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# Integration of JUNO simulation framework with Opticks: GPU accelerated optical propagation via NVIDIA OptiX

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Opticks is an open source project that accelerates optical photon simulation by integrating NVIDIA GPU ray tracing, accessed via NVIDIA OptiX, with
Geant4 toolkit based simulations. A single NVIDIA Turing architecture GPU has been measured to provide optical photon simulation speedup factors exceeding 1500 times single threaded Geant4 with a full JUNO analytic GPU geometry automatically translated from the Geant4 geometry.
Optical physics processes of scattering, absorption, scintillator reemission and
boundary processes are implemented within CUDA OptiX programs based on the Geant4
implementations. Wavelength-dependent material and surface properties as well as
inverse cumulative distribution functions for reemission are interleaved into
GPU textures providing fast interpolated property lookup or wavelength generation. Major recent developments are the integration of Opticks with the JUNO simulation framework using the minimal G4Opticks interface class and implementation of collection efficiency hit culling on GPU that enables only collected hits to be copied to CPU, substantially reducing both the CPU memory needed for photon hits and copying overheads. Also progress with the migration of Opticks to the all new NVIDIA OptiX 7 API is described.

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