





The LiteBIRD space mission

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on behalf of the LiteBIRD collaboration

LiteBIRD Collaboration

Over 300 researchers from **Japan**, **North America** and **Europe**

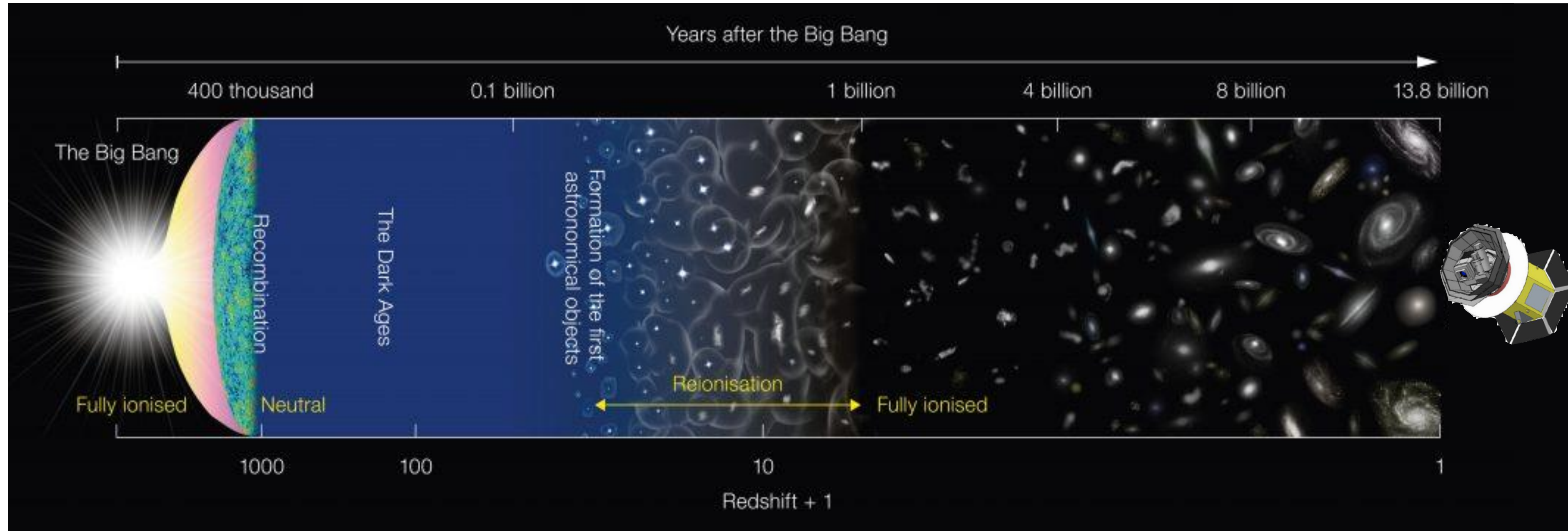
Team experience in CMB experiments, X-ray satellites and other large projects (ALMA, HEP experiments, ...)



LiteBIRD Global F2F meeting
Summer 2024 in Vancouver, Canada

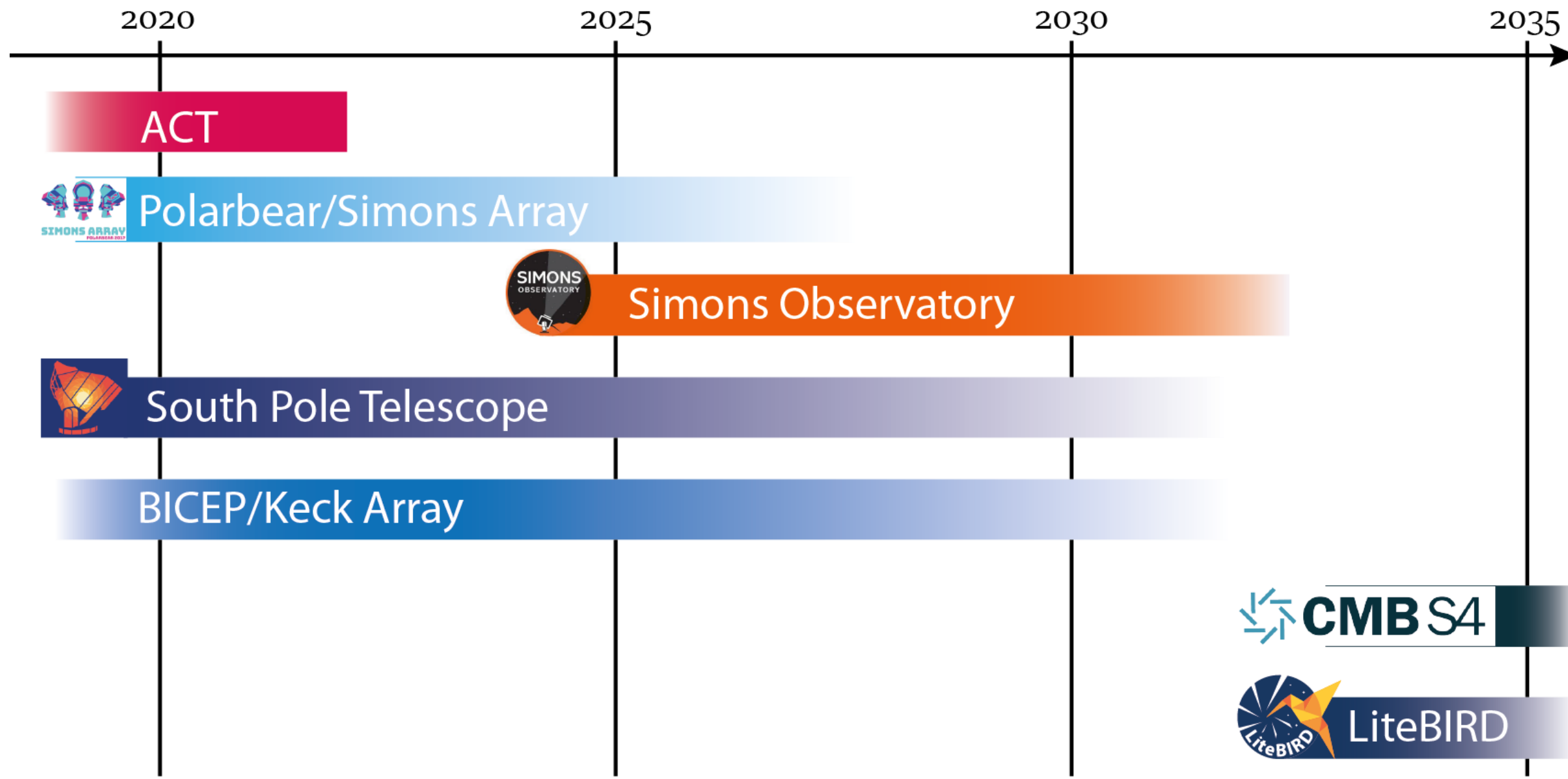
Cosmology overview

Credits NAOJ

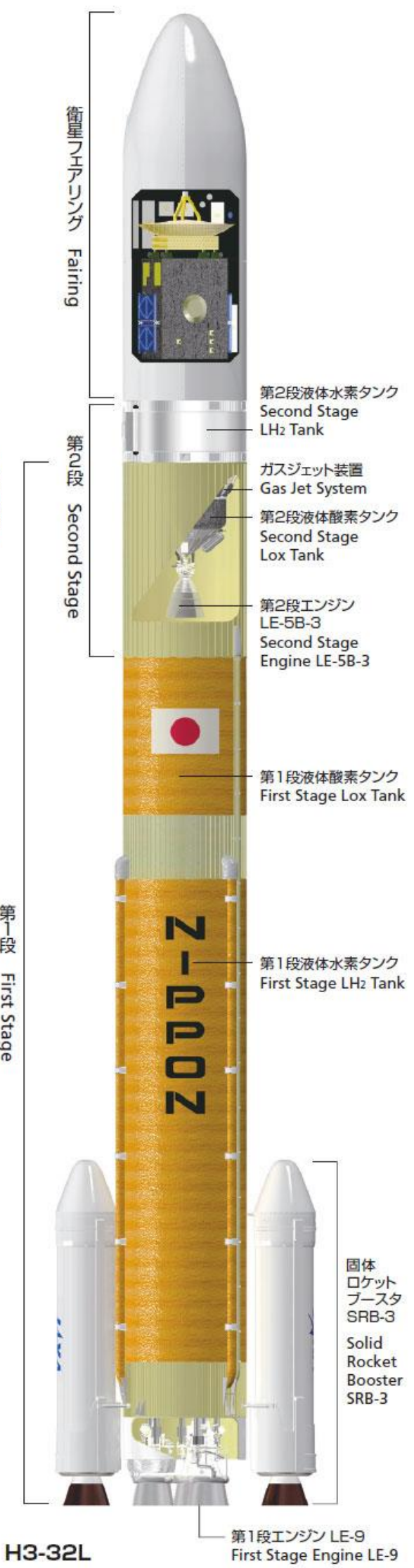
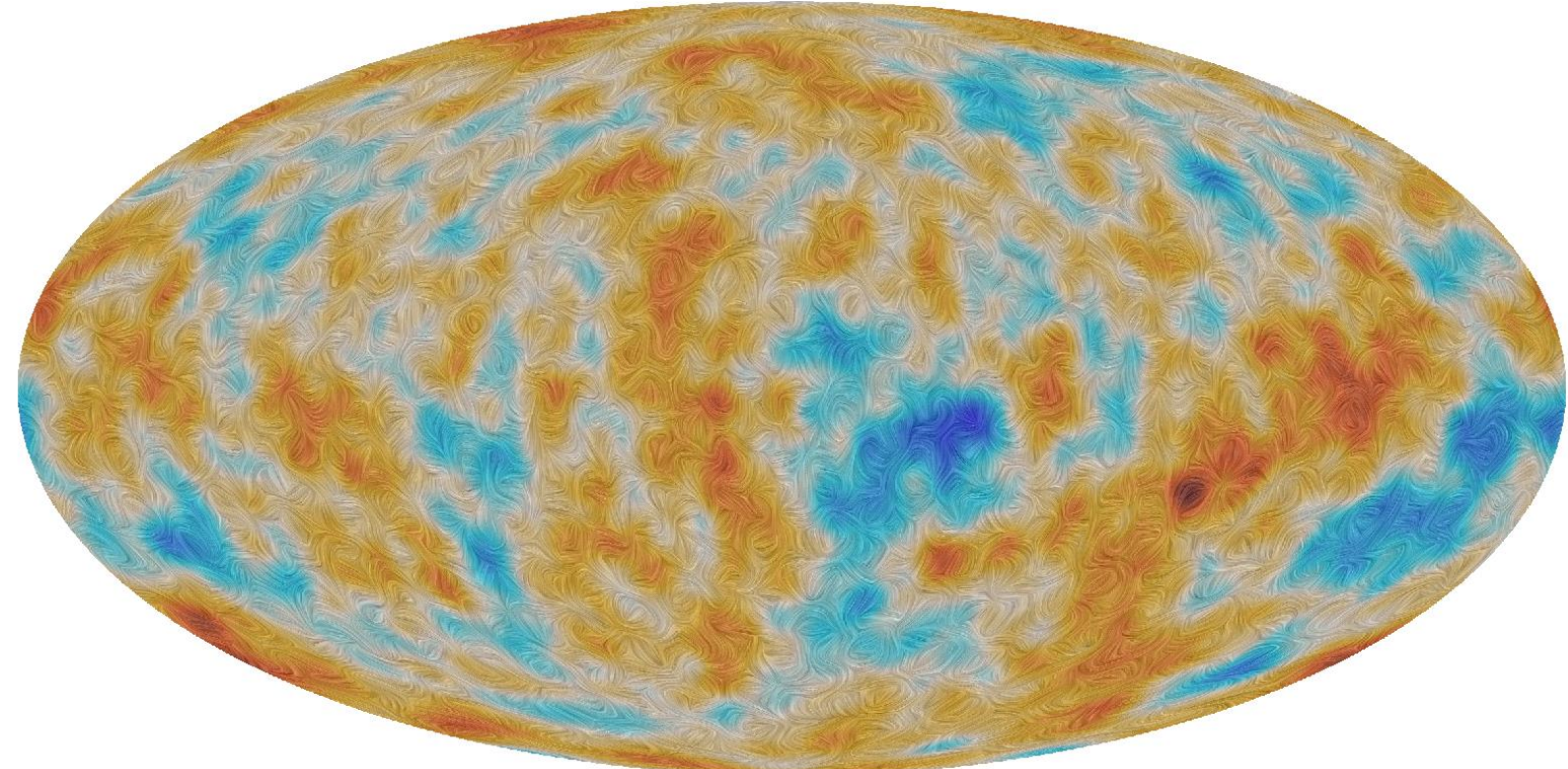


- Very successful cosmological model, with remaining questions to be answered:
 - **Why is the Universe so homogeneous ?**
 - **Why does the Universe look so flat ?**
 - **What seeded the large-scale structures of the Universe ?**
- The commonly accepted framework explain these by an **era of cosmic inflation** in the first instants of the Universe
- Currently only indirect hints → **need for strong evidence**

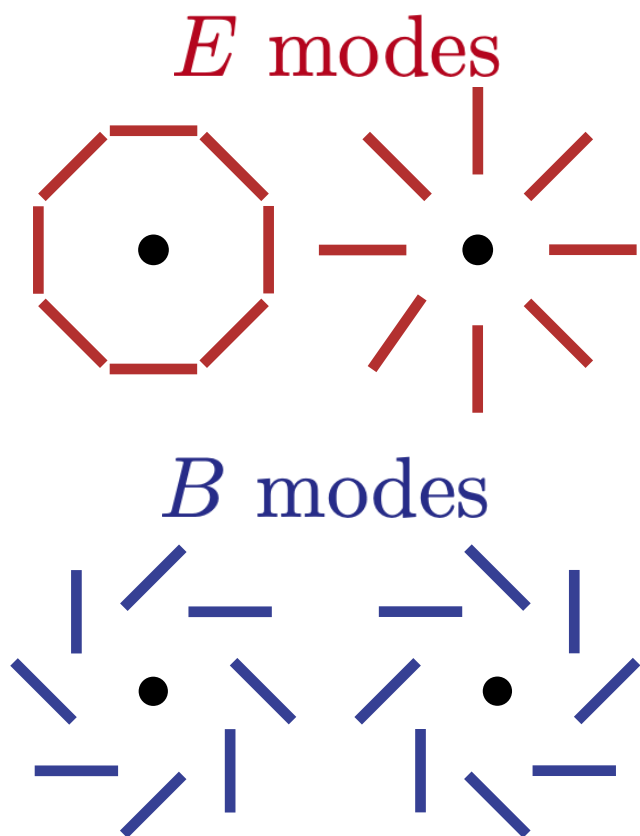
LiteBIRD overview



Hazumi+ SPIE 2020

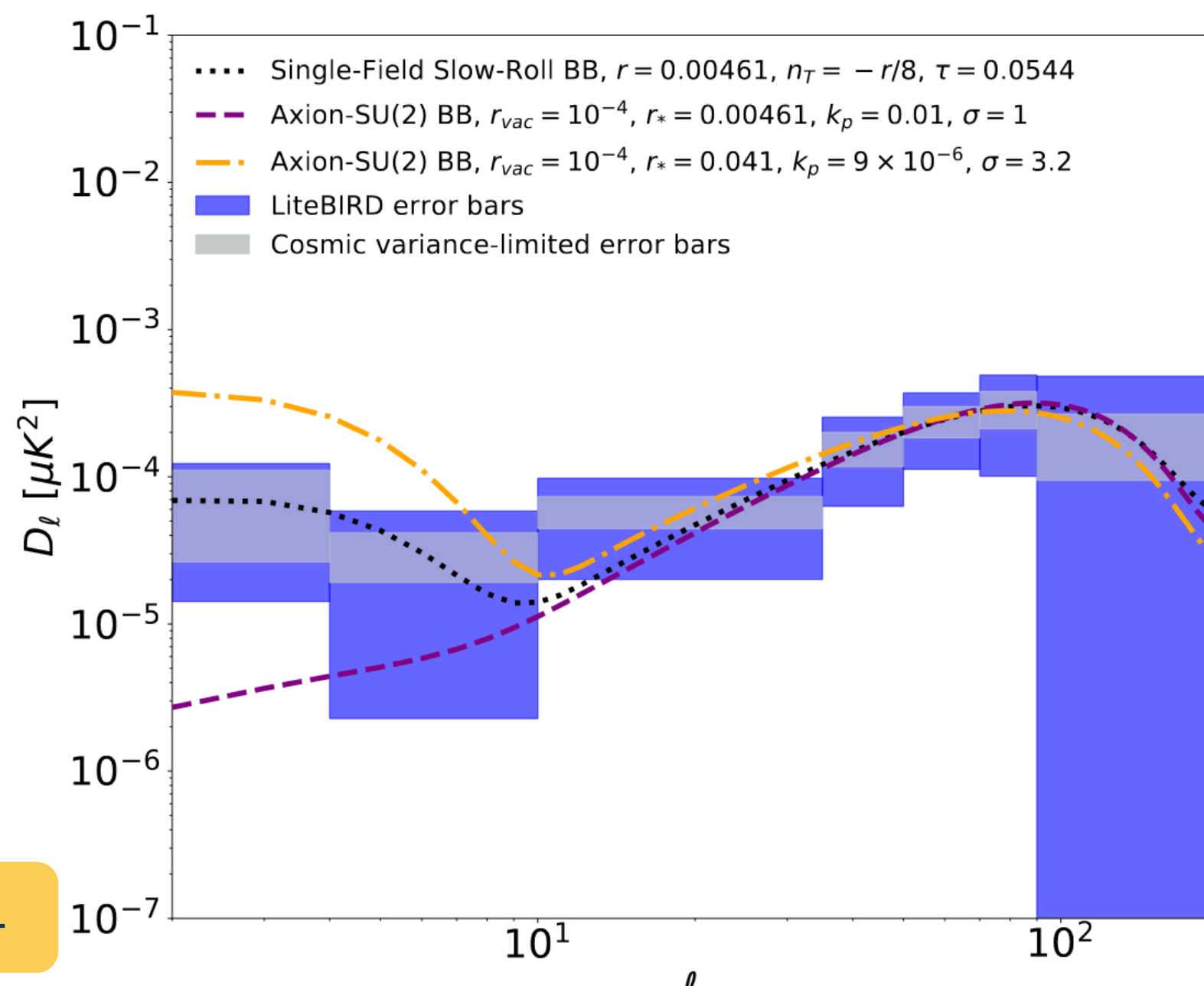


- JAXA's L-class mission selected in May 2019
- Expected launch in late **2032** with JAXA's H3 rocket
- **All-sky 3-year survey**, from Sun-Earth Lagrangian point L2
- Large frequency coverage (**34–448 GHz** in 15 bands) at **70–18 arcmin** angular resolution for precision measurements of the **CMB B-modes**
- Final combined sensitivity: **2.2 $\mu\text{K}\cdot\text{arcmin}$**
- CNES in charge of the Medium and High Frequency Telescope

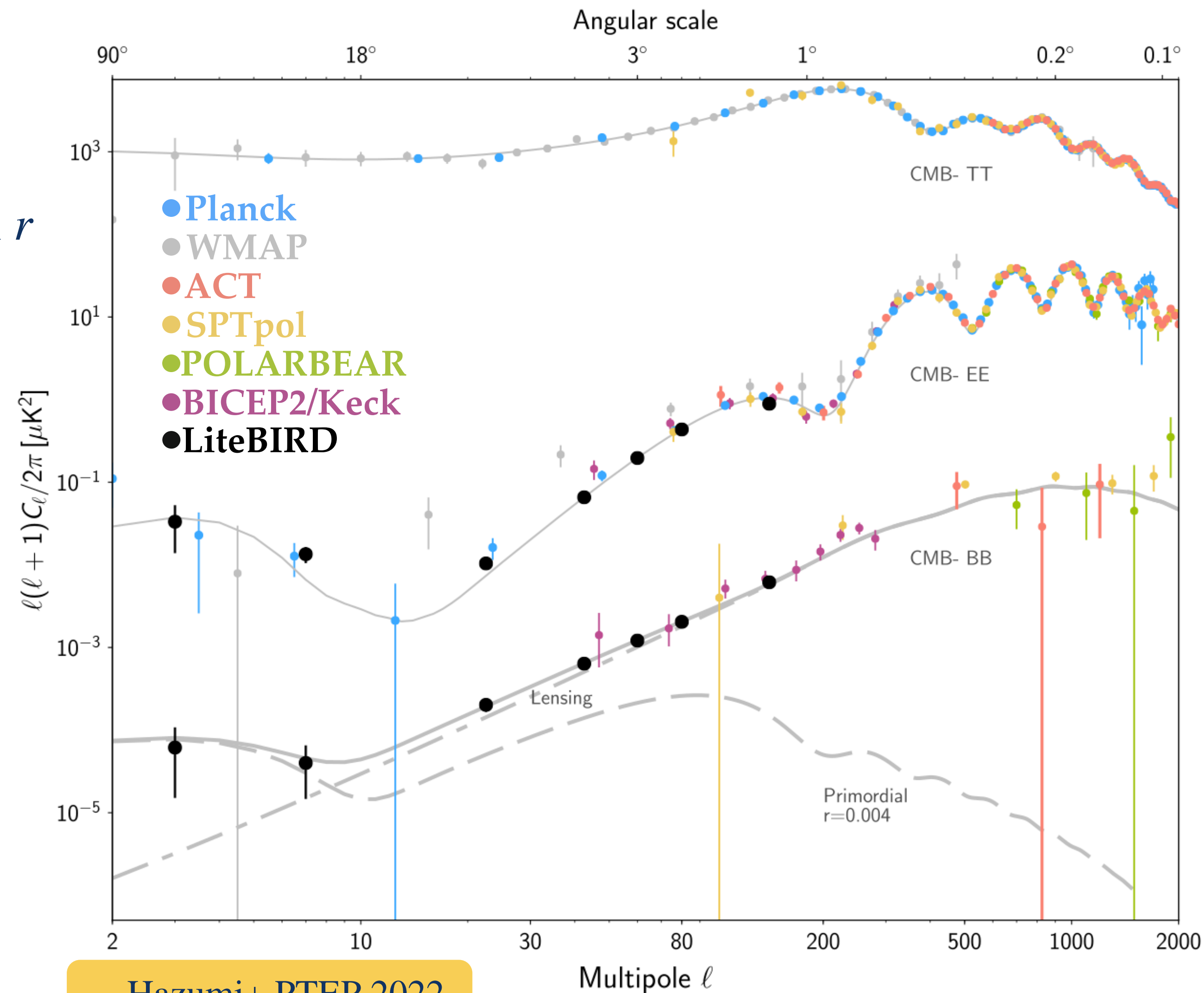


Scientific goal

- The inflationary (i.e. primordial) B -mode power is proportional to the **tensor-to-scalar ratio, r**
- Current best constraint: $r < 0.032$ (Tristram et al. 2021)
- LiteBIRD will have a sensitivity on r **improved by ~ 50**
- Mission specifications are driven by the scientific goal on r
- Huge discovery impact:
first evidence for the quantum nature of gravitation
- Unique possibility of observing the largest scales (low- ℓ)



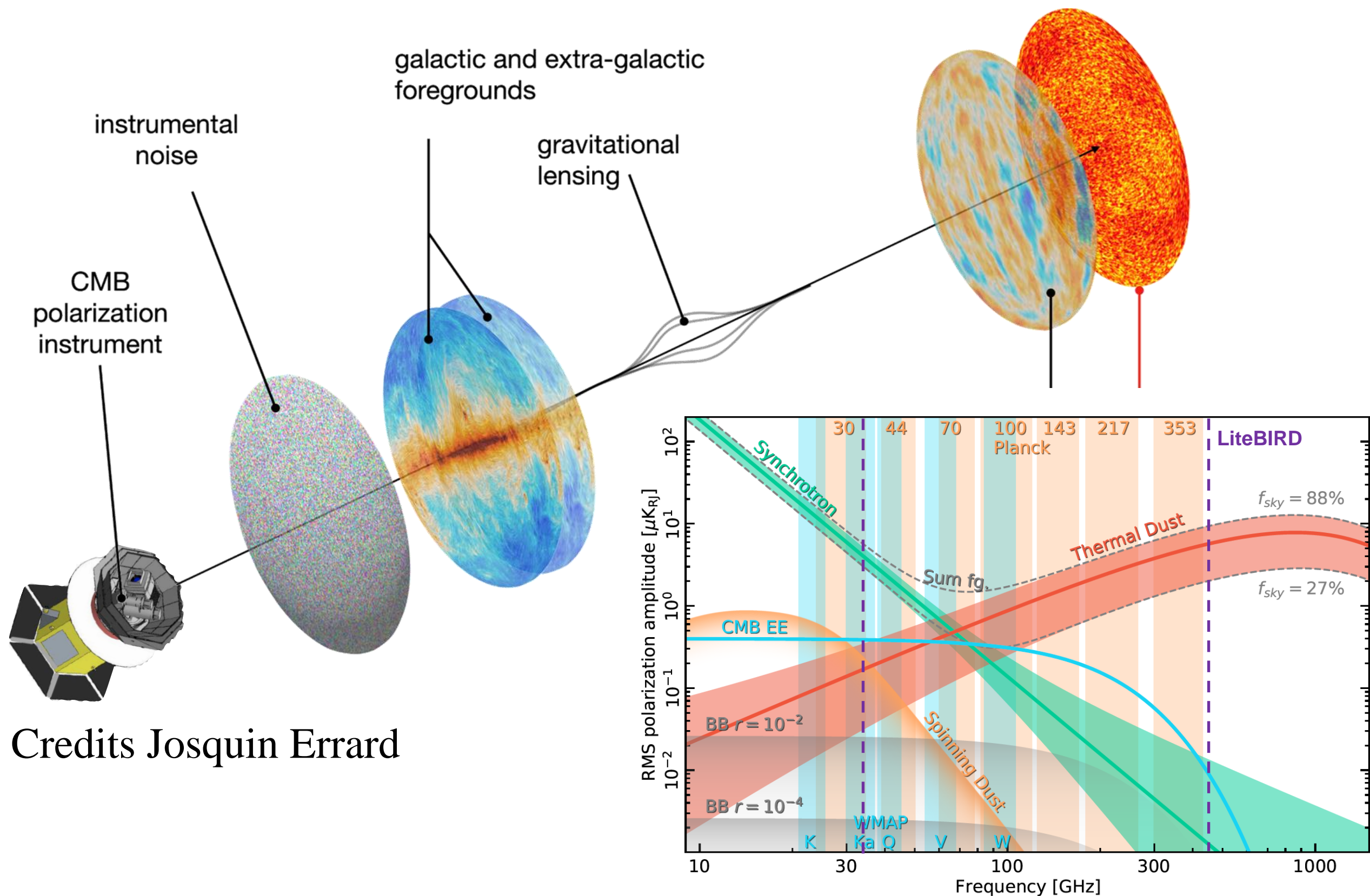
■ Campeti+ JCAP 2024



■ Hazumi+ PTEP 2022

Observational challenges

Galactic foreground contamination



Adapted from BeyondPlanck

Credits Josquin Errard

Instrumental systematic effects

Category	Systematic effect	Category	Systematic effect
Beam	Far sidelobes	Polarization angle	Absolute angle
	Near sidelobes		Relative angle
	Main lobe		HWP position
	Ghost		Time variation
	Polarization and shape in band		Efficiency
Cosmic ray	Cosmic-ray glitches	Pointing	Offset
HWP	Instrumental polarization	Bandpass	Time variation
	Transparency in band		HWP wedge
	Polarization efficiency in band		Bandpass efficiency
	Polarization angle in band	Crosstalk	
Gain	Relative gain in time	Transfer function	Detector time constant knowledge
	Relative gain in detectors		
	Absolute gain		

Leloup+ JCAP 2024

