radiated Emissions			Ant	Correction Factors	Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Ant.(dB/m)	Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
0.021	22.90	AV	H	21.73	44.63	110.58	-65.95
0.717	22.64	QP	H	20.97	43.61	50.50	-6.89
3.493	11.12	QP	H	21.36	32.48	69.50	-37.02
15.433	14.69	QP	H	25.02	39.71	69.50	-29.79
28.030	9.61	QP	H	26.69	36.30	69.50	-33.20

Radiated Emissions			Ant	Correction Factors	Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Ant.(dB/m)	Emission Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
0.021	21.74	AV	V	21.73	43.47	110.58	-67.11
0.717	23.44	QP	V	20.97	44.41	50.50	-6.09
3.851	12.41	QP	V	21.46	33.87	69.50	-35.63
15.433	16.00	QP	V	25.02	41.02	69.50	-28.48
26.478	10.34	QP	V	24.79	35.13	69.50	-34.37

Remark:

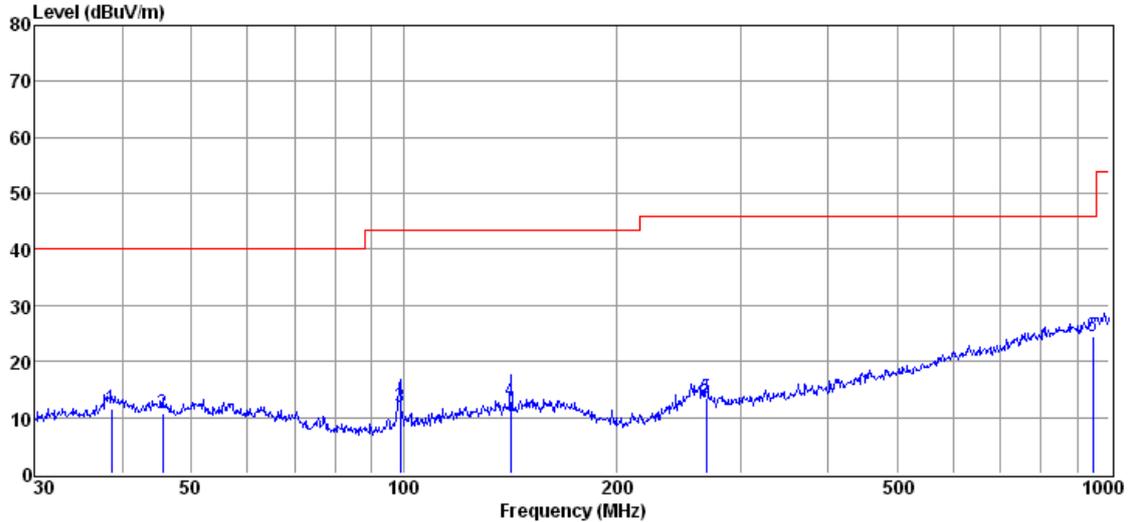
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Above limits have been translated by the formula



30MHz~1GHz

For the EUT is portable device, rotated EUT through three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Antenna Horizontal

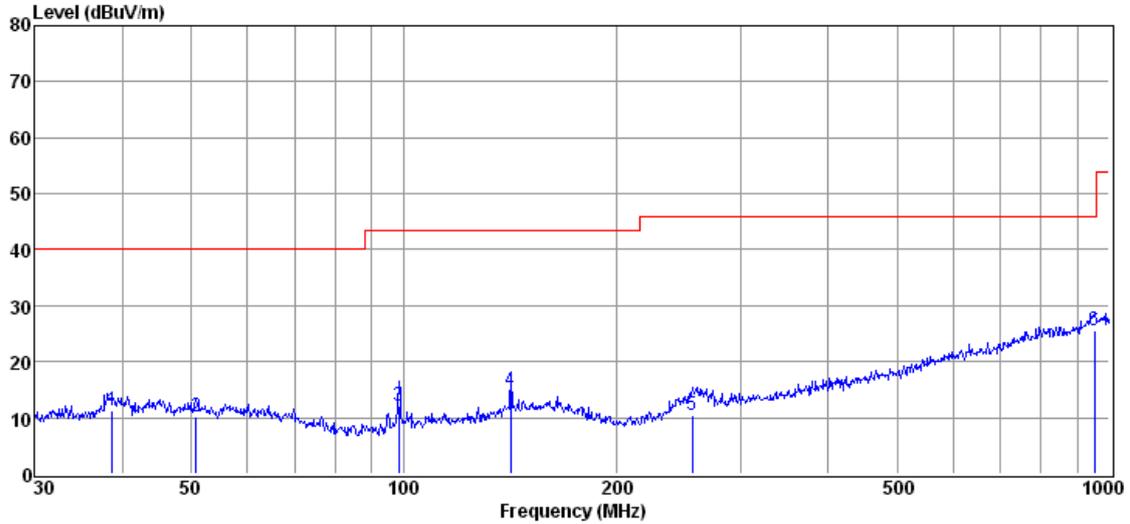


Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Pream p Factor (dB)	Cabl e Loss (dB)	Result Level (dBμV/ m)	Limit Line (dBμV/ m)	Over Limit (dB)	Detector
38.51	22.74	13.03	24.70	0.54	11.61	40.00	-28.39	QP
45.56	21.72	13.07	24.70	0.61	10.70	40.00	-29.30	QP
98.83	26.33	9.12	24.70	1.03	11.78	43.50	-31.72	QP
141.83	24.30	12.21	24.70	1.24	13.05	43.50	-30.45	QP
268.49	24.65	11.39	24.50	1.81	13.35	46.00	-32.65	QP
948.76	20.54	23.88	23.80	3.80	24.42	46.00	-21.58	QP

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Antenna Vertical



Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Pream p Factor (dB)	Cabl e Loss (dB)	Result Level (dBμV/ m)	Limit Line (dBμV/ m)	Over Limit (dB)	Detector
38.61	22.39	13.05	24.70	0.54	11.28	40.00	-28.72	QP
50.76	21.58	12.75	24.70	0.66	10.29	40.00	-29.71	QP
98.52	26.76	9.10	24.70	1.03	12.19	43.50	-31.31	QP
141.83	25.98	12.21	24.70	1.24	14.73	43.50	-28.77	QP
256.53	22.33	10.81	24.50	1.76	10.40	46.00	-35.60	QP
952.13	21.64	23.92	23.79	3.80	25.57	46.00	-20.43	QP

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4.9.2 Antenna Requirement

Test Requirement: FCC Part15 15.203

5.3.7.1 Standard 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 shall be considered sufficient to comply with the provisions of this Section. 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.

5.3.7.2 Antenna Connected Construction

The antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

5.3.7.3 Result

The EUT antenna is inside Antenna. It comply with the standard requirement.

End of the Test Report