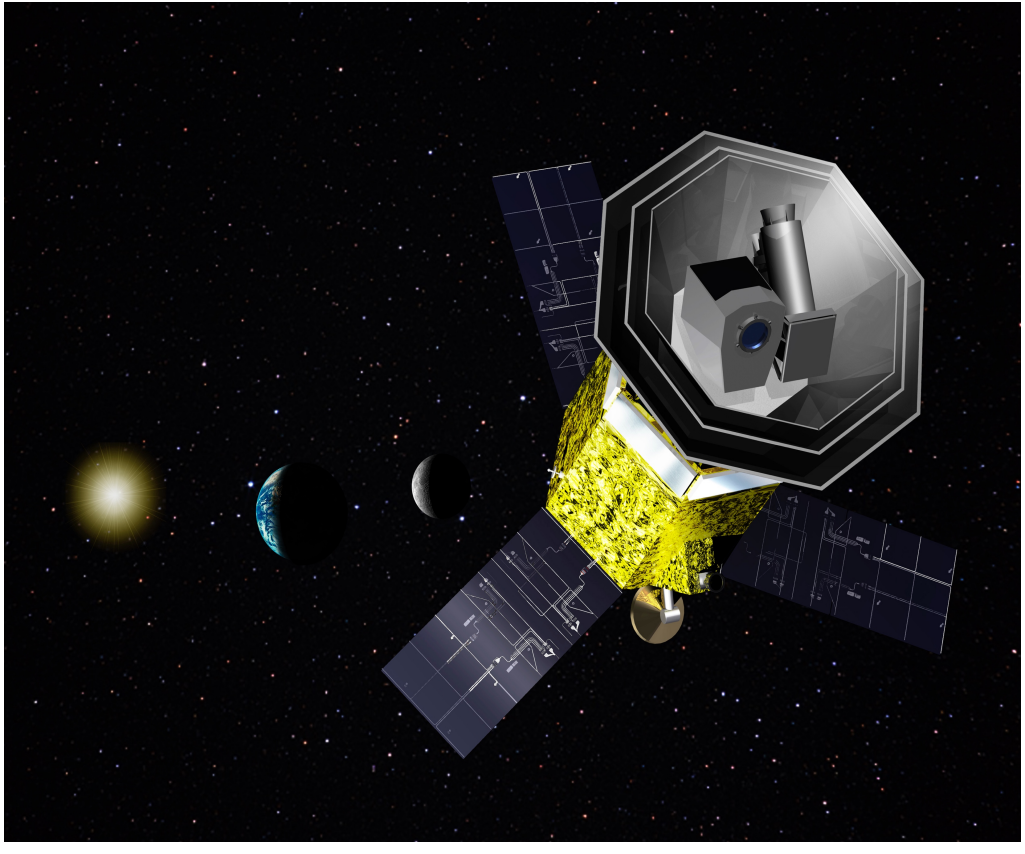


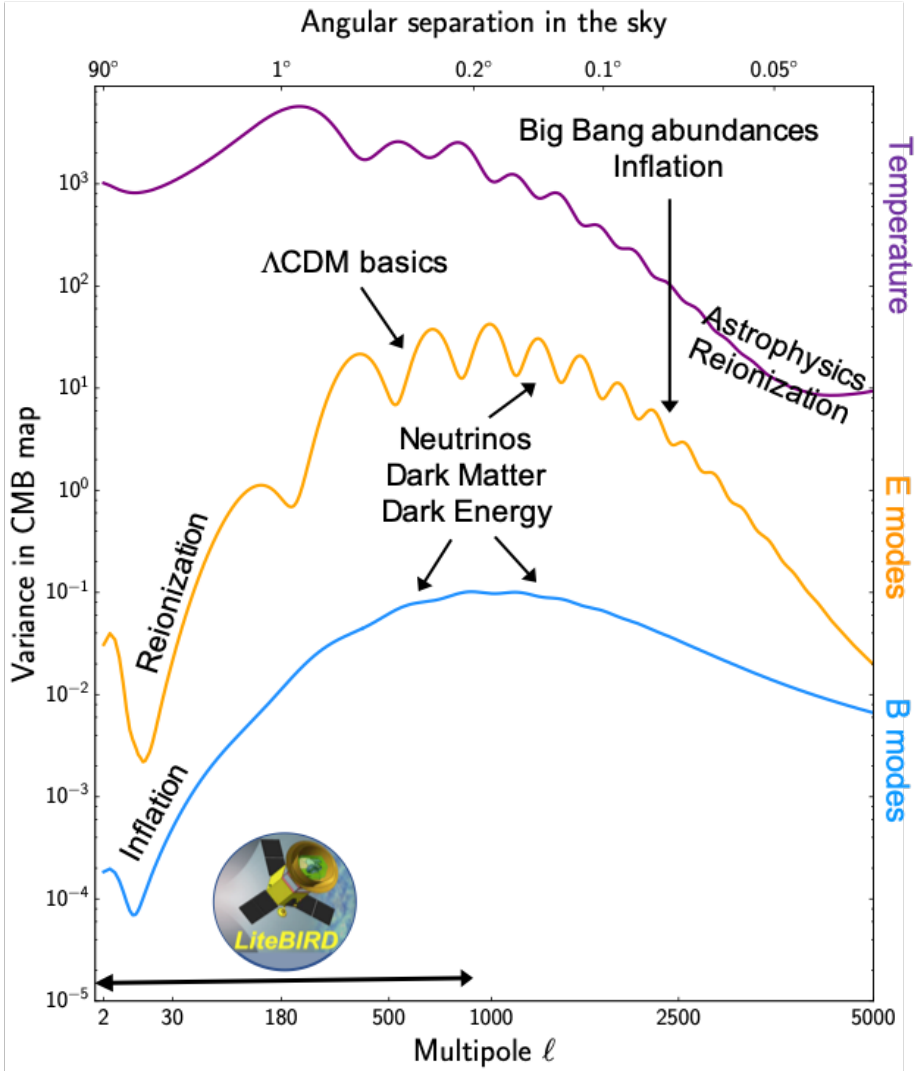
LiteBIRD
Science Overview

Erminia Calabrese
STFC Rutherford Fellow & Lecturer

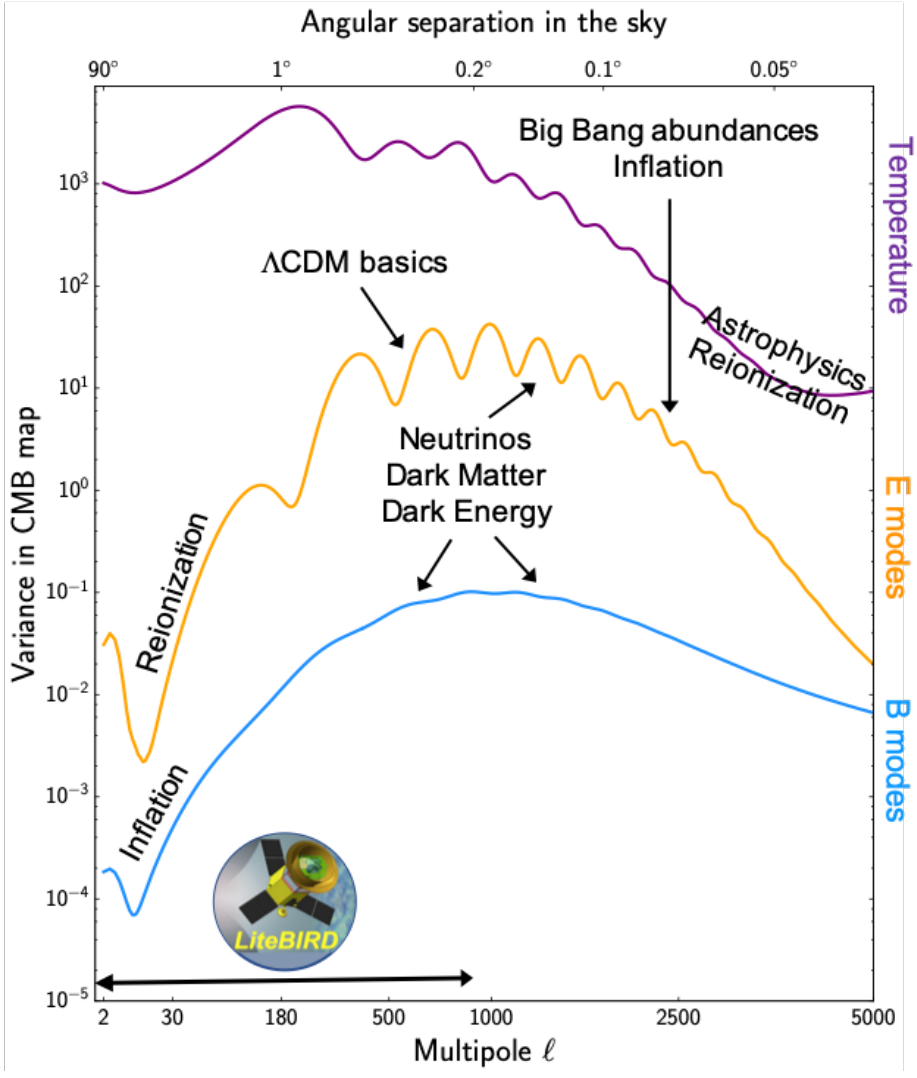
CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD
Science & Technology Facilities Council

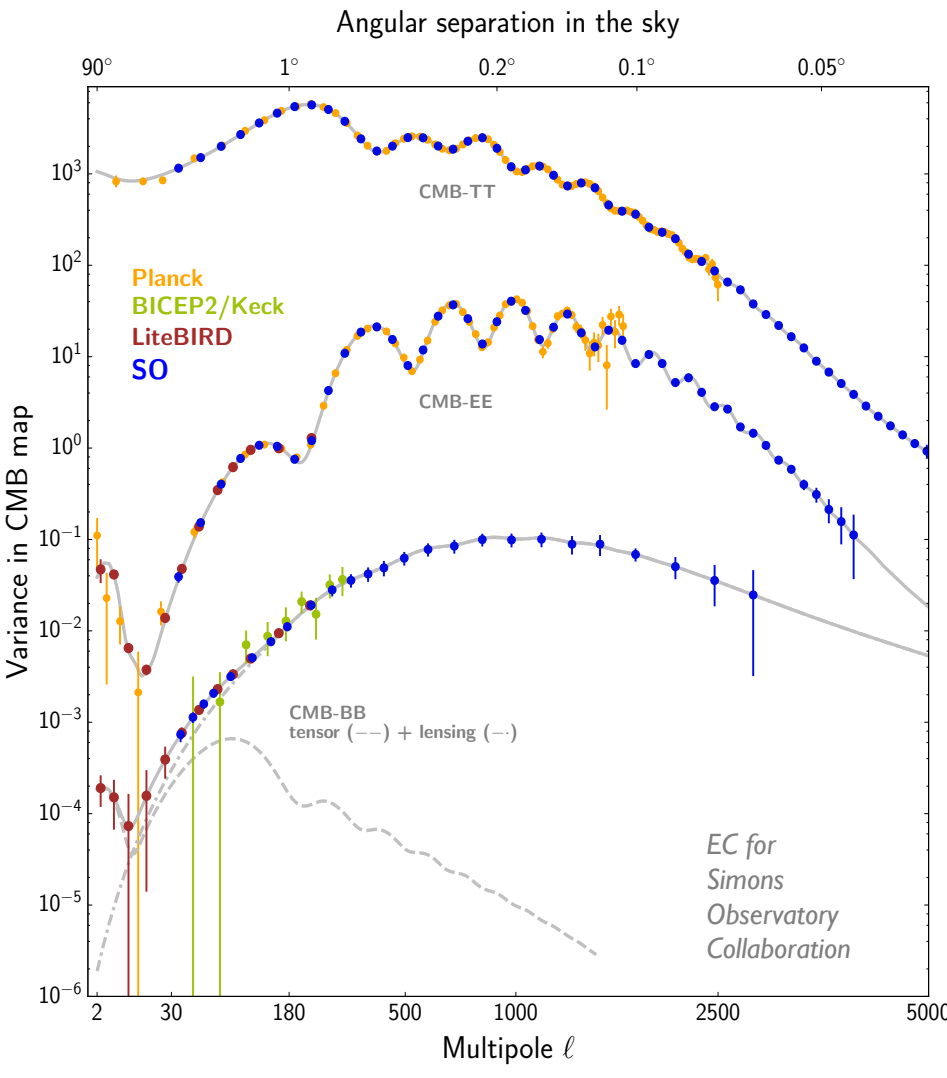
Tokyo Kick-off Symposium, July 2nd 2019

Cosmology and fundamental physics from CMB power spectra

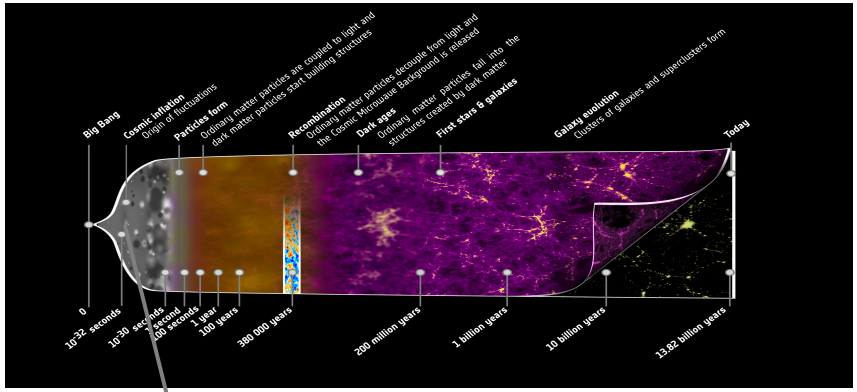


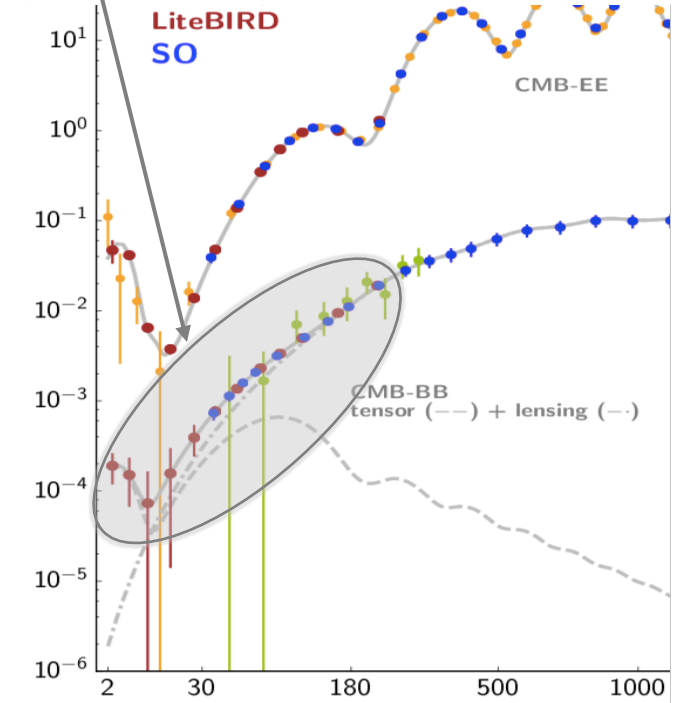
Cosmology and fundamental physics from CMB power spectra





How did the Universe begin?





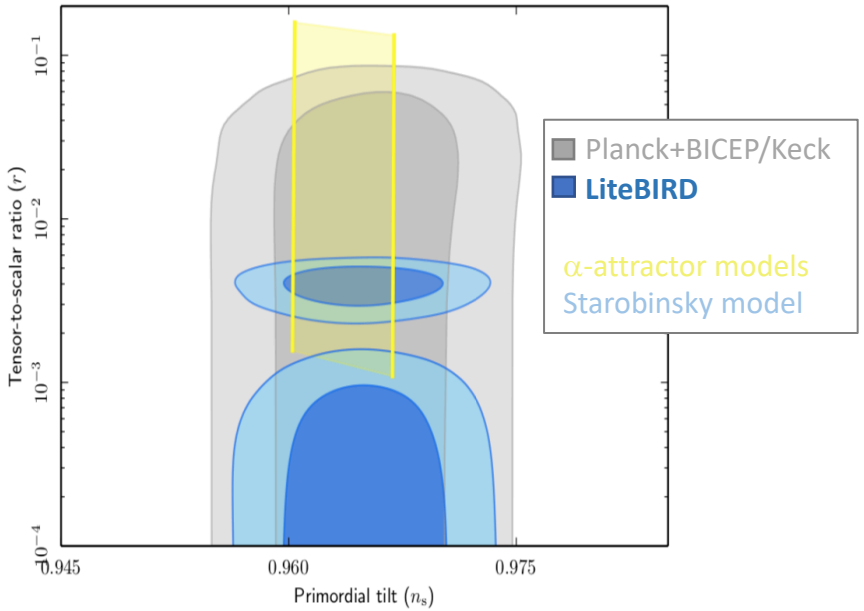
LiteBIRD primary goal

LiteBIRD full success

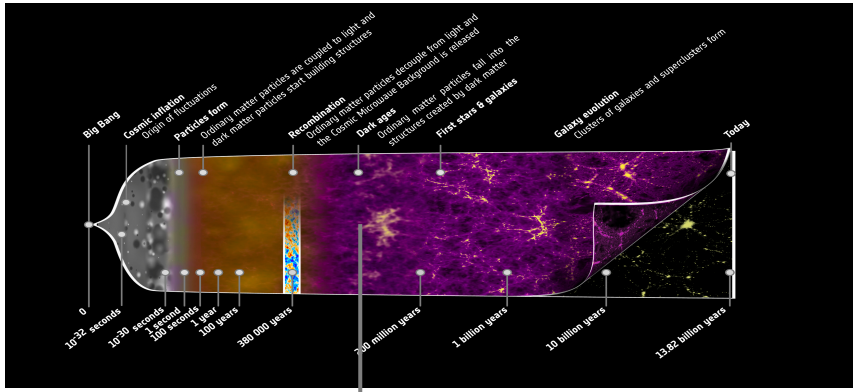
$\delta r < 10^{-3}$ if $r=0$

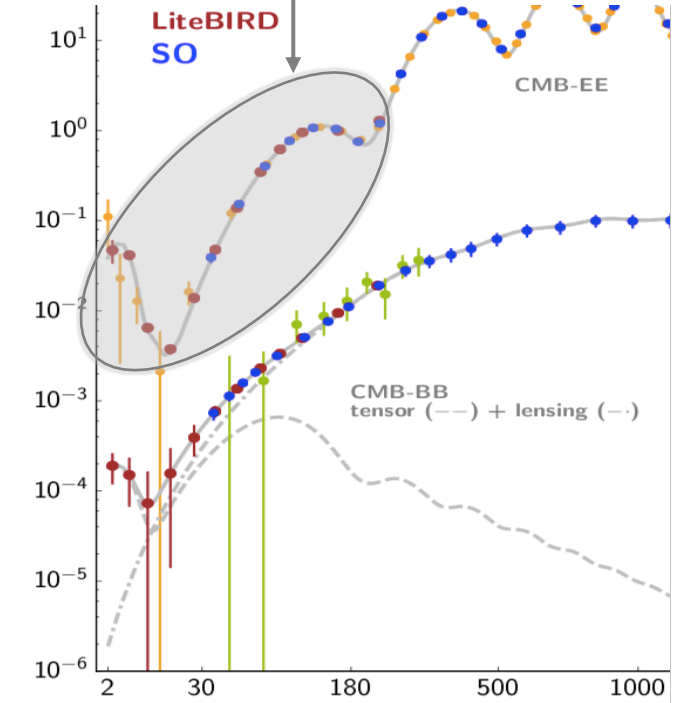
$>5\sigma$ if $r \geq 0.01$

- Reach Starobinsky-like inflation
- Rule out/in entire class of large field inflation models
- Robust measurement



How did the Universe reionize?

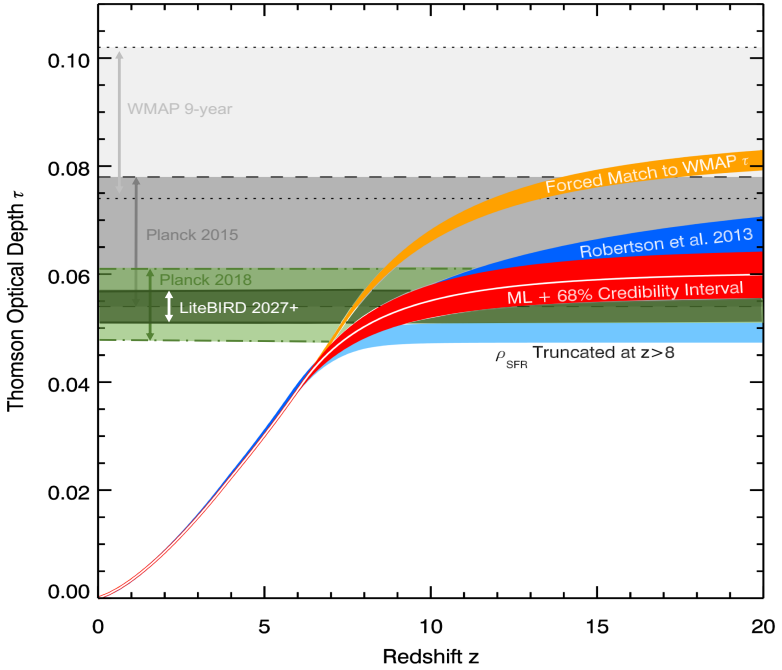




Best possible measurement of optical depth to reionization

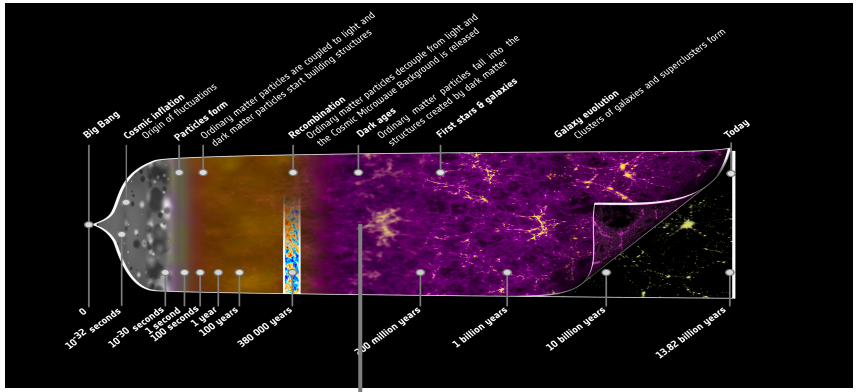
$\sigma(\tau)=0.002$

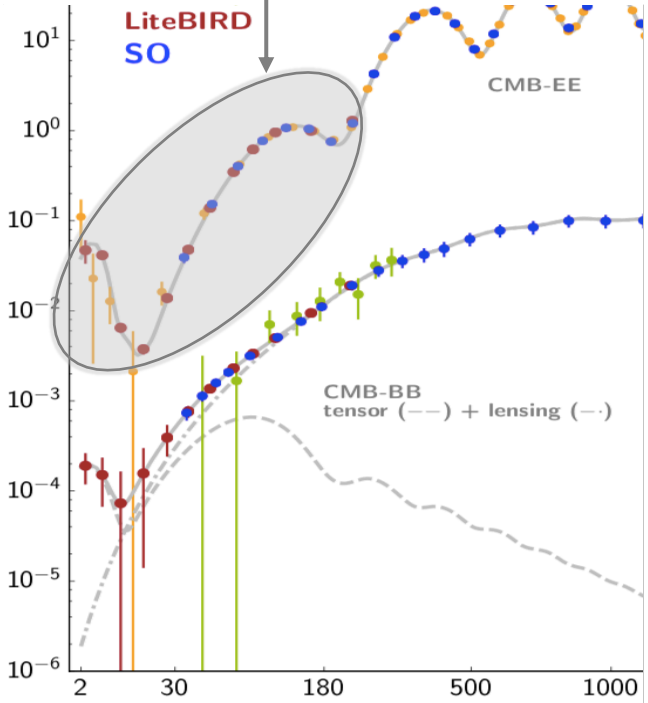
→ ❖ Test different reionization histories



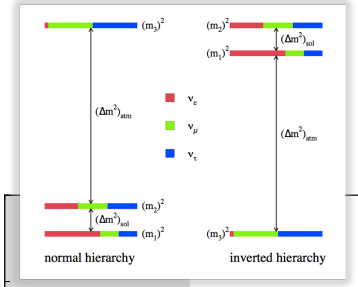
Readapted from Robertson++ 2015

What's the absolute mass of neutrino particles?

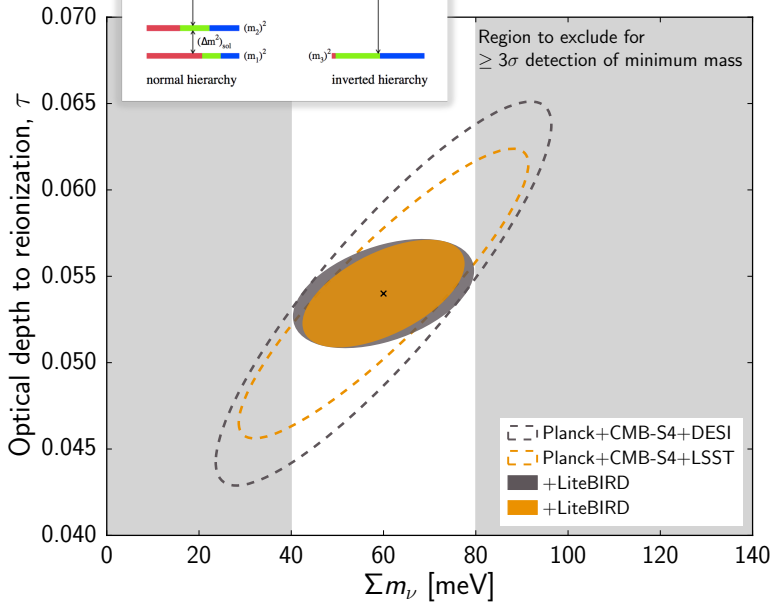




Best possible measurement of optical depth to reionization enabling discovery regime for neutrino mass

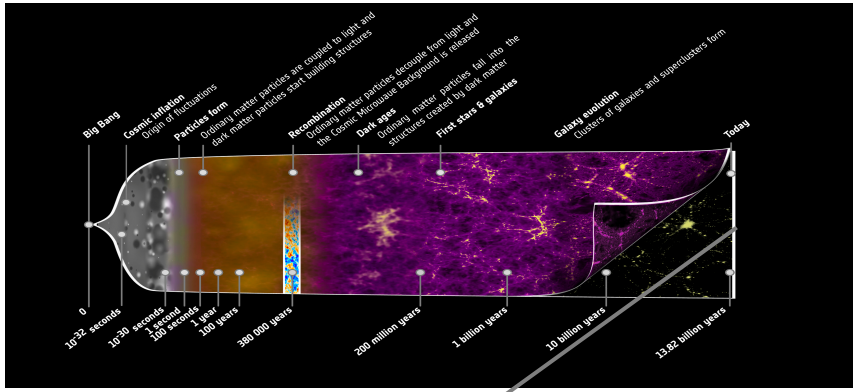


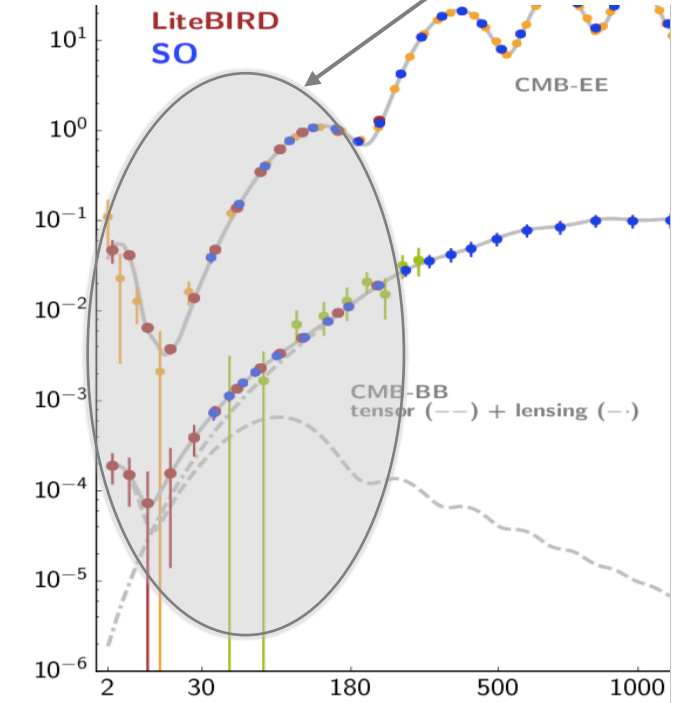
$\sigma(\Sigma m_\nu)$=15meV



Readapted from Calabrese++ 2016

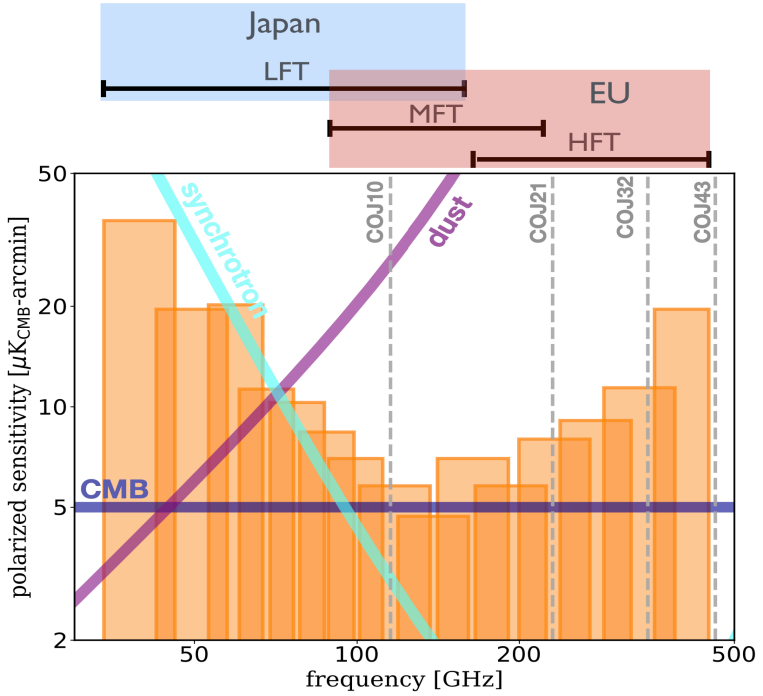
Polarization in the Galaxy





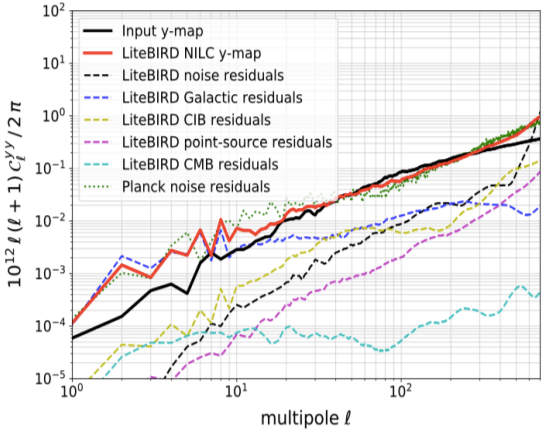
Wide and dense frequency coverage

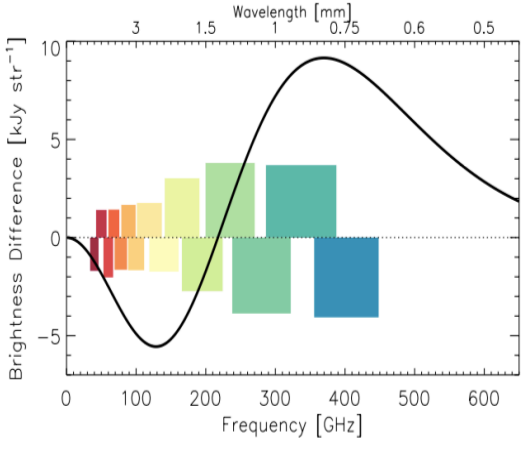
- 402GHz map new reference for statistical analysis of magnetic fields
- Composition and physics of interstellar dust



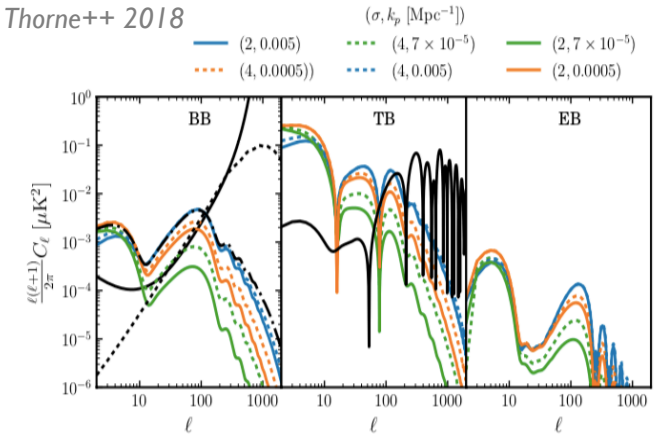
Additional outcomes

Mapping hot gas with SZ

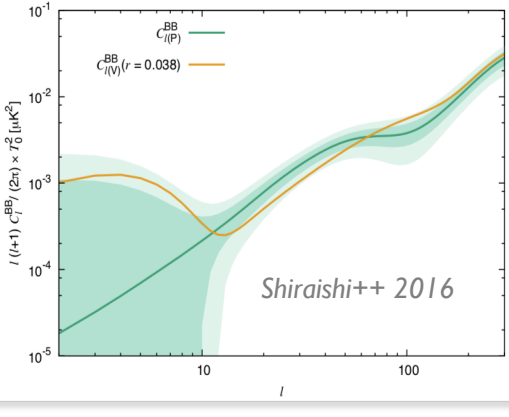


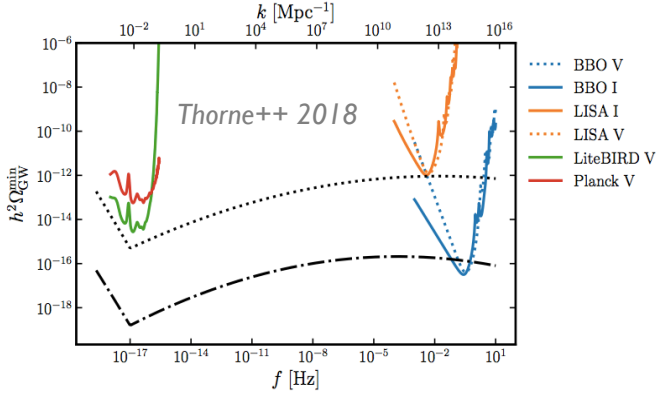


Primordial cosmic birefringence

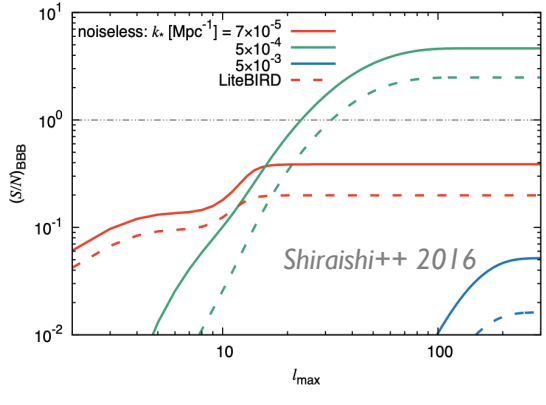


New source fields of GW/Origin of primordial GW

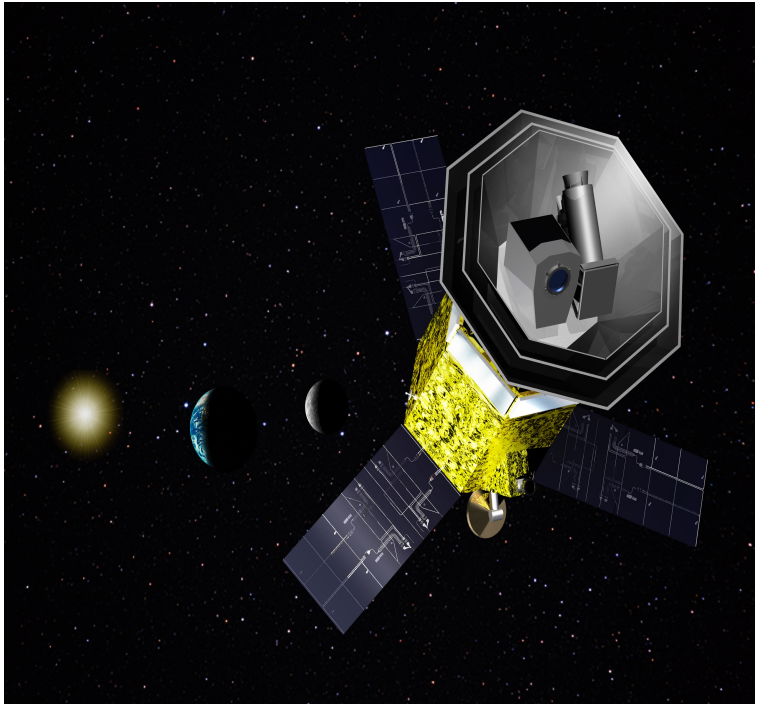




Primordial non-Gaussianity



Summary of LiteBIRD science reach



1. r and inflation – full success
2. Better r and inflation – extra success
3. Characterization of B-mode (e.g scale-invariance, non-Gaussianity, and parity violation)
4. Large-scale E mode and its implications for reionization history and the neutrino mass
5. Birefringence
6. Power spectrum features in polarization
7. SZ effect (thermal and relativistic correction)
8. Anomaly
9. Cross-correlation science
10. Galactic science