



# SPEChpc™ 2021 Medium Result

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## IBM

(Test Sponsor: Oak Ridge National Laboratory)

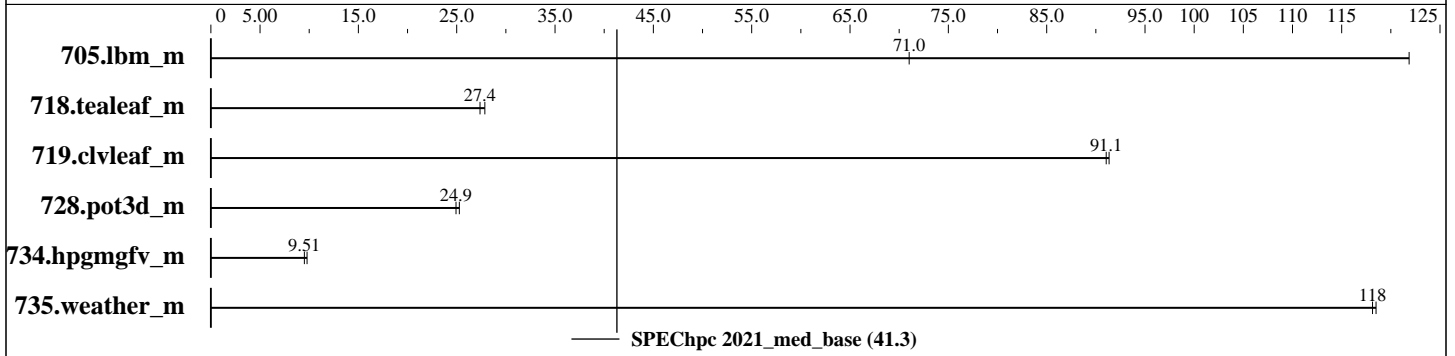
SPEChpc 2021\_med\_base = 41.3

SPEChpc 2021\_med\_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	Model	Ranks	Thrds/Rnk	Base				Peak									
				Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio						
705.lbm_m	ACC	4200	1	<b>17.3</b>	<b>71.0</b>	10.1	122										
718.tealeaf_m	ACC	4200	1	48.4	27.9	<b>49.3</b>	<b>27.4</b>										
719.clvleaf_m	ACC	4200	1	20.3	91.3	<b>20.3</b>	<b>91.1</b>										
728.pot3d_m	ACC	4200	1	<b>74.2</b>	<b>24.9</b>	73.2	25.3										
734.hpgmgfv_m	ACC	4200	1	102	9.78	<b>105</b>	<b>9.51</b>										
735.weather_m	ACC	4200	1	20.3	118	<b>20.3</b>	<b>118</b>										

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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: 700  
Total Chips: 1400  
Total Cores: 15400  
Total Threads: 61600  
Total Memory: 350 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: 4200  
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: 700  
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 nvaccelinfo

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 705.lbm_m(base) 718.tealeaf_m(base) 734.hpgmgfv_m(base)
=====
```

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

```
=====
FC 719.clvleaf_m(base) 728.pot3d_m(base) 735.weather_m(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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