



# RF Exposure Evaluation Report

For

MODEL NO. 1770

FCC ID: C3K1770

IC ID: 3048A-1770

Test Report No. R-TR209-FCCIC-MPE-3

Issue Date: 13 November 2015

FCC CFR47 Part 2.1093

Industry 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:** 1770

**FCC ID:** C3K 1770

**IC ID:** 3048A-1770

## Applicable Standards

Specification	Test Result
FCC CFR47 Part 2.1093 Industry Canada RSS-102 Issue 5	Complies

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.

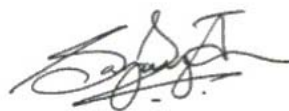
This report shall not be used to claim product certification, approval, or endorsement by A2LA or any agency of any Government.

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This report replaces the previously issued Test Report # R-TR209-FCCIC-MPE-2 issued by Microsoft EMC Labs on 11/05/2015.



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## 2 Product Description

Company Name:	Microsoft Corporation
Address:	One Microsoft Way
City, State, Zip:	Redmond, WA 98052-6399
Customer Contact:	Pamela Galvan
Functional Description of the EUT:	Wireless Input Device
Model:	1770
FCC ID:	C3K1770
IC ID:	3048A-1770
Radio Description:	IEEE WLAN 802.11a/g/n with 20MHz Signal Bandwidths (SISO only)
Frequency Range of Operation:	2.4- 2.4835 GHz 5170 – 5250MHz, 5250 – 5330MHz, 5490 – 5710MHz, and 5735 – 5835MHz
Max Antenna Gain:	-0.55 dBi (2.4GHz) 1.95 dBi (5 GHz)
EUT Classification:	DTS device
Equipment Design State:	Production
Equipment Condition:	Good
RF Exposure Conditions:	Extremity Exposure, 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 67<sup>th</sup> 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

### 4.3 Test Configurations

#### **Test Software Details:**

Test software “Radio Test 2 (ART-GUI) created by the chipset manufacturer was used to program the EUT to transmit continuously. The maximum output power declared by the manufacturer is 8 dBm.

## 5 Average Conducted Output Power Measurements

### 5.1 Test Method

Antenna port conducted measurements were performed on a bench-top setup consisting of a spectrum analyzer, power meter (as necessary), splitters/combiners (as necessary), attenuators, and pre-characterized RF cables.

The correction factors between the EUT and the Spectrum Analyzer is added internally in the Analyzer settings. The plots displayed accounts for these correction factors.

#### **Spectrum Analyzer Settings:**

##### **DTS Average Measurements:**

*AVGSA-1 Alternative Method of KDB 558074.*

RBW= 1-5% of the OBW, not to exceed 1 MHz

VBW $\geq$  3 x RBW

Trace Mode= Average Detector (Max Hold)

Number of points in sweep  $\geq$  2 x span / RBW

Sweep time= Auto

Trace mode = average at least 100 traces in power average mode

Power integration over the 99% Occupied Bandwidth.

#### **Spectrum Analyzer Settings:**

##### **UNII Average Measurements:**

RBW= 1 MHz

VBW= 3 MHz

Detector = RMS

Trace Mode= Average over 100 traces

Sweep time= Auto

Sweep Point  $\geq$  2\*Span/RBW

Span= large enough to encompass the 26-dB Emission Bandwidth or alternatively the 99% Occupied Bandwidth.

Use the band power measurement function to integrate the power over the 26-dB Emission Bandwidth or 99% Occupied Bandwidth.

Duty cycle correction factor is added as an offset in the Spectrum Analyzer to obtain the final average power readings.

EIRP was calculated based on the following formula:

$$e.i.r.p. (dBm) = \text{Conducted Output Power (dBm)} + \text{Antenna Gain (dBi)}$$

## 5.2 Test Equipment List

Manufacturer	Description	Model #	Asset #	Calibration Due
Agilent	Spectrum Analyzer	N9030A	RF-011	2/29/2016
Agilent	Spectrum Analyzer	N9030A	EMC-605	06/15/2016

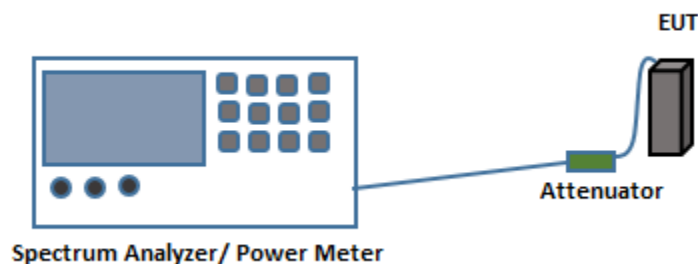


Fig.1. Test setup for antenna port conducted measurements

## 5.3 Test Results

Table 1. Average Output Power – DTS (2.4 GHz Band)

Frequency (MHz)	Mode	Measured Average Power (dBm)	Measured Average Power (mW)	Maximum Antenna Gain (dBi)	e.i.r.p. (dBm)	e.i.r.p. (mW)
2412	802.11g	8.30	6.76	-0.55	7.75	5.96
2437	802.11g	8.18	6.58	-0.55	7.63	5.79
2462	802.11g	8.15	6.53	-0.55	7.6	5.75
2412	802.11n	8.30	6.76	-0.55	7.75	5.96
2437	802.11n	8.13	6.50	-0.55	7.58	5.73
2462	802.11n	8.39	6.90	-0.55	7.84	6.08



**Table 2. Average Output Power – UNII (5 GHz Bands)**

Frequency (MHz)	Mode	Measured Average Power (dBm)	Measured Average Power (mW)	Maximum Antenna Gain (dBi)	e.i.r.p. (dBm)	e.i.r.p. (mW)
5180	802.11a	8.34	6.82	1.95	10.29	10.69
5200	802.11a	8.11	6.47	1.95	10.06	10.14
5240	802.11a	8.1	6.46	1.95	10.05	10.12
5260	802.11a	8.01	6.32	1.6	9.61	9.14
5300	802.11a	8.27	6.71	1.6	9.87	9.71
5320	802.11a	8.15	6.53	1.6	9.75	9.44
5500	802.11a	8.27	6.71	0.5	8.77	7.53
5580	802.11a	8.02	6.34	0.5	8.52	7.11
5700	802.11a	8.38	6.89	0.5	8.88	7.73
5745	802.11a	8.29	6.75	1.8	10.09	10.21
5785	802.11a	8.05	6.38	1.8	9.85	9.66
5825	802.11a	8.11	6.47	1.8	9.91	9.79
5180	802.11n	8.25	6.68	1.95	10.2	10.47
5200	802.11n	8.17	6.56	1.95	10.12	10.28
5240	802.11n	8.06	6.40	1.95	10.01	10.02
5260	802.11n	8.32	6.79	1.6	9.92	9.82
5300	802.11n	8.05	6.38	1.6	9.65	9.23
5320	802.11n	8.38	6.89	1.6	9.98	9.95
5500	802.11n	8.27	6.71	0.5	8.77	7.53
5580	802.11n	8.15	6.53	0.5	8.65	7.33
5700	802.11n	8.23	6.65	0.5	8.73	7.46
5745	802.11n	8.25	6.68	1.8	10.05	10.12
5785	802.11n	8.27	6.71	1.8	10.07	10.16
5825	802.11n	8.38	6.89	1.8	10.18	10.42

## 6 SAR Test Exclusion

### 6.1 SAR Test Exclusion Criteria

Based on Manufacturer drawings of the EUT, the minimum separation distance of the antenna from the EUT enclosure is 10 mm.

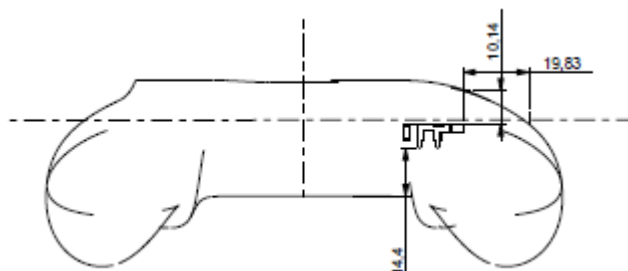


Fig. 2. Minimum Antenna Separation Distance - Dimensions in mm

### 6.2 FCC

According to FCC KDB 447498 D01 General RF Exposure Guidance v06 Section 4.3.1, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm is defined as

$$\frac{(\text{max.power of channel, including tune-up tolerance, mW})}{(\text{min.test separation distance, mm})} \times [\sqrt{f_{\text{(GHz)}}}] \leq 3.0$$

where

- $f_{\text{(GHz)}}$  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

#### 6.2.1 FCC SAR Test Exclusion Evaluation

The EUT was excluded from routine SAR evaluation measurements, since the SAR test exclusion criteria were met.

Frequency (MHz)	Measured Average Output Power (dBm)	Output power including tune-up tolerance (dBm)	Output power including tune-up tolerance (mW)	SAR Exclusion Threshold	SAR Exclusion Limit	Result
2462	8.39	9.5	8.91	1.4	<3.0	SAR Not Required
5825	8.38	9.5	8.91	2.2	<3.0	SAR Not Required

## 6.3 IC

For limb worn devices, with a separation distance of 10mm, SAR evaluation is exempt for transmitters operating with an output power < 17.5mW at 2450 MHz, and < 15mW at 5800 MHz (RSS-102 Table 1). The maximum value of conducted output power is used where it is greater than the e.i.r.p.

### 6.3.1 IC SAR Test Exclusion Evaluation

The EUT was excluded from routine SAR evaluation measurements, since the SAR test exclusion criteria were met.

**Table 3. SAR Test Exclusion**

Frequency (MHz)	Average Output Power (dBm)	Output power including tune-up tolerance (dBm)	Output power including tune-up tolerance (mW)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	SAR Exclusion Limit (mW)	Result
2462	8.39	9.5	8.91	-0.55	8.95	7.85	17.5	SAR Not Required
5180	8.34	9.5	8.91	1.95	11.45	13.96	15	SAR Not Required

End of Report