System Thermal Test Report

Model: **The Tower 500**

Version: **20220517A**

NO:RS202205090001

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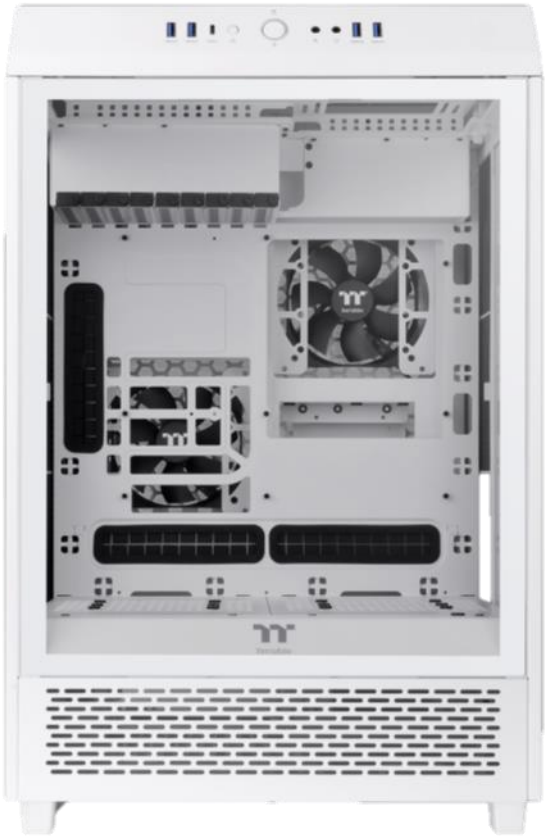
1. Objective



Our objective is to find out if the Tower 500 can efficiently extract the heat generated by the latest components, so we built a system with an Intel i9-12900K and a GIGABYTE AORUS GeForce RTX™ 3090 XTREME and put it to the test. The passing criteria we set was to keep the internal temperature under 45°C while the system is running at Full load, with two pre-installed fans and a AIO 360 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

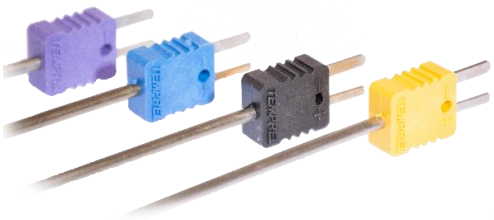
Testing steps:

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

1. Laboratory Equipment
2. Chassis Hardware List
3. Chassis Fan Allocation
4. Chassis Thermal Airflow
5. Chassis Measured Points
6. Thermal Stress Test
7. AIDA64 & FurMark Test
8. Graphics Performance Testing
9. Acoustic Test

1. Laboratory Equipment



Thermocouple

Sound Level Meter

Thermal Imaging Camera

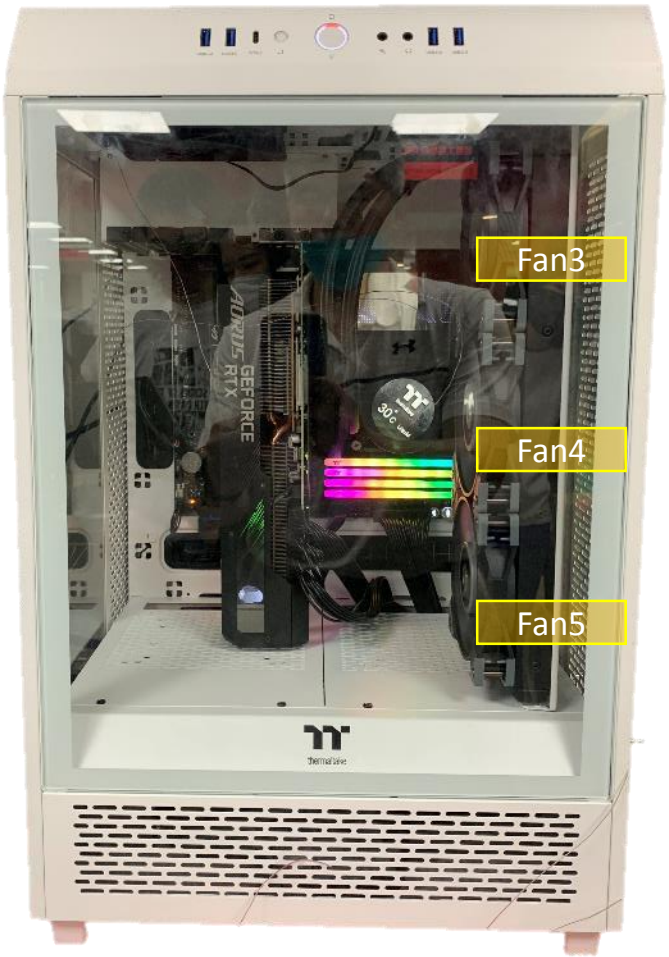
Temperature Data Acquisition

Temperature & Humidity Chamber

2. Chassis Hardware List

Component	Model
Chassis	The Tower 500 Snow
Motherboard	ASUS ROG MAXIMUS Z690 HERO
CPU	Intel Core i9-12900K(TDP 125W/OC 241W)
GPU	GIGABYTE AORUS GeForce RTX™ 3090 XTREME
RAM	TOUGHRAM Z-ONE RGB DDR5 64G (16G x 4)
SSD	Plextor PX-128M6V
PSU	Toughpower TF1 1550W - TT Premium Edition
CPU Cooler	TOUGHLIQUID Ultra 360 All-In-One Liquid Cooler
Fans	AIO: TOUGHFAN Turbo 120mm x 3 Chassis: Standard Fan x 2 (Rear)
Software	1. AIDA64 Extreme 2. FurMark ROG Edition V0.8.10.0 3. CPU-Z Ver.1.97.0 x64 4. Core Temp V1.17.1
Full load	30 minutes
Camera	Testo 885-2 Thermal Imaging Camera

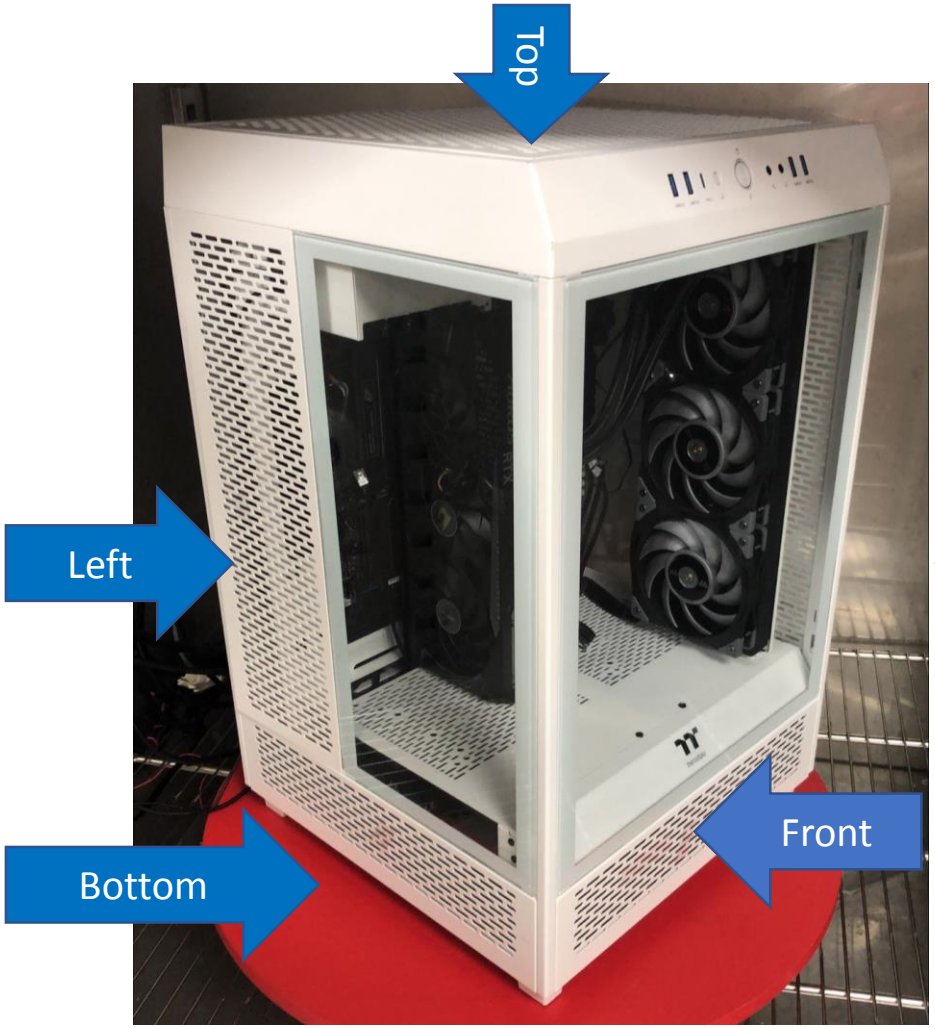
3. Chassis Fan Allocation

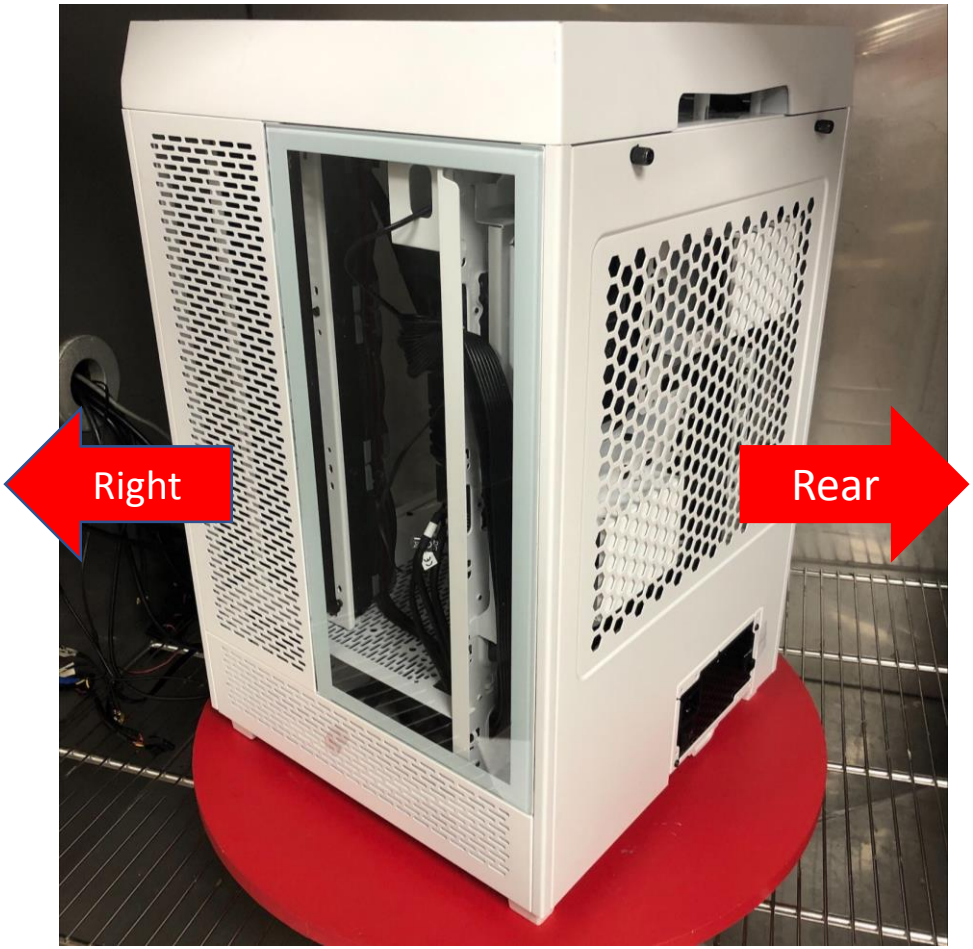


4. Chassis Thermal Airflow

Cool Airflow Inlets

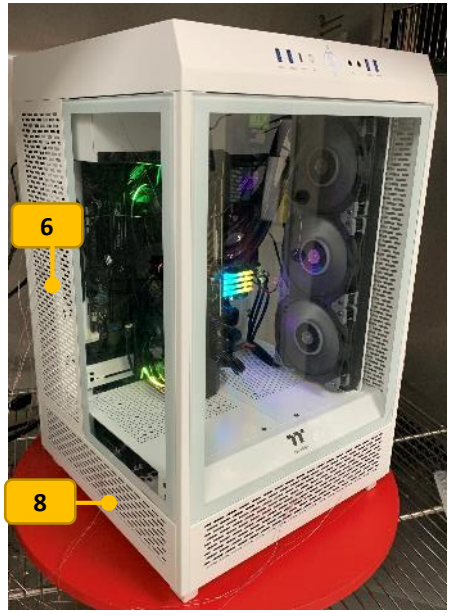
Hot Airflow Exhausts

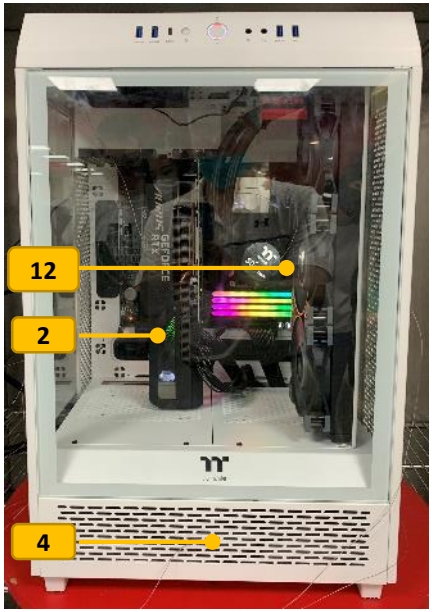


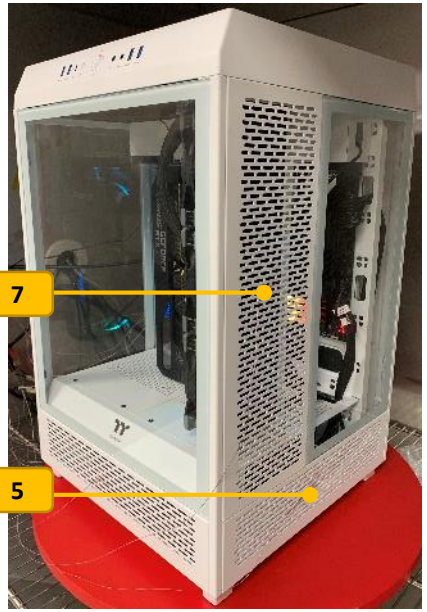


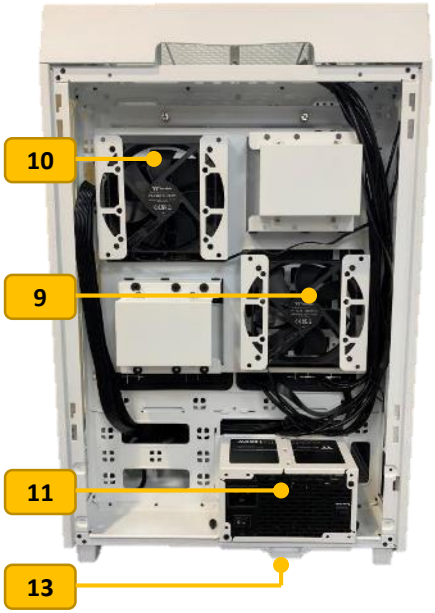
5. Chassis Measured Points

Measure Point	Description	Thermocouple Number
1	Chassis Top Fan (None)	101
2	**VGA Fan (Intake)**	102
3	VGA Rear Slot (Exhaust)	103
4	Chassis Front (Intake)	104
5	Chassis Right (Intake)	105
6	Chassis Left (Intake)	106
7	Chassis Middle-Right (Exhaust)	108
8	Chassis Middle-Left (Intake)	110
9	Chassis Rear VGA Fan (Exhaust)	111
10	Chassis Rear CPU Fan (Exhaust)	112
11	PSU Rear (Exhaust)	113
12	**AIO Fan (Intake)**	114
13	Chassis Bottom (Intake)	115

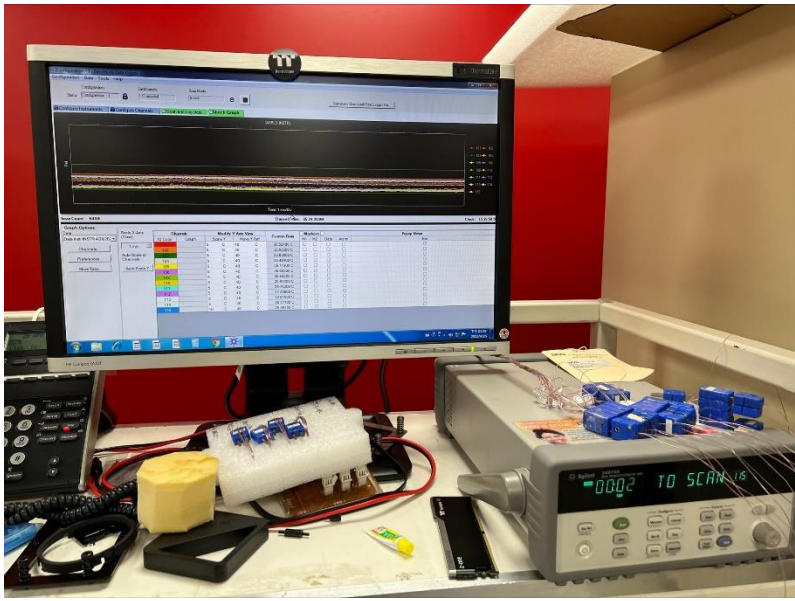








6. Thermal Stress Test



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

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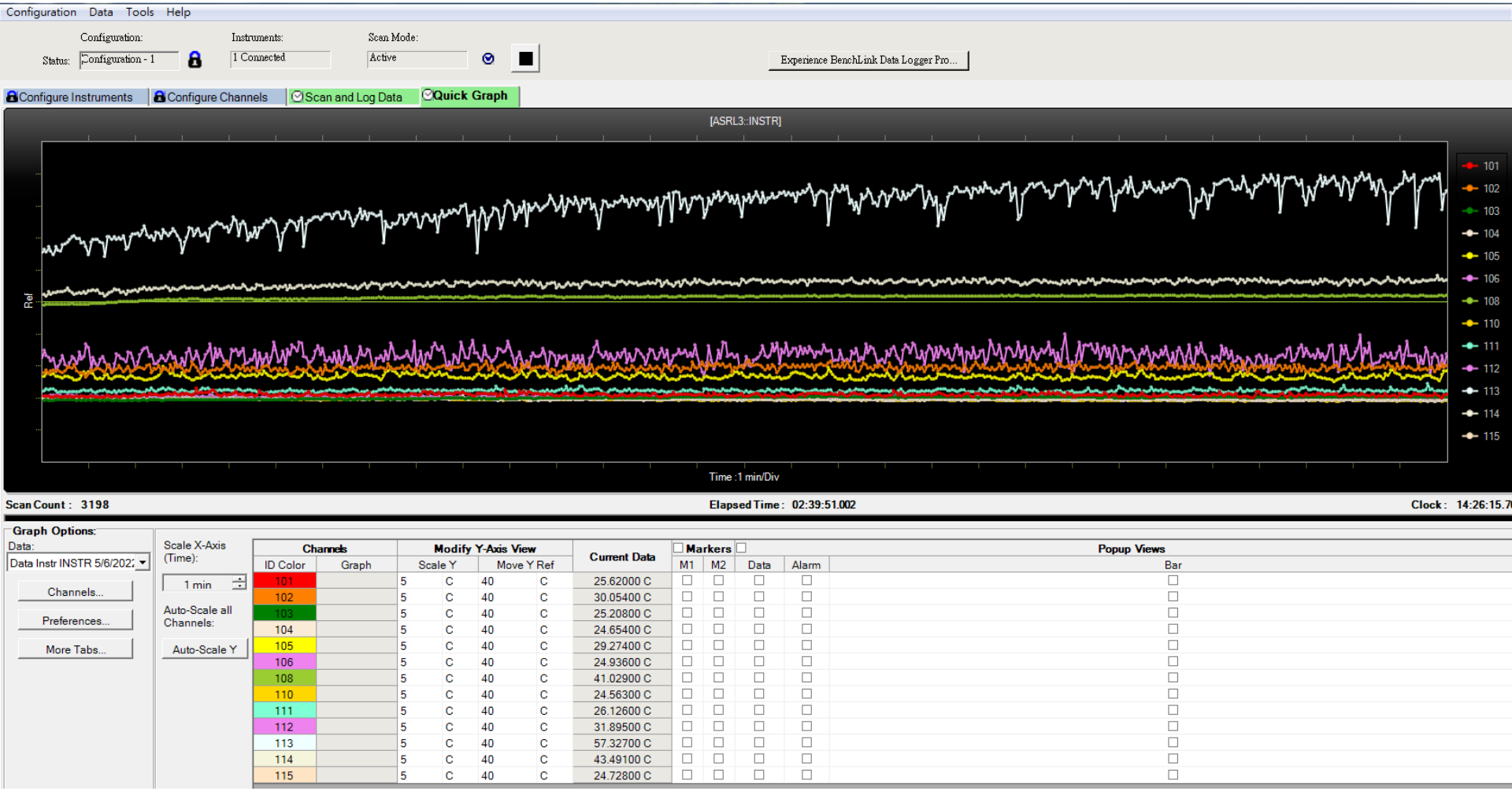
6. Thermal Stress Test



Channels		Modify Y-Axis View				Current Data	Markers				Popup Views
ID Color	Graph	Scale Y		Move Y Ref			M1	M2	Data	Alarm	Bar
101		5	C	40	C	25.62000 C					
102		5	C	40	C	30.05400 C					
103		5	C	40	C	25.20800 C					
104		5	C	40	C	24.65400 C					
105		5	C	40	C	29.27400 C					
106		5	C	40	C	24.93600 C					
108		5	C	40	C	41.02900 C					
110		5	C	40	C	24.56300 C					
111		5	C	40	C	26.12600 C					
112		5	C	40	C	31.89500 C					
113		5	C	40	C	57.32700 C					
114		5	C	40	C	43.49100 C					
115		5	C	40	C	24.72800 C					

Temperature Data Recoding

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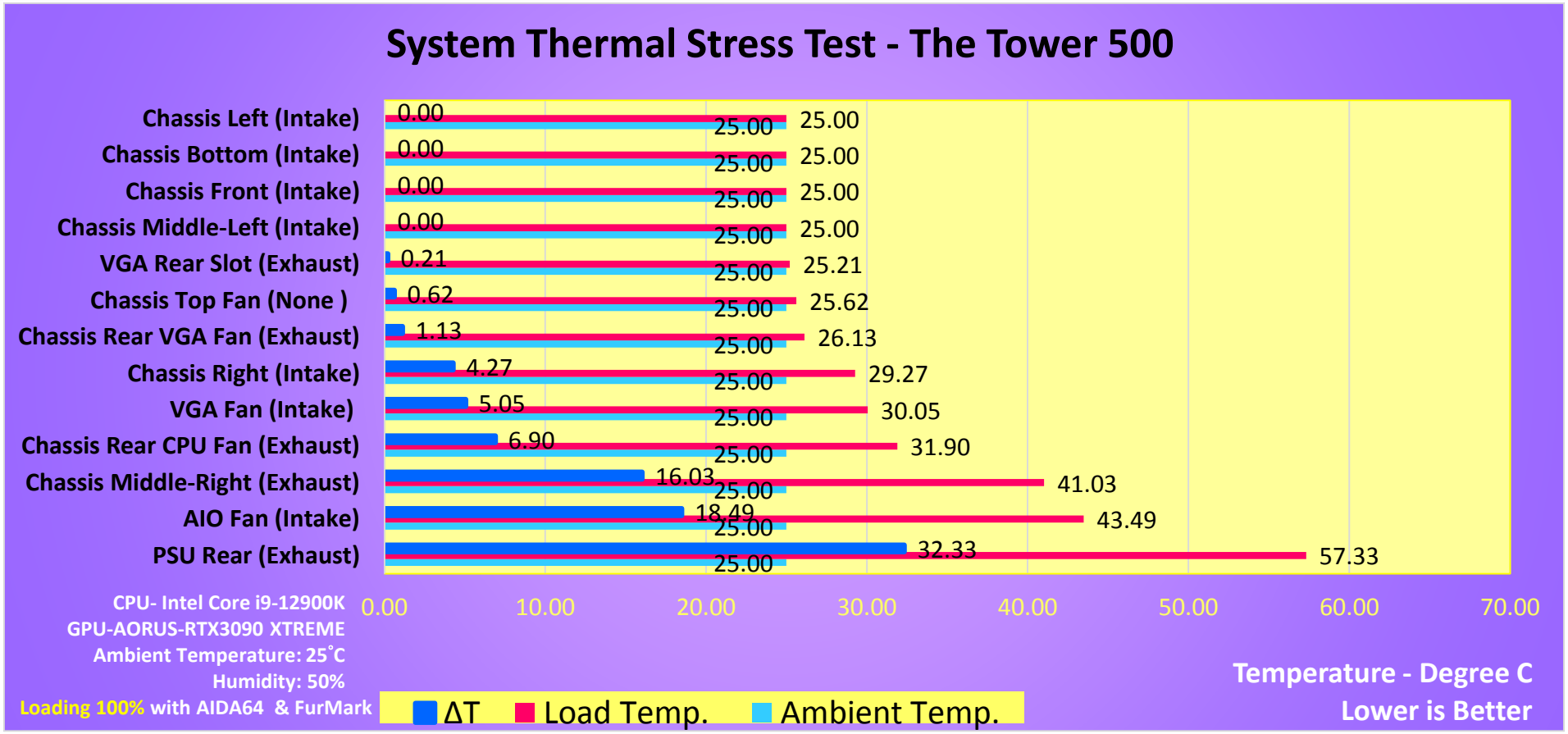
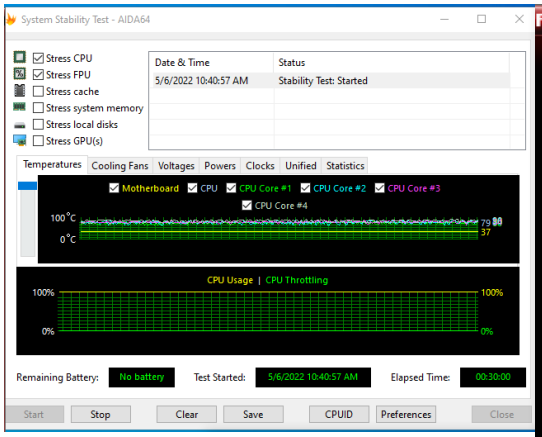
6. Thermal Stress Test

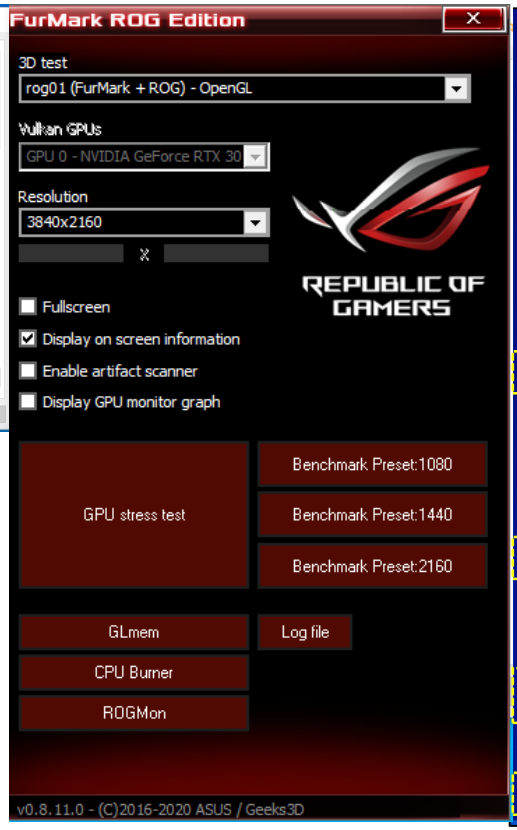


We expected to see higher temperature at the exhaust points and relatively lower temperature at the intake positions. The highest temperature was found at the AIO exhaust, which is reasonable given the CPU was running at full load. Most of the intake positions recorded a temperature lower than 30°C since they were drawing air from environment. Two critical positions we were looking at are **NO. 102 VGA Fan** and **NO. 114 AIO Fan**, which were drawing internal air to cool two of the most important components.

7. AIDA64 & FurMark Test

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





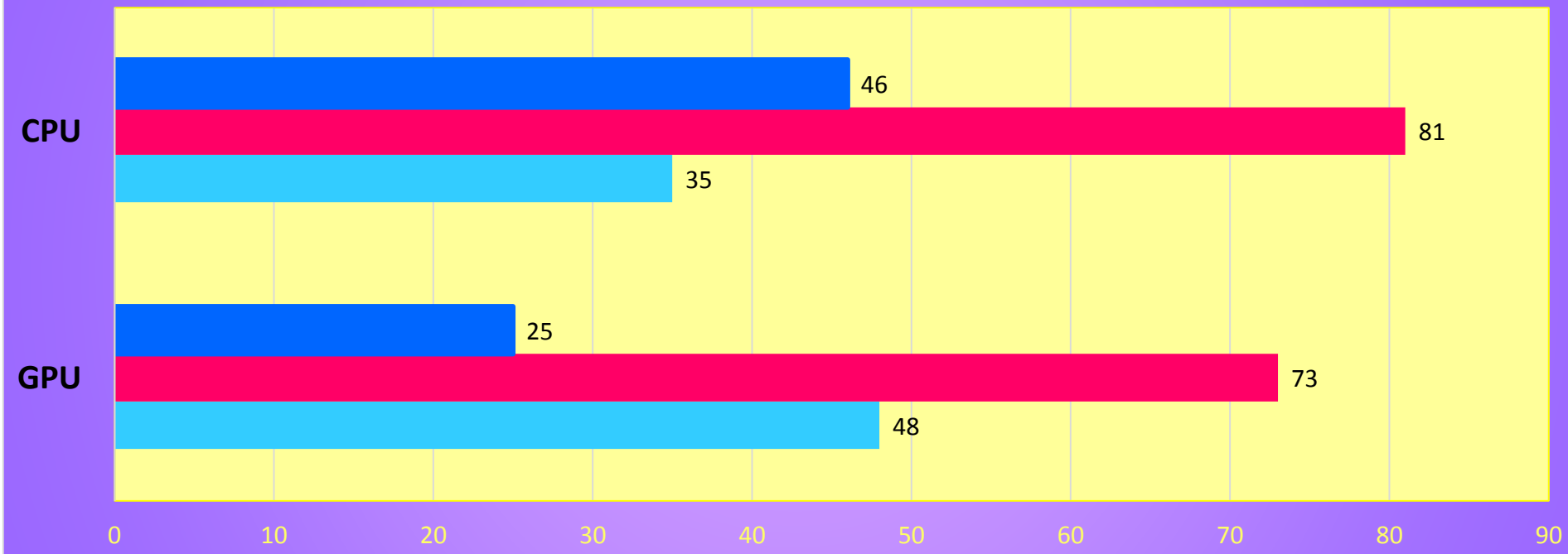
Date	5/6/2022	Date	5/6/2022
Time (HH:MM)	11:20 AM	Time (HH:MM)	11:10 AM
UpTime (HH:MM)	00:46	UpTime (HH:MM)	00:37
CPU Clock	5001 MHz	CPU Clock	4900 MHz
Free Memory	61375 MB	Free Memory	61089 MB
GPU Clock	210 MHz	GPU Clock	1440 MHz
Motherboard	33°C	Motherboard	37°C
CPU	35°C	CPU	81°C
CPU Package	33°C	CPU Package	92°C
CPU IA Cores	33°C	CPU IA Cores	92°C
CPU GT Cores	28°C	CPU GT Cores	50°C
GPU	48°C	GPU	73°C
GPU Hotspot	59°C	GPU Hotspot	85°C
CPU	2450 RPM	CPU	2463 RPM
CPU Package	26.67 W	CPU Package	219.81 W
CPU GT Cores	6.56 W	CPU GT Cores	9.08 W
GPU TDP%	9%	GPU TDP%	100%

AIDA64 Extreme | FurMark | Idle | Full load

7. AIDA64 & FurMark Test

CPU & GPU Thermal Stress Test

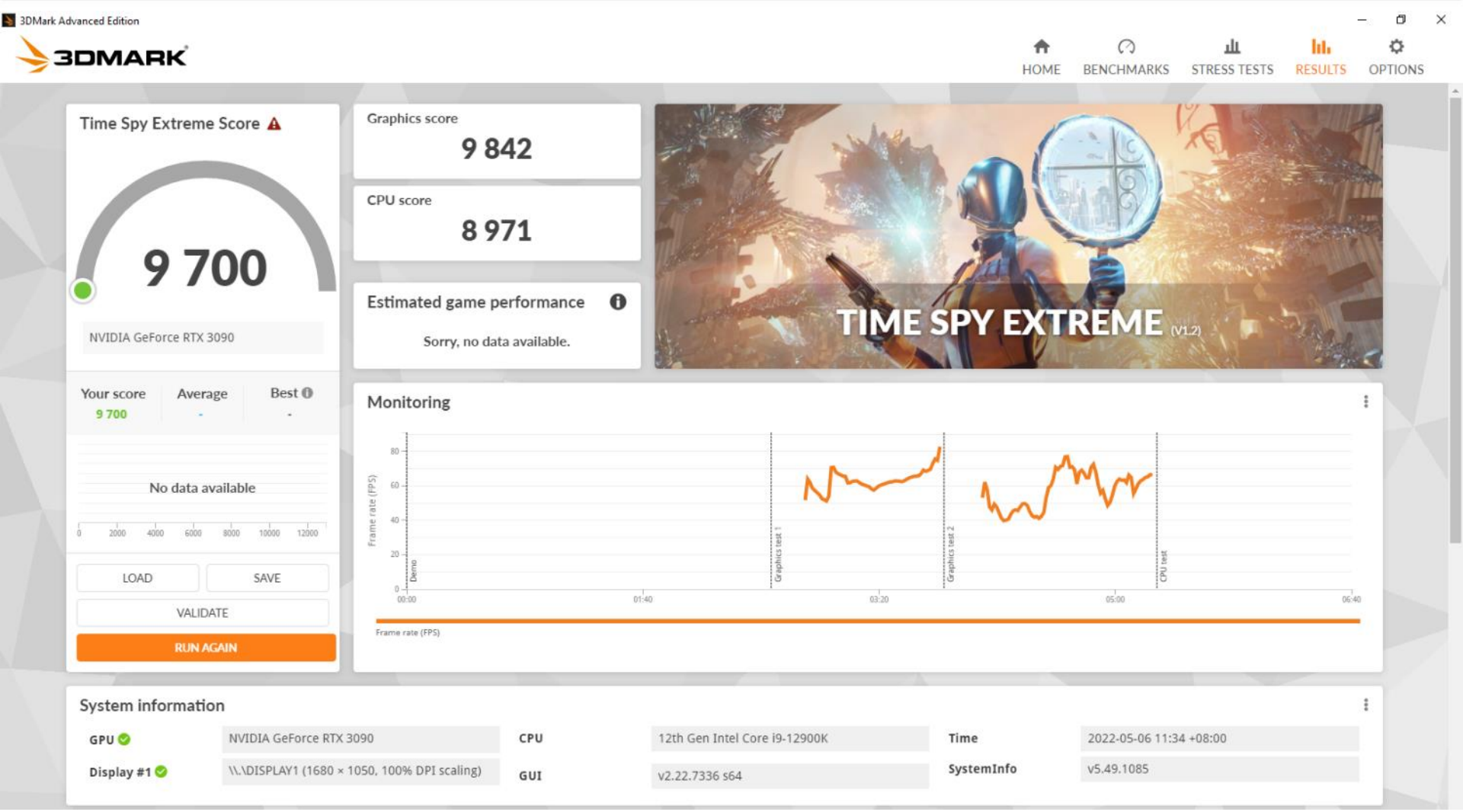
The Tower 500



CPU- Intel Core i9-12900K
GPU-AORUS-RTX3090 XTREME
Ambient Temperature: 25˚C
Humidity: 50%
Loading with AIDA64 & FurMark

Temperature - Degree C
Lower is Better

8. Graphics Performance Testing



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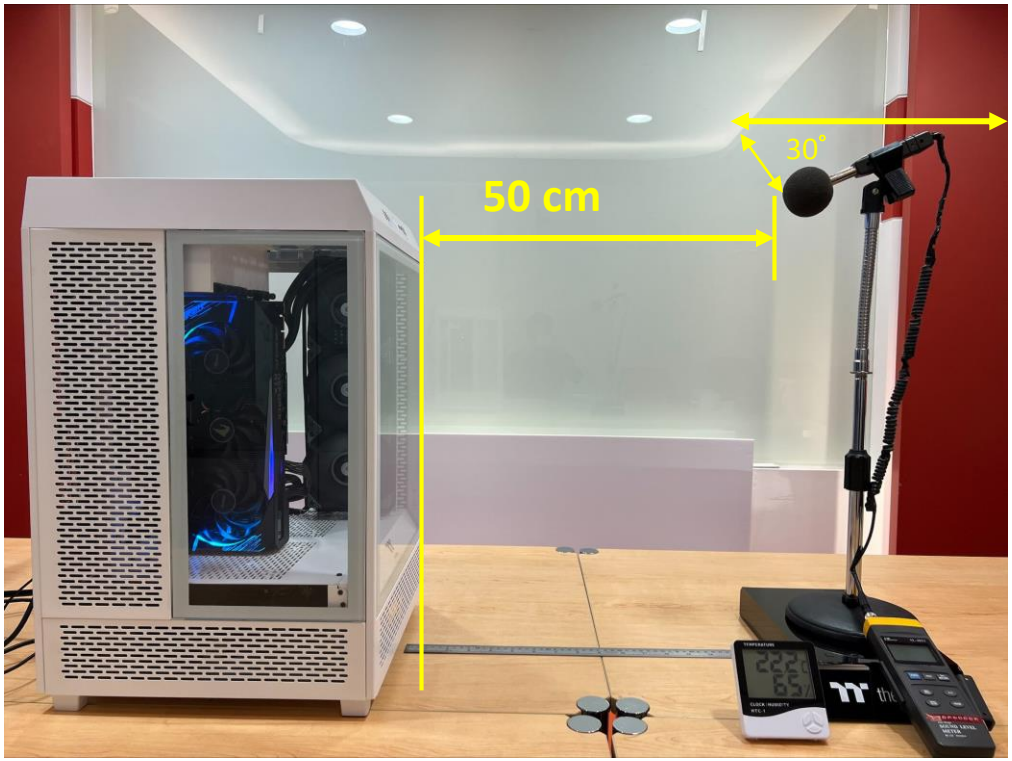
9. Acoustic Sound Pressure Level Test

Test Environment：Thermaltake Taipei Office
Test Model: The Tower 500
Test Ambience: 21.7 ℃(Temperature) / 69% R.H.(Relative Humidity)
Microphone position: 50 cm / in front of PC system
Background Noise：**37.7 dBA**.



Microphone position

Test Ambience

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9. Acoustic Sound Pressure Level Test

Idle – **38.6dBA**

Date	5/17/2022
UpTime	00:01:11
CPU Clock	5000 MHz
CPU	36°C
CPU Package	34°C
CPU IA Cores	52°C
CPU Core	1.225 V
CPU Package	23.31 W
CPU	890 RPM
Chassis #1	1331 RPM
AIO Pump	2922 RPM
GPU	58°C
GPU Hotspot	69°C
GPU Memory	64°C
GPU Core	0.000 V
GPU	23.19 W
GPU	0 RPM

3DMARK Loading - **41dBA**

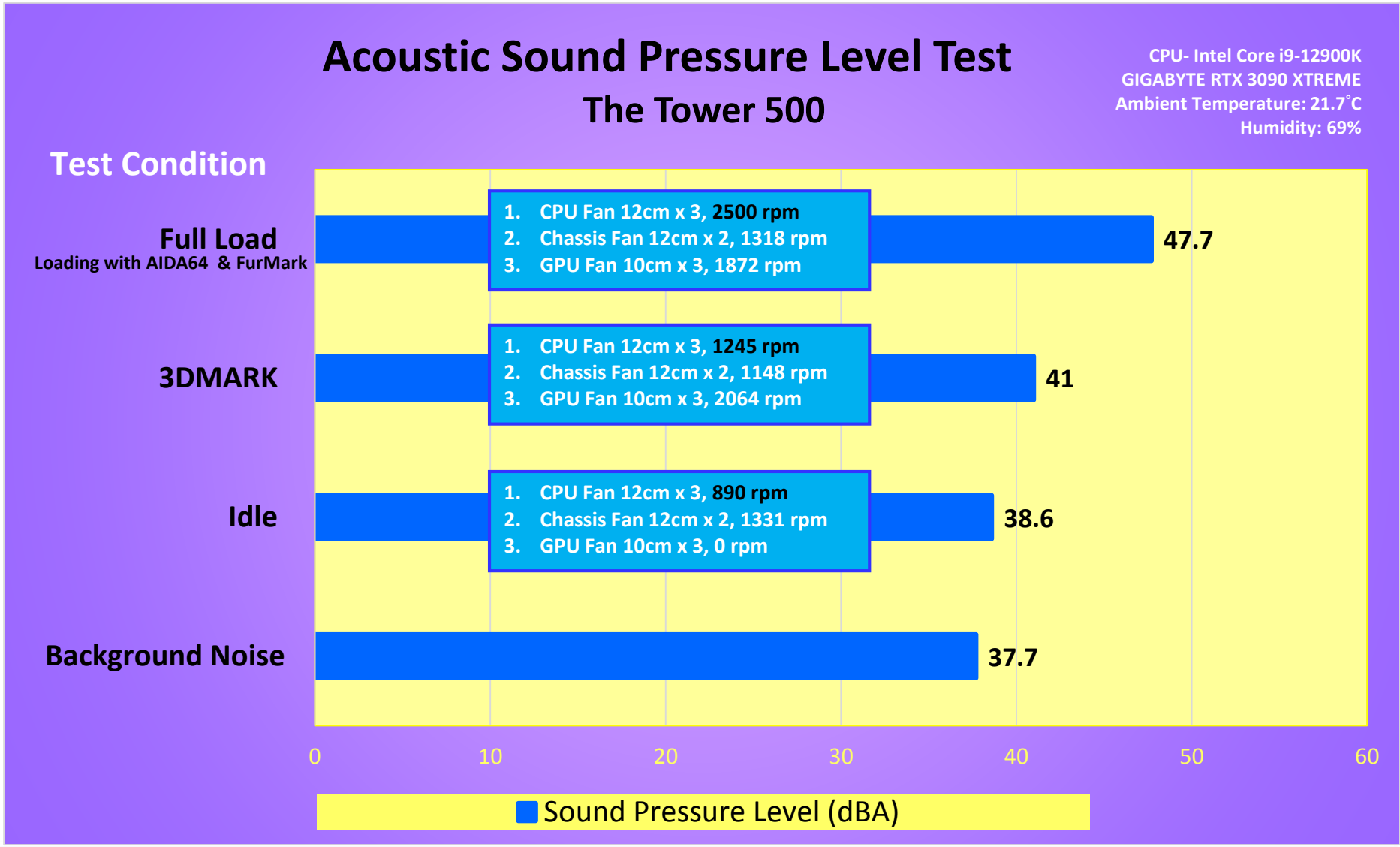
Date	5/17/2022
UpTime	00:04:46
CPU Clock	4900 MHz
CPU	50°C
CPU Package	61°C
CPU IA Cores	63°C
CPU Core	1.217 V
CPU Package	102.08 W
CPU	1245 RPM
Chassis #1	1148 RPM
AIO Pump	3268 RPM
GPU	77°C
GPU Hotspot	90°C
GPU Memory	96°C
GPU Core	1.025 V
GPU	373.94 W
GPU	2064 RPM

Full load - **47.7dBA**

Loading with AIDA64 & FurMark

Date	5/17/2022
UpTime	00:03:38
CPU Clock	4800 MHz
CPU	74°C
CPU Package	85°C
CPU IA Cores	86°C
CPU Core	1.021 V
CPU Package	228.68 W
CPU	2500 RPM
Chassis #1	1318 RPM
AIO Pump	3276 RPM
GPU	75°C
GPU Hotspot	86°C
GPU Memory	88°C
GPU Core	0.838 V
GPU	374.19 W
GPU	1872 RPM

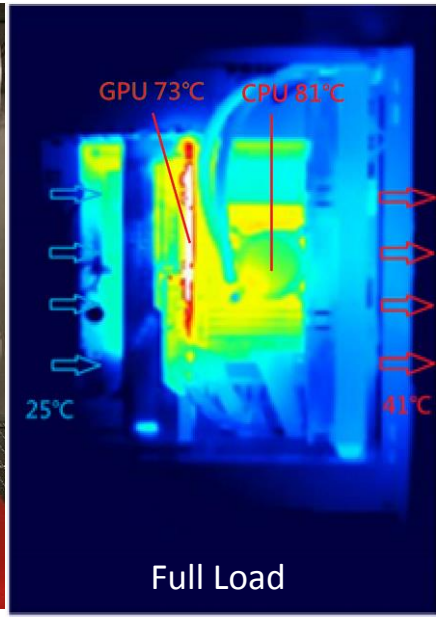
9. Acoustic Sound Pressure Level Test



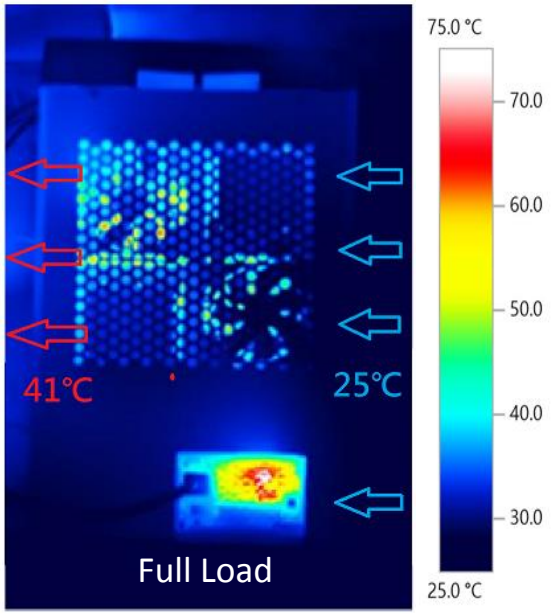
C. Conclusion

Conclusion

Front View



Rear View



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

-INTEL I9 12900K，CPU Temp. (Max)：81℃

-GIGABYTE AORUS GeForce RTX™ 3090 XTREME，GPU Temp. (Max)：73℃

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 Tower 500 is regarding cooling performance.

thermaltake

20 YEARS

Thank you!