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Raspberry Pi 4 vs. Intel Comet Lake

Benchmarks for a future article.

Automated Executive Summary

Core i3 10100 had the most wins, coming in first place for 80% of the tests.

Based on the geometric mean of all complete results, the fastest (Core i3 10100) was 11.214x the speed of the slowest (Atom 330). Pentium Gold G6400 was 0.728x the speed of Core i3 10100, Celeron G5900 was 0.783x the speed of Pentium Gold G6400, Raspberry Pi 4 was 0.322x the speed of Celeron G5900, Atom 330 was 0.486x the speed of Raspberry Pi 4.

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

PyPerformance (Benchmark: regex_compile) at 433.333x
PyPerformance (Benchmark: float) at 419.333x
PyPerformance (Benchmark: 2to3) at 221.788x
GraphicsMagick (Operation: Rotate) at 63x
OpenSSL (RSA 4096-bit Performance) at 45.242x
PolyBench-C (Test: Covariance Computation) at 42.547x
PolyBench-C (Test: Correlation Computation) at 42.459x
GraphicsMagick (Operation: HWB Color Space) at 38.875x

PolyBench-C (Test: 3 Matrix Multiplications) at 37.306x
GraphicsMagick (Operation: Resizing) at 31.214x.

Test Systems:

Raspberry Pi 4

Processor: ARMv7 Cortex-A72 @ 1.50GHz (4 Cores), Motherboard: BCM2711 Raspberry Pi 4 Model B Rev 1.1, Memory: 2048MB, Disk: 32GB SC32G, Graphics: V3D 4.2 2GB, Monitor: VA2431

OS: Raspbian 10, Kernel: 5.4.51-v7l+ (armv7l), Desktop: LXDE 0.10.0, Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, OpenGL: 2.1 Mesa 19.3.2, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: snd_bcm2835.enable_compat_alsa=0 snd_bcm2835.enable_hdmi=1 snd_bcm2835.enable_headphones=1
Compiler Notes: --build=arm-linux-gnueabihf --disable-libitm --disable-libquadmath --disable-libquadmath-support --disable-sjlj-exceptions --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --program-prefix=arm-linux-gnueabihf- --target=arm-linux-gnueabihf --with-arch=armv6 --with-default-libstdcxx-abi=new --with-float=hard --with-fpu=vfp --with-gcc-major-version-only --with-target-system-zlib -v
Processor Notes: Scaling Governor: cpufreq-dt ondemand
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Raspbian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3

Core i3 10100

Processor: Intel Core i3-10100 @ 4.30GHz (4 Cores / 8 Threads), Motherboard: Gigabyte B460M DS3H (F2 BIOS), Chipset: Intel Device 9b63, Memory: 16GB, Disk: 500GB Western Digital WDS500G3X0C-00SJG0, Graphics: EFI VGA, Audio: Realtek ALC887-VD, Network: Realtek RTL8111/8168/8411

OS: Debian 10, Kernel: 4.19.0-9-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xcc
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + 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

Pentium Gold G6400

Processor: Intel Pentium Gold G6400 @ 4.00GHz (2 Cores / 4 Threads), Motherboard: Gigabyte B460M DS3H (F2 BIOS), Chipset: Intel Device 9b73, Memory: 16GB, Disk: 500GB Western Digital WDS500G3X0C-00SJG0, Graphics: EFI VGA, Audio: Realtek ALC887-VD, Network: Realtek RTL8111/8168/8411

OS: Debian 10, Kernel: 4.19.0-9-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xcc
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + 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

Celeron G5900

Processor: Intel Celeron G5900 @ 3.40GHz (2 Cores), Motherboard: Gigabyte B460M DS3H (F2 BIOS), Chipset: Intel Device 9b73, Memory: 16GB, Disk: 500GB Western Digital WDS500G3X0C-00SJG0, Graphics: EFI VGA, Audio: Realtek ALC887-VD, Network: Realtek RTL8111/8168/8411

OS: Debian 10, Kernel: 4.19.0-9-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xcc
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + 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

Atom 330

Processor: Intel Atom 330 (2 Cores / 4 Threads), Motherboard: VS Company VS-AD330 (080013 BIOS), Chipset: Intel 82945G/GZ/P/PL + ICH7, Memory: 2048MB, Disk: 160GB Western Digital WD1600AAJS-2, Graphics: ECS Intel 945G 256MB, Audio: VIA VT1708BCE, Monitor: L226WTQ, Network: Qualcomm Atheros Attansic L2

OS: Ubuntu 20.04, Kernel: 5.4.0-81-generic (x86_64), Desktop: LXQt 0.14.1, Display Server: X Server 1.20.11, OpenGL: 1.4 Mesa 21.0.3, Vulkan: 1.0.2, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1680x1050

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-HskZEa/gcc-9-9.3.0/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: CPU Microcode: 0x219
Java Notes: OpenJDK Runtime Environment (build 16.0.1+9-Ubuntu-120.04)
Python Notes: Python 3.8.10
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Not affected + spectre_v1: Not affected + spectre_v2: Not affected + srbds: Not affected + tsx_async_abort: Not affected

	Raspberry Pi 4	Core i3 10100	Pentium Gold G6400	Celeron G5900	Atom 330

Raspberry Pi 4 vs. Intel Comet Lake

LAMMPS Molecular Dynamics Simulator - Rhodopsin Protein (ns/day)	0.499	**3.219**	1.657	1.381	**0.092**
Normalized	15.5%	100%	51.48%	42.9%	2.86%
Standard Deviation	0.2%	0.4%	0.6%	0.7%	6.9%
DaCapo Benchmark - H2 (msec)	14385	**3146**	3375	3616	**37155**
Normalized	21.87%	100%	93.21%	87%	8.47%
Standard Deviation	3.9%	5.8%	9.7%	2.7%	7.2%
DaCapo Benchmark - Jython (msec)	34367	**4151**	5482	6084	**79235**
Normalized	12.08%	100%	75.72%	68.23%	5.24%
Standard Deviation	2%	1.4%	6%	1.8%	1.5%
DaCapo Benchmark - Tradebeans (msec)	**21087**		**4135**		
Normalized	19.61%		100%		
Standard Deviation	0.7%				
TSCP - A.C.P (Nodes/s)	350771	**1376258**	1268492	1078690	**187659**
Normalized	25.49%	100%	92.17%	78.38%	13.64%
Standard Deviation	0.2%	0.1%	0.2%	0.2%	0.2%
GraphicsMagick - Swirl (Iterations/min)	34	**187**	94	65	**8**
Normalized	18.18%	100%	50.27%	34.76%	4.28%
Standard Deviation	1.7%	2.5%			3.6%
GraphicsMagick - Rotate (Iterations/min)	85	**1134**	1057	873	**18**
Normalized	7.5%	100%	93.21%	76.98%	1.59%
Standard Deviation		2.7%	0.1%	0.8%	
GraphicsMagick - Sharpen (Iterations/min)	15	**60**	30	25	**3**
Normalized	25%	100%	50%	41.67%	5%
GraphicsMagick - Enhanced (Iterations/min)	16	**92**	45	37	**3**
Normalized	17.39%	100%	48.91%	40.22%	3.26%
GraphicsMagick - Resizing (Iterations/min)	48	**437**	246	197	**14**
Normalized	10.98%	100%	56.29%	45.08%	3.2%
Standard Deviation		0.3%	0.4%		
GraphicsMagick - Noise-Gaussian (Iterations/min)	16	**117**	55	39	**6**
Normalized	13.68%	100%	47.01%	33.33%	5.13%
Standard Deviation	25.4%				
GraphicsMagick - HWB Color Space (Iterations/min)	83	**933**	519	419	**24**
Normalized	8.9%	100%	55.63%	44.91%	2.57%
Standard Deviation		0.2%	0.1%	0.1%	
TTSIOD 3D Renderer - P.R.W.S.S.M (FPS)	25.4479	**262.097**	132.556	76.4398	**13.2047**
Normalized	9.71%	100%	50.58%	29.16%	5.04%
Standard Deviation	0.7%	0.3%	0.9%	0.3%	0.1%
Coremark - CoreMark Size 666 - I.P.S (Iterations/Sec)	33031	**179882**	88892	53412	**11891**
Normalized	18.36%	100%	49.42%	29.69%	6.61%
Standard Deviation	0%	1.1%	1.9%	0.1%	0%

Raspberry Pi 4 vs. Intel Comet Lake

7-Zip Compression - C.S.T	3466	**27500**	15033	7920	**1779**
Normalized	12.6%	100%	54.67%	28.8%	6.47%
Standard Deviation	0.1%	1.2%	0.2%	0.6%	0.1%
Timed GDB GNU Debugger Compilation - Time To Compile (sec)	970.537	**118.874**	178.803	274.528	**2888**
Normalized	12.25%	100%	66.48%	43.3%	4.12%
Standard Deviation	0.5%	0.3%	0.1%	0.1%	0.2%
Timed MPlayer Compilation - Time To Compile (sec)	543.837	**69.218**	128.701	198.335	**1890**
Normalized	12.73%	100%	53.78%	34.9%	3.66%
Standard Deviation	0%	0.1%	0%	0.1%	0%
Timed PHP Compilation - Time To Compile (sec)	638.584	**88.578**	143.935	220.076	**2046**
Normalized	13.87%	100%	61.54%	40.25%	4.33%
Standard Deviation	0.2%	0.2%	0.1%	0.3%	0.1%
C-Ray - Total Time - 4.1.R.P.P (sec)	680.080	**157.068**	322.191	400.348	**2747**
Normalized	23.1%	100%	48.75%	39.23%	5.72%
Standard Deviation	4.3%	0%	0%	0%	0%
Smallpt - G.I.R.1.S (sec)	130.180	**22.802**	46.453	74.585	**509.295**
Normalized	17.52%	100%	49.09%	30.57%	4.48%
Standard Deviation	1.4%	0.1%	0.1%	0.1%	0.3%
Numpy Benchmark (Score)	26.54	**375.55**	336.12	282.42	**18.87**
Normalized	7.07%	100%	89.5%	75.2%	5.02%
Standard Deviation	0.1%	0.2%	0.1%	0.4%	0.2%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	416.907	**42.488**	69.307	123.883	**578.068**
Normalized	10.19%	100%	61.3%	34.3%	7.35%
Standard Deviation	2.8%	0.3%	0.4%	0.1%	0%
OpenSSL - R.4.b.P (Signs/sec)	97.6	**1253**	389.3	315.0	**27.7**
Normalized	7.79%	100%	31.06%	25.14%	2.21%
Standard Deviation	0.1%	0.3%	0.1%	0.6%	0.4%
Aircrack-ng (k/s)	1162	**15519**	2813	2347	**564.860**
Normalized	7.49%	100%	18.12%	15.12%	3.64%
Standard Deviation	0.6%	0.4%	0.3%	0%	0.1%
libjpeg-turbo tjbench - D.T (Megapixels/sec)	49.657148	**205.777836**	172.928584	147.209265	**27.355269**
Normalized	24.13%	100%	84.04%	71.54%	13.29%
Standard Deviation	0.4%	0.4%	0.5%	1%	0.1%
SQLite Speedtest - Timed Time - Size 1,000 (sec)	766.550	**54.246**	65.150	82.015	**1022**
Normalized	7.08%	100%	83.26%	66.14%	5.31%
Standard Deviation	0.5%	0.6%	2.3%	0%	0.2%
GEGL - Crop (sec)	50.874	**8.527**	9.509	10.893	**90.934**
Normalized	16.76%	100%	89.67%	78.28%	9.38%
Standard Deviation	2.7%	0.9%	1.5%	1.1%	2.5%
GEGL - Scale (sec)	36.875	**5.478**	6.236	7.229	**83.991**
Normalized	14.86%	100%	87.84%	75.78%	6.52%
Standard Deviation	0.5%	1.1%	1.3%	0.1%	0.2%
GEGL - Cartoon (sec)	647.548	**105.900**	117.134	137.544	**944.651**
Normalized	16.35%	100%	90.41%	76.99%	11.21%
Standard Deviation	0.8%	0.3%	0.3%	0.1%	0%
GEGL - Reflect (sec)	**14.988**	31.140	33.538	39.431	**253.510**

Raspberry Pi 4 vs. Intel Comet Lake

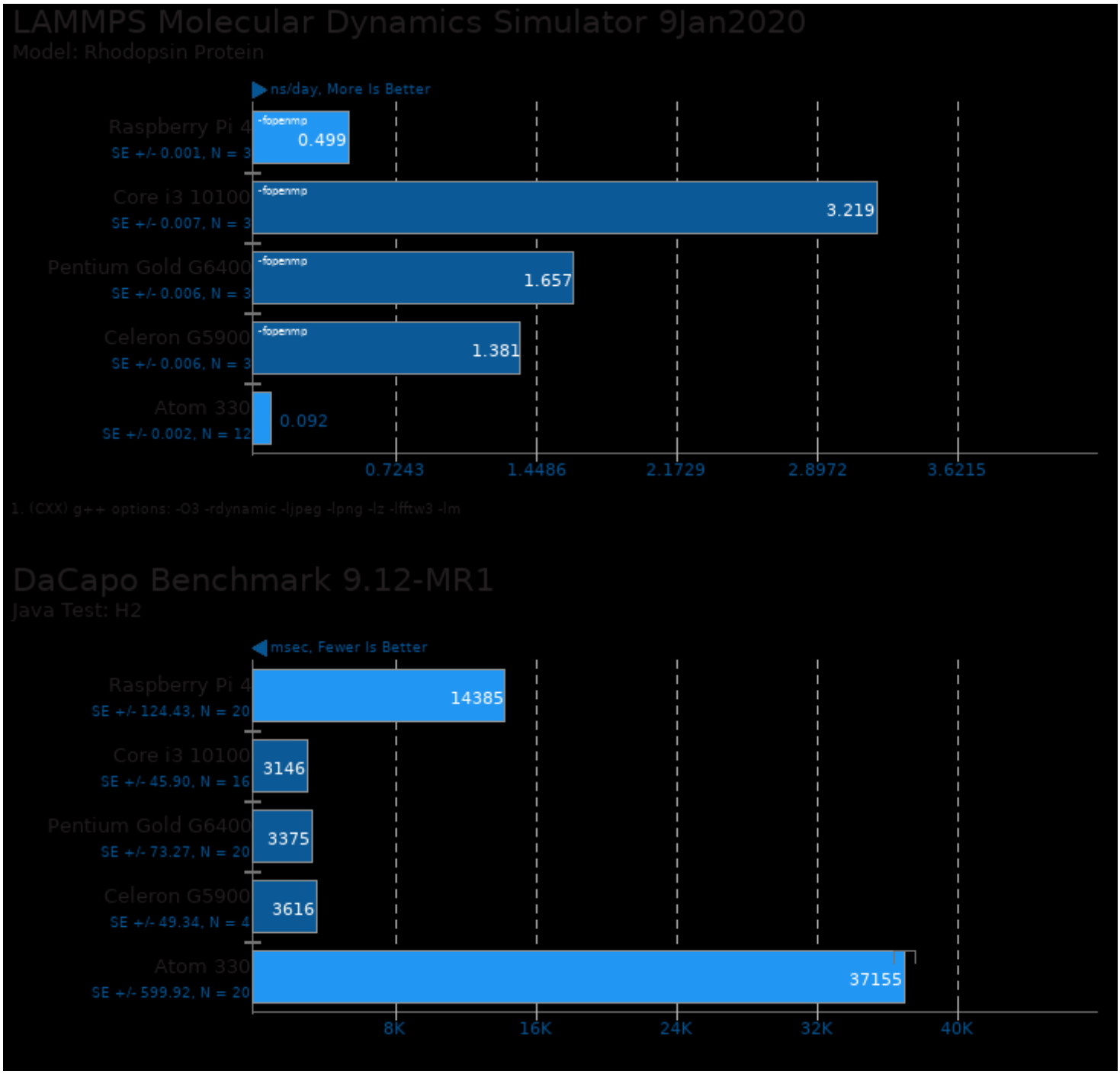
Normalized	100%	48.13%	44.69%	38.01%	5.91%
Standard Deviation	0.7%	0.4%	0.2%	0.3%	0%
GEGL - Antialias (sec)	214.859	**40.701**	47.341	56.741	**345.487**
Normalized	18.94%	100%	85.97%	71.73%	11.78%
Standard Deviation	0.5%	0.1%	0.5%	0.1%	0.3%
GEGL - Tile Glass (sec)	161.312	**30.744**	33.043	38.373	**278.628**
Normalized	19.06%	100%	93.04%	80.12%	11.03%
Standard Deviation	1.2%	0.2%	0.6%	0.1%	0.2%
GEGL - Wavelet Blur (sec)	326.606	**62.372**	68.478	79.504	**487.348**
Normalized	19.1%	100%	91.08%	78.45%	12.8%
Standard Deviation	0.7%	0.3%	0.3%	0%	0.1%
GEGL - Color Enhance (sec)	341.548	**59.441**	64.276	75.070	**593.145**
Normalized	17.4%	100%	92.48%	79.18%	10.02%
Standard Deviation	0.5%	0.1%	0.1%	0.1%	0.3%
GEGL - Rotate 90 Degrees (sec)	246.618	**41.734**	47.592	56.293	**411.065**
Normalized	16.92%	100%	87.69%	74.14%	10.15%
Standard Deviation	0.3%	0.2%	0.4%	0.1%	0.2%
GIMP - resize (sec)	**4.576**	8.728	10.648	**13.147**	
Normalized	100%	52.43%	42.98%	34.81%	
Standard Deviation	23.2%	0.5%	0.1%	1.7%	
GIMP - rotate (sec)	**4.389**	17.599	18.878	**22.125**	
Normalized	100%	24.94%	23.25%	19.84%	
Standard Deviation	8.9%	0%	0.2%	0.1%	
GIMP - auto-levels (sec)	**4.291**	20.780	23.198	**27.685**	
Normalized	100%	20.65%	18.5%	15.5%	
Standard Deviation	0.5%	0.5%	0.1%	0.1%	
GIMP - unsharp-mask (sec)	**4.345**	24.968	26.371	**31.529**	
Normalized	100%	17.4%	16.48%	13.78%	
Standard Deviation	1.9%	0.1%	0.1%	0.1%	
Hugin - P.P.A.S.T (sec)	471.413	**68.367**	96.509	140.394	**1237**
Normalized	14.5%	100%	70.84%	48.7%	5.53%
Standard Deviation	0.4%	0.6%	0.5%	0.2%	0.8%
Inkscape - SVG Files To PNG (sec)	137.212	**24.347**	25.719	30.616	**282.643**
Normalized	17.74%	100%	94.67%	79.52%	8.61%
Standard Deviation	0.8%	0.1%	0.2%	0.2%	1.3%
OCRMyPDF - P.6.P.P.D (sec)	**376.428**	**44.347**	89.362	121.326	
Normalized	11.78%	100%	49.63%	36.55%	
Standard Deviation	0.3%	0.1%	0.1%	0.1%	
GNU Octave Benchmark (sec)	**100.389**	**6.167**	6.605	7.633	
Normalized	6.14%	100%	93.37%	80.79%	
Standard Deviation	0.5%	0.4%	1.1%	1%	
RawTherapee - T.B.T (sec)	748.022	**104.108**	147.977	213.383	**1682**
Normalized	13.92%	100%	70.35%	48.79%	6.19%
Standard Deviation	0.3%	0%	0%	0.1%	0.1%
librsvg - SVG Files To PNG (sec)	77.222	**13.551**	13.878	16.452	**217.049**
Normalized	17.55%	100%	97.64%	82.37%	6.24%
Standard Deviation	2.2%	0.3%	0.1%	0.2%	0.5%
PyBench - T.F.A.T.T	5235	**945**	1020	1199	**10608**
Normalized	18.05%	100%	92.65%	78.82%	8.91%
Standard Deviation	0.2%		0.5%	0.5%	0.1%
PHPBench - P.B.S (Score)	102546	**729845**	668540	568837	**60885**
Normalized	14.05%	100%	91.6%	77.94%	8.34%
Standard Deviation	0.5%	0.1%	0.3%	0.1%	0.3%
Scikit-Learn (sec)	79.112	**27.067**	29.554	34.693	**229.904**

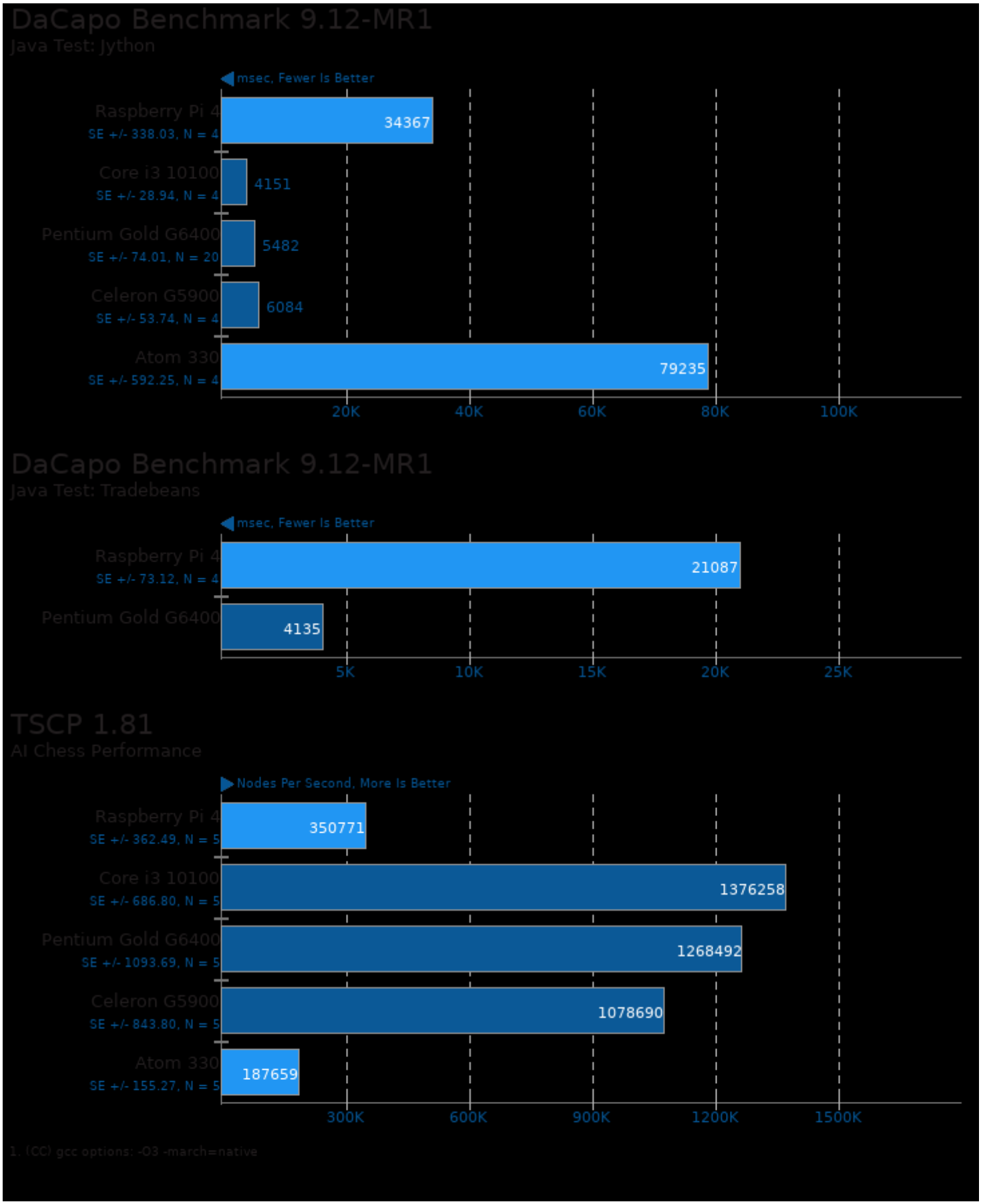
Raspberry Pi 4 vs. Intel Comet Lake

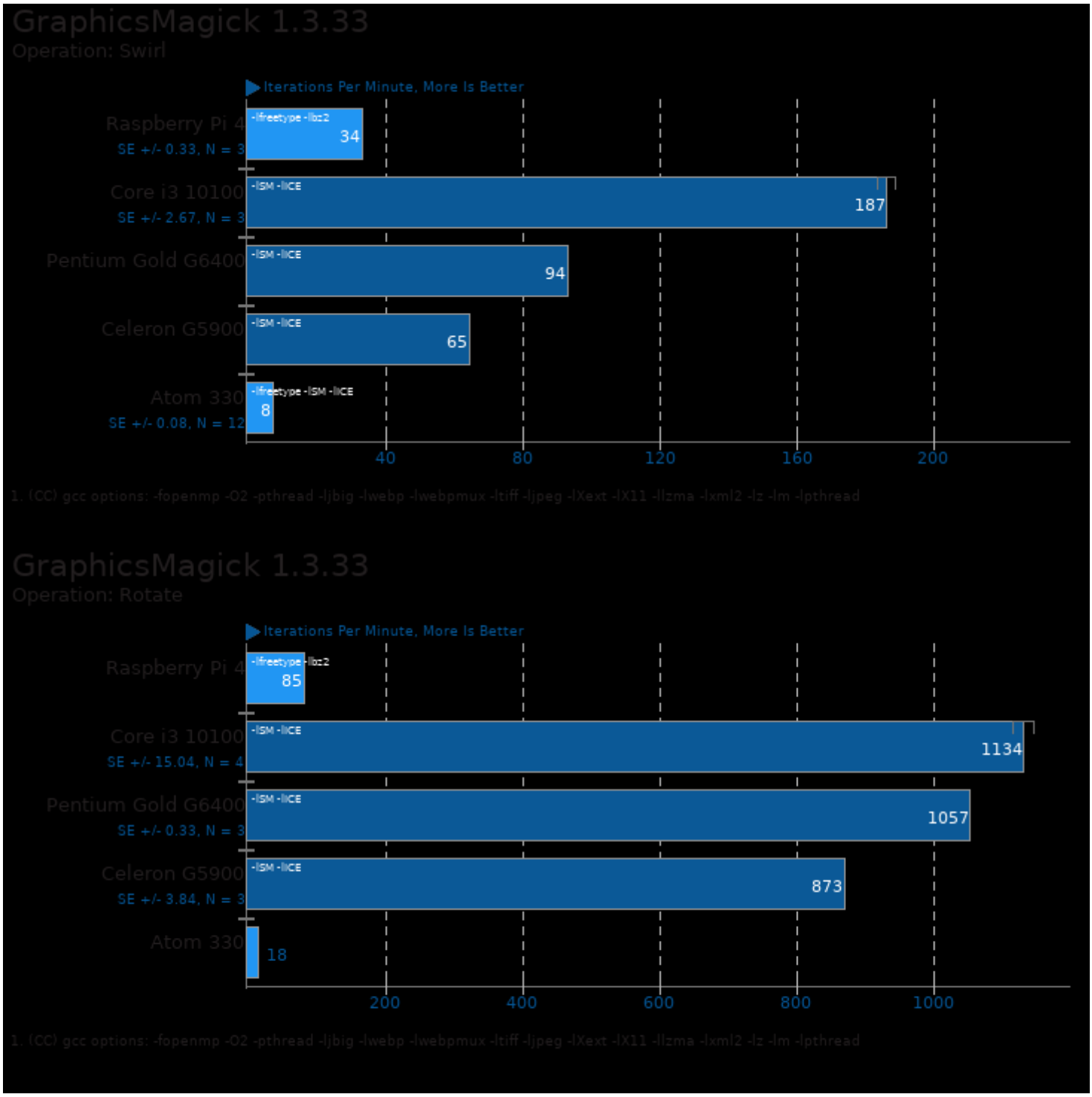
Normalized	34.21%	100%	91.58%	78.02%	11.77%
Standard Deviation	0.4%	0.3%	0.1%	0.1%	1.9%
Tesseract OCR - T.T.O.7.I (sec)	**136.504**	**25.010**	30.871	54.798	
Normalized	18.32%	100%	81.01%	45.64%	
Standard Deviation	0.1%	0.2%	0.1%	0%	
PolyBench-C - C.C (sec)	31.015			**2.168**	**92.241**
Normalized	6.99%			100%	2.35%
Standard Deviation	0.1%			0.3%	0.9%
PolyBench-C - C.C (sec)	31.021			**2.170**	**92.137**
Normalized	7%			100%	2.36%
Standard Deviation	0.1%			0.4%	0.9%
PolyBench-C - 3.M.M (sec)	24.910	**3.338**	3.832	4.446	**124.528**
Normalized	13.4%	100%	87.11%	75.08%	2.68%
Standard Deviation	0%	0.1%	0.1%	0.1%	0.1%
Timed HMMer Search - P.D.S (sec)	53.889	**7.438**	12.846	19.579	**118.588**
Normalized	13.8%	100%	57.9%	37.99%	6.27%
Standard Deviation	1.4%	1.5%	0.9%	0.2%	1.3%
Timed MAFFT Alignment - M.S.A (sec)	22.514	**3.855**	6.593	9.417	**63.664**
Normalized	17.12%	100%	58.47%	40.94%	6.06%
Standard Deviation	3%	6.6%	1.2%	0.4%	4.1%
AOBench - 2048 x 2048 - Total Time (sec)	123.692	**32.747**	35.179	41.546	**433.185**
Normalized	26.47%	100%	93.09%	78.82%	7.56%
Standard Deviation	0%	0%	0%	2.7%	0.1%
FLAC Audio Encoding - WAV To FLAC (sec)	109.371	**8.420**	9.456	11.108	**122.968**
Normalized	7.7%	100%	89.04%	75.8%	6.85%
Standard Deviation	1.1%	0.2%	0.1%	0.1%	0.2%
LAME MP3 Encoding - WAV To MP3 (sec)	41.587	**8.122**	8.667	10.181	**90.894**
Normalized	19.53%	100%	93.71%	79.78%	8.94%
Standard Deviation	0.2%	0.1%	0%	0.2%	0.1%
Perl Benchmarks - Pod2html	0.61497660	**0.10872912**	0.11884498	0.14005805	**1.68430969**
Normalized	17.68%	100%	91.49%	77.63%	6.46%
Standard Deviation	0.5%	0.2%	0.4%	0.3%	0.3%
Perl Benchmarks - Interpreter	0.00714413	0.00108894	**0.00075872**	0.00101531	**0.00958229**
Normalized	10.62%	69.68%	100%	74.73%	7.92%
Standard Deviation	6%	22%	0.2%	0.4%	0.4%
LibreOffice - 2.D.T.P (sec)	**5.751**	7.510	8.064	9.739	**109.186**
Normalized	100%	76.58%	71.32%	59.05%	5.27%
Standard Deviation		2.7%	1.4%	1.8%	4.7%
PyPerformance - 2to3 (Milliseconds)	**1.79**	304	328	**397**	4.42
Normalized	100%	0.59%	0.55%	0.45%	40.5%
Standard Deviation	0%				0.1%
PyPerformance - float (Milliseconds)	**629**	95.7	104	123	**1.5**
Normalized	0.24%	1.57%	1.44%	1.22%	100%
Standard Deviation		0.1%			0%
PyPerformance - pathlib (Milliseconds)	142	**17.9**	19.5	23.6	**363**
Normalized	12.61%	100%	91.79%	75.85%	4.93%

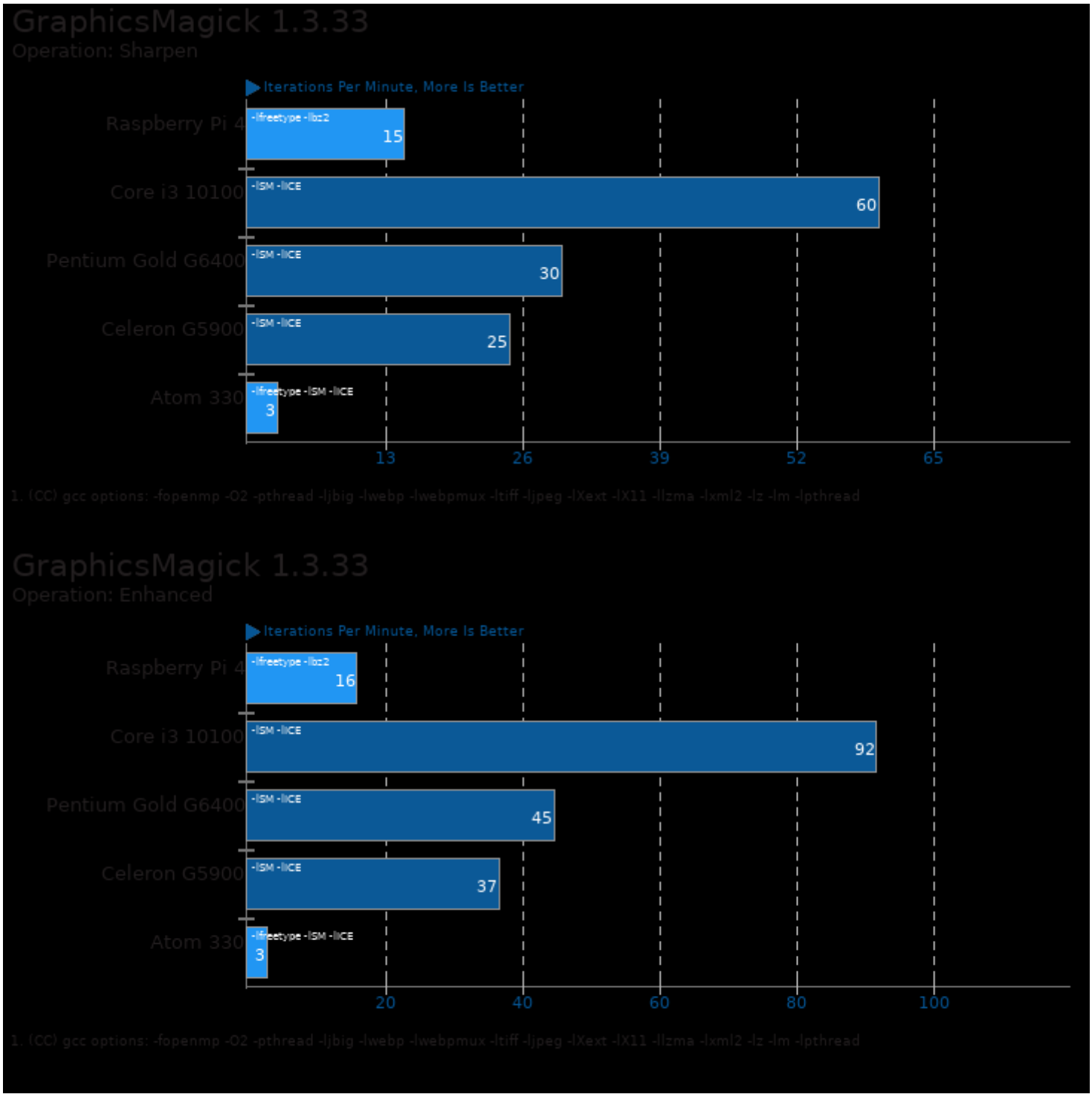
Raspberry Pi 4 vs. Intel Comet Lake

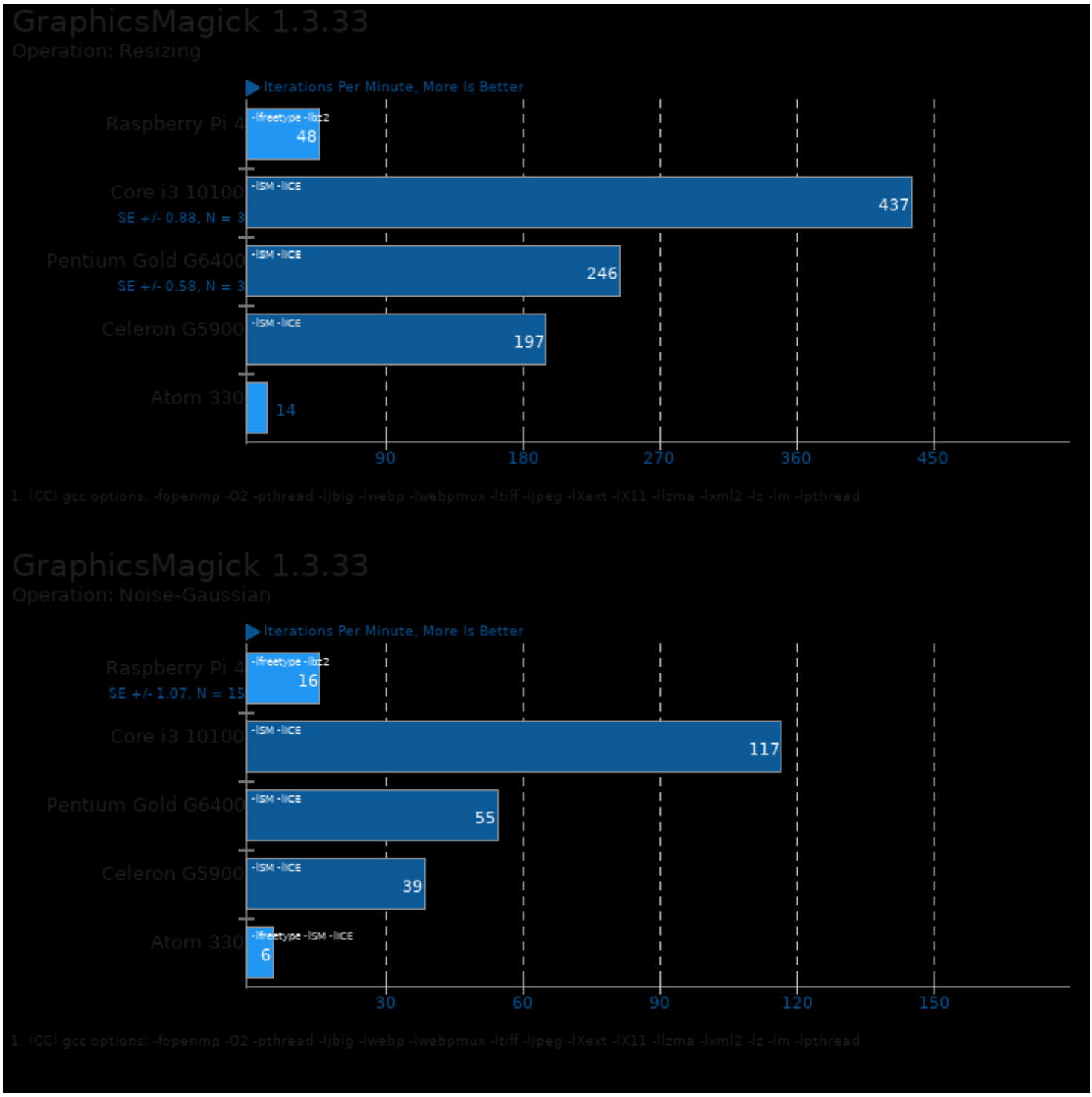
Standard Deviation		0%	0.3%	0%	0.3%
PyPerformance - json_loads (Milliseconds)	144	**23.6**	25.5	30.1	**316**
Normalized	16.39%	100%	92.55%	78.41%	7.47%
Standard Deviation	0.7%	0.2%	0.2%	0.2%	0.2%
PyPerformance - regex_compile (Milliseconds)	**962**	167	180	212	**2.22**
Normalized	0.23%	1.33%	1.23%	1.05%	100%
Standard Deviation	0.1%				0.3%
PyPerformance - python_startup (Milliseconds)	42.5	**7.49**	7.96	9.8	**96.5**
Normalized	17.62%	100%	94.1%	76.43%	7.76%
Standard Deviation	0.1%	0.2%	0%	0%	0.1%
Timed Apache Compilation - Time To Compile (sec)	180.753	**24.444**	37.116	54.742	**527.226**
Normalized	13.52%	100%	65.86%	44.65%	4.64%
Standard Deviation	0.6%	0.2%	0.1%	0.1%	0%
GIMP - resize (sec)					10.932
Standard Deviation					43.3%
GIMP - rotate (sec)					9.833
Standard Deviation					1.7%
GIMP - auto-levels (sec)					11.310
Standard Deviation					37.4%
GIMP - unsharp-mask (sec)					10.121
Standard Deviation					6%
OCRMyPDF - P.6.P.P.D (sec)					1360
Standard Deviation					0.6%
GNU Octave Benchmark (sec)					92.149
Standard Deviation					1.2%
Tesseract OCR - T.T.O.7.I (sec)					342.921
Standard Deviation					0.1%

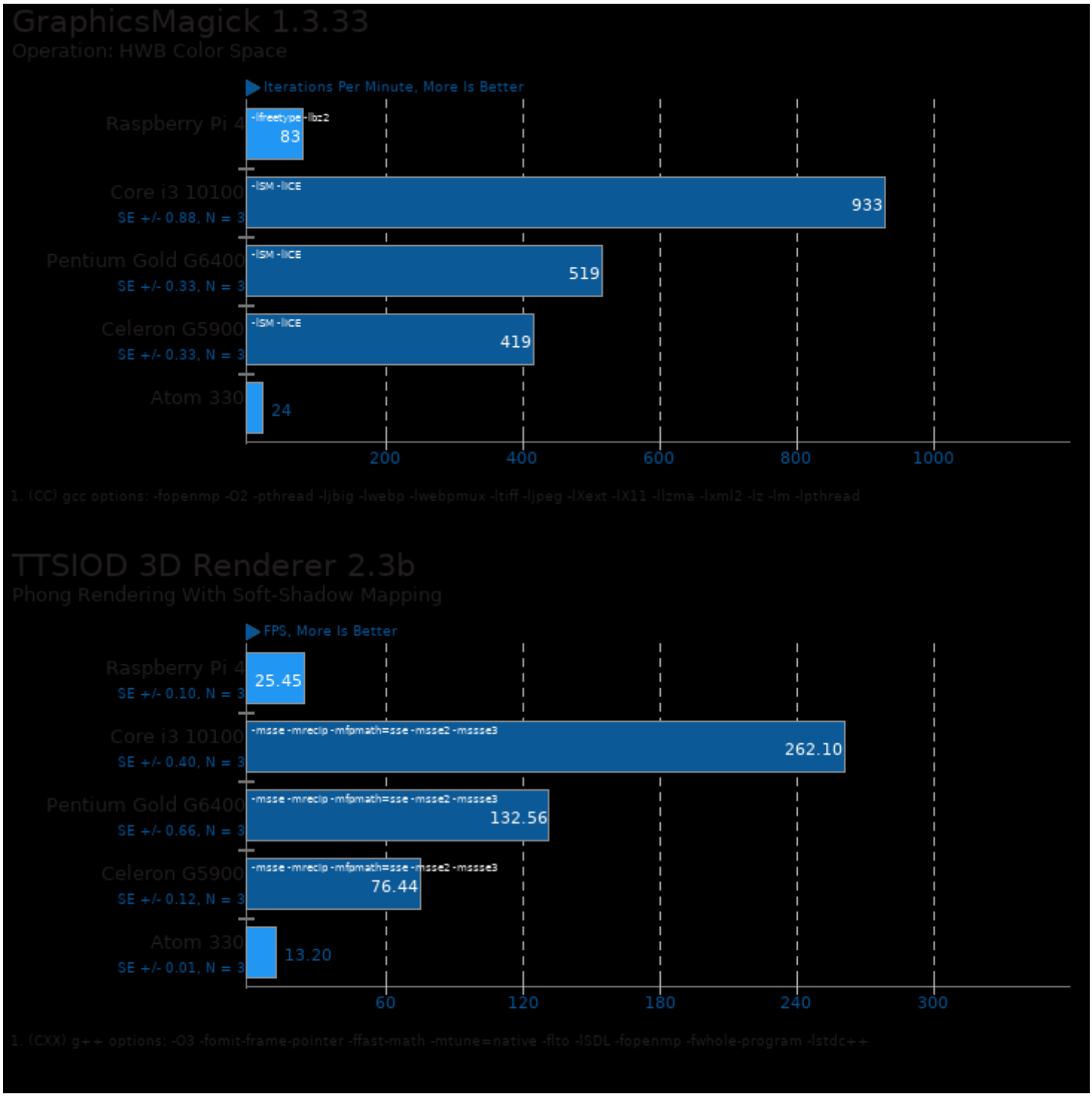

LAMMPS Molecular Dynamics Simulator 9Jan2020
Model: Rhodopsin Protein
ns/day, More Is Better
Raspberry Pi 4
SE +/- 0.001, N = 3
-fopenmp
0.499
Core i3 10100
SE +/- 0.007, N = 3
-fopenmp
3.219
Pentium Gold G6400
SE +/- 0.006, N = 3
-fopenmp
1.657
Celeron G5900
SE +/- 0.006, N = 3
-fopenmp
1.381
Atom 330
SE +/- 0.002, N = 12
0.092
0.7243
1.4486
2.1729
2.8972
3.6215
1. (CXX) g++ options: -O3 -rdynamic -ljpeg -lpng -lz -lfftw3 -lm
DaCapo Benchmark 9.12-MR1
Java Test: H2
msec, Fewer Is Better
Raspberry Pi 4
SE +/- 124.43, N = 20
14385
Core i3 10100
SE +/- 45.90, N = 16
3146
Pentium Gold G6400
SE +/- 73.27, N = 20
3375
Celeron G5900
SE +/- 49.34, N = 4
3616
Atom 330
SE +/- 599.92, N = 20
37155
8K
16K
24K
32K
40K

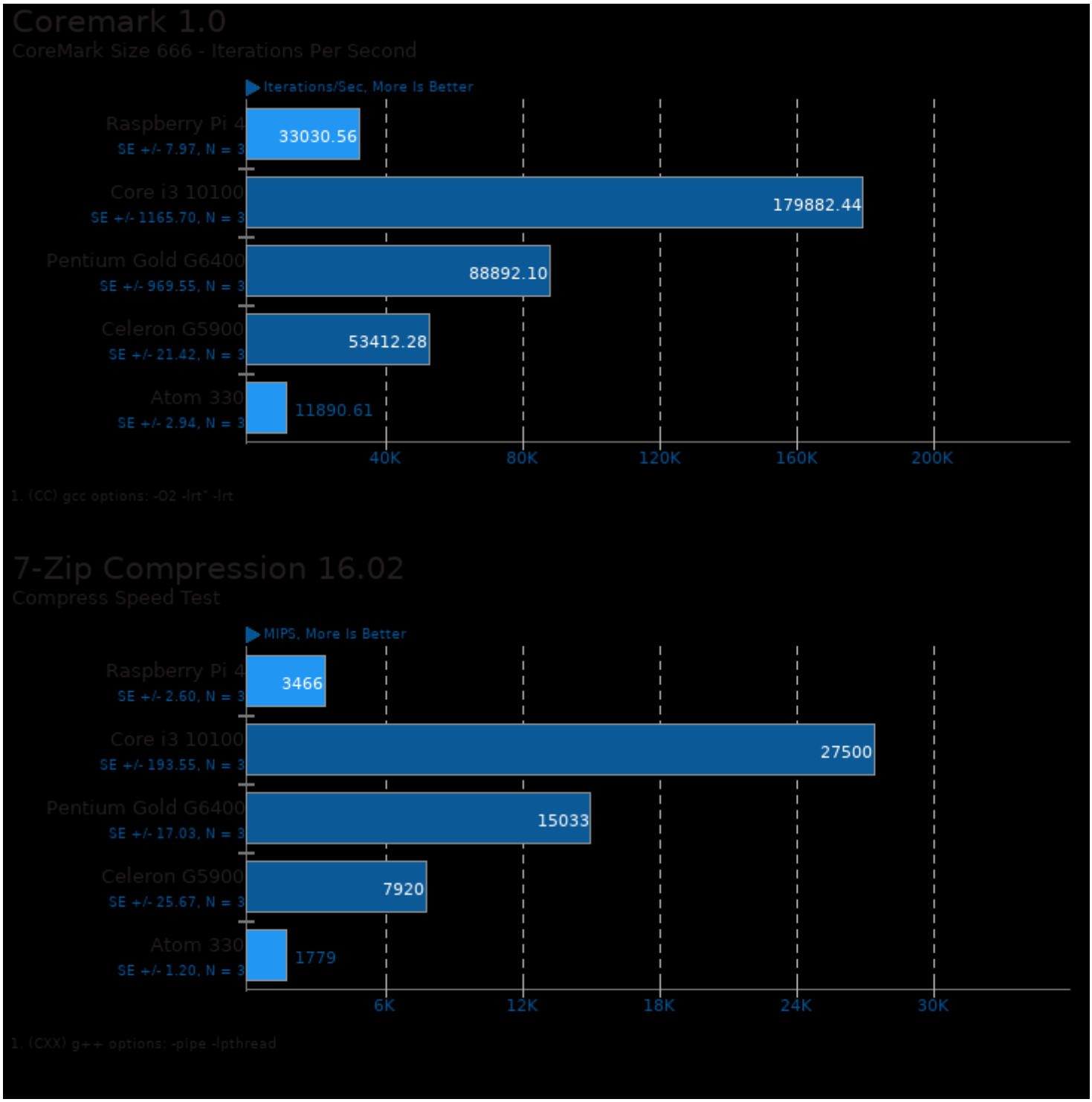

DaCapo Benchmark 9.12-MR1
Java Test: Jython
msec, Fewer Is Better
Raspberry Pi 4
SE +/- 338.03, N = 4
34367
Core i3 10100
SE +/- 28.94, N = 4
4151
Pentium Gold G6400
SE +/- 74.01, N = 20
5482
Celeron G5900
SE +/- 53.74, N = 4
6084
Atom 330
SE +/- 592.25, N = 4
79235
20K
40K
60K
80K
100K
DaCapo Benchmark 9.12-MR1
Java Test: Tradebeans
msec, Fewer Is Better
Raspberry Pi 4
SE +/- 73.12, N = 4
21087
Pentium Gold G6400
4135
5K
10K
15K
20K
25K
TSCP 1.81
AI Chess Performance
Nodes Per Second, More Is Better
Raspberry Pi 4
SE +/- 362.49, N = 5
350771
Core i3 10100
SE +/- 686.80, N = 5
1376258
Pentium Gold G6400
SE +/- 1093.69, N = 5
1268492
Celeron G5900
SE +/- 843.80, N = 5
1078690
Atom 330
SE +/- 155.27, N = 5
187659
300K
600K
900K
1200K
1500K
1. (CC) gcc options: -O3 -march=native

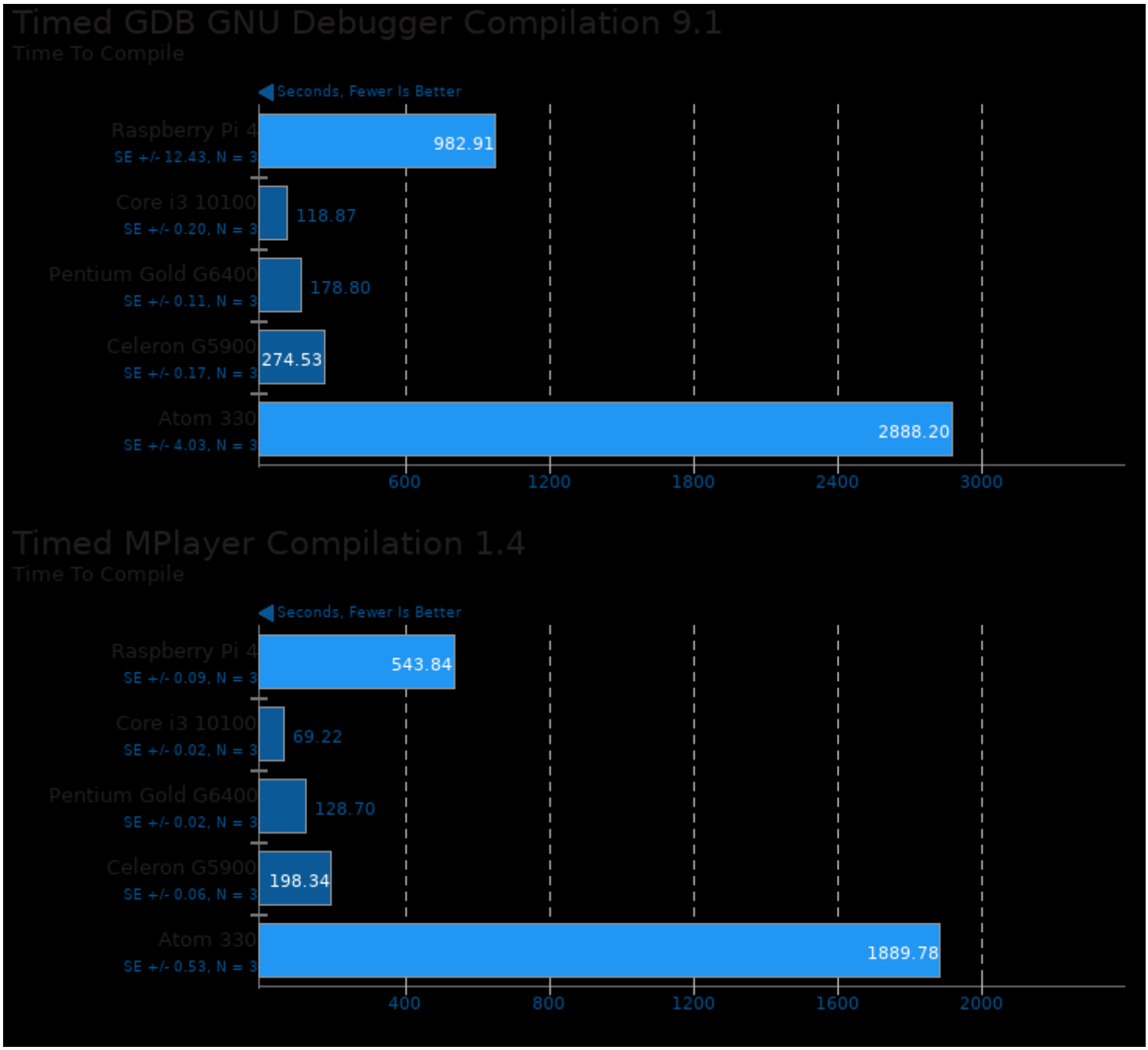

GraphicsMagick 1.3.33
Operation: Swirl
Iterations Per Minute, More Is Better
Raspberry Pi 4
SE +/- 0.33, N = 3
-lfreetype -lbz2
34
Core i3 10100
SE +/- 2.67, N = 3
-lSM -lICE
187
Pentium Gold G6400
-lSM -lICE
94
Celeron G5900
-lSM -lICE
65
Atom 330
SE +/- 0.08, N = 12
-lfreetype -lSM -lICE
8
40
80
120
160
200
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Rotate
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
85
Core i3 10100
SE +/- 15.04, N = 4
-lSM -lICE
1134
Pentium Gold G6400
SE +/- 0.33, N = 3
-lSM -lICE
1057
Celeron G5900
SE +/- 3.84, N = 3
-lSM -lICE
873
Atom 330
18
200
400
600
800
1000
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

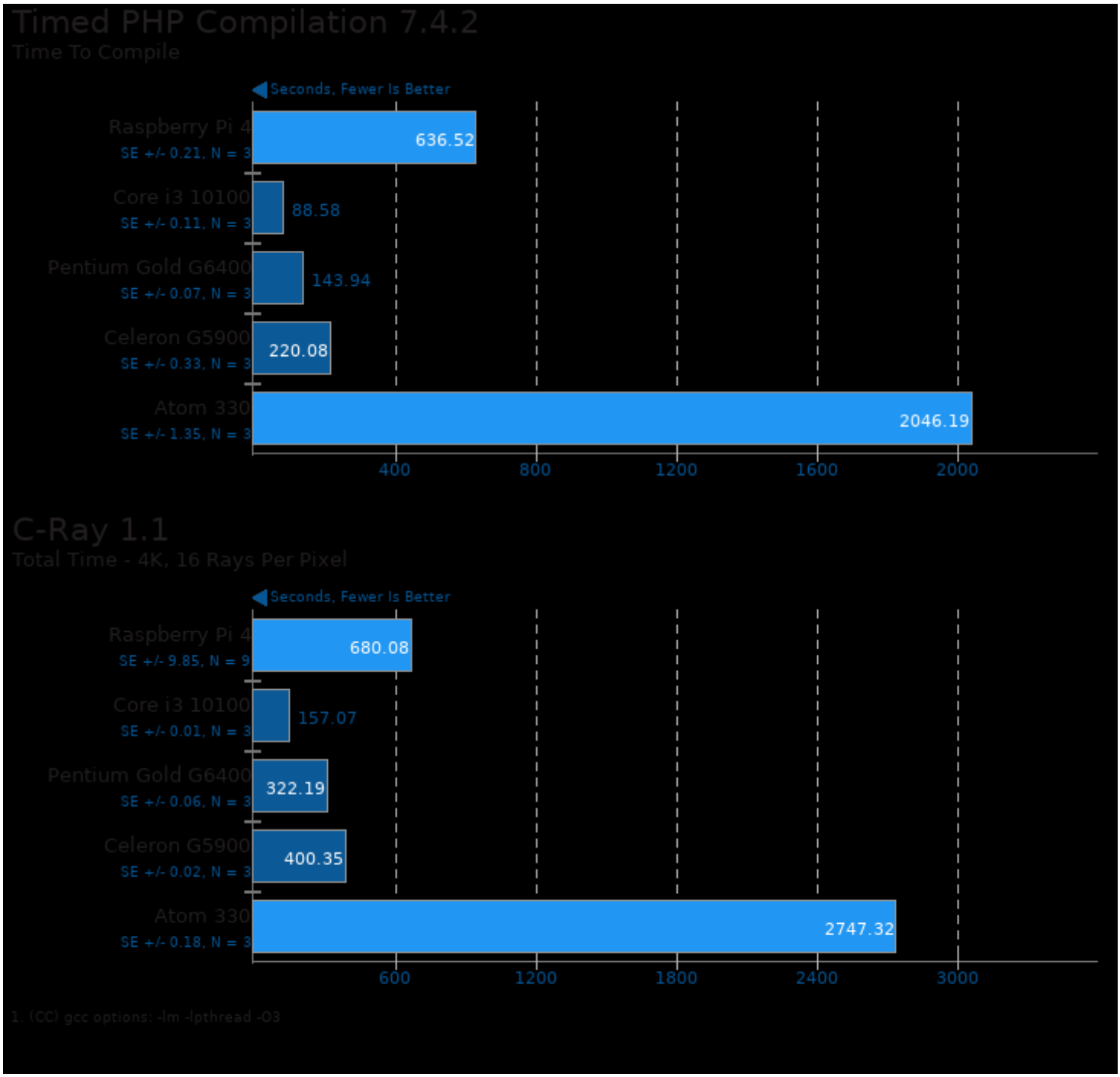

GraphicsMagick 1.3.33
Operation: Sharpen
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
15
Core i3 10100
-lSM -lICE
60
Pentium Gold G6400
-lSM -lICE
30
Celeron G5900
-lSM -lICE
25
Atom 330
-lfreetype -lSM -lICE
3
13
26
39
52
65
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Enhanced
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
16
Core i3 10100
-lSM -lICE
92
Pentium Gold G6400
-lSM -lICE
45
Celeron G5900
-lSM -lICE
37
Atom 330
-lfreetype -lSM -lICE
3
20
40
60
80
100
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

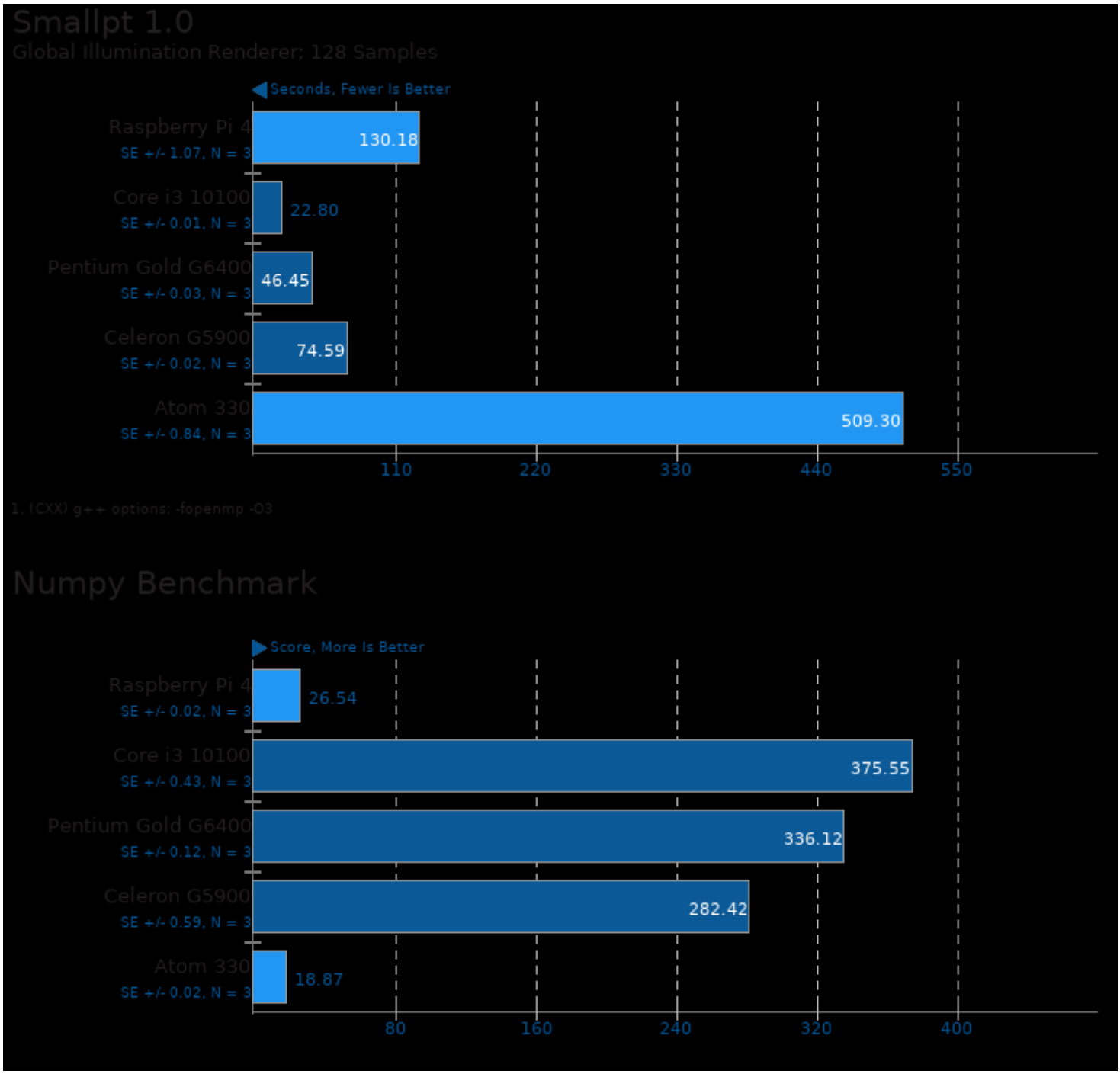

GraphicsMagick 1.3.33
Operation: Resizing
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
48
Core i3 10100
SE +/- 0.88, N = 3
-lSM -lICE
437
Pentium Gold G6400
SE +/- 0.58, N = 3
-lSM -lICE
246
Celeron G5900
-lSM -lICE
197
Atom 330
14
90
180
270
360
450
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Noise-Gaussian
Iterations Per Minute, More Is Better
Raspberry Pi 4
SE +/- 1.07, N = 15
-lfreetype -lbz2
16
Core i3 10100
-lSM -lICE
117
Pentium Gold G6400
-lSM -lICE
55
Celeron G5900
-lSM -lICE
39
Atom 330
-lfreetype -lSM -lICE
6
30
60
90
120
150
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

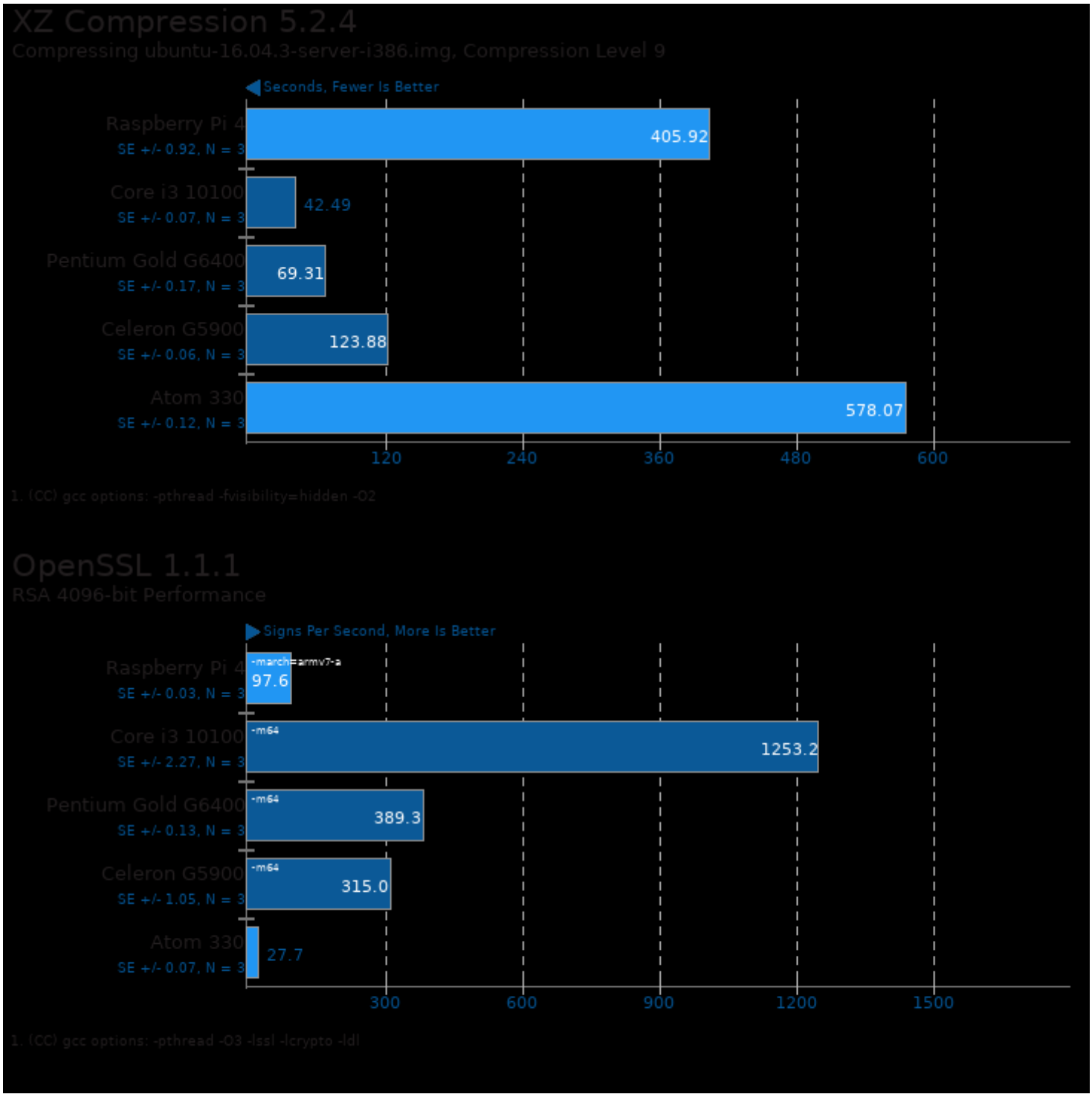

GraphicsMagick 1.3.33
Operation: HWB Color Space
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
83
Core i3 10100
SE +/- 0.88, N = 3
-lSM -lICE
933
Pentium Gold G6400
SE +/- 0.33, N = 3
-lSM -lICE
519
Celeron G5900
SE +/- 0.33, N = 3
-lSM -lICE
419
Atom 330
24
200
400
600
800
1000
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
TTSIOD 3D Renderer 2.3b
Phong Rendering With Soft-Shadow Mapping
FPS, More Is Better
Raspberry Pi 4
SE +/- 0.10, N = 3
25.45
Core i3 10100
SE +/- 0.40, N = 3
-msse -mrecip -mfpmath=sse -msse2 -mssse3
262.10
Pentium Gold G6400
SE +/- 0.66, N = 3
-msse -mrecip -mfpmath=sse -msse2 -mssse3
132.56
Celeron G5900
SE +/- 0.12, N = 3
-msse -mrecip -mfpmath=sse -msse2 -mssse3
76.44
Atom 330
SE +/- 0.01, N = 3
13.20
60
120
180
240
300
1. (CXX) g++ options: -O3 -fomit-frame-pointer -ffast-math -mtune=native -flto -lSDL -fopenmp -fwhole-program -lstdc++

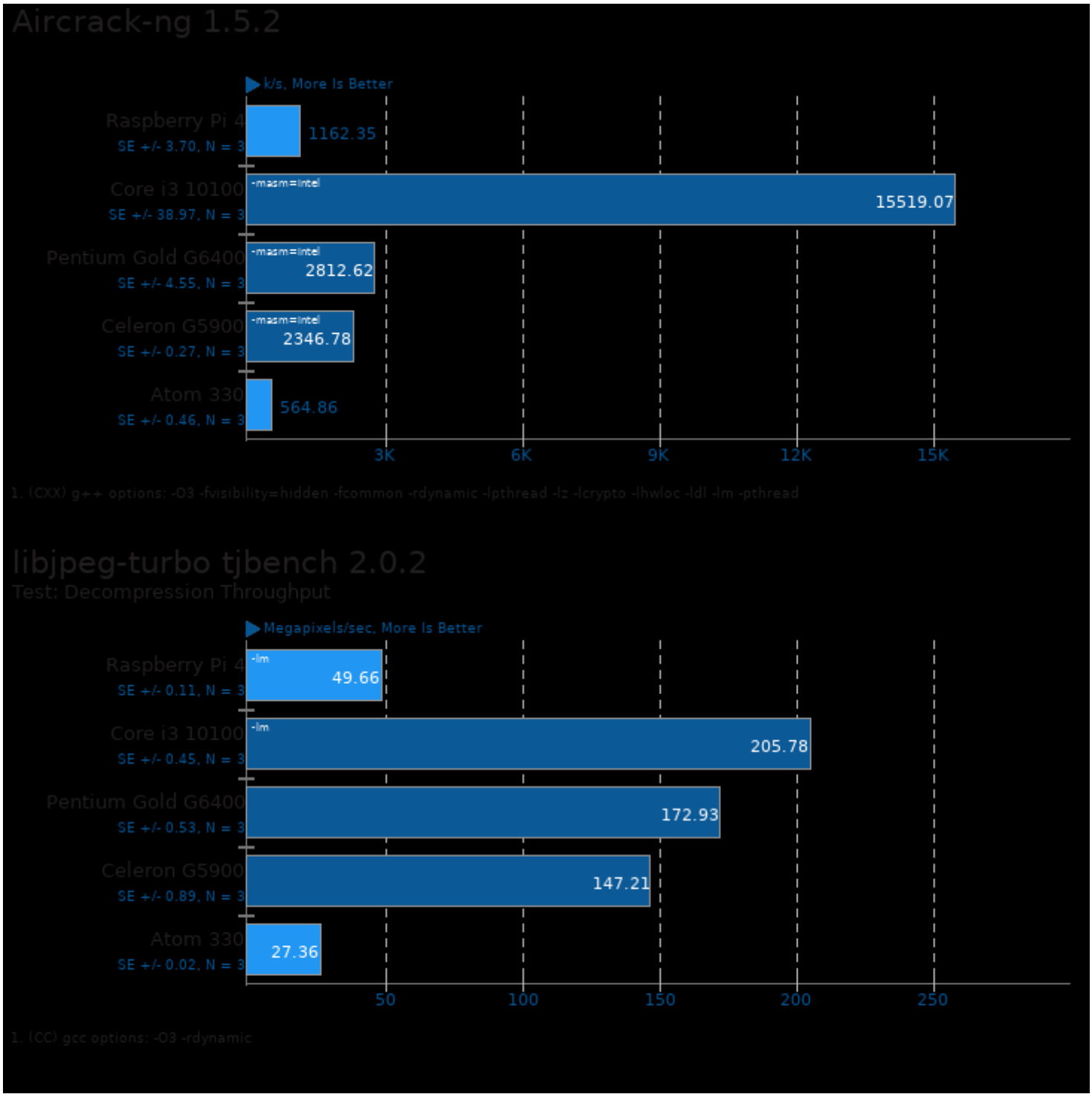

Coremark 1.0
CoreMark Size 666 - Iterations Per Second
Iterations/Sec, More Is Better
Raspberry Pi 4
SE +/- 7.97, N = 3
33030.56
Core i3 10100
SE +/- 1165.70, N = 3
179882.44
Pentium Gold G6400
SE +/- 969.55, N = 3
88892.10
Celeron G5900
SE +/- 21.42, N = 3
53412.28
Atom 330
SE +/- 2.94, N = 3
11890.61
40K
80K
120K
160K
200K
1. (CC) gcc options: -O2 -lrt" -lrt
7-Zip Compression 16.02
Compress Speed Test
MIPS, More Is Better
Raspberry Pi 4
SE +/- 2.60, N = 3
3466
Core i3 10100
SE +/- 193.55, N = 3
27500
Pentium Gold G6400
SE +/- 17.03, N = 3
15033
Celeron G5900
SE +/- 25.67, N = 3
7920
Atom 330
SE +/- 1.20, N = 3
1779
6K
12K
18K
24K
30K
1. (CXX) g++ options: -pipe -lpthread

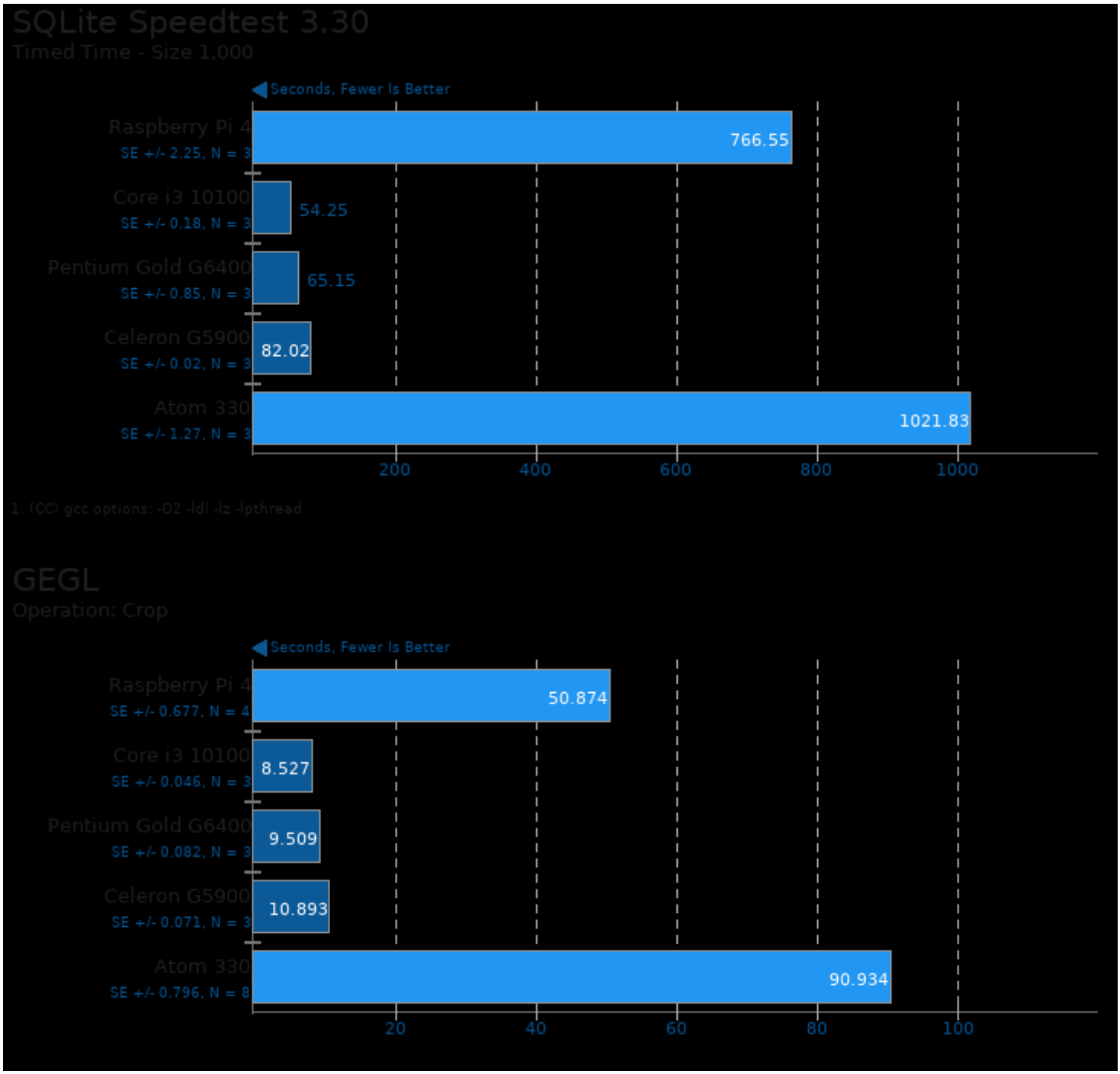

Timed GDB GNU Debugger Compilation 9.1
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 12.43, N = 3
982.91
Core i3 10100
SE +/- 0.20, N = 3
118.87
Pentium Gold G6400
SE +/- 0.11, N = 3
178.80
Celeron G5900
SE +/- 0.17, N = 3
274.53
Atom 330
SE +/- 4.03, N = 3
2888.20
600
1200
1800
2400
3000
Timed MPlayer Compilation 1.4
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.09, N = 3
543.84
Core i3 10100
SE +/- 0.02, N = 3
69.22
Pentium Gold G6400
SE +/- 0.02, N = 3
128.70
Celeron G5900
SE +/- 0.06, N = 3
198.34
Atom 330
SE +/- 0.53, N = 3
1889.78
400
800
1200
1600
2000

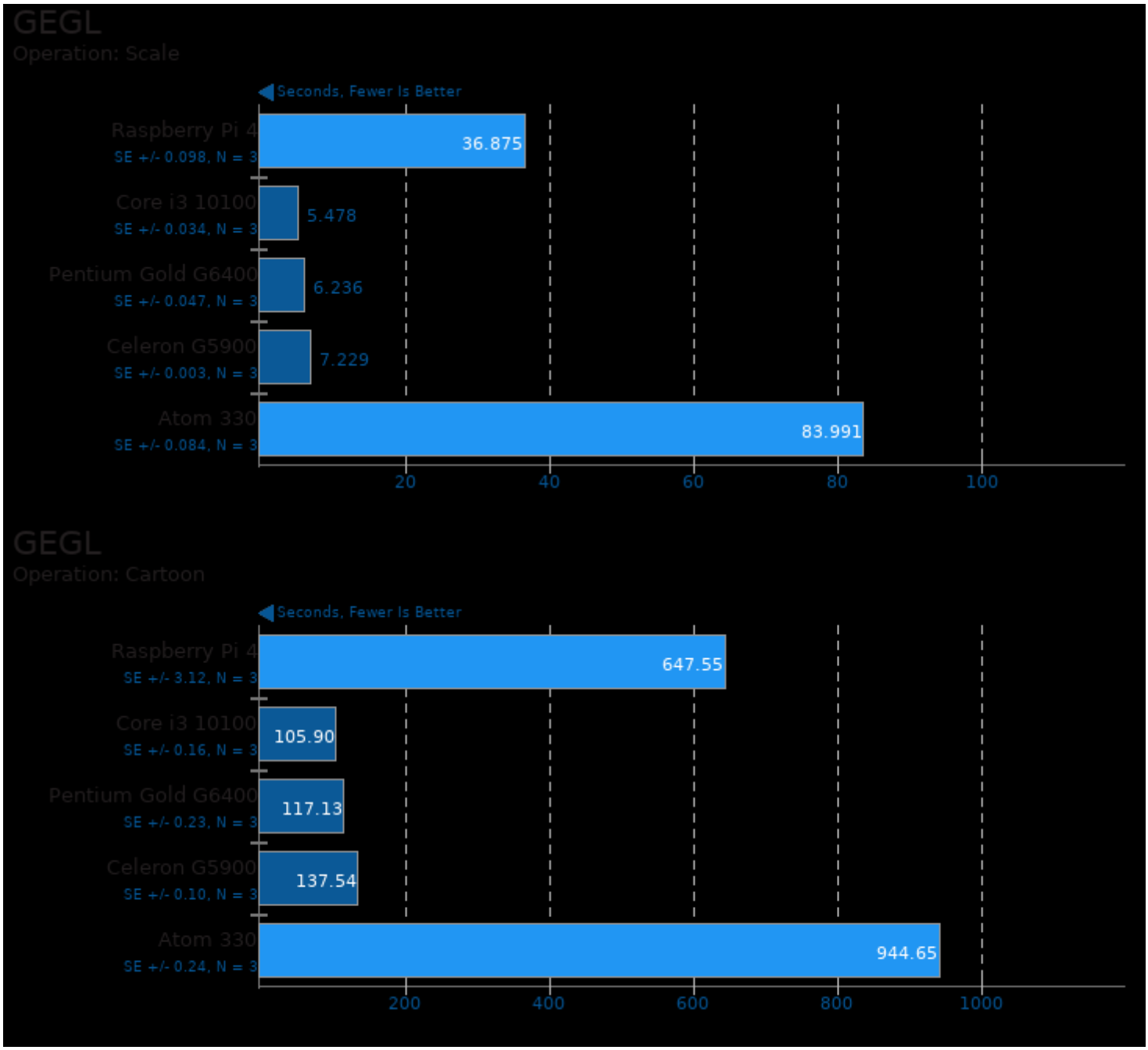

Timed PHP Compilation 7.4.2
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.21, N = 3
636.52
Core i3 10100
SE +/- 0.11, N = 3
88.58
Pentium Gold G6400
SE +/- 0.07, N = 3
143.94
Celeron G5900
SE +/- 0.33, N = 3
220.08
Atom 330
SE +/- 1.35, N = 3
2046.19
400
800
1200
1600
2000
C-Ray 1.1
Total Time - 4K, 16 Rays Per Pixel
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 9.85, N = 9
680.08
Core i3 10100
SE +/- 0.01, N = 3
157.07
Pentium Gold G6400
SE +/- 0.06, N = 3
322.19
Celeron G5900
SE +/- 0.02, N = 3
400.35
Atom 330
SE +/- 0.18, N = 3
2747.32
600
1200
1800
2400
3000
1. (CC) gcc options: -lm -lpthread -O3

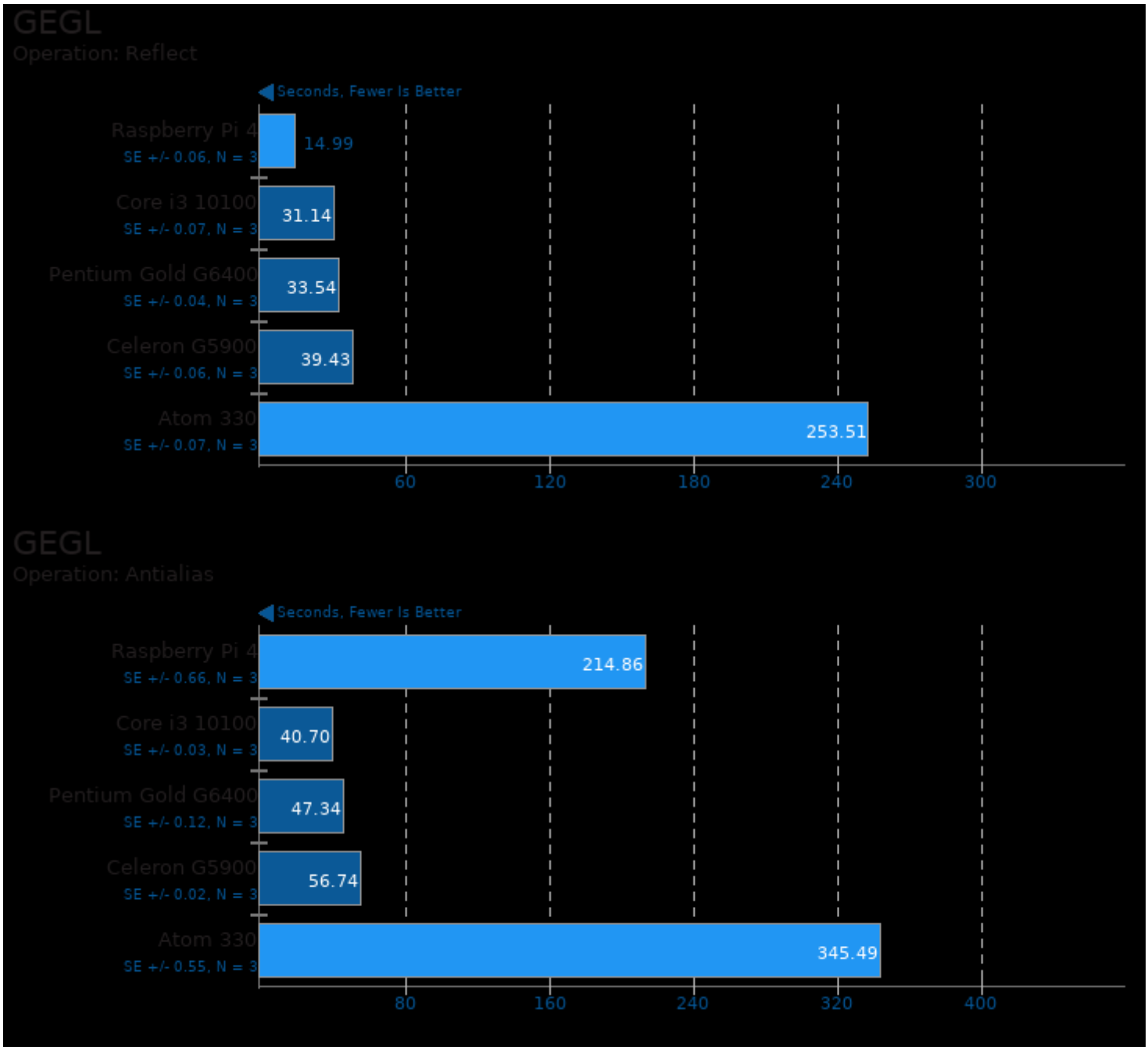

Smallpt 1.0
Global Illumination Renderer; 128 Samples
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.07, N = 3
130.18
Core i3 10100
SE +/- 0.01, N = 3
22.80
Pentium Gold G6400
SE +/- 0.03, N = 3
46.45
Celeron G5900
SE +/- 0.02, N = 3
74.59
Atom 330
SE +/- 0.84, N = 3
509.30
110
220
330
440
550
1. (CXX) g++ options: -fopenmp -O3
Numpy Benchmark
Score, More Is Better
Raspberry Pi 4
SE +/- 0.02, N = 3
26.54
Core i3 10100
SE +/- 0.43, N = 3
375.55
Pentium Gold G6400
SE +/- 0.12, N = 3
336.12
Celeron G5900
SE +/- 0.59, N = 3
282.42
Atom 330
SE +/- 0.02, N = 3
18.87
80
160
240
320
400

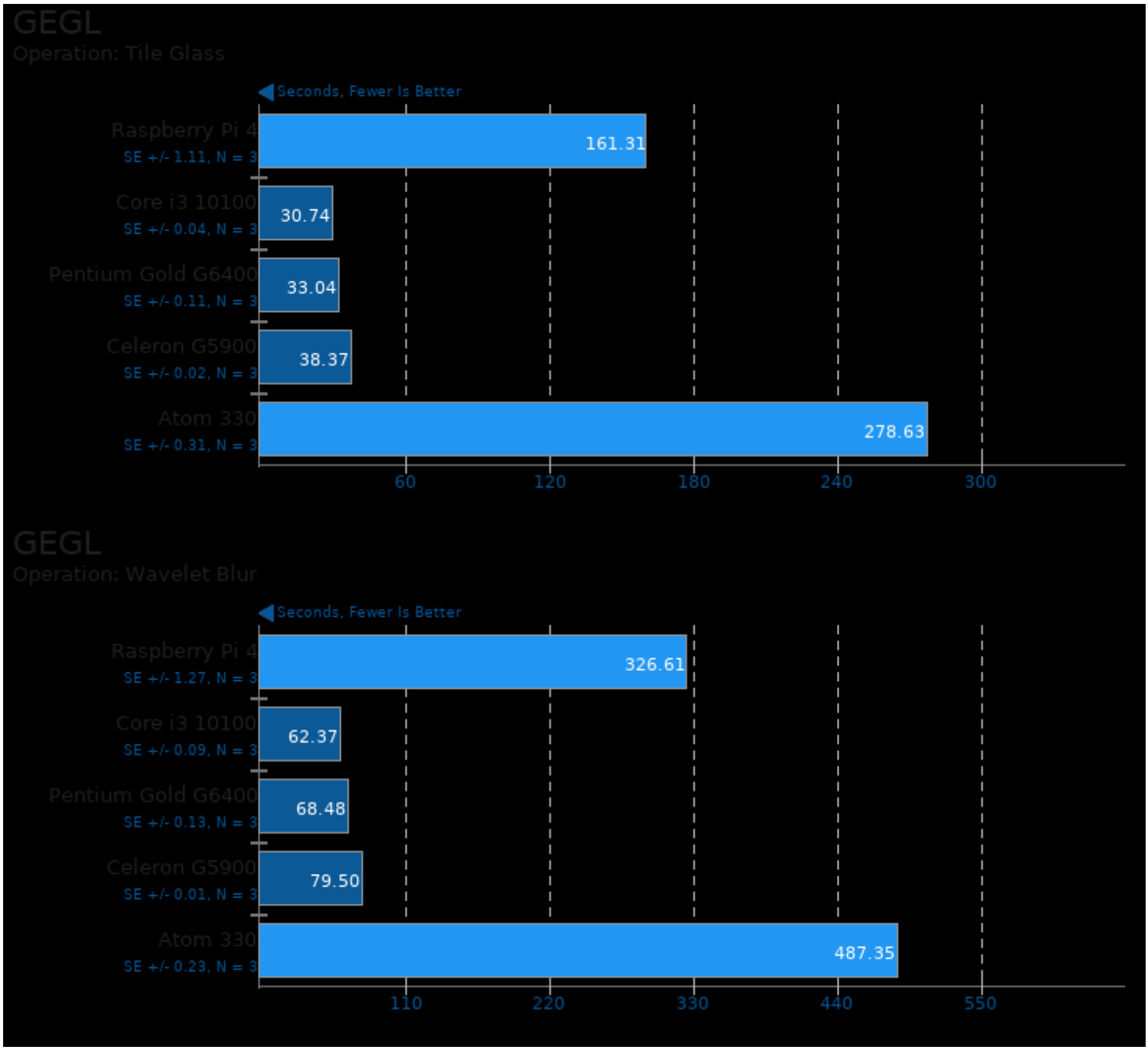

XZ Compression 5.2.4
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.92, N = 3
405.92
Core i3 10100
SE +/- 0.07, N = 3
42.49
Pentium Gold G6400
SE +/- 0.17, N = 3
69.31
Celeron G5900
SE +/- 0.06, N = 3
123.88
Atom 330
SE +/- 0.12, N = 3
578.07
120
240
360
480
600
1. (CC) gcc options: -pthread -fvisibility=hidden -O2
OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second, More Is Better
Raspberry Pi 4
SE +/- 0.03, N = 3
-march=armv7-a
97.6
Core i3 10100
SE +/- 2.27, N = 3
-m64
1253.2
Pentium Gold G6400
SE +/- 0.13, N = 3
-m64
389.3
Celeron G5900
SE +/- 1.05, N = 3
-m64
315.0
Atom 330
SE +/- 0.07, N = 3
27.7
300
600
900
1200
1500
1. (CC) gcc options: -pthread -O3 -lssl -lcrypto -ldl

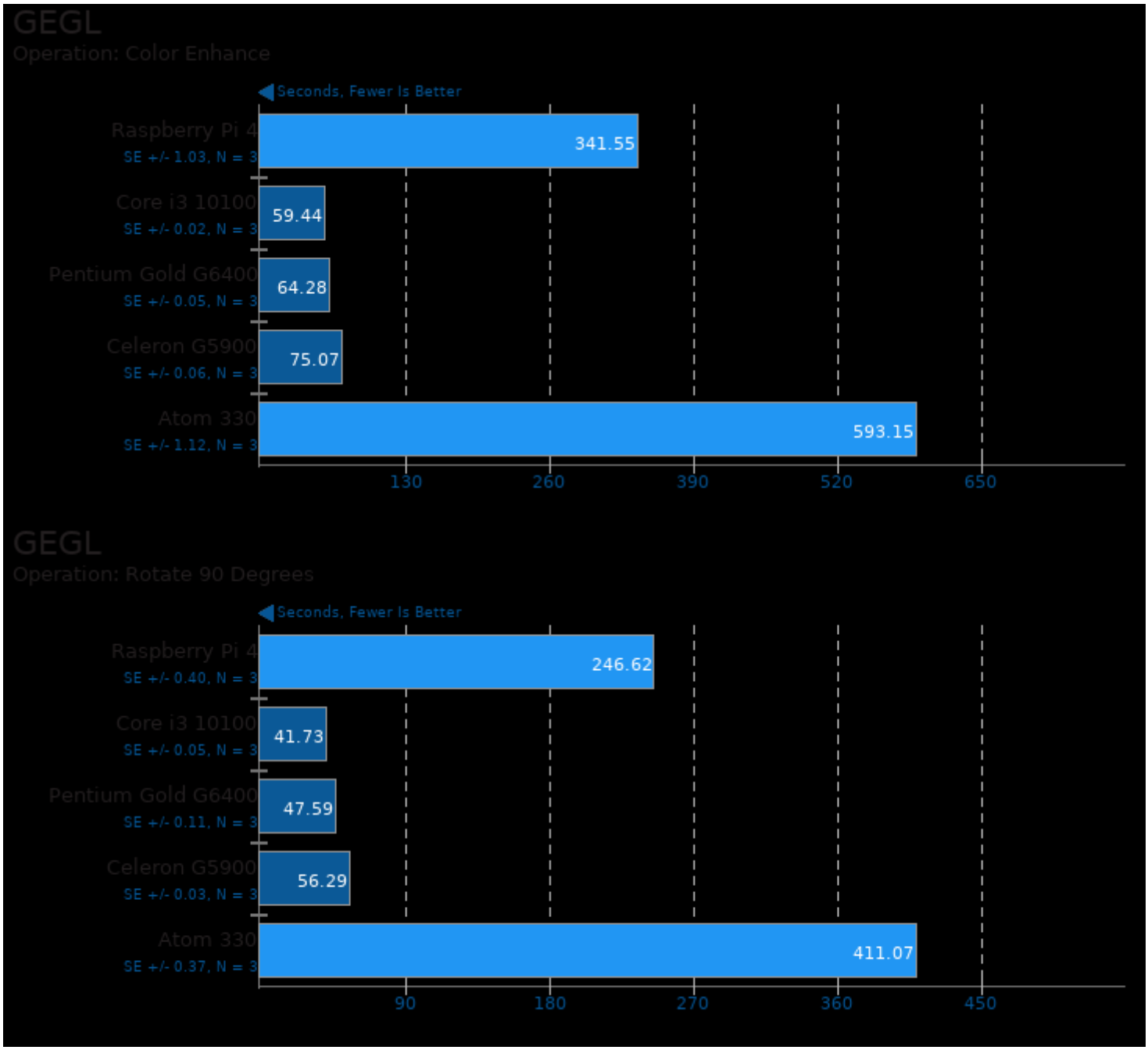

Aircrack-ng 1.5.2
k/s, More Is Better
Raspberry Pi 4
SE +/- 3.70, N = 3
1162.35
Core i3 10100
SE +/- 38.97, N = 3
-masm=intel
15519.07
Pentium Gold G6400
SE +/- 4.55, N = 3
-masm=intel
2812.62
Celeron G5900
SE +/- 0.27, N = 3
-masm=intel
2346.78
Atom 330
SE +/- 0.46, N = 3
564.86
3K
6K
9K
12K
15K
1. (CXX) g++ options: -O3 -fvisibility=hidden -fcommon -rdynamic -lpthread -lz -lcrypto -lhwloc -ldl -lm -pthread
libjpeg-turbo tjbench 2.0.2
Test: Decompression Throughput
Megapixels/sec, More Is Better
Raspberry Pi 4
SE +/- 0.11, N = 3
-lm
49.66
Core i3 10100
SE +/- 0.45, N = 3
-lm
205.78
Pentium Gold G6400
SE +/- 0.53, N = 3
172.93
Celeron G5900
SE +/- 0.89, N = 3
147.21
Atom 330
SE +/- 0.02, N = 3
27.36
50
100
150
200
250
1. (CC) gcc options: -O3 -rdynamic


SQLite Speedtest 3.30
Timed Time - Size 1,000
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 2.25, N = 3
766.55
Core i3 10100
SE +/- 0.18, N = 3
54.25
Pentium Gold G6400
SE +/- 0.85, N = 3
65.15
Celeron G5900
SE +/- 0.02, N = 3
82.02
Atom 330
SE +/- 1.27, N = 3
1021.83
200
400
600
800
1000
1. (CC) gcc options: -O2 -ldl -lz -lpthread
GEGL
Operation: Crop
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.677, N = 4
50.874
Core i3 10100
SE +/- 0.046, N = 3
8.527
Pentium Gold G6400
SE +/- 0.082, N = 3
9.509
Celeron G5900
SE +/- 0.071, N = 3
10.893
Atom 330
SE +/- 0.796, N = 8
90.934
20
40
60
80
100

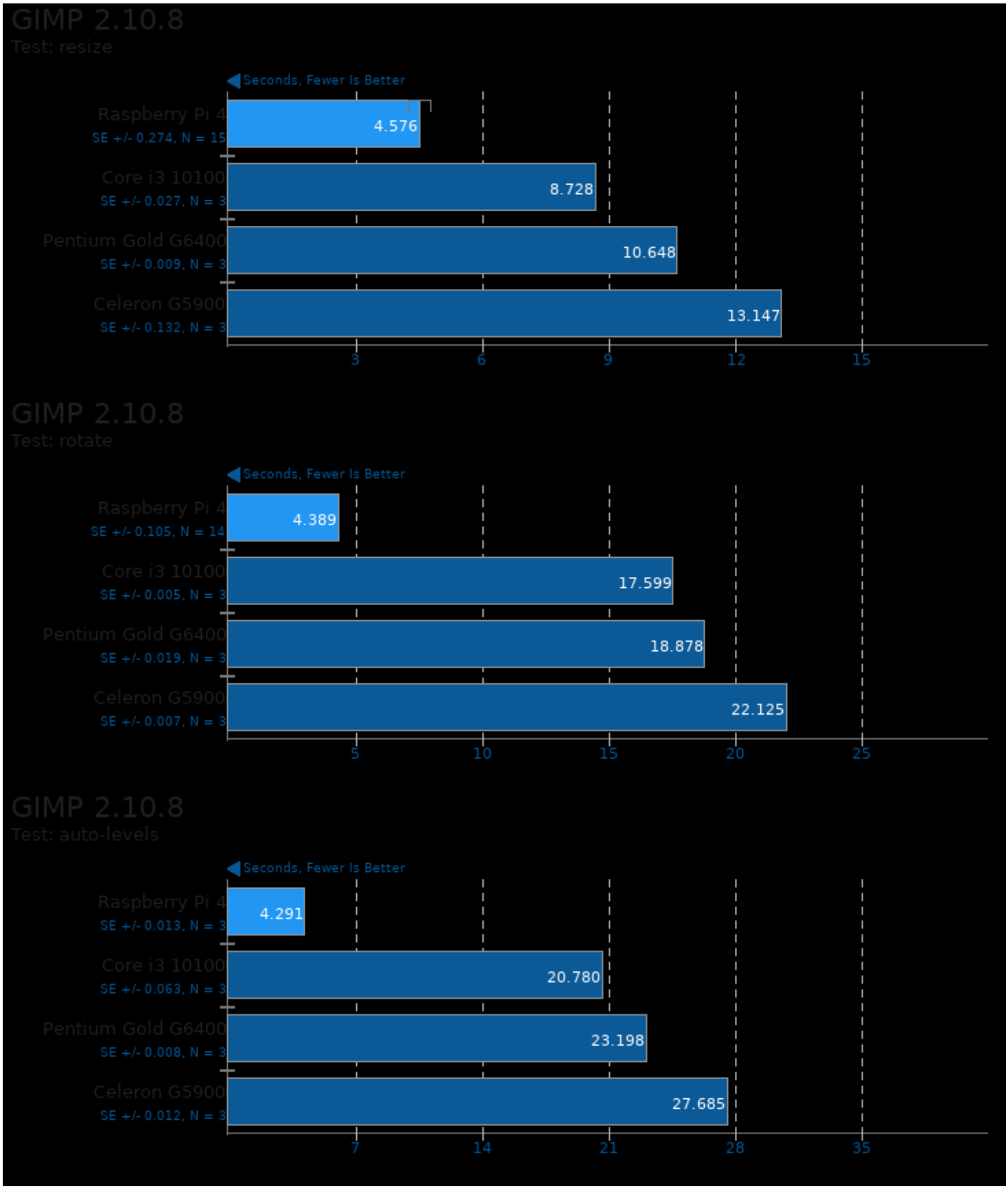

GEGL
Operation: Scale
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.098, N = 3
36.875
Core i3 10100
SE +/- 0.034, N = 3
5.478
Pentium Gold G6400
SE +/- 0.047, N = 3
6.236
Celeron G5900
SE +/- 0.003, N = 3
7.229
Atom 330
SE +/- 0.084, N = 3
83.991
20
40
60
80
100
GEGL
Operation: Cartoon
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 3.12, N = 3
647.55
Core i3 10100
SE +/- 0.16, N = 3
105.90
Pentium Gold G6400
SE +/- 0.23, N = 3
117.13
Celeron G5900
SE +/- 0.10, N = 3
137.54
Atom 330
SE +/- 0.24, N = 3
944.65
200
400
600
800
1000

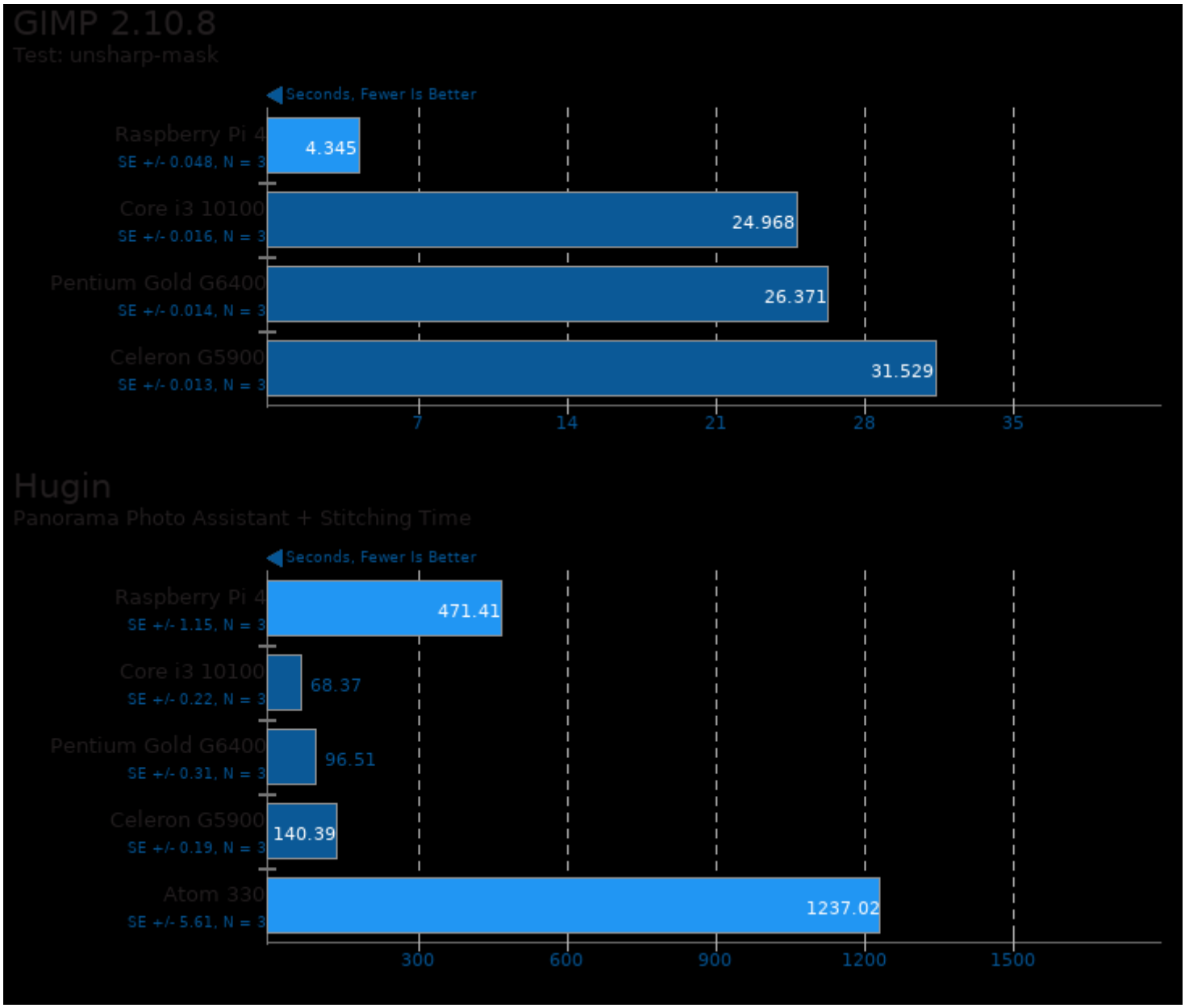

GEGL
Operation: Reflect
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.06, N = 3
14.99
Core i3 10100
SE +/- 0.07, N = 3
31.14
Pentium Gold G6400
SE +/- 0.04, N = 3
33.54
Celeron G5900
SE +/- 0.06, N = 3
39.43
Atom 330
SE +/- 0.07, N = 3
253.51
60
120
180
240
300
GEGL
Operation: Antialias
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.66, N = 3
214.86
Core i3 10100
SE +/- 0.03, N = 3
40.70
Pentium Gold G6400
SE +/- 0.12, N = 3
47.34
Celeron G5900
SE +/- 0.02, N = 3
56.74
Atom 330
SE +/- 0.55, N = 3
345.49
80
160
240
320
400

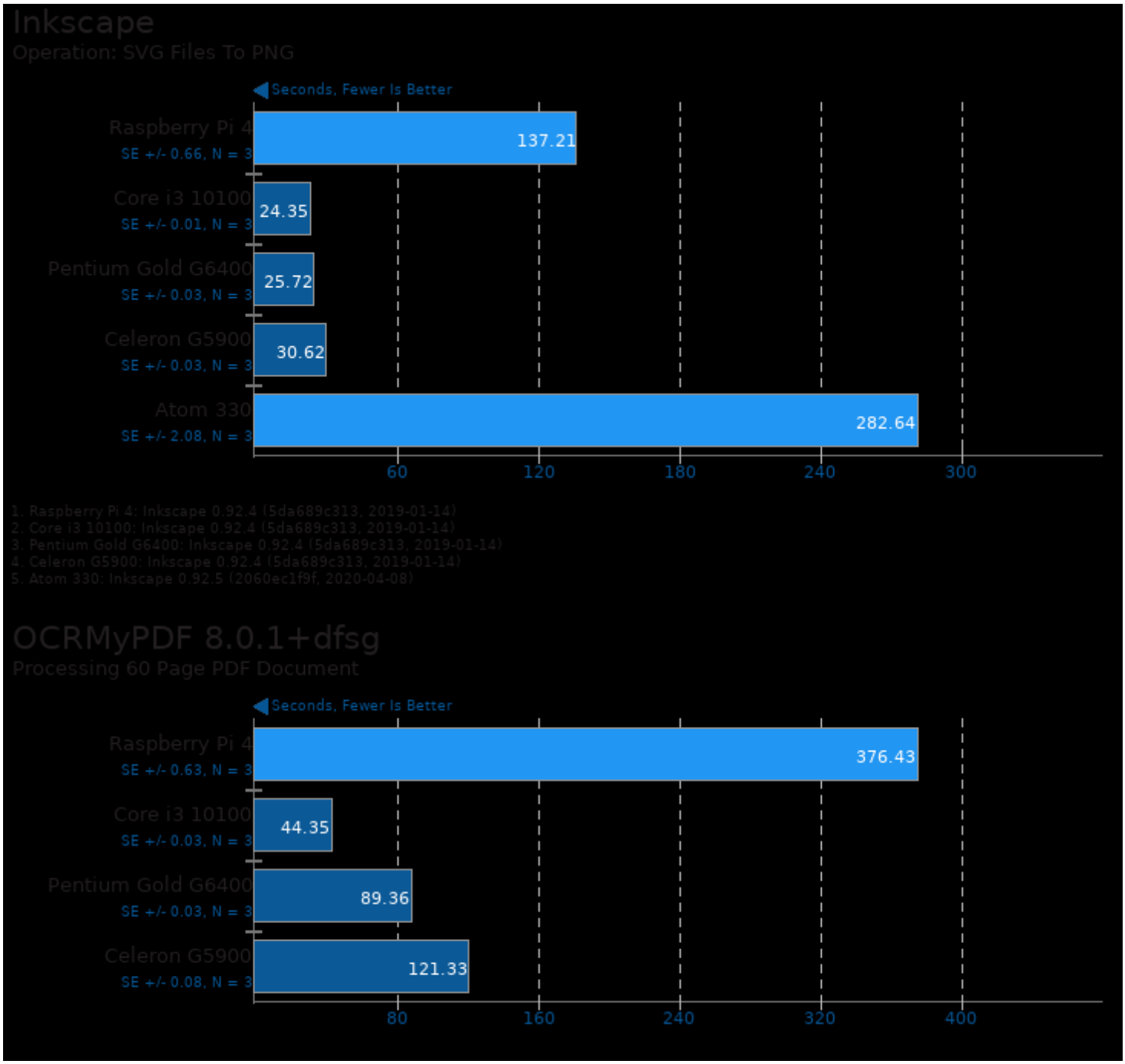

GEGL
Operation: Tile Glass
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.11, N = 3
161.31
Core i3 10100
SE +/- 0.04, N = 3
30.74
Pentium Gold G6400
SE +/- 0.11, N = 3
33.04
Celeron G5900
SE +/- 0.02, N = 3
38.37
Atom 330
SE +/- 0.31, N = 3
278.63
60
120
180
240
300
GEGL
Operation: Wavelet Blur
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.27, N = 3
326.61
Core i3 10100
SE +/- 0.09, N = 3
62.37
Pentium Gold G6400
SE +/- 0.13, N = 3
68.48
Celeron G5900
SE +/- 0.01, N = 3
79.50
Atom 330
SE +/- 0.23, N = 3
487.35
110
220
330
440
550

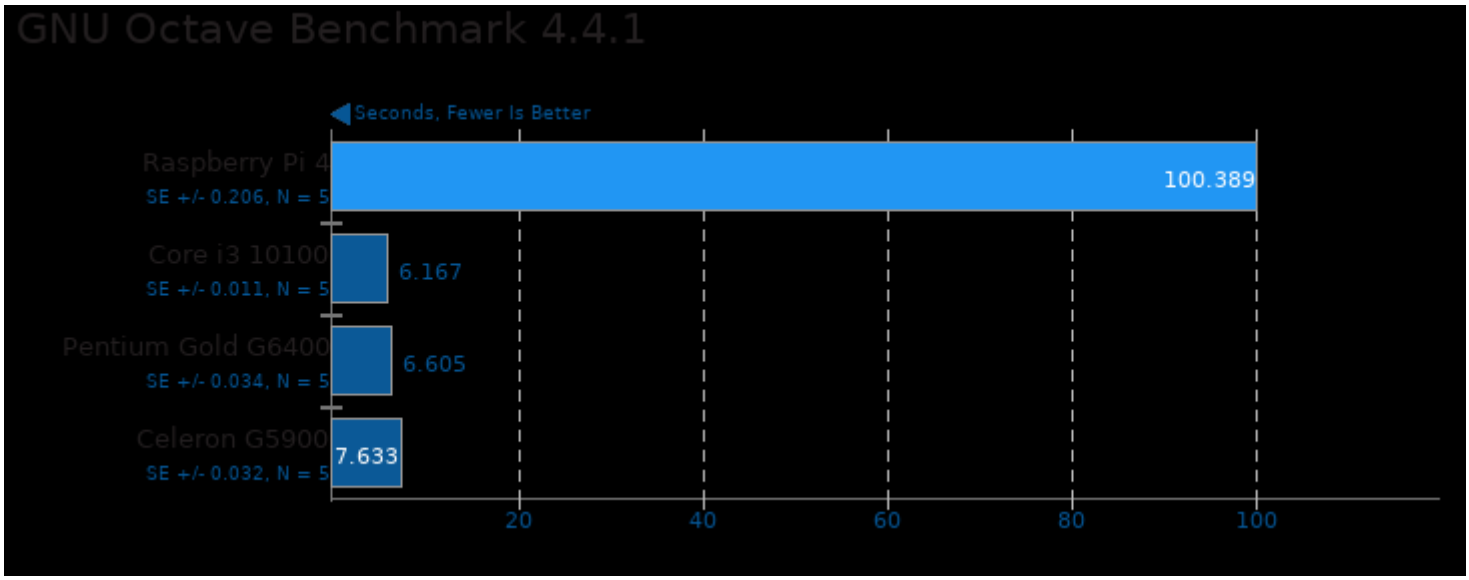

GEGL
Operation: Color Enhance
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.03, N = 3
341.55
Core i3 10100
SE +/- 0.02, N = 3
59.44
Pentium Gold G6400
SE +/- 0.05, N = 3
64.28
Celeron G5900
SE +/- 0.06, N = 3
75.07
Atom 330
SE +/- 1.12, N = 3
593.15
130
260
390
520
650
GEGL
Operation: Rotate 90 Degrees
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.40, N = 3
246.62
Core i3 10100
SE +/- 0.05, N = 3
41.73
Pentium Gold G6400
SE +/- 0.11, N = 3
47.59
Celeron G5900
SE +/- 0.03, N = 3
56.29
Atom 330
SE +/- 0.37, N = 3
411.07
90
180
270
360
450

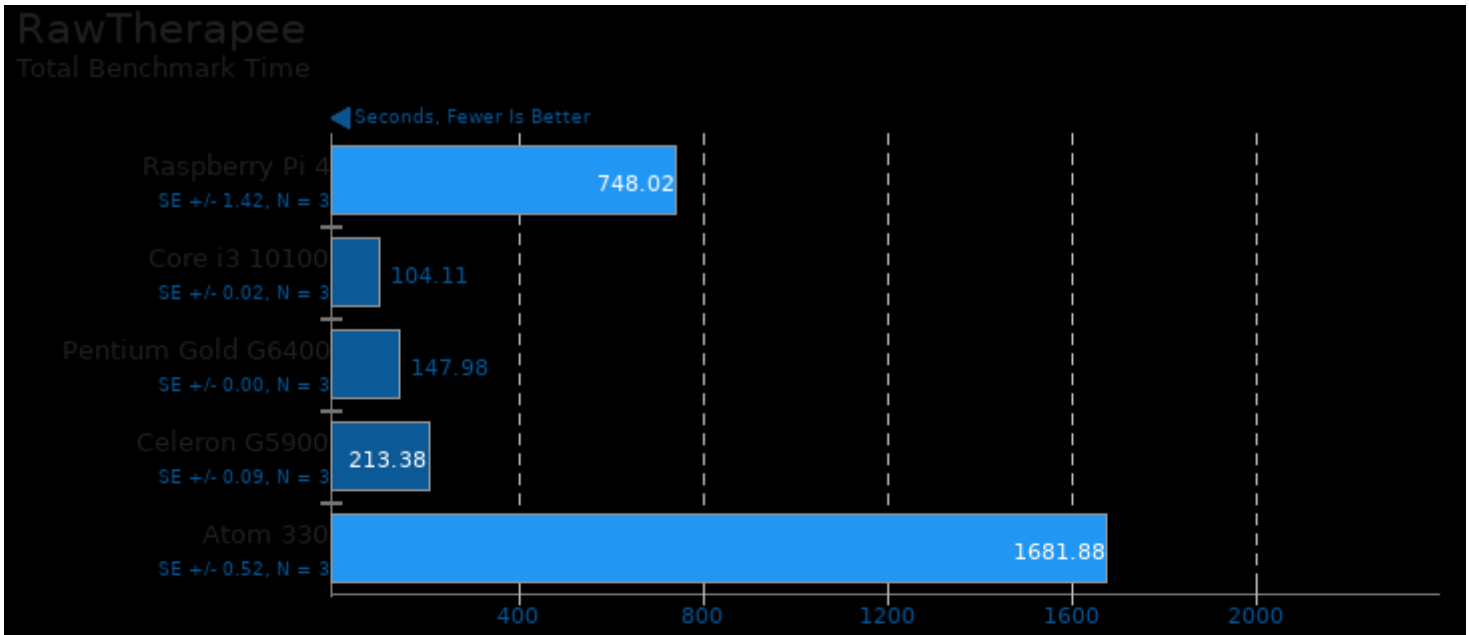
Raspberry Pi 4 vs. Intel Comet Lake




GIMP 2.10.8
Test: unsharp-mask
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.048, N = 3
4.345
Core i3 10100
SE +/- 0.016, N = 3
24.968
Pentium Gold G6400
SE +/- 0.014, N = 3
26.371
Celeron G5900
SE +/- 0.013, N = 3
31.529
7
14
21
28
35
Hugin
Panorama Photo Assistant + Stitching Time
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.15, N = 3
471.41
Core i3 10100
SE +/- 0.22, N = 3
68.37
Pentium Gold G6400
SE +/- 0.31, N = 3
96.51
Celeron G5900
SE +/- 0.19, N = 3
140.39
Atom 330
SE +/- 5.61, N = 3
1237.02
300
600
900
1200
1500


Inkscape
Operation: SVG Files To PNG
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.66, N = 3
137.21
Core i3 10100
SE +/- 0.01, N = 3
24.35
Pentium Gold G6400
SE +/- 0.03, N = 3
25.72
Celeron G5900
SE +/- 0.03, N = 3
30.62
Atom 330
SE +/- 2.08, N = 3
282.64
60
120
180
240
300
1. Raspberry Pi 4: Inkscape 0.92.4 (5da689c313, 2019-01-14)
2. Core i3 10100: Inkscape 0.92.4 (5da689c313, 2019-01-14)
3. Pentium Gold G6400: Inkscape 0.92.4 (5da689c313, 2019-01-14)
4. Celeron G5900: Inkscape 0.92.4 (5da689c313, 2019-01-14)
5. Atom 330: Inkscape 0.92.5 (2060ec1f9f, 2020-04-08)
OCRMyPDF 8.0.1+dfsg
Processing 60 Page PDF Document
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.63, N = 3
376.43
Core i3 10100
SE +/- 0.03, N = 3
44.35
Pentium Gold G6400
SE +/- 0.03, N = 3
89.36
Celeron G5900
SE +/- 0.08, N = 3
121.33
80
160
240
320
400


GNU Octave Benchmark 4.4.1
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.206, N = 5
100.389
Core i3 10100
SE +/- 0.011, N = 5
6.167
Pentium Gold G6400
SE +/- 0.034, N = 5
6.605
Celeron G5900
SE +/- 0.032, N = 5
7.633
20
40
60
80
100



1. Raspberry Pi 4: RawTherapee, version 5.5, command line.
An advanced, cross-platform program for developing raw photos.

Website: http://www.rawtherapee.com/
Documentation: http://rawpedia.rawtherapee.com/
Forum: https://discuss.pixls.us/c/software/rawtherapee
Code and bug reports: https://github.com/Beep6581/RawTherapee

Symbols:
<Chevrons> indicate parameters you can change.
[Square brackets] mean the parameter is optional.
The pipe symbol | indicates a choice of one or the other.
The dash symbol - denotes a range of possible values from one to the other.

Usage:
rawtherapee-cli -c <dir>|<files> Convert files in batch with default parameters.
rawtherapee-cli <other options> -c <dir>|<files> Convert files in batch with your own settings.

Options:
rawtherapee-cli[-o <output>|-O <output>] [-q] [-a] [-s|-S] [-p <one.pp3> [-p <two.pp3> ...]] [-d] [-j[1-100] -js<1-3> | -t[z] -b<8|16|16f|32> | -n -b<8

-c <files> Specify one or more input files or folders.
When specifying folders, Rawtherapee will look for image file types which comply
with the selected extensions (see also '-a').
-c must be the last option.

-o <file>|<dir> Set output file or folder.
Saves output file alongside input file if -o is not specified.

-O <file>|<dir> Set output file or folder and copy pp3 file into it.

-q Quick-start mode. Does not load cached files to speedup start time.

-a Process all supported image file types when specifying a folder, even those
not currently selected in Preferences > File Browser > Parsed Extensions.

-s Use the existing sidecar file to pull raw processing parameters,
store the results in a new sidecar file in the same folder.
If the sidecar file does not exist, neutral values will be used.

-S Like -s but skip if the sidecar file does not exist.

-p <file.pp3> Specify processing profile to be used for all conversions.
To specify options for individual profiles, repeat "-p <one.pp3>" options as you like,
each will be built on top of the previous one, as explained below.
Use the default raw or non-raw processing profile as setup in
Preferences > Image Processing > Default Processing Profile

-j[1-100] Specify output to be JPEG (default, if -t and -n are not set).
Optionally specify compression 1-100 (default value: 92).

-js<1-3> Specify the JPEG chroma subsampling parameter, where:
1 = Best compression: 2x2, 1x1, 1x1 (4:2:0)
Chroma halved vertically and horizontally.
2 = Balanced (default): 2x1, 1x1, 1x1 (4:2:2)
Chroma halved horizontally.
3 = Best quality: 1x1, 1x1, 1x1 (4:4:4)

-t[z] Specify one or more output files or folders.
When specifying folders, Rawtherapee will look for image file types which comply
with the selected extensions (see also '-a').
Specify bit depth per channel.
-t must be the last option.
Applies to JPEG, PNG and TIFF. Default for JPEG and PNG.

-b<8|16|16f|32> Specify bit depth per channel.
8 = 8 bit integer. Applies to JPEG, PNG and TIFF. Default for JPEG and PNG.
16 = 16 bit integer. Applies to TIFF and PNG. Default for TIFF.
16f = 16 bit float. Applies to TIFF.
32 = 32 bit float. Applies to TIFF.

-n Specify output to be compressed PNG.

2. Core i3 10100: RawTherapee, version 5.5, command line.
An advanced, cross-platform program for developing raw photos.

Website: http://www.rawtherapee.com/
Documentation: http://rawpedia.rawtherapee.com/
Forum: https://discuss.pixls.us/c/software/rawtherapee
Code and bug reports: https://github.com/Beep6581/RawTherapee

Symbols:
<Chevrons> indicate parameters you can change.
[Square brackets] mean the parameter is optional.
The pipe symbol | indicates a choice of one or the other.
The dash symbol - denotes a range of possible values from one to the other.

Usage:
rawtherapee-cli -c <dir>|<files> Convert files in batch with default parameters.
rawtherapee-cli <other options> -c <dir>|<files> Convert files in batch with your own settings.

Options:
rawtherapee-cli[-o <output>|-O <output>] [-q] [-a] [-s|-S] [-p <one.pp3> [-p <two.pp3> ...]] [-d] [-j[1-100] -js<1-3> | -t[z] -b<8|16|16f|32> | -n -b<8

-c <files> Specify one or more input files or folders.
When specifying folders, Rawtherapee will look for image file types which comply
with the selected extensions (see also '-a').
-c must be the last option.

-o <file>|<dir> Set output file or folder.
Saves output file alongside input file if -o is not specified.

-O <file>|<dir> Set output file or folder and copy pp3 file into it.

-q Quick-start mode. Does not load cached files to speedup start time.

-a Process all supported image file types when specifying a folder, even those
not currently selected in Preferences > File Browser > Parsed Extensions.

-s Use the existing sidecar file to pull raw processing parameters,
store the results in a new sidecar file in the same folder.
If the sidecar file does not exist, neutral values will be used.

-S Like -s but skip if the sidecar file does not exist.

-p <file.pp3> Specify processing profile to be used for all conversions.
To specify options for individual profiles, repeat "-p <one.pp3>" options as you like,
each will be built on top of the previous one, as explained below.
Use the default raw or non-raw processing profile as setup in
Preferences > Image Processing > Default Processing Profile

-j[1-100] Specify output to be JPEG (default, if -t and -n are not set).
Optionally specify compression 1-100 (default value: 92).

-js<1-3> Specify the JPEG chroma subsampling parameter, where:
1 = Best compression: 2x2, 1x1, 1x1 (4:2:0)
Chroma halved vertically and horizontally.
2 = Balanced (default): 2x1, 1x1, 1x1 (4:2:2)
Chroma halved horizontally.
3 = Best quality: 1x1, 1x1, 1x1 (4:4:4)

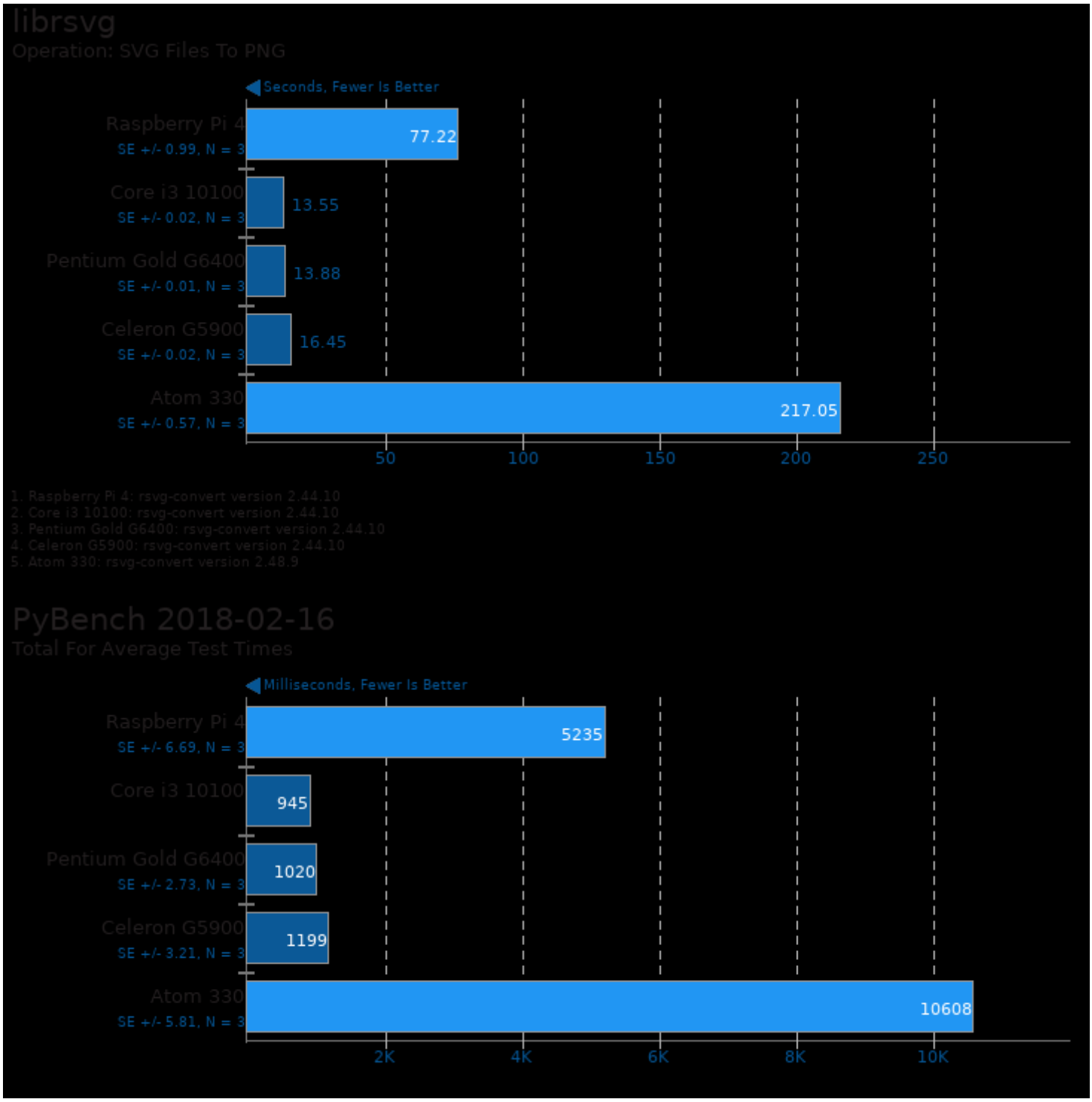
-t[z] Specify one or more output files or folders.
When specifying folders, Rawtherapee will look for image file types which comply
with the selected extensions (see also '-a').
Specify bit depth per channel.
-t must be the last option.
Applies to JPEG, PNG and TIFF. Default for JPEG and PNG.

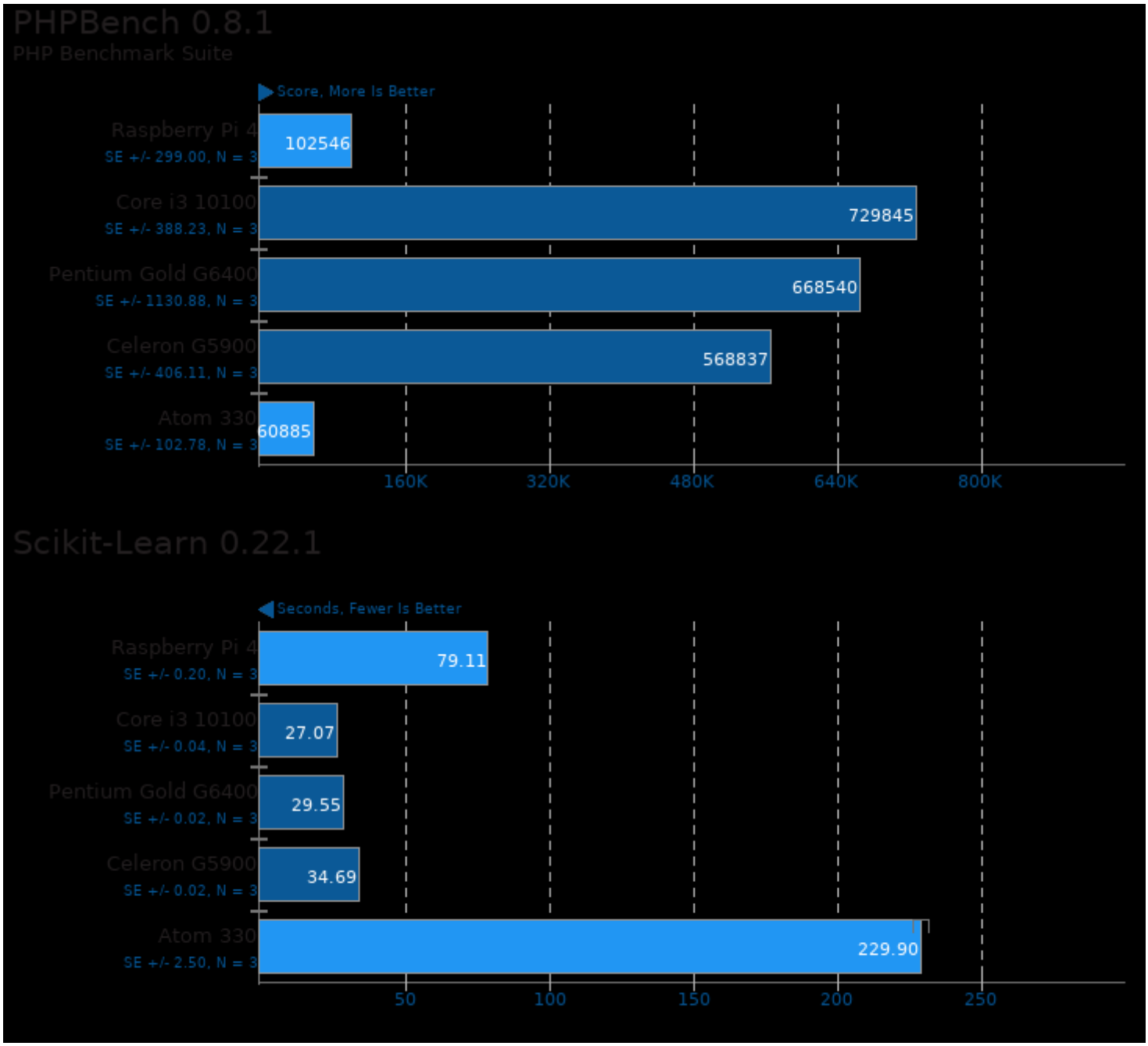
-b<8|16|16f|32> Specify bit depth per channel.
8 = 8 bit integer. Applies to JPEG, PNG and TIFF. Default for JPEG and PNG.
16 = 16 bit integer. Applies to TIFF and PNG. Default for TIFF.
16f = 16 bit float. Applies to TIFF.
32 = 32 bit float. Applies to TIFF.

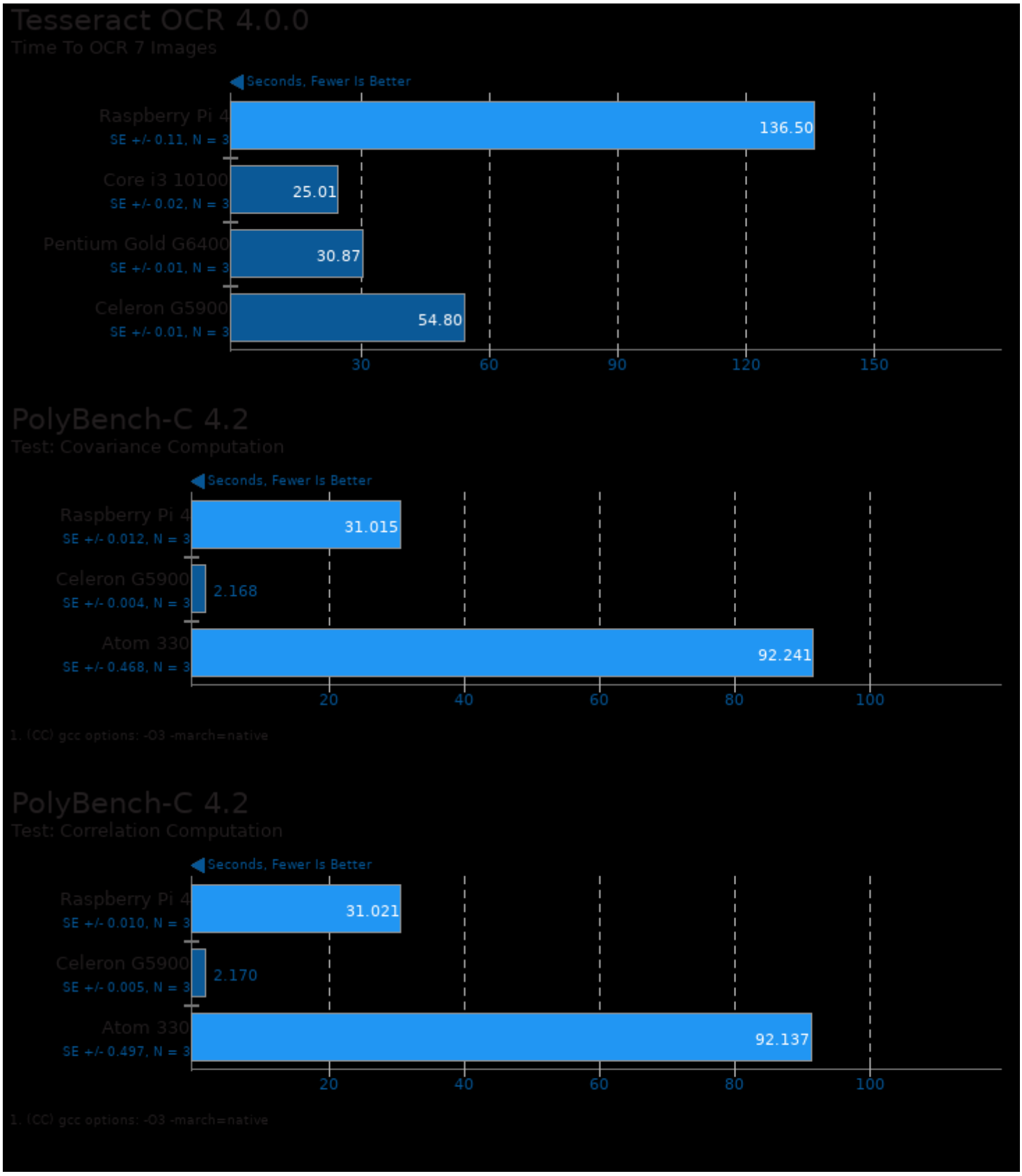
-n Specify output to be compressed PNG.

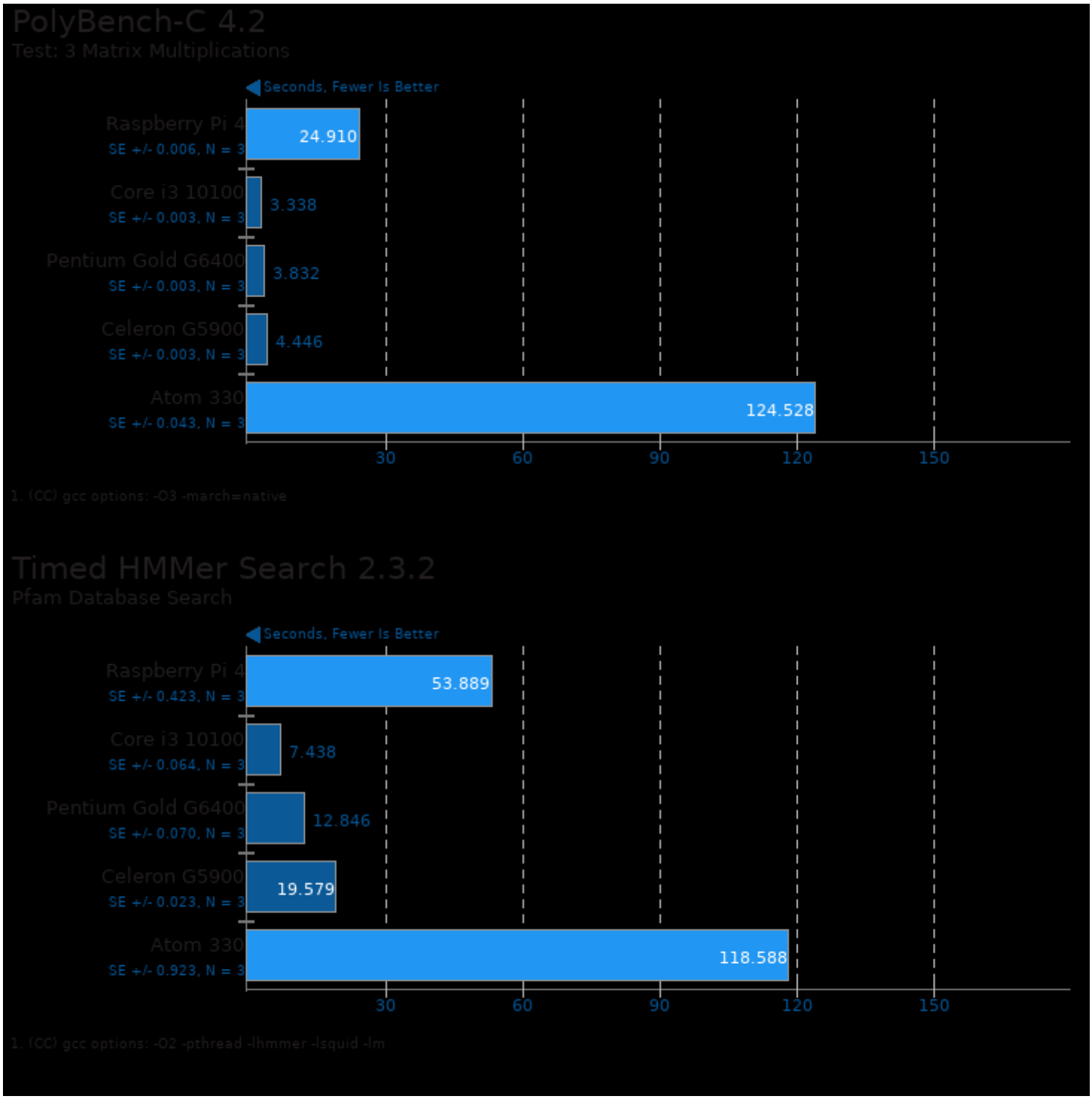
3. Pentium Gold G6400: RawTherapee, version 5.5, command line.
An advanced, cross-platform program for developing raw photos.

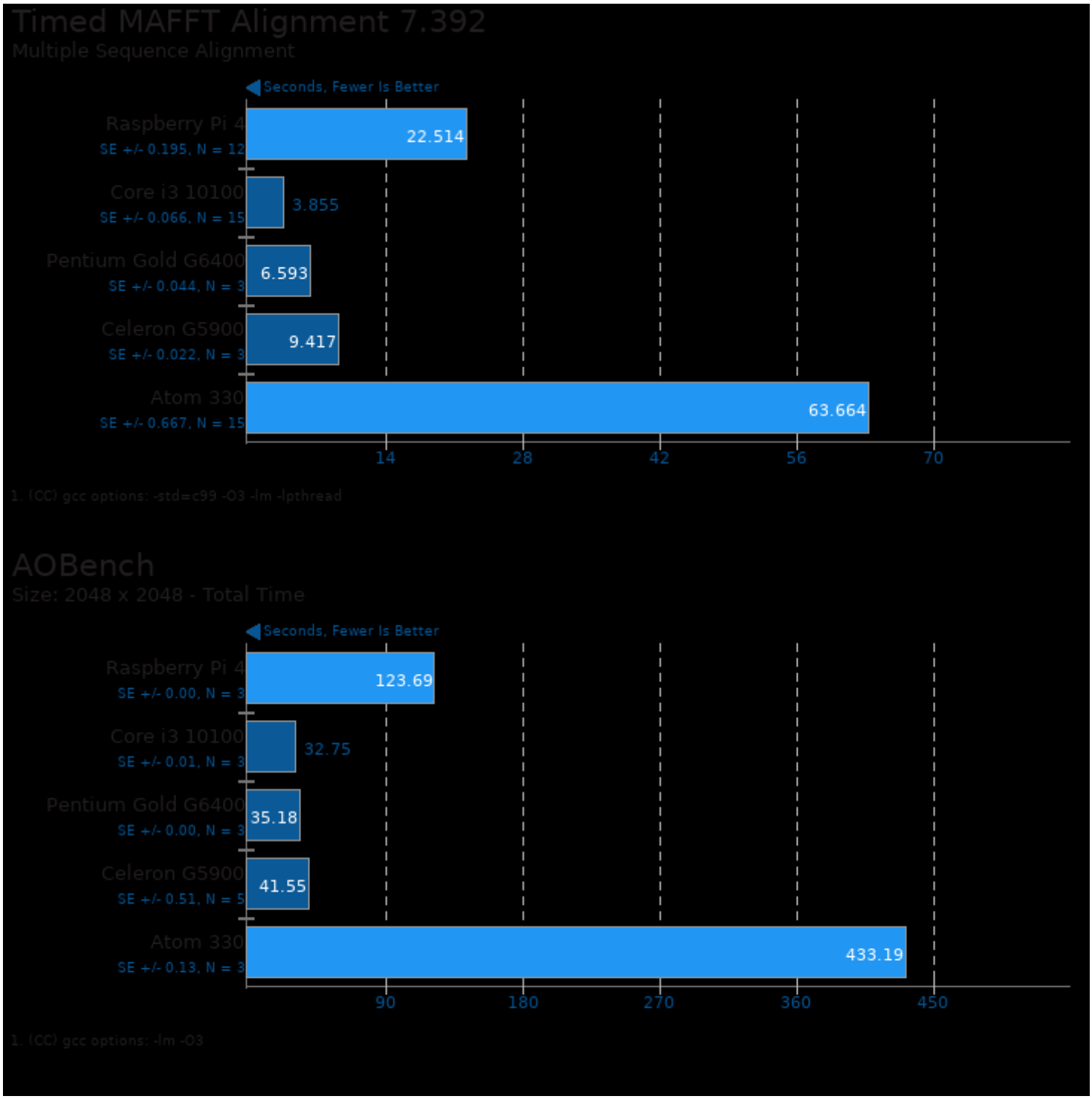
Website: http://www.rawtherapee.com/
Documentation: http://rawpedia.rawtherapee.com/
Forum: https://discuss.pixls.us/c/software/rawtherapee
Code and bug reports: https://github.com/Beep6581/RawTherapee

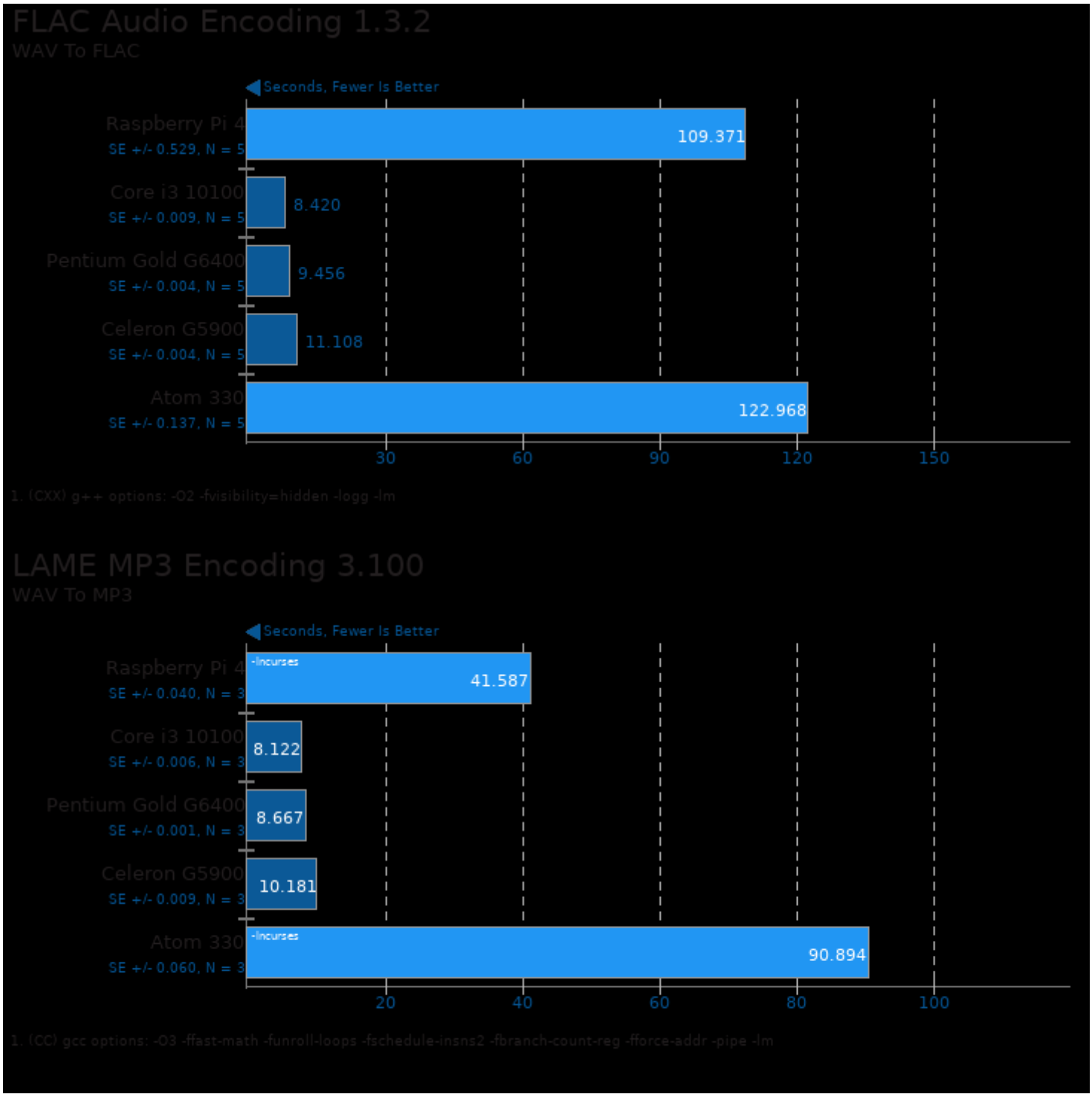

librsvg
Operation: SVG Files To PNG
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.99, N = 3
77.22
Core i3 10100
SE +/- 0.02, N = 3
13.55
Pentium Gold G6400
SE +/- 0.01, N = 3
13.88
Celeron G5900
SE +/- 0.02, N = 3
16.45
Atom 330
SE +/- 0.57, N = 3
217.05
50
100
150
200
250
1. Raspberry Pi 4: rsvg-convert version 2.44.10
2. Core i3 10100: rsvg-convert version 2.44.10
3. Pentium Gold G6400: rsvg-convert version 2.44.10
4. Celeron G5900: rsvg-convert version 2.44.10
5. Atom 330: rsvg-convert version 2.48.9
PyBench 2018-02-16
Total For Average Test Times
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 6.69, N = 3
5235
Core i3 10100
SE +/- 2.73, N = 3
945
Pentium Gold G6400
SE +/- 2.73, N = 3
1020
Celeron G5900
SE +/- 3.21, N = 3
1199
Atom 330
SE +/- 5.81, N = 3
10608
2K
4K
6K
8K
10K

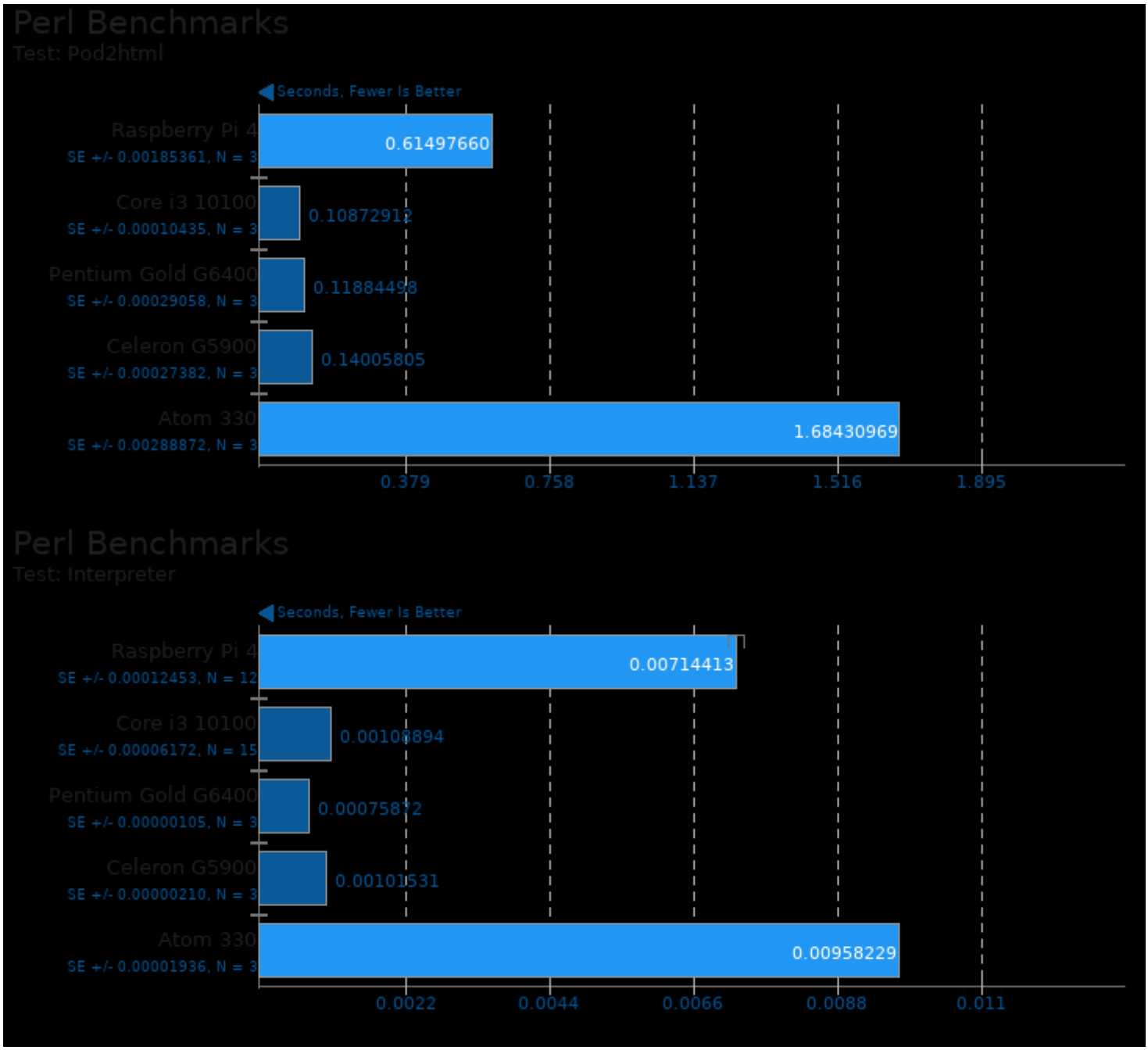

PHPBench 0.8.1
PHP Benchmark Suite
Score, More Is Better
Raspberry Pi 4
SE +/- 299.00, N = 3
102546
Core i3 10100
SE +/- 388.23, N = 3
729845
Pentium Gold G6400
SE +/- 1130.88, N = 3
668540
Celeron G5900
SE +/- 406.11, N = 3
568837
Atom 330
SE +/- 102.78, N = 3
60885
160K
320K
480K
640K
800K
Scikit-Learn 0.22.1
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.20, N = 3
79.11
Core i3 10100
SE +/- 0.04, N = 3
27.07
Pentium Gold G6400
SE +/- 0.02, N = 3
29.55
Celeron G5900
SE +/- 0.02, N = 3
34.69
Atom 330
SE +/- 2.50, N = 3
229.90
50
100
150
200
250


Tesseract OCR 4.0.0
Time To OCR 7 Images
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.11, N = 3
136.50
Core i3 10100
SE +/- 0.02, N = 3
25.01
Pentium Gold G6400
SE +/- 0.01, N = 3
30.87
Celeron G5900
SE +/- 0.01, N = 3
54.80
30
60
90
120
150
PolyBench-C 4.2
Test: Covariance Computation
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.012, N = 3
31.015
Celeron G5900
SE +/- 0.004, N = 3
2.168
Atom 330
SE +/- 0.468, N = 3
92.241
20
40
60
80
100
1. (CC) gcc options: -O3 -march=native
PolyBench-C 4.2
Test: Correlation Computation
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.010, N = 3
31.021
Celeron G5900
SE +/- 0.005, N = 3
2.170
Atom 330
SE +/- 0.497, N = 3
92.137
20
40
60
80
100
1. (CC) gcc options: -O3 -march=native

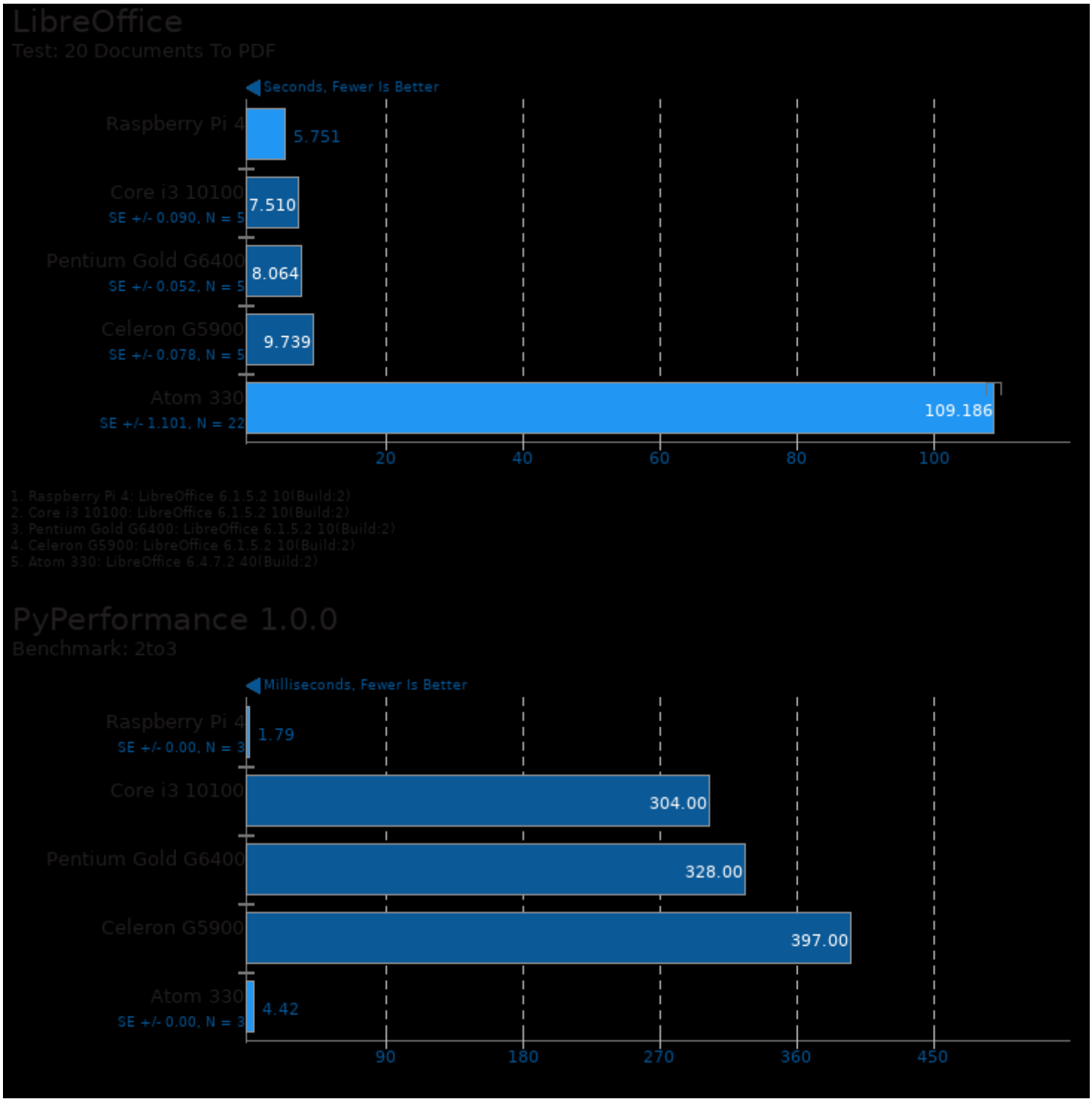

PolyBench-C 4.2
Test: 3 Matrix Multiplications
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.006, N = 3
24.910
Core i3 10100
SE +/- 0.003, N = 3
3.338
Pentium Gold G6400
SE +/- 0.003, N = 3
3.832
Celeron G5900
SE +/- 0.003, N = 3
4.446
Atom 330
SE +/- 0.043, N = 3
124.528
30
60
90
120
150
1. (CC) gcc options: -O3 -march=native
Timed HMMer Search 2.3.2
Pfam Database Search
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.423, N = 3
53.889
Core i3 10100
SE +/- 0.064, N = 3
7.438
Pentium Gold G6400
SE +/- 0.070, N = 3
12.846
Celeron G5900
SE +/- 0.023, N = 3
19.579
Atom 330
SE +/- 0.923, N = 3
118.588
30
60
90
120
150
1. (CC) gcc options: -O2 -pthread -lhmmer -lsquid -lm

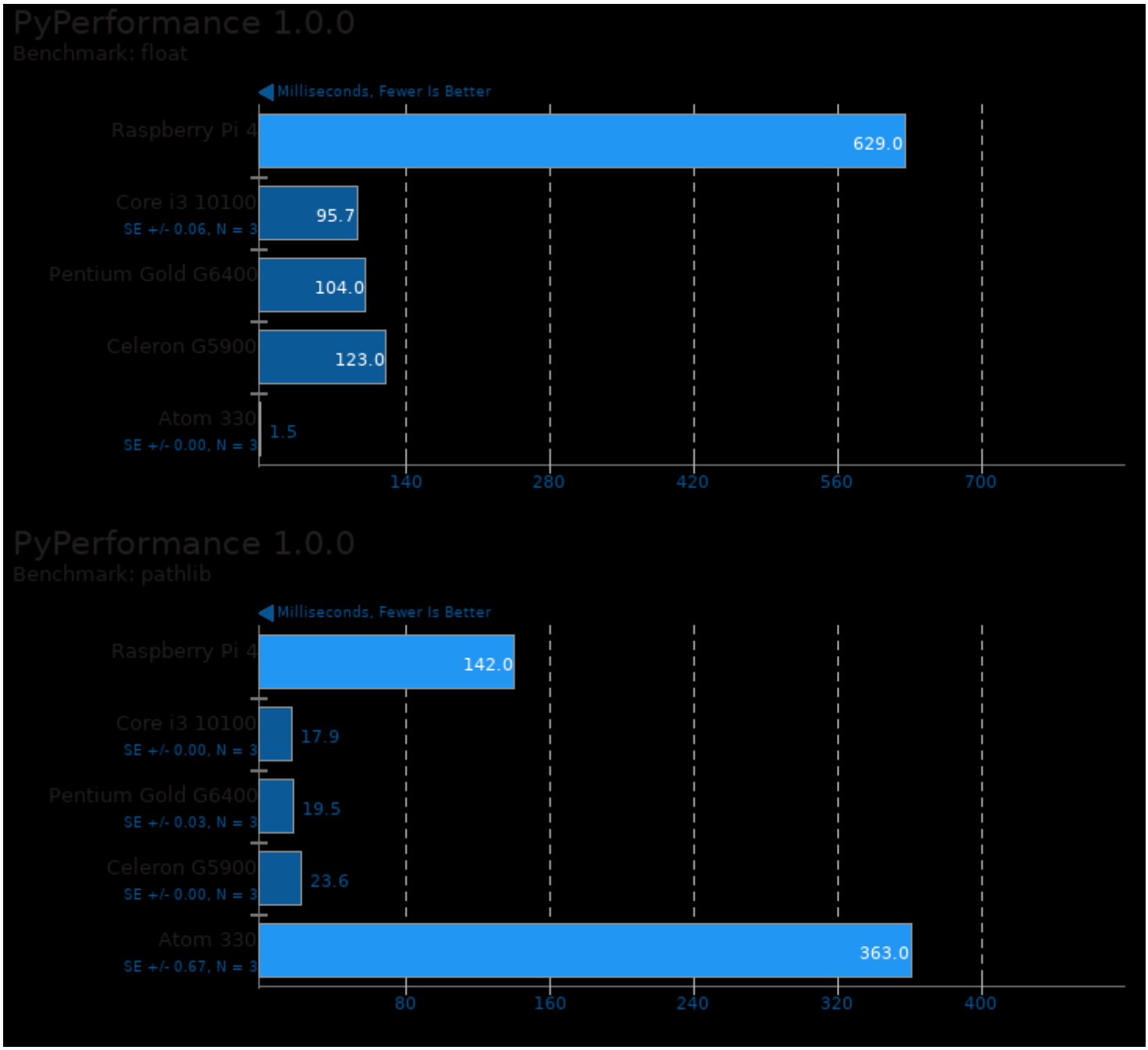

Timed MAFFT Alignment 7.392
Multiple Sequence Alignment
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.195, N = 12
22.514
Core i3 10100
SE +/- 0.066, N = 15
3.855
Pentium Gold G6400
SE +/- 0.044, N = 3
6.593
Celeron G5900
SE +/- 0.022, N = 3
9.417
Atom 330
SE +/- 0.667, N = 15
63.664
14
28
42
56
70
1. (CC) gcc options: -std=c99 -O3 -lm -lpthread
AOBench
Size: 2048 x 2048 - Total Time
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00, N = 3
123.69
Core i3 10100
SE +/- 0.01, N = 3
32.75
Pentium Gold G6400
SE +/- 0.00, N = 3
35.18
Celeron G5900
SE +/- 0.51, N = 5
41.55
Atom 330
SE +/- 0.13, N = 3
433.19
90
180
270
360
450
1. (CC) gcc options: -lm -O3

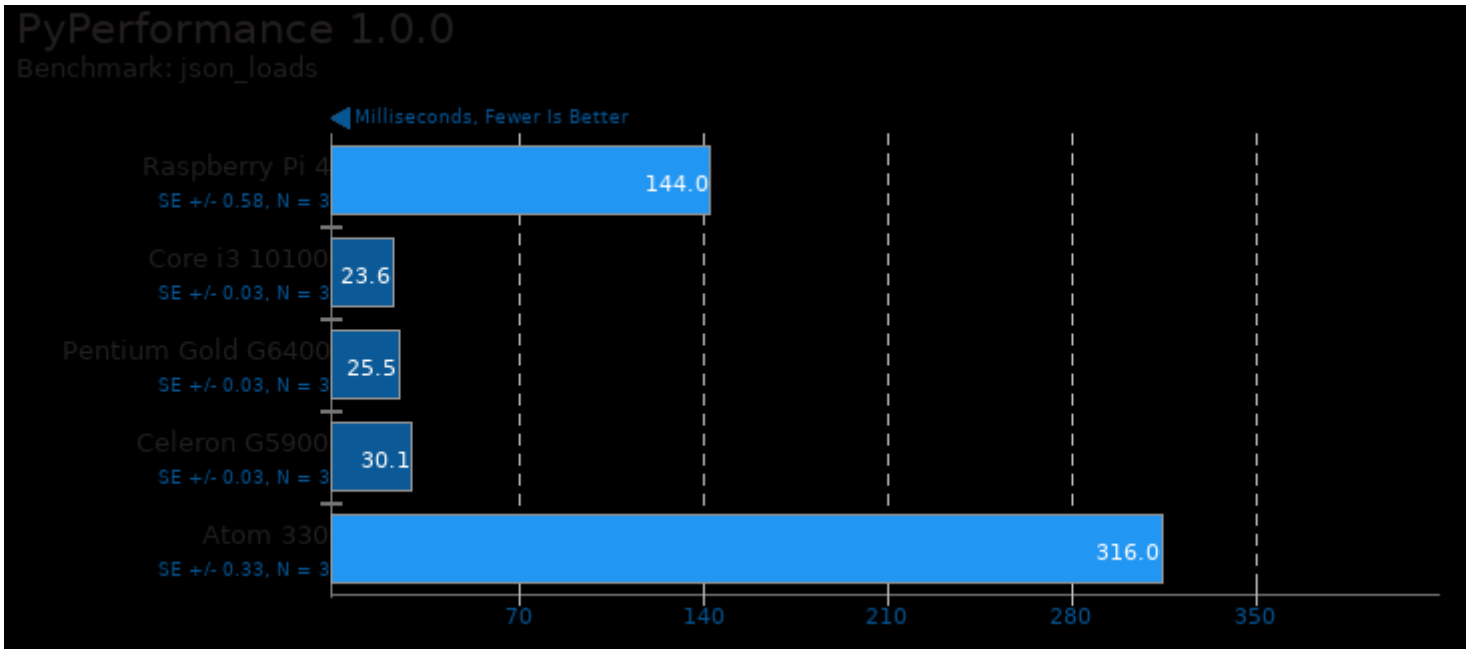

FLAC Audio Encoding 1.3.2
WAV To FLAC
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.529, N = 5
109.371
Core i3 10100
SE +/- 0.009, N = 5
8.420
Pentium Gold G6400
SE +/- 0.004, N = 5
9.456
Celeron G5900
SE +/- 0.004, N = 5
11.108
Atom 330
SE +/- 0.137, N = 5
122.968
30
60
90
120
150
1. (CXX) g++ options: -O2 -fvisibility=hidden -logg -lm
LAME MP3 Encoding 3.100
WAV To MP3
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.040, N = 3
-lncurses
41.587
Core i3 10100
SE +/- 0.006, N = 3
8.122
Pentium Gold G6400
SE +/- 0.001, N = 3
8.667
Celeron G5900
SE +/- 0.009, N = 3
10.181
Atom 330
SE +/- 0.060, N = 3
-lncurses
90.894
20
40
60
80
100
1. (CC) gcc options: -O3 -ffast-math -funroll-loops -fschedule-insns2 -fbranch-count-reg -fforce-addr -pipe -lm

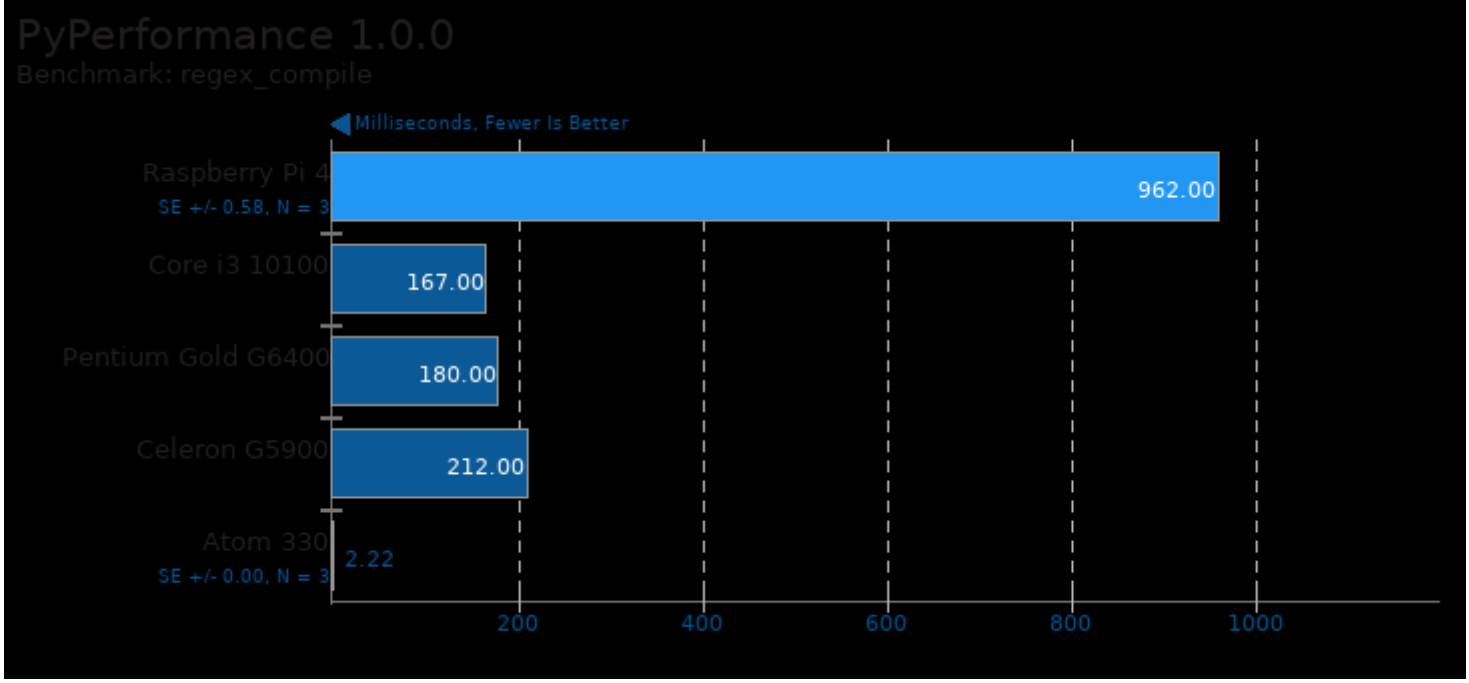

Perl Benchmarks
Test: Pod2html
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00185361, N = 3
0.61497660
Core i3 10100
SE +/- 0.00010435, N = 3
0.10872912
Pentium Gold G6400
SE +/- 0.00029058, N = 3
0.11884498
Celeron G5900
SE +/- 0.00027382, N = 3
0.14005805
Atom 330
SE +/- 0.00288872, N = 3
1.68430969
0.379
0.758
1.137
1.516
1.895
Perl Benchmarks
Test: Interpreter
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00012453, N = 12
0.00714413
Core i3 10100
SE +/- 0.00006172, N = 15
0.00106894
Pentium Gold G6400
SE +/- 0.00000105, N = 3
0.00075872
Celeron G5900
SE +/- 0.00000210, N = 3
0.00101531
Atom 330
SE +/- 0.00001936, N = 3
0.00958229
0.0022
0.0044
0.0066
0.0088
0.011

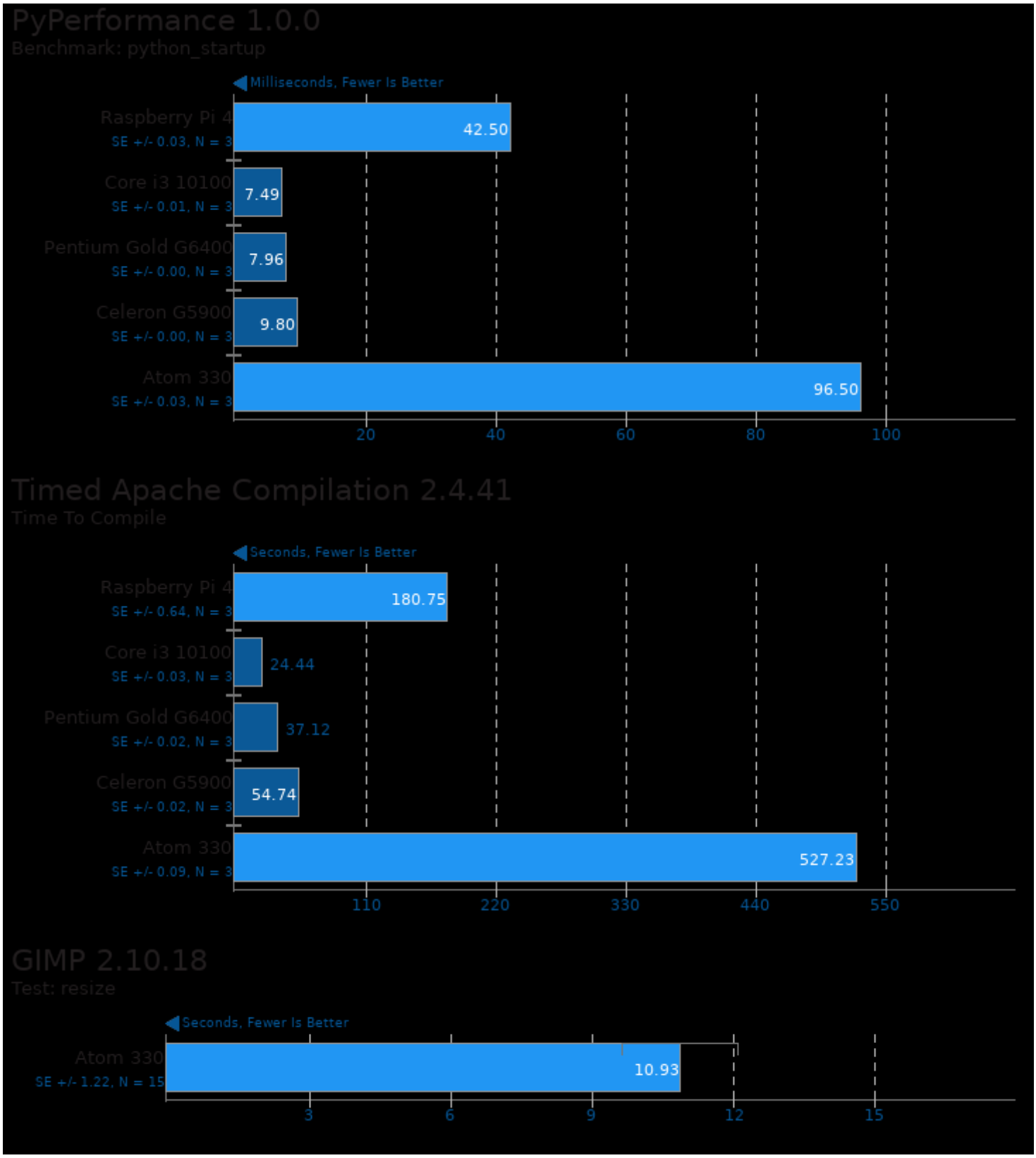
Raspberry Pi 4 vs. Intel Comet Lake




PyPerformance 1.0.0
Benchmark: float
Milliseconds, Fewer Is Better
Raspberry Pi 4
629.0
Core i3 10100
SE +/- 0.06, N = 3
95.7
Pentium Gold G6400
104.0
Celeron G5900
123.0
Atom 330
SE +/- 0.00, N = 3
1.5
140
280
420
560
700
PyPerformance 1.0.0
Benchmark: pathlib
Milliseconds, Fewer Is Better
Raspberry Pi 4
142.0
Core i3 10100
SE +/- 0.00, N = 3
17.9
Pentium Gold G6400
SE +/- 0.03, N = 3
19.5
Celeron G5900
SE +/- 0.00, N = 3
23.6
Atom 330
SE +/- 0.67, N = 3
363.0
80
160
240
320
400

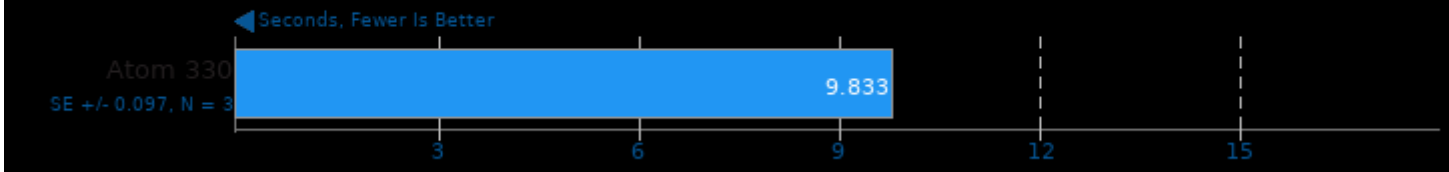

PyPerformance 1.0.0
Benchmark: json_loads
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.58, N = 3
144.0
Core i3 10100
SE +/- 0.03, N = 3
23.6
Pentium Gold G6400
SE +/- 0.03, N = 3
25.5
Celeron G5900
SE +/- 0.03, N = 3
30.1
Atom 330
SE +/- 0.33, N = 3
316.0
70
140
210
280
350


PyPerformance 1.0.0
Benchmark: regex_compile
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.58, N = 3
962.00
Core i3 10100
167.00
Pentium Gold G6400
180.00
Celeron G5900
212.00
Atom 330
SE +/- 0.00, N = 3
2.22
200
400
600
800
1000


PyPerformance 1.0.0
Benchmark: python_startup
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.03, N = 3
42.50
Core i3 10100
SE +/- 0.01, N = 3
7.49
Pentium Gold G6400
SE +/- 0.00, N = 3
7.96
Celeron G5900
SE +/- 0.00, N = 3
9.80
Atom 330
SE +/- 0.03, N = 3
96.50
20
40
60
80
100
Timed Apache Compilation 2.4.41
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.64, N = 3
180.75
Core i3 10100
SE +/- 0.03, N = 3
24.44
Pentium Gold G6400
SE +/- 0.02, N = 3
37.12
Celeron G5900
SE +/- 0.02, N = 3
54.74
Atom 330
SE +/- 0.09, N = 3
527.23
110
220
330
440
550
GIMP 2.10.18
Test: resize
Seconds, Fewer Is Better
Atom 330
SE +/- 1.22, N = 15
10.93
3
6
9
12
15

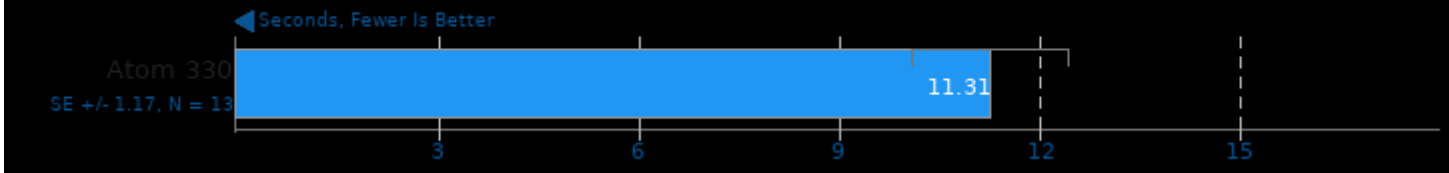
GIMP 2.10.18

Test: rotate



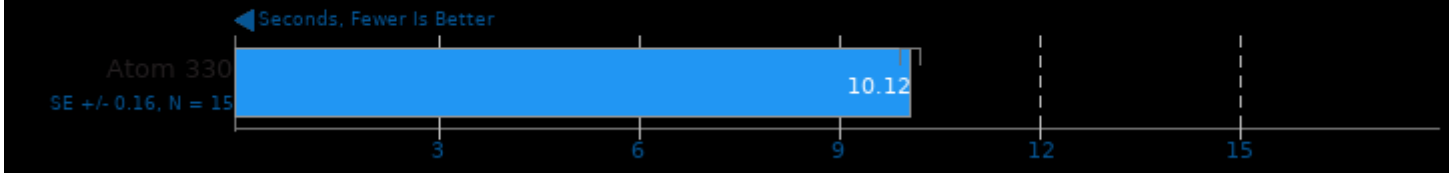
GIMP 2.10.18

Test: auto-levels



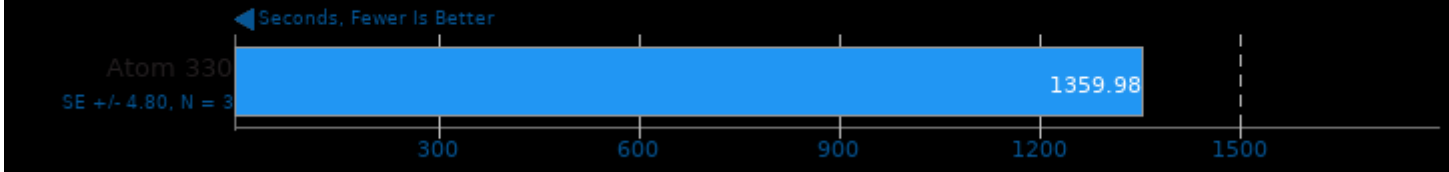
GIMP 2.10.18

Test: unsharp-mask

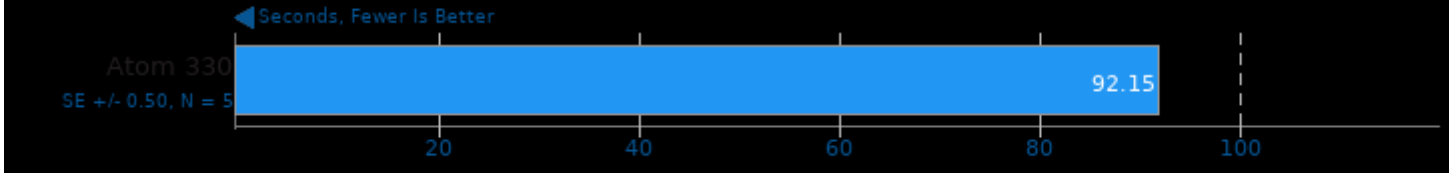


OCRMyPDF 9.6.0+dfsg

Processing 60 Page PDF Document

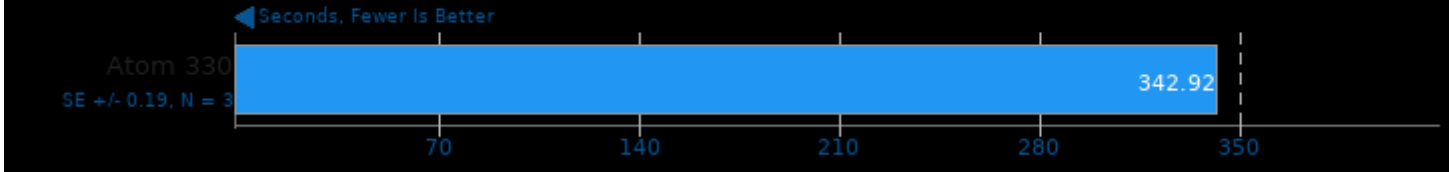


GNU Octave Benchmark 5.2.0

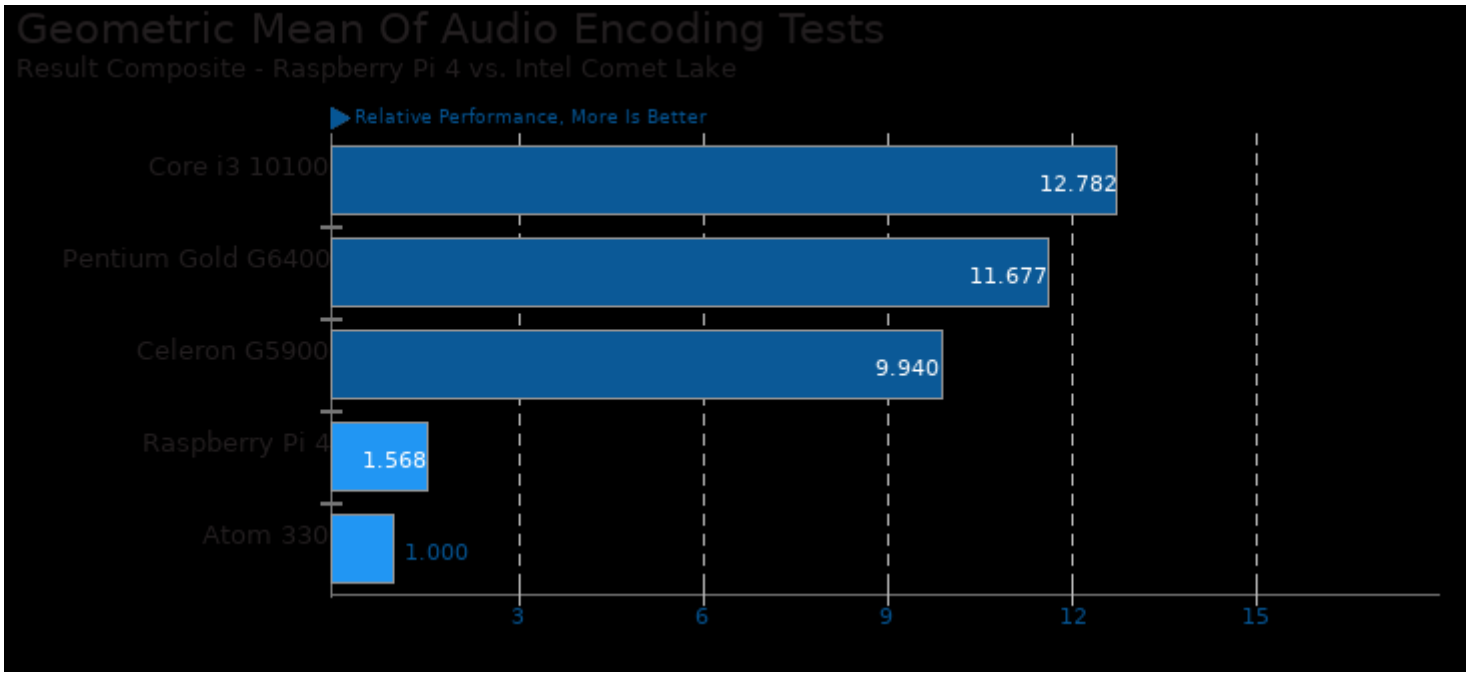


Tesseract OCR 4.1.1

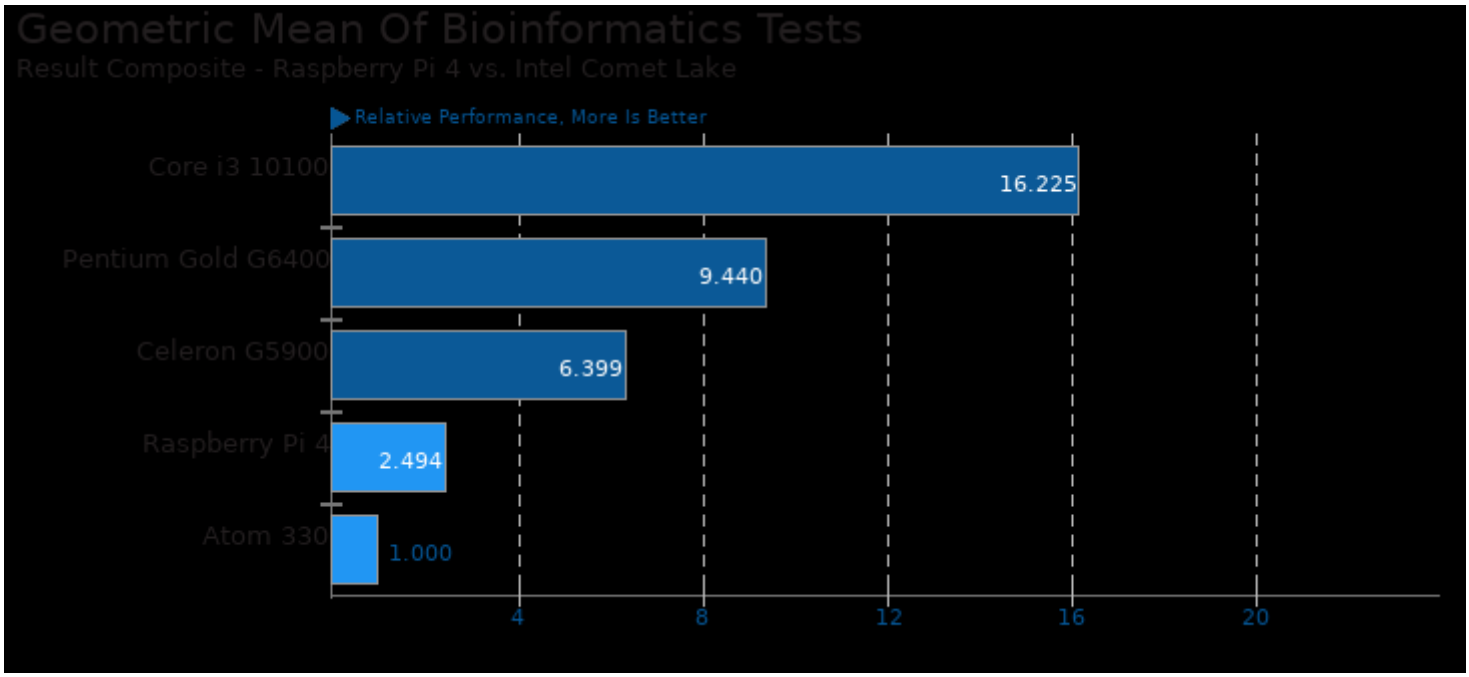
Time To OCR 7 Images



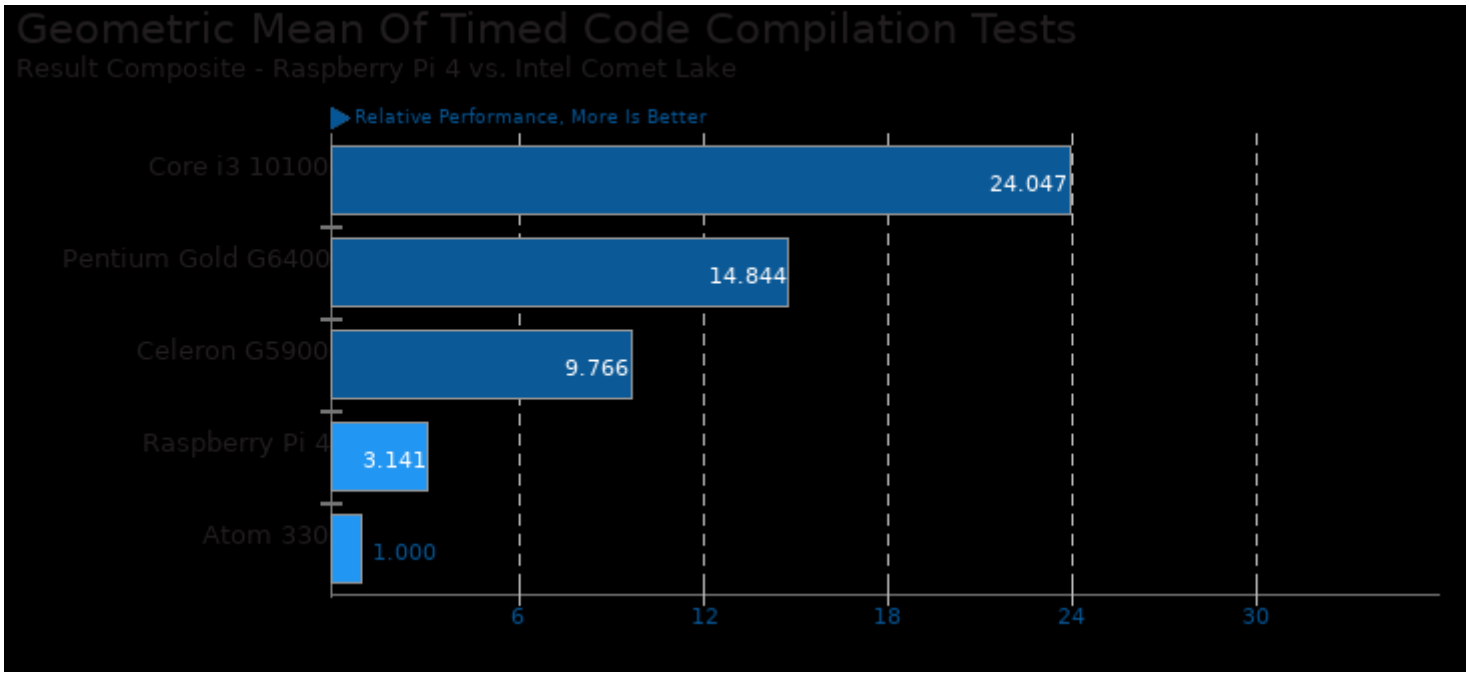
These geometric means are based upon test groupings / test suites for this result file.



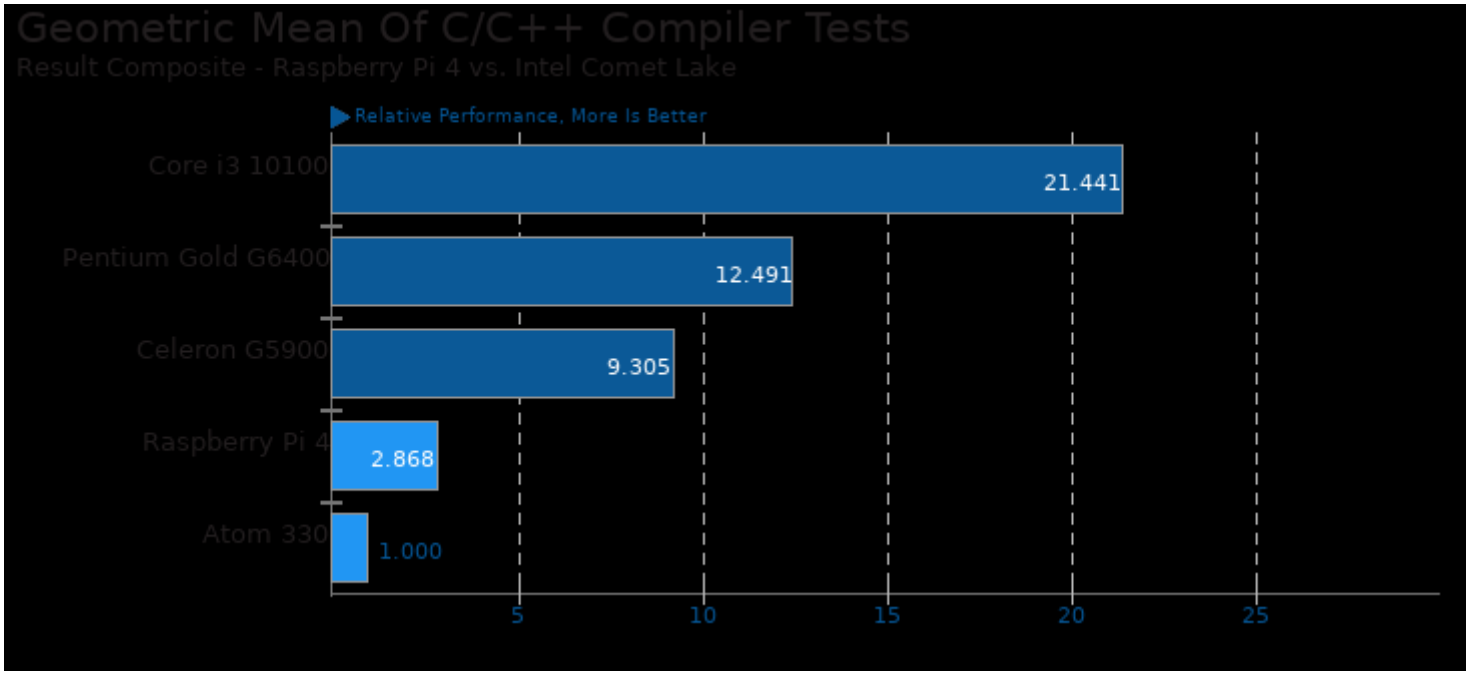
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac



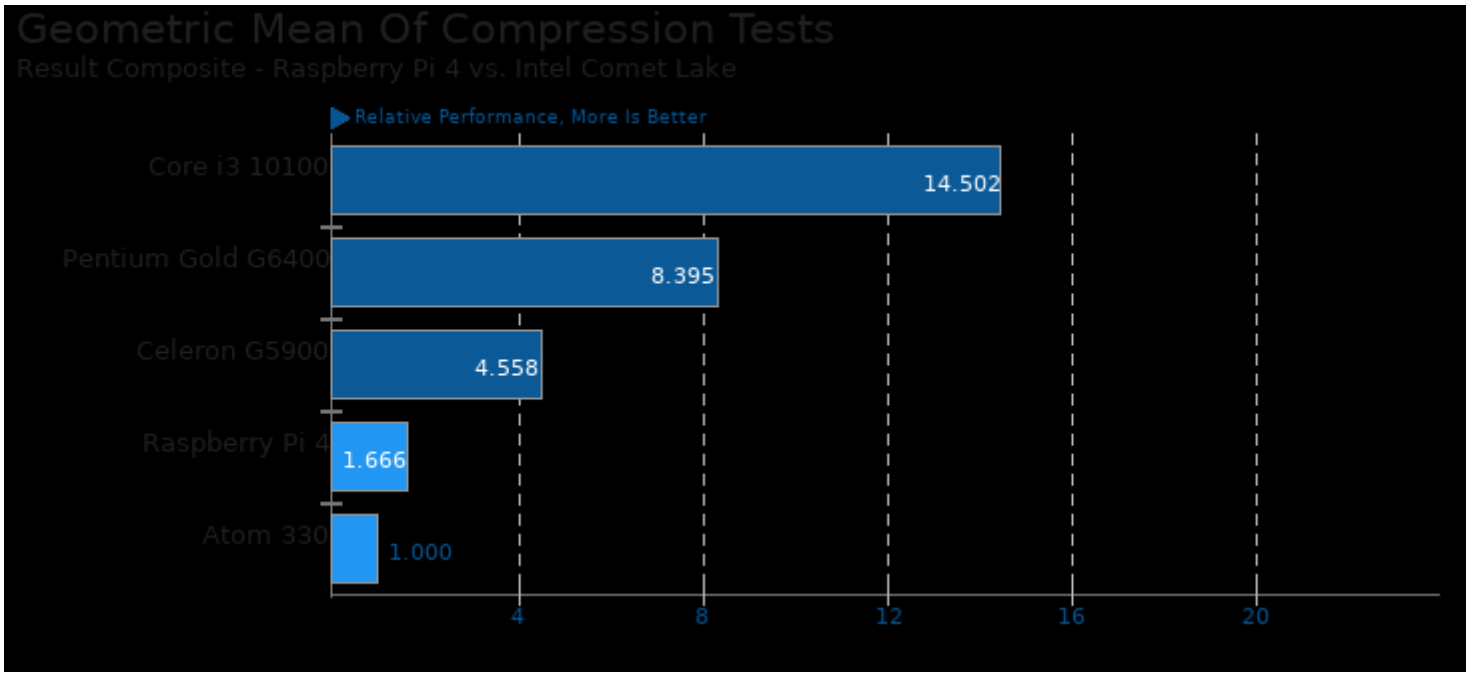
Geometric mean based upon tests: pts/hmmer and pts/mafft



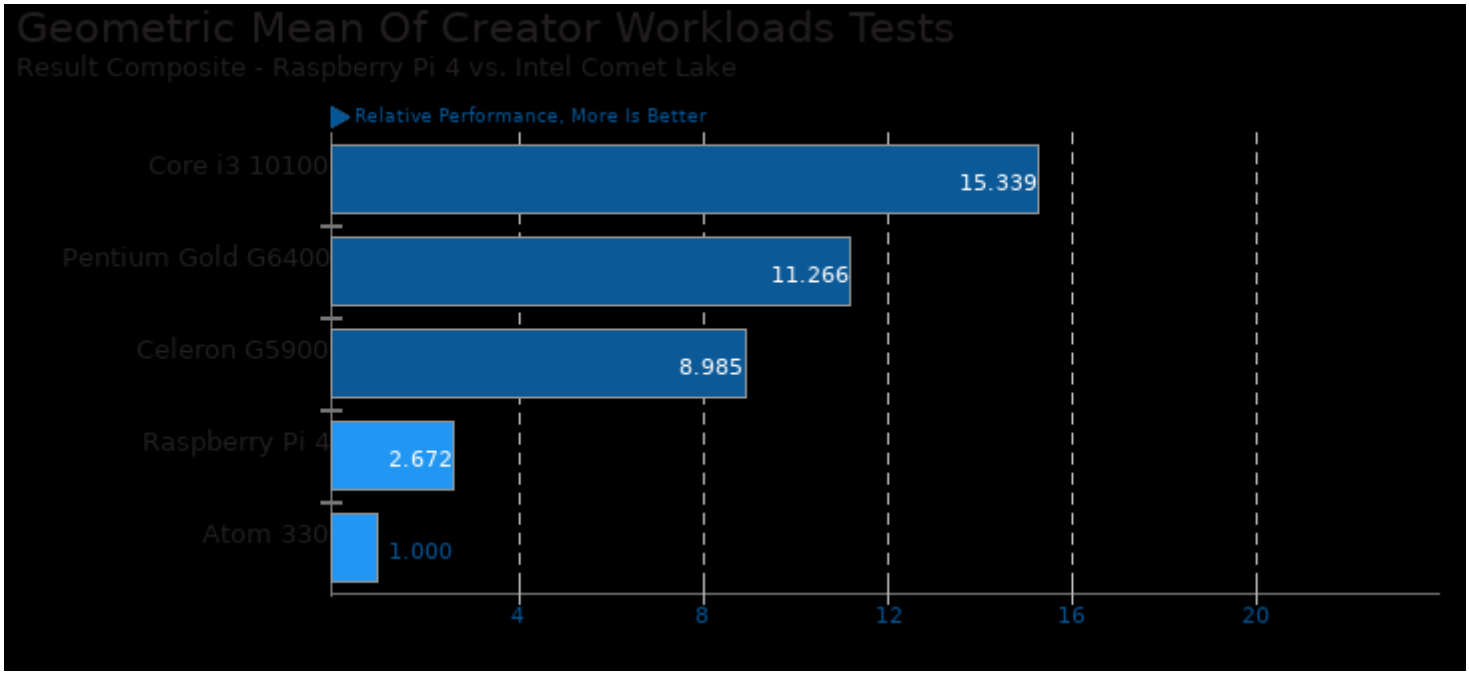
Geometric mean based upon tests: pts/build-apache, pts/build-php, pts/build-gdb and pts/build-mplayer



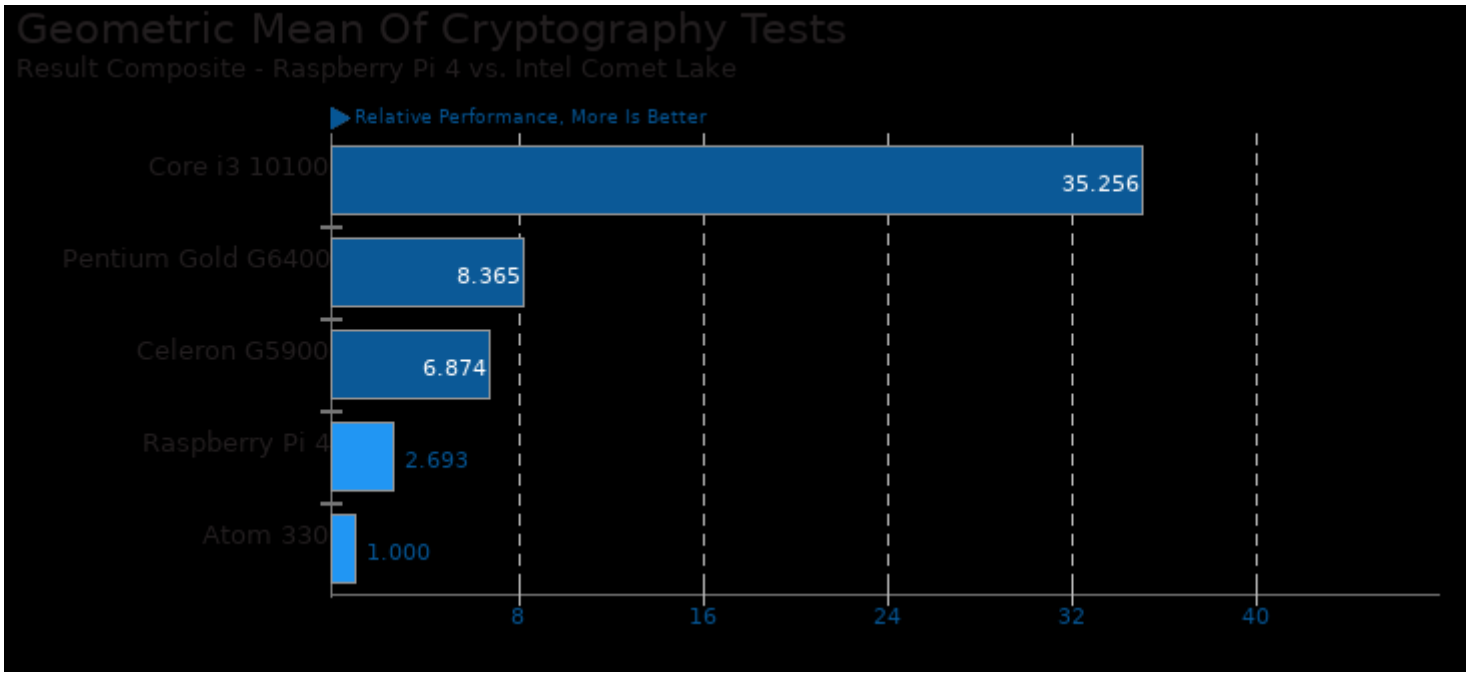
Geometric mean based upon tests: pts/mafft, pts/aobench, pts/tscp, pts/graphics-magick, pts/hmmer, pts/build-php, pts/c-ray, pts/compress-7zip, pts/encode-mp3, pts/encode-flac, pts/sqlite-speedtest, pts/compress-xz, pts/openssl, pts/lammps, pts/aircrack-ng, pts/build-gdb, pts/build-apache and pts/build-mplayer



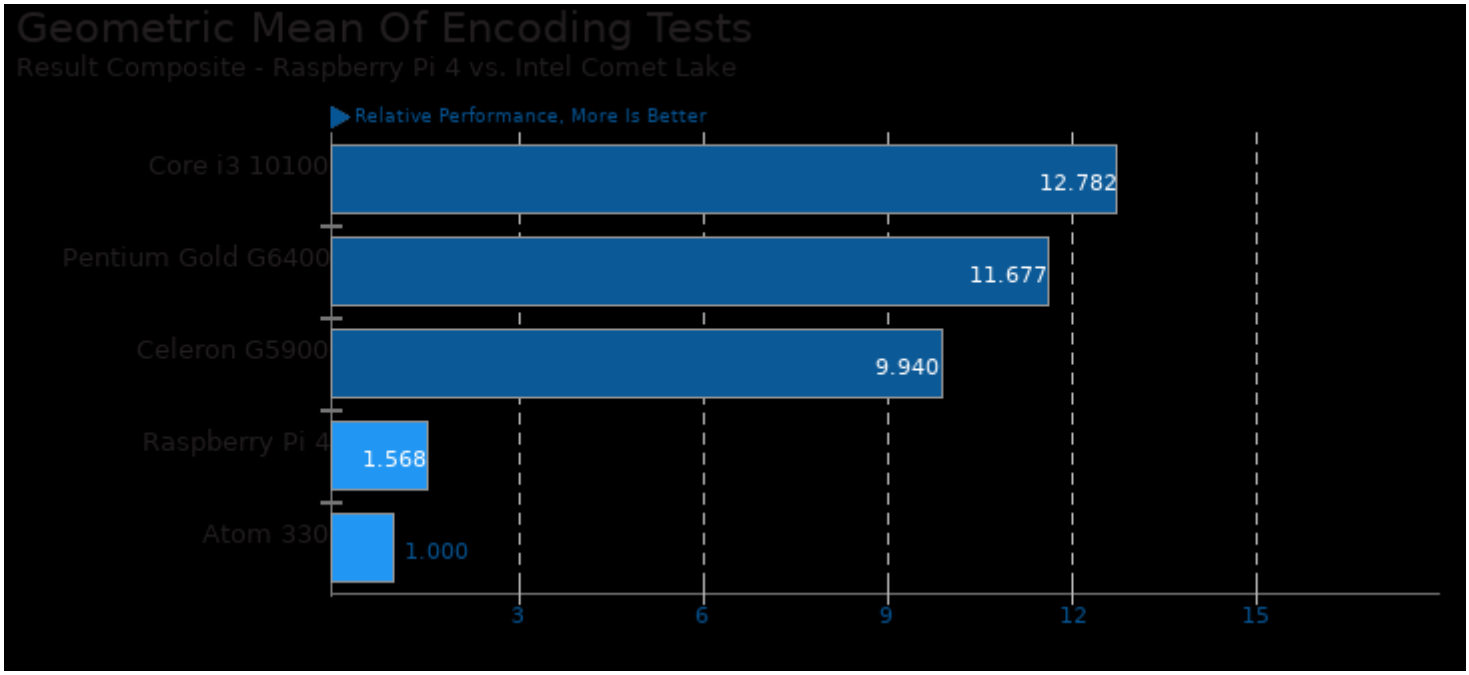
Geometric mean based upon tests: pts/compress-7zip and pts/compress-xz



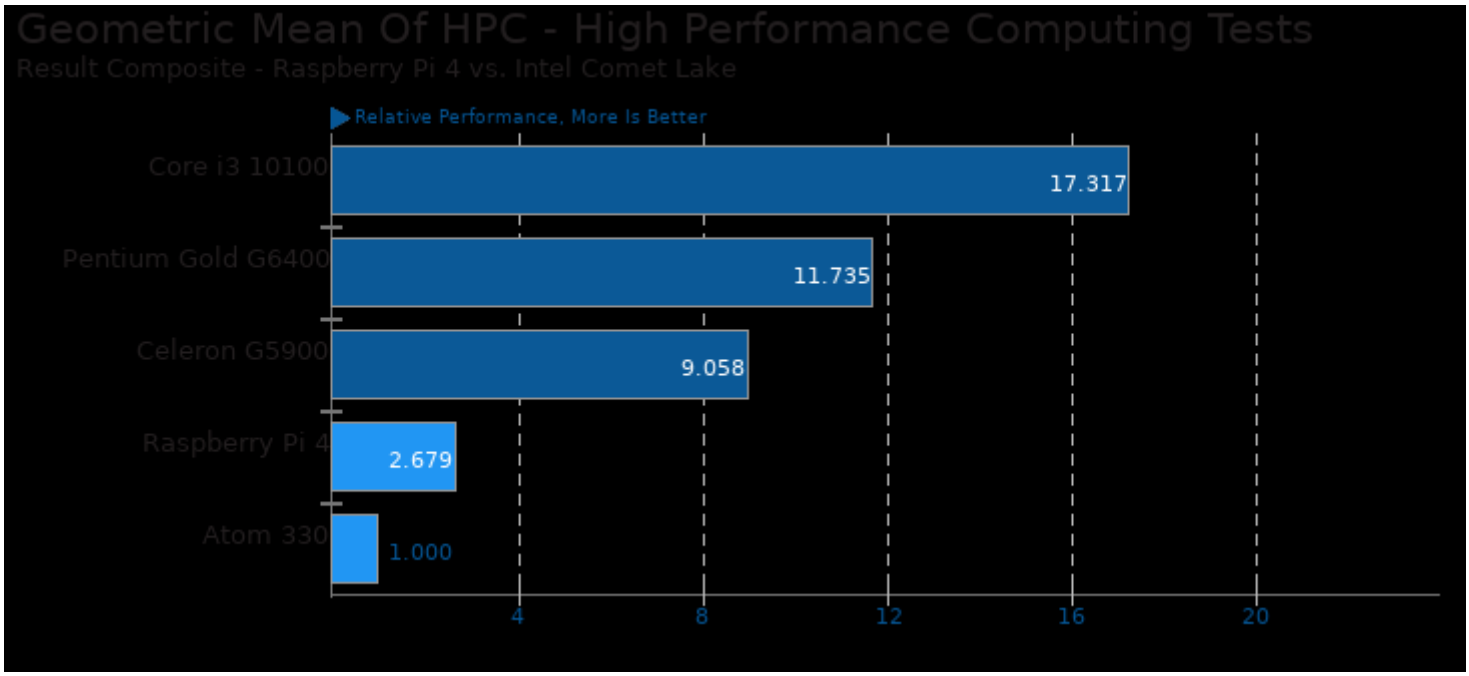
Geometric mean based upon tests: pts/c-ray, pts/aobench, pts/smallpt, pts/ttsiod-renderer, system/tesseract-ocr, system/ocrmypdf, pts/encode-mp3, pts/encode-flac, pts/graphics-magick, system/inkscape, system/rawtherapee, pts/tjbench, system/gimp, system/hugin, system/rsvg and system/gegl



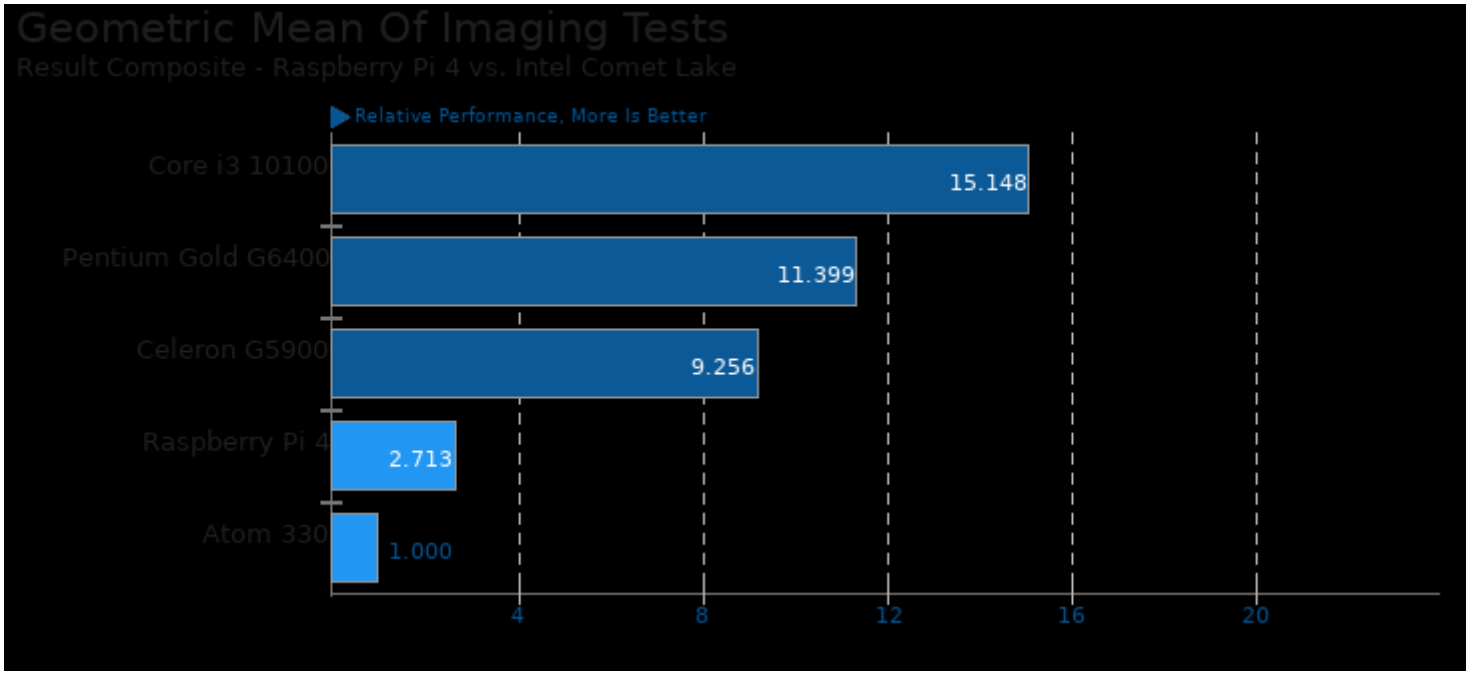
Geometric mean based upon tests: pts/openssl and pts/aircrack-ng



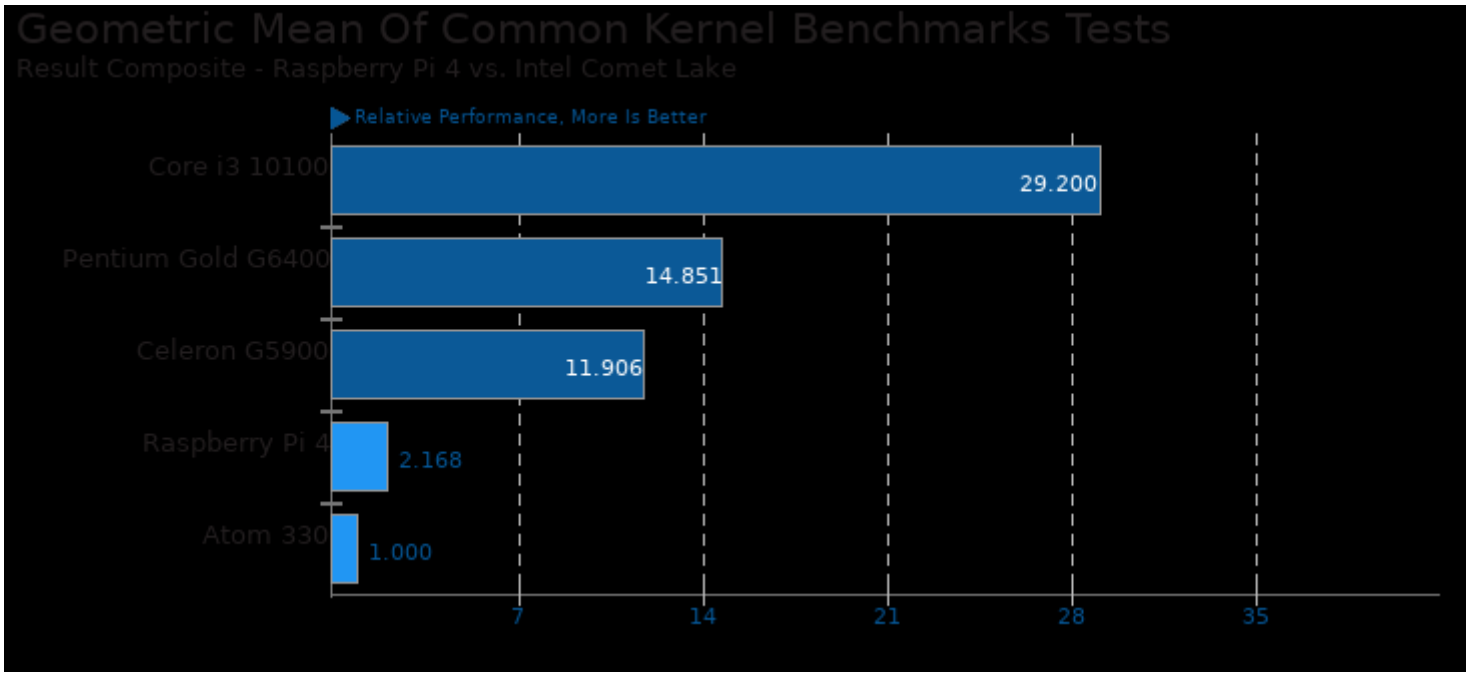
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac



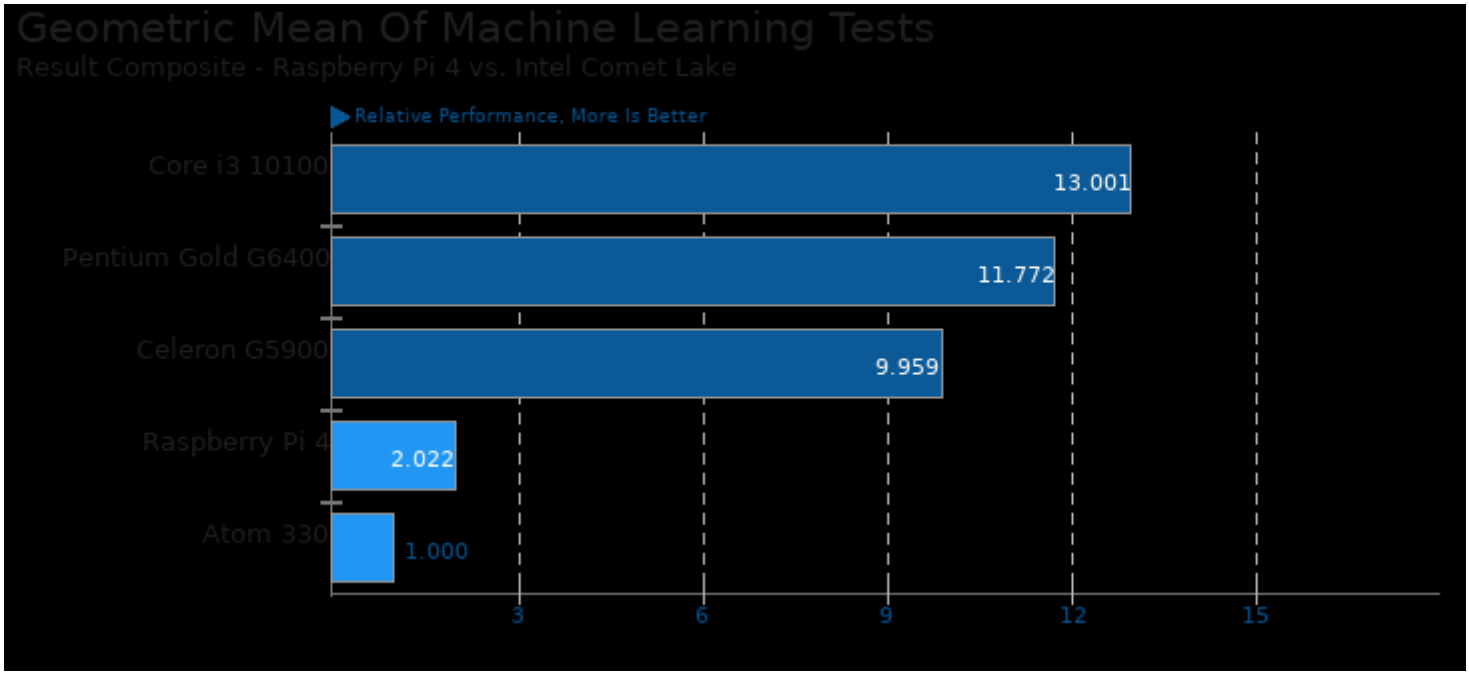
Geometric mean based upon tests: system/octave-benchmark, pts/lammps, pts/hmmer, pts/mafft, pts/numpy and pts/scikit-learn



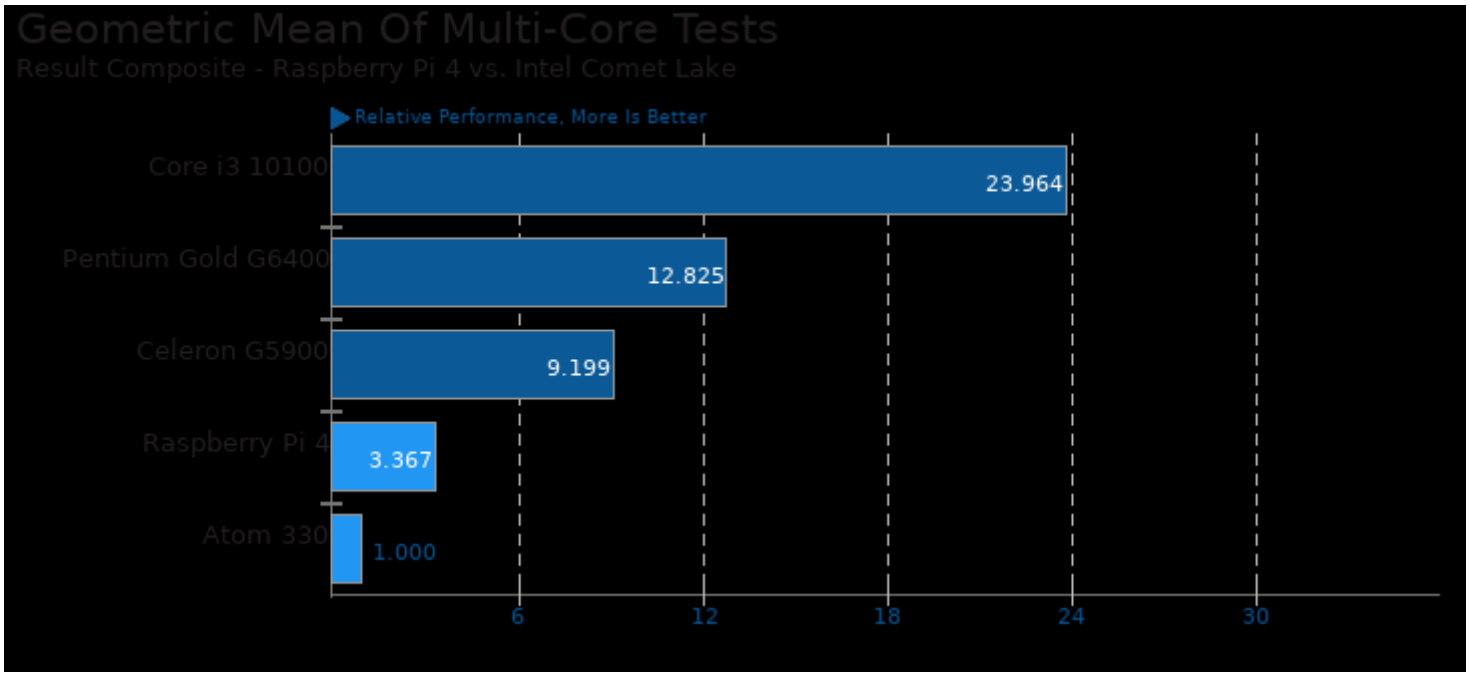
Geometric mean based upon tests: pts/graphics-magick, system/inkscape, system/rawtherapee, pts/tjbench, system/gimp, system/hugin, system/rsvg and system/gegl



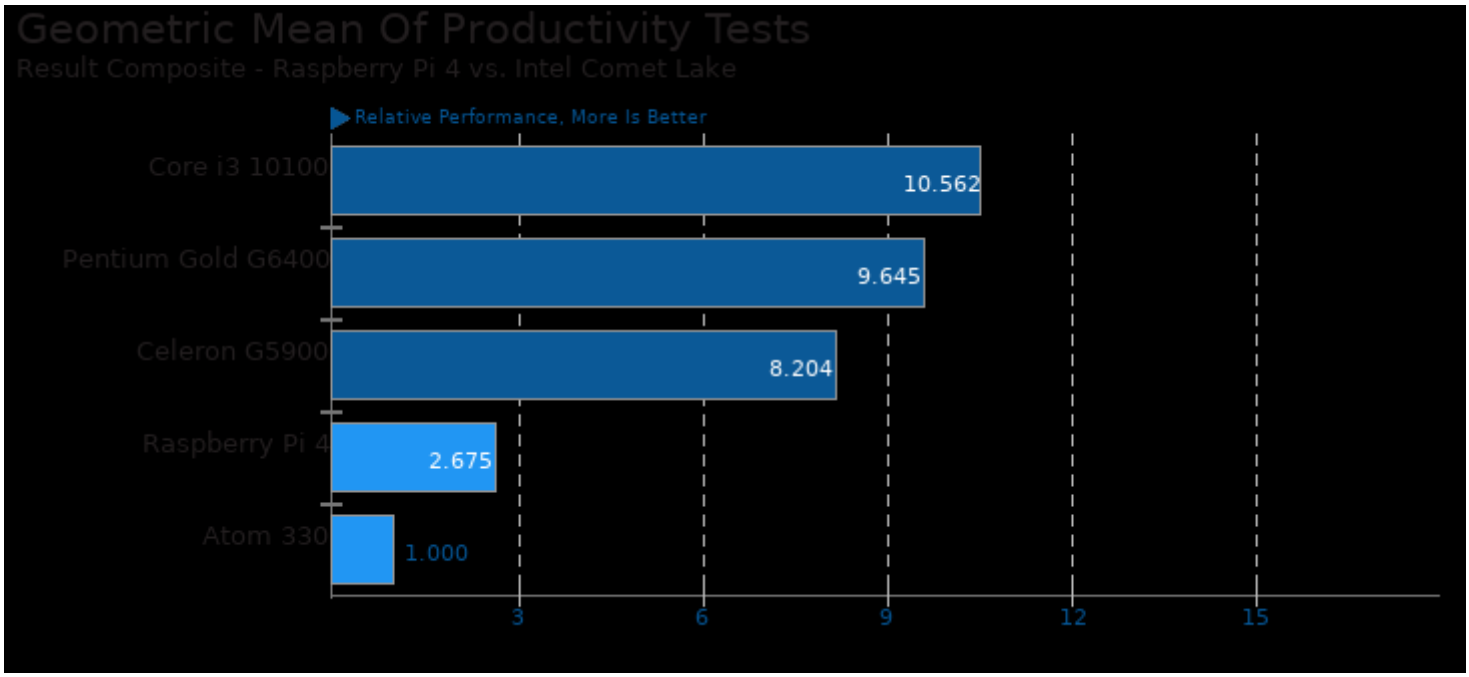
Geometric mean based upon tests: pts/sqlite-speedtest and pts/openssl



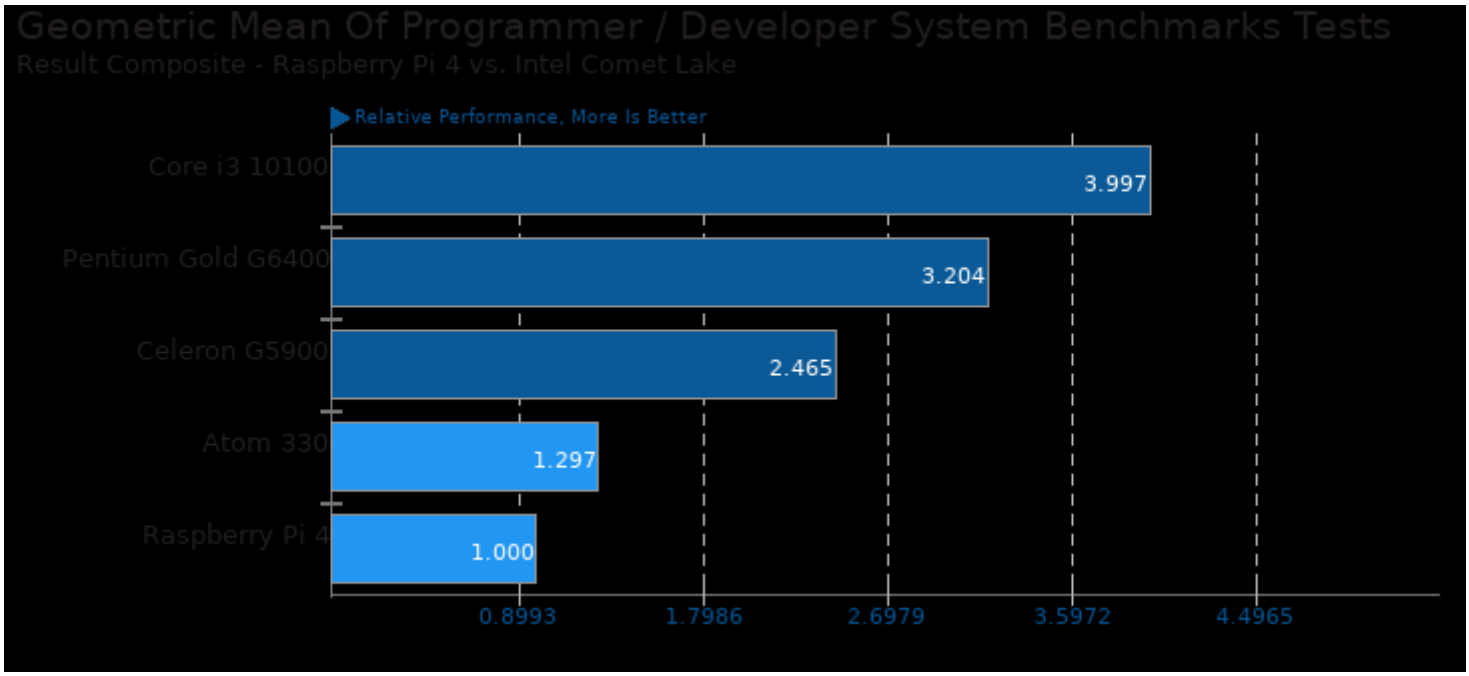
Geometric mean based upon tests: pts/numpy and pts/scikit-learn



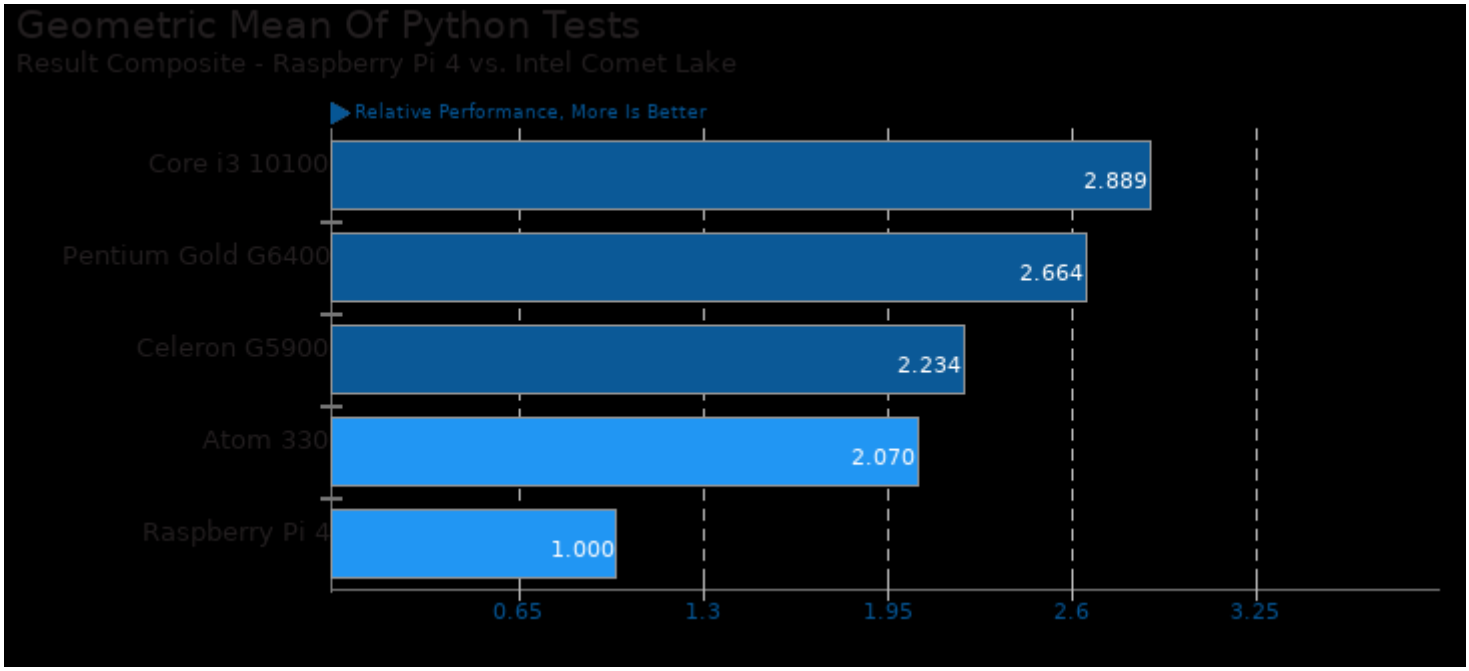
Geometric mean based upon tests: pts/c-ray, pts/coremark, pts/aircrack-ng, pts/smallpt, pts/graphics-magick, pts/lammps, pts/compress-7zip, pts/build-apache, pts/build-php, pts/build-gdb, pts/build-mplayer, pts/aobench and pts/ttsiod-renderer



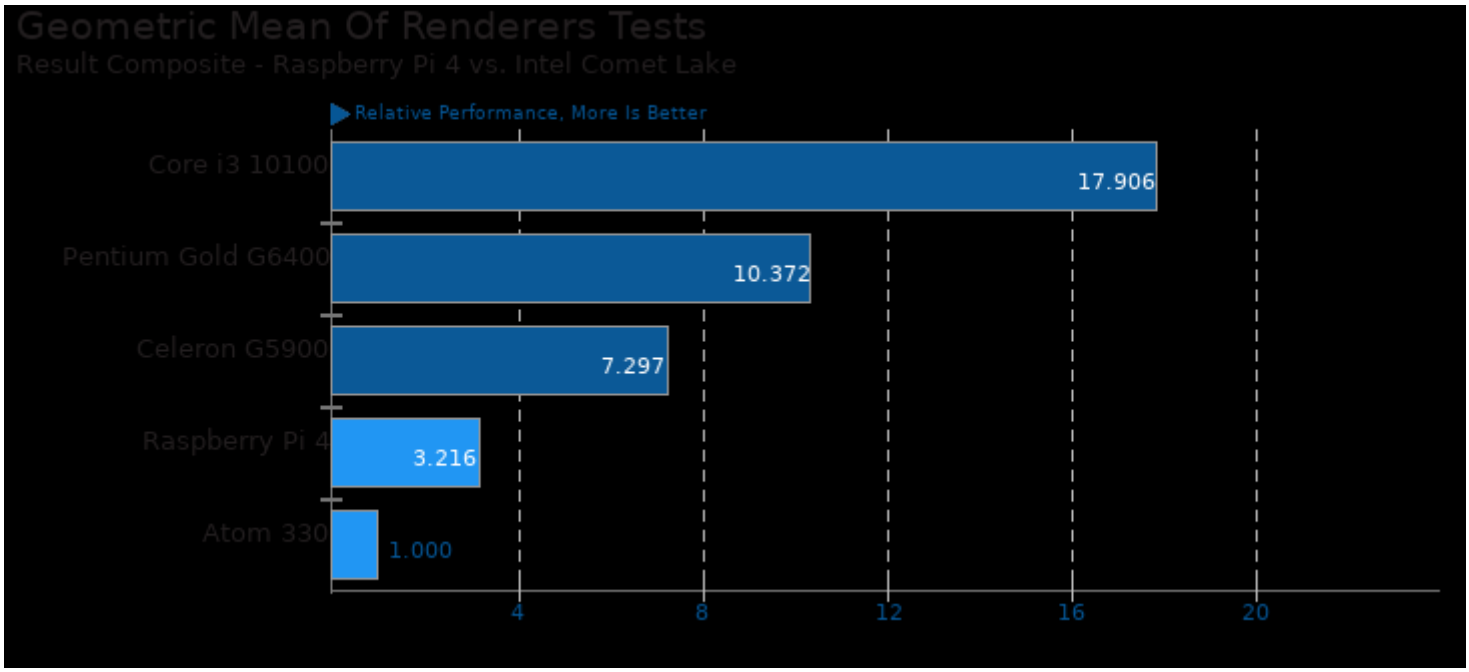
Geometric mean based upon tests: system/libreoffice, system/octave-benchmark, system/inkscape, system/gimp, system/gegl and system/rsvg



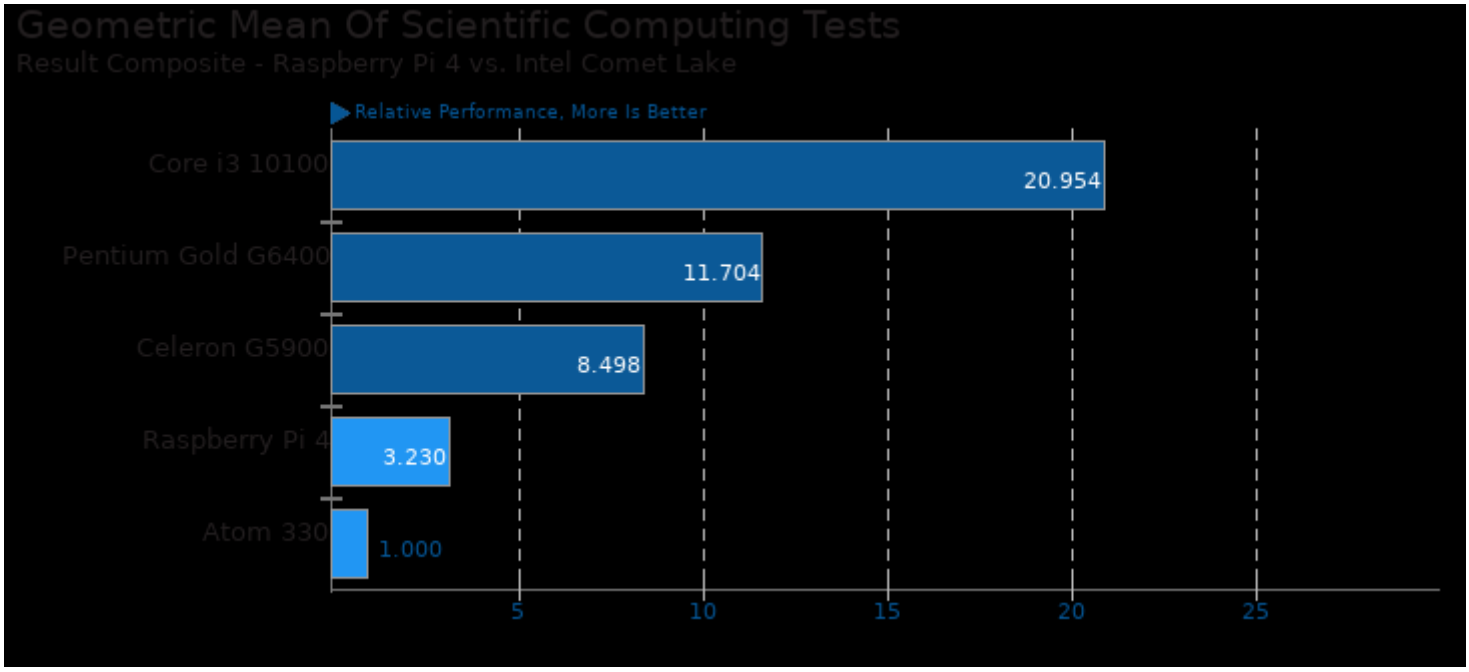
Geometric mean based upon tests: pts/sqlite-speedtest, pts/pyperformance, pts/pybench, pts/build-apache, pts/build-php, pts/build-gdb and pts/build-mplayer



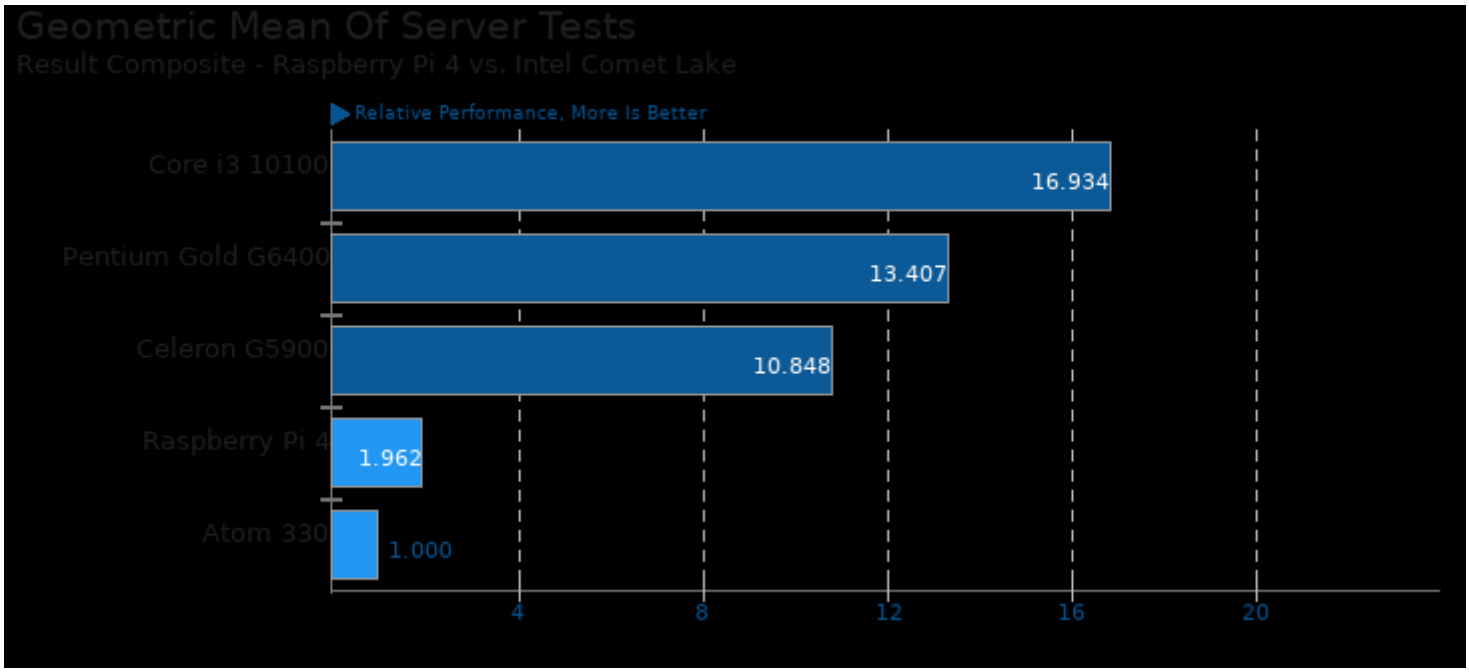
Geometric mean based upon tests: pts/pybench, pts/numpy, pts/scikit-learn and pts/pyperformance



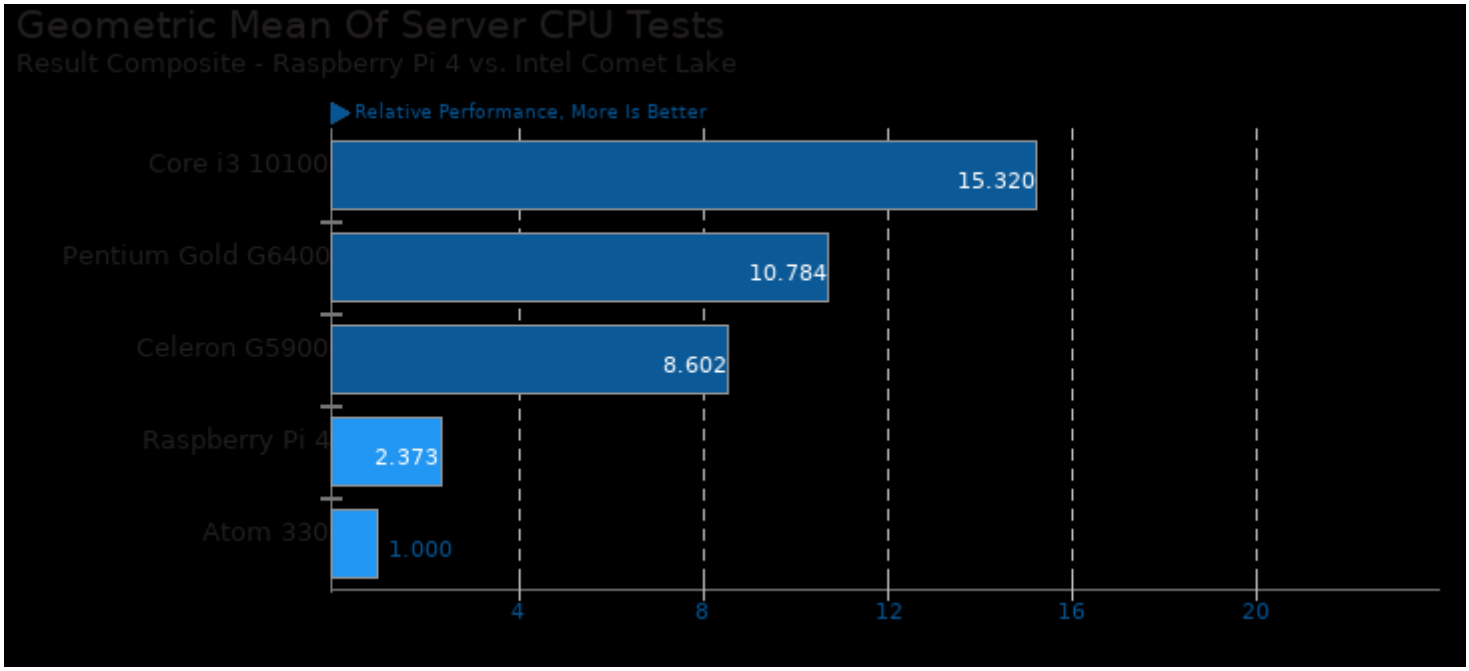
Geometric mean based upon tests: pts/c-ray, pts/aobench, pts/smallpt and pts/ttsiod-renderer



Geometric mean based upon tests: system/octave-benchmark, pts/lammps, pts/hmmer and pts/mafft

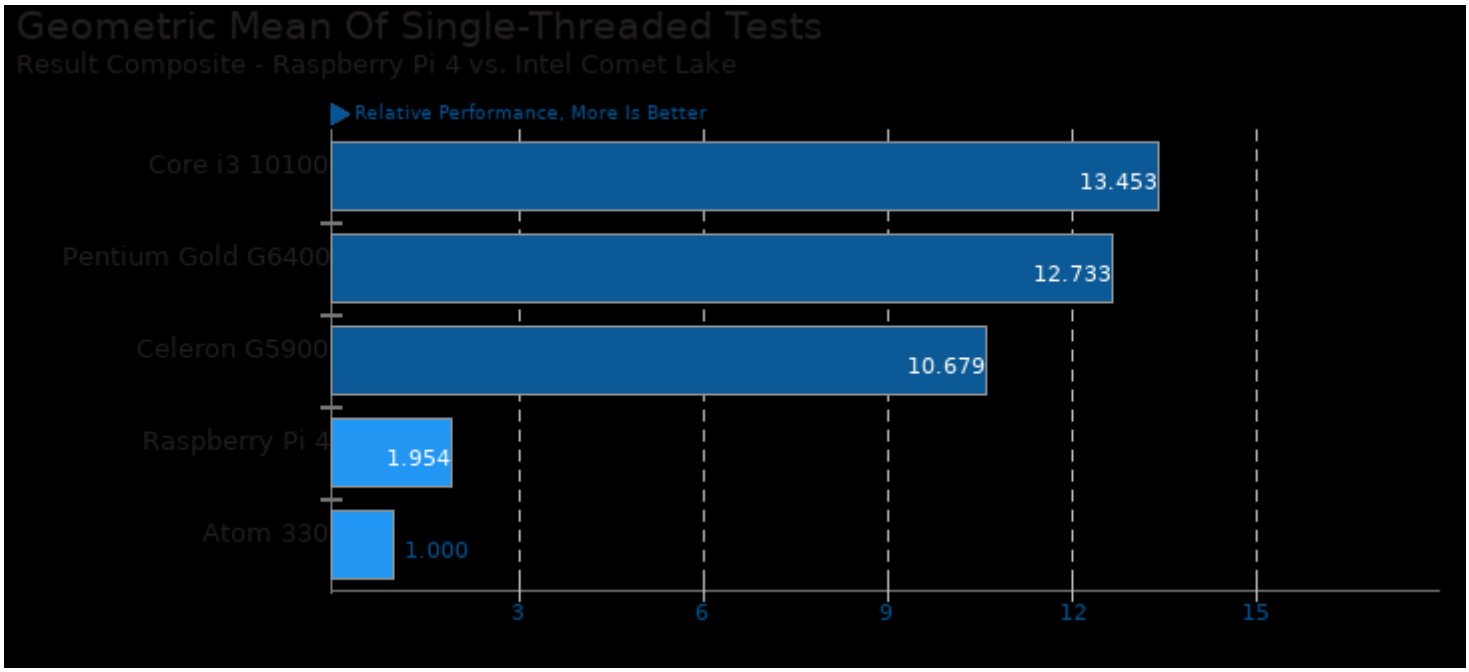


Geometric mean based upon tests: pts/phpbench, pts/openssl, pts/perl-benchmark and pts/sqlite-speedtest



Geometric mean based upon tests: pts/dacapobench, pts/compress-7zip, pts/build-php, pts/c-ray, pts/openssl, pts/tjbench, system/gimp, pts/pybench, pts/numpy, pts/phpbench, pts/scikit-learn and system/tesseract-ocr

Raspberry Pi 4 vs. Intel Comet Lake



Geometric mean based upon tests: pts/polybench-c, pts/numpy, pts/encode-flac, pts/encode-mp3, pts/perl-benchmark, pts/tjbench, system/inkscape, pts/pybench, pts/phpbench and system/tesseract-ocr

This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 12:51.