



The science behind the report: Dell Precision 5470: Harness more power for content creation projects

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report [Dell Precision 5470: Harness more power for content creation projects](#).

We concluded our hands-on testing on September 9, 2022. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on September 9, 2022 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to <http://facts.pt/calculating-and-highlighting-wins>. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1: Results of our testing. We ran each comparison five times and took the average run as the representative score for each test.

	Dell Precision™ 5470 14"	Apple® MacBook Pro® 14" (2021)
Hand-timed Adobe Photoshop® tasks (h:mm:ss)		
Launch Adobe Photoshop	0:00:04	0:00:03
Convert RAW file to JPEG	0:01:10	0:01:13
Merge images to panorama	0:00:40	0:01:07
Merge images to HDR Pro	0:00:16	0:00:14
Autodesk® Maya 2022 with Autodesk Arnold 2022 renderer benchmark		
Render time (h:mm:ss)	0:38:39	3:58:04
Handbrake benchmark	(with Intel QSV H.265 encoder)	(with Apple Video Toolbox H.265 encoder)
Hardware 4K H.265 video encoding (h:mm:ss)	0:00:42	0:01:13
Average frames per second	188.53	100.95
Onshape benchmark (on Chrome)		
Triangles per second (millions)	834.04	826.96
Lines per second (millions)	665.6	630.16

	Dell Precision™ 5470 14"	Apple® MacBook Pro® 14" (2021)
Blender GPU benchmark		
Monster workload	560.119	353.561
Junkshop workload	233.867	181.013
Classroom workload	288.483	166.184
iPerf 3 Wi-Fi 6 performance (Mb/s)		
Single stream upload speeds (-t 70 -O 10)	325	242
Single stream download speeds (-t 70 -O 10 -R)	320	321
Four parallel stream upload speeds (-t 70 -O 10 -P 4)	502	465
Four parallel stream download speeds (-t 70 -O 10 -P 4 -R)	573	634
BAPCo® CrossMark® benchmark		
Average overall scores	1,880	1,621
Productivity	1,731	1,376
Creativity	2,117	2,176
Responsiveness	1,684	1,098
WebXPRT 4 benchmark		
Overall scores	262	232
Photo Enhancement (ms)	328	404
Organize Album using AI (ms)	1,279	1,835
Stock Option Pricing (ms)	106	106
Encrypt Notes and OCR Scan (ms)	758	772
Sales Graphs (ms)	211	285
Online Homework (ms)	1,692	1,462
Maxon Cinebench R23 benchmark		
Multi-core score	13,541	12,388
Single-core scores	1,697	1,532

System configuration information

Table 2: Detailed information on the systems we tested.

System configuration information	Dell Precision 5470 14"	Apple MacBook Pro 14" (2021)
Price 9/20/2022	\$5,402.93	\$3,299.00
Processor		
Vendor	Intel®	Apple
Model number	Core™ i9-12900H	M1 Max
Core frequency (GHz)	2.5 – 5.0	2.0 - 3.2
Number of cores	14	10
Logical processors	20	N/A
Memory		
Amount (GB)	32	32
Type	LPDDR5	Unified
Graphics		
Vendor	Intel	Apple
Model number	Intel Iris® Xe Graphics	M1 Max 32-core GPU
Discrete graphics		
Vendor	NVIDIA®	NA
Model number	RTX A1000	NA
Storage		
Amount (TB)	4	1
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Intel Wi-Fi 6E AX211	802.11ax Wi-Fi 6
Bluetooth	5.2	5.0
USB	1 x MicroSD card reader 4 x Thunderbolt 4 ports	1 x SDXC card 3 x Thunderbolt 4 ports
Battery		
Type	Integrated Lithium-ion	Integrated Lithium-polymer
Rated capacity (Whr)	72	70
Display		
Size (in.)	14	14
Resolution	2,560 x 1,600	3,024 x 1,964

System configuration information	Dell Precision 5470 14"	Apple MacBook Pro 14" (2021)
Operating system		
Vendor	Microsoft	Apple
Name	Windows 11 Pro	macOS® Monterey
Version	21H2 Build 22000.978	12.5
BIOS		
BIOS name and version	Dell Inc. 1.5.0	7459.141.1
Dimensions		
Height (in.)	0.74	0.61
Width (in.)	12.22	12.31
Depth (in.)	8.27	8.71
System weight (lbs.)	3.56	3.58
System and power adapter weight (lbs.)	4.32	4.25

How we tested

Setting up the systems

Setting up the Dell Precision 5740 and updating the OEM image

1. Boot the system.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set the Windows power mode to Best Performance.
 - Click the battery icon in the bottom right-hand corner and move the slider to Best Performance.
4. Set Screen and Sleep options to Never:
 - Right-click the desktop, and select Display settings.
 - From the left-hand column, select Power & Sleep.
 - For all power options under Screen and Sleep, select Never.
5. Disable User Account Control notifications.
 - Select Windows Start, type UAC, and press Enter.
 - Move the slider control to Never notify, and click OK.
6. Run Windows Update, and install all updates available.
7. Launch the Windows Store app, and install all Store app updates.
8. Verify the date and time are correct, and synchronize the system clock with the time server.
9. Disable Automatic Windows Update:
 - Right-click Windows Start.
 - Select Computer Management.
 - Select Services and Applications.
 - Select Services.
 - Scroll down, and double-click Windows Update.
 - Click Stop.
 - From the Startup type drop down menu, select Disabled.

Setting up the Apple MacBook Pro and updating the OEM image

1. Boot the system.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set Screen and Sleep options to Never:
 - Select System Preferences.
 - Select Desktop & Screensaver.
 - Uncheck Show screensaver after.
 - Return to System Preferences, and select Battery. (Note: On M1 Max processor system set Energy mode to Automatic)
 - Select Power Adapter, and move the slider bar to Never. (Note: On M1 Max processor system set Energy mode to High Power)
 - Select Battery, uncheck Slightly dim the display while on battery, and move the slider bar to Never.
4. Disable automatically adjust brightness:
 - Select System Preferences.
 - Select Display
 - Uncheck Automatically adjust brightness.
5. Run Software Update, and install all updates available.
6. Launch the App Store, and install all App Store updates.
7. Verify the date and time are correct.
8. Disable Automatic Mac Updates:
 - Click the Apple icon, and select About This Mac.
 - Click Software Update.
 - Uncheck Automatically keep my Mac up to date.

Completing Adobe Photoshop hand-timed tasks

We recorded how long it took to launch Adobe Photoshop, image process 50 RAW NEF images and convert to JPEG, use photo merge panorama to create a 45MP image, and use HDR Pro to merge five images to an HDR image.

A stopwatch is required for this test.

We used the following application:

- Adobe Photoshop v23.5.0

Setting up the test (Windows and macOS)

1. Copy the test images to the desktop of the test system.

Running the tests (Windows and macOS)

Application launch time test

1. Simultaneously start the timer and launch Photoshop.
2. Stop the timer when Photoshop has loaded.

RAW file conversion to JPEG test

1. Select File→Scripts→Image Processor.
2. Click the Select Folder button and select the test file directory.
3. Select 10 as the JPEG Quality.
4. Simultaneously start the timer and click Run.
5. Stop the timer when the spinning circle disappears and record the result.
6. Repeat steps 1 through 5 four more times.

Merge images to panorama test

1. Select File→Automate→Photomerge.
2. Browse to the directory where the images are located, select them, and click OK.
3. Simultaneously start the timer and click OK.
4. Stop the timer when the panoramic picture appears.
5. Close the panoramic picture file without saving.
6. Repeat steps 1 through 5 four more times.

Merge images to HDR Pro test

1. Select File→Automate→Merge to HDR Pro.
2. Browse to the directory where the images are located, select them, and click OK.
3. Simultaneously start the timer and click OK.
4. Stop the timer when the preview merged file appears.
5. Simultaneously start the timer and click Ok.
6. Stop the timer when the HDR image has been created.
7. Repeat steps 1 through 6 four more times.

Running the Autodesk Maya 2022 with Arnold Renderer benchmark

Setting up the test (Windows and MacOS)

1. Download and install the Maya 2022 30-day trial from <https://www.autodesk.com/products/maya/free-trial>. During installation verify that Arnold renderer is checked to be installed as an additional component.
2. Launch Maya 2022, and point the Project Window to the correct directory.
 - a. Go to File→Project Window.
 - b. Click New and enter the name `Dinner_scene`.
 - c. Set the Location to `Documents/maya/projects`.
 - d. Click Accept.
3. Create a Maya 2022 test workload scene named `Dinner_scene`. We used the YouTube tutorial created by Creative Tap.
4. Copy the Maya 2022 `Dinner_scene` test workload to the `Documents\maya\projects` directory on the other test system. When prompted, select Yes to overwrite the `Dinner_scene` directory.
5. Close Maya 2022.

Running the test (Windows and MacOS)

1. Launch Maya 2022, and select the test workload scene by browsing to `Documents\maya\projects\Dinner_scene\Dinner_scene_v1.mb`.
2. From the top menu bar select the Display render settings icon.
3. Next to the Render Using field, select Arnold Renderer.
4. Under the Common tab
 - a. Next to File name prefix, type a project name.
 - b. Next to Image Format, select PNG.
 - c. Next to Frame/Animation ext, select `name_#.ext`
 - d. Next to Start frame, select 1.000
 - e. Next to End frame, select 250.000
 - f. Next to Renderable Camera, select camera1
 - g. Next to Image Size Presets, select HD_1080
5. Under the Arnold Renderer tab select the following settings
 - Camera (AA)= 3
 - Diffuse= 2
 - Specular= 2
 - Transmission= 2
 - SSS= 2
 - Volume Indirect= 2
6. Under the System tab select GPU as the Render Device, if available.
7. Under the Diagnostics tab, change the Verbosity Level to Info, and click the File checkbox.
8. Click the folder icon to choose a folder under the `Dinner_scene` project, and click Select.
9. Close the Render Settings dialog.
10. From the top menu, select Open Render View.
11. Click Render, and click the small square to the right of Render Sequence.
12. In the Current Camera field, select camera1.
13. Click Render Sequence.
14. Browse to the folder specified in step 8, and open the first and last render files (`render.1.log` and `render.250.log`).
15. To determine the total render time, subtract the first timestamp in `render.1` from the final timestamp in `render.250`.
16. Repeat steps 1 through 15 four more times.

Running the HandBrake benchmark

Setting up the test

1. Download HandBrake from <https://handbrake.fr/downloads.php>
2. Install HandBrake with default options.
3. Copy the 4K file to be transcoded to the test system.
4. Launch HandBrake.
5. Browse to the 4K source file, and click Open.

Running the Hardware 4K H.265 encoder test

Windows

1. Click the preset drop-down, and select H.265 NVENC 2160p 4K.
2. On the Video tab, change the Framerate (FPS) to 60.
3. Set the preset to Fast.
4. On the Chapters tab, uncheck Create chapter markers.
5. Click Start.
6. When complete, to view the encoding statistics, click Show Queue.
7. Repeat for the H.265 QSV 2160p 4K preset.
8. Repeat steps 1-6 four more times.

MacOS

1. Click the Preset drop-down, and select H.265 MKV 2160p 60.
2. Change the Format to MP4.
3. On the Filters tab, set all to Off.
4. On the Video tab, change the Video Encoder to H.265 (Video Toolbox).
5. Set the preset to Fast
6. On the Chapters tab, uncheck Create chapter markers.
7. Click Start.
8. When complete, click the Show Queue menu item to view the encoding statistics.
9. Repeat steps 1-8 four more times.

Running the Onshape Online Benchmark using Chrome web browser

Setting up the test (Windows)

1. On systems with dual graphic capabilities, verify that the Chrome web browser is using the discrete GPU.
 - a. In the Windows Search Box, type `Graphics Settings`, and press Enter.
 - b. Under the Custom options for apps heading, click Browse, and Add `C:\Program Files\Google\Chrome\Application\Chrome.exe`
 - c. Click the newly added Chrome application, and click Options.
 - d. Select discrete graphics option, and select Save.

Running the high-content quality test (Windows and MacOS)

1. Go to <https://cad.onshape.com/check>.
2. Record the Performance Check results.
3. Repeat steps 1 through 2 four more times.

Running the Blender benchmark

Setting up the test (Windows and macOS)

1. Download the Blender Benchmark from <https://opendata.blender.org/>.

Running the test (Windows and macOS)

1. Launch the Blender Benchmark.
2. At the Welcome screen, click Next.
3. Select Blender version 3.1.0, and click Next.
4. At the Benchmark Scenes screen, click Next.
5. At the Benchmark Device screen, select the GPU option, and click Start Benchmark.
6. Record the results.
7. Wait 15 minutes before performing the next run.
8. Repeat steps 1 through 7 four more times.

Running the iPerf3 Wi-Fi 6 tests

iPerf 3 is a standard test for measuring network throughput.

Server

1. Download iPerf3 compiled binaries from <https://iperf.fr/iperf-download.php>
2. Extract the zip file to a folder on the server system.
3. Open a terminal session in the folder, and run `.\iperf3.exe /s`

Windows

1. Download iPerf3 compiled binaries from <https://iperf.fr/iperf-download.php>
2. Extract the zip file to a folder on the test system.
3. Open a terminal session in the folder, and run:

```
.\iperf3.exe -c <ServerIP> -t 70 -o 10
.\iperf3.exe -c <ServerIP> -t 70 -o 10 -R
.\iperf3.exe -c <ServerIP> -t 70 -o 10 -P 4
.\iperf3.exe -c <ServerIP> -t 70 -o 10 -P 4 R
```

4. Capture the throughput from each test.
5. Wait 5 minutes, and run steps 1-4 four more times.

MacOS

1. Install Homebrew package manager for macOS:

```
/bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
```

2. Install iPerf3 using brew:

```
brew install iperf3
```

3. Open a terminal session, and run:

```
iperf3 -c <ServerIP> -t 70 -o 10
iperf3 -c <ServerIP> -t 70 -o 10 -R
iperf3 -c <ServerIP> -t 70 -o 10 -P 4
iperf3 -c <ServerIP> -t 70 -o 10 -P 4 R
```

4. Capture the throughput from each test.
5. Wait 5 minutes, and run steps 1-4 four more times.

Running the BAPCo CrossMark benchmark

Setting up the test (Windows)

1. From the Microsoft Store, download and install CrossMark.
2. Follow the instruction found inside the [BAPCo CrossMark user guide](#), and make the following system configuration changes:
 - a. Disable User Account Control (UAC):
 - i. Click on the Windows start icon and type `regedit` in the search field and press Enter to open the Registry Editor.
 - ii. Go to `HKEY_LOCAL_MACHINE→SOFTWARE→Microsoft→Windows→CurrentVersion→Policies→System`.
 - iii. Double-click `EnableLUA`.
 - iv. In the value data field, type `0`.
 - v. Click OK.
 - vi. Double-click `onsentPromptBehaviorAdmin`.
 - vii. In the value data field, type `0`.
 - viii. Click OK.

- b. Create BAPCo Power Scheme:
 - i. Right-click the desktop, and select Display settings.
 - ii. Select Power & Sleep.
 - iii. In the right-hand column, click Additional power settings.
 - iv. Click Create a power plan.
 - v. For the name, enter `CrossMark`, and click Next.
 - vi. Set Turn off display to Never.
 - vii. Set Put the computer to sleep to Never.
 - viii. Click Create.
 - ix. Click Change plan settings.
 - x. Click Change advanced power settings.
 - xi. Set Processor power management→Minimum processor state→ to 100%.
 - xii. Set Battery→Critical battery level→ to 0%.
 - xiii. Set Battery→Critical battery action→ to Do Nothing.
 - xiv. Set Battery→Low battery level→ to 0%.
 - xv. Set Battery→Low battery notification→ to Off.
 - xvi. Set Battery→Low battery action→ to Do Nothing.
 - xvii. Set Battery→Reserve battery level→ to 0%.
 - xviii. Set Power buttons and lid→Lid close action→ to Do Nothing.
 - xix. Set Power buttons and lid→Power button action→ to Do Nothing.
 - xx. Set Power buttons and lid→Sleep button action→ to Do Nothing.
 - xxi. Set Hard disk→Turn off hard disk after→ to Never.
 - xxii. Click Apply
 - xxiii. Click OK.
- c. Set Power Mode to Best Performance.
- d. Press the Windows key + X
- e. Select Windows PowerShell (Admin).
- f. Type `powercfg.exe -SETACTIVEINDEX SCHEME_CURRENT SUB_NONE 245d8541-3943-4422-b025-13a784f679b7 1`
- g. Press Enter.
- h. Close Windows PowerShell.
- i. Disable WinSAT service:
 - i. Click the Windows start icon
 - ii. In the search field, type `task scheduler`
 - iii. To open the Task Scheduler., press Enter
 - iv. Click Task Scheduler Library→Microsoft→Windows→Maintenance
 - v. Right-click WinSAT, and select Disable.
- j. Disable Windows Update:
 - i. Click the Windows start icon
 - ii. Select Settings→Update & Security→Windows Update.
 - iii. Select Advanced Options
 - iv. Turn off the following:
 - v. Receive updates for other Microsoft products when you update Windows
 - vi. Download updates over metered connections
 - vii. When a restart is required to install an update, as soon as possible, restart the laptop.
 - viii. When a laptop requires a restart to finish updating, show a notification.
- k. Disable Windows Search, Diagnostic policy service, and SysMain service:
 - i. Click the Windows start icon
 - ii. In the search field, type `services` in the search field
 - iii. Press Enter.
 - iv. Right-click Diagnostic policy service, and select Stop.
 - v. Double-click Diagnostic policy service
 - vi. From Startup, type drop-down menu
 - vii. Select Disabled.
 - viii. Click Apply

- ix. Click Ok.
 - x. Right-click Windows Search service, and select Stop.
 - xi. Double-click Windows Search service
 - xii. From Startup, type drop-down menu
 - xiii. Select Disabled.
 - xiv. Click Apply.
 - xv. Click OK.
 - xvi. Right-click SysMain service, and select Stop.
 - xvii. Double-click SysMain service
 - xviii. From Startup, type drop-down menu
 - xix. Select Disabled.
 - xx. Click Apply.
 - xxi. Click OK.
- l. Disable Windows Security Center:
- i. Click the Windows start icon
 - ii. In the search field, type regedit
 - iii. To open the Registry Editor, press Enter.
 - iv. Go to HKEY_LOCAL_MACHINE→SYSTEM→CurrentControlSet→Services→SecurityHealthService.
 - v. Double-click Start
 - vi. In the value field, type 4.
 - vii. Click OK.
 - viii. Go to HKEY_LOCAL_MACHINE→SYSTEM→CurrentControlSet→Services→wscsvc.
 - ix. Double-click Start
 - x. In the value field, type 4. type 4
 - xi. Click OK.
- m. Disable Tamper protection:
- i. Click the Windows start icon.
 - ii. Select Settings→Update & Security→Windows Security.
 - iii. Under Virus & Threat Protection settings, click manage settings.
 - iv. Turn off Tamper protection.
- n. Disable Windows Defender:
- i. Click the Windows start icon.
 - ii. In the search field, type regedit.
 - iii. To open the Registry Editor., press Enter.
 - iv. Go to HKEY_LOCAL_MACHINE→SOFTWARE→Policies→Microsoft→Windows Defender.
 - v. Right-click Windows Defender.
 - vi. Select New→Key→DWORD (32-bit) Value.
 - vii. Type `DisableAntiSpyware`.
 - viii. Press Enter.
 - ix. Double-click `DisableAntiSpyware`.
 - x. In th value data field, type 1
 - xi. Click Ok.
- o. For the changes to take effect, reboot the system.

Setting up the test (macOS)

1. From the Apple App Store, download and install CrossMark
2. Follow the instruction found inside the [BAPCo CrossMark user guide](#) and make the following system configuration changes:
 - a. Set Turn display off after slider to Never:
 - i. Click the Apple icon, and select System Preferences.
 - ii. Click Battery.
 - iii. Select Power Adapter, and move the slider to Never.
 - b. Check Prevent the computer from sleeping automatically when the display is off:
 - i. Click the Apple icon, and select System Preferences.
 - ii. Click Battery.
 - iii. Select Power Adapter
 - iv. Check Prevent computer from sleeping automatically when the display is off.
 - c. Uncheck Put hard disks to sleep when possible:
 - i. Click the Apple icon, and select System Preferences.
 - ii. Click Battery.
 - iii. Select Power Adapter.
 - iv. Uncheck Put hard disks to sleep when possible.
 - d. Uncheck Wake for Wi-Fi network access:
 - i. Click the Apple icon.
 - ii. Select System Preferences.
 - iii. Click Battery.
 - iv. Select Power Adapter.
 - v. Uncheck Wake for Wi-Fi network access.
 - e. Uncheck Enable Power Nap while plugged into a power adapter
 - i. Click the Apple icon.
 - ii. Select System Preferences.
 - iii. Click Battery.
 - iv. Select Power Adapter.
 - v. Uncheck Enable Power Nap while plugged into a power adapter.

Running the test (Windows and macOS)

1. Launch CrossMark.
2. Click Settings.
3. For Number of Iterations choose 5.
4. Enter a valid email address, and click Back.
5. Click Run Benchmark.
6. Record the results.

Running the WebXPRT 4 benchmark

Running the test on the Chrome web browser (Windows and macOS)

1. Open the web browser under test, and go to <https://www.principledtechnologies.com/benchmarkxpert/webxpert/>.
2. Click Run WebXPRT 4.
3. At the Ready to test your browser screen, click Continue.
4. Click Start.
5. When the test completes, record the results.
6. To rerun WebXPRT, click Run Again, and click Start. Record the results.
7. Repeat step 6 three more times.

Running the Cinebench R23 benchmark

Setting up the test (Windows and macOS)

1. From either the Microsoft Store or the Apple App Store, download and install Cinebench.

Running the test (Windows and macOS)

1. Launch Cinebench.
2. Select either CPU (Multi Core) or CPU (Single Core), and click Start.
3. Record the result.
4. Wait 15 minutes before re-running.
5. Repeat steps 1 through 4 four more times.

Read the report at <https://facts.pt/nT37YW1>



This project was commissioned by Dell.



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