



# Using the 20 Meter

Brenne Gregory  
(Thanks to Sue Ann Heatherly)



- Built by RSI and funded by US Naval Observatory for Earth orientation observing programs
- Refurbished in 2012 as the first radio telescope in the Skynet Robotic Telescope Network
- Old receivers from the 140ft were revived and adapted for use on the 20 meter
- Used by students around the world





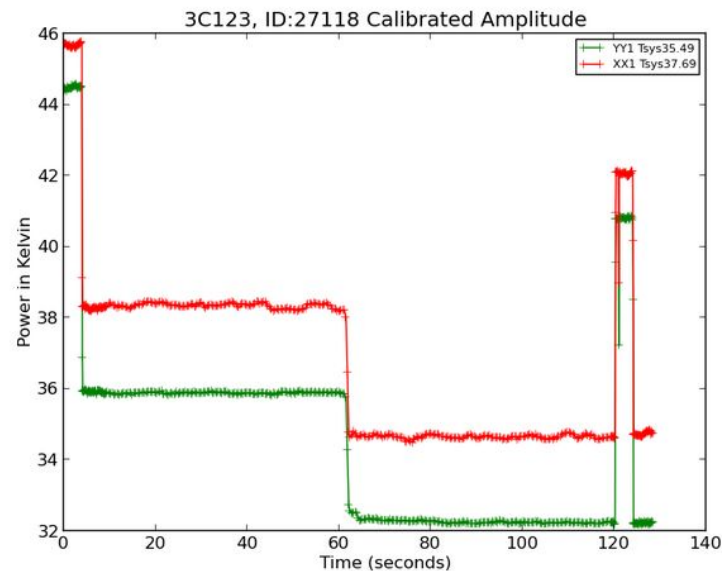
# Features

- Fully Steerable
- L-Band receiver 1.3-1.8 GHz
- Angular Resolution = 0.7 degrees
- Beam size of 44 arcminutes
- Sky Patterns: Daisy, Map, OnOff, Track
- Two-Spectral Modes:
  - Low Resolution (wide-band, several filters)
  - High Resolution (narrow-band, 15.625 MHz)
- Pulsar Mode



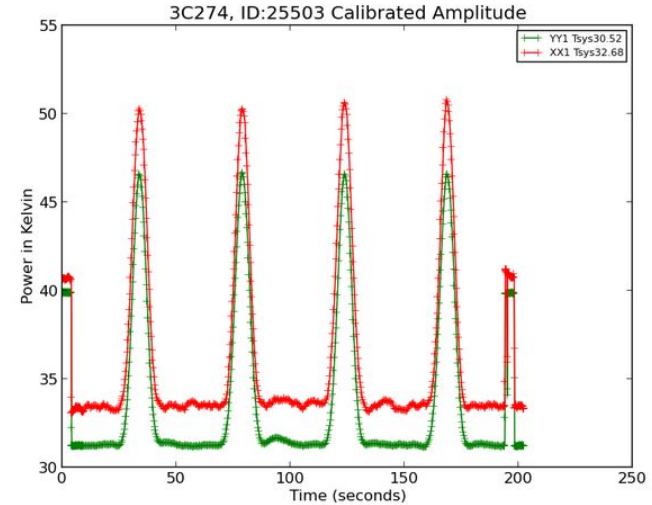
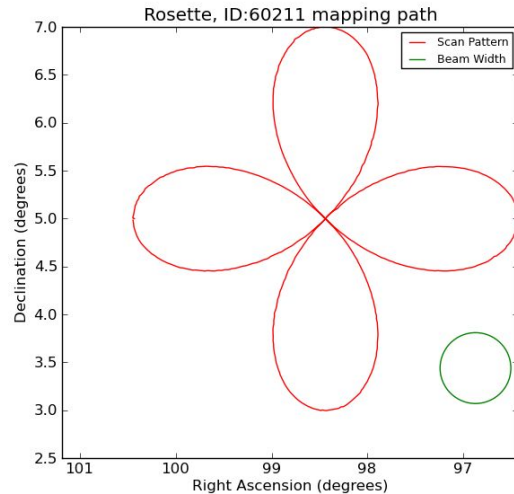
# OnOff Sky Pattern

- Spectral resolution: Low or High
- Why:
  - Good for measuring intensity of your object
  - Can average multiple observations together in HIRES mode



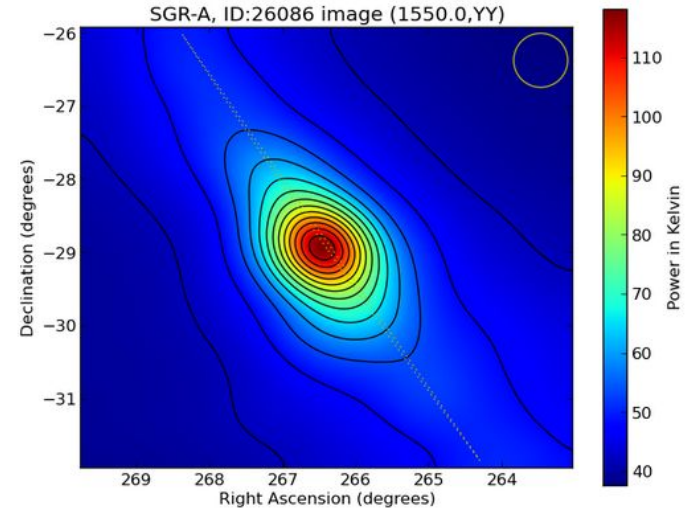
# Daisy Sky Pattern

- Spectral resolution: Low
- Why: Good for measuring the strength of a source



# Map Sky Pattern

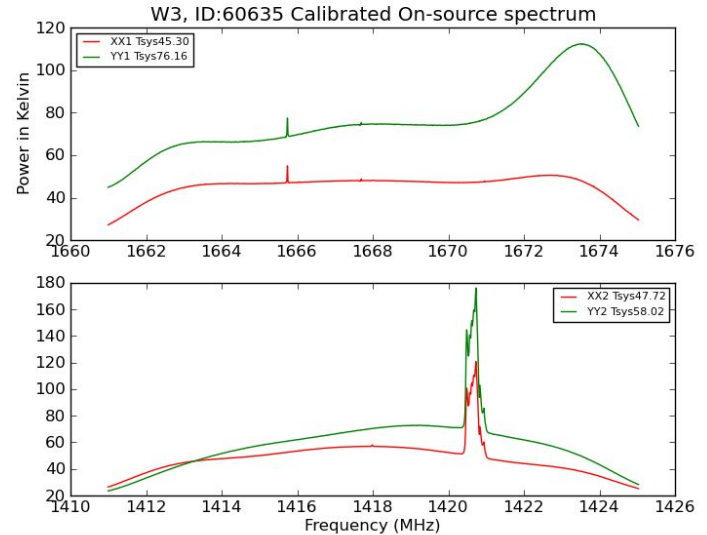
- Spectral resolution: Low or High
- Why:
  - Good for making an image of an area of sky
  - e.g., nebulae, galactic plane



[YY1 FITS file](#)

# Track Sky Pattern

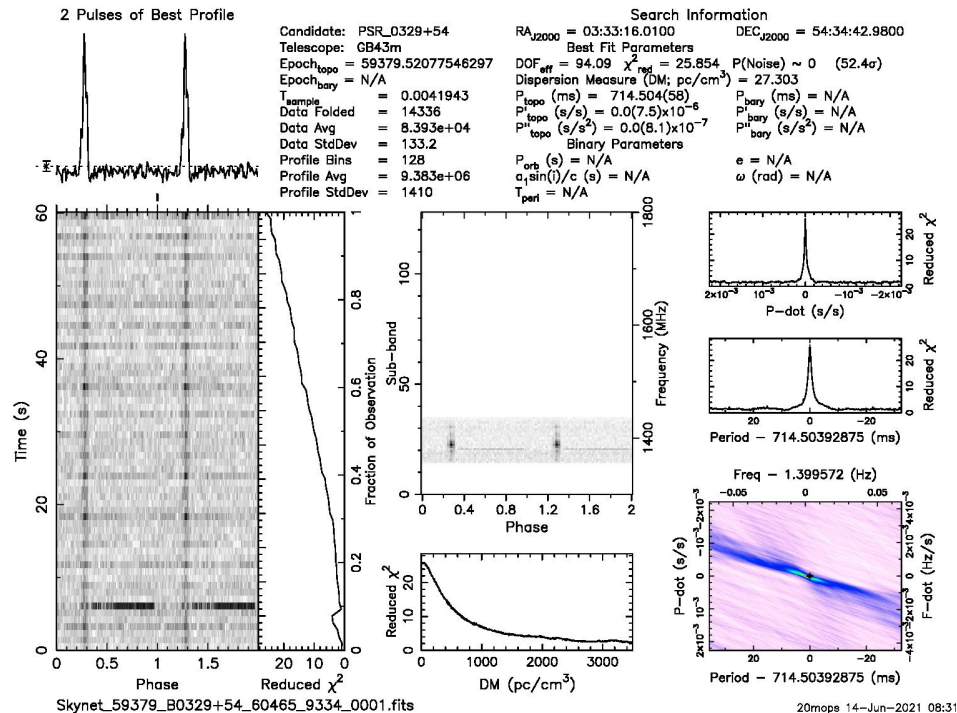
- Spectral resolution: High
- Why:
  - Good for observing spectra in high-resolution mode





# Pulsar Observation

- Spectral resolution: Low
- Why:
  - Good for observing known pulsars



# Data Products

- Data are archived at [www.gb.nrao.edu/20m](http://www.gb.nrao.edu/20m)
- Under Radio Observations

Radio Observations				
ID	Name	Map Type	Target	State
27797	HI_L245_b0	track	07:55:00   -28:10:59.8	completed

## Radio Observing | Observation 27797

### Observation Data

You can now view and download your data at the [National Radio Astronomy Observatory - Green Bank website](http://www.nrao.edu).

# Searching the Archive

## Skynet 20m: Education and Science Collaboration

<b>Links</b>	<a href="#">UNC Skynet</a>	 <a href="#">NEW 20m skynet status display</a>	<a href="#">Log of 20m results</a>	<a href="#">Search projects</a>	<a href="#">latest observation</a>	<a href="#">NRAO Skynet wiki</a>	<a href="#">NRAO Skynet main(this page)</a>
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[Skynet](#) is a world wide network of astronomical telescopes operated by the University of North Carolina at Chapel Hill. The NRAO has developed a 20m radio telescope located at the Green Bank Observatory in West Virginia and provides observations at 1.3 to 1.8 GHz and 8 to 10 GHz.

[Skynet Junior Scholars](#)


[Skynet Junior Scholars Forum](#)

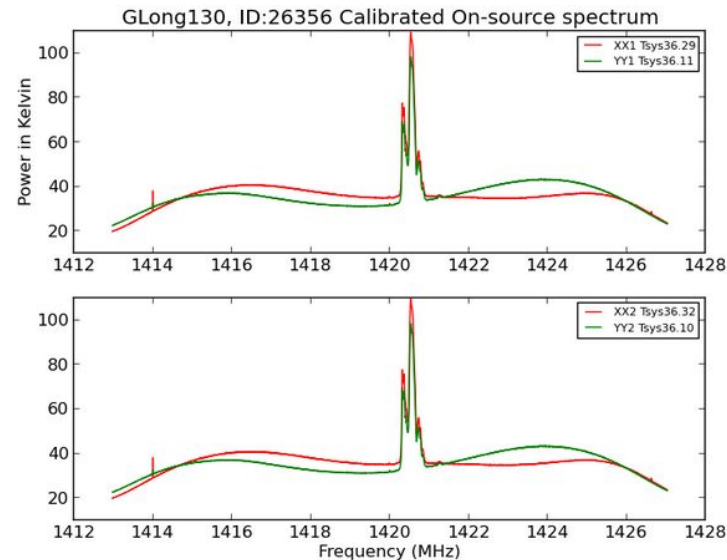
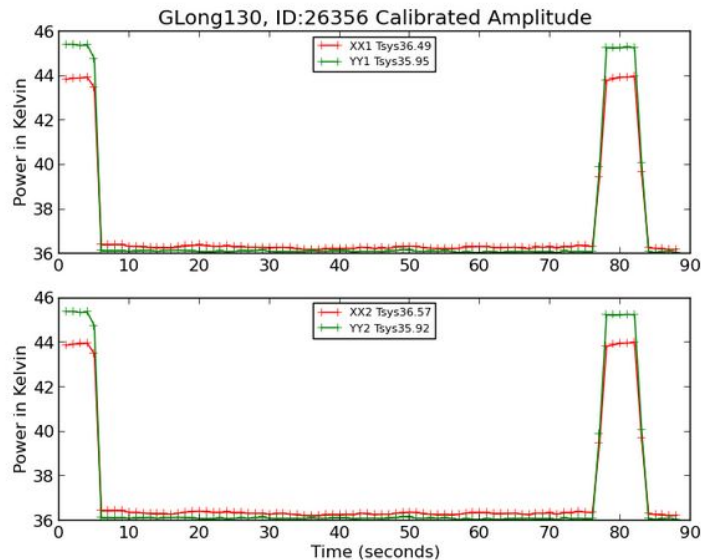
### [Observing Advice for Skynet Users](#)

[Example Data](#)

[Explanation of data files.](#)

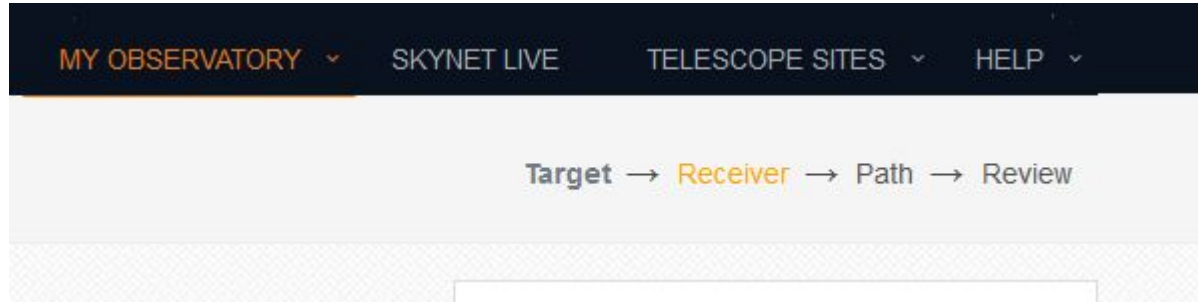
# Radio Skynet Observation: Skynet\_57806\_GLong130\_26356\_26684

<b>Continuum</b> <a href="#">Raw data</a> <a href="#">Calibrated</a> <a href="#">Calibration Info</a>  <a href="#">Data File Description</a>	<b>Spectra</b> <a href="#">Calibrated</a>	2017-02-22 02:38:20 (UT)	<a href="#">Latest</a>	<a href="#">20m Info</a>	
		Observer: jcastronomy_10861	<a href="#">Log</a>	<a href="#">20m Skynet</a>	
		HIRES track; filter 1355_1435; 88 secs			



[Dcal 1 spectrum](#) [Dcal 2 spectrum](#)

# Setting Up Your Observations



[https://skynet.unc.edu/radio\\_obs](https://skynet.unc.edu/radio_obs)



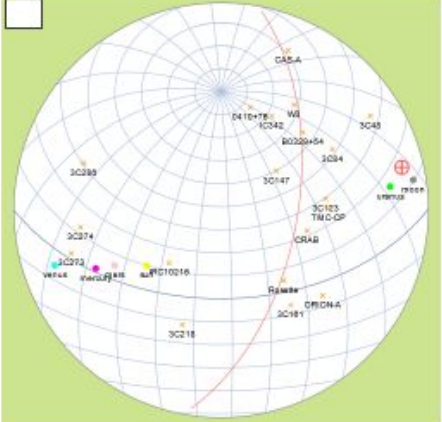
# Target Selection

- Type in target and search or click on it in the Skyviewer
- You can just add in the coordinates
- Create an observation name - include your group number

Radio Observing | Add Observation

Target → Receiver → Path → Review

Click on your target in the SkyViewer or lookup target coordinates by name below:



2021/8/27 11:13:31 AM US/Eastern Time Zone

Green Bank Observatory

GreenBank-20

hour

sunset

Az/El Grid

☒ RA/Dec Grid

☒ Galactic Plane

☐ Stars

☒ Solar System

☐ Messier Catalog

☐ Large/Bright Galaxies

☒ Bright Radio Catalog

☐ Sky Brightness

★ Radio Observations

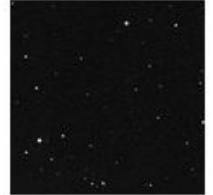
+ Add New Observation

Target Lookup

keywords:

Search

DSS Preview



Coordinate Type: RA/Dec J2000

Right Ascension (J2000): 02:13:34.7042

Declination (J2000): 16:01:23.7455

Observation Name:

Min Sun Separation: 0.0

Min Target Elevation: 20.0

☐ Delay the start of this observation until  UTC

☐ Cancel observation if not started before  UTC

# Setting Up Your Observations

- At the bottom of the Target selection page is a visibility target graph
- Click save and continue at the bottom



# Receiver

Radio Observing | Add Observation

### Receiver Settings

Current Receiver: L-Band 1300.0MHz-1800.0MHz

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Receiver Data Acquisition Mode: Low Resolution Mode Bandwidth: 80 MHz

+ Filter: HI (1355.0-1435.0) + Center Frequency (MHz): 1395

+ Channels: 1024

☐ Pulsar Mode

Save and Continue

- Select Low or High resolution
- Select Filter
- If high resolution, your two bands need to have center frequencies spaced as multiples of 15.625 MHz

# Path

Radio Observing | Add Observation

### Path Settings

Based on your selected frequencies, your estimated beam width is 0.74 degrees

#### Time Account

ID	Sponsor	Balance	Priority
<input checked="" type="radio"/> 18047	NRAO-Green Bank	379,753 credits	1 ▾

#### Path Type

Track ▾

⚙ Duration:  ⚙ Integration Time:  ⚙ Repeat:  ▾

Save and Continue

- Choose Track or OnOff for spectra
- Choose Daisy or Map for images
- Complete the additional info for each field
- At this stage you can see how much the observation will cost (in credits)

# Daisy Path

## Path Settings

Based on your selected frequencies, your estimated beam width is 0.75 degrees

### Time Account

ID	Sponsor	Balance	Priority
<input checked="" type="radio"/> 18045	NRAO-Green Bank	67,676 credits	1

### Path Type

Daisy

Radius (arcmins):

120

Number of Petals:

4

Duration:

240

Integration Time:

0.3

Save and Continue

Total estimated observing time will be 4.0 minutes (240 credits)

- Radius: 90 to 120 arcminutes
- Number of Petals: Use 4 for a quick look, 8-12 for a more complete map
- Integration Time: 0.2 or 0.3 seconds is usually good
- Duration: 180 seconds for 4 petals and 360 seconds for 8 petals



# OnOff Path

## Path Settings

Based on your selected frequencies, your estimated beam width is 0.75 degrees

### Time Account

ID	Sponsor	Balance	Priority
18045	NRAO-Green Bank	67,676 credits	1

### Path Type

On/Off

Duration:

RA|Lng|Az Offset (degs):

Dec|Lat|El Offset (degs):

60

-4

Repeat:

Integration Time:

☐ Observe reference position before target (Off/On):

0

1.0

Save and Continue

Total estimated observing time will be 2.0 minutes (120 credits)

- If doing continuum observations, this is good for measuring flux density of an object
- If doing spectral line, good for observing fainter objects
- Duration: 30-60 seconds or 200-300 for hydrogen in nearby galaxies
- Offset: a few beamwidths

# Mapping Path

- Map size is specified by either “Beam Widths” or “Degrees”
- Gaps between sweeps:
  - For quick or large scale: 1/4 or 1/3
  - For more detailed: 1/5 or 1/10
- Gap along sweep: keep this box checked
- Map depth: do not increase to more than 2 seconds

Path Type

Map

Map Size

Specified By: ☒ Beam Widths ☐ Degrees

RA | Lng | Az Size: 8 beam widths 6.012 degrees

Dec | Lat | El Size: 8 beam widths 6.009 degrees

Maps should be at least 6 beam widths across in both directions and even larger if you wish to measure source brightness. Otherwise, only raw scan data will be returned.

Sampling Density

Direction: RA|Lng|Az

Gap Between Sweeps: 1/5 Beam Width

Gap Along Sweeps: ☒ same as gap between 1/5 Beam Width

Gaps should be the same in both directions and no greater than 1/4 of a beam width if you wish to measure source brightness. If not the same in both directions, only raw scan data will be returned.

Map Depth

Specified By: ☒ Integration Time ☐ Slew Speed

Integration Time: 0.3 seconds

Slew Speed: 0.501 degrees/second

Note: The telescope's slew speed may not exceed 2.0 degrees / second.

Save and Continue

Total estimated observing time will be 8.0 minutes (481 credits) and consist of 40 sweeps each taking 12.0 seconds

# Review and Submit

Radio Observing | Add Observation

Target → Receiver → Path → Review

OBSERVATION NAME:	abcd
COORDINATE TYPE:	RA_DEC_COORD
RA LNG AZ:	02:13:34.7
DEC LAT EL:	16:01:23.7
MIN SUN SEPARATION:	0.0 degrees
MIN TARGET ELEVATION:	20.0 degrees
RECEIVER MODE:	highres
FILTER:	N/A

★ Radio Observations

+ Add New Observation



# GREEN BANK OBSERVATORY

[greenbankobservatory.org](https://greenbankobservatory.org)

*The Green Bank Observatory is a facility of the National Science Foundation  
operated under cooperative agreement by Associated Universities, Inc.*

