VLASS Science Planning Workshop

Key Questions and Exploration Areas

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Imaging Considerations

- Condon – sky is full of sources, which have profiles/sized. There is surface brightness limit to resolution (tension higher res -> deeper)
- White – imaging quality of (wideband multi-scale) clean etc.
- Q: How do normal and hybrid (e.g. B+D) configurations perform for low surface brightness source (wideband) imaging? Should we craft a new one? DESIGN STUDY NEEDED
- Q: Is there a good synthetic sky model to use (e.g. SKADS? But the sizes seem off)?

Polarization

- Stil – Polarization purity <1% desirable (avg. poln is 2%). RM fitting and synthesis techniques. Extended sources important, surface brighness sensitivity needed.
- Q: What is the polarization imaging performance of the JVLA in OTF/snapshop/ wideband survey mode for real sources? How do RM fit/synth methods perform?

Synoptic Surveys & Transients

- Hallinan – go wide. High resolution for ID. EM counterparts to GW need "reference sky"
- Q: What are the minimal requirements (epochs, sensitivity, band) for reference survey?
- The Correlator and Correlator Backend are highly flexible and configurable. Do we need to develop and test new modes, e.g. to have simulataneous high-time-resolution observing in some sub-bands during normal observing in others (useful to piggyback on "normal" GO projects too).

Spectral Lines

- Roshi – key spectral lines, value of added single dish (e.g. GBT)
- Q: What are requirements on added single dish observations for GBT? What about other single dishes? What about complementary lines (e.g. mm with ARO, CARMA, PdBI, or ALMA)? Could VLBA dishes (e.g. idle ones, Mauna Kea at high freqs.) be used for this? What about VLA auto-correlations?

Survey Design

- Lazio – "gap" in medium-wide (100-1000 deg^2) at 0.1-1mJy surveys in past. Cosmology main known science driver to all-sky. Opportunity for 10-100 deg^2 at 1-10μJy?
- Q: What is optimal mix of aspirational surveys plus VLASS? In frequency / resolution? Can the data be combined for imaging improvement (e.g. lower resolution information)? Should we arrange co-observing (simultaneous)?

Multi-wavelength Surveys

- Menten/Ivezic/Civano/Chambers – many missions and surveys out there. There are many key synergies between these and VLASS.
- Q: How do we best complement, coordinate, contribute, and capture data from these? Should we form (or join existing) multi-survey working group? What capabilities and process changes (scheduling,response,configurations) do we need to make?

Commissioning Survey Capabilities

- Tracking and Pointing for High Frequencies and OTF
- Calibration Stability for Multi-Epoch OTF surveys
- Optimal Polarization Calibration for Surveys
- Optimal Configurations for Wideband Surveys
- Imaging (polarimetric) performance
- Efficient Pipelining for Calibration and Imaging
- Efficient Pipelining for Transient Detection
- Opportunities for you to be involved through SSG and SDG and through JVLA RSRO program!

The VLASS is its data products!

New Mode: On-the-fly (OTF) scanning

- Atomic Element: "OTF Scan" of length Duration in time
  - StartPosition (RA,Dec) ➔ EndPosition (RA,Dec)
    - COSMOS Field Example: 2 square degrees = 85' x 85'
    - COSMOS-C example: 150sec for 85' = 34"/s = 2x sidereal
  - Usually at fixed Dec, weave in RA alternate scan lines
    - Step phase center every 1s to 10s (rate dependent)
  - Currently available only as Resident Shared Risk (RSRO)