Comparison of BeamCal electron veto performance in head-on and 20 mrad

preliminary

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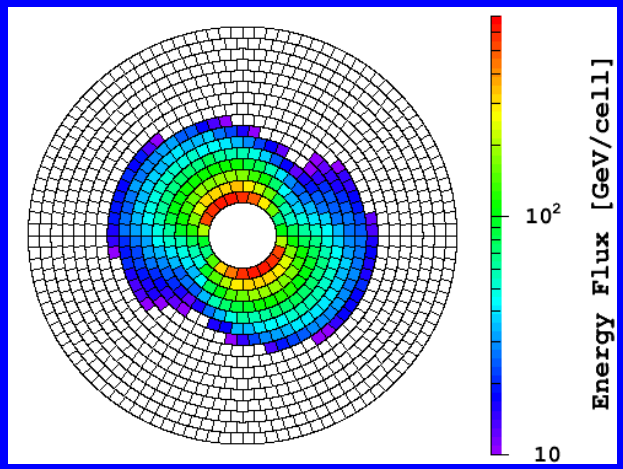
Snowmass 2005

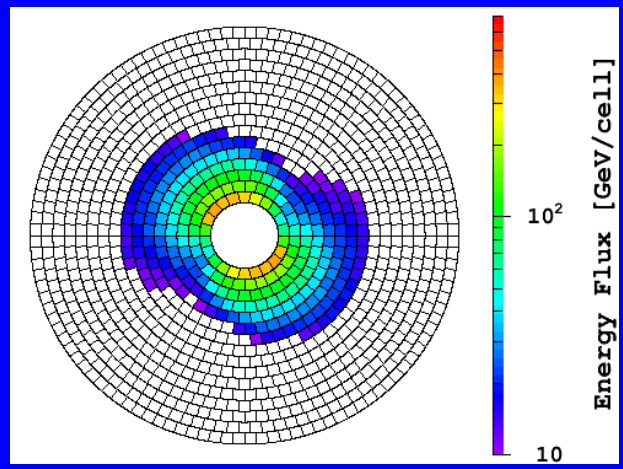
Based on on-going work by Vladimir Drugakov, U. of Minsk

Pair energy in Beamcal (l*=4m, B=4T)

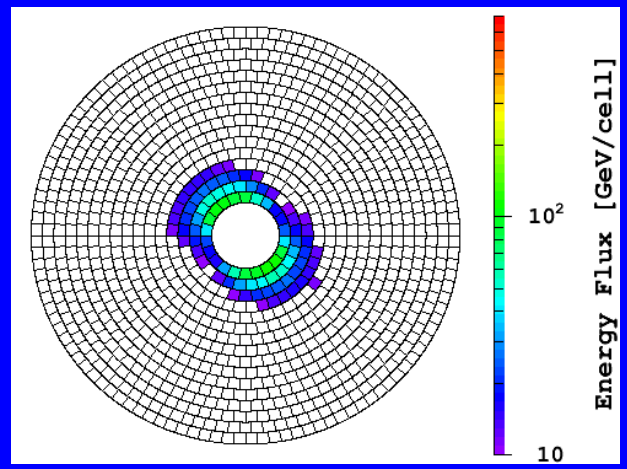
TESLA



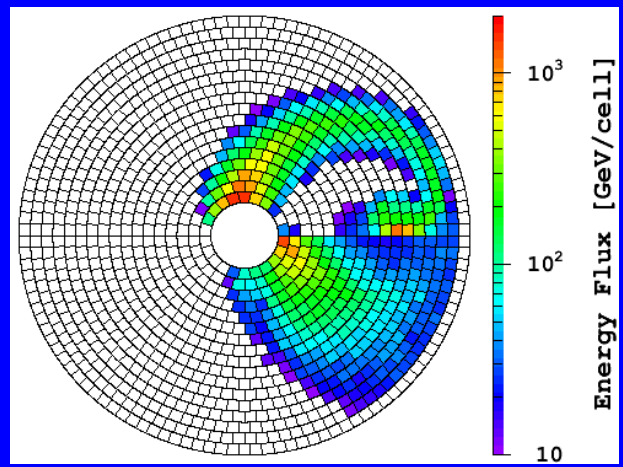
ILC – nom



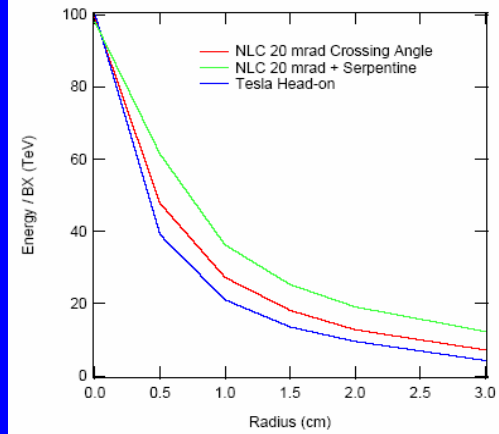
ILC – lowQ



ILC – nom
20 mrad with
idealised DID



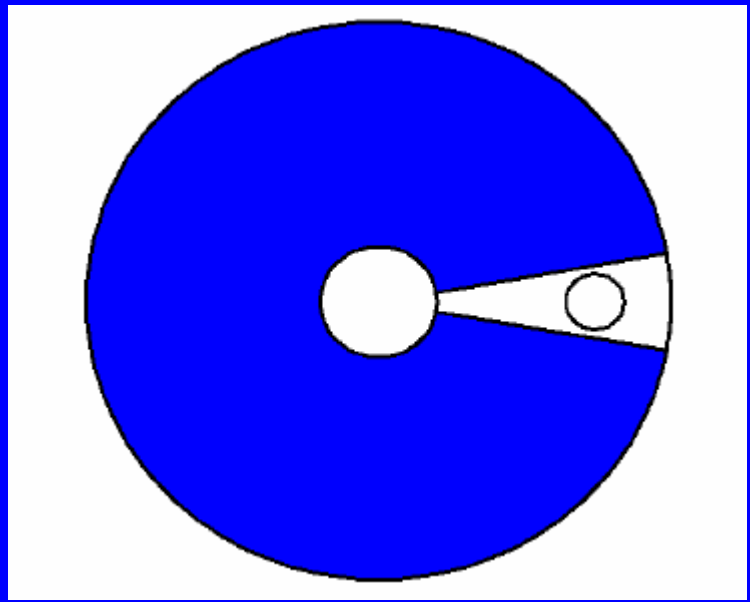
T. Maruyama



Features of simulation and comparison

- GEANT4 instead of GEANT3 and new algorithm
- averaging over rings instead with 10000 events in each
- algorithm tuned with common energy threshold and fake rate (5%) for head-on and 20 mrad (may not be fully optimal)
- electron energies: 100, 125, 150, 175, 200, 225, 250 GeV
- pairs from 500 bunch crossings are simulated for head-on and 20mrad

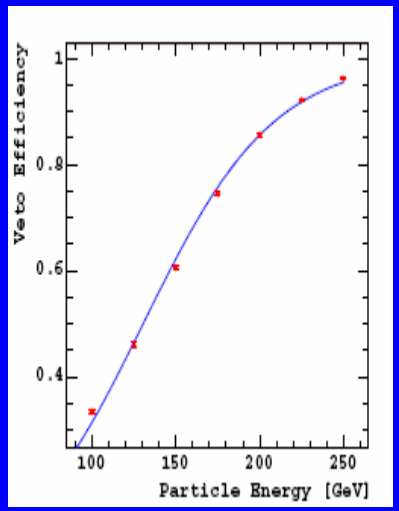
- for 20 mrad, suppose blind area for :
  -15 degree $< \varphi <$ 15 degree
  this blind area is excluded from the efficiency calculation

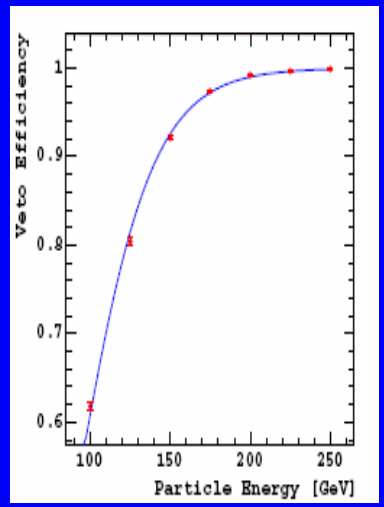


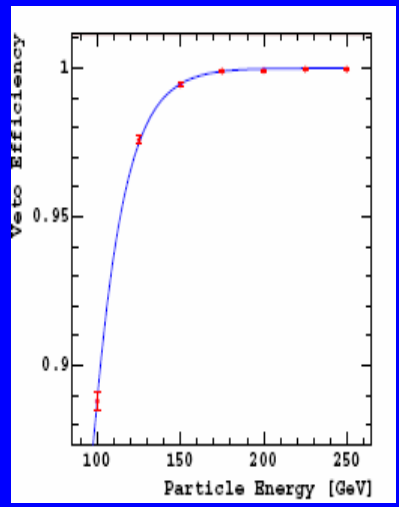
Comparison of veto eff. in 4 first rings

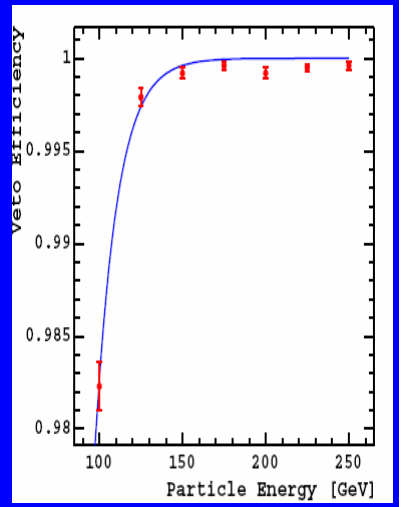
Ring 1 2 3 4

Head-on ILC nom

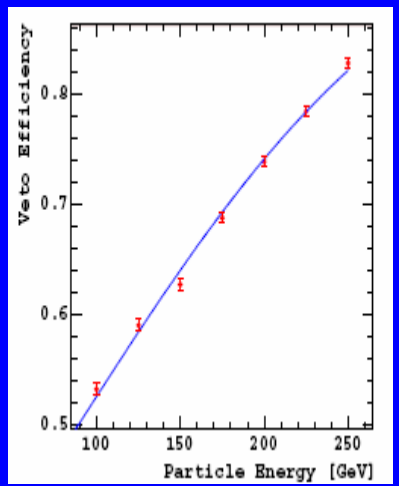


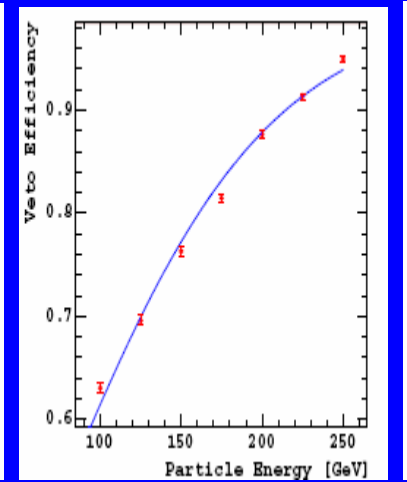


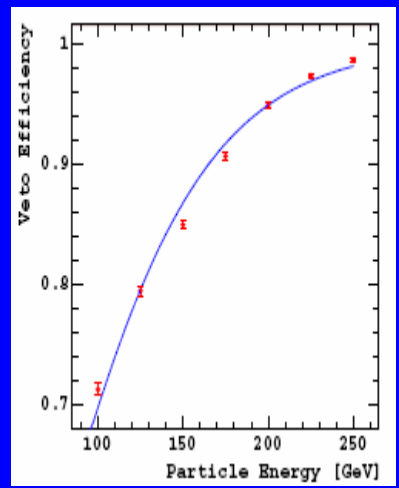


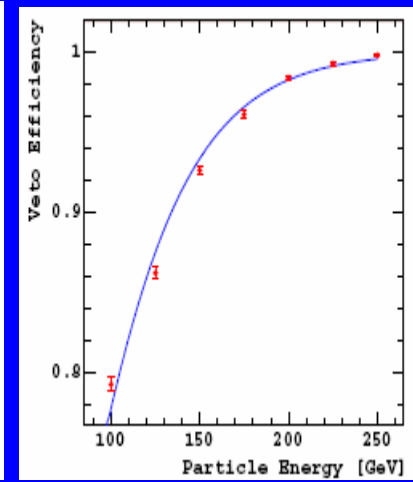


20 mrad ILC nom



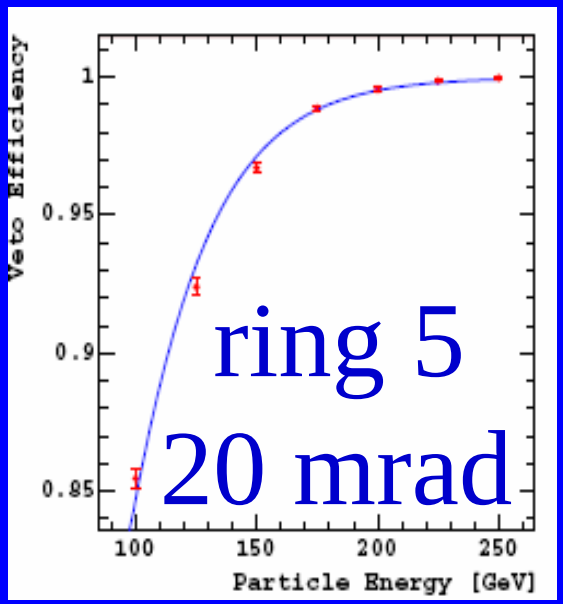


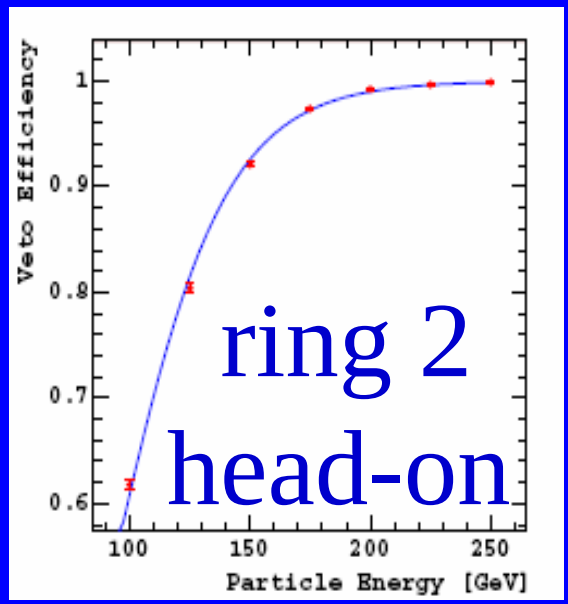


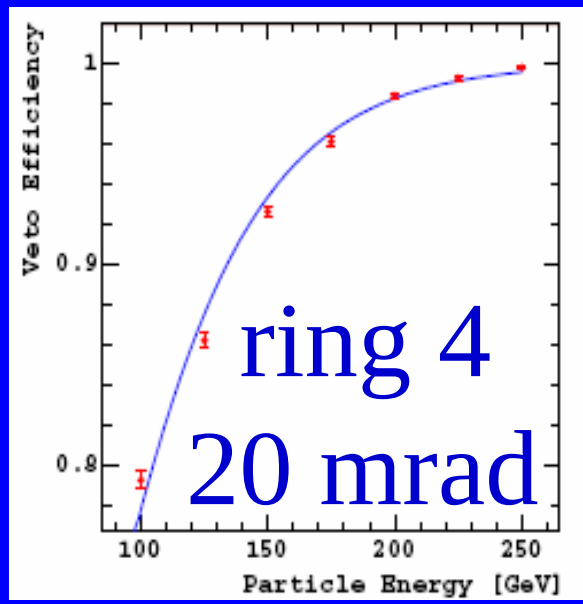


20 mrad + DID $\theta \sim$ 11 mrad

$\Leftrightarrow$ head-on $\theta \sim$ 7.5 mrad







$\theta \sim$ 11.5 mrad

$\theta \sim$ 7.5 mrad

$\theta \sim$ 10 mrad

This first look $\rightarrow \Delta m$ (head-on) $\sim 1.5 \times \Delta m$ (20 mrad)

250 GeV efficiencies

ring	head-on	20 mrad & DID
0	0.9620 ± 0.0019	0.8278 ± 0.0039
1	0.9991 ± 0.0003	0.9495 ± 0.0023
2	0.9996 ± 0.0002	0.9868 ± 0.0012
3	0.9996 ± 0.0002	0.9978 ± 0.0005
4	0.9997 ± 0.0002	0.9997 ± 0.0002
5	0.9995 ± 0.0002	0.9998 ± 0.0001
6	0.9999 ± 0.0001	0.9998 ± 0.0001
7	0.9996 ± 0.0002	0.9998 ± 0.0001
8	0.9999 ± 0.0001	0.9997 ± 0.0002

200 GeV efficiencies

ring	head-on	20 mrad & DID
0	0.8568 ± 0.0035	0.7386 ± 0.0046
1	0.9924 ± 0.0009	0.8765 ± 0.0034
2	0.9992 ± 0.0003	0.9492 ± 0.0023
3	0.9992 ± 0.0003	0.9837 ± 0.0013
4	0.9997 ± 0.0002	0.9957 ± 0.0007
5	0.9996 ± 0.0002	0.9988 ± 0.0004
6	0.9999 ± 0.0001	0.9996 ± 0.0002
7	0.9998 ± 0.0001	0.9996 ± 0.0002
8	0.9999 ± 0.0001	0.9997 ± 0.0002

Conclusions and questions

- Preliminary results show veto efficiencies > 99.9% beyond a larger enough radii R_{MIN} in the BeamCal
- For 20 mrad crossing-angle, R_{MIN} is ~ 1cm larger than for head-on; this corresponds to reachable mass differences between the lightest sleptons and the LSP (in SUSY scenarios with highly degenerate mass spectra) which are larger by ~ factor 1.5 (e.g. 5 GeV $\rightarrow$ 7.5 GeV)
- Significant difference seen between different ILC beam parameter sets: “low Q” best… will be worked on more
- Present results statistics limited at the 0.0001 level
- Systematics (e.g. hadronic content) also to be worked on