Experiment Design: Reflection with Laser

1 Goal

Design an experiment to verify the Law of Reflection using laser. Try to go beyond the obvious method and create ways you can achieve as high precision and accuracy as possible. Spend some time to think before you begin. You will not get more than 50% if you simple point a laser at a mirror and measure the angles. You have to explain why your method is better than what a ten-year-old can come up with.

2 Hints

I do not wish to limit your imaginations, but one possibility include using multiple mirrors so the light reflects more than once so if the Law of Reflection is wrong the discrepancy will be magnified. You can also think of how you adjust the angle of incidence: Do you move the mirror or the laser? It does not make any difference theoretically, but experimentally one is often better than the other.

3 Equipment

- Laser pointer
- Plane mirrors
- Any other items of your choosing from the physics stockroom

4 Setup

Describe your setup in details, preferably with diagrams.

5 Procedure

Describe (step by step, not in one big paragraph) how you collect the data. Specifically what physical quantities do you measure, and how? How many trials are there?

6 Data

Typically you organize all your data in the form of a table. Design a table based on the data your are planning to measure.

7 Analysis

Is the answer what you expect theoretically? How do you calculate the theoretical value? What is the percentage error? What additional ideas can you learn from the experiment?

8 Experimental Errors

Describe any possible experimental errors.

9 Improvements

If you have more sophisticated equipment or more time, how would you improve the experiment? Justify your answer by explaining how your suggestion could improve the precision.