Update: Electron Mode in FRENSIE

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Outline

Electron Mode

- Single Scattering Events from 100 GeV to 10 eV
- Elastic, Bremsstrahlung, Electroionization, Atomic Excitation
- Secondary particles created, but photons not tracked
- Atomic relaxation implemented

Adjoint Papers

- Hybrid Multigroup/Continuous-Energy Monte Carlo using Boltzmann-Fokker-Planck Equation
- Discrete Scattering Angles and Discrete Energy Losses

Electron Mode

Capabilities

- Single Scattering Events from 100 GeV to 10 eV
- Elastic, Bremsstrahlung, Electroionization, Atomic Excitation
- Secondary particles created, but photons not tracked
- Atomic relaxation implemented

Problems

- Absorption at low energies
- Negative energy from Electroionization

Absorption at low energies

- At energies near the cutoff (10 eV) the reaction cross section is dominated by elastic scattering (by order 10^7 for H)
- It is unlikely the electron will scatter below the cutoff energy
- A temporary fix is to raise the cutoff energy (to 15eV for H) to prevent indefinite elastic scattering
- MCNP notes this problem and suggests a minimum cutoff energy of 20eV

Negative energy from Electroionization

- ACE tables provide CDF of the knock-on energy, E_{knock}, based on the incident electron energy.
- When the incident electron energy is between two tables a weighted random variable is used to chose the appropriate table
- This can result in a E_{knock} that is larger than physically possible
- In this case the energy of incident electron is reduce to $1E{-}15$
- This can be avoided by interpolation between tables, which is more computationally expensive
- MCNP does something similar

Differences in Results

- Had discrepencies from MCNP caused by knock-on electron ejection angles