Kristina V. Collins

Glennan 9A,
10900 Euclid Avenue
Cleveland, Ohio 44106

216.536.2180
kvc2@case.edu

Current Position

NSF Office of Polar Programs Postdoctoral Research Fellow
Space Science Institute

Education

2022	PhD, Electrical Engineering, Case Western Reserve University
2019	Master of Science, Electrical Engineering, Case Western Reserve University
2019	Bachelor of Science, Electrical Engineering, Case Western Reserve University Minor, English

Research Areas

Communications engineering, distributed instrumentation, robotics, space systems, citizen science and education

Research Grants as PI or Co-PI

2025-2028	NSF 2432824 Collaborative Research: DASI Track 2: Deployment and Operations of the Ham Radio Science Citizen Investigation (HamSCI) Personal Space Weather Station Network
2023-2024	NSF 2218996 OPP-PRF: Conjugate Experiment to Explore Magnetospheric Phenomena Via Spatial Sonification and Mixed Reality

Ongoing Research Projects

2019 —	Low-Cost Personal Space Weather Station *An NSF-funded project to develop a small, citizen scientist-operated multi-instrument system that can make ground-based measurements of the space environment, via measurement of time standard stations and other signals of opportunity.*
2021	NIST WWV/H Scientific Modulation Working Group *Leadership of a 20-person working group to increase the scientific utility of WWV and WWVH, the time standard stations of the National Institute of Standards and Technology. Working group membership includes NIST management and station engineers, as well as external geospace scientists. Details at* `www.hamsci.org/wwv`.
2020 —	HamSCI Eclipse Festivals of Frequency Measurement *Conceived and conducted international crowdsourced science campaigns to prototype systems and techniques for the PSWS. Participation of over 100 volunteers from 45 countries. Ongoing effort.*

Professional and Research Experience

2019	Mesoscale Science Lab, CWRU Materials Science & Engineering Dept. *Under Dr. Jennifer Carter, built data acquisition system for creep frames to enable material stress tests. Developed documentation in collaboration with NASA staff under Dr. Cheryl Bowman.*
2019	Functional Electrostimulation Center, Cleveland VA Hospital *Repaired robotic arm used in robot teleoperation technology demonstration for the Human Fusions Institute.*
2015—2018	Summer Intern, NASA Glenn Research Center *Under Dr. Bob Romanofsky, Dr. Daniel Raible and Mr. Alan Hylton, conducted avionics research in support of the Integrated Radio and Optical Communication (iROC) project. Supported development of doped SiC with RF-transparency at 32 GHz, tested electronic beam steering for space-based laser communication, conducted validation of hardware prototype for precision pointing, and collaborated on analysis of kinematic singularities in partial failure case of parallel robotic pointing platform.*
2012—2016	think[box] Teaching Assistant *Under Mr. Ian Charnas, supported the development of CWRU's premier makerspace and transition from basement room to 50,000+ square foot space. Participated in early ideation and construction stage, specified and procured approximately $20,000 in hardware for electronics lab, maintained and documented equipment, and assisted users from the university community and the public in a customer-facing position.*
2015	Medical Robotics and Computer Integrated Surgery (MeRCIS) Lab, CWRU Electrical Engineering & Computer Science Dept. *Under Dr. Cenk Cavusoglu and Dr. Russell Jackson, developed image segmentation code to facilitate camera-based feedback control of MRI-actuated steerable catheter system.*
2013	EE Co-Op, Philips Healthcare *In the Gantry/Couch/X-Ray Division, conducted module testing for CT scanners, supported RoHS compliance for medical equipment, conducted failure analysis, and assisted in testing of PET/CT alpha unit. Participated in CT physics reading group.*
2011	ASM Materials Education Foundation *Supported ASM Materials Camp, a program of summer camps for high school students and teachers. Chaperoned flagship high school camp. Remotely facilitated 50 teachers' camps at universities across the United States.*

Honors and Awards

2022	Runner-Up, AGU Michael H. Freilich Student Visualization Competition
2022	Induction into the Order of the Engineer, Link 1
2022	Finalist, K. Patricia Cross Future Leaders Award
2021	Induction into the Luxuriant Flowing Hair Club For Scientists
2021	Ruth Barber Moon Award, CWRU School of Graduate Studies
2021	CWRU University Media Board Design of the Year: Film Society Poster Gallery
2014	Electrical Engineering Service Award
2010	National Merit Scholar

Additional Grants and Fundraising

May 2021	$81,793 from the Amateur Radio Digital Communications foundation to support antenna farm replacement at CWRU
April 2021	$23,861 in small donations to start CWRU Film Society endowment fund
July 2020	∼$8000 from the University Media Board, Putnam Collection and Strosacker Family Foundation to support construction of the CWRU Film Society poster gallery

Publications

ORCID: 0000-0002-3816-1948

Dissertation

2022 Kristina V. Collins. "Development of a Scalable, Low-Cost Meta-Instrument for Distributed Observations of Ionospheric Variability". Dissertation. 2022. URL: `http://rave.ohiolink.edu/etdc/view?acc_num=case1670685416402421`

Graduate Thesis

2019 Kristina V. Collins. "Towards a Canfield Joint for Deep Space Optical Communication". MS thesis. Case Western Reserve University School of Graduate Studies, 2019. URL: `http://rave.ohiolink.edu/etdc/view?acc%5C_num=case1536104606070327`

Preprints and Articles Under Review

Nathaniel Anthony Frissell et al. "Heliophysics and Amateur Radio: Citizen Science Collaborations for Atmospheric, Ionospheric, and Space Physics Research and Operations". In: *Frontiers in Astronomy and Space Sciences* (). In press.

2021 Christian Bueno et al. *A Geometric Approach to the Kinematics of the Canfield Joint*. 2021. arXiv: `2105.05955 [cs.RO]`

Journal Publications

Nathaniel Anthony Frissell et al. "Heliophysics and Amateur Radio: Citizen Science Collaborations for Atmospheric, Ionospheric, and Space Physics Research and Operations". In: *Frontiers in Astronomy and Space Sciences* (). In press.

2023 Kristina Collins et al. "Crowdsourced Doppler measurements of time standard stations demonstrating ionospheric variability". In: *Earth System Science Data* 15.3 (Mar. 2023), pp. 1403–1418. DOI: 10.5194/essd-15-1403-2023. URL: https://doi.org/10.5194/essd-15-1403-2023

2022 John Gibbons et al. "Grape Version 1: First Prototype of the Low-Cost Personal Space Weather Station Receiver". In: *HardwareX* (Mar. 2022), e00289. DOI: 10.1016/j.ohx.2022.e00289. URL: https://doi.org/10.1016/j.ohx.2022.e00289

2022 Kristina Collins, Daniel Raible, and Laura Burke. "Development and Validation of a Canfield Joint as a Precision Pointing System for Deep Space Instrumentation". In: *IEEE Aerospace and Electronic Systems Magazine* (2022), pp. 1–1. DOI: 10.1109/MAES.2022.3159237

2021 K. Collins et al. "Citizen Scientists Conduct Distributed Doppler Measurement for Ionospheric Remote Sensing". In: *IEEE Geoscience and Remote Sensing Letters* (2021), pp. 1–1. DOI: 10.1109/LGRS.2021.3063361

Conference Publications

2021 Nathaniel A. Frissell et al. *HamSCI Personal Space Weather: Architecture and Applications to Radio Astronomy*. Virtual: Society of Amateur Radio Astronomers (SARA), July 2021. URL: https://rasdr.org/store/books/books/journals/proceedings-of-annual-conference

2019 G. Clark et al. "Testing a Neural Network Accelerator on a High-Altitude Balloon". In: *2019 IEEE Cognitive Communications for Aerospace Applications Workshop (CCAAW)*. 2019, pp. 1–8. DOI: 10.1109/CCAAW.2019.8904886

2017 J. Krieger, K. Collins, and C. Mercer. "Leveraging Academic Maker and Biohacker Spaces to Drive Innovation in Cultured Meat Research". In: *International Symposium on Academic Makerspaces*. 2017, p. 78

2017 K. Collins et al. "Radio Sloyd: An amateur radio approach to a University-level critical thinking and writing class". In: *2017 IEEE Integrated STEM Education Conference (ISEC)*. 2017, pp. 143–149. DOI: 10.1109/ISECon.2017.7910230

Posters

2023 Kristina Collins et al. *Doppler Flash Observations Via HamSCI Personal Space Weather Station Network*. San Francisco, CA, Dec. 2023

2023 Kristina Collins and Michael Hartinger. *Analysis of Magnetosheath Jets and Pc5/Pc6 Geomagnetic Pulsations Via Interhemispheric Comparison of Polar Ground Magnetometers*. San Francisco, CA, Dec. 2023

2023 Kristina Collins. *Toward Exploring the Magnetosphere With Sonification, Mixed Reality, and VR*. Presented remotely. San Diego, CA, June 2023

2022 Kristina Collins et al. *Crowdsourced Doppler Measurements of Time Standard Stations Demonstrating Ionospheric Variability (Poster)*. Dec. 2022. DOI: 10.5281/zenodo.7588140. URL: https://doi.org/10.5281/zenodo.7588140

2021 *December 2020 Eclipse Festival Analysis*. Scranton, PA (Virtual): HamSCI, Mar. 2021. URL: https://hamsci2021-uscranton.ipostersessions.com/?s=24-20-1F-16-09-FF-74-70-E0-78-1D-88-6D-21-D5-3F

2021 *Data Collection from WWV, WWVH, and WWVB: A Histoanatomy of NIST's Radio Beacon Transmissions*. Mar. 2021. URL: https://hamsci2021-uscranton.ipostersessions.com/?s=65-9B-EB-D7-81-ED-65-2D-38-C6-5F-CB-F3-ED-B2-B0

2021 *W8EDU: Case Amateur Radio Club from 2010 to 2021*. Scranton, PA (Virtual): HamSCI, Mar. 2021. URL: https://hamsci2021-uscranton.ipostersessions.com/?s=B5-39-13-BC-26-3A-2E-F1-35-30-97-99-27-96-4D-CD

2020 K. Collins, A. Montare, and D. Kazdan. "The June 2020 Eclipse Festival of Frequency Measurement". In: *AGU Fall Meeting Abstracts*. Vol. 2020. Dec. 2020, SY014–0005

2019 C. Bueno. "The Configuration Space and Kinematics of the Canfield Joint". 2019. Poster presented at SIAM Conference on Applied Algebraic Geometry, Bern, Switzerland

2019 Kristina Collins et al. "A Low-Cost Citizen Science HF Doppler Receiver for Measuring Ionospheric Variability". In: *American Geophysical Union Fall Meeting*. American Geophysical Union. San Francisco, CA: American Geophysical Union, Dec. 2019. URL: https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/602677

Non-Academic Publications

2021 K. Collins, D. Kazdan, and N. Frissell. *Ham Radio Forms a Planet-Sized Space Weather Sensor Network - Eos*. Reprinted in *QST Magazine* and elsewhere. 2021. URL: https://doi.org/10.1029/2021EO154389

2017 K. Collins. "The Last Word: Sloyd". In: *Case Alumnus* 28.2 (2017). Winter 2017 issue., p. 28. URL: http://digital.watkinsprinting.com/publication/index.php?m=24283&i=382632&p=1&pre=1&ver=html5

Invited Talks and Interviews

20 Sept 2024	GNU Radio Con Keynote *The Lion in the Path: Amateur Radio Science and GNU Radio*
19 January 2023	University of Michigan Amateur Radio Club, W8UM *Grape, Tangerine & Solar Eclipse Radio Project*
16 December 2021	AGU Fall Meeting, December 2021, New Orleans LA *Prospects for Ionospheric Model Validation Using Citizen Science Datasets*
4 December 2021	South African Radio League *Ionospheric Meta-Instrumentation*
4 November 2021	Ham Talk Live! Podcast *The Antarctic Eclipse Festival*
21 October 2021	Potomac Geophysical Society *Ionospheric Remote Sensing via Distributed Citizen Science Measurements*
21 Sept 2021	CWRU Hacker Society *Introduction to Academic Publishing and LaTeX*
10 August 2021	Madison DX Club *WWV and the Low-Cost Personal Space Weather Station*
11 March 2021	ARRL Eclectic Tech Podcast *Personal Space Weather Station*
9 January 2019	MIT Radio Society IAP Lecture Series, Cambridge MA *Baba Yaga's Hut: A Laboratory Experience in Signal Modulation and Phasor Analysis*

7 March 2018 Cleveland Technical Societies Council Honor Junior Speaker
The Lion in the Path

Conference Presentations

2023 *The potential of HamSCI Doppler Observations for inferring Solar Flare Effects on the Ionosphere*. Scranton, PA: HamSCI, Mar. 2023

2022 *Crowdsourced Doppler Measurements of Time Standard Stations Demonstrating Ionospheric Variability*. Charlotte, NC: Tucscon Amateur Packet Radio Network, Sept. 2022

2022 *WWV/H Scientific Modulation Working Group: Designing for Citizen Science*. Huntsville, AL: HamSCI, Mar. 2022

2021 *The Antarctic Eclipse and 3D Mapping Challenges*. Virtual: 3C GIS Day, Nov. 2021

2021 *WWV Scientific Modulation Working Group: Progress Report*. Virtual: ARRL-TAPR Digital Communications Conference, Sept. 2021. URL: `https://youtu.be/O3Q7LOTNGtk`

2021 *June 2021 Eclipse Festival Preliminary Results*. Virtual: Coupling, Energetics and Dynamics in Atmospheric Regions (CEDAR) Workshop, June 2021. URL: `http://cedarweb.vsp.ucar.edu/wiki/index.php/2021_Workshop:2021_Eclipses`

2021 *PSWS Grape Hardware: Version 1.0 and Pilot Experiments*. Scranton, PA (Virtual): HamSCI, Mar. 2021

2020 *The Elephant in the Sky: Early Results of Festival of Frequency Measurement Experiment and June 21, 2020 Asian Eclipse*. Virtual: ARRL-TAPR, Sept. 2020. URL: `https://www.youtube.com/watch?v=n9p0FpZkxE4`

2020 K. Collins, D. Kazdan, and J. Gibbons. "Update on the Low-Cost Personal Space Weather Station". In: *HamSCI Workshop 2020*. HamSCI. Scranton, PA: HamSCI, Mar. 2020

2019 *The Lion in the (Propagation) Path*. Detroit: ARRL-TAPR, Sept. 2019

2018 *Baba Yaga's Hut*. Newark, New Jersey: HamSCI Workshop, Mar. 2018

White Papers

2022 Nathaniel A. Frissell et al. "Amateur Radio: An Integral Tool for Atmospheric, Ionospheric, and Space Physics Research and Operations". In: *White Paper Submitted to the National Academy of Sciences Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033* (2022)

2022 Nathaniel A. Frissell et al. "Fostering Collaborations with the Amateur Radio Community". In: *White Paper Submitted to the National Academy of Sciences Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033* (2022)

Courses Taught
Courses marked with † were co-taught with Dr. David Kazdan.

Spring 2016, Fall 2016, Spring 2017

Enrollment: 17

USSO 290Y: Shrinking the World: Ham Radio and Distance Communication†:
Radio operators can talk to each other across the world, launch and use space satellite stations, and bounce their voices off the moon. And yet the Federal Communications Commission still regulates what they may say on the air. Why is that? And why does amateur radio require a license? In this course, we'll discuss the history of long-distance communication methods stretching from the British Penny Post into the modern digital age, viewed particularly through the lens of the Amateur Radio Service. We will also explore the ways that advances in communication technology have changed politics, entertainment and personal interactions. Who makes the rules for a new system of communication? What causes changes in those rules? Was Orson Welles morally, ethically, or legally responsible for causing a mass panic with his reading of "War of the Worlds?" What might the future hold for communications? Students will earn amateur radio licenses, make contacts with other radio amateurs around the world and with each other, and possibly bounce signals off the moon and listen for their return. We will also look at the ham radio culture, from QSL cards to public service and contesting. Students will learn some basic hands-on electronics, but no previous technical background is required.

Spring 2017

Enrollment: 10

EECS 397/600 – Introduction to RADAR†:
Basic aspects of history of radar and of modern radar systems, with laboratory work. Topics will include radar cross section, noise, modulation, the radar range equation, waveform design, pulse compression, detection, antennas, propagation, synthetic aperture radar, and miscellaneous general topics. Comparisons with acoustic ranging SONAR will be made. Laboratory exercises will include passive radar demonstration using amateur radio equipment, acoustic ranging, and small-team construction of synthetic aperture radar system capable of sensing range, doppler, and synthetic aperture radar imaging.

Spring 2018

Enrollment: 50

EECS 351: Communications and Signal Analysis†:
Fourier transform analysis and sampling of signals. AM, FM and SSB modulation and other modulation methods such as pulse code, delta, pulse position, PSK and FSK. Detection, multiplexing, performance evaluation in terms of signal-to-noise ratio and bandwidth requirements.

Spring 2020, Spring 2021, Spring 2022

Enrollment: 75 (approx.)

ECSE 309: Electromagnetic Fields I† :
Maxwell's integral and differential equations, boundary conditions, constitutive relations, energy conservation and Poynting vector, wave equation, plane waves, propagating waves and transmission lines, characteristic impedance, reflection coefficient and standing wave ratio, in-depth analysis of coaxial and strip lines, electro- and magneto-quasistatics, simple boundary value problems, correspondence between fields and circuit concepts, energy and forces. Prereq: PHYS 122 or PHYS 124. Prereq or Coreq: MATH 224.

Service and Professional Activities

Conference Organizing

2024	HamSCI Workshop Local Organizing Committee
2022	HamSCI Workshop Technical Committee
2021	Primary Session Convener, "The MacGyver Session: The Place for Novel, Exciting, Self-Made, Hacked, or Improved Sensors and Software Solutions to Understand Space Weather", AGU Fall Meeting 2021, New Orleans.
2021	Session Convener, "Geospace System Response During Solar Eclipses," AGU Fall Meeting 2021, New Orleans.
2021	HamSCI Workshop Technical Committee
2020	Primary Session Convener, "Amateur Radio in Geophysics with HamSCI," AGU Fall Meeting 2020, Virtual.
2019	HamSCI Workshop Local Organizing Committee Chair

Workshop Attendance

2021	Incoherent Scatter Radar Workshop, Virtual
2021	High Performance Computing Cluster Introduction, CWRU, Virtual
2019	Space Generations Workshop Delegate, SGC 2019, Washington DC
2019	AMSAT Space Symposium, Arlington, VA
2019	Cubesat Development Workshop, San Luis Obispo, CA
2016	RF Boot Camp, IEEE Microwave Symposium, San Francisco, CA

Senior Project Mentorship

Spring 2024	April 2024 Solar Eclipse Data Collection *Adam Goodman, Laura Schwartz, Maris Usis*
Fall 2021	December 2020 Solar Eclipse Data Analysis (cont'd) *Michael Ritchey, Richard Chen, Rachel Hopey*
Fall 2021	Magnetic Loop Antenna for Personal Space Weather Station *Bryanne Lewis*
Fall 2021	Balloonsat Communication System *Brian Anderson, Harry Grubman, Maxwell Bauer*
Fall 2021	SNASH Nimbly Archives Sound Headers (Cross-Platform WAV Recorder) *Zachary Kadish, Martin Bui, Daniel Warner, Shivvanandh Mohan*
Spring 2021	RadioJOVE Installation at Squire Valleevue Farm *Skylar Dannhoff, Tyler Kovach, Jared May*
Spring 2021	December 2020 Solar Eclipse Data Analysis *David Casente, Joanna Elia, Marius Mereckis*

Fall 2020	WSPR Buoy Design for Ionospheric Sensing *Lydia Sgouros, Mylee Rolock, Anthony Istfan*

Other Course Facilitation

Fall 2024	EMAE 360 Introduction to LaTeX
Fall 2019	Civil Engineering Survey of Squire Valleevue Farm

Campus Activities

2010 —	CWRU Amateur Radio Club
2011 —	CWRU Film Society

Skills

MATLAB, LaTeX, Python

Professional Societies

American Geophysical Union, Life Member

Volunteer Work

2012—	Amateur Radio Volunteer Examiner
2024—	Web design, GIS mapping and community science work for UNDIVIDED Cleveland, a grassroots organization dedicated to eliminating childhood lead poisoning.
2022—	Hessler Neighborhood Association Board: Community support and historic preservation of Cleveland's first Historic District. Chaired tree planting committee, identified vendor for wood block replacement on Hessler Court, supported 2023 Hessler Folk Fest with Northeast Ohio Musical Heritage Association.
2017	Repair of automatic hourly tolling system for bells at the McGaffin Carillon, Church of the Covenant, Cleveland OH
2014 — 2015	Women in Science and Engineering Peer Mentor
2013 — 2016	Beaumont School, Volunteer Circuits Instructor

Licenses and Certifications

Ohio NCEES Engineering Intern - completed FE Exam
Amateur Extra, callsign KD8OXT
Marine Radio Operator Permit
General Radiotelephone Operator License, Ship Radar Endorsement
PADI Advanced Open Water SCUBA Certification