Opportunity Title: High-Sensitivity Far-IR Detectors
Opportunity Reference Code: 0163-NPP-NOV23-JPL-Astrophys

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0163-NPP-NOV23-JPL-Astrophys

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

Description We are seeking one or more postdoctoral researchers with hands-on experience in low-temperature superconducting devices and far-IR to millimeter-wave instrumentation to join our team developing the world's most sensitive far-infrared detectors. We are pursuing detector arrays in which each pixel provides background-limited performance in a dispersive spectrometer on a cryogenic space telescopes; that is a per-pixel noise equivalent power of 10^-19 W/sqrt(Hz) or lower. The researcher(s) will make use of a dilution-cooled sub-100mK cryostat to characterize devices built in the JPL micro devices lab (MDL). We are pursuing transition-edge-sensed (TES) bolometers, kinetic inductance detectors (KIDs), and quantum capacitance detectors (QCDs), with an initial emphasis on the bolometers in preparation for the SPICA mission. We will implement frequency-domain readout techniques developed by a range of US and international collaborators, and the candidate(s) should be willing to travel and interface with a diverse range of scientists and engineers in support of this activity. We envision that the thrust of the work will be in the low-NEP detector system demonstration, but opportunities also exist for collaboration on ongoing and proposed ground-based and balloon-borne instruments targeting the early Universe. Examples include SuperSpec (a millimeter-wave spectrometer on a chip slated for the large millimeter telescope targeting individual high-redshift galaxies), TIME (a mm-wave tomographic intensity mapper targeting ionized carbon fro the Reionzation epoch), and TIM ((formerly STARFIRE), a proposed balloon-borne far-IR imaging spectrometer targeting the history of star formation when the Universe was half its current age). Key people in the JPL detector group include Pierre Echternach and Matt Kenyon

References:

C. M. Bradford, P. F. Goldsmith, A. Bolatto, L. Armus, J. Bauer, P. Appleton, A. Cooray, C. Casey, D. Dale, B. Uzgil, J. Aguirre, J. D. Smith, K. Sheth, E. J. Murphy, C. McKenney, W. Holmes, M. Rizzo, E. Bergin, and G. Stacey. A Cryogenic Space Telescope for Far-Infrared Astrophysics: A Vision for NASA in the 2020 Decade. ArXiv e-prints, May 2015.

P. M. Echternach, K. J. Stone, C. M. Bradford, P. K. Day, D. W. Wilson, K. G. Megerian, N. Llombart, and J. Bueno. Photon shot noise limited detection of terahertz radiation using a quantum capacitance detector. Applied Physics Letters, 103(5):053510, July 2013.

M. Kenyon, P.K Day, C.M. Bradford, J.J. Bock, and H.G. LeDuc. J. Low Temp. Physics, 151:112–118, January 2008.

A. D. Beyer, M. E. Kenyon, P. M. Echternach, B.-H. Eom, J. Bueno, P. K. Day, J. J. Bock, and C. M. Bradford. Characterizing SixNy absorbers and support beams for far- infrared/submillimeter transition-edge sensors. In

Opportunity Title: High-Sensitivity Far-IR Detectors
Opportunity Reference Code: 0163-NPP-NOV23-JPL-Astrophys

Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, volume 7741 of Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, July 2010.

A‟‹.‟‹D‟‹.‟‹B‟‹e‟‹y‟‹e‟‹r‟‹,‟‹M‟‹.‟‹E‟‹.‟‹K‟‹e‟‹n‟‹y‟‹o‟‹n‟‹,‟‹P‟‹.‟‹M‟‹.‟‹E‟‹c‟‹h‟‹t‟‹e‟‹r‟‹n‟‹a‟‹c‟‹h‟‹,‟‹T‟‹.‟‹C‟‹h‟‹u‟‹i‟ Holmes, and C. M. Bradford. Ultra-sensitive Transition-Edge Sensors for the Background Limited Infrared/Sub-mm Spectrograph (BLISS). Journal of Low Temperature Physics, page 143, December 2011.

A. D. Beyer, P. M. Echternach, M. E. Kenyon, M. C. Runyan, B. Bumble, C. M. Bradford, J. J. Bock, and W. A. Holmes. E↵ect of mo/cu superconducting bilayer geometry on ultra- sensitive transition-edge sensor performance. IEEE Transactions on Applied Superconductivity, 23(3):2100104–2100104, June 2013.

J. Kuur, J. Beyer, M. Bruijn, J. R. Gao, R. Hartog, R. Heijmering, H. Hoevers, B. Jackson, B. J. Leeuwen, M. Lindeman, M. Kiviranta, P. Korte, P. Mauskopf, H. Weers, and S. Withing- ton. The spica-safari tes bolometer readout: Developments towards a flight system. Journal of Low Temperature Physics, 167(5):561–567, 2012.

L‟‹.‟‹G‟‹o‟‹t‟‹t‟‹a‟‹r‟‹d‟‹i‟‹,‟‹J‟‹.‟‹v‟‹a‟‹n‟‹d‟‹e‟‹K‟‹u‟‹u‟‹r‟‹,‟‹S‟‹.‟‹B‟‹a‟‹n‟‹d‟‹l‟‹e‟‹r‟‹,‟‹M‟‹.‟‹B‟‹r‟‹u‟‹i‟‹j‟‹n‟‹,‟‹P‟‹ Hijmering, H. Hoevers, P. Koshropanah, C. Kilbourne, M. A. Lindemann, M. Parra Borderias, and M. Ridder. Ac read-out circuits for single pixel characterization of tes microcalorimeters and bolometers. IEEE Transactions on Applied Superconductivity, 21(3):272–275, June 2011.

R. Hartog, M. D. Audley, J. Beyer, D. Boersma, M. Bruijn, L. Gottardi, H. Hoevers, R. Hou, G. Keizer, P. Khosropanah, M. Kiviranta, P. Korte, J. Kuur, B.-J. Leeuwen, A. C. T. Nieuwen- huizen, and P. Winden. Low-noise readout of tes detectors with baseband feedback frequency domain multiplexing. Journal of Low Temperature Physics, 167(5):652–657, 2012.

R. A. Hijmering, R. H. den Hartog, A. J. van der Linden, M. Ridder, M. P. Bruijn, J. van der Kuur, B. J. van Leeuwen, P. van Winden, and B. Jackson. The 160 tes bolometer read-out using fdm for safari, 2014.

Wheeler, J.; Hailey-Dunsheath, S.; Shirokoff, E.; Barry, P. S.; Bradford, C. M.; Chapman, S.; Che, G.; Glenn, J.; Hollister, M.; Kovács, A.; LeDuc, H. G.; Mauskopf, P.; McGeehan, R.; McKenney, C. M.; O''Brient, R.; Padin, S.; Reck, T.; Ross, C.; Shiu, C.; Tucker, C. E.; Williamson, R.; Zmuidzinas, J. SuperSpec: development towards a full-scale filter bank. Proceedings of the SPIE, V. 9914, 99143K9. 2016

Location:
Jet Propulsion Laboratory
Pasadena, California

Field of Science: Astrophysics

Opportunity Title: High-Sensitivity Far-IR Detectors
Opportunity Reference Code: 0163-NPP-NOV23-JPL-Astrophys

Advisors:
Matt Bradford
matt.bradford@jpl.nasa.gov
818.726.8622

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/oiir/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.