SILVIA

In-Orbit Demonstration of Ultra-Precision Formation Flying

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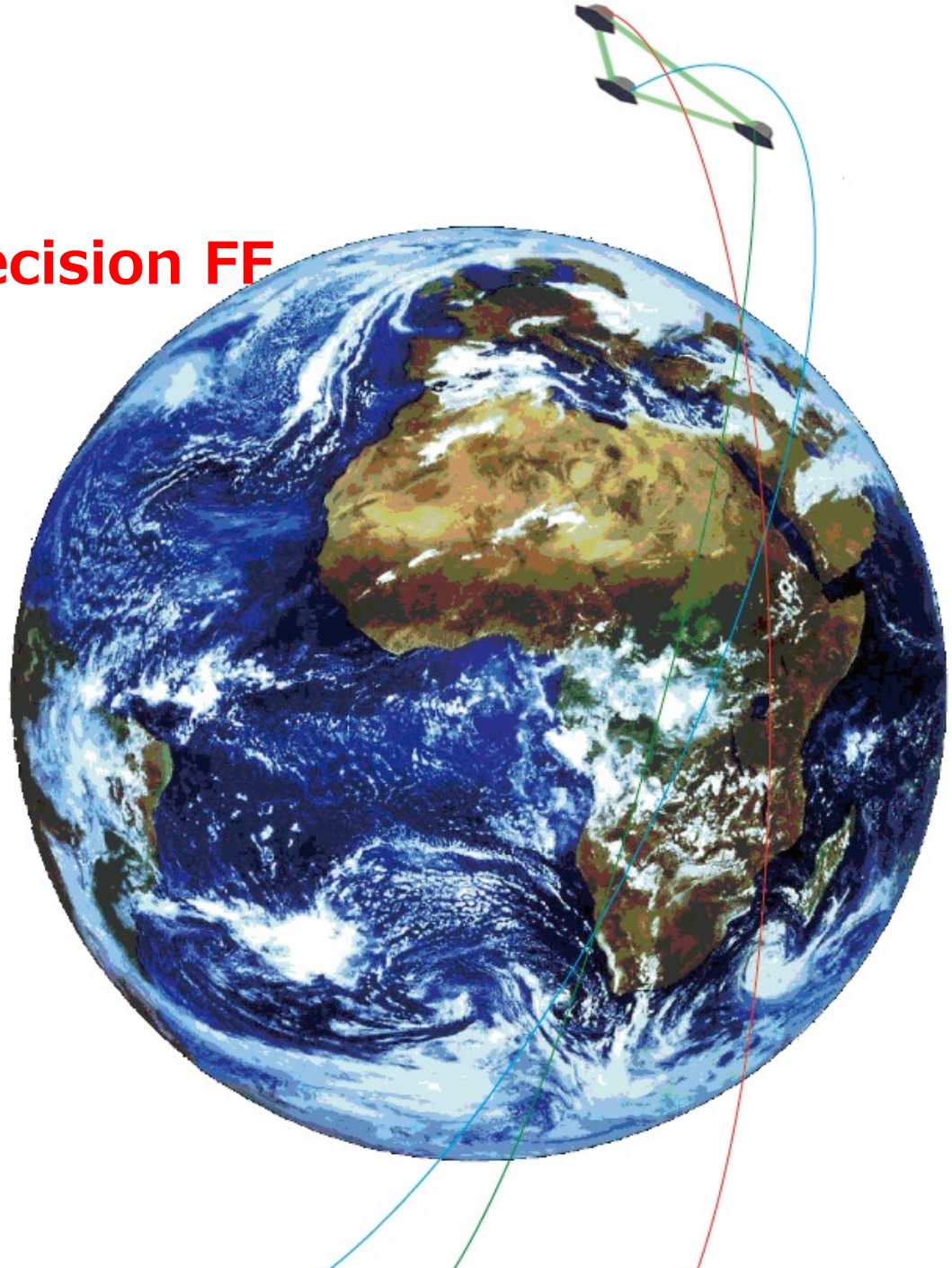
SILVIA

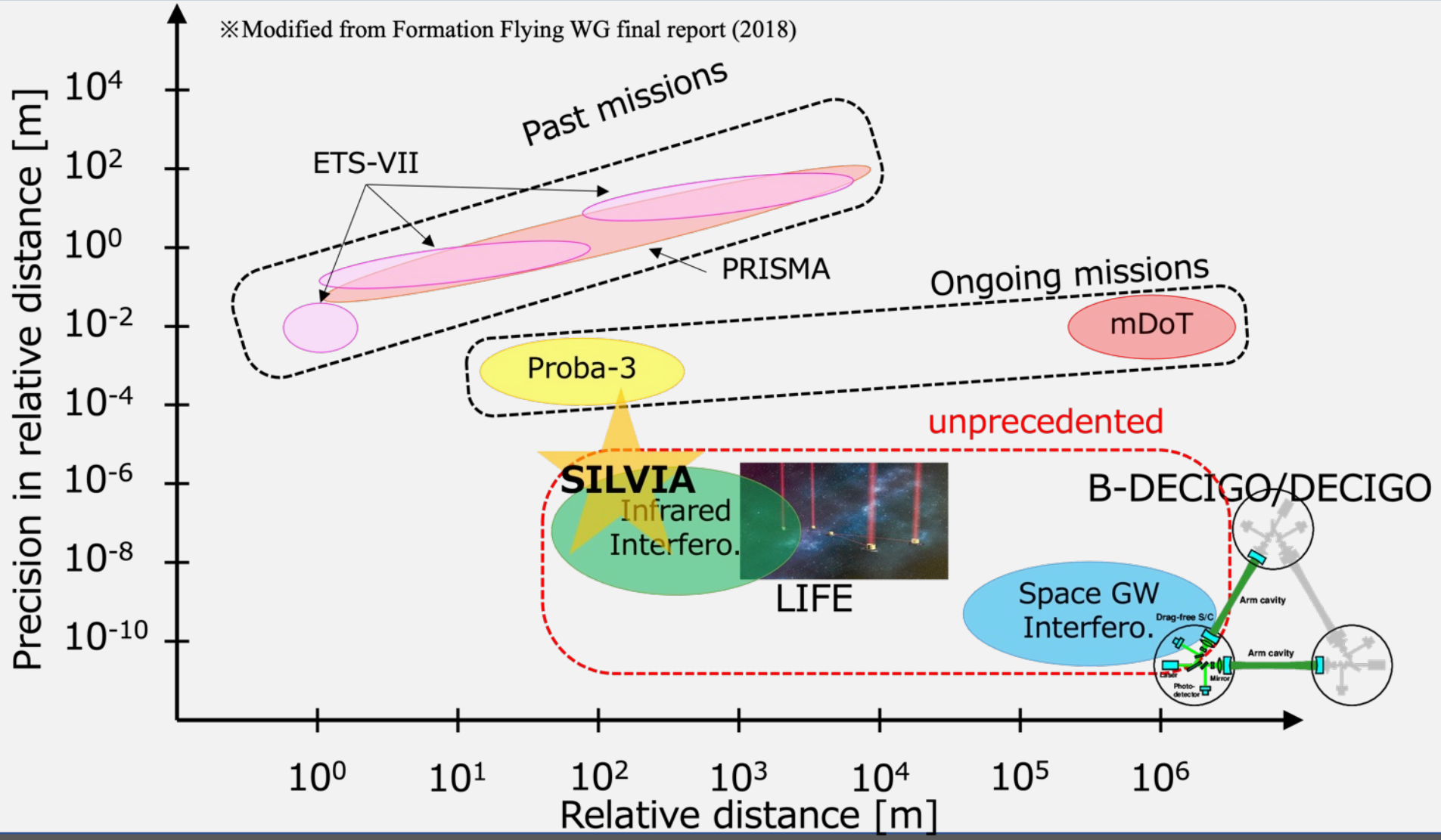
Acquisition of technologies relevant to precision FF

- **JAXA's M-class mission concept**
  - Use of Epsilon launch vehicle
  - SILVIA proposed in Feb. 2020
  - SILVIA proceeded to Pre-phase A1b in Aug. 2020

- **Technology demonstration**
  - Precision formation flying
  - Inter-satellite laser interferometer
  - Drag-free control for disturbance suppression

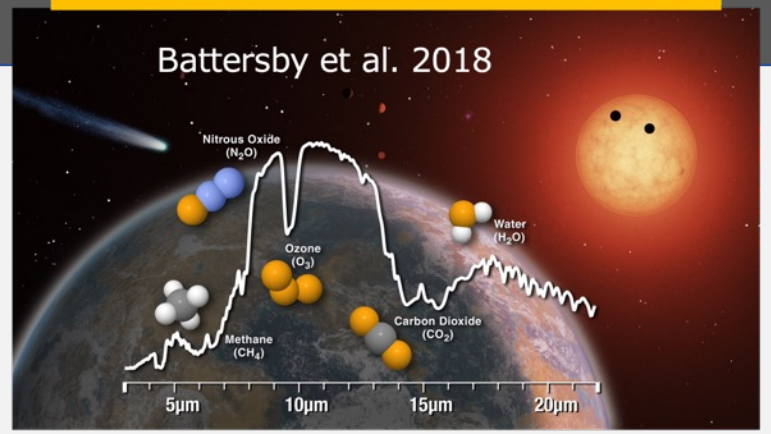


Strategy

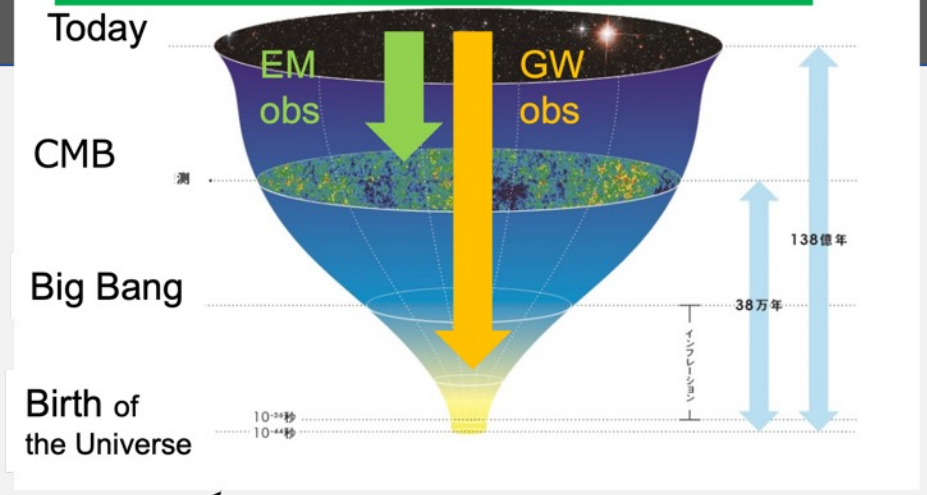

※Modified from Formation Flying WG final report (2018)
Past missions
ETS-VII
PRISMA
Ongoing missions
mDoT
Proba-3
unprecedented
SILVIA
Infrared Interfero.
LIFE
B-DECIGO/DECIGO
Space GW Interfero.
Arm cavity
Drag-free S/C
Arm cavity
Laser
Photo-detector
Mirror
Precision in relative distance [m]
10^{4}
10^{2}
10^{0}
10^{-2}
10^{-4}
10^{-6}
10^{-8}
10^{-10}
10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} 10^{6}
Relative distance [m]

Ultimate goals

Search for life in the Universe



Observation of the Early Universe

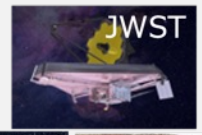


Necessity of SILVIA

Size limitation of space telescopes

Formation flight (FF) in space

VIS/IR



X-ray

GW

New generation missions

Innovative results of space observation

1 10^2 10^4 10^6

Telescope size (m)

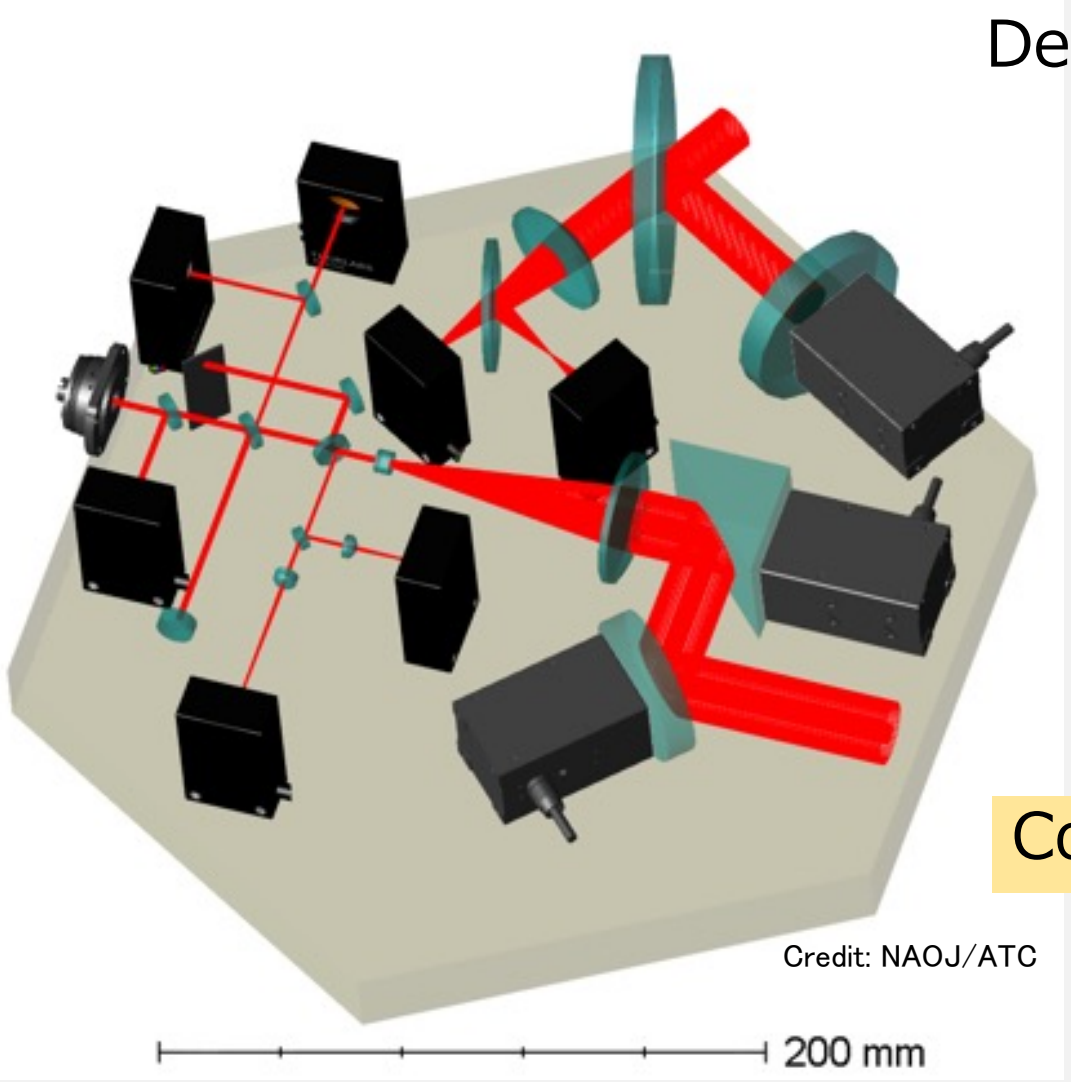
Problems

- Increased telescope size
  - ➢ Size limitation
  - ➢ Technical difficulty
  - ➢ Larger cost
  - ➢ Longer development term

Solution with FF

- Breaking the limitation
- Significant improvement in observation

Why NAOJ?



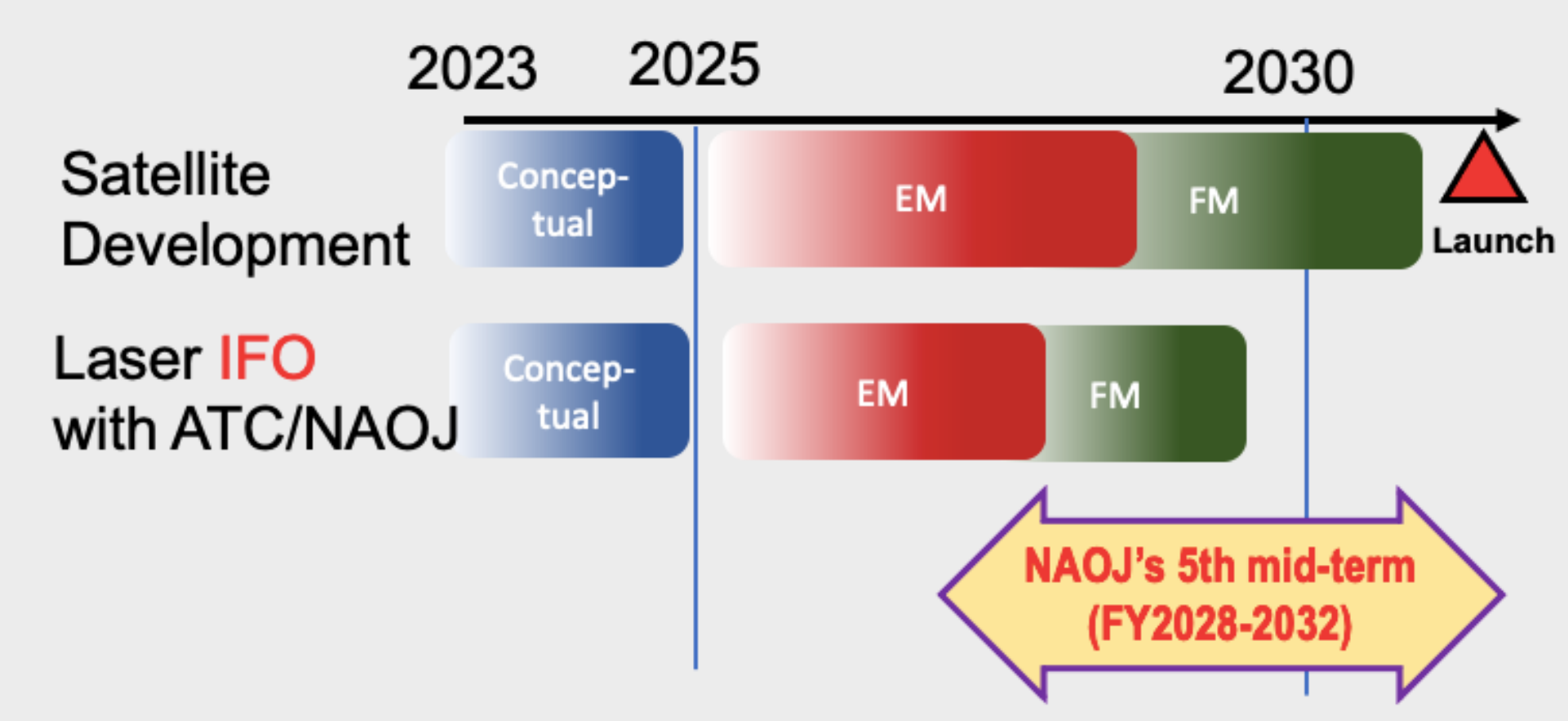
Development of laser interferometer subsystem

- Heritages on instrument development, including KAGRA and others
- Highly skilled teams at ATC
- Laser interferometer common to any precision FF missions

Contribution activities of ATC currently active.

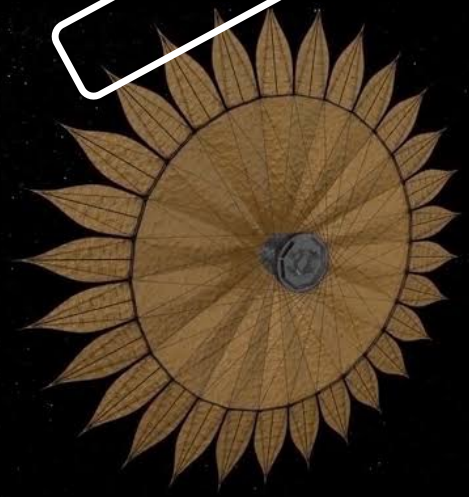
Current satus

Currently in pre-phase A2, to be launched early 2030's



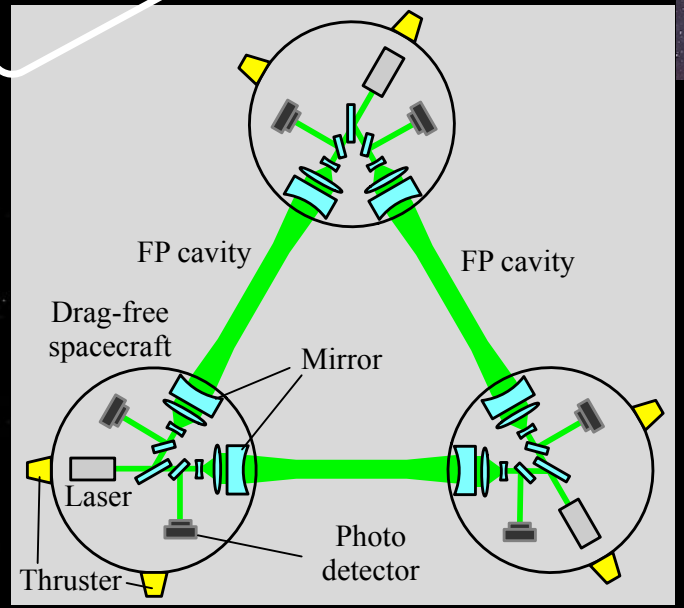
Tell us your favorite FF

Occulter

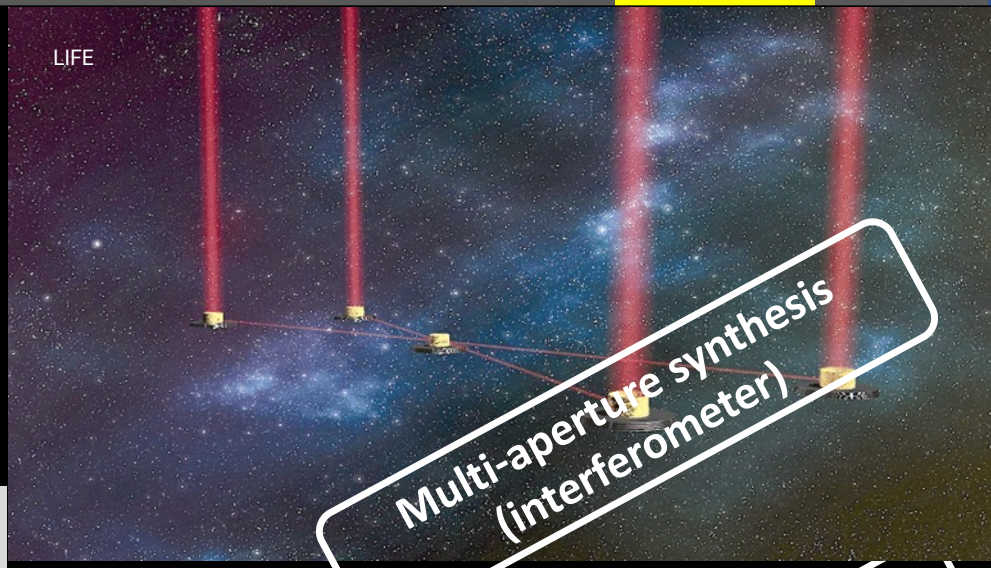


Starshade (NASA)

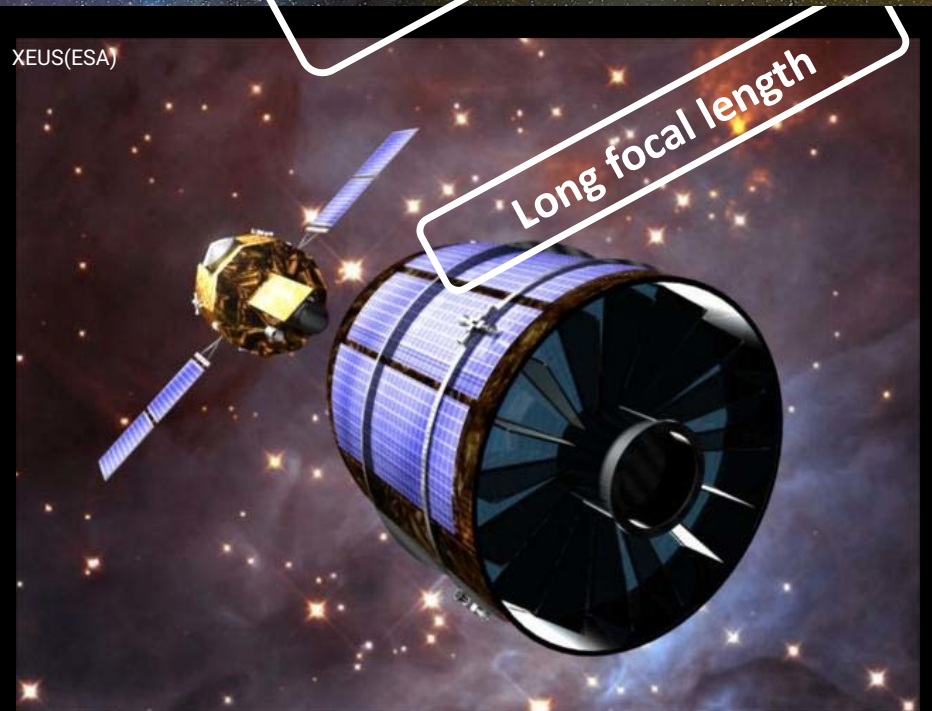
Gravitational wave observatories



B-DECIGO/DECIGO (Japan)



Multi-aperture synthesis (interferometer)



Long focal length