Muon Yield Comparisons for Different ICOOL Versions and Lattices

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Simulation

• Run MARS15 with target & beam configuration settings from optimization study. (MARS events of $10^6$ for 2, 3, 4 GeV, $4 \times 10^5$ for 5, 6, 7, 8 GeV, $10^5$ events for 9, 10, 11, 12, 13, 14 GeV; target parameters of 11 and 13 GeV from interpolation)

• Take the muon/pion/kaons at $z=0$ m from MARS output (Field & solenoid position of ST2a configuration) to generate the for003.dat without smear of the particle time.

• Particles are tracked until the end of the cooling channel with different ICOOL decks (ST2a-BNL/ST2a-ISS/IDR) and different ICOOL versions (v310/v316/v320).

• Acceptance cuts (using ecalc9f):
  100 < $p_z$ < 300 MeV/c, no tail cut ($\sigma_{cut} = 0$)
  $A// = 150$ mm, no $p_z$-$A\perp$ correlation ($pzcorr = 0$)
  $A\perp = 30$ mm
Consistency of Running MARS

![Graph showing N\nu/\text{Pr} vs. Proton Kinetic Energy, GeV]

- Sum/PAC09
- Sum/Run-Nov1710
Muon Yield from Different Versions of ICOOL with ST2a-BNL Input Deck
Muon Yield from Different Versions of ICOOL with ST2a-ISS Input Deck
Muon Yield from Different Versions of ICOOL with IDR Input Deck

![Muon Yield Graph]

The graph compares the muon yield from different versions of ICOOL using IDR input decks, showing variations in proton kinetic energy and normalized muon yield. The versions compared are Sum/IDR-v310, Sum/IDR-v316, and Sum/IDR-v320.
Muon Yield from Different Input Decks with ICOOL v310
Muon Yield from Different Input Decks with ICOOL v316
Muon Yield from Different Input Decks with ICOOL v320
Summary

• ST2a-BNL input deck gives almost same muon yields at any proton KE no matter which version of ICOOL is used.

• ST2a-ISS input deck gives less muon yield than ST2a-BNL input deck at ICOOL v310 or ICOOL v316. They only have similar muon yield at ICOOL v320.

• IDR input deck gives higher muon yield than ST2a-BNL and ST2a-ISS input deck at any proton KE no matter which version of ICOOL is used.