Construct, Conduct & Comprehend Physics Experiments

LEOK-3-15 Lloyd's Mirror Interference Experiment

- *Complete set*
- *Cost effective solution*
- *Detailed instructional manual*
- *Easy alignment*

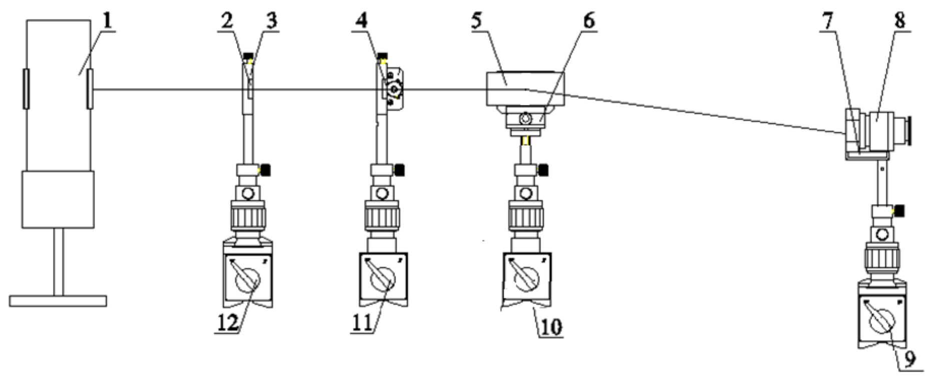


Figure 15-1 Schematic of experiment setup

1: Sodium Lamp (LLE-2, w/small hole)

2: Lens L_1 (f'= 50 mm)

3: Lens Holder (SZ-08)

4: Adjustable Slit (SZ-27)

5: Lloyd's Mirror (black glass)

6: Plate Holder (SZ-12)

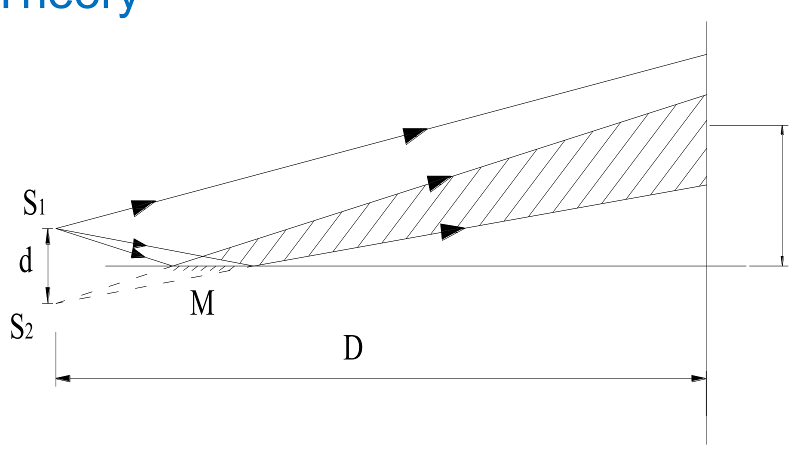
7: DMM Holder (SZ-36)

8: Eyepiece of DMM

9-12: Magnetic Base (SZ-04)

*Others: Lens L_2 (f'= 150 mm), Lens Holder (SZ-08), Magnetic Base (SZ-04).

Theory



Lloyd's mirror is simpler to construct than Fresnel's mirrors. As seen in the left schematic, a point source S_1 is placed some distance away from a plane mirror *M* and it is closed to the plane of the mirror surface, so that light is reflected at nearly grazing incidence. The coherent sources are the primary source S_1 and its virtual image S_2 formed by the mirror. The bisector of S_1 and S_2 then lies in the plane of the mirror surface.

Similar to Fresnel's mirror experiment, we have the expression: $\lambda = \frac{d}{D}\Delta x$, where λ is the wavelength of the light source, *D* is the distance between the source and the viewing screen, *d* is the distance between the primary point source and its virtual image formed by the mirror, and Δx is the interval between two adjacent dark fringes (or bright fringes) on the screen.

Experiment Procedures

1. Refer to Figure 15-1, align all components in same height;
2. Focus the hole of the light source onto the single slit by lens L_1, mount Lloyd's mirror approximately vertical;
3. Slowly move the Lloyd's mirror close to the optical axis from one side, let the input light sweep across the mirror. Behind the mirror, using one eye to observe the direct and the reflected beams, the slit *S* and its virtual image *S′* (by Lloyd's mirror) will be observed;
4. Rotate the single slit to align *S* and *S′* in parallel, fix Lloyd's mirror when the interval of *S* and *S′* is about 1~2 mm;
5. Use direct measurement microscope to observe Lloyd's mirror interference pattern, and equal-interval bright/dark fringe pairs will be observed;
6. Measure the fringe interval Δx between two adjacent dark (or bright) fringes using direct measurement microscope and the distance *D* between single slit and microscope;
7. To obtain the interval *d* between the two light sources *S* and *S′*, put a lens L_2 (f' = 150 mm) behind Lloyd's mirror to image the two light sources into real images, move the direct measurement microscope to the real image plane and measure the distance between the two real images as *d′*. Obtain *d* by using the lens equation;
8. Use d, Δx, D and equation (15-1) to calculate the wavelength λ of the illumination light.

Note: above product information is subject to change without notice.

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