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Observing Earth-like exoplanets with require contrast levels of $\sim 10^{-10}$ over extended integration time. This requires unprecedented observatory stability (picometric for some mode).

The Habitable Worlds Observatory will require:

- A very stable structure
- An active coronagraph

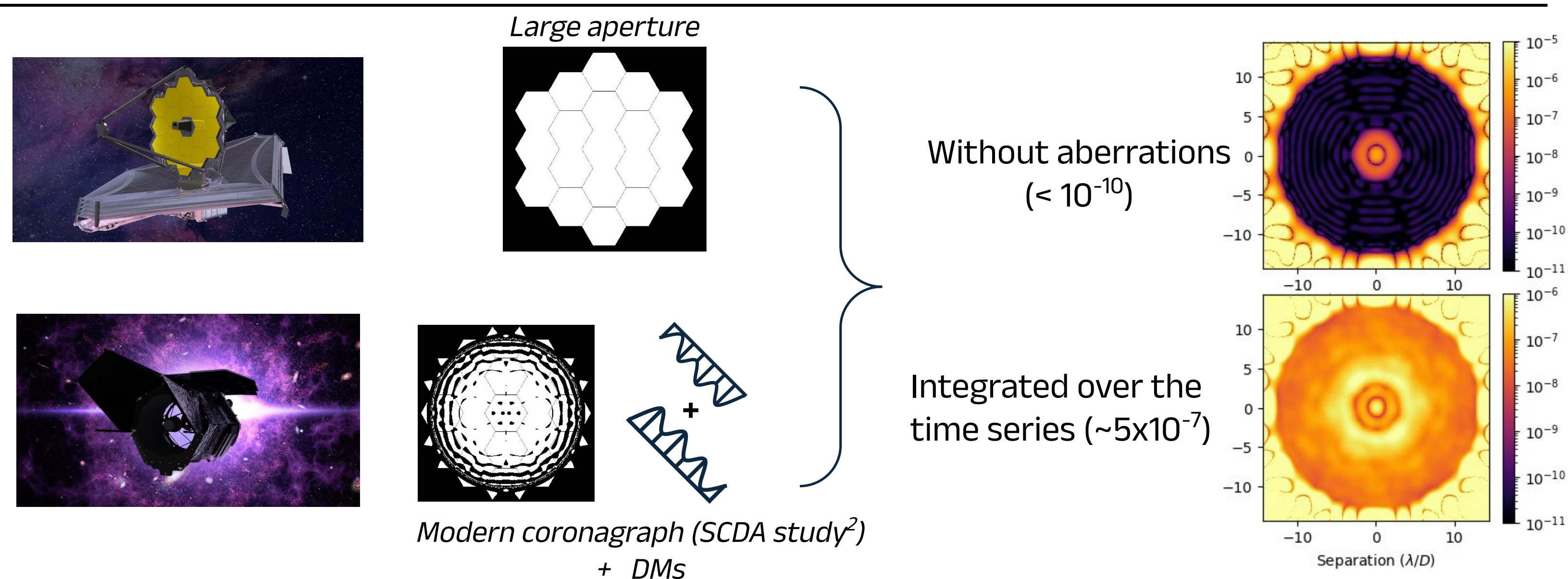
⇒ How far is current technology?

Example architecture "EAC 1" studied for HWO¹



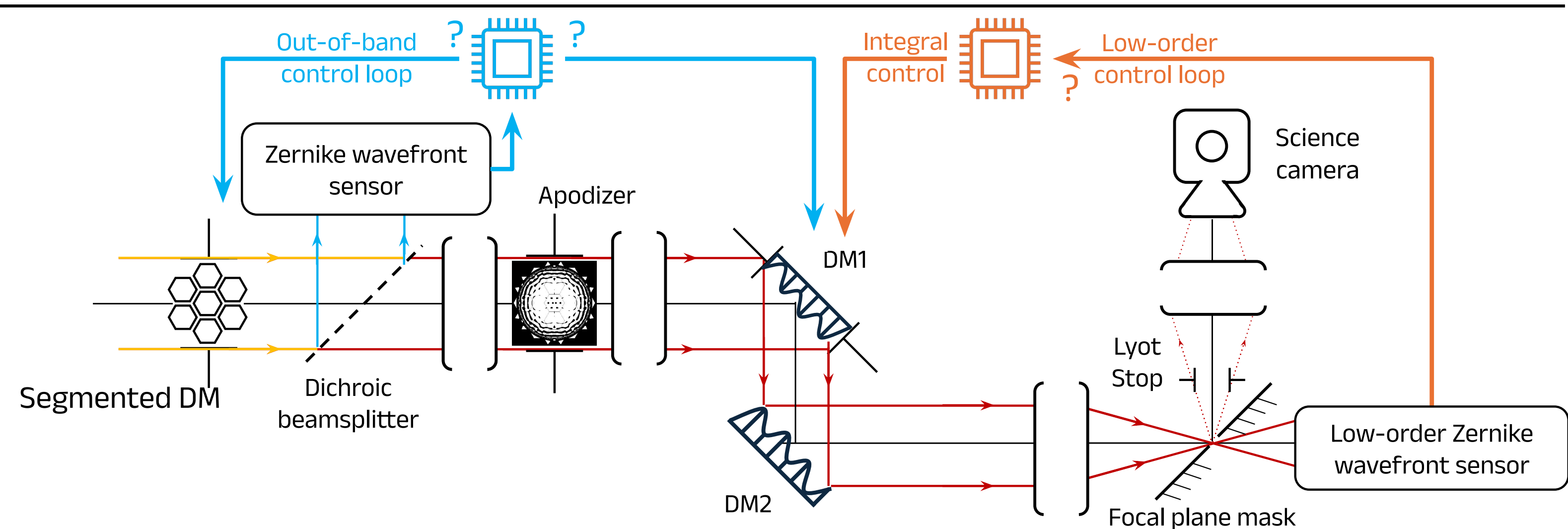
Current technologies

- JWST:
 - Very stable
 - But static / older coronagraph
- Roman Space Telescope-style coronagraph:
 - apodizer + focal plane mask + Lyot stop
 - 2 DMs control



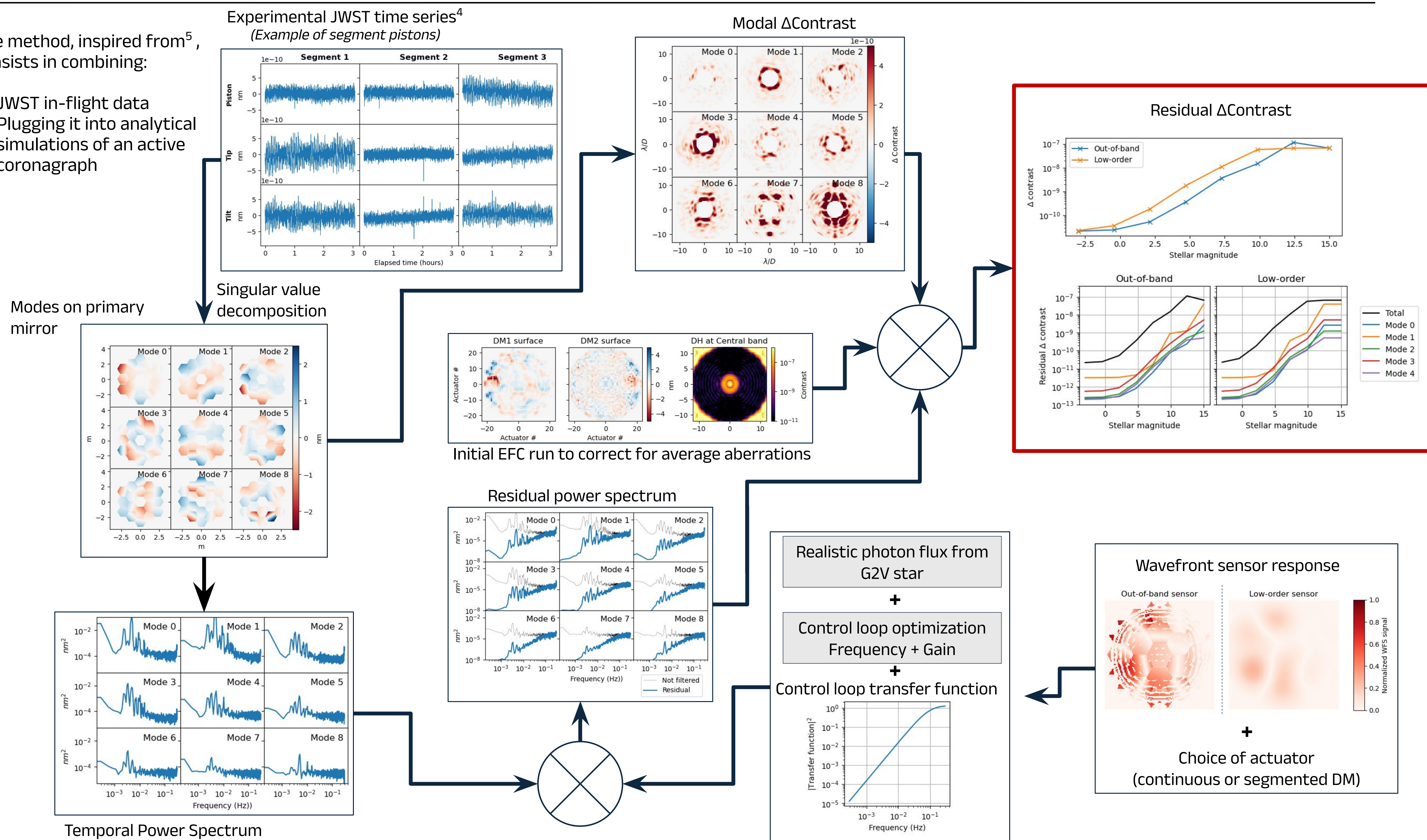
Simulated implementation (using CATkit2³):

- Two versions of Zernike Wavefront sensors
- Correction with primary (segmented) mirror vs. correction with continuous deformable mirror (DM)



The method, inspired from⁵, consists in combining:

- JWST in-flight data
- Plugging it into analytical simulations of an active coronagraph



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References:

¹Feinberg et al., ArXiv, 2026
²Nickson et al., SPIE, 2022

³Por et al., Github / Zenodo

⁴Telfer et al., SPIE, 2024

⁵Potier et al., JATIS, 2022