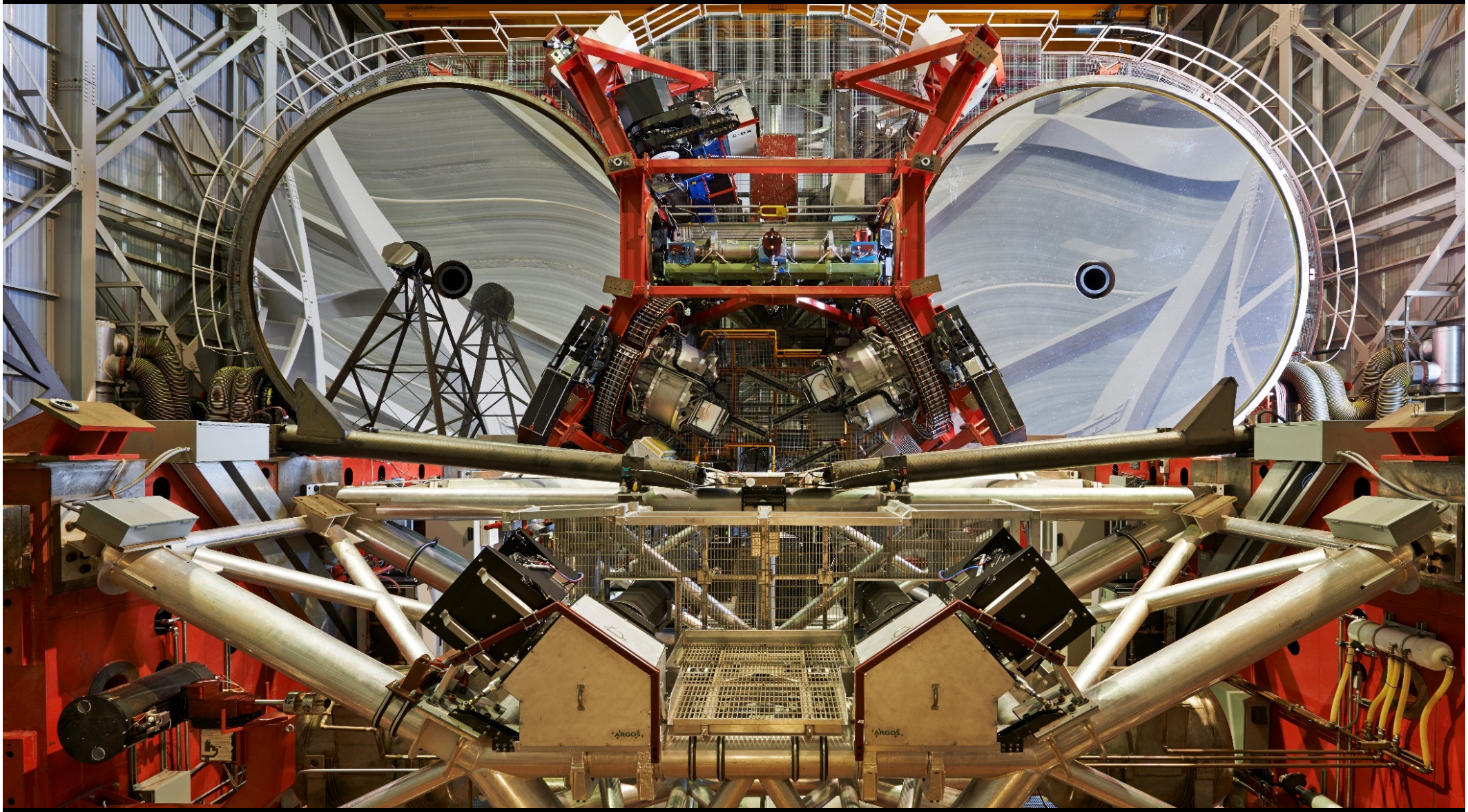
LBT Status

A. Fontana - Ottobre 2014



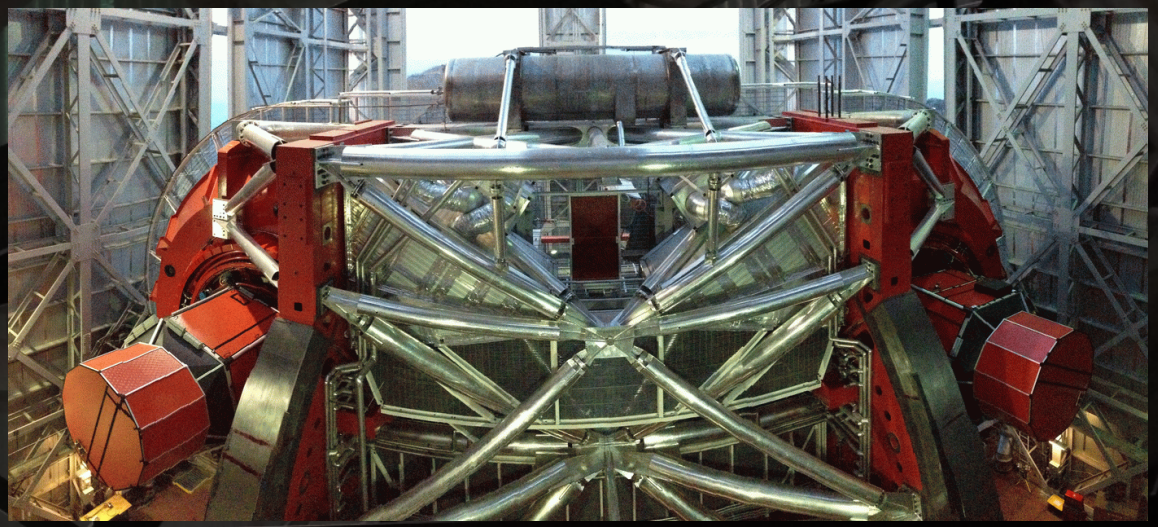
LBT has at least a decade to play as a major optical telescope

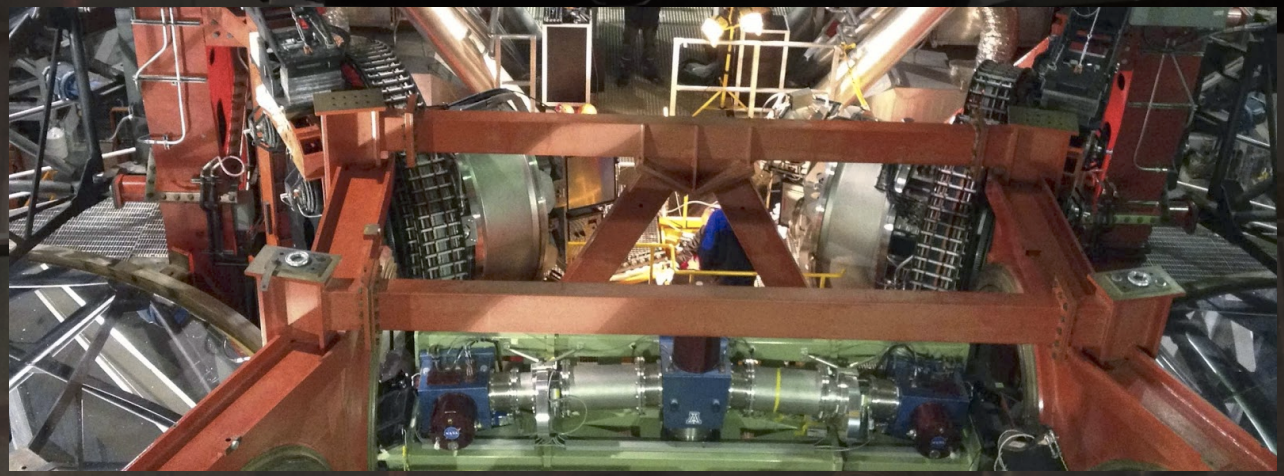
It is not (only) the last 8m-class, but also the first prototype of 2x-m class telescopes.

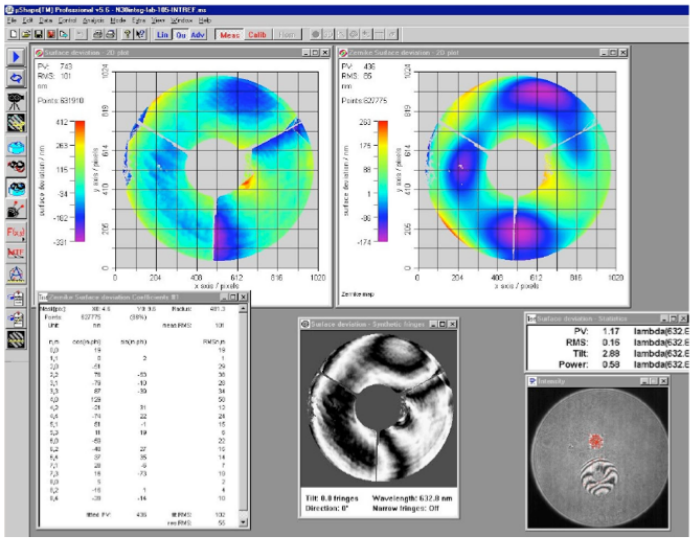
Implements and test cutting-edge key technologies for ELTs;
Starts to explore science domains that will be the science focus of ELTs

“Commissioning/Development” Activities

- All instruments (but LN) are on the mountain: LUCI2, MODS2, PEPSI





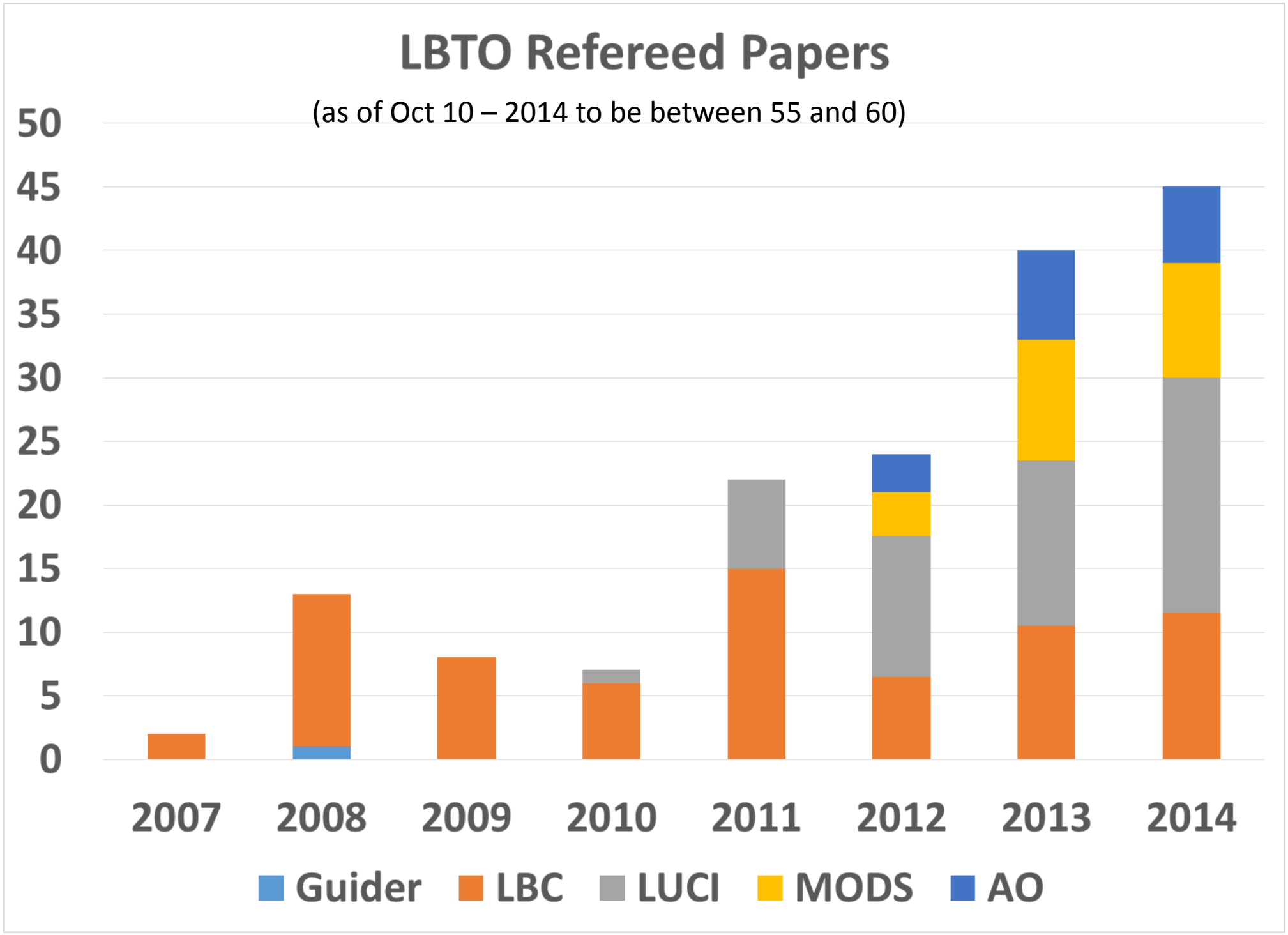
Crucial items in 2013	Update in 2014
LUCI1-MOS repeatedly unavailable	Completely refurbished during summer 2014
LUCI2-AO delayed	LUCI2-AO delivered! 

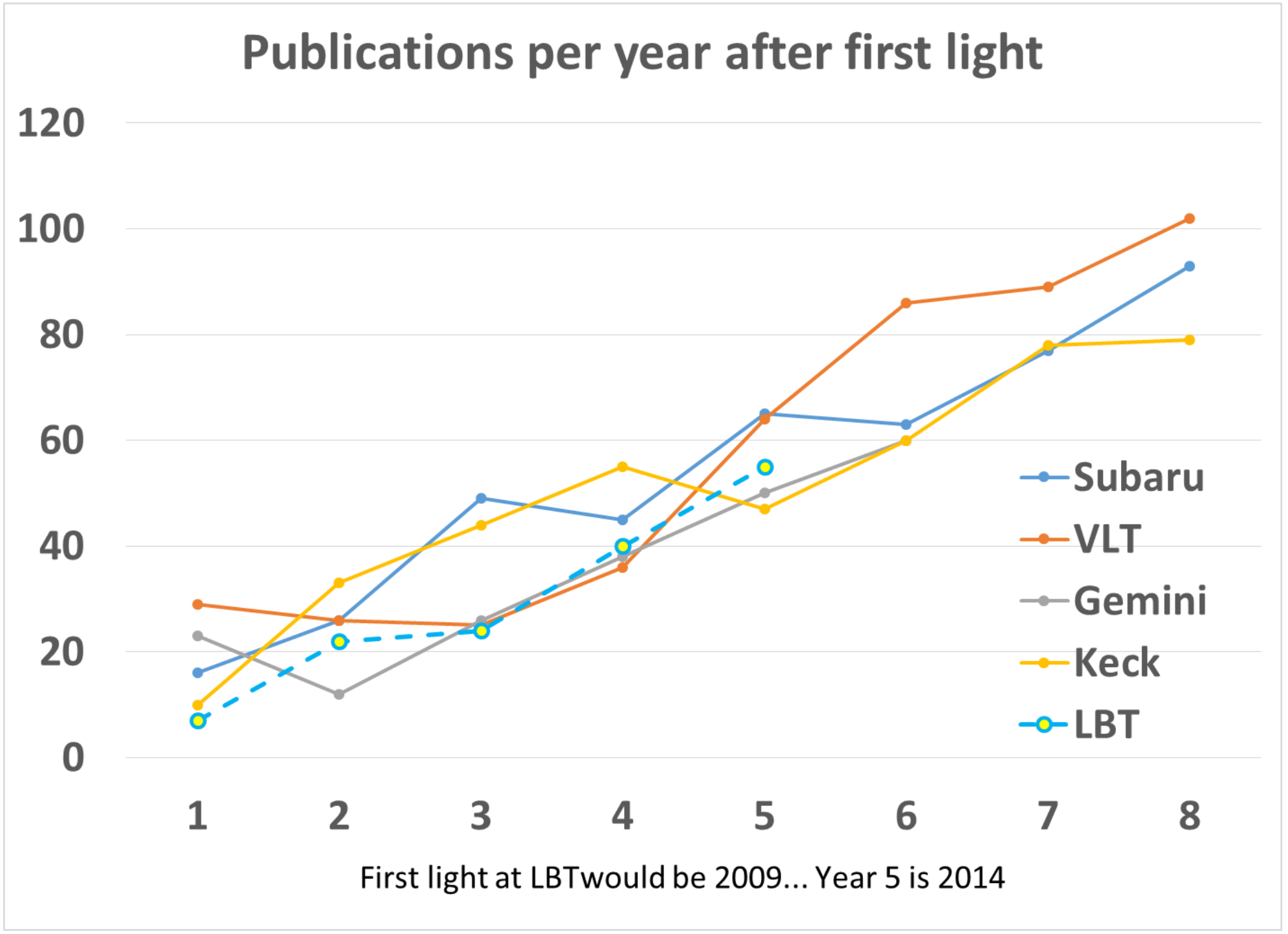
LUCI2 AO Camera

Measurement	Rms	Zernike. Rms	Astigmat. rms	Coma rms	Trifoil rms	Spheric. rms
Warm, lab, normal	101 nm	85 nm	38 nm	28 nm	34 nm	56 nm
Warm, lab, reversed	120 nm	114 nm	70 nm	116 nm	30 nm	114 nm
Warm, cyrostat, rev.	119 nm	117 nm	57 nm	47 nm	37 nm	102 nm
Warm, cryostat, p=0	114 nm	112 nm	55 nm	41 nm	36 nm	94 nm
Cold, cyrostat, 100K	100 nm	98 nm	45 nm	42 nm	42 nm	79 nm
Cold, cryostat, 78K	**90 nm**	**88 nm**	**34 nm**	**40 nm**	**31 nm**	**66 nm**

Wavelength Filter band	Strehl %
Z (1.0μm)	72
J	77
H	86
K	92

Table 3: Calculated Strehl ratios of the cold camera


LBTO Refereed Papers
(as of Oct 10 – 2014 to be between 55 and 60)
50
45
40
35
30
25
20
15
10
5
0
2007
2008
2009
2010
2011
2012
2013
2014
Guider
LBC
LUCI
MODS
AO


Publications per year after first light
120
100
80
60
40
20
0
1
2
3
4
5
6
7
8
Subaru
VLT
Gemini
Keck
LBT
First light at LBTwould be 2009... Year 5 is 2014

Workshop
Italiano
30 speakers
4 focused
discussions
>100 partecipanti

Tucson User Meeting
50 speakers
70 partecipanti

LBTO 2014 Users' Meeting

March 22-25, 2014 - Tucson, AZ (USA)

New Projects: Q-mode

An aggressive plan to introduce full queue-mode observing at LBT.

Optimizes science and engineering nights

Managed by LBTO staff, building on partners' experience

Plan presented to 2014 fall Board
Approved pending technical review early 2015

Schedule: test phase 2016A
implemented (LBC LUCI MODS) 2016B

New instruments

Project	Category	Current status (5 Oct 2014)	Short Description	PI
LMIRCam	Upgrade	Proposal ready LBTO funding requested	(1) developing a new IFU mode for LMIRcam, (2) increasing the field-of-view of LMIRcam, and (3) improvingLMIRcam's JHK capabilities	A. Skemer (UA) M. Skrutskie (UVa)
SOUL	Upgrade	Proposal for a Preliminary Design Study to be submitted by Oct 10	The plan is to improve the AO wave-front sensors on the four LBT AO ports (LUCIs and LBTI), installing new detectors (fasters - less readout noise) and more sub-apertures (from the current 30x30 to 40x40)40x40 instead of 30x30lenslet array.	Enrico Pinna (Arcetri - INAF)
SHARK-IR	New Instrument	Proposal for a Preliminary Design Study submitted	An extreme AO near-IR imager (with a coronagraphic mode) designed to benefit from the superb performances of the LBT Adaptive Optics. Will use one of the AO ports of LBTI and will be installed on the LBTI structure.	Jacopo Farinato (Obs. Padova - INAF)
iLocater	New Instrument	Instrument moving forward on external funding - LBTO now following the project (Kickoff: 3 Oct 2014 - PDR: Apr 2015)	A diffraction-limited fiber-fed spectrograph in Y band Y-band (0.95um – 1.13um), providing R=110,000 spectral resolution with radial velocity precision < 1 m/s	Justin Crepp (ND - RC)
SHARK-V	New Instrument	No proposal now - The team is preparing a technical document and feasibility tests (see on the right) before submitting a proposal to SAC and Board at a later date.	Same philosophy as SHARK-IR, but in the visible. Tests still to be made will provide a crucial assessment of the future performances of SHARK VIS in the wavelength range from 600 to 900 nm.	Fernando Pedichini (Obs. Rome - INAF)
LBC Upgrade	Upgrade	No proposal now - The team is assessing the current LBC performances before proposing a possible hardware upgrade.		Enrico Cappellaro (Obs Padova - INAF)

Forthcoming instruments with AO-capabilities

LBTO potential AO performances JC-CV Oct 2014

	Z	J	H	K	Notes
LUCI N30	72%	77%	86%	92%	camera only
SHARK-NIR		97%	98%	99%	all instrument
LMIRCam					LMIRCam itself designed to have *near perfect Strehl ratios for > 1 micron* . A window and potentialy a diamond-turned optics could be replaced if needed (more information pending)
LN-MCAO		~60%			Uniform on all field, unlike narrow-field high-Strehl NIR/AO

	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B
Infrastructure													
Queue	Development			Test	Stage1		Stage2		Stage3				
AO	Completion												
?? SOUL ??	? Development/Commissioning ?												
?? ARGOS UPGRADE ??					??? Development /Commissioning/Operation ???								
Facility													
LUCI1													
LUCI1 AO			Commissioning	Binocular	Binocular								
LUCI2 AO		Commissioning											
MODS1			Binocular										
MODS2	Commissioning												
LBCB	Binocular			??Upgrade??									
LBCR													
ARGOS	Commissioning				In operation								
New Facility													
?? SHARK-IR ??	??? Development ???							Commissioning	??? In operation ???				
?? SHARK-VIS ??	??? Development ???						Commissioning		??? In operation ???				
Strategic													
LBTI	Commissioning	In operation - with increasing capabilities ??? Facility Status ???											
LMIRCam		?? Upgrades ??		??? Facility Status ??									
?? LIVE ??				??? Development/Commissioning/Operation ???									
Lean-MCAO	Development			Commissioning	In operation ??upgrade to wider field??								
LINC-NIRVANA				??? Development/Commissioning ???				In operation - with increasing capabilities ?? Facility status ??					
PI													
PEPSI	Development	Spectro		Spectro-polarimetry		?? Facility status ??							
?? iLocater ??	?? Development/Commissioning ??						?? In operation - Facility Status ??						

Premiali LBT

2012
Richiesti: 3.3 ME
Rimanenti: ~1.1ME

2013
Richiesti: 3.8 ME
Disponibili: 2.7ME

Sensori Strategici per LBT: dal laser all'origine dell'Universo.

Coordinatore del progetto:
Adriano Fontana
INAF-Osservatorio Astronomico di Roma
Via Frascati 33 Monte Porzio Catone
00040 Roma
adriano.fontana@oa-roma.inaf.it

Responsabili Unità Operative:
Simone Esposito – INAF Oss. Arcetri
Emanuele Giallongo – INAF Oss. Roma
Roberto Ragazzoni – INAF Oss. Padova
Emiliano Diolaiti – INAF Oss. Bologna
Bianca Garilli – INAF IASF Milano
Gli altri partecipanti sono elencati in Tabella 3

Settori di afferenza: **Principale: DISPOSITIVI SENSORIALI**

Secondari: MADE IN ITALY, SPAZIO, SALUTE DELL'UOMO, ICT

Parole Chiave: FOTONICA; OPTOMECCANICA; SISTEMI DI CONTROLLO; COOPERAZIONE INTERNAZIONALE.

Project Title	**Strategic Sensors for LBT: using lasers to probe the origin of the Universe**	
Field of action	Health, demographic evolution and well-being	Secondary
	Future manufacturing and Made in Italy	Secondary
	ICT and sensor devices	**Primary**
	Aeronautics and space	Secondary
Coordinator's main affiliation facility	**Registered Name: INAF OSSERVATORIO ASTRONOMICO DI ROMA** Address: Via Frascati 33 Monte Porzio Catone (Roma)	
Project Coordinator	**Name Surname: Adriano Fontana** Mail: adriano.fontana@oa-roma.inaf.it Tel: +39 06 94286456 / +39 337 1090857	
Other participating EPR	**Registered Name: Università degli Studi di Padova – Dipartimento di Fisica ed Astronomia** Address Via dell'Osservatorio 5 35131 Padova	

Scopo della richiesta:

- Finanziare lo sviluppo di strumentazione avanzata per LBT
- - Finanziare l'uso scientifico di LBT

Parte di questi programmi erano già in esecuzione e finanziati da INAF -> non viene finanziato il funzionamento ordinario di LBTO (rata annuale).

Principali linee di intervento:

- Sviluppo di una nuova generazione dei secondari adattivi

- Sviluppo di un imager/coronografo bicanale per Extreme Adaptive Optics

- Completamento di LINC-NIRVANA

- Upgrade di LBC

- Supporto utilizzo scientifico (i.e. Service Mode + Data processing italiano)

- Sviluppo di una nuova generazione dei secondari adattivi

Scopo:

- permettere di osservare oggetti molto piu' deboli (1-1.5 mag) a parita' di SR
- estendere XAO nel range visibile (600-900nm)

Come:

- sostituzione CCD attuali con fast-readout;
- re-design del firmware dei secondari adattivi

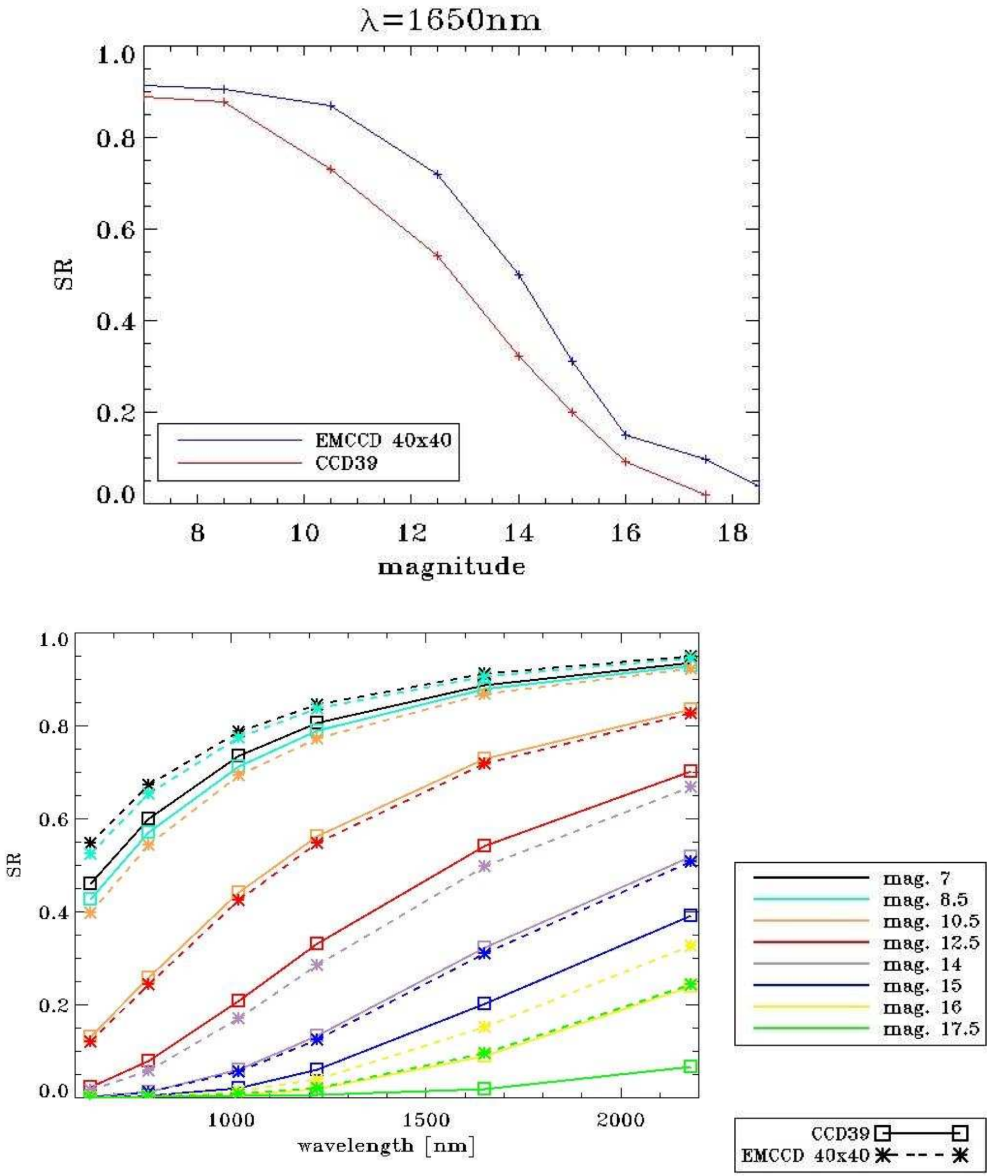
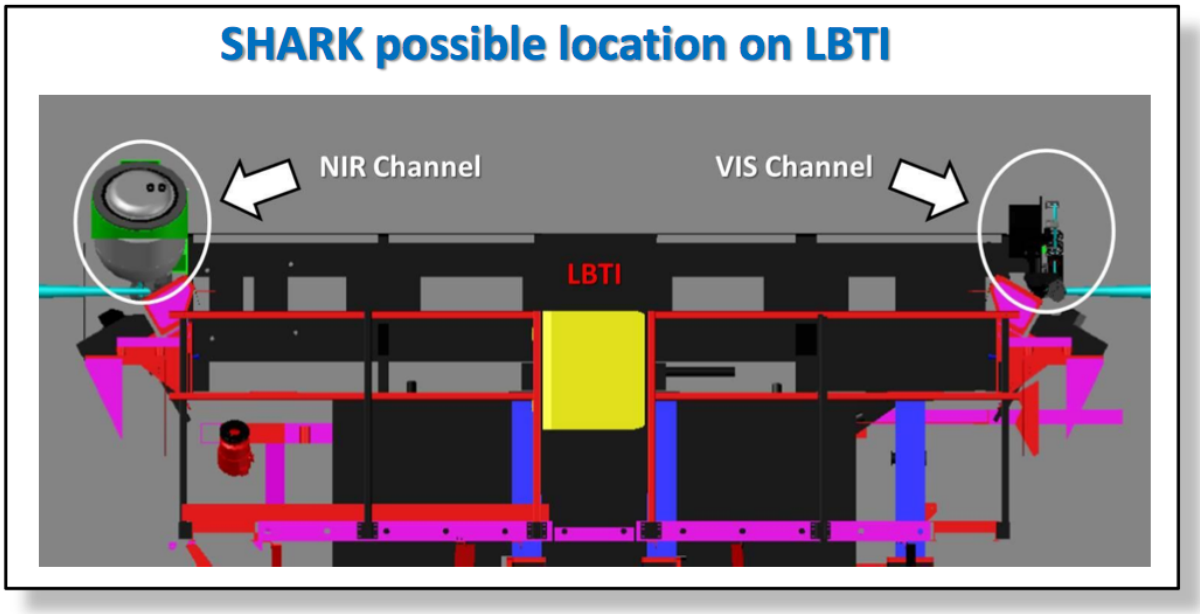
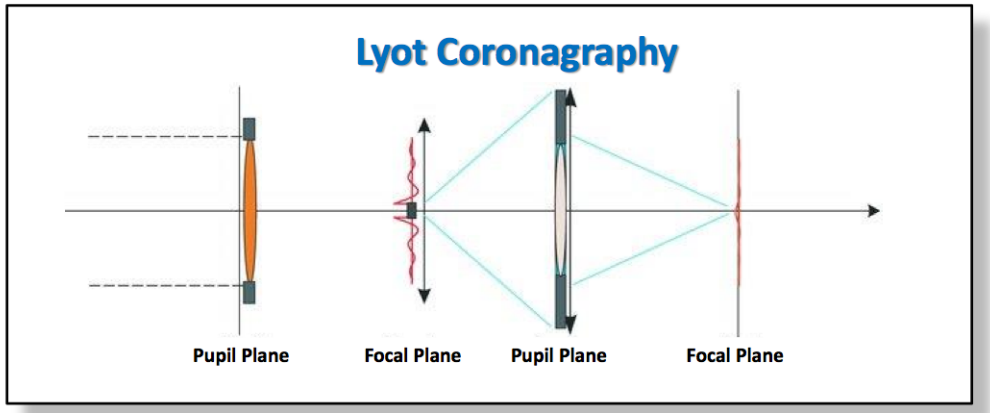


Figure 7 The achieved SR for existing (continuous) and upgraded (dashed) SCAO systems at the LBT. We note that the SR in the visible range (500-1000nm) are improved by a factor from 3 to 5.

- Sviluppo di un imager/coronografo bicanale per Extreme Adaptive Optics

SHARK is a proposal aimed at investigating the technical feasibility and the scientific capabilities of **high contrast cameras** to be implemented at **LBT**. Two channels are foreseen for SHARK, a near infrared channel and a visible one, both providing **imaging** and **coronagraphic modes**.



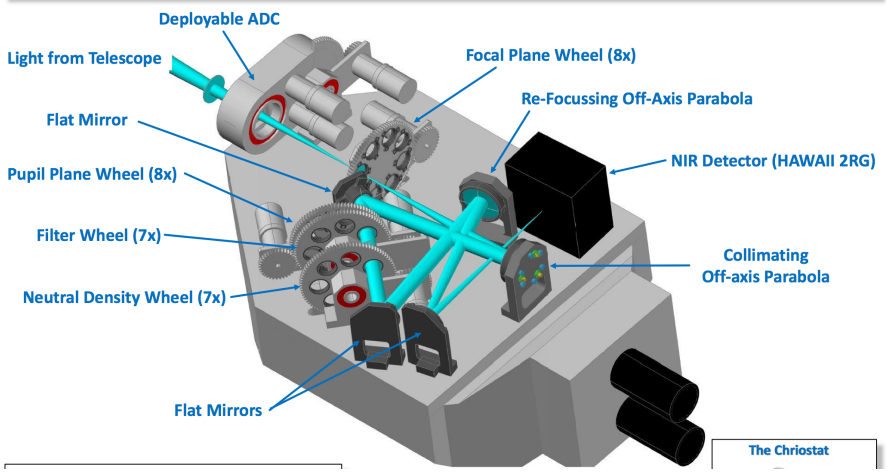


The NIR arm of SHARK@LBT

Jacopo Farinato [1], Carlo Baffa [2], Andrea Baruffolo [1], Maria Bergomi [1], Luca Carbonaro [2], Alexis Carlotti [3], Mauro Centrone [4], Johanan Codona [5], Marco Dima [1], Simone Esposito [2], Daniela Fantinel [1], Giancarlo Farisato [1], Wolfgang Gaessler [6], Emanuele Giallongo [4], Davide Greggio [1], Juan Carlos Guerra [5], Phil Hinz [5], Franco Lisi [2], Demetrio Magrin [1], Luca Marafatto [1], Fernando Pedichini [4], Enrico Pinna [2], Alfio Puglisi [2], Roberto Ragazzoni [1], Bernardo Salasnich [1], Marco Stangalini [4], Valentina Viotto [1], Christophe Verinaud [3]

[1] INAF Padova, [2] INAF Arcetri, [3] IPAG, [4] INAF Roma, [5] University of Arizona, [6] MPIA

mail to : jacopo.farinato@oapd.inaf.it



SHARK NIR Characteristics

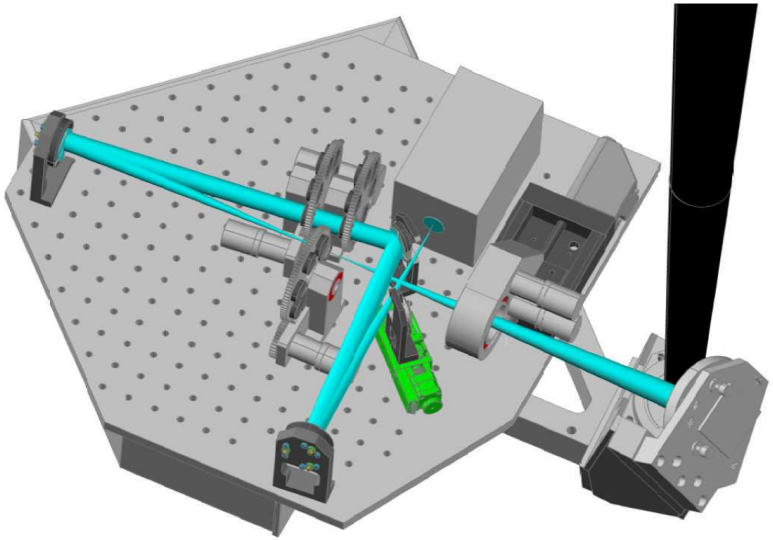
Observing Modes	Imager/Coronagraph
Field of View [arcsec]	19.2 x 19.2
Wavelength Range [μm]	1.1-2.4
Sampling [marcsec/pix]	19
E.E. @ 37 mas (J Band Diffraction Limit PSF)	> 83%
Intrinsic Optical Quality (0°-25° Zenithal Distance - NO ADC) [SR]	>99.8%
Intrinsic Optical Quality (30° Zenithal Distance with ADC) [SR]	>97.8%
Intrinsic Optical Quality (45° Zenithal Distance with ADC) [SR]	>97.7%
Coronagraph type	Lyot (+ TBD?)
Filters	TBD (J, H, K + Narrow Bands?)
Polarimetric filters	TBD

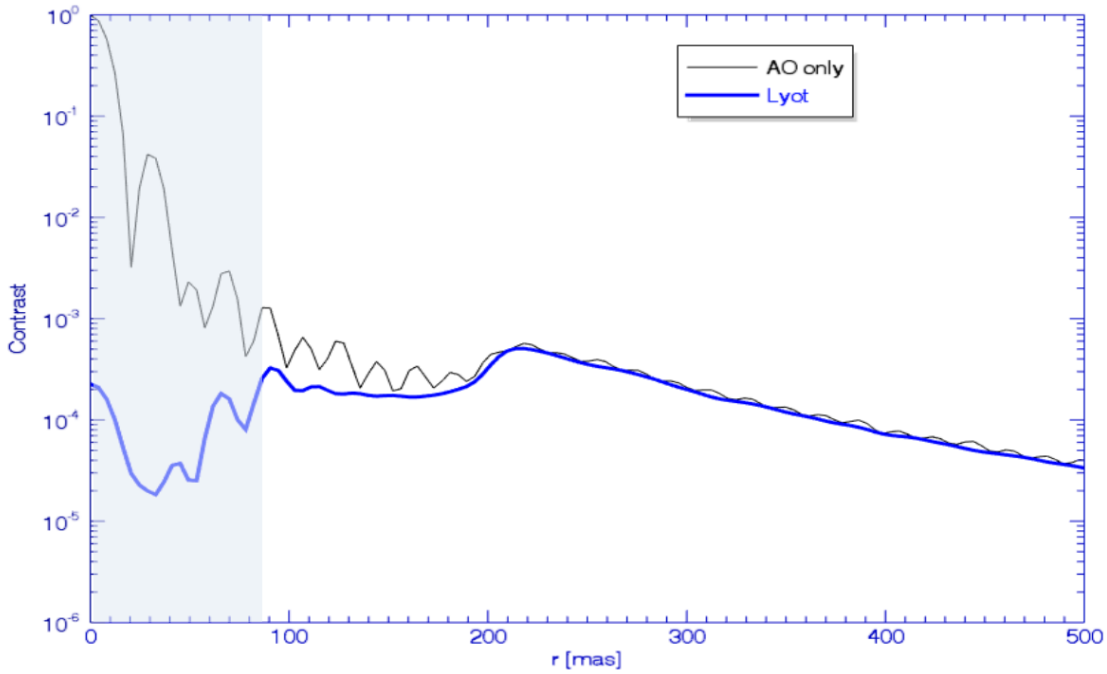
SHARK: the VISUAL arm

Pedichini F. [1], Carbonaro L., Centrone M. [1], Esposito S., Farinato J., Giallongo E. [1], Pinna. E, Ragazzoni R., Stangalini M. [1], Testa V. [1] and Hinz P. [4]

[1] INAF Roma, [2] INAF Arcetri, [3] INAF Padova, [4] University of Arizona

mail to : fernando.pedichini@inaf.it





Expected contrast using a Lyot coronagraph with 90 mas IWA. Simulation performed at 675nm, 50nm BW using FLAO residual turbulence at 0.4 arcsec seeing.

- Supporto utilizzo scientifico (i.e. Service Mode + Data processing italiano)

- 5 Assegni di ricerca (2 OA-RM, 1 OA-Bo, 1OA-Fi, 1 IASF-Mi)
- osservazioni in service mode (7-8 run/anno)
- analisi dati e archiviazione
- scienza con dati LBC