Pipeline fotometriche per la gestione dei dati di imaging da LBT per la partenrship italiana

Vincenzo Testa (e il team LBT Italia)
INAF-OAR

LBTO

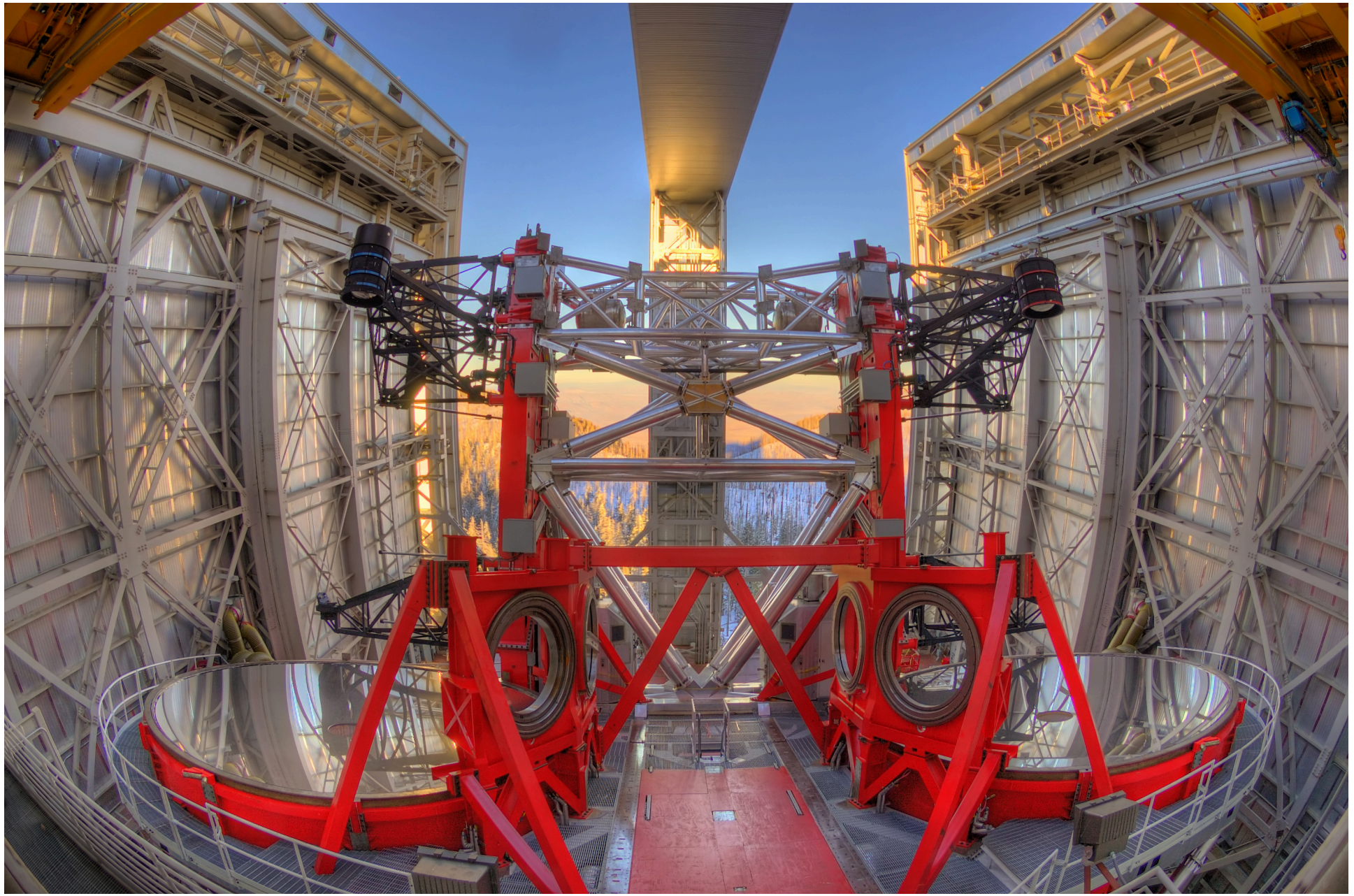
- CONSORZIO INTERNAZIONALE DI DIRITTO PRIVATO PER LA COSTRUZIONE GESTIONE E OPERAZIONE DI LBT

- FORMATO DA :
  - ITALIA (25%) COMUNITA' NAZIONALE, OPERATO DA INAF
  - GERMANIA (25%) LBTB – CONSORZIO DI ISTITUTI
  - ARIZONA (25%) – TRE UNIV. STATALI GUIDATE DA UA TUCSON
  - OSU (12.5%)
  - RESEARCH CORPORATION (12.5%) – MINNESOTA, NOTRE DAME, U. VIRGINIA, OSU

- LBT ITALIA: FACILITY NAZIONALE PER LA GESTIONE DELLA PARTNERSHIP ITALIANA IN LBT (AL 2010). HQ PRESSO OAR MONTE PORZIO, RESP: A. FONTANA

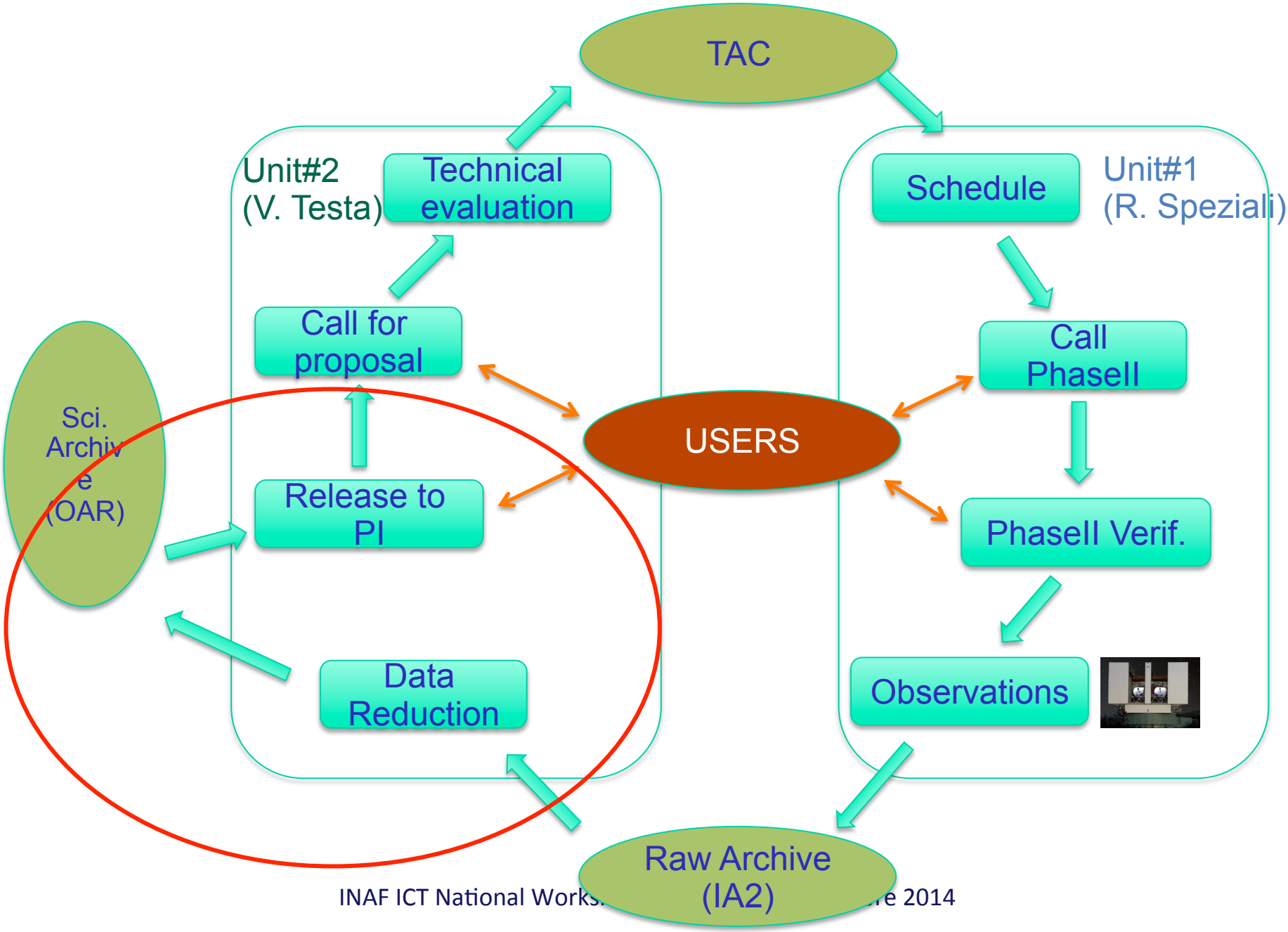
LBT

- TELESCOPIO BINOCULARE COMPOSTO DA 2 TELESCOPI SINGOLI CON SPECCHIO PRINCIPALE DA 8.4M
- PUO' LAVORARE IN MODALITA' BINOCULARE INCOERENTE (DIAM. EQ. 11M) O COERENTE PER INTERFEROMETRIA (DIAM. EQ. 23 M).
- CORREDO STRUMENTALE PERMANENTEMENTE MONTATO, CAMBIO STRUMENTO POSSIBILE IN 30 MINUTI CIRCA IN CORSO DI NOTTE
- DAL SEMESTRE ATTUALE POSSIBILITA' DI USARE DUE STRUMENTI DIFFERENTI NEI DUE TELESCOPI SINGOLI
- CORREDO ATTUALE:
  - LBC – PRIME FOCUS CAMERA
  - LUCI – NASMYTH INFRARED CAMERA AND SPECTROGRAPH
  - MODS – GREGORIAN OPTICAL CAMERA AND SPECTROGRAPH
  - LBTI – NIR/MIR INTERFEROMETER



Settembre 2014

ORGANIZZAZIONE DI LBT Italia



TASKS OF UNIT #2

- Preparation and collection of proposals (in collaboration with TNG) and storage in the LSC database
- Notification to the PIs of raw and reduced data availabilty
- Service data reduction with *ad-hoc* pipelines
- Distribution of reduced data to PIs
- Support to the “customer” from soon after the observation to the publication

ALL RAW DATA

TUCSON ARCHIVE

All designed and powered by IA2

OHIO RAW DATA

ITALIAN RAW DATA

GERMAN RAW DATA

OHIO ARCHIVE

IA2 ARCHIVE TRIESTE OBS.

HEIDELBERG ARCHIVE

IMAGING DATA REDUCTION (LSC-OA ROMA) [RESP.:V. TESTA]

SPECTROSCOPIC DATA REDUCTION (IASF-MILANO) [RESP.: B. GARILLI]

"REDUCED" IMAGES

"REDUCED" SPECTRA

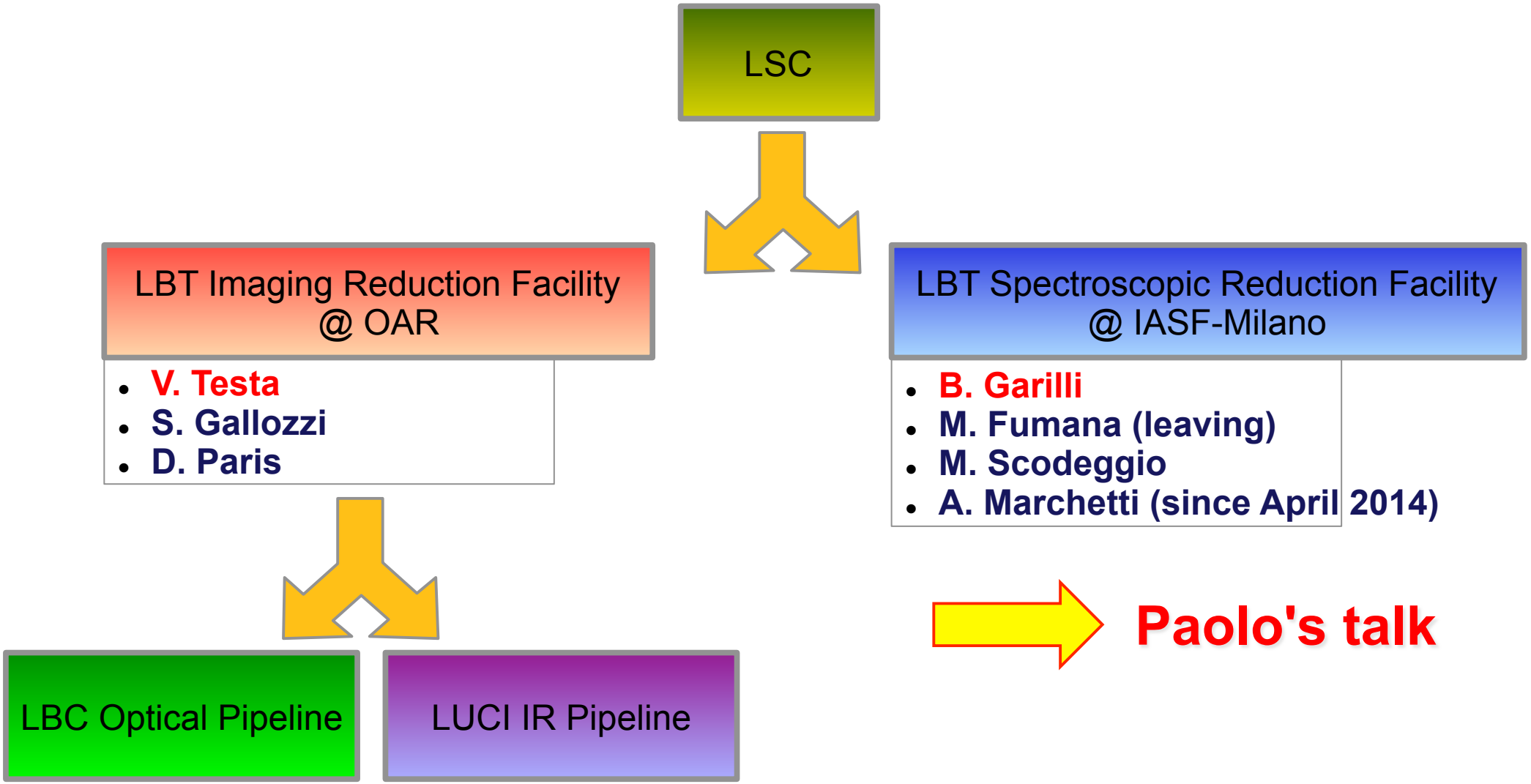
~1 day

~2-4 weeks

PI

~2-4 weeks

SERVICE DATA REDUCTION

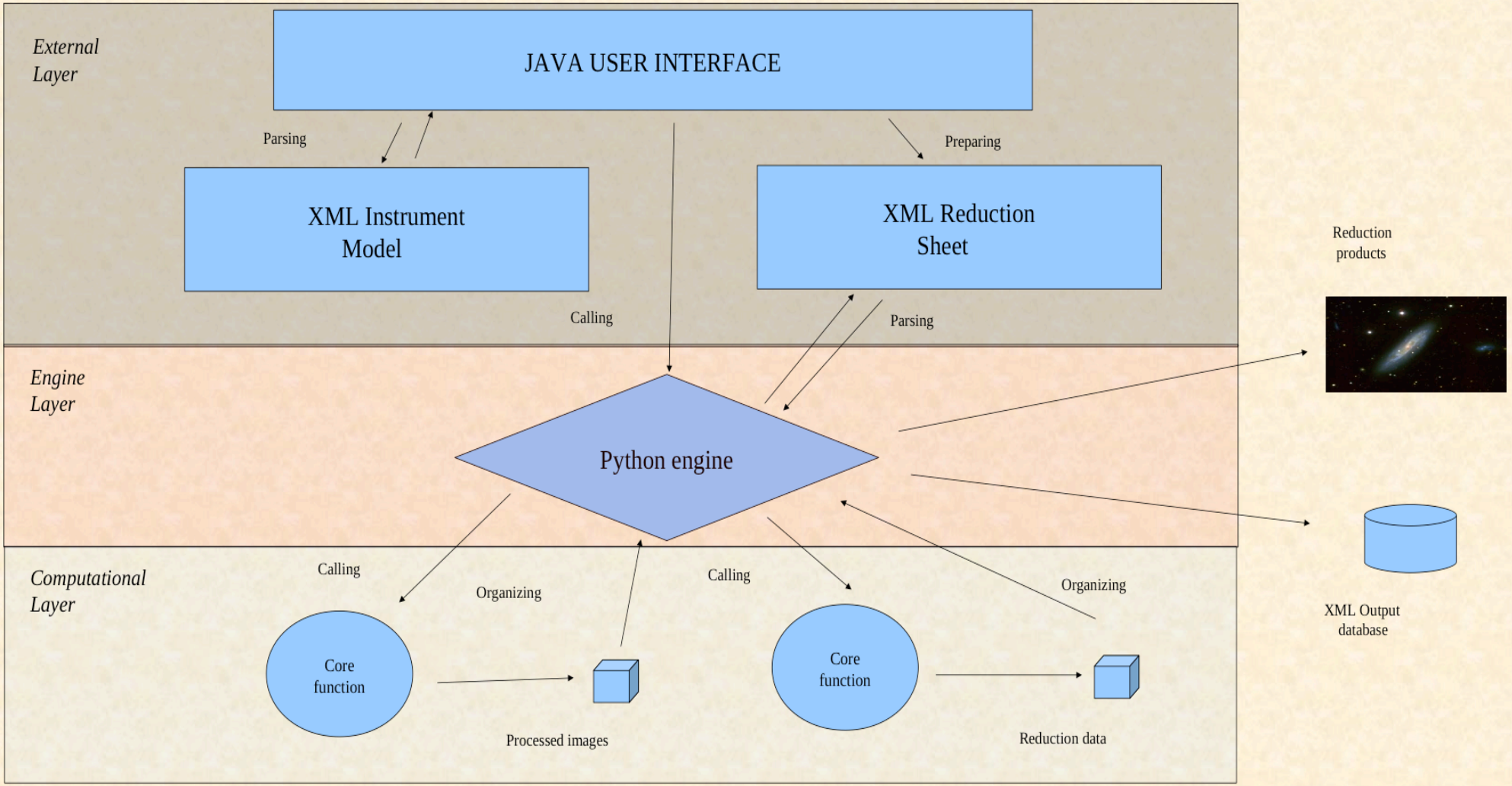


REDUCTION PROCEDURE

- calibration of scientific images by removing the bias (or the dark) and applying a flat-field to the resulting image in order to normalize the response of each image pixel;
- creation of pixel masks in order to flag bad (hot/cold) CCD pixels, saturated regions, cosmic rays events and satellite tracks.
- application of advanced algorithms to carefully equalize, correct for the super-flat and subtract the sky as well as the background, especially for the NIR bands (i.e. LUCIFER).
- correction for geometric distortions and astrometric calibration.
- resampling of each scientific image creating a final coaddition and its rms map.
- Instruments involved: LBC, LUCI, PISCES, MODS (applied to HAWK-I and FORS 1 / 2)

Pipeline architecture

S. Gallozzi, D. Paris



Scheme of three-layer Pipeline architecture

BOTTOM-LAYER INGREDIENTS

- Use both third-party software:
  - Sextractor (E. Bertin) for object detection and masking
  - Swarp (E. Bertin) for image resampling and stacking
  - AstromC (M.Radovich) for astrometric correction

- …and home-written software:
  - Trail detection and masking (van Dokkum algorithm)
  - Image calibration and flat fielding
  - ….
- Written in C++/python and being reengineered

Pipeline GUI - Powered by Java

File About

Form for selecting pipeline instrument

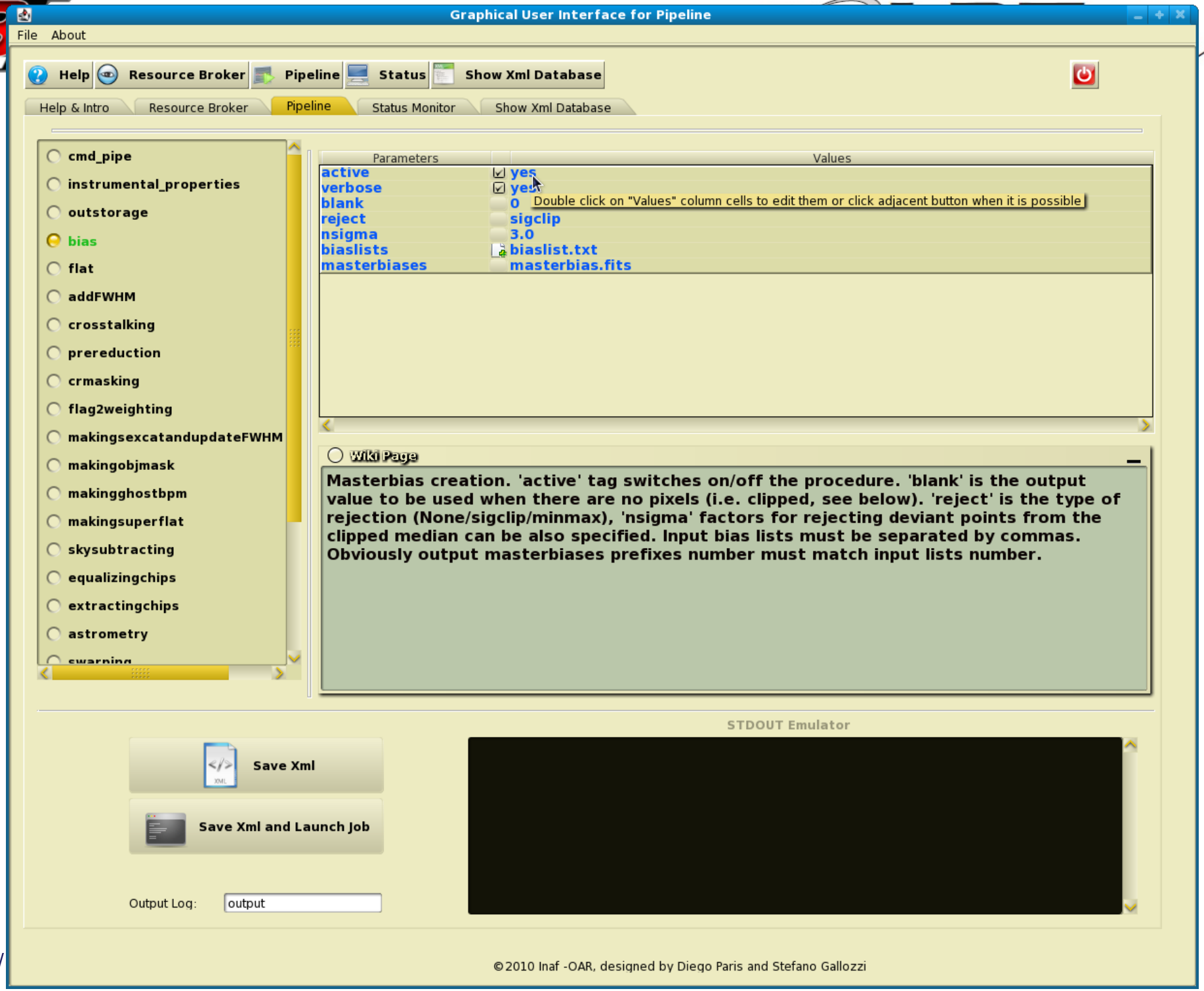
NGC6946 taken with LBC

Please, select an instrument:

LBC

Now click Ok button

Ok


Graphical User Interface for Pipeline
File
About
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Resource Broker
Pipeline
Status
Show Xml Database
Help & Intro
Resource Broker
Pipeline
Status Monitor
Show Xml Database
cmd_pipe
instrumental_properties
outstorage
bias
flat
addFWHM
crosstalking
prereduction
crmasking
flag2weighting
makingsexcatandupdateFWHM
makingobjmask
makingghostbpm
makingsuperflat
skysubtracting
equalizingchips
extractingchips
astrometry
Parameters
Values
active
yes
verbose
yes
blank
0
reject
sigclip
nsigma
3.0
biaslists
biaslist.txt
masterbiases
masterbias.fits
Double click on "Values" column cells to edit them or click adjacent button when it is possible
Wiki Page
Masterbias creation. 'active' tag switches on/off the procedure. 'blank' is the output value to be used when there are no pixels (i.e. clipped, see below). 'reject' is the type of rejection (None/sigclip/minmax), 'nsigma' factors for rejecting deviant points from the clipped median can be also specified. Input bias lists must be separated by commas. Obviously output masterbiases prefixes number must match input lists number.
STDOUT Emulator
Save Xml
Save Xml and Launch Job
Output Log:
output
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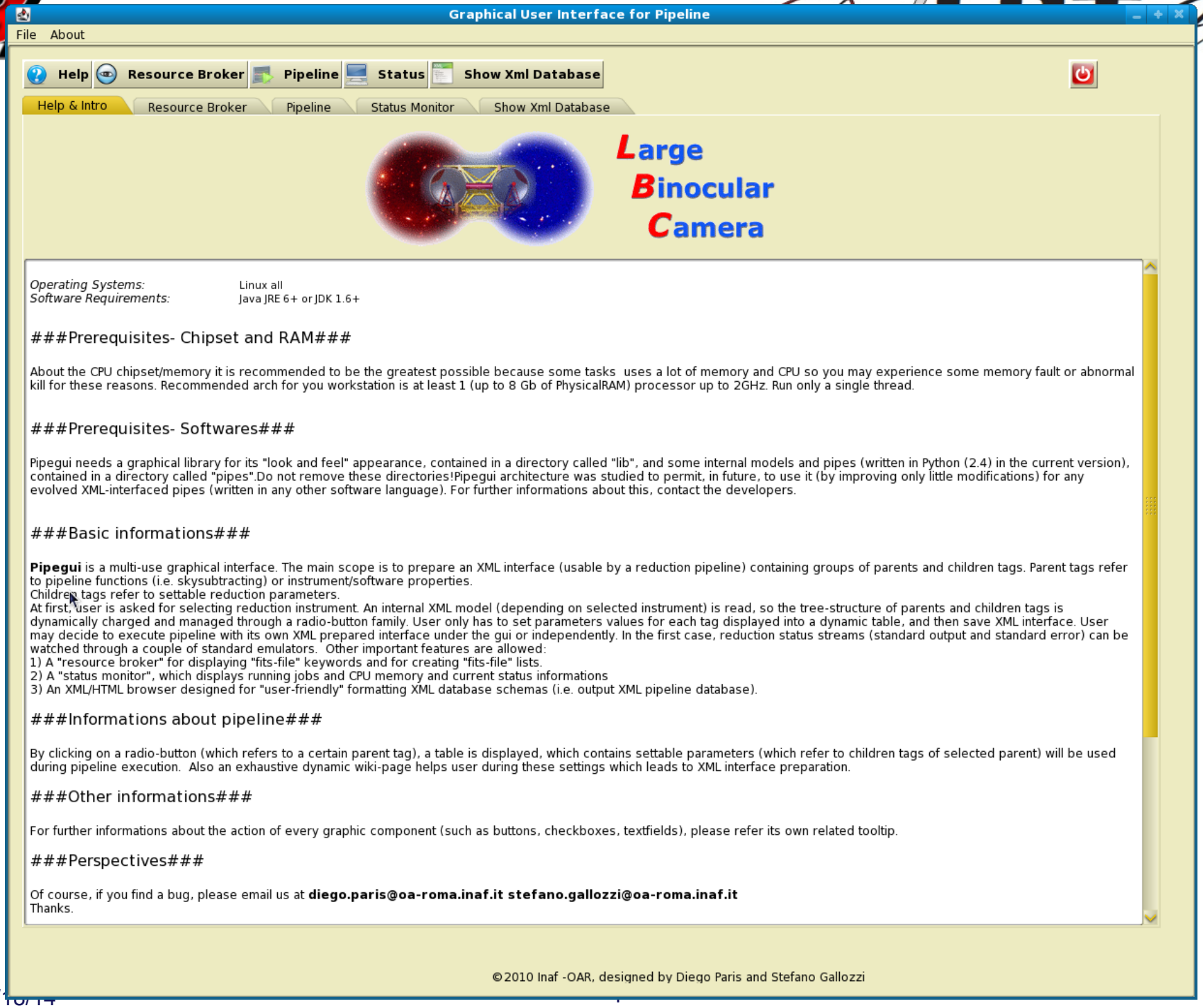
Graphical User Interface for Pipeline
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Status Monitor
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Large
Binocular
Camera
Operating Systems: Linux all
Software Requirements: Java JRE 6+ or JDK 1.6+
###Prerequisites- Chipset and RAM###
About the CPU chipset/memory it is recommended to be the greatest possible because some tasks uses a lot of memory and CPU so you may experience some memory fault or abnormal kill for these reasons. Recommended arch for you workstation is at least 1 (up to 8 Gb of PhysicalRAM) processor up to 2GHz. Run only a single thread.
###Prerequisites- Softwares###
Pipegui needs a graphical library for its "look and feel" appearance, contained in a directory called "lib", and some internal models and pipes (written in Python (2.4) in the current version), contained in a directory called "pipes".Do not remove these directories!Pipegui architecture was studied to permit, in future, to use it (by improving only little modifications) for any evolved XML-interfaced pipes (written in any other software language). For further informations about this, contact the developers.
###Basic informations###
Pipegui is a multi-use graphical interface. The main scope is to prepare an XML interface (usable by a reduction pipeline) containing groups of parents and children tags. Parent tags refer to pipeline functions (i.e. skysubtracting) or instrument/software properties.
Children tags refer to settable reduction parameters.
At first, user is asked for selecting reduction instrument. An internal XML model (depending on selected instrument) is read, so the tree-structure of parents and children tags is dynamically charged and managed through a radio-button family. User only has to set parameters values for each tag displayed into a dynamic table, and then save XML interface. User may decide to execute pipeline with its own XML prepared interface under the gui or independently. In the first case, reduction status streams (standard output and standard error) can be watched through a couple of standard emulators. Other important features are allowed:
1) A "resource broker" for displaying "fits-file" keywords and for creating "fits-file" lists.
2) A "status monitor", which displays running jobs and CPU memory and current status informations
3) An XML/HTML browser designed for "user-friendly" formatting XML database schemas (i.e. output XML pipeline database).
###Informations about pipeline###
By clicking on a radio-button (which refers to a certain parent tag), a table is displayed, which contains settable parameters (which refer to children tags of selected parent) will be used during pipeline execution. Also an exhaustive dynamic wiki-page helps user during these settings which leads to XML interface preparation.
###Other informations###
For further informations about the action of every graphic component (such as buttons, checkboxes, textfields), please refer its own related tooltip.
###Perspectives###
Of course, if you find a bug, please email us at diego.paris@oa-roma.inaf.it stefano.gallozzi@oa-roma.inaf.it
Thanks.
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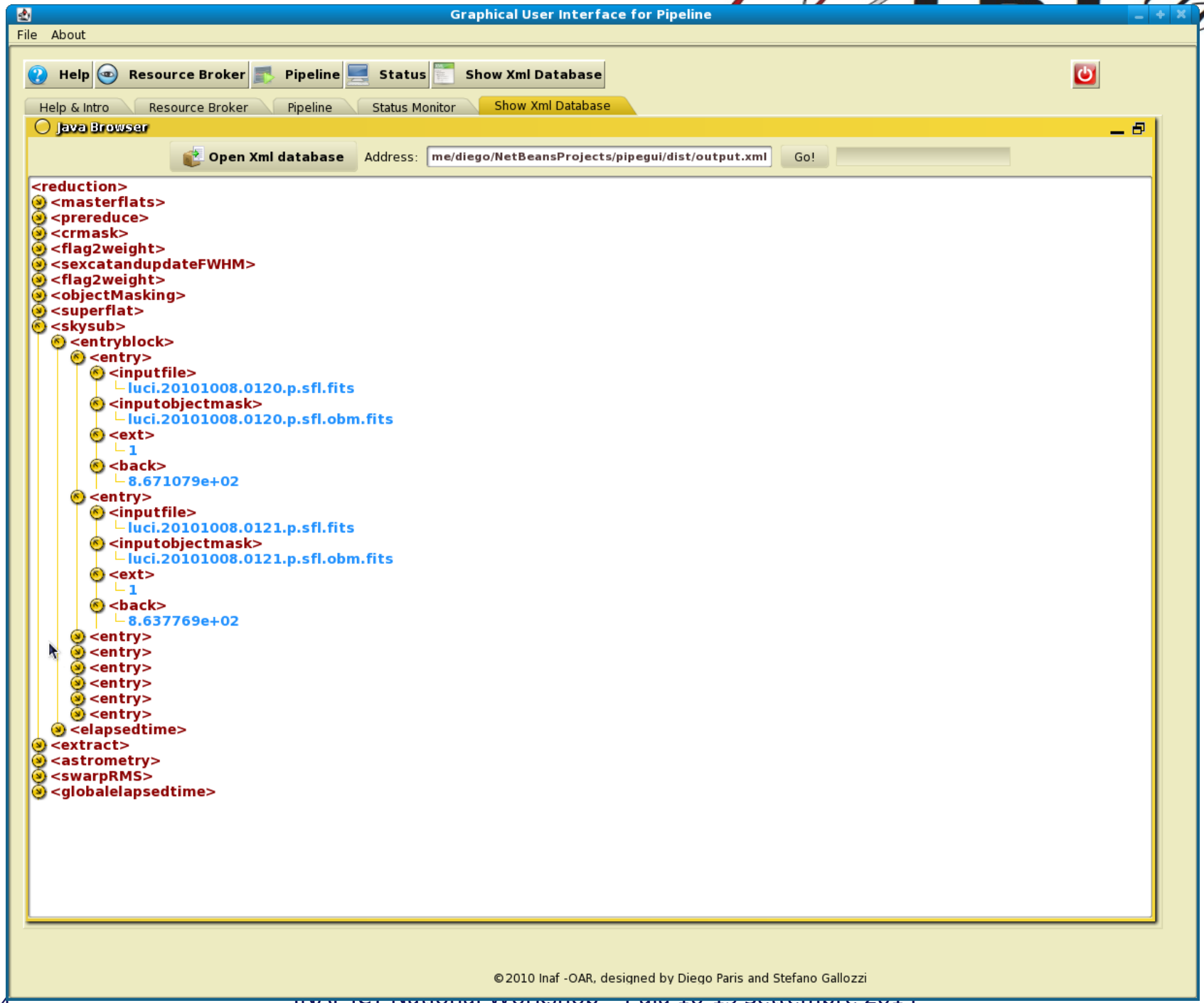
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Resource Broker
Pipeline
Status Monitor
Show Xml Database
Java Browser
Open Xml database
Address:
me/diego/NetBeansProjects/pipegui/dist/output.xml
Go!
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<prereduce>
<crmask>
<flag2weight>
<sexcatandupdateFWHM>
<flag2weight>
<objectMasking>
<superflat>
<skysub>
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<entry>
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<inputobjectmask>
luci.20101008.0120.p.sfl.obm.fits
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<back>
8.671079e+02
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luci.20101008.0121.p.sfl.obm.fits
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<astrometry>
<swarpRMS>
<globalelapsedtime>
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HARDWARE

RACK-MOUNT 4U SERVER LINUX:

- 8 Intel Xeon 4-core cpu @ 2.66 GHz
- cache size: 6144 KB
- RAM TOTALE: 33012540k
- SWAP: 64002952k
- ~ 10 TB INTERNAL DISK
- LONG TERM STORAGE: 30 TB NAS

Since October 2005: about 7 TB LBC raw data, about 1.5 TB reduced data

Since January 2010: about 200 GB LUCI raw data, about 40 GB reduced data (only imaging)

PIPELINE PERFORMANCE

LBT Italia

Input 5 Uspec RAW lbcb images

- make masterflat ~565 sec / make masterbias ~120 sec
- crosstalk correction + standard prereduction ~75 sec
- trails mask ~460 sec / area correction ~50 sec
- object masking ~115 sec
- build and apply superflat ~475sec
- sky evaluation and subtraction ~ 405 sec
- chip equalization ~70 sec
- cosmic rays mask ~1465 sec
- background subtraction (sextractor ~135 sec / constant ~70 sec)
- photometric correction ~15 sec / chip extraction ~20 sec
- astrometry minimization ~110 sec
- resampling & coadd ~155 sec
- Build r.m.s./weight and exposure maps ~1010 sec

GLOBAL PIPELINE PERFORMANCE

total elapsed time ~ 4500 sec ~1.26 hours

input files size:

~400MB (LBC RAW science frames) +
~600MB (MASTER CALIBS)

output files size:

~1.2GB final (+ ~42GB intermediate files to be removed)

GNU-parallel “embarassing parallelization” – serial parallelization, factor ~8 gain

THE LSC PORTAL

LSC Data Centre - Data Program Acquisition and Reductions

SEMESTER: All PROPOSAL: All
RUN_NAME: All INSTRUMENT: All
TARGET: All FILTER: All
search reset

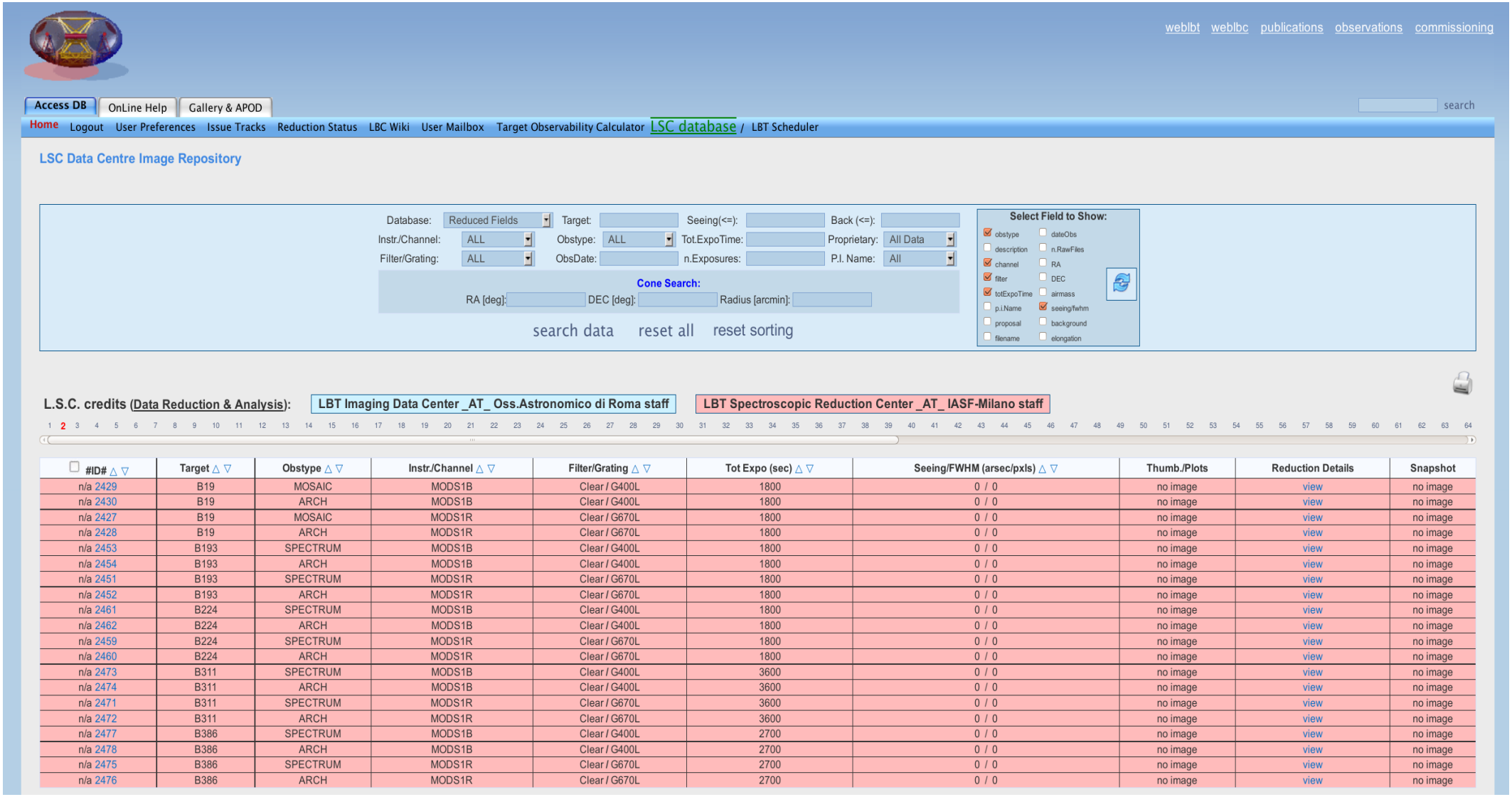
Attention the reduction-status of programs may be not updated!
we recommend you to check for physical data presence on the IA2 and LSC archive independently of the queries results on this page.

Science Program:
Observing Date:
ask reduction

SEMESTER.PROPOSAL.RUN	Prop. TITLE	RANKING	OB list	INSTRUMENT	CONSTRAINTs			ACQ. STATUS	FITS list	RED. STATUS -> DOWNLOADS
					seeing	airmass	moon/sky			
2012A.18.A	In search of mainly-first-generation globular clusters	92	n.0	LBC-BIN	1	1.3	DARK/CLEAR	0	n.0	TO-DO
2012A.18.B	In search of mainly-first-generation globular clusters	93	n.0	LBC-BIN	1	2	DARK/CLEAR	0	n.0	TO-DO
2010A.5.a	LBT ToO observations of magnetars	0	n.0	LBC-Red	0.6	1.5	GREY/CLEAR	0	n.0	TO-DO
2010A.5.b	LBT ToO observations of magnetars	0	n.0	LUCI1-IMA	0.6	1.5	GREY/CLEAR	0	n.0	TO-DO
2010A.5.c	LBT ToO observations of magnetars	0	n.0	LUCI1-IMA	0.6	1.5	GREY/CLEAR	0	n.0	TO-DO
2010A.5.d	LBT ToO observations of magnetars	0	n.0	LBC-Red	0	0	GREY/CLEAR	0	n.0	TO-DO
2010A.5.e	LBT ToO observations of magnetars	0	n.0	LBC-Red	0	0	GREY/CLEAR	0	n.0	TO-DO
2010A.5.f	LBT ToO observations of magnetars	0	n.0	LBC-Red	0	0	GREY/CLEAR	0	n.0	TO-DO
2010A.5.g	LBT ToO observations of magnetars	0	n.0	LUCI1-IMA	0	0	GREY/CLEAR	0	n.0	TO-DO
2010A.5.h	LBT ToO observations of magnetars	0	n.0	LUCI1-IMA	0	0	GREY/CLEAR	0	n.0	TO-DO

Tue, 11 Feb 2014 08:36:03 +0100

realized by LSC team



weblbt weblbc publications observations commissioning

Access DB | OnLine Help | Gallery & APOD

search

Home Logout User Preferences Issue Tracks Reduction Status LBC Wiki User Mailbox Target Observability Calculator LSC database / LBT Scheduler

LSC Data Centre Image Repository

Database: Reduced Fields Target: Seeing(<=): Back (<=):
Instr./Channel: ALL Obstype: ALL Tot.ExpoTime: Proprietary: All Data
Filter/Grating: ALL ObsDate: n.Exposures: P.I. Name: All

Cone Search:
RA [deg]: DEC [deg]: Radius [arcmin]:

search data reset all reset sorting

Select Field to Show:
obstype, dateObs, description, n.RawFiles, channel, RA, filter, DEC, totExpoTime, airmass, p.i.Name, seeing/fwhm, proposal, background, filename, elongation

L.S.C. credits (Data Reduction & Analysis): LBT Imaging Data Center _AT_ Oss.Astronomico di Roma staff | LBT Spectroscopic Reduction Center _AT_ IASF-Milano staff

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64

#ID#	Target	Obstype	Instr./Channel	Filter/Grating	Tot Expo (sec)	Seeing/FWHM (arsec/pxls)	Thumb./Plots	Reduction Details	Snapshot
n/a 2429	B19	MOSAIC	MODS1B	Clear / G400L	1800	0 / 0	no image	view	no image
n/a 2430	B19	ARCH	MODS1B	Clear / G400L	1800	0 / 0	no image	view	no image
n/a 2427	B19	MOSAIC	MODS1R	Clear / G670L	1800	0 / 0	no image	view	no image
n/a 2428	B19	ARCH	MODS1R	Clear / G670L	1800	0 / 0	no image	view	no image
n/a 2453	B193	SPECTRUM	MODS1B	Clear / G400L	1800	0 / 0	no image	view	no image
n/a 2454	B193	ARCH	MODS1B	Clear / G400L	1800	0 / 0	no image	view	no image
n/a 2451	B193	SPECTRUM	MODS1R	Clear / G670L	1800	0 / 0	no image	view	no image
n/a 2452	B193	ARCH	MODS1R	Clear / G670L	1800	0 / 0	no image	view	no image
n/a 2461	B224	SPECTRUM	MODS1B	Clear / G400L	1800	0 / 0	no image	view	no image
n/a 2462	B224	ARCH	MODS1B	Clear / G400L	1800	0 / 0	no image	view	no image
n/a 2459	B224	SPECTRUM	MODS1R	Clear / G670L	1800	0 / 0	no image	view	no image
n/a 2460	B224	ARCH	MODS1R	Clear / G670L	1800	0 / 0	no image	view	no image
n/a 2473	B311	SPECTRUM	MODS1B	Clear / G400L	3600	0 / 0	no image	view	no image
n/a 2474	B311	ARCH	MODS1B	Clear / G400L	3600	0 / 0	no image	view	no image
n/a 2471	B311	SPECTRUM	MODS1R	Clear / G670L	3600	0 / 0	no image	view	no image
n/a 2472	B311	ARCH	MODS1R	Clear / G670L	3600	0 / 0	no image	view	no image
n/a 2477	B386	SPECTRUM	MODS1B	Clear / G400L	2700	0 / 0	no image	view	no image
n/a 2478	B386	ARCH	MODS1B	Clear / G400L	2700	0 / 0	no image	view	no image
n/a 2475	B386	SPECTRUM	MODS1R	Clear / G670L	2700	0 / 0	no image	view	no image
n/a 2476	B386	ARCH	MODS1R	Clear / G670L	2700	0 / 0	no image	view	no image

FINAL CONSIDERATIONS

- The Unit #2 mechanisms is now “well lubricated” and general users’ satisfaction has been achieved
- Got good suggestions from users and some of them have been implemented
- Next upgrades: Improve end-to-end process, bottom layer re-engineering, calibration z.p. monitoring, parallelization