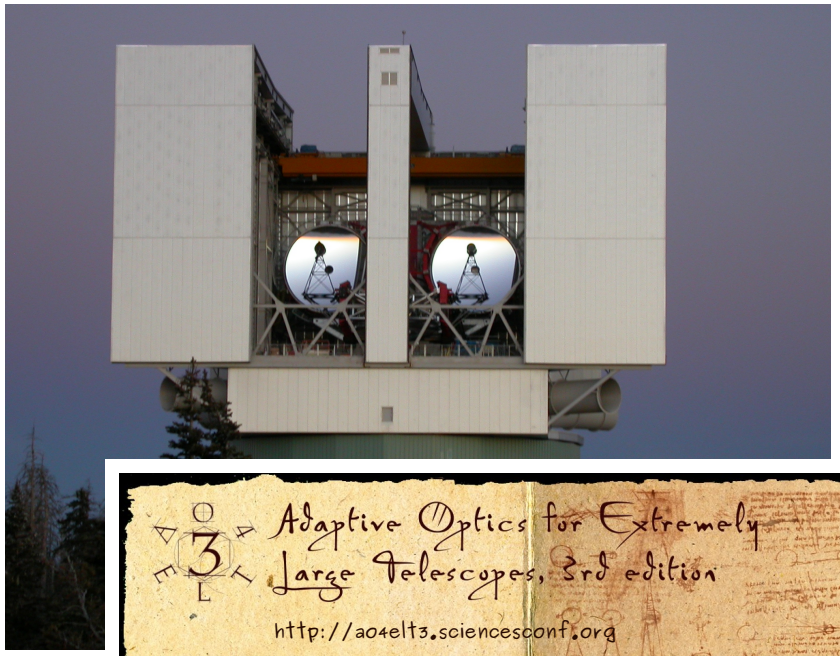
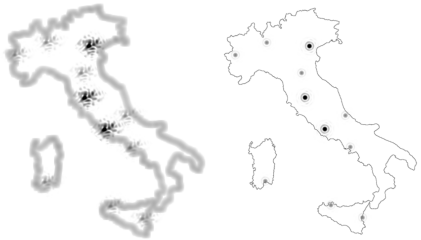
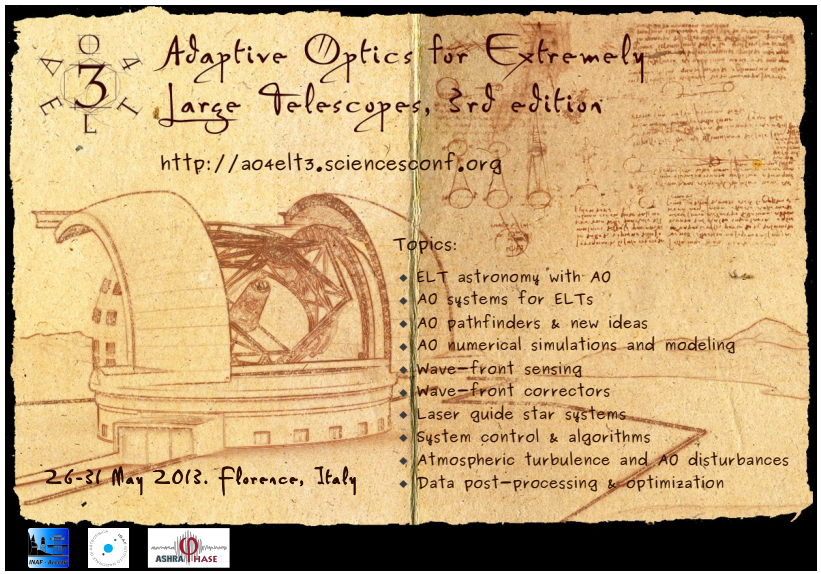
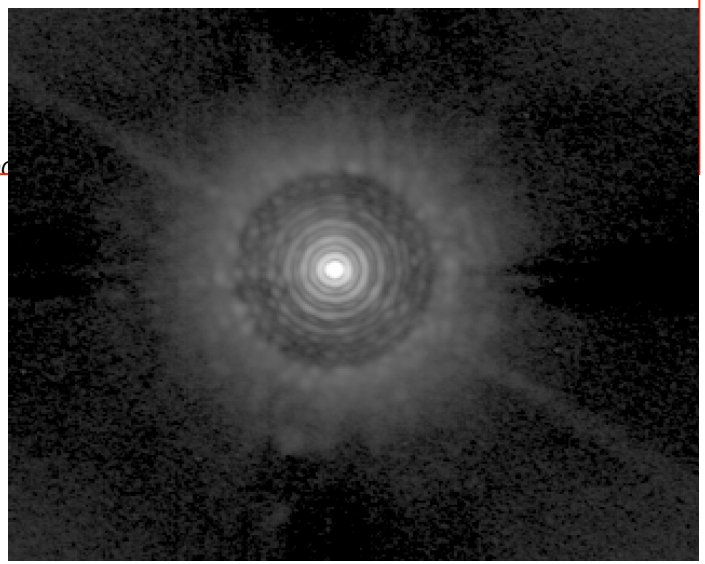
Il gruppo AO di Arcetri



Espression of Interest in response to INAF Decree 34/2012 proposing the establishment of an
ADaptive Optics National laboratory – Italy (ADONI)







Incontro Istituto Nazionale di Ottica ed Osservatorio di Arcetri,
20 Febbraio 2013, Firenze.

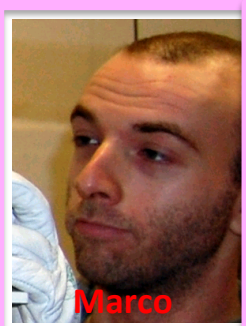
Simone Esposito

AO Group People Core and Collab.

Guido Agapito

Carmelo Arcidiacono (OABo)

Valdemaro Biliotti (IR Group/AO)

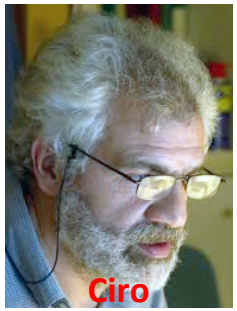


Marco Bonaglia

Runa Briguglio

Lorenzo Busoni

Luca Carbonaro (Radio/AO)



Ciro Del Vecchio

Simone Esposito

Debora Ferruzzi (IR Group/AO)

Luca Fini

Franco Lisi

Enrico Pinna

Alfio Puglisi

Fernando Quirós-Pacheco

Armando Riccardi

Marco Xompero

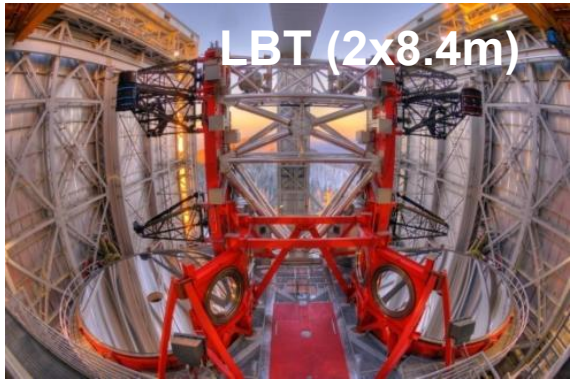
Tommaso Mazzoni

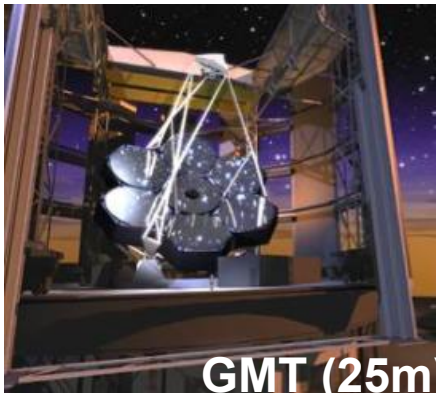
Mauro Sozzi

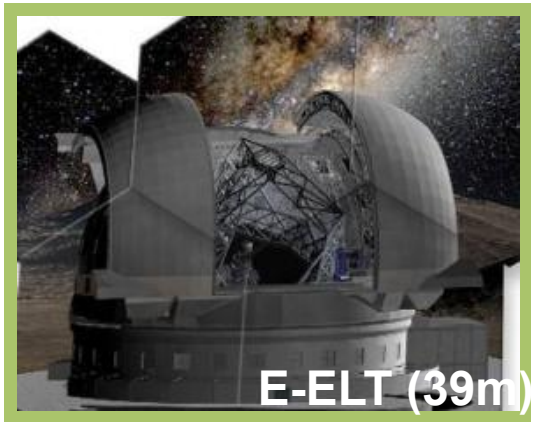
Jacopo Antichi

AO group activity in short

1) The current 8m class telescopes







2) The ELT class telescopes 25/40m

3) Space telescopes

- Adaptive Secondary mirrors
- Pyramid wavefront sensors

A list of current projects:

LBT Telescope (2x8.4m):

1) FLAO#1 & FLAO#2 [end by 2014]
2) ARGOS [end by 2014]
3) Sodium Laser AO upgrade [end by 2015]
4) Shark [end by 2015]

VLT Telescopes (4x8.2m):

5) UT4 DSM (1170 actuators) [end by 2013]
6) ERIS [start Feb. 2013, end 2017]

Magellan Telescope (6.5m):

7) VisAO system [end by 2013]

GMT telescope (25m)

8) NGAO system [end by 2019]

E-ELT telescope (39m)

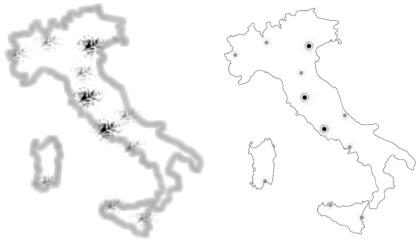
9) NGWFS system [start off end 2013]
10) M4 tower test

LATT telescope (4m)

10) Mirror prototype [end of 2013]

Espression of Interest in response to INAF Decree 34/2012 proposing the establishment of an

ADaptive Optics National laboratory – Italy (ADONI)



Written by R. Ragazzoni, S. Esposito, E. Giallongo and P. Salinari

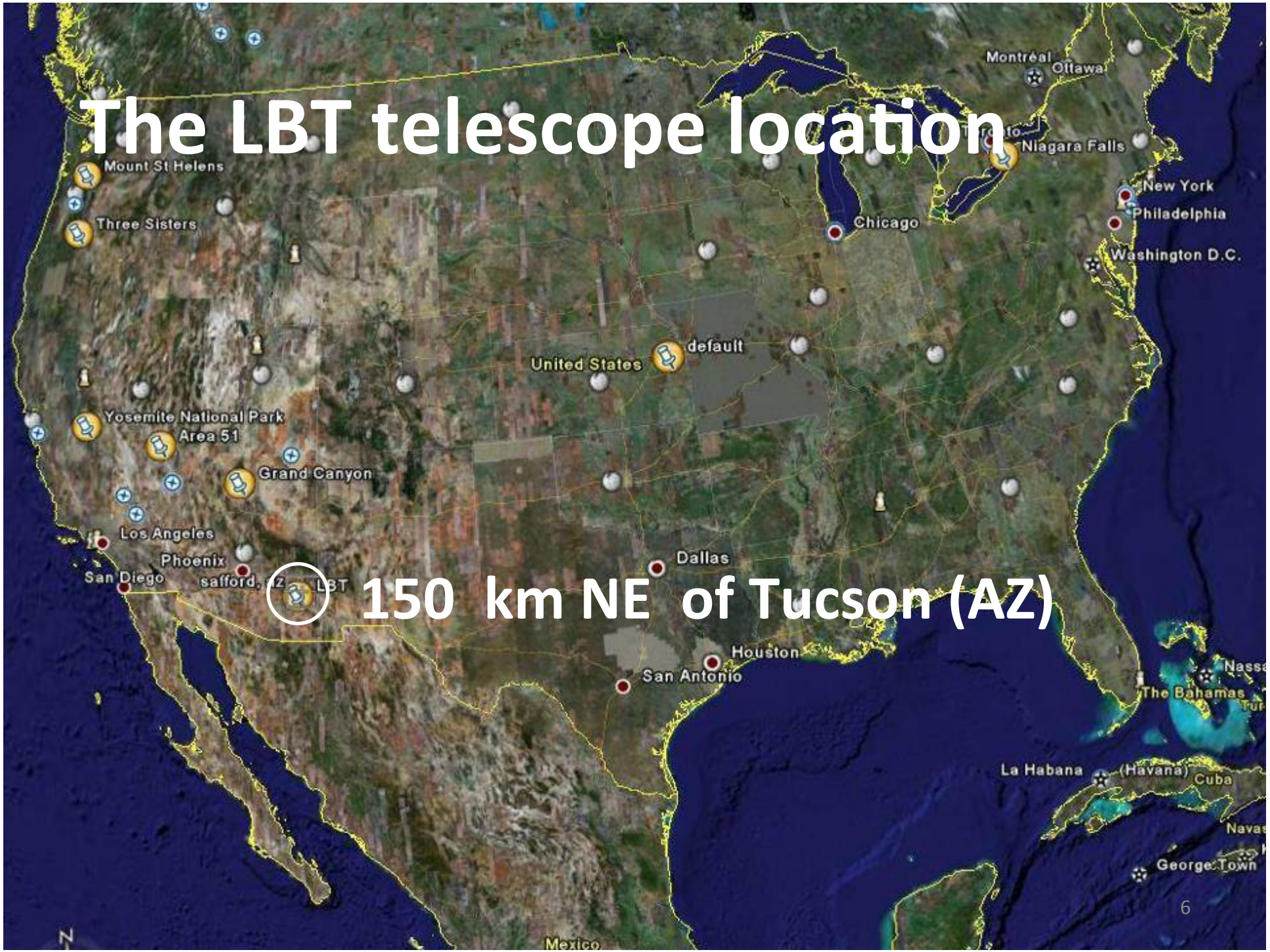
ADONI at glance:

Host institution:	Arcetri Astrophysical Observatory
Joint Institutions:	Padova and Roma Astronomical Observatories
Overall personnel involved:	49
Areas of interest:	1. AO for 8m class and Extremely Large Telescopes 2. Development of new AO concepts and components 3. Exploitation of technologies grown in AO framework 4. Dissemination of non astronomical AO application
Key goals:	1. To reach a critical mass to be able to have a key role in AO systems for the largest existing and planned astronomical facilities 2. To organize the various forces active in the AO field in Italy in order to maintain the present leadership in the AO field

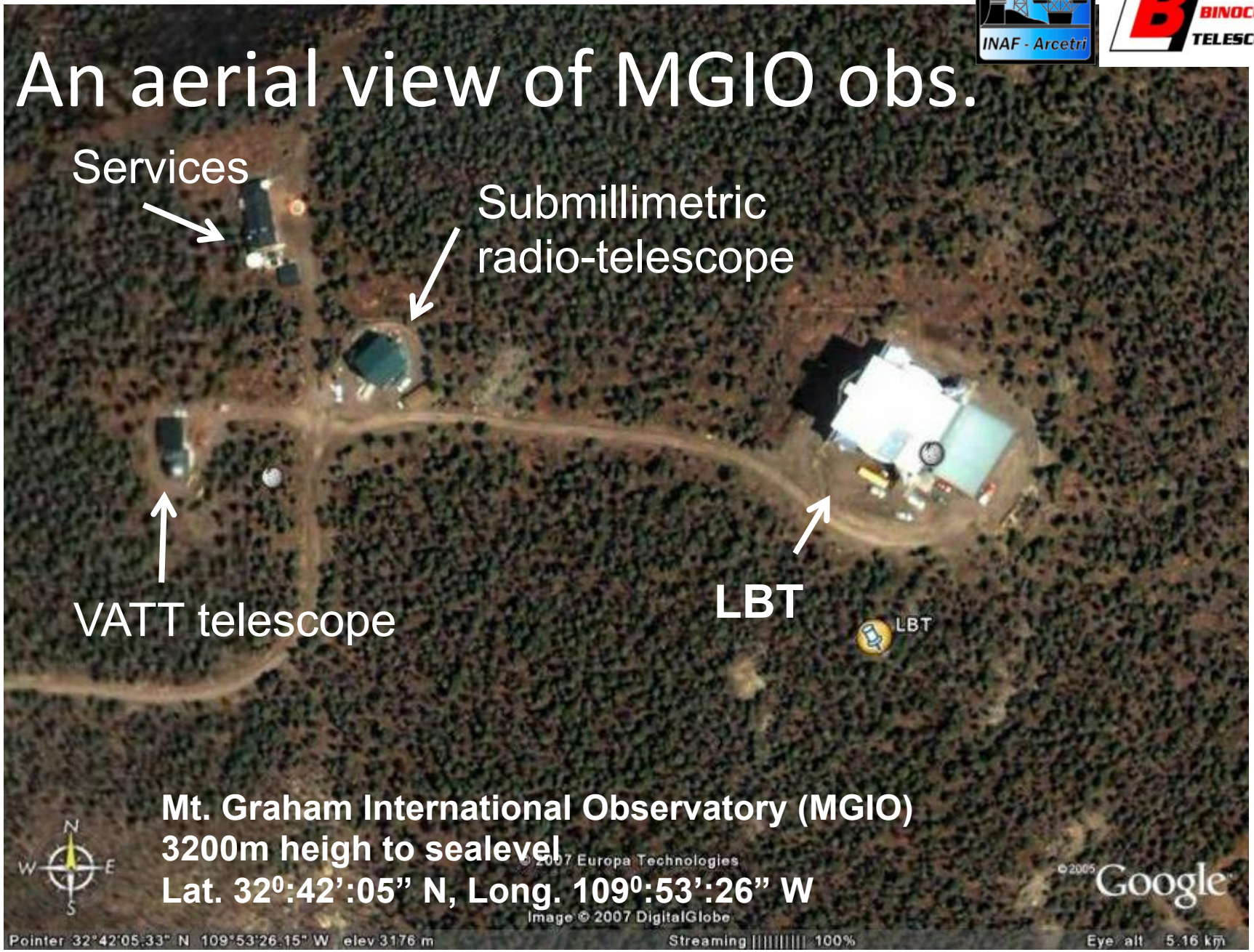
Il progetto LBT: First Ligh Adaptive Optics system [FLAO]

Una meta' del FLAO team ad LBT durante il primo run di commisssioning

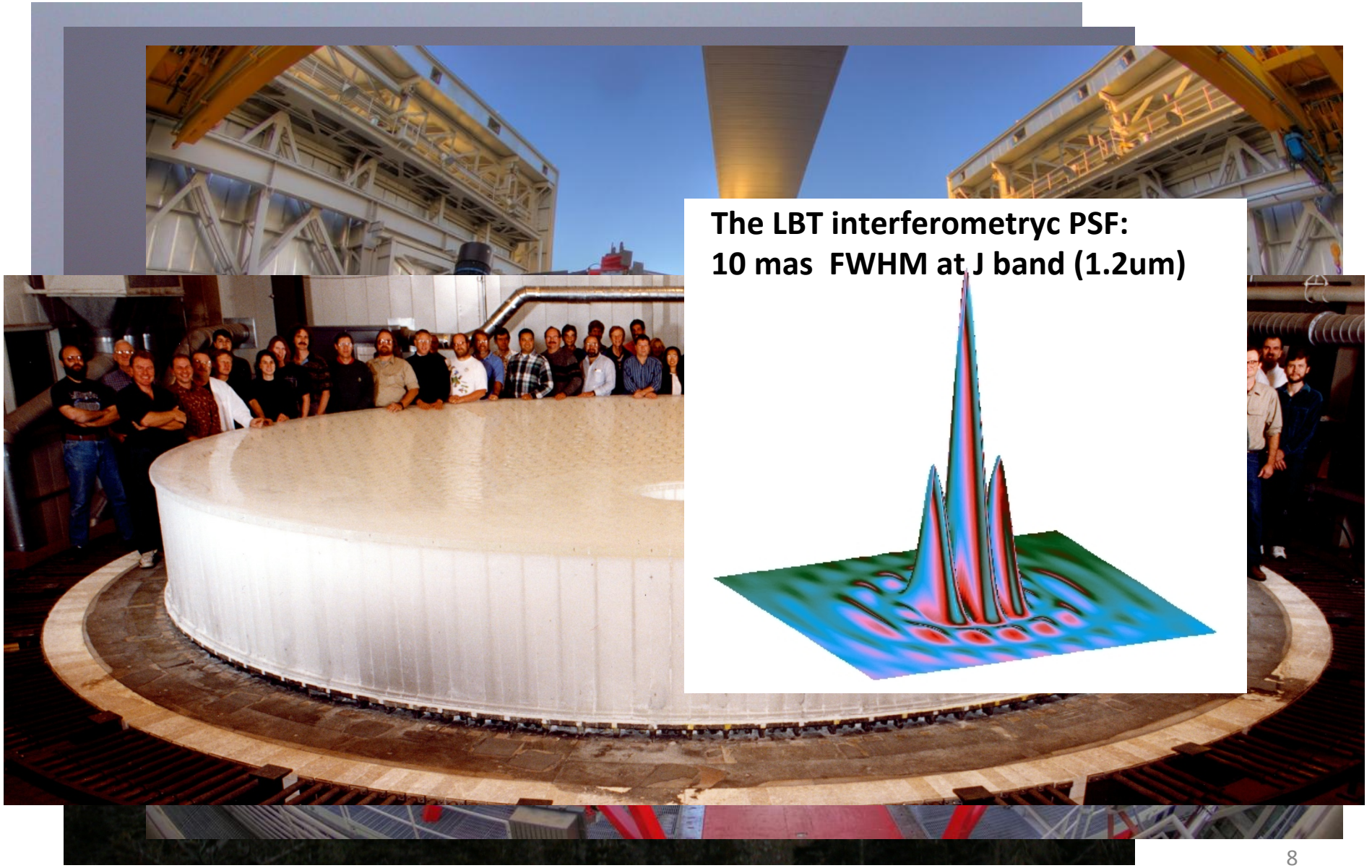
[Un progetto che si e' esteso dal 2000 al 2010 !!]


The LBT telescope location
Montréal
Ottawa
Niagara Falls
Mount St Helens
New York
Philadelphia
Three Sisters
Chicago
Washington D.C.
default
United States
Yosemite National Park
Area 51
Grand Canyon
Los Angeles
Phoenix
Dallas
San Diego
safford
LBT
150 km NE of Tucson (AZ)
Houston
San Antonio
The Bahamas
La Habana
(Havana)
Cuba
George Town
Mexico

An aerial view of MGIO obs.



The LBT telescope: two 8.4m mirrors.

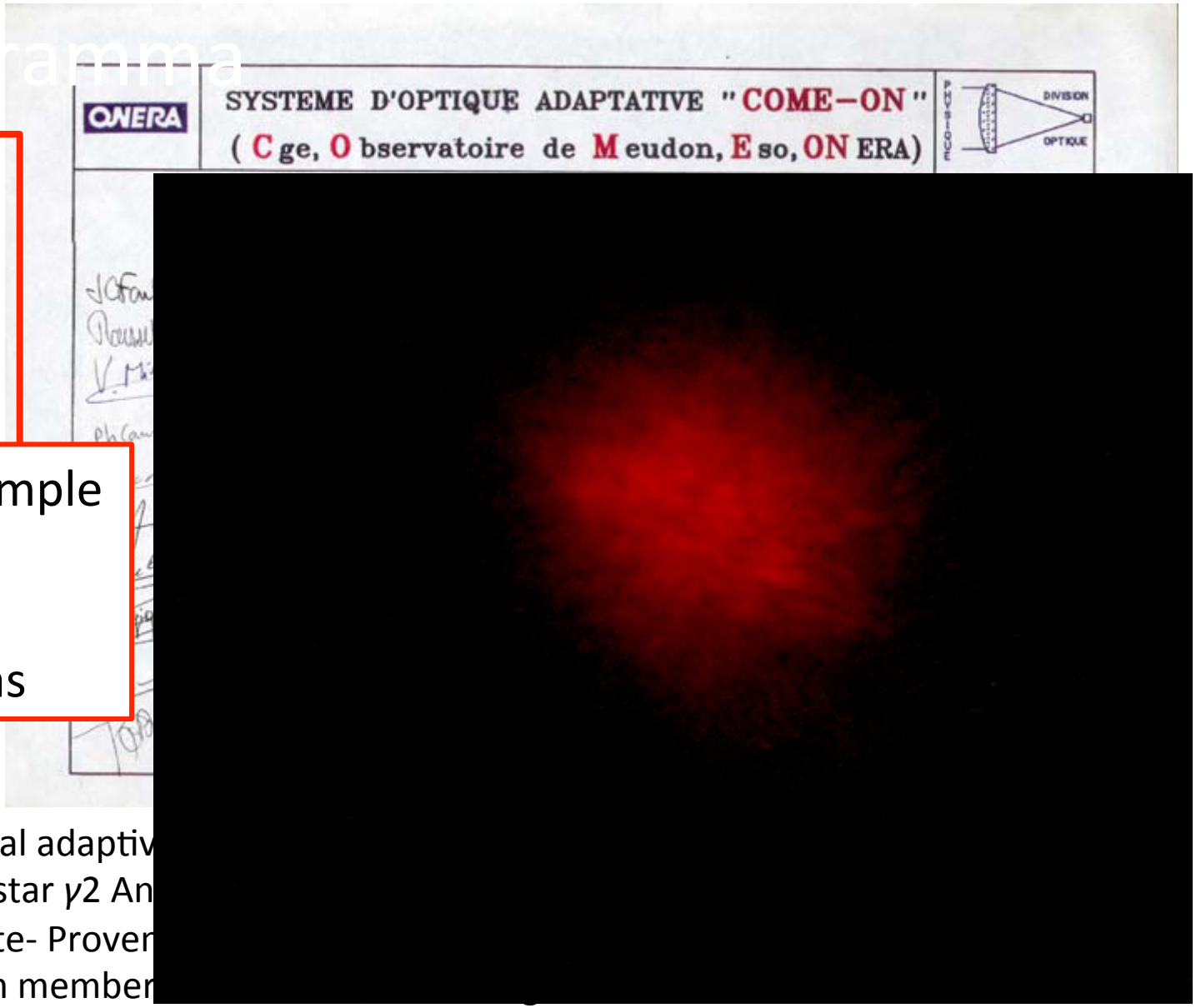


The LBT interferometryc PSF:
10 mas FWHM at J band (1.2um)

A first example:

A double star with separation smaller than the seeing value (0.8 arcsec). An example from Come-OnAO system

An updated example from LBT:
SR>60% H band
FWHM DL 40mas

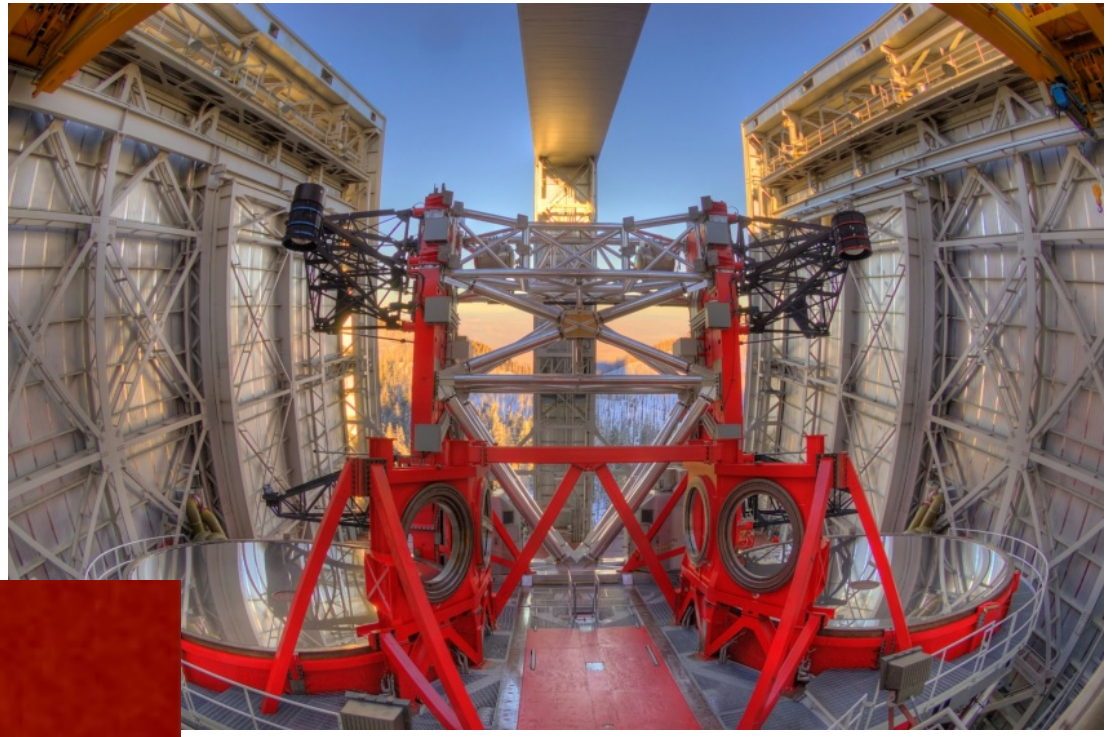


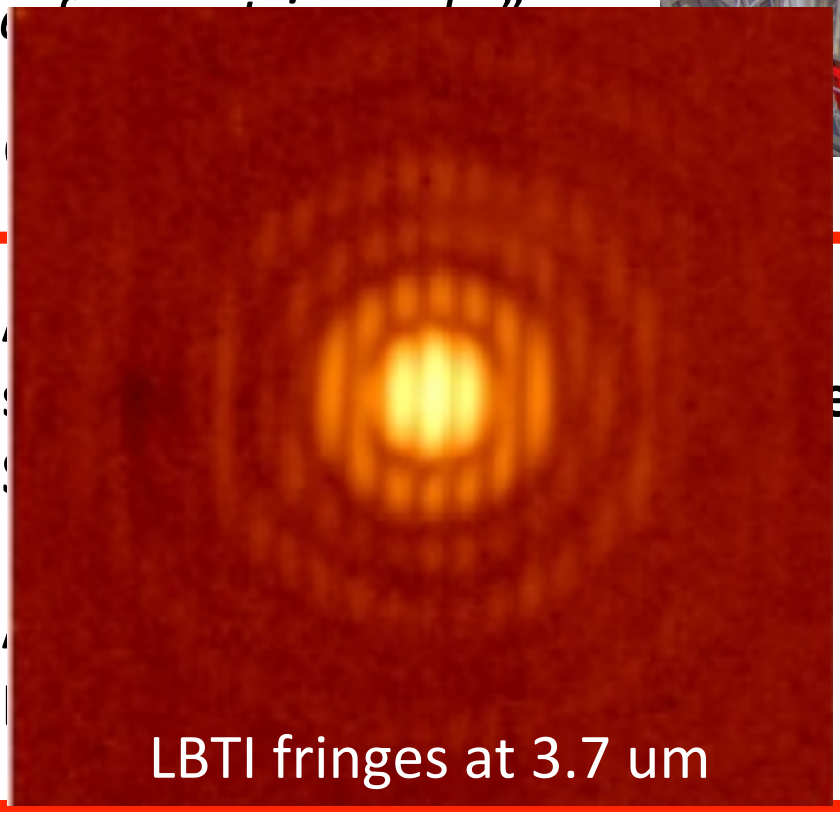
"The first astronomical adaptiv
image of the double star γ2 An
Observatoire de Haute- Prover
Signatures from team member
Rousset and a few others celebrate the event." (Picture & text from P. Lena, 2009)

LBT Adaptive Optics

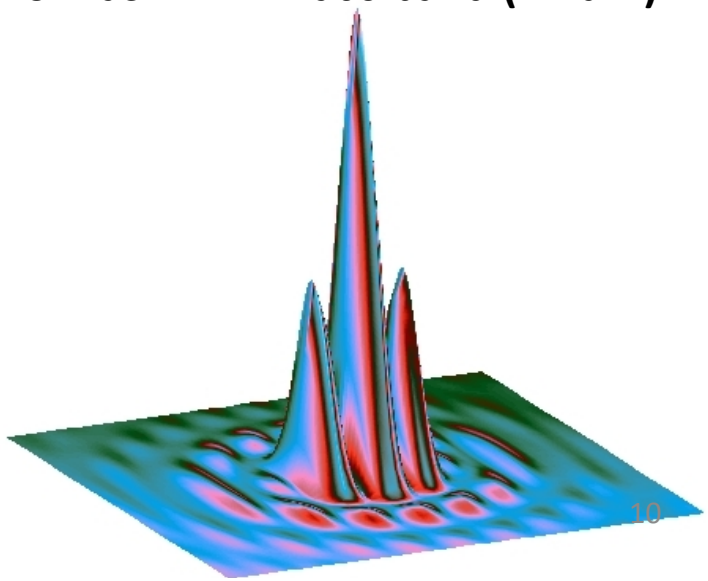
"A powerful and flexible AO system is mandatory to achieve the ELT-like performance of LBT in inte

Th

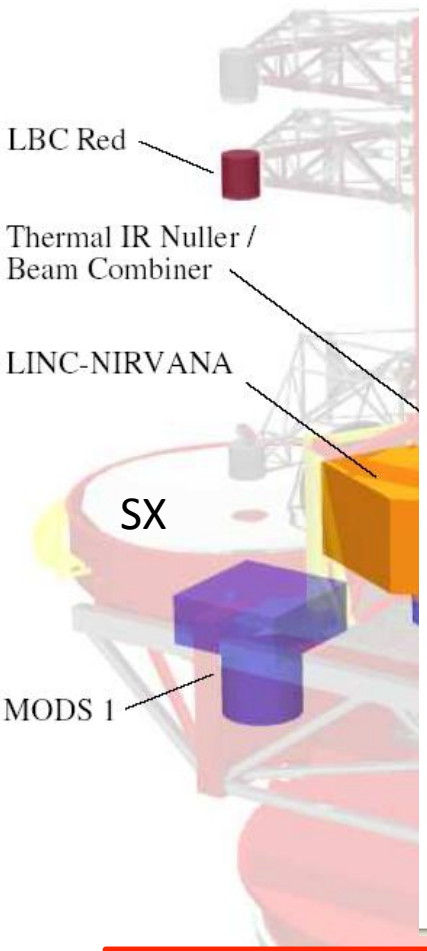




The LBT interferometryc PSF:
10 mas FWHM at J band (1.2um)

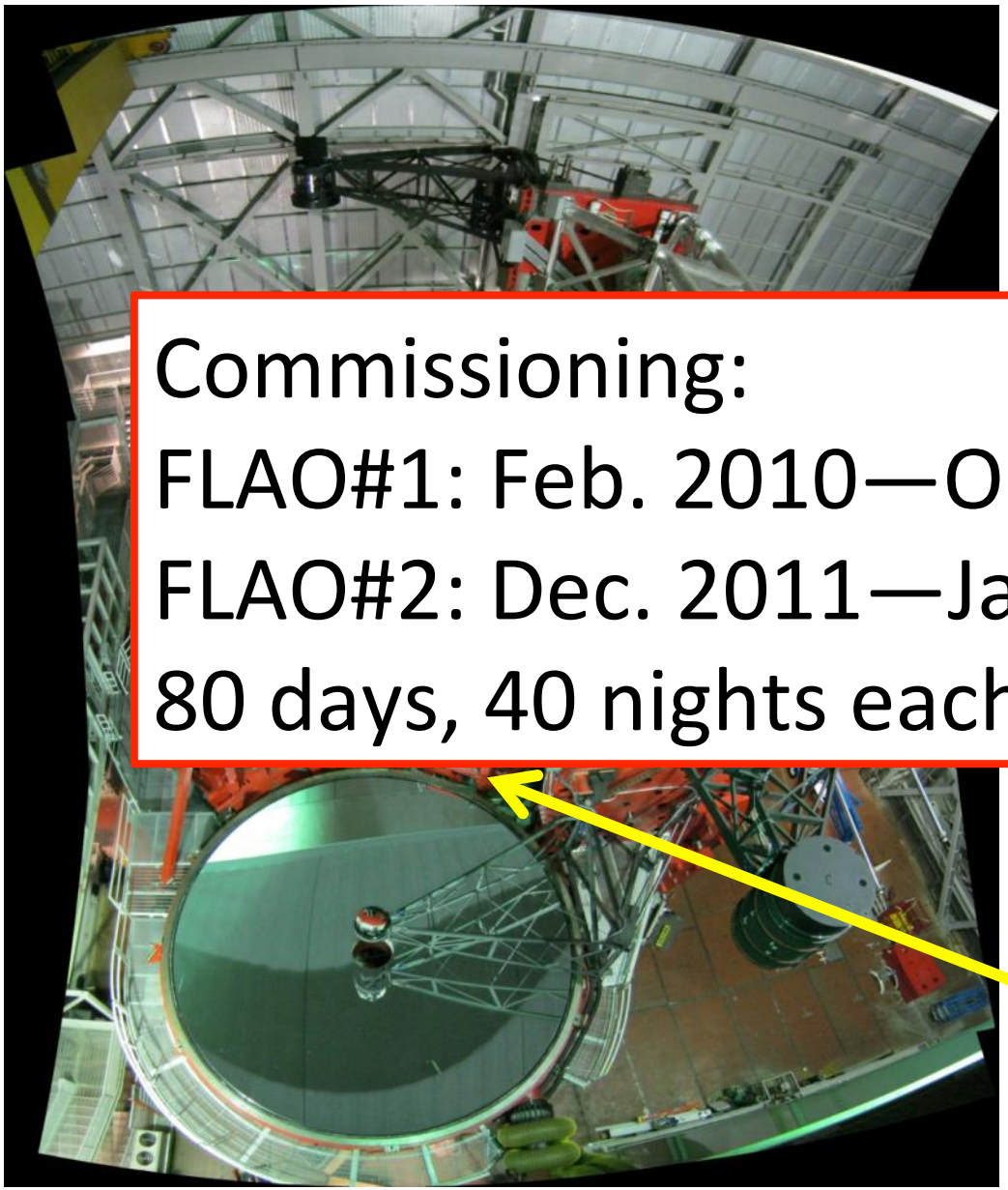


The LBT NIR imager/spectrograph LUCIFER



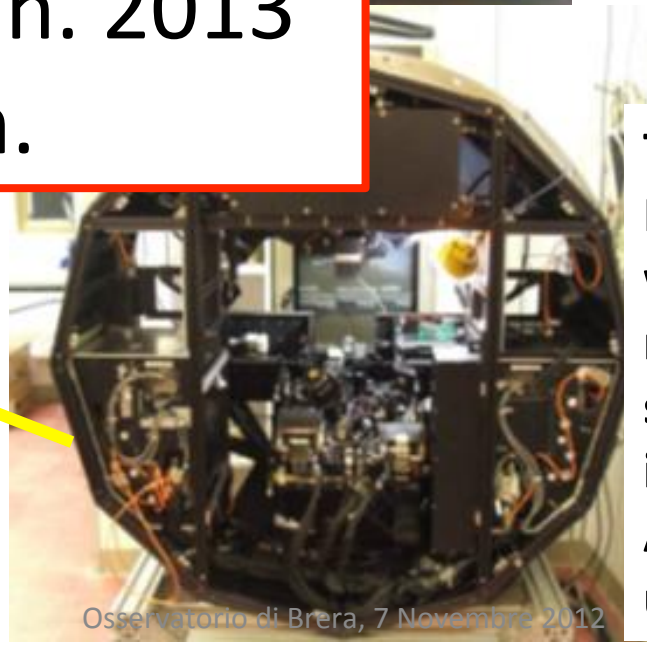
Initial Scientific Observation carried out with PISCES NIR camera LUCI2 expected by mid 2013

The LBT FLAOs systems



Commissioning:
FLAO#1: Feb. 2010—Oct. 2011
FLAO#2: Dec. 2011—Jan. 2013
80 days, 40 nights each.

The adaptive secondary mirror with the thin shell covered



The Pyramid wavefront sensor in the AGW unit

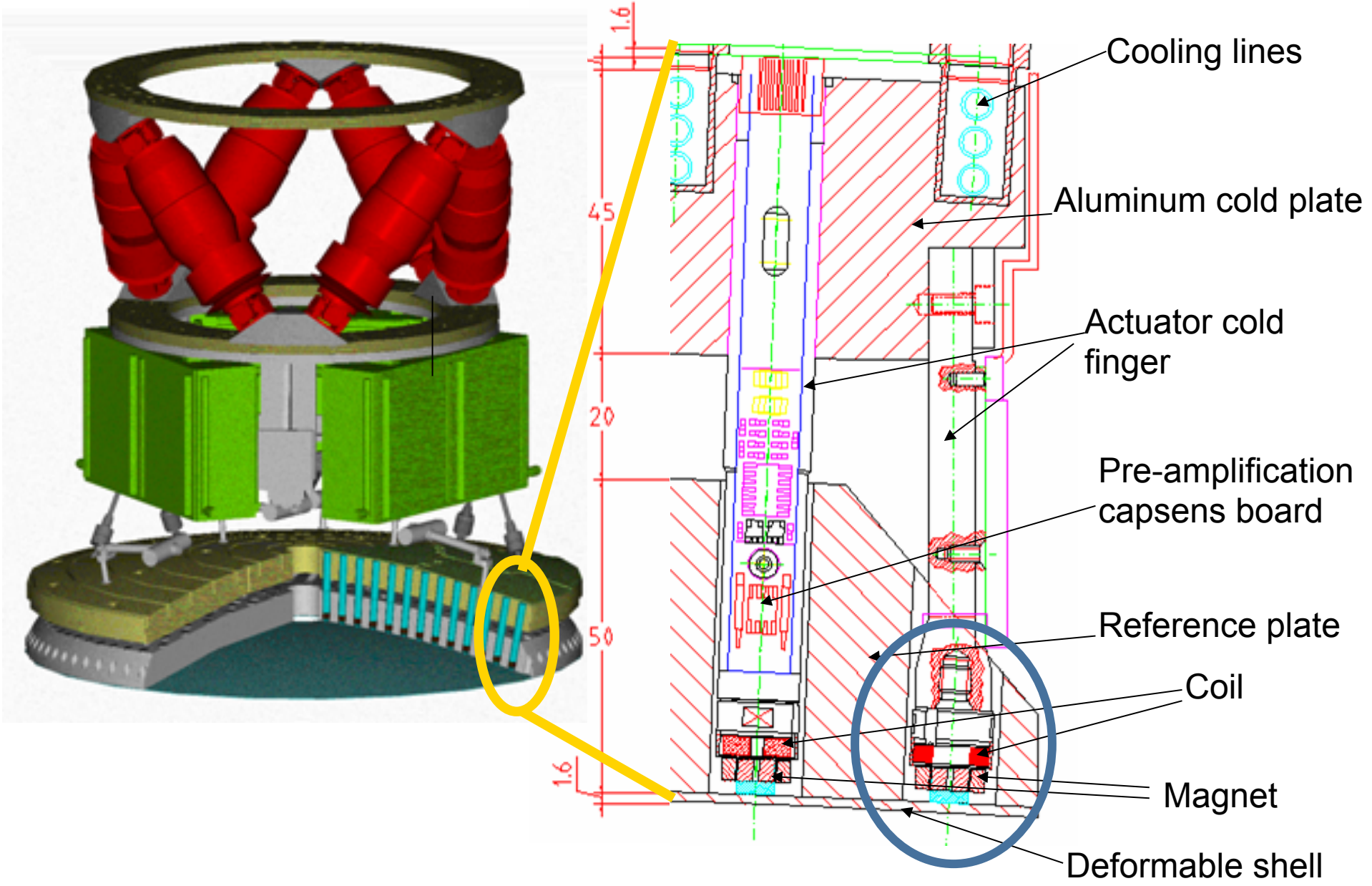
The LBT672 unit

Adsec concept, [P. Salinari, 1994]
MMT unit, [Brusa, 1999]
LBT unit, [Riccardi, 2003]

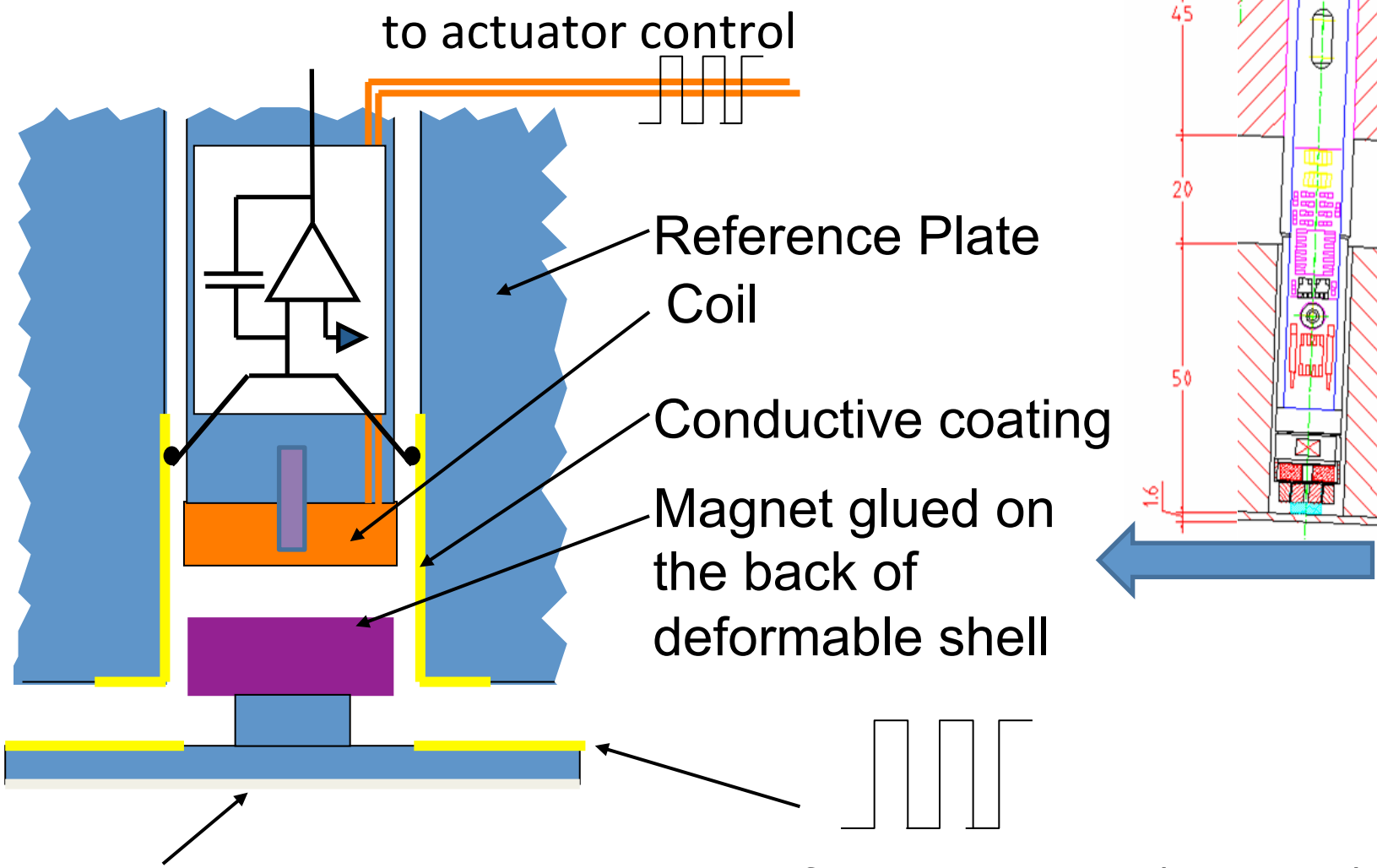
Main specs.:

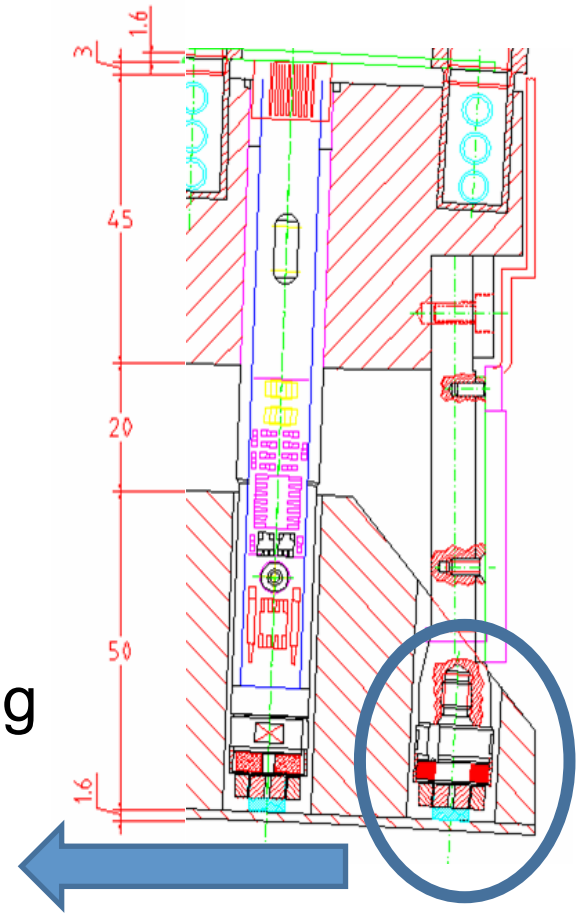
- 672 actuators
- 911mm diam.
- 1.6mm shell tickness
- 30mm act pitch
- 100μm stroke
- 360kg (wo hub)
- 1.8kW power
- 10 l/min cooling@-3C

The mirror control I



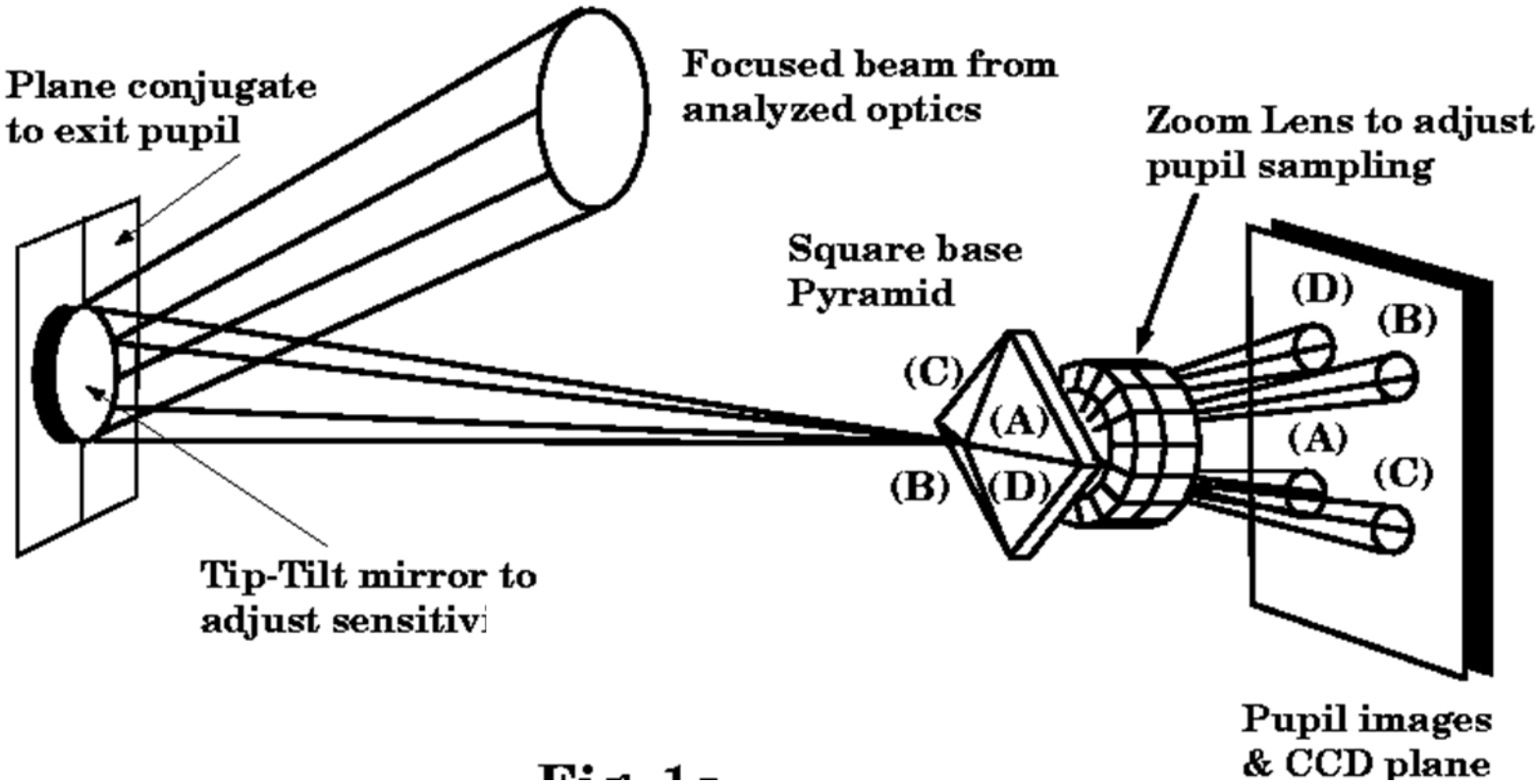
The mirror control II





The pyramid sensor concept

Introduced by R. Ragazzoni in 1996, as a generalization of the Foucault optical test.



The LBT pyramid WFS

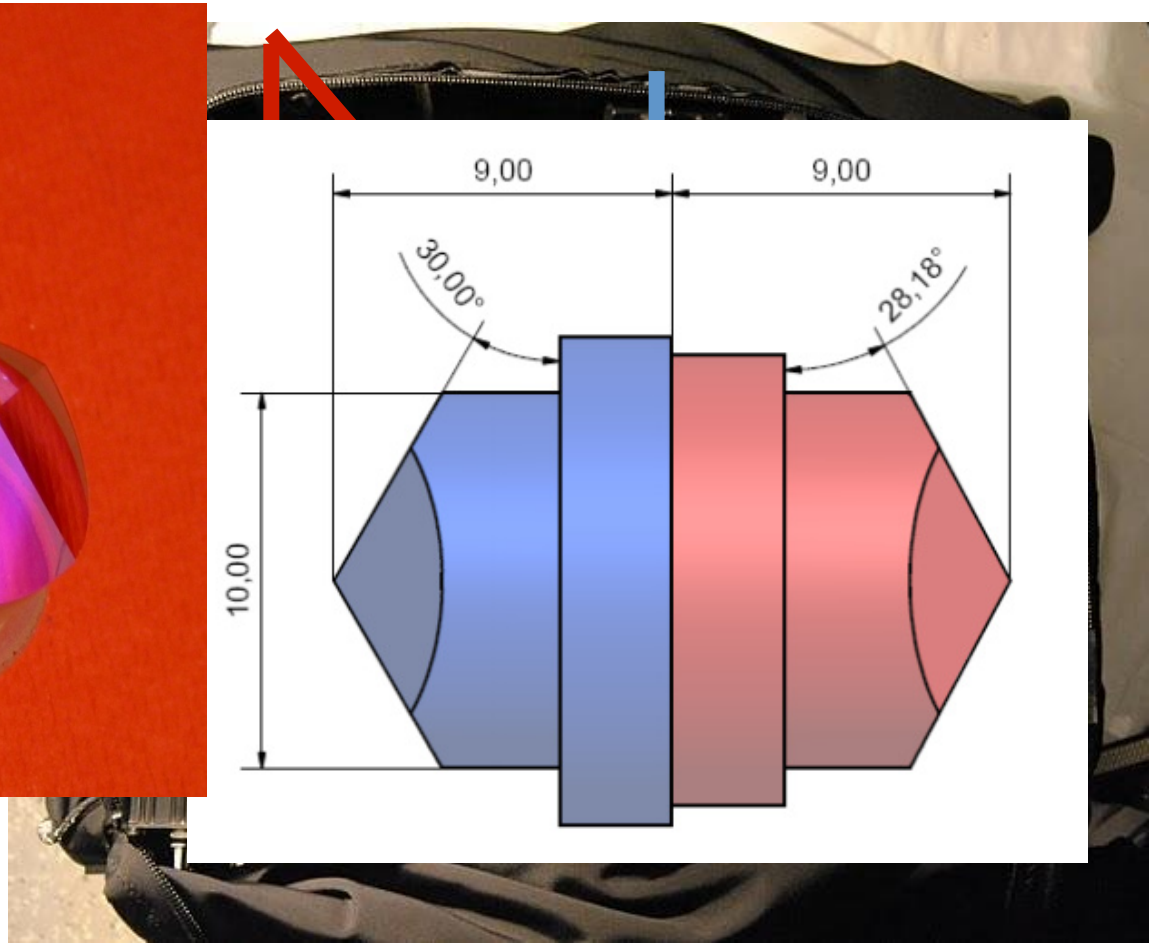
WFS concept, [R. Ragazzoni, 1996]
TNG AO, [R. Ragazzoni, 1997]
LBT AO&WFS, [S. Esposito, 2003]

WFS main specs.:

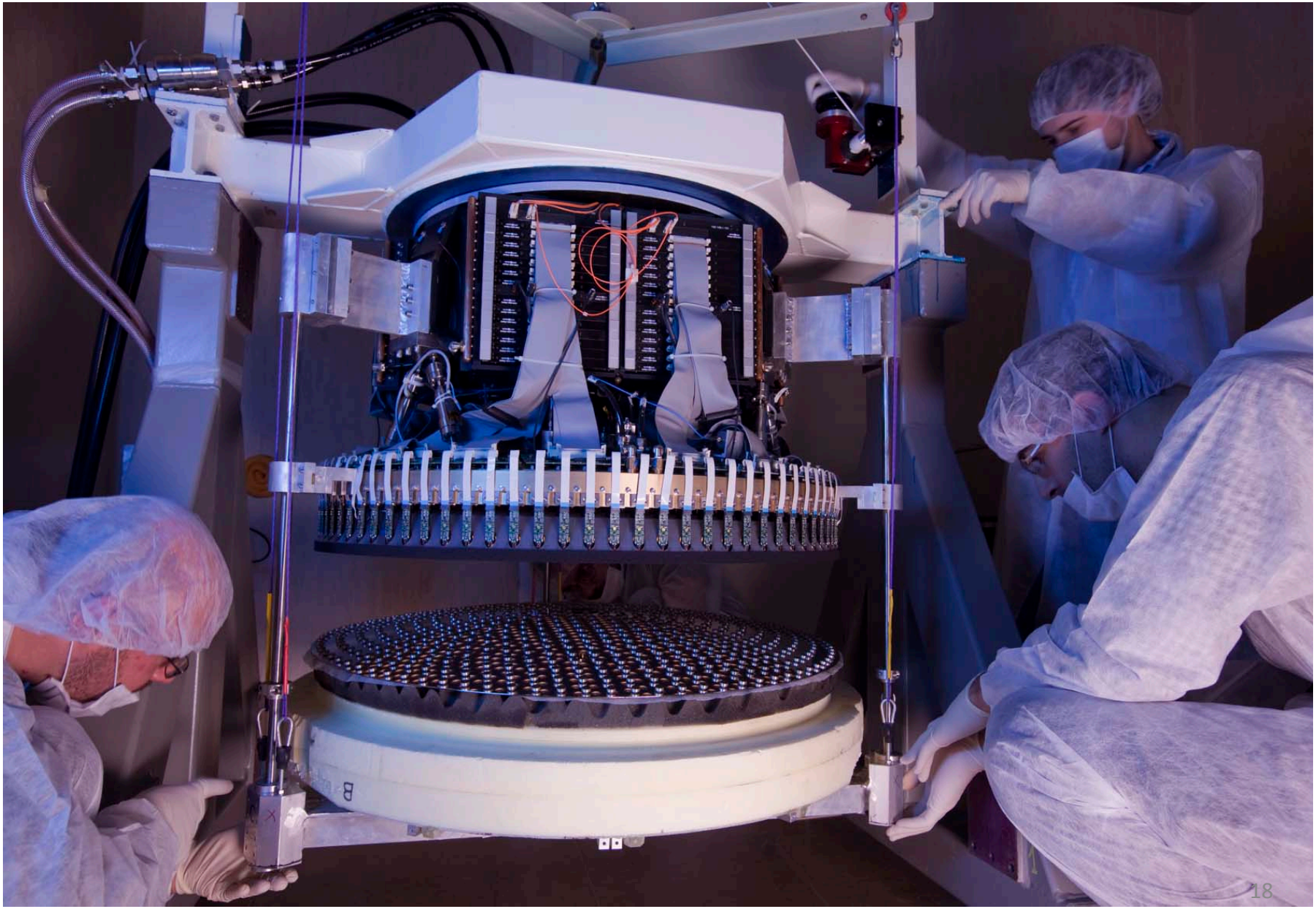
- 30x30 to 5x5 subap.
- Tilt mod. ± 2-6 λ/D
- 1Kfps max [30x30subap.]

Input beam
from LBT

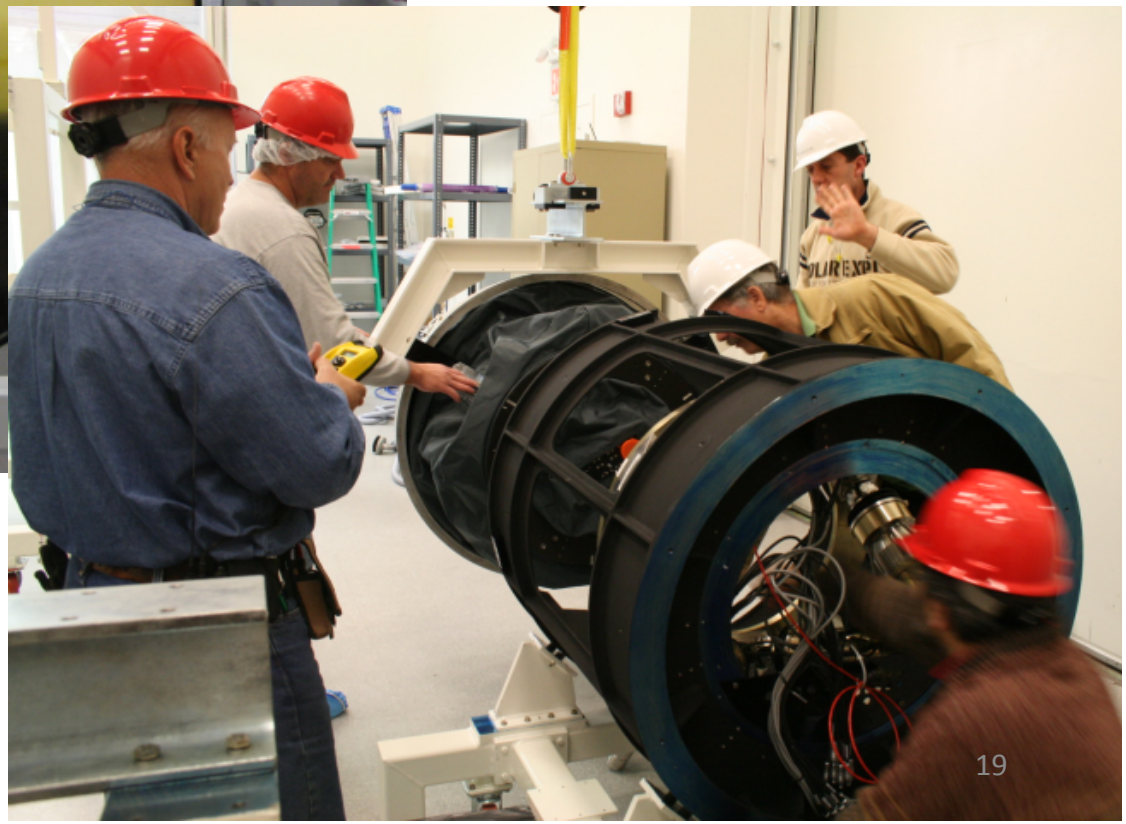
(below
600nm)



FLAO system installation at LBT...(Feb-Mar 2010).



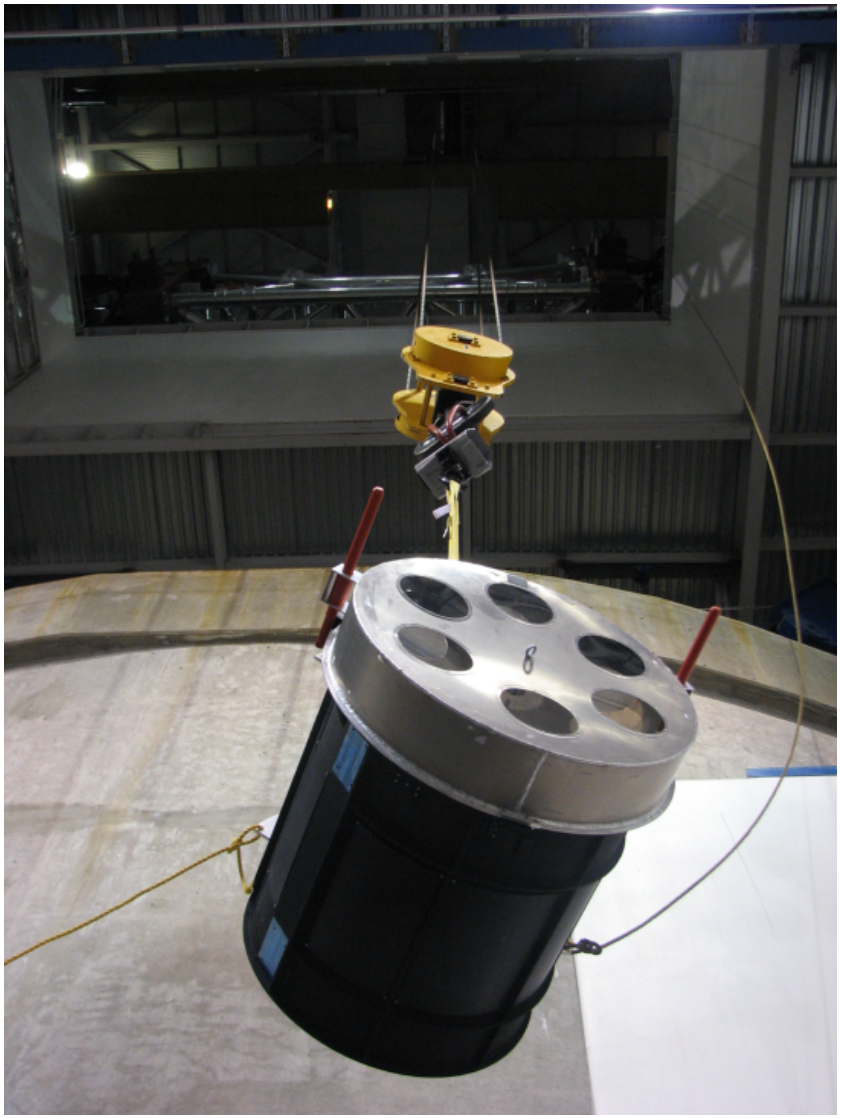
FLAO system installation at LBT



February 9th --March 17th 2010

FLAO system installation @ LBT

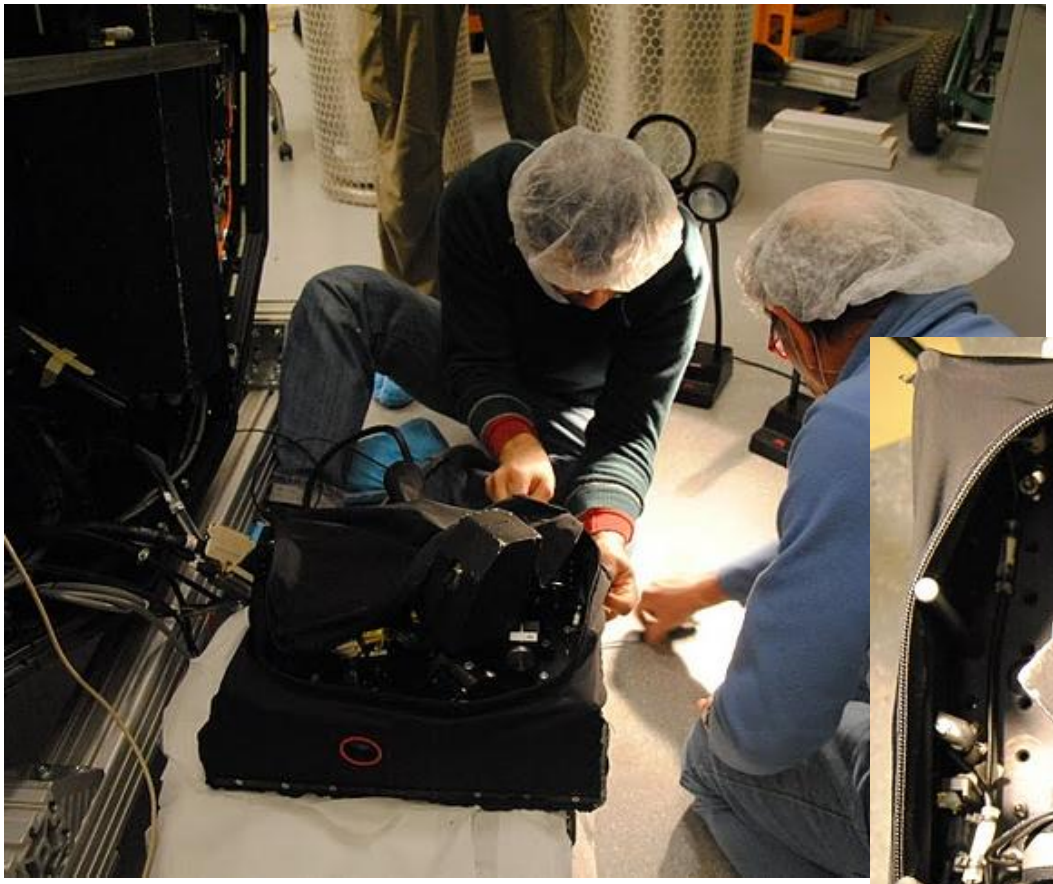
February 9th --March 17th 2010

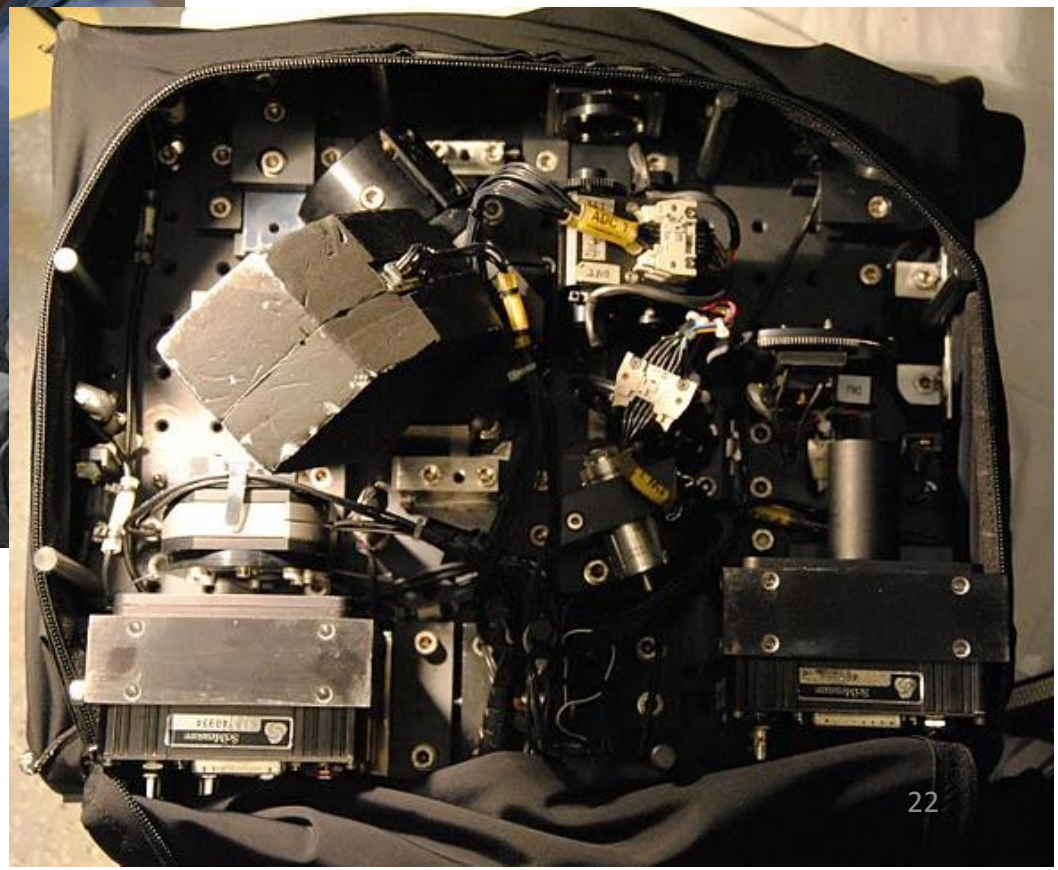


FLAO system installation at LBT

February 9th --March 17th .2010

FLAO system installation at LBT





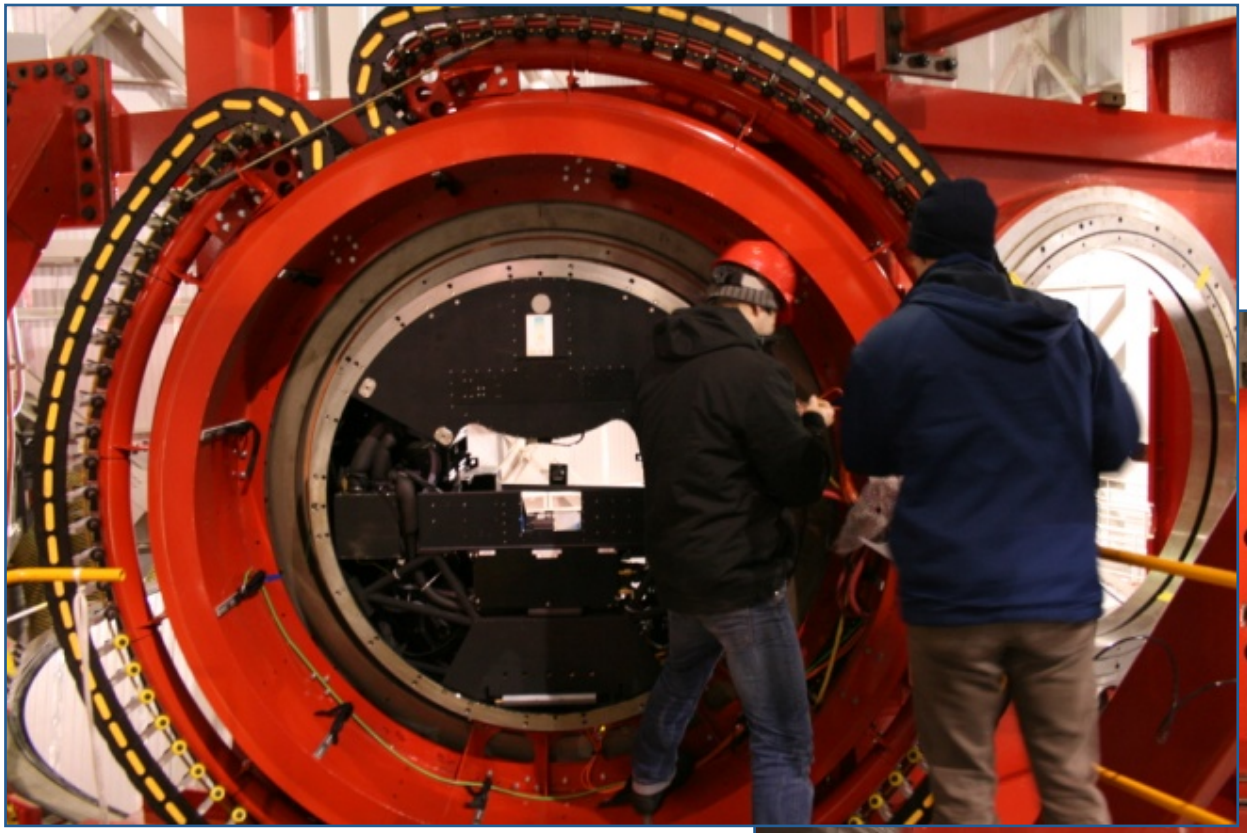
February 9th --March 17th 2010

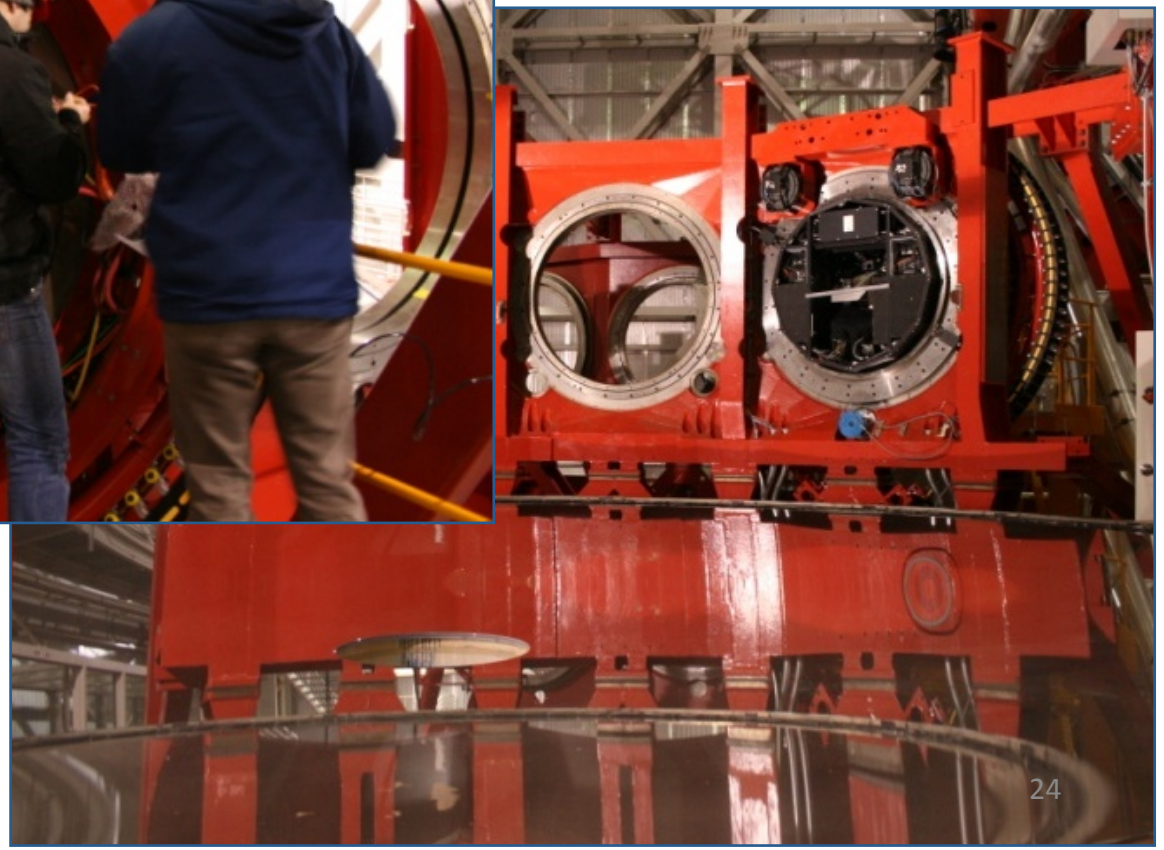
FLAO system installation at LBT

February 9th --March 17th 2010

FLAO system installation @ LBT

February 9th --March 17th 2010





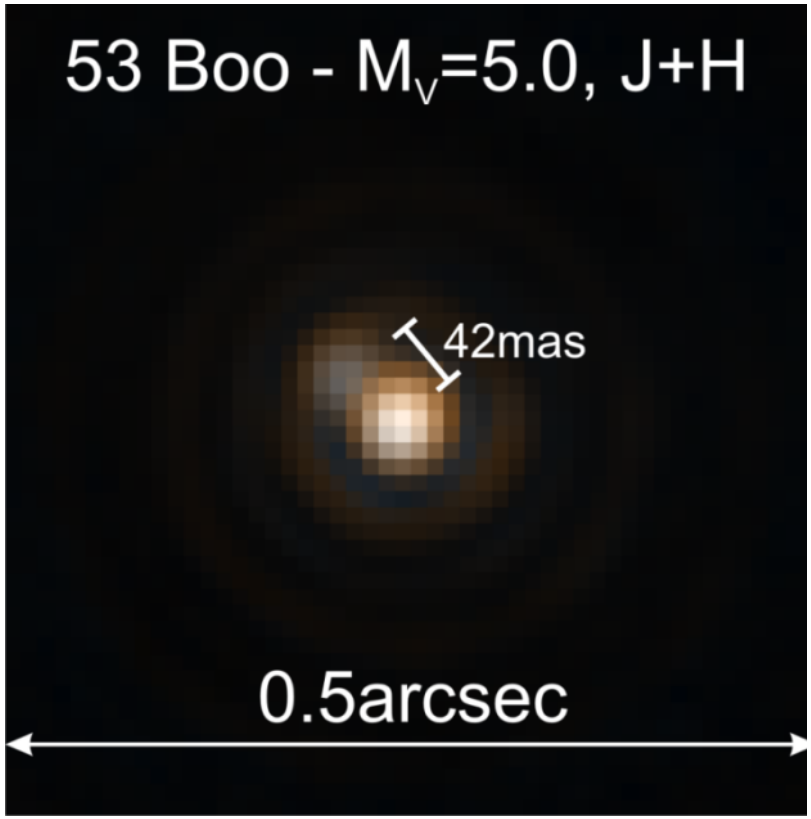
February 9th --March 17th 2010

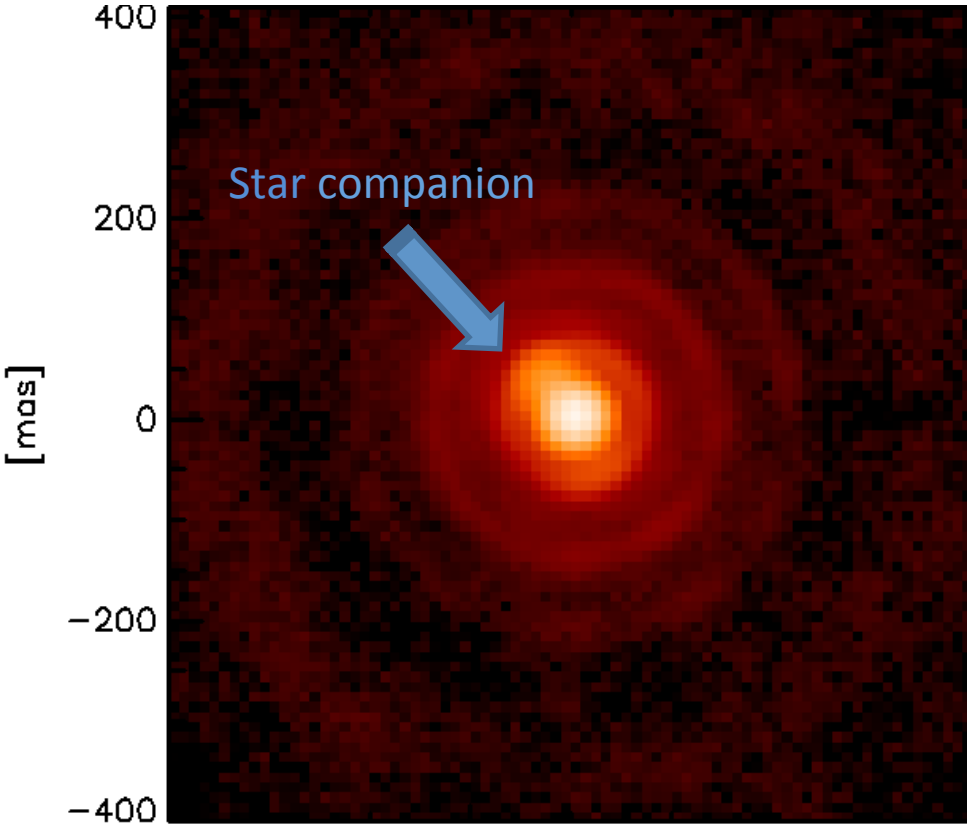
FLAO system installation @ LBT

February 9th --March 17th .2010

February 9th --March 17th 2010

May2010: first on sky results, a 40mas separation binary

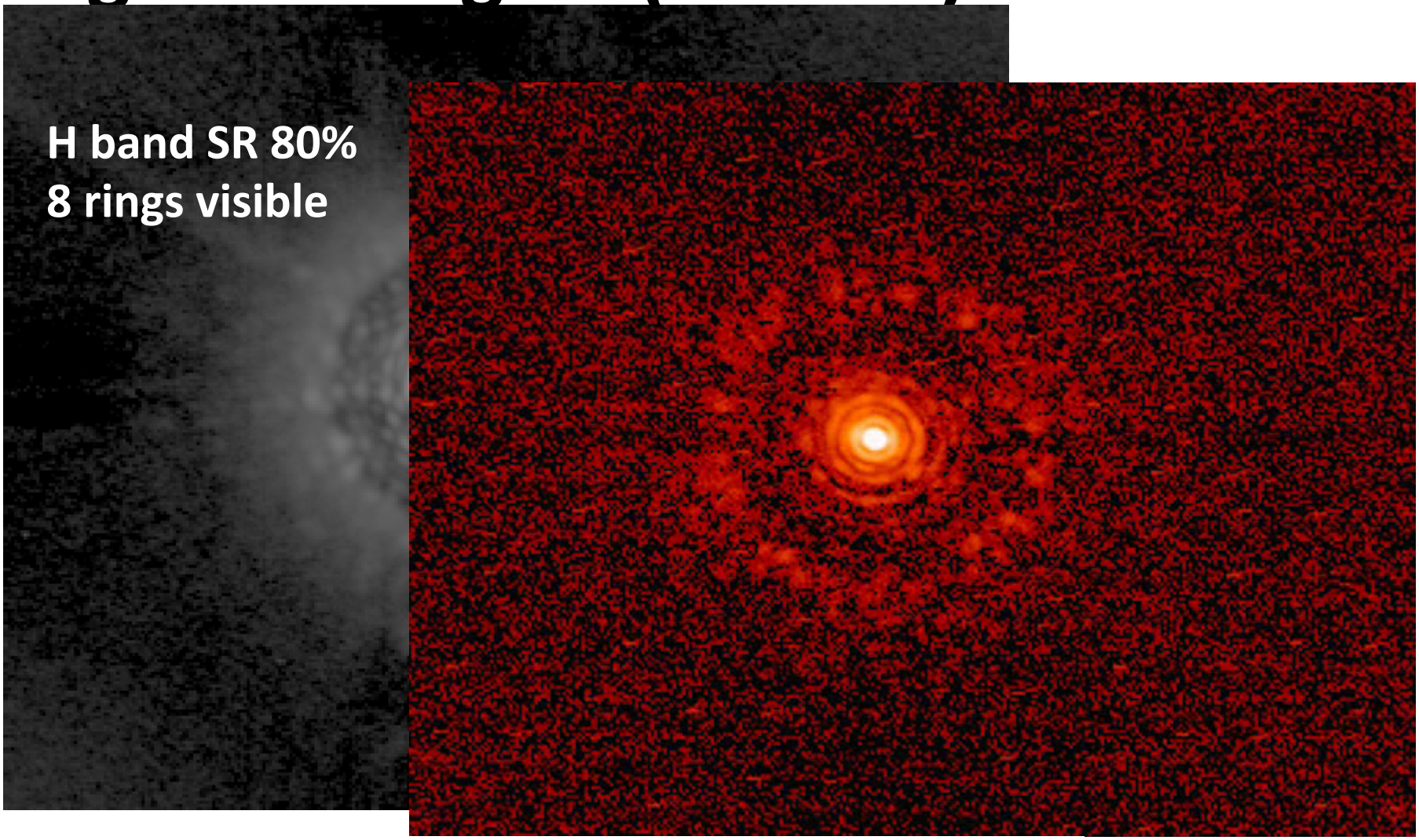




FLAO parameters
30x30 subaps
400 corrected modes
1Khz frame rate

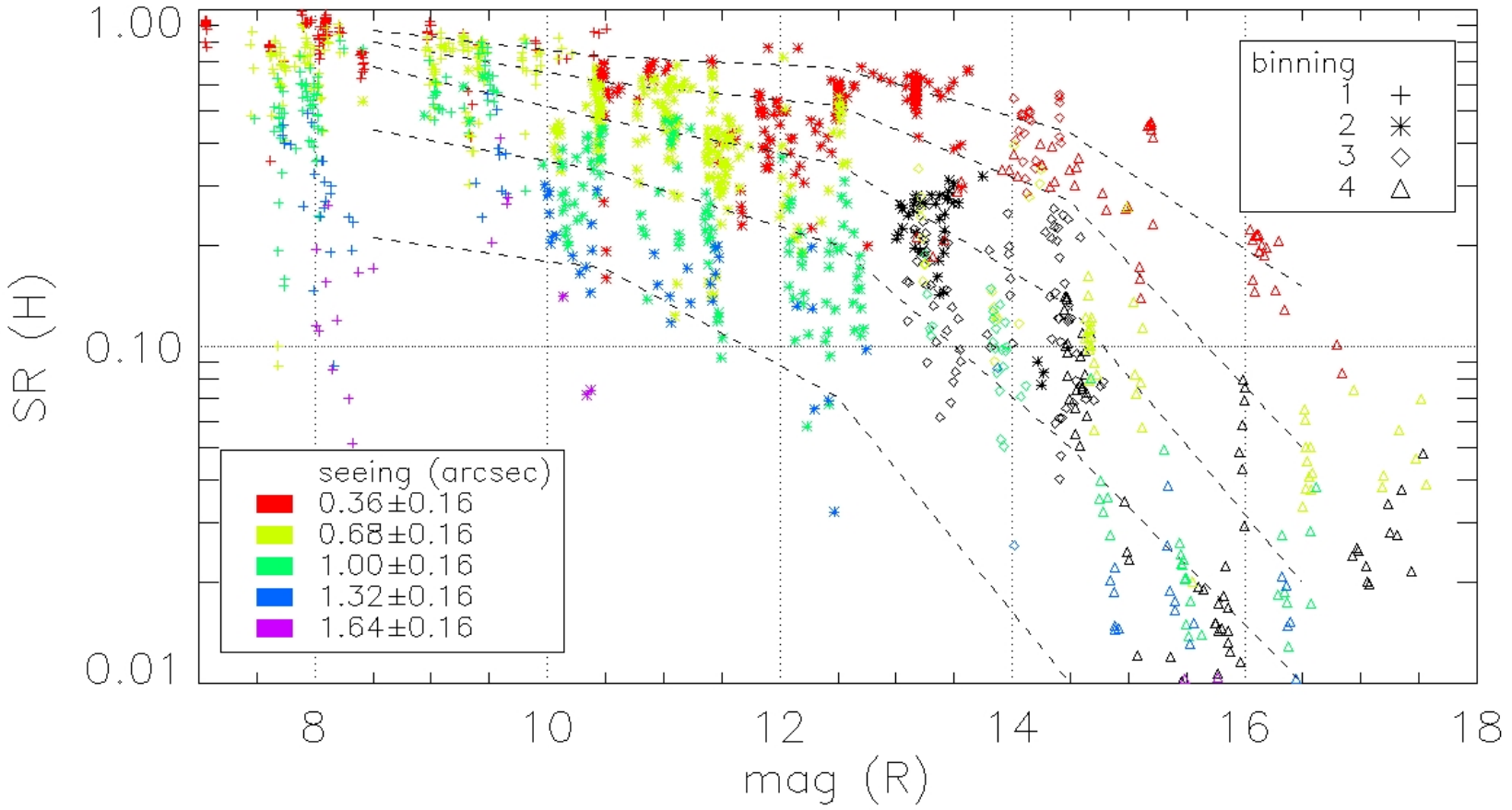
Image data
H band
4s exposure time
SR > 60% (no correction for 2nd star flux)

High SR images..(H band)



The reference: HD175658, R =6.5, H=2.5
The atmosphere: seeing 0.9 arcsec V band
FLAO parameters: 1KHz, 30x30 subaps, 400 corrected modes

Resuming SR plot for FLAO



1) SR > 80% for rmag <10.0 and 0.7 arcsec
2) Limiting mag 17.0, H band SR 2-10% depending on seeing

FLAO Press releases and similar..

Applied Optics

ISSN: 0003-6935

ADAPTIVE OPTICS

Plenary Sessions

Astronomical Optics and Instrumentation Plenary Session

Convention Center, Room 6A

Sunday 21 August . . . . . 3:30 to 5:00 pm

Session Chairs: **Howard A. MacEwen,** ManTech SRS Technologies (United States); **James B. Breckinridge,** California Institute of Technology (United States)

3:30 pm to 3:35 pm: **Welcome and Opening Remarks,** Dr. James B. Breckinridge, California Institute of Technology (United States)

3:35 to 4:15 pm:

The Little Photometer That Could: Technical Challenges and Science Results from the Kepler Mission

Dr. Jon M. Jenkins, NASA Ames Research Ctr. (United States)

Abstract: The Kepler Mission launched on March 6, 2009, initiating NASA's first search for Earth-size planets orbiting Sun-like stars. This photometer, with a precision near 20 ppm in 6.5 hours, is sensitive to its thermal environment, complicating the task of detecting 84 ppm transit signatures. The first confirmed rocky planet, Kepler-10b, with a radius of 1.4 that of Earth, was announced in January 2011. To date, Kepler has announced 15 exoplanets, including a system of six transiting a Sun-like star, and has identified over 1200 candidate planets in the first 120 days of observations, including 54 that are in or near the habitable zones of their stars.

Biography: **Dr. Jon Jenkins,** SETI Institute Senior Research Scientist, is Co-Investigator for Data Analysis for NASA's Kepler Mission. He developed the algorithms for the science pipeline and leads the team that evolve the algorithms based on instrument performance. Dr. Jenkins received his Ph.D. in Electrical Engineering from the Georgia Institute of Technology.

4:15 to 5:00 pm:

Large Binocular Telescope Adaptive Optics System: New Achievements and Perspectives in Adaptive Optics

Dr. Simone Esposito, INAF - Osservatorio Astrofisico di Arcetri (Italy)

Abstract: The LBT is a unique telescope featuring two co-mounted optical trains with 8.4m primary mirrors. The telescope Adaptive Optics (AO) system uses two innovative key-components namely an adaptive secondary mirror with 672 actuators and a high order pyramid wavefront sensor. During on sky commissioning such a system reached performance never achieved before on a ground based large optical telescope. Images with 40mas resolution and Strehl-Ratio (SR)>90% has been acquired in H band (1.6 um). Such images showed a contrast as high as 10^{-4}. We present the telescope on sky results and discuss the application of similar AO systems to the Extremely Large Telescopes projects of the next future.

Biography: **Dr. S. Esposito** is the leader of the Adaptive Optics Group of the Arcetri Observatory. The group developed adaptive secondary mirrors and high order correction pyramid sensors for several international projects and telescopes like LBT, VLT, Magellan and E-ELT. He is currently the PI of the LBT First Light AO system (FLAO).

Symposium-wide Plenary Session

Convention Center, Room 6A

Sunday 21 August . . . . . 6:00 to 7:25 pm

6:00 to 6:05 pm: **Introduction and Opening Remarks**

6:05 to 6:45 pm:

Nanophotonics: Where We've Been and Where We're Going

Naomi J. Halas, Rice Univ. (United States)

Biography: **Naomi Halas** is the Stanley C. Moore Professor of Electrical and Computer Engineering at Rice University, where she also holds faculty appointments in the Departments of Physics and Astronomy, Chemistry, and Bioengineering. She is author of more than 200 refereed publications, has more than ten issued patents, and has presented more than 300 invited talks. She is known in the field of Plasmonics as the inventor of tunable plasmonic nanoparticles whose optical resonances are controlled by their geometry, spanning the visible and infrared regions of the spectrum. Halas pursues fundamental studies of coupled plasmonic systems, investigating how they give rise to new nanoscale optical properties and effects. She pursues applications of plasmonics in biomedicine, chemical sensing, and energy. She is a Member of the American Academy of Arts and Sciences and a Fellow of five professional societies: the American Physical Society, the Optical Society of America, SPIE, the Institute for Electrical and Electronics Engineers, and the American Association for the Advancement of Science. She is a Visiting Professor at the Institute of Physics, Chinese Academy of Sciences and an Associate Editor of Nano Letters.

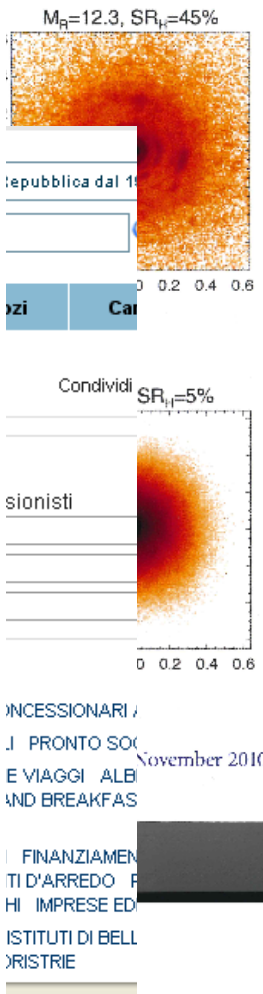
6:45 to 7:25 pm:

Organic Transistor Based Sensors for Flexible Artificial Electronic Skin

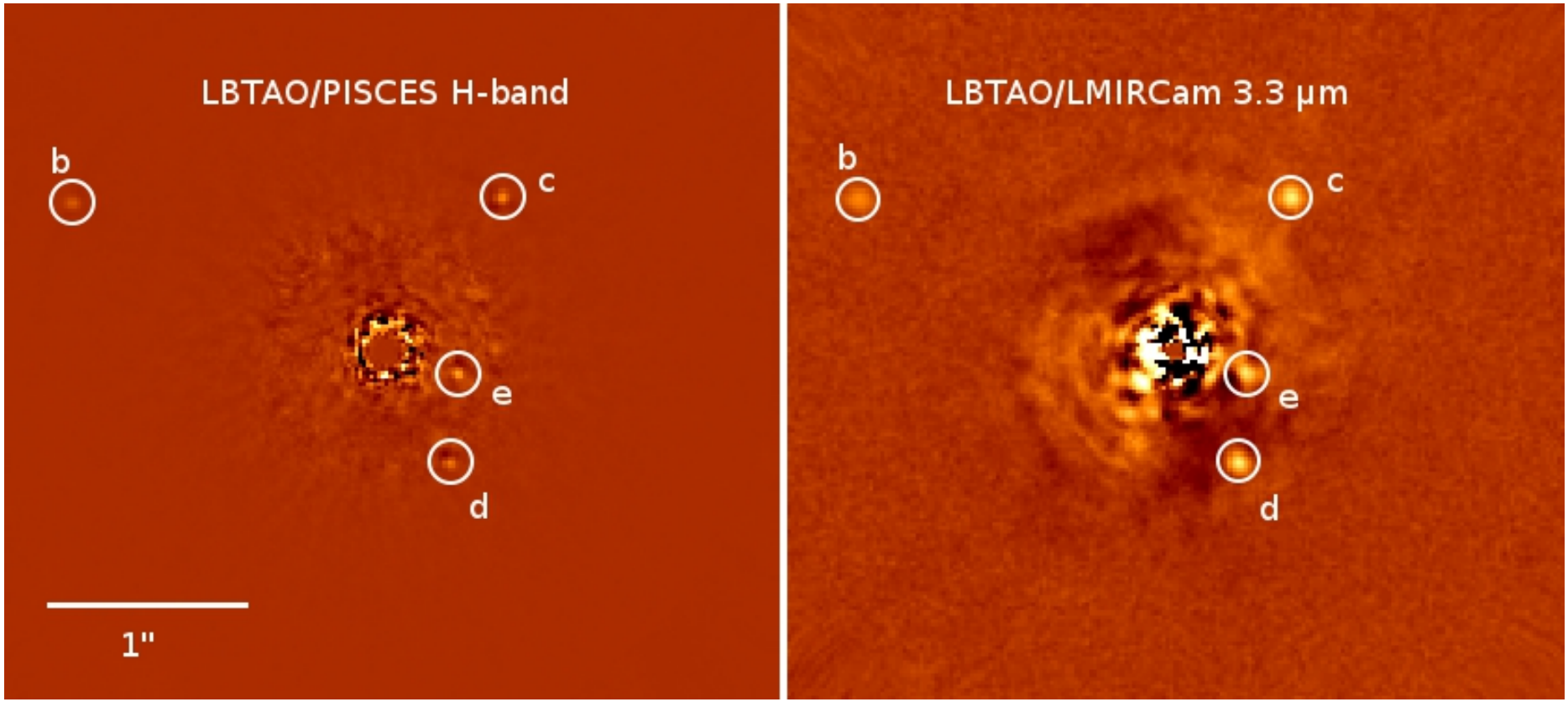
Zhenan Bao, Stanford Univ. (United States)

Abstract: The field of organic electronics holds tremendous potential for applications that benefit from the use of organic materials, (e.g. very low cost, flexible and amendable to large-area processing techniques or roll-to-roll printing). Specifically, these benefits can lead to manufacturing of electronic units for electronic skin, as well as medicinal, food storage, and environmental monitoring applications. We invision an artificial electronic skin platform that includes various sensor, such as touch, chemical and biological sensors. The sensory elements of our electronic skin (composed of Organic Field Effect Transistor, OFET) are akin to the various layers and constituents of human skin, in which each layer of the OFET can be optimized to carry out a specific recognition function. Furthermore, progress in stretchable solar cells may be utilized to enable self-powered electronic skin. This talk will cover present progresses in the fabrication of chemical, biological, pressure sensors and stretchable organic solar cells that are major constituents for a multi-modal sensing electronic skin.

Biography: **Professor Bao** received her Ph.D. from University of Chicago. After spending 8 years in Bell Labs, she joined Stanford as an Associate Professor in 2004. She has over 200 refereed publications and 35 US patents. Selected recent awards include: SPIE Fellow in 2008, ACS Author Cope Scholar Award for 2011, ACS PMSE Fellow in 2011, RSC Beilby Medal and Prize in 2009 and IUPAC Creativity in Applied Polymer Science Prize in 2008 (See: http://cheme.stanford.edu/faculty/layout.php?sunetid=zbao).



LBT AO with PISCES & LBTI



- Esposito S. et al. 2012 – A&A – Title: "LBT observations of the HR 8799 planetary system: First detection of HR8799e in H band "
- Skemer A.J. et al. 2012 – Ap.J.– Title: "First Light LBT AO Images of HR 8799 bcde at 1.65 and 3.3µm: New Discrepancies between Young Planets and Old Brown Dwarfs

A close up view of jet in IRAS 20126+4104

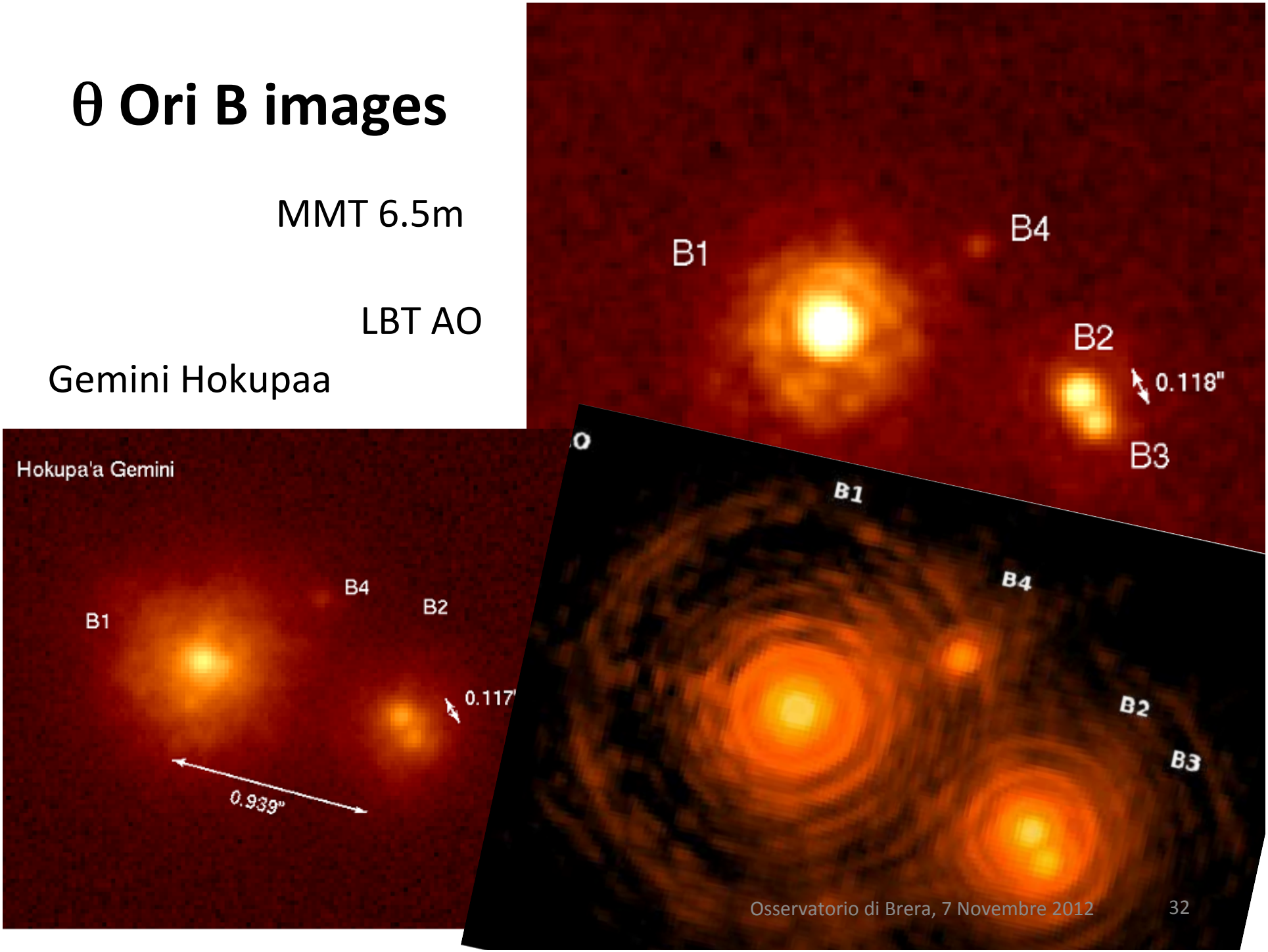
"The scope of our new observations is to significantly improve (by a factor ~3) on the angular resolution of previous IR im- ages and thus shed light on the nature of the structures observed within a few 1000 AU from the IRAS 20126+4104 protostar."

θ Ori B images

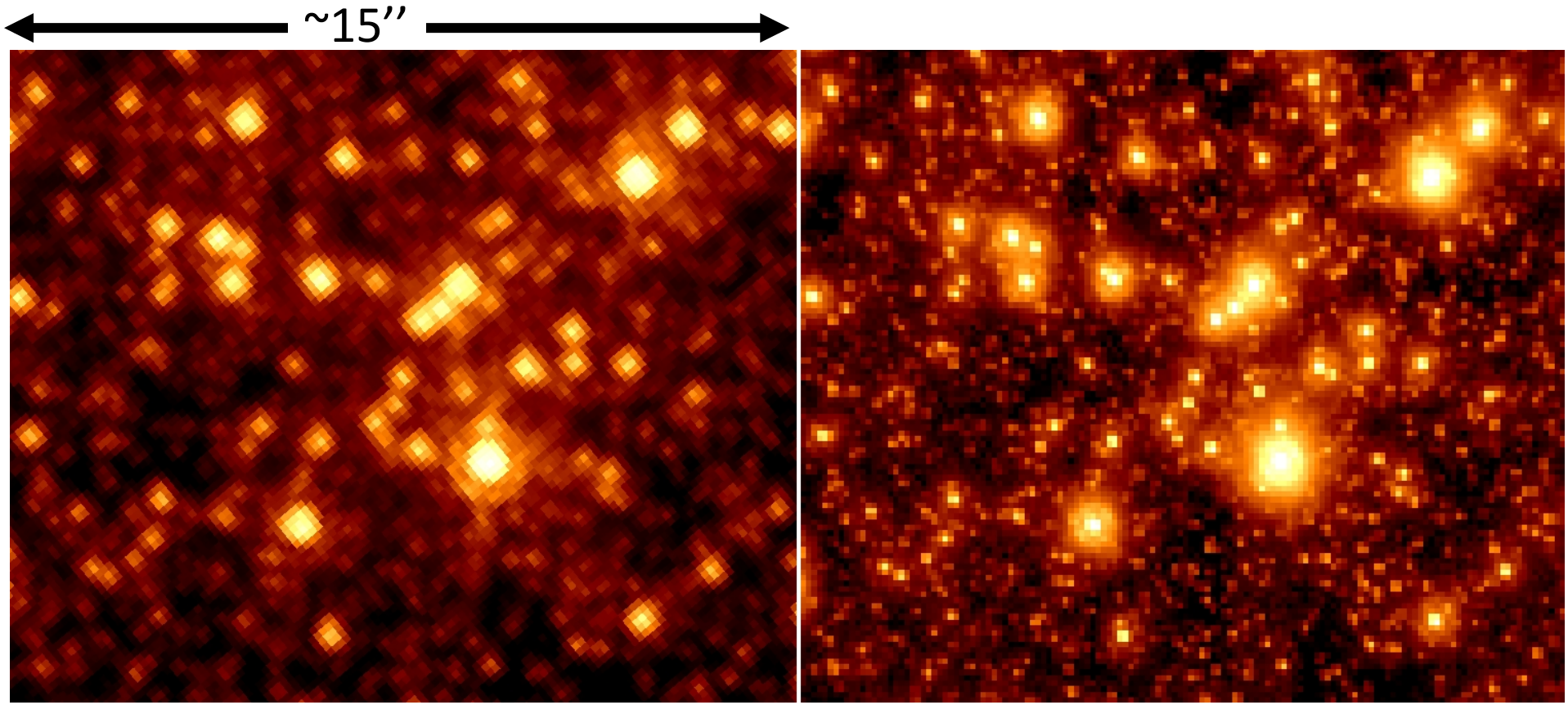
MMT 6.5m

LBT AO

Gemini Hokupaa



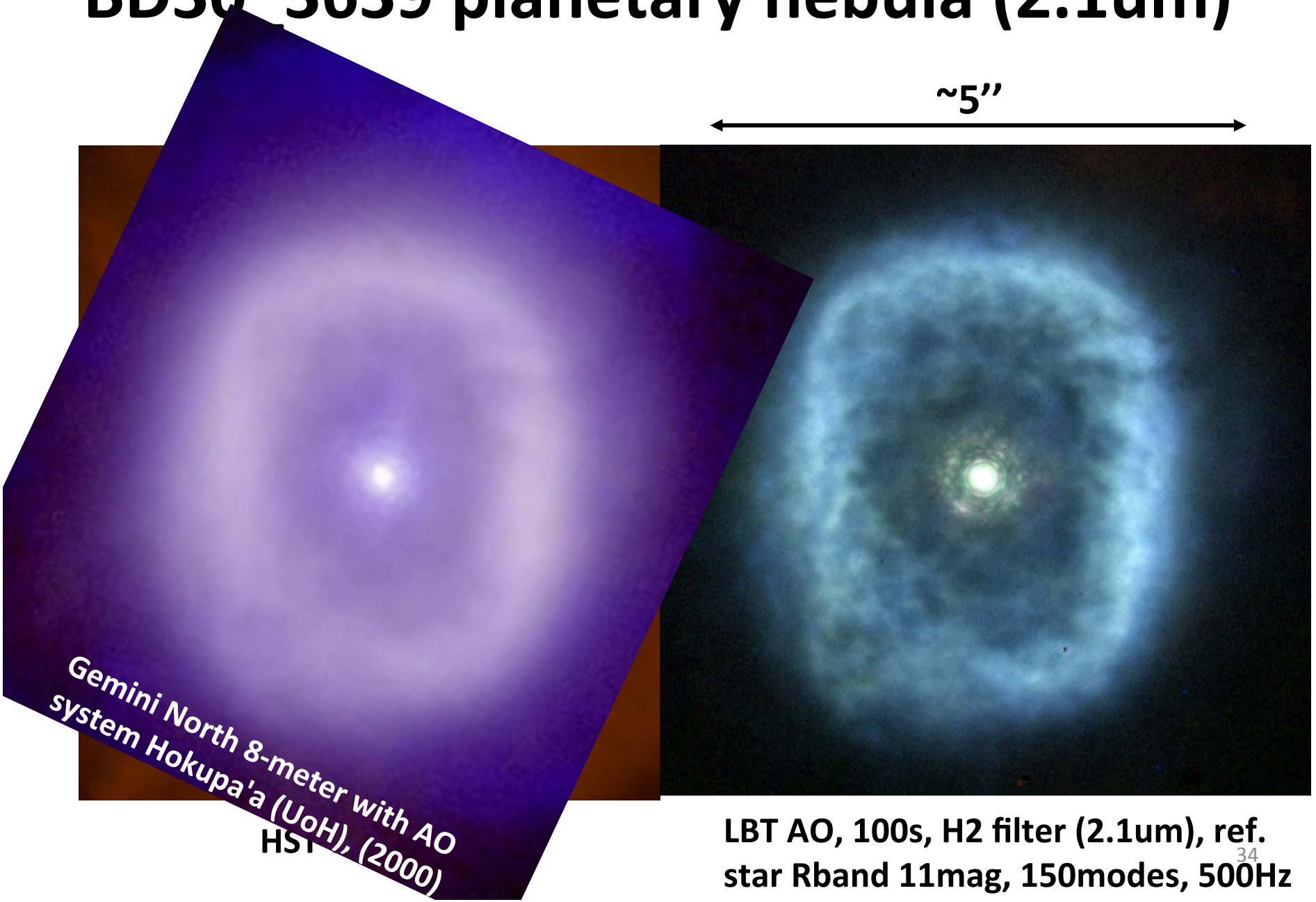
Photometry of crowded fields: M92



HST WFPC3, H band, 21 min **LBT+FLAO, H band, 8 min**

Main data: Rmag 11.5, 0.7'' seeing,
AO settings: 0.5KHz, 15x15 subaps, 153 corrected modes

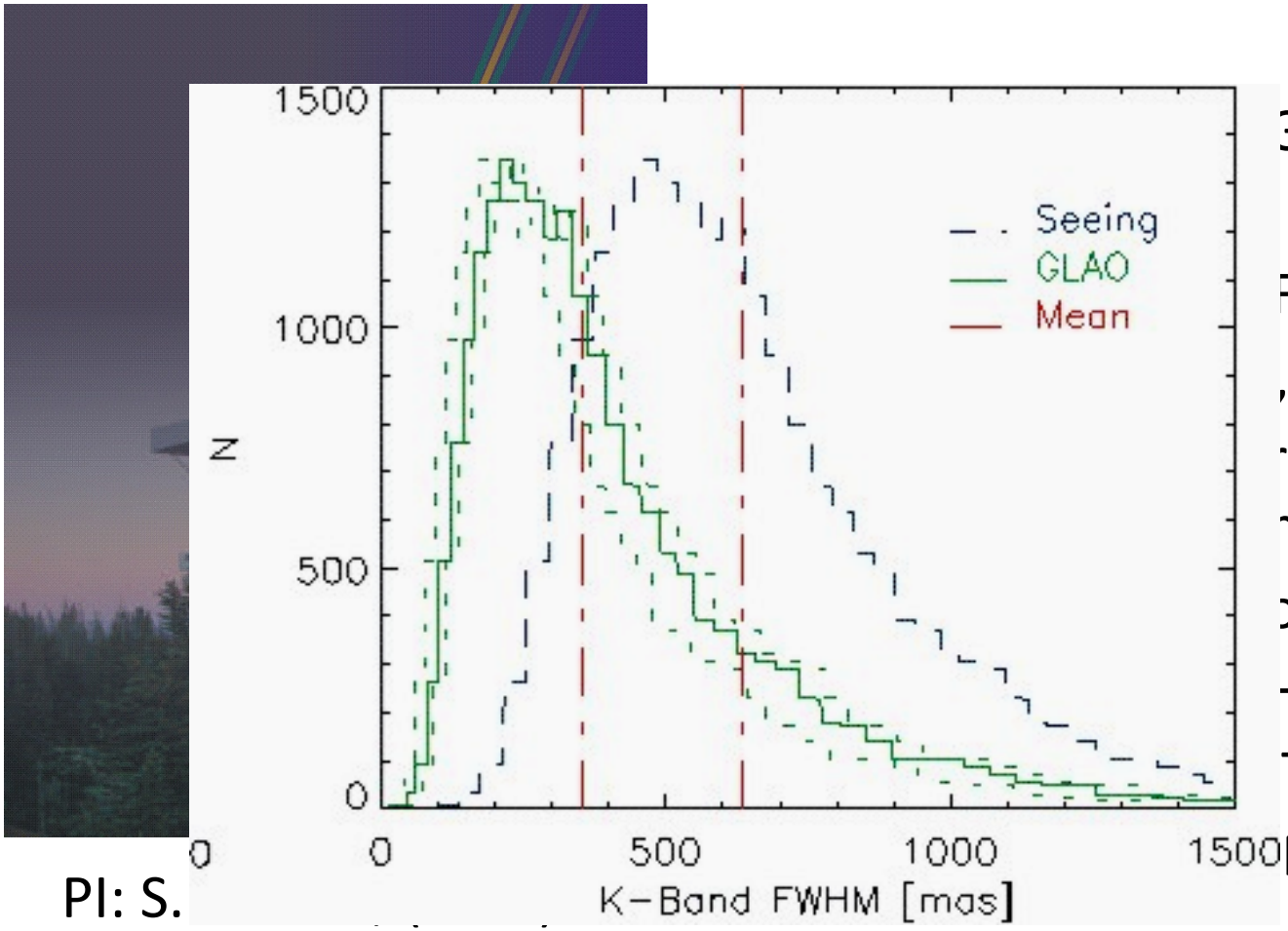
BD30_3639 planetary nebula (2.1um)



LBT AO, 100s, H2 filter (2.1um), ref. star Rband 11mag, 150modes, 500Hz

Altri progetti astronomici

ARGOS: LBT GLAO system

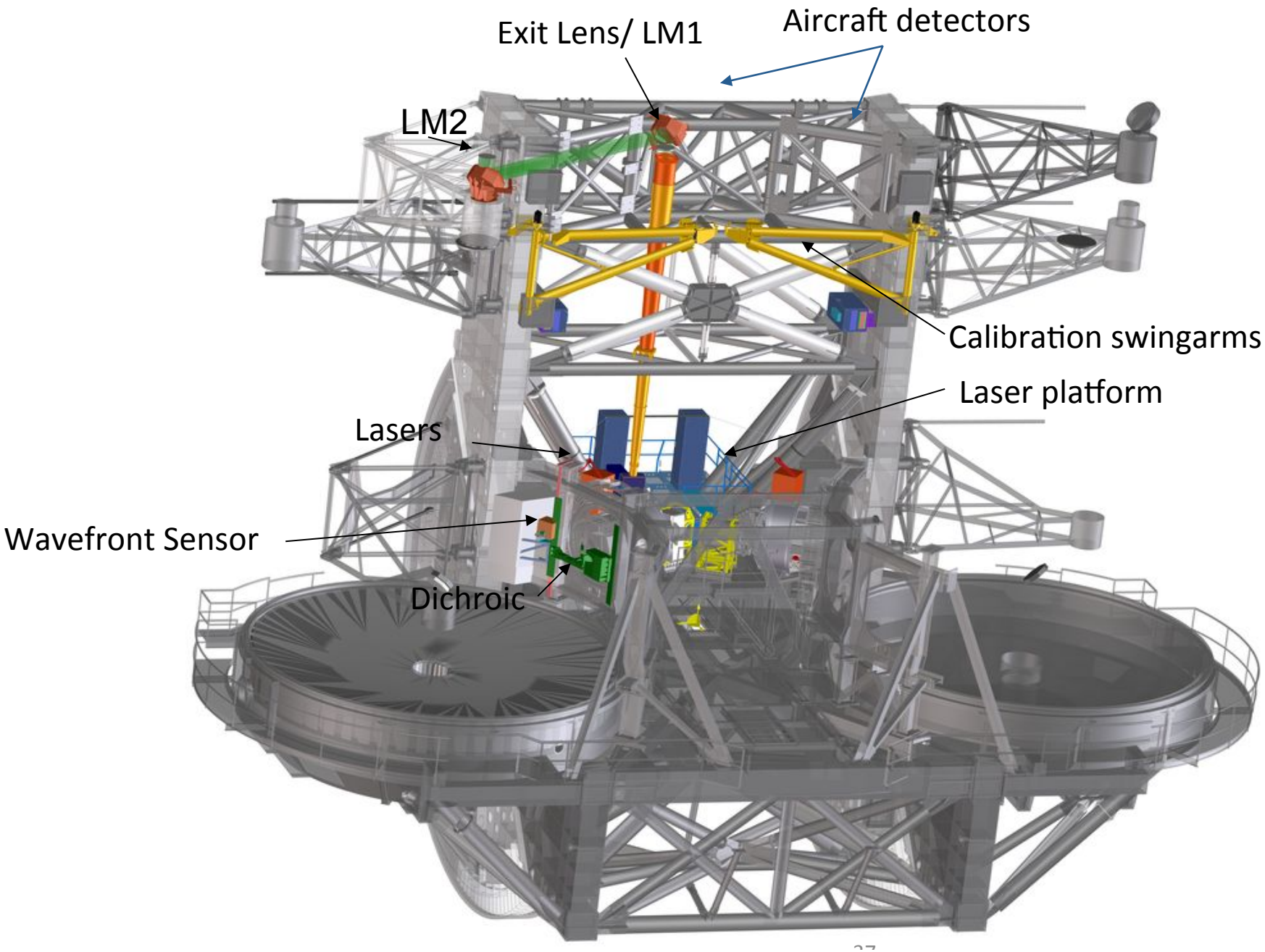


Garching
Heidelberg
Firenze
, Bonn
rsity of Arizona,
n
otsdam
Heidelberg
Tucson
NSensor

PI: S.

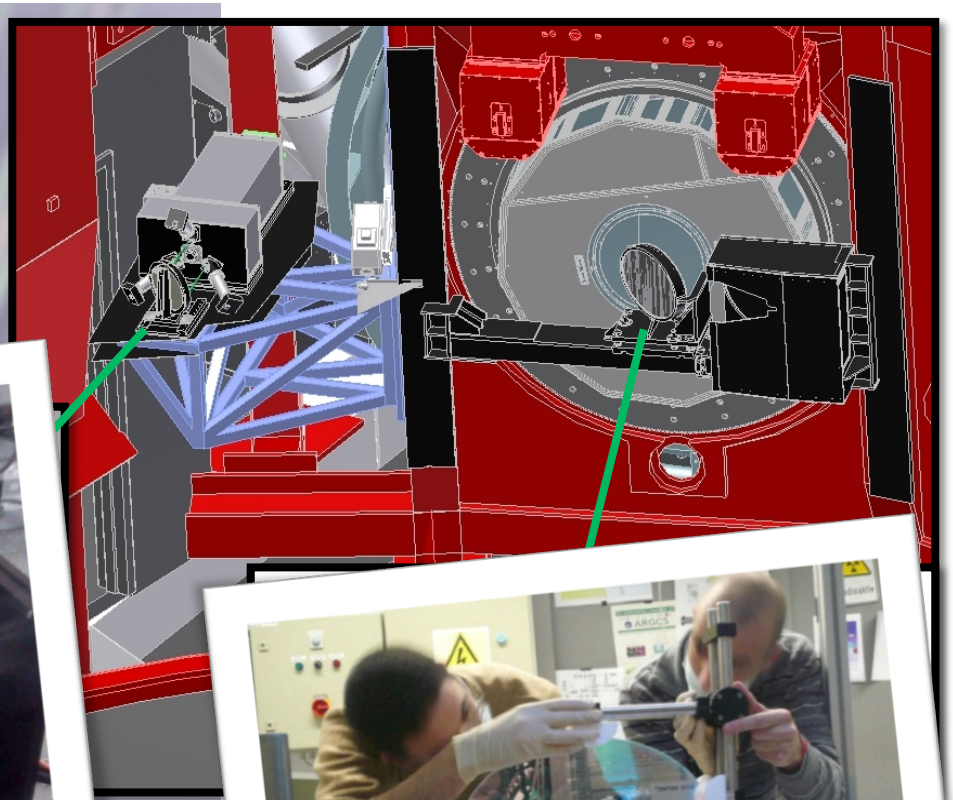
L. Barl, U. Beckmann, T. Blümchen, M. Bonaglia, J. L. Borelli, J. Brynnel, L. Busoni, L. Carbonaro, C. Conot, R. Davies, M. Deysenroth, O. Durney, M. Elberich, S. Esposito, V. Gasho, W. Gässler, H. Gemperlein, R. Genzel, R. Green, M. Haug, M. Lloyd Hart, P. Hubbard, S. Kanneganti, M. Kulas, E. Masciadri, J. Noenickx, G. Orban de Xivry, D. Peter, A. Quirrenbach, M. Rademacher, H. W. Rix, P. Salinari, C. Schwab, J. Storm, L. Strüder, M. Thiel, G. Weigelt, J. Ziegleder

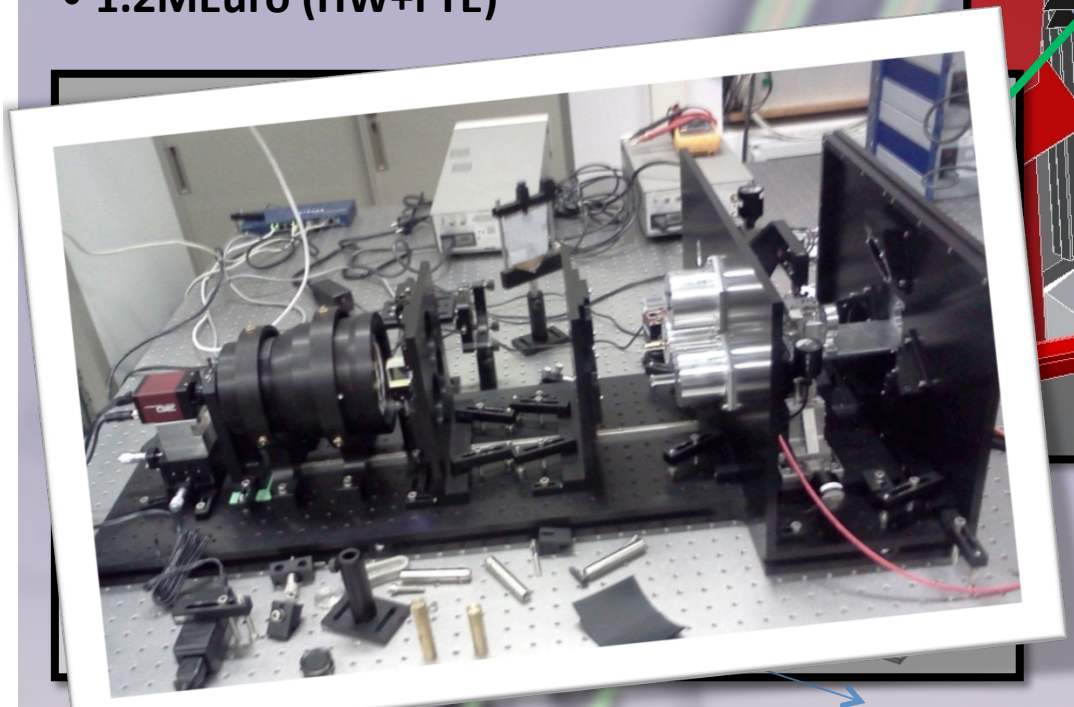
ARGOS parts locations at LBT



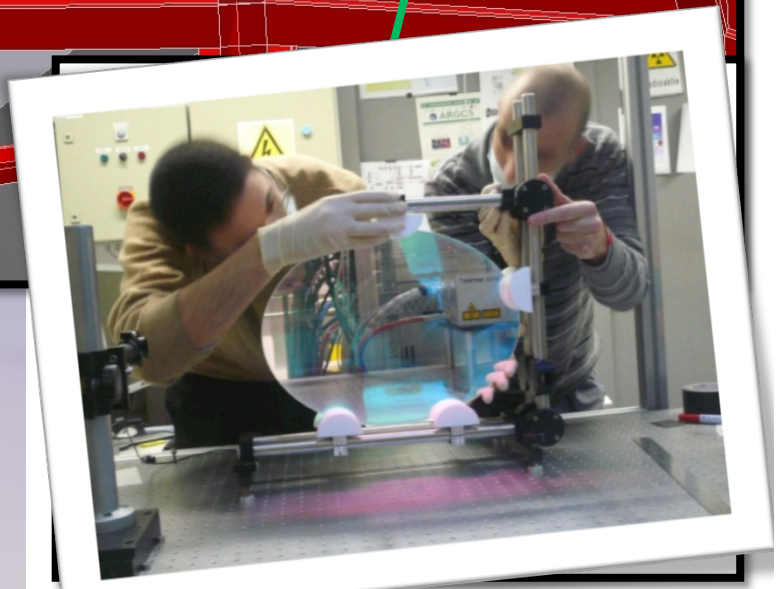
Arcetri's tasks in ARGOS

- **Dichroic and LGS WFS design, integration and test**
- **10 FTE in 3 years**
- **1.2MEuro (HW+FTE)**





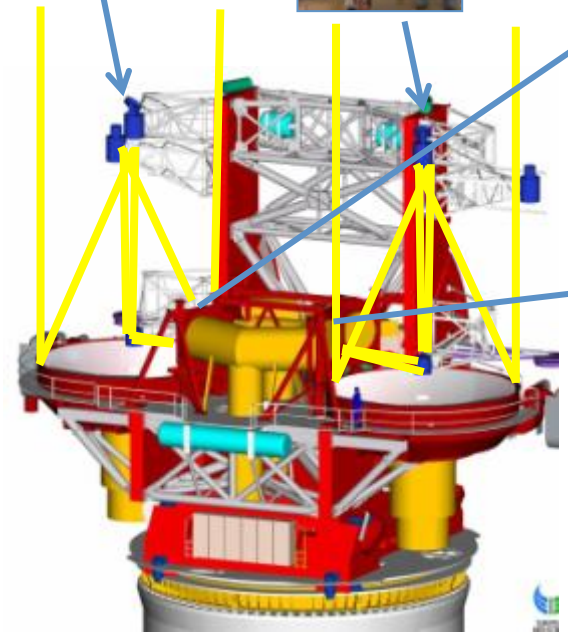
3 laser beams combined on a single detector 15x15 subaps @ 1kHz, pupil and jitter actively compensated, acquisition cameras 1' FoV, Pockels cells to gate @ 12km

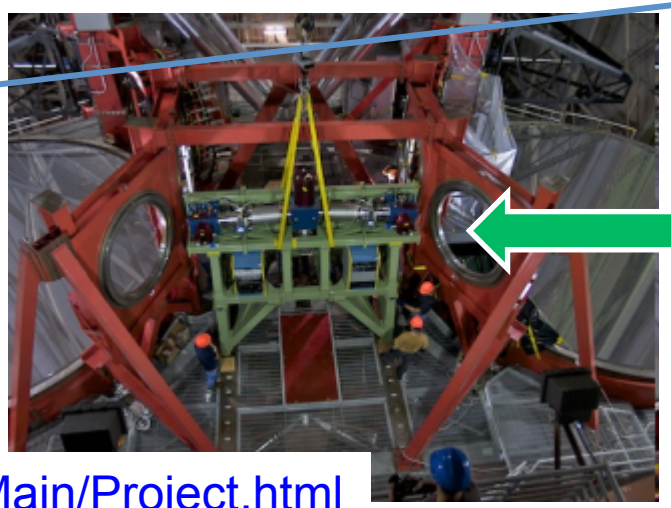


Dichroic unit deployed to split laser beams from red & NIR

AO system for LBTI

Focal Station	Modes	Spectral Coverage (μm)	Spectral Resolution	Field of View	Pixel Scale (arcsec/pixel)
Center-Bent	Nulling Interf Short Fizeau Long Fizeau	8 – 13 3-5 8-25	2 - 30	25″	0.1





Nulling and Imaging Camera:

- Nulling Optimized Mid-Infrared Camera (8-25um)

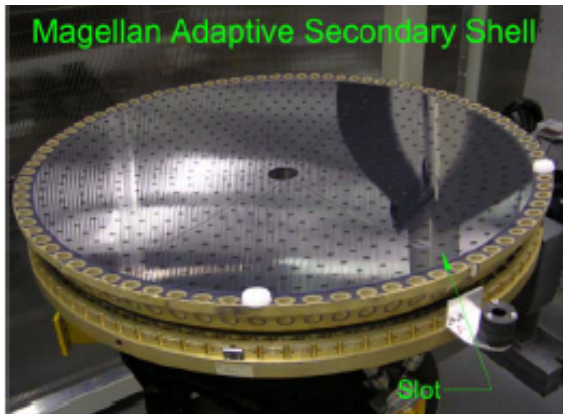
- LMIRCam (3-5um)
[Hinz - SPIE 2008]

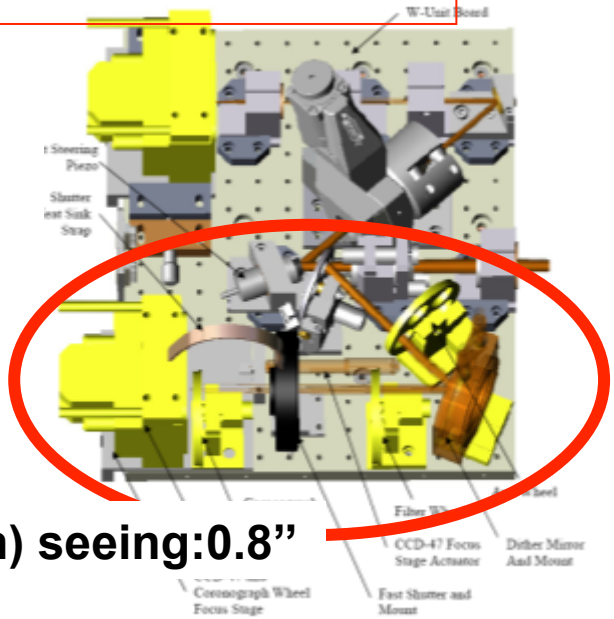
http://lbti.as.arizona.edu/LBTI-Main/Project.html

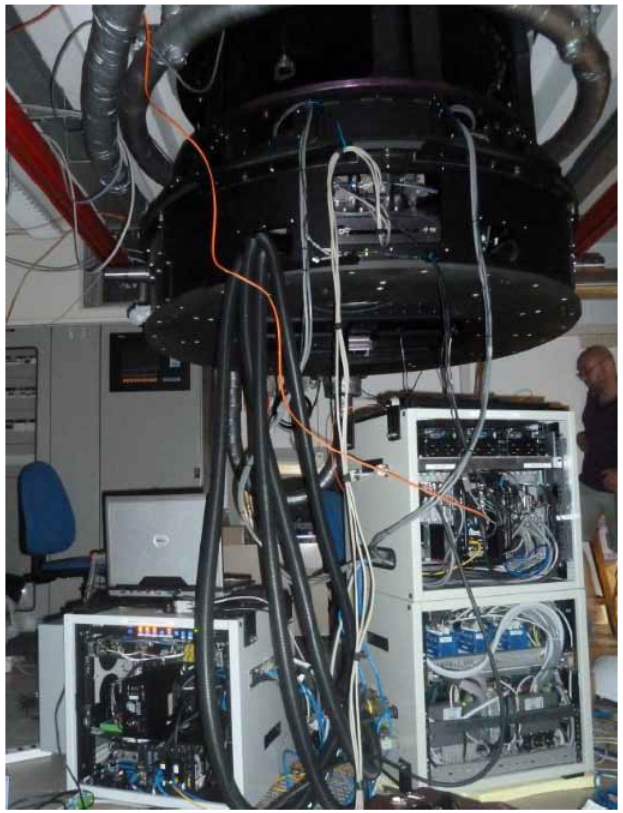
Magellan

Contract with UofA "AO W unit" #2.05.23.01
Funds to Arcetri: 500 k€ (9 persons)

- **Pyramid WFS**
- **AdSec optical calibration**
- **AO control SW**
- **AO closed loop tests in Arcetri**







VisAO: SR=55%@i'(765nm) seeing:0.8"

Scala temporale

Magellan tasks	dates
AO acceptance ad Arcetri	Feb – Mar 2012
Commissioning a Magellan	Set 2012 – Mar 2013

Accordi per osservazioni future ?

VLT DSM (AOF)

VLT-DSM: 1170act, D=1120mm

VLT-DSM: Contratto Microgate-ESO

- Arcetri ha partecipato alla fase di disegno con OPTICON (2004-2008)
- Nell'attuale fase di produzione e test Arcetri partecipa con due sottocontratti verso Microgate:

  - **Software per Maintenance and Calibration DSM (90k€ contratto in essere, 0.5 FTE)**

  - **Test Ottica del DSM a ESO (Assist) (contratto in definizione, 1 FTE)**

Scala temporale

DSM Production, Integration and EM test (Mantainance and Calibration SW)	Lug 2008 - Lug 2012 (Mar 2009 – Giu 2012)
Test ottici DSM a ESO	Gen 2013 – Mar 2013
Test con Strumenti dell AOF a ESO	Mar 2013– Feb 2014
DSM in Cile con AOF	Mid 2014

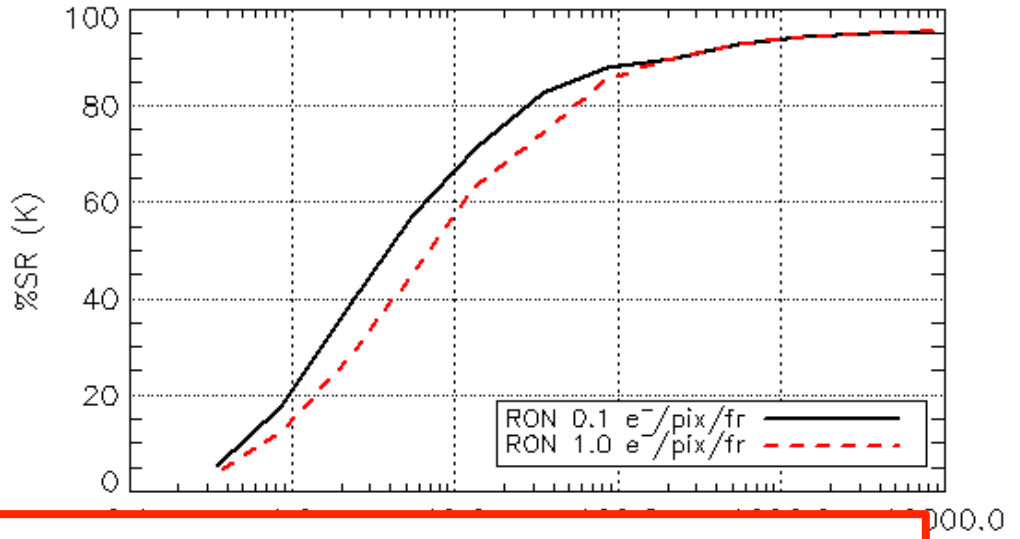
VLT ERIS (AOF)

ERIS: Enhanced Resolution Imager and Spectrograph
Wavelenghts: JHK-LM
Observing modes: LGS-AO (SH + Pyr), NGS-AO (Pyr)

2012: NACO will be decommissioned Needed general purpose high-res imager in AOF: -> ERIS

2012 VLT-ERIS: Contratto Arcetri-ESO

- ❑ **Conceptual Design of a NGS Pyramid WFS for ERIS**
- ❑ **Ott-2011 Apr-2012.**
- ❑ **1.4 FTE (8 persons in Arcetri)**
- ❑ **Total to Arcetri: 60k€**



Submitted on Dic 2012 proposal
Ph. B-C-D-E
4 FTE/year x 3years
+ support test in Garc
+ support commissio
2017)

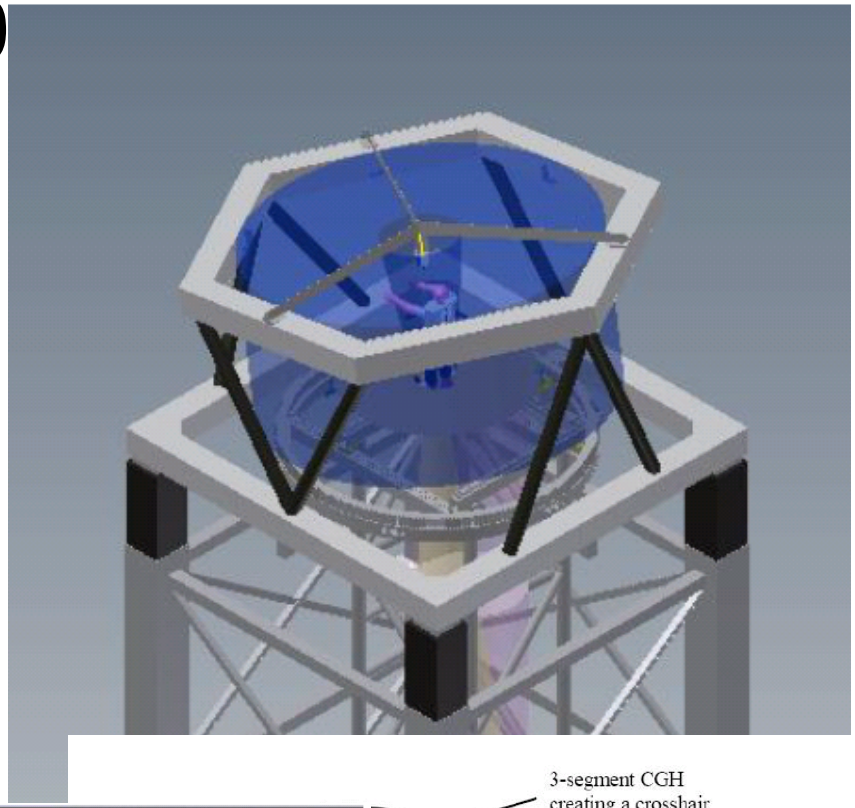
Proposal di Arcetri approvato da ESO in Febbraio 2013. Primo meeting il 5 marzo 2013.

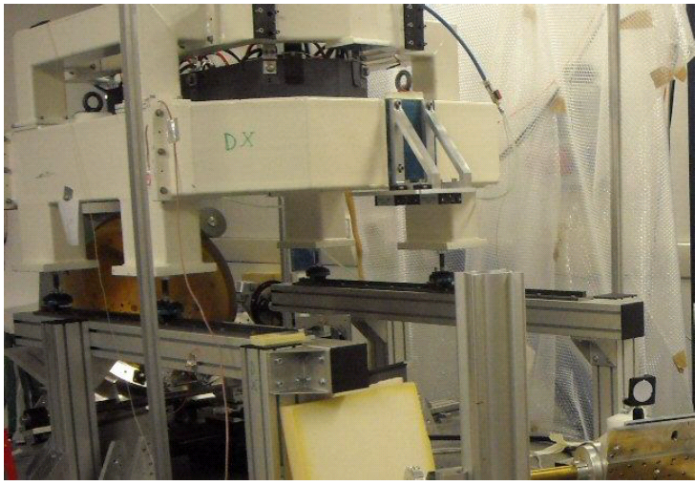
M4-EELT: TecnoINAF 2010

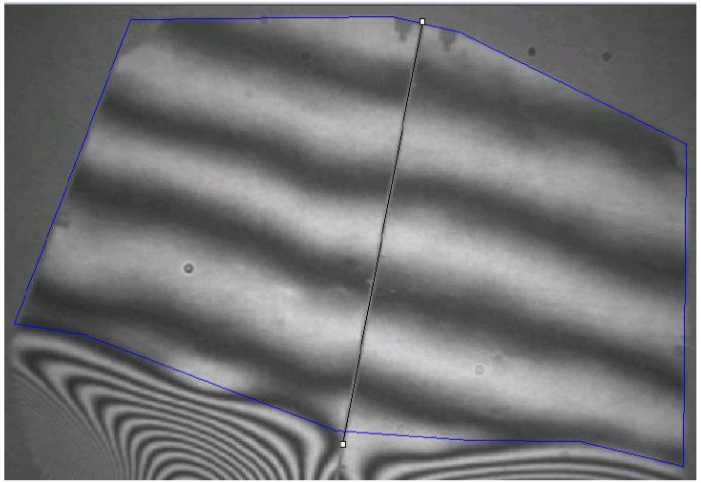
Arcetri + Brera

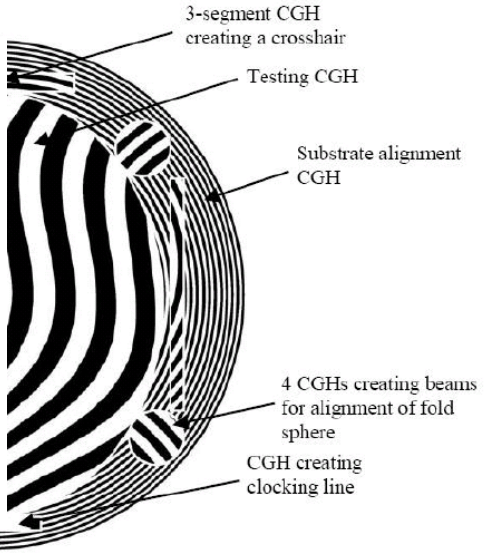
Development and test of new CGH-based techniques with automate calibration for future large-format Adaptive-Optics mirrors

Jul 2011 – Jul 2013 (to be shift to Dec 2013)
Tot. ad Arcetri: 42.5k€, 2.6FTE (3 persone)

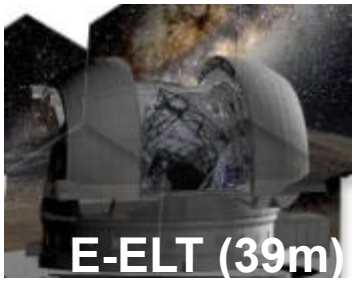








E-ELT: M4 adattivo per E-ELT



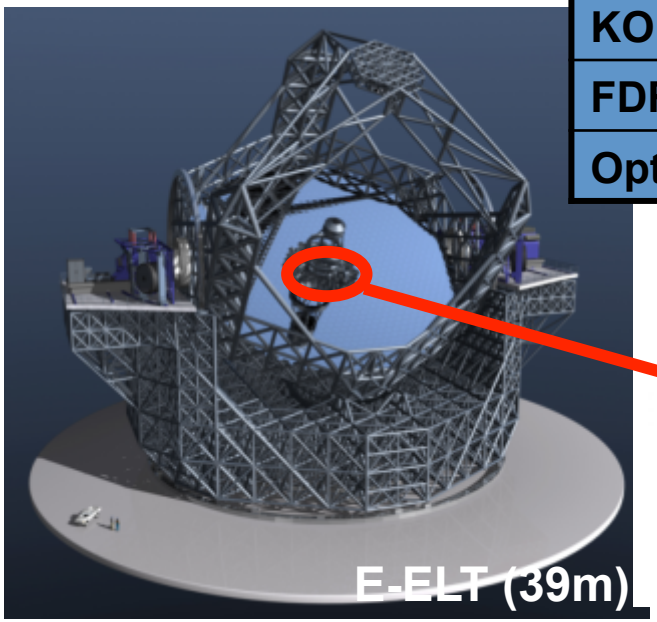
Estensione della tecnologia dei secondari adattivi a E-ELT
Prototyping and Preliminary Design: 2007 - 2010

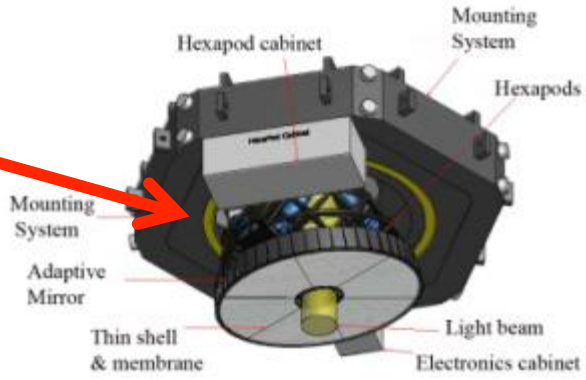
End 2011: ESO Council approva EELT Construction Plan (nostro M4 OK)

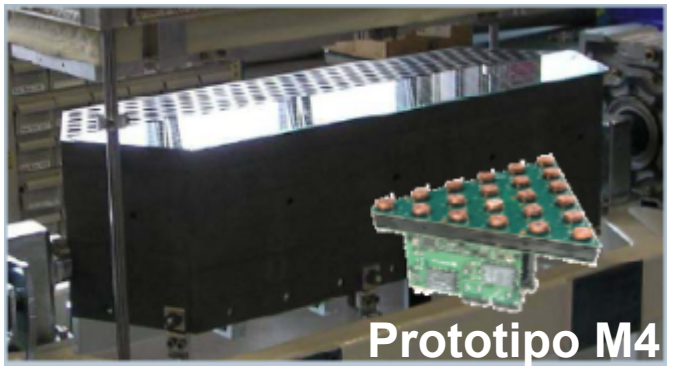
Contratto Microgate-ESO (INAF subcontract) 2012-2013 per:

- ❑ **Delta PDR per M4 adattivo da 2.6m (~6300 attuatori)**
- ❑ **Brera: disegno ottico torre test ottico di M4**
- ❑ **Arcetri: AO-exertise + optical test procedures**
- ❑ **Totale ad Arcetri: 1M€, 13 FTE (4 persone)**

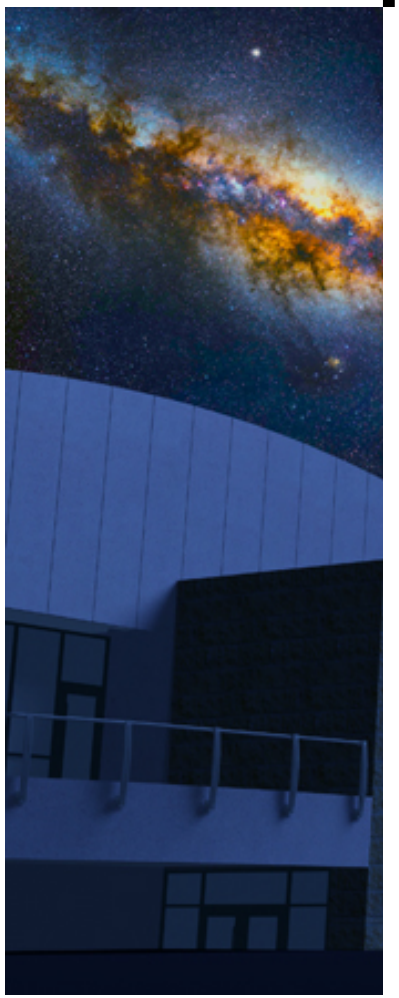
KO	**Lug 2012**
FDR	**Gen 2015**
Optical test	**2019-2020**

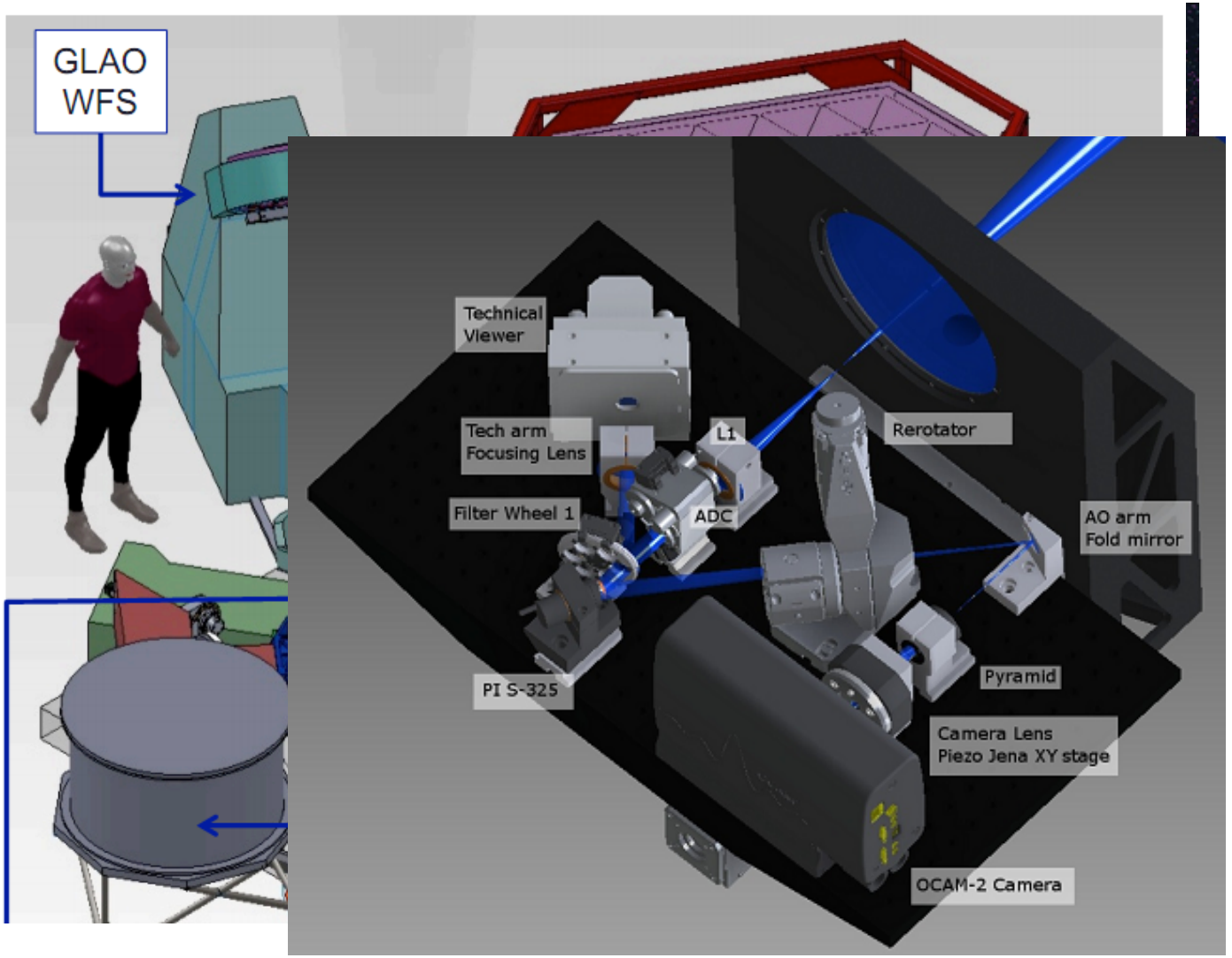






NGS wfs (NGWS) study for the GMT telescope

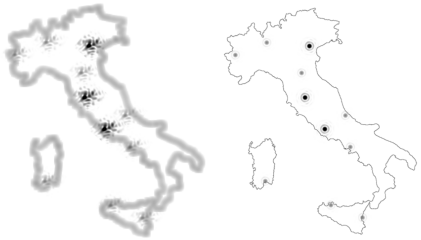




Il laboratorio nazionale di Ottica Adattiva: ADONI.

Espression of Interest in response to INAF Decree 34/2012 proposing the establishment of an

ADaptive Optics National laboratory – Italy (ADONI)



Written by R. Ragazzoni, S. Esposito, E. Giallongo and P. Salinari

ADONI at glance:

Host institution:	Arcetri Astrophysical Observatory
Joint Institutions:	Padova and Roma Astronomical Observatories
Overall personnel involved:	49
Areas of interest:	1. AO for 8m class and Extremely Large Telescopes 2. Development of new AO concepts and components 3. Exploitation of technologies grown in AO framework 4. Dissemination of non astronomical AO application
Key goals:	1. To reach a critical mass to be able to have a key role in AO systems for the largest existing and planned astronomical facilities 2. To organize the various forces active in the AO field in Italy in order to maintain the present leadership in the AO field

[Arcetri sede aggregante]

CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO NAZIONALE DI OTTICA

INOA - CNR - INO
Tit. Cl. F.
N. 0008100 12/09/2012

Al Direttore dell'Osservatorio di Arcetri

Dott.Filippo Mannucci

Caro Filippo,

ho saputo dell'interessante proposta di INAF che prevede la costituzione di alcuni laboratori nazionali sparsi sul territorio ed ho anche appreso che l'Osservatorio di Arcetri potrebbe essere sede aggregante di un laboratorio nazionale di Ottica Adattiva.

Ritengo che questa sia un'ottima iniziativa per creare iniziative congiunte di ricerca. Infatti, il Colle di Arcetri e Firenze sono, in un certo modo, già un laboratorio nazionale dedicato all'ottica. Ne sono prova le molte collaborazioni in essere tra INO-CNR e Osservatorio di Arcetri, dedicate soprattutto all'*optical design*. Queste collaborazioni, favorite dalla distanza di pochi metri tra le nostre sedi (fattore che resta non trascurabile anche all'epoca del web) hanno permesso un mutuo incremento di competenze. Allo stesso modo assai proficua è stata la collaborazione tra la nostra officina ottica e il personale dell'Osservatorio: in molti casi si è trattato di componenti ottici realizzati ad hoc solo grazie al continuo interscambio di informazioni tra le nostre due strutture.

Allo stesso tempo, è rilevante citare il recente accordo per la valorizzazione della collina di Arcetri, realizzato tra Università di Firenze, Istituto Nazionale di Ottica ed Osservatorio. L'accordo mira a creare sulla collina un centro che possa essere di interscambio di competenze, ma anche una vetrina dell'ottica italiana. In questo senso, il fatto che ai nostri Enti sia stata resa disponibile la Villa il Gioiello, splendida dimora di Galileo, per l'organizzazione di meeting e workshop, permette di avere a disposizione una sede davvero unica per eventuali attività che il futuro laboratorio nazionale volesse organizzare.

A sostegno della candidatura in oggetto, faccio anche notare come Firenze sia anche sede di molte altre strutture di ricerca pubblica dedicate all'ottica (come ad esempio il LENS, Laboratorio Europeo di Spettroscopia Non Lineare, infrastruttura europea di eccellenza), ma anche di molte aziende, da quelle più grandi, come Galileo ed EL.EN, a quelle più piccole ma comunque molto attive. Tutto ciò induce a considerare a considerare la nostra città, come dicevo all'inizio, un naturale polo aggregatore dell'ottica.

Concludo augurandomi quindi che l'Osservatorio possa veder premiata la sua ottima attività nel settore dell'ottica adattiva con la realizzazione ad Arcetri del Laboratorio Nazionale: ne verrebbe sicuramente premiato tutto il nostro Paese.

Ti saluto cordialmente,

Paolo

Dott.Paolo De Natale

Direttore INO-CNR

LARGO ENRICO FERMI, 6 - IT50125 ARCETRI - FIRENZE - TEL. +39 055230881 FAX +39 0552337755 - P.IVA 02118311006 - C.F. 80054330586 - WWW.INO.IT

Collaborazione INO/OAA……(Lab. Naz.)

2 Thematic areas of interest.

The thematic area of the proposed group is the development of AO Systems, concepts and related instrumentation for Astronomical and non-Astronomical applications; industrial applications are –in fact- a very relevant field for the purposes of the laboratory.

More specifically the goals of the proposed laboratory are briefly summarized below:

1) Development and realization of AO systems and instrumentation for ground based Astronomy trough

2) Extension of deformable mirrors/pyramid sensor/ AO technologies to active space telescopes.

3) Exploitation of technologies and concepts developed in the AO framework in *i)* astronomical and *ii)* nor astronomical applications not directly involving AO.

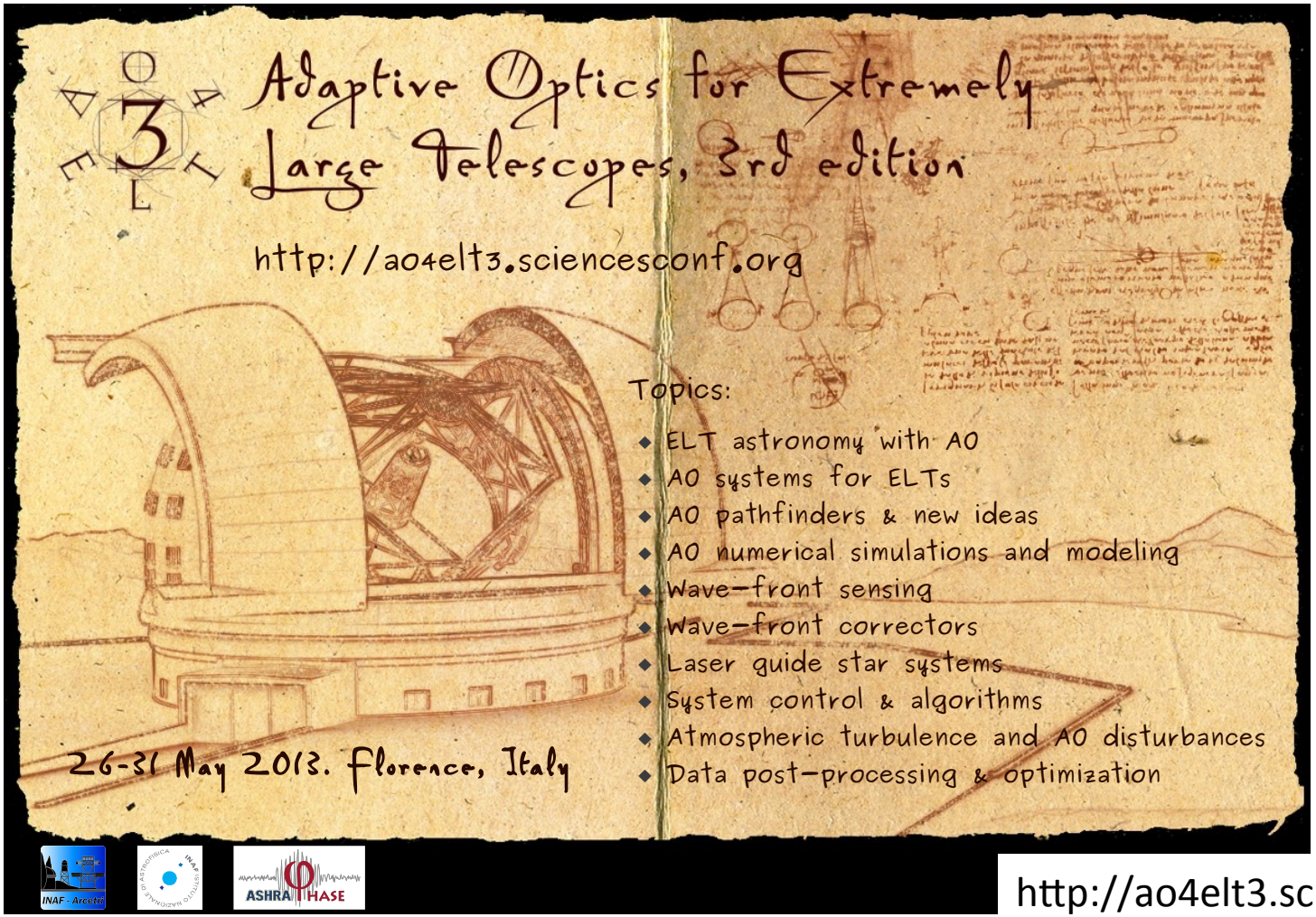
4) Non astronomical applications like:

- AO based ophthalmic instruments and eye surgery,
- high power lasers beam shaping,
- space-to-ground satellites communications at visible wavelength,
- optical metrology for laboratory and industrial use.

5) Training of students and industry personnel in the AO field.

AO4ELT3 conference

The third edition of the international conference *"Adaptive Optics for the ELTs"* is organized by Arcetri in Florence (Palazzo degli Affari) on May 26th-31st 2013.



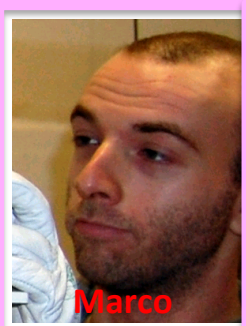
http://ao4elt3.sciencesconf.org

A nome di tutti, grazie per l'attenzione……


Guido Agapito


Carmelo Arcidiacono (OABo)

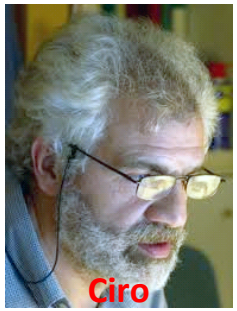

Valdemaro Biliotti (IR Group)


Marco Bonaglia


Runa Briguglio


Lorenzo Busoni


Luca Carbonaro (Radio/AO)


Ciro Del Vecchio


Simone Esposito


Debora Ferruzzi (IR Group/AO)


Luca Fini


Franco Lisi


Enrico Pinna


Alfio Puglisi


Fernando Quiròs-Pacheco


Armando Riccardi


Marco Xompero

Tommaso Mazzoni

Mauro Sozzi

Jacopo Antichi