

Curriculum Vitae

Contact Information

Ryan McKnight
Graduate Research Assistant, Avionics Engineering Center, Ohio University
Pathways Intern, NASA Goddard Space Flight Center
740-407-9609
ryanmck13@gmail.com
<https://www.ryanmck.net/>

Education and Registration

Engineer Intern (E.I.) License License number: EI.14688	Ohio Board of Engineers and Surveyors
Ph.D. Electrical Engineering and Computer Science <i>In progress, expected graduation December 2024</i> Title of Dissertation: Terrestrial Timing using Radio-Frequency Pulsars	Ohio University
M.S. Electrical Engineering, 2023	Ohio University
B.S. Electrical Engineering, 2019	Ohio University

Research Experience

Involved in various research activities as an undergraduate research assistant (2017-2019) and graduate research assistant (2019-present) at Ohio University, and as a Pathways Intern (2022-present) at NASA Goddard Space Flight Center.

Radio-Frequency Pulsar Navigation and Timing

Use of signals from radio-frequency pulsars as a timing or navigation source. Applications include terrestrial timing resiliency for critical infrastructure (as an alternative to GNSS timing), or navigation for spacecraft in deep space. Involves use of long integration to recover very weak signals from below the noise floor. I am the primary researcher for this project, and it forms the basis of my dissertation work.

GNSS Inter-Constellation Time Offset Estimation from LEO

Estimation of timing offsets between major GNSS constellations including GPS (USA), Galileo (EU), GLONASS (Russia), and Beidou (China) using a CubeSat in low Earth orbit. Successfully developed, launched, and operated the Bobcat-1 CubeSat in support of this work. Applications include enhanced multi-GNSS interoperability, enabling improvement of positioning/timing availability and accuracy for high-altitude or other low-visibility users. Continuing work to include development and operation of a long-term (> 10 years) experiment on board the PHASMA CubeSat mission in collaboration with the Libre Space Foundation (LSF). I am collaborating with Dr. Sabrina Ugazio and fellow graduate students Zachary Arnett and Brian C. Peters for this work.

GNSS Spectrum Monitoring from LEO

Monitoring and identification of instances of GNSS radio-frequency interference from low Earth orbit CubeSat platform. Bobcat-1 mission included basic spectrum monitoring capabilities; enhanced capabilities are currently under development for the PHASMA CubeSat mission. Upcoming work may allow for capability to geolocate interference or identify the interference source. I am collaborating with Dr. Sabrina Ugazio and fellow graduate students Austin McKibben, Brian C. Peters, and Zachary Arnett for this work.

GNSS Navigation at or beyond Lunar Distances

Simulations and case studies of the use of GNSS to navigate spacecraft beyond lunar distances. This involves the use of low-SNR GNSS acquisition and tracking receiver technology and integration of GNSS range and Doppler measurements with orbital navigation filters. I am assisting fellow graduate student Brian C. Peters with this work.

X-Ray Pulsar Navigation and Timing (XNAV)

Research conducted during employment at NASA Goddard Space Flight Center. Estimation of X-Ray pulsar phase and frequency measurements using simulated data and data collected by NICER instrument on-board the International Space Station. Integration of pulsar measurements into orbital navigation filter. I am assisting Dr. Luke Winternitz (NASA GSFC) with this work.

Low SNR GNSS Acquisition using Long Integration

Investigation of various coherent/non-coherent long acquisition techniques to enable the acquisition and tracking of GNSS signals in low-SNR environments, e.g. in the presence of jamming or other interference. I have provided occasional assistance to Dr. Sabrina Ugazio and Dr. Frank van Graas with this work. Worked on flight-ready receiver implementation (NavCube3-mini) at NASA Goddard Space Flight Center.

Teaching Experience

Recipient of a Graduate Assistant in Areas of National Need (GAANN) fellowship for a term covering Spring of 2023 through Spring of 2025. Currently engaged in teaching training as stipulated by the fellowship. Training includes assignments as teaching assistant (TA) and instructor of record for various EECS courses selected in collaboration with the School of EECS, along with workshops and training seminars conducted by the OU Center for Teaching, Learning, and Assessment (CTLA).

Instructor of Record

Ohio University, School of EECS

EE 3223 Electromagnetics and Materials II

Spring 2024

Teaching Assistant

Ohio University, School of EECS

EE 3334 Linear Signals and Systems

Fall 2023

EE 4403/5403 Antenna and Microwave Theory

Spring 2023

EE 3954 Microprocessors and Microcontrollers

Spring 2023

Employment

Pathways Intern

NASA Goddard Space Flight Center

June 2022 – Present

Greenbelt, MD

- Development of flight software and FPGA firmware for NavCube3-mini high-altitude space GNSS receiver platform
- Setup and operation of laboratory testing and verification procedures for NavCube3-mini
- Research involving navigation using X-Ray pulsar phase and frequency measurements (XNAV)

College Intern Technical

Northrop Grumman

May 2020 – August 2020

San Diego, CA

- Operation, troubleshooting, and testing of LN-251 and KN-4074 embedded GPS/INS navigation units
- Laboratory and mobile testing using a replica of aircraft navigation system

Engineering Intern

Athens Technical Specialists

September 2016 – July 2019

Athens, OH

- Printed circuit board (PCB) design and microcontroller firmware development
- Mechanical design and prototyping of custom injection molded enclosures and other parts

Engineering Intern

SPOT Engineering

March 2014 – June 2018

Lancaster, OH

- Design and build industrial control systems for automated machinery using programmable logic controllers (PLCs)
 - Build and repair printed circuit boards (PCBs), microcontroller firmware development
 - Electrical and mechanical drafting
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Scholarships and Awards

IEEE Aerospace and Electronic Systems Society Graduate Engineering Scholarship Recipient, \$10,000, 2023

Russ College Outstanding Senior in Electrical Engineering, \$500, April 2019

Russ College Outstanding Junior in Electrical Engineering, \$250, April 2018

Professional Memberships

Institute of Electrical and Electronics Engineers	Member
IEEE Aerospace and Electronic Systems Society	Member
Institute of Navigation	Member

Publications and Presentations

Copies of these publications can be downloaded from <https://www.ryanmck.net/>

Refereed Conference Papers

- [1] **R. McKnight** and F. van Graas, "Radio-frequency pulsar observation using small-aperture antennas," in *Proceedings of the 2022 International Technical Meeting of The Institute of Navigation*, Long Beach, California, Jan. 2022, pp. 856–866. DOI: 10.33012/2022.18259.
- [2] Z. Arnett, **R. McKnight**, S. Ugazio, and F. van Graas, "Receiver inter-constellation time offset at low Earth orbit: An experiment with Bobcat-1, the Ohio University CubeSat," in *Proceedings of the 2022 International Technical Meeting of The Institute of Navigation*, Long Beach, California, Jan. 2022, pp. 844–855. DOI: 10.33012/2022.18176.
- [3] S. Ugazio, B. C. Peters, K. Croissant, G. Jenkins, **R. McKnight**, and F. van Graas, "GNSS inter-system time-offset estimates and impact on high altitude SSV," in *Proceedings of the 2020 International Technical Meeting of The Institute of Navigation*, San Diego, California, Sep. 2020, pp. 320–330. DOI: 10.33012/2020.17146.

Non-Refereed Conference Papers

- [1] **R. McKnight**, B. C. Peters, Z. Arnett, and S. Ugazio, "Analysis of small-aperture radio-frequency pulsar data," in *Proceedings of the 2024 International Technical Meeting of the Institute of Navigation*, Long Beach, California, Jan. 2024, pp. 770–777. DOI: 10.33012/2024.19494.
- [2] B. C. Peters, **R. McKnight**, Z. Arnett, S. Ugazio, and M. Braasch, "Exploring the use of GNSS beyond the moon," in *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023)*, Denver, Colorado, Sep. 2023, pp. 1530–1543. DOI: 10.33012/2023.19386.
- [3] Z. Arnett, B. C. Peters, **R. McKnight**, and S. Ugazio, "Characterization of multi-GNSS receiver biases and their temperature-induced variations in low Earth orbit," in *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023)*, Denver, Colorado, Sep. 2023, pp. 1460–1473. DOI: 10.33012/2023.19360.
- [4] A. McKibben, **R. McKnight**, B. C. Peters, Z. Arnett, and S. Ugazio, "Interference effects on a multi-GNSS receiver on board a CubeSat in LEO," in *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023)*, Denver, Colorado, Sep. 2023, pp. 1245–1258. DOI: 10.33012/2023.19247.

- [5] S. Ugazio, Z. Arnett, **R. McKnight**, and B. C. Peters, “Receiver-specific GNSS inter-system bias in low Earth orbit,” in *Proceedings of the 2023 International Technical Meeting of The Institute of Navigation*, Long Beach, California, Jan. 2023, pp. 831–843. DOI: 10.33012/2023.18678.
- [6] **R. McKnight**, Z. Arnett, B. C. Peters, and S. Ugazio, “Performance characterization for a small-aperture radio-frequency pulsar experiment,” in *Proceedings of the 35th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2022)*, Denver, Colorado, Sep. 2022, pp. 1933–1941. DOI: 10.33012/2022.18543.
- [7] K. Croissant, G. Jenkins, **R. McKnight**, B. C. Peters, S. Ugazio, and F. van Graas, “Bobcat-1, the Ohio University CubeSat: Preliminary data analysis,” in *Proceedings of the 2021 International Technical Meeting of The Institute of Navigation*, Jan. 2021, pp. 625–636. DOI: 10.33012/2021.17854.
- [8] K. Croissant, G. Jenkins, **R. McKnight**, B. C. Peters, S. Ugazio, and F. van Graas, “Design and mission planning of Bobcat-1, the Ohio University CubeSat,” in *Proceedings of the 33rd International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS+ 2020)*, Sep. 2020, pp. 1383–1393. DOI: 10.33012/2020.17649.

Non-Refereed Magazine Articles

- [1] S. Ugazio, Z. Arnett, B. C. Peters, **R. McKnight**, and A. McKibben, “GNSS timing measurements from a low Earth orbiting satellite,” *GPS World Magazine*, vol. 35, no. 2, pp. 36–41, Feb. 2024.

Invited Presentations

1. “Navigation and Timing using Radio-Frequency Pulsars”, Institute of Navigation, Dayton Section Luncheon, Dayton, Ohio, 15 Feb 2024.