



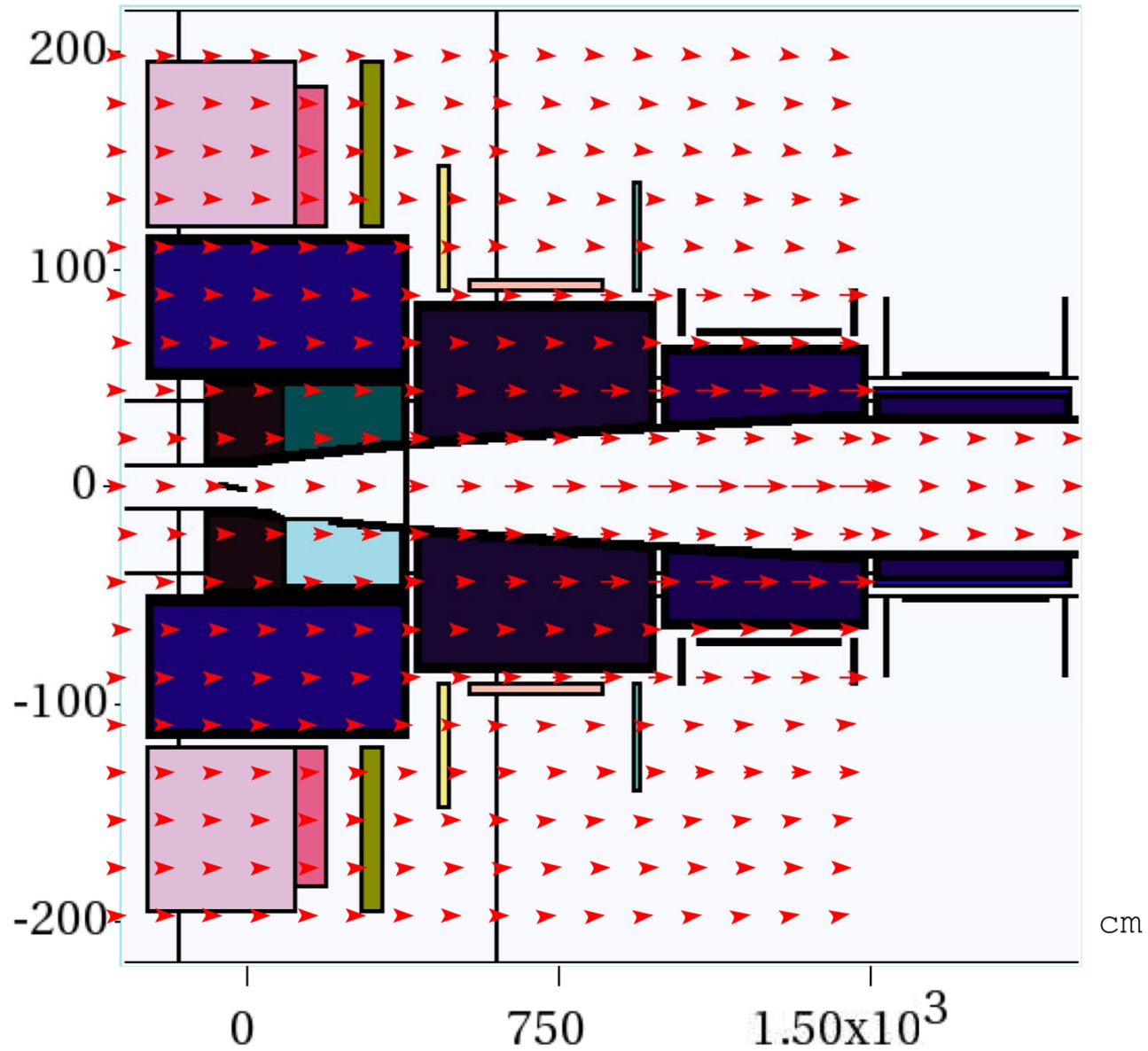
Comparison of Particle Production between MARS and FLUKA (Update)

X. Ding, UCLA

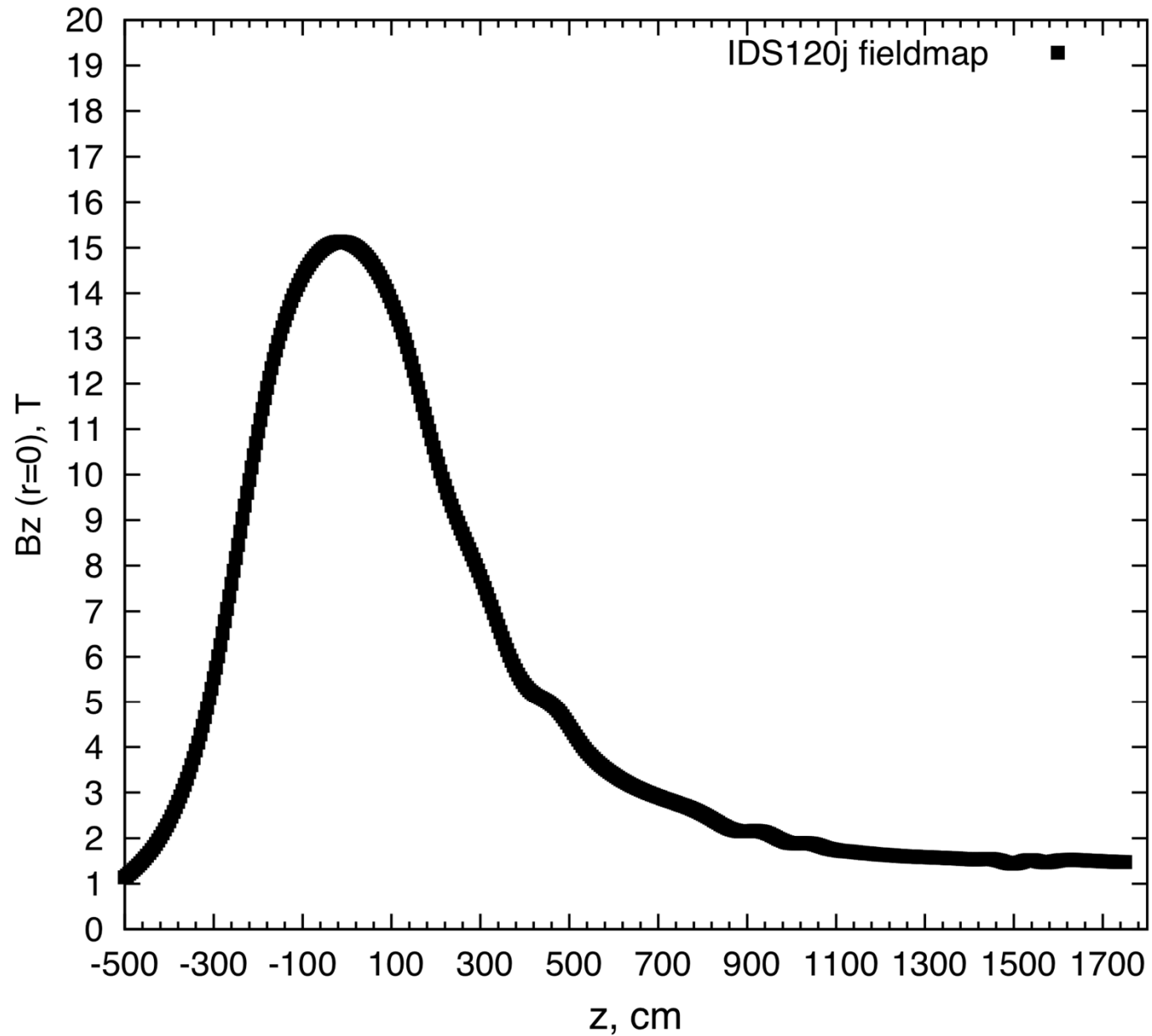
Target Studies
Aug. 8, 2013



IDS120j Geometry



Fieldmap



Target Setting

- Original setting: MARS (Nicholas), FLUKA (John)
- Fieldmap: (IDS120j, 15 T \rightarrow 1.5 T)
- Target parameters at 3 GeV (*from IDS120h*):
 - Carbon: target radius/0.346 cm, beam radius/0.0865 cm, beam angle/42 mrad, jet angle/42 mrad; launch at $z = -100$ cm;
 - Galium: target radius/0.34cm, beam radius/0.102 cm, beam angle/114 mrad, jet angle/125 mrad; launch at $z = -75$ cm;
 - Mercury: target radius/0.23 cm, beam radius/0.069 cm, beam angle/137 mrad, jet angle/155 mrad; launch at $z = -75$ cm.

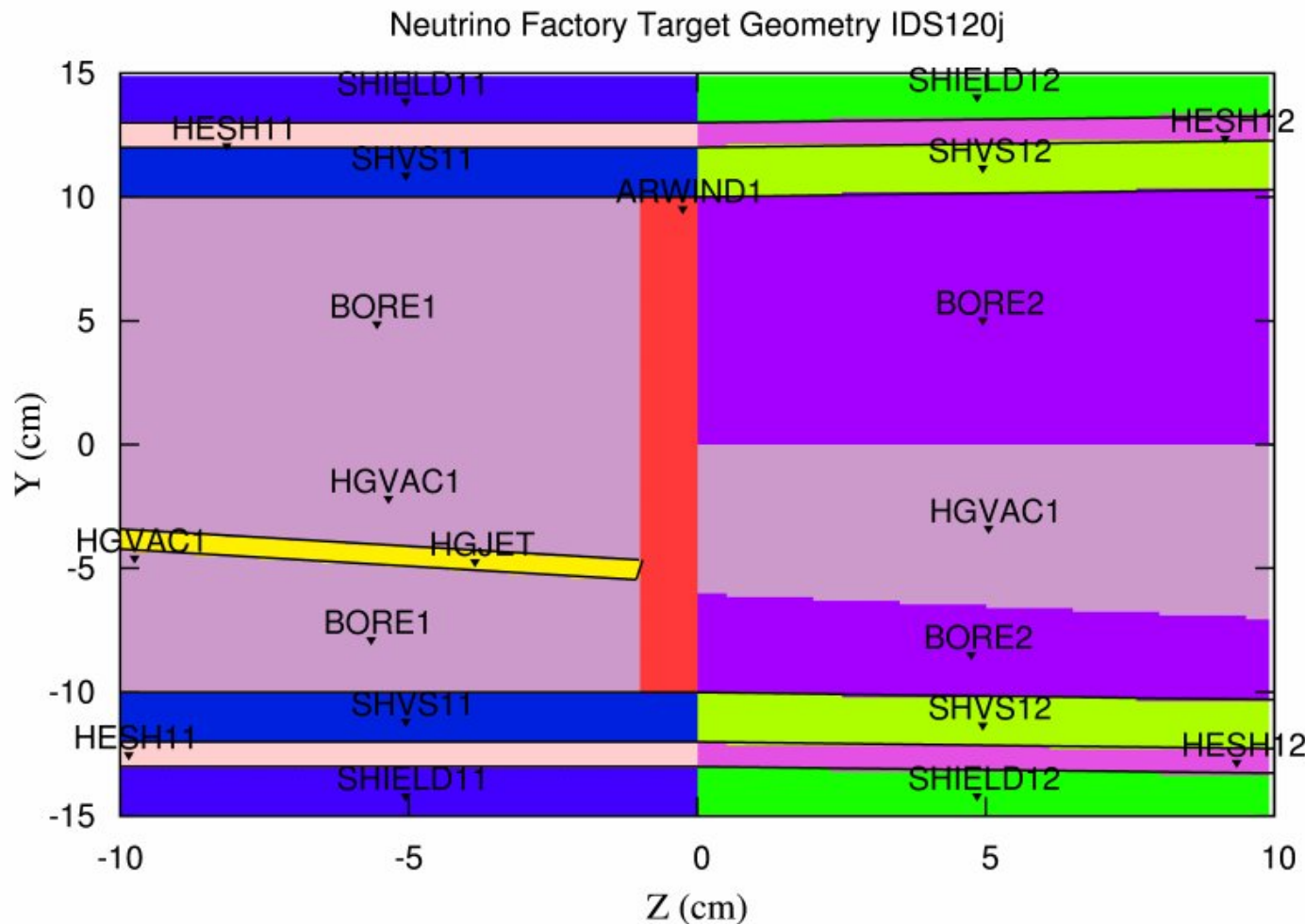
Target Setting (cont'd)

- Target parameters for Mercury at 8 GeV (*from IDS120h*):

Mercury: target radius/0.4 cm, beam radius/0.12 cm, beam angle/117 mrad, jet angle/137.6 mrad; launch at $z = -75$ cm.

- Production Collection: (0 m and 50 m downstream, $40\text{MeV} < \text{KE} < 180\text{MeV}$).
- Energy Spectrum at $z = 0$ m, $z = 3.8034$ m (Be Window) and $z = 50$ m.

Modified Target Geometry in FLUKA to collect particles at z=0



Add an air disk at $-1 \text{ cm} \leq z \leq 0$ and $r \leq 10 \text{ cm}$ so as to collect particles at $z = 0$ and it works.

Thanks J.J. Back in testing and correcting my geometry setting

Meson Production (IDS120j)

(Unit: Meson/proton/GeV)

		MARS	FLUKA
Carbon	3 GeV, z = 50 m	0.02606	0.02976 (neg: 0.01206, pos: 0.01770)
Carbon	3 GeV, z = 0 m	0.03257	0.03341 (neg: 0.01370, pos: 0.01971)
Mercury	3 GeV, z = 50 m	0.02059	0.02096 (neg: 0.01070, pos: 0.01026)
Mercury	3 GeV, z = 0 m		0.02496 (neg: 0.01273, pos: 0.01223)
Gallium	3 GeV, z = 50 m	0.02361	0.026036 (neg: 0.012056, pos: 0.01398)
Gallium	3 GeV, z = 0 m		0.030496 (neg: 0.014126, pos: 0.01637)

Meson Production (IDS120j)

(Unit: Meson/proton/GeV)

		MARS	FLUKA
Mercury	8 GeV, z = 50 m	0.0415	0.0263 (neg: 0.0136, pos: 0.0127)
Mercury	8 GeV, z = 0 m	0.04108	0.02907 (neg: 0.01508, pos: 0.01399)

Production of MARS vs. FLUKA

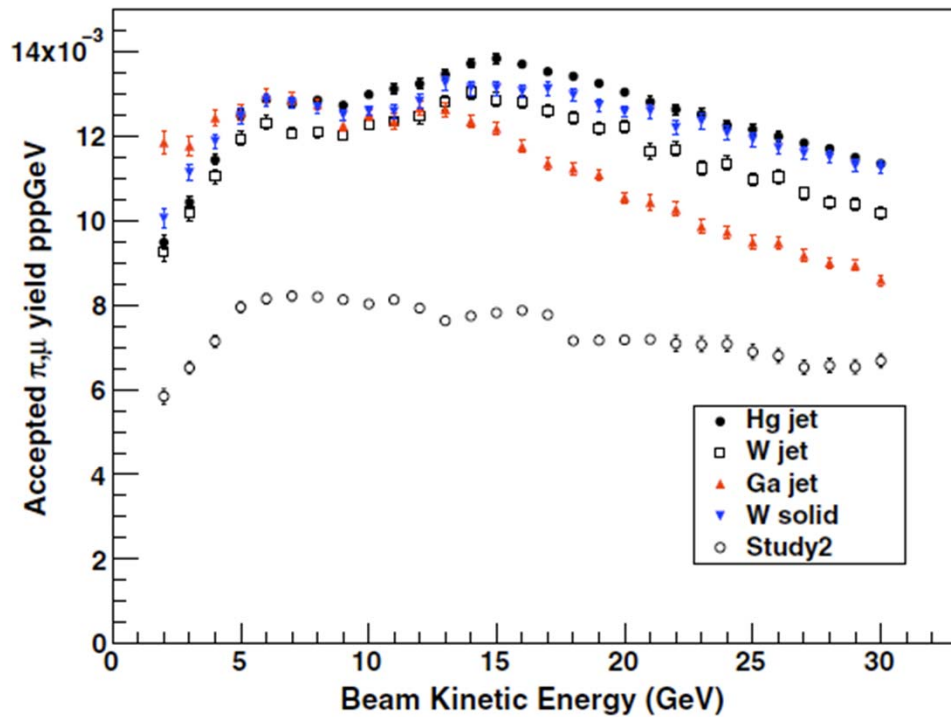
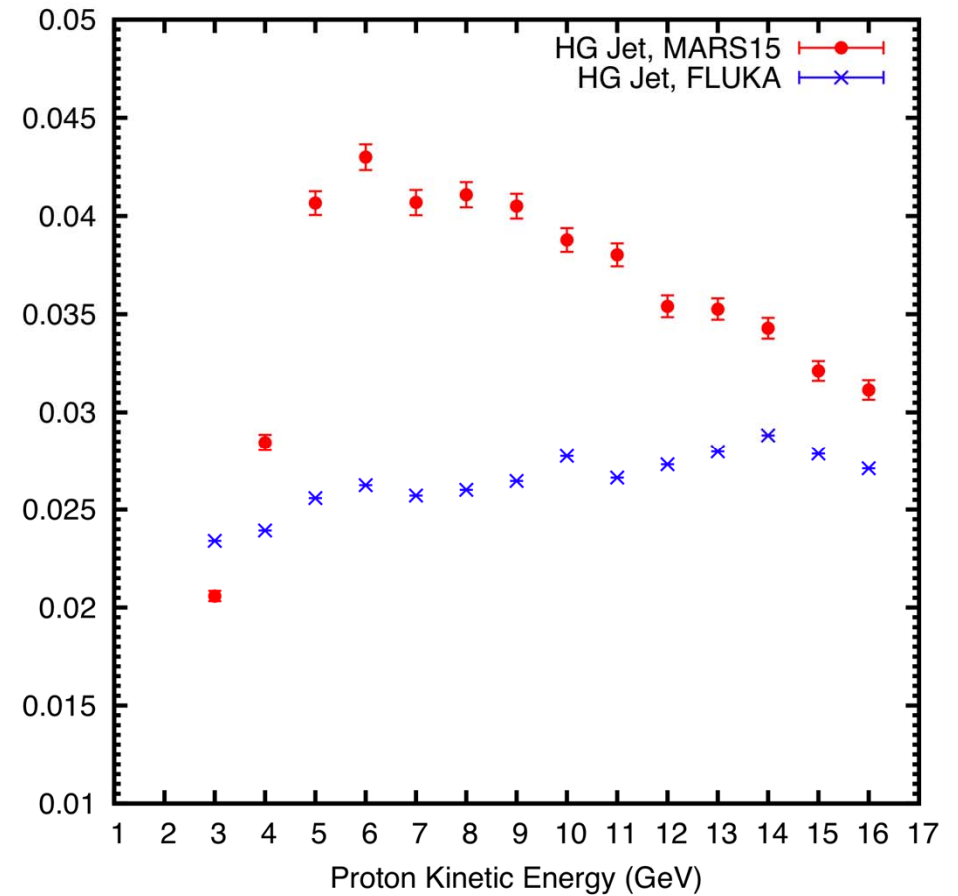


FIG. 6. The charged-averaged accepted pion and muon yield per proton per GeV for various targets in the new increased shielding geometry. Also shown are the equivalent yields for the mercury jet target in the Study 2 geometry.

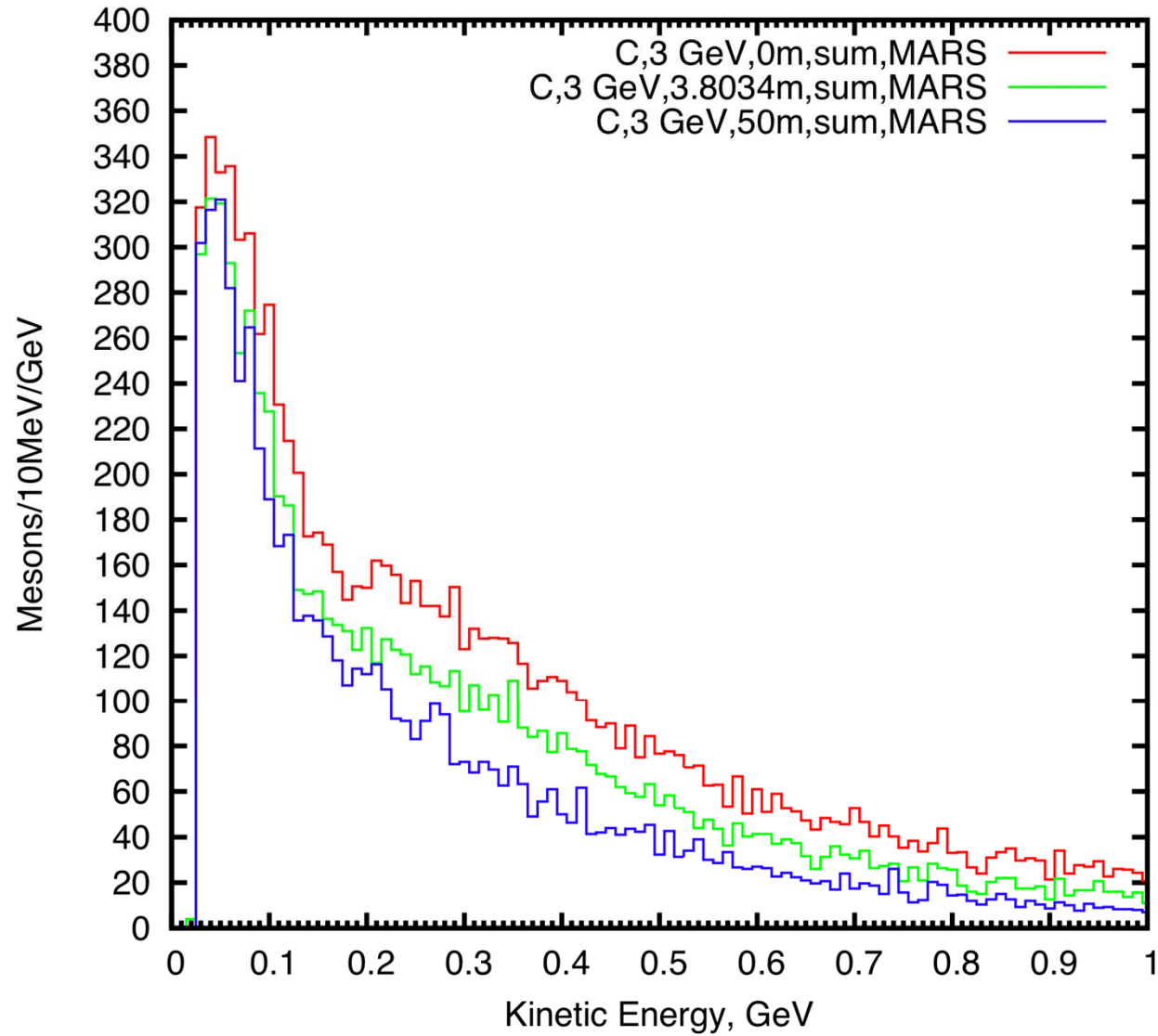
FLUKA (Average)



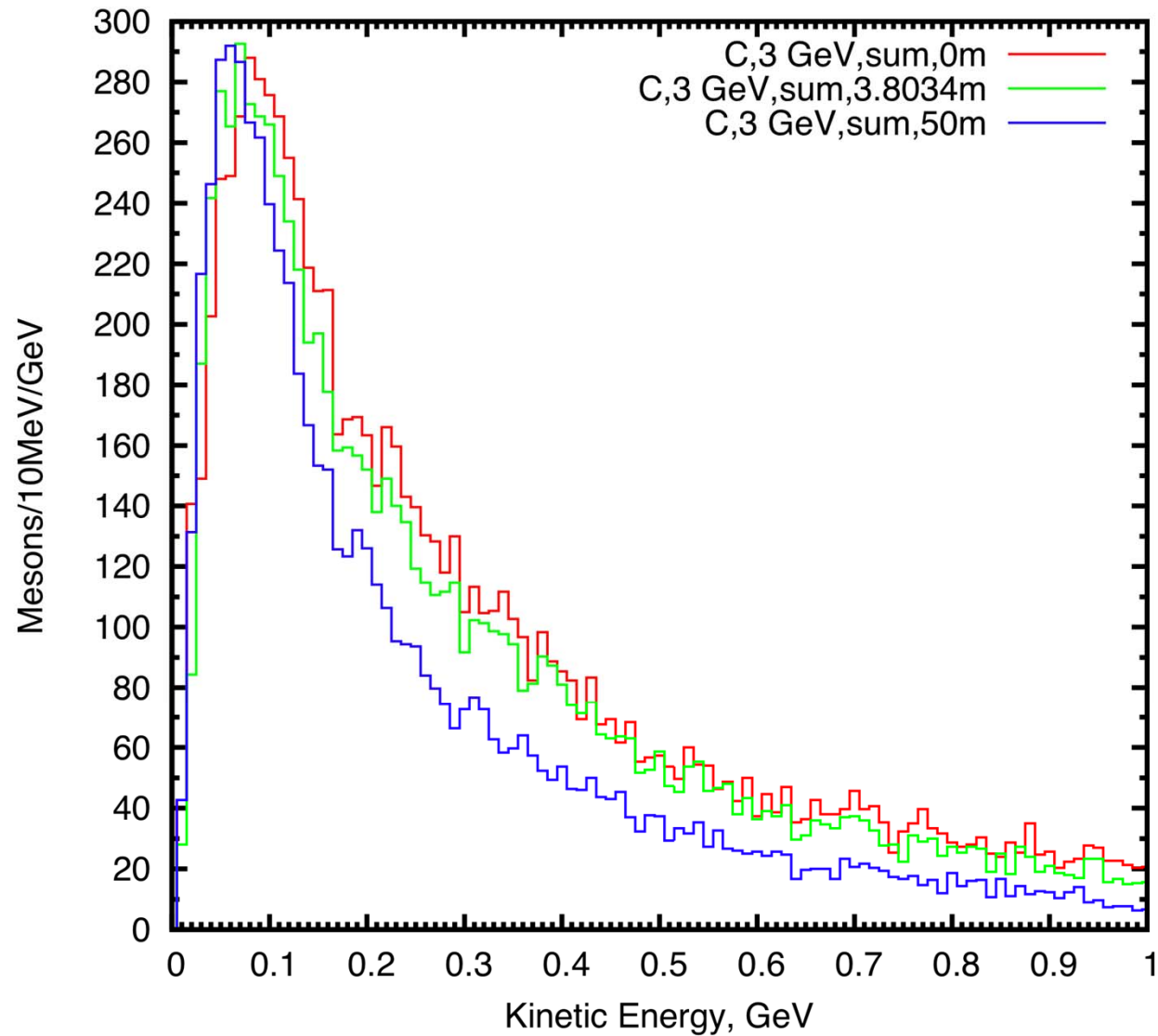
FLUKA(Sum), MARS(Sum)

John et al., PRSTAB 16, 021001 (2013)

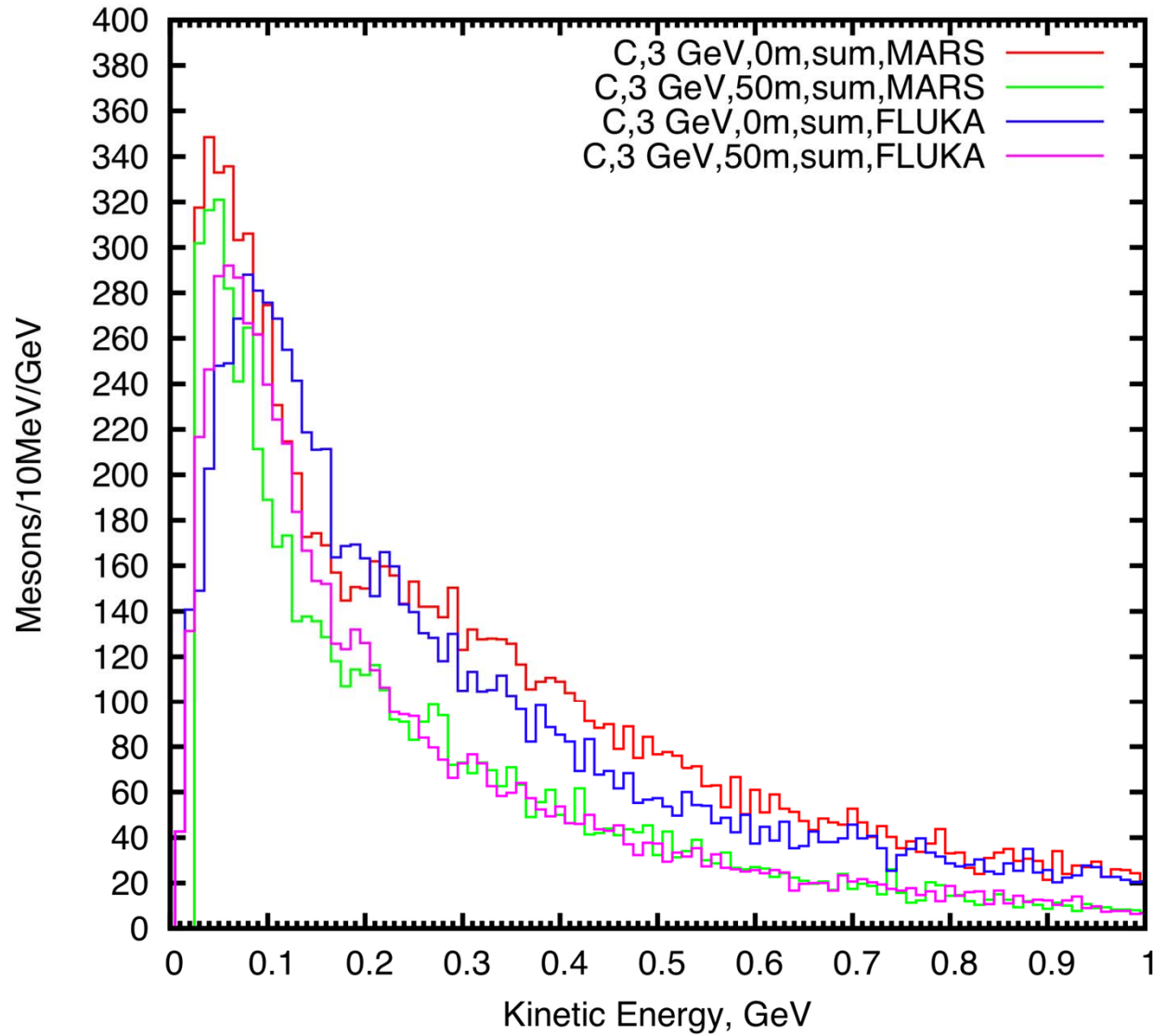
Carbon (MARS)



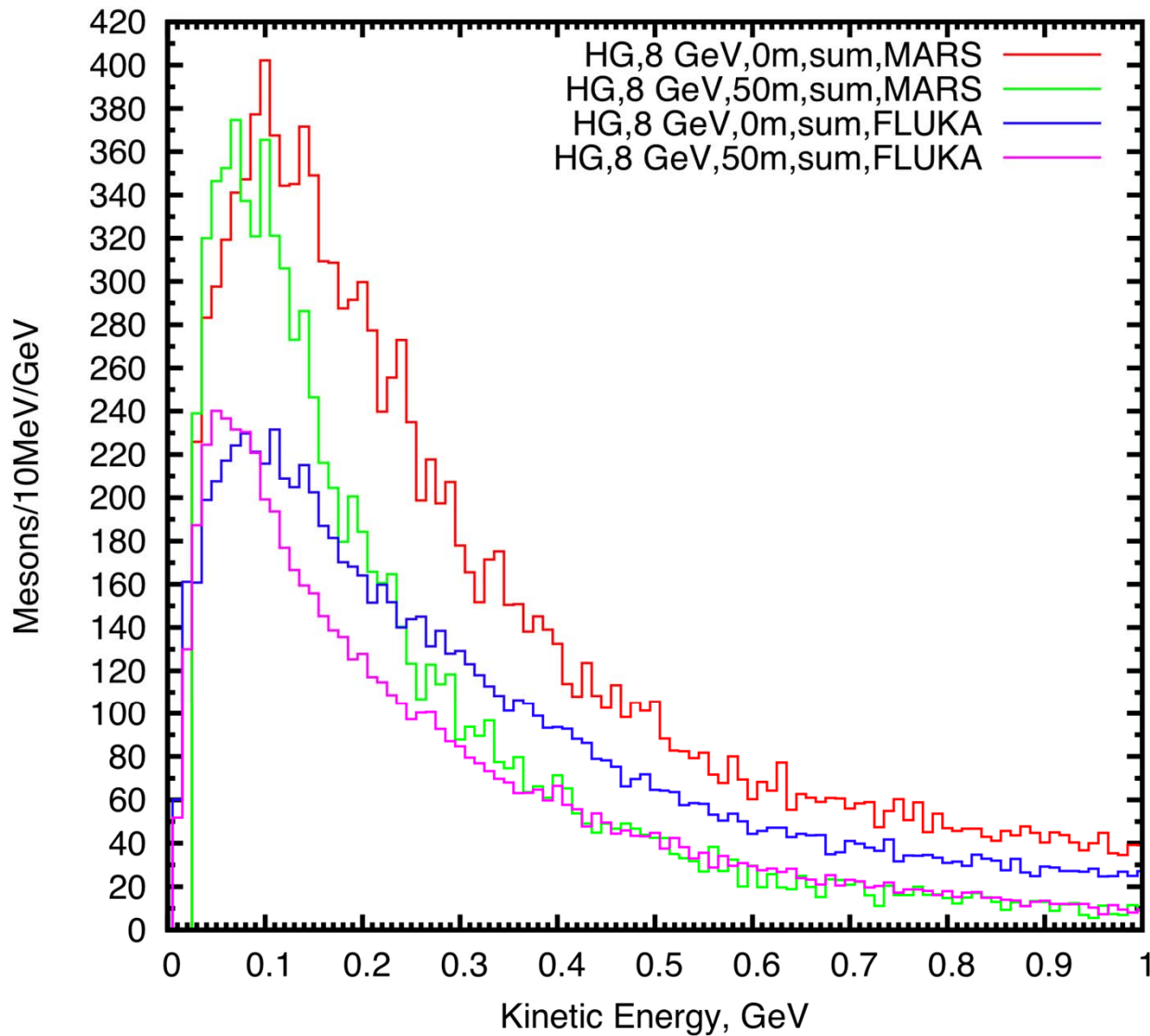
Carbon (FLUKA)



MARS vs. FLUKA (C, 3 GeV)



MARS vs. FLUKA (HG, 8 GeV)



Work plan (Aug. & Sept.)

- We have optimized target parameters with IDS120h configuration (20 T) for Carbon at 3 GeV from MARS.
- I will optimize the target parameters with IDS120j configuration (15 T) for Carbon at 3 GeV using MARS.
- Prepare the paper for NA-PAC'13 (Optimized particle production for a staged neutrino factory).