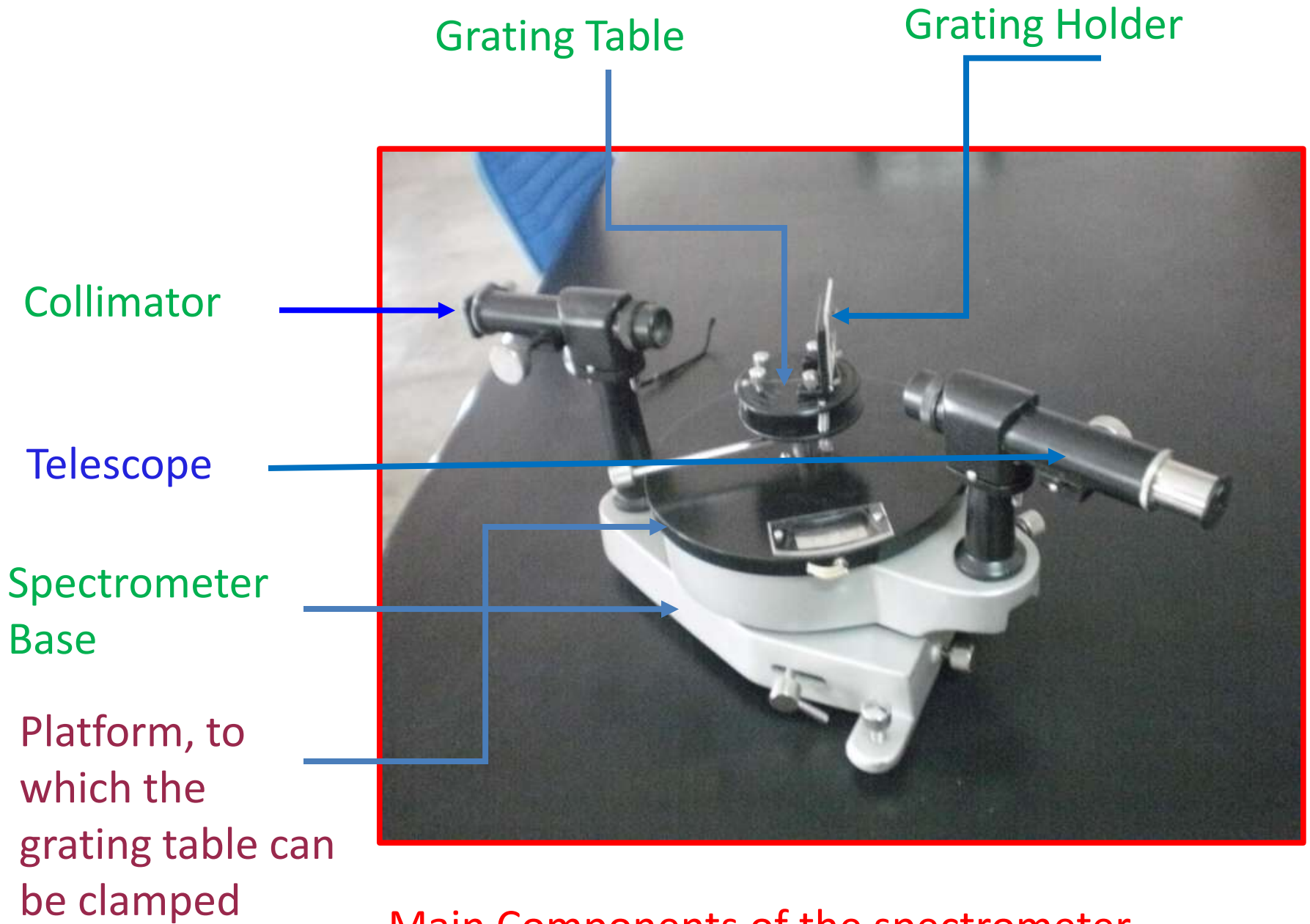


Diffraction Grating



This is the main instrument of the experiment, the prism/grating spectrometer. You will see its components in the following slides.



Grating Table

Grating Holder

Collimator

Telescope

Spectrometer
Base

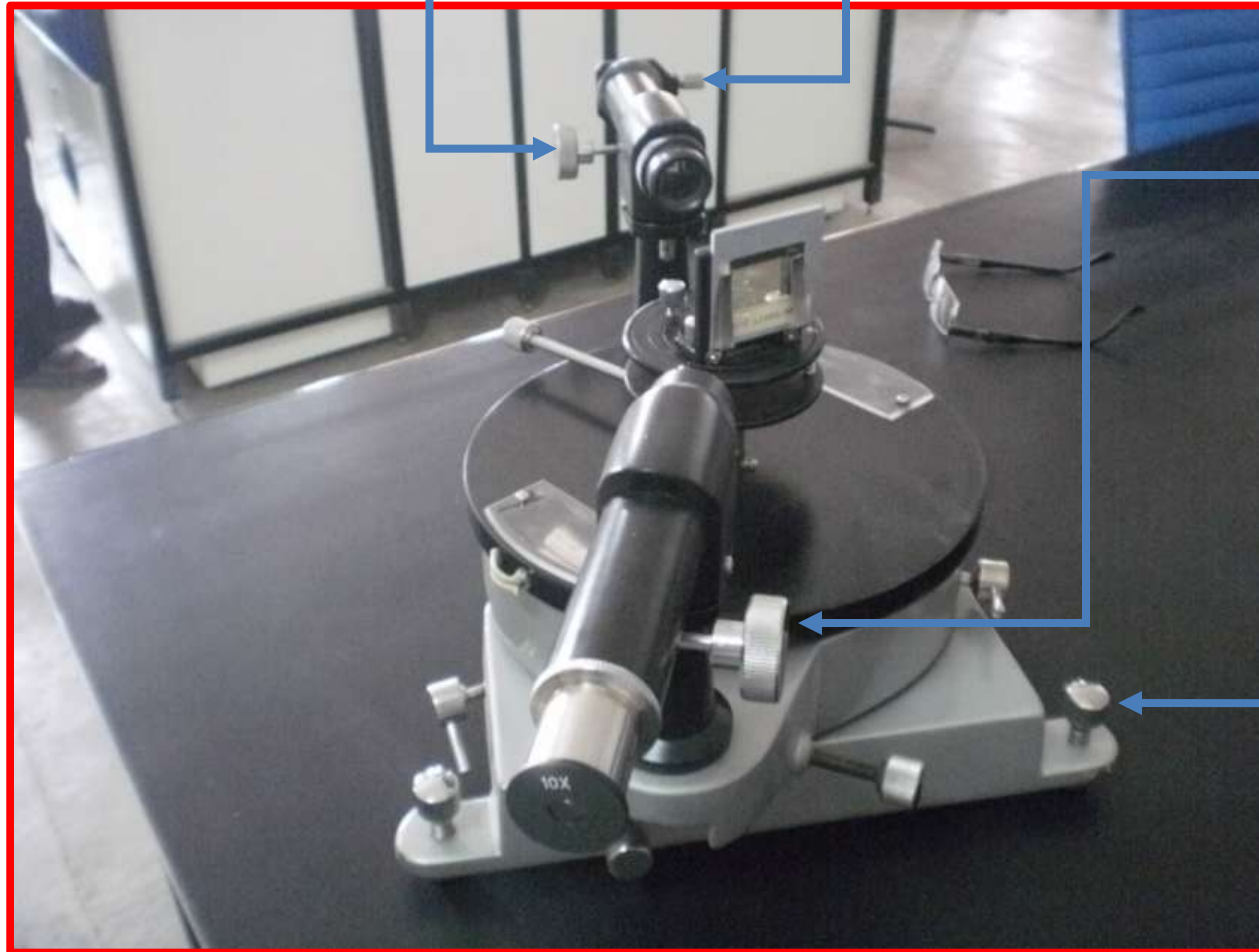
Platform, to
which the
grating table can
be clamped

Main Components of the spectrometer

See in the previous slide that, the telescope and the grating table, are mounted on two independently movable platforms. The grating table can be clamped to its platform (the black, disc-shaped, horizontal platform), while the telescope is rigidly fixed to its own platform.

Screw for Focusing the Collimator

Screw for Adjusting the Width of the Slit

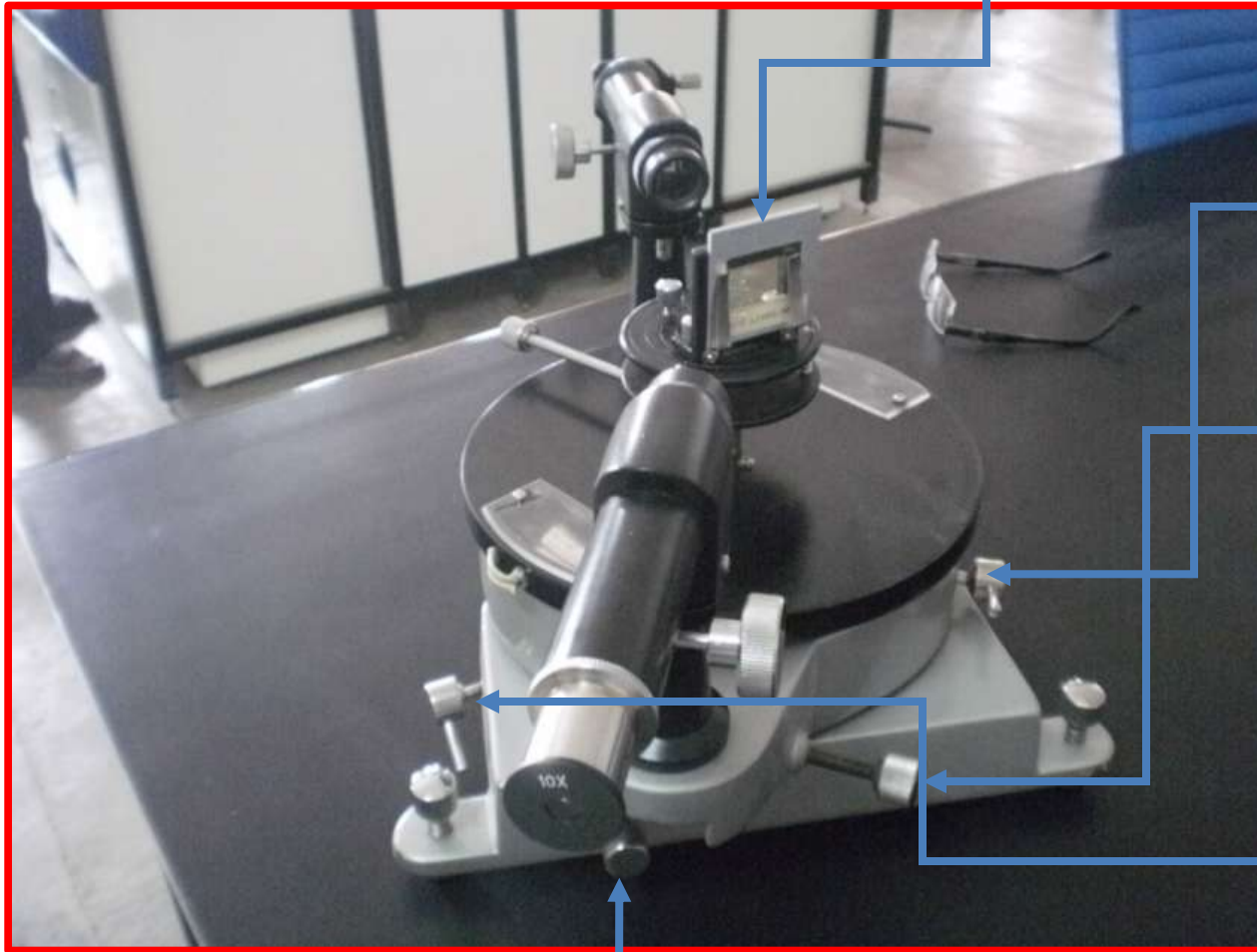


Screw for Focusing the Telescope

Leveling Screws for the base of spectrometer

Certain Adjustment Screws.
Few others are shown in the next slide

Grating in its Holder



Clamp for the Telescope

Screw for Finer Adjustment of Telescope Position, after Clamping

Clamp for Platform (black)

Screw for Finer Adjustment of the Position of Platform, after clamping it

Note that (refer to the previous slide) the platforms on which the telescope and the grating table are mounted, can both be clamped and then finely moved by appropriate screws.

Adjustments for grating Table

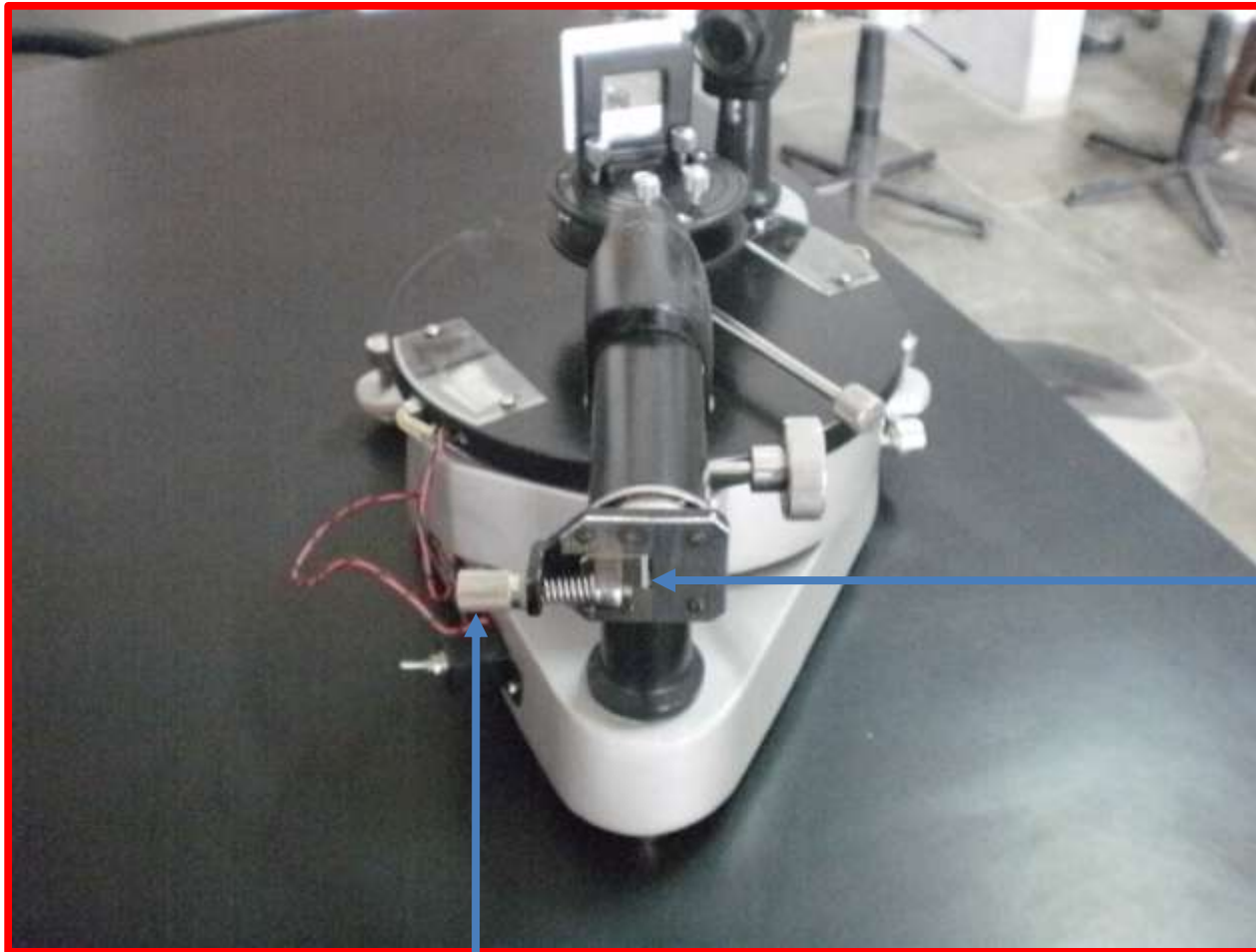


Screw for fixing the grating table to the platform (black)

Screw for fixing the height of the grating table

Screws, four of them, for leveling the grating table

Slit and the adjustment of its width



Slit to let the light from the vapor lamp to pass through the collimator

Screw to adjust the width of the slit. The slit width should be s.t., a sharp, bright image of it is seen through the telescope.

Slit and the adjustment of its width



Focusing the Collimator, so that a sharp image of the slit is seen

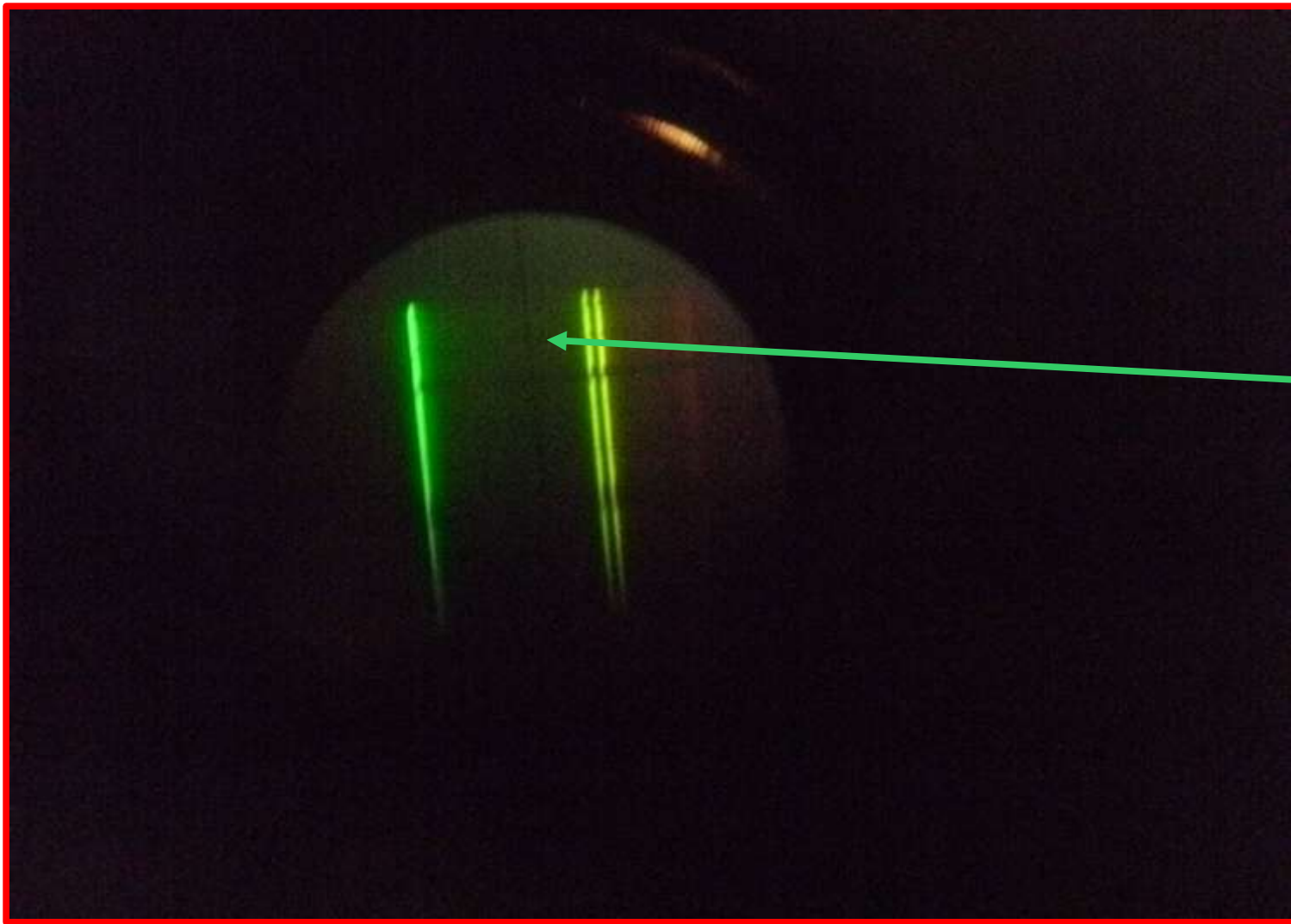




The telescope is focused at infinity using this screw, and is not disturbed afterwards. Focusing at infinity means focusing on an object at large distance.



Collimator focussed on the Helium Lamp



Faintly
visible
vertical
cross-wire

Typical spectral lines, seen through the telescope. The vertical cross wire should be made to coincide with a line, before taking reading

Taking Readings



Scale with the vernier to measure the angular position of telescope

Readings from both scales, diametrically opposite, should be taken, and the mean of the two be used.

Step-by-step Procedure

1. Level the base of the spectrometer using a spirit-level, and appropriate screws, as shown in one of the slides.
2. Focus the collimator on the lamp, and adjust the slit width, so as to get a sharp and bright image of the slit.
3. Focus the telescope at infinity. For this, turn the telescope around and focus it on an object which is several meters away. You may try the farthest object within the lab. Once the telescope is focused, do not disturb it.
4. Turn the telescope around to keep it in line with the collimator. For this, ensure that the vertical cross-wire of the telescope falls centrally, on the image of the slit, when seen through the telescope. For fine tuning the position of the telescope, clamp its base and use the screw for fine tuning. Refer to the slide where these adjustment screws are shown.

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Step-by-step Procedure

5. Level the grating table using appropriate screws, and clamp it at the proper height. Also, clamp the grating table to the platform (black). Put the grating in its stand, and turn the platform (black) around, so that light from the collimator falls at right angles on the grating. To ensure exact right angles, follow the steps below.
 - (a) Turn the telescope to one side (from its position as described in step 4 above) through exactly 90 degrees, by noting the readings from the reading scale.

...continued..

Step-by-step Procedure

(b) Turn the grating platform in the appropriate direction, so that light from the collimator, after reflection from the grating surface, is seen through the telescope. Do finer adjustment of the grating platform position, so that the reflected image of the slit as seen through the telescope, is aligned with the vertical cross-wire of the telescope.

(c) Since the light from the collimator meets the grating at angles of 45 degrees after step ii above, turn the grating platform through 45 degrees in the right direction, so that light from the collimator now falls at 90 degrees on the grating.

Step-by-step Procedure

- (d) Now, turn the telescope back to its original (step 4) position.
- (e) Once the final grating position is fixed as in step iv, its platform is securely clamped, not to be disturbed at all.

6. Whenever the position of the telescope is to be recorded, it must first be clamped, before the reading is taken.

7. Do not forget to record the initial (in-line-with-collimator) position of the telescope. You are going to focus the telescope on spectral lines, and measure the angular positions of the telescope w.r.t. the initial position.