Particle Production at 3 GeV

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Target Studies
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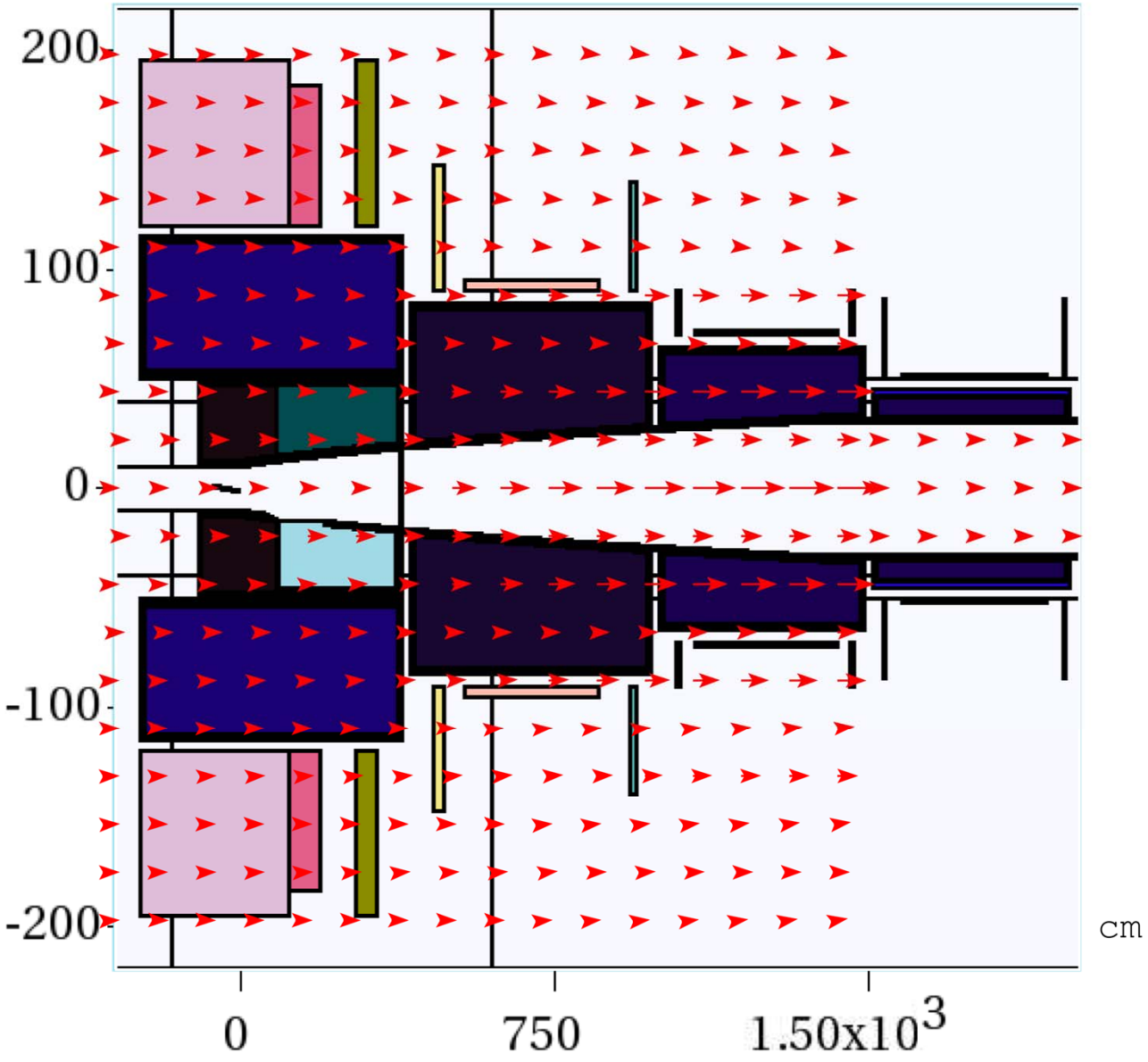
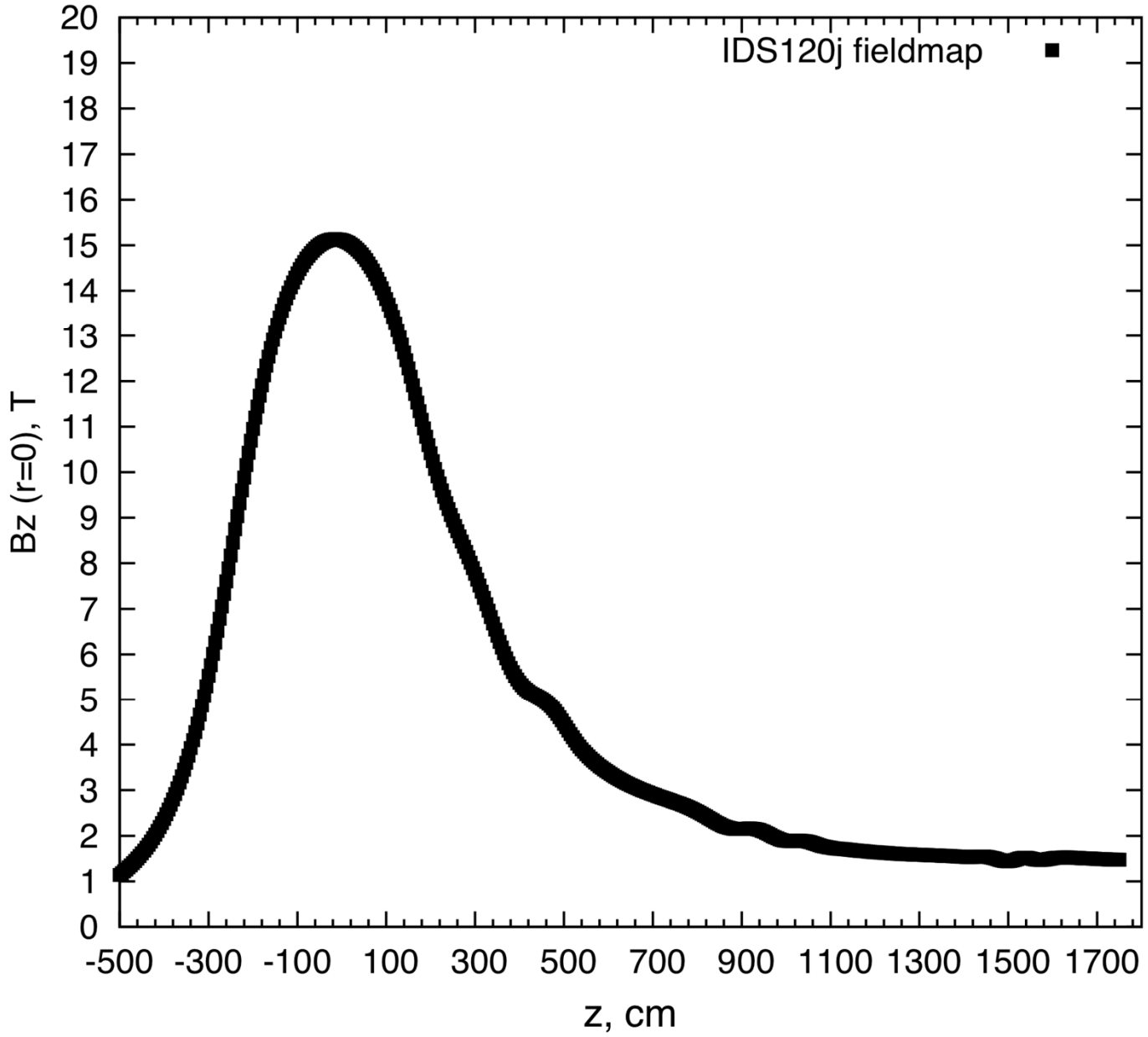
IDS120j Geometry



Fieldmap


IDS120j fieldmap
Bz (r=0), T
z, cm
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-500
-300
-100
100
300
500
700
900
1100
1300
1500
1700

Target Setting

- Original setting: MARS (Nicholas), FLUKA (John)
- Fieldmap: (IDS120j, 15T➔1.5T)
- 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; target length/72 cm along z axis;

  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 MeV < KE < 180 MeV).
- Energy Spectrum at z = 0 m and z = 50 m

Incident Particle Energy and the threshold in matter for subsequent generated particles

- ENRG E0 EM EPSTAM EMCHR EMNEU EMIGA EMIEL

  E0: The incident particle kinetic energy;

  EM: The hadron threshold energy (Default: 0.0145 GeV);

  EPSTAM: The star production threshold kinetic energy (Default: 0.03 GeV);

  EMCHR: The threshold energy applied collectively to muons, heavy ions and charged hadrons (Default: 0.001 GeV);

  EMNEU: The threshold energy for neutrons (Default:10^{-4} GeV)

  EMIGA: The threshold energy for γ (Default:10^{-4} GeV);

  EMIEL: The threshold energy for $e^{\pm}$ (Default: $5*10^{-4}$ GeV)

- Default Setting: ENRG E0
- Non-default setting: ENRG 1=E0 2=0.02 3=0.3 4=0.01 5=0.05 6=0.01 7=0.01

MARS Running Mode

- Mode 1: Normal Monte Carlo Session (INDX 4=T)
- Mode 2: Normal+MCNP (INDX 4=T 5=T)
- Mode 3: Normal+LAQGSM (INDX 4=T, ICEM 4=1)
- Mode 4: Normal+MCNP+LAQGSM

  (INDX 4=T 5=T, ICEM 4=1)

MCNP: for neutron transport below 14.5 MeV, with corresponding low energy photon production.

Hadron Production

LAQGSM: Quark-Glon String Model code. ICEM 4=1

CEM: Cascade-Excitation Model code. ICEM 4=0 (default)

Meson Production from MARS

(Unit: Meson/proton/GeV)

Carbon/3GeV/ z=0 m	Mode 1	Mode 2	Mode3	Mode4
ENRG (default)	0.0341	0.0335	0.0299	0.0296
ENRG (Non-default)	0.0326	0.0326	0.0300	0.0300

Carbon/3GeV/ Z=50 m	Mode 1	Mode 2	Mode 3	Mode4
ENRG (default)	0.0261	0.0254	0.0279	0.0273
ENRG (Non-default)	0.0262	0.0262	0.0284	0.0284

Meson Production from MARS

(Unit: Meson/proton/GeV)

Mercury/3GeV/ z=0 m	Mode 1	Mode 2	Mode 3	Mode 4
ENRG (default)	0.0368	0.0366	0.0361	0.0364
ENRG (Non-default)	0.0338	0.0335	0.0332	0.0332

Mercury/3GeV/ z=50 m	Mode 1	Mode 2	Mode 3	Mode 4
ENRG (default)	0.0204	0.0203	0.0200	0.0201
ENRG (Non-default)	0.0206	0.0205	0.0200	0.0200

Meson Production from MARS

(Unit: Meson/proton/GeV)

Mercury/8GeV/ z=0 m	Mode 1	Mode 2	Mode 3	Mode 4
ENRG(default)		0.0424	0.0460	0.0461
ENRG(Non-default)	0.0403	0.0416	0.0446	0.0453

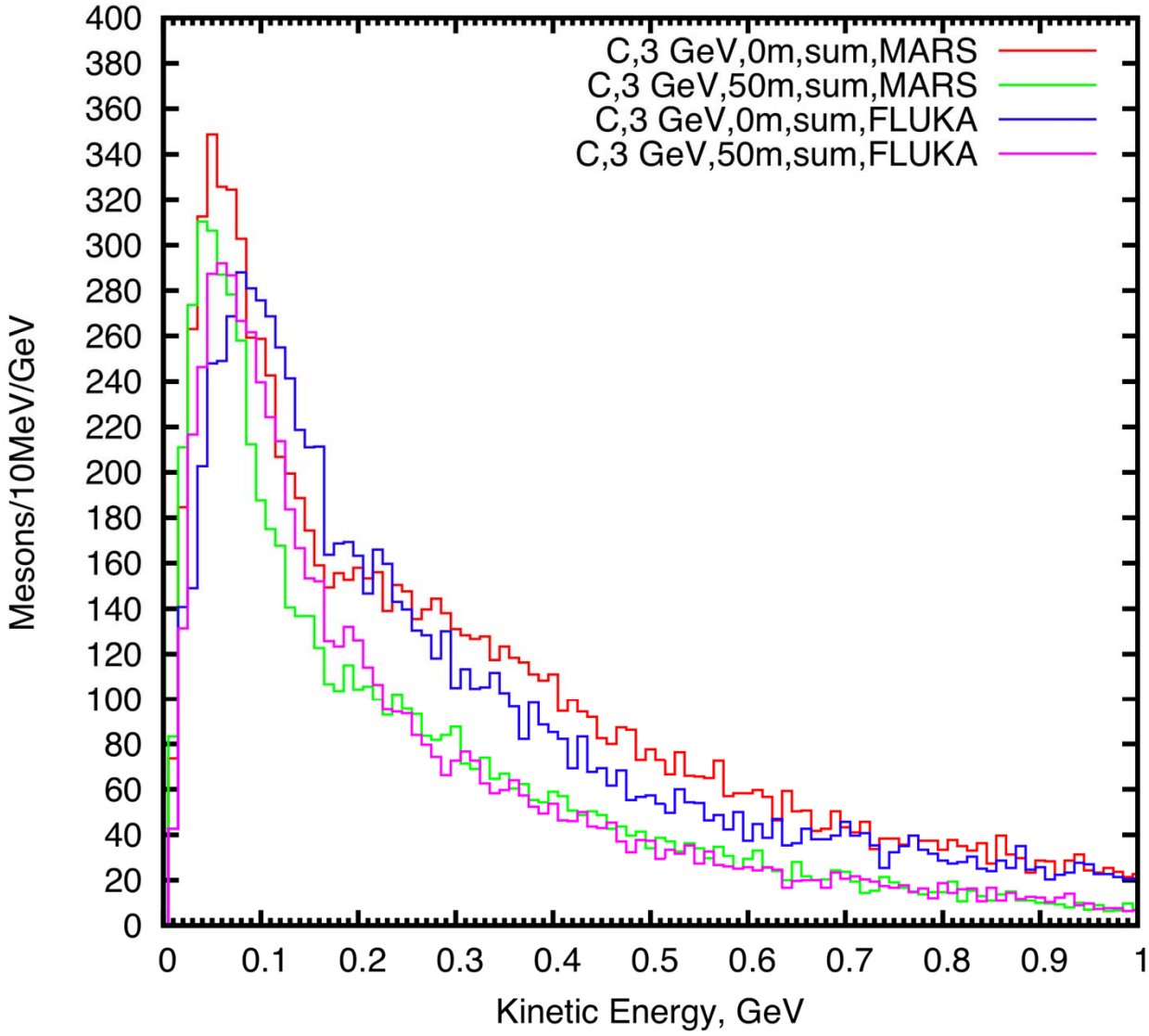
Mercury/8GeV/ z=50 m	Mode 1	Mode 2	Mode 3	Mode 4
ENRG(default)		0.0411	0.0356	0.0356
ENRG(Non-default)	0.0415	0.0410	0.0356	0.0362

Meson Production from FLUKA

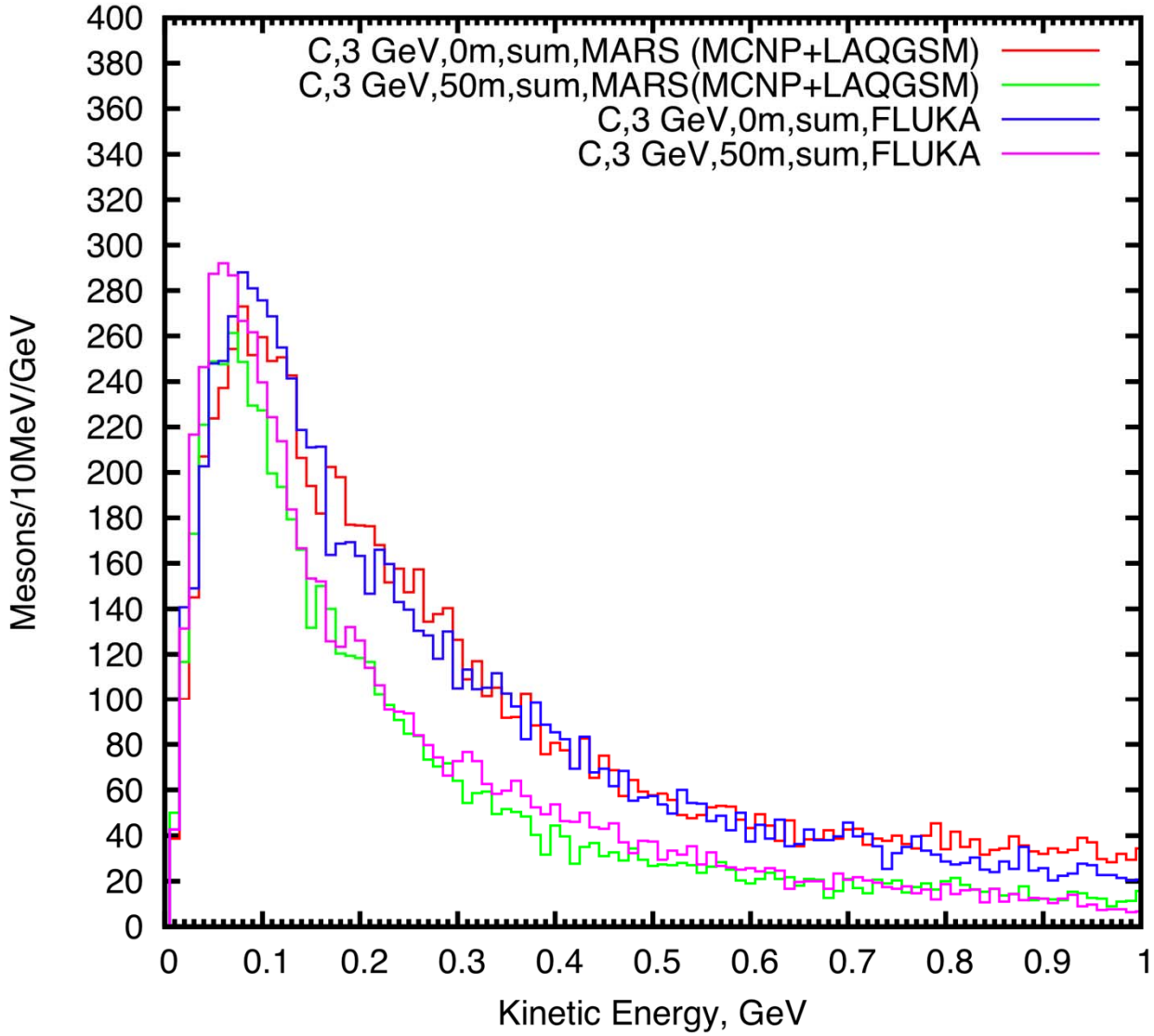
(Unit: Meson/proton/GeV)

		FLUKA
Carbon	3 GeV, Z = 50m	0.02976 (neg: 0.01206, pos: 0.01770)
Carbon	3 GeV, Z = 0m	0.03341 (neg: 0.01370, pos: 0.01971)
Mercury	3 GeV, Z = 50 m	0.02096 (neg: 0.01070, pos: 0.01026)
Mercury	3 GeV, Z = 0 m	0.02496 (neg: 0.01273, pos: 0.01223)
Mercury	8 GeV, Z = 50 m	0.0263 (neg: 0.0136, pos: 0.0127)
Mercury	8 GeV, Z = 0m	0.02907 (neg: 0.01508, pos: 0.01399)

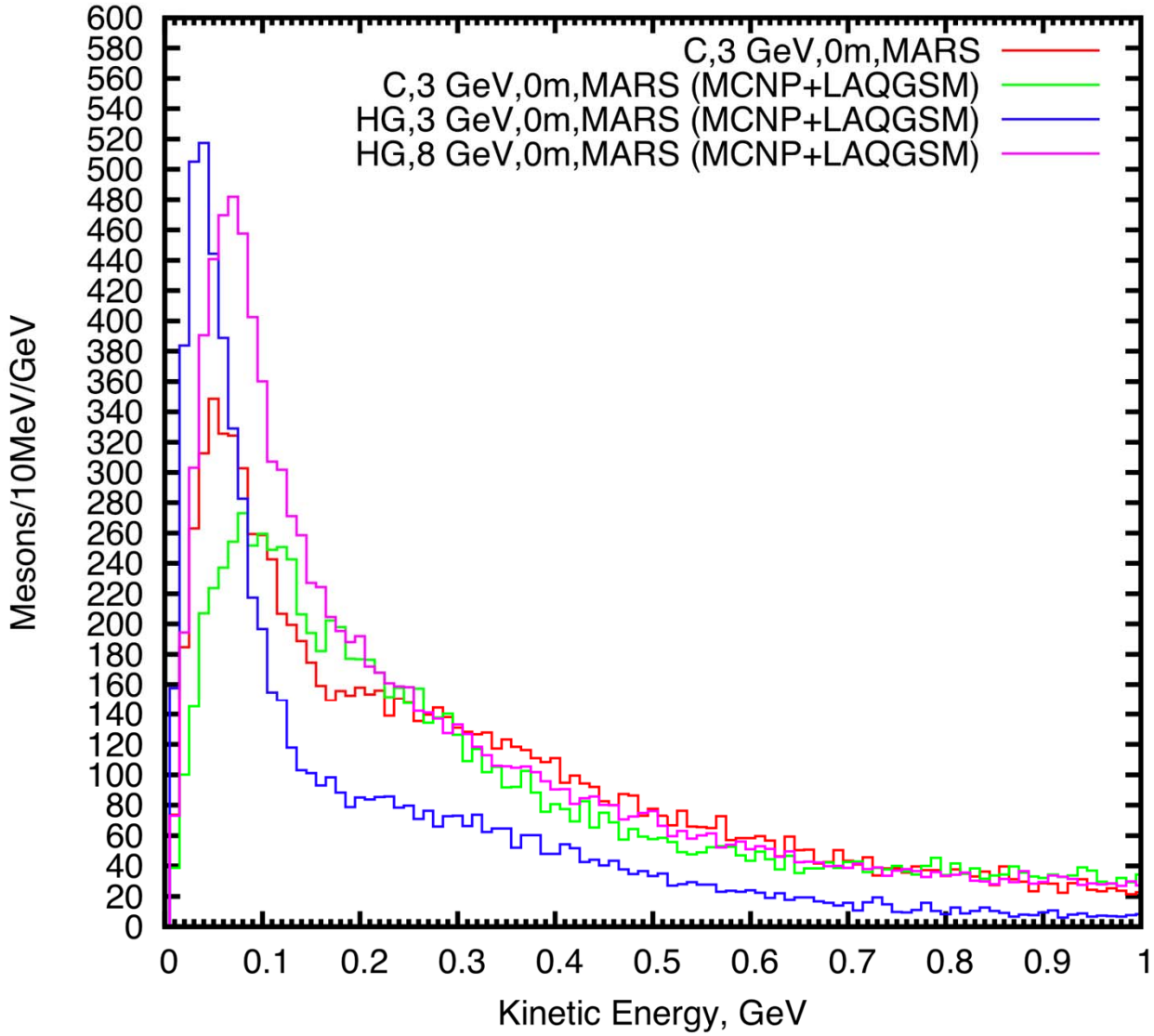
MARS vs. FLUKA



MARS (MCNP+LAQGSM) vs. FLUKA



Carbon vs. Mercury at z = 0 m (MCNP+LAQGSM)



Carbon vs. Mercury at z = 50 m (MCNP+LAQGSM)