Extreme relativistic

\[ E_2 = \gamma E_2^{NR} \text{ for } 1 < \frac{v}{c} \leq \frac{\sqrt{5}}{8} \]

\[ E_1 = \frac{q}{c} \text{ for } v = \frac{c}{8} \]

\[ v = 0 \quad \frac{v}{c} = 1 \]

3b Action of an em field

a) \[ S = S^\text{f} + S^\text{m} + S^\text{mp} \]

\[ \text{action of free particle} \quad \text{action of fields} \quad \text{action of particle in a field} \]

E.g.: superposition principle

\[ = \text{e.g. of motion are linear in fields} \]

\[ = \text{S is quadratic in fields} \]

\[ S = \int d^4x L \quad \text{Lagrangian density} \]

\( L \) should be a Lorentz scalar

\[ \text{tensors } A^\mu, J^\mu, F^{\mu\nu}, F^{\mu\nu} \]

\[ L = a F^{\mu\nu} F_{\mu\nu} + b A^\mu J^\mu + c F_{\mu\nu} F^{\mu\nu} \]