

PROPOSAL WRITING TUTORIAL

Outline

- 30 minutes: Lecture on Generic Issues
- 60 minutes: Small Groups Write Proposals
 - Group selects either VLA or VLBA case
 - Textbook, Observational Status Summaries provided
 - Scientific justification, target list provided
 - Group completes proposal, compares with “real” one

Generic Issues - 1

- Start with nifty scientific idea, target list
- What is desired angular resolution q_{HPBW} ?
- What is desired largest angular scale q_{LAS} ?
- What is desired observing frequency ν ?
 - Line programs have little flexibility
 - Physics dictates transition frequency
 - Earth-target radial motions then give observing frequency
 - Continuum programs have some flexibility
 - Multiple frequencies?
 - Need single or multiple receivers? Eg: SiO 43 and 86 GHz
 - Need matched resolution? Eg: Faraday rotation measures

Generic Issues - 2

- What are desired Stokes parameters $IQUV$?
- What is desired bandwidth $\Delta\nu$?
 - Line program has natural limit
 - Velocity spread converts to frequency spread
 - Add padding to reach zero or continuum level, ensure line in flat part of passband
 - Continuum program might have practical limit
 - Bandwidth smearing
 - Bandwidth depolarization
 - Tape capacity if VLBI

Generic Issues - 3

- Use documentation to select, evaluate trial array
- Evaluate for special needs. Eg: Redshifted HI
- Evaluate for geometry
 - Target up? Snapshot or full track of u-v coverage?
 - Enough range in angular scales?
 - Wavelength $\lambda = c/\nu$ in cm
 - Minimum, maximum baseline lengths B_{min}, B_{max} in km
 - Angular resolution in mas: $\theta_{HPBW} = 2063 \times \lambda / B_{max}$
 - Largest angular scale in mas: $\theta_{LAS} = 2063 \times \lambda / (2 \times B_{min})$
 - Enough information for good target reconstruction?
 - Full track with N antennas $\frac{\Omega_t}{\Omega_{HPBW}} \leq \left(\frac{N \times (N-1)}{2} \right)^2$
 - Uniform u-v coverage

Generic Issues - 4

- Evaluate for interferometer sensitivity
 - Antennas have system temperature T_{sys} , gain K
 - System equivalent flux density $SEFD = T_{sys}/K$
 - Interferometer has system efficiency h_s , sensitivity

$$\Delta S = \frac{1}{h_s} \times \frac{SEFD}{\sqrt{2 \times \Delta\nu \times t}}$$
 - Expect target flux density S , coherence time $t = t_{coh}$
 - Adequate signal-to-noise ratio for self-calibration?
 - Calibrator flux density S' , observation time $t = t_{obs}$
 - Adequate signal-to-noise ratio for calibration?

Generic Issues - 5

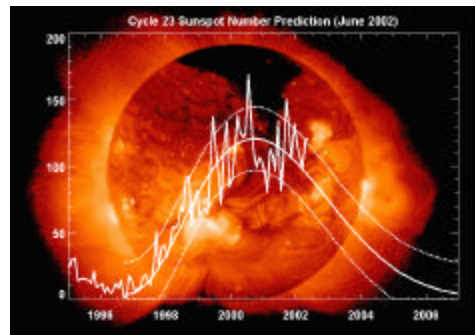
- Evaluate for image sensitivity
 - Antennas collect single polarization
 - Array has N antennas, integrates for time t_{int}

$$\Delta I_m = \frac{1}{h_s} \times \frac{SEFD}{\sqrt{N \times (N-1) \times \Delta\nu \times t_{int}}}$$
 - Evaluate for desired Stokes parameters $IQUV$

$$\Delta I = \Delta Q = \Delta U = \Delta V = \Delta I_m / \sqrt{2}$$

Generic Issues – 6

- Evaluate for undistorted field of view
 - Bandwidth, time-average smearing (lecture 18)
 - Non-coplanar baselines (lecture 19)
 - Primary beam width (lecture 3)
- Evaluate for optimal timeframes
 - Time of day?
 - *Eg: Better antenna pointing at nighttime*
 - Season?
 - *Eg: Better phase stability in dry months*
 - Year?
 - *Eg: Better polarimetry at Solar Minimum*



Generic Issues – 7

- If trial array ...
 - Fails evaluation then pick another array
 - Passes evaluation then continue
- Prepare, submit proposal
 - Deadlines?
 - Cover information?
 - Scientific justification + technical matters?
 - *Be clear, specific, concise*
 - Staff collaborator?
 - Submission route?
- Receive allocation notice

VLA and VLBA

- Prepare, submit proposal
 - Deadlines? **1 Feb, 1 Jun, 1 Oct**
 - Cover information? **Download, fill in .tex form**
 - *See www.nrao.edu/administration/directors_office*
 - Scientific justification + technical matters?
 - *Add < 1000 words to form: Be clear, specific, concise.*
 - *Science: Motivation, goals (eg)*
 - *Technical: Observing strategy, imaging strategy (eg)*
 - Staff collaborator? **Optional but welcomed**
 - *See www.aoc.nrao.edu/AOC/AD/aoc-research.html*
 - Submission route? **Email .ps file to proposoc@nrao.edu**
- Receive allocation notice **1 May, 1 Sep, 1 Jan**