



# SPEChpc™ 2021 Large Result

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## IBM

(Test Sponsor: Oak Ridge National Laboratory)

SPEChpc 2021\_lrg\_base = 41.0

SPEChpc 2021\_lrg\_peak = Not Run

Summit: IBM Power System AC922 (IBM Power9, Tesla V100-SXM2-16GB)

hpc2021 License: 056A

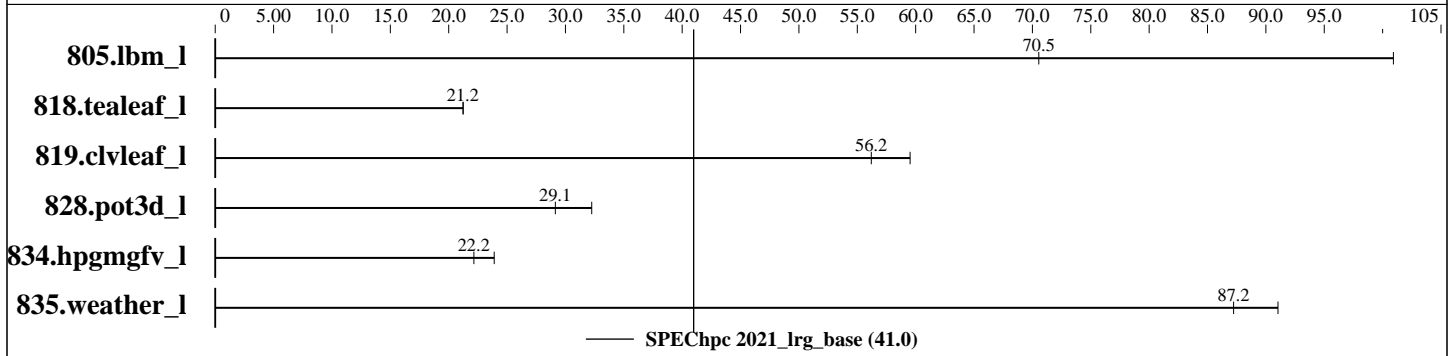
Test Sponsor: Oak Ridge National Laboratory

Tested by: Oak Ridge National Laboratory

Test Date: Sep-2021

Hardware Availability: Nov-2018

Software Availability: Jul-2021



## Results Table

Benchmark	Base								Peak							
	Model	Ranks	Thrds/Rnk	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Model	Ranks	Thrds/Rnk	Seconds	Ratio	Seconds	Ratio
805.lbm_1	ACC	8400	1	<u>38.6</u>	<u>70.5</u>	27.0	101									
818.tealeaf_1	ACC	8400	1	<u>68.3</u>	<u>21.2</u>	68.3	21.2									
819.clvleaf_1	ACC	8400	1	<u>37.4</u>	<u>56.2</u>	35.3	59.5									
828.pot3d_1	ACC	8400	1	<u>156</u>	<u>29.1</u>	141	32.3									
834.hpgmgfv_1	ACC	8400	1	<u>151</u>	<u>22.2</u>	140	23.9									
835.weather_1	ACC	8400	1	<u>39.3</u>	<u>87.2</u>	37.6	91.0									

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



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### Hardware Summary

Type of System: Homogenous Cluster  
Compute Node: IBM Power System AC922  
Interconnect: Mellanox InfiniBand  
Compute Nodes Used: 1400  
Total Chips: 2800  
Total Cores: 30800  
Total Threads: 123200  
Total Memory: 700 TB  
Max. Peak Threads: --

### Software Summary

Compiler: C/C++/Fortran: Version 21.7 of NVHPC Toolkit  
MPI Library: Spectrum MPI Version 10.4.0.3  
Other MPI Info: None  
Other Software: None  
Base Parallel Model: ACC  
Base Ranks Run: 8400  
Base Threads Run: 1  
Peak Parallel Models: Not Run  
Minimum Peak Ranks: --  
Maximum Peak Ranks: --  
Max. Peak Threads: --  
Min. Peak Threads: --

## Node Description: IBM Power System AC922

### Hardware

Number of nodes: 1400  
Uses of the node: compute  
Vendor: IBM  
Model: IBM Power System AC922  
CPU Name: IBM POWER9 2.1 (pvr 004e 1201)  
CPU(s) orderable: 2 chips  
Chips enabled: 2  
Cores enabled: 22  
Cores per chip: 44  
Threads per core: 4  
CPU Characteristics: Up to 3.8 GHz  
CPU MHz: 2300  
Primary Cache: 32 KB I + 32 KB D on chip per core  
Secondary Cache: 512 KB I+D on chip per core  
L3 Cache: 110 MB I+D on chip per chip  
Other Cache: None  
Memory: 512 GB (16 x 32 GB RDIMM-DDR4-2666)  
Disk Subsystem: 2 x 800 GB (Samsung Electronics Co Ltd NVMe SSD Controller 172Xa/172Xb)  
Other Hardware: None  
Accel Count: 4  
Accel Model: Tesla V100-SXM2-16GB  
Accel Vendor: NVIDIA Corporation  
Accel Type: GPU  
Accel Connection: NVLink 2.0  
Accel ECC enabled: Yes  
Accel Description: See Notes  
Adapter: Mellanox ConnectX-5  
Number of Adapters: 2  
Slot Type: None  
Data Rate: 100 Gb/s (4X EDR)

### Software

Accelerator Driver: NVIDIA CUDA 450.80.02  
Adapter: Mellanox ConnectX-5  
Adapter Driver: 4.9-2.2.4.1  
Adapter Firmware: 16.29.1016  
Operating System: Red Hat Enterprise Linux 8.2  
Local File System: xfs  
Shared File System: 250 PB IBM Spectrum Scale parallel filesystem over 4X EDR InfiniBand  
System State: Multi-user, run level 3  
Other Software: None

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## Node Description: IBM Power System AC922

### Hardware (Continued)

Ports Used: 2  
Interconnect Type: EDR InfiniBand

## Interconnect Description: Mellanox InfiniBand

### Hardware

Vendor: Mellanox  
Model: Mellanox Switch IB-2  
Switch Model: Mellanox IB EDR Switch IB-2  
Number of Switches: 1  
Number of Ports: 36  
Data Rate: 100 Gb/s  
Firmware: --  
Topology: Non-blocking Fat-tree  
Primary Use: MPI Traffic and GPFS access

### Software

: --

## Submit Notes

The config file option 'submit' was used.

## General Notes

MPI startup command:  
jsrun command was used to launch job using 1 GPU/rank.  
Detailed information from nvacelinfo

CUDA Driver Version: 11000  
NVRM version: NVIDIA UNIX ppc64le Kernel Module 450.80.02 Wed Sep 23 00:55:04 UTC 2020  
Device Number: 0  
Device Name: Tesla V100-SXM2-16GB  
Device Revision Number: 7.0  
Global Memory Size: 16911433728  
Number of Multiprocessors: 80  
Concurrent Copy and Execution: Yes  
Total Constant Memory: 65536  
Total Shared Memory per Block: 49152  
Registers per Block: 65536  
Warp Size: 32  
Maximum Threads per Block: 1024  
Maximum Block Dimensions: 1024, 1024, 64  
Maximum Grid Dimensions: 2147483647 x 65535 x 65535

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## General Notes (Continued)

Maximum Memory Pitch:	2147483647B
Texture Alignment:	512B
Clock Rate:	1530 MHz
Execution Timeout:	No
Integrated Device:	No
Can Map Host Memory:	Yes
Compute Mode:	exclusive-process
Concurrent Kernels:	Yes
ECC Enabled:	Yes
Memory Clock Rate:	877 MHz
Memory Bus Width:	4096 bits
L2 Cache Size:	6291456 bytes
Max Threads Per SMP:	2048
Async Engines:	4
Unified Addressing:	Yes
Managed Memory:	Yes
Concurrent Managed Memory:	Yes
Preemption Supported:	Yes
Cooperative Launch:	Yes
Multi-Device:	Yes
Default Target:	cc70

## Compiler Version Notes

```
=====
CC 805.lbm_l(base) 818.tealeaf_l(base) 834.hpgmgfv_l(base)
=====
```

```
/usr/lib64/crt1.o:(.rodata+0x8): undefined reference to `main'
/usr/bin/ld: link errors found, deleting executable `a.out'
pgacclnk: child process exit status 1: /sw/summit/xalt/1.2.1/bin/ld
nvc 21.7-0 linuxpower target on Linuxpower
NVIDIA Compilers and Tools
Copyright (c) 2021, NVIDIA CORPORATION & AFFILIATES. All rights reserved.
=====
```

```
=====
FC 819.clvleaf_l(base) 828.pot3d_l(base) 835.weather_l(base)
=====
```

```
nvfortran 21.7-0 linuxpower target on Linuxpower
NVIDIA Compilers and Tools
Copyright (c) 2021, NVIDIA CORPORATION & AFFILIATES. All rights reserved.
=====
```



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## Base Compiler Invocation

C benchmarks:  
mpicc

Fortran benchmarks:  
mpif90

## Base Optimization Flags

C benchmarks:  
-O3 -acc=gpu

Fortran benchmarks:  
-O3 -acc=gpu

The flags file that was used to format this result can be browsed at  
[http://www.spec.org/hpc2021/flags/nv2021\\_flags.html](http://www.spec.org/hpc2021/flags/nv2021_flags.html)

You can also download the XML flags source by saving the following link:  
[http://www.spec.org/hpc2021/flags/nv2021\\_flags.xml](http://www.spec.org/hpc2021/flags/nv2021_flags.xml)

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

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