Status of G4 Reverse Monte Carlo

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OUTLINE

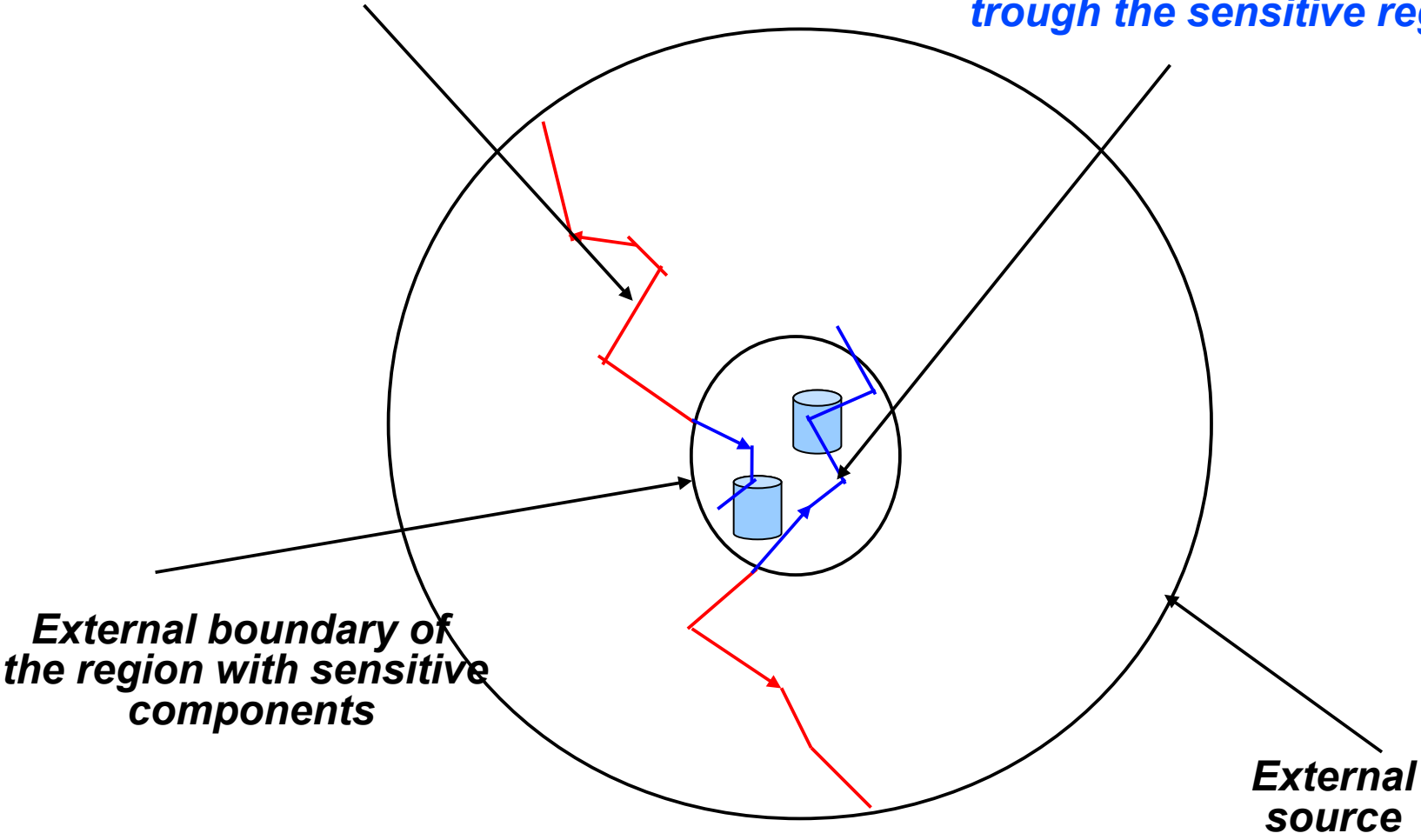Introduction

Recent developments, corrections

Problem of Convergence in Reverse MC

New tests

Reverse Monte Carlo in Geant4

**Backward Tracking from the Boundary of the sensitive region to the External source**

Forward Tracking trough the sensitive region.

External boundary of the region with sensitive components

External source

Recent developments

- New model of Reverse Bremsstrahlung based on G4 SeltzerBerger model has been implemented

- Problem of propagation of weight correction between two different along step do it has been solved:
  - In each "along step do it" the new weight needs to be passed to the PostStep Position rather than to the be proposed to the track
  - By this way the needed dEdX weight Correction is now correctly handled

- No longer need to specify the external surface of the adjoint tracking. Adjoint tracks are tracked till "OutOfWorld"

- Adding of point detector mode in GRAS RMC analysis
  - dose in a microscopic sphere at user defined position
  - Computation based on dEdX table
  - Plan to add this analysis in the Reverse example

Good agreement between reverse and forward for some use cases
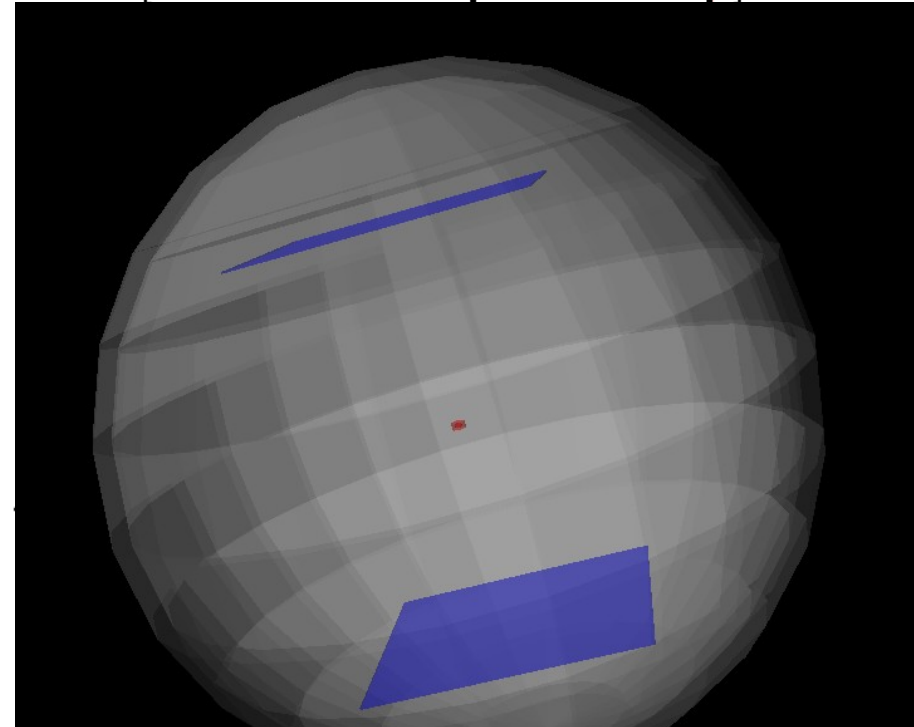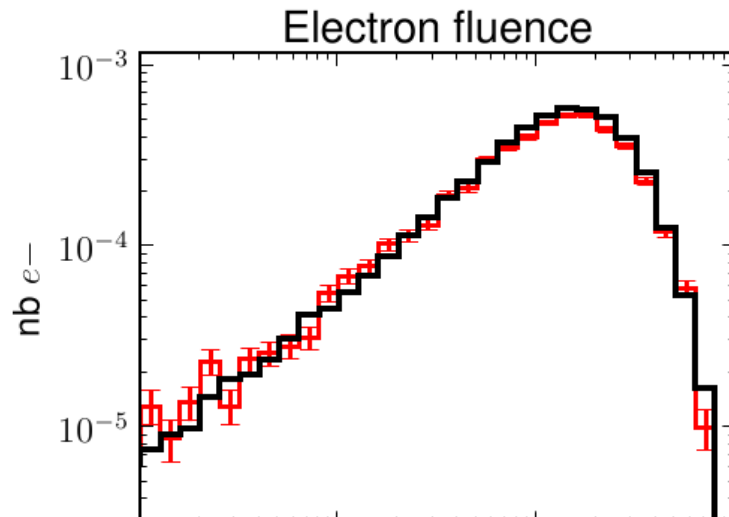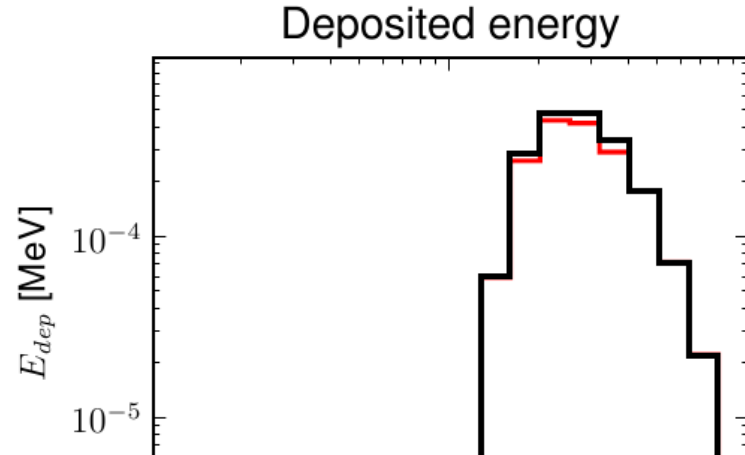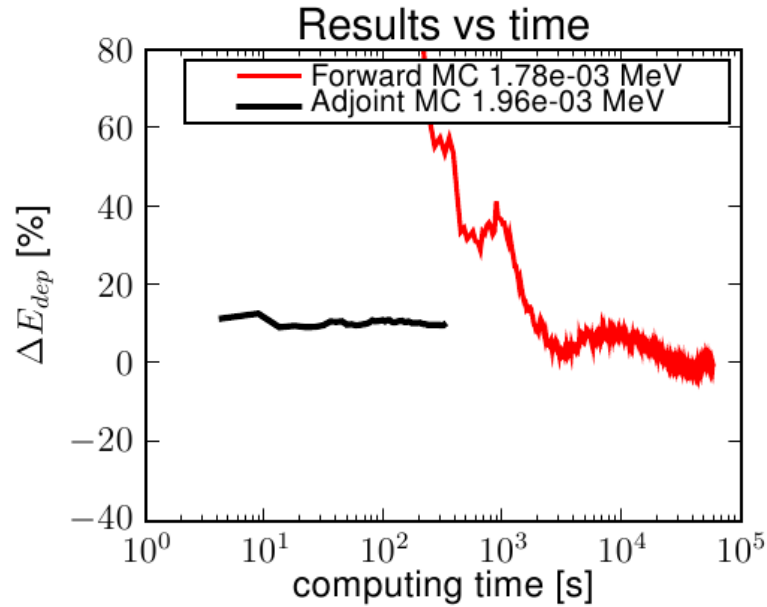
But problems of G4RMC for some use cases

- Recently important discrepancies (50-100%) between G4 Forward and G4 Reverse MC have been reported for some use cases

- Problem of convergence for computed dose within G4RMC
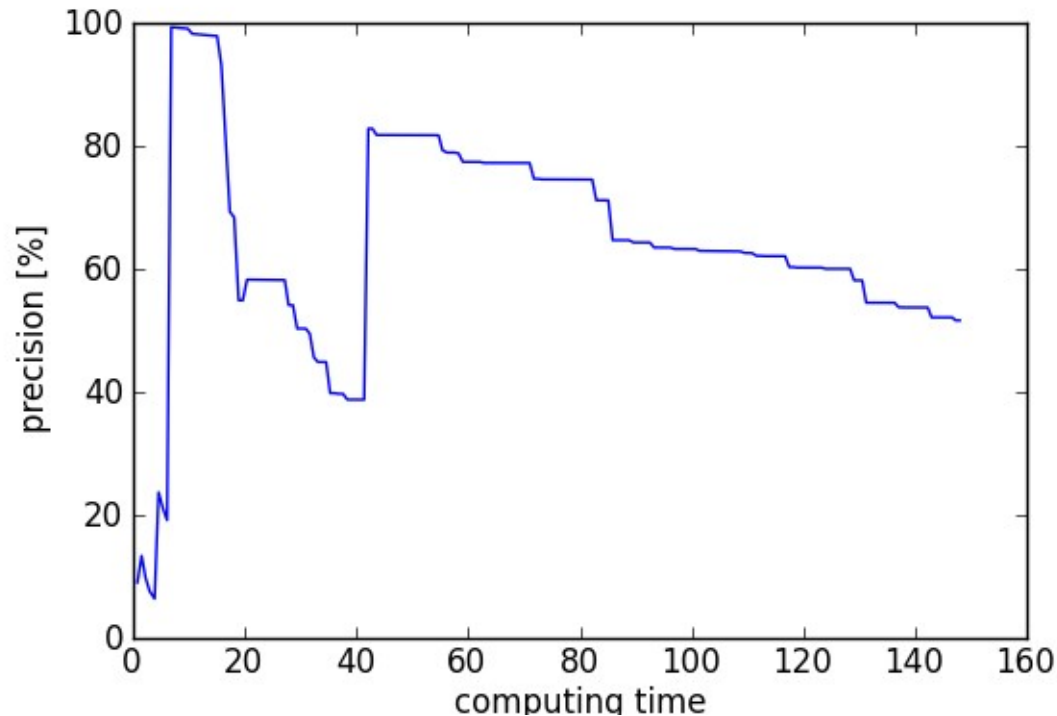
- Reasons for this discrepancy under study

New Tests of PostStepDoIt for all adjoint processes

- Forcing of the occurrence of reverse and equivalent forward process at primary vertex

- Comparisons of weighted adjoint secondary spectra to forward secondary spectra

- Allow to test:
    - sampling of secondary
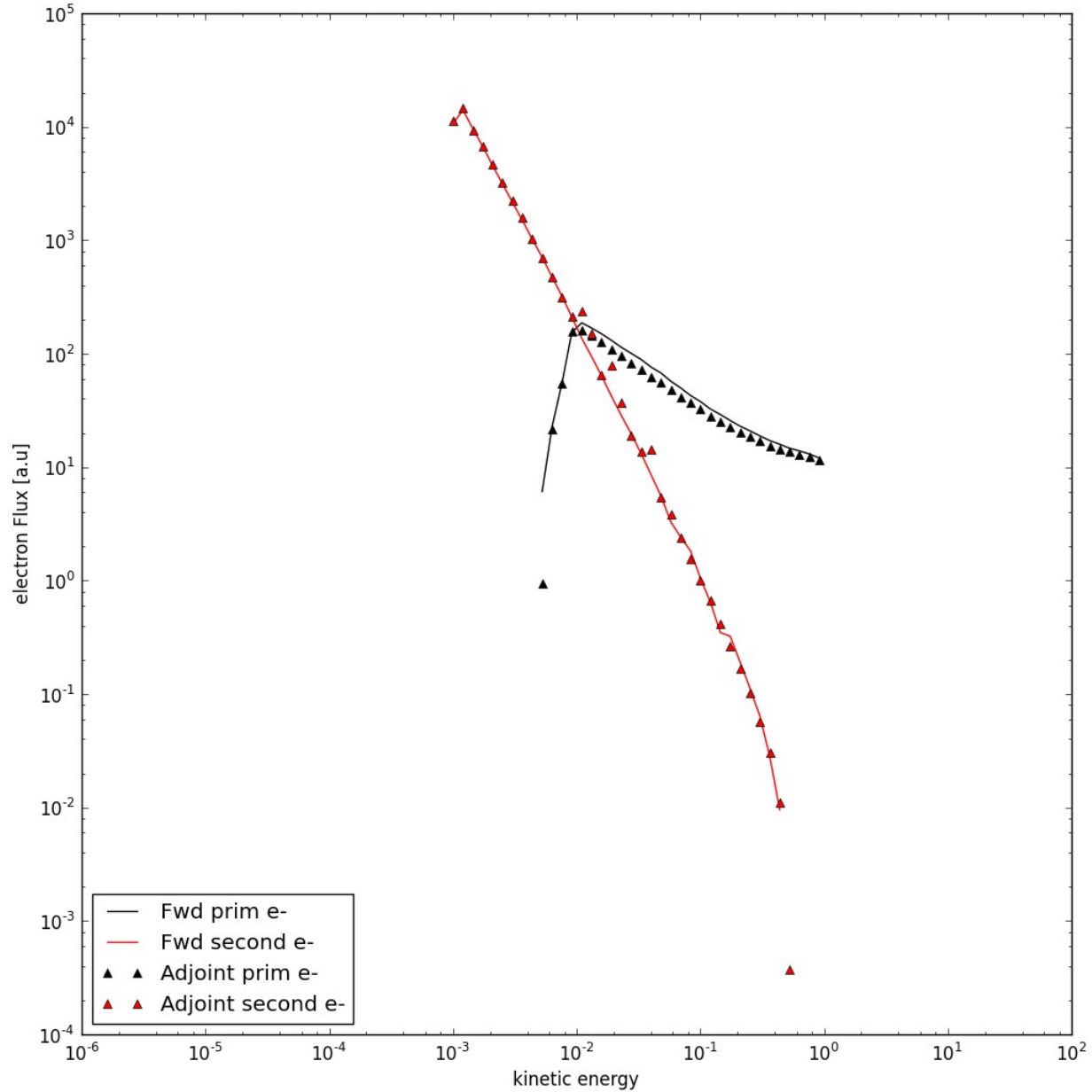   - handling of weight correction at the post step level

Test of PostStepDoIt for Reverse Compton
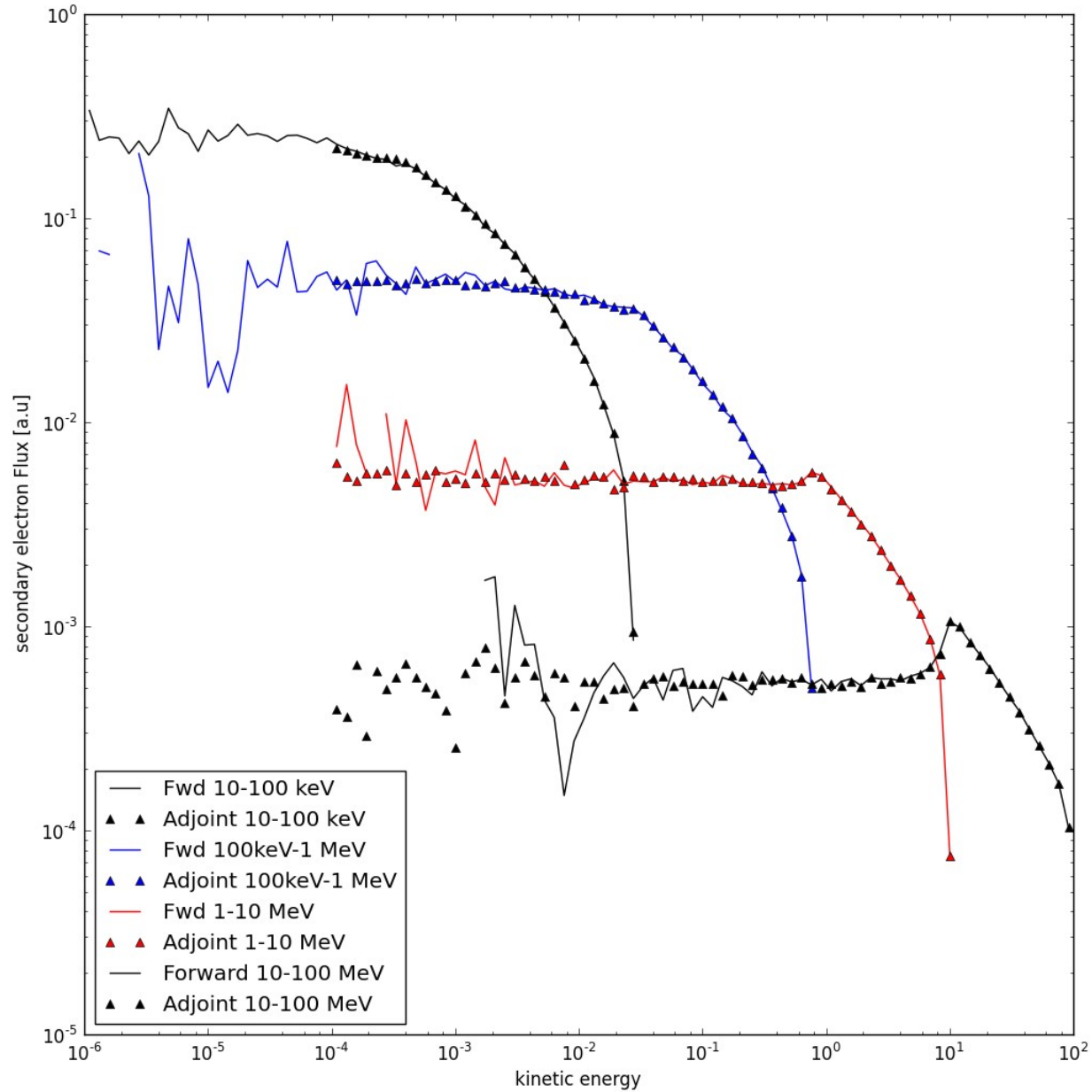
Test of PostStepDoIt for Reverse Photo Electric
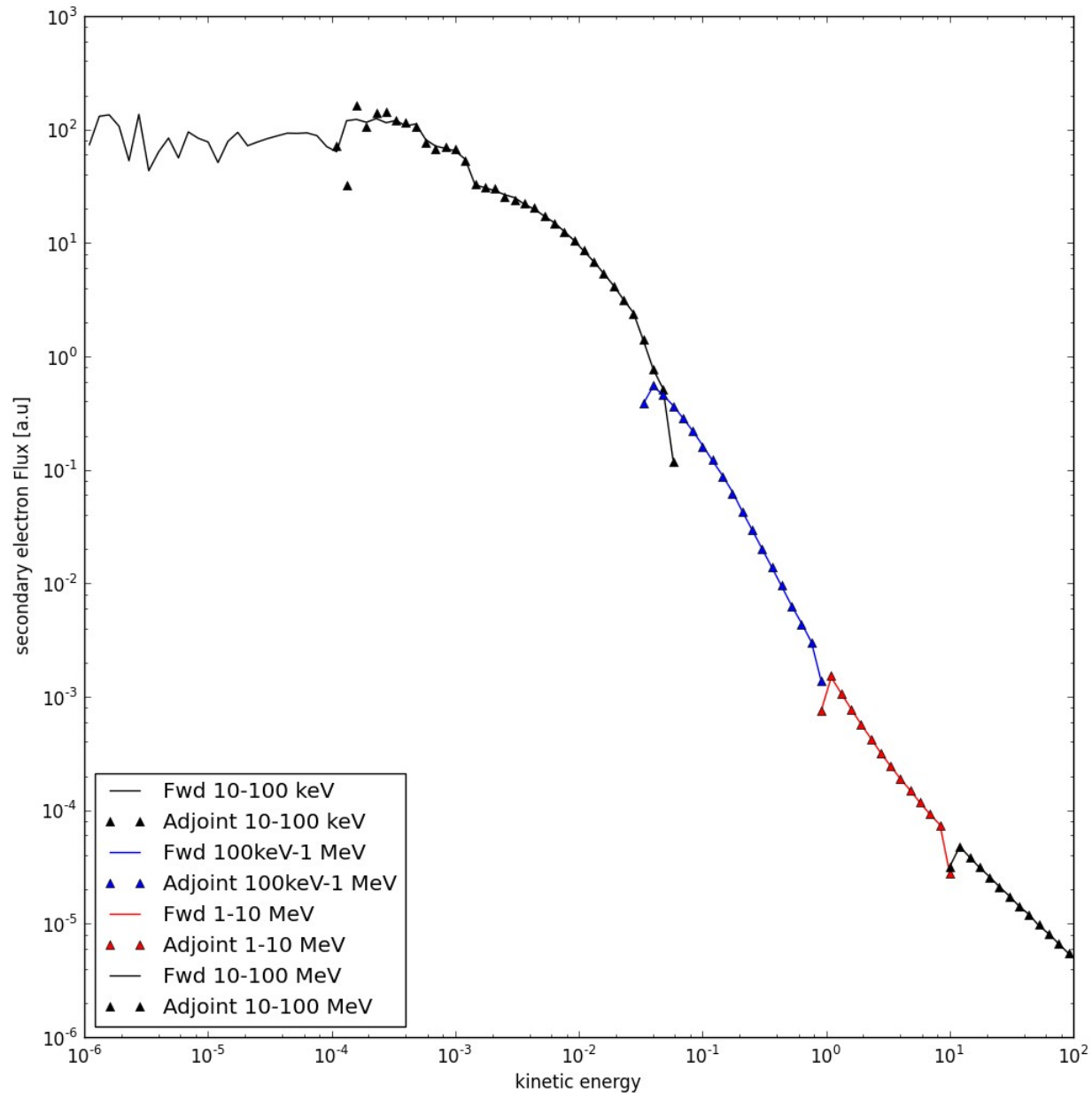
# Test of PostStepDoIt for Reverse Ionisation

Conclusion of Post step do it tests

- Weigh correction at post step do it level correctly handled

- Secondary adjoint particles correctly sampled

- Speed of secondary sampling for adjoint processes is equivalent than for forward processes

Influence of different processes on the RMC simulation convergence

- Computation of dose behind 5 mm Al-equivalent Tantalum shielding

- Jupiter environment spectrum

- Different physics cases considered:
  - Brem, Compton, photoelectric, ionisation, multiple scattering
  - Brem, ionisation, and multiple scattering
  - Brem, ionisation, photoelectric, and Compton
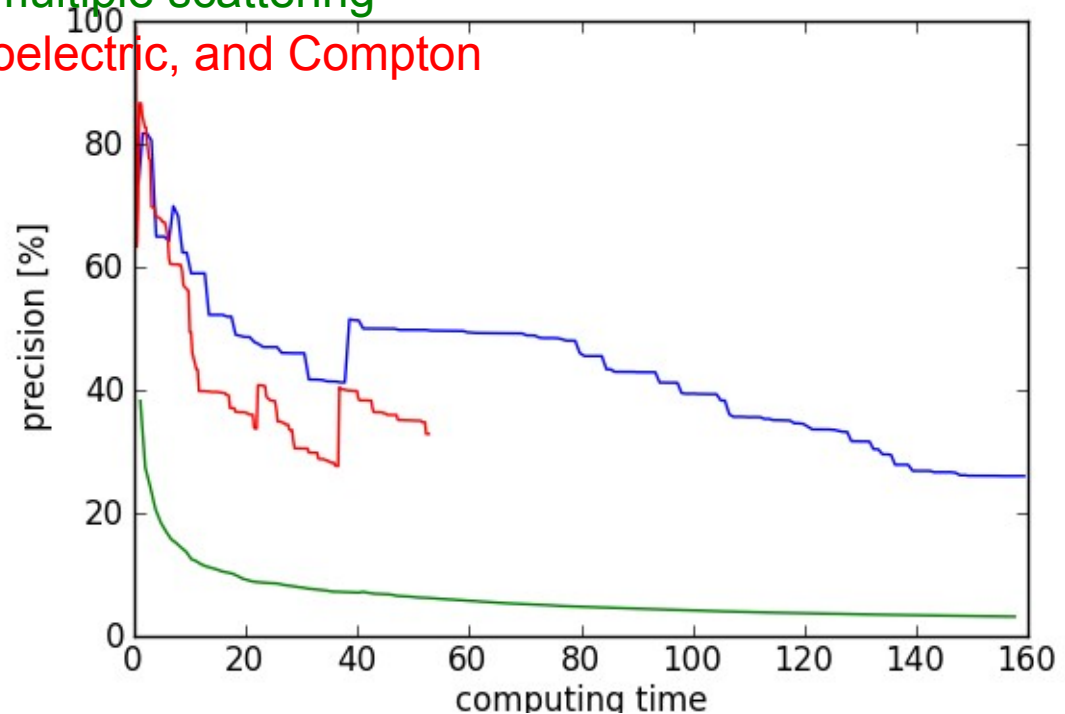
Plans

- Better understand the effect of Multiple scattering on the simulation results

- Study the possibility to use reverse single scattering

- Find a consistent way to limit the effect of huge weight on the simulation results