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# Core i9 12900K AVX-512 Alder Lake Benchmarks

12700k comparison vs original testing by Mich L. of AVX-512 12900k performance

**Automated Executive Summary**

*i9-12900K P-Cores + AVX-512 had the most wins, coming in first place for 50% of the tests.*

*Based on the geometric mean of all complete results, the fastest (i9-12900K P-Cores + AVX-512) was 1.921x the speed of the slowest (i9-12900K P-Cores). i7-12700K P-Cores + AVX-512 DDR4 was 0.972x the speed of i9-12900K P-Cores + AVX-512, i9-12900K was 0.745x the speed of i7-12700K P-Cores + AVX-512 DDR4, Intel Core i7-12700K was 0.868x the speed of i9-12900K, i9-12900K P-Cores was 0.828x the speed of Intel Core i7-12700K.*

*The results with the greatest spread from best to worst included:*

*Cpuminer-Opt (Algorithm: Myriad-Groestl) at 2.88x*
*Cpuminer-Opt (Algorithm: LBC, LBRY Credits) at 2.621x*
*Cpuminer-Opt (Algorithm: Quad SHA-256, Pyrite) at 2.237x*
*Cpuminer-Opt (Algorithm: Garlicoin) at 2.198x*
*Cpuminer-Opt (Algorithm: Blake-2 S) at 2.178x*
*Cpuminer-Opt (Algorithm: Triple SHA-256, Onecoin) at 2.061x*
*Cpuminer-Opt (Algorithm: Skeincoin) at 1.639x*
*Stockfish (Total Time) at 1.526x*

*Cpuminer-Opt (CPU Temperature Monitor) at -1x*
*Cpuminer-Opt (CPU Power Consumption Monitor) at -1x.*

# Test Systems:

## i9-12900K

Processor: Intel Core i9-12900K @ 6.50GHz (16 Cores / 24 Threads), Motherboard: ASUS ROG STRIX Z690-E GAMING WIFI (0702 BIOS), Chipset: Intel Device 7aa7, Memory: 64GB, Disk: 1000GB Western Digital WDS100T1X0E-00AFY0 + 2000GB, Graphics: Gigabyte AMD Radeon RX 6800/6800 XT / 6900 16GB (2575/1000MHz), Audio: Intel Device 7ad0, Monitor: ASUS VP28U, Network: Intel I225-V + Intel Wi-Fi 6 AX210/AX211/AX411

OS: Ubuntu 21.10, Kernel: 5.15.0-051500rc6daily20211023-generic (x86_64) 20211022, Desktop: GNOME Shell 40.5, Display Server: X Server 1.20.13 + Wayland, OpenGL: 4.6 Mesa 22.0.0-devel (git-c2d522b 2021-10-23 impish-oibaf-ppa) (LLVM 12.0.1 DRM 3.42 5.15.0-051500rc6daily20211023-generic), Vulkan: 1.2.195, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-ZPT0kp/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-11-ZPT0kp/gcc-11-11.2.0/debian/tmp-gcn/usr --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0x12 - Thermald 2.4.6
Graphics Notes: BAR1 / Visible vRAM Size: 16368 MB
Python Notes: Python 3.9.7
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

## i9-12900K P-Cores

## i9-12900K P-Cores + AVX-512

Processor: Intel Core i9-12900K @ 6.50GHz (8 Cores / 16 Threads), Motherboard: ASUS ROG STRIX Z690-E GAMING WIFI (0702 BIOS), Chipset: Intel Device 7aa7, Memory: 64GB, Disk: 1000GB Western Digital WDS100T1X0E-00AFY0, Graphics: Gigabyte AMD Radeon RX 6800/6800 XT / 6900 16GB (2575/1000MHz), Audio: Intel Device 7ad0, Monitor: ASUS VP28U, Network: Intel I225-V + Intel Wi-Fi 6 AX210/AX211/AX411

OS: Ubuntu 21.10, Kernel: 5.15.0-051500rc6daily20211023-generic (x86_64) 20211022, Desktop: GNOME Shell 40.5, Display Server: X Server 1.20.13 + Wayland, OpenGL: 4.6 Mesa 22.0.0-devel (git-c2d522b 2021-10-23 impish-oibaf-ppa) (LLVM 12.0.1 DRM 3.42 5.15.0-051500rc6daily20211023-generic), Vulkan: 1.2.195, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Environment Notes: CXXFLAGS="-O3 -march=native" CFLAGS="-O3 -march=native"
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto

--enable-offload-targets=nvptx-none=/build/gcc-11-ZPT0kp/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-11-ZPT0kp/gcc-11-11.2.0/debian/tmp-gcn/usr --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0x12 - Thermald 2.4.6
Graphics Notes: BAR1 / Visible vRAM Size: 16368 MB
Python Notes: Python 3.9.7
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

## Intel Core i7-12700K

Processor: Intel Core i7-12700K @ 5.00GHz (12 Cores / 20 Threads), Motherboard: MSI PRO Z690-A DDR4(MS-7D25) v1.0 (1.00 BIOS), Chipset: Intel Device 7aa7, Memory: 32GB, Disk: 500GB Western Digital WDS500G2B0C-00PXH0 + 3 x 10001GB Seagate ST10000DM0004-1Z + 128GB HP SSD S700 Pro, Graphics: MSI AMD Radeon RX 5600 XT 6GB (1500MHz), Audio: Realtek ALC897, Monitor: LG HDR WQHD, Network: Intel Device 15f3

OS: Pop 20.04, Kernel: 5.14.0-1008-oem (x86_64), Desktop: GNOME Shell 3.36.7, Display Server: X Server 1.20.11, OpenGL: 4.6 Mesa 21.2.2 (LLVM 12.0.0), OpenCL: OpenCL 1.2 Intel FPGA SDK for OpenCL 20.3 + OpenCL 3.0 LINUX + OpenCL 3.0, Vulkan: 1.2.182, Compiler: GCC 9.4.0 + Intel oneAPI DPC++/C++ Compiler 2021.4.0 (2021.4.0.20210924) + ICC 2021.4.0 20210910 + CUDA 10.2, File-System: ext4, Screen Resolution: 3440x1440

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-yTrUTS/gcc-9-9.4.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xf - Thermald 1.9.1
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

## i7-12700K P-Cores + AVX-512 DDR4

Processor: Intel Core i7-12700K @ 6.30GHz (8 Cores / 16 Threads), Motherboard: MSI PRO Z690-A DDR4(MS-7D25) v1.0 (1.15 BIOS), Chipset: Intel Device 7aa7, Memory: 32GB, Disk: 500GB Western Digital WDS500G2B0C-00PXH0 + 3 x 10001GB Seagate ST10000DM0004-1Z + 128GB HP SSD S700 Pro, Graphics: Gigabyte AMD Radeon RX 5600 OEM/5600 XT / 5700/5700 (1650/750MHz), Audio: Realtek ALC897, Monitor: LG HDR WQHD, Network: Intel I225-V

OS: Pop 21.04, Kernel: 5.15.5-76051505-generic (x86_64), Desktop: GNOME Shell 3.38.4, Display Server: X Server 1.20.11, OpenGL: 4.6 Mesa 21.3.0-devel (LLVM 12.0.1), OpenCL: OpenCL 1.2 Intel FPGA SDK for OpenCL 20.3 + OpenCL 3.0 LINUX + OpenCL 2.2 AMD-APP (3361.0), Vulkan: 1.2.182, Compiler: GCC 10.3.0 + Intel oneAPI DPC++/C++ Compiler 2021.4.0 (2021.4.0.20210924) + ICC 2021.4.0 20210910 + CUDA 10.2, File-System: ext4, Screen Resolution: 3440x1440

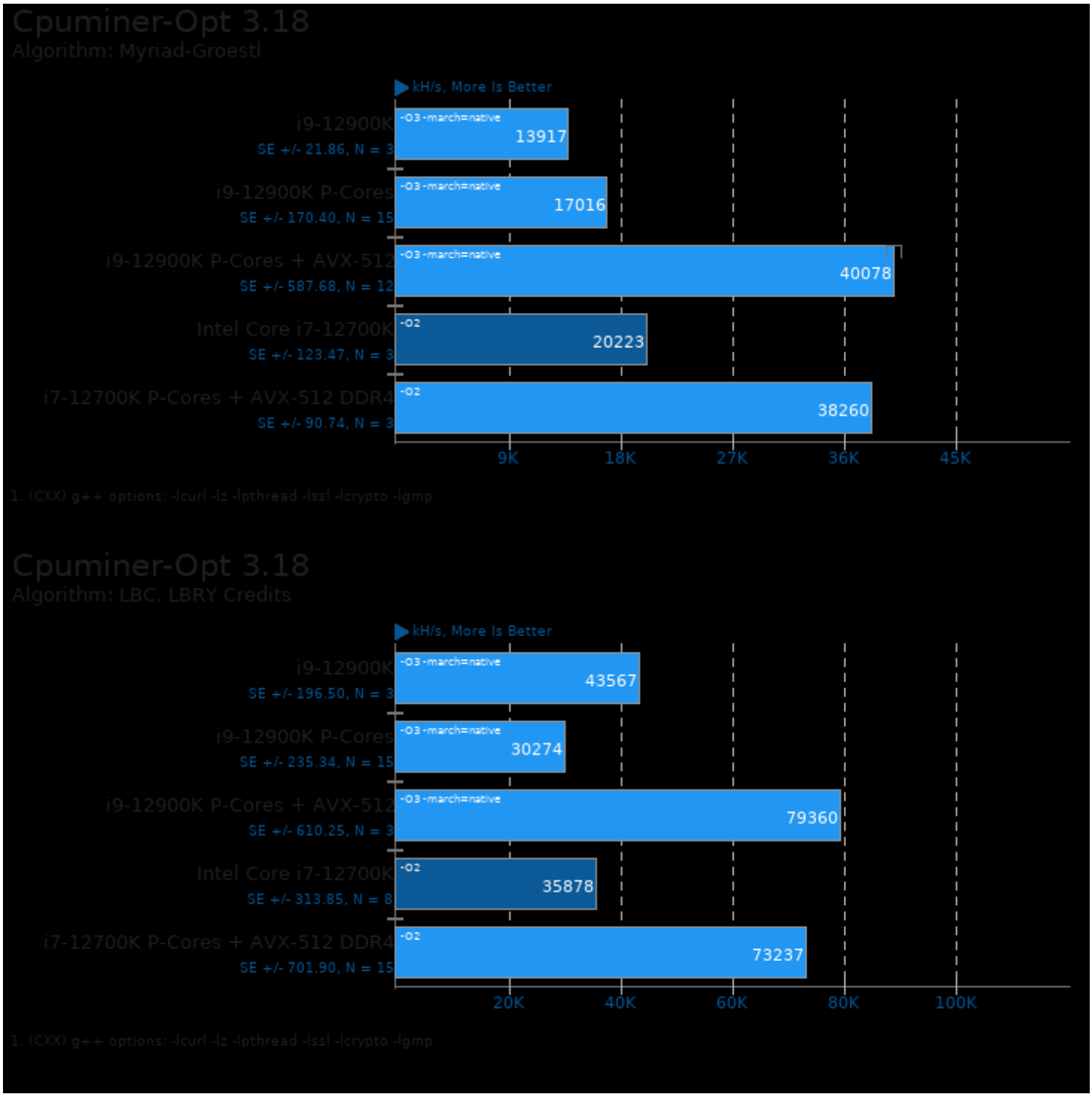
Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-mutex --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-gDeRY6/gcc-10-10.3.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-gDeRY6/gcc-10-10.3.0/debian/tmp-gcn/usr, hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0x15 - Thermald 2.4.3
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

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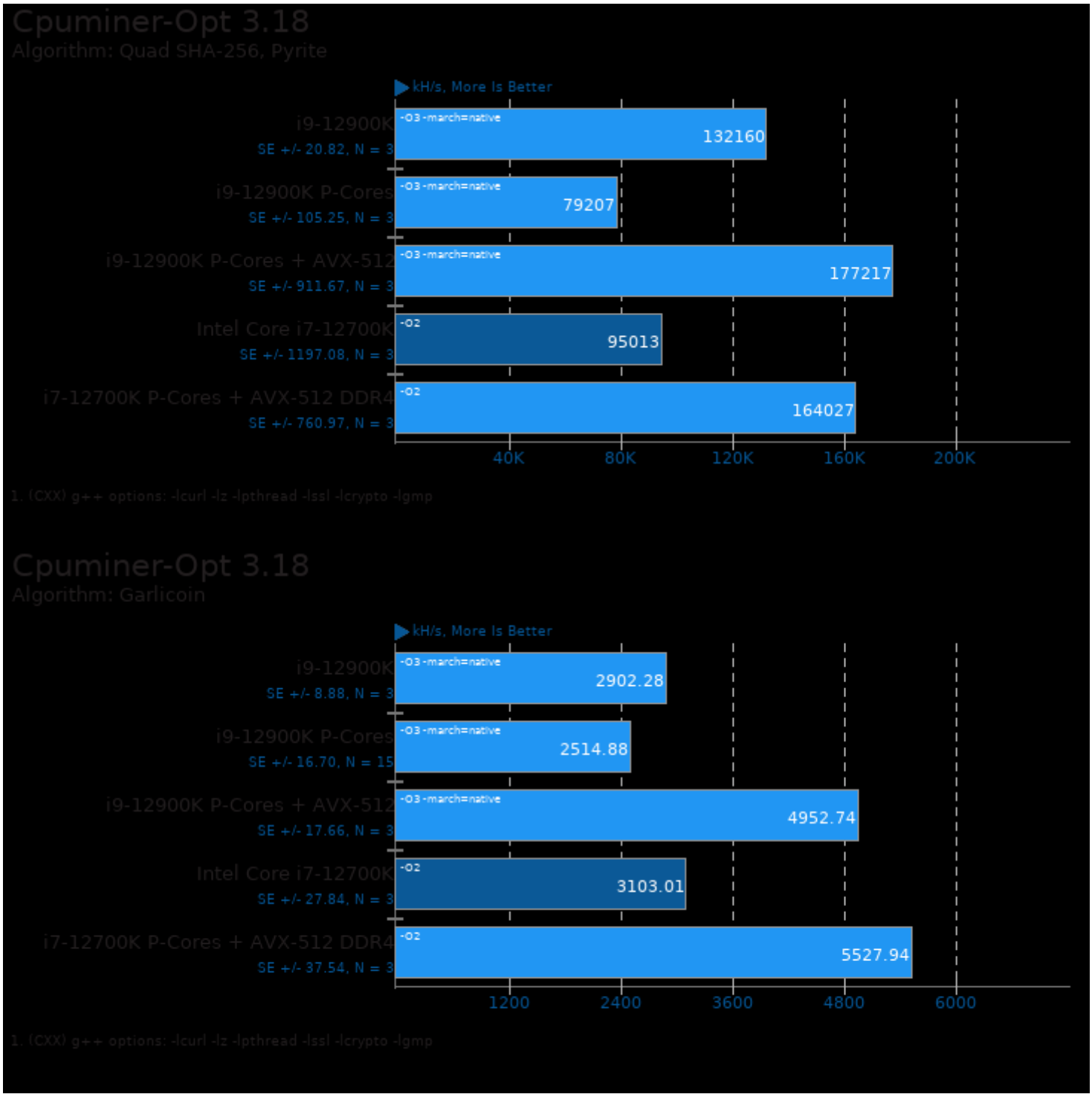
| | i9-12900K | i9-12900K P-Cores | i9-12900K P-Cores + AVX-512 | Intel Core i7-12700K | i7-12700K P-Cores + AVX-512 DDR4 |
|---|---|---|---|---|---|
| **Cpuminer-Opt - Myriad-Groestl (kH/s)** | 13917 | 17016 | 40078 | 20223 | 38260 |
| **Normalized** | 34.72% | 42.46% | 100% | 50.46% | 95.46% |
| **Standard Deviation** | 0.3% | 3.9% | 5.1% | 1.1% | 0.4% |
| **Cpuminer-Opt - LBC, LBRY Credits (kH/s)** | 43567 | 30274 | 79360 | 35878 | 73237 |
| **Normalized** | 54.9% | 38.15% | 100% | 45.21% | 92.28% |
| **Standard Deviation** | 0.8% | 3% | 1.3% | 2.5% | 3.7% |
| **Cpuminer-Opt - Q.S.2.P (kH/s)** | 132160 | 79207 | 177217 | 95013 | 164027 |
| **Normalized** | 74.58% | 44.69% | 100% | 53.61% | 92.56% |
| **Standard Deviation** | 0% | 0.2% | 0.9% | 2.2% | 0.8% |
| **Cpuminer-Opt - Garlicoin (kH/s)** | 2902 | 2515 | 4953 | 3103 | 5528 |
| **Normalized** | 52.5% | 45.49% | 89.59% | 56.13% | 100% |
| **Standard Deviation** | 0.5% | 2.6% | 0.6% | 1.6% | 1.2% |
| **Cpuminer-Opt - Blake-2 S (kH/s)** | 542007 | 419797 | 891470 | 430673 | 914216 |
| **Normalized** | 59.29% | 45.92% | 97.51% | 47.11% | 100% |
| **Standard Deviation** | 0.8% | 0.7% | 1.1% | 0.4% | 2.4% |
| **Cpuminer-Opt - T.S.2.O (kH/s)** | 264873 | 128547 | 246997 | 185503 | 229800 |
| **Normalized** | 100% | 48.53% | 93.25% | 70.03% | 86.76% |
| **Standard Deviation** | 0.8% | 0.5% | 0.5% | 0.2% | 0.9% |
| **Cpuminer-Opt - Skeincoin (kH/s)** | 115290 | 75593 | 123903 | 92027 | 114793 |
| **Normalized** | 93.05% | 61.01% | 100% | 74.27% | 92.65% |
| **Standard Deviation** | 1.1% | 0.2% | 2.2% | 0.6% | 4.7% |
| **Stockfish - Total Time (Nodes/s)** | 48294830 | 31639934 | 32217882 | 38151887 | 31953697 |
| **Normalized** | 100% | 65.51% | 66.71% | 79% | 66.16% |
| **Standard Deviation** | 2.9% | 2.6% | 0.4% | 2.3% | 1.4% |
| **Cpuminer-Opt - LBC, LBRY Credits (kH/s/Watt)** | 326.666 | 185.471 | 526.214 | | |
| **Normalized** | 62.08% | 35.25% | 100% | | |
| **Cpuminer-Opt - Skeincoin (kH/s/Watt)** | 1301 | 552.521 | 926.958 | | |
| **Normalized** | 100% | 42.45% | 71.22% | | |
| **Cpuminer-Opt - Garlicoin (kH/s/Watt)** | 16.088 | 14.518 | 25.276 | | |
| **Normalized** | 63.65% | 57.44% | 100% | | |
| **Cpuminer-Opt - Blake-2 S (kH/s/Watt)** | 7393 | 3706 | 7454 | | |
| **Normalized** | 99.18% | 49.72% | 100% | | |
| **Cpuminer-Opt - Myriad-Groestl (kH/s/Watt)** | 114.129 | 108.666 | 242.276 | | |
| **Normalized** | 47.11% | 44.85% | 100% | | |
| **Cpuminer-Opt - Q.S.2.P (kH/s/Watt)** | 1632 | 613.984 | 1335 | | |
| **Normalized** | 100% | 37.63% | 81.82% | | |
| **Cpuminer-Opt - T.S.2.O (kH/s/Watt)** | 3630 | 1151 | 1919 | | |
| **Normalized** | 100% | 31.71% | 52.87% | | |

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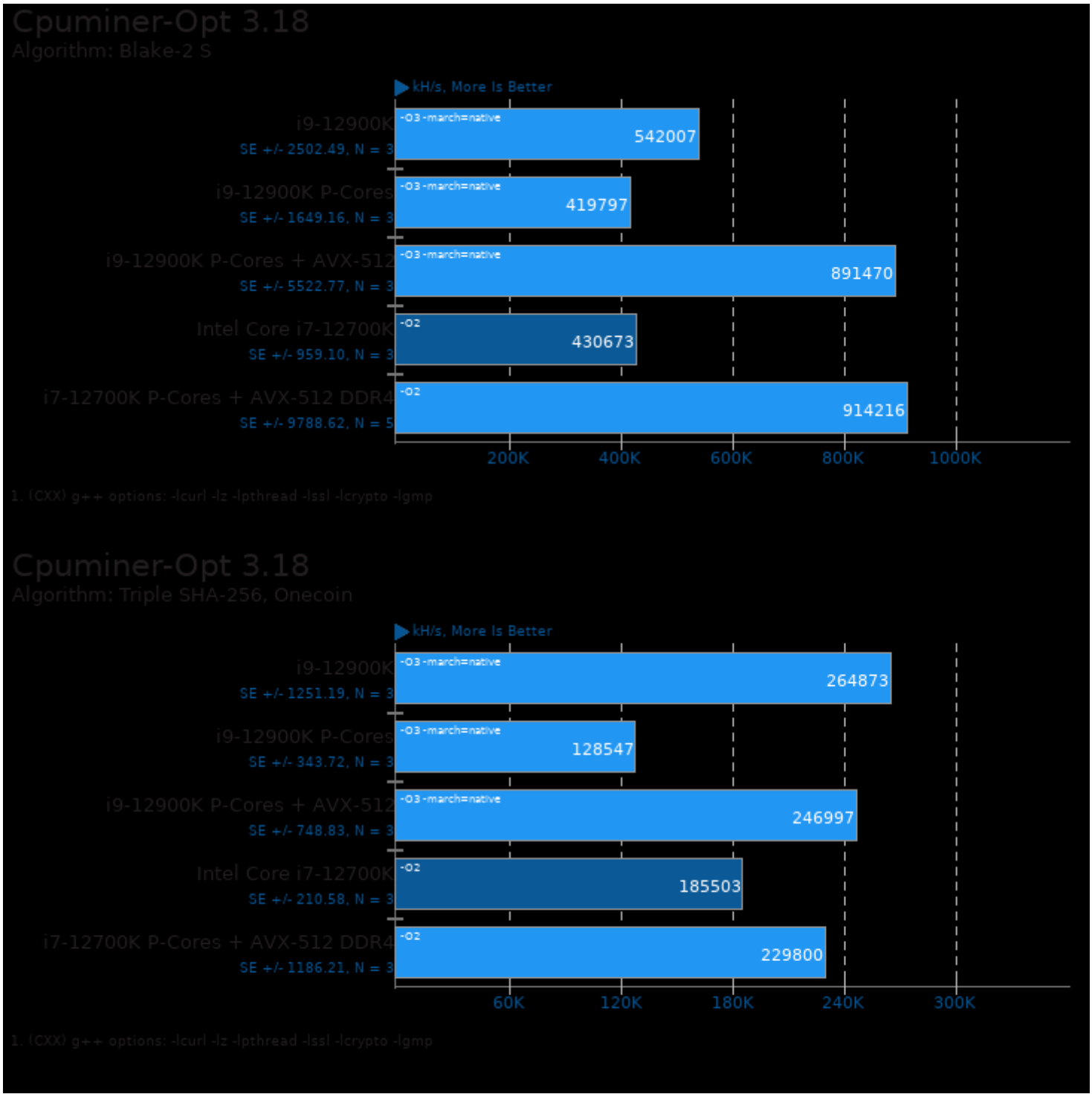
| | | | |
|---|---|---|---|
| **Stockfish - Total Time (Nodes/s/Watt)** | **253756** | 186824 | **173452** |
| **Normalized** | 100% | 73.62% | 68.35% |


Cpuminer-Opt 3.18
Algorithm: Myriad-Groestl
kH/s, More Is Better
i9-12900K
SE +/- 21.86, N = 3
-O3 -march=native
13917
i9-12900K P-Cores
SE +/- 170.40, N = 15
-O3 -march=native
17016
i9-12900K P-Cores + AVX-512
SE +/- 587.68, N = 12
-O3 -march=native
40078
Intel Core i7-12700K
SE +/- 123.47, N = 3
-O2
20223
i7-12700K P-Cores + AVX-512 DDR4
SE +/- 90.74, N = 3
-O2
38260
9K
18K
27K
36K
45K
1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp
Cpuminer-Opt 3.18
Algorithm: LBC, LBRY Credits
kH/s, More Is Better
i9-12900K
SE +/- 196.50, N = 3
-O3 -march=native
43567
i9-12900K P-Cores
SE +/- 235.34, N = 15
-O3 -march=native
30274
i9-12900K P-Cores + AVX-512
SE +/- 610.25, N = 3
-O3 -march=native
79360
Intel Core i7-12700K
SE +/- 313.85, N = 8
-O2
35878
i7-12700K P-Cores + AVX-512 DDR4
SE +/- 701.90, N = 15
-O2
73237
20K
40K
60K
80K
100K
1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp

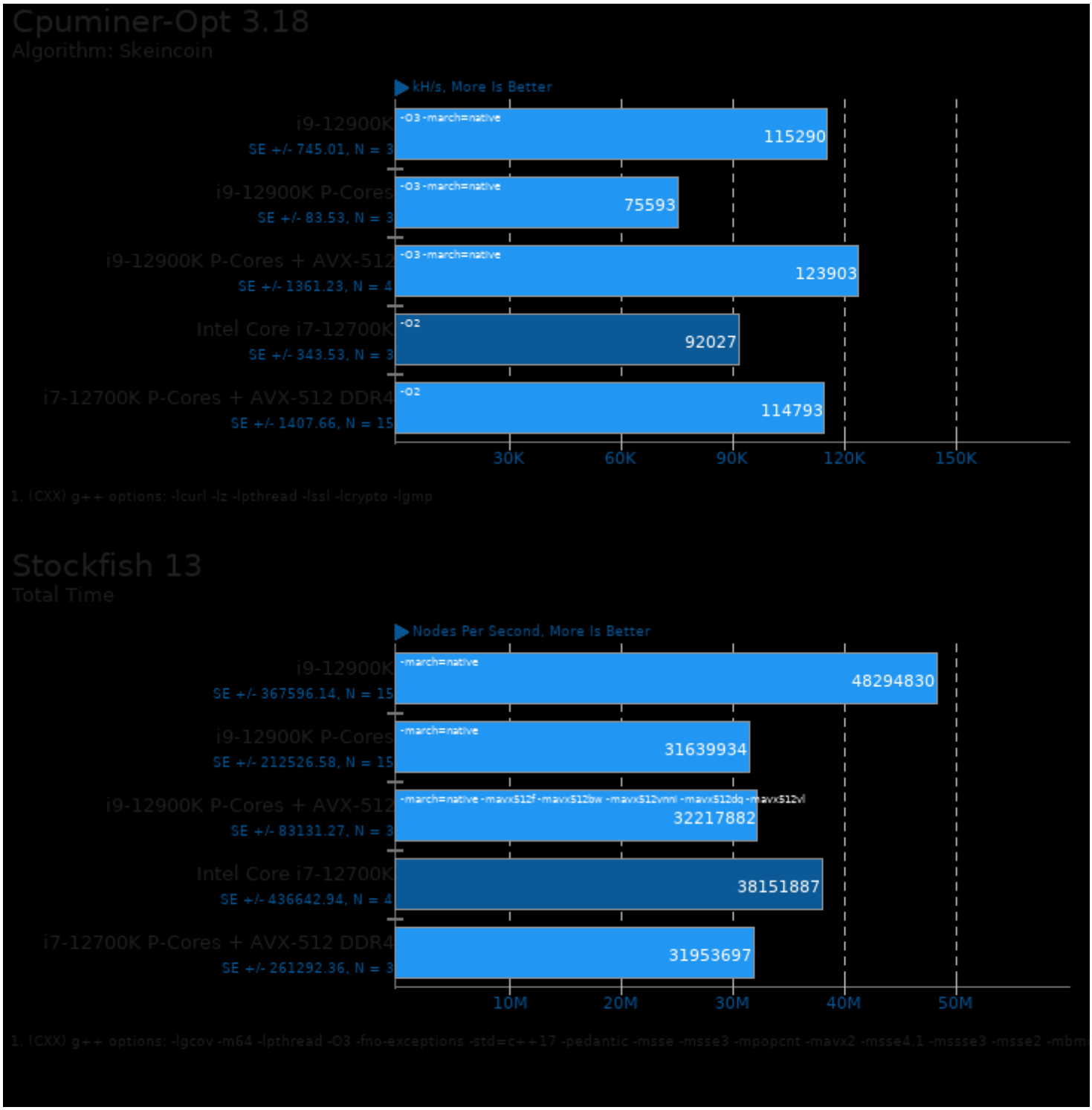
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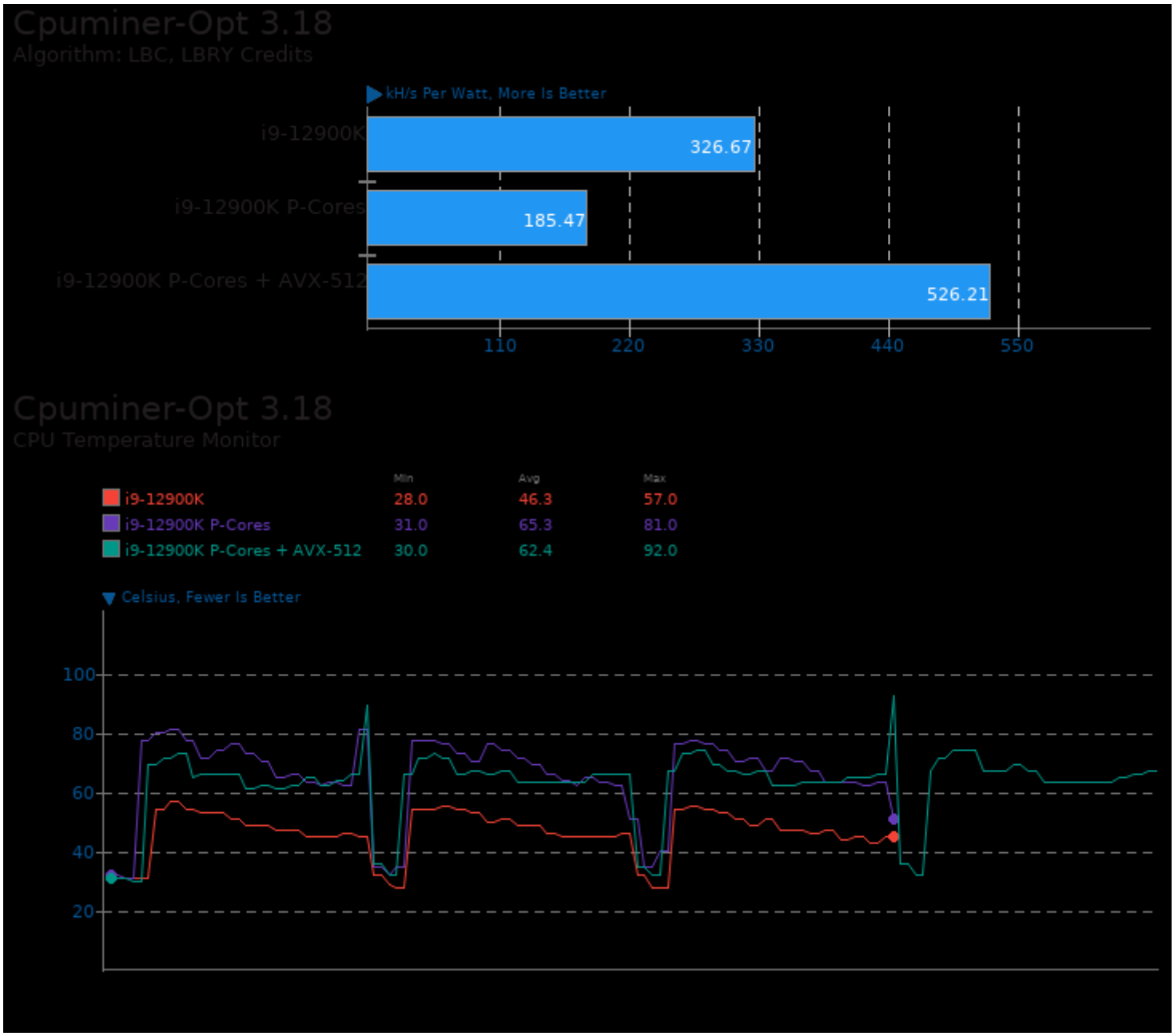
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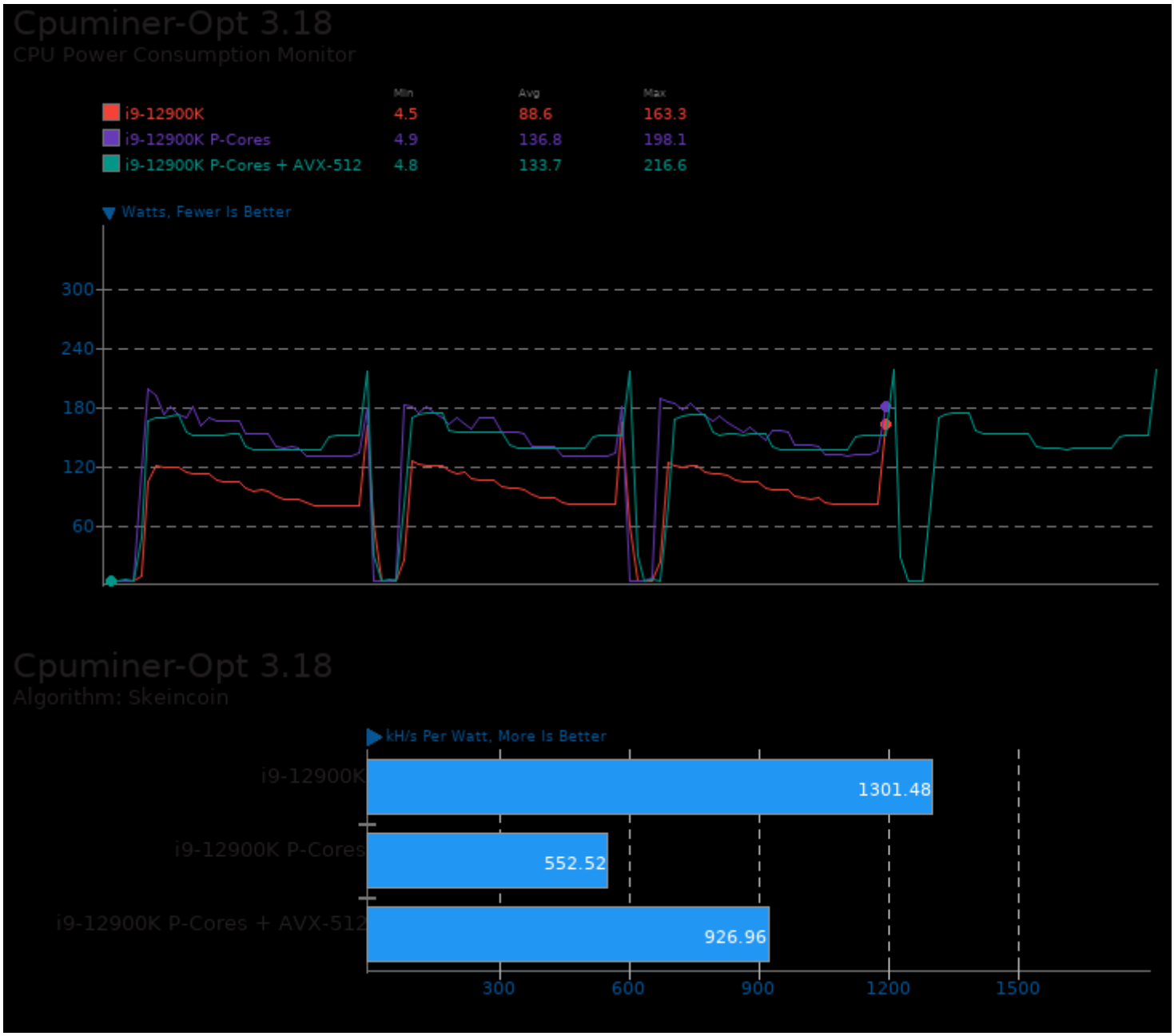
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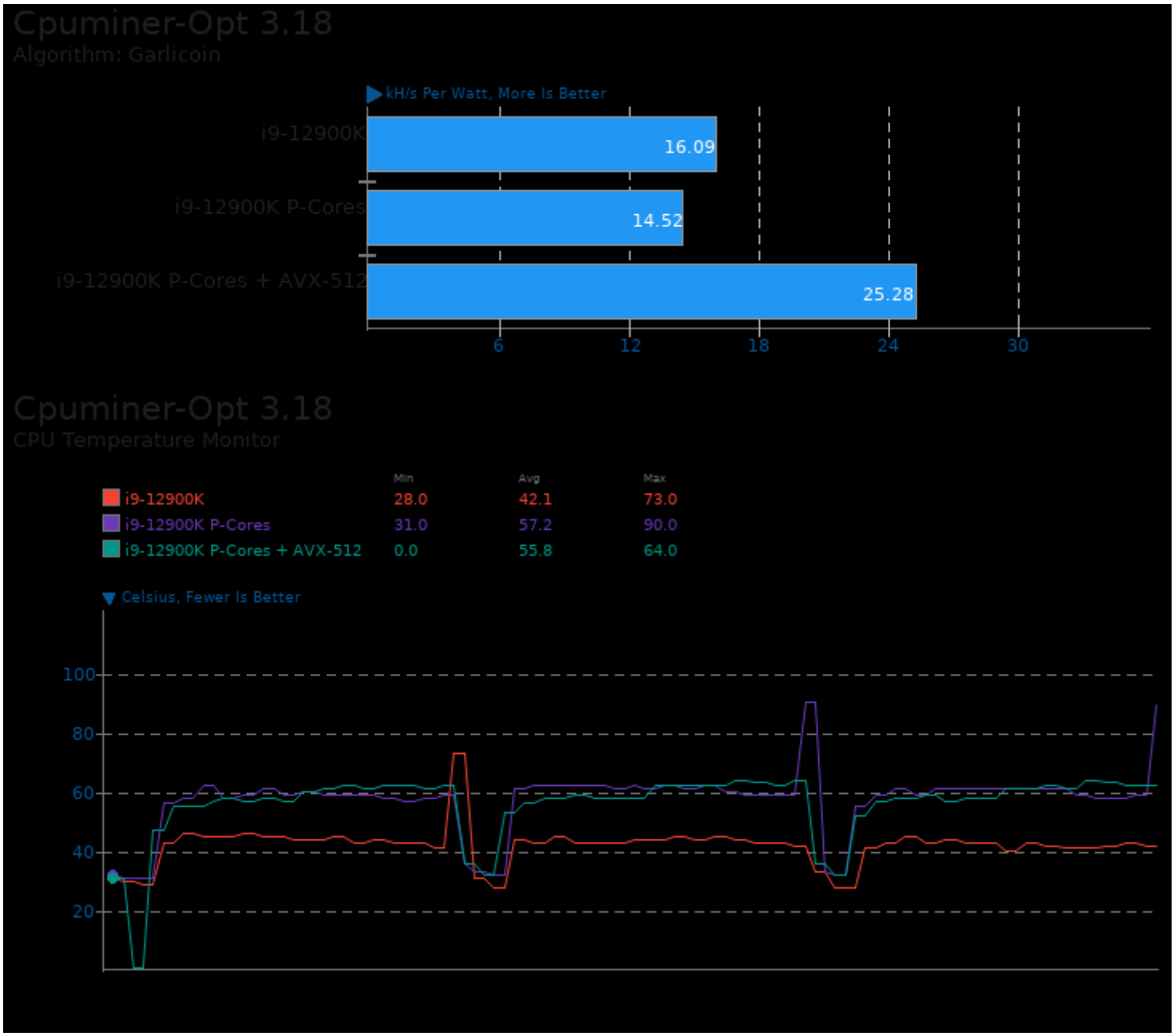
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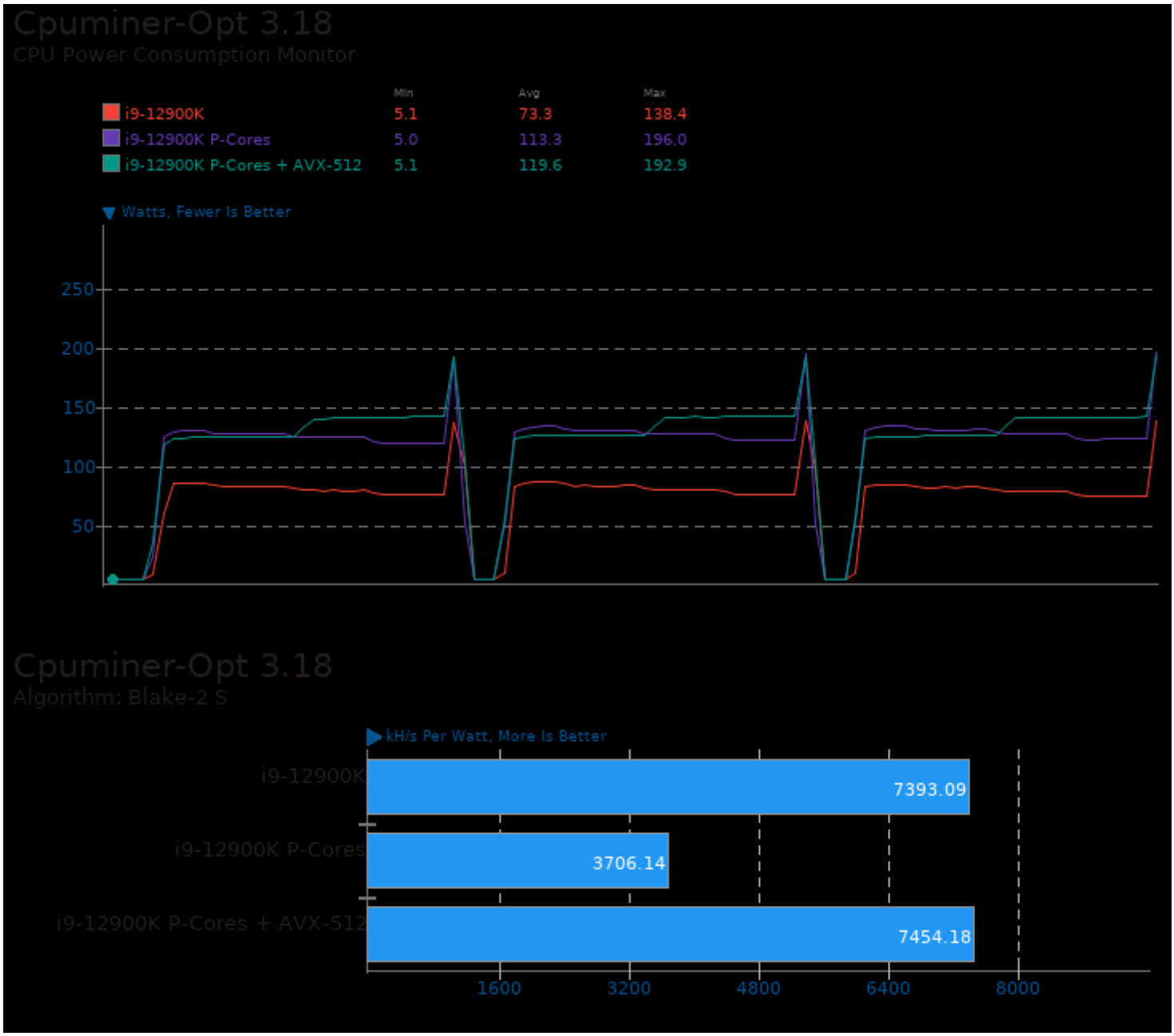
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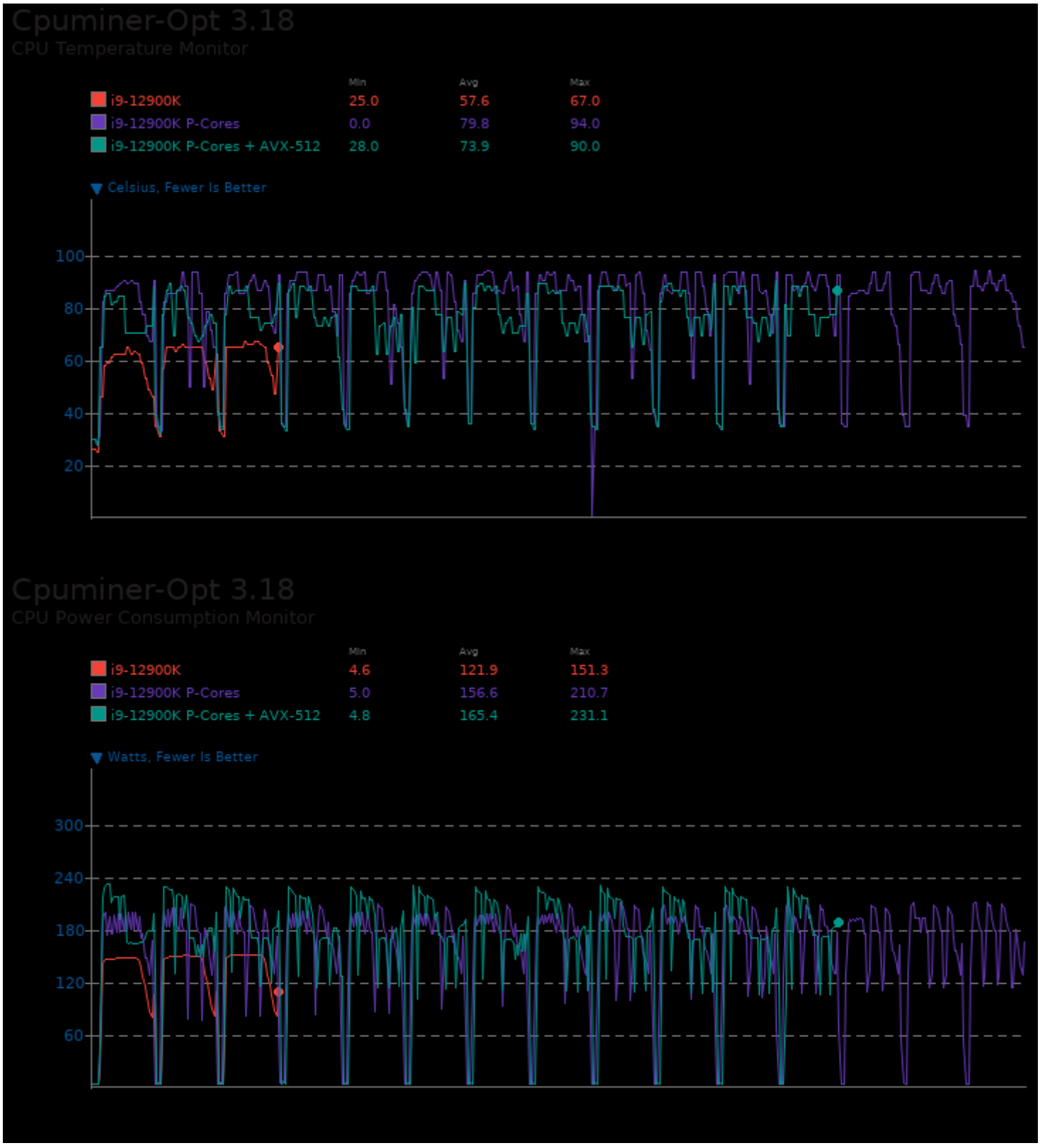


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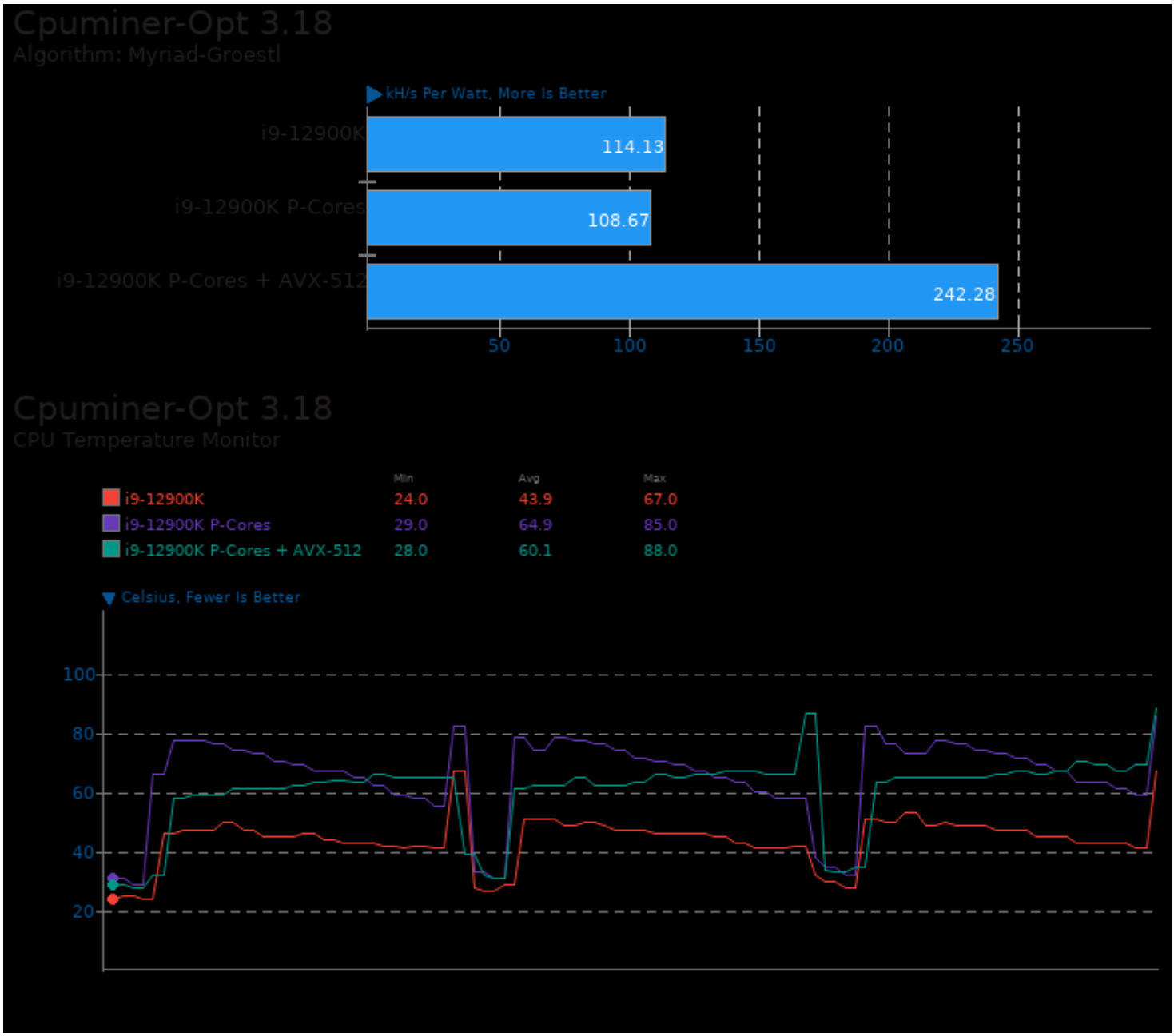


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Cpuminer-Opt 3.18
CPU Temperature Monitor
Min
Avg
Max
i9-12900K
25.0
57.6
67.0
i9-12900K P-Cores
0.0
79.8
94.0
i9-12900K P-Cores + AVX-512
28.0
73.9
90.0
Celsius, Fewer Is Better
100
80
60
40
20
Cpuminer-Opt 3.18
CPU Power Consumption Monitor
Min
Avg
Max
i9-12900K
4.6
121.9
151.3
i9-12900K P-Cores
5.0
156.6
210.7
i9-12900K P-Cores + AVX-512
4.8
165.4
231.1
Watts, Fewer Is Better
300
240
180
120
60

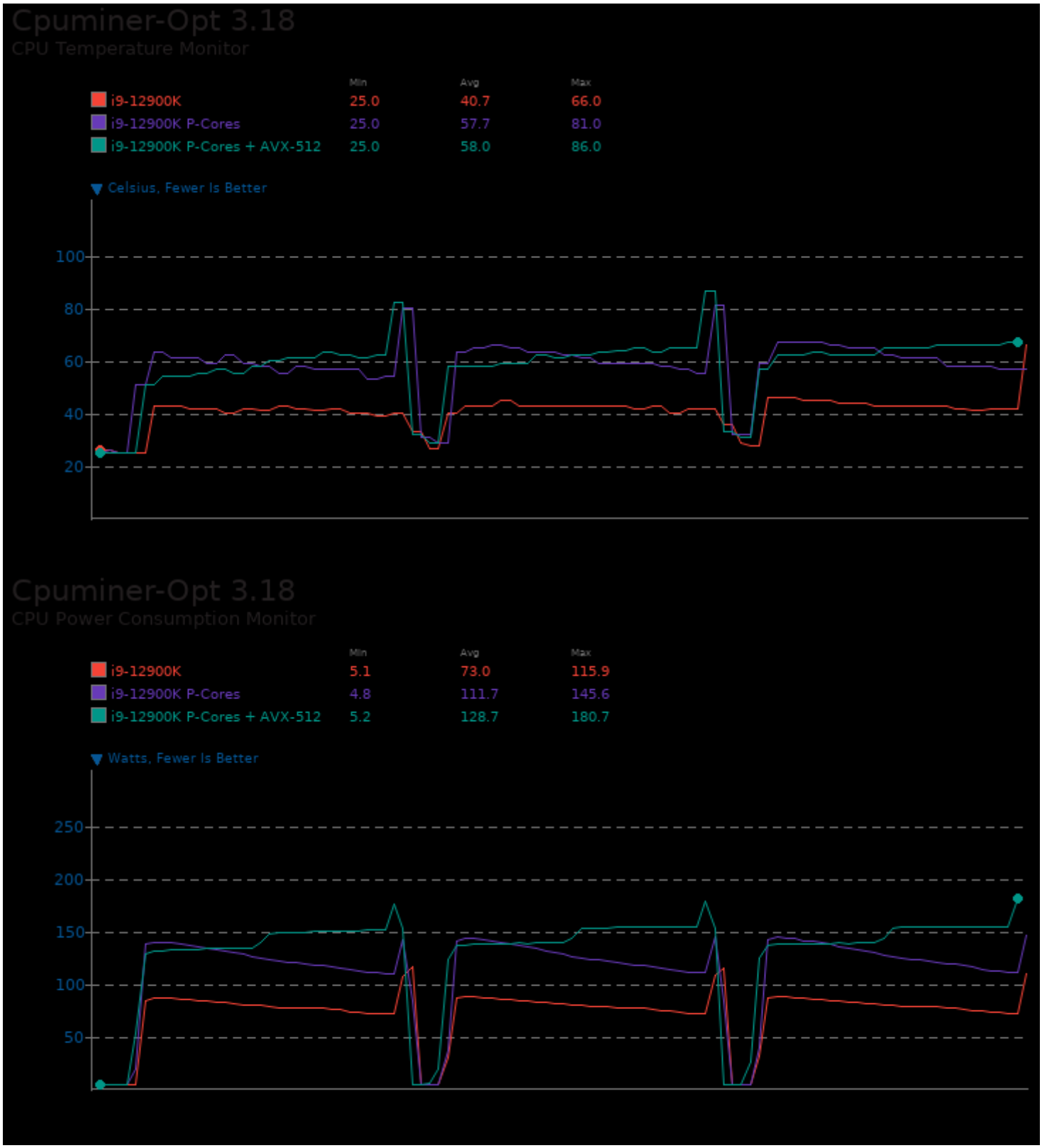
# Core i9 12900K AVX-512 Alder Lake Benchmarks



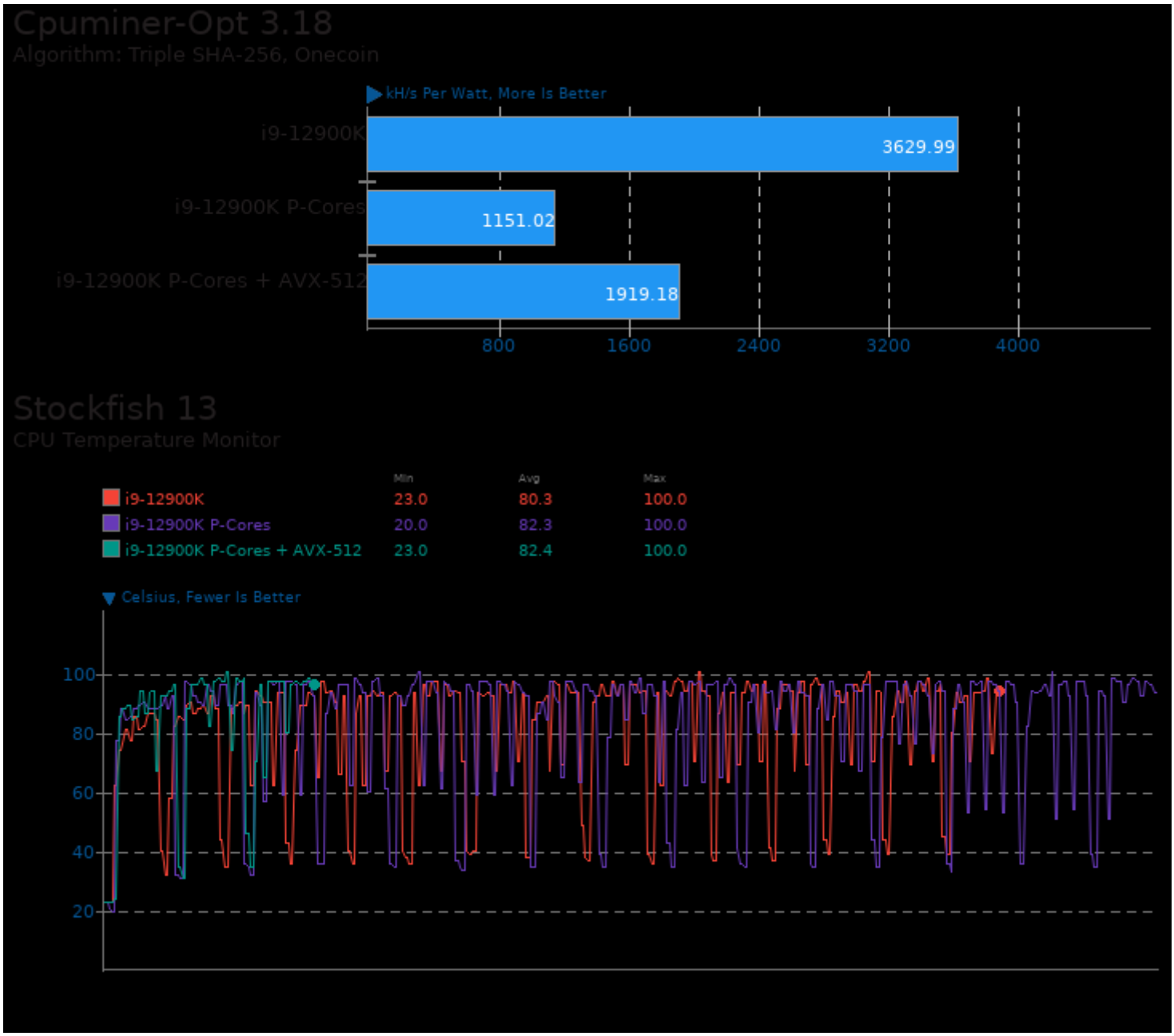
# Core i9 12900K AVX-512 Alder Lake Benchmarks



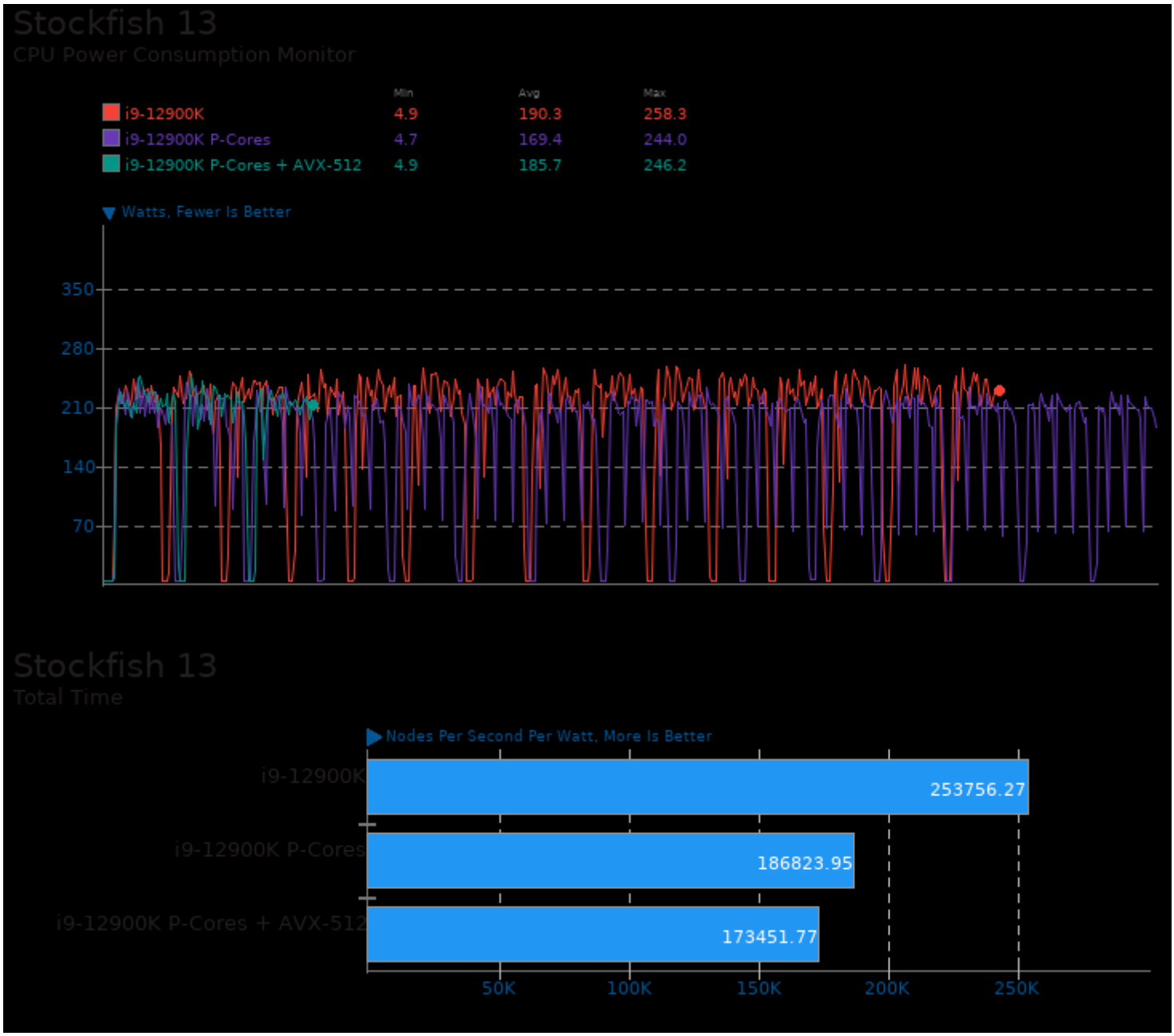
# Core i9 12900K AVX-512 Alder Lake Benchmarks



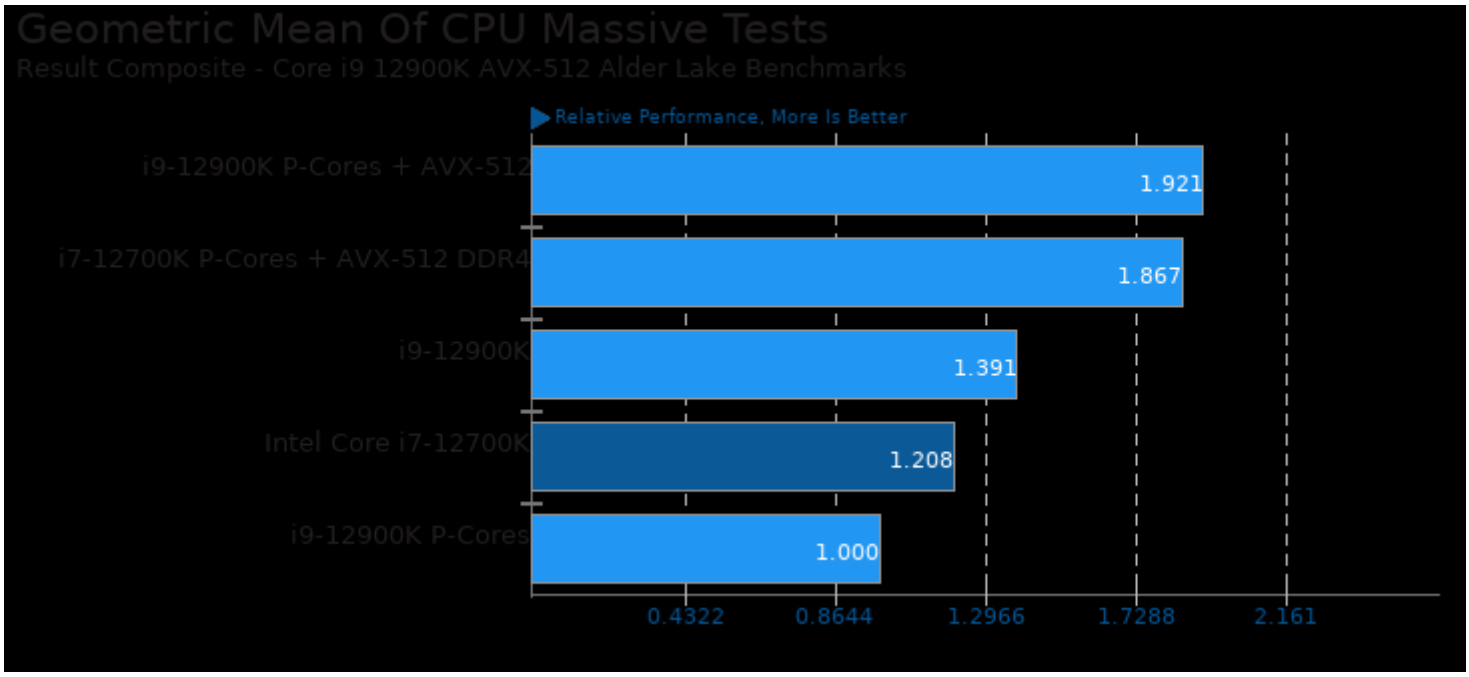
# Core i9 12900K AVX-512 Alder Lake Benchmarks



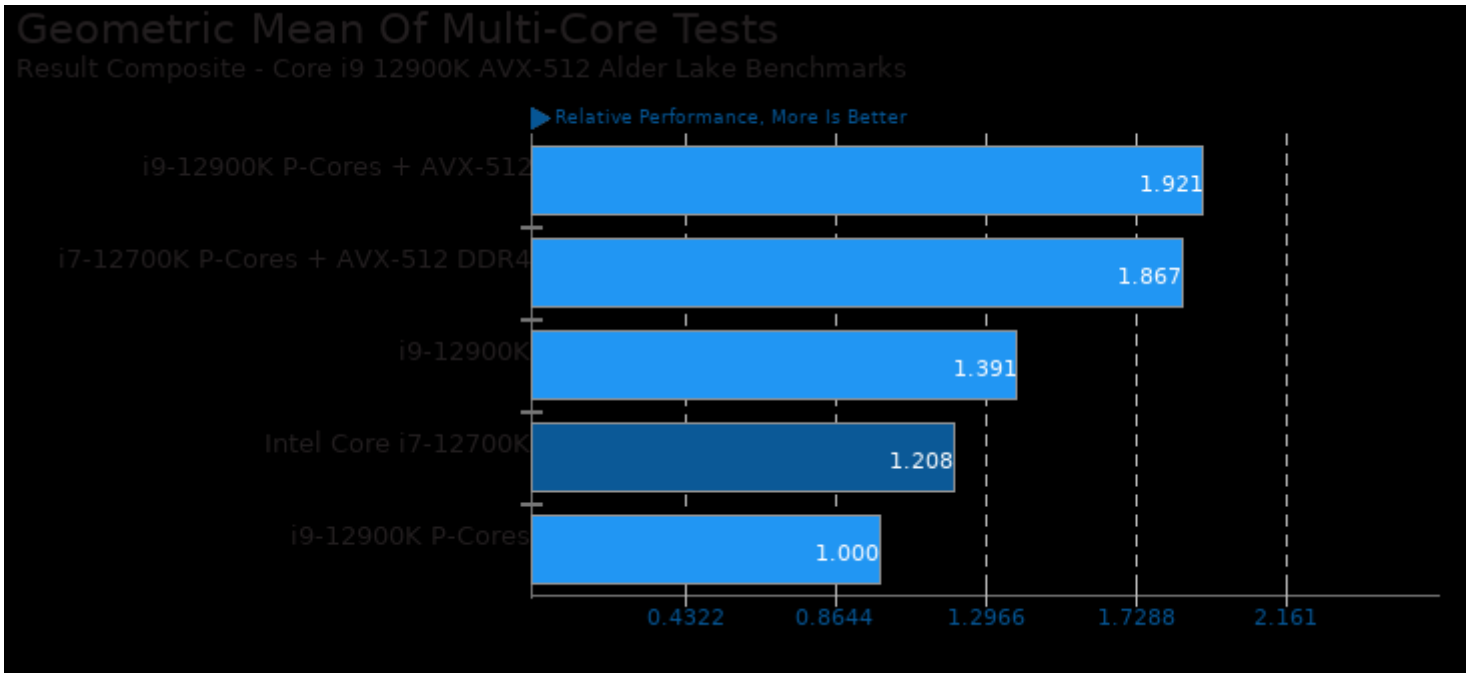
# Core i9 12900K AVX-512 Alder Lake Benchmarks



These geometric means are based upon test groupings / test suites for this result file.

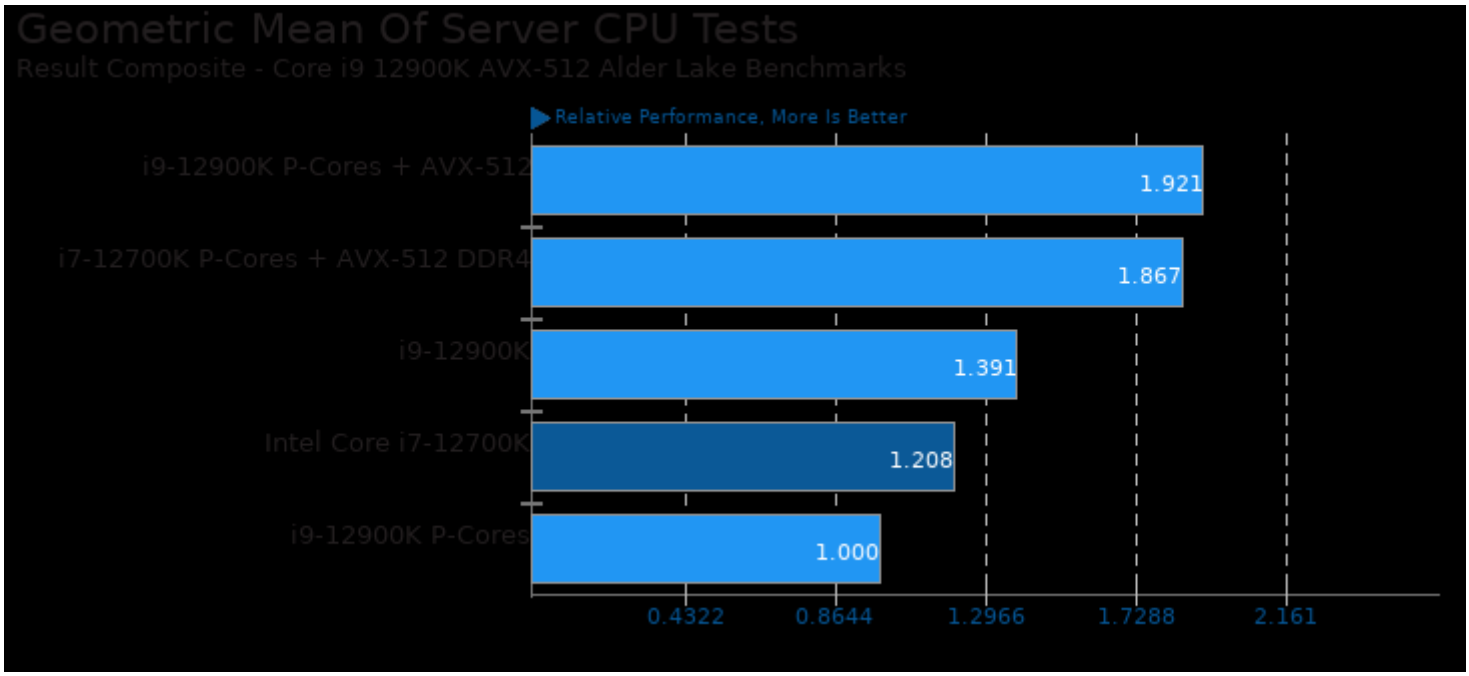



Geometric mean based upon tests: pts/stockfish and pts/cpuminer-opt




Geometric mean based upon tests: pts/cpuminer-opt and pts/stockfish

# Core i9 12900K AVX-512 Alder Lake Benchmarks




Geometric mean based upon tests: pts/stockfish and pts/cpuminer-opt

*This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 02:04.*