

Low-cost, compact, multi-purpose SLR system, Omni-SLR

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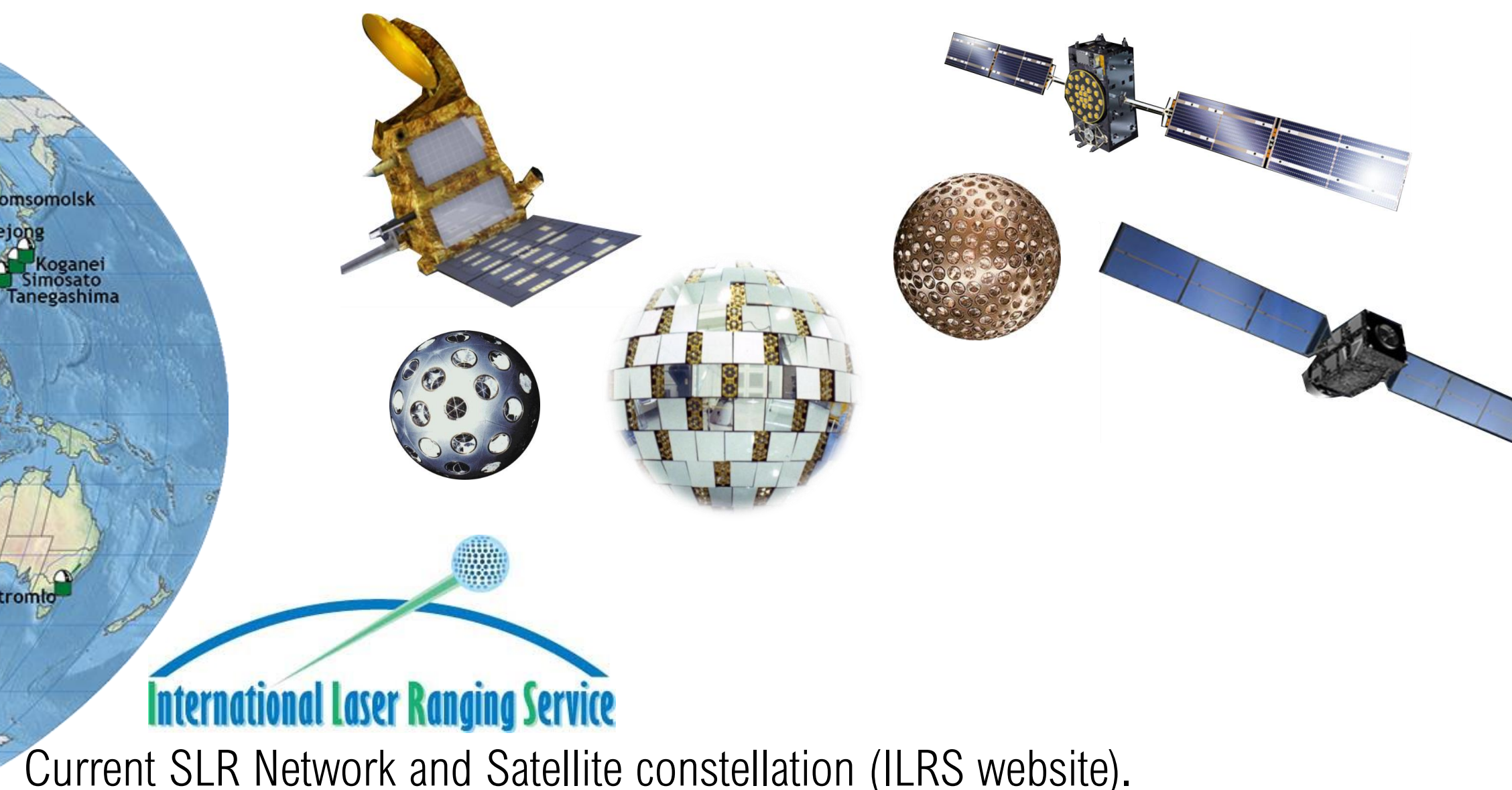
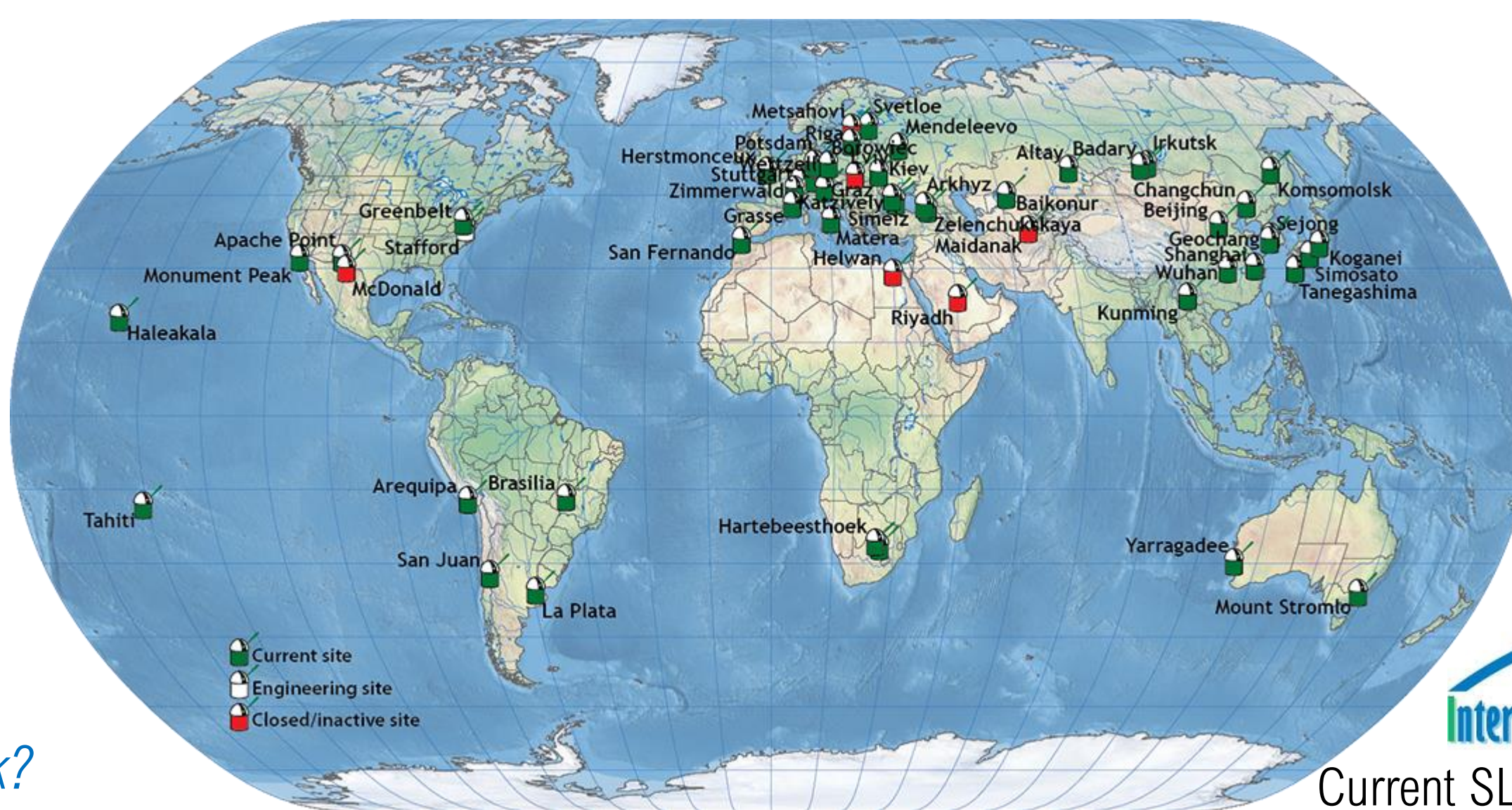
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Satellite Laser Ranging (SLR)

- Direct/precise measurement of the ground-satellite distance.
- Essential for global-scale geodesy and orbit determination.
- Regarded as a “big” and “expensive” facility (similar to VLBI).
- Boosting number of reflector-equipped satellites, LEO to GNSS.
- Current network not evenly distributed on the Earth.

What should we do for expanding/improving the ground network?



Current SLR Network and Satellite constellation (ILRS website).

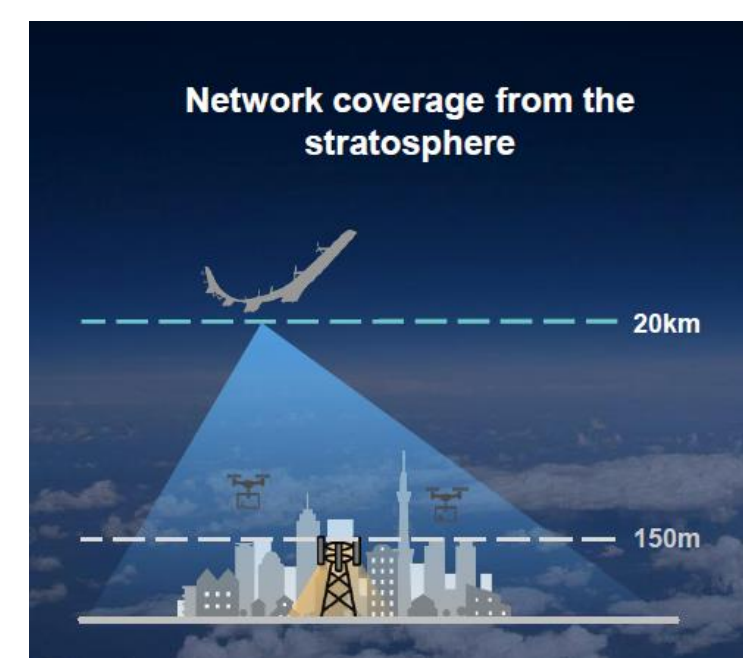
Omni-SLR Concepts

Very low-cost

- Use of COTS products
- Current setup: USD/EUR 50-60 k per station.

Very compact

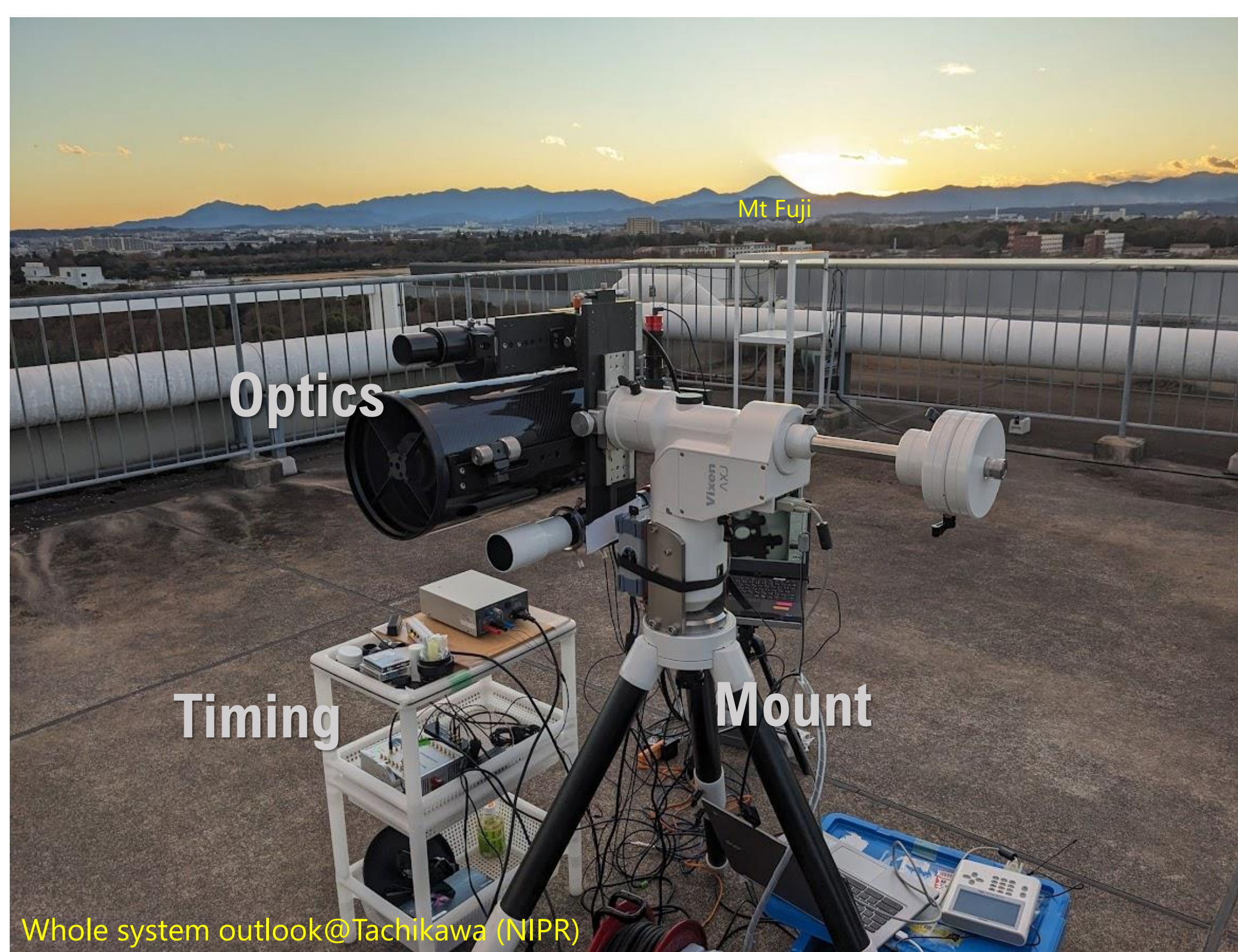
- Conveyable by a car.
- < 100 kg.



https://hpsalliance.org/

Multi-purpose

- Primary: SLR.
- Airborne/Spaceborne optical communications.
- Time transfer.
- More? Proposals welcome.



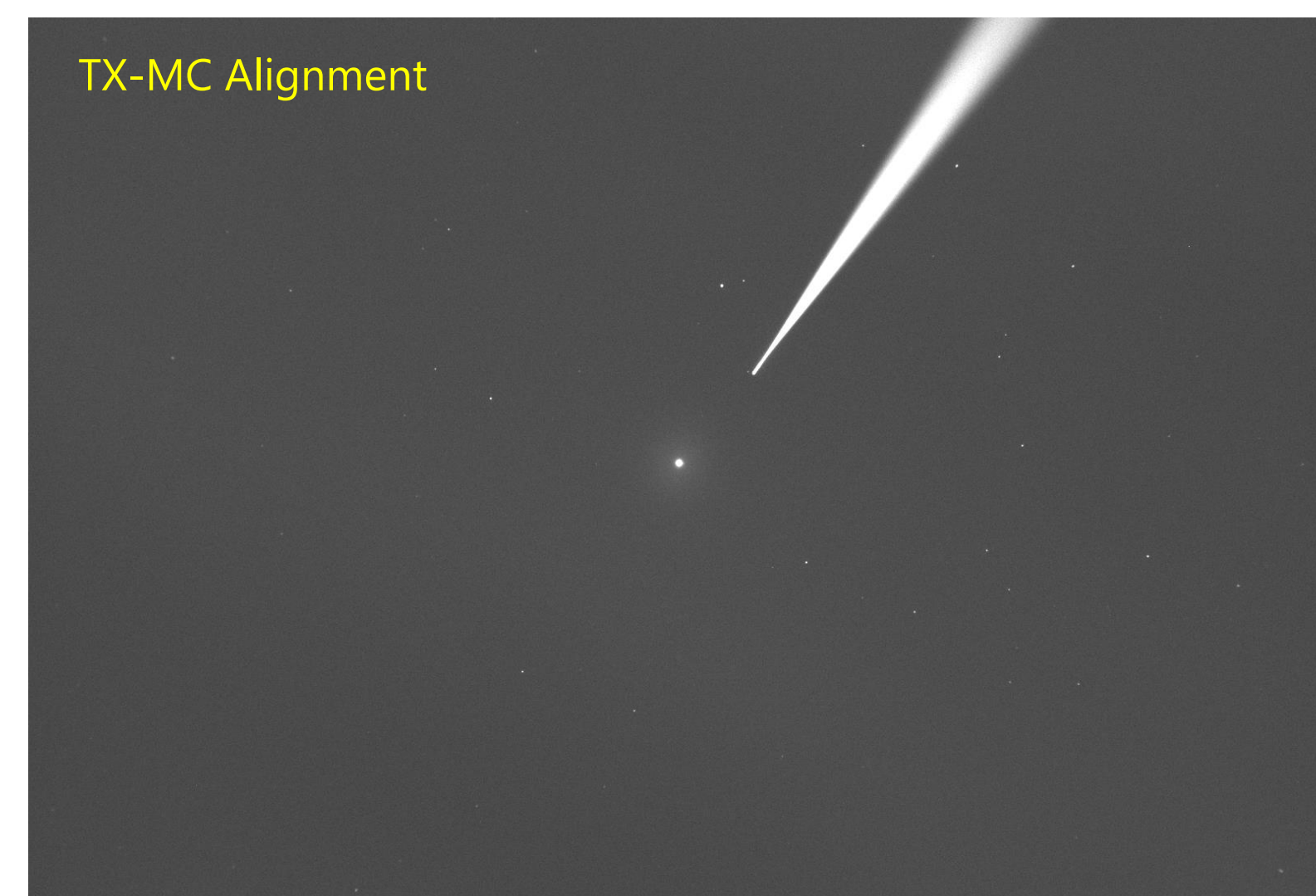
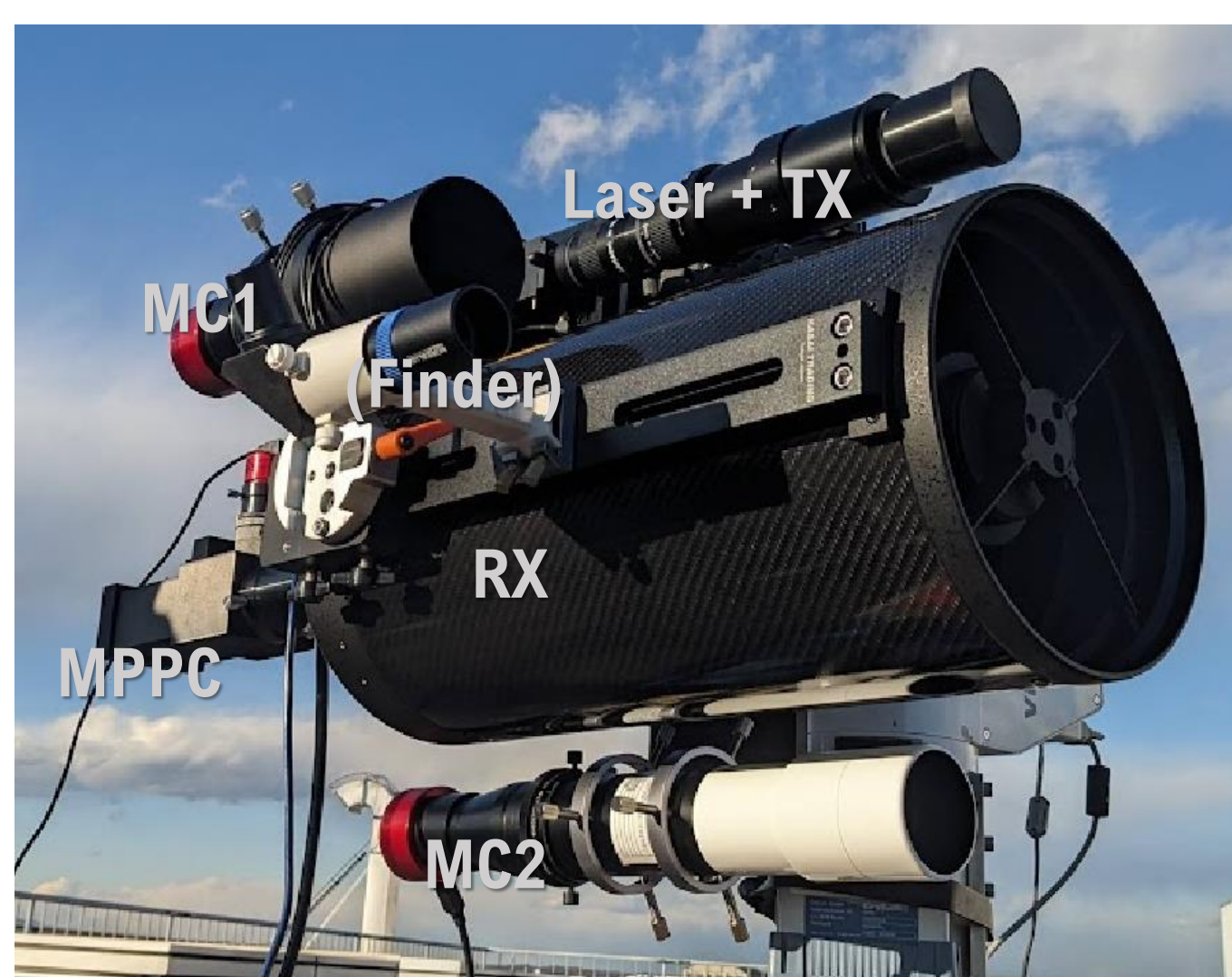
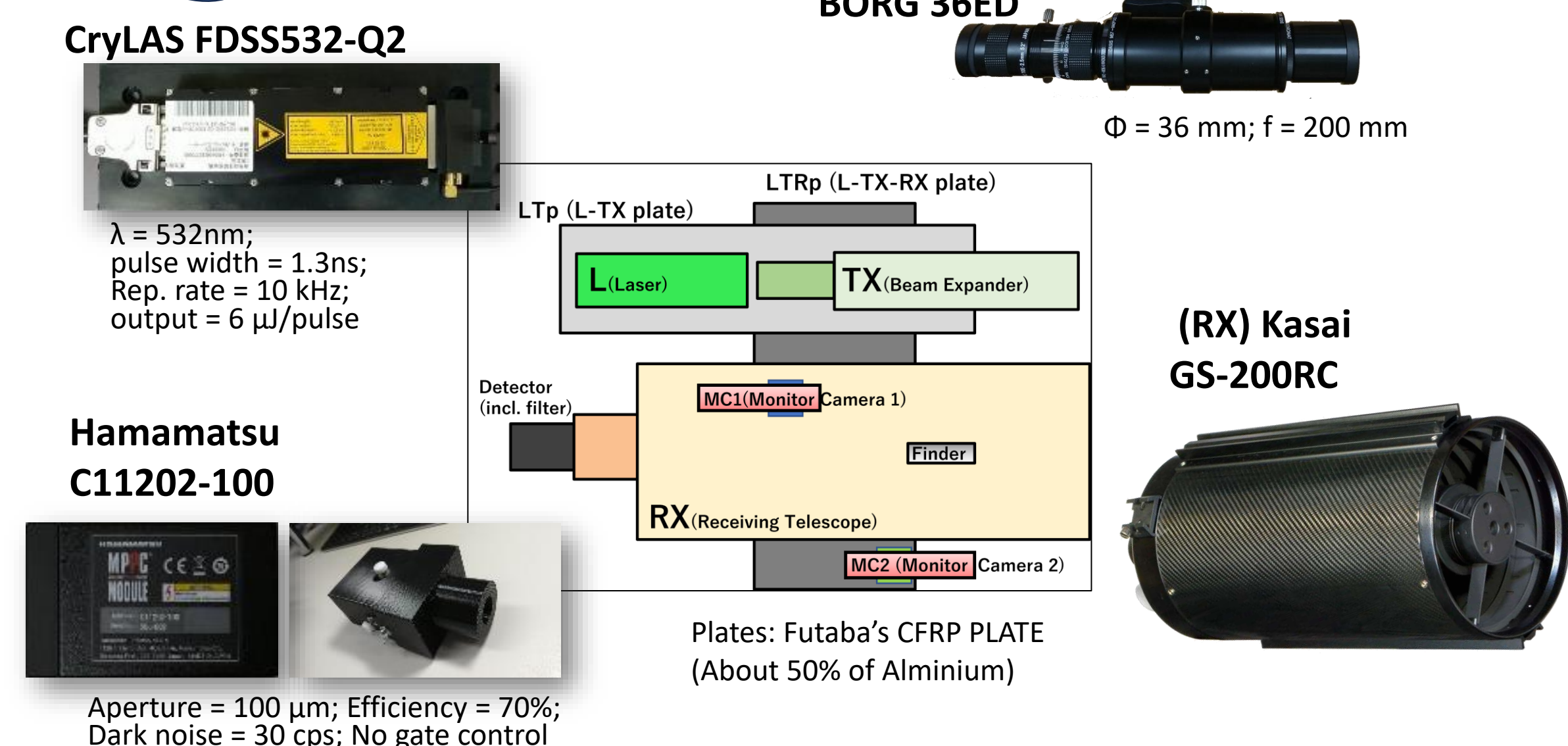
Whole system outlook@Tachikawa (NIPR)



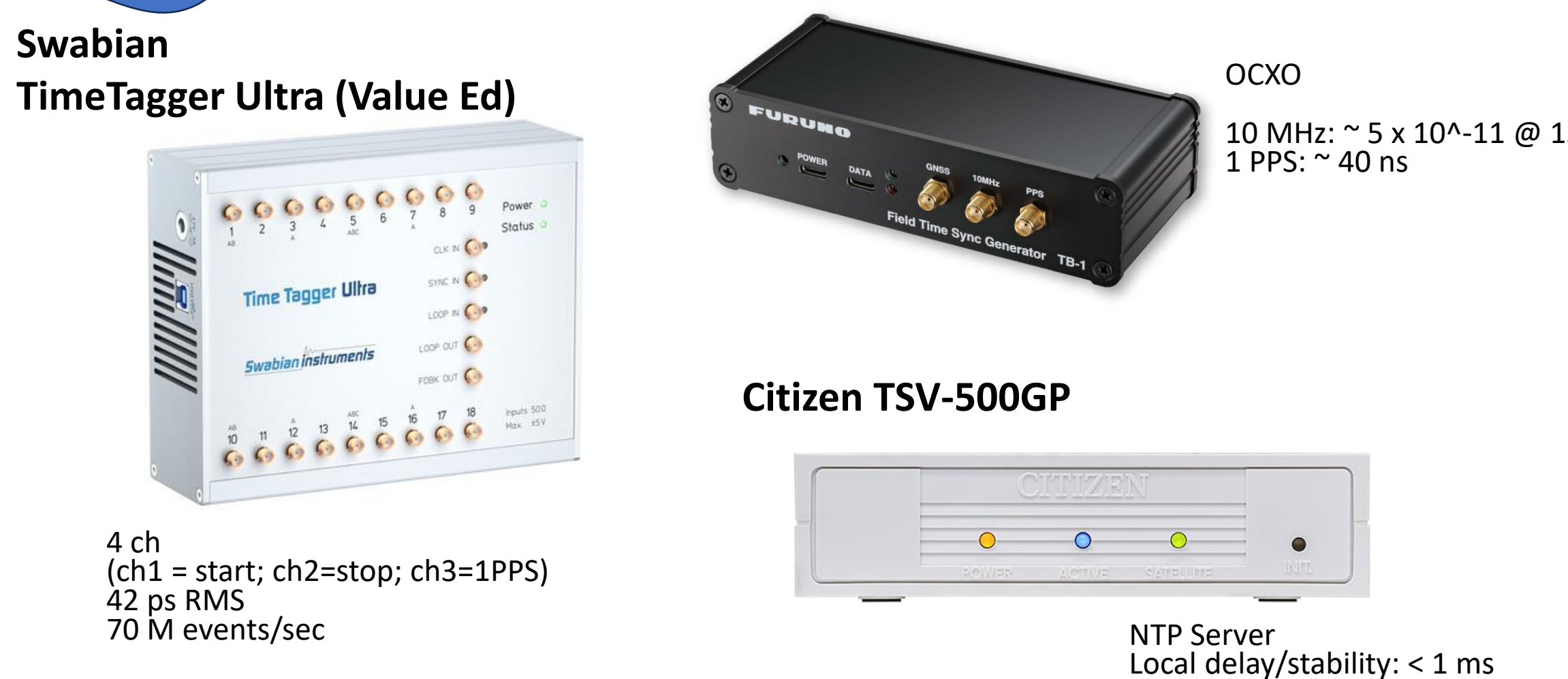
Nighttime ranging@Tachikawa (NIPR)

Omni-SLR System

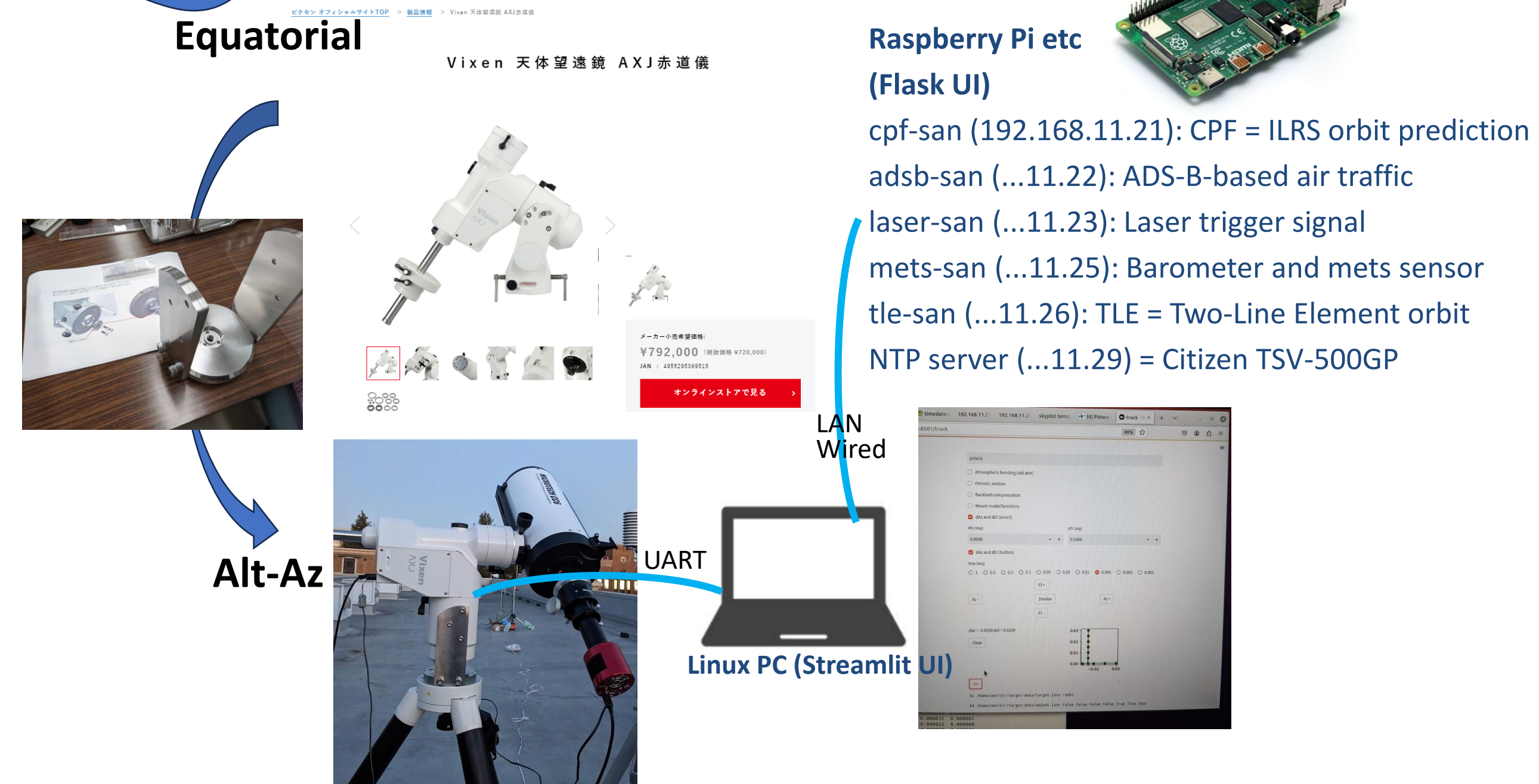
Optics



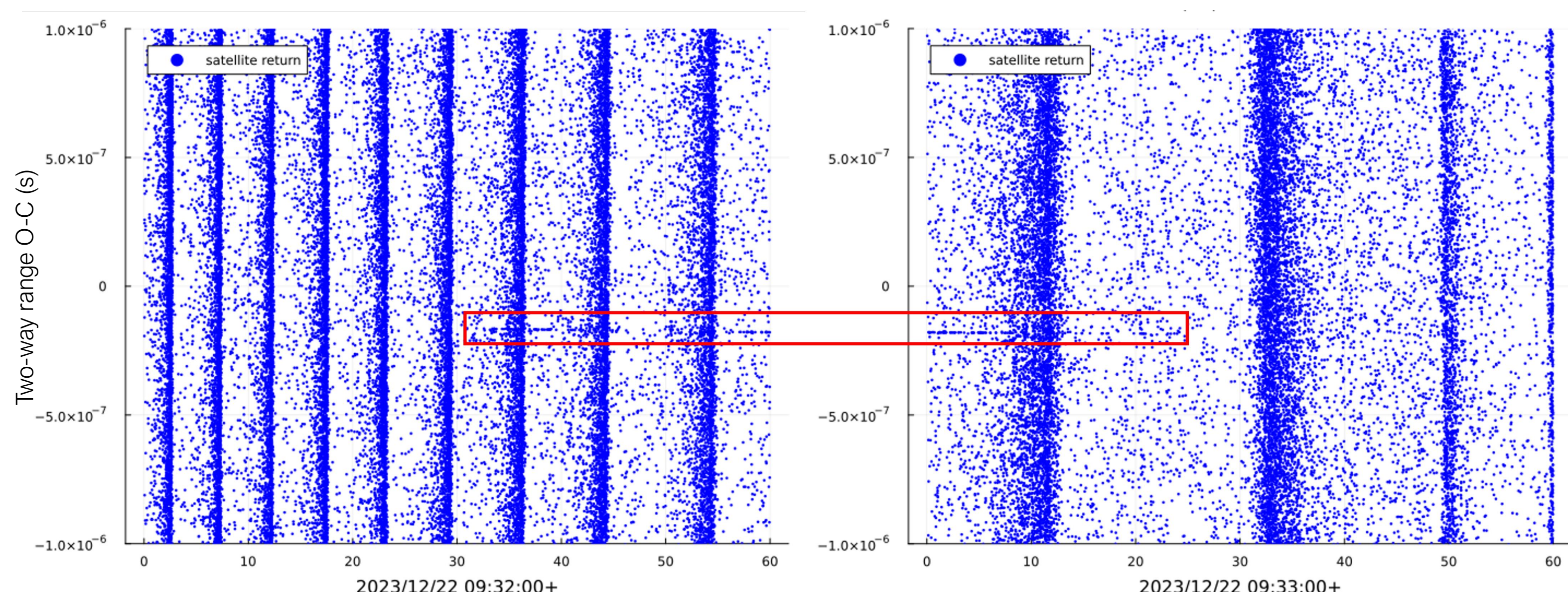
Timing



Mount



First successful returns in December 2023



- Link budget: 0.5% return rate (⇔ estimate 1-10%).
- Single shot precision = 7 cm two-way → Normal point precision < 1 cm.

Current & Future projects

- Still lots of things to be done as a basic SLR station. More to be done for standardising the system.
- ILRS/IERS registration: CDP Number “7317” “95” “01”, DOMES Number 21791S00X (to be assigned).
- March 2024: Deployment to **Ishioka Geodetic Station** (GSI). Various tests, collocation, etc.
- 2024+: Time transfer experiments (with NICT and Softbank).
- Early 2027 (summer): Deployment to **Syowa Station** (Antarctica). Low-temperature, daytime-only conditions.
- More projects ongoing/planned with national institutes, companies, etc.

