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

588 West Jindu Road,Songjiang District,Shanghai,China
Telephone: +86 (0) 21 6191 5666
Fax: +86 (0) 21 6191 5678
ee.shanghai@sgs.com

1 Cover Page

RF Test Report

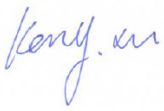
Application No.:	SHEM1408001992RF
Applicant:	BEIJING STRONGLINK TECHNOLOGY CO., LTD.
FCC ID:	2ADI8-303132
Equipment Under Test (EUT): **NOTE:** The following sample(s) submitted was/were identified on behalf of the client as	
Product Name:	Mifare Module
Model No.(EUT):	SL030
Add Model No.:	SL031, SL032
Standards:	FCC PART 15 Subpart C: 2013
Date of Receipt:	August 07, 2014
Date of Test:	September 19, 2014 to October 24, 2014
Date of Issue:	October 28, 2014
Test Result:	**Pass***

*In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Tony Wu
E&E Section Manager
SGS-CSTC (Shanghai) Co., Ltd.

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00		October 28, 2014		Original

Authorized for issue by:				
Engineer		Eddy Zong **Print Name**		
Clerk		Susie Liu **Print Name**		
Reviewer		Keny Xu **Print Name**		

3 Test Summary

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	/	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10:2009 Section 6.2	PASS
Emission Mask	47 CFR Part 15, Subpart C Section 15.225(a)/(b)/(c)	ANSI C63.10 (2009) Section 6.4&6.5&6.6	PASS*
Radiated Emissions	47 CFR Part 15, Subpart C Section 15.225)/15.209	ANSI C63.10 (2009) Section 6.4&6.5&6.6	PASS
Frequency Tolerance	47 CFR Part 15, Subpart C Section 15.225(e)	ANSI C63.10:2009 Section 6.8	PASS
20dB Bandwidth	47 CFR Part 15, Subpart C Section 15.215	ANSI C63.10:2009 Section 6.9.1	PASS

Remark: * The test level of the fundamental signal is below the limit of general spurious emission, so the test no performs.

Note: There are 3 models mentioned in this report, and they are the similar in electrical and electronic characters. Only the model SL030 was tested since their differences were the model number.

4 Contents

Page

1 COVER PAGE 1
2 VERSION 2
3 TEST SUMMARY 3
4 CONTENTS 4
5 GENERAL INFORMATION 5
5.1 CLIENT INFORMATION 5
5.2 GENERAL DESCRIPTION OF E.U.T. 5
5.3 TECHNICAL SPECIFICATIONS 5
5.4 E.U.T OPERATION MODE 5
5.5 DESCRIPTION OF SUPPORT UNITS 5
5.6 TEST LOCATION 6
5.7 TEST FACILITY 6
6 EQUIPMENTS LIST 7
7 TEST RESULTS AND MEASUREMENT DATA 8
7.1 ANTENNA REQUIREMENT 8
7.2 CONDUCTED EMISSIONS 9
7.3 RADIATED EMISSIONS 12
7.4 FREQUENCY TOLERANCE 17
7.5 20DB BANDWIDTH 19
8 TEST SETUP PHOTOGRAPHS 21
9 EUT CONSTRUCTIONAL DETAILS 21

5 General Information

5.1 Client Information

Applicant:	BEIJING STRONGLINK TECHNOLOGY CO., LTD.
Address of Applicant:	RM3-303-03,Xi'erqi Street, Haidian District, Beijing, China.100085
Manufacturer:	BEIJING STRONGLINK TECHNOLOGY CO., LTD.
Address of Manufacturer:	RM3-303-03,Xi'erqi Street, Haidian District, Beijing, China.100085
Factory:	BEIJING STRONGLINK TECHNOLOGY CO., LTD.
Address of Factory:	RM3-303-03,Xi'erqi Street, Haidian District, Beijing, China.100085

5.2 General Description of E.U.T.

Product Description:	RF ID Modular
Power Supply:	DC 2.5~3.6V
Test Voltage:	DC 3.3V via host device

5.3 Technical Specifications

Operation Frequency:	13.56MHz
Modulation Type:	100% ASK
Antenna Type:	Integral PCB Antenna

5.4 E.U.T Operation Mode

Test Mode	Description of Test Mode
Engineering mode:	Using RF card trigger the EUT working in continuous transmitting

5.5 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Supplied by
RF Card	STRONGLINK	AB 000003775	Client
Adapter for host device	STRONGLINK	9V2A DC	Client
Host Device	STRONGLINK	T030	Client

Adapter Specifications:

Rated Input:	AC 100-240V 50/60Hz	
Rated Output:	DC 9V 1A	
Cable Length:	AC port:	2 wires
	DC port:	About 130cm

5.6 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab
No.588 West Jindu Road, Songjiang District, Shanghai, China. 201612.
Tel: +86 21 6191 5666
Fax: +86 21 6191 5678
No tests were sub-contracted.

5.7 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 17025:2005 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: 2017-07-14.

- **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: 2017-09-16.

- **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-1. Expiry Date: 2017-06-18.

- **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-3868 and C-4336 respectively. Date of Registration: 2012-05-29. Date of Expiry: 2015-05-28.

6 Equipments List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	EMI test receiver	Rohde & Schwarz	ESCS30	100086	2014-02-14	2015-02-13
2	Line impedance stabilization network	SCHWARZBECK	NSLK8127	8127-490	2014-02-14	2015-02-13
3	Line impedance stabilization network	ETS	3816/2	00034161	2014-02-14	2015-02-13
4	Spectrum Analyzer	Rohde & Schwarz	FSP-30	2705121009	2014-02-14	2015-02-13
5	EMI test receiver	Rohde & Schwarz	ESU40	100109	2014-02-14	2015-02-13
6	Active Loop Antenna (9kHz to 30MHz)	Rohde & Schwarz	FMZB 1519	1519-034	2014-03-19	2015-03-18
7	Broadband UHF-VHF ANTENNA (25MHz to 2GHz)	SCHWARZBECK	VULB9168	9168-313	2014-02-14	2015-02-13
8	Ultra broadband antenna (25MHz to3GHz)	Rohde & Schwarz	HL562	100227	2014-10-09	2015-10-08
9	Horn Antenna (1GHz to 18GHz)	Rohde & Schwarz	HF906	100284	2014-02-14	2015-02-13
10	Horn Antenna (1GHz to 18GHz)	SCHWARZBECK	BBHA9120D	9120D-679	2014-07-28	2015-07-27
11	Horn Antenna (14GHz to 40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170373	2014-02-14	2015-02-13
12	Pre-amplifier (9KHz – 2GHz)	LNA6900	TESEQ	71033	2014-02-14	2015-02-13
13	Pre-amplifier (1GHz – 26.5GHz)	Rohde & Schwarz	SCU-F0118-G40-BZ4-CSS(F)	10001	2014-02-14	2015-02-13
14	Pre-amplifier (14GHz – 40GHz)	Rohde & Schwarz	SCU-F1840-G35-BZ3-CSS(F)	10001	2014-02-14	2015-02-13
15	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT800.0/880.0-0.2/40-5SSK	9	2014-06-02	2015-06-01
16	High pass Filter	FSCW	HP 12/2800-5AA2	19A45-02	2014-06-02	2015-06-01
17	High-low temperature cabinet	Suzhou Zhihe	TL-40	50110050	2014-04-13	2015-04-12
18	AC power stabilizer	WOCEN	6100	51122	2014-06-02	2015-06-01
19	DC power	QJE	QJ30003SII	611145	2014-06-02	2015-06-01
20	Signal Generator (Interferer)	Agilent	SMR40	100555	2014-02-14	2015-02-13
21	Signal Generator (Blocker)	Rohde & Schwarz	SMJ100A	02.20.360.142	2014-02-14	2015-02-13
22	Splitter	Anritsu	MA1612A	M12265	/	/
23	Coupler	e-meca	803-S-1	900-M01	/	/

7 Test results and Measurement Data

7.1 Antenna Requirement

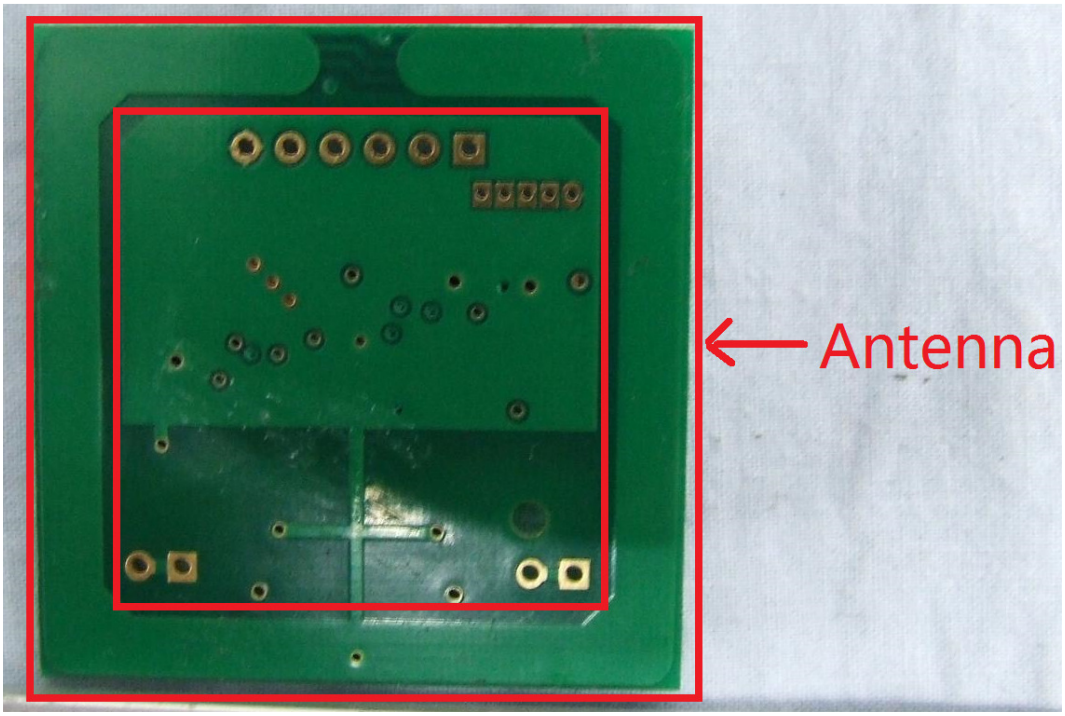
Standard requirement: 47 CFR Part 15C Section 15.203

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 integrated on the main PCB and no consideration of replacement.

Antenna Configuration:



7.2 Conducted Emissions

Test Frequency Range: 150kHz to 30MHz

Limit:

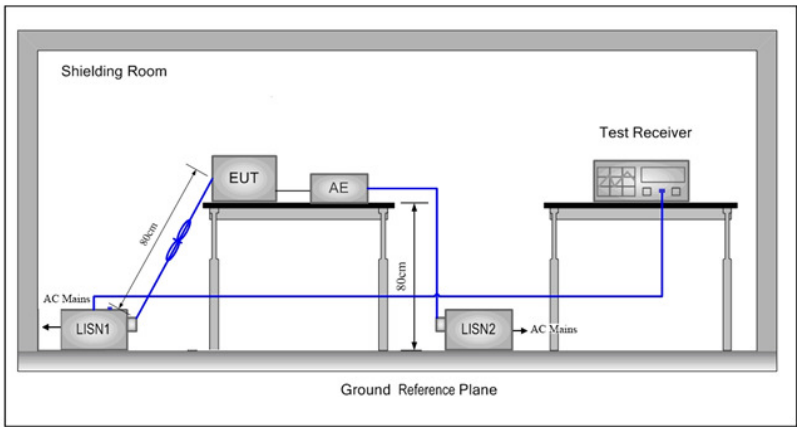
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) 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: 2009 on conducted measurement.

Test Setup:



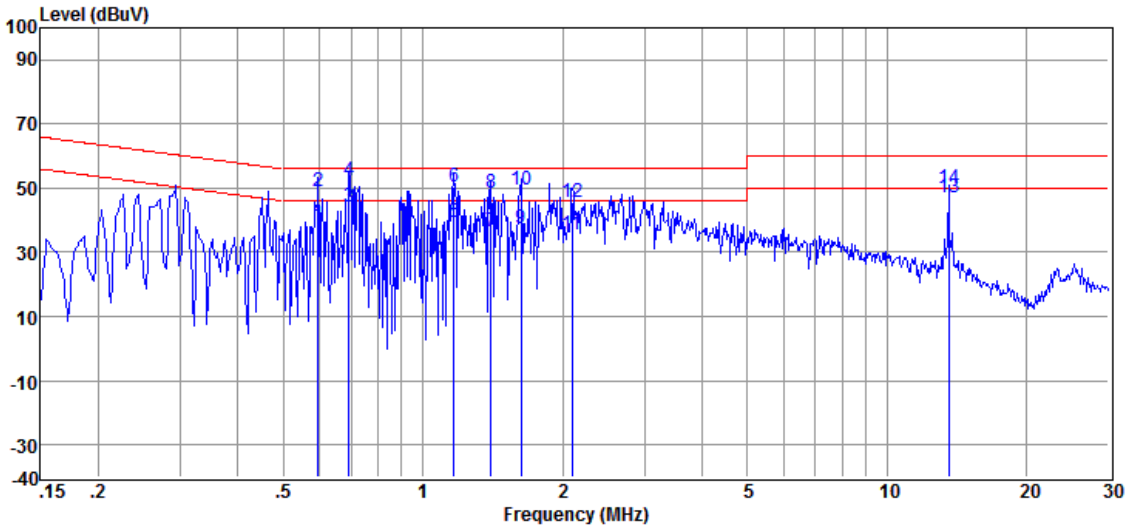
Test Results: Pass

Measurement Data:

An initial pre-scan was performed on the live and neutral lines with peak detector.

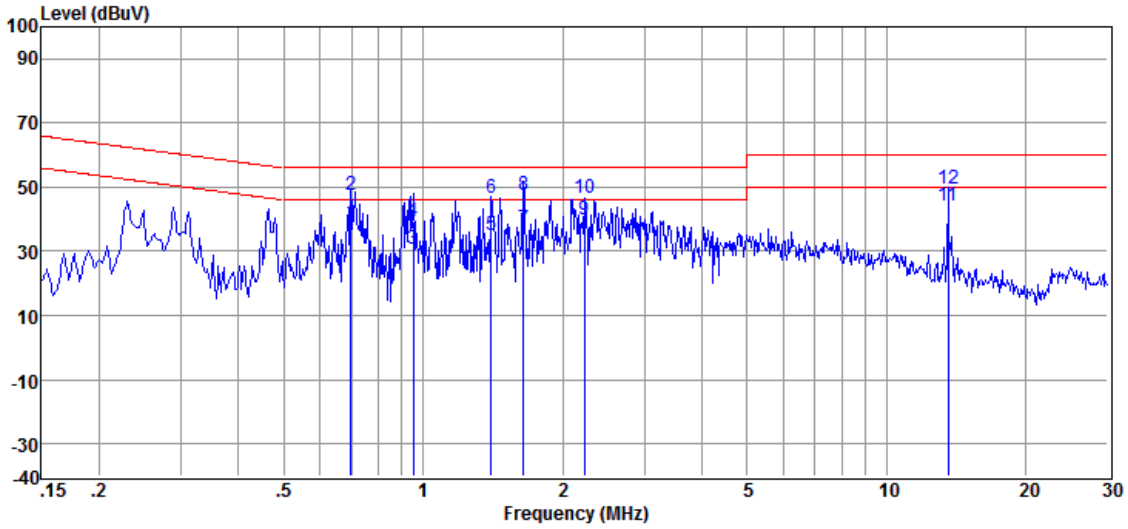
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



Item	Freq.	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB)	(dB)	(dBµV)	(dBµV)	(dB)	
1	0.595	38.13	0.23	0.10	38.46	46.00	-7.54	Average
2	0.595	48.89	0.23	0.10	49.22	56.00	-6.78	QP
3	0.694	43.64	0.22	0.10	43.96	46.00	-2.04	Average
4	0.694	52.01	0.22	0.10	52.33	56.00	-3.67	QP
5	1.166	39.22	0.21	0.10	39.53	46.00	-6.47	Average
6	1.166	50.05	0.21	0.10	50.36	56.00	-5.64	QP
7	1.403	35.93	0.26	0.10	36.29	46.00	-9.71	Average
8	1.403	48.06	0.26	0.10	48.42	56.00	-7.58	QP
9	1.628	37.16	0.30	0.10	37.56	46.00	-8.44	Average
10	1.628	49.28	0.30	0.10	49.68	56.00	-6.32	QP
11	2.099	35.10	0.36	0.11	35.57	46.00	-10.43	Average
12	2.099	45.08	0.36	0.11	45.55	56.00	-10.45	QP
13	13.551	46.54	0.34	0.10	46.98	50.00	-3.02	Average
14	13.551	49.74	0.34	0.10	50.18	60.00	-9.82	QP

Neutral Line:



Item	Freq.	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB)	(dB)	(dBµV)	(dBµV)	(dB)	
1	0.697	38.77	0.19	0.10	39.06	46.00	-6.94	Average
2	0.697	47.11	0.19	0.10	47.40	56.00	-8.60	QP
3	0.953	30.48	0.22	0.10	30.80	46.00	-15.20	Average
4	0.953	38.93	0.22	0.10	39.25	56.00	-16.75	QP
5	1.403	34.51	0.60	0.10	35.21	46.00	-10.79	Average
6	1.403	45.67	0.60	0.10	46.37	56.00	-9.63	QP
7	1.645	36.32	0.78	0.10	37.20	46.00	-8.80	Average
8	1.645	46.81	0.78	0.10	47.69	56.00	-8.31	QP
9	2.225	38.75	0.93	0.11	39.79	46.00	-6.21	Average
10	2.225	45.75	0.93	0.11	46.79	56.00	-9.21	QP
11	13.551	43.74	0.37	0.10	44.21	50.00	-5.79	Average
12	13.551	48.87	0.37	0.10	49.34	60.00	-10.66	QP

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

7.3 Radiated Emissions

Test frequency range: 9KHz – 1GHz

Test Site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency (MHz)	RBW	VBW	Detector
0.009-0.015	200Hz	1KHz	Quasi-peak
0.015-30	9kHz	30KHz	Quasi-peak
30-1000	120 kHz	300KHz	Quasi-peak

Note: The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector. For the frequency bands 9~90 kHz, 110~490 kHz and above 1000 MHz, the radiated emission limits are based on measurements employing an average detector.

Limit:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)	Limit @3m (dBμV/m)
0.009-0.490	2400/F(kHz)	300	128.5 ~ 93.8
0.490-1.705	24000/F(kHz)	30	73.8 ~63.0
1.705-30	30	30	69.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
960-1000	500	3	54.0

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*log (D_{TEST} / D_{SPEC}) where D_{TEST} = Test Distance and D_{SPEC} = Specified Distance.

Field strength limit (dBμV/m)@test distance= Field strength limit (dBμV/m)@specified distance -Distance Extrapolation Factor

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

Test Procedure:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. 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 Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Test Setup:

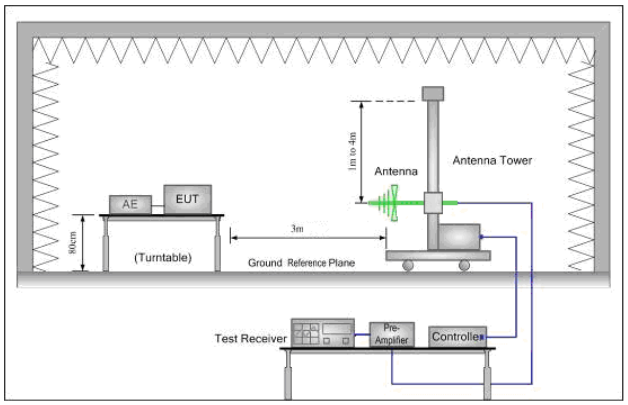


Figure 1. Below 30MHz

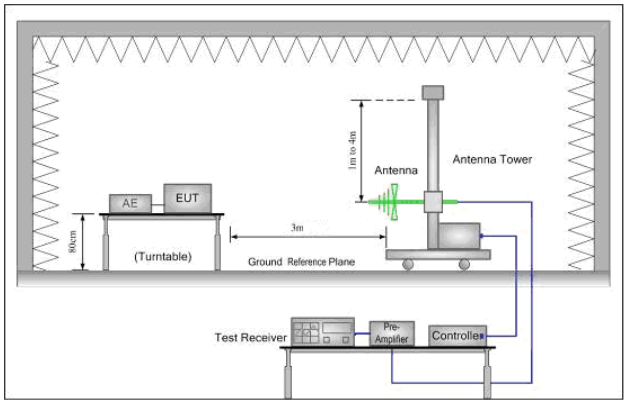


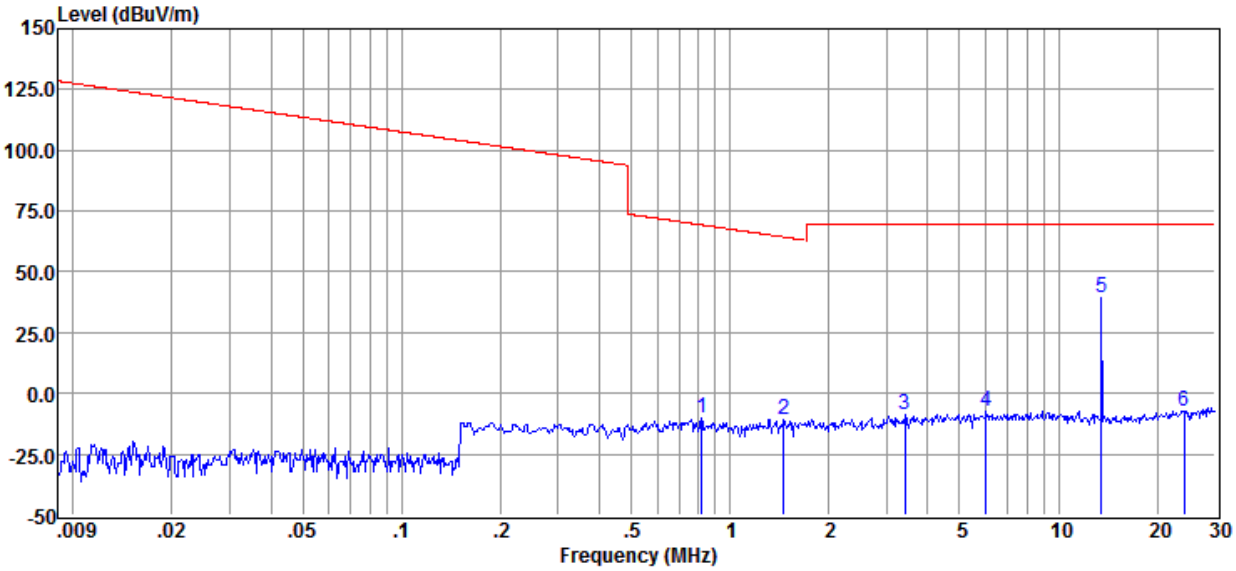
Figure 2. 30MHz to 1GHz

Test Results: Pass

Measurement Data

9 kHz-30MHz:

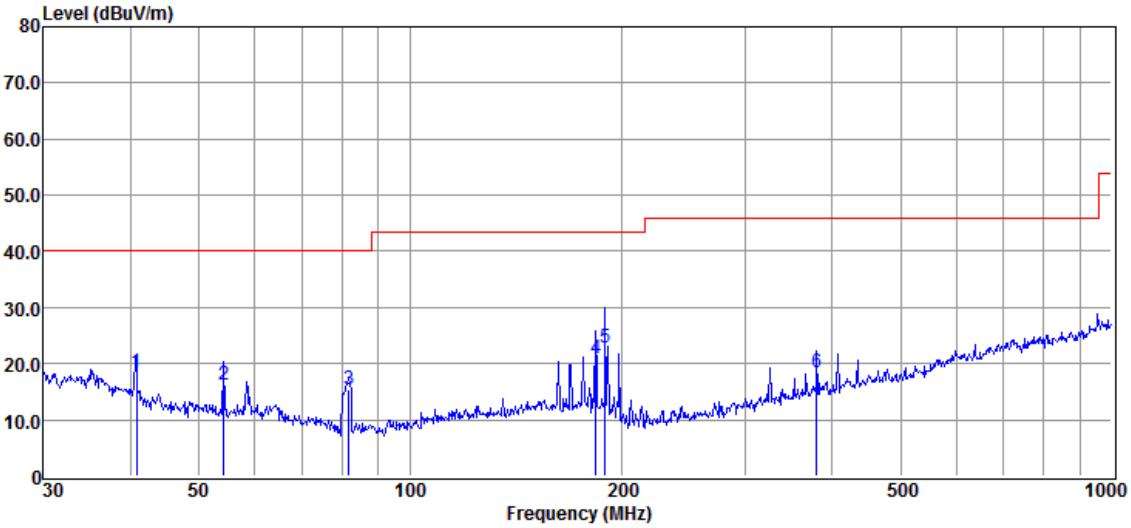
Y:



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.818	-8.56	-31.52	51.50	23.82	1.95	-10.45	69.36	Peak
2	1.456	-6.66	-31.61	51.50	23.83	-0.14	-10.74	64.37	Peak
3	3.412	-4.56	-31.59	51.50	23.80	-0.04	-8.49	69.50	Peak
4	6.020	-3.85	-31.52	51.50	23.79	0.07	-7.59	69.50	Peak
5	13.548	43.22	-31.70	51.50	23.76	0.16	39.42	69.50	Peak
6	24.099	-4.30	-31.45	51.50	23.73	0.48	-7.50	69.50	Peak

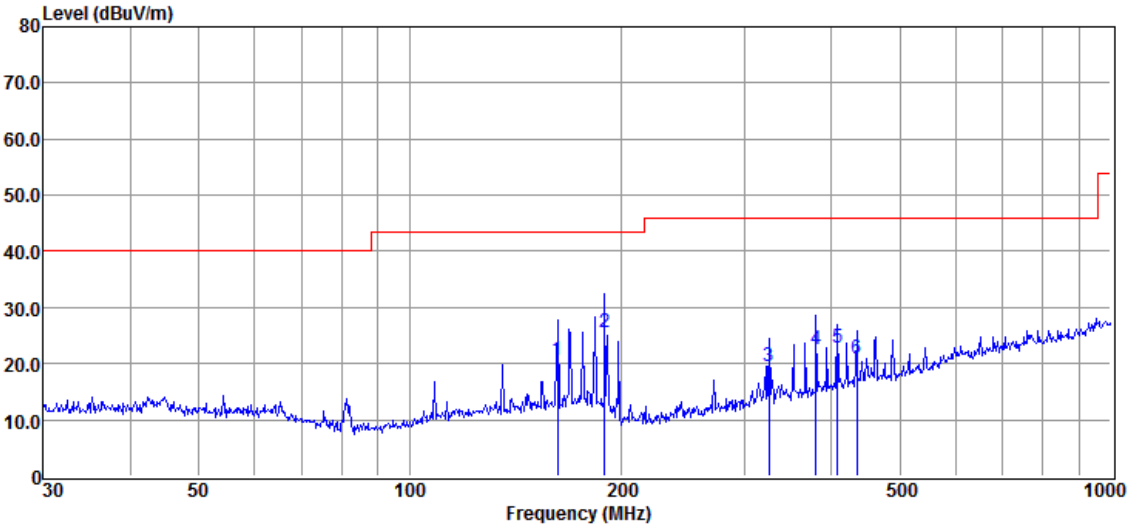
30MHz-1GHz:

Vertical



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
1	40.702	28.73	13.10	23.70	0.27	18.40	40.00	-21.60	QP
2	54.261	27.26	12.18	23.69	0.47	16.22	40.00	-23.78	QP
3	81.783	29.90	8.47	23.67	0.72	15.42	40.00	-24.58	QP
4	183.844	31.25	11.83	23.62	1.35	20.81	43.50	-22.69	QP
5	189.738	33.68	11.45	23.62	1.37	22.88	43.50	-20.62	QP
6	379.914	25.84	14.15	23.70	2.10	18.39	46.00	-27.61	QP

Horizontal



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
1	162.611	30.87	12.28	23.63	1.24	20.76	43.50	-22.74	QP
2	189.738	36.50	11.45	23.62	1.37	25.70	43.50	-17.80	QP
3	325.596	28.14	13.11	23.68	1.92	19.49	46.00	-26.51	QP
4	379.914	30.05	14.15	23.70	2.10	22.60	46.00	-23.40	QP
5	407.514	29.87	14.56	23.71	2.22	22.94	46.00	-23.06	QP
6	434.065	26.80	15.52	23.71	2.28	20.89	46.00	-25.11	QP

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

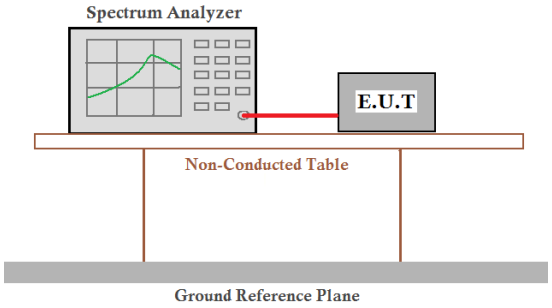
7.4 Frequency tolerance

Frequency Range: Operation within the band 13.110-14.010 MHz

Requirements: 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, 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.

Method of Measurement: The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.

Test setup:



Test Result: Pass

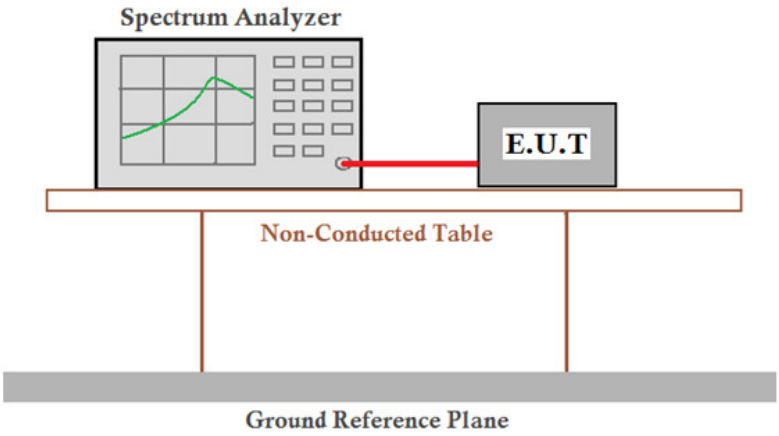
Test Data:

Nominal Operation Frequency: 13.56MHz

Test Conditions		Test Result (MHz)	Deviation (kHz)	Limit (KHz)	Result
Temp (℃)	Volt (V AC)				
T_{nom} (25)	V_{nom} (120)	13.5607	0.70	±0.01% (1.3560KHz)	Pass
T_{max} (50)	V_{min} (102)	13.5606	0.60		Pass
	V_{max} (138)	13.5608	0.80		Pass
T_{max} (40)	V_{min} (102)	13.5609	0.90		Pass
	V_{max} (138)	13.5605	0.50		Pass
T_{max} (30)	V_{min} (102)	13.5604	0.40		Pass
	V_{max} (138)	13.5610	1.00		Pass
T_{max} (20)	V_{min} (102)	13.5613	1.30		Pass
	V_{max} (138)	13.5611	1.10		Pass
T_{max} (10)	V_{min} (102)	13.5612	1.20		Pass
	V_{max} (138)	13.5611	1.10		Pass
T_{max} (0)	V_{min} (102)	13.5611	1.10		Pass
	V_{max} (138)	13.5612	1.20		Pass
T_{max} (-10)	V_{min} (102)	13.5613	1.30		Pass
	V_{max} (138)	13.5610	1.00		Pass
T_{min} (-20)	V_{min} (102)	13.5609	0.90		Pass
	V_{max} (138)	13.5608	0.80		Pass

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

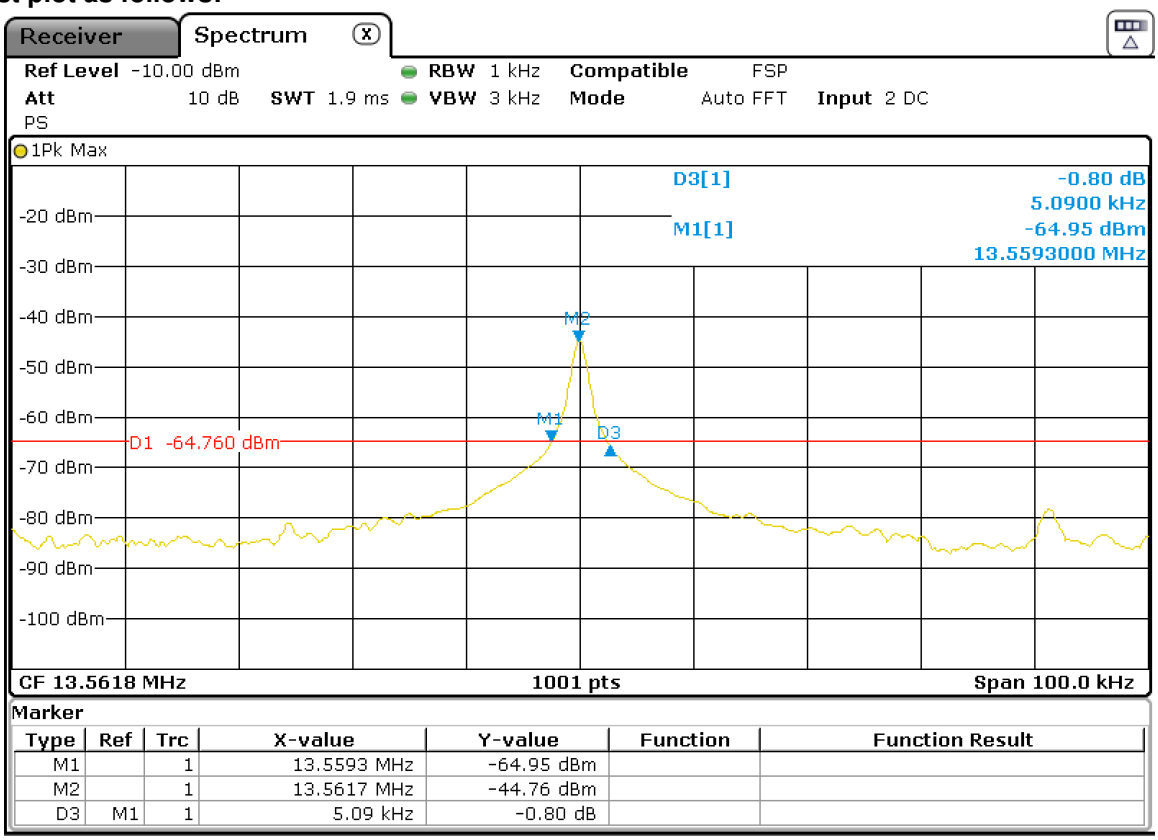
7.5 20dB Bandwidth

Test Setup:	
Frequency Range:	Operation within the band 13.110 – 14.010 MHz
Requirements:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §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 is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.
Test Result:	Pass

Measurement Data:

20dB bandwidth (kHz)	Result
5.09	Pass

Test plot as follows:



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	13.5593 MHz	-64.95 dBm		
M2		1	13.5617 MHz	-44.76 dBm		
D3	M1	1	5.09 kHz	-0.80 dB		

8 Test Setup Photographs

Refer to the < SL030_Test Setup Photos-FCC >

9 EUT Constructional Details

Refer to the < SL030_External Photos-FCC> & < SL030_Internal Photos-FCC>.

--End of the Report--