Experimental Arrangement

The standard scattering arrangement we use is outlined in Fig. (1.1), where incident radiation travels along the *z-axis* and scattered light is received in the *y-z* plane [1].

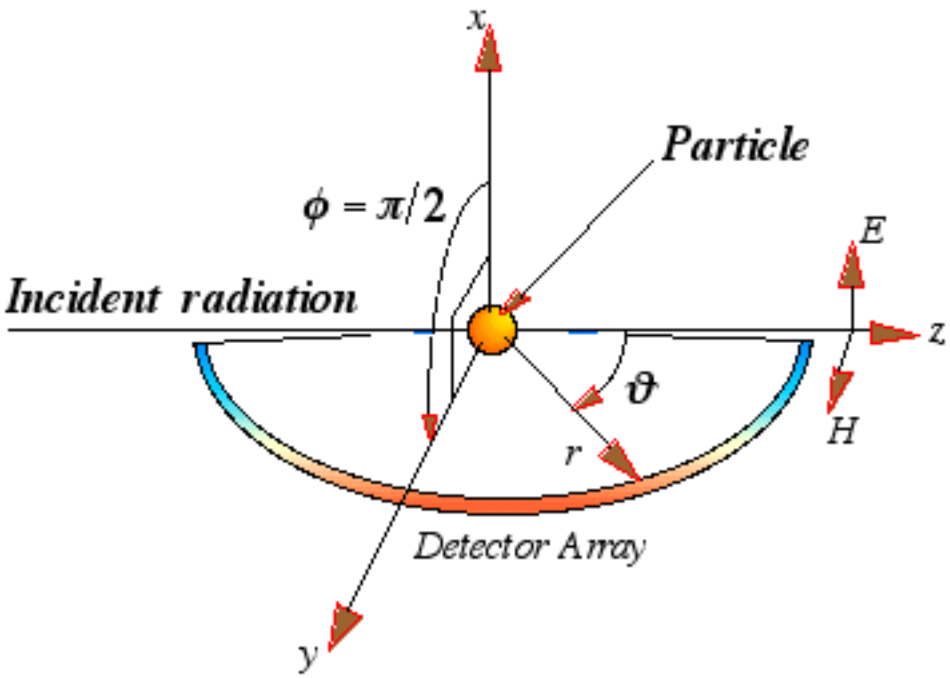

Figure 1.1
A schematic representation of the laser diffractometer used to detect vertically polarised scattered light.

The light scattering irradiance for spheres is calculated using the equation

$$H_{\wp}^{S} = \frac{H_0}{k^2 r^2} \left| S_{\wp}(\vartheta) \right|^2 , \qquad 1.0$$

where $S_{\wp}(\vartheta)$ is the scattering amplitude function given by [2]

$$S_{\left\{ \parallel \atop \perp \right\}}(z) = \sum_{n=1}^{\infty} \frac{2n+1}{n(n+1)} \left[a_n \begin{Bmatrix} \tau_n(z) \\ \pi_n(z) \end{Bmatrix} + b_n \begin{Bmatrix} \pi_n(z) \\ \tau_n(z) \end{Bmatrix} \right] . \qquad 1.1$$

The scattering amplitudes of Rayleigh, Rayleigh-Debye and Mie theory comprise two fundamental terms, the angular part and functions which relate to the particle size parameters. In Mie theory the scattering coefficients a_n and b_n are functions of the size parameters α and β .

An example of the irradiance is given below in Fig. (1.2) for a particle with inner and outer size parameters α=25, β =30 respectively. A particle with these parameters immersed in an ambient medium of absolute refractive index $n = 1.336$ (water) and irradiated by monochromatic light of wavelength $\lambda = 0.5145 \mu m$ will have a radius $r = 1.532 \mu m$ and an absolute refractive index $n_2 = 1.6032$.

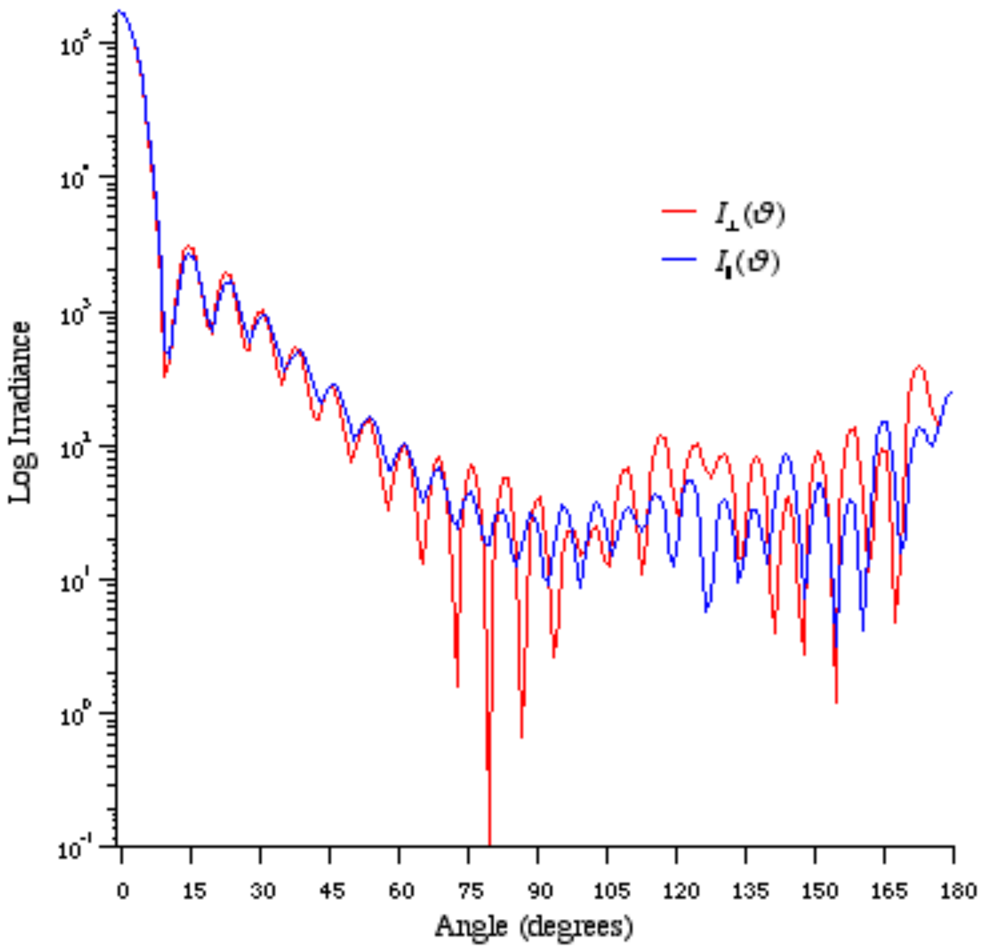

Figure 1.2.
Angular light scattering irradiance pattern of a homogeneous sphere of size parameters α=25,

$\beta = 30$.

References

1. Everitt, J. (1999). Thesis, Gegenbauer Analysis of Light Scattering from Spheres. Theoretical, University of Hertfordshire, England
2. Kerker, M. (1969). General Theory of Scattering. The scattering of light and other electromagnetic radiation. M. L. Ernest. New York, Academic Press. 16: 45.