Update on e/π^0 Likelihood

Fanny Dufour, May 22nd 2006

Outline

- Reminder of Nakayama's variables
- Adding Chiaki's variables
  - energy fraction
  - Tot pe charge/evis
- Comparing efficiencies

Nakayama's variable

Ring couting parameter

PID parameter

cosnue

pi0mass (polfit)

pi0 Likelihood (polfit)

Compare efficiency (Nakayama-Fanny)

We try to improve the high energy range

	Nakayama-san			Fanny (same 5 variables)		
Erec(GeV)	Signal	Bckg(νμ CC)	Bckg(NC)	Signal	Bckg(νμ CC)	Bckg(NC)
0~0.35	90.8%	25.9%	12.2%	92.2%	37.3% !!	14.5%
0.35~0.85	83.3%	39.5%	25.5%	84.3%	43.3%	26.5%
0.85~1.5	78.2%	25.2%	27.5%	79.1%	31.2%	27.7%
1.5~	58.9%	22.5%	39.5%	64.8%	20.7%	37.8%

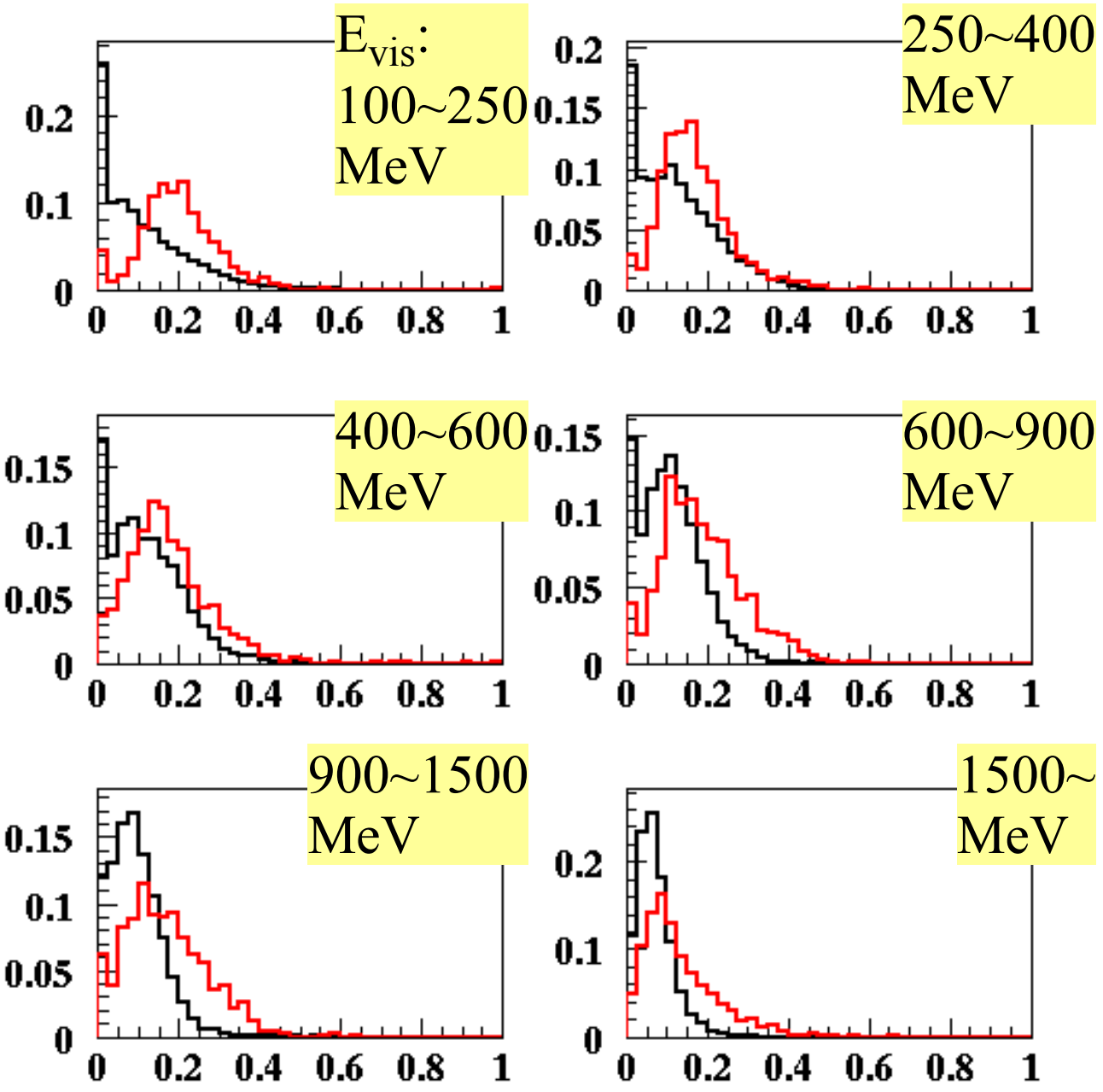
Notes: -fixed the bug I had in Mozumi (was due to bad decay electron cut)
- need to understand the low E behavior (for the background rejection)

Compare efficiency (Chiaki-Fanny)

	Chiaki		Fanny (5 variables + efrac + (totpe/evis))		
Erec (GeV)	Signal	Bckg	Signal	Bckg(numu)	Bckg(NC)
0~0.5	88.0%	15.0%	88.7%	41.5%	16.2%
0.5~1	78.0%	25.0%	82.7%	42.2%	27.2%
1.0~1.5	75.0%	22.0%	79.8%	33.7%	28.0%
1.5~2.0	70.0%	30.0%	78.9%	19.7%	36.9%
2.0~2.5	80.0%	30.0%	76.6%	20.2%	38.8%
2.5~	85.0%	35.0%	71.0%	21.9%	42.6%

Notes:
- Chiaki's numbers come from an estimation on plot p.34 of his talk
- I did not implement the Cherenkov angle yet
- Need to reweight my bckg in order to really be able to compare

Energy fraction



ν_e CCQE

ν_μCC + NC

The energy fraction is $E(\gamma_2)/(E(\gamma_1)+E(\gamma_2))$

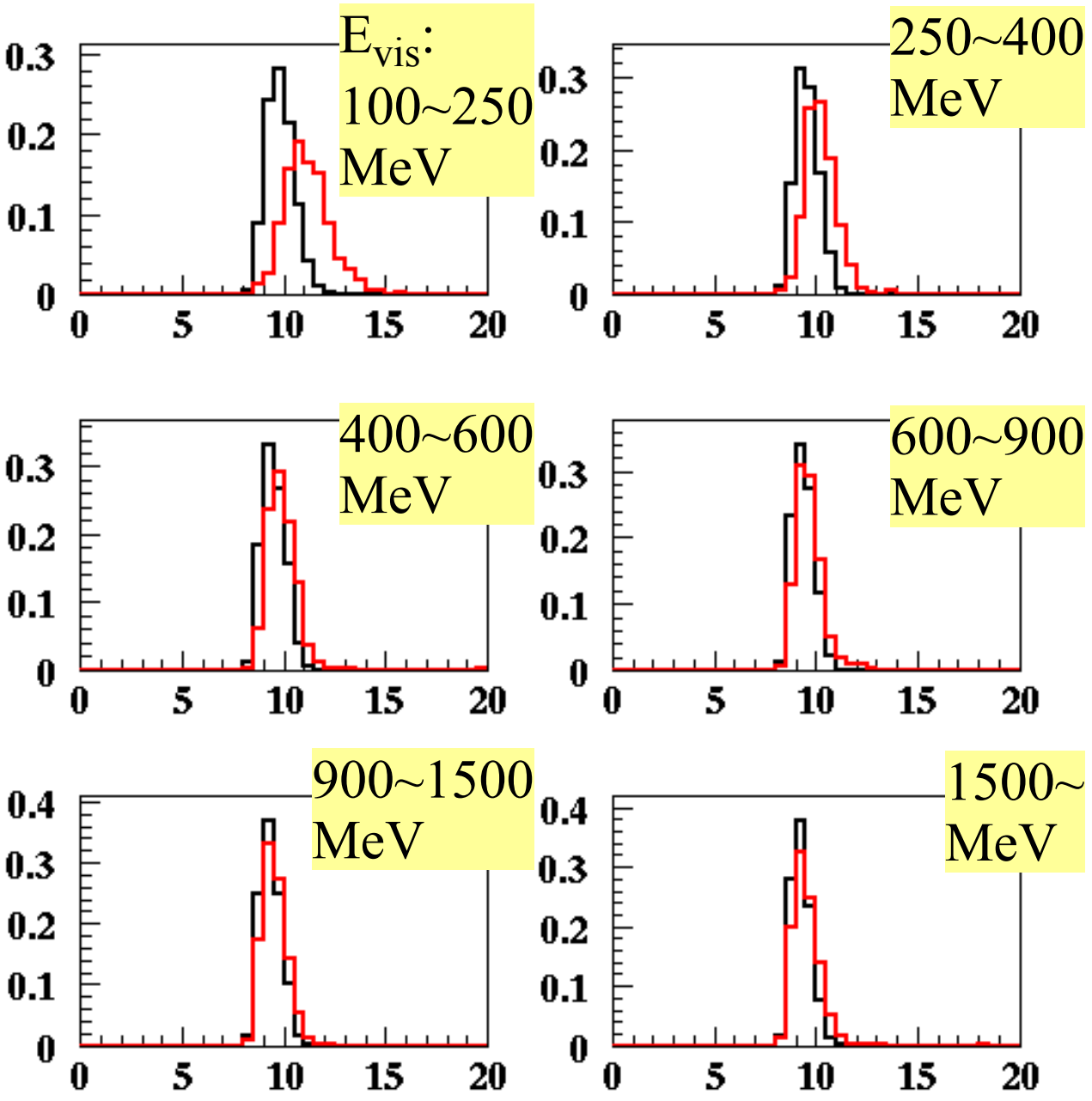
$$\frac{\texttt{pi0\_e(2,1)}}{\texttt{(pi0\_e(1,1)+pi0\_e(2,1))}}$$

Efficiency with/without energy fraction

	5 variables +efrac			5 variables		
Erec(GeV)	Signal	Bckg(νμ CC)	Bckg(NC)	Signal	Bckg(νμ CC)	Bckg(NC)
0~0.35	90.7%	43.3%	14.5%	92.2%	37.3%	14.5%
0.35~0.85	83.3%	43.5%	25.8%	84.3%	43.3%	26.5%
0.85~1.5	80.1%	34.2%	27.8%	79.1%	31.2%	27.7%
1.5~	75.3%	21.1%	40.4%	64.8%	20.7%	37.8%

Note: Adding the energy fraction improves the separation at high E

Total pe charge /evis



ν_e CCQE

ν_μCC + NC

Where I plotted:
`totpe/evis`

Does not seem useful at high energies.

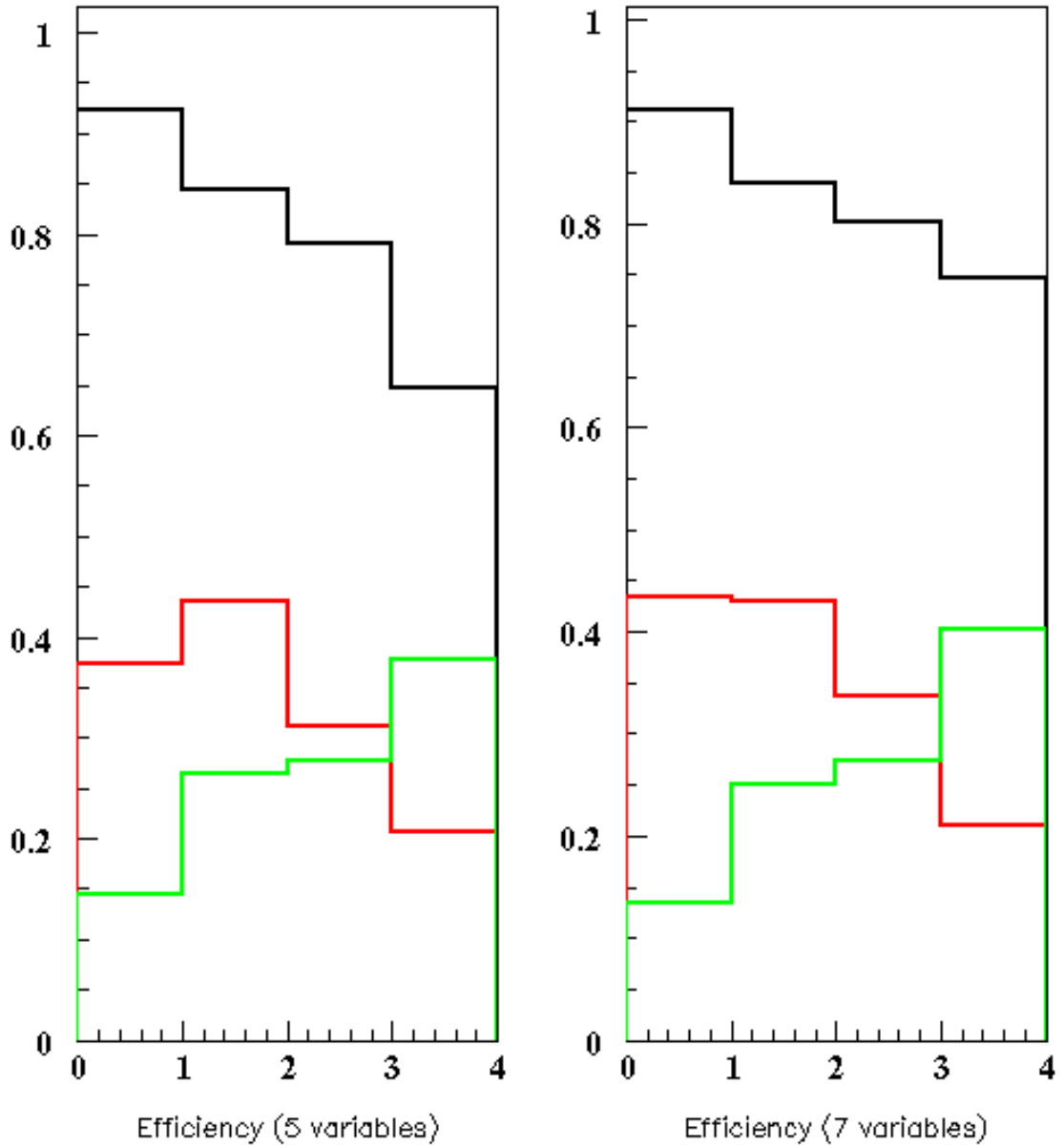
Efficiency with/without totpe/evis

	5 variables +totpe/evis			5 variables		
Erec(GeV)	Signal	Bckg(νμ CC)	Bckg(NC)	Signal	Bckg(νμ CC)	Bckg(NC)
0~0.35	92.2%	38.6%	13.4%	92.2%	37.3%	14.5%
0.35~0.85	84.6%	41.2%	25.7%	84.3%	43.3%	26.5%
0.85~1.5	79.1%	29.5%	27.8%	79.1%	31.2%	27.7%
1.5~	64.6%	20.5%	39.4%	64.8%	20.7%	37.8%

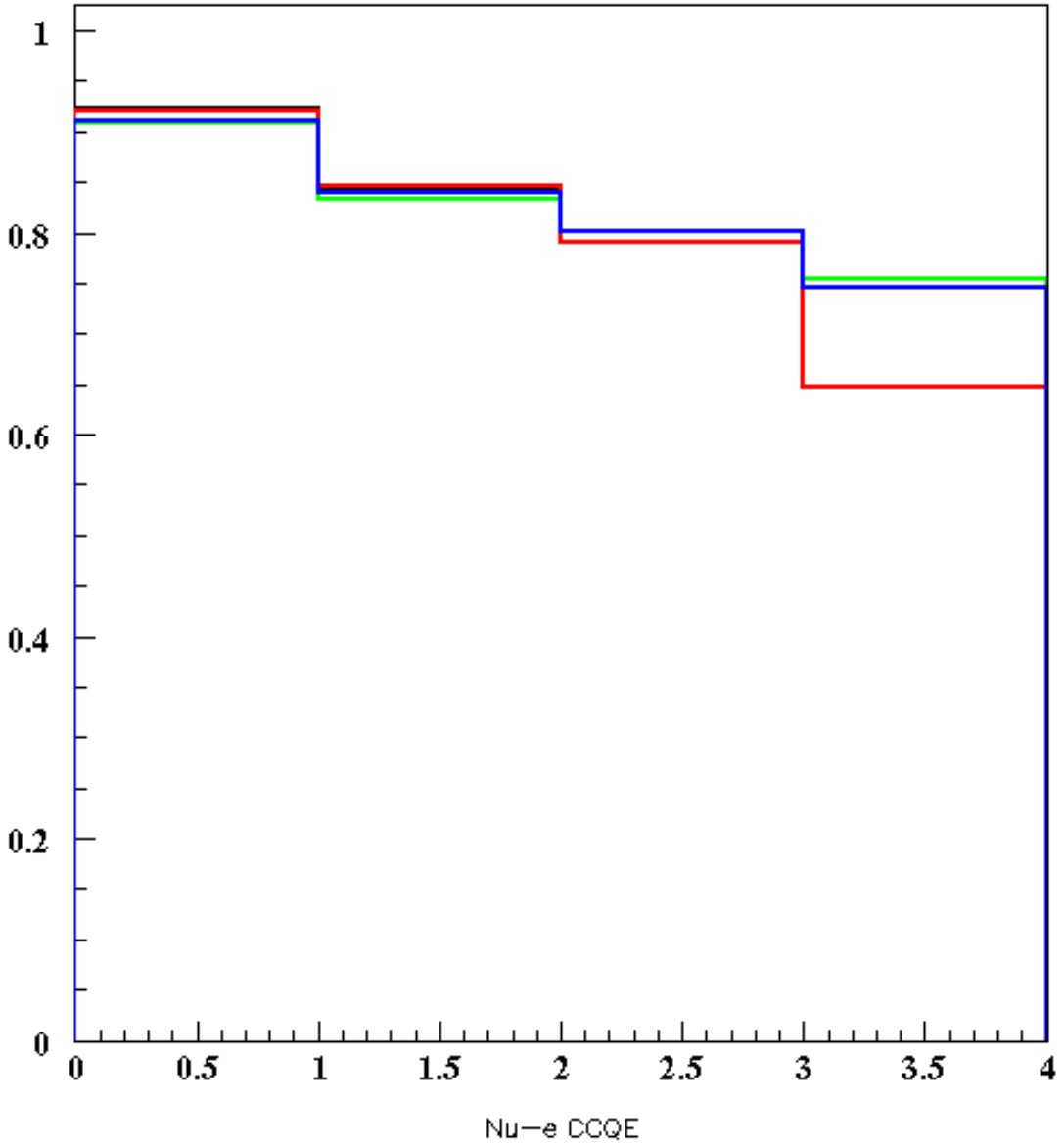
Note: Adding totpe/evis does NOT improve much the separation at high E

Backups

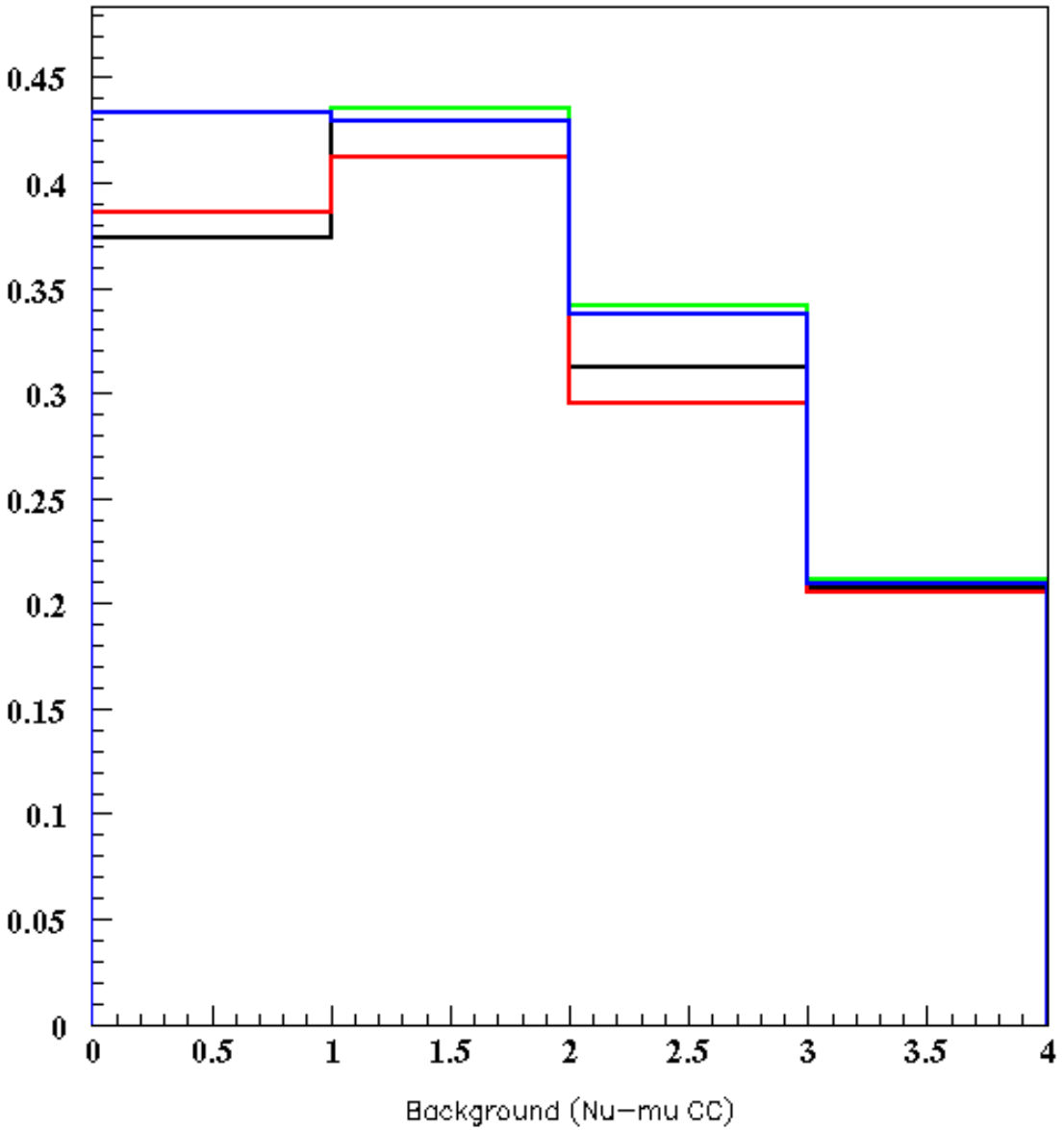
General efficiency



Comparing variables efficiencies



Comparing variables efficiencies



Comparing variables efficiencies