FCC & IC RF TEST REPORT
for
Primax Electronics Ltd.

Lenovo Yoga Mouse with Laser Presenter
Model No.: MOBTCMO

FCC ID: EMJMMOBTCMO
IC: 4251A-MMOBTCMO

Prepared for	:	Primax Electronics Ltd.
Address	:	No. 669, Ruey Kuang Road, Neihu, Taipei, Taiwan, R.O.C.
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
Address	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China. Tel: +86-755-26503290 Fax: +86-755-26503396

Report No.	:	ATE20190718
Date of Test	:	April 28-May 12, 2019
Date of Report	:	May 17, 2019

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Description Page

Test Report Certification

Applicant	:	Primax Electronics Ltd.
Address	:	No. 669, Ruey Kuang Road, Neihu, Taipei, Taiwan, R.O.C.
Factory	:	Primax Electronics (CQ) Corp., Ltd.
Address	:	No.2669 Xinglong Road, Yongchuan, Chongqing City, P.R. China
Product	:	Lenovo Yoga Mouse with Laser Presenter
Model No.	:	MOBTCMO
Trade Mark	:	Lenovo

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013
RSS-247 Issue 2 February 2017
RSS-Gen Issue 5 April 2018

The EUT was tested according to DTS test procedure of August 24, 2018 KDB558074 D01 DTS Meas Guidance v05 for compliance to FCC 47CFR 15.247 requirements

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 and RSS-247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC and IC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test :	April 28-May 12, 2019
Date of Report :	May 17, 2019

Prepared by : _____
(Steven Yang, Engineer)

Approved & Authorized Signer : _____
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

EUT	:	Lenovo Yoga Mouse with Laser Presenter
Model Number	:	MOBTCMO
HVIN	:	MOBTCMO
Bluetooth Version	:	V5.0 BLE
Frequency Range	:	2402-2480MHz
Modulation Type	:	GFSK
Number of Channels	:	40 channels
Channel Spacing	:	2MHz
Antenna Gain	:	0.5dBi
Antenna Type	:	Chip Antenna
Power Supply	:	DC 3.7V

1.2.Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

1.3.Special Accessory and Auxiliary Equipment

N/A

1.4.Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358 Listed by Innovation, Science and Economic Development Canada (ISEDC) The Registration Number is 5077A-2 Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193 Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.5.Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 05, 2019	One Year
EMI Test Receiver	Rohde&Schwarz	ESR	101817	Jan. 05, 2019	One Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 05, 2019	One Year
Pre-Amplifier	Agilent	8447D	294A10619	Jan. 05, 2019	One Year
Pre-Amplifier	Compliance Direction	RSU-M2	38322	Jan. 05, 2019	One Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 05, 2019	One Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 05, 2019	One Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 05, 2019	One Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 05, 2019	One Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 05, 2019	One Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 05, 2019	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 05, 2019	One Year
Conducted Emission Measurement Software: ES-K1 V1.71					
Radiated Emission Measurement Software: EZ_EMC V1.1.4.2					

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2402MHz
Middle Channel: 2440MHz
High Channel: 2480MHz

3.2.Configuration and peripherals

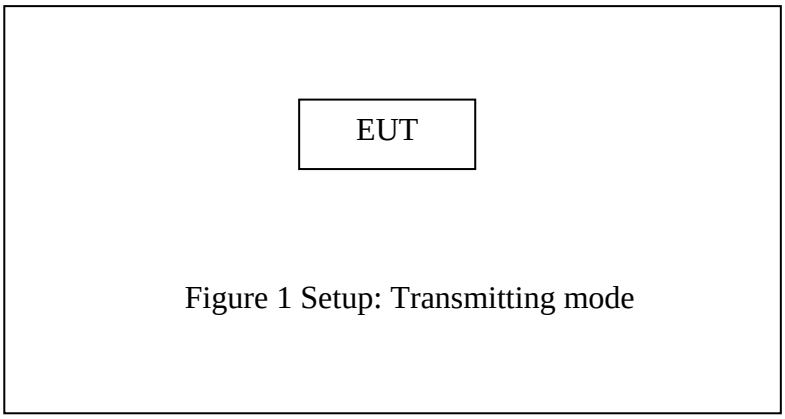


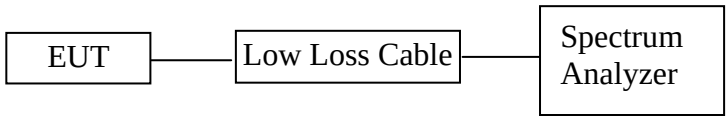
Figure 1 Setup: Transmitting mode

4. TEST PROCEDURES AND RESULTS

FCC & IC Rules	Description of Test	Result
FCC Section 15.247(a)(2) RSS-247 Section 5.2(a)	6dB Bandwidth Test	Compliant
RSS-Gen Section 6.7	99% Occupied Bandwidth Test	Compliant
FCC Section 15.247(b)(3) RSS-247 Section 5.4(d)	Maximum Peak Output Power Test	Compliant
FCC Section 15.247(e) RSS-247 Section 5.2(b)	Power Spectral Density Test	Compliant
FCC Section 15.247(d) RSS-247 Section 5.5 RSS-Gen Section 8.9 RSS-Gen Section 8.10	Band Edge Compliance Test	Compliant
FCC Section 15.247(d) FCC Section 15.209 RSS-247 Section 5.5 RSS-Gen Section 6.13 RSS-Gen Section 8.9	Radiated Spurious Emission Test	Compliant
FCC Section 15.207 RSS-Gen Section 8.8	AC Power Line Conducted Emission Test	Compliant
FCC Section 15.203 RSS-Gen Section 6.8	Antenna Requirement	Compliant

5. 6DB BANDWIDTH TEST

5.1.Block Diagram of Test Setup



5.2.The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3.The Requirement For RSS-247 Section 5.2(a)

The minimum 6 dB bandwidth shall be 500 kHz.

5.4.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.5.Operating Condition of EUT

5.5.1.Setup the EUT and simulator as shown as Section 5.1.

5.5.2.Turn on the power of all equipment.

5.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

5.6.Test Procedure

5.6.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.6.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

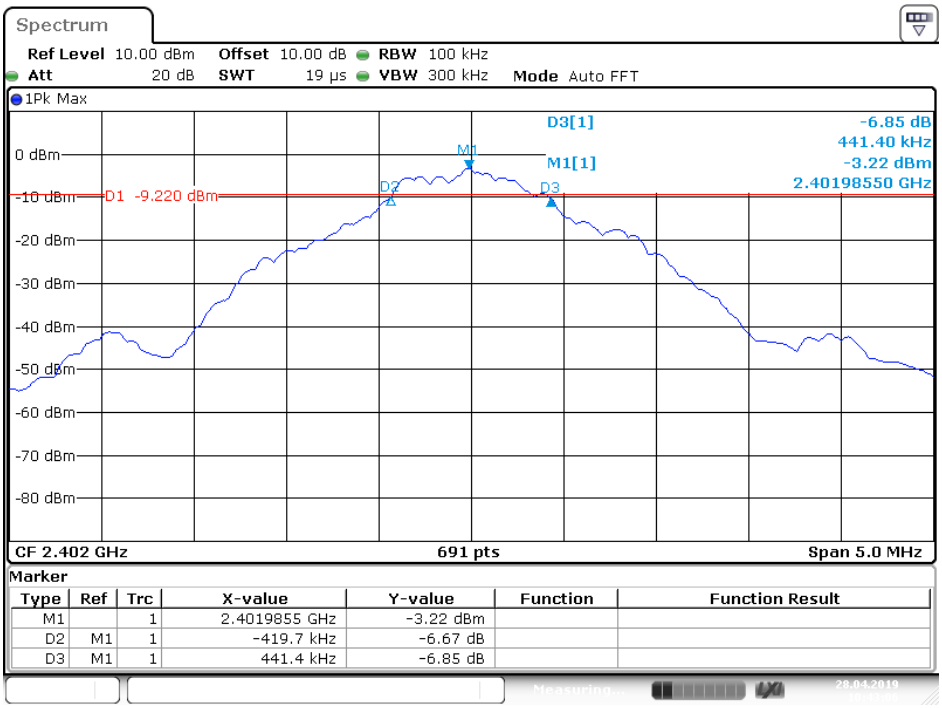
5.6.3.The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.7.Test Result

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit(MHz)	Result
0	2402	0.861	0.5	Pass
19	2440	0.868	0.5	Pass
39	2480	0.905	0.5	Pass

The spectrum analyzer plots are attached as below.

Channel 0



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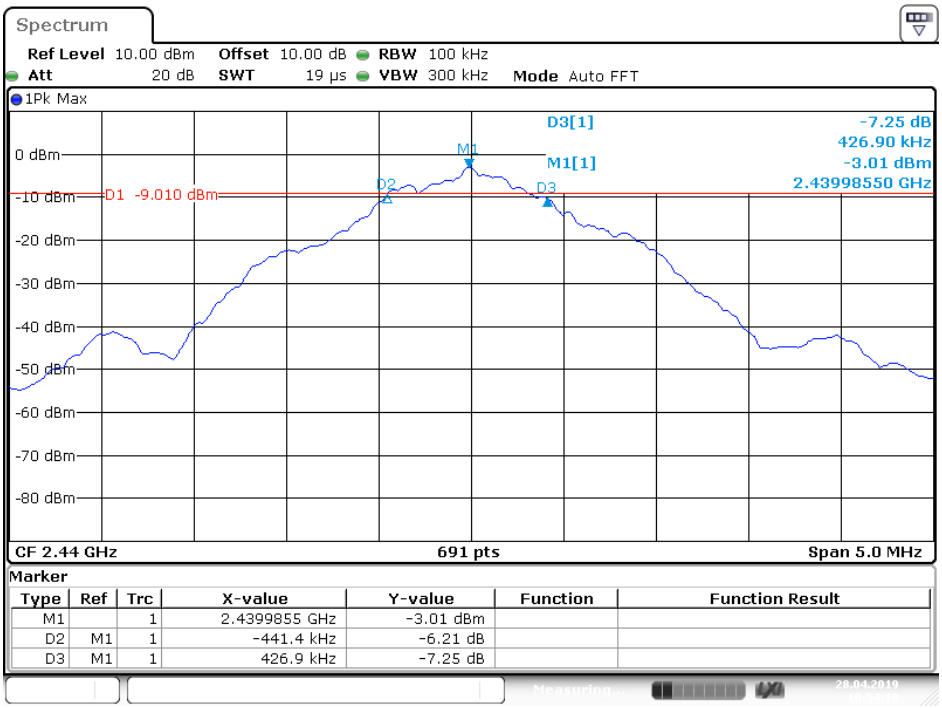
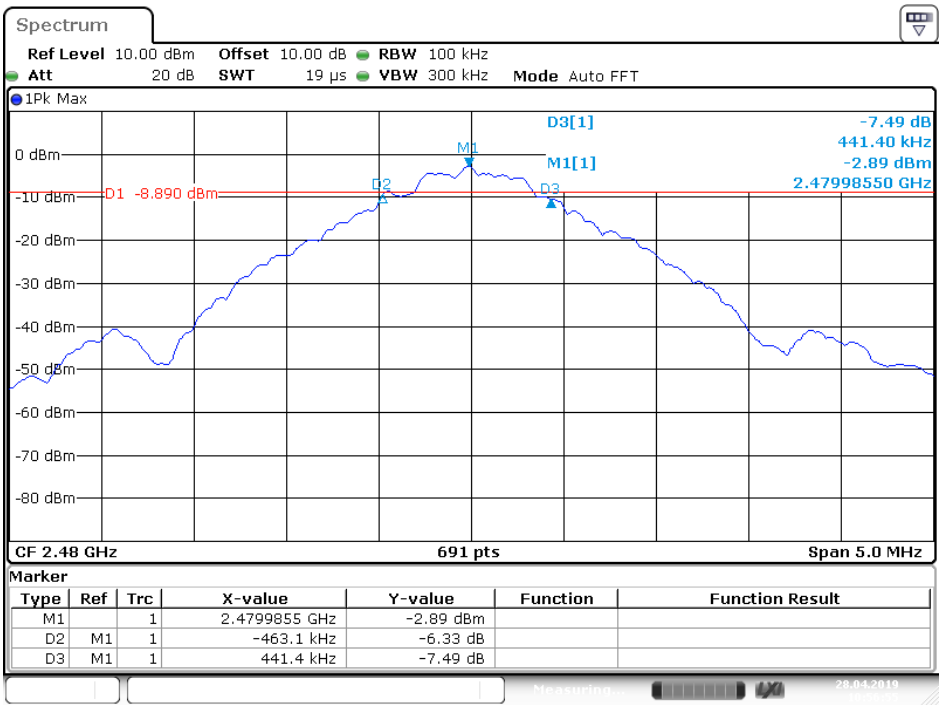
Channel 19



Date: 28.APR.2019 10:54:18

Channel 39



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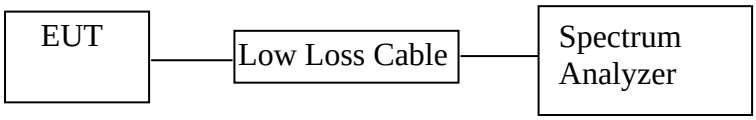
6. 99% OCCUPIED BANDWIDTH TEST

6.1.Block Diagram of Test Setup



6.2.The Requirement for RSS-Gen Clause 6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

6.3.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

6.5.Test Procedure

6.5.1.The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2.The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

6.5.3.The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

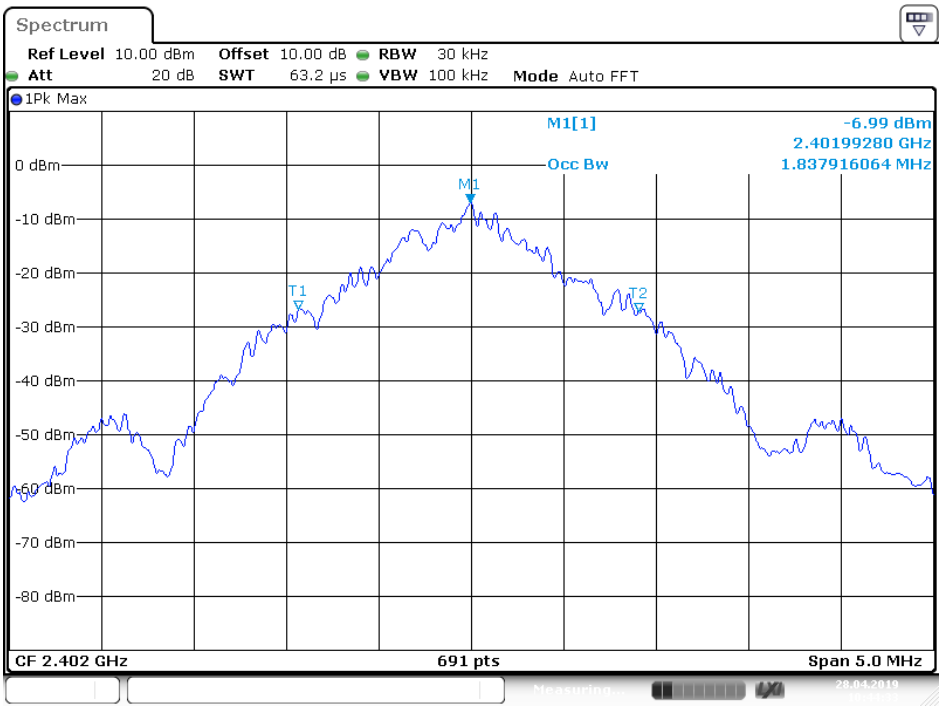
6.5.4. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

6.6.Test Result

Channel	Frequency (MHz)	99% Bandwidth (MHz)	Result
0	2402	1.838	Pass
19	2440	1.831	Pass
39	2480	1.823	Pass

The spectrum analyzer plots are attached as below.

Channel 0



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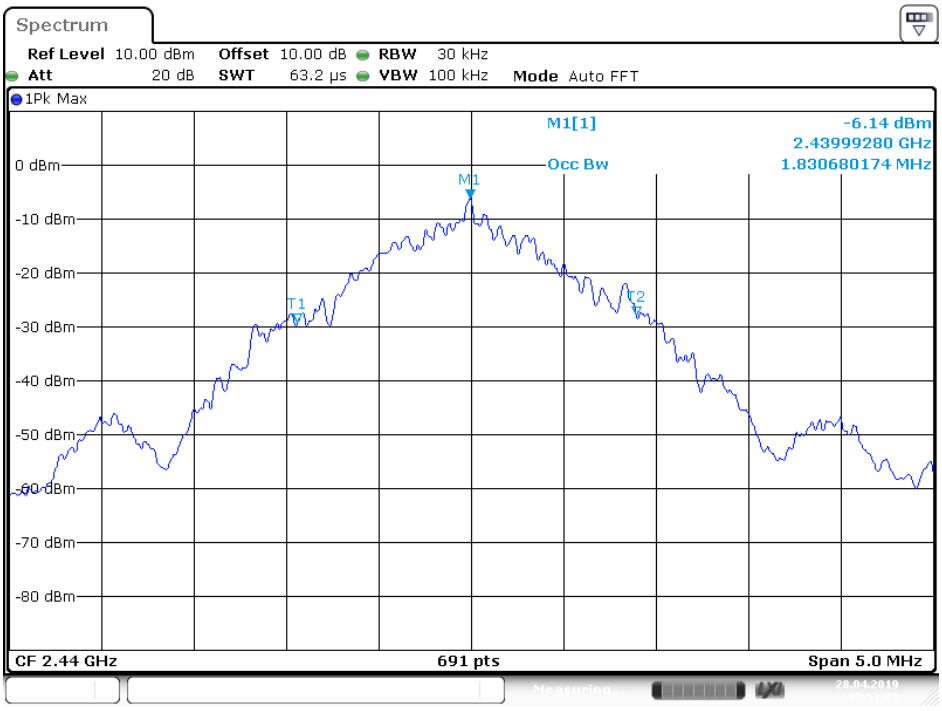
Channel 19



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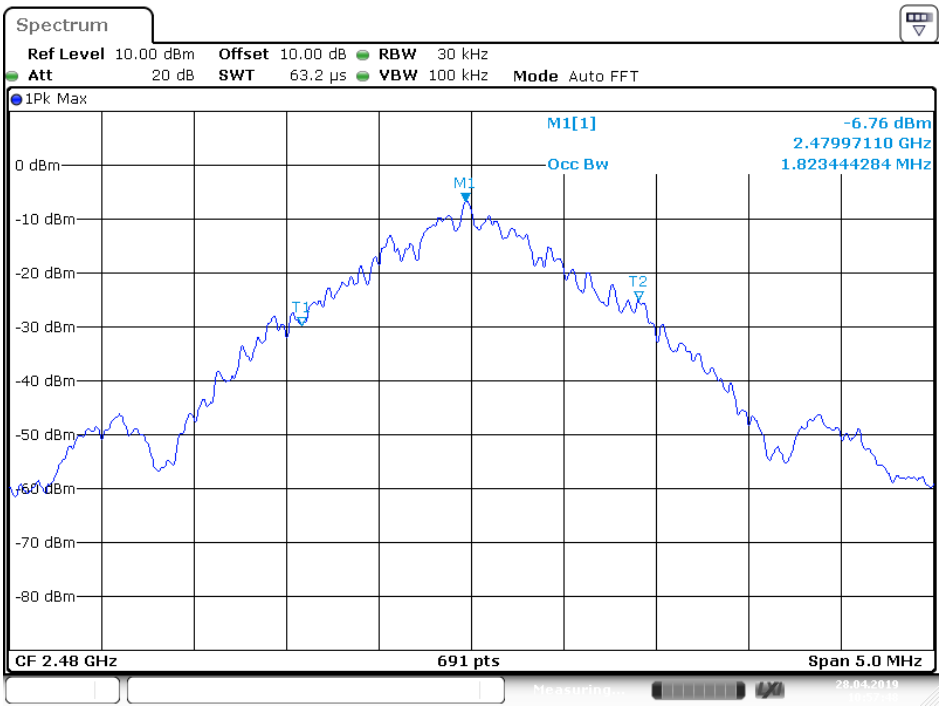
Channel 39



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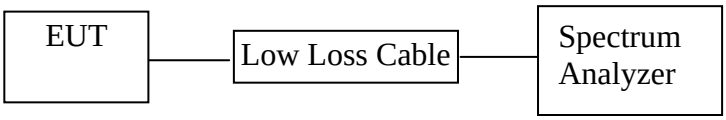
7. MAXIMUM PEAK OUTPUT POWER TEST

7.1.Block Diagram of Test Setup



7.2.The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

7.3.The Requirement For RSS-247 Section 5.4(d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

7.4.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.5.Operating Condition of EUT

7.5.1.Setup the EUT and simulator as shown as Section 7.1.

7.5.2.Turn on the power of all equipment.

7.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

7.6.Test Procedure

7.6.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.6.2.Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz.

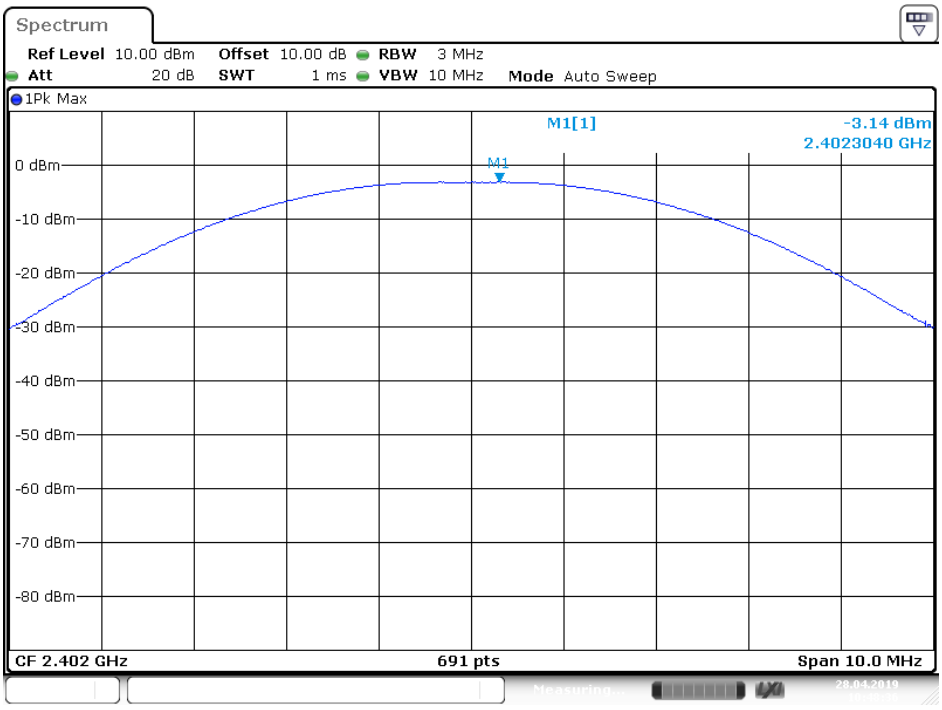
7.6.3.Measurement the maximum peak output power.

7.7.Test Result

Channel	Frequency (MHz)	Peak Power Output (dBm)	E.I.R.P (dBm)	Peak Power Limit (dBm)	Result
0	2402	-3.14	-2.64	30	Pass
19	2440	-2.93	-2.43	30	Pass
39	2480	-2.81	-2.31	30	Pass

The spectrum analyzer plots are attached as below.

Channel 0



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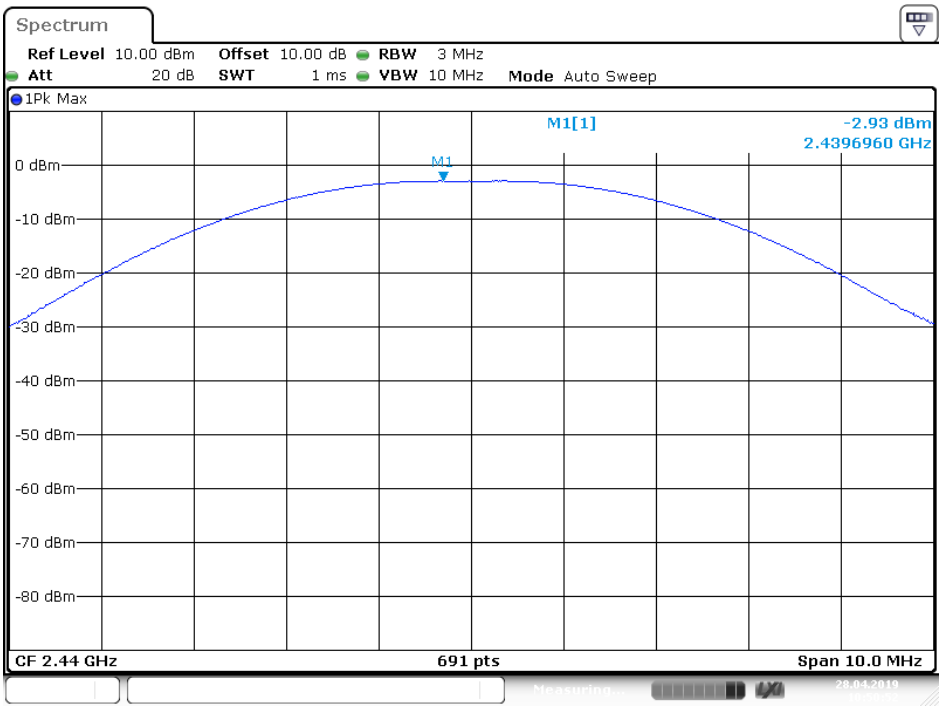
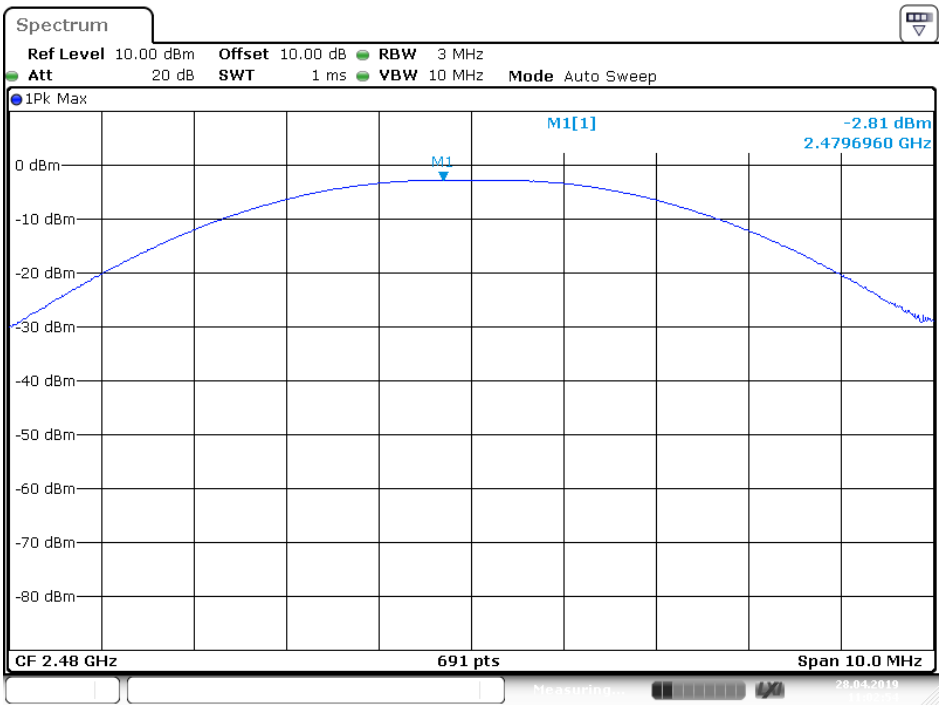


Date: 28.APR.2019 10:50:52

Channel 39



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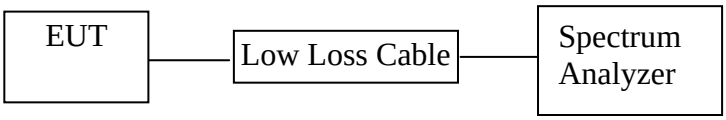
8. POWER SPECTRAL DENSITY TEST

8.1.Block Diagram of Test Setup



8.2.The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3.The Requirement For RSS-247 Section 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d),(i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

8.4.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.5.Operating Condition of EUT

8.5.1.Setup the EUT and simulator as shown as Section 8.1.

8.5.2.Turn on the power of all equipment.

8.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

8.6.Test Procedure

8.6.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.6.2.Measurement Procedure PKPSD:

8.6.3.This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS Channel center frequency.
2. Set the span to 1.5 times the DTS Channel bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat.

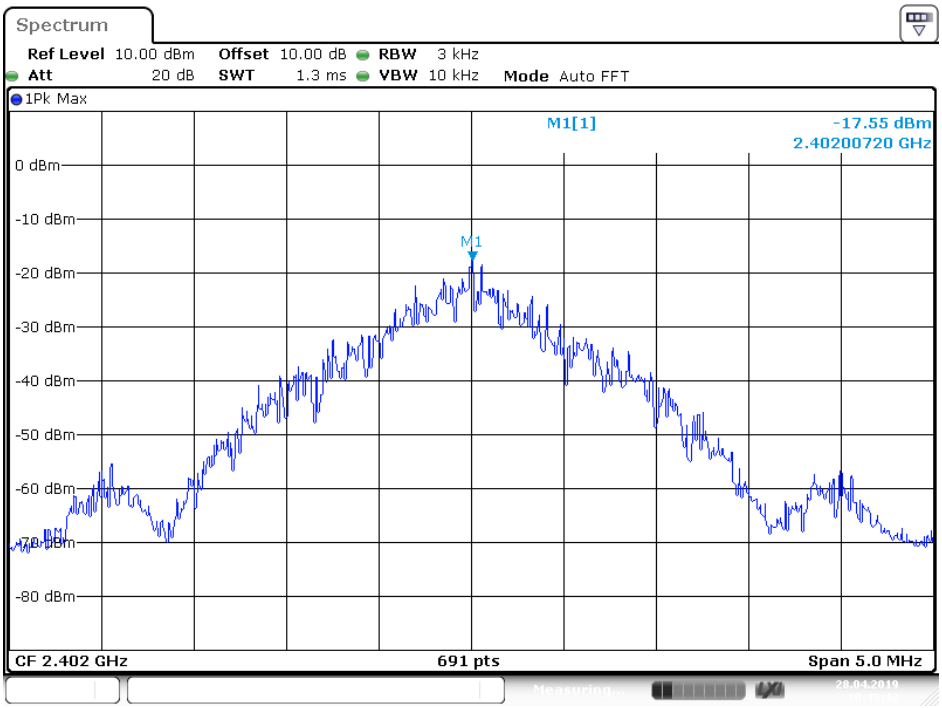
8.6.4.Measurement the maximum power spectral density.

8.7.Test Result

Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
0	2402	-17.55	8	Pass
19	2440	-17.47	8	Pass
39	2480	-18.93	8	Pass

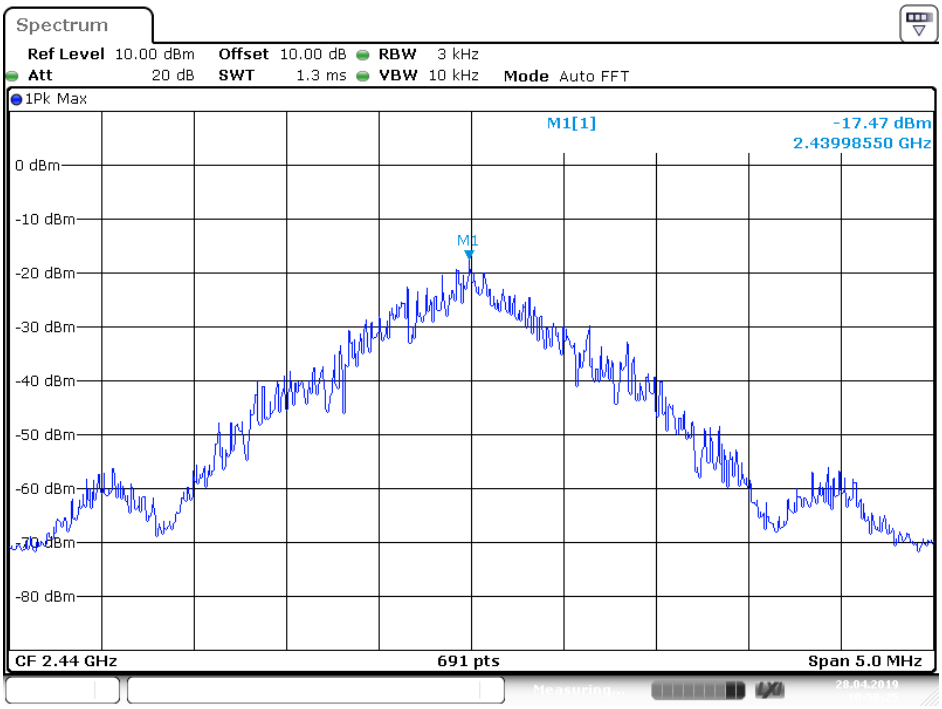
The spectrum analyzer plots are attached as below.

Channel 0



Date: 28.APR.2019 10:49:42

Channel 19



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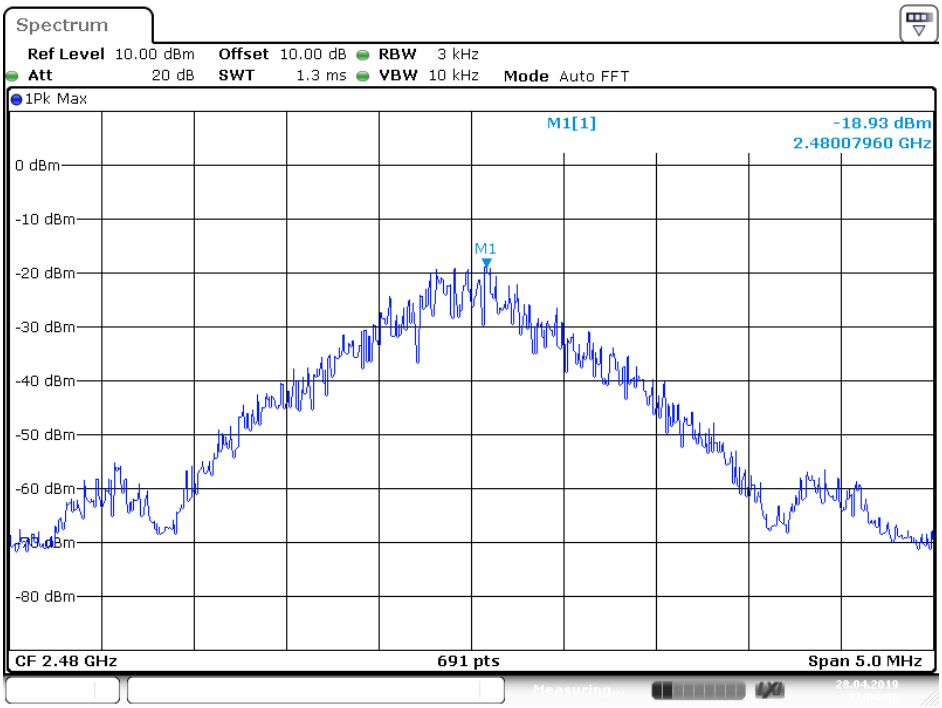
Channel 39



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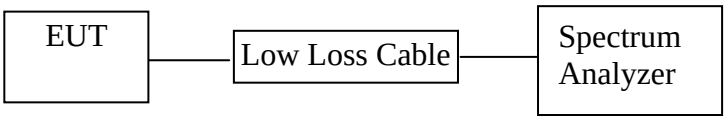
9. BAND EDGE COMPLIANCE TEST

9.1.Block Diagram of Test Setup



9.2.The Requirement For Section 15.247(d)

Section 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

9.3.The Requirement For RSS-247 Section 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

9.4.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.5.Operating Condition of EUT

9.5.1.Setup the EUT and simulator as shown as Section 9.1.

9.5.2.Turn on the power of all equipment.

9.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

9.6.Test Procedure

Conducted Band Edge:

9.6.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

9.6.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

Radiate Band Edge:

9.6.3.The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.

9.6.4.The turntable was rotated for 360 degrees to determine the position of maximum emission level.

9.6.5.EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

9.6.6.Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

9.6.7.RBW=1MHz, VBW=1MHz

9.6.8.The band edges was measured and recorded.

9.7.Test Result

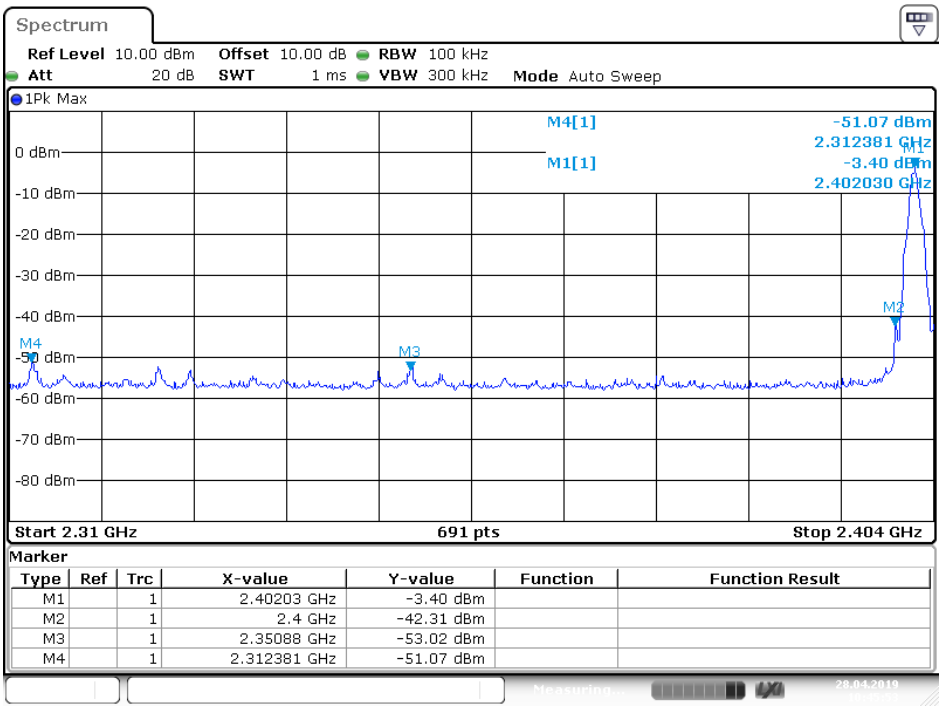
Pass.

Conducted Band Edge Result

Channel	Frequency	Delta peak to band emission	Limit(dBc)
0	2402MHz	38.91	＞20
39	2480MHz	52.89	＞20

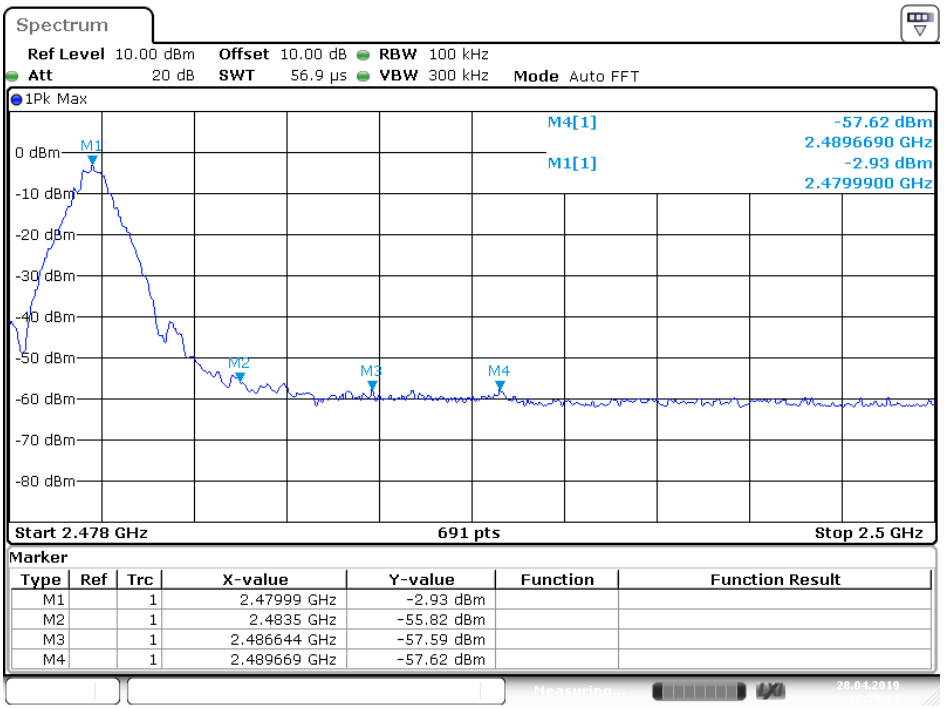
The spectrum analyzer plots are attached as below.

Channel 0



Date: 28.APR.2019 10:45:53

Channel 39



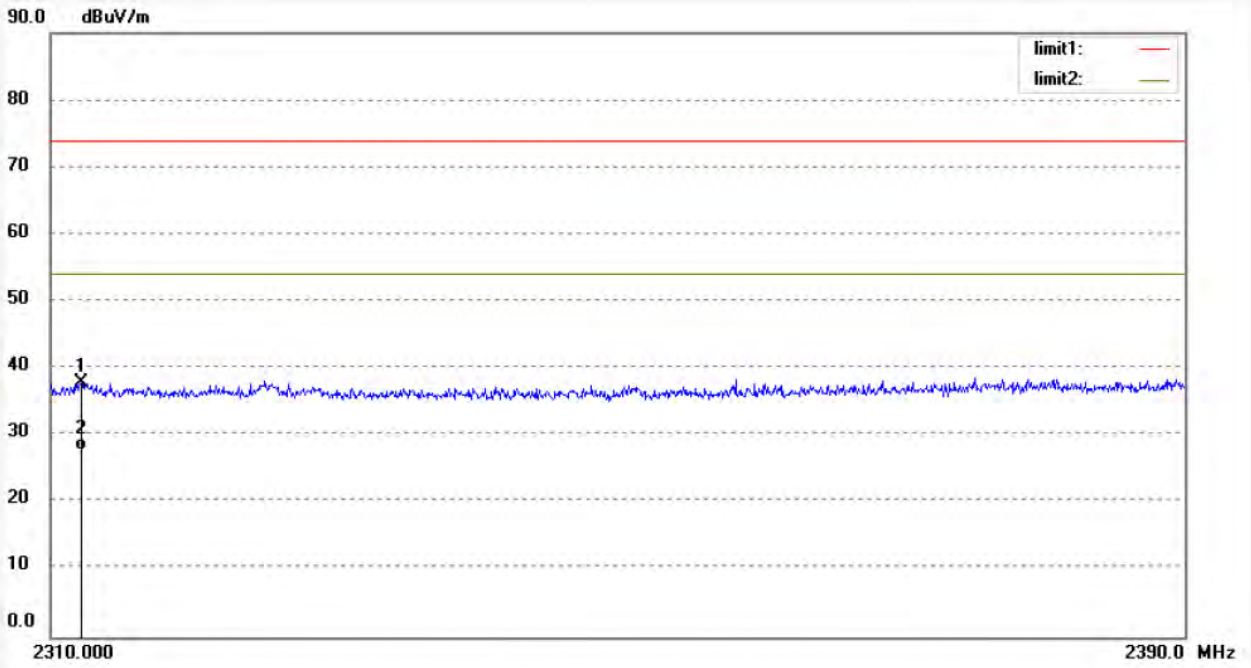
Date: 28.APR.2019 10:59:14

Radiated Band Edge Result

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1400	Polarization: Horizontal
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/04/28/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Lenovo Yoga Mouse with Laser Presenter	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: MOBTCMO	
Manufacturer: Primax Electronics Ltd.	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2312.160	37.52	0.46	37.98	74.00	-36.02	peak			
2	2312.160	27.22	0.46	27.68	54.00	-26.32	AVG			

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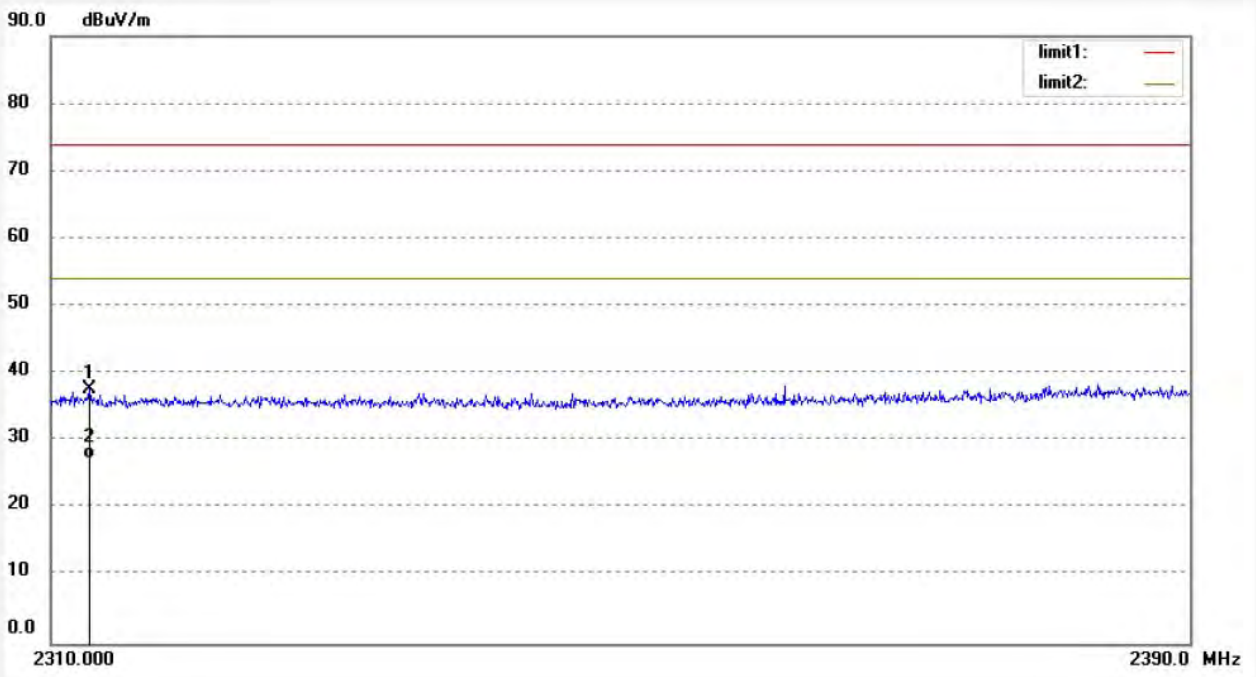
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1399	Polarization: Vertical
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/04/28/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Lenovo Yoga Mouse with Laser Presenter	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: MOBTCMO	
Manufacturer: Primax Electronics Ltd.	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2312.720	37.22	0.46	37.68	74.00	-36.32	peak			
2	2312.720	26.91	0.46	27.37	54.00	-26.63	AVG			

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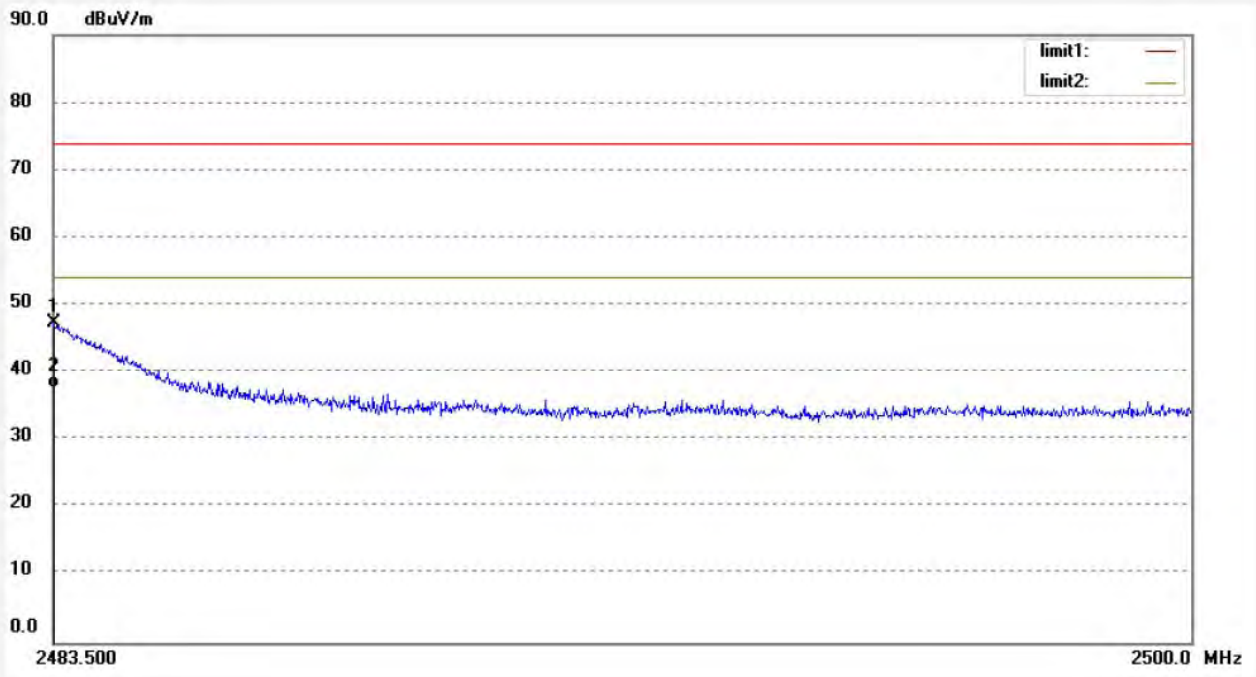
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1405	Polarization: Horizontal
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/04/28/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Lenovo Yoga Mouse with Laser Presenter	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: MOBTCMO	
Manufacturer: Primax Electronics Ltd.	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	46.20	1.10	47.30	74.00	-26.70	peak			
2	2483.500	36.55	1.10	37.65	54.00	-16.35	AVG			

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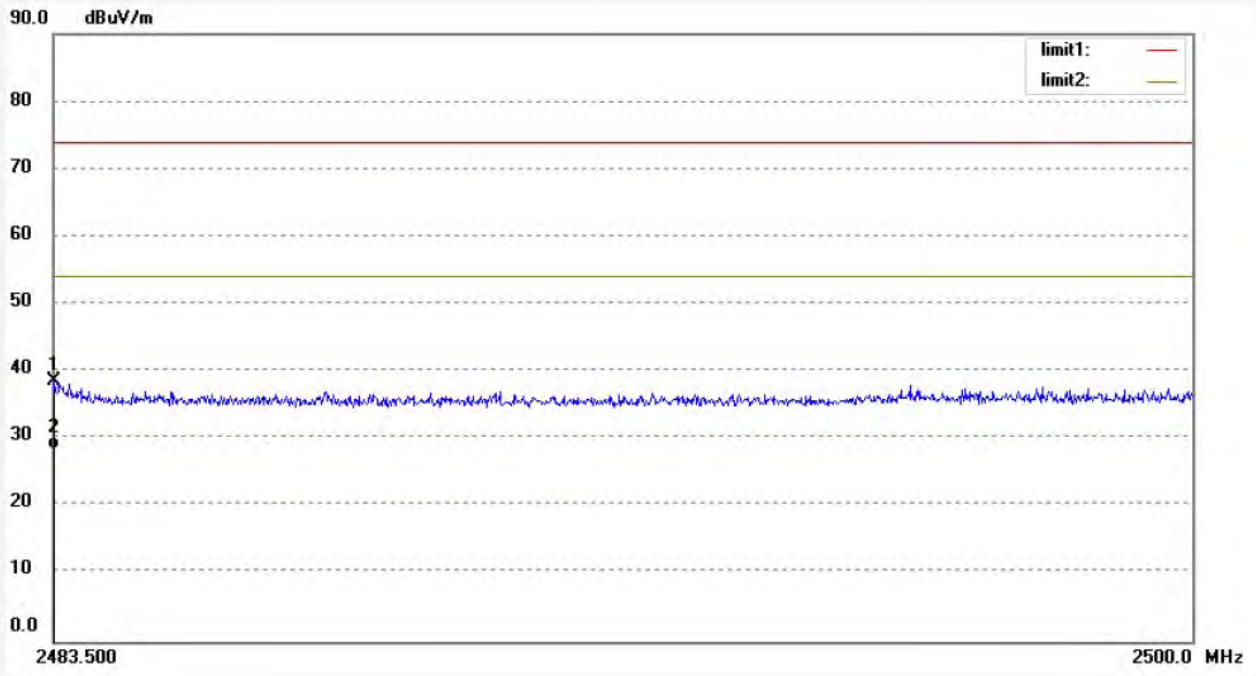
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1406	Polarization: Vertical
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/04/28/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Lenovo Yoga Mouse with Laser Presenter	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: MOBTCMO	
Manufacturer: Primax Electronics Ltd.	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.517	37.44	1.10	38.54	74.00	-35.46	peak			
2	2483.517	27.25	1.10	28.35	54.00	-25.65	AVG			

Note:

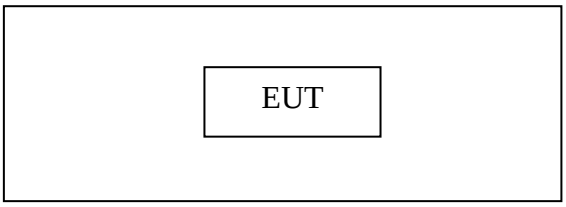
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

   Result = Reading + Corrected Factor

10.RADIATED SPURIOUS EMISSION TEST

10.1.Block Diagram of Test Setup

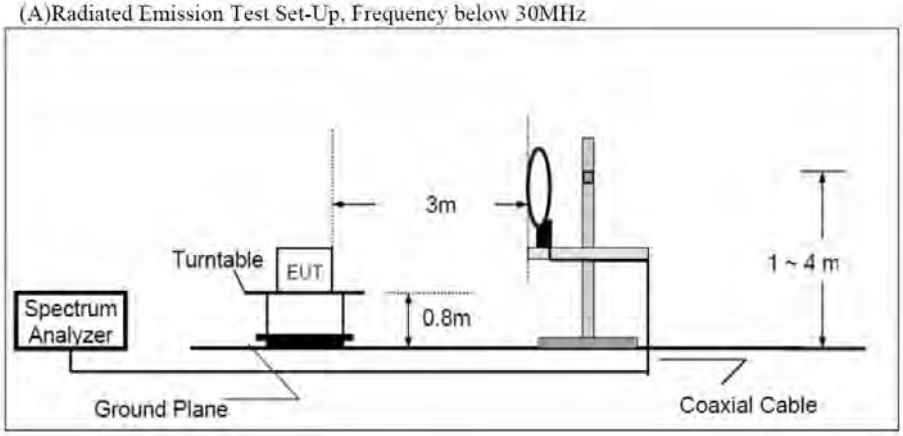
10.1.1.Block diagram of connection between the EUT and peripherals



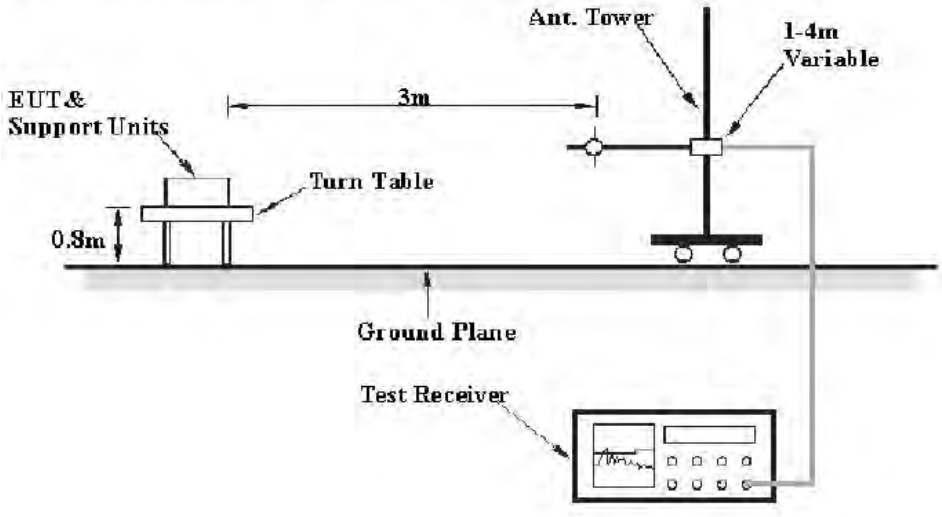
Setup: Transmitting mode

10.1.2.Semi-Anechoic Chamber Test Setup Diagram

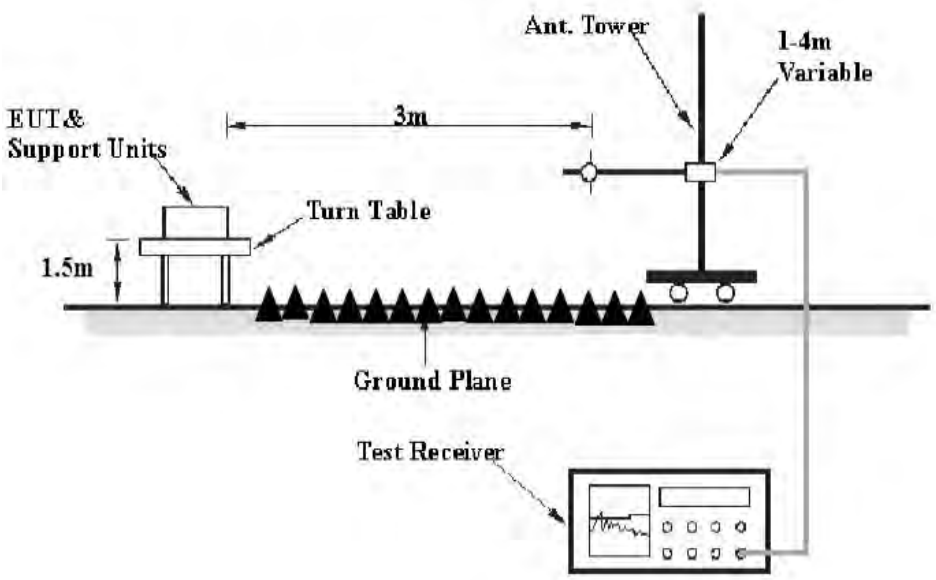
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



(B)Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up. Frequency above 1GHz



10.2.The Limit For Section 15.247(d)

Section 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

10.3.The Limit For RSS-247 Section 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.4.Transmitter Emission Limit

Radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (μV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement distance (m)
9 - 490 kHz [1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

10.5.Restricted bands of operation

10.5.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

10.5.2.RSS-Gen 8.10 Restricted bands of operation

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a)The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, *Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).*

(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

(c) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

Table 7 – Restricted frequency bands*

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

10.6.Operating Condition of EUT

10.6.1.Setup the EUT and simulator as shown as Section 10.1.

10.6.2.Turn on the power of all equipment.

10.6.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

10.7.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

The bandwidth of test receiver is set at 9 kHz in below 30MHz. and set at 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The final measurement in band 9-90 kHz, 110-490 kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading.

10.8.Data Sample

Frequency (MHz)	Reading (dBμv)	Factor (dB/m)	Result (dBμv/m)	Limit (dBμv/m)	Margin (dB)	Remark
X.XX	43.85	-22.22	21.63	43.5	-21.87	QP

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

10.9.Test Result

Pass.

The frequency range from 9kHz to 26.5GHz is checked.

Emissions attenuated more than 20 dB below the permissible value are not reported.

The spectrum analyzer plots are attached as below.

9kHz-30MHz test data

ACCURATE TECHNOLOGY CO.,LTD

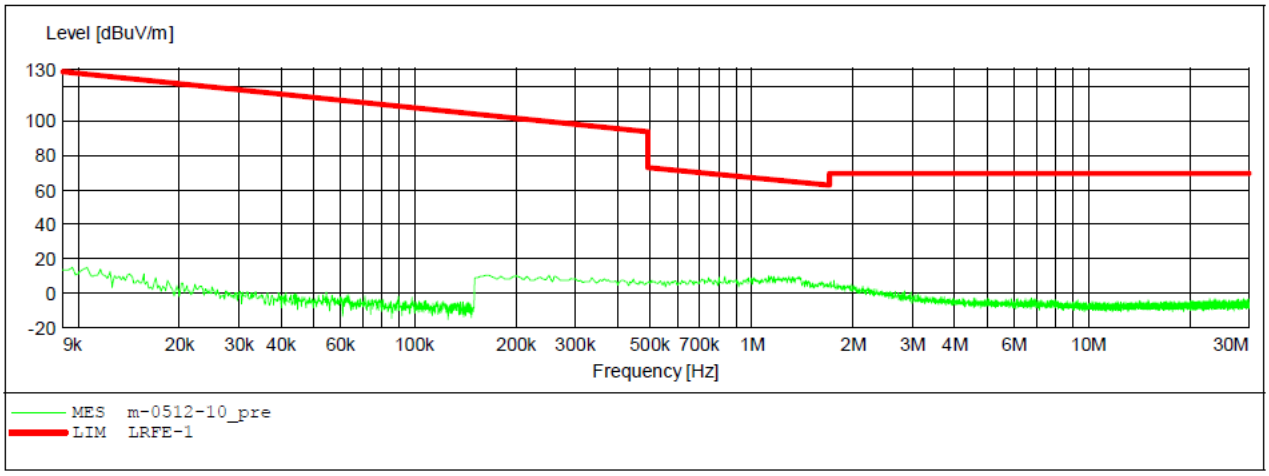
FCC Part 15C 3M Radiated

EUT: Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer: Primax Electronics Ltd.
Operating Condition: TX 2402MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: X
Start of Test: 2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

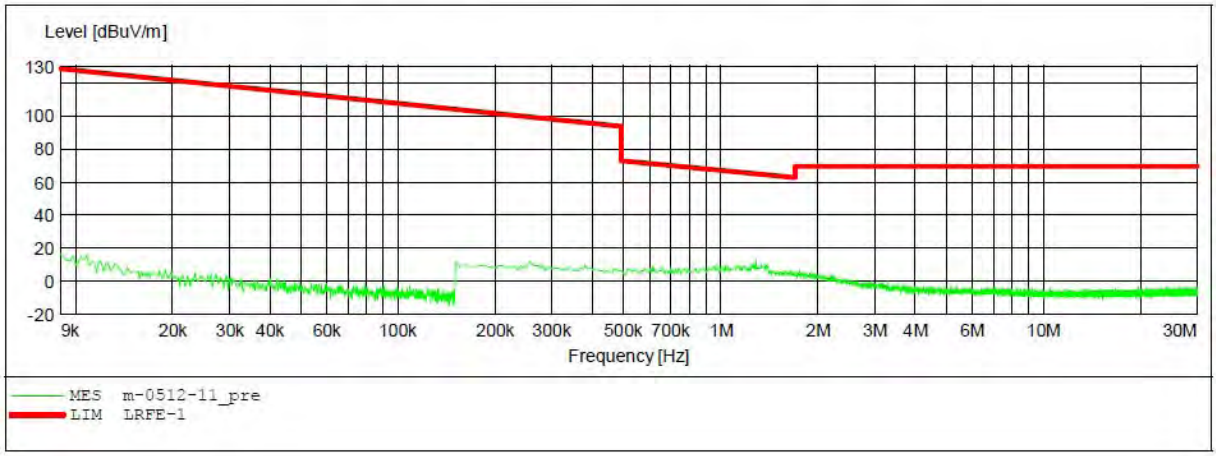
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2402MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Y
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

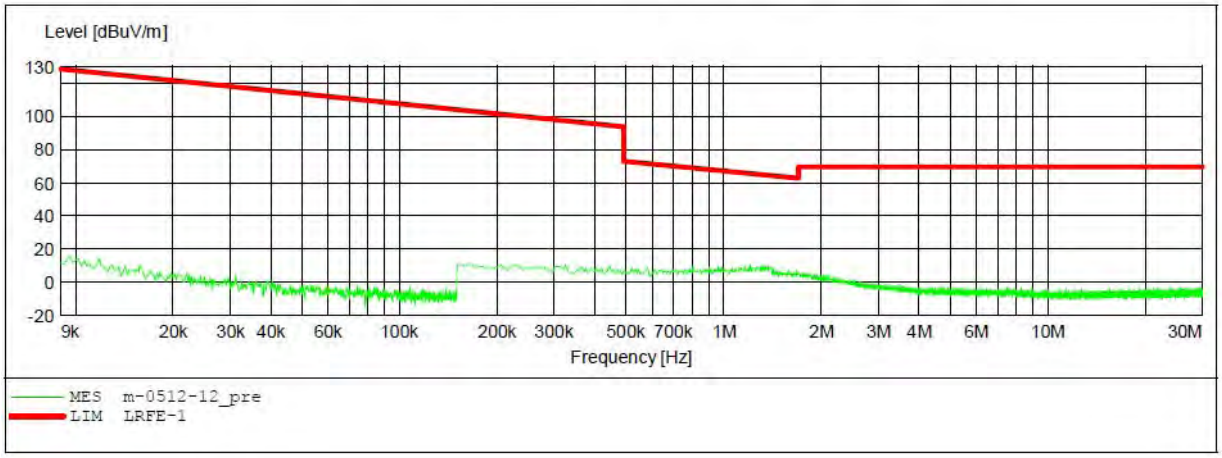
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2402MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Z
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

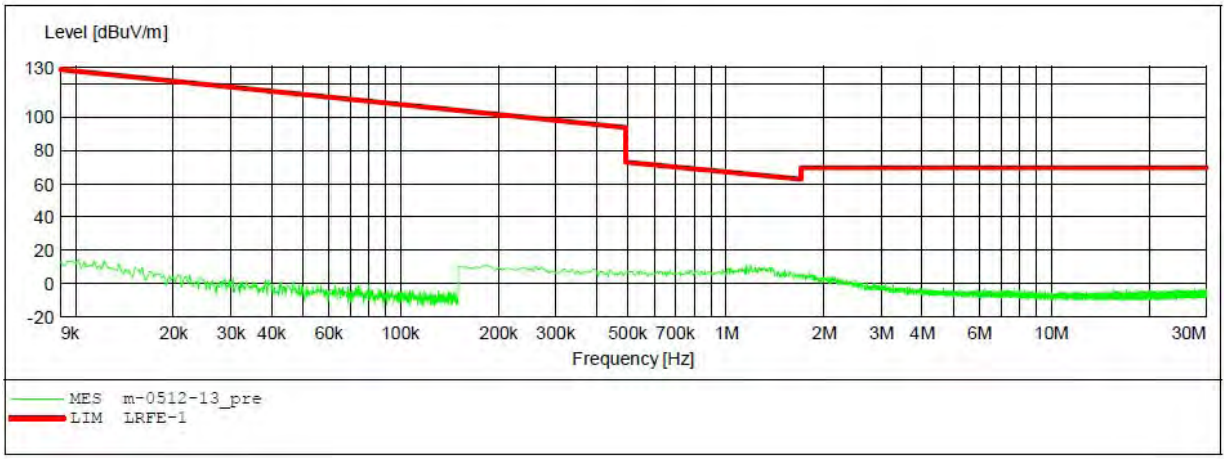
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2440MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	X
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

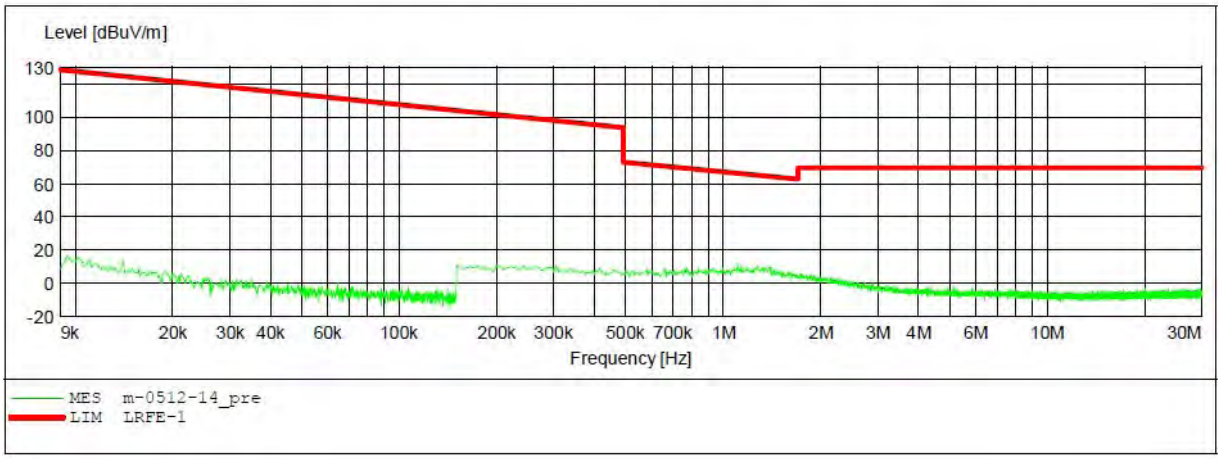
FCC Part 15C 3M Radiated

EUT: Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer: Primax Electronics Ltd.
Operating Condition: TX 2440MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Y
Start of Test: 2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

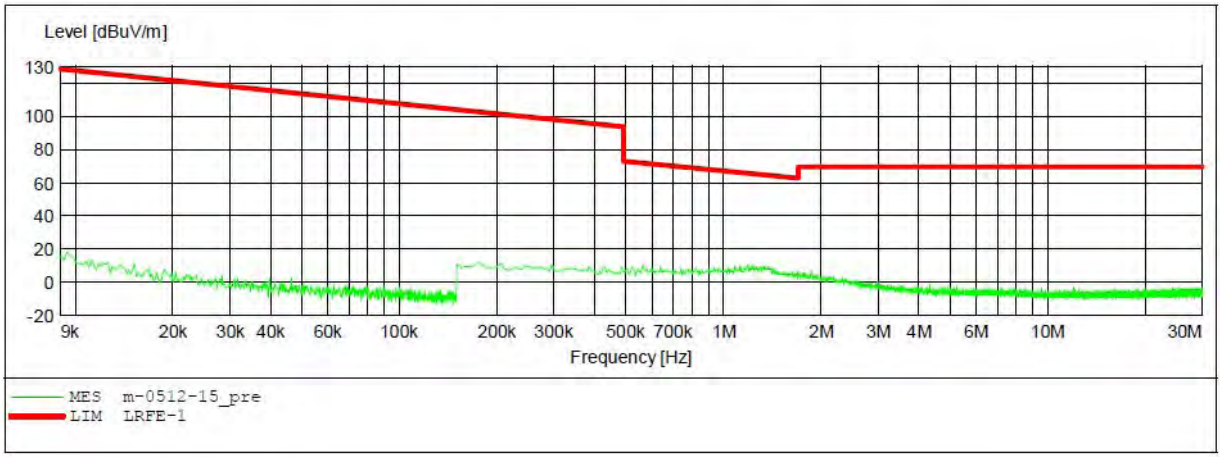
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2440MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Z
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

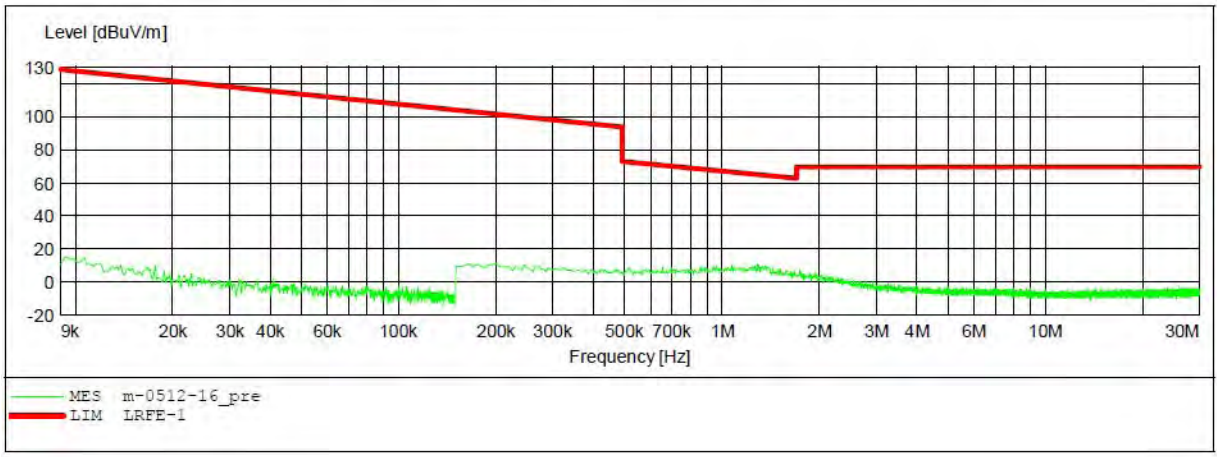
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2480MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	X
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

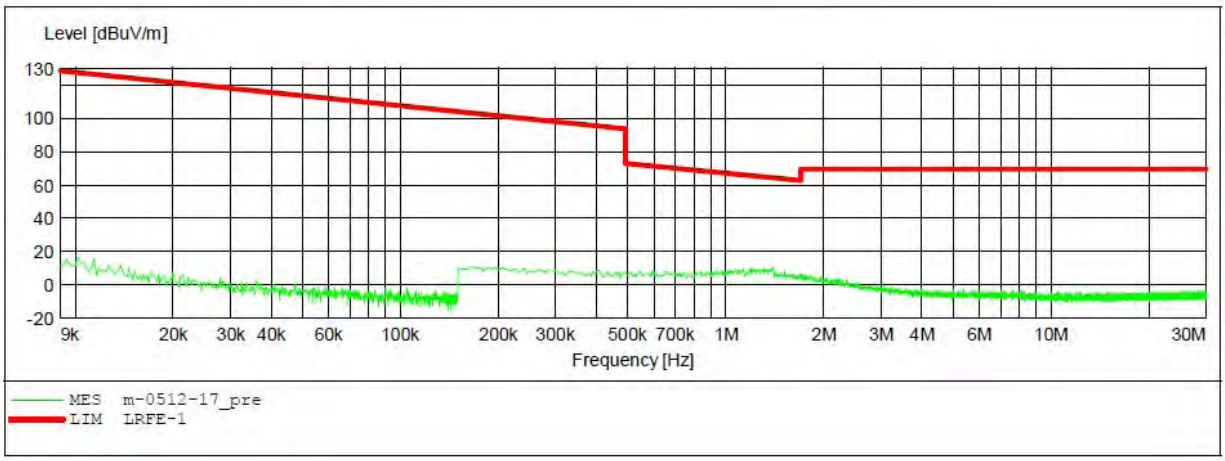
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2480MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Y
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



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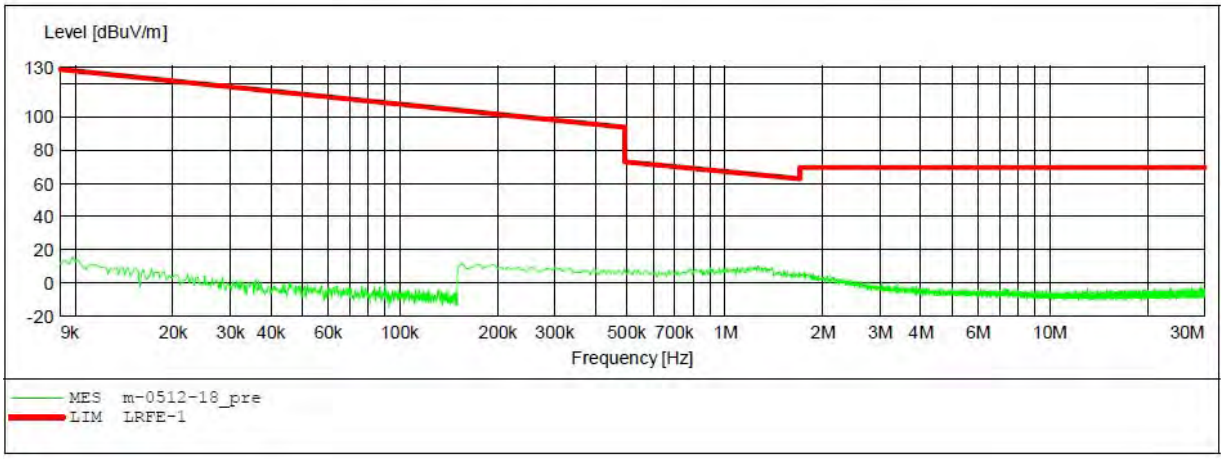
FCC Part 15C 3M Radiated

EUT:	Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer:	Primax Electronics Ltd.
Operating Condition:	TX 2480MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Z
Start of Test:	2019-5-12 /

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



30MHz-1000MHz test data

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
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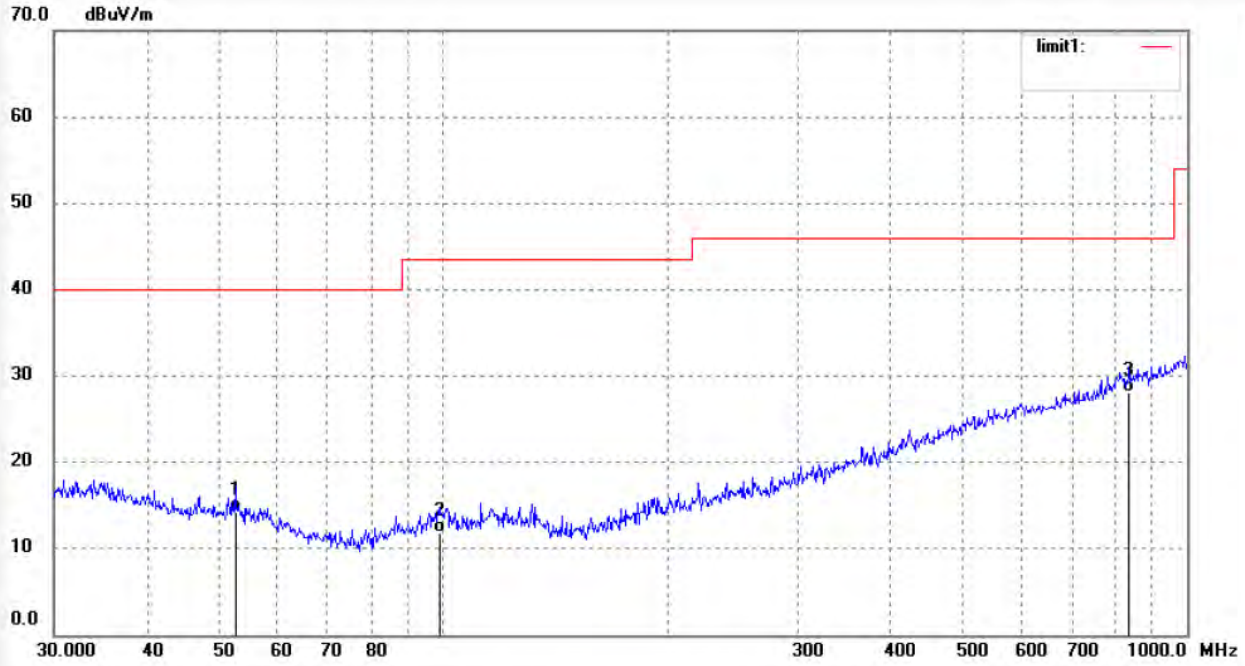
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1413
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2402MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	52.5752	27.07	-12.77	14.30	40.00	-25.70	QP			
2	98.8324	25.17	-13.44	11.73	43.50	-31.77	QP			
3	836.2441	26.69	1.45	28.14	46.00	-17.86	QP			

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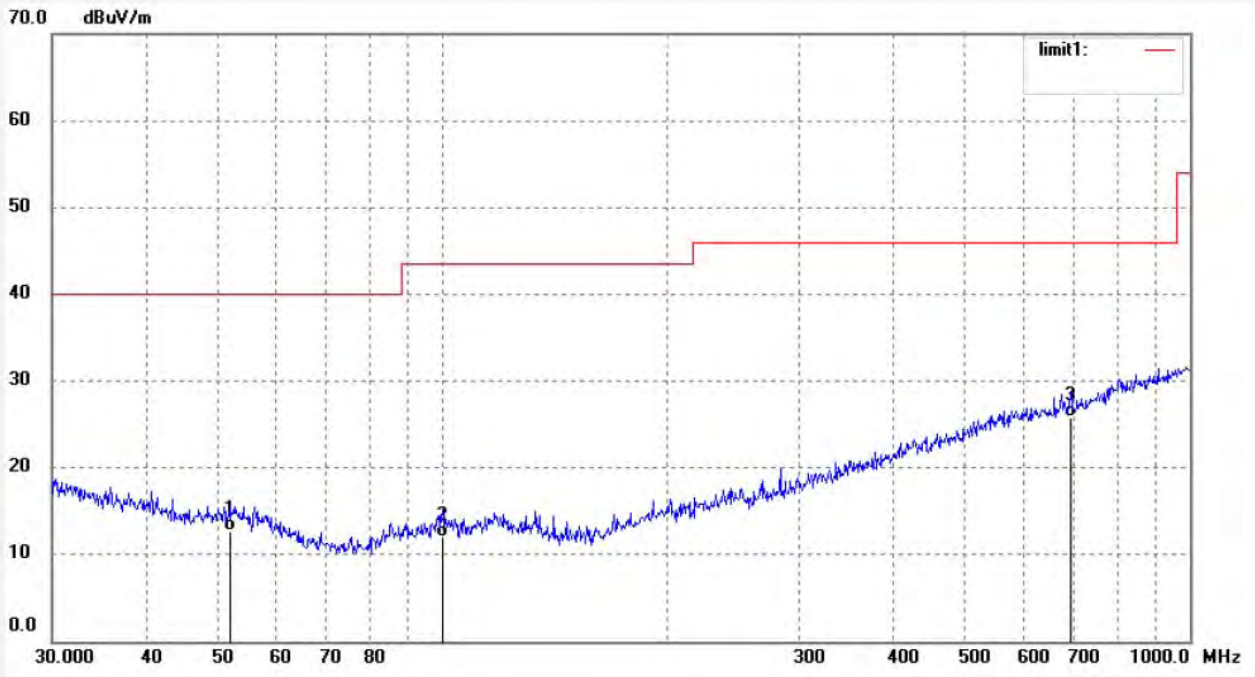
Fax:+86-0755-26503396

Job No.: LGW2019 #1414
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2402MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	51.8430	25.34	-12.73	12.61	40.00	-27.39	QP			
2	99.8777	25.16	-13.09	12.07	43.50	-31.43	QP			
3	691.9867	27.05	-1.22	25.83	46.00	-20.17	QP			

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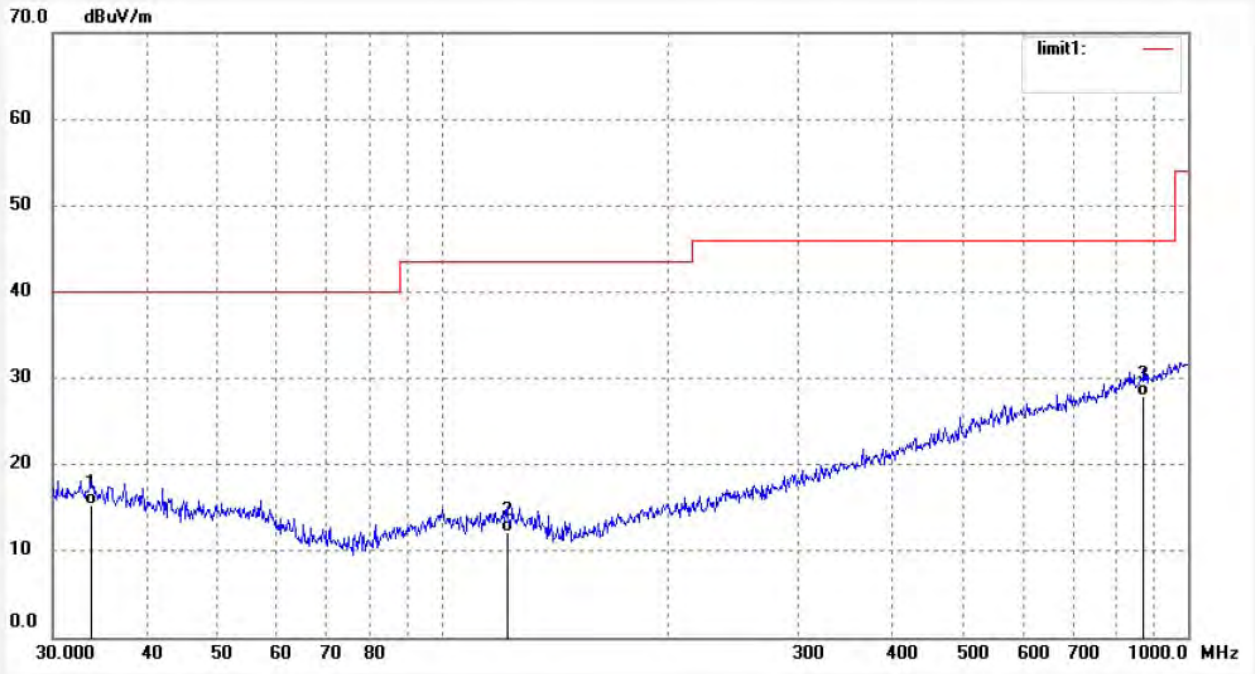
Job No.: LGW2019 #1416
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2440MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.7986	25.54	-10.30	15.24	40.00	-24.76	QP			
2	121.9754	25.47	-13.29	12.18	43.50	-31.32	QP			
3	872.1832	26.06	1.94	28.00	46.00	-18.00	QP			

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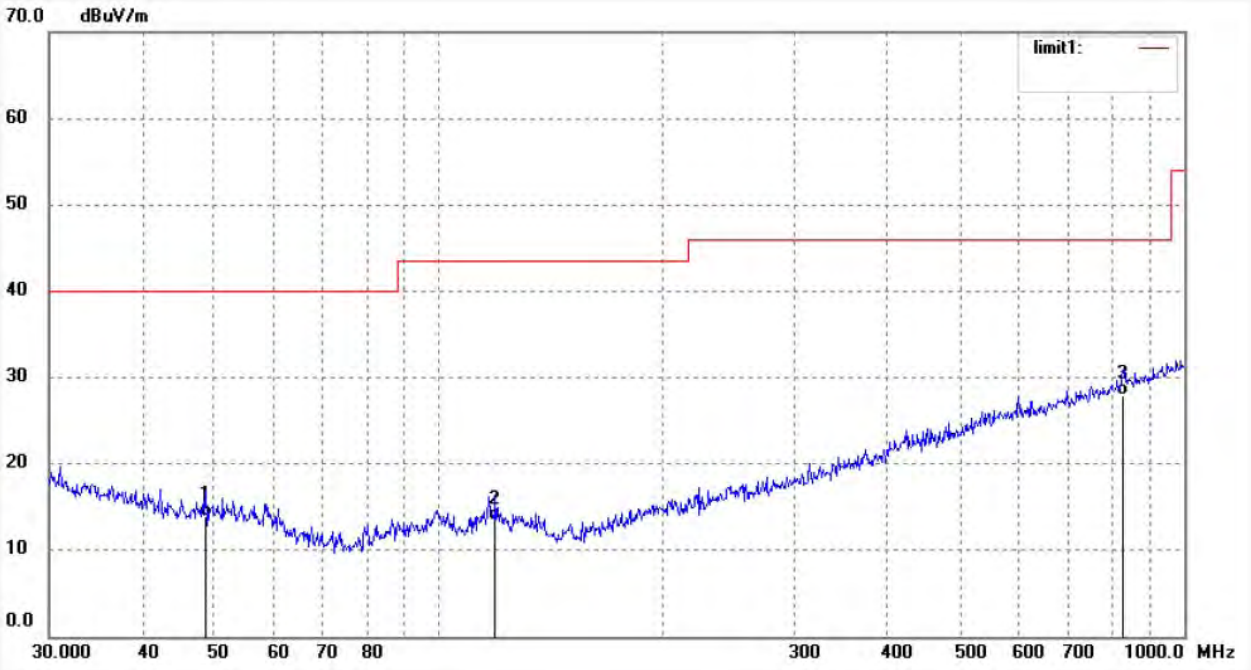
Job No.: LGW2019 #1415
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2440MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	48.6719	26.53	-12.59	13.94	40.00	-26.06	QP			
2	119.0180	26.44	-13.06	13.38	43.50	-30.12	QP			
3	827.4933	26.54	1.30	27.84	46.00	-18.16	QP			

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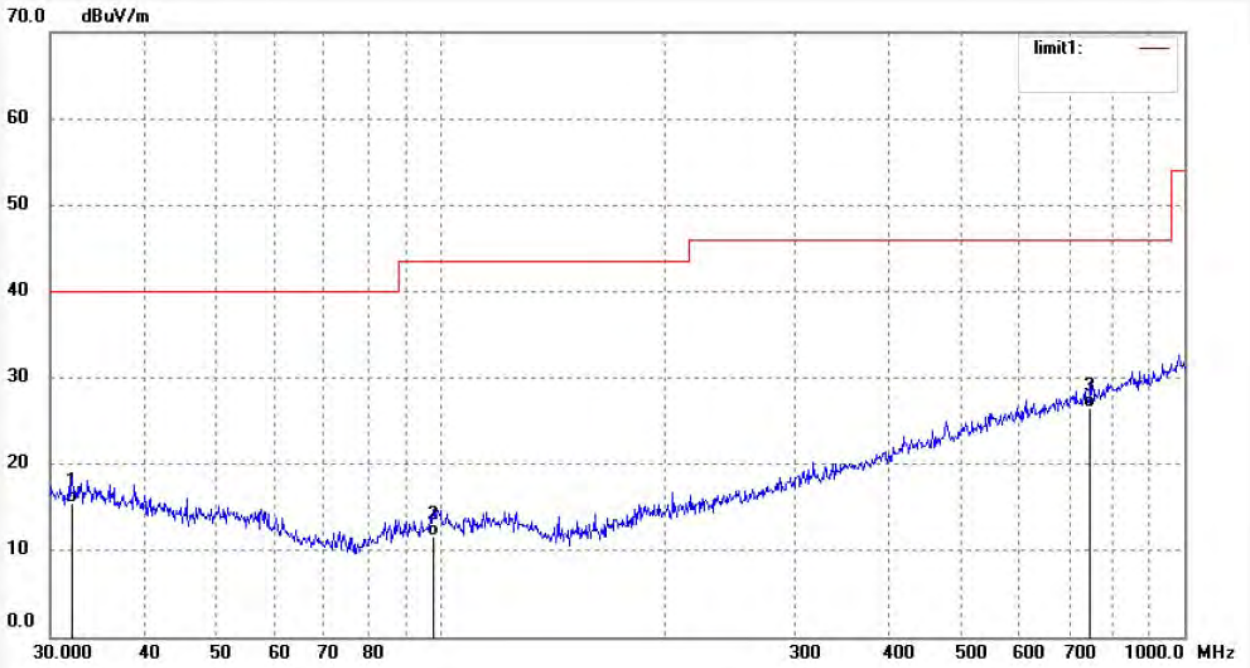
Job No.: LGW2019 #1417
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2480MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	32.0667	25.60	-10.13	15.47	40.00	-24.53	QP			
2	98.1419	25.39	-13.68	11.71	43.50	-31.79	QP			
3	747.4825	26.85	-0.33	26.52	46.00	-19.48	QP			

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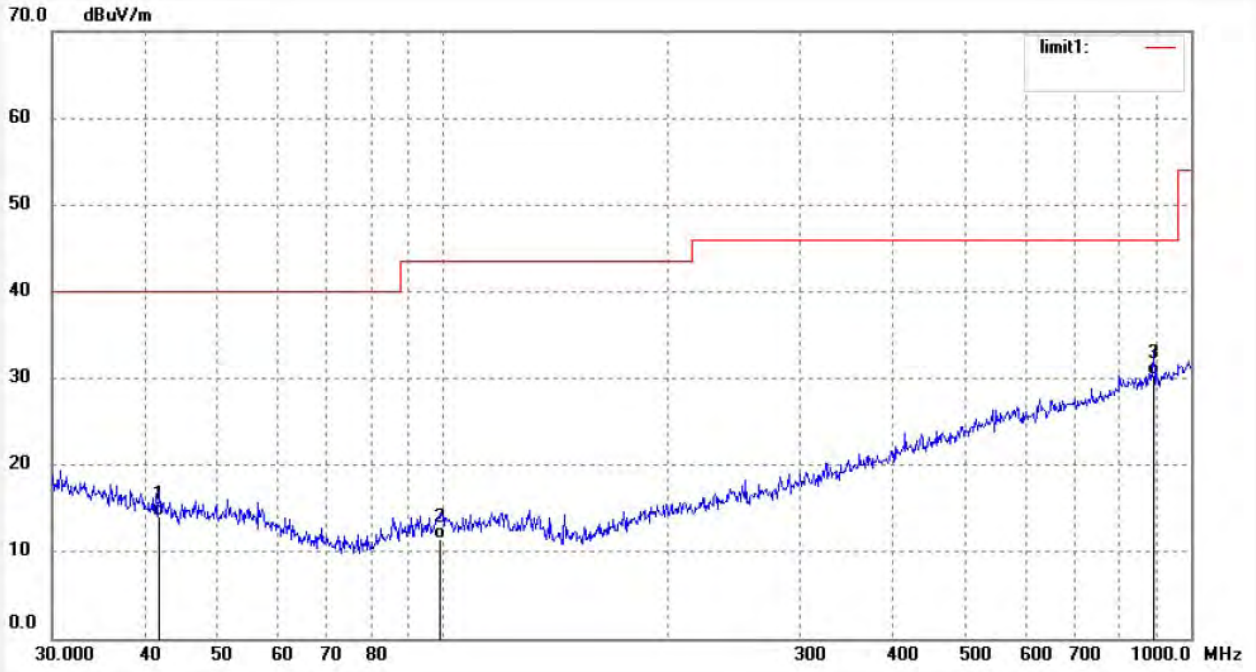
Job No.: LGW2019 #1418
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2480MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	41.7129	25.99	-11.91	14.08	40.00	-25.92	QP			
2	99.1796	24.71	-13.33	11.38	43.50	-32.12	QP			
3	890.7278	28.14	2.16	30.30	46.00	-15.70	QP			

1GHz-18GHz test data

ACCURATE TECHNOLOGY CO., LTD.
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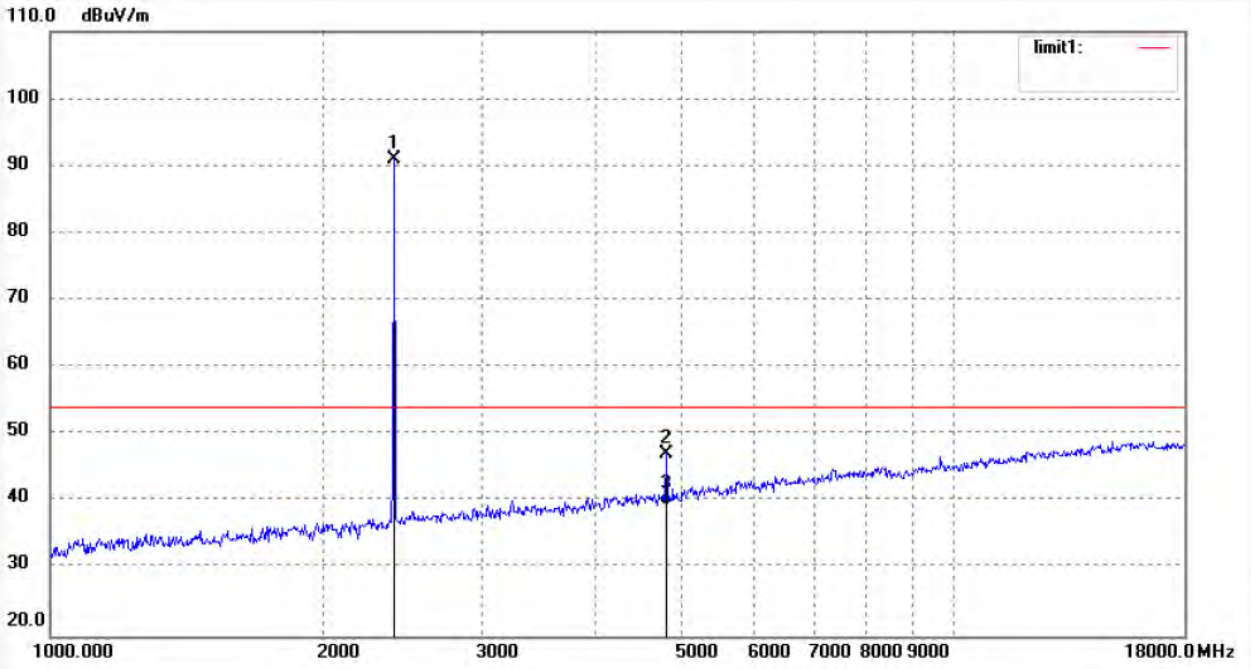
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1397	Polarization: Horizontal
Standard: FCC Part 15C 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/04/28/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Lenovo Yoga Mouse with Laser Presenter	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: MOBTCMO	
Manufacturer: Primax Electronics Ltd.	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	90.17	0.89	91.06	/	/	peak			
2	4804.023	39.74	7.40	47.14	74.00	-26.86	peak			
3	4804.023	32.16	7.40	39.56	54.00	-14.44	AVG			

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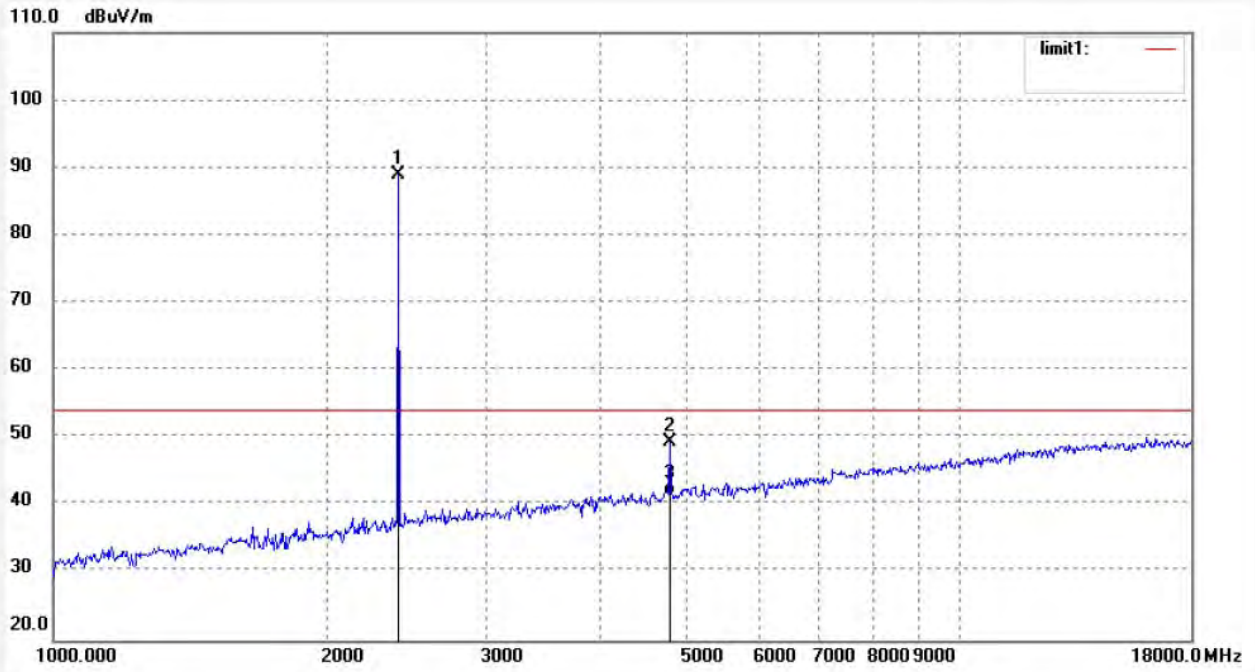
Fax:+86-0755-26503396

Job No.: LGW2019 #1398
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2402MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	88.13	0.89	89.02	/	/	peak			
2	4804.025	41.92	7.40	49.32	74.00	-24.68	peak			
3	4804.025	34.17	7.40	41.57	54.00	-12.43	AVG			

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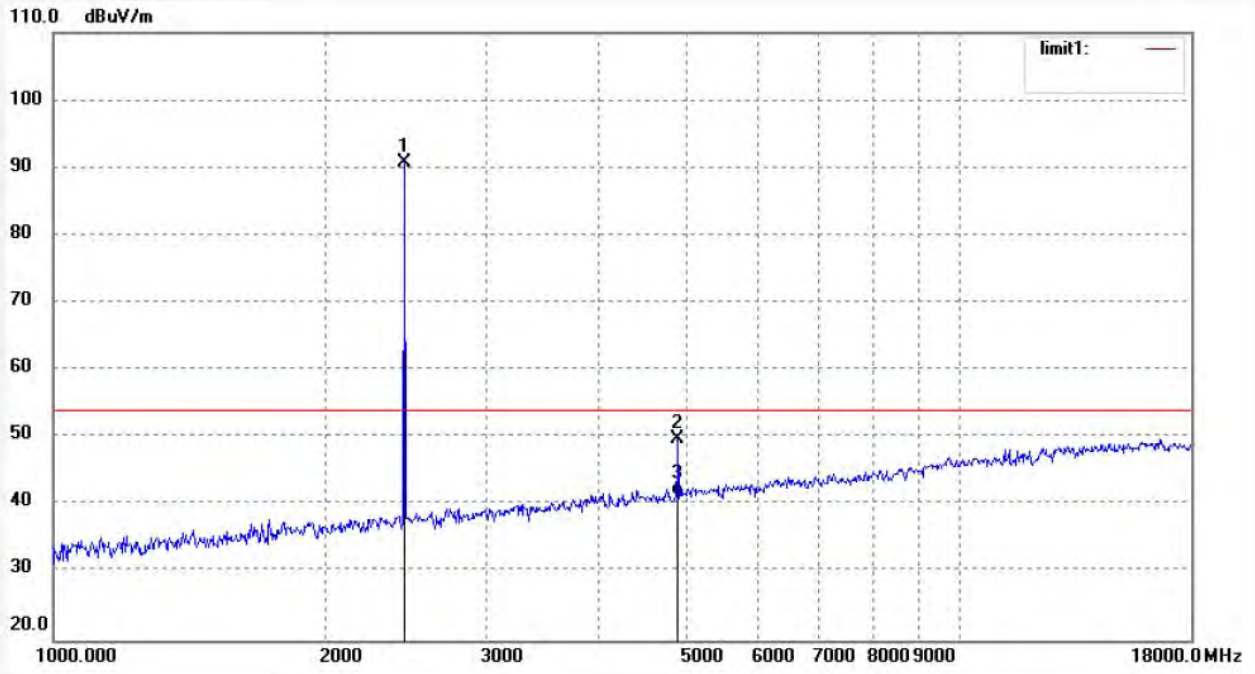
Fax:+86-0755-26503396

Job No.: LGW2019 #1401
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2440MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.000	89.76	1.04	90.80	/	/	peak			
2	4880.025	41.80	8.10	49.90	74.00	-24.10	peak			
3	4880.025	33.42	8.10	41.52	54.00	-12.48	AVG			

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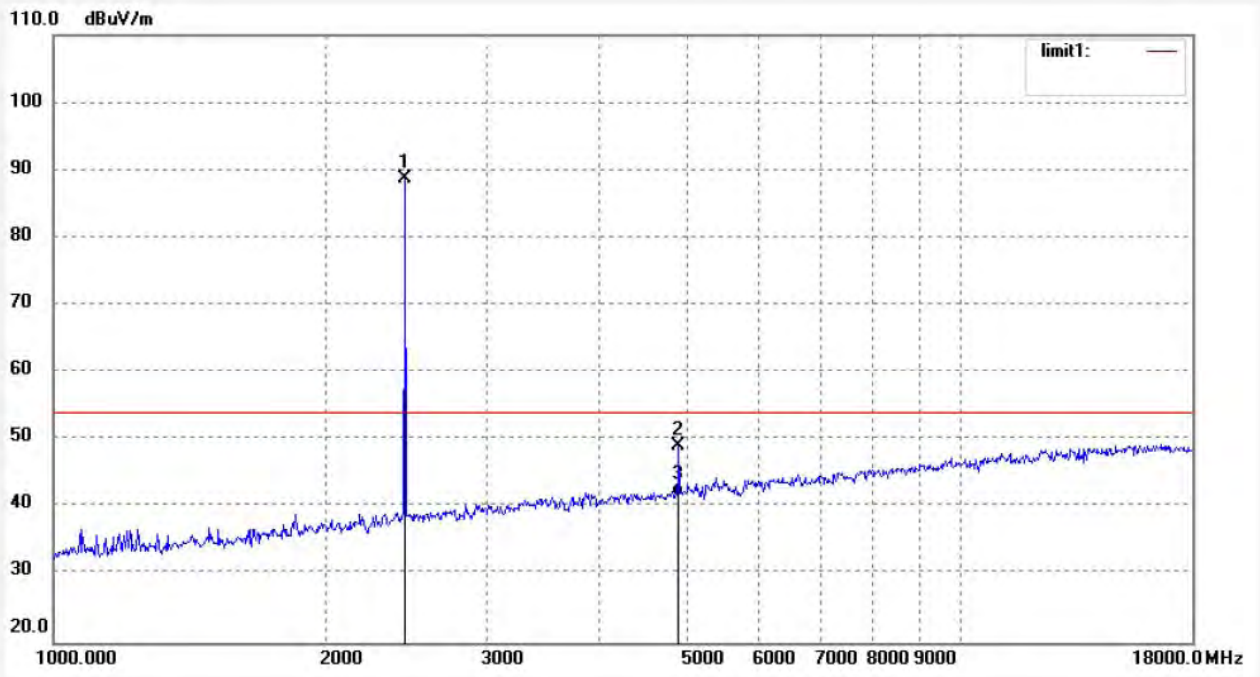
Fax:+86-0755-26503396

Job No.: LGW2019 #1402
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2440MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.000	87.59	1.04	88.63	/	/	peak			
2	4880.026	41.10	8.10	49.20	74.00	-24.80	peak			
3	4880.026	33.68	8.10	41.78	54.00	-12.22	AVG			

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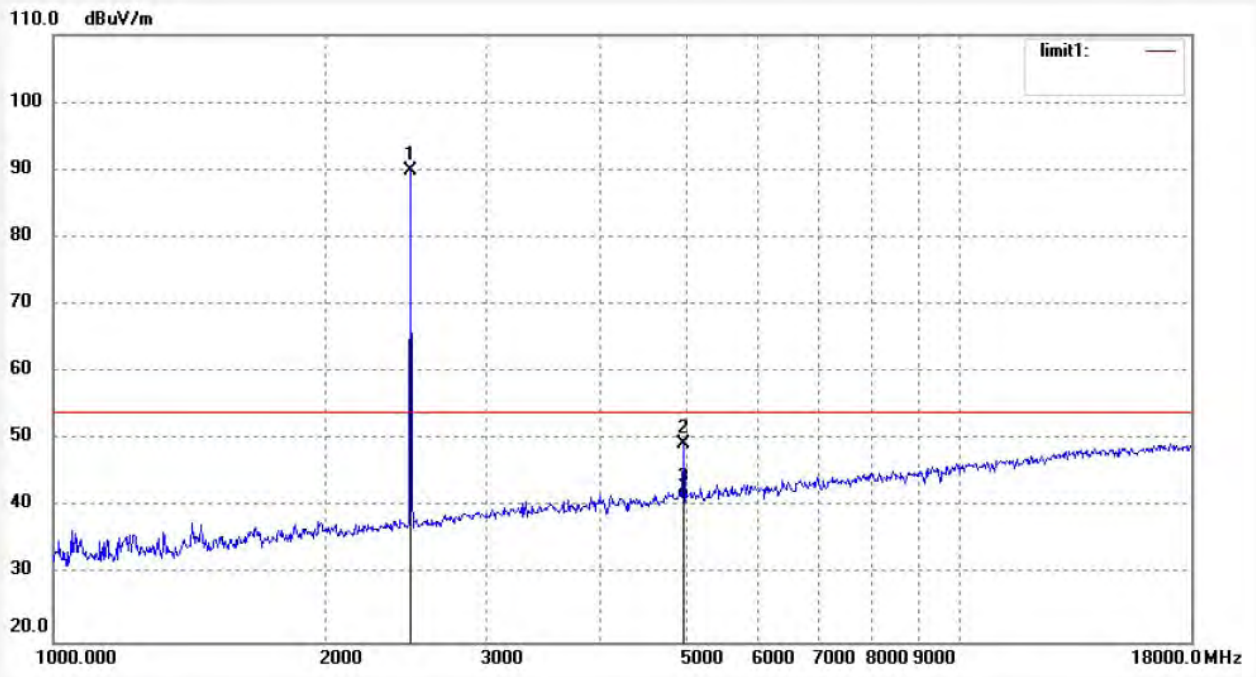
Job No.: LGW2019 #1404
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2480MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	88.77	1.10	89.87	/	/	peak			
2	4960.029	40.67	8.60	49.27	74.00	-24.73	peak			
3	4960.029	32.66	8.60	41.26	54.00	-12.74	AVG			

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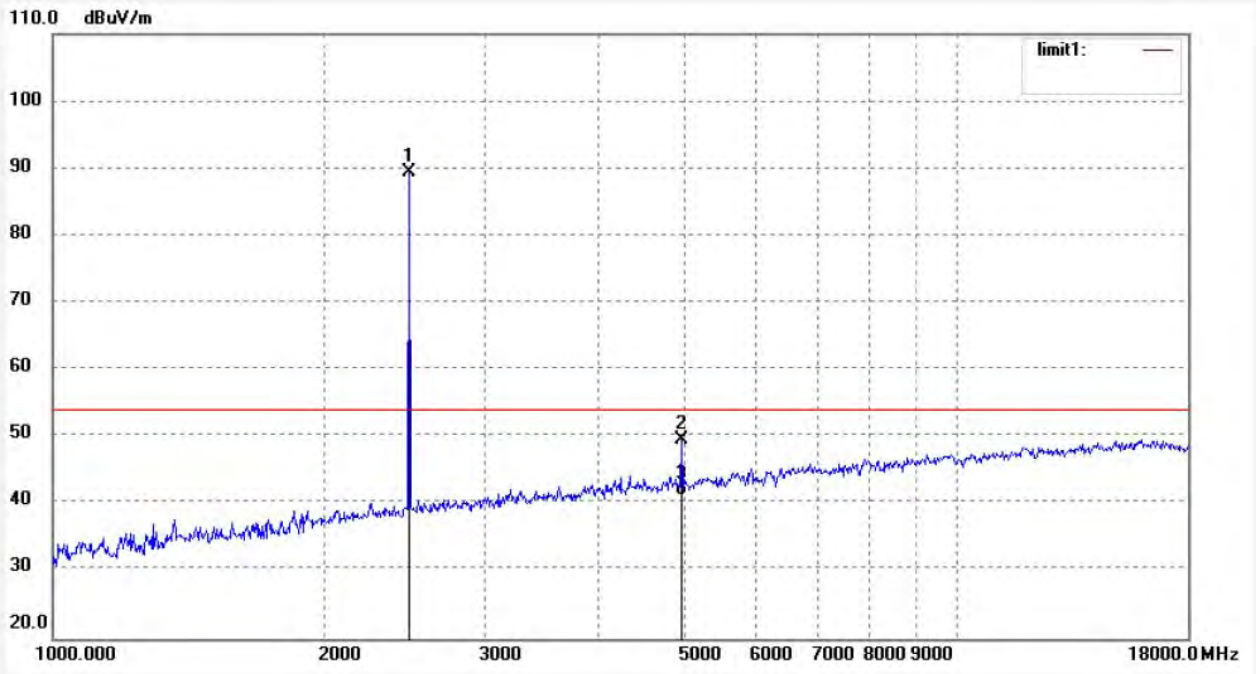
Job No.: LGW2019 #1403
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2480MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	88.22	1.10	89.32	/	/	peak			
2	4960.027	40.99	8.60	49.59	74.00	-24.41	peak			
3	4960.027	32.63	8.60	41.23	54.00	-12.77	AVG			

18GHz-26.5GHz test data

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
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Site: 2# Chamber
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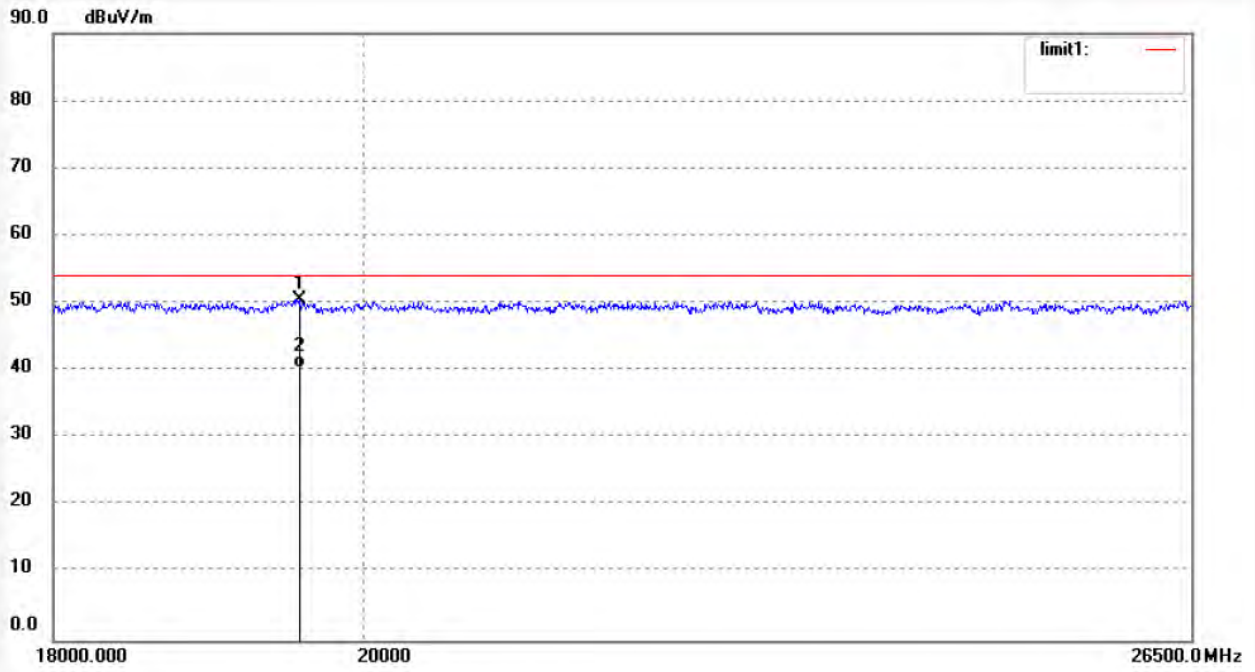
Job No.: LGW2019 #1408	Polarization: Horizontal
Standard: FCC Part 15C 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/04/28/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Lenovo Yoga Mouse with Laser Presenter	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: MOBTCMO	
Manufacturer: Primax Electronics Ltd.	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	19568.375	19.53	30.99	50.52	74.00	-23.48	peak			
2	19568.375	9.36	30.99	40.35	54.00	-13.65	AVG			

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
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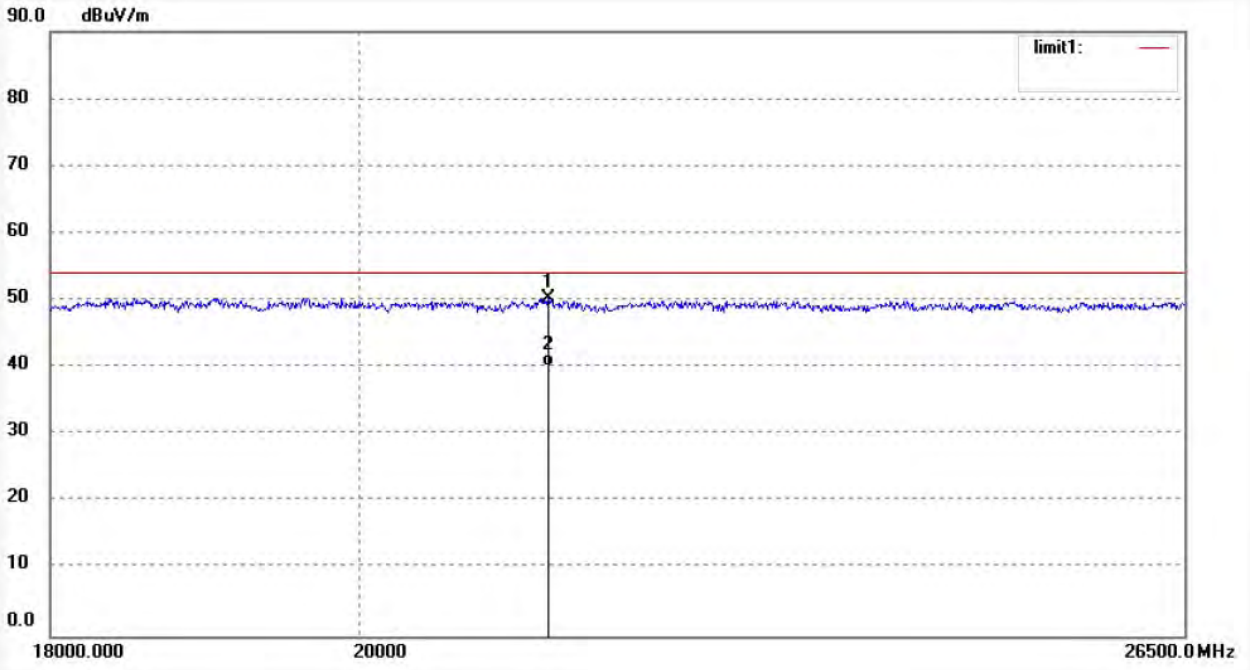
Job No.: LGW2019 #1407
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2402MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21331.078	18.08	32.22	50.30	74.00	-23.70	peak			
2	21331.078	8.02	32.22	40.24	54.00	-13.76	AVG			

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Site: 2# Chamber
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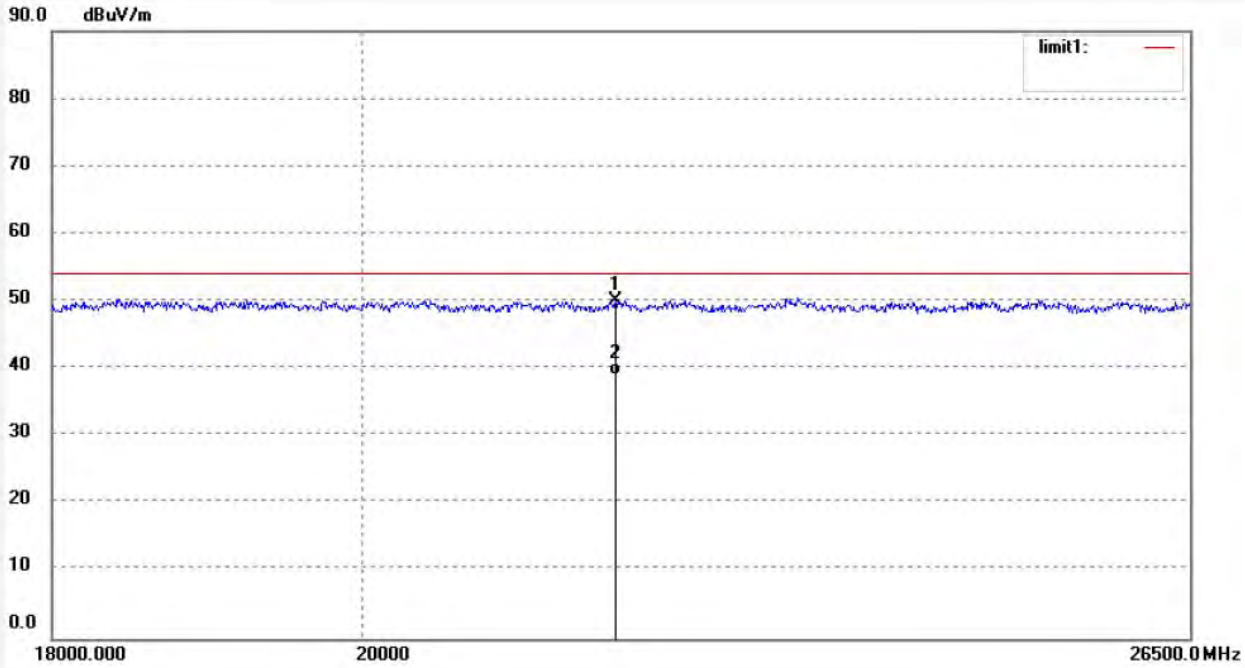
Fax:+86-0755-26503396

Job No.: LGW2019 #1409
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2440MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21798.134	18.11	31.86	49.97	74.00	-24.03	peak			
2	21798.134	7.29	31.86	39.15	54.00	-14.85	AVG			

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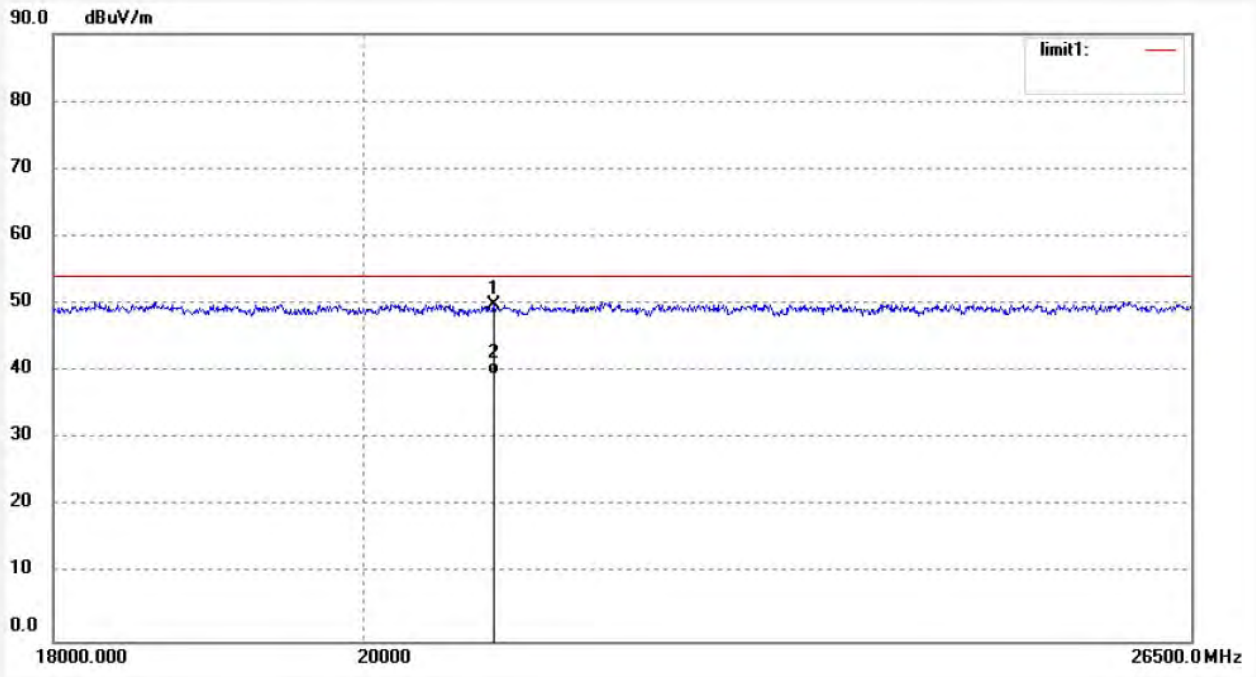
Job No.: LGW2019 #1410
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2440MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	20906.349	17.60	32.17	49.77	74.00	-24.23	peak			
2	20906.349	7.39	32.17	39.56	54.00	-14.44	AVG			

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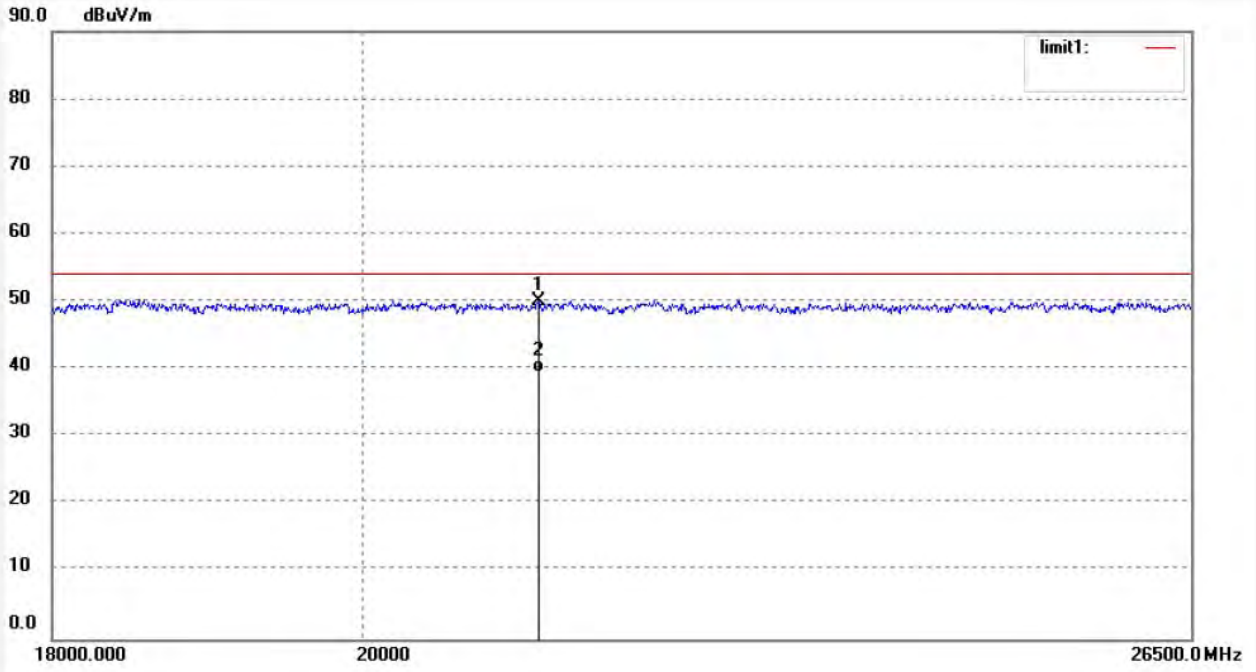
Job No.: LGW2019 #1412
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2480MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21232.304	18.62	31.37	49.99	74.00	-24.01	peak			
2	21232.304	8.19	31.37	39.56	54.00	-14.44	AVG			

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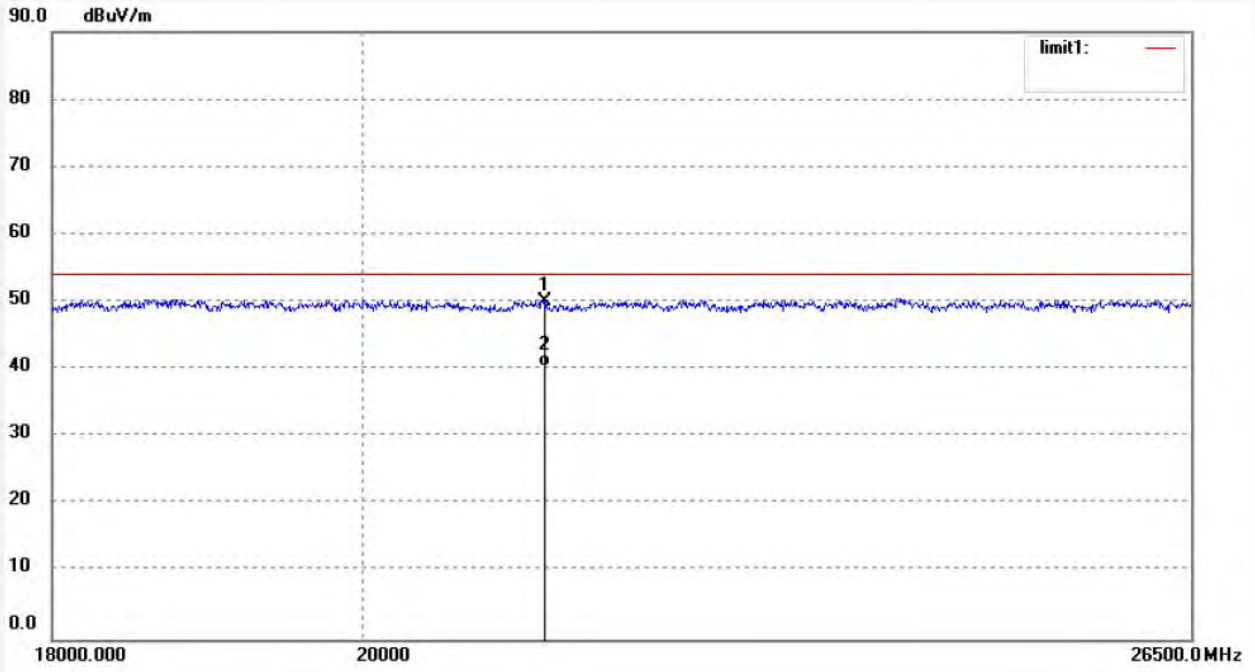
Job No.: LGW2019 #1411
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Lenovo Yoga Mouse with Laser Presenter
Mode: TX 2480MHz
Model: MOBTCMO
Manufacturer: Primax Electronics Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/04/28/
Time:
Engineer Signature: WADE
Distance: 3m

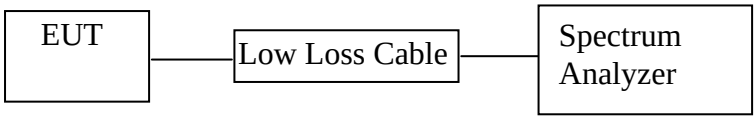
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21281.634	17.84	32.23	50.07	74.00	-23.93	peak			
2	21281.634	8.12	32.23	40.35	54.00	-13.65	AVG			

11. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

11.1. Block Diagram of Test Setup



11.2. The Requirement For Section 15.247(d)

Section 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3. The Requirement For RSS-247 Section 5.5

Section 5.5: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

11.4. EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.5.Operating Condition of EUT

11.5.1.Setup the EUT and simulator as shown as Section 11.1.

11.5.2.Turn on the power of all equipment.

11.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

11.6.Test Procedure

11.6.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

11.6.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz

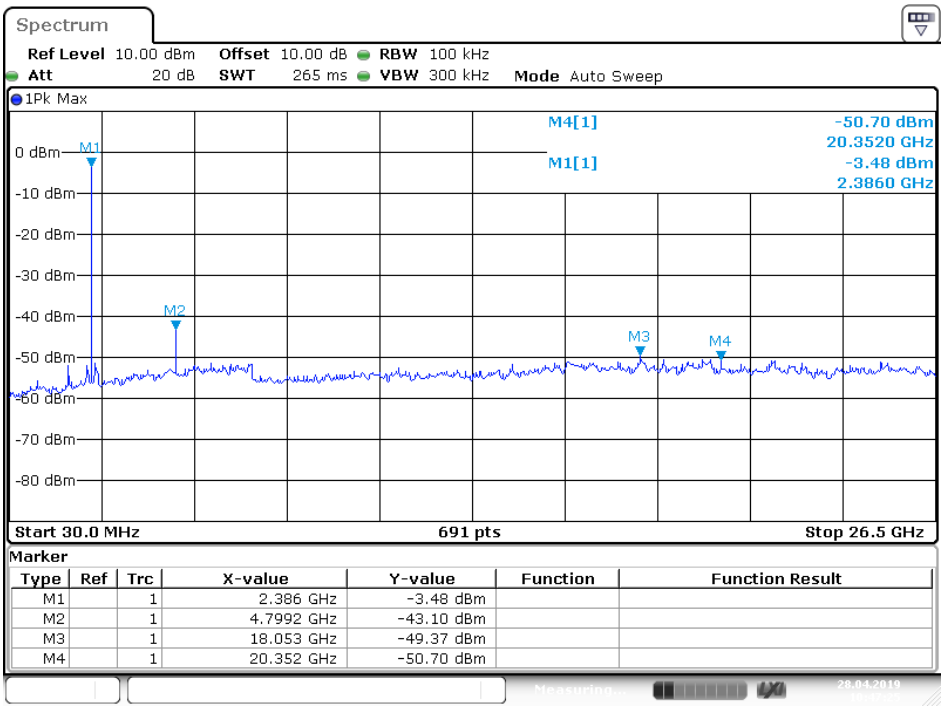
11.6.3.The Conducted Spurious Emission was measured and recorded.

11.7.Test Result

Pass.

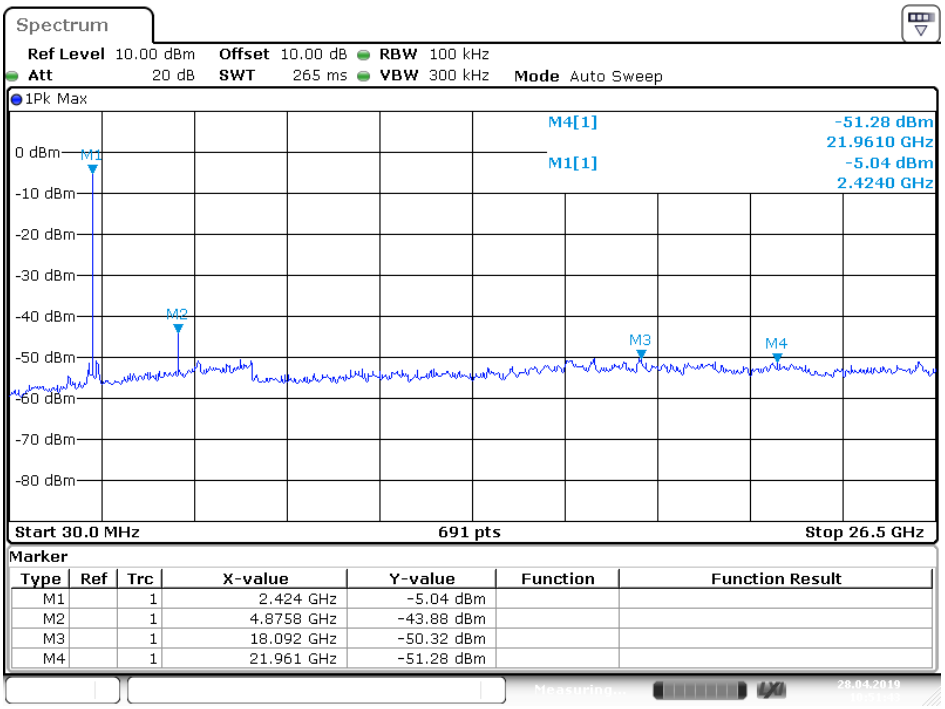
The spectrum analyzer plots are attached as below.

Channel 0



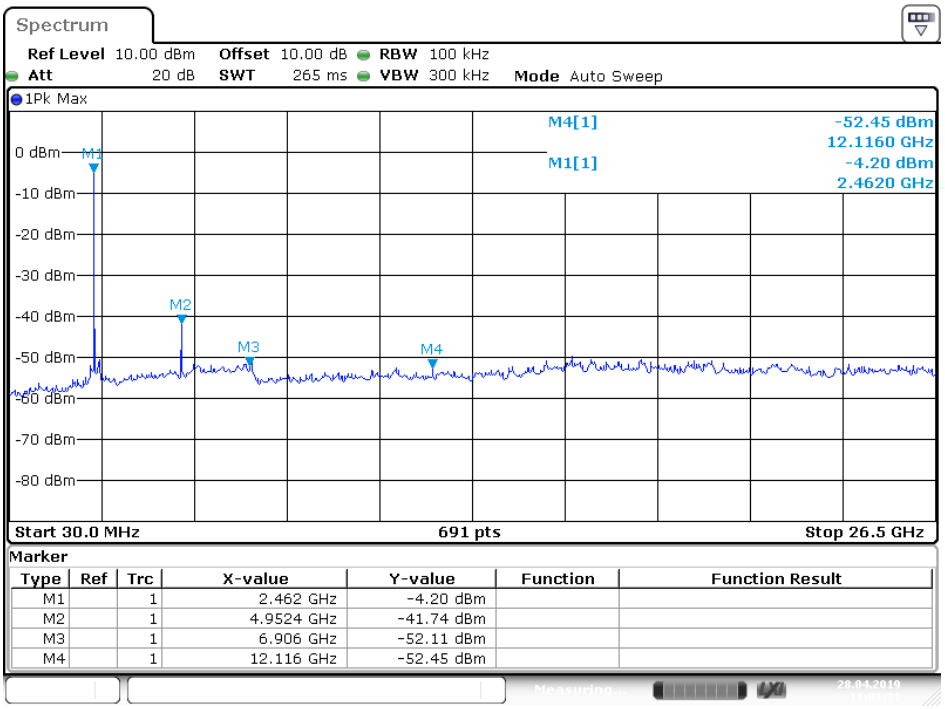
Date: 28.APR.2019 10:47:26

Channel 19



Date: 28.APR.2019 10:51:44

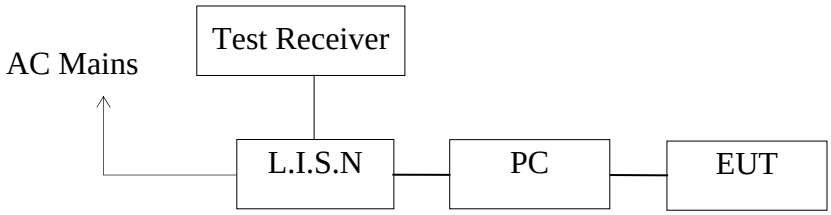
Channel 39



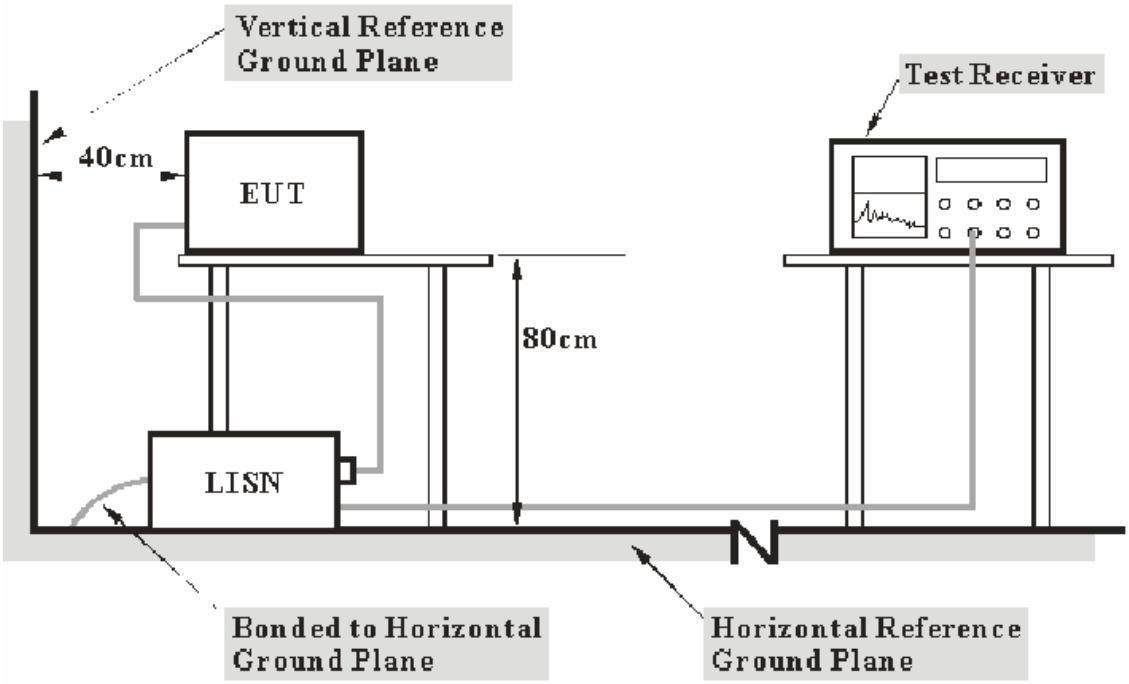
Date: 28.APR.2019 11:01:31

12. AC POWER LINE CONDUCTED EMISSION TEST

12.1. Block Diagram of Test Setup



12.2. Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

12.3.Test Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies. NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

12.4.Configuration of EUT on Measurement

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

12.5.Operating Condition of EUT

12.5.1.Setup the EUT and simulator as shown as Section 12.1.

12.5.2.Turn on the power of all equipment.

12.5.3.Let the EUT work in test mode and measure it.

12.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.
The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

12.7.Data Sample

Frequency (MHz)	Transducer value (dB)	QuasiPeak Level (dBμV)	Average Level (dBμV)	QuasiPeak Limit (dBμV)	Average Limit (dBμV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	10.5	51.1	34.2	56.0	46.0	4.9	11.8	Pass

Frequency(MHz) = Emission frequency in MHz
Transducer value(dB) = Insertion loss of LISN + Cable Loss
Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value
Limit (dBμV) = Limit stated in standard

Calculation Formula:
Margin = Limit (dBμV) - Level (dBμV)

12.8.Test Result

Pass.

The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

The spectral diagrams are attached as below.

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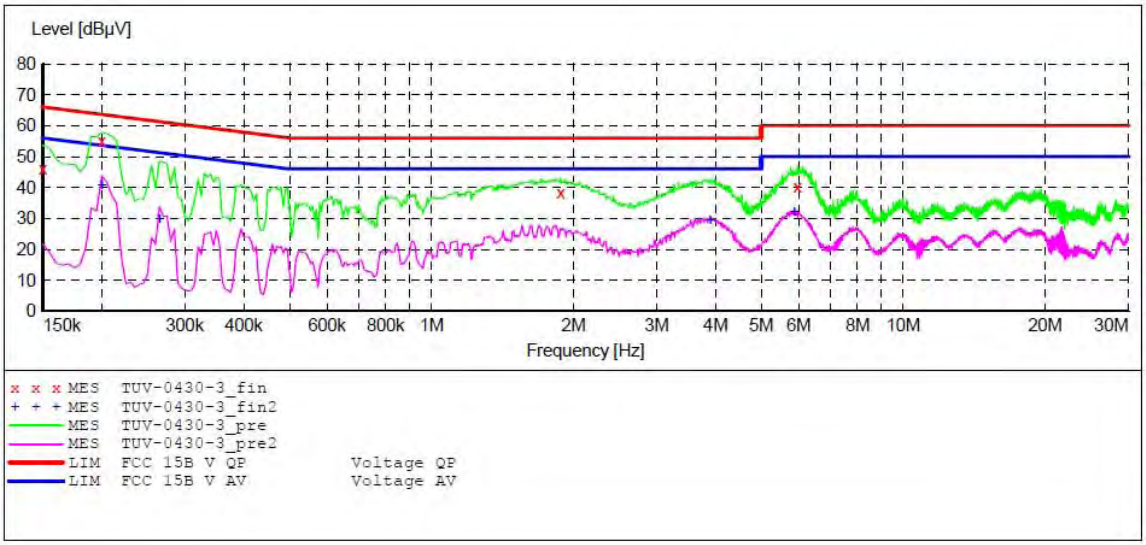
CONDUCTED EMISSION STANDARD FCC PART 15 C

```
EUT:                  Lenovo Yoga Mouse with Laser Presenter  M/N:MOBTCMO
Manufacturer:         Primax Electronics Ltd.
Operating Condition:  Charging
Test Site:            1#Shielding Room
Operator:             WADE
Test Specification:   L 120V/60Hz
Comment:              Mains port
Start of Test:        4/30/2019 /
```

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak Average	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "TUV-0430-3_fin"

4/30/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	46.10	10.5	66	19.9	QP	L1	GND
0.200000	55.00	10.5	64	8.6	QP	L1	GND
1.880000	38.20	11.0	56	17.8	QP	L1	GND
5.970000	40.40	11.2	60	19.6	QP	L1	GND

MEASUREMENT RESULT: "TUV-0430-3_fin2"

4/30/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.200000	40.70	10.5	54	12.9	AV	L1	GND
0.265000	29.80	10.6	51	21.5	AV	L1	GND
3.900000	29.30	11.1	46	16.7	AV	L1	GND
5.880000	31.90	11.2	50	18.1	AV	L1	GND

ACCURATE TECHNOLOGY CO.,LTD

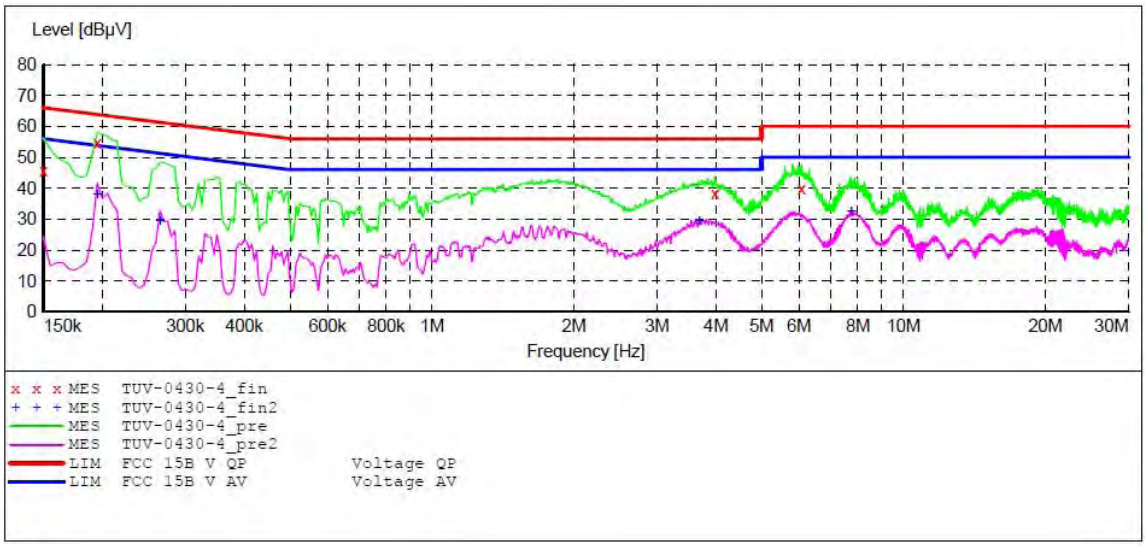
CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: Lenovo Yoga Mouse with Laser Presenter M/N:MOBTCMO
Manufacturer: Primax Electronics Ltd.
Operating Condition: Charging
Test Site: 1#Shielding Room
Operator: WADE
Test Specification: N 120V/60Hz
Comment: Mains port
Start of Test: 4/30/2019 /

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak Average	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "TUV-0430-4_fin"

4/30/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	45.60	10.5	66	20.4	QP	N	GND
0.195000	54.80	10.5	64	9.0	QP	N	GND
3.980000	38.30	11.1	56	17.7	QP	N	GND
6.070000	39.90	11.2	60	20.1	QP	N	GND

MEASUREMENT RESULT: "TUV-0430-4_fin2"

4/30/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	38.00	10.5	54	15.8	AV	N	GND
0.265000	29.50	10.6	51	21.8	AV	N	GND
3.690000	29.40	11.1	46	16.6	AV	N	GND
7.750000	32.30	11.2	50	17.7	AV	N	GND

13. ANTENNA REQUIREMENT

13.1. The Requirement

According to FCC Section 15.203 and RSS-Gen Section 6.8, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

13.2. Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0.5dBi. Therefore, the equipment complies with the antenna requirement of FCC Section 15.203 and RSS-Gen Section 6.8.

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