

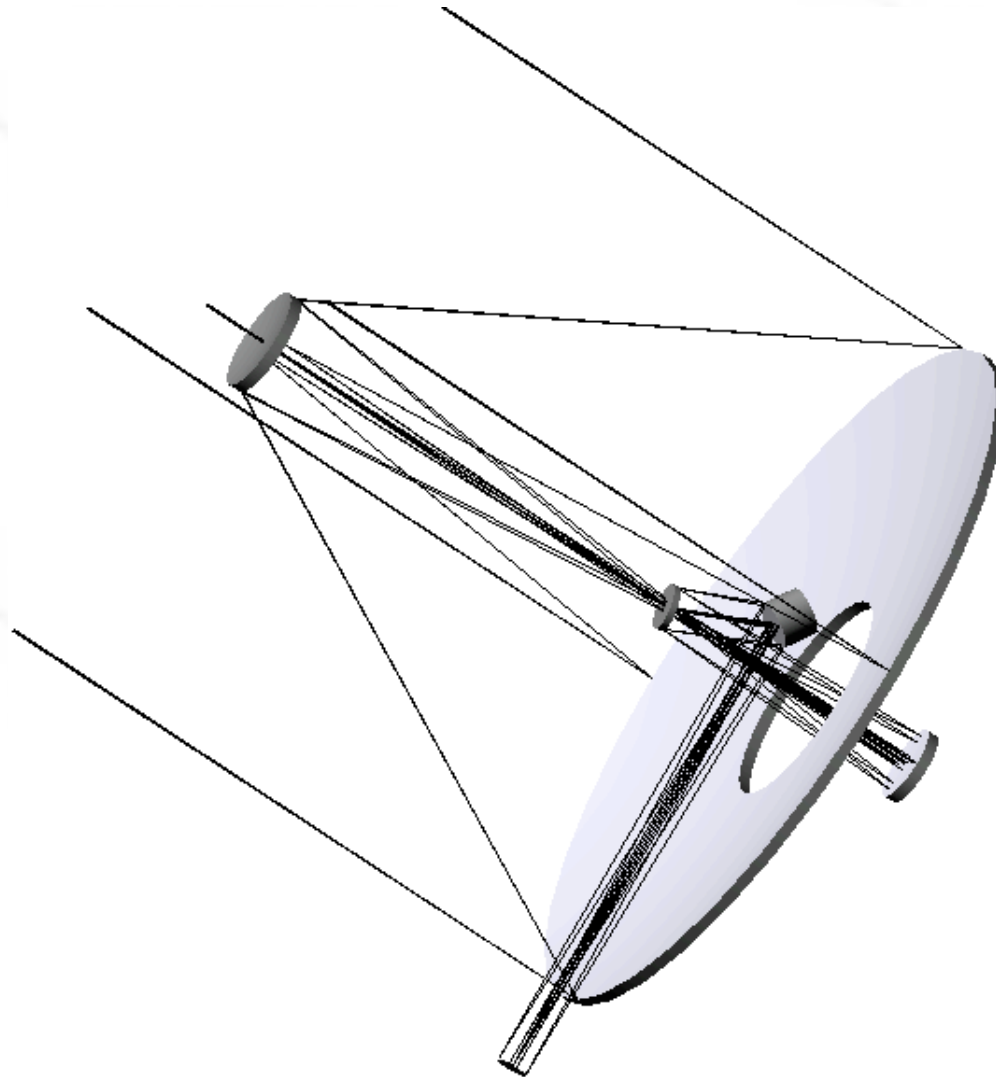


EELT

Jason Spyromilio



The Telescope





5 M

Aberrations are compensated by M4

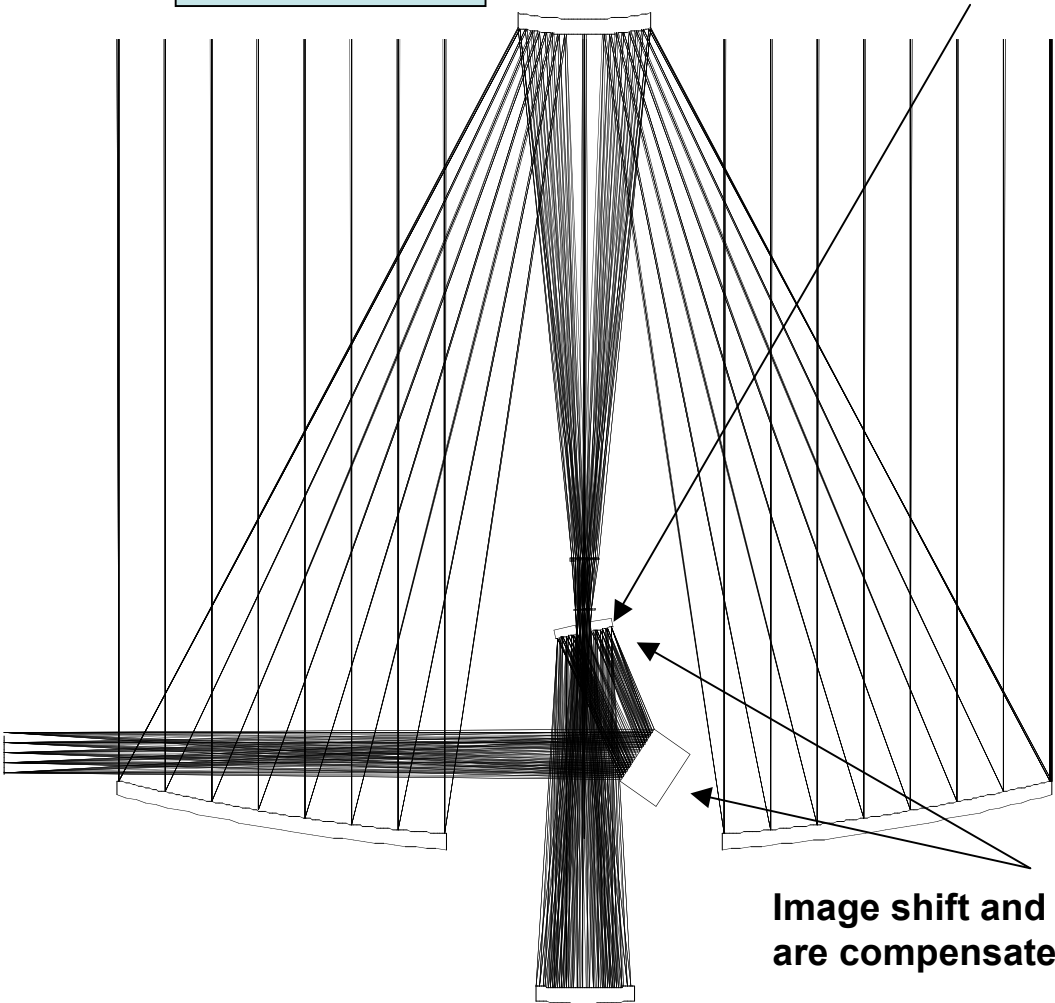
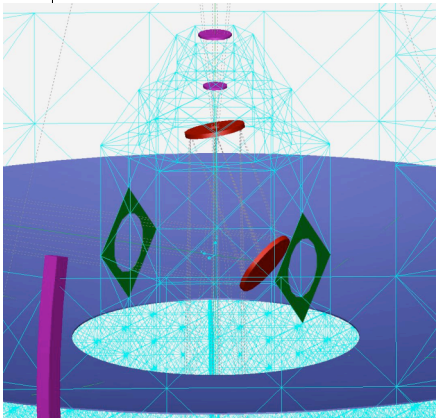


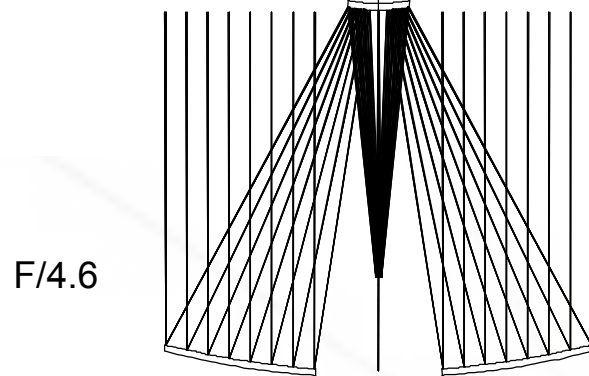
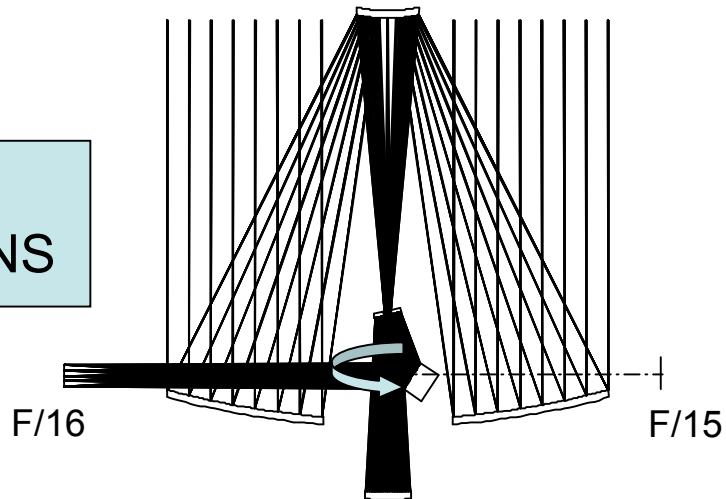
Image shift and beam orientation
are compensated by M4 and M5

806.45 CM

Scale: 0.0031 25-Jul-06

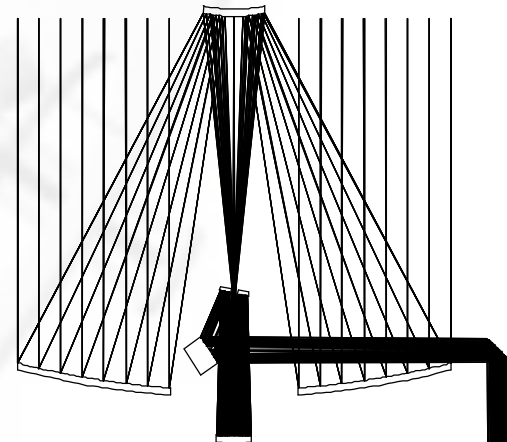
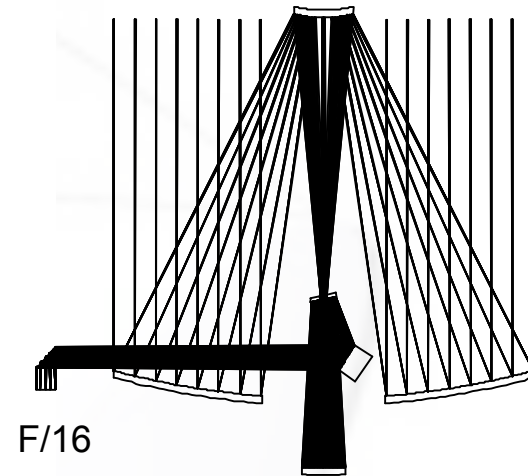
FOCAL
STATIONS

Nasmyth focus (2)



Intermediate focus

Gravity invariant focus



Coude focus

F/34.6

A reconfigurable telescope



exceptional image quality^{5 arc min}

- Excellent image quality across the field of view
- Chief ray concentric to the exit pupil at all locations of the focal plane.
- Nearly flat focal plane.

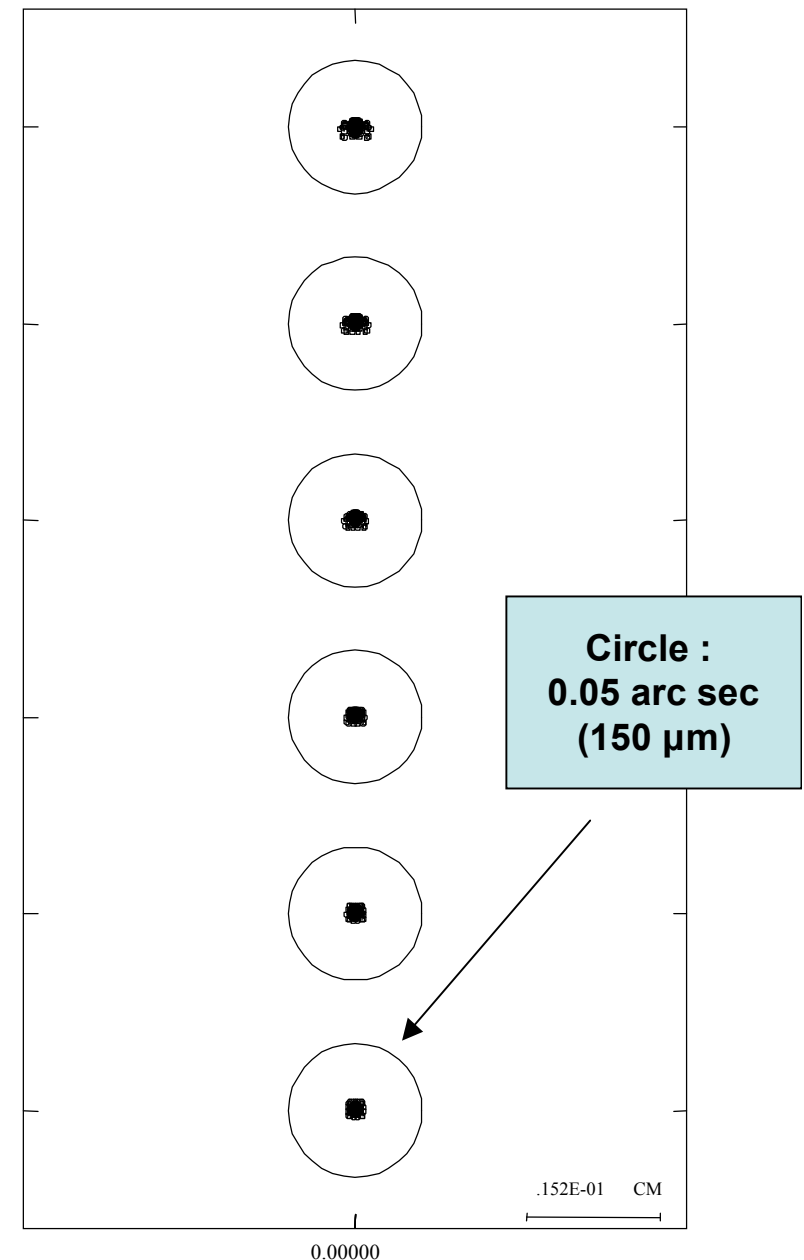
4 arc min

3 arc min

2 arc min

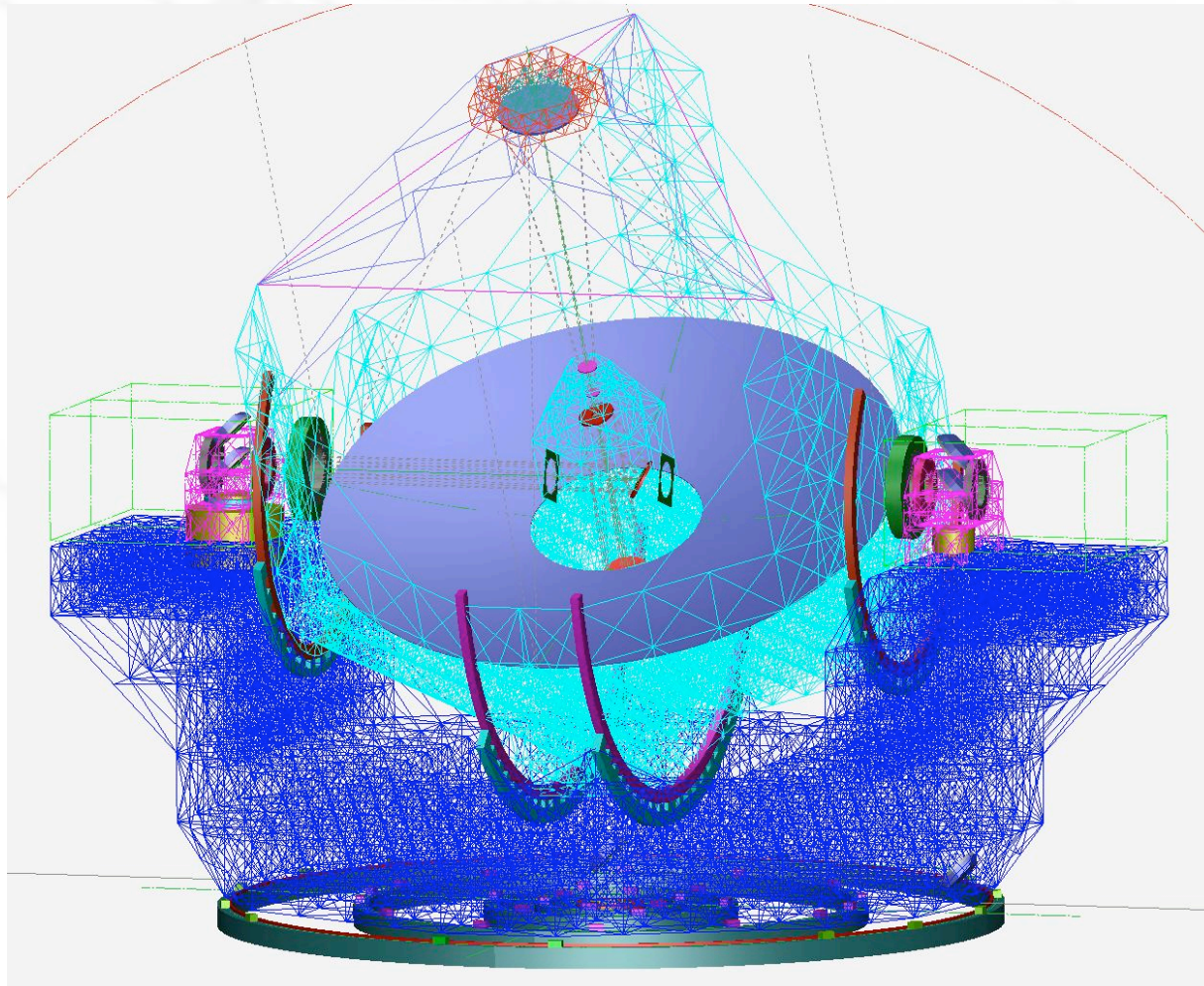
1 arc min

axis





A stable observing platform

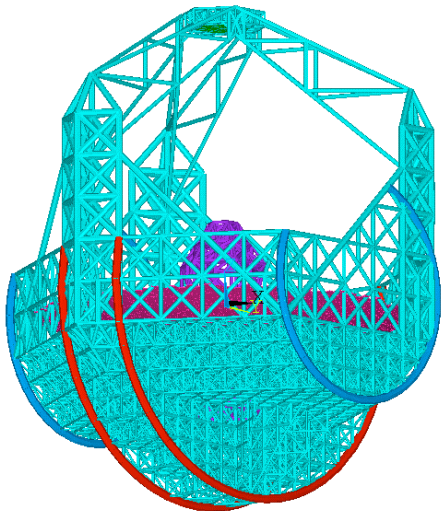




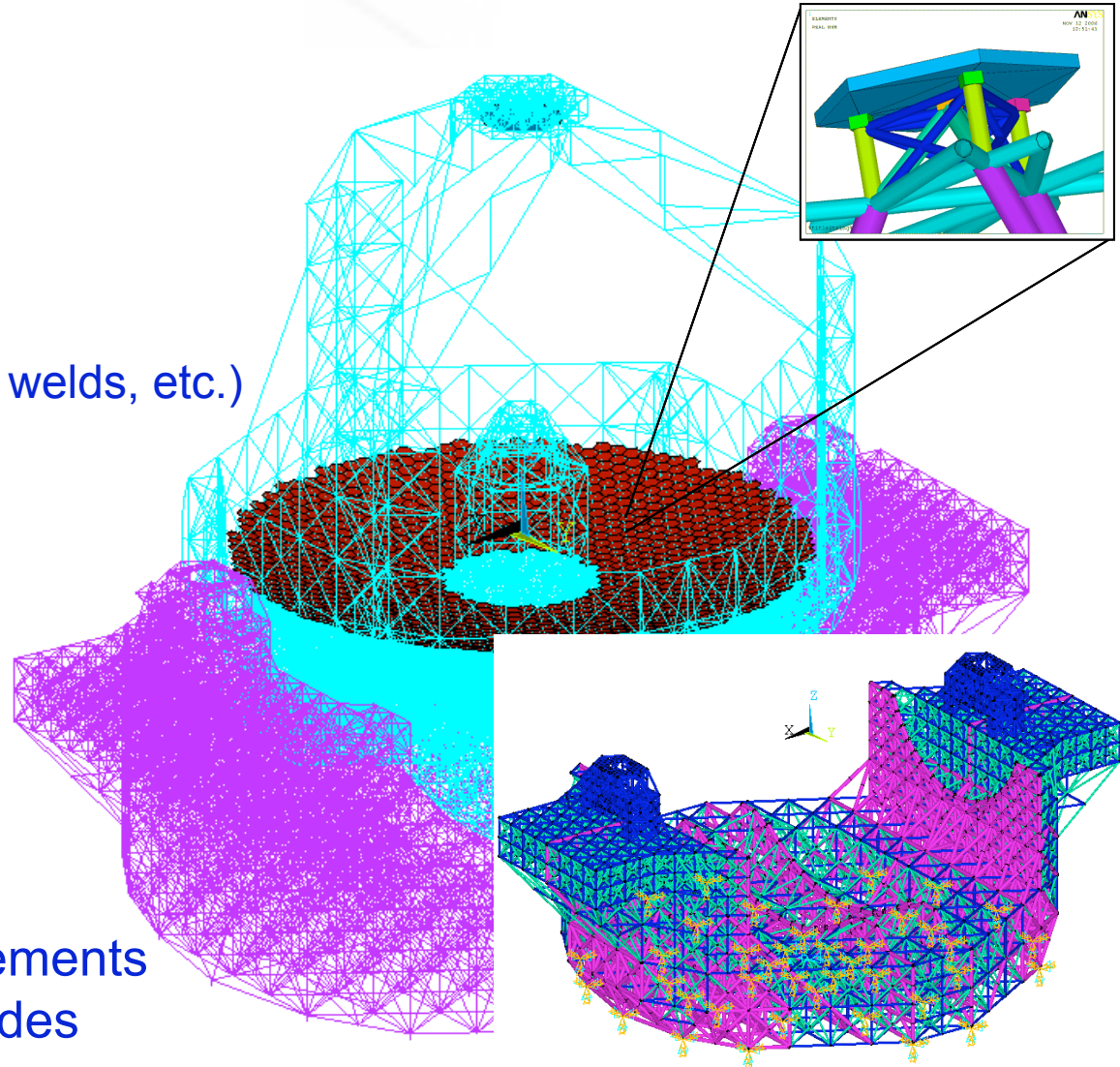
Finite Element Model

Assumptions:

- Basic reference design
- Hydrostatic bearings
 - Equivalent beam elements
- B.C. foundation interface
- M1 segments
- 10 % higher density (cables, welds, etc.)

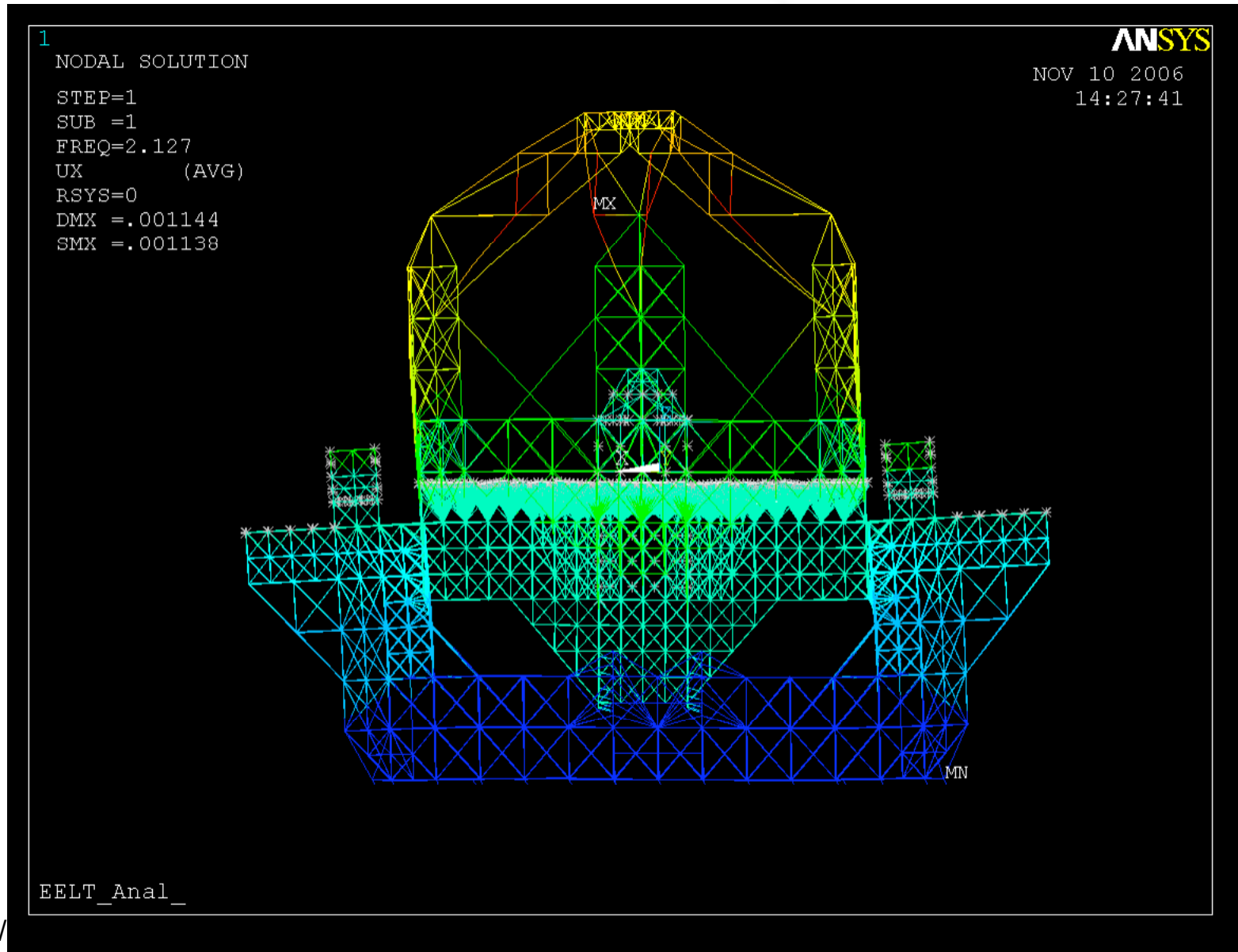


85008 elements
27106 nodes



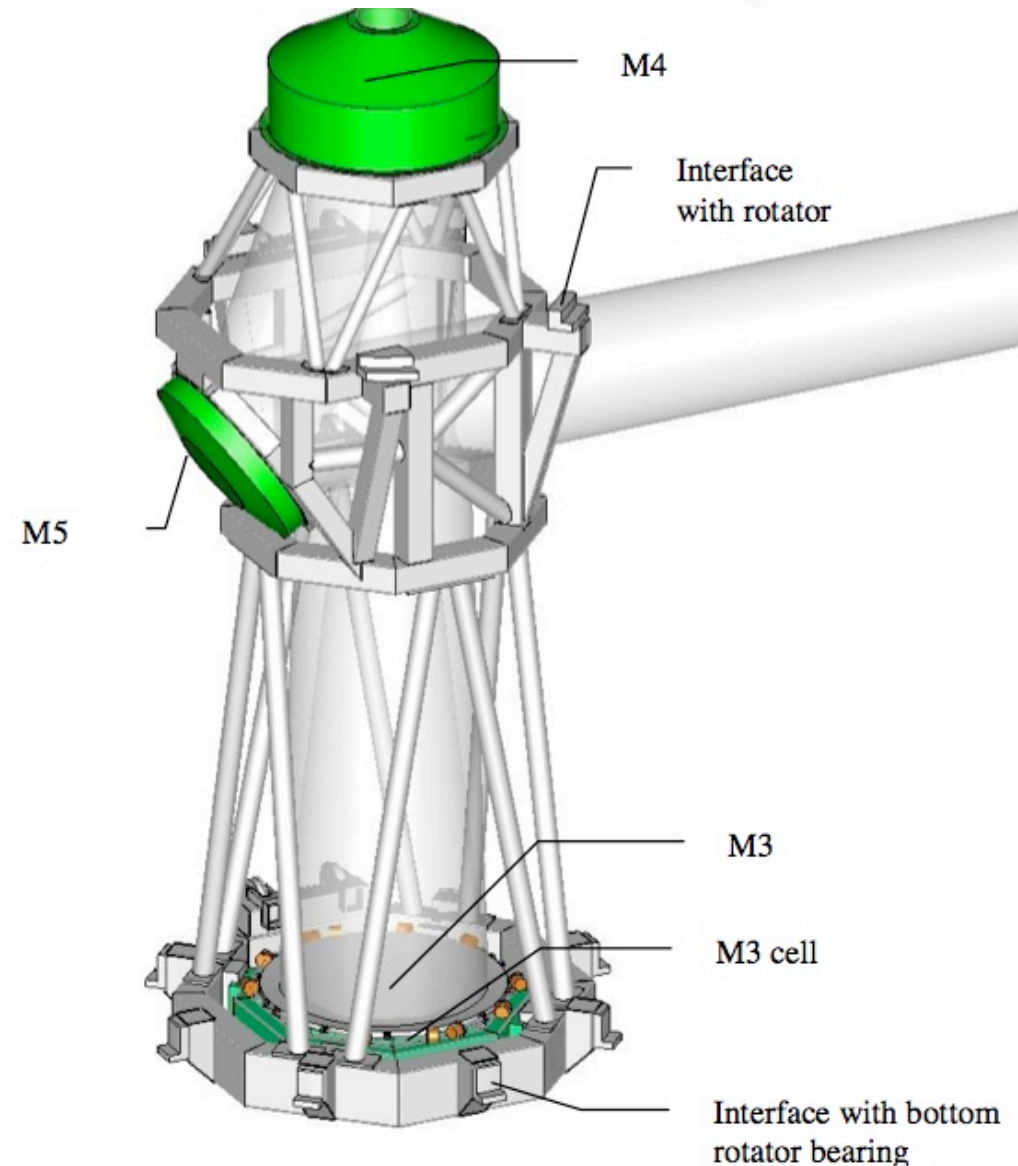


Cross Altitude Mode 2.1 Hz





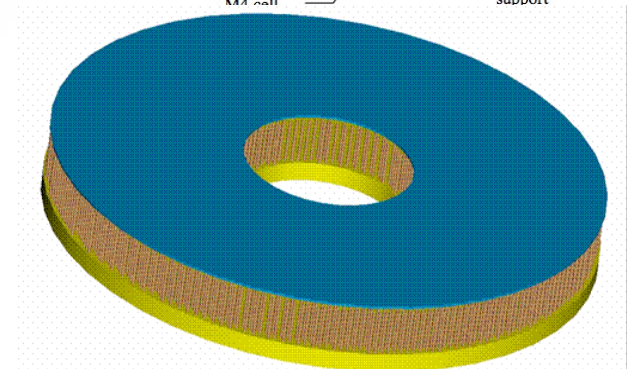
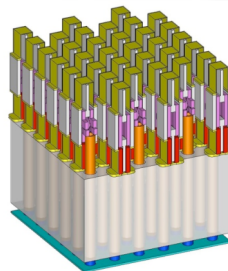
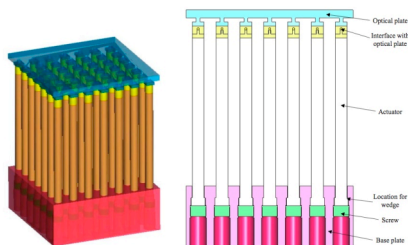
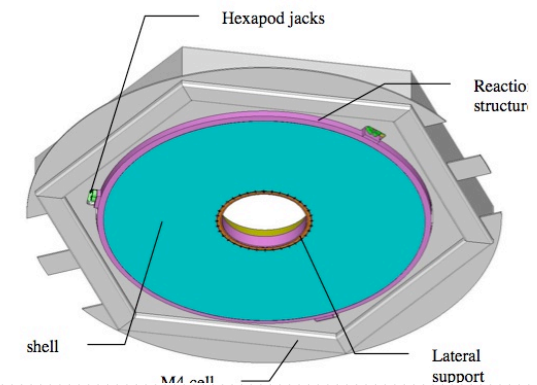
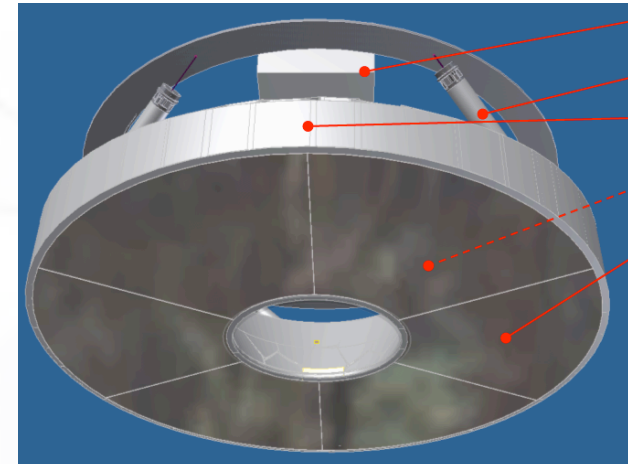
An Adaptive Telescope





powerful adaptive mirrors

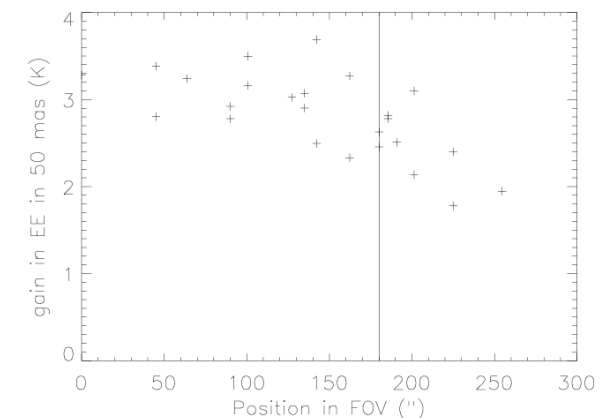
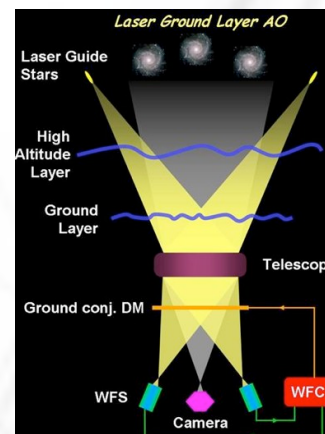
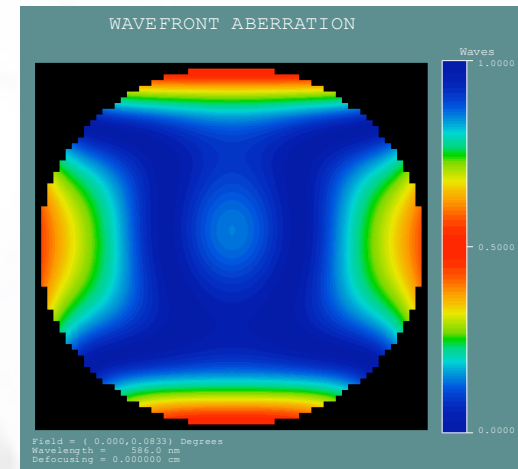
- Separating field-stabilization (telescope) from adaptive optics (atmosphere) giving bandwidth and stroke to the global system.
- A clear evolutionary path towards more and more actuators. 30 mm pitch, 20 mm pitch, (15 mm pitch?) at affordable costs and schedules.
- Designed to cope with bad seeing.





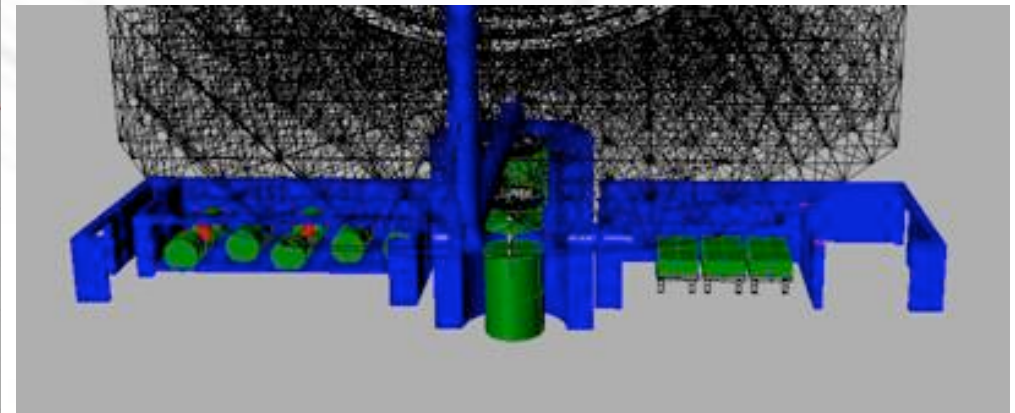
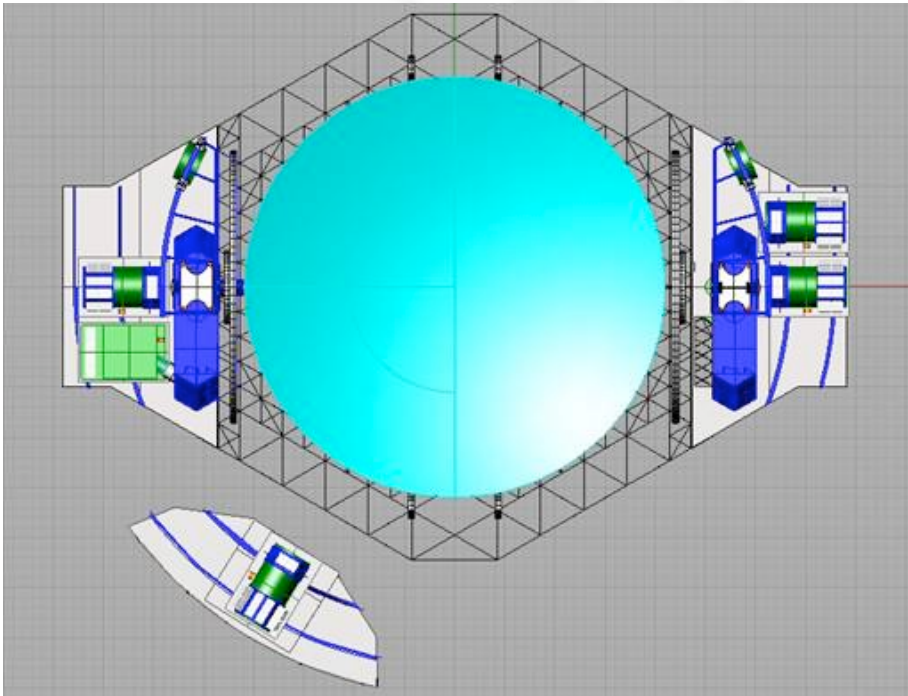
An Adaptive Optics friendly telescope

- Friendly to the lasers (low aberrations)
- Friendly to the post focal systems (takes the ground layer out and reduces stroke)





A telescope with places to put both big and small instruments and with a coude



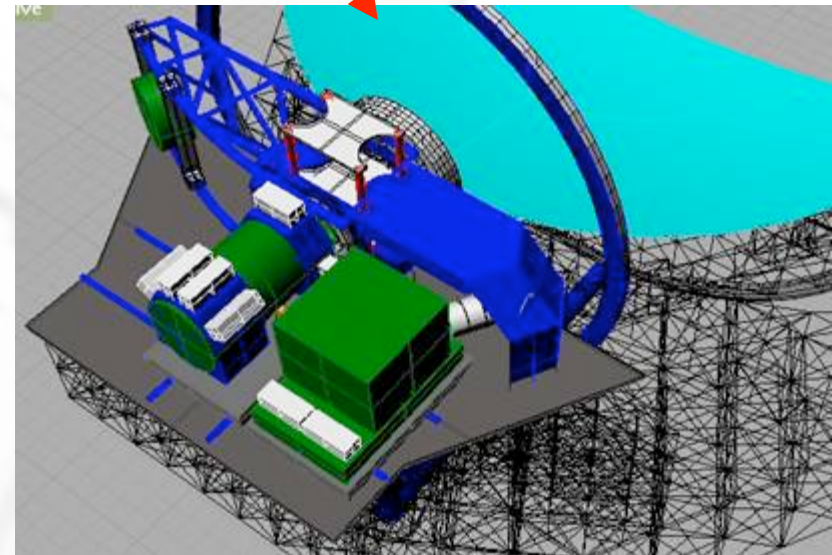
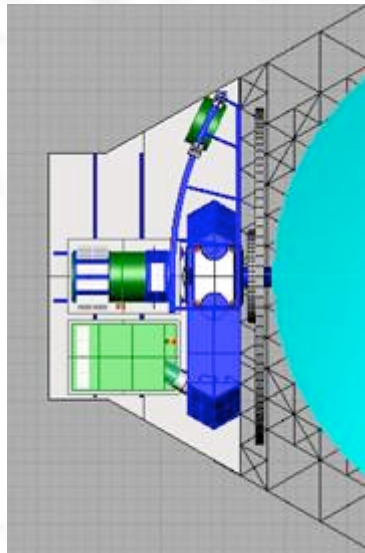
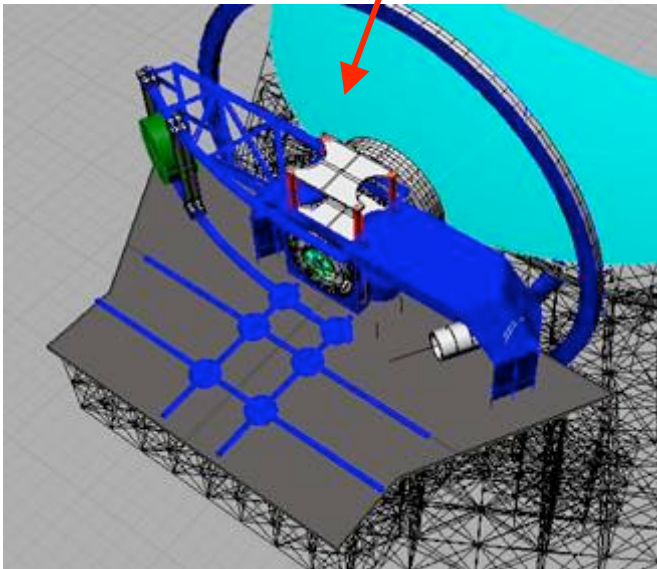


OBSERVATORY – INSTRUMENT INTERFACES

POPULATION OF ONE NASMYTH FOCUS

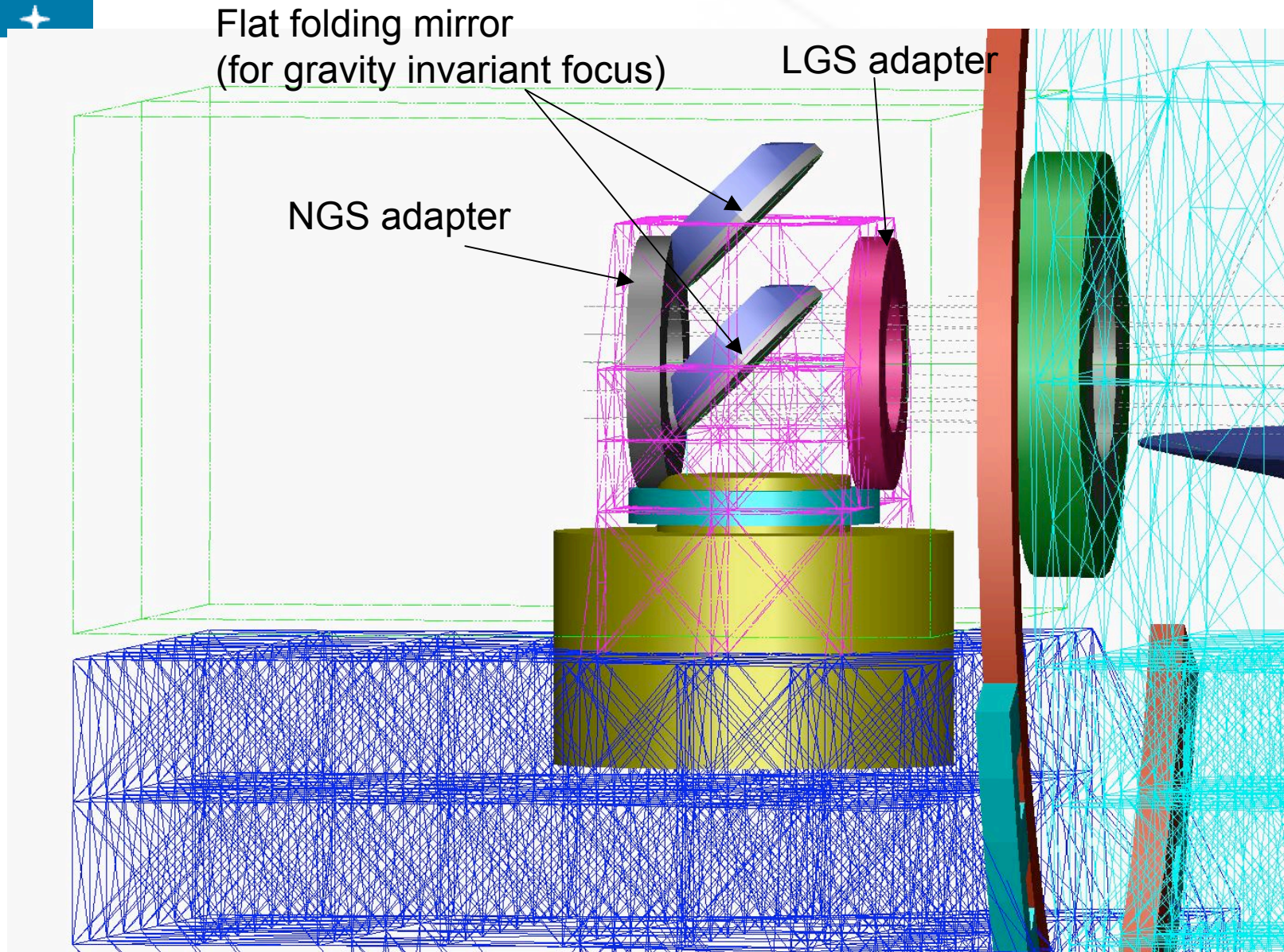
Nasmyth A with AO adators and instrument platform tracks

configuration with 2 instruments and the Test Camera on the platform





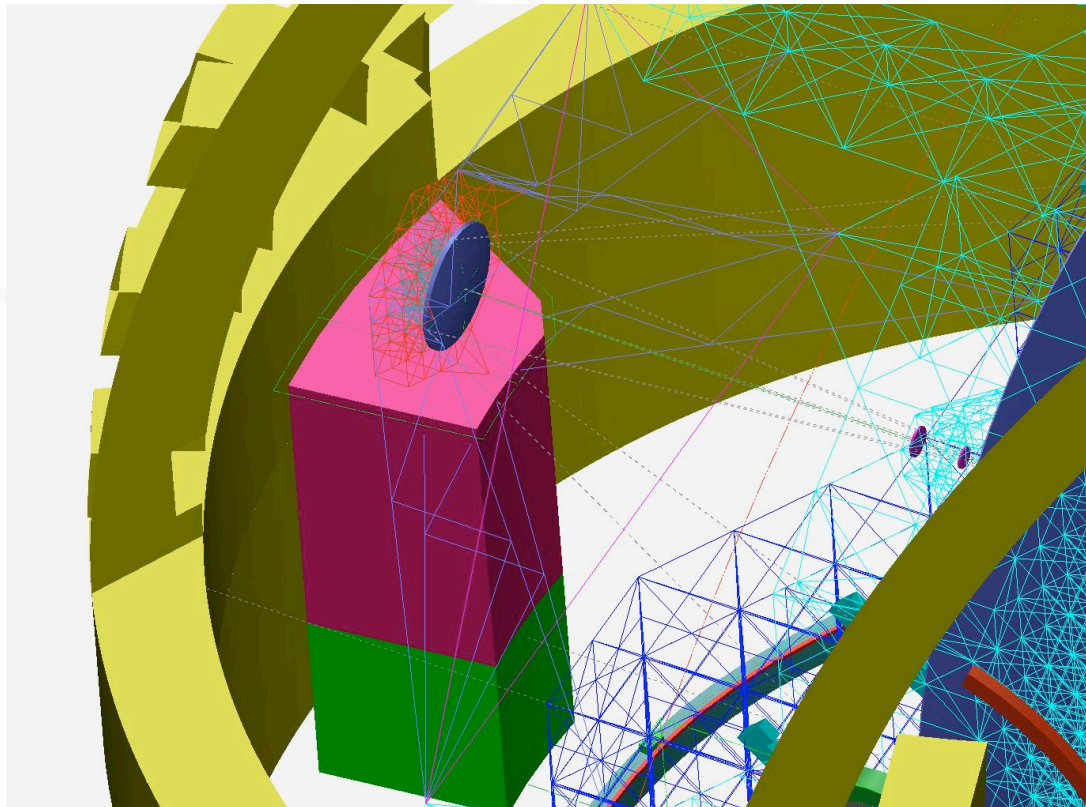
Nasmyth f/16





Operation and maintenance:

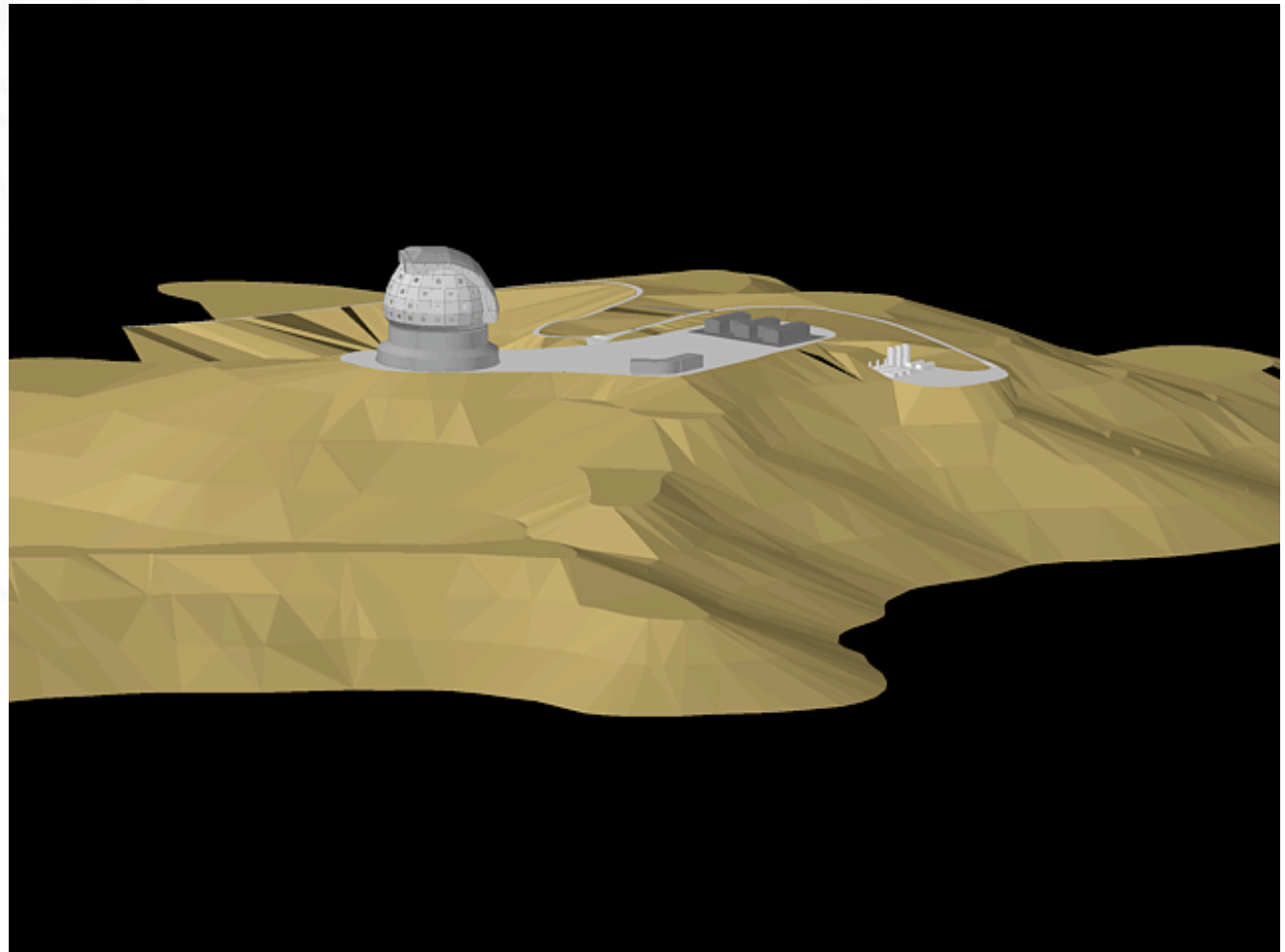
- Hydraulic lift built into the enclosure
- Suitable for M2 and instruments
- Fits into the enclosure





Infrastructure

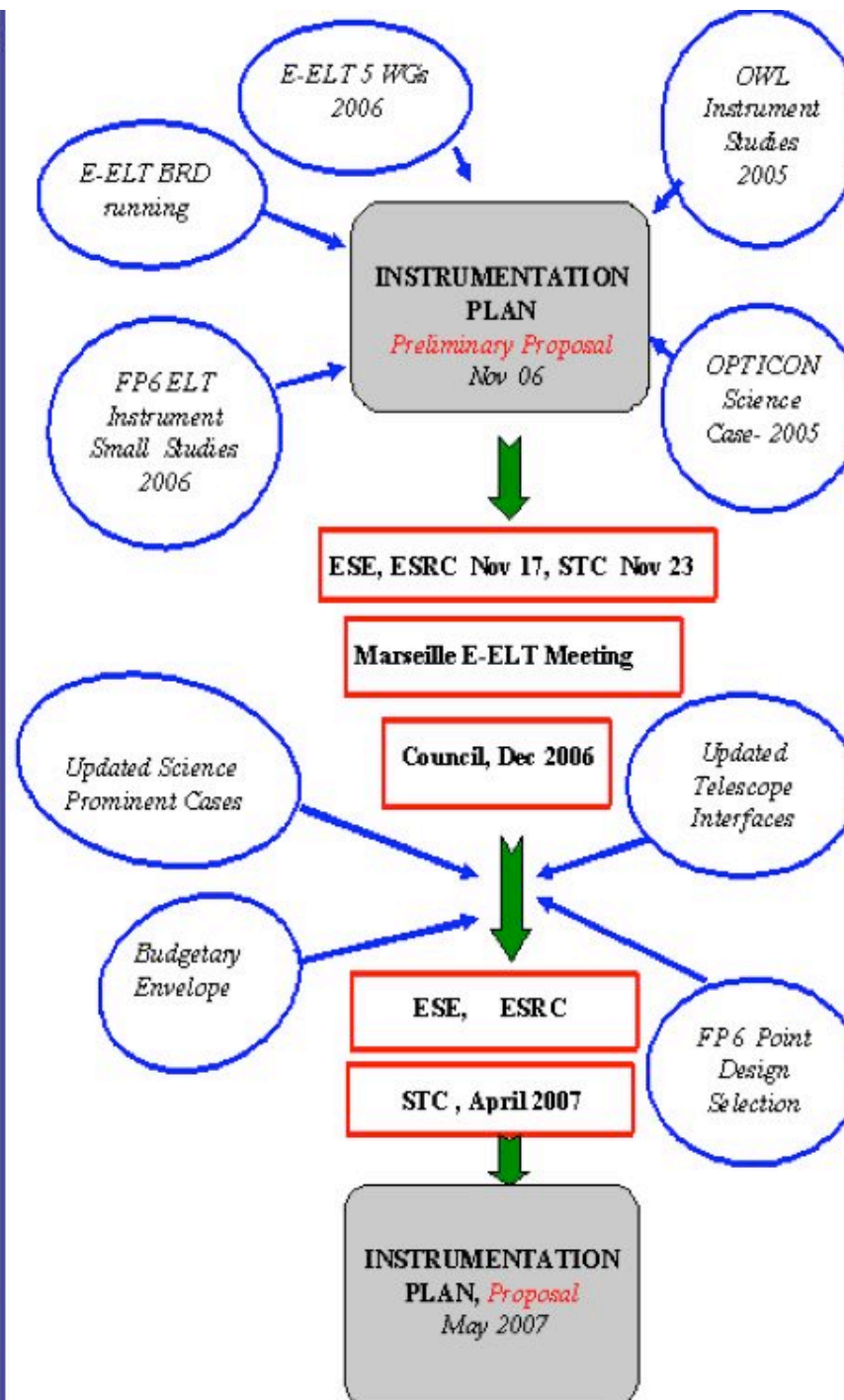
- The infrastructure plan includes
 - 10 km of paved road
 - 6 MWatts of local generated power
 - Water capacity of 500 cubic metres
 - Telecommunications in and out of the site
 - Accommodation for 100 staff
 - Control building and laboratories separated from the dome.
 - Temporary accommodation during construction.





le ploton at
start


ROADMAP TO THE E-ELT INSTRUMENTATION PLAN (11.2006-5.2007)





DRAFT

High Priority Instrument Batch : *candidates for 1st generation*

INSTRUMENT	OBS. MODES	FOCUS / AO *	WAV. RANGE (μm)	FIELD 	PIXEL SIZE (mas)	$\Delta\lambda / \lambda$	PROMINENT SCIENCE CASES +	REF. STUDY
DL, NIR Imager	imaging	Nasm./LTAO , MCAO	0.9-2.5	>30"	4	wide, n. bands	~ all	ONIRICA @ OWL
Narrow Field Spectrograph	spectroscopy	Nasm./SCAO , LTAO	0.6- 2.5	1"/ 10":	20/ 50	3000, 20000:	~ all	Not studied
High Resolution Vis Spectrograph	spectroscopy	Coude/ GLAO	0.4 -0.8	Point source	=	150000	C2, C7	CODEX
Planetary Imager Spectrograph	imaging, spectroscopy	Nasm/ EXAO	0.6-1.75	~2" V ~4" H	>= Nyquist	>15	S3, S9	EPICS
NIR MOS	Spectroscopy multiplex.20	Grav. Inv./ MOAO	0.8-2.5	>= 5'	30 - 50	3000, 10000:	C4, C10	WFSPEC, MOMSI
NIR MOS ,DL	Spectroscopy multiplex 20	Grav. Inv. or Nas/MCAO	0.8- 2.5	>30"	10 - 30	3000 , 20000	G4, G9	MOMSI
MIR Imager	imaging (+limited spectroscopy)	Nas or IF/ SCAO or LTAO	3-20	30"	6 - 20	w-n bands,	S3, S9, S5, G9, C10	MIDIR

* Minimum Strehl or EE to be specified ; +: from Science WG Report <http://www.eso.org/projects/e-elt/publications.html>



Fishing Pond : *instruments concepts still to be investigated for the 42m, or not yet firmly associated to prominent science cases*

INSTRUMENT	OBS. MODES	FOCUS/ AO	WAV. RANGE (μ m)	FIELD	PIXEL SIZE (mas)	$\Delta\lambda / \lambda$	SCIENCE CASE	REF. STUDY
Wide Field NIR Imager	Imaging	Nasmyth/ GLAO, LTAO	0.8 – 2.5	> 5' x 5'	50	Wide,narrow bands	C4,C10,S5,G4	ONIRICA @ OWL
High Time Res. Imager	Fast photometry	NASMYTH/ GLAO, SCAO	0.4 - 0.8	2 times (2" x 2")	tbd	Wide, narrow bands	Photon stat., rapidly varying phenomena	QUANTEYE @ OWL, HTRI
High Res. IR Spectrog.	HR spectroscopy	coude/ SCAO,LTAO	0.8 – 1.8 (5)	<1"	tbd	150000:	S9, G4, G9, C7	HYSPEC
High Res. MIR Spectrog	HR spectroscopy	Nasmyth/SCAO,LTAO	3 – 20:	2" :	tbd	50000:	S9, G9, C7,	MIDIR
Polarimeter*	Imaging, spectroscopy	IF, Nasmyth? / GLAO, LTAO:	0.35- 0.8	tbd	tbd	W-n bands,LRS	S9,C7,	No study
MOS Visual	MR spectroscopy	Nasmyth/ GLAO	0.35 – 1	~ 6' x 6'	100:	1000-15000:	C10, C4,G4	No study
Wide Field Visual Imager	Imaging	Nasmyth/ GLAO	0.35- 1	~7' x7'	50-100:	Wide bands	C10, C4,G4	No study
Sub-mm Imager	Imaging	Nasmyth/ tbd	350-450-850	5'	1- 2.5"	Wide Bands	C10	SCOWL, SCELt

* : Polarimetry can be included as an observing mode in other instruments, if required by their respective science cases



Phase B

- What is phase B?
 - Move the conceptual design endorsed by STC, ESRC, Marseille and Council into the preliminary design phase.
 - 57 Million Euro in manpower and cash.



The ESO finance committee

- Representation from the member states
- All contracts above 150,000 Euro have to be approved by the Finance committee
- Finance committee meets twice per year. May and November.



Cheapest technically acceptable offer.

- When we ask for a VW we will buy the cheapest VW that is offered. Even if a Rolls Royce is offered for only 1 Euro more, we will take the VW.

ESO's collaboration with Industry

Schott



Zeiss

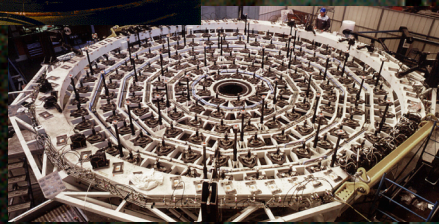
Fokker
TNO/TPD



REOSC



Skanska

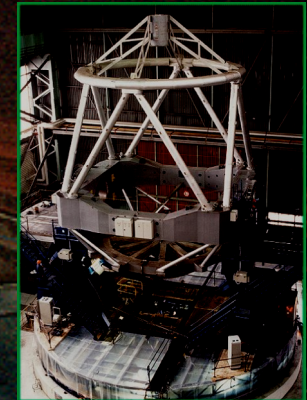


SOIMI

Linde

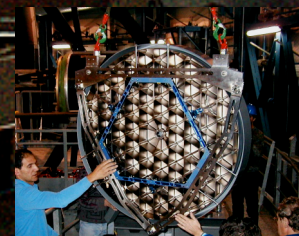
Cegelec

Ansaldo AES



AMOS

Dornier



Collaboration with Industry has been a key factor for the success of the VLT



What happens in phase B?

- Concepts are generated either in house or contracted out.
- Concepts form the basis of preliminary designs that are contracted out.
- Current calls:
 - One or more 5.2 million M4 PDR
 - One or more 1.2 million M5 (mechanics) Concept
 - One or more 0.5 million Main structure concept verification
 - One or more 0.5 million Enclosure concept
 - One or more 0.15 million segment support concept



What are we doing now?

- Tweaking of optical and mechanical designs
- Integrated modeling
- FP6 WEB, APE, edge sensors, site, actuators
- Preparation of M2 mirror cell concept
- Preparation of M3 mirror cell concept
- Optical manufacturing conceptual designs (primary mirror)
- Optical manufacturing conceptual design (secondary mirror)
- Preparation of Adapter/rotator concepts
- Preparation of control architecture concept
- Development of Design Reference Missions to evaluate design/science tradeoffs.
- M5 mirror concept study
- Additional/alternate cost estimates
- Project structure definition, work breakdown structure, management plan, cost evaluation plan, interface definition, error budgets...
- Requirements definition (DOORS)

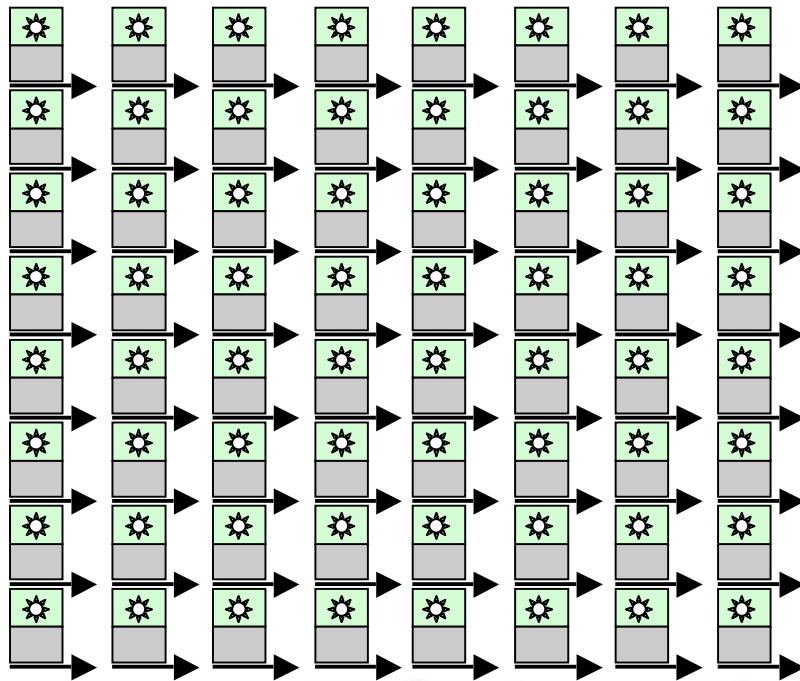


R & D in phase B

- Development required/ongoing (e.g. FP6) in
 - Larger adaptive mirrors (DMtec0, DMtec1)
 - Actuators for deformable mirrors
 - Actuators for primary mirror
 - Edge sensors (capacitive/inductive/direct)
 - Better wavefront sensing detectors
 - Phasing sensing techniques (APE)
 - Observing techniques with multiple lasers
 - Fast computers for AO
- Research in:
 - better lasers (fibre lasers)
 - Better algorithms for AO
 - Alternate mirror substrates (for adaptive thin shells and secondary mirror)
 - Higher density large adaptive mirrors



WFS detectors: Small CCD per Spot

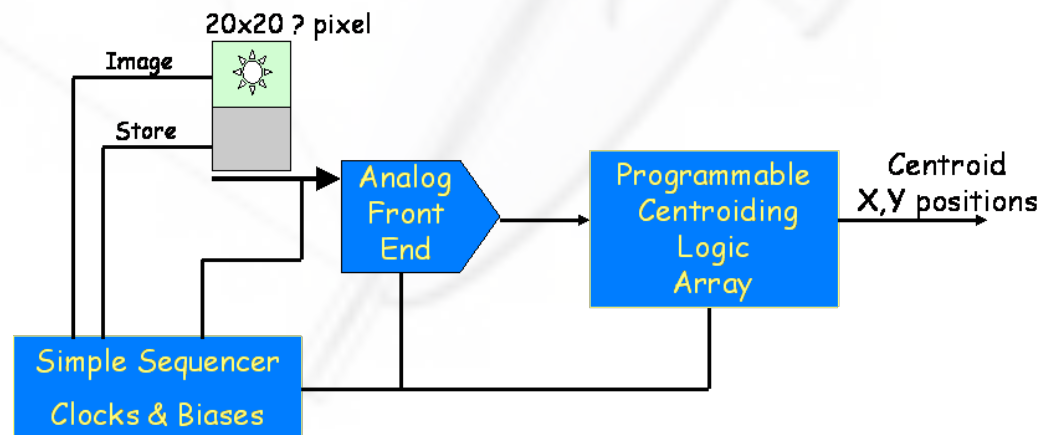


LGS WF sensing to Univ. Durham

+

Feasibility study of a "LGS" WFS detector being launched (ELT-DS)

- LGS WF sensing requires new detector
- Complete CCD (20x20) per spot
- Modest pixel read out speed → low RON
- On chip sequencer & centroiding
- Integral Electronic Shutter (Exposure times of 1-2 μ s) to 'freeze' the laser pulse





R&D for instrumentation

- XAO
- coronagraphy
- MOAO
- Large focal plane arrays
- Intelligent focal planes
- New observing techniques
- Novel instrumentation



Phase B tentative schedule

- May 07 finance committee
 - Contracts for M4, M5 (mechanics), enclosure, main structure and mirror support
- October 07 review
- November 07 FC
 - Contracts for M2 cell, M1 segments, M2 test setups, adapter/rotator concepts. M5 mirror conceptual design.
- May 08 FC
 - Preliminary design contracts for main structure and enclosure. Laser launch system concepts
- November 08 FC
 - Preliminary design contracts for adapters, conceptual design for site facilities.
- February 09 review
- October 09 cost validation review



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Or talk to Paloma and she will help you find us.