

# CF6: Dark Energy and Cosmic Acceleration: Complementarity of Probes and New Facilities

- Cosmic Frontier topic 6 (CF6) conveners:
  - Brenna Flaugher (FNAL)
  - David Schlegel (LBNL)
  - Chihway Chang (UChicago, rotating off)
- Slack channel: #cf06-dark\_energy\_comp
- Communication on slack + mailing list
- Wiki page: <https://snowmass21.org/cosmic/start>

# CF6: Dark Energy and Cosmic Acceleration: Complementarity of Probes and New Facilities

## Process for this sub-group

- Reviewed Astro2020 submissions (from July 2019)
- Defined splits between CF3/4/5/6/7
- Solicited LOIs — Aug 31, 2020
- Review LOIs with the goal of coordinating Snowmass white papers
- Short presentations+discussions, alternating weeks CF4 & CF6 (July—Nov 2020)
- “Fermilab” community planning meeting (Oct 5-9, 2020)
- Drafted white paper plans + identified “facilitators”
- Hit “pause”, re-start in Sep 2021

# CF6: Dark Energy and Cosmic Acceleration: Complementarity of Probes and New Facilities

This group consist two fairly separate themes, addressed at the community planning workshop sessions #142-144 —

- **Complementary Probes:** Joint analysis is key to making progress in understanding Dark Energy and Cosmic Acceleration. Dedicated resources and collaborations for joint analysis is critical. (#142/143)
- **New facilities:** An overview/summary of all new facilities proposed in this snowmass process that focus on Dark Energy/Cosmic Acceleration. (#144, but also #69/70/71)

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Goals going into the Community Planning Workshop Nov 2020 —

- **#142/143: Connect LOI authors of similar interest**, form smaller groups that could be in close contact going forward (whitepaper writing and/or responsible for subsections in the TG report). Plans for future telecons/workshop (maybe with CF4/5/7).
- **#144: Have an overall picture of the landscape of proposed new facilities** (in science goals, wavelength, scale of project etc.). Discuss possible grouping of projects (corresponding to subsections in the TG report). Plans for future telecons/workshop (maybe with CF4/5/7).

# CF6 “Solicited” White Paper Topics

- **Joint-analysis of Static Probes** [[overleaf](#)] [[notes](#)] [[#wp-cf06-static-probes](#)]  
Importance of joint analysis in static (large-scale structure) probes.  
Facilitators: Andrew Hearin, Eric Baxter, Chihway Chang
- **Joint-analysis of Transient Probes** [[overleaf](#)] [[notes](#)] [[#wp-cf06-transient-probes](#)]  
Importance of joint analysis in transient (time-domain) probes.  
Facilitators: Maria Elidaiana, Alex Kim, Antonella Palmese
- **Collaboration Structure for Joint Analysis** [[overleaf](#)] [[notes](#)] [[#wp-cf06-collaboration](#)]  
Importance of substantial change in funding and collaboration model for joint analysis.  
Facilitators: Jason Rhodes, Brenna Flaughner
- **New Facilities:** Currently we do not plan to have an overall white paper for new facilities, but rather to summarize facility white papers across CF in the report
  - CF3 has solicited a paper on new facilities [[#wp-cf03-dark\\_matter\\_facilities](#)]
  - CF7 has a GW facility paper

# LOIs covered by each proposed CF6 white paper

- **CF6: Joint-analysis of Static Probes**

[Higher-order statistics with galaxy and CMB surveys](#)

[Theory and Computing Across LSST, DESI, and CMB-S4](#)

[Improving Cosmological Constraints by Cross-correlating Galaxy and CMB surveys](#)

[Dark Energy Discovery with Multi-Survey Cross-Correlations](#)

[CMB-S4: Mapping matter in the Cosmos](#)

[CMB-HD: High-resolution, ultra-low-noise matter mapping](#)

[Cosmology from Multi-Wavelength Observations of Clusters of Galaxies](#)

[Unified inference of the cosmological parameters from noise-dominated galaxy clustering and shear](#)

[Joint pixel-level processing of WFIRST, Euclid, LSST, and SPHEREx](#)

[Understanding the accelerated expansion of the Universe with Rubin Observatory's Legacy Survey of Space and Time](#)

[Narrow band imaging as a cosmological survey complement](#)

[Multi-Wavelength Simulations](#)

[CosmoSIS for the Next Decade](#)

[Cosmological Synergies Enabled by Joint Analysis of Multi-probe data from...](#)

[Complementarity of ground- and space-based observations of the cosmic microwave background](#)

[Cycle and symbiosis: AI and Cosmology intersect to produce new knowledge and tools](#)

[Synergies between Millimeter-Wave Line Intensity Mapping with Radio, Optical and Microwave Observations](#)

# LOIs covered by each proposed CF6 white paper

- **CF6:Dark Energy Science with Multimessenger Probes and the Vera Rubin Observatory's Legacy Survey of Space and Time**

[Probing the expansion history of the Universe with Gravitational Waves](#)

[Multi-messenger Probes of Cosmology and Fundamental Physics using Gravitational Waves](#)

[Probing Dark Energy with Gravitational Wave Standard Sirens in the HEP Experimental Cosmic Frontier](#)

[Cycle and symbiosis: AI and Cosmology intersect to produce new knowledge and tools](#)

# LOIs covered by each proposed CF6 white paper

- **CF6: Collaboration Structure for Joint Analysis (many of the above might also be relevant, LOI authors feel free to add/reach out)**

[The US Extremely Large Telescope Program](#)

[Cosmological Synergies Enabled by Joint Analysis of Multi-probe data from...](#)

[Complementarity of ground- and space-based observations of the cosmic microwave background](#)

[Joint pixel-level processing of WFIRST, Euclid, LSST, and SPHEREx](#)

[Theory and Computing Across LSST, DESI, and CMB-S4](#)

[Cycle and symbiosis: AI and Cosmology intersect to produce new knowledge and tools](#)



# LOIs covered by each proposed CF6 white paper

- **CF6: New Facility LOIs (not going into a single white paper but scattered around white papers hosted under different CF3/4/5/7)**

[MegaMapper: a Massively-Multiplexed Spectroscopic Instrument for Cosmology](#)

[The Maunakea Spectroscopic Explorer](#)

[Enhancing probes of the dark sector with Keck-FOBOS optical spectroscopy](#)

[The US Extremely Large Telescope Program](#)

[La Silla Schmidt Southern Survey](#)

[Illuminating the Dark Universe with ATLAS Probe](#)

[Packed Ultra-wideband Mapping Array \(PUMA\): Next generation facility for Sky Survey in Radio](#)

[Millimeter-Wave Line Intensity Mapping Facilities](#)

[An Intelligent Platform for Theoretical Understandings of Type Ia Supernovae](#)

[CMB-HD: An Ultra-Deep, High-Resolution Millimeter-Wave Survey Over Half the Sky](#)

**[+ GW and CR new facilities]**

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- Activities to re-start in September 2021
- We did not *decide* the White Paper “leads”, we just identified “facilitators” that could take on the task to contact other LOI authors to get the discussion going → explained in Oct 29th e-mail

We made an effort on the call to identify initial volunteers for each white paper to contact relevant LOI authors and start the discussion (see some names on slide 39), but do feel free to contact us or the names on that slide if you also like to help coordinate/contribute. If you like to help coordinate, please do so in the next week.

- Suggesting the recognition of cross-collaboration (multi-wavelength) analyses at the “project” level
- What cannot be done with current models? i.e. simulations, tools
- Ideas for what the model actually looks like, i.e. DESC+CMB, DESI+CMB
- Articulate the need for “additional funding”, or can existing projects not just talk to each other?
- Transient followup