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New Geant4 Simulation Model of Electromagnetic Processes in Oriented Crystals and its Applications in Accelerator Physics

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Electromagnetic processes of charged particles interaction with oriented crystals provide a wide variety of innovative applications such as beam steering, crystal-based extraction/collimation of leptons and hadrons in an accelerator, a fixed-target experiment on magnetic and electric dipole moment measurement, a positron source for lepton and muon colliders, X-ray and gamma radiation source for radiotherapy and nuclear physics as well as plasma acceleration in the crystal media. One of the main challenges is to develop an up-to-date, universal and fast simulation tool to simulate these applications.

We present a new simulation model capable to simulate both steering and radiation electromagnetic processes in oriented crystals implemented into the Geant4 simulation toolkit. *We validate the model with the experimental data and benchmark it with other simulations*^{*}. We discuss the advantages and perspectives of this model for the applications of oriented crystals mentioned above.

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Footnotes

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