

QE measurement setup for Humboldt University

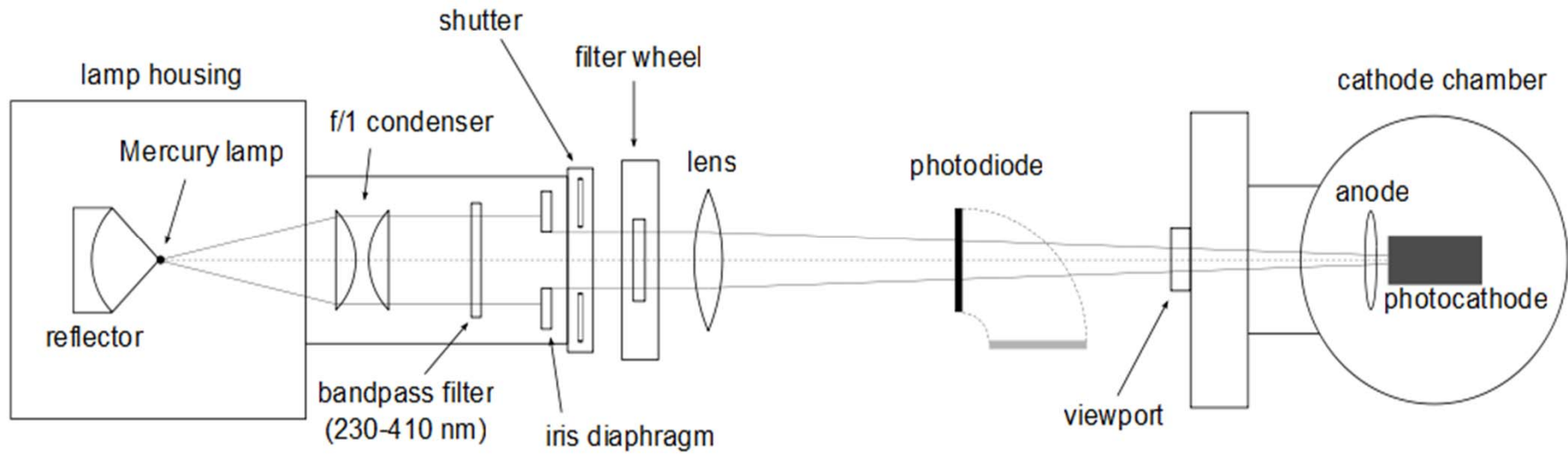
Background

- Based on the QE setup J.H. Han used
- Altered in 2005 for the practical course at Humboldt University
- Never finished

Requirements for the experiment

- Students should experience the scientific work that is done at PITZ (i.e. “real” experiments)
- Setup must not be a “black box”
- Overall workload ~ 30 h (including several hrs. of preparation, ~ 8 h performing the experiment, rest for analysis and writing of report)

Setup



Problems faced

Measuring the exact amount of light with the laser power meter that hits the cathode:

- corona of diffuse stray light together with
- Different form, size and distance to lense
- Reflection at viewport

Theoretical Basis for Students

- Short(!) abstract on relevance of cathode for FEL`s
- Photo emission process described in 3-step-model
- Consequences for the experiment will be discussed in detail

Measurements

- Previous to measurement: align the optics, cabling, etc.
- Photocurrent vs. UV power to determine QE by fitting for 5 different wavelengths
- repeating the measurement for different bias voltages to see space charge effects (if possible)
- Measuring the Mo-substrate for high UV-Power to demonstrate different transport processes for metals and semiconductors

Possible measurements (not yet planed)

- Photocurrent vs. bias voltage to verify Child-Langmuir-Law
- ?

Analysis

- Determine QE by fitting
- Plott QE vs. photon energy, explaining observtion
- Compare QE of Cs_2TE and Mo
- Compare QE with value from LASA

Feedback and ideas are
welcome!