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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 75% 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). i9-12900K was 0.724x the speed of i9-12900K P-Cores + AVX-512, 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: Blake-2 S) at 2.124x
Cpuminer-Opt (Algorithm: Triple SHA-256, Onecoin) at 2.061x
Cpuminer-Opt (Algorithm: Garlicoin) at 1.969x
Cpuminer-Opt (Algorithm: Skeincoin) at 1.639x
Stockfish (Total Time) at 1.526x
Cpuminer-Opt (Algorithm: Triple SHA-256, Onecoin) at -1x

Cpuminer-Opt (Algorithm: Quad SHA-256, Pyrite) 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

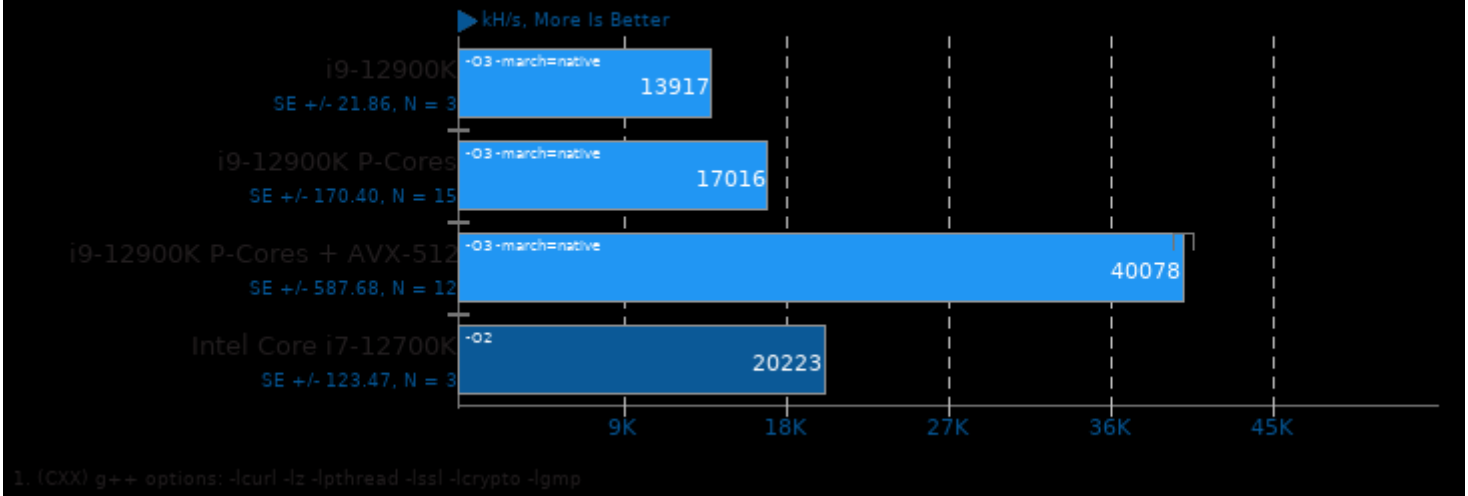
	i9-12900K	i9-12900K P-Cores	i9-12900K P-Cores + AVX-512	Intel Core i7-12700K
Cpuminer-Opt - Myriad-Groestl (kH/s)	**13917**	17016	**40078**	20223
Normalized	34.72%	42.46%	100%	50.46%
Standard Deviation	0.3%	3.9%	5.1%	1.1%
Cpuminer-Opt - Garlicoin (kH/s)	2902	**2515**	**4953**	3103
Normalized	58.6%	50.78%	100%	62.65%
Standard Deviation	0.5%	2.6%	0.6%	1.6%
Cpuminer-Opt - T.S.2.O (kH/s/Watt)	**3630**	**1151**	1919	
Normalized	100%	31.71%	52.87%	
Cpuminer-Opt - Q.S.2.P (kH/s/Watt)	**1632**	**613.984**	1335	
Normalized	100%	37.63%	81.82%	
Cpuminer-Opt - Myriad-Groestl (kH/s/Watt)	114.129	**108.666**	**242.276**	
Normalized	47.11%	44.85%	100%	
Cpuminer-Opt - Garlicoin (kH/s/Watt)	16.088	**14.518**	**25.276**	
Normalized	63.65%	57.44%	100%	
Cpuminer-Opt - Q.S.2.P (kH/s)	132160	**79207**	**177217**	95013
Normalized	74.58%	44.69%	100%	53.61%
Standard Deviation	0%	0.2%	0.9%	2.2%
Cpuminer-Opt - Skeincoin (kH/s/Watt)	**1301**	**552.521**	926.958	
Normalized	100%	42.45%	71.22%	

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Cpuminer-Opt - T.S.2.O (kH/s)	**264873**	**128547**	246997	185503
Normalized	100%	48.53%	93.25%	70.03%
Standard Deviation	0.8%	0.5%	0.5%	0.2%
Cpuminer-Opt - Skeincoin (kH/s)	115290	**75593**	**123903**	92027
Normalized	93.05%	61.01%	100%	74.27%
Standard Deviation	1.1%	0.2%	2.2%	0.6%
Cpuminer-Opt - Blake-2 S (kH/s/Watt)	7393	**3706**	**7454**	
Normalized	99.18%	49.72%	100%	
Cpuminer-Opt - LBC, LBRY Credits (kH/s/Watt)	326.666	**185.471**	**526.214**	
Normalized	62.08%	35.25%	100%	
Cpuminer-Opt - Blake-2 S (kH/s)	542007	**419797**	**891470**	430673
Normalized	60.8%	47.09%	100%	48.31%
Standard Deviation	0.8%	0.7%	1.1%	0.4%
Cpuminer-Opt - LBC, LBRY Credits (kH/s)	43567	**30274**	**79360**	35878
Normalized	54.9%	38.15%	100%	45.21%
Standard Deviation	0.8%	3%	1.3%	2.5%
Stockfish - Total Time (Nodes/s)	**48294830**	**31639934**	32217882	38151887
Normalized	100%	65.51%	66.71%	79%
Standard Deviation	2.9%	2.6%	0.4%	2.3%
Stockfish - Total Time (Nodes/s/Watt)	**253756**	186824	**173452**	
Normalized	100%	73.62%	68.35%	

Cpuminer-Opt 3.18

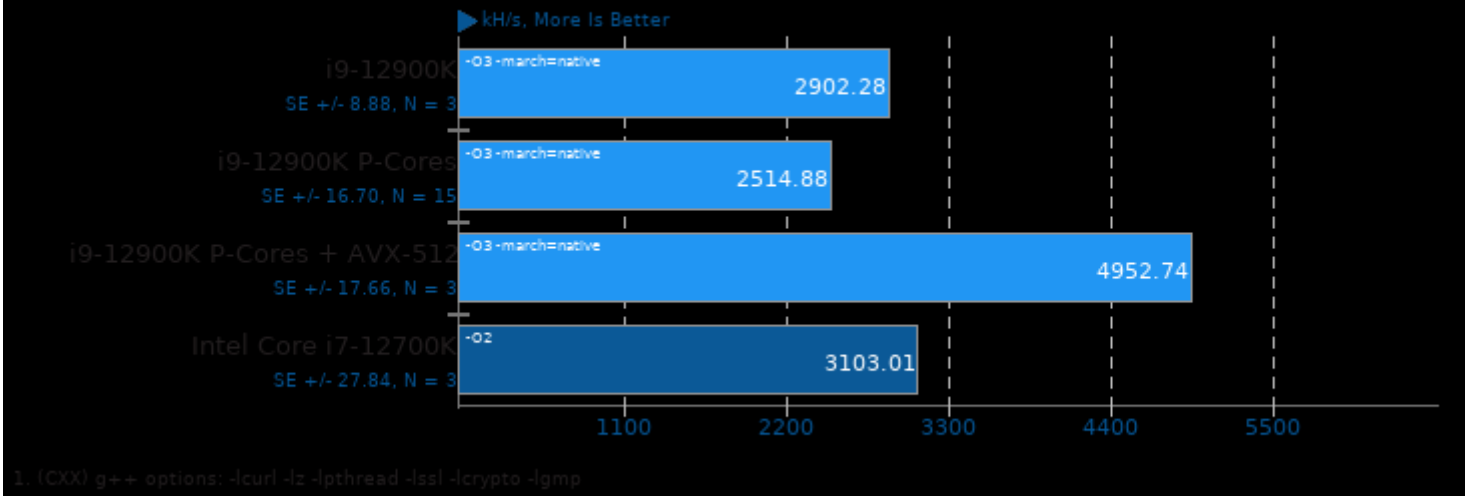
Algorithm: Myriad-Groestl



1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp

Cpuminer-Opt 3.18

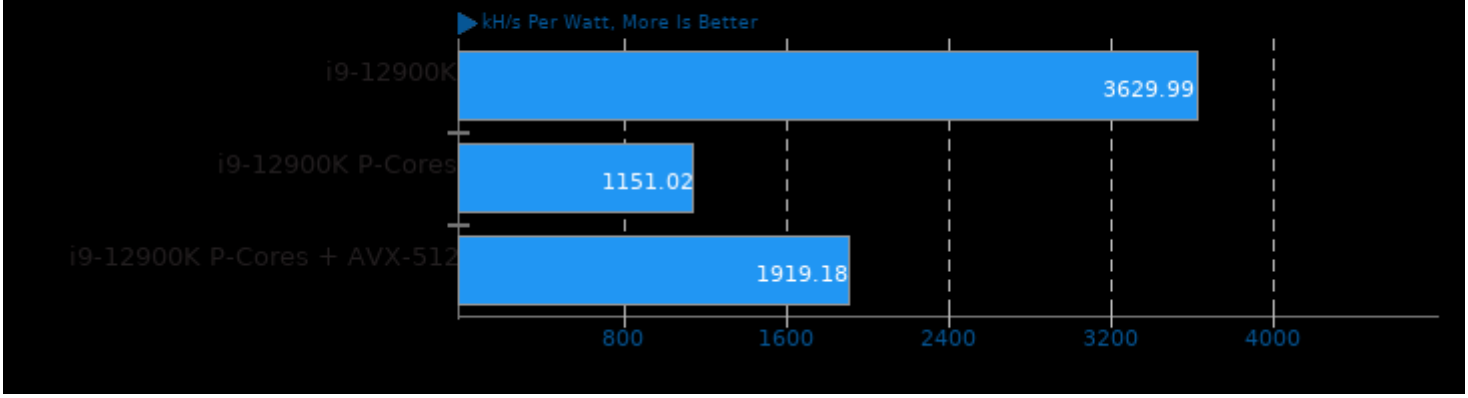
Algorithm: Garlicoin



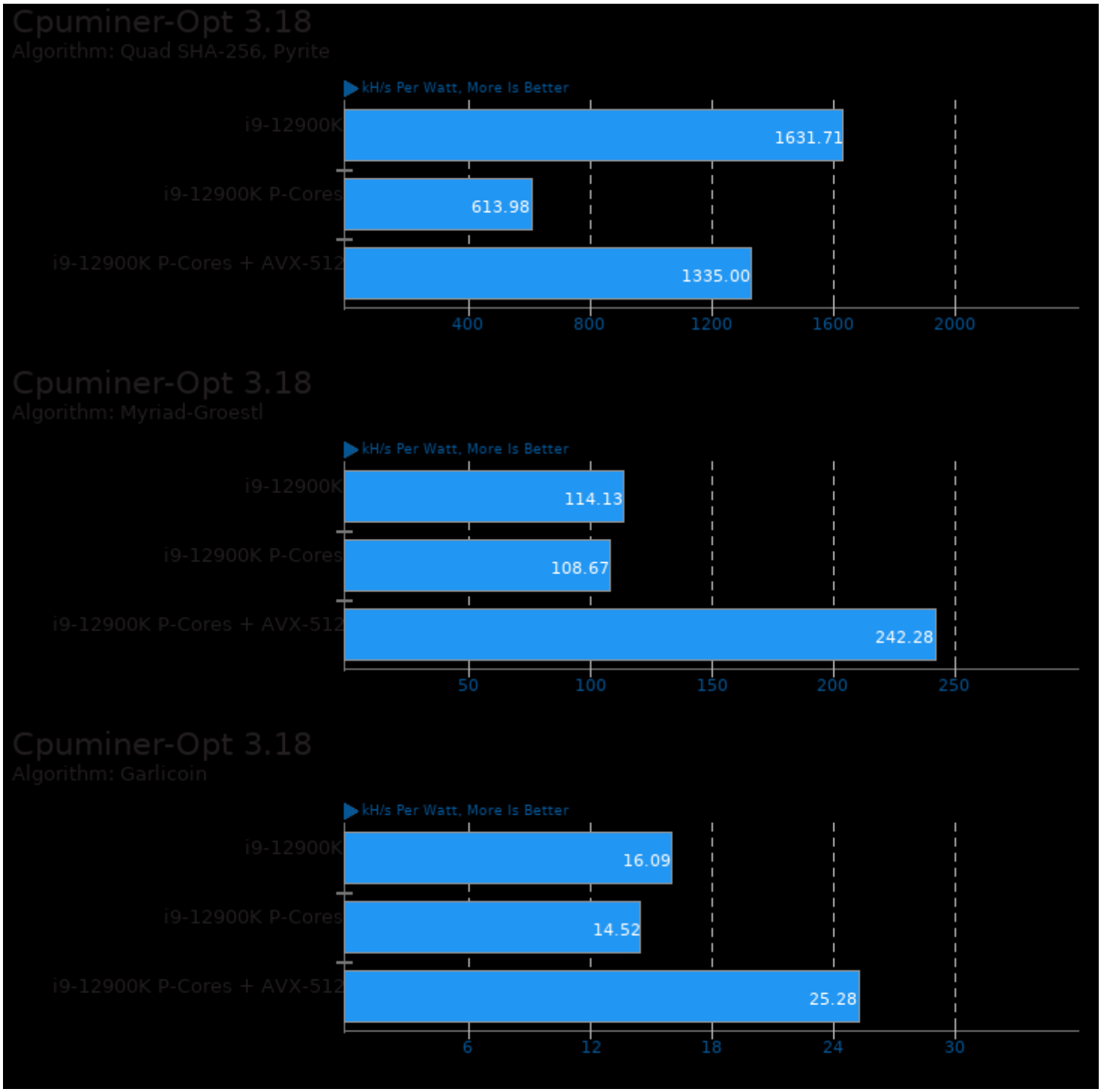
1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp

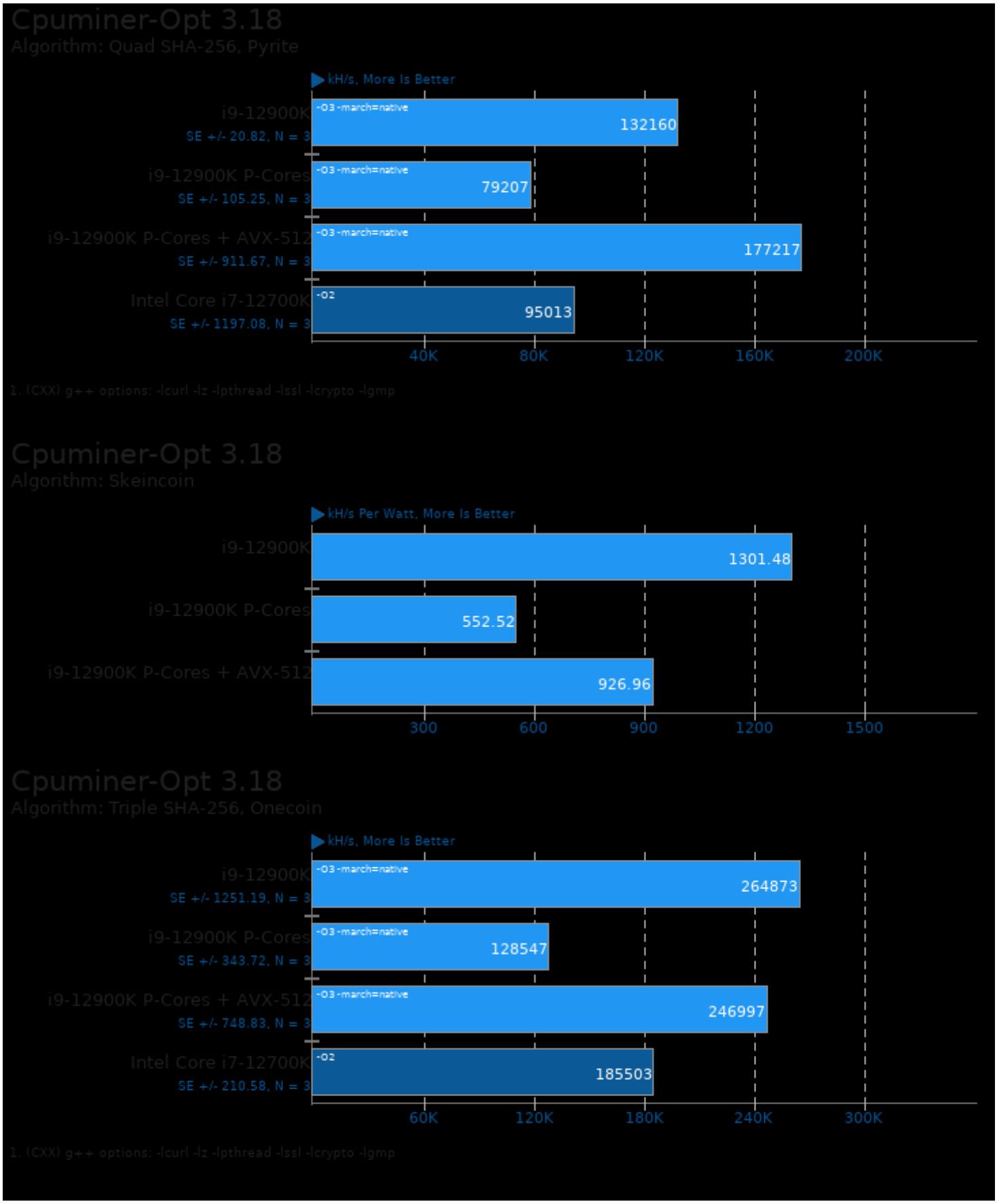
Cpuminer-Opt 3.18

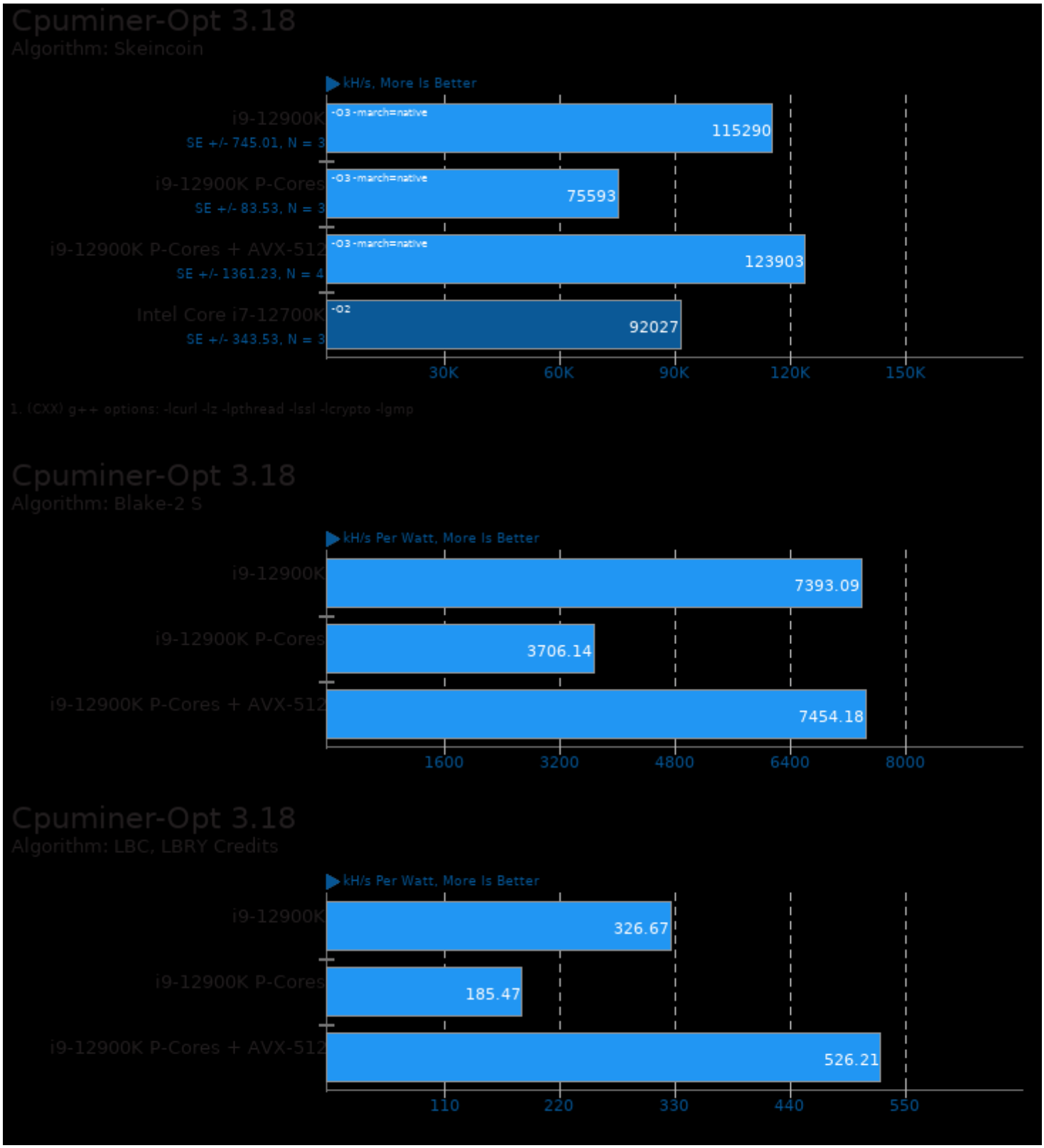
Algorithm: Triple SHA-256, Onecoin



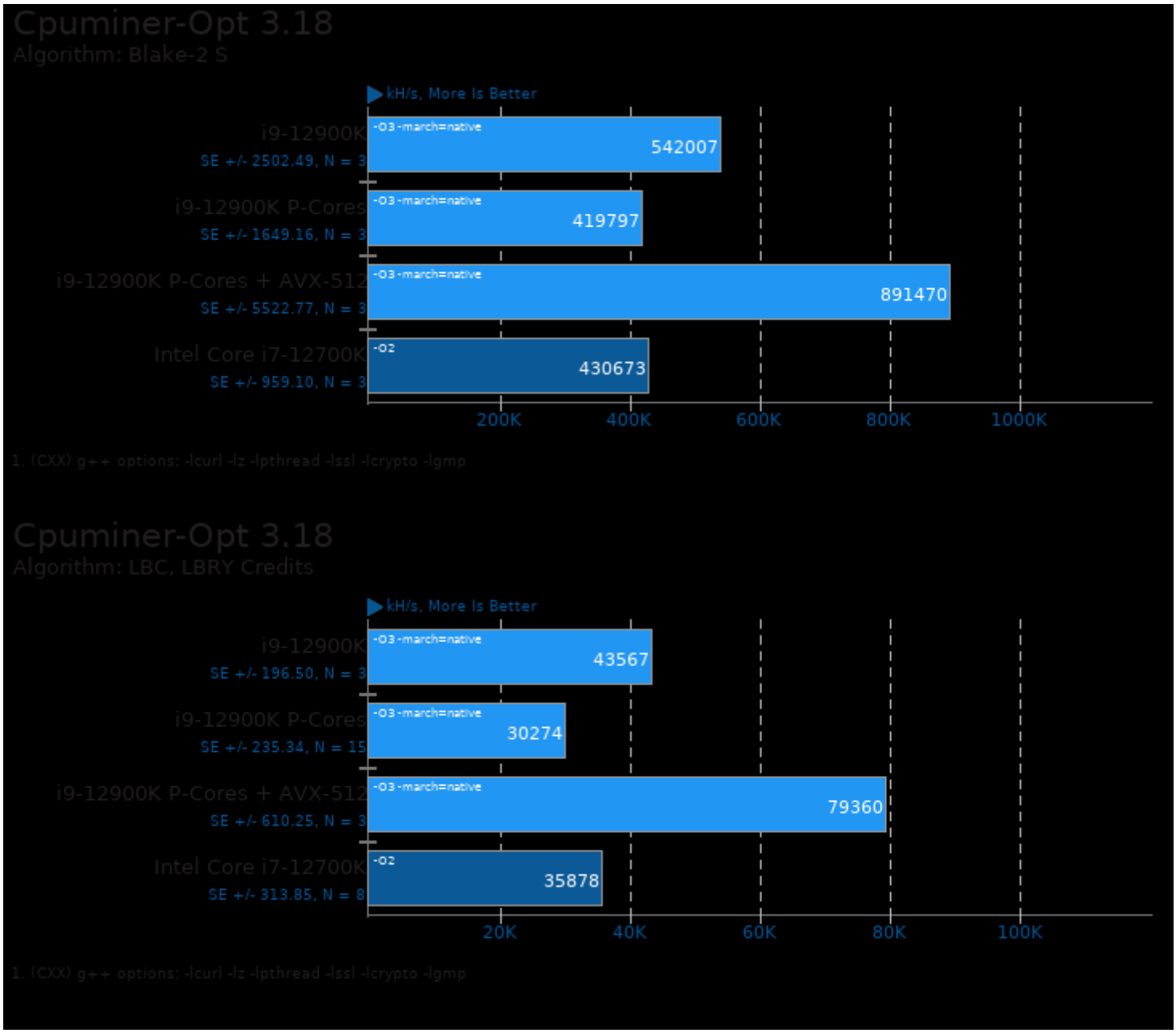
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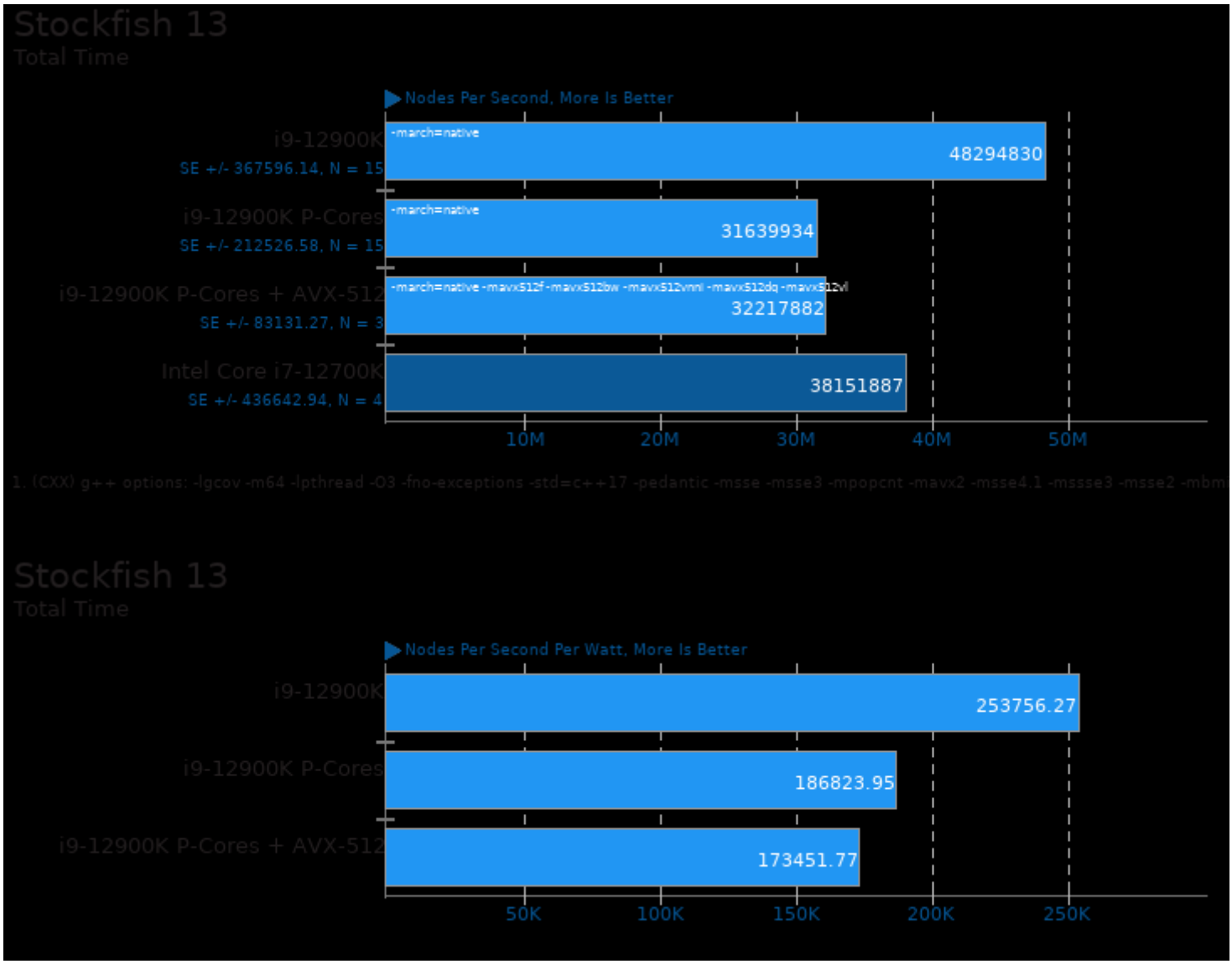

Cpuminer-Opt 3.18
Algorithm: Quad SHA-256, Pyrite
kH/s, More Is Better
i9-12900K
SE +/- 20.82, N = 3
-O3 -march=native
132160
i9-12900K P-Cores
SE +/- 105.25, N = 3
-O3 -march=native
79207
i9-12900K P-Cores + AVX-512
SE +/- 911.67, N = 3
-O3 -march=native
177217
Intel Core i7-12700K
SE +/- 1197.08, N = 3
-O2
95013
40K
80K
120K
160K
200K
1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp
Cpuminer-Opt 3.18
Algorithm: Skeincoin
kH/s Per Watt, More Is Better
i9-12900K
1301.48
i9-12900K P-Cores
552.52
i9-12900K P-Cores + AVX-512
926.96
300
600
900
1200
1500
Cpuminer-Opt 3.18
Algorithm: Triple SHA-256, Onecoin
kH/s, More Is Better
i9-12900K
SE +/- 1251.19, N = 3
-O3 -march=native
264873
i9-12900K P-Cores
SE +/- 343.72, N = 3
-O3 -march=native
128547
i9-12900K P-Cores + AVX-512
SE +/- 748.83, N = 3
-O3 -march=native
246997
Intel Core i7-12700K
SE +/- 210.58, N = 3
-O2
185503
60K
120K
180K
240K
300K
1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp


Cpuminer-Opt 3.18
Algorithm: Skeincoin
kH/s, More Is Better
i9-12900K
-O3 -march=native
115290
SE +/- 745.01, N = 3
i9-12900K P-Cores
-O3 -march=native
75593
SE +/- 83.53, N = 3
i9-12900K P-Cores + AVX-512
-O3 -march=native
123903
SE +/- 1361.23, N = 4
Intel Core i7-12700K
-O2
92027
SE +/- 343.53, N = 3
30K
60K
90K
120K
150K
1. (CXX) g++ options: -lcurl -lz -lpthread -lssl -lcrypto -lgmp
Cpuminer-Opt 3.18
Algorithm: Blake-2 S
kH/s Per Watt, More Is Better
i9-12900K
7393.09
i9-12900K P-Cores
3706.14
i9-12900K P-Cores + AVX-512
7454.18
1600
3200
4800
6400
8000
Cpuminer-Opt 3.18
Algorithm: LBC, LBRY Credits
kH/s Per Watt, More Is Better
i9-12900K
326.67
i9-12900K P-Cores
185.47
i9-12900K P-Cores + AVX-512
526.21
110
220
330
440
550

Core i9 12900K AVX-512 Alder Lake Benchmarks

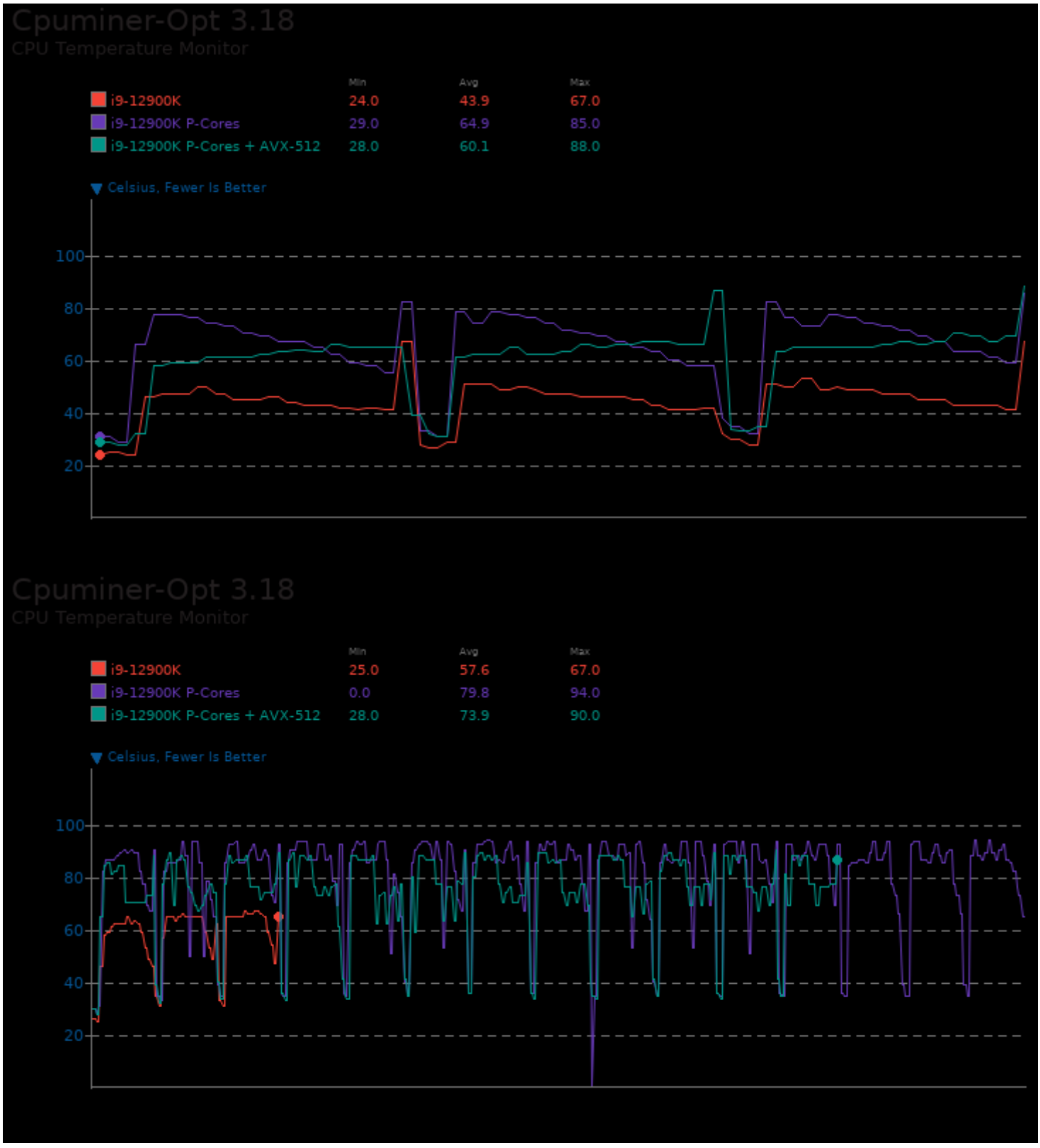


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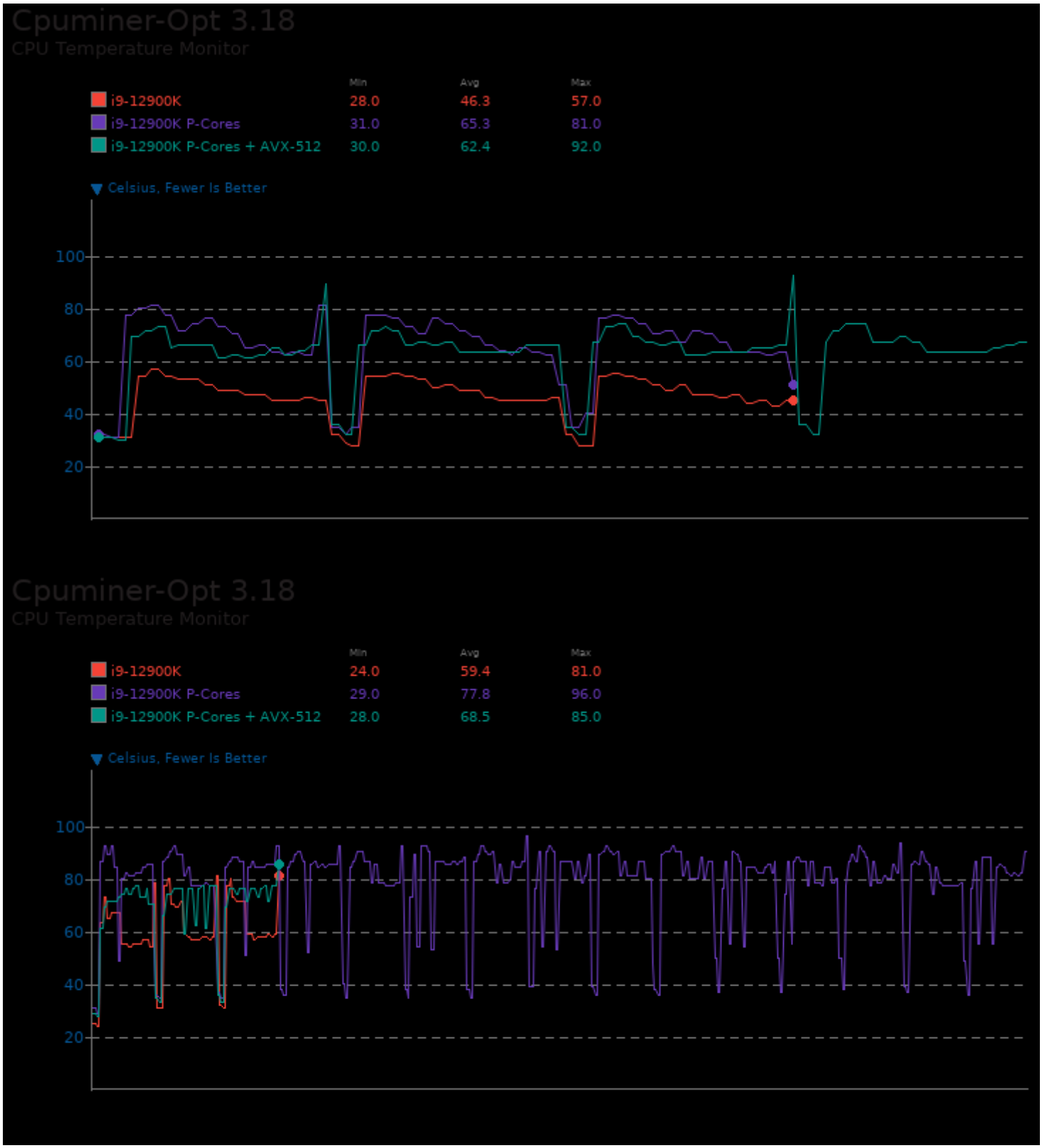



Cpuminer-Opt 3.18
CPU Temperature Monitor
Min
Avg
Max
i9-12900K
24.0
43.9
67.0
i9-12900K P-Cores
29.0
64.9
85.0
i9-12900K P-Cores + AVX-512
28.0
60.1
88.0
Celsius, Fewer Is Better
100
80
60
40
20
Cpuminer-Opt 3.18
CPU Temperature Monitor
Min
Avg
Max
i9-12900K
25.0
57.6
67.0
i9-12900K P-Cores
0.0
79.8
94.0
i9-12900K P-Cores + AVX-512
28.0
73.9
90.0
Celsius, Fewer Is Better
100
80
60
40
20

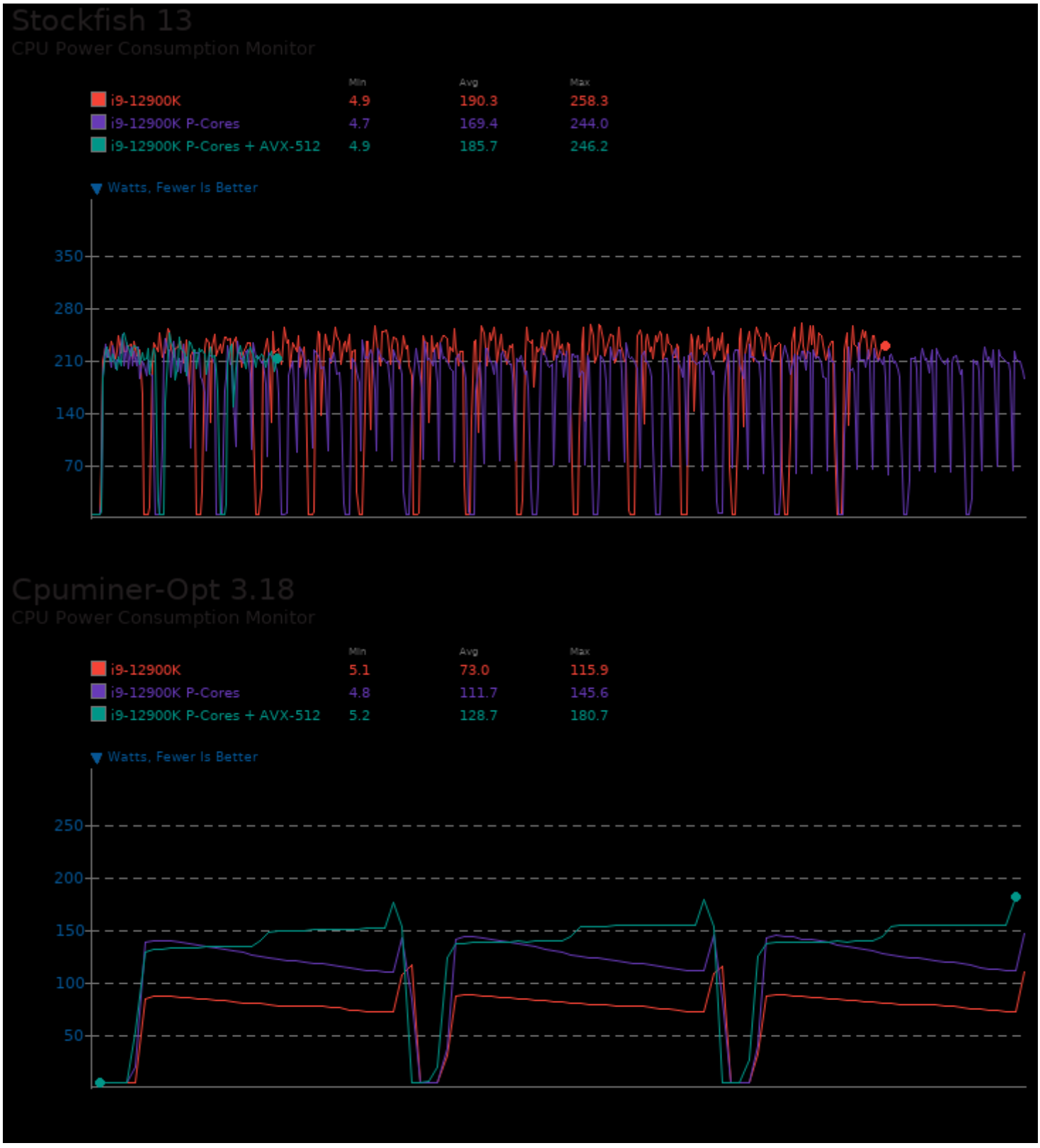
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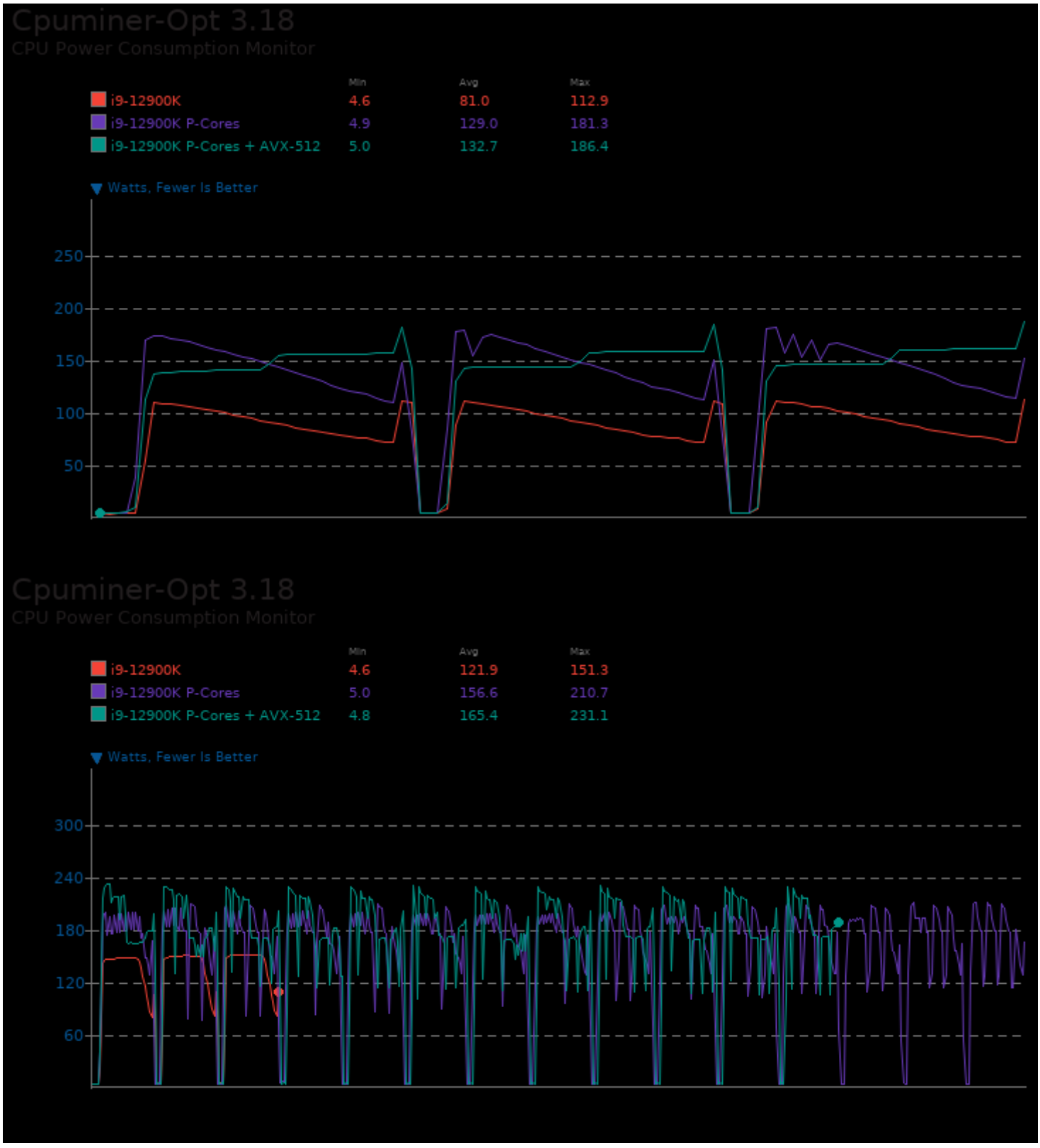
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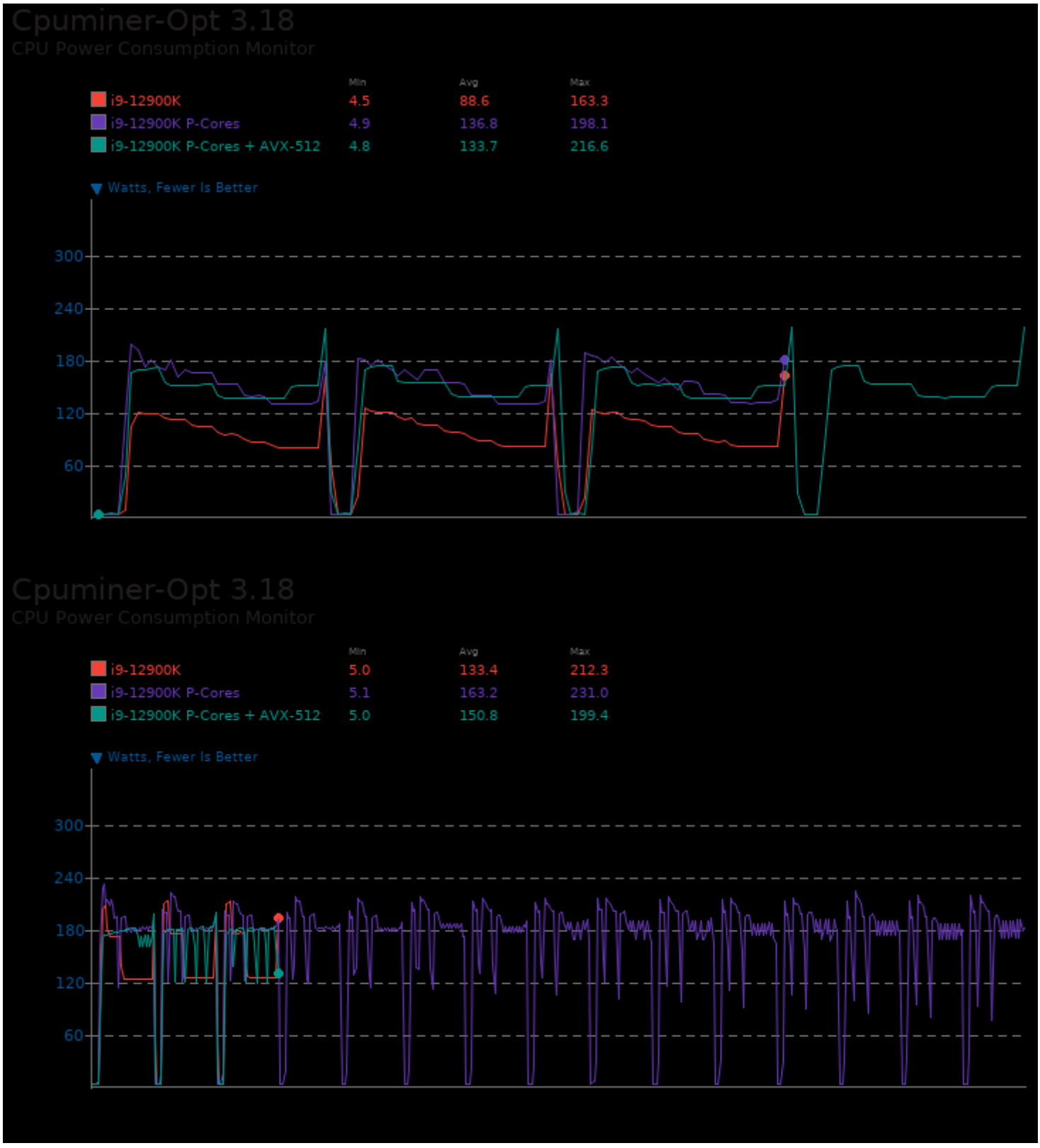
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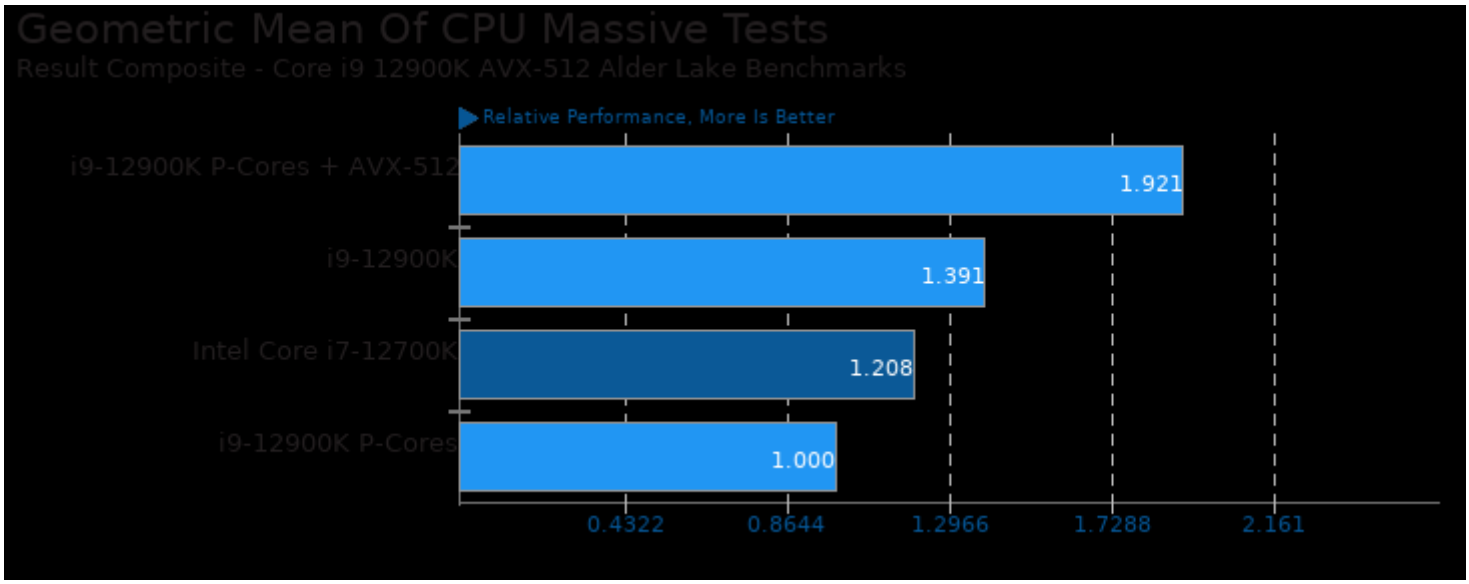


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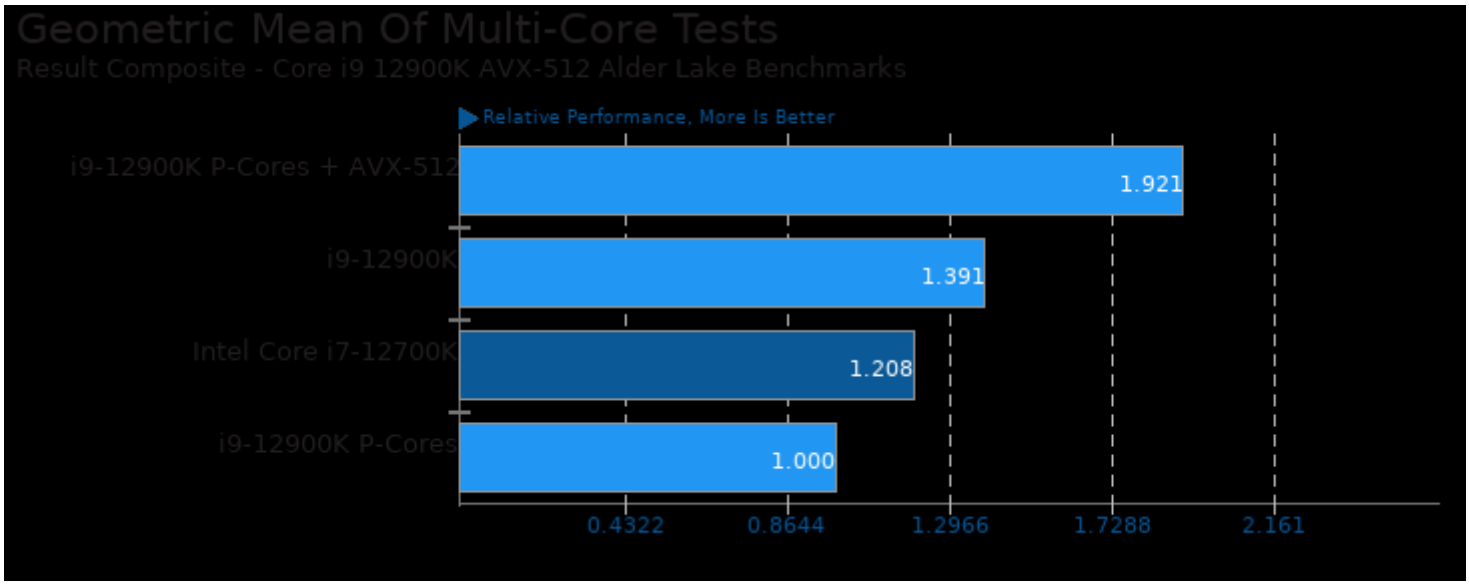


Core i9 12900K AVX-512 Alder Lake Benchmarks

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

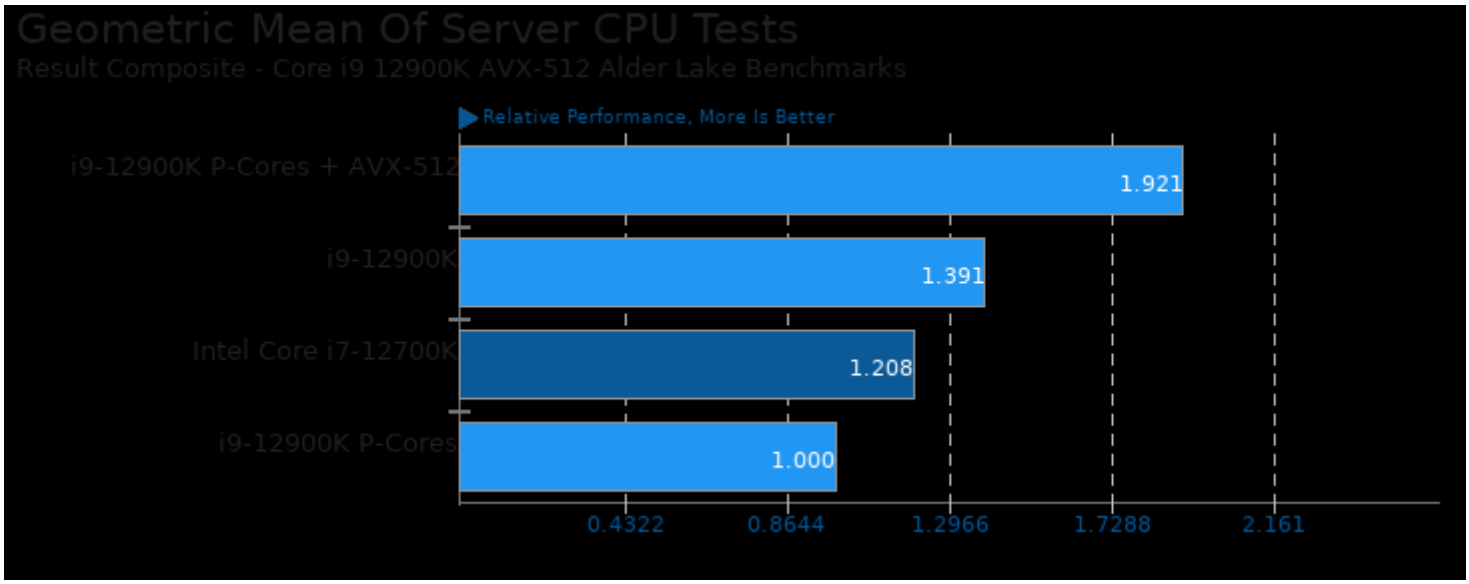


Geometric mean based upon tests: pts/stockfish and pts/cpuminer-opt



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

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