FYS3500 Spring 2024 - Problem set 3

Topic: Basic concepts in particle physics

Concepts of the week

Explain these concepts: Cross section, Parity, Lifetime, Charge Conjugation, Decay Width

Problem 1: Parity

a) The positive pion (π^+) is a bound state of a u-quark (fermion) and a $\bar{d}$-quark (anti-fermion). What is the intrinsic parity of the pion?

b) Say we have two fermions bound in an $L = 1$ state. What is the parity of the state?

c) Exercise 1.2 in Martin&Shaw 2019.

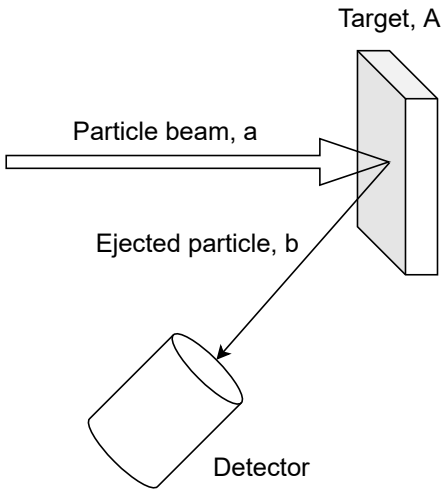

Figure 1: Experiment $A(a, b)$.

Problem 2: Cross section

a) We're going to look at an experiment where we have a particle beam a that hits a stationary target A and the particle b is ejected, see Fig.1. The compact notation for this experiment is $A(a, b)$. Discuss what quantities affect the amount of particle b observed by the detector.

b) Exercise 1.15 in Martin&Shaw 2019.