Re-tune Run14 D0 cuts in Centralities

Xiaolong Chen

Targets

- 1. Improve D0 significance at very low pT (0-0.5)

- 2. Improve D0 significance at very peripheral events (60-80%)

Method

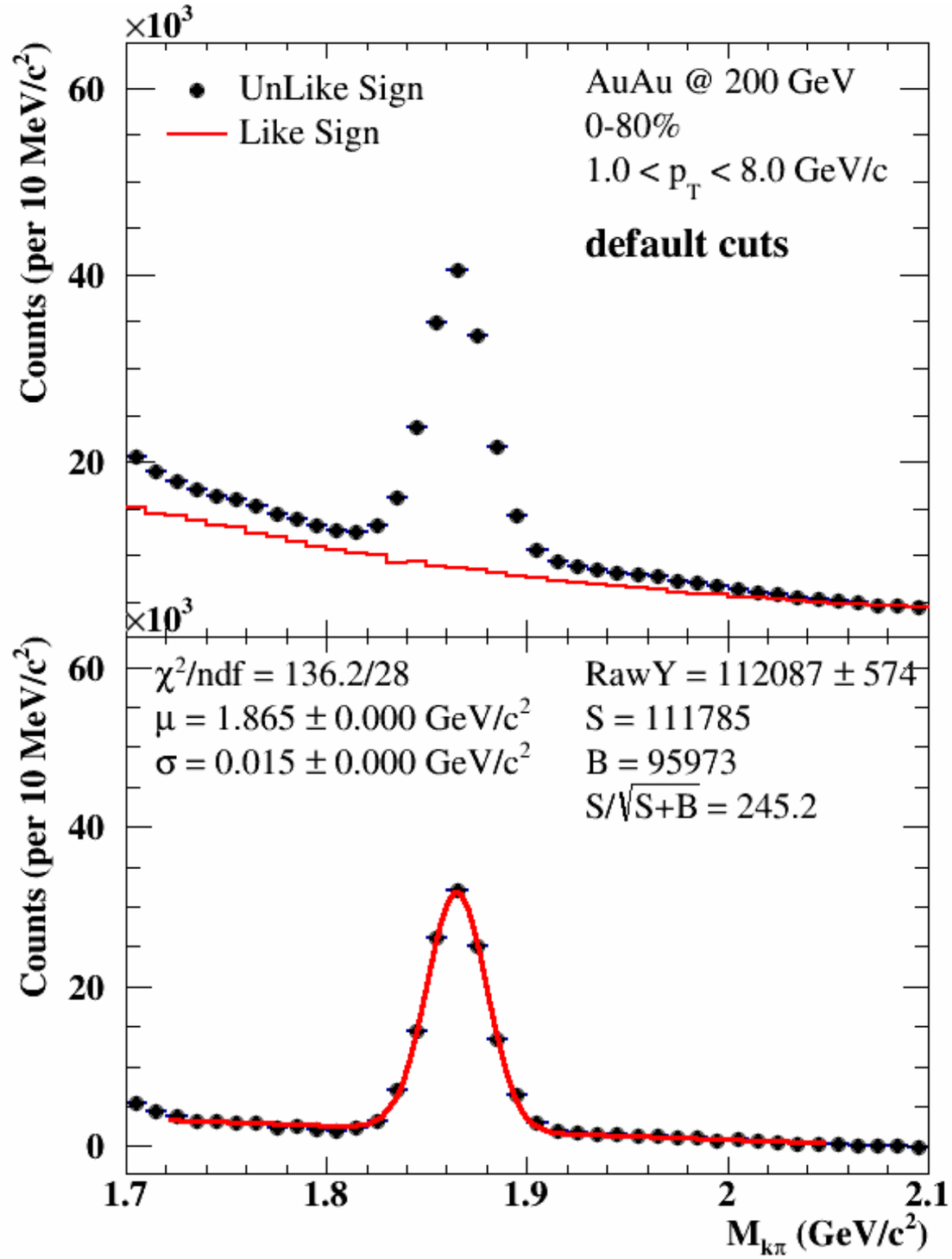
- Three Minimization Methods in TMVA rectangle cuts
  - Monte Carlo sampling (MC):
    —> improved by increasing SampleSize
  - Genetic Algorithm (GA)
    —> increase "popSize" (at least >10 * number of variables)
    —> increase "nsteps"
  - Simulated Annealing (SA) algorithm: "Increasing Adaptive" approach
    —> increase "MaxCalls"
    —> adjust "MinTemperature"
    …

- CutsSA is fastest in D0 topological cuts tuning

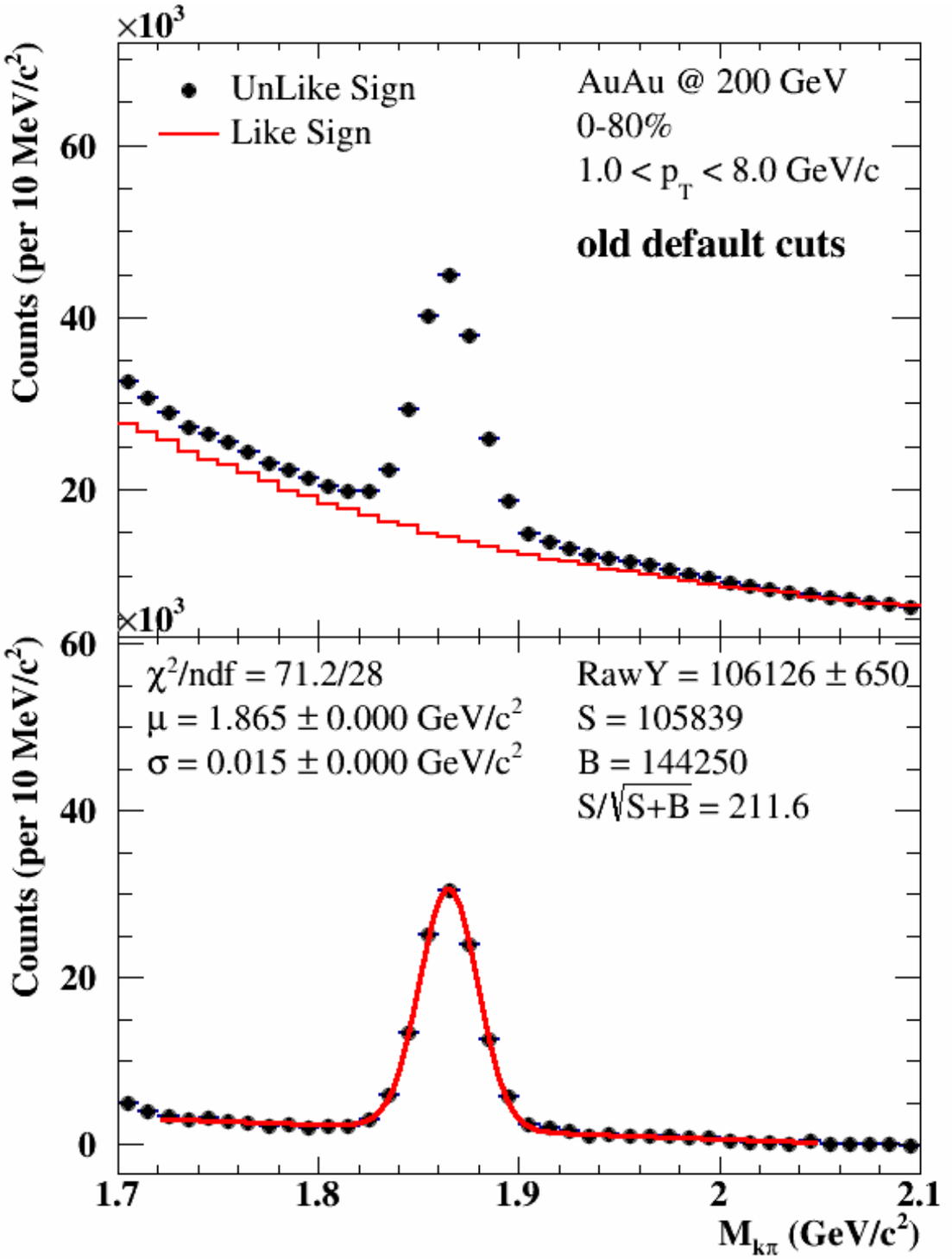
```
if (Use["CutsSA"])
factory->BookMethod( TMVA::Types::kCuts, "CutsSA",
                     "H:!V:FitMethod=SA:EffSel:VarProp[0]=FMax:VarProp[1]=FMax
:VarProp[2]=FMin:VarProp[3]=FMin:VarProp[4]=FMax:MaxCalls=150000:KernelTemp=IncAdaptive:InitialTemp=1e+6:
MinTemp=1e-6:Eps=1e-10:UseDefaultScale" );
```

Total D0 signal

New

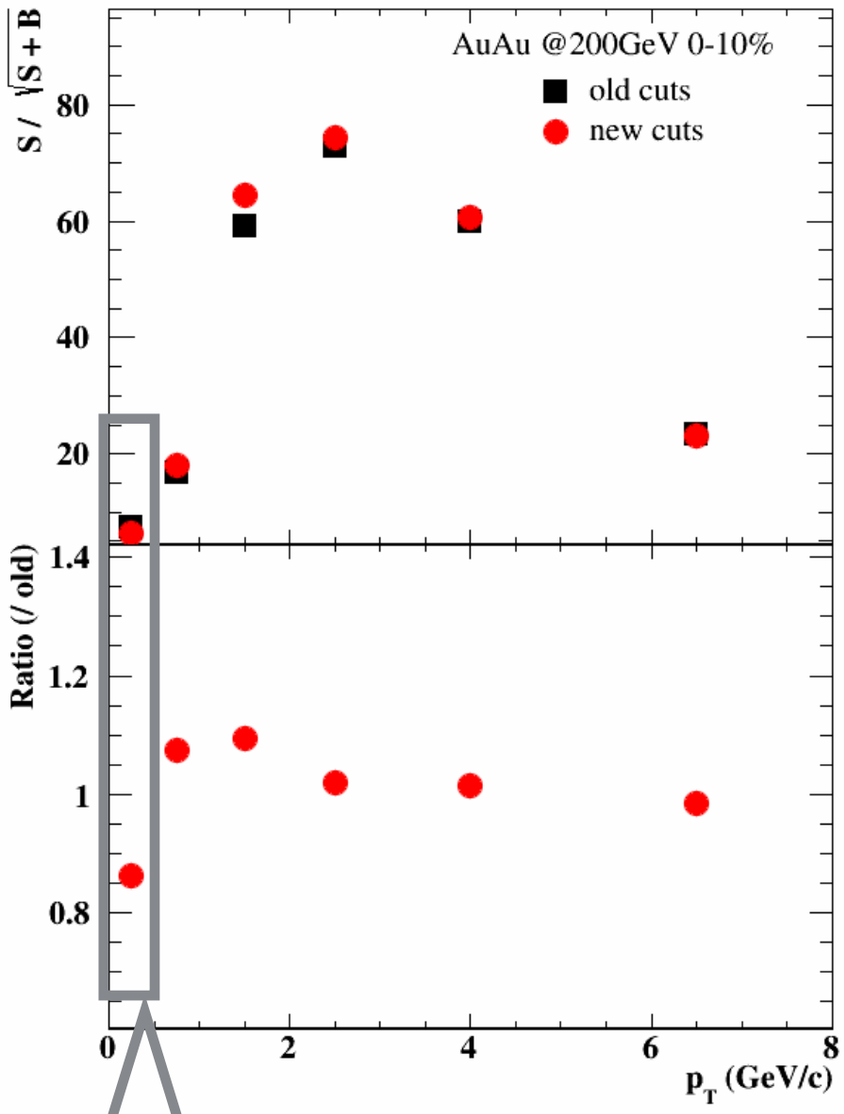


Old

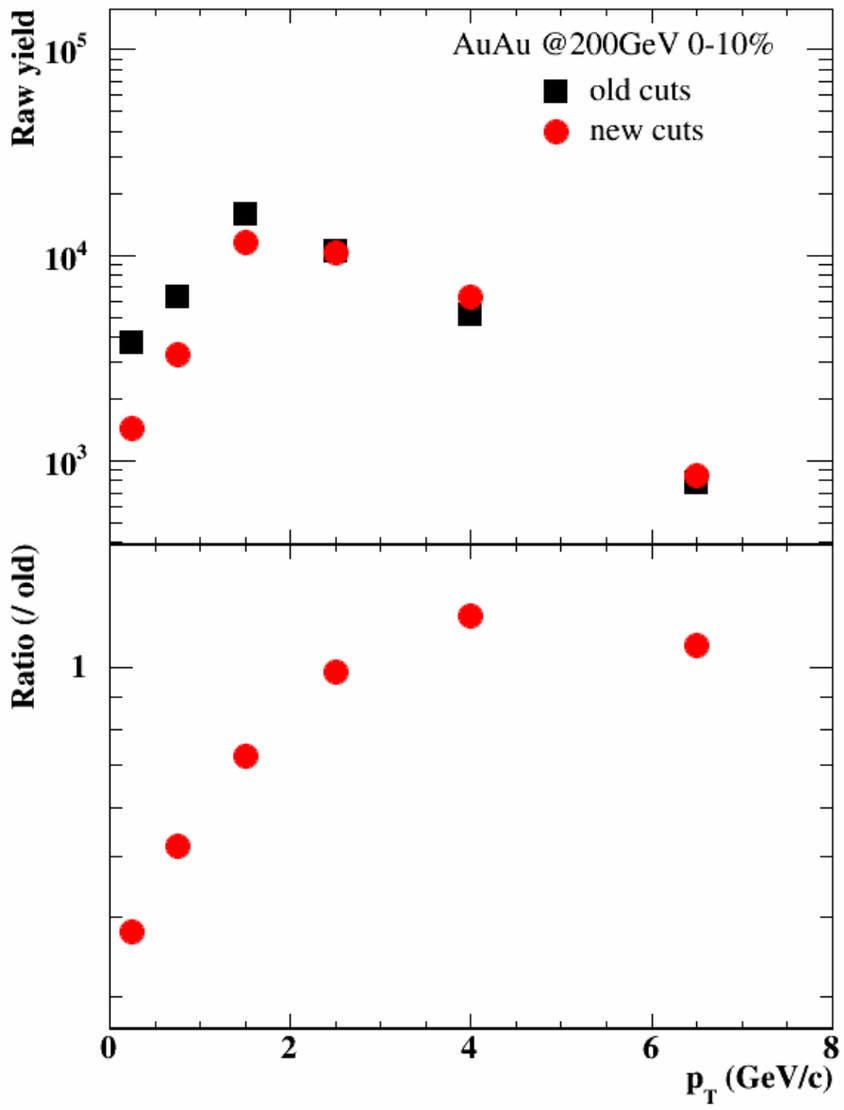


Compare with old results: 0-10%

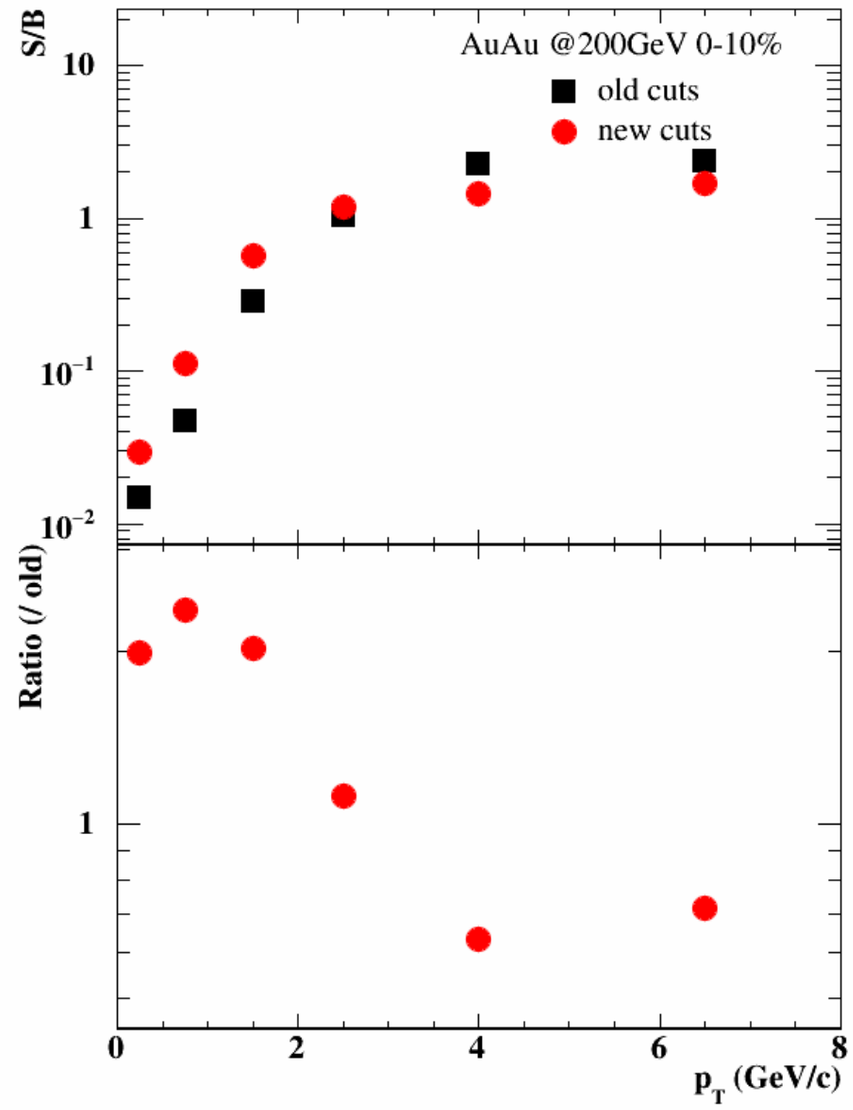
Significance



Raw yield



S / B



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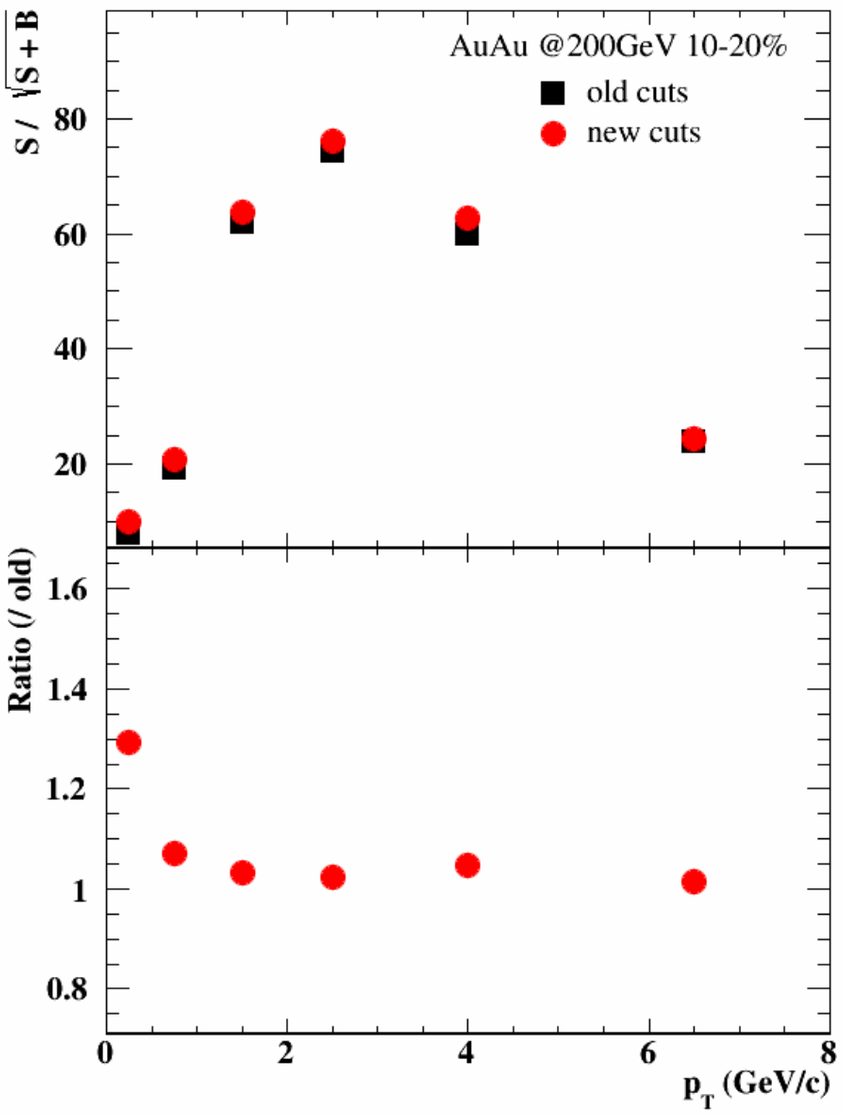
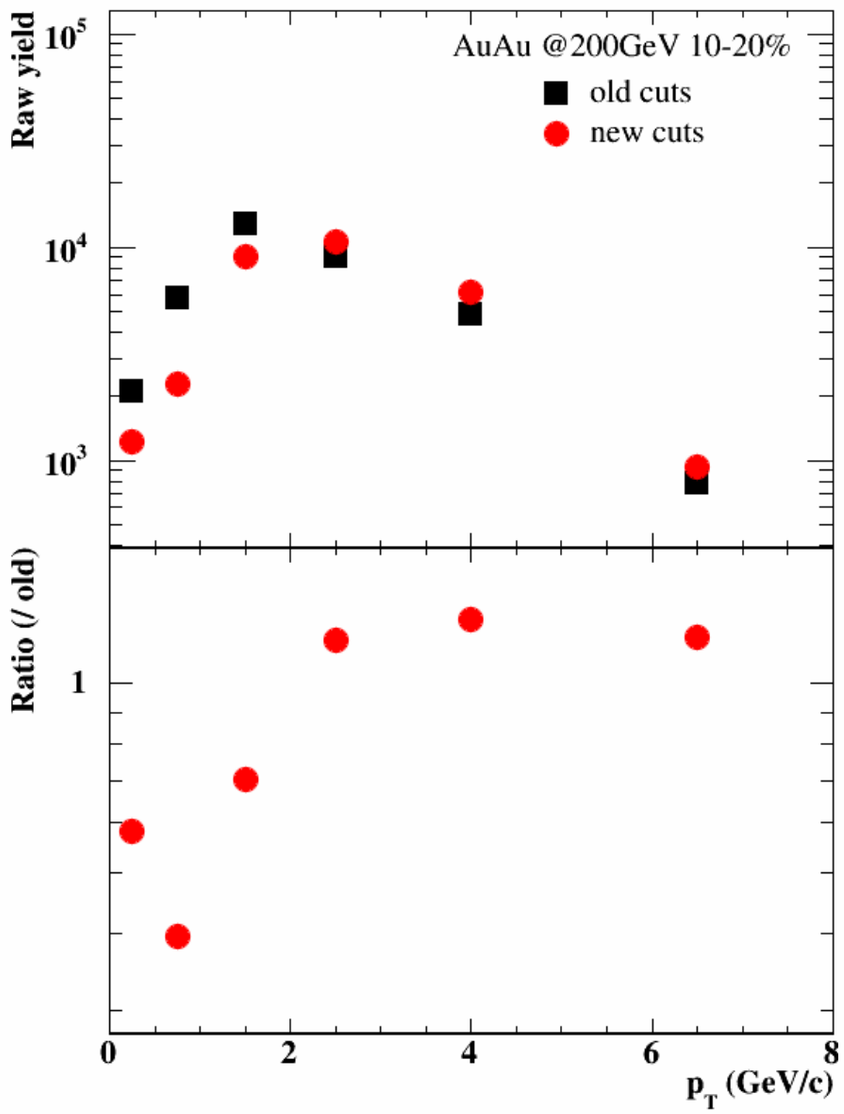
Compare with old results: 10-20%

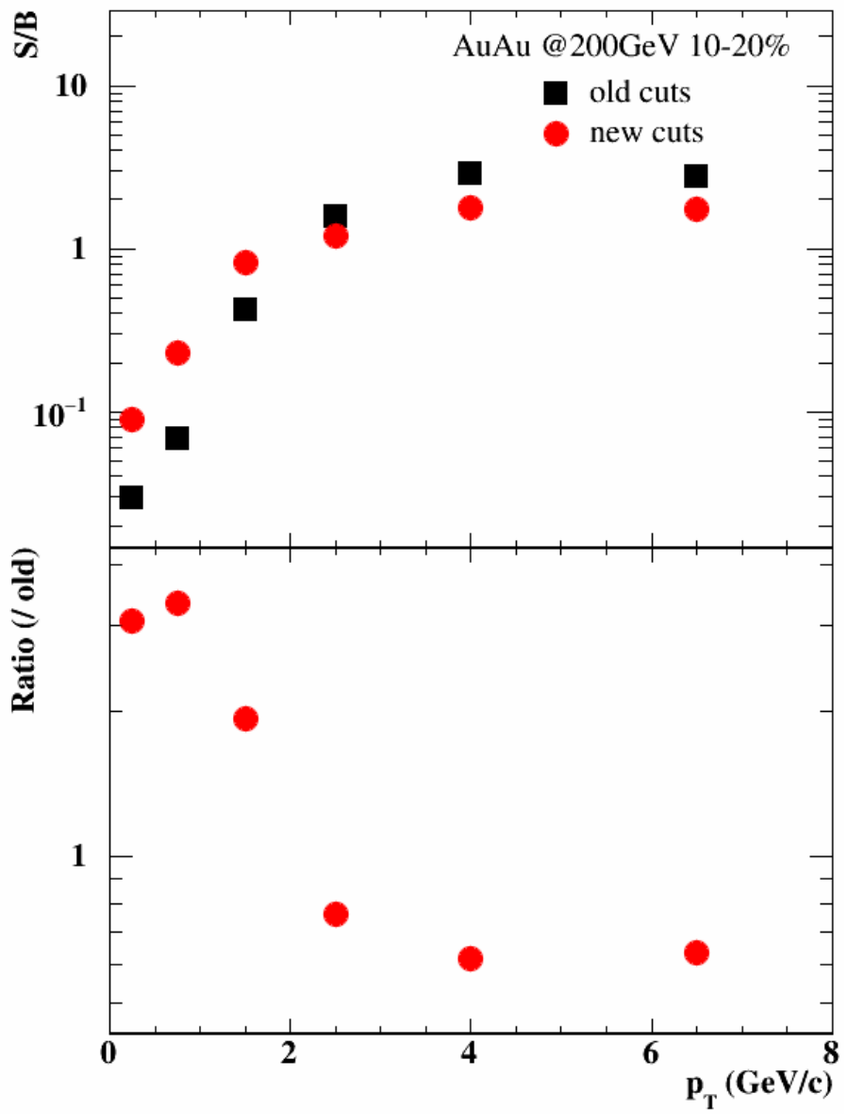
Significance



Raw yield

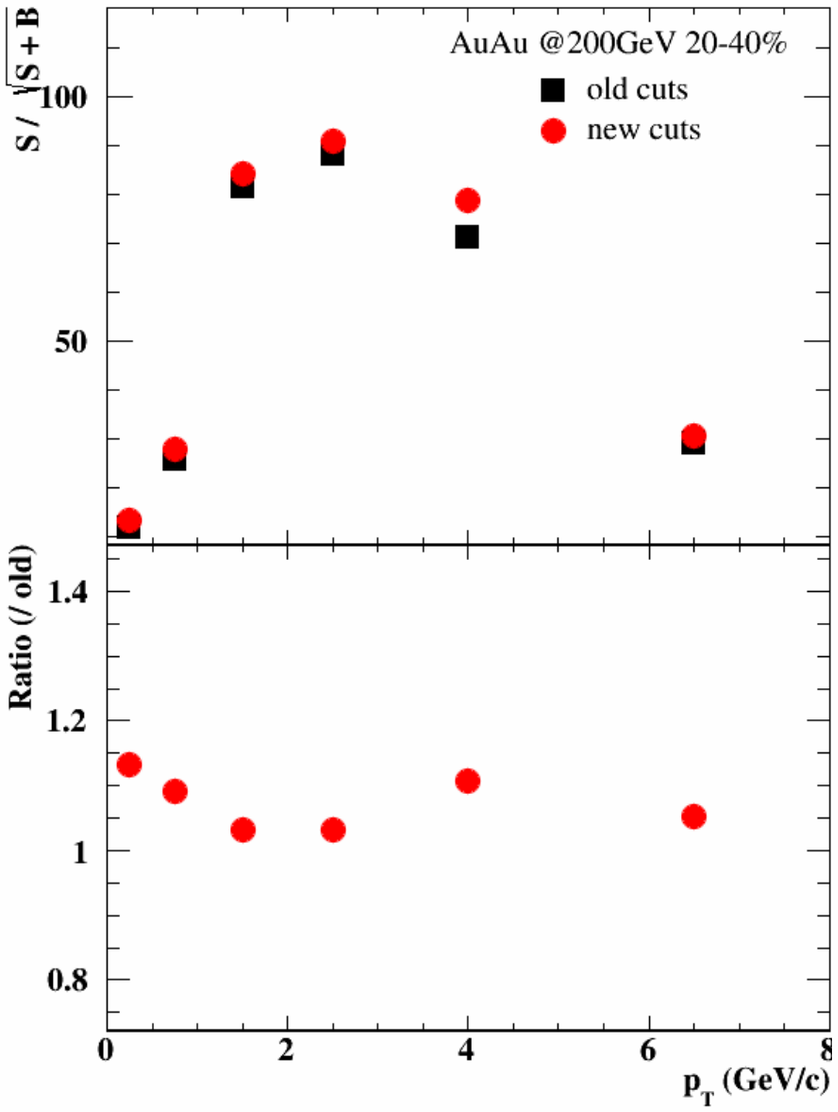


S / B

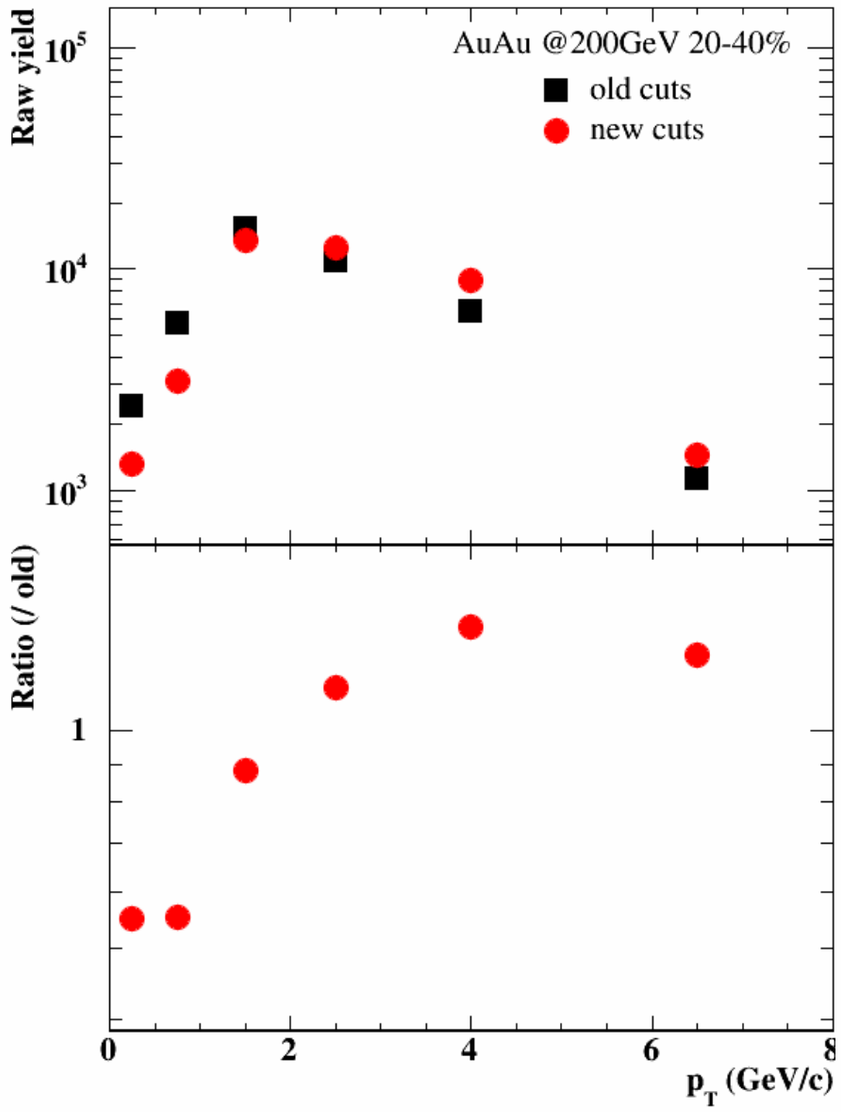


Compare with old results: 20-40%

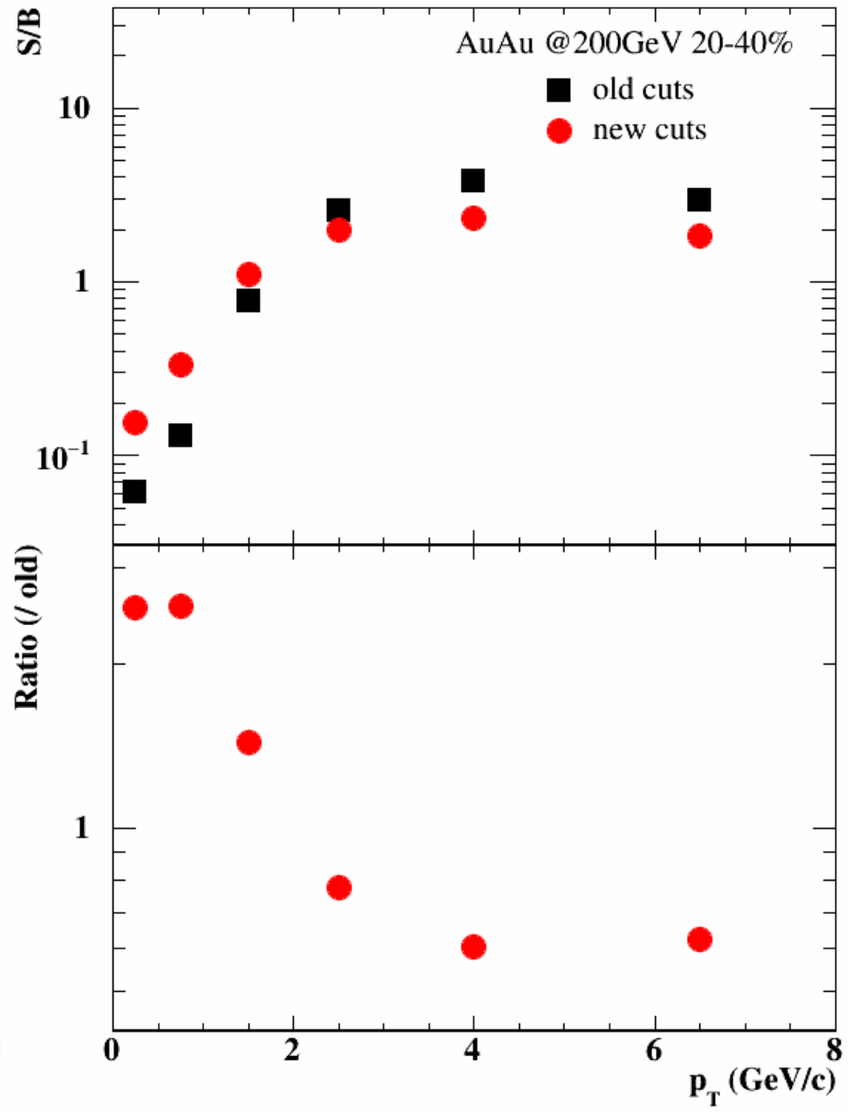
Significance



Raw yield

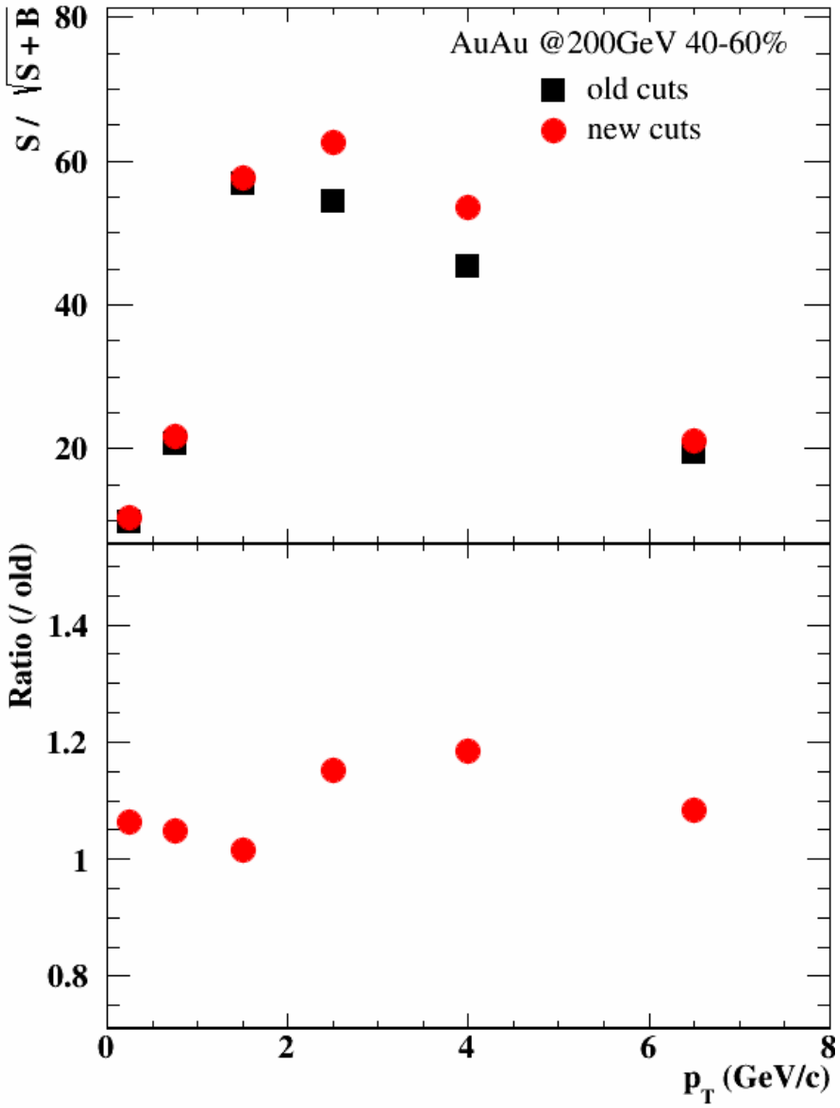


S / B

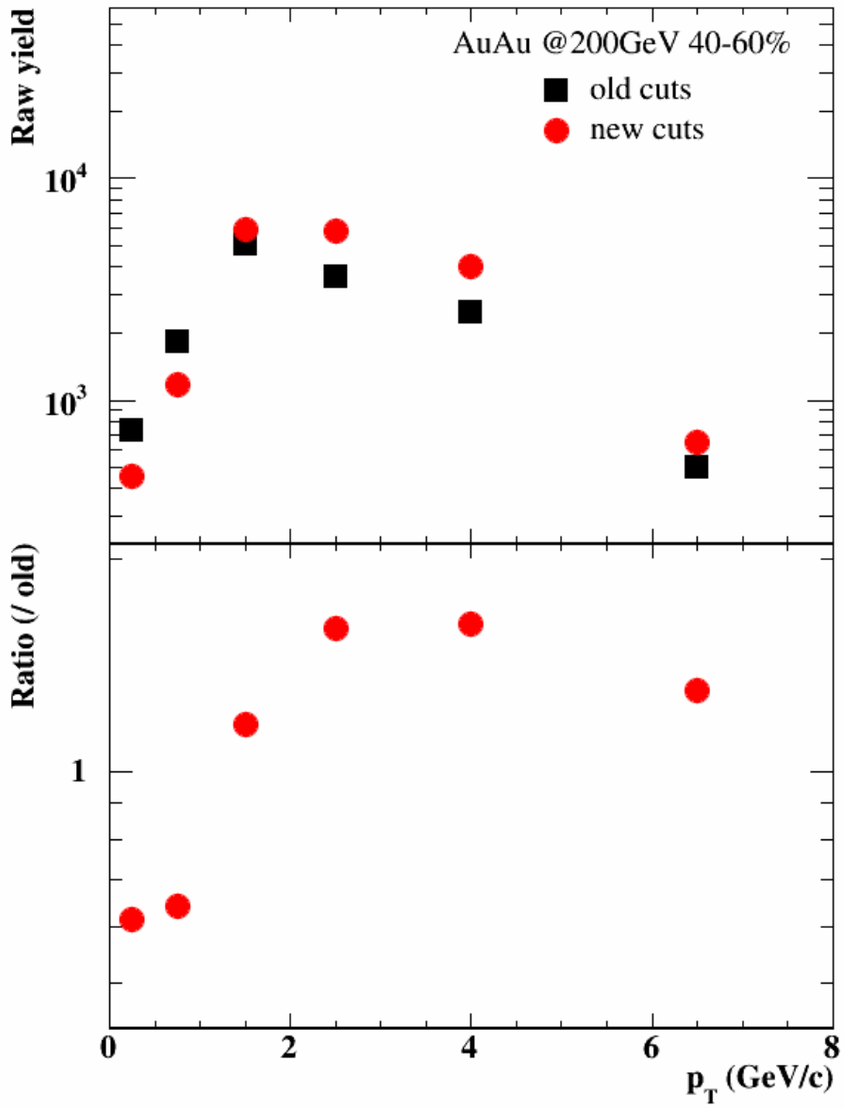


Compare with old results: 40-60%

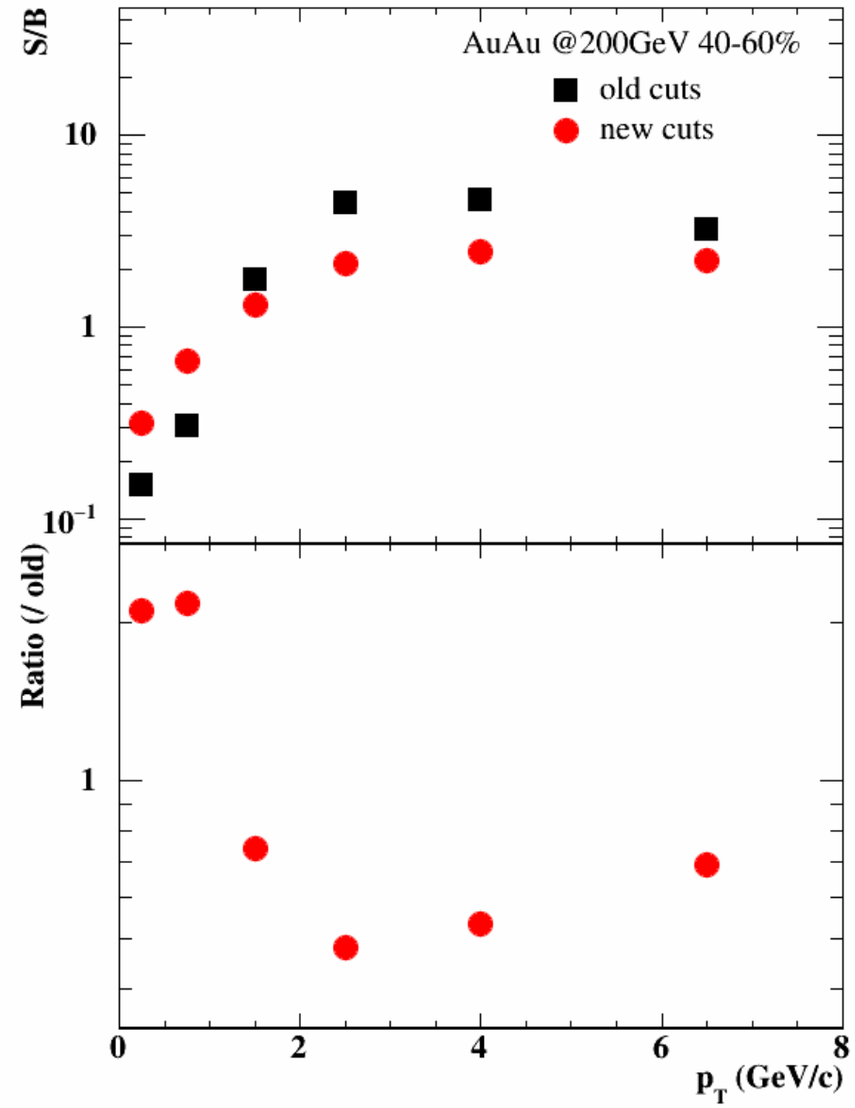
Significance



Raw yield

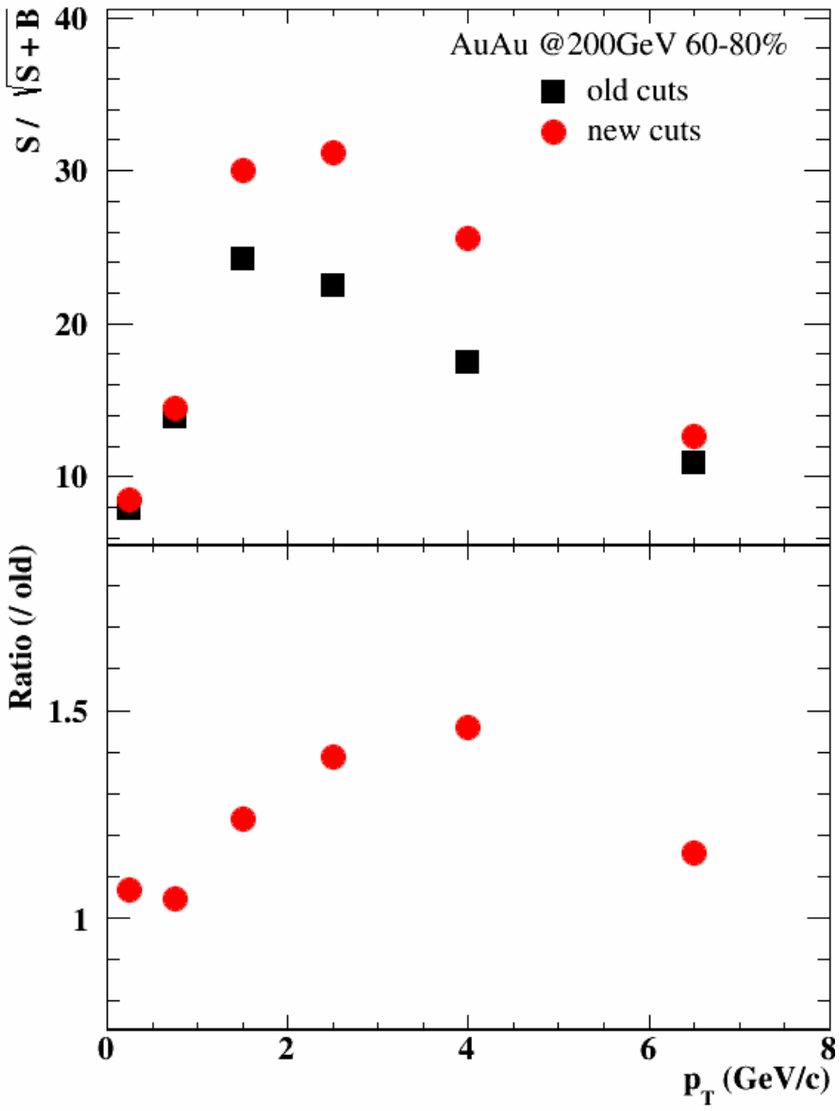


S / B

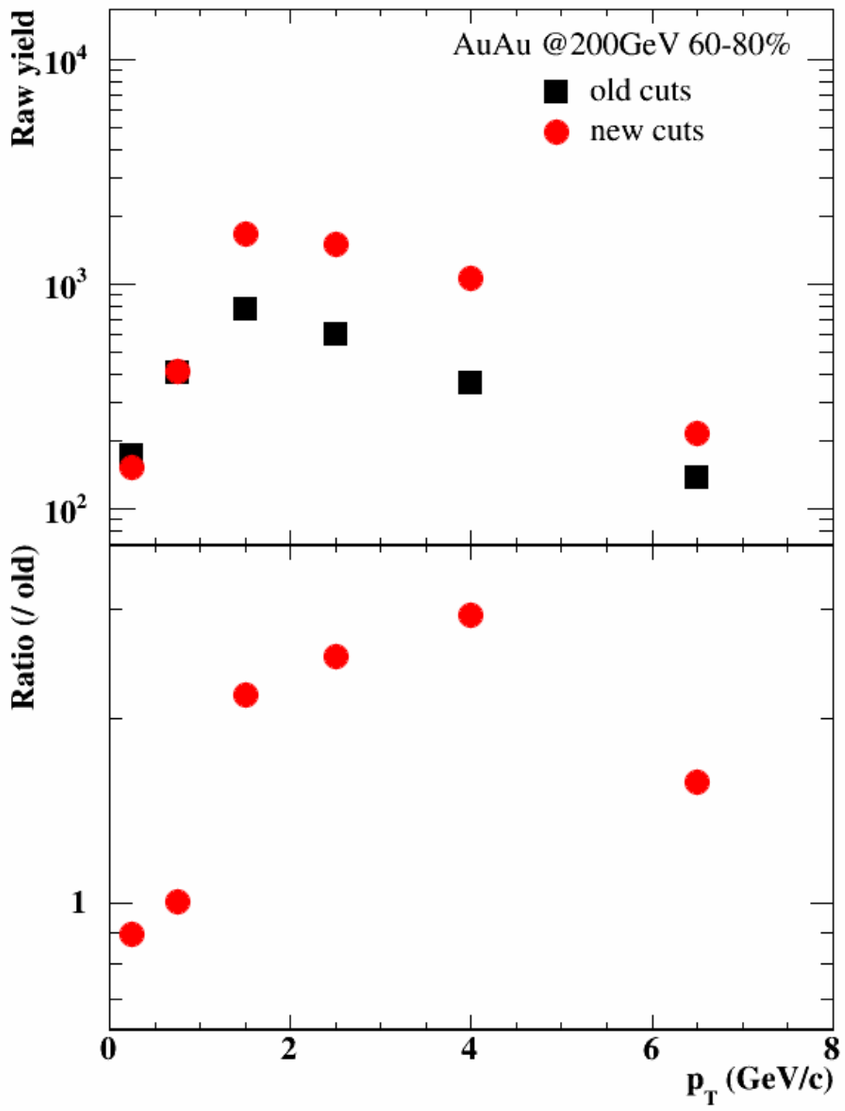


Compare with old results: 60-80%

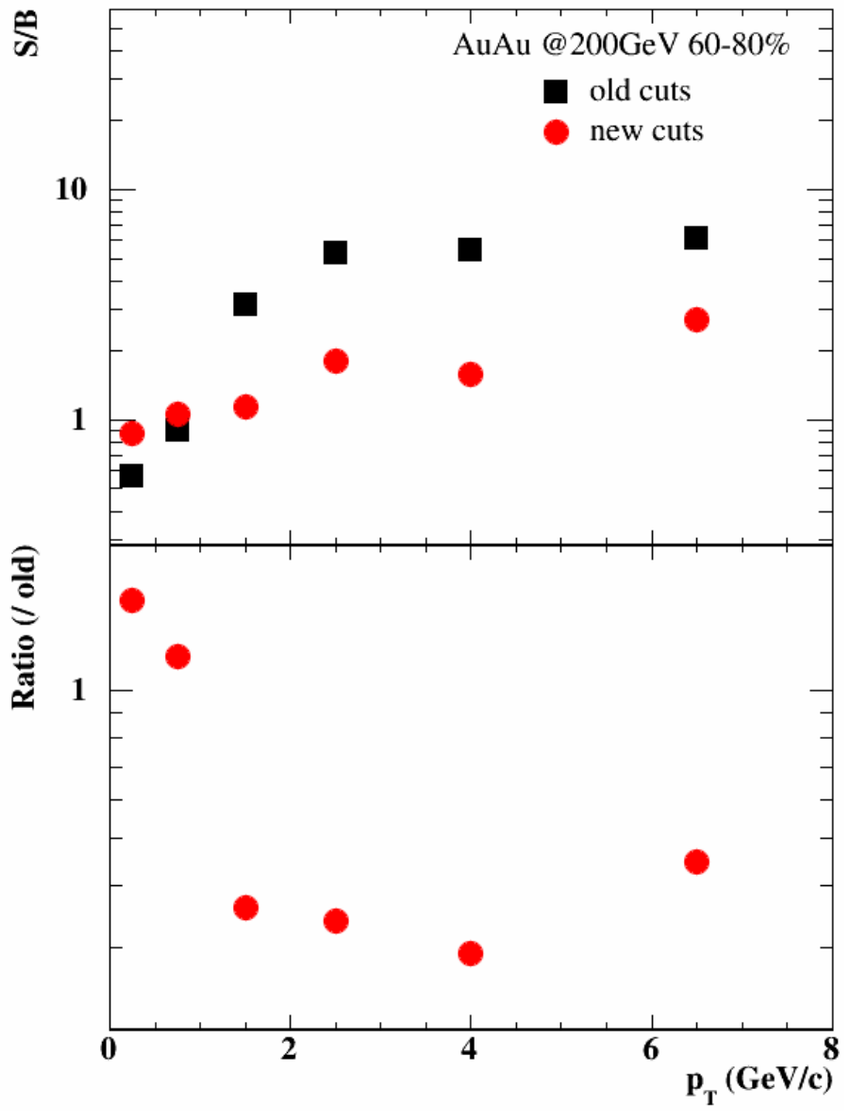
Significance



Raw yield

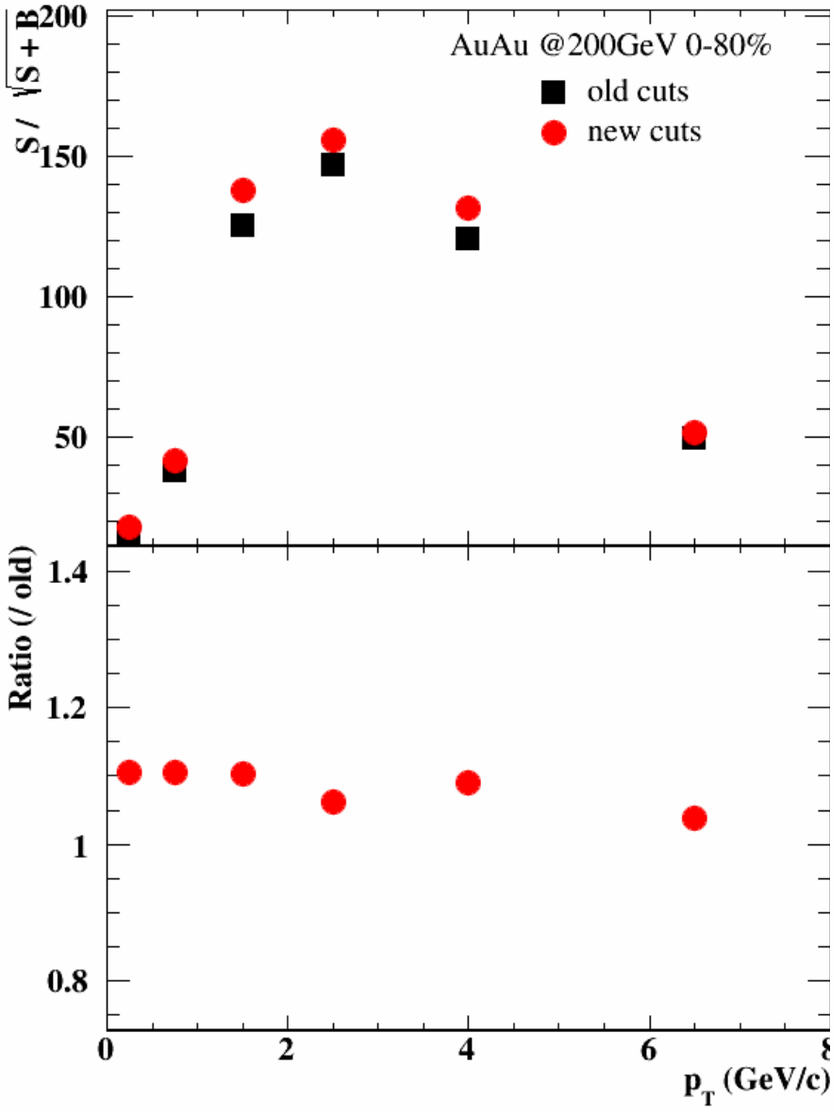


S / B

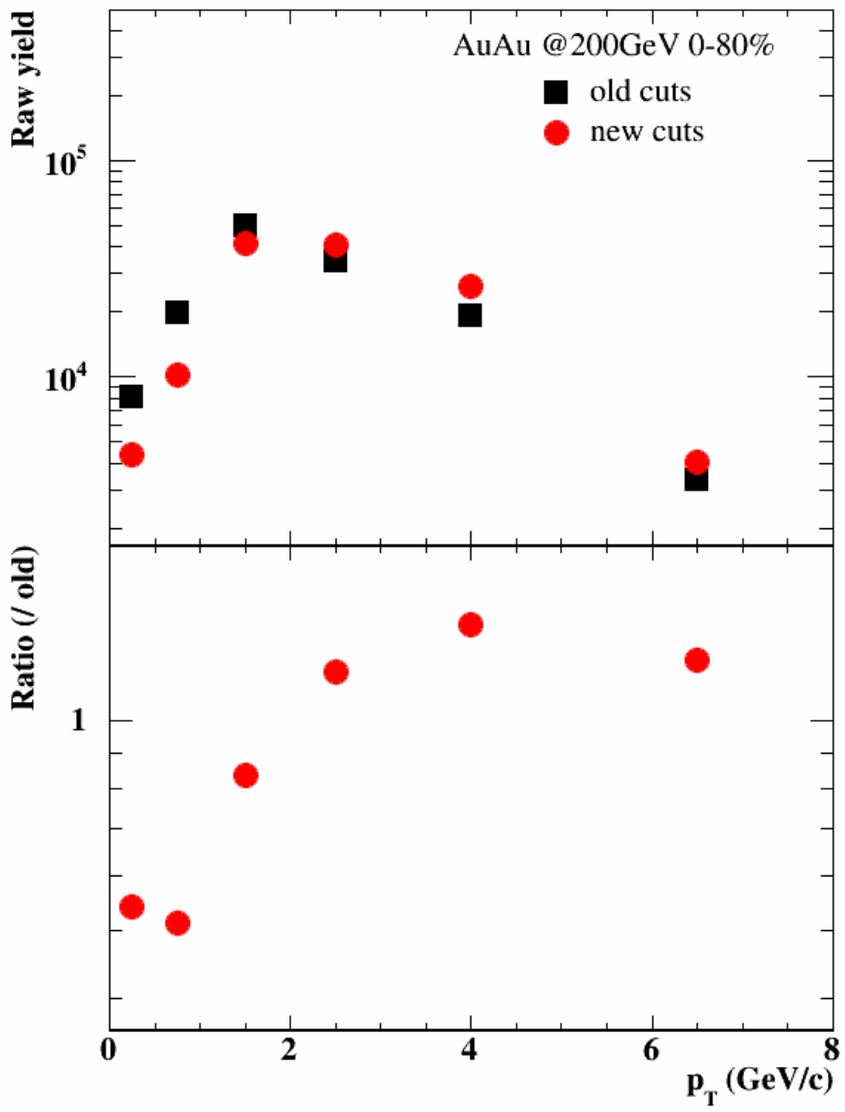


Compare with old results: 0-80%

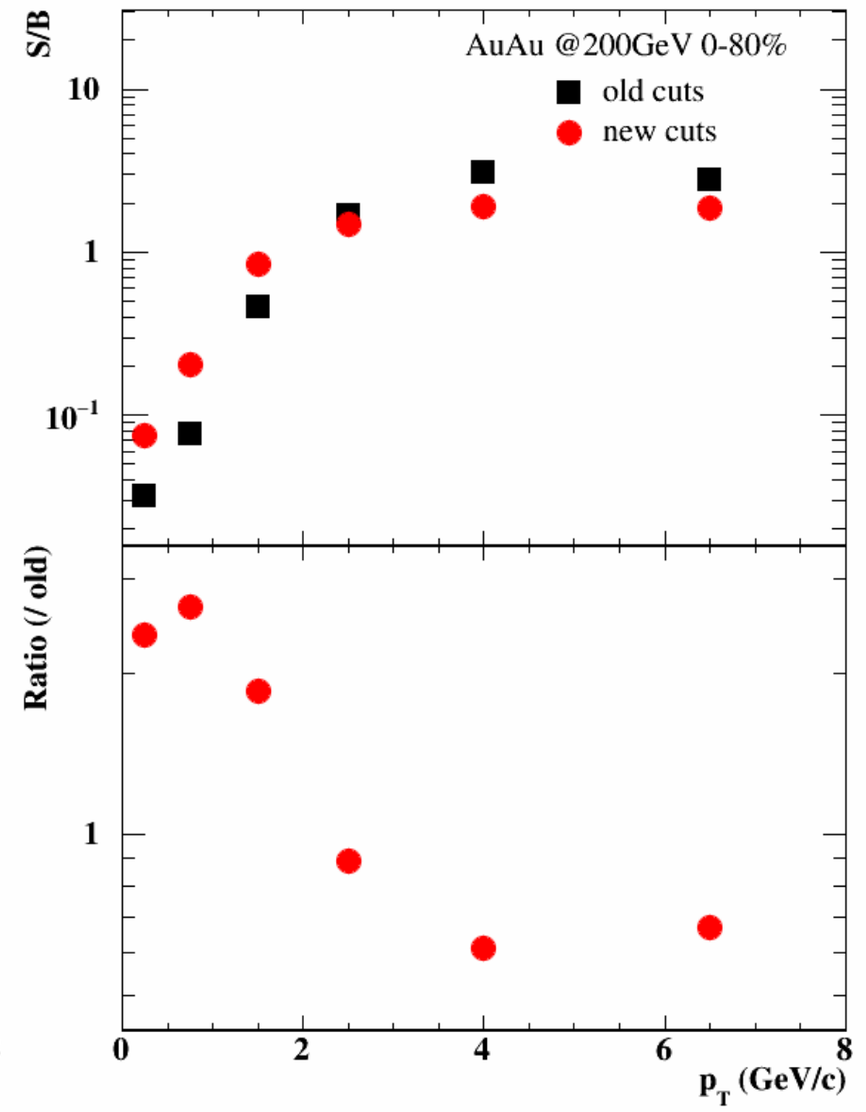
Significance



Raw yield



S / B

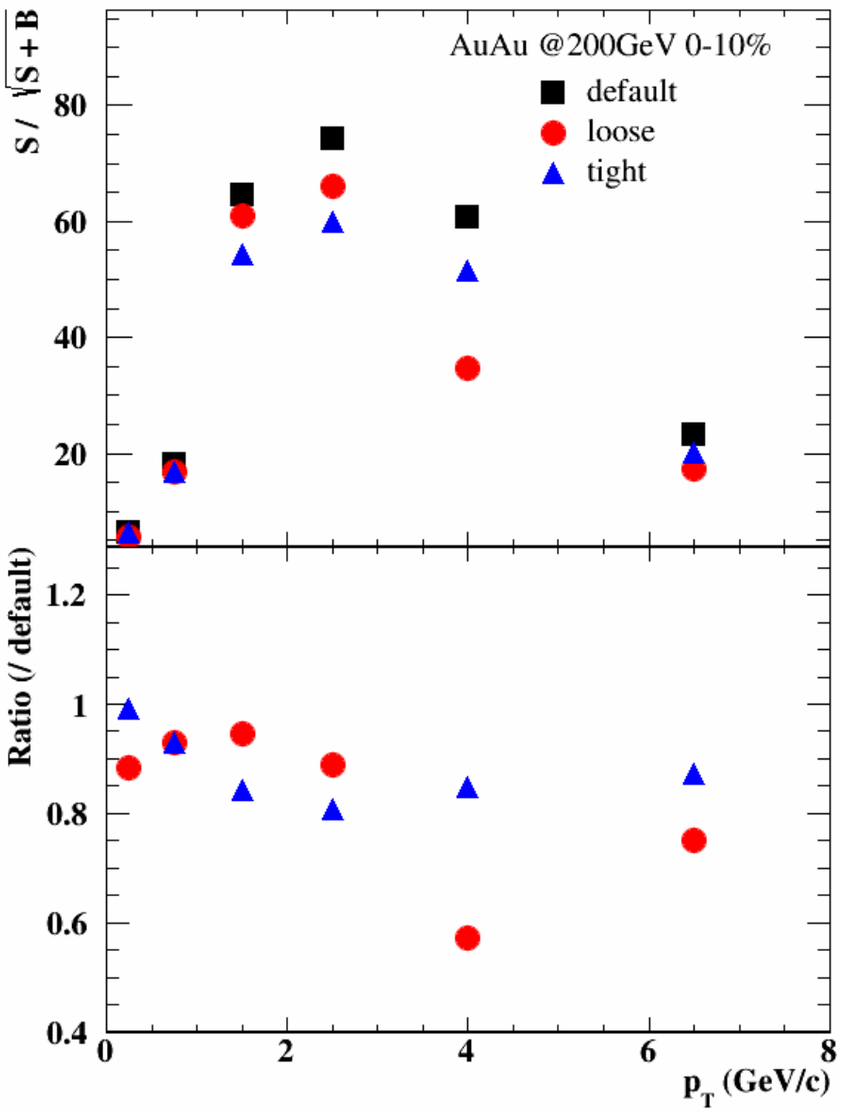


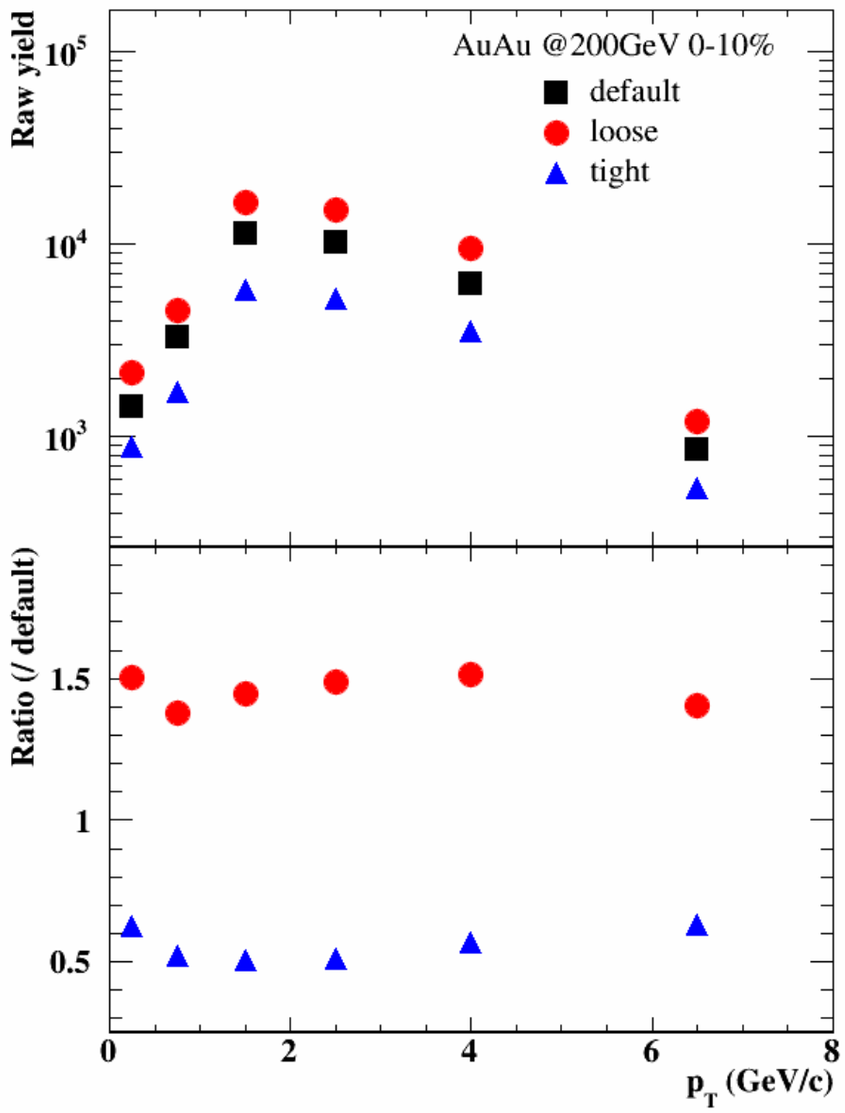
Tight and loose cuts: 0-10%

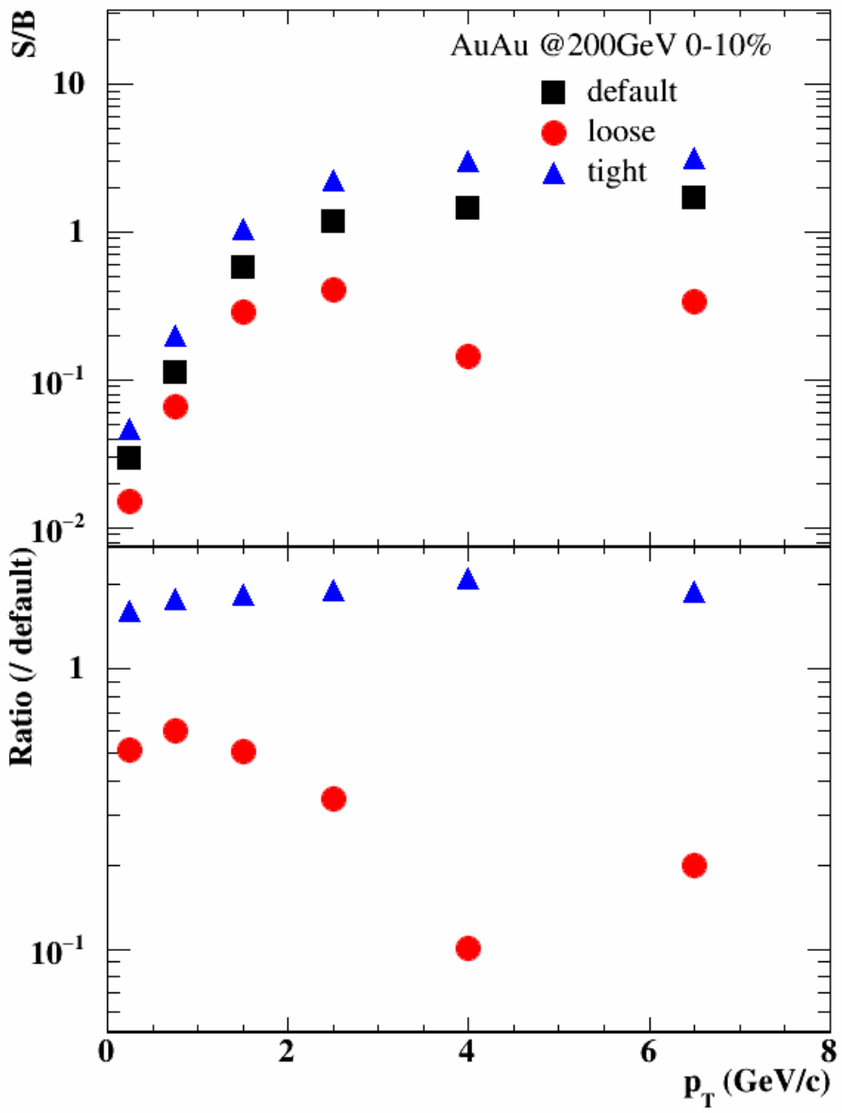
Significance

Raw yield

S / B

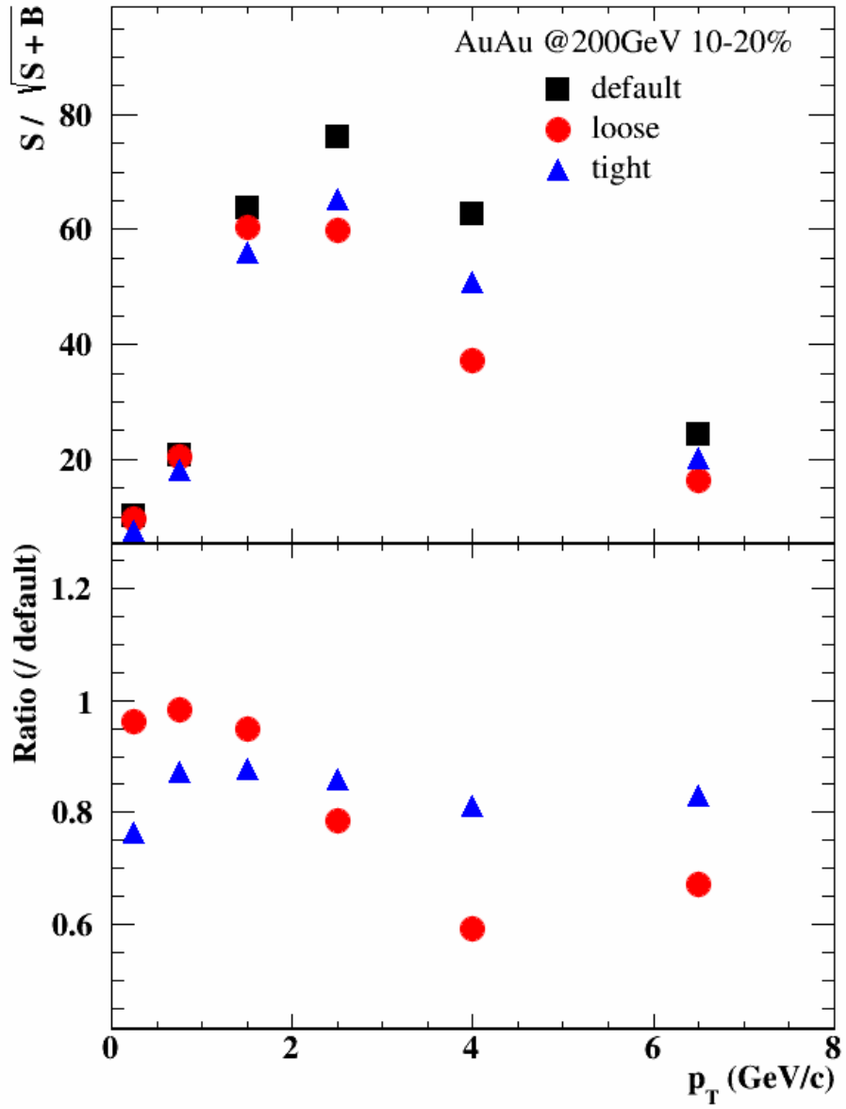




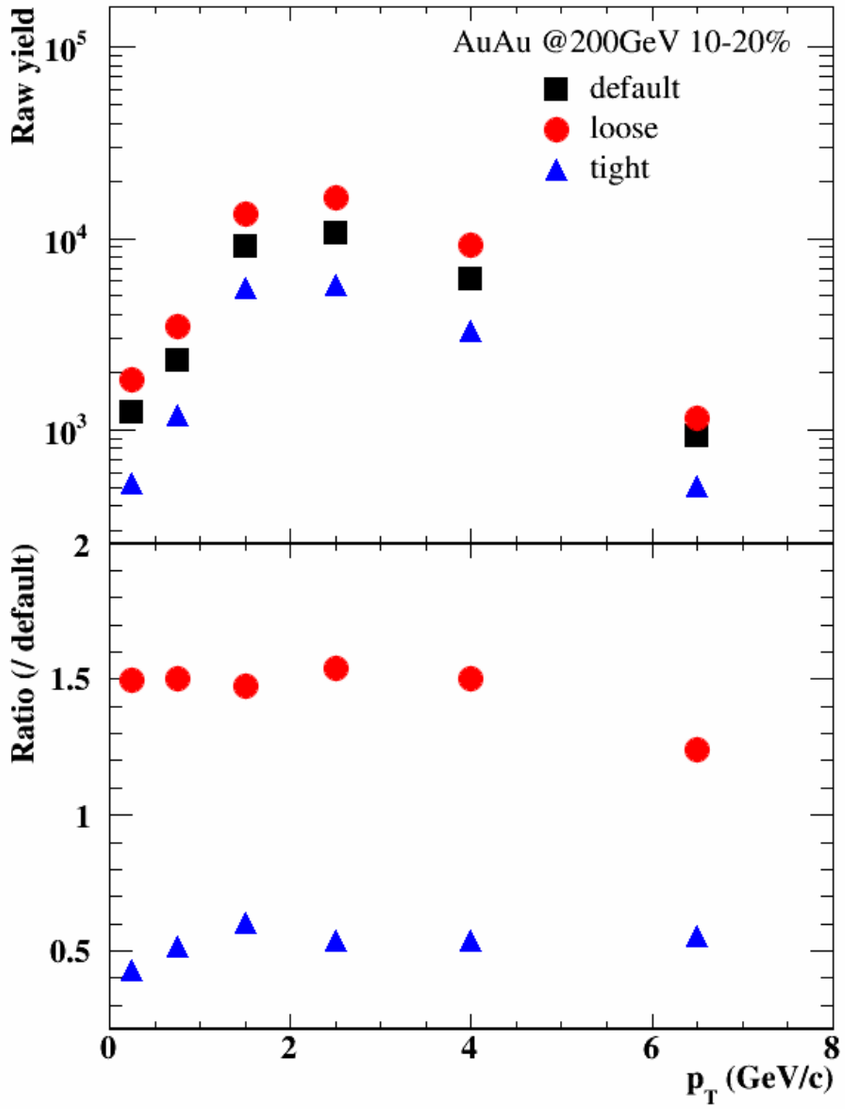


Tight and loose cuts: 10-20%

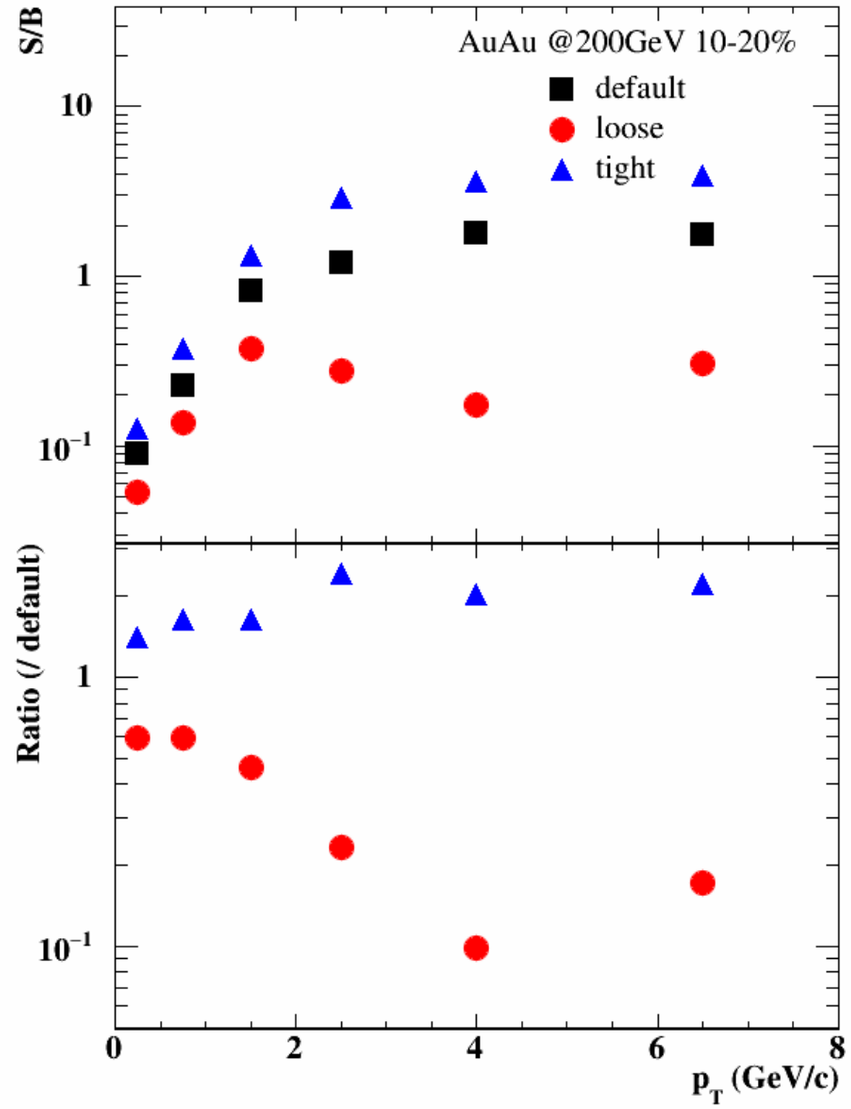
Significance



Raw yield

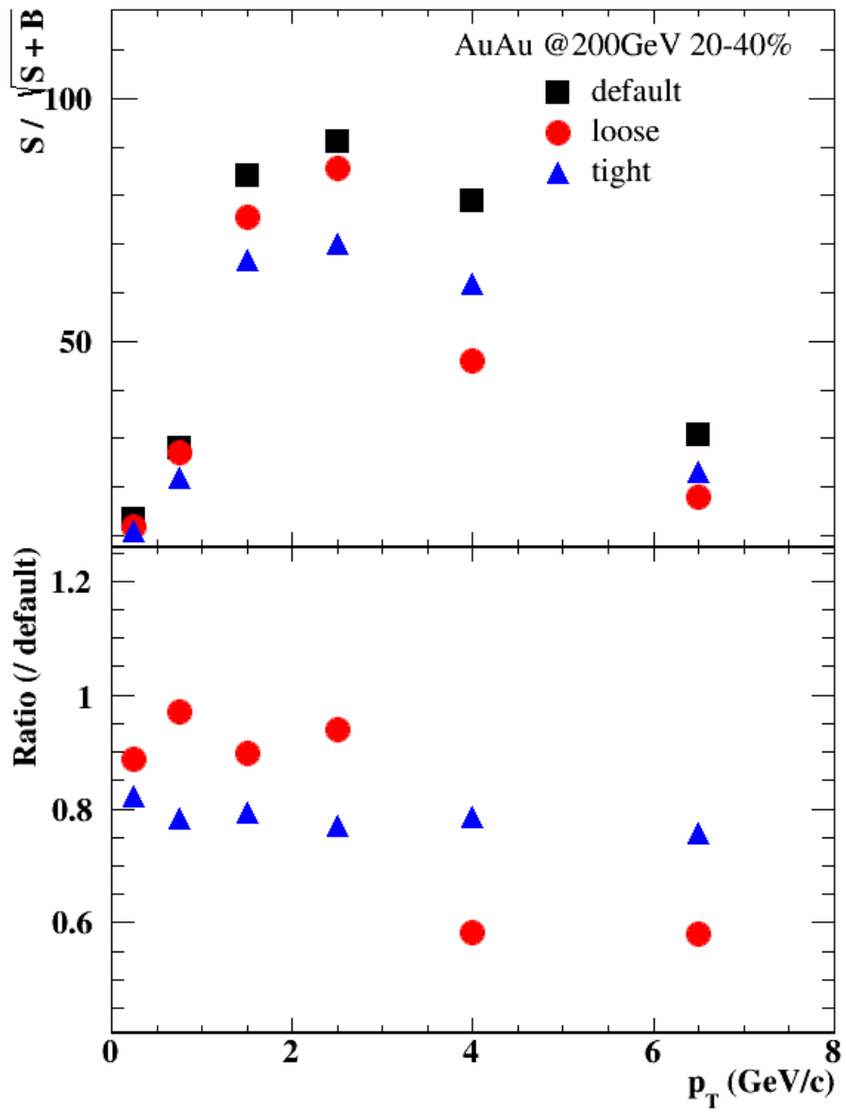


S / B

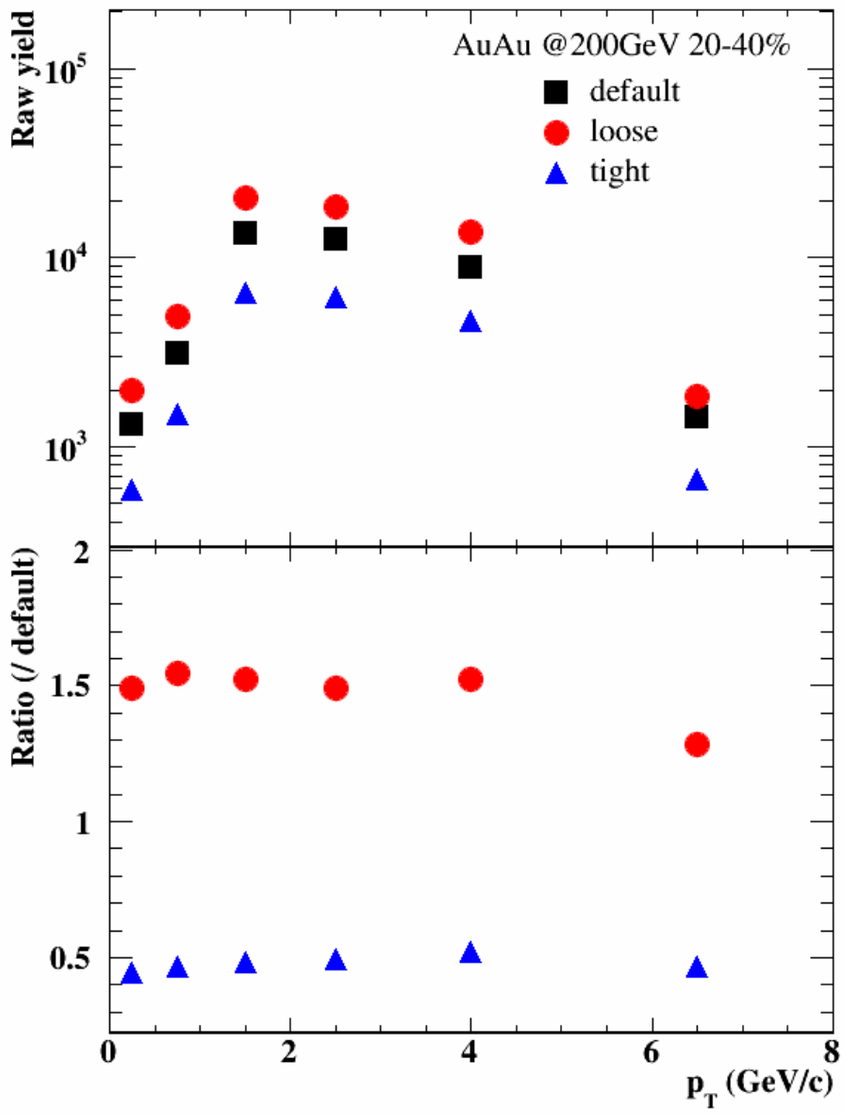


Tight and loose cuts: 20-40%

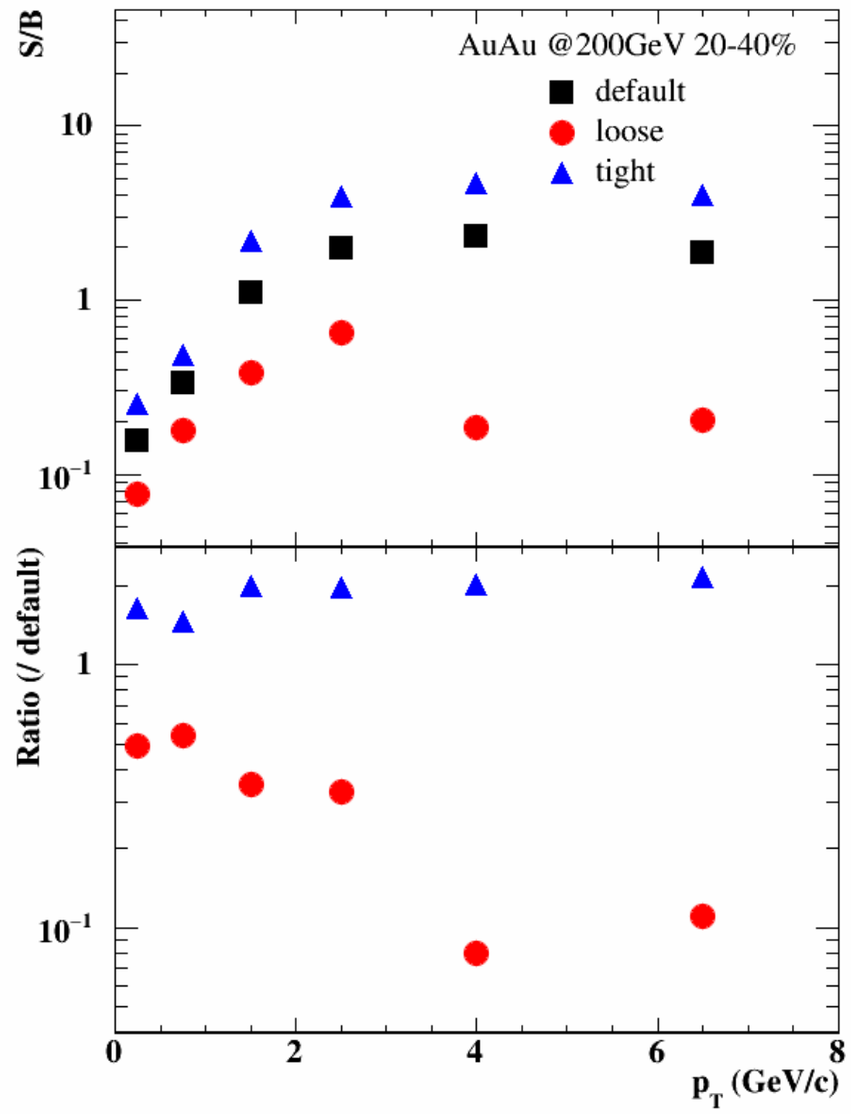
Significance



Raw yield

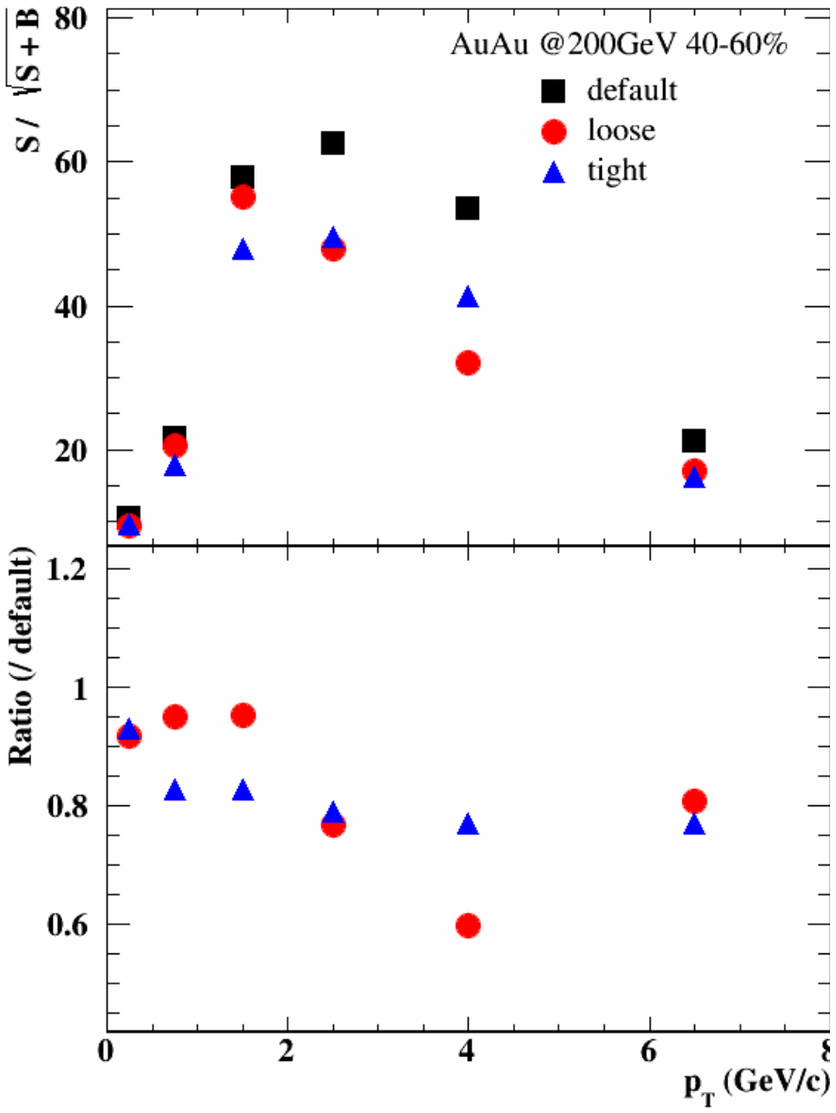


S / B

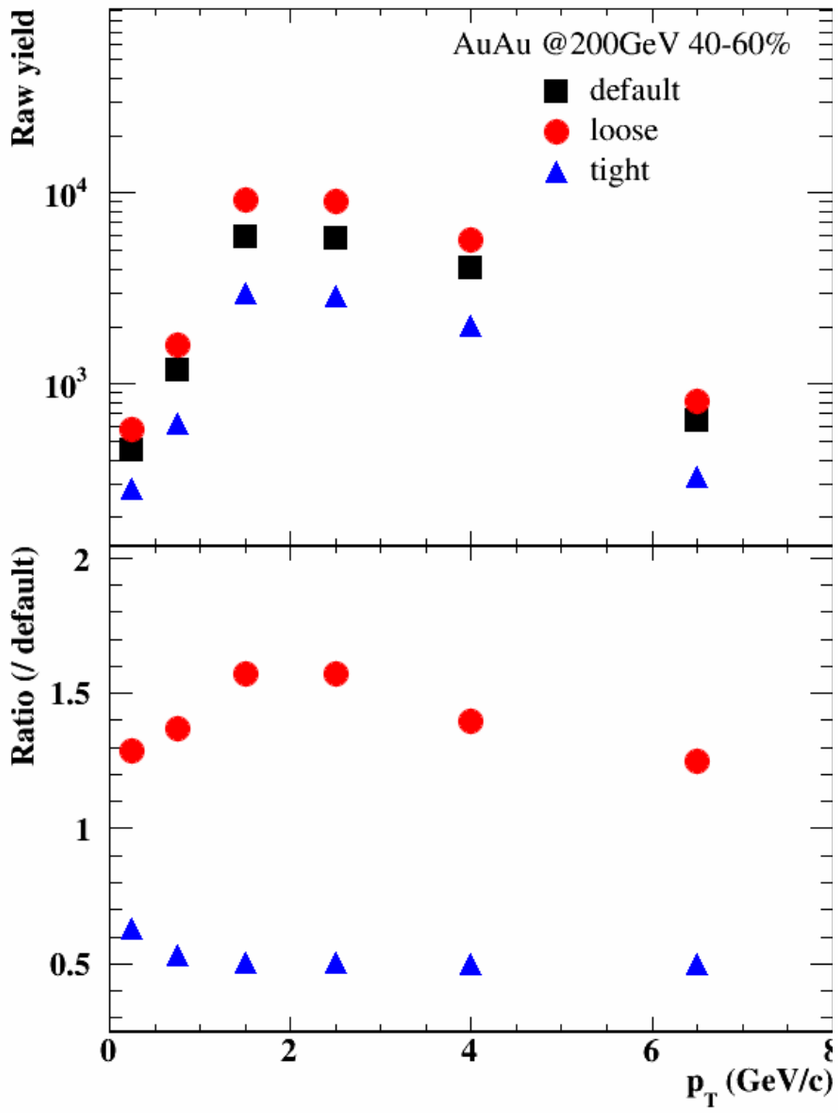


Tight and loose cuts: 40-60%

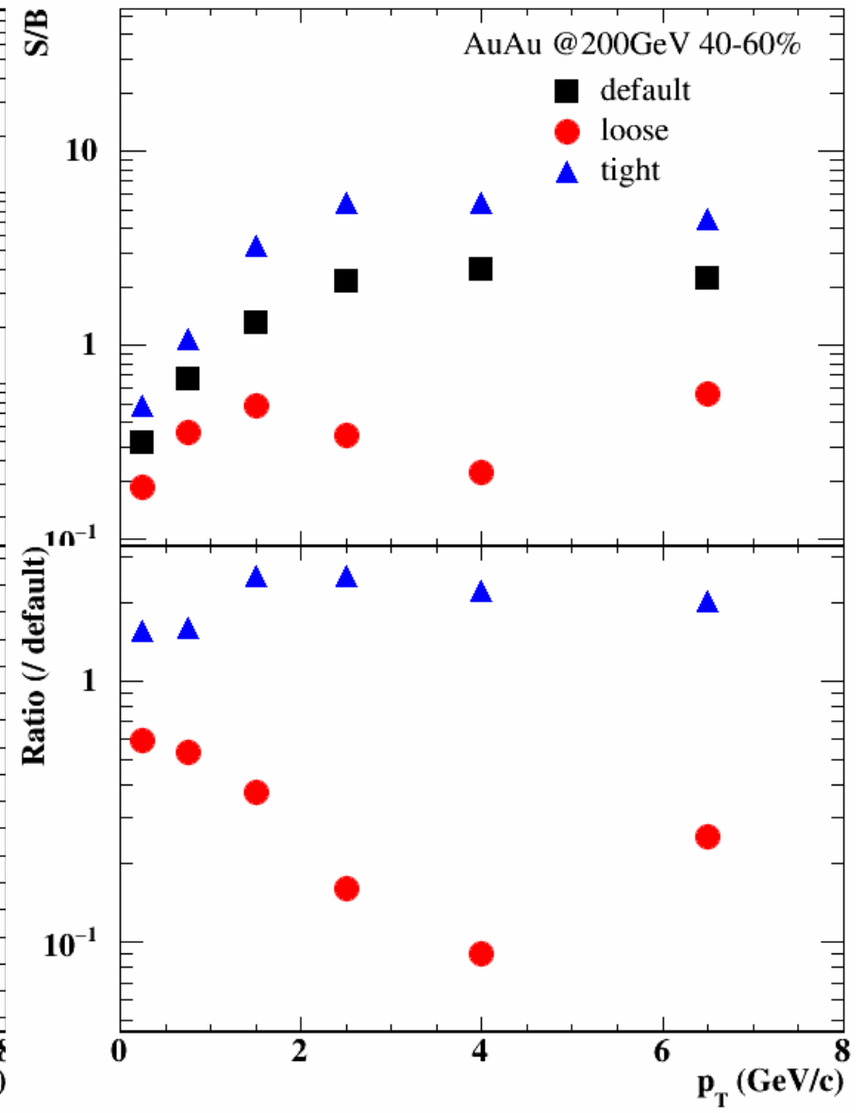
Significance



Raw yield



S / B

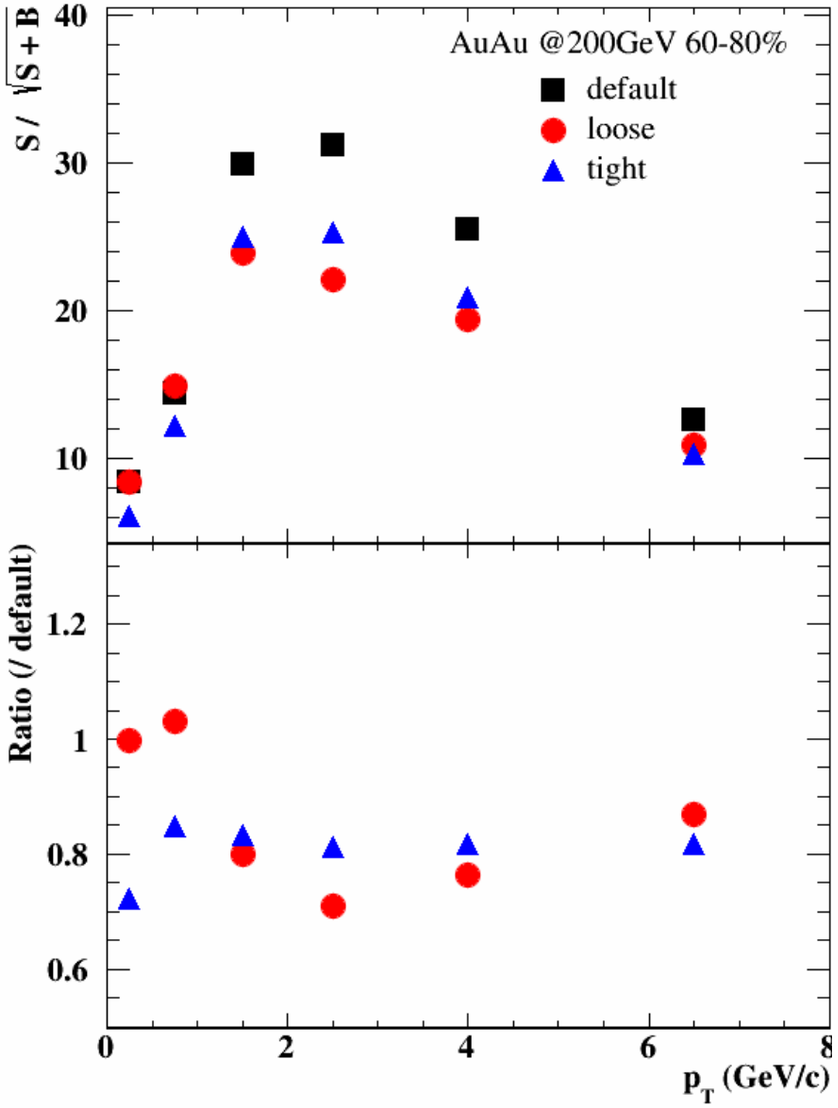


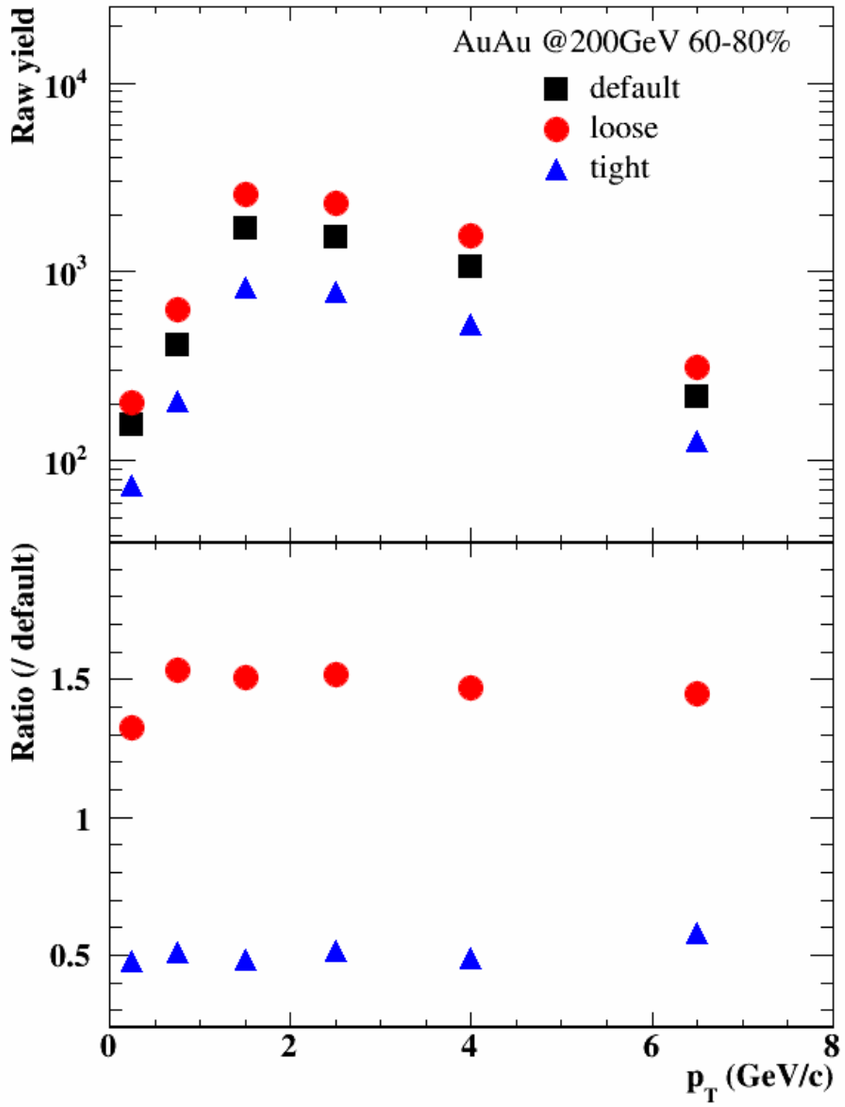
Tight and loose cuts: 60-80%

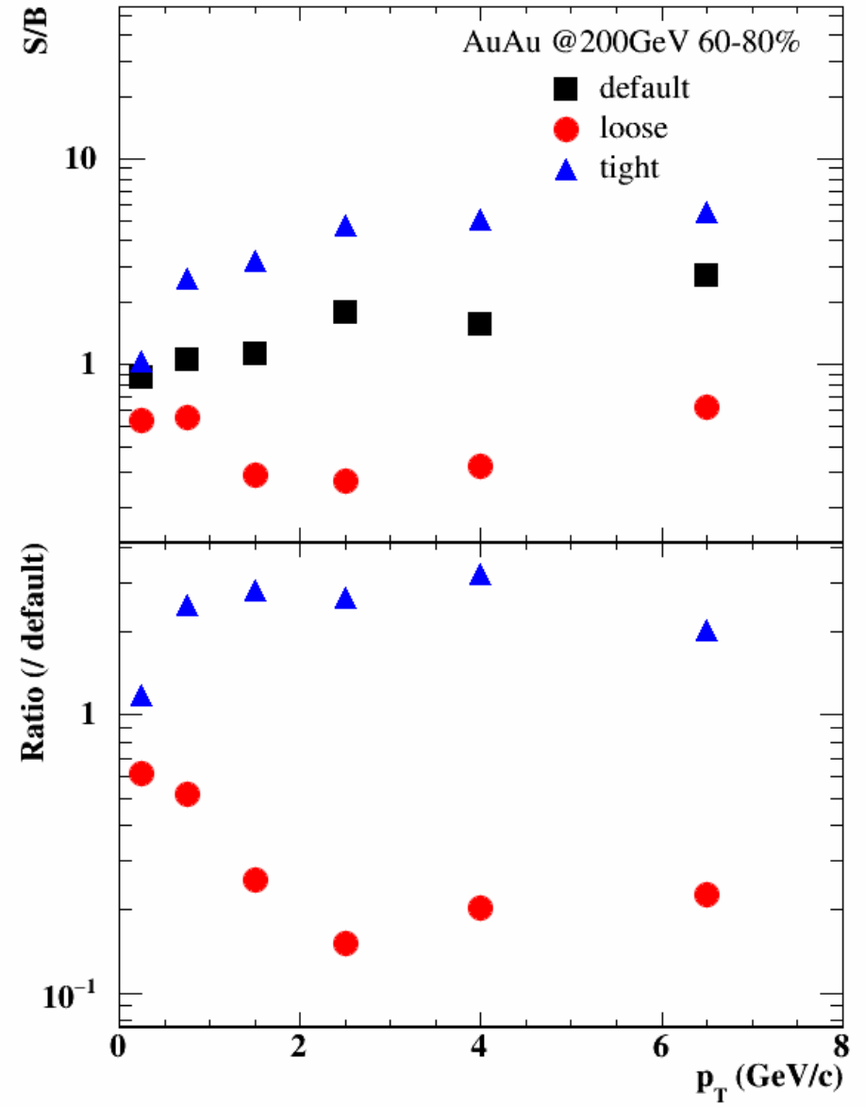
Significance

Raw yield

S / B







Backup

Supply

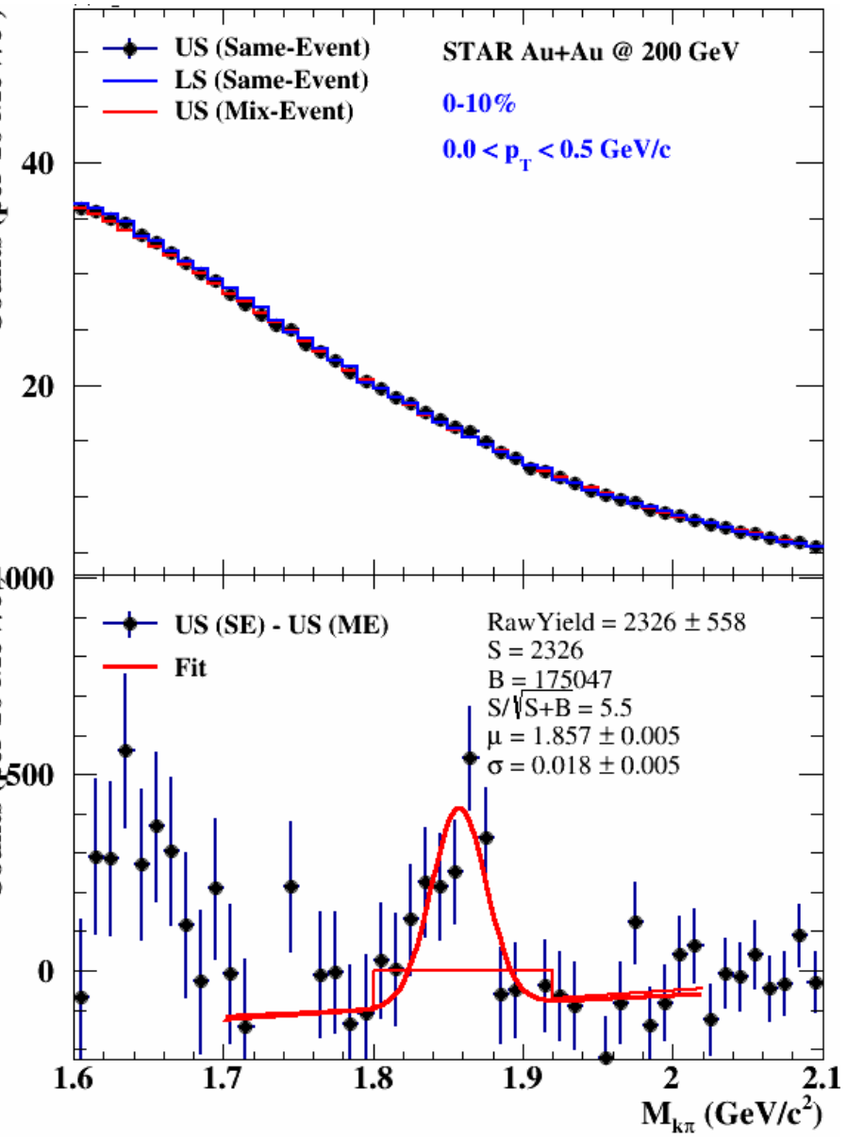
- 1. New rectangle cuts http://portal.nersc.gov/project/star/xlchen/D0_Summary/D0_reTune/StAnaCuts.h

- 2. Cuts as function of pT plots http://portal.nersc.gov/project/star/xlchen/D0_Summary/D0_reTune/topoCutsRun14.pdf

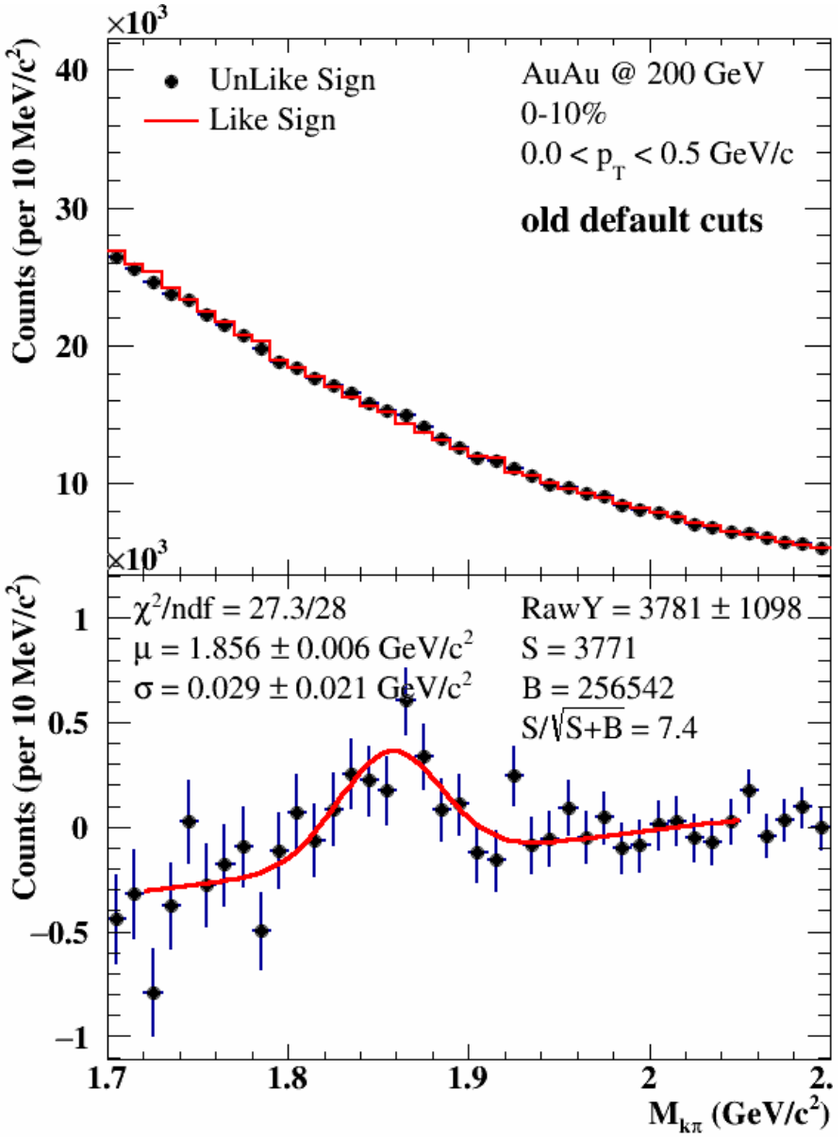
- 2. BDT http://portal.nersc.gov/project/star/xlchen/D0_Summary/D0_reTune/D0_reTuneBDT.pdf

D0 Signal at 0-0.5GeV, 0-10%

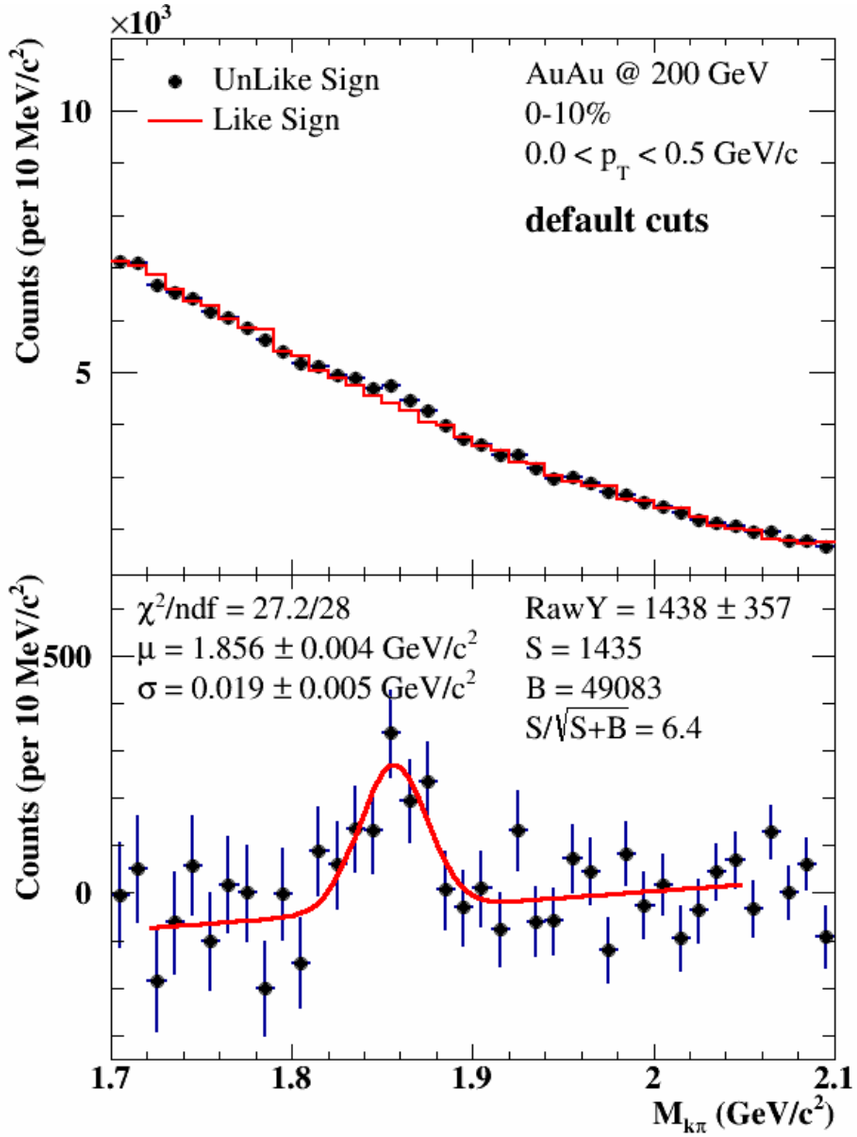
Old cuts: Mix-event



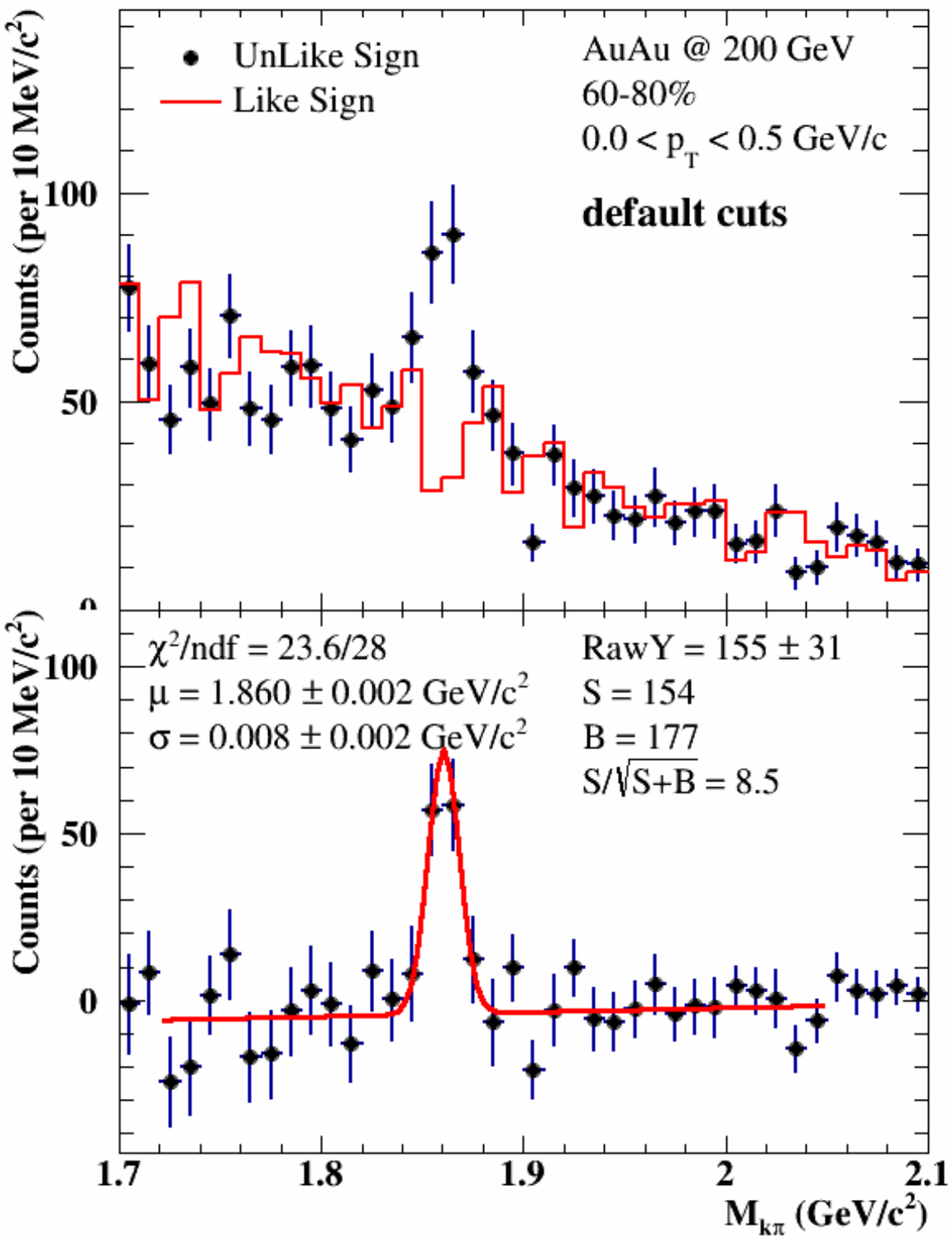
Old cuts: Like-sign



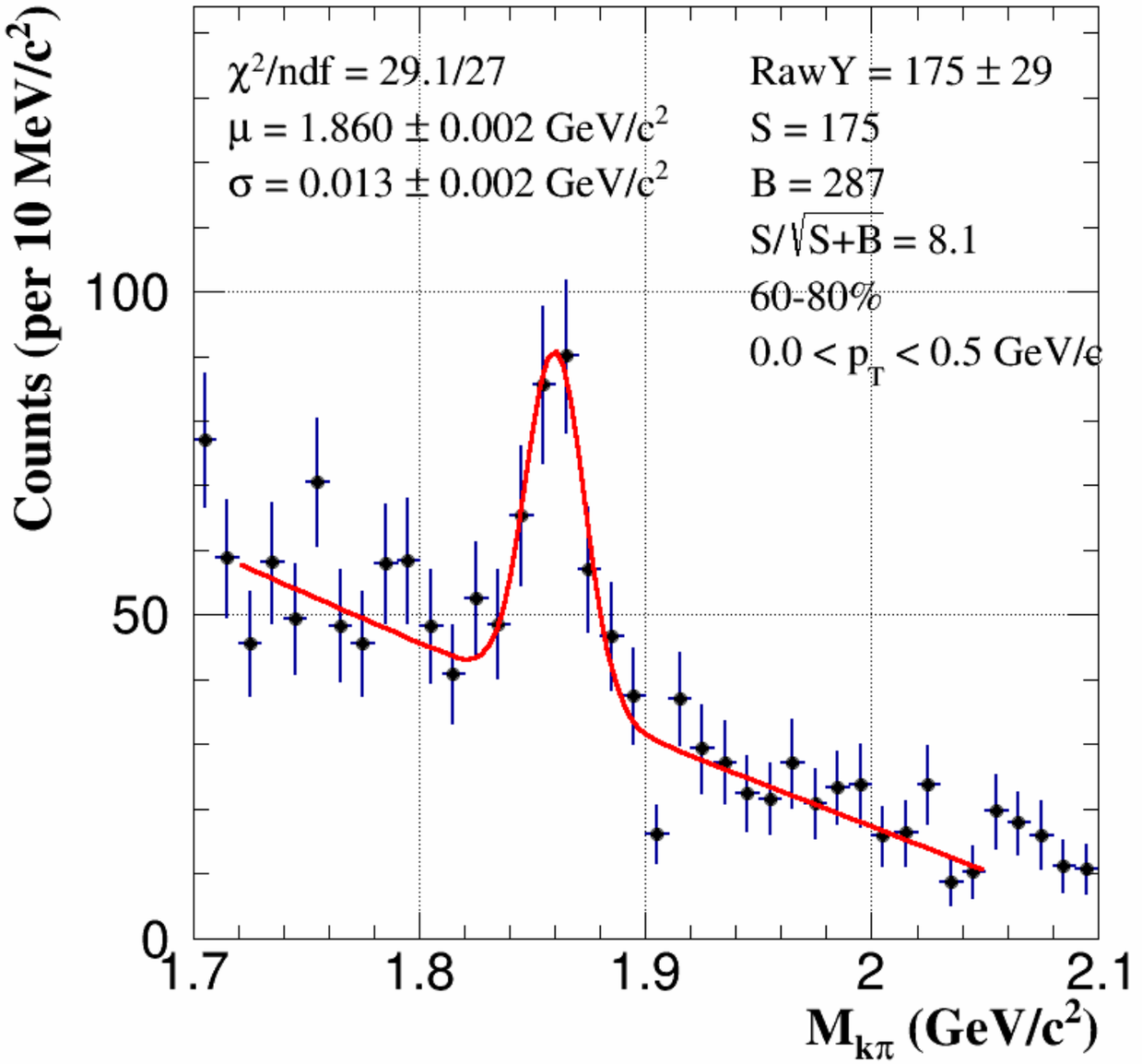
new cuts



D0 signal at 0-0.5GeV, 60-80%

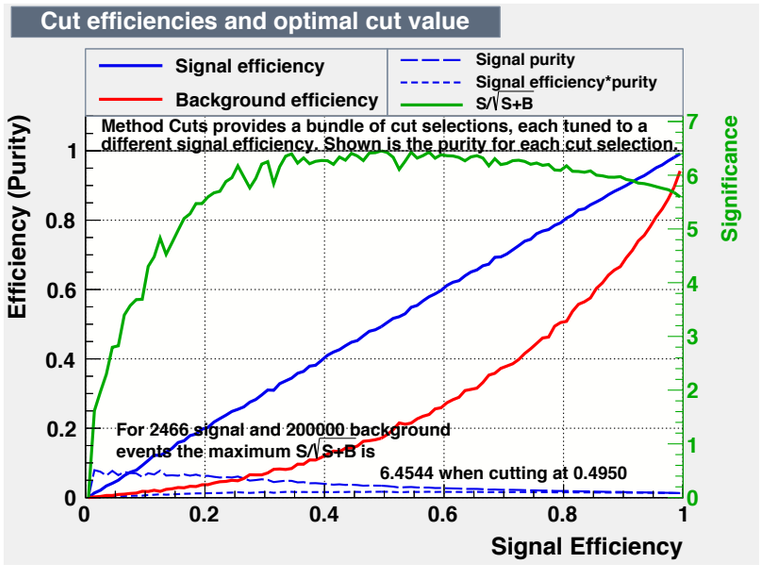


Fit unlike-sign: gaus+pol2

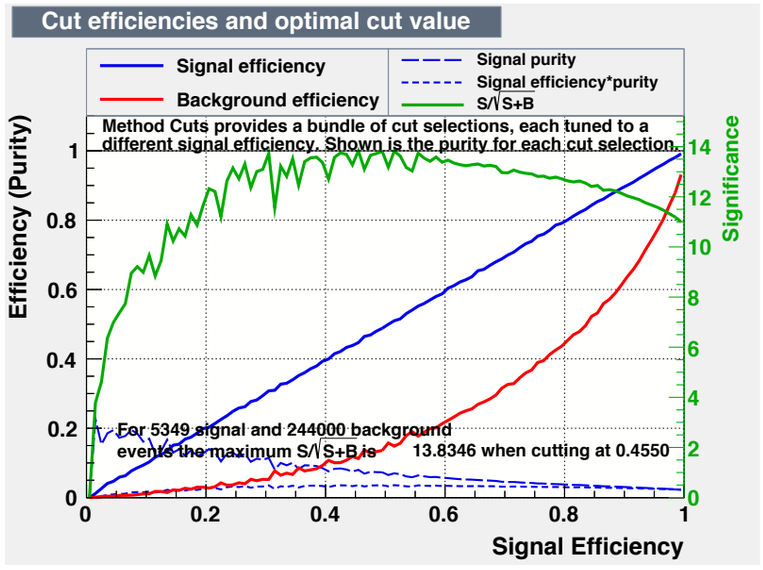


0-10% tuning: scaled to 100M events

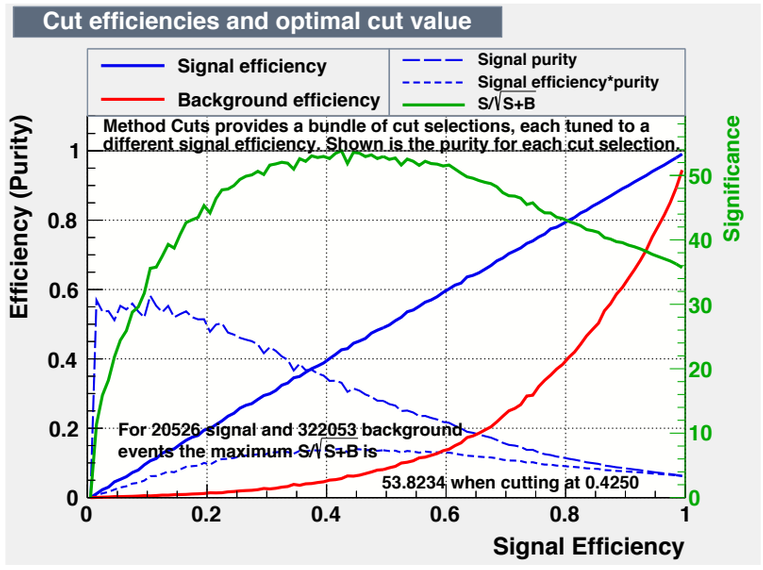
0-0.5 GeV



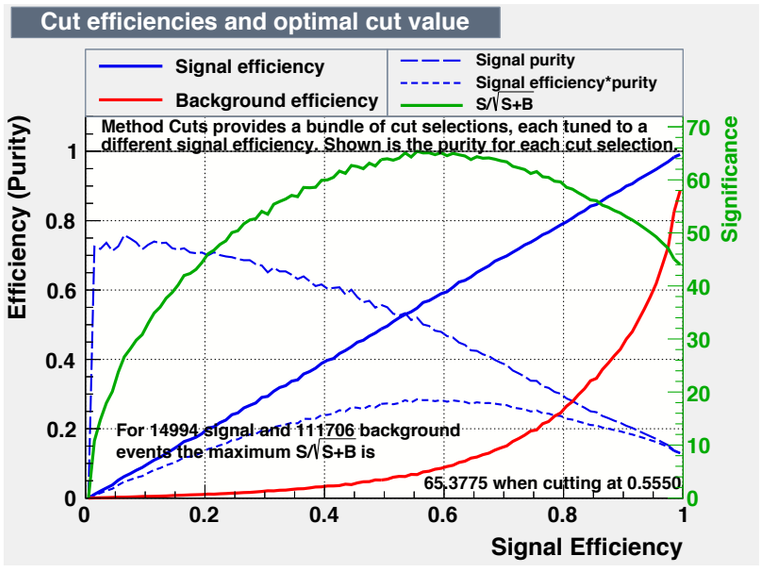
0.5-1.0 GeV



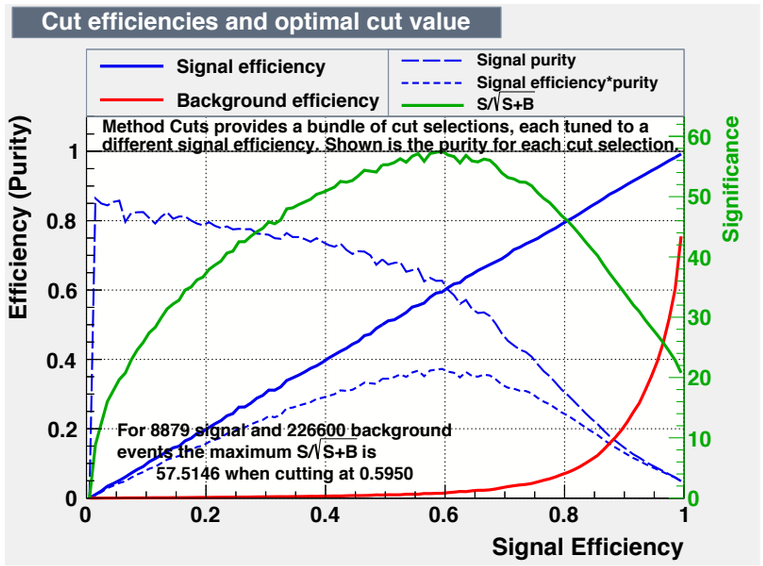
1.0-2.0 GeV



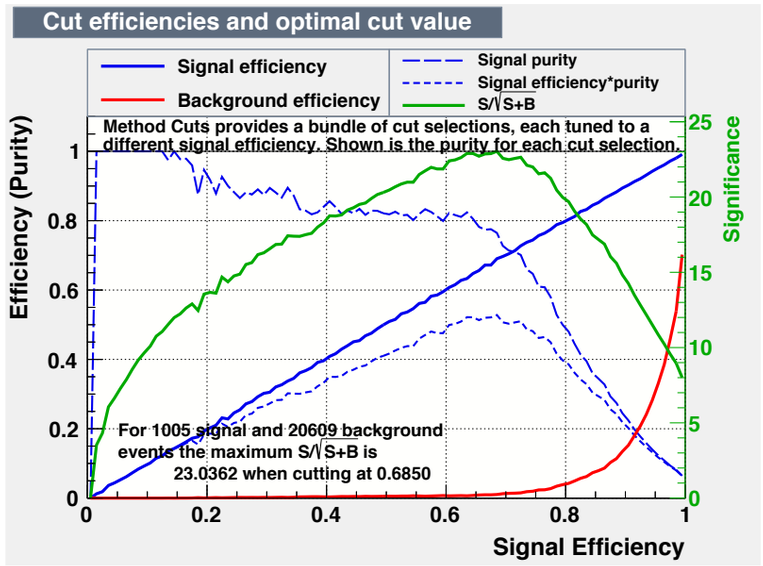
2.0-3.0 GeV



3.0-5.0 GeV

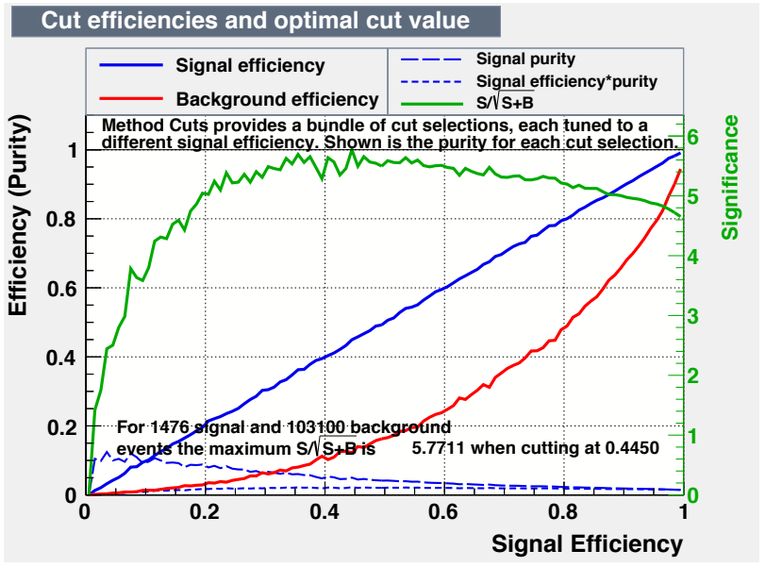


5.0-8.0 GeV

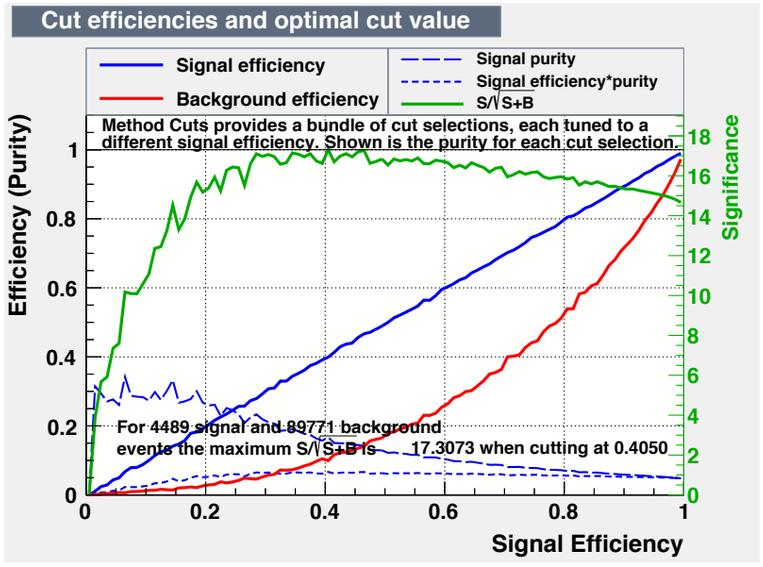


10-20% tuning: scaled to 100M events

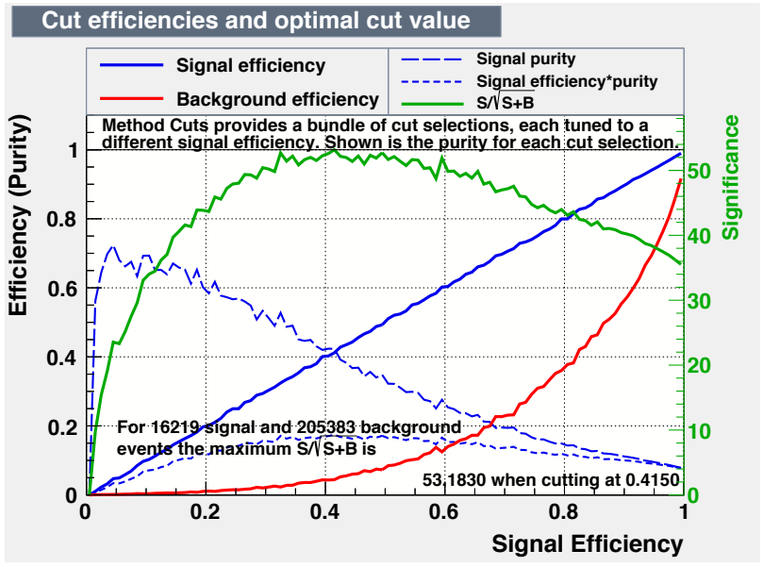
0-0.5 GeV



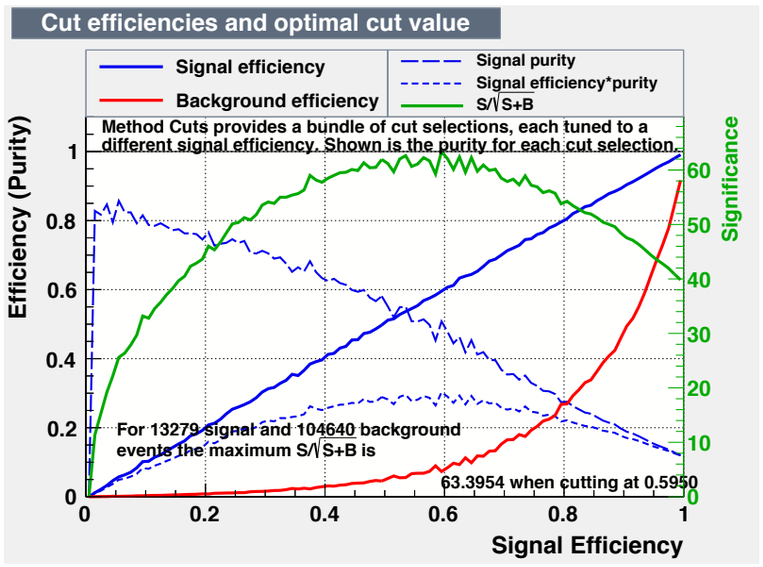
0.5-1.0 GeV



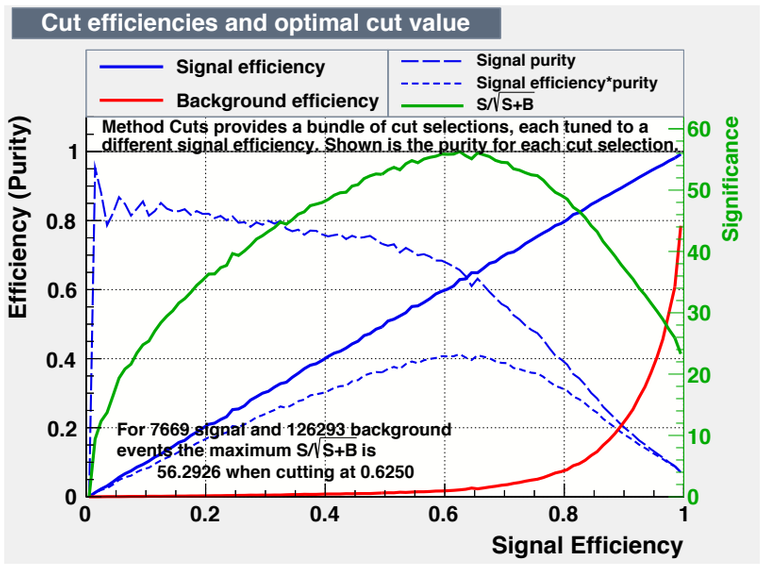
1.0-2.0 GeV



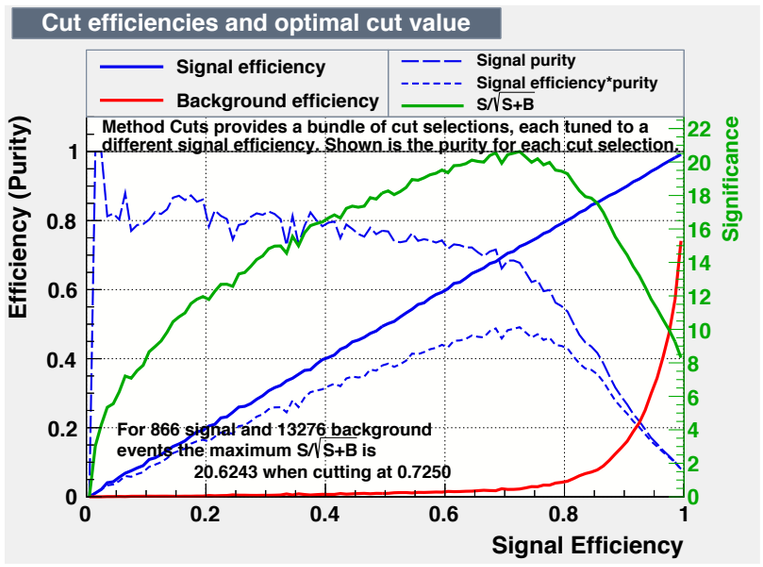
2.0-3.0 GeV



3.0-5.0 GeV

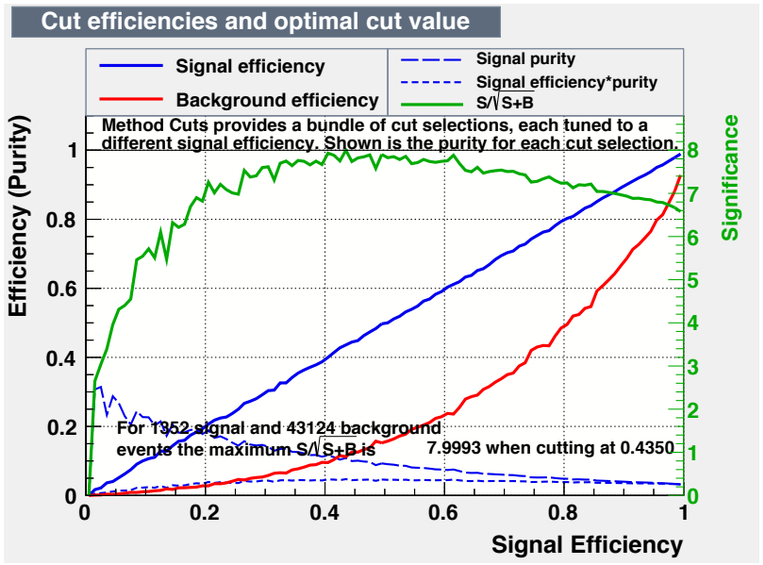


5.0-8.0 GeV

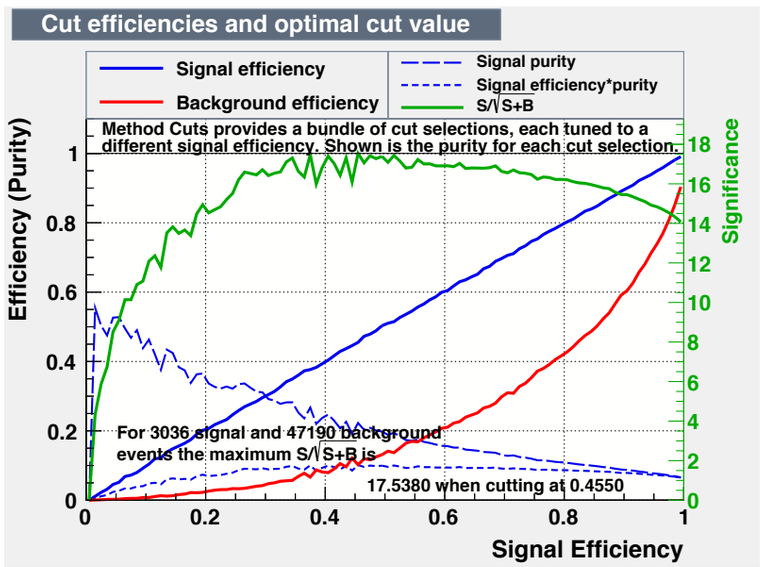


20-40% tuning: scaled to 100M events

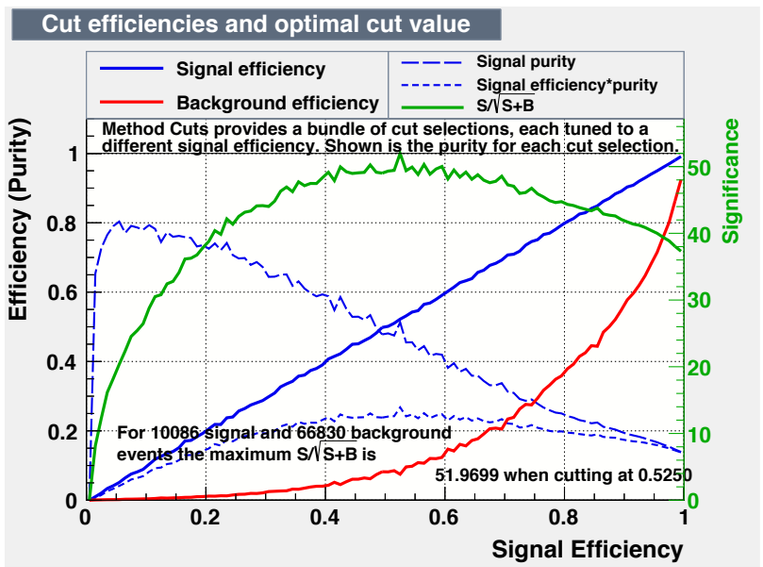
0-0.5 GeV



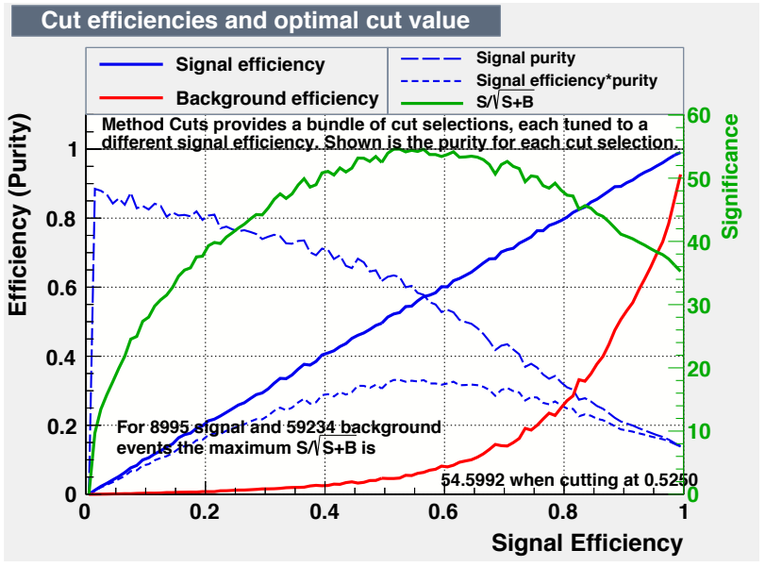
0.5-1.0 GeV



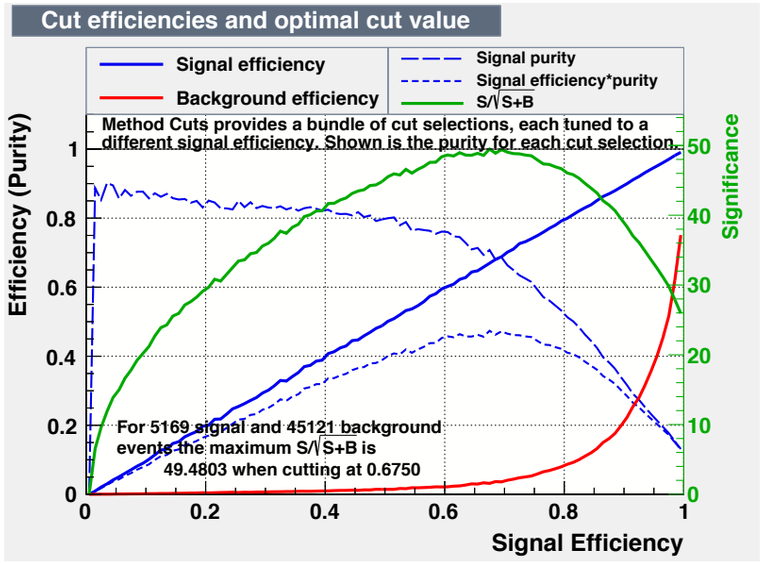
1.0-2.0 GeV



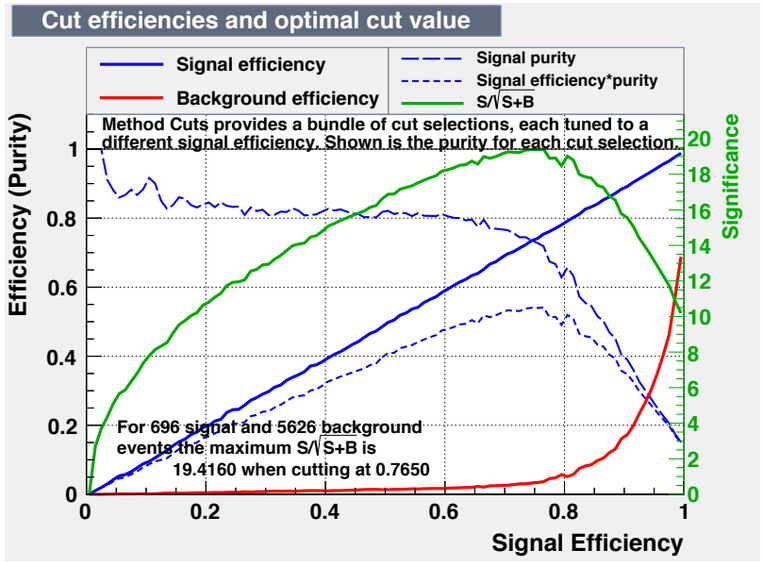
2.0-3.0 GeV



3.0-5.0 GeV

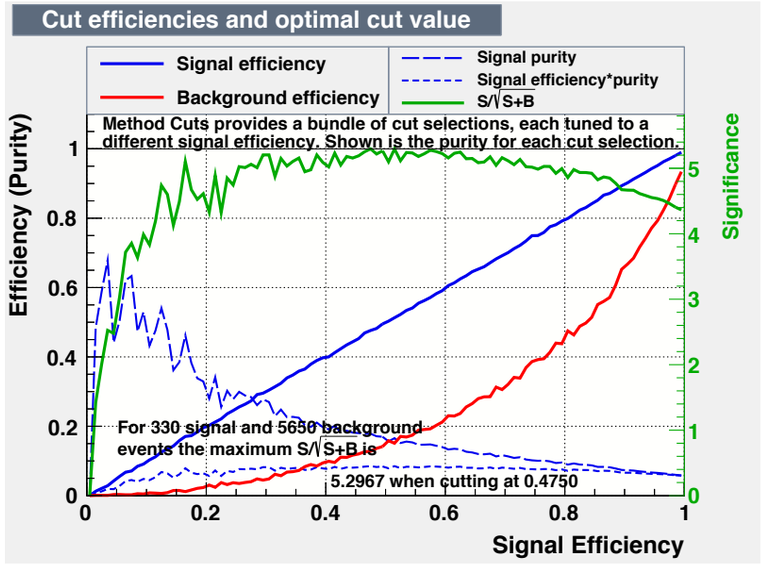


5.0-8.0 GeV

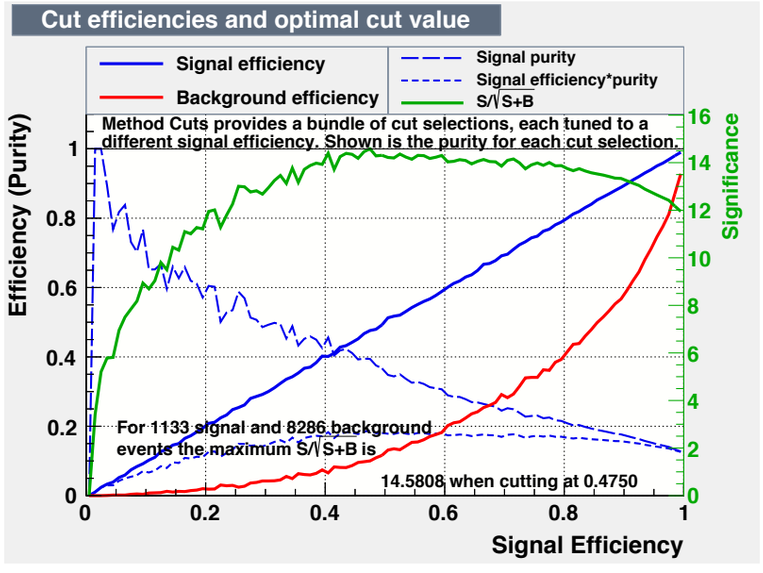


40-60% tuning: scaled to 100M events

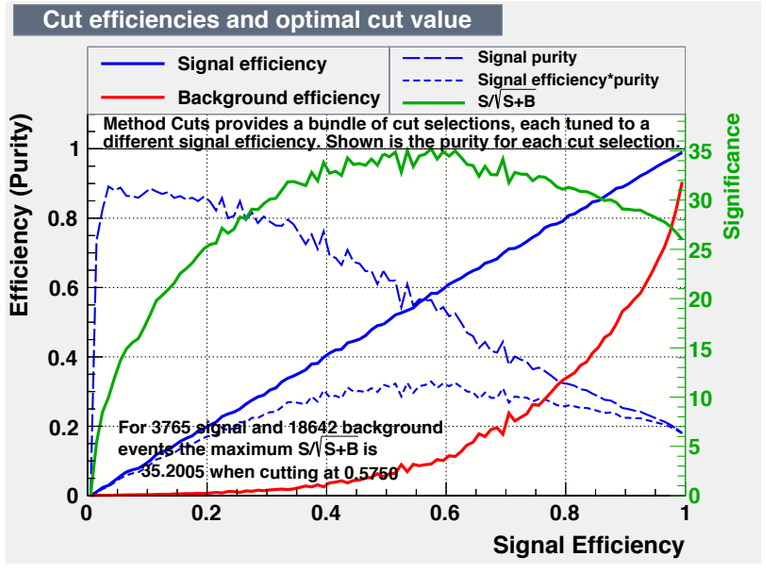
0-0.5 GeV



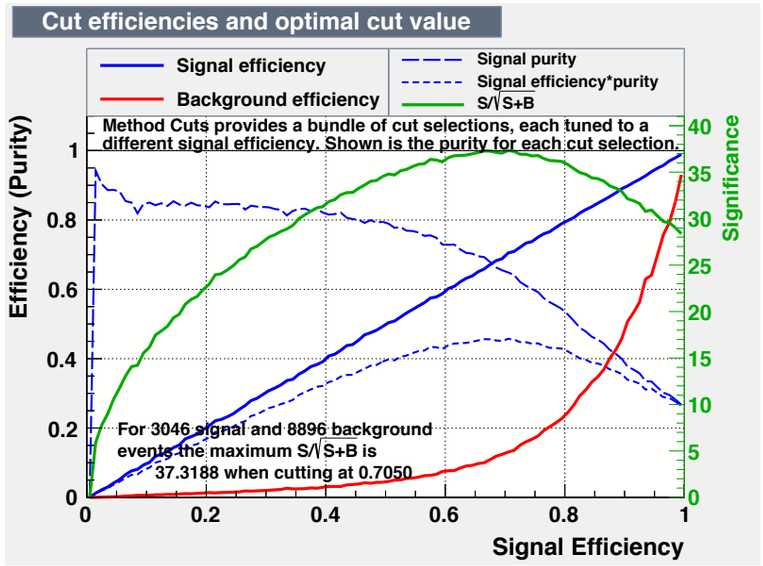
0.5-1.0 GeV



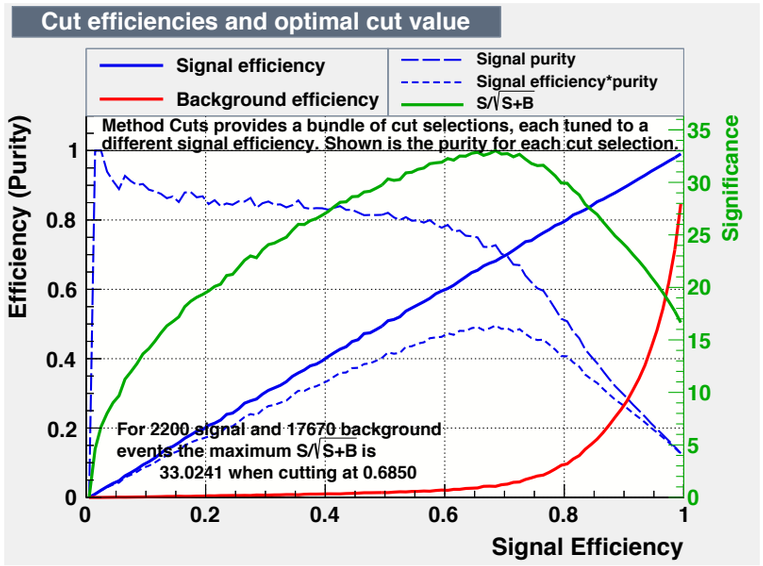
1.0-2.0 GeV



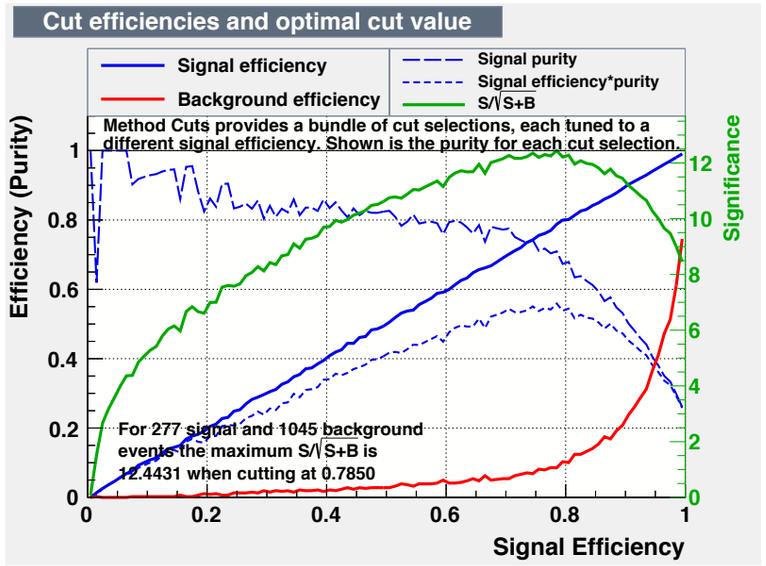
2.0-3.0 GeV



3.0-5.0 GeV

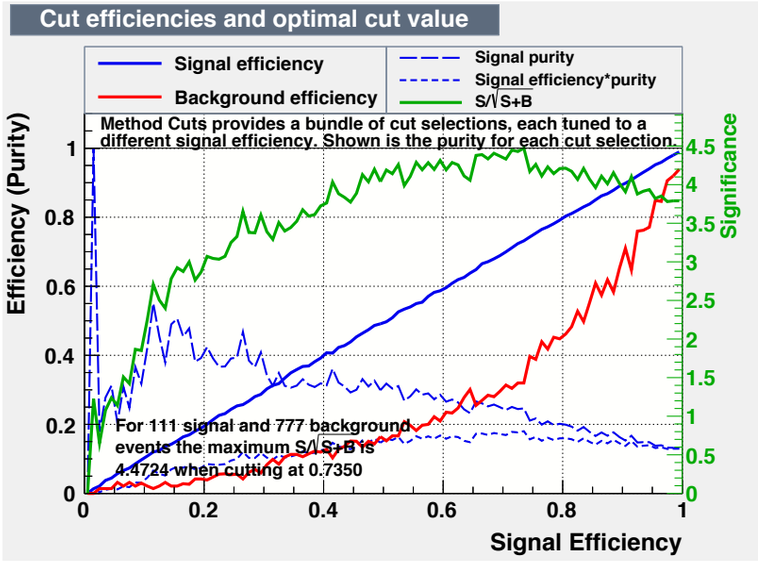


5.0-8.0 GeV

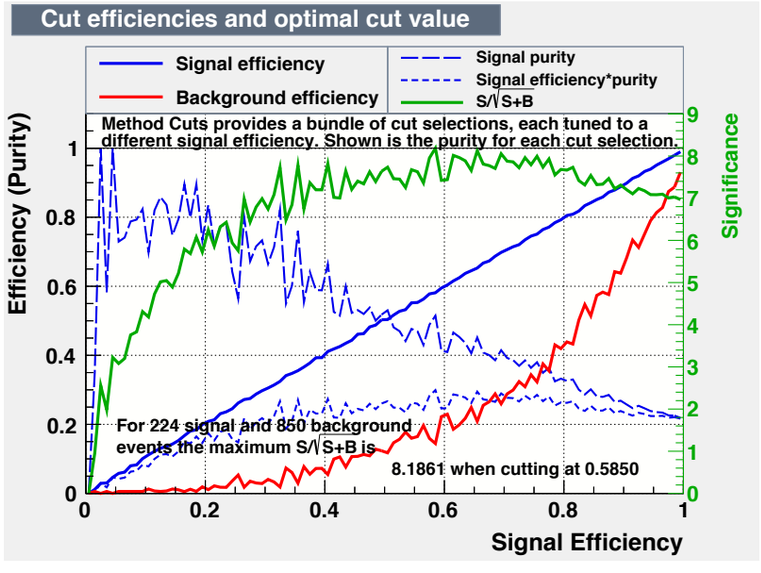


60-80% tuning: scaled to 100M events

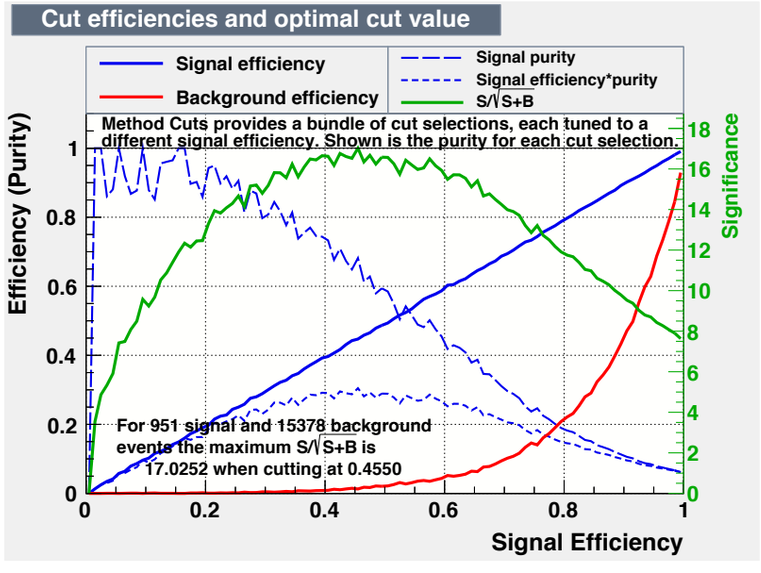
0-0.5 GeV



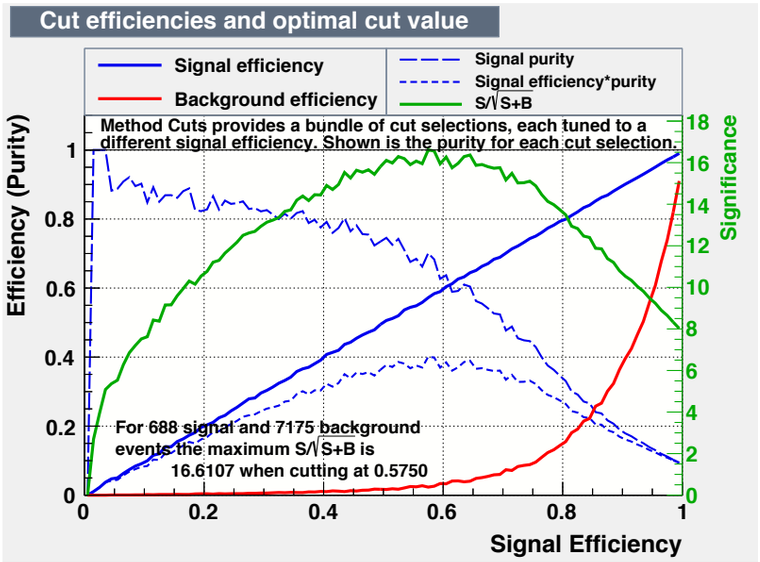
0.5-1.0 GeV



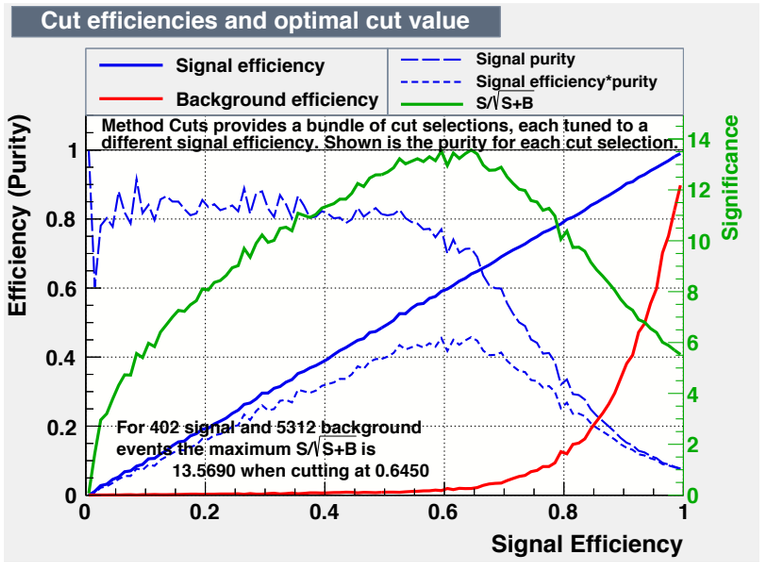
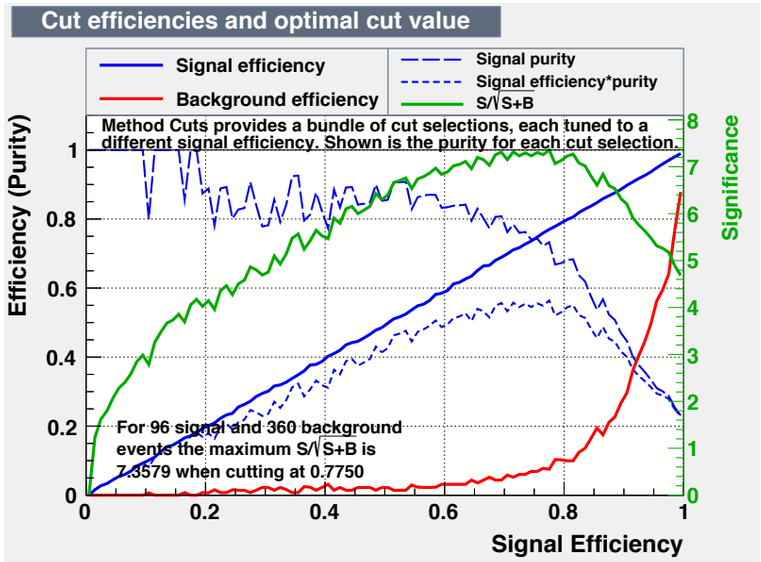
1.0-2.0 GeV



2.0-3.0 GeV



3.0-5.0 GeV



5.0-8.0 GeV