



European
Southern
Observatory

38th User Committee Meeting
Garching, April 10-11, 2014

Observing Tools

Feedback from the COSMIC-LAB project

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INAF – Osservatorio Astronomico, Bologna (Italy)

on behalf of the COSMIC-LAB team

Garching, April 11, 2014

THE PROJECT



Star Clusters as Cosmic Laboratories
for Astrophysics, Dynamics and Fundamental Physics

- ★ 5-year project funded by the European Research Council (ERC)
- ★ PI: Francesco R. Ferraro (Dip. of Physics & Astronomy – Bologna)
- ★ Co-Is: B. Lanzoni, A. Mucciarelli, E. Dalessandro + 4 Post-doc and 4 PhD
- ★ kickoff: May 2011
- ★ **AIM: understanding the complex interplay between dynamics and stellar evolution**
- ★ **HOW: using globular clusters as cosmic laboratories and**
 - Blue Straggler Stars**
 - Millisecond Pulsars**
 - Intermediate-mass Black Holes**as test particles



MID-TERM REPORT – first 30 months



Granted telescope time:

More than 200 orbits with HST and 500 hours at the 8-10m class telescopes have been assigned to projects related to COSMIC-LAB

★ HST: Cycle 19 = 39 orbits Cycle 20 = 28 orbits Cycle 21 = 15+**131** orbits

★ ESO-VLT: Period 87= 6 nights + 15 hours
Period 89= 3 nights + 3 hours
Period 90= 5 nights + 21 hours
Period 91= 2 nights + 24.5 hours
Period 92= 3 nights + 33 hours
Period 93= 31 + **194 hours**



**Large
Programme**

★ GEMINI: 7.5 hours KECK: 30 hours

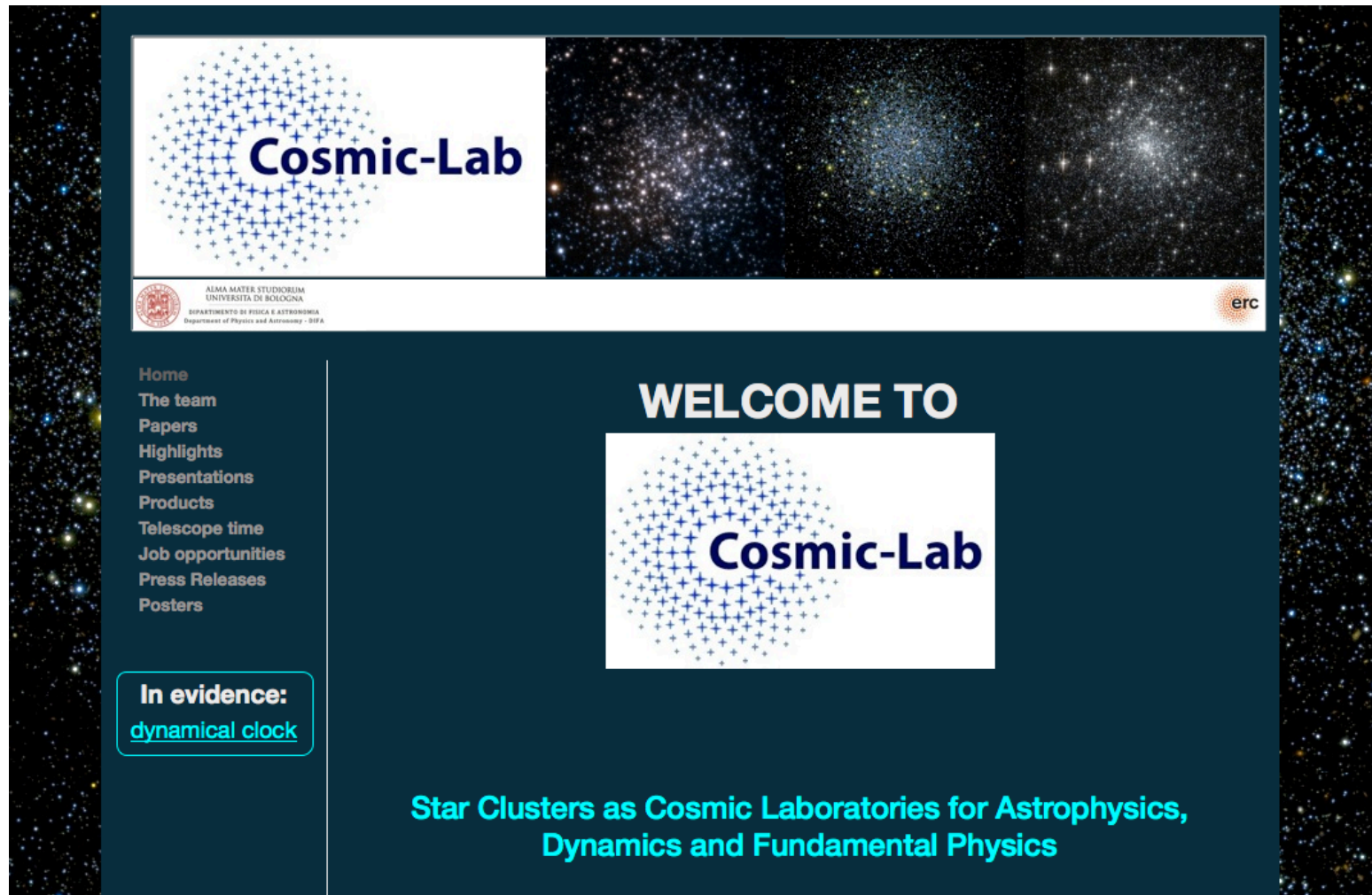
Published papers:

24 papers have been published in peer-reviewed journals

THE PROJECT



web-page: <http://www.cosmic-lab.eu/>



www.cosmic-lab.eu



Focus on VLT observations

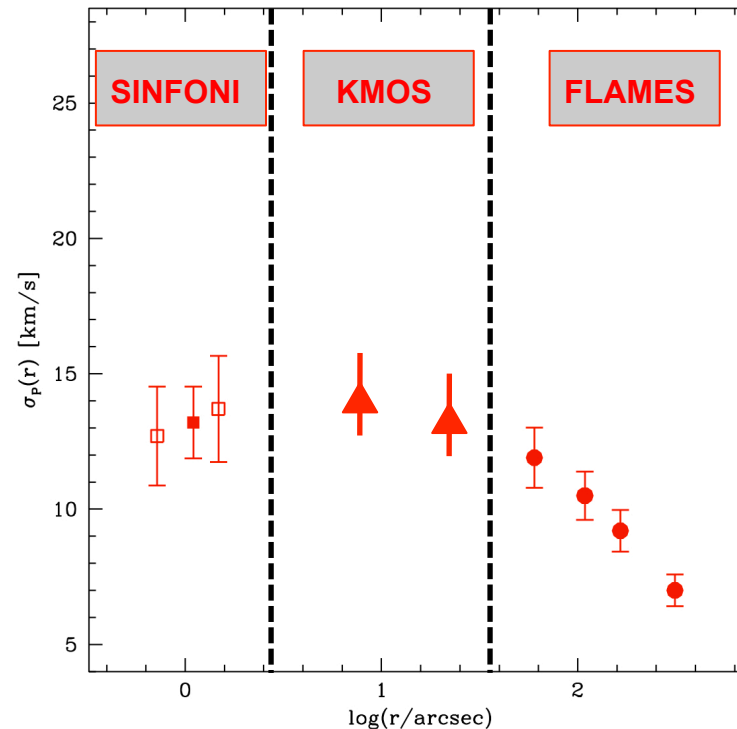
Cosmic-Lab: Probing globular cluster internal dynamics

Radial velocity dispersion and rotation profiles for 30 Galactic globular clusters

ESO-VLT LARGE PROGRAMME (P93+94+95) KMOS + FLAMES PI: Ferraro 194 hours

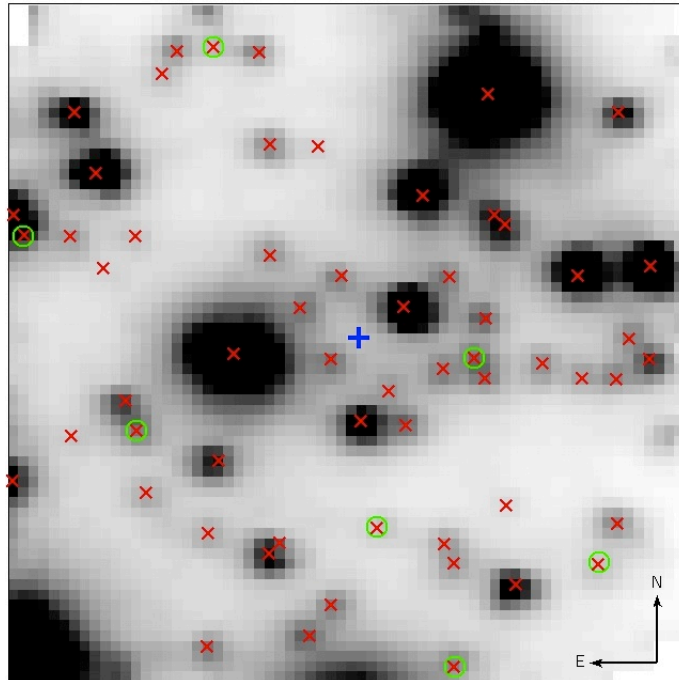
Inner velocity dispersion and rotation profiles of five concentrated globular clusters from the radial velocities of individual stars

COMPANION PROPOSAL (P93) SINFONI PI: Lanzoni 31 hours

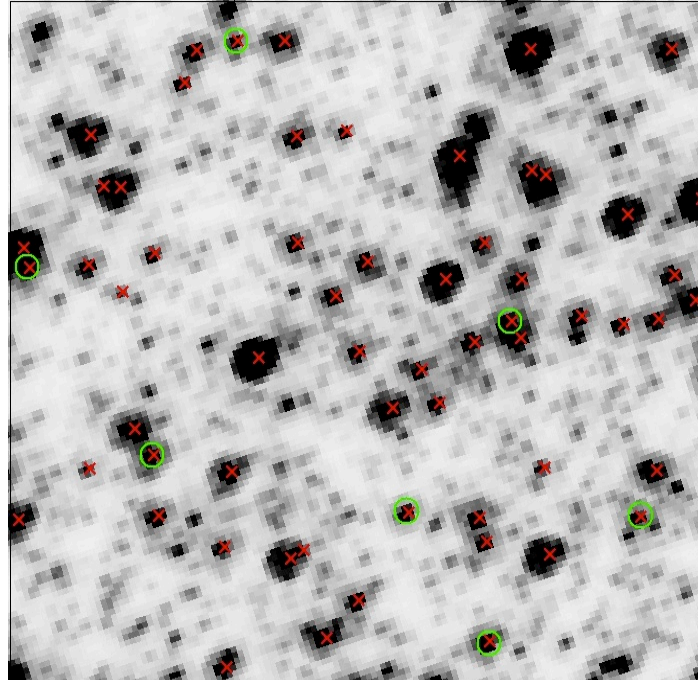


VLT-SINFONI AO-assisted

SINFONI

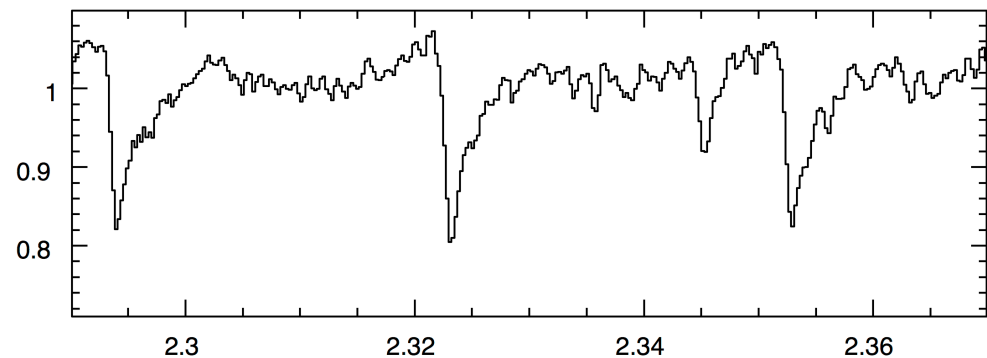


HST/HRC

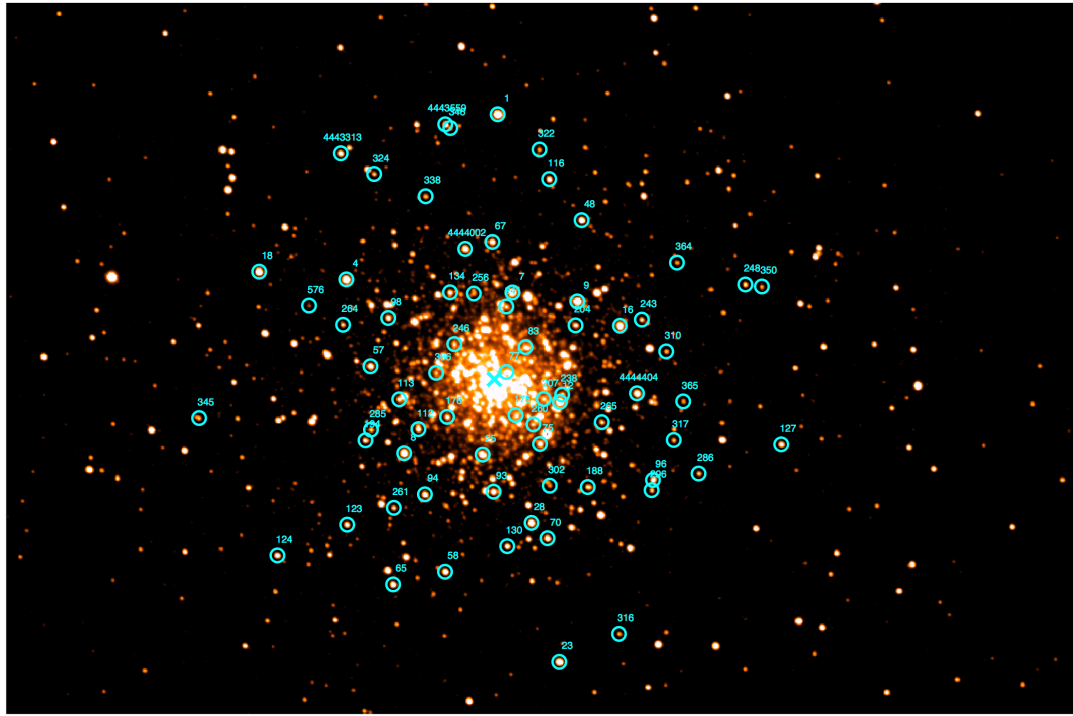


pilot project in the core
region of NGC 6388

K band spectra at $R \sim 4,000$
 ~ 60 stars at $r < 1.6$ arcsec



VLT-KMOS deployable IFU

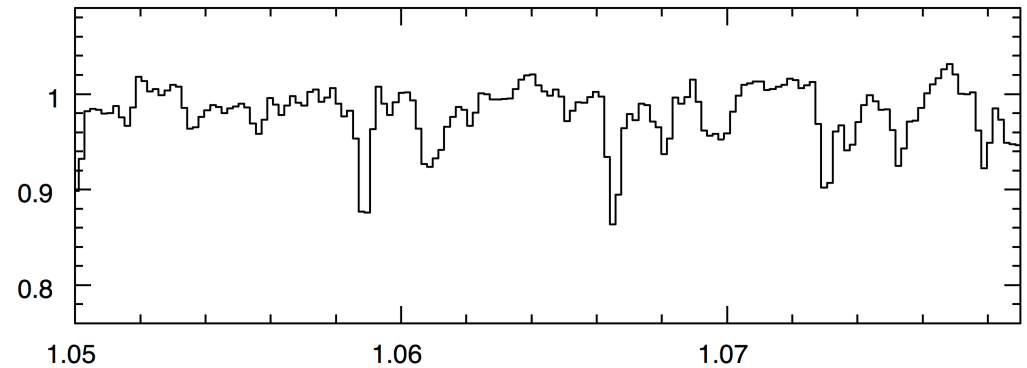
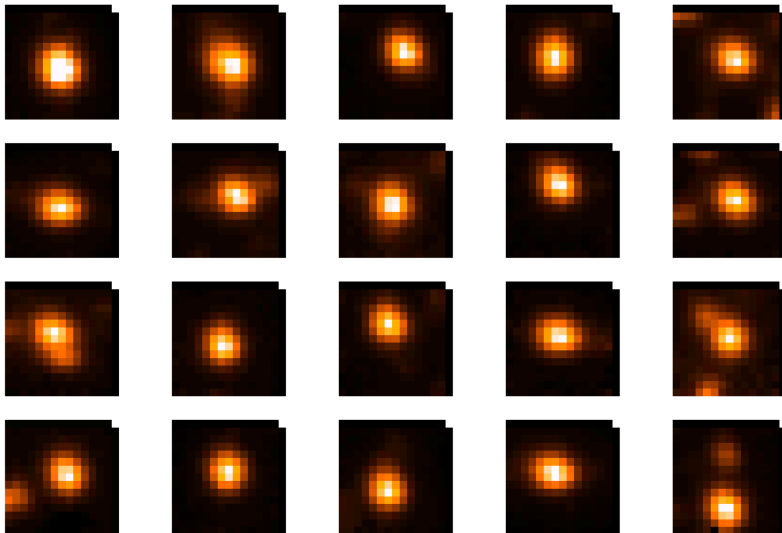


SV - pilot project in the
NGC 6388 central region

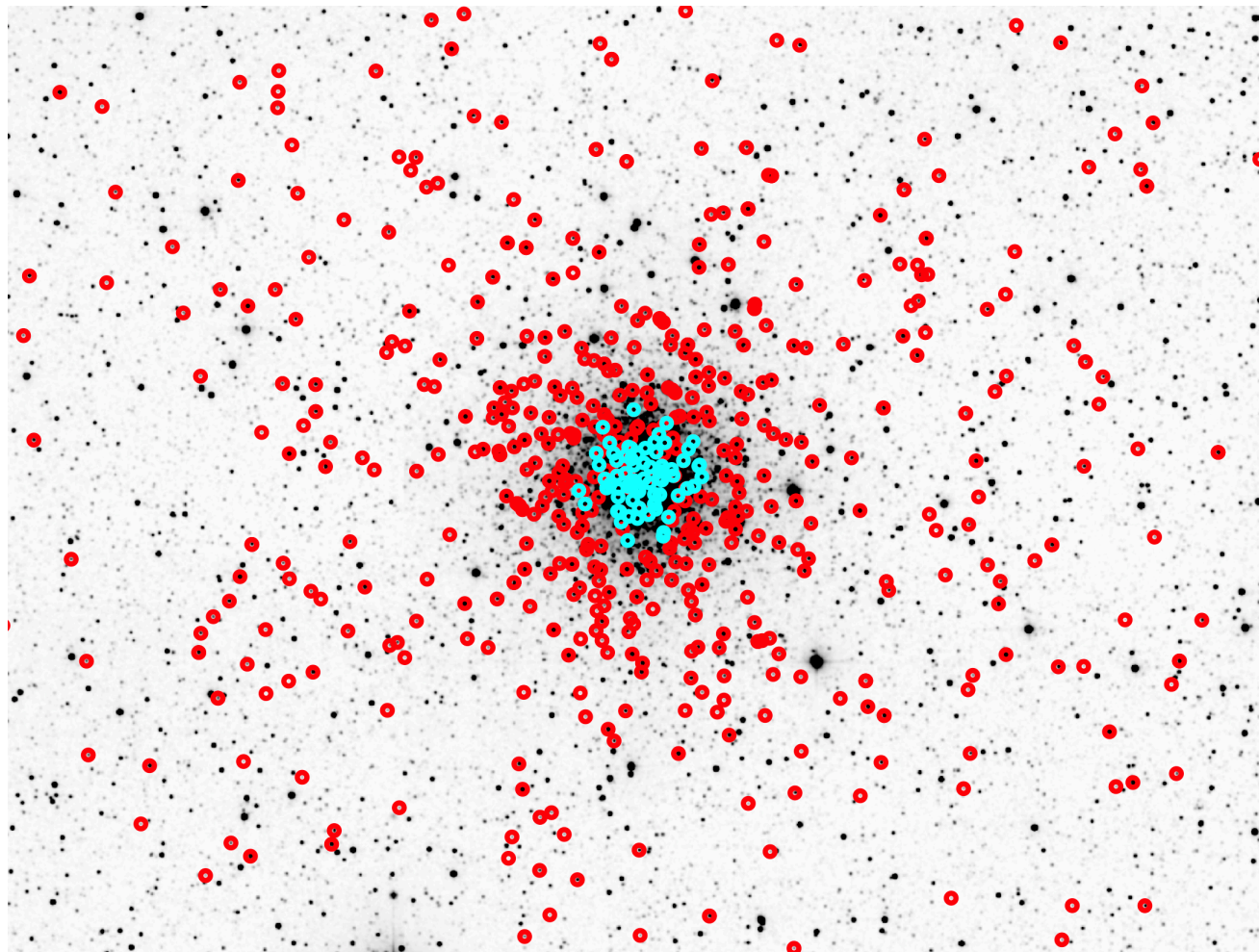
YJ band spectra at
 $R \sim 3,400$

nod to sky mode

4 pointings, ~ 90 stars at
 $R < 70''$



FLAMES



NGC 6388
outer regions

GIRAFFE/MEDUSA
HR21 CaT $I < 17$

Focus on VLT observations

Cosmic-Lab: stellar systems with large pop of MSPs

Bulge building blocks: chemistry and kinematics of Terzan 5, Liller 1, Terzan 6

ESO-VLT Proposals (P85-P91) X-Shooter + FLAMES PI: Ferraro 10 nights + 23 hrs

high reddening $\rightarrow A_v > 7$ mag

XSHOOTER

VIS arm (RVs, CaT)

slit 0.9", $I < 18$

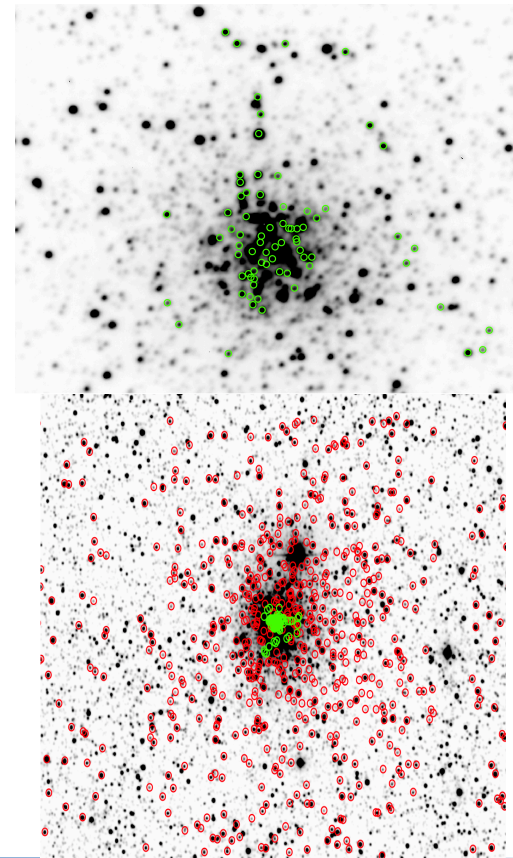
NIR arm (RVs, chemistry)

slit 0.6", $J < 16$

FLAMES

GIRAFFE/MEDUSA HR21

(RVs, CaT) , $I < 17$



Focus on VLT observations

P2PP - general considerations

facts/requests

almost every period new releases of P2PP and related instrument software/tools

releases for Mac OS should become a standard

number of independent packages to manage is becoming large

tools, e.g. to produce finding charts, to check target visibility, to recover basic info (e.g. target and NGS coordinates, id, setups etc.) from Phase-I etc., **inside the P2PP**

e.g., HST APT

e.g., the HST APT tool bar

The screenshot shows the Astronomer's Proposal Tools (APT) Version 22.0.2 interface. A red box highlights the top toolbar, which includes icons for Form Editor, Spreadsheet Editor, Orbit Planner, Visit Planner, View in Aladin, BOT, Target Confirmation, PDF Preview, Submission, Errors and Warnings, Run All Tools, and Stop. Below the toolbar, the main window displays the 'Proposal Information of Unsubmitted HST Phase I Proposal (Unsaved)'. The left sidebar shows a tree view with 'Proposal Information' selected, and sub-items like 'Unnamed PI', 'Unnamed Col', 'Targets', and 'Observations'. The main panel contains various input fields and buttons for proposal details. Three red boxes with arrows point to specific features: one points to the 'Targets' icon in the sidebar, another points to the 'Target Confirmation' icon in the toolbar, and a third points to the 'Orbits This Cycle' field. A fourth red box points to the 'Targets' icon in the sidebar.

checks and displays constraints on a proposal, and calculates observing windows

generates fixed target confirmation charts

displays exposure apertures against an image of the sky, it is useful for target and/or coordinate confirmation

Unsubmitted HST Phase I Proposal (Unsaved)

Proposal Information of Unsubmitted HST Phase I Proposal (Unsaved)

Title: Test

Abstract

Remaining characters: 1692

Category: GO ☐ Calibration ☐ Treasury ☐ UV Initiative

Cycle: 22

Primary Orbits: 10

Parallel Orbits:

Orbits This Cycle: 10

Orbits Next Cycle:

Orbits After Next Cycle:

Proposal Size: SMALL

Proprietary Period: Default (Default is 12 months)

Scientific Category: RESOLVED STELLAR POPULATIONS

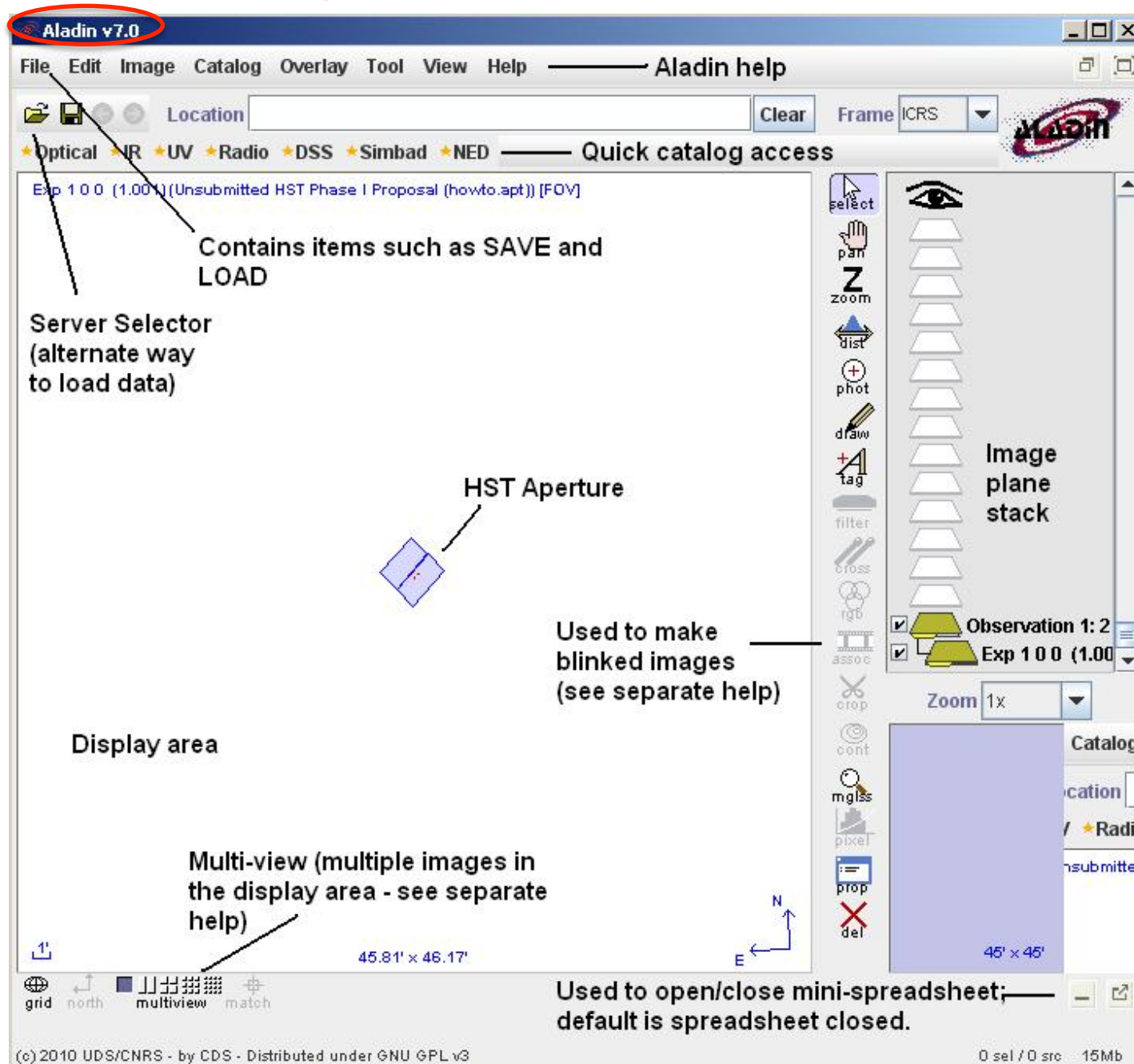
Science Keywords: Globular Clusters, Resolved Stellar Populations, X-Ray Binaries

Proposal...	Title	Abstract	Category	Cycle	Primary Or...	Parallel Or...	Primary Or...	Parallel Or...	Primary Or...	Parallel Or...	Multi-Cycl...	Prop
Proposal I...	Test	Abstract	GO	22	10							Defa

Show: Proposal Information

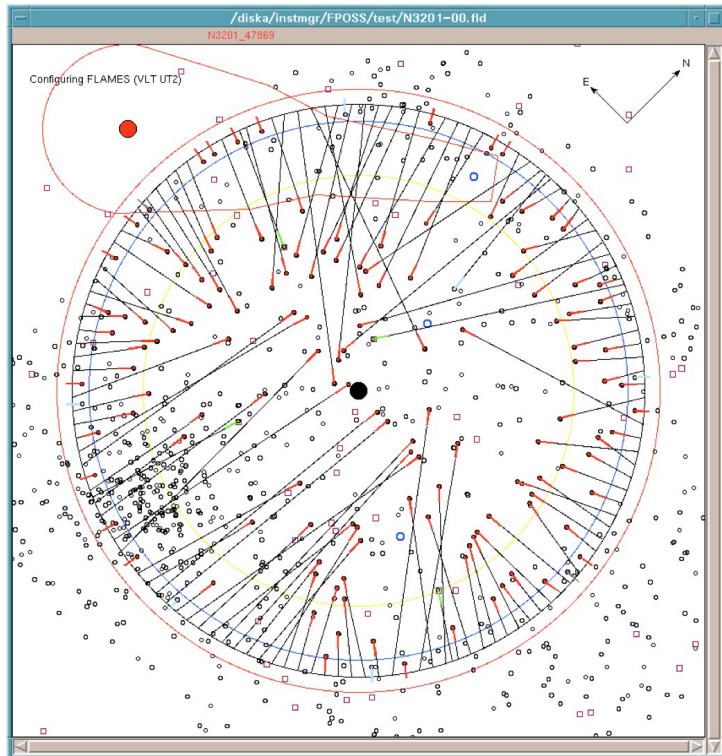
6 errors & warnings (Click for Details)

e.g., the HST APT



Focus on VLT observations: Positioners

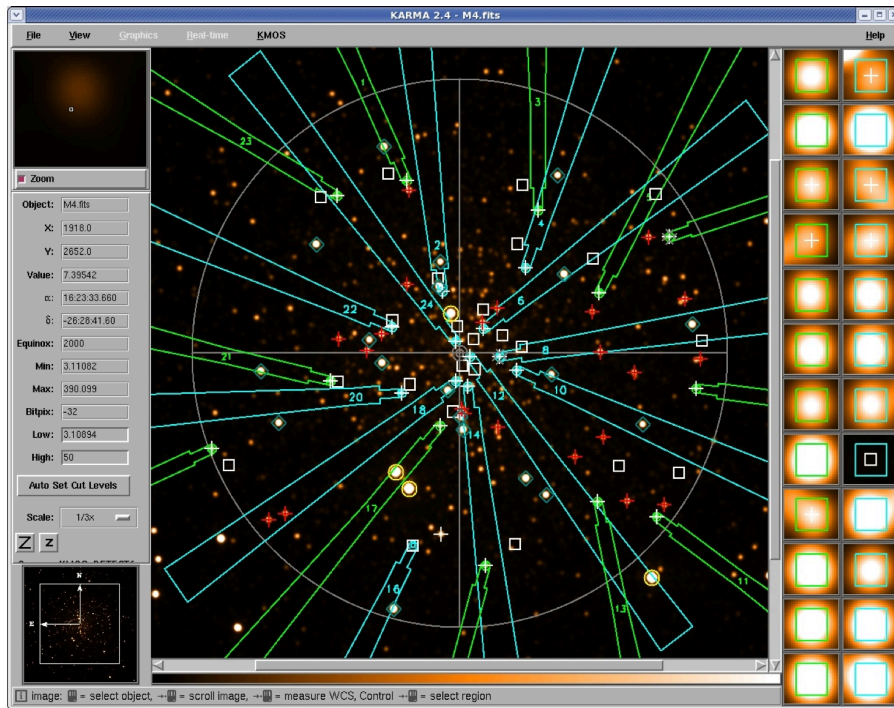
FPOSS-FLAMES



➤ successfully used by the Community since many years

- It does not run on Mac OS (only on a 32 or 64-bit Linux pc)
- The finding charts must be prepared with the FIMS software that runs only on 32-bit Linux pc
- It does not allow to load a FITS image and overplot the target catalog for an easier identification
- It does not allow to save intermediate configurations (e.g., with partial fiber allocation)
- Once a fiber configuration has been finalized (saved in a .ins file) it is not possible to update/modify it (e.g., change some fiber allocation)

Focus on VLT observations: Positioners



KARMA-KMOS

- It runs on both Mac OS and (32 or 64-bit) Linux pc
- It allows to load a FITS image, and to overplot target positions
- It allows to modify the display setup (e.g., colors, cuts etc.)

➤ **valuable** if one could **offset** a given ifu from the nominal target position, e.g., to include an additional target that is just outside of the ifu fov, **without** having it automatically flagged as sky

➤ to observe globular clusters in nod to sky mode, one must load a fits image with a large fov (\gg KMOS) for checking offset positions (a few arcmin) \rightarrow ~ only 2MASS (low resolution, bad to check target allocation)
valuable if one could have the option to load a high res image (small fov) to allocate/check targets, then change to 2MASS to allocate/check sky

Focus on VLT observations: **SINFONI**

ETC *facts*/requests

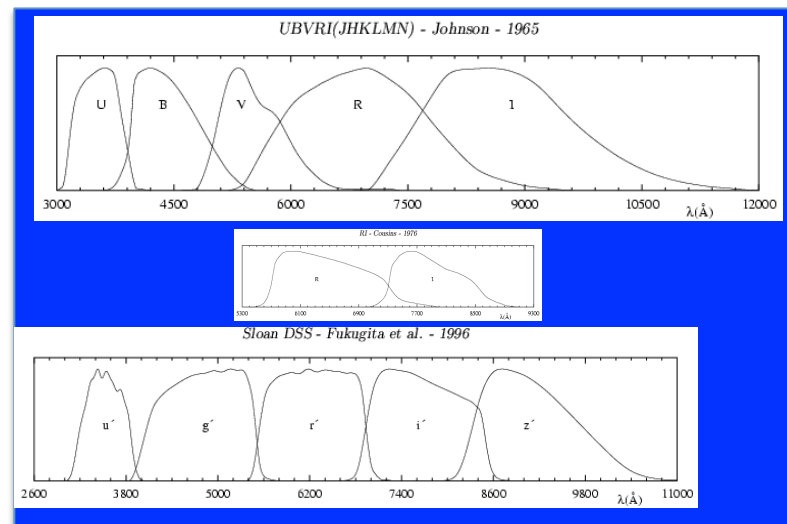
AO-mode requires R and (B-R) photometric info for the guide star

can V and (V-I) be an alternative?

(MCAO WFS response curve not found)

if R and (B-R) critical, in which photometric system?

(e.g. Johnson, Cousins, SLOAN; Vegamag or AB etc.)



e.g., for a star with $T_{\text{eff}} = 5000 \text{ K}$

$$\Delta(R_c - R_J) \cong +0.2 \text{ mag}$$

$$\Delta(R_c - R_S) \cong -0.2 \text{ mag}$$

$$\Delta(R_{\text{Vega}} - R_{\text{AB}}) \cong 0.4 \text{ mag}$$

also, the observed (B-R) can be red since the star is intrinsically cool (BB-like) or reddened ($\sim \lambda^{-1.5}$) or both

Focus on VLT observations: SINFONI

ETC *facts/requests*

*output: s/n and encircled energy over the DL core
max intensity (obj+bg) and bg per pix & DIT*

however, in crowded stellar fields

- *the background can be enhanced due to the unresolved stellar continuum*
- *the usable star signal is the one in the brightest pixel and occasionally around it (within about the PSF DL core)*

it would be very valuable if the ETC could

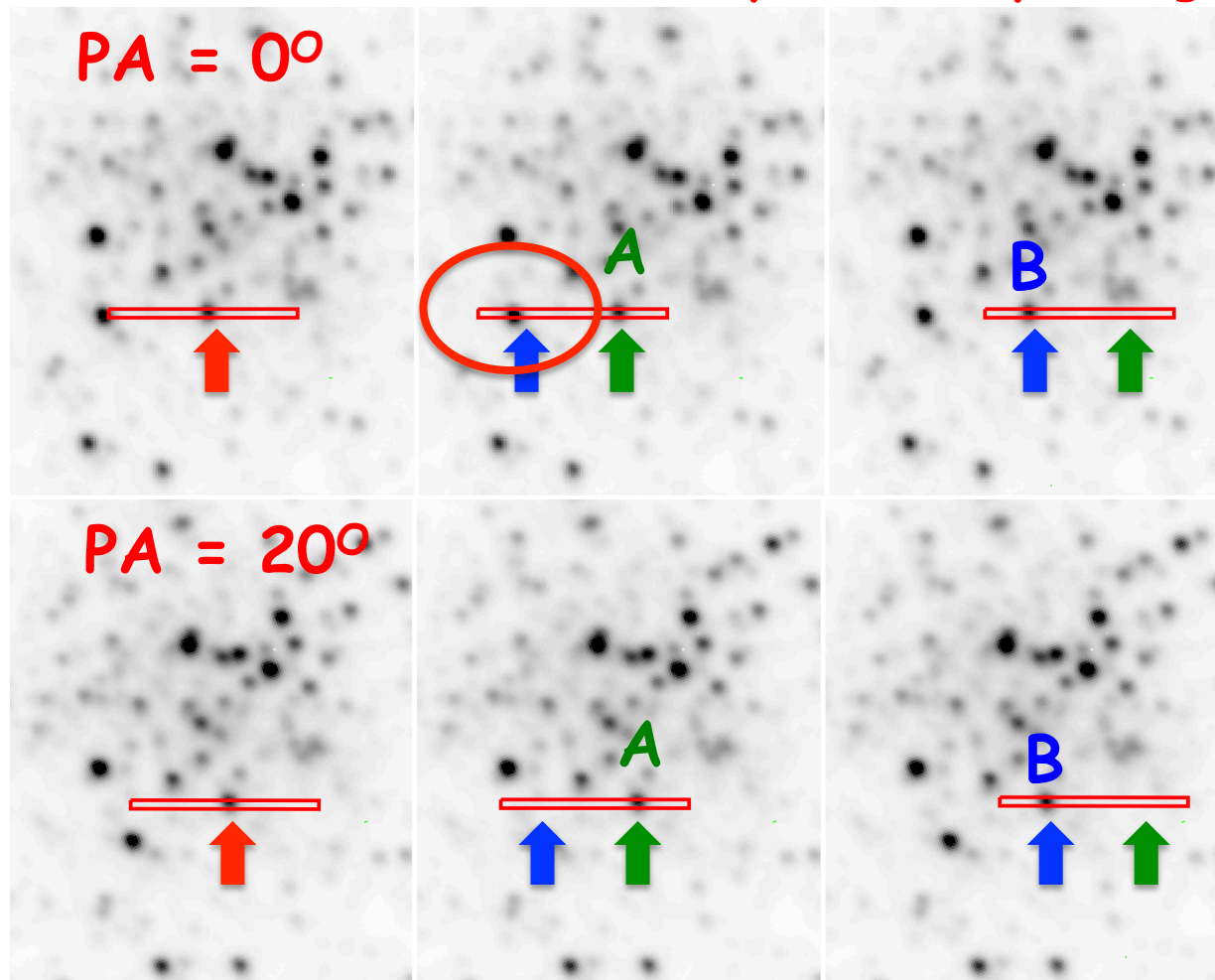
- allow to change the bg value
- provide also the s/n of the brightest pixel (subtracted by the bg), now it can be computed manually by the user

Focus on VLT observations X-Shooter

nod-on-slit tool inside the P2PP

to visualize target and the sky in the **A** and **B** positions within the slit, with varying the nodding throw and position angle

tool useful/available for any IR slit spectrograph



slit $\rightarrow 11''$
throw $\rightarrow 6''$
position angle $\rightarrow 0^\circ$

in **A** sky contaminated
by a star

slit $\rightarrow 11''$
throw $\rightarrow 6''$
position angle $\rightarrow 20^\circ$

no contamination

Observing Tools

Feedback from the COSMIC-LAB project

Summary

- P2PP and other sw/tools → releases for Mac
- tools (e.g. finding charts, target visibility, etc.) within the P2PP
- new tools:
 - prop-info**: to transfer Phase I info (targets coord, id, etc.) into Phase 2 OBs (also some info into the Readme file)
 - nod-on-slit**: to set optimal nodding throw and PA for IR slit spectrographs (e.g. XShooter, CRIRES+)
- some new features:
 - in FPOSS and KARMA
 - in the SINFONI ETC