

Atomic and nuclear physics

Atomic shell

Emission and absorption spectra

Recording the spectra of
gas discharge lamps with a
compact spectrometer

Description from SpectraLab (467 250)

For loading examples,
please use the SpectraLab help.

The emission lines of gas discharge lamps



Experiment description

Gas discharge lamps produce spectra which consist only of individual spectral lines. These are referred to as line spectra. The wavelengths of individual spectral lines are characteristic for the given gas. This experiment will investigate the emission spectrum of a quicksilver spectral tube.

Required equipment

1	Compact spectrometer, physics	467 251
	or	
1	Compact UV spectrometer, physics	467 261
1	Fibre holder	460 251
1	Spectral tubes, e.g. Hg (with Ar)	467 63
1	Holder for spectral tubes	467 81
1	High-voltage power supply, 10 kV	521 70
1	Measuring resistor, 100 k Ω	536 251
1	Stand base, small	300 02
1	Saddle base	300 11
1	Safety connection lead, 50 cm, red	500 621
1	Safety connection lead, 50 cm, blue	500 622
1	Safety connection lead, 25 cm, red	500 611
1	Safety connection lead, 25 cm, yellow-green	500 610
1	PC with Windows 2000/XP/Vista/7/8	

The line spectra of various gasses and the wavelengths of spectral lines are listed in the spectral table (667 7101).

Experiment setup (see picture)

Insert the spectral tube into the spectral tube holder. Put the fibre optic waveguide into the fibre holder and place it in front of the spectral tube.

Performing the experiment

- Activate  to begin a new measurement.
- Select the **Intensity I1** display.
- Start the measurement with .
- Switch on the high-voltage power supply and slowly increase voltage until it ignites the spectral tube (2–5 kV).
- Align the fibre optic waveguide to maximise intensity. Adapt the integration time, either directly or with  or , such that maximum intensity lies between 75 % and 100 %.

- Turn down the high-voltage back to zero in order to measure the background spectrum.
- Open the **Offset I0** display.
- The displayed spectrum will be removed from subsequent measurements as the background spectrum.
- Change back to the **Intensity I1** display.
- Slowly increase voltage again until the spectral tube ignites (2–5 kV).
- Use the **■** control to stop the measurement or save the spectrum with **●**.
- If desired, record spectra for other spectral tubes.

Evaluation

The spectrum of Hg (with Ar) spectral tubes are comprised of various spectral lines. To determine the wavelength, a vertical line can be drawn and the wavelength read. The strongest emission lines from quicksilver lie at 366 nm, 405 nm, 436 nm, 546 nm, 577 nm and 579 nm. The emission lines in the red and infrared spectral range originate from the Argon used in the spectral tube as the igniting gas.

Note

Spectral tubes with the following gas fillings are also available:

N₂, O₂, H₂, H₂O, He, Ar, Ne, Kr.