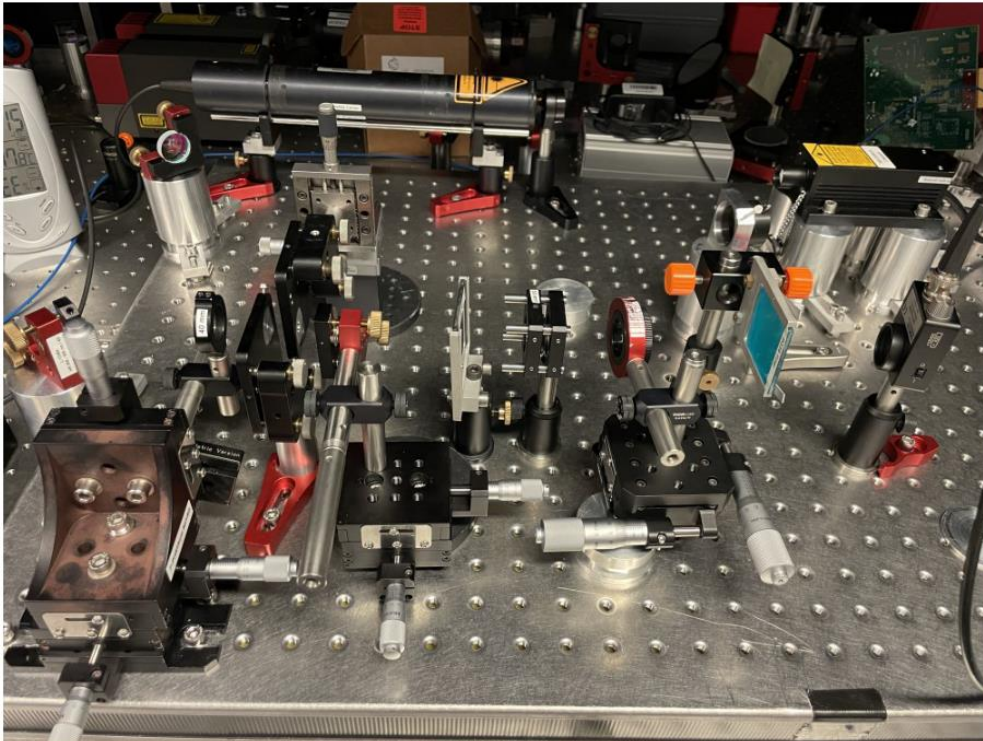


ILP4 Nd:YAG Laser



F-Praktikum Review Day 10.5.23

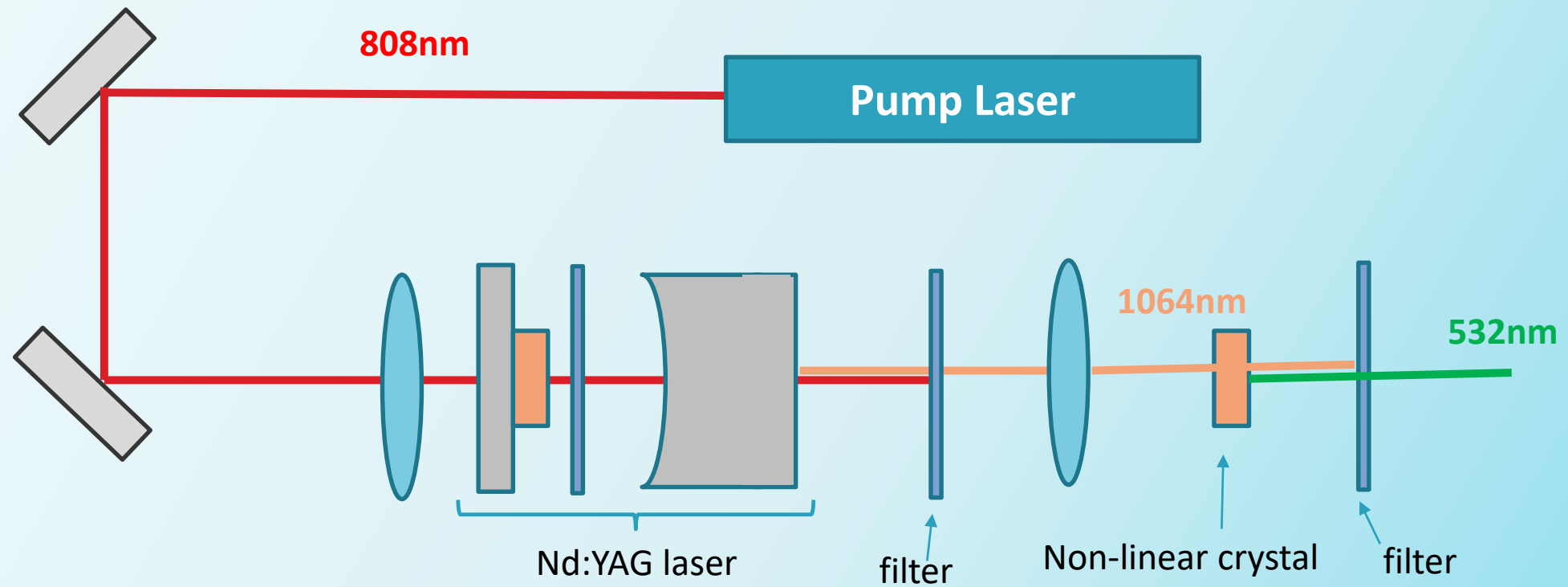
Luca Asteria
Research Group Sengstock/Weitenberg



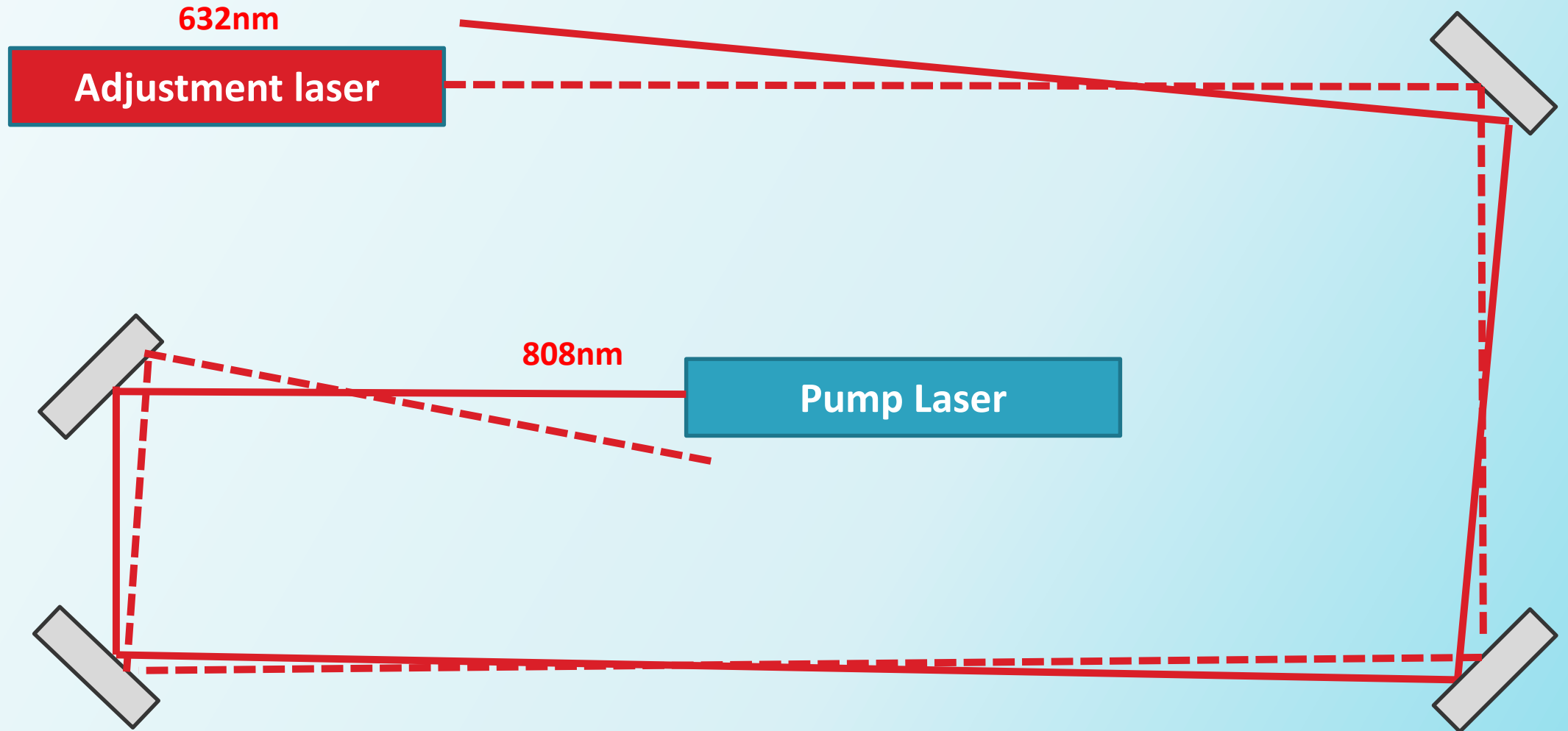
Goals

- Make students familiar with important concepts of laser sources
- Provide them with an idea of how it's like to work in a quantum optics lab (many such labs in AIM cluster)
- Measure and perform analysis of the data using error propagation, data fitting, comparison with expected models and existing literature

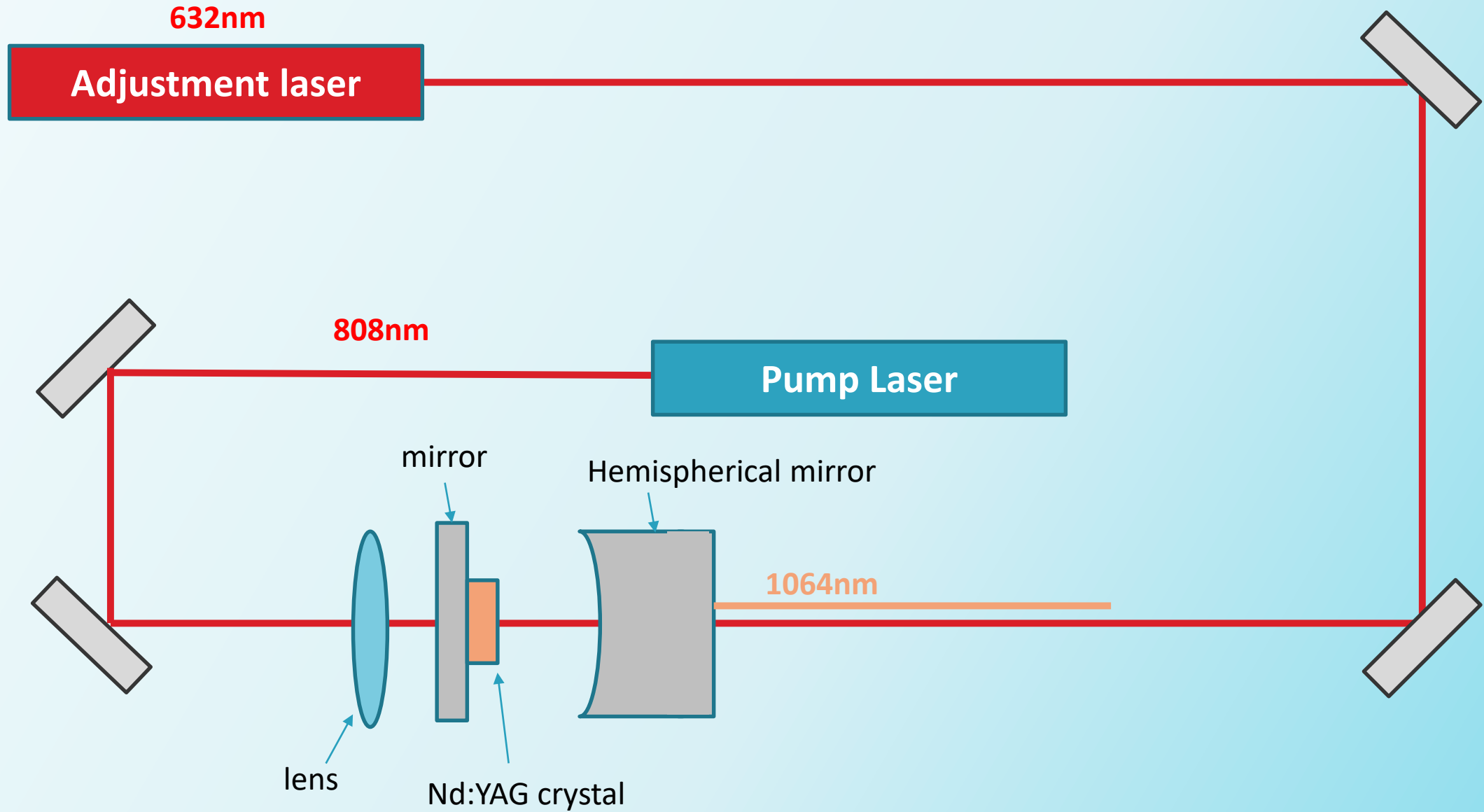
Final setup



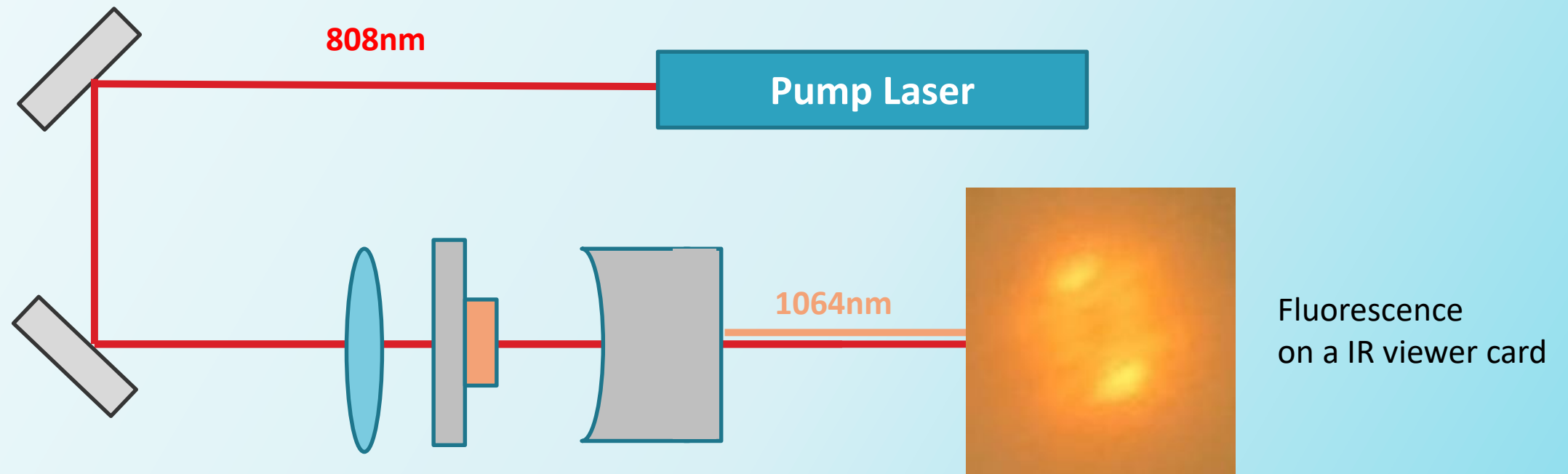
Setup with adjustment laser



Nd:YAG laser setup



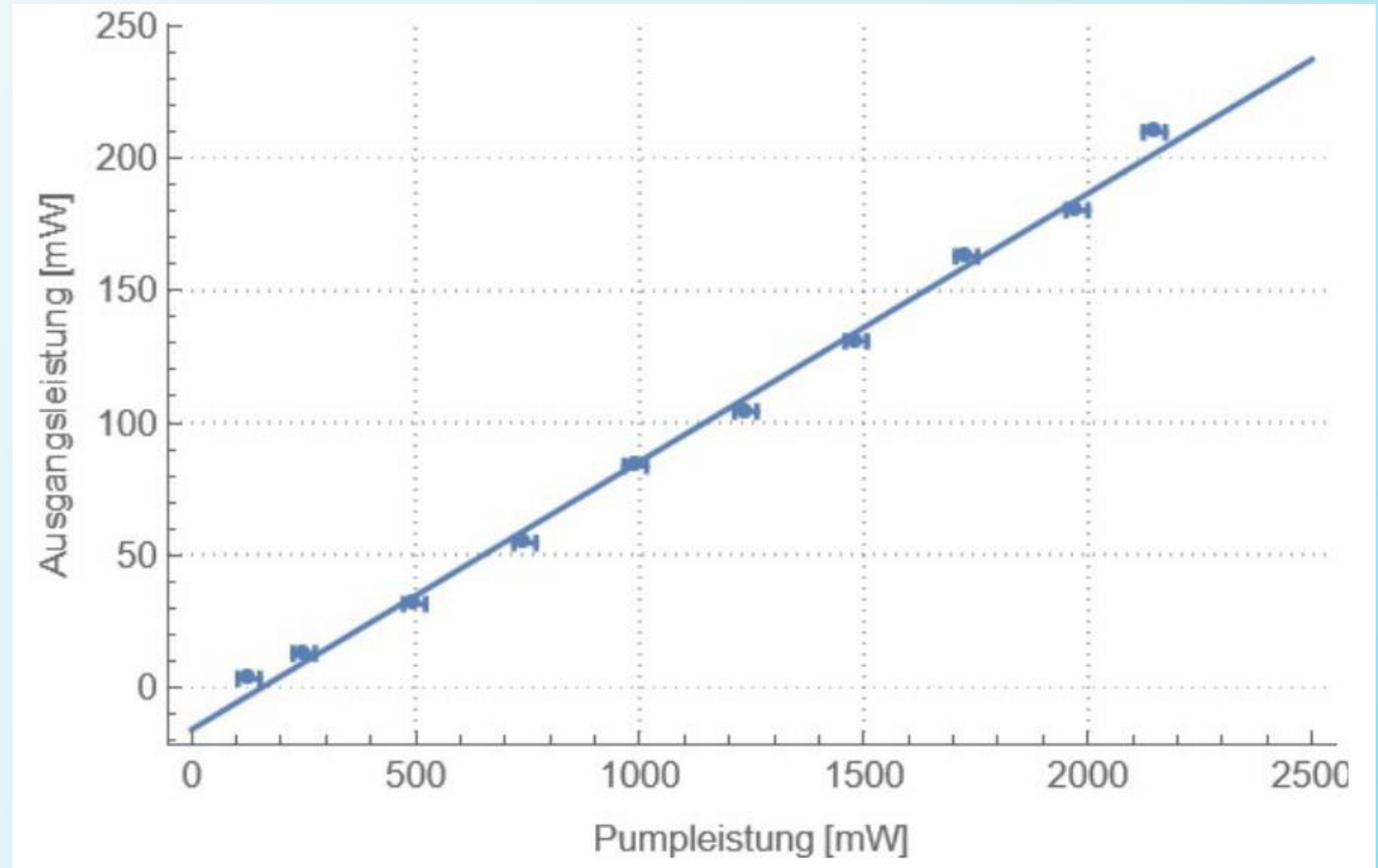
Selecting the resonator mode



Nd:YAG laser setup

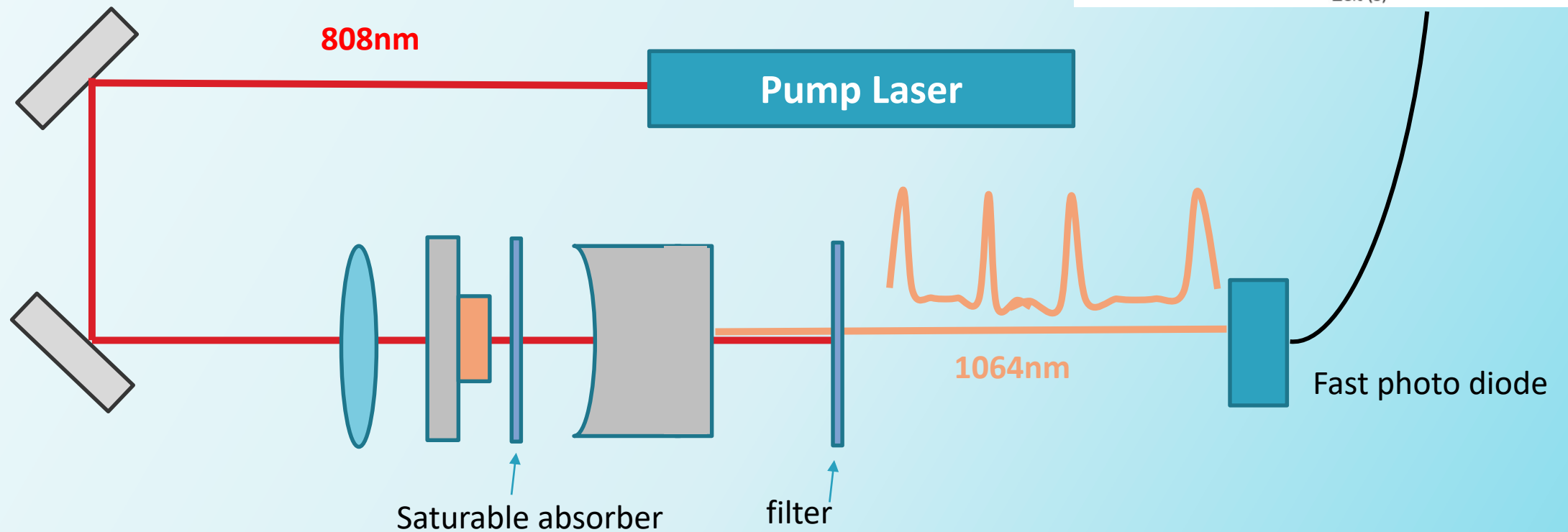
Example of a power curve
(Power out vs Power in)

Observation and discussion
of laser threshold

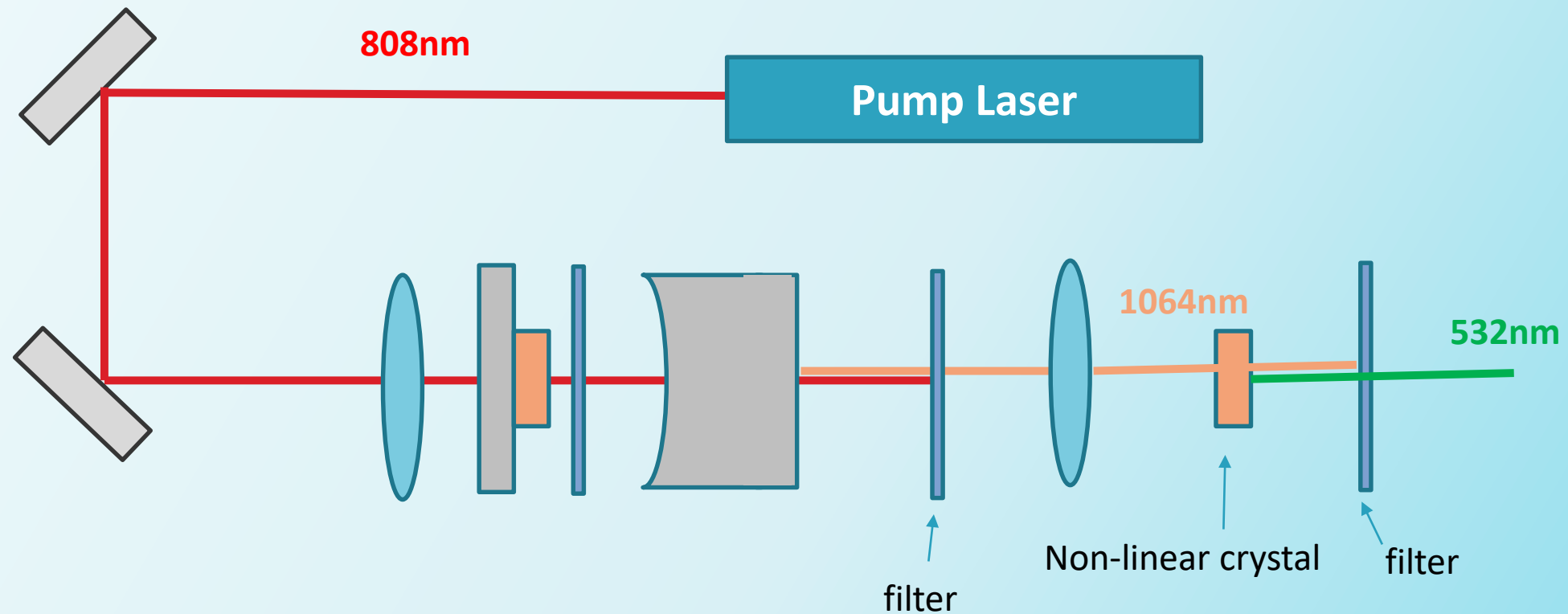


Q-switching

Characterize pulse length and pulse repetition rate



Setup for second harmonic generation



Theory

Theory: radiation-matter interaction, inversion of the internal levels population, Optical resonators and resonator modes, Q-Switching, second harmonic generation

Connections made between theory and experiment (during initial discussion the first day, during the week, and In the protocol)

Practical skills acquired

Practice: measurement of optical power, laser thresholds. Fitting and discussing experimental data.
Extracting from data quantities that can not be measured directly

Skills acquired: basic alignment of optical setups and of a simple optical resonator,
selecting the fundamental resonator mode

Get feedback on how to report experimental values and errors and how to write a protocol more like
a real „scientific publication“.

Feedback

- Preparation of the students is usually adequate, even though not always „perfect“.
Some concepts (usually related to more detailed quantum mechanical notions) usually understood on a qualitative level
- Groups can usually perform the measurement and take the data mostly „on their own“, with moments of discussion and help for the laser adjustment from the supervisor
- Students give positive feedback on this experiment („learned a lot“, „very interesting“,...)
Sometimes it can be frustrating for them in the initial stages not to being able to start the laser operation probably due to a not optimal alignment, of which they are not aware.