

# Cosmic Frontier Large Projects

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Background image: The Dark Energy Survey

# Introduction

The Cosmic Frontier studies fundamental physics over scales small to cosmic and has yielded compelling new discoveries that form the basis of much of the current HEP program.



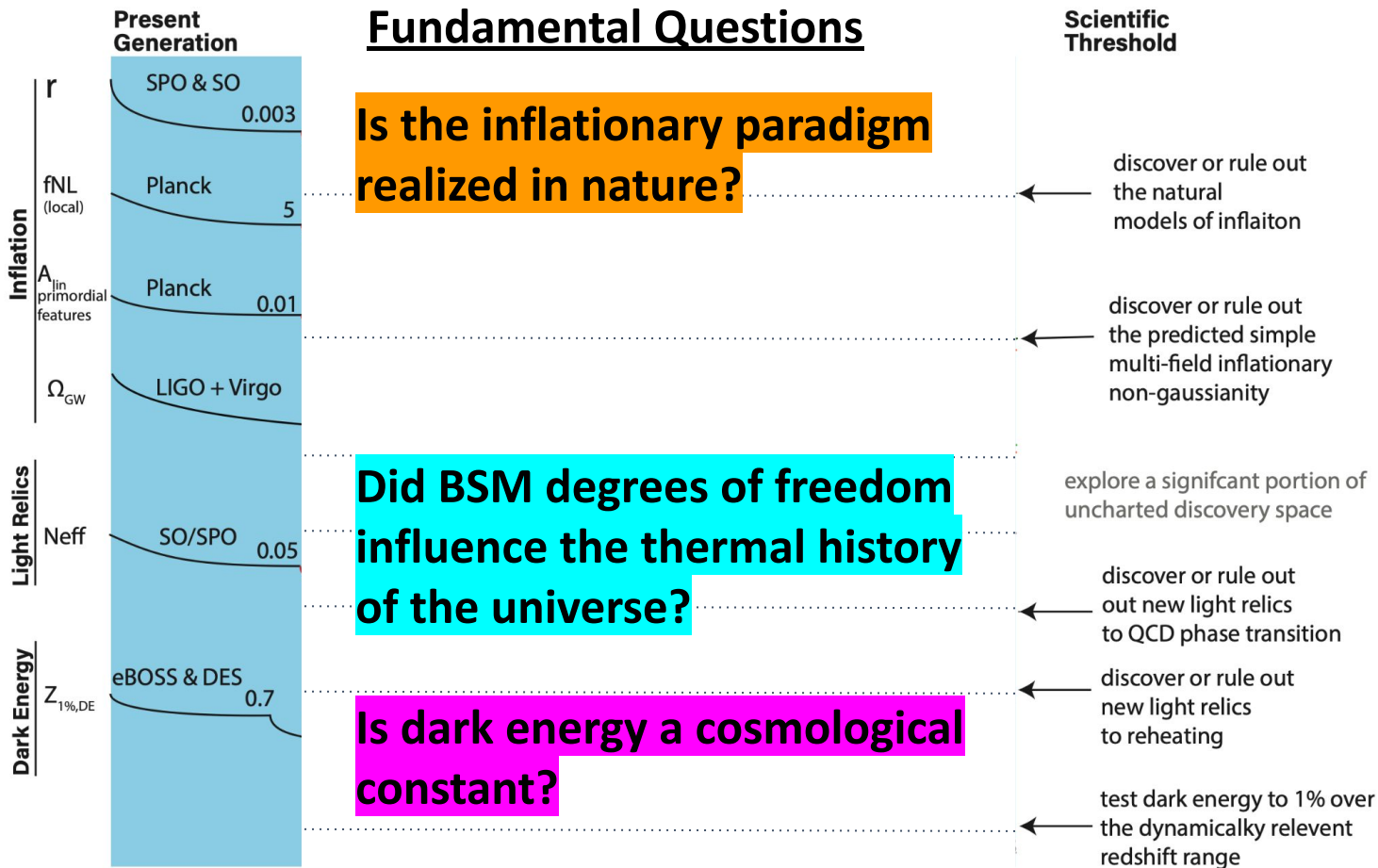
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# The Cosmic Frontier strategy

In order to completely fulfill its science mission:

- CF's top project priority is to complete the construction of CMB-S4, launch new efforts to delve deep and search wide for dark matter, and to aim high in advancing dark energy and cosmic acceleration research.
- CF seeks increased research support to execute the science goals of all projects in its portfolio, including new funding mechanisms to support cross-survey science and theory, and to leverage projects such as DESI, LSST, and CMB-S4.

# Fundamental Questions



Not shown:  
**Neutrinos**  
**Dark Matter**

# CMB-S4

CMB-S4 is ready to build now:

- CD-0 achieved in 2019
- CD-1 preparations underway

**CMB-S4 is at the core of the CF program. It uniquely addresses cosmic inflation and its results will impact the science of many HEP frontiers.**

The community consensus is that building and operating CMB-S4 is a **top immediate priority**.



CMB-S4

# Spec-S5

## Stage V Spectroscopic Facility

6-10m telescope, 20-50k fiber focal plane  
leap in survey power and science reach

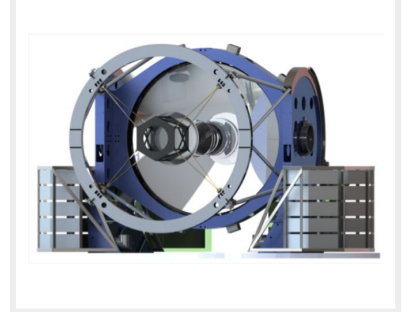
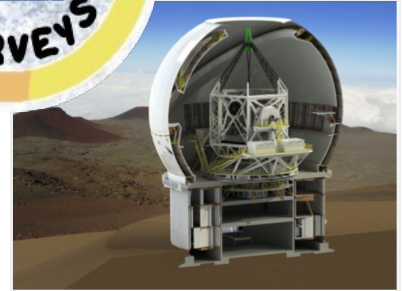


Spec-S5 will be ready to build soon:

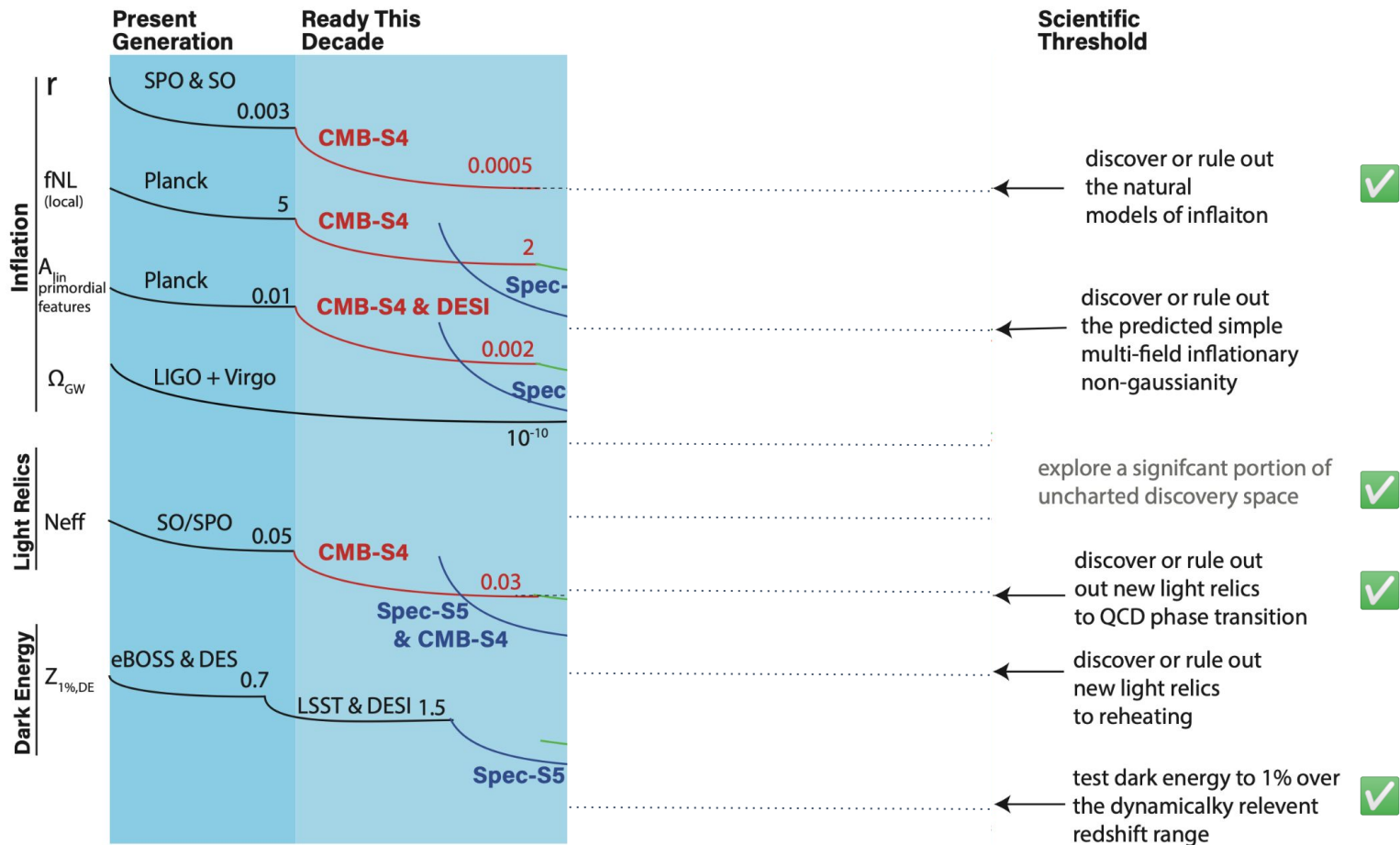
- Pathfinder small project ready now (DESI-II)
- Target CD-0 well before 2030

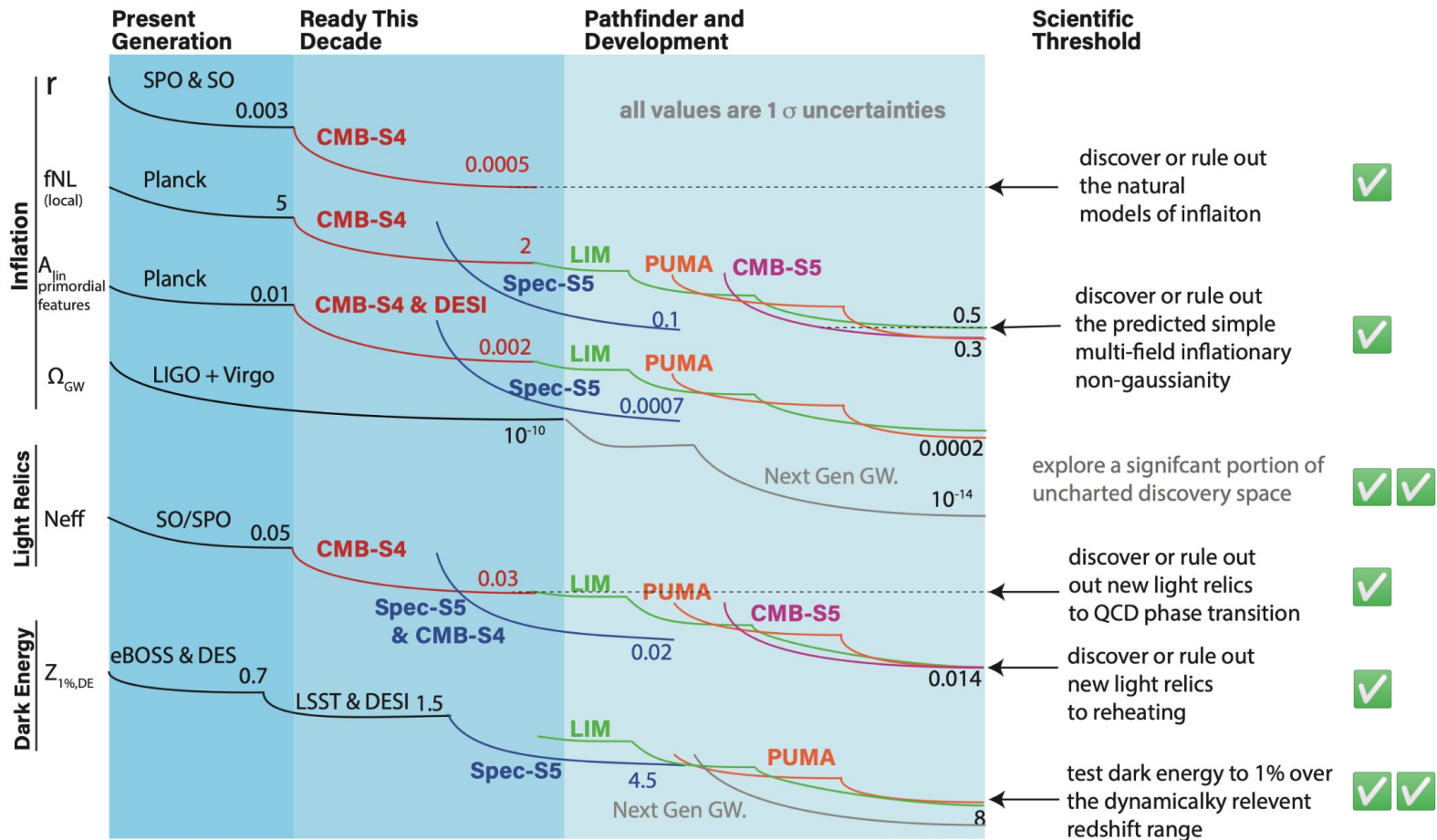
**Spec-S5 will propel us into a new era of precision cosmology, ensuring that the U.S. community will remain a leader in CF science for decades to come.**

The community consensus is that building Spec-S5 is our **top near-term priority**.



Spec-S5







# Timeline of CF large projects

- **2022-2036: Build & operate CMB-S4 (current large project)**
- 2022-2036: Science with DESI, LSST, CMB-S4
- 2022-2025: Pathfinder for 21cm (LuSEE-Night)
- 2024-2027: Pathfinder for Spec-S5 target selection (DESI-II)
- **2024: Target date for CD-0 for Spec-S5 (next large project)**
- 2025-2029: Pathfinders for next-generation GW Observatory
- 2027-2029: Pathfinders for 21cm/mm-wave line intensity mapping
- **2029: Begin CD process for LIM, GWO (future large project)**

