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FCC TEST REPORT

Report No: STS1704193F01

Issued for

Spigen Korea Co., Ltd.

N0. 1709 STX-V Tower, 371-37, Gasan-Dong,
GeumCheon-Gu, Seoul, South Korea

Product Name:	Fast Wireless Charger
Brand Name:	
Model Name:	F303W
Series Model:	N/A
FCC ID:	2AFKNF303W
Test Standard:	FCC Part 15 Subpart C

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TEST RESULT CERTIFICATION

Applicant's name : Spigen Korea Co., Ltd.


Address : NO. 1709 STX-V Tower, 371-37, Gasan-Dong, GeumCheon-Gu, Seoul, South Korea

Manufacture's Name : Shenzhen Fang Xin Technology Co.,Ltd.

Address : 27F-JK, ShangbuBuilding, 68, NanYuan, RD, FuTian, SHenZhen,GuangDong, China

Product description

Product name : Fast Wireless Charger

Brand name : 

Model and/or type reference : F303W

Standards : FCC Part 15 Subpart C

Test Procedure : ANSI C63.10-2013

This device described above has been tested by BZT, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of performance of tests: 09 Sep. 2016 ~28 Sep. 2016

Date of Issue : 15 May. 2017

Test Result : **Pass**

Testing Engineer :



(Leo li)

Technical Manager :



(Tony liu)

Authorized Signatory :



(Vita Li)





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**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	15 May. 2017	STS1704193F01	ALL	Initial Issue



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.209	Radiated emission, Spurious Emission	PASS	
15.35	20 dB Bandwidth	PASS	

1.1 TEST FACTORY

BZT Testing Technology Co., Ltd.

Add. : Buliding 17, Xinghua Road Xingwei industrial Park Fuyong,
Baoan District, Shenzhen, Guangdong, China

FCC Registration No.: 701733


1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %** .

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{ dB}$
3	All emissions,radiated(<1G) 30MHz-200MHz	$\pm 2.83\text{dB}$
4	All emissions,radiated(<1G) 200MHz-1000MHz	$\pm 2.94\text{dB}$
5	Temperature	$\pm 0.5^{\circ}\text{C}$
6	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT


Equipment	Fast Wireless Charger
Trade Name	 spigen
Model Name	F303W
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 4
Equipemnt Category	Non-ISM frequency
Operating frequency	111-205KHz
Modulation Type	GFSK
Power Adapter	Input: AC 5V, 2A
Hardware version number	V1.0.1
Software version number	V1.1.2
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.

T est Channel					
Channel	Frequency (KHz)	Channel	Frequency (KHz)	Channel	Frequency (KHz)
01	111	65	175	95	205

3. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	NOTE
1	 spigen	F303W	Coil	NA	

The EUT antenna is Coil Antenna. No antenna other than that furnished by the responsible party shall be used with the device.



4

Channel List					
Channel	Frequency (KHz)	Channel	Frequency (KHz)	Channel	Frequency (KHz)
01	111	33	143	65	175
02	112	34	144	66	176
03	113	35	145	67	177
04	114	36	146	68	178
05	115	37	147	69	179
06	116	38	148	70	180
07	117	39	149	71	181
08	118	40	150	72	182
09	119	41	151	73	183
10	120	42	152	74	184
11	121	43	153	75	185
12	122	44	154	76	186
13	123	45	155	77	187
14	124	46	156	78	188
15	125	47	157	79	189
16	126	48	158	80	190
17	127	49	159	81	191
18	128	50	160	82	192
19	129	51	161	83	193
20	130	52	162	84	194
21	131	53	163	85	195
22	132	54	164	86	196
23	133	55	165	87	197
24	134	56	166	88	198
25	135	57	167	89	199
26	136	58	168	90	200
27	137	59	169	91	201
28	138	60	170	92	202
29	139	61	171	93	203
30	140	62	172	94	204
31	141	63	173	95	205
32	142	64	174		

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	FULL LOAD+Low channel
Mode 2	FULL LOAD +Mid channel
Mode 3	FULL LOAD +High channel
Mode 4	NO LOAD+Low channel
Mode 5	NO LOAD +Mid channel
Mode 6	NO LOAD +High channel

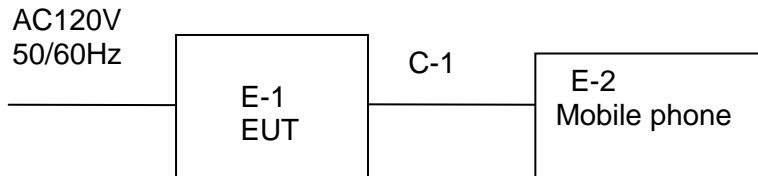
For Conducted Emission	
Final Test Mode	Description
Mode 1	FULL LOAD+Low channel
Mode 2	FULL LOAD +Mid channel
Mode 3	FULL LOAD +High channel
Mode 4	NO LOAD+Low channel
Mode 5	NO LOAD +Mid channel
Mode 6	NO LOAD +High channel

For Radiated Emission	
Final Test Mode	Description
Mode 1	FULL LOAD+Low channel
Mode 2	FULL LOAD +Mid channel
Mode 3	FULL LOAD +High channel
Mode 4	NO LOAD+Low channel
Mode 5	NO LOAD +Mid channel
Mode 6	NO LOAD +High channel

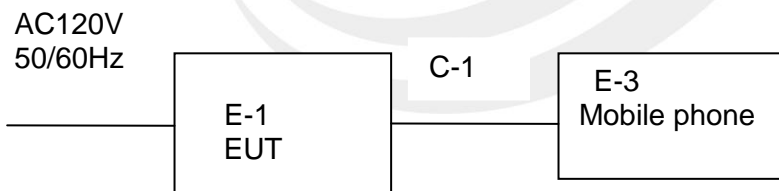
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Conducted Emission Test




Radiated Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-1	Fast Wireless Charger		F303W	N/A	EUT
E-2	Mobile phone	SAMSUNG	GALAXY S6	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	USB Cable (FTP)	NO	50cm	/

Note:

- (1) FCC DOC approved.
- (2) FTP is Foiled Twisted Pair.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Spectrum Analyzer	Agilent	E4407B	MY50140340	2016.10.23	2017.10.22
Test Receiver	R&S	ESCI	101427	2016.10.23	2017.10.22
Bilog Antenna	TESEQ	CBL6111D	34678	2014.11.24	2017.11.23
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2014.11.24	2017.11.23
PreAmplifier	Agilent	8449B	60538	2016.10.23	2017.10.22
Loop Antenna	EMCO	6502	9003-2485	2016.03.06	2019.03.05
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2016.10.23	2017.10.22

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	102086	2016.10.23	2017.10.22
LISN	R&S	ENV216	101242	2016.10.23	2017.10.22
LISN	EMCO	3810/2NM	000-23625	2016.10.23	2017.10.22

3.CONDUCTED EMISSION TEST RESULT(SECTION 15.207)

3.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 15.207 limit in the table below has to be followed.

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

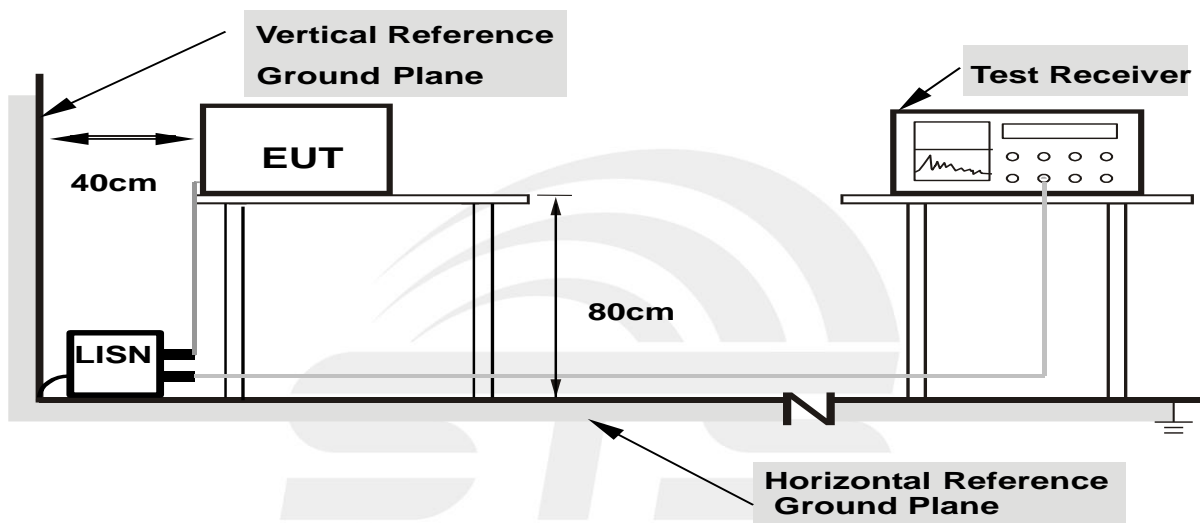
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.5 TEST RESULTS

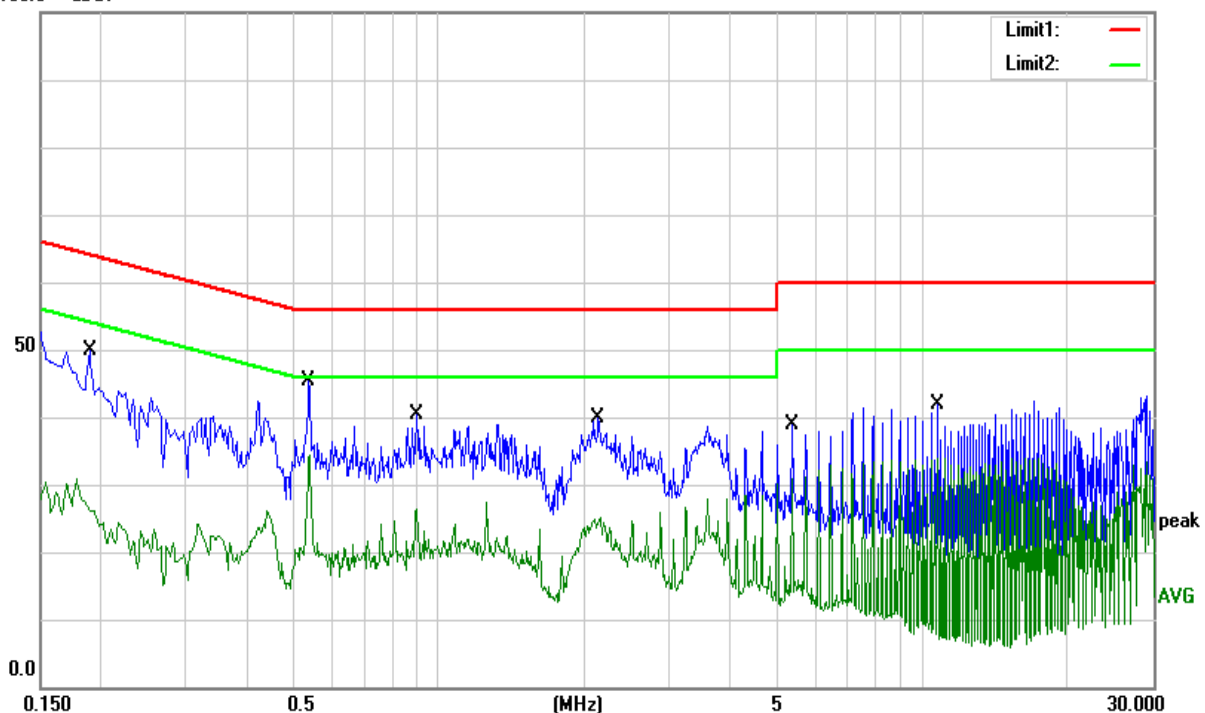
Temperature:	23.1 °C	Relative Humidity:	61%
Pressure:	1010hPa	Phase:	L
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 1/2/3/4/5/6 (Mode1-worst case)

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.1900	40.56	9.23	49.79	64.04	-14.25	QP
2	0.1900	16.83	9.23	26.06	54.04	-27.98	AVG
3	0.5380	36.22	9.16	45.38	56.00	-10.62	QP
4	0.5380	24.78	9.16	33.94	46.00	-12.06	AVG
5	0.9020	31.11	9.25	40.36	56.00	-15.64	QP
6	0.9020	17.20	9.25	26.45	46.00	-19.55	AVG
7	2.1420	30.61	9.26	39.87	56.00	-16.13	QP
8	2.1420	14.96	9.26	24.22	46.00	-21.78	AVG
9	5.3820	29.72	9.27	38.99	60.00	-21.01	QP
10	5.3820	21.52	9.27	30.79	50.00	-19.21	AVG
11	10.7620	32.36	9.41	41.77	60.00	-18.23	QP
12	10.7620	24.34	9.41	33.75	50.00	-16.25	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) – Limit

100.0 dBuV





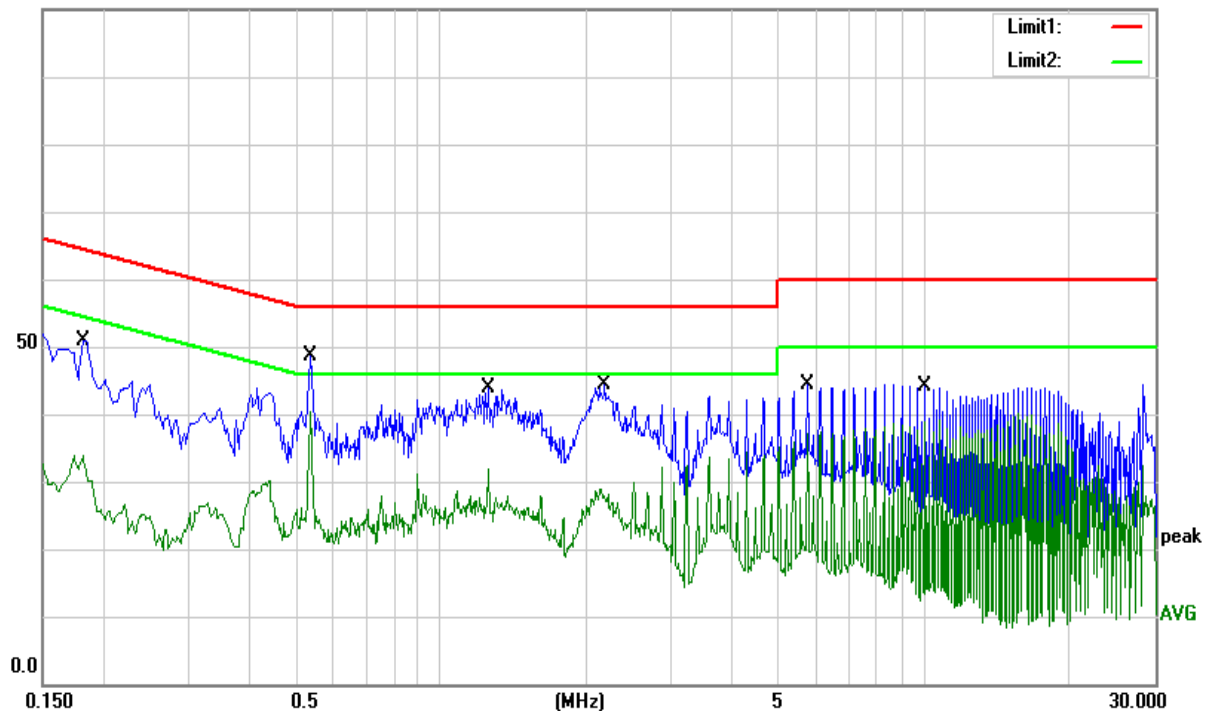
Temperature:	23.1 °C	Relative Humidity:	61%
Pressure:	1010hPa	Phase:	N
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 1/2/3/4/5/6 (Mode1-worst case)

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.1820	41.67	9.23	50.90	64.39	-13.49	QP
2	0.1820	24.22	9.23	33.45	54.39	-20.94	AVG
3	0.5380	39.39	9.16	48.55	56.00	-7.45	QP
4	0.5380	31.20	9.16	40.36	46.00	-5.64	AVG
5	1.2540	34.51	9.25	43.76	56.00	-12.24	QP
6	1.2540	22.28	9.25	31.53	46.00	-14.47	AVG
7	2.1820	35.06	9.26	44.32	56.00	-11.68	QP
8	2.1820	18.72	9.26	27.98	46.00	-18.02	AVG
9	5.7180	35.16	9.27	44.43	60.00	-15.57	QP
10	5.7180	27.75	9.27	37.02	50.00	-12.98	AVG
11	10.0460	34.69	9.40	44.09	60.00	-15.91	QP
12	10.0460	29.49	9.40	38.89	50.00	-11.11	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) - Limit

100.0 dBuV



4. RADIATED& FIELD EMISSION TEST RESULT(SECTIOU 15.209)

4.1 Limit

Frequency [MHz]	Field Strength [uV/m]	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	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

§ 15.209(d)The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

4.2 TEST PROCEDURE

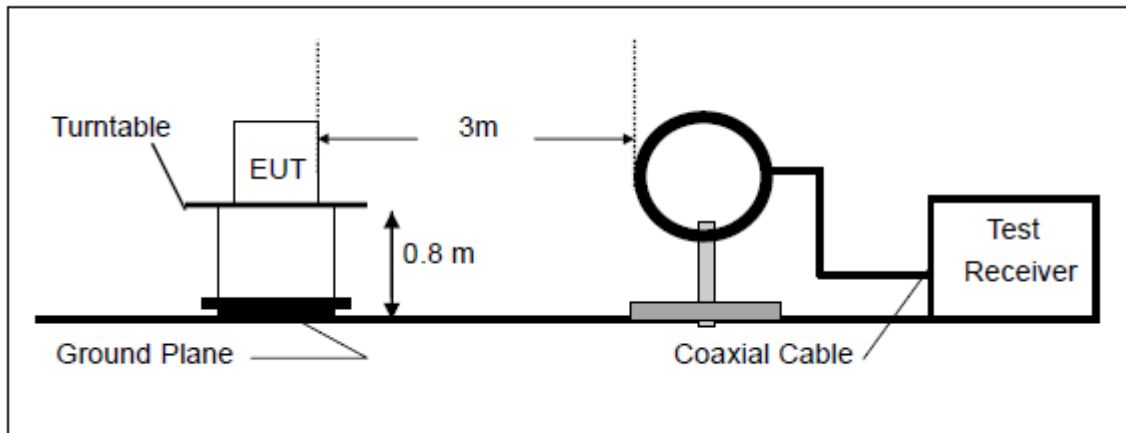
- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- d. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

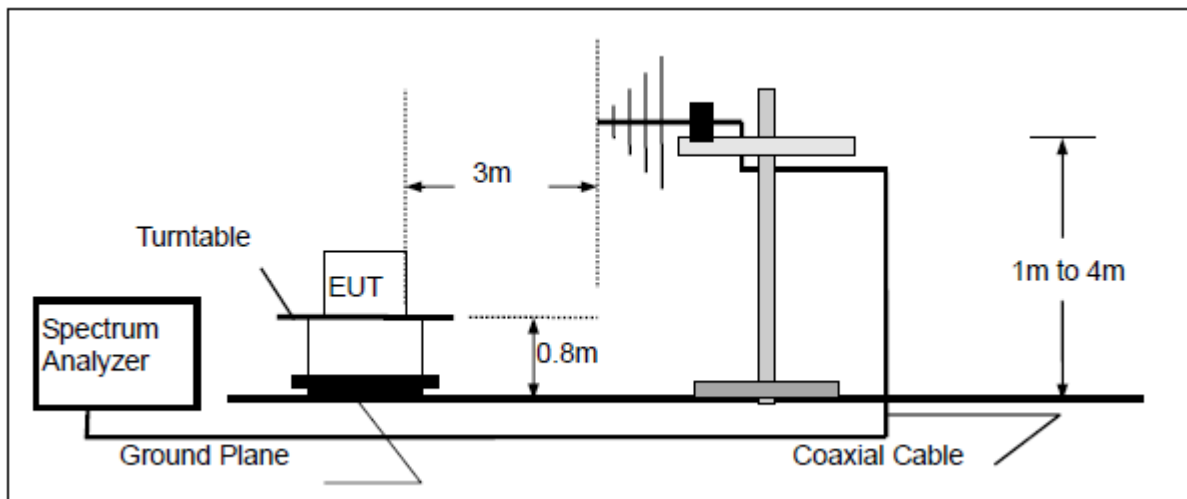
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

4.3 TEST SETUP

(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz





4.4 TEST RESULTS

Temperature :	23.1 °C	Relative Humidity :	61%
Pressure :	1012 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	Mode 1/2/3/4/5/6(Mode1-worst case)		

4.4.1 Spurious Radiated Emission Below 30 MHz

Frequency	Reading	Detector	Ant. Factor	Cable	Emission	Limits	Margin
(KHz)	(dBμV)	(PK/QP/AV)	(dB/m)	Loss	Level (dBμV/m)	(dBμV/m)	(dB)
9	66.23	PK	28.16	0.1	94.49	148.52	-54.03
9	58.67	AV	28.16	0.1	86.93	128.52	-41.59
54	68.25	PK	27.21	0.1	95.56	132.95	-37.39
54	57.36	AV	27.21	0.1	84.67	112.95	-28.28
72	65.32	PK	21.32	0.1	86.74	130.46	-43.72
72	56.14	AV	21.32	0.1	77.56	110.46	-32.90
95	63.25	PK	20.25	0.1	83.60	128.05	-44.45
95	55.47	AV	20.25	0.1	75.82	108.05	-32.23
111	89.36	PK	10.04	0.1	99.50	126.78	-27.28
111	80.96	AV	10.04	0.1	91.10	106.78	-15.68
175	90.15	PK	9.57	0.1	99.82	122.74	-22.92
175	82.35	AV	9.57	0.1	92.02	102.74	-10.72
205	91.74	PK	9.43	0.1	101.27	121.37	-20.10
205	82.16	AV	9.43	0.1	91.69	101.37	-9.68
554	53.13	QP	-16.36	0.1	36.87	72.73	-35.86
23214	41.22	QP	-17.9	0.9	24.22	53.98	-29.76

1. “*” Means Fundamental frequency

2. Emission Level [dBμV/m] = Reading [dBμV] + Ant. Factor [dB/m] + Cable Loss [dB]

3. Margin [dB] = Emission Level [dBμV/m] – Limit [dBμV/m]

4. Limit calculation: Limit at specified distance + $40\log(300/3)$ = Limit + 80 dB for up to 0.49 MHz

Limit at specified distance + $40\log(30/3)$ = Limit + 40 dB for above 0.49 MHz, Below 30 MHz



4.4.2 Spurious Radiated Emission below 1 GHz

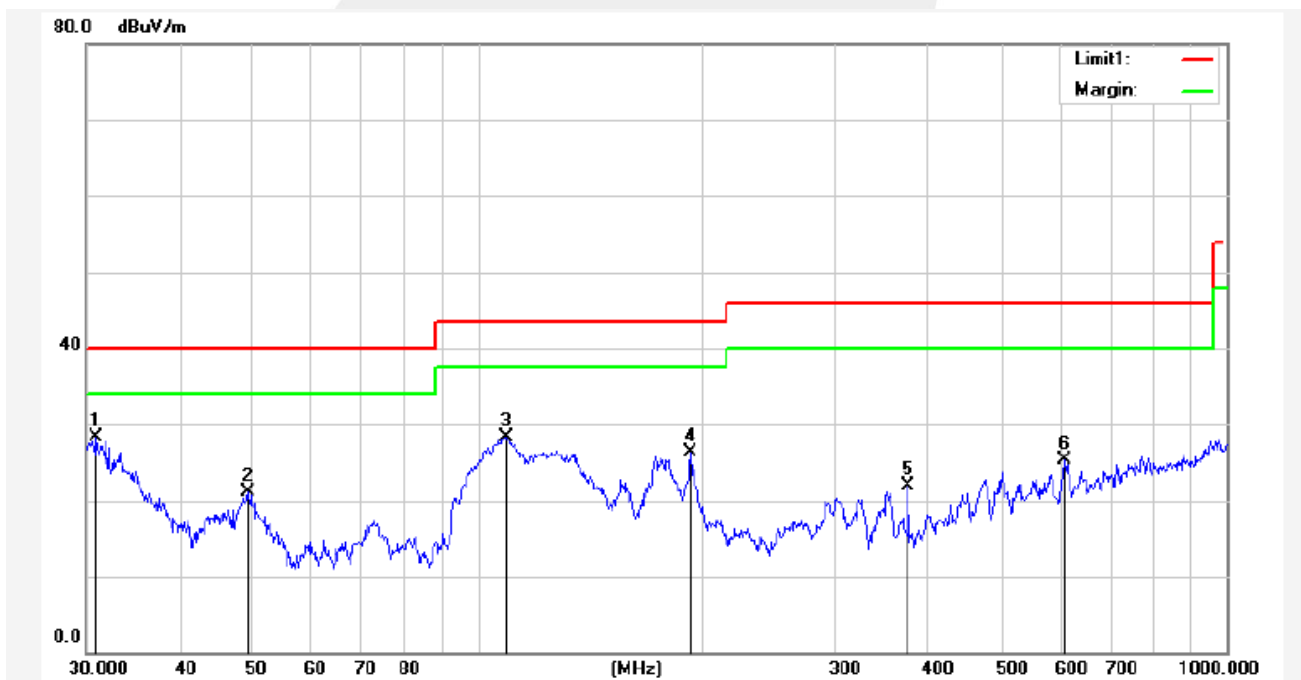
Temperature :	26℃	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 5V
Test Mode :	Mode 1/2/3/4/5/6(Mode1-worst case)		

The following table shows the highest levels of radiated emissions on polarizations of vertical

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
30.9620	39.94	-11.68	28.26	40.00	-11.74	QP
49.3594	42.29	-21.15	21.14	40.00	-18.86	QP
109.0286	46.80	-18.42	28.38	43.50	-15.12	QP
192.4186	46.50	-20.24	26.26	43.50	-17.24	QP
375.9385	34.57	-12.73	21.84	46.00	-24.16	QP
607.7867	32.23	-6.89	25.34	46.00	-20.66	QP

Remark: Horizontal

1. Margin = Result (Result =Reading + Factor)-Limit





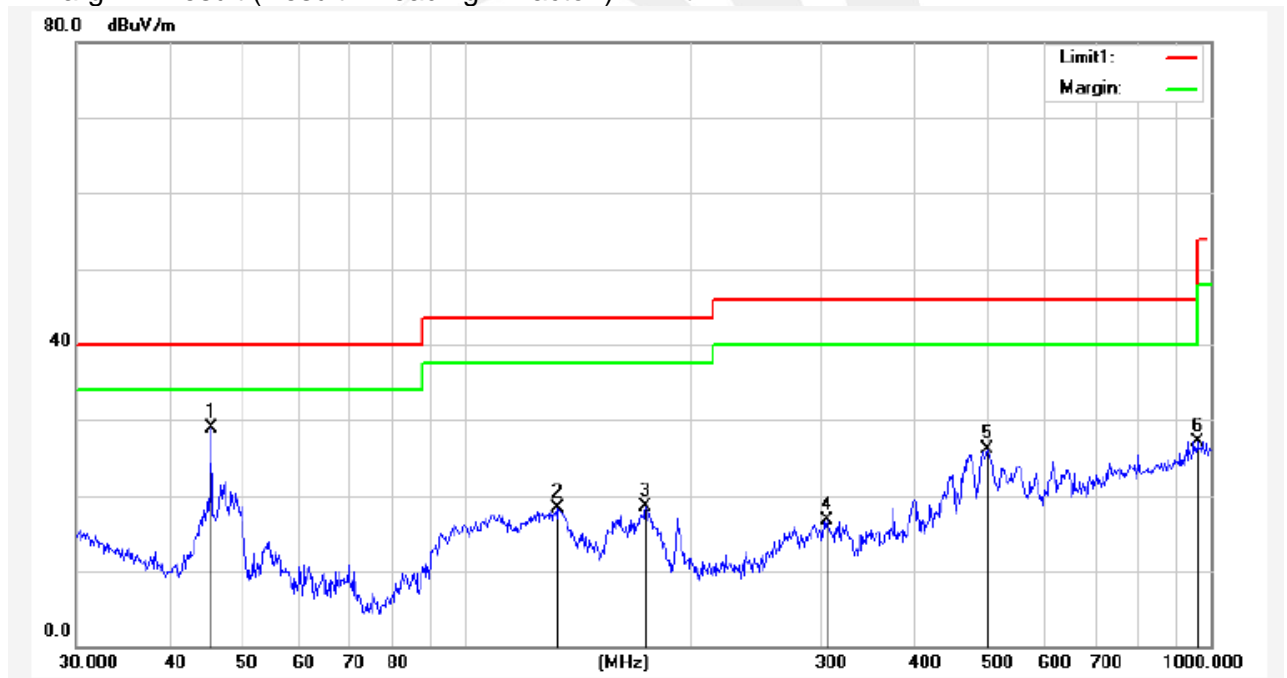
Temperature :	26 °C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 5V
Test Mode :	Mode 1/2/3/4/5/6(Mode1-worst case)		

The following table shows the highest levels of radiated emissions on polarizations of horizontal

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
45.5348	48.18	-19.18	29.00	40.00	-11.00	QP
133.1511	35.92	-17.54	18.38	43.50	-25.12	QP
174.4241	37.85	-19.38	18.47	43.50	-25.03	QP
305.6800	31.32	-14.63	16.69	46.00	-29.31	QP
501.1790	34.94	-8.90	26.04	46.00	-19.96	QP
958.7943	27.35	-0.16	27.19	46.00	-18.81	QP

Remark: Vertical

1. Margin = Result (Result =Reading + Factor)–Limit





5. 20 DB BANDWIDTH TEST

5.1 Limit

FCC Part 2.1049, Only applicable to report.

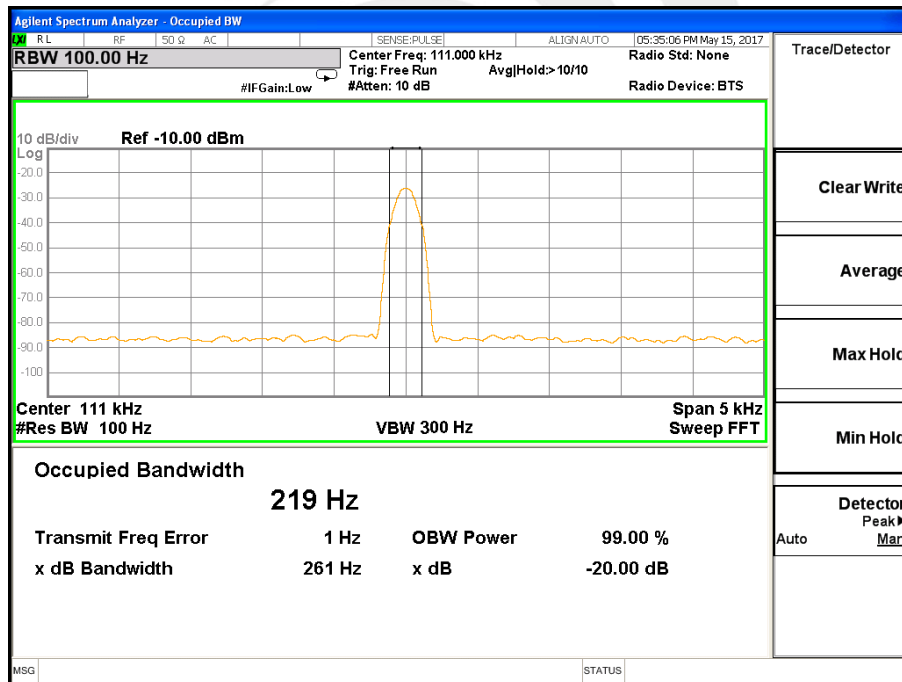
5.2 TEST SETUP

The test program and configuration, Refer to 4.2 and 4.3

5.3 TEST RESULTS

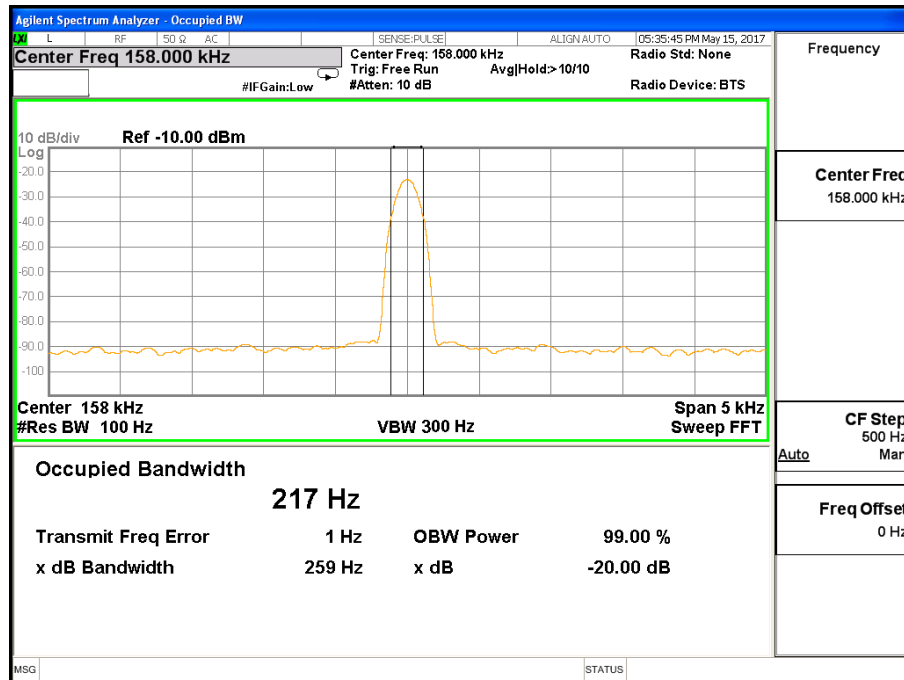
OperatingFrequency (kHz)	20 dB Bandwidth(Hz)
111	261
158	259
205	258

CH01

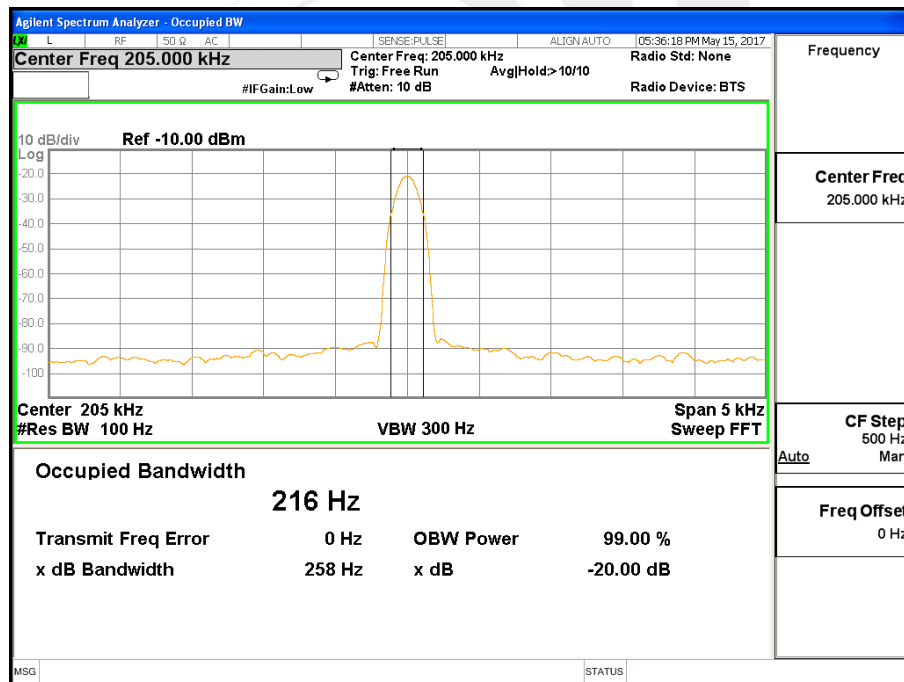




CH48

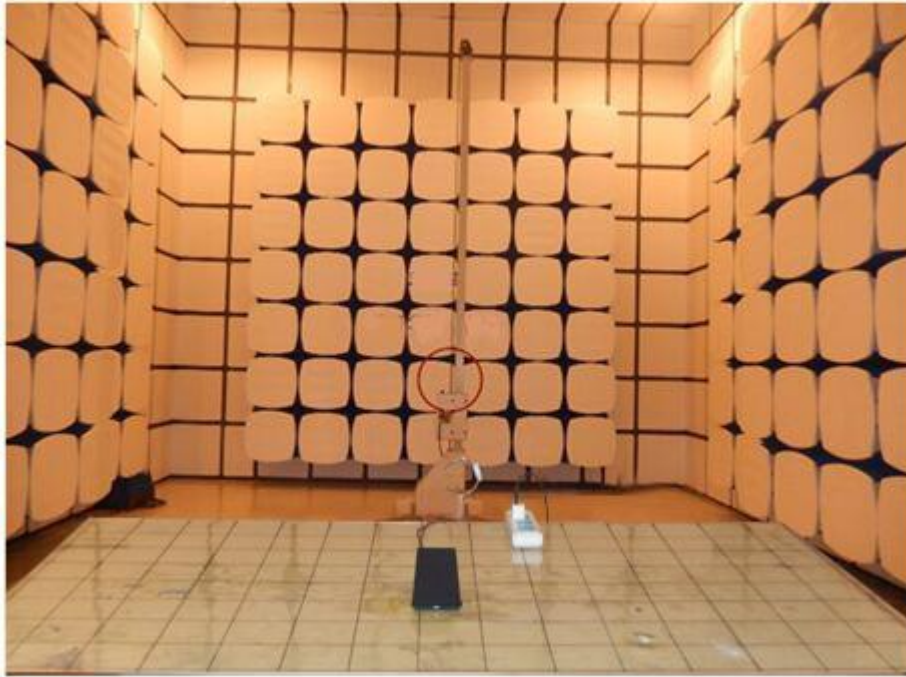


CH95

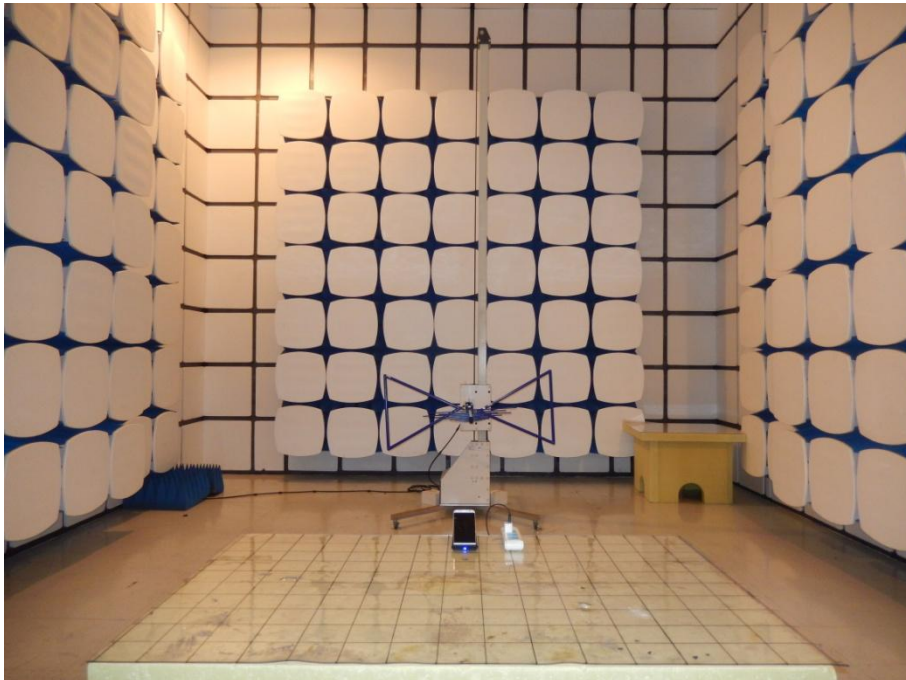


APPENDIX-PHOTOS OF TEST SETUP

Radiated emission Measurement Photos(9KHz-30MHz)



Radiated emission Measurement Photos(30MHz-1000MHz)



Conduction Measurement Photos



※※※※※END OF THE REPORT※※※※※