PAUL SCHERRER INSTITUT

PSI

Steven Johnson :: Experiment laser group :: Paul Scherrer Institut

Experiment laser systems: status & outlook

SwissFEL performance workshop, January 27, 2021

Experiment (“pump”) laser group: Who we are

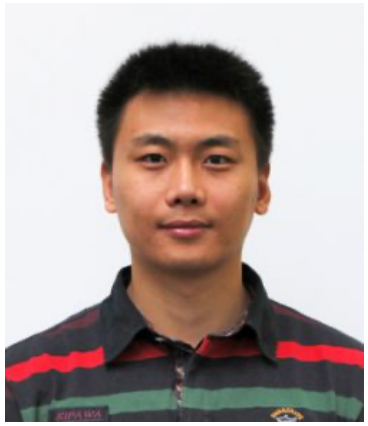
Steven Johnson
Group leader

Yunpei Deng
Bernina interface

Philip Johnson
Alvra interface

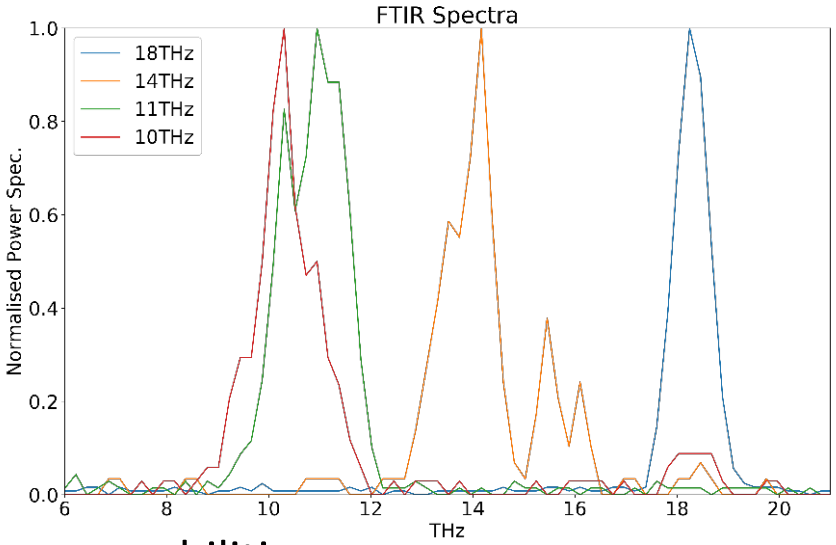
Xinhua Xie
ATHOS laser / experiments

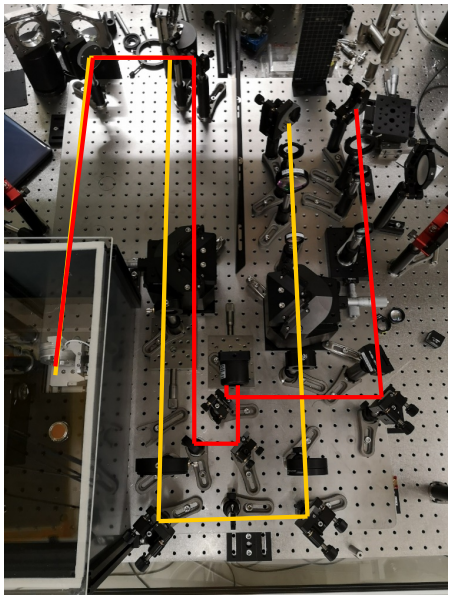
Benjamin Strudwick
Narrow-band THz (postdoc)



Biaolong Liu
ATHOS experiments

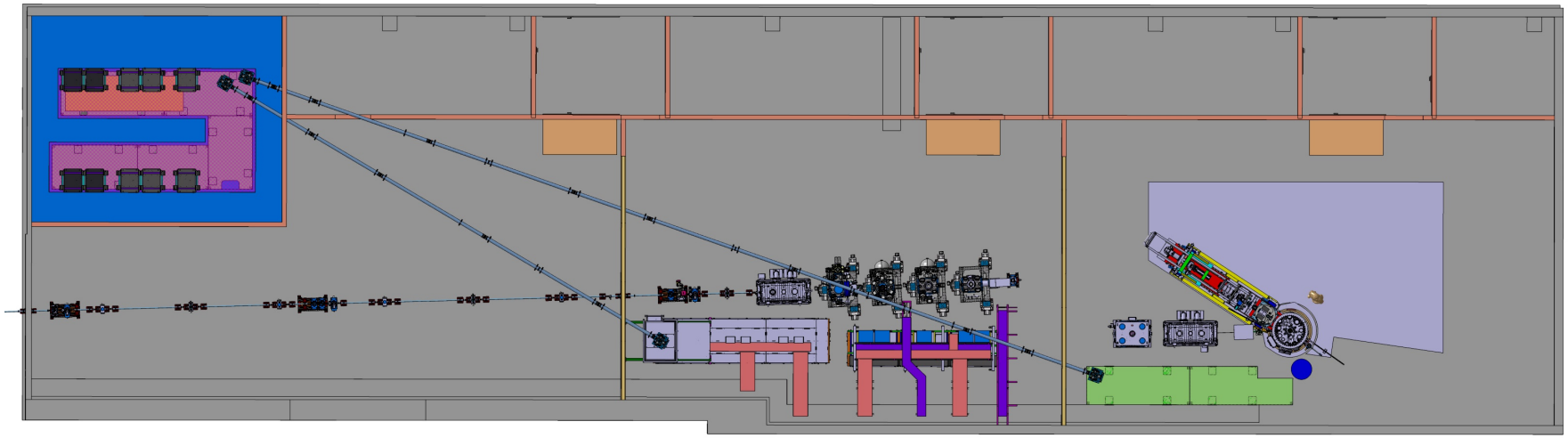
ARAMIS developments 2020





- ARAMIS laser capabilities
  - 2x 100 Hz, 20 mJ laser systems, < 40 fs pulse duration, synchronized to SwissFEL
  - Wavelengths from THz to UV, also 100 fs option for Bernina
  - **New:** 2 ns FWHM pulses tunable from 250 nm – 2.5 um, pulse energies up to 1 mJ, fiber delivery to Alvra (R'Equip grant)
  - **New**: ultrashort pulse options (< 10 fs) for both Alvra and Bernina, multiple methods and parameters (X. Xie, P. Johnson, Y. Deng)
  - **Upcoming:** narrowband mid-IR / THz, 1-10% BW from 4-20 THz, delivery to Bernina (B. Strudwick, Y. Deng)
  - Robustness & field strength improvements (~750 kV/cm) for broadband THz via $LiNbO_3$, exceeds user requests by 2x (Y. Deng, R. Winkler)

ATHOS status & plans



- Many delays in infrastructure (laser room, transfer)
- Main laser installation delayed, now set for Feb 2021 (factory acceptance just done)
- Maloja delivery expected in spring 2021
- Short (< 30 fs) and long (~ 100 fs) modes
- Dedicated OPAs foreseen for each endstation anticipated
- At Furka a focus on early THz and mid-IR delivery

Outlook

- Close cooperation with experiment station groups important
  - Particularly important to communicate expectations / needs / priorities
  - Close integration with experimental operations
- **Reliability**: Late 2020 issue with oscillator at ARAMIS, considering possible spare
- Timing and Synchronization
  - Integration with short pulse operation (e.g. HERO) will require excellent synchronization
  - Migration to optical synchronization