

**Opportunity Title:** Superconducting Detectors for CMB observations

**Opportunity Reference Code:** 0207-NPP-NOV23-JPL-Astrophys

**Organization** National Aeronautics and Space Administration (NASA)

**Reference Code** 0207-NPP-NOV23-JPL-Astrophys

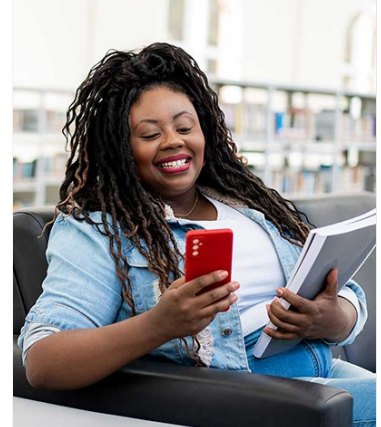
**Application Deadline** 11/1/2023 6:00:59 PM Eastern Time Zone

**Description** We are developing experimental approaches to fundamental questions in cosmology, specifically state-of-the-art instrumentation to study the Cosmic Microwave Background. Rapid advances in detector technology played a decisive role in the experimental progression of this science, from the discovery of the CMB to the exquisite temperature and polarization maps available today. We are currently developing large format antenna-coupled TES bolometer arrays for BICEP Array that operates at the South Pole, and developing new approaches to both time-domain and radio frequency-domain multiplexing. We are also developing Thermal Kinetic Inductance Detectors (TKIDs), that combine the sensitivity and design flexibility of TES bolometers with the ease of readout of KIDs. All of these technologies will have opportunities to deploy in the BICEP-Array. Last, we are beginning to explore horn-coupled designs that will allow JPL to assist with DOE driven efforts but also help design the next generation satellite CMB mission.


A NASA Post-doctoral researcher will have opportunities to assist in any of these efforts, and we are seeking an applicant who will play a leading role in developing these technologies. Experience with cryogenic systems, electrical and optical characterization of cryogenic detectors arrays, and design of microwave and millimeter wave circuitry and antennas are all highly desirable. The successful candidate will be expected to support our fabrication team in the MDL cleanroom by assisting with computer automation of the lithography and deposition systems as well as testing devices and materials that they produce.

References:

1. Wandui, A., Bock, J., ..., O'Brient, R. Thermal Kinetic Inductance Detectors for Millimeter-Wave Astrophysics  
<https://arxiv.org/abs/2001.08887>, accepted for publication in Journal of Applied Physics (2020).
2. BICEP2/Keck Collaboration: Ade, P., Aiken, R., ..., O'Brient, R., ... Yoon, K.W. Constraints on Primordial Gravitational Waves Using Planck, WMAP, and New BICEP2/Keck Observations through the 2015 Season Phys. Rev. Lett. 121, 221301 (2018)
3. BICEP2/Keck Collaboration: Ade, P., Aiken, R., ..., O'Brient, R., ... Yoon, K.W. New bounds on anisotropies of CMB polarization rotation and implications for axionlike particles and primordial magnetic fields Phys. Rev. D 96, 102003 (2017)
4. BICEP2/Keck Collaboration: Ade, P., Aiken, R., ..., O'Brient, R., ... Yoon, K.W. Measurement of Gravitational Lensing from Large-scale B-mode Polarization ApJ 833, 228 (2016)
5. BICEP2/Keck/ SPIDER Collaborations: Ade, P.; Aiken, R.; ... O'Brient, R.; ... Yoon, K.W. Antenna-coupled TES bolometers for degree-scale polarimeters used in BICEP2, Keck Array, and SPIDER ApJ 812, 176



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(2015). Corresponding author

6. BICEP2 Collaboration: Ade, P.; Aiken, R; ... O'Brient, R.; ... Yoon, K.W.  
Detection of B-mode polarization at degree angular scales., PRL 112,  
241101 (2014).

**Location:**

Jet Propulsion Laboratory  
Pasadena, California

**Field of Science:** Astrophysics

**Advisors:**

Roger O'Brient  
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626-773-0116

**Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States.** A complete list of Designated Countries can be found at: <https://www.nasa.gov/oijr/export-control>.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

**Eligibility Requirements**

- **Degree:** Doctoral Degree.