Simulation of accelerator beam using Geant4

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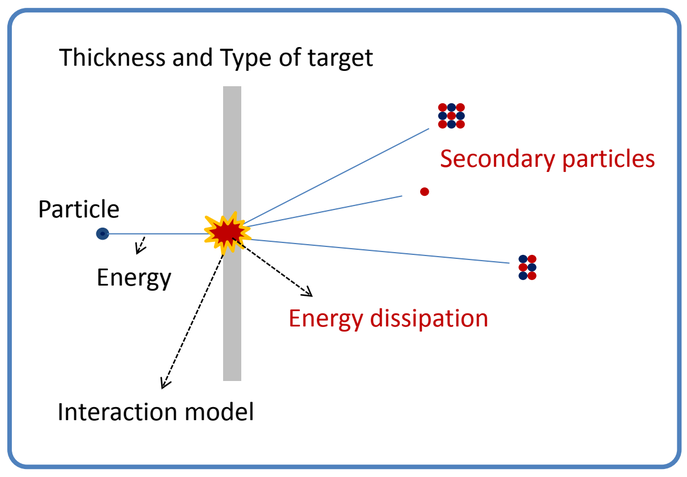
Object

Geant4 simulation for studying secondary beams and dE/dX

Method

To analyze dependence on incident beam, energies and target materials

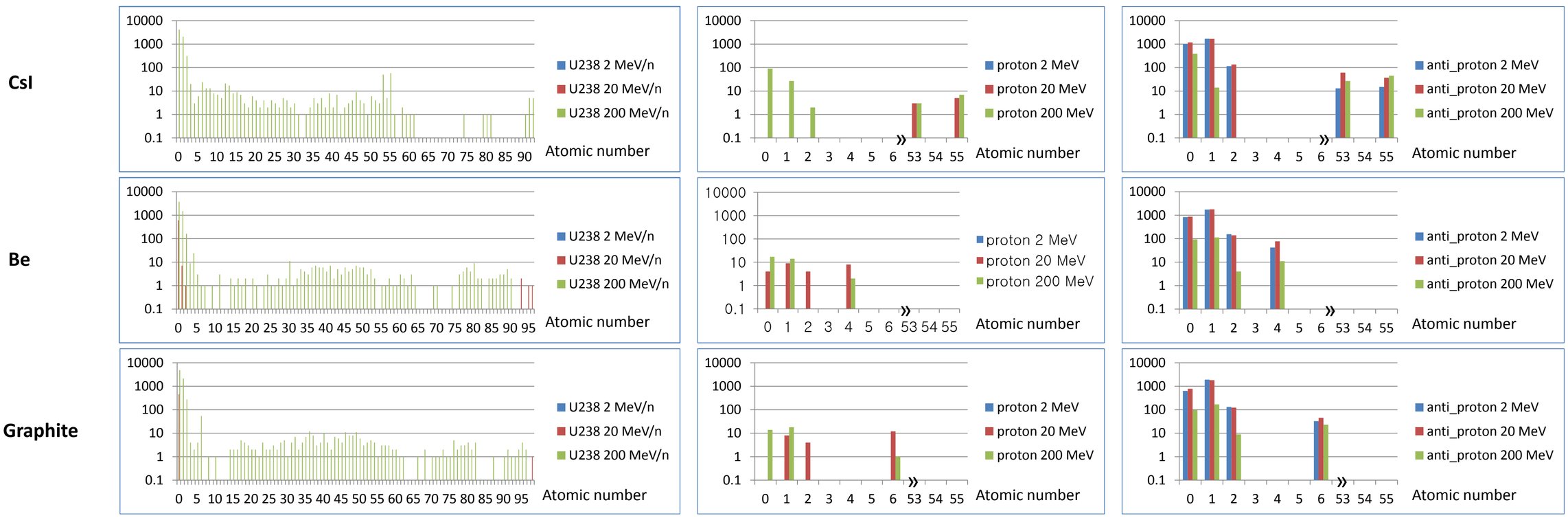
Purpose	Variables	Specific values
Secondary Particle Analysis	Incident Particle Type	^{238}U, proton, anti-proton, electron, positron, photon
	Particle Energy	2 MeV/n, 20 MeV/n, 200 MeV/n
	Target Material	CsI, Be, graphite
	Interaction Model	Electromagnetic processes, decays, transportation in field, QMD
dE/dX Analysis	Incident Particle Type	^{238}U, proton, anti-proton, electron, positron
	Particle Energy	Various energy range from 0.1 MeV ~ 50 GeV
	Target Material	CsI, Be, graphite
	Interaction Model	Electromagnetic processes, decays, transportation in field, QMD



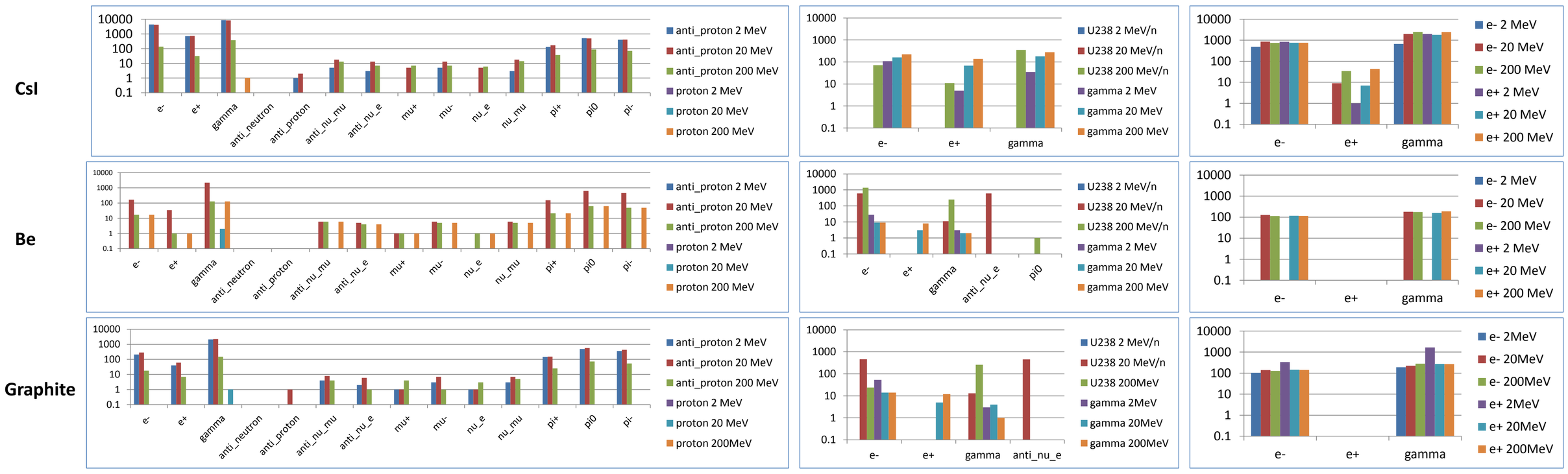
Results

I. Secondary particle analysis

Result on nucleus type secondary particles. (**X** – axis: atomic number, **Y** – axis: number of particles)

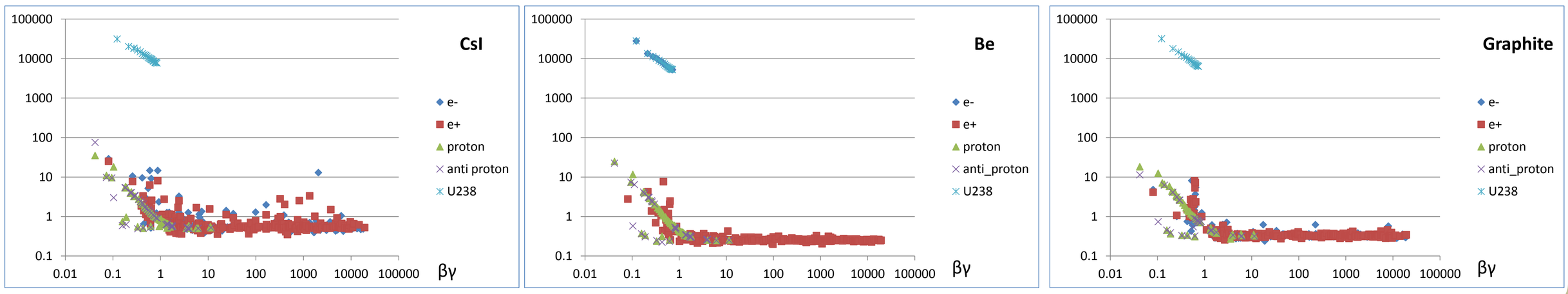


Results on hadrons, leptons, etc. (**X-** axis: type of particles, **Y** – axis: number of particles)



2. Specific ionization (dE/dX)

Results according to the target materials, incident beam, energy (**X**- axis: Beta Gamma(βγ) in log scale, **Y** – axis: dE/dX (MeV/mm) in log scale)



Conclusion

· A heavy ion beam with high energy (200 MeV/n) produced nucleus type secondary beam very well.
· In case of antiproton, electron and positron, hadron and lepton type secondary beam had been produced with high intensity.
· Simulated dE/dX curve is valid in low βγ region and U238 show relatively very high dE/dX value.
· Type of secondary particles depends on material of target significantly.