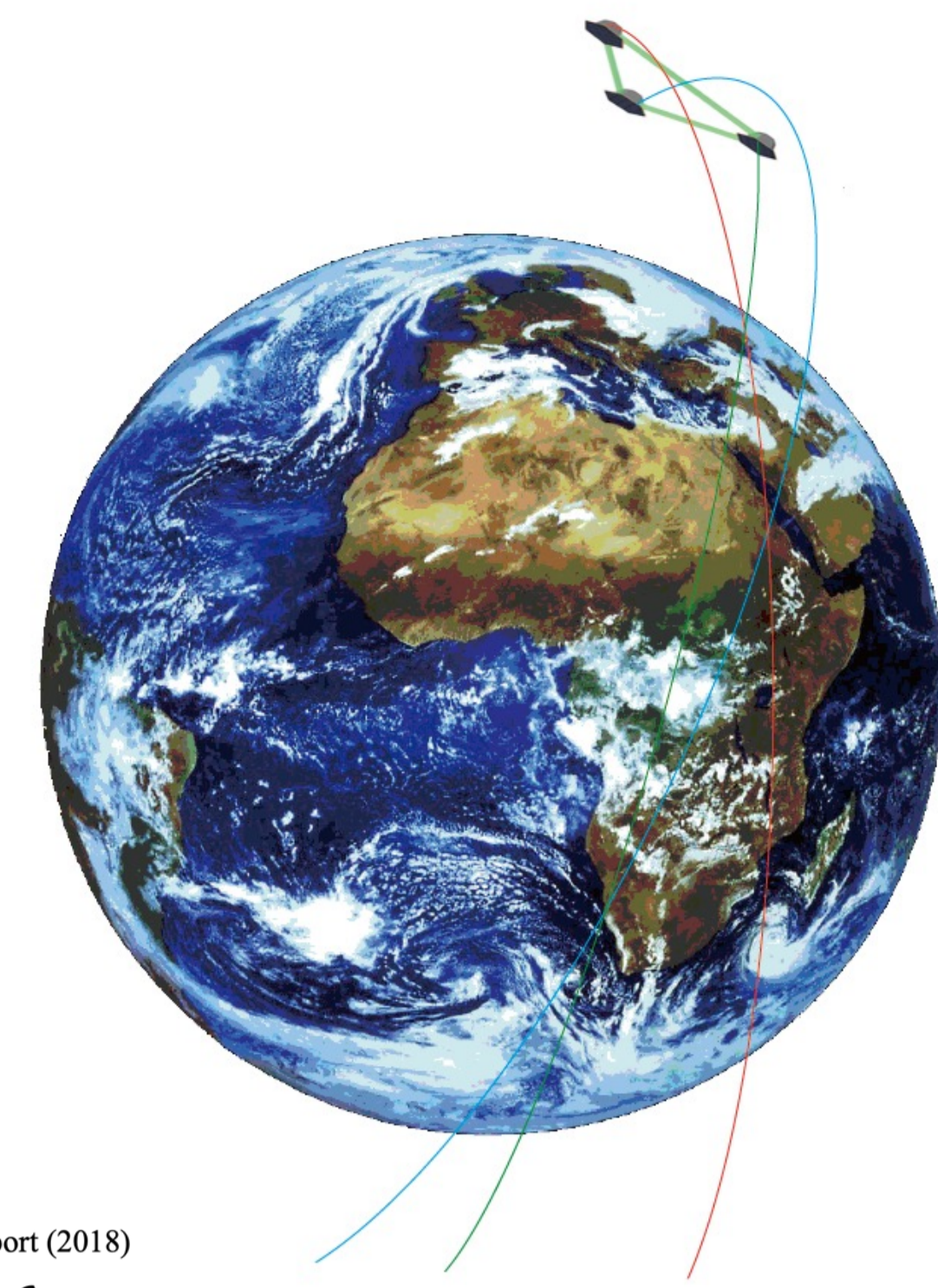


SILVIA: In-Orbit Demonstration of Ultra-Precision Formation Flying

SILVIA = Space Interferometer Laboratory Voyaging towards Innovative Applications



Principal Investigator (PI): Ikkoh Funaki (JAXA)

Research communities likely to be involved: Formation-flight working group, Japan Gravitational Wave Community (JGWC), Group of Optical and Infrared Astronomers (GOPIRA)

Current status

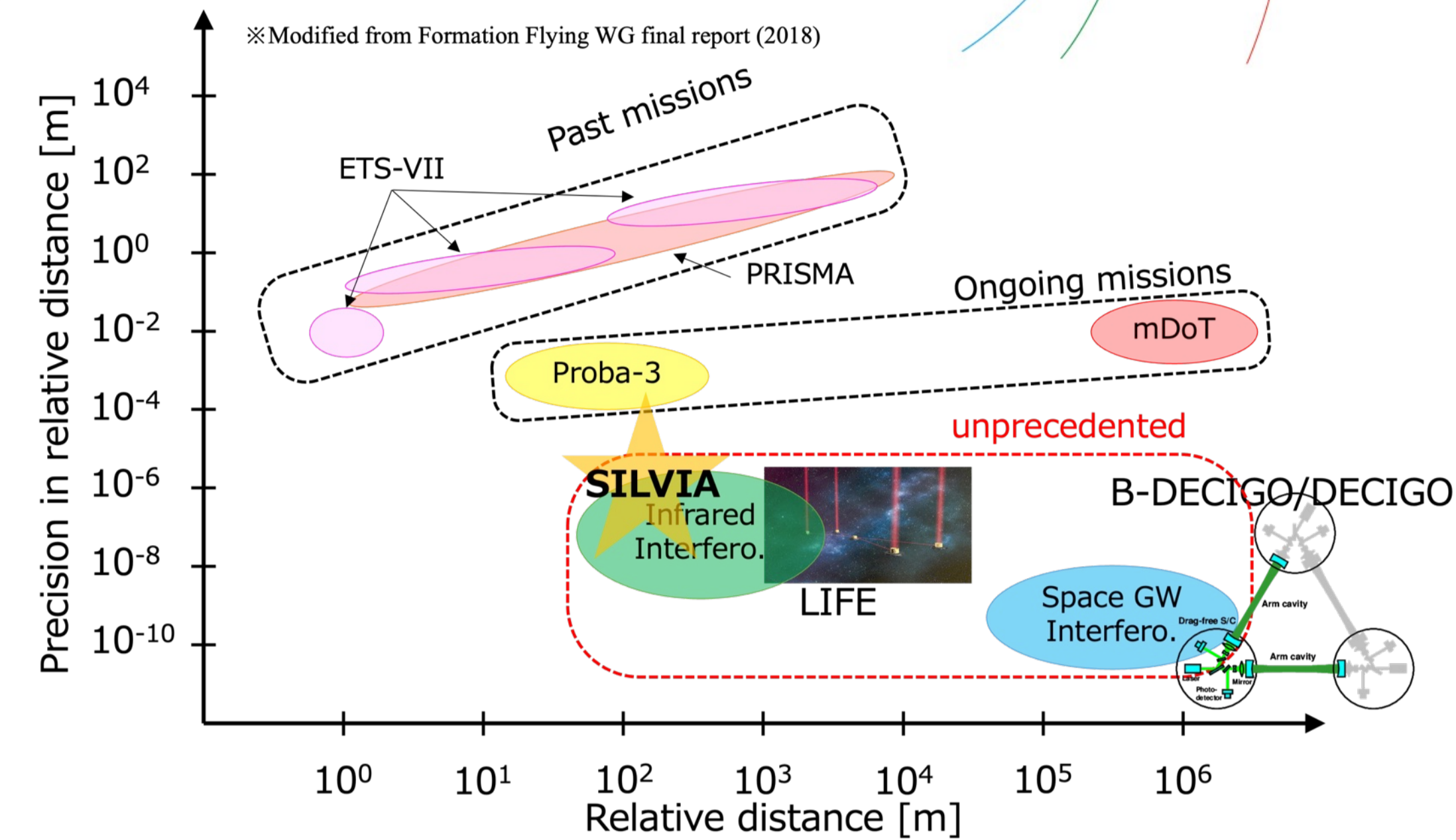
SILVIA is now in **PrePhase A2** in terms of the JAXA project phases. It was selected as one of the two finalists in the down-selection scheme for the Publicly Applied Small-scale Satellite V, but was not selected as a final candidate. We are continuing our activities for the next application.

Goal

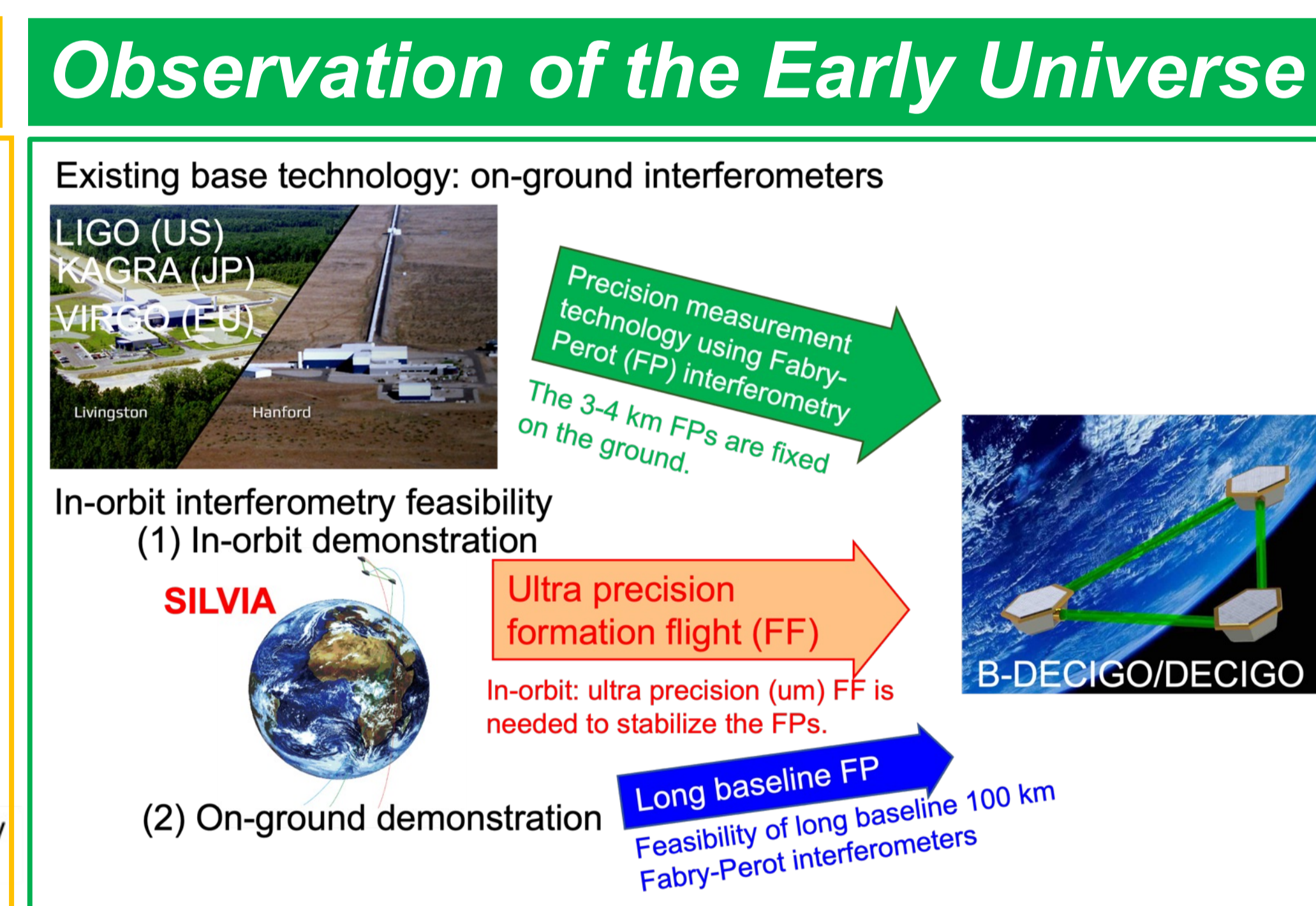
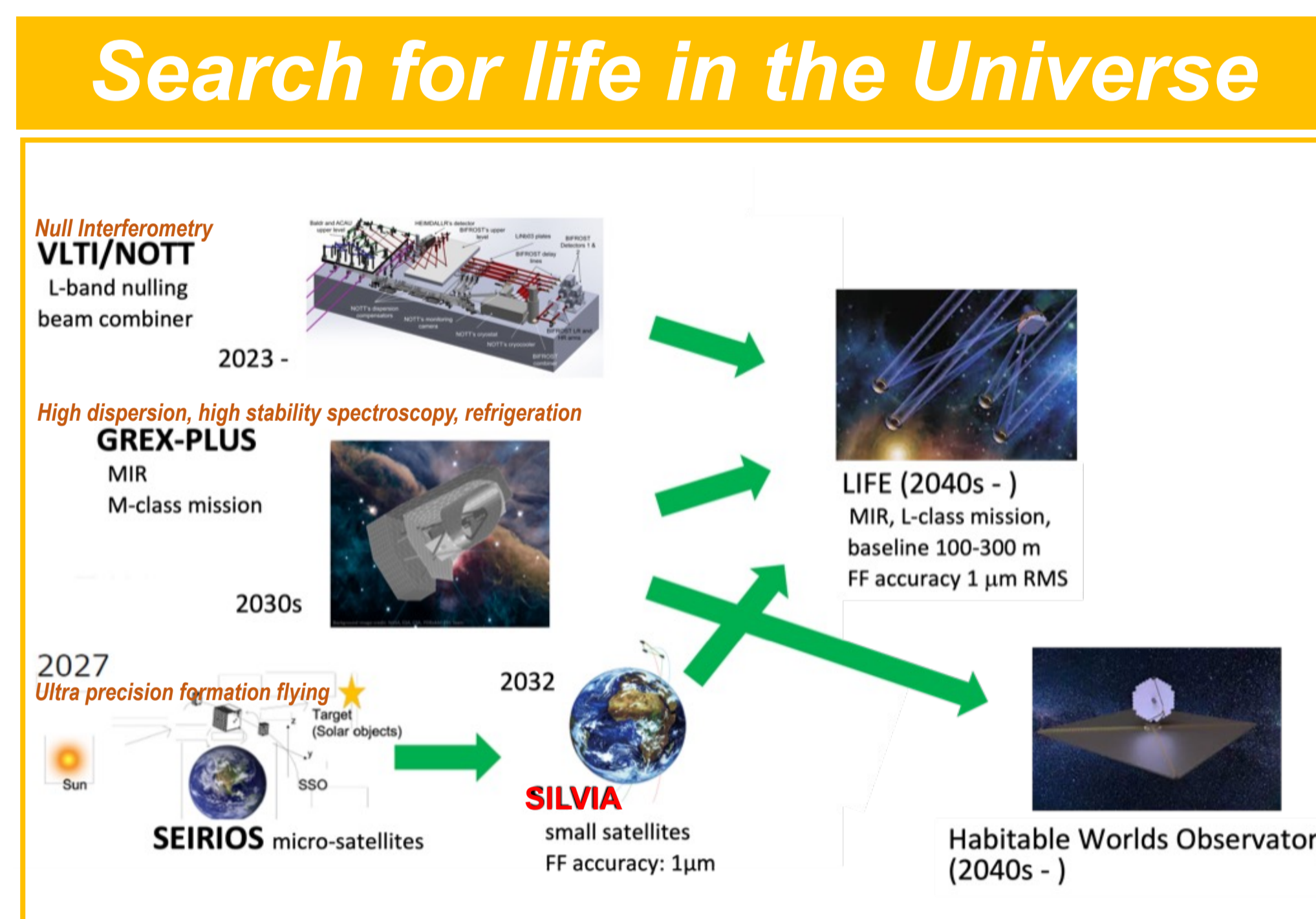
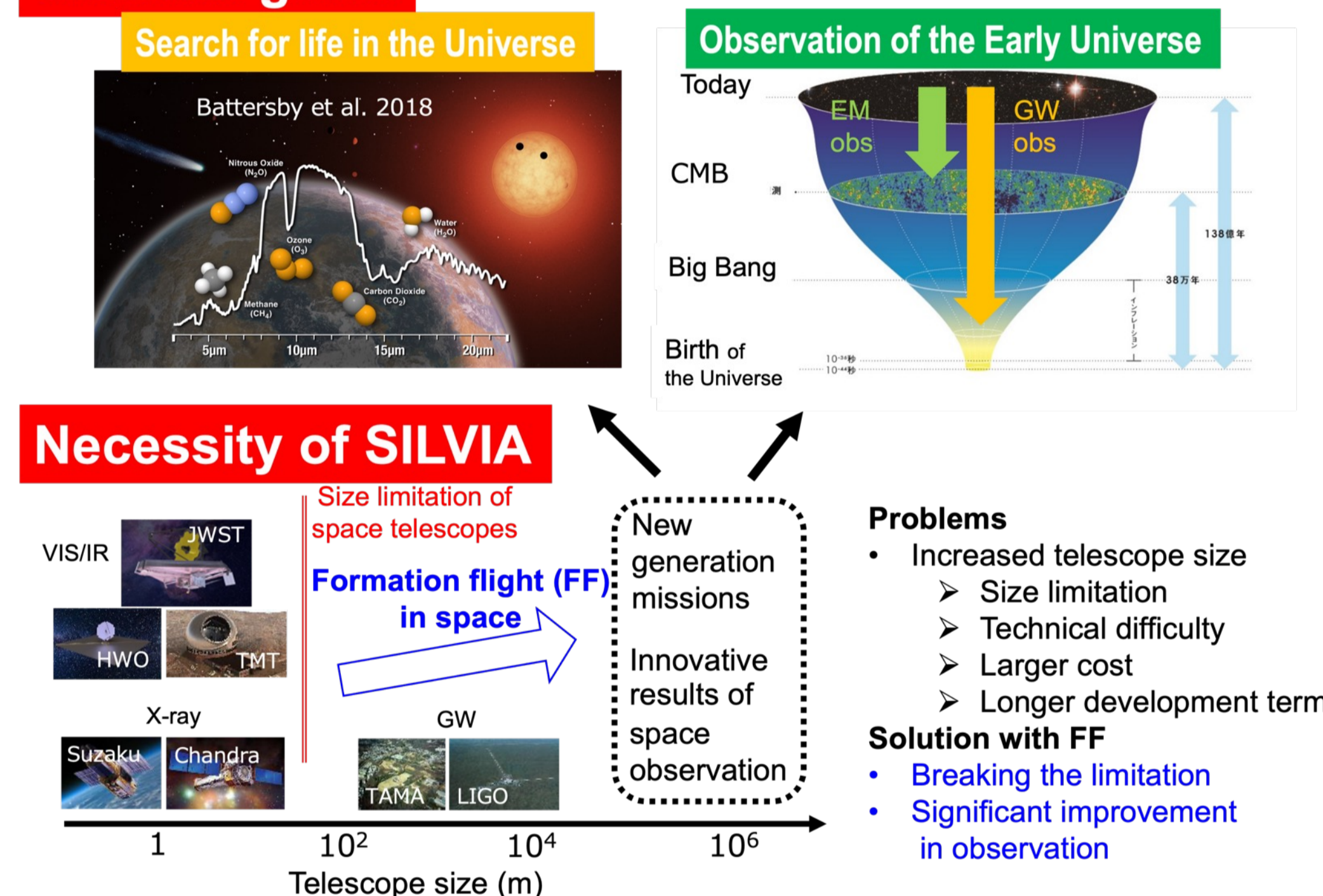
Demonstration of satellite formation flying technology for future spaceborne gravitational wave missions and/or infrared interferometer missions.

Objectives

Through **collaboration between science and engineering**, we aim to acquire the technology to build **a distributed platform using spacecrafts** for future science missions. With this overwhelming technological innovation, a consensus will emerge that large-scale observing instruments that have not been feasible with conventional single platforms will become **realistic**. This will lead to future large-scale instruments such as the gravitational-wave science mission B-DECIGO, the infrared interferometer mission LIFE, and further.



Ultimate goals



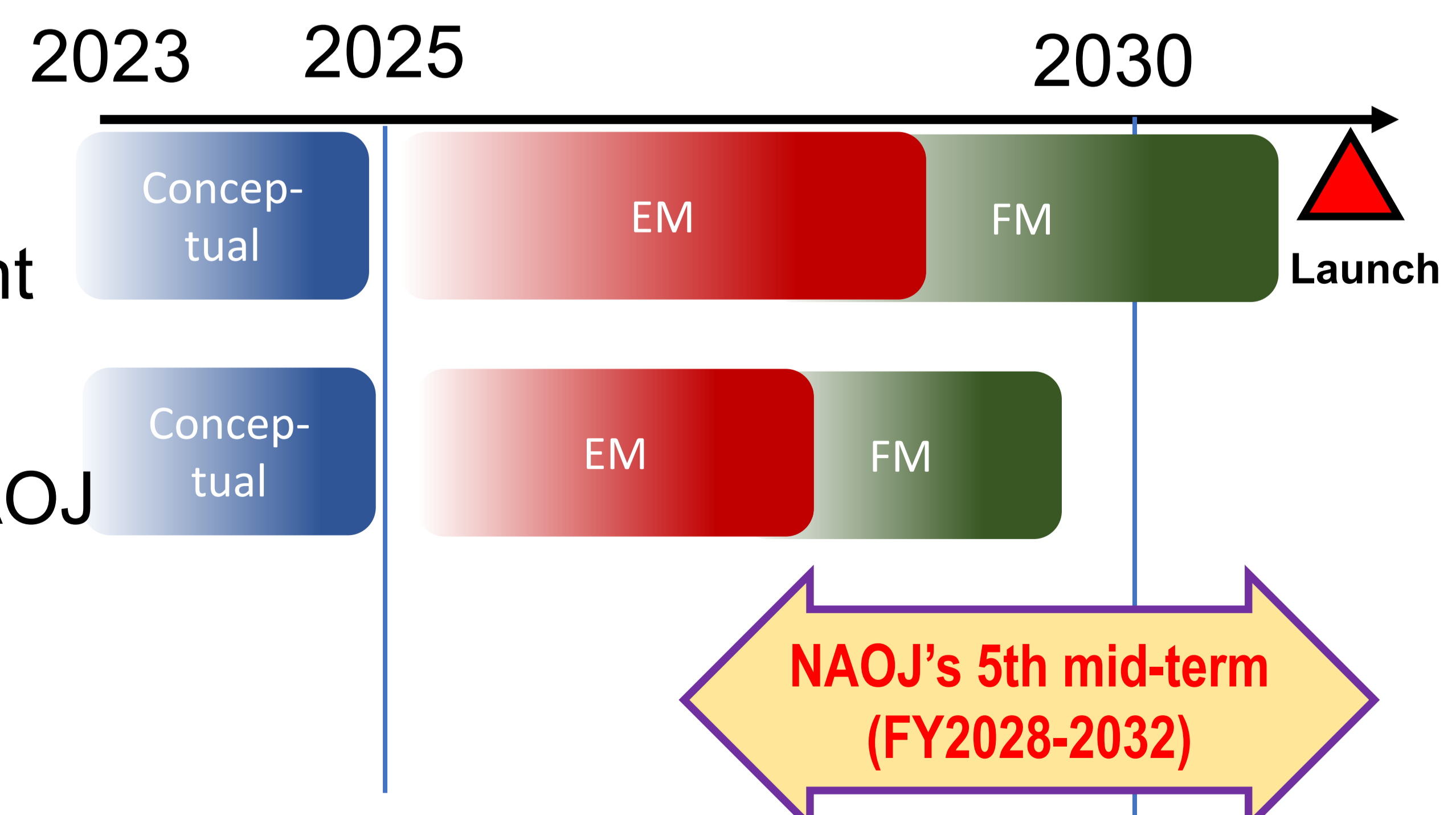
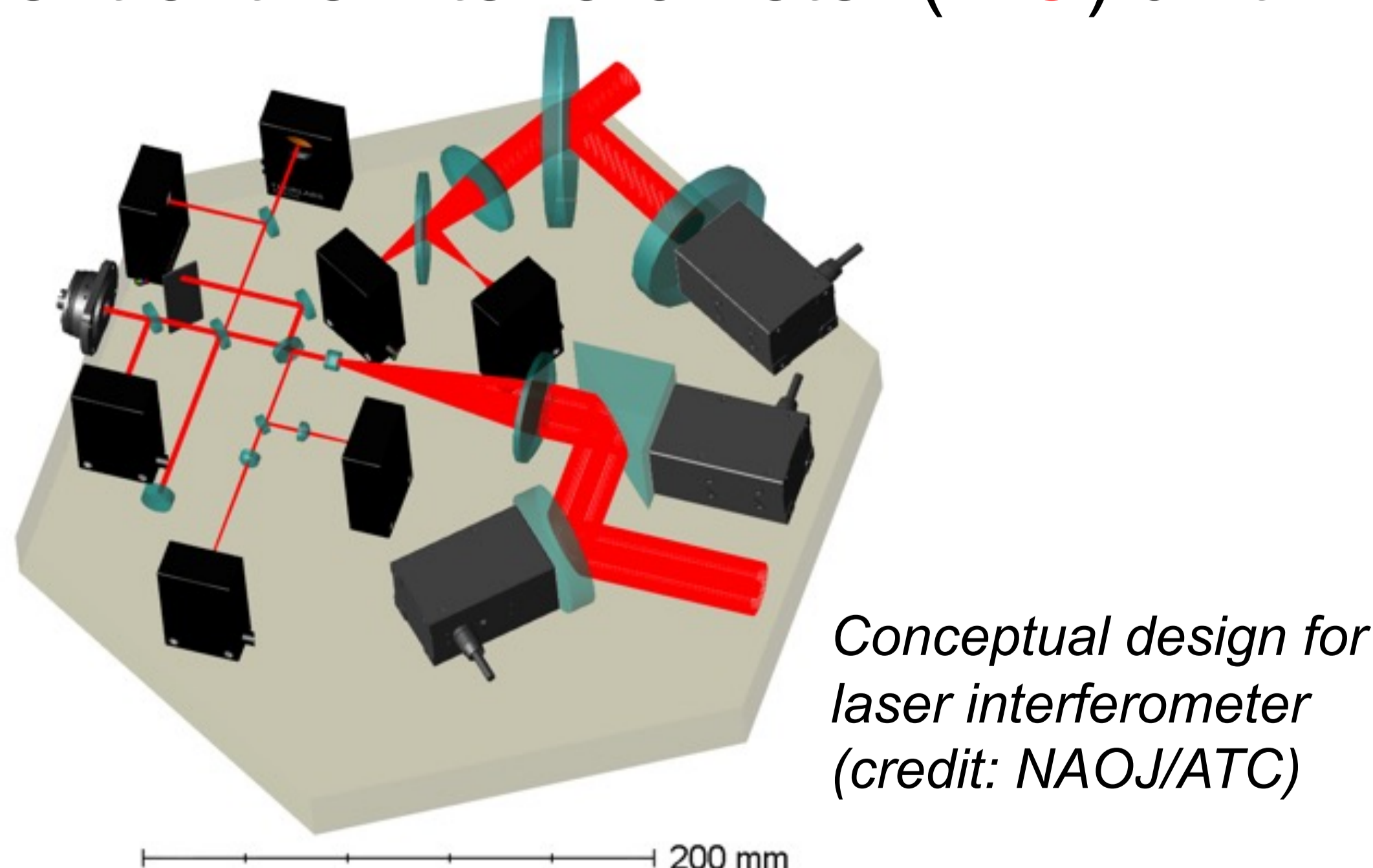
Science investigations

Demonstration of a distributed platform using three satellites apart by 100 m in orbit, including:

- Inter-satellite laser interferometer for controlling the relative distances between satellites **at a sub-micrometer precision level**. This is also for showing a feasibility for building the space-borne gravitational wave interferometers in future.
- Building an **infrared interferometer prototype** aboard such controlled satellites for directly studying feasibility of observing astronomical objects (TBD)
- Function to change the satellite formation

Expected role of NAOJ

Development of the interferometer (IFO) unit.



References

- S. Kawamura, *et al.*, "Current status of space gravitational wave antenna DECIGO and B-DECIGO," *Prog. Theor. Exp. Phys.* 05A105 (2021)
- S. P. Quanz, *et al.*, "Large Interferometer For Exoplanets (LIFE) I. Improved exoplanet detection yield estimates for a large mid-infrared space-interferometer mission," *A&A* 664, A21 (2022)