

物理实验教学中心

Physics Experiment Center



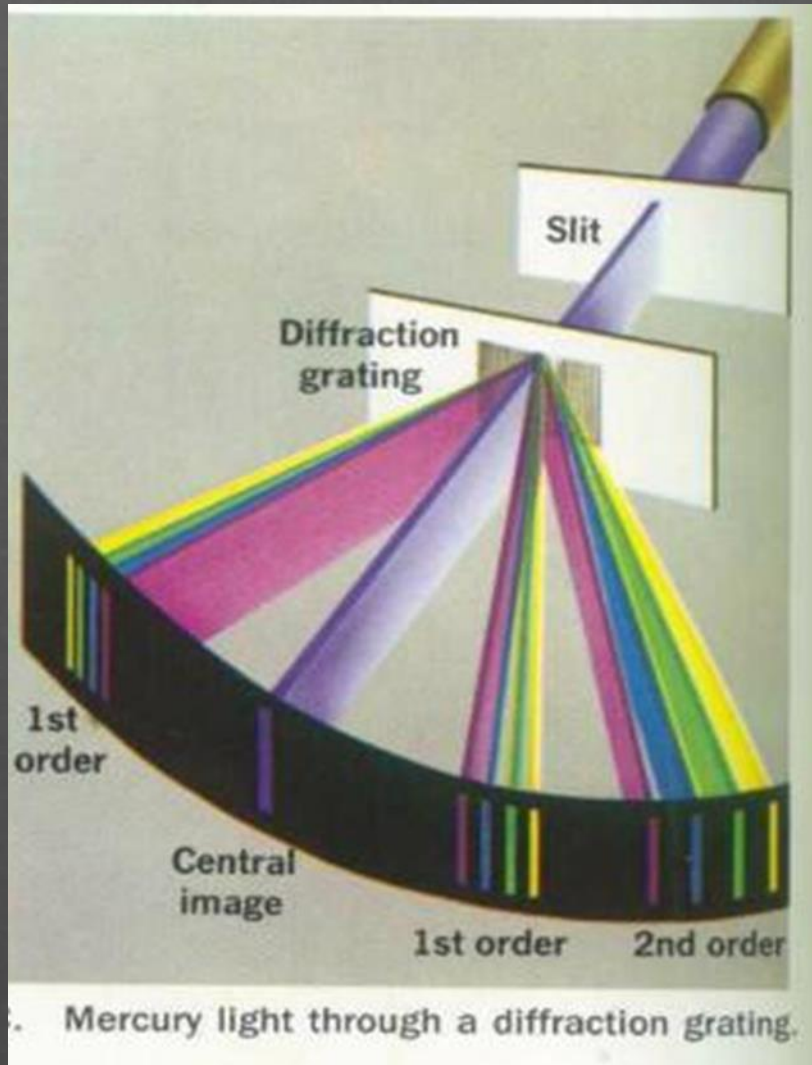
Download link: <https://github.com/bliseu/phylab/>

- [1]Qualitative study of atomic spectra, ROOM 532;
- [2]Equal thickness interference, ROOM 533;
- [3]Franck-Hertz experiment, ROOM 427;
- [4]Sound Velocity Measurement, ROOM 418;
- [5]11-cord potential difference meter, ROOM 417;
- [6]Amperemeter modification, ROOM 416;
- [7]Dielectric constant measurement, ROOM 429.

Qualitative study of atomic spectra

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NJUPT

I. Diffraction grating



Grating equation:

$$d \cdot \sin \theta = k \cdot \lambda, k=0, \pm 1, \pm 2, \dots$$

d : grating constant

θ : diffraction angle

k : order

λ : wavelength

II. The adjustment of spectrometer

➤ Final vision: see right

➤ Method:

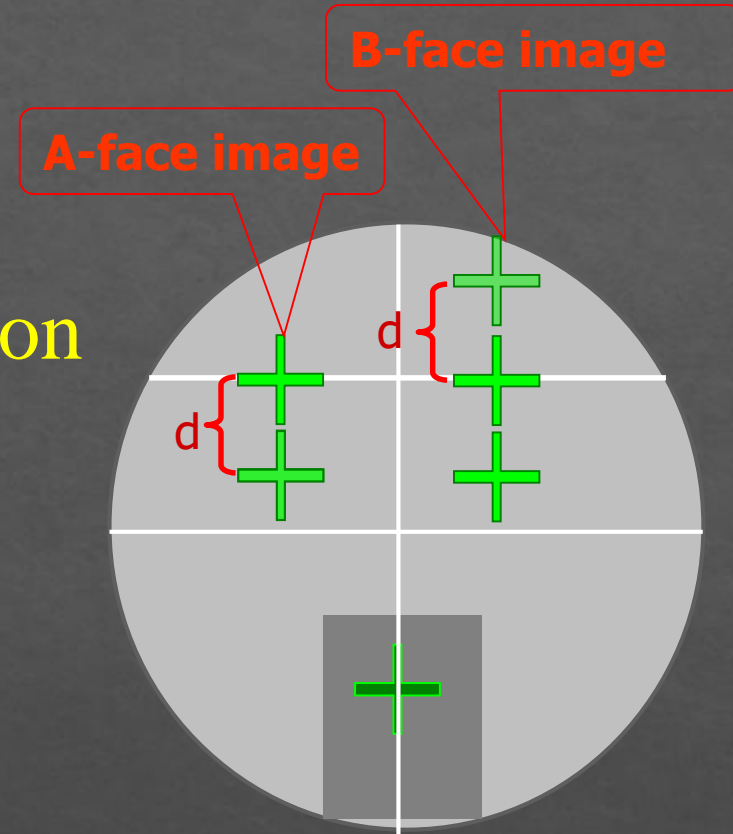
❖ Three adjusting screw button under the loading platform

❖ The telescope elevation adjusting screw

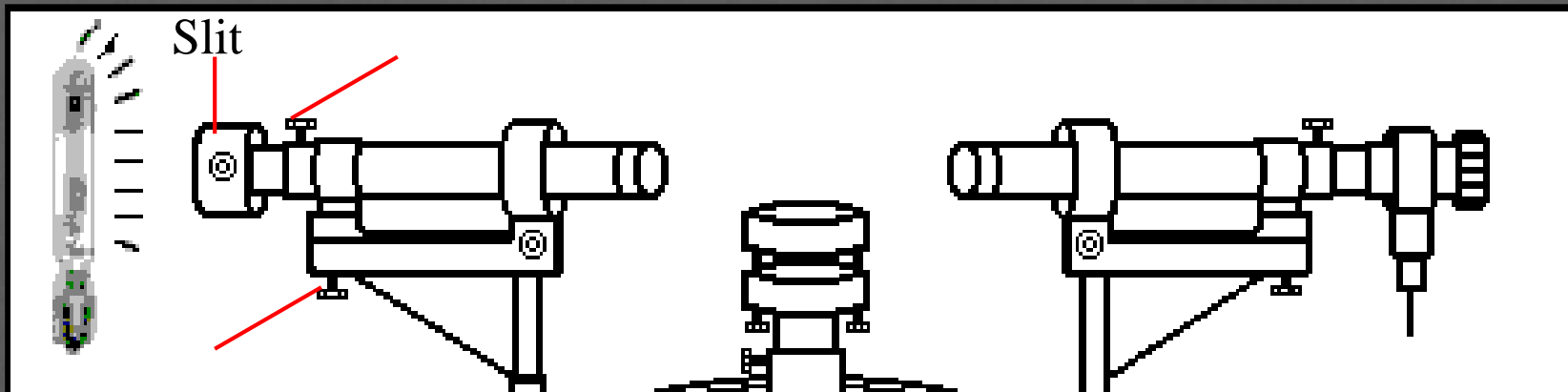
➤ Steps:

❖ Coarse adjustment

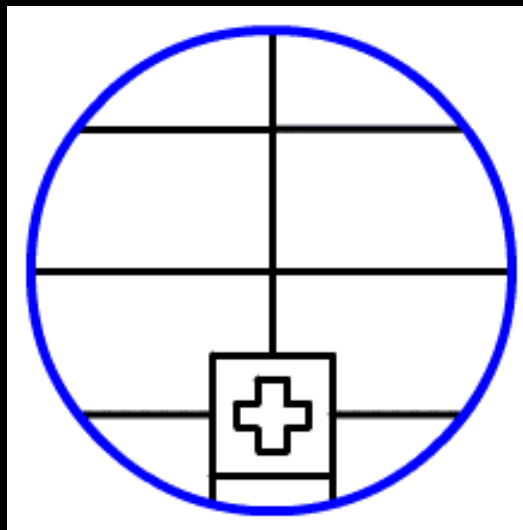
❖ Fine adjustment



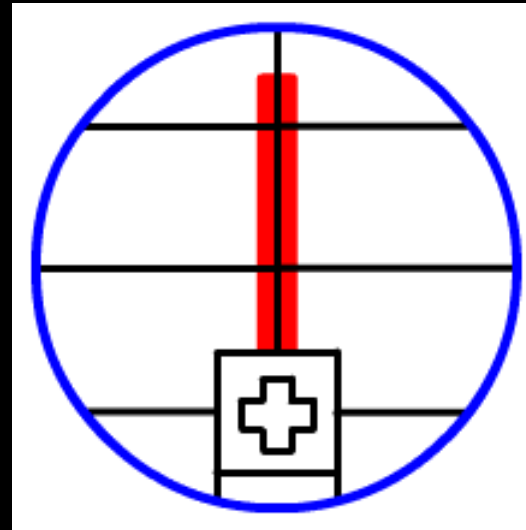
collimator



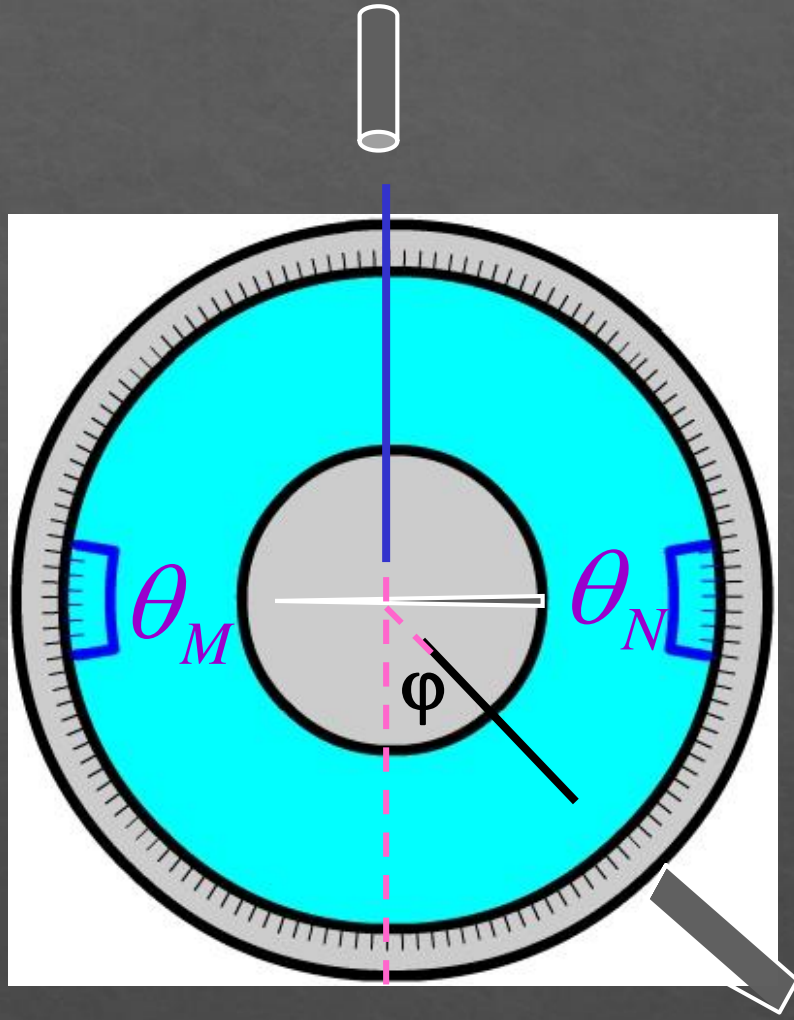
①



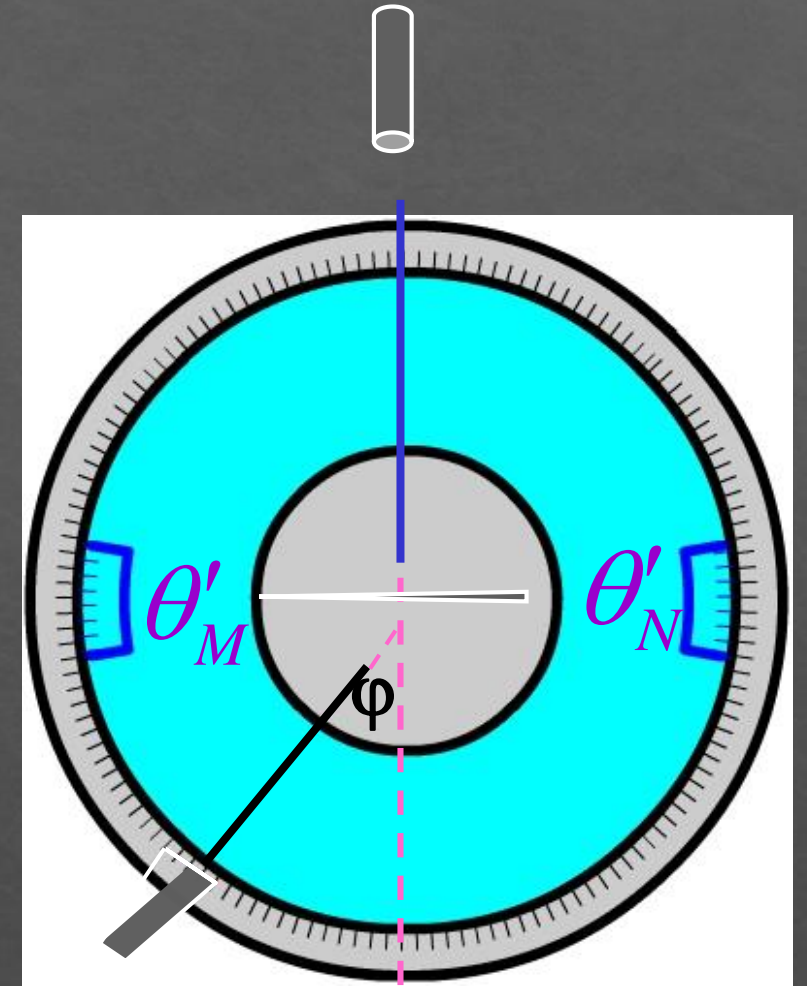
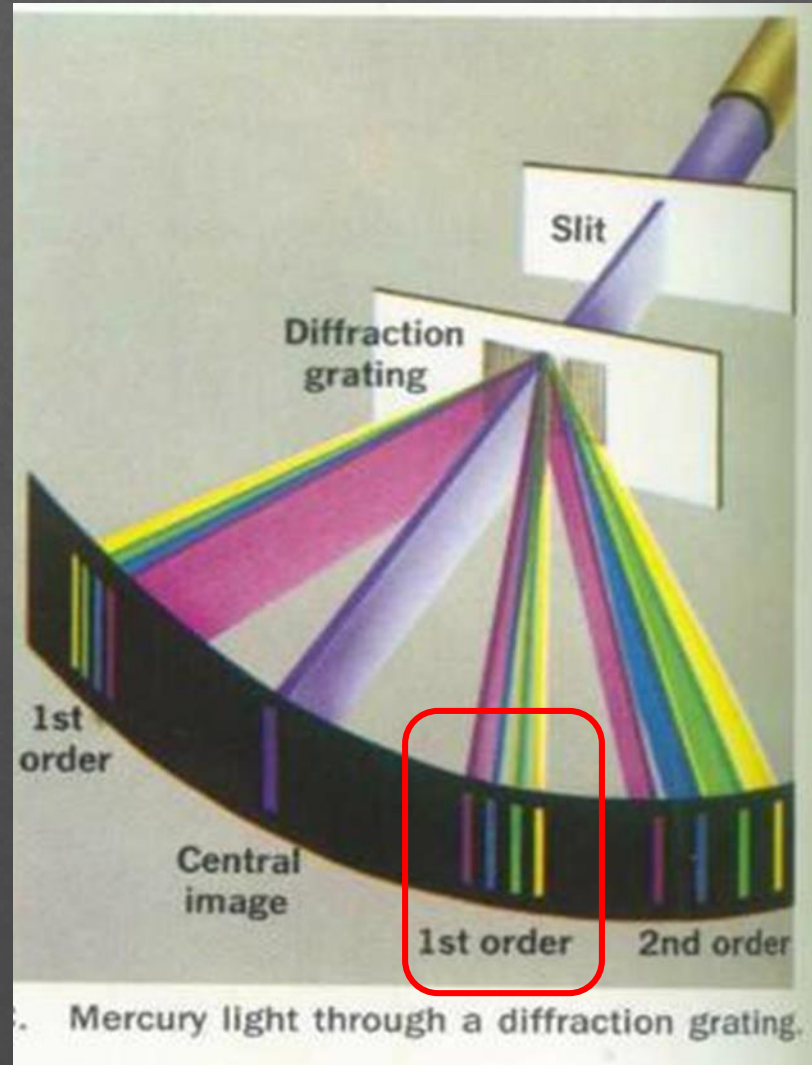
②



Measurement of the first-order diffraction angles

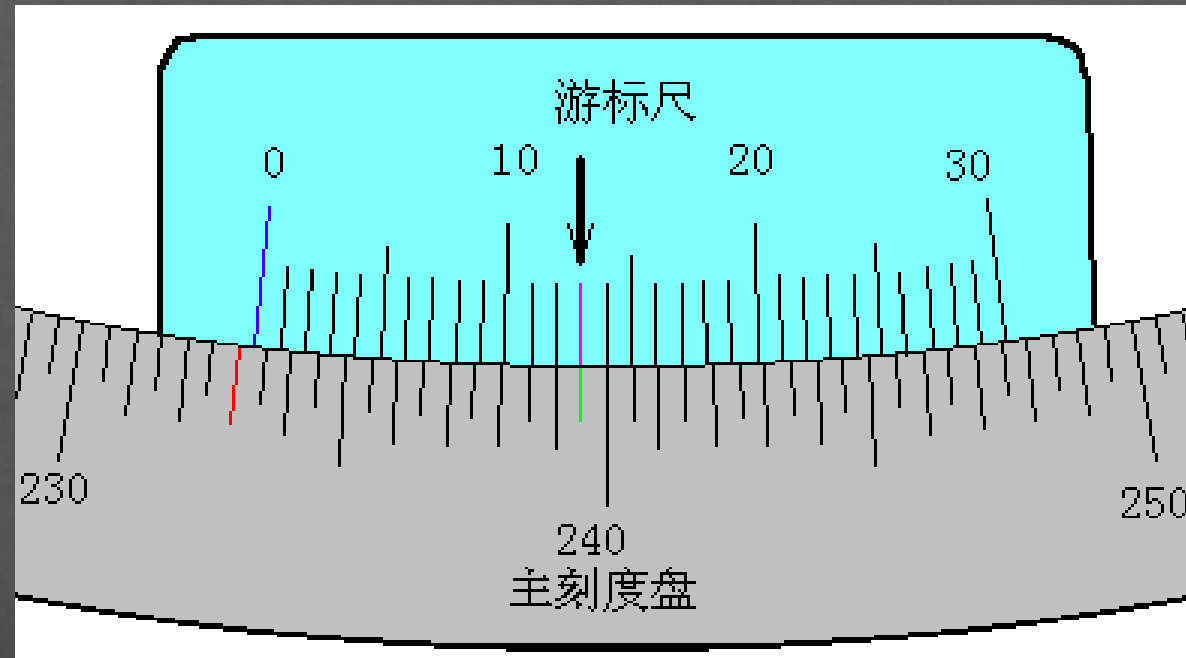


Right side



Left side

Read the angle



$233^{\circ}13'$

III. Experiment contents

1. With grating as diffraction device, measure the first-order diffraction angle of **helium**, determine the **diffraction angle(φ)-wavelength(λ) relation graph** according to the known **helium spectral wavelength**:

Color	Wavelength (nm)	Color	Wavelength (nm)	Color	Wavelength (nm)
Red(dark)	706.52	Green(light)	504.77	Blue	471.31
Red	667.82	Green	501.57	Purple	447.15
Yellow	587.56	Cyan	492.19	Purple (dark)	438.79

at least 6 groups of data(uncovered rows), plot λ - ϕ relation graph

Color	$\lambda (nm)$	θ_M	θ_N	θ'_M	θ'_N	$\phi = \frac{1}{4} (\theta'_M - \theta_M + \theta'_N - \theta_N)$
Red(dark)	706.52					
Red	667.82					
Yellow	587.56					
Green(light)	504.77					
Green	501.57					
Cyan	492.19					
Blue	471.31					
Purple	447.15					
Purple (dark)	438.79					

2. Measure the **diffraction angle** of **mercury** lamp, find out the corresponding **wavelength(λ)** of mercury according to the former **λ - φ** relation graph from **the helium data**.

Color	θ_M	θ_N	θ'_M	θ'_N	$\varphi = \frac{1}{4} (\theta'_M - \theta_M + \theta'_N - \theta_N)$	$\lambda(nm)$
Yellow						
Green						
Blue						
Purple						

V. Original data

1. Helium lamp (six groups of data (uncovered)):

Color	$\lambda (nm)$	θ_M	θ_N	θ'_M	θ'_N	$\varphi = \frac{1}{4} (\theta'_M - \theta_M + \theta'_N - \theta_N)$
Red(dark)	706.52					
Red	667.82					
Yellow	587.56					
Green(lig ht)	504.77					
Green	501.57					
Cyan	492.19					
Blue	471.31					
Purple	447.15					
Purple (dark)	438.79					

2. Mercury lamp (four groups of data):

Color	θ_M	θ_N	θ'_M	θ'_N	$\varphi = \frac{1}{4} (\theta'_M - \theta_M + \theta'_N - \theta_N)$	$\lambda (nm)$
Yellow						
Green						
Blue						
Purple						

END