Comparison of Current LCD Tracking Options

Bruce Schumm
Santa Cruz Institute for Particle Physics
and the
University of California, Santa Cruz

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Comparison of Tracker Parameters

We have three detectors concepts in various states of maturity:

- LARGE: Very refined by now
- PRECISE: Since FNAL, but never really discussed in polite company
- SILICON: 'S' redux; still crude (first presentation)

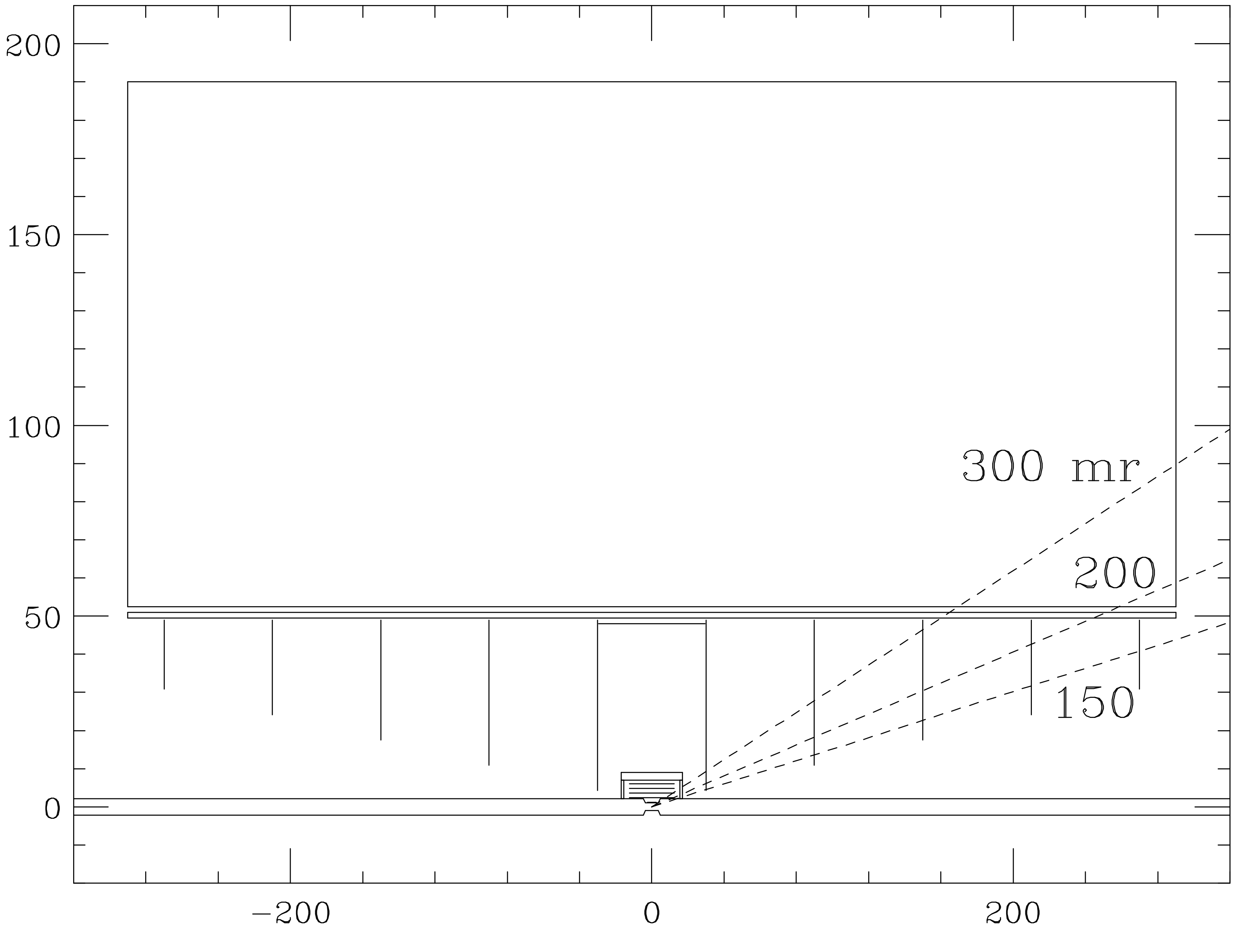
How uniform is agreement on what these detectors are? What is simulated?

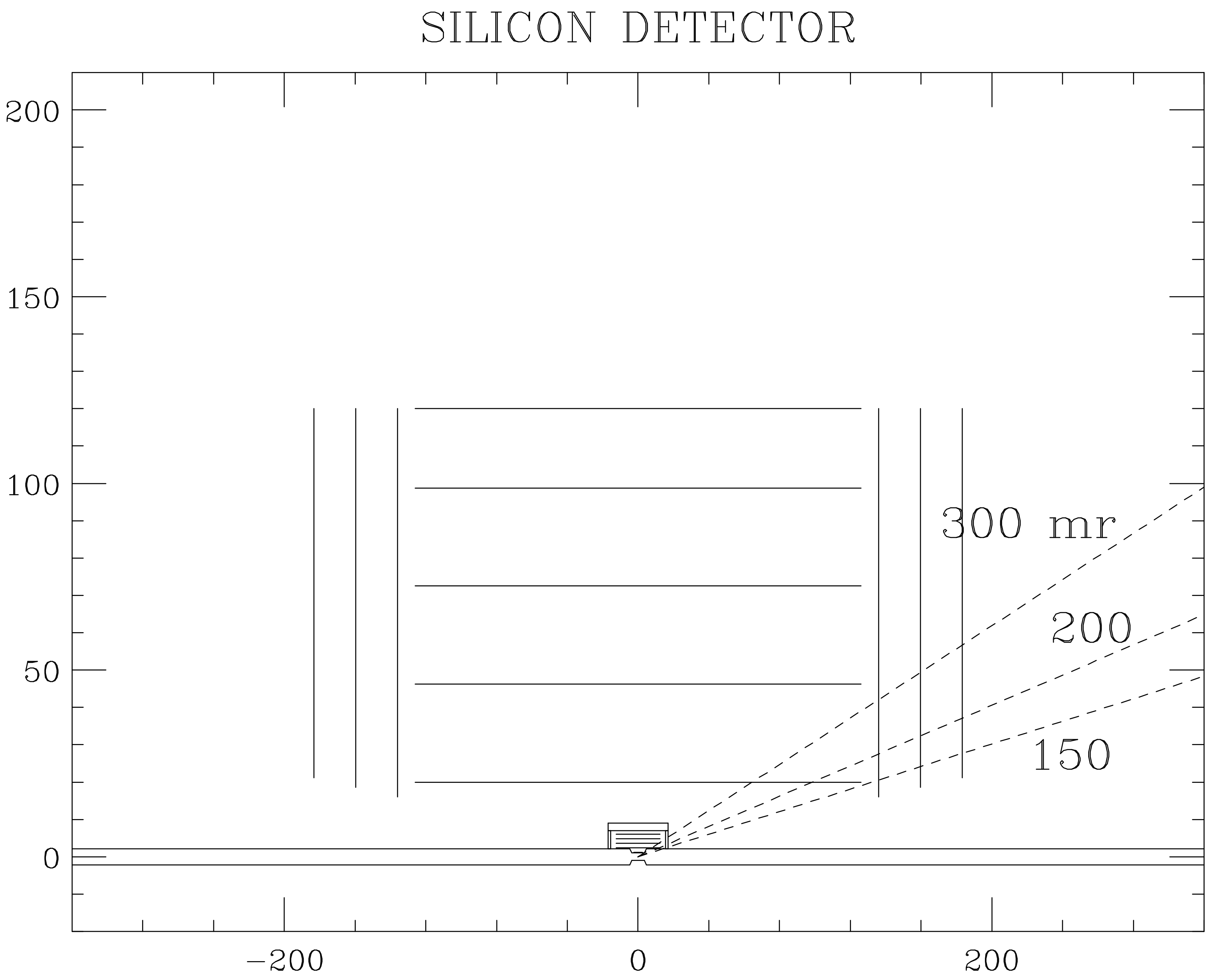
Paramaters...

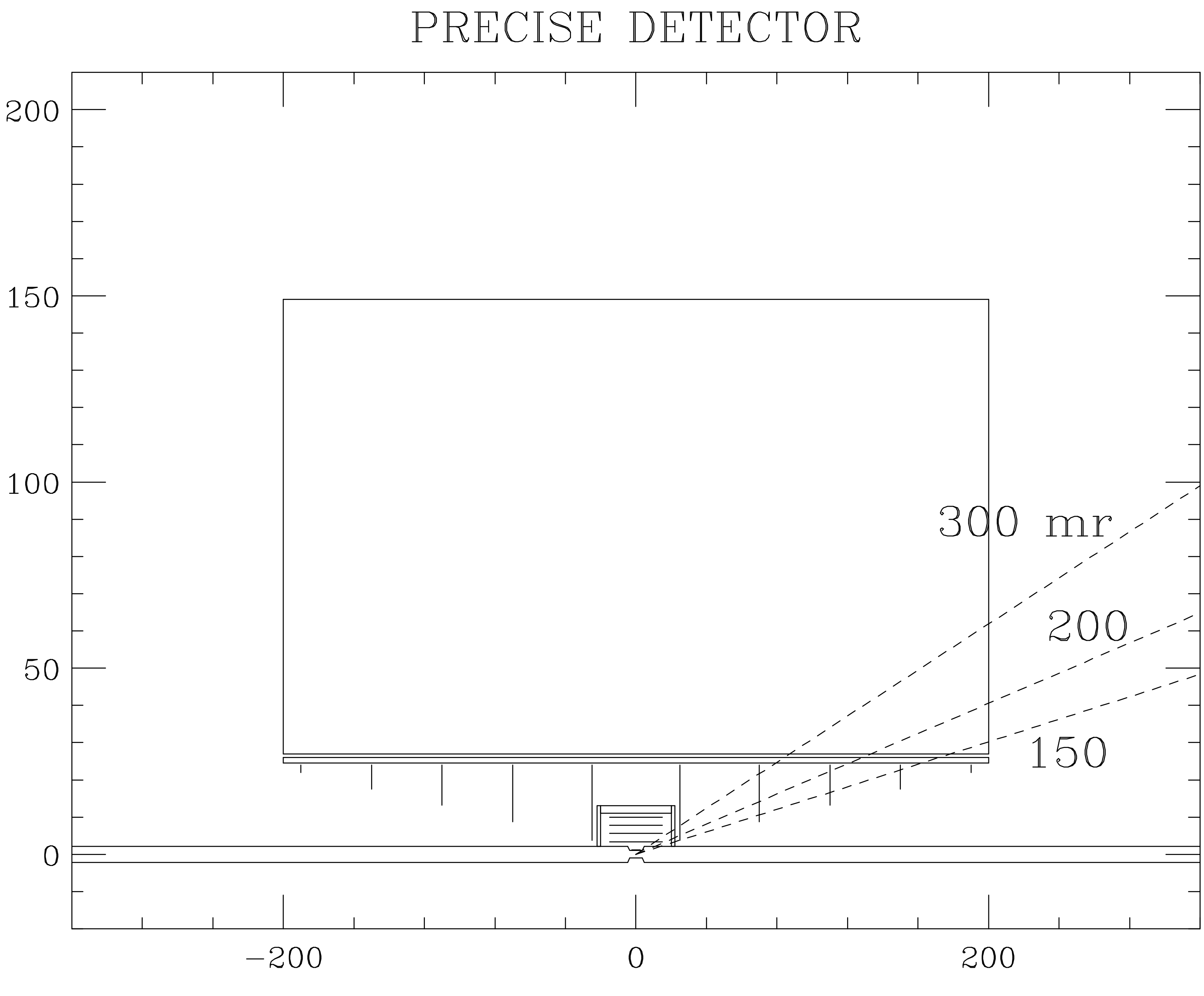
(Note: All disks go down to 110 mrad + 1cm clearance)

Parameter	Large	Silicon	Precise	SLD
VTX Inner Radius	1.2	1.2	1.2	2.8
VTX Outer Radius	6.0	6.0	10.0	4.8
No. VTX Layers	5	5	5	3
Max $\cos\theta$ 1 VTX	.982	.982	.975	.944
Max $\cos\theta$ All VTX	.902	.902	.832	.856
VTX Resolution (μm)	5	5	5	5.4
Intermediate Tracker?	Y	N	N	N
TRK Inner Radius	50	20	25	20
TRK Outer Radius	190	125	150	100
No. TRK Layers	144	5	122	80
$r-\phi$ Resolution (μm)	140	7	140	100
No. Disks	5	3	5	
Max Disk z	270	183	190	
Stereo Angle (rad)	.020	.020	.020	
Disk Resolution (μm)	7	7	7	
B (Tesla)	3	5	3	0.6

LARGE DETECTOR




SILICON DETECTOR
200
150
100
50
0
−200
0
200
300 mr
200
150


PRECISE DETECTOR
200
150
100
50
0
-200
0
200
300 mr
200
150

Resolution Comparisons, Conclusions

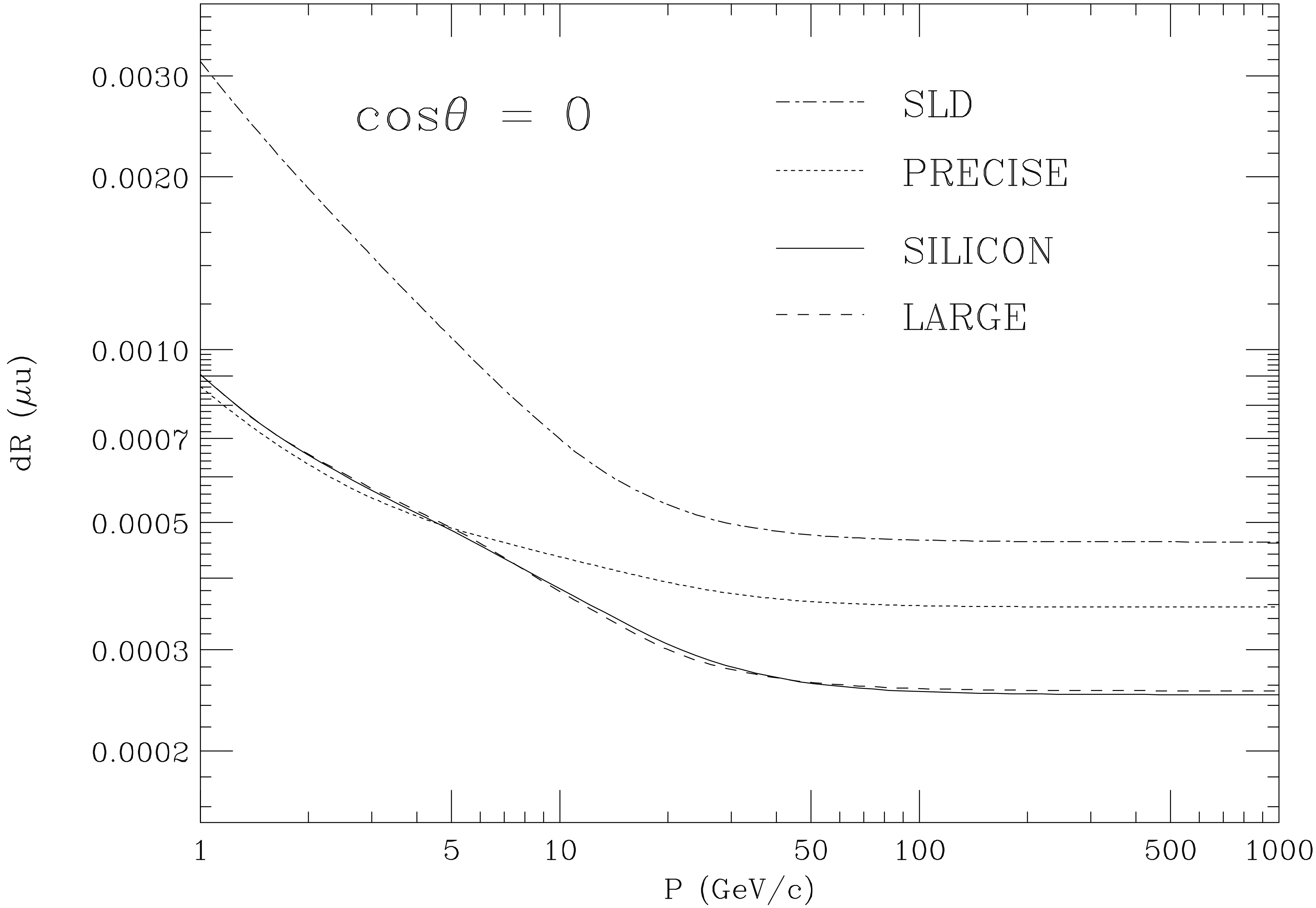
All but dR are *Beam Contrained*! (this seems fair given motivations for p, θ resolutions)

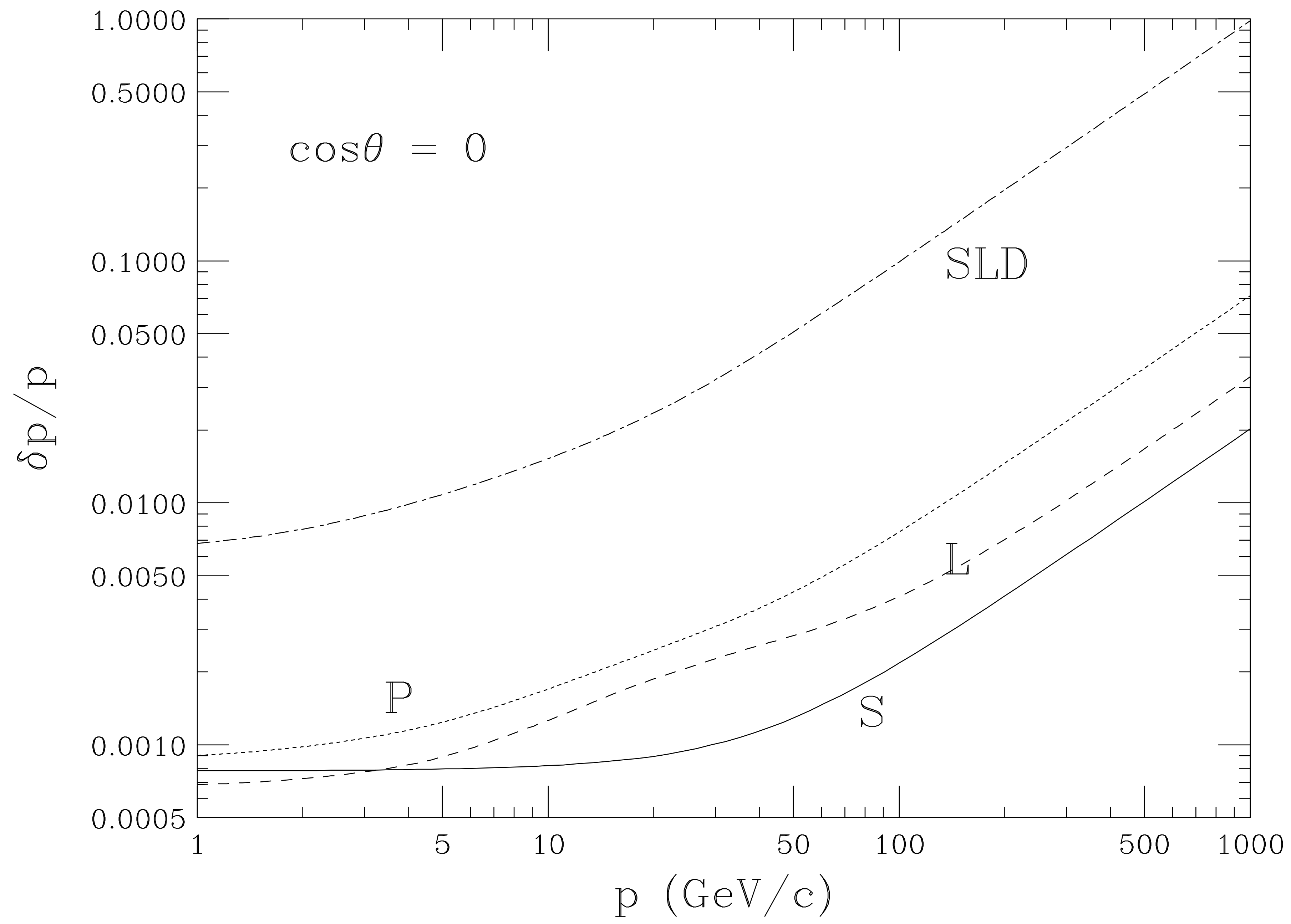
S detector p resolution quite good over all angles

Low angle tracking somewhat more pressed for new S design (pattern recognition, θ resolution)

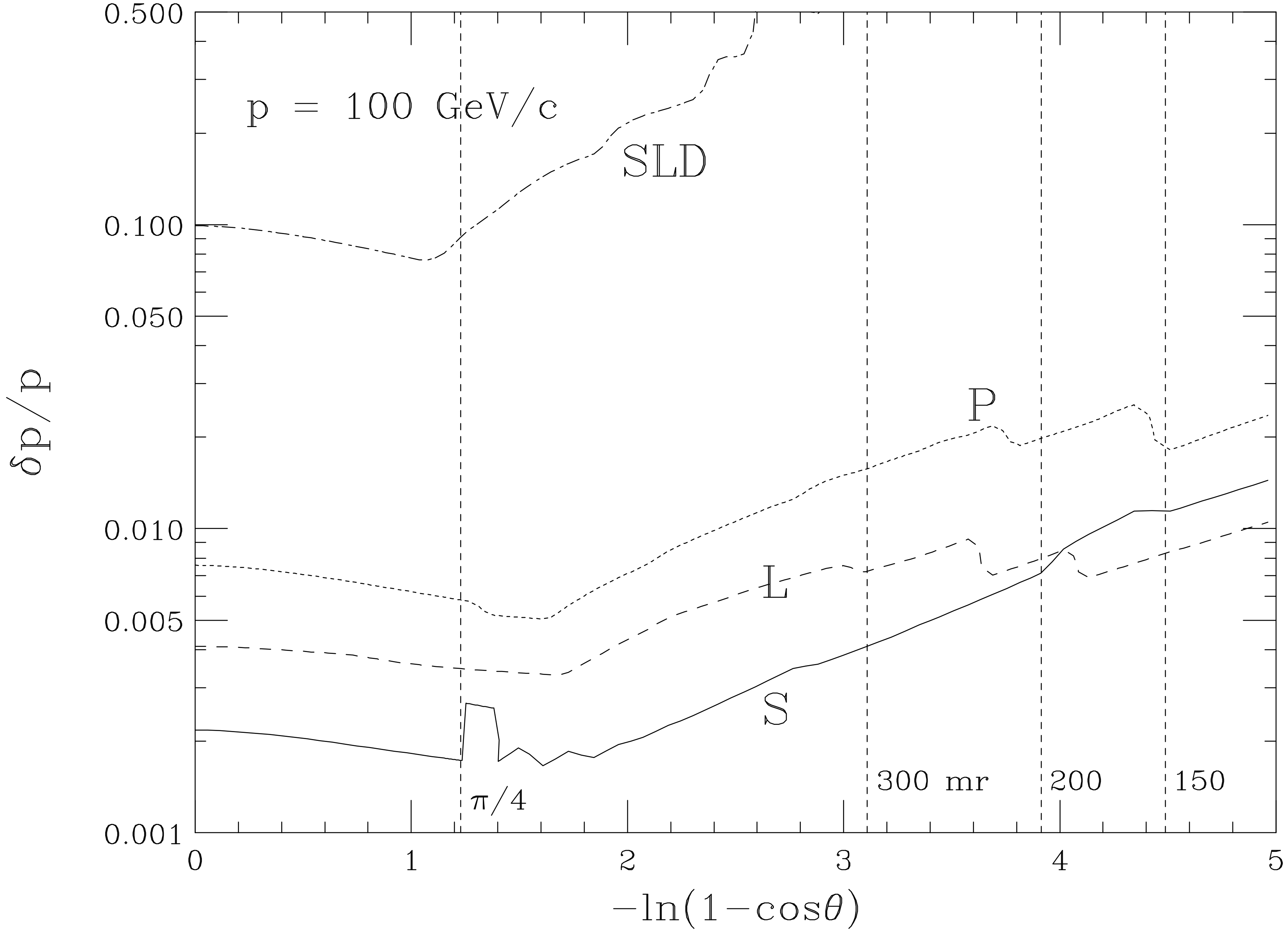
S detector in real trouble at low angle w/out beam constraint (see final plot with beam contraint removed)

S does not seem so robust in forward direction. I think we should refine a bit.

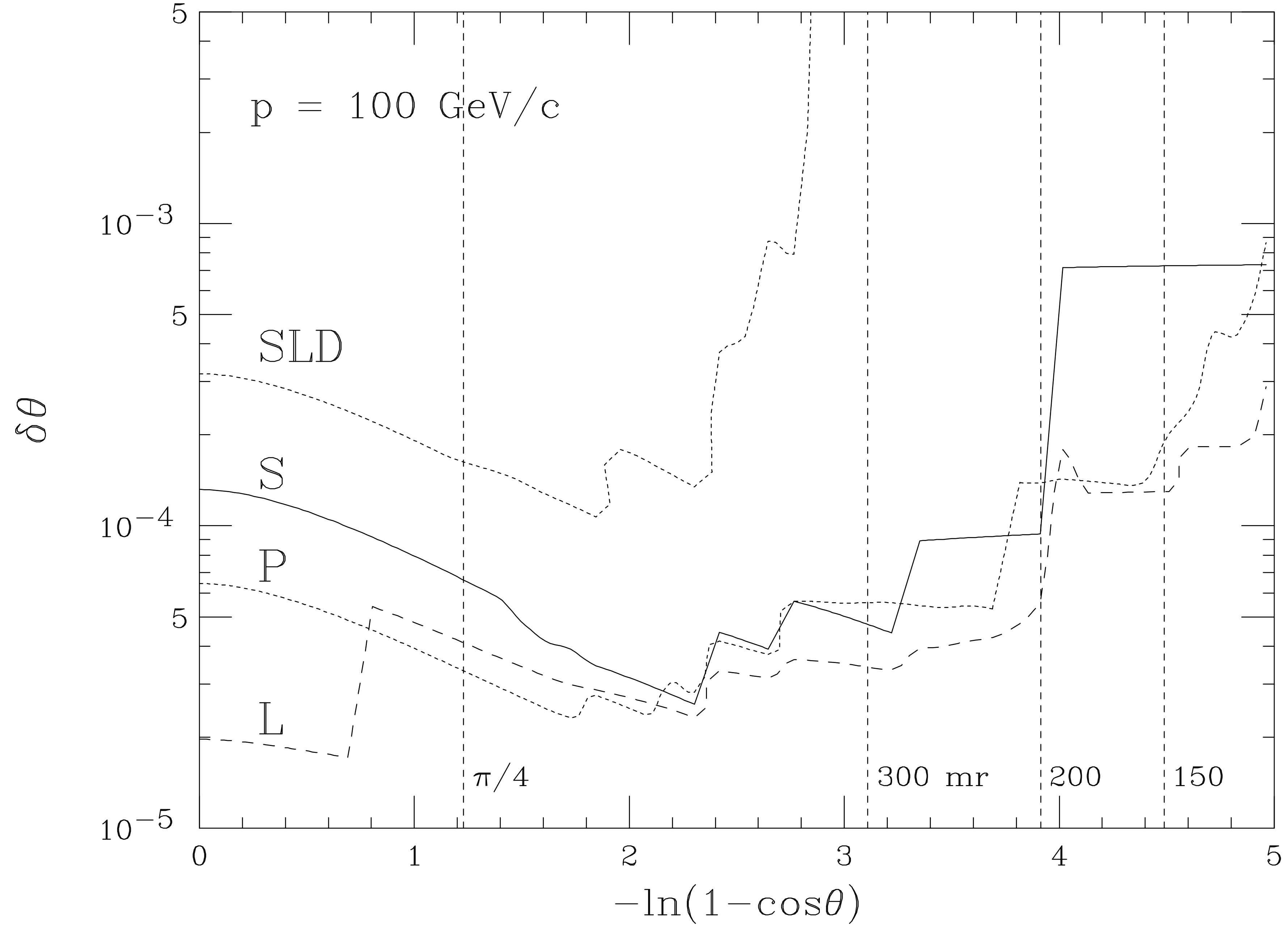

cosθ = 0
SLD
PRECISE
SILICON
LARGE
dR (μu)
0.0030
0.0020
0.0010
0.0007
0.0005
0.0003
0.0002
1
5
10
50
100
500
1000
P (GeV/c)

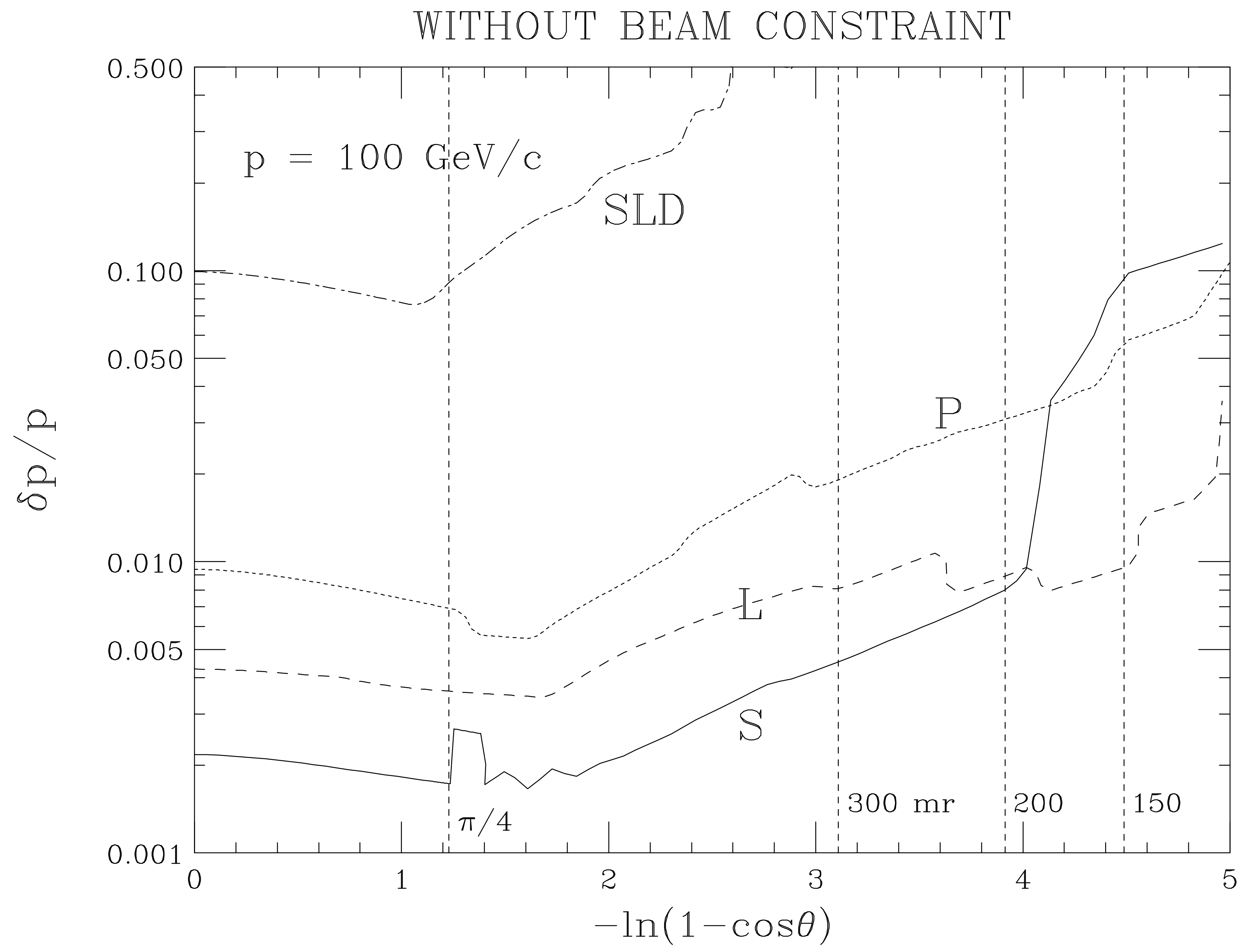


δp/p
1.0000
0.5000
0.1000
0.0500
0.0100
0.0050
0.0010
0.0005
cosθ = 0
SLD
P
L
S
1
5
10
50
100
500
1000
p (GeV/c)



p = 100 GeV/c
SLD
P
L
S
π/4
300 mr
200
150
δp/p
0.500
0.100
0.050
0.010
0.005
0.001
0
1
2
3
4
5
−ln(1−cosθ)


p = 100 GeV/c
SLD
S
P
L
π/4
300 mr
200
150
δθ
−ln(1−cosθ)
10−3
10−4
10−5
5


WITHOUT BEAM CONSTRAINT
p = 100 GeV/c
SLD
P
L
S
π/4
300 mr
200
150
δp/p
0.500
0.100
0.050
0.010
0.005
0.001
0
1
2
3
4
5
−ln(1−cosθ)