

TEST REPORT

EMI Test for FCC Certification of WSP-R241 Model

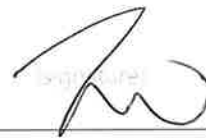
APPLICANT
WOOSIM SYSTEMS INC.

REPORT NO.
HCT-EM-2208-FC009

DATE OF ISSUE
August 23, 2022

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TEST REPORT

EMI Test for
FCC Certification

REPORT NO.

HCT-EM-2208-FC009

DATE OF ISSUE

August 23, 2022

FCC ID.

QDDWSP-R241W

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-R241

Date of Test

July 25, 2022 to August 18, 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



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1. GENERAL INFORMATION

1.1 Description of EUT

The EUT is Mobile Printer.

FCC ID	QDDWSP-R241W
Model Name	WSP-R241
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, 1 150 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-R241	-	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 Ω / 50 μ 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	



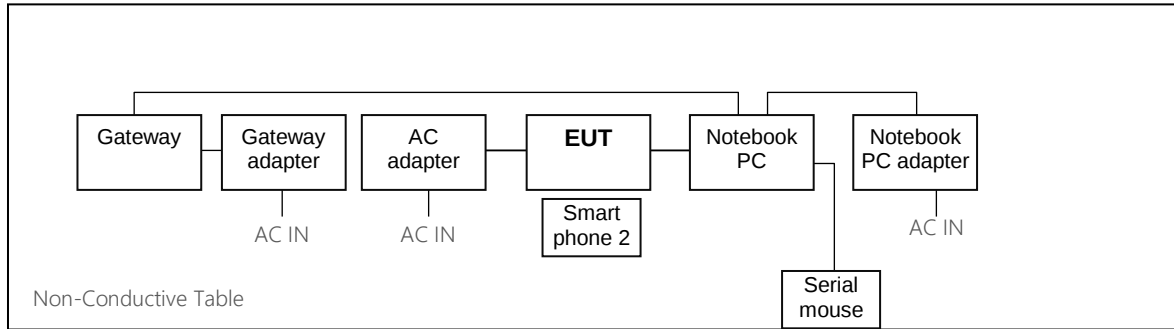
2.2.1 Frequency Range of Radiated Measurements

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

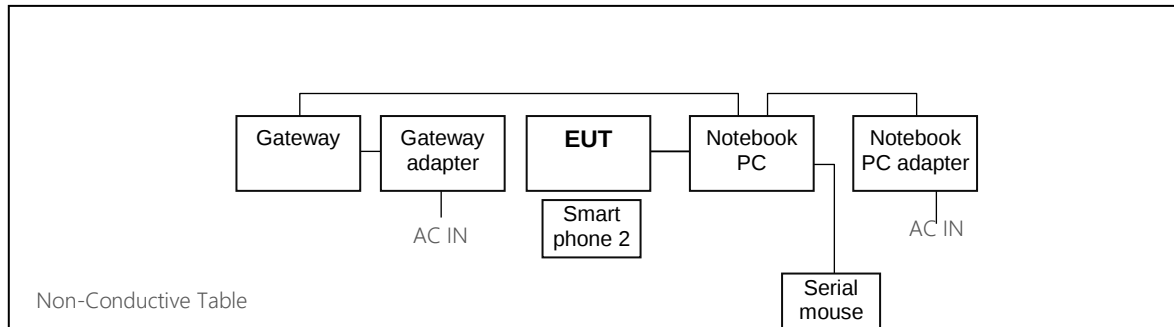
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System

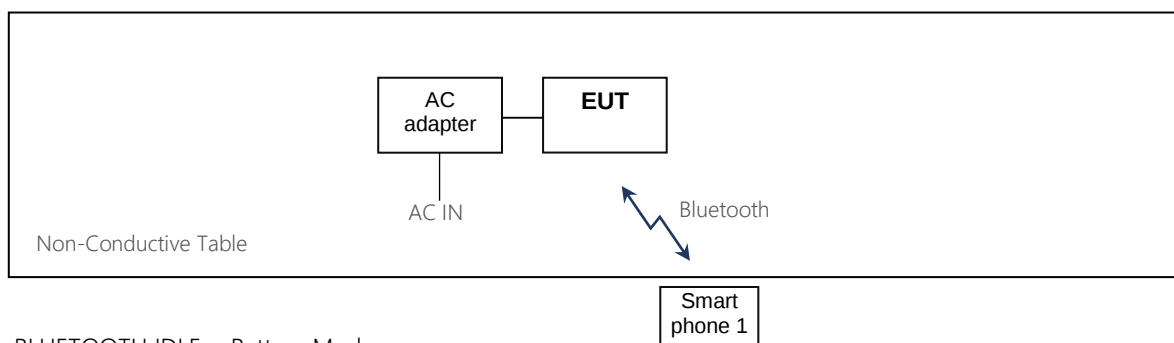
USB(Printer) + MSR + Charging Mode



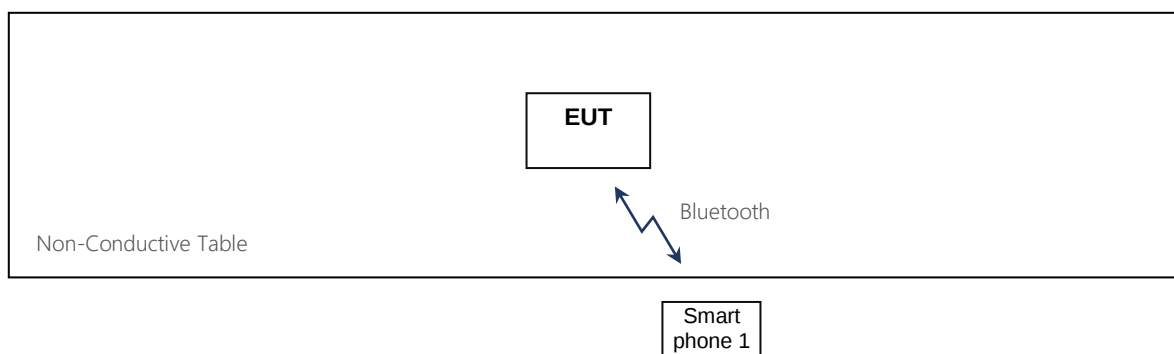
USB(Printer) + MSR + Battery Mode



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

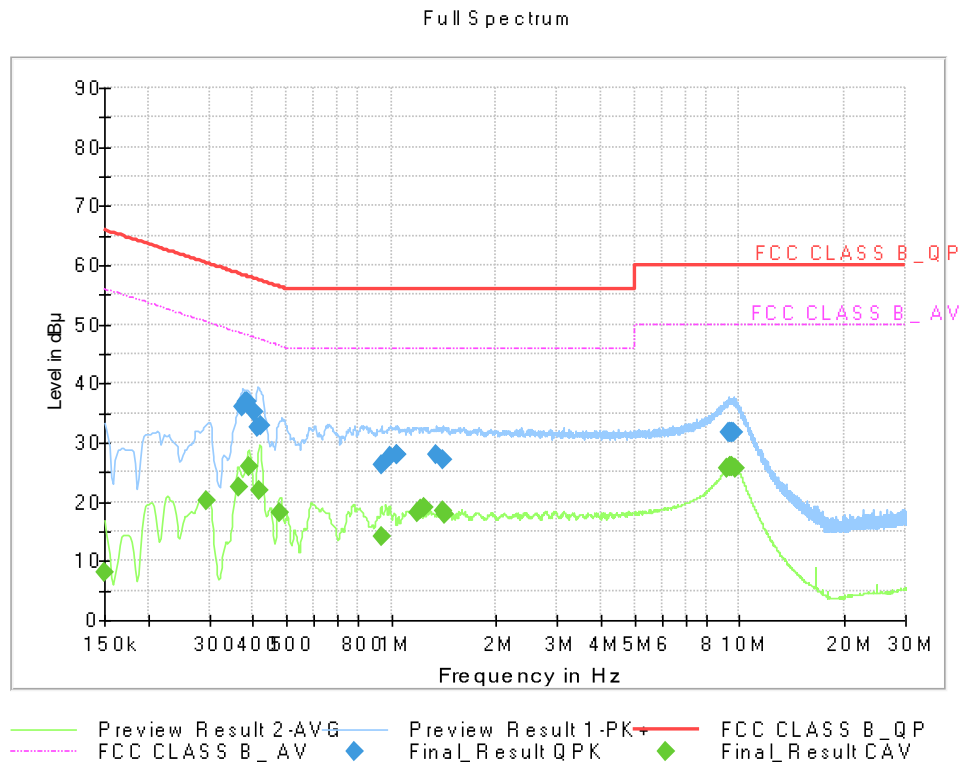
The test results of conducted emission at mains ports provide the following information:

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. 57.2 %
Test Date	August 08 / August 18, 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)





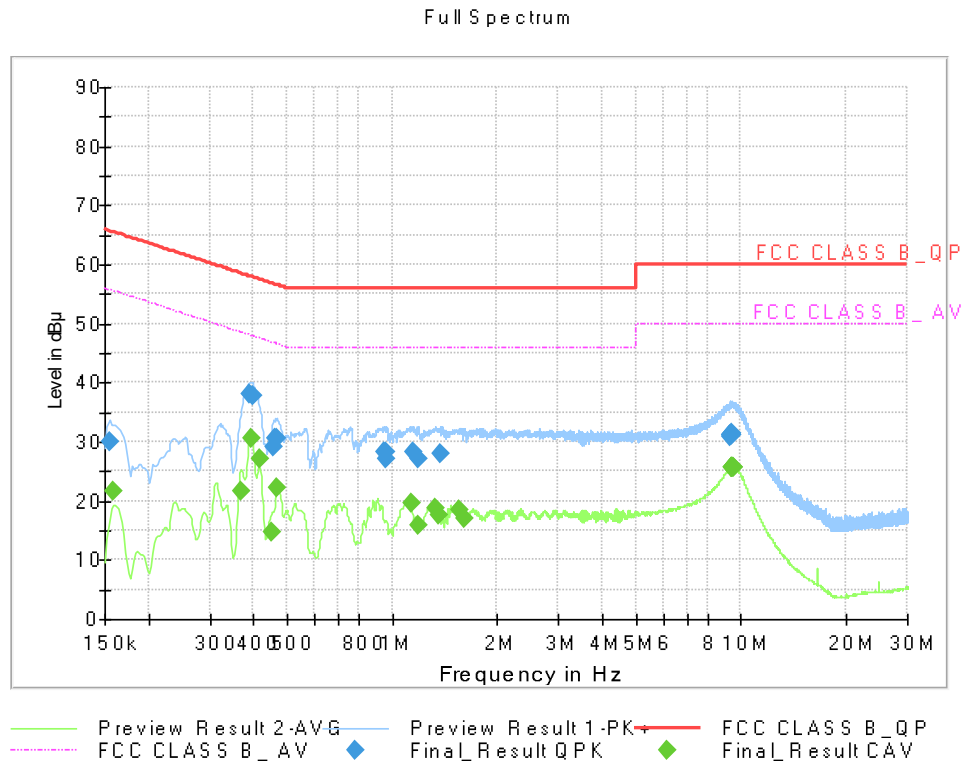
QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.3750	36.04	58.39	22.35	9.000	L1	9.6
0.3818	37.03	58.24	21.21	9.000	L1	9.6
0.3863	37.04	58.14	21.10	9.000	L1	9.6
0.4043	35.32	57.77	22.45	9.000	L1	9.6
0.4133	32.57	57.58	25.01	9.000	L1	9.6
0.4223	32.90	57.40	24.50	9.000	L1	9.6
0.9388	26.39	56.00	29.61	9.000	L1	9.6
0.9950	27.71	56.00	28.29	9.000	L1	9.6
1.0333	28.10	56.00	27.90	9.000	L1	9.6
1.0378	28.05	56.00	27.95	9.000	L1	9.6
1.3483	27.94	56.00	28.06	9.000	L1	9.6
1.4090	27.16	56.00	28.84	9.000	L1	9.6
9.3200	31.63	60.00	28.37	9.000	L1	9.8
9.3920	31.64	60.00	28.36	9.000	L1	9.8
9.4010	31.68	60.00	28.32	9.000	L1	9.8
9.4708	31.66	60.00	28.34	9.000	L1	9.8
9.4843	31.78	60.00	28.22	9.000	L1	9.8
9.5923	31.61	60.00	28.39	9.000	L1	9.8

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1500	7.98	56.00	48.02	9.000	L1	9.6
0.2963	20.29	50.35	30.05	9.000	L1	9.6
0.3638	22.45	48.64	26.19	9.000	L1	9.6
0.3885	25.95	48.10	22.15	9.000	L1	9.6
0.4178	21.91	47.49	25.59	9.000	L1	9.6
0.4785	18.28	46.37	28.08	9.000	L1	9.6
0.9343	14.25	46.00	31.75	9.000	L1	9.6
1.1908	18.16	46.00	27.84	9.000	L1	9.6
1.2133	18.78	46.00	27.22	9.000	L1	9.6
1.2380	18.90	46.00	27.10	9.000	L1	9.6
1.4090	18.52	46.00	27.48	9.000	L1	9.6
1.4225	17.77	46.00	28.23	9.000	L1	9.6
9.2210	25.69	50.00	24.31	9.000	L1	9.8
9.4010	25.92	50.00	24.08	9.000	L1	9.8
9.4685	26.04	50.00	23.96	9.000	L1	9.8
9.4820	26.10	50.00	23.90	9.000	L1	9.8
9.5563	26.09	50.00	23.91	9.000	L1	9.8
9.7813	25.55	50.00	24.45	9.000	L1	9.8

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





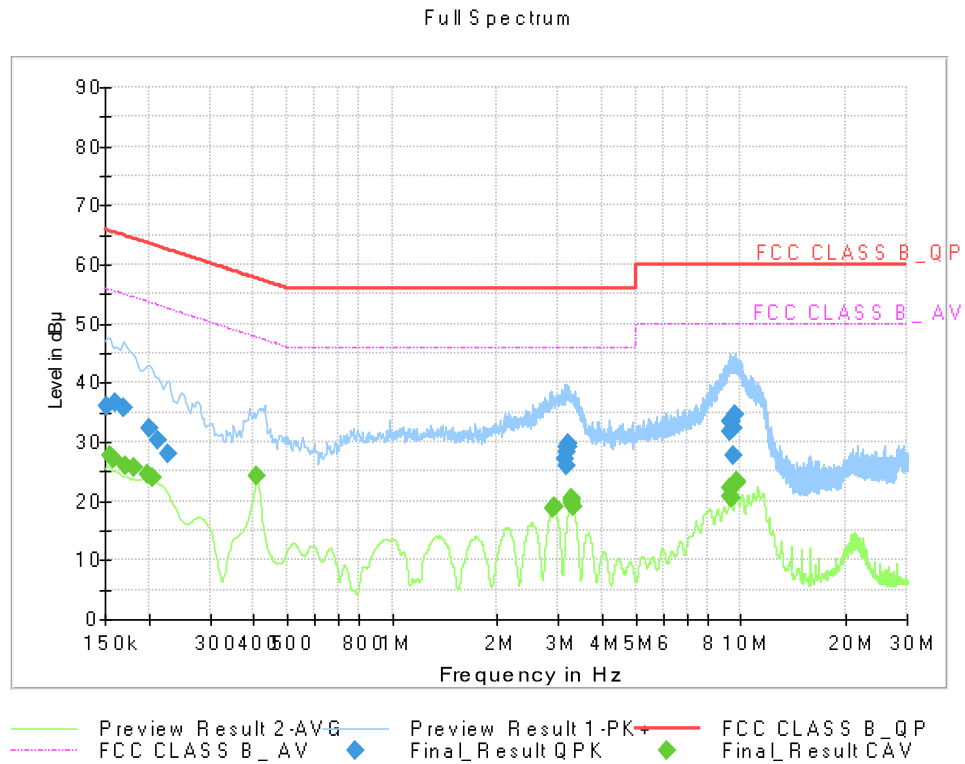
QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	30.07	65.75	35.68	9.000	N	9.6
0.3908	38.16	58.05	19.89	9.000	N	9.6
0.3975	37.79	57.91	20.12	9.000	N	9.6
0.4583	29.13	56.72	27.60	9.000	N	9.6
0.4628	30.70	56.64	25.94	9.000	N	9.6
0.4673	30.48	56.56	26.08	9.000	N	9.6
0.9500	28.26	56.00	27.74	9.000	N	9.6
0.9568	28.32	56.00	27.68	9.000	N	9.6
0.9635	27.12	56.00	28.88	9.000	N	9.6
1.1458	28.32	56.00	27.68	9.000	N	9.6
1.1840	27.08	56.00	28.92	9.000	N	9.6
1.3798	27.86	56.00	28.14	9.000	N	9.6
9.2705	31.06	60.00	28.94	9.000	N	9.8
9.2908	30.98	60.00	29.02	9.000	N	9.8
9.3155	31.07	60.00	28.93	9.000	N	9.8
9.3965	31.31	60.00	28.69	9.000	N	9.8
9.4078	31.22	60.00	28.78	9.000	N	9.8
9.4303	31.25	60.00	28.75	9.000	N	9.8

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1590	21.67	55.52	33.85	9.000	N	9.6
0.3705	21.55	48.49	26.94	9.000	N	9.6
0.3930	30.70	48.00	17.30	9.000	N	9.6
0.4155	27.12	47.54	20.41	9.000	N	9.6
0.4538	14.59	46.81	32.22	9.000	N	9.6
0.4695	22.18	46.52	24.34	9.000	N	9.6
1.1368	19.59	46.00	26.41	9.000	N	9.6
1.1908	15.82	46.00	30.18	9.000	N	9.6
1.3348	18.62	46.00	27.38	9.000	N	9.6
1.3618	17.58	46.00	28.42	9.000	N	9.6
1.5530	18.57	46.00	27.43	9.000	N	9.6
1.6138	16.88	46.00	29.12	9.000	N	9.6
9.4033	25.70	50.00	24.30	9.000	N	9.8
9.4078	25.78	50.00	24.22	9.000	N	9.8
9.4303	25.68	50.00	24.32	9.000	N	9.8
9.4573	25.78	50.00	24.22	9.000	N	9.8
9.5113	25.69	50.00	24.31	9.000	N	9.8
9.5248	25.71	50.00	24.29	9.000	N	9.8

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





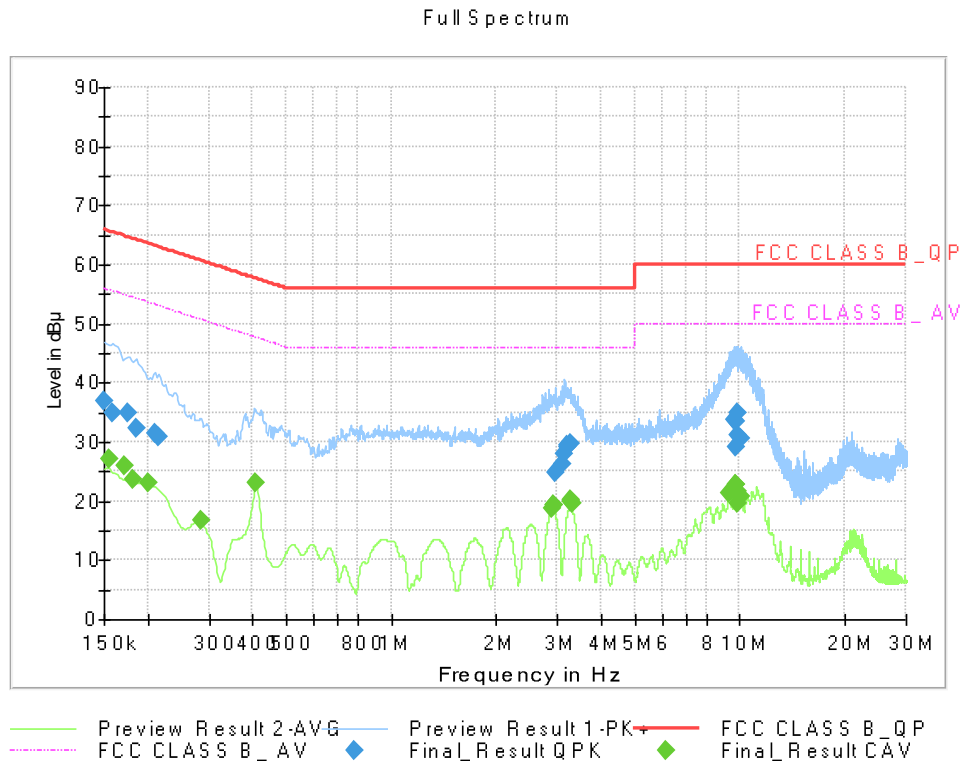
QuasiPeak Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1523	35.95	65.88	29.92	9.000	L1	9.6
0.1613	36.59	65.40	28.81	9.000	L1	9.6
0.1703	35.65	64.95	29.29	9.000	L1	9.6
0.2018	32.27	63.54	31.27	9.000	L1	9.6
0.2130	30.38	63.09	32.71	9.000	L1	9.6
0.2265	27.88	62.58	34.70	9.000	L1	9.6
3.1168	27.13	56.00	28.87	9.000	L1	9.8
3.1573	28.29	56.00	27.71	9.000	L1	9.8
3.1640	25.94	56.00	30.06	9.000	L1	9.8
3.1775	29.01	56.00	26.99	9.000	L1	9.8
3.2045	29.27	56.00	26.73	9.000	L1	9.8
3.2113	29.58	56.00	26.42	9.000	L1	9.8
9.3065	33.44	60.00	26.56	9.000	L1	10.0
9.3605	31.82	60.00	28.18	9.000	L1	10.0
9.3853	33.57	60.00	26.43	9.000	L1	10.0
9.4730	27.71	60.00	32.29	9.000	L1	10.0
9.4910	32.19	60.00	27.81	9.000	L1	10.0
9.5945	34.70	60.00	25.30	9.000	L1	10.0

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	27.64	55.75	28.11	9.000	L1	9.6
0.1590	27.06	55.52	28.46	9.000	L1	9.6
0.1725	26.04	54.84	28.80	9.000	L1	9.6
0.1815	25.80	54.42	28.61	9.000	L1	9.6
0.1995	24.45	53.63	29.18	9.000	L1	9.6
0.2063	23.88	53.36	29.47	9.000	L1	9.6
0.4088	24.29	47.67	23.38	9.000	L1	9.7
2.9053	18.83	46.00	27.17	9.000	L1	9.8
2.9098	18.96	46.00	27.04	9.000	L1	9.8
3.2563	20.40	46.00	25.60	9.000	L1	9.8
3.2653	20.21	46.00	25.79	9.000	L1	9.8
3.2788	19.50	46.00	26.50	9.000	L1	9.8
3.2968	19.13	46.00	26.87	9.000	L1	9.8
9.3065	22.17	50.00	27.83	9.000	L1	10.0
9.3583	20.68	50.00	29.32	9.000	L1	10.0
9.3853	20.51	50.00	29.49	9.000	L1	10.0
9.6868	23.07	50.00	26.93	9.000	L1	10.0
9.7430	23.39	50.00	26.61	9.000	L1	10.0

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)
0.1500	36.91	66.00	29.09	9.000	N	9.6
0.1590	34.87	65.52	30.65	9.000	N	9.6
0.1748	34.97	64.73	29.76	9.000	N	9.6
0.1860	32.17	64.21	32.04	9.000	N	9.6
0.2108	31.39	63.18	31.79	9.000	N	9.6
0.2153	30.75	63.00	32.25	9.000	N	9.6
2.9638	24.92	56.00	31.08	9.000	N	9.8
3.0808	26.18	56.00	29.82	9.000	N	9.8
3.1438	28.09	56.00	27.91	9.000	N	9.8
3.1955	29.36	56.00	26.64	9.000	N	9.8
3.2090	29.27	56.00	26.73	9.000	N	9.8
3.2675	29.71	56.00	26.29	9.000	N	9.8
9.6733	33.77	60.00	26.23	9.000	N	10.0
9.7318	33.46	60.00	26.54	9.000	N	10.0
9.7813	29.10	60.00	30.90	9.000	N	10.1
9.8060	31.25	60.00	28.75	9.000	N	10.1
9.8578	34.98	60.00	25.02	9.000	N	10.1
10.0490	30.70	60.00	29.30	9.000	N	10.1

CAverage Final Result

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	27.06	55.75	28.70	9.000	N	9.6
0.1725	25.86	54.84	28.98	9.000	N	9.6
0.1815	23.60	54.42	30.82	9.000	N	9.6
0.2018	23.09	53.54	30.45	9.000	N	9.6
0.2850	16.68	50.67	33.99	9.000	N	9.6
0.4088	22.94	47.67	24.74	9.000	N	9.7
2.9030	18.76	46.00	27.24	9.000	N	9.8
2.9233	19.36	46.00	26.64	9.000	N	9.8
2.9323	19.29	46.00	26.71	9.000	N	9.8
3.2765	20.17	46.00	25.83	9.000	N	9.8
3.2833	19.95	46.00	26.05	9.000	N	9.8
3.2968	19.72	46.00	26.28	9.000	N	9.8
9.3628	21.43	50.00	28.57	9.000	N	10.0
9.7318	22.69	50.00	27.31	9.000	N	10.0
9.7543	22.78	50.00	27.22	9.000	N	10.0
9.8578	19.65	50.00	30.35	9.000	N	10.1
9.8803	21.74	50.00	28.26	9.000	N	10.1
10.1075	20.71	50.00	29.29	9.000	N	10.1

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. 23.0 °C / max. 25.9 °C
Relative Humidity	min. 49.1 % / max. 58.0 %
Test Date	July 25 / August 16, 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)
30.6400	32.25	40.00	7.75	103.4	V	245.0	18.3
41.6230	30.25	40.00	9.75	100.0	V	309.0	19.4
60.2070	33.28	40.00	6.72	174.6	V	238.0	19.3
64.7760	31.16	40.00	8.84	100.0	V	271.0	18.6
527.9980	37.30	46.00	8.70	125.2	V	132.0	25.3
576.0130	34.51	46.00	11.49	100.0	V	-2.0	26.3

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)
30.7200	28.76	40.00	11.24	103.1	V	155.0	18.4
34.4390	27.30	40.00	12.70	100.0	V	106.0	18.7
60.0070	27.49	40.00	12.51	194.2	V	333.0	19.3
64.8060	30.83	40.00	19.17	374.6	H	164.0	18.6
527.9980	37.08	46.00	8.92	103.4	V	9.0	25.3
544.1970	33.38	46.00	12.62	103.7	V	6.0	25.7

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

Frequency (MHz)	Quasi Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)
44.7100	27.36	40.00	12.64	100.0	V	281.0	19.7
60.5080	29.40	40.00	10.60	100.0	V	273.0	19.3
72.1250	27.71	40.00	12.29	102.8	V	64.0	17.1
87.9660	29.96	40.00	10.04	103.3	V	73.0	14.4
527.9980	35.50	46.00	10.50	100.0	V	191.0	25.3
576.0130	32.24	46.00	13.76	100.0	V	244.0	26.3

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

Frequency (MHz)	Quasi Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)
60.0130	24.46	40.00	15.54	104.2	V	296.0	19.3
66.2650	14.62	40.00	25.38	100.0	V	326.0	18.3
527.9980	33.38	46.00	12.62	100.0	V	130.0	25.3
576.0130	31.13	46.00	14.87	104.2	V	344.0	26.3
624.0280	31.17	46.00	14.83	100.0	V	334.0	27.2
672.0030	28.87	46.00	17.13	174.6	V	333.0	27.8

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&Schwartz	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. 23.1 °C / max. 24.5 °C
Relative Humidity	min. 52.3 % / max. 57.8 %
Test Date	August 16 / August 17 / August 18, 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)
1795.0450	47.8	100.0	V	31.0	-20.0	26.2	74.0
2391.2000	46.2	249.9	V	336.0	-18.5	27.8	74.0
2987.9200	47.5	100.0	V	116.0	-16.9	26.5	74.0
3597.7550	46.1	100.0	V	43.0	-15.8	27.9	74.0
5984.9150	47.5	100.0	V	72.0	-7.8	26.5	74.0
14288.7950	50.4	150.1	V	0.0	8.5	23.6	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1795.0450	26.3	100.0	V	31.0	-20.0	27.7	54.0
2391.2000	26.4	249.9	V	336.0	-18.5	27.6	54.0
2987.9200	26.4	100.0	V	116.0	-16.9	27.6	54.0
3597.7550	26.4	100.0	V	43.0	-15.8	27.6	54.0
5984.9150	29.3	100.0	V	72.0	-7.8	24.7	54.0
14288.7950	37.8	150.1	V	0.0	8.5	16.2	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)
1795.5450	48.4	206.6	V	43.0	-20.0	25.6	74.0
2397.2950	46.8	249.9	V	0.0	-18.5	27.2	74.0
3596.2000	46.6	100.0	V	87.0	-15.8	27.4	74.0
4785.2900	45.8	100.0	V	102.0	-11.1	28.2	74.0
5999.9000	47.5	237.5	V	266.0	-7.8	26.5	74.0
14283.5850	49.9	142.6	V	78.0	8.5	24.1	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1795.5450	26.7	206.6	V	43.0	-20.0	27.3	54.0
2397.2950	25.4	249.9	V	0.0	-18.5	28.6	54.0
3596.2000	27.2	100.0	V	87.0	-15.8	26.8	54.0
4785.2900	27.1	100.0	V	102.0	-11.1	26.9	54.0
5999.9000	27.5	237.5	V	266.0	-7.8	26.5	54.0
14283.5850	37.7	142.6	V	78.0	8.5	16.3	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)
1152.1500	34.9	100.0	V	68.0	-21.4	39.1	74.0
1247.9600	35.0	219.7	H	242.0	-21.1	39.0	74.0
1295.7850	31.8	207.7	H	227.0	-21.0	42.2	74.0
3322.1450	32.5	249.8	V	332.0	-16.4	41.5	74.0
9166.6250	43.4	150.2	V	111.0	-1.9	30.6	74.0
17990.2796	58.9	150.2	V	327.0	17.4	15.1	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1152.150000	29.7	100.0	V	68.0	-21.4	24.3	54.0
1247.960000	29.8	219.7	H	242.0	-21.1	24.2	54.0
1295.785000	24.1	207.7	H	227.0	-21.0	29.9	54.0
3322.145000	20.0	249.8	V	332.0	-16.4	34.0	54.0
9166.625000	31.2	150.2	V	111.0	-1.9	22.8	54.0
17990.279640	46.5	150.2	V	327.0	17.4	7.5	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)
1151.8500	33.4	207.7	V	60.0	-21.4	40.6	74.0
1248.2750	31.8	192.6	H	320.0	-21.1	42.2	74.0
1343.9750	33.2	206.6	V	201.0	-20.9	40.8	74.0
8746.0100	43.0	113.5	V	116.0	-2.7	31.0	74.0
10275.9650	45.4	205.6	V	227.0	0.9	28.6	74.0
17975.3800	59.9	176.8	V	235.0	17.2	14.1	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1151.8500	27.6	207.7	V	60.0	-21.4	26.4	54.0
1248.2750	23.8	192.6	H	320.0	-21.1	30.2	54.0
1343.9750	26.0	206.6	V	201.0	-20.9	28.0	54.0
8746.0100	30.3	113.5	V	116.0	-2.7	23.7	54.0
10275.9650	33.2	205.6	V	227.0	0.9	20.8	54.0
17975.3800	46.1	176.8	V	235.0	17.2	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-FC009-P	August 23, 2022	Initial Release

End of report