

### **Experimental Validation of the Law of Reflection Using Angular Measurement with Multiple Light Sources**

The Law of Reflection was investigated to determine whether the angle of incidence equals the angle of reflection ( $\theta = \theta'$ ) for plane mirror systems. In Part 1, five trials were conducted at incident angles of  $15^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ , and  $75^\circ$  using a standard light source. Ray paths were traced on graph paper, and angles were measured using a protractor with a  $\pm 0.5^\circ$  precision. The angle differences ( $\theta - \theta'$ ) ranged from  $-1^\circ$  to  $+1^\circ$ , all within the calculated uncertainty of  $\pm 0.71^\circ$ . Percent errors ranged from 0% to 6.7%, confirming quantitative agreement with the theoretical prediction. In Part 2, the experiment was repeated using a blue laser to investigate wavelength independence; four of five trials yielded angle differences within  $\pm 0.5^\circ$  uncertainty ( $0^\circ$ ,  $+1^\circ$ ,  $-1^\circ$ , and  $0^\circ$ ), while one trial at  $15^\circ$  showed a larger deviation of  $+2 \pm 0.5^\circ$ . Percent errors for the laser trials ranged from 0% to 13.3%. The results demonstrated that the Law of Reflection accurately describes light behavior for plane mirrors across different light sources, though the blue laser produced slightly larger deviations. Both qualitative observations of symmetric ray paths and quantitative measurements supported the validity of the Law of Reflection within experimental uncertainties.