SPEC® CPU2017 Floating Point Speed Result

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GIGA-BYTE TECHNOLOGY CO., LTD.

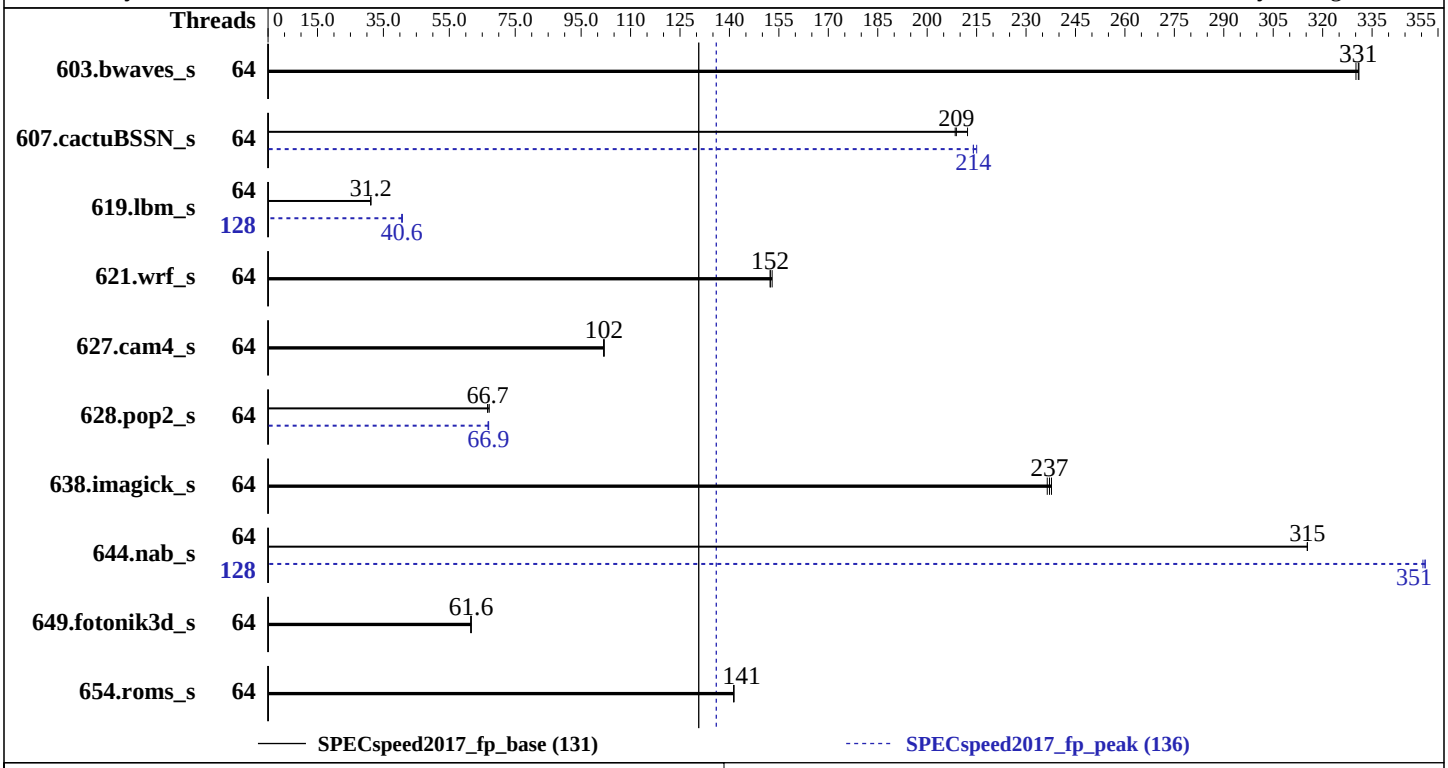
R272-Z30
(AMD EPYC 7742, 2.25GHz)

SPECspeed2017_fp_base = 131

SPECspeed2017_fp_peak = 136

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

Test Date: Jul-2019
Hardware Availability: Aug-2019
Software Availability: Aug-2019



Hardware

CPU Name:	AMD EPYC 7742
Max MHz.:	3400
Nominal:	2250
Enabled:	64 cores, 1 chip, 2 threads/core
Orderable:	1 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	512 KB I+D on chip per core
L3:	256 MB I+D on chip per chip, 16 MB shared / 4 cores
Other:	None
Memory:	512 MB (8 x 64 GB 2Rx4 PC4-3200AA-R)
Storage:	1 x 1.92 TB SATA SSD
Other:	None

Software

OS:	Ubuntu 19.04 (x86_64) kernel version 5.0.0-16-generic
Compiler:	C/C++: Version 1.3.0 of AOCC Fortran: Version 4.8.2 for GCC
Parallel:	Yes
Firmware:	Version R03b released Jun-2019
File System:	ext4
System State:	Run level 5 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	jemalloc: jemalloc memory allocator library V5.2.0;

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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	64	178	331	179	330	**178**	**331**	64	178	331	179	330	**178**	**331**
607.cactuBSSN_s	64	80.0	209	78.5	212	**79.8**	**209**	64	77.5	215	**77.9**	**214**	77.9	214
619.lbm_s	64	168	31.2	**168**	**31.2**	168	31.2	128	**129**	**40.6**	129	40.6	128	40.8
621.wrf_s	64	86.8	152	**86.8**	**152**	86.5	153	64	86.8	152	**86.8**	**152**	86.5	153
627.cam4_s	64	87.1	102	**86.9**	**102**	86.9	102	64	87.1	102	**86.9**	**102**	86.9	102
628.pop2_s	64	177	67.1	178	66.6	**178**	**66.7**	64	177	66.9	178	66.8	**178**	**66.9**
638.imagick_s	64	**60.8**	**237**	60.7	238	61.0	236	64	**60.8**	**237**	60.7	238	61.0	236
644.nab_s	64	**55.4**	**315**	55.4	315	55.4	315	128	**49.8**	**351**	49.8	351	49.9	350
649.fotonik3d_s	64	**148**	**61.6**	148	61.6	148	61.5	64	**148**	**61.6**	148	61.6	148	61.5
654.roms_s	64	111	141	**111**	**141**	111	141	64	111	141	**111**	**141**	111	141

SPECspeed2017_fp_base = 131

SPECspeed2017_fp_peak = 136

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

Submit Notes

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

Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
sync then drop_caches=3 to reset caches before invoking runcpu

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)
```

General Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-63"
LD_LIBRARY_PATH = "/root/cpu2017/amd_speed_aocc130_naples_A_lib/64;/root/cpu2017/amd_speed_aocc130_naples_A_lib/32:"
```

(Continued on next page)

General Notes (Continued)

```
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

Binaries were compiled on a system with 2p AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.6

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 AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/amd-aocc/

The AOCC Fortran Plugin version 1.3.0 was used to leverage AOCC optimizers
with gfortran. It is available here:
http://developer.amd.com/amd-aocc/

jemalloc: configured and built with GCC v4.8.5 in RHEL v7.2 under default conditions.
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2
```

Platform Notes

```
 BIOS settings:
 cTDP = 240
 Determinism Slider set to Power
 SMT set to auto
 IOMMU set to enable
 Package Power Limit set to 240
 Enforce POR Overclock set to Enable
 NUMA nodes per socket set to NPS1
 Sysinfo program /root/cpu2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on test Wed Jul  3 08:48:03 2019

 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 : AMD EPYC 7742 64-Core Processor
       1  "physical id"s (chips)
       128 "processors"
```

(Continued on next page)

Platform Notes (Continued)

```
    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 : 64
       siblings  : 128
       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 60 61 62 63

 From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      Address sizes:       43 bits physical, 48 bits virtual
      CPU(s):              128
      On-line CPU(s) list: 0-127
      Thread(s) per core:  2
      Core(s) per socket:  64
      Socket(s):           1
      NUMA node(s):        1
      Vendor ID:           AuthenticAMD
      CPU family:          23
      Model:               49
      Model name:          AMD EPYC 7742 64-Core Processor
      Stepping:            0
      CPU MHz:             2153.387
      CPU max MHz:         2250.0000
      CPU min MHz:         1500.0000
      BogoMIPS:            4500.26
      Virtualization:      AMD-V
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            512K
      L3 cache:            16384K
      NUMA node0 CPU(s):   0-127
      Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
      pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
      constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni
      pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
      rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
      osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb
      cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2
      smep bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1
      xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr
      wbnoinvd arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid
      decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid
      overflow_recov succor smca
```

(Continued on next page)

Platform Notes (Continued)

```
/proc/cpuinfo cache data
   cache size : 512 KB

From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
physical chip.
  available: 1 nodes (0)
  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 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
  111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
  node 0 size: 515897 MB
  node 0 free: 513576 MB
  node distances:
  node   0
    0:  10

From /proc/meminfo
   MemTotal:       528279228 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
   Ubuntu 19.04

From /etc/*release* /etc/*version*
   debian_version: buster/sid
   os-release:
      NAME="Ubuntu"
      VERSION="19.04 (Disco Dingo)"
      ID=ubuntu
      ID_LIKE=debian
      PRETTY_NAME="Ubuntu 19.04"
      VERSION_ID="19.04"
      HOME_URL="https://www.ubuntu.com/"
      SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
   Linux test 5.0.0-16-generic #17-Ubuntu SMP Wed May 15 10:52:21 UTC 2019 x86_64 x86_64
   x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown):          Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional,
IBRS_FW, STIBP: always-on, RSB filling
```

(Continued on next page)

Platform Notes (Continued)

```
 run-level 5 Jul 3 08:45

 SPEC is set to: /root/cpu2017
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda2      ext4  1.8T   25G  1.7T   2% /

 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.
   BIOS GIGABYTE R03b 06/25/2019
   Memory:
    8x SK Hynix HMAA8GR7AJR4N-XN 64 kB 2 rank 3200
    8x Unknown Unknown

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
 CC  619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
------------------------------------------------------------------------------
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
  AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
 FC  607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
  AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
  AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
```

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Compiler Version Notes (Continued)

```
You may redistribute copies of GNU Fortran
under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING
------------------------------------------------------------------------------

==============================================================================
 FC  603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base,
      peak)
------------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
You may redistribute copies of GNU Fortran
under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING
------------------------------------------------------------------------------

==============================================================================
 CC  621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
------------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
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under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
  AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
clang gfortran

Benchmarks using both Fortran and C:
clang gfortran

Benchmarks using Fortran, C, and C++:
clang++ clang gfortran

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
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:
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -ljemalloc -lamdlibm

Fortran benchmarks:
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -mavx -madx
-funroll-loops -ffast-math -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lamdlibm -lgfortran

Benchmarks using both Fortran and C:
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -mavx -madx -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl

(Continued on next page)

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
-ljemalloc -lamdlibm -lgfortran

Benchmarks using Fortran, C, and C++:
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -enable-vectorize-compares=false -mavx
-madx -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lamdlibm

Base Other Flags

C benchmarks:
-Wno-return-type -DUSE_OPENMP

Fortran benchmarks:
-DUSE_OPENMP -Wno-return-type

Benchmarks using both Fortran and C:
-DUSE_OPENMP -Wno-return-type

Benchmarks using Fortran, C, and C++:
-Wno-return-type -DUSE_OPENMP

Peak Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
clang gfortran

Benchmarks using both Fortran and C:
clang gfortran

(Continued on next page)

Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
clang++ clang gfortran

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

619.lbm_s: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -ljemalloc
-lamdlibm

638.imagick_s: basepeak = yes

644.nab_s: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -ljemalloc

Fortran benchmarks:

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

(Continued on next page)

Peak Optimization Flags (Continued)

627.cam4_s: `basepeak = yes`

628.pop2_s: `-flto -Wl,-plugin-opt=-merge-constant -Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1 -fstruct-layout=3 -mllvm -vectorize-memory-aggressively -mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays -mllvm -inline-threshold=1000 -O3 -mavx2 -madx -funroll-loops -ffast-math -fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant -fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -ljemalloc -lamdlibm -lgfortran`

Benchmarks using Fortran, C, and C++:
`-std=c++98 -flto -Wl,-plugin-opt=-merge-constant -Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1 -fstruct-layout=3 -mllvm -vectorize-memory-aggressively -mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays -mllvm -inline-threshold=1000 -finline-aggressive -O3 -mavx2 -madx -funroll-loops -ffast-math -fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant -fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -ljemalloc -lamdlibm`

Peak Other Flags

C benchmarks:
`-Wno-return-type -DUSE_OPENMP`

Fortran benchmarks:
`-DUSE_OPENMP -Wno-return-type`

Benchmarks using both Fortran and C:
`-DUSE_OPENMP -Wno-return-type`

Benchmarks using Fortran, C, and C++:
`-Wno-return-type -DUSE_OPENMP`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/aocc130-flags-revA21.html
http://www.spec.org/cpu2017/flags/gcc.2019-08-07.html
http://www.spec.org/cpu2017/flags/GIGA-BYTE-Platform-SPECcpu2017-Flags-V1.1-Rome-B.html

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

```
http://www.spec.org/cpu2017/flags/aocc130-flags-revA21.xml
http://www.spec.org/cpu2017/flags/gcc.2019-08-07.xml
http://www.spec.org/cpu2017/flags/GIGA-BYTE-Platform-SPECcpu2017-Flags-V1.1-Rome-B.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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