Search for time-dependent fluctuations in cosmic rays spectra with the AMS01 detector

Kinetic Energy Spectra :

background and reconstruction efficiency estimation

Averaged kinetic energy spectra

$$\overline{F}(E_k, \cos\Theta_m, \Phi_m) = \frac{\sum N(E_k, \cos\Theta_m, \Phi_m)}{\varepsilon \Delta t(\cos\Theta_m, \Phi_m)}$$

Kinetic Energy: $E_k \Rightarrow \Delta E_k$

Geomagnetic Latitude and Longitude: $\Theta_m, \Phi_m \Rightarrow \Delta\Theta_m, \Delta\Phi_m$

Number of particles with Kinetic Energy $\mathrm{E_k}$ in range $(\cos\Theta_m, \Phi_m)$: N

Lifetime in range $(\cos\Theta_m, \Phi_m)$: $\Delta t(\cos\Theta_m, \Phi_m) \Rightarrow \Delta t(\Delta|\Theta_m|, \Delta\Phi_m)$

Acceptance: ε

Background & Reconstruction Efficiency estimation

Number of particles with Kinetic Energy E_k :

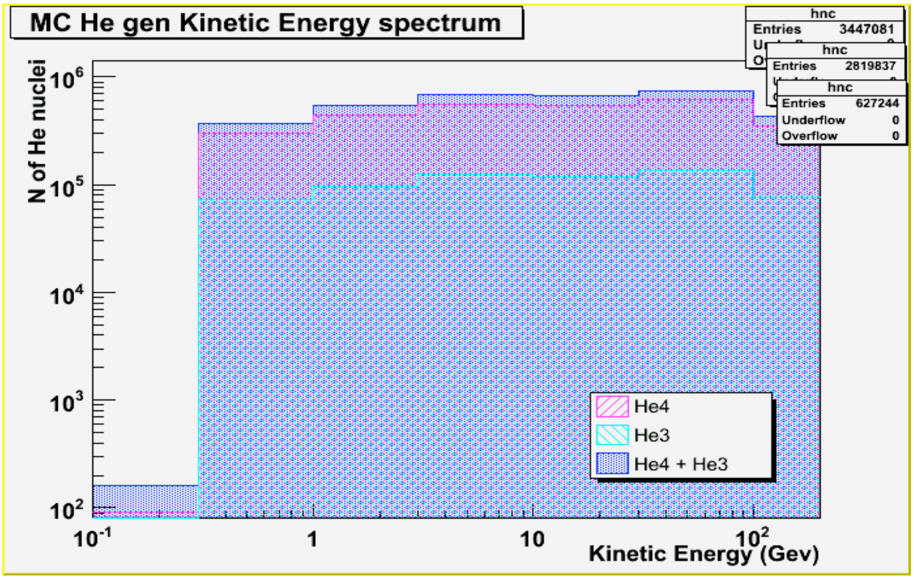
$$N(E_k) = \frac{N^{DATA}_{rec\ as\ i} - b_i}{\varepsilon_i} \qquad i = He, p, e^-$$

Background : b_i due to particle's misidentification :

$$b_i(E_k) \approx \sum_{\substack{j=He,\,p,\,e^- \\ j\neq i}} \frac{\varepsilon_{ij}}{\varepsilon_{jj}} N^{DATA}_{rec\ as\ j}(E_k) \quad \text{with} \qquad \varepsilon_{ij} = \frac{N^{MC}_{\substack{rec\ as\ i \\ when\ gen\ as\ j}}(E_k)}{N^{MC}_{gen\ as\ j}(E_k)}$$

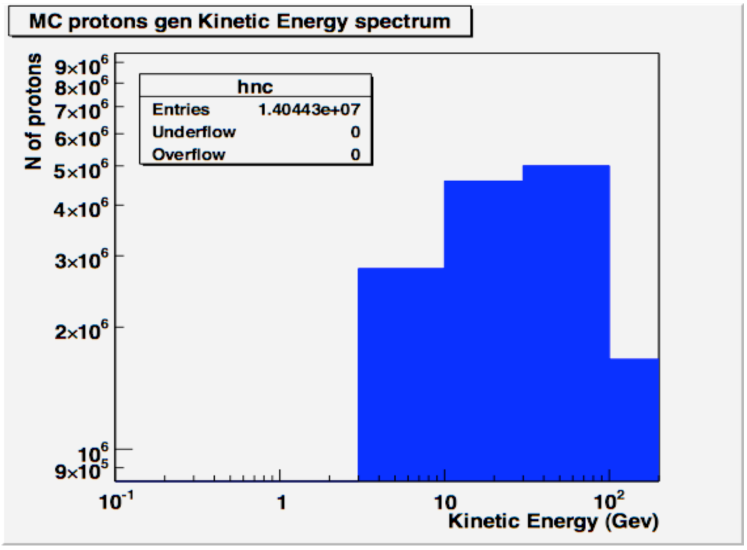
Reconstruction efficiency : $\varepsilon_i = \varepsilon_{ii} = \dfrac{N^{MC}_{\substack{rec\ as\ i \\ when\ gen\ as\ i}}(E_k)}{N^{MC}_{gen\ as\ i}(E_k)}$

He MC sample



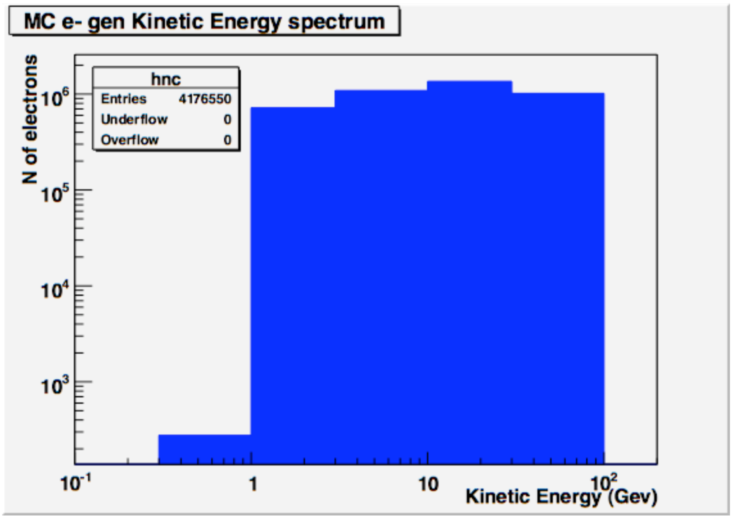
Protons MC sample

p_{gen} 6 GeV -> 150 GeV



Electrons MC sample

p_{gen} 1 GeV -> 60 GeV



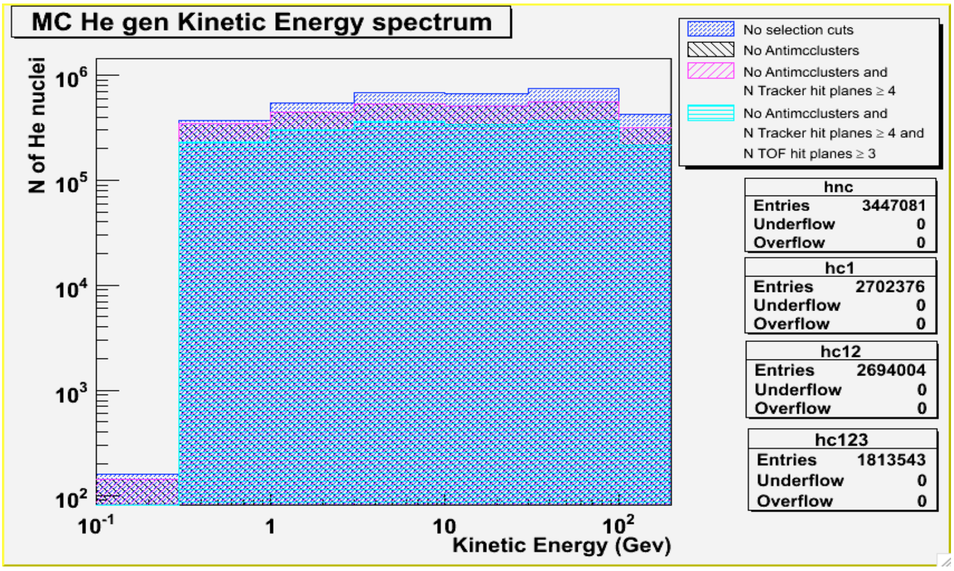
MC selection

Selection cuts on generated He nuclei to fulfil geometrical pattern required in DATA selection:

✓No MC hits in Anticoincidence counter
⇨ No hits in Anticoincidence counter
✓At least 4 hit planes in Tracker
⇨ To make advanced fit possible
⇨ Number of True Tracker K clusters ≥ 3
✓At least 3 hit planes in TOF
⇨ Number of TOF planes ≥ 3

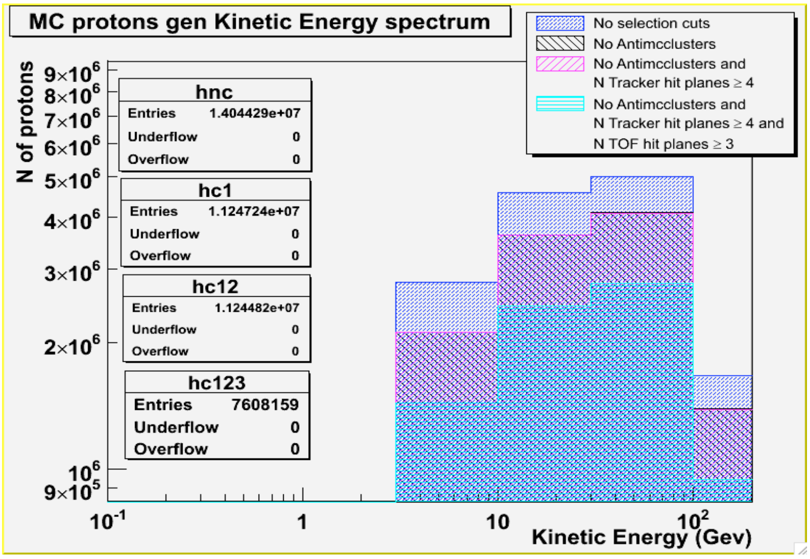
▪MC cuts (⇒gen cuts) ▪DATA cuts/requirements

MC He selected sample



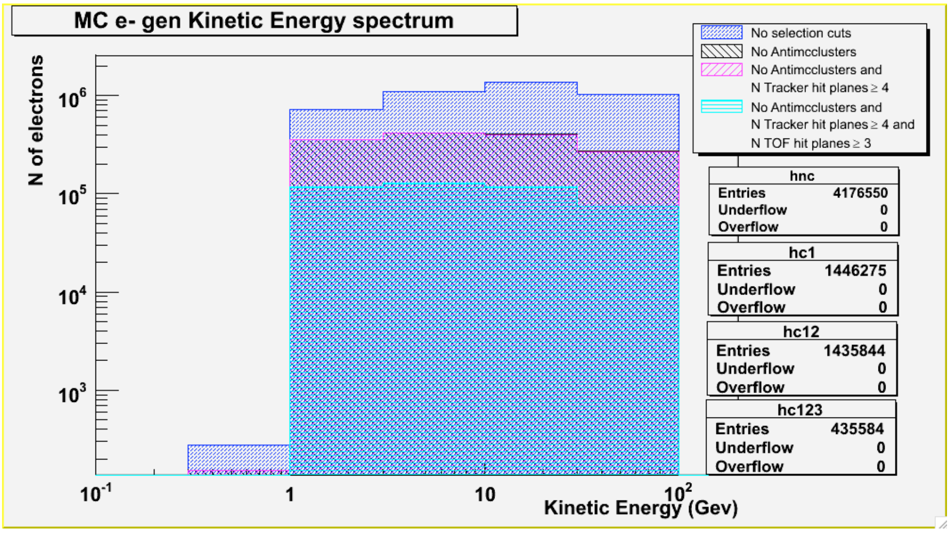
MC Protons selected sample:

p_{gen} 6 GeV -> 150 GeV

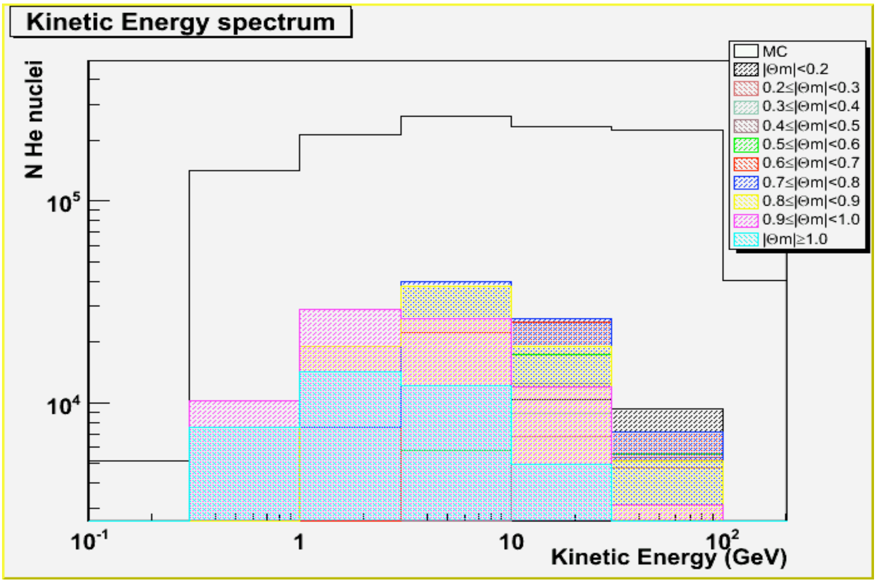


MC Electrons selected sample:

p_{gen} 1 GeV -> 60 GeV

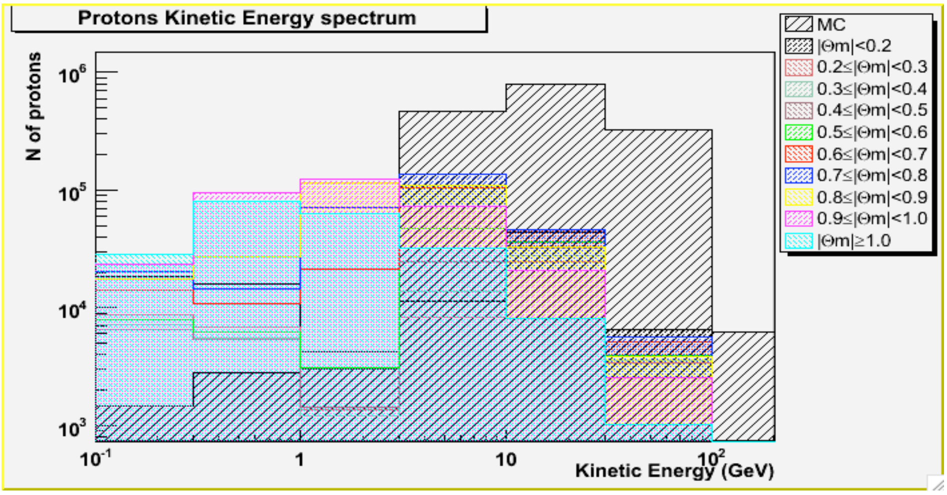


MC vs DATA Statistics: He



May 17, 2006 AMS-unige meeting

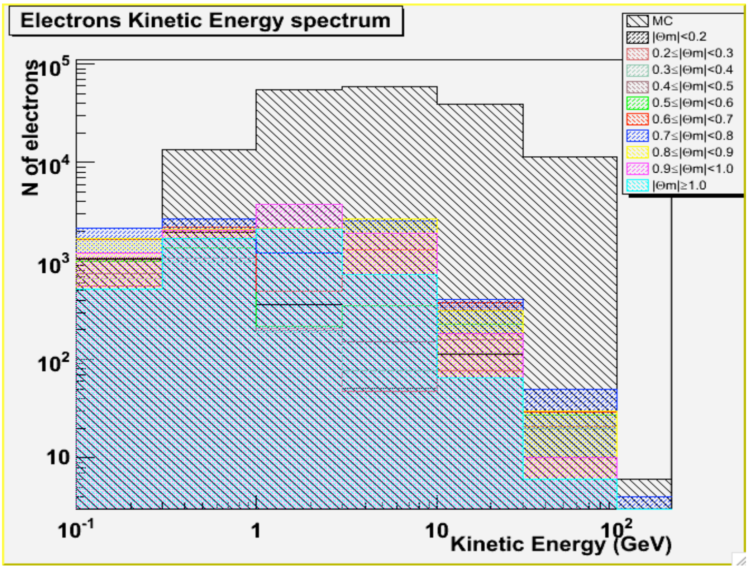
MC vs DATA Statistics: p



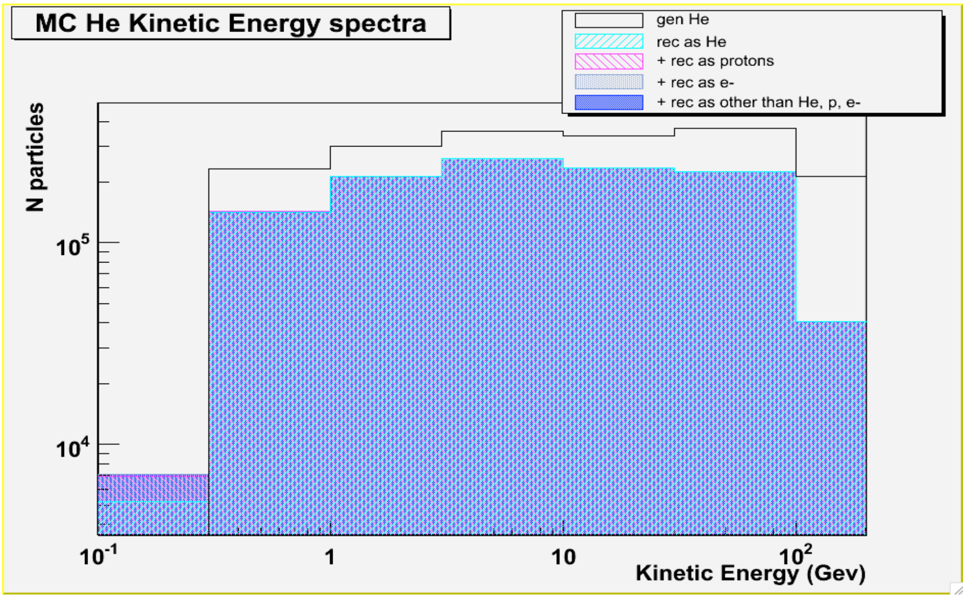
Events with Kinetic Energy between 100 MeV and 5 GeV are being produced by V.C.

May 17, 2006 AMS-unige meeting

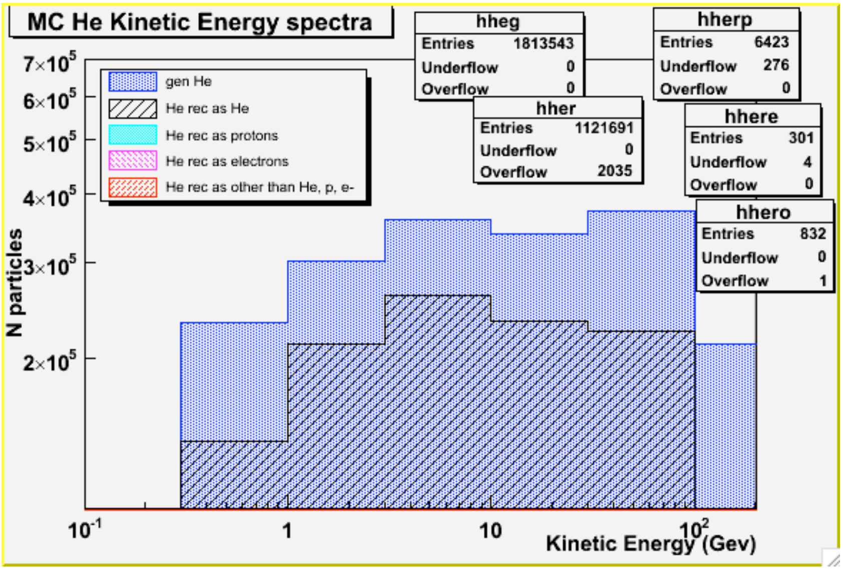
MC vs DATA Statistics: e-



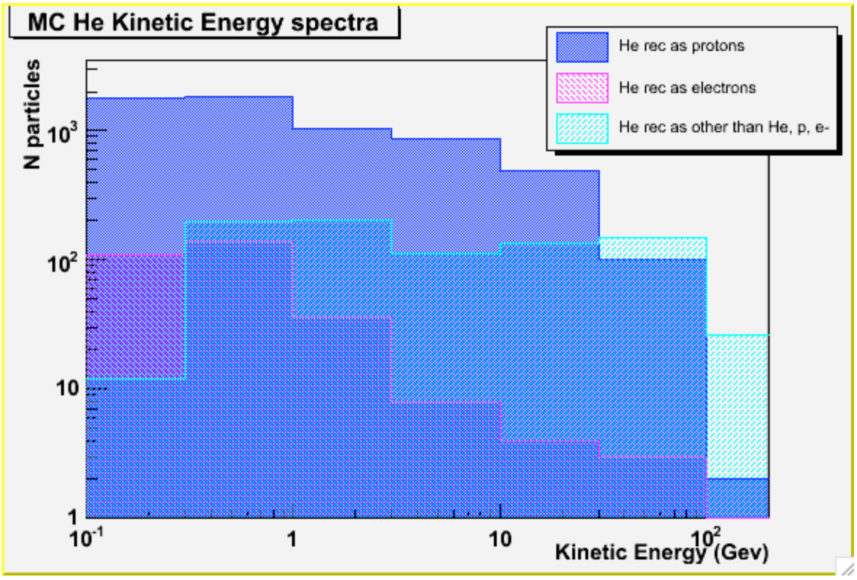
MC He sample reconstruction

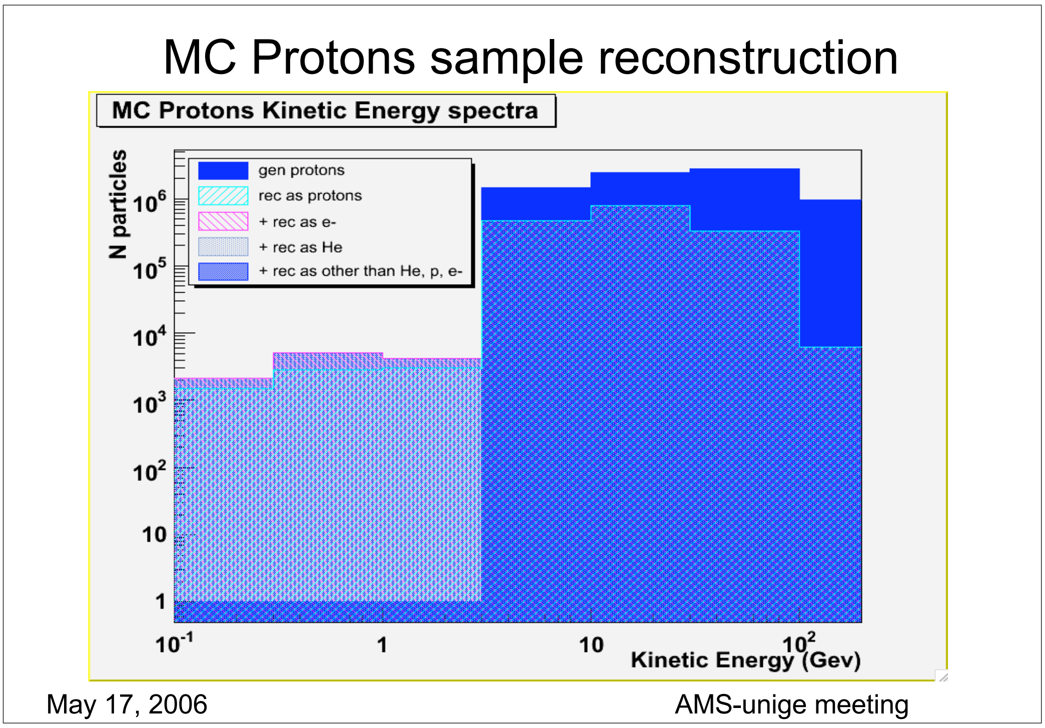


MC He sample reconstruction

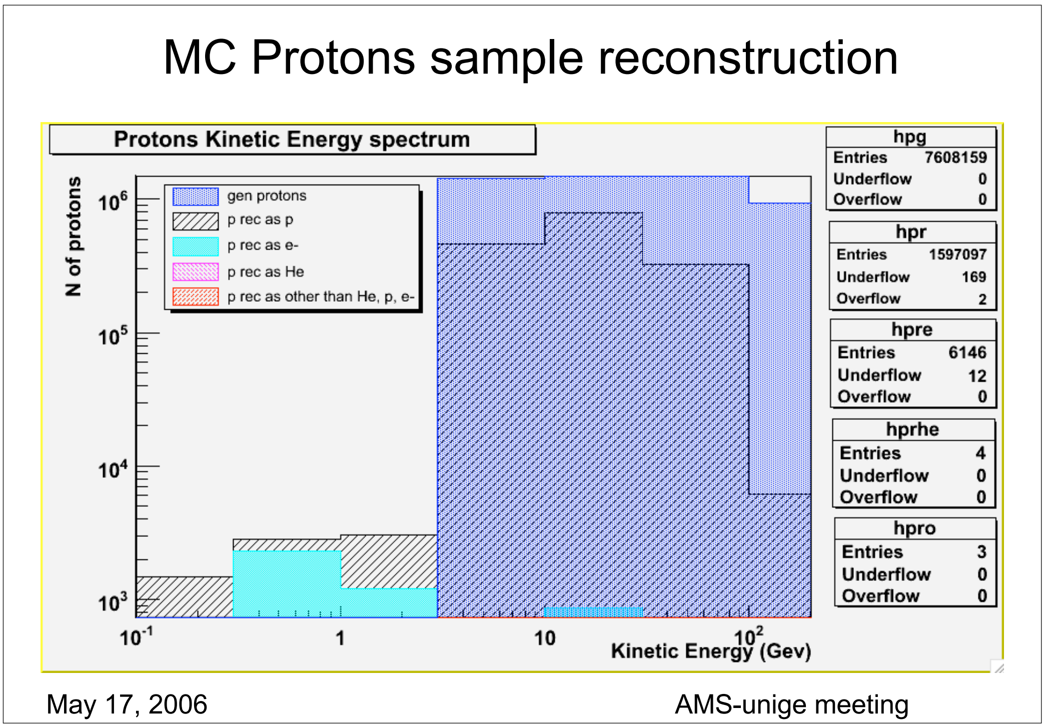


MC He sample reconstruction



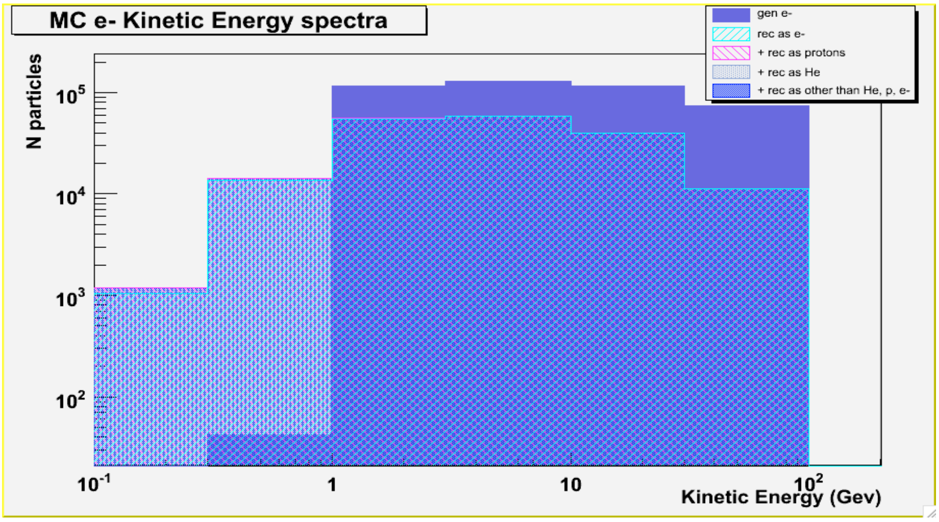


MC Protons sample reconstruction

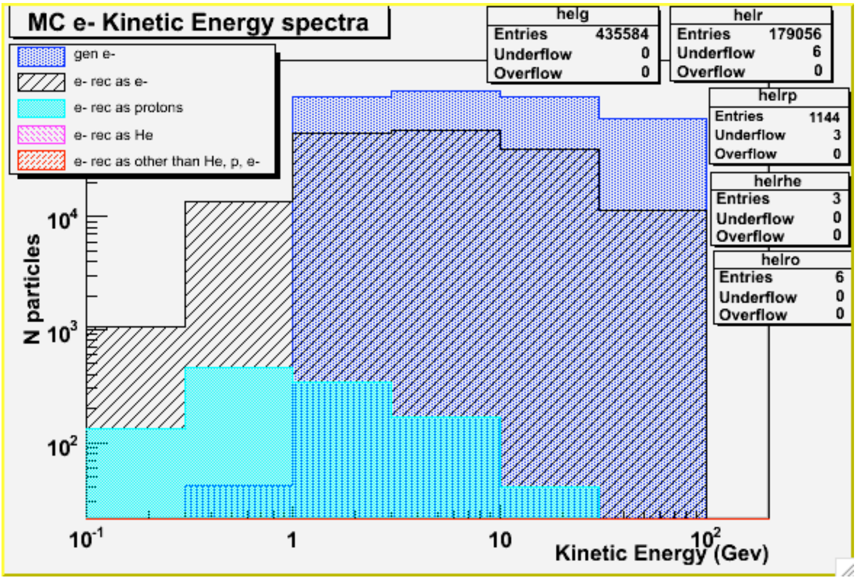


MC Protons sample reconstruction

MC Electrons sample reconstruction



MC Electrons sample reconstruction



ε matrix 0.1GeV≤Ek<0.3GeV

gen as rec as	He	p	e-
He	n.a.	n.a.	n.a.
p	n.a.	n.a.	n.a.
e-	n.a.	n.a.	n.a.
others	n.a.	n.a.	n.a.

ε matrix 0.3GeV≤Ek<1GeV

gen as rec as	He	p	e-
He	0.609	n.a.	n.a.
p	0.008	n.a.	n.a.
e-	0.0006	n.a.	n.a.
others	0.0008	n.a.	n.a.

ε matrix 1GeV≤Ek<3GeV

gen as rec as	He	p	e-
He	0.707	n.a.	0.000009
p	0.003	n.a.	0.003
e-	0.0001	n.a.	0.472
others	0.0007	n.a.	0.00002

ε matrix 3GeV≤Ek<10GeV

gen as rec as	He	p	e-
He	0.728	n.a.	0.00002
p	0.002	n.a.	0.001
e-	0.00002	n.a.	0.458
others	0.003	n.a.	0

ε matrix 10GeV≤Ek<30GeV

gen as rec as	He	p	e-
He	0.693	0	0
p	0.002	0.323	0.0003
e-	0.00001	0.003	0.337
others	0.0004	0	0.00003

ε matrix 30GeV≤Ek<100GeV

gen as rec as	He	p	e-
He	0.606	0	0*
p	0.0003	0.118	0.00007*
e-	0.000008	0.0002	0.153*
others	0.0004	0	0*

*e- generated momentum until 60 GeV

ε matrix 100GeV$\leq$Ek<200GeV

gen as rec as	He	p	e-
He	0.19	0*	n.a.
p	0.000009	0.007*	n.a.
e-	0	0.00001*	n.a.
others	0.0001	0*	n.a.

*p generated momentum until 150 GeV