Mid-year CUC meeting

Welcome

CUC members

Adam Leroy (CUC chair, Ohio State Univ., USA)
Olga Bayandina (INAF Florence, Italy)
Jihyun Kang (KASI, Korea)
Ruta Kale (NCRA India)
Yoshimasa Watanabe (Shibaura Inst. Tech. Japan)
Yu-Nung Su (ASIAA, Taiwan)

Rolled off 2022:
Adam Avison
Michael Bietenholz
Hauyu (Baobab) Liu
Alessandra Corsi
D.J. Pisano

CASA Team/NRAO

Jeff Kern (Dir. Data Mgmt & Software)
Urvashi Rao (CASA Lead)
Bjorn Emonts (CASA User Liaison)

CASA Team:
29 members (NRAO/ESO/NAOJ)
+ 11 affiliates (JIVE, ARDG, pipeline)

Rolled off management:
Ryan Raba *(CASA lead)*
Jennifer Donovan *(Project scientist)*

New management:
Urvashi Rao (*CASA lead)*
Sandra Castro *(Lead verification testing)*
Darrell Schiebel *(Lead visualization)*
Takeshi Nakazato *(Lead Single Dish)*
Josh Marvil *(Scientific validation)*
TBD (Lead infrastructure)

Agenda

Mid-year CUC meeting

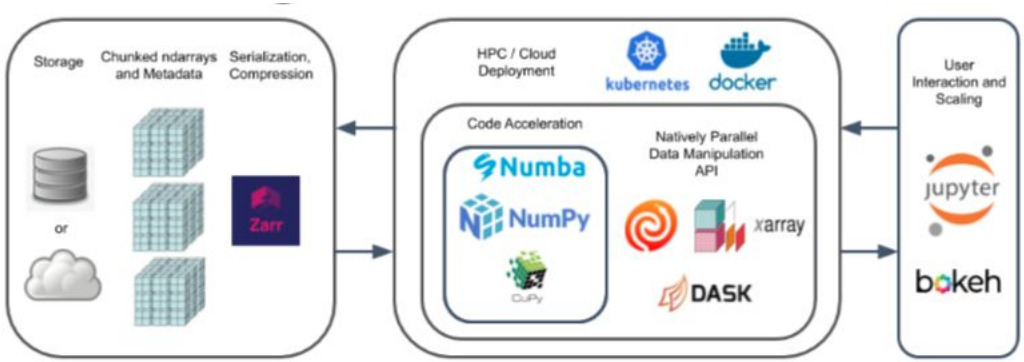
- Roundtable introduction
- Organizational changes & strategic view NRAO/CASA (Jeff Kern)
- CASA Next Generation Infrastructure (Urvashi Rao)
- Recent highlights & CUC report 2021 (Bjorn Emonts)
- *Other topics?*
- Committee business

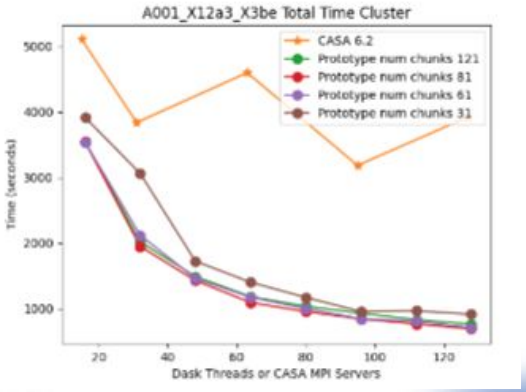
Organizational changes + Strategic view

Jeff Kern (NRAO)

CASA Next-generation Infrastructure

- CNGI Project : Replacement of casacore/parallelization infrastructure of CASA
  - Trade Study + Prototype + Benchmarks (ALMA-LargeProject + VLA-Chiles)
  - CNGI demo package : https://cngi-prototype.readthedocs.io/en/stable/
  - SiRIUS simulator package : https://sirius-sim.readthedocs.io

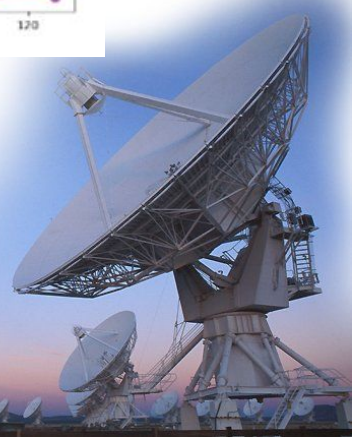




Imaging Time

Speedups

- Experimental use in two new tasks : feather + msuvbinflag
- Plans for casa6 → ngCASA : **TBD**, after DMS-System design work.



CASA 6.3-6.5 highlights

Rolling release cycle → 2-month cadence

- *imbaseline:* new SD task image-based baseline subtraction (6.5.0)
- *plotms:* enhanced support channel-averaging caltables (6.5/6.4)
- *ft:* support models with spectral curvature (6.4.4)
- *tclean:* "Adaptive Scale Pixel" deconvolution algorithm (6.4.4 - experimental)

  + mixed polarization setups (6.4.3)
- *gencal:* a new caltype parameter 'jyperk' (6.4.3)
- *flagdata:* improvements flagging with time or channel averaging (6.4.3)
- *plotcal/plotms:* Functionality plotcal → plotms; plotcal deprecated (6.4.0)
- *phaseshift:* new task to shift phase center; replaced fixvis (6.3.0) 6.4.0)
- *tsdimaging:* new timerange parameter (6.3.0)
- *smoothcal:* smooths caltables produced with accor (6.3.0)

Upcoming CASA Versions

CASA 6.5 & 6.6 (big items)

- uv-continuum subtraction and self-calibration for pipeline
- GPU gridder
- msuvbin autoflag algorithm
- Pipeline support (for Cycle 10 development)
- Experimental tasks CNGI technology (math) (not part of release)
- Holography and antenna-location fitting for ngVLA

Stakeholder priorities general users / CUC

- Interactive tclean widget (not supported by CARTA)
- Continued improvements Joint Deconvolution task sdintimaging
- Complete upgrades task deconvolve
- Uvtaper not working with natural weighting (bug)
- Adjustments changes JPL ephemerides
- (Add various observatories to list of CASA and simulator)
- (plotms refactor → tclean widget priority)
- (ASP deconvolution implementation → 6.4)

CUC Report 2021

https://safe.nrao.edu/wiki/bin/view/Software/CASA/CASAUsersCommittee

CUC Report 2021:

Testing: code, metrics, and benchmarks

- **Verification tests:** Large suite of tests, against CASA Docs documentation (Verification test group; S. Castro)

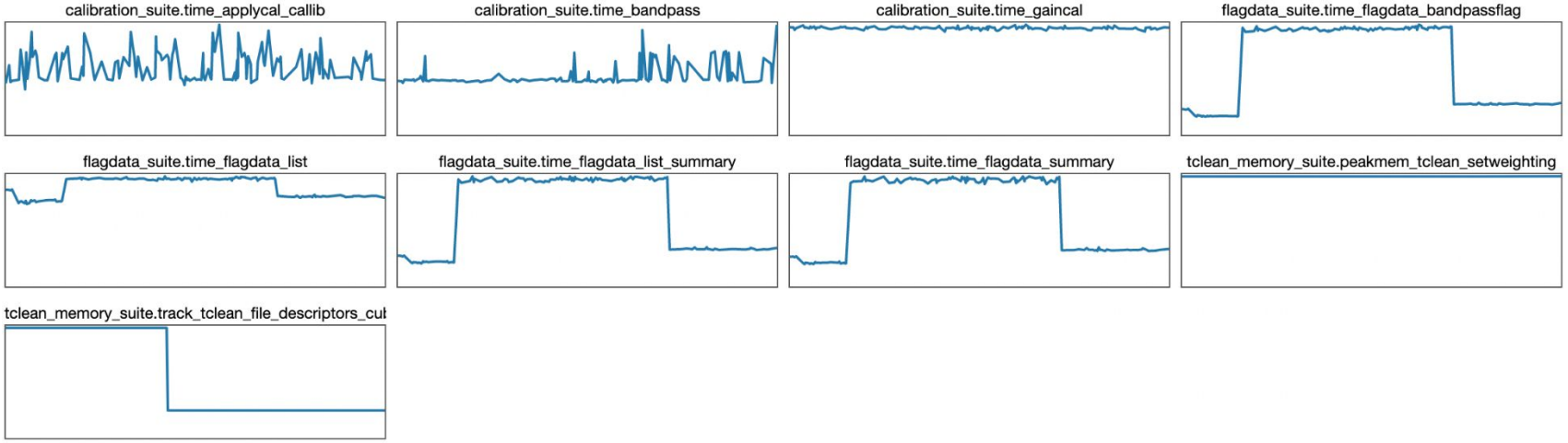
- **Performance tests/benchmarks:** webpage in prep.

- **Numerical tests/benchmarks:** stakeholder tests
  Status: Ongoing (internal)
  - Stakeholder tests based on pipeline use-cases.
  - Current/new dev topics : Numerical characterization
    – Example : Deconvolver comparison
    – Example : Heterogeneous Array Simulation and Imaging
    – Plus… several other notebooks/memos
  - New topics + Future Use-Case definitions : Include metrics and tolerances (“goal” vs “requirement”), etc.

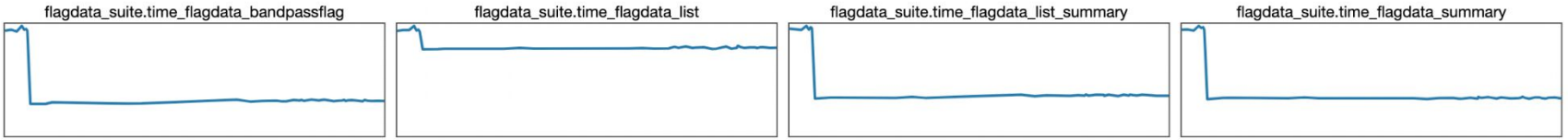
CUC Report 2021:

Testing: code, metrics, and benchmarks

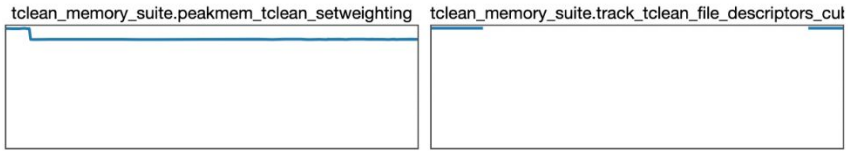
casademo



casatasks_flagdata



casatasks_tclean



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CUC Report 2021:

CASA Bug Report system

Scope:

- Code bugs in CASA code
- Documentation bugs in CASA Docs
- New features
- General feedback
- Direct communication CASA team → User community
- Improve workflow Helpdesks → CASA team

CUC Report 2021:

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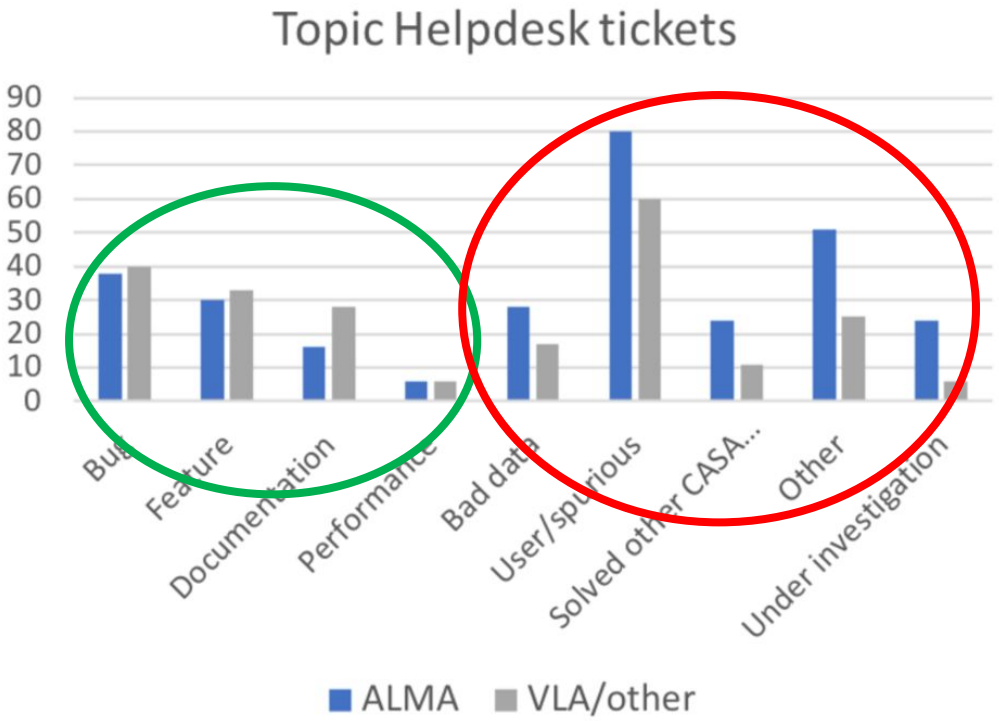
- General feedback

Not a CASA Helpdesk!

CASA team does not have resources to address general questions or weed out false bug claims

- Best-effort basis
- Open to community

CASA Memo #6



CUC Report 20

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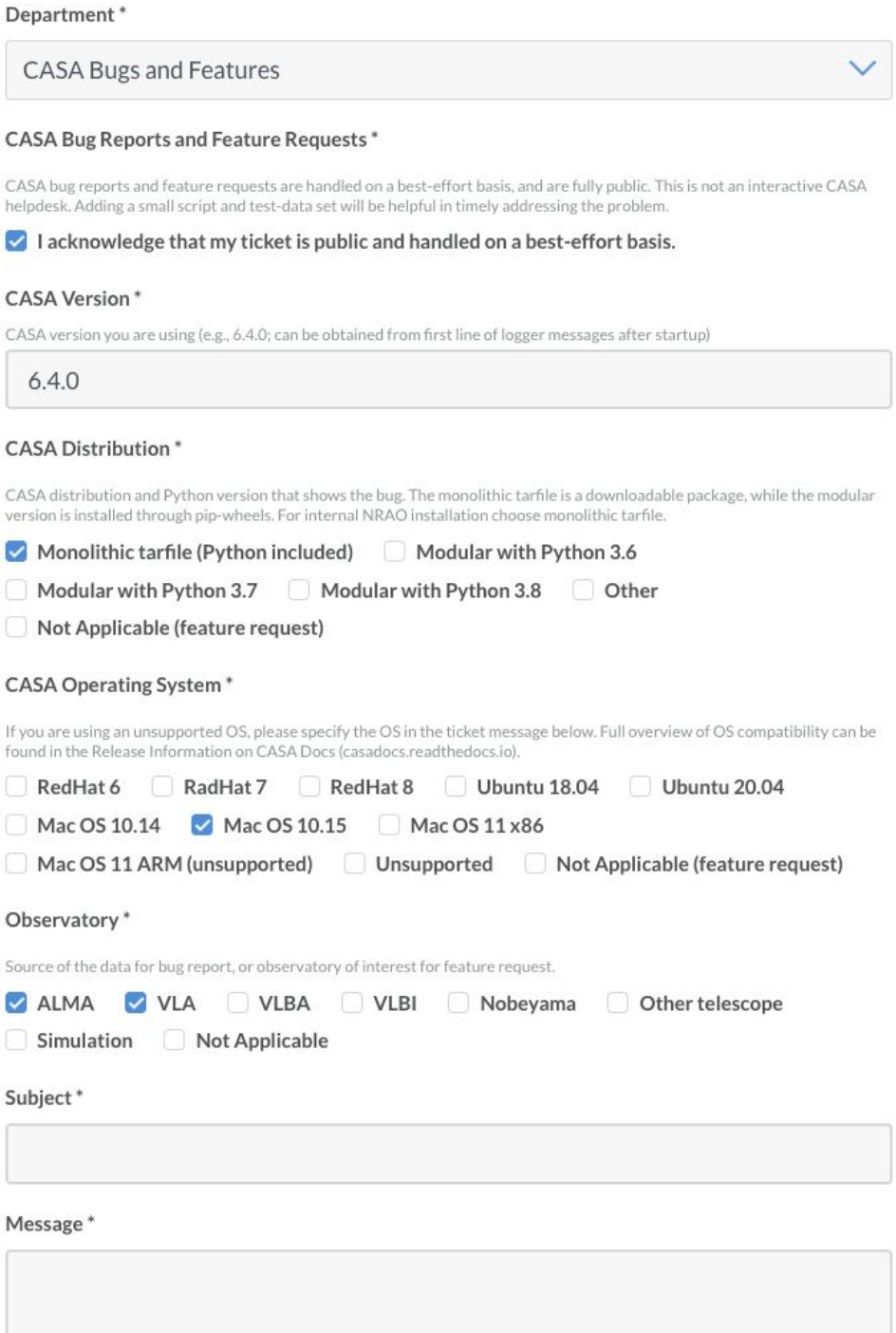


CUC Report 2021:

CARTA update

- **CARTA v.3.0-beta** (CARTA team - release summer 2022)

  New features: - PV-generator
  - vector field rendering
  - angular distance tool
  - multi-panel view
  - 2D fitting
  - publication export

- **Viewer replacement:**

  Timeline primarily set by:
  - Remaining gaps: *full CASA image support; FITS legacy support (e.g., old AIPS labeling); cube rotation; fitting support; annotations; channel maps; Python scripting; robust start-up*
  - Development widget interactive tclean (~1yr);
  - Incompatibility with future Mac OS ARM versions

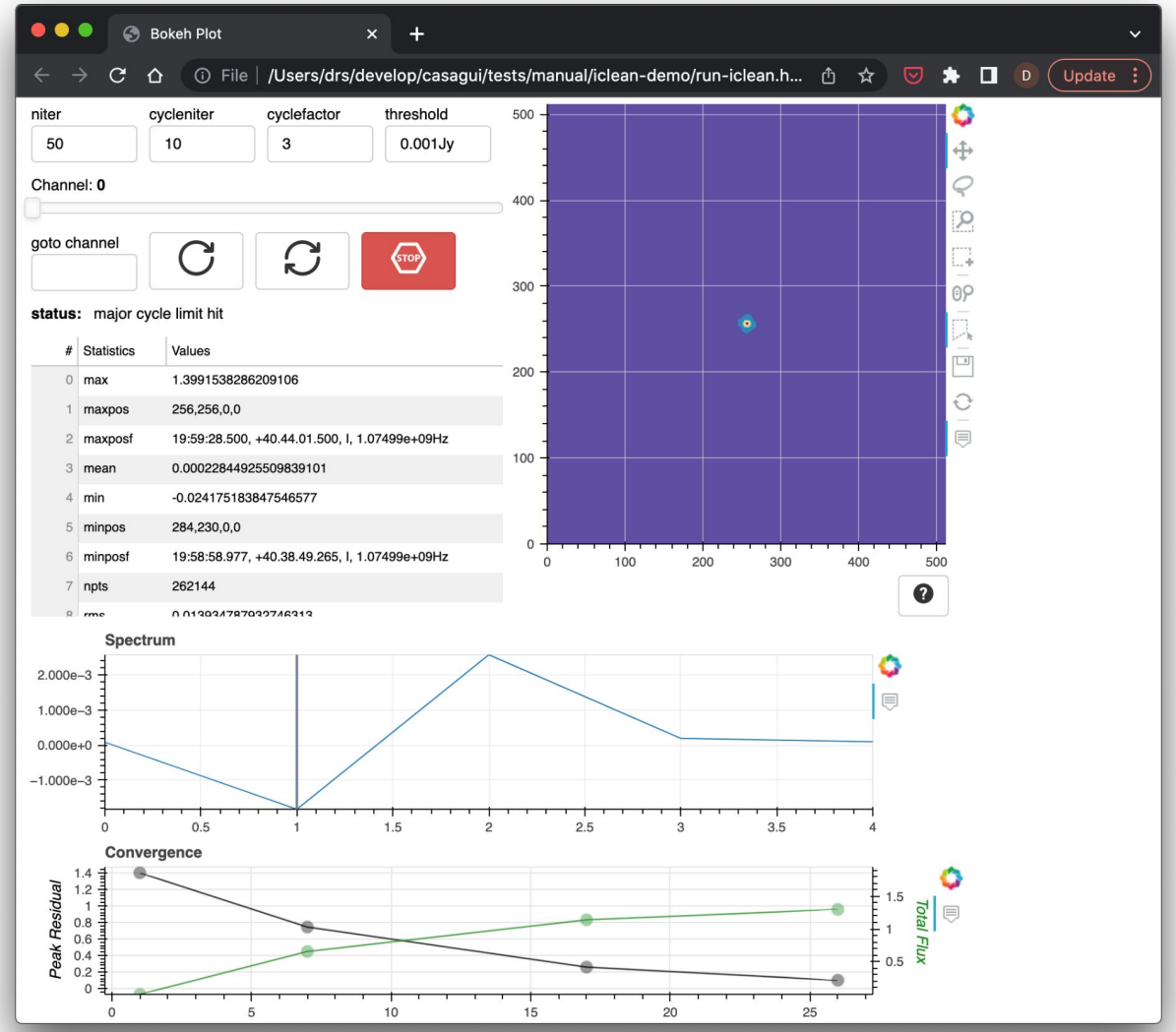
Question for CUC: once widget interactive tclean is done, can Viewer be removed from future CASA releases ? (CASA has little influence on CARTA)

CUC Report 2021:

Update CASA GUI interfaces (CASA Visualization group)

CASA's current focus GUIs:

- **interactive clean** →
- remaining CARTA features



Future of GUI interfaces (e.g. plotms, logging, etc..): Prototypes beginning, but future is TBD, pending DMS-system design work and re-lation to SSA (WorkSpaces) and SRDP plans for user interaction.

CUC Report 2021:

Implementation of ARDG algorithms

- ASP : Released in CASA in early 2022.

- MSuvbinflag : Ongoing development
- GPU imaging (for VLASS) : Ongoing development
- Holography : ARDG prototype exists. ngVLA prototype-antenna use-case is driving development in CASA.

- Wideband-ASP : Ready from ARDG. Not yet scheduled for CASA
- Time variability imaging : R&D Prototype exists. Not scheduled (low priority).
- Autoflag auto-tuning : R&D prototype exists. Not scheduled (low priority)
- PB models from other instruments : ARDG prototype exists. Not yet scheduled for CASA, but included in future plans as part of data repo (or an API)
- Full-Mueller imaging : ARDG work ongoing.

CUC Report 2021:

OS support: Mac, Ubuntu, compatibility

- **Native Mac support:**
  DMS-wide decision to support Mac OS.
  CASA concerns → looking into hire for Mac OS build and support.

- **Ubuntu, other linux:**
  Lower priority than Mac,
  but accepting bugs

  Compatibility: CASA Docs →

	Python 2.7	Python 3.6	Python 3.7	Python 3.8
RHEL 6	5.8	<=6.3		
RHEL 7	5.8	>=6.1		>=6.4
RHEL 8				>=6.4
Ubuntu 18.04		>=6.2		>=6.4
Ubuntu 20.04		>=6.2		>=6.4
Mac OS 10.14	5.8	>=6.1		<=6.3
Mac OS 10.15	5.8	>=6.1		>=6.3
Mac OS 11 x86		>=6.3		>=6.3
Mac OS 12 ARM*				>=6.4

CUC Report 2021:

CASA / CASA-VLBI reference papers

CASA, the Common Astronomy Software Application for Radio Astronomy

THE CASA TEAM

Under review!

(Received June 16, 2022)

Submitted to PASP

ABSTRACT

CASA, the *Common Astronomy Software Applications*, is the primary data processing software for the Atacama Large Millimeter/submillimeter Array (ALMA) and the Karl G. Jansky Very Large Array (VLA), and is frequently used also for other radio telescopes. The CASA software can handle data from single-dish, aperture-synthesis, and Very Long Baseline Interferometery (VLBI) telescopes. One of its core functionalities is to support the data reduction and imaging pipelines for ALMA, VLA, VLA Sky Survey (VLASS), and the Nobeyama 45m telescope. This paper presents a high-level overview of the basic structure of the CASA software, as well as procedures for calibrating and imaging astronomical radio data in CASA. CASA is being developed by an international consortium of scientists and software engineers based at the National Radio Astronomical Observatory (NRAO), the European Southern Observatory (ESO), the National Astronomical Observatory of Japan (NAOJ), and the Joint Institute for VLBI European Research Infrastructure Consortium (JIV-ERIC), under the guidance of NRAO.

CUC Report 2021:

CASA / CASA-VLBI reference papers

CASA, the Common Astronomy Software Application for Radio Astronomy

THE CASA TEAM

Under review!

CASA on the fringe – Development of VLBI processing capabilities for CASA

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[9] *Leiden Observatory, Leiden University, Postbus 2300, 9513 RA Leiden, The Netherlands*
[10] *University of New Mexico, Department of Physics and Astronomy, Albuquerque, NM 87131, USA*

ABSTRACT

New functionality to process Very Long Baseline Interferometry (VLBI) data has been implemented in the CASA package. This includes two new tasks to handle fringe fitting and VLBI-specific amplitude calibration steps. Existing tasks have been adjusted to handle VLBI visibility data and calibration meta-data properly.

CUC Report 2021:

CASA / CASA-VLBI reference papers

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[8] *INAF – Osser*
[9] *Leiden Observat*
[10] *University of New M*

C… for t… Arra… data… One… VLA… level… imag… of sc… the l… and… the …

New functionality to process V… in the CASA package. This includes tw… ration steps. Existing tasks have been adjusted to handle VLBI visibility data and calibration meta-data properly.

VLBI Pipeline requirements analysis

Mean = ability produce scientific results (0=low → 5=high)
Stand Dev.= Need for adjustments to meet requirements (0=easiest → 2=hardest)

Package	Mean	Standard Dev.
AIPS	3.9	1.2
Miriad	2.3	1.0
HOPS	2.3	1.1
CASA	4.5	0.8
LOFAR	3.2	1.3
PIMA	2.3	1.6

Other CUC topics

Committee business

CUC membership

- 4 new members (3x NA; 1x EU)

2022 face-to-face meeting

- When? (October/November)
- Virtual
- CUC requests?