

Learn More About the HamSCI Personal Space Weather Station



Grape WSPR RX888

HamSCI encourages you to get involved in our Personal Space Weather project. HamSCI utilizes multiple different types of measurement tools, including:

GRAPE = **G**reat **R**adio **A**mateur **P**ropagation **E**xperiment, GPS disciplined frequency measurements of standard time signal stations, such as WWV, WWVH and CHU.

WSPR = **W**eam **S**ignal **P**ropagation **R**eporter, a method of transmitting and receiving digital signals, uniquely suited to the study of radio wave propagation. Software can be downloaded at (wsjt.sourceforge.io).



To learn more about our Personal Space Weather Station, please visit the HamSCI web page.



hamsci.org

Welcome To the Q1 2025 Edition of the HamSCI NEWSLETTER!



VY 73 de Nathaniel W2NAF

NASA's Heliophysics Big Year, which took place from October 14, 2023, to December 24, 2024, and included HamSCI's Festivals of Eclipse Ionospheric Science, is the perfect launching point into our own HamSCI's Big Year in 2025. The solar eclipses may now be behind us, but HamSCI's work is as exciting as ever!

These eclipses gave us the impetus to launch our Personal Space Weather Station network and show that we could successfully engage the global amateur radio community in coordinated, large-scale experiments to study the ionosphere and radio propagation.

We now have a treasure trove of observations currently being analyzed by our HamSCI members, and new ideas to carry us through to future studies of space weather and radio science. During this HamSCI's Big Year, we will see continued expansion of the Personal Space Weather Station network and the development of new experimental campaigns.

Already this year, Dr. Michael Hartje DK5HH brought a new PSWS WSPRDaemon receiver online at the German Neumayer Antarctic station, and McKenzie Denton KO4GLN is making excellent headway planning a new HamSCI Meteor Scatter QSO Party.

HamSCI members from around the globe will gather in March at the New Jersey Institute of Technology in Newark, New Jersey, for the 8th annual HamSCI Workshop. In April, HamSCI will team up with the ARRL and SciStarter to celebrate World Amateur Radio Day and Citizen Science month, helping to generate One Million Acts of Science and promote awareness of amateur radio.

This issue of the HamSCI newsletter features these activities and many of the people who make HamSCI work.

I hope you can join us in celebrating HamSCI's Big Year!

— Dr. Nathaniel Frissell, Ph.D.

2025 HamSCI WORKSHOP

By Gareth Perry KD2SAK



The 8th annual HamSCI Workshop is upon us! Join us at the New Jersey Institute of Technology (NJIT) in Newark, New Jersey, on March 14-15, 2025. We're excited to welcome you to this fast-growing meeting. Organizers have worked hard to put together a memorable two-day event.

This year's theme, "HamSCI's Big Year," celebrates the community's achievements, including the Festivals of Eclipse Ionospheric Science (FoEIS) during the 2023 annular and 2024 total solar eclipses. The workshop features nearly 50 poster and oral presentations, four HamSCI tutorials, and a keynote address by ARRL's Bob Inderbitzen (NQ1R) at the HamSCI Banquet on Friday, March 14

Find travel, hotel, and registration details at hamsci.org/hamsci2025. The workshop is generously supported by Amateur Radio Digital Communications (ARDC).

AND... IF YOU'RE READING THIS AT THE CONFERENCE—WELCOME!!



HamSCI IN THE NEWS ▶▶▶▶▶

Grant will Help Young Amateur Radio Operators Become Contesters. A grant from the Frankford Radio Club supports the W3USR station efforts. (ARRL)



Scranton University students and faculty member at a DXing contest: Left to right, Rebecca Potter KE2EBI, Dr. Christine Zakzewski KE2FDW, Nina Tormann, Gerard Piccini KD2ZHK, Owen Ruzanski KD3ALD, & Matthew Eble KB3VAV.

Find the feature online at: arrl.org/news/grant-will-help-young-amateur-radio-operators-become-contesters

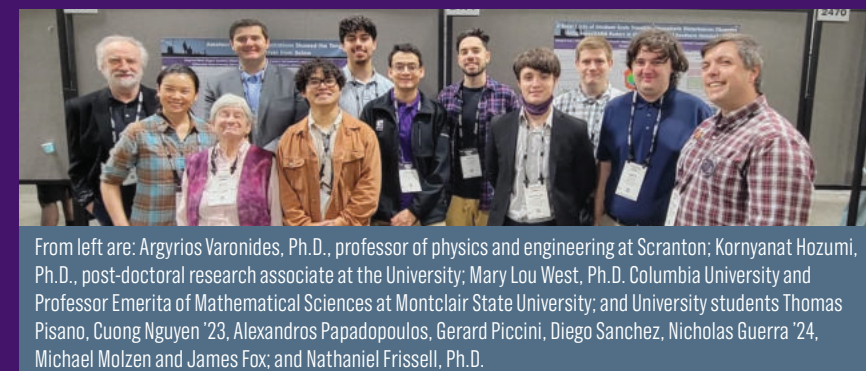


Podcaster Kevin Thomas

McKenzie K04GLN on Ham Radio and Beyond Podcast

HamSCI Collegiate Contributor McKenzie Denton (K04GLN) Featured on Recent Episode of Ham Radio and Beyond Podcast, "Young Leader, Bright Future."

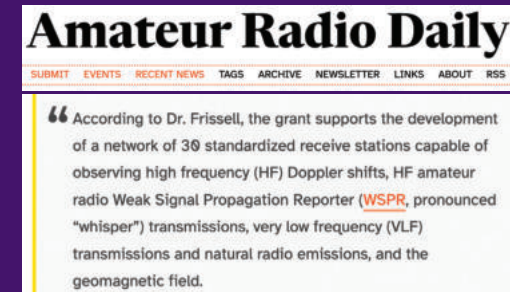
Find the podcast online at: youtube.com/watch?v=WM9wR7wbUpE&t=29s



From left are: Argyrios Varonides, Ph.D., professor of physics and engineering at Scranton; Korynanat Hozumi, Ph.D., post-doctoral research associate at the University; Mary Lou West, Ph.D. Columbia University and Professor Emerita of Mathematical Sciences at Montclair State University; and University students Thomas Pisano, Cuong Nguyen '23, Alexandros Papadopoulos, Gerard Piccini, Diego Sanchez, Nicholas Guerra '24, Michael Molzen and James Fox; and Nathaniel Frissell, Ph.D.

Students and Faculty Present Space Physics Research.

Find the Royal News feature at: news.scranton.edu/articles/2024/12/news-student-physics-dec-american-geophysical.shtml



HamSCI Program Gets Boost from \$1.8 Million National Science Foundation Grant.

Find the feature online at: daily.hamweekly.com/2024/10/hamsci-receives-grant-to-continue-ionosphere-study/



NASA's Solar Eclipse Experiments Yield Intriguing Early Data.

Find the feature online at: <https://phys.org/news/2024-12-nasa-solar-eclipse-yield-intriguing.html>



HamSCI Partnering with Sci-Starter and the ARRL to promote *Ham Radio Open House* Commemorating the 100th Anniversary of the IARU and World Amateur Radio Day in April.

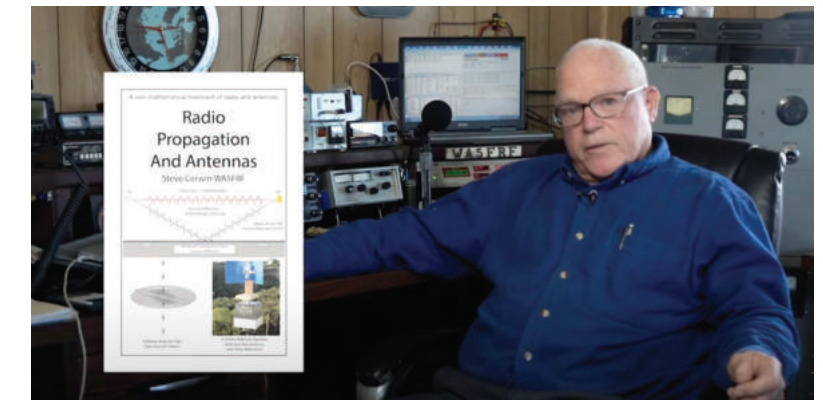
Find the March issue of QST at: <https://www.arrl.org/qst>

The March HamSCI Workshop received a nice mention in the March issue of *RadCom* published by the Radio Society of Great Britain.

SCIENTIST PROFILE STEVE CERWIN WA5FRF

Experimental physicist and antenna enthusiast Steve Cerwin WA5FRF was born near San Antonio, Texas, and has spent almost his entire life there. He was a physics major at local St. Mary's University and eventually taught Advanced Electronic Design at the university for 15 years.

Steve became interested in ham radio at 12 and has held callsign WA5FRF for over sixty years. His ham radio adventures include meteor scatter and even a moon bounce with a Canadian radio club which borrowed a 140-foot dish. These techniques are big on repetitious redundancy and patience.



Steve's superpower is designing and building sensors for a multitude of applications. He also understands radio antennas and how to MacGyver them out of what's at hand, often teaching these skills in week-long workshops. His book, "Radio Propagation and Antennas: A Non-Mathematical Treatment of Radio and Antennas," was published in 2019.

He has retired from Southwest Research Institute, where as an Institute Scientist (one of only a few without a Ph.D.) he had 50 people working for him on a variety of projects, problem solving solutions for clients in government and industry. He holds eleven patents.

Steve ran a model rocket program at a local middle school, mentoring sixth, seventh, and eighth graders. They learned physics and math in the process. Some of the rockets carried TV cameras and played the images live on TV cable mode. A few rose to 8,000 feet altitude. HamSCI might consider trying similar programs to increase young people's interest in ham radio.

Steve was a volunteer fire chief for eight years. He also flew large radio-controlled model airplanes with cameras to survey river vegetation for the USGS' models of flood prediction, and he holds his commercial pilot's license.

Steve's main activity for HamSCI is the Time Difference of Arrival (TDOA) experiment he designed and carried out during the recent solar eclipses. A carefully crafted audio chirp signal is sent repeatably between two hams and the interference pattern heard by a sound card is measured. This technique analyzes the interference of one-hop and two-hop paths in order to measure the height of ionization layers. Steve enjoys ham radio, ionosphere research, problem-solving, flying, scuba diving, and raising chickens. His advice is to be alert to surprises and to strive to be a life-long learner.



POST DOC SCIENTIST PROFILE KUKKAI KORNANAT HOZUMI: A Wide-Ranging Scientist and Data Processing Computer Pro

Kukkai grew up in Thailand where she did taekwondo and played khim, a beautiful stringed musical instrument. She enjoyed video games and airplane shows and dreamed of becoming a fighter pilot or working at NASA. When she was eight years old, she saw a solar eclipse.

Kukkai was the developer of HF START, a high-frequency propagation simulator developed to meet the needs of space weather users for, but not limited to, telecommunications. She has also written propagation columns for some of Japan's amateur radio magazines.

At college, she studied telecommunication engineering, earned a Ph.D. in Informatics (Communication and Computer Engineering), and learned how to learn. She did hands-on electronics maintenance at an airport and at ionospheric observatories in five countries in Asia. She dealt with power failures, missing tools, lightning strikes, curious wildlife, and mud, and she noticed that when you install instruments in nature, nature sometimes fights back!

Kukkai was a postdoc at NASA Community Coordinated Modeling Center at Goddard Space Flight Center in Maryland and is now a HamSCI postdoc at the University of Scranton. She enjoys exploring creative ways to utilize HamSCI data as a space physics tool, especially for investigating ionospheric equatorial plasma bubbles.

She admires the technical expertise and passion of hams for their hobby and finds that the HamSCI community is organic and welcoming. One of her heroes is Ellen White, K1STO, who was the contest organizer at ARRL for many years. It would be great to see more educational outreach so new folks, like Kukkai, can jump in with confidence.



AN EXPANDED SPACE WEATHER STATION TELECON

HamSCI recently announced an expanded weekly teleconference. The HamSCI PSWS Operations Telecon, formerly the Grape Telecon, will now cover the ever-expanding HamSCI Personal Space Weather Station (PSWS) network. Since inception, more than fifty Grape stations remain actively reporting data, including most that operated during the 2023 annular and 2024 total.

The "new" teleconference will cover the operational aspects (planning network expansion, project timelines, data collection topics, network monitoring, maintenance, etc.) of HamSCI's DASI funded projects (DASI = Distributed Array of Scientific Instruments). It will be a joint effort of the University of Scranton, Case Western Reserve University, and the University of Alabama, with additional contributions from New Jersey Institute of Technology.

PSWS Operations meetings will be held on Thursdays at 1000 Eastern time. Zoom details are on the HamSCI Get Involved web page under 'HamSCI Weekly Telecons.' The ham radio community is welcome to join in, learn about, and contribute to the project.

AMATEUR PROFILE DAVE SWARTZ WODAS

Q: How did you learn about HamSCI and how did you get involved? How have you been involved in the past? What is your current involvement?

A: I became aware of HamSCI in 2019 when I was working on a Special Event Station for the 100th anniversary of WWV. Dr. David Kazdan, AD8Y, reached out and proposed the Festival of Frequency Measurement as part of the five-day event. That's when I first became aware that WWV reception can be measured to the milliHertz precision, showing the Doppler Shifts due to diurnal sunrise/sunset as well as Travelling Ionic Disturbances on "active" nights. This was toward the beginning of the HamSCI Grape Personal Space Weather Station project.

I am operating four distinct Grape receivers at a site four miles to the east of WWV, making ground wave recordings of WWV. They are the "Control" for the various flavors of Grapes: Grape 1, Grape DRF, and Grape 2. Additionally, an RX-888 and KA9Q SDR are also recording WWV and CHU as well as operating as a WSPR receiver.

Along with maintaining the Grapes, I helped to install a WSPRsonde-8 transmitter this summer at WWV/B. The transmitter site ended up being just feet from the two 50 kW transmitters of WWVB, and the multiple WSPR signals have been very successfully received worldwide. Comparing WSPR and WWV Doppler Shifts, they are nearly identical, potentially paving the way for multiple source signals for future Grape Doppler measurements.

Q: What HamSCI projects interest you?

I'm personally involved in the Grape project maintaining control measurements for the various Grape flavors as well as physically supporting the WSPRsonde installation at WWVB. I help with the FTP repository coordination for the WWV Amateur Radio Club. I also contribute to the WWV/H Modulation Working Group and ongoing Grape discussions.

Q: What skills do you have that are best suited to HamSCI? How might other amateurs obtain similar skills?



Although I am retired, my career was in public education as a high school science teacher. I continue to work for Colorado State University at the College of Natural Science Education and Outreach Center developing various STEM programs. Although my involvement in HamSCI has centered on science, I am very interested in helping with outreach and educational activities, especially to middle and high schools, involving the Grape projects and ionospheric research in general.

Q: How active a ham would you say you are? When were you first licensed? License class?

A: I am very active as the President of the WWV Amateur Radio Club, but I've had family challenges this past year that have limited my operating time. When I do get on, it's for contests or our own special event station activities with the club. I still sneak a late-night or early morning chance for a rare QSO and enjoy operating POTA, but not regularly.

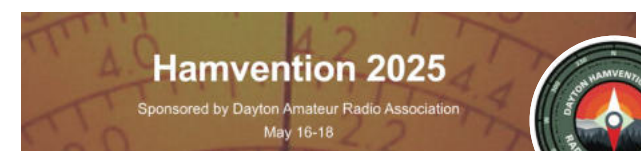
Q: What would you say is the future of HamSCI? What should HamSCI be doing to increase its awareness and provide more value to you as a ham?

A: I think the science being addressed is excellent, and with the advent of AI, the data the Grape experiments are collecting could lead to significant discoveries.

Keep doing what HamSCI is doing! I would like to see a group that would give one-hour presentations about current research, perhaps even historical talks on ionospheric science. I would be interested in helping with educational initiatives.

Finally, a brief bio about your contribution to HamSCI as well as to scientific research.

My contribution to HamSCI specifically is continuing a good relationship with National Institute of Science and Technology (NIST) here in Colorado, including the Time and Frequency Division at the Boulder lab as well as the WWV/WWVB station staff here in Fort Collins. I also hope to spend more time being involved with the Grape working group, continue with the WWV/H Modulation discussions, and to become part of a HamSCI project specifically focused on educating youth.



Going to Hamvention?
Stop By and Visit HamSCI!

HamSCI will be at Hamvention in Dayton, Ohio, from May 16-18, 2025, at the Greene County Fairgrounds in Xenia. We will be talking about science! Stop by our booth to learn more about our work and please check out the program for more information on our presenters. It's a great opportunity to learn more about HamSCI, citizen-science, and meet many HamSCI colleagues. *Hope to see you there!*

For more information, check out the Hamvention website: hamvention.org



This past summer, my wife and I were camping up in the Uinta mountains in Utah. One night, we were taking a walk and the skies were absolutely crystal clear. The view was breathtaking. We gazed up and talked quietly about the awe of the moment.

A similar scene happened a little over 85 years ago. A young girl and her sister were sharing a bed. Her older sister chose the outside, so the young girl found herself up against the wall and its window. Looking out was an unobstructed view of the stars. She was captivated by them. Night after night she began observing and then writing down what she saw. So began Dr. Vera Rubin's study of and love of the stars. The journey was not easy, but she never gave up.

Soon, Vera made the trip to the library, looking for books on astronomy and science. Since they were in the adult section, she needed a note from her mom, and she brought home all she could find.

Her father supported her passion for astronomy; together they built a telescope and attended the local astronomy club meetings.

Her interest in science continued into high school where she was one of two girls in the physics class. On the first day, the teacher told the students there were two kinds of physicists. Those that were very smart and very famous, and he mentioned a group of men.

CONTRIBUTOR COLUMN

DR. VERA RUBIN: A Pioneer Redefining Our Understanding of the Universe

By Ron KF7ZN

Then, the second kind of physicist. They worked well and got things done, but they were not at the same level as those in the first group. He mentioned one person — Marie Curie.

For that term, the teacher ignored the two girls, and Vera ignored him, refusing even to take her schoolbook home. After high school, she applied to Vassar, a prestigious women's college, and she received a scholarship there. When her teacher found out, he spoke to her for the first and last time, telling her that if she stayed away from science, she would do okay.

When Vera graduated from Vassar, she was the only female astronomy graduate. She applied to Princeton, who informed Vera that they did not admit women to their graduate astronomy program. She applied to Harvard, who responded back that they did not give degrees to women.

Finally, she applied to and was accepted by Cornell for her master's in physics. She then went on to Georgetown University, where she earned her Ph.D. under physicist George Gamow, who was at George Washington University. Vera credits much of her success to her husband and his total support as she navigated motherhood raising four children, her educational pursuits, and her career.

As she progressed in her research, Vera applied for observation time at the Palomar Observatory in California. Once there, she was told that the observatory rules stated she would not be able to stay as there were no bathrooms for women. Not to be deterred, Vera went to her room, cut out a piece of paper in the shape of a skirt, and taped it over the male figure on the door. She then told the

staff that they now had a women's bathroom. She became the first female astronomer to observe there.

She teamed up with Kent Ford, who had built the most sophisticated spectrometer at that time, which allowed them to study small regions of galaxies. They began to build on work done by Fritz Zwicky, who first discovered evidence of an unknown matter.



Traditional knowledge held that the stars in the galaxies farther out from the center rotate at a slower speed than their counterparts closer in. Rubin and Ford found that stars very distant from the galactic center were orbiting as fast as the stars close to the center.

At these speeds, the outer stars should escape the gravitational pull of their galaxy and be flung off into space. Galaxies should fly apart if gravity were the only force holding them together.

After eliminating other possibilities, Rubin and Ford deduced that there must be undetected matter causing the stars to be retained within the galaxies. This clear and thorough research was the evidence needed to convince astronomers that the bulk of the mass in the universe is unseen or indirectly detected. This affects the behavior and motion of all the matter that we can see. We still call it dark matter today.

Vera said, "What you see in a spiral galaxy, is not what you get."

When Dr. Rubin wrote and submitted papers, she ensured that all involved, including students, received credit as co-authors. From what I read, she was a champion of women's rights in the science community. She was

elected to the National Academy of Sciences and awarded the National Medal of Science in 1993.

The Dark Matter Telescope was renamed the Vera C. Rubin Observatory in Dr. Rubin's honor. This telescope is in Chile and will be completed this year, in 2025. According to what I found, it will be using the largest camera ever built. It will scan and capture the entire southern sky and galaxies for ten years. They say it will capture trillions of cosmic events and objects across space.

Also in 2025, Dr. Rubin's name and image will be featured on the United States quarter, where she will join a list of other distinguished women. These commemorative quarters started in 2022 and are released by the U.S. Mint in partnership with the Smithsonian Museum.

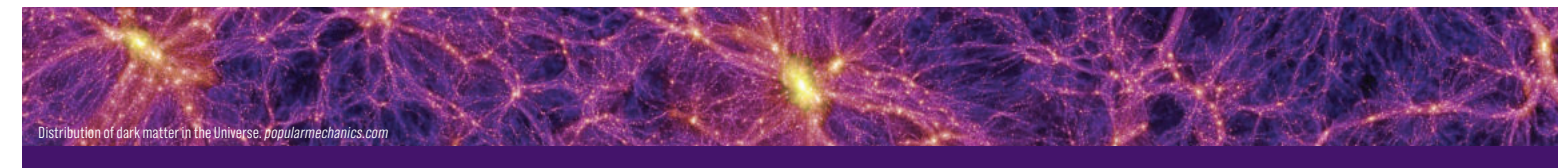
This short piece cannot do complete justice to Dr. Rubin. However, with the activation of the Vera C. Rubin Telescope this year and Dr. Rubin's outstanding achievements, this is a great opportunity for HamSCI to keep her memory alive.

While challenges and barriers were part of Dr. Rubin's career, her refusal to give up, her championing for others, and her passion for science are a testament to her character and memory.

A young Vera Rubin was already observing the stars when she was an undergraduate at Vassar College, where she earned her bachelor's degree in astronomy in 1948. Archives & Special Collections, Vassar College Library

SOURCES:

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HamSCIENCE: 2025 METEOR SCATTER PROPAGATION EXPERIMENT



As part of the International Amateur Radio Union (IARU) 2025 centenary, HamSCI will be celebrating the anniversary with an activity involving amateurs to study ionospheric changes during meteor shower events primarily in the HF bands. Follow the HamSCI.org website or check your emails and social media for further information.

A GRAPE GROWS IN ANTARCTICA



Rob Robinette AI6VN reports that HamSCI's first Antarctic GRAPE at the German Neumayer research site club station DP0GVN is now reporting daily. There is also a WSPRSONDE-8 transmitting FST4W-120 on 8 bands 80-10M and Ulli ON5KQ is reporting surprising strong (+2 dB SNR) and stable 10m spots in Belgium. Robinette says, "While WWV 10 MHz shows a lot of doppler shift, the strength and stability of WWV 25 MHz reception is surprising to me."

JOIN HamSCI

We welcome you to join the HamSCI community! We are a group of amateur radio operators and scientists working together to study the ionosphere and further amateur radio. HamSCI consists of many different types of projects accessible to a variety of skill levels with various focuses on science to engineering to pure amateur radio.

The easiest way to participate in the HamSCI Community is by joining the HamSCI Google Group. The HamSCI Google Group is an e-mail discussion forum to facilitate communication between hams, the professional space and atmospheric science communities, and anyone else interested. When requesting to join, please include some information about who you are and why you would like to join. WELCOME!!

ABOUT CITIZEN SCIENCE

Citizen science is scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.

HamSCI engages amateur radio operators to help with the collection and analysis of data to help better understand the changing conditions of "space weather" within the ionosphere. As a HamSCI citizen scientist, you help collect valuable scientific data that can make a meaningful impact to scientific research.

HamSCI collaborators gratefully acknowledge the funding of NSF AGS-2045755, AGS-2230345, AGS-2230346, AGS-2404997, AGS-2432821, AGS-2432824, AGS-2432823, AGS-2432822, AGS-2431666, OPP-2332427, NASA 80NSSC25K7026, 80NSSC23K1322, Frankford Radio Club and ARDC grants.

The HamSCI silhouette photo is by Ann Marie Rogalcheck-Frissell KC2KRQ. Newsletter design by Vikki Lawhon, University of Scranton Creative Services.

WHAT IS HamSCI?

HamSCI, the Ham Radio Science Citizen Investigation, is a platform for the publicity and promotion of projects that are consistent with the following objectives:

- Advance scientific research and understanding through amateur radio activities.
- Encourage the development of new technologies to support this research.
- Provide educational opportunities for the amateur community and the public.

HamSCI serves as a means for fostering collaborations between professional researchers and amateur radio operators. It assists in developing and maintaining standards and agreements between all people and organizations involved.

HamSCI was started by ham-scientists who study upper atmospheric and space physics. These scientists recognized that projects such as the Reverse Beacon Network, WSPRNet, PSKReporter, DX Cluster, ClubLog, and others are generating big data sets that could provide useful observations of the Earth's ionosphere and related systems. Because of this, HamSCI's initial focus is on these fields of research. In the future, other researchers may join HamSCI and broaden its scope.

For scientists, working with the amateur radio community is a way to access individually managed stations, available by the hundreds in dozens of countries, with receive and transmit capabilities across the electromagnetic spectrum, easily identified in areas of interest and deployed to remote locations, for free.

RECENT HamSCI PRESENTATIONS

HamSCI's Thursday meetings often feature presentations by prominent scientists and amateurs that provide context to the weekly discussions.

Check the link for recent contributions from our members.

<https://hamsci.org/telecons>

Join our mailing list to be notified of upcoming topics and speakers.

HamSCI WEEKLY MEETINGS

There are numerous ways to learn about and participate in HamSCI activities. We meet three times a week on various aspects of our work:

TAPR/HamSCI Technical Session: This weekly telecon is hosted on Mondays at 9 PM Eastern by TAPR and The University of Scranton to support collaborative HamSCI-TAPR projects.

GRAPE-Low Cost PSWS Session: This weekly telecon is on Thursdays at 10 AM Eastern hosted by Case Western Reserve University to support the Grape Low-Cost Personal Space Weather Station Project.

The HamScience Telecon: Weekly telecon on Thursdays at 4 PM Eastern to discuss data collection, analysis and conclusions related to HamSCI's scientific research efforts. All backgrounds, including researchers, data analysts and citizen scientists, are welcome and encouraged to attend.

HamSCI Partners:



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