

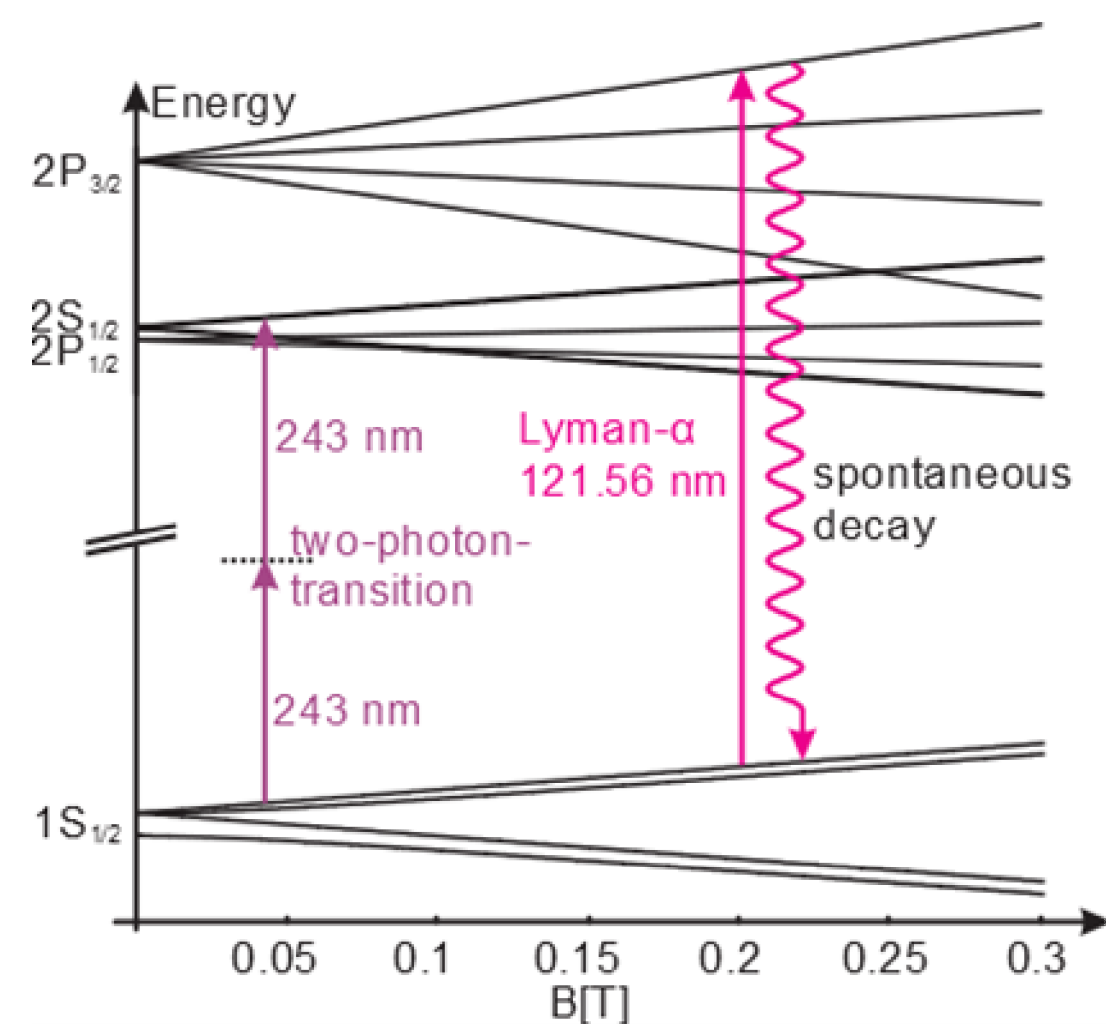
preliminary - Laser-System for Cooling of Anti-Hydrogen - preliminary

R. Steinborn, A. Koglbauer, T. Diehl, M. Stappel, P. Bachor and J. Walz

Helmholtz-Institut Mainz, D-55099 Mainz

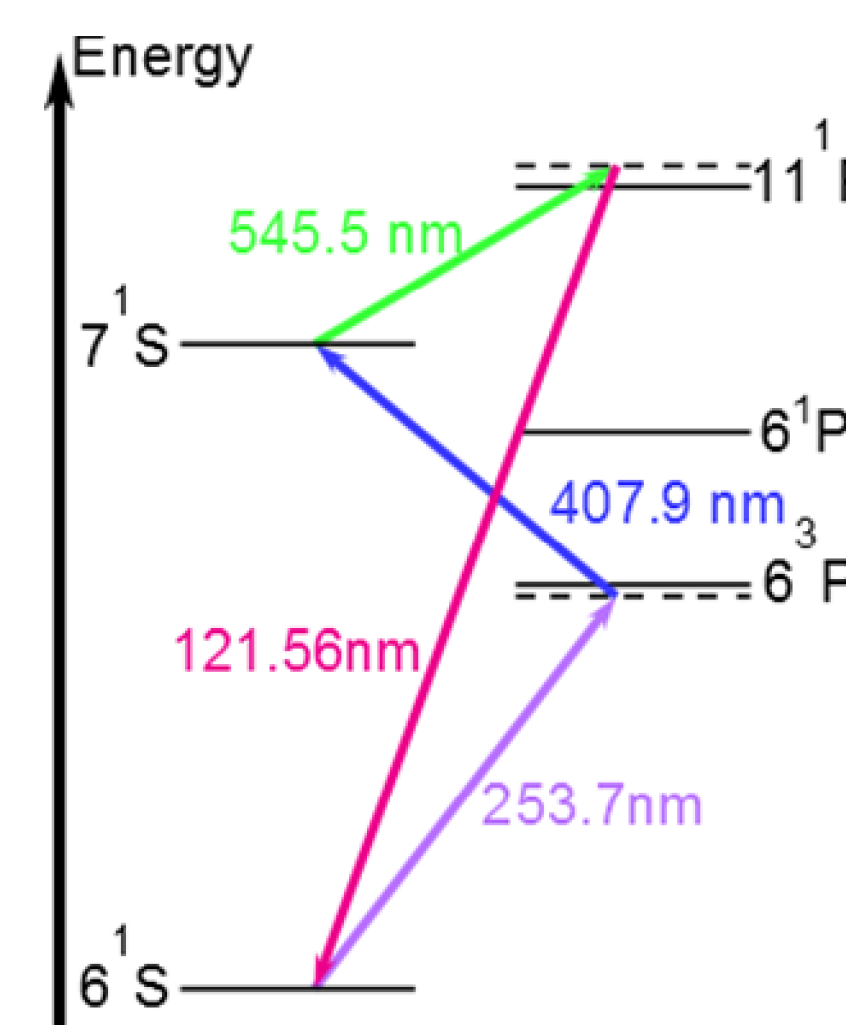
Motivation

Energy level scheme for (Anti-)Hydrogen



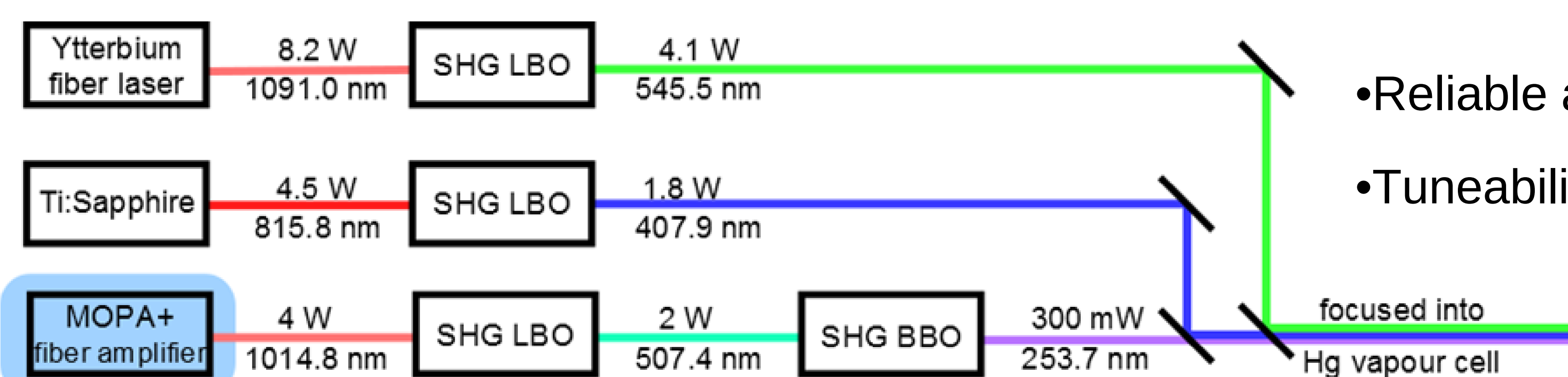
- Comparison of $H \leftrightarrow H$
- Test of CPT invariance theorem
- Laser cooling of trapped anti-atoms useful for precision spectroscopy
- Cooling transition: 121.56 nm

Four-wave mixing



- Non-degenerate four-wave mixing (FWM)
- Nonlinear medium: Hg vapour
- Using atomic resonances for efficiency enhancement

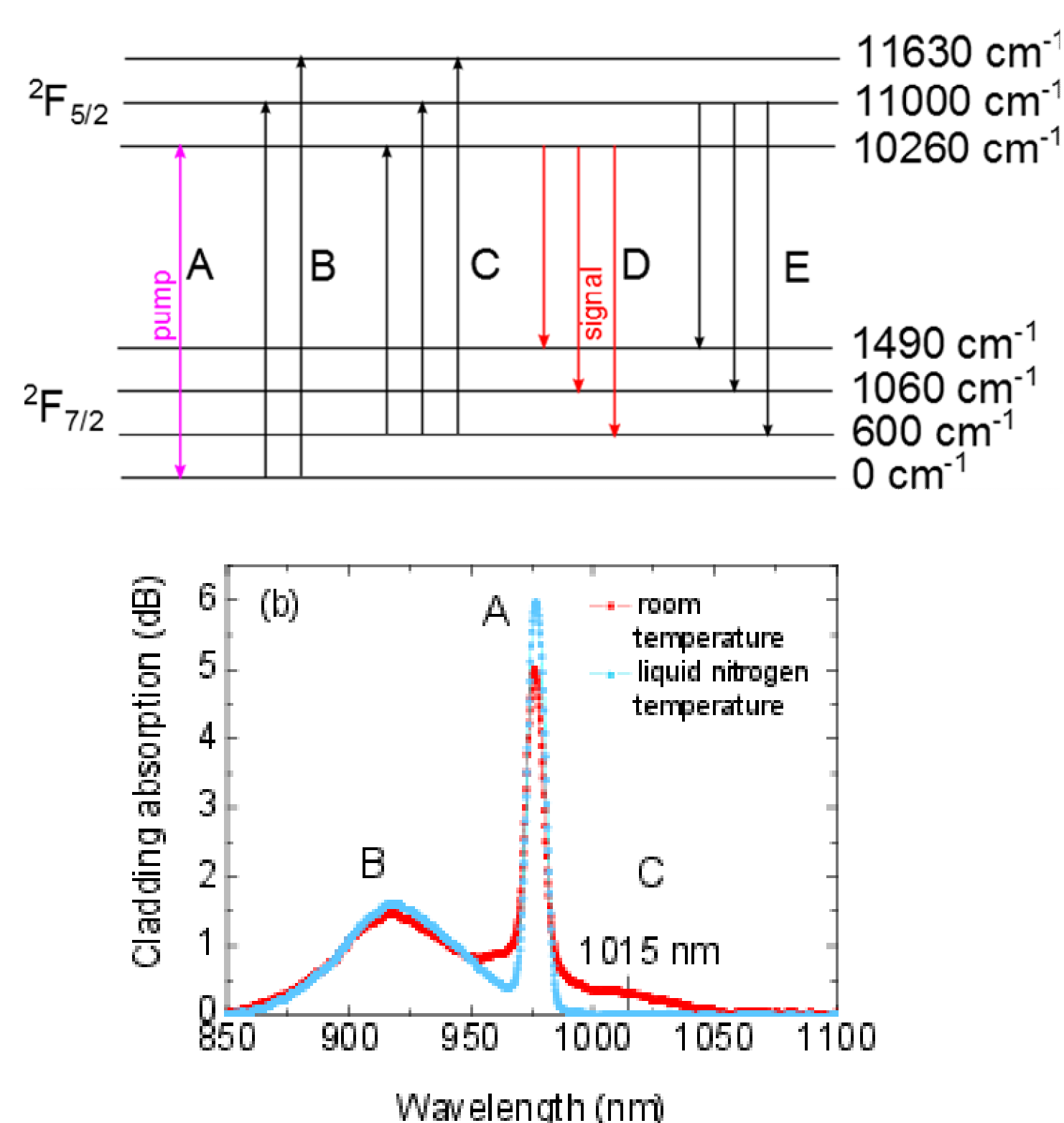
CW-Lasersystem



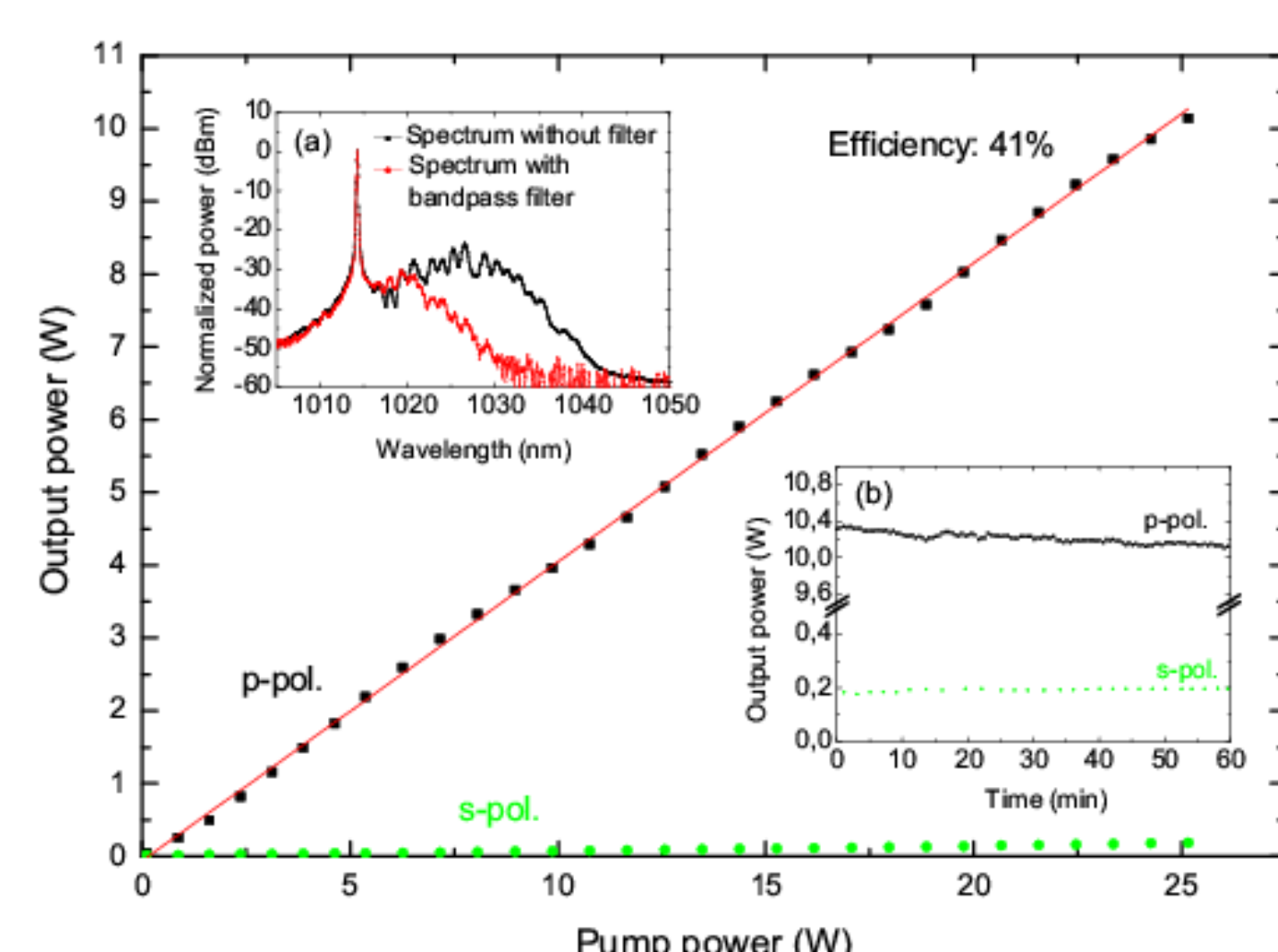
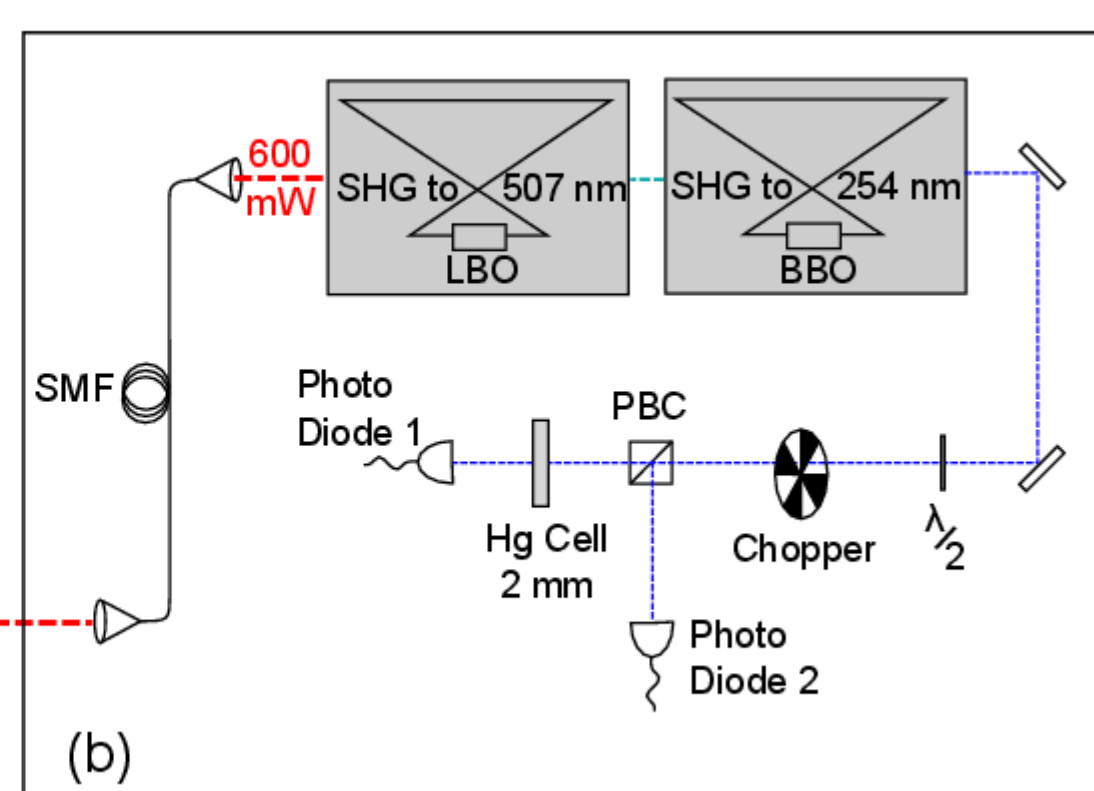
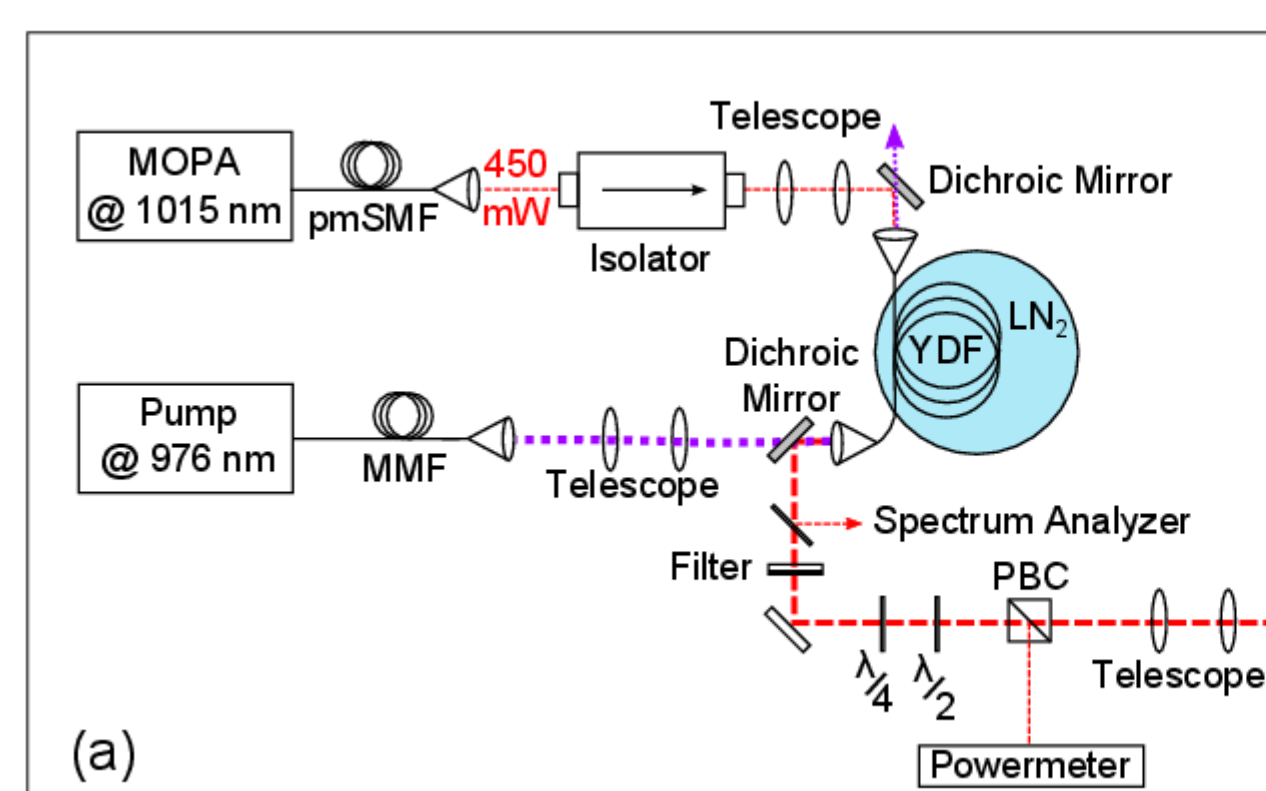
- Reliable and intense solid state fundamental laser system
- Tuneability close to the 61S-63P UV transition

Laser Development

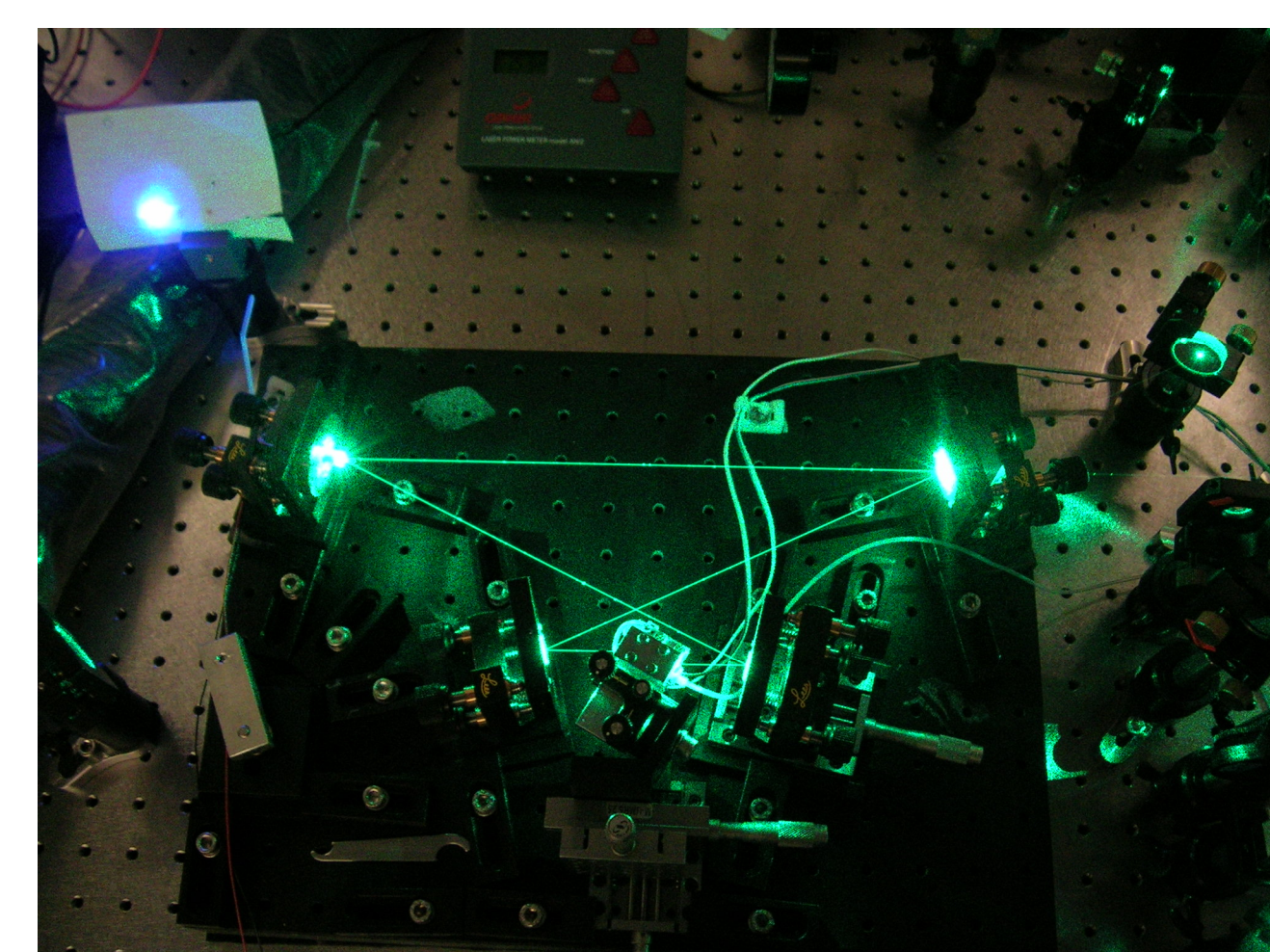
UV-Laser-System: Cryogenic Fiber Amplifier



- Up to 10 W output power @ 1015 nm
- High slope efficiency up to 41%
- Reliable system for generation of single mode & single frequency laser radiation @ 1015 nm
- Suitable for two subsequent second harmonic generation
- to generate UV radiation @ 254 nm



Second Harmonic Generation



- First frequency doubling stage using a 90° cut temperature phase matched LBO crystal and the Pound-Drever-Hall locking scheme
- Second frequency doubling stage using a Brewster cut angle phase matched BBO crystal and the Hänsch-Couillaud locking scheme