

TEST REPORT

EMI Test for FCC Certification of WSP-i350 Model

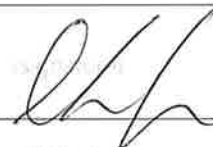
APPLICANT
WOOSIM SYSTEMS INC.

REPORT NO.
HCT-EM-2208-FC006

DATE OF ISSUE
August 23, 2022

Tested by
Kyoung-Hee Yoon

Technical Manager
Kun-Hyoung Kim



HCT CO., LTD.
Bongjai Huh
BongJai Huh / CEO

HCT Co., Ltd.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Tel. +82 31 645 6300 Fax. +82 31 645 6401



HCT Co., Ltd.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 645 6300 Fax. +82 31 645 6401

TEST REPORT

EMI Test for
FCC Certification

REPORT NO.

HCT-EM-2208-FC006

DATE OF ISSUE

August 23, 2022

FCC ID.

QDDWSP-I350W

Applicant

WOOSIM SYSTEMS INC.

60, Sandan-ro 388beon-gil, Chwisaeng-ri, Galsan-myeon, Hongseong-gun,
Chungcheongnam-do, Republic of Korea

Product Name

Mobile Printer

Model Name

WSP-i350

Date of Test

July 26, 2022 to August 17, 2022

Test Standard Used

FCC CFR 47 PART 15 Subpart B Class B
ANSI C63.4-2014

Test Results

Refer to the present document

Manufacturer

WOOSIM SYSTEMS INC.

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 23, 2022	Initial Release

The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr



CONTENTS

1. GENERAL INFORMATION	5
1.1 Description of EUT	5
1.2 Tested System Details	5
1.3 Cable Description	6
1.4 Noise Suppression Parts on Cable (I/O Cable)	7
1.5 Test Facility	8
1.6 Calibration of Measuring Instrument	8
1.7 Measurement Uncertainty	8
2. DESCRIPTION OF TEST	9
2.1 Measurement of Conducted Emission	9
2.2 Measurement of Radiated Emission	10
2.3 Configuration of Tested System	12
3. OPERATION OF THE EUT	13
3.1 Conducted Emission	13
3.2 Radiated Emission	13
4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY	14
4.1 Conducted Emission	14
4.2 Radiated Emission Below 1 GHz	23
4.3 Radiated Emission Above 1 GHz	27
5. APPENDIX A. TEST SETUP PHOTO	33



1. GENERAL INFORMATION

1.1 Description of EUT

The EUT is Mobile Printer.

FCC ID	QDDWSP-I350W
Model Name	WSP-i350
Product Name	Mobile Printer
Frequency	2 402 MHz ~ 2 480 MHz (Bluetooth)
Operating Voltage	Rated voltage: DC 8.4 V, 0.8 A Travel adapter: AC 100 ~ 240 V, 50 ~ 60 Hz Battery: DC 7.4 V, 1 800 mAh
Manufacturer	WOOSIM SYSTEMS INC.

1.2 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Product Name	Model Name	Serial Number	Manufacturer
Mobile Printer	WSP-i350	-	WOOSIM SYSTEMS INC.
AC Adapter	PA-1400-96	-	LITE-ON TECHNOLOGY CHANGZHOU CO., LTD
Notebook PC	NT551EAA	0WRX91IM100062P	HP
Notebook PC Adapter	A13-040N2A	-	Chicony Power Technology Co., Ltd
Gateway	TL-WR747N	-	TP Link
Gateway Adapter	T090060-2H1	-	TP Link
Serial Mouse	Serial 2 Button mouse	02031069	Radio Shack
Smart Phone 1	LM-G710EM	-	LG Electronics
Smart Phone 2	SM-N950N	R39JA08C5P	SAMSUNG



1.3 Cable Description

USB(Printer) + MSR + Charging Mode

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	DC IN	N	N/A	(P)1.5
	USB	N/A	N/A	(D)1.2
Notebook PC	RJ 45	N/A	N	(D) 1.6
	Serial(Mouse)	N/A	Y	(D) 1.8
	DC IN	N	N/A	(P) 1.8
Gateway	DC IN	N	N/A	(P) 1.8

"(D)" Data cable, "(P)" Power cable

USB(Printer) + MSR + Battery Mode

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	USB	N/A	N/A	(D)1.2
Notebook PC	RJ 45	N/A	N	(D) 1.6
	Serial(Mouse)	N/A	Y	(D) 1.8
	DC IN	N	N/A	(P) 1.8
Gateway	DC IN	N	N/A	(P) 1.8

BLUETOOTH IDLE + Charging Mode

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	DC IN	N	N/A	(P)1.5
Smart Phone 1	-	-	-	-

BLUETOOTH IDLE + Battery Mode

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	USB	N/A	N/A	(D)1.2
Smart Phone 1	-	-	-	-

NOTE. This product has a removable battery.

1.4 Noise Suppression Parts on Cable (I/O Cable)

USB(Printer) + MSR + Charging Mode

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	DC IN	N	N/A	Y	EUT End
	USB	N	N/A	Y	Both End
Notebook PC	RJ 45	N	N/A	N	N/A
	Serial(Mouse)	N	N/A	Y	Notebook End

USB(Printer) + MSR + Battery Mode

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	USB	N	N/A	Y	Both End
Notebook PC	RJ 45	N	N/A	N	N/A
	Serial(Mouse)	N	N/A	Y	Notebook End

BLUETOOTH IDLE + Charging Mode

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	DC IN	N	N/A	Y	EUT End

BLUETOOTH IDLE + Battery Mode

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	-	-	-	-	-

1.5 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014 and ANSI C63.4a-2017. Our laboratories are accredited and designated in accordance with the provisions of Radio Waves ACT and International Standard ISO/IEC 17025:2017. (National Radio Research Agency, CABID No. KR0032)

1.6 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5:2017

1.7 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Test Item	Test Site (Chamber)	Expanded Uncertainty
Conducted Emission (0.15 MHz to 30 MHz)	EMI Shield Room	2.0 dB
Radiated Emission (30 MHz to 1 GHz)	3 m Semi Anechoic Chamber #2	5.1 dB
Radiated Emission (1 GHz to 18 GHz)	3 m Semi Anechoic Chamber #1	4.8 dB

2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).

If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).

Other support units were connected to the power mains through another LISN.

The two LISNs provide $50\ \Omega$ / $50\ \mu\text{H}$ of coupling impedance for the measuring instrument.

b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.

c. The frequency range from 150 kHz to 30 MHz was searched.

Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dB μ V)	Average (dB μ V)	Quasi-Peak (dB μ V)	Average (dB μ V)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.

2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber.
The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. (1 GHz to 40 GHz)

Radiated Emission Limits

Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)	
Above 1 000	3	80	60	74	54	



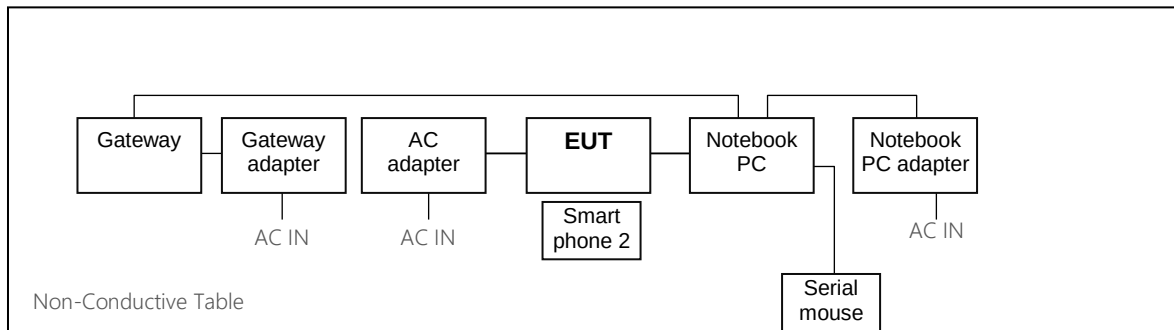
2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

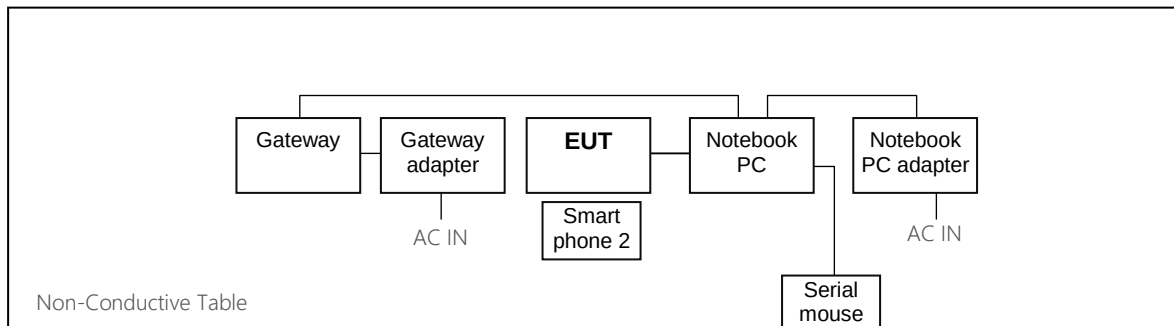
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System

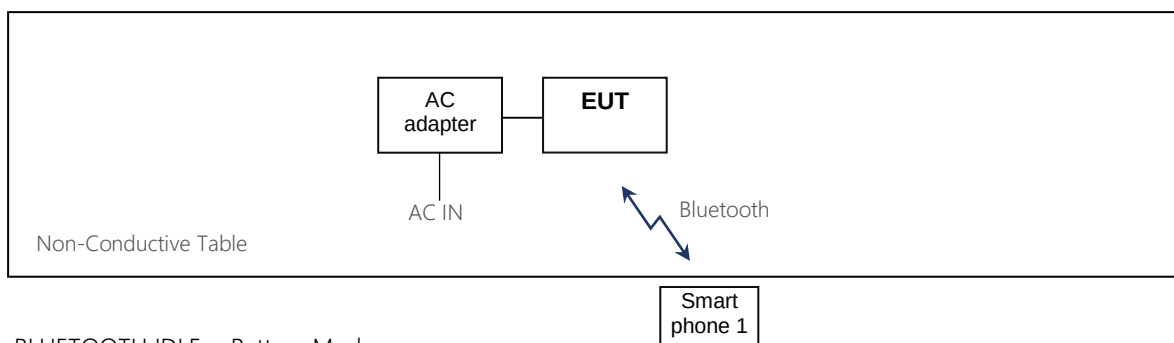
USB(Printer) + MSR + Charging Mode



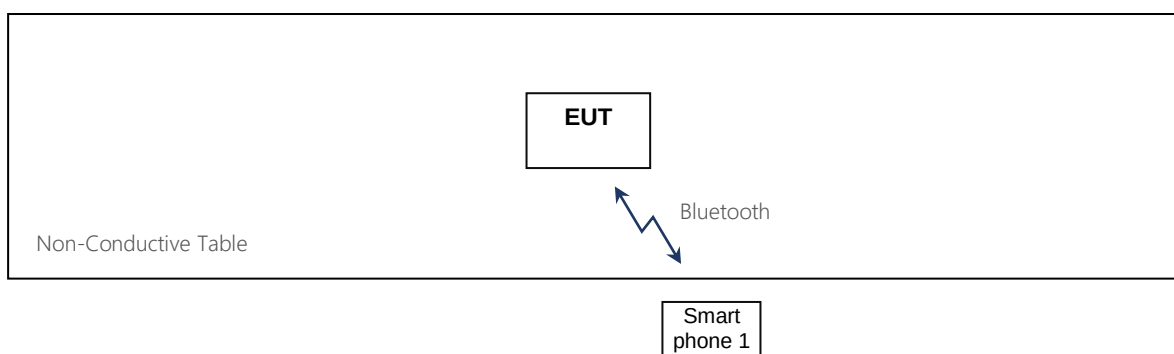
USB(Printer) + MSR + Battery Mode



BLUETOOTH IDLE + Charging Mode



BLUETOOTH IDLE + Battery Mode





3. OPERATION OF THE EUT

During preliminary test and final tests, the following operating mode was investigated.

3.1 Conducted Emission

After connecting the peripheral to the EUT, the following operating modes were tested.:

Operating Mode: BLUETOOTH IDLE + Charging Mode
 USB(Printer) + MSR + Charging Mode

3.2 Radiated Emission

After connecting the peripheral to the EUT, the following operating modes were tested.:

Operating Mode: USB(Printer) + MSR + Charging Mode
 USB(Printer) + MSR + Battery Mode
 BLUETOOTH IDLE + Charging Mode
 BLUETOOTH IDLE + Battery Mode

4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission

4.1.1 Measuring instruments

	Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Calibration Date
☒	EMI Test Receiver	ESR7	Rohde & Schwarz	101910	1 year	06.07.2022
☒	LISN	ENV216	Rohde & Schwarz	102245	1 year	08.23.2021
☒	LISN	ENV216	Rohde & Schwarz	100073	1 year	05.12.2022
☒	Software	EMC32	Rohde & Schwarz	-	-	-

4.1.2 Operating Condition

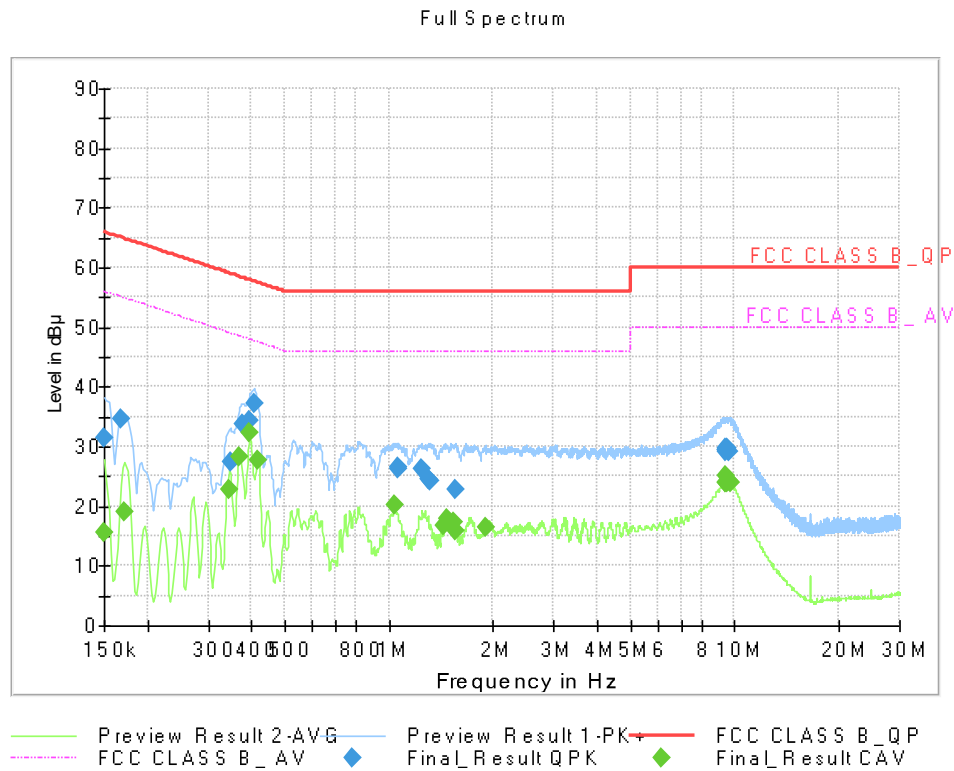
The test results of conducted emission at mains ports provide the following information:

Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	0.15 MHz to 30 MHz
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Test Site	EMI Shield Room
Temperature	min. 22.3 °C / max. 24.6 °C
Relative Humidity	min. 52.3 % / max. 56.6 %
Test Date	August 08 / August 17, 2022

- Calculation Formula:
1. Conductor L1 = Hot, Conductor N = Neutral
 2. Corr. = LISN Factor + Cable Loss
 3. QuasiPeak or CAverage= Receiver Reading + Corr.
 4. Margin = Limit – QuasiPeak or CAverage

4.1.3 Measurement Data

Figure 1: Conducted Emission (0.15 to 30) MHz, BLUETOOTH IDLE + Charging mode, Line(L1)





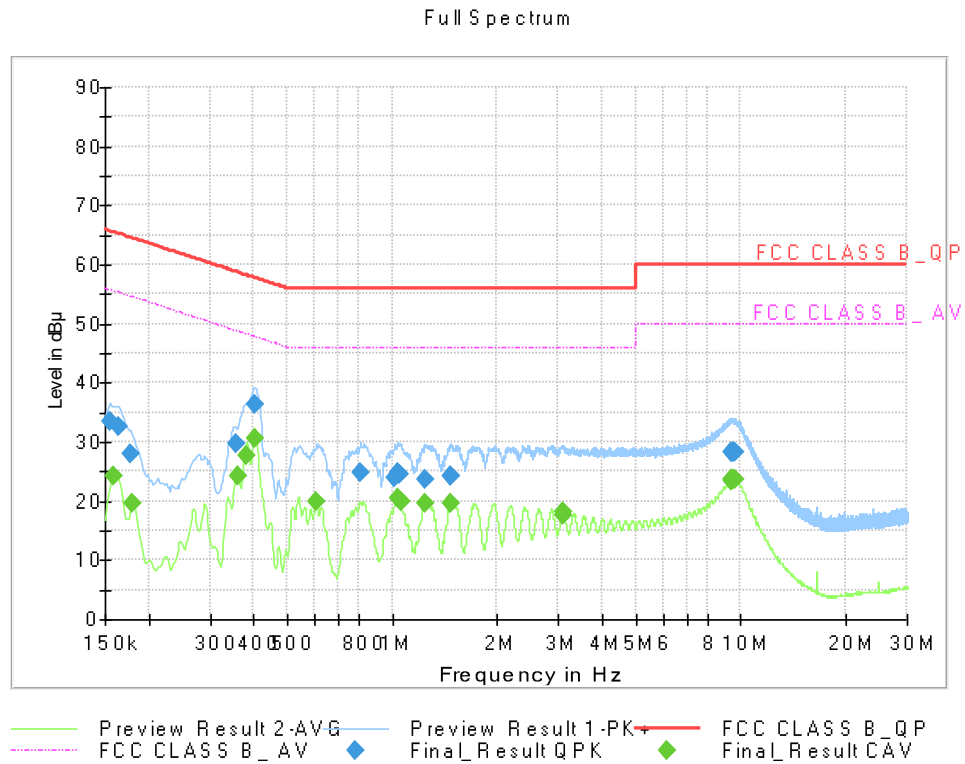
QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1500	31.47	66.00	34.53	9.000	L1	9.6
0.1680	34.71	65.06	30.35	9.000	L1	9.6
0.3480	27.46	59.01	31.55	9.000	L1	9.6
0.3773	33.87	58.34	24.47	9.000	L1	9.6
0.3953	34.21	57.95	23.75	9.000	L1	9.6
0.4065	37.20	57.72	20.52	9.000	L1	9.6
1.0580	26.63	56.00	29.37	9.000	L1	9.6
1.0625	26.22	56.00	29.78	9.000	L1	9.6
1.2403	26.21	56.00	29.79	9.000	L1	9.6
1.3010	24.65	56.00	31.35	9.000	L1	9.6
1.3145	24.29	56.00	31.71	9.000	L1	9.6
1.5553	22.74	56.00	33.26	9.000	L1	9.6
9.3763	29.60	60.00	30.40	9.000	L1	9.8
9.3943	29.28	60.00	30.72	9.000	L1	9.8
9.4033	29.34	60.00	30.66	9.000	L1	9.8
9.4100	29.15	60.00	30.85	9.000	L1	9.8
9.4730	29.61	60.00	30.39	9.000	L1	9.8
9.6283	29.21	60.00	30.79	9.000	L1	9.8

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1500	15.59	56.00	40.41	9.000	L1	9.6
0.1725	18.96	54.84	35.88	9.000	L1	9.6
0.3458	22.73	49.06	26.34	9.000	L1	9.6
0.3705	28.15	48.49	20.34	9.000	L1	9.6
0.3953	32.22	47.95	15.73	9.000	L1	9.6
0.4178	27.69	47.49	19.80	9.000	L1	9.6
1.0355	20.28	46.00	25.72	9.000	L1	9.6
1.4450	16.62	46.00	29.38	9.000	L1	9.6
1.4653	17.83	46.00	28.17	9.000	L1	9.6
1.5350	17.34	46.00	28.66	9.000	L1	9.6
1.5575	15.94	46.00	30.06	9.000	L1	9.6
1.8973	16.43	46.00	29.57	9.000	L1	9.6
9.3718	24.02	50.00	25.98	9.000	L1	9.8
9.3920	25.03	50.00	24.97	9.000	L1	9.8
9.3988	23.94	50.00	26.06	9.000	L1	9.8
9.5495	24.08	50.00	25.92	9.000	L1	9.8
9.5900	24.10	50.00	25.90	9.000	L1	9.8
9.7183	23.89	50.00	26.11	9.000	L1	9.8

Figure 2: Conducted Emission (0.15 to 30) MHz, BLUETOOTH IDLE + Charging mode, Line(N)





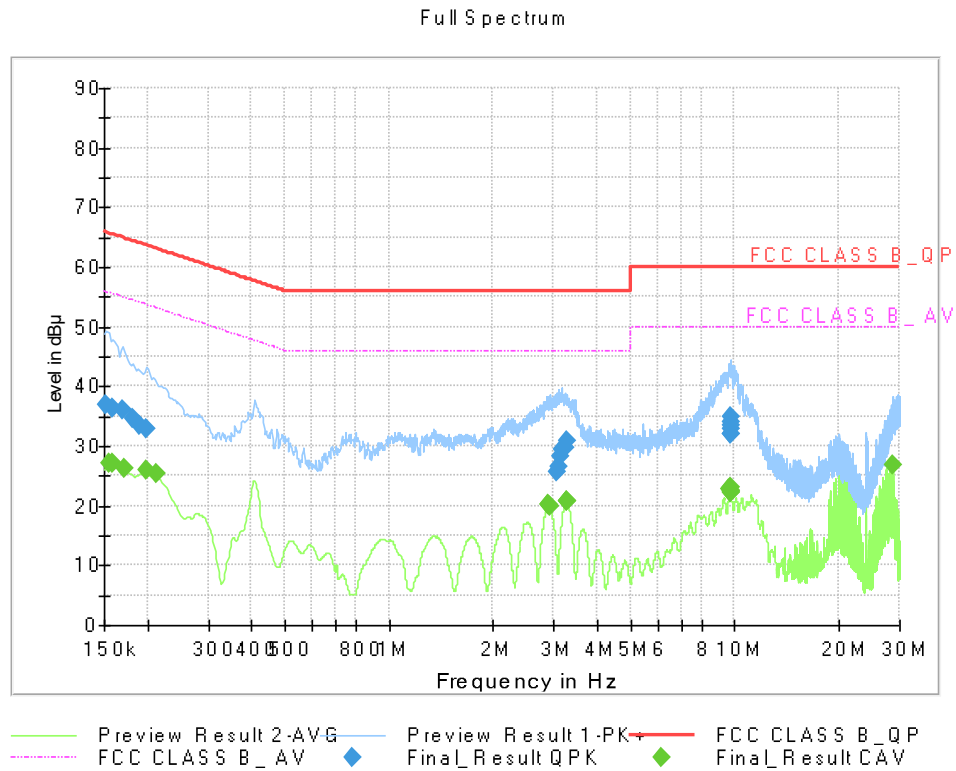
QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	33.33	65.75	32.43	9.000	N	9.6
0.1635	32.53	65.28	32.76	9.000	N	9.6
0.1770	27.93	64.63	36.69	9.000	N	9.6
0.3548	29.62	58.85	29.23	9.000	N	9.6
0.4043	36.31	57.77	21.45	9.000	N	9.6
0.8128	24.78	56.00	31.22	9.000	N	9.6
1.0198	23.84	56.00	32.16	9.000	N	9.6
1.0378	24.84	56.00	31.16	9.000	N	9.6
1.0558	24.56	56.00	31.44	9.000	N	9.6
1.2425	23.75	56.00	32.25	9.000	N	9.6
1.4653	24.17	56.00	31.83	9.000	N	9.6
1.4743	24.36	56.00	31.64	9.000	N	9.6
9.3763	28.28	60.00	31.72	9.000	N	9.8
9.4123	28.30	60.00	31.70	9.000	N	9.8
9.4640	28.20	60.00	31.80	9.000	N	9.8
9.5428	28.22	60.00	31.78	9.000	N	9.8
9.5540	28.27	60.00	31.73	9.000	N	9.8
9.5878	28.32	60.00	31.68	9.000	N	9.8

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1590	24.31	55.52	31.21	9.000	N	9.6
0.1793	19.54	54.52	34.98	9.000	N	9.6
0.3593	24.12	48.75	24.63	9.000	N	9.6
0.3818	27.62	48.24	20.62	9.000	N	9.6
0.4043	30.43	47.77	17.33	9.000	N	9.6
0.6058	19.90	46.00	26.10	9.000	N	9.6
1.0378	20.45	46.00	25.55	9.000	N	9.6
1.0580	19.80	46.00	26.20	9.000	N	9.6
1.2403	19.64	46.00	26.36	9.000	N	9.6
1.4653	19.49	46.00	26.51	9.000	N	9.6
3.0763	17.58	46.00	28.42	9.000	N	9.7
3.0943	18.23	46.00	27.77	9.000	N	9.7
9.3875	23.47	50.00	26.53	9.000	N	9.8
9.3943	23.55	50.00	26.45	9.000	N	9.8
9.4190	23.56	50.00	26.44	9.000	N	9.8
9.4325	23.62	50.00	26.38	9.000	N	9.8
9.4820	23.76	50.00	26.24	9.000	N	9.8
9.6305	23.58	50.00	26.42	9.000	N	9.8

Figure 3: Conducted Emission (0.15 to 30) MHz, USB(Printer) + MSR + Charging mode, Line(L1)





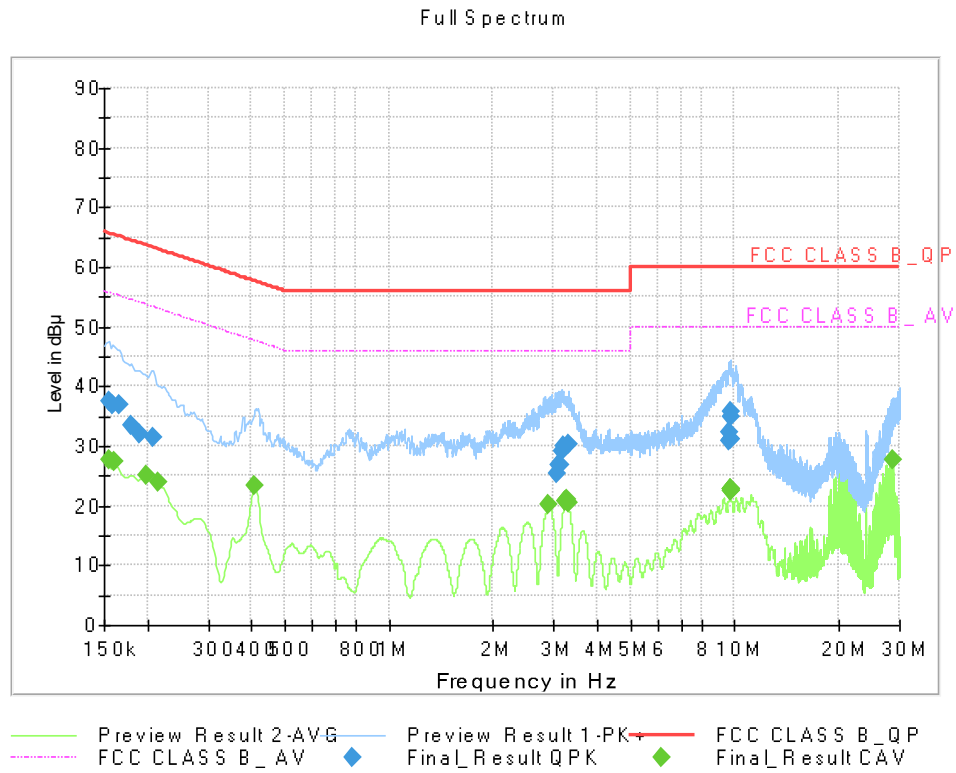
QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1523	37.06	65.88	28.82	9.000	L1	9.6
0.1590	36.28	65.52	29.24	9.000	L1	9.6
0.1703	36.01	64.95	28.94	9.000	L1	9.6
0.1815	34.58	64.42	29.83	9.000	L1	9.6
0.1905	33.51	64.02	30.51	9.000	L1	9.6
0.1995	32.81	63.63	30.82	9.000	L1	9.6
3.0695	25.77	56.00	30.23	9.000	L1	9.8
3.0808	26.58	56.00	29.42	9.000	L1	9.8
3.1370	28.32	56.00	27.68	9.000	L1	9.8
3.1708	29.57	56.00	26.43	9.000	L1	9.8
3.2180	29.62	56.00	26.38	9.000	L1	9.8
3.2720	30.95	56.00	25.05	9.000	L1	9.8
9.6980	31.96	60.00	28.04	9.000	L1	10.0
9.7138	32.79	60.00	27.21	9.000	L1	10.0
9.7205	31.93	60.00	28.07	9.000	L1	10.0
9.7543	34.00	60.00	26.00	9.000	L1	10.0
9.7633	34.80	60.00	25.20	9.000	L1	10.0
9.7858	33.57	60.00	26.43	9.000	L1	10.0

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	27.22	55.75	28.53	9.000	L1	9.6
0.1590	27.25	55.52	28.26	9.000	L1	9.6
0.1725	26.12	54.84	28.72	9.000	L1	9.6
0.1995	25.92	53.63	27.71	9.000	L1	9.6
0.2130	25.29	53.09	27.79	9.000	L1	9.6
2.8828	20.18	46.00	25.82	9.000	L1	9.8
2.9053	20.20	46.00	25.80	9.000	L1	9.8
2.9233	19.84	46.00	26.16	9.000	L1	9.8
3.2563	20.86	46.00	25.14	9.000	L1	9.8
3.2698	20.81	46.00	25.19	9.000	L1	9.8
3.2743	20.79	46.00	25.21	9.000	L1	9.8
9.6823	22.87	50.00	27.13	9.000	L1	10.0
9.6868	22.33	50.00	27.67	9.000	L1	10.0
9.7003	22.99	50.00	27.01	9.000	L1	10.0
9.7183	22.39	50.00	27.61	9.000	L1	10.0
9.7295	22.13	50.00	27.87	9.000	L1	10.0
9.7498	22.40	50.00	27.60	9.000	L1	10.0
28.5598	26.92	50.00	23.08	9.000	L1	10.6

Figure 4: Conducted Emission (0.15 to 30) MHz, USB(Printer) + MSR + Charging mode, Line(N)





QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	37.42	65.75	28.33	9.000	N	9.6
0.1590	36.89	65.52	28.62	9.000	N	9.6
0.1658	36.81	65.17	28.36	9.000	N	9.6
0.1793	33.39	64.52	31.13	9.000	N	9.6
0.1905	31.96	64.02	32.05	9.000	N	9.6
0.2085	31.44	63.27	31.83	9.000	N	9.6
3.0538	25.46	56.00	30.54	9.000	N	9.8
3.0965	26.85	56.00	29.15	9.000	N	9.8
3.1100	26.83	56.00	29.17	9.000	N	9.8
3.1528	29.00	56.00	27.00	9.000	N	9.8
3.1820	29.92	56.00	26.08	9.000	N	9.8
3.3013	30.25	56.00	25.75	9.000	N	9.8
9.6598	30.83	60.00	29.17	9.000	N	10.0
9.6665	32.34	60.00	27.66	9.000	N	10.0
9.7048	34.83	60.00	25.17	9.000	N	10.0
9.7138	35.78	60.00	24.22	9.000	N	10.0
9.7295	31.23	60.00	28.77	9.000	N	10.0
9.7453	31.27	60.00	28.73	9.000	N	10.0

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	27.77	55.75	27.98	9.000	N	9.6
0.1613	27.45	55.40	27.95	9.000	N	9.6
0.1995	25.24	53.63	28.39	9.000	N	9.6
0.2153	23.88	53.00	29.12	9.000	N	9.6
0.4088	23.33	47.67	24.35	9.000	N	9.7
2.8873	20.16	46.00	25.84	9.000	N	9.8
3.2383	20.86	46.00	25.14	9.000	N	9.8
3.2518	20.86	46.00	25.14	9.000	N	9.8
3.2630	20.92	46.00	25.08	9.000	N	9.8
3.2833	20.71	46.00	25.29	9.000	N	9.8
3.3013	20.36	46.00	25.64	9.000	N	9.8
9.6890	22.86	50.00	27.14	9.000	N	10.0
9.7048	22.84	50.00	27.16	9.000	N	10.0
9.7093	22.53	50.00	27.47	9.000	N	10.0
9.7183	22.93	50.00	27.07	9.000	N	10.0
9.7408	22.67	50.00	27.33	9.000	N	10.0
9.7498	22.37	50.00	27.63	9.000	N	10.0
28.5598	27.55	50.00	22.45	9.000	N	10.7

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Calibration Date
10 m Semi Anechoic Chamber #1					
☐ EMI test receiver	ESU26	Rohde & Schwarz	100241	1 year	06.14.2022
☐ Bilog Antenna	VULB 9168	SCHWARZBECK	847	2 year	05.27.2022
☐ Antenna master	MA4000-EP	INNCO systems	MA4000/283	N/A	-
☐ Turn Table	DT3000-3t	INNCO systems	DT3000/69	N/A	-
☐ Low Noise Amplifier	TK-PA01S	TESTEK	200112-L	1 year	06.14.2022
10 m Semi Anechoic Chamber #2					
☐ EMI Test Receiver	ESW44	Rohde & Schwarz	101946	1 year	07.04.2022
☐ Bilog Antenna	VULB9168	Schwarzbeck	760	2 year	02.22.2021
☐ Ant MAST	MA4000-EP	INNCO systems	-	N/A	-
☐ Ant MAST Controller	CO3000	INNCO systems	CO3000/999/ 40240317/G	N/A	-
☐ Turn Table	DDT6000/3000-5T	INNCO systems	-	N/A	-
☐ Low Noise Amplifier	TK-PA1S	TESTEK	190005-L	1 year	04.11.2022
3 m Semi Anechoic Chamber #1					
☐ EMI Test Receiver	ESU40	Rohde & Schwarz	100524	1 year	05.10.2022
☐ Bilog Antenna	VULB9168	Schwarzbeck	255	2 year	03.15.2021
☐ Antenna master	MA4640-XP-ET	INNCO SYSTEM	-	N/A	-
☐ Antenna master controller	CO3000	INNCO SYSTEM	CO3000/870 /35990515/L	N/A	-
☐ Turn Table	1060	INNCO SYSTEM	-	N/A	-
☐ Turn Table controller	CO2000	INNCO SYSTEM	CO2000/095 /7590304/L	N/A	-
☐ DC Power Supply	PWS-3003D	Protek	04050810	1 year	10.27.2021
☐ Software	EMC32	Rohde & Schwarz	-	-	-
3 m Semi Anechoic Chamber #2					
☒ EMI Test Receiver	ESU40	Rohde&Schwartz	100361	1 year	09.17.2021
☒ Bilog Antenna	VULB 9168	SCHWARZBECK	01156	2 year	05.27.2022
☒ Antenna Master	MA4640-XP-ET	INNCO SYSTEM	-	N/A	-
☒ Antenna Master Controller	CO3000	INNCO SYSTEM	CO3000/1250 /4892320/P	N/A	-
☒ Turn Table	DS2000-S	INNCO SYSTEM	-	N/A	-
☒ Turn Table Controller	CO2000	INNCO SYSTEM	CO3000/1250 /4892320/P	N/A	-
☒ Software	EMC32	Rohde & Schwarz	-	-	-



4.2.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	30 MHz to 1 000 MHz
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Measurement Distance	3 m
Antenna height	1 m to 4 m
Test Site	3 m Semi Anechoic Chamber #2
Temperature	min. 23.2 °C / max. 26.0 °C
Relative Humidity	min. 49.4 % / max. 58.0 %
Test Date	July 26 / August 11 / August 12, 2022

Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak

4.2.3 Measuring Data

Figure 5: Radiated Emission (30 to 1 000) MHz, USB(Printer) + MSR + Charging Mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)
72.0240	30.79	40.00	9.21	100.0	V	257.0	17.2
216.2750	30.25	46.00	15.75	104.0	H	231.0	17.3
335.9950	41.65	46.00	4.35	103.4	H	100.0	21.1
352.1370	36.75	46.00	9.25	192.7	H	146.0	21.5
407.8030	38.85	46.00	7.05	207.2	H	124.0	22.7
415.8660	39.51	46.00	6.49	221.5	H	108.0	22.9

Figure 6: Radiated Emission (30 to 1 000) MHz, USB(Printer) + MSR + Battery Mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)
74.6420	33.33	40.00	6.67	274.5	H	-17.0	16.4
79.8450	32.62	40.00	7.38	125.1	V	285.0	15.0
298.6330	25.57	46.00	20.43	100.0	H	-25.0	20.2
359.7880	42.90	46.00	3.10	104.2	H	297.0	21.6
367.8510	40.80	46.00	5.20	100.0	H	295.0	21.8
960.0360	36.26	54.00	17.74	100.0	H	272.0	31.1

Figure 7: Radiated Emission (30 to 1 000) MHz, BLUETOOTH IDLE + Charging Mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)
38.2010	16.70	40.00	23.30	104.4	V	181.0	19.1
44.4940	28.10	40.00	11.90	100.0	V	25.0	19.7
47.5220	24.70	40.00	15.30	378.5	V	86.0	19.8
65.3350	27.15	40.00	12.85	100.0	V	183.0	18.5
335.9950	37.36	46.00	8.64	100.0	H	103.0	21.1
816.0310	38.76	46.00	7.24	102.6	H	294.0	29.8

Figure 8: Radiated Emission (30 to 1 000) MHz, BLUETOOTH IDLE + Battery Mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)
60.0130	24.89	40.00	15.11	100.0	V	30.0	19.3
335.9950	29.00	46.00	17.00	178.1	V	332.0	21.1
527.9980	30.21	46.00	15.79	100.0	V	208.0	25.3
816.0080	37.22	46.00	8.78	103.8	H	72.0	29.8
864.0230	37.52	46.00	8.48	100.0	H	269.0	30.1
960.0130	38.12	54.00	15.88	100.0	H	271.0	31.1

4.3 Radiated Emission Above 1 GHz

4.3.1 Measuring instruments

Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Calibration Date
3 m Semi Anechoic Chamber #1					
☒ EMI test receiver	ESU40	Rohde & Schwarz	100524	1 year	05.10.2022
☒ Horn Antenna	BBHA 9120D	SCHWARZBECK	1518	1 year	09.15.2021
☒ Power Amplifier	TK-PA18H	TESTEK	170012-L	1 year	04.21.2022
☐ Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year	02.24.2022
☐ Horn Antenna	BBHA9170	Schwarzbeck	BBHA 9170 #786	1 year	11.18.2021
☒ Antenna master	MA4640-XP-ET	INNCO Systems	-	N/A	-
☒ Antenna master controller	CO3000	INNCO Systems	CO3000/870/ 35990515/L	N/A	-
☒ Turn table	1060	INNCO Systems	-	N/A	-
☒ Turn table controller	CO2000	INNCO Systems	CO2000/095/ 7590304/L	N/A	-
☐ Low Noise amplifier	TK-PA18H	TESTEK	170034-L	1 year	02.24.2022
☐ Horn antenna	BBHA 9120D	Schwarzbeck	01836	1 year	07.21.2022
☐ Band Reject Filter	WRCJ2400/2483.5 -2370/2520-60/14SS	Wainwright Instruments	1	1 year	02.07.2022
☒ Software	EMC32	Rohde & Schwarz	-	-	-
3 m Semi Anechoic Chamber #2					
☐ EMI test receiver	ESU40	Rohde&Schwarz	100361	1 year	09.17.2021
☐ Horn Antenna	BBHA 9170	SCHWARZBECK	810	1 year	04.25.2022
☐ Power Amplifier	TK-PA1804H	TESTEK	170033-L	1 year	04.15.2022
☐ Horn Antenna	BBHA 9120D	SCHWARZBECK	296	1 year	02.17.2022
☐ Amplifier	CBLU5183530	CERNEX	24348	1 year	06.02.2022
☐ Antenna Master	MA4640-XP-ET	INNCO SYSTEM	-	N/A	-
☐ Antenna Master Controller	CO3000	INNCO SYSTEM	CO3000/1250 /4892320/P	N/A	-
☐ Turn Table	DS2000-S	INNCO SYSTEM	-	N/A	-
☐ Turn Table Controller	CO2000	INNCO SYSTEM	CO3000/1250 /4892320/P	N/A	-
10 m Semi Anechoic Chamber #1					
☐ EMI test receiver	ESU26	ROHDE&SCHWARZ	100241	1 year	06.14.2022
☐ Horn Antenna	BBHA 9120 D	SCHWARZBECK	1639	1 year	09.06.2021
☐ Antenna master	AS2000-PP	INNCO systems	AS2000/135/ 34270914/L	N/A	-
☐ Turn table	DT3000-3t	INNCO systems	DT3000/69	N/A	-
☐ Amplifier	CBLU1183540	CERNEX	21691	1 year	06.14.2022
10 m Semi Anechoic Chamber #2					
☐ EMI Test Receiver	ESW44	Rohde & Schwarz	101946	1 year	07.04.2022
☐ Amplifier	TK-PA6S	TESTEK	130012	1 year	01.18.2022
☐ Horn Antenna	BBHA 9120D	SCHWARZBECK	1641	1 year	06.30.2022
☐ Horn Antenna	BBHA 9120D	Schwarzbeck	1152	1 year	02.23.2022
☐ Ant MAST	MA4000-EP	INNCO systems	-	N/A	-
☐ Ant MAST Controller	CO3000	INNCO systems	CO3000/999 /40240317/G	N/A	-
☐ Ant MAST	MA4640/800 XP-ET	INNCO systems	-	N/A	-
☐ Ant MAST Controller	CO3000	INNCO systems	CO3000/951 /38590616/G	N/A	-
☐ Turn Table	DDT6000/3000-5T	INNCO systems	-	N/A	-

4.3.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Peak, CISPR-Average
Bandwidth	1 MHz
Highest Frequency	2 480 MHz
Tested Frequency Range	1 GHz to 18 GHz
Measurement Distance	3 m
Antenna height	1 m to 4 m
Test Site	3 m Semi Anechoic Chamber #1
Temperature	min. 21.5 °C / max. 25.4 °C
Relative Humidity	min. 46.6 % / max. 55.4 %
Test Date	August 16 / August 17, 2022

- Calculation Formula:
1. POL. H = Horizontal, POL. V = Vertical
 2. Peak or CAverage = Reading (Receiver Reading) + Corr.
 3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
 4. Margin = Limit - Peak or CAverage

4.3.3 Measurement Data

Figure 9: Radiated Emission (1 to 18) GHz, USB(Printer) + MSR + Charging Mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1197.0950	43.5	197.5	V	2.0	-21.3	30.5	74.0
1795.8700	47.8	207.7	V	42.0	-20.0	26.2	74.0
2392.8500	44.9	249.9	V	356.0	-18.5	29.1	74.0
3594.6150	42.9	128.7	V	191.0	-15.8	31.1	74.0
5978.8450	46.3	128.9	V	190.0	-7.8	27.7	74.0
14685.2850	50.3	206.5	V	99.0	8.8	23.7	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1197.0950	26.0	197.5	V	2.0	-21.3	28.0	54.0
1795.8700	27.1	207.7	V	42.0	-20.0	26.9	54.0
2392.8500	25.5	249.9	V	356.0	-18.5	28.5	54.0
3594.6150	24.6	128.7	V	191.0	-15.8	29.4	54.0
5978.8450	28.2	128.9	V	190.0	-7.8	25.8	54.0
14685.2850	38.1	206.5	V	99.0	8.8	15.9	54.0



Figure 10: Radiated Emission (1 to 18) GHz, USB(Printer) + MSR + Battery Mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1792.7100	46.5	220.5	V	43.0	-20.0	27.5	74.0
2398.1600	46.0	113.5	V	146.0	-18.5	28.0	74.0
3583.0700	47.5	199.7	V	339.0	-15.9	26.5	74.0
5994.0650	47.5	100.0	V	73.0	-7.8	26.5	74.0
14502.4250	50.4	250.0	V	0.0	9.1	23.6	74.0
17972.1515	58.9	143.6	V	198.0	17.1	15.1	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1792.7100	25.3	220.5	V	43.0	-20.0	28.7	54.0
2398.1600	25.8	113.5	V	146.0	-18.5	28.2	54.0
3583.0700	25.7	199.7	V	339.0	-15.9	28.3	54.0
5994.0650	28.7	100.0	V	73.0	-7.8	25.3	54.0
14502.4250	38.2	250.0	V	0.0	9.1	15.8	54.0
17972.1515	46.1	143.6	V	198.0	17.1	7.9	54.0



Figure 11: Radiated Emission (1 to 18) GHz, BLUETOOTH IDLE + Charging Mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1056.0350	31.2	218.6	V	132.0	-21.7	42.8	74.0
1151.9150	39.7	126.8	H	174.0	-21.4	34.3	74.0
1248.0450	38.4	206.7	H	150.0	-21.1	35.6	74.0
1344.2100	37.2	192.6	H	137.0	-20.9	36.8	74.0
4028.6850	35.1	177.7	H	196.0	-14.2	38.9	74.0
17961.7200	58.7	149.6	H	116.0	17.0	15.3	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1056.0350	22.1	218.6	V	132.0	-21.7	31.9	54.0
1151.9150	37.0	126.8	H	174.0	-21.4	17.0	54.0
1248.0450	36.3	206.7	H	150.0	-21.1	17.7	54.0
1344.2100	33.9	192.6	H	137.0	-20.9	20.1	54.0
4028.6850	22.4	177.7	H	196.0	-14.2	31.6	54.0
17961.7200	46.0	149.6	H	116.0	17.0	8.0	54.0



Figure 12: Radiated Emission (1 to 18) GHz, BLUETOOTH IDLE + Battery Mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1151.9700	34.9	234.5	V	32.0	-21.4	39.1	74.0
1248.0500	37.2	206.7	H	147.0	-21.1	36.8	74.0
1343.9800	36.3	112.7	V	206.0	-20.9	37.7	74.0
3924.2450	34.4	249.8	V	62.0	-14.6	39.6	74.0
11144.2150	46.9	150.1	V	104.0	3.4	27.1	74.0
17969.4050	58.5	100.0	H	326.0	17.1	15.5	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1151.9700	29.8	234.5	V	32.0	-21.4	24.2	54.0
1248.0500	33.8	206.7	H	147.0	-21.1	20.2	54.0
1343.9800	32.1	112.7	V	206.0	-20.9	21.9	54.0
3924.2450	22.1	249.8	V	62.0	-14.6	31.9	54.0
11144.2150	34.3	150.1	V	104.0	3.4	19.7	54.0
17969.4050	46.1	100.0	H	326.0	17.1	7.9	54.0



5. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A and test setup photo file no. as follows;

File No.	Date of Issue	Description
HCT-EM-2208-FC006-P	August 23, 2022	Initial Release

End of report