

Using Geant 4 Simulation: to determine the hadronic Interaction length

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Fermilab

- Definition of Interaction length
- Description of Geant 4 Simulation
- Results
- Conclusions



Description of Geant 4 Simulation

Hadronic Interaction models: Geisha, Precompound Model

Shoot 10 GeV single Protons on solid block of material (4 m³)

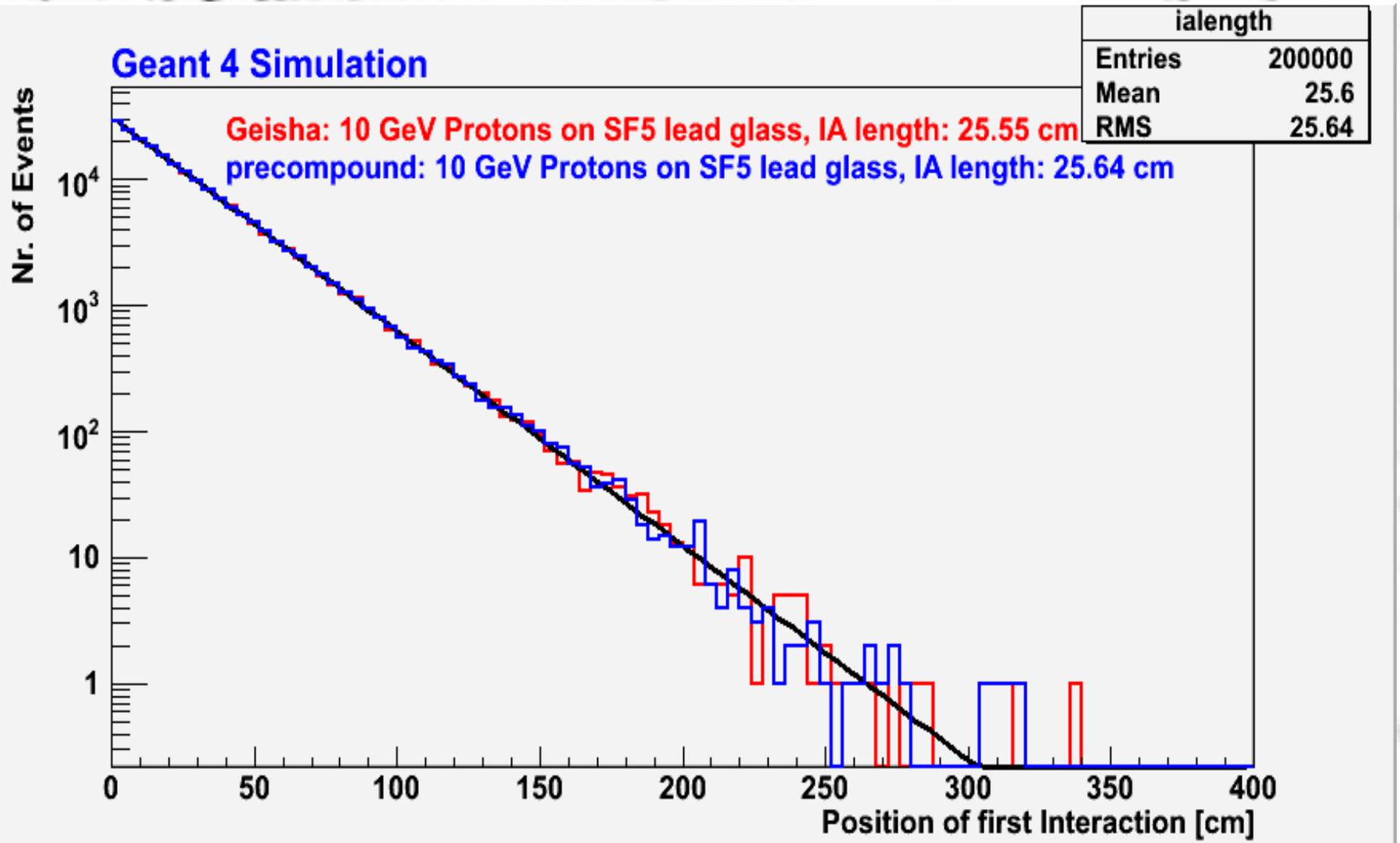
To save time we stop processing the event after first hadronic interaction (in G4Stackingaction). Position of interaction is recorded in a histogram.

Interaction length is estimated by fitting an exponential to the distribution. Interaction length: length when Nr of particles that haven't interacted reduced to e^{-1} .

Materials and Physics model can be controlled in interactive Geant 4 menus.

Some known materials are simulated to be able to compare with literature values.

Results



Results

Model:		GEISHA:		Precompound		Literature
Material	Density [g/cm ³]	IA length [cm]	IA length [g/cm ²]	IA length [cm]	IA length [g/cm ²]	IA length [g/cm ²]
Al	2.7	37.55	101.4	37.74	101.9	106
Fe	7.86	15.75	123.8	15.7	123.4	132
Pb	11.34	16.82	190.8	16.92	191.9	193
F5 Lead Glass	3.47	29.04	100.78	28.97	100.53	
SF5 Lead Glass	4.07	25.55	104	25.64	104.3	
SF57 Lead Glass	5.57	20.6	114.75	20.55	114.48	
PbF2	8.24	19.76	163.8	19.81	163.2	

Conclusions

- Both models give very similar results.
- The results agree with literature values within a few percent