Contrasting Supersymmetry and Universal Extra Dimensions at the e^+e^- Linear Collider

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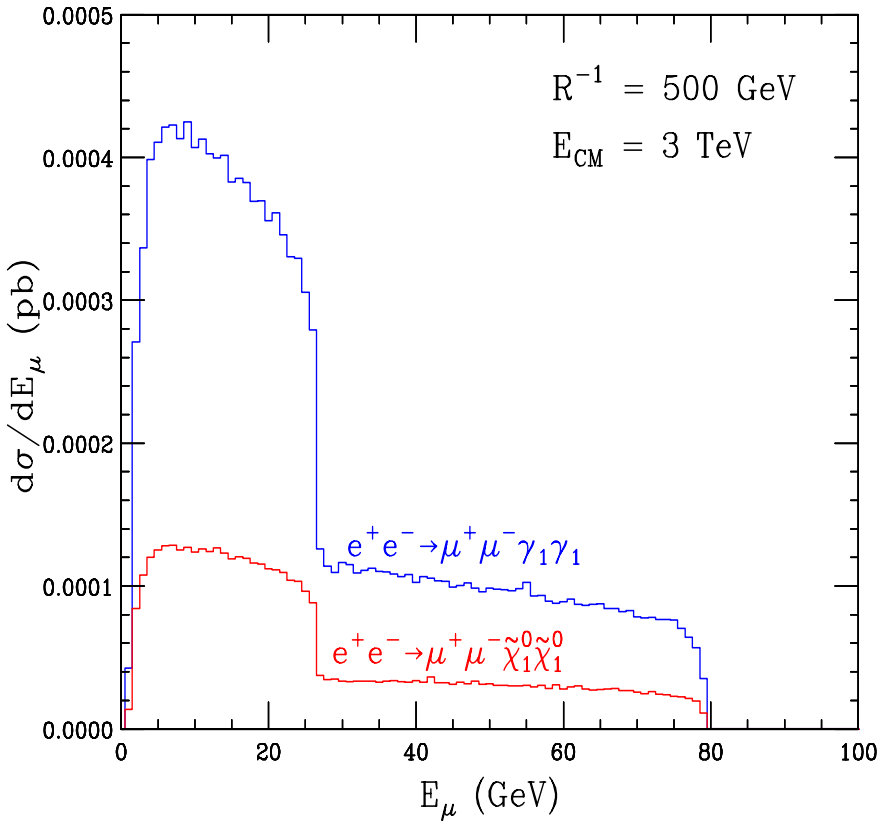
UED with $R^{-1} = 500$ GeV and $\Lambda R = 20$

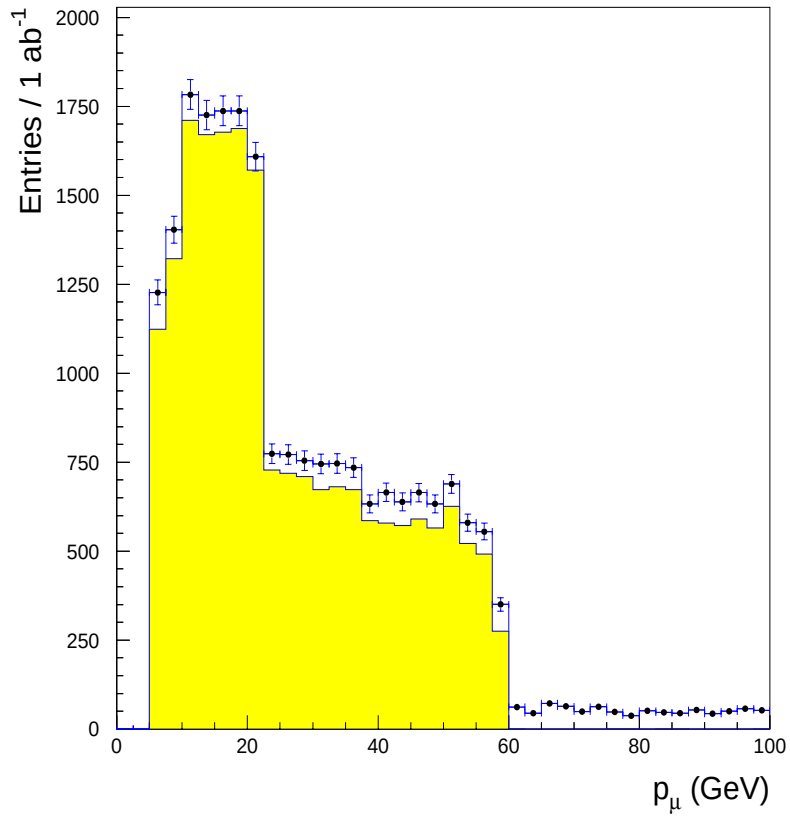
Particle	Mass
μ_1^D	515.0 GeV
μ_1^S	505.4 GeV
γ_1	500.9 GeV

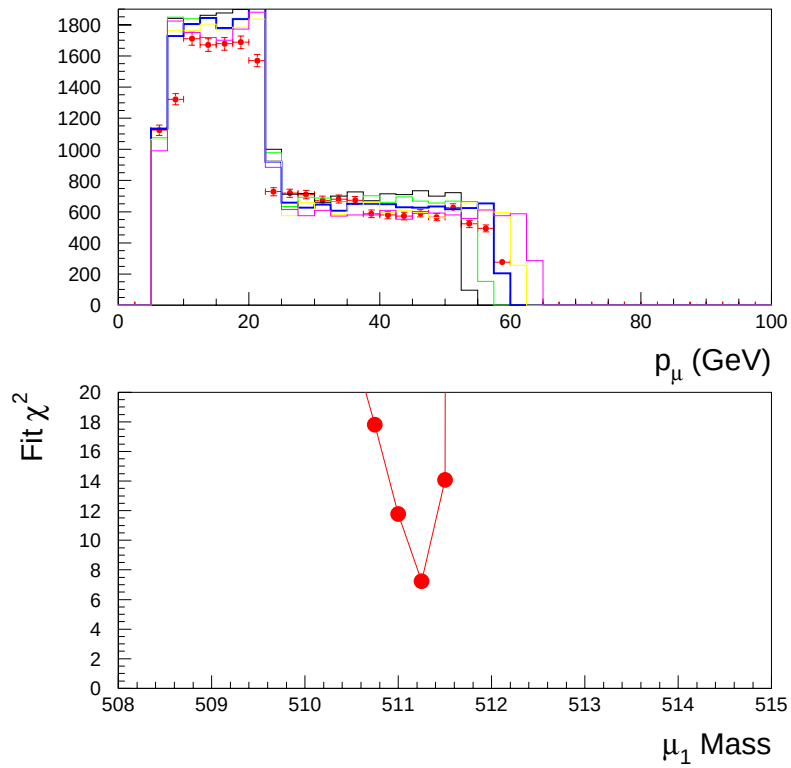
Matching MSSM

MSSM Parameter	Value
μ	1000 GeV
M_1	502.65 GeV
M_2	1005. GeV
M_{l2}	512.83 GeV
M_{r2}	503.63 GeV
$\tan\beta$	10

$$E_{max/min} = \frac{1}{2} M_{\tilde{\mu}} \left(1 - \frac{M^2_{\tilde{\chi}^0_1}}{M^2_{\tilde{\mu}}} \right) \gamma(1 \pm \beta)$$

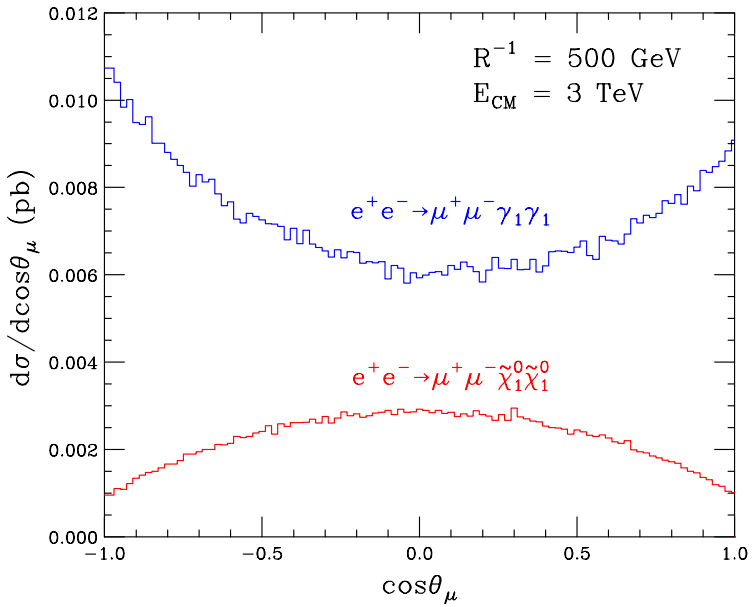


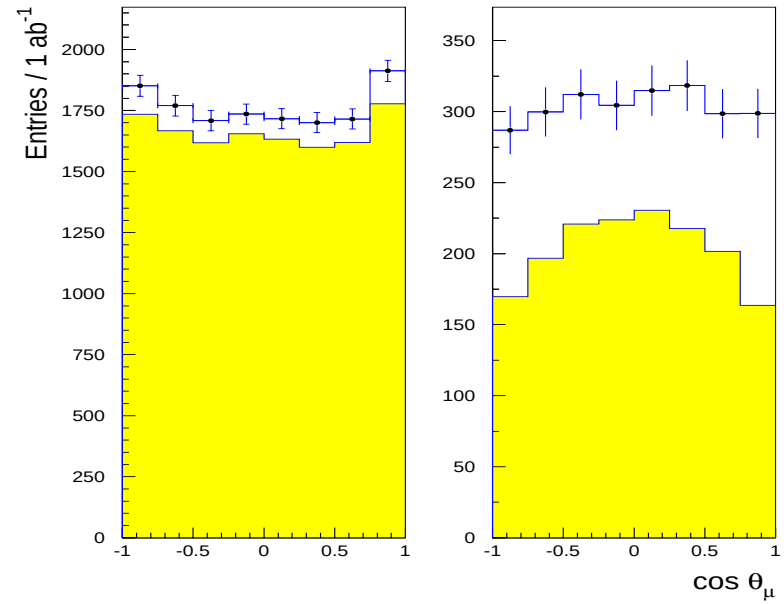




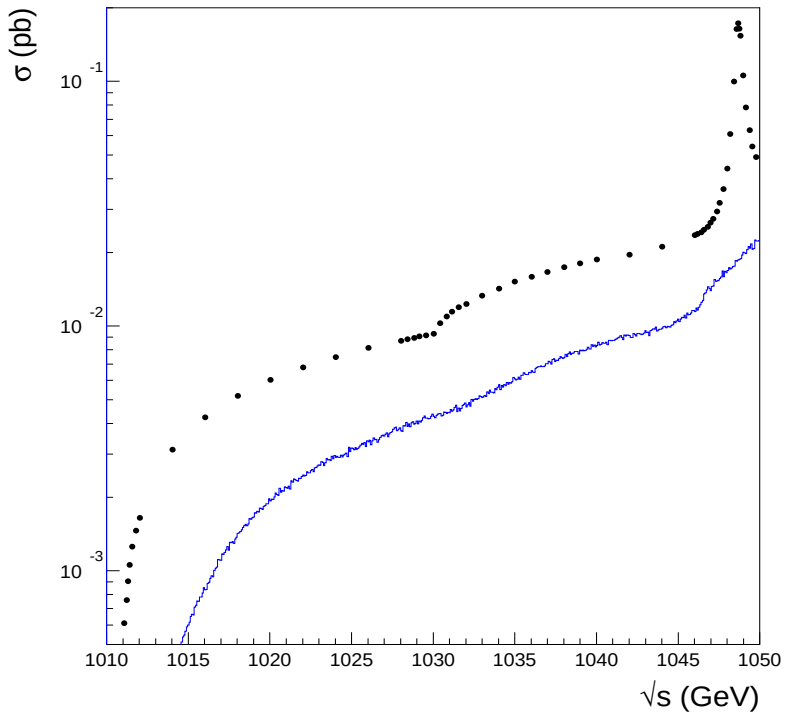
A one parameter fit, assuming the mass of the γ_1 state known, gives an uncertainty on the μ_1 mass of ± 0.25 GeV for 1 ab^{-1} of statistics at 3 TeV.

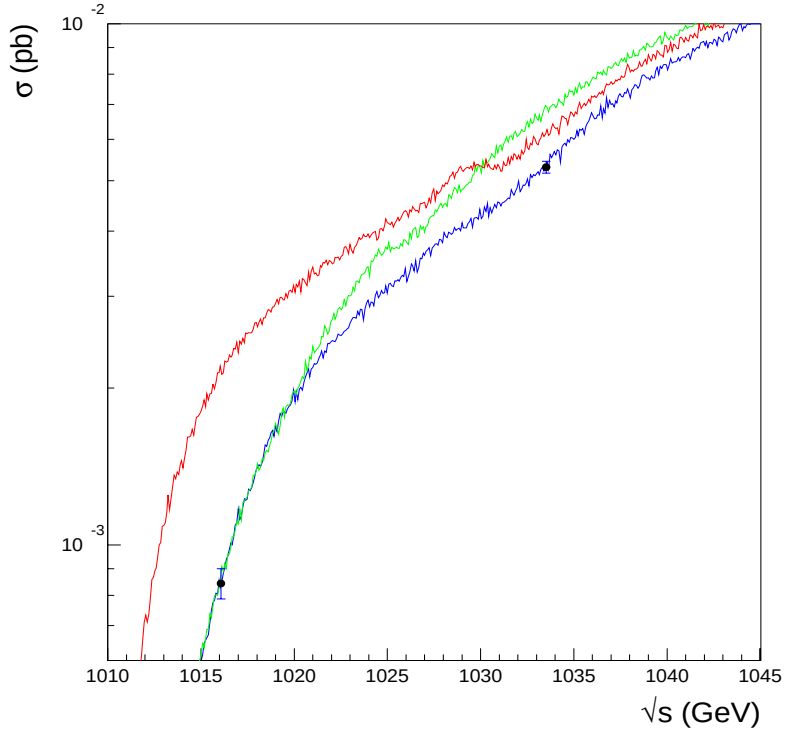
$$\left(\frac{d\sigma}{d\cos\theta}\right)_{UED} \sim 1+\cos^2\theta \qquad \left(\frac{d\sigma}{d\cos\theta}\right)_{SUSY} \sim 1-\cos^2\theta$$



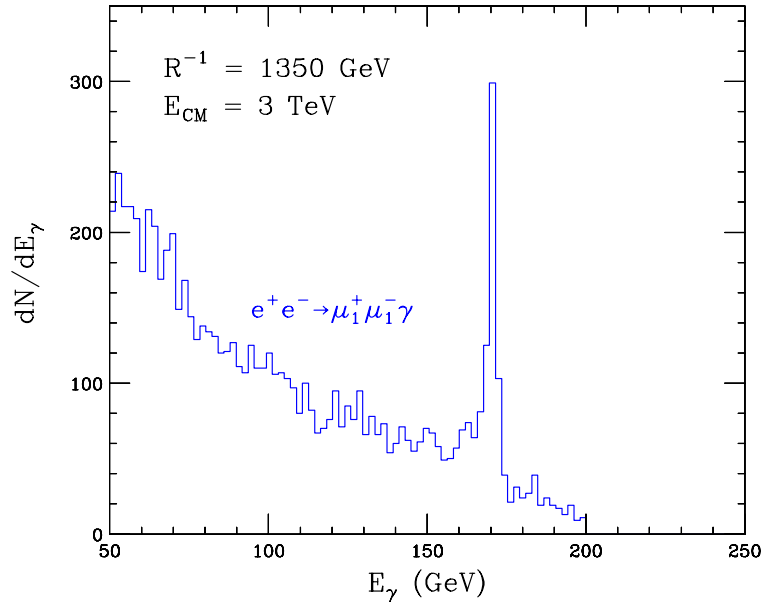
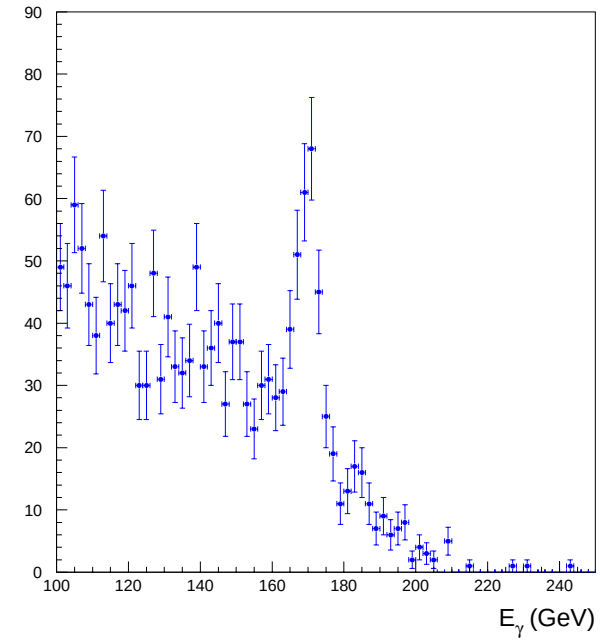


By performing a χ^2 fit to the normalised polar angle distribution, the UED scenario considered here could be distinguished from the MSSM, on the sole basis of the distribution shape, with 350 fb^{-1} of data at $\sqrt{s} = 3$ TeV.





The masses of the two UED muon excitations can be determined to ± 0.11 GeV and ± 0.23 GeV for the singlet and the doublet states respectively, with a total luminosity of 1 ab^{-1} shared in three points, when the particle widths can be disregarded.

Radiative Return to Z_2

$$E_\gamma = \frac{1}{2}\, E_{CM} \left(1 - \frac{M_{Z_2}^2}{E_{CM}^2}\right)$$