

CALIM2009 report on: Wide Field Computational Approaches

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Presenter: S. Bhatnagar

Attendees

- Steve Myers
- Jeroen Stil
- Bill Cotton
- Stefan Wijnholds
- Danielle Fenech
- Russ Taylor
- Robert Laing
- David Whysong
- Sanjay Bhatnagar

Relevant talks

- Projection methods
 - MS-MFS: Rau
 - AW-Projection: Bhatnagar, Morales
 - W-Stacking, ASKAPSoft: Cornwell, Vornokov
 - EoR Gridr: Myers
- Facet based corrections
 - Peeling/MeqTrees (DoF per direction)
 - Smirnov, Pandey
 - Obit: Cotton (global model for 1st order correction)

Relevant talks

- Global parameter estimation
 - LSQ All Sky Imaging: Wijnholds
 - Leshem's talks
- MFS: Rau, Fenech
- Correlator-based FoV shaping
 - Lonsdale
- PB modeling
 - Phased array feeds: Jeffs
 - Holographic measurements: Harp
 - FPA simulations: Willis

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- In the list of methods/algorithms, following is implicitly assumed
 - Applicable to spectral line imaging in addition to continuum imaging
 - Applicable to Polarimetry
 - Can deal with full Stokes DD corrections
 - DD corrections are known through calibration or iterative modeling or measurements

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- Direction dependent corrections during imaging: Projection methods
 - AW-Projection:
 - CASA, ASKAPSoft, EoRGridr
 - W-Stacking:
 - ASKAPSoft

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- Image plane facet based correction
 - Facet based imaging
 - AIPS, Obit, CASA, ASKAPSoft
 - Peeling
 - Use DoFs per direction: MeqTrees
 - Correction for 1st order effects
 - Use global model for DD gains in Peeling: Cotton (Obit)

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- Global parameter estimation approach
 - Direct Linear Algebra methods
 - OMM
 - Statistical methods
 - LS-MVI, NNLS, Global LSQ methods
 - MEM, MCMC

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- Multi Frequency Synthesis (MFS)
 - Image plane estimation of Sky frequency Dependence: CASA, ASKAPSoft,
 - Sault-Wieringa MFS
 - MS-MFS (higher order frequency dependent Terms)
 - Projection methods of instrumental corrections
- Image cube based methods
 - AIPS (Imagr), Obit
 - CASA

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- Mosaicking
 - Projection methods
 - CASA, ASKAPSoft, EoRGridr
 - Faceting + linear mosaic
 - ASKAPSoft

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- Corrections for W-term and ionosphere using image re-projection
 - Correction for only geometric effects
 - MWA Software

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- Faraday rotation synthesis
 - Work in progress for implementation in AIPS (Kogan)
 - Someone in NL, implemented in Python

Unresolved issues

- Automatic source extraction
 - Algorithms exist in AIPS, ASKAPSoft, CASA, Obit
 - Needs to be improved for SKA
- Dealing with transients
 - Variability during observation
- All stokes full-beam full-band imaging
- RFI, flagging,...