



MPE TEST REPORT

For

MODEL NO.: 1846

FCC ID: C3K1846

IC ID: 3048A-1846

Test Report No. S-215-FCCISED-MPE-2

Issue Date: November 10th, 2020

FCC 47CFR Parts 1.1307, 1.1310, 2.1091
Innovation, Science and Economic Development
Canada RSS-102 Issue 5

Prepared by

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TESTING CERT #3472.01

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Test Report Attestation

Microsoft Corporation
Model: 1846
FCC ID: C3K1846
ISED ID: 3048A-1846

Applicable Standards

Specification	Test Result
FCC CFR47 Rule Parts 1.1307, 1.1310, 2.1091	Pass
ISED RSS-102 Issue 5	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.

This report shall not be used to claim product certification, approval, or endorsement by A2LA or any agency of any Government. Reproduction, duplication, or publication of extracts from this test report is prohibited and requires prior written approval of Microsoft EMC Laboratory.



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2 Deviations from Standards

None.

3 Facilities and Accreditations

3.1 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

3.2 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

FCC Registration Number: US1141

IC Site Registration Numbers: 26315

4 Product Description

Company Name:	Microsoft Corporation		
Address:	One Microsoft Way		
City, State, Zip:	Redmond, WA 98052-6399		
Customer Contact:	Chaitrali Limaye		
Functional Description of the EUT:	SRD Radio		
RF Exposure Conditions:	Mobile Exposure Conditions (Separation distance of ≥ 20 cm)		
Model:	1846		
FCC ID:	C3K1846		
IC ID:	3048A-1846		
Radio Descriptions:	SRD Radio		
Frequency Range of Operation:	SRD Radio:	24.15– 24.25 GHz	
Antenna Peak Gains (dBi):	Radio	Band	Chain A
	SRD Radio:	24.15– 24.25 GHz	4.0
Equipment Design State:	Prototype/Production Equivalent		
Equipment Condition:	Good		

5 MPE Requirements

5.1 FCC MPE Requirements

The FCC MPE limits from CFR 47 Part 1.1310 are shown in the table below.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

5.1.1 FCC RF Exposure Exemption Criteria

The exemption criteria for RF exposure evaluation from CFR 47 Part 2.1091(c) are as follows:

(c)(1) Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if:

- (i) They operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or
- (ii) They operate at frequencies above 1.5 GHz and their ERP is 3 watts or more.

(2) Unlicensed personal communications service devices, unlicensed millimeter wave devices and unlicensed NII devices authorized under §§15.253(f), 15.255(g), 15.257(g), 15.319(i), and 15.407(f) of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their ERP is 3 watts or more or if they meet the definition of a portable device as specified in §2.1093(b) requiring evaluation under the provisions of that section.

(3) All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§1.1307(c) and 1.1307(d) of this chapter.

5.2 ISED MPE Requirements

The ISED MPE limits from RSS-102 Issue 5 are shown in the table below.

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i>	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
<p>Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).</p>				

5.2.1 ISED MPE Exemption Requirements from RSS-102 Section 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 22.48/*f*^{0.5} W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10⁻² *f*^{0.6834} W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

6 Maximum Device EIRP and ERP

The declared maximum output powers including tune-up tolerances are used in conjunction with the maximum antenna gains to find the maximum EIRP and ERP values.

For transmitters with multiple transmit chains, total EIRP and total ERP are calculated as:

$$EIRP_{TOT} = EIRP_1 + EIRP_2 + \dots + EIRP_n$$

$$ERP_{TOT} (dBm) = EIRP_{TOT} (dBm) - 2.15 dB$$

Maximum EIRP and ERP of all Device Radios									
Radio	Band (GHz)	Chain A Max Power (dBm)	Chain A Max Gain (dBi)	Chain A Max EIRP (dBm)	Chain B Max Power (dBm)	Chain B Max Gain (dBi)	Chain B Max EIRP (dBm)	Max Total EIRP (dBm)	Max Total ERP (dBm)
SRD Radio	24.25	6	4.0	10				10.0	7.85

7 Evaluation Against Exemption Criteria for RF Exposure Evaluation

Evaluation of Device Radios Against FCC and ISED Exemption Criteria							
Radio / Rulepart	Band (GHz)	Max Total ERP (mW)	FCC Exemption ERP Limits (mW)	FCC Exempt?	Max Total EIRP (mW)	ISED Exemption EIRP Limits (mW)	ISED Exempt?
SRD Radio 15.249	24.25	6.10	NA	Yes ¹	10.00	2702.91	Yes

¹Since 2.1091(c) does not reference Part 15.247 or 15.249, SRD Radio is categorically exempted from routine RF exposure evaluation by Part 2.1091(c)(3).

SRD Radio is exempt from routine RF Exposure Evaluation for both FCC and ISED.

8 MPE Calculations and Evaluation

Power densities are calculated for all radios, and the sum totals are compared to the FCC and ISED limits to support the 20 cm minimum device-user separation distance.

Power density is calculated as:

$$S = \frac{EIRP}{4\pi R^2}$$

For FCC, the power densities of all radios are calculated and summed to show that the worst case is less than the corresponding power density limits.

MPE Power Density Evaluation at 20cm										
Antenna	Band (GHz)	Max EIRP (dBm)	Max EIRP (mW)	S ($\frac{mW}{cm^2}$)	FCC Limit ($\frac{mW}{cm^2}$)	FCC Result	S ($\frac{W}{m^2}$)	ISED Limit ($\frac{W}{m^2}$)	$\frac{S}{Limit}$	ISED Result
SRD Radio	24.25	10.00	10.00	0.002	1.0	Pass	0.02	10	0.01	Pass

- Since all FCC Bands have the same limit, Max EIRP and power densities are summed and the sum is compared to the FCC MPE limit.
- For FCC evaluation, the WLAN band with the highest EIRP is chosen for the worst-case total since the device can only transmit in one WLAN band at a time.
- ISED limits for 300 – 6000 MHz are calculated as (from table in section 5.2):

$$ISED\ Limit = 0.02619 * f^{0.6834} \frac{W}{m^2}$$

- For ISED in accordance with RSS-102 Section 3.2, the fractions of the applicable limits are summed and the sum shown to be below 1 since the limits differ by band.
- For ISED evaluation, The WLAN band with the highest fraction of the applicable limit is chosen for the worst-case total since the device can only transmit in one WLAN band at a time.

End of Report