Muon capture as function of the beam energy for the ICOOL ST2a lattice a.k.a. ISS lattice (cont'd)

Simulation

Beam file:

- MARS15 (m1507) code @CERN (version of 21st July 2009).
- Target & beam configuration settings from BNL.
- Field & solenoid position is ST2a configuration.
- Take the muon/pion/kaons at z=0 m from MARS output.
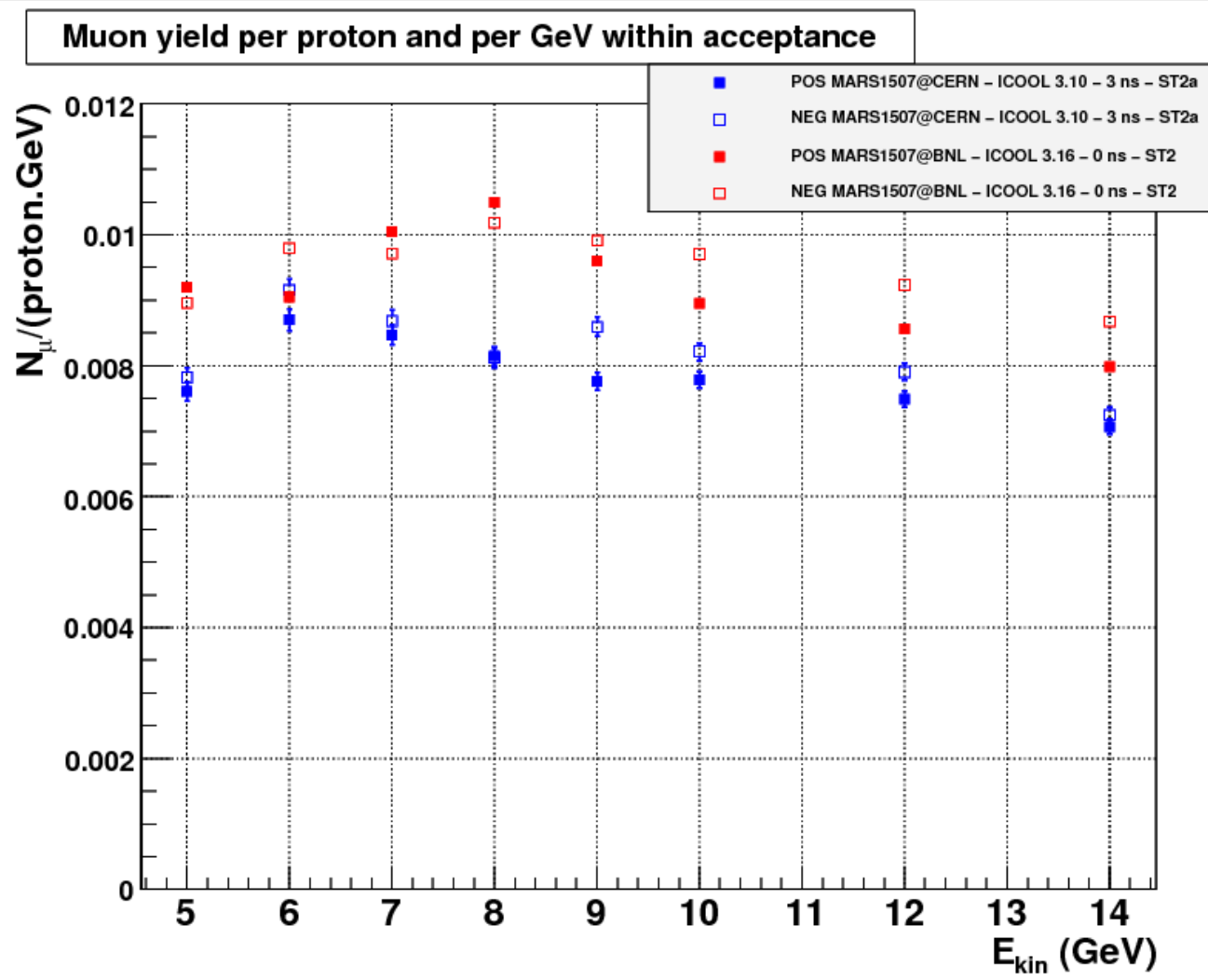- Smear the particle time by a gaussian of $\sigma = 3$ ns (gasdev).

ICOOL deck is the ISS (ST2a deck).

Particles are tracked until the end of the cooling channel.

Acceptance cuts (using ecalc9f):

- $50 < p_z < 400$ MeV/c   tail cutting function on ($\sigma = 4$)
- $A_{/\!/} = 150$ mm   correction for pz-$A_\perp$ correlation on
- $A_\perp = 30$ mm

Muons yield comparison (16x4h processing)

Muon yield per proton and per GeV within acceptance

Legend:
- POS MARS1507@CERN – ICOOL 3.10 – 3 ns – ST2a
- NEG MARS1507@CERN – ICOOL 3.10 – 3 ns – ST2a
- POS MARS1507@BNL – ICOOL 3.16 – 0 ns – ST2
- NEG MARS1507@BNL – ICOOL 3.16 – 0 ns – ST2

Y-axis: $N_\mu/(proton.GeV)$

X-axis: E_{kin} (GeV)

Error bars (blue):

$$E = \sqrt{\frac{NS_2 - S_1^2}{N-1}}$$

$$S_1 = \sum w_i$$

$$S_2 = \sum w_i^2$$

Dependence in energy different between blue and red points.

Up to 25% difference in the yield.

3

Simulation comparison

Difference in the yield may come from:

- 1- different versions of MARS code
- 2- different versions of ICOOL
- 3- different time smearing used (looking at time dependence)
- 4- different field maps in MARS (comparing ST2/ST2a @CERN)

But:

Whether it comes from 1-2-3 or 4 or all combined, we will have to deal with it in the future (MARS and ICOOL are likely to have new versions available, we are likely to change our field taper and maybe the time smearing before the RDR).

Why not giving a range value for the muon yield
or provide some errors bars/uncertainties ?