

# Snowmass Cosmic Frontier Summary: Dark Energy and Cosmic Acceleration

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Background image: The Dark Energy Survey & Seattle Workshop Logo

# Introduction

Through the Snowmass process, the US HEP community comes together to plan the future of the field over a 10-20 year timescale.

The Cosmic Frontier encompasses a diverse research portfolio to study fundamental physics over scales small to cosmic and has yielded compelling new discoveries that form the basis of much of the current HEP program.

In this talk, I summarize the Snowmass consensus achieved at the Community Workshop in Seattle. I will focus on dark energy, inflation, and exploring new physics in the early universe (Aaron's talk will focus on dark matter).



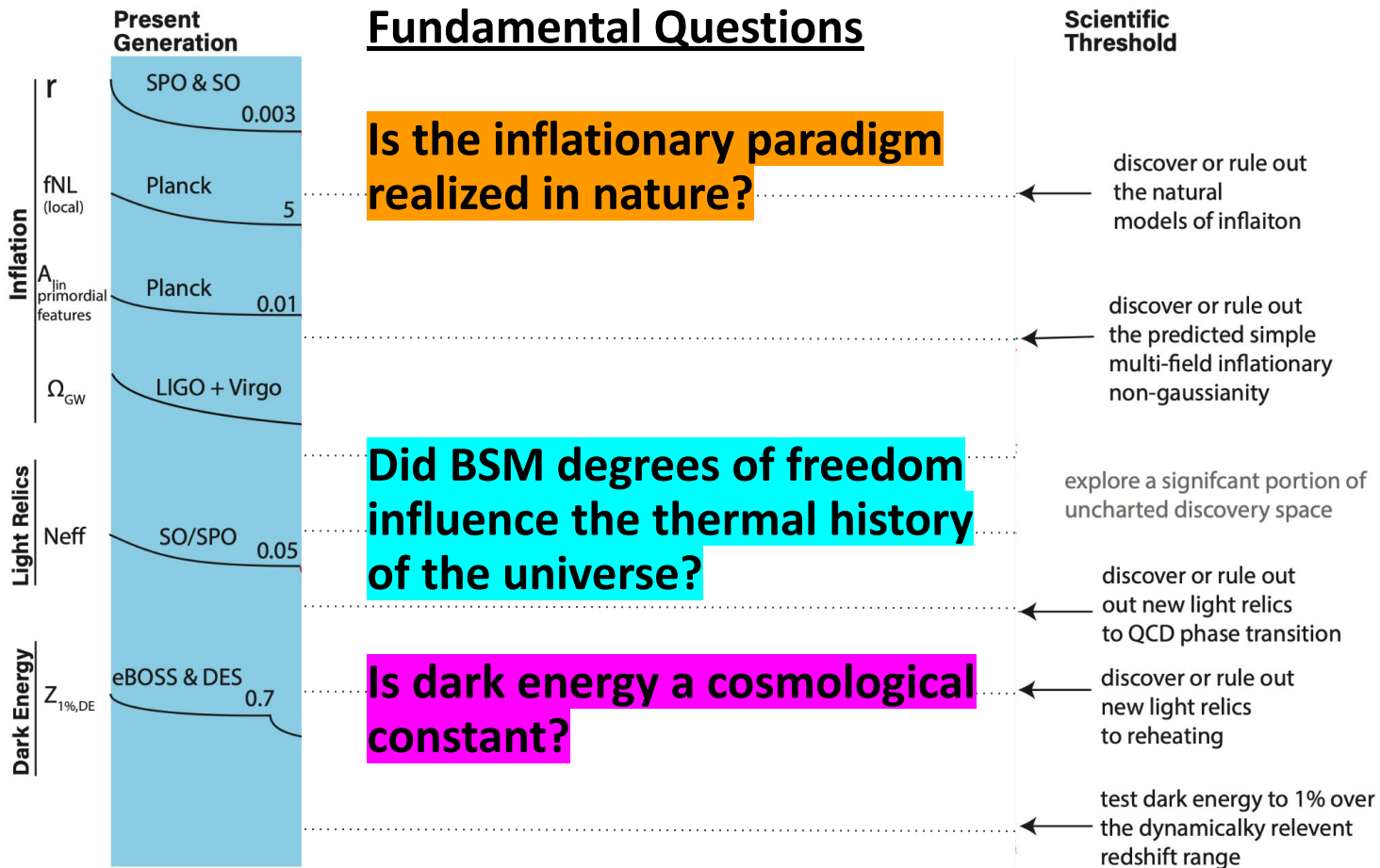
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# The Cosmic Frontier strategy

In order to completely fulfill its science mission:

- CF's project priorities are 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 with Spec-S5 and novel techniques such as GW and LIM.
- 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

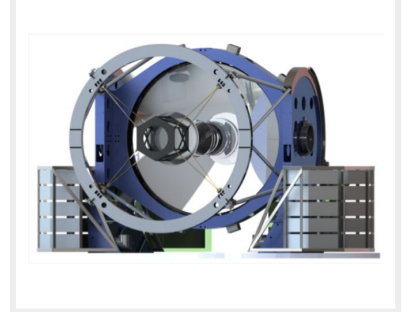
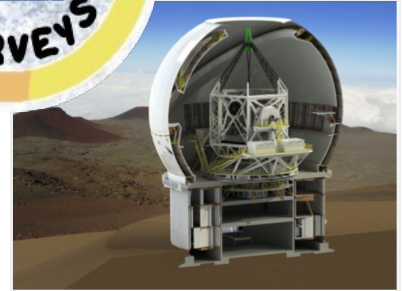


Spec-S5 will be ready to build soon:

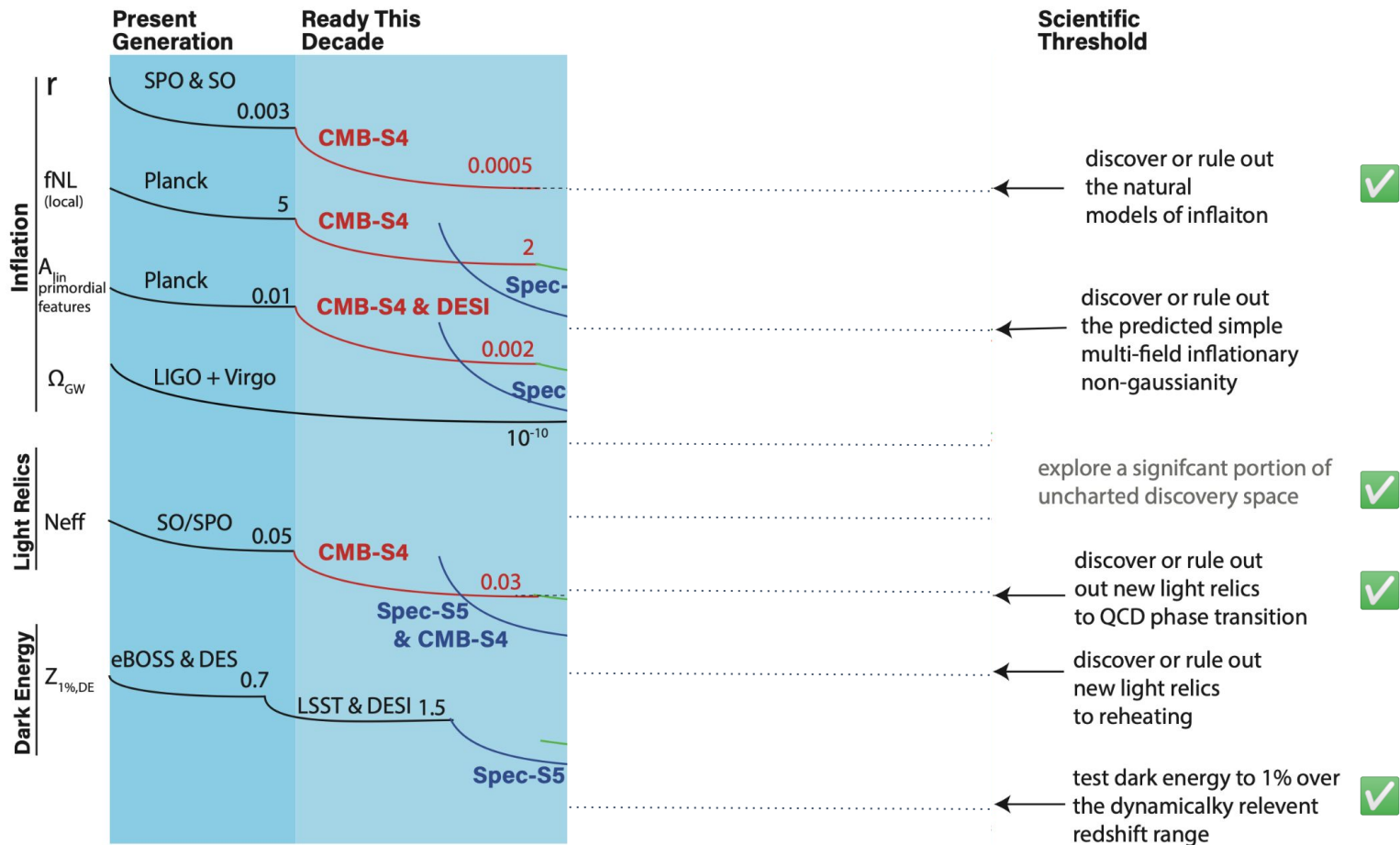
- Pathfinder small project ready now (DESI-II)
- Target CD-0 well before 2030

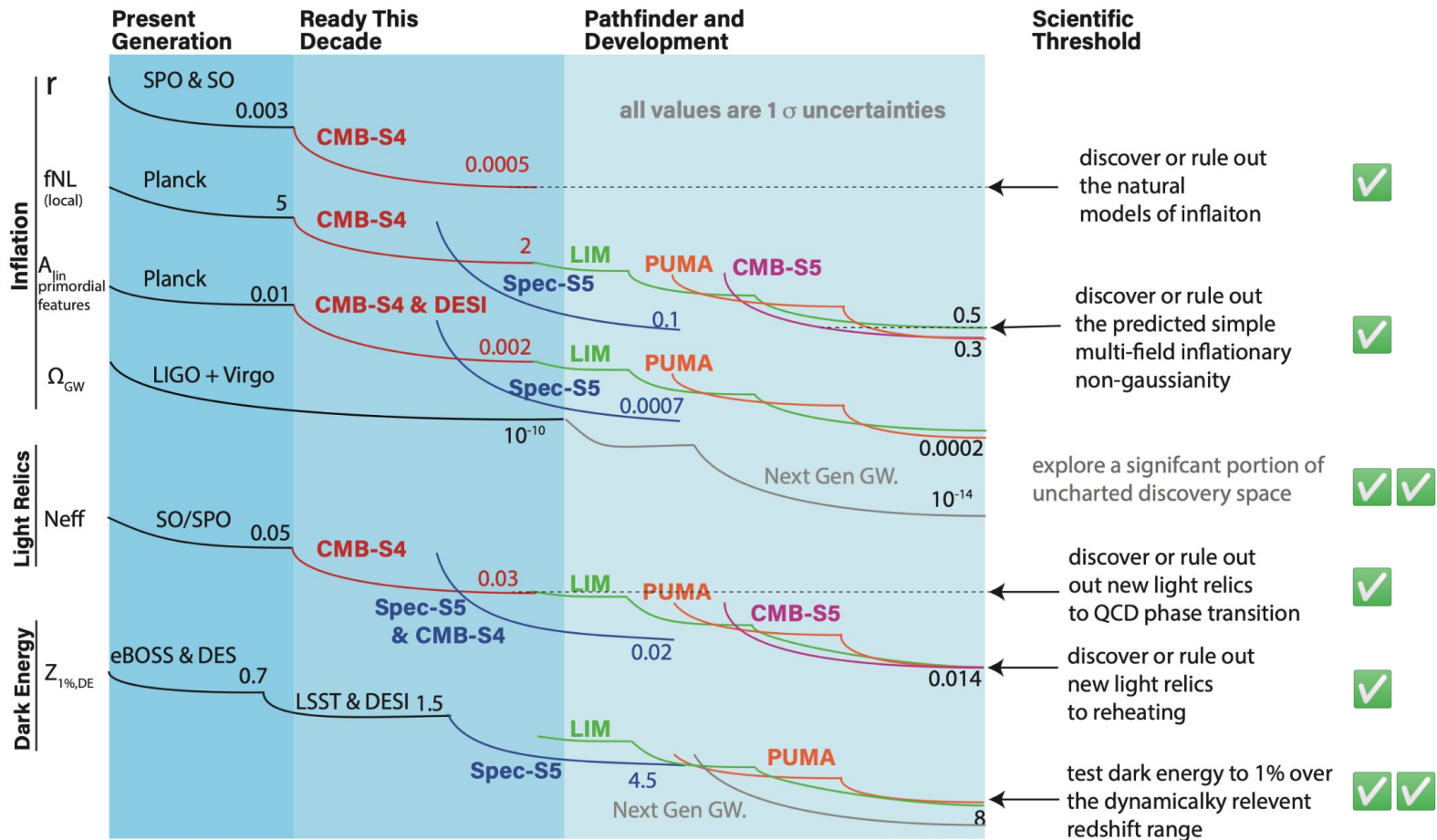
**Spec-S5 will propel us into a new era of precision cosmology, ensuring that the U.S. community will remain a leader in CF science for decades to come.**

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)**



# What's next?

- Conveners are finishing up their written reports.
  - Aiming to have a completed CF draft in early September.
  - Snowmass-wide report to be released in October.
- Meanwhile, the P5 committee is being selected.
  - Send nominations to: [pfive@slac.stanford.edu](mailto:pfive@slac.stanford.edu)
  - Nominations deadline: Aug 31