

TEST REPORT

Application No.: SHEM2104002968CR
FCC ID: 2AZLRQ7S
Applicant: Zhejiang Laiu Technology Co., Ltd.
Address of Applicant: Second Floor, Building 1, No. 16, South Yingui Road, Chengxi New District, Yongkang, Zhejiang, China
Manufacturer: Zhejiang Laiu Technology Co., Ltd.
Address of Manufacturer: Second Floor, Building 1, No. 16, South Yingui Road, Chengxi New District, Yongkang, Zhejiang, China
Factory: Zhejiang Laiu Technology Co., Ltd.
Address of Factory: No.16 Yingui South Road Huachuan District Yongkang city Zhejiang Pro. China
Equipment Under Test (EUT):
EUT Name: Fingerprint password smart lock
Model No.: Q7S,A8-1,H5,E6,E8,E9,L8,L9,L9S,Q7,L3,L3S,RF2-13,LUM13,LUM17, LU01,LU02,LY01,LY02,LY03,LY04,LY05,LY06,LY07,LY08,LY09,LY10, LY11,LY12,LY13,LY14,LY15,LY16,LY17,LY18,LY19,LY20,LY21,LY22, LY23, LY24,LY25,LY26,LY27,LY28,LY29,LY30
 Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Standard(s) : 47 CFR Part 15, Subpart C 15.225
Date of Receipt: 2021-04-07
Date of Test: 2021-04-14 to 2021-05-10
Date of Issue: 2021-05-12

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan

Parlam Zhan
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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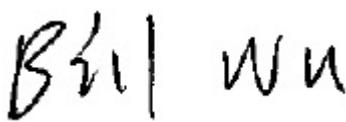
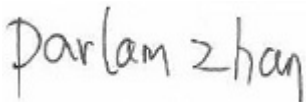
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Revision Record			
Version	Description	Date	Remark
00	Original	2021-05-12	/

Authorized for issue by:			
			
		Bill Wu / Project Engineer	
			
		Parlam Zhan / Reviewer	



2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.225	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Emission Mask	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)	Pass*
Frequency tolerance	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart C 15.225(e)	Pass
Radiated Emissions(9kHz-30MHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass
Radiated Emissions(30MHz-1GHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass

Note1*: The test level of the fundamental signal is below the limit of general spurious emission, so the test item doesn't be performed.

Declaration of EUT Family Grouping:

Note2: There are series models mentioned in this report, and they are the similar in electrical and electronic characters. Only the model Q7S was tested since their differences were the model number and appearance.



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4 General Information

4.1 Details of E.U.T.

Power supply: DC 7.4V 4000mAh rechargeable battery
Test voltage: DC 7.4V
Antenna Type: Loop Antenna
Modulation Type: ASK
Number of Channels: 1
Operation Frequency: 13.56MHz

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
/	/	/	/

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10 ⁻⁸
2	Timeout	2s
3	Occupied Bandwidth	3%
4	Radiated Spurious emission test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)
5	Temperature test	1°C
6	Humidity test	3%
7	Supply voltages	1.5%
8	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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4.4 Test Location

All tests were performed at:

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588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

No tests were sub-contracted.

4.5 Test Facility

The test facility 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 17025:2017 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.

- **A2LA (Certificate No. 6332.01)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA).

- **FCC (Designation Number: CN1301)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized by Federal Communications Commission (FCC) as an accredited testing laboratory.

- **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2020-12-20	2021-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2020-12-20	2021-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2020-12-20	2021-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2019-10-14	2021-10-13
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2020-04-30	2022-04-29
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2018-10-24	2021-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2019-10-14	2021-10-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2018-10-31	2021-10-30
Pre-amplifier (9kHz-2GHz)	CLAVIO	BDLNA-0001	SHEM164-1	2020-08-13	2021-08-12
Pre-amplifier (1-18GHz)	CLAVIO	BDLNA-0118	SHEM050-2	2020-08-13	2021-08-12
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2020-12-20	2021-12-19
Signal Generator	R&S	SMR40	SHEM058-1	2020-08-13	2021-08-12
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2020-12-20	2021-12-19
Test software	ESE	E3	Version: 6.111221a	/	/



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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 Loop and no consideration of replacement.

Antenna location: Refer to Appendix(Internal Photos)



7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

Test Method: ANSI C63.10 (2013) Section 6.9

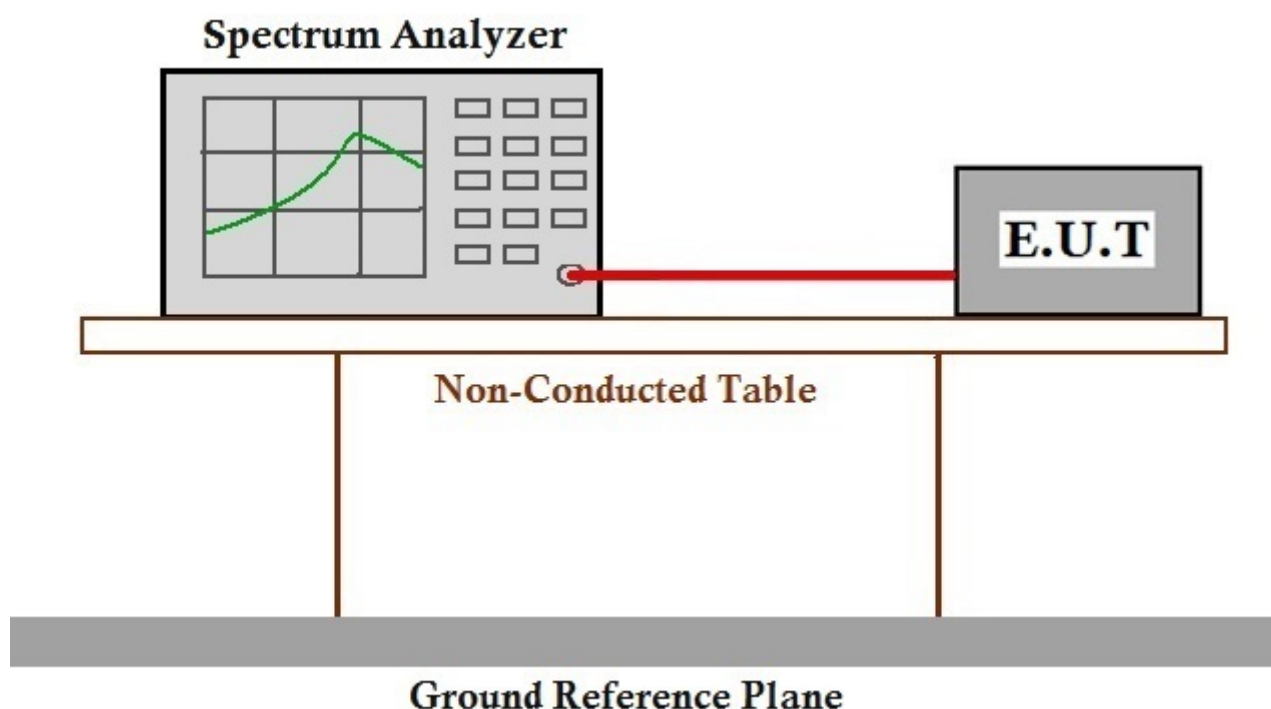
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data



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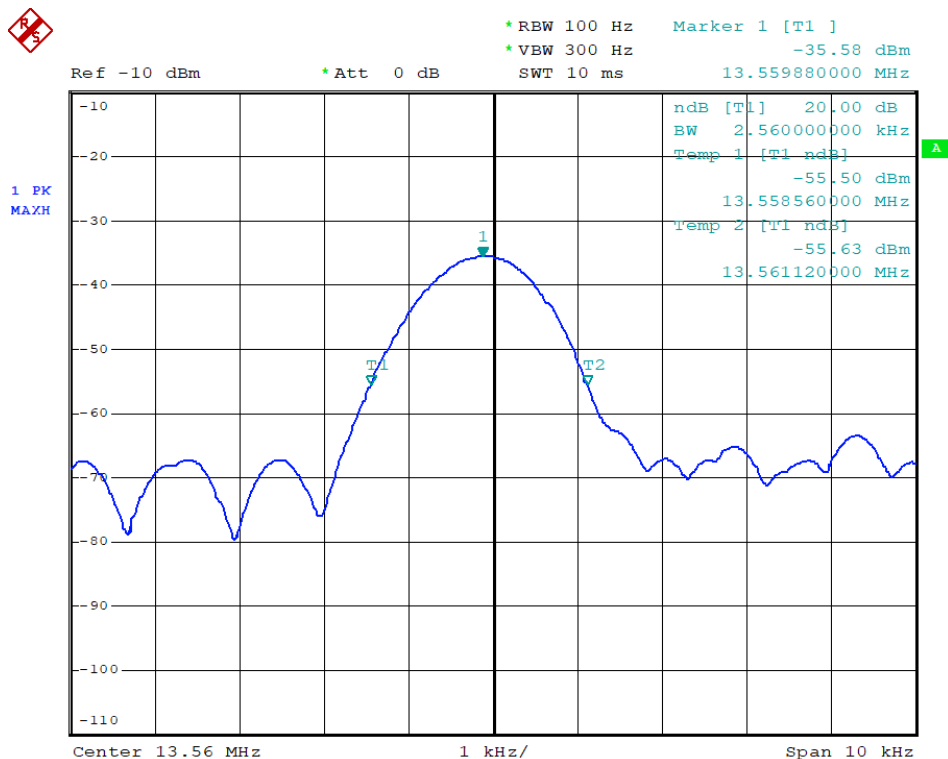
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20dB bandwidth (kHz)	F _L (MHz)	F _H (MHz)	Limit(MHz)	Result
2.56	13.559	13.561	13.110 – 14.010	Pass

Test plot as follows:



Date: 8.MAY.2021 09:17:42



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7.2 Emission Mask

Test Requirement 47 CFR Part 15 Subpart C 15.225(a)&(b)&(C)

Test Method: ANSI C63.10 (2013) Section 6.4

Limit:

(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.

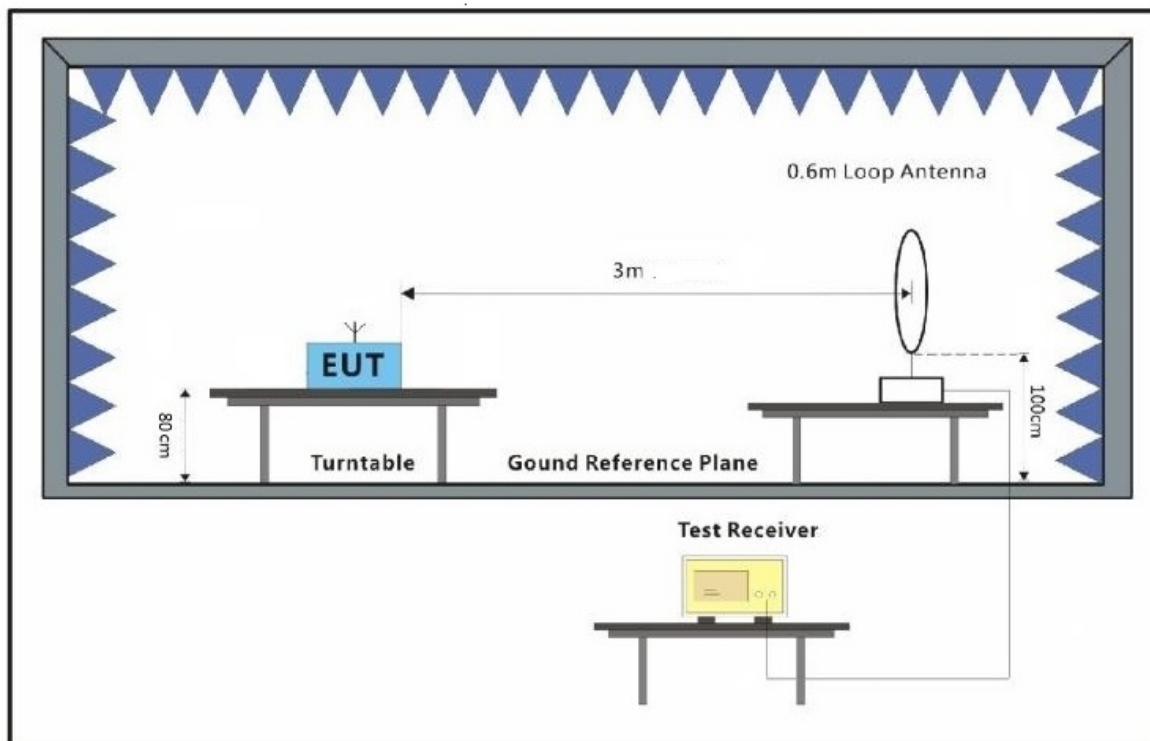
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a: TX mode_Keep the EUT in transmitting with modulation mode.

7.2.2 Test Setup Diagram





7.2.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

Note: The test level of the fundamental signal is below the limit of general spurious emission, so the test item doesn't be performed.



7.3 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)

Test Method: ANSI C63.10 (2013) Section 6.8

Limit: 1.356kHz

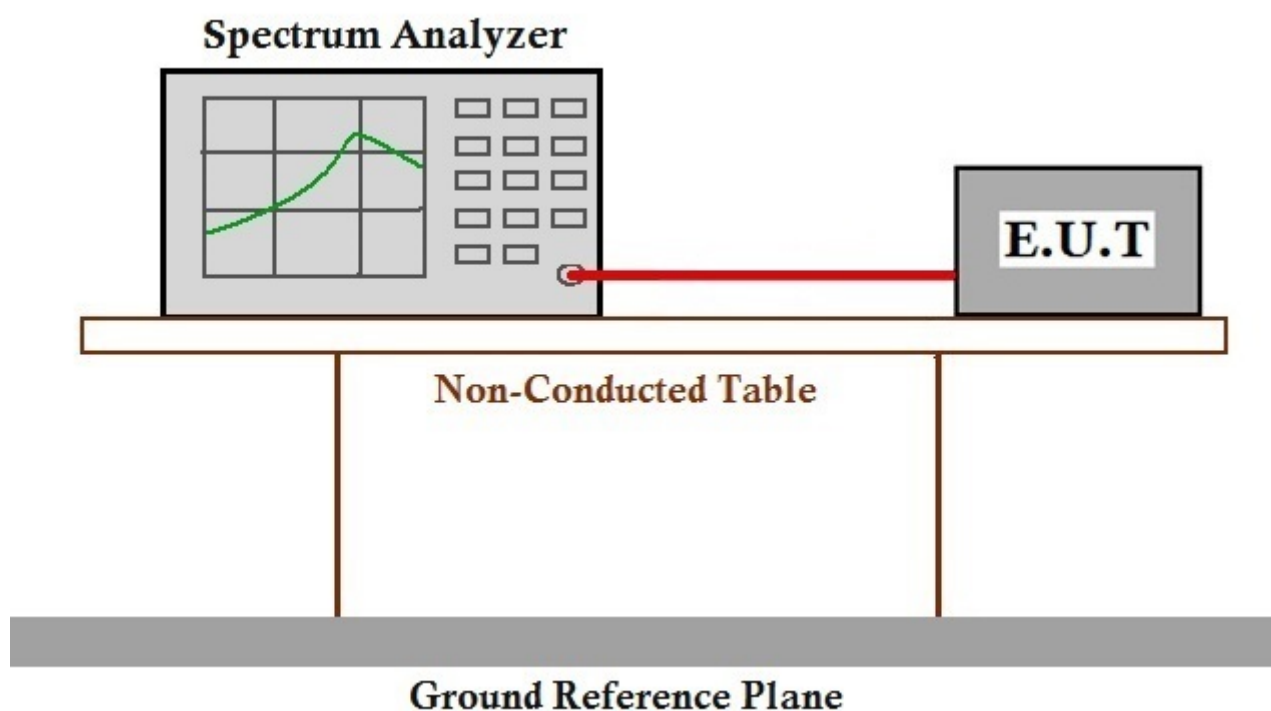
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a: TX mode_Keep the EUT in transmitting with modulation mode.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data



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Nominal Operation Frequency: 13.56MHz

Test Conditions		Test Result (MHz)	Deviation (kHz)	Limit (kHz)	Result
Temp (°C)	Volt (V DC)				
T _{nom} (-20)	V _{nom} (7.4)	13.56004	0.04	±0.01% (1.3560kHz)	Pass
T _{nom} (-10)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (0)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (10)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (20)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (30)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (40)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (50)	V _{nom} (7.4)	13.56004	0.04		Pass
T _{nom} (20)	V _{min} (6.29)	13.56006	0.06		Pass
	V _{max} (8.51)	13.56003	0.03		Pass

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


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7.4 Radiated Emissions(9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

NOTE:

- (1) For test distance other than what is specified, but fulfilling the requirements of section 15.31(f) (2) the field strength is calculated by adding additionally an extrapolation factor of 40dB/decade (inverse linear distance for field strength measurements).

So the Distance Extrapolation Factor in dB is $40 \cdot \log(D_{TEST} / D_{SPEC})$ where D_{TEST} = Test Distance and D_{SPEC} = Specified Distance.

Field strength limit (dBuV/m)@test distance= Field strength limit (dBuV/m)@specified distance +Distance Extrapolation Factor

- (2) The lower limit shall apply at the transition frequencies.

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode



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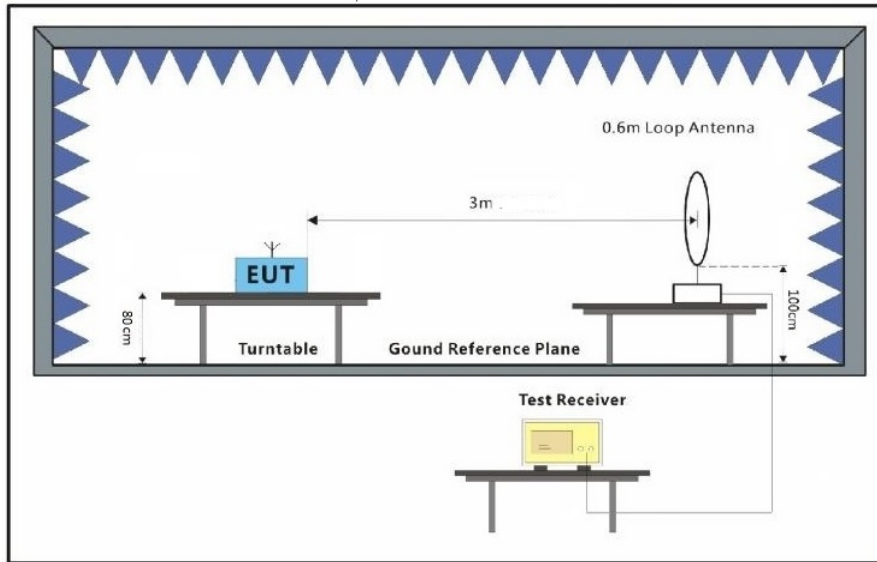
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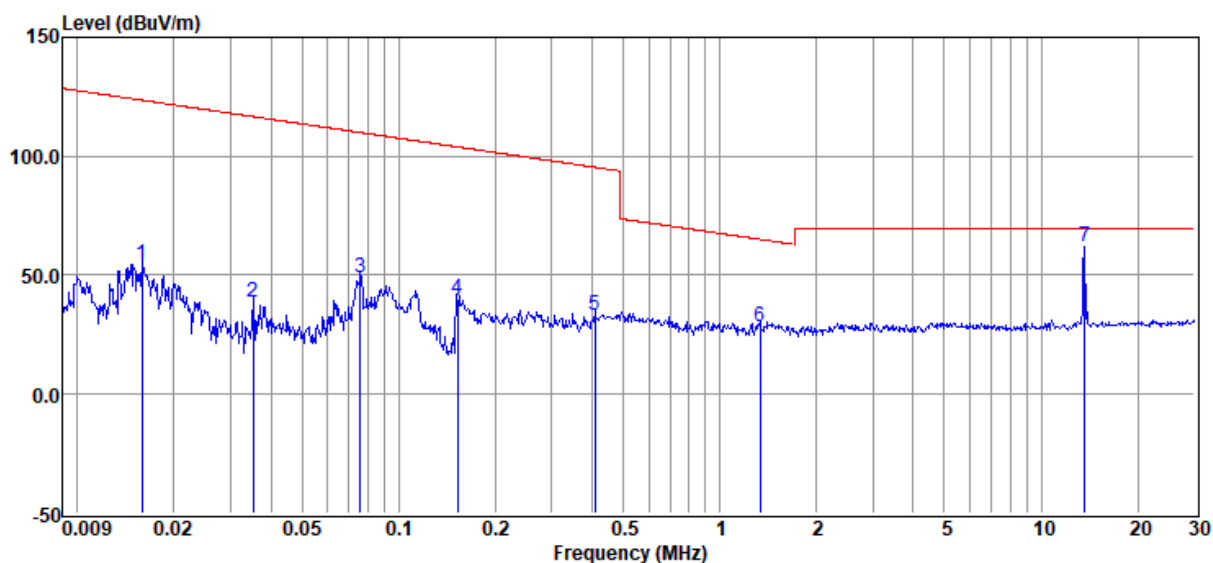
7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.





Item	Freq.	Read Level	Correct Factor	Result Level@ 3m	Result Level@SPE C	Limit Line@SPE C	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB/m)	(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	
1	0.016	34.56	19.66	54.22	-25.78	43.57	-69.35	QP
2	0.035	19.04	19.77	38.81	-41.19	36.67	-77.86	QP
3	0.076	29.12	19.77	48.89	-31.11	29.98	-61.09	QP
4	0.153	20.32	19.88	40.20	-39.8	23.92	-63.72	QP
5	0.407	12.96	19.99	32.95	-47.05	15.4	-62.45	QP
6	1.331	7.87	20.41	28.28	-11.72	25.14	-36.86	QP
7	13.658	41.24	20.52	61.76	21.76	29.5	-7.74	Peak



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7.5 Radiated Emissions(30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3

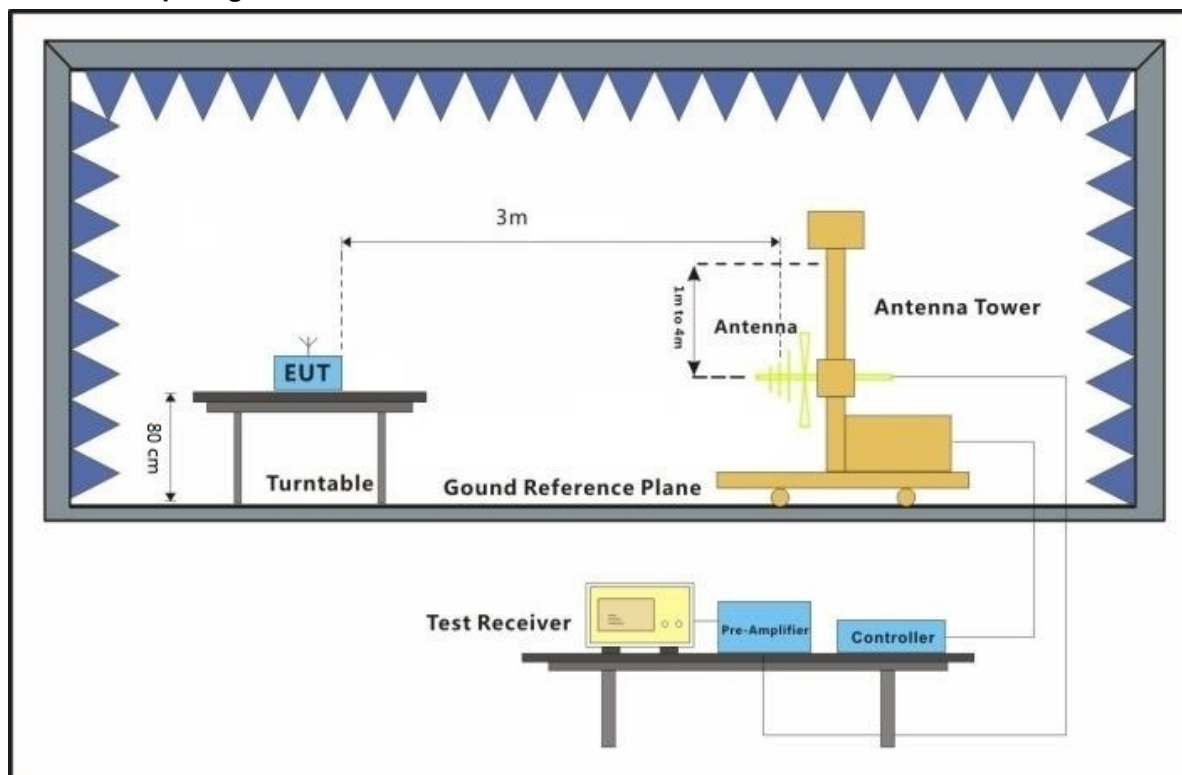
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- 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 (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.
- 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 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.
- g. 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.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



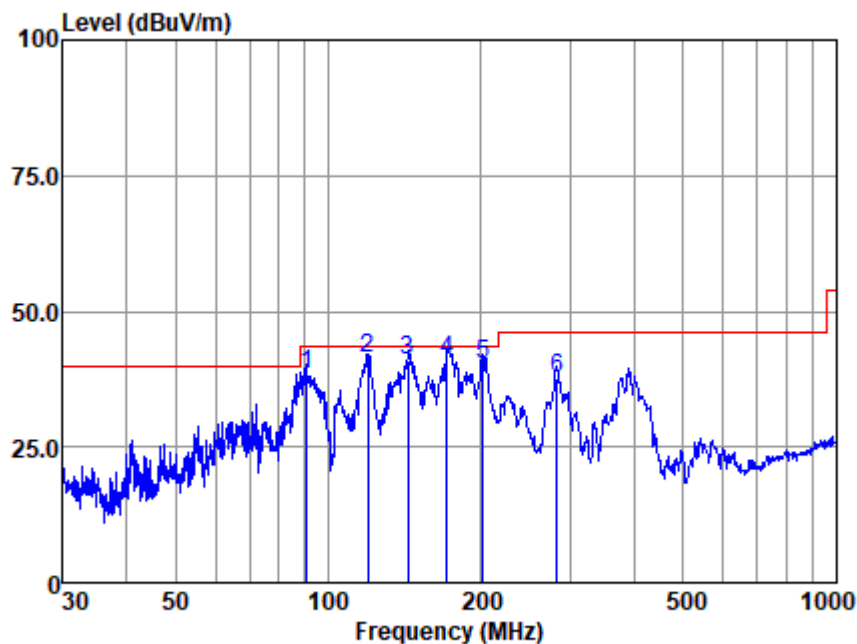
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Mode:a; Polarization:Horizontal



Antenna Polarity :HORIZONTAL

EUT/Project :2969CR

Test mode :a

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	90.537	71.47	7.77	1.41	42.30	38.35	43.50	-5.15	QP
2	119.436	70.91	10.96	1.64	42.26	41.25	43.50	-2.25	QP
3	143.326	68.64	12.64	1.82	42.21	40.89	43.50	-2.61	QP
4	171.393	68.39	12.68	2.00	42.20	40.87	43.50	-2.63	QP
5	202.100	70.21	9.87	2.27	42.19	40.16	43.50	-3.34	QP
6	281.995	64.17	12.87	2.76	42.10	37.70	46.00	-8.30	QP

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



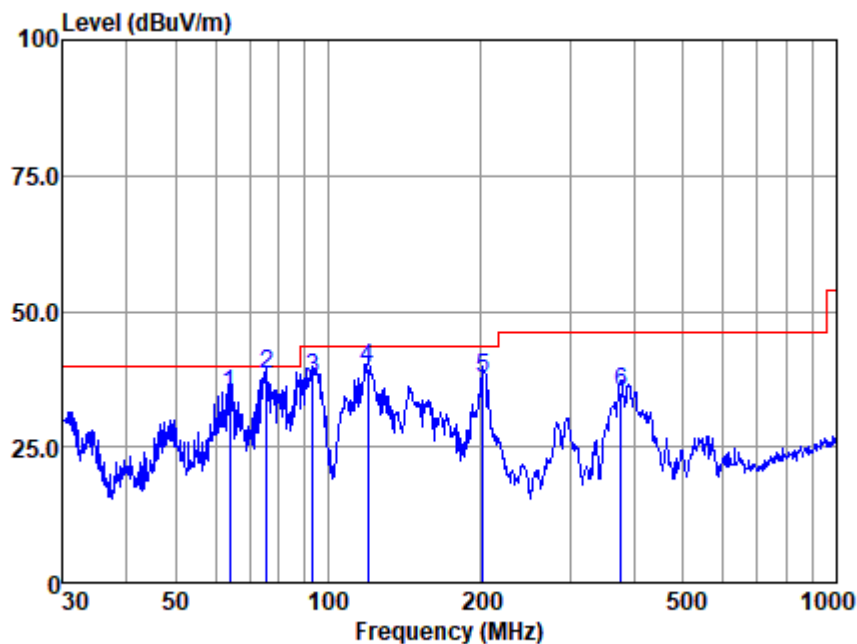
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Mode:a; Polarization:Vertical



Antenna Polarity :VERTICAL

EUT/Project :2969CR

Test mode :a

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	63.983	63.43	12.53	1.15	42.30	34.81	40.00	-5.19	QP
2	75.711	69.22	10.25	1.27	42.30	38.44	40.00	-1.56	QP
3	93.113	70.51	8.03	1.43	42.30	37.67	43.50	-5.83	QP
4	119.436	69.19	10.96	1.64	42.26	39.53	43.50	-3.97	QP
5	202.100	67.77	9.87	2.27	42.19	37.72	43.50	-5.78	QP
6	377.259	58.92	15.05	3.07	41.90	35.14	46.00	-10.86	QP

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

- End of the Report -

