

Status and Progress on Requests from the Cosmic and High Intensity Frontiers

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Requested Projects Recently Completed or Under Development

Cosmic Frontier

- Phonon and charge carrier physics
 - phonon and e/h model in Ge at 0 K is well-advanced
 - to be completed early next year
- Improved energy conservation for α and β decay channels
 - done
- Addition of low energy (α , n) reactions
 - done with addition of unified ParticleHP, available in 10.2
- GENIE-Geant4 interface for nuclear final state interactions
 - underway, starting with Bertini cascade interfaced to GENIE
 - ready late this year/early next

Cosmic Frontier

- Provide missing levels and lifetimes in radioactive decay
 - good progress, may be ready for 10.2

Intensity Frontier

- Parameter variation in hadronic models
 - work begun
 - also currently doing a multi-parameter search for best Bertini model values
- Bertini K+ interactions up to 30 GeV
 - nearly done, ready for 10.2
- Improved μ stopping, capture and atomic cascade models
 - done
- Neutrino interactions
 - see slide 3

Projects Either Just Started or Not Yet Begun

Cosmic Frontier

- Extend phonon/charge carrier model to Si
- Add lattice parameterizations for Al, W, Si
- Develop new phonon processes for boundary reflections and phonon to particle-hole pair conversion
- Improved models for interactions in noble liquids, especially scintillation
- Better photo-neutron models for $E < 20$ MeV

Cosmic Frontier

- High energy nucleus-nucleus (> 500 GeV/N)
 - some progress with FTF, but new model needed
- Low energy nucleus-nucleus (< 50 MeV/N)
 - new model needed
- Add new decay channels to RDM
 - β -delayed neutron emission
 - spontaneous fission of Cf

Cosmic Frontier

- General improvement of RDM code including:
 - **biasing**
 - **missing levels (if not done by 10.2)**
- Add new RDM channels
 - **β -delayed neutron emission**
 - **spontaneous fission**

Intensity Frontier

- Provide biasing of neutrino scattering
 - use new Geant4 methods
- New tools for estimating systematic errors in hadronic models
- Improved anti-proton production
 - currently using FTF
- Better muon spin models