TEST REPORT

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

1. Applicant

◦ Name : MOBASE ELECTRONICS CO., LTD.

◦ Address : 100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Republic of Korea

◦ Date of Receipt : 2022-03-14

2. Manufacturer

◦ Name : MOBASE ELECTRONICS CO., LTD.

◦ Address : 100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Republic of Korea

3. Use of Report : For FCC Certification, For ISED Certification

4. Test Sample / Model : Wireless Charging System/ MBECNWPC2207

5. Date of Test : 2022-04-12

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.209
RSS-Gen Issue 5, RSS-216 Issue 2

7. Testing Environment: Temp.: (24.8 ± 1) ℃, Humidity: (47 ± 3) % R.H.

8. Test Results : Compliance

9. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
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Approval	Tested by Bong-seok Kim: (Signature)	Technical Manager Young-taek Lee: (Signature)

Remark. This report is not related to KOLAS accreditation and relevant regulation.

2022-04-19

CTK Co., Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-04-19	Issued (CTK-2022-01177)	all

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1. General Product Description

1.1 Client Information

Company	MOBASE ELECTRONICS CO., LTD.
Contact Point	100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Republic of Korea
Contact Person	Name : Hee-Tack Ryu E-mail : shadow@mobaseelec.com Tel : +82-31-8091-2611

1.2 Product Information

FCC ID	NYOMBECNWPC2207	
IC	3109A-MBECNWPC227	
Product Description	Wireless Charging System	
Model name	MBECNWPC2207	
Variant Model name	-	
FVIN	N/A	
Classification of WPT devices	☐	Type 1 (Interference-causing Equipment)
	☐	Type 2 (Category II Radio Apparatus)
	☒	Type 3 (Category I Radio Apparatus)
Charging Frequency	115 kHz	
RF Output Power	88.9 dBuV/m @ 3m	
Power Transfer Method	Magnetic induction and only single primary coil coupling secondary coil	
Output power from each primary coil	< 15 W	
That may have multiple primary coils	No	
Antenna Type	Coil	
Charging Method	Directly contact	
Power Source	DC 12 V	

1.3 Antenna Information

☒	Integral antenna (antenna permanently attached)	
	☐	Temporary RF connector provided
	☒	No temporary RF connector provided 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.
☐	External antenna (dedicated antennas)	

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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	RSS-Gen 6.8	Antenna Requirement	C	1.3
15.215(c)	RSS-Gen 6.7	Emission Bandwidth	C	4.1
15.209	RSS-216 6.2.2.2	Radiated Emissions	C	4.2
15.207	RSS-216 6.2.2.1	AC Power line Conducted Emissions	NA(Note 4)	-
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
Note 2: The data in this test report are traceable to the national or international standards.				
Note 3: The sample was tested according to the following specification: ANSI C63.10-2013.				
Note 4: The equipment is operated on battery power only				

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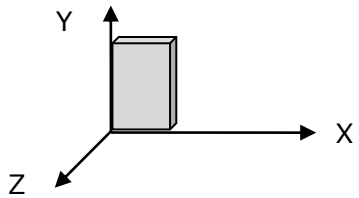
3.2 Mode of operation during the test

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
115 kHz

The Worst Case Measurement Configuration

Tests Item	Transmitter Radiated Emissions, Emission Bandwidth
Condition	Radiated measurement
User Position	☒ EUT will be placed in fixed position.
	☐ EUT will be placed in mobile position and operating multiple positions.
	☐ 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	997931
2	WPT Load(15W)	-	-	-

Note : WPT load was provided by manufacturer.

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	3.98 dB(C.L. : Approx. 95%, k = 2)

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.

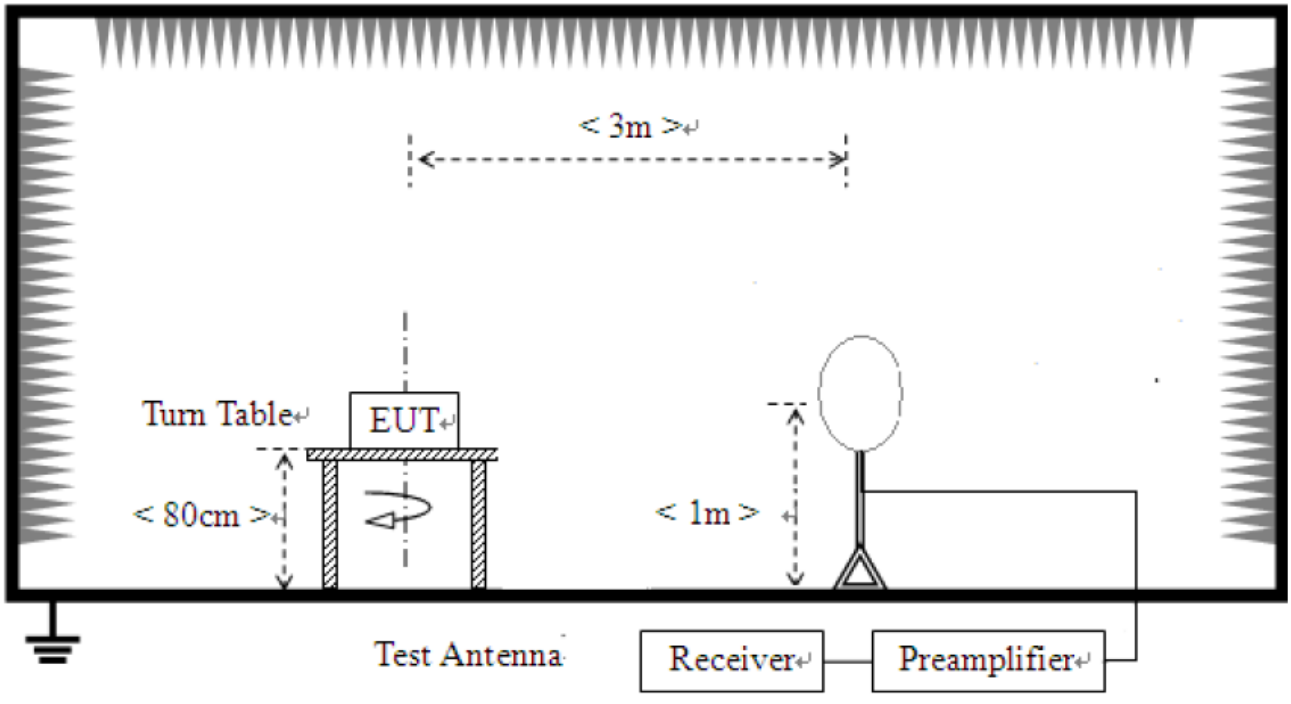
The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

Test Procedures

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

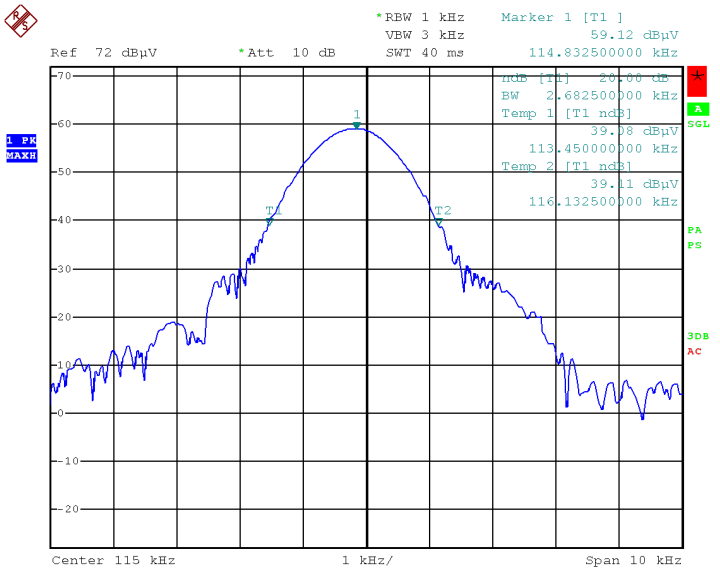
Test Setup



Test results

Emission Bandwidth	Result	Limit
20 dB Bandwidth	2.683 kHz	N/A
99 % Bandwidth	2.324 kHz	N/A

Emission Bandwidth Plot 20dB Bandwidth



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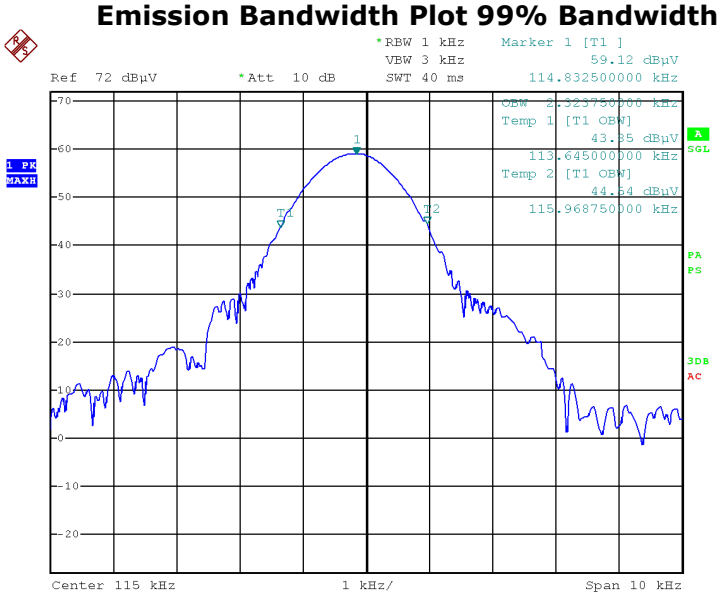
Emission Bandwidth Plot 99% Bandwidth



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4.2 Radiated emissions

FCC 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.

ISED Requirement

The magnetic field radiated emissions within 9 kHz – 30 MHz from the WPT subassembly of WPT source and client devices and WPT systems shall comply with the limits applicable to induction cooking equipment, as set out in ICES-001.

The preferred test method for WPT devices that may be used in residential environments and that have a maximum dimension of less than or equal to 1.6 m is the test method using the van Veen loop antenna system, as per ICES-001.

However, it is acceptable to use the alternate 60 cm loop test method and corresponding limit for these small residential WPT devices (the same as for commercial/industrial and large residential devices).
The electric field radiated emissions within 30 – 1000 MHz from the WPT subassembly of WPT source and client devices and WPT systems shall comply with limits applicable to induction cooking equipment, as set out in ICES-001.

Frequency Range [MHz]	Quasi-peak, at 3 m distance Field Strength [dBuA/m]	Field Strength [dBuV/m]-QP
0.009 – 0.07	69	120.5
0.07 – 0.15	69 - 39*	120.5 – 90.5
0.15 – 30	39 - 7*	90.5 – 58.5
*The limit level in dBμA/m decreases linearly with the logarithm of frequency. Conversion factor between dBuA/m and dBuV/m is 51.5 dB.		

Frequency Range [MHz]	Quasi-peak, at 3 m distance Field Strength [dBuV/m]
30 – 230	40
230 – 1 000	47

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Test Location

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

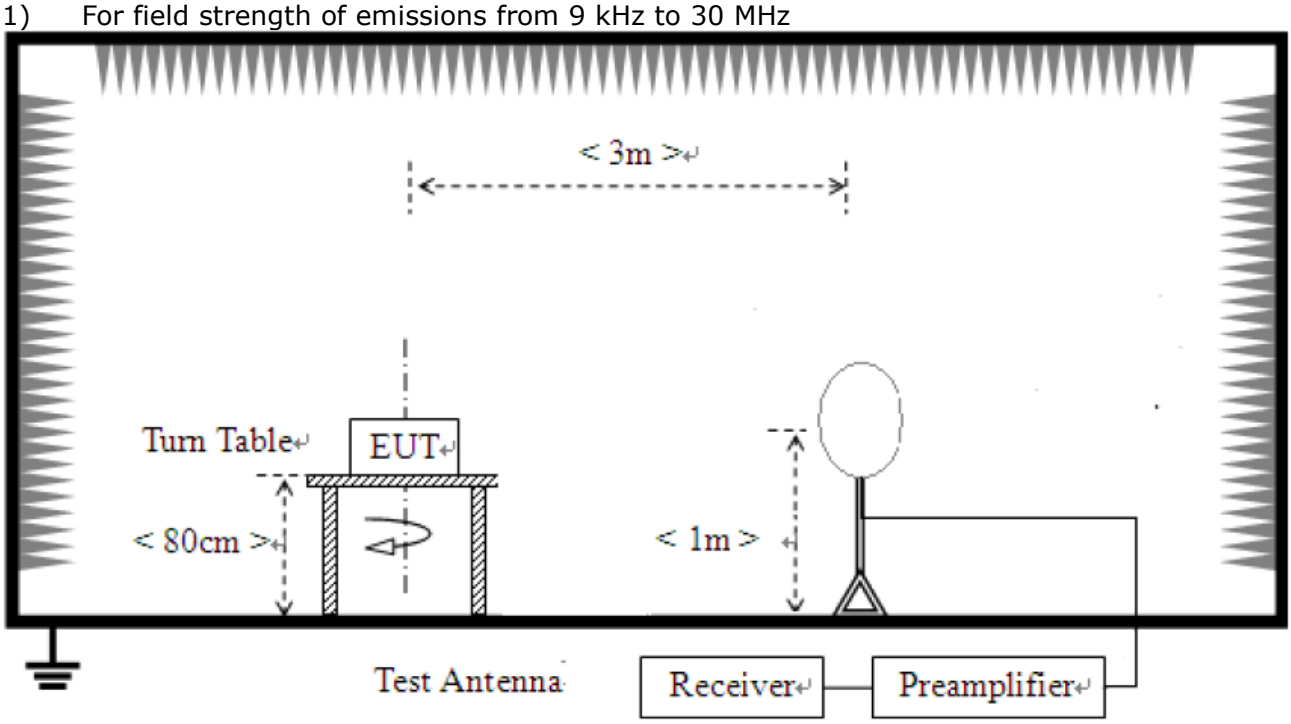
Test Procedures

Test Method	
☒	Refer as ANSI C63.10-2013, clause 6.4(Radiated emissions from unlicensed wireless devices below 30 MHz).
☒	Radiated emission tests shall be performed in the frequency range of 9 kHz to 30 MHz, using a calibrated loop antenna. 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. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
	☒ The results shall be by using the square of an inverse linear distance extrapolation factor(40 dB/decade).
☒	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).
☒	In the frequency rage 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.
☒	Emissions more than 20 dB below the limit do not need to be reported.

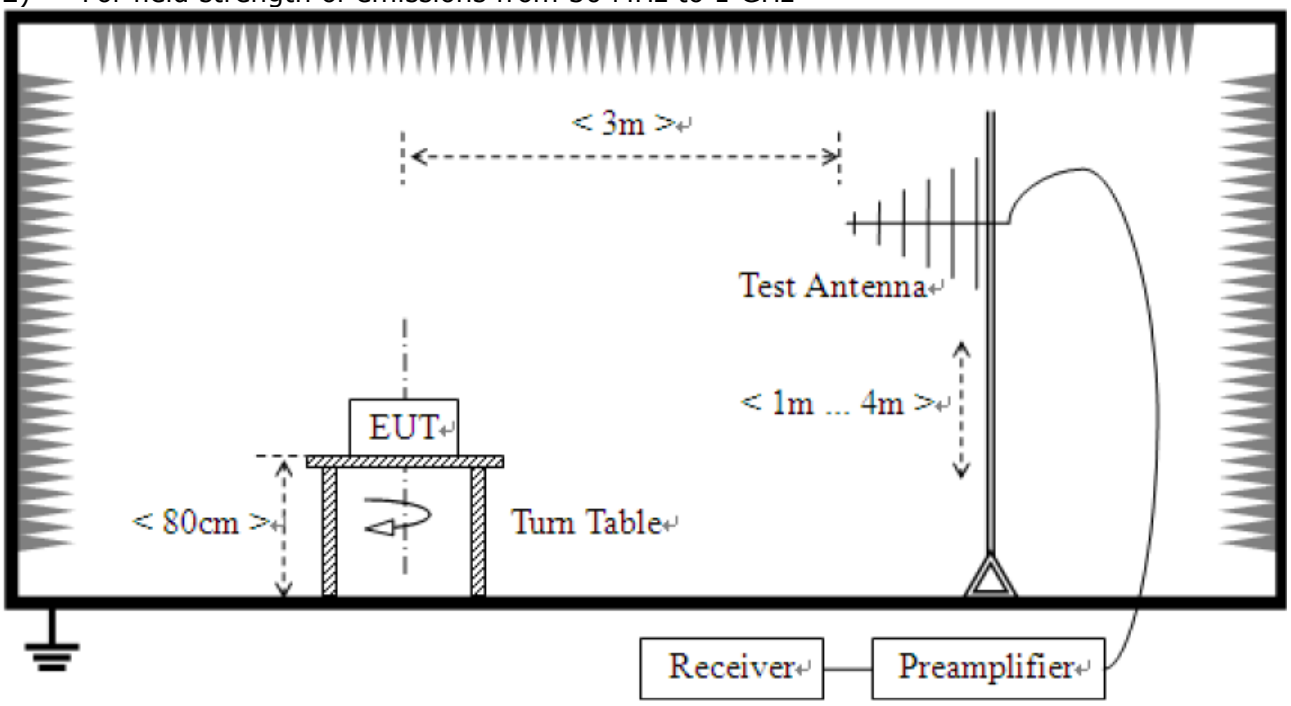
Measuring instrument Settings	
Frequency Range	9 kHz – 1 000 MHz
RBW	200 Hz (9 kHz – 150 kHz) 9 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1 000 MHz)
VBW	≥ RBW
Sweep time	auto couple
Detector function	CISPR quasi-peak(below 1 000 MHz)

Test Setup

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



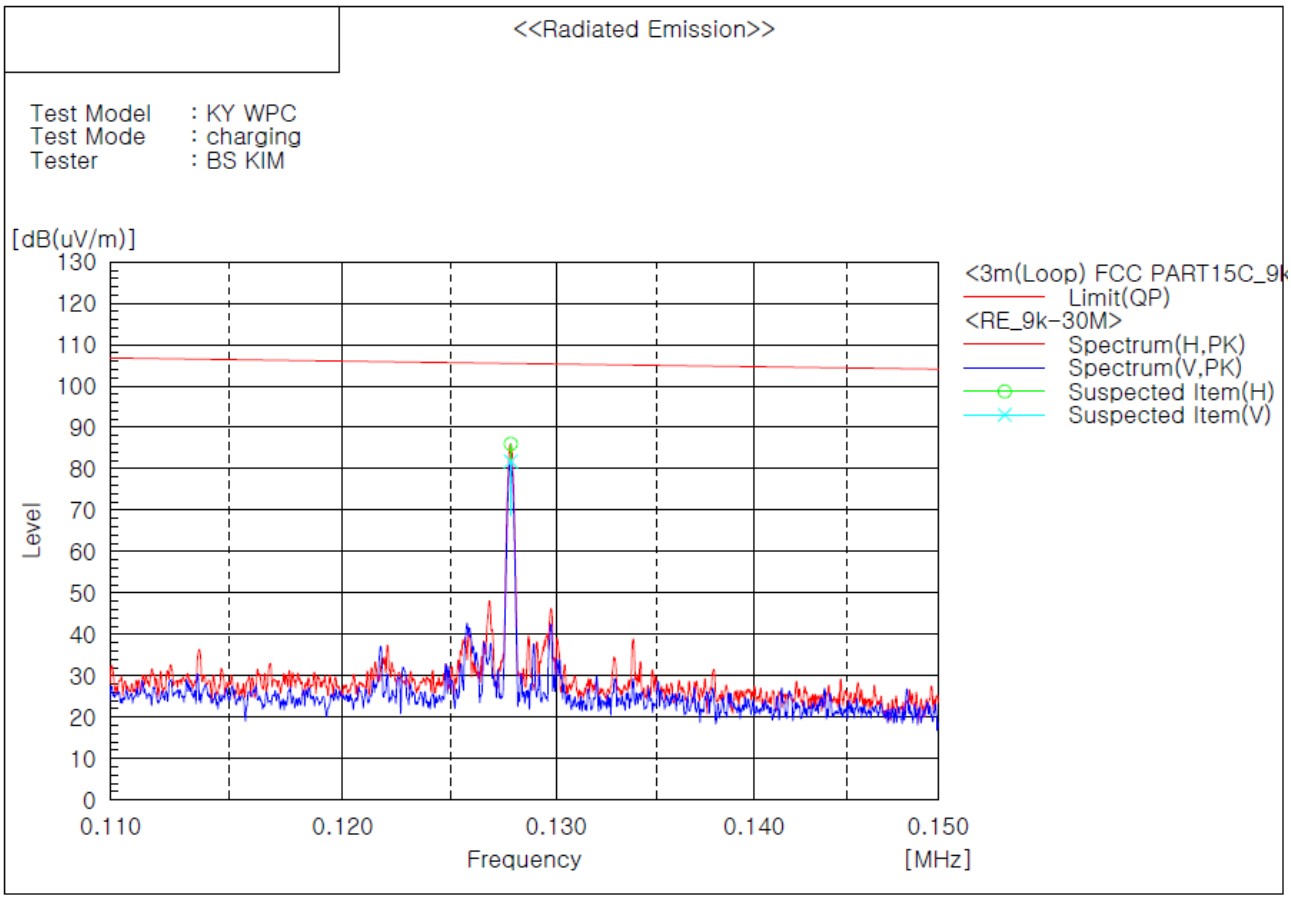
2) For field strength of emissions from 30 MHz to 1 GHz



Test results

1) Radiated emissions of fundamental frequency

The requirements are:
☒ Complies



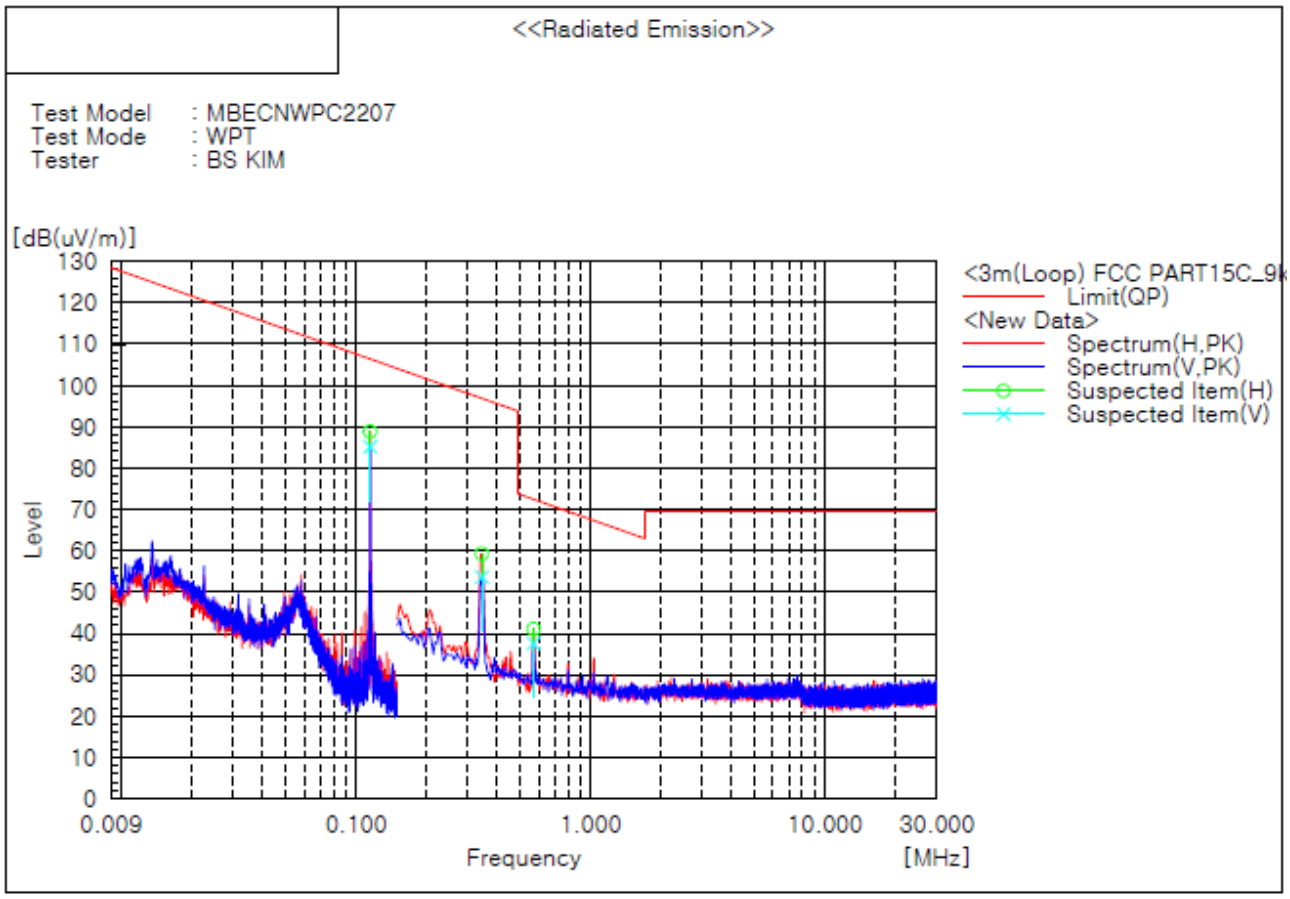
Frequency [kHz]	Reading [dBuV]	c.f [dB/m]	Result [dBuV/m]
115	64.0	24.9	88.9

Remark :

1. Result = Reading + c.f(correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
3. FCC Limit : 20log(2400/115) + 40log(300/3) = 106.4 dBuV/m
4. ISED Limit : -(3/8)*115 + 95.25 = 52.1 dBuA/m => 103.6 dBuV/m
5. 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

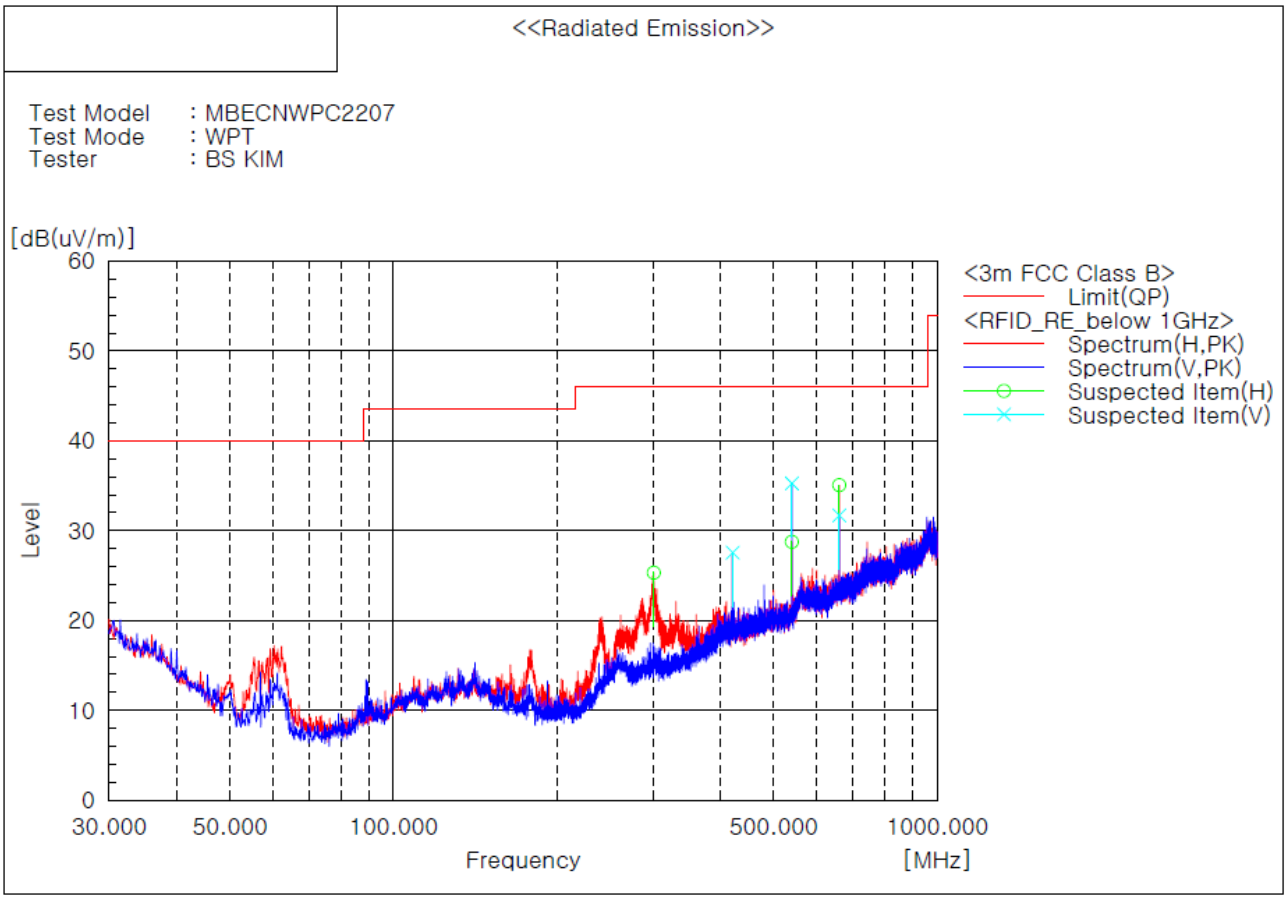
No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	0.115	H	64.0	24.9	88.9	106.4	17.5	101.0	192.0
2	0.115	V	60.3	24.9	85.2	106.4	21.2	100.0	280.0
3	0.344	H	34.3	25.0	59.3	96.9	37.6	101.0	1.0
4	0.344	V	28.6	25.0	53.6	96.9	43.3	100.0	308.0
5	0.572	H	16.2	24.9	41.1	72.5	31.4	101.0	346.0
6	0.572	V	12.7	24.9	37.6	72.5	34.9	100.0	298.0

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	301.115	H	33.9	-8.6	25.3	46.0	20.7	101.0	39.0
2	420.425	V	31.7	-4.2	27.5	46.0	18.5	101.0	339.0
3	540.463	V	37.3	-2.0	35.3	46.0	10.7	101.0	175.0
4	540.463	H	30.8	-2.0	28.8	46.0	17.2	307.0	333.0
5	660.621	V	30.5	1.2	31.7	46.0	14.3	192.0	98.0
6	660.621	H	33.9	1.2	35.1	46.0	10.9	101.0	166.0

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	2021-10-20	2022-10-20
2	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
3	Bilog Antenna	TESEQ	CBL6111D	58490	2021-03-03	2023-03-03
4	AMPLIFIER	SONOMA	310	291721	2022-01-21	2023-01-21
5	6dB Attenuator	BIRD	5W 6dB	1744	2021-11-18	2022-11-18
6	ATTENUATOR	PASTERNACK	PE7047-6	NONE	2022-02-22	2023-02-22

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (1 GHz below Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2022-04-12
2	RF Cable (1 GHz below Radiated)	CANARE	10m 1G below-1	N/A	2022-04-12
3	RF Cable (1 GHz below Radiated)	CANARE	10m 1G below-2	N/A	2022-04-12
4	3m Loop Cable (1 GHz below Radiated)	CANARE	3m loop	N/A	2022-04-12

-END-