

## Scattering of Light:

### 1. Goals:

1. Particle size determination using Mie scattering phenomena: Scatterer size is determined from angular scattering distribution measurements of laser light scattered from a dilute suspension of particles and analyze the angular scattering distributions using Mie theory.
2. A study of electric dipole radiation via scattering of polarized laser light: Explore electric dipole radiation in the optical frequency domain by using a polarized laser beam to illuminate an aqueous suspension of skim milk, and measuring the amount of light scattered from the suspension in the plane perpendicular to the laser beam as a function of the angle with respect to the plane of polarization.

**2. Theory:** Please read the articles Scattering 1 and Scattering 2.

**Scattering 1.** Particle Size and Mie Scattering: Read the Article in the pdf file “Particle Size and Mie Scattering” by Weiner et al, 2001, Am J. Phys, 69, 129. The theory is given in Section II. Write the summary of the theory in your own words in the report.

**Scattering 2.** Electric Dipole Radiation and Scattering of Polarized Light: Read the Article in the pdf file “Electric Dipole Radiation and Scattering of Polarized Light:” by Sharma et al, 2003, Am J. Phys, 71, 1294. The theory is given in Section II. Write the summary of the theory in your own words in the report.

### 3. Apparatus:

Angular distribution of the scattered light is measured by using experimental setups shown in Figures 1 and 2. In case of experiment 1 the light source and the detectors are in the same plane and in experiment 2 they are in planes perpendicular to each other. Sketch the schematics of the experimental setup in your lab report.

1. Laser source, 2. Scattering platform. 3. Detector, 4. Measuring meter.

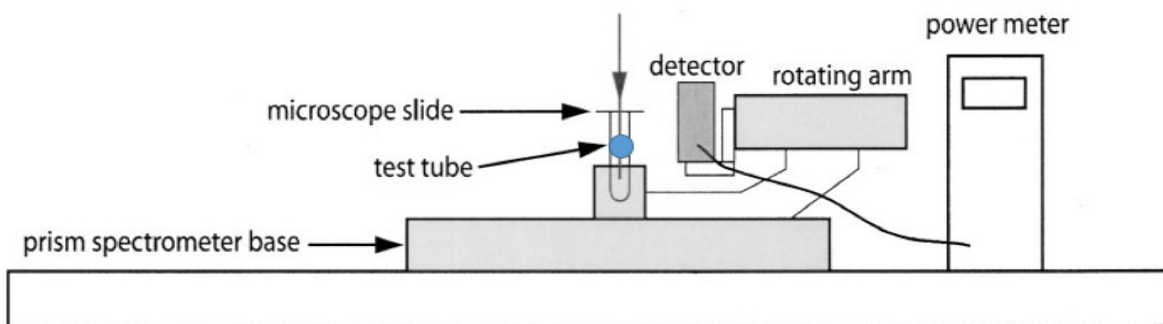


Fig. 1. The polarized laser beam travels in the direction perpendicular to the surface of the paper and impinges on the test tube at the blue circle. An old prism spectrometer table holds the test tube

in place and enables the rotation of the optical detector in the plane along the beam.

2. 1. Laser platform, 2. Scattering platform, 3. Detector, 4. Measuring meter.

Side View

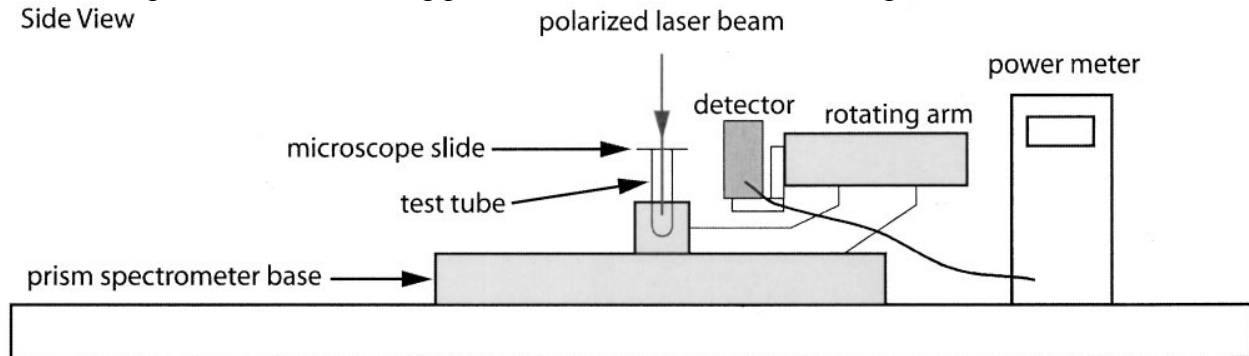


Fig. 2. The polarized laser beam travels downward and impinges on the microscope slide covering the test tube. An old prism spectrometer table holds the test tube in place and enables the rotation of the optical detector in the plane perpendicular to the beam.

#### 4. Procedure:

**Analysis:** Use Mie scattering calculator to fit the observed measurements.

[http://omlc.org/calc/mie\\_calc.html](http://omlc.org/calc/mie_calc.html)

#### 5. Problems:

1. Derive Equation 20 in Article 1 and define each term.
2. Derive Equation 13 in Article 2 and define each term.