Contribution ID: **158** Type: **Oral**

# Computing Performance of GeantV Physics Models

*Tuesday 11 October 2016 11:15 (15 minutes)*

The recent progress in parallel hardware architectures with deeper vector pipelines or many-cores technologies brings opportunities for HEP experiments to take advantage of SIMD and SIMT computing models. Launched in 2013, the GeantV project studies performance gains in propagating multiple particles in parallel, improving instruction throughput and data locality in HEP event simulation.
One of challenges in developing highly parallel and efficient detector simulation is the minimization of the number of conditional branches or thread divergence during the particle transportation process.
Due to the complexity of geometry description and physics algorithms of a typical HEP application, performance analysis is indispensable in identifying factors limiting parallel execution.
In this report, we will present design considerations and computing performance of GeantV physics models on coprocessors (Intel Xeon Phi and NVidia GPUs) as well as on mainstream CPUs.
As the characteristics of these platforms are very different, it is essential to collect profiling data with a variety of tools and to analyze hardware specific metrics and their derivatives to be able to evaluate and tune the performance.
We will also show how the performance of parallelized physics models factorizes from the rest of GeantV event simulation.

## Tertiary Keyword (Optional)

## Secondary Keyword (Optional)

High performance computing

## Primary Keyword (Mandatory)

Parallelization

**Author:** JUN, Soon Yung (Fermi National Accelerator Lab. (US))

**Co-authors:** BHATTACHARYYA, Abhijit; MOHANTY, Ajit Kumar (Bhabha Atomic Research Centre (IN)); RIBON, Alberto (CERN); ANANYA, Ananya (IIT- Indian Institute of Technology (IN)); GHEATA, Andrei (CERN); DE PAULA BIANCHINI, Calebe (UNESP - Universidade Estadual Paulista (BR)); Dr HARIRI, Farah (CERN); CARMINATI, Federico (CERN); AMADIO, Guilherme (UNESP - Universidade Estadual Paulista (BR)); LIMA, Guilherme (FermiLab (US)); KUMAWAT, Harphool (Bhabha Atomic Research Centre (IN)); GOULAS, Ilias (CERN); APOSTOLAKIS, John (CERN); GENSER, Krzysztof (Fermi National Accelerator Laboratory (US)); DUHEM, Laurent; BANDIERAMONTE, Marilena (CERN); GHEATA, Mihaela (ISS - Institute of Space Science (RO)); NOVAK, Mihaly (CERN); SHADURA, Oksana (National Technical Univ. of Ukraine "Kyiv Polytechnic Institute); CANAL, Philippe (Fermi National Accelerator Lab. (US)); SEHGAL, Raman; BRUN, Rene (CERN); IOPE, Rogerio (UNESP - Universidade Estadual Paulista (BR)); WENZEL, Sandro Christian (CERN); Dr VALLECORSA, Sofia (Gangneung-Wonju National University (KR)); NIKITINA, Tatiana (Gangneung-Wonju National University (KR)); ELVIRA, Victor Daniel (Fermi

National Accelerator Lab. (US)); POKORSKI, Witold (CERN); ZHANG, Yang (KIT - Karlsruhe Institute of Technology (DE))

**Presenter:** JUN, Soon Yung (Fermi National Accelerator Lab. (US))

**Session Classification:** Track 5: Software Development

**Track Classification:** Track 5: Software Development