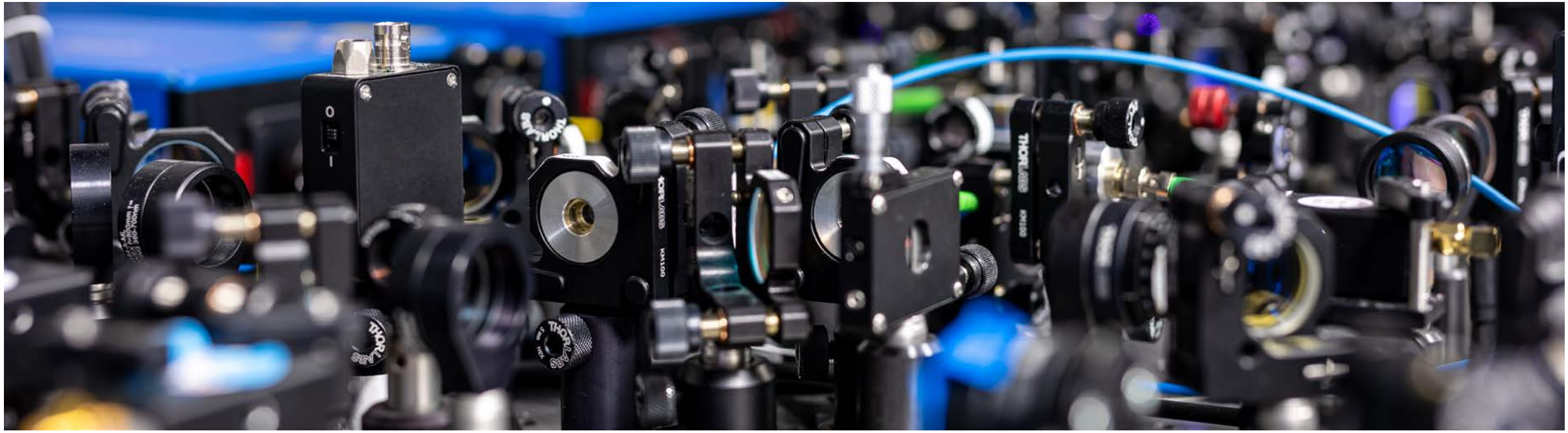
INSTITUTE OF SCIENTIFIC INSTRUMENTS
The Czech Academy of Sciences

The Czech Academy of Sciences

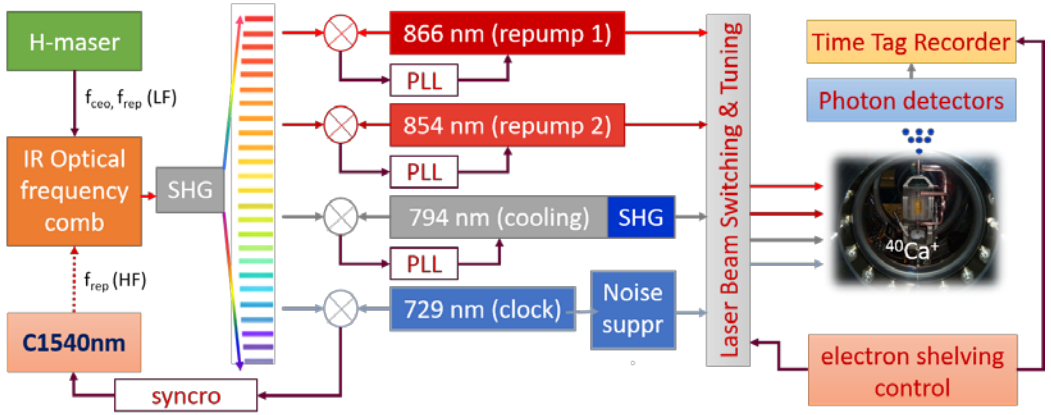


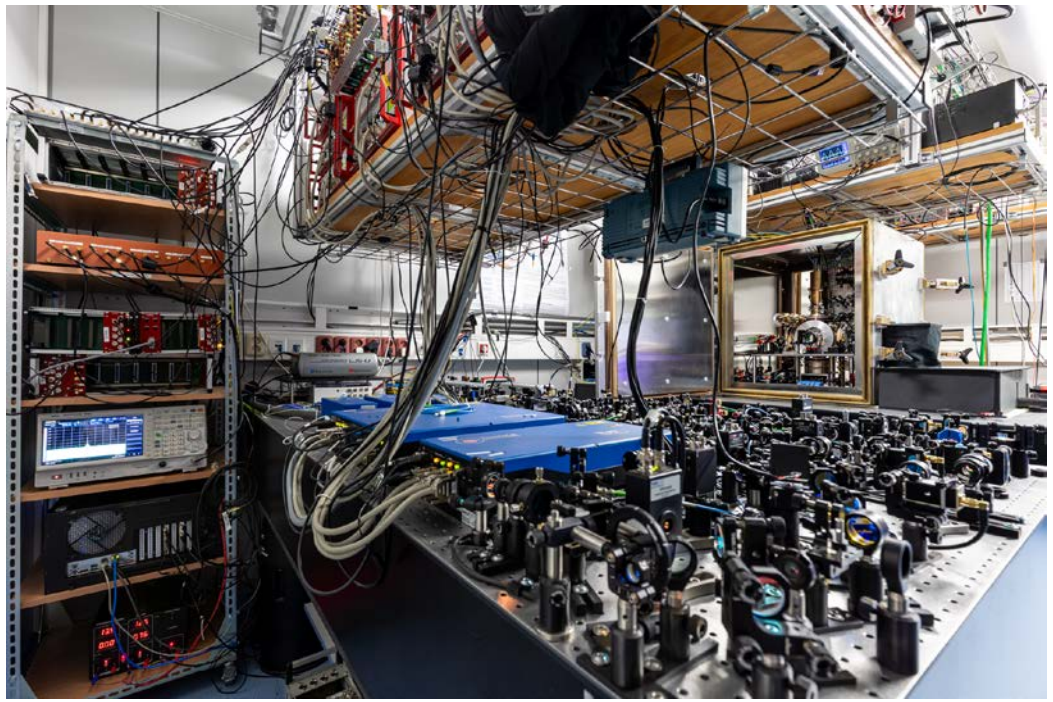
Coherence Optics Dept., ISI CAS – Space-related activities

Jan Hrabina, hrabina@isibrno.cz

Quantum Metrology

Laboratory of Ca+, optical ion clocks, ISI

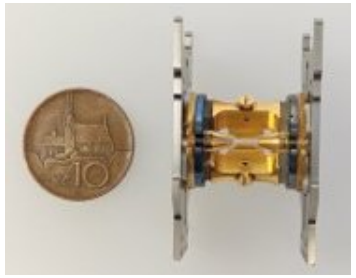




Ca+ ion clock at ISI:

- 2014: project start
- 2015: 1st trapped ions
- 2025: stability ~$5*10^{-17}$

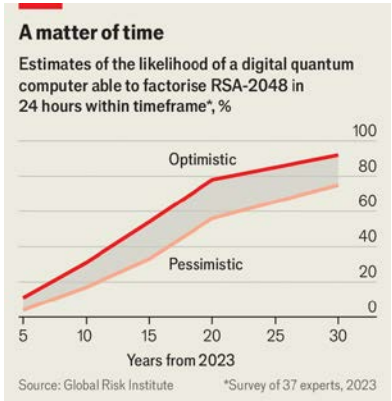
Optical ion trap, ISI



Why do we need precise time?

- GNSS systems, space research
- Distributed infrastructures (VLBI)
- Security sector, …

Q-day risk



Courtesy: The Economist

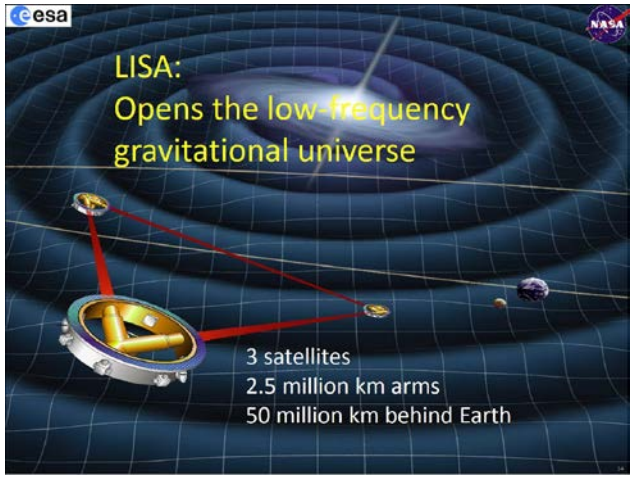
ISI CAS:

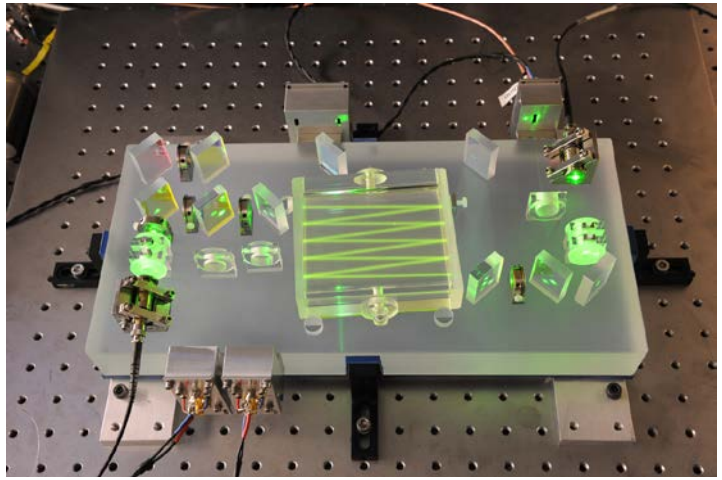
- Develops optical clock systems
- Distributes precise time and frequency signals
- Studies QKD methods
- Studies fundamentals of quantum metrology

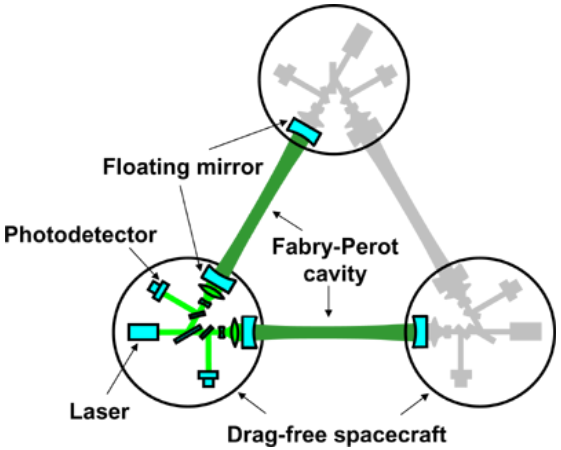
Frequency References and Dissemination

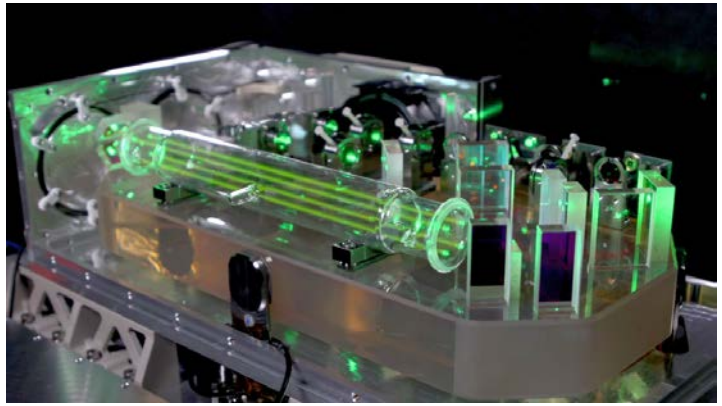
World-class optical frequency references for laser standards:

- Gravitational wave detectors (ESA LISA, JAXA DECIGO)
- Global Navigation Satellite Systems
- Space-ready iodine optical clocks

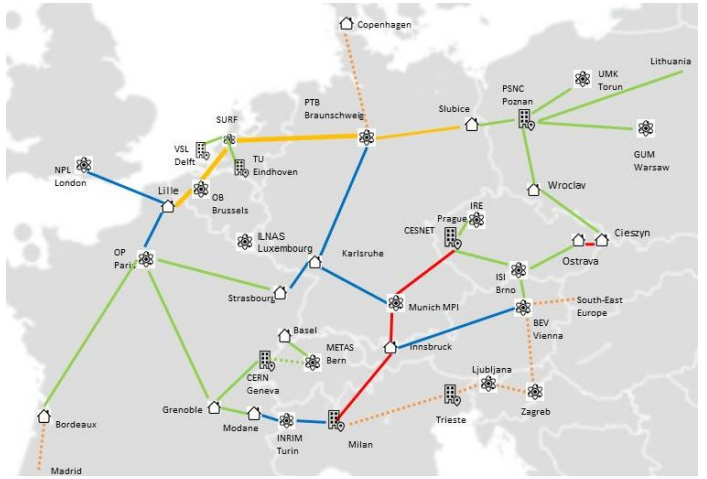




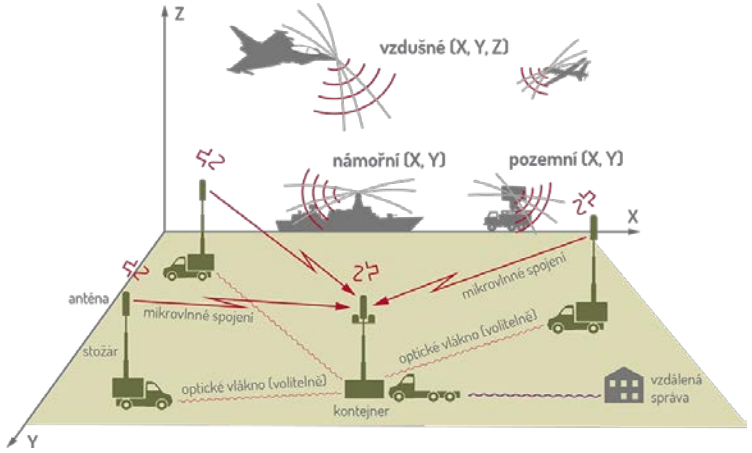




Time & Frequency Infrastructure



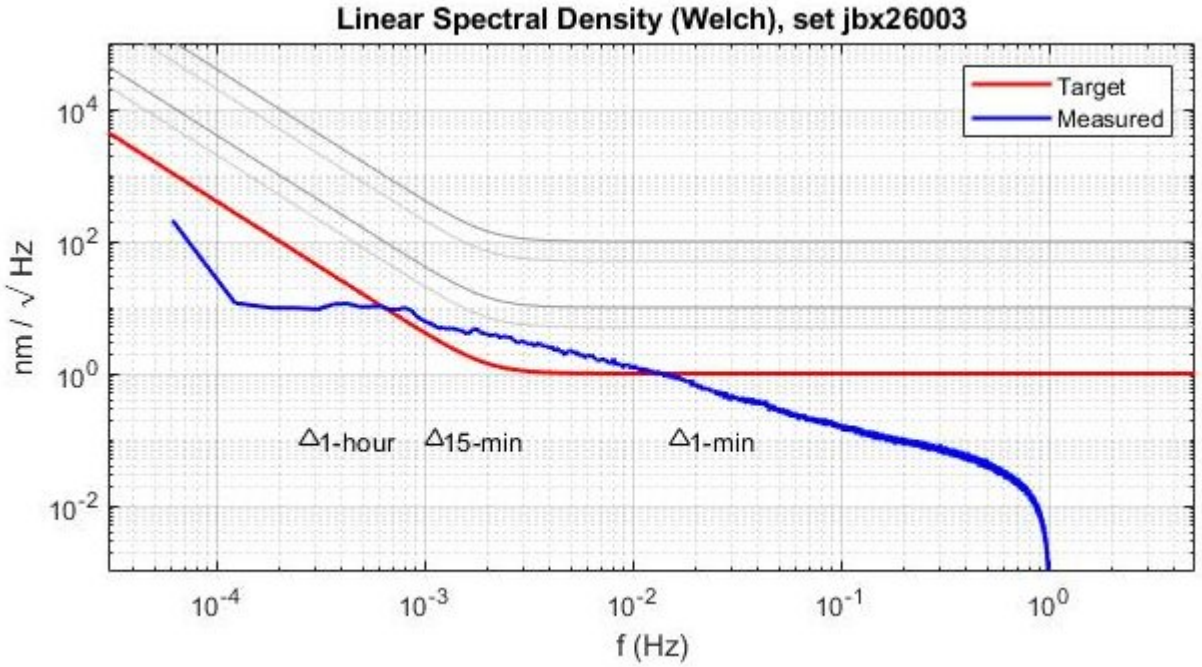
Precise timing for navigation/ radar systems

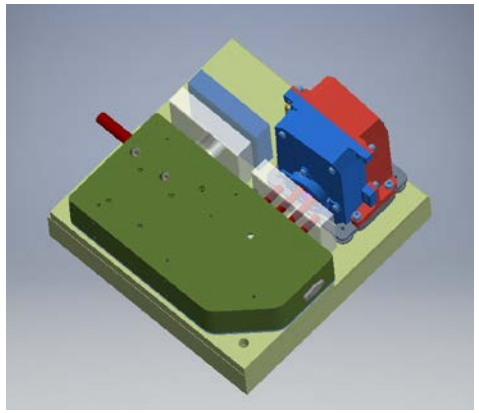


Courtesy: ESA, JAXA, DLR, ERA

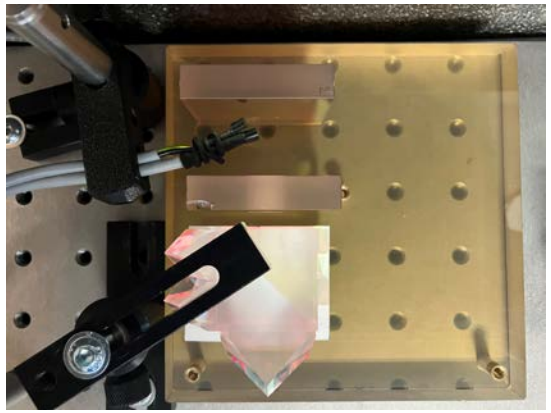
Interferometric and Fiberoptic Instrumentation

Differential interferometer – FSUA mechanism testing



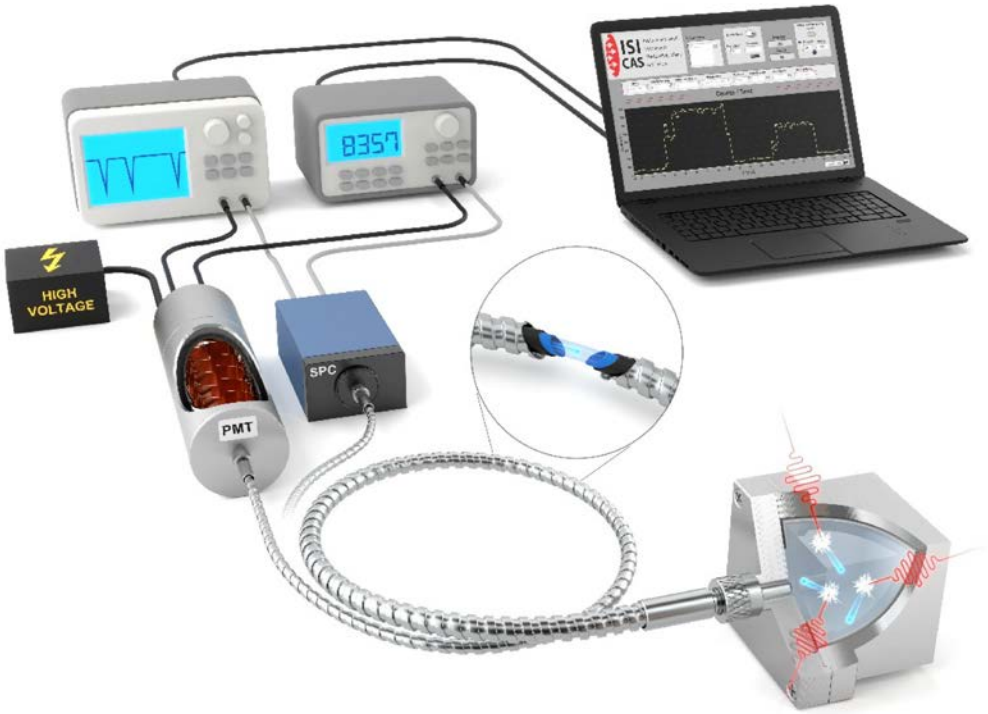


Measurement system model



Interferometer environmental test

Optical fiber sensors and sensing



Custom UV, VIS, NIR optical coatings