so you need more data...

writing a telescope proposal

Lydia Guertin, Cornell University

the essentials of proposals (of any kind)

you have an idea

you can’t find the answer in the literature

you know this idea is scientifically tractable

you’re competing for limited resources

the three steps to getting time

1) why your idea is worth doing
    a) motivating the relevant background
    b) explaining why previous observations (if any) cannot be used
2) how your idea will come to life
    a) why this instrument is necessary to achieve your science goals*
    b) what specifically within the instrument needs to be done
3) the nitty-gritty
    a) numbers & observational settings

scientific justification

technical justification

technical setup

the two steps to an observing proposal

1) why your idea is worth doing
   a) motivating the relevant background
   b) explaining why previous observations (if any) cannot be used
2) how your idea will come to life
   a) why this instrument is necessary to achieve your science goals
   b) what specifically within the instrument needs to be done
3) the nitty-gritty
   a) numbers & observational settings

uploaded document(s)

proposal submission tool (PST)

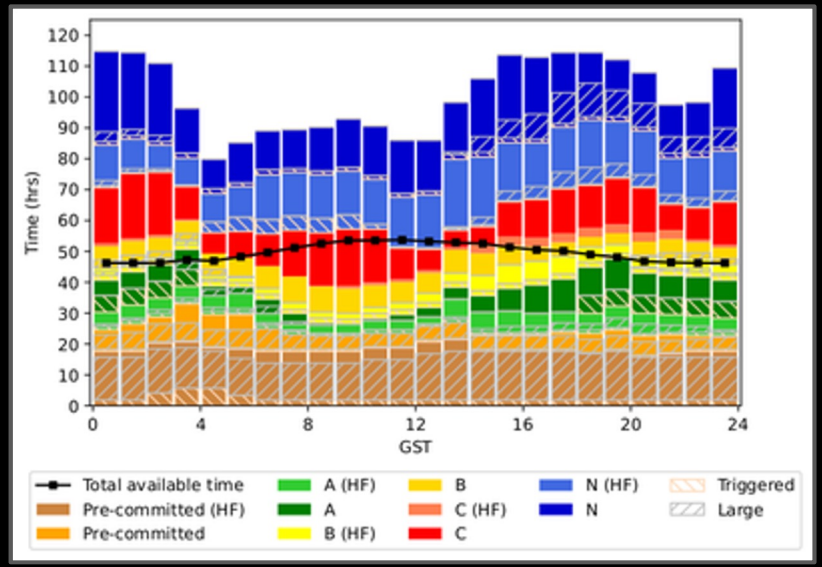
but lydia, isn't it difficult?

Statistics by Proposal Count			
Proposals	**GBT**	**VLBA**	**VLA**
Submitted	53	70	164
Approved	31	33	62
Filler	6	16	41
Rejected	16	21	61
Oversubscription	1.7	2.1	2.6

Statistics by Proposal Hours			
Proposals	**GBT**	**VLBA**	**VLA (B)**
Requested	6472.83	1814.8	4754.22
Available	1931.77	593.0	1743.00
Approved	2035.50	584.9	1624.00
Filler	134.00	337.9	939.09
Rejected	4155.08	891.9	1985.93
Pressure	3.4	3.1	2.7

NRAO Proposal Statistics 25B Semester

VLBA 25B Semester Pressure Plot



the scientific justification

1) the goal

explaining how your goal arises from the current state of the field, and it's 'novelty' — be interdisciplinary when possible

scenario #1

re-measuring a parameter for *the same astrophysical system with a different instrument*

scenario #2

re-measuring a parameter for *the same astrophysical system with the same instrument*

scenario #3

re-measuring a parameter for *a different astrophysical system with the same instrument*

2) the method

you have to convince them you know what you're doing, without getting too deep into the details

- would a reviewer understand how i will process the raw data?
- would a reviewer understand how the final result is produced?
- why does my method require these instrument specs?

if any ancillary goals can be achieved, be sure to note them as part of your 'argument'

formatting: not just LaTex templates**

how can you advertise your expertise and the novelty as clearly as possible?
(don't be afraid of formatting!)

- bold acronyms upon first use
- bulleted list of goals or takeaways
- figures only when absolutely necessary to demonstrate a point
  - at least one if possible!!!
- reformat the references!
  - minimize the number, but self-reference previous work when possible to demonstrate expertise
- page limits…

scientific justification example: be nice

https://drive.google.com/file/d/1_1sdDj1v2vz8MNC5Ca2r3yjclf2FV-w7/view?usp=sharing

the technical justification

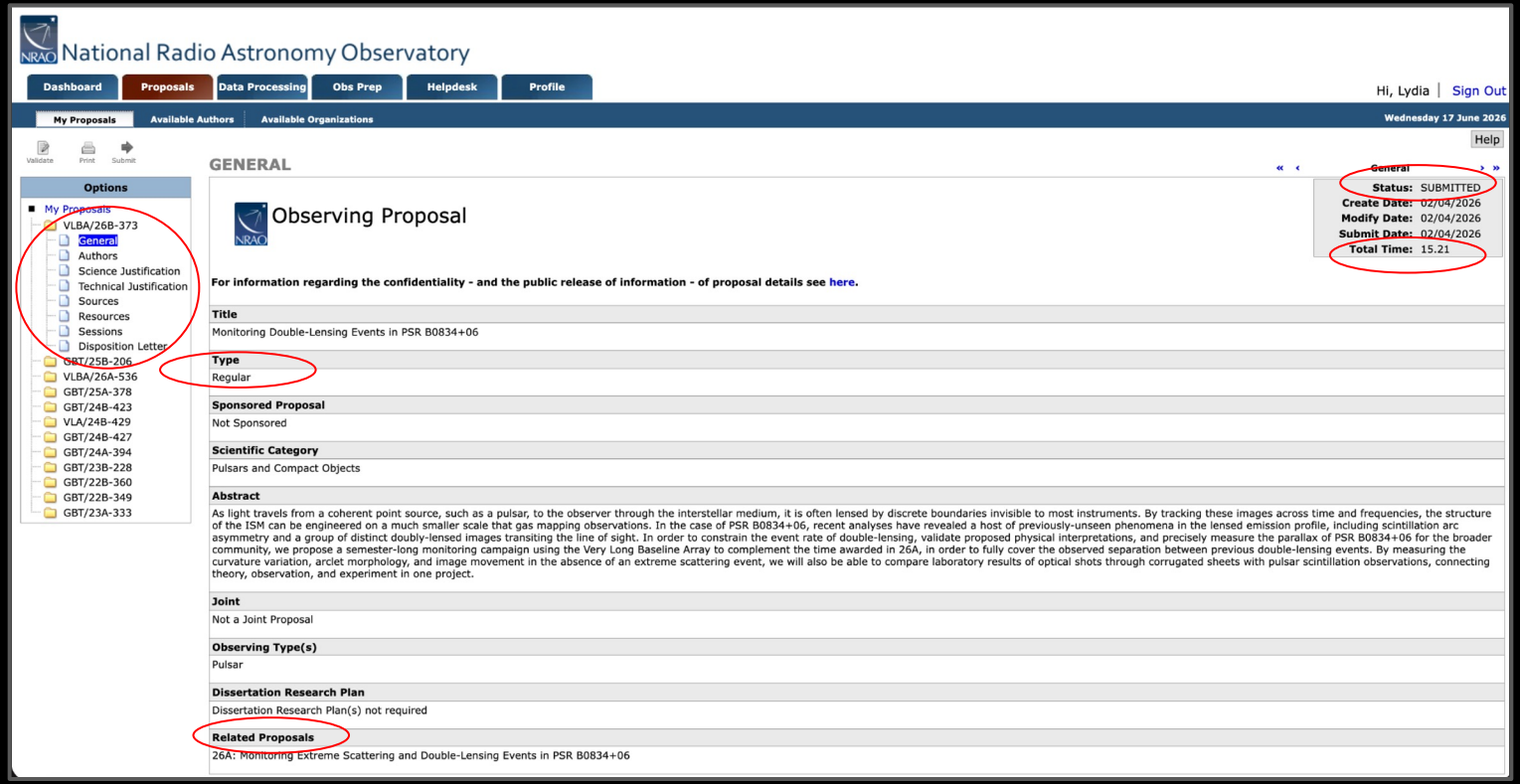
the instrument

why can't this be done with another instrument or existing data?

- size (e.g. dish size; baseline lengths)
- resolution (frequency, time, space)
- receiver/frontend (observing frequency)
- timespan or cadence, or expected event occurrence
- backend (processing technique, data format)
- or, just more data necessary to confirm prior observations!

the technical setup

proposal submission tools**



technical setup**

highly dependent on which observatory you're proposing to use

- sensitivity calculations
- data rate calculations & allocated processing time
  - requests for long-term storage, or even shipping hard drives
- source elevation limits
  - sun separation & weather constraints
- array configuration & stations needed (VLBI)
- calibration specification (phase for VLBI; flux for all)
- correlator specifications (VLBI)

generally done by hand with values from literature

often, calculators exist. check archive limits

calibrator catalogs; must be close to target source (in-beam is king)

aside: the review process

first step (before proposal calls):
how much time is even available?

time allocation**

multiple rounds of review from varying perspectives

individual and panel review

1-5 reviewers (at least two, generally)

scientific merit, but not always from your subfield; technical feasibility (observatory staff)

sometimes double-blind

each give a score from 0.1 to 9.9

time allocation committee (TAC)

given the linear rankings from panel review, assigns the priorities (A, B, C, D, N)

TAC considers, i.e., existing campaigns, distribution of subject area, distribution of receiver availability and weather constraints

interpreting the disposition letter

rankings & reviews**

generally, you'll be awarded **full, partial, or no time**, and whether or not this is actually observed depends on your letter ranking

A is scheduled for the proposed semester, can roll over into the following semester, and is the only guaranteed ranking

observing parameters guaranteed (cadence, weather, etc.)

B is only during the proposed semester

observing parameters likely

C & D are filler time, and N is not scheduled

looser observation constraints more likely to be observed**

example (don't bully me)

DISPOSITION LETTER « ‹ **Disposition Letter** › »

This email contains specific information about proposal VLBA/26B-373 for Semester 2026B.

Congratulations! We are pleased to inform you that your proposal has been accepted, in full or in part, by NRAO (see below for details).

Proposal ID: VLBA/26B-373

Legacy ID: BG323

Proposal Title: Monitoring Double-Lensing Events in PSR B0834+06

Proposal Type: Regular

Proposal Authors: Lydia Guertin, Daniel Baker

Science Review Panel (SRP): Interstellar Medium

Time Allocation Summary:
15.2 hours at Priority B in the VLBA dynamic queue.
[see section below for explanation].

Linear Ranked Score: 2.5

Comments from the Time Allocation Committee (TAC):

This proposal could only be awarded B priority as all A priority time in the requested GST range had already been awarded to higher ranked proposals. Requiring all VLBA antennas could make this hard to schedule and may make achieving the requested cadence impossible.

Time Allocation:

Session Name	Sem	Receiver	Time (hours)	Time (hh:mm)	GST Range	Priority	Scheduling
Monitoring	26B	90	13 x 1.17	14:00-18:00	B		

Comments from the SRP:
Summary:
A VLBA monitoring program of PSR B0834+06 is proposed to constrain the rate of double-lensing events, to confirm proposed interpretations, and to measure a precise parallax of the target. Discrete structures along the line of sight will be probed using the frequency-dependent geometric delay they induce in pulsar signals.

Proposal strengths:
- The theoretical background is presented and summarized well, motivating these observations.
- Source selection is logical, as PSR B0834+06 is a well-studied target with double-lensing events and deserves follow-up observations, and goals/deliverables are clearly outlined.
- Non-detections are still useful to constrain the temporal variations and establishing the stability of these signals. Parallax measurements would be of great benefit to the community.

Proposal weaknesses:
- While the science goals are evident, there is a dearth of discussion addressing the planned analysis, making it difficult to assess the feasibility of accomplishing the presented goals. For example, how does the rate of double-lensing events result in a better understanding of the formation of the structures causing these events?
- Figure numbers are not referenced correctly in the main body, making it difficult to follow their descriptions in the main text body.

Recommended time: The SRP does not recommend a change to the proposed time request.

Technical issues affecting ranking or recommended time: None

Comments from the NRAO:

Submission of Observing Files: Schedule (.key) files for proposals allocated time in the VLBA dynamic queue should be sent to vlbiobs@nrao.edu by the start of the semester (August 1, 2026). For advice on preparing your scheduling blocks, please see https://science.nrao.edu/facilities/vlba/observing or use the NRAO Helpdesk at https://help.nrao.edu. Proposals with fixed-date allocations (e.g., HSA proposals) should also submit schedule (.key) files by this date to facilitate scheduling of their observations; it is also helpful to include dynamic scheduling information for fixed-date observations as this is useful in determining when the observations can be scheduled.

For additional information, please see https://science.nrao.edu/facilities/vlba/docs/manuals/obsvlba/letter

Further information for proposers and observers, including statistics and telescope pressure plots, is available from the TAC report at https://science.nrao.edu/observing/proposal-types/tac-reports/26b-tac-report

Comments from the NRAO Technical Reviewer:
Technical review comments:

Stations Requested: The proposers note "rich substructure on the order of 100 microarcseconds" but they should keep in mind that at 90 cm, the resolution of the VLBA is a few tens of milliarcsecond.

Receivers Requested: If total intensity is of interest, then dual pol recording will be needed.

Scheduling Considerations: Would have been useful to know how far the sun is, as it could severely impact observations at this band.

Correlator Setup: The setup requested in the cover sheet (PFB, 32MHz subbands, 16 baseband channels, dual pol, and 2048 Mb/s bit rate) is inconsistent with that requested in the technical justification asking for 256 Mb/s, and what's used in the sensitivity calculator printout which is asking for 16 subbands each 1 MHz wide with dual pol. We ask the proposers to provide consistent information. Furthermore, the requested setup (16 subbands x 1 MHz in dual pol) cannot be delivered. Maximum of up to 8 data channels, which can translate to 8 subbands in single polarization, or 4 subbands in dual polarization can be delivered with the DDC system of the RDBE. To cover the requested 16 MHz frequency span, if this is what's indeed intended, then the proposers should use 4 MHz x 8 data channels (4 data channels per polarization), with 16384 spectral points per data channel.
The correlator gating setup appears okay, but the proposers do not address where they will get a reliable pulse phase ephemeris to use for the gating. Typically, contemporaneous monitoring on other telescopes is used for this.

Self-Calibration and Phase Referencing:
The proposers note "We will be using the in-beam phase calibrator J083646.4+061108, which has an expected flux density of around 4 mJy (Liu et al. 2016)." A 4 mJy source cannot be considered a calibrator, especially for the 90cm band which is not a sensitive band.

Sensitivity: There will be some loss in sensitivity due to RFI. Also, there may be some likely challenges with calibrating 90cm band data. For more details, see the technical memo: https://library.nrao.edu/public/memos/vlba/sci/VLBAS_42.pdf

Correlator Output Data Size: The data size is only for 1hr. It should be multiplied by 13 since there are multiple sessions.

Technical information supplied was satisfactory:

Integration Time:
Imaging Considerations:
Polarization:
Flux Calibration:
Min/Max GST:

another aside: you’re not done yet

observing scripts**

sometimes you have a ‘project friend’ that will help you create these, sometimes it’s up to you, **always there will be a helpdesk. abuse it.**

generally includes:

scheduling constraints

observer / PI information

receiver settings

backend settings

source list → scan commands

metadata to record

a sched .key file; generally used for VLBI setups

```
overwrit

! ======================================
  Preferred Dynamic Constraints
! ======================================
! Equipment constraints:
!    Stations
!      SC  HN  NL  FD  LA  PT  KP  OV  BR  MK
!      o   o   o   o   o   o   o   o   o   n
!        Comments
!          If SC 90cm is still not available, do not use SC
!        Minimum number of stations: 5
!     Bands and polarizations
!      90cm  50cm  20cm  13cm  6cm  4cm  2cm  1cm  7mm  3mm
!      d
!
  Weather constraints:
!     appropriate for 90cm with the minimum 7 stations
! Date constraints:
!    No preferred date(s), no excluded date(s)
!    Preferred interval between segments in days: 10
!    Special conditions: None
! Start-time constraints:
!    Start-time range in (hhmm - hhmm), in PT_LST: (0415 - 0830)

!!!!!!!!!!COVER INFO!!!!!!!!!!

version = 1
expt = 'B0834+06 in-beam cal'
expcode = 'bg320'
obstype = 'VLBA'

piname = 'Lydia Guertin'
email = 'lydia.guertin@nanograv.org'
address1 = 'Cornell University Department of Astronomy'
address2 = 'Space Sciences Building'
address3 = 'Ithaca, New York, 14850'
address4 = 'U.S.A.'
phone = '615 979 9036'

!!!!!!!!!CORRELATOR INFO!!!!!!!!!!!!

correl = 'Socorro'
coravg = 2
corchan = 4096
corpol = 'off'
corsrcs = 'SCHEDULE'
cortape = 'ftp'
cornote1 = 'three correlator passes (gated and ungated on pulsar; one on in-beam phase cal
J083646.4+061108)'
```

```
!!!!!!!!!!SOURCES!!!!!!!!!!!!

srccat /
EQUINOX=J2000
SOURCE='B0834+06' RA=08:37:05.6485930 DEC=+06:10:16.06361 REMARKS='target pulsar' /
SOURCE='J0831+0429' RA=08:31:48.87696017 DEC=+04:29:39.0858617 REMARKS='fringe finder' /
! ICRF3 X/S astro solution, 1437 observations, RAERR=0.05 DECERR=0.06, CALCODE='V' FLUX=2.2,
0.571, 0.355, 5.0, 0.483, 0.298, 8.4, 0.613, 0.412, 15.2, 0.798, 0.566 FLUXREF='rfc_2025a'
SOURCE='J083646.4+061108' RA=08:36:46.4 DEC=+06:11:08 REMARKS='in-beam phase calibrator for
correlation' /
endcat /

!!!!!!!!!!SETUP INFO!!!!!!!!!!!!

setini = band.9050 /
dbe = rdbe_ddc
netside = U
sideband = U
bbfilt = 4
nchan = 8
pol = dual
bits = 2
freqref = 320.75, 320.75, 324.75, 324.75, 328.75, 328.75, 608.75, 608.75
firstlo = -500,-500,-500,-500,-500,-500,0,0 /
endset /

!!!!!!!!!!SCHEDULE!!!!!!!!!!!
LST = VLBA_PT
year = 2026
month = 04
day = 10
start = 07:00:00
OPMINANT = 7
STATIONS = SC, HN, NL, FD, LA, PT, KP, OV, BR, MK
Setup = 'band.9050'

!!!!!!!!!!SCANS!!!!!!!!!!!!
source = 'J0831+0429' dwell=300 gap=0 /
group 1 rep 12
source = 'B0834+06' dwell=300 gap=0 /
source = 'J0831+0429' dwell=300 gap=0 /
source = 'J0542+4951' dwell=150 gap=0 / ! backup fringe finder (3C147)

! end
```

things i left out (speedrun)

extras

- types of proposals
  - **director's discretionary time (DDT), regular call (normal, large, multi-semester)**, special call, target of opportunity (ToO), triggered, joint, etc.
- the wide variety of PSTs, review processes, and proposal formats
  - most things that vary from site to site have been marked with **
- sometimes, proposals from citizens of the site country are prioritized
  - some instruments have limits on the overall hours awarded to external PIs, or per-country limits (ex. VLA, run by the NRAO)
- generally, VLBI proposals are handled differently
  - joint proposals may require separate submission to both observatories, or perhaps not
- travel priority boosts & data reduction runs!
  - sometimes, observatories offer a boost in scheduling priority when the PI visits the site, and some travel funding is available for PIs to observe/reduce data on-site
- student dissertation plans!!

summary

- proposals are competitive, but there are ways to maximize your chances
- every accepted proposal is valuable (put it on your CV ASAP)
- the helpdesk exists for a reason, and they won't get mad at you for using it
  - usually
- you know your science is worth doing — you just have to convince the TAC that it is!