COMPOSITENESS

WHEN EVER WE ENTER A NEW KINEMATIC REGIME, WE CHECK FOR THE (STILL MYSTERIOUS) "POINT-LIKE" QUALITY OF PARTICLES

e

μ

τ

THAT DO HAVE "INTERNAL" QUANTUM NUMBERS.

(→ SPIN...)

Møller scattering

IS A PARTICULARLY SUCCESSFUL TOOL TO INVESTIGATE "SUBSTRUCTURE" LEVELS.

A CANONICAL STUDY OF THE SENSITIVITY OF MØLLER SCATTERING TO CONTACT INTERACTION TERMS AT ENERGY Λ SHOWS THE IMPORTANCE OF

→ HIGH ENERGY

→ HIGH DEGREES OF POLARISATION FOR BOTH BEAMS

COMPOSITENESS

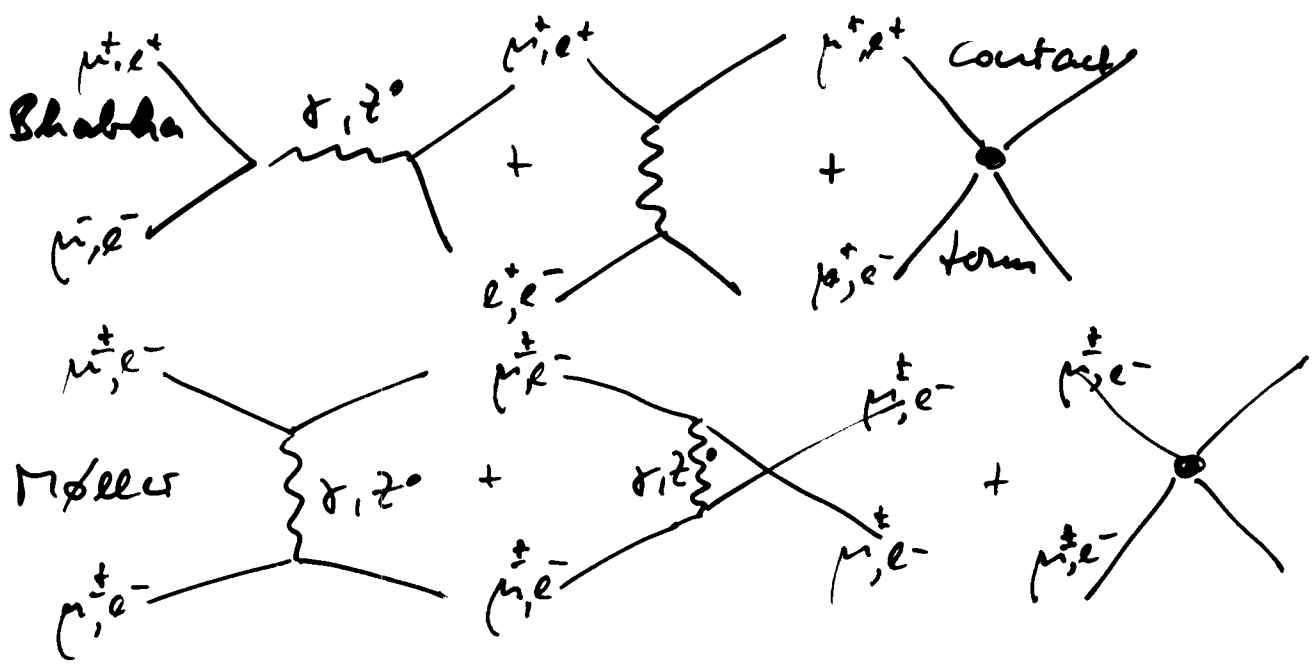
AT SOME ENERGY SCALE Λ, WRITE GENERAL CONTACT INTERACTION LAGRANGEAN

$$\mathcal{L}_{eff} = \frac{g^2}{2\Lambda^2}\Big[\eta_{LL}\,\bar{\mu}_L\gamma_\mu\mu_L\,\bar{\mu}_L\gamma^\mu\mu_L + \eta_{RR}\,\bar{\mu}_R\gamma_\mu\mu_R\,\bar{\mu}_R\gamma^\mu\mu_R + 2\eta_{RL}\,\bar{\mu}_R\gamma_\mu\mu_R\,\bar{\mu}_L\gamma^\mu\mu_L\Big]$$

convention: $\frac{g^2}{4\pi} = 1$

Λ = compositeness scale

for <u>Møller</u> scattering

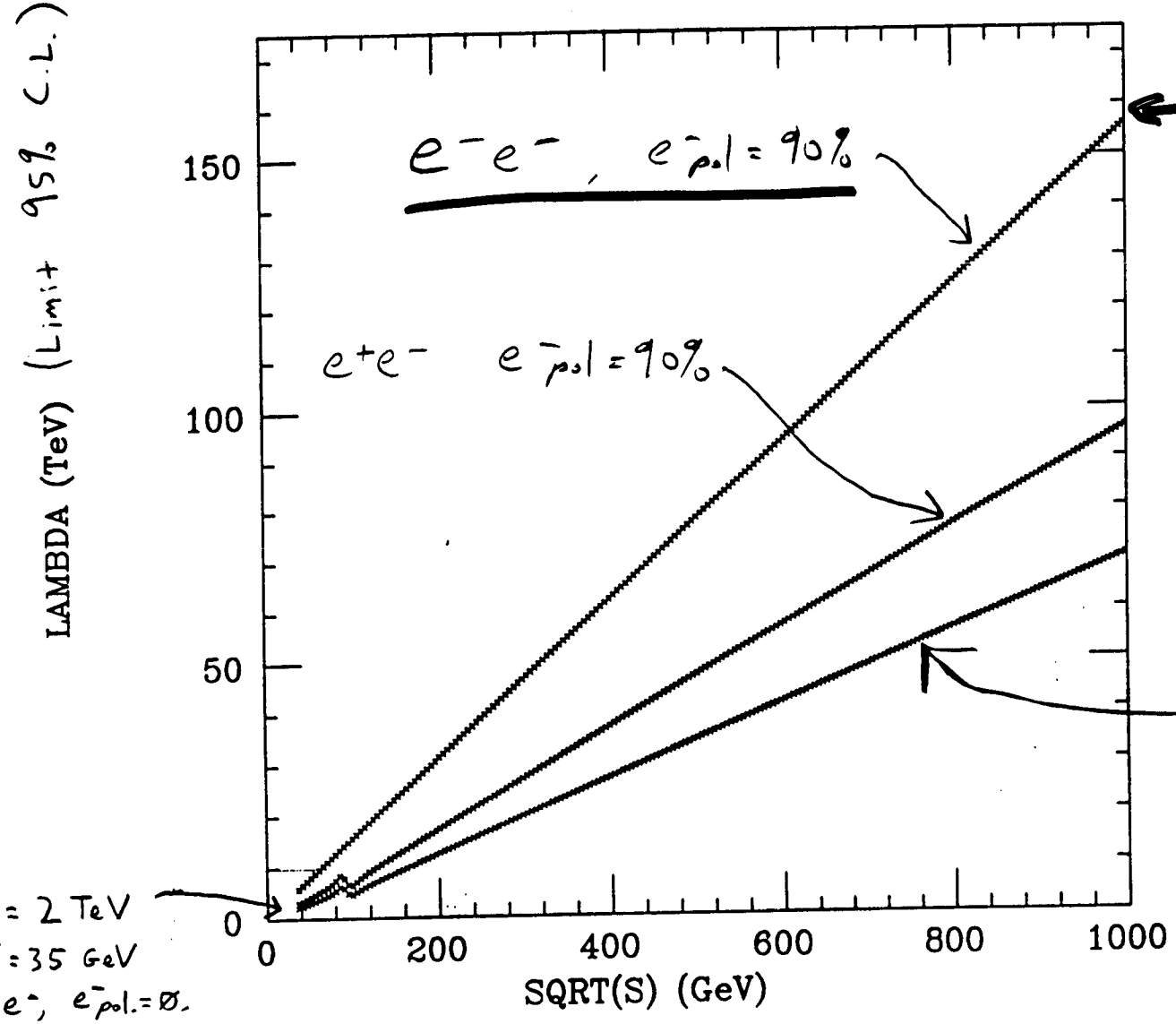


(Λ^{+}_{LL})

95% C.L. LAMBDA VS. SQRT(S)

$\mathcal{L} = \frac{680\,pb^{-1}}{M_Z^2} \cdot S$

@ $\sqrt{S}$ = 35 GeV	$\mathcal{L}$ = 100 pb^{-1}
100	816 pb^{-1}
200	3200 pb^{-1}
500	20 fb^{-1}
1000	82 fb^{-1}



Sensitivity for e^-e^- (or $\mu^-\mu^-$)

$\Lambda_{LL} = 2$ TeV @ $\sqrt{S} = 35$ GeV + e^+e^-, $e^-_{pol.} = 0$.

Note: With $\mathcal{L} = \frac{680\,pb^{-1}}{M_Z^2} \cdot S$, the statistics at each $\sqrt{S}$ are the same as the statistics of the PETRA experiments.

WHENCE THIS SENSITIVITY OF Møller Scattering?

CROSSING

$$\frac{1}{\Lambda^2}\Big|_{\mu^+\mu^-} = \sqrt{2a}\,\left(s^4+u^4+t^4\right)^{1/2}\left(\frac{1}{3\omega_0}\right)\sqrt{\frac{1}{\mathcal{L}}}\;\frac{1}{u^3}$$

SO WE COMPARE

$$\Lambda_{\mu^+\mu^+} = (2a)^{-1/4}\left(s^4+u^4+t^4\right)^{-1/4}(3\omega_0)^{1/2}\left(\frac{\mathcal{L}}{2}\right)^{1/4} s^{3/2}$$

$(\mu^-\mu^-)$

$$\Lambda_{\mu^+\mu^-} = \quad \cdots \quad u^{3/2}$$

FOR A RATIO

$$\boxed{\frac{\Lambda_{\mu^\pm\mu^\pm}}{\Lambda_{\mu^+\mu^-}} = 2^{-1/4}\left(\frac{s}{u}\right)^{3/2}}$$

$$= 2^{-1/4}\left(\frac{2}{1+z}\right)^{3/2}$$

$$= 2^{5/4}\,\frac{1}{(1+z)^{3/2}}$$

$$= 2.38 \;\%/90^\circ$$

(NOTE: this numerical calculation neglects z exchange)