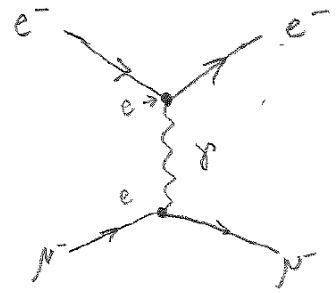
Abb. III.1a Höhere Ordnungen

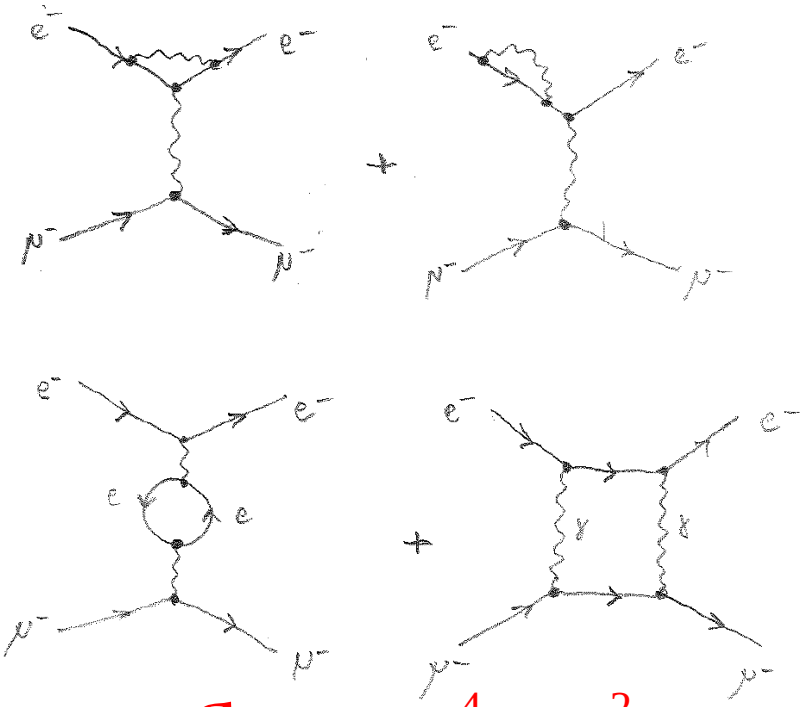
Bsp.: $e^- \mu^- \to e^- \mu^-$

Leading Order (LO)



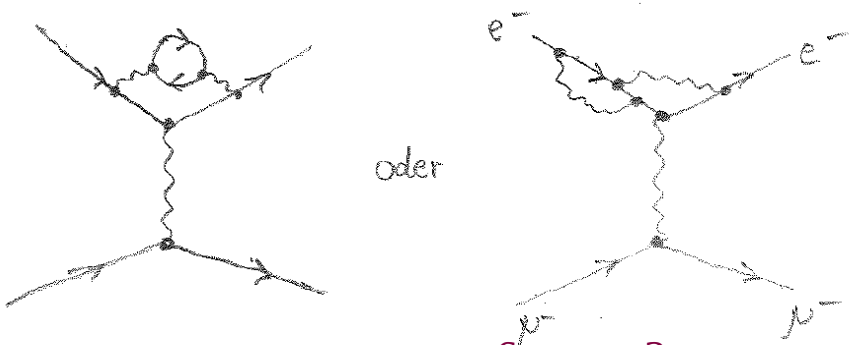
$$\mathcal{A}_{LO} \sim e^2 \sim \alpha$$

Next to Leading Order (NLO)



$$\mathcal{A}_{NLO} \sim e^4 \sim \alpha^2$$

Next to Next to Leading Order (NLO)

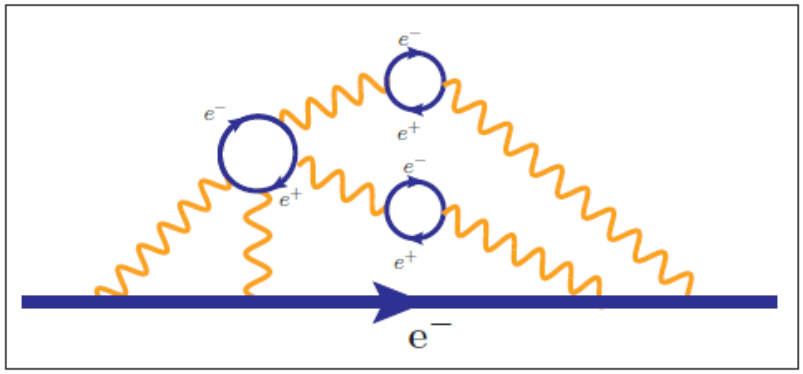


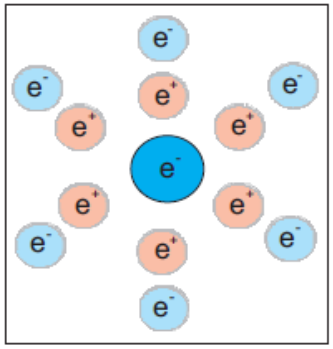
$$\mathcal{A}_{NNLO} \sim e^6 \sim \alpha^3$$

$$\alpha \sim \frac{1}{137}$$

$\Rightarrow$ Amplituden werden Ordnung für Ordnung kleiner

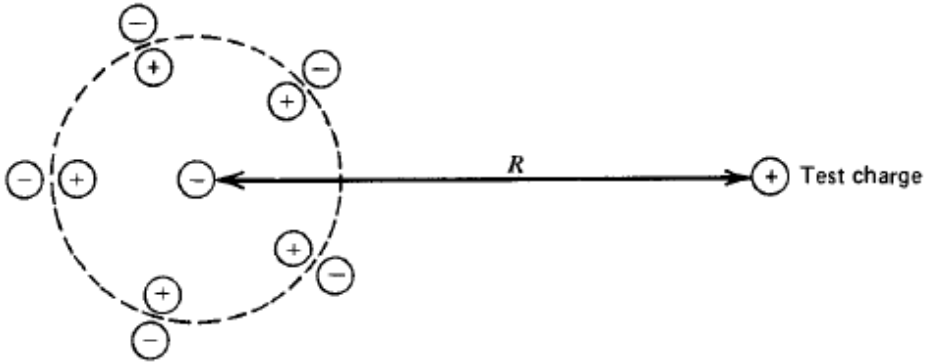
Abb. III.1b Vakuumpolarisation in QED





Großer Abstand: Abschirmung

Kleiner Abstand: “nackte” Ladung



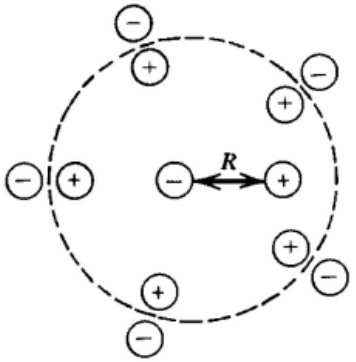
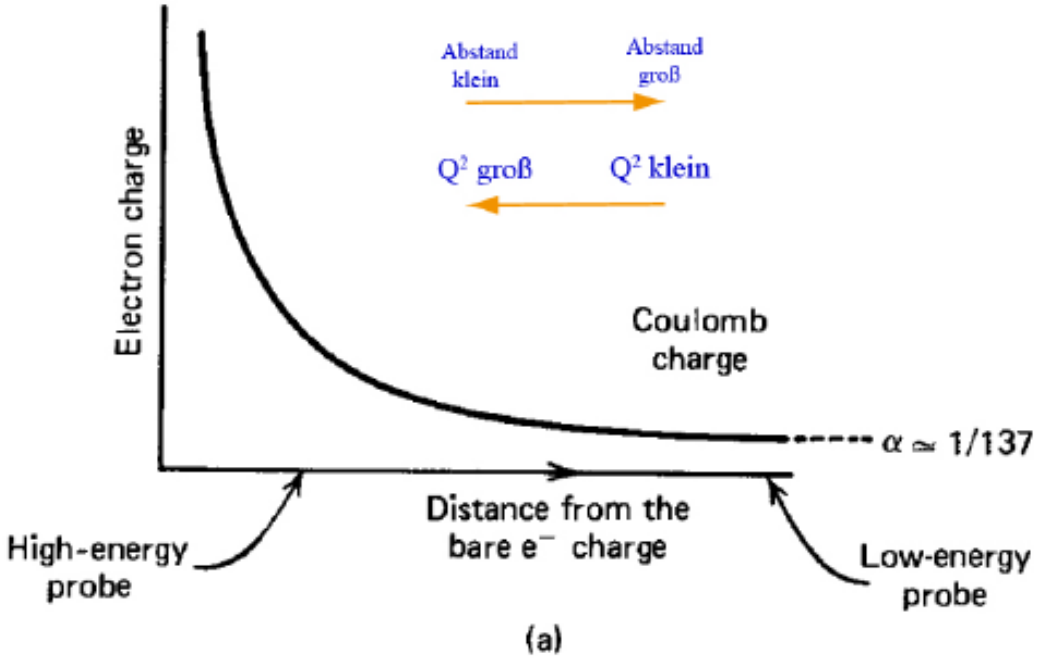


Abb. III.2 Laufende Kopplungskosntante



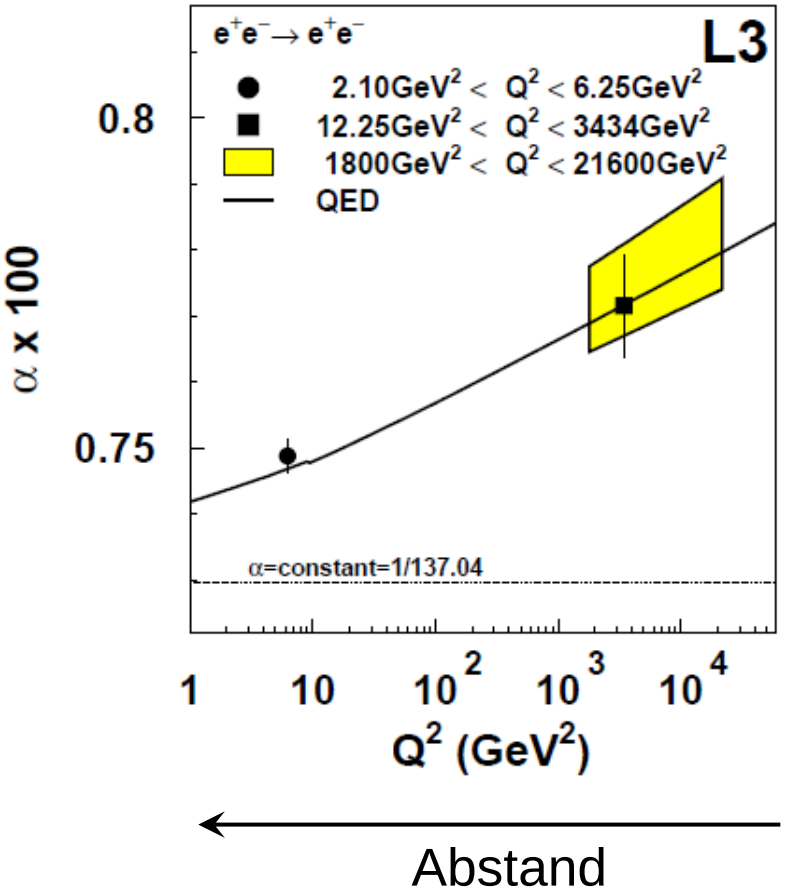


Abb. III.3a Laufende Kopplung der starken Wechselwirkung

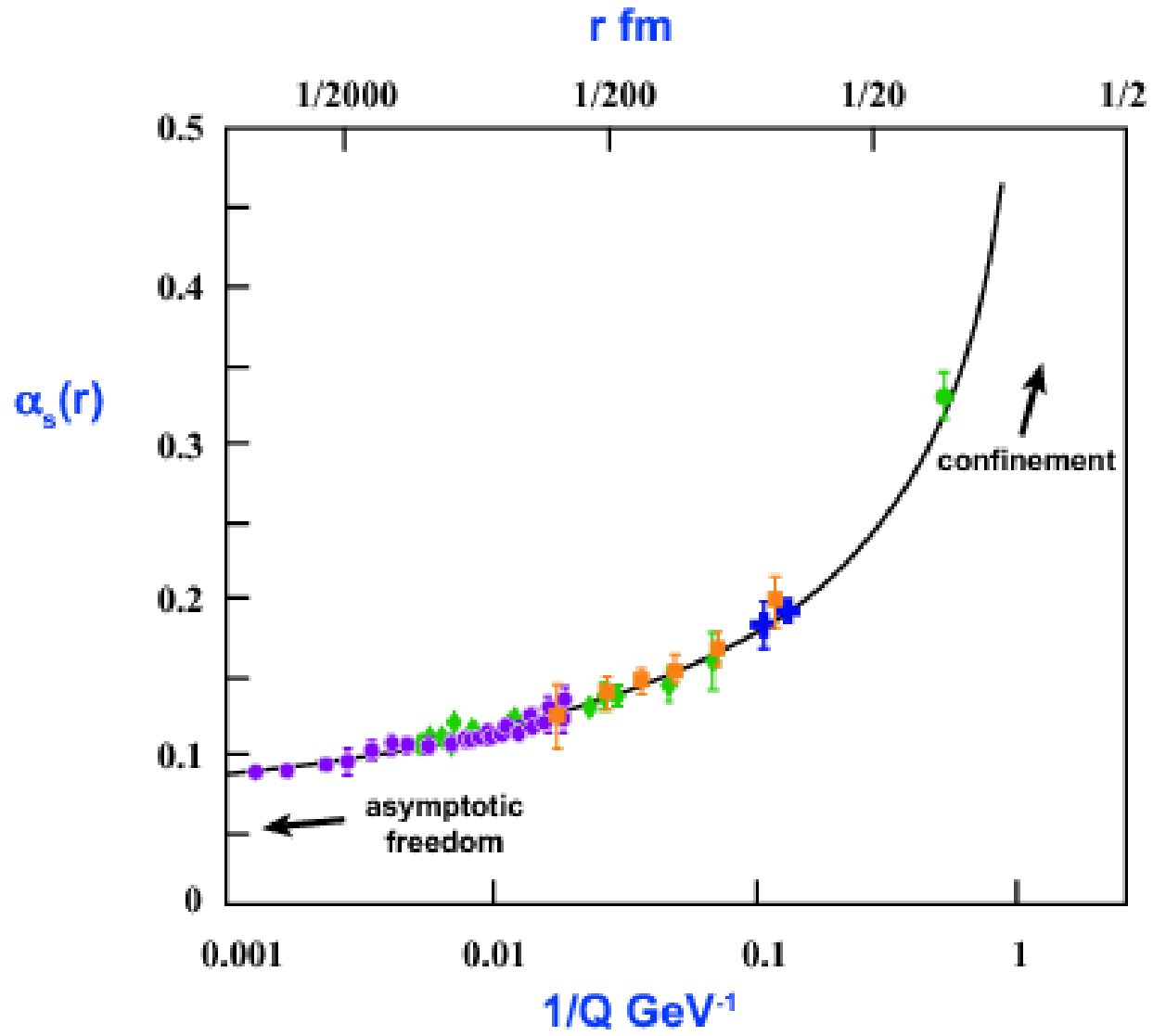


Abb. III.3b Laufende Kopplung der starken Wechselwirkung