

Snapdragon X Series Efficiency and Impact on System Sound Levels

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Ryan Shrout Matthew Connatser

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Importance of Silicon Efficiency and Sound Levels

In a previous report, we looked at how silicon and system efficiency affected and impacted thermals of a laptop, relative to performance, and how the Snapdragon X Elite operated much more optimally than the latest processors from Intel and AMD. This time, we're going to be analyzing another important aspect of laptops and computers that's intricately tied up with efficiency and temperature: sound.

As we said before, efficiency is more than battery life and silicon capability is more than just performance; efficiency is an important aspect of silicon design that translates into important user benefits. Greater power efficiency can mean better performance for no additional power consumption, or the same performance while consuming less, or a mix. Getting more performance is pretty nice, but don't underestimate the benefits of requiring less power, because power consumption has wide ranging implications for a laptop or any computer in general.

Naturally, power draw matters a ton for battery life, but thermals are another important consideration as all the energy a processor consumes to operate is turned into heat. How much heat a chip creates will have influence on the design of the laptop, because that heat needs to be sucked out of the processor with a cooler. Like we discussed in our thermal testing paper, coolers impact a laptop's size, weight, and even price. There's one thing that most laptops have in order to achieve good performance: one or more fans. Fans technically aren't necessary, since the heatsink of the cooler can passively dissipate heat into the air, but since laptops are designed to be thin and compact, it's rare for a heatsink to be large enough to make passive cooling work except in the case of ultra low-power processors.

Fans bring noise into the equation, as the counterpart to heat. A cool laptop may be a noisy laptop, and a hot laptop might be whisper quiet, depending on design specifications like the dimensions of the laptop, how much power the chip inside uses, and how cool it needs to run. A lower-power processor enabled by



Source: ASUS

superior efficiency can make balancing sound and thermals easy, to the point where cool and quiet are both easily attainable goals. That in turn can give a processor lots of breathing room to achieve excellent performance.





At Signal65 we think looking at real-world experiences is critical.



Although experiences often encompass performance, application experience, and real-world usage comparisons, it can also mean looking at system behaviors that many customers might not think of when considering a purchase. Sound in particular is often overlooked when it comes to buying a laptop; spec sheets rarely ever touch on noise, and even if they did offer a figure for it, it's hard to get a good sense of the impact of that noise just from a number.

Looking at sound levels is important for several reasons. For starters, it can affect the experience of using the machine in a day-to-day environment, both when working remotely or working in a crowded office space. No user wants to endure having to listen to annoying, loud fans that could be a distraction depending on how noisy they are. While headphones might put a bandaid on the issue, it doesn't help if a roaring loud fan hits other people's ears or the user's microphone, which can become a big

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problem for video meetings.

A loud fan is also a fan that's spinning continuously, which can reduce the fan's lifespan. Whether it's because the processor is too hot or the cooler isn't capable enough, a fan will have to spin

a fan will have to spin faster and more frequently to combat excessive heat. Broken fans can cause a headache for any sort of user, both at home and in the workplace. An on-site repair for a laptop with a broken fan isn't convenient since it involves opening up the machine and having a new fan ready to install; it might just be better to send it to the original manufacturer or to a thirdparty repair company, but getting the laptop back can take some time.

How you balance sound, along with thermals, and the resulting performance



of the system is the key driver for how we want to compare systems. These are three aspects of a laptop that are usually in contention with each other. A high performance laptop will generally be hot or loud or even both at the same time; a quiet laptop usually isn't very fast, and may also get fairly warm; and a cool laptop may need the processor to run at a low power with worse performance, and also keep the fans spinning at a decent clip.



The Test for Today

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For this testing, we wanted to look at the efficiency of competing silicon solutions in the PC space in the heavily multi-threaded rendering application Blender, one of the more intense compute scenarios for any laptop. We have results from three models of the Acer Swift 14 AI, each with a different processor, as well as the Asus Vivobook S15 and Vivobook S16, both of which have different processors. In particular, we are looking at the balance between sound levels of each set of laptops and performance. The outcomes should help tell us which modern laptop processors are more efficient and how much that difference can translate into observable and tangible benefits to consumers.

Test Setup

This test is a comparison of the Snapdragon X Elite against Intel Lunar Lake and Arrow Lake, and AMD Strix Point laptops. This can be challenging to do correctly, since there can be subtle or dramatic differences between laptops that might even appear the same on the

outside, and those differences need to be minimized to derive the best comparisons. Thankfully, companies like Acer and ASUS have fully embraced the Snapdragon X Elite and are making We mainstream laptops based on those the processors; we conducted our tests ent using the Acer Swift 14 AI, and the ASUS Vivobook S15 and S16.

Testing Process

Signal65 sound testing takes place in a sound isolated chamber so that our data isn't compromised by the outside environment. Testing equipment includes a Larson Davis SoundExpert LxT integrating Sound Level Meter with a PRMLXT1L preamplifier with a 377B02 microphone. We used the Blender rendering application and the common "Monster" benchmark workload to represent a saturated compute state to showcase the thermal and sound level state of a fully utilized laptop.







Results: ASUS Vivobook with Blender 4.4.0

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Like we mentioned previously, our ASUS Vivobook systems are not exactly an iso-chassis comparison, but they are similar in design and build quality, and definitely target the same audience and segment of the market, even though the Intel-based system has a 16" screen vs the Qualcomm-based design with a 15" screen. The intent is that by measuring only OEM-to-OEM, we can reasonably ensure that the same design methodology and strategy is used across the devices; the only caveat is that given the Intel model's larger size, it could have a slight to modest advantage in cooling over the Qualcomm model.

The Vivobook S15 features the lowestpower X1E-78-100 version of the 285H, which trails by 31%. Snapdragon X Elite, while the S16 sports the Core Ultra 9 285H (Arrow Lake-H). These two CPUs might be considered to Substantially higher performance can address different market segments, but sometimes require the compromise of increasing fan speed and noise for the performance results in Blender say greater cooling, but that's not the case otherwise. The ASUS Vivobook S15 with this time. The Vivobook S15 with the the Snapdragon X Elite achieves baseline



better performance compared to the Vivobook S16 with the Intel Core Ultra 9

Snapdragon X Elite processor is quieter in general, producing 2 dBA less noise at idle and 3.7 dBA less under our tested load than the S16 with the Intel Core Ultra 9 285H. This indicates that the Snapdragon-based system maintains a lower acoustic profile, even under heavy workloads.



Results: ASUS Vivobook with Blender 4.4.0



To fully illustrate the advantage the Snapdragon X Elite showed against the Core Ultra 9 285H, we plotted the real-time data from each laptop onto a line graph. Although the Qualcomm model was initially louder than the Intel-powered laptop, it's clear that the Snapdragon-based PC runs much quieter after about a minute, once both machines have settled in. You may also notice that the line for the Qualcomm laptop ends sooner than for the Intel model; that's when the Snapdragon X Elite finished the workload.



Results: ASUS Vivobook with Blender 4.4.0



The results indicate that the Snapdragon X Elite not only delivers better performance, but also operates more quietly under sustained workloads, an efficiency advantage that will appeal to users prioritizing both speed and silence, two things that rarely go hand-in-hand.



Results: Acer Swift 14 Al with Blender 4.4.0

The Acer Swift 14 AI created maybe the most unique comparison in our analysis as it allows us to look across a set of three different processors, all using basically identical chassis. Our testing looks at the Snapdragon X Elite X1E-78-100 (the lowest-power variant of the chip), the Intel Core Ultra 7 258V, and the AMD Ryzen AI 9 365. For this testing we are again utilizing the Blender 3D rendering application and the "Monster" workload.

The performance results reveal a wide performance spread in the Blender workload. The Acer Swift 14 Al with Snapdragon X Elite delivers impressive

performance, outperforming the AMD Ryzen AI 9 365 system by 14% and Snapdragon X Elite system is slightly quieter than the AMD Ryzen AI 9 365 more than doubling the performance model at idle, and significantly quieter of the Intel Core Ultra 7 256V, which under load (40.8 dBA vs. 43.5 dBA), but trails significantly. it is louder than the Intel Core Ultra 7 256V system, which remains the quietest Again, higher performance is usually overall under Blender load at 31.7 dBA. counterbalanced by higher noise, but Qualcomm's flagship PC processor

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Results: Acer Swift 14 AI with Blender 4.4.0



Through both the performance and sound data, the Snapdragon system demonstrates a complex tradeoff: while it does run louder than the Intel-based model under load, it delivers over twice the performance. This reinforces the point that evaluating thermals and acoustics in isolation can be misleading without also considering computational throughput. The comparison against the AMD system is much more simple, since the Qualcomm model is both faster and quieter.



Results: Acer Swift 14 Al with Blender 4.4.0



Using the line graph, we can more clearly compare the relationship between sound and performance, paying particular attention to how much longer the workload needs to run on the Intel-based platform. For users prioritizing speed in creative workflows, the Snapdragon platform offers superior overall efficiency and a welcome balance of noise and capability.





Conclusions

In our testing across two different laptop comparisons, the Snapdragon X Elite demonstrated better performance efficiency and the ability to balance sound levels with thermals. Even more impressive, it did this while maintaining performance leadership in all competitive comparisons, by more than 2x in one case. That is the ideal combination for a

CPU and platform design: offer amazing There are obviously other comparisons performance and capabilities without and considerations you could look at, running too loud, or too hot. including other OEM designs, comparing different sizes and form factors, and even It's a clear demonstration that Qualcomm using other benchmarks or workloads to nailed power efficiency with the load the system. The power management Snapdragon X Elite. It's not unusual for systems on Windows laptops are incredibly complex and are a combination a new chip to make significant strides in performance, or thermals, or noise, but of great silicon design, hardware it's very rare to see so much progress in implementation, and software to manage all three directions. All of those hinge on it all. It can and will vary from OEM to leading power efficiency, which is hard to OEM, and that's why it is key to look at make up for with fancier cooling solutions a wide range of options when making or increased power delivery. broad claims.

In respect to noise in particular, running louder means that you could have a more disruptive system to cool less efficient CPU options, and a lower quality user experience due to increased noise. Good power efficiency does a lot of heavy lifting in solving noise issues, among other things.

One of Qualcomm's key tenets of its Snapdragon X Elite platform launch back in 2024 was its ability to offer leadership CPU performance thanks to its Oryon core, while utilizing its expertise in thermal and power management with its history in smartphone chip design, to build a truly differentiated Windows experience. Competition is moving all the time, but as we see the market today, Qualcomm has achieved these goals, especially in regards to sound. We can't wait to see what they build next!





Important Information About this Report

Contact Information

Signal65 | signal65.com | info@signal65.com

Contributors

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

Inquiries

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

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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.



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System Configurations

	ASUS Vivobook S15	ASUS Vivobook S16
СРИ	Snapdragon X Elite 78-100	Intel Core Ultra 9 285H
Graphics	Qualcomm Adreno X1-85	Intel Arc 140T
RAM	16GB LPDDR5X-8533	32GB LPDDR5X-7467
Storage	1TB Micron MTFDKBA1T0QFM	1TB Micron MFTDKBA1T00
Display	15" 2880x1620	16: 2880x1800
System BIOS	S550QAD.362	S5606CA.305
Operating System	Windows 11 26100.3476	Windows 11 26100.3476
Windows Power Mode	Best Performance	Best Performance
OEM Power Mode	Performance	Performance
Virtualization Based Security	Enabled	Enabled
	Acer Swift 14 Al	Acer Swift 14
	Acer Swift 14 Al	Acer Swift 14
СРՍ	Acer Swift 14 AI Snapdragon X Elite 78-100	Acer Swift 14 Intel Core Ultra 7 258V
CPU Graphics	Acer Swift 14 AISnapdragon X Elite 78-100Qualcomm Adreno X1-85	Acer Swift 14 Intel Core Ultra 7 258V Intel Arc 140V
CPU Graphics RAM	Acer Swift 14 AISnapdragon X Elite 78-100Qualcomm Adreno X1-8516GB LPDDR5X-8533	Acer Swift 14Intel Core Ultra 7 258VIntel Arc 140V32GB LPDDR5X-8533
CPU Graphics RAM Storage	Acer Swift 14 AISnapdragon X Elite 78-100Qualcomm Adreno X1-8516GB LPDDR5X-85331TB Western Digital PC SN5000S	Acer Swift 14Intel Core Ultra 7 258VIntel Arc 140V32GB LPDDR5X-85331TB Micron 2250
CPU Graphics RAM Storage Display	Acer Swift 14 AISnapdragon X Elite 78-100Qualcomm Adreno X1-8516GB LPDDR5X-85331TB Western Digital PC SN5000S14.5" 2560x1600	Acer Swift 14 Intel Core Ultra 7 258V Intel Arc 140V 32GB LPDDR5X-8533 1TB Micron 2250 14" 1920x1200
CPU Graphics RAM Storage Display System BIOS	Acer Swift 14 AI Snapdragon X Elite 78-100 Qualcomm Adreno X1-85 16GB LPDDR5X-8533 1TB Western Digital PC SN5000S 14.5" 2560x1600 1.18	Acer Swift 14 Intel Core Ultra 7 258V Intel Arc 140V 32GB LPDDR5X-8533 1TB Micron 2250 14" 1920x1200 1.12
CPU Graphics RAM Storage Display System BIOS Operating System	Acer Swift 14 AI Snapdragon X Elite 78-100 Qualcomm Adreno X1-85 16GB LPDDR5X-8533 1TB Western Digital PC SN5000S 14.5" 2560x1600 1.18 Windows 11 26100.3476	Acer Swift 14 Intel Core Ultra 7 258V Intel Arc 140V 32GB LPDDR5X-8533 1TB Micron 2250 14" 1920x1200 1.12 Windows 11 26100.3476
CPU Graphics RAM Storage Display System BIOS Operating System Windows Power Mode	Acer Swift 14 AISnapdragon X Elite 78-100Qualcomm Adreno X1-8516GB LPDDR5X-853317B Western Digital PC SN5000S14.5" 2560x16001.18Windows 11 26100.3476Best Performance	Acer Swift 14Intel Core Ultra 7 258VIntel Arc 140V32GB LPDDR5X-85331TB Micron 225014" 1920x12001.12Windows 11 26100.3476Best Performance
CPU Graphics RAM Storage Display System BIOS Operating System Windows Power Mode	Acer Swift 14 AISnapdragon X Elite 78-100Qualcomm Adreno X1-8516GB LPDDR5X-853316GB LPDDR5X-85331TB Western Digital PC SN5000S14.5" 2560x16001.18Windows 11 26100.3476Best PerformancePerformance	Acer Swift 14Intel Core Ultra 7 258VIntel Arc 140V32GB LPDDR5X-853317B Micron 225014" 1920x12001.12Windows 11 26100.3476Best PerformancePerformance



QGN

Acer Swift 14

AMD Ryzen Al 9 365

AMD Radeon 880M

32GB LPDDR5X-7500

1TB Western Digital PC SN5000S

14" 1920x1200

1.08

Windows 11 26100.3476

Best Performance

N/A

Enabled

Applications Used

Blender 4.4.0

UL Procyon 2.10.1663

