



Contribution ID: 21

Type: **not specified**

High Energy Particle Transport in a Solar Magnetised Medium with Geant4

Thursday, 8 July 2021 18:40 (20 minutes)

Monte Carlo codes are used in many fields to study energetic particle propagation, secondary production and radiation. They can thus be useful tools for interpreting flare gamma-rays and drawing conclusions about energetic ions at the Sun. In magnetised plasmas such as those found in solar active regions. The enormous disparity between particle gyroradii and system scales proves to be a major computational obstacle. To address this problem we have written a new module in Geant4 using the Guiding Center (GC) approach in which the particle motion is averaged over a gyrofrequency. We describe the formulation and implementation of this method in particular dealing with the uncertainty in gyrophase so that particle velocities are well-defined for input to the modules handling reactions. We compare the propagation and slowing down of primary protons, secondary particle production and runtimes in the GC limit with the Newton Lorentz (NL) approach, finding very good agreement between the two methods and orders of magnitude improvement in run times in the GC case. We show illustrative results for neutron and gamma-ray emission from ions in a dipole loop.

Email

jordituneu@protonmail.com

Primary authors: Dr TUNEU, Jordi (Mackenzie Presbyterian University); Prof. SZPIGEL, Sergio (Mackenzie Presbyterian University); MACKINNON, Alexander (University of Glasgow); GIMÉNEZ DE CASTRO, Guillermo (CRAAM/Universidade Presbiteriana Mackenzie)

Presenter: Dr TUNEU, Jordi (Mackenzie Presbyterian University)

Session Classification: Working Group 3: Ion studies and Fermi/LAT

Track Classification: Working Group 2: Particle acceleration