PASEO Meeting

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The EVLA pipeline and reference images

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Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array
Robert C. Byrd Green Bank Telescope
Very Long Baseline Array

NRAO

Overview

- Outline of talk
  - Plans for the EVLA pipeline and reference images
  - Relevant details of the EVLA pipeline processing
  - Remaining issues

- Conclusions
  - OSRO data products can be provided by 2011 using AIPS
  - SRO data products planned in 2012 using CASA
  - WIDAR/CASA data handling learning curve for everyone
  - Simultaneous commissioning of EVLA/WIDAR, CASA, pipeline

Plans for the EVLA pipeline

- Staged approach during shared risk (early science) observing period
  - Expand on the AIPS VLA pipeline to provide data products for OSRO
    - Works already on multitude of different VLA data
    - EVLA OSRO is "VLA like"
    - VLA pipeline in AIPS needs only minor modifications for OSRO
    - Can expand with recent AIPS algorithms not yet in CASA
    - Start late summer, 1-2 FTE months, deliver products in winter
  - Develop similar EVLA pipeline in CASA
    - Primary goal: calibration tables and reference images (+code/logs)
    - Learning curve for e.g. wide bandwidths, new calibration strategies, dealing with large amounts of data and many different subbands, …
    - Start in fall/winter, 6-8(?) FTE months, deliver next winter

Plans for the EVLA pipeline (cont.)

- Expand on the CASA pipeline to provide data products for SRO
  - More subband pairs, different subband pair setups
  - Better RFI excision, wide field (etc.) algorithms
  - Matured EVLA data path, flux models, calibration strategies, …
  - Matured quality assurance (also new in AIPS)
  - Extract new calibrator properties, polarization images
  - Gradual evolution of CASA EVLA pipeline during last year of SRO
  - Expect only a few modifications may be needed for reference images during full science operations
- No specialized data reduction in pipeline:
  - Not needed for reference images (see next)
  - Leave to user as it depends on (unknown) science goal

EVLA reference images

- EVLA reference images are total intensity continuum images of part of the primary beam produced by only simple CLEANing of each spectral band of the calibrated data of a standard observation as performed by the EVLA pipeline version available at the time of processing and using only information contained in the data itself without any SELF-CAL or other special processing for a particular science goal
- The NRAO VLA Archive Survey has produced ~195,000 of such images
- The reference images can be used as first indication of data quality
- Best effort approach can never correct for bad observing conditions
- Quality depends on using "standard observing modes" and
  - Performance of hardware (antenna mechanics, receiver band, correlator glitches)
  - Actual weather conditions (should improve with dynamic scheduling)
  - Radio Frequency Interference (application of automated editing algorithms)
  - Observing strategy (provide template observing blocks and staff resources)

Home Links

NRAO, the National Radio Astronomy Observatory

NRAO Data Archive System

NRAO Very Large Array (VLA)

NRAO Astronomical Image Processing System (AIPS)

Main page (NVAS Home)

NRAO Large proposal links

Cone Search (uses cookies)

Name look up : NED SIMBAD
(paste J2000 below)

Position J 17 45 40.038 -29 00 28.0

Radius 0.25 arcminutes

RMS ≤ 10000 micro Jy

Scale (?5 GHz)/frequency

Do not scale search radius

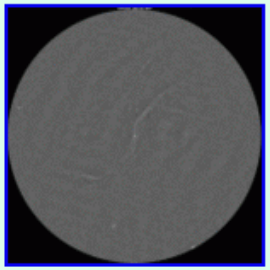
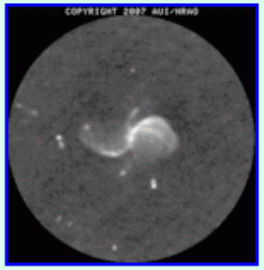
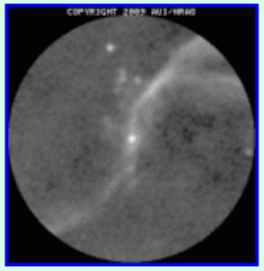
Search Frequency ranges:

Separate VLA images:

- NVSS (AllSky 1.4 GHz/45")
- FIRST (SDSS 1.4 GHz/5")

Index of J121857.5+471814 *Generated on 2010 Jun 07 (02:14 MDT)*

These images were generated on a **best effort** basis using the VLA pipeline in AIPS.

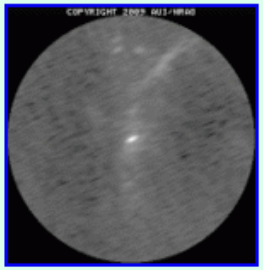
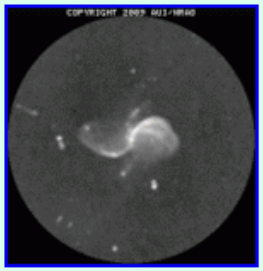
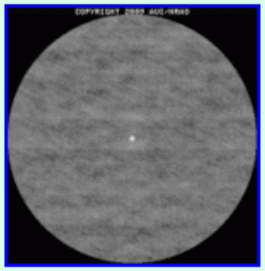
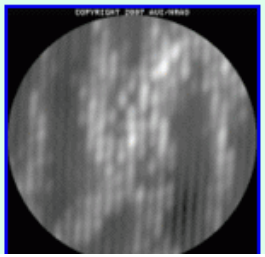
Basic Info	UV Info	JPEG	Image Info	Links
12h18m57.5s 47d18'14" (J2000 image center) 1995 AUG 28 1.41 GHz (L-band) Version: 2009 Jan 29	Full polarization A/A configuration 27 antennas subarray 1 Calibrated uv-FITS 56MBytes		Stokes I Beam = 1.23 arcsec fov: R = 3.92 arcmin rms = 23.9 micro Jy Download FITS image 5.7MBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data
Basic Info	**UV Info**	**JPEG**	**Image Info**	**Links**
12h18m57.5s 47d18'14" (J2000 image center) 1997 JUL 15 1.44 GHz (L-band) Version: 2007 Jun 13	Full polarization C/C configuration 27 antennas subarray 1 Calibrated uv-FITS 75MBytes		Stokes I Beam = 14.2 arcsec fov: R = 10.1 arcmin rms = 63.8 micro Jy Download FITS image 371KBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data
Basic Info	**UV Info**	**JPEG**	**Image Info**	**Links**
12h18m57.5s 47d18'14" (J2000 image center) 1987 DEC 11 1.51 GHz (L-band) Version: 2009 May 12	Full polarization B/B configuration 26 antennas subarray 1 Calibrated uv-FITS 47MBytes		Stokes I Beam = 4.05 arcsec fov: R = 1.64 arcmin rms = 37.4 micro Jy Download FITS image 397KBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data

- VLSS (AllSky 75 MHz/80")
- NRAO Image Gallery

Browse:

- README ! (pop-up window)
- README ! (in the browser)
- VLA archive images
- Dates processed
- Projects processed
- AIPS pipeline code

Version 2008-Sep-26 [an error occurred while processing this directive]

Basic Info	UV Info	JPEG	Image Info	Links
12h18m57.5s 47d18'14" (J2000 image center) 1987 NOV 6 1.51 GHz (L-band) Version: 2009 May 08	Full polarization B/A configuration 26 antennas subarray 1 Calibrated uv-FITS 43MBytes		Stokes I Beam = 3.07 arcsec fov: R = 1.07 arcmin rms = 39.6 micro Jy Download FITS image 397KBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data
Basic Info	**UV Info**	**JPEG**	**Image Info**	**Links**
12h18m57.5s 47d18'14" (J2000 image center) 1988 MAR 22 1.51 GHz (L-band) Version: 2009 Mar 30	Full polarization C/C configuration 26 antennas subarray 1 Calibrated uv-FITS 82MBytes		Stokes I Beam = 13.1 arcsec fov: R = 10.1 arcmin rms = 292. micro Jy Download FITS image 397KBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data
Basic Info	**UV Info**	**JPEG**	**Image Info**	**Links**
12h18m57.5s 47d18'14" (J2000 image center) 1997 JAN 7 1.69 GHz (L-band) Version: 2009 Feb 05	Full polarization A/A configuration 27 antennas subarray 1 Calibrated uv-FITS 23MBytes		Stokes I Beam = 1.11 arcsec fov: R = 42.0 arcsec rms = 41.6 micro Jy Download FITS image 506KBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data
Basic Info	**UV Info**	**JPEG**	**Image Info**	**Links**
12h18m57.5s 47d18'14" (J2000 image center) 1999 JUN 3 1.69 GHz (L-band) Version: 2007 Apr 27	Full polarization A/A configuration 27 antennas subarray 1 Calibrated uv-FITS 21MBytes		Stokes I Beam = 5.83 arcsec fov: R = 1.16 arcmin rms = 126. micro Jy Download FITS image 506KBytes	General data log u-v data coverage Re-Im data plot visibility plot AIPS pipeline runs Original u-v data

Relevant pipeline details

- Data should enable pipelining
  - Requires standard observation strategy for high probability of success
  - Observer supplies "clues" when creating observing schedule
  - Clues in the data drive the non-project-specific pipeline
  - Non-astronomer should be able to operate and assess
- User has to be able to reproduce results
  - Use CASA tasks and toolkit only; no proprietary or specific code
  - Provide variables and log along with calibration tables/reference image
- Design to add new insight in evolving versions
  - New commissioned and more complicated WIDAR setups
  - Advances in wide band calibration techniques, etc.
  - Algorithms not yet in CASA, such as automated quality assessment
  - Details of evolution are matter of future experience and development

Remaining issues

- Currently commissioning a new instrument (EVLA+WIDAR), completing the functionality and developing new algorithms in the data reduction package (CASA) and designing a calibration data pipeline in parallel
  - Some functionality/algorithms in the pipeline may be missing at first
  - Need to manage community's expectations
- Exact details on dealing with complex WIDAR data in CASA unknown
  - Need more experience, and that will take time
    - Formulate, program and test algorithms before adding to pipeline
    - Will have to incorporate into CASA development
- OSRO data manageable with existing algorithms and processors
  - Can start with pipelining OSRO data before above is resolved
- Full science observing pipeline and reference images expected to need only small modifications, mainly to deal with more data in a faster way

Conclusions

- OSRO data products can be provided by 2011 using AIPS
- SRO data products planned in 2012 using CASA
- WIDAR/CASA data handling learning curve for everyone
- Simultaneous commissioning of EVLA/WIDAR, CASA, pipeline