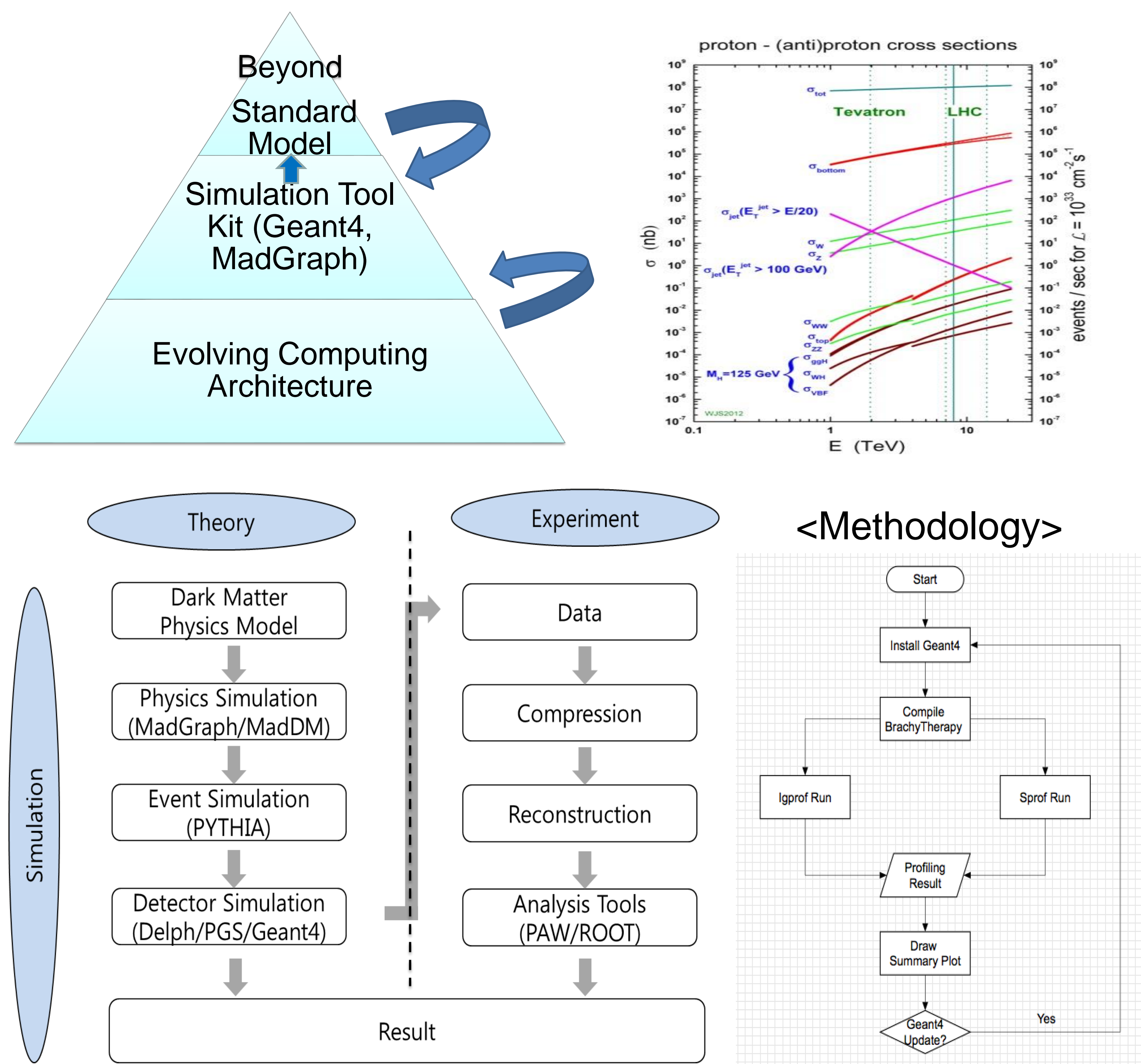


Development of profiling system for low-energy physics

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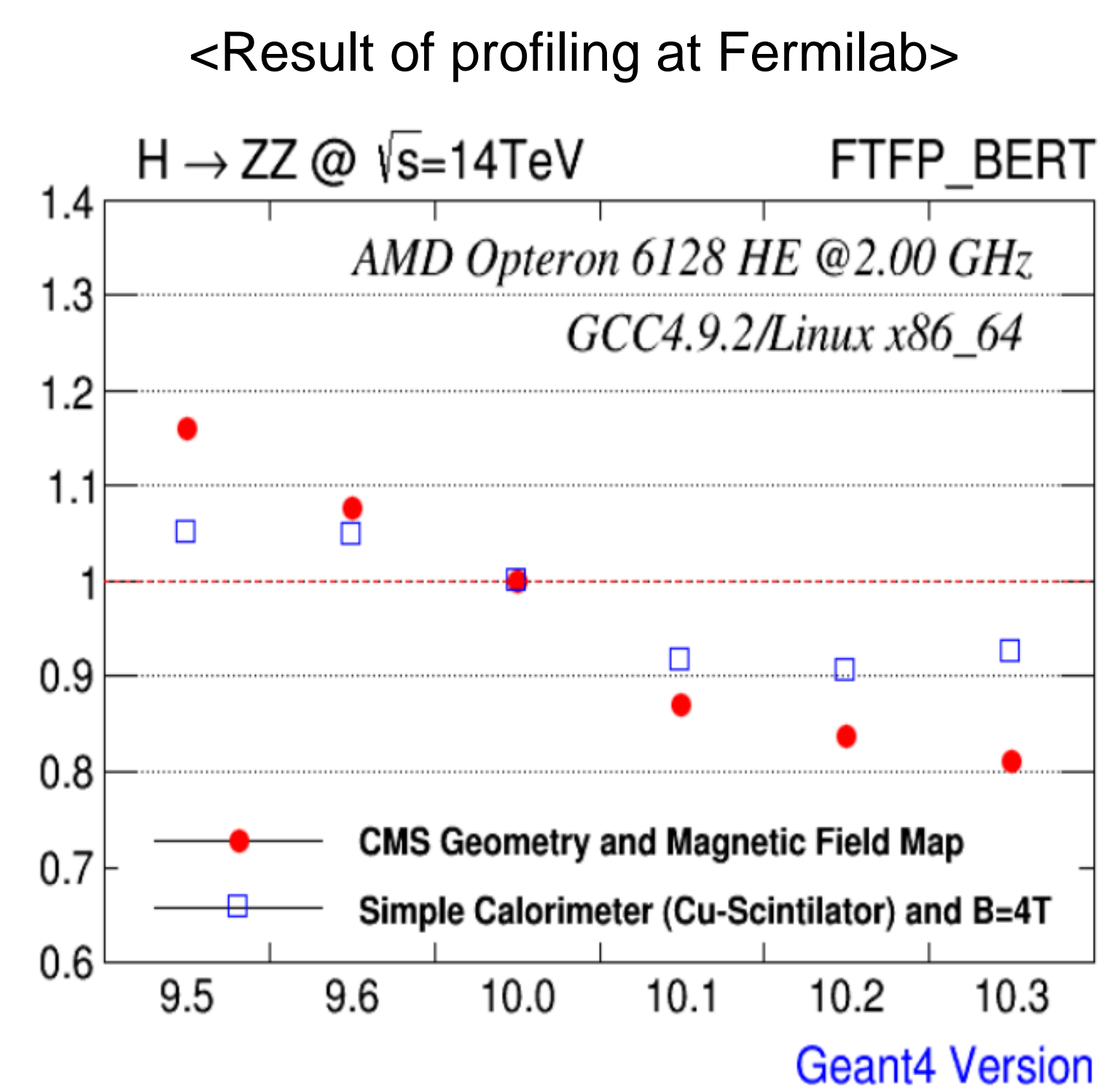
Introduction



- Why profiling?
 - Diversity of physics applications
 - Evolving computing
 - ⇒ S/W development
 - ⇒ Profiling tools
- Current status
 - High energy physics profiling (Fermilab)
 - SimpliCarlo (Sequential)
 - CMSEXP (Multi-Thread)
 - Low energy physics profiling
 - Does not exist
 - Using Brachytherapy code
 - Sequential

<Geant4 prerequisites by version>

Item	Geant4.10.01	Geant4.10.02
Release Date	December 2014	December 2015
Language	C++	C++11
gcc	4.4.6	4.9.3 (4.8 or higher)
cmake	2.8.11.1	3.4 (3.4 or higher)
make	3.81	3.81
ROOT [9]	5.22 or higher	
Iprof [10]	5.9.16 or higher	
FAST [11]	6.2 or higher	
R [13]	3.2.1 or higher	
SQLite [14]	3.3.6 or higher	

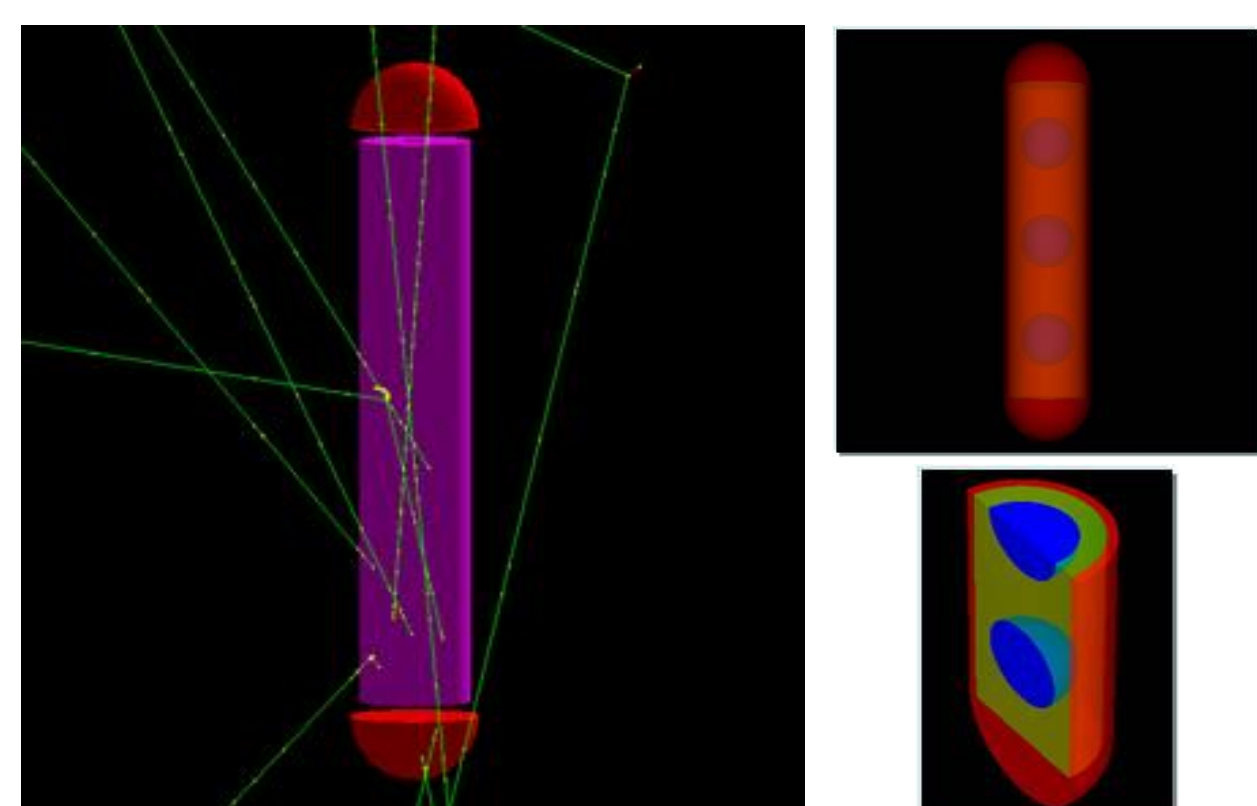


<Tachyon2 supercomputer system overview (KISTI)>

Section	Specs
Model	SUN Blade 6275
CPU	Intel Xeon X5570 2.93 GHz(Nehalem)
Nodes	3,200
Total cores	25,408 cores (8 cores/node)
Rpeak	300 TFlops
Memory	DDR3/1333 MHz 76.8TB (24GB/node, 3GB/core)
Storage(Disk)	1.125 TB (Disk) 2,520 TB(Disk)
Storage(Tape)	2,112 TB
Interconnect	Infiniband 40G 4X QDR
Network	

Simulation

- Brachytherapy simulation
- Low energy physics profiling
- CPU/Memory usage
- Mesh size
- Version dependency
- Scalability for new computing architecture (KISTI supercomputer)



Results

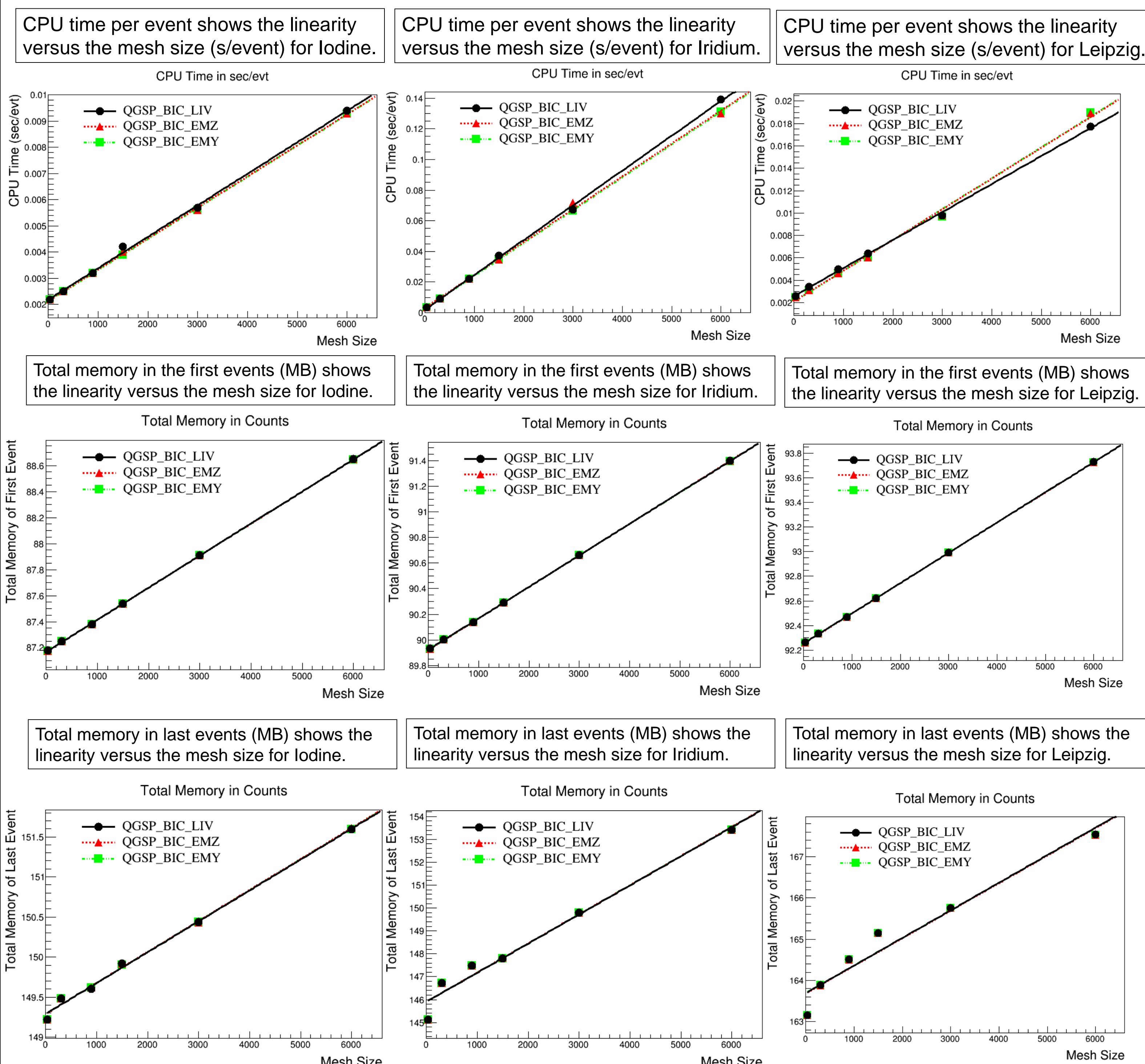
• CPU time in s/event

Sample	Physics list	Energy (keV)	Process (s)
Iodine	QGSP_BIC_LIV	35	0.0026
	QGSP_BIC_EMZ	35	0.0025
	QGSP_BIC_EMY	35	0.0025
Iridium	QGSP_BIC_LIV	356	0.0092
	QGSP_BIC_EMZ	356	0.0093
	QGSP_BIC_EMY	356	0.0092
Leipzig	QGSP_BIC_LIV	356	0.0031
	QGSP_BIC_EMZ	356	0.0031
	QGSP_BIC_EMY	356	0.0032

• Total memory in count/10,000 events

Sample	Physics list	Energy (keV)	First event (MB)	Last event (MB)
Iodine	QGSP_BIC_LIV	35	87.2486	149.482
	QGSP_BIC_EMZ	35	87.2479	149.482
	QGSP_BIC_EMY	35	87.2479	149.478
Iridium	QGSP_BIC_LIV	356	90.0031	146.720
	QGSP_BIC_EMZ	356	90.0024	146.719
	QGSP_BIC_EMY	356	90.0024	146.729
Leipzig	QGSP_BIC_LIV	356	92.3335	163.892
	QGSP_BIC_EMZ	356	92.3328	163.891
	QGSP_BIC_EMY	356	92.3328	163.890

• Mesh size dependence



Conclusions

- ◆ Simulation tool kit needs solutions for the evolving architecture and new physics.
- ◆ We developed a profiling tool for low-energy physics applications.
- ◆ The results of our analysis of this application show that there is linear dependence on the mesh size.

Reference

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