RF Exposure Evaluation Report

For

MODEL NO. 1864
FCC ID: C3K1864

Test Report No. S-176-FCC-SAR-1
Issue Date: September 9, 2019

FCC CFR47 Part 2.1093

Prepared by
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ACCREDITED
TESTING CERT #3472.01

1 Record of Revisions

Revision	Date	Section	Page(s)	Summary of Changes	Author/Revised By:
1.0	09/09/2019	All	All	Version 1.0	Z. Gray

Microsoft

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Test Report Attestation

Microsoft Corporation
Model: 1864
FCC ID: C3K1864

Applicable Standards

Specification	Test Result
FCC CFR47 Part 2.1093	Pass

Microsoft EMC Laboratory attests that the product model identified in this report has been tested to and meets the requirements identified in the above standards. The test results in this report solely pertains to the specific sample tested, under the conditions and operating modes as provided by the customer.

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Written/ Issued By: Zack Gray
SAR Test Lead

Reviewed By: Wei Sun
SAR/Radio Test Engineer

2 Product Description

Company Name:	Microsoft Corporation
Address:	One Microsoft Way
City, State, Zip:	Redmond, WA 98052-6399
Customer Contact:	Mike Boucher
Functional Description of the EUT:	Portable Computing, I/O accessory device with NFC charging capability
Model:	1864
FCC ID:	C3K1864
Radio Description:	NFC Charging @ 13.56 MHz
Frequency Range of Operation:	13.56 MHz
Antenna Type:	Integral Coil
EUT Classification:	Part 15 Low Power Transmitter
Equipment Design State:	Production
Equipment Condition:	Good
RF Exposure Conditions:	Body Exposure

3 Deviations from Standards

None.

4 Facilities and Accreditations

4.1 Test Facility

All test facilities used to collect the test data are located at Microsoft EMC Laboratory, 17760 NE 67th Ct, Redmond WA, 98052, USA

4.2 Accreditations

The lab is established and follows procedures as outlined in IEC/ISO 17025 and A2LA accreditation requirements.
A2LA Accredited Testing Certificate Number: 3472.01

5 SAR Test Exclusion

5.1 FCC SAR Test Exclusion Criteria

The full FCC standalone SAR test exclusion criteria from **KDB 447498 D01** are as follows.

a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

b) For 100 MHz to 6 GHz and *test separation distances* > 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following (also illustrated in Appendix B)
1) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·(f(MHz)/150)]} mW, for 100 MHz to 1500 MHz
2) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C)
1) For *test separation distances* > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by [1 + log(100/f(MHz))]
2) For *test separation distances* ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by ½
3) SAR measurement procedures are not established below 100 MHz.

5.1.1 FCC SAR Test Exclusion Evaluation

Since the transmitter frequency is 13.56 MHz to be used with a separation distance ≤ 50mm, step c)2 is applicable. This calls for making the calculation in four parts:

1) Calculate the power allowed at the numeric threshold in step a) for 100 MHz and a 50mm separation distance.

   $$P\ (mW) \leq \frac{3*50mm}{\sqrt{0.1GHz}}$$

   P (mW) ≤ 474.34 mW

2) Calculate the test exclusion threshold for 100 MHz and a 50mm separation distance using step b)1 with the previous result from step a).

   474.34 mW + (50mm – 50mm) * (100 MHz / 150) = 474.34 mW

3) Perform step c)1 on the result found from step b)1 for the 13.56 MHz frequency.

   474.34 mW * [1 + log(100/13.56)] = 885.94 mW

4) Perform step c)2 on the result found from step c)1.

   0.5 * 885.94 mW = 443 mW

The SAR test exclusion level for a 13.56 MHz transmitter used closer than 50mm from the body is thus 443 mW. **The maximum power delivered to the transmit coil in the EUT is 330 mW.**

Thus, the EUT is excluded from routine SAR evaluation measurements since the SAR test exclusion criteria are met.

Frequency (MHz)	Maximum Output Power (dBm)	Maximum Output Power (mW)	Separation Distance (mm)	SAR Test Exclusion Power Threshold	Result
13.56	25.2	330	0	443 mW	SAR Testing Excluded

5.1.2 Simultaneous Transmission Considerations

The shortest separation distance between the EUT's NFC coil and any of the antennas in the host device is greater than 20cm due to the host-EUT operating configurations.

In addition to showing standalone SAR test exclusion eligibility, SAR measurements were attempted. All measurements showed SAR levels at the measurement system's noise floor.

In combination this information shows that the contribution of the NFC transmitter to the host's SAR levels would be negligible, and the EUT's NFC transmitter can thus be excluded from simultaneous transmission analysis. This was agreed on through KDB inquiry.

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End of Report