

EVALUATION REPORT ***for Certification***

Manufacturer: SL CORPORATION

Date of Issue: Apr. 18, 2022

77 Gongdan6-ro, Jillyang-eup, Gyeongsan-si,

Order Number: GETEC-C1-22-157

Kyeongsangbuk-do, 712-837, Republic of Korea

Test Report Number: GETEC-E3-22-056

Attn: Mr.Un-Yong, Jang / Assistant Manager

Test Site: GUMI UNIVERSITY EMC CENTER

CAB Designation Number: KR0033

RESPONSIBLE PARTY : SL CORPORATION

ADDRESS : 77 Gongdan6-ro, Jillyang-eup, Gyeongsan, Kyeongsangbuk-do,
712-837, Republic of Korea

CONTACT PERSON : Mr. Un-Yong, Jang

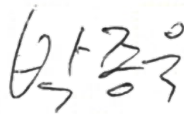
Rule Part(s)	: FCC Part 15 Subpart C-Intentional Radiator § 15.225
Test Method	: ANSI C63.10 (2013)
Equipment Class	: Part 15 Low Power Communication Device Transmitter (DXX)
EUT Type	: Wireless Charger
Type of Authority	: Certification
Model Name	: WC-MP01N

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10 (2013)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the vest of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Reviewed by,



Jong-Wook Park / Senior Engineer
GUMI UNIVERSITY EMC CENTER



Hyun Kim / Technical Manager
GUMI UNIVERSITY EMC CENTER



Version

Test Report No.	Date	Description
GETEC-E3-22-006	Jan. 14, 2022	- First Approval Report





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Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

1. General Information

Applicant: SL CORPORATION

Applicant Address: 77 Gongdan6-ro, Jillyang-eup, Gyeongsan, Kyeongsangbuk-do,
712-837, Republic of Korea

Applicant: SL CORPORATION

Applicant Address: 77 Gongdan6-ro, Jillyang-eup, Gyeongsan, Kyeongsangbuk-do,
712-837, Republic of Korea **Contact Person:** Changhwa Lee, CEO

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● FCC ID.	2AFGCWC-MP01N
● Equipment Class	Part 15 Low Power Communication Device Transmitter (DXX)
● EUT Type	Wireless Charger
● Model Name	WC-MP01N
● Rule Part(s)	FCC Part 15 Subpart C-Intentional Radiator § 15.225
● Test Method	ANSI C63.10 (2013)
● Type of Authority	Certification
● Test Procedure(s)	ANSI C63.10 (2013)
● Dates of Test	Apr. 17, 2022 ~ Apr. 18, 2022
● Place of Test	GUMI UNIVERSITY EMC CENTER 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea (FCC Test firm Registration No.: 269701) (ISED Test Site Registration No.: 7920A)
● Test Report Number	GETEC-E3-22-056
● Dates of Issue	Apr. 18, 2022



2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **SL CORPORATION. Wireless Charger (Model Name: WC-MP01N)**.

These measurement tests were conducted at **GUMI UNIVERSITY EMC CENTER**.

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea

This test site is one of the highest point of GUMI UNIVERSITY at about 200 kilometers away from Seoul city and 40 kilometers away from Daejeon city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.10 (2013)

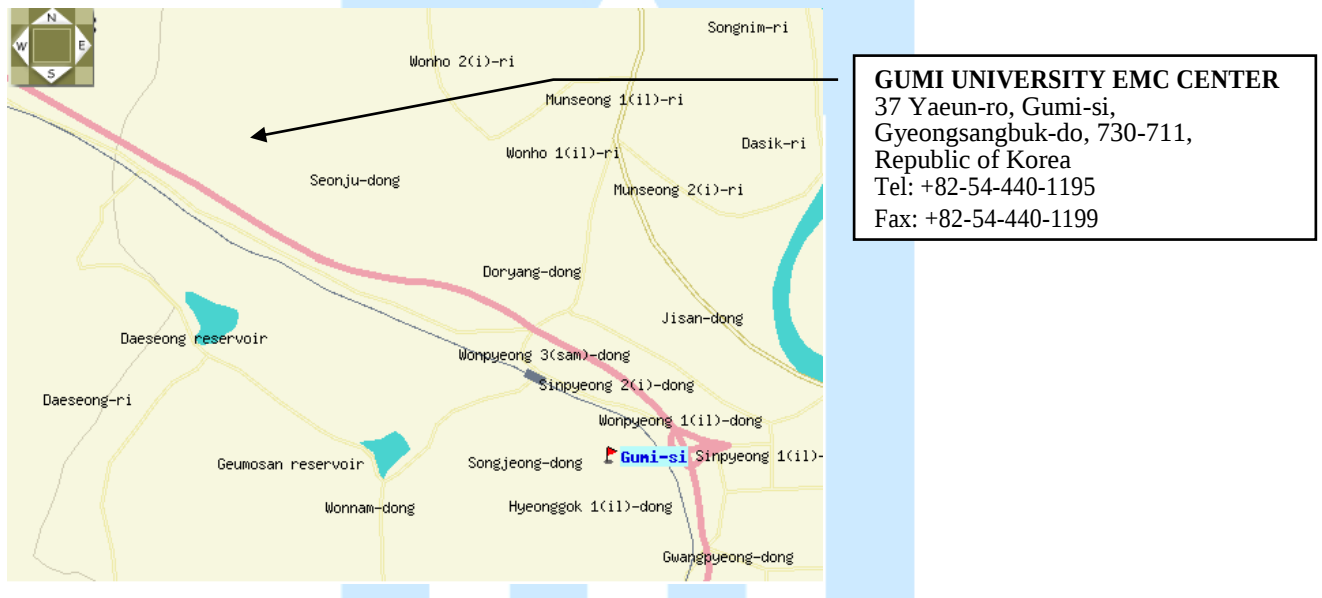


Fig 1. The map above shows the Gumi University in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **SL CORPORATION Wireless Charger (Model Name: WC-MP01N) FCC ID.: 2AFGCWC-MP01N**

Type of Equipment	Wireless Charger
Model Name	WC-MP01N
Serial Number	Prototype
RF Frequency	13.56 MHz
External connector	DC input 1 EA
Rated Voltage	Input : DC 13.5 V
Antenna type	Internal (Loop)

3.2 Definition of models

- None.

3.3 Support Equipment / Cables used

3.3.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
-	-	-	-

3.3.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
-	-	-	-

3.3.3 Used Cable(s)

Cable Name	Condition	Description
-	-	-

3.4 Modification Item(s)

-. None



4. Antenna Requirement - §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

4.1 Description of Antenna

The **SL CORPORATION. Wireless Charger.** comply with the requirement of §15.203 with a loop antenna permanently attached to the transmitter.

5. Description of tests

5.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used.

The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: 13.5 V / DC
- Operating condition during the test(s) :
 - . Continuous RF transmitting mode with nominal maximum RF output power.
 - . Operating channel frequency and modulation technology

Mode	Available channel	Frequency	Modulation Technology
NFC	1	13.56 MHz	ASK

- . EUT set condition (Test Software)

Test Software	-
Test Software version	-

6. References Standards

- FCC Part 15 (2009) Subpart C-Intentional Radiator §15.225
- ANSI C 63.10 (2013): American National Standard for Testing Unlicensed Wireless Devices



7. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Result
§15.207	AC Power line Conducted Emissions	N/A ¹⁾
§15.225(a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	Pass
§15.209	Radiated Spurious Emissions	Pass
§15.225(e)	Frequency Stability	Pass

1) The EUT is operating by car battery, Therefore the test was not applicable.

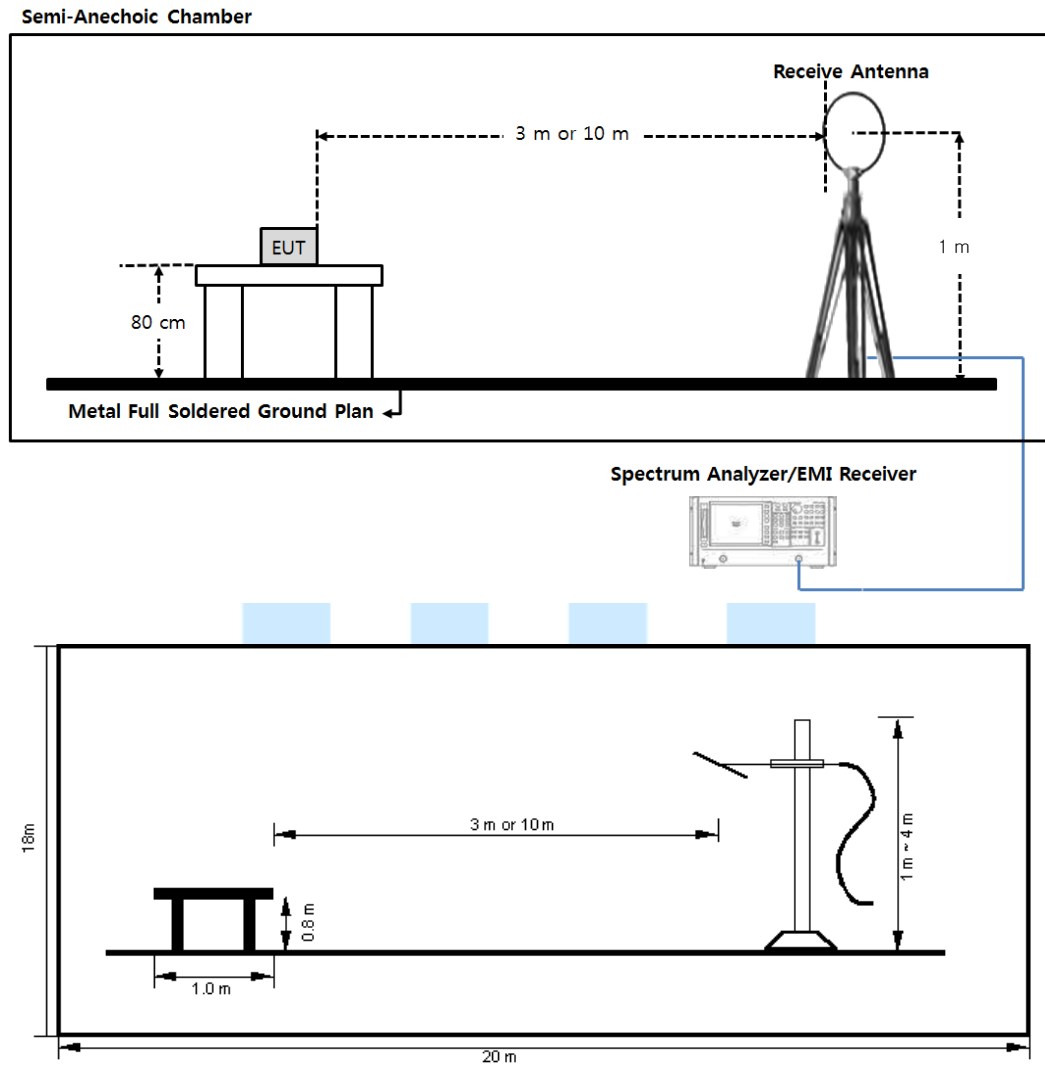


8. Field Strength of Fundamental Emissions and Spectrum Mask

8.1 Operating environment

Temperature : 19.4 °C
Relative Humidity : 25.6 % R.H.

8.2 Test Set-up (Layout)





8.3 Limit

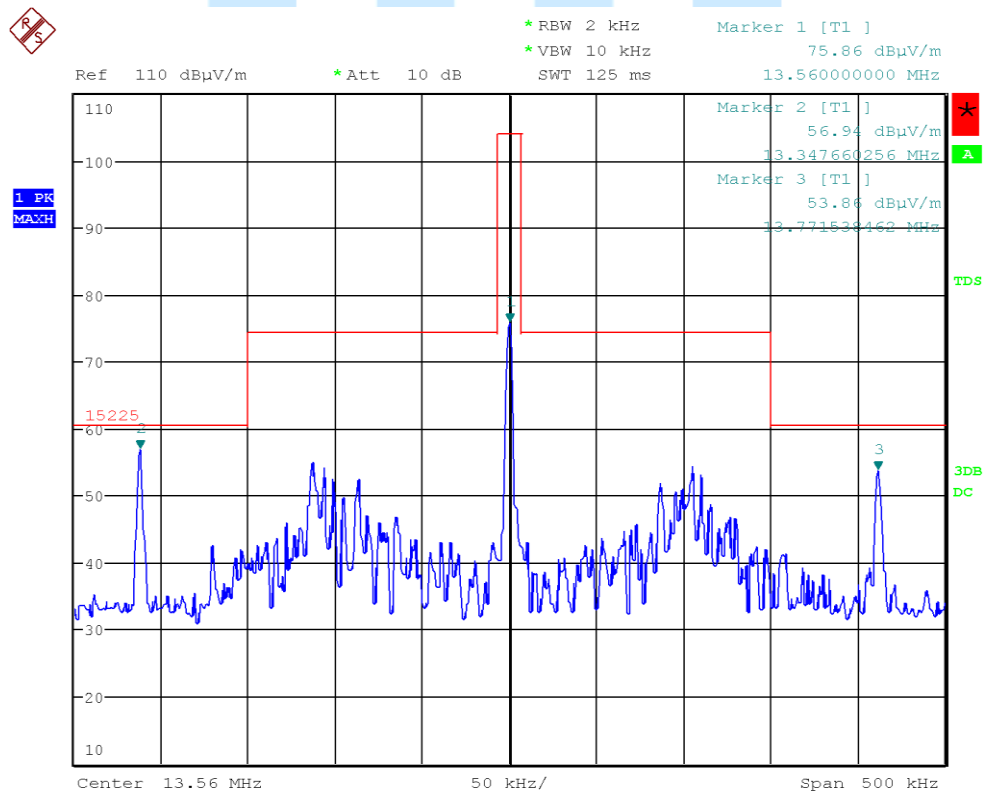
- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

8.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESU 40	Rohde & Schwarz	EMI Test Receiver	100266	Apr. 08, 2022
■ - HFH2-Z2	Rohde & Schwarz	Loop ANT	100041	Apr. 28, 2022
■ - MCU066	matur GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	matur GmbH	Turntable	1390307	N/A

8.5 Test result

- Test Date : Apr. 17, 2022
- Reference Standard : Part 15 Subpart C, Sec. 15.225(a)~(c)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (13.56 MHz)
- Power Source : DC 13.5 V





9. Radiated Spurious Emissions

Exploratory Radiated measurements were conducted at the 3m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

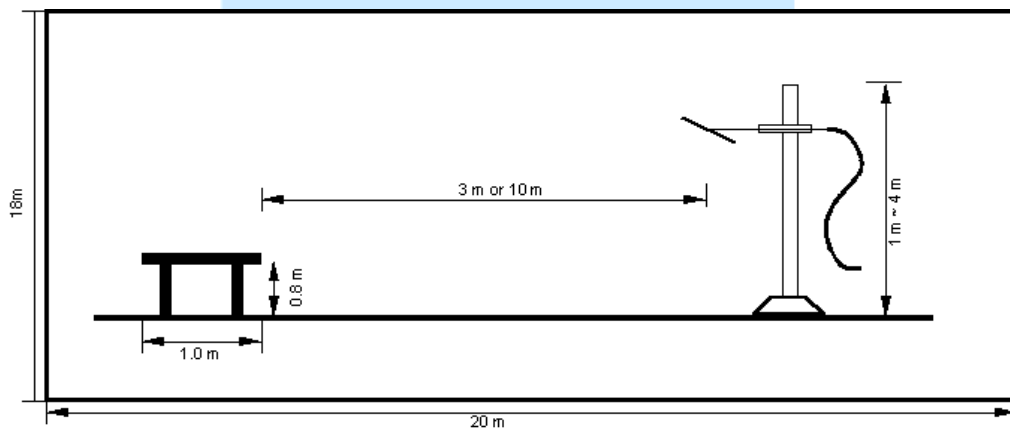
Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements of below 1GHz were made at 3m or 10 m Chamber that complies with CISPR 16/ANSI C63.10. Above 1GHz final measurements were conducted at the 3m Chamber only.

For measurements above 1GHz, the bottom side of 3m chamber was installed with absorbers in order to meet SVSWR Limit.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1GHz) and Peak & Average mode (Above 1GHz).

The measurements were performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.



Dimensions of test site (Below 1GHz)



9.1 Operating environment

Temperature : 21.9 °C
Relative humidity : 28.1 % R.H.

9.2 Test set-up

A preliminary and final measurement was at 3 m anechoic chamber.

The EUT was placed on a non-conducting table.

For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane.

For emission measurements above 1 GHz, the table height is 1.5 m above the reference ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.

This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

9.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95 %.

Test items(Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	5.14 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	5.10 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	6.05 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	5.19 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m, V/H)	5.20 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (6 000 MHz ~ 18 000 MHz, 3 m, V/H)	5.20 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (18 000 MHz ~ 26 000 MHz, 3 m, V/H)	5.53 dB	Confidence level of approximately 95 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



9.4 Limit

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2 400/F (kHz)	300
0.490 ~ 1.705	2 400/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

9.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESU40	Rohde & Schwarz	EMI Test Receiver	100266	Apr. 08, 2022
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	100041	Apr. 28, 2023
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3313	Apr. 08, 2022
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - CO3000	Innco system GmbH	Position Controller	CO3000/1804/4 2760218/P	N/A
■ - MA4640-XP-ET	Innco system GmbH	Antenna Mast	5580916	N/A
■ - EMC 32	Rohde & Schwarz	Testing Software	VER10.50.10	N/A



9.6 Test data for Radiated Spurious Emission

- Test Date : Apr. 17, 2022
- Reference Standard : Part 15 Subpart C, Sec. 15.209
- Measuring Distance : 3 m
- Resolution Bandwidth : 200 Hz, 9 kHz(Below 30 MHz) / 120 kHz(30 MHz ~ 1GHz)
- Detector mode : Quasi Peak detector mode / Peak detector mode / Average detector mode
- Power Source : DC 13.5 V
- Note : Through three orthogonal axes were investigated and the worst case is report

Radiated Spurious Emission (9 kHz to 1 000 MHz)

Frequency [MHz]	Pol.	Frequency Component	Reading [dBuV]	Transducer Factor [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
0.83	V	Other	19.92	19.50	39.42	49.18	9.76	QPK

Note 1)

If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

Note 2)

Test Result = Reading + Transducer Factor

Where, Transducer Factor = ACF + CL

ACF = Antenna Collection Factor

CL = Cable loss + Preamplifier gain + High Pass Filter

Pol.: H(Horizontal), V(Vertical)

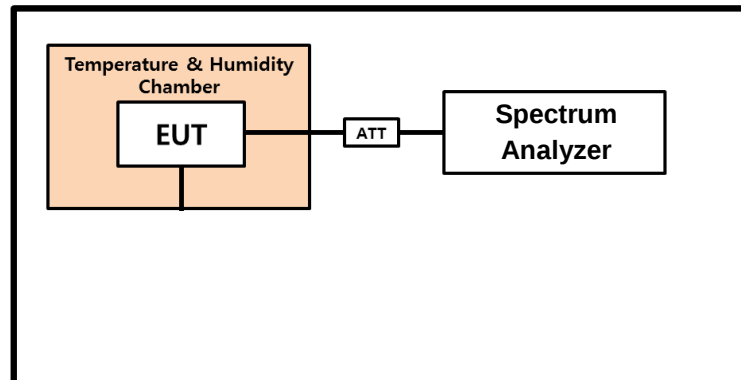


10. Frequency Stability

10.1 Operating environment

Temperature : 20.1 °C
Relative Humidity : 28.8 % R.H.

10.2 Test Set-up (Layout)



10.3 Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+ 50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

10.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSV	Rohde & Schwarz	Spectrum Analyzer	101552	Apr. 09, 2022
■ - OST-THB04-C10	OSUNG ST Co.,LTD	Temperature chamber	OSST-09022301118	Apr. 09, 2022

10.5 Test Test Procedure

- Set RBW = 1 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.



10.6 Test result

- Test Date : Apr. 18, 2022
- Reference Standard : Part 15 Subpart C, Sec. 15.225(e)
- Test Procedure(s) : ANSI C63.10 (2013)
- Operating Condition : RF transmitting mode (13.56 MHz)
- Power Source : DC 13.5 V, 11.475 V(85%), 15.525 V(115%)

Condition	Frequency (MHz)	Results (MHz)	Deviation (Hz)	Limit (Hz)
T _{-20°C} V _{nom}	13.56	N/A	N/A	N/A
T _{-10°C} V _{nom}		N/A	N/A	N/A
T _{0°C} V _{nom}		N/A	N/A	N/A
T _{10°C} V _{nom}		N/A	N/A	N/A
T _{20°C} V _{max}		13.560 058	58	1 356
T _{20°C} V _{min}		13.560 058	58	1 356
T _{20°C} V _{nom}		13.560 043	43	1 356
T _{30°C} V _{nom}		13.560 043	43	1 356
T _{40°C} V _{nom}		13.559 957	43	1 356
T _{50°C} V _{nom}		13.559 899	101	1 356



11. Sample Calculations

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \text{ Log}_{10}(\mu\text{V}/\text{m}) \\ \text{dB}\mu\text{V} &= \text{dBm} + 107 \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

11.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dB μV
Reading	= 39.2 dB μV
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV = 8.8 dB

11.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$
Reading	= 31.0 dB μV
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dB $\mu\text{V}/\text{m}$
Margin	= 40.0 dB $\mu\text{V}/\text{m}$ - 36.8 dB $\mu\text{V}/\text{m}$ = 3.2 dB



12. Recommendation & Conclusion

The data collected shows that the **SL CORPORATION. Wireless Charger (Model Name: WC-MP01N)** was complies with §15.225 of the FCC Rules.

- The end -

