System Thermal Test Report

Model: **CTE T500 Air**

Version: **20230526A**

NO: RS202305260001

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3. Procedure

1. Objective

Our objective is to find out if the CTE T500 Air can efficiently extract the heat generated by the latest components, so we built a system with an Intel i9-13900K and a ASUS ROG Strix GeForce RTX® 4090 OC and put it to the test. The passing criteria we set was to keep the internal temperature under **40˚C** while the system is running at full load, with **eight** installed fans and a AIO 420 installed.

2. Equipment

The equipment we used in the thermal testing includes:

1. Temperature & Humidity Chamber
2. Data Acquisition Device
3. Thermocouple

The Temp. & Humidity Chamber ensures consistency in the testing environment, particularly temperature and humidity. The **temperature** was set at **25˚C** and the **humidity** at **50%** in the chamber.

The Data Acquisition Device helps us to directly collect the data through **thermocouples**, which is the most important equipment for our testing. We set up the thermocouple inside the case at various points to measure the temperature.

We used **AIDA64 Extreme** and **FurMark ROG Edition** to push 100% load on the CPU and GPU and tested for 30 minutes.

3. Procedure

Testing steps:

1. Ready the systems
2. Place the chassis into the Temp. & Humidity Chamber
3. Set the thermocouple at the specified places
4. Set up the Temp. & Humidity Chamber - temperature at 25 ˚C and the humidity at 50%
5. Turn on the Temp. & Humidity Chamber and start testing (for 30 minutes)
6. Check the data acquired from the Data Acquisition device
7. End testing

B. Test Configuration

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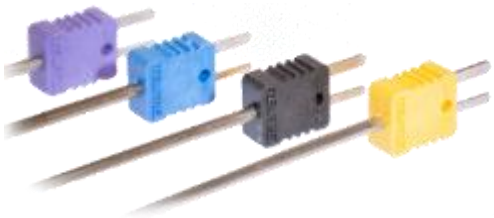
1. Laboratory Equipment



Thermocouple

Sound Level Meter

Temperature & Humidity Chamber

Thermal Imaging Camera

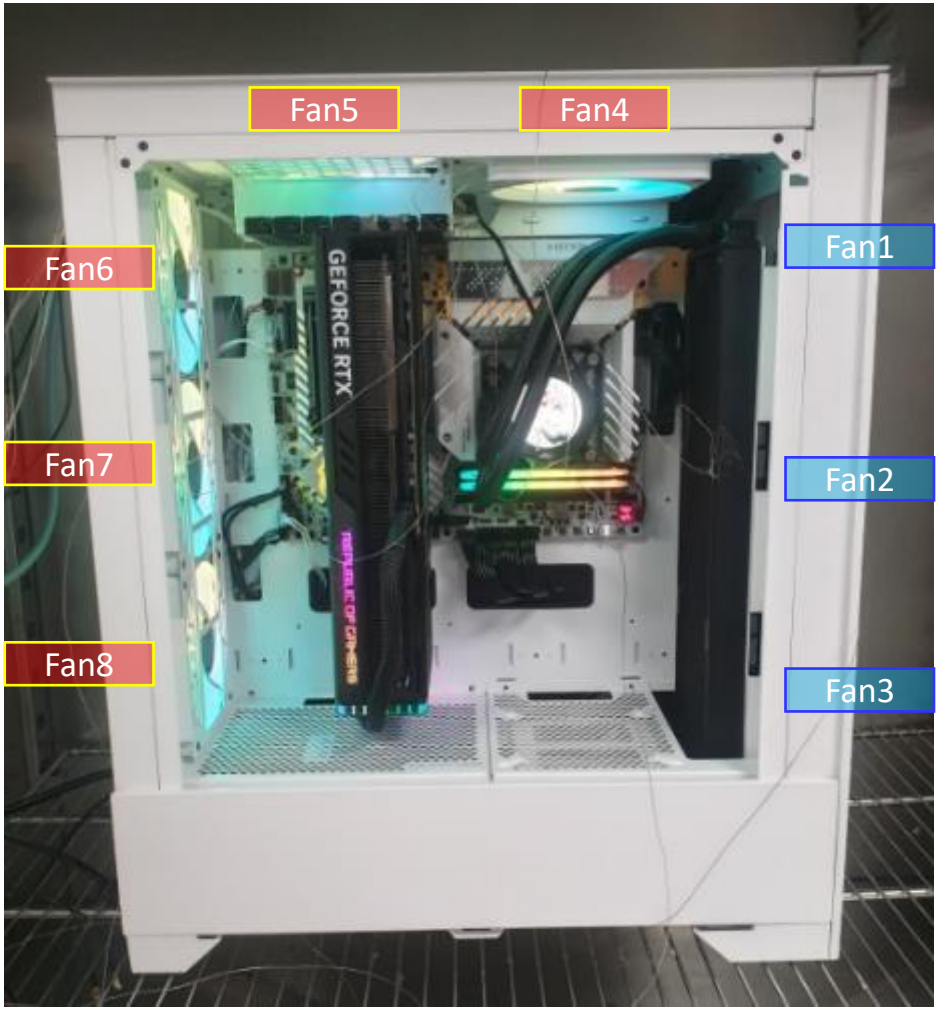
Temperature Data Acquisition

2. Chassis Hardware List

Component	Model
Chassis	CTE T500 Air Snow
Motherboard	ASUS ROG MAXIMUS Z790 APEX
CPU	Intel® Core™ i9-13900K Processor (TDP 253W)
GPU	ASUS ROG Strix GeForce RTX® 4090 OC 24GB GDDR6X
RAM	TOUGHRAM Z-ONE RGB D5 (16G x 2)
SSD	Seagate SSD 120G
PSU	Toughpower GF3 1200W - TT Premium Edition
CPU Cooler	TOUGHLIQUID Ultra 420 AIO Liquid Cooler
Fans	AIO:TOUGHFAN 140mm x 3 (2000rpm) Chassis: CT 140mm x 5 (1500 rpm) (Top x 2 , Rear x 3)
Software	1. AIDA64 Extreme 2. FurMark ROG Edition V0.8.14.0 3. CPU-Z Ver.2.015 x64 4. Core Temp V1.18
Full load	30 minutes
Camera	Testo 885-2 Thermal Imaging Camera

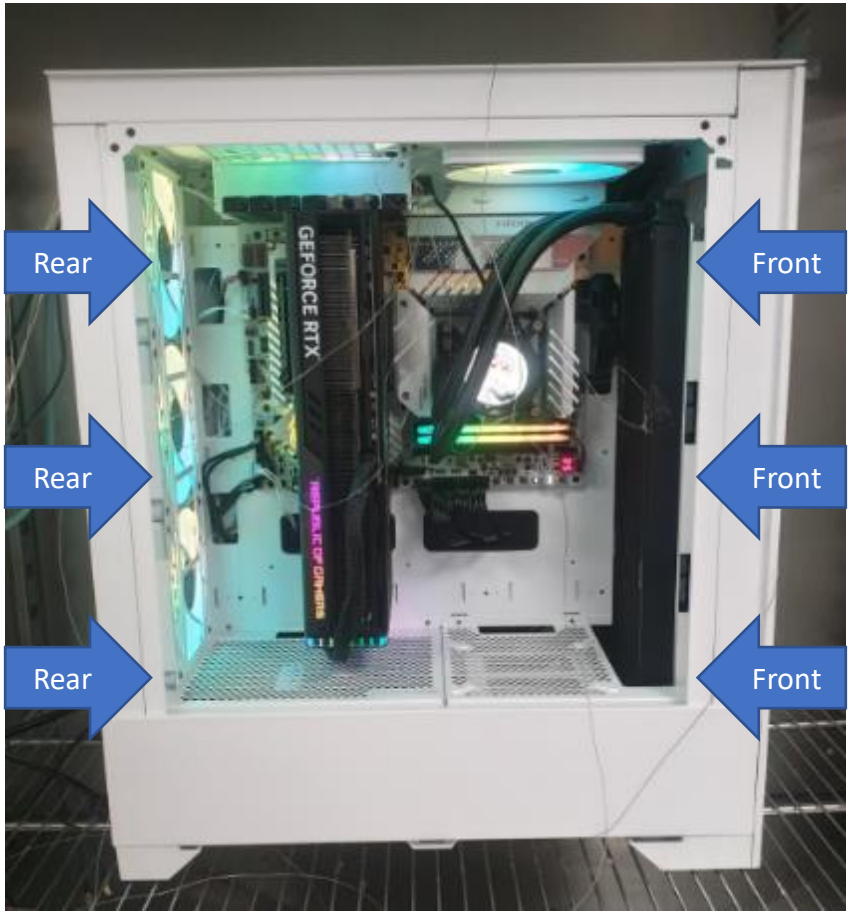
NO: RS202305260001

3. Chassis Fan Allocation



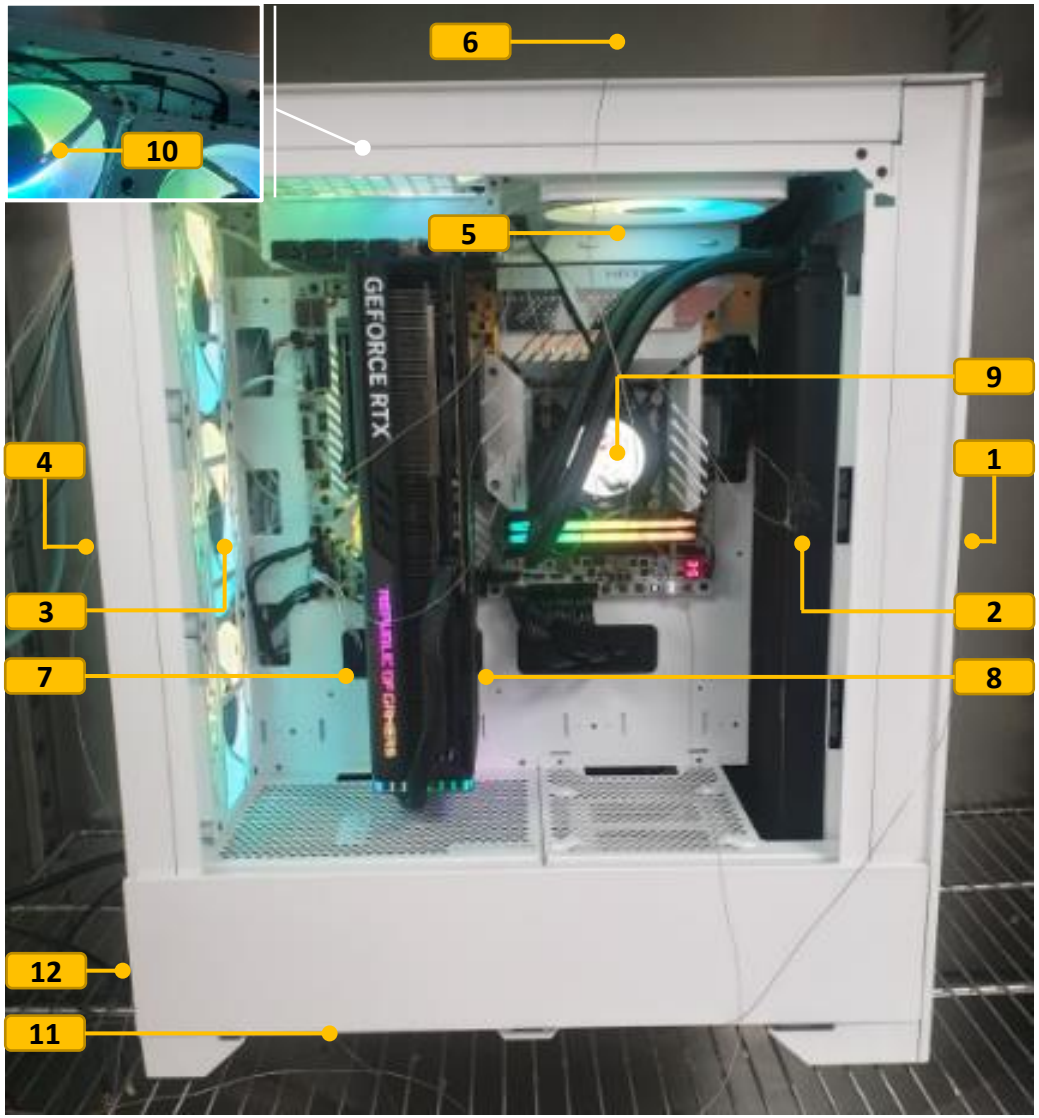
4. Chassis Thermal Airflow

Cool Airflow Inlets (Active)



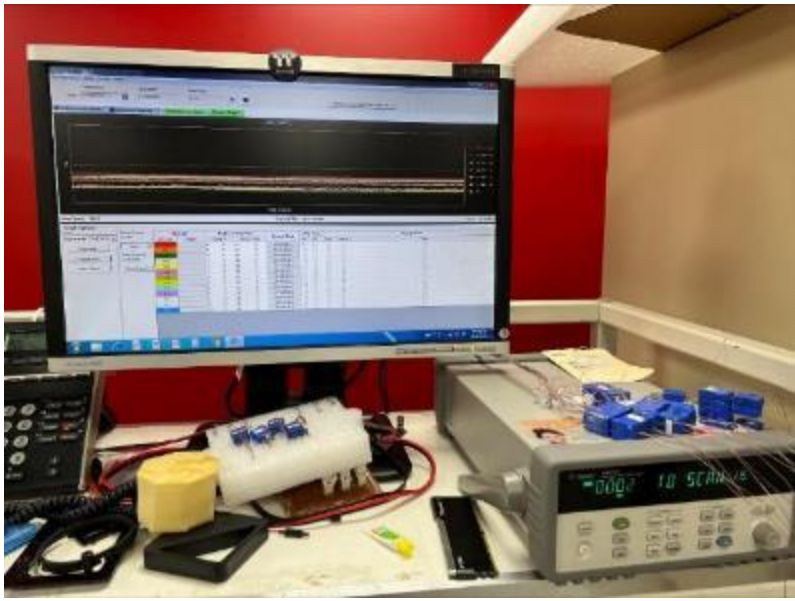
Hot Airflow Exhausts

5. Chassis Measured Points



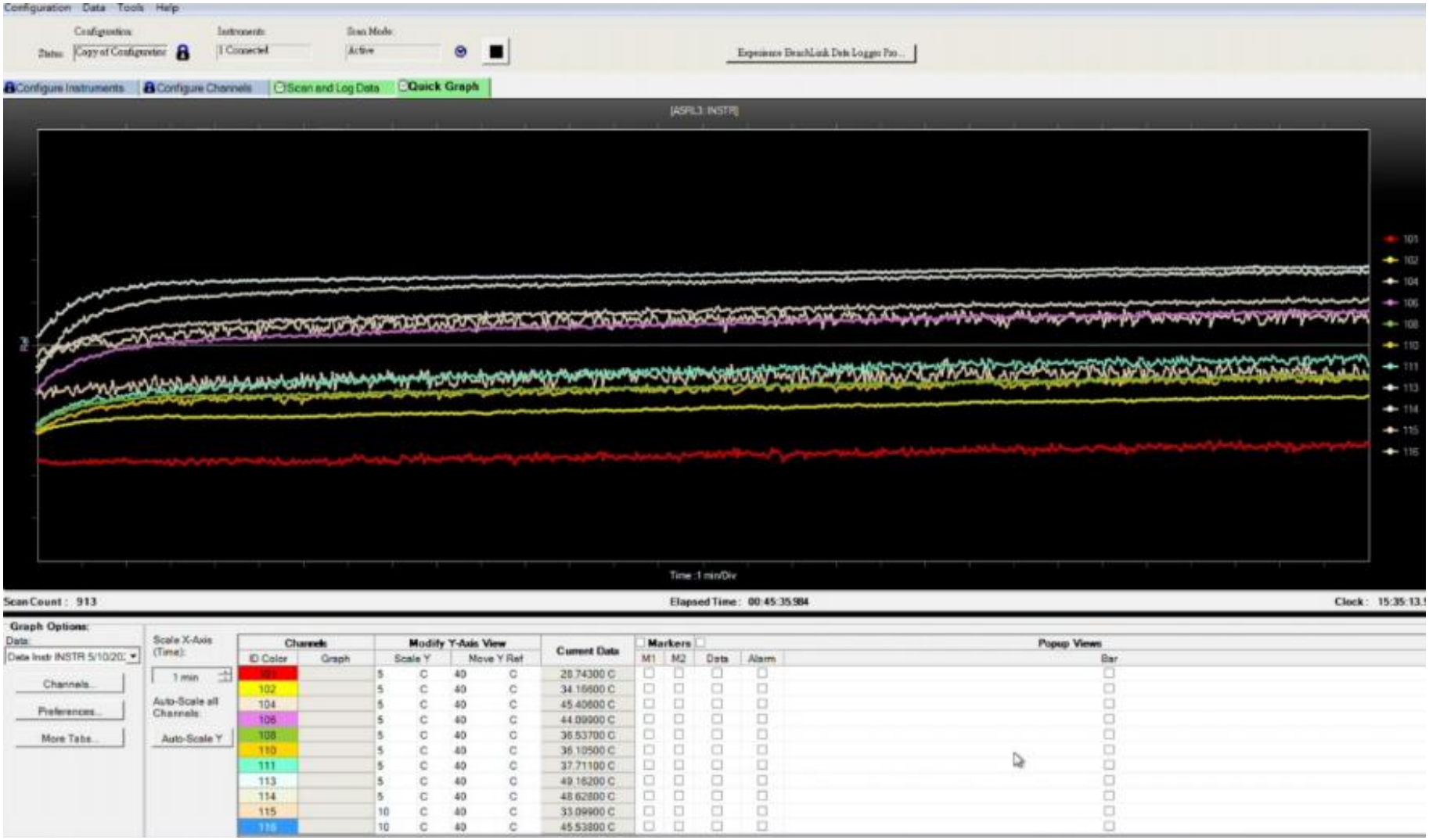
Measure Point	Description	Airflow	Thermocouple Number
1	Chassis Front External	Intake	101
2	Chassis Front Internal	Intake	102
3	Chassis Rear Internal	Intake	104
4	Chassis Rear External	Intake	106
5	Chassis Top Internal	Exhaust	108
6	Chassis Top External	Exhaust	110
7	GPU Left Fan	Intake	111
8	GPU Right	Exhaust	113
9	AIO Top Cover	-	114
10	VGA Right Slot	Exhaust	115
11	PSU Bottom	Intake	116
12	PSU Rear	Exhaust	117

6. Thermal Stress Test



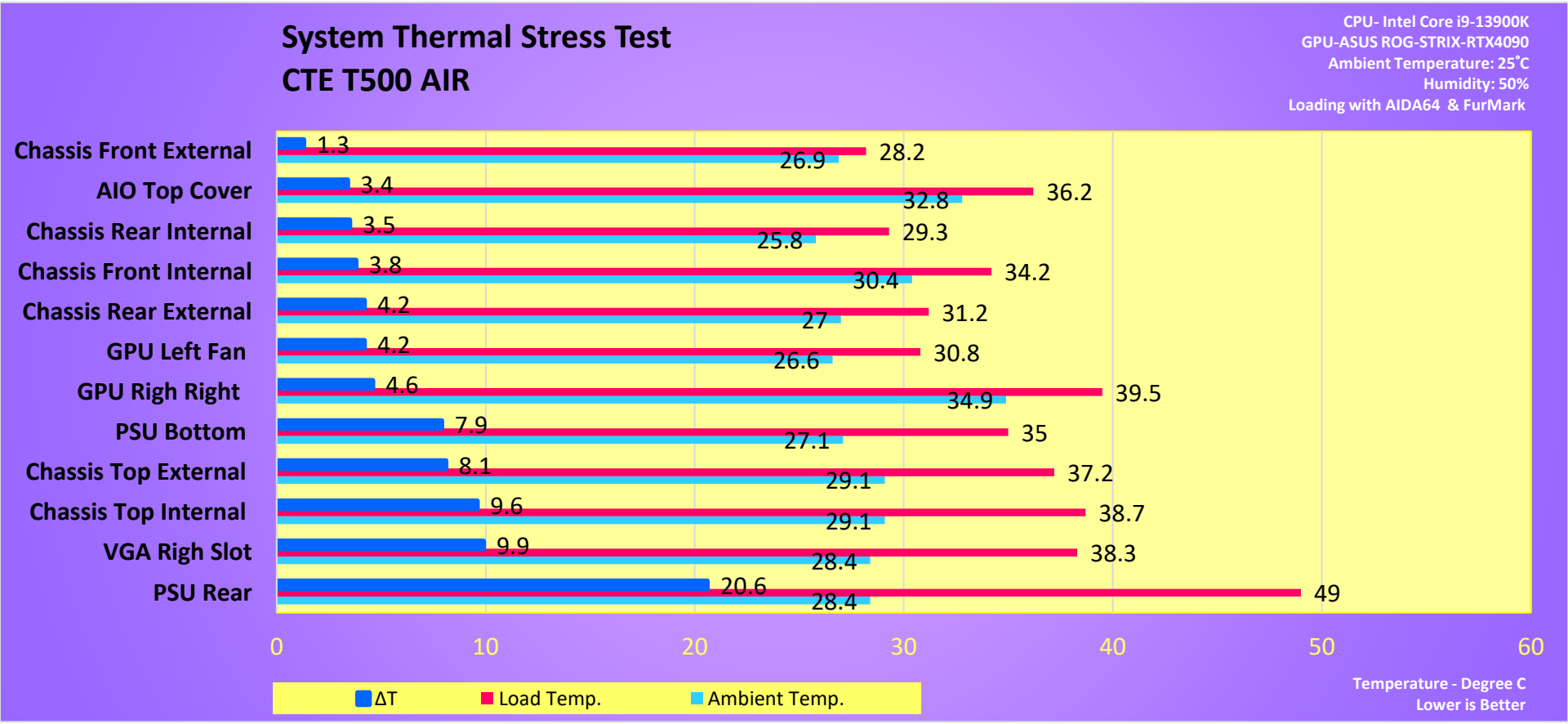
- Setting up the chamber temperature and humidity
- Temperature: 25°C
- Humidity: 50%
- Recording Data

6. Thermal Stress Test



Temperature Data Recoding

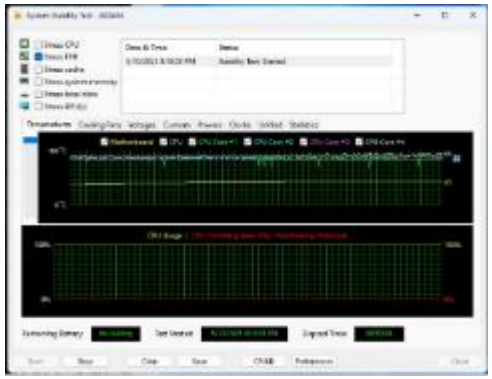
6. Thermal Stress Test



We expected to see higher temperature at the exhaust points and relatively lower temperature at the intake positions. The highest temperature was found at the AIO exhaust, which is reasonable given the CPU was running at full load. Most of the intake positions recorded a temperature lower than **40˚C** since they were drawing air from environment. Two critical positions we were looking at are **NO. 113 GPU Right Fan** and **NO. 114 AIO Cover**, which were drawing internal air to cool two of the most important components.

7. AIDA64 & FurMark Test

We used **AIDA64 Extreme** (stress FPU) and **FurMark ROG Edition (resolution: 3840 x 2160) to push 100% load** on the CPU and GPU for 30 minutes.



AIDA64 Extreme

FurMark

Date	5/18/2023
Time (HH:MM)	11:10 AM
CPU Clock	5500 MHz
Motherboard	Asus ROG Maximus Z790 Apex
BIOS Version	0812
Free Memory	26678 MB
GPU Clock	240 MHz
Motherboard	33°C
CPU	38°C
CPU Package	43°C
GPU Diode	41°C
GPU Hotspot	49°C
AIO Pump	3183 RPM
CPU	598 RPM
Chassis #3	734 RPM
GPU	0 RPM
GPU	0%
CPU Core	1.305 V
GPU Core	0.875 V
CPU Package	37.74 W
GPU	15.08 W
GPU TDP%	3%

Idle

Date	5/18/2023
Time (HH:MM)	11:42 AM
CPU Clock	5200 MHz
Motherboard	Asus ROG Maximus Z790 Apex
BIOS Version	0812
Free Memory	26416 MB
GPU Clock	2760 MHz
Motherboard	36°C
CPU	84°C
CPU Package	95°C
GPU Diode	82°C
GPU Hotspot	91°C
AIO Pump	3183 RPM
CPU	1965 RPM
Chassis #3	1644 RPM
GPU	2716 RPM
GPU	87%
CPU Core	1.199 V
GPU Core	0.995 V
CPU Package	253.97 W
GPU	486.56 W
GPU TDP%	97%

Full load

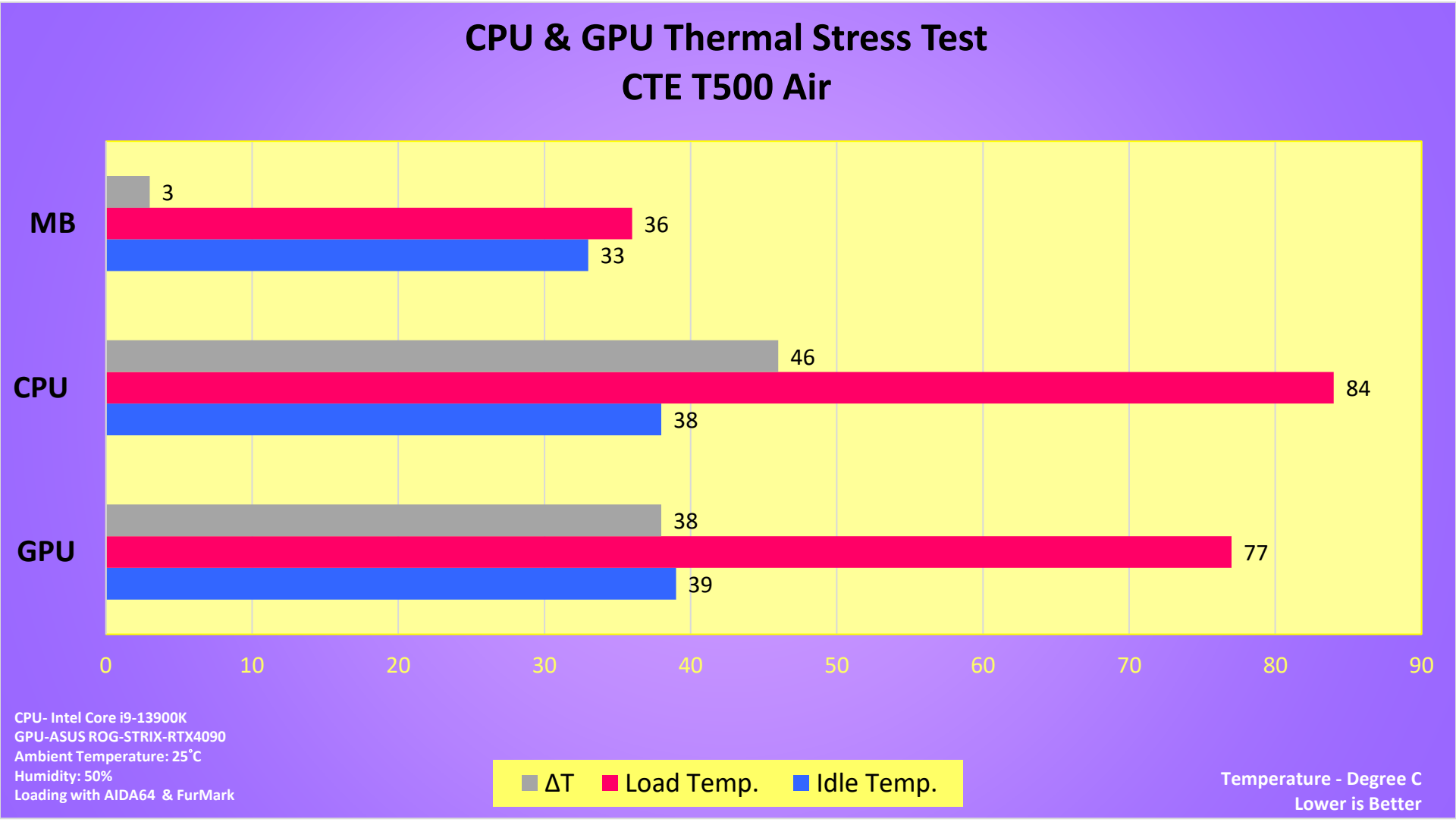
7. AIDA64 & FurMark Test

We used **AIDA64 Extreme** (stress FPU) and **FurMark ROG Edition (resolution: 3840 x 2160) to push 100% load** on the CPU and GPU for 30 minutes.

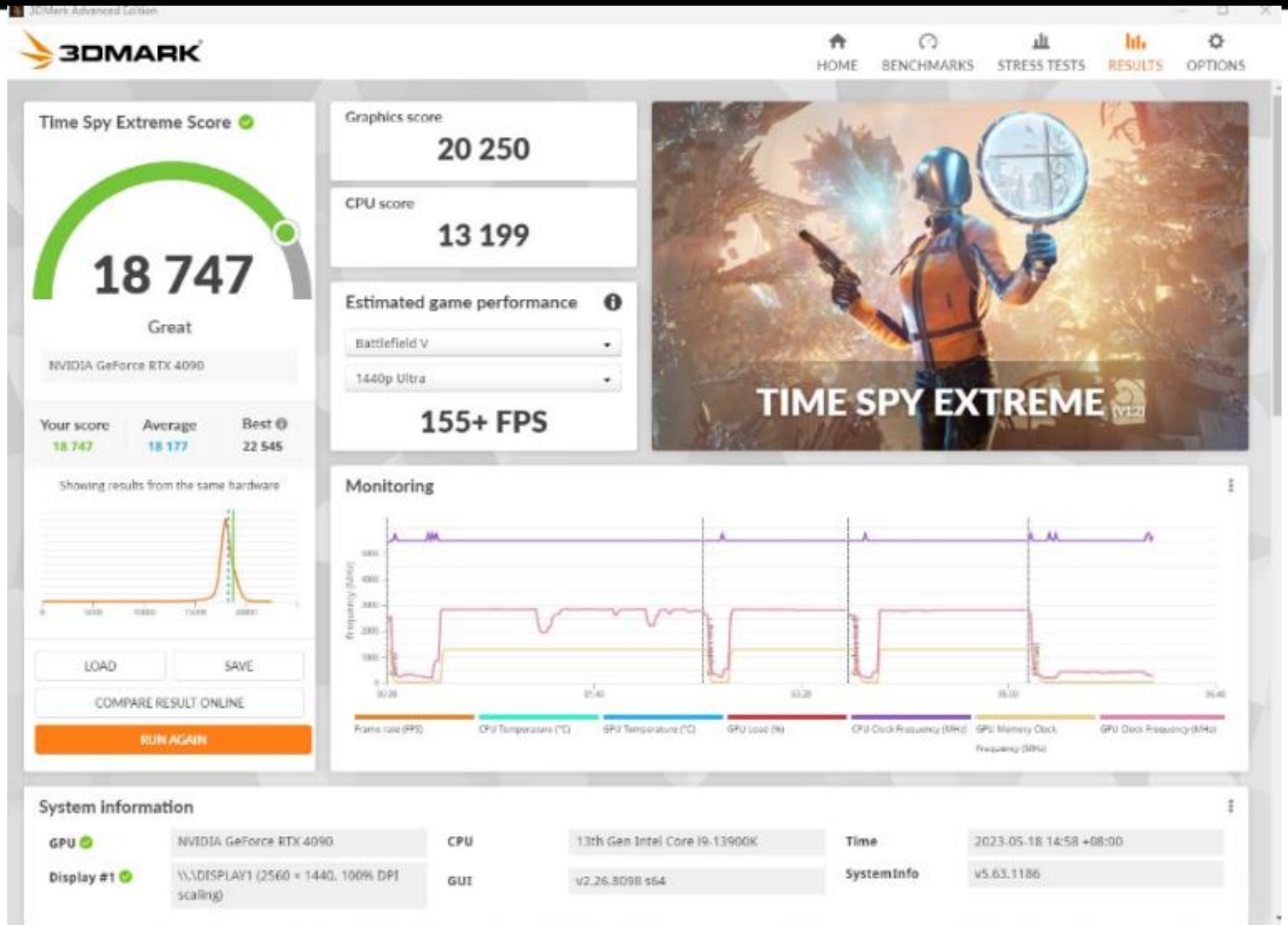
Idle

Full load

7. AIDA64 & FurMark Test

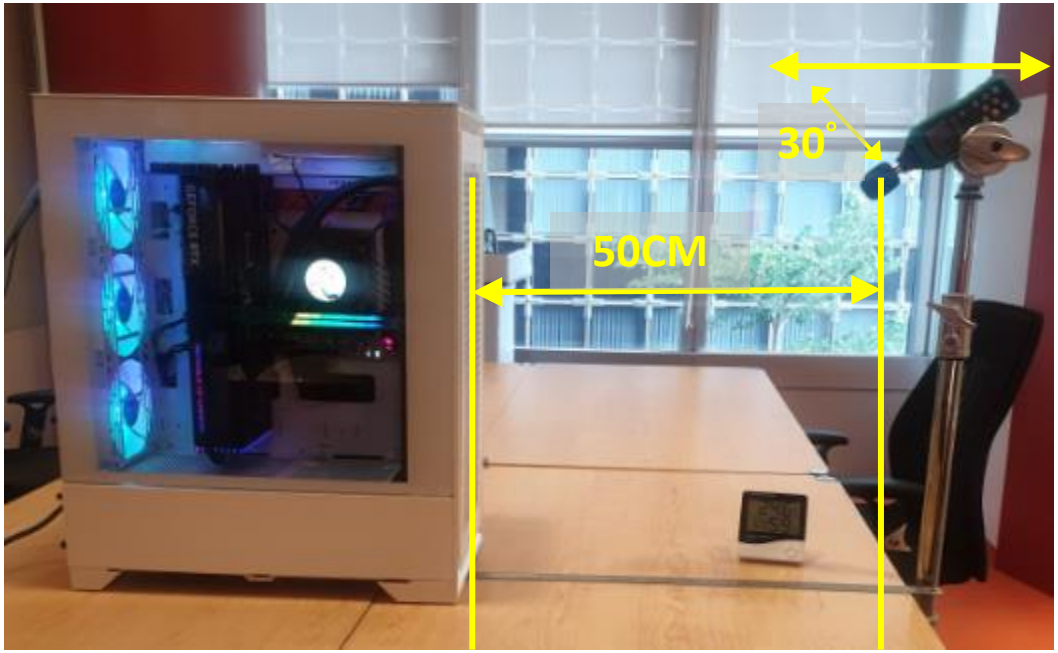


8. Graphics Performance Testing



9. Acoustic Sound Pressure Level Test

Test Environment：**Thermaltake Taipei Office**
Test Model: CTE T500 AIR
Test Ambience: **24.5 ℃(Temperature) / 60% R.H.(Relative Humidity)**
Microphone position: **50 cm / in front of PC system**
Background Noise：**35.9 dBA.**



Microphone position

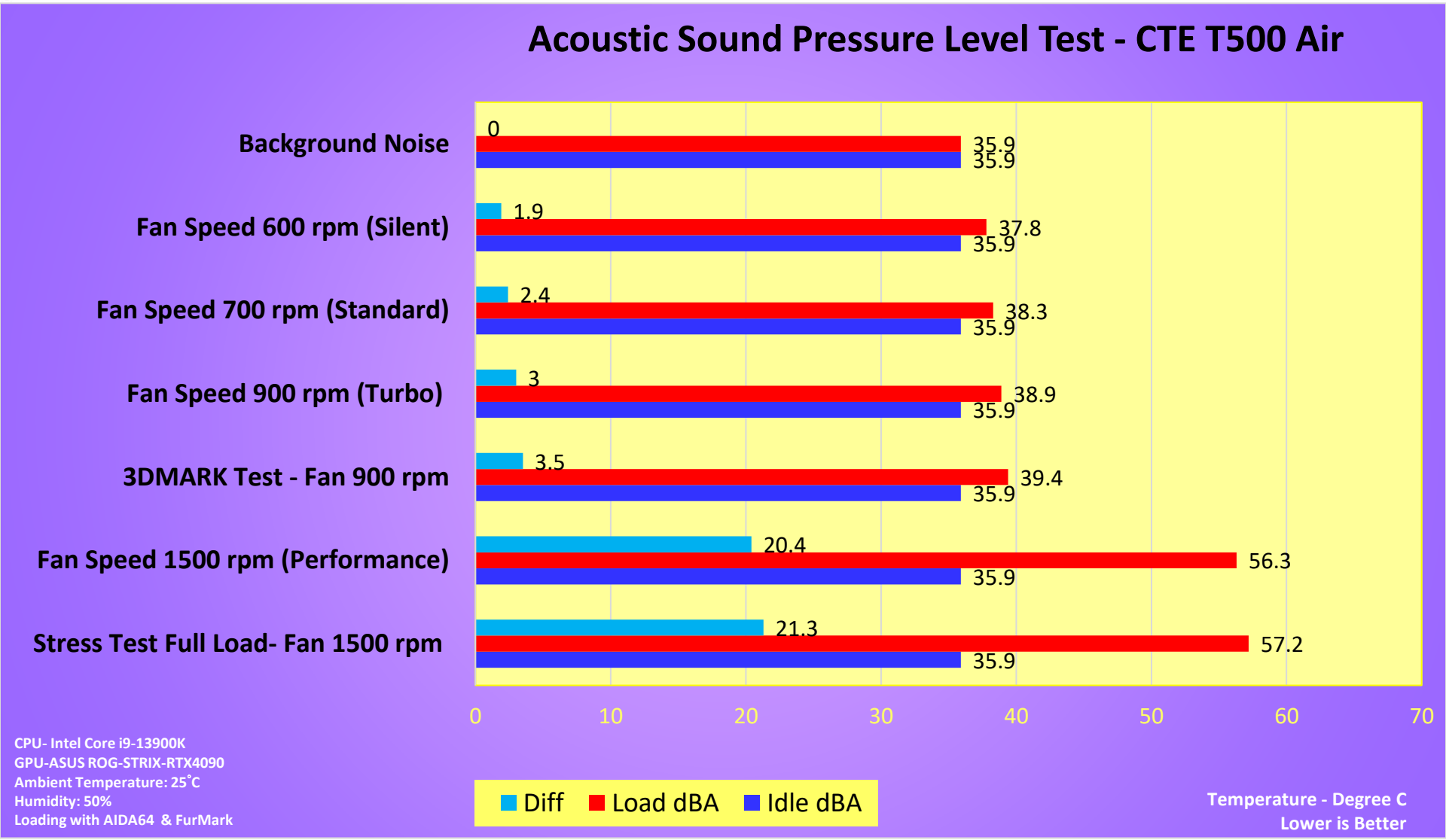
Test Ambience

9. Acoustic Sound Pressure Level Test

Fan Speed 600rpm – **37.8dBA**	Fan Speed 700rpm – **38.3dBA**	Fan Speed 900rpm – **38.9dBA**	Fan Speed 1500rpm – **56.3dBA**

Date	5/22/2023	5/22/2023	5/22/2023
Time (HH:MM)	2:44 PM	2:51 PM	3:02 PM	3:07 PM
CPU Clock	5500 MHz	5500 MHz	5500 MHz	5500 MHz
Motherboard	Asus ROG Maximus Z790 Apex	Asus ROG Maximus Z790 Apex	Asus ROG Maximus Z790 Apex	Asus ROG Maximus Z790 Apex
BIOS Version	0812	0812	0812	0812
Free Memory	27338 MB	27501 MB	27318 MB	27487 MB
GPU Clock	210 MHz	210 MHz	210 MHz	210 MHz
Motherboard	32°C	32°C	32°C	31°C
CPU	37°C	30°C	35°C	31°C
CPU Package	41°C	39°C	39°C	38°C
GPU Diode	40°C	42°C	40°C	38°C
GPU Hotspot	48°C	50°C	48°C	46°C
AIO Pump	3183 RPM	3176 RPM	3199 RPM	3169 RPM
CPU	476 RPM	487 RPM	821 RPM	3192 RPM
Chassis #3	608 RPM	699 RPM	916 RPM	1624 RPM
GPU	0 RPM	0 RPM	0 RPM	0 RPM
GPU	0%	0%	0%	0%
CPU Core	1.296 V	1.332 V	1.305 V	1.305 V
GPU Core	0.875 V	0.875 V	0.875 V	0.875 V
CPU Package	31.99 W	24.77 W	29.23 W	29.55 W
GPU	11.39 W	13.16 W	12.65 W	12.09 W
GPU TDP%	2%	3%	3%	2%

9. Acoustic Sound Pressure Level Test



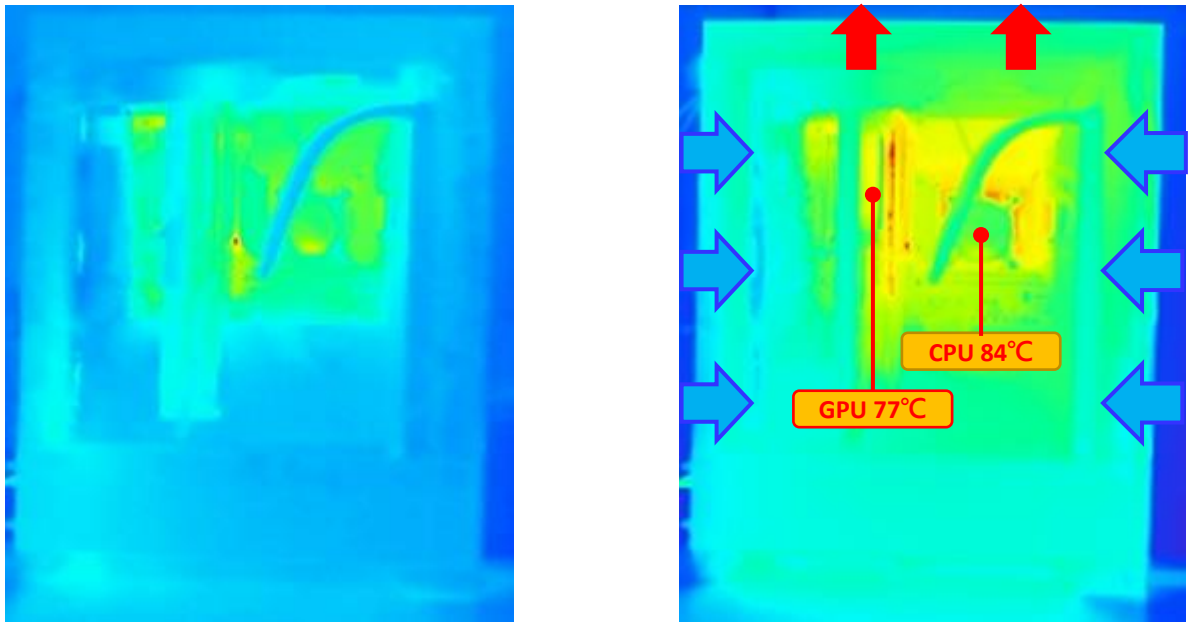
CPU- Intel Core i9-13900K
GPU-ASUS ROG-STRIX-RTX4090
Ambient Temperature: 25˚C
Humidity: 50%
Loading with AIDA64 & FurMark

C. Conclusion

Idle

Left View

Full Load



AIDA64 Extreme (stress FPU) and **FurMark ROG Edition** (**resolution: 3840 x 2160) to push 100% load** on the CPU and GPU for 30 minutes**.**

-INTEL i9 13900K / CPU Temp. (Max)：84℃ (TDP 253W)

-ASUS ROG Strix GeForce RTX® 4090 OC / GPU Temp. (Max)：77℃

Through the thermal image, we found that the internal heat was effectively directed to designated exhaustion vents, keeping the system operating at a cooler temperature. This finding validates how efficient The CTE T500 Air is regarding cooling performance.

thermaltake

Thank you!