



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

## NEC Corporation

SPECrate®2017\_fp\_base = 204

Express5800/R120h-1M (Intel Xeon Gold 6240)

SPECrate®2017\_fp\_peak = 217

CPU2017 License: 9006

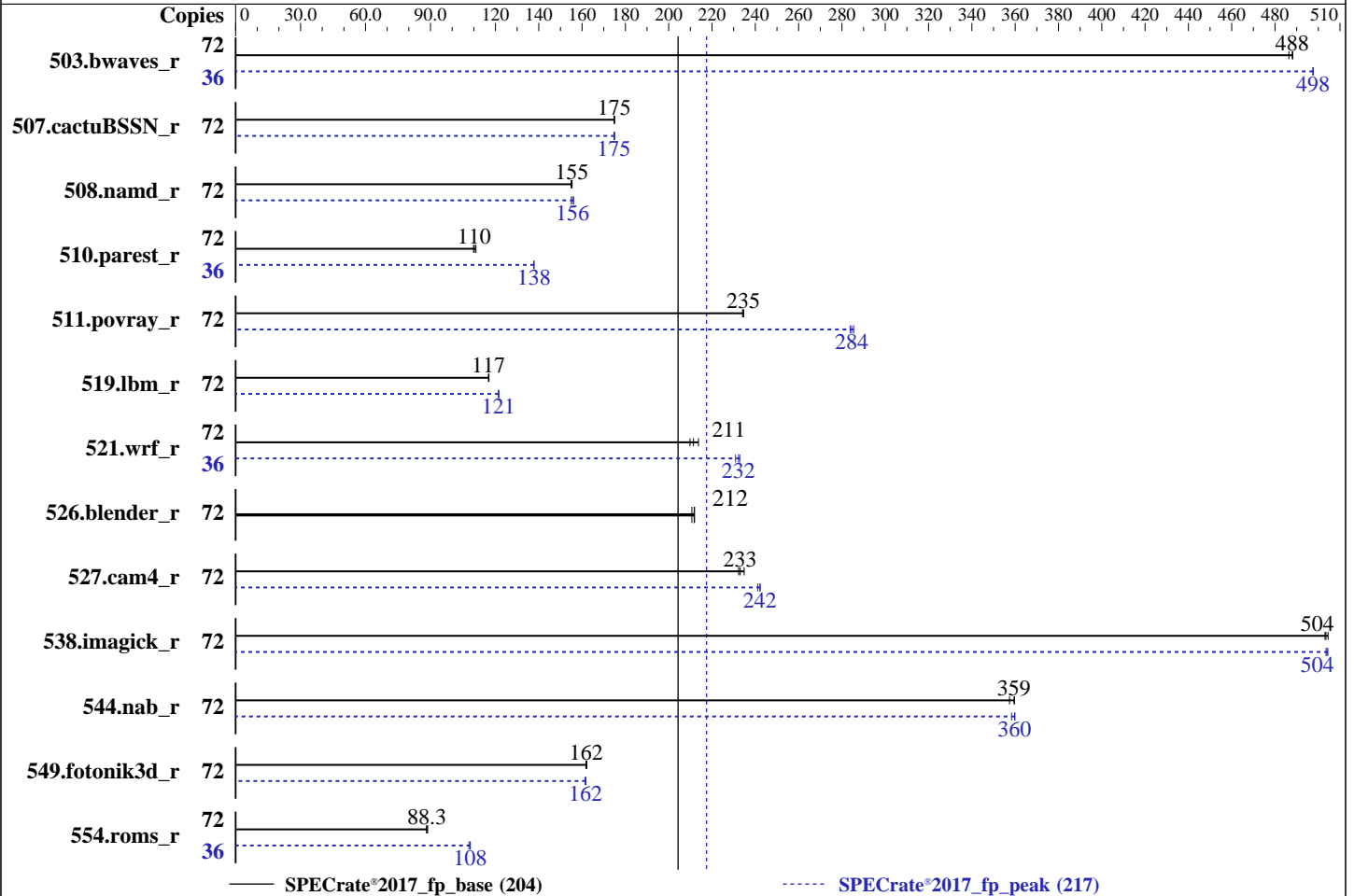
Test Sponsor: NEC Corporation

Tested by: NEC Corporation

Test Date: Oct-2020

Hardware Availability: Dec-2019

Software Availability: Sep-2019



### Hardware

CPU Name: Intel Xeon Gold 6240  
 Max MHz: 3900  
 Nominal: 2600  
 Enabled: 36 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: 24.75 MB I+D on chip per chip  
 Other: None  
 Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)  
 Storage: 1 x 1 TB SATA, 7200 RPM, RAID 0  
 Other: None

### Software

OS: Red Hat Enterprise Linux Server release 7.7 (Maipo)  
 Kernel 3.10.0-1062.1.1.el7.x86\_64  
 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: NEC BIOS Version U32 v2.32 03/09/2020 released Jun-2020  
 File System: ext4  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: None  
 Power Management: BIOS 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	72	<b><u>1480</u></b>	<b><u>488</u></b>	1484	486	1479	488	36	726	498	<b><u>726</u></b>	<b><u>498</u></b>	726	498
507.cactuBSSN_r	72	521	175	521	175	<b><u>521</u></b>	<b><u>175</u></b>	72	521	175	522	175	<b><u>521</u></b>	<b><u>175</u></b>
508.namd_r	72	<b><u>441</u></b>	<b><u>155</u></b>	441	155	440	155	72	441	155	438	156	<b><u>440</u></b>	<b><u>156</u></b>
510.parest_r	72	1697	111	1714	110	<b><u>1708</u></b>	<b><u>110</u></b>	36	684	138	<b><u>684</u></b>	<b><u>138</u></b>	683	138
511.povray_r	72	<b><u>717</u></b>	<b><u>235</u></b>	718	234	717	235	72	592	284	<b><u>591</u></b>	<b><u>284</u></b>	589	285
519.lbm_r	72	650	117	<b><u>650</u></b>	<b><u>117</u></b>	649	117	72	625	121	625	121	<b><u>625</u></b>	<b><u>121</u></b>
521.wrf_r	72	755	214	769	210	<b><u>763</u></b>	<b><u>211</u></b>	36	349	231	<b><u>347</u></b>	<b><u>232</u></b>	346	233
526.blender_r	72	517	212	<b><u>518</u></b>	<b><u>212</u></b>	520	211	72	517	212	<b><u>518</u></b>	<b><u>212</u></b>	520	211
527.cam4_r	72	542	232	536	235	<b><u>540</u></b>	<b><u>233</u></b>	72	522	241	<b><u>520</u></b>	<b><u>242</u></b>	520	242
538.imagick_r	72	355	505	<b><u>356</u></b>	<b><u>504</u></b>	356	503	72	<b><u>355</u></b>	<b><u>504</u></b>	355	504	356	504
544.nab_r	72	339	357	<b><u>337</u></b>	<b><u>359</u></b>	337	360	72	337	360	<b><u>337</u></b>	<b><u>360</u></b>	338	358
549.fotonik3d_r	72	<b><u>1732</u></b>	<b><u>162</u></b>	1730	162	1735	162	72	1735	162	<b><u>1736</u></b>	<b><u>162</u></b>	1739	161
554.roms_r	72	1298	88.2	1290	88.7	<b><u>1295</u></b>	<b><u>88.3</u></b>	36	<b><u>528</u></b>	<b><u>108</u></b>	528	108	531	108

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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"

### 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:  
sync; echo 3 > /proc/sys/vm/drop\_caches

(Continued on next page)



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### General Notes (Continued)

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 Settings:

- Thermal Configuration: Maximum Cooling
- Workload Profile: General Throughput Compute
- Memory Patrol Scrubbing: Disabled
- LLC Dead Line Allocation: Disabled
- LLC Prefetch: Enabled
- Enhanced Processor Performance: Enabled
- Workload Profile: Custom
- Advanced Memory Protection: Advanced ECC Support

Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011  
running on rl20h1m Tue Oct 6 17:28:05 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 6240 CPU @ 2.60GHz
 2 "physical id"s (chips)
 72 "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 : 18
siblings  : 36
physical 0: cores 0 1 2 3 8 9 10 11 16 17 18 19 20 24 25 26 27
physical 1: cores 0 1 2 3 8 9 10 11 16 17 18 19 20 24 25 26 27

```

From lscpu:

```

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian

```

(Continued on next page)



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### Platform Notes (Continued)

```

CPU(s): 72
On-line CPU(s) list: 0-71
Thread(s) per core: 2
Core(s) per socket: 18
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6240 CPU @ 2.60GHz
Stepping: 6
CPU MHz: 2600.000
BogoMIPS: 5200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0-8,36-44
NUMA node1 CPU(s): 9-17,45-53
NUMA node2 CPU(s): 18-26,54-62
NUMA node3 CPU(s): 27-35,63-71

```

```

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
aperfmpperf eagerfpu pni pclmulqdq dtes64 monitor 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 epb cat_l3 cdp_l3 invpcid_single
intel_ppin intel_pt ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ept vpid fsgsbase tsc_adjust bmil hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw
avx512vl xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pln pts pku ospke avx512_vnni md_clear spec_ctrl intel_stibp
flush_lld arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 25344 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 4 5 6 7 8 36 37 38 39 40 41 42 43 44
node 0 size: 97960 MB
node 0 free: 95542 MB
node 1 cpus: 9 10 11 12 13 14 15 16 17 45 46 47 48 49 50 51 52 53
node 1 size: 98304 MB
node 1 free: 96008 MB

```

(Continued on next page)



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### Platform Notes (Continued)

```

node 2 cpus: 18 19 20 21 22 23 24 25 26 54 55 56 57 58 59 60 61 62
node 2 size: 98304 MB
node 2 free: 95955 MB
node 3 cpus: 27 28 29 30 31 32 33 34 35 63 64 65 66 67 68 69 70 71
node 3 size: 98303 MB
node 3 free: 95997 MB
node distances:
node  0  1  2  3
  0: 10 21 21 21
  1: 21 10 21 21
  2: 21 21 10 21
  3: 21 21 21 10

```

```

From /proc/meminfo
MemTotal:          395917512 kB
HugePages_Total:      0
Hugepagesize:       2048 kB

```

```

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.7 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.7"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.7 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.7:ga:server

```

```

uname -a:
Linux r120h1m 3.10.0-1062.1.1.el7.x86_64 #1 SMP Tue Aug 13 18:39:59 UTC 2019 x86_64
x86_64 x86_64 GNU/Linux

```

Kernel self-reported vulnerability status:

```

CVE-2018-3620 (L1 Terminal Fault):          Not affected
Microarchitectural Data Sampling:          Not affected
CVE-2017-5754 (Meltdown):                  Not affected
CVE-2018-3639 (Speculative Store Bypass):  Mitigation: Speculative Store Bypass disabled
via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):         Mitigation: Load fences, usercopy/swaps
barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):         Mitigation: Full retpoline, IBPB

```

(Continued on next page)



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### Platform Notes (Continued)

run-level 3 Oct 6 17:22

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda3	ext4	908G	184G	678G	22%	/

```

From /sys/devices/virtual/dmi/id
BIOS:      NEC U32 03/09/2020
Vendor:    NEC
Product:   Express5800/R120h-1M
Serial:    JPN0084094

```

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 HPE P03050-091 16 GB 2 rank 2933

(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.
-----

```

```

=====
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,
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```

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### Compiler Version Notes (Continued)

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

-----

=====  
 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,  
 Version 19.0.4.227 Build 20190416  
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

-----

### Base Compiler Invocation

C benchmarks:  
 icc -m64 -std=c11

C++ benchmarks:  
 icpc -m64

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## Base Compiler Invocation (Continued)

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

## 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:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
```

```
-qopt-mem-layout-trans=4
```

C++ benchmarks:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
```

```
-qopt-mem-layout-trans=4
```

Fortran benchmarks:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
```

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## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte
```

Benchmarks using both Fortran and C:

```
-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++:

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

Benchmarks using Fortran, C, and C++:

```
-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 -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

Benchmarks using both Fortran and C:

```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:

```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

## Peak Portability Flags

Same as Base Portability Flags



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## Peak Optimization Flags

C benchmarks:

519.lbm\_r: -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: -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: -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: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves\_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -auto  
-nostandard-realloc-lhs -align array32byte

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

554.roms\_r: -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 -nostandard-realloc-lhs  
-align array32byte

Benchmarks using both Fortran and C:

-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 -nostandard-realloc-lhs  
-align array32byte

Benchmarks using both C and C++:

511.povray\_r: -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

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# SPEC CPU®2017 Floating Point Rate Result

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NEC Corporation

SPECrate®2017\_fp\_base = 204

Express5800/R120h-1M (Intel Xeon Gold 6240)

SPECrate®2017\_fp\_peak = 217

CPU2017 License: 9006

Test Sponsor: NEC Corporation

Tested by: NEC Corporation

Test Date: Oct-2020

Hardware Availability: Dec-2019

Software Availability: Sep-2019

## Peak Optimization Flags (Continued)

526.blender\_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-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-ic19.0u1-official-linux64.2019-07-09.html>  
<http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevE.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml>  
<http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevE.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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