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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.

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Report No. : ATE20190718

Date of Test : April 28-May 12, 2019

Date of Report : May 17, 2019



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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

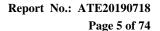
RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 April 2018

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 :	(STAPPROVED APPROVED
Approved & Authorized Signer:	(See A
	(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

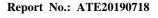
Antenna Gain : 0.5dBi

Antenna Type : Chip Antenna

Power Supply : DC 3.7V

1.2. Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channe 1	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



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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 = 3.08dB, k=2

(9kHz-30MHz)

Radiated emission expanded uncertainty = 4.42dB, k=2

(30MHz-1000MHz)

Radiated emission expanded uncertainty = 4.06dB, k=2

(Above 1GHz)





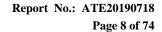
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2. MEASURING DEVICE AND TEST EQUIPMENT

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-10S S	N/A	Jan. 05, 2019	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-23 75/2510-60/11SS	N/A	Jan. 05, 2019	One Year
Conducted Emission	Measurement Soft	ware: ES-K1 V1.71			

Radiated Emission Measurement Software: EZ_EMC V1.1.4.2





3. OPERATION OF EUT DURING TESTING

3.1. Operating Mode

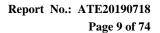
The mode is used: **Transmitting mode**

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

3.2.Configuration and peripherals

EUT

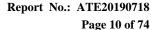
Figure 1 Setup: Transmitting mode





4. TEST PROCEDURES AND RESULTS

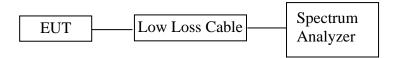
FCC & IC Rules	Description of Test	Result	
FCC Section 15.247(a)(2) RSS-247 Section 5.2(a)	6dB Bandwidth Test	Compliant	
RSS-Gen Section 6.7	99% Occupied Bandwidth Test	Compliant	
FCC Section 15.247(b)(3) RSS-247 Section 5.4(d)	Maximum Peak Output Power Test	Compliant	
FCC Section 15.247(e) RSS-247 Section 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

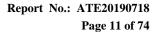
The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

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.

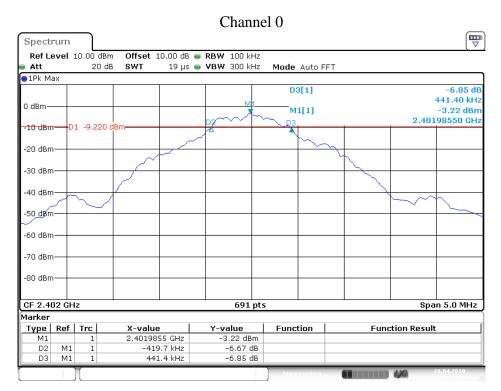




5.7.Test Result

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.

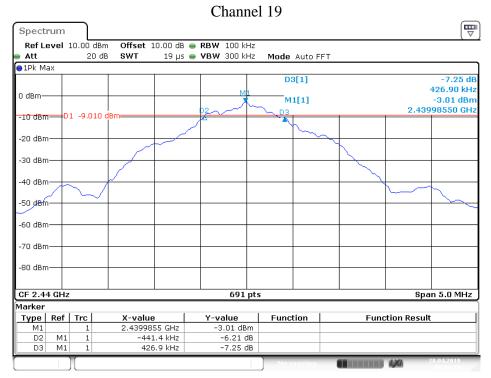


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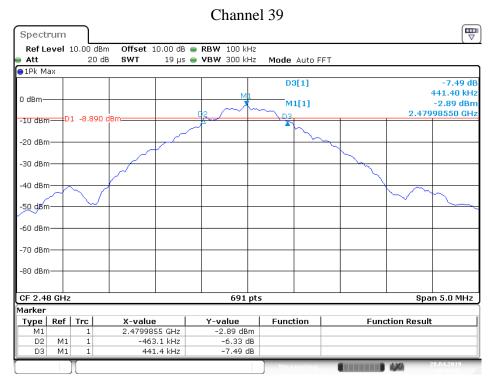


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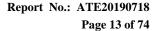




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6. 99% OCCUPIED BANDWIDTH TEST

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.

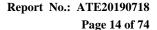
In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum 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

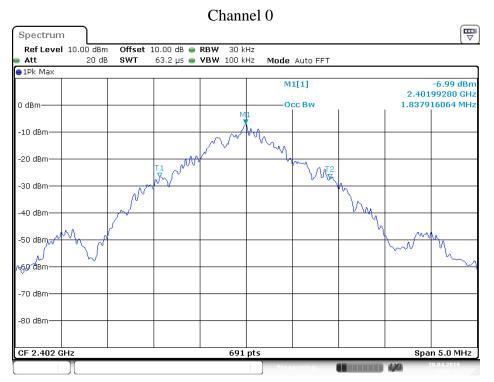
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Result
0	2402	1.838	Pass
19	2440	1.831	Pass
39	2480	1.823	Pass

The spectrum analyzer plots are attached as below.

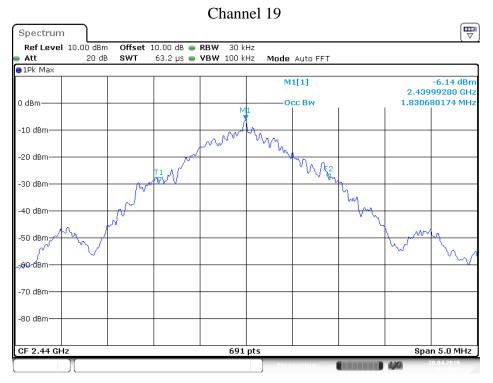


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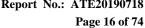


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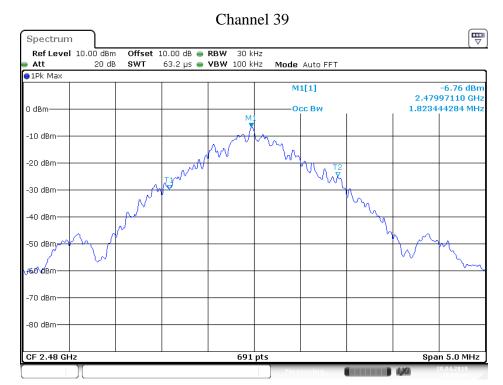


Date: 28.APR.2019 10:53:01

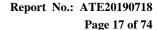








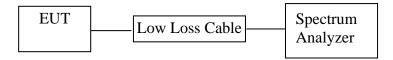
Date: 28.APR.2019 10:57:48





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

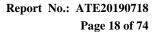
The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

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.

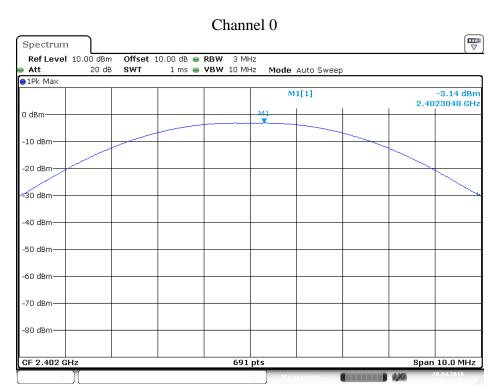




7.7.Test Result

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

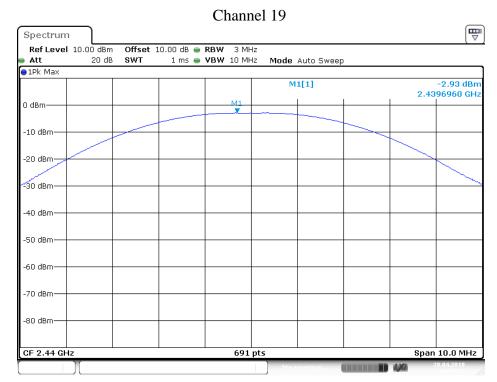
The spectrum analyzer plots are attached as below.



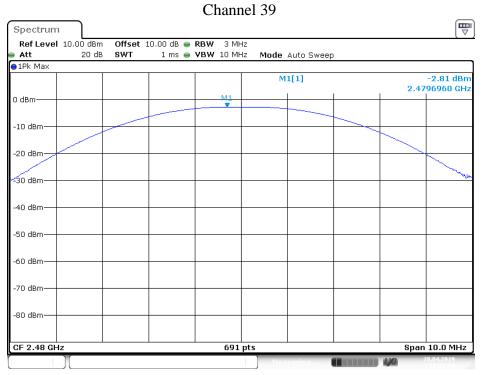


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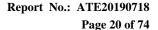




Date: 28.APR.2019 10:50:52



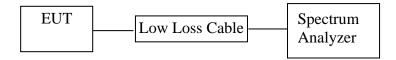
Date: 28.APR.2019 11:02:54





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.



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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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - 4. Set the VBW \geq 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.

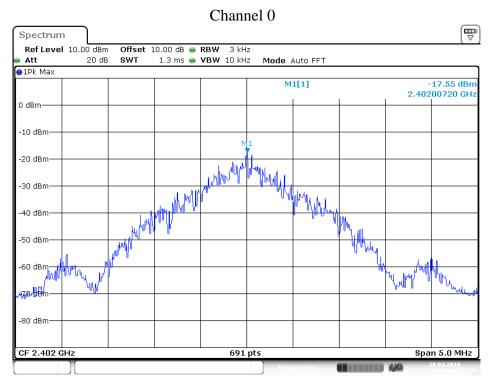
8.7.Test Result

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

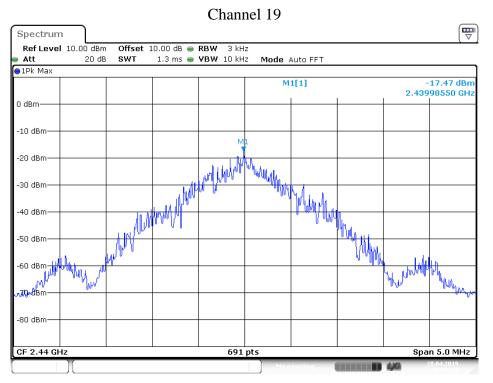
The spectrum analyzer plots are attached as below.

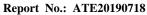


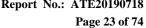




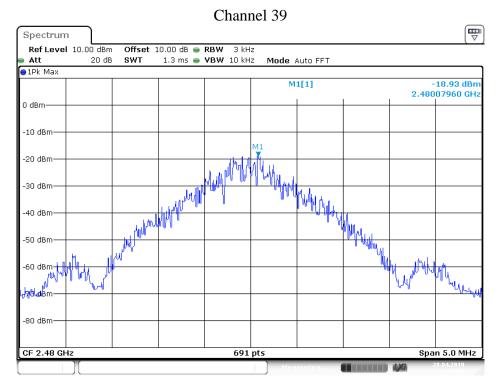
Date: 28.APR.2019 10:49:42



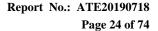








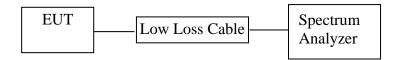
Date: 28.APR.2019 11:04:00





9. BAND EDGE COMPLIANCE TEST

9.1.Block Diagram of Test Setup



9.2. The Requirement For Section 15.247(d)

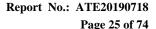
Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band 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

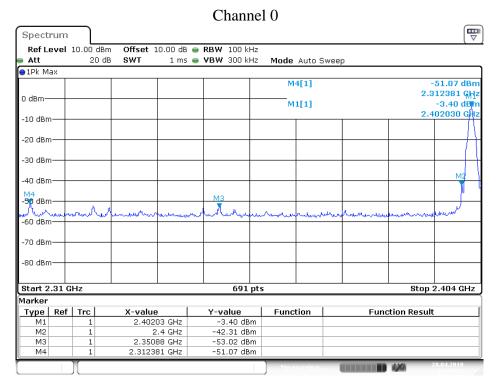
Channel	Frequency	Delta peak to band emission	Limit(dBc)
0	2402MHz	38.91	>20
39	2480MHz	52.89	>20

The spectrum analyzer plots are attached as below.

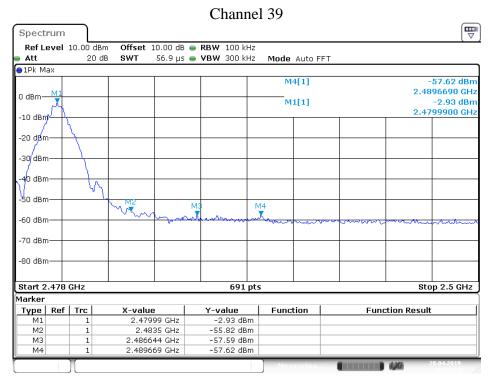


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Date: 28.APR.2019 10:45:53



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



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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

2390.0 MHz

Job No.: LGW2019 #1400 Standard: FCC (Band Edge) Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Lenovo Yoga Mouse with Laser Presenter

Mode: TX 2402MHz Model: **MOBTCMO**

20

10

0.0

2310.000

Manufacturer: Primax Electronics Ltd.

Horizontal Polarization: Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

Distance: 3m

Note: 90.0 dBuV/m limit1: limit2: 80 70 60 50 40 30

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			1
2	2312.160	27.22	0.46	27.68	54.00	-26.32	AVG		11 = 11	



ACCURATE TECHNOLOGY CO., LTD.

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

Report No.: ATE20190718

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F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park, Nanshan Shenzhen, P.R. China

Job No.: LGW2019 #1399 Vertical Polarization: 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: Engineer Signature: WADE Lenovo Yoga Mouse with Laser Presenter

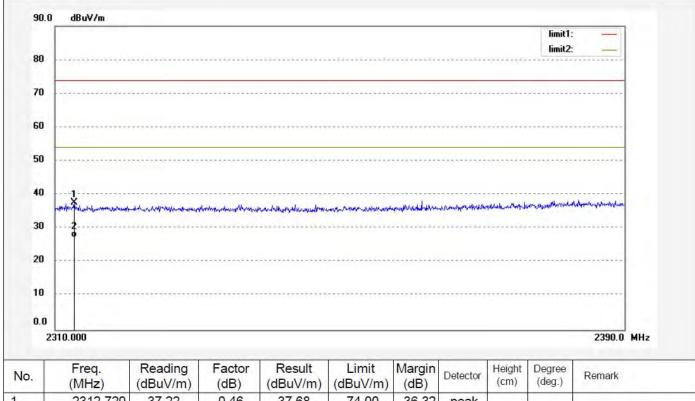
Mode: TX 2402MHz Distance: 3m

Manufacturer: Primax Electronics Ltd.

MOBTCMO

Note:

Model:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (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				



Report No.: ATE20190718

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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 #1405 Standard: FCC (Band Edge)

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.

Note:

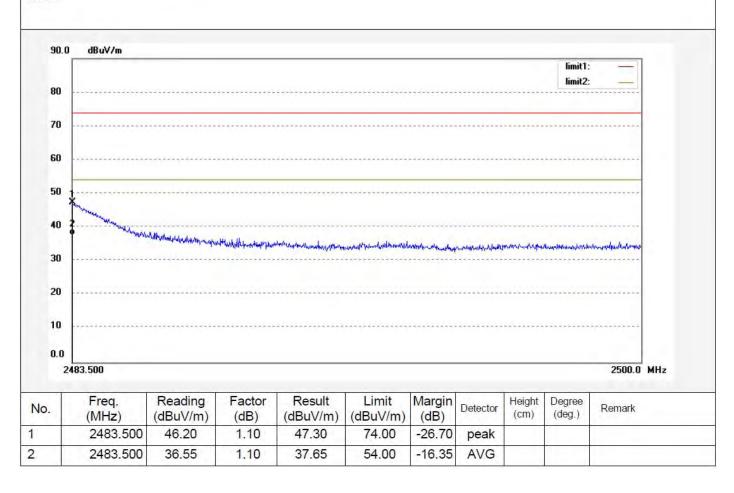
Polarization: Horizontal Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

Distance: 3m







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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 #1406 Standard: FCC (Band Edge) 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

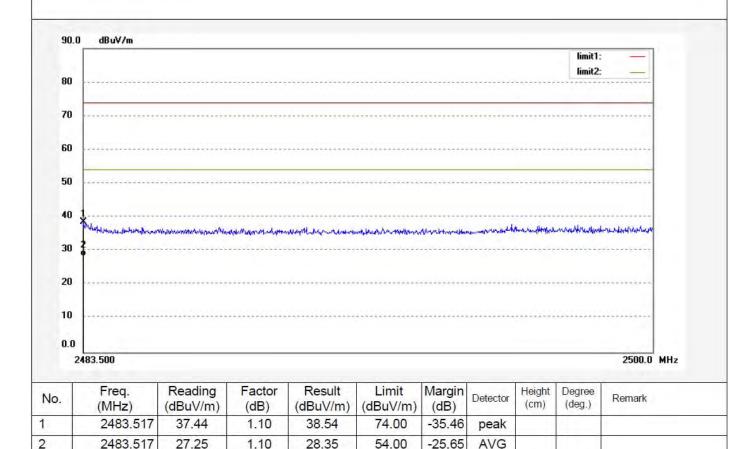
Date: 19/04/28/

Time:

Engineer Signature: WADE

Distance: 3m

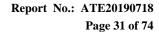
Note:



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

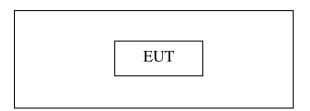




10. RADIATED SPURIOUS EMISSION TEST

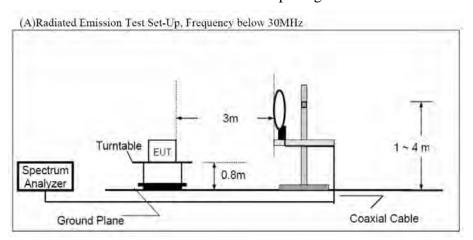
10.1.Block Diagram of Test Setup

10.1.1.Block diagram of connection between the EUT and peripherals

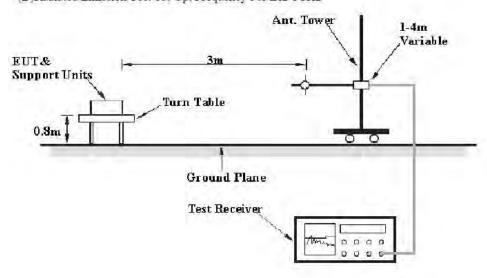


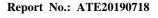
Setup: Transmitting mode

10.1.2.Semi-Anechoic Chamber Test Setup Diagram



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

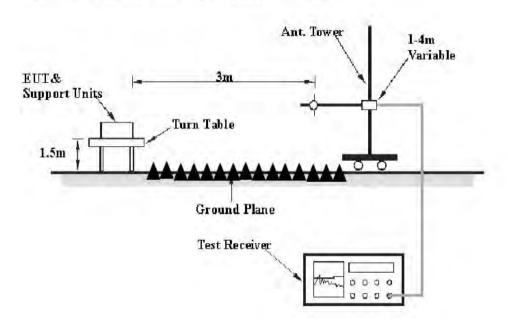




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ATC

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

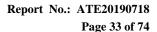


10.2. The Limit For Section 15.247(d)

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
49 0 - 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.



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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	$\binom{2}{}$
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

(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.

²Above 38.6





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.

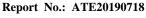
Table 7 - Restricted frequency bands*

MHz	
0.090 - 0.110	
0.495 - 0.505	
2.1735 - 2.1905	
3.020 - 3.026	
4.125 - 4.128	
4.17725 - 4.17775	
4.20725 - 4.20775	
5.677 - 5.683	
6.215 - 6.218	
6.26775 - 6.26825	
6.31175 - 6.31225	
8.291 - 8.294	
8.362 - 8.366	
8.37625 - 8.38675	
8.41425 - 8.41475	
12.29 - 12.293	
12.51975 - 12.52025	
12.57675 - 12.57725	
13.36 - 13.41	1
16.42 - 16.423	
16.69475 - 16.69525	
16.80425 - 16.80475	
25.5 - 25.67	
37.5 - 38.25	
73 - 74.6	
74.8 - 75.2	
108 - 138	

MHz	
149.9 - 15	0.05
56.52475 - 13	56.52525
156.7 - 15	56.9
162.0125 - 1	167.17
167.72 - 1	73.2
240 - 28	35
322 - 33	5.4
399.9 - 4	110
608 - 6	14
960 - 14	27
1435 - 16	26.5
1645.5 - 10	546.5
1660 - 1	710
1718.8 - 1	722.2
2200 - 23	300
2310 - 23	390
2483.5 - 2	2500
2655 - 29	900
3260 - 32	267
3332 - 33	339
3345.8 - 3	358
3500 - 44	400
4500 - 5	150
5350 - 5	460
7250 - 7	750
8025 - 85	500
- (A)	

GHz	
9.0 - 9.2	
9.3 - 9.5	
10.6 - 12.7	
13.25 - 13.4	
14.47 - 14.5	
15.35 - 16.2	
17.7 - 21.4	
22.01 - 23.12	
23.6 - 24.0	
31.2 - 31.8	
36.43 - 36.5	
Above 38.6	

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





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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.





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10.8.Data Sample

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

Frequency(MHz) = Emission frequency in MHz

Reading($dB\mu v$) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss - Amplifier gain

Result($dB\mu v/m$) = Reading($dB\mu v$) + Factor(dB/m)

Limit $(dB\mu v/m) = Limit$ stated in standard

Margin (dB) = Result(dB μ v/m) - Limit (dB μ v/m)

QP = Quasi-peak Reading

Calculation Formula:

 $Margin(dB) = Result (dB\mu V/m) - Limit(dB\mu V/m)$

Result($dB\mu V/m$)= Reading($dB\mu V$)+ 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.



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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 /

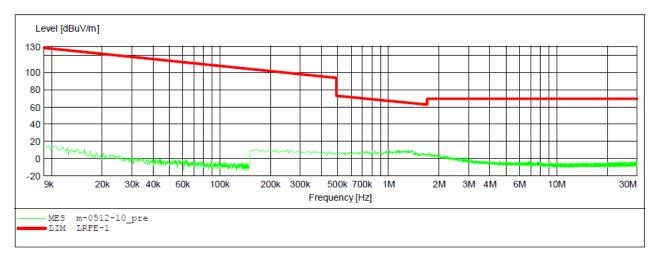
SCAN TABLE: "LFRE Fin"

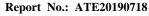
Short Description: _SUB_STD_VTERM2 1.70

Start Stop Step Detector Meas. IF Transducer

Frequency Frequency Width Time Bandw.

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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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 2# Chamber Test Site: Operator: WADE Test Specification: DC 3.7V

Comment:

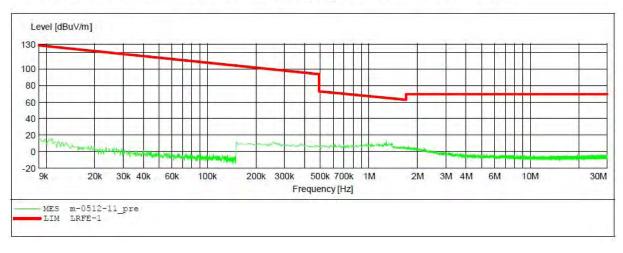
Start of Test: 2019-5-12 /

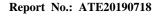
SCAN TABLE: "LFRE Fin"
Short Description: SUB STD VTERM2 1.70

Start Step Stop Detector Meas. IF Transducer

Frequency Frequency Width Time Bandw.

9.0 kHz 100.0 Hz QuasiPeak 1.0 s 1516M 150.0 kHz 200 Hz 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz 1516M





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ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3M Radiated

EUT: Lenovo Yoga Mouse with Laser Presenter $\,$ M/N:MOBTCMO Primax Electronics Ltd.

Manufacturer:

Operating Condition: TX 2402MHz 2# Chamber Test Site: Operator: WADE Test Specification: DC 3.7V Comment:

Start of Test: 2019-5-12 /

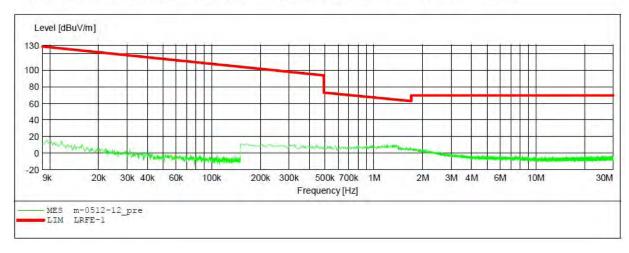
SCAN TABLE: "LFRE Fin"
Short Description:

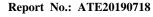
SUB_STD_VTERM2 1.70

Start Step Stop Detector Meas. IF Transducer

Frequency Frequency Width Time Bandw.

100.0 Hz QuasiPeak 1.0 s 9.0 kHz 150.0 kHz 200 Hz 1516M QuasiPeak 1.0 s 9 kHz 150.0 kHz 30.0 MHz 5.0 kHz 1516M







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ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3M Radiated

EUT: Lenovo Yoga Mouse with Laser Presenter $\,$ M/N:MOBTCMO Primax Electronics Ltd.

Manufacturer:

Operating Condition: TX 2440MHz Test Site: 2# Chamber Operator: WADE Test Specification: DC 3.7V

Comment: X

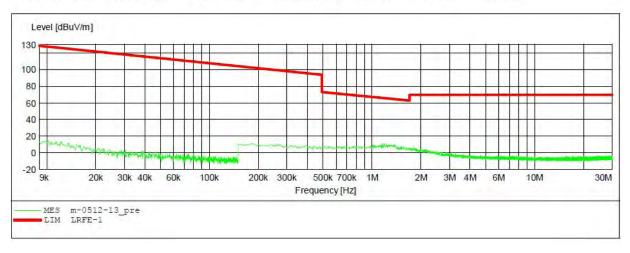
Start of Test: 2019-5-12 /

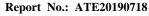
SCAN TABLE: "LFRE Fin"
Short Description: _SUB_STD_VTERM2 1.70

IF Transducer Start Stop Step Detector Meas.

Frequency Frequency Width Time Bandw.

100.0 Hz 9.0 kHz QuasiPeak 1.0 s 200 Hz 1516M 150.0 kHz QuasiPeak 1.0 s 150.0 kHz 30.0 MHz 5.0 kHz 9 kHz 1516M







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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:

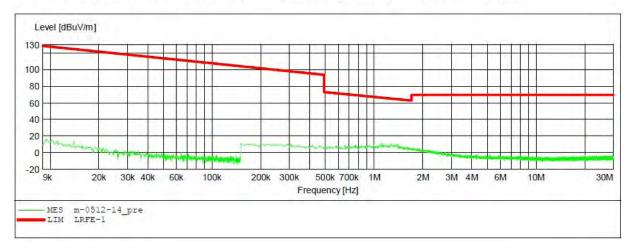
Start of Test: 2019-5-12 /

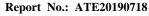
SCAN TABLE: "LFRE Fin"
Short Description: SUB STD VTERM2 1.70

Stop Start Step Detector Meas. IF Transducer

Frequency Frequency Width Time Bandw.

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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ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3M Radiated

Lenovo Yoga Mouse with Laser Presenter $\,$ M/N:MOBTCMO Primax Electronics Ltd. EUT:

Manufacturer:

Operating Condition: TX 2440MHz 2# Chamber Test Site: Operator: WADE Test Specification: DC 3.7V Comment:

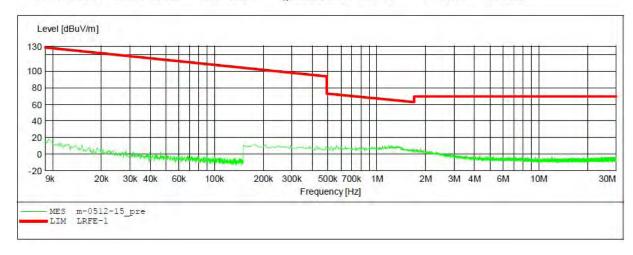
Start of Test: 2019-5-12 /

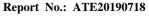
SCAN TABLE: "LFRE Fin"
Short Description: SUB STD VTERM2 1.70

Step Start Stop Detector Meas. IF Transducer

Time Frequency Frequency Width Bandw.

QuasiPeak 1.0 s 1516M 150.0 kHz 100.0 Hz 200 Hz 9 kHz 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 1516M





Page 44 of 74

ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3M Radiated

Lenovo Yoga Mouse with Laser Presenter $\,$ M/N:MOBTCMO Primax Electronics Ltd. EUT:

Manufacturer:

Operating Condition: TX 2480MHz 2# Chamber Test Site: Operator: WADE DC 3.7V Test Specification:

Comment:

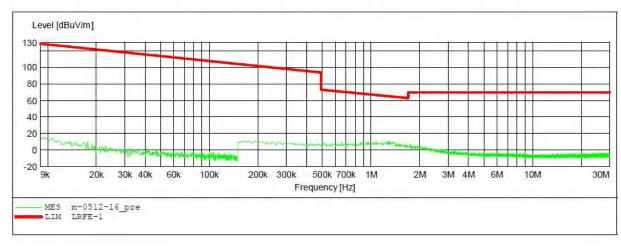
Start of Test: 2019-5-12 /

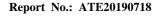
SCAN TABLE: "LFRE Fin"
Short Description: _SUB_STD_VTERM2 1.70

Start Step Stop IF Detector Meas. Transducer

Frequency Frequency Width Time Bandw.

9.0 kHz QuasiPeak 1.0 s 150.0 kHz 100.0 Hz 200 Hz 1516M 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz 1516M





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ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3M Radiated

Lenovo Yoga Mouse with Laser Presenter $\,$ M/N:MOBTCMO Primax Electronics Ltd. EUT:

Manufacturer:

Operating Condition: TX 2480MHz 2# Chamber Test Site: Operator: WADE Test Specification: DC 3.7V

Comment:

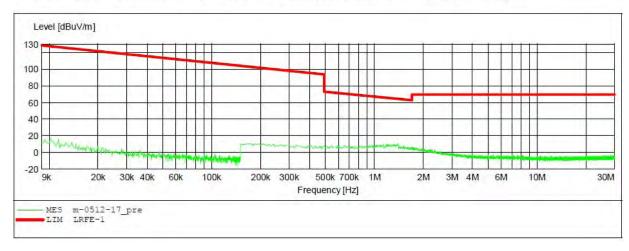
Start of Test: 2019-5-12 /

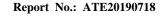
SCAN TABLE: "LFRE Fin"
Short Description: SUB_STD_VTERM2 1.70

Start Stop Step IF Transducer Detector Meas.

Time Frequency Frequency Width Bandw.

QuasiPeak 1.0 s 9.0 kHz 150.0 kHz 100.0 Hz 1516M 200 Hz 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz 1516M





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ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3M Radiated

Lenovo Yoga Mouse with Laser Presenter $\,$ M/N:MOBTCMO Primax Electronics Ltd. EUT:

Manufacturer:

Operating Condition: TX 2480MHz 2# Chamber Test Site: Operator: WADE DC 3.7V Test Specification: Comment:

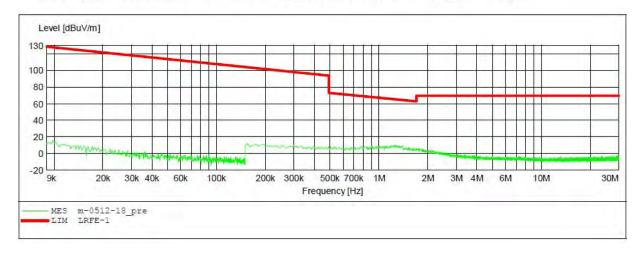
Start of Test: 2019-5-12 /

SCAN TABLE: "LFRE Fin"
Short Description: _SUB_STD_VTERM2 1.70

IF Start Step Stop Detector Meas. Transducer

Frequency Frequency Width Time Bandw.

100.0 Hz QuasiPeak 1.0 s 200 Hz 1516M 9.0 kHz 150.0 kHz QuasiPeak 1.0 s 150.0 kHz 30.0 MHz 5.0 kHz 9 kHz 1516M





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30MHz-1000MHz test data



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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.

Note:

3

Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/ Time:

Engineer Signature: WADE

Distance: 3m

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	0.000 40	50 60 70	80		i.	300	0 400	500	600 70	0 1000.0	MHz
0.0	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)		Height (cm)	Degree (deg.)	0 1000.0 Remark	MHz

46.00

-17.86

QP

836.2441

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

Report No.: ATE20190718

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F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park, Nanshan Shenzhen, P.R. China

> Polarization: Vertical Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

Distance: 3m

Job No.: LGW2019 #1414

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

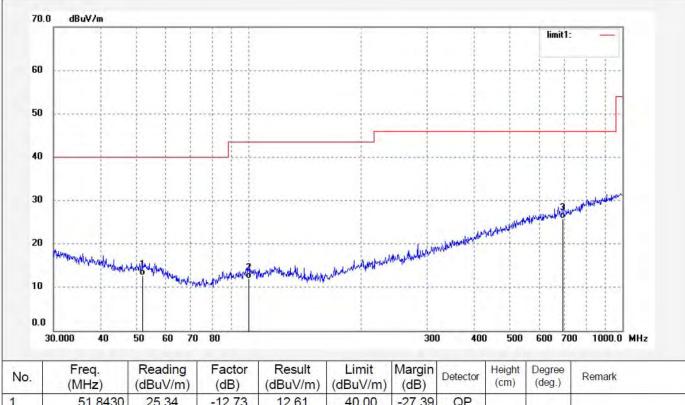
Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Lenovo Yoga Mouse with Laser Presenter

Mode: TX 2402MHz Model: **MOBTCMO**

Manufacturer: Primax Electronics Ltd.

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				



ATC 8

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Report No.: ATE20190718

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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.

Note:

Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark	
	33.7986	25.54	-10.30	15.24	40.00	-24.76	QP				
\neg	121.9754	25.47	-13.29	12.18	43.50	-31.32	QP		11 11		



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Report No.: ATE20190718
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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 #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.

Note:

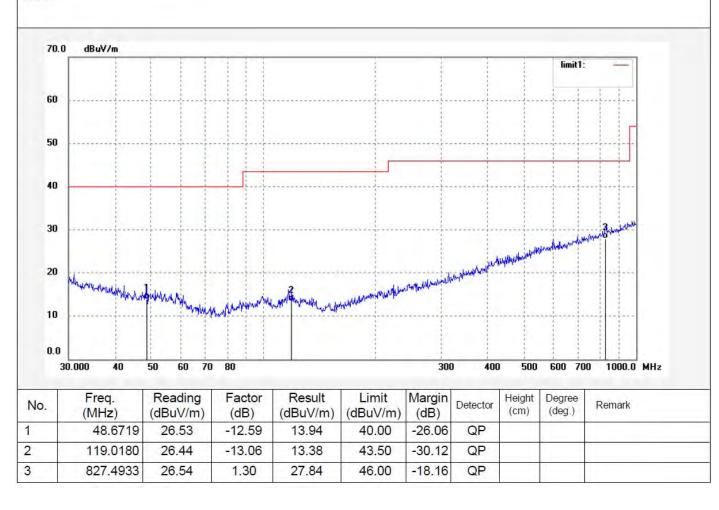
Polarization: Vertical

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE





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Report No.: ATE20190718

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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.

Note:

Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
	32.0667	25.60	-10.13	15.47	40.00	-24.53	QP			
		25.39	-13.68	11.71	43.50	-31.79	QP		F	
+	98.1419	25.59	10.00		4-0-0					



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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.

Note:

Polarization: Vertical Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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	50.000 40	30 60 70	0 0			300	J 400	5 500	000 70	iu 1000.0 F	ппи
	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark	
	41.7129	25.99	-11.91	14.08	40.00	-25.92	QP				
	99.1796	24.71	-13.33	11.38	43.50	-32.12	QP				
	890.7278	28.14	2.16	30.30	46.00	-15.70	QP				



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1GHz-18GHz test data



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Job No.: LGW2019 #1397

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.

Note:

Polarization: Horizontal Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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40 30 20.0	Freq. (MHz)	Reading (dBuV/m)	000	3000	5000	Margin			Degree (deg.)	18000.0 MHz
40 30 20.0 1	000.000 Freq.	20 Reading	000 Factor	3000 Result	5000 Limit	Margin		Height		
40 30 20.0 1	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	3000 Result (dBuV/m)	5000 Limit	Margin (dB)	Detector peak	Height		





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

Report No.: ATE20190718

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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.

Note:

Polarization: Vertical

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
	2402.000	88.13	0.89	89.02	1	1	peak			
	4804.025	41.92	7.40	49.32	74.00	-24.68	peak			
	4804.025	34.17	7.40	41.57	54.00	-12.43	AVG			



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Site: 2# Chamber Tel:+86-0755-26503290 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.

Note:

Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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20.0										
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	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
	2440.000	89.76	1.04	90.80	1	1	peak			
	4880.025	41.80	8.10	49.90	74.00	-24.10	peak			
\rightarrow	4880.025	33.42	8.10	41.52	54.00	-12.48	AVG		1	



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Report No.: ATE20190718

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F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China

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.

Note:

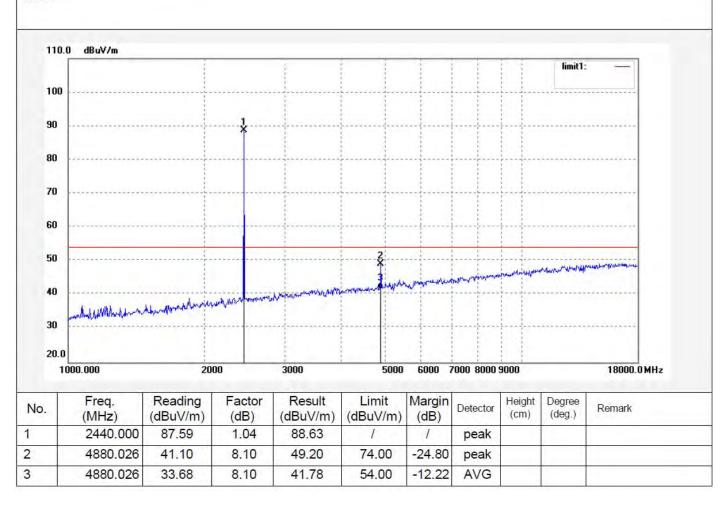
Polarization: Vertical

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE





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Report No.: ATE20190718

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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.

Note:

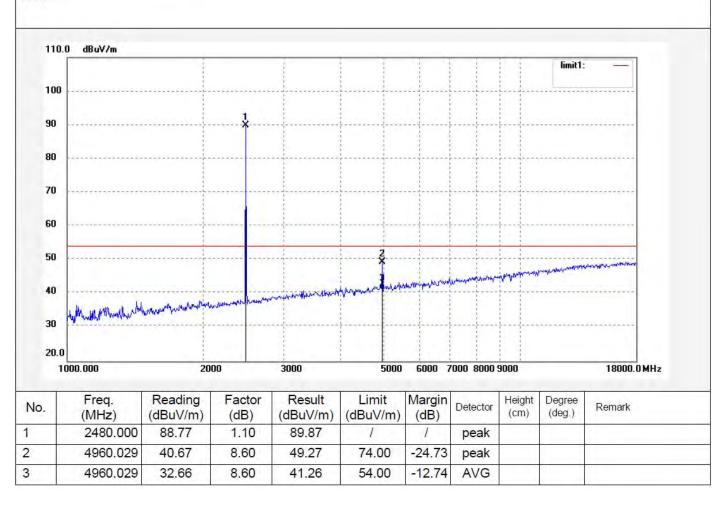
Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE





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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.

Note:

Polarization: Vertical Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

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20.0		Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
20.0	Freq.	Reading	Factor	Result	Limit		Detector peak			Remark
20.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit		Detector			Remark



Report No.: ATE20190718
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18GHz-26.5GHz test data



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Job No.: LGW2019 #1408

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

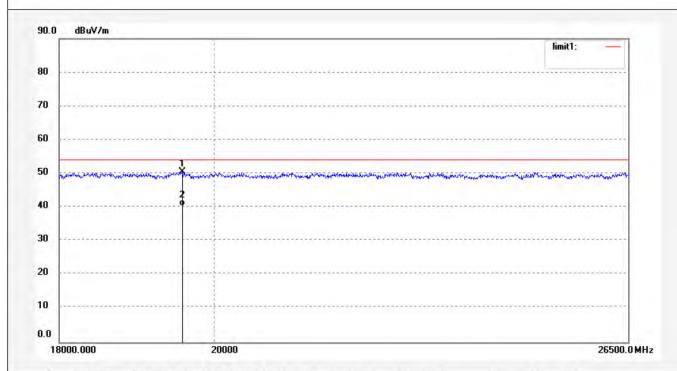
Date: 19/04/28/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)		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				





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Report No.: ATE20190718

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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.

Note:

Polarization: Vertical

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

	dBuV/m									
			i.						limit1:	_
30		******			***			****		
70										
60		,			**********	********				
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40	************	******		2				****		2005-2005-4
30					*******	**********	******		******	
20										
10		,					*******			
0.0			20000							26500.0 MHz
	8000.000									
1	Freq.	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
0.0		Reading (dBuV/m) 18.08	Factor (dB) 32.22	Result (dBuV/m) 50.30	Limit (dBuV/m) 74.00	Margin (dB) -23.70	Detector peak	Height (cm)	Degree (deg.)	Remark





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Report No.: ATE20190718

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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.

Note:

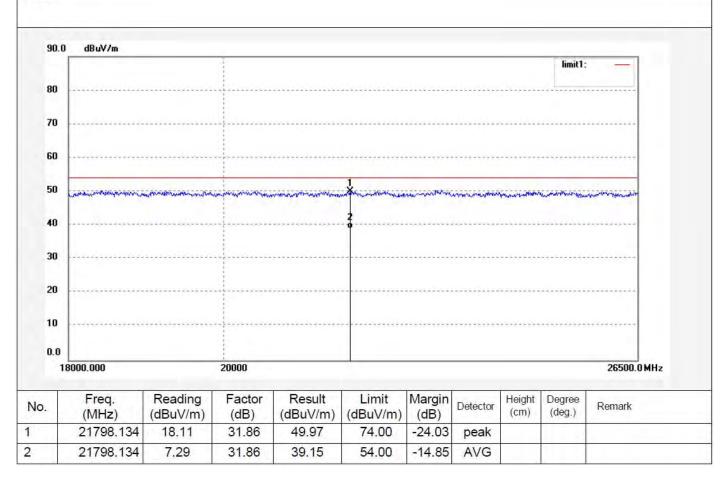
Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE







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

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.

Note:

Polarization: Vertical

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

	D dBuV/m									
			3						limit1:	_
80		**********				dan eran er		******		*********
70										
60		************								
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40			-							
30	*************	********					**********			
20										

10										
10 0.0	18000.000	*************	20000							26500.0 MHz
10 0.0	18000.000 Freq. (MHz)	Reading (dBuV/m)	20000 Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	26500.0 MHz Remark
20	Freq.		Factor			Margin (dB)	Detector			



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Report No.: ATE20190718

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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.

Note:

Polarization: Horizontal

Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

90.	0 dBuV/m									
			1						limit1:	-
80	V									**********
70								*****	********	******
60						********				
50	Interest to constitution when	protection of the protection of the second	Lughan Markey Contra	ymment many thrown	an war provided in the partition	and made in support	in the prompto	and a second second		www.manner
40				2					2020222	
30										********
20										
10										
0.0										
7	18000.000		20000							26500.0 MHz
	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
	(1411 12)		04.07	40.00	74.00	-24.01	peak			
	21232.304	18.62	31.37	49.99	74.00	21.01	1			



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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.

Note:

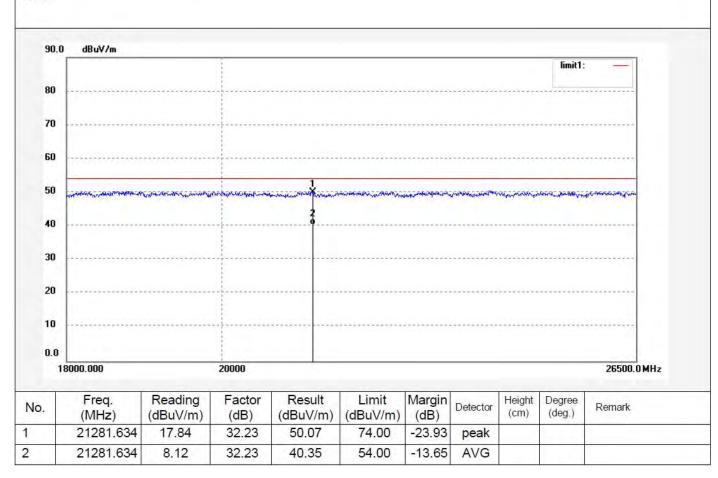
Polarization: Vertical

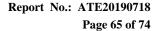
Power Source: DC 3.7V

Date: 19/04/28/

Time:

Engineer Signature: WADE

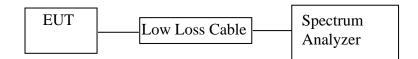






11. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

11.1.Block Diagram of Test Setup



11.2. The Requirement For Section 15.247(d)

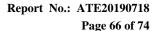
Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band 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 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.

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

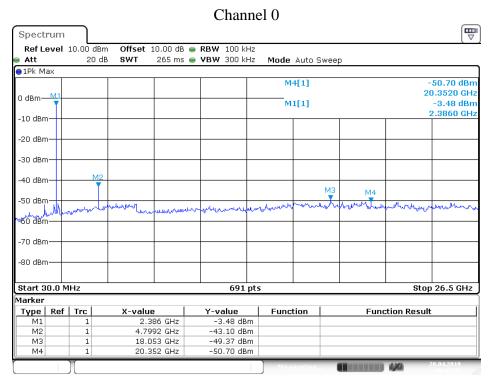
Pass.

The spectrum analyzer plots are attached as below.

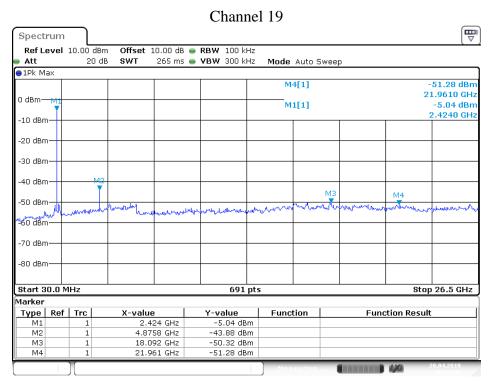


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Date: 28.APR.2019 10:47:26

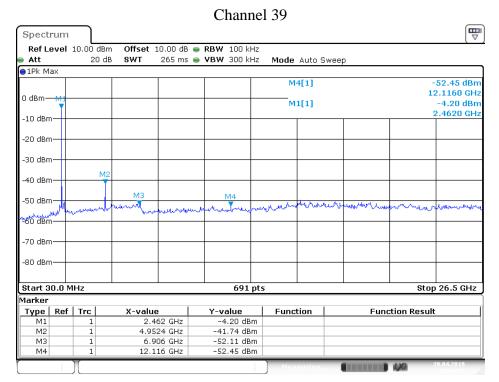


Date: 28.APR.2019 10:51:44

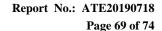


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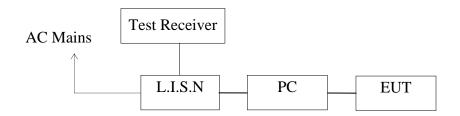
Date: 28.APR.2019 11:01:31



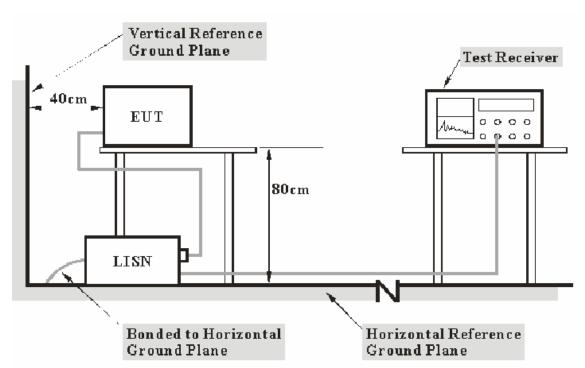


12.AC POWER LINE CONDUCTED EMISSION TEST

12.1.Block Diagram of Test Setup

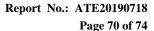


12.2.Test System Setup



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	Limit dB(μV)				
(MHz)	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.



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12.7.Data Sample

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

 $\label{eq:frequency} Frequency(MHz) = Emission\ frequency\ in\ MHz \\ Transducer\ value(dB) = Insertion\ loss\ of\ LISN + Cable\ Loss \\ Level(dB\mu V) = Quasi-peak\ Reading/Average\ Reading\ + Transducer\ value\ Limit\ (dB\mu V) = Limit\ stated\ in\ standard$

Calculation Formula:

 $Margin = Limit (dB\mu V) - Level (dB\mu V)$

12.8.Test Result

Pass.

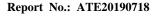
The frequency range from 150kHz to 30MHz is checked.

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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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: 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 Stop Step Detector Meas. IF Transducer

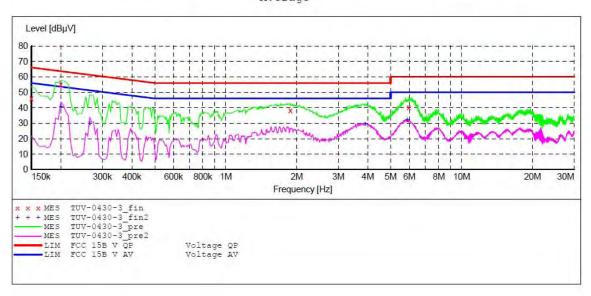
Frequency Frequency Width Time Bandw.

9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008

Average

150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008

Average

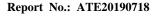


MEASUREMENT RESULT: "TUV-0430-3 fin"

4/30/2019							
Frequency MHz		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



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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 Stop Step Detector Meas. IF Transducer

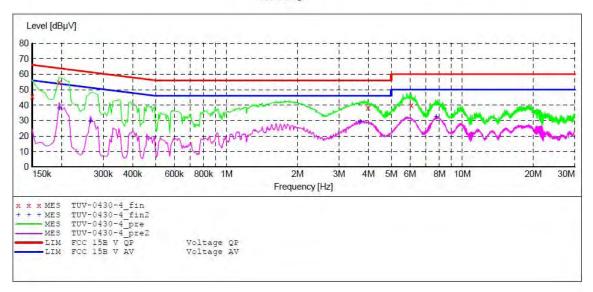
Frequency Frequency Width Time Bandw.

9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008

Average

150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008

Average

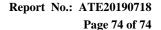


MEASUREMENT RESULT: "TUV-0430-4 fin"

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 *****