Spring of 2021 has seen the continuation of the remote school and work trend in full force with plenty of compelling mobile-productivity platforms being released to try and address this insatiable market. Many professionals who were previously accustomed to a highly integrated desktop and monitor within their office or cubicle now must complete the majority of their day's work in make-shift offices around the house. Mobility matters more than ever but this cannot occur at the expense of productivity given that most of these paradigms have moved well beyond "temporary discomforts".

Detachable notebooks, reflect the pinnacle of mobility yet that have, historically, been considered a mixed blessing by most business-class customers. The reason for this is that detachable notebooks are notoriously underpowered for most office applications. In other words, they are slow and unfit replacements for the desktop or performance notebook most customers depend upon every day. The reason that detachable and tablet-style PC's are so slow is the same fundamental physics problem we continuously run up against: performance creates heat, heat requires size to dissipate, tablets lack size, ipso facto, tablets lack performance (thorough explanation [here]).

While this stereotype regarding detachable notebook performance has been well earned throughout their history, advances in both cooling technology and CPU efficiencies found in Intel's 11th generation (Tiger Lake) notebook platform have given rise to a generation of detachable notebook PCs that maintain the mobility strengths of their predecessors but pack enough computational horsepower under the hood to keep pace with their "clamshell" notebook brethren.

In this article, we will briefly compare two recently launched 13" detachable notebook powerhouses:

- **The Incumbent segment champion**: Microsoft Surface Pro 7+
- **The Challenger**: Dell Latitude 7320 Detachable

For this battle, the focus will be upon 4 Key Performance Indicators (KPIs):

- Application Performance
- Skin Temperature
- Sound Output
- Battery Life

Both the Dell Latitude 7320 Detachable and the Microsoft Surface Pro 7+ feature multiple CPU options from Intel's latest 11th gen (Tiger Lake) architecture. The Core i7 series of notebook CPUs are designed with application performance as the top priority where the Core i5 series CPUs represent a balance of performance, efficiency, and cost. With this in mind, the performance oriented KPIs will be evaluated on both platforms using the Core i7 series and Battery Life will be tested using Core i5 series CPUs.

System Test Configurations

Table 1 below details the hardware configurations for each of the units utilized in this investigation along with a table that denotes which system was used for each KPI. As previously mentioned, the Intel Core i5 series notebooks were utilized in battery longevity tests while the Core i7 series notebooks were utilized for application performance, acoustic, and thermal testing consistent with previous investigations. All four of the 13" detachable notebook systems offer similar hardware features with various pros and cons. Though not the core focus of this investigation, it is interesting to note that the Surface Pro 7+ does not offer WWAN on their Core i7 detachable which has become a popular feature amongst the ultra-mobility product set. Furthermore, the Dell Latitude 7320 appears to offer a large number of security and accessibility features not found on the Surface Pro 7+ including presence detection, fingerprint reader, integrated pen, and smart card security options.

Table 1. System configuration details for the detachable PC KPI study

Hardware Configurations				
	Microsoft	**Dell**	**Microsoft**	**Dell**
	Surface Pro 7+	**Latitude 7320 Det.**	**Surface Pro 7+**	**Latitude 7320 Det.**
Processor	Intel i5-1135G7	Intel i5-1130G7	Intel i7-1165G7	Intel i7-1180G7
Memory	8GB DDR4 2666MHz	8GB DDR4 2666MHz	16GB DDR4 2666MHz	16GB DDR4 2666MHz
Storage	120GB PCIE NVMe	256GB PCIE NVMe	238GB PCIE NVMe	1TB PCIE NVMe
Battery Capacity	49 Whr	40 Whr	49 Whr	40 Whr
Display Resolution	2736x1824	1920x1280	2736x1824	1920x1280
BIOS Version	12.41.141	1.1.0	12.41.141	1.1.0
OS Power Scheme	Battery Saver	Battery Saver	Best Performance	Best Performance
Physical Dimensions				
Width x Height (mm)	292 x 201	288.4 x 207.9	292 x 201	288.4 x 207.9
Z -Thickness (mm)	8.5	8.44	8.5	8.44
Product Volume (mm^3)	498,882	506,048	498,882	506,048
Screen Border (mm)	sides: 14.5 top/bot: 12.5	sides: 4.95 top/bot: 10.4	sides: 14.5 top/bot: 12.5	side: 4.95 top/bot: 10.4
Screen Size (inches)	12.3"	13"	12.3"	13"
Screen Dimensions (mm)	263 x 176	278.5 x 187.1	263 x 176	278.5 x 187.1
Product Weight	1.7lb	1.7lb	1.7lb	1.7lb
Additional Features				
Presence Detection	No	Yes	No	Yes
Serviceable	No	Yes	No	Yes
WWAN	Yes	Yes	No	Yes
Fingerprint Reader	No	Yes	No	Yes
Integrated Folio Pen	No	Yes	No	Yes
Security (Smart Card, NFC)	No	Yes	No	Yes
Testing Usage				
Application Performance			X	X
Skin Temperature			X	X
Sound Output			X	X
Battery Life	X	X		

Application Performance

Incumbent: Microsoft Surface Pro 7+ with Intel **Core i7-1165G7**

Challenger: Dell Latitude 7320 Detachable with Intel **Core i7-1180G7**

The first KPI in this study is *Application Performance*. BAPCo's SYSMark 25 and UL's PCMark 10 are both considered premier office productivity benchmarks allowing for direct comparison of how efficiently a platform can work through the most common applications used in the business environment such as web browsing, email, word processing, and spreadsheets. Both detachable PCs perform extremely well these office-centric benchmarks with the Latitude taking the lead in SYSMark 25 and the Surface holding a slight edge in PCMark 10.

SYSMark 25
(Higher is Better)

■ Dell Latitude 7320 ■ Microsoft Surface Pro 7+

Dell Latitude 7320: 1336
Microsoft Surface Pro 7+: 1203
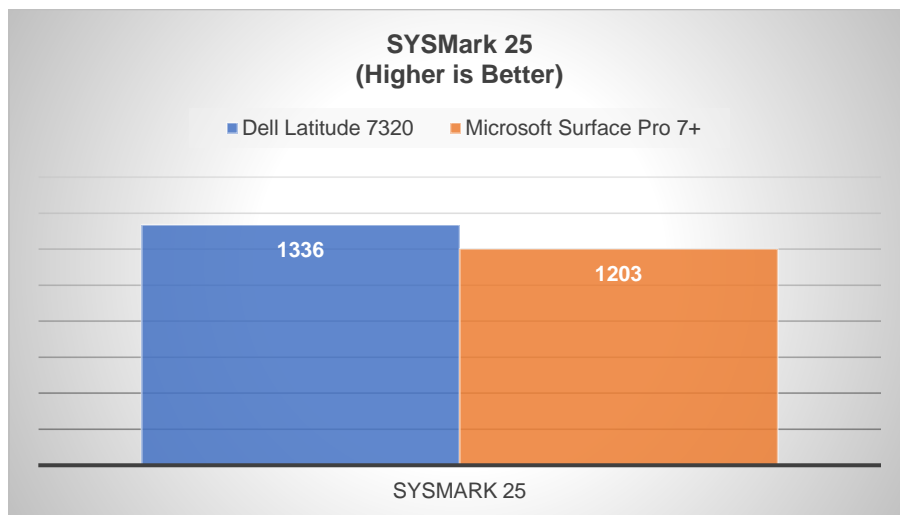
SYSMARK 25

Figure 1. SYSMark 25 office productivity benchmark results

PCMark 10
(Higher is Better)

■ Dell Latitude 7320 ■ Microsoft Surface Pro 7+

Dell Latitude 7320: 4755
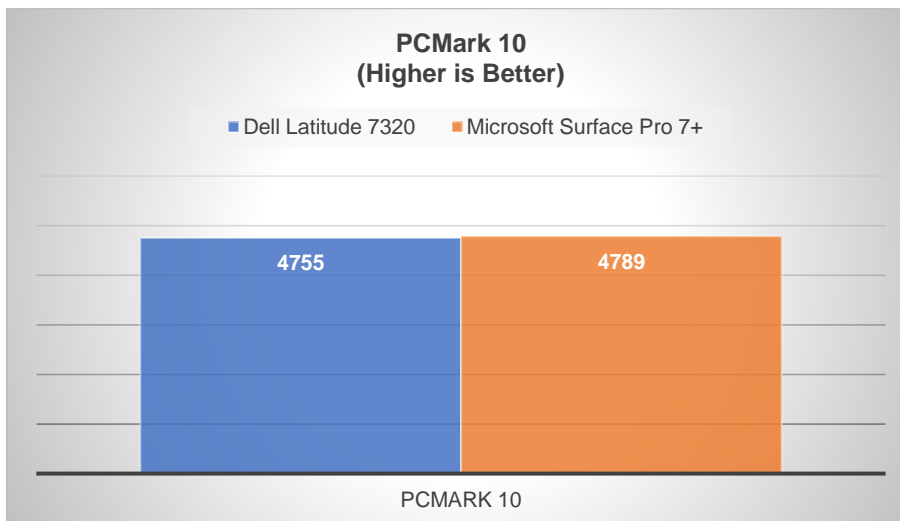Microsoft Surface Pro 7+: 4789

PCMARK 10

Figure 2. PCMark 10 office productivity benchmark results

Productivity Winner: **Tie. Both detachable notebooks claim victory to one of the two premier office-productivity benchmarks.**

Skin Temperature

Incumbent: Microsoft Surface Pro 7+ with Intel **Core i7-1165G7**

Challenger: Dell Latitude 7320 Detachable with Intel **Core i7-1180G7**

In order to effectively thermally stress each detachable notebook and capture their respective maximum skin temperature, the Cinebench R20 photo rendering benchmark was utilized and configured to run in a continuous loop for 30 minutes. While Cinebench is a fantastic benchmark for comparing raw CPU throughput on many compute platforms, it was not included in the application performance section of this article simply because very few people would look to a detachable notebook for CPU-intensive photo rendering usage making it a somewhat irrelevant performance proxy. That said, the application does provide a very stable and consistent workload for capturing both maximum skin temperature and maximum sound output.

Determining the appropriate location to capture skin temperature is best accomplished with an IR camera which makes hot spots on the device surface easy to spot. Figure 3 below shows the IR captures for hot spots on the Microsoft Surface (left) and Dell Latitude (right) notebooks, respectively.
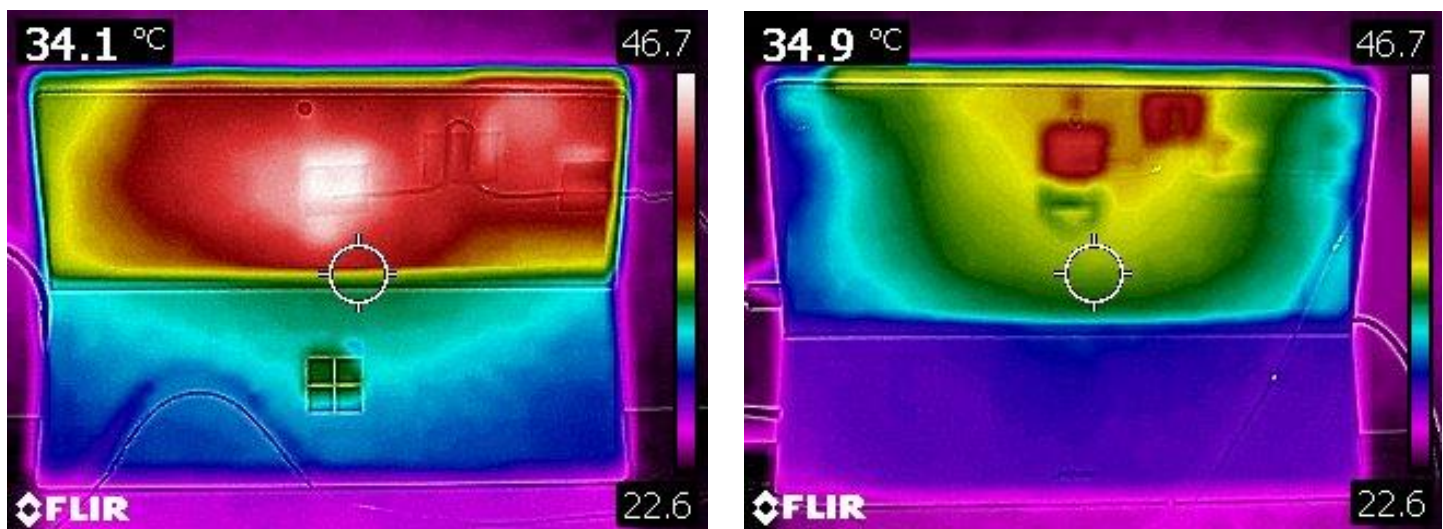

Figure 3. Product skin temperature mapping utilizing FLIR IR camera for the Microsoft Surface Pro 7+ (left) and Dell Latitude 7320 (right)

Not surprisingly, the hottest location on both detachable notebooks is found directly in the middle of the rear cover which is close to the location of the CPU just inside the cover. What is interesting is that the Dell Latitude 7320 does show remarkably cooler temperatures along the side edges of the detachable where human fingers are most likely to be found which does show thoughtfulness in the heatsink placement on Dell's part. The hottest location on both detachable notebooks was instrumented using type-T thermocouples to properly capture skin temperature throughout operation and the results are shown in Figures 4 and 5 below.
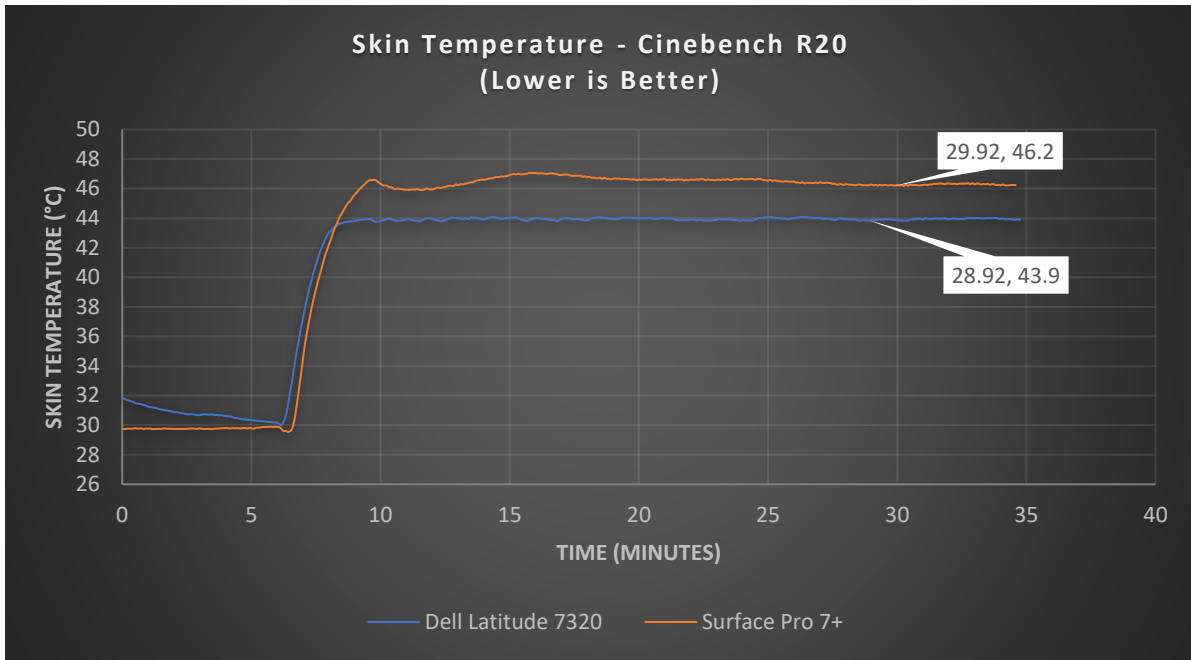
Figure 4. Skin temperature vs time recorded during a 30-minute dwell test with Cinebench R20.
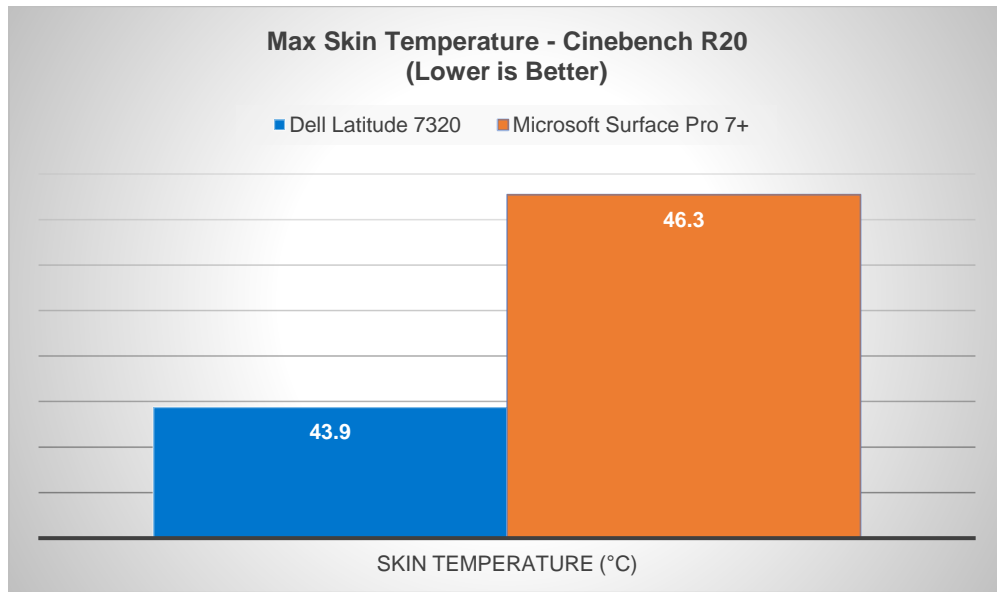

Figure 5. Maximum skin temperature recorded during a 30-minute dwell test with Cinebench R20.

Skin Temperature Winner: **Dell Latitude 7320 is nearly 3°C cooler to the touch than the Microsoft Surface Pro 7+.**

Sound Output

Incumbent: Microsoft Surface Pro 7+ with Intel **Core i7-1165G7**

Challenger: Dell Latitude 7320 Detachable with Intel **Core i7-1180G7**

Using the same workload methodology employed in the Skin Temperature KPI, *Sound Output* was tested using the Cinebench R20 thermal stress to induce consistent workload on both detachable notebooks. The benchmark was, again, programmed to operate in a 30-minute continuous loop to ensure that component temperatures were stable and fan speeds could reach their steady state value. Sound level output was captured in the Strategic Thermal Labs pseudo-anechoic chamber (shown in Figure 6) and the results of the study are shown in Figures 7 and 8 below.
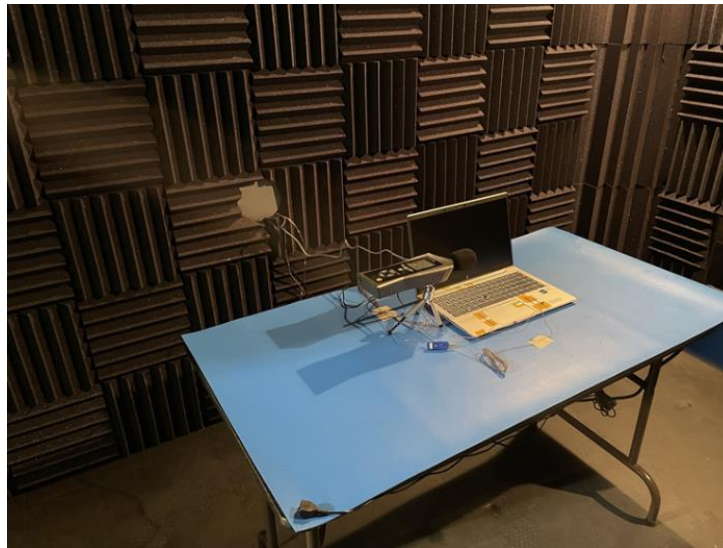

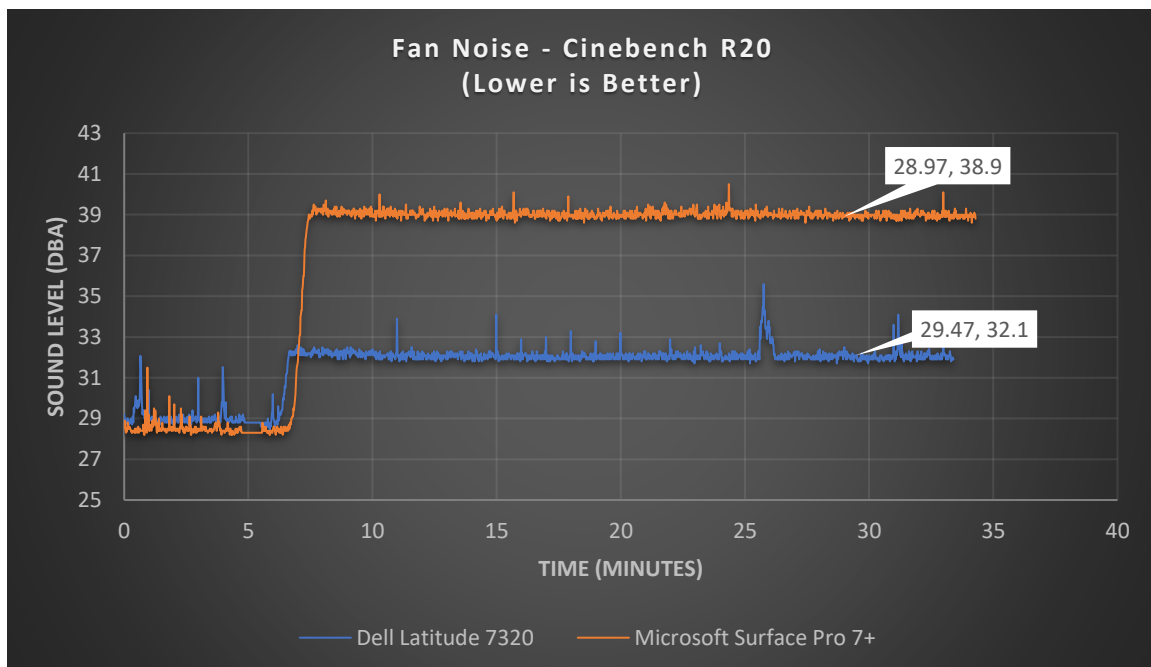*Figure 6. Notebook acoustic testing (sound level output) in Strategic Thermal Labs pseudo-anechoic chamber.*

Figure 7. Notebook acoustic testing (sound level output) in Strategic Thermal Labs pseudo-anechoic chamber.

Fan Noise - Cinebench R20
(Lower is Better)

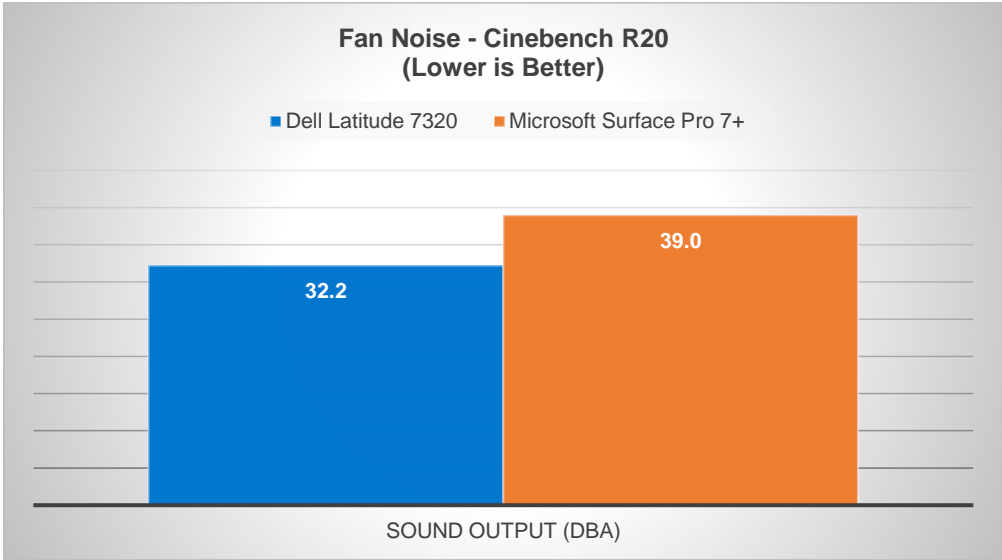■ Dell Latitude 7320 ■ Microsoft Surface Pro 7+

32.2

39.0

SOUND OUTPUT (DBA)

Figure 8. Maximum steady-state sound output recorded during a 30-minute dwell test with Cinebench R20.

Sound Output Winner: **Dell Latitude 7320 is the clear winner in this test as well with a maximum sound output that is nearly 7 dBA quieter than the Surface Pro 7+.**

Battery Life

Incumbent: Microsoft Surface Pro 7+ with Intel **Core i5-1135G7**

Challenger: Dell Latitude 7320 Detachable with Intel **Core i5-1130G7**

The final KPI in the detachable notebook comparison is *Battery Life*. When designing an ultra-mobile productivity platform such as the business-class detachable notebook, battery size and performance are critical tuning parameters. With too small of a battery, the mobile platform becomes useless during those trans-Pacific working sessions where the availability of power outlets can be hit or miss. Too large of a battery will cause the detachable to become heavy, bulky, or force tradeoffs in other features like screen and CPU heatsink size impeding application performance. In addition to properly sizing the battery itself, system designers also have the ability to fine tune power consumption within the notebook to prolong battery life when you need it most.

Figure 9 shows the physical battery capacity for both detachable products in this study. Figure 10 shows how that physical battery size actually translates into battery life in the PCMark 10 Modern Office battery performance benchmark. This application measures the length of time that a notebook can sustain common office-centric tasks before succumbing to low-battery sleep.
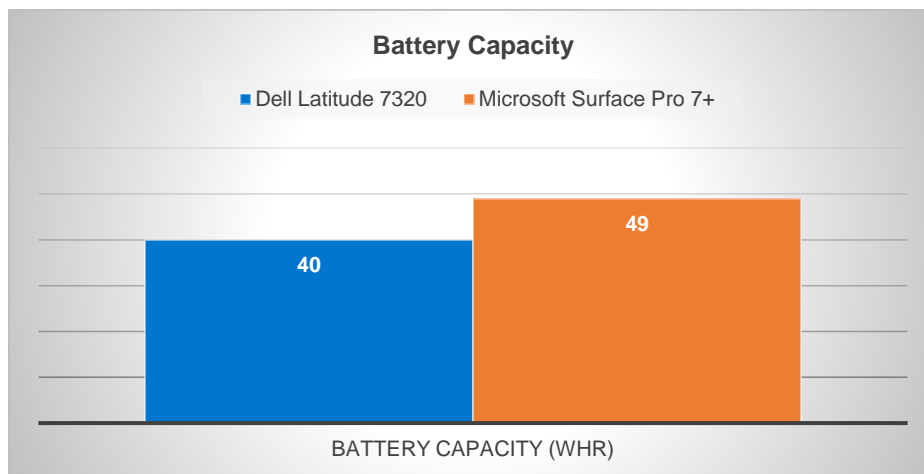

Figure 9. Comparison of physical battery capacity between the Dell Latitude 7320 and Microsoft Surface Pro 7+.
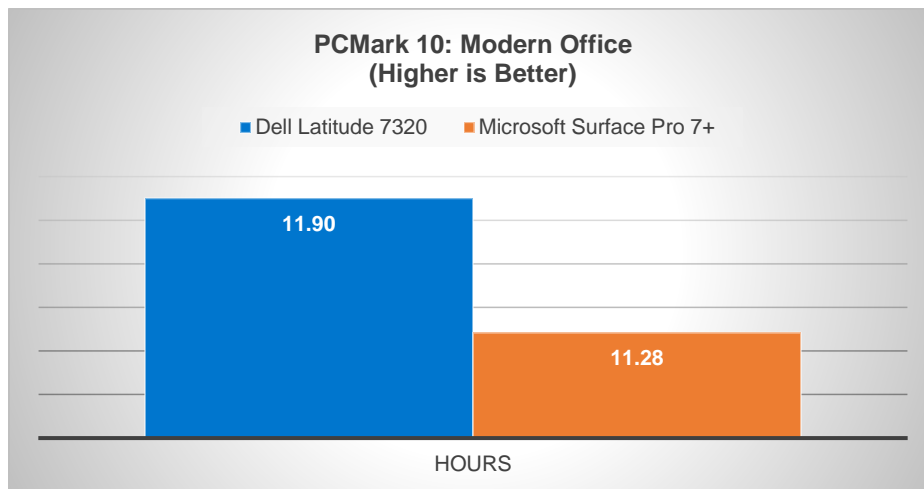

Figure 10. PCMark 10 Modern Office battery endurance test results.

Battery Life Winner: **Dell Latitude 7320 keeps users productive for an extra half hour on battery.**

KPI Winner Summary

Application Performance: **Tie**. The Microsoft Surface Pro 7+ takes a slight lead in PCMark 10 while the Dell Latitude 7320 scores a notable victory in SYSMark 25. These applications are, arguably considered to be the golden standard for office productivity benchmarking. If there was, however, to be a tie breaker in this category, it would likely go to the Dell Latitude 7320 for winning SYSMark 25 due to this simple reason: SYSMark uses legitimate versions of the most popular office applications like Microsoft Office, Adobe Creative Suite, Google Chrome, WinZip, and more where PCMark 10 relies upon the Libre Office Suite and other open-source applications. This does not undermine the value of the PCMark 10 benchmark, however, most business-class customers are using Microsoft Office and, though Libre Office is a reasonable proxy application, trust must defer to the 'real' application over its proxy.

Skin Temperature: **Dell Latitude 7320**. Maximum skin temperature for the Latitude product was nearly 3°C cooler during a sustained CPU workload which is a remarkable difference. We also see from Infrared imaging that the Latitude 7320 is significantly cooler around the periphery of the notebook where fingers are likely to hold the system.

Sound Output: **Dell Latitude 7320**. Steady state sound (fan noise) emissions from the Microsoft Surface Pro 7+ are nearly 7 dBA louder than the Dell Latitude 7320 during the same sustained CPU workload. 7 dBA is considered to be a very significant difference in the world of sound as dBA follows a logarithmic scale and a *10 dBA increase in sound would be perceived by most humans as being twice as loud*.

Battery Life: **Dell Latitude 7320**. The PCMark 10: Modern Office battery benchmark is an application designed to emulate real-world battery usage scenarios by executing common office tasks like web browsing, video conferencing, word processing, and spreadsheets. Utilizing these common applications, the benchmark tool measures how long a system can continue operating before a low battery forces the system into sleep/standby mode. Despite having a smaller battery size, through system tuning, the Dell Latitude 7320 comes out ahead of the Microsoft Surface Pro 7+ in the PCMark 10: Modern Office battery test.

Conclusions

Both the Microsoft Surface Pro 7+ and the Dell Latitude 7320 detachable notebooks continue to debunk the historical narrative that detachable notebooks are unsuitable for high-productivity workloads in the office environment. These systems both manage to offer the portability of a tablet PC and still put-up fantastic scores in the application benchmarks that are most reflective of the workloads business customers utilize every single day. Both notebooks have very similar exterior dimensions but where Microsoft wins the award for highest screen resolution, Dell scores points for its ultra-thin border providing the user 13% more usable screen area. The Dell Latitude 7320 also comes in slightly thinner at 8.4mm compared to the Microsoft Surface Pro 7+ at 8.5mm. If application performance is of greatest interest, both of these detachable wills provide very similar value. If, however, skin temperature, sound emission, and/or battery life are also of great importance, the Dell Latitude 7320 is the clear winner from this study.

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