LOFAR Status:
My Personal Perspective

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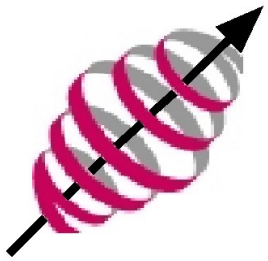


LOFAR

MAX-PLANCK-GESELLSCHAFT

The LOFAR De-Scope

- LOFAR77 was already a de-scope from the previous plan
- Eliminating ¾ of the collecting area from LOFAR77 is not a re-scope
- It is a de-scope which is half-way to a dead-scope
- But I am a pessimist
  - Which means that I am happier and less stressed than an optimist

So What Can You Do With LOFAR?

- Lots of great science!
- The current LOFAR plans will result in a good new instrument
- Frequencies from < 30 MHz to 240 MHz
- Baselines from ~ 1 m to > 1000 km
- Fantastic science will be possible soon
- Great science possible now
  - Not enough people available to use LOFAR
  - Existing people spending all of their time on commissioning

What Is Available Now?

- CS-1
  - LBA array, 16 dipole array, plus 48 dipole array
  - HBA array, several single dipoles, plus some tiles
- 2π sr all-sky imaging
- All LOFAR frequencies available
- Can easily reach confusion limit with the short baselines available
- But there is lots of unexplored frequency space
- Transients, the Sun, and more

Effelsberg

- Effelsberg single station observations ongoing
  - 96 LBA dipoles (more than CS-1)
  - All-sky imaging
  - Observations planned for Saturn, can also do lots of other interesting things
- Effelsberg to Exloo long baseline observations soon
  - Fringes not yet detected
  - I am currently writing a DiFX module to read in LOFAR data to perform the correlation
  - Lots of interesting science available once fringes are routine, hopefully within the next few weeks

The Near Future

- The Dutch should have 20 stations operational by 2009 April
  - 13 Core stations, 7 Remote stations
  - Hardware (electronics and LBA dipoles) installation begins 2008 July
- 7 International stations operational by 2009 April
  - Hardware installation begins 2008 Summer (possibly August or September), or as soon as the fields are ready

MSSS, The Million Source Shallow Survey: What Is It, And Why Should You Care?

MSSS Presentation by de Bruyn 1

Why do a MS^3 ?

LOFAR20 needs a ***Global Sky Model (GSM)*** for the northern sky (~ 21,000 □°) in an early phase and which:

- has a proper flux scale
- has validated (initial) source parameters (spectrum, structure, ..)
- is astrometrically correct to better than 0.5"
- interfaces efficiently to calibration & imaging pipeline (LSM)

It will create a ***joint focus for activities*** related to scheduling, monitoring, processing, calibration & imaging

It will provide realistic requirements for early storage and processing

MSSS Presentation by de Bruyn 2

How to do an MS^3 ?

Proposal:

- 20 stations (13+7) --> three snapshots (5-15m) for uv-coverage
- limit to two frequencies: 60 MHz & 150 MHz
- < 3 months (assuming 50% efficiency) & real-time processing
- 4 beams of ~8 MHz

Providing:

- ~ 1 million sources, of which ~ 100,000 will be high S/N (~ 5 / □°)
- 2-3x better resolution than VLSS/WENSS (= initial reference)

Why Should GLOW Care?

- First year of "real" LOFAR observing is already being planned out
- Cannot get all software written in time
  - Must make hard decisions on what software and algorithms get implemented first
- Initial project momentum will probably determine capabilities for first several years
- Magnetism, Solar, E-LOFAR modes need to be defined now!
- We can get good science out of MSSS
  - Better science if we encourage certain tweaks

E-LOFAR Issues

- Most of the necessary software to utilize E-LOFAR already required by the rest of LOFAR anyway
  - Ionospheric calibration one of the few areas with large changes
- Major change is actually in the hardware requirements
  - E-LOFAR community needs to push LOFAR to install adequate processing hardware
- E-LOFAR will only be able to observe small fields of view for first few years
  - May require modest additional software to select fields of interest

E-LOFAR Data Rates

- Ionosphere and time/bandwidth spearing require < 1 kHz channels and <= 0.25 s integrations

	CS1	MSSS LBA	MSSS HBA	LOFAR 36 LBA	LOFAR 54HBA
Duration	12 hr	45 min	15 min	4 hr	4 hr
Before averaging	25 GB	760 GB	680 GB	12 TB	28 TB
Per day	50 GB	9.1 TB	8.2 TB	72 TB	168 TB
After averaging	0.5 GB	4 GB	1 GB	?	?
Image cube	0.3 GB	0.14GB	0.12GB	1.5 TB	2.4 TB

- E-LOFAR Phase 1 ~2 GB/s!
- E-LOFAR Phase 2/3 ~35 GB/s!
- HBA > 50 GB/s?
- 2π sr gives ~4×10^{12} pixels at 0.”25 res.

CALIM2008 presentation by van Diepen

GLOW Tautenburg Meeting: 2008 May 05--06

Chair: Ralf-Juergen Dettmar

Vice-chair: Marcus Brueggen

Secretary: Rainer Beck (Note: This position will change in the next couple of months when Matthias is confirmed in Tautenburg)

Technical Working Group Chair: James M Anderson

Scientific Working Group Chair: Benedetta Ciardi

Station Status Reports

- Tautenburg
- Potsdam
- Garching
- Juelich
- Effelsberg

LOFAR Station at TLS Tautenburg

Jochen Eislöffel

Thüringer Landessternwarte Tautenburg

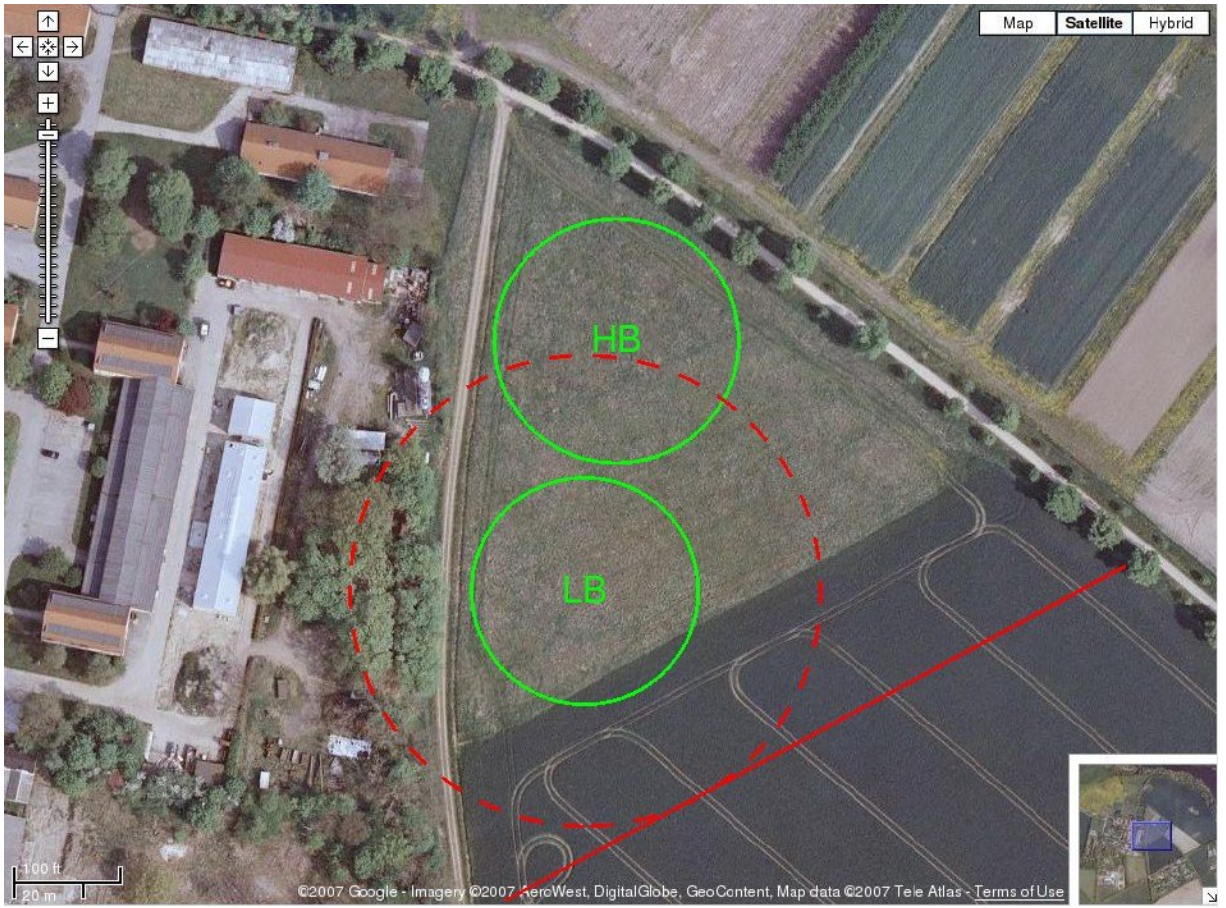
Field after the clearing – Apr 2008

Remote LOFAR-Station in Potsdam-Bornim

Gottfried Mann
Astrophysikalisches Institut Potsdam,
An der Sternwarte 16, D-14482 Potsdam, Germany
GMann@aip.de

The AIP as a member of GLOW intends to establish a remote LOFAR station in Potsdam-Bornim in the neighbourhood of the Leibniz-Institut für Agrartechnik Potsdam-Bornim e.V., because of the good link to the DFN (Deutsches-Forschungs-Netz).

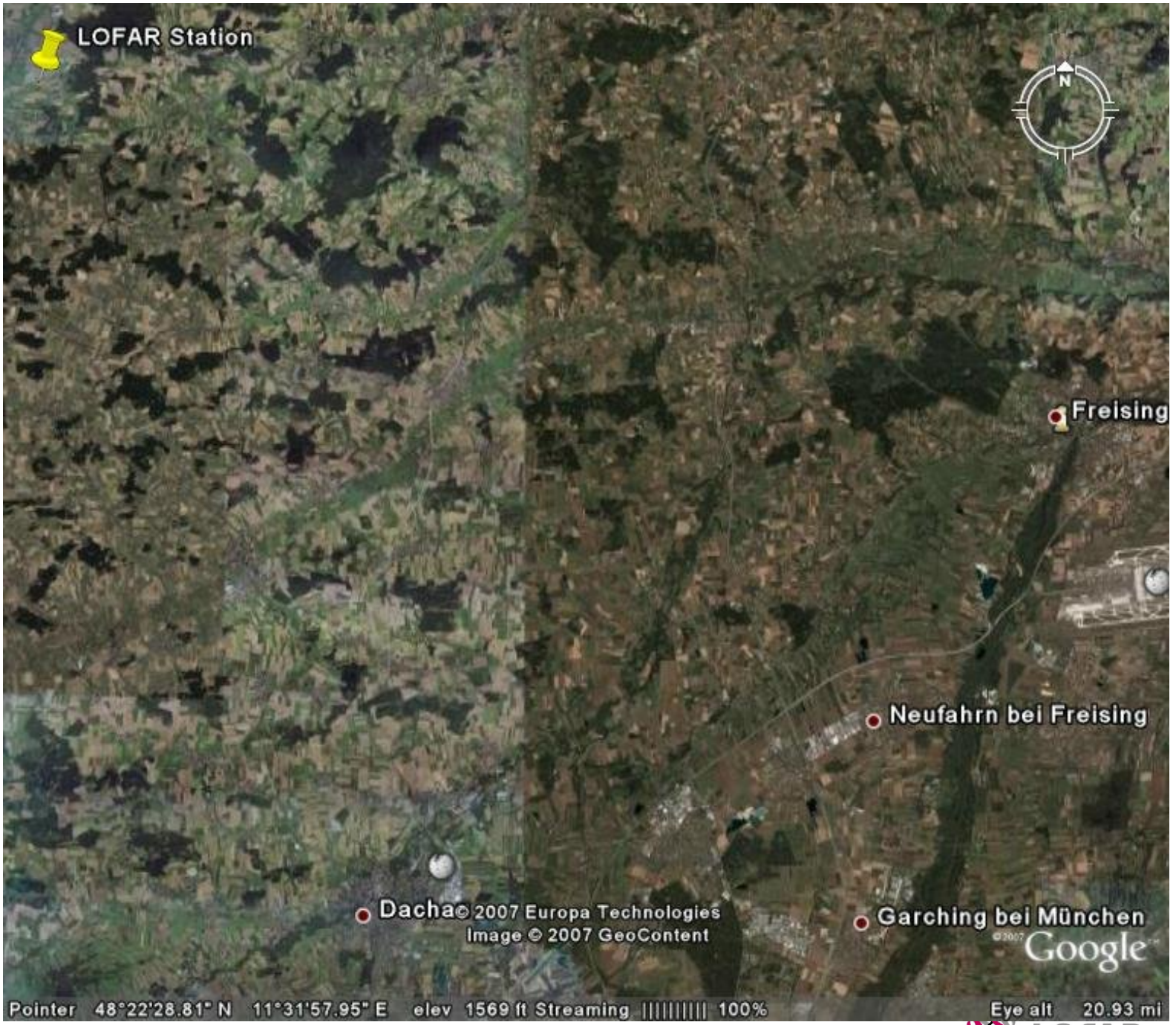
Remote LOFAR Station in Potsdam-Bornim



Status

- preparation for a contract of ordering a remote LOFAR station at ASTRON
  (expecting the draft of the contract next week)
- the LOFAR station will be paid by the budget of the institute
- preparation of the area (e.g. geometric measurements, cable channels etc.)
  (soft money in the framework of EFRE)
- AIP intends to become a full member of the DFN together with the ATB
- applying for 4 positions for LOFAR
  - in the framework of SAW of the WGL
    - dynamics of CMEs (solar physics)
    - reionization and intergalactic medium
    - week activity at block holes
  - in the framework of Verbundforschung of the BMBF
    - IT position of the solar

MPA Remote Station



MPA Remote Station

Antragsteller:

PI: Jacobs University Bremen

Ruhr-Universität Bochum
Universität Bonn
Universität Hamburg
Astrophysikalisches Institut Potsdam
Thüringer Landessternwarte Tautenburg
in Zusammenarbeit mit dem
Forschungszentrum Jülich

- 6 Dec. 2007 **meeting in Bremen**
- 20 Dec. 2007 **proposal finished**
- April 2008 **review panel makes recommendations**
- May 2008 **grants awarded**
- **D-LOFAR received very good reviews and is largely going to be funded**

LOFAR Software Status

- LAD
- Processing Software
- BBS
- MeqTrees
- Information

LOFAR Astronomical Development Plan

Mode	Definition	Realization	Testing	Total
Standard imaging mode	52	240	64	356
Real-time calibration mode	24	61	48	133
Known pulsar mode	34	192	44	270
VHECR mode	42	107	52	201
Transient detection mode	54	180	56	290
EoR mode	42	92	48	182
UHEP mode	36	156	56	248
Pulsar survey mode	32	102	46	180
Thunderstorm mode	24	52	28	104
HECR mode	18	44	28	90
Sub-total	358	1182	470	2054
General activities				1095
Total				3149

LAD 200801

- Lots of software development required
- Dutch KSPs had 10 observing modes defined by early 2008
- 60 man-years of effort (120 years more likely)
- Missing new KSPs and E-LOFAR

GLOW and LAD

- Cosmic Magnetism and Solar KSPs need to submit own operation modes
  - Magnetism KSP software meeting held on April 23
- Planning and pre-observations for mode commissioning observations
  - MSSS and MEEE for Cosmic Magnetism
- Software development
  - Magnetism Rotation Measure Synthesis mode currently estimates > 1200 man-weeks of implementation time
  - > 800 man-weeks beyond standard imaging mode
  - Does not include R&D time

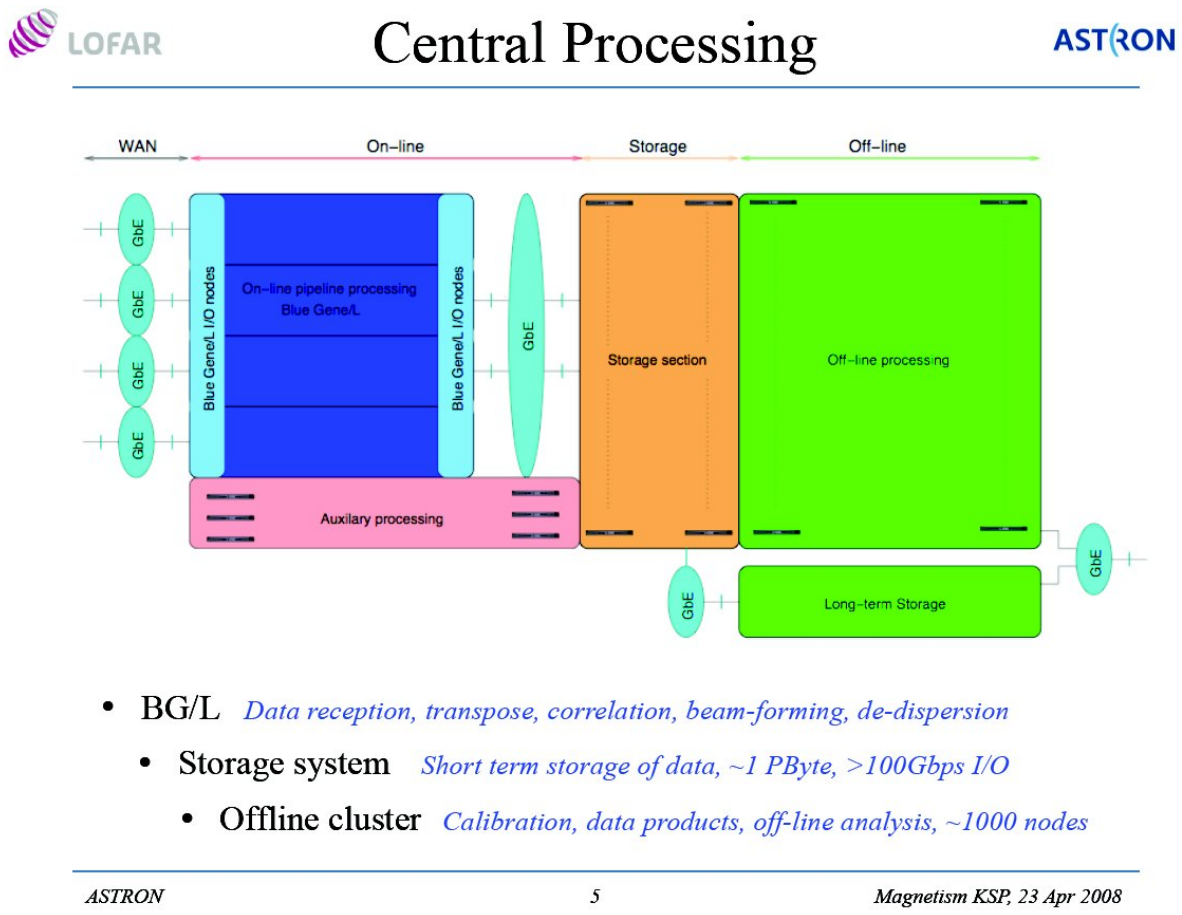
What Does GLOW Need to Do?

- Software development specific to Magnetism and Solar KSPs
  - LOFAR is a software telescope, and we need more software developers
- Software support for other KSPs
- Observations and data reduction
  - Are you trying to reduce LOFAR commissioning or science data yet?
- Research and development
  - What do we need to figure out about using LOFAR
  - How can we do it?

Software

- Stand-alone mode
  - We have software packages from ASTRON
    - Stephan Wijnholds et al.
  - Developments at Bonn to integrate with existing single-dish software
    - Peter Müller et al.
- Interferometry software
  - Slides to follow
- Hardware (control, realtime) software
  - Leaving that to ASTRON?

Interferometry Processing Path



LAD presentation by M. Wise

- Current pipeline system for imaging working in Groningen
- Current software really only works for baselines < 2 km
- Huge amount of work to be done by this time next year for new stations

BBS (Blackboard Selfcal)

Present Status:- Initial Time Performance *

	Case1	Case2
• Copy to destination	5.2h	3.9h
• Band pass correction	3.7h	3.2h
• Freq Flagging	5.2h	4.3h
• Channel Collapse	9.0h	7.3h
• Copying back	0.3h	0.2h
• Data combiner	1.8h	1.8h
• Total	27.0h	21.0h

Case 1. SB0,1,2,...17 on lifs001 -> SB0,1,2,..17 on lifs011
Case 2. SB0,1,2,...17 on lifs001 -> SB0,1,2,8 on lifs006, SB9,10,..,17 on lifs011

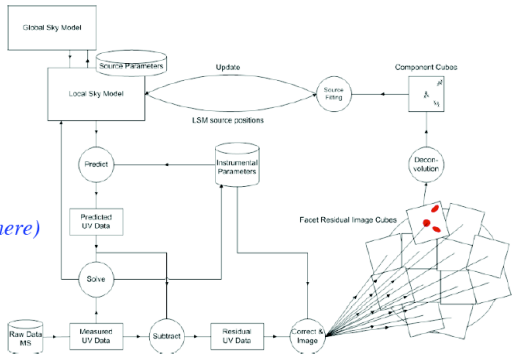
MS5660, March 3-4, 2008, 14hrs, 10s integration
Each subband 195KHz, 18SBands of each 5.4GB

ASTRON

MSSS presentation by Pandey

LOFAR BBS SelfCal ASTRON

- Solving for:
  - *Instrumental parameters*
  - *Direction-dependent sky parameters (beam, ionosphere)*
  - *Source parameters (point and gaussian)*
- Subtract sources
- Apply corrections for instrumental parameters
- Distributed; can solve globally (almost done)
- Multi-threaded

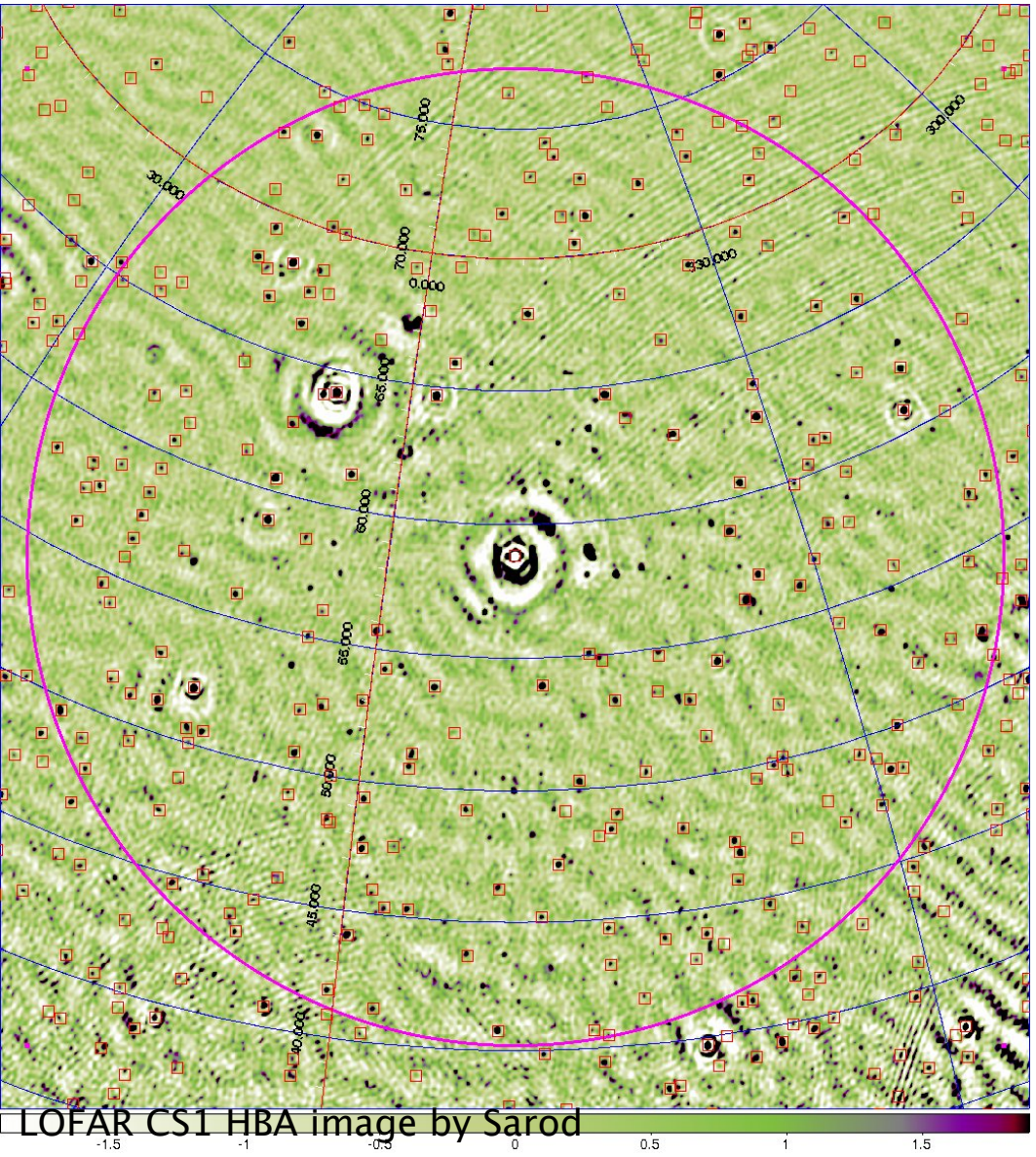


ASTRON 12 Magnetism KSP, 23 Apr 2008

LAD presentation by M. Wise

- Main LOFAR pipeline software
- C++ and Python
- CASACore based (eventually)
- Only a small number of developers at this time

MeqTrees



- Not officially part of LOFAR
- Being used for much of the CS-1 development and commissioning
- Promised to be made easier to install in the next few months
- Bonn seen as a testbed
- aips++ and Python (soon CASACore)

For More Information

- LOFAR web page http://www.lofar.org nearly useless
- LOFAR wiki better, http://www.lofar.org/operations
  - You will need to register for a login to see anything useful
  - Many important details still hidden, requiring Super-Duper Top-Secret clearance
    - Bonn people can just come talk with me
- LOFAR software wiki far more open, http://usg.lofar.org/wiki
- http://www.astron.nl/meqwiki/TimbaFrontPage