

## Variant FCC Test Report

**Report No.:** RF191021C06A-2

**FCC ID:** I4L-LAVIELVAX200

**Test Model:** LN20006A

**Received Date:** Jan. 06, 2020

**Test Date:** Jan. 10, 2020

**Issued Date:** Feb. 03, 2020

**Applicant:** Micro-Star International Co., Ltd.

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**FCC Registration /  
Designation Number:** 427177 / TW0011



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### Release Control Record

Issue No.	Description	Date Issued
RF191021C06A-2	Original Release	Feb. 03, 2020

## 1 Certificate of Conformity

**Product:** Notebook PC

**Brand:** NEC

**Test Model:** LN20006A

**Sample Status:** Mass product

**Applicant:** Micro-Star International Co., Ltd.

**Test Date:** Jan. 10, 2020

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2013

This report is issued as a supplementary report to BV CPS report no.: RF191021C06-2. This report shall be used by combining with its original report.

**Prepared by :** Rona Chen, **Date:** Feb. 03, 2020  
Rona Chen / Specialist

**Approved by :** Dylan Chiou, **Date:** Feb. 03, 2020  
Dylan Chiou / Senior Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	N/A	Refer to Note 2
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.14 dB at 222.78 MHz.
15.247(d)	Antenna Port Emission	N/A	Refer to Note 2
15.247(a)(2)	6 dB Bandwidth	N/A	Refer to Note 2
---	Occupied Bandwidth Measurement	N/A	Refer to Note 2
15.247(b)	Conducted power	N/A	Refer to Note 2
15.247(e)	Power Spectral Density	N/A	Refer to Note 2
15.203	Antenna Requirement	N/A	Refer to Note 2

Note:

1. N/A: Not Applicable
2. Only Radiated Emissions below 1GHz test was performed for this addendum. Refer to original report for other test data.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Notebook PC
<b>Brand</b>	NEC
<b>Test Model</b>	LN20006A
<b>Status of EUT</b>	Mass product
<b>Power Supply Rating</b>	20.0 / 15.0 / 9.0 / 5.0 Vdc (Adapter) 15.36 Vdc (Li-ion battery)
<b>Modulation Type</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM for OFDMA
<b>Modulation Technology</b>	DSSS, OFDM, OFDMA
<b>Transfer Rate</b>	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300.0 Mbps 802.11ax: up to 573.5 Mbps
<b>Operating Frequency</b>	2412 ~ 2472 MHz
<b>Number of Channel</b>	13 for 802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20) 9 for 802.11n (HT40), 802.11ax (HE40)
<b>Antenna Type</b>	PIFA antenna with -0.15 dBi gain
<b>Antenna Connector</b>	i-pex(MHF)
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

1. This report is issued as a supplementary report to BV CPS report no.: RF191021C06-2. The difference compared with original report is revising the design of vents on bottom plate of EUT. Therefore, only Radiated Emissions below 1GHz test was verified on the worst case of original report.
2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ax (HE20)	2TX
802.11ax (HE40)	2TX

3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	NEC	A19-095P1A	I/P: 100-240 Vac, 50-60 Hz, 1.6 A O/P: 20 Vdc, 4.75 A / 15 Vdc, 3 A / 9 Vdc, 3 A / 5 Vdc, 3 A
Battery	NEC	PC-VP-WP151	15.36 Vdc, 5235 mAh, Min.4711 mAh (72Wh)
WLAN Module	Intel	AX200NGW	--

4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

13 channels are provided for 802.11b, 802.11g, 802.11n (HT20) and 802.11ax (HE20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

9 channels are provided for 802.11n (HT40) and 802.11ax (HE40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	8	2447
4	2427	9	2452
5	2432	10	2457
6	2437	11	2462
7	2442		

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To	Description
	RE<1G	
-	√	-

Where **RE<1G**: Radiated Emission below 1 GHz

**Note:** "-" means no effect.

#### **Radiated Emission Test (Below 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11ax (HE20)	1 to 13	13	OFDMA	BPSK	MCS0

#### **Test Condition:**

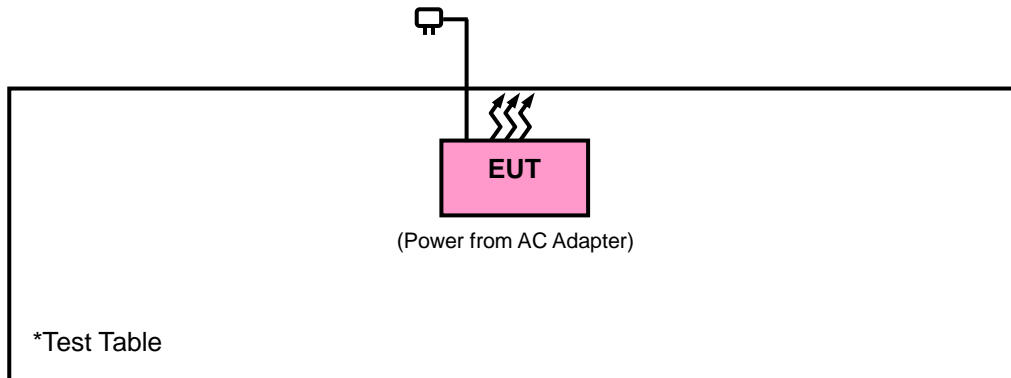
Applicable To	Environmental Conditions	Input Power	Tested by
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee



### 3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

#### **FCC Part 15, Subpart C (15.247)**

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

#### **References Test Guidance :**

**KDB 558074 D01 Meas Guidance v05r02**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

All test items have been performed as a reference to the above KDB test guidance.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 26, 2019	Aug. 25, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 22, 2019	Nov. 21, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
Loop Antenna	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier Agilent	310N	187226	Jun. 18, 2019	Jun. 17, 2020
Preamplifier Agilent	83017A	MY39501357	Jun. 18, 2019	Jun. 17, 2020
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 18, 2019	Jun. 17, 2020
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 18, 2019	Jun. 17, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The test was performed in HsinTien Chamber 1.

#### 4.1.3 Test Procedures

##### **For Radiated Emission below 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

##### **For Radiated Emission above 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

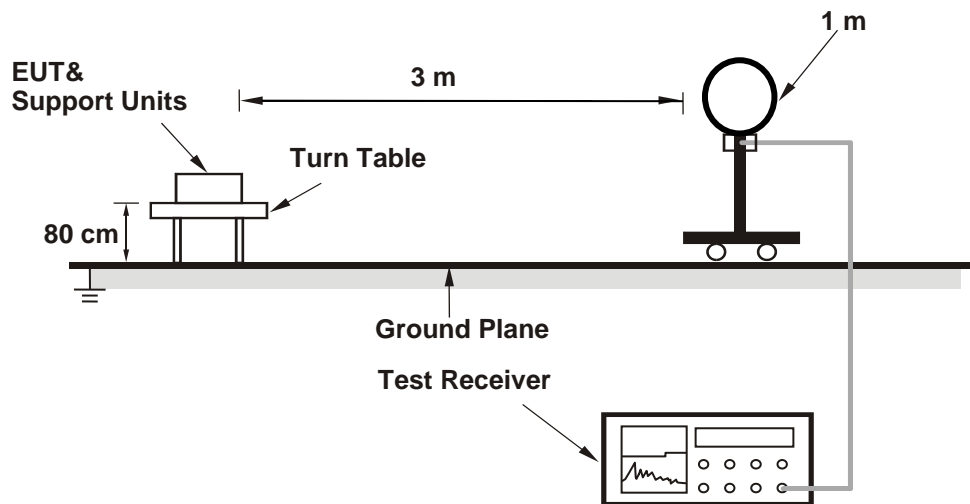
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or 10 Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1 GHz. (11ax (HE20): RBW = 1 MHz, VBW = 10 Hz)
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

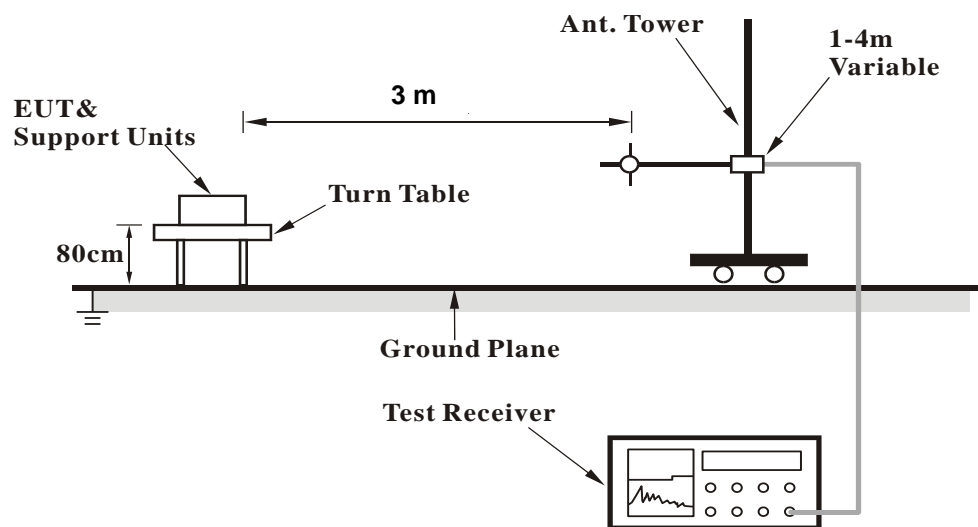
No deviation.

#### 4.1.5 Test Set Up

##### <Radiated Emission below 30 MHz>



##### <Radiated Emission 30 MHz to 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

##### 9 kHz ~ 30 MHz Data:

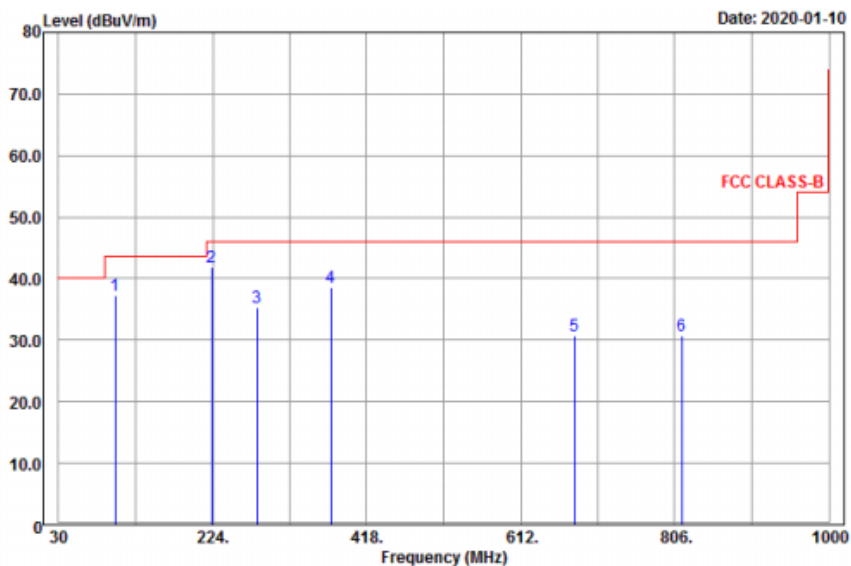
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

##### 30 MHz ~ 1 GHz Worst-Case Data:

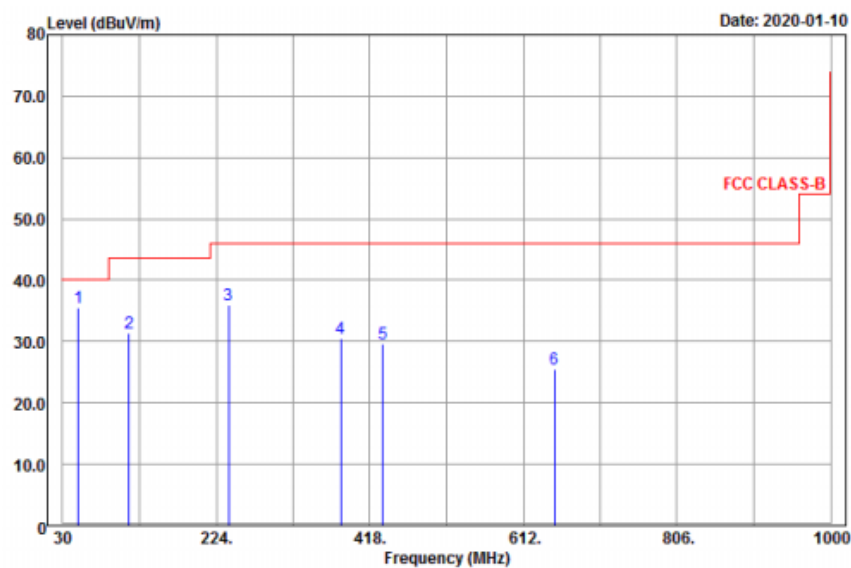
##### 802.11ax (HE20)

EUT Test Condition		Measurement Detail	
Channel	Channel 13	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

#### Horizontal



#### Vertical



**Antenna Polarity & Test Distance: Horizontal at 3 m**

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
101.01	37.17	54.35	-17.18	43.5	-6.33	101	131	Peak
<b>222.78</b>	<b>41.86</b>	<b>59.57</b>	<b>-17.71</b>	<b>46</b>	<b>-4.14</b>	<b>122</b>	<b>222</b>	<b>Peak</b>
280.02	35.3	51.73	-16.43	46	-10.7	124	17	Peak
372.8	38.64	53	-14.36	46	-7.36	128	2	Peak
680.1	30.71	40.22	-9.51	46	-15.29	164	199	Peak
814.5	30.83	38.28	-7.45	46	-15.17	134	302	Peak

**Antenna Polarity & Test Distance: Vertical at 3 m**

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
49.71	35.51	50.66	-15.15	40	-4.49	149	274	Peak
113.97	31.32	49.48	-18.16	43.5	-12.18	105	114	Peak
239.79	35.97	53.02	-17.05	46	-10.03	135	288	Peak
381.2	30.54	44.76	-14.22	46	-15.46	164	116	Peak
434.4	29.59	43.03	-13.44	46	-16.41	105	28	Peak
651.4	25.47	35.5	-10.03	46	-20.53	154	166	Peak

Remarks:

- Emission Level = Read Level + Factor  
Margin value = Emission level – Limit value.
- The emission levels of other frequencies were very low against the limit.

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).



## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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