\( \Delta S = \text{number of particles scattered into } d \Omega \text{ per unit time} \)

Cross-section \( \sigma(\theta, \phi) = \frac{1}{d \Omega} \frac{d \Delta S}{d \Omega} \)

Total cross-section \( \sigma_{\text{tot}} = \int \sigma(\theta, \phi) d \Omega \)

\( d \Omega = \sin \theta \, d \theta \, d \phi \)

Let us now consider axial symmetry.

\( d b = \text{impact parameter} \quad |\vec{b}| = m v t \)

\( \frac{d \Delta S}{d \theta} = 2 \pi \sigma(\theta) \sin \theta \, d \theta \)

Why \( d \Delta S = \int \sigma(\theta, \phi) \sin \theta \, d \theta \, d \phi \)

\( = \sigma(\theta) 2 \pi \int \sin \theta \, d \theta \)

We can also count the particles from the incoming side.