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

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TEST REPORT

Application No.:	SHEM111200169002
Applicant:	Beijing StrongLink Technology Co., Ltd.
Address:	RM 3-105 Building A, No. 170 Beiyuan Road, Chaoyang District, Beijing 100101
Equipment under Test (EUT)	
Name:	Mifare Module
Model No.:	SL030/SL031/SL032
Trade mark:	N/A
Standards:	ETSI EN 300 330-1 V1.7.1(2010-02)
	ETSI EN 300 330-2 V1.5.1(2010-02)
Date of Receipt:	2012-1-6
Date of Test:	2012-1-10 to 2012-01-16
Date of Issue:	2012-1-19
Test Result :	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above. Please refer to section 2 of this report for further details.

* The other tests (e.g. Low Voltage Directive 2006/95/EC) required in R&TTE directive (1999/5/EC) was not included in the report, only tests related to RF were performed and reported in this report. Hence to clarify compliance with R&TTE directive shall comply with the other essential required tests additionally.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.

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

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

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Member of the SGS Group (Société Générale de Surveillance)

1 Test Summary

Test Item	Test Requirement Test method	Result
H-field (radiated)	EN 300 330-1:2010 Clause 7.2.1	PASS
RF carrier current (Product Class 3 only)	EN 300 330-1:2010 Clause 7.2.2	N/A
Radiated E-field (Product Class 4 only)	EN 300 330-1:2010 Clause 7.2.3	N/A
Permitted frequency range of the modulation bandwidth	EN 300 330-1:2010 Clause 7.4	PASS
Conducted spurious emissions (Product class 3 only)	EN 300 330-1:2010 Clause 7.5.2	N/A
Spurious Domain Emission_Radiated field strength (< 30 MHz)	EN 300 330-1:2010 Clause 7.5.3	PASS
Spurious Domain Emission_Effective radiated power (≥ 30 MHz)	EN 300 330-1:2010 Clause 7.5.4	PASS

N/A is an abbreviation for Not Applicable.
Note 1: The EUT is divided into Product Class 1.
Note 2: The duty cycle of transmitter is class 4 equipment and ratio Up to 100%.
Note 3: There are 3 models mentioned in this report,the electrical circuit design,layout,components used and internal wiring for above three modes are identical,only their interface and MCU's memory size are different. So we choiced SL030 for the typical sample to do all the test.

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3 General Information

3.1 Client Information

Applicant:	Beijing StrongLink Technology Co., Ltd.
Address of Applicant:	RM 3-105 Building A, No. 170 Beiyuan Road, Chaoyang District, Beijing 100101
Manufacturer:	Beijing StrongLink Technology Co., Ltd.
Address of Manufacturer:	RM 3-105 Building A, No. 170 Beiyuan Road, Chaoyang District, Beijing 100101

3.2 General Description of E.U.T.

EUT Name:	Mifare Module
Model No.:	SL030/SL031/SL032

3.3 Details of E.U.T.

Working Frequency:	13.56MHz
Power Supply:	2.5~3.6 VDC

3.4 Test Location

All the 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

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3.5 Test Facility

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

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

- **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: 2012-03-17.

- **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.

- **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-3172 and C-3514 respectively. Date of Registration: 2009-11-30. Date of Expiry: 2012-03-17.

AUDIX Technology (Shanghai) Co., Ltd.

- **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, 2012.

- **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: 2012-04-28.

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4 Equipments Used during Test

Effective Radiated Power (≥ 30 MHz)

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	Antenna	Schaffner	CBL6112D	22252	2011-06-03	2012-06-02
2	Spectrum Analyzer	Agilent	E4447A	MY45300136	2011-04-02	2012-04-01
3	Pre - Amplifier	HP	8447D	2944A10924	2011-04-02	2012-04-01
4	Dipole antenna	Schwarzbeck	VHAP	1120	2011-05-03	2012-05-02
5	Dipole antenna	Schwarzbeck	VHAP	1121	2011-05-03	2012-05-02
6	Dipole antenna	Schwarzbeck	UHAP	1097	2011-05-03	2012-05-02
7	Dipole antenna	Schwarzbeck	UHAP	1098	2011-05-03	2012-05-02
8	Signal Generator	HP	E8257D	MY46130042	2011-05-09	2012-05-08

Radiated Field Strength (< 30 MHz)

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	Loop Antenna	Schaffner	HLA6120	1193	2011-05-06	2012-05-05
2	Spectrum Analyzer	Agilent	E7405A	MY45106600	2011-03-22	2012-03-21
3	Test Receiver	R&S	ESHS10	830223/007	2011-03-22	2012-03-21

H-field

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	Spectrum Analyzer	Agilent	E7405A	MY45106600	2011-03-22	2012-03-21
2	Loop Antenna	Schaffner	HLA6120	1193	2011-05-06	2012-05-05
3	Test Receiver	R&S	ESHS10	830223/007	2011-03-22	2012-03-21
4	Temperature and Humidity Test Chamber	TECRCHY	MHU-800L	850801	2011-05-19	2012-05-18

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Permitted frequency range

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	Spectrum Analyzer	Rohde & Schwarz	FSP-30	2705121009	2011-04-19	2012-04-17
2	High-low temperature cabinet	Suzhou Zhihe	TL-40	50110050	2011-09-05	2012-09-03

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5 Radio Technical Requirements Specification in EN 300 330-2

5.1 H-field (radiated)

Test Requirement: EN 300 330-2 clause 4.2.1.2

Test method: EN 300 330-1 clause 7.2.1.2

Test ambient: Temp.: 22.0°C, Humid.: 59 % Press.: 1013 mBar

Status: 1) Kept transmitting mode .
2) Test EUT in normal and extreme conditions.

Equipment Used: Refer to section 4 for details.

Test Procedure:

The following test procedure as below:

1) Kept tx operating with modulation

2).The EUT was powered ON and placed on a 1.5m hight table in the chamber. The antenna of the transmitter was extended to its maximum length.

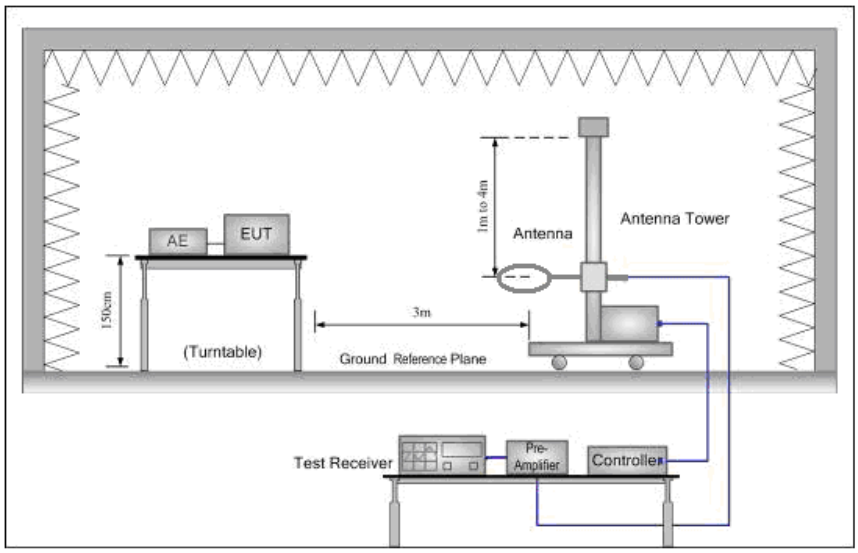
3) Adjust the centre frequency of spectrum analyzer on any frequency be measured.

4).The disturbance of the transmitter was maximized on the test receiver display by raising and lowering the receive antenna from 1m to 4m and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

5).Steps 2) to 4) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.

6) Repeat above procedures normal and extreme conditions measured were complete.

Test setup:



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Limit:

Table 5: H-field limits at 10 m

Frequency range (MHz)	H-field strength limit (H_f) dBμA/m at 10 m
0,009 ≤ f < 0,090	72 descending 3 dB/oct above 0,03 MHz or according to note 1 (see note 5)
0,09 ≤ f < 0,119	42
0,119 ≤ f < 0,135	66 descending 3 dB/oct above 0,119 MHz or according to note 1 (see notes 3 and 5)
0,135 ≤ f < 0,140	42
0,140 ≤ f < 0,1485	37,7
0,1485 ≤ f < 30	-5 (see note 4)
0,315 ≤ f < 0,600	-5
3,155≤ f < 3,400	13,5
4,234	9
4,516	7
7,400 ≤ f < 8,800	9
10,2 ≤ f < 11,00	9
12,5 ≤ f ≤ 20	-7
6,765 ≤ f ≤ 6,795 13,553 ≤ f ≤ 13,567 26,957 ≤ f ≤ 27,283	42 (see note 3)
13,553 < f < 13,567	60 (see notes 2 and 3)
27,095	42

NOTE 1: For the frequency ranges 9 kHz to 135 kHz, the following additional restrictions apply to limits above 42 dBμA/m:
- for loop coil antennas with an area ≥ 0,16 m^2 table 5 applies directly;
- for loop coil antennas with an area between 0,05 m^2 and 0,16 m^2 table 5 applies with a correction factor. The limit is: table value + 10 × log (area/0,16 m^2);
- for loop coil antennas with an area < 0,05 m^2 the limit is 10 dB below table 5.

NOTE 2: For RFID and EAS applications only.
NOTE 3: Spectrum mask limit, see annex G.
NOTE 4: For further information see annex H.
NOTE 5: Limit is 42 dBμA/m for the following spot frequencies: 60 kHz ± 250 Hz, 66,6 kHz ± 750 Hz, 75 kHz ± 250 Hz, 77,5 kHz ± 250 Hz, and 129,1 kHz ± 500 Hz.

Remark:

The H-field limit in dBμA/m at 3 m, H3m, is determined by the following equation:
H3m = H10m + C3
where: H10m is the H-field limit in dBμA/m at 10m distance according to the present document; and C3 is a conversion factor in dB determined from the following figure F.2.

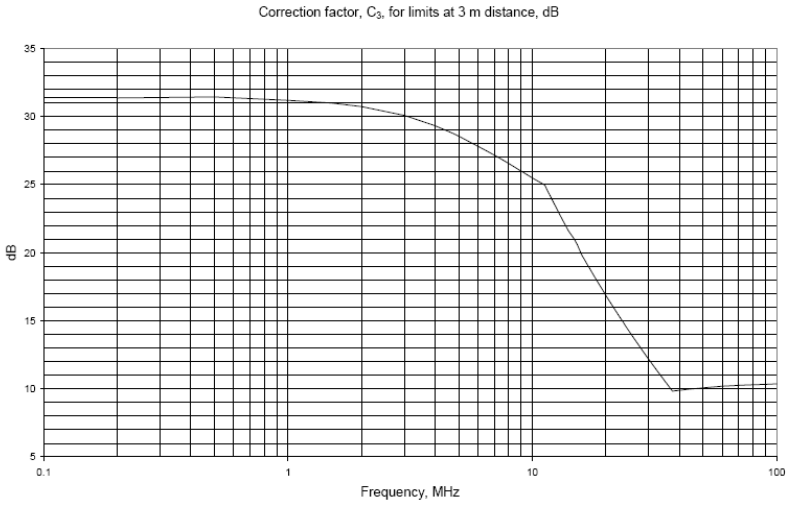

Figure F.2: Conversion factor C_3 versus frequency

e.g. H10m =60 dB μA/m@10m; C3=23dB;=> H3m=60+23=83 dB μA/m

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Test Data:

Channel	Test Voltage (V)	Temperature (°C)	Transmitter Frequency (MHz)	H-filed (dBμV/m)	H-filed (dBμA/m)	Limit (dBμA/m)	Result
/	DC3.3V	24°C	13.56MHz	54.47	2.97	83	Pass
/		-20°C	13.56MHz	55.53	4.03		
/		55°C	13.56MHz	54.18	2.68		
/	DC2.5V	-20°C	13.56MHz	55.37	3.87		
/		55°C	13.56MHz	56.24	4.74		
/	DC3.6V	-20°C	13.56MHz	54.28	2.78		
/		55°C	13.56MHz	55.31	3.81		

Note1-The H-filed filed strength limit at 10m for 13.56MHz is 60 dBμA/m.

The H-filed limit in dBμA/m at 3 m（H3m）is determined by the following equation:

H3m= H10m+C3.where:

C3 is a conversion factor in dB determined from ETSI EN 300 330-1 figure F.2,the value is 23 dB.

So, the H-filed filed strength limit at 3m for 13.56MHz is 83 dBμA/m.

Note2-According to ETSI EN 300 330-1 Sec.7.2.1.2:For measuring equipment calibrated in dBμV/m,the reading should be reduced by 51,5 dB to be converted to dBμA/m.

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5.2 Permitted frequency range of the modulation bandwidth

Test Requirement: EN 300 330-2 clause 4.2.1.3

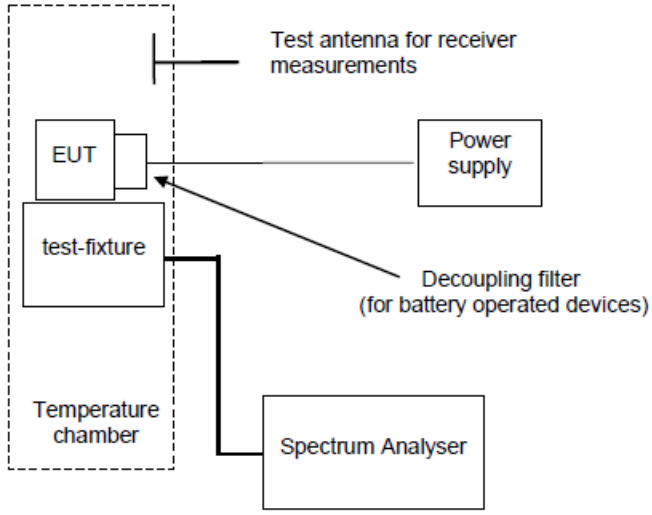
Test Method: EN 300 330-1 clause 7.4

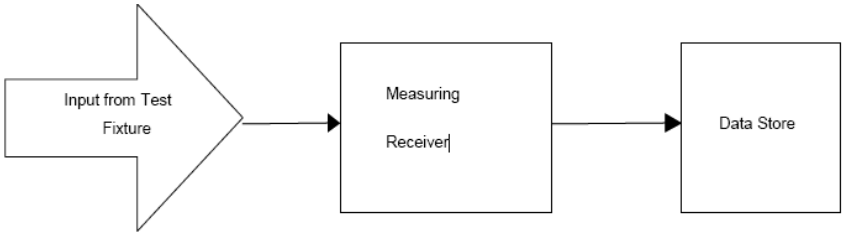
Test ambient: Temp.: 23.0°C, Humid.: 51 % Press.: 1010 mBar

Operation Status: 1) Kept transmitting with modulation
2) Test EUT in normal conditions.

Equipment Used: Refer to section 4 for details.

Test setup:





Test set-up for measuring the operating frequency range

Limit: The permitted range of operating frequency for intentional emissions shall be from 9 kHz to 30 MHz(table 1). Outside the permitted range of operating frequencies the unintentional emissions shall be reduced to the limits given in clause 7.5.(table 8)

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Table 1: Short Range Devices within the 9 kHz to 30 MHz permitted frequency bands

	Frequency Bands/frequencies	Applications
Transmit and Receive	9 kHz to 90 kHz	Inductive devices, Generic use
Transmit and Receive	90 kHz to 119 kHz	Inductive devices, Generic use
Transmit and Receive	119 kHz to 140 kHz	Inductive devices, Generic use
Transmit and Receive	140 kHz to 148,5 kHz	Inductive devices, Generic use
Transmit and Receive	148,5 kHz to 5 MHz	Inductive devices, Generic use
Transmit and Receive	400 kHz to 600 kHz	RFID only
Transmit and Receive	5 kHz to 30 MHz	Inductive devices, Generic use
Transmit and Receive	3 155 kHz to 3 400 kHz	Inductive devices, Generic use
Transmit and Receive	4 234 kHz	Inductive devices, Railway applications
Transmit and Receive	4 516 kHz	Inductive devices, Railway applications
Transmit and Receive	6 765 kHz to 6 795 kHz	Inductive devices, Generic use
Transmit and Receive	7 400 kHz to 8 800 kHz	Inductive devices, Generic use
Transmit and Receive	10 200 kHz to 11,000 MHz	Inductive devices, Generic use
Transmit and Receive	12,5 MHz to 20 MHz	Inductive devices, Wireless healthcare
Transmit and Receive	13,553 MHz to 13,567 MHz	Inductive devices, Generic use
Transmit and Receive	26,957 MHz to 27,283 MHz	Inductive devices, Generic use
Transmit and Receive	27,095 MHz	Inductive devices, Railway applications

The radiated field strength of the spurious domain emissions below 30 MHz shall not exceed the generated H-field dBµA/m at 10 m given in table 8.

Table 8

State	Frequency 9 kHz ≤ f < 10 MHz	Frequency 10 MHz ≤ f < 30 MHz
Operating	27 dBµA/m at 9 kHz descending 3 dB/oct	-3,5 dBµA/m

Test Data:

Assigened Frequency Band: 13.56MHz

Test Voltage (V)	Temperature (℃)	Lowest Frequency (MHz)	Highest Frequency (MHz)	Min. Lowest Frequency (MHz)		Max. Highest Frequency (MHz)		Result
				FL	Limit	FH	Limit	
3.3VDC	24℃	13.559	13.562	13.557	13.553	13.563	13.567	PASS
2.5VDC	-20℃	13.558	13.563					
	55℃	13.559	13.562					
3.6VDC	-20℃	13.557	13.562					
	55℃	13.558	13.563					

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5.3 Spurious Domain Emission

Test Requirement: EN 300 330-2 clause 4.2.1.4

Test Method: EN 300 330-1 clause 7.5.3 & 7.5.4

Test ambient: Temp.: 22-24°C, Humid.: 59 % Press.: 1010 - 1013 mBar

Test Status:
1) Kept EUT operating with normal modulation
2) keep the EUT in transmitting mode.
3) Test EUT in normal conditions.

Receiver setup:

Frequency: (f)	Detector type	Measurement receiver bandwidth	Spectrum analyser bandwidth
9 kHz ≤ f < 150 kHz	Quasi Peak	200 Hz	300 Hz
150 kHz ≤ f < 30 MHz	Quasi Peak	9 kHz	10 KHz
30 MHz ≤ f ≤ 1 000 MHz	Quasi Peak	120 kHz	100 kHz
NOTE: For the measurement of the ranges 6,765 MHz ≤ f ≤ 6,795 MHz and 13,553 MHz ≤ f ≤ 13,567 MHz, the measurement bandwidth has to be 200 Hz respectively 300 Hz.			

Equipment Used: Refer to section 4 for details.

Test setup:

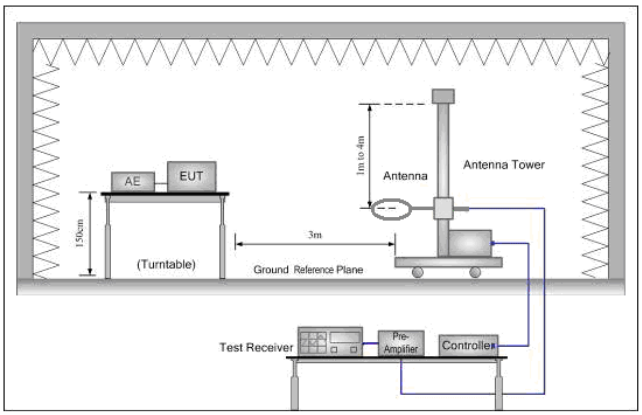

Figure 1. below 30MHz

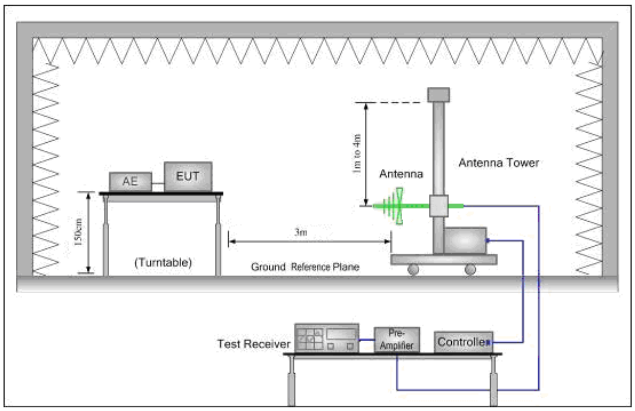

Figure 2. 30MHz-1GHz

Test Procedure:

Transmitter mode test procedure as below:

Below 30MHz test procedure as below:

1) Keep the EUT operating with normal modulation

2).The EUT was powered ON and placed on a 1.5m hight table in the chamber. The antenna of the transmitter was extended to its maximum length.

3) Adjust the centre frequency of spectrum analyzer on any frequency be measured.

4).The disturbance of the transmitter was maximized on the test receiver display by raising and lowering the receive antenna from 1m to 4m and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength

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measurement was made.

5).Steps 2) to 4) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.

30MHz-1GHz test procedure as below:

1) Keep the EUT operating unmodulated carrier, If an unmodulated carrier cannot be obtained then the measurements shall be made with the transmitter modulated by the normal test signal (see clause 6.1.2) in which case this fact shall be recorded in the test report.

2). The EUT was powered ON and placed on a 1.5m hight table in the chamber. The antenna of the transmitter was extended to its maximum length.

3). The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

4). Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.

5). The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.

6). A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.

7). The output power into the substitution antenna was then measured.

8). Steps 6) and 7)were repeated with both antennas polarized.

9) Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

where:

Pg is the generator output power into the substitution antenna.

Standby mode test procedure as below:

1) Below 30MHz test procedure Steps 2) to 5) and 30MHz-1GHz test procedure Steps 2) to 9) shall be repeated with the transmitter in the standby condition if this option is available.

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7.5.3.2 Limits

The radiated field strength of the spurious domain emissions below 30 MHz shall not exceed the generated H-field dBμA/m at 10 m given in table 8.

Limit:

Table 8

State	Frequency 9 kHz ≤ f < 10 MHz	Frequency 10 MHz ≤ f < 30 MHz
Operating	27 dBμA/m at 9 kHz descending 3 dB/oct	-3,5 dBμA/m
Standby	5,5 dBμA/m at 9 kHz descending 3 dB/oct	-25 dBμA/m

7.5.4.2 Limits

The power of any radiated emission shall not exceed the values given in table 9.

Table 9

State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies between 30 MHz to 1 000 MHz
Operating	4 nW	250 nW
Standby	2 nW	2 nW

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Test Data for Radiated field strength (< 30 MHz):

Operating Mode (Transmitting Mode)
Antenna Polarity: H

Frequency (MHz)	Emission Level (dBuV/m)	Emission Level (dBuA/m)	Limit (dBuA/m) at 10m	Correction factor (dB)	Limit (dBuA/m) at 3m	Margin (dB)
0.02014	80.02	28.52	23.51	31.40	54.91	26.39
0.03847	56.95	5.45	20.71	31.40	52.11	46.66
0.06216	47.73	-3.77	18.64	31.40	50.04	53.81
3.642	54.37	2.87	1.02	29.40	30.42	27.55
12.209	47.30	-4.20	-4.22	25.00	20.78	24.98
17.881	46.18	-5.32	-5.87	19.00	13.13	18.45

Antenna Polarity: V

Frequency (MHz)	Emission Level (dBuV/m)	Emission Level (dBuA/m)	Limit (dBuA/m) at 10m	Correction factor (dB)	Limit (dBuA/m) at 3m	Margin (dB)
0.02014	75.53	24.03	23.51	31.40	54.91	30.88
0.03889	57.21	5.71	20.67	31.40	52.07	46.36
0.06216	47.98	-3.52	18.64	31.40	50.04	53.56
1.851	52.38	0.88	3.95	30.80	34.75	33.87
3.941	58.21	6.71	0.68	29.40	30.08	23.37
17.881	41.84	-9.66	-5.87	19.00	13.13	22.79

Test result: Pass

Standby Mode: N/A (EUT has no standby mode or the emission level is too weak to be detected.)

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Test Data for Effective radiated power (≥ 30 MHz):

Operating Mode (Transmitting Mode)
Antenna Polarity: H & V

Test in 13.56MHz, keep in continuously transmitting status.				
Frequency	Spurious Emission Level		Limit	Margin
(MHz)	Polarity	(dBm)	(dBm)	(dB)
79	V	-61.5	-36	25.5
236	V	-66.6	-36	30.6
247	H	-59.3	-36	23.3

Test result: Pass

Standby Mode: N/A (EUT has no standby mode or the ERP level is too weak to be detected.)

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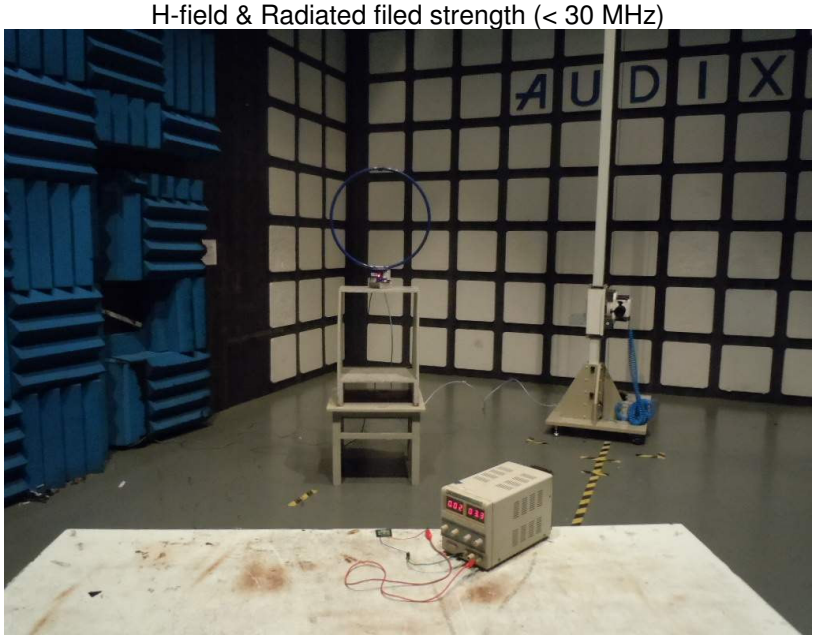
6 Test Setup Photos

H-field & Radiated filed strength (< 30 MHz)



Effective radiated power (≥ 30 MHz)

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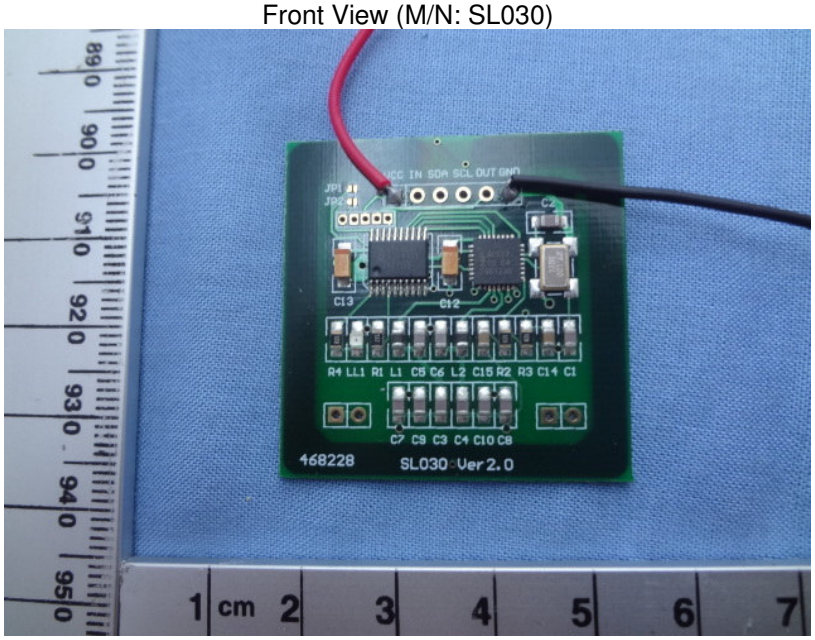
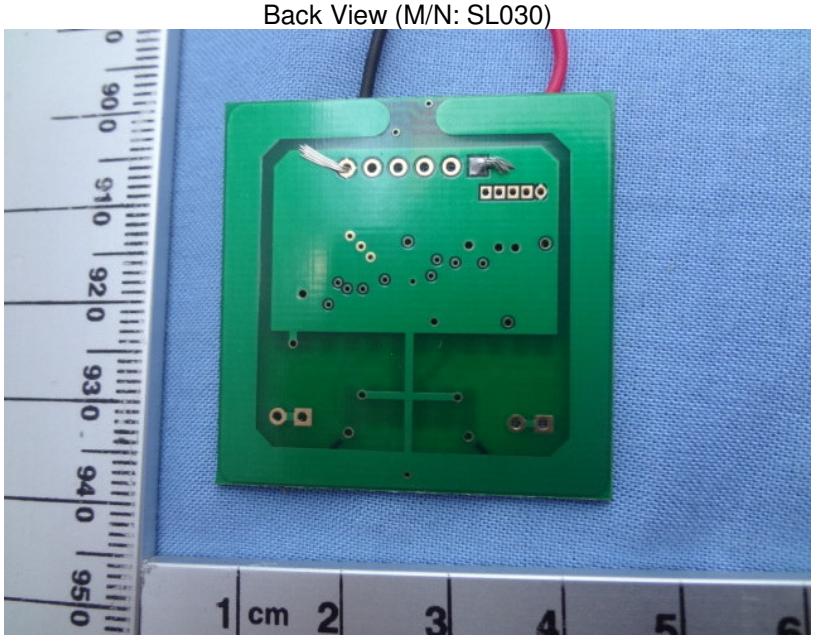
7 EUT Photos

Front View (M/N: SL030)



Back View (M/N: SL030)



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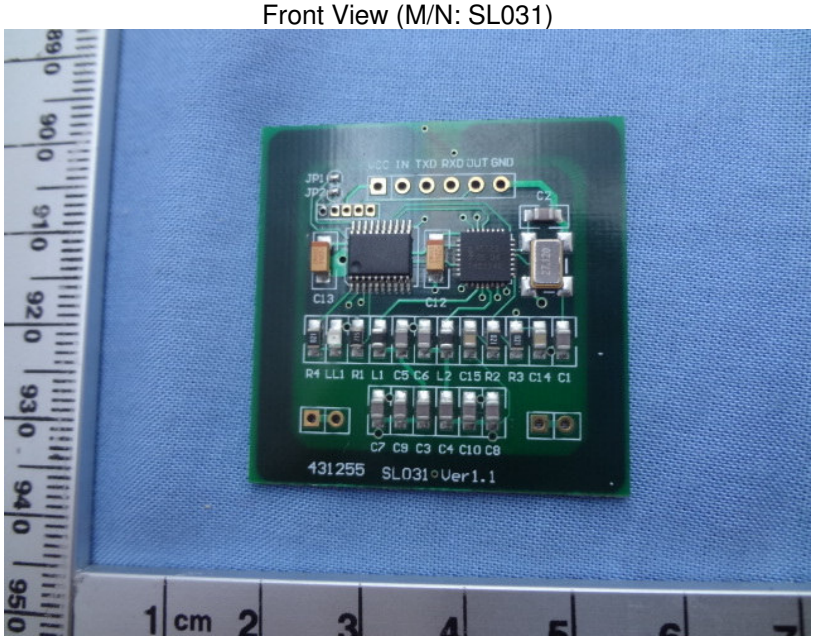
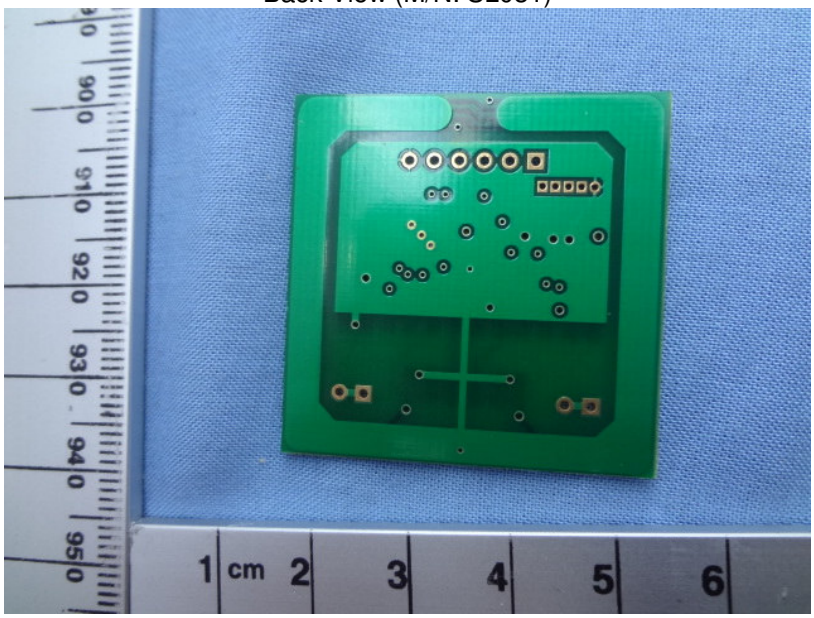
Front View (M/N: SL031)



Back View (M/N: SL031)



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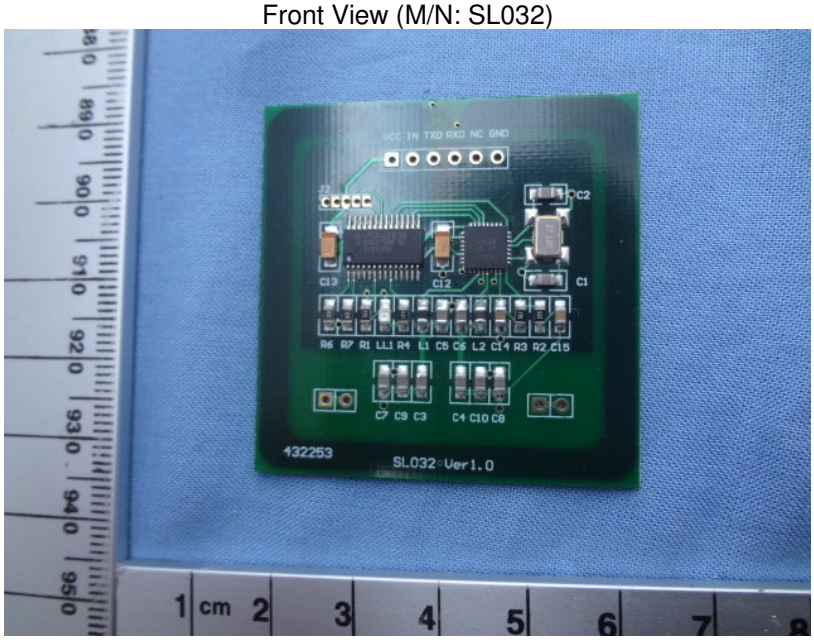
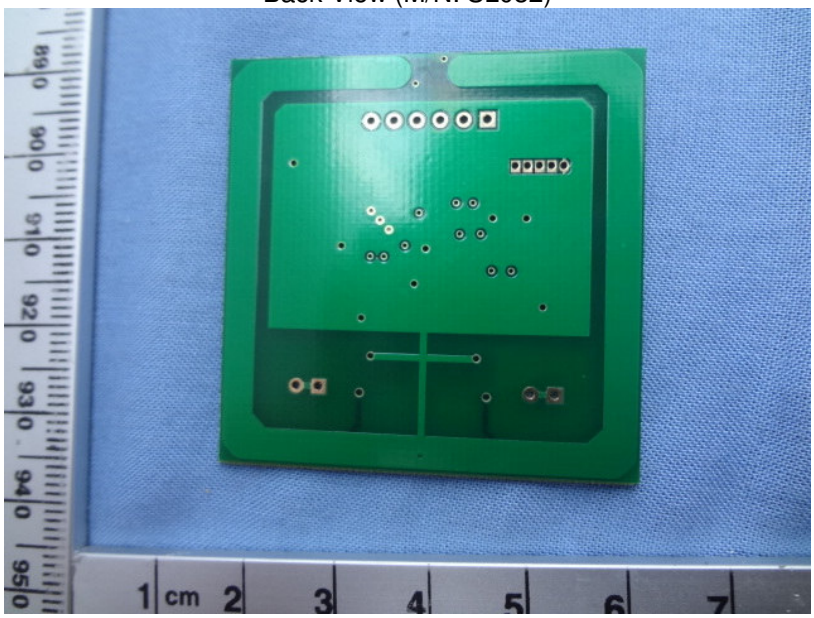
Front View (M/N: SL032)



Back View (M/N: SL032)



The end of report

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