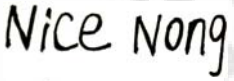
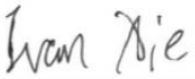
Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 E-mail: ctl@ctl-lab.com

FCC PART 15 SUBPART C TEST REPORT

Report Reference No.....:	**CTL1903153021-WF**	
Compiled by (position+printed name+signature)..:	Happy Guo (File administrators)	
Name of the organization performing the tests (position+printed name+signature)..:	Nice Nong (Test Engineer)	
Approved by (position+printed name+signature)..:	Ivan Xie (Manager)	
Test Firm .....:	**Shenzhen CTL Testing Technology Co., Ltd.**	
Address .....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055	
Applicant's name.....:	**Spigen Korea Co., Ltd**	
Address .....:	Spigen HQ-A, 446, Bongeunsa-ro, Gangnam-gu, Seoul, 06153, South Korea	
Test specification:		
Standard .....:	FCC Part 15C	
Master TRF.....:	Dated 2011-01	
Test item description .....:	Wireless Charging Dock	
FCC ID……..:	2AFKNF309W	
Trade Mark .....:	Spigen	
Model/Type reference.....:	F309W	
Transmit Frequency.....:	115~205 KHz	
Antenna type .....:	Loop antenna	
Date of receipt of test item .....:	Jul. 01, 2019	
Date of sampling.....:	Jul. 01, 2019	
Date of Test Date .....:	Jul. 01, 2019–Jul. 16, 2019	
Data of Issue .....:	Jul. 17, 2019	
Result.....:	**Pass**	

TEST REPORT

Test Report No. :	CTL1903153021-WF	Jul. 17, 2019 Date of issue

Equipment under Test	:	Wireless Charging Dock
Type / Model(s)	:	F309W
Applicant	:	**Spigen Korea Co., Ltd**
Address	:	Spigen HQ-A, 446, Bongeunsa-ro, Gangnam-gu, Seoul, 06153, South Korea
Manufacturer	:	**Shenzhen Cheng Hui Da Electronics Co., Ltd**
Address	:	7th building, Fuqiao 5th industrial area, Qiaotou community, Fuyong town, Shenzhen China 518103

Test Result according to the standards on page 4:	**Positive**

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.207,15.209, 15.215(c)

ANSI C63.10-2013

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jul. 01, 2019
Testing commenced on	:	Jul. 01, 2019
Testing concluded on	:	Jul. 16, 2019

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 5V from USB

2.3. Short description of the Equipment under Test (EUT)

A Wireless Charging Dock work frequency range 115-205 KHz.
For more details, refer to the user's manual of the EUT.
Serial number:F309W

2.4. EUT operation mode

The charger support DC 5V/2A and DC 9V/2A input modes, this 2 modes all have been tested, only worse case was reported. worse case is DC 5V/2A input with iPhone mobile mode.

2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

○ - supplied by the manufacturer
● - supplied by the lab

o USB Cable	Manufacturer:	Shenzhen Cheng Hui Da Electronics Co., Ltd
	Length.:	1.5m
● Notebook PC	Manufacturer:	DELL
	Model:	Inspiron 3180
● Mobile phone	Manufacturer:	SAMSUNG
	Model:	S7 edge
	Manufacturer:	Apple Inc.
	Model:	iPhone XR

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AFKNF309W** fileing to comply with FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. Summary of Test Results

The test summary of the EUT listed as below:

	Test Standards	Test Result
Electric Field Radiated Emissions	FCC Part 15 C (Section15.209)	PASS
20dB Bandwidth/99% Bandwidth	FCC Part 15 C (Section15.215(c))	PASS
Conducted Emissions	FCC Part 15 C (Section15.207)	PASS

Remark: The measurement uncertainty is not included in the test result.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

3.2. Test Facility

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

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9518B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9518B on Jan. 22, 2019.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested

may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	±3.70dB	(1)
Radiated Emission	30~1000MHz	±4.10dB	(1)
Radiated Emission	Above 1GHz	±4.32dB	(1)
Conducted Disturbance	0.15~30MHz	±3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Equipments Used during the Test

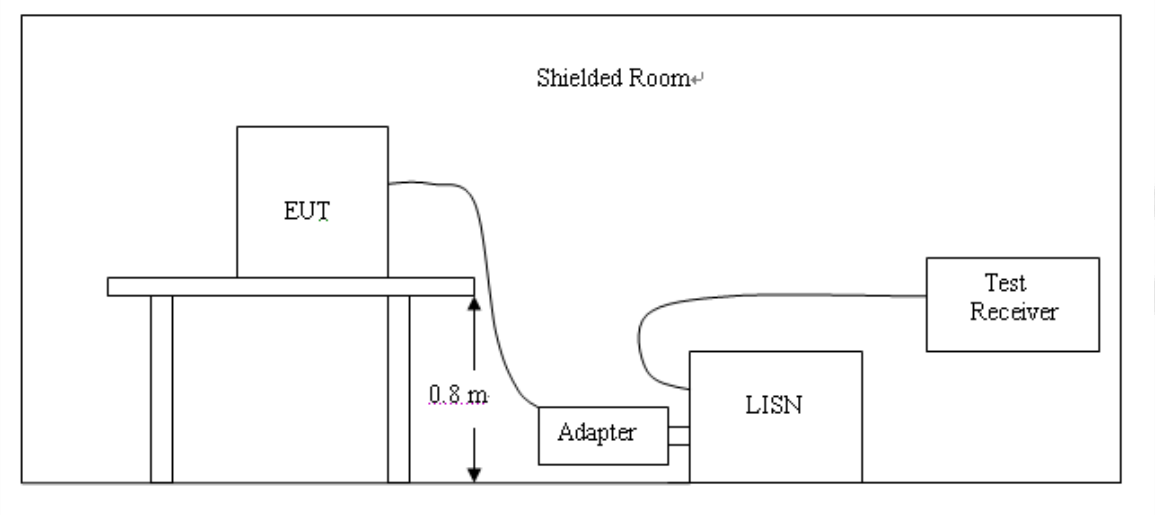
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.12	2019/05/24	2020/05/23
LISN	R&S	ESH2-Z5	860014/010	2019/05/24	2020/05/23
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2019/05/24	2020/05/23
EMI Test Receiver	R&S	ESCI	1166.5950.03	2019/05/24	2020/05/23
Spectrum Analyzer	Agilent	E4407B	MY41440676	2019/05/24	2020/05/23
Spectrum Analyzer	Agilent	N9020	US46220290	2019/05/24	2020/05/23
Controller	EM Electronics	EM 1000	060859	2019/05/24	2020/05/23
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2019/05/24	2020/05/23
Active Loop Antenna	Da Ze	ZN30900A	/	2019/05/24	2020/05/23
Amplifier	Agilent	8449B	3008A02306	2019/05/24	2020/05/23
Amplifier	Agilent	8447D	2944A10176	2019/05/24	2020/05/23
Temperature/Humidity Meter	Gangxing	CTH-608	02	2019/05/24	2020/05/23
High-Pass Filter	micro-tranics	HPM50108	G174	2019/05/24	2020/05/23
High-Pass Filter	micro-tranics	HPM50111	G142	2019/05/24	2020/05/23
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2019/05/24	2020/05/23
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2019/05/24	2020/05/23
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2019/05/24	2020/05/23
RF Cable	Megalon	RF-A303	N/A	2019/05/24	2020/05/23

The calibration interval was one year

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received DC5V power from USB port of PC, PC received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

AC Power Conducted Emission Limit

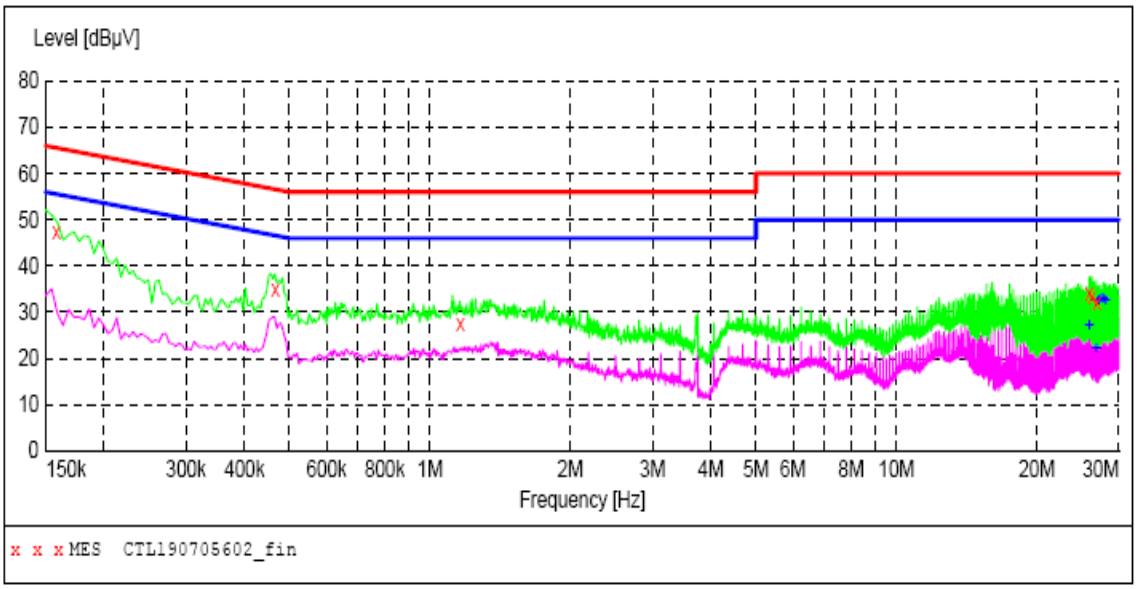
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL190705602_fin"

2019-7-5 03:45??

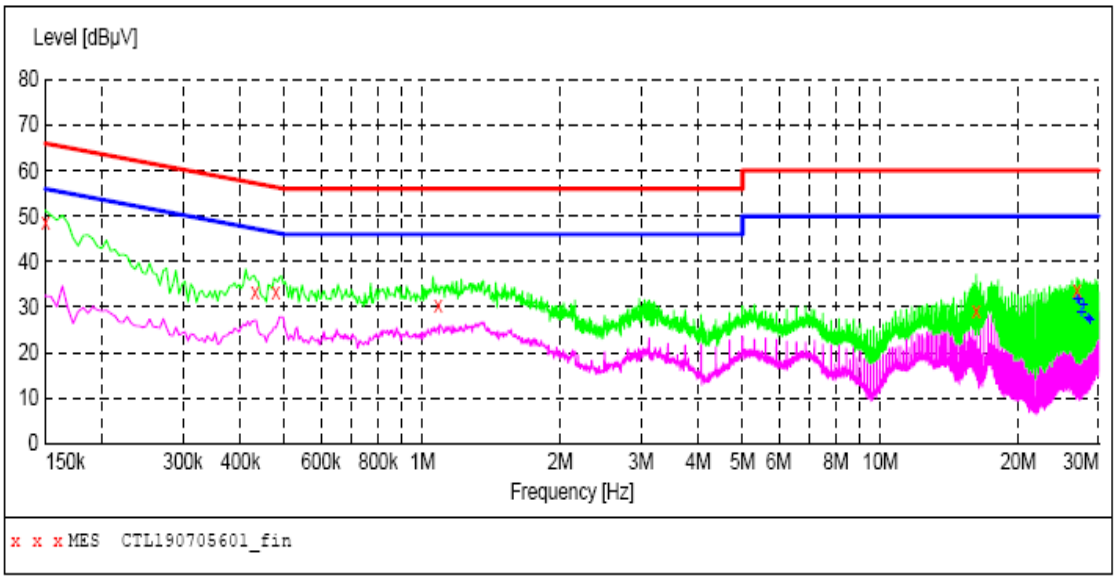
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.158000	47.20	11.2	66	18.4	QP	L1	GND
0.466000	35.10	11.2	57	21.5	QP	L1	GND
1.160000	27.50	11.3	56	28.5	QP	L1	GND
25.922000	34.20	11.6	60	25.8	QP	L1	GND
26.234000	33.40	11.6	60	26.6	QP	L1	GND
26.858000	32.20	11.7	60	27.8	QP	L1	GND

MEASUREMENT RESULT: "CTL190705602_fin2"

2019-7-5 03:45??

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
25.922000	27.20	11.6	50	22.8	AV	L1	GND
26.858000	22.00	11.7	50	28.0	AV	L1	GND
27.176000	32.60	11.7	50	17.4	AV	L1	GND
27.488000	32.80	11.7	50	17.2	AV	L1	GND
27.800000	32.90	11.7	50	17.1	AV	L1	GND
28.112000	32.30	11.7	50	17.7	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL190705601_fin"

2019-7-5 03:42??

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	48.80	11.2	66	17.2	QP	N	GND
0.430000	33.10	11.2	57	24.2	QP	N	GND
0.478000	33.40	11.2	56	23.0	QP	N	GND
1.082000	30.20	11.3	56	25.8	QP	N	GND
16.208000	29.00	11.2	60	31.0	QP	N	GND
26.870000	33.60	11.7	60	26.4	QP	N	GND

MEASUREMENT RESULT: "CTL190705601_fin2"

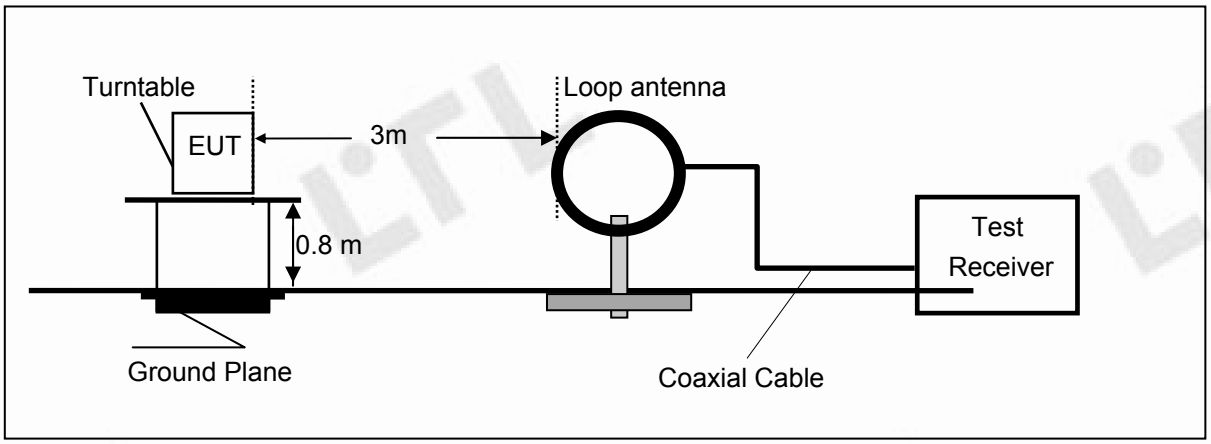
2019-7-5 03:42??

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
26.870000	31.80	11.7	50	18.2	AV	N	GND
27.182000	31.50	11.7	50	18.5	AV	N	GND
27.488000	28.60	11.7	50	21.4	AV	N	GND
27.800000	30.40	11.7	50	19.6	AV	N	GND
28.424000	27.30	11.7	50	22.7	AV	N	GND
28.736000	27.00	11.7	50	23.0	AV	N	GND

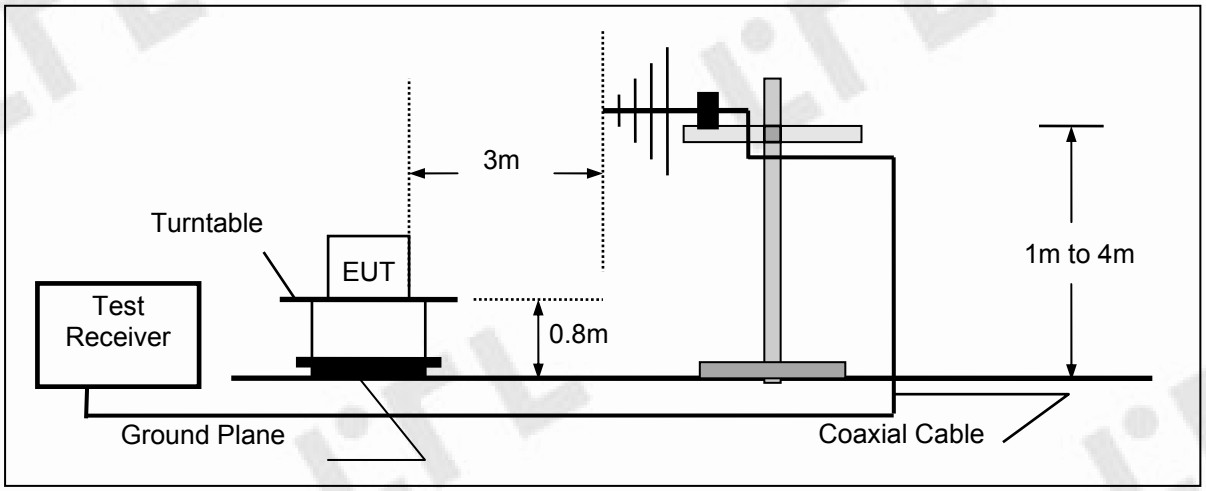
4.2. Radiated Emission

TEST CONFIGURATION

Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0 degree to 360 degrees to acquire the highest emissions from EUT
3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4 Repeat above procedures until all frequency measurements have been completed.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL – AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

RADIATION LIMIT

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

9k~30MHz:

Frequency Range (MHz)	E-field Strength Limit @ 30m (mV/m)	E-field Strength Limit @ 3m (dBμV/m)
0.009-0.490	2400/F(kHz)	129-94
0.490-1.705	24000/F(kHz)	74-63
1.705-30	30	70
Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula: $\text{Extrapolation(dB)} = 40\log_{10}(\text{Measurement Distance}/\text{Specification Distance})$		

Note:
(1) The tighter limit shall apply at the edge between two frequency bands.
(2) dBuV/m = 20*log(uV/m)

30M~1GHz:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

Note:
(1) The tighter limit shall apply at the edge between two frequency bands.
(2) Distance refers to the distance in meters between the test instrument antenna and the closest point of any part of the E.U.T.

TEST RESULTS

WORST-CASE RADIATED EMISSION BELOW 30 MHz

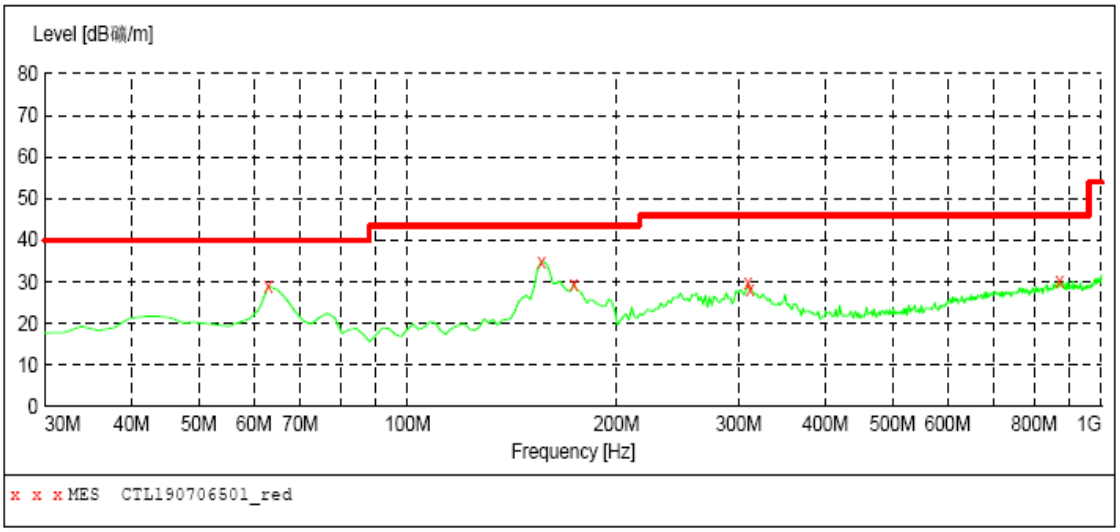
Frequency	Reading	Polar	Antenna Factor	Cable Loss	Emission Levels	Limits at 3m	Detector Mode
(MHz)	(dBμV/m)	Loop	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	
0.136(F)	59.45	Loop	23.64	0.01	83.10	105.81	PK
0.136(F)	53.20	Loop	23.64	0.01	76.85	85.81	AV
0.110	37.48	Loop	23.55	0.01	61.04	106.78	PK
0.110	34.77	Loop	23.55	0.01	58.33	86.78	AV
0.872	35.23	Loop	25.07	-0.17	60.13	70.02	QP
1.241	33.12	Loop	27.12	-0.25	59.99	65.73	QP
2.917	31.36	Loop	23.91	-0.24	55.03	70.00	QP

Remark: 1. Data of measurement within this frequency range shown " -" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
2. The test limit distance is 3m limit.
3. PK means Peak Value, QP means Quasi Peak Value, AV means Average Value.
4. F means Fundamental Frequency.

Radiated Emission Test Data 30-1000MHz:

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	VULB9168



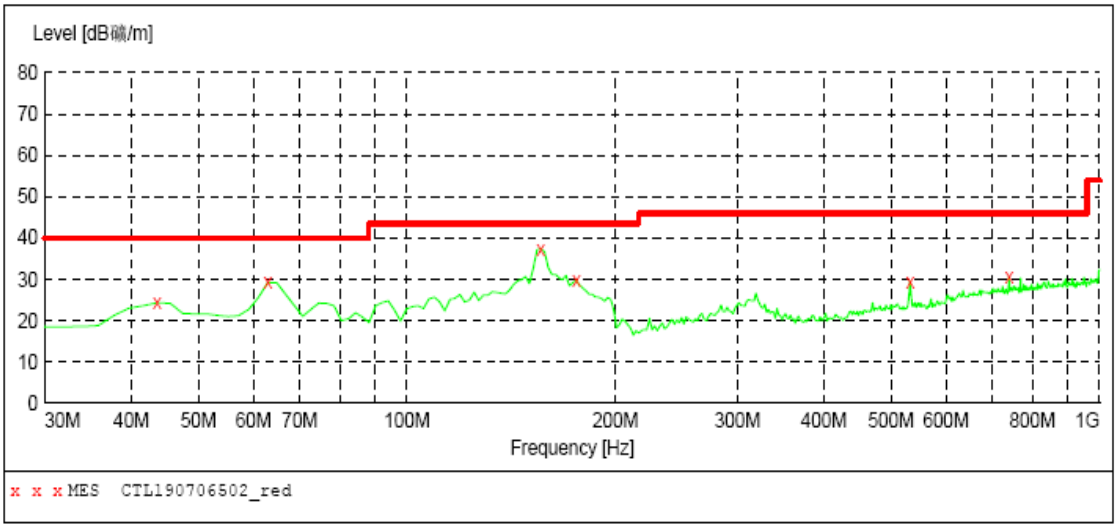
MEASUREMENT RESULT: "CTL190706501_red"

2019-7-6 9:29

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
62.980000	28.90	12.8	40.0	11.1	---	0.0	0.00	HORIZONTAL
156.100000	34.90	15.2	43.5	8.6	---	0.0	0.00	HORIZONTAL
173.560000	29.40	13.7	43.5	14.1	---	0.0	0.00	HORIZONTAL
309.360000	29.70	14.4	46.0	16.3	---	0.0	0.00	HORIZONTAL
311.300000	28.30	14.4	46.0	17.7	---	0.0	0.00	HORIZONTAL
870.020000	30.20	23.3	46.0	15.8	---	0.0	0.00	HORIZONTAL

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	VULB9168



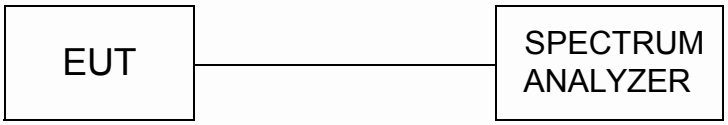
MEASUREMENT RESULT: "CTL190706502_red"

2019-7-6 9:31

Frequency MHz	Level dB礦/m	Transd dB	Limit dB礦/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.580000	24.40	14.5	40.0	15.6	---	0.0	0.00	VERTICAL
62.980000	29.30	12.8	40.0	10.7	---	0.0	0.00	VERTICAL
156.100000	37.40	15.2	43.5	6.1	---	0.0	0.00	VERTICAL
175.500000	29.80	13.4	43.5	13.7	---	0.0	0.00	VERTICAL
532.460000	29.60	18.8	46.0	16.4	---	0.0	0.00	VERTICAL
740.040000	30.70	22.1	46.0	15.3	---	0.0	0.00	VERTICAL

4.3. 20dB Bandwidth/99% Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 10Hz RBW and 30Hz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

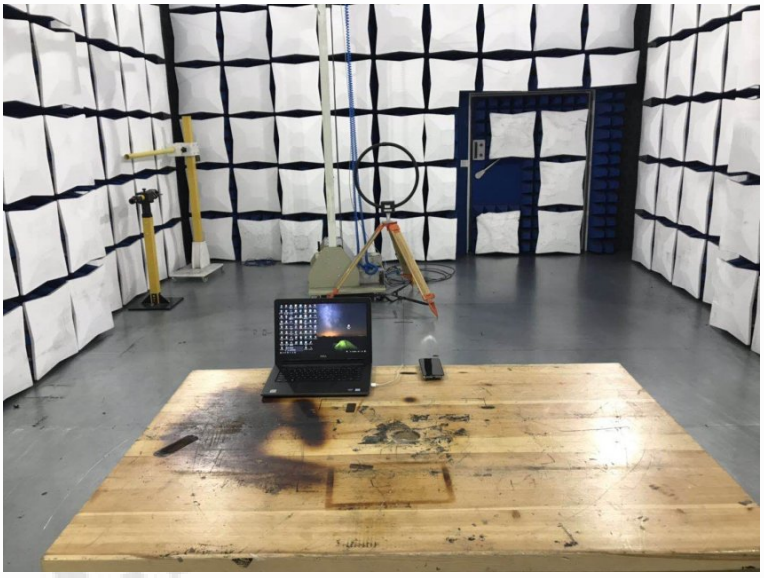
The 20dB bandwidth shall be less than 80% of the permitted frequency band.

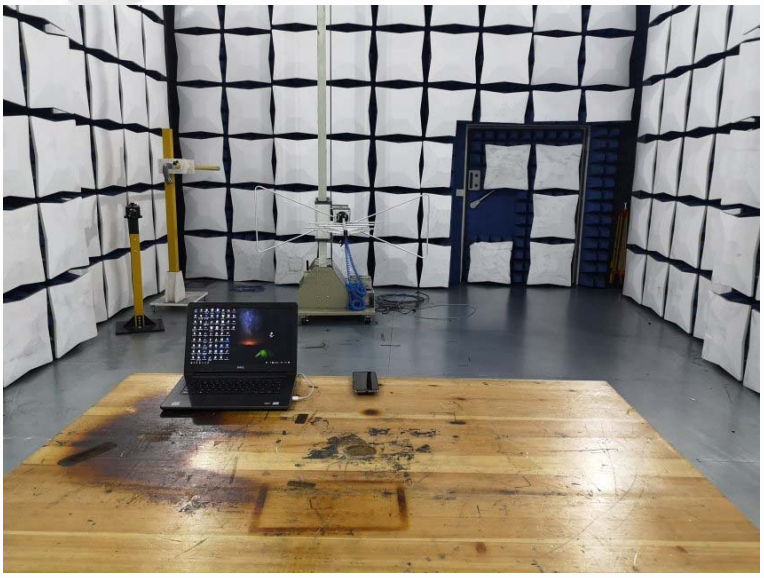
TEST RESULTS

PASS

136 KHz

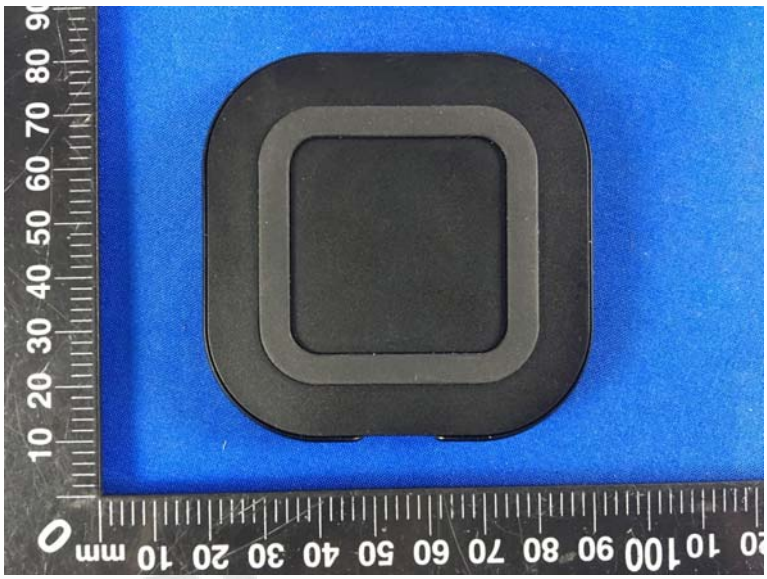
5. Test Setup Photos of the EUT





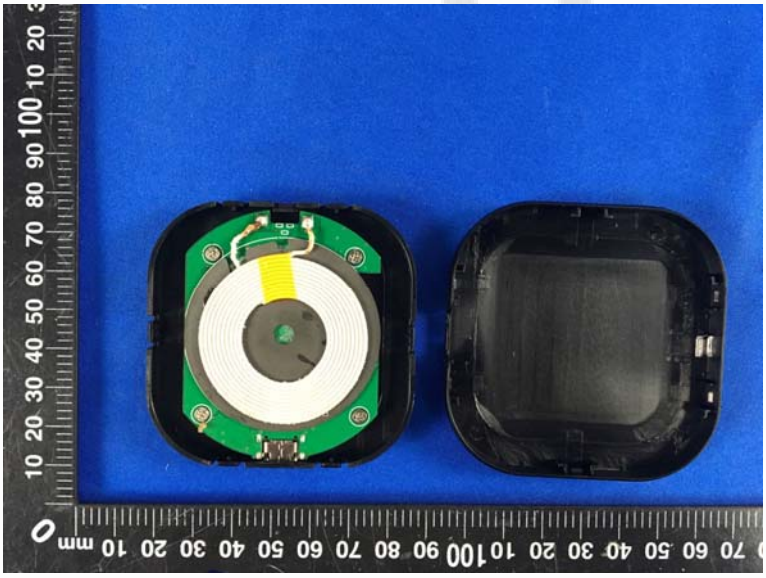
6. External and Internal Photos of the EUT

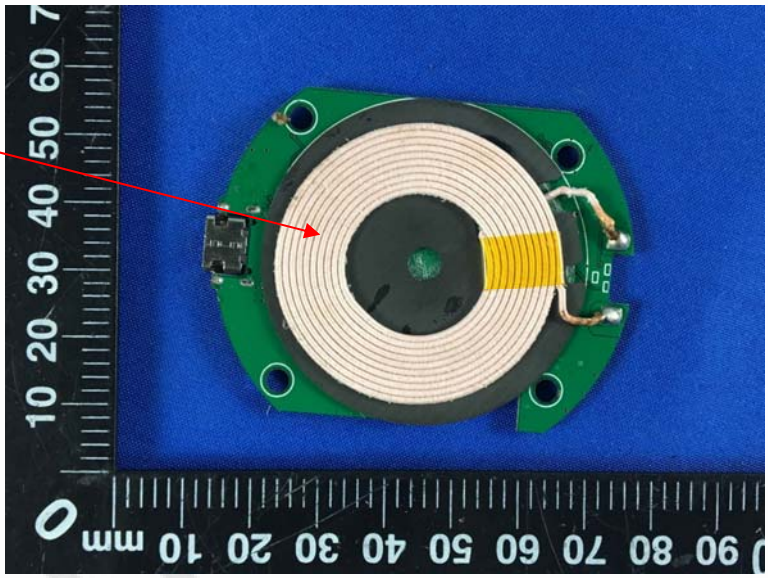
External photos

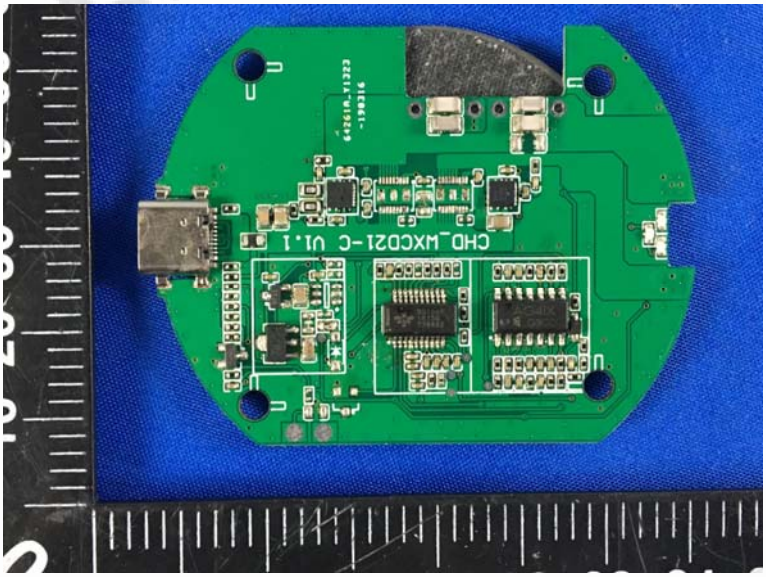



mm
10 20 30 40 50 60 70 80

Internal photos







.....End of Report.....