

CALIBRATION AND IMAGING TIGER TEAM



Infrastructure

- Generic Pipeline framework
- Other tools

Selfcal

- Standalone
 - Main routines to verify fit
 - Traced and used by many environments
 - Maintained and fixed for fast development cycles
 - Uses CIP2 tool for pipeline feedback plots
 - More calibration software being built
- RO selfcal pipeline
 - Back from initial development: RO pipeline framework
 - Can now access instrument data
 - The RO pipeline framework is fixed back to original

Calibration

- Features
 - Revised pipeline in CIP2
 - Revised pipeline in CIP2
 - Revised pipeline in CIP2
 - Revised pipeline in CIP2
- Speed
 - Revised pipeline in CIP2
 - Revised pipeline in CIP2
 - Revised pipeline in CIP2
 - Revised pipeline in CIP2
- Integration
 - Revised pipeline in CIP2
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AWImager 2.0

- Features
 - Revised pipeline in CIP2
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 - Revised pipeline in CIP2
- Gridding speed
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- Integration
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Conclusion

Main deliverable of CITT is a user-friendly version of facet calibration procedure.

Pipeline draws together progress in all other CITT areas, so cumulative result of work across the team.

CITT wraps up in July 2015.

Future

- Testing
- Documentation
- CITT (2)

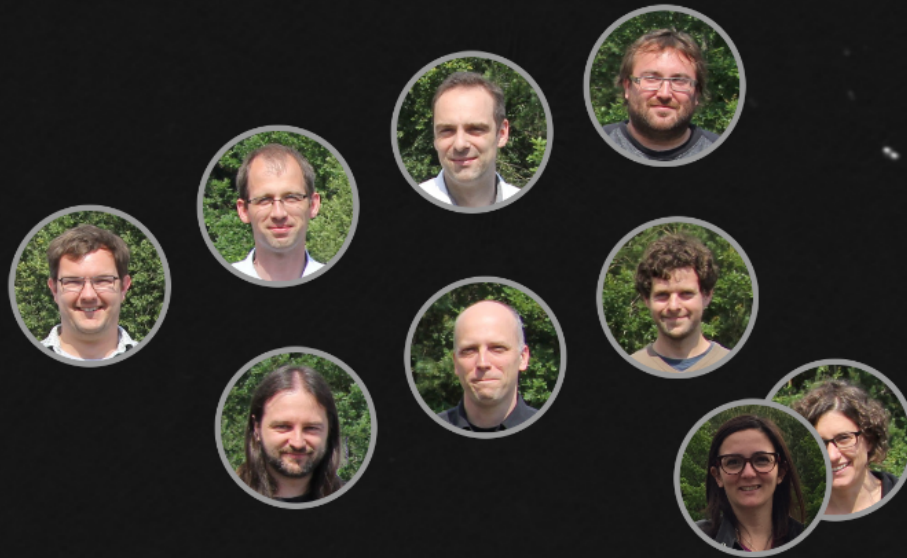
Facet Calibration

- Development
 - Revised pipeline in CIP2
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- Integration
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- Status
 - Revised pipeline in CIP2
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- Results (prelim.)
 - Revised pipeline in CIP2
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CALIBRATION AND IMAGING

TIGER TEAM



AWImager 2.0

Features

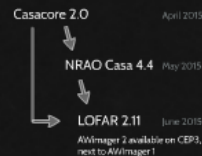
- More robust, user friendly than awimager 1
- Integrates with NRAO CASA 4.4
 - Multiscale wideband clean
- Pluggable / extensible
 - Use your own A-term (beam)
 - Choose different gridders

Gridding speed



Integration

Current status: AWImager 2 available on CITT branch on CEPs and fits
IDG still in development, 'classic' gridder available and tested



Features

More robust, user friendly than awimager 1

Integrates with NRAO CASA 4.4

Multiscale wideband clean

Pluggable / extensible

Use your own A-term (beam)

Choose different gridders

Gridding speed

* benchmark to be verified



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Casacore 2.0

April 2015



NRAO Casa 4.4

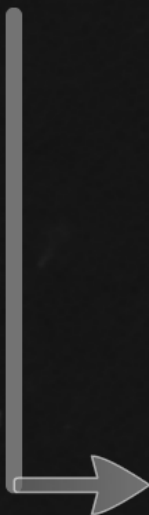
May 2015



LOFAR 2.11

June 2015

AWImager 2 available on CEP3,
next to AWImager 1



Calibration

Features

Nondirectional gain calibration in DPPP
Full Jones / Diagonal / 'CommonScalarPhase'
Use sky model or MODEL_DATA
Beam can be applied to either (only single direction for MODEL_DATA)
To be added: sliding window calibration for better S/N

Speed

Calibration part at least 10x faster than BBS
New multithreaded predict 20x faster than BBS predict
Also multithreaded beam application
Memory required independent of number of sources.

Integration

Current status: DPPP gaincal available in Lofar and LOFAR releases
Fast predict only on a branch, to be integrated

Fast gaincal

- Selfcal pipeline standalone ✓
- Selfcal pipeline RO version
- Facet calibration pipeline

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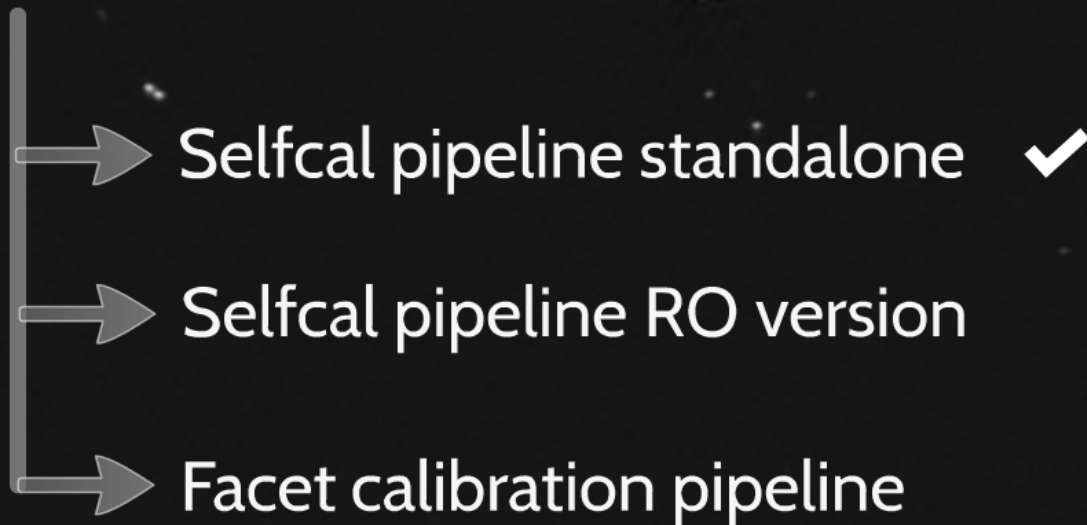
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Fast gaincal



Selfcal

Standalone

Many options in selfcal.py

Tested and used by many astronomers!

Maintained on github for fast development cycles

Uses LSMTool for graphical feedback plots

<https://github.com/nicolasvilchez/pyselfcal>

RO selfcal pipeline

Black box version developed in RO pipeline framework

Current status: in commissioning

The RO pipeline framework is (too) hard to program

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Extension to the existing Lofar Pipeline Framework used by RO.

Create pipelines by writing down the steps as a parset.

Pipeline framework takes care of distributing steps over nodes.

```
pipeline.steps( [ ph_shift, myscript, wsclean ]
```

```
ph_shift.control.type=diag  
ph_shift.argument.steps(phaseshift)  
ph_shift.argument.phaseshift.phasescenter= ...  
myscript.control.executable= @$(kern)/datautils.py  
myscript.arguments( [-s, -f, mapfile]
```

All programs can be trivially embedded
sagecal, CohJones, wsclean, excori, losoto, ...

Other tools

LSMTool: <https://github.com/dcafferty/LSMTool>
Tool for manipulating sky models

LoSoTo: <https://github.com/revoltek/losoto>
Set of tools for working with solutions (e.g. clock/tec separation)

SmartDemix DPPP step:
Currently being tested with new data set

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```
ph_shift.control.type=dppp  
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```
myscript.control.executable=~dijkema/dostuff.py  
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Facet Calibration

Development

Scheme developed by Reinout van Weeren. works for 1

Tested by Wendy Williams on Boötes field. works for 2

Further developed at Leiden Workshop 20-24 April '15

works for 7 [?]

```
git commit -m "Initial commit"
git push
git pull
git commit -m "Updated code"
git push
```

Integration



Status

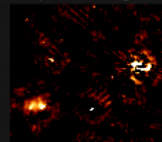
Current scripts (in development) on github.
<https://github.com/tammogan/facet-calibration>

CITT will deliver a mostly automated version of this scheme in the generic pipeline framework.

Implementation in pipeline framework to be wrapped up in CITT work week (next week).

Results (prelim.)

Global phase-cal, removal of bright sources



10 arcsec resolution

Facet calibration



6 arcsec resolution

Detail (30 x 30 arcmin) of Herchel-ATLAS NGP
Courtesy of Martin Hardcastle (Univ. of Hertfordshire)

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- Martin Hardcastle H-ATLAS NW
- Sarvesh Sridhar M101
- Elizabeth Mahony Lockman Hole
- Jose Sabater Montes ELAIS-N1
- Tim Shimwell A2034
- Reinout van Weeren A2256
- Duy Hoang and Edwin Retana Montenegro Boötes
- Francesco de Gasperin Toothbrush cluster; LBA
- David Rafferty & Stefan Fröhlich CITT pipeline / framework
- Tammo Jan Dijkema DPPP / general dev. support

works for 7 (?)

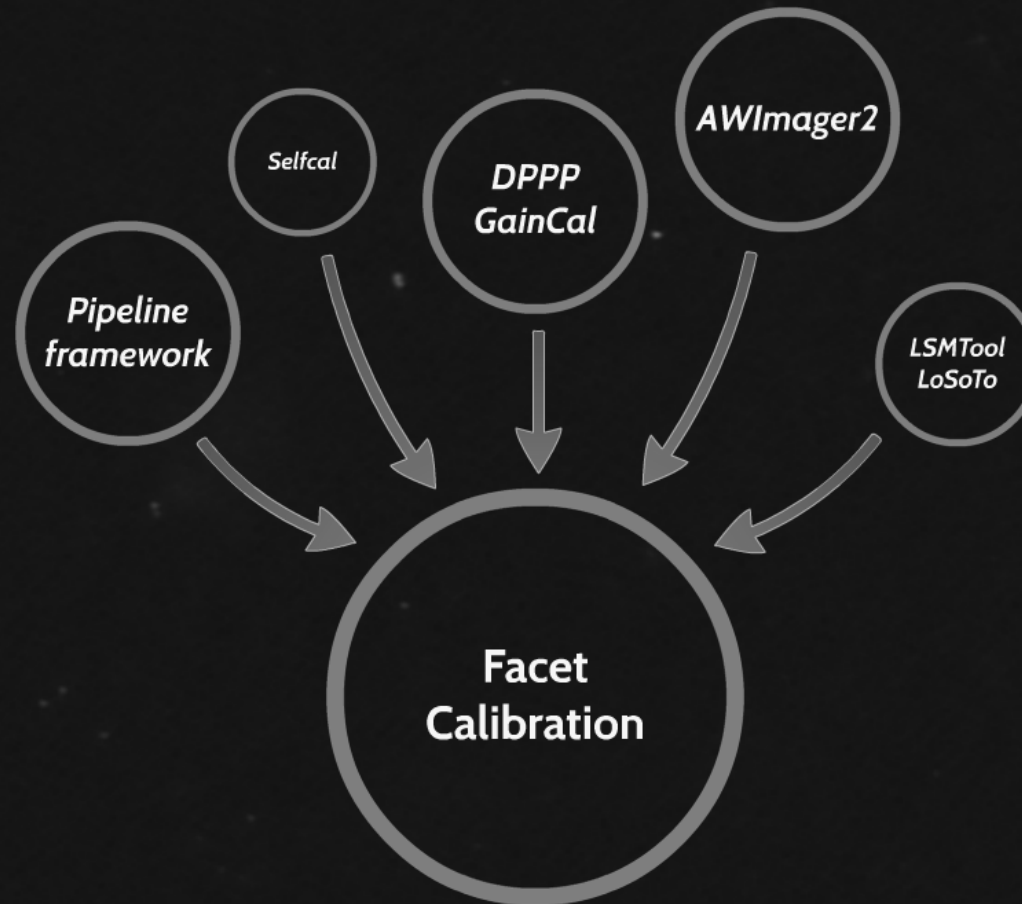
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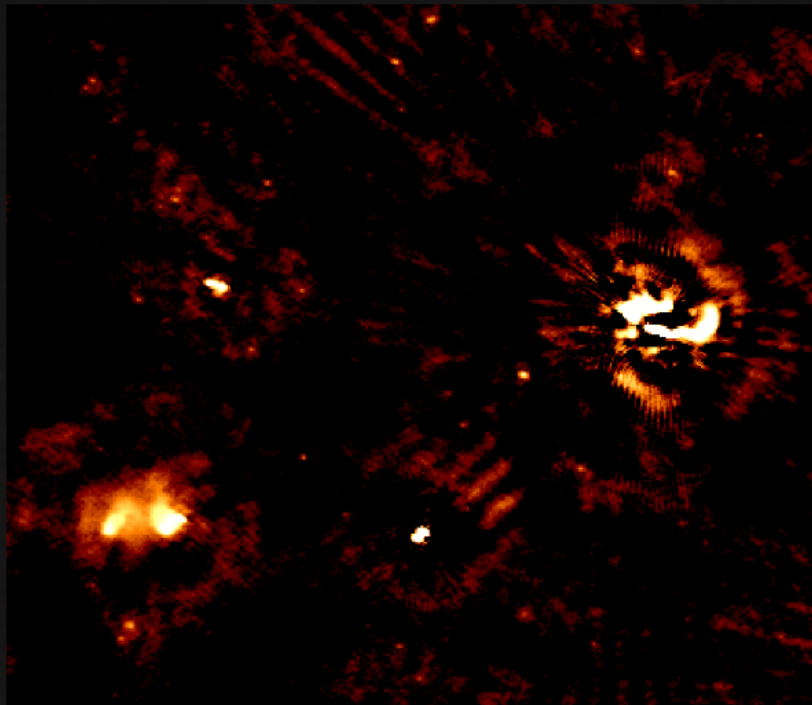


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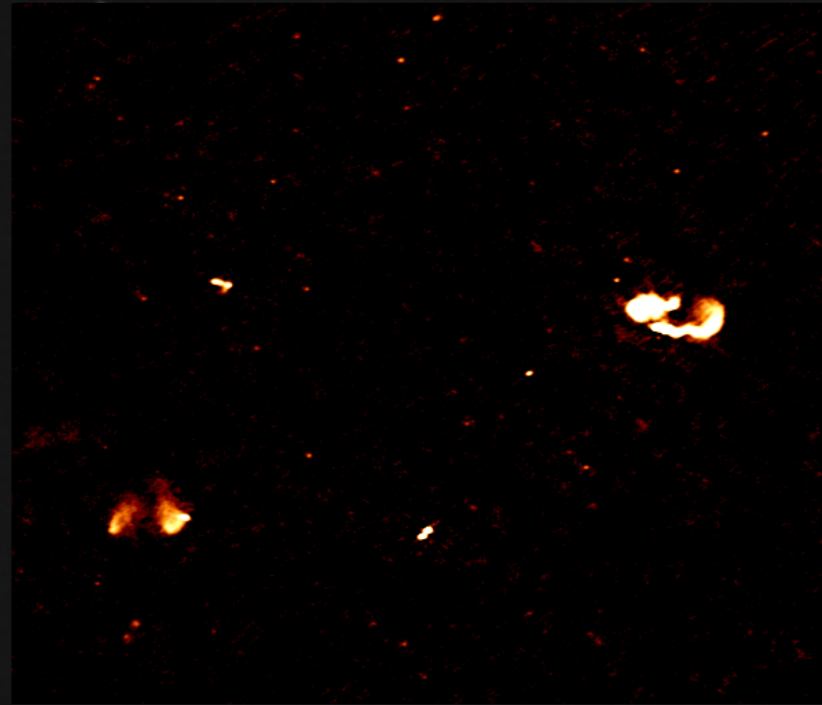
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Future

Testing

Community engagement is (has been) key to success

Great input from three busy weeks organized by CITT

New pipeline framework will allow faster feedback

Documentation

Lofar wiki (left sidebar, CITT)

<http://www.lofar.org/operations/observing/observingstatus>

Cookbook

Facet Calibration Manual

CITT2 (?)

Follow-up project is being considered

- Implementation / integration
- LBA-tuned pipeline
- GPU enhancements
- Calibration improvements

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 - Many Calibrations in house, others external
- RO selfcal pipeline
 - Block based pipeline development: RO pipeline framework
 - Can work across environments
 - The RO pipeline framework is fixed back to integrators

Calibration

- Features
 - Revised pipeline structure in CIP2
 - Advised / changed / improved pipeline
 - Full pipeline in one go
 - Can be run in parallel
 - Can be run on a cluster
- Speed
 - Calibration of full FOV takes 100s
 - Can be parallelized for 100s
 - Can be parallelized for 100s
 - Can be parallelized for 100s
- Integration
 - Can be integrated with other pipelines
 - Can be integrated with other pipelines
 - Can be integrated with other pipelines

AWImager 2.0

- Features
 - Parallelization of pipeline
 - Integration with other pipelines
 - Can be run in parallel
 - Can be run on a cluster
- Gridding speed
 - Can be parallelized for 100s
 - Can be parallelized for 100s
 - Can be parallelized for 100s
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Facet Calibration

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 - Development of pipeline framework
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- Integration
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- Status
 - CITT pipeline development is in progress
 - CITT pipeline development is in progress
 - CITT pipeline development is in progress
- Results (prelim.)
 - Initial results of pipeline framework
 - Initial results of pipeline framework
 - Initial results of pipeline framework

Future

- Testing
 - Testing of pipeline framework
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 - Testing of pipeline framework
- Documentation
 - Documentation of pipeline framework
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 - Documentation of pipeline framework
- CITT (2)
 - Next phase of pipeline framework
 - Next phase of pipeline framework
 - Next phase of pipeline framework