signal65

# Snapdragon X Plus Performance

The newest Snapdragon X Plus processors deliver improved performance and clear differentiation within the competitive AI PC market.

Ryan Shrout

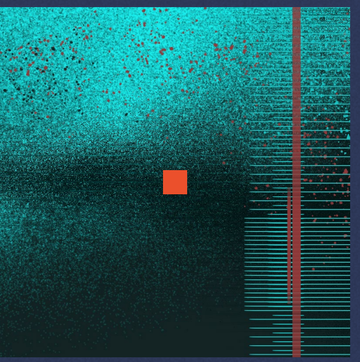
**In partnership with:**

Qualcomm

signal65.com

# Contents

# Introduction



Qualcomm's Snapdragon X Plus CPUs for laptops serve as the midrange counterpart to the high-end Snapdragon X Elite introduced last year. The first two Snapdragon X Plus models, the 10-core X1P-64-100 and the 8-core X1P-42-100, have appeared in laptops that fall squarely within the mainstream price segment, helping bring the Snapdragon PC platform to a wider audience.

The Snapdragon X Plus family has however had something of a gap between the X1P-64-100 and the X1P-42-100 in respect to both the CPU and GPU cores; the X1P-64-100's two extra cores can offer over 20% extra performance, and the integrated Adreno graphics boast 3.8 TFLOPS on the X1P-64-100 compared to 1.7 TFLOPS on the X1P-42-100. This gap has also translated to prices, as there's not too many options around the $600 to $700 segment of the market.

To bridge that gap, Qualcomm has launched a second 8-core model, the Snapdragon X Plus X1P-46-100, which sports an enhanced boost frequency and a faster integrated GPU. The maximum single-core boost clock has been pushed to 4.0 GHz from the original 3.4 GHz on the X1P-42-100, and the maximum multi-core frequency has been increased to 3.4 GHz from 3.2 GHz. Additionally, the iGPU has been elevated to 2.1 TFLOPS, up from 1.7 TFLOPS. In all, that's an 18% improvement to the single-core boost clock, a 6% increase to the multi-core frequency, and a 24% jump in graphics prowess. This means the X1P-46-100 can slot neatly in between the two original Snapdragon X Plus members and offer something more than just more CPU cores.

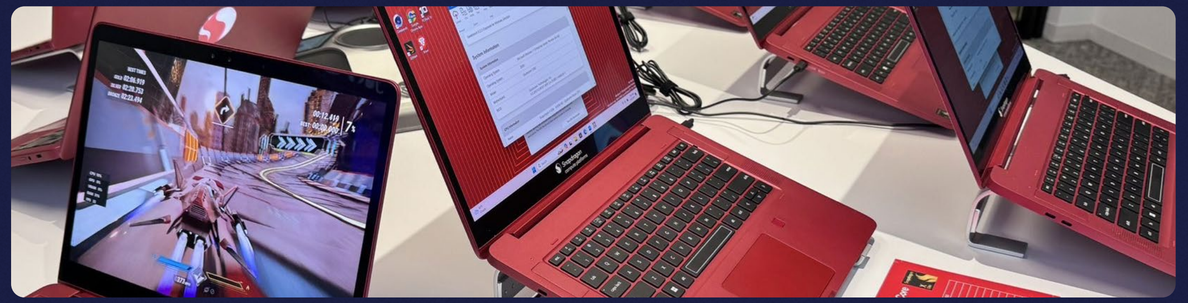
In terms of the product stack, the X1P-46-100 should easily be able to feature in laptops below the $700 mark like the X1P-42-100. Additional single-threaded performance (which has a great impact on responsiveness and overall system speed) will undoubtedly be an enticing reason to opt for the X1P-46-100 over the X1P-42-100, and the extra graphical fidelity will certainly help in gaming and GPU-accelerated applications.

| CPU | Cores | Total Cache | Max Multi-Core Frequency | Boost Frequency | Adreno GPU TFLOPS | Hexagon NUP TOPS | Memory |
|---|---|---|---|---|---|---|---|
| Snapdragon X Plus X1P-46-100 | 8 | 30 MB | 3.4 GHz | 4.0 GHz (Single Core) | 2.1 | 45 | LPDDR5X-8448 |
| Snapdragon X Plus X1P-42-100 | 8 | 30 MB | 3.2 GHz | 3.4 GHz (Single Core) | 1.7 | 45 | LPDDR5X-8448 |

**In our testing of Qualcomm's reference laptop and OEM laptops powered by competing CPUs, we made several findings:**

- The Snapdragon X1P-46-100 is up to 23% faster than the X1P-42-100 in threaded and content creation applications
- The X1P-46-100 offered generally better performance than Intel's competing processors, and is up to 87% faster than the Intel Core Ultra 226V in Geekbench and up to 247% faster than the Intel Core Ultra 235U in AI tests
- The X1P-46-100 was by far the superior CPU for on-battery performance compared to Intel platforms based on Lunar Lake and Arrow Lake architectures

# System Configurations and Competitive Comparisons



We performed our X1P-46-100 testing data from a reference Qualcomm laptop, which is not sold at retail but instead is intended for developer and OEM use. The reference system provides an early platform that is crucial for software development for Windows on Arm and for OEMs crafting their own Snapdragon X PCs. For our purposes, the reference design should give us a good idea of how upcoming laptops equipped with the X1P-46-100 will perform.

For comparison against the X1P-46-100 reference laptop, we tested four other systems that use different CPUs. One of these devices is of course a X1P-42-100-powered laptop, the Dell Latitude 5445. Like the X1P-46-100, the X1P-42-100 is an 8-core processor but has lower boost frequencies and its integrated GPU has less raw horsepower. We tested the X1P-42-100 in high performance mode.

For our non-Qualcomm laptops, we have the Dell Pro 16 with the Core Ultra 5 235U, an Arrow Lake-based processor meant for thin and light systems such as the Pro 16 that will be in the same price class. The 235U has 12 cores, but Intel uses a hybrid architecture design with Arrow Lake, which means 10 of these cores are efficiency-focused and 2 are performance-focused. By contrast, all 8 cores in the X1P-46-100 (or any Snapdragon X CPU for that matter) are performance cores. Additionally, the integrated Arc 140T graphics offers 4.8 TFLOPS, a big advantage for the 235U in theory, but real-world performance hinges on other factors as well.

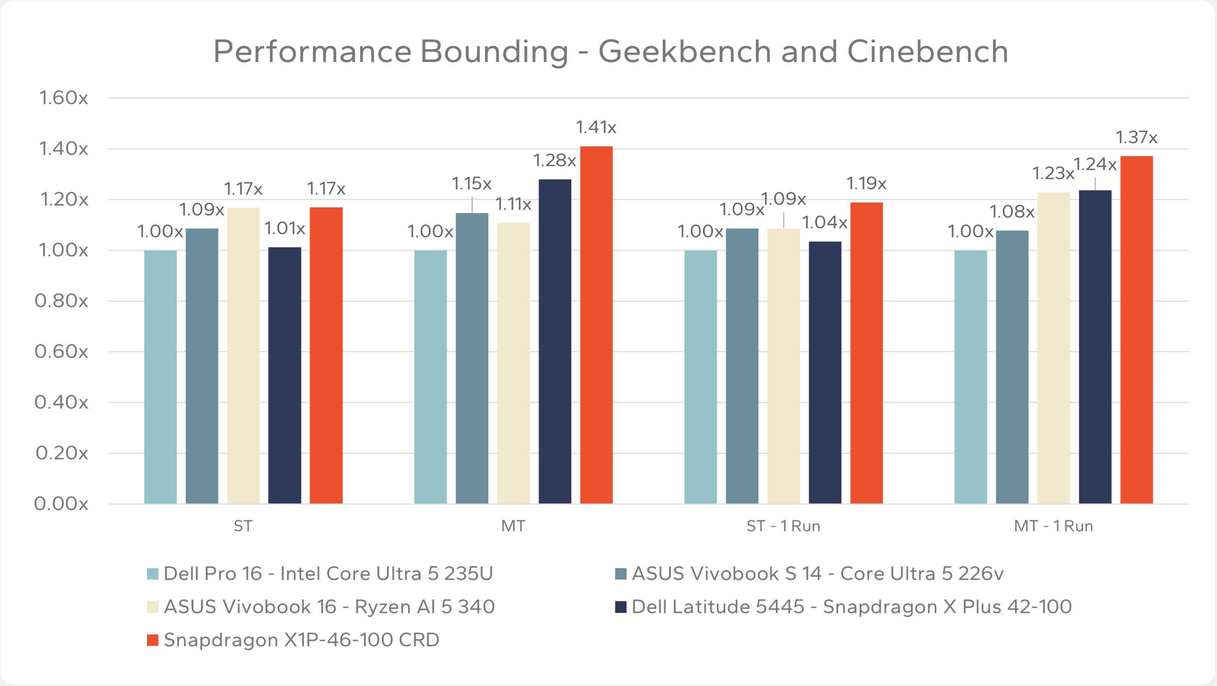
We also tested Intel's other platform for thin and light laptops, Lunar Lake, in the form of the Asus Vivobook S 14 with the Core Ultra 5 226V, a lower-cost model in the 200V product stack. The 226V has 8 cores like the X1P-46-100, but half are performance cores and the other half are efficiency cores. The integrated Arc 140V graphics can muster just about 4 TFLOPS, lower than the 140T's 4.8, but this is balanced out by the Lunar Lake iGPU using a newer architecture. Again, this is a significant advantage for Intel on paper.

| CPU | Cores | Boost Frequency | Integrated GPU TFLOPS | NPU TOPS |
|---|---|---|---|---|
| Snapdragon X Plus X1P-46-100 | 8 Oryon | 4.0 GHz (Single Core) | 2.1 | 45 |
| Snapdragon X Plus X1P-42-100 | 8 Oryon | 3.4 GHz (Single Core) | 1.7 | 45 |
| Core Ultra 5 235U | 12 (2P + 8E + 2LPE) | 4.9 GHz | 2.1 | 12 |
| Core Ultra 5 226V | 8 (4P + 4E) | 4.5 GHz | 3.3 | 40 |
| Ryzen AI 5 340 | 6 (3P + 3E) | 4.8 GHz | 1.5 | 50 |

Lastly, we benchmarked one AMD-powered laptop, the ASUS Vivobook 16 with the Ryzen AI 5 340. This is a lower-end of the Zen5 Krackan Point lineup with 6 cores in a hybrid architecture configuration: three performance cores and three efficient cores. Its integrated Radeon 840M graphics are capable of 1.5 TFLOPS, significantly lower than the X1P-46-100's 2.1 TFLOPS.

# Performance Results on AC / Plugged In

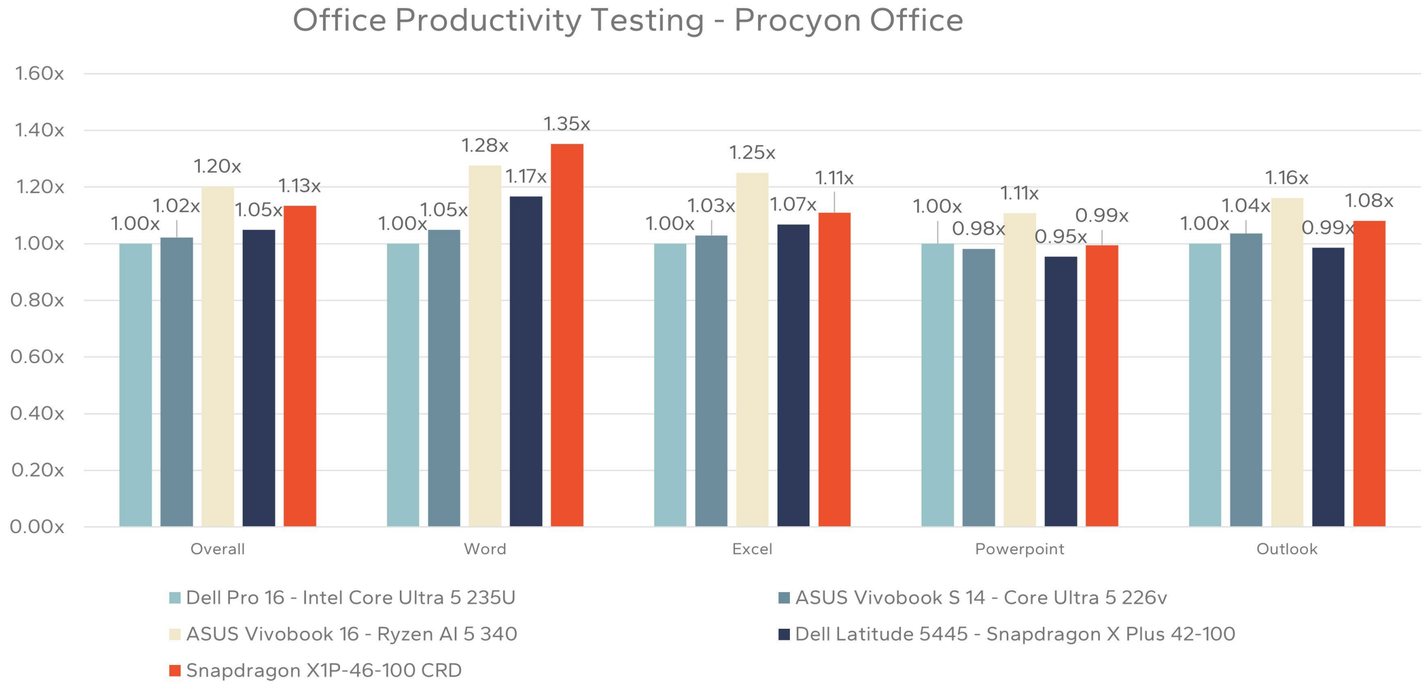
Our first sets of data come from using all these competing notebooks in a plugged-in state, running on AC. This is where OEMs tend to enable higher boost clocks, more power consumption, and where we see better performance.




In both the single- and multi-threaded tests in Geekbench 6 and Cinebench 2024, the X1P-46-100 effectively leads all other CPUs. The X1P-46-100 is especially potent in multi-threaded performance, even against the Core Ultra 5 235U and its 12 cores. Single-threaded speed, though not a total sweep for the X1P-46-100 since the Ryzen AI 340 tied it in the single-threaded mode of Geekbench, is also a bright spot for Qualcomm.

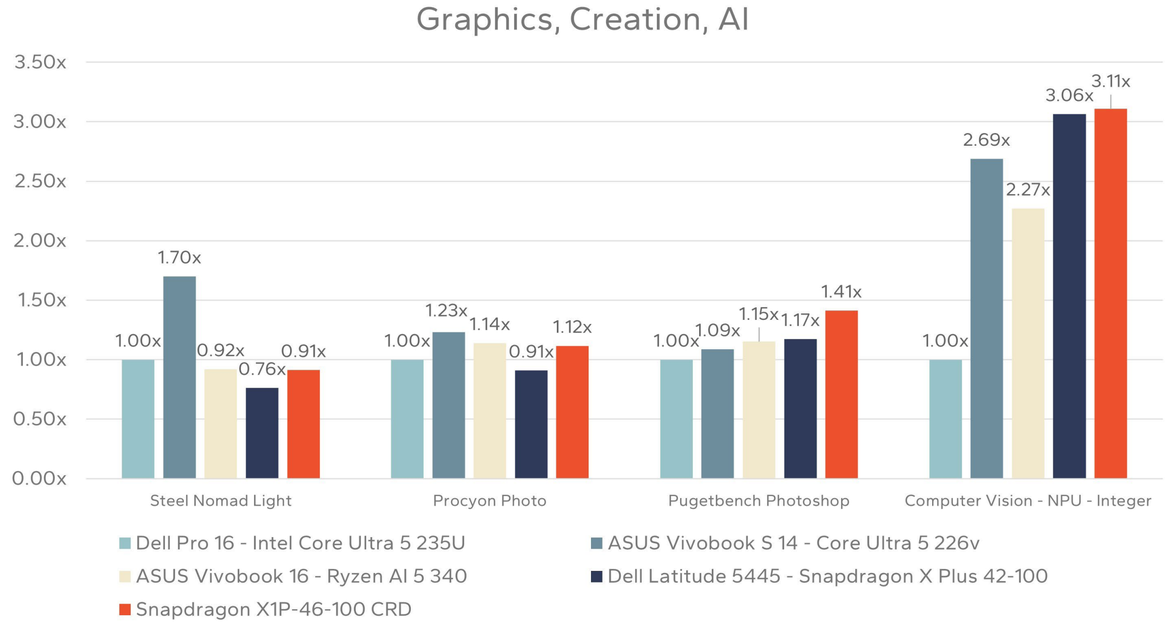
The X1P-46-100's performance was also a significant improvement over the X1P-42-100. In the single-threaded benchmarks, the newer SKU was about 15% faster, while in the multi-threaded tests it was a little over 10% faster. For both single- and multi-threaded workloads, this is where the extra clock speed comes into play and how the X1P-46-100 musters better performance.

# Performance Results on AC/ Plugged In




Though the Ryzen AI system has the overall lead, the new X1P-46-100 system comes in close behind it, and leads in the Word subtest. Meanwhile, there's a sizable gap between the X1P-46-100 and the Intel CPUs in most of the tests, and only in the PowerPoint test does any Intel chip (the 235U in this case) show better performance, and only by 1%. And of course, the X1P-46-100 has noticeably better performance than the X1P-42-100.

## Performance Results on AC/ Plugged In




More GPU heavy tests like 3DMark Steel Nomad Light and the Procyon Photo test indicate some advantages for the faster 140V integrated graphics paired with the Lunar Lake CPU. However, the Adreno iGPU in the X1P-46-100 was just about able to get even with the 235U's 140T graphics, which was slightly faster in Steel Nomad Light and slightly slower in Procyon Photo. The X1P-46-100 also traded blows with the 840M iGPU inside the Ryzen AI 5 340.

The tables are turned in Pugetbench Photoshop however, with the X1P-46-100 clearly in the lead, thanks to superior performance on the CPU side of the equation. The reference X1P-46-100 laptop is 23% faster than the AMD system, 29% faster than the Lunar Lake system, and a whopping 41% faster than the Arrow Lake system. This just builds on top of the lead that the existing X1P-42-100 already held in this test.

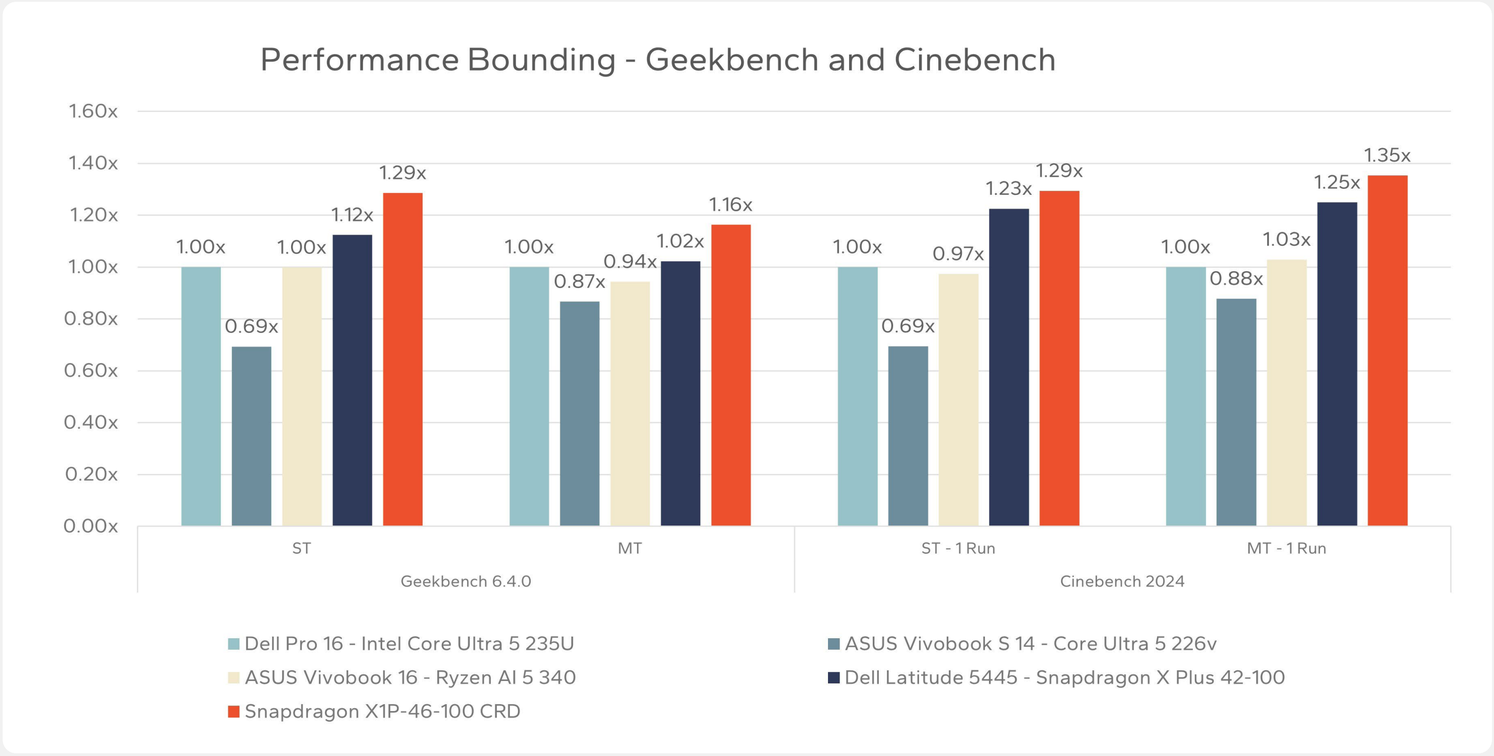
The X1P-46-100 is also the fastest chip in the Procyon Computer Vision test, which utilizes the integrated NPU. While the 226V is sort of in the same ballpark as the two Qualcomm chips, the Ryzen AI 5 340 and especially the 235U showed substantially worse performance. This isn't very surprising since the Hexagon NPU that the Snapdragon X Plus has is rated for 45 TOPS, while the 226V's NPU caps out at 40, and the 235U's NPU is limited to a mere 12. On paper, the Ryzen AI chip actually should have held the advantage since its NPU is capable of 50 TOPS, but that raw horsepower didn't translate very well, unlike with the X1P-46-100 and the X1P-42-100.

# Performance Results on DC / Unplugged

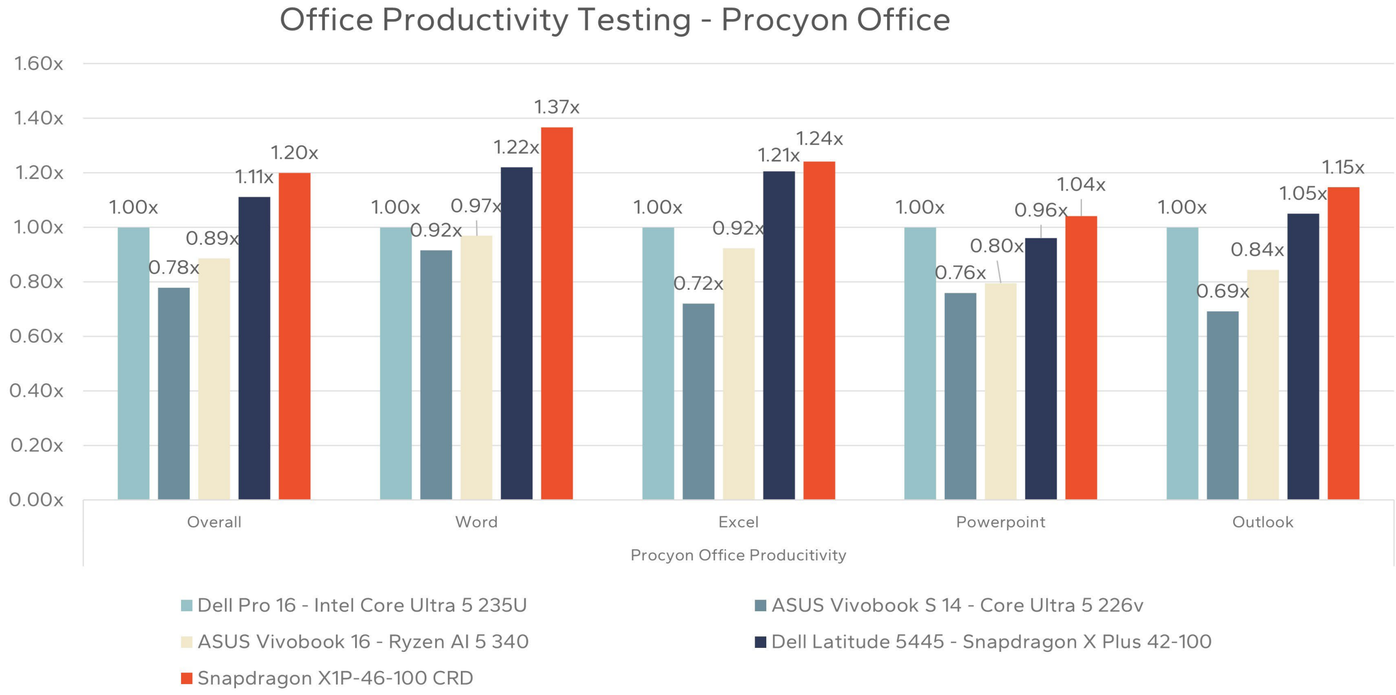
This second set of results are just as, if not more, important than the previous set. Here we are running on battery power only, DC mode, to see how the relative performance difference between the competing solutions changes. As you'll see, some platforms tend to more substantially lower performance when not plugged to the wall than others, resulting in a very different relative performance comparison between the laptops.

When running on battery, the advantages for the Snapdragon platform is even more dramatic. The Snapdragon X1P-46-100 is never less than 16% faster than the baseline 235U, and as you can see in the 226V bar, with its performance dropping noticeably in DC mode, Snapdragon X expands its lead to a very wide margin.

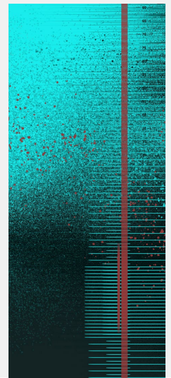
The X1P-46-100 is also consistently faster than the X1P-42-100 in both single- and multi-threaded tests, a similar result to our wall-power tests.



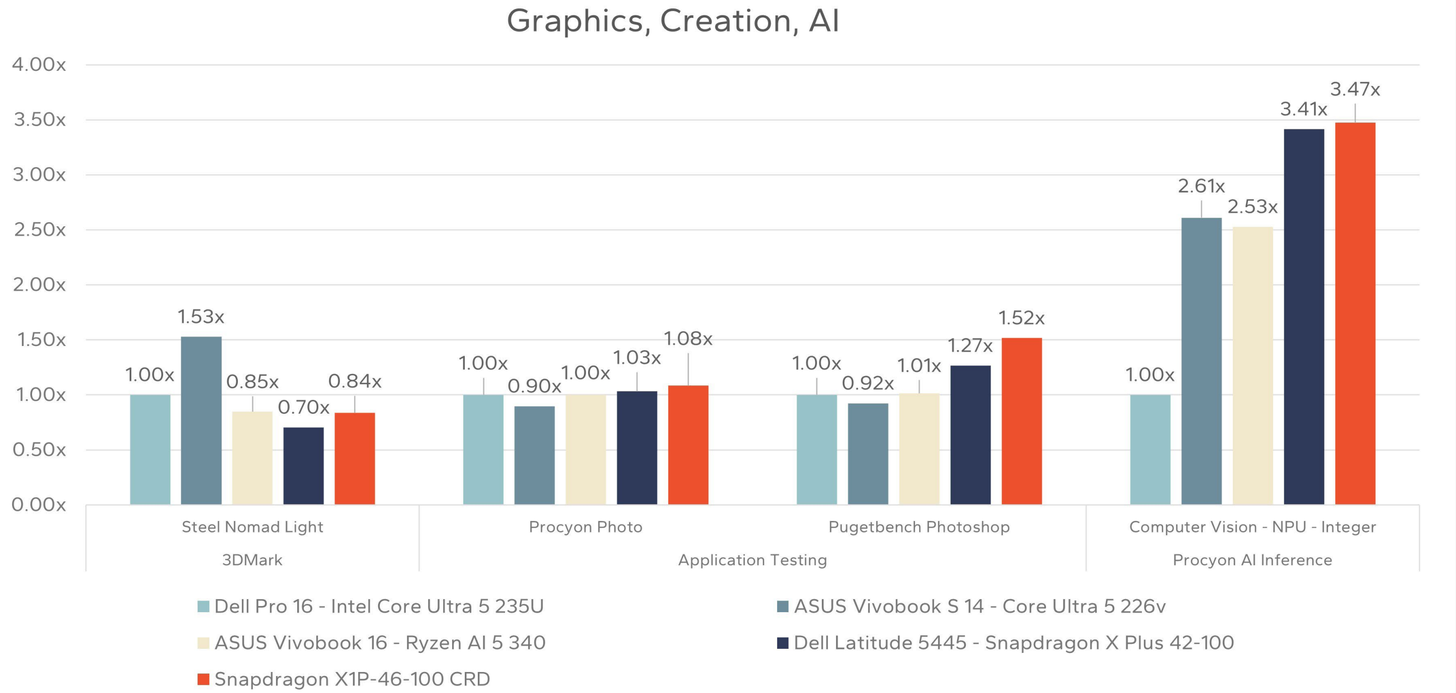
# Performance Results on DC/ Unplugged




The difference in performance running on battery versus when plugged in is even more apparent here. While the Snapdragon platforms had some wins and some losses before, both the X1P-46-100 and X1P-42-100 hold clear leads in this truly mobile scenario as the Lunar Lake and Krackan Point laptops experienced massive performance degradation. The Arrow Lake-based 235U was the only competing CPU to offer anything near the X1P-46-100, and it wasn't that close except in the PowerPoint benchmark.

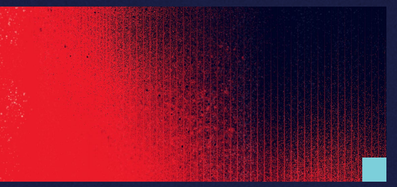


## Performance Results on DC/ Unplugged




Again, the advantages that the Snapdragon platform has in DC mode shine through, increasing its lead in the PugetBench Photoshop testing and turning a loss against the 226V in Procyon Photo into a significant win.

# Conclusions



The new Snapdragon X1P-46-100 builds on top of the existing X1P-42-100 and makes 8-core Snapdragon X Plus performance even better. Across all AC and DC tests, the X1P-46-100 was faster than at least one competing CPU except in a single benchmark, and most of the time it was the fastest outright. It did particularly well in Pugetbench Photoshop where it was roughly 50% faster than the competing processors, and also the Procyon Computer Vision NPU test, where the combined effect of the powerful Hexagon NPU and good software support come together. Overall, the X1P-46-100 was the best processor across the variety of workloads we tested.

This was even more apparent in our on-battery tests, where the Snapdragon X1P-46-100 only lagged behind any competing chip in just one instance: Steel Nomad Light, a gaming-focused graphics test. Elsewhere, the X1P-46-100 usually led the competition by 20% to as high as 90%; Pugetbench Photoshop and Procyon Office Word were particularly good for the Snapdragon X Plus chip, which scored 50% and 30% better respectively compared to the Intel and AMD CPUs. When it comes to on-the-go performance, a crucial specification for thin and light laptops, the X1P-46-100 Snapdragon X Plus was only rivaled by the X1P-42-100.

Given the significant gap between the X1P-42-100 and the 10-core X1P-64-100, Qualcomm's addition of the X1P-46-100 to the lineup is welcome. By increasing CPU core clock speeds and the raw horsepower of the Adreno integrated graphics, the X1P-46-100 can now offer a level of performance that's roughly in between the original 8- and 10-core chips. For users and companies who just wanted a little more out of the X1P-42-100 in order to build a more competitive solution using the Snapdragon chips, the X1P-46-100 is a great alternative that still has an affordable price.

Laptops featuring the X1P-46-100 model of the Snapdragon X Plus will ship soon, targeting the sub-$700 segment of the market. That means Qualcomm-powered laptops will have greater coverage across laptops selling for $1,000 or less, since systems with the X1P-42-100 have retailed closer to $500 to $600 while X1P-64-100-based devices are concentrated around the $800 to $1,000 region. With the newest member of the Snapdragon X Plus family, there will likely be a laptop for pretty much any price point between $500 and $1,000, all of which can offer a compelling competitive alternative to the x86 CPU options on the market.

# Important Information About this Report

**Contact Information**
Signal65 | signal65.com | info@signal65.com

## Contributors

**Ryan Shrout**
President & GM - Signal65
**Ken Addison**
Client Performance Director - Signal65
**Matthew Connatser**
Technical Analyst - Signal65

## Inquiries

Contact us if you would like to discuss this report and Signal65 will respond promptly.

## Citations

This paper can be cited by accredited press and analysts, but must be cited in-context, displaying author's name, author's title, and "Signal65." Non-press and non-analysts must receive prior written permission by Signal65 for any citations.

## Licensing

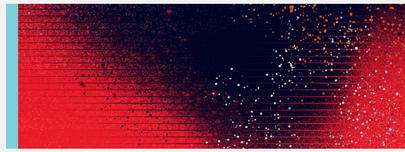


## Disclosures

Signal65 provides research, analysis, advising, and lab services to many high-tech companies, including those mentioned in this paper. Research of this document was commissioned by Qualcomm.

## In Partnership with:

Qualcomm



## About Signal65

Signal65 exists to be a source of data in a world where technology markets and product landscapes create complex and distorted views of product truth. We strive to provide honest and comprehensive feedback and analysis for our clients in order for them to better understand their own competitive positioning and create optimal opportunities to market and message their devices and services.

signal65

# System Configurations

| | QUALCOMM CRD | DELL LATITUDE 5445 | ASUS VIVOBOOK S 14 | DELL PRO 16 | ASUS VIVOBOOK 16 |
|---|---|---|---|---|---|
| **CPU** | Qualcomm Snapdragon X1-46-100 | Qualcomm Snapdragon X1-42-100 | Intel Core Ultra 5 226V | Intel Core Ultra 5 235U | AMD Ryzen AI 5 340 |
| **Graphics** | Qualcomm Adreno X1-45 | Qualcomm Adreno X1-45 | Intel Arc 130V | Intel Graphics | AMD Radeon 840M |
| **RAM** | 32GB LPDDR5X-8448 | 16GB LPDDR5X-8448 | 16GB LPDDR5X-8533 | 16GB DDR5-5600 | 16GB DDR5-5600 |
| **Storage** | 256GB Western Digital SN740 | 512GB SK hynix PVC10 | 512GB Micron MTFDKBA512QGN-1BN1AABGA | 256GB SK Hynix PVC10 | 512GB Micron MTFDKBA512QGN-1BN1AABGA |
| **Display** | 14” 2880x1800 | 14” 1920x1200 | 14” 1920x1200 | 16” 1920x1200 | 16” 1920x1200 |
| **System BIOS** | 6.02.241010 | 2.11.0 | S5406SA.323 | 1.5.2 | M1607KA.322 |
| **Operating System** | Windows 11 26100.4770 | Windows 11 26100.4770 | Windows 11 26100.4770 | Windows 11 26100.4770 | Windows 11 26100.4770 |
| **Windows Power Mode** | Balanced | Balanced | Balanced | Balanced | Balanced |
| **OEM Power Mode** | N/A | Optimized | Standard | Optimized | Standard |
| **Virtualization Based Security** | Enabled | Enabled | Enabled | Enabled | Enabled |

## Applications Used

Geekbench 6.4.0

Cinebench 2024.0.1

UL Procyon 2.10.1729

Microsoft Office 2507

3DMark v2.31.8385

Adobe Photoshop 26.8

Adobe Lightroom Classic 14.3.1

Pugetbench for Creators 1.3.20

Google Chrome 139.0.7258.128


signal65