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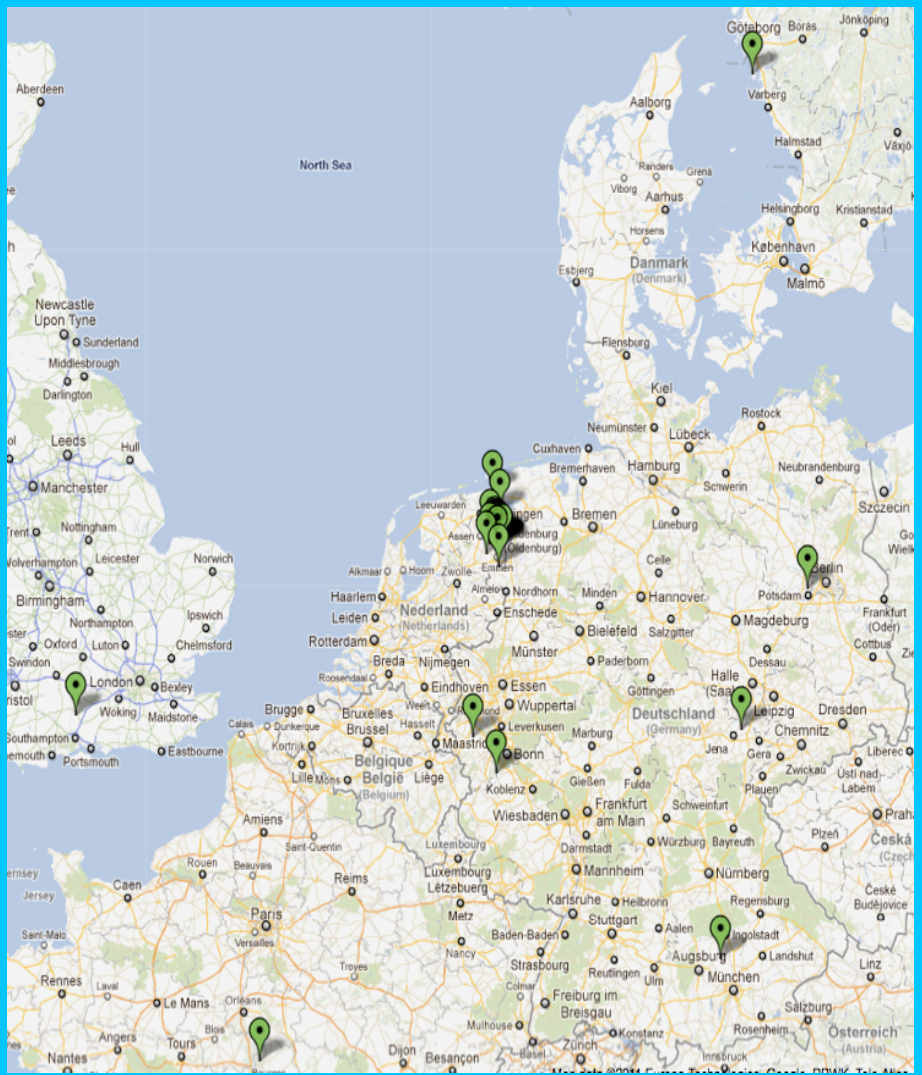
Netherlands Institute for Radio Astronomy

Programme:

1. *Software update - H. Munk*
2. *Observatory Update – E. Orru'*
3. *System characterization and preparation for Cycle 1 - E. Orru'*
4. *MSSS update - G. Heald*
5. *Element and array beam J. Hamaker*
6. *Cosmic Ray KSP update - P. Schellart*

Observatory Status



Current Status:

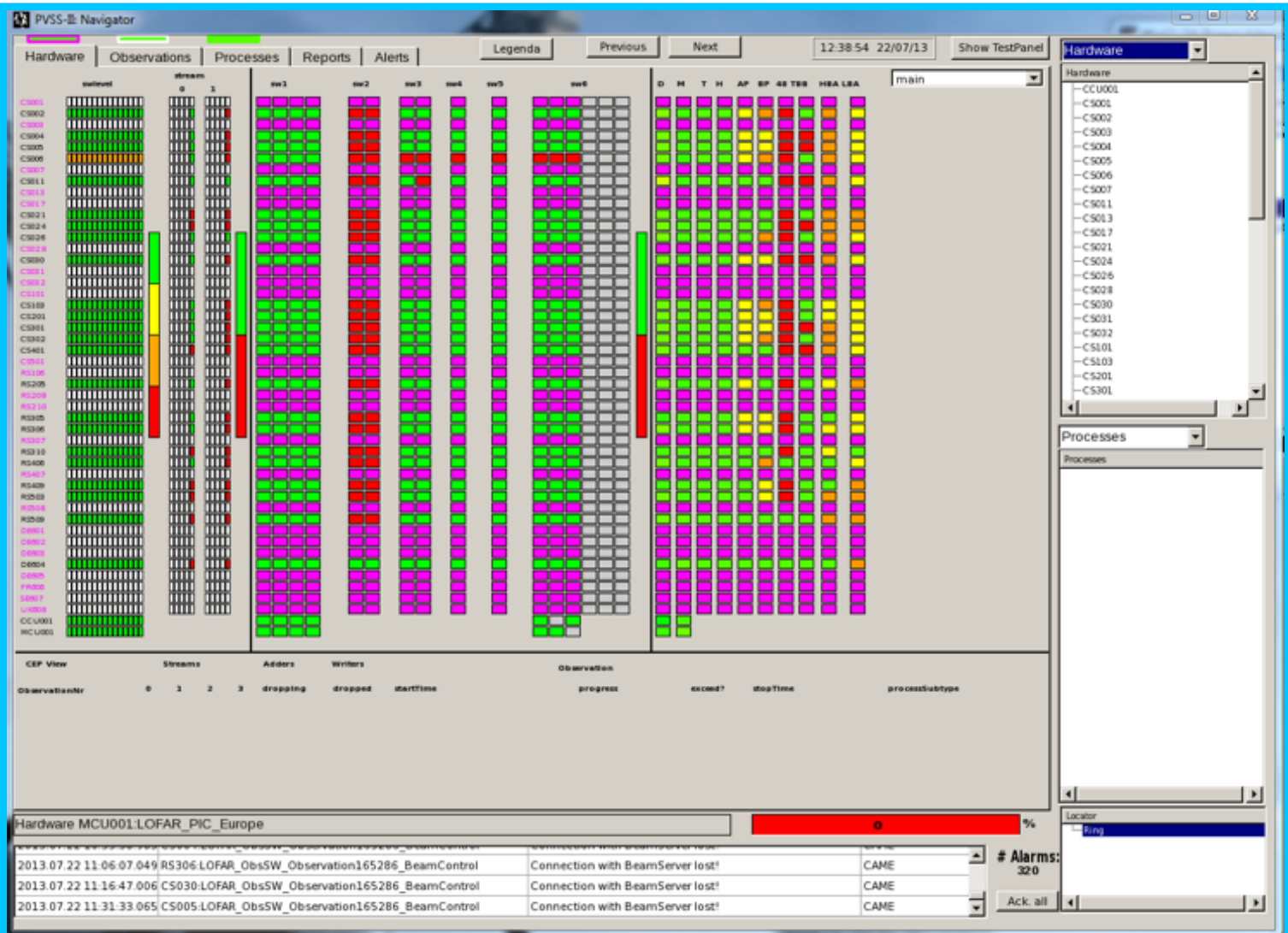
34 operational NL stations

24 core + 10 remote

8 Intern. stations part of the array

- 100% flagging with unknown reason: CS011, CS024, CS032, CS101, CS401.
- N station shut off due to high temperature, longest lasting RS509 and RS508.

www.astron.nl/radio-observatory/astronomers/current-status


PVSS-II: Navigator
Hardware
Observations
Processes
Reports
Alerts
Legenda
Previous
Next
12:38:54 22/07/13
Show TestPanel
main
Hardware
Processes
Hardware MCU001:LOFAR_PIC_Europe
Alarms:
320
Ack. all
2013.07.22 11:06:07.049 RS306:LOFAR_ObsSW_Observation165286_BeamControl Connection with BeamServer lost! CAME
2013.07.22 11:16:47.006 CS030:LOFAR_ObsSW_Observation165286_BeamControl Connection with BeamServer lost! CAME
2013.07.22 11:31:33.065 CS005:LOFAR_ObsSW_Observation165286_BeamControl Connection with BeamServer lost! CAME

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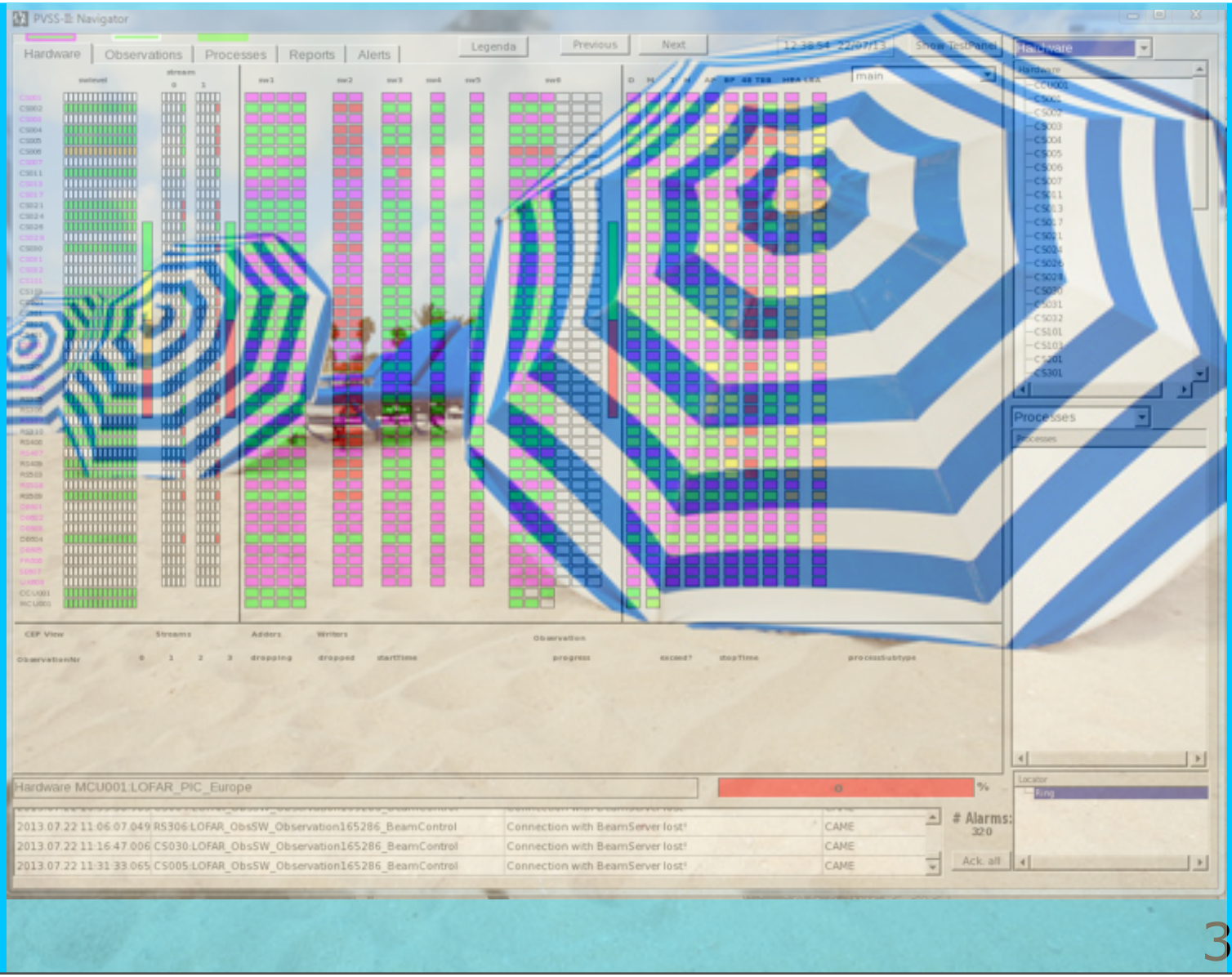

Observatory Status

- RS210 error in configuration table found and solved
- 100% flagging with unknown reason: CS011, CS024, CS032, CS101, CS401: waiting for field engineers to be back
- TBB upgrade(Isiterra) over all CS
- Network problems randomly occurring
- RS210 no connection due to fiber cut
- Week International station test:

News regarding observations and commissioning

- project suspended MSSS and EoR.
- LC0_032, LC0_043 and LC0_012 were successful: night time
- uncalibrated and calibrated data for calibrator and target pipelines are final products: archived

Week number	week day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
30, 22nd July	Mon										LC0_027 - Sun - 6 hours						TBB instead of EOR								
	Tue			TBB			Station test				LC0_027 - Sun - 6 hours												DDT - VLBI Pulsar		
	Wed										LC0_027 - Sun - 6 hours									Pulsars					
	Thu			Pulsars							LC0_027 - Sun - 6 hours							LC0_003 - PanSTARRS			DDT - VLBI Pulsar				
	Fri										LC0_027 - Sun - 6 hours												DDT - VLBI Pulsar		
	Sat											MSSS - HBA - 8 hrs											DDT - VLBI Pulsar		
	Sun							Pulsars									MSSS - HBA - 8 hrs								

Week number	week day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
31, 29th July	Mon										LC0_027 - Sun - 5 hours									LC0_019 (EoR) 7.5h NCP					
	Tue	LC0_019 (EoR) 7.5h NCP						LC0_030 Sun+IPS repeats															LC0_028 - Cygnus A - 4hrs		
	Wed	LC0_0 - Cygnu A - 4hrs						LC0_030 Sun+IPS repeats																	
	Thu							LC0_030 Sun+IPS repeats											MSSS - HBA - 8 hrs						
	Fri									MSSS - HBA - 8 hrs								LC0_003 - PanSTARRS							
	Sat																			Pulsars					
	Sun	Pulsars																							

CEP news:

- 2013.07.10 08:07:00Z locus005 hangs
- 2013.07.10 08:07:00Z locus005 hangs
- 2013.07.11 The locus008 RAID5 system has been rebuild.
- 2013-07-15 00:07:27 locus003 hangs on cpu 8
- 2013.07.20 11:54:51Z locus004 spontaneous reboot
- locus083: full MSSS people are trying to clean up
- 2013.7.10 lsexxx:/dat4 is filled for 100%

CEP1

- today 5am the airco of the RUG-CIT hall ("Landleven") broken. CEP2 offline
- automatic script to delete data older than 4 week from the stagin areas.
- lce042 out from the system to be repaired.

LTA

Feedback from a single user: download service did not work:

Staging requests were slow as there was maintenance on the tape systems + still issues with the http download service.

Important for the Observatory to have feedback about the LTA: what you would see improved, what is limiting you to use it...etc.

CALENDAR of requested busy weeks and other LOFAR activities

http://www.astron.nl/radio-observatory/astronomers/commissioning/commisioning-plan

- Next LSM August 21st

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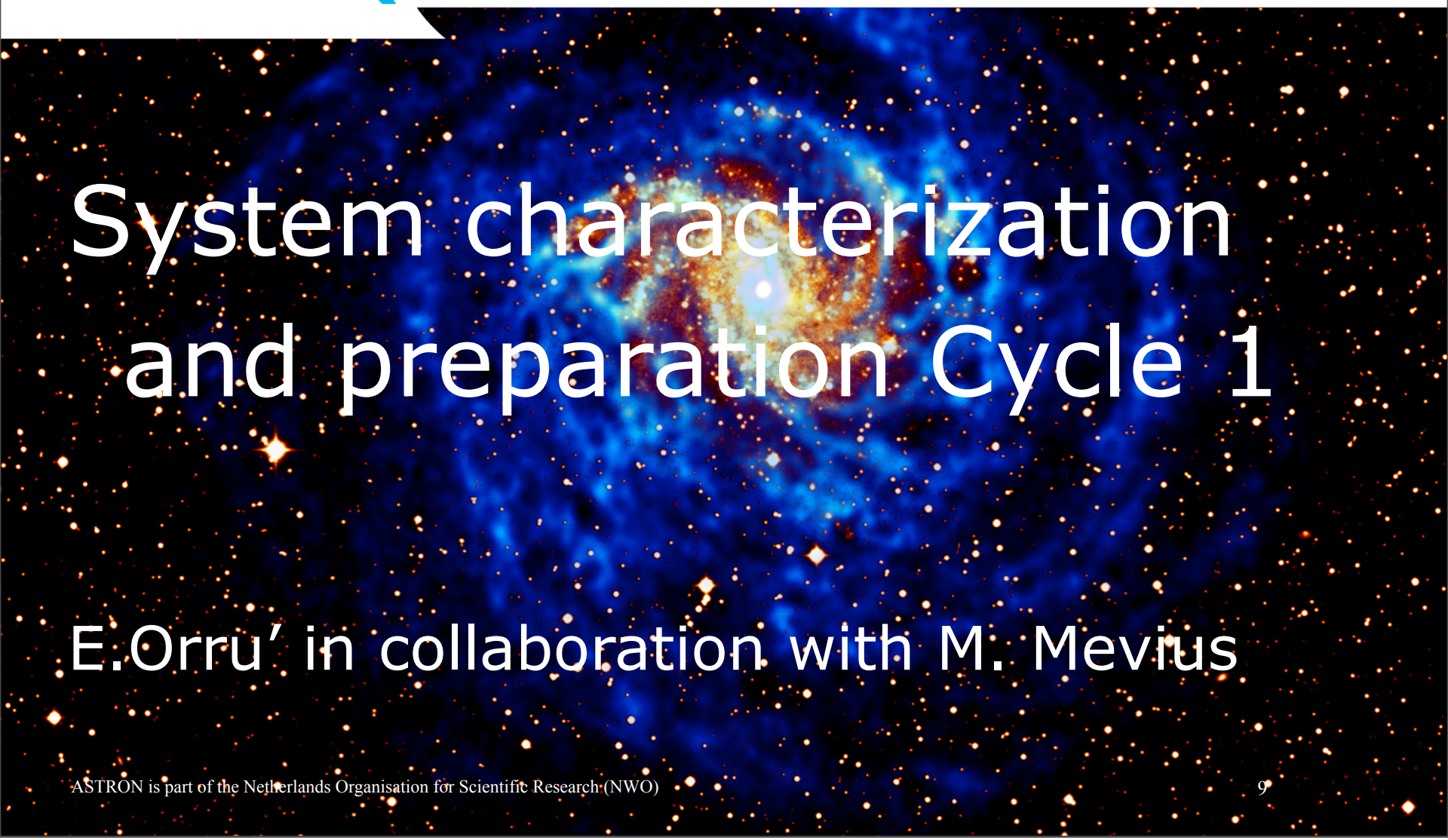


System characterization and preparation Cycle 1

E.Orru' in collaboration with M. Mevius

Interferometric mode

Observing strategies:

LBA:

dual beam continuous in time/Hour Angle,

Half of the bandwidth on the target field and half on calibrator

(BW<=48 MHz, <=244 subbands)

Standard Imaging or Pre-processing Pipeline

HBA:

1)Interleaved short calibrator observations full available bandwidth (BW < 80 MHz). (MSSS)

Standard Imaging Pipeline or Pre-processing Pipeline

2) dual beam Continuous in time/Hour Angle if present (<10 degrees) (LBA)

Standard Imaging Pipeline or Pre-processing Pipeline

...Observing strategies

HBA:

3) Dual beam, one on the target and a second on a "phase calibrator".

3/4 of the bandwidth on the target and 1/4 on the "phase calibrator", if present (<10degrees)

Pre-processing Pipeline and subsequently manually by the user. (experimental strategy for advanced users, e.g clusters and deep fields)

4) the full bandwidth on the target If the user has a good initial model

Pre-processing Pipeline + Calibrator pipeline (EoR)

Flux calibrations

3C196 and 3C295 are strongly recommended as flux calibrators

In the HBA, 3C147 and 3C48 may also be used.

For calibrating European baselines, use 3C196, 3C147, or 3C48.

Include them on a long run or by observing them for 5 min at the beginning and at the end of the observation.

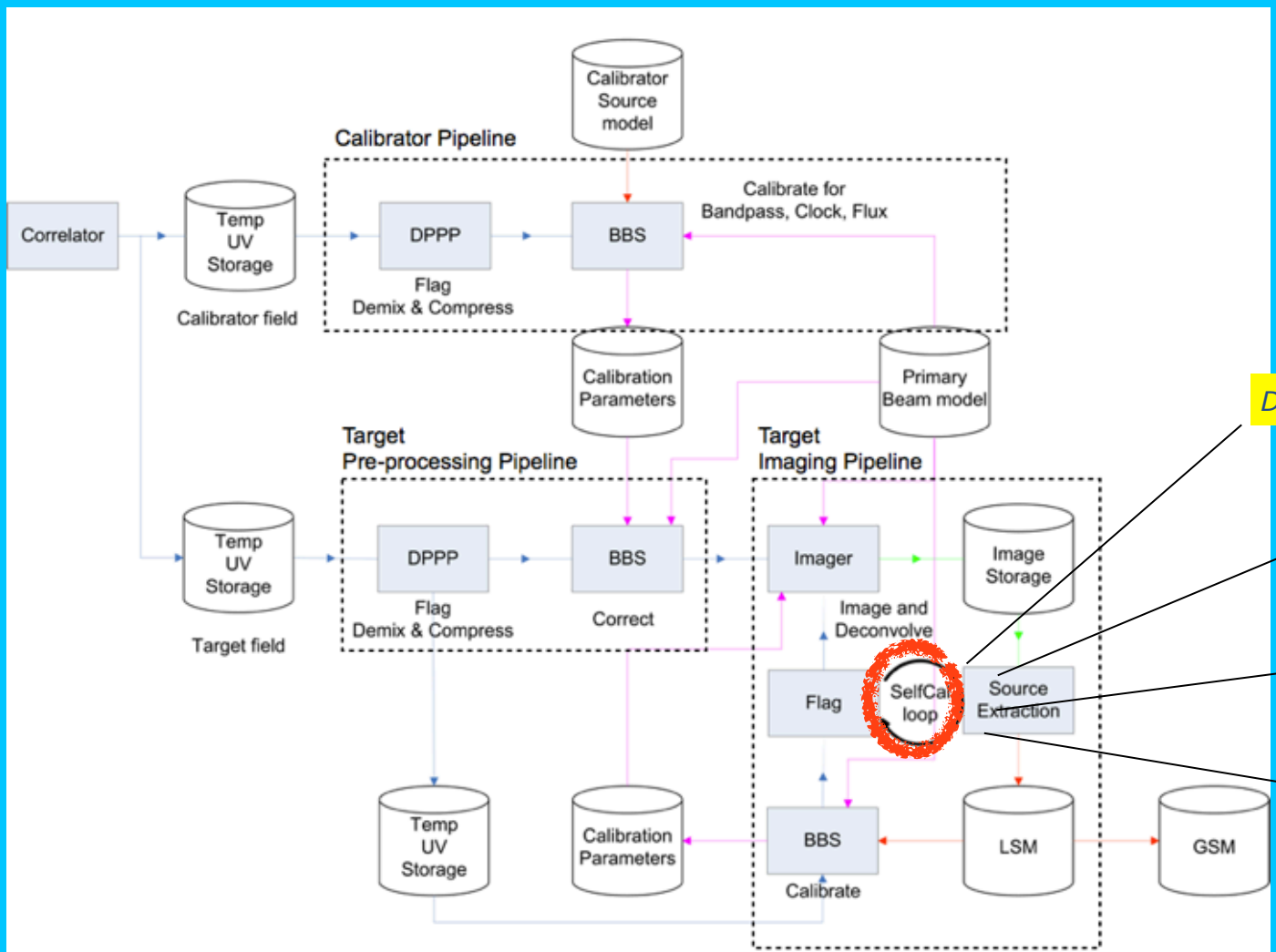
Standard imaging pipeline

Pre-Processing Pipeline Flags the data in time and frequency, performs the demix a subtraction of the contributions of the "A-team sources" (NDPPP). Users should specify if demixing is to be used, and which sources should be demixed. → uncalibrated data

***Calibrator** pipeline* After the Pre-Processing Pipeline, this uses the BBS software to compute the antenna gains, based on a calibrator for which the spectrum is well known at the LOFAR frequencies. The solutions of the BBS run are stored in the .INST files. → uncalibrated & calibrated data

Target pipeline after initial pre-processing a BBS correction step will apply the externally generated solutions for the calibrator to the target field (A&P).
→ uncalibrated & calibrated data

Imaging pipeline The sub-bands are concatenated in time, spikes are flagged. A run of phase calibration with BBS is performed using a GSM model from the VLSS. According to the size of the bandwidth you requested for your images (or using a default size) the SBs are concatenated before the imaging step. After this procedure, AWImager is performed and the images are produced.
→ hdf5



Direction-dependent calibration

Closing the Major Loop

Clock/TEC separation

Ionospheric correction

Current imaging performance: Manual reduction strategies

Commisioner(s)	Yatawatta	van Weeren	Mulcahy	Shulevsky
Band	HBA	HBA	HBA	HBA
Target Field	NCP	1RXSJ0603	NGC891	VLSS1331+1331
Total observing time (hrs)	120	10	10	5.6
Bandwidth	96	40	38	57.6
Resolution $ (arcsec)	6 x 6	6 x 6	20 x 20	11 x 11
Imaged FOV (deg)	12	10	7.5	4.5
Final RMS Noise (mJy/beam)	0.025	0.2	0.3	1.9
Equivalent noise over 2 MHz bandwidth and 6 hours (mJy/beam)	0.6	0.8		
Noise /thermal noise ratio	1.2	2	6.4	27
Calibration strategy	BBS intial calibration, SAGECAL with 3000 sources, casapy imaging	Careful check of the bandpass station. Self-calibration against an high resolution and high sensitivity GMRT model. awimager	Transfer of calibrator solutions, phase calibration against GSM (vlss) model, 1 self-calibration cycle.	Transfer of calibrator solutions, phase calibration, SAGECAL for Ateam removal,

Commisioner(s)	Bonafede	de Gasperin	MSSS
Band	LBA	LBA	LBA
Target Field	MACS0717+35	RXSJ0603	L070+69
Total observing time (hrs)	10	6	1.65
Bandwidth (MHz)	3.9	6	15.6
Resolution $ (arcsec)	23x16	23x15	310x210
Imaged FOV (deg)	7	9	15
Final RMS Noise (mJy/beam)	12	8	60
Equivalent noise over 2 MHz bandwidth and 6 hours (mJy/beam)	13	14	43.9
Noise /thermal noise ratio	6	4.4	10.5
Calibration strategy	Transfer of amplitude solutions, time smooth of the solutions, phase calibration	Transfer of amplitude solutions, self-calibration, DDE calibration, clock/TEC separation, phase only self-calibration	standard imaging pipeline

*Local dynamic range ~ 100

Current imaging performance: Standard imaging pipeline

Part 1 Field L227+69 6 hrs for 2 MHz bandwidth; analysis Standard Imaging Pipeline.

The imaging was performed for the full FOV and using various physical baseline selections, specifically 3, 6, 12, 24, 48, and 79 km

Part 2 One year after Part1 no major changes in the calibration software, a few features in the hardware were upgraded: syncopic boards, all core synchronized to the same clock and stations (RS409 and RS310) were added to the array.

L227+69 1 hrs for 2 MHz bandwidth; analysis Standard Imaging Pipeline

HBA between 115 and 185 MHz, LBA between 54 and 75 MHz.

The imaging was performed for the full FOV and using various physical baseline selections at 3.5, 50 and 82 km

All the process has been made automatic, a script that takes the concat.ms from the Imaging pipeline and images at various BL length or imaging parameters, measures the noise and time etc. and plots the results

(by M. Mevius)

RESULTS

No major differences between the Part 1 and Part 2 results

- The ionosphere is being more active this year due to higher Solar activity. Rapid phase variation could not be calibrated over short time scales, with such bad ionospheric conditions that the ratio between the sensitivity and thermal noise could increase by a factor of two or more.

- The images used for Part1 and Part2 were made with casapy in the first case and with the new awimager in the second case. Noise of Part2 images is artifact limited.

- Artifact level is higher in Part 2 since the uv-coverage was sampled with only one hour of observing time compared with the six hours of time

Reference noise values for Cycle 1 with Standard imaging pipeline

Central Frequency HBA band	116 MHz	141 MHz	160 MHz	180 MHz
Resolution $ (arcsec)	15 x 6	14 x 6	13 x 6	13 x 6
Field of View Imaged (deg)	6	6	6	6
Achieved RMS noise over 2MHz bandwidth and 6 hours (mJy/beam)	3.5	2.2	1.5	1.4
Noise/thermal noise ratio	16	13	9	7

Central Frequency LBA band	57 MHz	65 MHz	71 MHz	75 MHz
Resolution $ (arcsec)	28 x 13	26 x 11	23 x 10	26 x 9
Field of View Imaged (deg)	3	3	3	3
Achieved RMS noise over 2 MHz bandwidth and 6 hours (mJy/beam)	18	22	34	63
Noise /thermal noise ratio	5	6	9	15

Reference pre-processing time for Cycle 1 with Standard imaging pipeline

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Pre-processing Time

Type	Nr Sources	Nr SB	Nr Stations	P/O ratio
HBA dual inner	avg only	80	61	0.5
HBA dual inner	1	80	61	1.5
HBA dual inner	2	80	61	3.5
HBA dual inner	3	80	61	13
HBA dual inner	avg only	244	61	0.5
HBA dual inner	avg only	480	61	1.4
LBA outer	avg only	80	37	0.2
LBA outer	1	80	37	0.3
LBA outer	2	80	37	1
LBA outer	3	80	37	1.5
LBA outer	2	244	37	1.1

Reference imaging time for Cycle 1 with Standard imaging pipeline

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LBA outer

uv-range (km)	FOV (deg)	P/O
3.5	12	0.8
50	8	1.2
82	>3	20*

HBA dual inner

uv-range (km)	FOV (deg)	P/O
3.5	5	0.9
50	5	1.3
82	>3	20*

✱ Current imaging pipeline does not allow yet to select FOV and BL selection, only default values are allowed.

✱ With the currently available processing power, in order to image a dataset, the Field of View has to be limited, in order to include long baselines and produce high resolution images.

★ the imaging time becomes infinite if FOV>3 degrees

https://www.astron.nl/radio-observatory/astronomers/array-configurations/3-telescope-parameters-and-array-configurations

Any question @ Sciencesupport sciencesupport@astron.nl

Good luck

with your

Cycle 1 proposal!