Observing/Proposal Project

- We have ~4-8 hours of GBT time available for class.
- Groups of 2-4 people.
- You will propose for observations.
- Contiguous blocks not required (but if you're doing separate observing sessions, >=30 minute sessions useful).

5 Stages…

1. THIS WEEK: Do some thinking, or perhaps reading on arxiv.org on any topic of interest. Consider: what can single-dish radio observations contribute to the topic?

2. 21 April: In-class peer discussion.
   Come with some ideas to discuss!

3. 30 April: GROUP proposal due (1 page).
   In-class time assignment committee!

4. Due 6 May, 10am: Individual revises final proposal.
   (each student must separately revise the group proposal draft; 2-3 pages).

5. Possibly: observations!

Maybe you will publish!

I encourage you to contact other faculty to develop your ideas. I (and possibly they) can help you carry out observations and develop the work into a paper, if your proposal proposes original work.

CONSTRAINTS ON THE HI MASS FOR NGC 1052–DF2

AMY SARDONE[1,2], D.J. PISANO[1,2,3], SARAH BURKE-SPOLAOR[1,2], JOSHUA L. MASCOOP[1,2], AND NIHAN POL[1,2]
[1]Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506
[2]Gravitational Wave and Cosmology Center, Chestnut Ridge Research Building, Morgantown, WV 26505 USA and
[3]Adjunct Astronomer at Green Bank Observatory

Draft version January 24, 2019

ABSTRACT

We report deep, single-dish 21 cm observations of NGC 1052–DF2, taken with the Green Bank Telescope. NGC 1052–DF2, proposed to be lacking in dark matter, is currently classified as an ultra-diffuse galaxy in the NGC 1052 group. We do not detect the galaxy, and derive an upper limit on the HI mass. The galaxy is extremely gas-poor, and we find that a 3σ $M_{\rm HI}$ detection at a distance of 19 Mpc and using a line width of 3.2 km s^{-1} would have an upper limit of $M_{{\rm HI},lim} < 5.5 \times 10^5$ M$_\odot$. At this mass limit, the gas fraction of neutral gas mass to stellar mass is extremely low, at $M_{\rm HI}/M_\star < 0.0027$. This extremely low gas fraction, comparable to Galactic dwarf spheroidals and gas-poor dwarf ellipticals, implies that either the galaxy is within the virial radius of NGC 1052, where its gas has been stripped due to its proximity to the central galaxy, or that NGC 1052–DF2 is at distance large enough to inhibit detection of its gas. We also estimated the upper limit of the HI

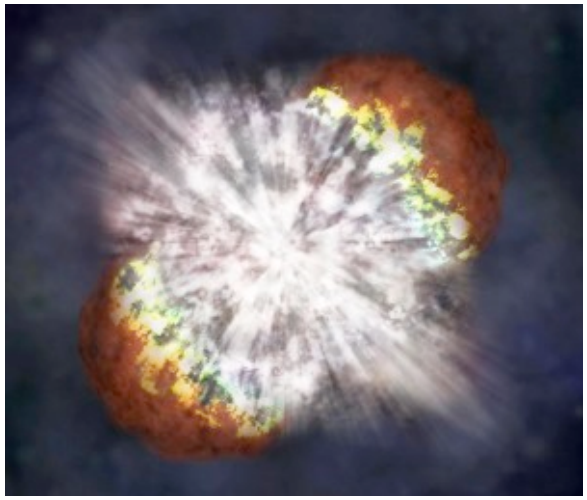
"We propose…

- … to confirm that young supernova remnant G1.9+0.3 has a non-thermal spectrum."
- … to search for a newborn pulsar in a young supernova remnant."
- … to search for FRBs in some particular region of sky or from some particular type of hypothesized progenitor."
- … to test whether pulsar XXXX-XXXX is in a binary system."
- … to measure emission/recombination lines in an interesting object."

What are your questions?

FRB searches

PROJECT IDEA 1: Search for FRBs in a hypothesized FRB progenitor.



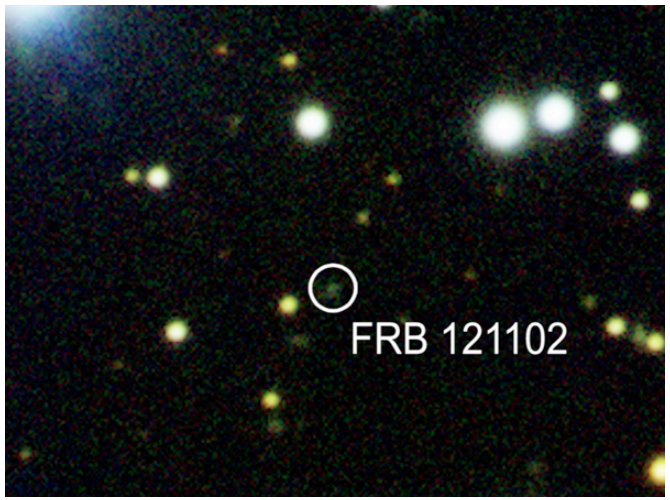
Do superluminous supernovae/long gamma-ray bursts make extreme young magnetars?

https://slsn.info/
https://heasarc.gsfc.nasa.gov/W3Browse/gamma-ray-bursts/grbcat.html

Good candidate: GRB 060218; thought to have made a neutron star based on afterglow modelling

- Things to consider:
  - Older objects better (lower SNR optical depth)—Look for SLSN/GRBs from 5+ years ago.
  - Some SLSN/GRBs are modelled to have formed neutron stars.
  - If you don't get a detection, will the data still be useful? Will this contribute to other campaigns? Will you have a chance at finding other objects like foreground pulsars in this field?

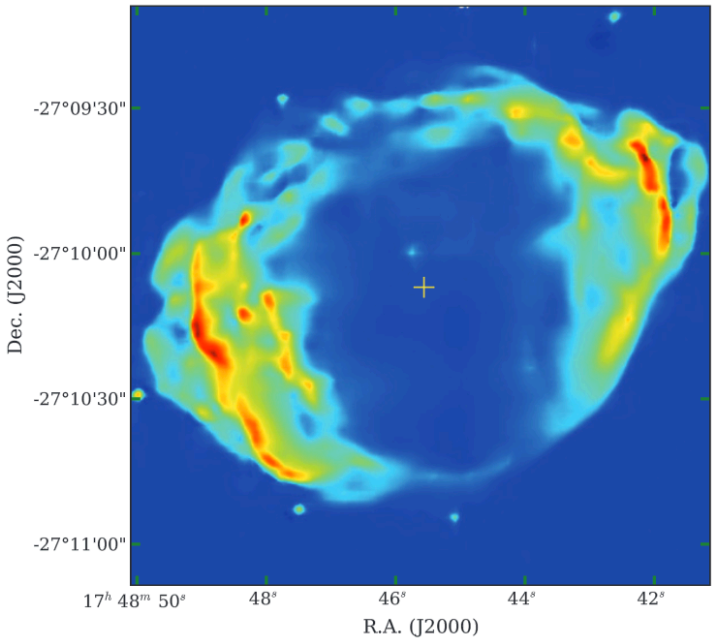
FRB searches



PROJECT IDEA 2: Search for more FRBs from a previously-detected FRB location.
http://frbcat.org/
http://adsabs.harvard.edu/abs/2015MNRAS.454..457P

- Things to consider:
  - What makes a good repeater-search target?
  - What knowledge is gained if you don't detect anything?

G1.9+0.3 Supernova Remnant



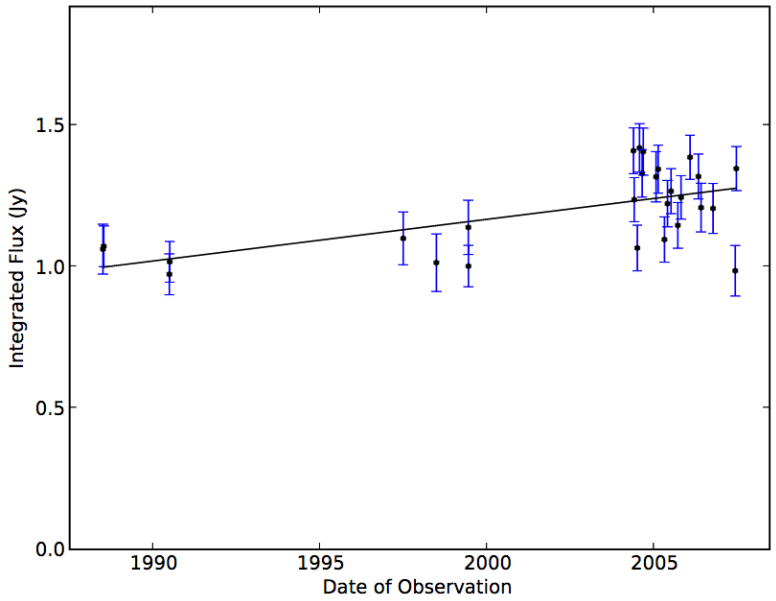


Figure 3. 843 MHz radio light curve for G1.9+0.3 from 1988 to 2007. Flux densities were calculated using a double Gaussian fit after polynomial subtraction of the background (see text for details of the flux density and error calculations). The solid line shows a least squares fit with gradient 0.015 Jy yr^{-1} and a flux density of 1.23 Jy on 2005/01/01.

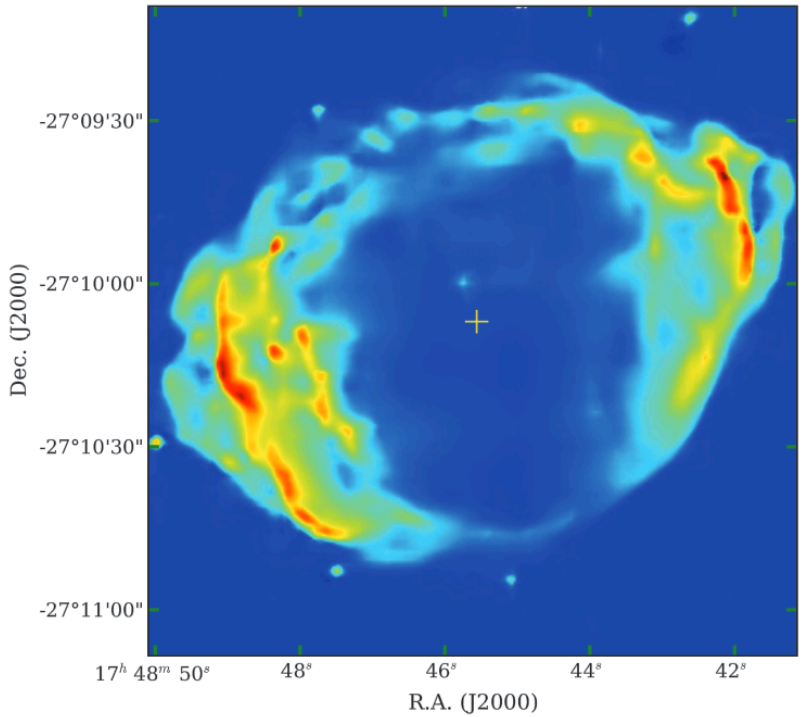
- **~100 year-old supernova remnant**
- **Still in early rapid expansion phase (1% per year!)**
- **Careful: close to galactic center!**

http://adsabs.harvard.edu/abs/2008ApJ...680L..41R
https://arxiv.org/abs/0806.1952

- **PROJECT IDEA 3: Is the emission of young SNRs thermal or non-thermal?**
- **PROJECT IDEA 4: Might there be a young pulsar visible in center? What might its spin properties be based on the remnant's age?**

G1.9+0.3 Supernova Remnant

- Things worth considering:
  - At what frequencies should I observe?
  - If searching for pulsar, what DM would the pulsar have? How much scattering?
  - Is the source bright enough? Will GBT be confused?



Do asteroids contain hydroxide?

- **Project idea #5: Search for OH emission lines from asteroids.**
- OH: 18cm line measures water outgassing rate from comets, measures volatile contents.
- Has been done only once: Park, Pisano, et al.
  - http://adsabs.harvard.edu/abs/2018arXiv180310187P

Do asteroids contain hydroxide?

- Things worth considering:
  - Proximity of body to Earth (nearby = stronger constraints)
  - Asteroids can move very fast! Will you have to track it?