



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

## Inspur Corporation

SPECrate®2017\_fp\_base = 232

### Inspur NF5180M5 (Intel Xeon Gold 5220R)

SPECrate®2017\_fp\_peak = 248

CPU2017 License: 3358

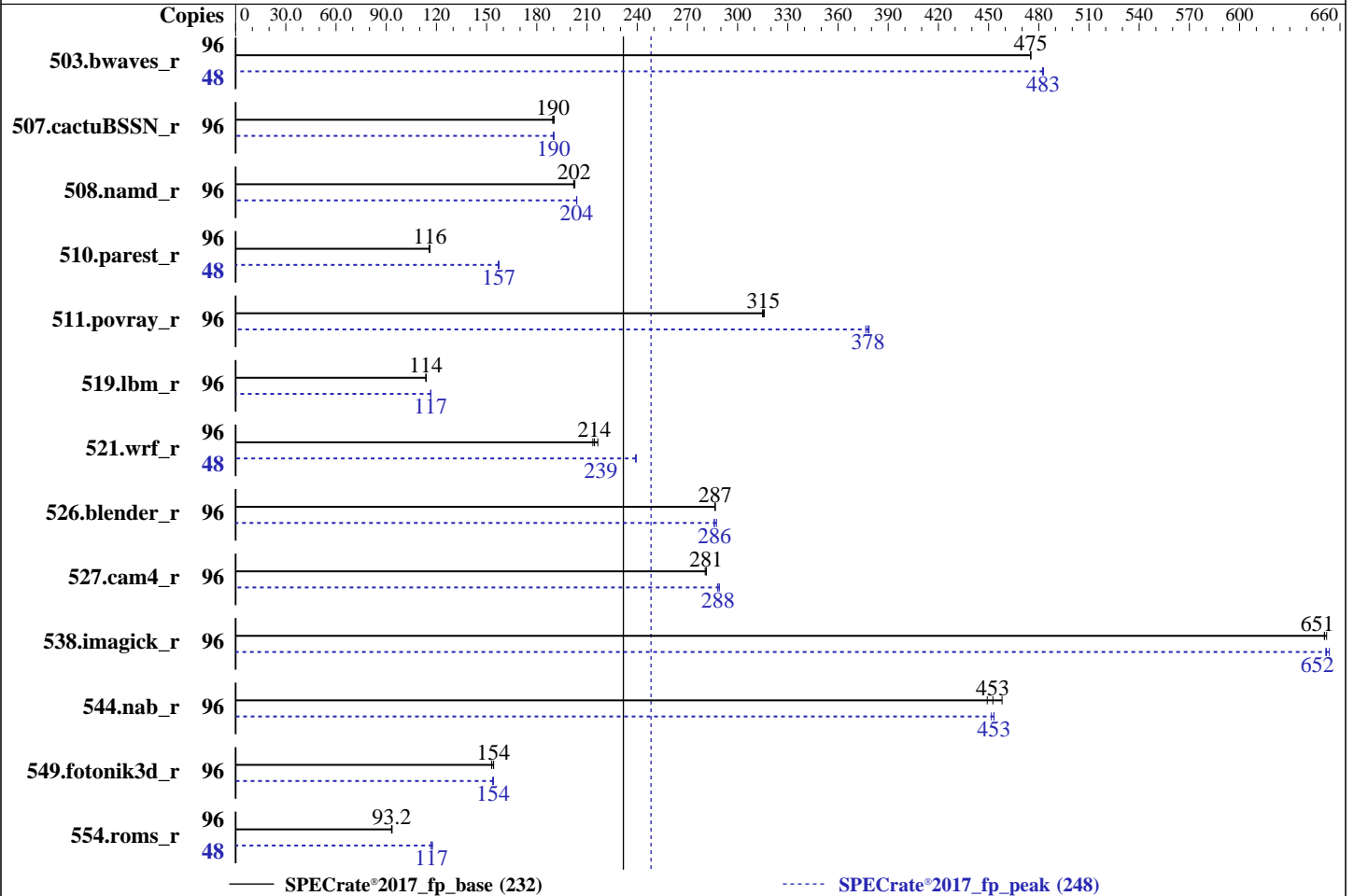
Test Sponsor: Inspur Corporation

Tested by: Inspur Corporation

Test Date: Jun-2020

Hardware Availability: Feb-2020

Software Availability: May-2019



### Hardware

CPU Name: Intel Xeon Gold 5220R  
 Max MHz: 4000  
 Nominal: 2200  
 Enabled: 48 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 35.75 MB I+D on chip per chip  
 Other: None  
 Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
 Storage: 1 x 2 TB NVME SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP4 4.12.14-94.41-default  
 Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;  
 Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux  
 Parallel: No  
 Firmware: Version 4.1.5 released May-2019  
 File System: ext4  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: None  
 Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.



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### Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	96	2026	475	<b><u>2026</u></b>	<b><u>475</u></b>	2026	475	48	998	482	997	483	<b><u>997</u></b>	<b><u>483</u></b>
507.cactuBSSN_r	96	641	190	638	190	<b><u>641</u></b>	<b><u>190</u></b>	96	639	190	<b><u>639</u></b>	<b><u>190</u></b>	640	190
508.namd_r	96	451	202	450	203	<b><u>451</u></b>	<b><u>202</u></b>	96	448	204	<b><u>448</u></b>	<b><u>204</u></b>	447	204
510.parest_r	96	2172	116	2162	116	<b><u>2162</u></b>	<b><u>116</u></b>	48	800	157	<b><u>798</u></b>	<b><u>157</u></b>	798	157
511.povray_r	96	710	316	<b><u>711</u></b>	<b><u>315</u></b>	712	315	96	595	377	<b><u>593</u></b>	<b><u>378</u></b>	592	379
519.lbm_r	96	890	114	888	114	<b><u>889</u></b>	<b><u>114</u></b>	96	867	117	<b><u>868</u></b>	<b><u>117</u></b>	868	117
521.wrf_r	96	1007	213	993	216	<b><u>1003</u></b>	<b><u>214</u></b>	48	450	239	449	239	<b><u>449</u></b>	<b><u>239</u></b>
526.blender_r	96	<b><u>510</u></b>	<b><u>287</u></b>	510	287	510	286	96	<b><u>511</u></b>	<b><u>286</u></b>	509	287	511	286
527.cam4_r	96	<b><u>597</u></b>	<b><u>281</u></b>	598	281	597	281	96	583	288	<b><u>582</u></b>	<b><u>288</u></b>	581	289
538.imagick_r	96	<b><u>367</u></b>	<b><u>651</u></b>	366	652	367	651	96	366	652	365	654	<b><u>366</u></b>	<b><u>652</u></b>
544.nab_r	96	353	458	360	449	<b><u>357</u></b>	<b><u>453</u></b>	96	356	453	<b><u>357</u></b>	<b><u>453</u></b>	358	452
549.fotonik3d_r	96	2426	154	<b><u>2429</u></b>	<b><u>154</u></b>	2445	153	96	2435	154	<b><u>2431</u></b>	<b><u>154</u></b>	2428	154
554.roms_r	96	1631	93.5	1636	93.2	<b><u>1636</u></b>	<b><u>93.2</u></b>	48	654	117	<b><u>652</u></b>	<b><u>117</u></b>	648	118

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

### Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

### Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"  
SCALING\_GOVERNOR set to Performance

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/CPU2017/lib/intel64"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5  
Transparent Huge Pages enabled by default  
Prior to runcpu invocation  
Filesystem page cache synced and cleared with:

(Continued on next page)



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### General Notes (Continued)

```
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
```

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.

### Platform Notes

BIOS configuration:

ENERGY\_PERF\_BIAS\_CFG mode set to Performance

Hardware Prefetch set to Disable

VT Support set to Disable

CLE Support set to Disable

IMC (Integrated memory controller) Interleaving set to 1-way

Sub NUMA Cluster (SNC) set to Enable

Sysinfo program /home/CPU2017/bin/sysinfo

Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011

running on linux-lycj Mon Jun 1 13:44:18 2020

SUT (System Under Test) info as seen by some common utilities.

For more information on this section, see

<https://www.spec.org/cpu2017/Docs/config.html#sysinfo>

From /proc/cpuinfo

model name : Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz

2 "physical id"s (chips)

96 "processors"

cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)

cpu cores : 24

siblings : 48

physical 0: cores 0 1 2 3 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 25 26 27 28 29

physical 1: cores 0 1 2 3 4 5 6 8 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

From lscpu:

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

CPU(s): 96

(Continued on next page)



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## Platform Notes (Continued)

```

On-line CPU(s) list:    0-95
Thread(s) per core:    2
Core(s) per socket:    24
Socket(s):              2
NUMA node(s):          4
Vendor ID:              GenuineIntel
CPU family:             6
Model:                  85
Model name:             Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
Stepping:               7
CPU MHz:                2200.000
CPU max MHz:            4000.0000
CPU min MHz:            1000.0000
BogoMIPS:               4400.00
Virtualization:        VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               1024K
L3 cache:               36608K
NUMA node0 CPU(s):     0-3,6-8,12-14,19,20,48-51,54-56,60-62,67,68
NUMA node1 CPU(s):     4,5,9-11,15-18,21-23,52,53,57-59,63-66,69-71
NUMA node2 CPU(s):     24-27,31,32,36-38,42-44,72-75,79,80,84-86,90-92
NUMA node3 CPU(s):     28-30,33-35,39-41,45-47,76-78,81-83,87-89,93-95
Flags:                  fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpperf pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm
pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c
rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single
intel_ppin ssbd mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq
rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec
xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln
pts pku ospke avx512_vnni flush_l1d arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 36608 KB

```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

```

available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 6 7 8 12 13 14 19 20 48 49 50 51 54 55 56 60 61 62 67 68
node 0 size: 192017 MB
node 0 free: 179203 MB
node 1 cpus: 4 5 9 10 11 15 16 17 18 21 22 23 52 53 57 58 59 63 64 65 66 69 70 71
node 1 size: 193530 MB
node 1 free: 183176 MB

```

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### Platform Notes (Continued)

```

node 2 cpus: 24 25 26 27 31 32 36 37 38 42 43 44 72 73 74 75 79 80 84 85 86 90 91 92
node 2 size: 193530 MB
node 2 free: 183281 MB
node 3 cpus: 28 29 30 33 34 35 39 40 41 45 46 47 76 77 78 81 82 83 87 88 89 93 94 95
node 3 size: 193319 MB
node 3 free: 183101 MB
node distances:
node  0  1  2  3
  0: 10 11 21 21
  1: 11 10 21 21
  2: 21 21 10 11
  3: 21 21 11 10

From /proc/meminfo
MemTotal:          790935372 kB
HugePages_Total:    0
Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
    SUSE Linux Enterprise Server 12 SP4

From /etc/*release* /etc/*version*
SuSE-release:
    SUSE Linux Enterprise Server 12 (x86_64)
    VERSION = 12
    PATCHLEVEL = 4
    # This file is deprecated and will be removed in a future service pack or release.
    # Please check /etc/os-release for details about this release.
os-release:
    NAME="SLES"
    VERSION="12-SP4"
    VERSION_ID="12.4"
    PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
    ID="sles"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:12:sp4"

uname -a:
    Linux linux-lycj 4.12.14-94.41-default #1 SMP Wed Oct 31 12:25:04 UTC 2018 (3090901)
    x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault):          Not affected
Microarchitectural Data Sampling:         No status reported
CVE-2017-5754 (Meltdown):                 Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled

```

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### Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1): via prctl and seccomp Mitigation: \_\_user pointer sanitization  
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS\_FW

run-level 3 Jun 1 04:21 last=5

SPEC is set to: /home/CPU2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/nvme0n1p4	ext4	1.8T	74G	1.7T	5%	/home

From /sys/devices/virtual/dmi/id

BIOS: American Megatrends Inc. 4.1.5 05/21/2019  
Vendor: Inspur  
Product: NF5180M5  
Serial: 217593356

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:

24x Hynix HMAA4GR7AJR8N-WM 32 GB 2 rank 2933, configured at 2666

(End of data from sysinfo program)

### Compiler Version Notes

=====  
C | 519.lbm\_r(base, peak) 538.imagick\_r(base, peak)  
544.nab\_r(base, peak)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----

=====  
C++ | 508.namd\_r(base, peak) 510.parest\_r(base, peak)  
-----

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
-----  
=====

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## Compiler Version Notes (Continued)

C++, C | 511.povray\_r(base, peak) 526.blender\_r(base, peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,

Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,

Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====  
C++, C, Fortran | 507.cactuBSSN\_r(base, peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,

Version 19.0.4.227 Build 20190416

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,

Version 19.0.4.227 Build 20190416

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)

64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====  
Fortran | 503.bwaves\_r(base, peak) 549.fotonik3d\_r(base, peak)

| 554.roms\_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)

64, Version 19.0.4.227 Build 20190416

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=====  
Fortran, C | 521.wrf\_r(base, peak) 527.cam4\_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)

64, Version 19.0.4.227 Build 20190416

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,

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## Base Compiler Invocation

C benchmarks:

icc

C++ benchmarks:

icpc

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using both C and C++:

icpc icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort

## Base Portability Flags

503.bwaves\_r: -DSPEC\_LP64

507.cactuBSSN\_r: -DSPEC\_LP64

508.namd\_r: -DSPEC\_LP64

510.parest\_r: -DSPEC\_LP64

511.povray\_r: -DSPEC\_LP64

519.lbm\_r: -DSPEC\_LP64

521.wrf\_r: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG -convert big\_endian

526.blender\_r: -DSPEC\_LP64 -DSPEC\_LINUX -funsigned-char

527.cam4\_r: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG

538.imagick\_r: -DSPEC\_LP64

544.nab\_r: -DSPEC\_LP64

549.fotonik3d\_r: -DSPEC\_LP64

554.roms\_r: -DSPEC\_LP64

## Base Optimization Flags

C benchmarks:

-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4

C++ benchmarks:

-m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

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## Base Optimization Flags (Continued)

C++ benchmarks (continued):

-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

-m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -auto

-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:

-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -auto

-nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:

-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:

-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -auto

-nostandard-realloc-lhs -align array32byte

## Peak Compiler Invocation

C benchmarks:

icc

C++ benchmarks:

icpc

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using both C and C++:

icpc icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort



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## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

```
519.lbm_r: -m64 -std=c11 -prof-gen(pass 1) -prof-use(pass 2) -ipo  
-xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

```
538.imagick_r: -m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
```

544.nab\_r: Same as 538.imagick\_r

C++ benchmarks:

```
508.namd_r: -m64 -prof-gen(pass 1) -prof-use(pass 2) -ipo  
-xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

```
510.parest_r: -m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

Fortran benchmarks:

```
503.bwaves_r: -m64 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -auto  
-nonstandard-realloc-lhs -align array32byte
```

549.fotonik3d\_r: Same as 503.bwaves\_r

```
554.roms_r: -m64 -prof-gen(pass 1) -prof-use(pass 2) -ipo  
-xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -auto  
-nonstandard-realloc-lhs -align array32byte
```

Benchmarks using both Fortran and C:

```
-m64 -std=c11 -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2  
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nonstandard-realloc-lhs  
-align array32byte
```

(Continued on next page)



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## Peak Optimization Flags (Continued)

Benchmarks using both C and C++:

```
511.povray_r: -m64 -std=c11 -prof-gen(pass 1) -prof-use(pass 2) -ipo  
-xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4
```

```
526.blender_r: -m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -auto  
-nonstandard-realloc-lhs -align array32byte
```

The flags files that were used to format this result can be browsed at

[http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.html)

<http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-V1.9.html>

You can also download the XML flags sources by saving the following links:

[http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.xml)

<http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-V1.9.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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