

TEST REPORT



CTK Co., Ltd.
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Report No.:
CTK-2021-03552
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1. Client

- Name : Aptiv Connection Systems Korea LLC
- Address : 3, Hyundaiakia-ro, Paltan-myeon, Hwaseong-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2021-08-20

2. Manufacturer

- Name : APTIV KUM LLC
- Address : 17, Yangdeungnonggong-gil, Sangbuk-myeon, Ulju-gun, Ulsan, Republic of Korea

3. Use of Report : For FCC Certification

4. Test Sample / Model : Wireless Power Charger / KY WPC

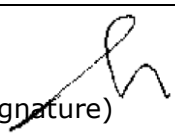
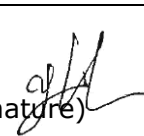
5. Date of Test : 2021-08-24

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.209

7. Testing Environment: Temp.: (23 ± 1) °C, Humidity: (48 ± 5) % R.H.

8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Technical Manager
	Bong-seok Kim: (Signature) 	Young-taek Lee: (Signature) 

2021-09-28

Republic of KOREA **CTK Co., Ltd.**



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REPORT REVISION HISTORY

Date	Revision	Page No
2021-09-28	Issued (CTK-2021-03552)	all

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 CTK Co., Ltd. <small>The Power Leader of Global Regulatory Certification</small>	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2021-03552 Page (4) / (17) Pages	
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1. General Product Description

1.1 Client Information

Company	Aptiv Connection Systems Korea LLC
Contact Point	3, Hyundaiakia-ro, Paltan-myeon, Hwaseong-si, Gyeonggi-do, Republic of Korea
Contact Person	Name : Maeng, MinKyung E-mail : min-kyung.maeng@aptiv.com Tel : +82-31-350-1799

1.2 Product Information

FCC ID	2A29IKYWPC
Product Description	Wireless Power Charger
Model name	KY WPC
Variant Model name	-
Charging Frequency	127.7 kHz
RF Output Power	86 dBuV/m @ 3m
Power Transfer Method	Magnetic induction and only single primary coil coupling secondary coil
Output power from each primary coil	< 10 W
That may have multiple primary coils	No
Antenna Type	Coil
Charging Method	Directly contact
Power Source	DC 12 V

1.3 Antenna Information

<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input type="checkbox"/>	No temporary RF connector provided
<input checked="" type="checkbox"/>	Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input type="checkbox"/>	External antenna (dedicated antennas)

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

FCC Part Section(s)	Requirement(s)	Status (Note 1)	Report Clause
15.203	Antenna Requirement	C	1.3
15.215(c)	Emission Bandwidth	C	4.1
15.209	Radiated Emissions	C	4.2
15.207	AC Power line Conducted Emissions	NA(Note 4)	-
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.			
<u>Note 3:</u> The sample was tested according to the following specification: FCC Part 15, ANSI C63.10-2013.			
<u>Note 4:</u> The equipment is operated on battery power only			

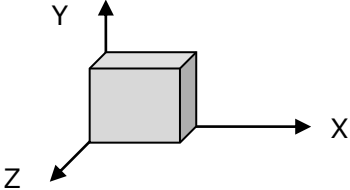
3.2 Mode of operation during the test

Wireless charger were performed all charging conditions including variable loading and non-charging operation, the worst mode is full charging loading.

Charger Frequency

Charger Frequencies
127.7 kHz

The Worst Case Measurement Configuration

Tests Item	Transmitter Radiated Emissions, Emission Bandwidth
Condition	Radiated measurement
User Position	<input checked="" type="checkbox"/> EUT will be placed in fixed position.
	<input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions.
	<input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.
Operating Mode	DC Power supply mode
EUT faces identified relative to view from receiving antenna	

3.3 Peripheral Devices

No.	Device	Manufacturer	Model No.	Serial No.
1	DC Power Supply	Topward Electric Instruments	6303D	711196
2	WPT Load(10W)	-	-	-

3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
 Coverage factor $k = 2$, Confidence levels of 95 %

Test Item	Uncertainty
Radiated emissions	4.38 dB

4. Technical Characteristic Test

4.1 Emission Bandwidth

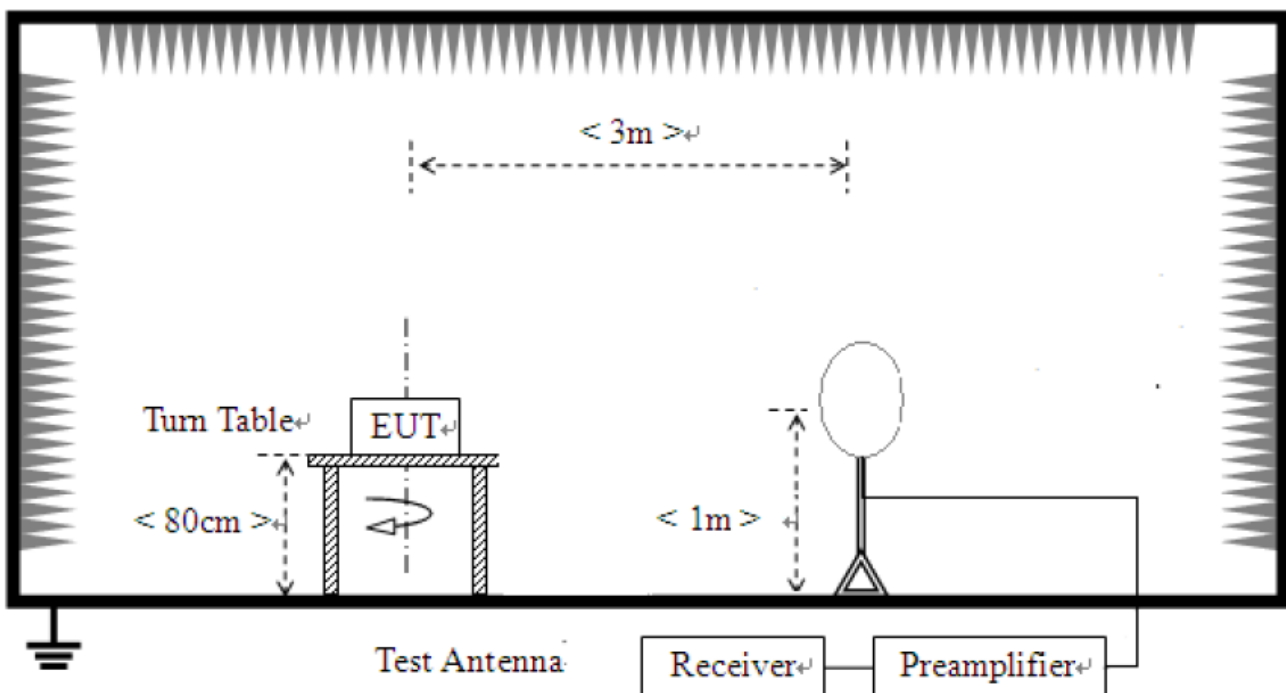
Requirement

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedures

For the emission bandwidth refer ANSI C63.10-2013, clause 6.9(Occupied bandwidth).

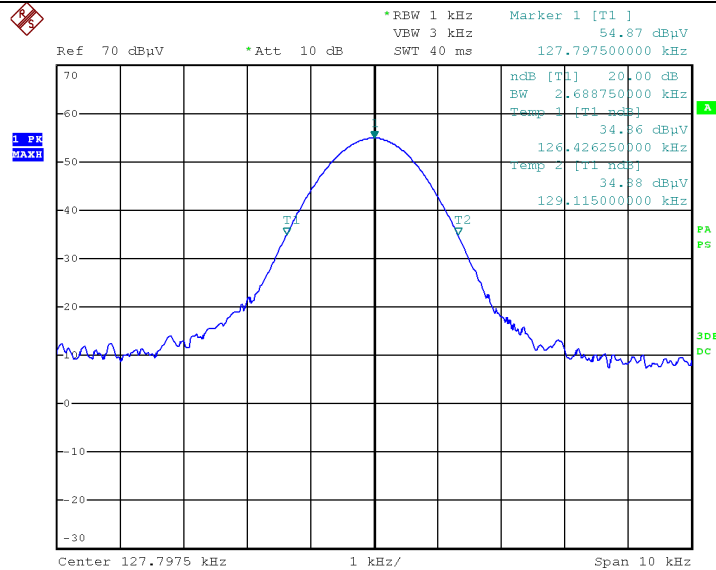
Test Setup



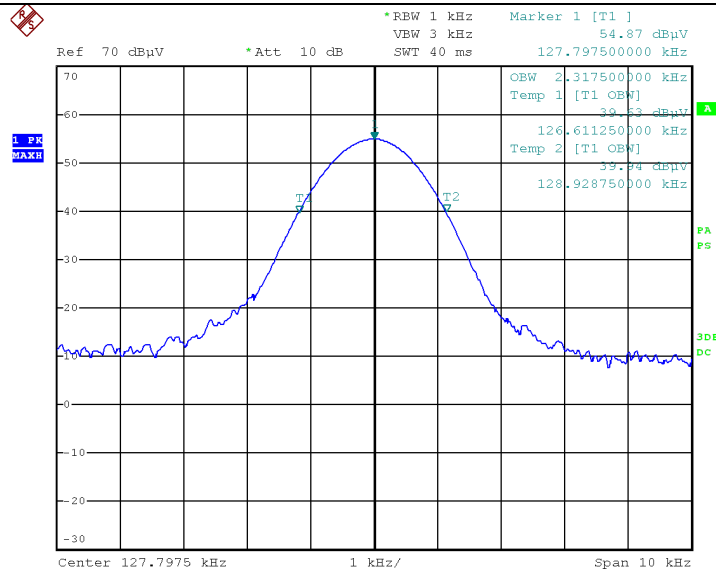
Test results

Emission Bandwidth	Result	Limit
20dB Bandwidth	2.689	N/A
99% Bandwidth	2.318	N/A

Emission Bandwidth Plot 20dB Bandwidth



Emission Bandwidth Plot 99% Bandwidth



4.2 Radiated emissions

Requirement

FCC Part 15 § 15.209 (a) 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 :

Frequency(MHz)	Field Strength uV/m	Field Strength dBuV/m	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	48.5 – 13.8	300
0.490-1.705	24000/F(kHz)	33.8 – 23	30
1.705-30	30	29.5	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note : 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.

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)

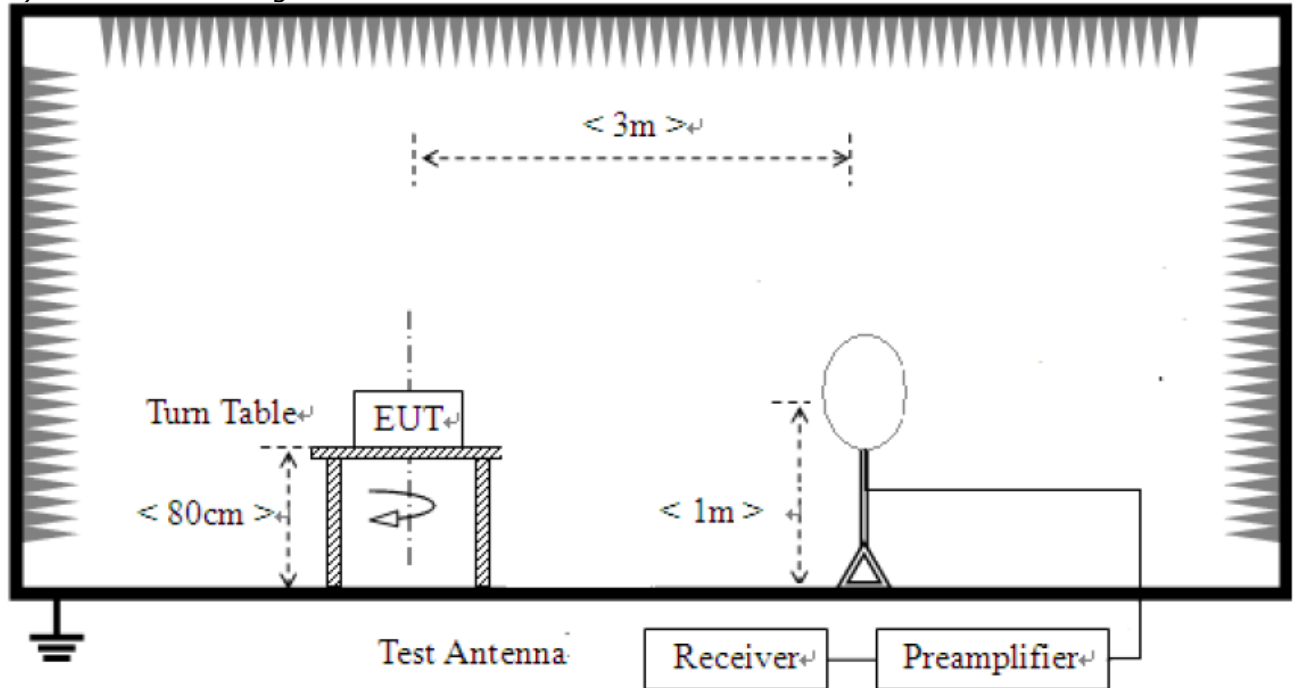
Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.4(Radiated emissions from unlicensed wireless devices below 30 MHz).
<input checked="" type="checkbox"/>	<p>Radiated emission tests shall be performed in the frequency range of 9 kHz to 30 MHz, using a calibrated loop antenna.</p> <p>When perpendicular to the ground plane, the lowest height of the magnetic antenna shall be 1 m above the ground and shall be positioned at the specified distance from the EUT.</p> <p>During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.</p>
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor(40 dB/decade).
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.5(Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz).
<input checked="" type="checkbox"/>	In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) is used. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.
<input checked="" type="checkbox"/>	Emissions more than 20 dB below the limit do not need to be reported.

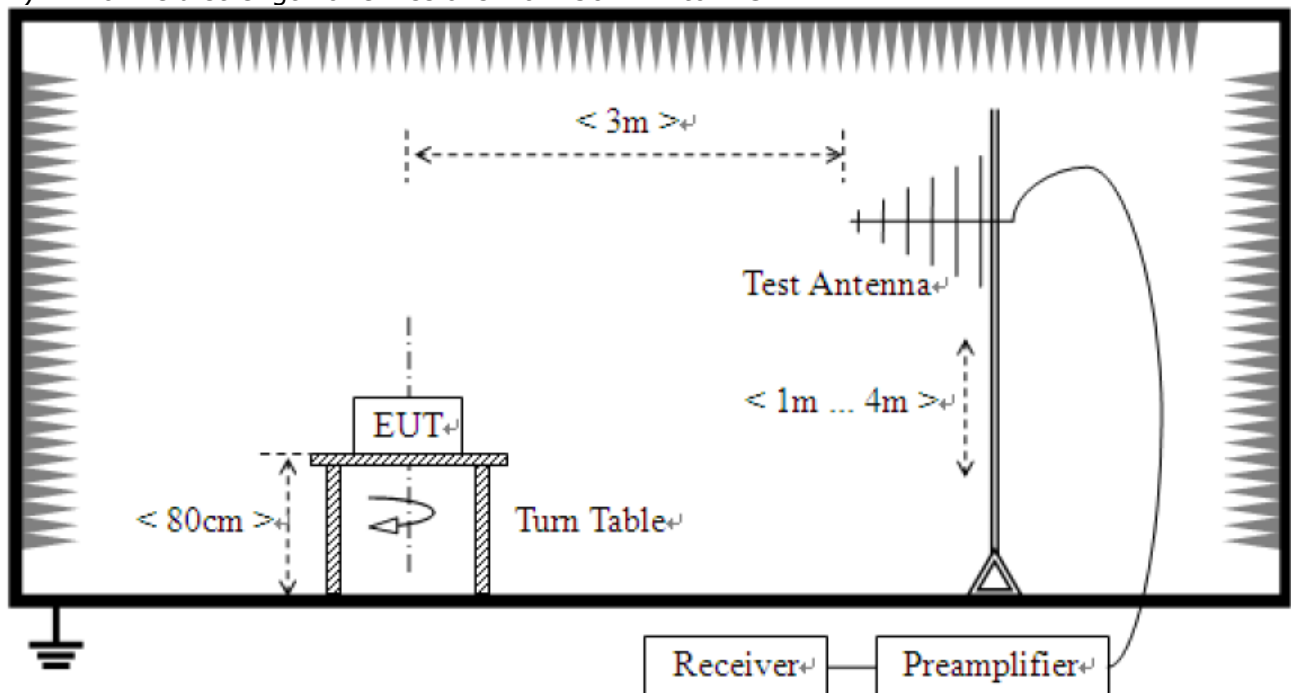
Measuring instrument Settings	
Frequency Range	9 kHz – 1 000 MHz
RBW	200 Hz (9 kHz – 150 kHz) 9 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1 000 MHz)
VBW	≥ RBW
Sweep time	auto couple
Detector function	CISPR quasi-peak(below 1 000 MHz)

Test Setup

- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz

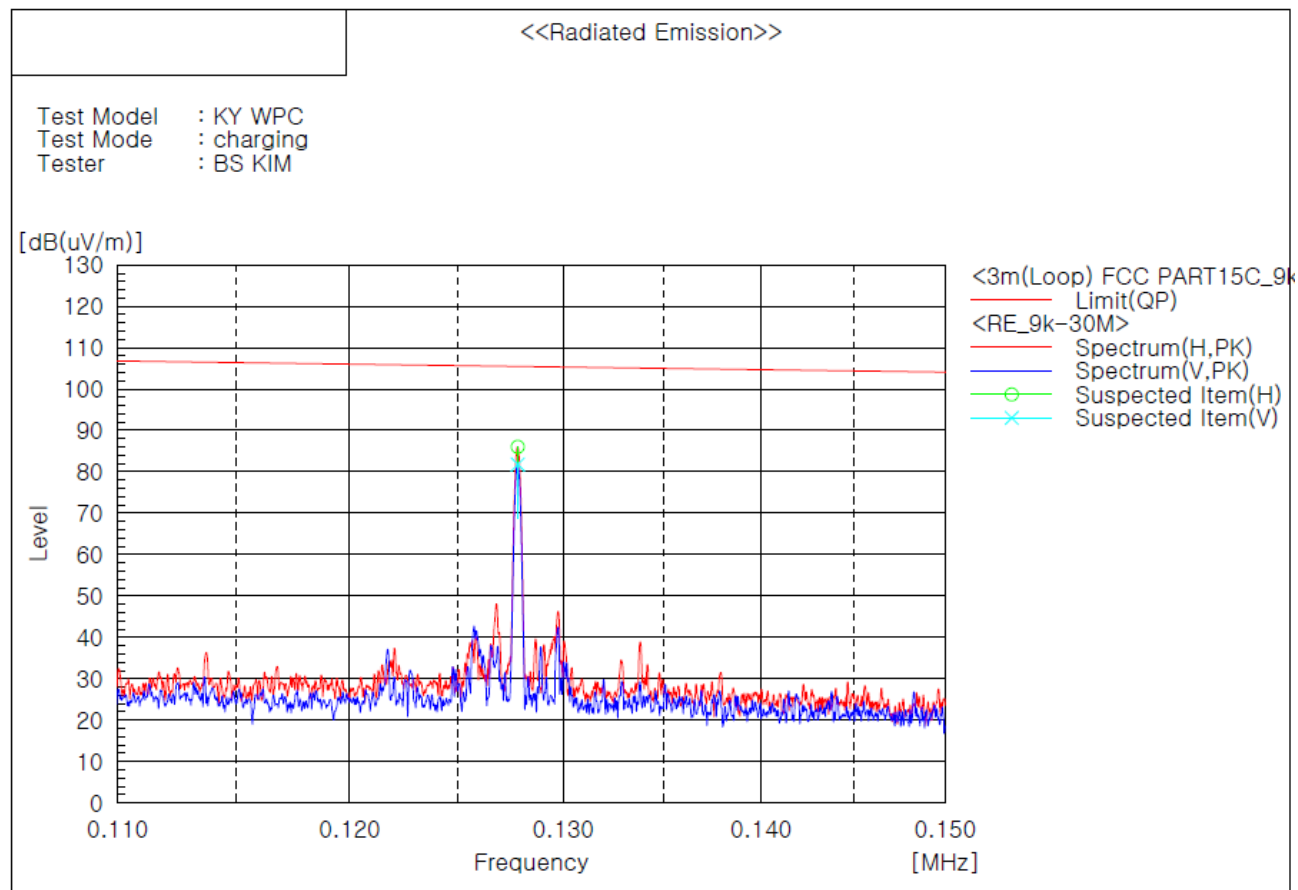


Test results

1) Radiated emissions of fundamental frequency

The requirements are:

☒ Complies



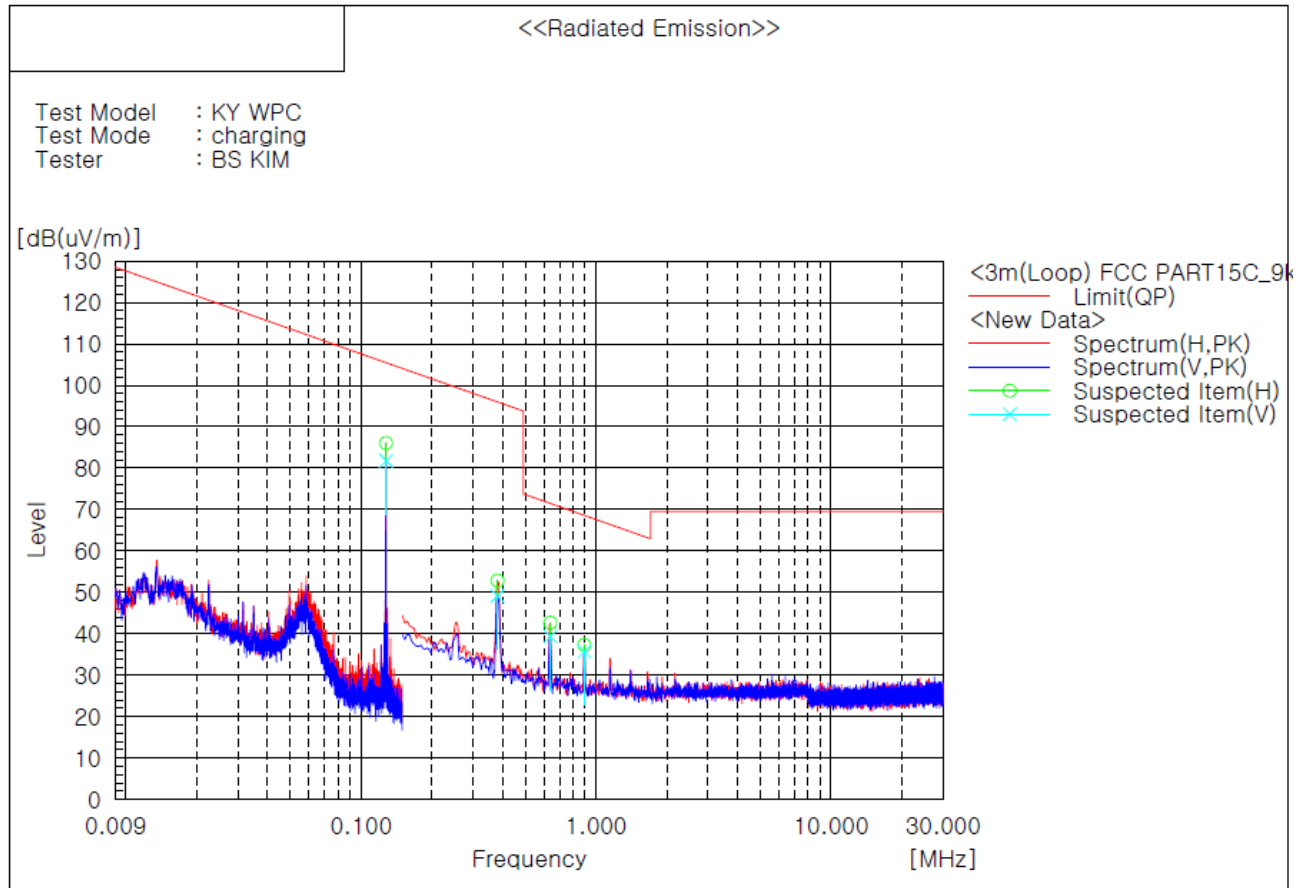
Remark :

1. Result = Reading + c.f(correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
3. Limit : $20\log(2400/127.7) + 40\log(300/3) = 105.5$ dBuV/m
4. The test result in peak detector is less than quasi-peak limit.

2) Radiated emissions in the frequency range of 9 kHz to 30 MHz

The requirements are:

☒ Complies



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	0.128	H	61.1	24.9	86.0	105.5	19.5	101.0	58.0
2	0.128	V	56.9	24.9	81.8	105.5	23.7	101.0	145.0
3	0.381	H	27.9	25.0	52.9	96.0	43.1	101.0	343.0
4	0.381	V	24.2	25.0	49.2	96.0	46.8	101.0	244.0
5	0.639	H	17.8	24.9	42.7	71.5	28.8	101.0	281.0
6	0.639	V	14.5	24.9	39.4	71.5	32.1	101.0	226.0
7	0.893	H	12.3	25.0	37.3	68.6	31.3	101.0	99.0
8	0.893	V	10.8	25.0	35.8	68.6	32.8	101.0	1.0

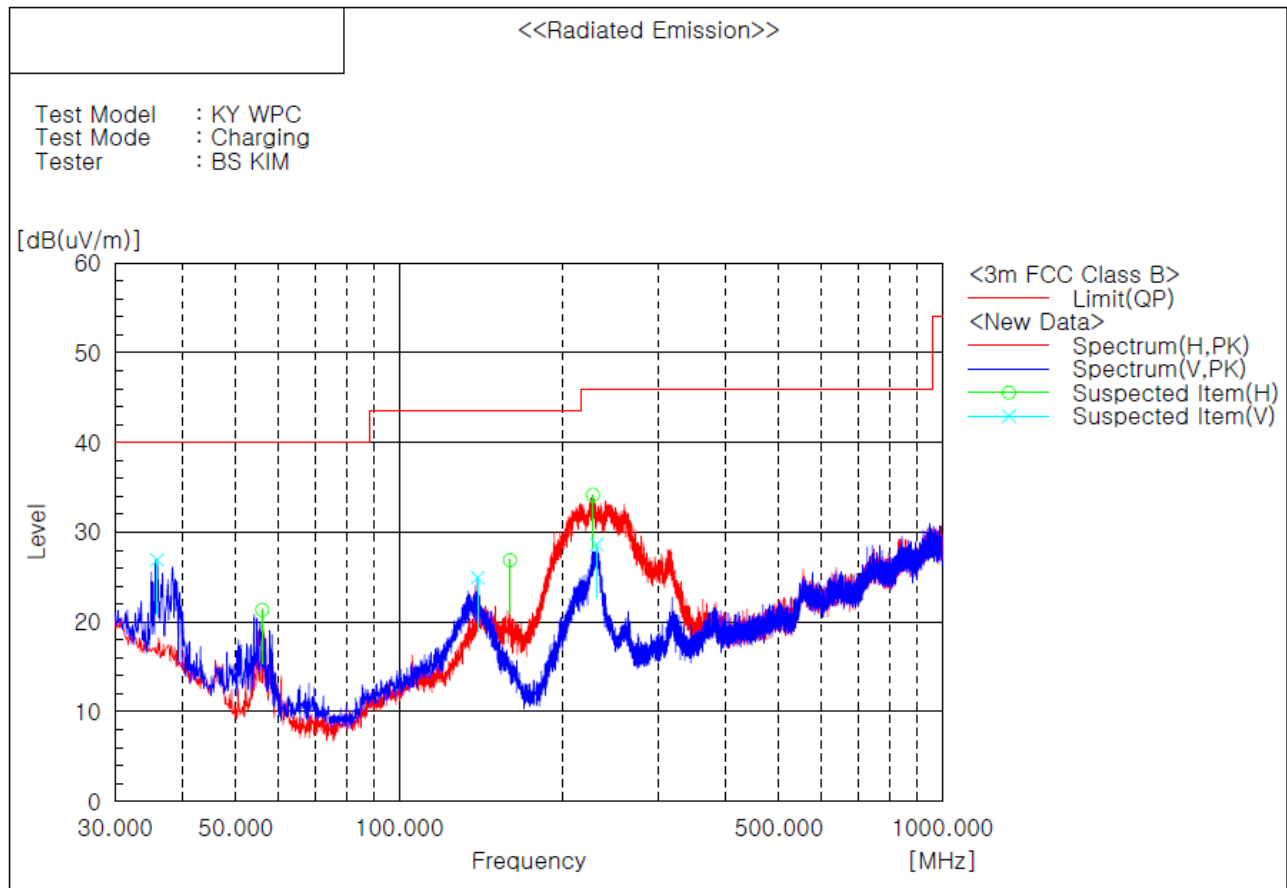
Remark :

1. Result = Reading + c.f(correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
3. The test result in peak detector is less than quasi-peak limit.

3) Radiated emissions in the frequency range of 30 MHz to 1 000 MHz

The requirements are:

☒ Complies



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	35.820	V	35.0	-8.1	26.9	40.0	13.1	101.0	97.0
2	55.948	H	39.2	-17.9	21.3	40.0	18.7	399.0	357.0
3	139.489	V	37.1	-12.2	24.9	43.5	18.6	101.0	207.0
4	159.980	H	39.7	-12.8	26.9	43.5	16.6	305.0	272.0
5	227.516	H	46.7	-12.5	34.2	46.0	11.8	101.0	9.0
6	231.033	V	40.7	-12.1	28.6	46.0	17.4	101.0	51.0

Remark :

1. Result = Reading + c.f(Correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
3. The test result in peak detector is less than quasi-peak limit.

APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2020-10-20	2021-10-20
2	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
3	Bilog Antenna	Schaffner	CBL6111C	2551	2021-03-22	2023-03-22
4	AMPLIFIER	SONOMA	310	291721	2021-01-22	2022-01-22
5	6dB Attenuator	R&S	DNF	272.4110.50-2	2020-10-23	2021-10-23
6	6dB Attenuator	BIRD	5W 6dB	1744	2020-12-16	2021-12-16