

TEST REPORT

Application No.: SZEM1903011422CR
Applicant: Spigen. Korea Co., Ltd.
Address of Applicant: Spigen HQ-A, 446, Bongeunsa-ro, Gangnam-gu, Seoul, 06153, South Korea.
Manufacturer: Spigen. Korea Co., Ltd.
Address of Manufacturer: Spigen HQ-A, 446, Bongeunsa-ro, Gangnam-gu, Seoul, 06153, South Korea.
Factory: Shenzhen Fang Xin Technology Co., Ltd.
Address of Factory: Rm 2406, 24F, Tower A, Xinghe World, No.1, Yabao Rd, Bantian St, Longgang Dist, Shenzhen, China

Equipment Under Test (EUT):

EUT Name: Fast Wireless Charger
Model No.: F303W
Trade mark: Essential
FCC ID: 2AFKNF303WR1
Standard(s) : 47 CFR Part 18
Date of Receipt: 2019-03-07
Date of Test: 2019-03-08 to 2019-04-20
Date of Issue: 2019-04-23

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


Keny Xu

Keny Xu
EMC Laboratory Manager





Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2019-04-23		Original

Authorized for issue by:			
			
		<hr/>	
		Powell Bao /Project Engineer	
			
		<hr/>	
		Eric Fu /Reviewer	





2 Test Summary

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted disturbance	47 CFR Part 18	FCC MP-5	Part 18.307	Pass
Radiated emission	47 CFR Part 18	FCC MP-5	Part 18.305	Pass



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4 General Information

4.1 Details of E.U.T.

Power supply:	Input: DC9V1.67A, DC12V1.5A Output: 5W/7.5W/10W
Cable:	USB Cable(Unshielded, 120cm)
Antenna Type:	Inductive Loop Coil Antenna
Modulation Type:	Load Modulation
Operation Frequency:	110.08kHz to 146.80kHz
Remark:	This device has been tested with the horizontal positioning and vertical positioning and all three load modes, the worse status(10W) was vertical positioning had been recorded in the report.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	XIAOMI (Provided by client)	MDY-10-EH Input: AC100-240V,50/60Hz, 0.7A Output: DC5V,3A; DC9V,3A; DC12V,2.25A; DC20V, 1.35A	N/A
iPhone 8	Apple	A1863	F4GVQ656JC6D
Mobile phone	SAMSUNG	SM-G9500	R28J9140LPB

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Conduction Emission	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
3	Occupied Bandwidth	$\pm 3\%$
4	Radiated Spurious emission test	$\pm 4.5\text{dB}$ (Below 1GHz)
		$\pm 4.8\text{dB}$ (Above 1GHz)
5	Temperature test	$\pm 1^\circ\text{C}$
6	Humidity test	$\pm 3\%$
7	Supply voltages	$\pm 1.5\%$
8	Time	$\pm 3\%$

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.

- **Innovation, Science and Economic Development Canada**

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

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted disturbance					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ChangZhou ZhongYu	GB-88	SEM001-06	2017-05-10	2020-05-09
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018-07-12	2019-07-11
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018-09-25	2019-09-24
LISN	ETS-LINDGREN	3816/2	SEM007-02	2018-04-02	2019-04-01
				2019-04-01	2020-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2018-04-02	2019-04-01
				2019-04-01	2020-03-31

Radiated emission					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2018-07-12	2019-07-11
EMI Test Receiver (9kHz-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2018-04-02	2019-04-01
				2019-04-01	2020-03-31
Trilog-Broadband Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2016-06-29	2019-06-28
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2018-04-13	2019-04-12
				2019-04-12	2020-04-11
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

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	2018-09-27	2019-09-26
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2018-09-27	2019-09-26
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2018-09-27	2019-09-26
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2018-04-05	2019-04-04
				2019-04-04	2020-04-03



6 Radio Spectrum Matter Test Results

6.1 Conducted disturbance

Test Requirement Part 18.307
Test Method: FCC MP-5
Limit:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	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.

6.1.1 E.U.T. Operation

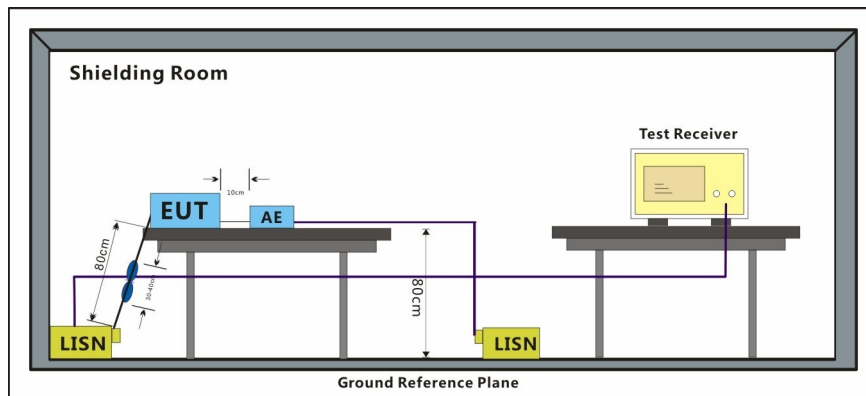
Operating Environment:

Temperature: 21.2 °C Humidity: 58 % RH Atmospheric Pressure: 1015 mbar

Pretest these modes to find the worst case:
a: Charge mode_Keep the EUT charging(5W)
b: Charge mode_Keep the EUT charging(7.5W)
c: Charge mode_Keep the EUT charging(10W)

The worst case for final test:
c: Charge mode_Keep the EUT charging(10W)

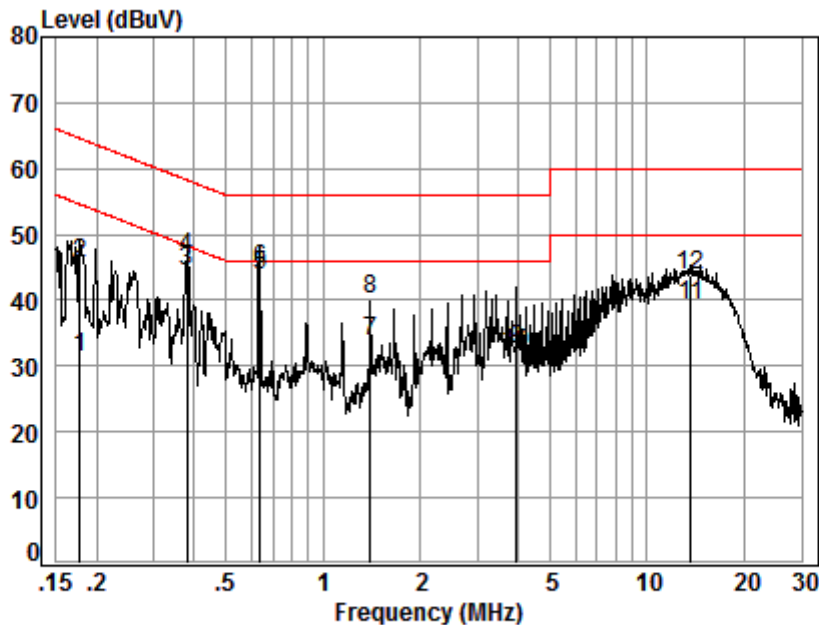
6.1.2 Test Setup Diagram



6.1.3 Measurement Procedure and Data



Mode:c; Line:Live Line

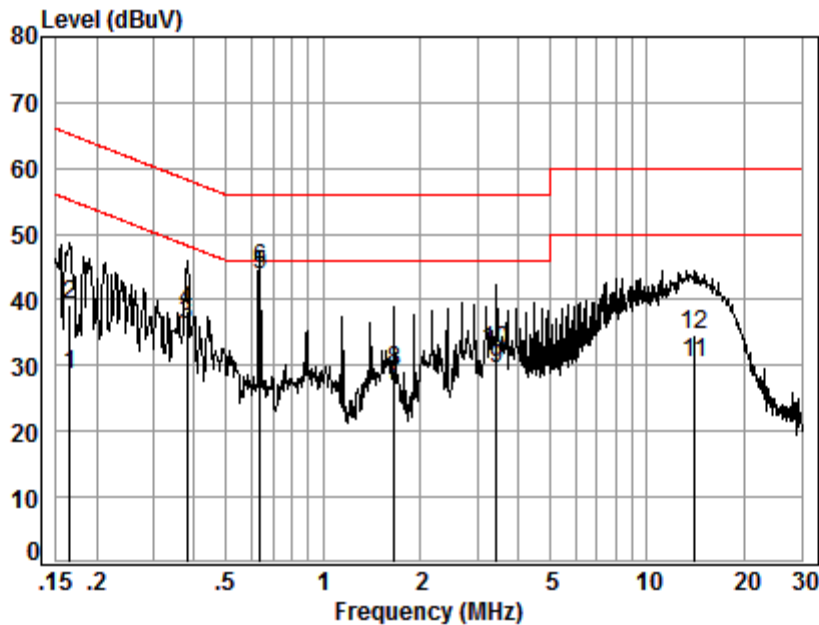


Site : Shielding Room
Condition: Line
Job No. : 11422CR
Test mode: c

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.18	0.02	9.66	21.76	31.44	54.59	-23.15	Average
2	0.18	0.02	9.66	36.01	45.69	64.59	-18.90	QP
3	0.38	0.05	9.67	34.63	44.35	48.25	-3.90	Average
4	0.38	0.05	9.67	36.79	46.51	58.25	-11.74	QP
5	0.64	0.07	9.67	34.14	43.88	46.00	-2.12	Average
6	0.64	0.07	9.67	35.01	44.75	56.00	-11.25	QP
7	1.40	0.12	9.73	23.99	33.84	46.00	-12.16	Average
8	1.40	0.12	9.73	30.21	40.06	56.00	-15.94	QP
9	3.94	0.16	9.72	22.68	32.56	46.00	-13.44	Average
10	3.94	0.16	9.72	22.12	32.00	56.00	-24.00	QP
11	13.62	0.20	10.23	28.74	39.17	50.00	-10.83	Average
12	13.62	0.20	10.23	33.51	43.94	60.00	-16.06	QP



Mode:c; Line:Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 11422CR
Test mode: c

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.17	0.01	9.64	19.08	28.73	55.21	-26.48	Average
2	0.17	0.01	9.64	29.71	39.36	65.21	-25.85	QP
3	0.38	0.05	9.65	26.64	36.34	48.25	-11.91	Average
4	0.38	0.05	9.65	28.75	38.45	58.25	-19.80	QP
5	0.64	0.07	9.64	34.16	43.87	46.00	-2.13	Average
6	0.64	0.07	9.64	35.07	44.78	56.00	-11.22	QP
7	1.65	0.14	9.70	17.20	27.04	46.00	-18.96	Average
8	1.65	0.14	9.70	19.48	29.32	56.00	-26.68	QP
9	3.44	0.16	9.68	19.75	29.59	46.00	-16.41	Average
10	3.44	0.16	9.68	22.43	32.27	56.00	-23.73	QP
11	14.06	0.20	10.29	19.79	30.28	50.00	-19.72	Average
12	14.06	0.20	10.29	24.05	34.54	60.00	-25.46	QP



6.2 Radiated emission

Test Requirement Part 18.305

Test Method: FCC MP-5

Measurement Distance: 3m

Limit:

(b) The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 $25 \times \text{SQRT}(\text{power}/500)$	300 ¹ 300
	Any non-ISM frequency	Below 500 500 or more	15 $15 \times \text{SQRT}(\text{power}/500)$	300 ¹ 300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 (²)	1,600 (²)
Medical diathermy	Any ISM frequency	Any	25	300
	Any non-ISM frequency	Any	15	300
Ultrasonic	Below 490 kHz	Below 500 500 or more	2,400/F(kHz) $2,400/\text{F}(\text{kHz}) \times \text{SQRT}(\text{power}/500)$	300 ³ 300
	490 to 1,600 kHz Above 1,600 kHz	Any Any	24,000/F(kHz) 15	30 30
Induction cooking ranges	Below 90 kHz	Any	1,500	⁴ 30
	On or above 90 kHz	Any	300	⁴ 30

¹Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

²Reduced to the greatest extent possible.

³Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.

⁴Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

6.2.1 E.U.T. Operation

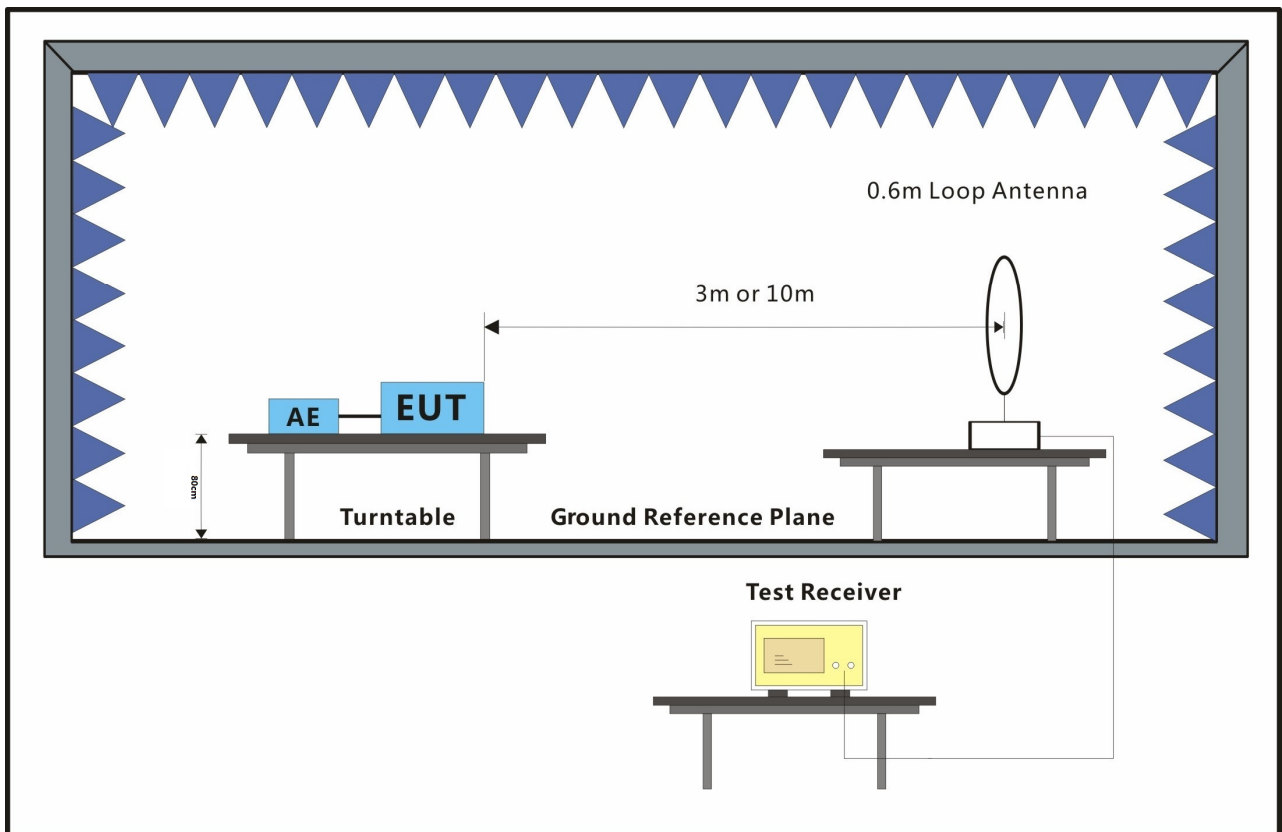
Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar

Pretest these modes to find the worst case:
 a: Charge mode_Keep the EUT charging(5W)
 b: Charge mode_Keep the EUT charging(7.5W)
 c: Charge mode_Keep the EUT charging(10W)

The worst case for final test:
 c: Charge mode_Keep the EUT charging(10W)

6.2.2 Test Setup Diagram

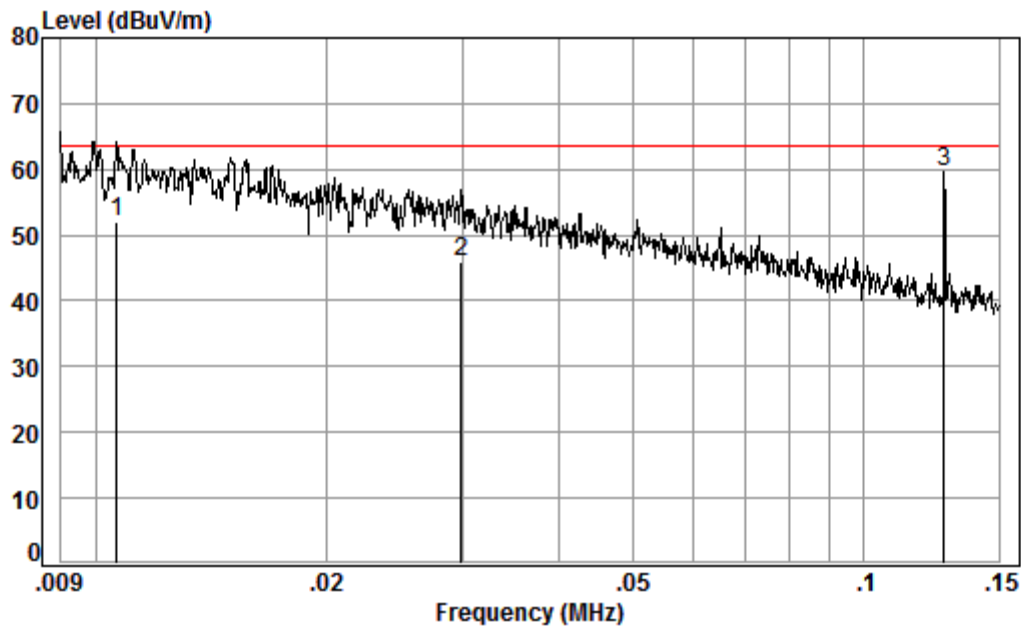


6.2.3 Measurement Procedure and Data

- Test Procedure:
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber(30MHz-1000MHz) and 3 meter semi-anechoic chamber(9kHz-30MHz). The table was rotated 360 degrees to determine the position of the highest radiation.
 - The EUT was set 10 meters(30MHz-1000MHz) and 10 meter (9kHz-30MHz) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
 - Above 30MHz: The Analyzer/Receiver scanned from 30MHz to 1000MHz. 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.
 - Below 30MHz: The Analyzer/Receiver scanned from 9kHz to 30MHz. The antenna height is 2 meters above the ground to determine the maximum value of the field strength.
 - 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 2 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
 - The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
 - 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.
 - Repeat above procedures until all frequencies measured was complete.
 - Measurement Requirement:
 - 1) This product belongs to non-ISM equipment, the field strength limit is 15uV/m at 300 meter distance.
 - 2) Limit: $20\log(15\mu\text{V/m}) + 20\log(300/3) = 23.52 + 40 = 63.52\text{dBuV/m}$ at 3 meters distance.



Mode c:
9kHz-150kHz



Condition: 3m
Job No. : 11422CR
Test Mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	0.28	18.91	31.43	64.36	52.12	63.52	-11.40	Average
2	0.03	0.18	13.86	32.00	63.97	46.01	63.52	-17.51	Average
3 pp	0.13	0.06	11.82	32.67	80.50	59.71	63.52	-3.81	Average

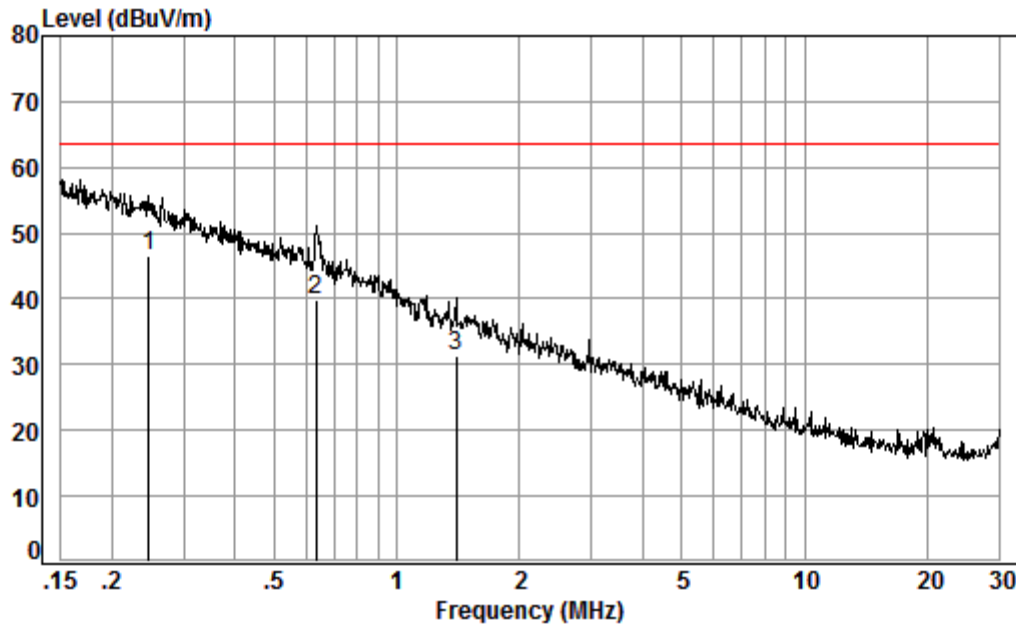


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150kHz-30MHz



Condition: 3m

Job No. : 11422CR

Test Mode: c

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	pp	0.25	0.00	11.99	32.66	67.36	46.69	63.52 -16.83 Average
2		0.63	0.00	11.88	32.65	60.74	39.97	63.52 -23.55 Average
3		1.40	0.00	12.05	32.65	51.88	31.28	63.52 -32.24 Average



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7 Photographs

7.1 Test Setup

Please refer to setup photos.

7.2 EUT Constructional Details (EUT Photos)

Please refer to external and internal photos for details.

- End of the Report -

