SPEC® CPU2017 Floating Point Speed Result

GIGA-BYTE TECHNOLOGY CO., LTD.

R282-Z90
(AMD EPYC 7742, 2.25GHz)

$SPECspeed2017\_fp\_base = 200$

$SPECspeed2017\_fp\_peak = 208$

CPU2017 License: 9082		**Test Date:** Jul-2019
Test Sponsor: GIGA-BYTE TECHNOLOGY CO., LTD.		**Hardware Availability:** Aug-2019
Tested by: GIGA-BYTE TECHNOLOGY CO., LTD.		**Software Availability:** Aug-2019

Threads 0 30.0 60.0 90.0 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570 600 650

- **603.bwaves_s** 128 — 637 / 640
- **607.cactuBSSN_s** 128 — 301 / 303
- **619.lbm_s** 128 — 76.7 ; **256** — 98.4
- **621.wrf_s** 128 — 142
- **627.cam4_s** 128 — 170
- **628.pop2_s** 128 — 65.7 / 65.7
- **638.imagick_s** 128 — 333 / 359
- **644.nab_s** 128 — 465 ; **256** — 477
- **649.fotonik3d_s** 128 — 88.6
- **654.roms_s** 128 — 324

——— **SPECspeed2017_fp_base (200)**   - - - - **SPECspeed2017_fp_peak (208)**

Hardware

CPU Name:	AMD EPYC 7742
Max MHz.:	3400
Nominal:	2250
Enabled:	128 cores, 2 chips, 2 threads/core
Orderable:	1,2 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:	1 TB (16 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 5.0.0-20-generic
Compiler:	C/C++: Version 1.3.0 of AOCC Fortran: Version 4.8.2 for GCC
Parallel:	Yes
Firmware:	Version D09 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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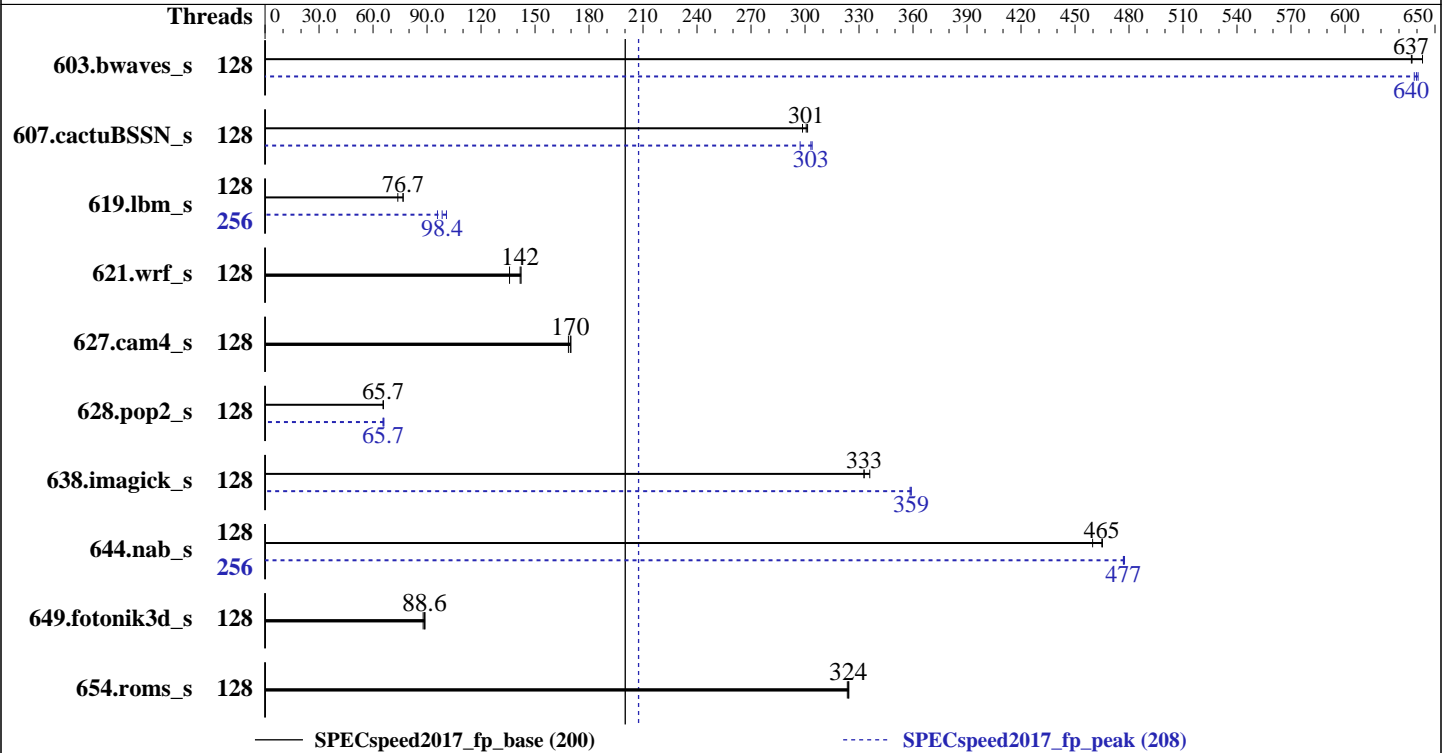
SPECspeed2017_fp_peak = 208

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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	128	91.7	643	92.6	637	**92.6**	**637**	128	92.4	638	92.1	641	**92.2**	**640**
607.cactuBSSN_s	128	55.3	301	**55.4**	**301**	55.8	299	128	56.1	297	54.8	304	**55.0**	**303**
619.lbm_s	128	71.0	73.8	**68.3**	**76.7**	68.3	76.7	256	**53.2**	**98.4**	52.0	101	54.7	95.8
621.wrf_s	128	97.4	136	93.0	142	**93.3**	**142**	128	97.4	136	93.0	142	**93.3**	**142**
627.cam4_s	128	52.6	169	52.2	170	**52.3**	**170**	128	52.6	169	52.2	170	**52.3**	**170**
628.pop2_s	128	**181**	**65.7**	181	65.6	181	65.8	128	180	66.0	**181**	**65.7**	181	65.6
638.imagick_s	128	**43.3**	**333**	43.4	333	42.9	336	128	40.3	358	40.2	359	**40.2**	**359**
644.nab_s	128	38.0	460	37.6	465	**37.6**	**465**	256	36.6	477	36.6	478	**36.6**	**477**
649.fotonik3d_s	128	104	87.8	**103**	**88.6**	103	88.9	128	104	87.8	**103**	**88.6**	103	88.9
654.roms_s	128	48.5	324	**48.6**	**324**	48.7	323	128	48.5	324	**48.6**	**324**	48.7	323
SPECspeed2017_fp_base =		**200**												
SPECspeed2017_fp_peak =		**208**												

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 = "0-127"
LD_LIBRARY_PATH = "/root/cpu2017/cpu2017/amd_speed_aocc130_naples_A_lib/64;
```

(Continued on next page)

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Software Availability: Aug-2019

General Notes (Continued)

```
/root/cpu2017/cpu2017/amd_speed_aocc130_naples_A_lib/32:"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "256"


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


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
 NUMA nodes per socket set to NPS1
 Sysinfo program /root/cpu2017/cpu2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on test Wed Jul  3 08:49:27 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
       2  "physical id"s (chips)
       256 "processors"
```

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Software Availability: Aug-2019

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
     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 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):              256
     On-line CPU(s) list: 0-255
     Thread(s) per core:  2
     Core(s) per socket:  64
     Socket(s):           2
     NUMA node(s):        2
     Vendor ID:           AuthenticAMD
     CPU family:          23
     Model:               49
     Model name:          AMD EPYC 7742 64-Core Processor
     Stepping:            0
     CPU MHz:             1812.823
     CPU max MHz:         2250.0000
     CPU min MHz:         1500.0000
     BogoMIPS:            4500.02
     Virtualization:      AMD-V
     L1d cache:           32K
     L1i cache:           32K
     L2 cache:            512K
     L3 cache:            16384K
     NUMA node0 CPU(s):   0-63,128-191
     NUMA node1 CPU(s):   64-127,192-255
     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 x2apic 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
```

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Test Date: Jul-2019
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Platform Notes (Continued)

```
     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

 /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: 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 60 61 62 63 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
    144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165
    166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187
    188 189 190 191
    node 0 size: 515929 MB
    node 0 free: 513981 MB
    node 1 cpus: 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
    113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 192 193 194 195 196 197 198
    199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220
    221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242
    243 244 245 246 247 248 249 250 251 252 253 254 255
    node 1 size: 516042 MB
    node 1 free: 513850 MB
    node distances:
    node   0   1
      0:  10  32
      1:  32  10

 From /proc/meminfo
    MemTotal:       1056739164 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"
```

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Platform Notes (Continued)

```
        VERSION_ID="19.04"
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

  uname -a:
     Linux test 5.0.0-20-generic #21-Ubuntu SMP Mon Jun 24 09:32:09 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

  run-level 5 Jul 3 08:48

  SPEC is set to: /root/cpu2017/cpu2017
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/sda2       ext4  1.8T   20G  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 D09 06/25/2019
    Memory:
     16x SK Hynix HMAA8GR7AJR4N-XN 64 kB 2 rank 3200
     16x 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)
```

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Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------------
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
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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)
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  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
--------------------------------------------------------------------------------
```

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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
```

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-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
-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
```

(Continued on next page)

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R282-Z90
(AMD EPYC 7742, 2.25GHz)

SPECspeed2017_fp_base = 200

SPECspeed2017_fp_peak = 208

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

Base Other Flags (Continued)

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
```

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: `-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`

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

SPEC CPU2017 Floating Point Speed Result

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Peak Optimization Flags (Continued)

638.imagick_s (continued):
```
-fopenmp=libomp -lomp -lpthread -ldl -ljemalloc
```

644.nab_s: `Same as 638.imagick_s`

Fortran benchmarks:

603.bwaves_s: `-flto -Wl,-plugin-opt=-merge-constant`
```
-Wl,-plugin-opt=-lsr-in-nested-loop -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
```

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: `-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
```

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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

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

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