

MG4GPU @ NVIDIA H100

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MACHINE SPECS (HOST)

itscrd-a100

ngt-h100

CPU	AMD EPYC 7313	Intel Xeon Platinum 8480+
CPUs (#)	16	224
Sockets (#)	1	2
Threads / Core (#)	1	2
Cores / Socket (#)	16	56
Numa Nodes (#)	1	2
Memory (GiB)	117	2048
OS	Alma 9.4	RHEL 8.9

MACHINE SPECS (DEVICE)

itscrd-a100

ngt-h100

GPU	A100 PCIe 40GB	H100 SXM5 80GB
SMs (#)	108	132
FP64 Cores / SM (#)	32	64
FP64 Cores /GPU ¹ (#)	3456	8448
Peak FP64 ¹ (TFLOPS)	9.7	30
Tensor Cores / GPU (#)	432	528
Memory Bandwidth (GB/s)	1555	3000

¹ excluding tensor cores

pp > t̄gg

▶ A100 process card

```
generate p p > t t~ g g
output madevent_simd PROC_pp_ttxgg_gpu
launch
set cudacpp_backend CUDA
set vector_size 32
set nb_warp 256
set nevents 250k
set sde_strategy 1
```

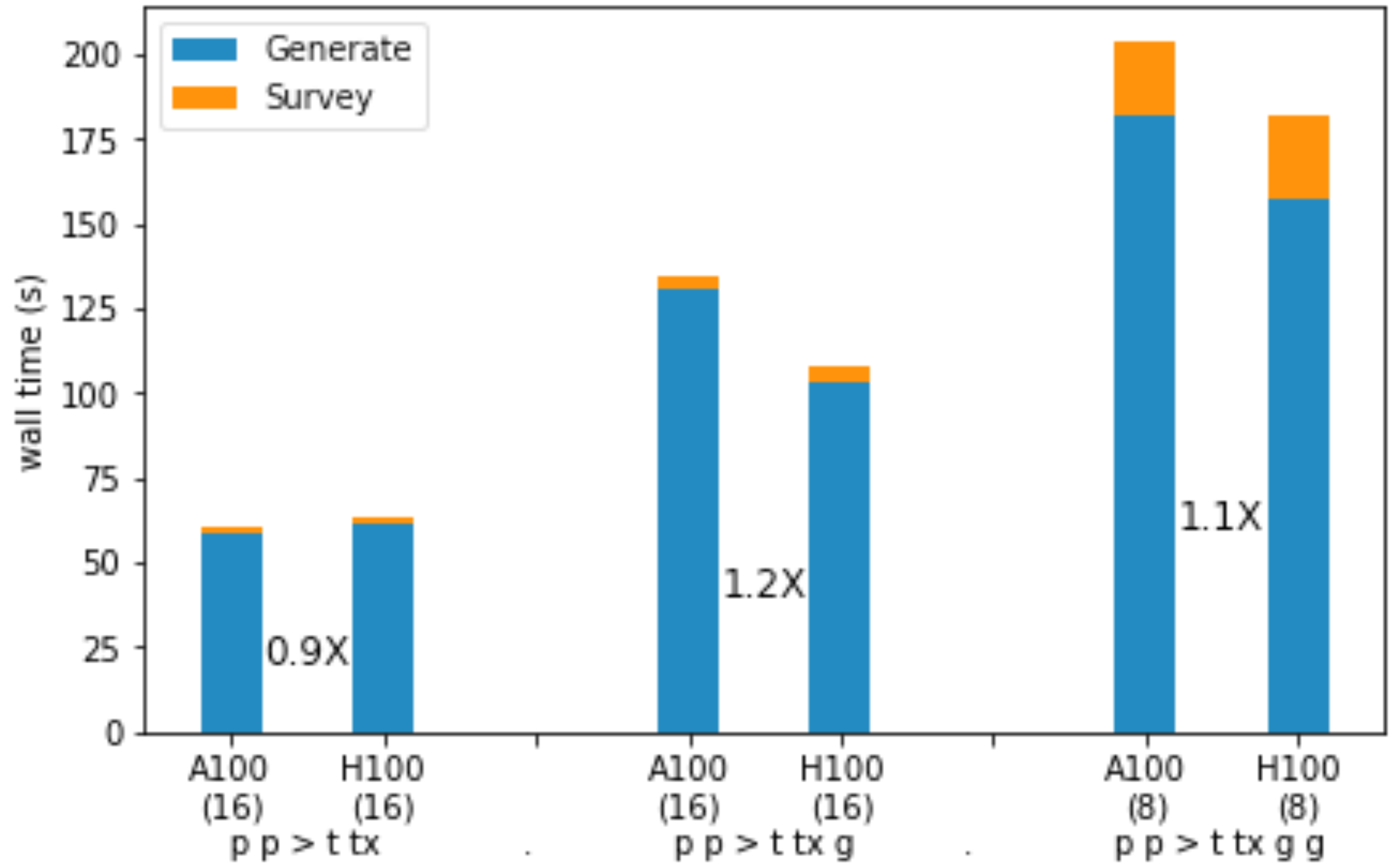
▶ H100 process card

```
generate p p > t t~ g g
output madevent_simd PROC_pp_ttxgg_gpu
launch
set cudacpp_backend CUDA
set vector_size 64
set nb_warp 264
set nevents 250k
set sde_strategy 1
```

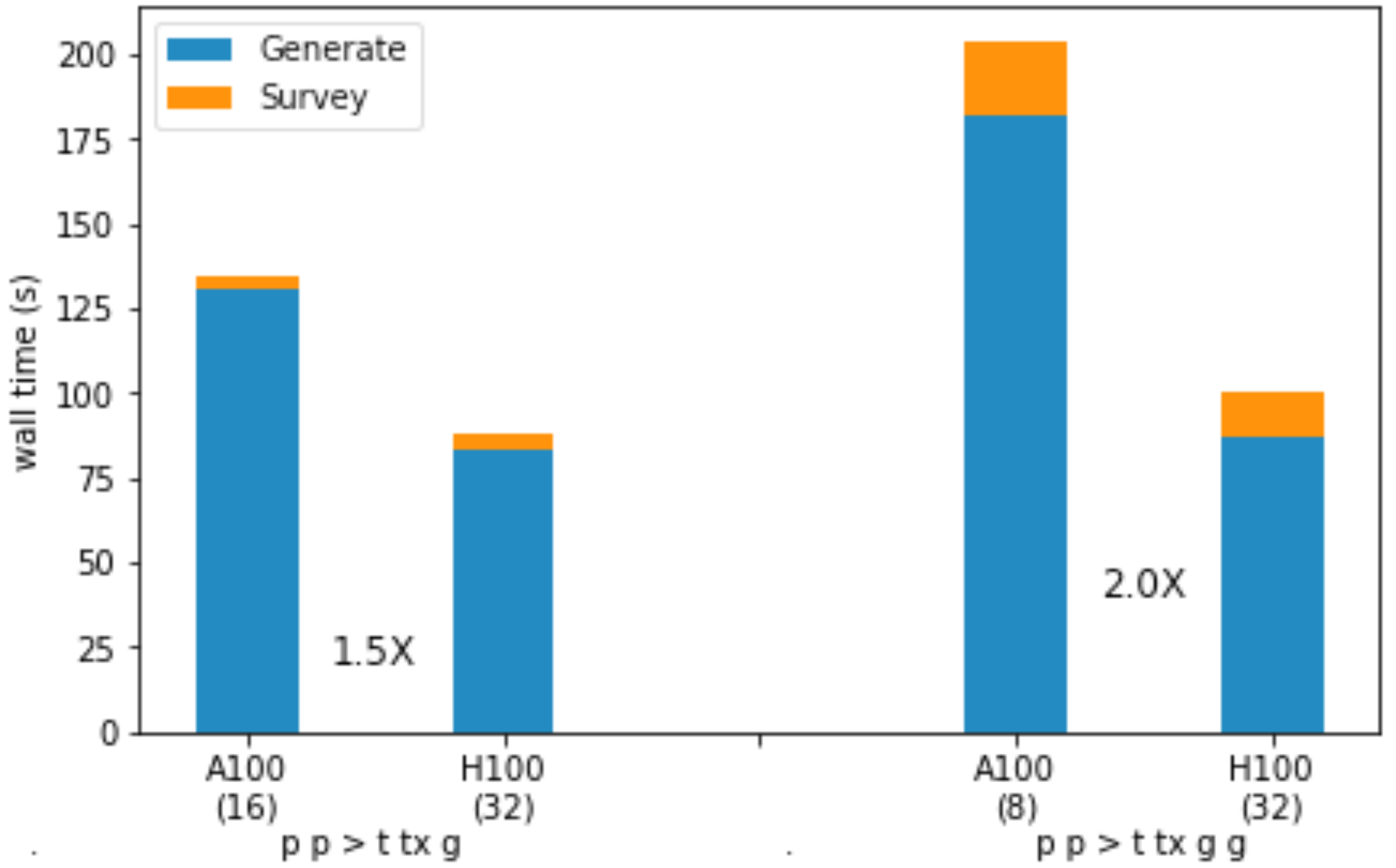
A FULL MG5 RUN

```
./bin/mg5 <myprocessfile>
```

./bin/mg5 (equal # cores)

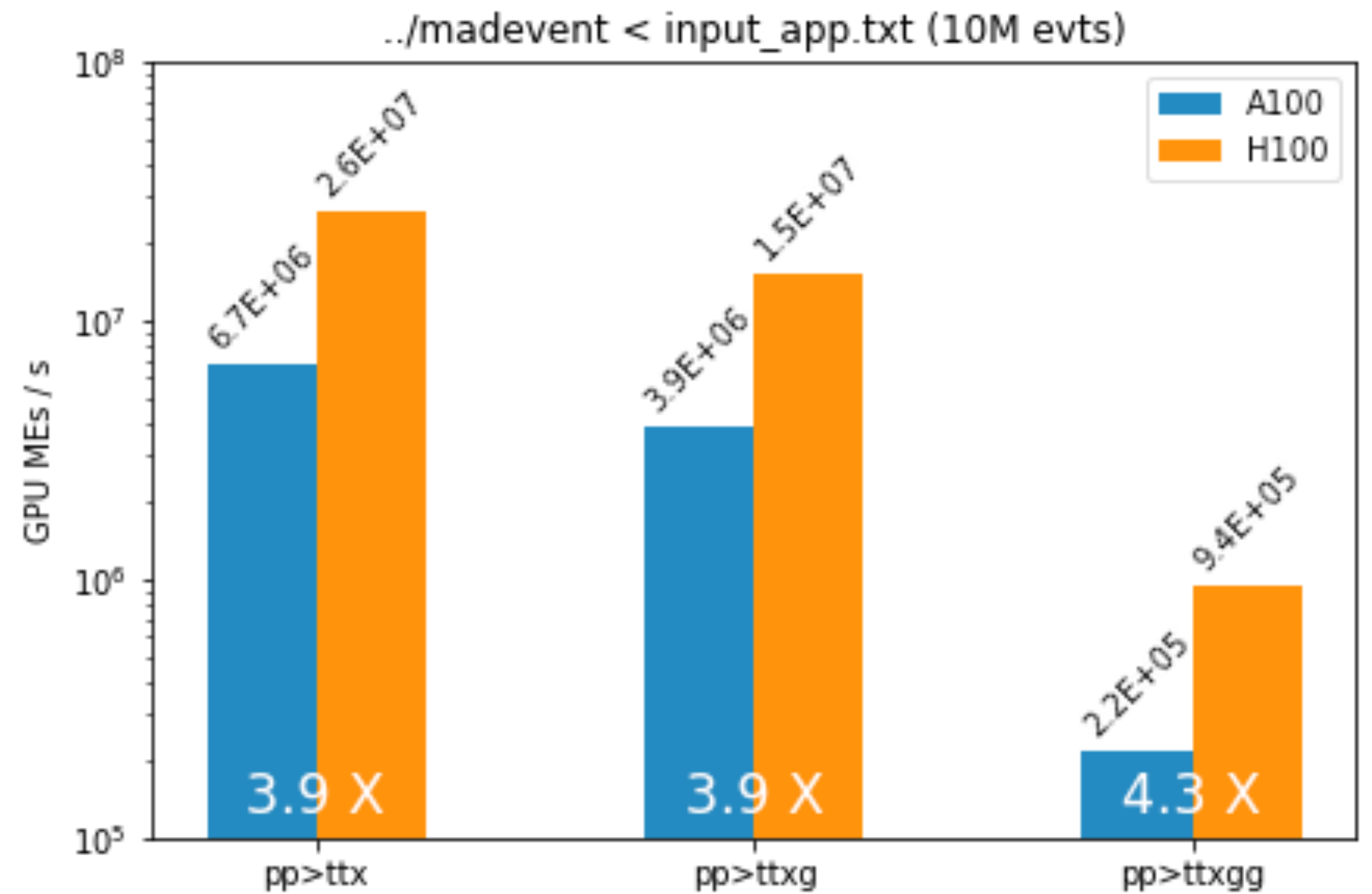
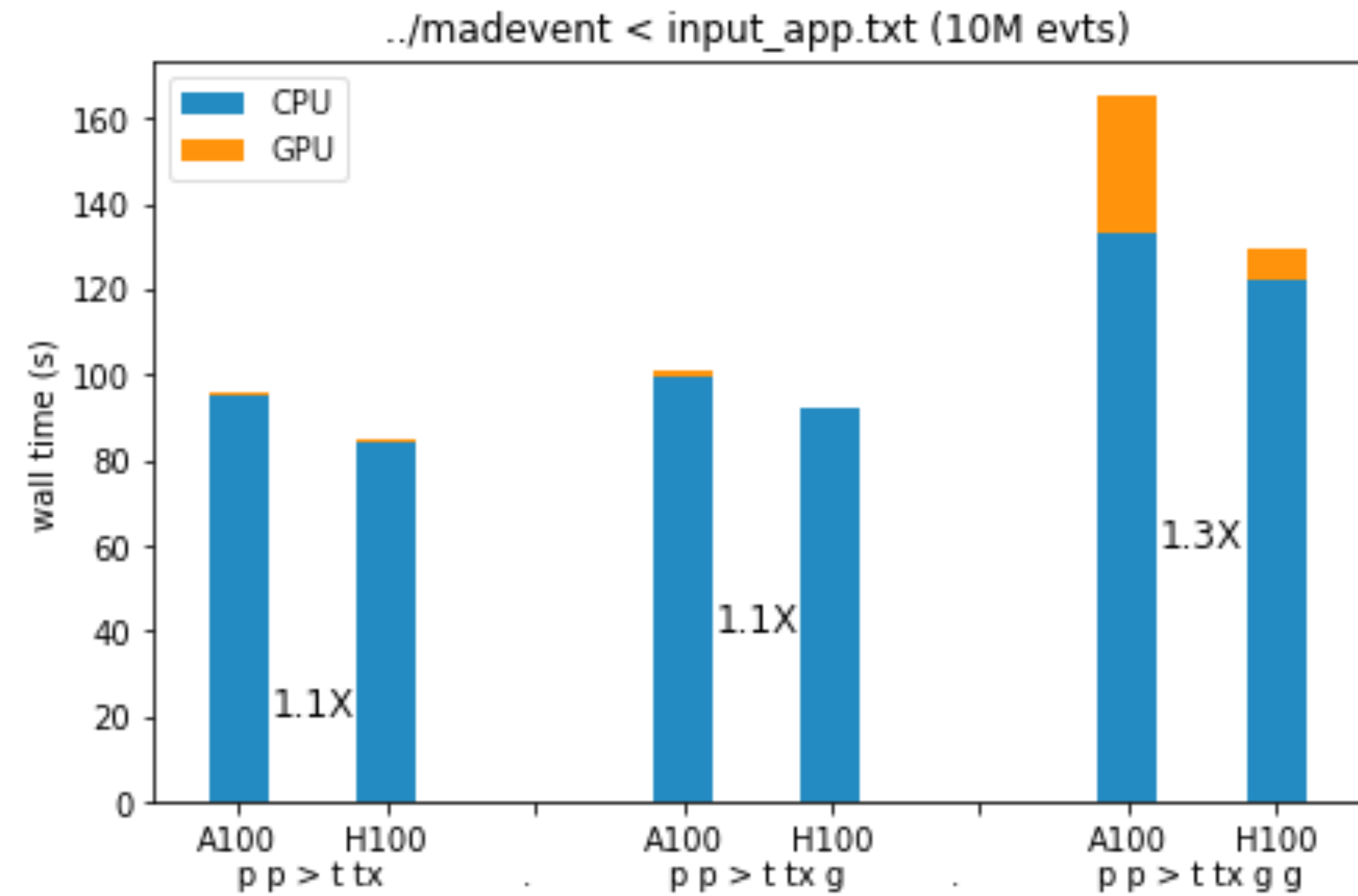


./bin/mg5 (best H100 nb_cores)

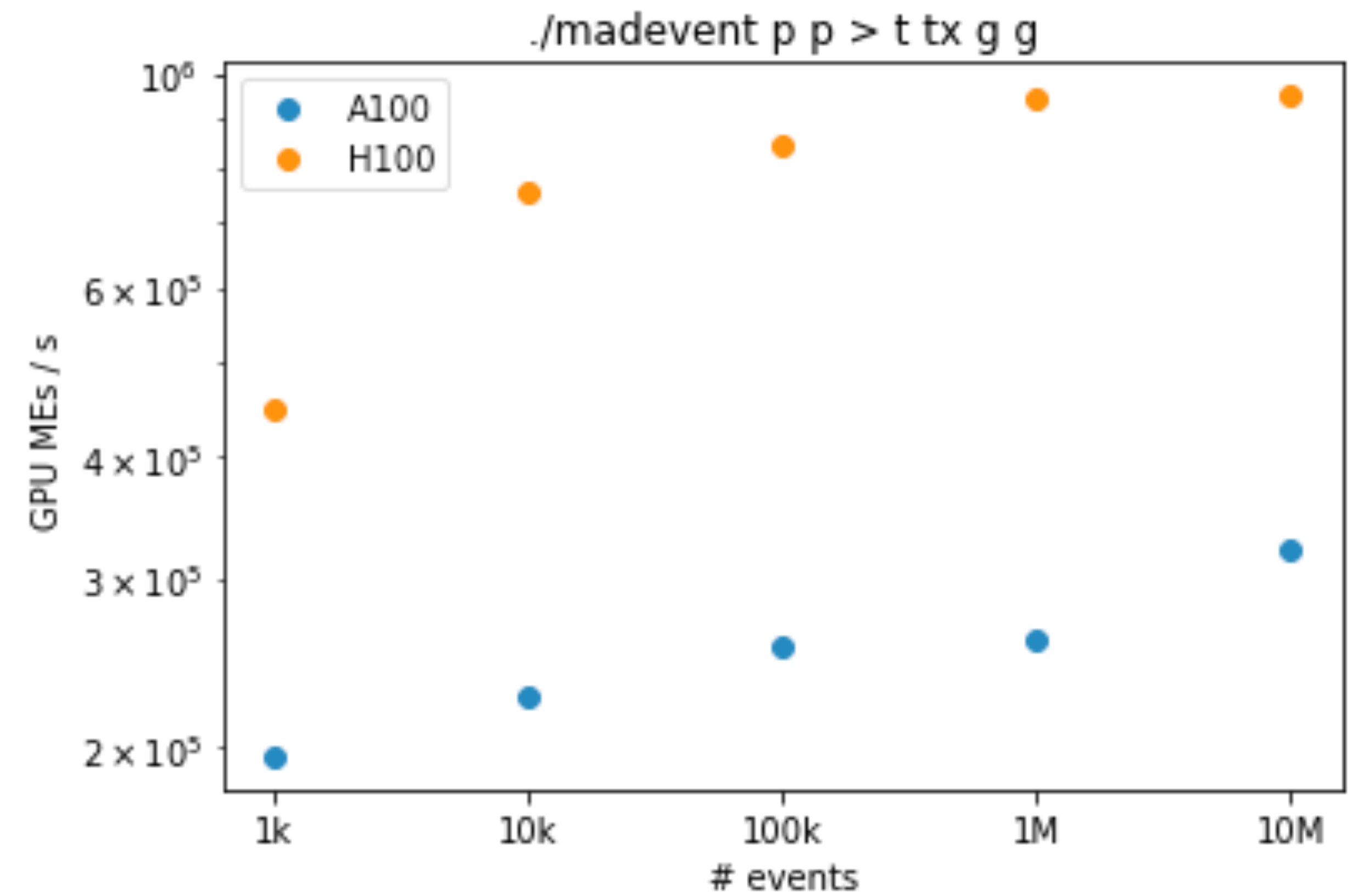
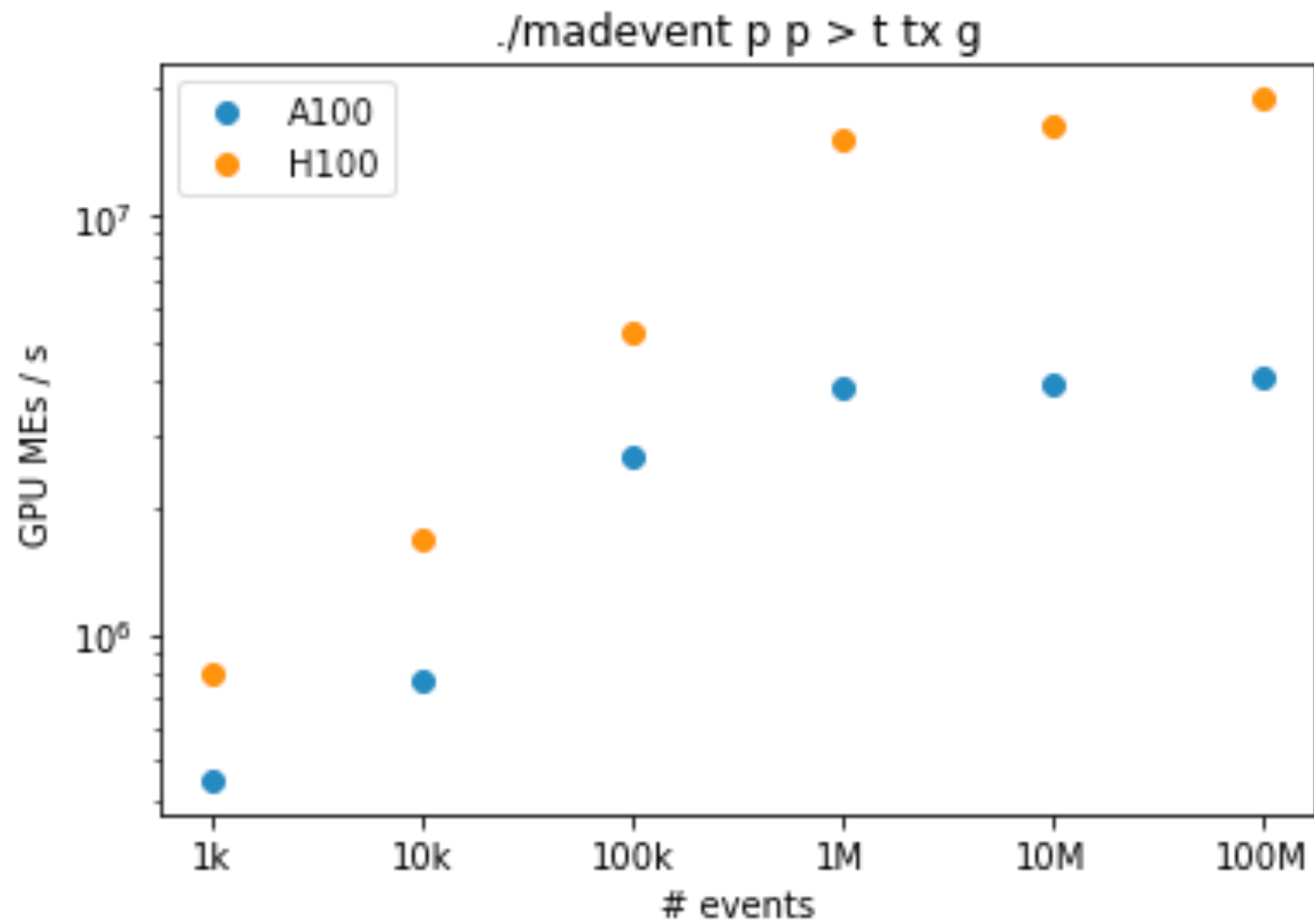


ONE MADEVENT EXECUTION FOR 10M EVENTS

```
../madevent < input_app.txt
```



ONE MADEVENT EXECUTION CRANKING UP THE NUMBER OF EVENTS



CONCLUSIONS

- ▶ Speedup of the GPU part for one madevent execution (10 M events) on the H100 over A100 is sizeable with ~ 4X
- ▶ We are highly dominated by the Fortran/CPU part of Madgraph/madevent
 - ▶ More parts of the workflow need to be ported to the GPU (phase space sampling, PDFs, ...)
 - ▶ Allows us to "start" on the GPU with random numbers?
- ▶ The more "work" we can put together into one madevent execution the better
 - ▶ The more complex the process is the earlier we hit the plateau of max throughput
 - ▶ More events to produce / more MEs to calculate / ...