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# CROSS SECTION

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AN INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS  
SCATTERING EXPERIMENTS

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# Chapter 1

## Introduction

### 1.1 Scattering Experiment

Here we will look into scattering cross sections and how they relate to scattering experiments.

#### 1.1.1 Experimental Setup

A typical experiment usually involves a beam of particles which is incident on some sort of target material as shown in figure 1.1.

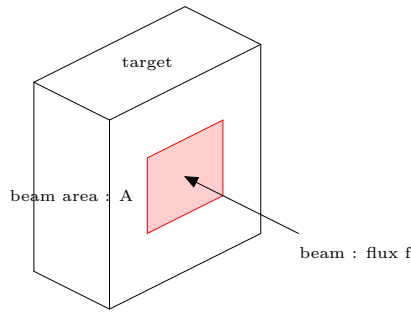


Figure 1.1: Typical scattering experiment setup. A target with a beam of particles incident on it.

#### The Target

The target material will have  $n'''$  target particles per unit volume. If the target material is of some known composition<sup>1</sup> then we can calculate the number of particles per unit mass of the target material.

$$\tilde{n} = \frac{N_A}{\tilde{m}} \quad (1.1.1)$$

where  $\tilde{m}$  is the mass of a mole of the target material and  $N_A$  is the Avogadro constant, which is the number of particles per mole<sup>2</sup>.

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<sup>1</sup>Either elemental or some known substance

<sup>2</sup>In the notation used in this book, we should really use the symbol  $\tilde{n}$  as this is the number of particles per mole of substance. However due to this being a constant with an already agreed upon symbol, namely  $N_A$ , we still stick to using that here.



# Appendix A

## Notation

Due to having many material properties used in calculations, it is useful to be able to track the type of property the symbol represents. To aid in keeping track the following the following notation (unless stated otherwise) will be used throughout this text.

Quantity	Description	Example
Specific quantity or a quantity per unit mass	Tilde above symbol	$\tilde{n}$
Quantity per unit length	Dash following symbol	$a'$
Quantity per unit area	Double dash following symbol	$a''$
Quantity per unit volume	Triple dash following symbol	$a'''$
Quantity per particle	Bar above symbol	$\bar{a}$
Quantity per mole	Check above symbol	$\check{a}$

Table A.1: Notation used in this book