# SPEC CPU®2017 Floating Point Rate Result

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## GIGA-BYTE TECHNOLOGY CO., LTD.

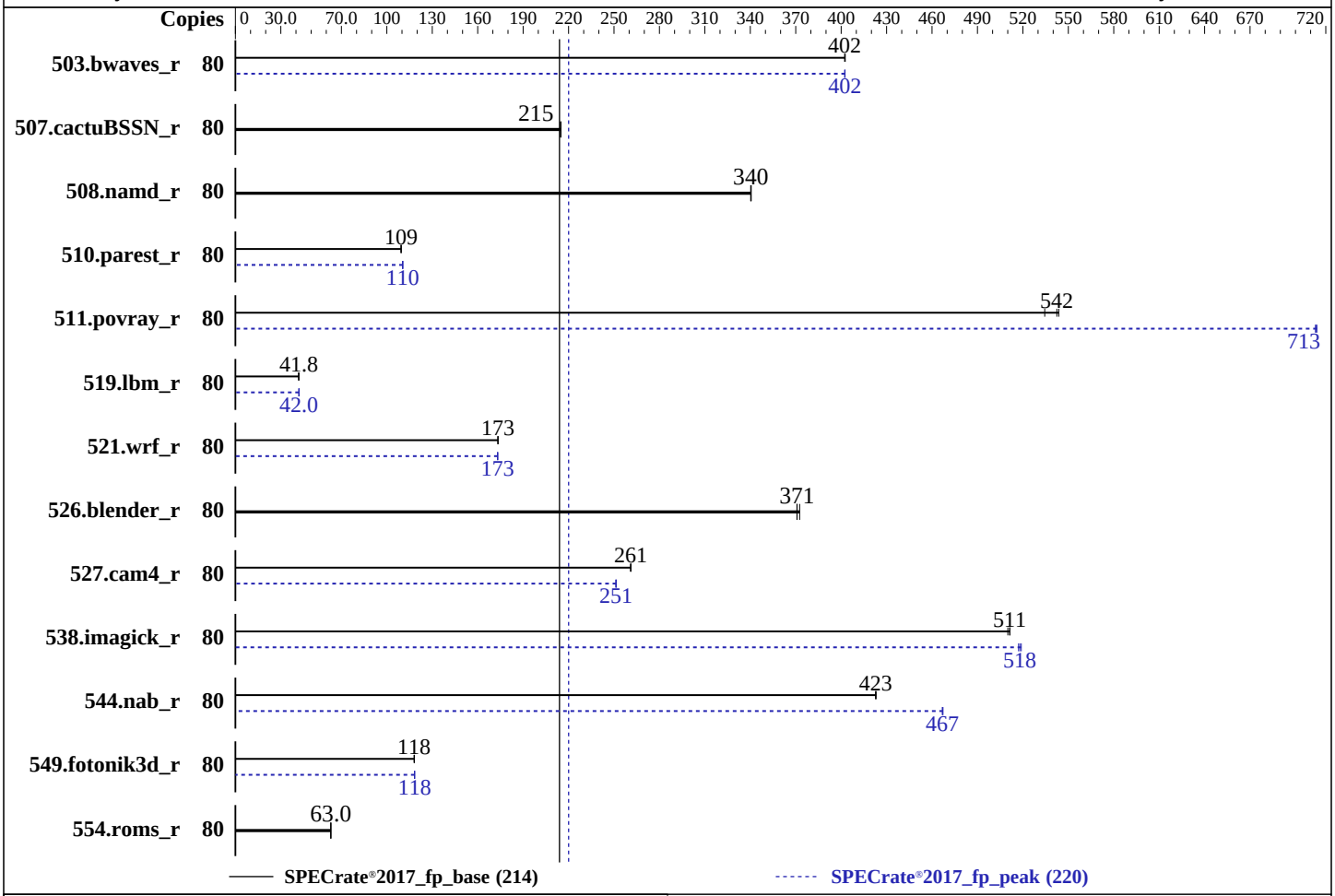
## E252-P30-00 (Ampere Altra Q80-33 3.0 GHz)

**SPECrate®2017_fp_base = 214**

**SPECrate®2017_fp_peak = 220**

**CPU2017 License:** 9082
**Test Sponsor:** GIGA-BYTE TECHNOLOGY CO., LTD.
**Tested by:** GIGA-BYTE TECHNOLOGY CO., LTD.

**Test Date:** Feb-2021
**Hardware Availability:** Mar-2021
**Software Availability:** Dec-2020




## Hardware

| | |
|---|---|
| CPU Name: | Ampere Altra Q80-33 |
| Max MHz: | 3300 |
| Nominal: | 3000 |
| Enabled: | 80 cores, 1 chip |
| Orderable: | 1 chips |
| Cache L1: | 64 KB I + 64 KB D on chip per core |
| L2: | 1 MB I+D on chip per core |
| L3: | 32 MB I+D on chip per chip |
| Other: | None |
| Memory: | 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R) |
| Storage: | 811 GB, NVME, M.2, PCIe Gen3 |
| Other: | None |

## Software

| | |
|---|---|
| OS: | CentOS Linux release 8.3.2011<br>4.18.0-240.1.1.el8_3.aarch64 |
| Compiler: | C/C++/Fortran: Version 10.2.1 of Ampere GCC |
| Parallel: | No |
| Firmware: | Version F05 released Jan-2021 |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 64-bit |
| Other: | Jemalloc memory allocator library v5.2.1 |
| Power Management: | 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 | 80 | 1994 | 402 | 1992 | 403 | **1994** | **402** | 80 | 1993 | 403 | **1993** | **402** | 1994 | 402 |
| 507.cactuBSSN_r | 80 | 472 | 215 | 471 | 215 | **471** | **215** | 80 | 472 | 215 | 471 | 215 | **471** | **215** |
| 508.namd_r | 80 | **223** | **340** | 223 | 340 | 223 | 341 | 80 | **223** | **340** | 223 | 340 | 223 | 341 |
| 510.parest_r | 80 | **1912** | **109** | 1912 | 109 | 1913 | 109 | 80 | 1896 | 110 | 1892 | 111 | **1895** | **110** |
| 511.povray_r | 80 | **344** | **542** | 344 | 544 | 350 | 534 | 80 | 262 | 714 | **262** | **713** | 262 | 713 |
| 519.lbm_r | 80 | 2014 | 41.9 | 2019 | 41.8 | **2016** | **41.8** | 80 | **2009** | **42.0** | 2010 | 41.9 | 2009 | 42.0 |
| 521.wrf_r | 80 | **1034** | **173** | 1033 | 173 | 1034 | 173 | 80 | 1035 | 173 | **1035** | **173** | 1034 | 173 |
| 526.blender_r | 80 | 327 | 373 | 329 | 371 | **328** | **371** | 80 | 327 | 373 | 329 | 371 | **328** | **371** |
| 527.cam4_r | 80 | **536** | **261** | 536 | 261 | 536 | 261 | 80 | 557 | 251 | 556 | 252 | **557** | **251** |
| 538.imagick_r | 80 | **389** | **511** | 389 | 511 | 390 | 510 | 80 | 383 | 519 | **384** | **518** | 385 | 517 |
| 544.nab_r | 80 | **318** | **423** | 318 | 423 | 318 | 423 | 80 | 288 | 467 | 288 | 467 | **288** | **467** |
| 549.fotonik3d_r | 80 | 2637 | 118 | **2640** | **118** | 2641 | 118 | 80 | **2635** | **118** | 2634 | 118 | 2635 | 118 |
| 554.roms_r | 80 | 2018 | 63.0 | **2017** | **63.0** | 2016 | 63.1 | 80 | 2018 | 63.0 | **2017** | **63.0** | 2016 | 63.1 |

**SPECrate®2017_fp_base = 214**

**SPECrate®2017_fp_peak = 220**

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

## Compiler Notes

```
Binaries were compiled on a system with 2x Ampere Altra Q80-33 CPU
chips + 256 GB Memory using CentOS 8.3.

Ampere GCC 10.2.1 is available via
https://github.com/AmpereComputing/ampere-gcc/releases
```

## Submit Notes

```
The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
```

## Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size
Set dirty_ratio=8 to limit dirty cache to 8% of memory
i.e. echo 8 | sudo tee /proc/sys/vm/dirty_ratio
Set swappiness=1 to swap only if necessary
i.e. echo 1 | sudo tee /proc/sys/vm/swappiness
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
i.e. echo 1 | sudo tee /proc/sys/vm/zone_reclaim_mode
Set drop_caches=3 to reset caches before invoking runcpu
i.e. echo 3 | sudo tee /proc/sys/vm/drop_caches
Set numa_balancing=0 to disable automatic numa balancing
```

**(Continued on next page)**

## Operating System Notes (Continued)

```
i.e. echo 0 | sudo tee /proc/sys/kernel/numa_balancing
Switch off all ktune and tuned settings
i.e. sudo tuned-adm off
Transparent huge pages set to 'never'
i.e. sudo bash -c "echo never > /sys/kernel/mm/transparent_hugepage/enabled"

runcpu command invoked through numactl i.e.
  numactl --interleave=0-3 runcpu
```

## Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/amptest/ampere_spec2017/jemalloc/install/lib:/home/amptest/ampere
     _spec2017/gcc/install/lib64/:/home/amptest/ampere_spec2017/gcc/install/l
     ib/:/home/ampere_spec2017/gcc/install/lib64:/home/ampere_spec2017/jemall
     oc/install/lib:"
```

## General Notes

```
Jemalloc v5.2.1 is available via
https://github.com/jemalloc/jemalloc/releases/download/5.2.1/jemalloc-5.2.1.tar.bz2
It was built on CentOS 8.3 using Version 10.2.1 of Ampere GCC with configure options
--prefix=/home/amptest/jemalloc/install --with-lg-quantum=3

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

## Platform Notes

```
BIOS settings:
Chipset > ANC Mode >  Set to Quadrant

Sysinfo program /home/ampere_spec2017/spec2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Thu Feb 18 20:02:01 2021

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)**

## Platform Notes (Continued)

```
 From /proc/cpuinfo
 *
 * Did not identify cpu model.  If you would
 * like to write your own sysinfo program, see
 * www.spec.org/cpu2017/config.html#sysinfo
 *
 *
 * 0 "physical id" tags found.  Perhaps this is an older system,
 * or a virtualized system.  Not attempting to guess how to
 * count chips/cores for this system.
 *
       80 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
    excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)

 From lscpu:
      Architecture:        aarch64
      Byte Order:          Little Endian
      CPU(s):              80
      On-line CPU(s) list: 0-79
      Thread(s) per core:  1
      Core(s) per socket:  80
      Socket(s):           1
      NUMA node(s):        4
      Vendor ID:           ARM
      Model:               1
      Stepping:            r3p1
      CPU max MHz:         3300.0000
      CPU min MHz:         1000.0000
      BogoMIPS:            50.00
      L1d cache:           64K
      L1i cache:           64K
      L2 cache:            1024K
      NUMA node0 CPU(s):   0-19
      NUMA node1 CPU(s):   20-39
      NUMA node2 CPU(s):   40-59
      NUMA node3 CPU(s):   60-79
      Flags:               fp asimd evtstrm aes pmull sha1 sha2 crc32 atomics fphp asimdhp
      cpuid asimdrdm lrcpc dcpop asimddp ssbs

 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 9 10 11 12 13 14 15 16 17 18 19
   node 0 size: 64513 MB
   node 0 free: 63833 MB
```

**(Continued on next page)**

## Platform Notes (Continued)

```
   node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
   node 1 size: 65459 MB
   node 1 free: 65118 MB
   node 2 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
   node 2 size: 65459 MB
   node 2 free: 64773 MB
   node 3 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
   node 3 size: 65424 MB
   node 3 free: 64638 MB
   node distances:
   node   0   1   2   3
     0:  10  11  11  12
     1:  11  10  12  11
     2:  11  12  10  11
     3:  12  11  11  10

 From /proc/meminfo
    MemTotal:       267117376 kB
    HugePages_Total:       0
    Hugepagesize:     524288 kB

 /sbin/tuned-adm active
     No current active profile.

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

 /usr/bin/lsb_release -d
    CentOS Linux release 8.3.2011

 From /etc/*release* /etc/*version*
    centos-release: CentOS Linux release 8.3.2011
    centos-release-upstream: Derived from Red Hat Enterprise Linux 8.3
    os-release:
       NAME="CentOS Linux"
       VERSION="8"
       ID="centos"
       ID_LIKE="rhel fedora"
       VERSION_ID="8"
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="CentOS Linux 8"
       ANSI_COLOR="0;31"
    redhat-release: CentOS Linux release 8.3.2011
    system-release: CentOS Linux release 8.3.2011
    system-release-cpe: cpe:/o:centos:centos:8

 uname -a:
```

**(Continued on next page)**

## Platform Notes (Continued)

```
   Linux localhost.localdomain 4.18.0-240.1.1.el8_3.aarch64 #1 SMP Thu Nov 19 22:13:39
   UTC 2020 aarch64 aarch64 aarch64 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: __user pointer
                                                        sanitization
 CVE-2017-5715 (Spectre variant 2):                     Not affected
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):               Not affected

 run-level 3 Feb 18 19:32

 SPEC is set to: /home/ampere_spec2017/spec2017
    Filesystem          Type  Size  Used Avail Use% Mounted on
    /dev/mapper/cl-home xfs   811G  119G  692G  15% /home

 From /sys/devices/virtual/dmi/id
     Vendor:         GIGABYTE
     Product:        E252-P30-00
     Product Family: Server
     Serial:         0123456789012345678 9AB

 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:
     1x Array 1 Manufacturer 10 Array 1 Part Number 10
     1x Array 1 Manufacturer 12 Array 1 Part Number 12
     1x Array 1 Manufacturer 14 Array 1 Part Number 14
     1x Array 1 Manufacturer 16 Array 1 Part Number 16
     1x Array 1 Manufacturer 2 Array 1 Part Number 2
     1x Array 1 Manufacturer 4 Array 1 Part Number 4
     1x Array 1 Manufacturer 6 Array 1 Part Number 6
     1x Array 1 Manufacturer 8 Array 1 Part Number 8
     8x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

 BIOS:
    BIOS Vendor:       GIGABYTE
    BIOS Version:      F05
```

**(Continued on next page)**

## Platform Notes (Continued)

```
    BIOS Date:         01/19/2021
    BIOS Revision:     5.15
    Firmware Revision: 1.3

  (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)
------------------------------------------------------------------------------
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
C++             | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
```

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## Compiler Version Notes (Continued)

```
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                | 554.roms_r(base, peak)
------------------------------------------------------------------------------
GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------

==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------
GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
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warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216
Copyright (C) 2020 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
gcc

C++ benchmarks:
g++

Fortran benchmarks:
gfortran

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## Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
gfortran gcc

Benchmarks using both C and C++:
g++ gcc

Benchmarks using Fortran, C, and C++:
g++ gcc gfortran

## 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_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
526.blender_r: -funsigned-char -DSPEC_LINUX -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
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:
-mabi=lp64 -std=c99 -L/home/amptest/ampere_spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto -fno-strict-aliasing -ljemalloc

C++ benchmarks:
-mabi=lp64 -std=c++03 -L/home/amptest/ampere_spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto -ljemalloc

Fortran benchmarks:
-mabi=lp64 -L/home/amptest/ampere_spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/gcc/install/lib

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## Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-L/home/amptest/ampere_spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto -fno-stack-arrays -ljemalloc

Benchmarks using both Fortran and C:
-mabi=lp64 -std=c99 -L/home/amptest/ampere_spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto -fno-stack-arrays -fno-strict-aliasing
-ljemalloc

Benchmarks using both C and C++:
-mabi=lp64 -std=c++03 -std=c99
-L/home/amptest/ampere_spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto -fno-strict-aliasing -ljemalloc

Benchmarks using Fortran, C, and C++:
-mabi=lp64 -std=c++03 -std=c99
-L/home/amptest/ampere_spec2017/gcc/install/lib64
-L/home/amptest/ampere_spec2017/gcc/install/lib
-L/home/amptest/ampere_spec2017/jemalloc/install/lib -g -Ofast
-mcpu=neoverse-n1 -flto -fno-stack-arrays -fno-strict-aliasing
-ljemalloc

## Base Other Flags

C benchmarks:
-Wl,-Map,mapfile

C++ benchmarks:
-Wl,-Map,mapfile

Fortran benchmarks:
-fallow-argument-mismatch -Wl,-Map,mapfile

Benchmarks using both Fortran and C:
-fallow-argument-mismatch -Wl,-Map,mapfile

Benchmarks using both C and C++:
-Wl,-Map,mapfile

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## Base Other Flags (Continued)

Benchmarks using Fortran, C, and C++:
`-fallow-argument-mismatch -Wl,-Map,mapfile`

## Peak Compiler Invocation

C benchmarks:
`gcc`

C++ benchmarks:
`g++`

Fortran benchmarks:
`gfortran`

Benchmarks using both Fortran and C:
`gfortran gcc`

Benchmarks using both C and C++:
`g++ gcc`

Benchmarks using Fortran, C, and C++:
`g++ gcc gfortran`

## Peak Portability Flags

`Same as Base Portability Flags`

## Peak Optimization Flags

C benchmarks:
`-mabi=lp64 -std=c99 -L/home/amptest/ampere_spec2017/gcc/install/lib64`
`-L/home/amptest/ampere_spec2017/gcc/install/lib`
`-L/home/amptest/ampere_spec2017/jemalloc/install/lib -fprofile-generate`
`-fprofile-use -g -Ofast -mcpu=neoverse-n1 -funroll-loops -flto=32`
`--param early-inlining-insns=96 --param max-inline-insns-auto=64`
`--param inline-unit-growth=96 -ljemalloc`

C++ benchmarks:

**(Continued on next page)**

## Peak Optimization Flags (Continued)

508.namd_r: `basepeak = yes`

510.parest_r: `-mabi=lp64 -std=c++03`
`-L/home/amptest/ampere_spec2017/gcc/install/lib64`
`-L/home/amptest/ampere_spec2017/gcc/install/lib`
`-L/home/amptest/ampere_spec2017/jemalloc/install/lib`
`-fprofile-generate -fprofile-use -g -Ofast`
`-mcpu=neoverse-n1 -funroll-loops -flto=32`
`--param early-inlining-insns=256`
`--param max-inline-insns-auto=128`
`--param inline-unit-growth=256 -ffinite-loops -ljemalloc`

Fortran benchmarks:

503.bwaves_r: `-mabi=lp64`
`-L/home/amptest/ampere_spec2017/gcc/install/lib64`
`-L/home/amptest/ampere_spec2017/gcc/install/lib`
`-L/home/amptest/ampere_spec2017/jemalloc/install/lib`
`-fprofile-generate -fprofile-use -g -Ofast`
`-mcpu=neoverse-n1 -funroll-loops -flto=32`
`-fno-stack-arrays -ljemalloc`

549.fotonik3d_r: `Same as 503.bwaves_r`

554.roms_r: `basepeak = yes`

Benchmarks using both Fortran and C:

521.wrf_r: `-mabi=lp64 -std=c99`
`-L/home/amptest/ampere_spec2017/gcc/install/lib64`
`-L/home/amptest/ampere_spec2017/gcc/install/lib`
`-L/home/amptest/ampere_spec2017/jemalloc/install/lib`
`-fprofile-generate -fprofile-use -g -Ofast`
`-mcpu=neoverse-n1 -funroll-loops -flto=32`
`--param early-inlining-insns=96`
`--param max-inline-insns-auto=64`
`--param inline-unit-growth=96 -fno-stack-arrays -ljemalloc`

527.cam4_r: `-mabi=lp64 -std=c99`
`-L/home/amptest/ampere_spec2017/gcc/install/lib64`
`-L/home/amptest/ampere_spec2017/gcc/install/lib`
`-L/home/amptest/ampere_spec2017/jemalloc/install/lib`
`-fprofile-generate -fprofile-use -g -Ofast`
`-mcpu=neoverse-n1 -funroll-loops -flto=32`
`--param early-inlining-insns=96`
`--param max-inline-insns-auto=64`

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## Peak Optimization Flags (Continued)

527.cam4_r (continued):
`--param inline-unit-growth=96 -fno-stack-arrays -fno-strict-aliasing -ljemalloc`

Benchmarks using both C and C++:

511.povray_r: `-mabi=lp64 -std=c++03 -std=c99 -L/home/amptest/ampere_spec2017/gcc/install/lib64 -L/home/amptest/ampere_spec2017/gcc/install/lib -L/home/amptest/ampere_spec2017/jemalloc/install/lib -fprofile-generate -fprofile-use -g -Ofast -mcpu=neoverse-n1 -funroll-loops -flto=32 --param early-inlining-insns=96 --param max-inline-insns-auto=64 --param inline-unit-growth=96 --param early-inlining-insns=256 --param max-inline-insns-auto=128 --param inline-unit-growth=256 -ffinite-loops -fno-strict-aliasing -ljemalloc`

526.blender_r: `basepeak = yes`

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: `basepeak = yes`

## Peak Other Flags

C benchmarks:
`-w -Wl,-Map,mapfile`

C++ benchmarks:
`-Wl,-Map,mapfile`

Fortran benchmarks (except as noted below):
`-Wl,-Map,mapfile`

554.roms_r: `-fallow-argument-mismatch -Wl,-Map,mapfile`

Benchmarks using both Fortran and C:

521.wrf_r: `-w -fallow-argument-mismatch -Wl,-Map,mapfile`

**(Continued on next page)**

## Peak Other Flags (Continued)

527.cam4_r: `-fallow-argument-mismatch -Wl,-Map,mapfile`

Benchmarks using both C and C++:
`-Wl,-Map,mapfile`

Benchmarks using Fortran, C, and C++:
`-fallow-argument-mismatch -Wl,-Map,mapfile`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/gcc.2021-07-21.html
http://www.spec.org/cpu2017/flags/GIGA-BYTE-platform-settings-Altra-rev.2.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/gcc.2021-07-21.xml
http://www.spec.org/cpu2017/flags/GIGA-BYTE-platform-settings-Altra-rev.2.xml


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


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