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LLVM Clang 3.8 Compiler Tuning Optimization Levels

More LLVM Clang 3.8 compiler optimization tuning benchmarks by Michael Larabel.

Automated Executive Summary

-O3 -march=native had the most wins, coming in first place for 25% of the tests.

Based on the geometric mean of all complete results, the fastest (-Ofast -march=native) was 1.426x the speed of the slowest (-O0). -Ofast was 0.997x the speed of -Ofast -march=native, -O3 -march=native was 0.989x the speed of -Ofast, -O3 was 0.997x the speed of -O3 -march=native, -O2 was 0.999x the speed of -O3, -O1 was 0.999x the speed of -O2, -Oz was 0.966x the speed of -O1, -O0 was 0.74x the speed of -Oz.

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

FLAC Audio Encoding (WAV To FLAC) at 8.079x
Himeno Benchmark (Poisson Pressure Solver) at 5.068x
GraphicsMagick (Operation: Local Adaptive Thresholding) at 4.667x
Timed PHP Compilation (Time To Compile) at 3.79x
Hierarchical INTegration (Test: FLOAT) at 2.864x
LAME MP3 Encoding (WAV To MP3) at 2.659x
C-Ray (Total Time) at 2.458x
Timed Apache Compilation (Time To Compile) at 2.364x

GraphicsMagick (Operation: Sharpen) at 1.885x
GraphicsMagick (Operation: HWB Color Space) at 1.807x.

Test Systems:

-O0

-O1

-O2

-Oz

-O3

-O3 -march=native

-Ofast

-Ofast -march=native

Processor: Intel Xeon E5-2687W v3 @ 3.50GHz (20 Cores), Motherboard: MSI X99S SLI PLUS (MS-7885) v1.0, Chipset: Intel Xeon E7 v3/Xeon, Memory: 16384MB, Disk: PNY CS1211 120GB + 80GB INTEL SSDSCKGW08, Graphics: AMD FirePro V7900 2048MB, Audio: Realtek ALC892, Monitor: ASUS PB278, Network: Intel Connection

OS: Ubuntu 16.04, Kernel: 4.5.0-040500rc1-generic (x86_64) 20160124, Desktop: Unity 7.4.0, Display Server: X Server 1.17.3, Display Driver: radeon 7.6.1, OpenGL: 3.3 Mesa 11.0.8 Gallium 0.4, Compiler: Clang 3.8.0 (SVN 259676) + LLVM 3.8.0, File-System: ext4, Screen Resolution: 2560x1440

Compiler Notes: Optimized build; Built Feb 3 2016 (13:57:10); Default target: x86_64-unknown-linux-gnu; Host CPU: haswell
Processor Notes: Scaling Governor: intel_pstate powersave

	-O0	-O1	-O2	-Oz	-O3	-O3 -march=native	-Ofast	-Ofast -march=native
Timed HMMer Search - P.D.S (sec)	12.18	**15.99**	14.02	15.09	15.13	14.80	**10.93**	12.12
Normalized	89.74%	68.36%	77.96%	72.43%	72.24%	73.85%	100%	90.18%
Standard Deviation	0.7%	2.1%	10.5%	7.2%	4.7%	7.6%	12.6%	13.2%

LLVM Clang 3.8 Compiler Tuning Optimization Levels

Phoronix Test Suite

SciMark - Composite (Mflops)	1803	1807	1802	1812	**1794**	**1918**	1814	1894
Normalized	94%	94.21%	93.96%	94.47%	93.49%	100%	94.58%	98.71%
Standard Deviation	2.3%	1.6%	1.3%	1.3%	1.8%	1%	0.9%	1.1%
SciMark - Monte Carlo (Mflops)	**238.14**	237.83	**234.76**	237.11	237.63	235.58	236.54	237.83
Normalized	100%	99.87%	98.58%	99.57%	99.79%	98.93%	99.33%	99.87%
Standard Deviation	3.9%	4.4%	4.2%	4.2%	4.3%	4.2%	3.4%	4.4%
SciMark - F.F.T (Mflops)	358.28	**357.19**	**363.59**	357.50	358.05	362.39	360.54	359.77
Normalized	98.54%	98.24%	100%	98.33%	98.48%	99.67%	99.16%	98.95%
Standard Deviation	3%	3.5%	0.8%	3.6%	3.5%	3.5%	2.4%	3.7%
SciMark - S.M.M	2808	2777	2798	2807	2767	2614	**2812**	**2571**
Normalized	99.87%	98.75%	99.52%	99.83%	98.4%	92.97%	100%	91.43%
Standard Deviation	3.9%	3.7%	3.4%	3.3%	3.5%	3.4%	3.7%	3.5%
SciMark - D.L.M.F (Mflops)	4134	4188	4137	4182	**4127**	**4901**	4185	4835
Normalized	84.35%	85.44%	84.41%	85.33%	84.21%	100%	85.4%	98.64%
Standard Deviation	3.5%	2.4%	2.5%	2.5%	2.1%	1%	2.3%	0.9%
SciMark - J.S.O.R (Mflops)	1478	1477	1478	1478	1478	**1479**	1477	**1465**
Normalized	99.92%	99.87%	99.97%	99.94%	99.96%	100%	99.9%	99.09%
Standard Deviation	4.3%	4.5%	4.3%	4.3%	4.3%	4.3%	4.3%	4.1%
GraphicsMagick - Blur (Iterations/min)	**67**	116	**119**	113	**119**	117	118	118
Normalized	56.3%	97.48%	100%	94.96%	100%	98.32%	99.16%	99.16%
Standard Deviation	0%	0%	0.5%	0%	0%	1.3%	0.8%	1%
GraphicsMagick - Sharpen	**61**	111	113	108	113	107	109	**115**
Normalized	53.04%	96.52%	98.26%	93.91%	98.26%	93.04%	94.78%	100%
Standard Deviation	0%	0%	0%	0%	0%	0%	0%	0.5%
GraphicsMagick - HWB Color Space (Iterations/min)	**83**	**150**	**150**	144	**150**	**150**	**150**	**150**
Normalized	55.33%	100%	100%	96%	100%	100%	100%	100%
Standard Deviation	0.7%	0%	0%	0.4%	0%	0%	0%	0%
GraphicsMagick - L.A.T (Iterations/min)	**18**	70	81	71	80	**84**	81	**84**
Normalized	21.43%	83.33%	96.43%	84.52%	95.24%	100%	96.43%	100%
Standard Deviation	0%	0%	0%	0%	0%	0%	0.7%	0%
Himeno Benchmark - P.P.S (MFLOPS)	**284.58**	1334	1359	1002	1354	1343	1390	**1442**
Normalized	19.73%	92.53%	94.23%	69.49%	93.91%	93.12%	96.4%	100%
Standard Deviation	1.1%	1.2%	0.9%	0.5%	0.2%	0.1%	1.1%	0.8%
Timed Apache Compilation - Time To Compile (sec)	**9.25**	17.83	21.27	19.22	21.67	**21.87**	21.59	21.51
Normalized	100%	51.88%	43.49%	48.13%	42.69%	42.3%	42.84%	43%
Standard Deviation	2.3%	1.1%	1.6%	0.3%	1%	1.2%	0.9%	0.9%
Timed PHP Compilation - Time To Compile (sec)	**4.24**	8.93	11.82	9.55	15.79	15.93	15.91	**16.07**
Normalized	100%	47.48%	35.87%	44.4%	26.85%	26.62%	26.65%	26.38%
Standard Deviation	0.1%	0.6%	0.5%	0.5%	0.6%	0.6%	1.9%	1.2%
C-Ray - Total Time (sec)	**27.58**	16.30	19.81	19.70	13.21	12.78	12.35	**11.22**

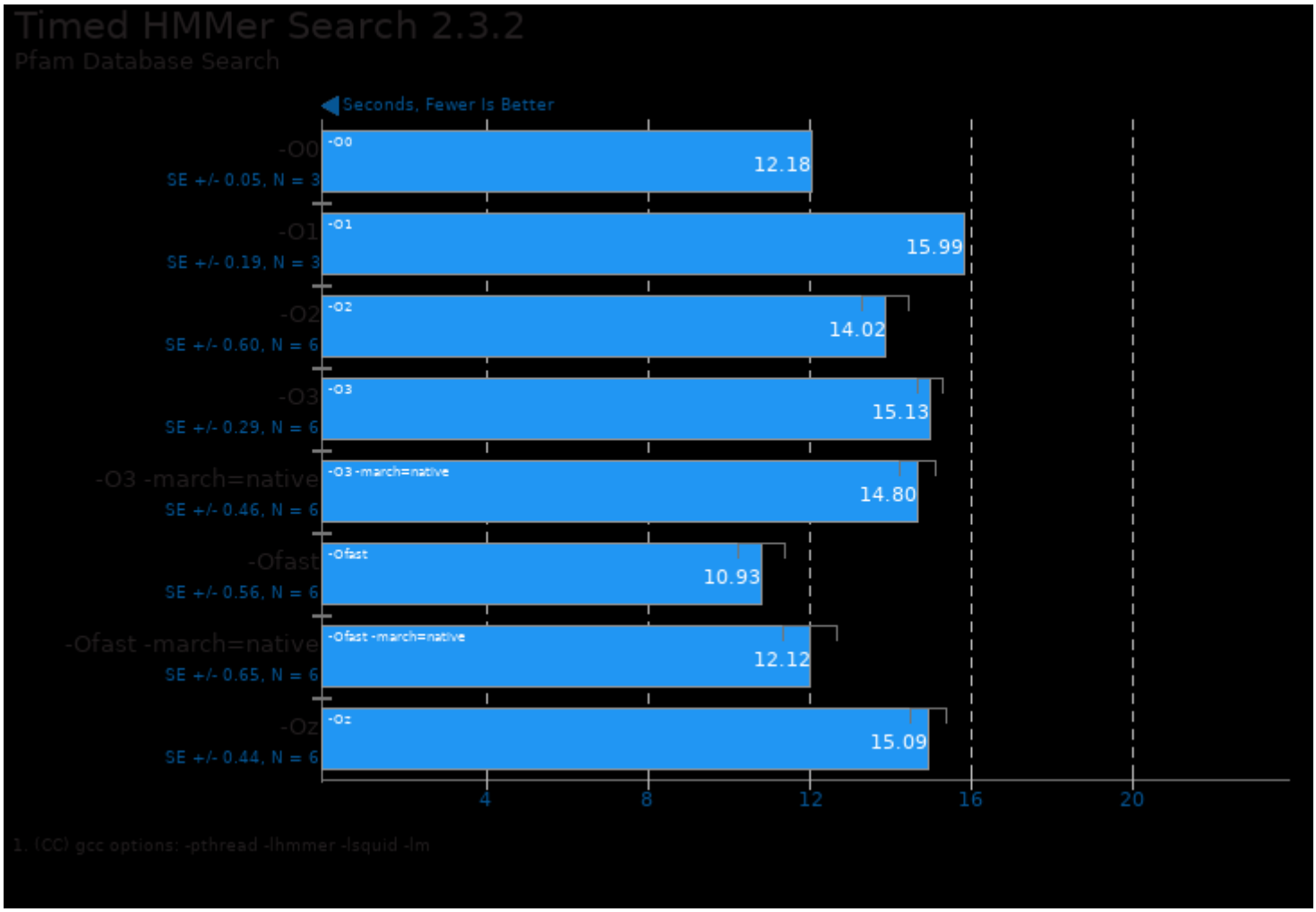
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Normalized	40.68%	68.83%	56.64%	56.95%	84.94%	87.79%	90.85%	100%
Standard Deviation	0.1%	0%	0.1%	0.1%	0.2%	0.2%	0.2%	0.3%
Smallpt - G.I.R.1.S (sec)			**12**	**13**	**12**	**12**	**12**	**12**
Normalized			100%	92.31%	100%	100%	100%	100%
Standard Deviation			0%	0%	0%	0%	4.4%	4.8%
FLAC Audio Encoding - WAV To FLAC (sec)	**57.44**	9.12	8.65	12.27	8.66	**7.11**	8.74	7.50
Normalized	12.38%	77.96%	82.2%	57.95%	82.1%	100%	81.35%	94.8%
Standard Deviation	0.6%	2.5%	2.7%	2.5%	2.9%	1.1%	2.5%	1.2%
LAME MP3 Encoding - WAV To MP3 (sec)	**37.10**	15.68	**13.95**	16.88	14.38	15.22	14.10	15.20
Normalized	37.6%	88.97%	100%	82.64%	97.01%	91.66%	98.94%	91.78%
Standard Deviation	0.6%	2.6%	1.8%	3.1%	3.3%	1.1%	2.6%	1.1%
PostgreSQL pgbench - Buffer Test - Normal Load - Read Write	5008	5049	4968	4737	**4598**	**5092**		
Normalized	98.34%	99.16%	97.56%	93.02%	90.29%	100%		
Standard Deviation	2.4%	1.3%	3.2%	1.3%	5%	6.7%		
PostgreSQL pgbench - Buffer Test - Single Thread - Read Write (TPS)	**284.51**	348.86	**379.00**	357.32	351.75	362.58		
Normalized	75.07%	92.05%	100%	94.28%	92.81%	95.67%		
Standard Deviation	2.5%	4.5%	1.7%	3.2%	3.1%	3%		
PostgreSQL pgbench - Buffer Test - Heavy Contention - Read Write (TPS)	5177	5209	5051	4911	**4630**	**5342**		
Normalized	96.9%	97.51%	94.55%	91.93%	86.67%	100%		
Standard Deviation	1.8%	0.8%	0.2%	3.2%	2.6%	4.4%		
Redis - LPOP	**541335**	642965	633016	631317	642801	624901	**652420**	632522
Normalized	82.97%	98.55%	97.03%	96.77%	98.53%	95.78%	100%	96.95%
Standard Deviation	1.8%	0.6%	2.4%	1.8%	1.7%	2%	1.6%	3.4%
Redis - SADD	**481943**	587107	599041	581864	592836	587748	589116	**602726**
Normalized	79.96%	97.41%	99.39%	96.54%	98.36%	97.51%	97.74%	100%
Standard Deviation	1.7%	1.9%	1.7%	2.5%	1.3%	2.3%	3.3%	1.4%
Redis - LPUSH (Reqs/sec)	**456864**	585267	570314	589079	587392	575188	**595840**	592685
Normalized	76.68%	98.23%	95.72%	98.87%	98.58%	96.53%	100%	99.47%
Standard Deviation	3.4%	3.4%	2.2%	3.1%	2.8%	2.6%	1.8%	4%
Redis - GET (Reqs/sec)	**527735**	625334	624757	632179	**649057**	642444	630965	625437
Normalized	81.31%	96.35%	96.26%	97.4%	100%	98.98%	97.21%	96.36%
Standard Deviation	0.9%	3.6%	1.9%	3.3%	3.1%	2.7%	2.7%	2.7%
Redis - SET (Reqs/sec)	**468102**	575055	579653	**585439**	582801	580209	567623	572158
Normalized	79.96%	98.23%	99.01%	100%	99.55%	99.11%	96.96%	97.73%
Standard Deviation	3.1%	3%	2.7%	1.4%	2.7%	3.4%	1.5%	1.4%
Hierarchical INTegration - FLOAT	**112554682**	266823792	**322378022**	314508487	321885789	268576817	298029221	251257760
Normalized	34.91%	82.77%	100%	97.56%	99.85%	83.31%	92.45%	77.94%
Standard Deviation	0.6%	0.3%	0.7%	0.8%	0.2%	0.6%	0.6%	0.1%
Apache Benchmark - S.W.P.S (Reqs/sec)	23021	23380	23361	23342	23283	23355	**23471**	**22669**
Normalized	98.08%	99.61%	99.53%	99.45%	99.2%	99.51%	100%	96.58%

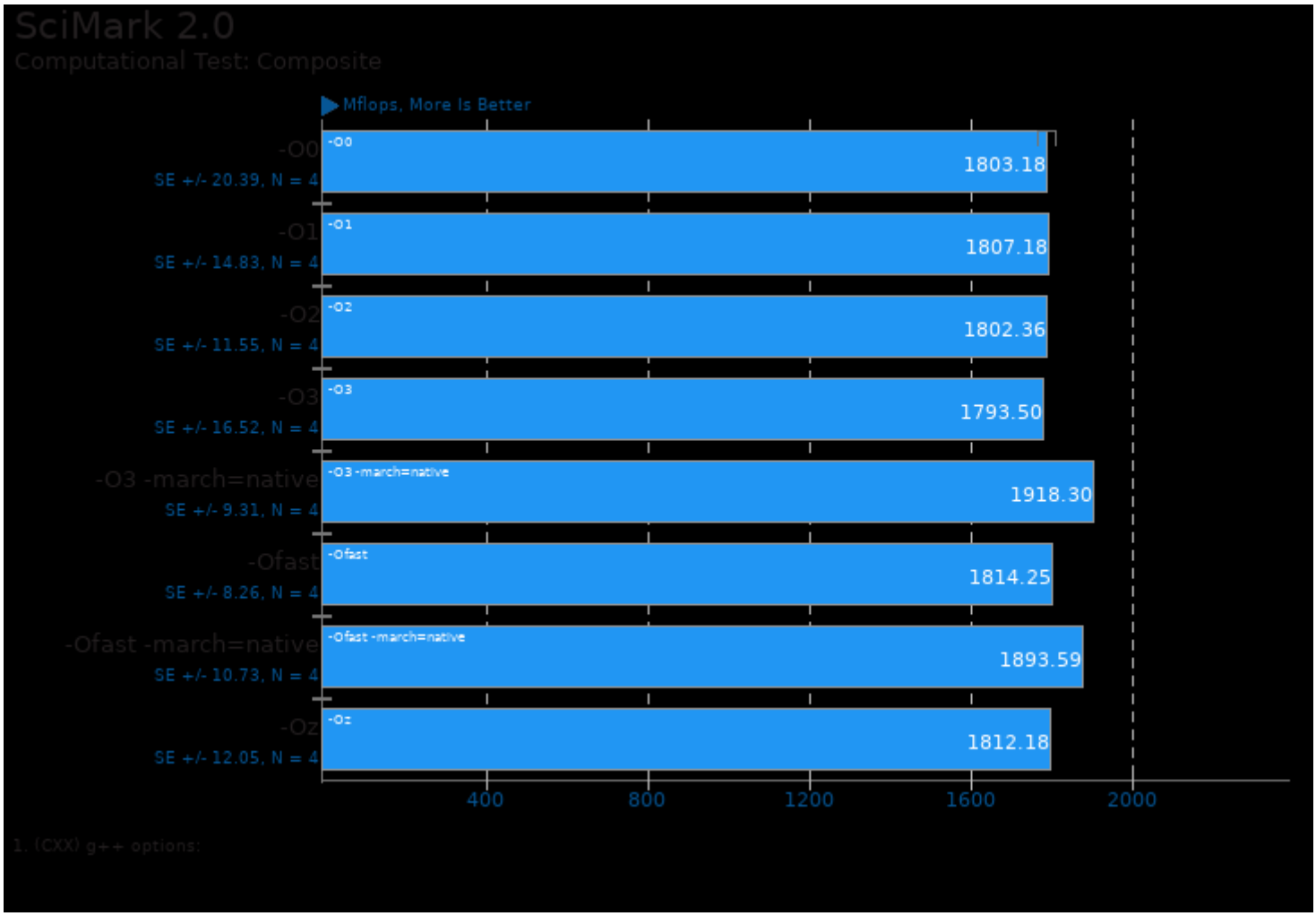
LLVM Clang 3.8 Compiler Tuning Optimization Levels

Standard Deviation	0.4%	0.4%	0.5%	0.2%	0.3%	0.8%	0.2%	0.5%

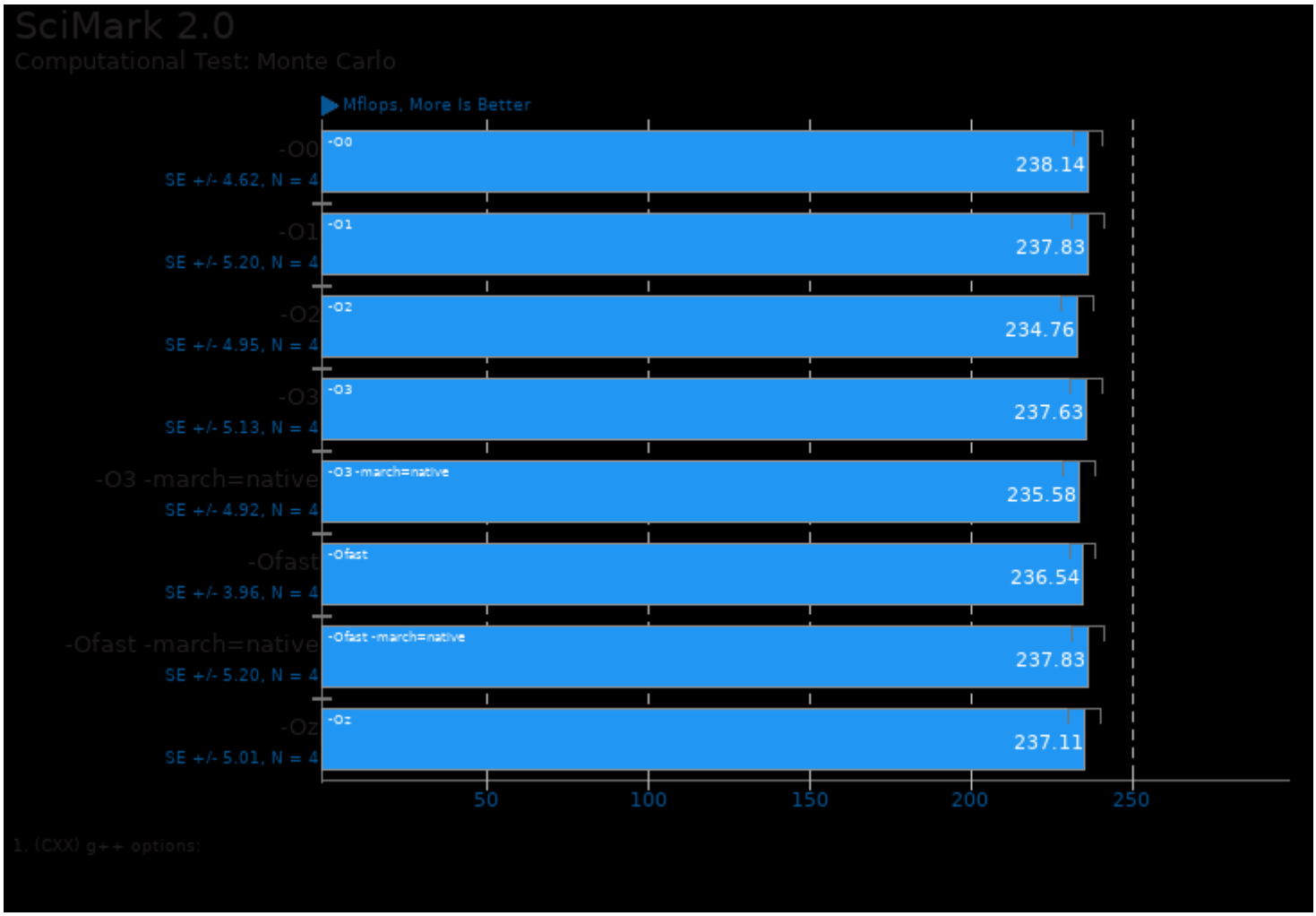
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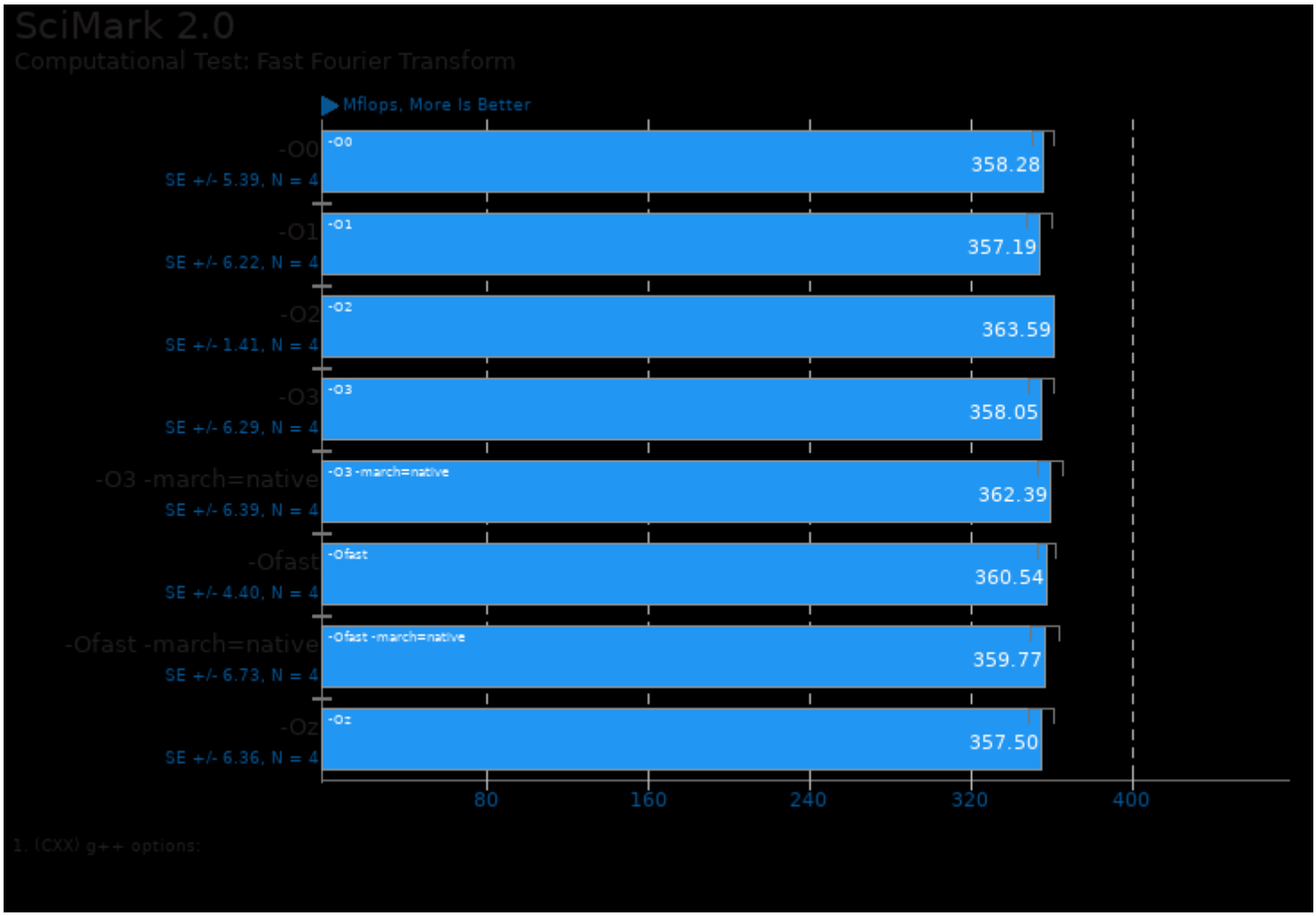
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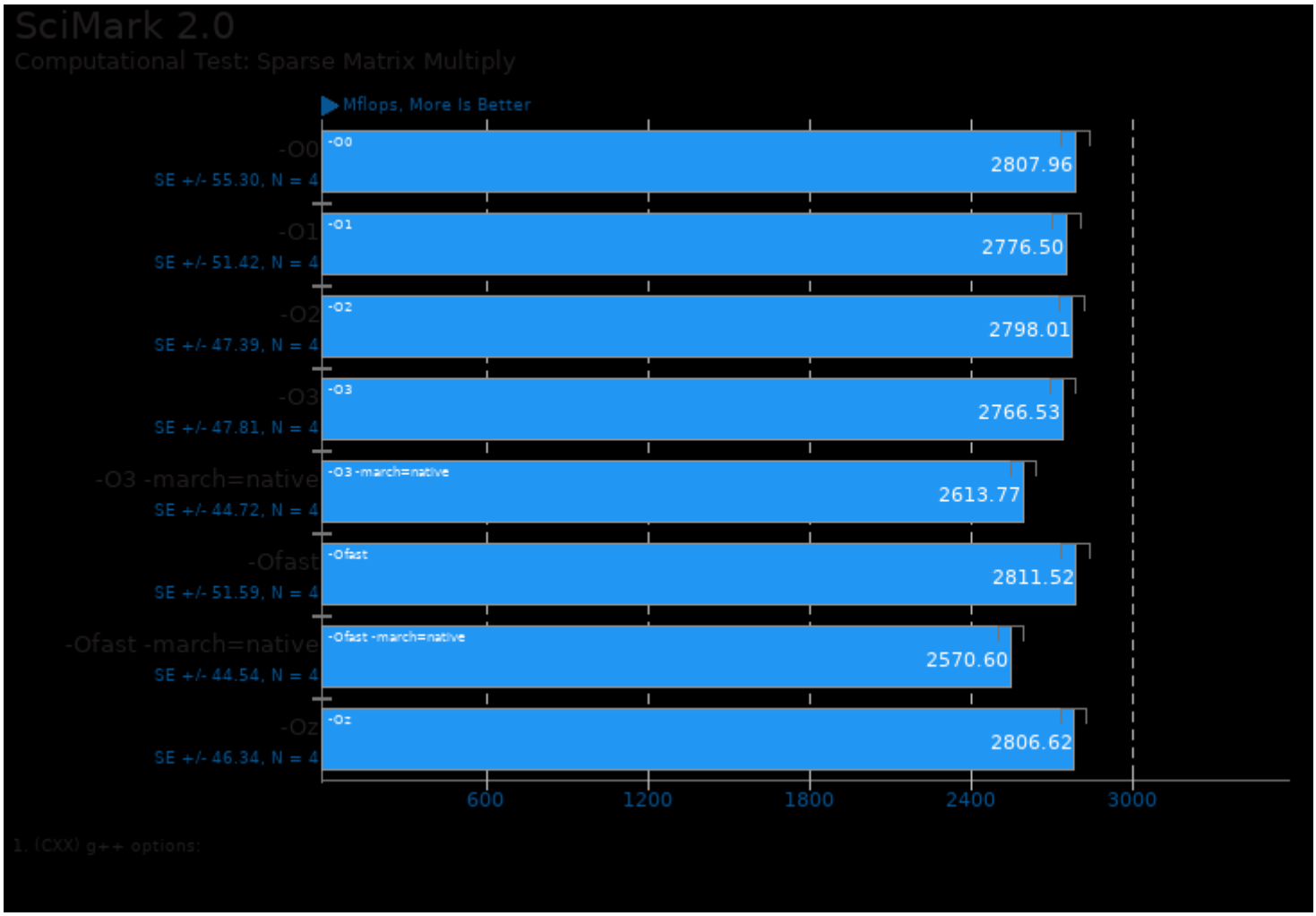
LLVM Clang 3.8 Compiler Tuning Optimization Levels



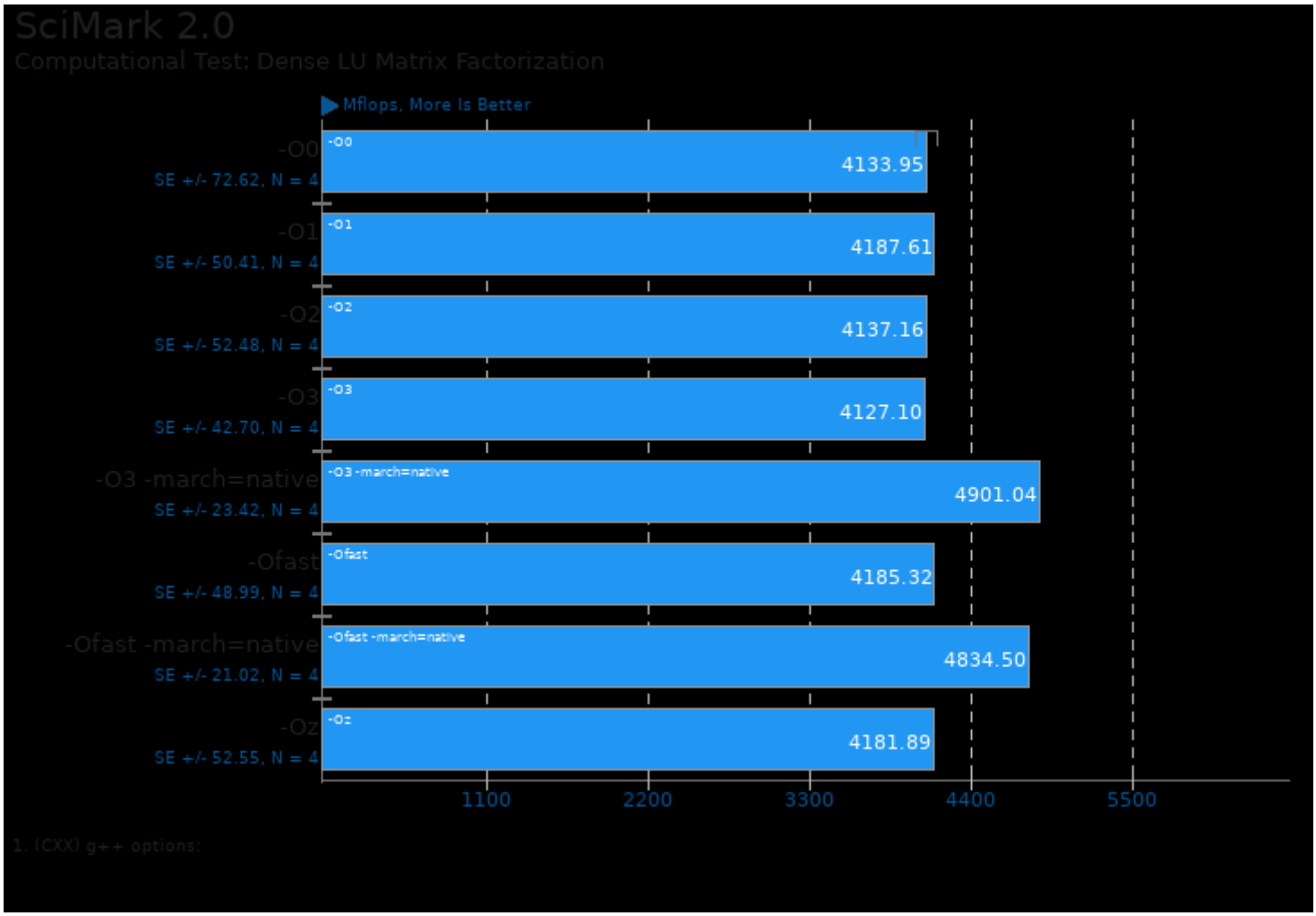
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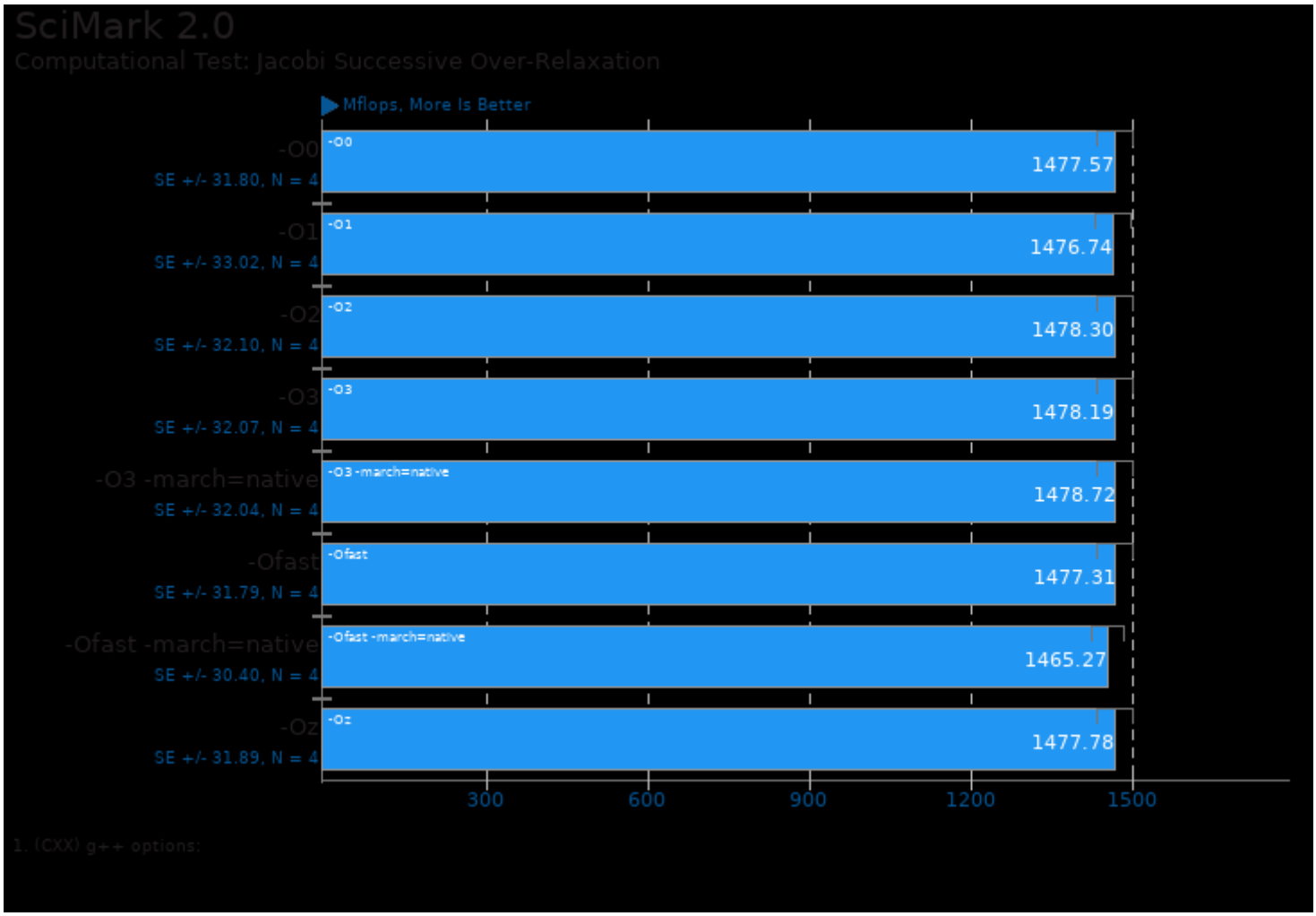
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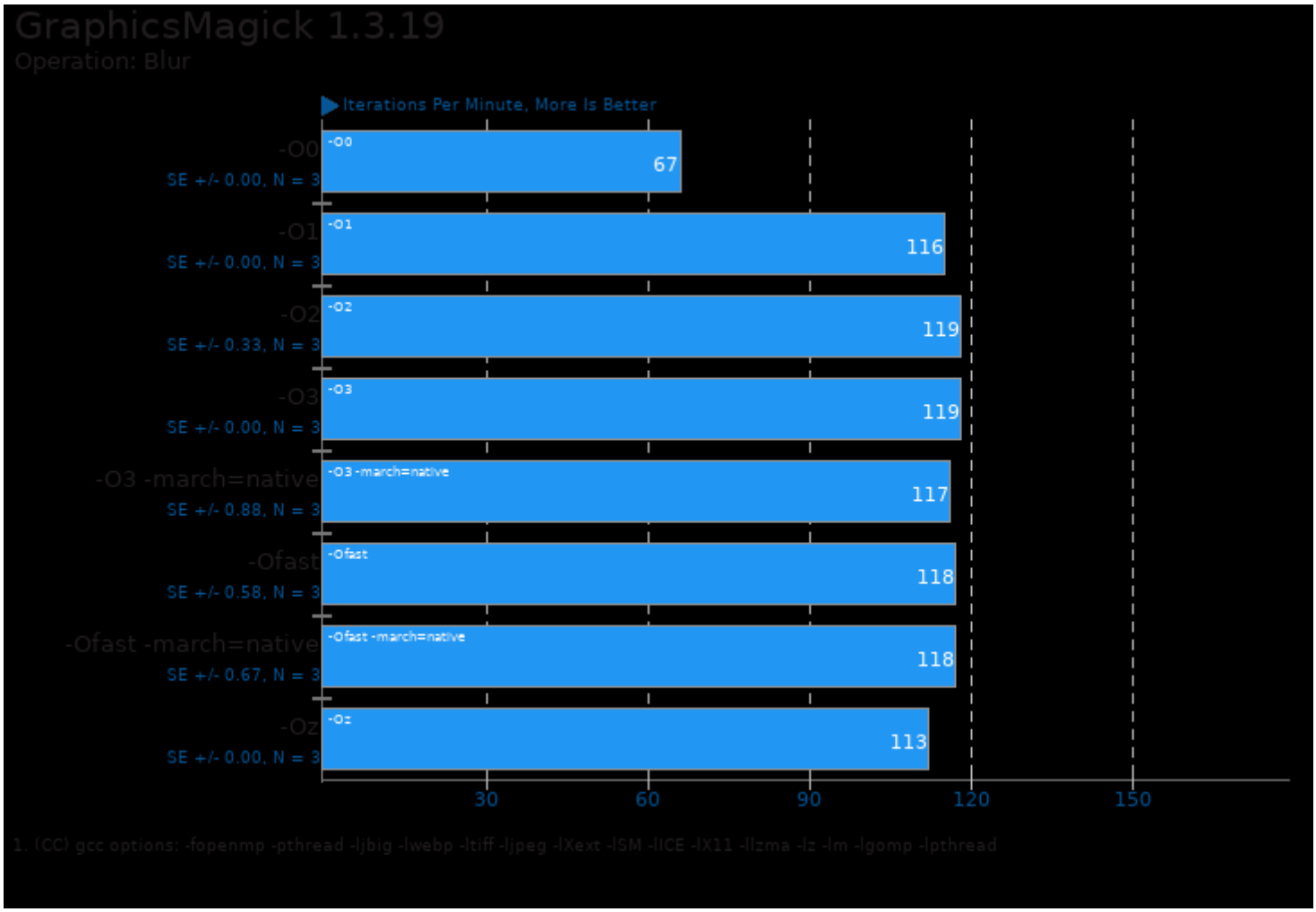
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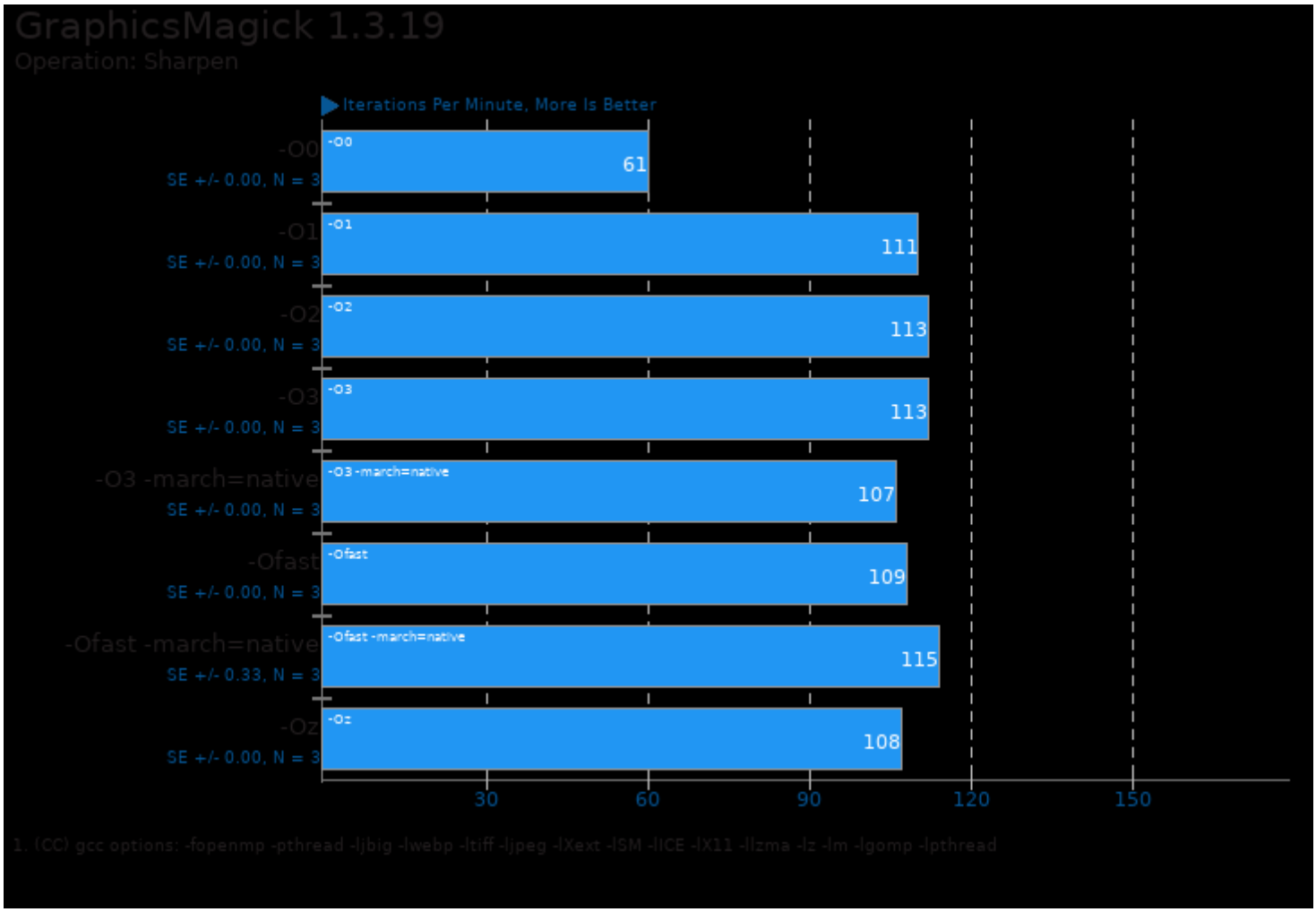
LLVM Clang 3.8 Compiler Tuning Optimization Levels



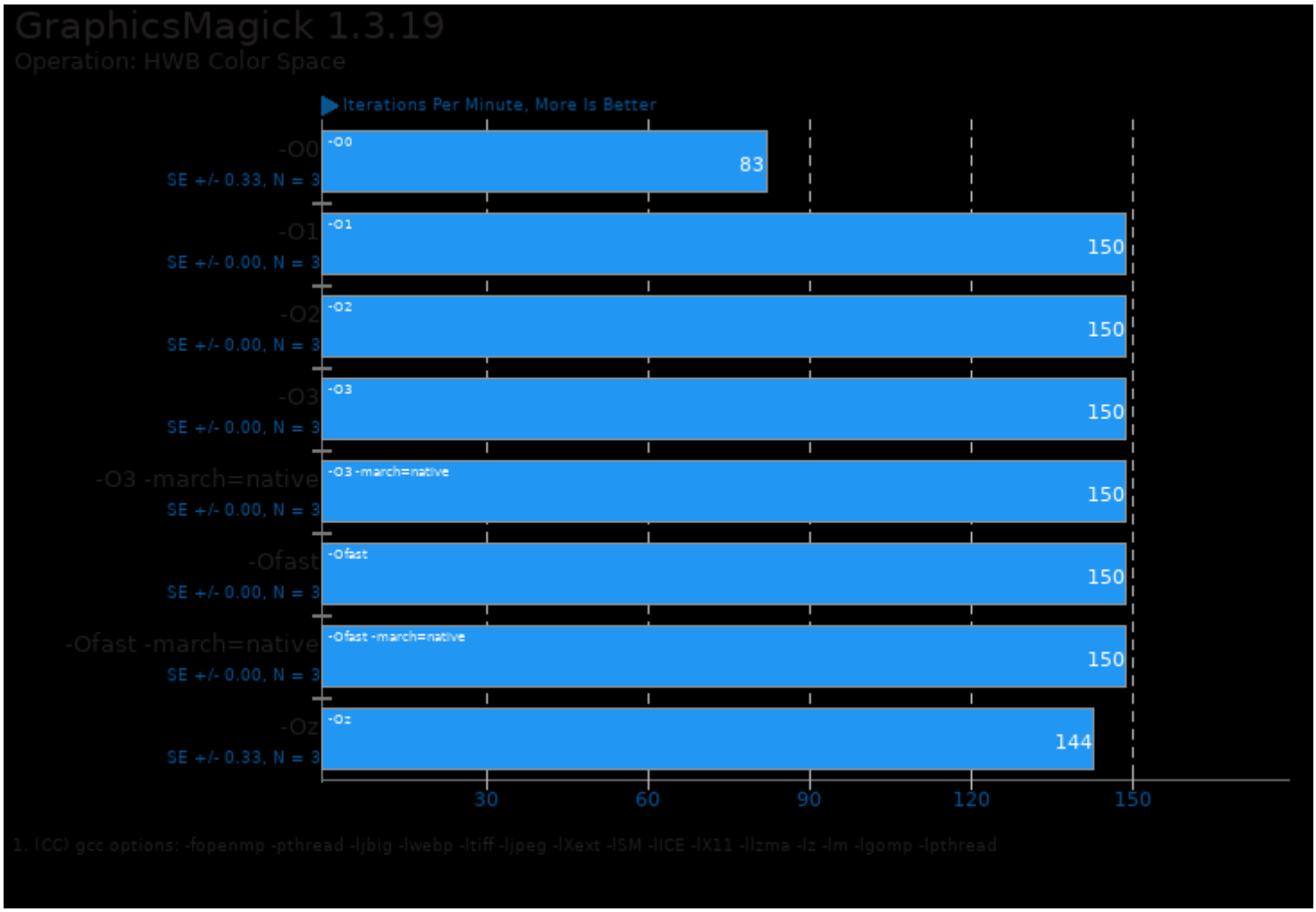
LLVM Clang 3.8 Compiler Tuning Optimization Levels



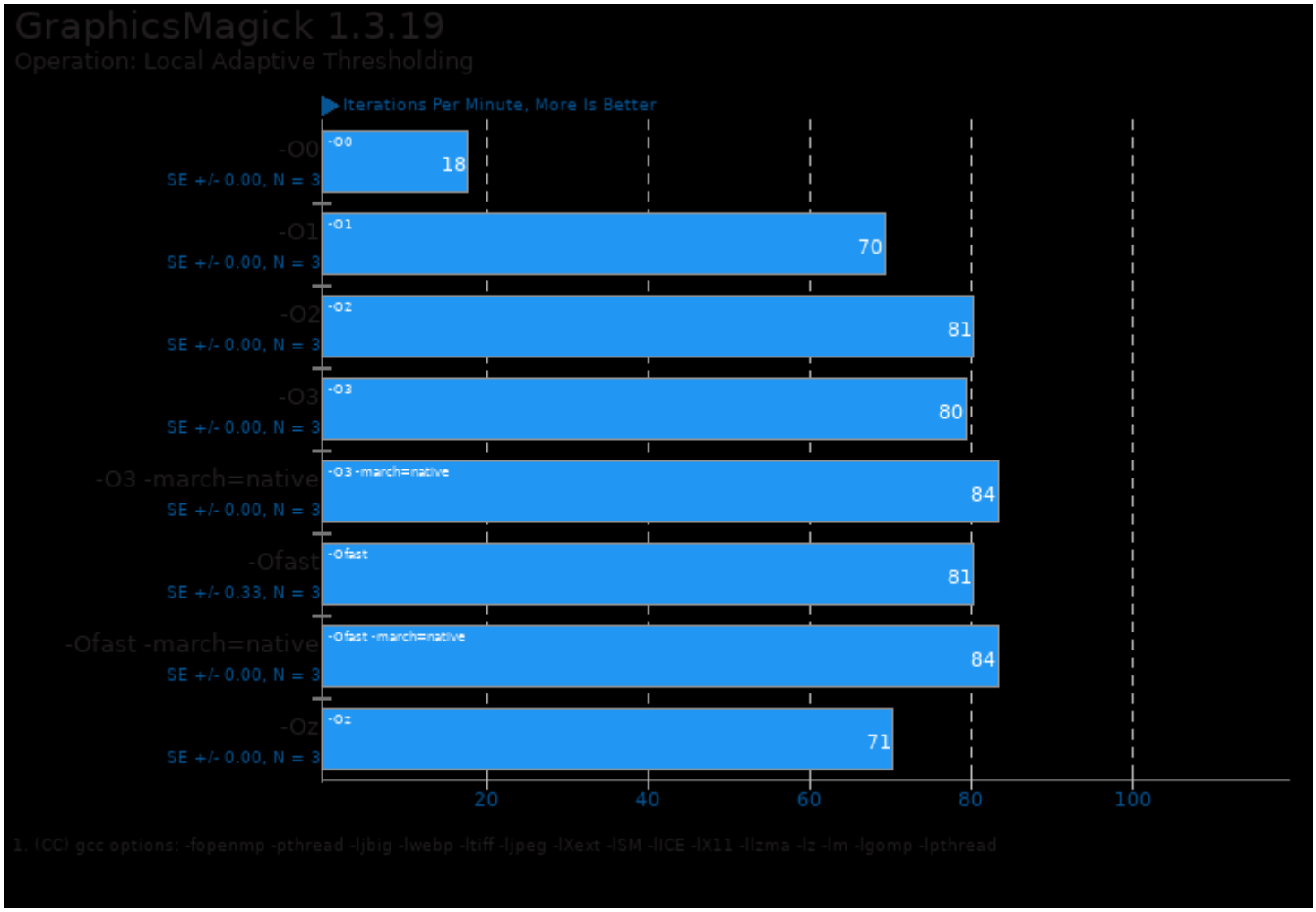
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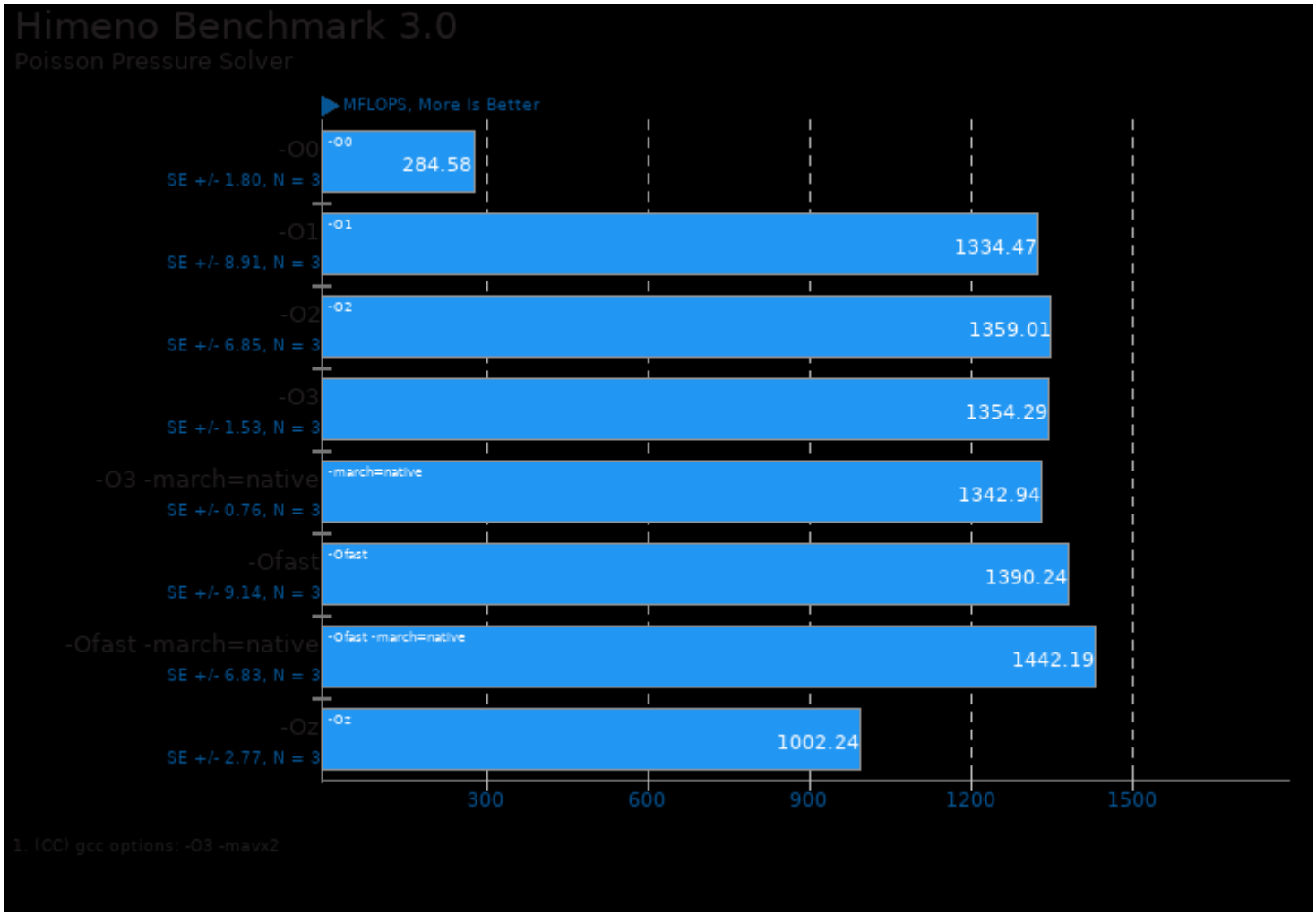
LLVM Clang 3.8 Compiler Tuning Optimization Levels



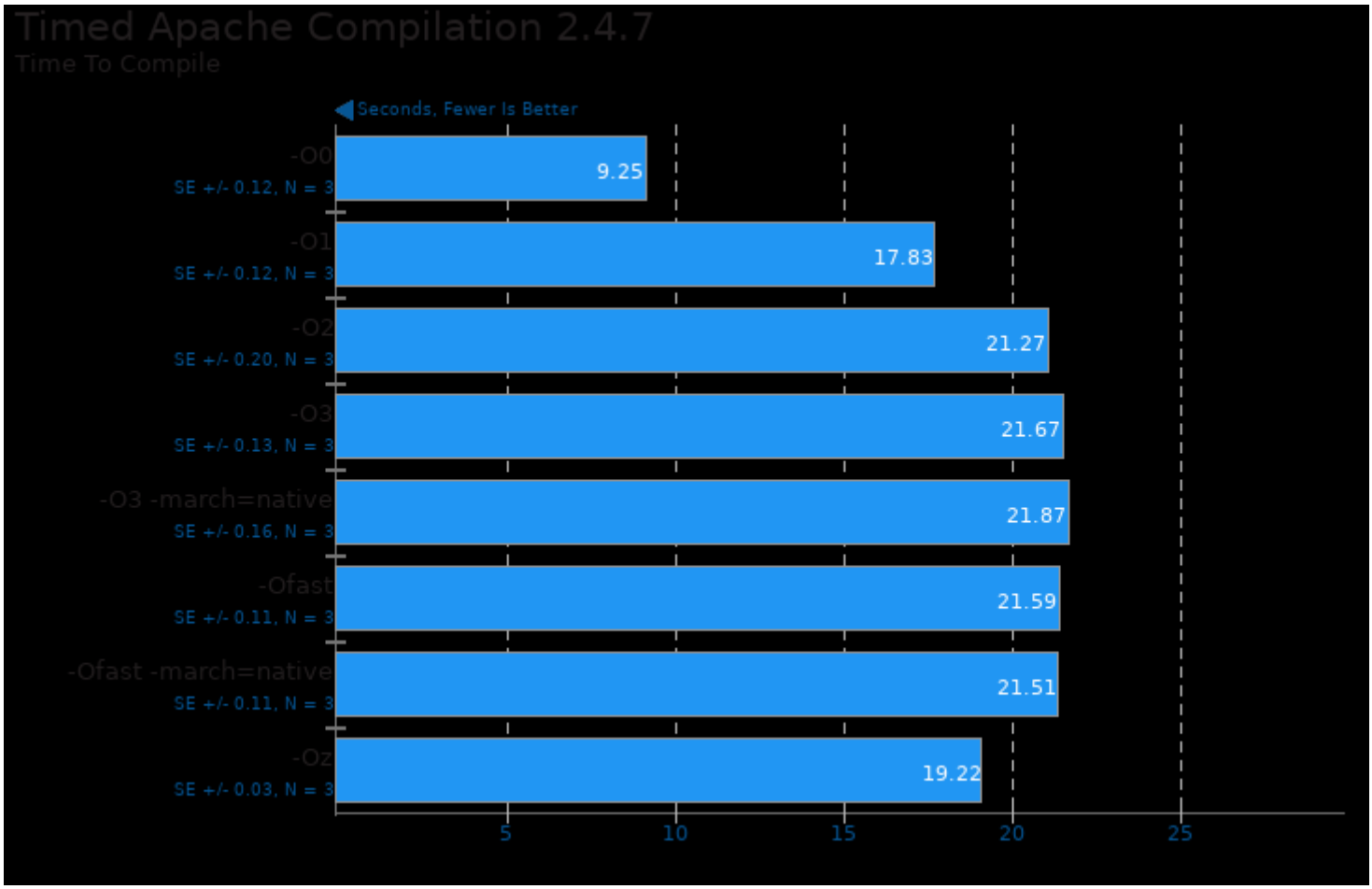
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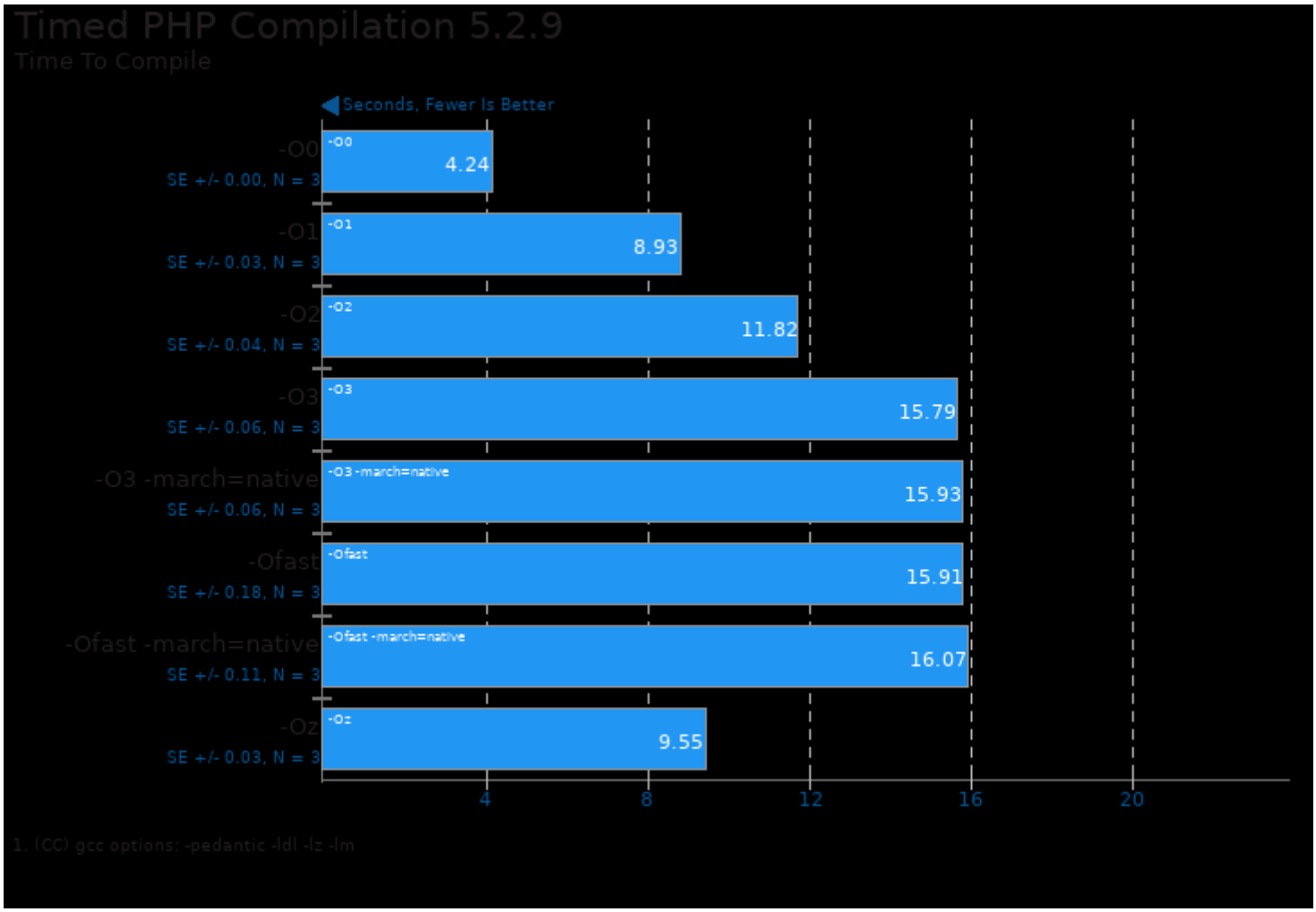
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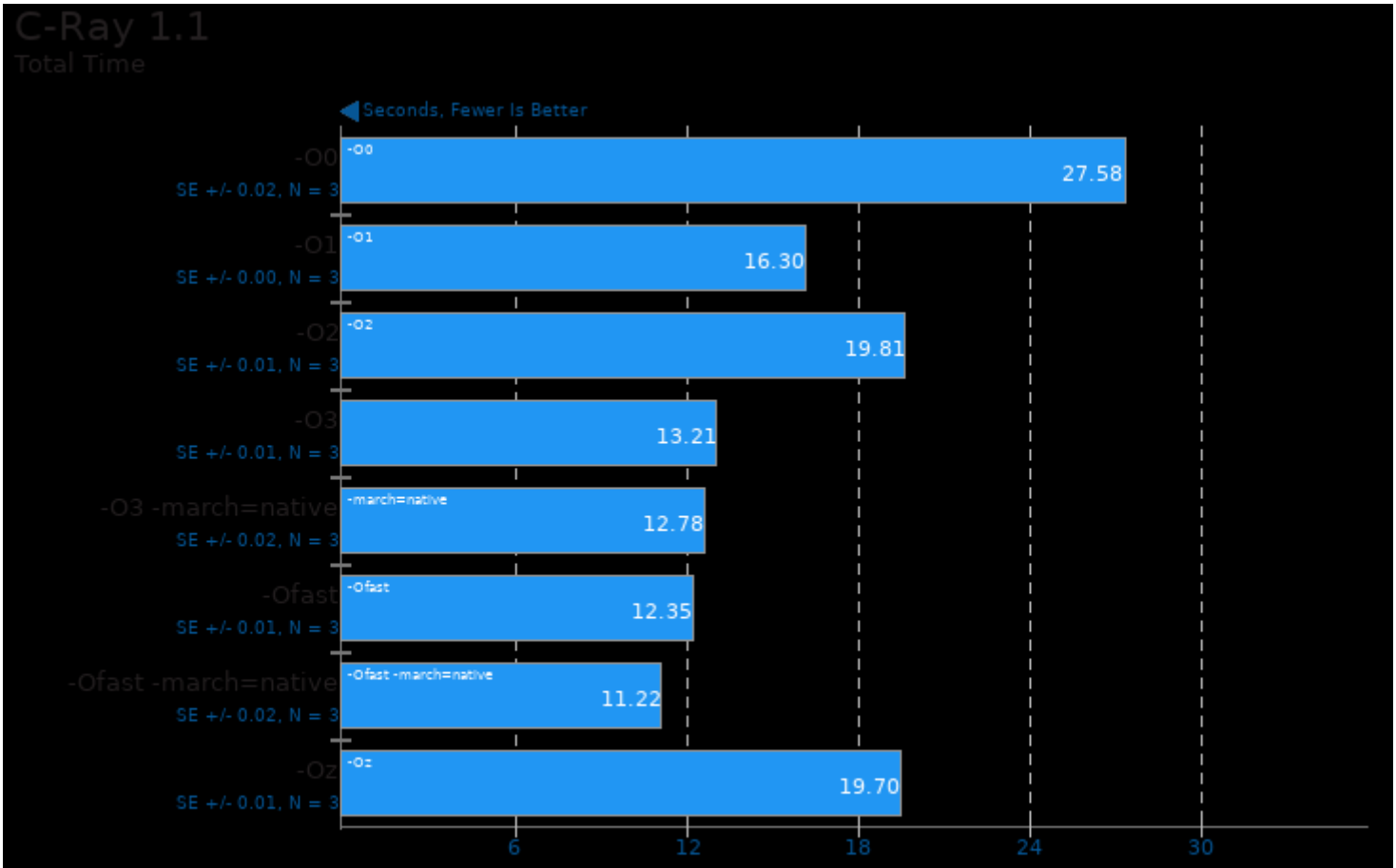
LLVM Clang 3.8 Compiler Tuning Optimization Levels



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C-Ray 1.1

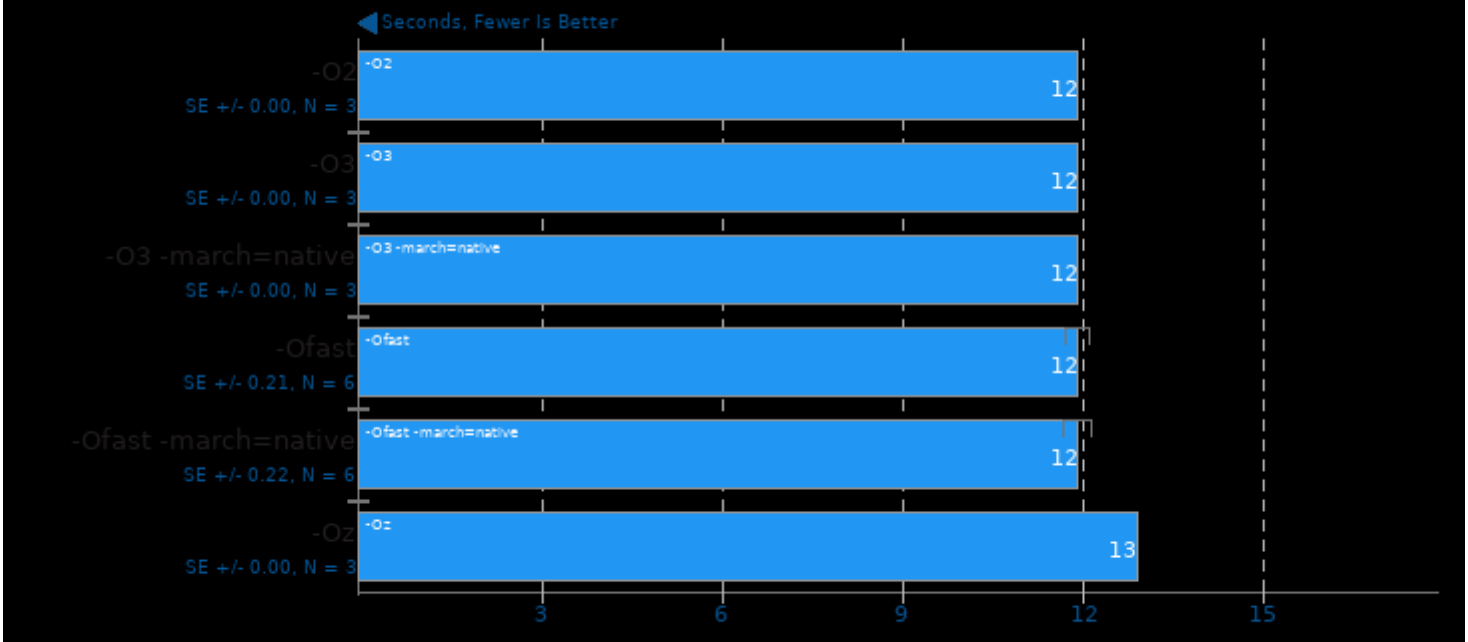
Total Time



1. (CC) gcc options: -lm -lpthread -O3

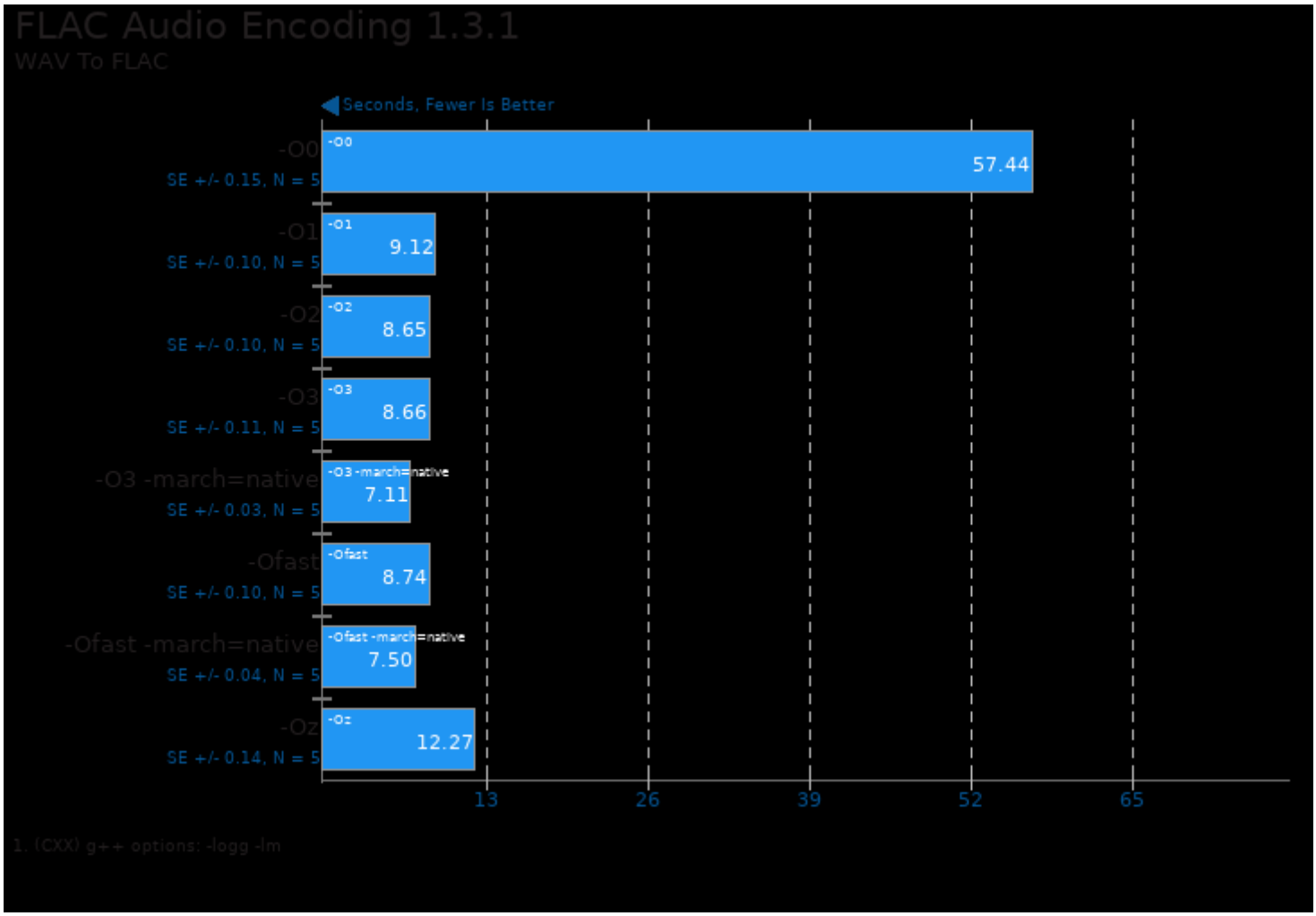
Smallpt 1.0

Global Illumination Renderer; 100 Samples



1. (CXX) g++ options: -fopenmp

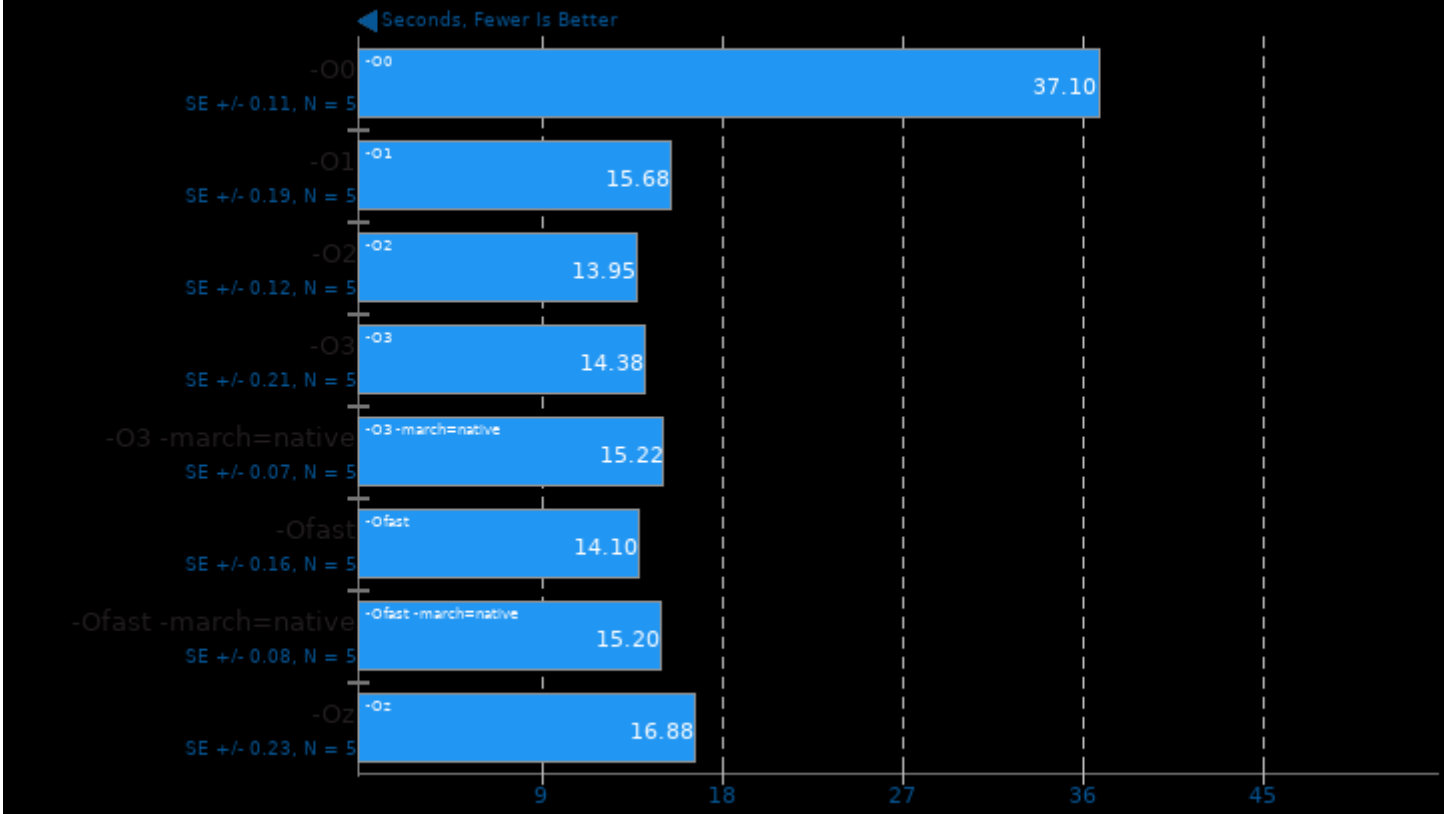
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LAME MP3 Encoding 3.99.3

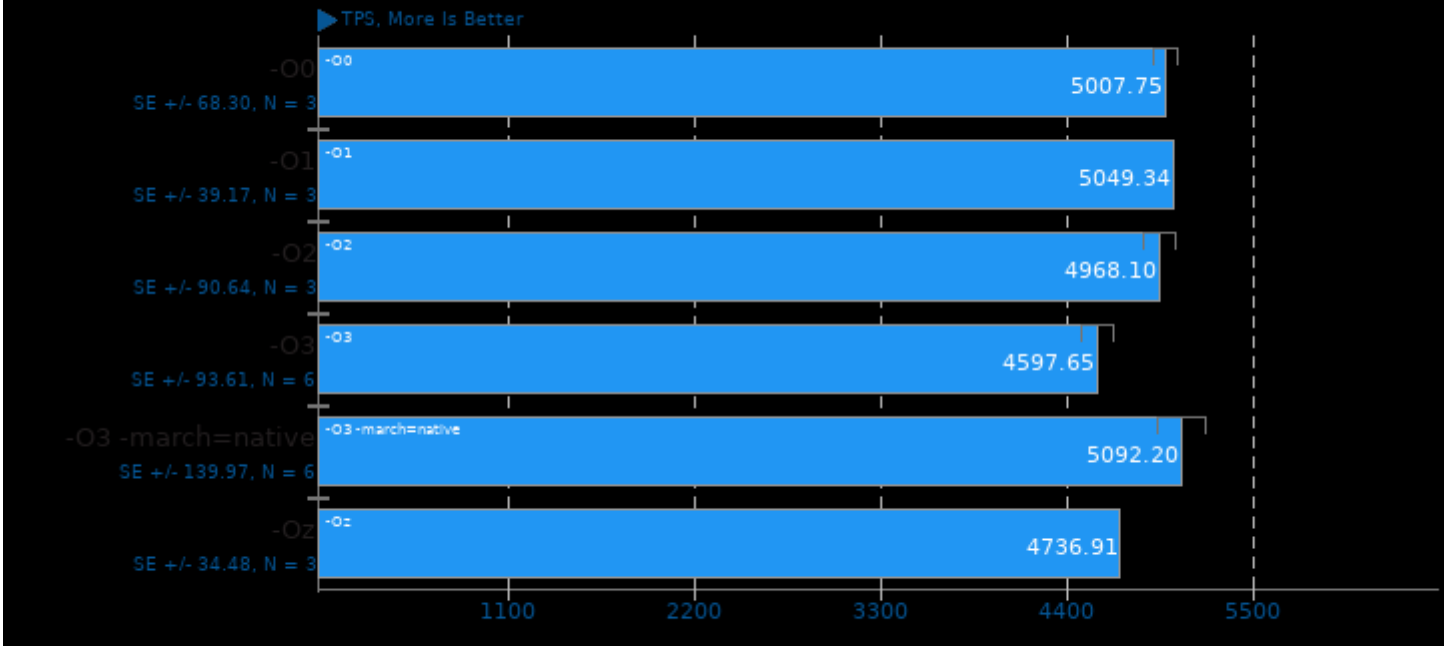
WAV To MP3



1. (CC) gcc options: -pipe -lm

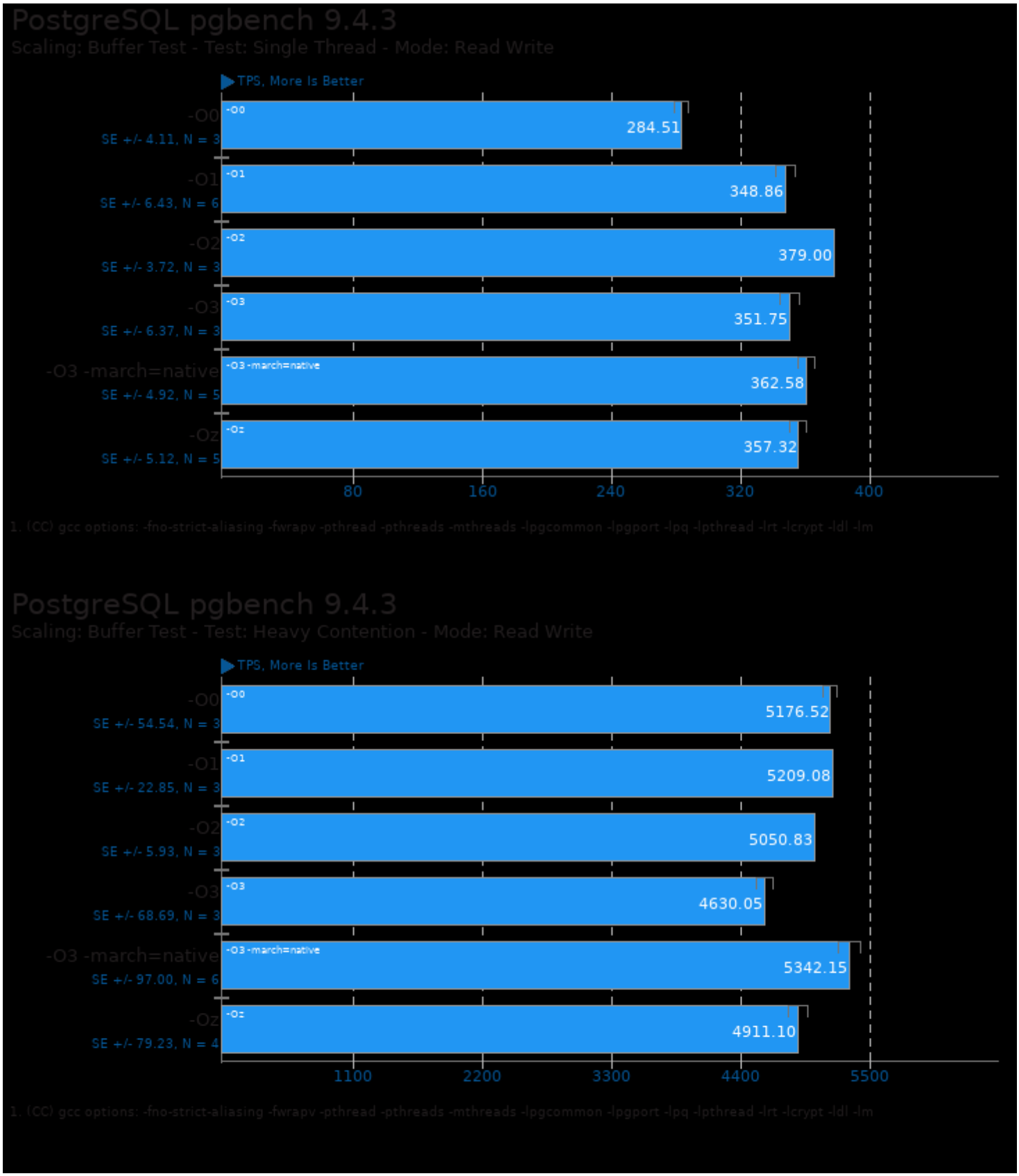
PostgreSQL pgbench 9.4.3

Scaling: Buffer Test - Test: Normal Load - Mode: Read Write

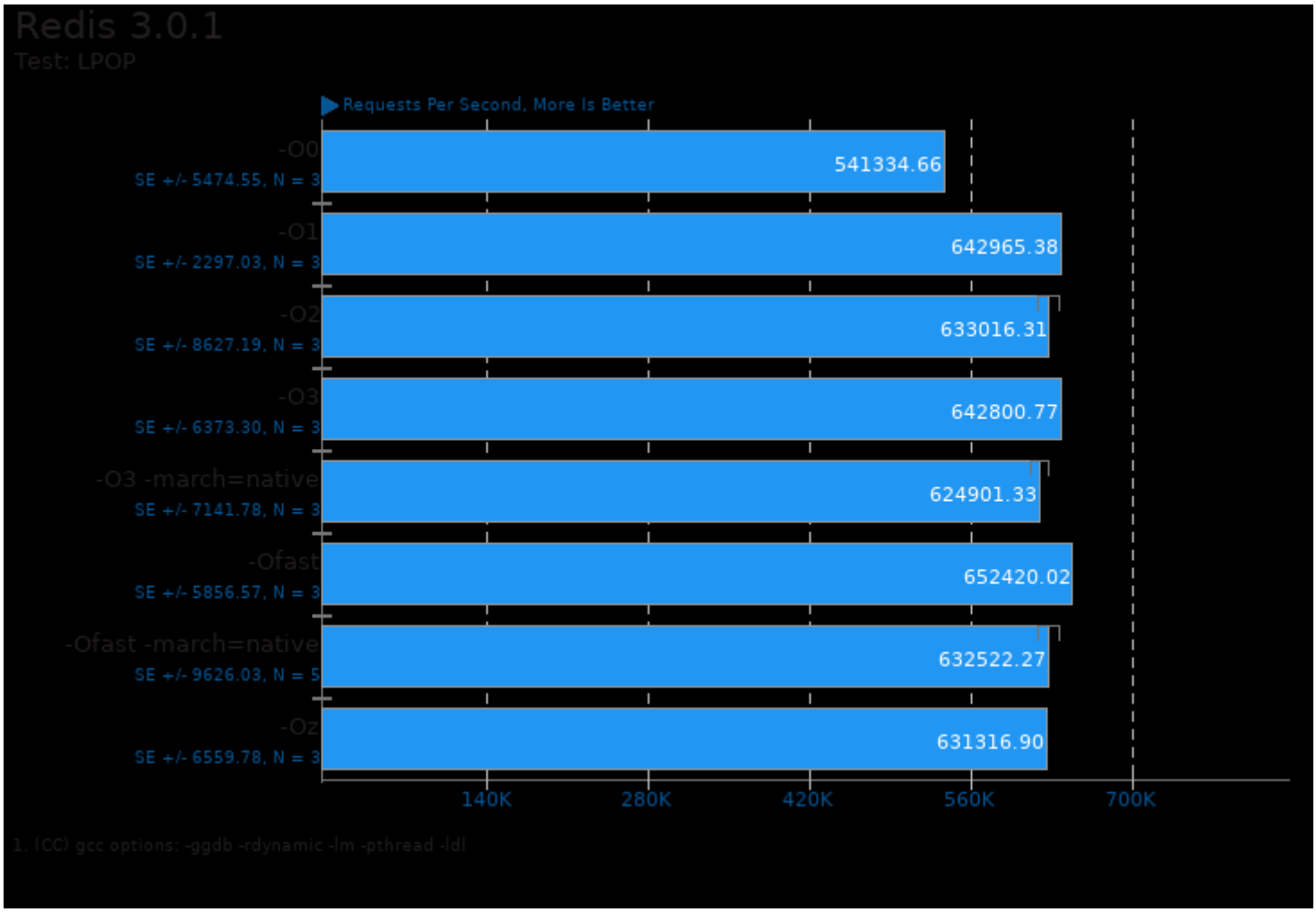


1. (CC) gcc options: -fno-strict-aliasing -fwrapv -pthread -pthreads -mthreads -lpgcommon -lpgport -lpq -lpthread -lrt -lcrypt -ldl -lm

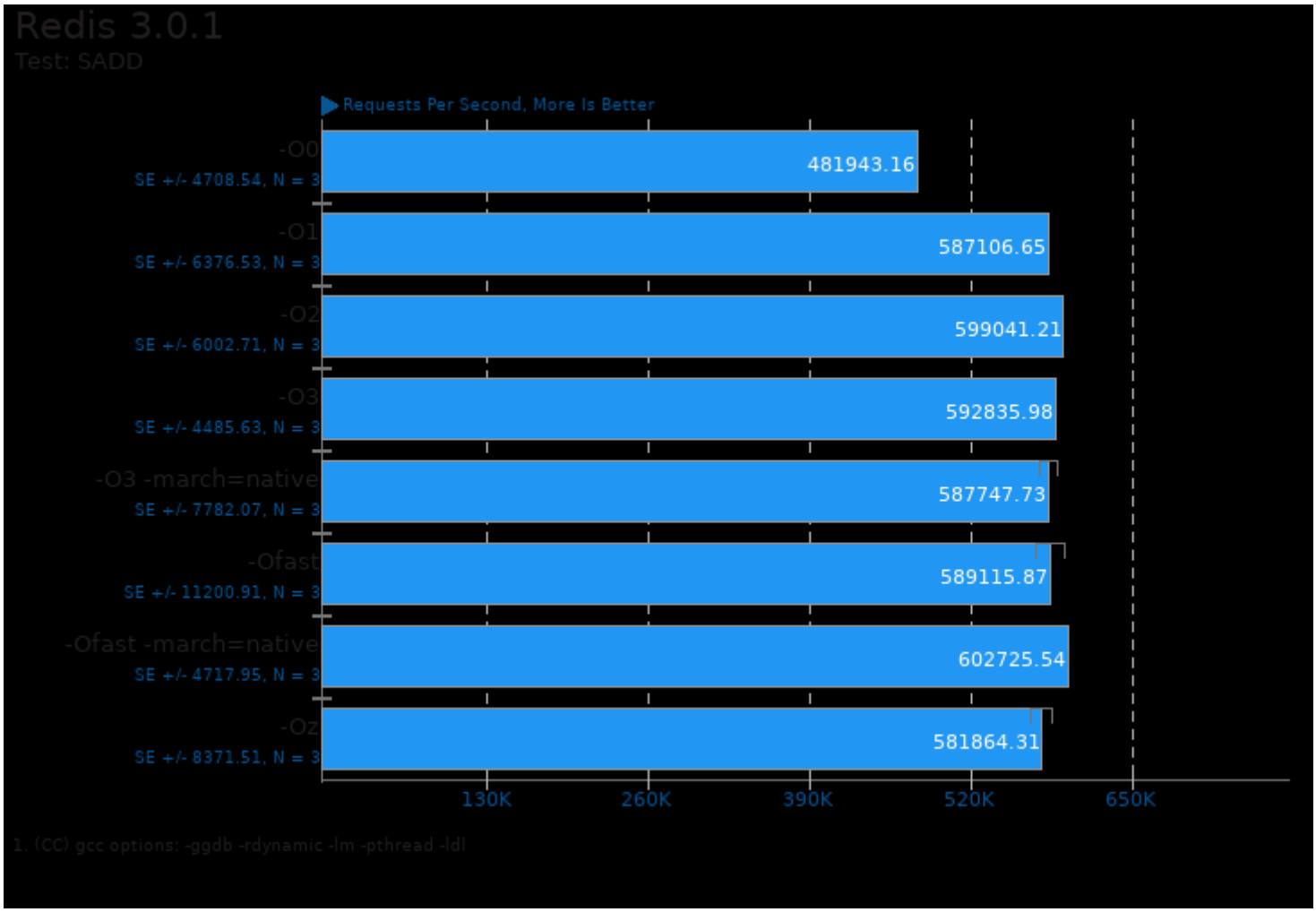
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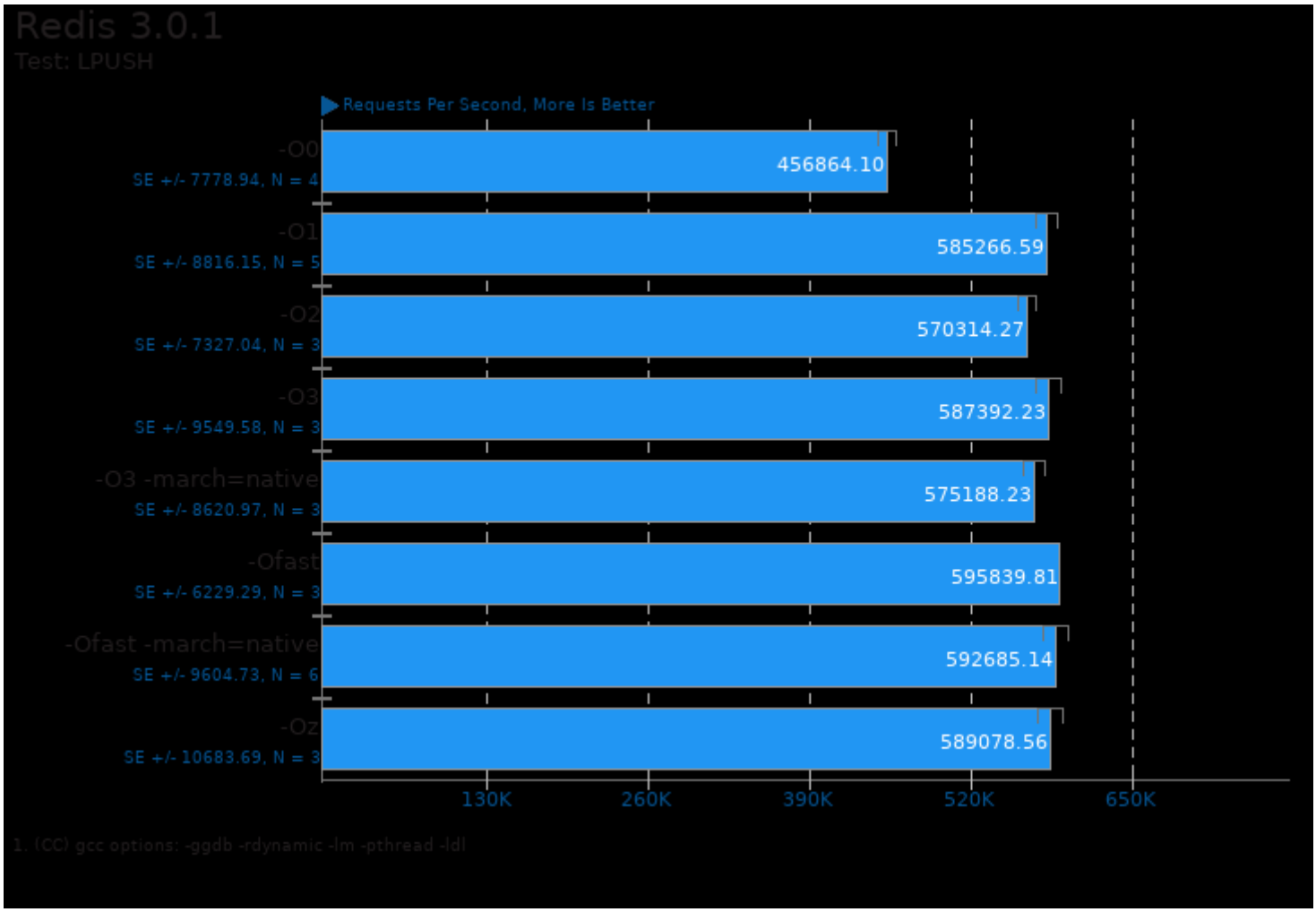
LLVM Clang 3.8 Compiler Tuning Optimization Levels



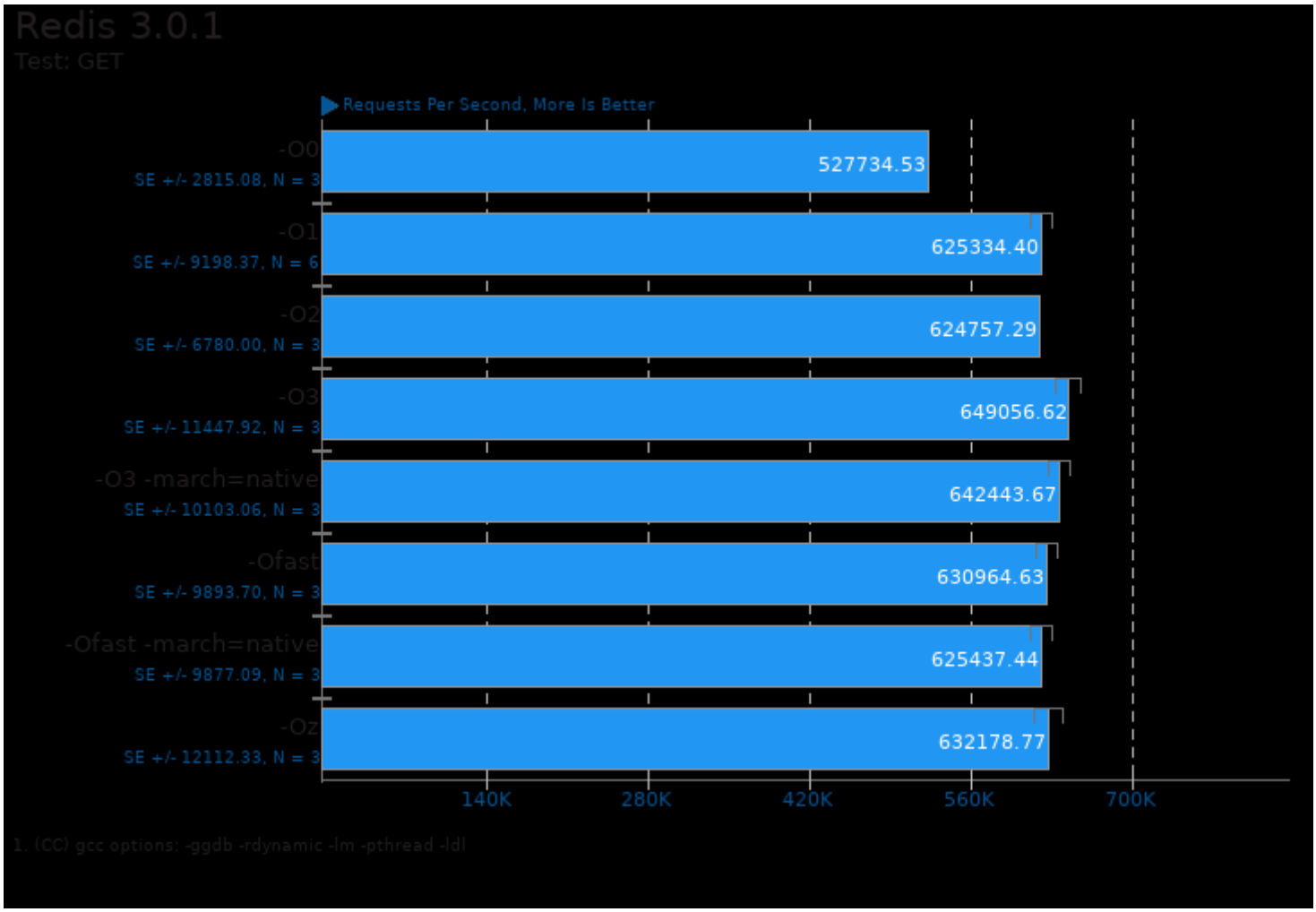
LLVM Clang 3.8 Compiler Tuning Optimization Levels



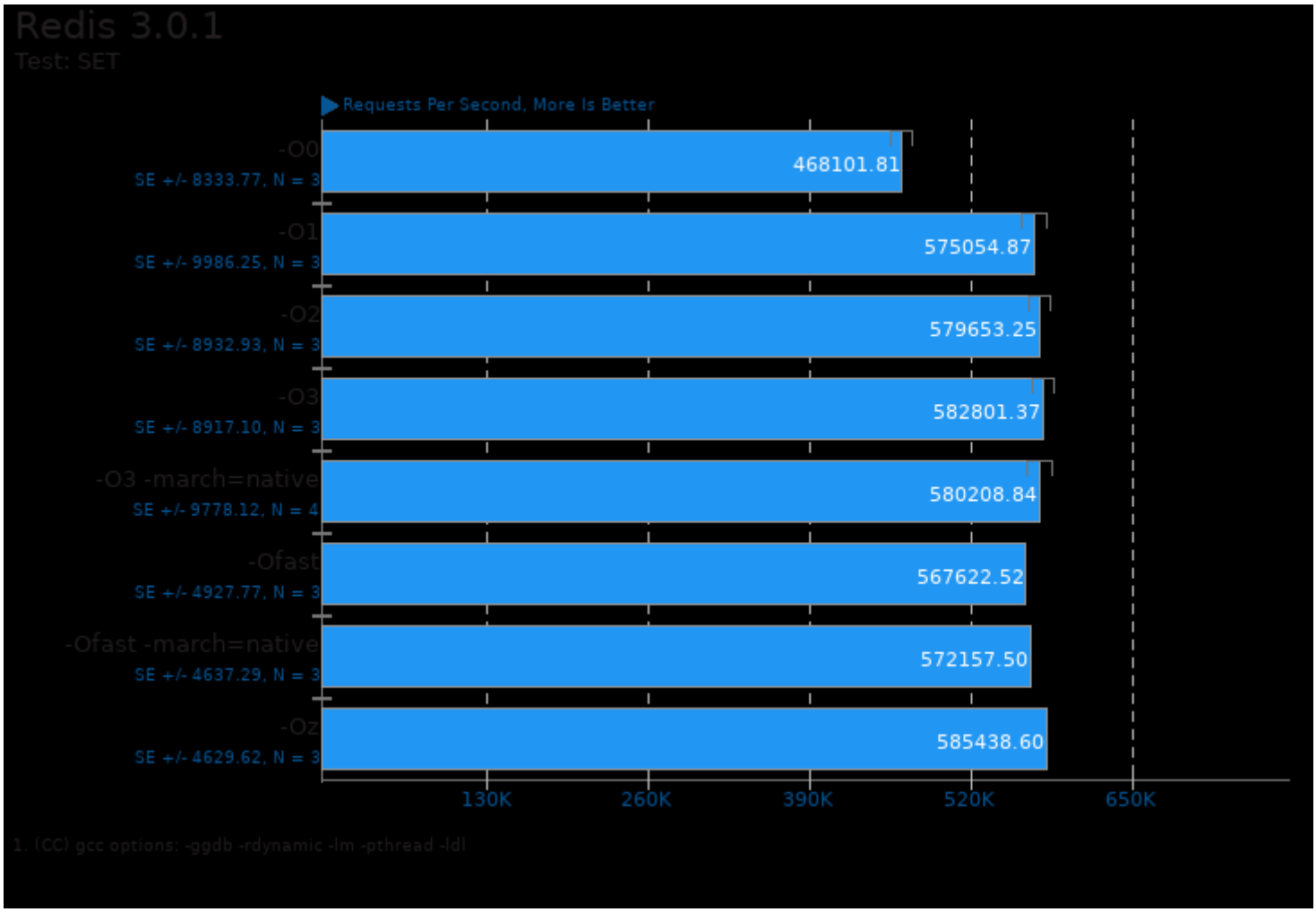
LLVM Clang 3.8 Compiler Tuning Optimization Levels



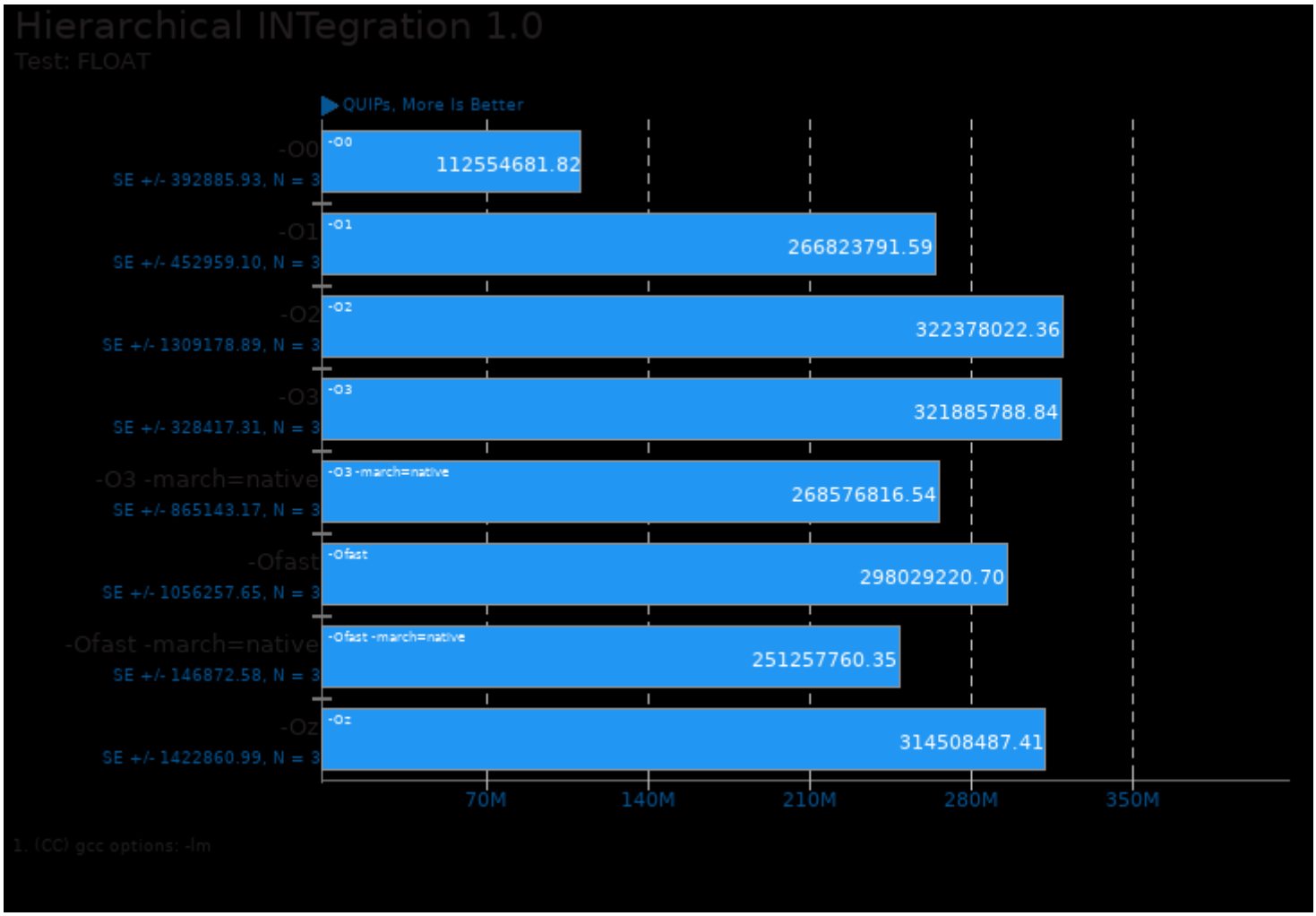
LLVM Clang 3.8 Compiler Tuning Optimization Levels



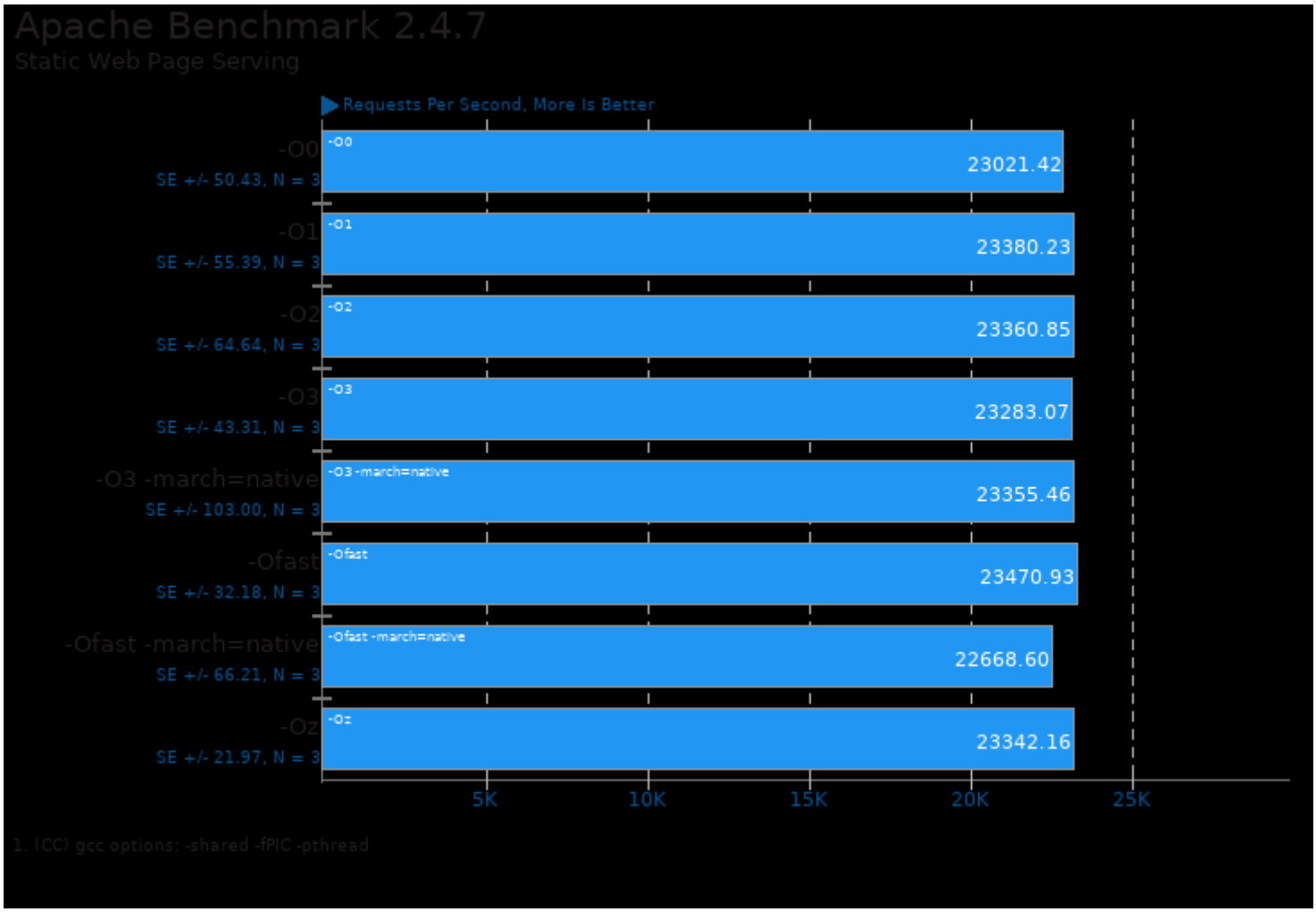
LLVM Clang 3.8 Compiler Tuning Optimization Levels



LLVM Clang 3.8 Compiler Tuning Optimization Levels

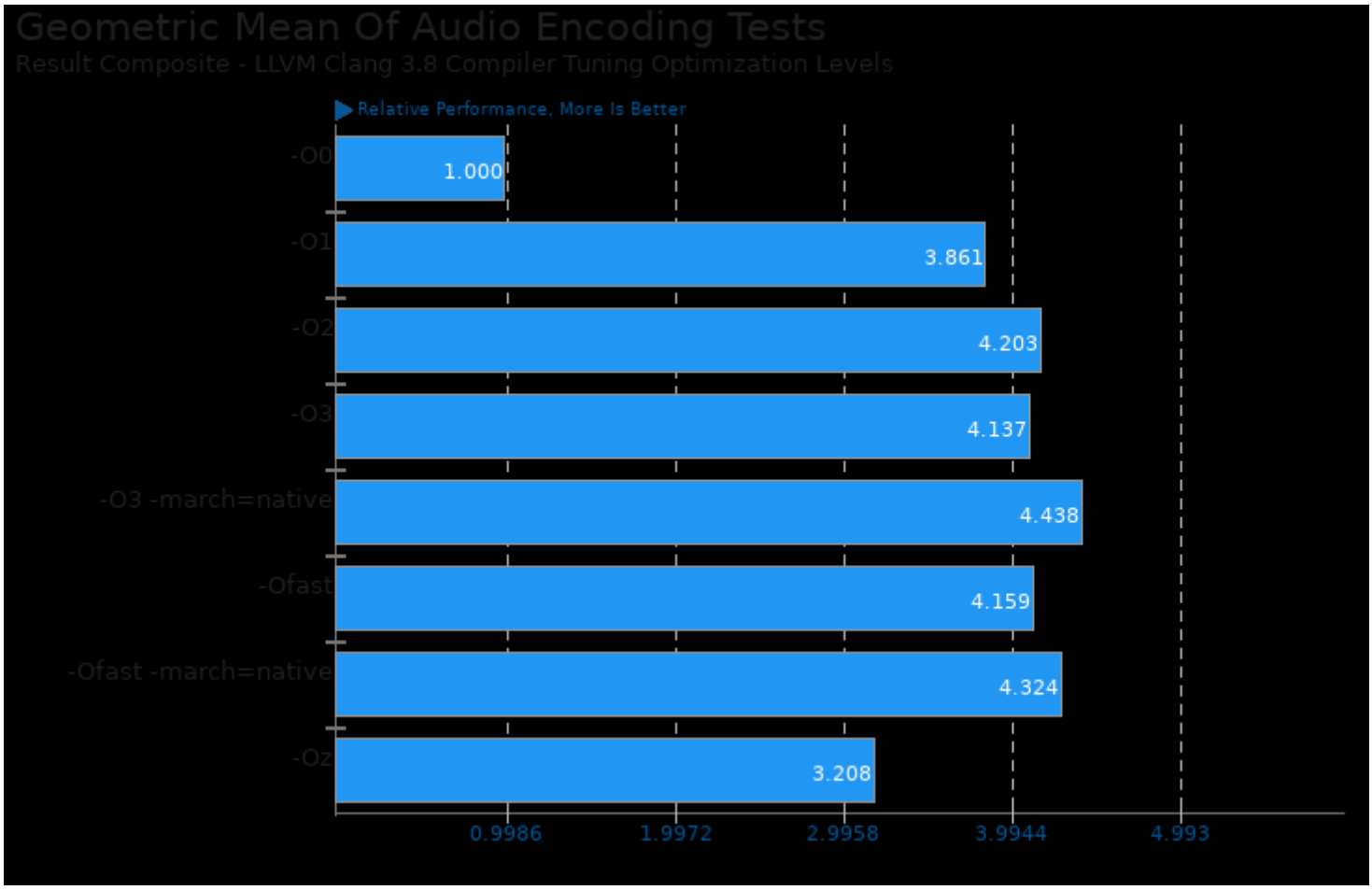


LLVM Clang 3.8 Compiler Tuning Optimization Levels



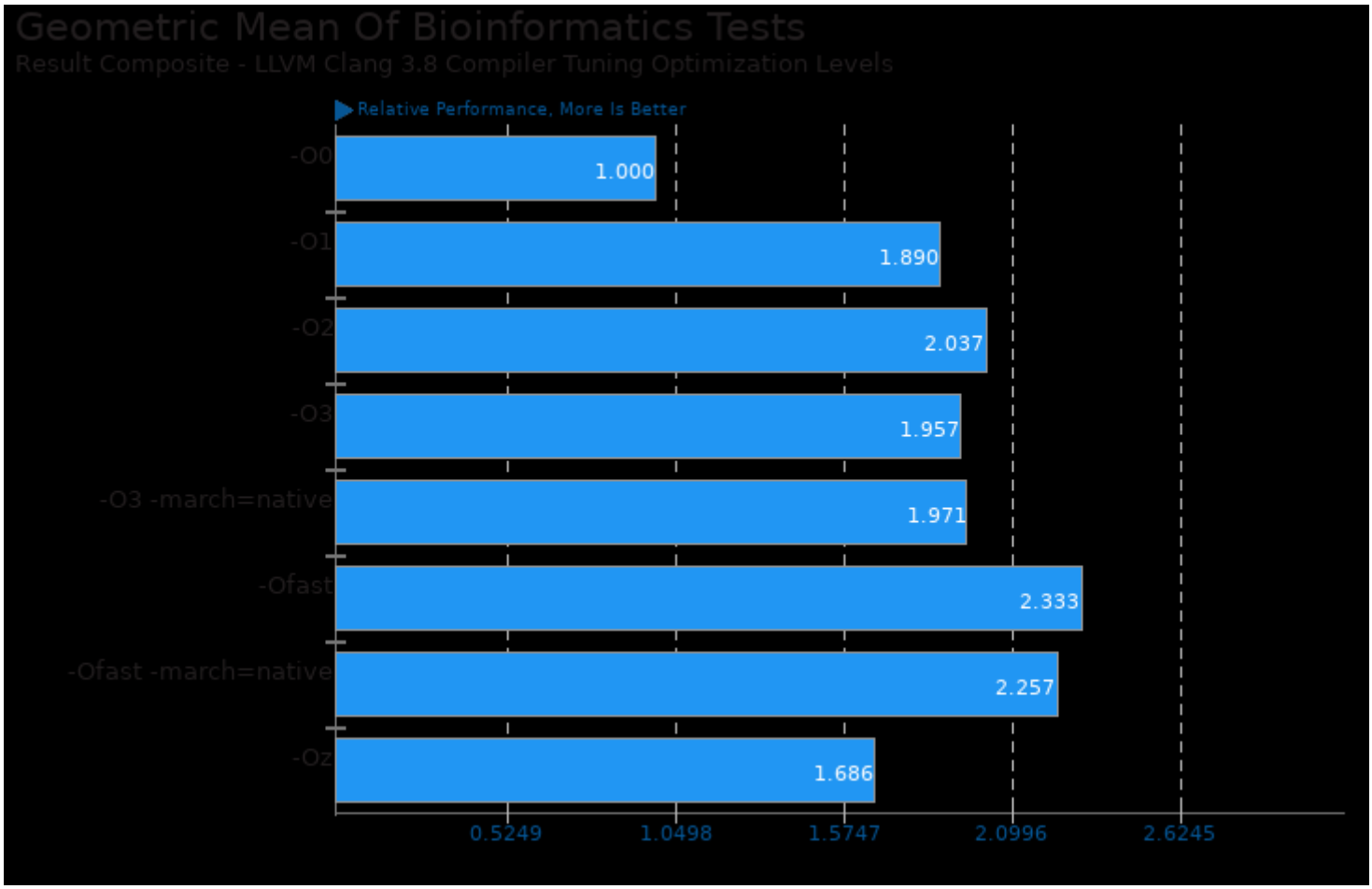
LLVM Clang 3.8 Compiler Tuning Optimization Levels

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



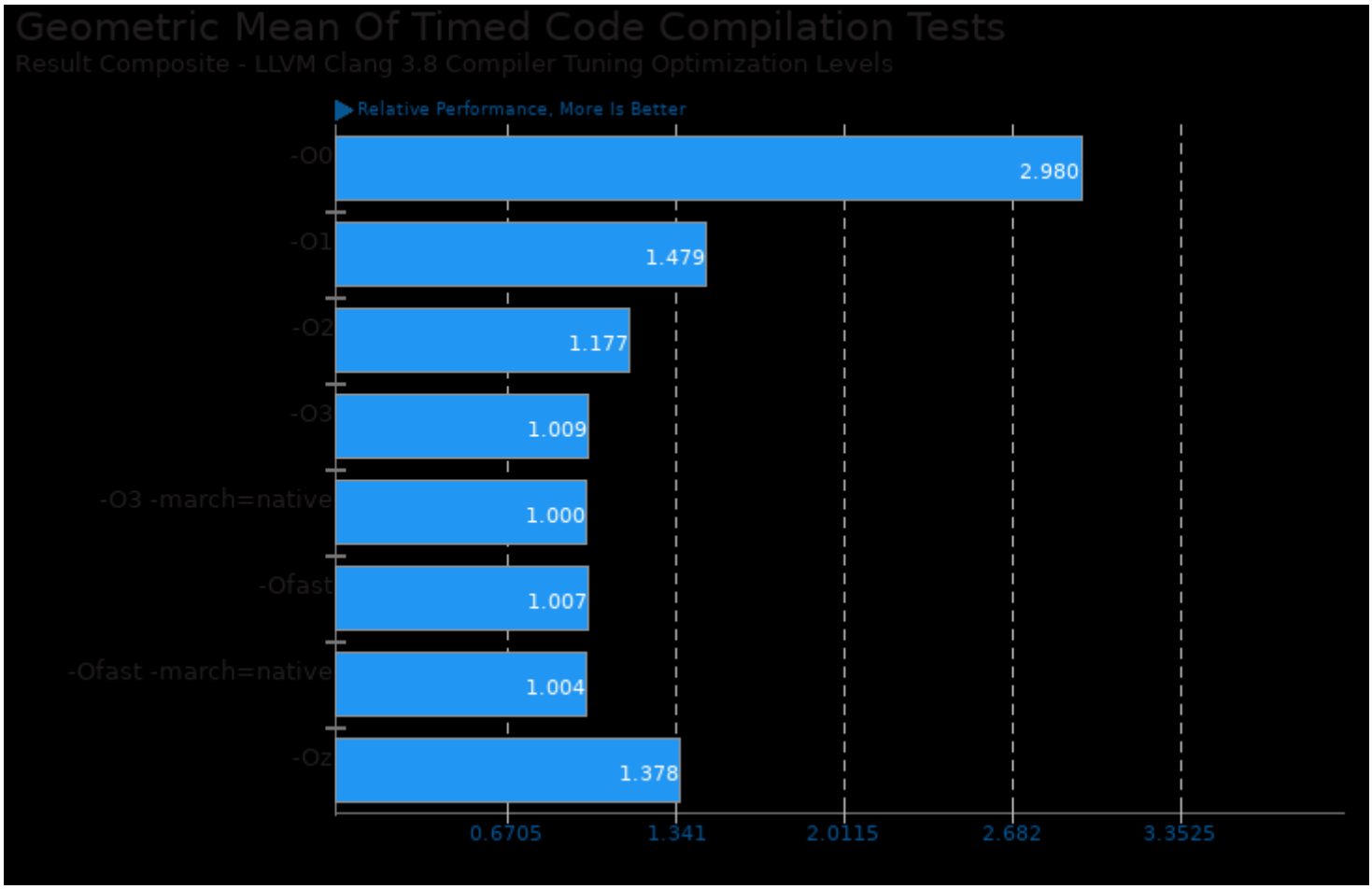
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac

LLVM Clang 3.8 Compiler Tuning Optimization Levels



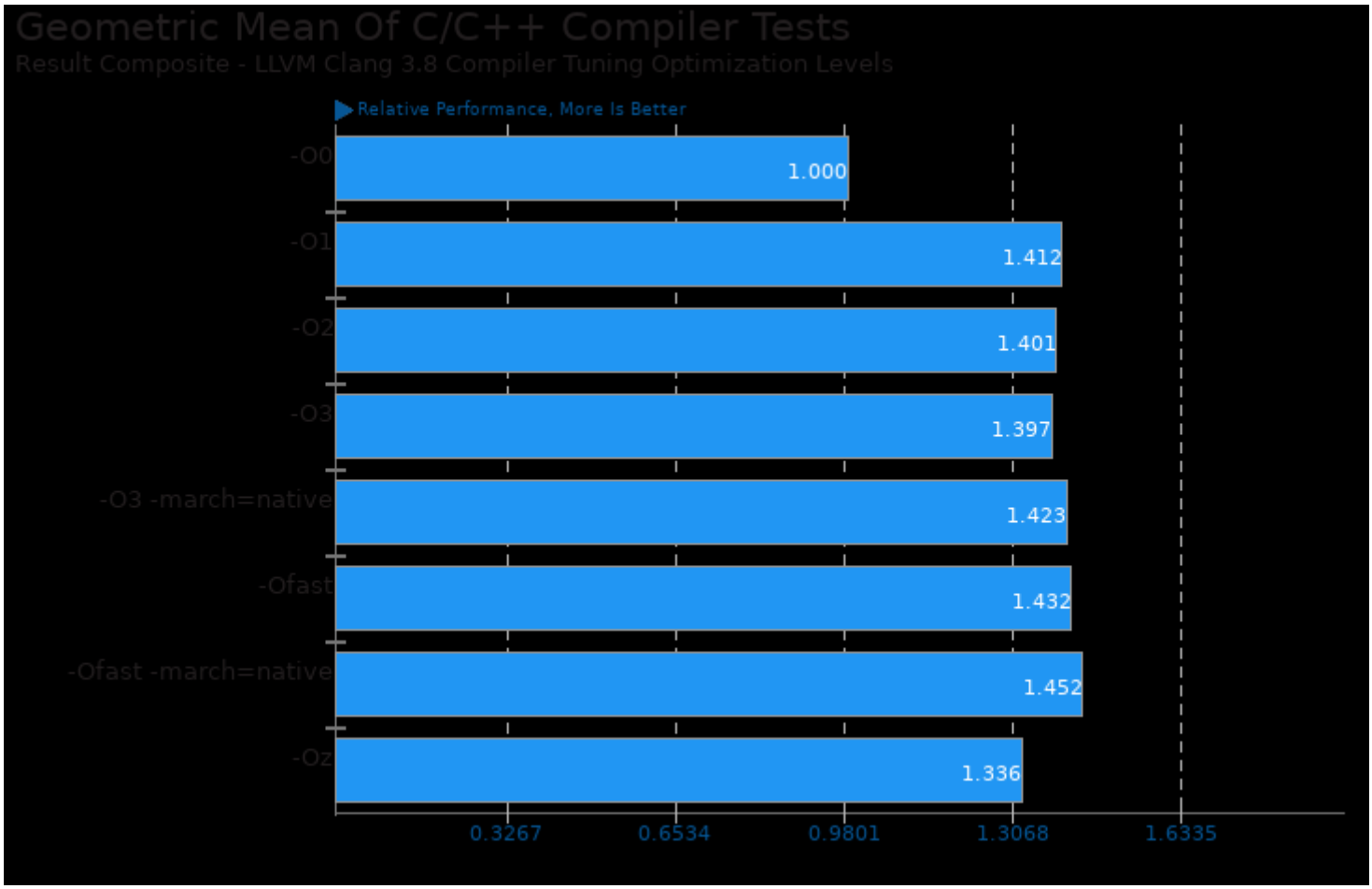
Geometric mean based upon tests: pts/himeno and pts/hmmer

LLVM Clang 3.8 Compiler Tuning Optimization Levels



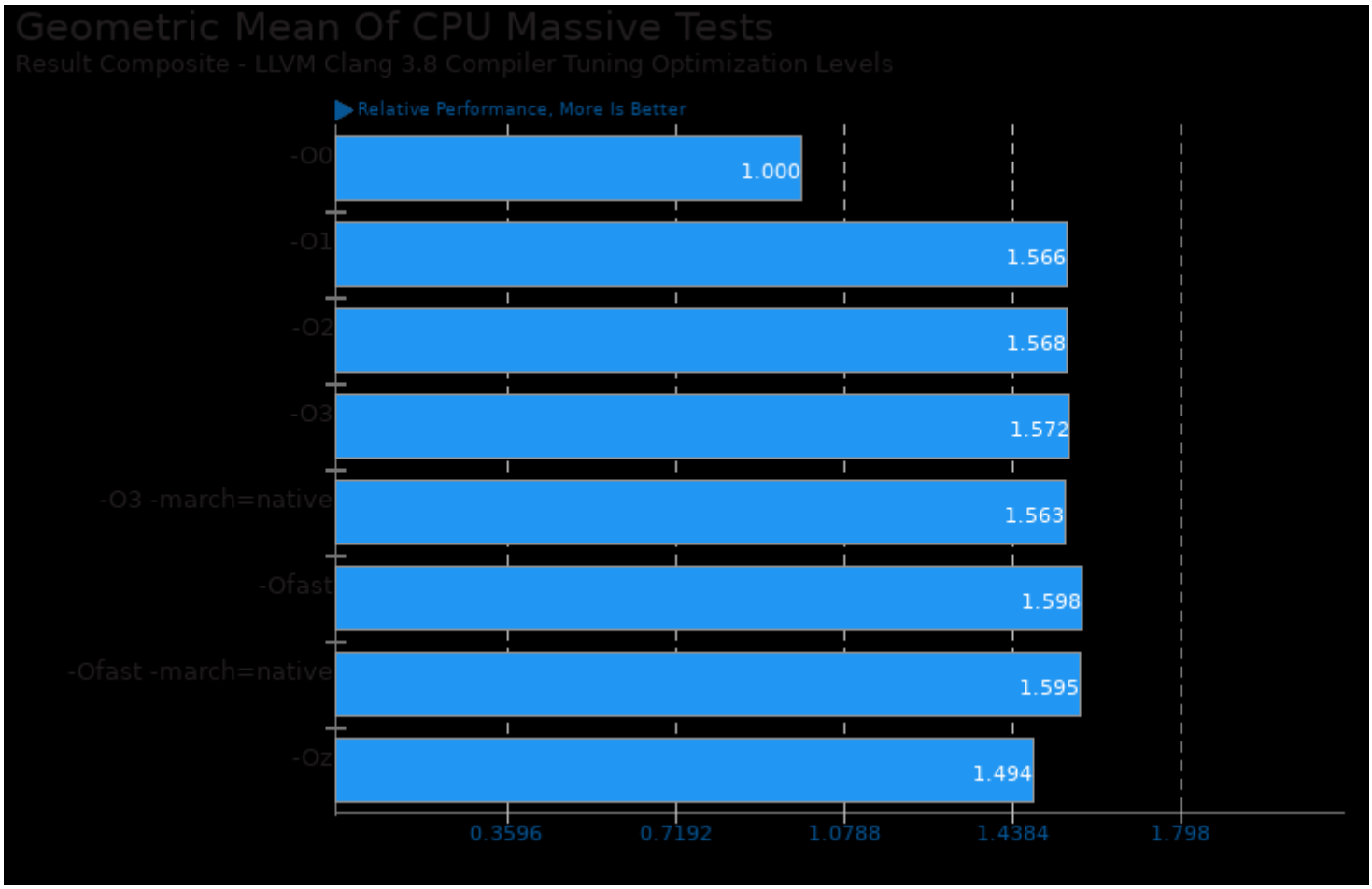
Geometric mean based upon tests: pts/build-apache and pts/build-php

LLVM Clang 3.8 Compiler Tuning Optimization Levels



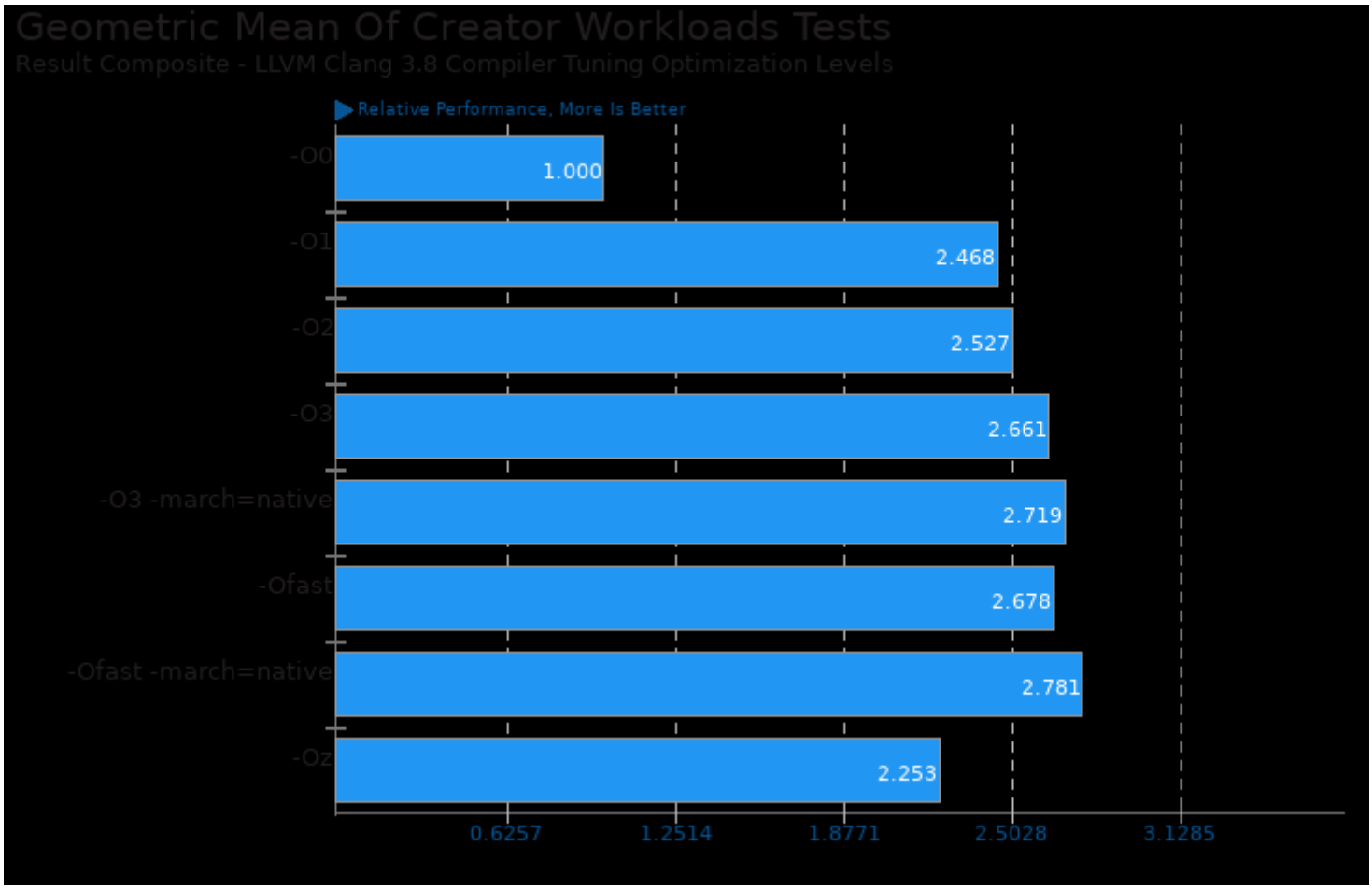
Geometric mean based upon tests: pts/scimark2, pts/graphics-magick, pts/himeno, pts/hmmer, pts/build-php, pts/c-ray, pts/encode-mp3, pts/encode-flac, pts/pgbench, pts/apache and pts/build-apache

LLVM Clang 3.8 Compiler Tuning Optimization Levels



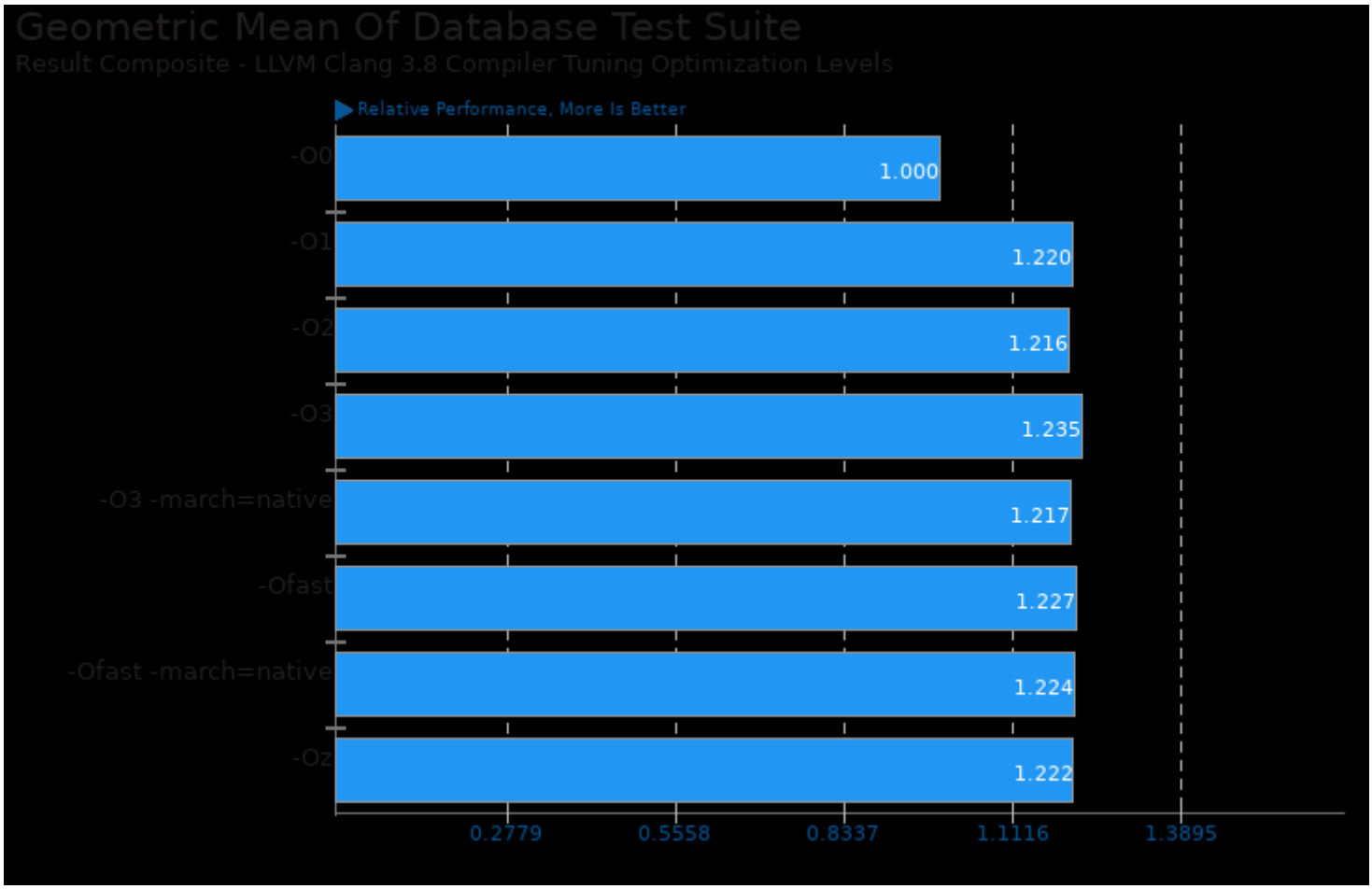
Geometric mean based upon tests: pts/apache, pts/build-apache, pts/build-php, pts/c-ray, pts/encode-flac, pts/encode-mp3, pts/graphics-magick, pts/himeno, pts/hint, pts/hmmer, pts/pgbench and pts/redis

LLVM Clang 3.8 Compiler Tuning Optimization Levels



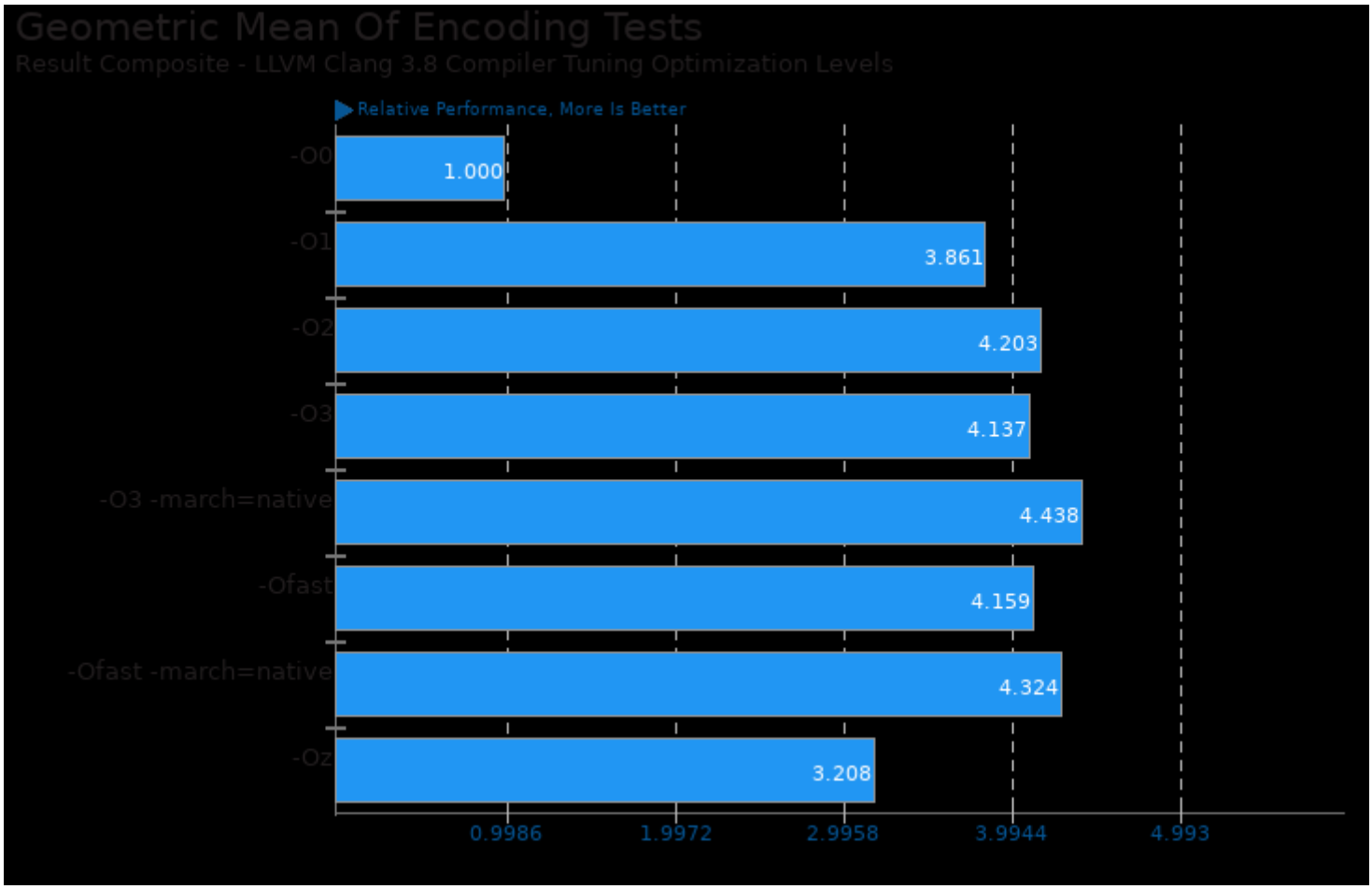
Geometric mean based upon tests: pts/c-ray, pts/smallpt, pts/encode-mp3, pts/encode-flac and pts/graphics-magick

LLVM Clang 3.8 Compiler Tuning Optimization Levels



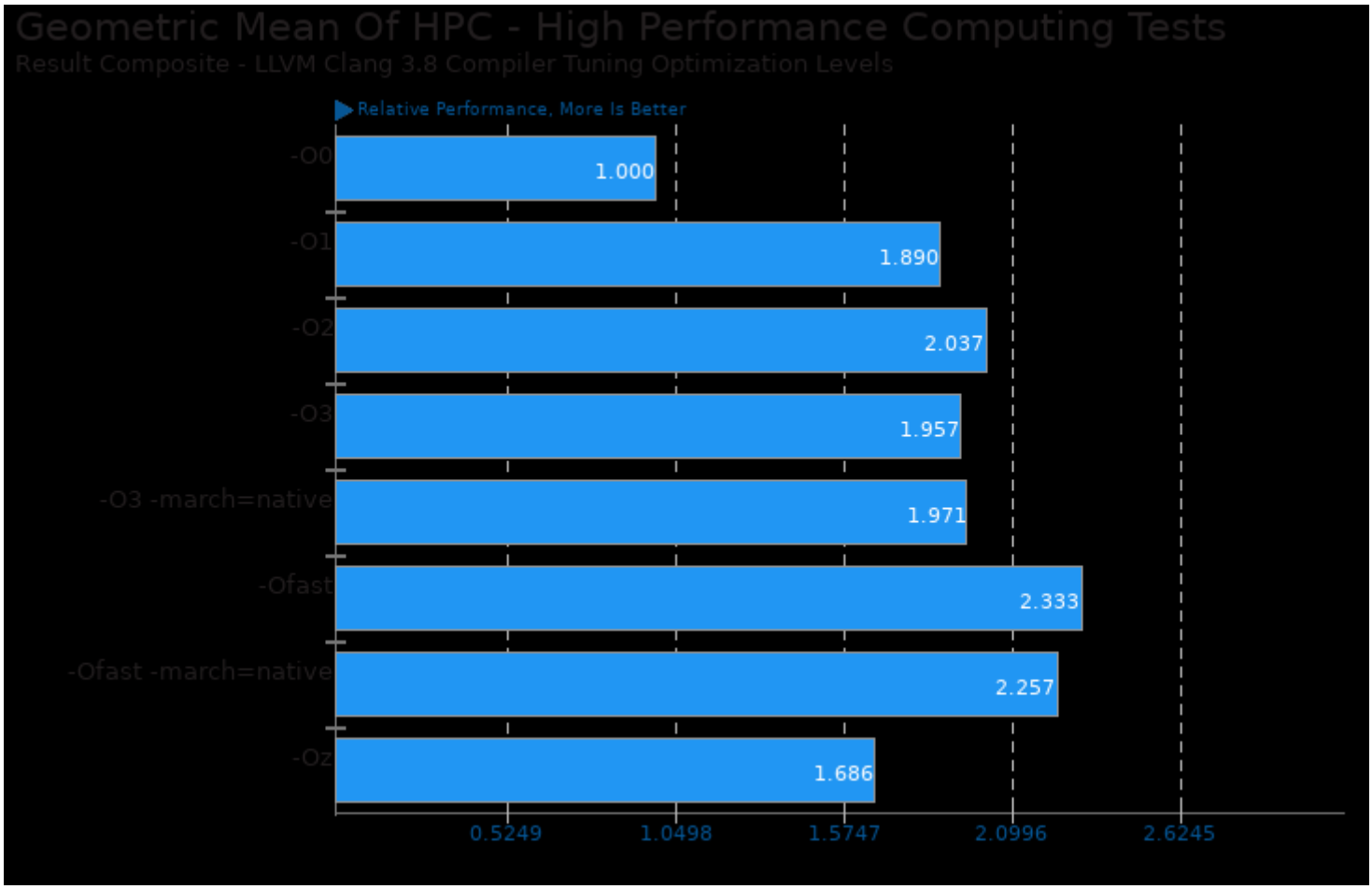
Geometric mean based upon tests: pts/redis and pts/pgbench

LLVM Clang 3.8 Compiler Tuning Optimization Levels



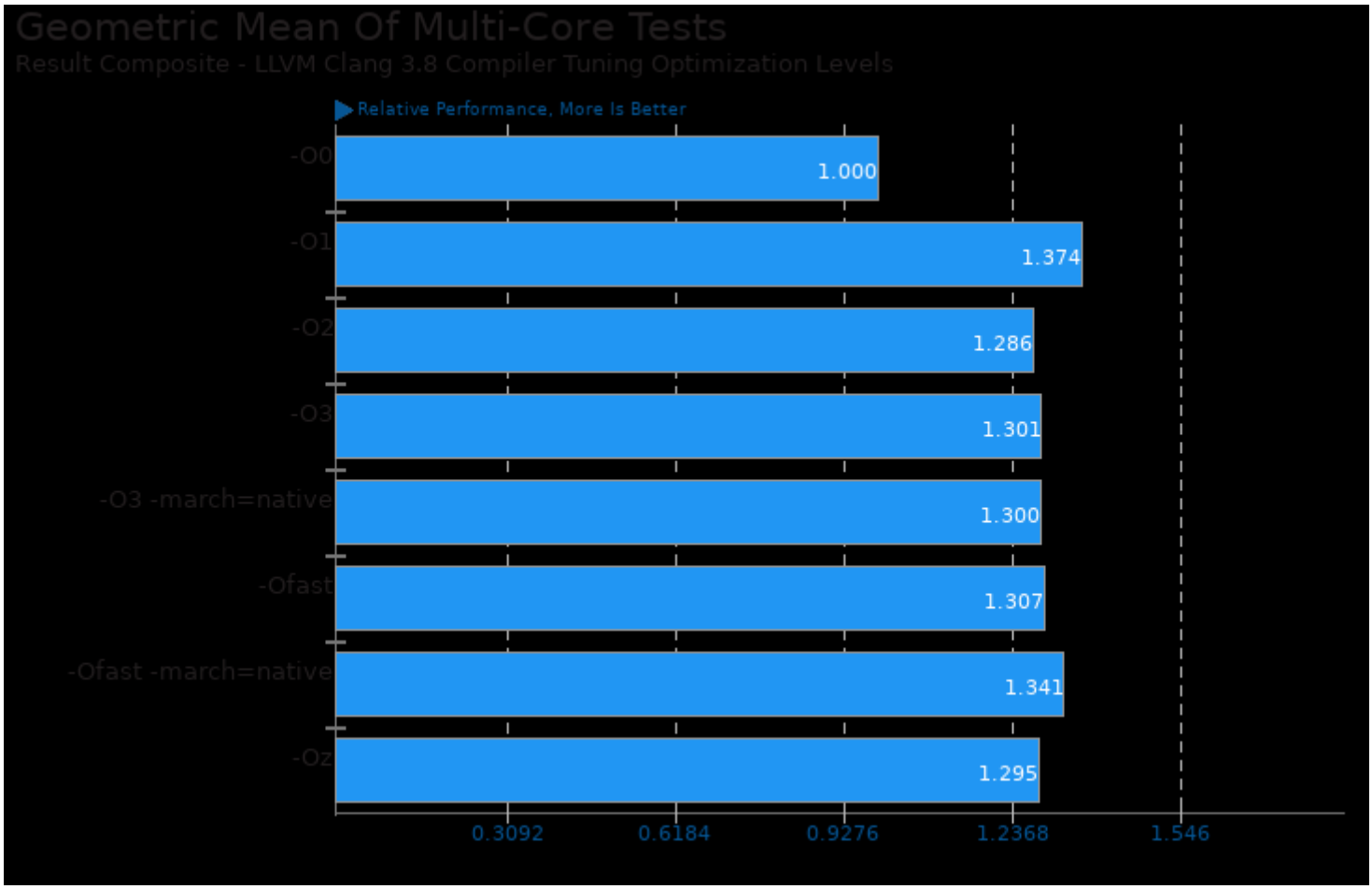
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac

LLVM Clang 3.8 Compiler Tuning Optimization Levels



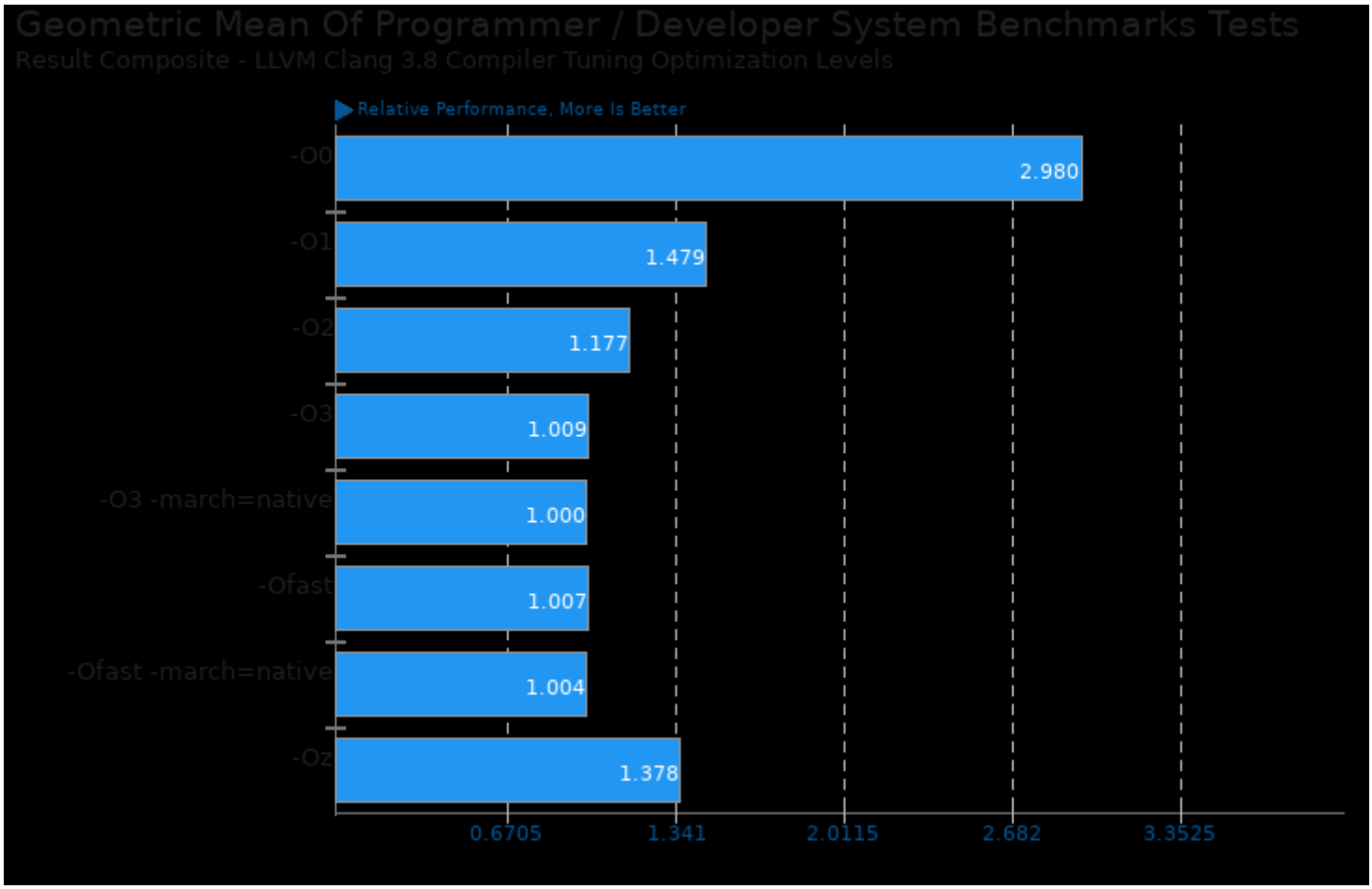
Geometric mean based upon tests: pts/himeno and pts/hmmer

LLVM Clang 3.8 Compiler Tuning Optimization Levels



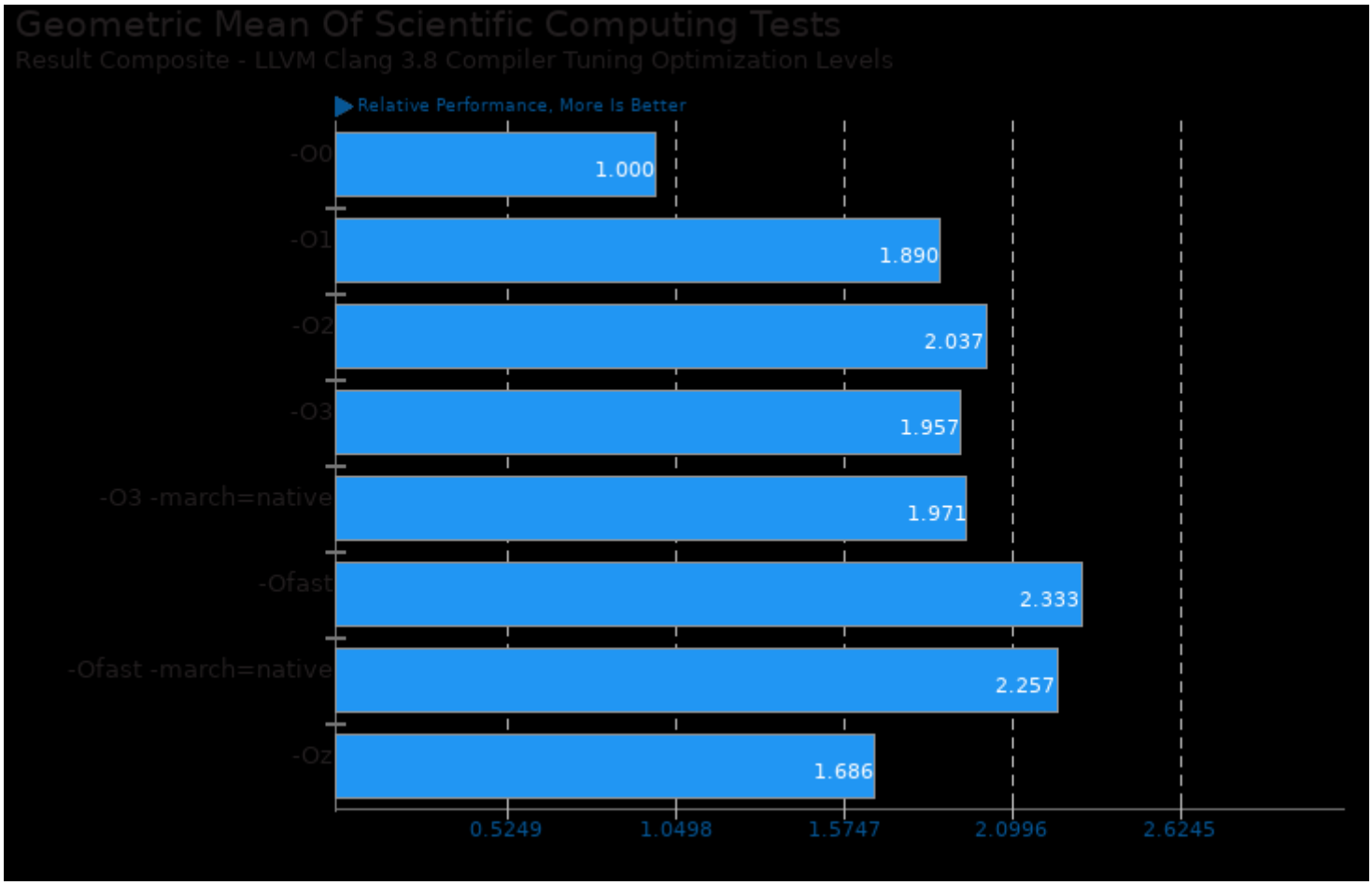
Geometric mean based upon tests: pts/c-ray, pts/smallpt, pts/graphics-magick, pts/build-apache, pts/build-php and pts/pgbench

LLVM Clang 3.8 Compiler Tuning Optimization Levels



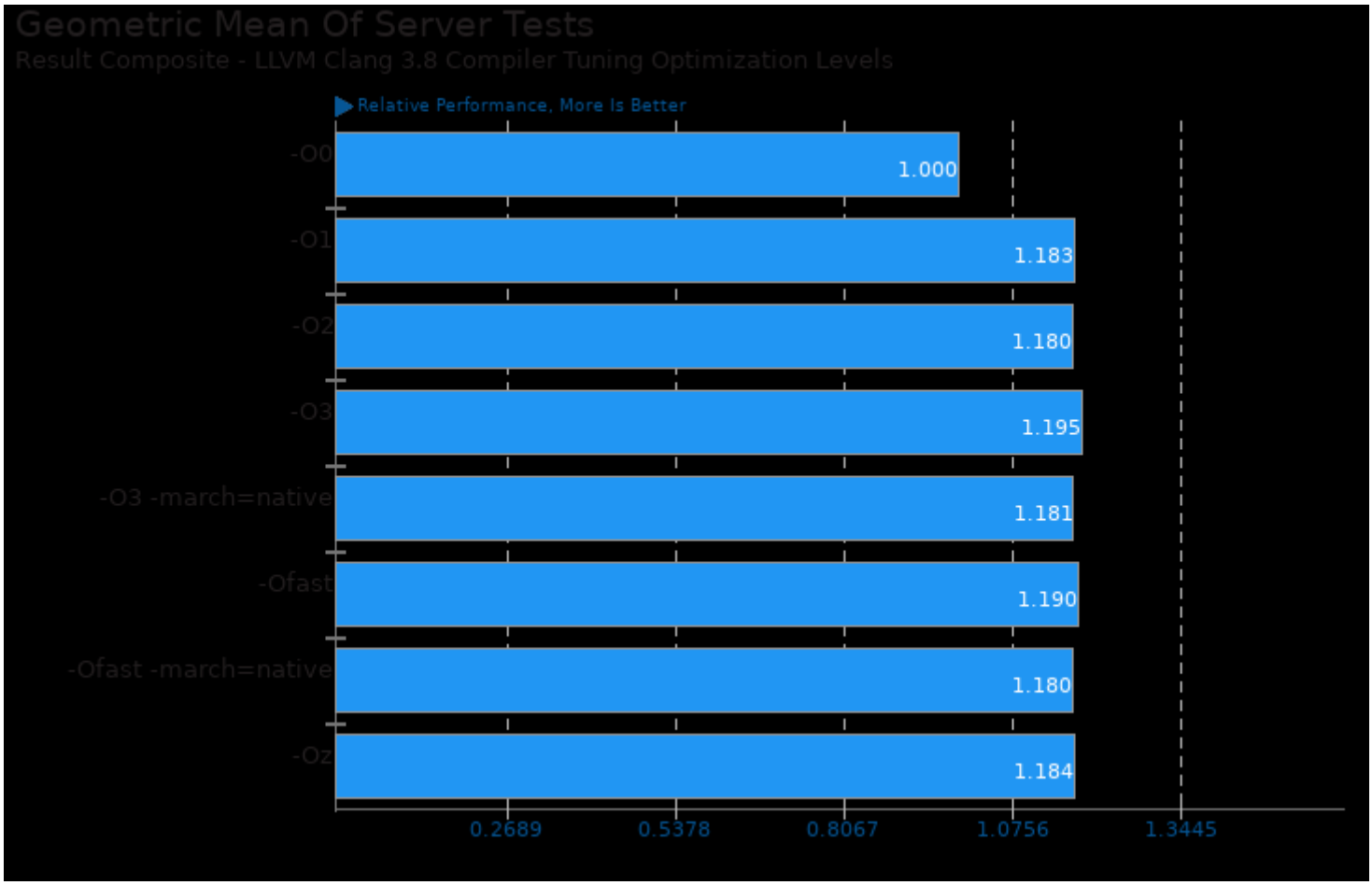
Geometric mean based upon tests: pts/build-apache and pts/build-php

LLVM Clang 3.8 Compiler Tuning Optimization Levels



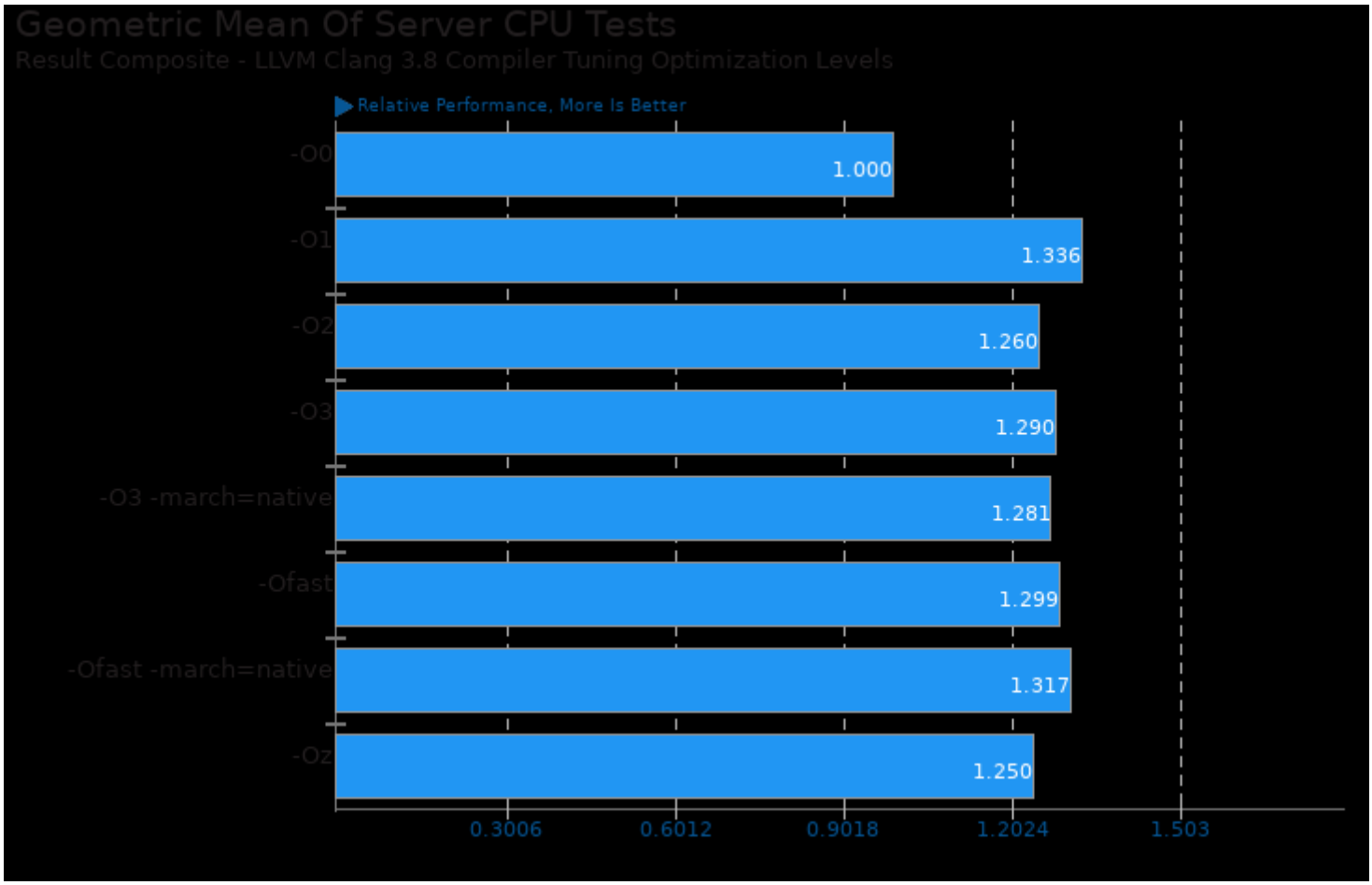
Geometric mean based upon tests: pts/himeno and pts/hmmer

LLVM Clang 3.8 Compiler Tuning Optimization Levels



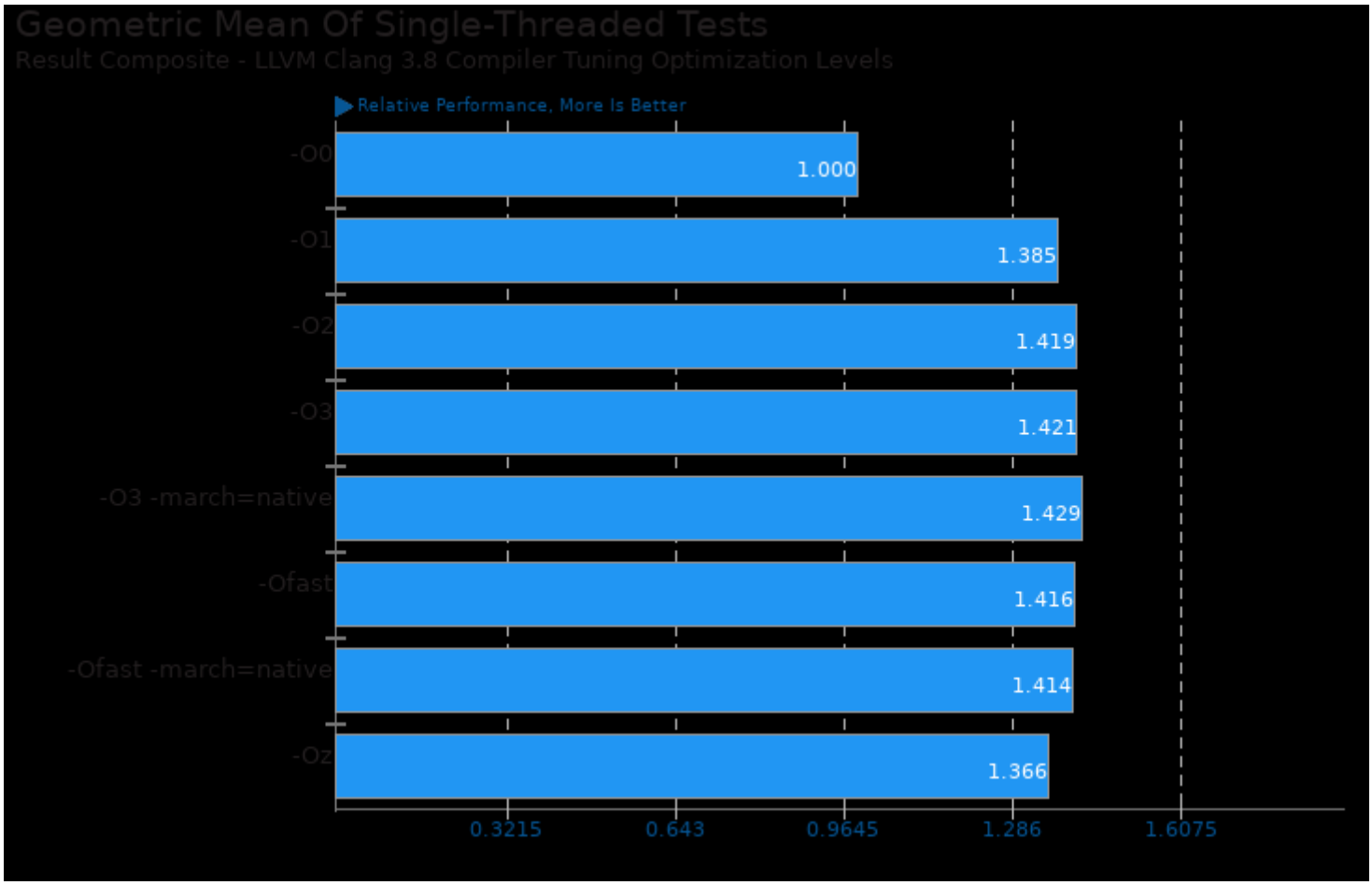
Geometric mean based upon tests: pts/apache, pts/pgbench and pts/redis

LLVM Clang 3.8 Compiler Tuning Optimization Levels



Geometric mean based upon tests: pts/himeno, pts/build-php, pts/c-ray and pts/redis

LLVM Clang 3.8 Compiler Tuning Optimization Levels



Geometric mean based upon tests: pts/scimark2, pts/encode-flac, pts/encode-mp3, pts/redis and pts/hint

This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 07:42.