The science behind the report:

Improve productivity with the Lenovo ThinkCentre M90a Pro Gen 4 all-in-one desktop PC

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 Improve productivity with the Lenovo ThinkCentre M90a Pro Gen 4 all-in-one desktop PC.

We concluded our hands-on testing on October 26, 2023. 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 10, 2023 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.

Performance benchmark results

Table 1: The table below represents our benchmark results in detail. Higher benchmark scores are better. We report the median score of three runs for each test.

	Lenovo® ThinkCentre M90a Pro Gen 4	24-inch Apple® iMac®
Cinebench R23 vR23.200 (score, higher is better)		
Multi-core	28,666	7,848
Single-core	2,108	1,519
WebXPRT 4 on Google Chrome v116.0.5845.140		
Overall score (higher is better)	339	225
Subscores (milliseconds, lower is better)		
Photo Enhancement	256	401
Organize Album Using AI	1,042	1,975
Stock Option Pricing	64	111
Encrypt Notes and OCR Scan using WASM	635	658
Sales Graphs	181	286
Online Homework	1,291	1,838

	Lenovo® ThinkCentre M90a Pro Gen 4	24-inch Apple® iMac®
CrossMark™ v1.0.1.95 Pro (score, higher is better)		
Overall	1,990	1,377
Subscores		
Productivity	1,889	1,307
Creativity	2,185	1,584
Responsiveness	1,754	1,059
Procyon® Office Productivity Benchmark v2.6.848 using Microsoft Office v2303 Build 16227.20318		
Overall (rating, higher is better)	258,000	176,000
Subscores (higher is better)		
Word	273,000	171,000
Excel	230,000	143,000
PowerPoint	276,000	224,000
Procyon Photo Editing Benchmark v2.6.848 using Adobe Photoshop v24.7.0 & Lightroom Classic v12.5 (score, higher is better)		
Overall	5,335	4,802
Subscores		
Image retouching	7,000	5,249
Batch processing	4,067	4,394
Geekbench 6 v6.1.3 (score, higher is better)		
CPU Multi-core	13,922	8,714
CPU Single-core	2,928	2,390

System and application responsiveness results

Table 2: The table below represents our hand-timed test findings in detail. Lower times are better. We report the median time of three runs for each test.

	Lenovo® ThinkCentre M90a Pro Gen 4	24-inch Apple® iMac®
Microsoft Office Word (seconds, lower is better)		
Time to launch	1.9	7.3
Time to open 90MB Word document	3.0	4.1
Time to perform word Find/Replace	1.9	2.0
Microsoft Office Excel (seconds, lower is better)		
Time to launch	2.1	7.3
Time to open 92MB Excel spreadsheet containing macro	15.5	16.8
Time to open 650KB 10K row Excel spreadsheet	2.2	3.0
Time to insert 3-D 100% Stacked Column Chart	17.2	20.7
Microsoft Office PowerPoint (seconds, lower is better)		
Time to launch	2.0	6.5
Time to export 180MB PPTX to PDF	7.1	10.2
Web browsing scenario (seconds, lower is better)		
Time to launch browser and load 20 tabs	37.81	38.91
Collaboration workflow using Zoom (seconds, lower is better)		
Time to perform workflow	98	105

Zoom video conferencing

Table 3: The table below represents our CPU findings in detail. Lower percentages are better. We report the median percentage of three runs.

	Lenovo® ThinkCentre M90a Pro Gen 4	24-inch Apple® iMac®
System maximum CPU utilization while using Zoom (percent utilization, lower is better)		
Host, 1:1 meeting	3	35
Guest, 1:1 meeting	1	14
Host, 1:3 meeting	2	38

Audio testing

Table 4: The table below represents our audio findings in detail. Lower LUFS are better and lower percentage of maximum volume output to reach target dB is better. We report the median score of three runs for each test.

	Lenovo® ThinkCentre M90a Pro Gen 4	24-inch Apple® iMac®
Microphone noise reduction		
Background fan volume (LUFS)	NA (did not register the fan noise)	Registered audible noise at -44.4 LUFS
Speaker volume output required to reach 64 dB		
Volume (percent, lower is better)	64	81

System configuration information

Table 5: Detailed information on the systems we tested.

System configuration information	Lenovo ThinkCentre M90a Gen 4 Pro (SVT)	Apple iMac 24"
Processor		
Vendor	Intel®	Apple
Model number	Core® i9-13900	M1
Core frequency	4.2 – 5.6GHz	3.2 GHz
Number of cores	24	8
Logical processors	32	N/A
Memory		
Amount	16 GB	16 GB
Type	DDR5	Unified
Graphics #1		
Vendor	Intel	Apple
Model number	Intel UHD Graphics 770	M1 8-core GPU
Storage		
Amount	1 TB	1 TB
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Intel Wi-Fi 6E AX211	Wi-Fi 6E (802.11ax)
Bluetooth	5.3	5.0
USB	1 x MicroSD card reader 2 x Thunderbolt™ 4 ports 5 x USB -A 3 x USB-C 1 x HDMI™ 1 x DisplayPort™ 1 x Gigabit Ethernet Port 1 x Smartcard reader 1 x Kensington Security Slot	2 x USB 3 ports 2 x Thunderbolt 4 ports
Display		
Size	23.8"	23.5"
Resolution	2,560 x 1,440	4,480 x 2,520
Operating system		
Vendor	Microsoft	Apple
Name	Windows 11 Pro	macOS Ventura
Version	22H2 Build 22621.2134	13.5.1
BIOS		
BIOS name and version	Lenovo M54KT1CA	8422.141.2

System configuration information	Lenovo ThinkCentre M90a Gen 4 Pro (SVT)	Apple iMac 24"
Dimensions		
Height (in)	21.26	18.1
Width (in)	13.78	21.5
Depth (in)	1.93	5.8
Weight (system) lbs.	25.4	9.13

How we tested

Setting up the system (Windows)

Setting up and updating the OEM image

1. Boot the system under test (SUT).
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set the Windows (plugged in) Power Mode to Best Performance.
4. Set Screen and Sleep options to Never:

   a. Right-click the desktop, and select Display settings.
   b. From the left column, select System.
   c. Click Power & Battery.
   d. For all power options listed under Screen and Sleep, select Never.

5. Disable User Account Control notifications:

   a. Select Windows Start, type `UAC`, and press Enter.
   b. Move the slider control to Never notify, and click OK.

6. Run Windows Update, and install all updates available.
7. Verify the date and time are correct, and synchronize the system clock with the time server.
8. Pause Automatic Windows Updates:

   a. Click the Windows Start button.

9. Type `Windows Update settings` and press Enter.

   a. From the Pause updates drop-down menu, select Pause for 5 weeks.

Setting up the system (macOS)

Setting up and updating the OEM image

1. Boot the SUT.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set Screen and Sleep options to Never:

   a. Select System Settings.
   b. Select Screensaver.
   c. Set Lock Screen Settings to Never.
   d. Return to System Settings, and select Battery.
   e. Set On power adapter setting to High Power.

4. Disable Automatically adjust brightness:

   a. Select System Settings.
   b. Select Display.
   c. Disable Automatically adjust brightness.

5. Run Software Update, and install all updates available.
6. Verify the date and time are correct.
7. Enable Automatic log in:

   a. Select System Settings.
   b. Click Users & Groups.
   c. Select the drop-down menu next to the Automatically log in as setting, and select the User account.

8. Disable Automatic Mac Updates:

   a. Select System Settings.
   b. Click General.
   c. Click Software Update.
   d. Click the information icon next to Automatic updates.
   e. Disable Check for updates.

Performance benchmark testing

Cinebench R23 benchmark testing

Setting up the Cinebench R23 test (Windows & macOS)

1. Download and install Cinebench from https://www.maxon.net/en/downloads/cinebench-r23-downloads.

Running the Cinebench R23 benchmark (Windows & macOS)

1. Launch Cinebench.
2. Select File→Advanced benchmark.
3. Set the Minimum Test Duration to Off.
4. Select either CPU (Multi Core) or CPU (Single Core), and click Start.
5. Record the result.
6. Wait 15 minutes before re-running.
7. Repeat steps 1 through 6 two more times.

Geekbench 6 Pro benchmark testing

Setting up the test (Windows & macOS)

1. Purchase a Pro license, and download and install Geekbench 6 Pro from https://www.geekbench.com/download/.

Running the test (Windows & macOS)

1. Launch Geekbench.
2. Click Run CPU Benchmark.
3. Record the result.
4. Wait 5 minutes before re-running.
5. Repeat steps 1 through 4 two more times.

Geekbench 6 Pro GPU OpenCL benchmark testing

Setting up the test (Windows & macOS)

1. Purchase a Pro license, and download and install Geekbench 6 Pro from https://www.geekbench.com/download/.

Running the test (Windows & macOS)

1. Launch Geekbench.
2. Click Run Compute Benchmark.
3. Record the result.
4. Wait 5 minutes before re-running.
5. Repeat steps 1 through 4 two more times.

BAPCo CrossMark benchmark testing

Setting up the test (Windows & macOS)

1. Download and install CrossMark from the Microsoft Store or Apple App Store.

Running the test (Windows & macOS)

1. Launch CrossMark.
2. Click Settings.
3. For Number of Iterations, choose 1.
4. Enter a valid email address, and click Back.
5. Click Run Benchmark.
6. Record the result.
7. Repeat steps 1 though 6 two more times.

WebXPRT 4 benchmark testing (Google Chrome)

Running the test (Windows & macOS)

1. Open the Web browser under test, and go to https://www.principledtechnologies.com/benchmarkxprt/webxprt/.
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. Click Run Again, and click Start to rerun WebXPRT. Record the results.
7. Repeat step 6 two more times.

Procyon Office Productivity Benchmark testing

Setting up the test (Windows)

1. Download and install Procyon.
2. Open Procyon.
3. Click Office Productivity Benchmark.
4. Click Register.
5. Enter the license key for the Office Productivity Benchmark, and click Register.
6. Before running the benchmark, make sure to install a licensed version of Microsoft 365.

Setting up the test (macOS)

1. Before running the benchmark, make sure to install a licensed version of Microsoft 365.
2. On a secondary system, log into https://testdriver.ul.com/ui/.
3. Download the client file and API key.
4. On the SUT, run the client installation file.
5. When prompted, enter the API key.
6. In Testdriver, select the client system.
7. Click Run.
8. In the Select Test drop-down menu, select Procyon Office Productivity Mac First Time Setup.
9. Click Run.
10. On the client SUT, select Start test now.
11. Allow any on-screen permissions checks during the first-time setup run.
12. Allow the benchmark to complete, and restart the system to begin testing.

Running the test (Windows)

1. Boot the system.
2. Launch Procyon.
3. Click Office Productivity Benchmark.
4. Click Run.
5. When the benchmark is complete, record the results.
6. Wait 15 minutes before rerunning the benchmark.
7. Repeat steps 3 through 6 twice more.

Running the test (macOS)

1. Boot the system.
2. On a second system, log into https://testdriver.ul.com/ui/.
3. In Testdriver, select the client SUT.
4. Select Run.
5. From the Select Test drop-down menu, select Procyon Office Productivity.
6. In the Run Name field, enter a test name.
7. Click Run.
8. On the client SUT, select Start test now.
9. When the benchmark completes, record the results.
10. Wait 15 minutes before rerunning the benchmark.
11. Repeat steps 3 through 10 twice more.

Procyon Photo Editing Benchmark testing

Setting up the test (Windows)

1. Download and install Procyon.
2. Open Procyon.
3. Click Photo Editing Benchmark.
4. Click Register.
5. Enter the license key for the Photo Editing Benchmark, and click Register.
6. Before running the benchmarks, install licensed versions of Adobe Photoshop 22.0 or higher and Adobe Lightroom Classic 10.0 or higher.

Setting up the test (macOS)

1. Before running the benchmark, install licensed versions of Adobe Photoshop 22.0 or higher and Adobe Lightroom Classic 10.0 or higher.
2. On a secondary system, log into https://testdriver.ul.com/ui/.
3. Download the client file and API key.
4. On the SUT, run the client installation file.
5. When prompted, enter the API key.
6. In Testdriver, select the client system.
7. Click Run.
8. From the Select Test drop-down menu, select Procyon Photo Editing Mac First Time Setup.
9. Click Run.
10. On the client SUT, select Start test now.
11. Allow any on-screen permissions checks during the first-time setup run.
12. Allow the benchmark to complete, and restart the system to begin testing.

Running the test (Windows)

1. Boot the system.
2. Launch Procyon.
3. Click Photo Editing Benchmark.
4. Click Run.
5. When the benchmark is complete, record the results.
6. Wait 15 minutes before rerunning the benchmark.
7. Repeat steps 1 through 6 twice more.

Running the test (macOS)

1. Boot the system.
2. On a second system, log into https://testdriver.ul.com/ui/.
3. In Testdriver, select the client SUT.
4. Select Run.
5. In the Select Test drop-down menu, select Procyon Photo Editing.
6. In the Run Name field, enter a test name.
7. Click Run.
8. On the client SUT, select Start test now.
9. When the benchmark completes, record the results.
10. Wait 15 minutes before rerunning the benchmark.
11. Repeat steps 3 through 10 twice more.

Hand-timed custom workflow testing and multitasking scenarios

Time to complete the hand-timed Microsoft PowerPoint scenario

We recorded how long it took to launch PowerPoint and export a 180MB PPTX to PDF. A stopwatch is required for this test.

We used the following application:

- Microsoft PowerPoint (Windows v16.0.16731.20194 & macOS v16.76.1.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch PowerPoint.
2. Stop the timer when PowerPoint has loaded.
3. Browse to where the test PowerPoint file is located.
4. Click File→Export→Create PDF/XPS.
5. Simultaneously start the timer and click Publish.
6. Stop the timer when the PDF has been created, and record the results.
7. Repeat steps 1 through 7 two more times.

Time to complete the hand-timed Microsoft Excel scenario

We recorded how long it took to launch Excel, open a 92MB macro Excel XLSX file, open a 650KB 10K row Excel XLSX and insert a 3D 100% stacked column chart into the 10K row spreadsheet. A stopwatch is required for this test.

We used the following application:

- Microsoft Excel (Windows v16.0.16731.20194 & macOS v16.76.23081101)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Excel.
2. Stop the timer when Excel has loaded.
3. Browse to where the test Excel macro file is located.
4. Simultaneously start the timer and open the Excel macro file.
5. Stop the timer when the Excel file has loaded.
6. Close the macro test file.
7. Browse to where the test Excel 10K row file is located.
8. Simultaneously start the timer and open the 10K row file.
9. Stop the timer when the Excel file has loaded.
10. Click Insert, and select the drop-down menu next to the Insert Column or Bar Chart icon.
11. At the bottom of the drop-down menu, select More Column Charts.
12. Under the Column section, choose 3-D 100% Stacked Column.
13. Simultaneously start the timer and click Ok.
14. Stop the timer when the 3-D 100% Stacked Column Chart appears.
15. Repeat steps 1 through 14 two more times.

Time to complete the hand-timed Microsoft Word scenario

We recorded how long it took to launch Word, open a 90MB Word DOCX file, and perform a find/replace task. A stopwatch is required for this test.

We used the following application:

- Microsoft Word (Windows v16.0.16731.20194 & macOS v16.49.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Word.
2. Stop the timer when Word has loaded.
3. Locate the test Word file.
4. Simultaneously start the timer and open the Word file.
5. Stop the timer when the Word document has fully loaded.
6. Press CTRL + H/Control + H to bring up the Find/Replace dialog box.
7. In the Find What field, type I
8. In the Replace With field, type TEST
9. Simultaneously start the timer and select Replace All.
10. Stop the timer when Word has replaced every I.
11. Close the Word document. Do not save changes.
12. Repeat steps 1 through 11 two more times.

Time to complete the hand-timed web-browsing scenario

We recorded how long it took to launch Firefox, load the Lenovo web page, and load 20 duplicate tabs. A stopwatch is required for this test.

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Mozilla Firefox.
2. Browse to https://www.lenovo.com/us/en/pc/.
3. When the web page fully loads, press CTRL/command and click the refresh button to duplicate the web page in a new tab.
4. Once the web page fully loads in a new tab, press CTRL/command and click the refresh button to duplicate the web page again in a new tab.
5. Repeat step 4 until 20 tabs are open.
6. Stop the timer when the web page on the 20th tab fully loads.
7. Repeat steps 1 through 6 twice more.

Time to complete the hand-timed collaboration workflow using Zoom workflow

We recorded how long it took to complete a multi-tasking scenario using multiple applications and tasks. Once we open an application, it remains open for the duration of the testing. A stopwatch is required for this test.

We used the following applications:

- Zoom
- Outlook
- PowerPoint
- Google Chrome web browser with 10 tabs open
- Excel

Setting up the test (Windows & macOS)

1. Open the Google Chrome web browser, and set the homepage to https://www.Lenovo.com/us/en/pc.
2. In the top right corner of the Chrome web browser, click the three-dot menu to Customize and control Google Chrome.
3. Select Settings.
4. In the left column, select On startup.
5. Select Open a specific page or set of pages, and click Use current pages.
6. Close Google Chrome, and re-open to verify that the web page that opens is https://www.Lenovo.com/us/en/pc.

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Zoom.
2. Click New Meeting.
3. Click Join with Computer Audio, and stop the timer once the meeting has started.
4. Simultaneously start the timer and launch Outlook.
5. Click New Email.
6. Input the email address of the recipient of the email in the To section.
7. Click Attach File, and select Browse This PC…
8. Navigate to the ~10mb test video file, and select it.
9. Click Send.
10. Stop the timer once the message is sent.
11. Simultaneously start the timer and launch the test PowerPoint file.
12. Launch a slideshow in presenter mode, and scroll through the slides.
13. Once the slideshow is complete, stop the timer.
14. Simultaneously start the timer and launch Google Chrome.
15. Browse to https://www.Lenovo.com/us/en/pc.
16. Right-click the tab, and select Duplicate.
17. Once the web page fully loads, as indicated by the spinning Lenovo icon becoming solid, right-click the tab and select duplicate to duplicate the web page again in a new tab.
18. Repeat step 17 until 10 tabs are open.
19. Stop the timer when the web page on the 10th tab fully loads.
20. Simultaneously start the timer and launch Excel.
21. Browse to where the test Excel macro file is located, and open the Excel macro file.
22. Browse to where the test Excel 10K row file is located, and open the 10K row file.
23. Click Insert and select the drop-down menu next to the Insert Column or Bar Chart icon.
24. At the bottom of the drop-down menu, select More Column Charts.
25. Under the Column section, choose 3D-100% Stacked Column.
26. Click Ok.
27. Stop the timer when the Column Chart appears.
28. Repeat steps 1 through 27 two more times.

Video-conferencing testing

Preparing to install Zoom (Windows)

1. Open Edge.
2. Navigate to https://zoom.us/downloads.
3. Under Zoom Desktop Client, click Download.
4. When the file is done downloading, click Open File to begin the installation.

Installing Zoom (Windows)

1. In the Installer, click Continue.
2. Click Yes to allow Zoom to install on Allow this program to make changes to your device.
3. When the installation finishes, click Done.

Configuring Zoom (Windows)

1. Right-click the Zoom icon in the tray, and click Check for Updates.
2. Click Ok to download updates.
3. Click Install to install updates.
4. If there are no updates, click Close.
5. Right-click the Zoom icon in the tray, and click Settings.
6. Under General, enable Enter full screen when starting or joining a meeting.
7. Under Preferences, click Video.
8. Click OK to allow Zoom access to the Camera.
9. Click Audio.
10. Click OK to allow Zoom access to the microphone.
11. Enable Automatically join computer audio when joining.
12. Click Share Screen.

Preparing to install Zoom (macOS)

1. Open Safari.
2. Navigate to https://zoom.us/downloads.
3. Under Zoom Desktop Client, click Download.
4. When prompted to allow downloads from zoom.us, click Allow.
5. When the download is complete, click the download icon on the Mac taskbar, and select zoomusInstallerFull.pkg.

Installing Zoom (macOS)

1. In the Installer, click Continue.
2. Click Install.
3. If prompted to enter user password, do so, and press enter. Otherwise, click Install.
4. Click OK to allow Installer to access files.
5. When the installation completes, click Done.

Configuring Zoom (macOS)

1. Navigate to the menu at the top of the screen, and click Check for Updates.
2. Click Ok to download updates.
3. Click Install to install updates.
4. Under General, enable Enter full screen when starting or joining a meeting.
5. Under Preferences, click Video.
6. Click OK to allow Zoom access to the Camera.
7. Click Audio.
8. Click OK to allow Zoom access to the microphone.
9. Enable Automatically join computer audio when joining.
10. Click Share Screen.
11. Enable Side-by-Side Mode.

Configuring the Zoom account on the Zoom.com portal

1. Navigate to Zoom.us, and sign into the admin account you will use to host the Zoom calls.
2. Navigate to Settings, under Personal.
3. Click Meeting.
4. Scroll down and enable the following:

    • Start meetings with host video on.

    • Start meetings with participant video on. Participants can change this during the meeting.

Configuring the host for a Zoom call

1. Click Sign in to log into Zoom.
2. Enter Username.
3. Enter Password.
4. Check Keep me signed in.
5. Click Sign in.
6. Close out of the Zoom experience by pressing the X in the top right of the pop-up window.
7. On the Zoom landing page, click the down arrow under New Meeting, and check to enable Use my Personal Meeting ID (PMI).

Notes on testing

• Once in the call, we used screen share to display a PowerPoint.

• To simulate talking that all devices could hear, we played audio from a YouTube video in the background.

• We pointed all devices at an oscillating fan to simulate movement for the duration of the test.

• The call lasted 10 minutes, starting from the time all devices were in the call, all cameras were on, a user had turned on screenshare, and audio was playing .

Joining a Zoom call as a guest

1. Click Join a Meeting.
2. Enter the Personal Meeting ID of the host meeting.

3. Click Join.

Audio quality testing

Note: We conducted testing in an audio room with an enclosed sound booth. In addition to the SUTs, we used one additional system, located in the audio room. We connected this system to the speaker in the sound booth.

Pre-test setup

1. Install Audacity on each SUT, and confirm that there are no issues with on-board mic recording.
2. Install VLC media player as a consistent media player on all SUTs.
3. Trim the sample song so that a roughly 20-second sample of the loudest part of the song remains.
4. Load the sample song file onto each SUT using a USB drive.

Microphone noise reduction

Setup

1. Place the Yamaha speaker in the sound booth, near the position where a laptop user would be speaking. Connect the speaker to the audio room computer, on which you have loaded a speaking sample representative of normal conversation. Use this same sample for each test for consistency.
2. Set the input volume of the onboard microphone to approximately 98%.
3. Place the SUT on the desk in the sound booth, and open Audacity. Measure the angle of screen tilt to maintain consistency across all SUTs. Press Record, and exit the sound booth.
4. On the audio room computer, press Play to play the speaking sample (roughly 20 seconds long).
5. Enter the sound booth, and stop recording in Audacity.
6. Transfer the recorded file to the audio room computer to analyze in Pro tools.
7. To match the stereo format of the Lenovo device recording, duplicate the Mac's mono audio file and combine the two mono duplicates into a single stereo track.
8. Use FabFilter Pro L2 in the Integrated setting in Loudness mode to measure the average loudness of both clips. Using clip gain as needed, level match clips to -21.1 LUFS. Note the volume difference of each system.
9. Add a fan in back corner of the sound booth, roughly 5 feet from the speaker. Keep the fan on and running at consistent speed during tests.

Testing

1. Place the SUT on the desk in the sound booth, and open Audacity. Measure the angle of screen tilt to maintain consistency across all SUTs. Press Record, and exit the sound booth.
2. Record at least 20 seconds of only fan noise.
3. Enter the sound booth, and stop recording in Audacity.
4. Transfer the recorded file to the audio room computer to analyze in Pro tools.
5. Level match recordings from both SUTs using the adjustment parameter from the "Setup" section.
6. Measure the volume level of fan noise using FabFilter Pro L2 using the Integrated setting in Loudness mode.

Maximum speaker volume output

Setup

1. Load VLC on each of the 12 SUTs with the file comprising the sample song clip.
2. Place Cirrus SPL meter in the audio booth in the same location as the speaker from Test 1.

Testing

1. Place the SUT on the desk in the sound booth. Measure the angle of screen tilt to maintain consistency across all SUTs.
2. Using the sample song clip and Cirrus SPL meter, adjust the output volume of each SUT to 64 dB. Measure SPL of all SUTs from the same distance and position. Document volume output level of SUT (0 percent to 100 percent).

Read the report at https://facts.pt/A28TVhw ▶

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