

# Mykhaylo Shumko

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msshumko@gmail.com

mshumko.github.io

## EDUCATION

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### Montana State University

*August 2014 - April 2020*

Masters in Physics

*Awarded in May 2016*

Ph.D. in Physics

*Awarded in December 2019*

Dissertation topic: Connecting Microburst Precipitation to Its Scattering Mechanism

[mshumko.github.io/files/shumko\\_dissertation.pdf](https://mshumko.github.io/files/shumko_dissertation.pdf)

### University of California, Santa Cruz

*September 2010 - June 2014*

B.S. in Astrophysics.

Thesis topic: Dynamic studies of punch thorough protection of silicon strip detectors with laser-based charge injection system.

[mshumko.github.io/files/shumko\\_thesis.pdf](https://mshumko.github.io/files/shumko_thesis.pdf)

## EXPERIENCE

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### Space Sciences and Engineering Laboratory

*September 2014 - April 2020*

*Graduate Research Assistant and Postdoctoral researcher*

*Bozeman, MT*

- Operate the FIREBIRD-II CubeSats and developed the data pipeline to automatically process and upload new data to the internet within 24 hours. Data is located at <http://solar.physics.montana.edu/FIREBIRD-II>
- Organized and led a Particle Precipitation Workshop at University of New Hampshire, April 17th-18th, 2019
- Use Two Line Elements to generate ephemeris and IRBEM-Lib to generate magnetic ephemeris
- Developed a conjunction toolkit, a software package for calculating magnetic conjunctions between spacecraft. Lists of past conjunctions are used for analysis, and future conjunctions to prioritize FIREBIRD-II data downloads
- Created a detection algorithm to identify transient and spatial features observed by the AeroCube-6 multi-spacecraft CubeSat mission
- Developed a Python wrapper for IRBEM-Lib  
<https://sourceforge.net/p/irbem/code/HEAD/tree/trunk/python/>
- Created a database of microbursts observed with the FIREBIRD-II CubeSats, detected using a wavelet filtering and reconstruction
- Advised REU and undergraduate students
- Programmed a Long Range LoRa Arduino software-defined radio to transmit data from remote locations
- Earned a Technician Class ham radio license
- Co-director of the Rocky Mountain Data Science Club <https://rmds.tech/>

### Los Alamos National Laboratory

*June - July 2018*

*Summer student*

*Los Alamos, NM*

- Performed a sensitivity analysis of the Magnetic Electron Ion Spectrometer on the Van Allen Probes
- Developed a forward model to convert a flux energy spectra to count rates observed by the Magnetic Electron Ion Spectrometer and optimized the model parameters using a Markov chain Monte Carlo sampler

**The Aerospace Corporation**  
*Graduate Intern*

May - August 2017  
*El Segundo, CA*

- Analyzed a microburst observed by the Van Allen Probes and used resonant diffusion theory to conclude that the electron transport is not consistent with particle transport along single-wave characteristics (diffusion curves for monochromatic waves)
- Estimated the magnetic field model footprint error for a variety of magnetic field models with IRBEM-Lib

**Santa Cruz Institute for Particle Physics**  
*Student Researcher*

September 2012 - August 2014  
*Santa Cruz, CA*

- Tested Punch-Through Protection resistance and safe operating voltage of Low Resistance silicon strip detectors in silicon sensor Laboratory using DC voltage sweep
- Performed laser injection studies on the ATLAS strip detectors to determine sensor tolerance to large injected charges from beam losses. Used ROOT, a C++ interpreter, to process measured waveforms

**Big Bear Solar Observatory**  
*Programmer & Researcher*

Summers of 2011, 2012, and 2013  
*Big Bear, CA*

- Analysed the performance of the PCO-EDGE Camera using IDL software to quantify non-linearity in intensity, readout noise and gain with a photon transfer curve, and fixed-pattern noise by image inspection

## PUBLICATIONS

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- Author, Electron Microburst Size Distribution Derived with AeroCube-6, submitted to Journal of Geophysical Research, November 2019
- Co-author, The FIREBIRD-II CubeSat Mission (Focused Investigations of Relativistic Electron Burst Intensity, Range, and Dynamics), submitted to Review of Scientific Instruments, November 2019
- Co-author, Direct Observation of Sub-Relativistic Electron Precipitation Driven by EMIC Waves, published in Geophysical Research Letters, November 2019 (DOI: 10.1029/2019GL084202)
- Author, Evidence of Microbursts Observed Near the Equatorial Plane in the Outer Van Allen Radiation Belt, published in Geophysical Research Letters, July 2018 (DOI: 10.1029/2018GL078451)
- Author, Microburst Scale Size Derived from a Bouncing Packet Microburst Simultaneously Observed with the FIREBIRD-II CubeSats, published in Geophysical Research Letters, July 2018 (DOI: 10.1029/2018GL078925)
- Co-author, Observations directly linking relativistic electron microbursts to whistler mode chorus: Van Allen Probes and FIREBIRD II, published in Geophysical Research Letters, November 2017 (DOI: 10.1002/2017GL075001)
- Co-Author, Low-Resistance Strip Sensors for Beam-Loss Event Protection, published in November 2014. (DOI: 10.1016/j.nima.2014.05.089)

## AWARDS

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- NASA Earth and Space Sciences Fellowship, 2018, 2019
- Vela Fellowship, 2018
- The Best Inner Magnetosphere Poster, GEM Workshop, 2016
- Montana Space Grant Consortium Fellowship, 2015 - 2016
- NASA EPSCoR Travel Grant, 2015

## CONFERENCES, MEETINGS, AND WORKSHOPS

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- Poster presenter, AGU Fall Meeting, Dec 2019

- Invited focus group talk and poster presenter, GEM workshop, June 2019
- Poster presenter, AGU Fall Meeting, Dec 2018
- Executive Secretary, NASA Review Panel, 2014, 2018
- Gave a student tutorial, focus group speaker, and poster presenter, GEM workshop, June 2018
- Speaker, AGU Fall Meeting, Dec 2017
- Speaker, Relativity and Astrophysics Seminar, MSU, Sept 2017
- Invited speaker, Space Sciences Lab, UC Berkeley, Aug 2017
- Gave a student tutorial, focus group speaker, and poster presenter, GEM workshop, June 2017
- Poster presenter, AGU Fall Meeting, Dec 2016
- Student, CISM Space Weather Summer School, July 2016
- Poster presenter, GEM Workshop, June 2016
- Speaker, MSGC Research Symposium, April 2016
- Speaker, Van Allen Probe ECT Teem Meeting, September 2015
- Poster presenter, CEDAR Workshop, June 2015

## TEACHING EXPERIENCE

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- Teaching Assistant, Physics 220, Intro to Physics I (w/ calculus), Spring 2016
- Instructor, Physics 201, Physics by Inquiry, Fall 2015
- Teaching Assistant, Physics 207, Intro to Physics II, Spring 2015, Summer 2015
- Teaching Assistant, Physics 205, Intro to Physics I, Fall 2014

## TECHNICAL STRENGTHS

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<b>Computer Languages</b>	Python, C and Assembly
<b>Protocols</b>	git, SSH and Samba Share
<b>Tools</b>	LaTeX, Visual Studio Code, Inkscape, Windows Subsystem for Linux
<b>Languages</b>	English and Russian

## OTHER EMPLOYMENT EXPERIENCE

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- Student Manager, UC Santa Cruz Cowell/Stevenson Dining Hall. September 2010 - May 2014
- Bike Mechanic, UC Santa Cruz Bike Maintenance Clinic. April 2012 - June 2014