



# SPEC® CFP2006 Result

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## IBM Corporation

IBM PowerLinux 7R4 (4.0 GHz, 32 core, RHEL, GCC)

**SPECfp®\_rate2006 = 1110**

**SPECfp\_rate\_base2006 = 983**

CPU2006 license: 11

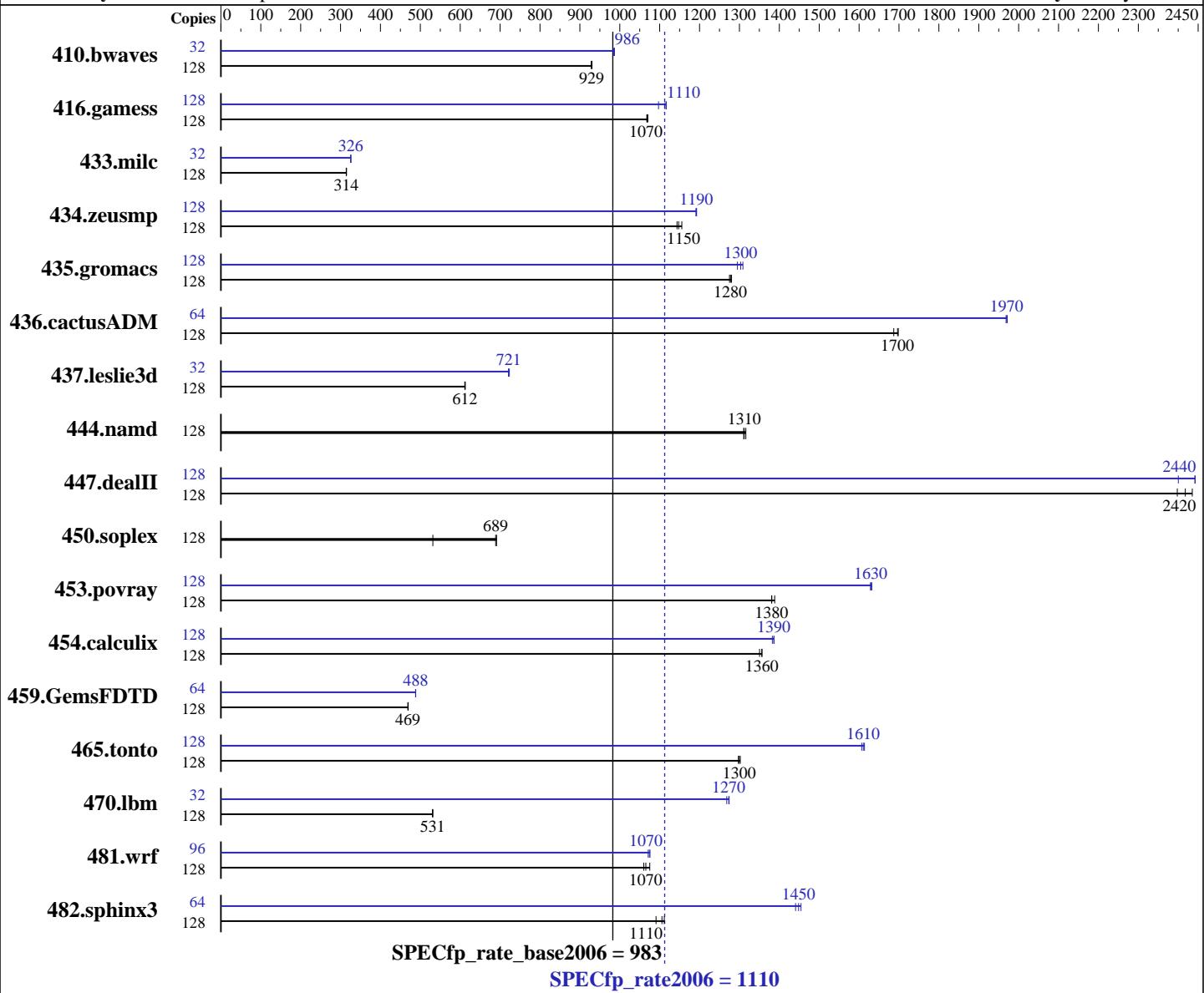
Test sponsor: IBM Corporation

Tested by: IBM Corporation

**Test date:** May-2013

**Hardware Availability:** Aug-2013

**Software Availability:** May-2013



### Hardware

CPU Name: POWER7+  
CPU Characteristics: Intelligent Energy Optimization enabled, up to 4.431 GHz  
CPU MHz: 4060  
FPU: Integrated  
CPU(s) enabled: 32 cores, 8 chips, 4 cores/chip, 4 threads/core  
CPU(s) orderable: 16, 32 cores  
Primary Cache: 32 KB I + 32 KB D on chip per core

### Software

Operating System: Red Hat Enterprise Linux Server release 6.4 (ppc64) kernel 2.6.32-358.6.1.el6.ppc64  
Compiler: C/C++/Fortran: Version 4.7.3 of IBM Advance Toolchain 6.0-4 gcc/g++/gfortran compiler  
Auto Parallel: No  
File System: ext4  
System State: Run level 3 (multi-user)  
Base Pointers: 32-bit  
Peak Pointers: 32/64-bit

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Secondary Cache: 256 KB I+D on chip per core  
 L3 Cache: 10 MB I+D on chip per core  
 Other Cache: None  
 Memory: 256 GB (64 x 4 GB) DDR3 1066 MHz  
 Disk Subsystem: 1 x 300 GB SAS SFF 15K RPM  
 Other Hardware: None

Other Software:  
 -IBM Advance Toolchain 6.0-4  
 -IBM Mathematical Acceleration Subsystem (MASS) libraries 7.1.0.2  
 -Post-Link Optimization for Linux on POWER, version 5.6.2-1

## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	128	1874	928	1870	930	<u>1872</u>	<u>929</u>	32	<u>441</u>	<u>986</u>	441	987	<u>441</u>	985
416.gamess	128	<b>2346</b>	<b>1070</b>	2341	1070	2347	1070	128	2284	1100	2244	1120	<b>2251</b>	<b>1110</b>
433.milc	128	3739	314	3730	315	<u>3738</u>	<u>314</u>	32	<u>902</u>	<u>326</u>	903	325	901	326
434.zeusmp	128	1019	1140	1008	1160	<u>1015</u>	<u>1150</u>	128	977	1190	978	1190	<u>977</u>	<u>1190</u>
435.gromacs	128	717	1280	714	1280	<u>715</u>	<u>1280</u>	128	698	1310	<u>701</u>	<u>1300</u>	706	1290
436.cactusADM	128	901	1700	907	1690	<u>902</u>	<u>1700</u>	64	389	1970	<u>388</u>	<u>1970</u>	388	1970
437.leslie3d	128	1964	613	<b>1966</b>	<b>612</b>	1968	611	32	417	721	416	723	<b>417</b>	<b>721</b>
444.namd	128	783	1310	780	1320	<u>782</u>	<u>1310</u>	128	783	1310	780	1320	<b>782</b>	<b>1310</b>
447.dealII	128	<b>606</b>	<b>2420</b>	611	2400	601	2440	128	610	2400	599	2440	<b>600</b>	<b>2440</b>
450.soplex	128	2009	531	1545	691	<u>1550</u>	<u>689</u>	128	2009	531	1545	691	<b>1550</b>	<b>689</b>
453.povray	128	490	1390	493	1380	<u>493</u>	<u>1380</u>	128	417	1630	<b>418</b>	<b>1630</b>	418	1630
454.calculix	128	778	1360	<b>779</b>	<b>1360</b>	782	1350	128	762	1390	764	1380	<b>762</b>	<b>1390</b>
459.GemsFDTD	128	2892	470	<b>2895</b>	<b>469</b>	2896	469	64	1391	488	1390	488	<b>1391</b>	<b>488</b>
465.tonto	128	971	1300	<b>969</b>	<b>1300</b>	967	1300	128	781	1610	784	1610	<b>782</b>	<b>1610</b>
470.lbm	128	3314	531	<b>3314</b>	<b>531</b>	3310	531	32	<u>345</u>	<u>1270</u>	347	1270	345	1270
481.wrf	128	1348	1060	1330	1080	<u>1342</u>	<u>1070</u>	96	997	1080	<b>998</b>	<b>1070</b>	1001	1070
482.sphinx3	128	2244	1110	2287	1090	<u>2256</u>	<u>1110</u>	64	858	1450	<b>861</b>	<b>1450</b>	866	1440

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

## Compiler Invocation Notes

For more information about IBM Advance Toolchain, including support, see  
[ftp://ftp.unicamp.br/pub/linuxpatch/toolchain/at/redhat/RHEL6/at6.0/release\\_notes.at6.0-6.0-4.html](ftp://ftp.unicamp.br/pub/linuxpatch/toolchain/at/redhat/RHEL6/at6.0/release_notes.at6.0-6.0-4.html)

## Peak Tuning Notes

Post-Link optimization tool used for:

410.bwaves

with options -O4 -omullX for optimization phase,  
 and -imullX for instrumentation phase

416.gamess

with options -O4 -omullX for optimization phase,  
 and -imullX for instrumentation phase

429.mcf

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## Peak Tuning Notes (Continued)

with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
433.milc  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
434.zeusmp  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
437.leslie3d  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
453.povray  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
454.calculix  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
459.GemsFDTD  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
465.tonto  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
470.lbm  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase  
481.wrf  
with options -O4 -fomit-llX for optimization phase,  
and -fimmit-llX for instrumentation phase

## Submit Notes

The config file option 'submit' was used  
to assign benchmark copy to specific kernel thread using  
the "numactl" command (see flags file for details).

## Operating System Notes

ulimit -s (stack) set to 1048576.

Large pages reserved as follows by root user:  
echo 8448 > /proc/sys/vm/nr\_hugepages

The Mathematical Acceleration Subsystem libraries  
are shipped with IBM XL C/C++ version 12.1 and  
IBM XL Fortran version 14.1 compiler products.

crashkernel was set to 256 MB in /etc/yaboot.conf file.



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## General Notes

Environment variables set by runspec before the start of the run:

```
HUGETLB_ELFMAP = "RW"  
HUGETLB_MORECORE = "yes"  
HUGETLB_VERBOSE = "0"  
TCMALLOC_MEMFS_MALLOC_PATH = "/libhugetlbfs"  
XLF RTEOPTS = "intrinthds=1"
```

## Base Compiler Invocation

C benchmarks:

```
/opt/at6.0/bin/gcc
```

C++ benchmarks:

```
/opt/at6.0/bin/g++
```

Fortran benchmarks:

```
/opt/at6.0/bin/gfortran
```

Benchmarks using both Fortran and C:

```
/opt/at6.0/bin/gcc /opt/at6.0/bin/gfortran
```

## Base Portability Flags

447.dealII: -DSPEC\_CPU\_LINUX

481.wrf: -DSPEC\_CPU\_CASE\_FLAG -DSPEC\_CPU\_LINUX\_PPC

482.sphinx3: -fsigned-char

## Base Optimization Flags

C benchmarks:

```
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt  
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model  
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib  
-L /opt/ibmcpp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib  
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7  
-lmass_simdp7 -lmass
```

C++ benchmarks:

```
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt  
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model  
-mveclibabi=mass --param max-inline-insns-auto=200  
-fno-associative-math -flto -fwhole-program -fuse-linker-plugin  
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib  
-L /opt/ibmcpp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib  
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7  
-lmass_simdp7 -lmass
```

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## Base Optimization Flags (Continued)

Fortran benchmarks:

```
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt  
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model  
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib  
-L /opt/ibmcpp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib  
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7  
-lmass_simdp7 -lmass
```

Benchmarks using both Fortran and C:

```
-ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt  
-fpeel-loops -funroll-loops -mpopcntd -m32 -fvect-cost-model  
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib  
-L /opt/ibmcpp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib  
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7  
-lmass_simdp7 -lmass
```

## Peak Compiler Invocation

C benchmarks:

```
/opt/at6.0/bin/gcc
```

C++ benchmarks:

```
/opt/at6.0/bin/g++
```

Fortran benchmarks:

```
/opt/at6.0/bin/gfortran
```

Benchmarks using both Fortran and C:

```
/opt/at6.0/bin/gcc /opt/at6.0/bin/gfortran
```

## Peak Portability Flags

436.cactusADM: -DSPEC\_CPU\_LP64

447.dealII: -DSPEC\_CPU\_LINUX

459.GemsFDTD: -DSPEC\_CPU\_LP64

470.lbm: -DSPEC\_CPU\_LP64

481.wrf: -DSPEC\_CPU\_CASE\_FLAG -DSPEC\_CPU\_LINUX\_PPC -DSPEC\_CPU\_LP64

482.sphinx3: -fsigned-char



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## Peak Optimization Flags

C benchmarks:

```
433.milc: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcpp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass
```

```
470.lbm: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib64 -L /opt/ibmcpp/xlmass/7.1/lib64
-Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64
```

```
482.sphinx3: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcpp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass
```

C++ benchmarks:

444.namd: basepeak = yes

```
447.dealII: -ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcntd -m32
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin --param max-inline-insns-auto=200
-fno-associative-math -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcpp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcpp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread
```

450.soplex: basepeak = yes

```
453.povray: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcntd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
```

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## Peak Optimization Flags (Continued)

453.povray (continued):

```
--param max-inline-insns-auto=200 -fno-associative-math
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread
```

Fortran benchmarks:

```
410.bwaves: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib64 -L /opt/ibmcmp/xlmass/7.1/lib64
-Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64
```

```
416.gamess: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread
```

```
434.zeusmp: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread
```

```
437.leslie3d: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m32 -fvect-cost-model
-mveclibabi=mass -flto -fwhole-program -fuse-linker-plugin
-Wl,-q -Wl,-Map=link.map,--cref -L /opt/at6.0/lib
-L /opt/ibmcmp/xlmass/7.1/lib -Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass_simdp7 -lmass
```

```
459.GemsFDTD: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -Wl,-q
```

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## Peak Optimization Flags (Continued)

459.GemsFDTD (continued):

```
-Wl,-Map=link.map,--cref -L /opt/at6.0/lib64
-L /opt/ibmcmp/xlmass/7.1/lib64 -Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7_64 -lmass_simdp7_64 -lmass_64
```

465.tonto: Same as 416.gamess

Benchmarks using both Fortran and C:

435.gromacs: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m32 -fvect-cost-model
-mveclibabi=mass -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass\_simdp7 -lmass

436.cactusADM: -fprofile-generate(pass 1) -fprofile-use(pass 2) -ffast-math
-O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt -fpeel-loops
-funroll-loops -mpopcnd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -Wl,-q
-Wl,-Map=link.map,--cref -L /opt/at6.0/lib64
-L /opt/ibmcmp/xlmass/7.1/lib64 -Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7\_64 -lmass\_simdp7\_64 -lmass\_64

454.calculix: -ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcnd -m32
-fvect-cost-model -mveclibabi=mass -flto -fwhole-program
-fuse-linker-plugin -Wl,-q -Wl,-Map=link.map,--cref
-L /opt/at6.0/lib -L /opt/ibmcmp/xlmass/7.1/lib
-Wl,-rpath,/opt/at6.0/lib
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib -lhugetlbfs -lmassvp7
-lmass\_simdp7 -lmass -ltcmalloc -lstdc++ -lpthread

481.wrf: -ffast-math -O3 -mcpu=power7 -mtune=power7 -mrecip=rsqrt
-fpeel-loops -funroll-loops -mpopcnd -m64 -mcmodel=medium
-fvect-cost-model -mveclibabi=mass -Wl,-q
-Wl,-Map=link.map,--cref -L /opt/at6.0/lib64
-L /opt/ibmcmp/xlmass/7.1/lib64 -Wl,-rpath,/opt/at6.0/lib64
-Wl,-rpath,/opt/ibmcmp/xlmass/7.1/lib64
-Wl,-dynamic-linker,/opt/at6.0/lib64/ld64.so.1 -lhugetlbfs
-lmassvp7\_64 -lmass\_simdp7\_64 -lmass\_64



# SPEC CFP2006 Result

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## IBM Corporation

IBM PowerLinux 7R4 (4.0 GHz, 32 core, RHEL,  
GCC)

**SPECfp\_rate2006 = 1110**

**SPECfp\_rate\_base2006 = 983**

**CPU2006 license:** 11

**Test date:** May-2013

**Test sponsor:** IBM Corporation

**Hardware Availability:** Aug-2013

**Tested by:** IBM Corporation

**Software Availability:** May-2013

The flags file that was used to format this result can be browsed at

<http://www.spec.org/cpu2006/flags/IBM-Linux-AT.20130813.html>

You can also download the XML flags source by saving the following link:

<http://www.spec.org/cpu2006/flags/IBM-Linux-AT.20130813.xml>

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For questions about this result, please contact the tester.  
For other inquiries, please contact [webmaster@spec.org](mailto:webmaster@spec.org).

Tested with SPEC CPU2006 v1.2.

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