



Project No: TM-2411000343P  
Report No.: TMWK2412004573KS

FCC ID: A5M-M90APG6F043

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# RF Exposure Evaluation Report

**FCC 47 CFR § 2.1091**

**For**

**Personal Computer**

**Model No.: ThinkCentre M90a Pro Gen6**

**Machine Type: 13AM\*\*\*\*\*, 13AN\*\*\*\*\*, 13AQ\*\*\*\*\*, 13AR\*\*\*\*\*,  
13AS\*\*\*\*\* (Where \* can be 0-9, a-z, A-Z, hyphen or blank for  
marketing purpose)**

**Trade Name: Lenovo**

Prepared for:

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Prepared by

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Issue Date: January 13, 2025

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History

| Rev. | Issue Date       | Revisions     | Effect Page | Revised By |
|------|------------------|---------------|-------------|------------|
| 00   | January 13, 2025 | Initial Issue | ALL         | Peggy Tsai |

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1 Attestation of Test Results

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Applicant Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Lenovo (Beijing) Limited<br>201-H2-6, Floor 2, Building 2, No.6 Shangdi West Road,<br>Haidian District, Beijing 100085, China  |
| Model Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ThinkCentre M90a Pro Gen6                                                                                                      |
| Machine Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 13AM*****, 13AN*****, 13AQ*****, 13AR*****, 13AS*****<br>(Where * can be 0-9, a-z, A-Z, hyphen or blank for marketing purpose) |
| Applicable Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FCC 47 CFR § 2.1091<br>FCC 47 CFR § 1.1307<br>FCC 47 CFR § 1.1310<br>Published RF exposure KDB procedures                      |
| Receive EUT Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | December 4, 2024                                                                                                               |
| Compliance Certification Services Inc. , tested the above equipment in accordance with the requirements set forth in the above standards. Determination of compliance is based on the results of the compliance measurement,not taking into account measurement instrumentation uncertainty.All indications of Pass/Fail in this report are opinions expressed by Compliance Certification Services Inc, based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. |                                                                                                                                |
| Approved & Released By:<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                |
| Sky Zhou<br>Asst. Section Manager                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                |

## 2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1091, the following FCC Published RF exposure [KDB](#) procedures:

- 447498 D04 Interim General RF Exposure Guidance v01
- 865664 D02 RF Exposure Reporting v01r02



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### 3 Device Under Test (DUT) Information

#### 3.1 DUT Description

|                                             |                                                                                                                                 |                   |                         |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------|
| Product                                     | Personal Computer                                                                                                               |                   |                         |
| Trade Name                                  | Lenovo                                                                                                                          |                   |                         |
| Model No.                                   | ThinkCentre M90a Pro Gen6                                                                                                       |                   |                         |
| Model Discrepancy                           | N/A                                                                                                                             |                   |                         |
| Machine Type                                | 13AM***** , 13AN***** , 13AQ***** , 13AR***** , 13AS***** (Where * can be 0-9, a-z, A-Z, hyphen or blank for marketing purpose) |                   |                         |
| Module Name / Trade Name / Regulatory Model | <b>Name of Equipment</b>                                                                                                        | <b>Trade Name</b> | <b>Regulatory Model</b> |
|                                             | Lenovo HPD card gen2                                                                                                            | Lenovo            | KQ676 NS-F043           |
| Hardware Version                            | 1.0                                                                                                                             |                   |                         |
| Software Version                            | 1.0                                                                                                                             |                   |                         |
| Sample Stage                                | Identical prototype                                                                                                             |                   |                         |

### 3.2 Wireless Technologies

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |          |            |        |          |            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|------------|--------|----------|------------|
| Frequency bands            | <div><input type="checkbox"/> Bluetooth: 2402MHz-2480MHz</div> <div><input type="checkbox"/> 802.11b/g/n HT20: 2412MHz ~ 2462 MHz</div> <div><input type="checkbox"/> 802.11n HT40: 2422MHz ~ 2452 MHz</div> <div><input type="checkbox"/> 802.11a/n HT20: 5180MHz ~ 5240MHz / 5260 ~ 5320MHz / 5500 ~ 5700MHz / 5745MHz ~ 5825MHz</div> <div><input type="checkbox"/> 802.11n HT40: 5190 MHz ~ 5230 MHz / 5270 MHz ~ 5310 MHz / 5510 MHz ~ 5670 MHz / 5755 MHz ~ 5795MHz</div> <div><input type="checkbox"/> 802.11ac VHT20: 5180MHz ~ 5240MHz / 5260 ~ 5320MHz / 5500 ~ 5700MHz / 5745MHz ~ 5825MHz</div> <div><input type="checkbox"/> 802.11ac VHT40: 5190 MHz ~ 5230 MHz / 5270 MHz ~ 5310 MHz / 5510 MHz ~ 5670 MHz / 5755 MHz ~ 5795MHz</div> <div><input type="checkbox"/> 802.11ac VHT80: 5210 MHz / 5290 MHz / 5530 MHz / 5775 MHz</div> <div><input type="checkbox"/> 802.11ax HE20: 5180MHz ~ 5240MHz / 5260 ~ 5320MHz / 5500 ~ 5700MHz / 5745MHz ~ 5825MHz</div> <div><input type="checkbox"/> 802.11ax HE40: 5190 MHz ~ 5230 MHz / 5270 MHz ~ 5310 MHz / 5510 MHz ~ 5670 MHz / 5755 MHz ~ 5795MHz</div> <div><input type="checkbox"/> 802.11ax HE80: 5210 MHz / 5290 MHz / 5530 MHz / 5775 MHz</div> <div><input checked="" type="checkbox"/> Others: Mode1: 60.5 ~ 61.5GHz</div> <div><input checked="" type="checkbox"/> Others: Mode2: 58 ~ 62GHz</div> |            |          |            |        |          |            |
| Exposure classification    | <div><input type="checkbox"/> Occupational/Controlled exposure</div> <div><input checked="" type="checkbox"/> General Population/Uncontrolled exposure</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |          |            |        |          |            |
| Antenna Specification      | <div>Built-in Antenna</div> <div>Gain: 5 dBi</div> <div>Radar      Gain :      5.00 dBi      (Numeric gain: 3.16)      Worst</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |          |            |        |          |            |
| Maximum Peak tune up power | <table><tr><td>Mode 1</td><td>8.50 dBm</td><td>(7.079 mW)</td></tr><tr><td>Mode 2</td><td>8.00 dBm</td><td>(6.310 mW)</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Mode 1     | 8.50 dBm | (7.079 mW) | Mode 2 | 8.00 dBm | (6.310 mW) |
| Mode 1                     | 8.50 dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (7.079 mW) |          |            |        |          |            |
| Mode 2                     | 8.00 dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (6.310 mW) |          |            |        |          |            |

#### Notes:

- For more details, please refer to the User's manual of the EUT.
- Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- Disclaimer: Variant information between/among machine type is provided by the applicant, test results of this report are applicable to the sample EUT received of main test model name.
- The tune up power referred the Peak power of the test report TMWK2411004107KR for RF Exposure assessment purpose.

## 4 Maximum Permissible Exposure

### 4.1 Limits for Maximum Permissible Exposure (MPE)

**Table 1 - Limits for Maximum Permissible Exposure (MPE)**

| Frequency range<br>(MHz)                                | Electric field<br>strength<br>(V/m) | Magnetic field<br>strength<br>(A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging time<br>(minutes) |
|---------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|-----------------------------|
| (A) Limits for Occupational/Controlled Exposure         |                                     |                                     |                                        |                             |
| 0.3-3.0                                                 | 614                                 | 1.63                                | * 100                                  | 6                           |
| 3.0-30                                                  | 1842/f                              | 4.89/f                              | * 900/f <sup>2</sup>                   | 6                           |
| 30-300                                                  | 61.4                                | 0.163                               | 1.0                                    | 6                           |
| 300-1,500                                               |                                     |                                     | f/300                                  | 6                           |
| 1,500-100,000                                           |                                     |                                     | 5                                      | 6                           |
| (B) Limits for General Population/Uncontrolled Exposure |                                     |                                     |                                        |                             |
| 0.3-1.34                                                | 614                                 | 1.63                                | * 100                                  | 30                          |
| 1.34-30                                                 | 824/f                               | 2.19/f                              | * 180/f <sup>2</sup>                   | 30                          |
| 30-300                                                  | 27.5                                | 0.073                               | 0.2                                    | 30                          |
| 300-1,500                                               |                                     |                                     | f/1500                                 | 30                          |
| <b><u>1,500-100,000</u></b>                             |                                     |                                     | 1.0                                    | 30                          |

## 4.2 MPE Calculation Method

### Calculation

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \text{ Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm<sup>2</sup>

If, Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

### 4.3 MPE EXEMPTION

- (A) The available maximum time-averaged power is no more than 1 mW
- (B) The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

- (C) Using Table 1 and the minimum separation distance ( $R$  in meters) from the body of a nearby person for the frequency ( $f$  in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply,  $R$  must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

| Single RF Sources Subject to Routine Environmental Evaluation |                       |
|---------------------------------------------------------------|-----------------------|
| RF Source frequency (MHz)                                     | Threshold ERP (watts) |
| 0.3-1.34                                                      | $1,920 R^2$ .         |
| 1.34-30                                                       | $3,450 R^2/f^2$ .     |
| 30-300                                                        | $3.83 R^2$ .          |
| 300-1,500                                                     | $0.0128 R^2 f$ .      |
| 1,500-100,000                                                 | $19.2 R^2$ .          |
| Note: $R$ is in meters, $f$ is in MHz.                        |                       |

#### 4.4 Multiple RF sources

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation),

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$



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## 5 Radio Frequency Radiation Max Exposure Evaluation

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where  $P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

| Mode   | Frequency (MHz) | Max.Peak Tune-up power (dBm) | Max.Peak Tune-up power (mW) | G(dBi) | G(num.) | D(cm) | Power Density in mW/cm <sup>2</sup> | Limit (mW/cm <sup>2</sup> ) |
|--------|-----------------|------------------------------|-----------------------------|--------|---------|-------|-------------------------------------|-----------------------------|
| Mode 1 | 60600           | 8.5                          | 7.08                        | 5      | 3.16    | 20    | 0.004                               | 1                           |
| Mode 2 | 60910           | 8.0                          | 6.31                        | 5      | 3.16    | 20    | 0.004                               | 1                           |

## 6 Simultaneous Transmission Analysis

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation),

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

### Simultaneous Transmission Condition

| RF Exposure Condition | Item | Capable Transmit Configurations |          |
|-----------------------|------|---------------------------------|----------|
|                       | 1    | Mode 1                          | + Mode 2 |

#### 6.1 Sum of the Mode 1 & Mode 2

Therefore, the worst-case situation is  $0.004 / 1 + 0.004 / 1 = 0.008$ , which is less than “1”.

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## 7 Facilities

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

**END OF REPORT**