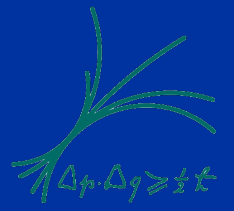
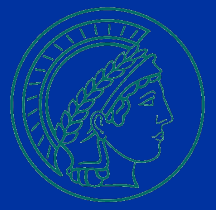




MAX-PLANCK-INSTITUT
FÜR PHYSIK

– AWAKE –
Getting the laser ready for the 2024 run

Collaboration Meeting

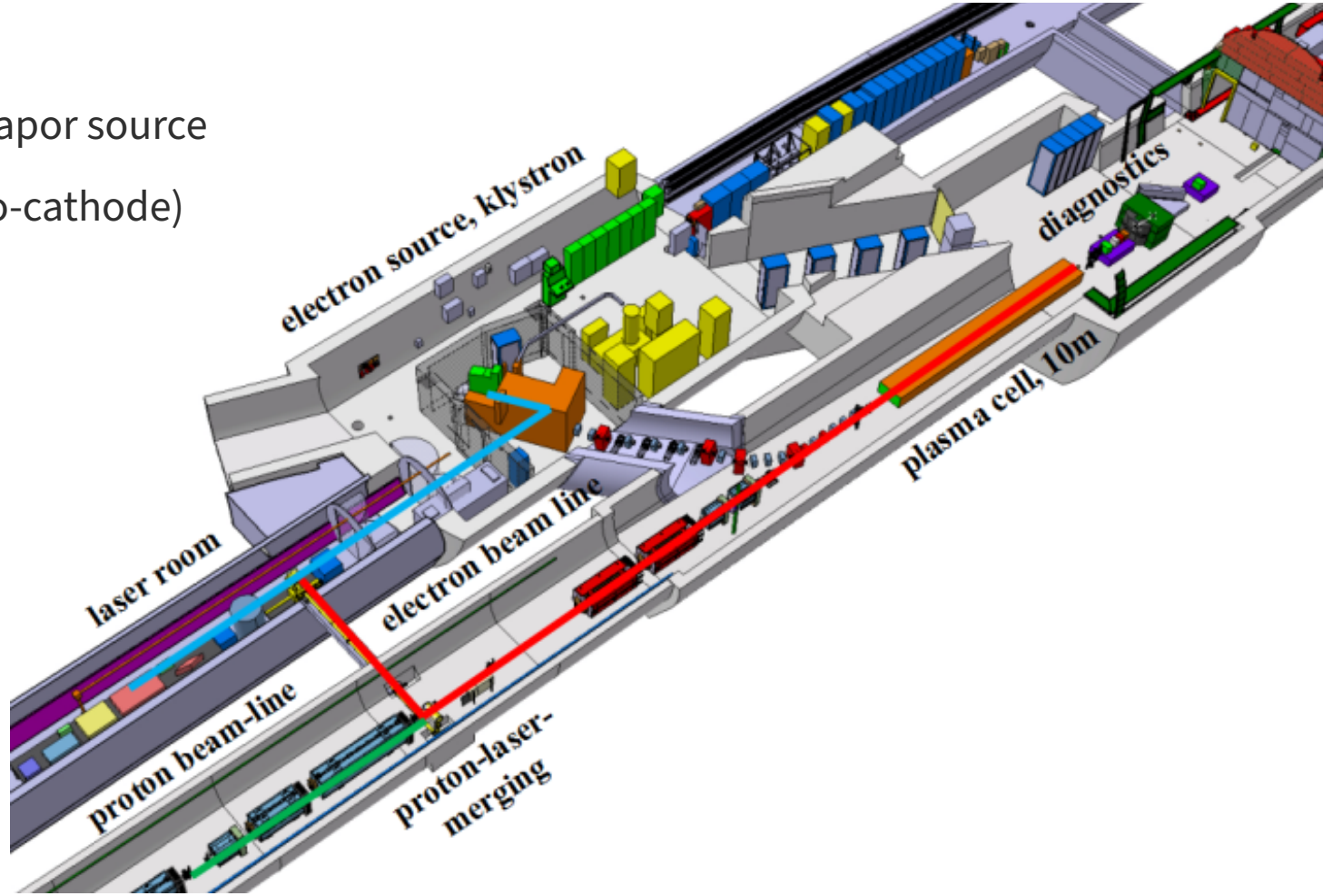
Lucas Ranc

12/03/2023

Laser OverViEw

HPLS in charge of running:

- Ionization of the 10m Rb in the vapor source
- Generate a short UV pulse (photo-cathode)
- Generate a diagnostic beam line



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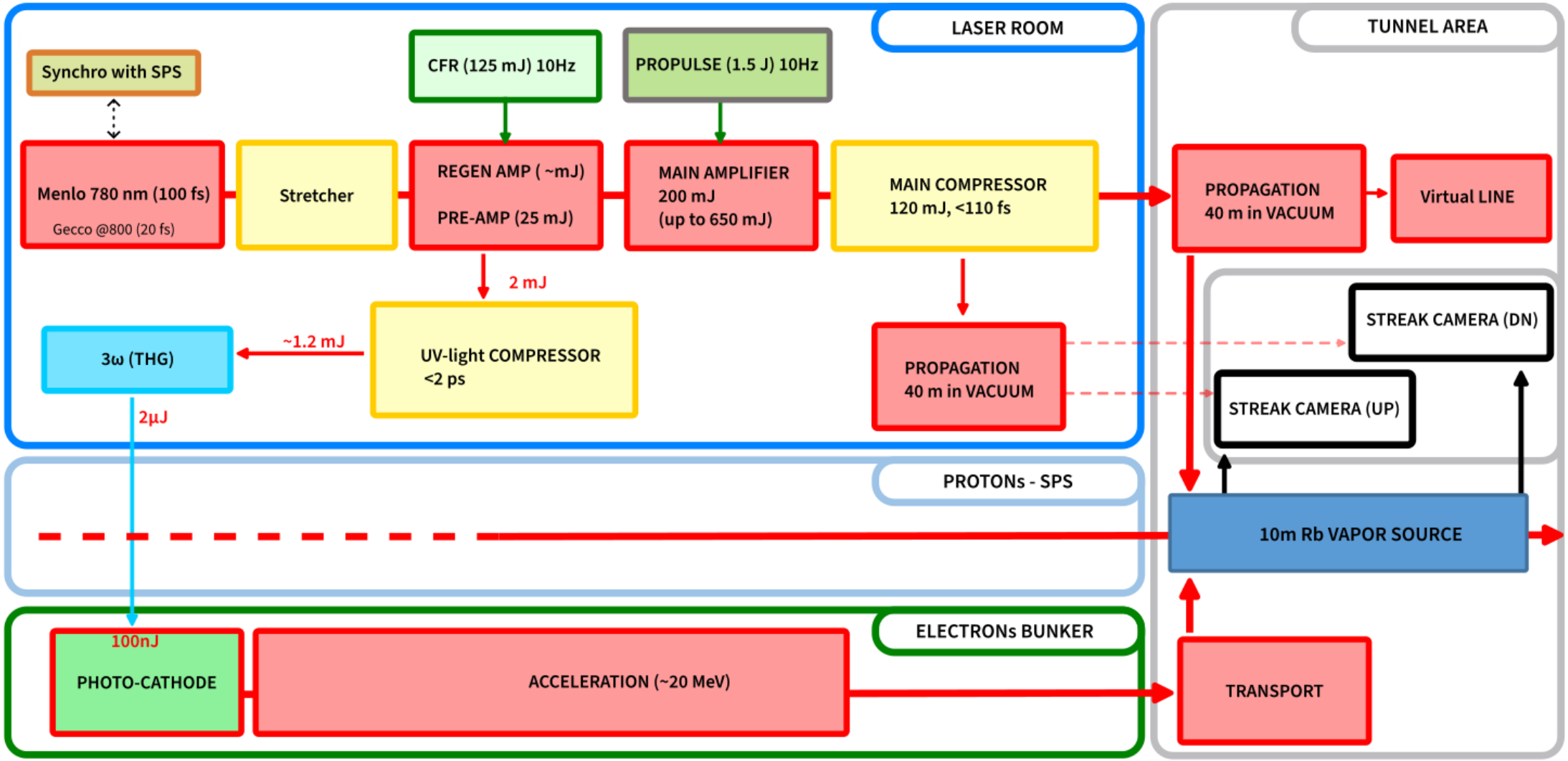
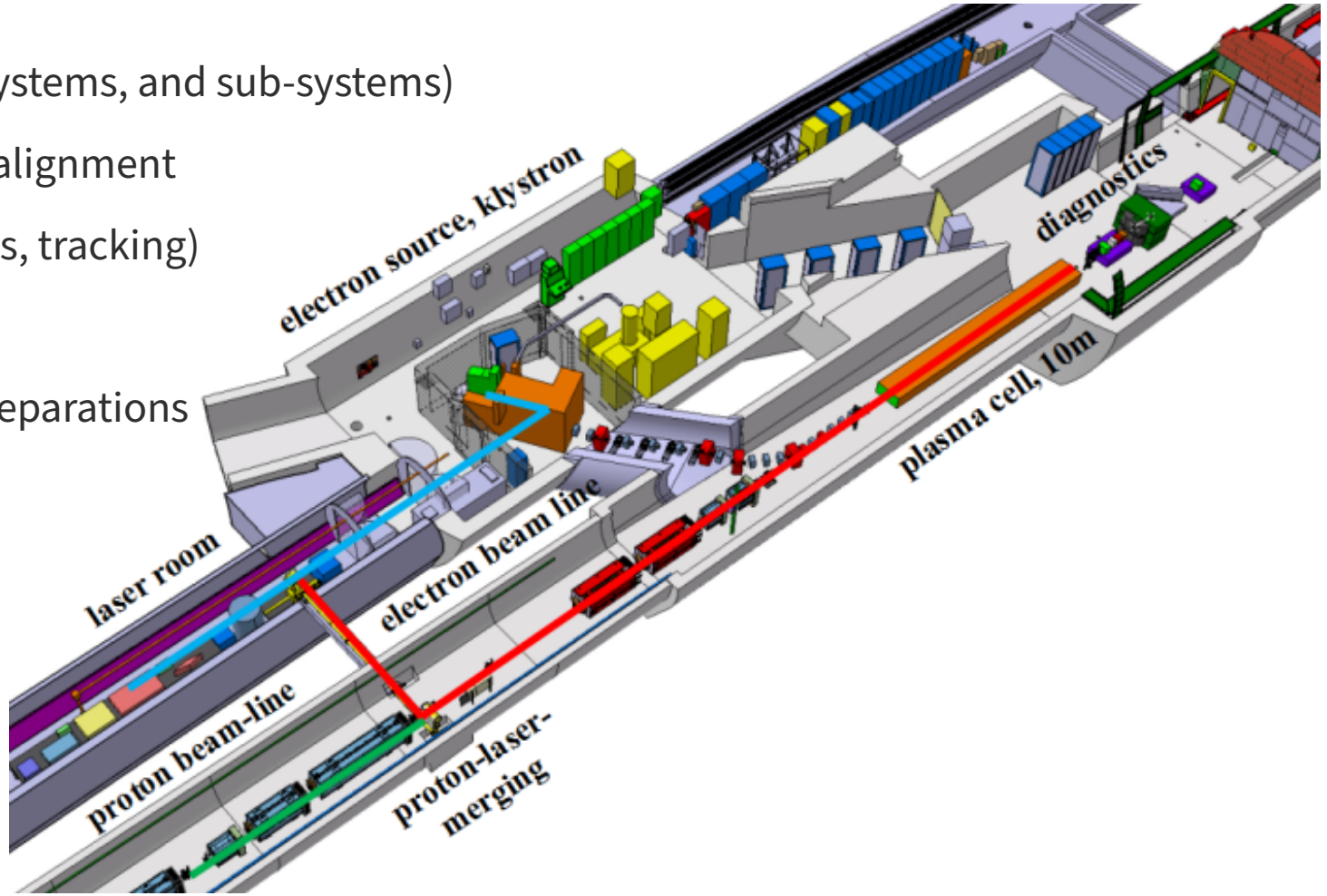


Laser OverViEw

Ongoing activities :

- Availability vs. Maintenance Duties (systems, and sub-systems)
- UV light for electrons re-work and re-alignment
- Control systems (Modes, Beam Dumps, tracking)
- Laser Interlock (Re-)Certification
- Physics studies : Ionization studies preparations

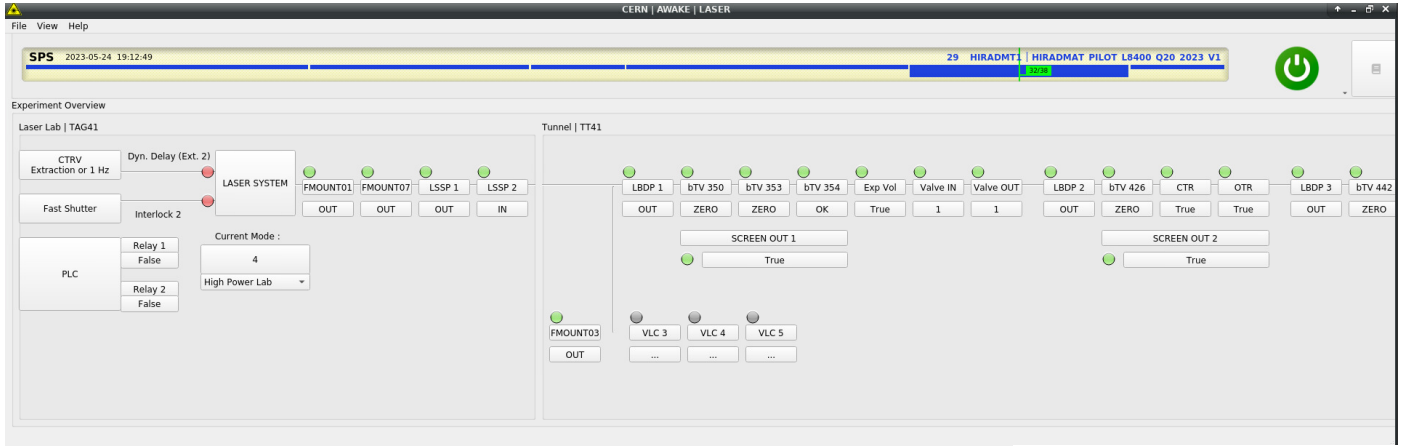


Laser vs. Experiment – Specifications :

GUIs (alignment, interlock, counters…)

- **Spatial**
  - Overlap with proton beam (new cameras involves to check, but usually done just before the run)
  - VLC line and Jitter :
    - Monitoring with virtual line is maintained
    - Mainline correlation analysis (usually done just before the run)
- **Temporal**
  - Pulse length at ~110 fs FWHM → reliable
- **Energy**
  - High power 120 mJ only on proton beam extraction shots or 1Hz
  - Low power ~ <1-10 mJ /shot @ 10 Hz.
  - Very low for specific devices <<mJ @ 10Hz

Control system

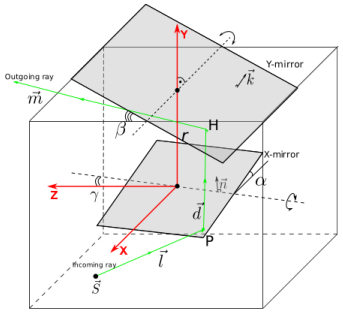


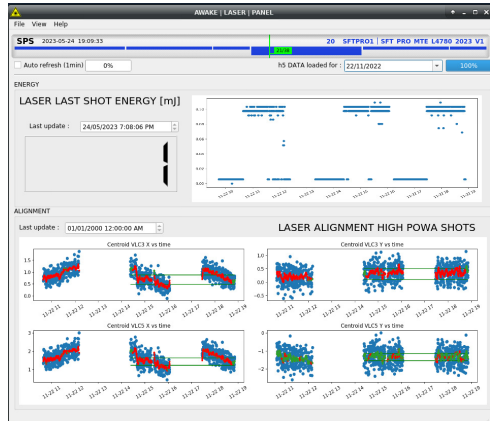
Goal:

- Change modes (Automatic transitions)
- Monitor & Alignment

Improvements:

- Alignment code re-renewed – ~~multi-thread~~ to Model-View-Controller one/two computers
- GUI to track VLC misalignment and stores a h5 file of the analyzed data for faster comparisons
- Beam dumps: automatic movement
- ~~Overview display of devices linked to the laser beam~~ TTS shouting information





Laser internal Maintenance duties

Maintenance :

- The Main Amplifier and pre-amplifiers pump flash lamps and chillers are EOL and need to be maintained (half done) 25M
- Fine tuning of the Compressor (optimization)
- Verify synchronicity/delay of cameras
- Contrast optimization (done)
  - Contrast measured at <1e-7@1.5 ns
  - No more issues
  - Remote scope connection

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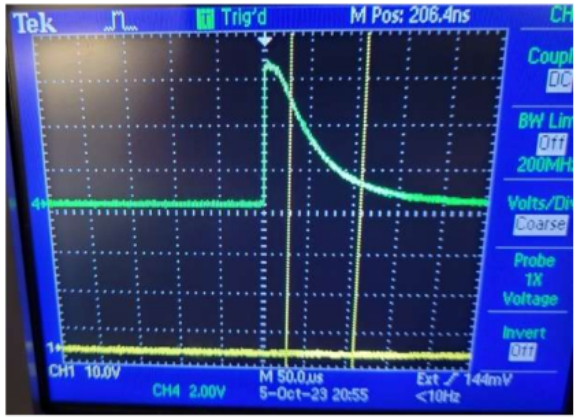
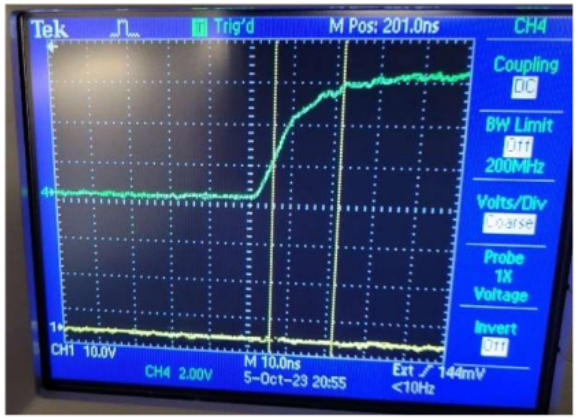
- **The ns prepulse problem is verified with a photodiode and an oscilloscope.**
  - **It appears as a pedestal at about 1 ns before the main pulse, that could correspond to the difference of periode between the oscillator (11,3 ns since 88,17 MHz) and the regenerative amplifier (10,4 ns).**





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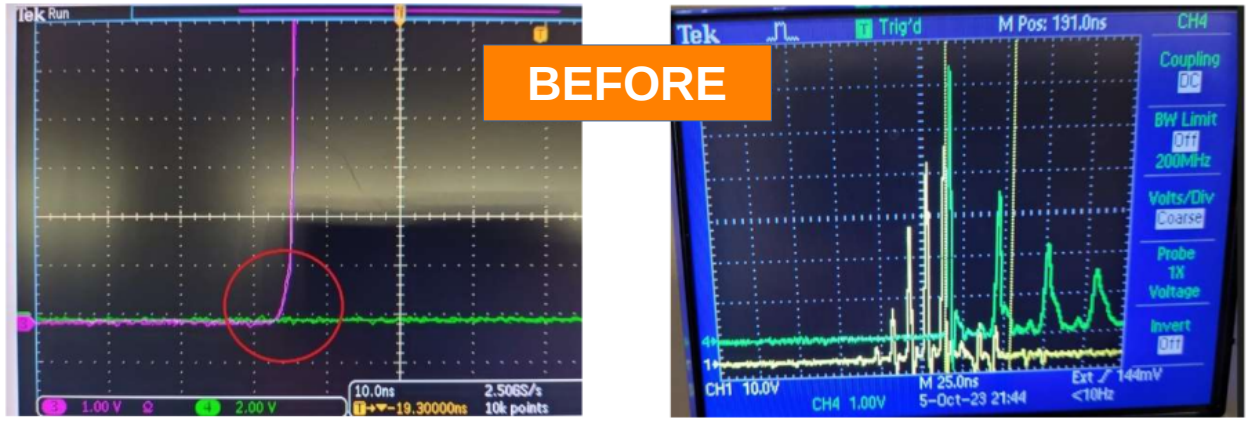
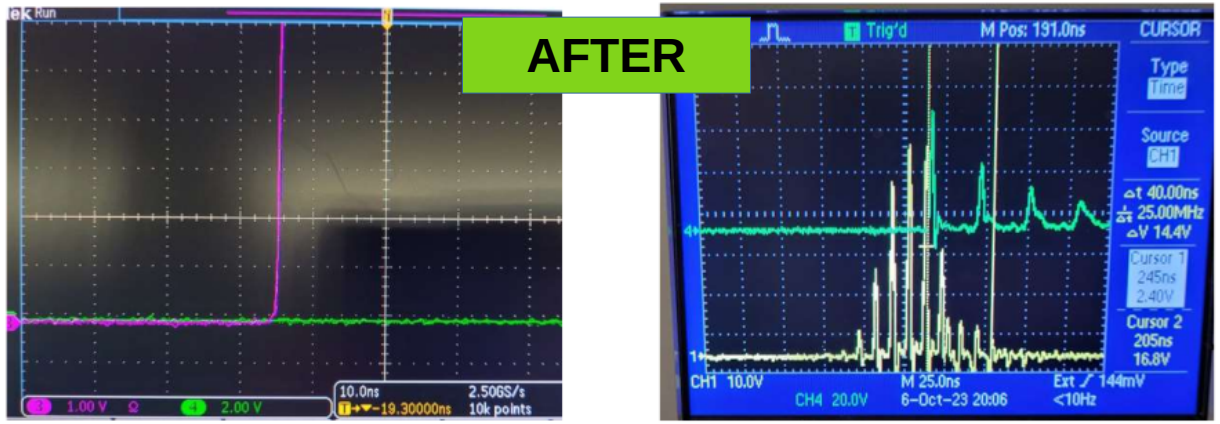


Typical contrast and regen trace when CH3 delay is optimized for energy



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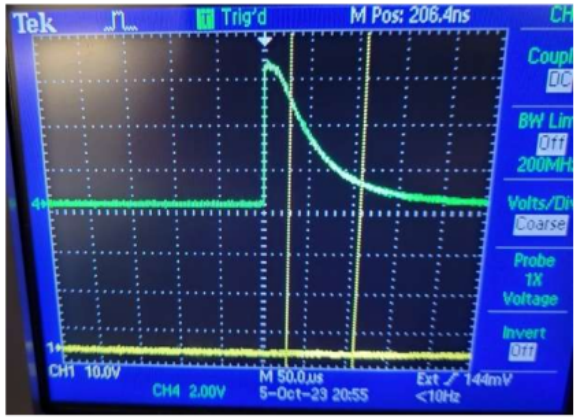

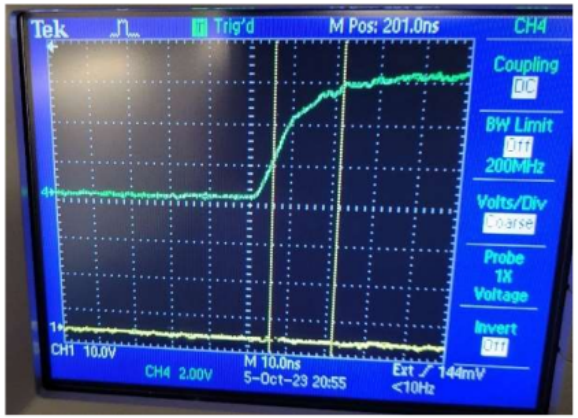

Laser – Plasma ionization studies :

- **Collaboration with Wigner institute**
  - Two experiments:
    - Probe along the plasma (blue – 420nm) : ionization
      - Counter-propagating (quasi)resonant diode laser beam
      - Measurement of the attenuation of the beam intensity:
        Naive picture: resonant light in vapor – no transmission
        vapor fully ionized – full transmission
      - Detection of the transmitted probe laser beam:
        Versus time: fast photodetector
        Lateral distribution: gated camera
    - Probe across the plasma (schlieren – 780 nm) : size
      - Transverse propagation
      - proposed to determine the plasma radius
      - Detection of the transmitted probe laser beam:
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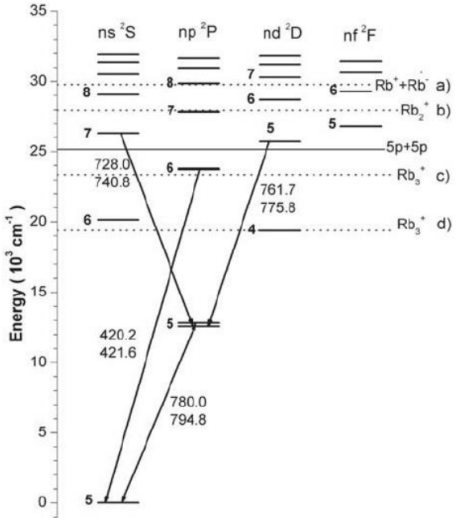

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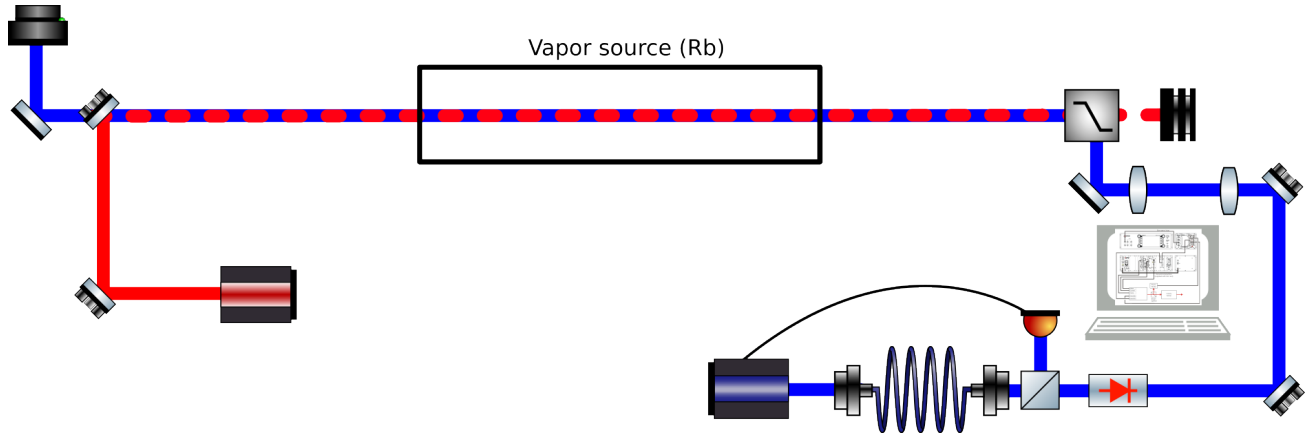

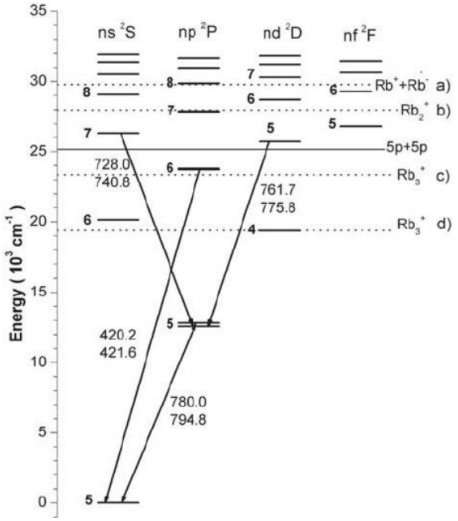

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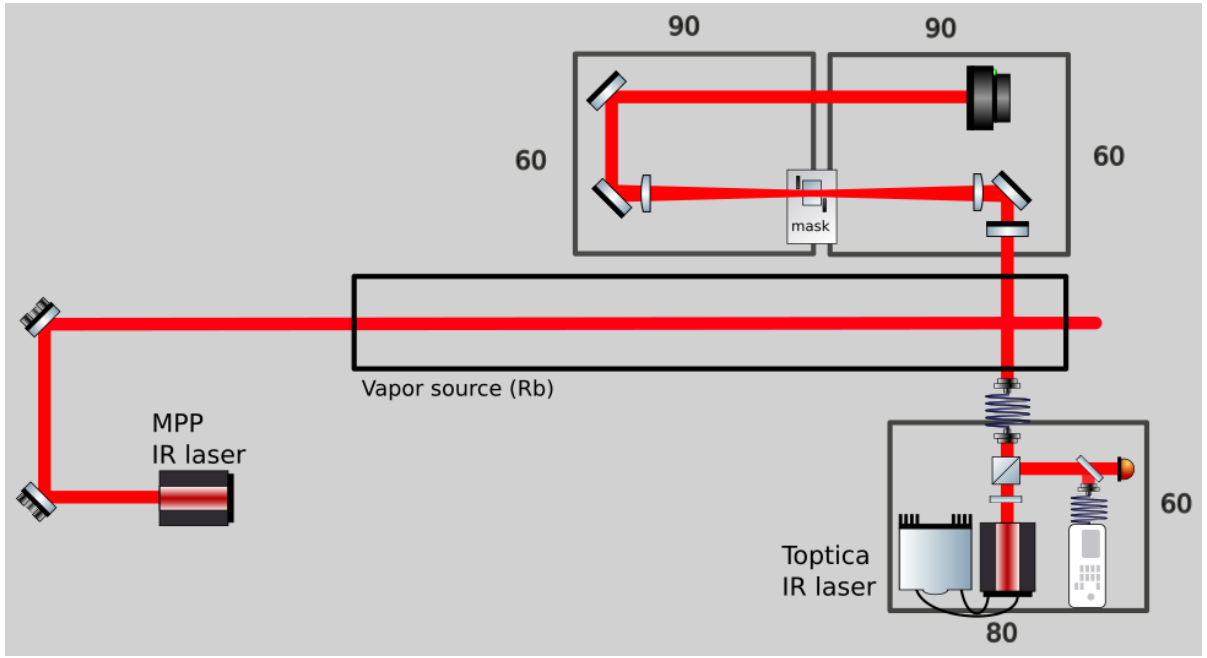

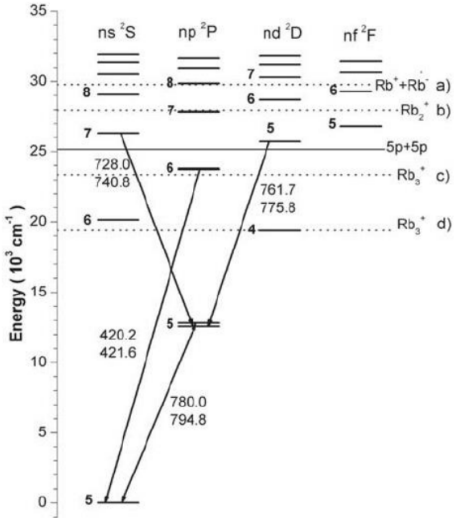

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FIN

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