SPEC CPU®2017 Floating Point Speed Result

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xFusion

FusionServer 2288H V7 (Intel Xeon Platinum 8490H)

$SPECspeed^{®}2017\_fp\_base = 371$

$SPECspeed^{®}2017\_fp\_peak = 372$
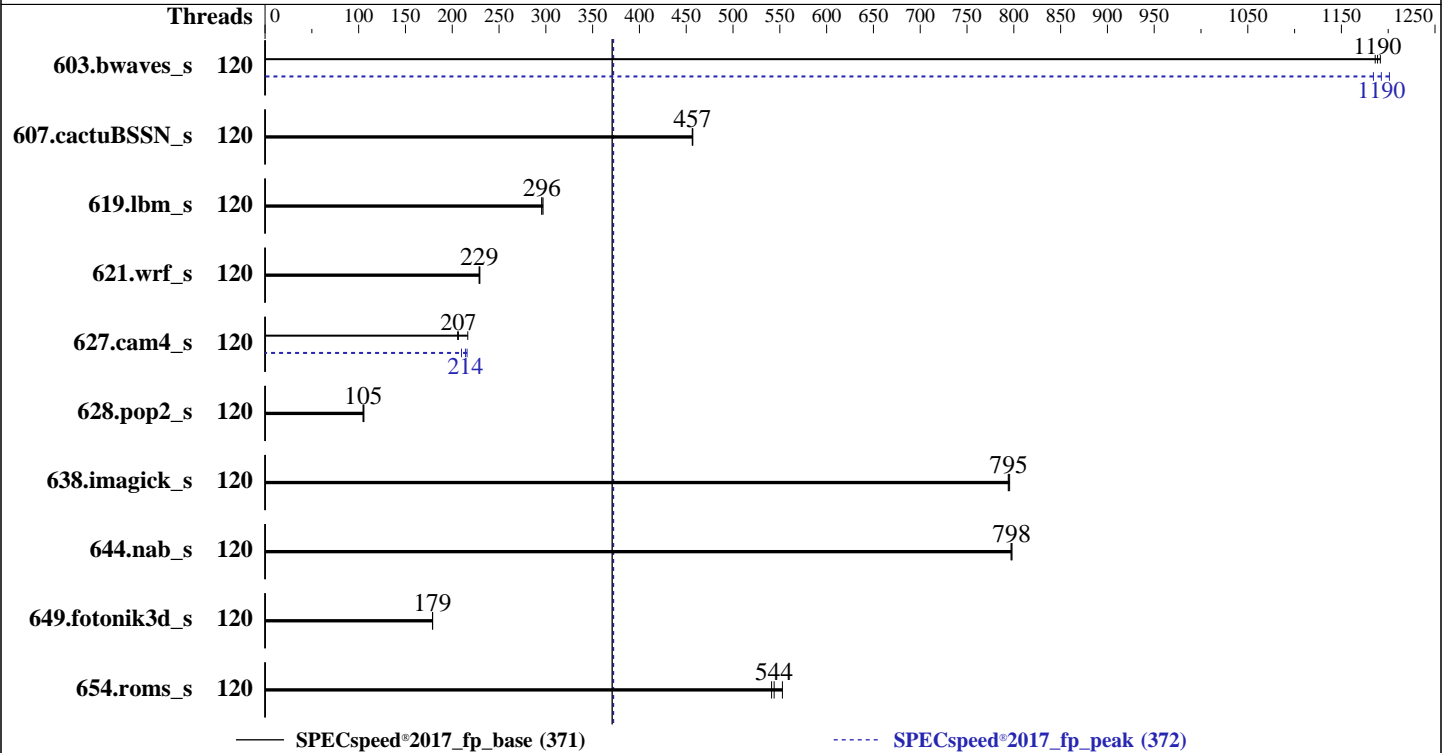
CPU2017 License: 6488
Test Sponsor: xFusion
Tested by: xFusion

Test Date: Feb-2023
Hardware Availability: Jan-2023
Software Availability: May-2022

Threads

- **603.bwaves_s** 120 — 1190 / 1190
- **607.cactuBSSN_s** 120 — 457
- **619.lbm_s** 120 — 296
- **621.wrf_s** 120 — 229
- **627.cam4_s** 120 — 207 / 214
- **628.pop2_s** 120 — 105
- **638.imagick_s** 120 — 795
- **644.nab_s** 120 — 798
- **649.fotonik3d_s** 120 — 179
- **654.roms_s** 120 — 544

——— SPECspeed®2017_fp_base (371)   ------ SPECspeed®2017_fp_peak (372)

Hardware

CPU Name: Intel Xeon Platinum 8490H
 Max MHz: 3500
 Nominal: 1900
Enabled: 120 cores, 2 chips
Orderable: 1,2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 112.5 MB I+D on chip per chip
 Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 1920 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 9.0 (Plow)
5.14.0-70.13.1.el9_0.x86_64
Compiler: C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;
Parallel: Yes
Firmware: Version 2.00.35 Released Nov-2022
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: OS set to prefer performance at the cost of additional power usage

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Results Table

Benchmark	Base						Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	120	49.5	1190	49.7	1190	**49.6**	**1190**	120	49.8	1180	**49.5**	**1190**	49.1	1200
607.cactuBSSN_s	120	36.5	456	36.5	457	**36.5**	**457**	120	36.5	456	36.5	457	**36.5**	**457**
619.lbm_s	120	17.7	296	**17.7**	**296**	17.6	297	120	17.7	296	**17.7**	**296**	17.6	297
621.wrf_s	120	57.8	229	57.6	230	**57.8**	**229**	120	57.8	229	57.6	230	**57.8**	**229**
627.cam4_s	120	**42.9**	**207**	43.1	206	40.9	217	120	42.2	210	41.1	216	**41.4**	**214**
628.pop2_s	120	**113**	**105**	113	105	112	106	120	**113**	**105**	113	105	112	106
638.imagick_s	120	**18.2**	**795**	18.2	794	18.1	796	120	**18.2**	**795**	18.2	794	18.1	796
644.nab_s	120	**21.9**	**798**	21.9	798	21.9	797	120	**21.9**	**798**	21.9	798	21.9	797
649.fotonik3d_s	120	50.9	179	51.0	179	**50.9**	**179**	120	50.9	179	51.0	179	**50.9**	**179**
654.roms_s	120	28.5	553	**28.9**	**544**	29.1	541	120	28.5	553	**28.9**	**544**	29.1	541
SPECspeed®2017_fp_base =	**371**												
SPECspeed®2017_fp_peak =	**372**												

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

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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH =
     "/home/Uniautos/cpu2017/lib/intel64:/home/Uniautos/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

```
 Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB 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
 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.
 jemalloc, a general purpose malloc implementation
```

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Test Date: Feb-2023
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General Notes (Continued)

```
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

Platform Notes

```
BIOS configuration:
Performance Profile Set to Load Balance
Enable LP [Global] Set to Single LP

Sysinfo program /home/Uniautos/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Wed Feb  8 12:55:55 2023

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) Platinum 8490H
      2  "physical id"s (chips)
      120 "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 : 60
      siblings  : 60
      physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
      25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
      53 54 55 56 57 58 59
      physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
      25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
      53 54 55 56 57 58 59

From lscpu from util-linux 2.37.4:
      Architecture:              x86_64
      CPU op-mode(s):            32-bit, 64-bit
      Address sizes:             46 bits physical, 57 bits virtual
      Byte Order:                Little Endian
      CPU(s):                    120
      On-line CPU(s) list:       0-119
      Vendor ID:                 GenuineIntel
      BIOS Vendor ID:            Intel(R) Corporation
      Model name:                Intel(R) Xeon(R) Platinum 8490H
      BIOS Model name:           Intel(R) Xeon(R) Platinum 8490H
      CPU family:                6
      Model:                     143
      Thread(s) per core:        1
```

(Continued on next page)

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FusionServer 2288H V7 (Intel Xeon Platinum 8490H)

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Platform Notes (Continued)

```
Core(s) per socket:           60
Socket(s):                    2
Stepping:                     8
Frequency boost:              enabled
CPU max MHz:                  1901.0000
CPU min MHz:                  800.0000
BogoMIPS:                     3800.00
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 aperfmperf tsc_known_freq 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 cpuid_fault
epb cat_l3 cat_l2 cdp_l3 invpcid_single intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp
ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1
avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma
clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1
xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect avx_vnni
avx512_bf16 wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku ospke waitpkg
avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq
la57 rdpid bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities
Virtualization:               VT-x
L1d cache:                    5.6 MiB (120 instances)
L1i cache:                    3.8 MiB (120 instances)
L2 cache:                     240 MiB (120 instances)
L3 cache:                     225 MiB (2 instances)
NUMA node(s):                 2
NUMA node0 CPU(s):            0-59
NUMA node1 CPU(s):            60-119
Vulnerability Itlb multihit:  Not affected
Vulnerability L1tf:           Not affected
Vulnerability Mds:            Not affected
Vulnerability Meltdown:       Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
prctl
Vulnerability Spectre v1:      Mitigation; usercopy/swapgs barriers and __user
pointer sanitization
Vulnerability Spectre v2:      Mitigation; Enhanced IBRS, IBPB conditional, RSB
filling
Vulnerability Srbds:          Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:
    NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL   SETS PHY-LINE COHERENCY-SIZE
    L1d       48K     5.6M   12 Data            1     64        1             64
    L1i       32K     3.8M    8 Instruction     1     64        1             64
```

(Continued on next page)

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Platform Notes (Continued)

```
      L2          2M     240M  16 Unified         2   2048         1                64
      L3      112.5M     225M  15 Unified         3 122880         1                64

 /proc/cpuinfo cache data
    cache size : 115200 KB

 From numactl --hardware
 WARNING: a numactl 'node' might or might not correspond to a physical chip.
   available: 2 nodes (0-1)
   node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
   28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
   57 58 59
   node 0 size: 257096 MB
   node 0 free: 248980 MB
   node 1 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84
   85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
   110 111 112 113 114 115 116 117 118 119
   node 1 size: 257988 MB
   node 1 free: 250954 MB
   node distances:
   node   0   1
     0:  10  21
     1:  21  10

 From /proc/meminfo
    MemTotal:       527446892 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 /sbin/tuned-adm active
      Current active profile: throughput-performance

 /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
    performance

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
       VERSION="9.0 (Plow)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="9.0"
       PLATFORM_ID="platform:el9"
       PRETTY_NAME="Red Hat Enterprise Linux 9.0 (Plow)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 9.0 (Plow)
    system-release: Red Hat Enterprise Linux release 9.0 (Plow)
```

(Continued on next page)

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Platform Notes (Continued)

```
    system-release-cpe: cpe:/o:redhat:enterprise_linux:9::baseos

  uname -a:
    Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14
    12:42:38 EDT 2022 x86_64 x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2018-12207 (iTLB Multihit):                       Not affected
  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
  CVE-2017-5753 (Spectre variant 1):                    Mitigation: usercopy/swapgs
                                                        barriers and __user pointer
                                                        sanitization
  CVE-2017-5715 (Spectre variant 2):                    Mitigation: Enhanced IBRS, IBPB:
                                                        conditional, RSB filling
  CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
  CVE-2019-11135 (TSX Asynchronous Abort):              Not affected

  run-level 3 Feb 8 04:20

  SPEC is set to: /home/Uniautos/cpu2017
    Filesystem              Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   1.7T  137G  1.6T   9% /home

  From /sys/devices/virtual/dmi/id
    Vendor:        XFUSION
    Product:       2288H V7
    Product Family: Eagle Stream
    Serial:        2106182101X3N8000002

  Additional information from dmidecode 3.3 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:
      16x Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800

  BIOS:
    BIOS Vendor:      XFUSION
    BIOS Version:     2.00.35
    BIOS Date:        11/30/2022
    BIOS Revision:    0.35
```

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Platform Notes (Continued)

```
 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C                     | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                      | 644.nab_s(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
  2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran          | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
                 | 654.roms_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
  2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran, C       | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                 | 628.pop2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
  2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
```

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Compiler Version Notes (Continued)

Base Compiler Invocation

C benchmarks:
`icx`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

Benchmarks using Fortran, C, and C++:
`icpx icx ifx`

Base Portability Flags

```
603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64
```

Base Optimization Flags

C benchmarks:
```
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:
```
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-nostandard-realloc-lhs -align array32byte -auto
```

(Continued on next page)

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using both Fortran and C:
```
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using Fortran, C, and C++:
```
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Peak Compiler Invocation

C benchmarks:
```
icx
```

Fortran benchmarks:
```
ifx
```

Benchmarks using both Fortran and C:
```
ifx icx
```

Benchmarks using Fortran, C, and C++:
```
icpx icx ifx
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

```
619.lbm_s: basepeak = yes
```

(Continued on next page)

Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/

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Peak Optimization Flags (Continued)

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: -m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -nostandard-realloc-lhs
-align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-SPR-V1.0-revB.html

The You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-SPR-V1.0-revB.xml

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Test Sponsor: xFusion
Tested by: xFusion

Test Date: Feb-2023
Hardware Availability: Jan-2023
Software Availability: May-2022

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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