



SIMULTANEOUS TRANSMISSION TEST REPORT

Report Number: R12922855-E12

Applicant : Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399
USA

Model : 1867

FCC ID : C3K1867

IC : 3048A-1867

EUT Description : Portable Computing Device

Test Standard(s) : FCC 47 CFR PART 15 SUBPARTS C and E
ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 5

Date Of Issue:
2019-09-09

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REPORT REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
1	2019-08-29	Initial Issue	Brian T. Kiewra
2	2019-09-09	Added AC power adaptor to support equipment. Added model similarity explanation to Section 5.1	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399
USA

EUT DESCRIPTION: Portable Computing Device

MODEL: 1867

SERIAL NUMBER: See Section 5.4

DATE TESTED: 2019-08-20

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subparts C and E	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

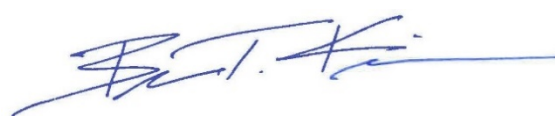
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Approved & Released
For UL LLC By:



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UL – Consumer Technology Division

Prepared By:



Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 14-30, FCC KDB 662911 D01 v02r01, FCC KDB 789033 D02 v02r01, ANSI C63.10-2013, FCC 06-96, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 27590, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

12 Laboratory Dr.	2800 Perimeter Park Dr.
Site Code: 2180C	
☐ Chamber A RTP	☒ North Chamber
☐ Chamber C RTP	☐ South Chamber

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable} \\ &\text{Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Final Voltage (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \\ &\text{LISN Insertion Loss.} \\ 36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} &= 46.6 \text{ dBuV} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
All emissions, conducted	3.65 dB
All emissions, radiated	5.17 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a Portable Computing Device that contains 802.11 a/ac/ax/b/g/n 20/40/80/160MHz 2x2 dual band and BT/BLE radios.

Models 1867 and 1868 are electrically and RF equivalent as they use the same motherboard, radio module and on-board RF components. Both models share a common WiFi and BT power table. The radio-related firmware and driver versions are the same for the two models. The peak antenna gains are in the antenna gain section of the report. Antenna port conducted emissions measurements are done on model 1868 (FCC ID: C3K1868, IC: 3048A-1868) and the data is leveraged for model 1867 (FCC ID: C3K1867, IC: 3048A-1867). Highest antenna gain across the two models in each band has been considered while doing the conducted emissions measurements. Separate radiated & SAR measurements are done on each model.

5.2. MAXIMUM OUTPUT POWER

Refer to Model 1868 (FCC ID: C3K1868, IC: 3048A-1868) reports R12935938-E5, -E6, -E7, -E8, -E9, and -E10 for output power.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Range (GHz)	Antenna Type	Peak Gain (dBi) Chain 0 (Right)	Peak Gain (dBi) Chain 1 (Left)
Model 1867			
2.4 to 2.48	PIFA	0.7	2.6
5.15 to 5.25		4.9	4.4
5.25 to 5.35		6.1	5.0
5.47 to 5.72		7.2	5.5
5.725 to 5.85		9.4	5.6
Model 1868			
2.4 to 2.48	PIFA	0.4	1.0
5.15 to 5.25		3.6	2.2
5.25 to 5.35		5.2	3.5
5.47 to 5.72		6.4	4.7
5.725 to 5.85		7.8	4.5

The 5 GHz WLAN radio utilizes Chain 0 and chain 1.

NOTE: Antenna 1 = Chain 0

Antenna 2 = Chain 1

5.4. SOFTWARE AND FIRMWARE

EUT	Serial Number	Radio Test Tool Version	OS Version	BT Driver Version	WiFi Driver Version	EUT's Power Supply (s/n)
R-557-1867-FCC-RADIATED-08	006438792757	11.1916.0-09531	MTEOS 1.652.0	21.0.19157.20088	99.0.43.8	0D130P028D596
R-557-1867-FCC-RADIATED-09	006439692757	11.1916.0-09531	MTEOS 1.652.0	21.0.19157.20088	99.0.43.8	0D130P01H1596

5.5. SIMULTANEOUS TRANSMISSION CONFIGURATIONS

The EUT has one intended orientations, X; therefore, all final radiated testing was performed with the EUT in X orientation.

Simultaneous transmission of the following was investigated:

- 5GHz and Bluetooth

Per the manufacturer, no other radios transmit simultaneously. The device was found to still be compliant.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
USB Hub	J5 Create	JCA374	AY2A1904000477 / AY6A1903004261	N/A
Earbuds	Sony	MDR-EX14AP	Non-Serialized	N/A
AC Adaptor	Microsoft	1706	0D130P01H1596	N/A
USB Flash Drive	Kingston	Data Traveler G4	Non-Serialized	N/A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Mains	1	12-pin	Mains	<3m	None
2	USB-A	1	USB-A	USB	<3m	None
3	USB-C	1	USB-C	USB	<3m	None
4	Aux	1	Aux	Aux	<3m	None

TEST SETUP

The test utility software was located on the EUT during the tests and was used to exercised the radios.

SETUP DIAGRAMS

Please refer to 12922855-EP1 for setup diagrams

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
1-18 GHz					
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-03-22	2020-03-22
Gain-Loss Chains					
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-15	2020-03-15
Receiver & Software					
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

NOTES:

1. For equipment listed above that was calibrated during the testing period, please note the equipment was used for testing after calibration.
2. For equipment listed above that has a calibration due date during the testing period, the testing was completed before the equipment expiration date.

7. MEASUREMENT METHOD

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Section II G.3, G.5 and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Section II G.3 and G.5.

8. SIMULTANEOUS TRANSMISSION RESULTS

LIMITS

FCC §15.205 and §15.209 – Restricted bands
FCC §15.407(b)(1-4) – Unrestricted bands
RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

After January 01, 2019 for Outside of the Restricted Bands Emissions

RSS 247 Issue 2 Sections
6.2.1.2 (for 5150-5250 MHz band)
6.2.2.2 (for 5250-5350 MHz band)
6.2.3.2 (for 5470-5600 MHz and 5650-5725 MHz bands)
6.2.4.2 (for 5725-5850 MHz band)

NCC LP0002 §2.7 and §2.8

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 1.5 m above the ground plane for measurements above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

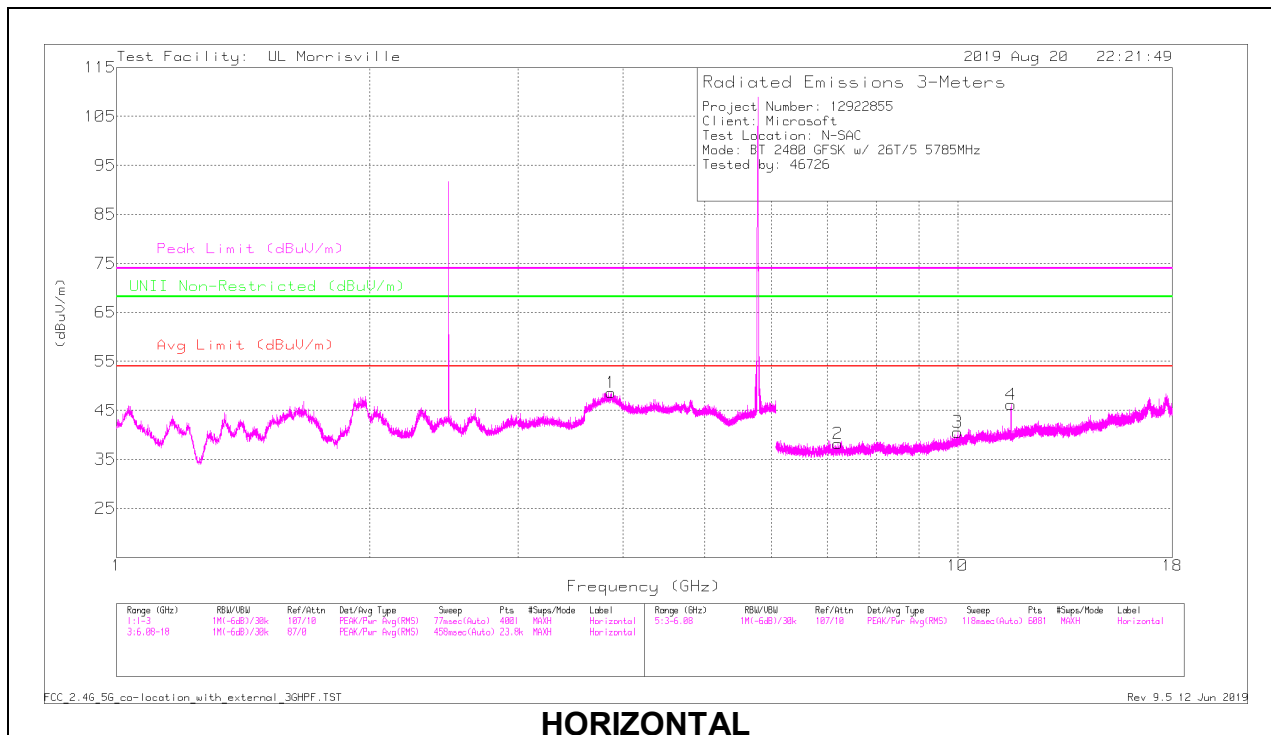
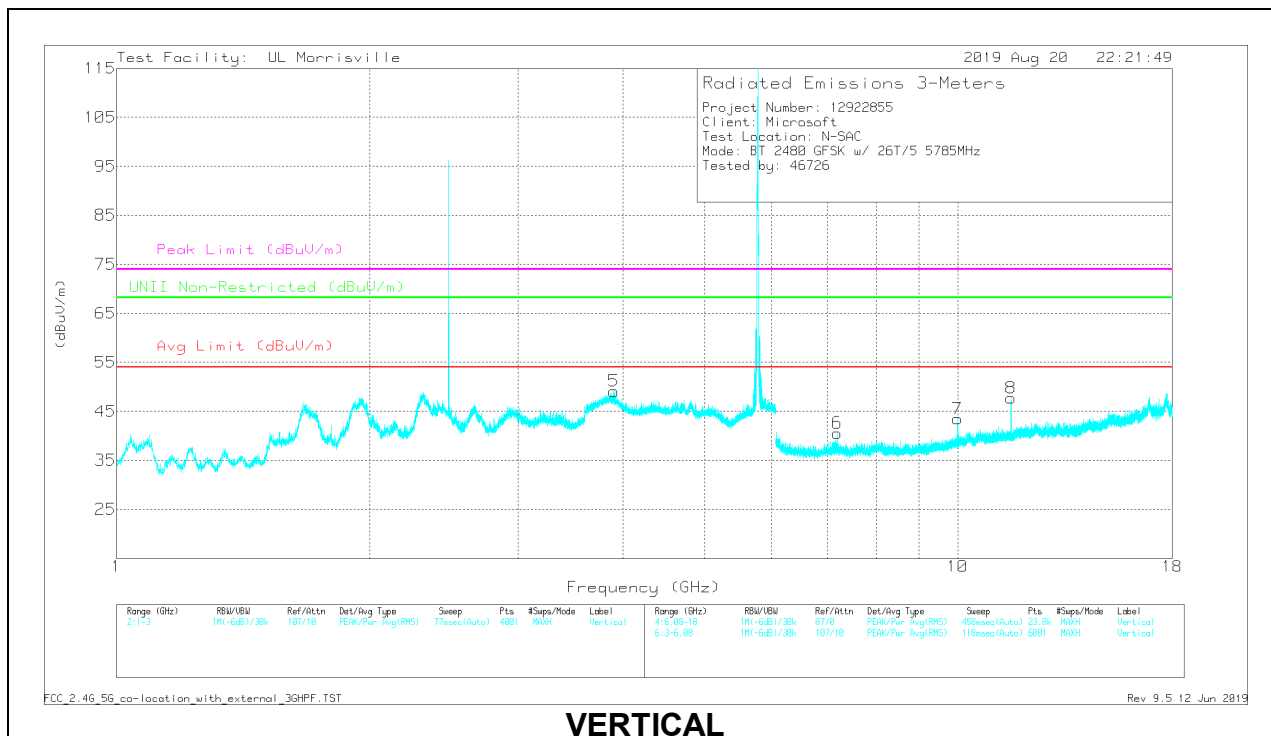
For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements. Detector used was RMS average detector.

The spectrum below 1 to 18GHz is investigated with the transmitter set to the modes and channels with the highest output power and PSD.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

8.1. BT GFSK 2480MHz and 5GHz WLAN 802.11ax HE20 26T RU 5 5785MHz SIMULTANEOUS TRANSMISSION



Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Fitr/Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* ** 3.87089	40.16	PK-U	33.5	-20.1	.8	54.36	-	-	74	-19.64	68.2	-13.84	131	282	H
* ** 3.87096	28.26	ADR	33.5	-20.1	.8	42.46	54	-11.54	-	-	-	-	131	282	H
* ** 3.87131	28.6	V1TR	33.5	-20.1	.8	42.8	54	-11.2	-	-	-	-	131	282	H
* ** 3.90149	40.03	PK-U	33.5	-20.2	.8	54.13	-	-	74	-19.87	68.2	-14.07	30	367	V
* ** 3.90144	28.16	ADR	33.5	-20.2	.8	42.26	54	-11.74	-	-	-	-	30	367	V
* ** 3.90146	28.6	V1TR	33.5	-20.2	.8	42.7	54	-11.3	-	-	-	-	30	367	V
* ** 11.57502	47.6	PK-U	38.3	-26.3	0	59.6	-	-	74	-14.4	68.2	-8.6	255	355	H
* ** 11.57498	37.29	ADR	38.3	-26.3	0	49.29	54	-4.71	-	-	-	-	255	355	H
* ** 11.57497	37.77	V1TR	38.3	-26.3	0	49.77	54	-4.23	-	-	-	-	255	355	H
* ** 11.57457	40.76	PK-U	38.3	-26.3	0	52.76	-	-	74	-21.24	68.2	-15.44	10	392	V
* ** 11.57461	29.5	ADR	38.3	-26.3	0	41.5	54	-12.5	-	-	-	-	10	392	V
* ** 11.57459	29.97	V1TR	38.3	-26.3	0	41.97	54	-12.03	-	-	-	-	10	392	V
7.19237	40.03	PK-U	35.6	-29.7	0	45.93	-	-	-	-	68.2	-22.27	44	102	V
7.19237	28.17	ADR	35.6	-29.7	0	34.07	-	-	-	-	-	-	44	102	V
7.19237	28.55	V1TR	35.6	-29.7	0	34.45	-	-	-	-	-	-	44	102	V
7.21573	37.89	PK-U	35.6	-29.4	0	44.09	-	-	-	-	68.2	-24.11	330	136	H
7.2154	25.73	ADR	35.6	-29.4	0	31.93	-	-	-	-	-	-	330	136	H
7.21569	26.14	V1TR	35.6	-29.4	0	32.34	-	-	-	-	-	-	330	136	H
9.99997	39.87	PK-U	37.1	-27.3	0	49.67	-	-	-	-	68.2	-18.53	191	106	V
9.99997	30.48	ADR	37.1	-27.3	0	40.28	-	-	-	-	-	-	191	106	V
9.99997	30.7	V1TR	37.1	-27.3	0	40.5	-	-	-	-	-	-	191	106	V
10.00038	37.46	PK-U	37.1	-27.3	0	47.26	-	-	-	-	68.2	-20.94	5	372	H
10.00037	26.41	ADR	37.1	-27.3	0	36.21	-	-	-	-	-	-	5	372	H
10.00036	26.74	V1TR	37.1	-27.3	0	36.54	-	-	-	-	-	-	5	372	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

V1TR - U-NII: VB=1/Ton, Average where: Ton is packet duration

9. SETUP PHOTOS

Please refer to R12922855-EP1 for setup photos

END OF TEST REPORT