



[radiojove.gsfc.nasa.gov](http://radiojove.gsfc.nasa.gov)



# The Radio JOVE Project 2.0



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**Citizen Scientists**

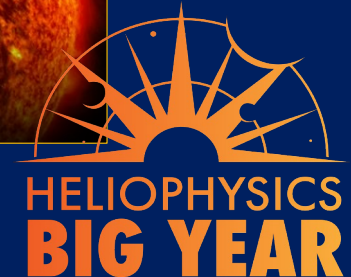
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**Radio JOVE uses hands-on radio astronomy  
to help people learn and do science.**

**Citizen Science is defined as a form of open collaboration in which individuals or organizations participate voluntarily in the scientific process in various ways. (NASA SMD Policy Document SPD-33)**

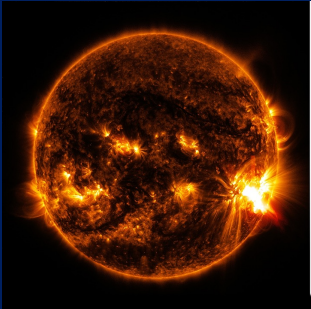
# Partners

- NASA Heliophysics Education Activation Team (HEAT) [solarsystem.nasa.gov/heat/home/](http://solarsystem.nasa.gov/heat/home/)
- SunRISE Mission [sunrise.umich.edu/](http://sunrise.umich.edu/)
- Heliophysics Big Year: [solarsystem.nasa.gov/solar-system/sun/helio-big-year/](http://solarsystem.nasa.gov/solar-system/sun/helio-big-year/)
- Society of Amateur Radio Astronomers (SARA): [radio-astronomy.org/](http://radio-astronomy.org/)
- Funding: NASA ROSES Citizen Science Seed Funding Program (CSSFP)



# Radio JOVE 2.0 Overview

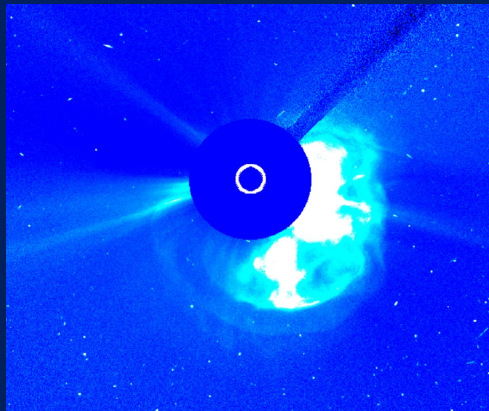
[radiojove.gsfc.nasa.gov](http://radiojove.gsfc.nasa.gov)



NASA/SDO



[NASA/Cassini]



SOHO/LASCO Coronal Mass Ejection (CME) with shock.

Citizen Science using a multi-frequency (16-24 MHz) radio telescope to observe Jupiter, the Sun, the Milky Way Galaxy, and Earth-based radio emissions.

## Goals

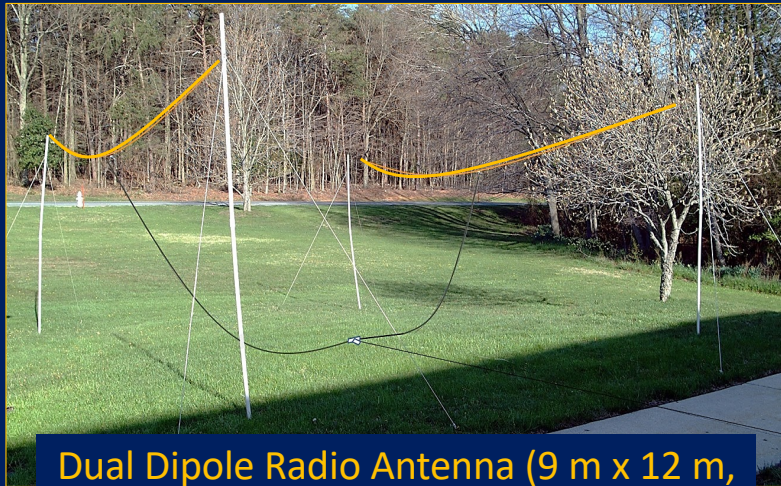
- Inspire amateurs to become citizen scientists
- Increase science literacy and understanding of the scientific process
- Provide a hands-on experience in radio astronomy
- Expand a network of radio telescopes for advanced projects
- Enable access to other participants, online observatories, and real data

## Participants

General Public, Radio Enthusiasts, Astronomy Clubs  
High Schools, Colleges, and Universities

**We are looking for amateurs to become citizen scientists**

# Radio JOVE 2.0 Telescope



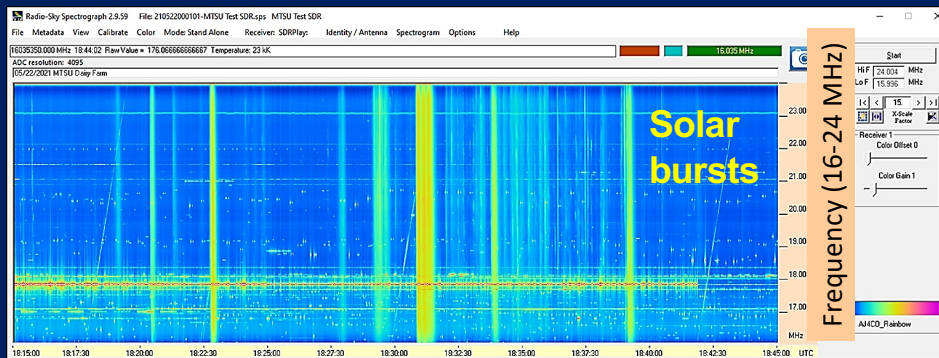
Dual Dipole Radio Antenna (9 m x 12 m,  
30 ft x 40 ft)

8 MHz bandwidth

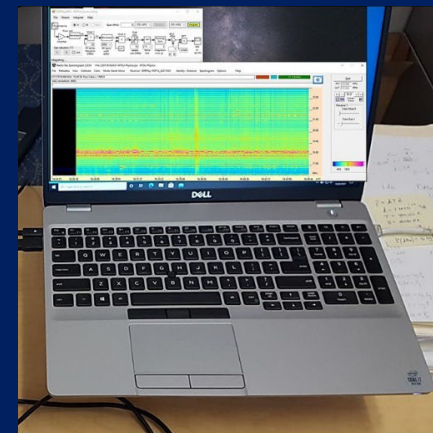


SDRplay\* RSP1A  
Radio Receiver

\*SDRplay ([www.sdrplay.com](http://www.sdrplay.com)) is a UK-based company that manufactures Software Defined Radio (SDR) radios.



Radio-Sky Spectrograph Recording Software from [www.radiosky.com](http://www.radiosky.com)

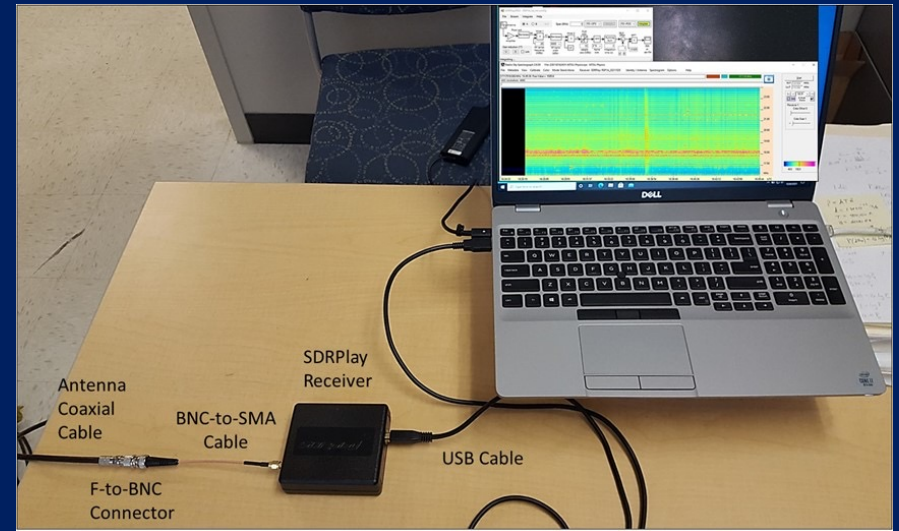


Radio JOVE 2.0 Hardware: Dual Dipole antenna, SDRplay RSP1A receiver, and Radio-Sky Spectrograph (RSS) software. [Kit does not include antenna support structure].

# Radio JOVE 2 Setup

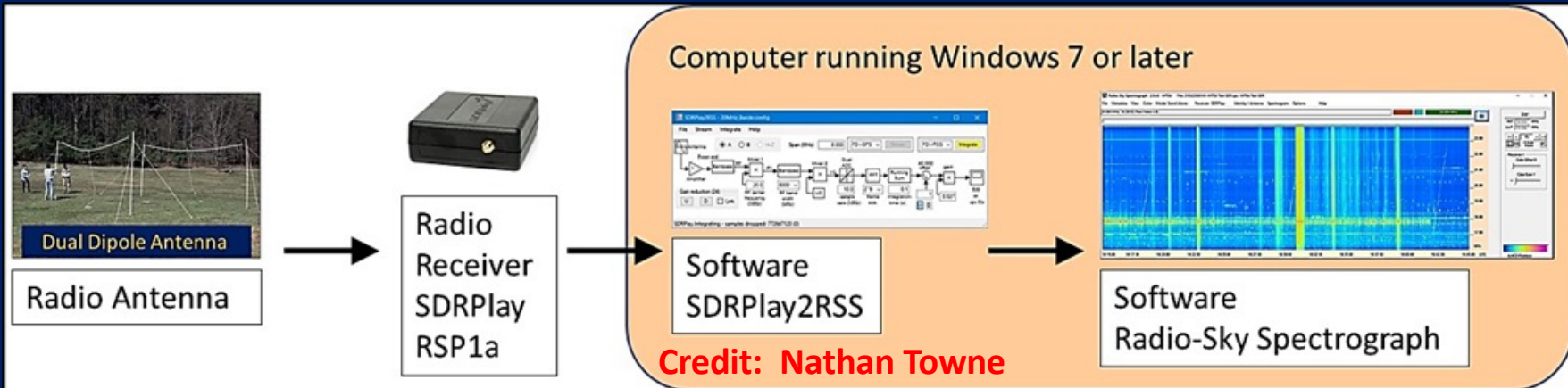
Instruction Manuals

[radiojove.gsfc.nasa.gov/radio-telescope/building\\_testing.php](http://radiojove.gsfc.nasa.gov/radio-telescope/building_testing.php)



The receiver and computer hardware setup.

A block diagram of the Radio JOVE spectrograph.



# Radio JOVE 2.0 Kits

## Radio JOVE 2.0 Kit Purchases

- Complete kit (receiver, software, unbuilt antenna): **\$220.00\*** + shipping
- Prebuilt Complete kit (receiver, software, professionally built antenna): **\$384.00\*** + shipping
- Orders: [http://radiojove.org/kit/order\\_form.html](http://radiojove.org/kit/order_form.html)

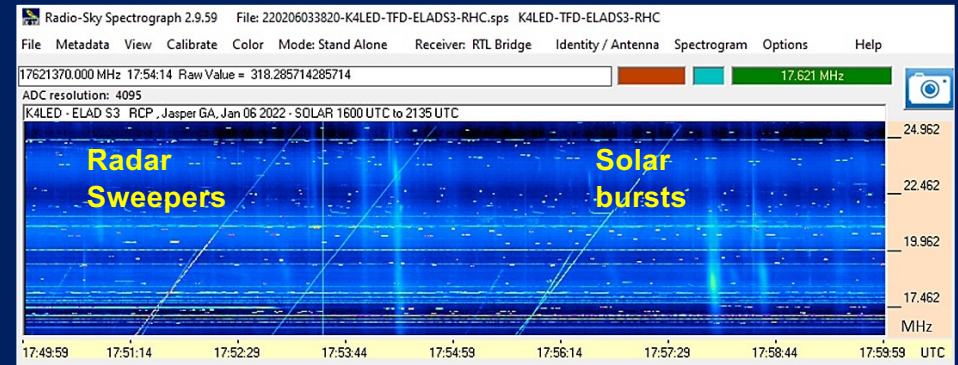
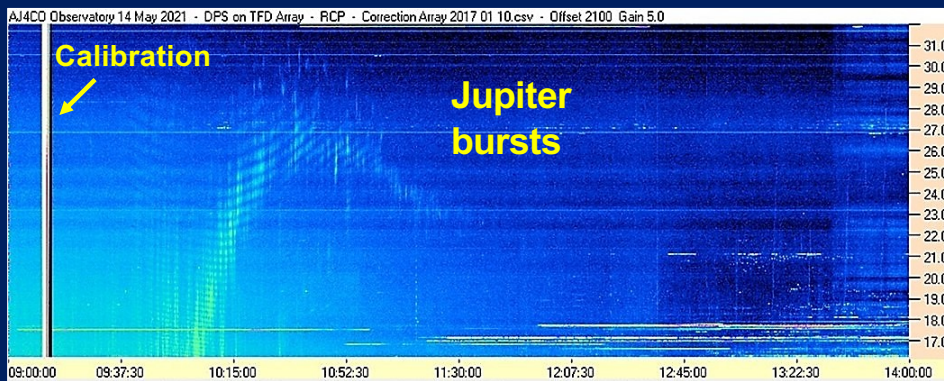
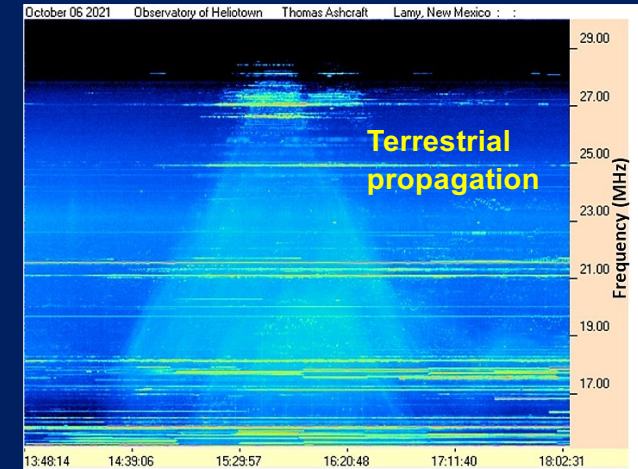
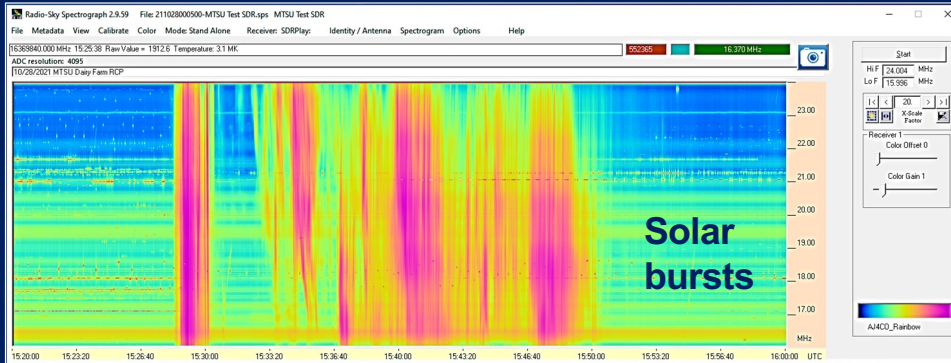
Antenna support materials could be \$150.00 extra.

\*Prices subject to change.



Radio JOVE 2.0 Hardware: SDRplay RSP1A, cables, Antenna Kit, assembly manuals, and Radio-Sky Spectrograph (RSS) software.

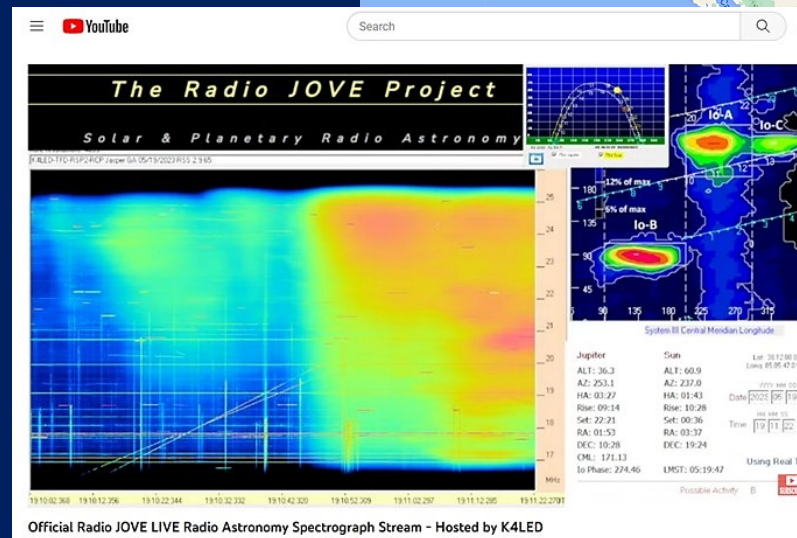
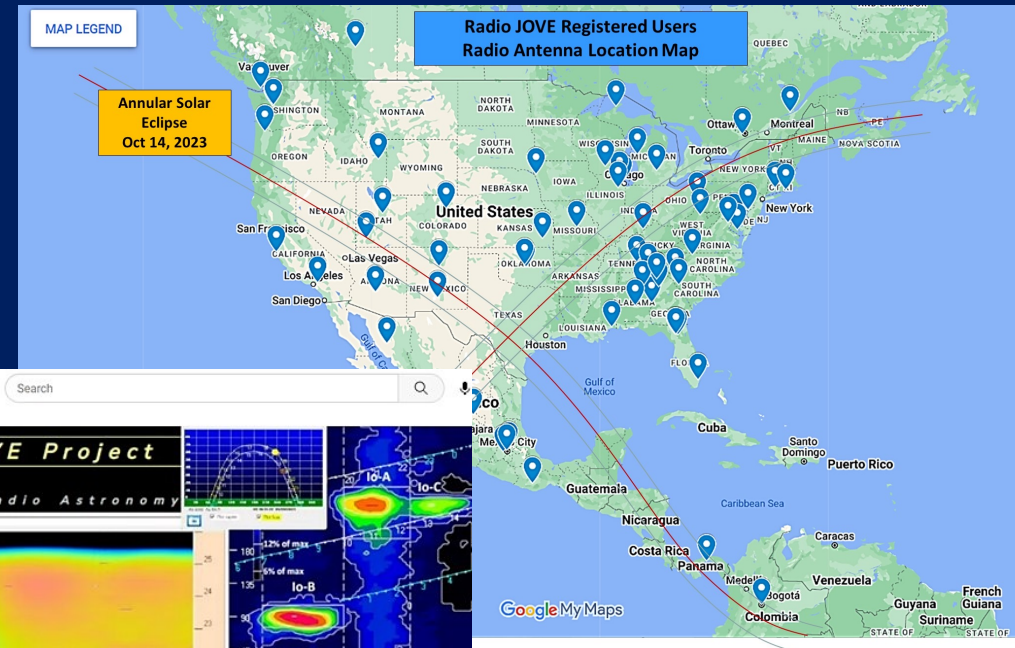
# Example Observations



Example Radio JOVE frequency-time spectrograms of terrestrial, solar, and Jupiter radio bursts seen by different observers. Terrestrial “TP” propagation from lightning (T. Ashcraft), solar bursts (C. Higgins), Jupiter Io-B event (D. Typinski), and solar bursts and terrestrial radar sweepers (L. Dodd).

# Community Connections

- Website: [radiojove.gsfc.nasa.gov/](http://radiojove.gsfc.nasa.gov/)
- Email Listserv: [groups.io/g/radio-jove](https://groups.io/g/radio-jove)
- Google Observers Map
- Coordinated Observations & Help Sessions
- Live Data Streaming
- Data Archive: [radiojove.net/archive](http://radiojove.net/archive)



Live Data – Larry Dodd (K4LED) Jasper, GA

<https://youtube.com/channel/Uctawz3MnMBwjz9ShhSC0ygQ/live>



# Citizen Science Training Modules

Radio JOVE and the SunRISE mission

- Help amateurs become citizen scientists
- Online self-paced training modules

Topics

- Radio Astronomy
- Radio Telescope Operation
- Advanced Hardware
- Citizen Science Methods

## Training Module 1.1: Introduction to Radio Astronomy (part 1)

The Radio  
JOVE Project



[radiojove.gsfc.nasa.gov](http://radiojove.gsfc.nasa.gov)

Radio JOVE is a  
astronomy telesco  
people learn a



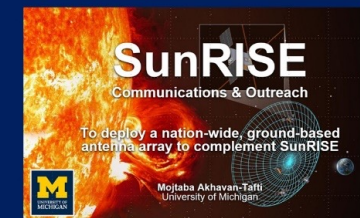
## Training Module 1.c: Identifying Solar Radio Bursts

The Radio  
JOVE Project



[radiojove.gsfc.nasa.gov](http://radiojove.gsfc.nasa.gov)

Radio JOVE is a hands-on radio  
astronomy telescope project to help  
people learn and do science.



To deploy a nation-wide, ground-based  
antenna array to complement SunRISE

# 2023-24 Solar Eclipse Citizen Science

- Observe the 2023 and 2024 solar eclipses
  - Use a network of radio spectrograph (16-24 MHz) and single-frequency (20 MHz) radio telescopes.
  - Need observers inside and outside the path of totality.

**2023 Coordinated Observing Practice Sessions**  
June 14, July 14, August 14, September 14  
**Annular Solar Eclipse, October 14, 2023**

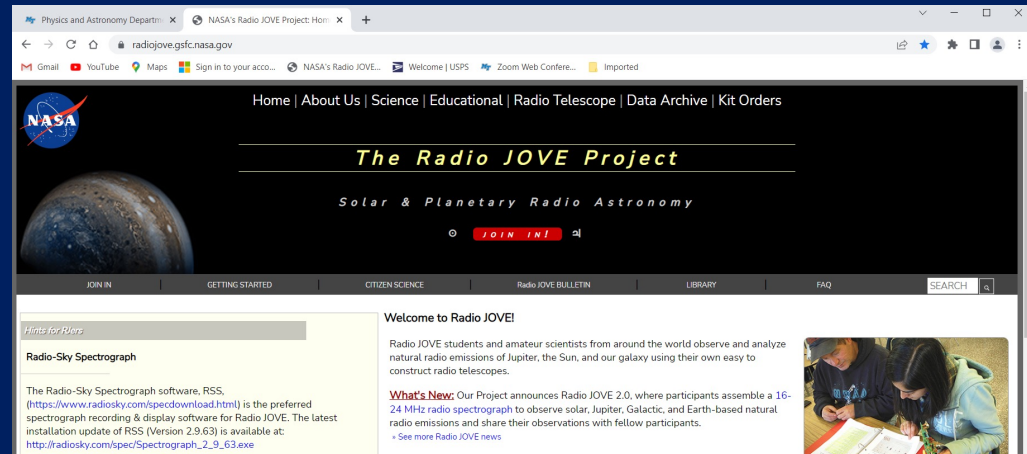
## Other Projects

- Calibrated observations (Jupiter, Sun, Galaxy)
- Galactic background Quiet Day Curve (QDC)
- Ionosphere radio wave propagation and space weather
- Monthly solar burst counts
- Jupiter radio emission probability maps



# Radio JOVE Website and Data Archive

<https://radiojove.gsfc.nasa.gov/>



- **Data Archive:** [radiojove.net/archive.html](http://radiojove.net/archive.html)
- Contains more than 6000 Jupiter and solar observations (files, images, sound files, spectrograph data)
- Calibrated spectral data archived at NASA Space Physics Data Facility and the Planetary Data System Plasma Node [pds-ppi.igpp.ucla.edu](http://pds-ppi.igpp.ucla.edu)

### Radio JOVE Archive Search

Log In to Upload | Sign Up

Enter filtering criteria in the following input fields and click "Search" to see the results in the table below.

Observer Name	<input type="text"/>	Submitter group	-- all groups --
Observing Location	<input type="text"/>		
Receiver system (observing equipment used)	<input type="text"/>	Calibrated	Yes
Object	-- select object (optional) -- Galactic Background Interference Jupiter		
Storm Type	-- Not Identified (optional) -- Jupiter Io-A Jupiter Io-B Jupiter Io-C		
Spectral Output Type	-- select file type (optional) --		
Start Date (mm/dd/yyyy)	<input type="text"/>	Stop Date (mm/dd/yyyy)	<input type="text"/>

Inventory entries matching search criteria are displayed below.

# Advanced Hardware

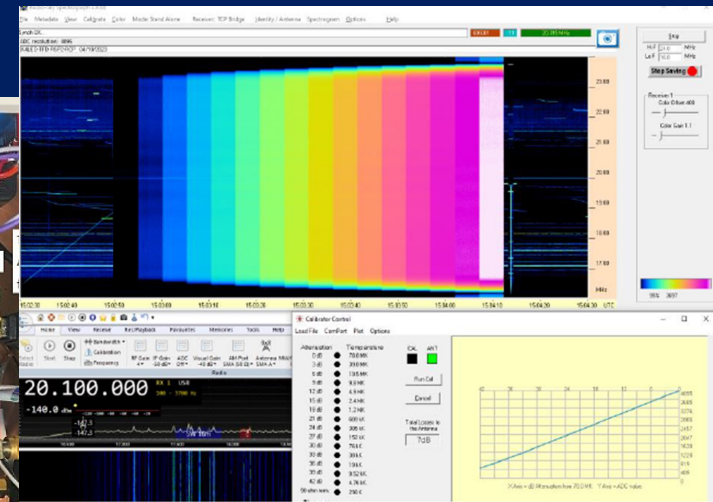
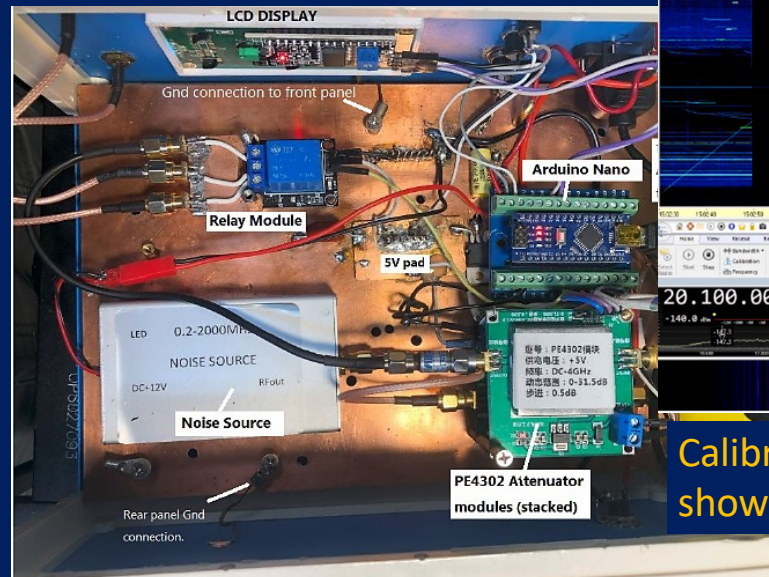
- Wide band antennas
- Polarization Measurements
- GPS Timing
- Multi-Step Calibration

**JOVE CAL 1 DIY Step Calibrator**  
**Parts Cost \$125.00**



A Terminated Folded Dipole (TFD) Square Array

## Multistep Calibrator



Calibrator Control Panel in RSS showing the response of an SDRplay



# Radio JOVE 2.0 Summary



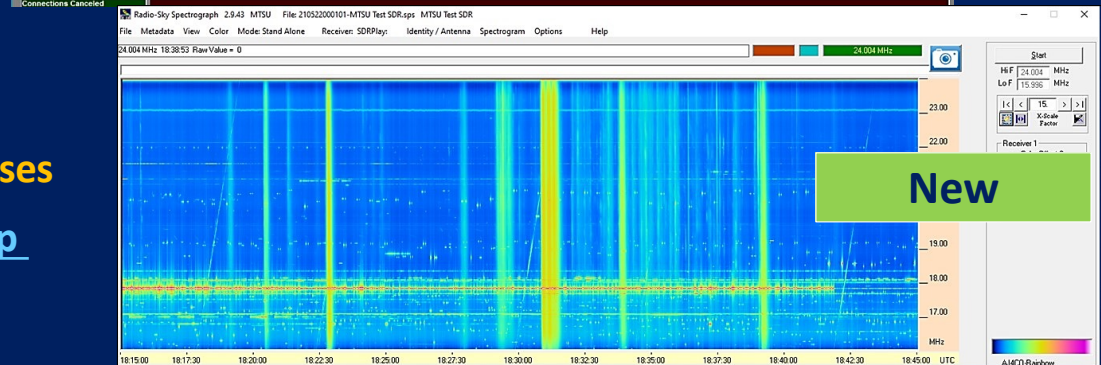
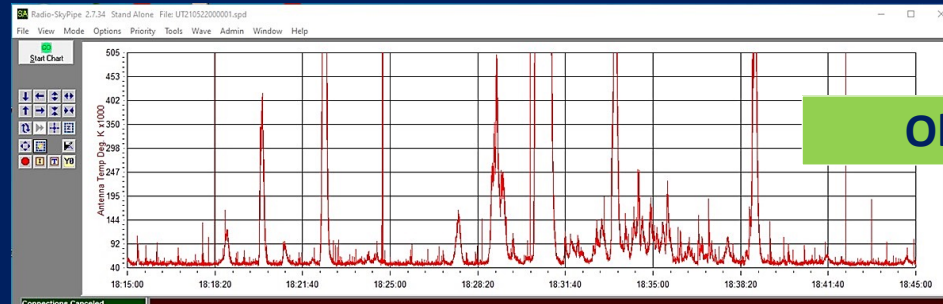
- Radio JOVE 2.0 is active and using SDR radios
- Developing training modules to help participants
- Stay connected with an email listserv

Email Listserv on Groups.io:

<https://groups.io/g/radio-jove>

- Updated Website + Data Archive
- Observing campaign for 2023 and 2024 solar eclipses
- Join Us: <https://radiojove.gsfc.nasa.gov/joinin.php>

We are looking for amateurs to  
become citizen scientists  
Thank you!



Solar Bursts 05/22/21, Top: Radio JOVE Bottom: SDRPlay  
RSPIA, MTSU Dairy Farm, Murfreesboro, TN

Contact Chuck Higgins [chiggins@mtsu.edu](mailto:chiggins@mtsu.edu)