Geant4 simulation of the passage of particles through matter for the MuCool Test Area (MTA)

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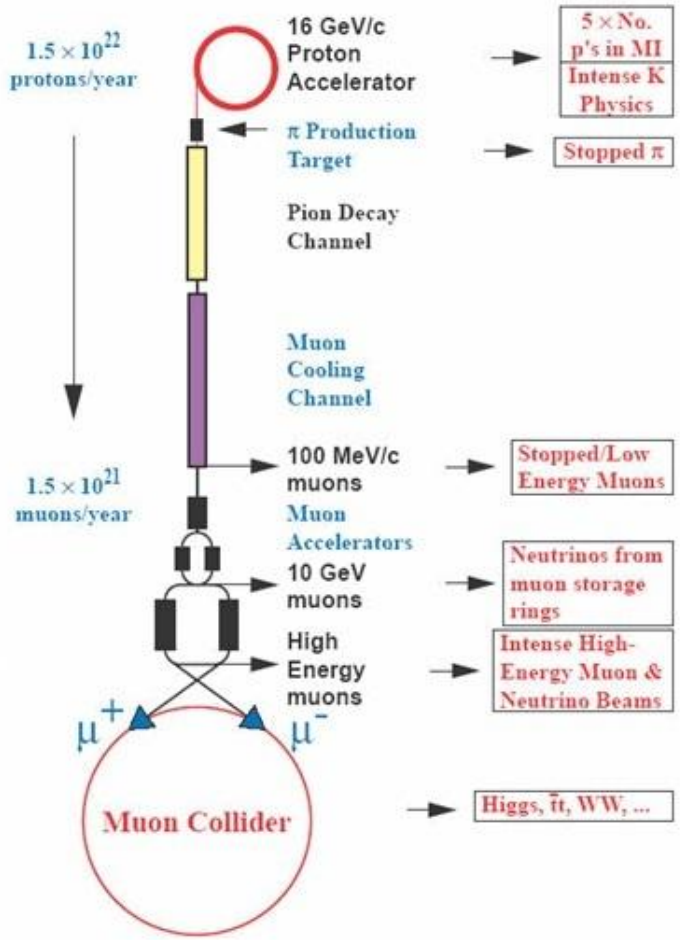
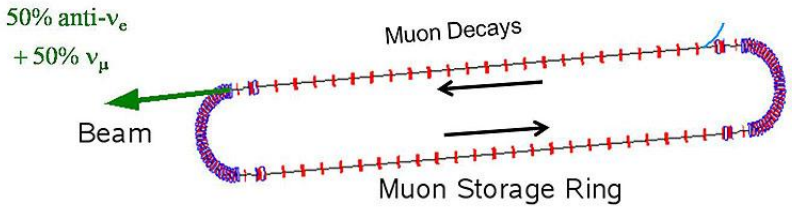
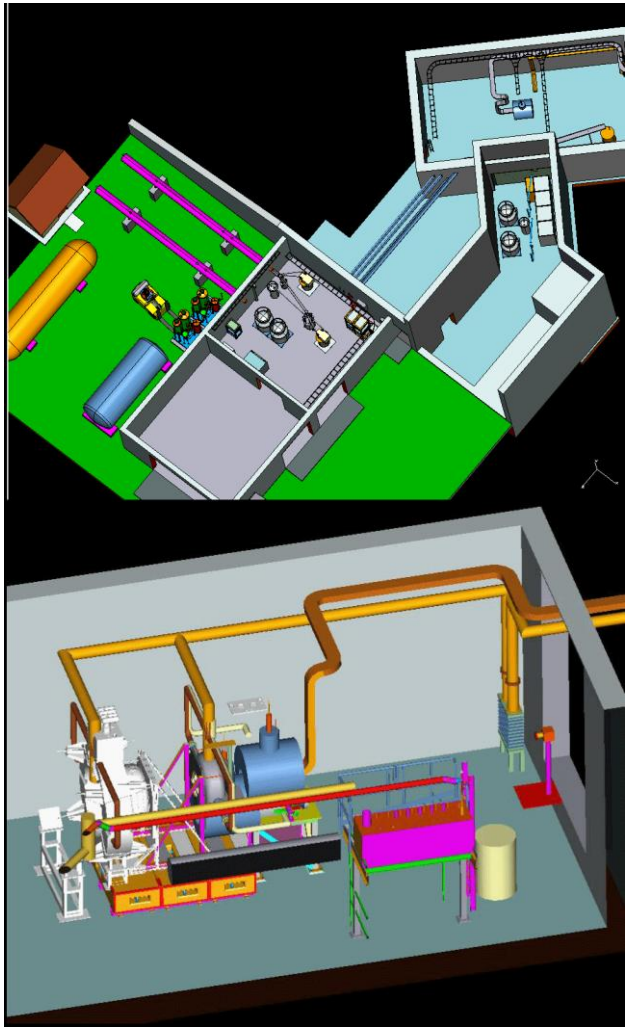
Muon Collider



- The Muon Collider provides a possible realization of a multi-TeV lepton collider.
- The frontend of the facility provides an intense muon source that can perhaps support both a Neutrino Factory and an energy-frontier Muon Collider.

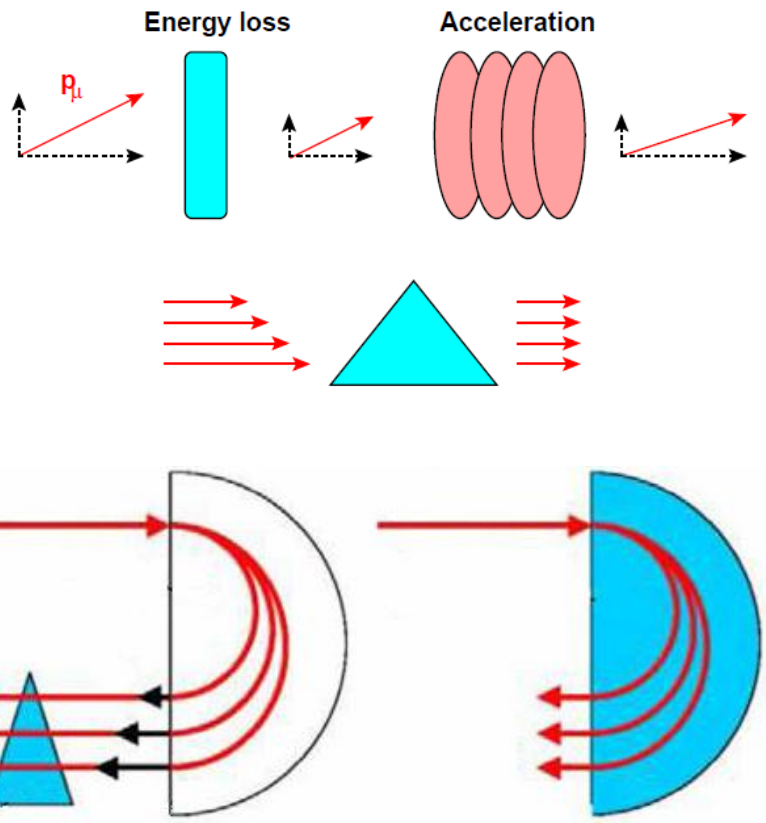


MuCool Test Area



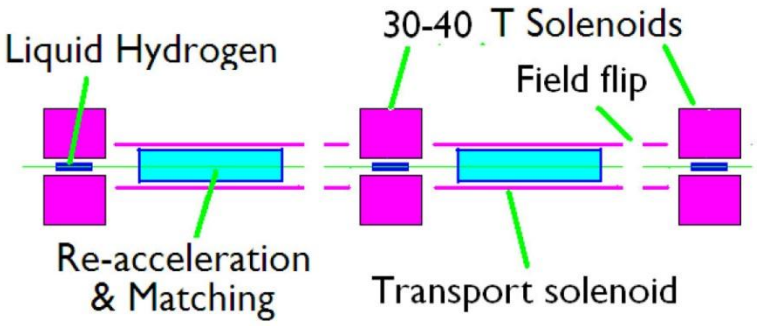
- The Facility:
  - cryogenics plant
  - the access pit
  - MTA hall
- MTA:
  - cryogen valve/distribution box (pink)
  - 5T solenoid (blue)
  - 2.5T large-bore solenoid (white)
  - MTA Beam Line (400 MeV p)

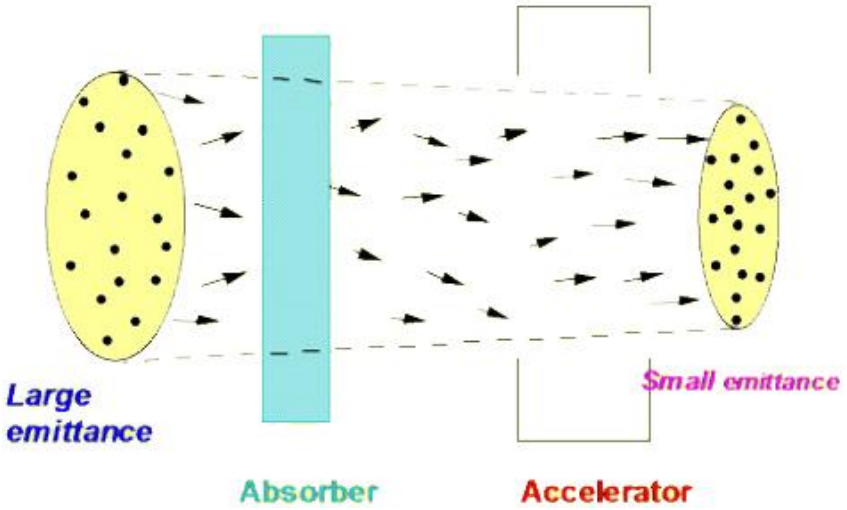
Muon Ionization Cooling



- The only muon cooling scheme that appears practical within the muon lifetime
- Mainly transverse
- Longitudinal cooling requires momentum-dependent path-length through the energy absorbers

Muon Ionization Cooling





- Multi-stage process
- 30-40T HTS magnets
  - operating at 4K
- Bunch length may rise up to 400cm
- Cooling down to 5 MeV
- It is thought that ionization electrons will recombine with hydrogen before they can form a dense plasma

Goals

- Main:
  - Make a Geant4 simulation of the passage of particles through matter for the MuCool Test Area (MTA):
    - Main 5T solenoid
    - +
    - High pressure RF cavity
    - +
    - Get results using the particle gun
- Additional:
  - Add support of G4beamline to use its particles