SPEC CPU®2017 Integer Rate Result

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NEC Corporation
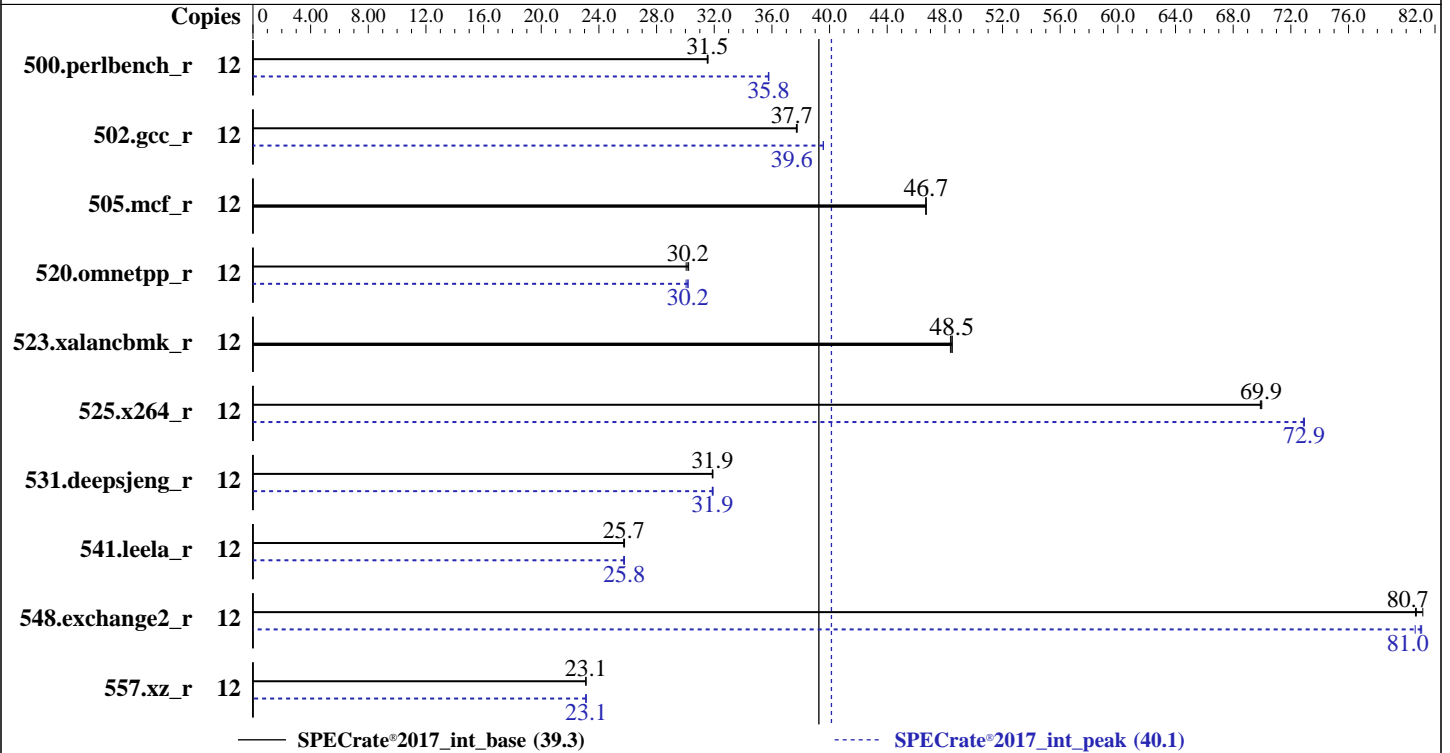
Express5800/R120h-1M (Intel Xeon Bronze 3204)

$SPECrate^{®}2017\_int\_base = 39.3$

$SPECrate^{®}2017\_int\_peak = 40.1$

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Tested by: NEC Corporation

Test Date: Sep-2020
Hardware Availability: Dec-2019
Software Availability: Sep-2019

Benchmark	Copies	Base	Peak
500.perlbench_r	12	31.5	35.8
502.gcc_r	12	37.7	39.6
505.mcf_r	12	46.7	
520.omnetpp_r	12	30.2	30.2
523.xalancbmk_r	12	48.5	
525.x264_r	12	69.9	72.9
531.deepsjeng_r	12	31.9	31.9
541.leela_r	12	25.7	25.8
548.exchange2_r	12	80.7	81.0
557.xz_r	12	23.1	23.1

SPECrate®2017_int_base (39.3)   SPECrate®2017_int_peak (40.1)

Hardware

CPU Name: Intel Xeon Bronze 3204
 Max MHz: 1900
 Nominal: 1900
Enabled: 12 cores, 2 chips
Orderable: 1,2 chips
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 8.25 MB I+D on chip per chip
 Other: None
Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2133)
Storage: 1 x 1 TB SATA, 7200 RPM, RAID 0
Other: None

Software

OS: Red Hat Enterprise Linux Server release 7.7 (Maipo)
Kernel 3.10.0-1062.1.1.el7.x86_64
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
Parallel: No
Firmware: NEC BIOS Version U32 v2.32 03/09/2020 released Jun-2020
File System: ext4
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS 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
500.perlbench_r	12	**606**	**31.5**	605	31.6	606	31.5	12	**534**	**35.8**	534	35.8	534	35.8
502.gcc_r	12	451	37.7	450	37.7	**450**	**37.7**	12	**429**	**39.6**	429	39.6	429	39.6
505.mcf_r	12	**415**	**46.7**	415	46.7	415	46.7	12	**415**	**46.7**	415	46.7	415	46.7
520.omnetpp_r	12	521	30.2	524	30.1	**522**	**30.2**	12	**522**	**30.2**	522	30.2	524	30.0
523.xalancbmk_r	12	**261**	**48.5**	262	48.4	261	48.5	12	**261**	**48.5**	262	48.4	261	48.5
525.x264_r	12	**300**	**69.9**	301	69.9	300	70.0	12	**288**	**72.9**	288	72.9	288	72.9
531.deepsjeng_r	12	431	31.9	432	31.9	**431**	**31.9**	12	431	31.9	**431**	**31.9**	432	31.9
541.leela_r	12	**772**	**25.7**	772	25.7	771	25.8	12	771	25.8	**772**	**25.8**	773	25.7
548.exchange2_r	12	390	80.6	**390**	**80.7**	387	81.2	12	390	80.6	**388**	**81.0**	388	81.1
557.xz_r	12	561	23.1	**561**	**23.1**	561	23.1	12	561	23.1	**561**	**23.1**	561	23.1
SPECrate®2017_int_base =		39.3										
SPECrate®2017_int_peak =		40.1										

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

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

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:
LD_LIBRARY_PATH =
    "/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-
    32"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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
runcpu command invoked through numactl i.e.:

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General Notes (Continued)

```
numactl --interleave=all runcpu <etc>

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

Platform Notes

```
BIOS Settings:
 Thermal Configuration: Maximum Cooling
 Workload Profile: General Throughput Compute
 Memory Patrol Scrubbing: Disabled
 LLC Dead Line Allocation: Disabled
 LLC Prefetch: Enabled
 Enhanced Processor Performance: Enabled
 Workload Profile: Custom
  Advanced Memory Protection: Advanced ECC Support
  Sub-NUMA Clustering: Disabled


Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on r120h1m Tue Sep 15 18:17:50 2020

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) Bronze 3204 CPU @ 1.90GHz
      2  "physical id"s (chips)
      12 "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 : 6
      siblings  : 6
      physical 0: cores 0 1 2 3 4 5
      physical 1: cores 0 1 2 3 4 5

From lscpu:
```

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Platform Notes (Continued)

```
        Architecture:          x86_64
        CPU op-mode(s):        32-bit, 64-bit
        Byte Order:            Little Endian
        CPU(s):                12
        On-line CPU(s) list:   0-11
        Thread(s) per core:    1
        Core(s) per socket:    6
        Socket(s):             2
        NUMA node(s):          2
        Vendor ID:             GenuineIntel
        CPU family:            6
        Model:                 85
        Model name:            Intel(R) Xeon(R) Bronze 3204 CPU @ 1.90GHz
        Stepping:              6
        CPU MHz:               1900.000
        BogoMIPS:              3800.00
        Virtualization:        VT-x
        L1d cache:             32K
        L1i cache:             32K
        L2 cache:              1024K
        L3 cache:              8448K
        NUMA node0 CPU(s):     0-2,6-8
        NUMA node1 CPU(s):     3-5,9-11
        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
    aperfmperf eagerfpu 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 epb cat_l3 cdp_l3 invpcid_single
    intel_ppin intel_pt ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
    flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
    cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw
    avx512vl xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
    dtherm arat pln pts pku ospke avx512_vnni md_clear spec_ctrl intel_stibp flush_l1d
    arch_capabilities

 /proc/cpuinfo cache data
    cache size : 8448 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 6 7 8
    node 0 size: 196265 MB
    node 0 free: 191707 MB
    node 1 cpus: 3 4 5 9 10 11
    node 1 size: 196607 MB
```

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Platform Notes (Continued)

```
   node 1 free: 192109 MB
   node distances:
   node   0   1
     0:  10  21
     1:  21  10

From /proc/meminfo
   MemTotal:       395928236 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.7 (Maipo)"
      ID="rhel"
      ID_LIKE="fedora"
      VARIANT="Server"
      VARIANT_ID="server"
      VERSION_ID="7.7"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.7 (Maipo)"
   redhat-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
   system-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:7.7:ga:server

uname -a:
   Linux r120h1m 3.10.0-1062.1.1.el7.x86_64 #1 SMP Tue Aug 13 18:39:59 UTC 2019 x86_64
   x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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: Load fences, usercopy/swapgs
                                          barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):        Mitigation: Full retpoline, IBPB

run-level 3 Sep 15 18:12

SPEC is set to: /home/cpu2017
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda3       ext4  908G  186G  677G  22% /

From /sys/devices/virtual/dmi/id
```

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Platform Notes (Continued)

```
      BIOS:    NEC U32 03/09/2020
      Vendor:  NEC
      Product: Express5800/R120h-1M
      Serial:  JPN0084094

 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:
      24x HPE P03050-091 16 GB 2 rank 2933

 (End of data from sysinfo program)
Regarding the sysinfo display about the memory speed, the correct configured
memory speed is 2133 MT/s. The dmidecode description should be as follows:
24x HPE P03050-091 16 GB 2 rank 2933, configured at 2133
```

Compiler Version Notes

```
==============================================================================
C        | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
  19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
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Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==========================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==========================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icc -m64 -std=c11`

C++ benchmarks:
`icpc -m64`

Fortran benchmarks:
`ifort -m64`

Base Portability Flags

  500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
  502.gcc_r: `-DSPEC_LP64`
  505.mcf_r: `-DSPEC_LP64`
  520.omnetpp_r: `-DSPEC_LP64`
  523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
  525.x264_r: `-DSPEC_LP64`

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Base Portability Flags (Continued)

531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

C++ benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

Fortran benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

Peak Compiler Invocation

C benchmarks (except as noted below):
`icc -m64 -std=c11`

502.gcc_r: `icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin`

C++ benchmarks:
`icpc -m64`

Fortran benchmarks:
`ifort -m64`

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Peak Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Peak Optimization Flags

C benchmarks:

500.perlbench_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4`
`-fno-strict-overflow`
`-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
`-lqkmalloc`

502.gcc_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4`
`-L/usr/local/je5.0.1-32/lib -ljemalloc`

505.mcf_r: basepeak = yes

525.x264_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4 -fno-alias`
`-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
`-lqkmalloc`

557.xz_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4`
`-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
`-lqkmalloc`

C++ benchmarks:

520.omnetpp_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4`
`-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
`-lqkmalloc`

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Peak Optimization Flags (Continued)

523.xalancbmk_r: `basepeak = yes`

531.deepsjeng_r: `Same as 520.omnetpp_r`

541.leela_r: `Same as 520.omnetpp_r`

Fortran benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.html
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevE.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevE.xml

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

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