SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

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TEST REPORT

Application No.:	SZEM1711012091CR
Applicant:	Spigen Korea Co., Ltd.
Address of Applicant:	N0. 1709 STX-V Tower, 128, Gasan digital 1-ro, Geumcheon-gu, Seoul, 08507, Republic of Korea, Seoul, South Korea
Manufacturer:	Spigen Korea Co., Ltd.
Address of Manufacturer:	N0. 1709 STX-V Tower, 128, Gasan digital 1-ro, Geumcheon-gu, Seoul, 08507, Republic of Korea, Seoul, South Korea
Factory:	Spigen Korea Co., Ltd.
Address of Factory:	N0. 1709 STX-V Tower, 128, Gasan digital 1-ro, Geumcheon-gu, Seoul, 08507, Republic of Korea, Seoul, South Korea
Equipment Under Test (EUT):	
EUT Name:	Fast Wireless Charger
Model No.:	F301W
Trade mark:	Spigen
FCC ID:	2AFKNF301W
Standard(s) :	47 CFR PART 18
Date of Receipt:	2017-12-07
Date of Test:	2017-12-07 to 2018-1-29
Date of Issue:	2018-1-29
Test Result:	Pass*

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

Keny Xu
EMC Laboratory 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.

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2018-1-29		

Authorized for issue by:				
				
		Moon Zhang /Project Engineer		
				
		Eric Fu /Reviewer		

2 Test Summary

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Class / Severity**	**Result**
Radiated Emissions (9kHz-30MHz)	47 CFR PART 18	FCC OST/ MP-5:1986	18.305(b)	Pass
Conducted Emission (150 kHz to 30 MHz)	47 CFR PART 18	FCC OST/ MP-5:1986	18.307(a)	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Adaptor: APS-FW018W1-G Input: 100-240V~50/60Hz 0.5A MAX Output:DC 5.0V/3A ;9V/2A; 12V/1.5A Total output: 18W Fast Wireless Charger F301W Input: 5V/1A 9V /1.8A Output: 5V/1A;9V/1A
Cable:	USB Cable: 120cm unshielded
EUT Function:	wireless charging transmitter
Carrier Frequency	110-205kHz
Antenna Type	Loop antenna
Modulation type:	Load modulation

4.2 Description of Support Units

The EUT has been tested as an independent unit.

Description	Manufacturer	Model No.
Full load receiver	Provided by Client	10W
Adjustable load receiver	Provided by Client	0-10W
Samsung phone	Provided by Client	SM-G9500

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25×10^{-8}
2	Duty cycle	0.37%
3	Occupied Bandwidth	3%
4	RF conducted power	0.75dB
5	RF power density	2.84dB
6	Conducted Spurious emissions	0.75dB
7	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
8	Radiated Spurious emission test	4.5dB (Below 1GHz)
		4.8dB (Above 1GHz)
9	Temperature test	1℃
10	Humidity test	3%
11	Supply voltages	1.5%
12	Time	3%

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab 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.

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Radiated Emissions (9kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2017-05-10	2018-05-09
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2017-07-13	2018-07-12
EMI Test Receiver (9kHz-3GHz)	Rohde & Schwarz	ESR	SEM004-03	2017-04-14	2018-04-13
Trilog-Broadband Antenna(30MHz-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2016-01-26	2019-01-25
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-03	2017-06-05	2018-06-04
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

Conducted Emissions at Mains Terminals (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	ChangZhou ZhongYu	GB-88	SEM001-06	2017-05-10	2018-05-09
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2017-07-13	2018-07-12
LISN	Rohde & Schwarz	ENV216	SEM007-01	2017-09-27	2018-09-26
LISN	ETS-LINDGREN	3816/2	SEM007-02	2017-04-14	2018-04-13
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2017-04-14	2018-04-13

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-28
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-17

6 Radio Spectrum Matter Test Results

6.1 Radiated Emissions (9kHz-30MHz)

Test Requirement 47 CFR PART 18

Test Method: FCC OST/ MP-5:1986

Test Site: Measurement Distance: 10m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW
9kHz~150kHz	Quasi-peak	200Hz	≥RBW
150kHz~30MHz	Quasi-peak	9kHz	≥RBW
30MHz~1GHz	Quasi-peak	100kHz	≥RBW

Limit:

Frequency	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009-30MHz	53.0	Quasi-peak	10
30MHz-88MHz	40.0	Quasi-peak	3
88MHz-216MHz	43.5	Quasi-peak	3
216MHz-1000MHz	46.0	Quasi-peak	3

Remark:According to the article 18.305(b), The operating frequency is non-ISM frequency;the RF Power generated by equipment is below 500(watts); According to the clause 18.305(c), the EUT belongs to Consumer equipment.

6.1.1 E.U.T. Operation

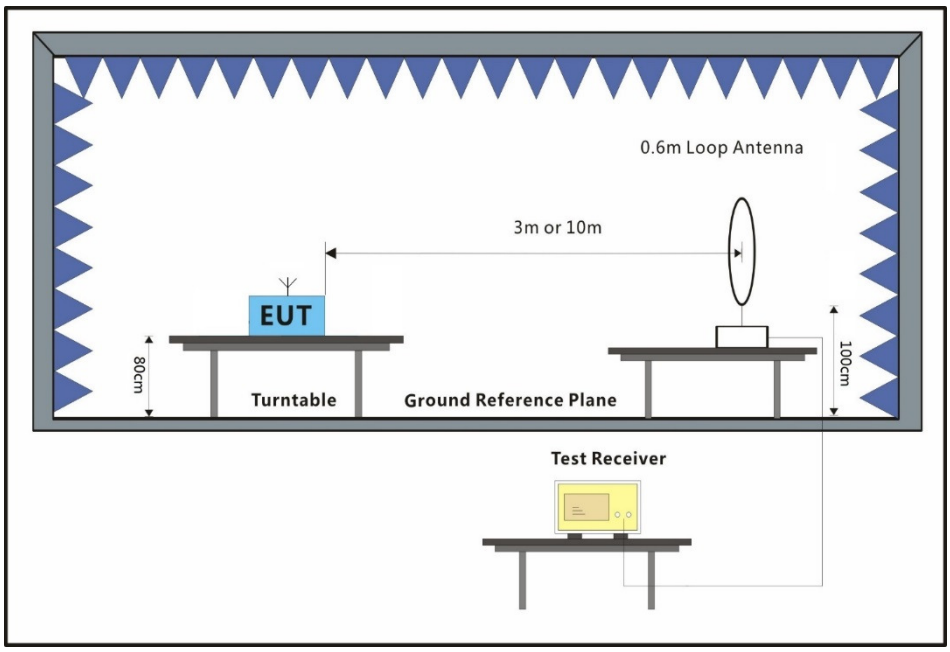
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1020 mbar

a:Normal Working_ Keep EUT working at normal working.

Test mode: Test were conducted in three load modes(low, medium and high load mode) and only the worst case is submitted.

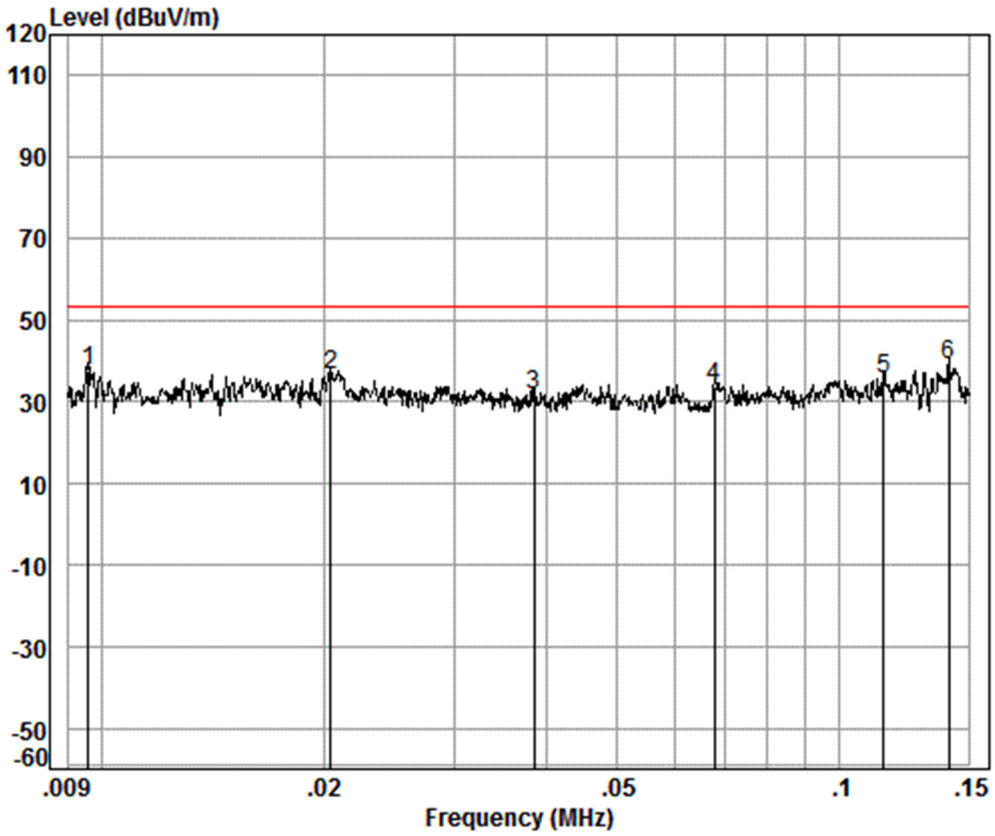
6.1.2 Test Setup Diagram



6.1.3 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.

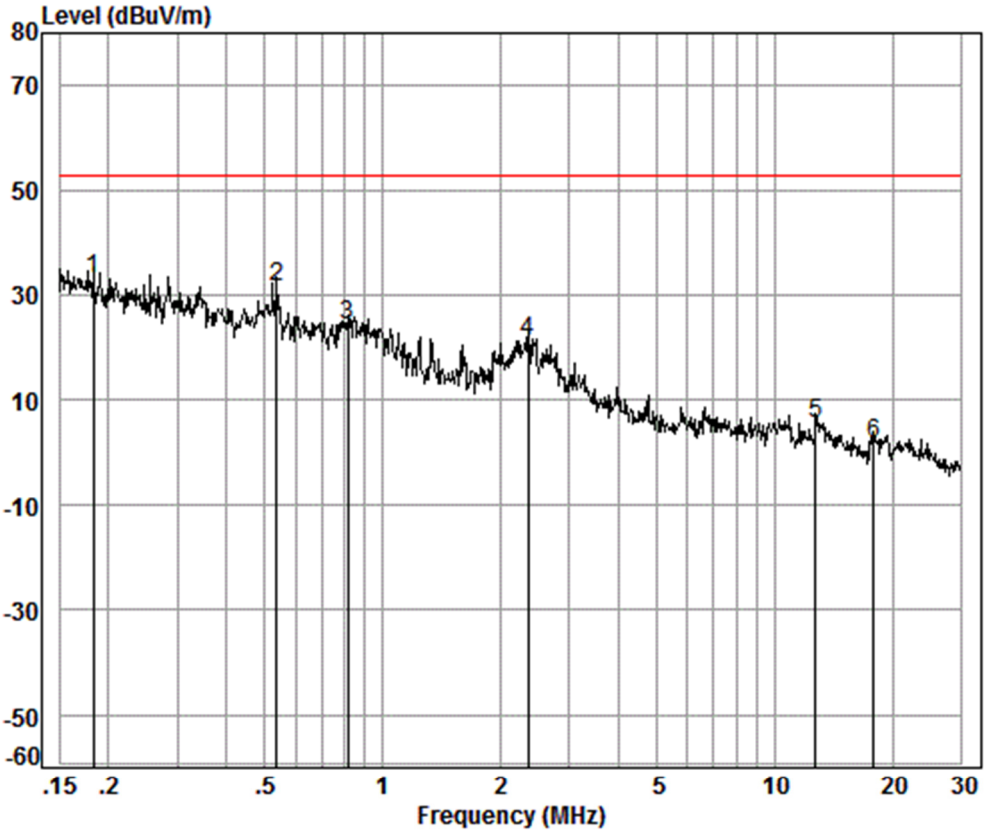
Mode a: (DC 9V, 1.0A)



Condition: 10m
Job No. : 12091CR
Test Mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	0.01	0.29	19.57	32.32	49.98	37.52	53.06	-15.54
2	0.02	0.21	14.93	32.49	53.75	36.40	53.06	-16.66
3	0.04	0.15	13.14	32.50	50.87	31.66	53.06	-21.40
4	0.07	0.09	12.18	32.51	54.00	33.76	53.06	-19.30
5	0.11	0.06	11.90	32.51	56.06	35.51	53.06	-17.55
6 pp	0.14	0.06	11.75	32.50	59.80	39.11	53.06	-13.95

Mode a: (DC 9V, 1.0A)



Condition: 10m
Job No. : 12091CR
Test Mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	0.18	0.07	11.82	32.51	53.81	33.19	53.06	-19.87
2	0.54	0.12	11.75	32.49	52.15	31.53	53.06	-21.53
3	0.81	0.19	12.00	32.46	44.42	24.15	53.06	-28.91
4	2.35	0.35	12.14	32.46	41.18	21.21	53.06	-31.85
5	12.72	0.55	10.52	32.50	26.97	5.54	53.06	-47.52
6	17.94	0.64	9.84	32.52	23.98	1.94	53.06	-51.12

Remark:

1: The loop antenna rotated about both Vertical and Horizontal to find the maximum emission, So only the worst position(Horizontal) was report.

2: According to the clause 2.3 of MP-5:1986, the hightest frequency is 205kHz, So the Range of frequency measurements is 9kHz to 30MHz.

The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

$L_{300} / L_{10} = D_{10} / D_{300}$

Note:

L_{300}: Level @ 300m distance. Unit: uV/m;

L_{10}: Level @ 10m distance. Unit: uV/m;

D_{300}: 300m distance. Unit: m

D_{10}: 10m distance. Unit: m

The level at 300m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 300m (uV/m)	Level @ 300m (dBuV/m)	Limit @ 300m (dBuV/m)	Margin (dB)
0.01	37.52	75.16	2.51	7.99	23.52	-15.53
0.02	36.40	66.07	2.20	6.85	23.52	-16.67
0.04	31.66	38.28	1.28	2.14	23.52	-21.38
0.07	33.76	48.70	1.62	4.19	23.52	-19.33
0.11	35.51	59.57	1.99	5.98	23.52	-17.54
0.14	39.11	59.63	1.99	5.98	23.52	-17.54
0.18	33.19	45.66	1.52	3.64	23.52	-19.88
0.54	31.53	37.71	1.26	2.01	23.52	-21.51
0.81	24.15	16.13	0.54	-5.35	23.52	-28.87
2.35	21.21	11.49	0.38	-8.40	23.52	-31.92
12.72	5.54	1.89	0.06	-24.44	23.52	-47.96
17.94	1.94	1.25	0.04	-27.96	23.52	-51.48

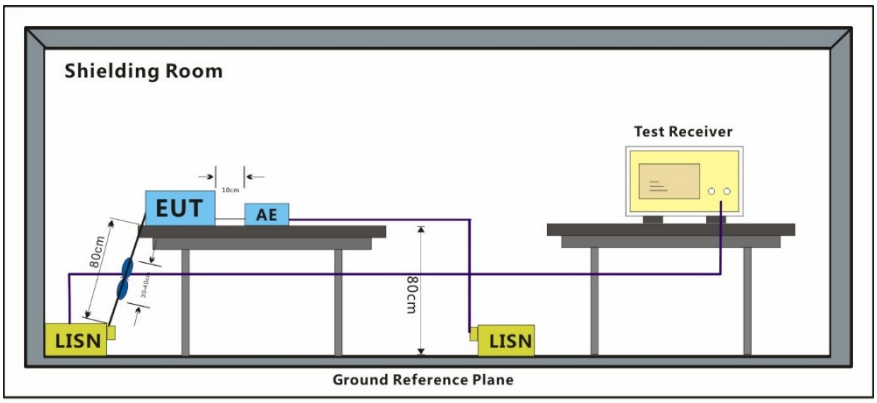
6.1 Conducted Emissions at Mains Terminals (150kHz-30MHz)

Test Requirement: 47 CFR Part 15,Subpart B:2016
Test Method: ANSI C63.4
Frequency Range: 150kHz to 30MHz
Limit:
0.15M-0.5MHz 66dB(μV)-56dB(μV) quasi-peak, 56dB(μV)-46dB(μV) average
0.5M-5MHz 56dB(μV) quasi-peak, 46dB(μV) average
5M-30MHz 60dB(μV) quasi-peak, 50dB(μV) average
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

6.1.1 E.U.T. Operation

Operating Environment:
Temperature: 24 °C Humidity: 35.8 % RH Atmospheric Pressure: 1020 mbar
a:Normal Working_ Keep EUT working at normal working.
Test mode: Test were conducted in three load modes(low, medium and high load mode) and only the worst case is submitted.

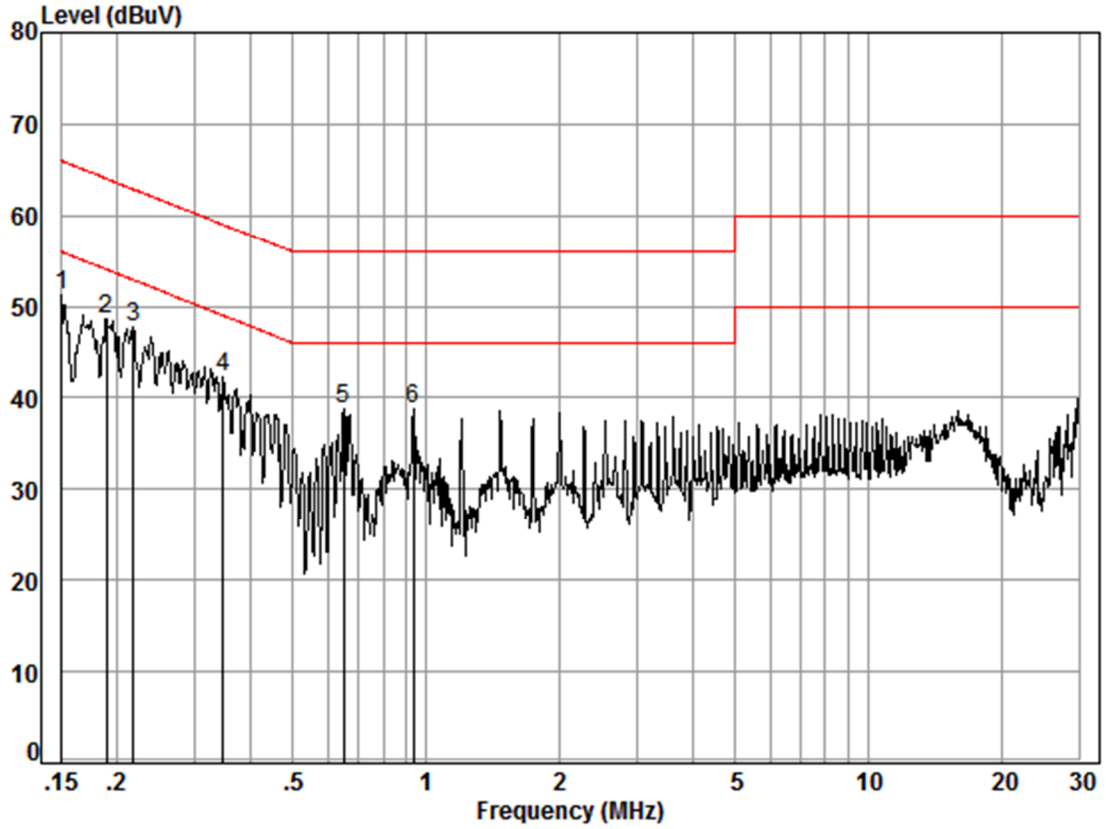
6.1.2 Test Setup Diagram



6.1.3 Measurement Data

An initial pre-scan was performed with peak detector.Quasi-Peak or Average measurement were performed at the frequencies with maximized peak emission were detected.

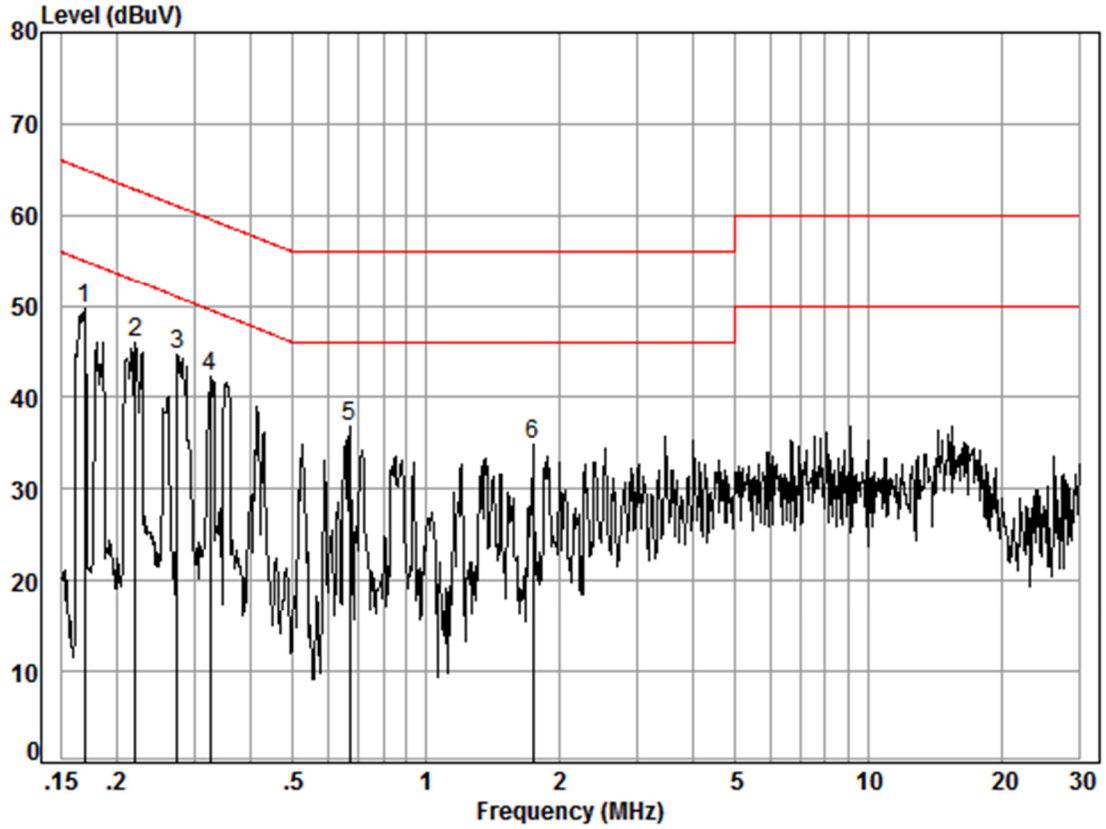
Mode:a; Line:Live Line



Site : Shielding Room
Condition: Line
Job No. : 12091CR
Test mode: a

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15	0.02	9.51	41.80	51.33	56.00	-4.67	Peak
2	0.19	0.02	9.51	39.03	48.56	54.06	-5.50	Peak
3	0.22	0.02	9.50	38.11	47.63	52.88	-5.25	Peak
4	0.35	0.01	9.50	32.81	42.32	49.00	-6.68	Peak
5	0.65	0.02	9.51	29.20	38.73	46.00	-7.27	Peak
6	0.94	0.02	9.49	29.24	38.75	46.00	-7.25	Peak

Mode:a; Line:Neutral Line

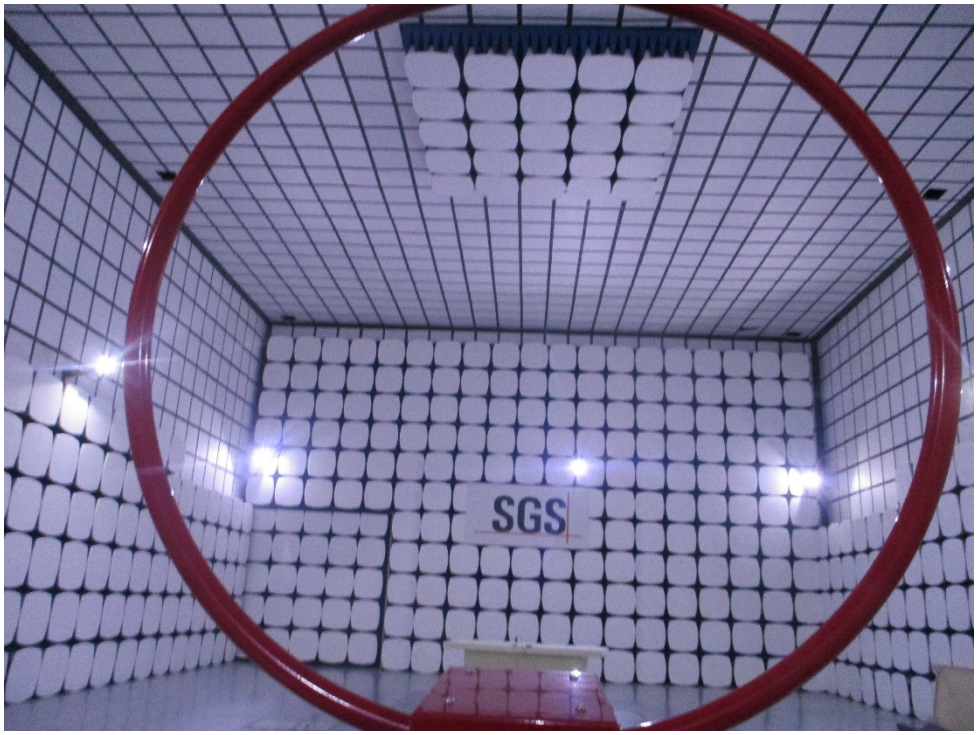


Site : Shielding Room
Condition: Neutral
Job No. : 12091CR
Test mode: a

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.17	0.02	9.59	40.07	49.68	54.99	-5.31	Peak
2	0.22	0.02	9.57	36.32	45.91	52.79	-6.88	Peak
3	0.27	0.01	9.58	35.10	44.69	50.98	-6.29	Peak
4	0.33	0.01	9.58	32.76	42.35	49.57	-7.22	Peak
5	0.67	0.02	9.62	27.15	36.79	46.00	-9.21	Peak
6	1.74	0.02	9.64	25.31	34.97	46.00	-11.03	Peak

7 Photographs

7.1 Radiated Emissions (9kHz-30MHz) Test Setup



7.2 Conducted Emissions at Mains Terminals (150kHz-30MHz) Test Setup

7.3 EUT Constructional Details (EUT Photos)

Refer to EUT external and internal photos.

- End of the Report -