

Opportunity Title: Integrated EOM combs for astronomical calibration

Opportunity Reference Code: 0254-NPP-NOV23-JPL-TechDev

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0254-NPP-NOV23-JPL-TechDev

How to Apply All applications must be submitted in [Zintellect](#)

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

Description Description:

High precision astronomical spectrographs are essential tools in the search for extrasolar planets, as they are needed to detect the minute wavelength shifts in the stellar spectrum due to orbiting planets. These planets induce a weak radial velocity (RV) shift in the host star that provides a powerful method for planet detection and characterization; the RV technique provides information about the exoplanet mass, which is unavailable with the complementary transit photometry technique.

We are intend to develop a platform capable of generating a near infrared ($\sim 1.5 \mu\text{m}$) astrocomb on a chip-scale photonic integrated platform. Such implementation allows efficient, compact, robust and reliable generation of frequency combs for calibration of precision RV observations of exoplanet-hosting stars. The proposed architecture will enable spectrograph calibration at the few cm s^{-1} level required for detecting Earth-mass extra-solar planets. It does this by providing a spectrally broad 'comb' of optical frequencies that are precisely and accurately stabilized through the process of self-referencing. Self-referencing ensures that both the comb's spectral line spacing and the common offset frequency of the spectral lines from the origin are locked to a radio-frequency standard, resulting in a remarkably accurate and stable 'optical ruler'. Furthermore, it will allow seamless and interchangeable application of comb sources to calibration of different spectrographs at different times and make comparisons between different spectrographs feasible. The proposed chip-based platform with its small size, weight and power (SWaP) is suitable for ubiquitous and autonomous application outside the laboratory settings and is amenable to infusion into future flight instruments.

The successful candidate will be involved with design, fabrication and testing of such devices. The candidate should be familiar with standard nanophotonic fabrication techniques and tools and be comfortable working individually and within team.

Field of Science: Technology Development

Advisors:

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Applications with citizens from Designated Countries will not be



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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/oii/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.