Smuon and Neutralino Mass Error vs. Tracker Momentum Error

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SLAC

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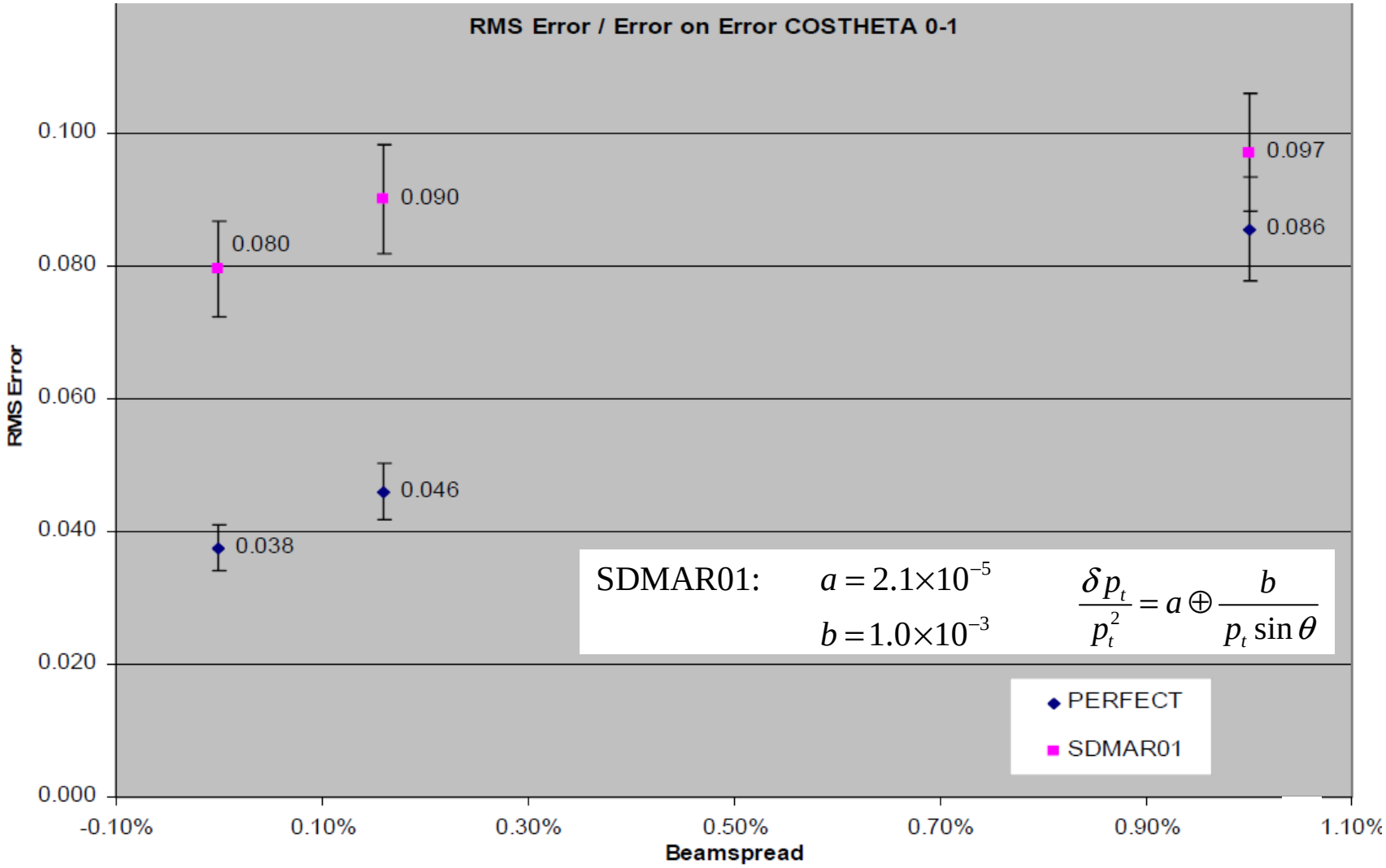
SPS1a Selectron Mass Measurement at 1 TeV B. Schumm et al.

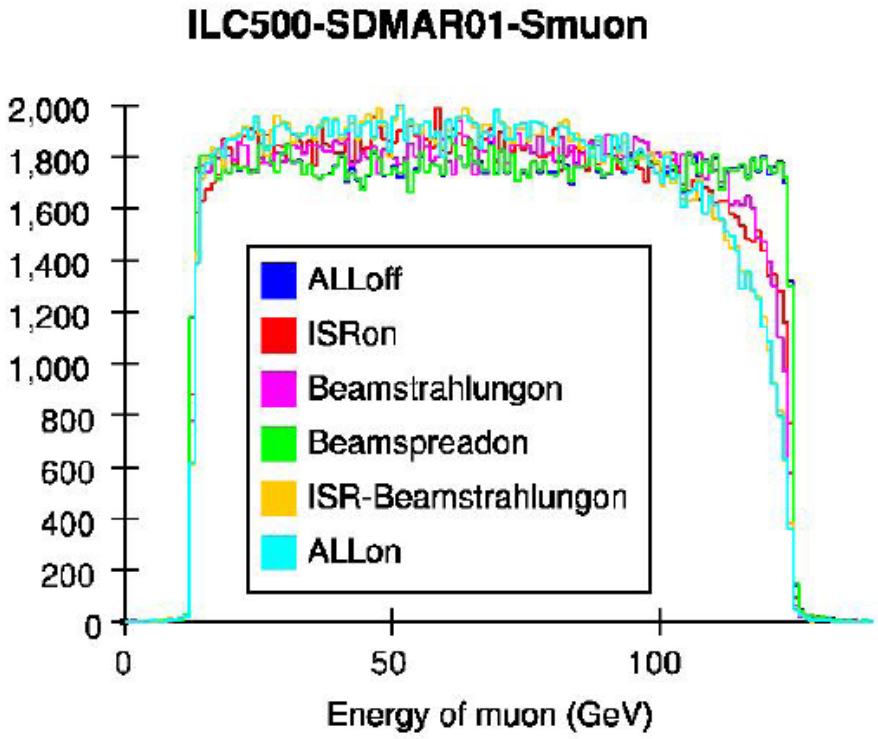


ILC Beam Effect – SPS#1

➔ISR and Beamstrahlung distort the endpoints of muon energy spectrum significantly(~40%).

➔ Beam energy spread has little effect (~3%).

$L = 50fb^{-1}$ 20% random background	Smuon mass error (relative)	Neutralino mass error (relative)
ALL OFF	260 MeV (0.182%)	167 MeV (0.174%)
Beam energy spread(0.11%) ON	266 MeV (0.186%)	172 MeV (0.179%)
ALL ON	420 MeV (0.294%)	294 MeV (0.306%)
$L=500\ fb^{-1}$	133 MeV	93 MeV

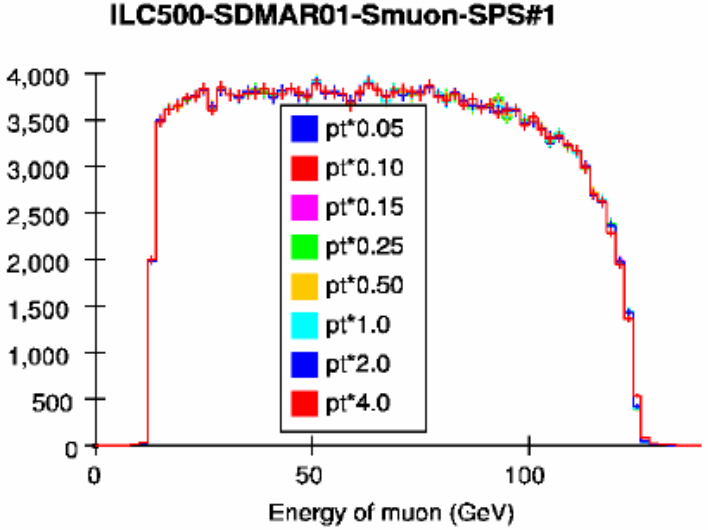


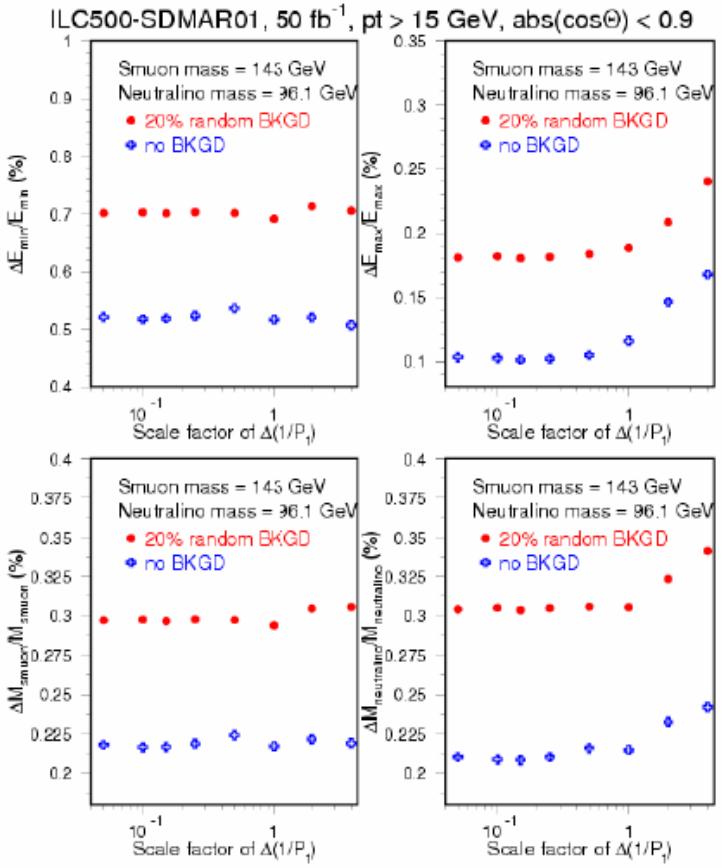
Worldwide Study of the Physics and Detectors for Future Linear e^+e^- Colliders

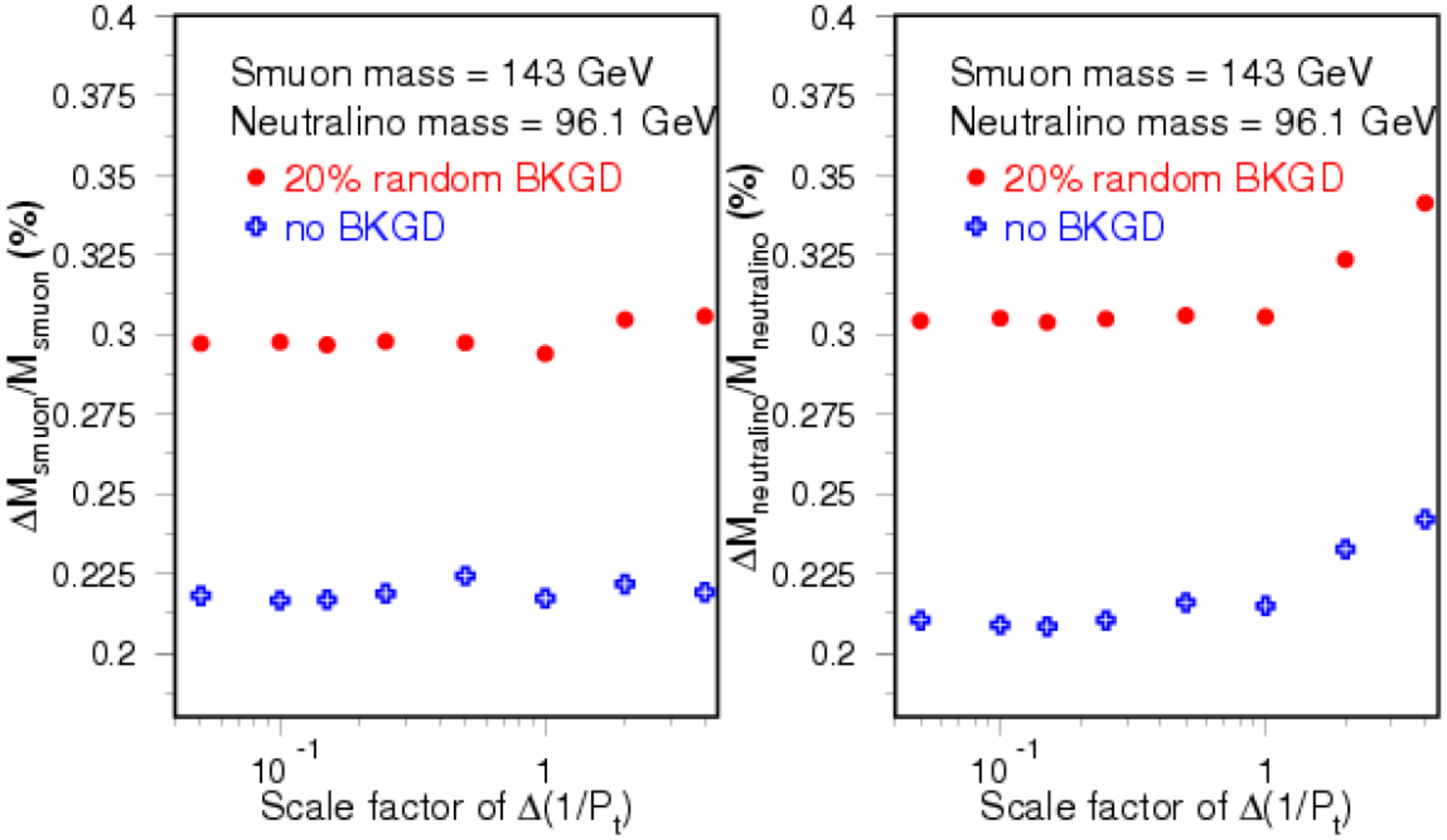
SPS#1, High Mass Difference (ΔM=47 GeV)

➔No apparent improvement on Susy mass precision by improving track resolution.
➔Smuon mass error is dominant by relative error of the low energy endpoint E_{min}.

➔Susy mass precision is affected by background contamination. The mass errors degraded ~30% when 20% random background(20% of N_{signal}) presented.





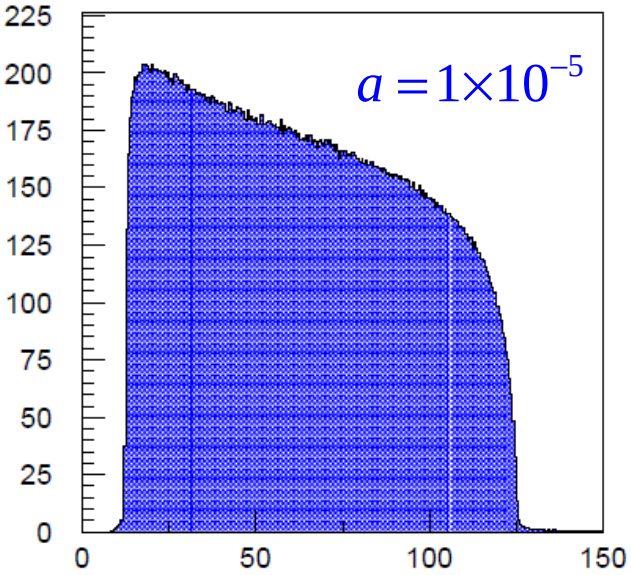

Smuon mass = 143 GeV
Neutralino mass = 96.1 GeV
20% random BKGD
no BKGD
$\Delta M_{smuon}/M_{smuon}$ (%)
Scale factor of $\Delta(1/P_t)$
Smuon mass = 143 GeV
Neutralino mass = 96.1 GeV
20% random BKGD
no BKGD
$\Delta M_{neutralino}/M_{neutralino}$ (%)
Scale factor of $\Delta(1/P_t)$

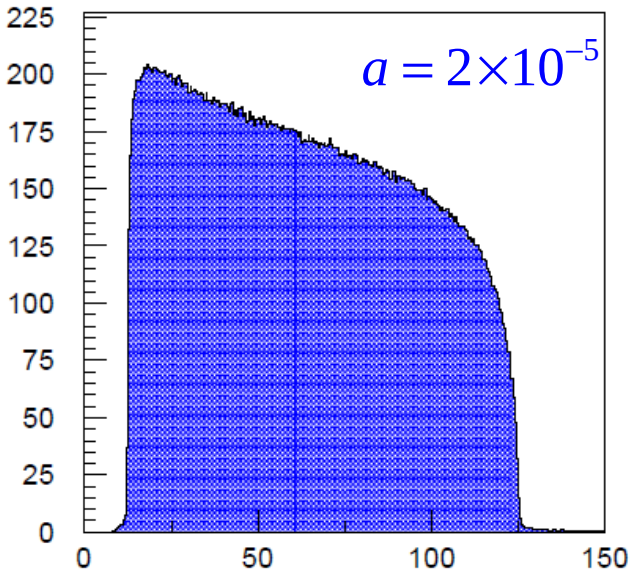
$$e^+e^- \to \tilde{\mu}^+\tilde{\mu}^-$$
$$\to \mu^+\mu^-\tilde{\chi}_1^0\tilde{\chi}_1^0$$

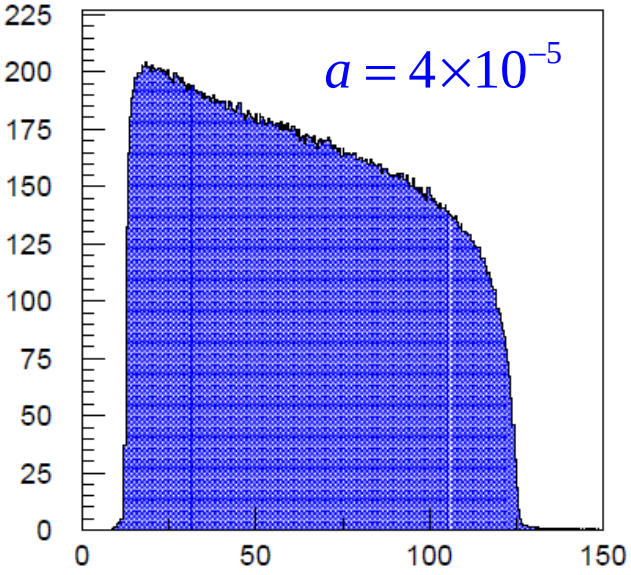
$$\sqrt{s} = 500\ GeV$$

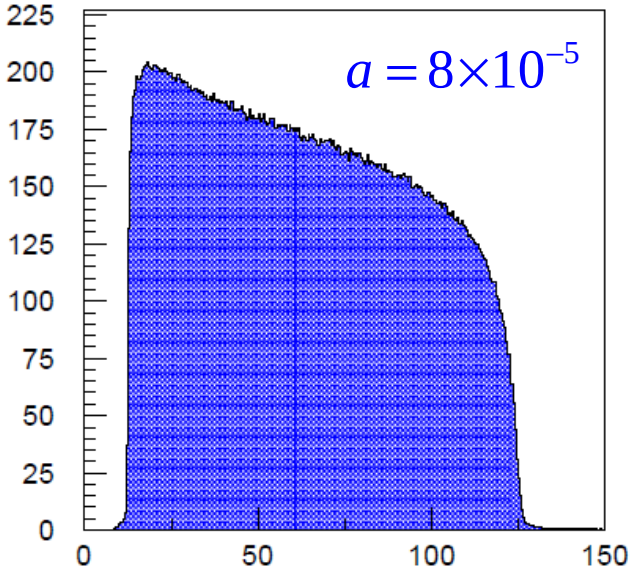
$$L = 500\ fb^{-1}$$

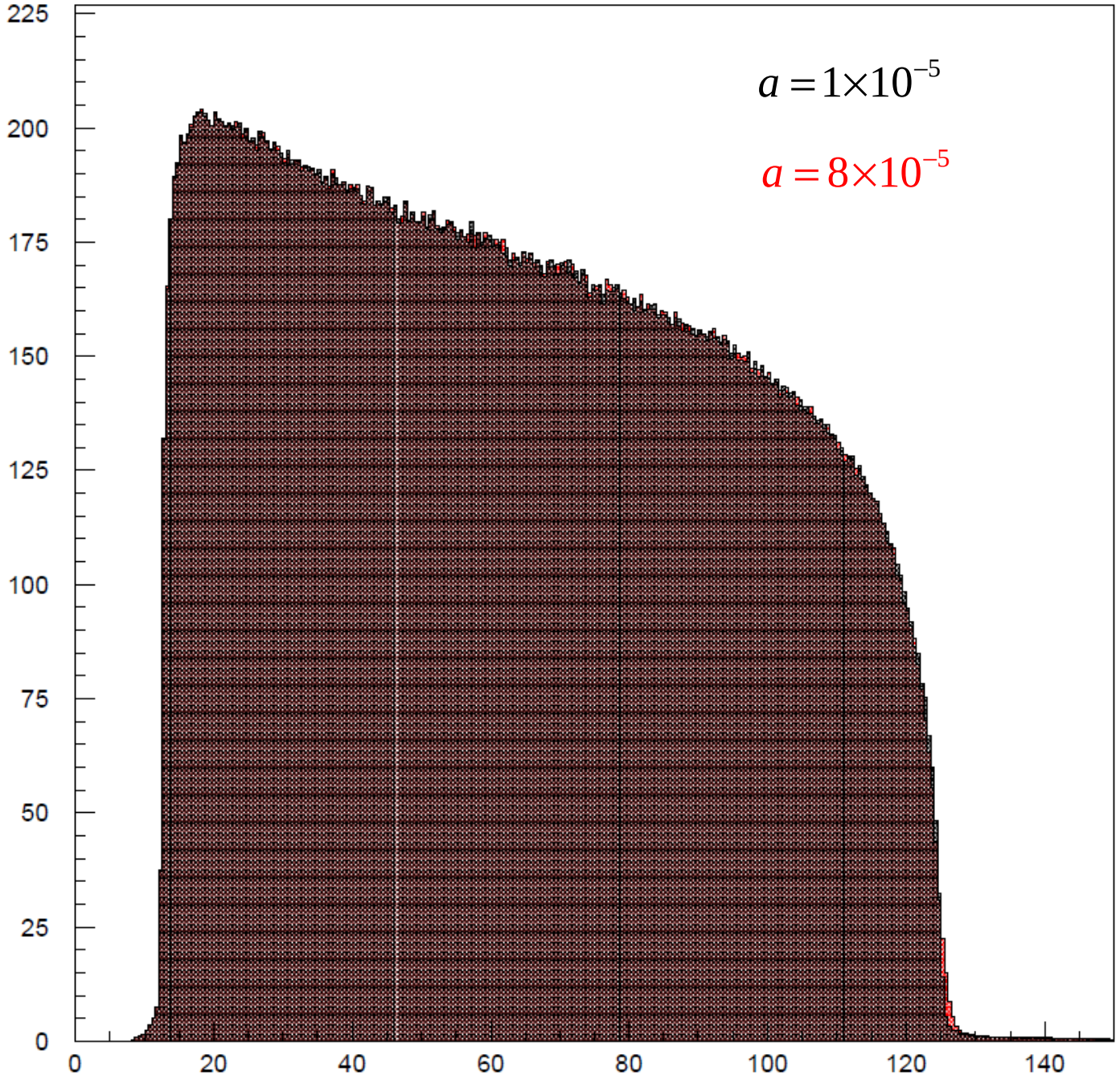
$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin\theta}$$



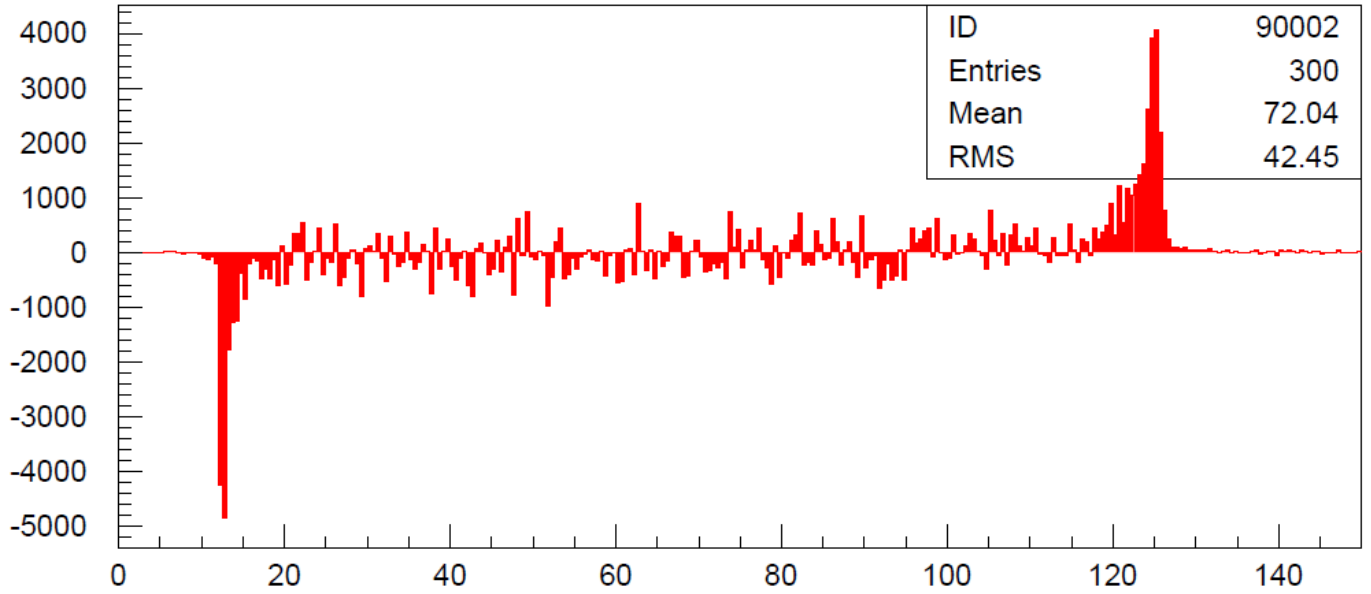




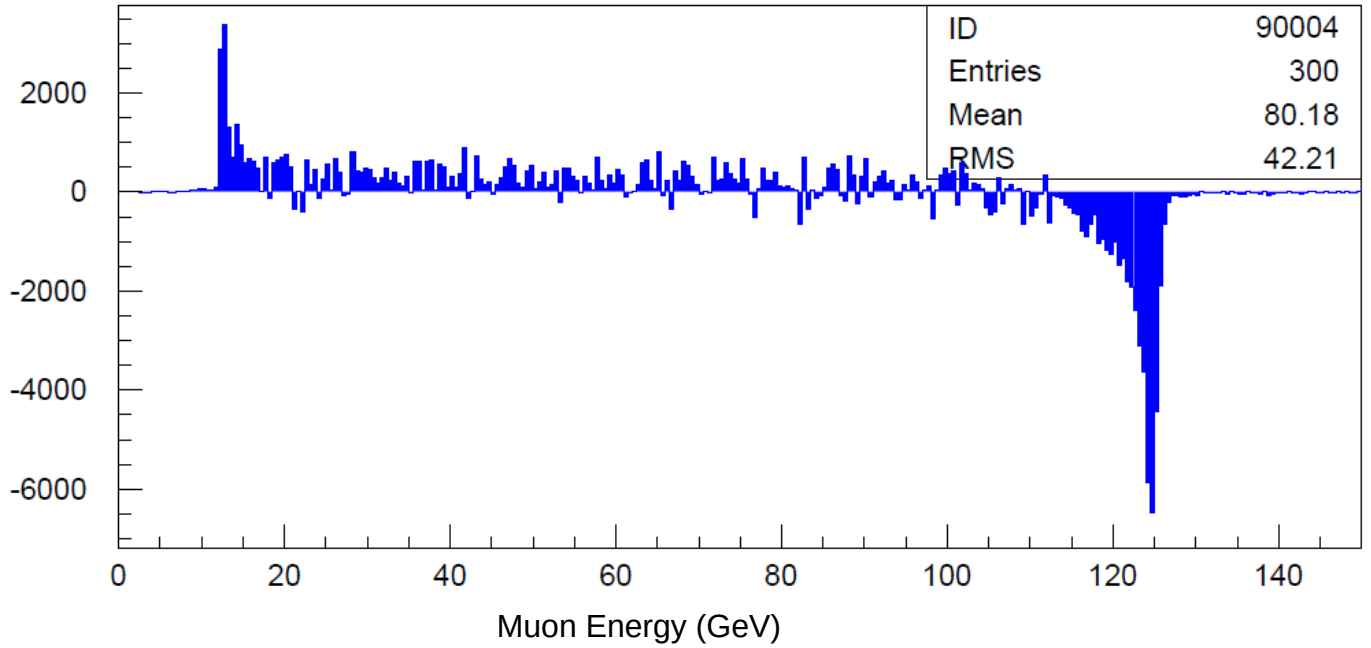



$a = 1\times10^{-5}$
$a = 8\times10^{-5}$
225
200
175
150
125
100
75
50
25
0
0
20
40
60
80
100
120
140

$$\left.\frac{dN_{bin}}{dM_{\tilde{\mu}}}\right|_{M\tilde{\mu}=143\,GeV}$$



$$\left.\frac{dN_{bin}}{dM_{\tilde{\chi}_1^0}}\right|_{M_{\tilde{\chi}_1^0}=96\,GeV}$$



$$e^+e^- \to \tilde{\mu}^+\tilde{\mu}^-$$
$$\to \mu^+\mu^-\tilde{\chi}_1^0\tilde{\chi}_1^0$$

$\sqrt{s} = 500\ GeV$

$L = 500\ fb^{-1}$

$\Delta M_{\tilde{\mu}}$, $\Delta M_{\tilde{\chi}_1^0}$ (MeV)