Writing a proposal

Zsolt Paragi (JIVE)

An update on Robert Laing's ERIS'19 presentation

Proposal preparation

MONDAY

- Form teams of about seven
- Come up with a science goal
- Write it down on the white board in the central hall
  (we help you with a topic in case you need!)

TUESDAY

- We will allocate a **mentor** to each project
- Use the flipchart to (1 sheet per group) to recruit others

MONDAY-THURSDAY

- Learn about interferometry and modern arrays
- Brainstorm about how to achieve the proposed goals

FRIDAY

- Team presentations (1 slide science case, 1 slide technical justification)

The project

The science case

- Select a source or define a sample (how many targets?)
- The science case must be topical and interesting
- Perhaps something you are familiar with already
- But welcome to use your imagination!
- Present the science case in a slide

The observations

- Select an array for the project, e.g.

  EVN/global VLBI, LOFAR, JVLA, e-MERLIN, MeerKAT, ASKAP, MWA, ALMA, NOEMA, (ng)EHT, GMRT, FAST (SKA, ngVLA ?)
  (N/S declinations, frequenice, sensitivity: which arrays can do what I want?)

- May think about observations as part of a multi-messenger campaign!
- Decide what frequency, bandwidth, configuration, backend (e.g. pulsar) to use
- Outline the technical justification in a slide

Scientific justification

Are the science goals well-defined?

- Write a one-sentence summary (goals/expected result/impact)!
- Briefly outline the science background (the field, the target(s))

Are the proposed observation unique?

- Check literature, archives
- Describe how the new observations would result in unique new information

A clear observing goal that is directly relevant to the science question(s) to be addressed is very important

- Is it possible to reach these goals? => **Technical Justification**

Technical justification - 1

What frequency/frequencies?

- Spectral lines: think about ν_{rest} rest frequency and z redshift
- Continuum: trade-offs between sensitivity and flux density for a given α spectral index

What spatial resolution and range of sactial scales for imaging?

- Linear resolution d [AU] or [pc] => angular resolution α [(milli-)arcseconds] => frequency ν_{obs} [GHz] => maximum baseline D_{max} [km]
- Shortest baseline D_{max} [km] => detectable largest angular scale

What spectral resolution and bandwidth?

- velocity range => $\Delta\nu$ [MHz] bandwidth
- required velocity resolution => N_s spectral channels

What time resolution (correlator)?

- E.g. pulsars: epochs; gating/binning parameters
- VLBI: Δt together with $\Delta\nu$ => field of view

Technical justification - 2

Sensitivity

- Use a **Sensitivity Calculator** to find rms noise in intensity / [Jy/beam]
  (Intensity = surface brightness is the ket parameter, not flux density!)
  - Is the source resolved??? (especiallly for VLBI…)
  - Peak brightness / “correlated flux density”?
    (earlier studies/guesstimate)

Are the observing goals feasible?

- If yes: ready!
- If not, think about
  - Frequency
  - Bandwidth
  - Resolution
  - Number of sources
  - Another (future) array? Specify requirements!

See the lectures on Wednesday morning by Manu and Benito!

How to achieve these goals?

Calibration

- Station calibration (sometimes) done at the observatories
- Additional steps by data centres (e.g. pipelines)
- For final calibration think about
  - Which and how many Calibrators to use?
  - How frequently to observe these
  - Is self-calibration an option

Imaging

- Use scheduling tools provided by arrays!
  - How complex is the field?
  - Snapshot or full-track imaging?
  - Need to combine arrays or configurations?

Additional considerations

Special considerations

- For polarization (e.g. PA, RM)?
- Fur ultra-precise astrometry?
- Special observing mode/equipment to use?
- Time constraints (coordinated campaigns)?
- Target of Opportunity?

Proposal pressure

- Highs/low-demand arrays
- Some GST ranges are more popular
- Do you need excellent whether conditions?

Possible topics - 1

Solar system

- Space weather

Galactic

- Probe episodic accretion in high-mass star formation
- Find a hitherto unknown population of black holes
- Compare gas and dust distribution in a protoplanetary disk; what can you find about snow lines using various tracers?
- The Great Dimming of Betelgeuse - what causes surface irregularities in red supergiants and are these linked to mass loss?
- How does binarity affect mass loss from evolved stars: investigating the kinematics with masers (see Atomium et al. 2006)
- Localise NS-NS(BH?) mergers

Possible topics - 2

Extragalactic

- CO/HI kinematics in a low-redshift galaxy
- CO/HI probing of AGN jet-driven feedback in galaxies

Active Galactic Nuclei

- Resolve a BH shadow and measure fundamental BH properties (other than SgrA* and M87)
- Tracing ejecta from tidal disruption events with VLBI

Distant Universe/Cosmology

- HI absorption at high redshifts
- CII observations of a 1000 Solar mass/yr star forming galaxy at redshift ~15

SETI

- “Are we alone?”

Forming groups

- Please self-organize in small groups (4-12 people; 8-10 groups)
- If you are the first to pick a topic, write the title and your name(s) on the white board
- If it is your own topic, then please check with the tutors that we can support you!
- We will see if topics need to be merged or groups split up!
- On Tuesday signing up starts to fill the groups (for the still open groups)
- By Wednesday morning all should be finalized!
- Proposal tutorials on Wednesday morning – come forward with questions related to the proposals you will be working on
- There will be some free time on Wednesday evening, in between advanced tutorials and during the Thursday dinner for group discussions
- Friday: 2-slide presentations!

Announcement - 1

- For after-lunch tutorals the suggested seating order is:

S S S S S
S S S S S
free for tutors to move
S S S S S
S S S S S
free for tutors to move
S S S S S
S S S S S
free for tutors to move
S S S S S
S S S S S

Announcement - 2

From Dhanya Nair:
A new post-doc position to work on EHT imaging of SMBHs is opening in Dr. Neil Nagar's group at the University of Concepcion, Chile

Here is the advertisement for the position
https://jobregister.aas.org/ad/d2e714b1