Comparison of Particle Production between MARS15(2012) ICEM4=0 mode and MARS15(2012) ICEM4=1 mode (Mercury Target and IDS120j Configuration)

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Target Studies
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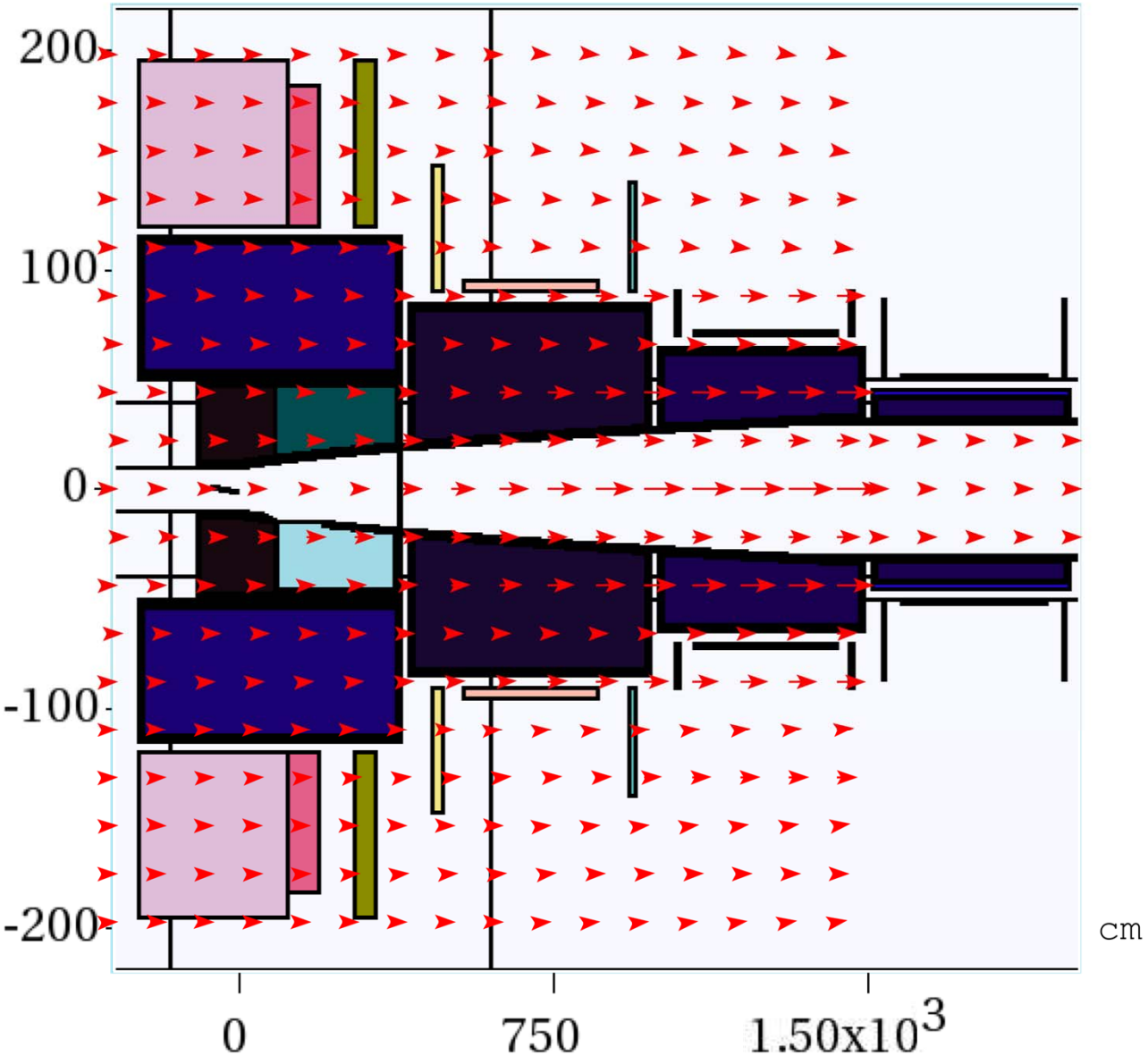
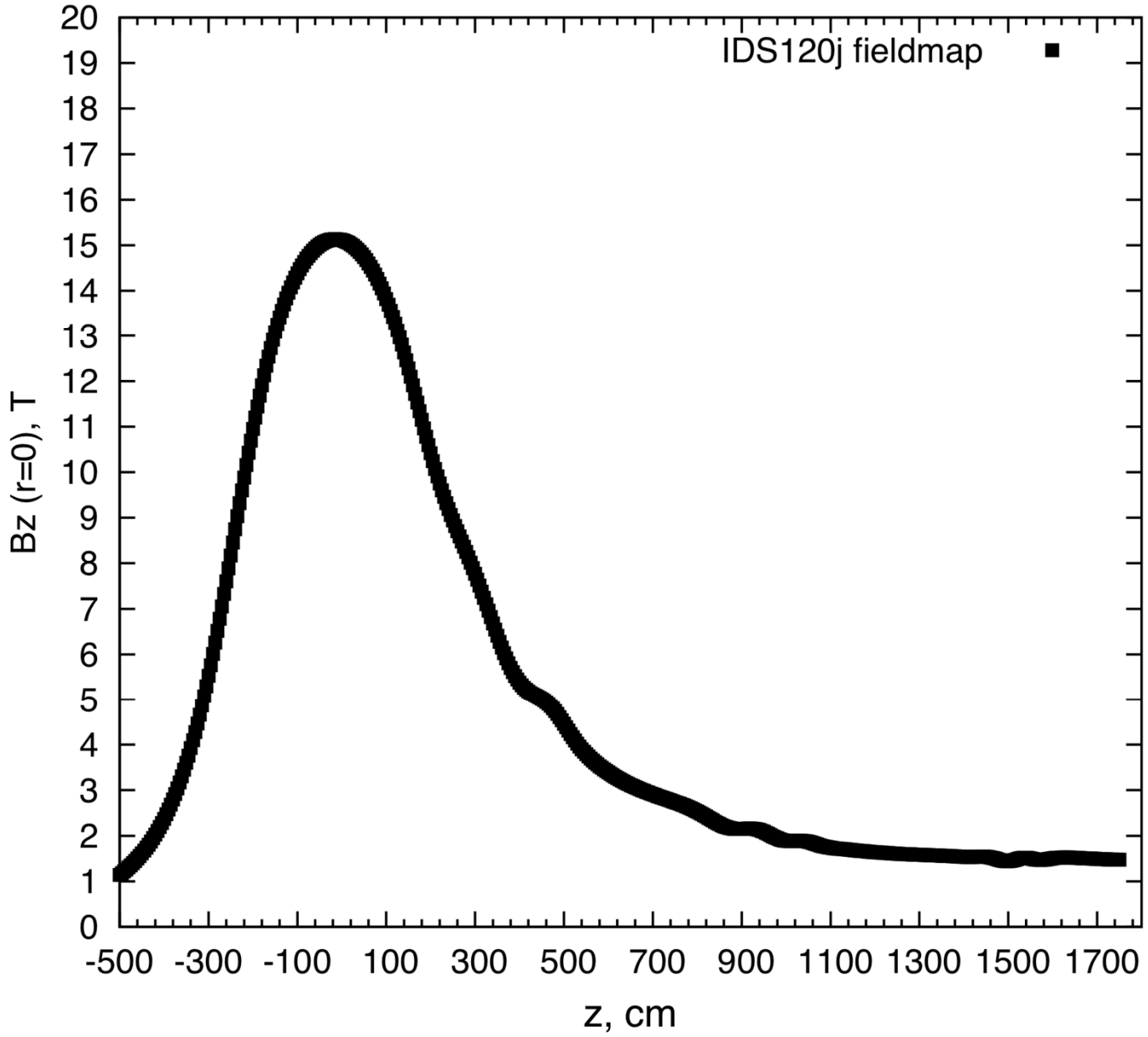
IDS120j Geometry



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 Station Setting

- IDS120j Configuration and Fieldmap (15T➔1.5T);
- MARS15(2012) default mode (ICEM4=0, without either LAQGSM or the MCNP tables) and MARS15(2012) in hybrid mode (ICEM4=1) are used;

  MARS15(2014) will be installed in the following several weeks! MARS15(2014) default mode will be ICEM4=1 (a hybid mode with LAQGSM)
- Proton beam (below the Hg jet): launched for MARS15(2012) IECM4=0 mode at z = -75 cm and for MARS15(2012) in ICEM4=1 mode at z = -100 cm;
- Mercury Target setting: with tilt angle to SC axis;
- Production Collection: (50 m downstream, 40 MeV < KE < 180 MeV).

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)

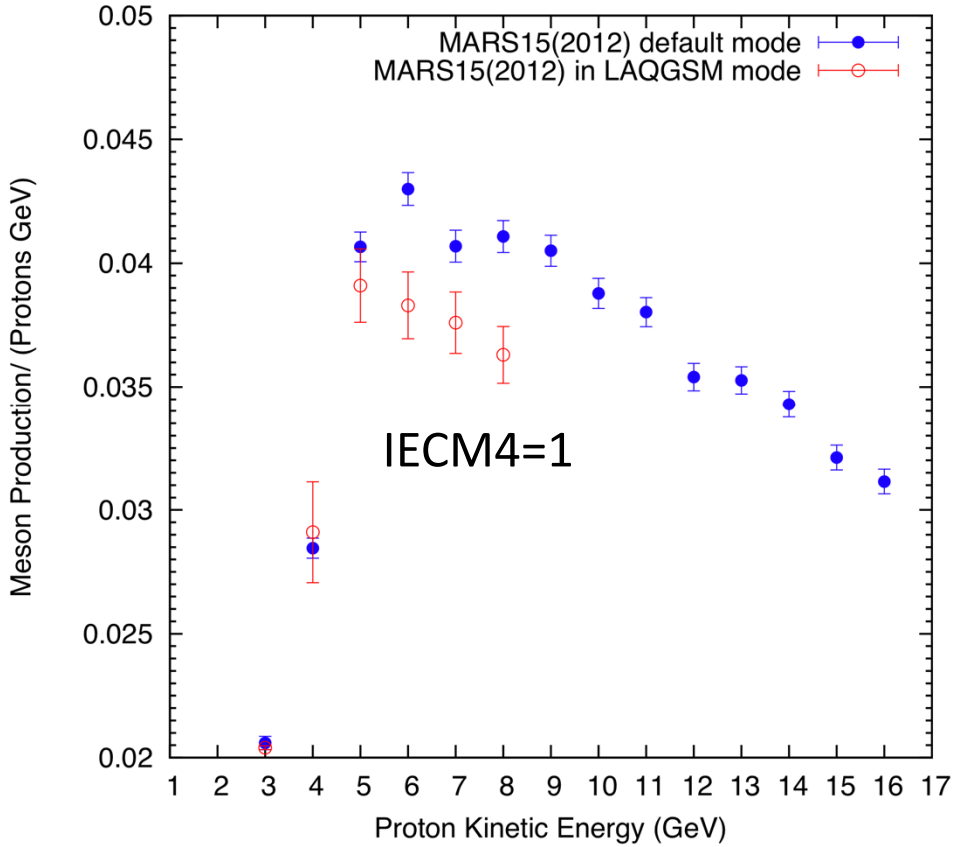
  Use non-default setting: ENRG 1=3 2=0.02 3=0.3 4=0.01 5=0.05 6=0.01 7=0.01

Target Parameters

	Target radius cm	Beam angle mrad	Crossing angle mrad
3 GeV, IECM4=0	0.23	137	18
3 GeV, IECM4=1	0.26	137	18
4 GeV, IECM4=0	0.30	132	18
4 GeV, IECM4=1	0.39	132	20.6
5 GeV, IECM4=0	0.36	119	19.2
5 GeV, IECM4=1	0.337	122	16.7
6 GeV, IECM4=0	0.395	117	21.1
6 GeV, IECM4=1	0.365	117	20.4
7 GeV, IECM4=0	0.39	119	20.4
7 GeV, IECM4=1	0.364	117	19.2
8 GeV, IECM4=0	0.404	117	20.6
8 GeV, IECM4=1	0.37	117	19.7

Beam radius is set at 30% of target radius.

Comparison of Particle Production (IECM4=0 vs. IECM4=1)

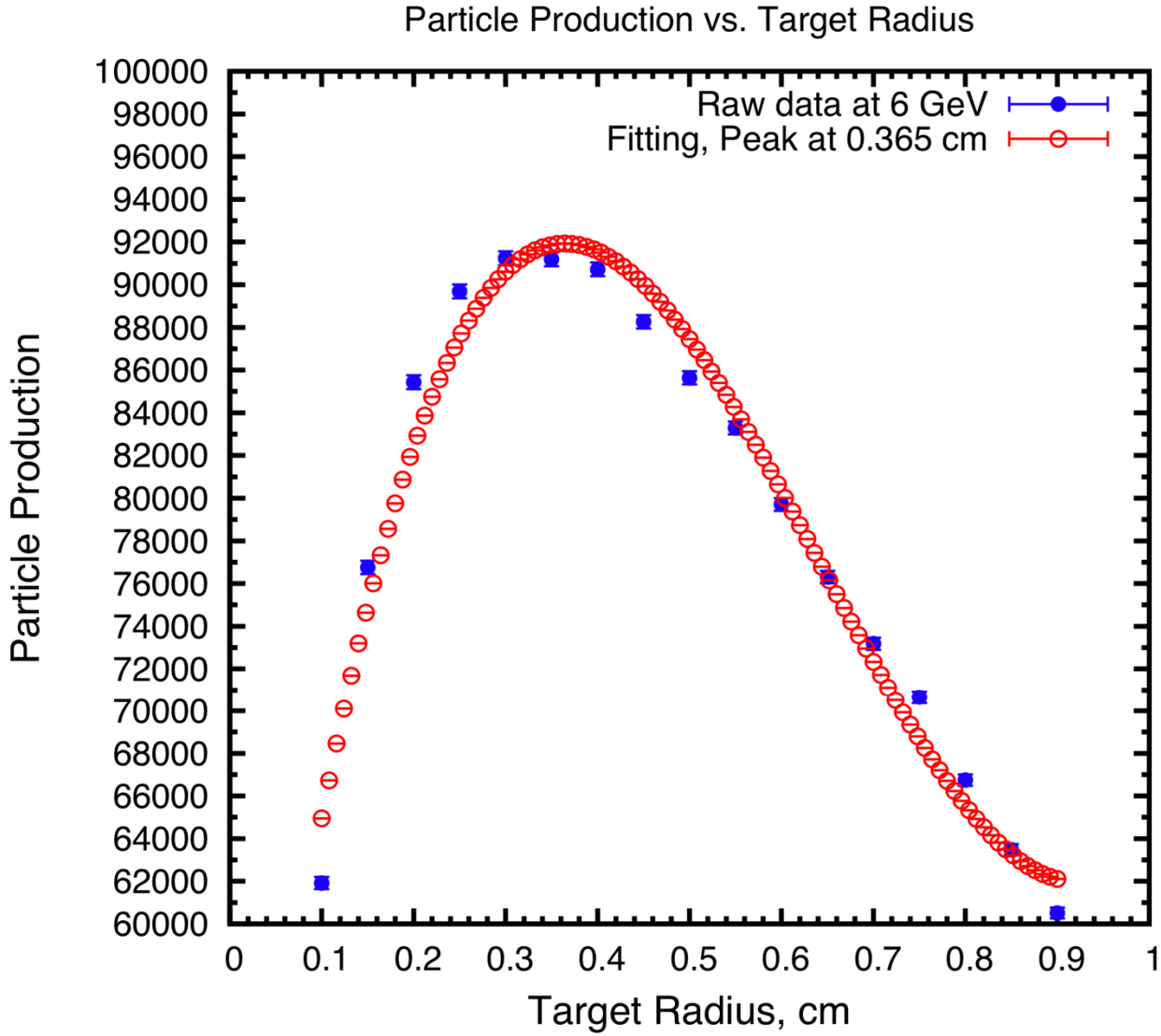


"default" mode = ICEM4=0
"LAQGSM" mode = ICEM4=1

100,000 protons used for MARS15(2012) IECM4=0;
400,000 protons used for MARS15(2012) in IECM4=1 (but 1000,000 protons for 3 GeV case);

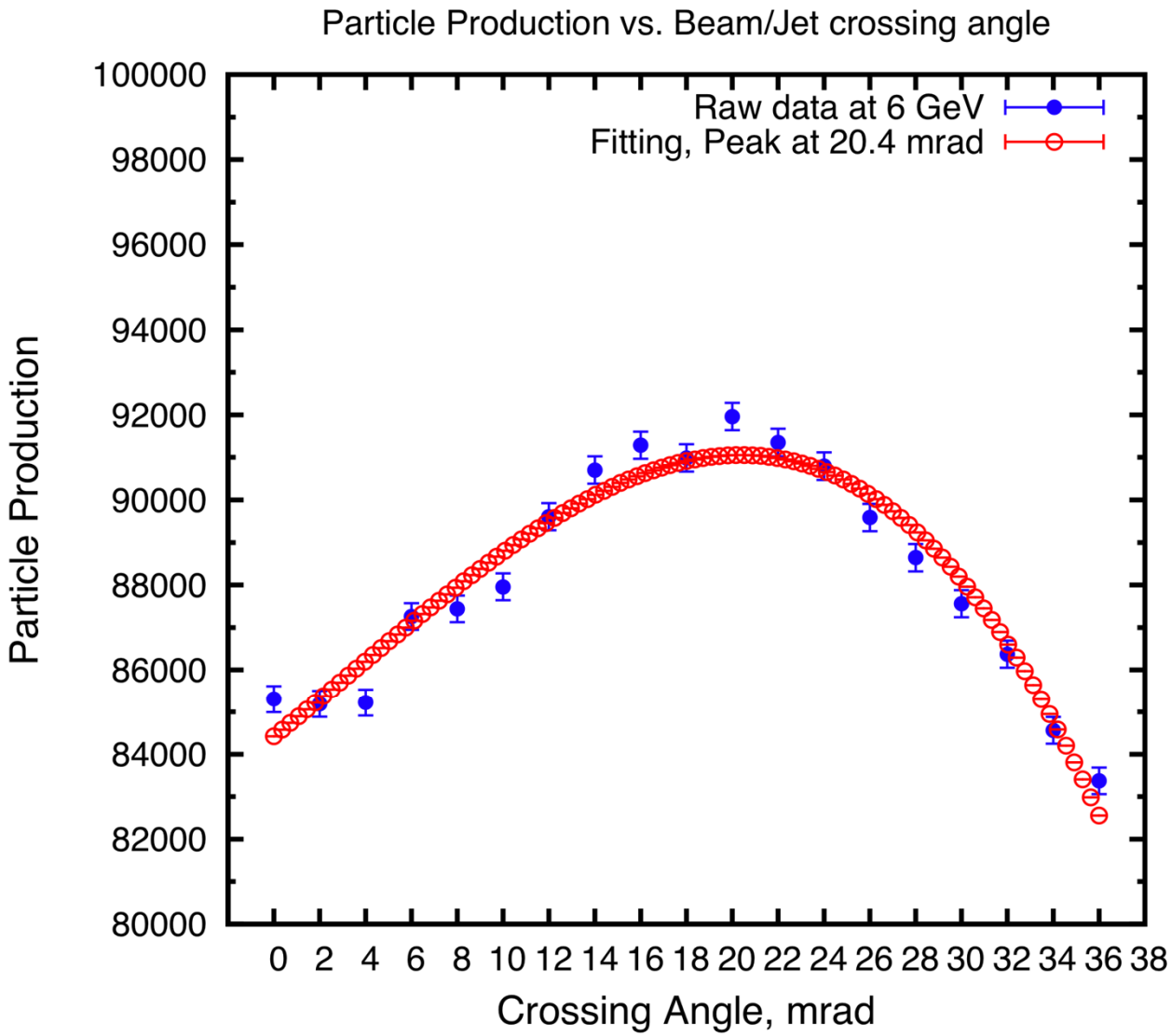
Particle Production vs. Target Radius

(6 GeV, Hg target, IECM4-1 mode)



Particle Production vs. Crossing Angle between Beam and Hg Jet

(6 GeV, IECM4=1 mode)



Particle Production vs. Beam Angle

(6 GeV, Hg target, IECM4=1 mode)