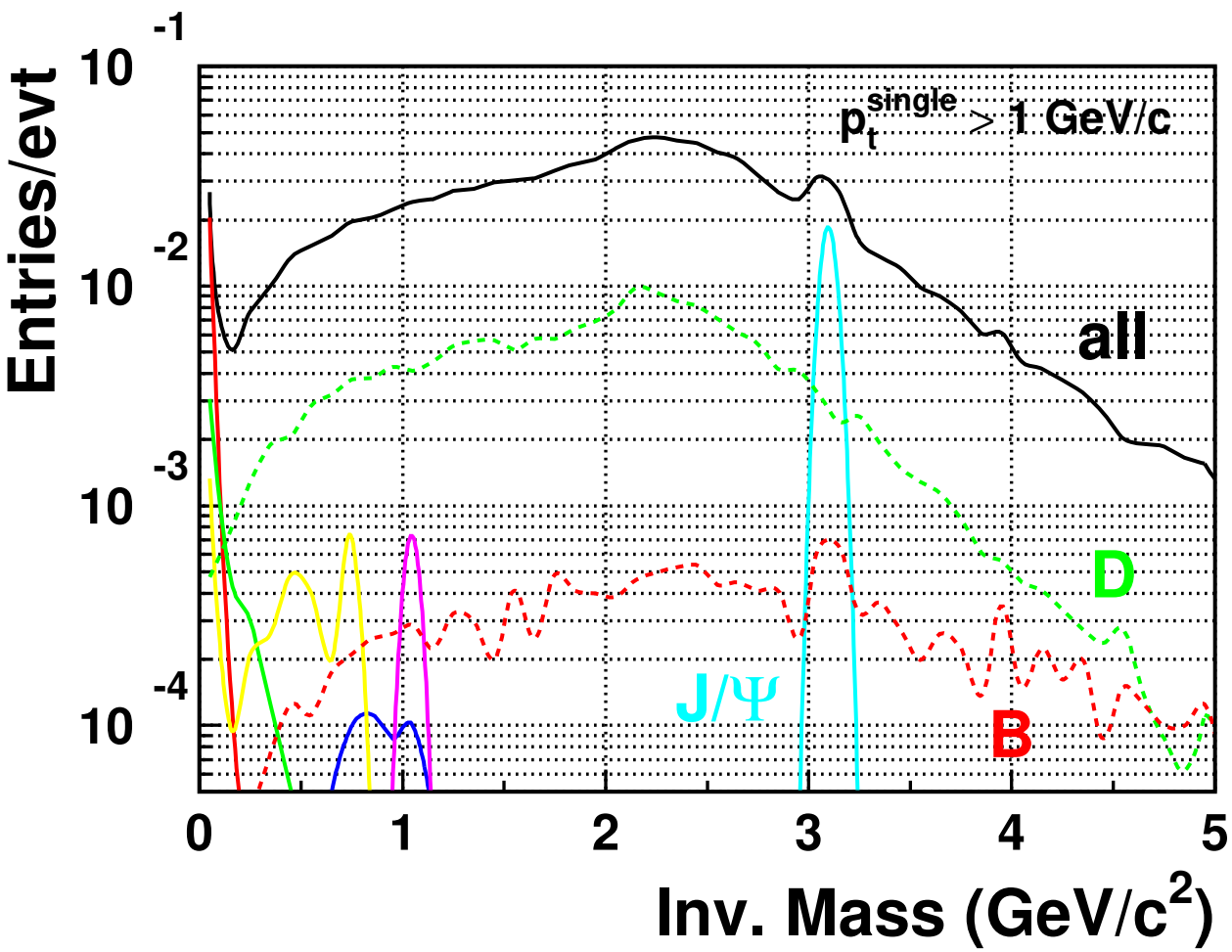
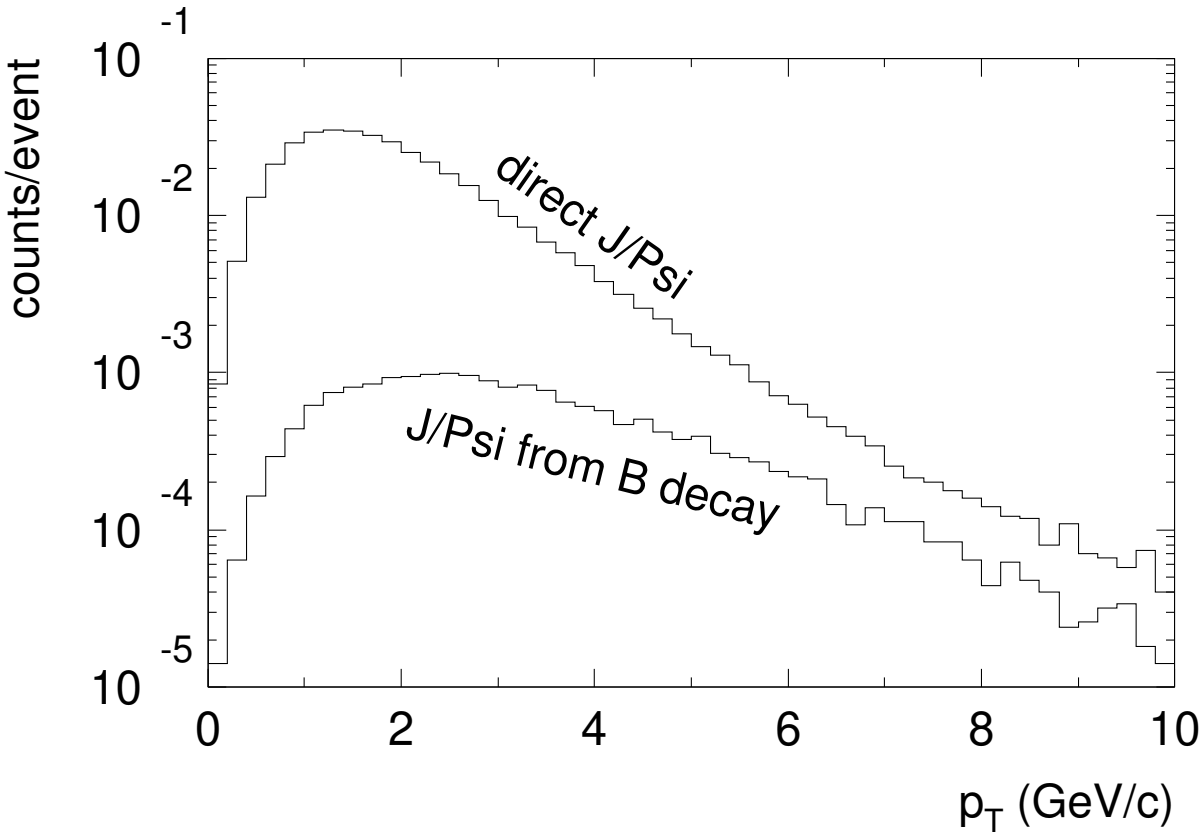
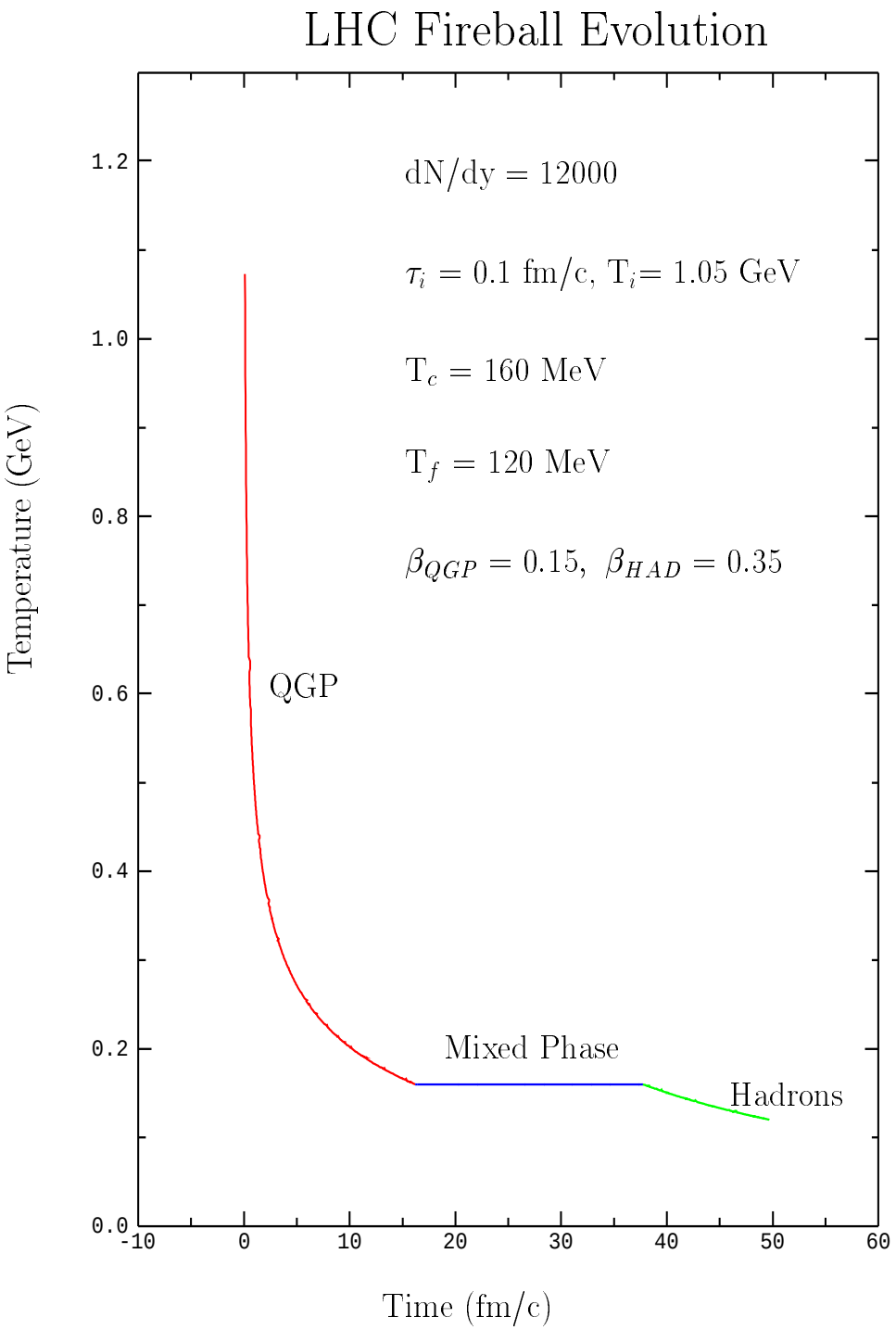
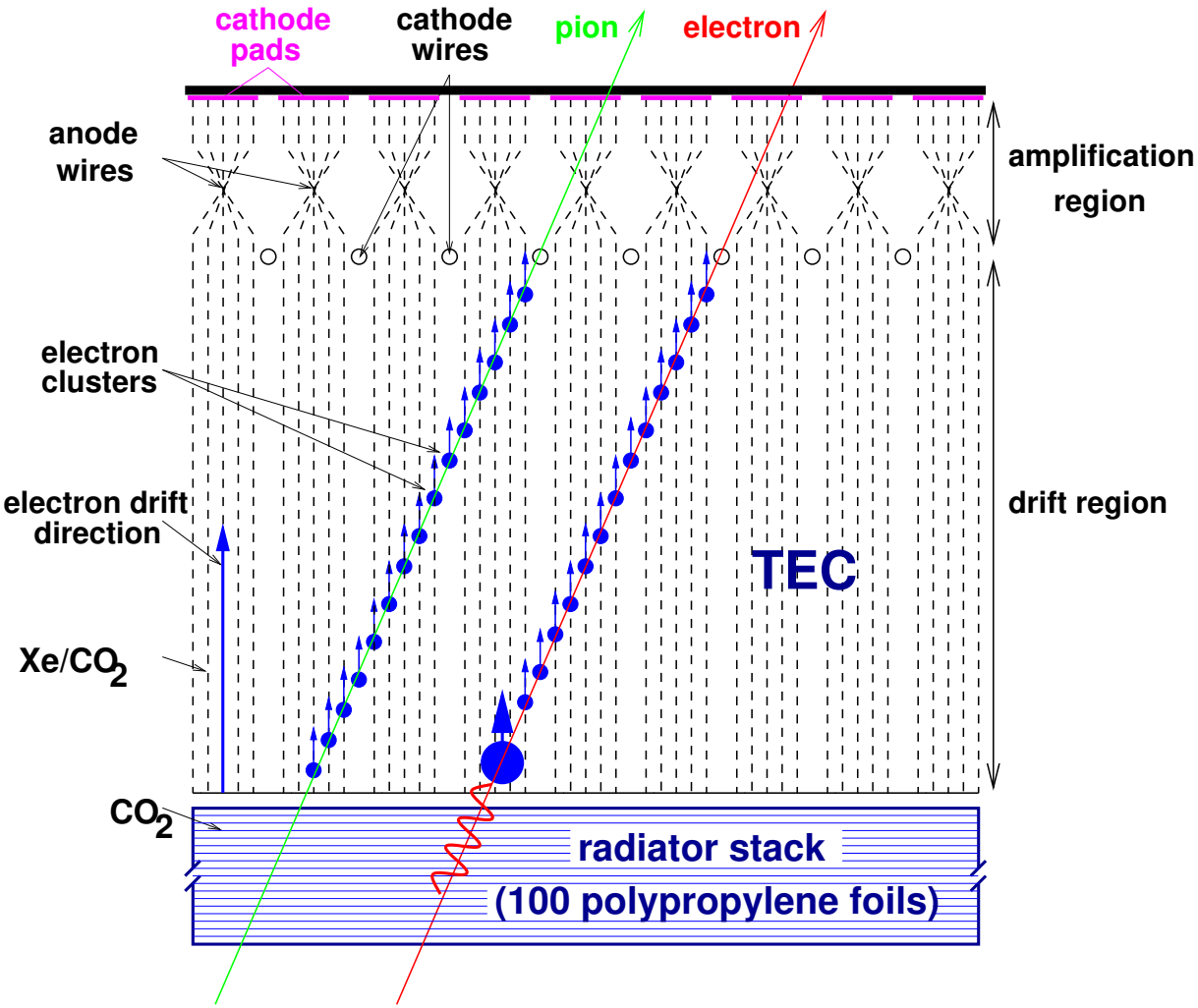
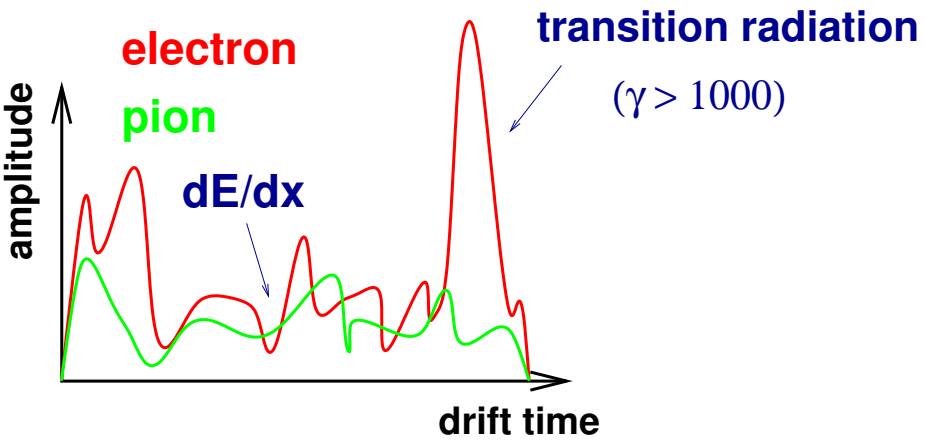
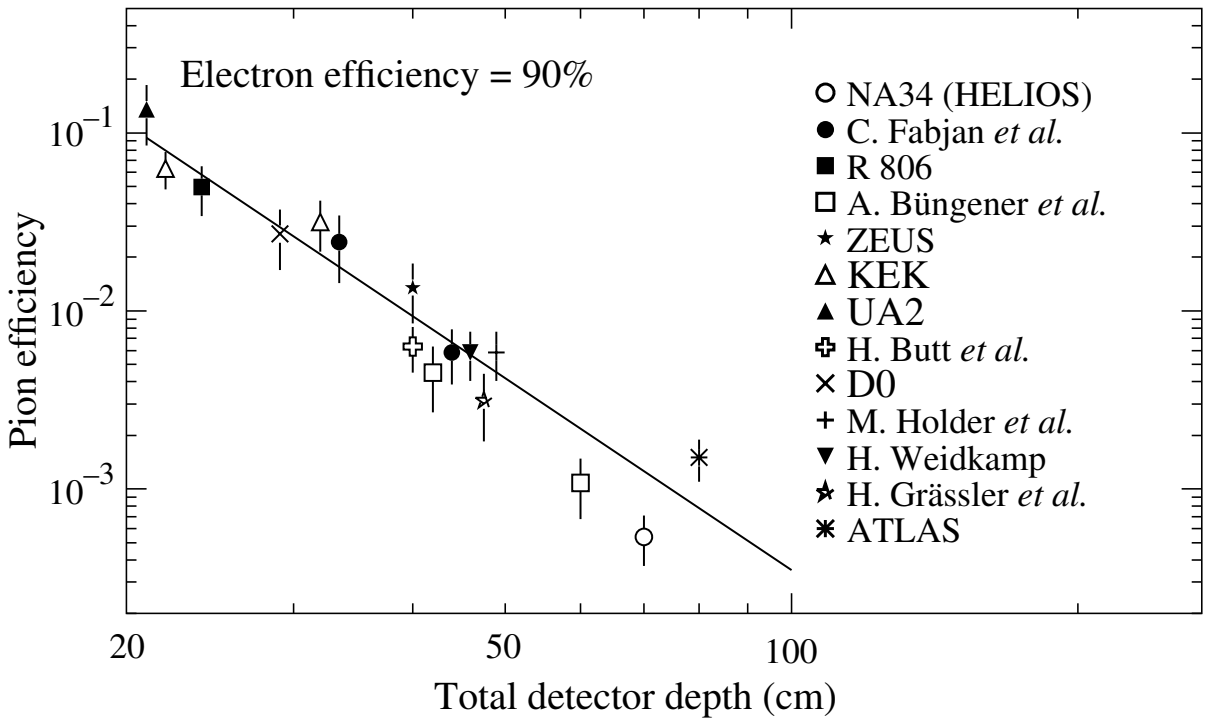

Entries/evt
10^{-1}
10^{-2}
10^{-3}
10^{-4}
$p_t^{single} > 1$ GeV/c
all
D
J/Ψ
B
0
1
2
3
4
5
Inv. Mass (GeV/c^2)

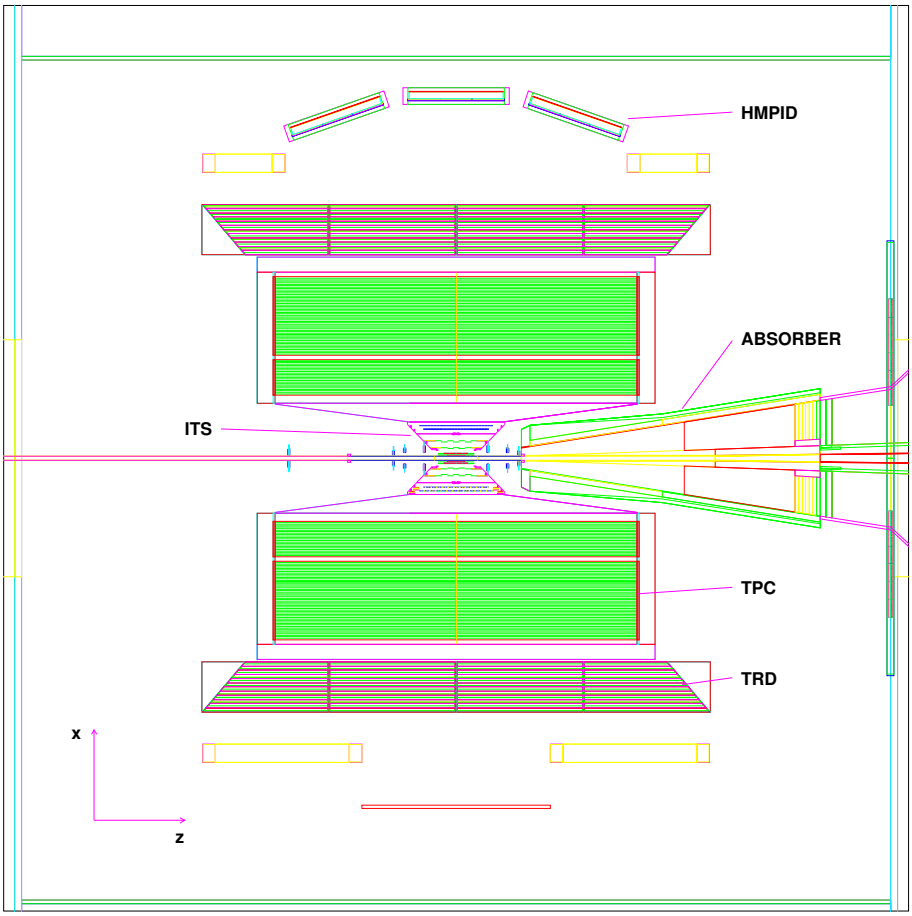

counts/event
10^-1
10^-2
10^-3
10^-4
10^-5
0
2
4
6
8
10
p_T (GeV/c)
direct J/Psi
J/Psi from B decay

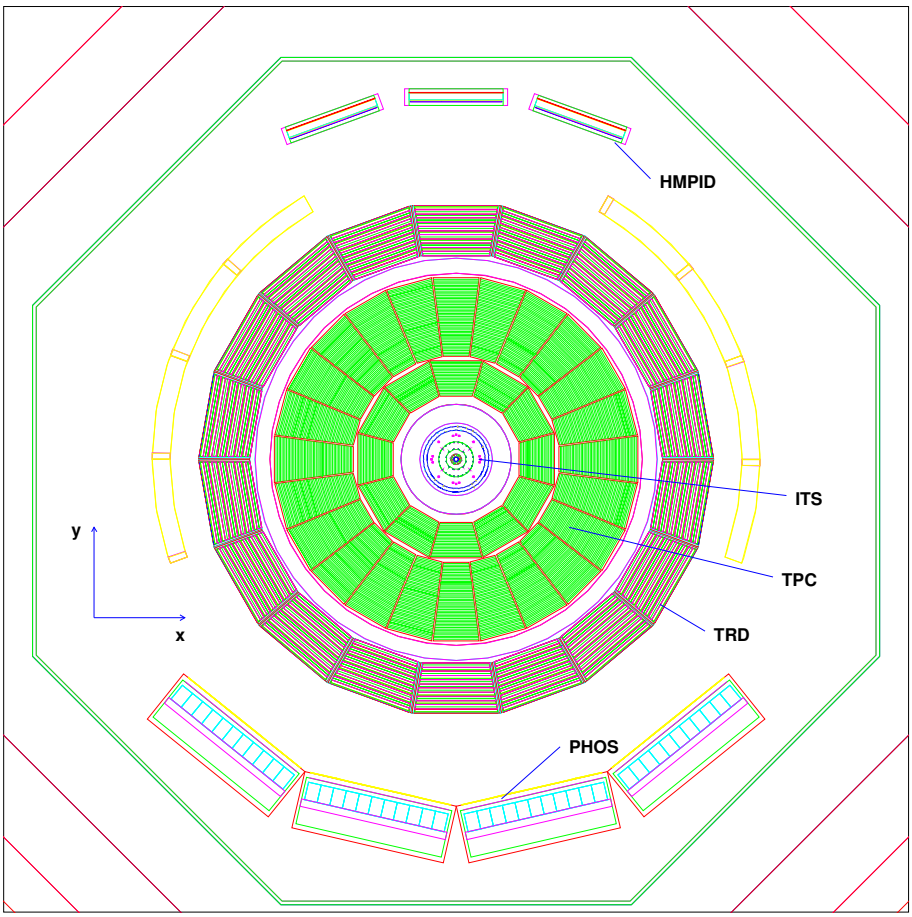

LHC Fireball Evolution
dN/dy = 12000
τ_i = 0.1 fm/c, T_i= 1.05 GeV
T_c = 160 MeV
T_f = 120 MeV
$\beta_{QGP} = 0.15,\ \beta_{HAD} = 0.35$
QGP
Mixed Phase
Hadrons
Temperature (GeV)
Time (fm/c)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
-10
0
10
20
30
40
50
60

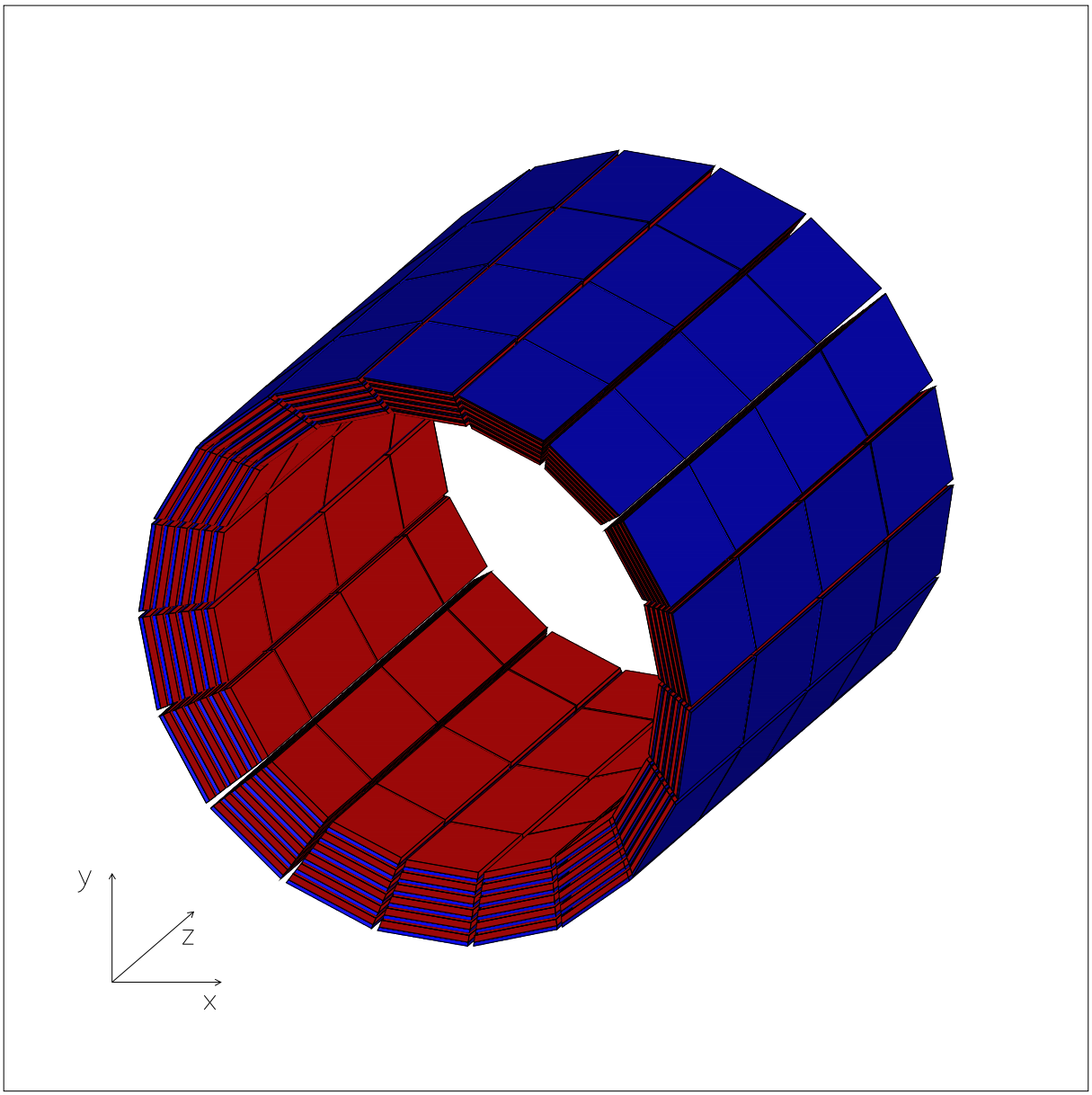

cathode pads
cathode wires
pion
electron
anode wires
amplification region
electron clusters
electron drift direction
drift region
TEC
Xe/CO2
CO2
radiator stack
(100 polypropylene foils)

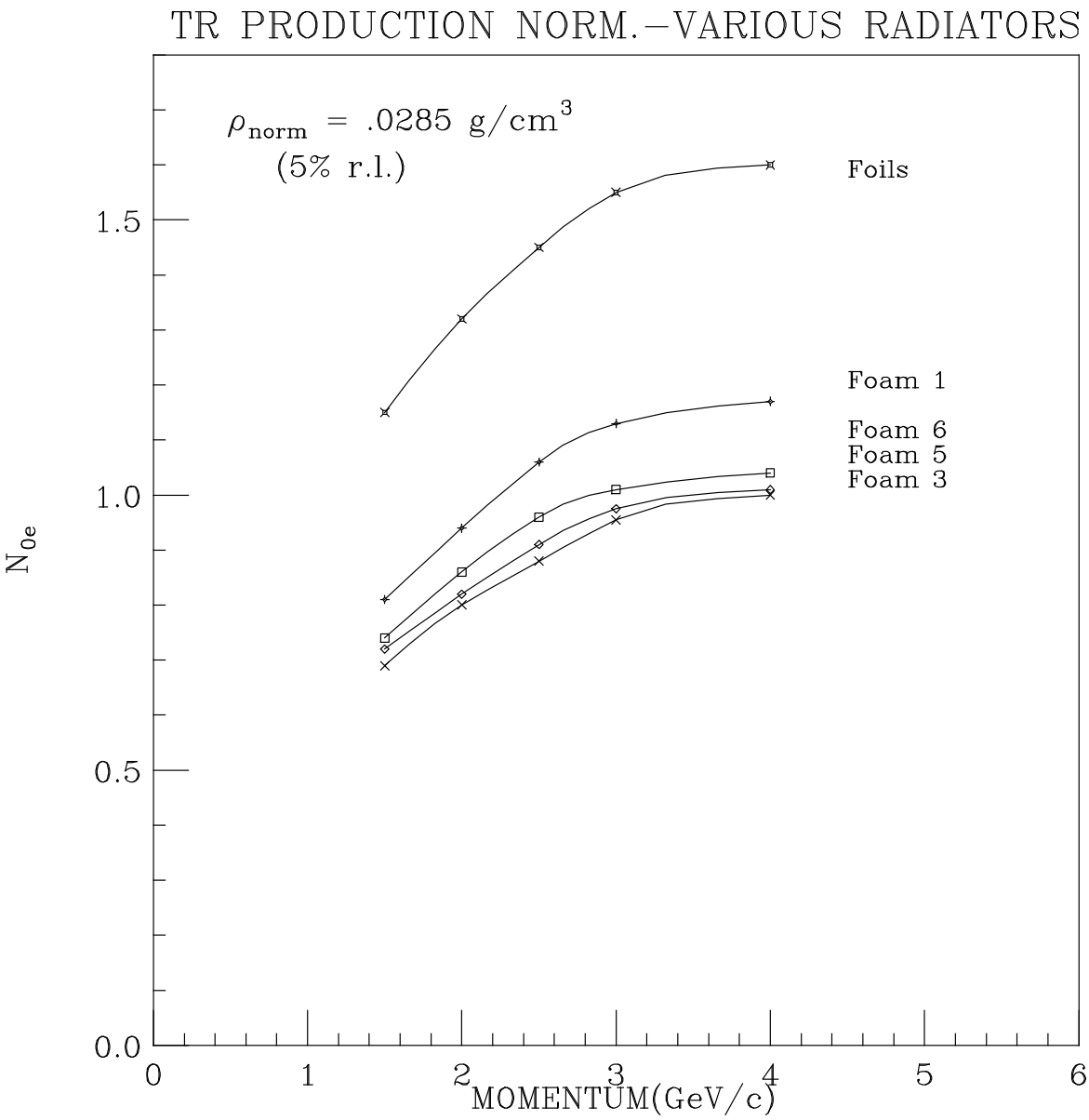

electron
pion
dE/dx
transition radiation
(γ > 1000)
amplitude
drift time

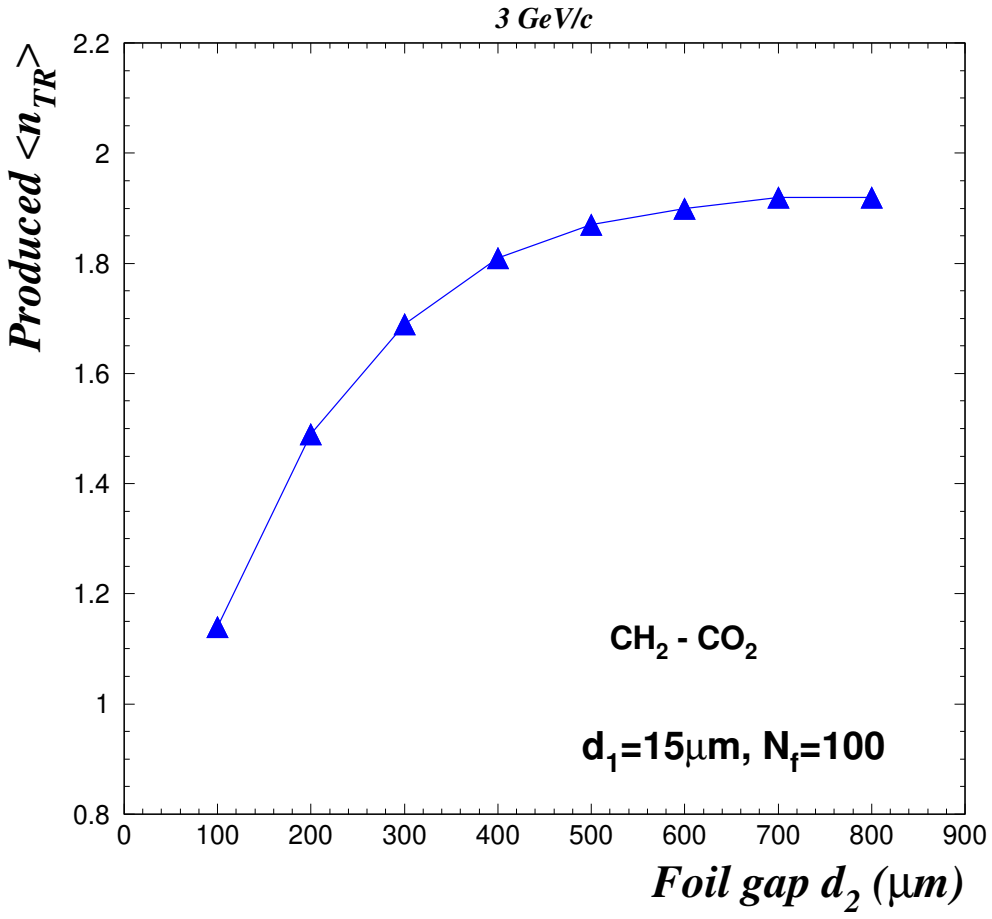

Electron efficiency = 90%
Pion efficiency
10^{-1}
10^{-2}
10^{-3}
20
50
100
Total detector depth (cm)
NA34 (HELIOS)
C. Fabjan *et al.*
R 806
A. Büngener *et al.*
ZEUS
KEK
UA2
H. Butt *et al.*
D0
M. Holder *et al.*
H. Weidkamp
H. Grässler *et al.*
ATLAS

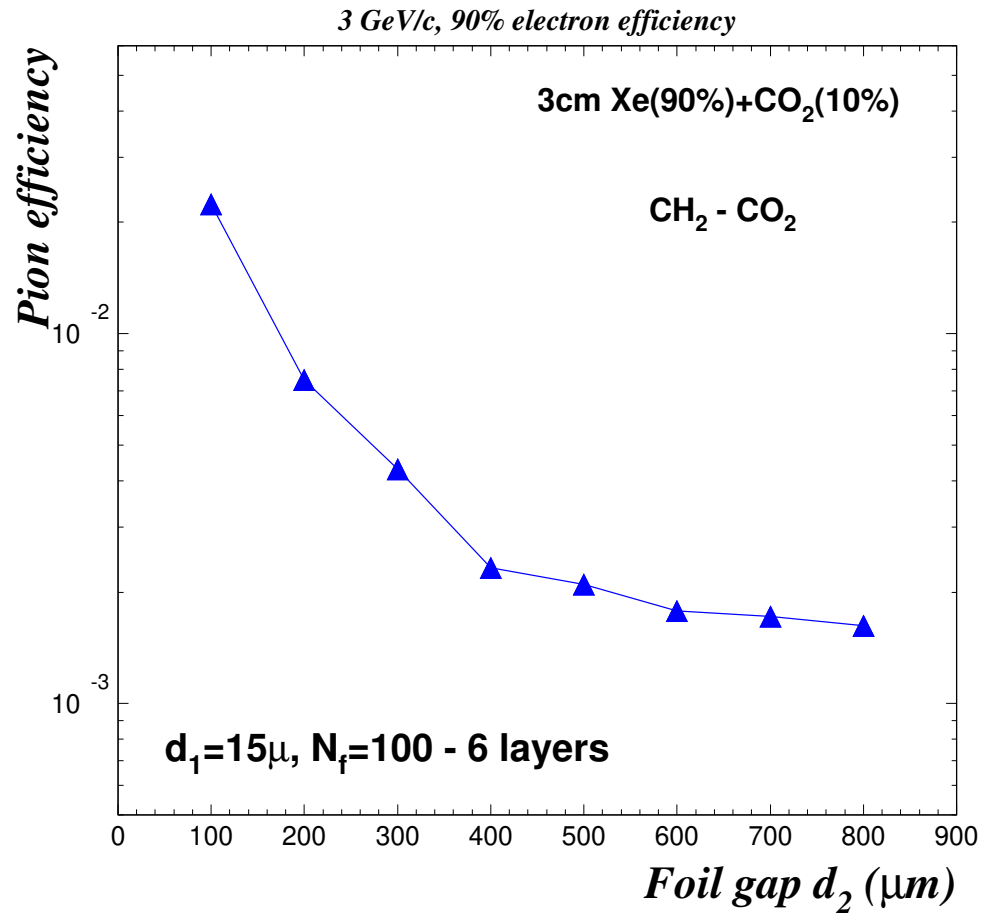

HMPID
ABSORBER
ITS
TPC
TRD
x
z

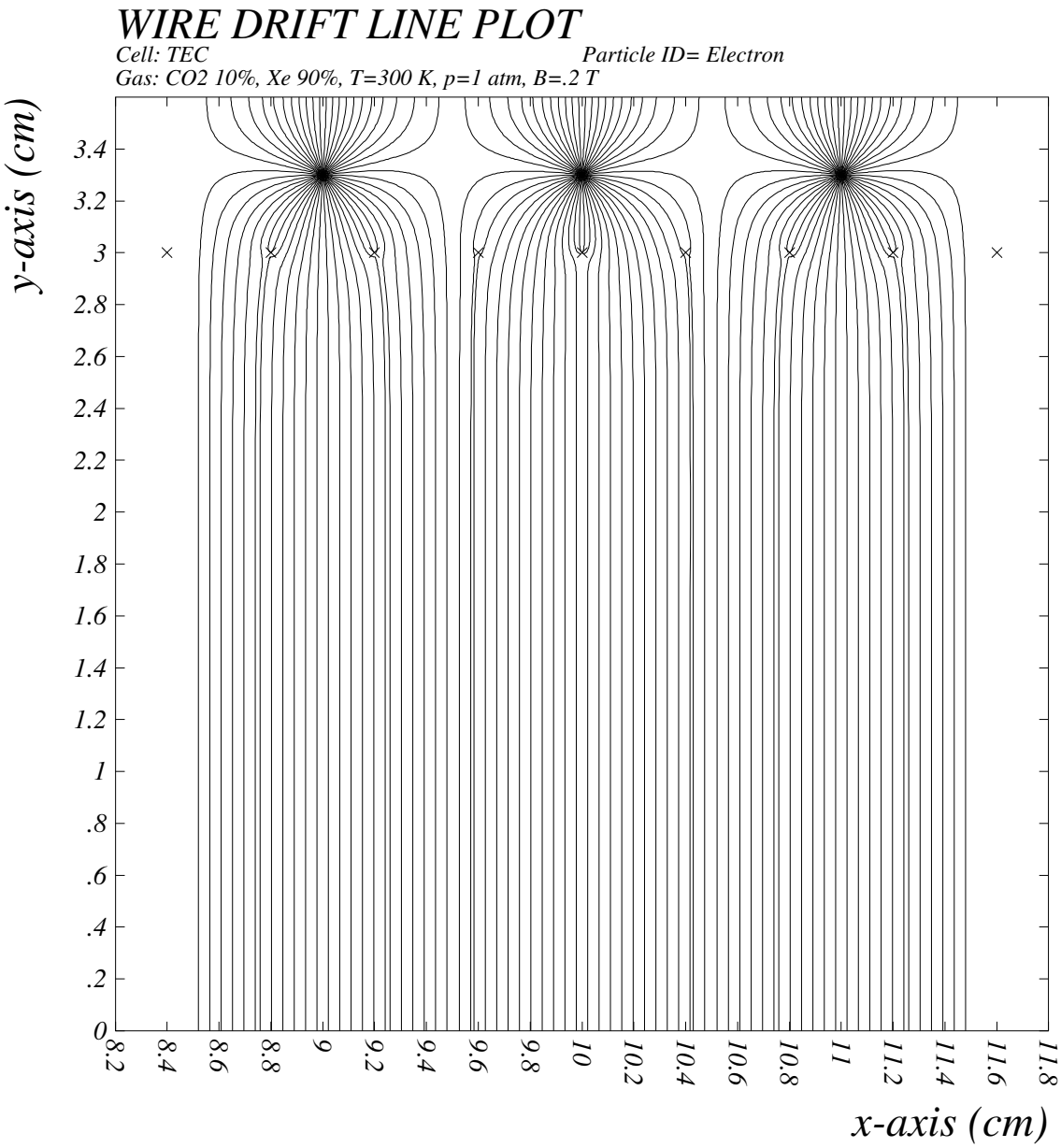

HMPID
ITS
TPC
TRD
PHOS
y
x


y
z
x

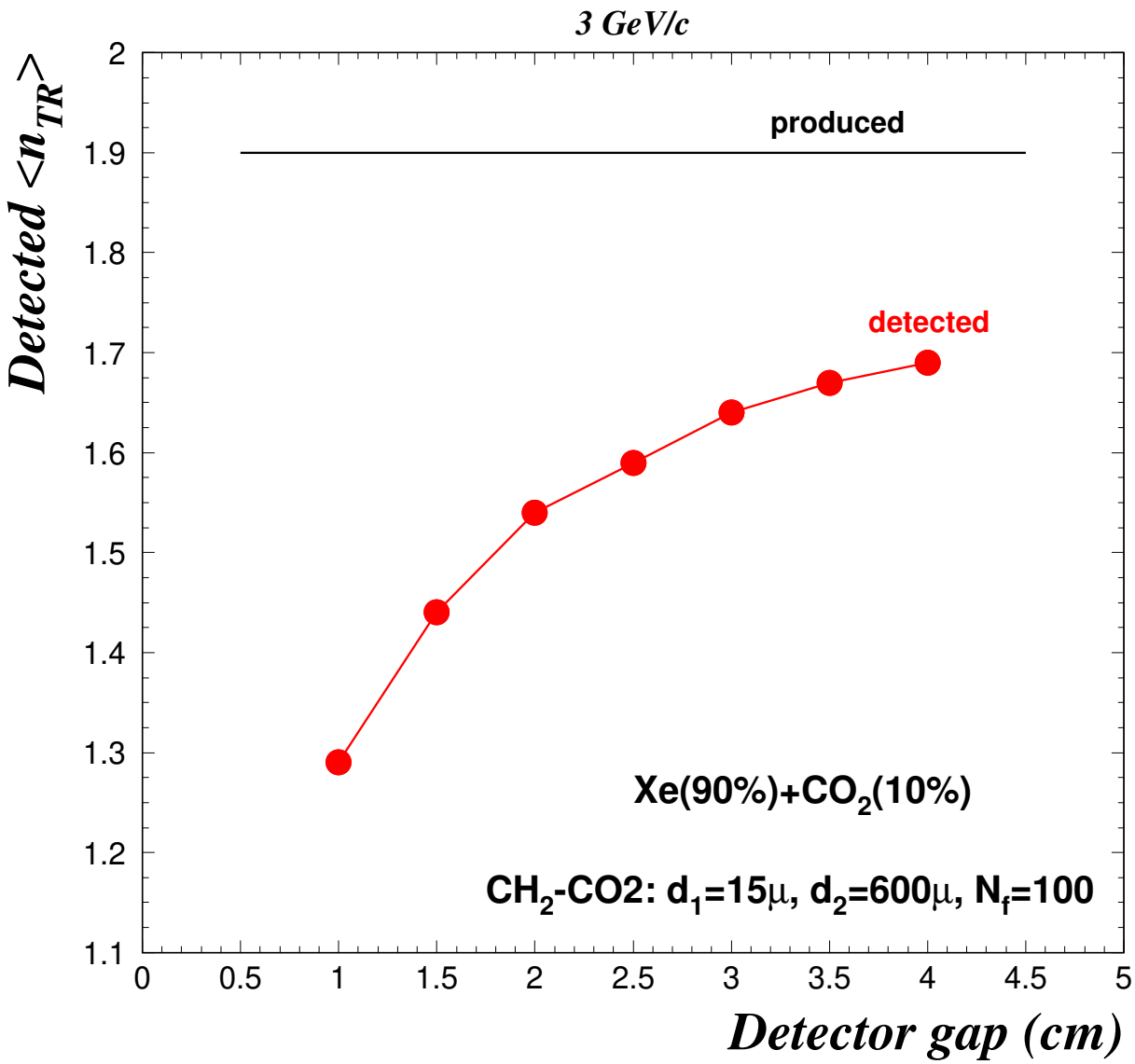

TR PRODUCTION NORM.−VARIOUS RADIATORS
ρ_{norm} = .0285 g/cm^3
(5% r.l.)
Foils
Foam 1
Foam 6
Foam 5
Foam 3
N_{0e}
0.0
0.5
1.0
1.5
0
1
2
3
4
5
6
MOMENTUM(GeV/c)

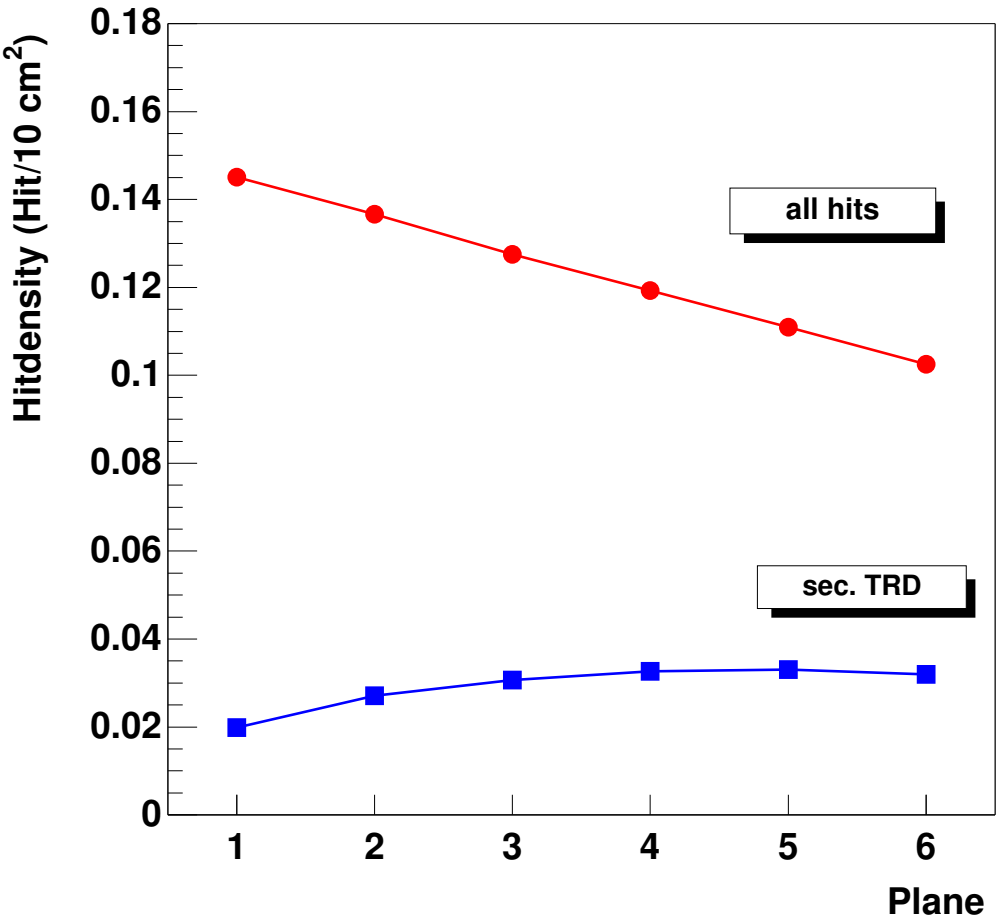

3 GeV/c
Produced <n_{TR}>
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0
100
200
300
400
500
600
700
800
900
CH_2 - CO_2
d_1=15μm, N_f=100
Foil gap d_2 (μm)

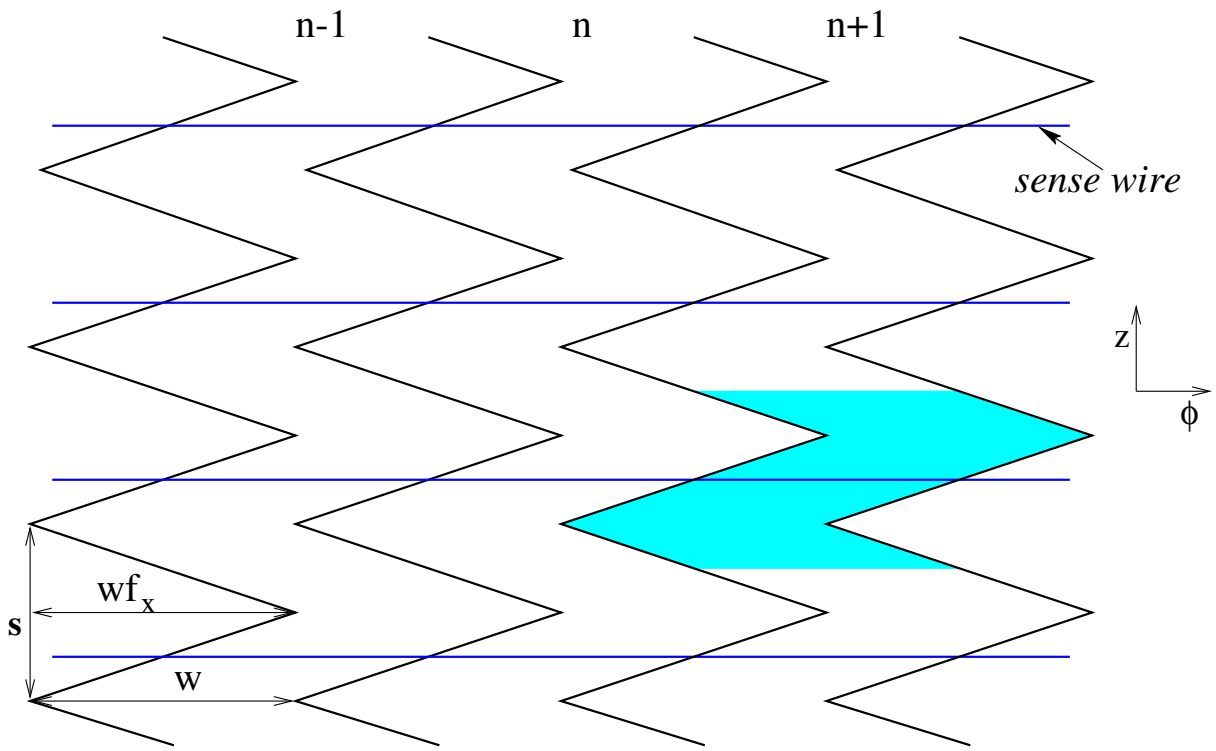

3 GeV/c, 90% electron efficiency
Pion efficiency
10^{-2}
10^{-3}
3cm Xe(90%)+CO_2(10%)
CH_2 - CO_2
d_1=15μ, N_f=100 - 6 layers
0
100
200
300
400
500
600
700
800
900
Foil gap d_2 (μm)

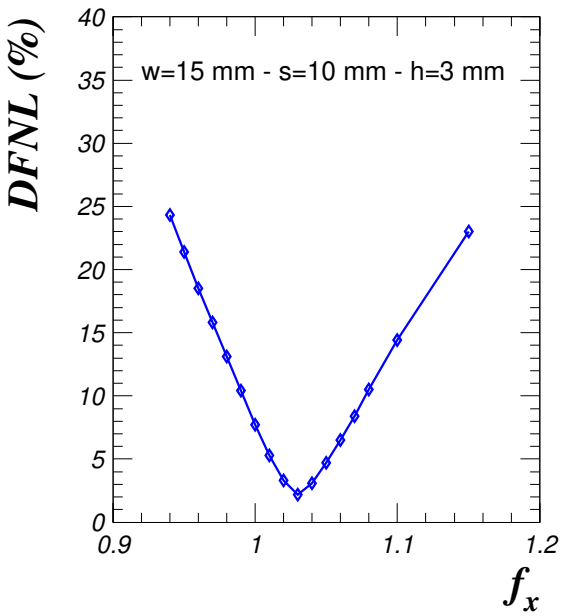


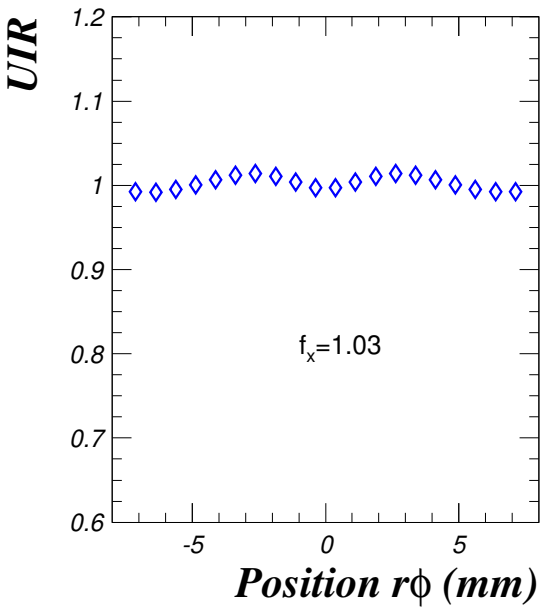
Plotted at 14.32.52 on 20/11/98 with Garfield version 5.04.

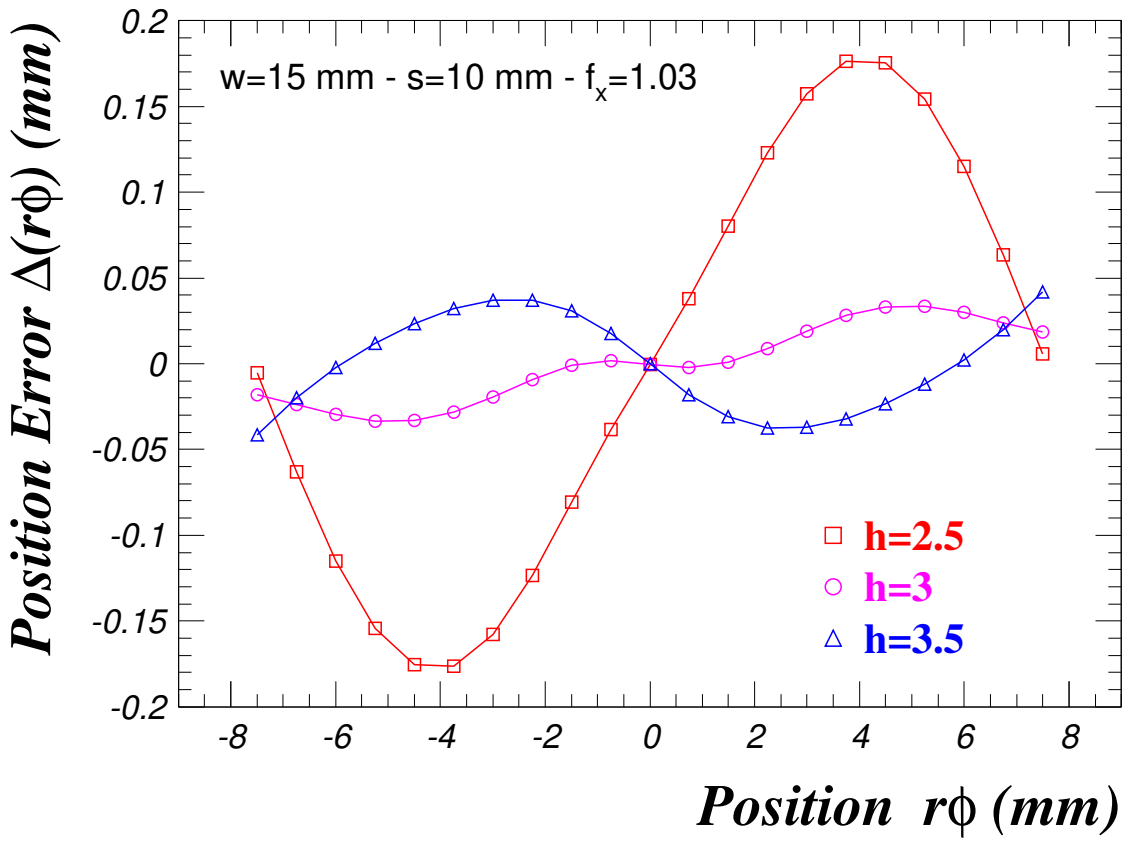

3 GeV/c
Detected <n_{TR}>
produced
detected
Xe(90%)+CO$_2$(10%)
CH$_2$-CO2: d$_1$=15μ, d$_2$=600μ, N$_f$=100
Detector gap (cm)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

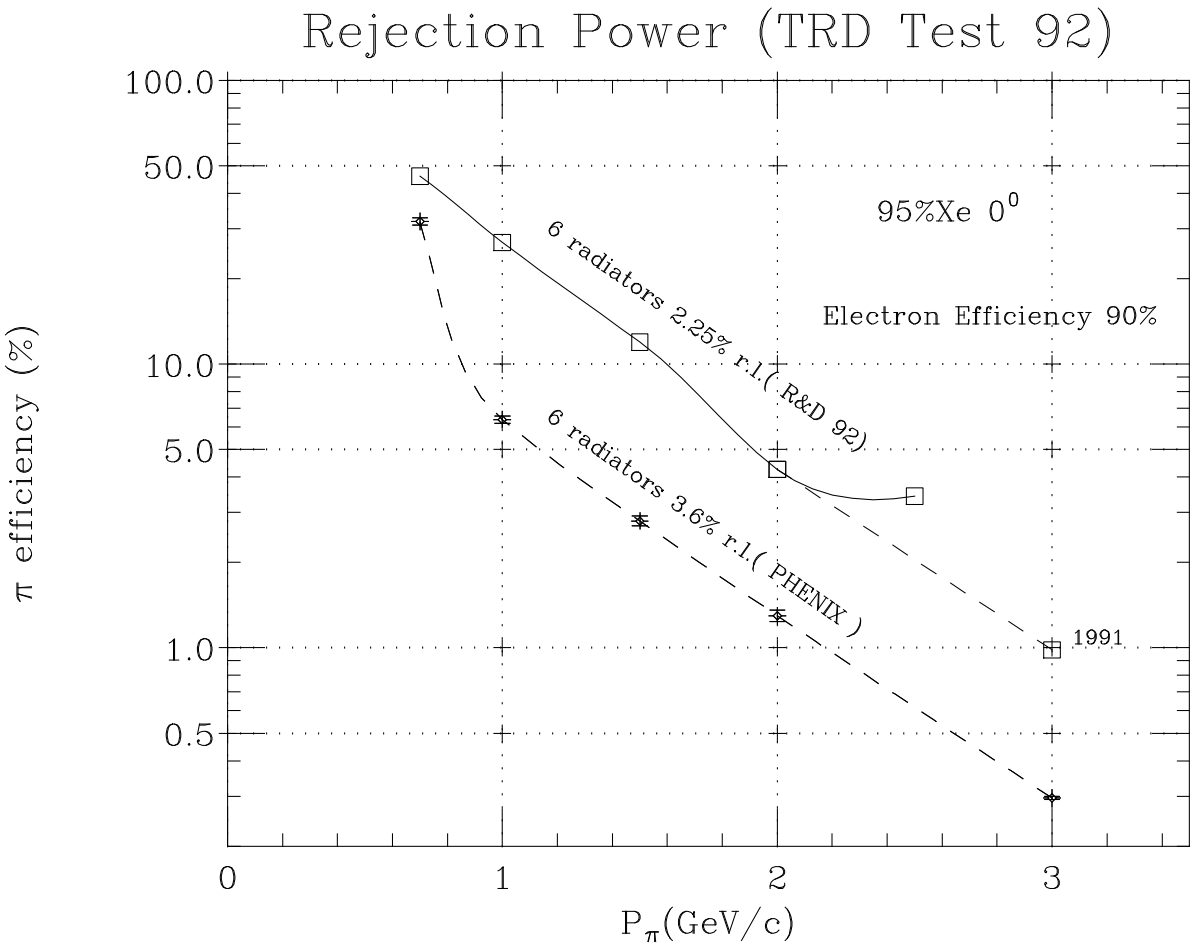

Hitdensity (Hit/10 cm^2)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
Plane
all hits
sec. TRD

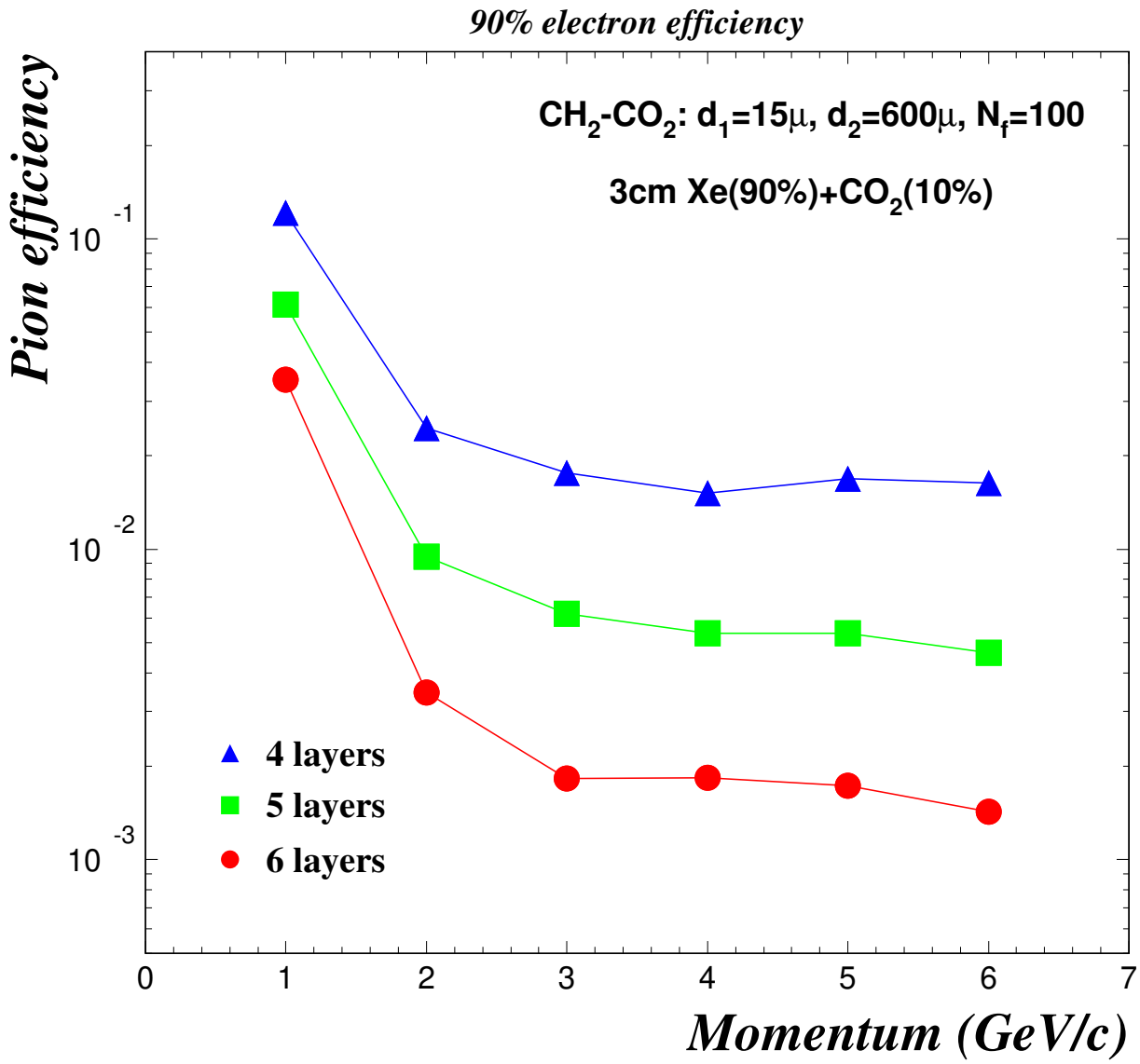

n-1
n
n+1
sense wire
z
ϕ
s
wf$_x$
w

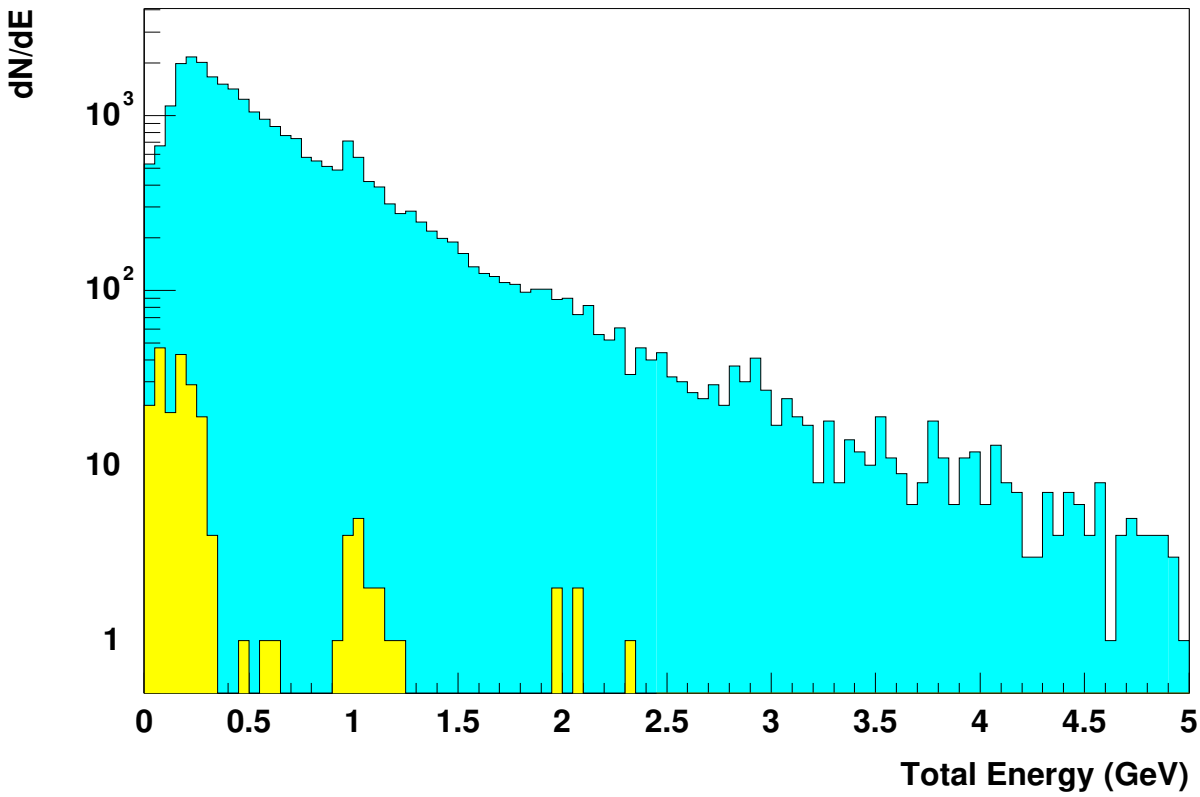

DFNL (%)
w=15 mm - s=10 mm - h=3 mm
40
35
30
25
20
15
10
5
0
0.9
1
1.1
1.2
f_x

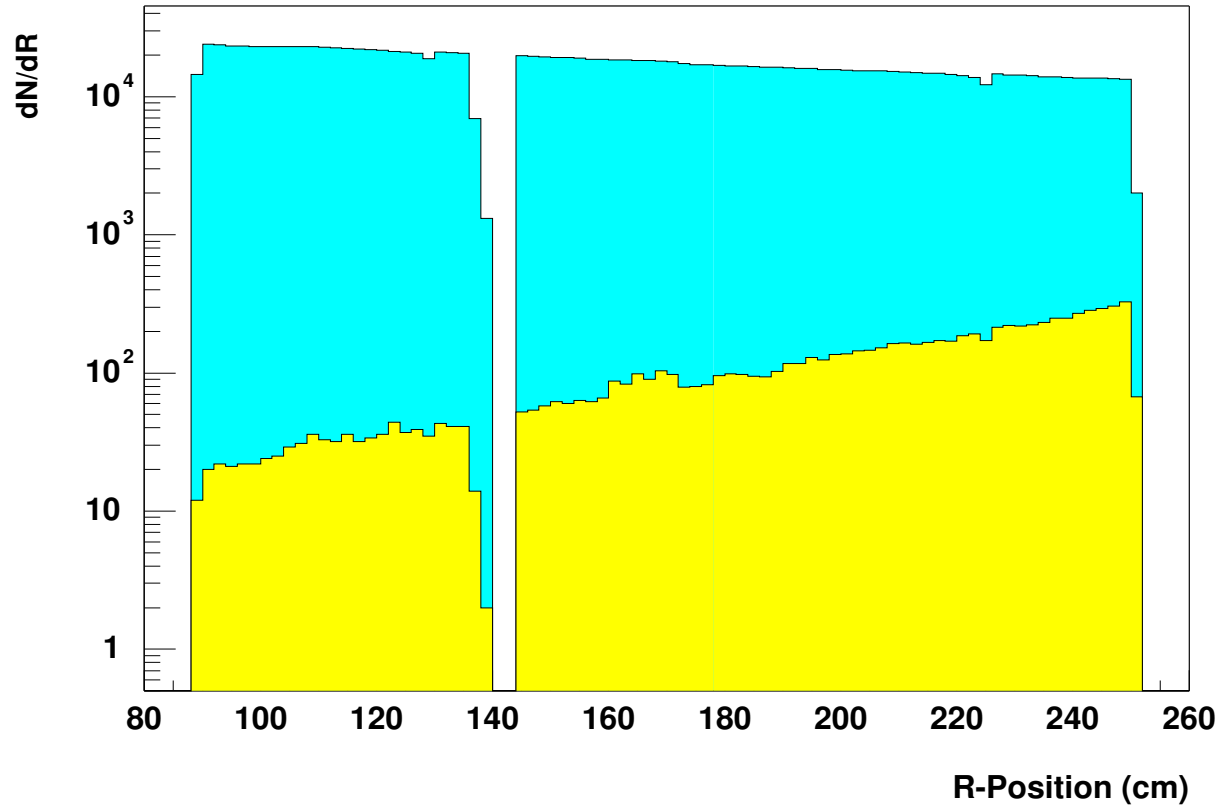

UIR
1.2
1.1
1
0.9
0.8
0.7
0.6
f_x=1.03
-5
0
5
Position rϕ (mm)

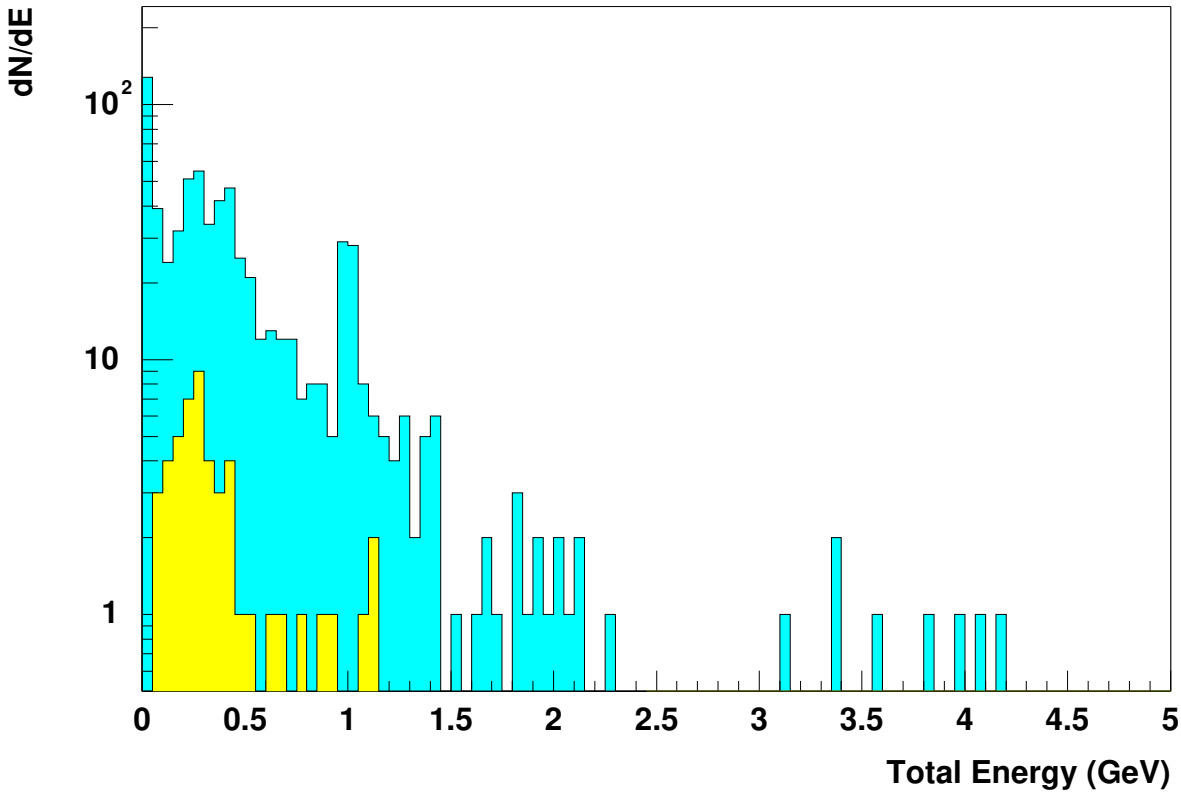

Position Error Δ(rϕ) (mm)
w=15 mm - s=10 mm - f_x=1.03
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-8
-6
-4
-2
0
2
4
6
8
h=2.5
h=3
h=3.5
Position rϕ (mm)

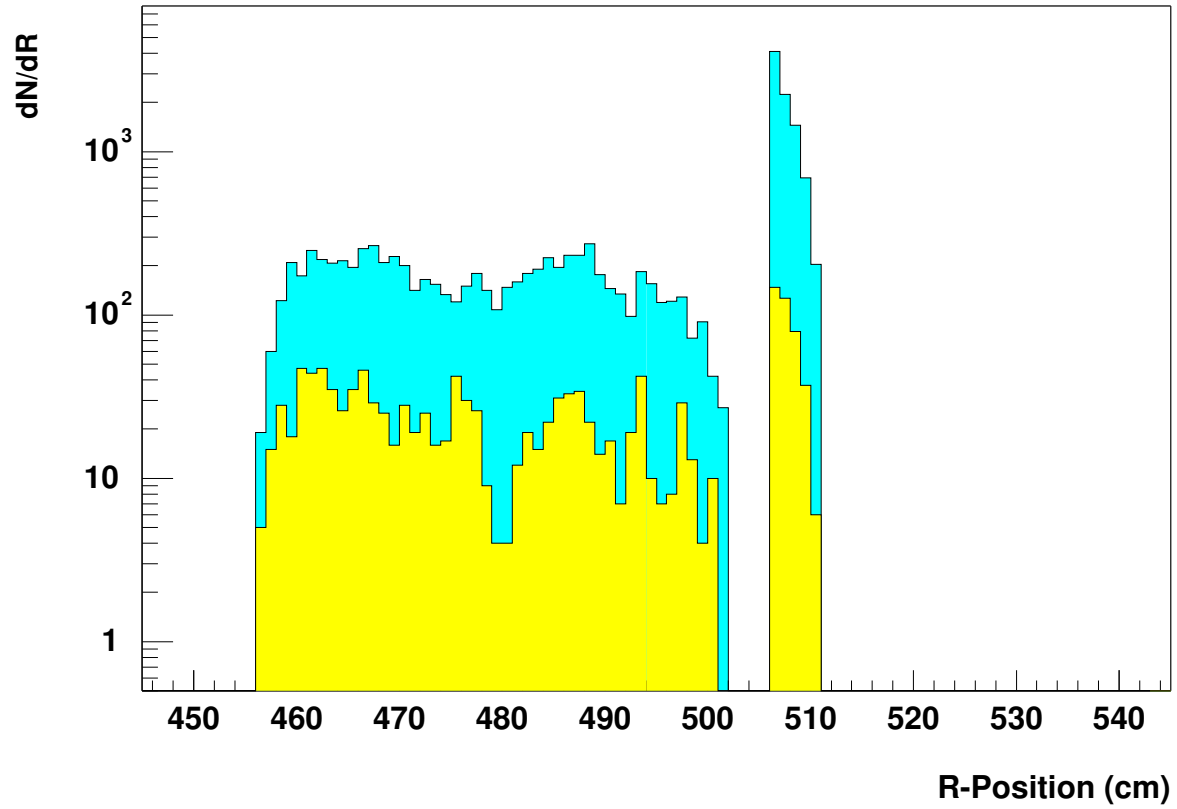

Rejection Power (TRD Test 92)
100.0
50.0
10.0
5.0
1.0
0.5
π efficiency (%)
95%Xe 0⁰
Electron Efficiency 90%
6 radiators 2.25% r.l.(R&D 92)
6 radiators 3.6% r.l.(PHENIX)
1991
0
1
2
3
P_π(GeV/c)

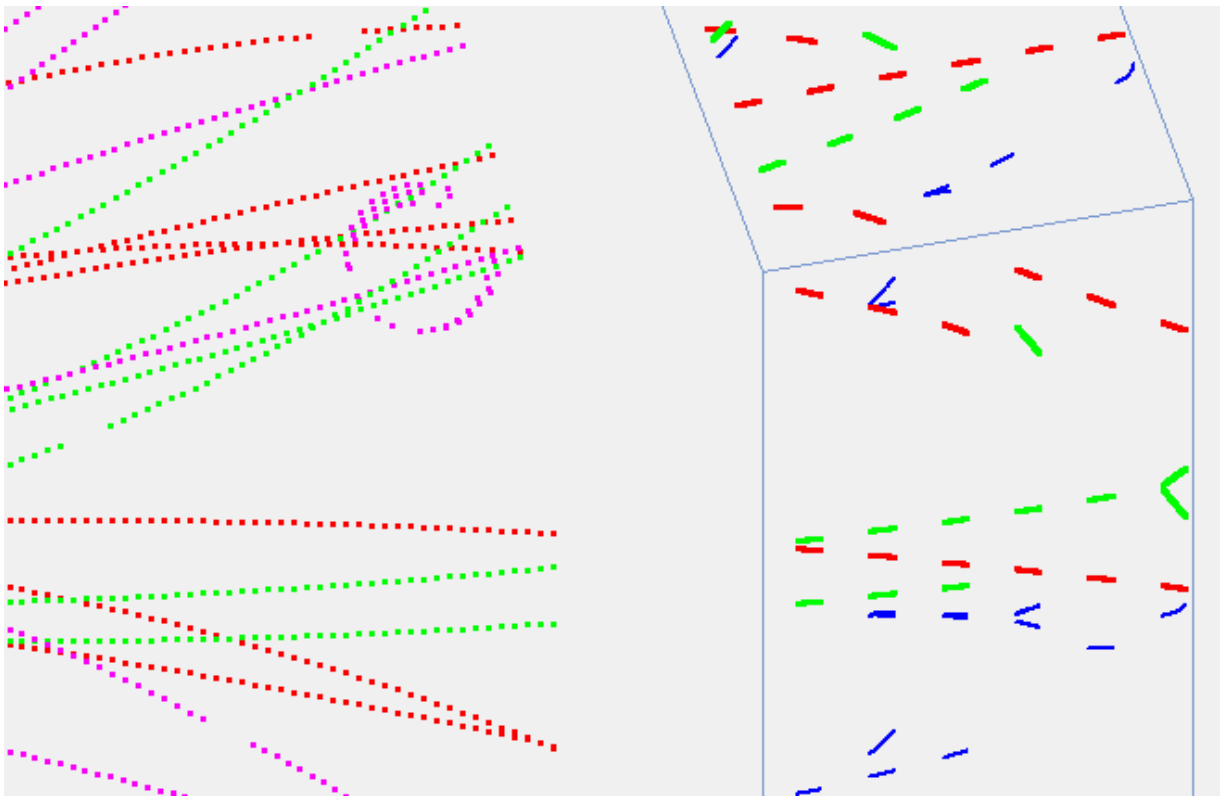

90% electron efficiency
Pion efficiency
CH2-CO2: d1=15μ, d2=600μ, Nf=100
3cm Xe(90%)+CO2(10%)
4 layers
5 layers
6 layers
10 -1
10 -2
10 -3
0
1
2
3
4
5
6
7
Momentum (GeV/c)

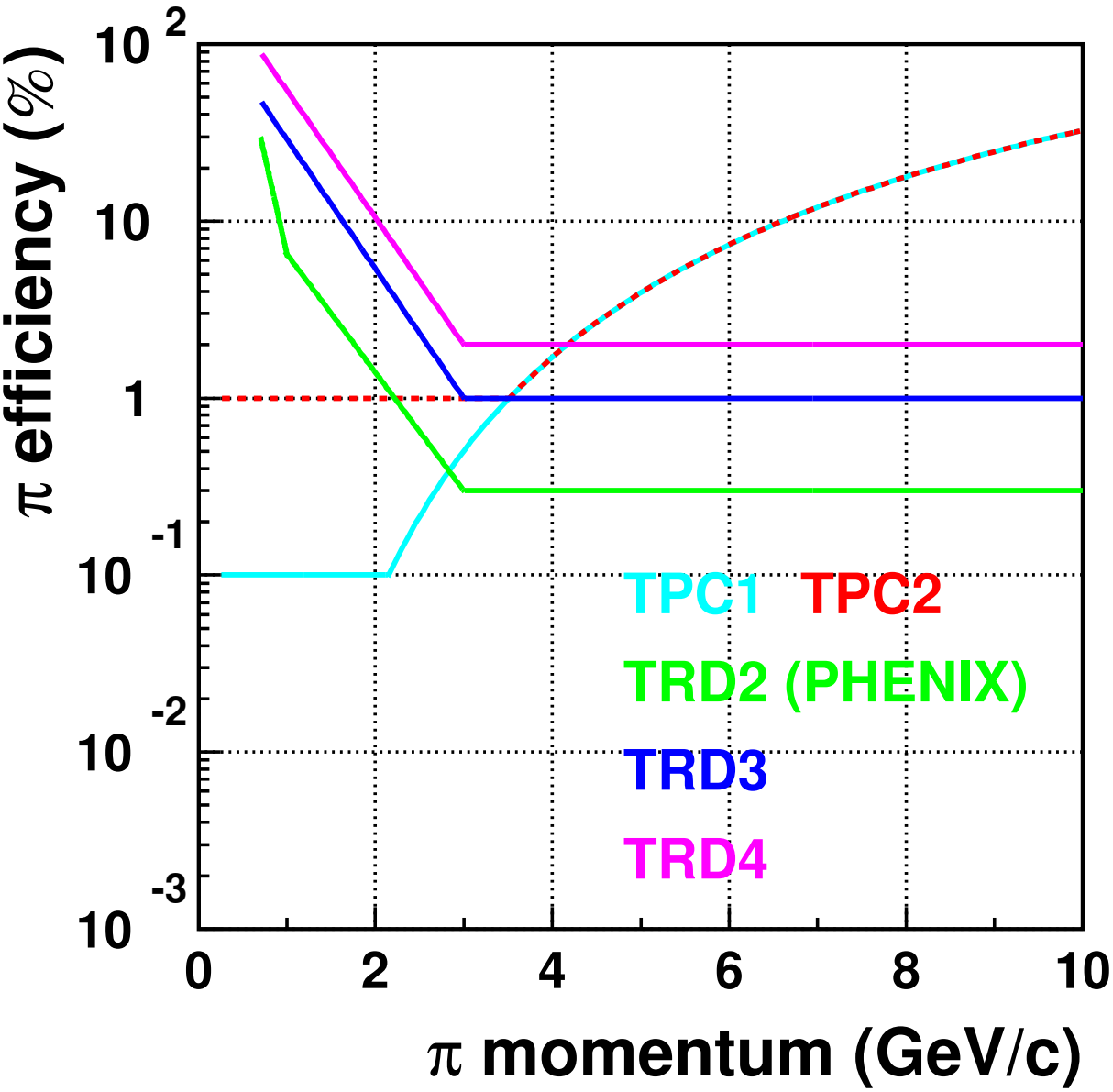

dN/dE
10^3
10^2
10
1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Total Energy (GeV)

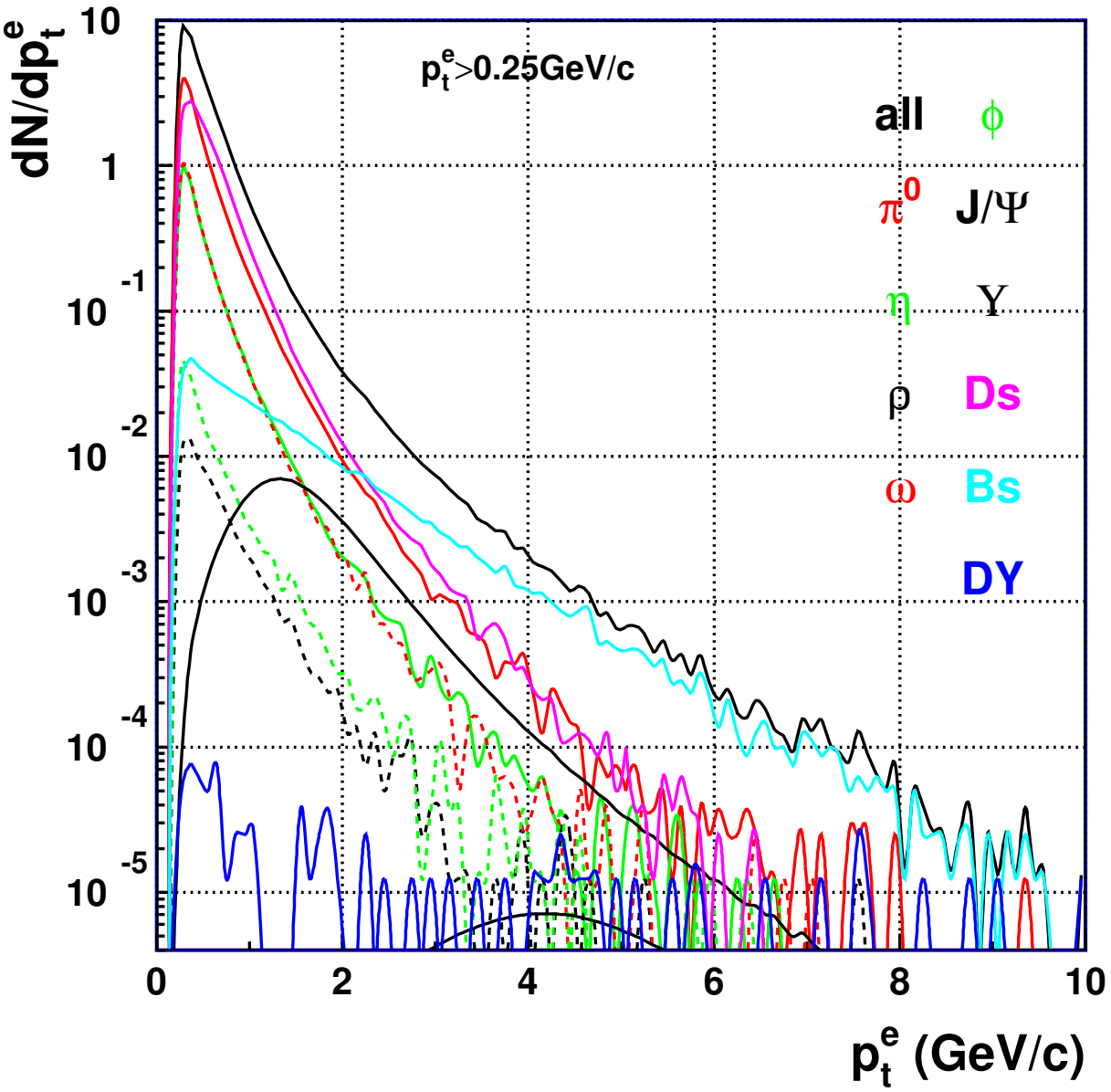

dN/dR
10^4
10^3
10^2
10
1
80
100
120
140
160
180
200
220
240
260
R-Position (cm)


dN/dE
10^2
10
1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Total Energy (GeV)

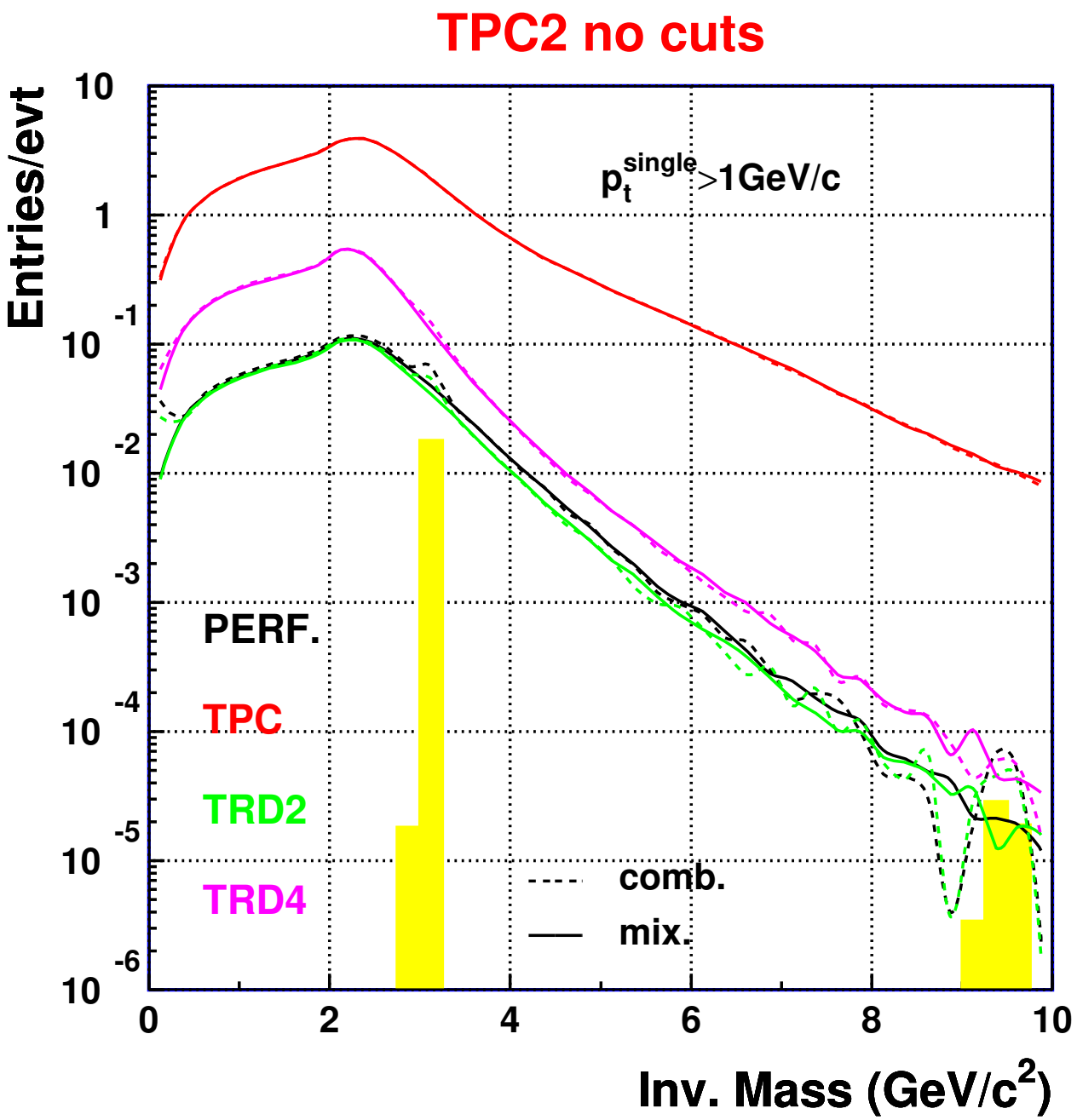

dN/dR
10^3
10^2
10
1
450
460
470
480
490
500
510
520
530
540
R-Position (cm)

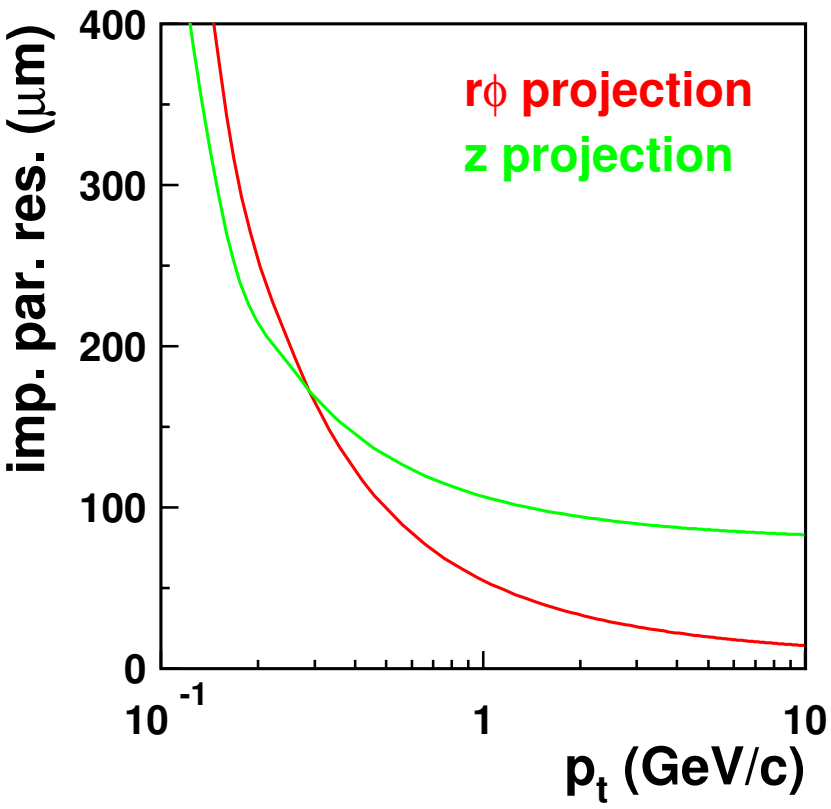


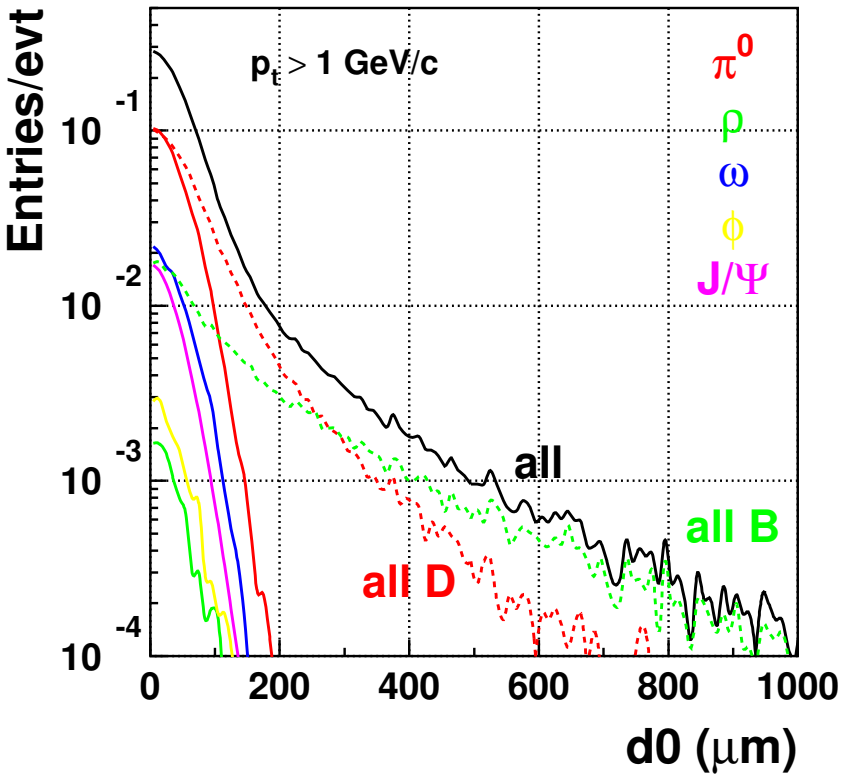

π efficiency (%)
10 2
10
1
10 -1
10 -2
10 -3
0
2
4
6
8
10
π momentum (GeV/c)
TPC1
TPC2
TRD2 (PHENIX)
TRD3
TRD4

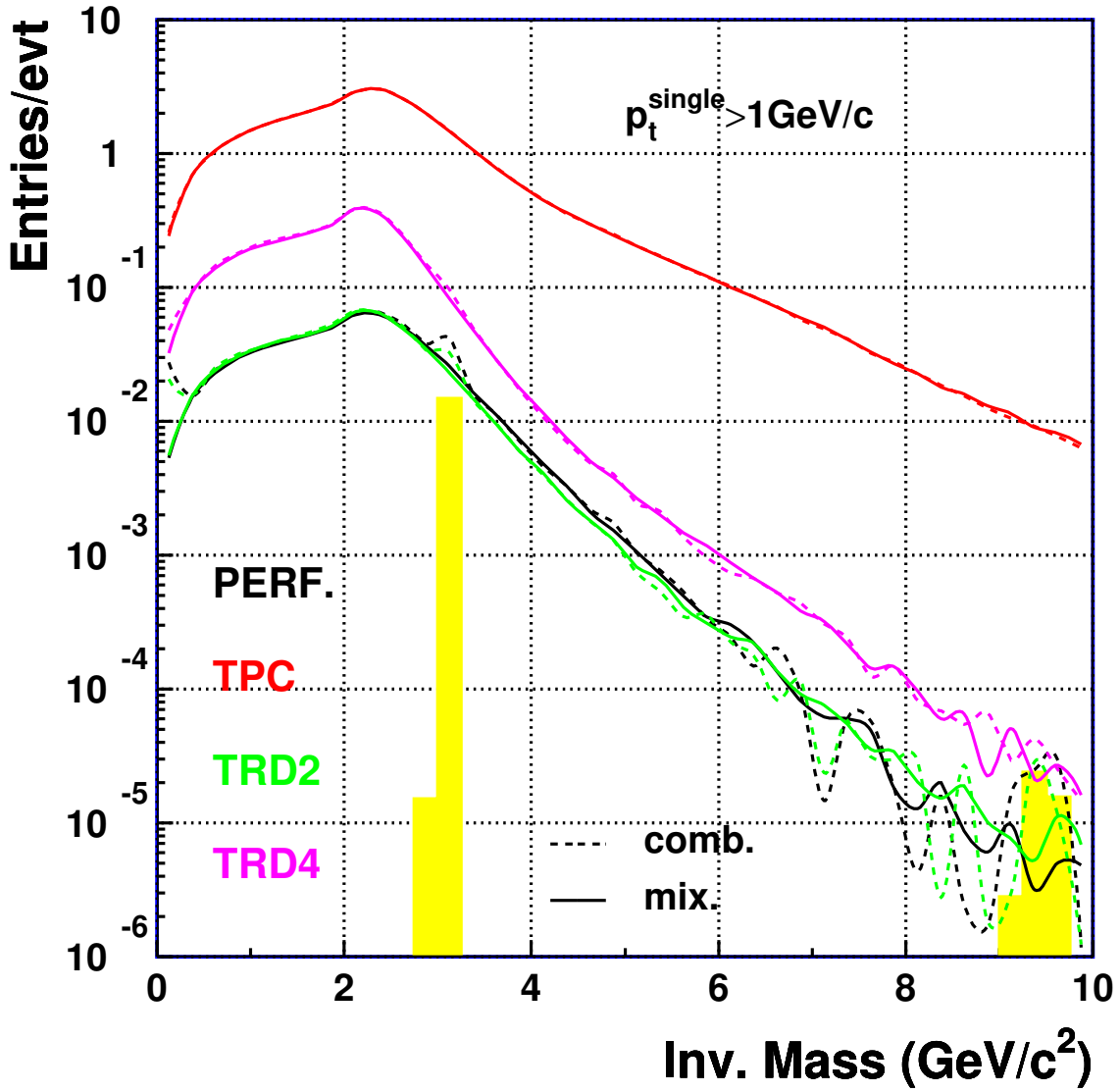

dN/dp$_t^e$
p_t^e>0.25GeV/c
all
ϕ
π^0
J/Ψ
η
Υ
ρ
Ds
ω
Bs
DY
p_t^e (GeV/c)

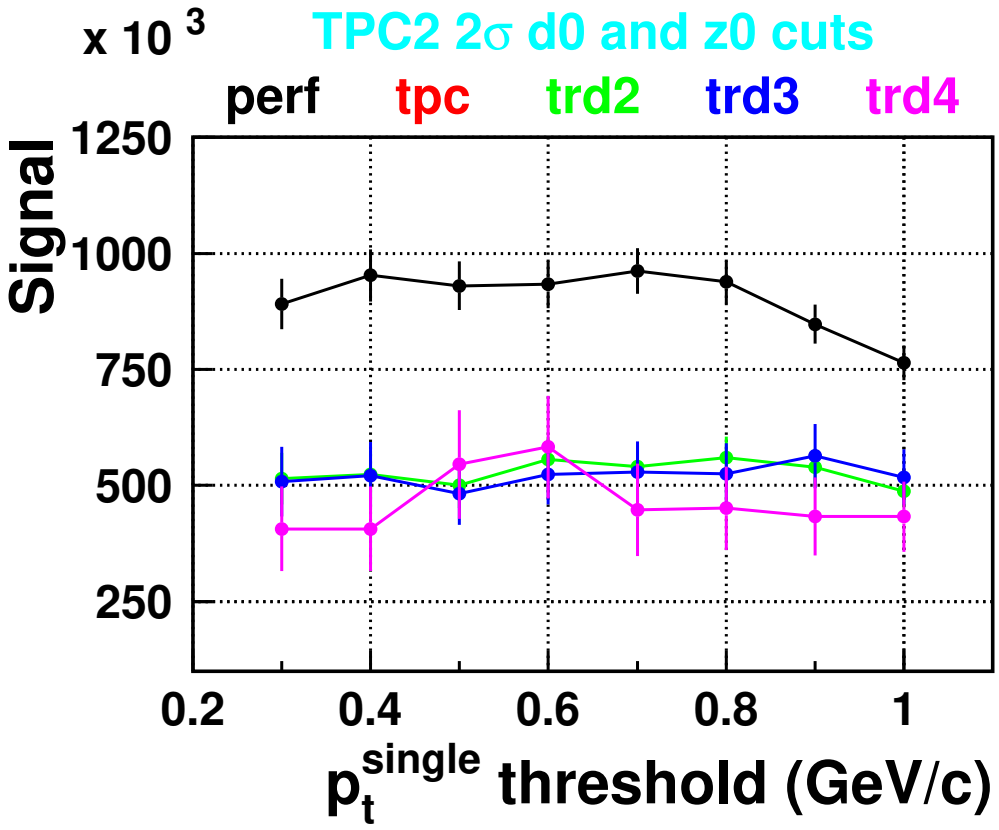
	SHAKER	$e^{\pm}$ after decays and cuts	
particle	# primaries	#	$\langle p_t \rangle$ (GeV/c)
π^o	6000	11.446	0.473
η	1005	2.686	0.465
$\pi^{\pm}$	2×6000	0	---
$p^{\pm}$	2×450	0	---
$K^{\pm}$	2×675	0.056	0.377
K^o	2×675	0.249	0.368
ρ	1800	0.061	0.639
ω	1680	2.773	0.456
ϕ	195	0.146	0.558
J/Ψ ($e^{\pm}$)	9.3×10^{-2}	0.101	1.593
Υ ($e^{\pm}$)	2.22×10^{-4}	0.0002	4.408
$D^{\pm}$	2×33	4.472	0.551
D^o	2×96	6.078	0.554
$D_s^{\pm}$	2×18	1.181	0.531
$B^{\pm}$	2×1.2	0.207	1.304
B^o	2×1.2	0.237	1.240
$B_s^{\pm}$	2×0.3	0.062	1.253
DY	0.0078	0.0012	2.999

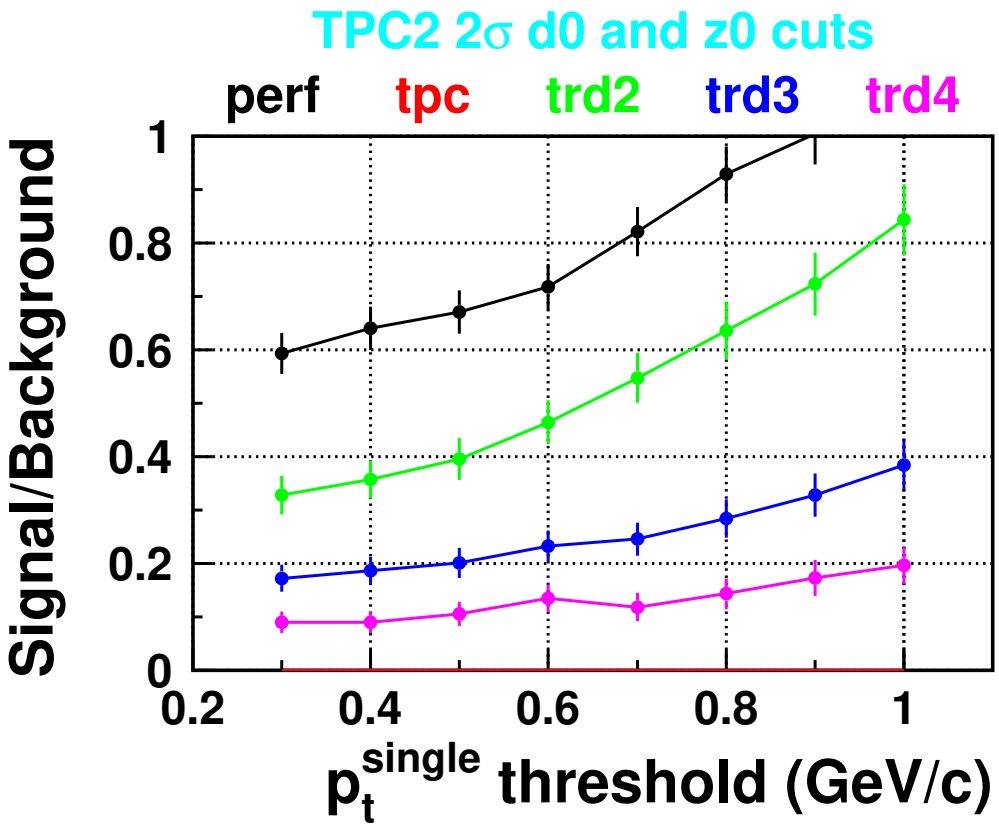

TPC2 no cuts
Entries/evt
p_t^{single}>1GeV/c
PERF.
TPC
TRD2
TRD4
comb.
mix.
Inv. Mass (GeV/c^2)

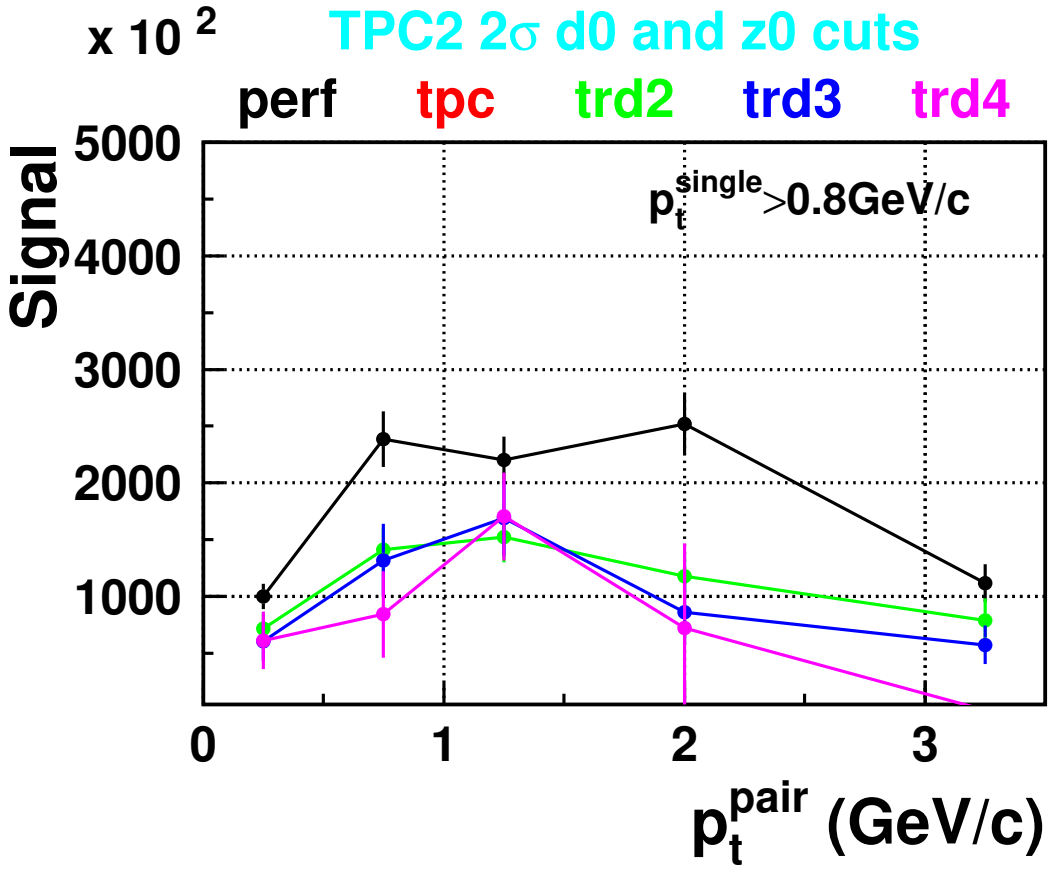

imp. par. res. (μm)
400
300
200
100
0
10^-1
1
10
p_t (GeV/c)
rφ projection
z projection

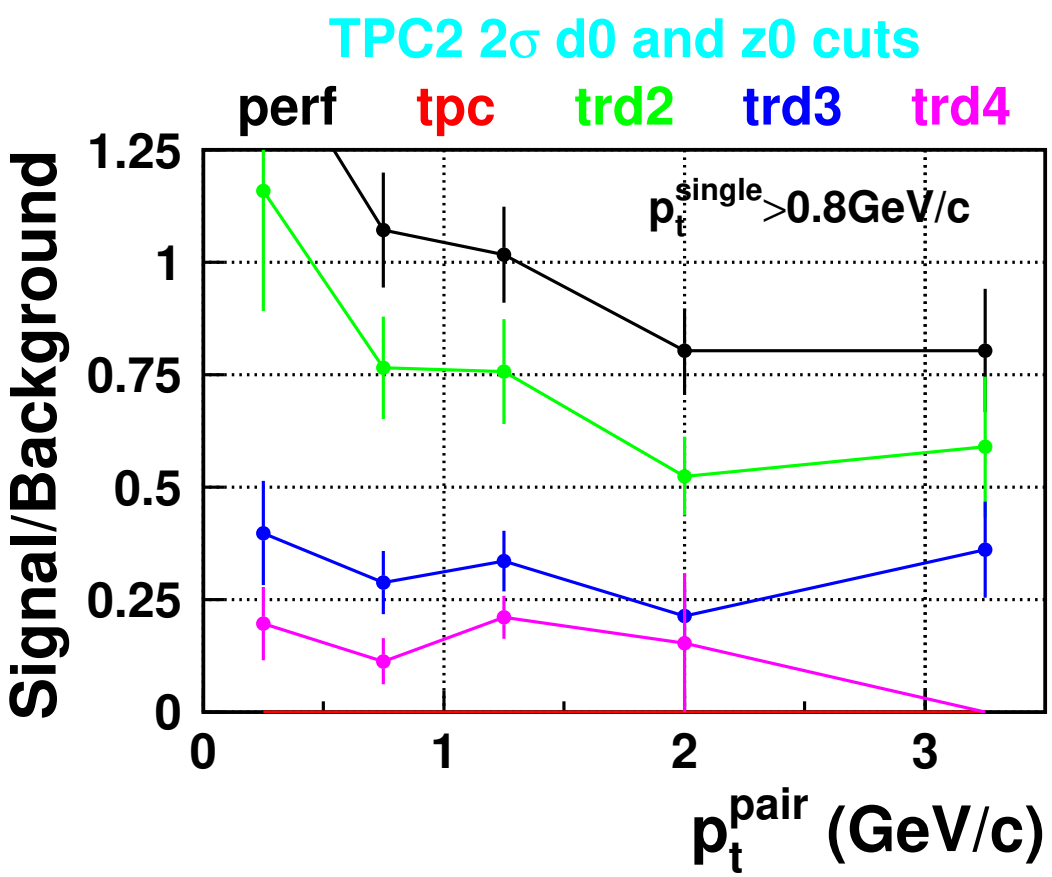

Entries/evt
10^-1
10^-2
10^-3
10^-4
0
200
400
600
800
1000
d0 (μm)
p_t > 1 GeV/c
π^0
ρ
ω
φ
J/Ψ
all
all B
all D

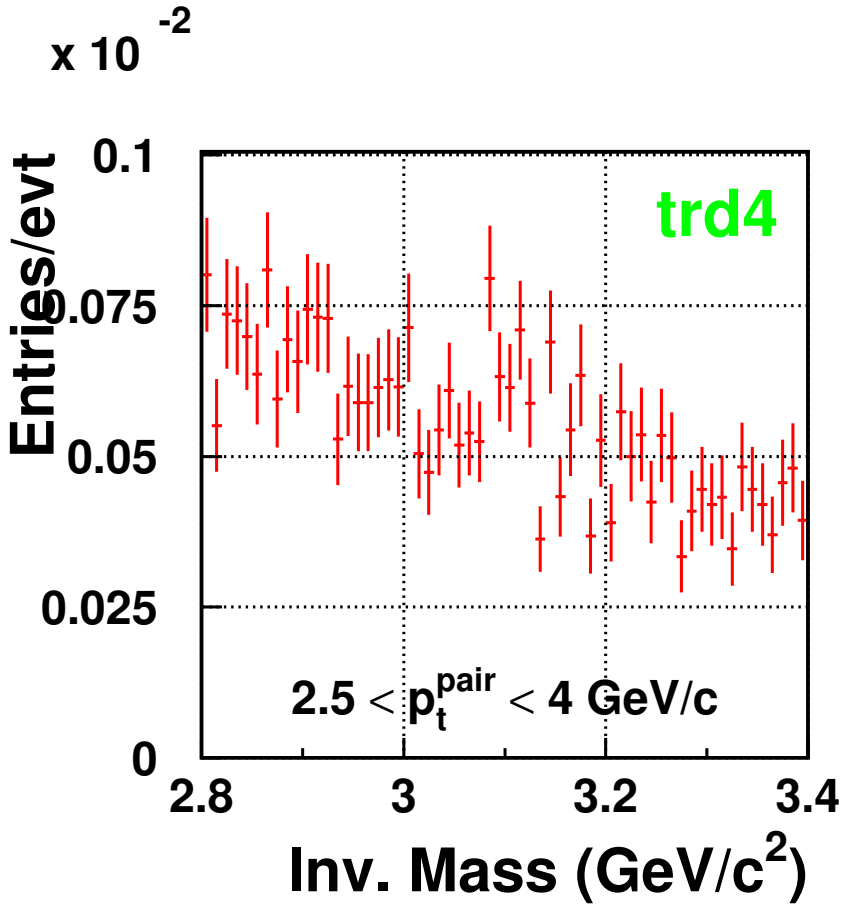

TPC2 2σ d0 and z0 cut
Entries/evt
p_t^{single}>1GeV/c
PERF.
TPC
TRD2
TRD4
comb.
mix.
Inv. Mass (GeV/c^2)

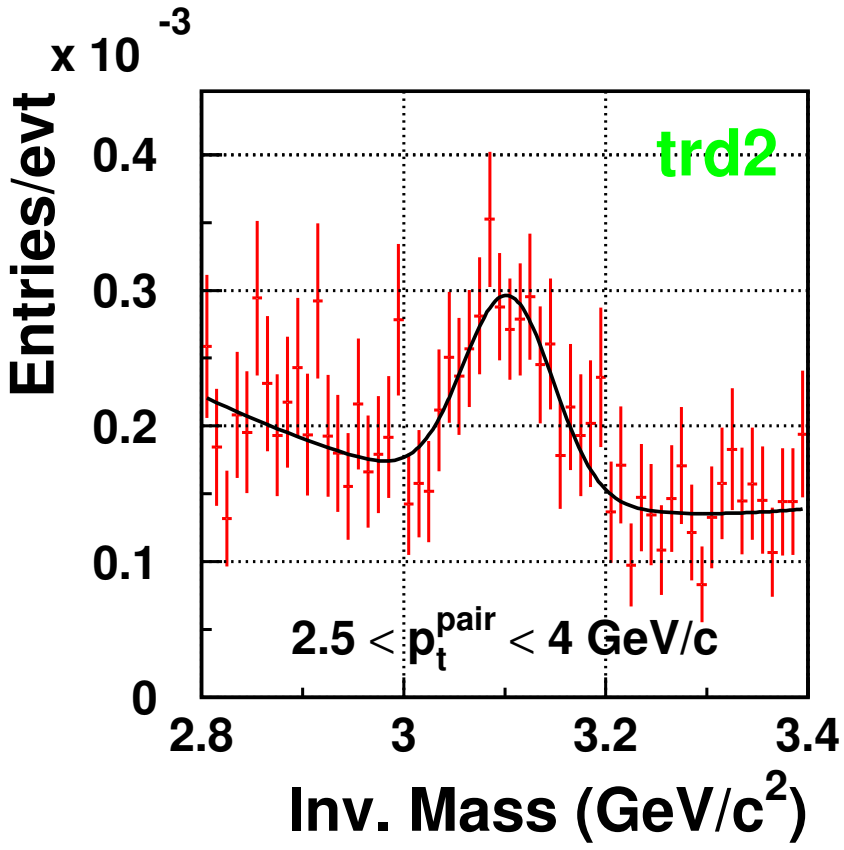

TPC2 2σ d0 and z0 cuts
perf
tpc
trd2
trd3
trd4
x 10 3
Signal
1250
1000
750
500
250
0.2
0.4
0.6
0.8
1
p_t^single threshold (GeV/c)

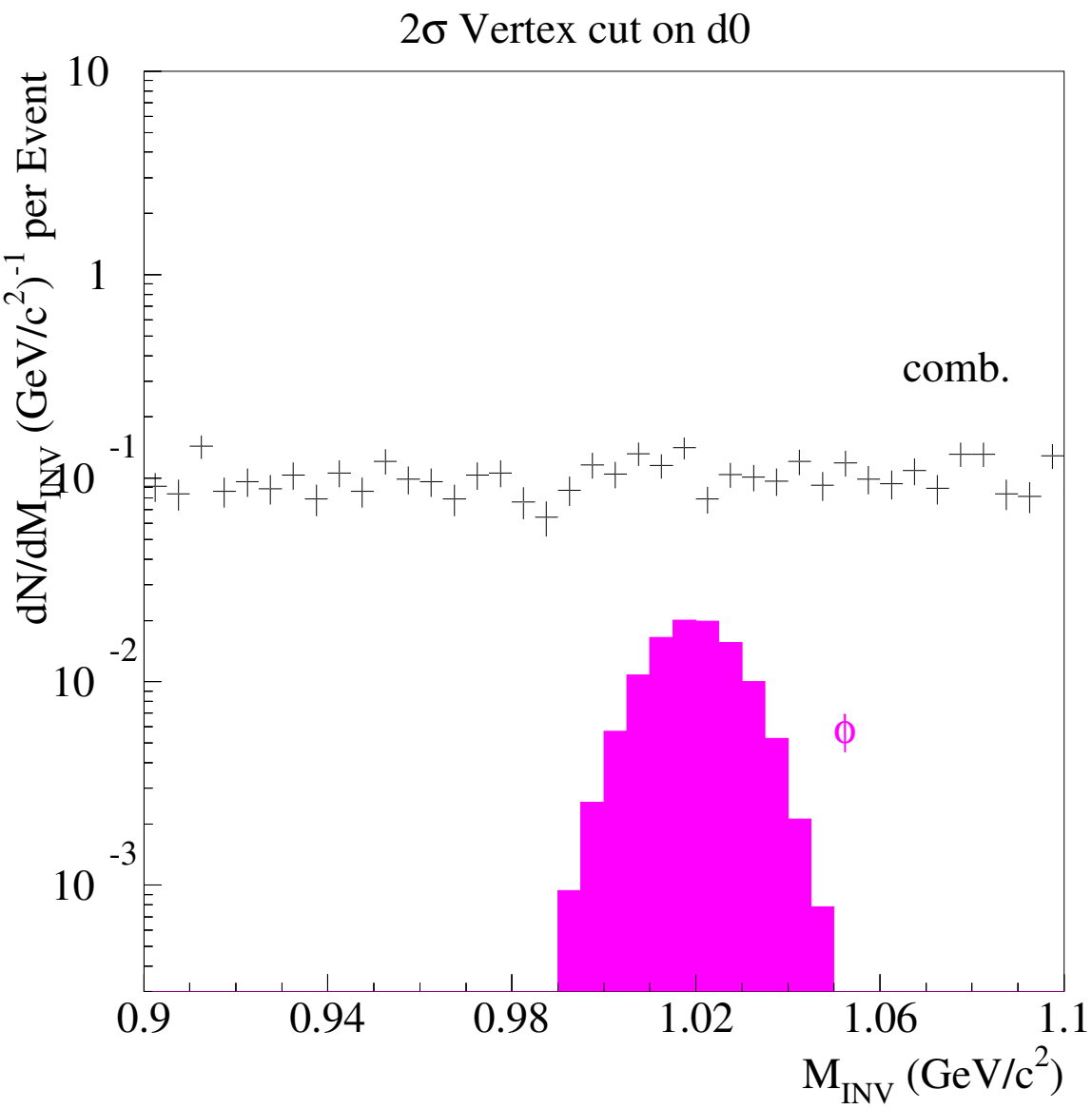

TPC2 2σ d0 and z0 cuts
perf
tpc
trd2
trd3
trd4
Signal/Background
1
0.8
0.6
0.4
0.2
0
0.2
0.4
0.6
0.8
1
p_t^single threshold (GeV/c)

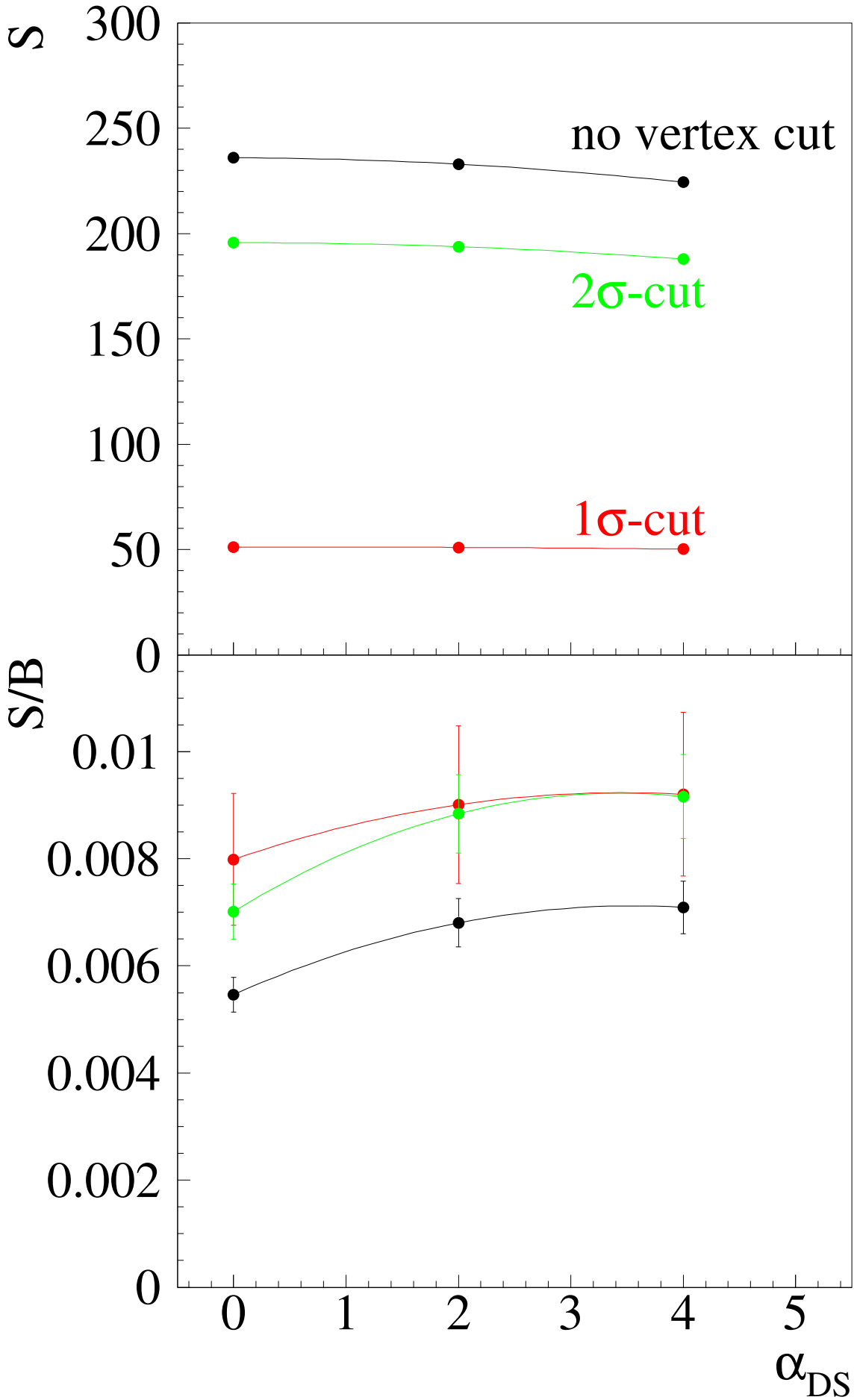

x 10 2
TPC2 2σ d0 and z0 cuts
perf
tpc
trd2
trd3
trd4
Signal
5000
4000
3000
2000
1000
p_t^{single}>0.8GeV/c
0
1
2
3
p_t^{pair} (GeV/c)

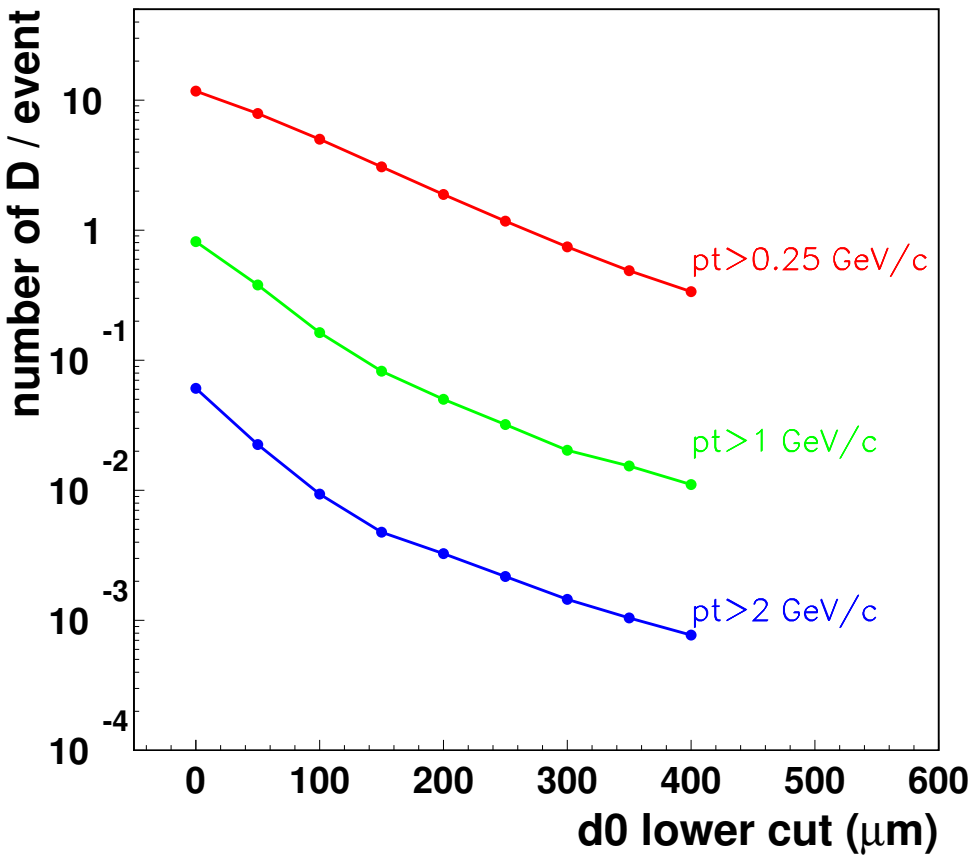

TPC2 2σ d0 and z0 cuts
perf
tpc
trd2
trd3
trd4
Signal/Background
1.25
1
0.75
0.5
0.25
0
p_t^{single}>0.8GeV/c
0
1
2
3
p_t^{pair} (GeV/c)

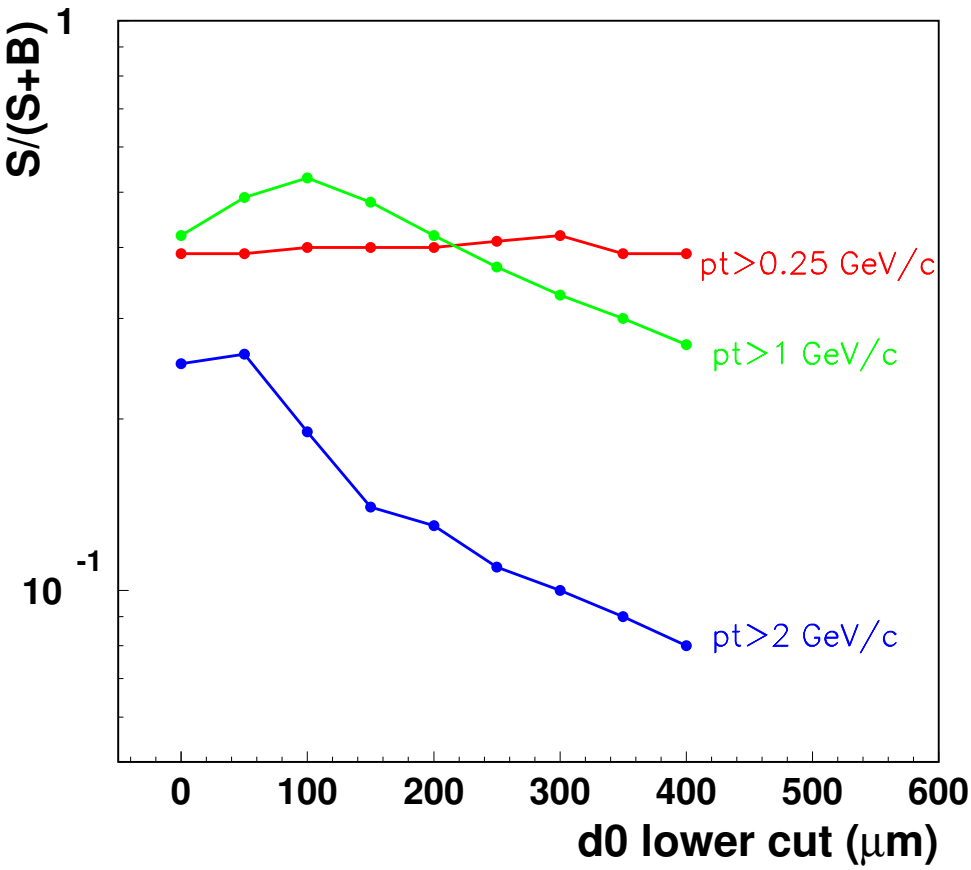

x 10 -2
Entries/evt
0.1
0.075
0.05
0.025
0
trd4
2.5 < p_t^pair < 4 GeV/c
2.8
3
3.2
3.4
Inv. Mass (GeV/c^2)

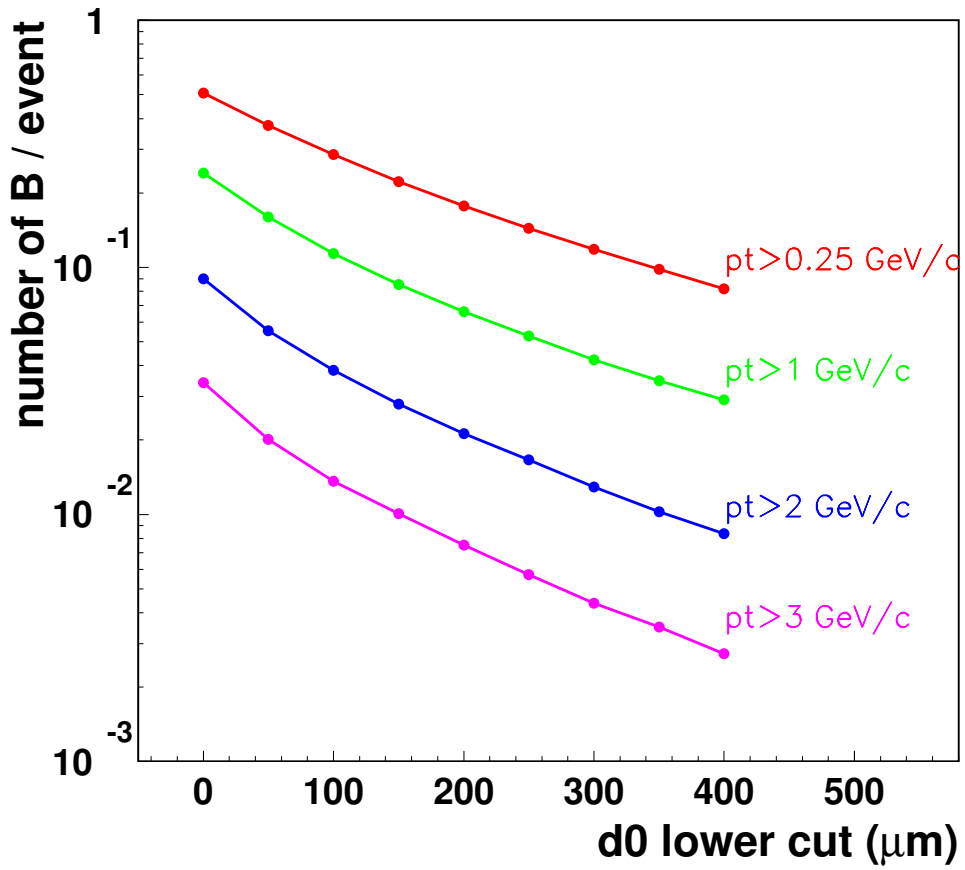

x 10 -3
Entries/evt
0.4
0.3
0.2
0.1
0
trd2
2.5 < p_t^pair < 4 GeV/c
2.8
3
3.2
3.4
Inv. Mass (GeV/c^2)

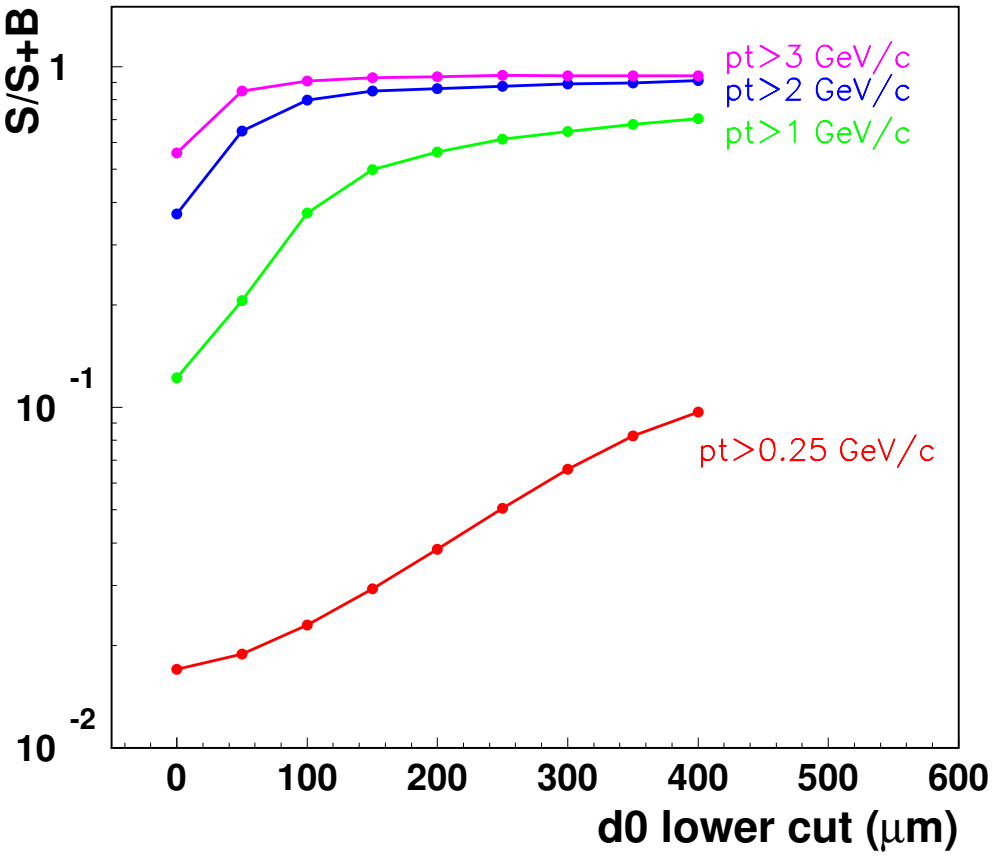

2σ Vertex cut on d0
dN/dM_INV (GeV/c^2)^-1 per Event
10
1
10^-1
10^-2
10^-3
comb.
φ
0.9
0.94
0.98
1.02
1.06
1.1
M_INV (GeV/c^2)

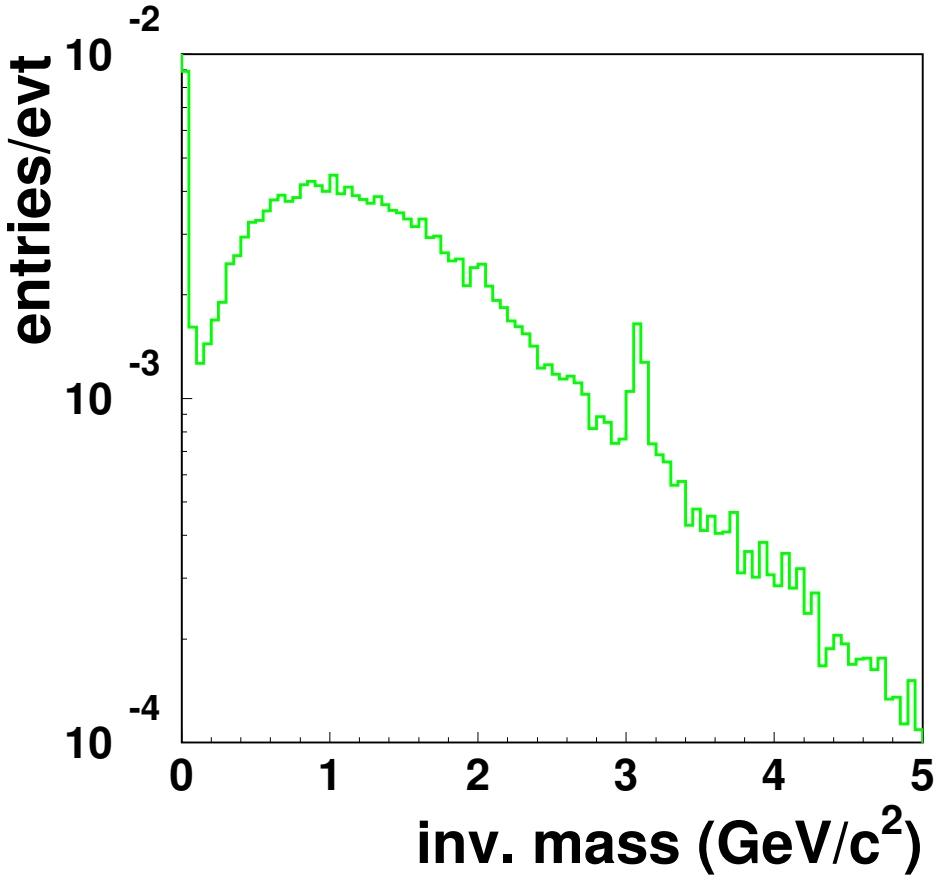

S
300
250
200
150
100
50
0
no vertex cut
2σ-cut
1σ-cut
S/B
0.01
0.008
0.006
0.004
0.002
0
0
1
2
3
4
5
α_DS

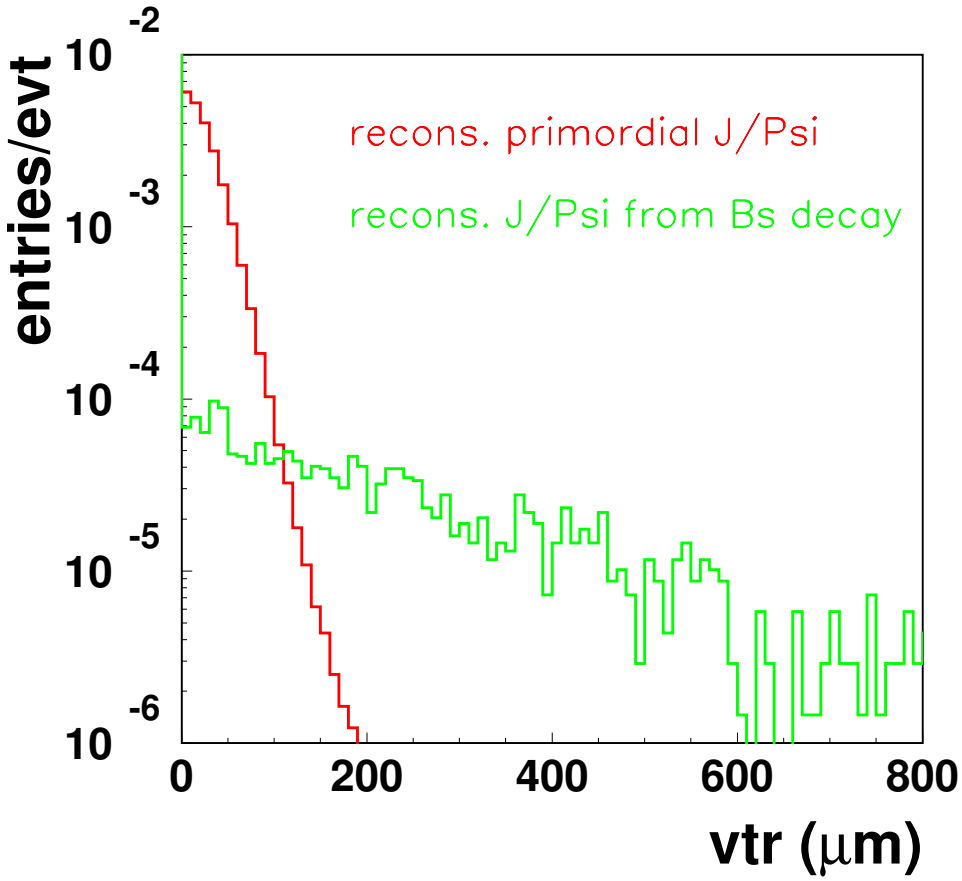

number of D / event
10
1
10^-1
10^-2
10^-3
10^-4
pt>0.25 GeV/c
pt>1 GeV/c
pt>2 GeV/c
0
100
200
300
400
500
600
d0 lower cut (μm)

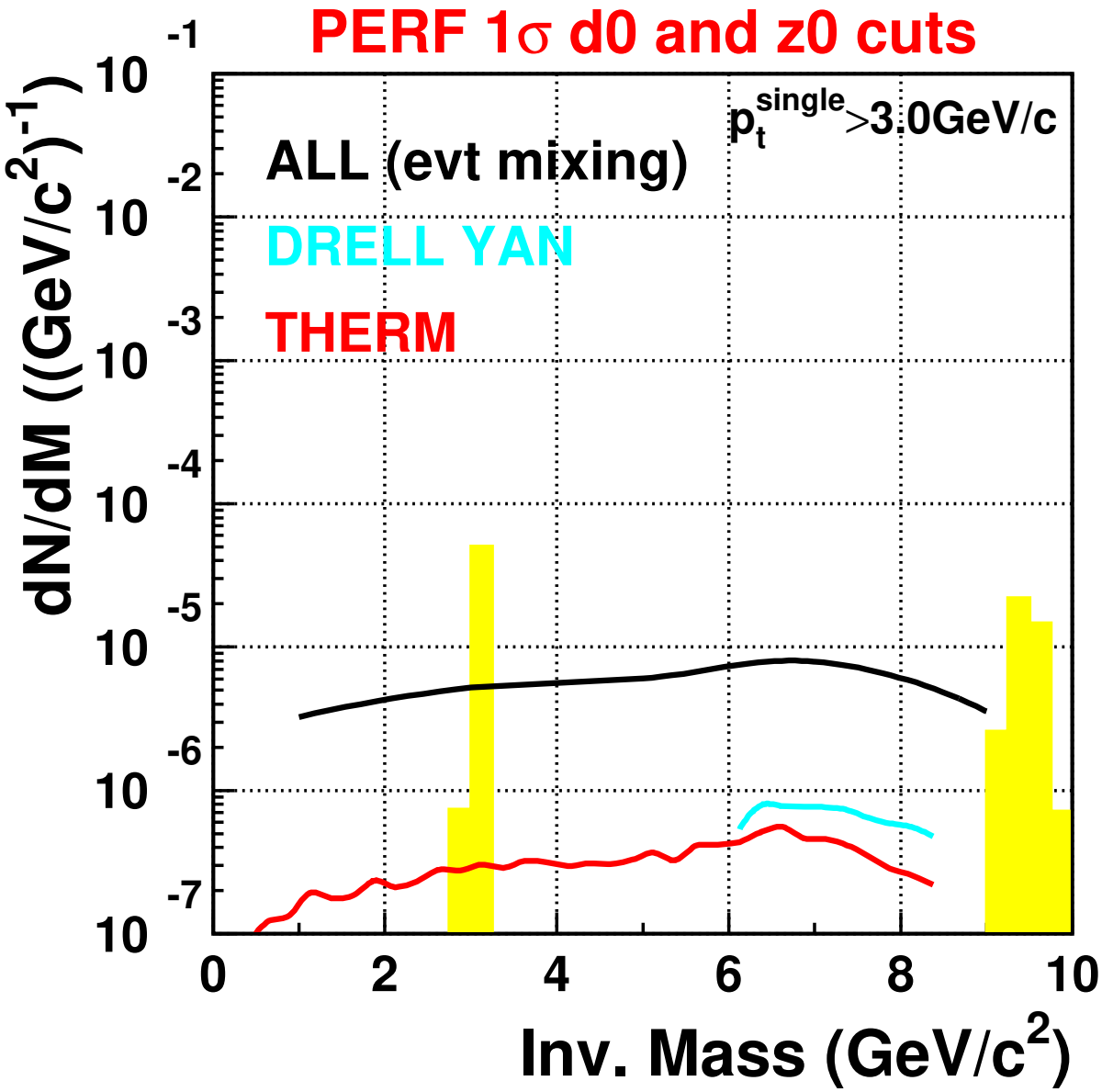

S/(S+B)
1
10^-1
pt>0.25 GeV/c
pt>1 GeV/c
pt>2 GeV/c
0
100
200
300
400
500
600
d0 lower cut (μm)


number of B / event
1
10^-1
10^-2
10^-3
0
100
200
300
400
500
d0 lower cut (μm)
pt>0.25 GeV/c
pt>1 GeV/c
pt>2 GeV/c
pt>3 GeV/c


S/S+B
1
10^-1
10^-2
0
100
200
300
400
500
600
d0 lower cut (μm)
pt>3 GeV/c
pt>2 GeV/c
pt>1 GeV/c
pt>0.25 GeV/c


entries/evt
10^-2
10^-3
10^-4
0
1
2
3
4
5
inv. mass (GeV/c^2)


entries/evt
10^-2
10^-3
10^-4
10^-5
10^-6
recons. primordial J/Psi
recons. J/Psi from Bs decay
0
200
400
600
800
vtr (μm)


PERF 1σ d0 and z0 cuts
p_t^{single}>3.0GeV/c
ALL (evt mixing)
DRELL YAN
THERM
dN/dM ((GeV/c^2)$^{-1}$)
Inv. Mass (GeV/c^2)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
0
2
4
6
8
10