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Electromagnetic Physics Models for Parallel Computing Architectures

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The recent advent of hardware architectures characterized by many-core or accelerated processors has opened up new opportunities for parallel programming models using SIMD or SIMT. To meet ever increasing needs of computing performance for future HEP experimental programs, the GeantV project was initiated in 2012 to exploit both the vector capability of mainstream CPUs and multi-threading capabilities of coprocessors including NVidia GPUs and Intel Xeon Phi. Major objectives of GeantV cover all levels of parallelism managed by a concurrent task scheduler for processing multiple particles in highly parallel manner with vectorized geometries and physics algorithms. In this paper we describe implementation of portable physics models of electromagnetic processes that can be commonly used in hybrid computing platforms. Preliminary performance evaluation and validation results of new vector physics models on both CPU and coprocessors will be presented as well.

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