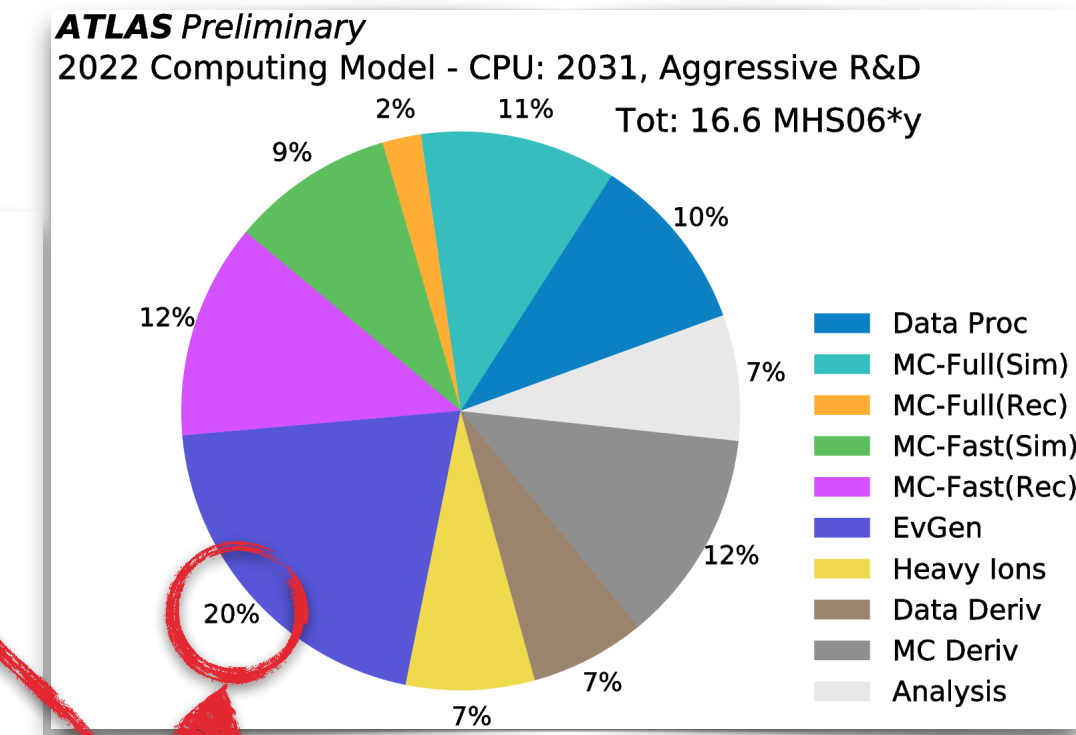
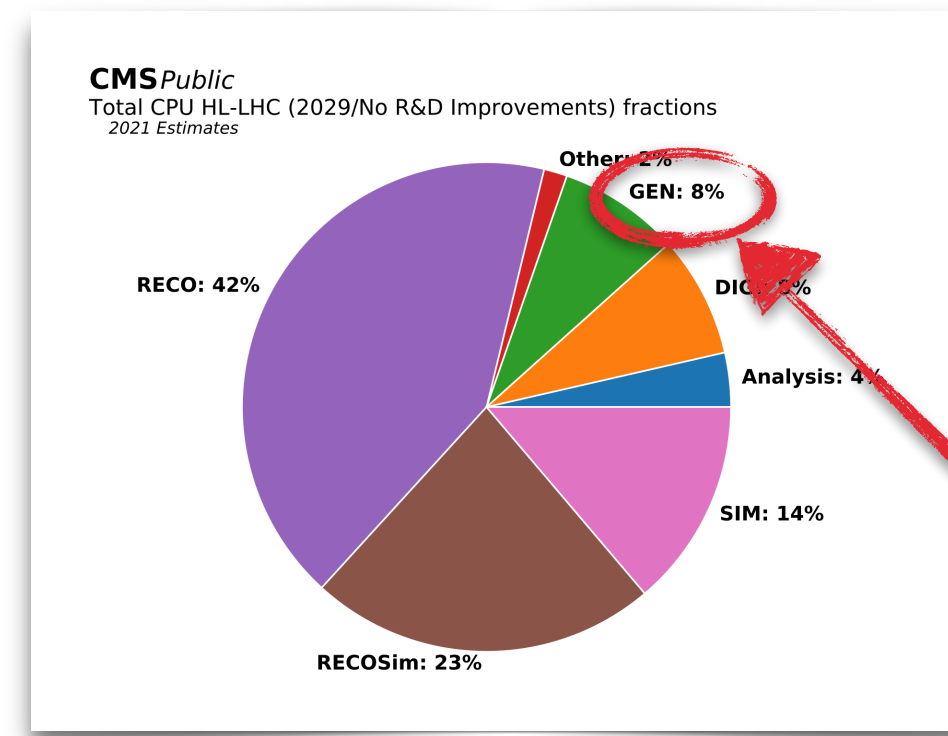


POWER CONSUMPTION OF THE MADGRAPH5 EVENT GENERATOR ON MODERN HARDWARE

- ▶ Madgraph5 (MG5) is an important event generator in the event simulation chain for LHC experiments
 - ▶ Used by CMS, ATLAS, LHCb, ...
- ▶ Current project to use MG5 on GPUs and vectorised CPUs
 - ▶ Development by CERN/IT & University Louvain (BE)
 - ▶ Plan to measure workflow power consumption (W/event)
 - ▶ Compare "classical CPUs" to modern hardware
 - ▶ Measure with IT computer center infrastructure and tools
 - ▶ Envisage collaboration with Hepix benchmarking WG



HL-LHC event generators computing budget estimates

Implementation (gg@ tt \bar{g})	MEs/second Double	MEs/second Float
1-core MadEvent Fortran scalar	3.96E3 (x2.2)	---
1-core Standalone C++ scalar	1.84E3 (x1.00)	1.80E3 (x0.98)
1-core Standalone C++ 128-bit SSE4.2 (x2 doubles, x4 floats)	3.36E3 (x1.8)	6.60E3 (x3.6)
1-core Standalone C++ 256-bit AVX2 (x4 doubles, x8 floats)	6.86E3 (x3.7)	1.31E4 (x7.1)
1-core Standalone C++ "256-bit" AVX512 (x4 doubles, x8 floats)	7.68E3 (x4.2)	1.41E4 (x7.7)
1-core Standalone C++ 512-bit AVX512 (x8 doubles, x16 floats)	6.52E3 (x3.5)	1.32E4 (x7.2)
Standalone CUDA NVidia V100S-PCIe-32GB (TFlops*: 7.1 FP64, 14.1 FP32)	4.89E5 (x270)	9.27E5 (x500)

Realistic Madgraph5 CPU & GPU speedups

Observed speedups over single threaded CPU execution