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TEST REPORT

SCOPE OF WORK
FCC TESTING–1919

REPORT NUMBER
190929011SZN-002

ISSUE DATE **[REVISED DATE]**

10 February 2020 [----------]

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TEST REPORT

Intertek Report No.: 190929011SZN-002

Microsoft Corporation

Application
For
Certification

FCC ID: C3K1830

Bluetooth Accessory

Model: 1919

2.4GHz Transceiver

Report No.: 190929011SZN-002

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-18]

Prepared and Checked by:

Rui Zhou
Project Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: 10 February 2020

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MEASUREMENT/TECHNICAL REPORT

Bluetooth Accessory

Model: 1919

FCC ID: C3K1830

This report concerns (check one) Original Grant _____ Class II Change X

Equipment Type: DTS - Part 15 Digital Transmission Systems (Bluetooth LE portion)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No X

If yes, defer until : _____ date

Company Name agrees to notify the Commission by: _____ date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No X

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-17] Edition] provision.

Report prepared by:

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Revision History

Report No.	Version	Description	Issued Date
190929011SZN-002	Rev.01	Initial issue of report	31 December 2019
190929011SZN-002	Rev.02	Update some description	10 January 2020
190929011SZN-002	Rev.03	Update some description	14 January 2020
190929011SZN-002	Rev.04	Update bandedge plots	10 February 2020

Note: This report replaces previous report dated: 14 January 2020.

Table of Contents

1.0 Summary of Test results

Applicant: Microsoft Corporation

Address: One Microsoft Way Redmond, WA 98052 USA

Bluetooth Accessory

Model: 1919

FCC ID: C3K1830

TEST ITEM	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
AC Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Bluetooth Accessory with Bluetooth function operating at 2402-2480MHz.For more detailed features description, please refer to the user's manual.

Bluetooth Version: 5.0 (dual-mode)
Antenna Type: Integral antenna
Antenna Gain: 2.5 dBi
Modulation Type: GFSK, π/4-DQPSK and 8-DPSK

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants

This is an application for certification of transceiver for the Bluetooth Accessory which has Bluetooth function(BLE mode), and for the classic Bluetooth mode was tested and demonstrated in report 190929011SZN-001. Other digital functions were reported in the SDOC report:190929014SZN-001.

2.3 Test Methodology

All measurements were performed according to the procedures in ANSI C63.10: 2013 and KDB 558074 D01 v05r02. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 1F/2F, Building B, QiaoAn Scientific Technology Park, Shangkeng Community, Guanhu Subdistrict, Longhua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. Only the worst case data was reported.

For maximizing emissions, the EUT was rotated through 360°, the EUT was placed on the styrene turntable with 0.8m up to 1GHz and 1.5 m above 1GHz. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

The unit was placed at the center of turntable and the rear of unit was flushed with the rear of the styrene table.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

The EUT was mounted to a plastic stand if necessary and placed on the styrene turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. The worst case is X orthogonal axes placement.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

3.3 Special Accessories

N/A.

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Measurement Uncertainty	Uncertainty
Occupied Channel Bandwidth	±5%
RF Output Power	±1.5dB
Power Spectral Density	±3.0dB
Conducted Unwanted Emission	±3.0dB
Spurious emission (Above 1GHz)	±6.0dB
Radiated emission (Up to 1GHz)	±4.8dB
AC Conducted emission	±3.6 dB
Temperature	±1°C
Humidity	±5%

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by Microsoft Corporation will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

3.6 Support Equipment List and Description

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
Laptop PC (Provided by Intertek)	DELL	3450
USB A-C Cable (Provided by Applicant)	N/A	Shielded, 135cm
AC Adaptor (Provided by Intertek)	HMD Global Oy	FC0200

4.0 Measurement Results

4.1 Maximum Peak Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW > DTS bandwidth and power was read directly in dBm.

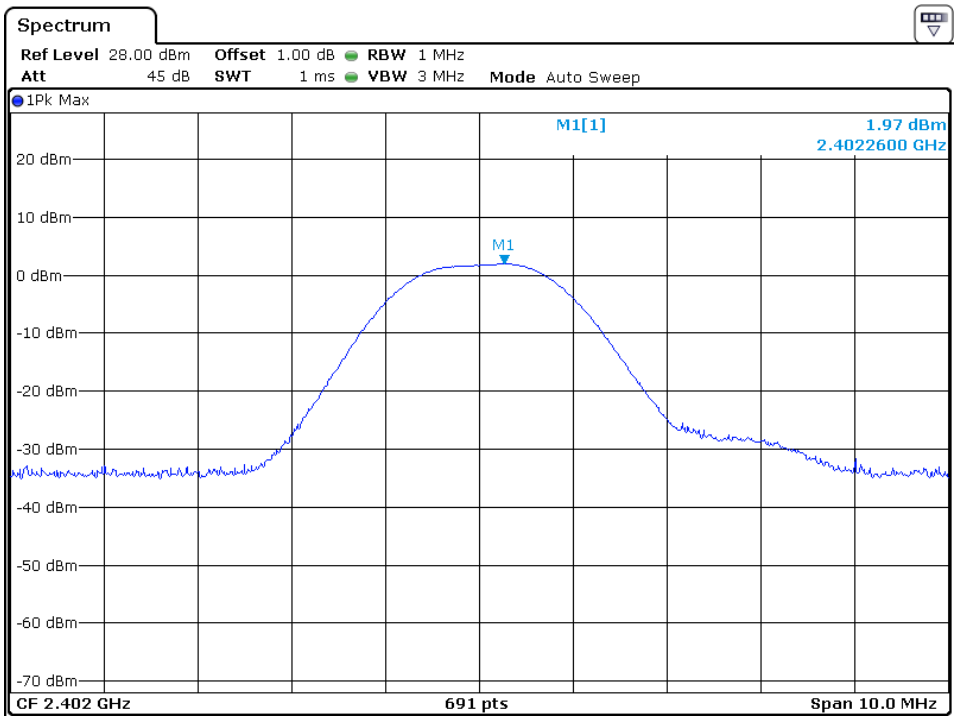
For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

Antenna Gain = 2.5dBi		
Frequency (MHz)	Output power in dBm (Peak Reading)	Power in mWatt
Low Channel: 2402	1.97	1.574
Middle Channel: 2440	3.39	2.183
High Channel: 2480	3.30	2.138

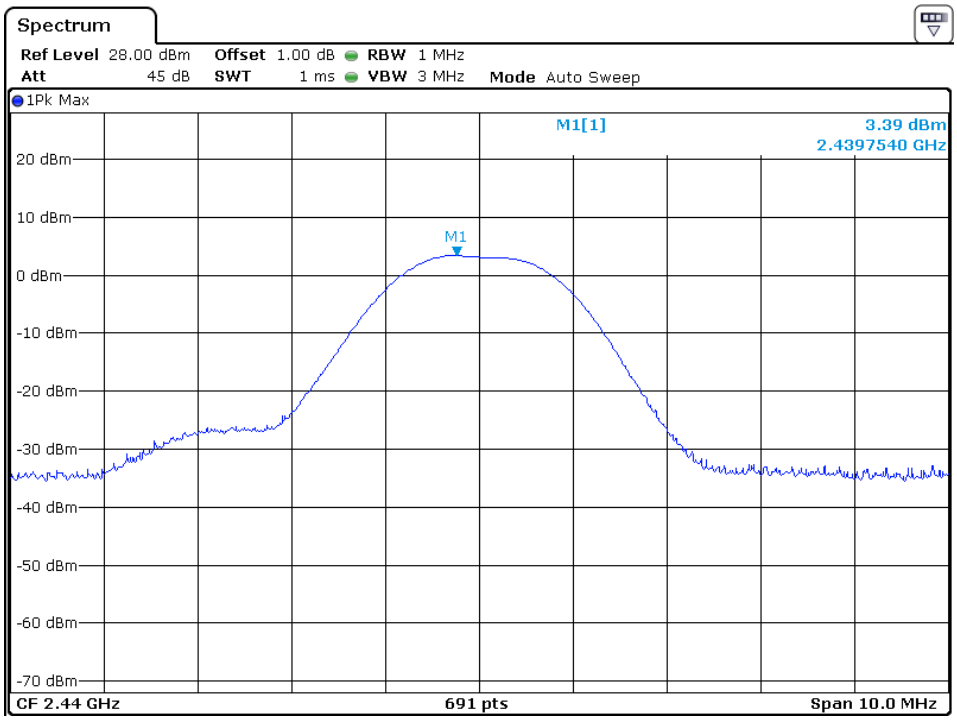
Cable loss, external attenuation has been included in OFFSET function.

EUT max. output level = 3.39dBm

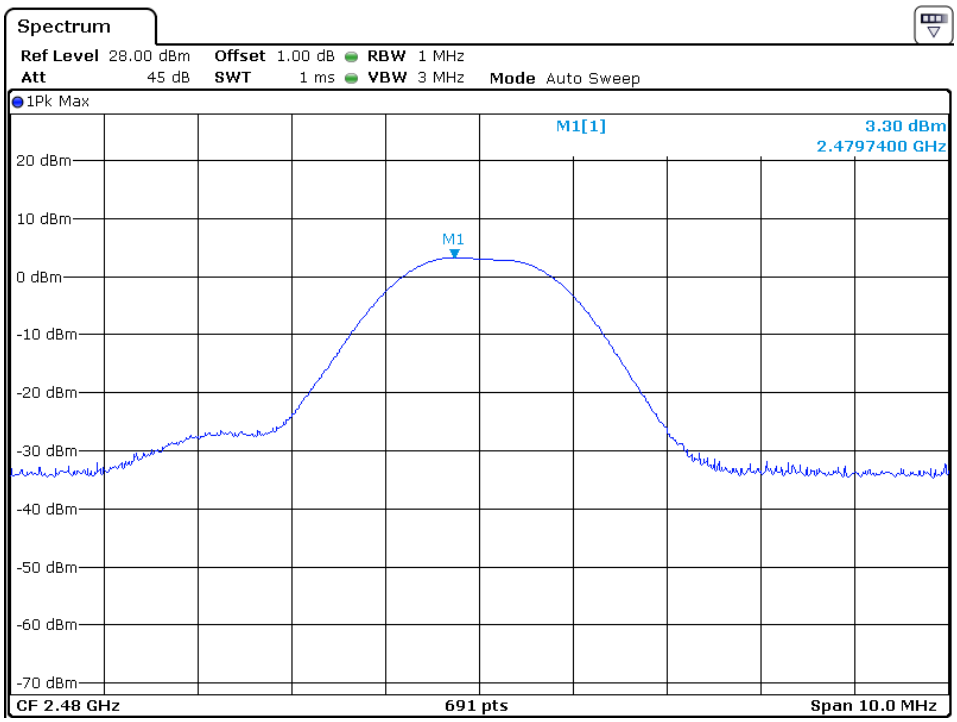
Low Channel



Middle Channel



High Channel



Applicant: Microsoft Corporation
Date of Test: November 5, 2019 Model: 1919

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):

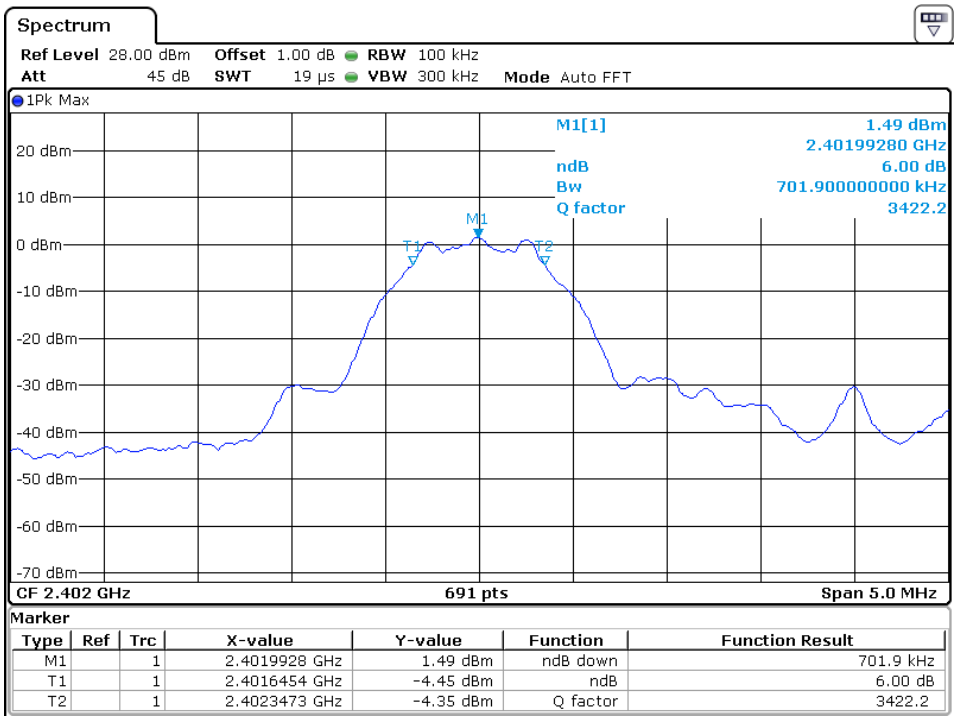
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01 v05r02. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

Frequency (MHz)	6 dB Bandwidth (KHz)
2402	701.9
2440	716.4
2480	716.4

The test plots are attached as below.

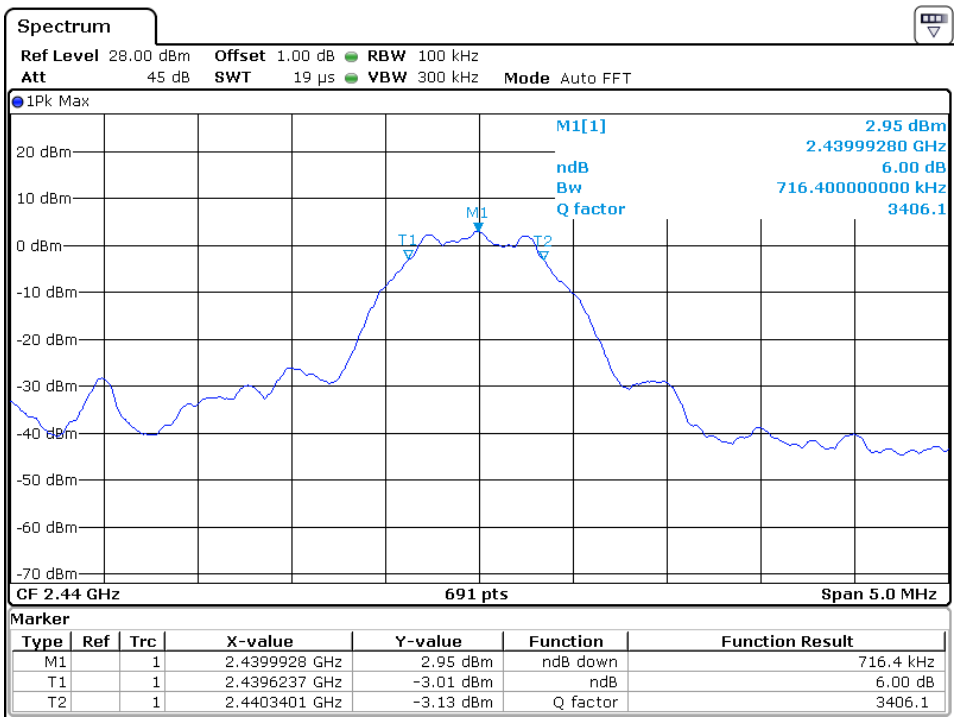
Low Channel



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4019928 GHz	1.49 dBm	ndB down	701.9 kHz
T1		1	2.4016454 GHz	-4.45 dBm	ndB	6.00 dB
T2		1	2.4023473 GHz	-4.35 dBm	Q factor	3422.2

Date: 5.NOV.2019 10:49:36

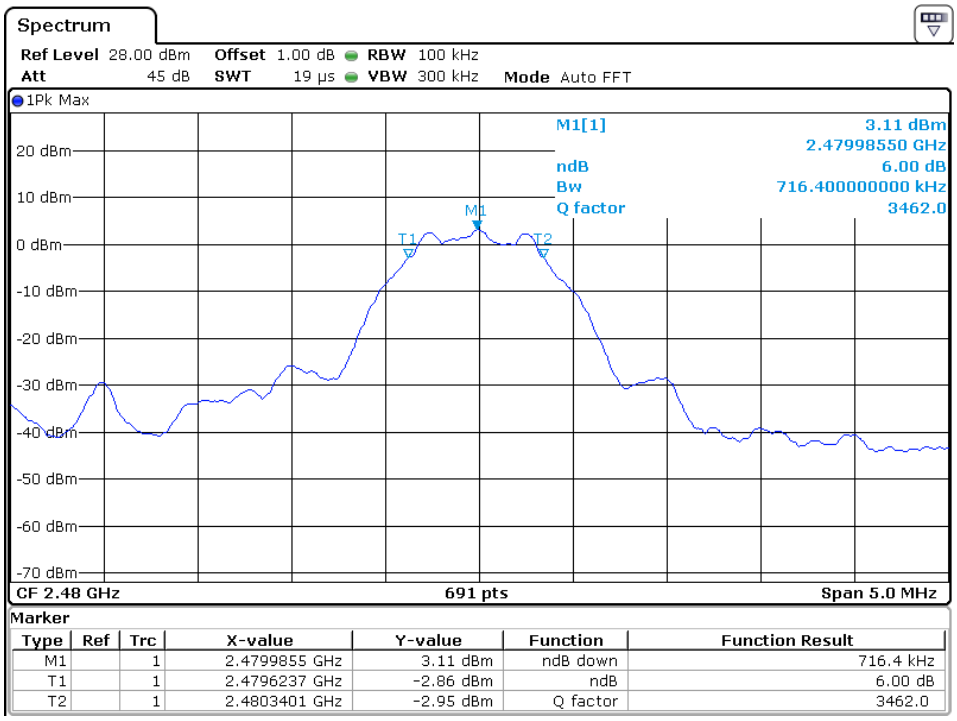
Middle Channel



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4399928 GHz	2.95 dBm	ndB down	716.4 kHz
T1		1	2.4396237 GHz	-3.01 dBm	ndB	6.00 dB
T2		1	2.4403401 GHz	-3.13 dBm	Q factor	3406.1

Date: 5.NOV.2019 10:54:03

High Channel



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4799855 GHz	3.11 dBm	ndB down	716.4 kHz
T1		1	2.4796237 GHz	-2.86 dBm	ndB	6.00 dB
T2		1	2.4803401 GHz	-2.95 dBm	Q factor	3462.0

Date: 5.NOV.2019 11:06:50

4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05r02.

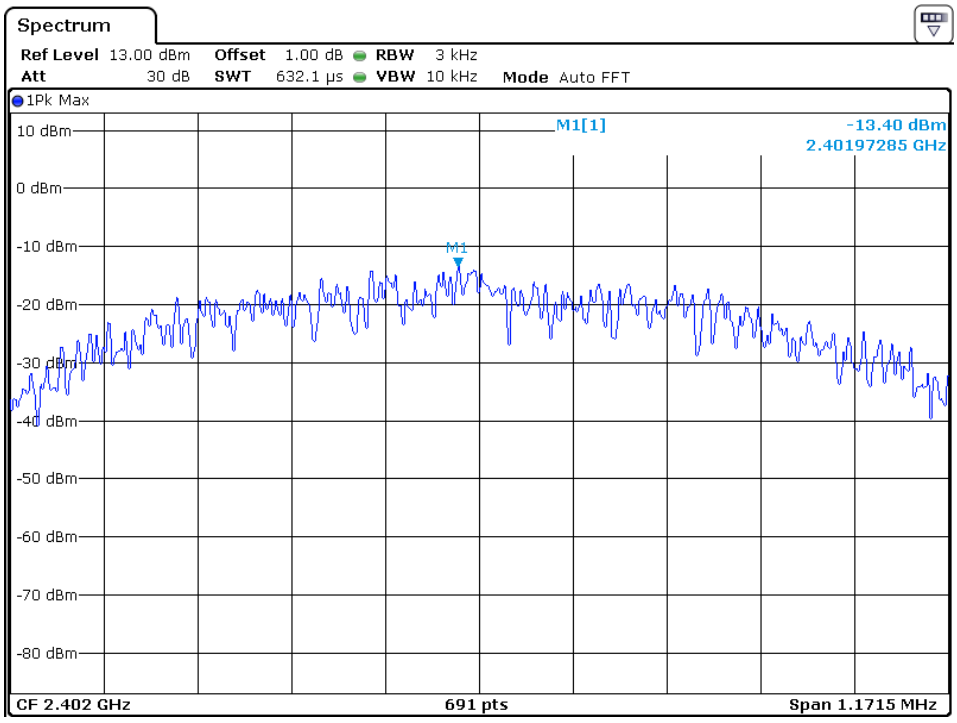
Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/3 kHz.

Frequency (MHz)	Power Density with RBW 3KHz
2402	-13.40
2440	-12.05
2480	-12.17

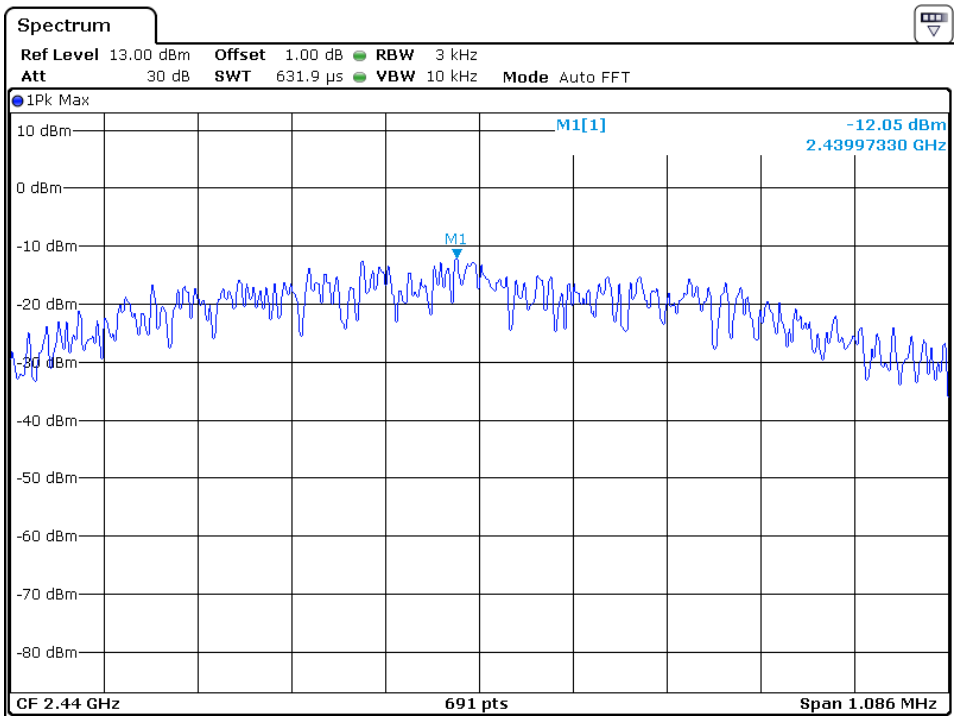
The test plots are attached as below.

Low Channel



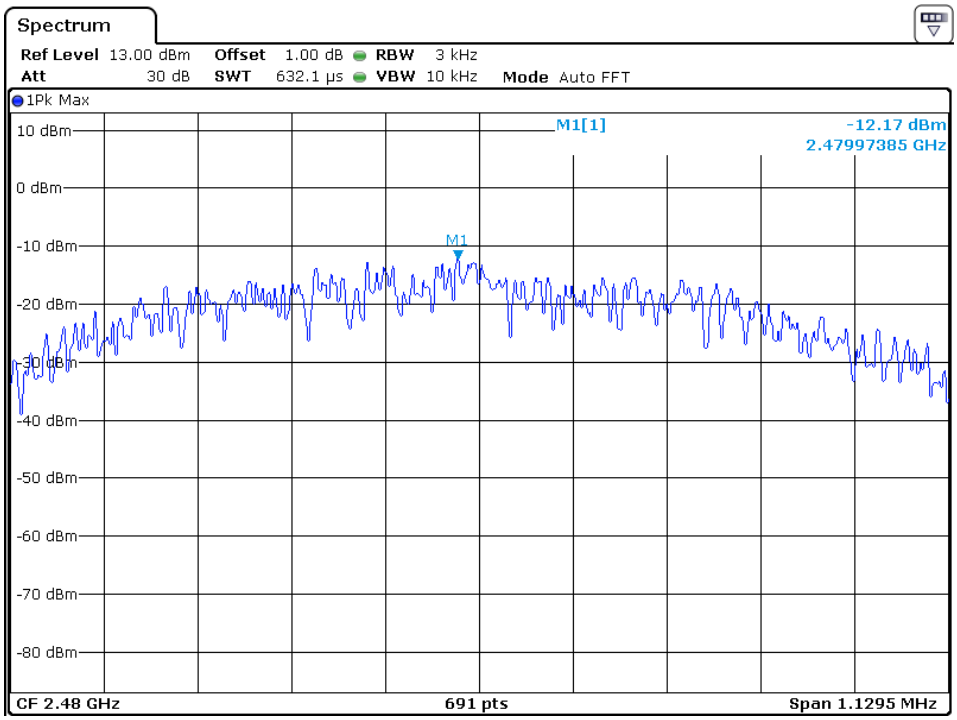
Date: 29.SEP.2019 19:29:00

Middle Channel



Date: 29.SEP.2019 19:35:29

High Channel



4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. The Measurement Procedure was set according to the FCC KDB 558074 D01 v05r02.

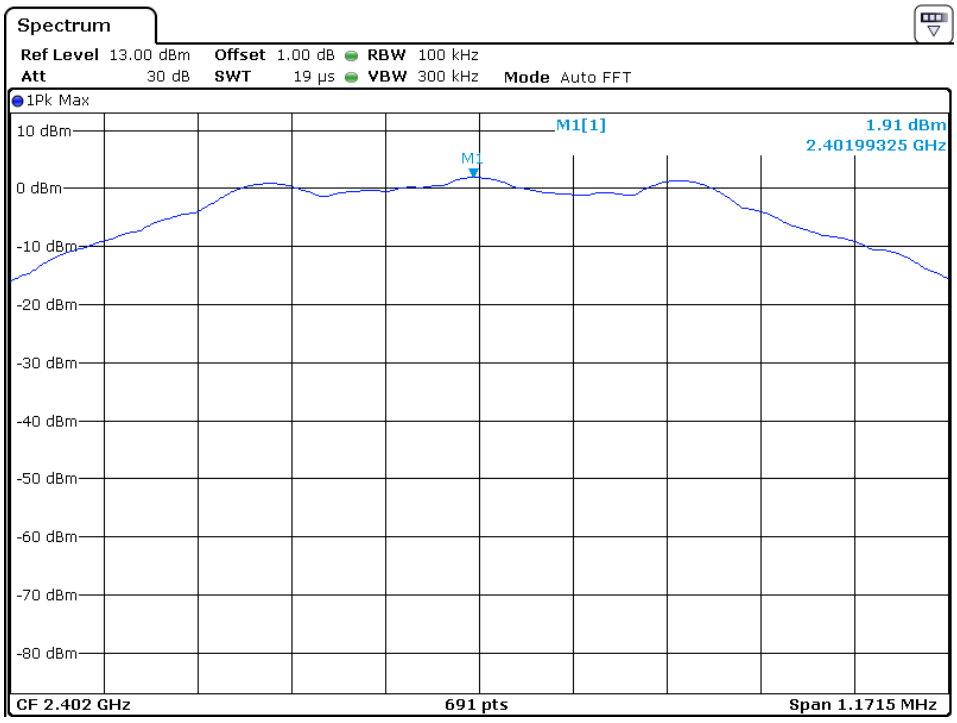
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the attached test plot for out of band conducted emissions data.

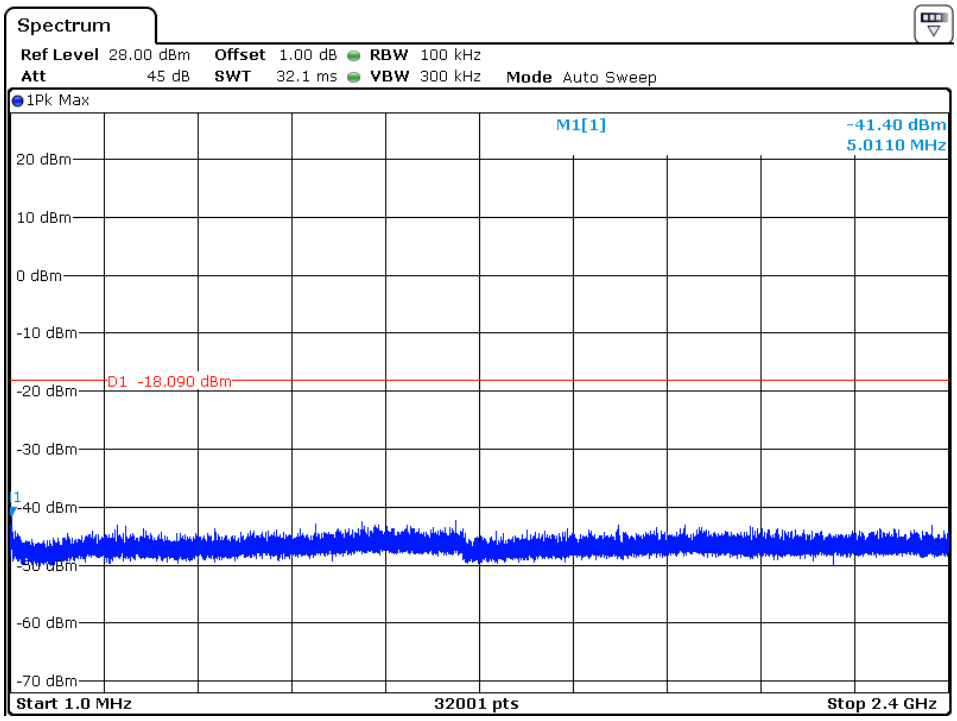
The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The test plots are attached as below.

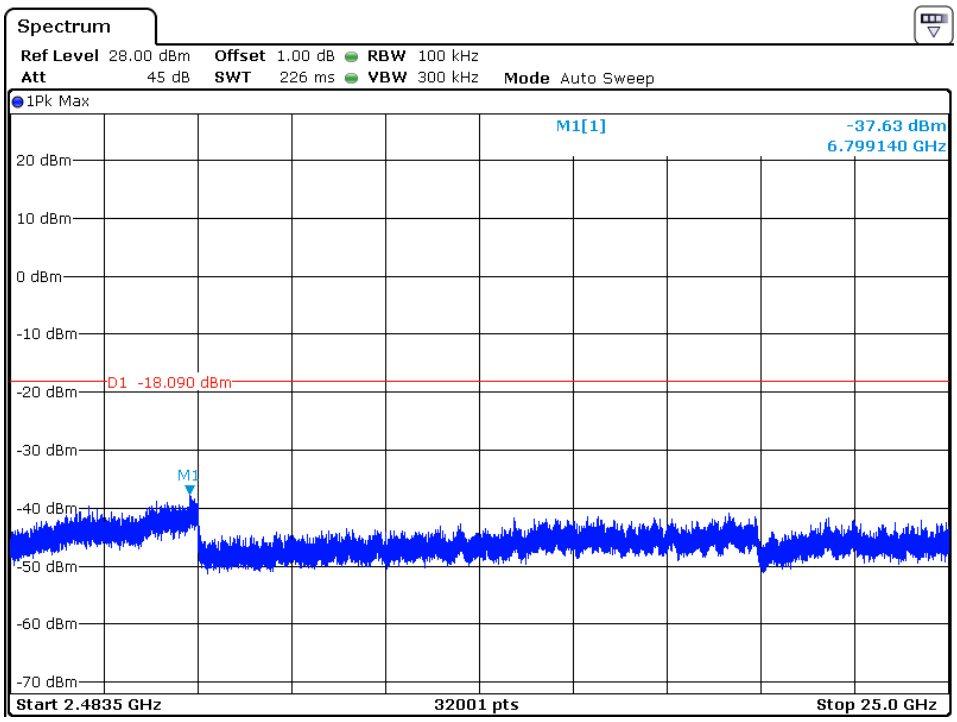
Low Channel Reference Level: 1.91dBm



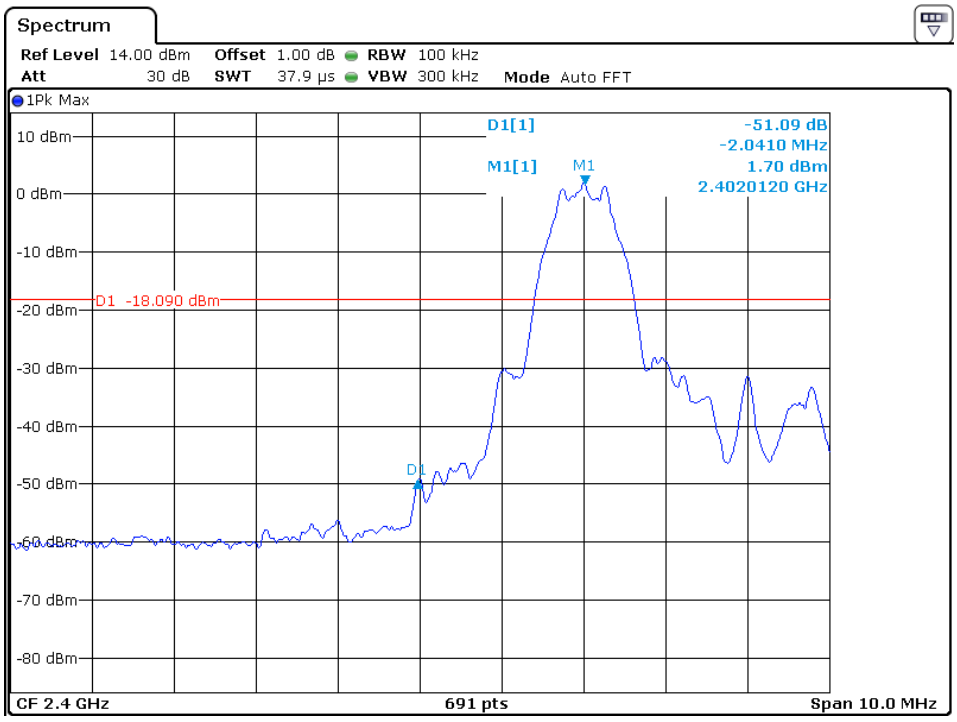
Date: 29.SEP.2019 19:29:28



Date: 5.NOV.2019 10:51:48

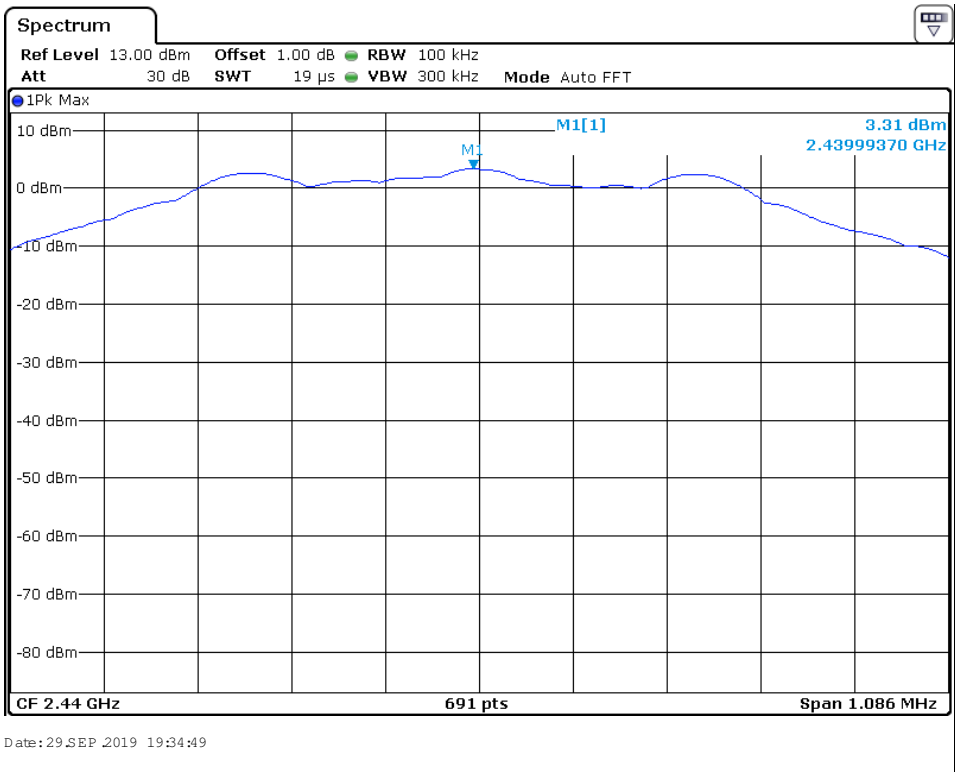


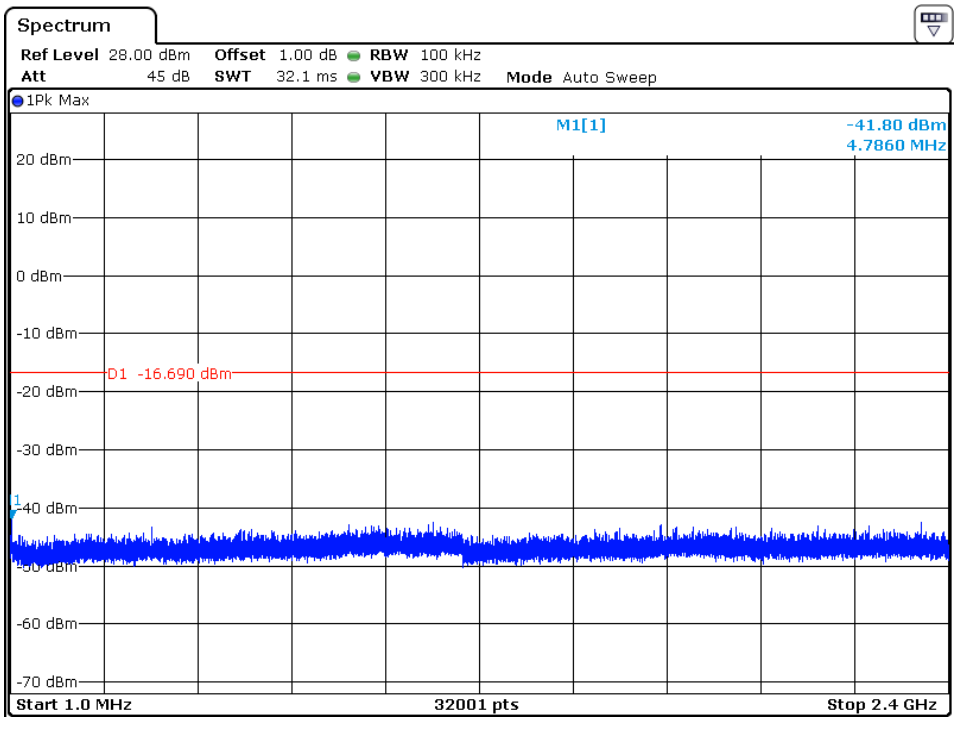
Date: 5.NOV.2019 10:52:32

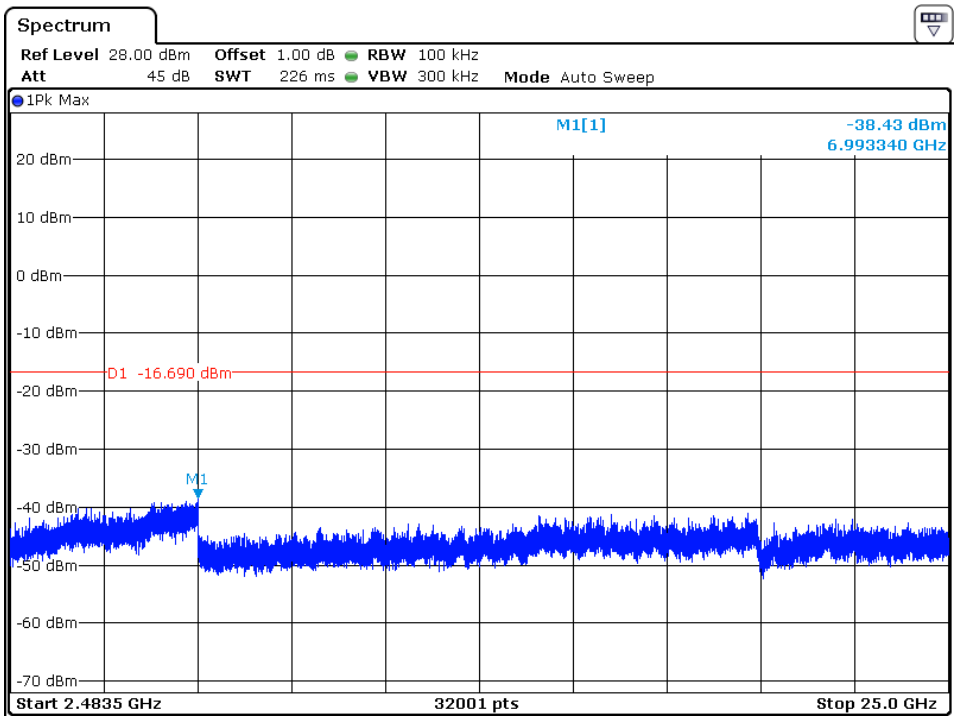


Date: 30.SEP.2019 11:47:22

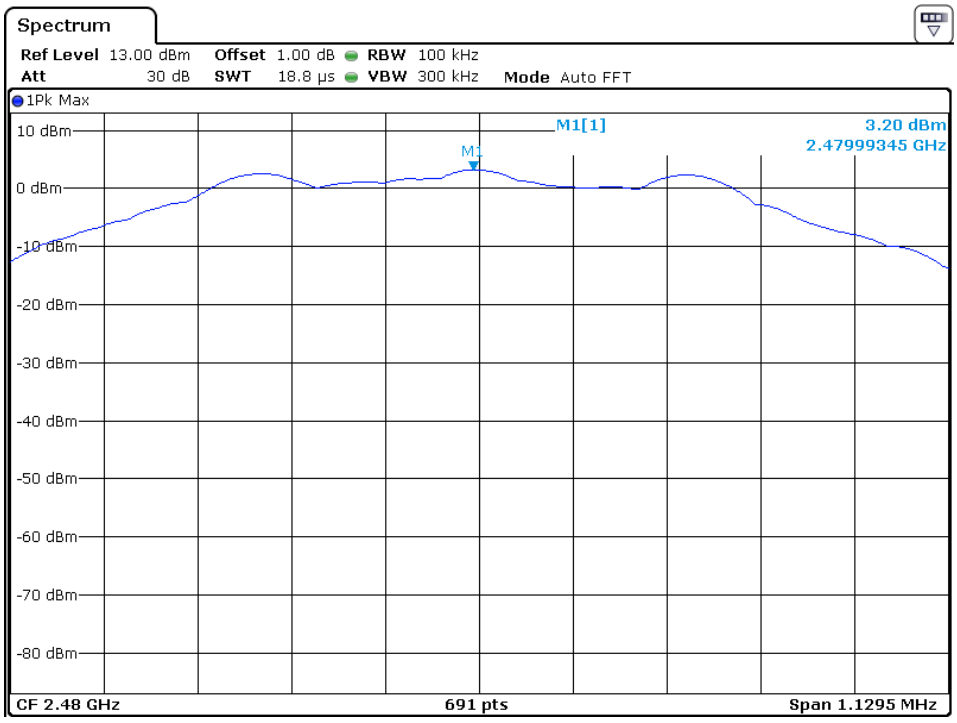
Middle Channel Reference Level: 3.31dBm



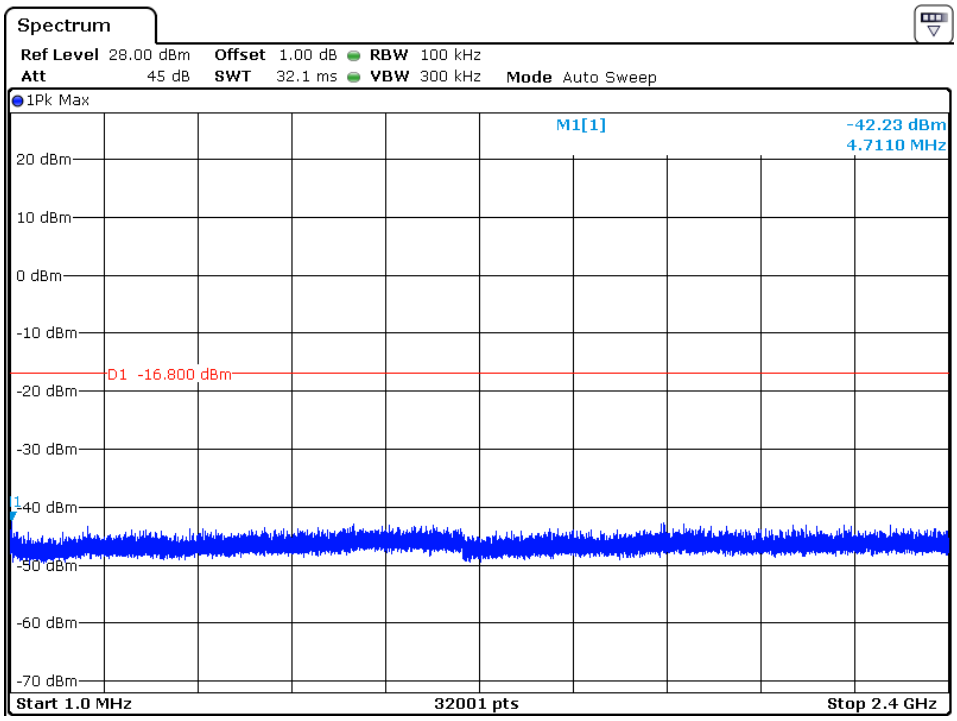



Spectrum
Ref Level 28.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -38.43 dBm
6.993340 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
D1 -16.690 dBm
-20 dBm
-30 dBm
M1
-40 dBm
-50 dBm
-60 dBm
-70 dBm
Start 2.4835 GHz
32001 pts
Stop 25.0 GHz
Date: 5.NOV.2019 10:55:28

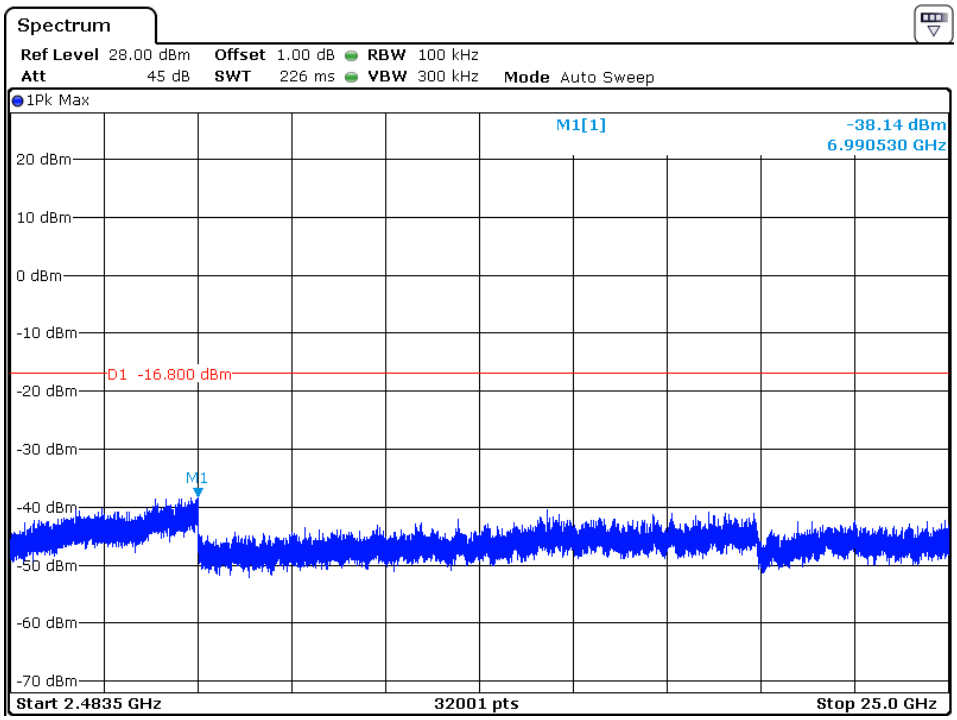
High Channel Reference Level: 3.20dBm

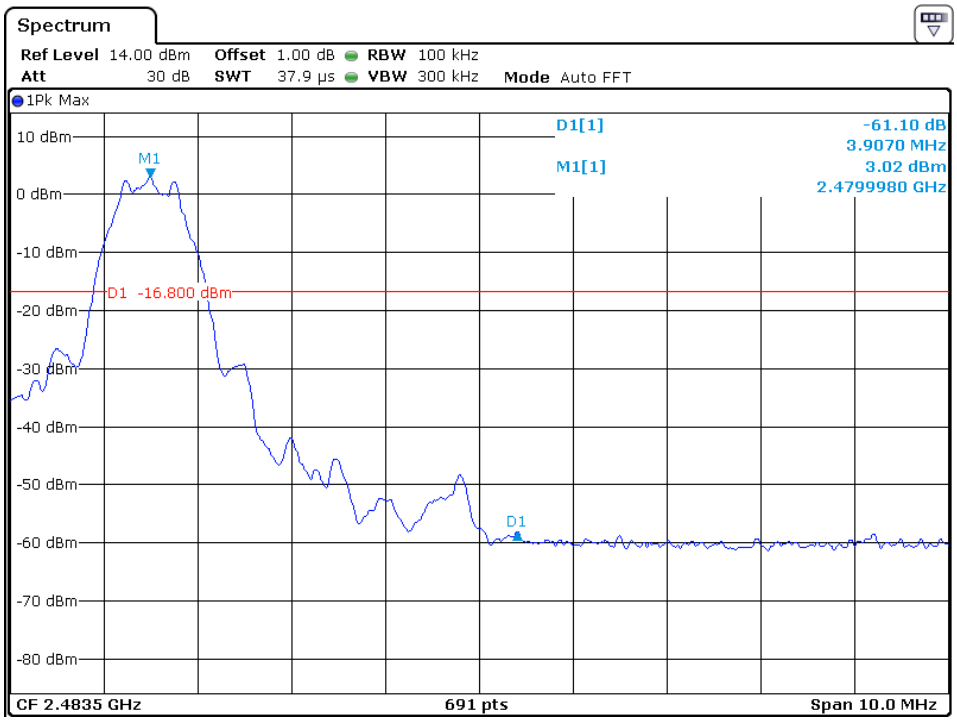


Date: 29.SEP.2019 19:40:47



Date: 5.NOV.2019 10:56:37


Spectrum
Ref Level 28.00 dBm Offset 1.00 dB RBW 100 kHz
Att 45 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -38.14 dBm
6.990530 GHz
D1 -16.800 dBm
M1
Start 2.4835 GHz 32001 pts Stop 25.0 GHz
Date: 5.NOV.2019 10:57:08


Spectrum
Ref Level 14.00 dBm Offset 1.00 dB RBW 100 kHz
Att 30 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -61.10 dB
3.9070 MHz
M1[1] 3.02 dBm
2.4799980 GHz
D1 -16.800 dBm
M1
D1
CF 2.4835 GHz 691 pts Span 10.0 MHz
Date: 30.SEP.2019 11:48:51

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[×] Not required, since all emissions are more than 20dB below fundamental
[ ] See attached data sheet

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b) (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD

Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 42 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBμV/m

Level in mV/m = Common Antilogarithm [(42 dBμV/m)/20] = 125.9 μV/m

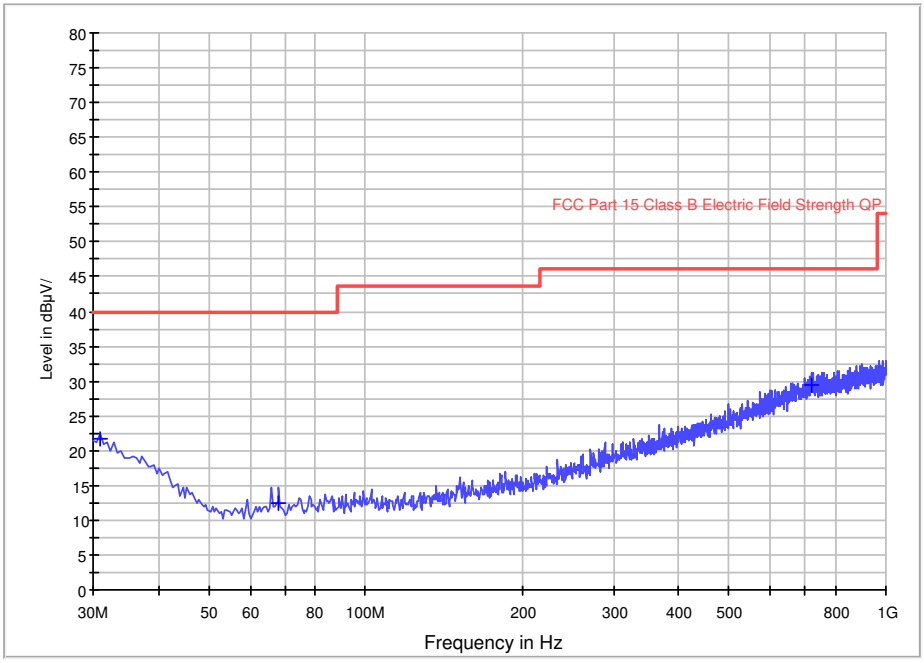
4.8 Radiated Spurious Emission

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: Test Setup Photos.pdf.

Applicant: Microsoft Corporation
Date of Test: October 27, 2019 Model: 1919
Worst Case Operating Mode: Transmitting(2402MHz)

ANT Polarity: Horizontal

FCC Part 15



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
30.980000	21.8	1000.0	120.000	0.0	H	17.5	-18.2	40.0
68.315000	12.4	1000.0	120.000	0.0	H	8.3	-27.6	40.0
718.210000	29.5	1000.0	120.000	0.0	H	25.5	-16.5	46.0

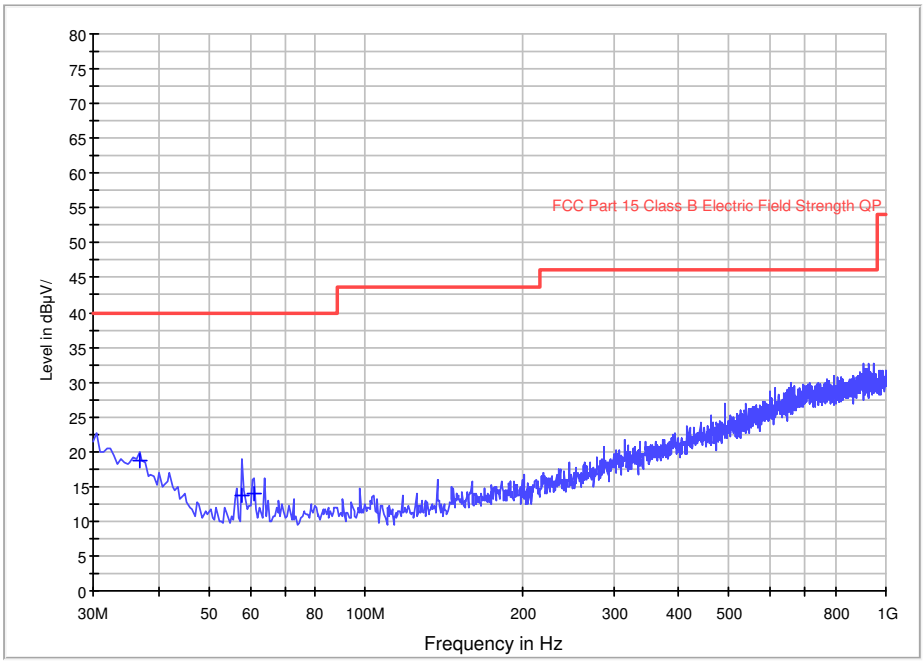
Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

NOTES:
1. Quasi-Peak detector is used for frequency below 1GHz.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. All emissions are below the QP limit.
5. The spurious emissions were very low against the limit in the frequency range 9KHz to 30MHz. The amplitude of spurious emissions that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Applicant: Microsoft Corporation
Date of Test: October 27, 2019 Model: 1919
Worst Case Operating Mode: Transmitting(2402MHz)

ANT Polarity: Vertical

FCC Part 15



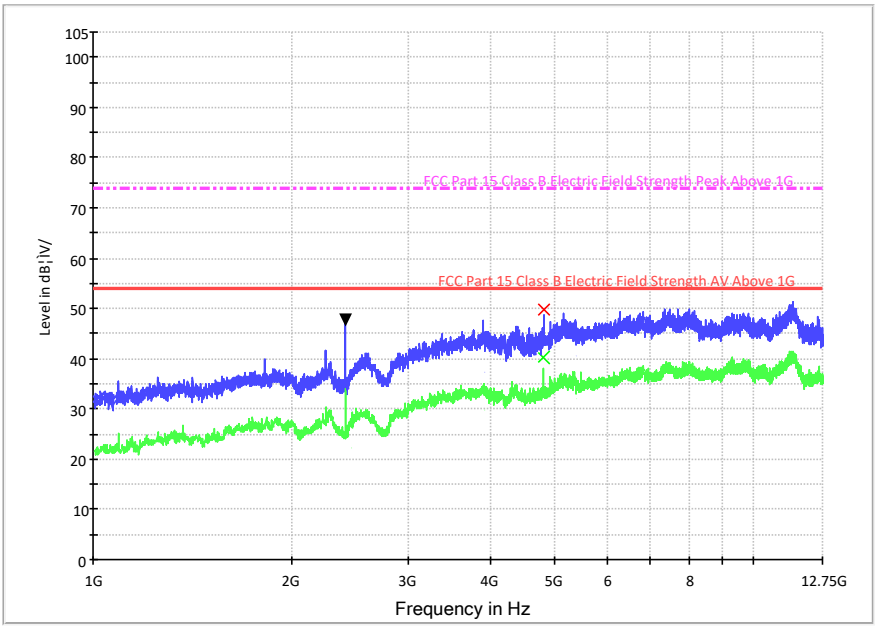
Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
36.780000	18.8	1000.0	120.000	0.0	V	14.7	-21.2	40.0
58.120000	13.8	1000.0	120.000	0.0	V	7.7	-26.2	40.0
61.040000	14.0	1000.0	120.000	0.0	V	7.8	-26.0	40.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

NOTES:
1. Quasi-Peak detector is used for frequency below 1GHz.
2. All measurements were made at 3 meters.
6. Negative value in the margin column shows emission below limit.
7. All emissions are below the QP limit.
8. The spurious emissions were very low against the limit in the frequency range 9KHz to 30MHz. The amplitude of spurious emissions that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Applicant: Microsoft Corporation
Date of Test: November 25, 2019 Model: 1919
Worst Case Operating Mode: Transmitting (2402MHz)

Radiated Emissions



Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4804.000	53.5	36.7	33.5	50.3	74.0	-23.7

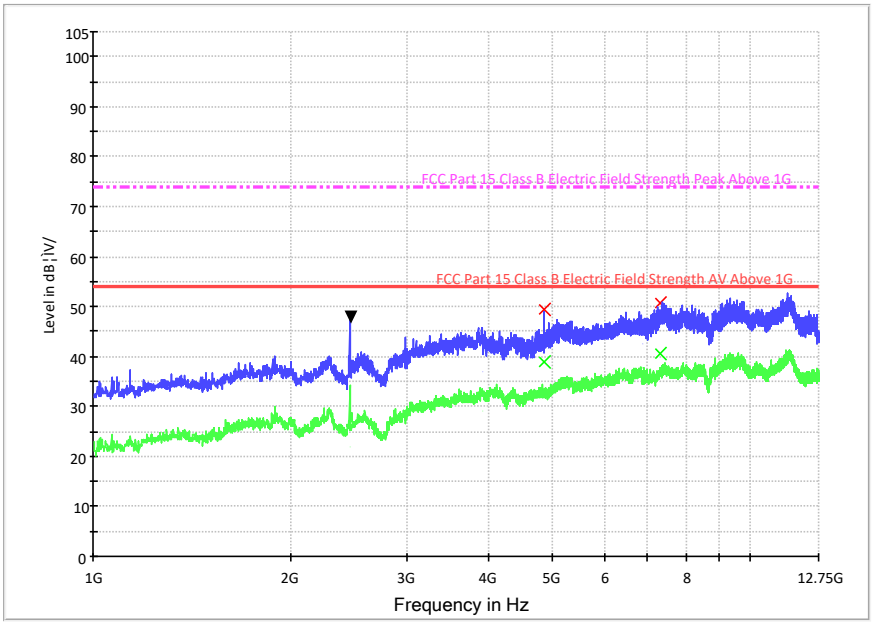
Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4804.000	43.5	36.7	33.5	40.3	54.0	-13.7

NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value. RBW=1MHz/VBW=3KHz for average value.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Microsoft Corporation
Date of Test: November 25, 2019 Model: 1919
Worst Case Operating Mode: Transmitting (2440MHz)

Radiated Emissions



Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4880.000	52.9	36.7	33.4	49.6	74.0	-24.4
Horizontal	*7320.000	50.1	36.1	36.8	50.8	74.0	-23.2

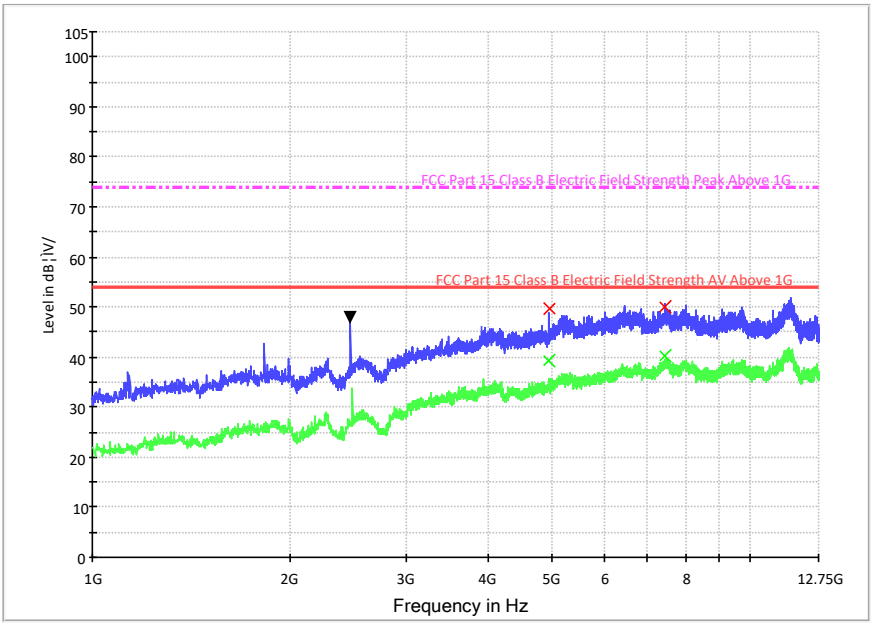
Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4880.000	42.4	36.7	33.4	39.1	54.0	-14.9
Horizontal	*7320.000	39.9	36.1	36.8	40.6	54.0	-13.4

NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value. RBW=1MHz / VBW=3KHz for average value.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Microsoft Corporation
Date of Test: November 25, 2019 Model: 1919
Worst Case Operating Mode: Transmitting (2480MHz)

Radiated Emissions



Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4960.000	53.6	36.7	33.3	50.2	74.0	-23.8
Horizontal	*7440.000	50.3	36.1	36.7	50.9	74.0	-23.1

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4960.000	43.7	36.7	33.3	40.3	54.0	-13.7
Horizontal	*7440.000	39.6	36.1	36.7	40.2	54.0	-13.8

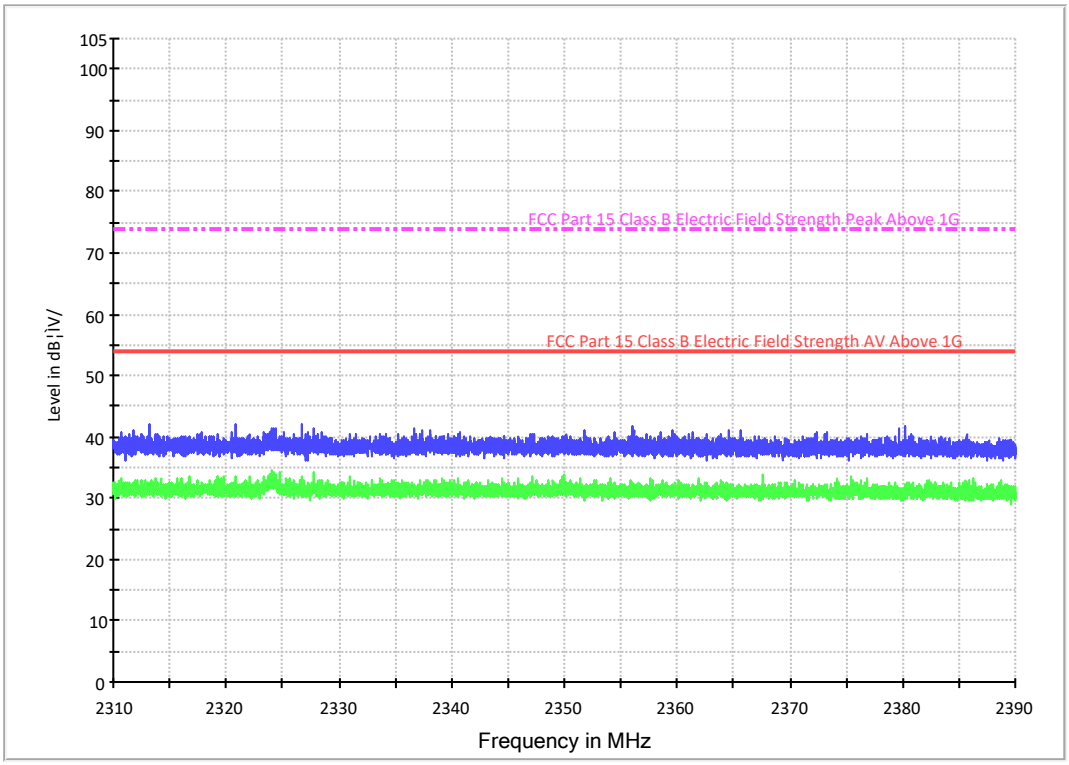
NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value. RBW=1MHz / VBW=3KHz for average value.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Restricted-Band Band-Edge Emissions (2310-2390MHz)

Applicant: Microsoft Corporation
Date of Test: November 25, 2019 Model: 1919
Worst Case Operating Mode: Transmitting (2402MHz)

Radiated Emissions



Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2380.280	50.5	36.7	28.1	41.9	74.0	-32.1

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2374.260	42.1	36.7	28.1	33.5	54.0	-20.5

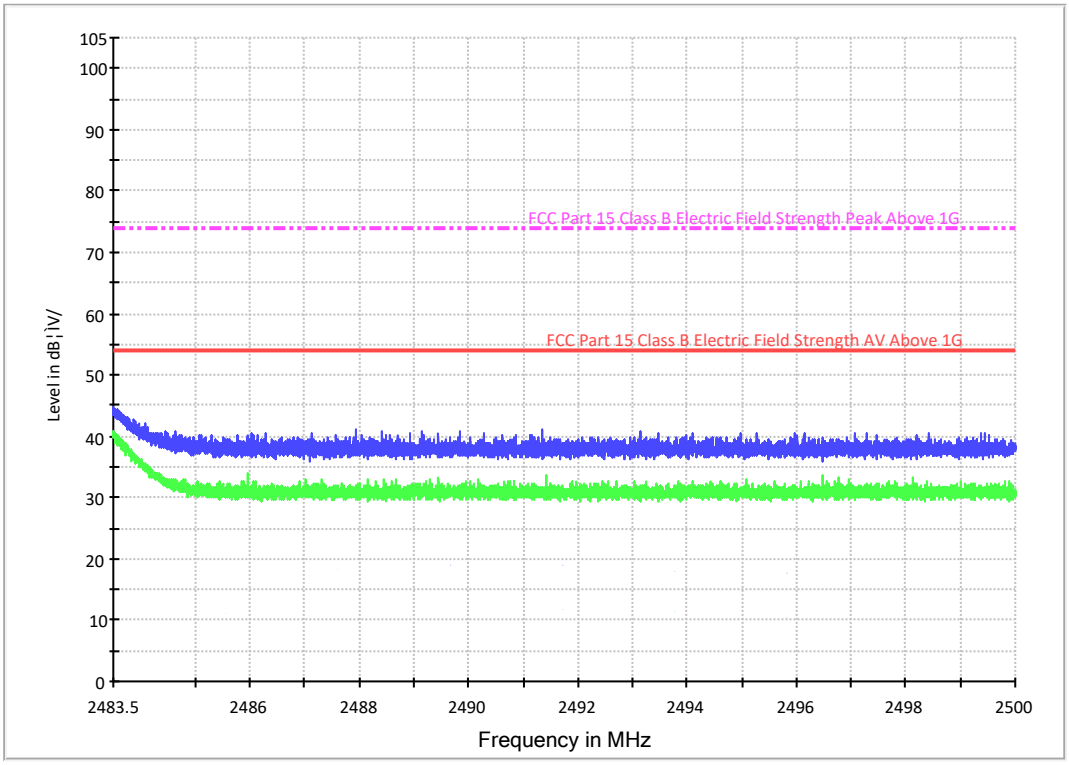
NOTES: 1. All measurements were made at 3 meters.

2. Negative value in the margin column shows emission below limit.

Restricted-Band Band-Edge Emissions (2483.5-2500MHz)

Applicant: Microsoft Corporation
Date of Test: November 25, 2019 Model: 1919
Worst Case Operating Mode: Transmitting (2480MHz)

Radiated Emissions



Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2483.558	53.3	36.7	28.1	44.7	74.0	-29.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2483.537	49.1	36.7	28.1	40.5	54.0	-13.5

NOTES: 1. All measurements were made at 3 meters.

2. Negative value in the margin column shows emission below limit.

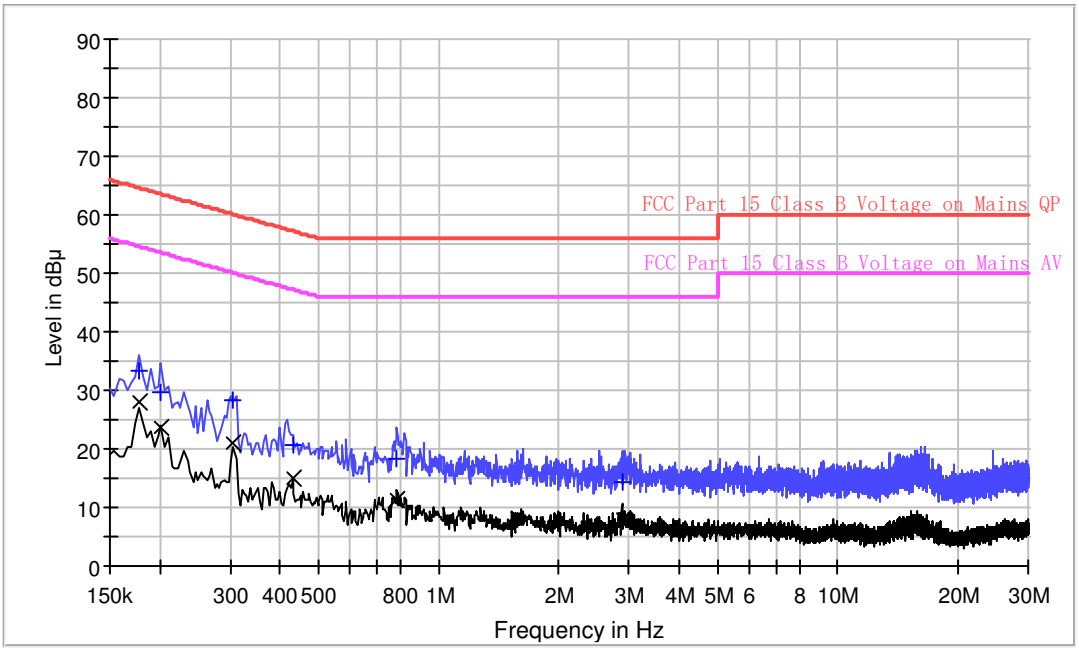
4.9 Conducted Emission

All connecting cables of EUT and peripherals were moved to find the maximum emission.

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

Applicant: Microsoft Corporation
Date of Test: December 20, 2019
Model: 1919
Worst Case Operating Mode: BT Link
Phase: Live

Conducted Emission Test



Result Table QP

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.178000	33.6	L	9.6	-31.0	64.6
0.202000	29.7	L	9.7	-33.8	63.5
0.306000	28.2	L	9.7	-31.9	60.1
0.430000	20.6	L	9.7	-36.7	57.3
0.785000	18.2	L	9.7	-37.8	56.0
2.878000	14.3	L	10.1	-41.7	56.0

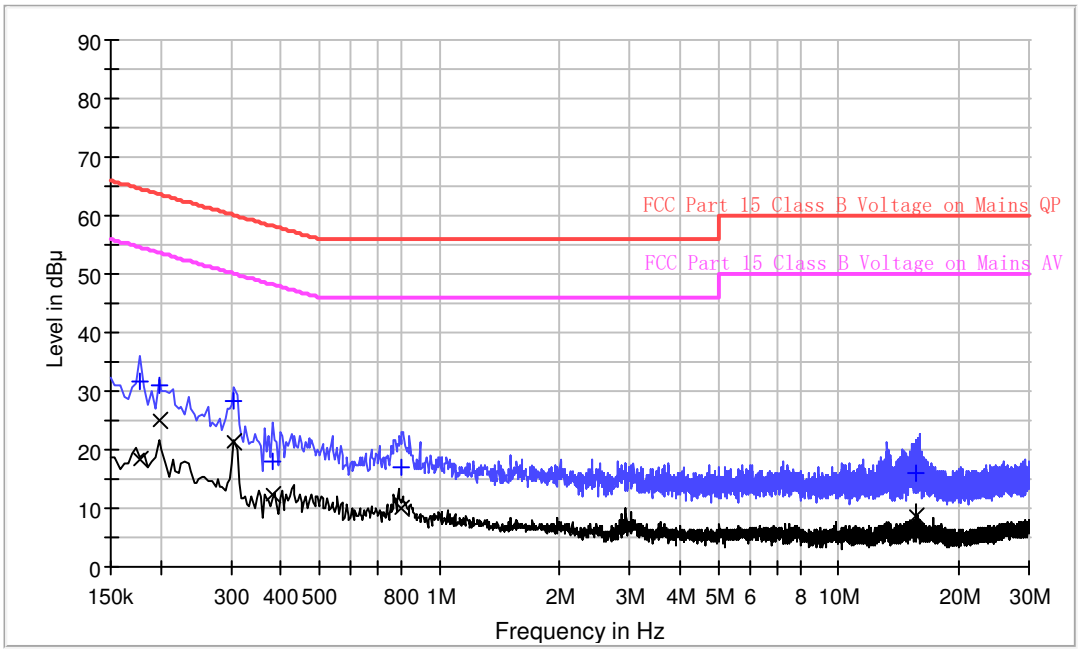
Result Table AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.178000	28.3	L	9.7	-26.3	54.6
0.202000	23.6	L	9.7	-29.9	53.5
0.306000	21.1	L	9.7	-29.0	50.1
0.430000	15.1	L	9.7	-32.2	47.3
0.785000	11.3	L	9.7	-34.7	46.0
2.878000	8.3	L	9.8	-37.7	46.0

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBµV) – Limit (dBµV)

Applicant: Microsoft Corporation
Date of Test: December 20, 2019
Model: 1919
Worst Case Operating Mode: BT Link
Phase: Neutral

Conducted Emission Test



Result Table QP

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.178000	31.8	N	9.7	-32.8	64.6
0.198000	30.9	N	9.7	-32.8	63.7
0.306000	28.4	N	9.7	-31.7	60.1
0.382000	18.1	N	9.7	-40.1	58.2
0.806000	16.9	N	9.7	-39.1	56.0
15.646000	16.1	N	10.2	-43.8	60.0

Result Table AV

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.178000	18.2	N	9.7	-36.4	54.6
0.198000	25.0	N	9.7	-28.7	53.7
0.306000	21.2	N	9.7	-28.9	50.1
0.382000	12.2	N	9.7	-36.0	48.2
0.806000	9.9	N	9.7	-36.1	46.0
15.646000	8.7	N	10.2	-41.3	50.0

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBµV) – Limit (dBµV)

Applicant: Microsoft Corporation
Model: 1919

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

[ ] Not required - No digital part

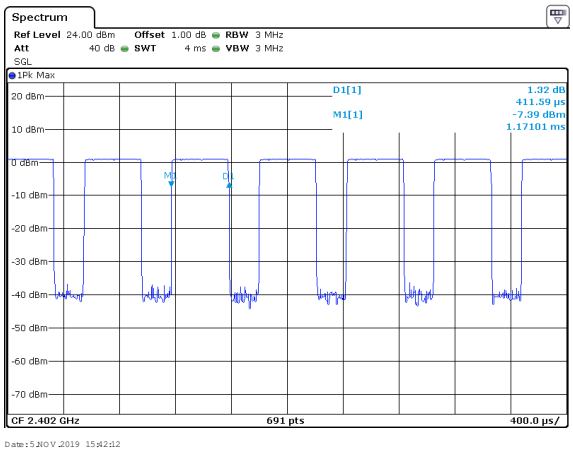
[ ] Test results are attached

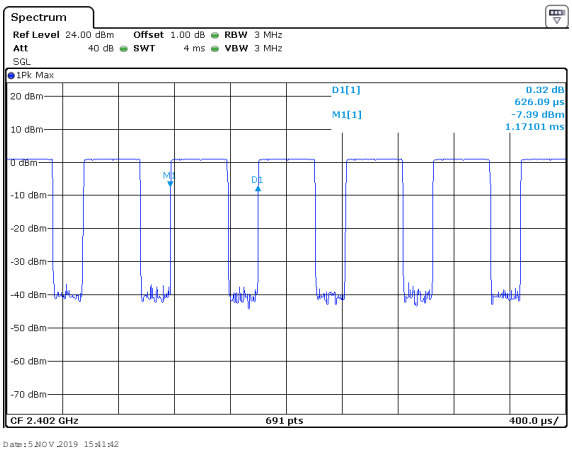
[x] Included in the separated report.

Applicant: Microsoft Corporation
Model: 1919

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:





T_{on} =411.59 µs
T=626.09 µs

Maximum Duty Cycle=65.7%

5.0 Miscellaneous Information

This miscellaneous information includes details of the test procedure and calculation of factor such as pulse desensitization.

5.1 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

5.2 Discussion of Transmitter Duty Cycle

The device cannot operate at >98% duty cycle because of hardware limitation. EUT operated at its maximum power control level and operated at the maximum achievable duty cycle and set the transmit duration as long as possible during the test.

6.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	14-Sep-2018	14-Sep-2020
SZ185-01	EMI Receiver	R&S	ESCI	100547	04-Jan-2019	04-Jan-2020
SZ061-08	Horn Antenna	ETS	3115	00092346	24-Aug-2019	24-Aug-2021
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	24-May-2019	24-May-2020
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	28-May-2019	28-May-2020
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	28-May-2019	28-May-2020
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	05-Jul-2019	05-Jul-2020
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2020
SZ062-02	RF Cable	RADIALL	RG 213U	--	10-Jun-2019	10-Jun-2020
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	10-Jun-2019	10-Jun-2020
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	10-Jun-2019	10-Jun-2020
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	05-Jun-2018	05-Jun-2020
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	29-Oct-2019	29-Oct-2020
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	28-May-2019	29-May-2020
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2017	16-Jan-2020

********** End of Report**********