# SPEC CPU®2017 Floating Point Speed Result

## ASUSTeK Computer Inc.

ASUS RS720-E11-RS12U(Z13PP-D32) Server System
(2.00 GHz, Intel Xeon Platinum 8480+)

$SPECspeed^{®}2017\_fp\_base = 371$

$SPECspeed^{®}2017\_fp\_peak = 371$

| | | | |
|---|---|---|---|
| **CPU2017 License:** | 9016 | **Test Date:** | Jan-2023 |
| **Test Sponsor:** | ASUSTeK Computer Inc. | **Hardware Availability:** | Jan-2023 |
| **Tested by:** | ASUSTeK Computer Inc. | **Software Availability:** | Jun-2022 |

Threads

| Benchmark | Threads | Result |
|---|---|---|
| 603.bwaves_s | 112 | 1150 |
| 607.cactuBSSN_s | 112 | 458 |
| 619.lbm_s | 112 | 304 |
| 621.wrf_s | 112 | 212 |
| 627.cam4_s | 112 | 215 |
| 628.pop2_s | 112 | 99.1 |
| 638.imagick_s | 112 | 811 |
| 644.nab_s | 112 | 808 |
| 649.fotonik3d_s | 112 | 182 |
| 654.roms_s | 112 | 571 |

SPECspeed®2017_fp_base (371)     SPECspeed®2017_fp_peak (371)

## Hardware

CPU Name: Intel Xeon Platinum 8480+
 Max MHz: 3800
 Nominal: 2000
Enabled: 112 cores, 2 chips
Orderable: 1, 2 chip(s)
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 105 MB I+D on chip per chip
 Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 1 x 1.6 TB PCIE NVME SSD
Other: None

## Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86_64)
 Kernel 5.14.21-150400.22-default
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 0501 released Dec-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: BIOS and OS set to prefer performance
 at the cost of additional power usage.

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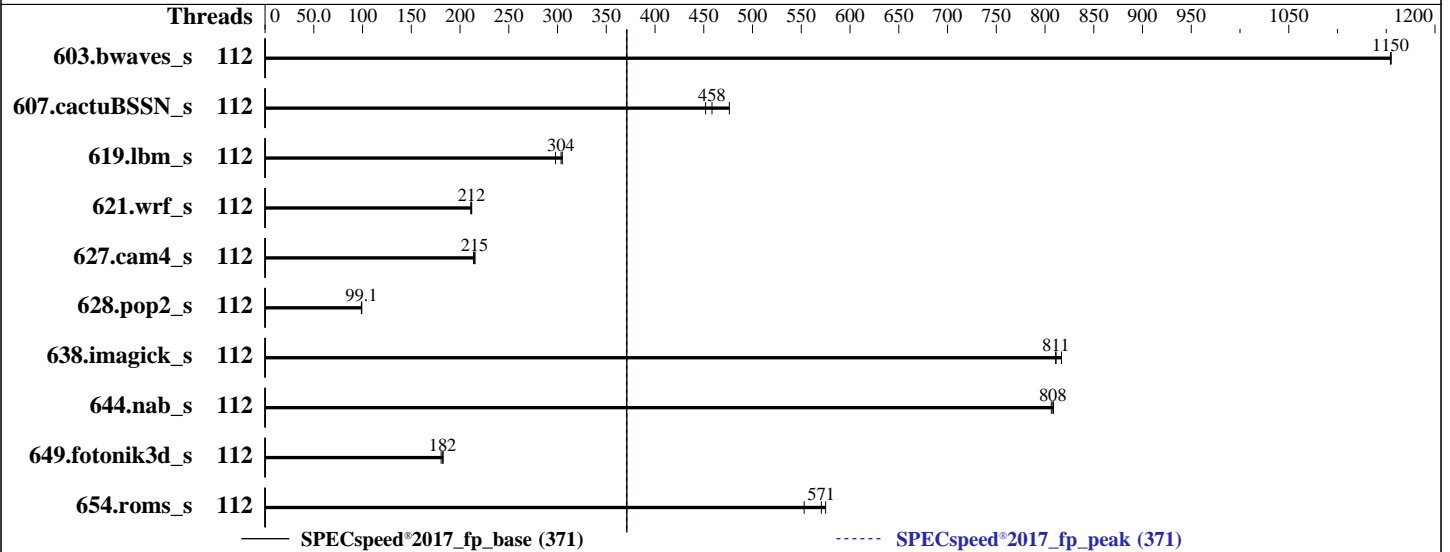
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## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 603.bwaves_s | 112 | 51.1 | 1160 | 51.1 | 1150 | **51.1** | **1150** | 112 | 51.1 | 1160 | 51.1 | 1150 | **51.1** | **1150** |
| 607.cactuBSSN_s | 112 | 36.9 | 452 | **36.4** | **458** | 35.0 | 476 | 112 | 36.9 | 452 | **36.4** | **458** | 35.0 | 476 |
| 619.lbm_s | 112 | **17.3** | **304** | 17.2 | 305 | 17.6 | 298 | 112 | **17.3** | **304** | 17.2 | 305 | 17.6 | 298 |
| 621.wrf_s | 112 | **62.4** | **212** | 62.4 | 212 | 62.7 | 211 | 112 | **62.4** | **212** | 62.4 | 212 | 62.7 | 211 |
| 627.cam4_s | 112 | **41.2** | **215** | 41.2 | 215 | 41.5 | 214 | 112 | **41.2** | **215** | 41.2 | 215 | 41.5 | 214 |
| 628.pop2_s | 112 | **120** | **99.1** | 120 | 98.8 | 120 | 99.1 | 112 | **120** | **99.1** | 120 | 98.8 | 120 | 99.1 |
| 638.imagick_s | 112 | 17.7 | 817 | 17.8 | 811 | **17.8** | **811** | 112 | 17.7 | 817 | 17.8 | 811 | **17.8** | **811** |
| 644.nab_s | 112 | 21.7 | 806 | 21.6 | 809 | **21.6** | **808** | 112 | 21.7 | 806 | 21.6 | 809 | **21.6** | **808** |
| 649.fotonik3d_s | 112 | **50.0** | **182** | 50.5 | 181 | 49.9 | 183 | 112 | **50.0** | **182** | 50.5 | 181 | 49.9 | 183 |
| 654.roms_s | 112 | **27.6** | **571** | 27.4 | 575 | 28.5 | 553 | 112 | **27.6** | **571** | 27.4 | 575 | 28.5 | 553 |
| **SPECspeed®2017_fp_base =** | **371** | | | | | | | | | | | | | |
| **SPECspeed®2017_fp_peak =** | **371** | | | | | | | | | | | | | |

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"
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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/spec2017/lib/intel64:/spec2017/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
  built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
```

**(Continued on next page)**

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## General Notes (Continued)

sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

## Platform Notes

```
BIOS Configuration:
VT-d = Disabled
Patrol Scrub = Disabled
Hyper-Threading = Disable
Engine Boost = Aggressive
SR-IOV Support = Disabled
BMC Configuration:
Fan mode = Full speed mode

 Sysinfo program /spec2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost Tue Jan  3 12:12:04 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 8480+
       2  "physical id"s (chips)
       112 "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 : 56
       siblings  : 56
       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
       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

 From lscpu from util-linux 2.37.2:
       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):                   112
       On-line CPU(s) list:      0-111
       Vendor ID:                GenuineIntel
       Model name:               Intel(R) Xeon(R) Platinum 8480+
       CPU family:               6
```

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## Platform Notes (Continued)

```
       Model:                       143
       Thread(s) per core:          1
       Core(s) per socket:          56
       Socket(s):                   2
       Stepping:                    8
       CPU max MHz:                 3800.0000
       CPU min MHz:                 800.0000
       BogoMIPS:                    4000.00
       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
   hle avx2 smep bmi2 erms invpcid rtm 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 hwp
   hwp_act_window hwp_epp hwp_pkg_req 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:                   5.3 MiB (112 instances)
       L1i cache:                   3.5 MiB (112 instances)
       L2 cache:                    224 MiB (112 instances)
       L3 cache:                    210 MiB (2 instances)
       NUMA node(s):                2
       NUMA node0 CPU(s):           0-55
       NUMA node1 CPU(s):           56-111
       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 and seccomp
       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
```

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## Platform Notes (Continued)

```
      L1d        48K      5.3M   12 Data           1     64       1            64
      L1i        32K      3.5M    8 Instruction    1     64       1            64
      L2          2M      224M   16 Unified        2   2048       1            64
      L3        105M      210M   15 Unified        3 114688       1            64

  /proc/cpuinfo cache data
     cache size : 107520 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
    node 0 size: 515688 MB
    node 0 free: 514268 MB
    node 1 cpus: 56 57 58 59 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
    node 1 size: 516052 MB
    node 1 free: 513788 MB
    node distances:
    node   0   1
      0:  10  21
      1:  21  10

  From /proc/meminfo
     MemTotal:       1056502804 kB
     HugePages_Total:          0
     Hugepagesize:          2048 kB

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

  From /etc/*release* /etc/*version*
     os-release:
        NAME="SLES"
        VERSION="15-SP4"
        VERSION_ID="15.4"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp4"

  uname -a:
     Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18
     UTC 2022 (49db222) x86_64 x86_64 x86_64 GNU/Linux
```

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## Platform Notes (Continued)

```
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 and
                                                    seccomp
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 Jan 3 10:35

SPEC is set to: /spec2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/nvme0n1p8 xfs   1.3T   13G  1.3T   2% /

From /sys/devices/virtual/dmi/id
    Vendor:         ASUSTeK COMPUTER INC.
    Product:        RS720-E11-RS12U
    Product Family: Server

Additional information from dmidecode 3.2 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 M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

BIOS:
   BIOS Vendor:      American Megatrends Inc.
   BIOS Version:     0501
   BIOS Date:        12/29/2022
   BIOS Revision:    5.1

(End of data from sysinfo program)
```

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## 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)
------------------------------------------------------------------------------
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Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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------------------------------------------------------------------------------
```

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## 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 -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`

**(Continued on next page)**

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

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# Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
```
-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`

638.imagick_s: `basepeak = yes`

644.nab_s: `basepeak = yes`

Fortran benchmarks:

**(Continued on next page)**

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# Peak Optimization Flags (Continued)

603.bwaves_s: `basepeak = yes`

649.fotonik3d_s: `basepeak = yes`

654.roms_s: `basepeak = yes`

Benchmarks using both Fortran and C:

621.wrf_s: `basepeak = yes`

627.cam4_s: `basepeak = yes`

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/ASUSTekPlatform-Settings-z13-V1.0.html`
`http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.2022-10-12.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-z13-V1.0.xml`
`http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.2022-10-12.xml`

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

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