# SPEC CPU®2017 Floating Point Rate Result

**ASUSTeK Computer Inc.**

ASUS RS720-E9(Z11PP-D24) Server System
(2.40 GHz, Intel Xeon Gold 6240R)

**SPEC Crater®2017_fp_base = 287**

**SPEC Crater®2017_fp_peak = 305**

<table>
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<th>CPU2017 License:</th>
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<td>Test Sponsor:</td>
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<td>Tested by:</td>
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<td>Test Date:</td>
<td>Oct-2020</td>
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<td>Hardware Availability:</td>
<td>Feb-2020</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Apr-2020</td>
</tr>
</tbody>
</table>

## Hardware

### CPU Name:
Intel Xeon Gold 6240R

<table>
<thead>
<tr>
<th>Max MHz:</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal:</td>
<td>2400</td>
</tr>
<tr>
<td>Enabled:</td>
<td>48 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1, 2 chip(s)</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>35.75 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
</tbody>
</table>

| Memory: | 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R) |
| Storage: | 1 x 1 TB SATA SSD |
| Other: | None |

## Software

### OS:
SUSE Linux Enterprise Server 15 SP1


### Compiler: C/C++:
Version 19.1.1.217 of Intel C/C++ Compiler Build 20200306 for Linux;

| Fortran: Version 19.1.1.217 of Intel Fortran Compiler Build 20200306 for Linux |

### Parallel:
No

| Firmware: | Version 6102 released Dec-2019 |
| File System: | xfs |

| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 64-bit |
| Other: | jemalloc; jemalloc memory allocator library V5.0.1 |

## Power Management:
BIOS and OS set to prefer performance at the cost of additional power usage

---

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<th>SPECrate®2017_fp_base (287)</th>
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<td>554.roms_r</td>
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The SPEC CPU®2017 Floating Point Rate Result is a benchmark that measures the performance of processors in floating point operations. The results show the peak and base performance of the system under test.
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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</tbody>
</table>

**Compiler Notes**

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler.

The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

**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"

OS set to performance mode via cpupower frequency-set -g performance

**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:

LD_LIBRARY_PATH = "/191u1/lib/intel64:/191u1/je5.0.1-64"

MALLOCONF = "retain:true"
ASUSTeK Computer Inc.

ASUS RS720-E9(Z11PP-D24) Server System
(2.40 GHz, Intel Xeon Gold 6240R)

SPECrate®2017_fp_base = 287
SPECrate®2017_fp_peak = 305

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
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
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.

The jemalloc library was
configured and built at default for
32bit (i686) and 64bit (x86_64) targets;
built with the RedHat Enterprise 7.5,
and the system compiler gcc 4.8.5;
sources available from jemalloc.net or

Platform Notes

BIOS Configuration:
VT-d = Disabled
Patrol Scrub = Disabled
ENERGY_PERF_BIAS_CFG mode = performance
SNC = Enabled
IMC interleaving = 1-way
Engine Boost = Level3(Max)
Enforce POR = Disable
Memory Frequency = 2933
LLC dead line allc = Disabled
SR-IOV Support = Disabled
CSM Support = Disabled

Sysinfo program /191u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbble6e46a485a0011
running on linux-628j Thu Oct 1 00:52:12 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

(Continued on next page)
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CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Test Date: Oct-2020
CPU2017 License: 9016
Tested by: ASUSTeK Computer Inc.
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Platform Notes (Continued)

From /proc/cpuinfo

model name : Intel(R) Xeon(R) Gold 6240R CPU @ 2.40GHz
  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 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
Address sizes:       46 bits physical, 48 bits virtual
CPU(s):              96
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 6240R CPU @ 2.40GHz
Stepping:            7
CPU MHz:             2400.000
CPU max MHz:         4000.0000
CPU min MHz:         1000.0000
BogoMIPS:            4800.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            36608K
NUMA node0 CPU(s):   0-3,7,8,12-14,18-20,48-51,55,56,60-62,66-68
NUMA node1 CPU(s):   4-6,9-11,15-17,21-23,52-54,57-59,63-65,69-71
NUMA node2 CPU(s):   24-27,31-33,37-39,43,44,72-75,79-81,85-87,91,92
NUMA node3 CPU(s):   28-30,34-36,40-42,45-47,76-78,82-84,88-90,93-95
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
aperf perf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrn 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

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

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ASUS RS720-E9(Z11PP-D24) Server System
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Platform Notes (Continued)

invpcid_single intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced 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 xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku ospke avx512_vnni md_clear flush_lld 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 7 8 12 13 14 18 19 20 48 49 50 51 55 56 60 61 62 66 67 68
    node 0 size: 192078 MB
    node 0 free: 177698 MB
    node 1 cpus: 4 5 6 9 10 11 15 16 17 21 22 23 52 53 54 57 58 59 63 64 65 69 70 71
    node 1 size: 193501 MB
    node 1 free: 183759 MB
    node 2 cpus: 24 25 26 27 31 32 33 37 38 39 43 44 72 73 74 75 79 80 81 85 86 87 91 92
    node 2 size: 193531 MB
    node 2 free: 183816 MB
    node 3 cpus: 28 29 30 34 35 36 40 41 42 45 46 47 76 77 78 82 83 84 88 89 90 93 94 95
    node 3 size: 193529 MB
    node 3 free: 183824 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: 791185084 kB
    MemFree: 177698 MB
    HugePages_Total: 0
    Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
    os-release:
        NAME="SLES"
        VERSION="15-SP1"
        VERSION_ID="15.1"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp1"

(Continued on next page)
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SPECrate\textsuperscript{\textregistered}2017\textsubscript{fp}_base = 287
SPECrate\textsuperscript{\textregistered}2017\textsubscript{fp}_peak = 305

Platform Notes (Continued)

uname -a:
    Linux linux-628j 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Sep 30 17:13

SPEC is set to: /191u1
    Filesystem  Type  Size  Used  Avail  Use%  Mounted on
/dev/sda4    xfs   932G   60G  872G   7%  /

From /sys/devices/virtual/dmi/id
    BIOS: American Megatrends Inc. 6102 12/05/2019
    Vendor: ASUSTeK COMPUTER INC.
    Product: Z11PP-D24 Series
    Product Family: Server
    Serial: System Serial Number

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 Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C | 519.ibm_r(base, peak) 538.imagick_r(base, peak)
   | 544.nab_r(base, peak)
==============================================================================

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304

(Continued on next page)
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Compiler Version Notes (Continued)

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____________________________________________________________________________

C++  |  508.namd_r(base, peak) 510.parest_r(base, peak)  

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NextGen Build 20200304  
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____________________________________________________________________________

C++, C  |  511.povray_r(base) 526.blender_r(base, peak)  

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NextGen Build 20200304  
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____________________________________________________________________________

C++, C  |  511.povray_r(peak)  

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C++, C  |  511.povray_r(peak)  

(Continued on next page)
Compiler Version Notes (Continued)

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**Tested by:** ASUSTeK Computer Inc.  
**Test Date:** Oct-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

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**Compiler Version Notes (Continued)**

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306

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Fortran, C  | 521.wrf_r(base) 527.cam4_r(base, peak)
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306

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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304

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Fortran, C  | 521.wrf_r(peak)
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306

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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

(Continued on next page)
Base Compiler Invocation (Continued)

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.ibm_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
528.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 -qnextgen -std=c11
-Wl,-plugin-opt=--x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=--x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=--x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

ASUSTeK Computer Inc. 
ASUS RS720-E9(Z11PP-D24) Server System (2.40 GHz, Intel Xeon Gold 6240R) 

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:

- -m64
- -qnextgen -std=c11
- -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
- -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
- -qopt-prefetch -ffinite-math-only
- -qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
- -align array32byte -auto -mbranches-within-32B-boundaries
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both C and C++:

- -m64 -qnextgen -std=c11
- -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
- -funroll-loops -qopt-mem-layout-trans=4
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:

- -m64 -qnextgen -std=c11
- -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
- -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
- -qopt-prefetch -ffinite-math-only
- -qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
- -align array32byte -auto -mbranches-within-32B-boundaries
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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

(Continued on next page)
Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes
538.imagick_r: basepeak = yes
544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: -m64 -qnextgen
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast
-ffast-math -flto -fmpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

Fortran benchmarks:

503.bwaves_r: -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

549.fotonik3d_r: basepeak = yes
554.roms_r: Same as 503.bwaves_r

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS720-E9(Z11PP-D24) Server System
(2.40 GHz, Intel Xeon Gold 6240R)

SPECrate®2017_fp_base = 287
SPECrate®2017_fp_peak = 305

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.

Test Date: Oct-2020
Tested with SPEC CPU®2017 v1.1.0 on 2020-09-30 12:52:12-0400.
Originally published on 2020-11-10.

Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

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

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml

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