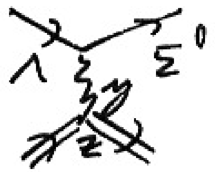
Higher hadron physics Exercise 1 Julian Bergmann

Nr. 4

The first method is using Primakoff's effect with the dominant decay mode of the Σ^0 hyperon:



with Z as the atomic number of a nucleus.

$$\Lambda + Z \to \Sigma^0 + Z \quad , \quad \Sigma^0 \to \Lambda^0 + \gamma$$

So as Σ^0 is primarily produced with little transverse momentum, meassurement of cross-section leads to the determination of its real transition moment.

As the spin precesses around the magnetic field, the "spin precession approach" is another method of determining the magnetic moment of Σ^0.

The precession angle for uncharged hyperons is calculated with $\phi = \frac{2\mu}{\beta} \int B\,dl$, with μ as magnetic moment.

(β → speed of hyperon; $\int B\,dl$ → field integral)

Using the hyperon decay we are able to get the field orientation by observing the process and afterwards, after calculating ϕ with that, get μ.

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No 3

Electron scattering on protons / hydrogen-Ion (H^+).
You are scattering an electronbeam on a thin proton-target with a certain beam energy but diffent solid angles in which the detector is put. This way you can measure the cross-section with different $|q|$.
As $\left(\frac{d\sigma}{d\Omega}\right)_{exp} = \left(\frac{d\sigma}{d\Omega}\right)^{*}_{Mott} |F(q^2)|^2$, you can divide the measure through the calculated Mott cross-section to get the square of abolute value of the proton's formfactor.
This shows that the depending variablels are the electron beam's energy and the solid angle of the detector.