

**Opportunity Title:** Compact Broad Band mid- Infrared Spectrometers

**Opportunity Reference Code:** 0093-NPP-NOV23-JPL-TechDev

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

**Reference Code** 0093-NPP-NOV23-JPL-TechDev

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

**Description** Ultrasensitive and extremely compact laser based spectrometers/sensors based on broad band Mid-Infrared optical comb generation in Whispery Gallery Mode (WGM) resonators are of interest for application in planetary, earth science and remote sensing applications. We are currently pursuing two efforts in which a postdoctoral researcher could participate. The first is the development of a very compact miniaturized ultrasensitive spectrometer for detection of methane and its isotopes. This will be the first miniaturized and extremely compact instrument based on WGM for detection of methane. It employs Mid-Infrared lasers [1, 2] and a centimeter-sized crystal dielectric WGM resonator [3] for cavity-enhanced absorption detection. The second is the development of an extremely compact spectrometer based on WGM micro optical resonator for both broadband spectral light generation and cavity-enhanced absorption detection. It enables simultaneous detection of multiple molecular species through their (near or mid) infrared absorption characteristics. We are doing proof-of-principle tests to demonstrate the detectivity and sensitivity of the instrument.

Successful candidate will carry out research and develop chemistry, physics and optics necessary for making these instruments in the Quantum Science and Technology Group. Will interact with collaborators at JPL, Caltech and other institutions. Will work in team environment and will contribute to team's effort. Will publish in technical refereed journals and present results in technical conferences.

- 1) K. Mansour, Y. Qiu, C. J. Hill, A. Soibel, R. Q. Yang. (2006) "Mid-infrared Interband cascade lasers at thermoelectric cooler temperatures," Electronics Letters, v 42, n 18, PP1034-6.
- 2) L. Christensen, K. Mansour, R. Yang. (2010) "Thermo-Electrically Cooled Operating Interband Cascade laser for Field Measurement", Opt. Eng. 49, 111119.
- 3) Grudin, I. S., Strekalov, D., Yu, N. (2009) Generation of optical frequency combs with a CaF<sub>2</sub> resonator, Opt. Lett. Vol. 34, 878.

**Location:**

Jet Propulsion Laboratory  
Pasadena, California

**Field of Science:** Technology Development

**Advisors:**

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**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/oiiir/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.