

The Large Sky Area Multi-Object Fiber Spectroscopic Telescope Project (The LAMOST Project)

The Chinese National Big Science Program

The LAMOST Project Organization

Chinese Academy of Sciences

National Astronomical Observatories

Chinese Academy of Sciences

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Homepage: <http://lamost.bao.ac.cn>

A meridian reflecting Schmidt telescope

Main features

- unique in combining large aperture (4-meter) with wide field of view (5-degree)
- unprecedented 4000 fibers spectroscopy

Technical innovations

- active optics for segmented thin mirrors
- parallel controllable fiber positioning

Performance

- spectroscopic survey telescope of the highest spectrum acquiring rate — 4000 spectra of objects down to 20.5 magnitude with 1 nm spectral resolution in 1.5 hours exposure, to breakthrough the bottleneck of ever-increasing need for spectroscopic observation in astronomy

Science: wide field and large sample astronomy

- extra-galactic spectroscopic survey — large scale structure of the universe and physics of galaxies
- stellar spectroscopic survey — structure of the Galaxy and stellar physics
- cross identification of multi-waveband surveys

Location

**Xinglong Station,
Beijing Astronomical Observatory,
Chinese Academy of Sciences**

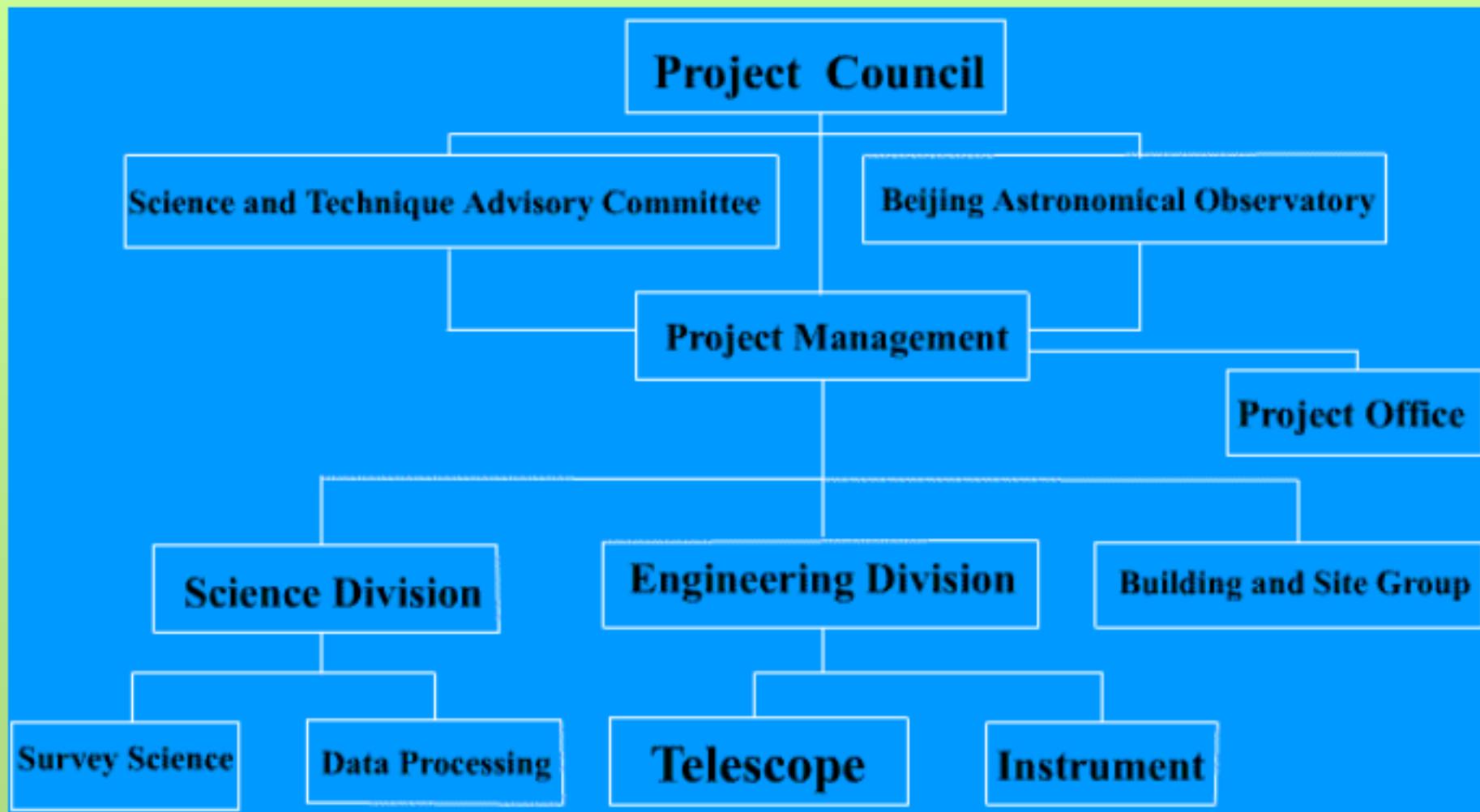
Cost

RMB 235 Million yuan (~\$30M)

Construction Period

7 years (1997 - 2004)

Project Organization

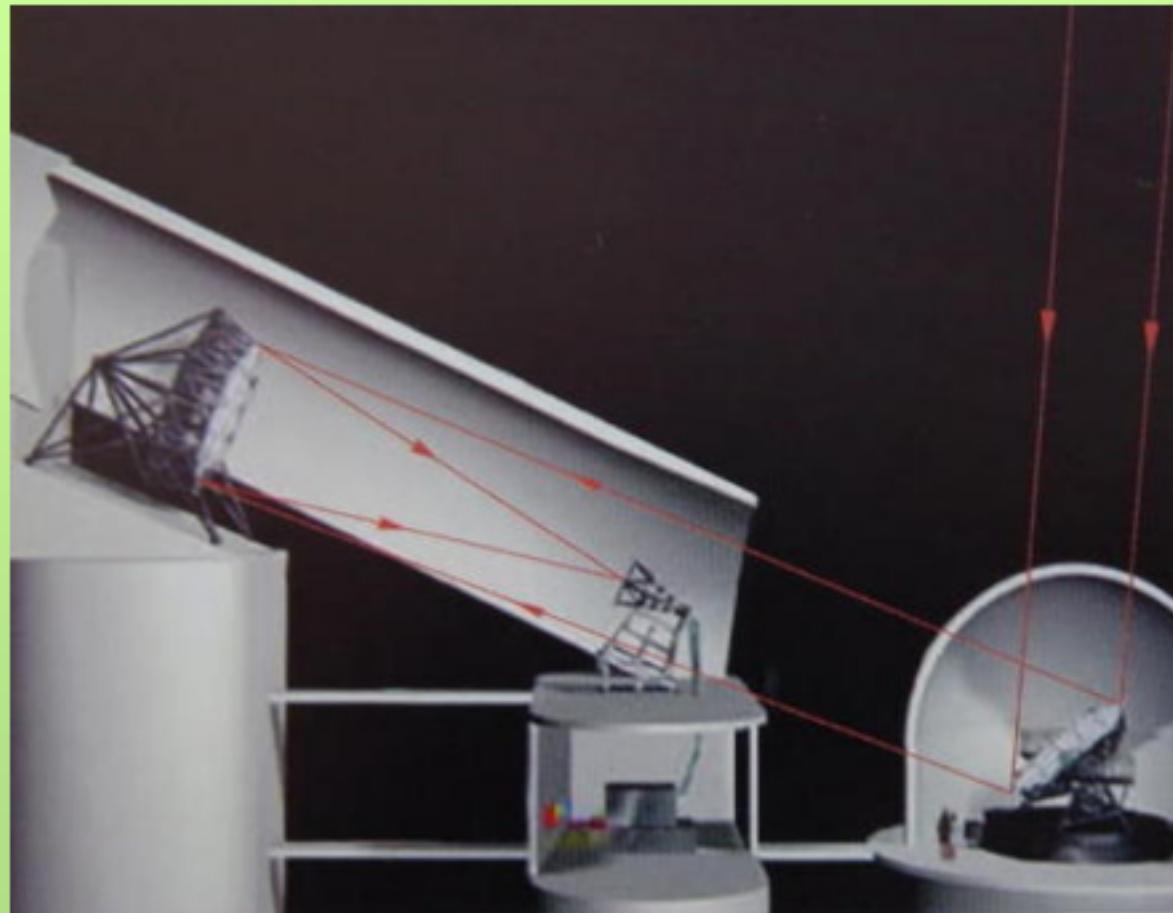


Present Status

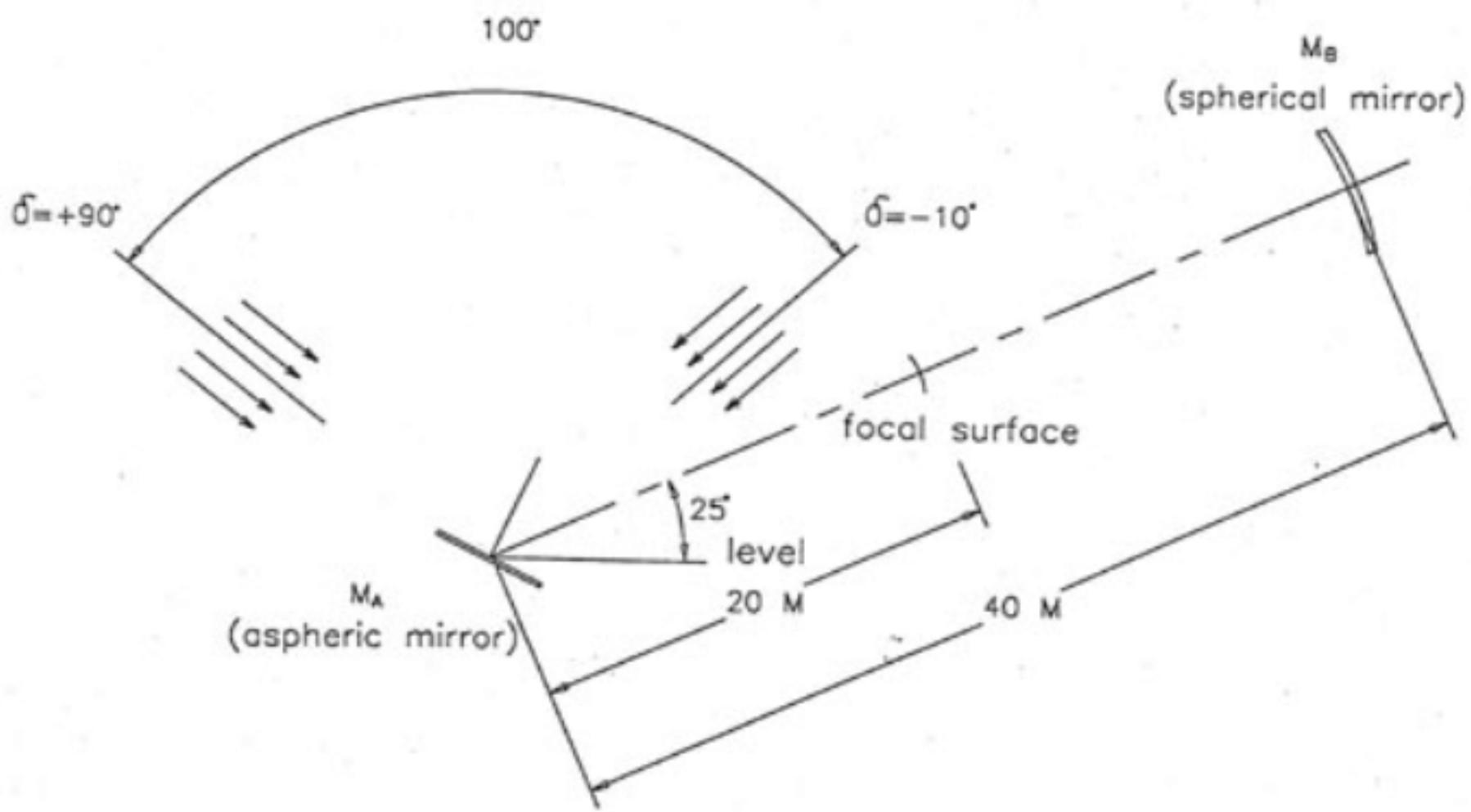
	<u>reviewed</u>	<u>approved</u>
Proposal	Nov. 1996	Apr. 1997
Feasibility Study	Jul. 1997	Aug. 1997
Preliminary Design	Apr.-May 1999	Jun. 1999
Detailed Design		2000
Building		2001-2004
First Light		Dec. 2004

Subsystems of LAMOST

1. Optical
2. Active optics & support
 - Active optics
 - supporting
3. Mounting & tracking
4. Telescope control
5. Instruments
 - fibers
 - fiber positioning
 - spectroscopes
 - CCDs
6. Enclosure
7. Observatory control & data processing
8. Input catalogs & survey strategy

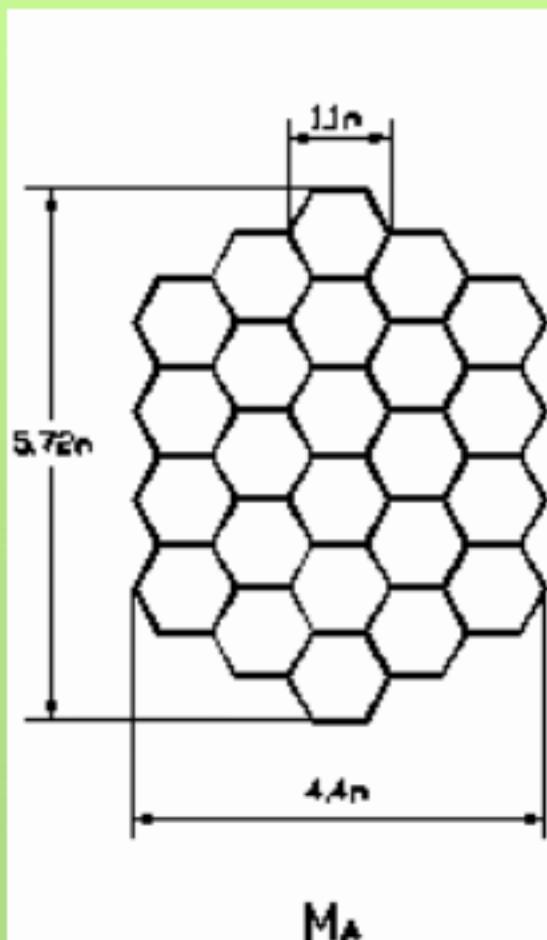


Optics

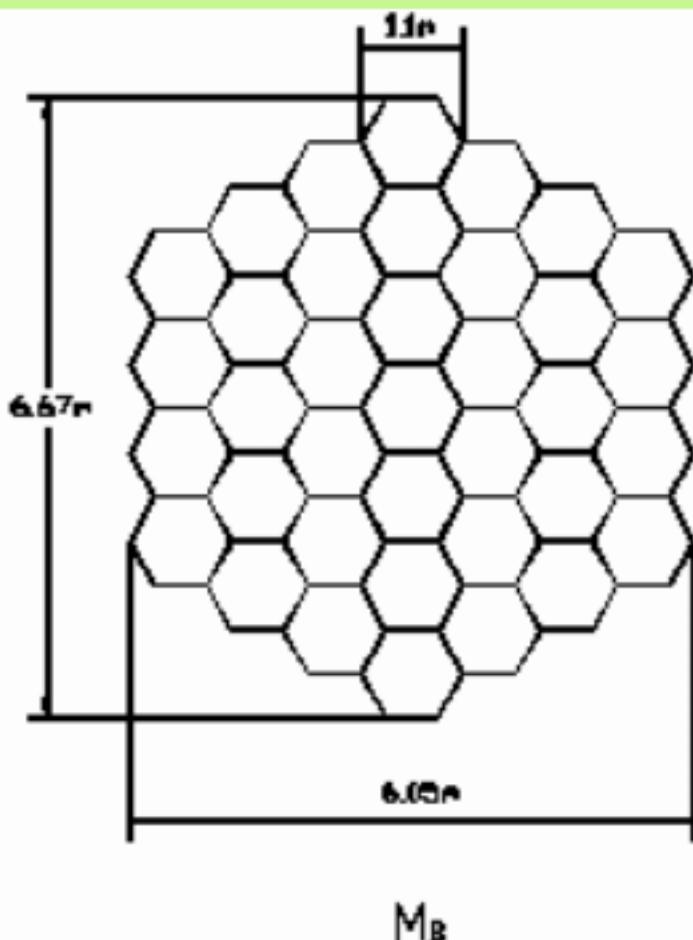


M_A : reflecting corrector

M_B : spherical mirror



M_A

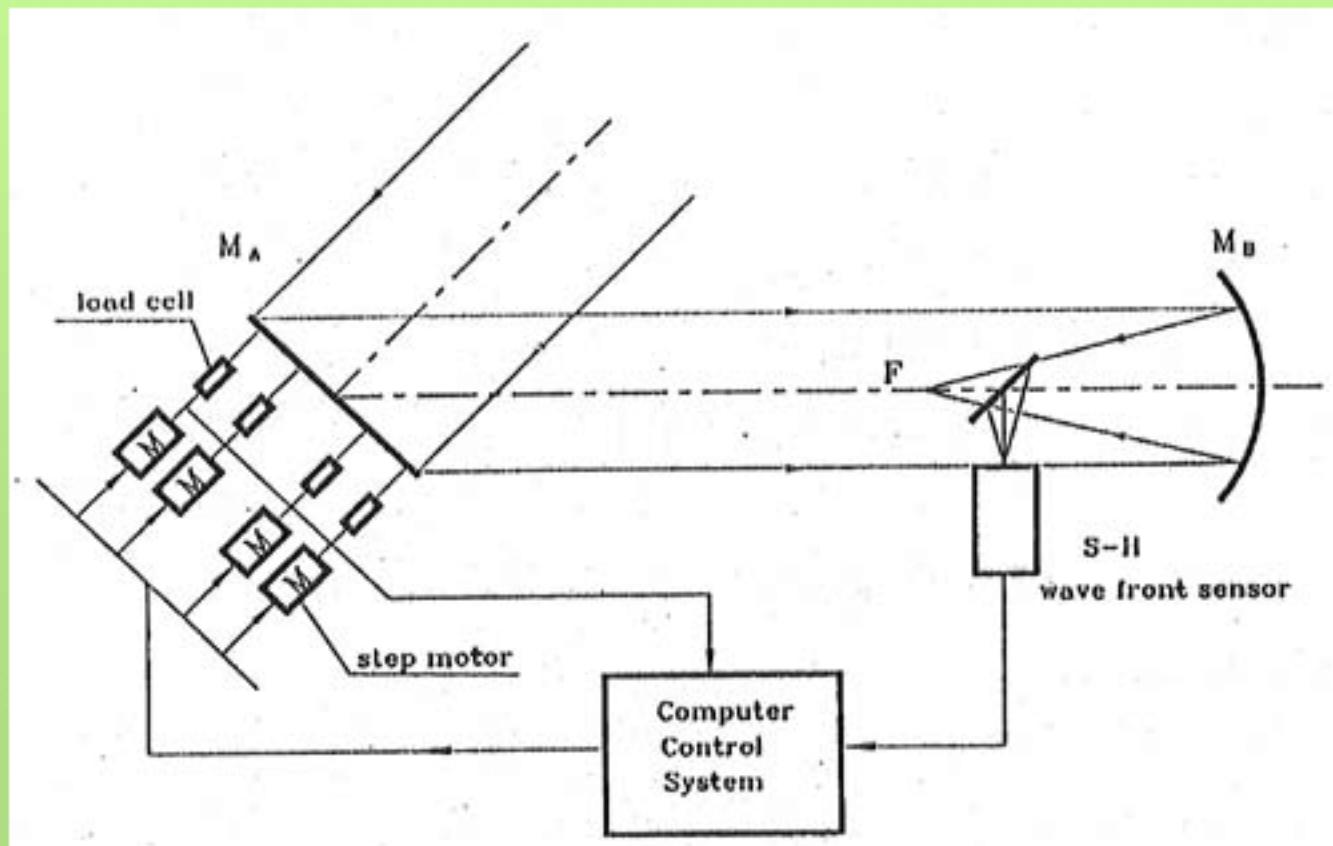


M_B

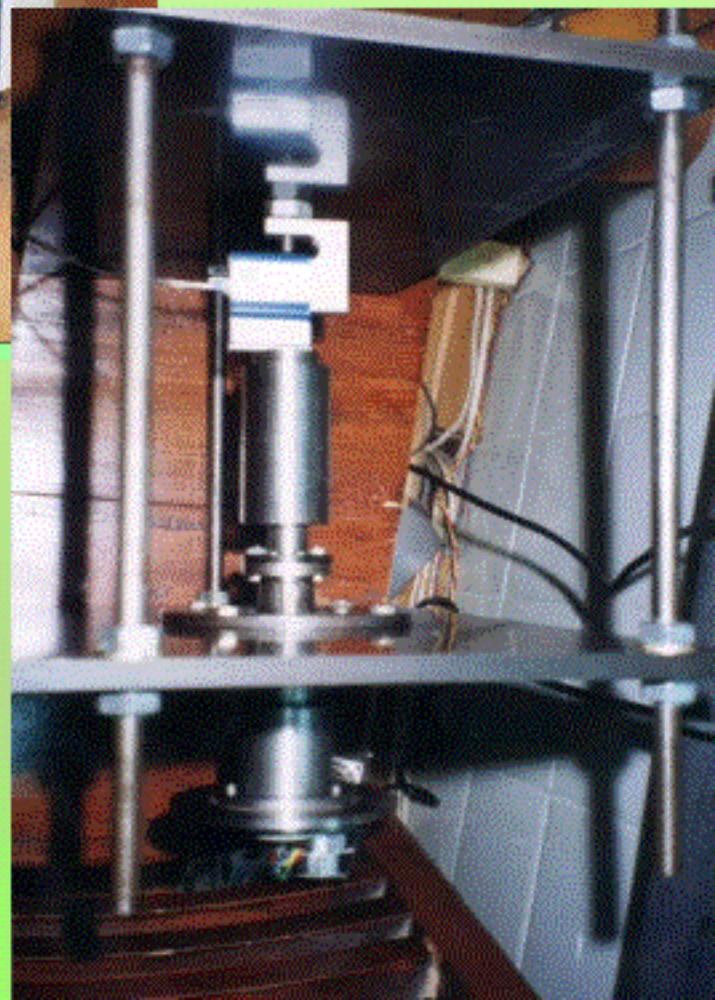
Active optics & supporting

Active Optics

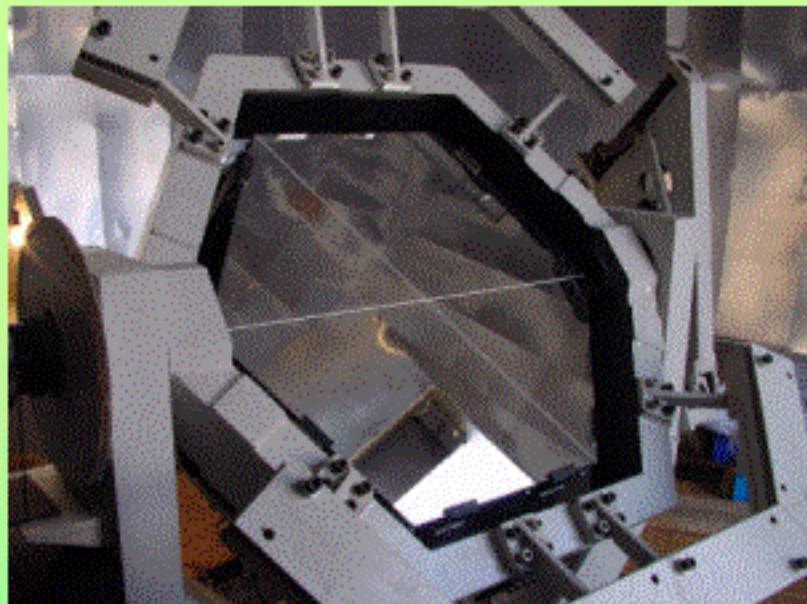
$$t = \frac{1}{64f^3 \cos\theta} \left[(y^2 \cos^2 \theta + z^2)^2 - 2K r^2 (y^2 \cos^2 \theta + z^2) \right]$$



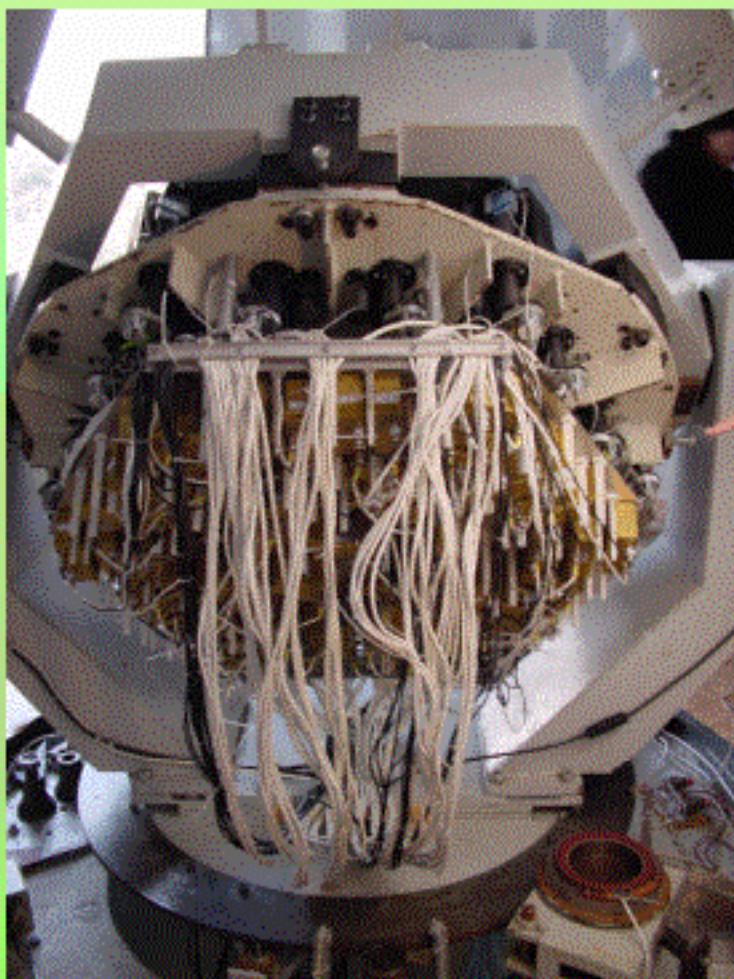
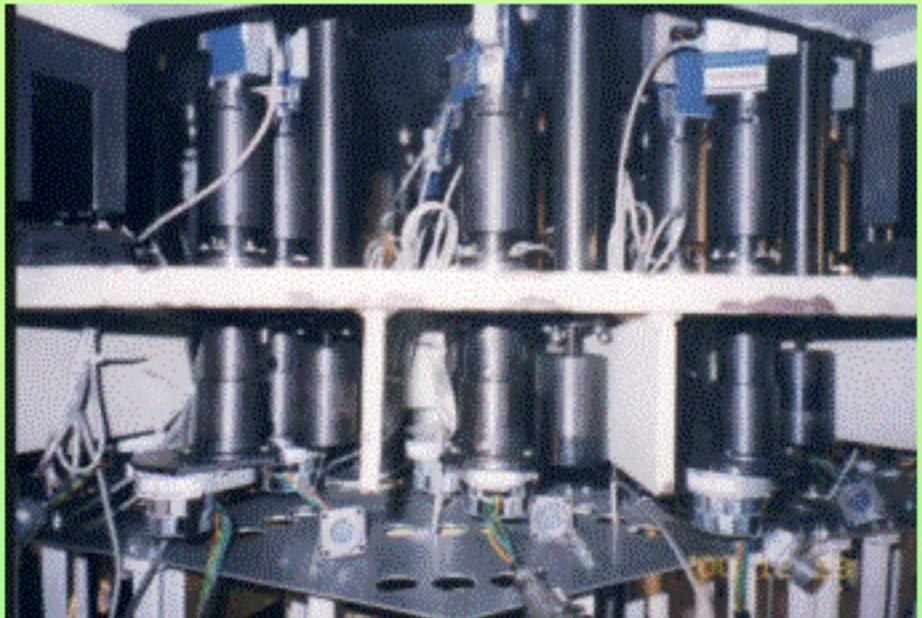
Tests for active optics in Lab



Tests for active optics in outdoor (1)

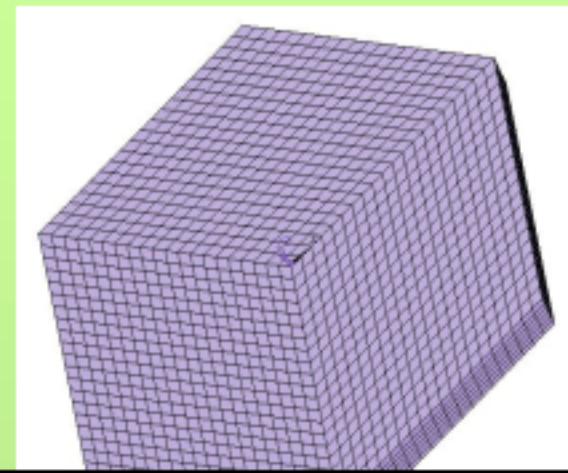
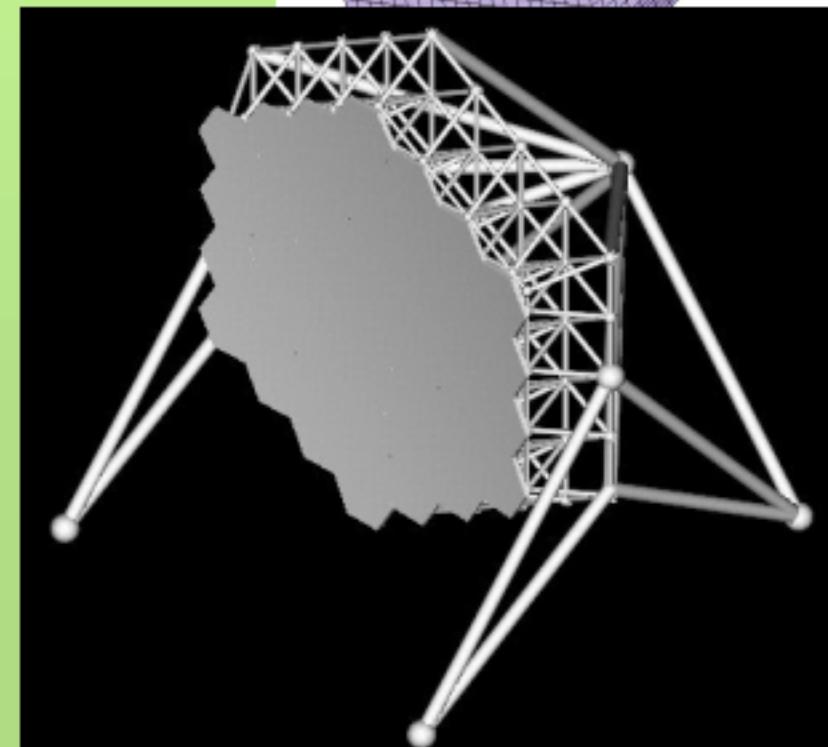
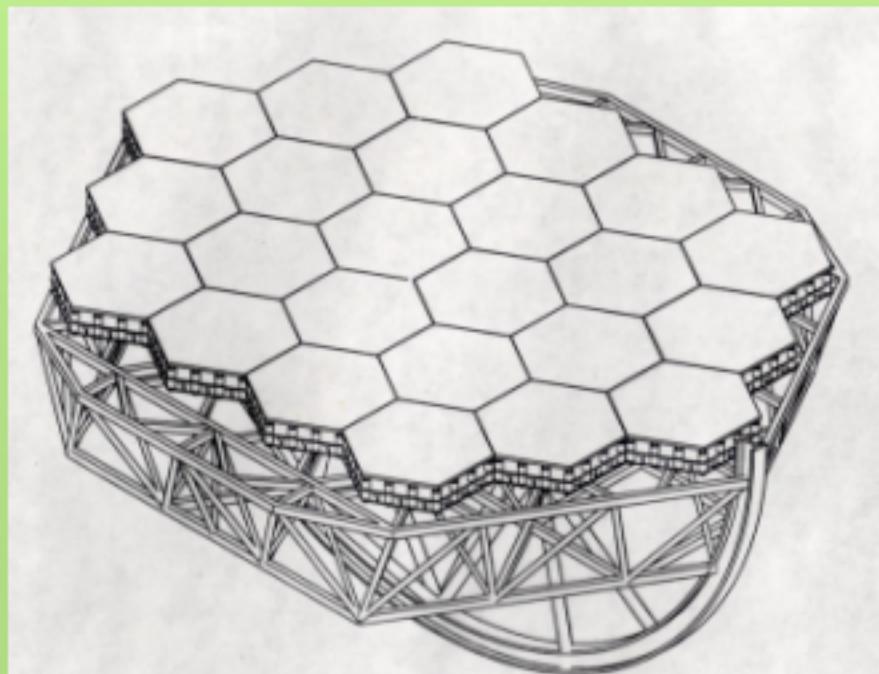


Tests for active optics in outdoor (2)



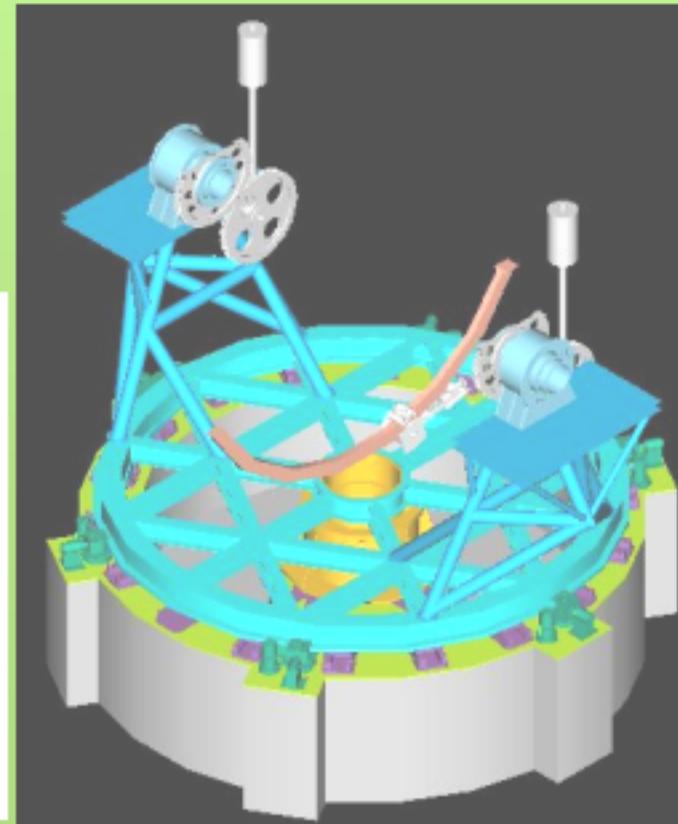
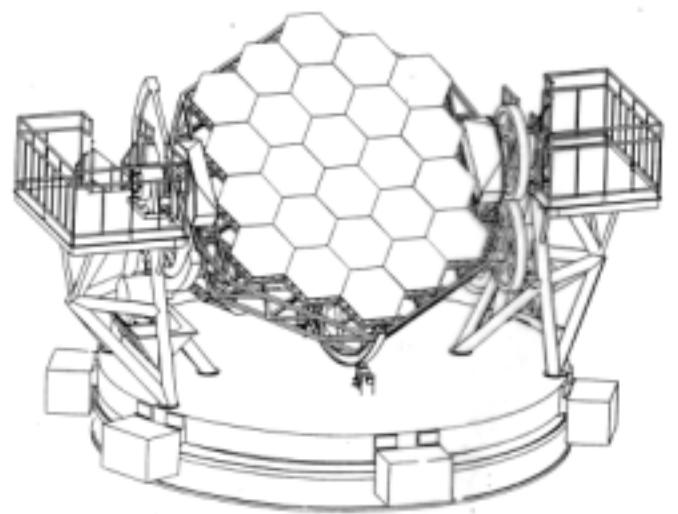
Active optics & supporting

Mirror Supporting

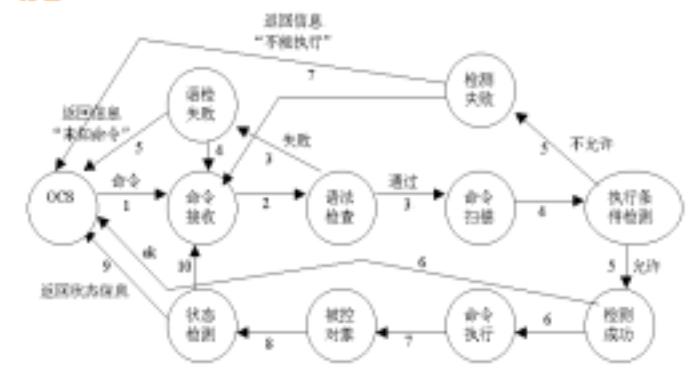
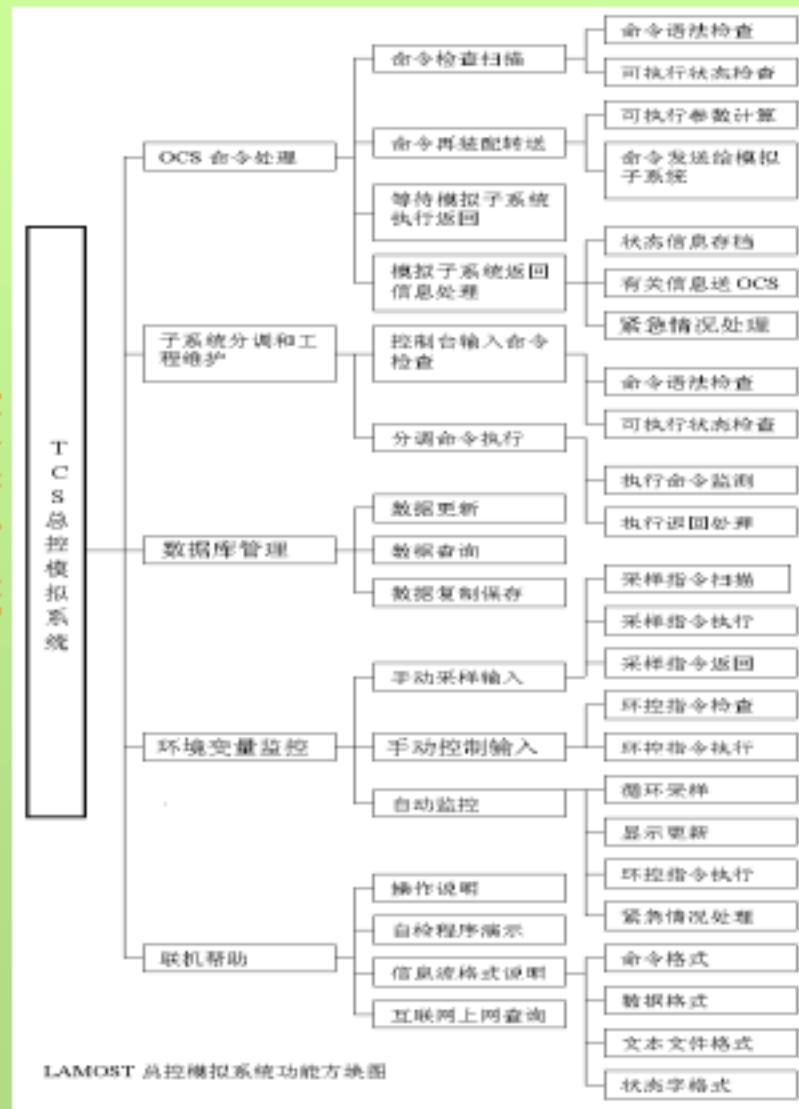


Mounting & tracking

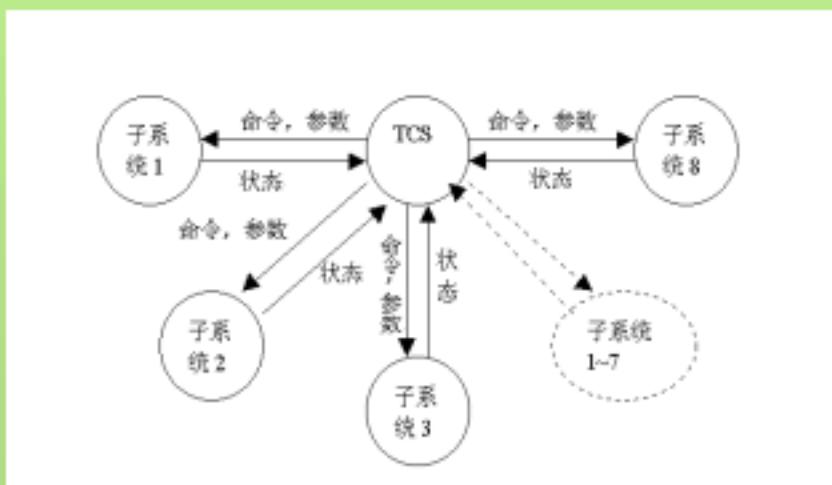
- M_A mounting
- Focal plane



Telescope control



TCS和各子系统之间的接口数据流

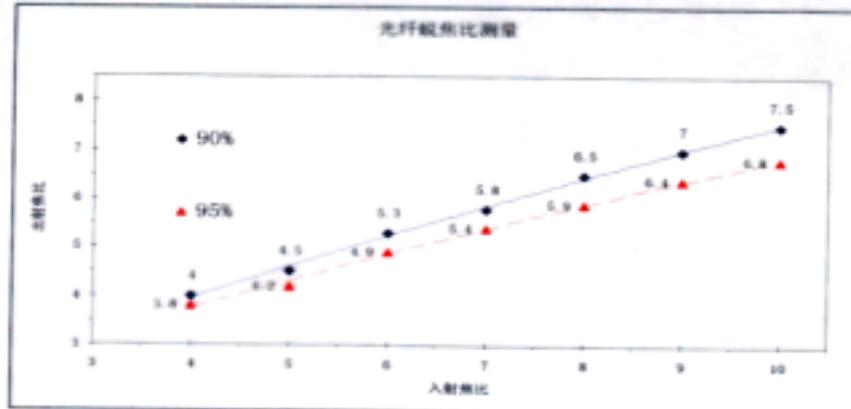
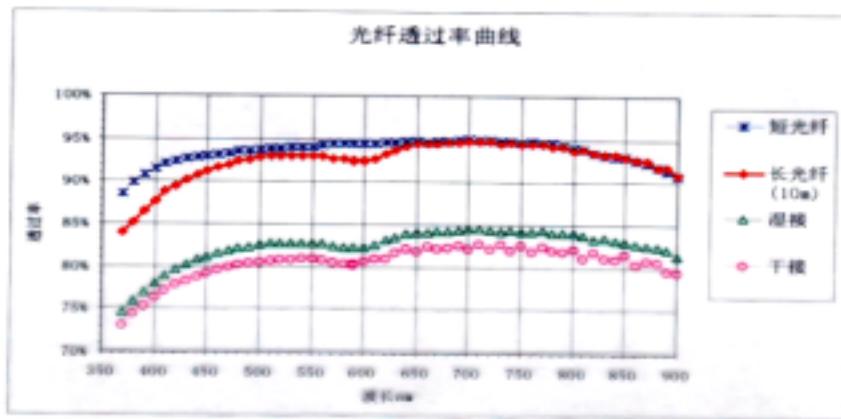


Instruments

Fibers

LAMOST 之光纤性能测试结果

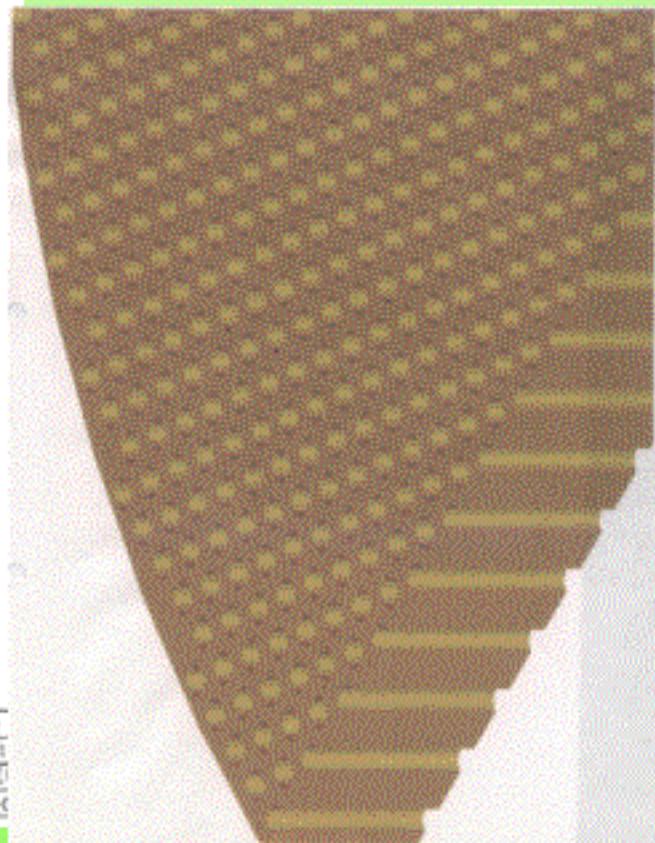
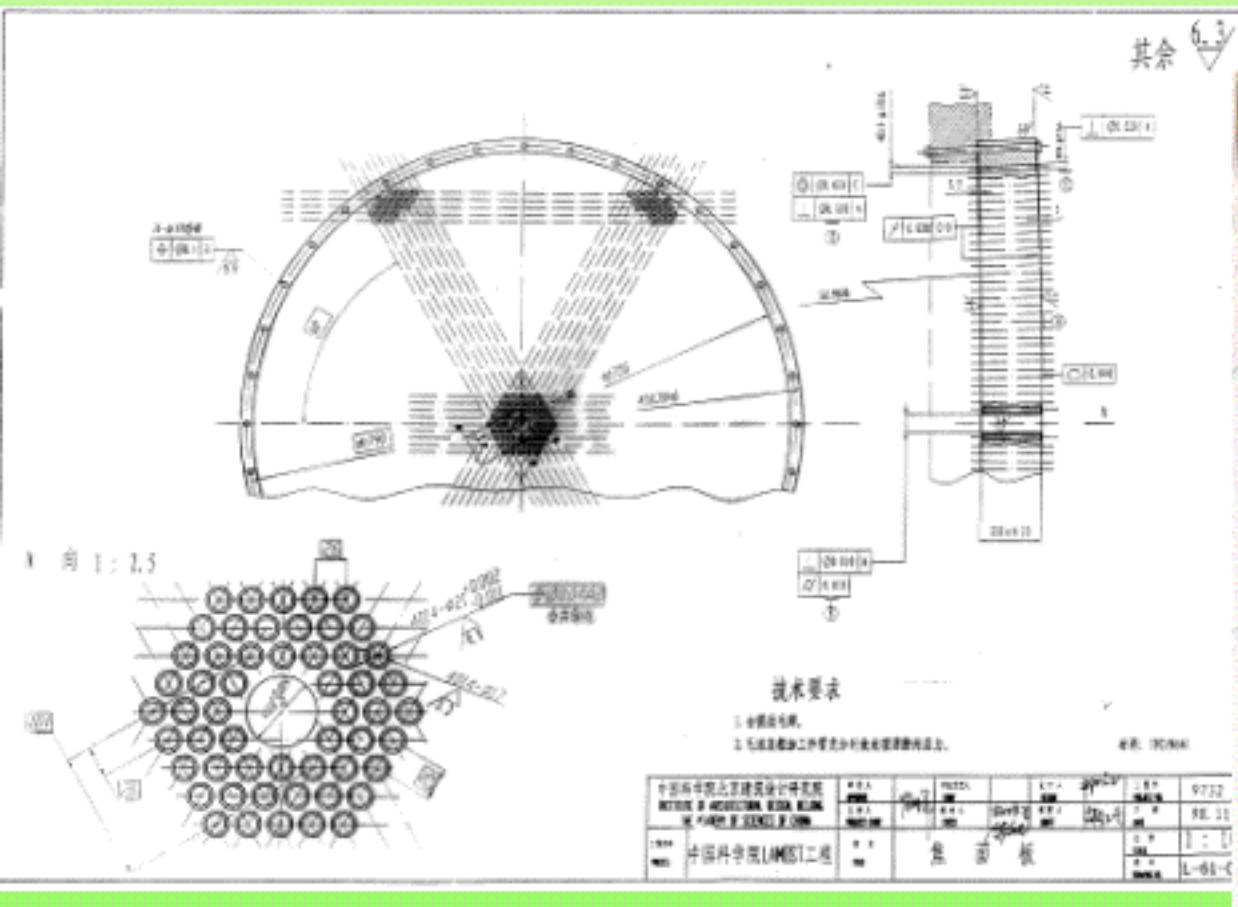
材料		光纤			Buffer 类型	制造者		
STU 石英	生产者 Heraeus	直径(微米)						
		core	cladding	buffer				
		320	340	380	硬	Polymicro		





Fiber
positioning
unit

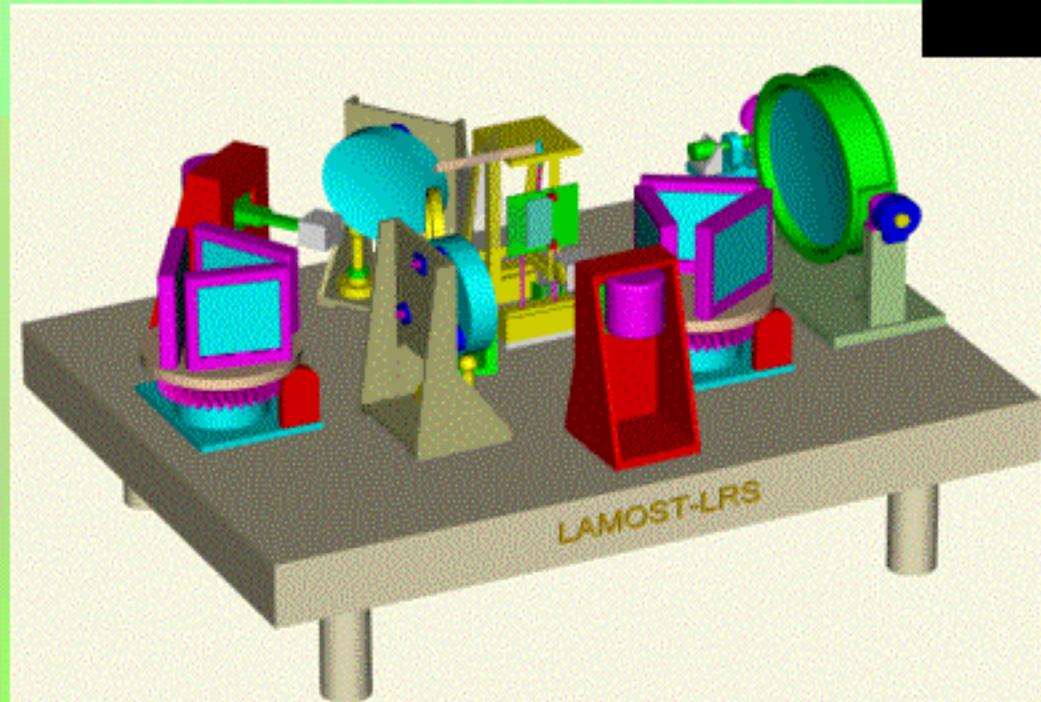
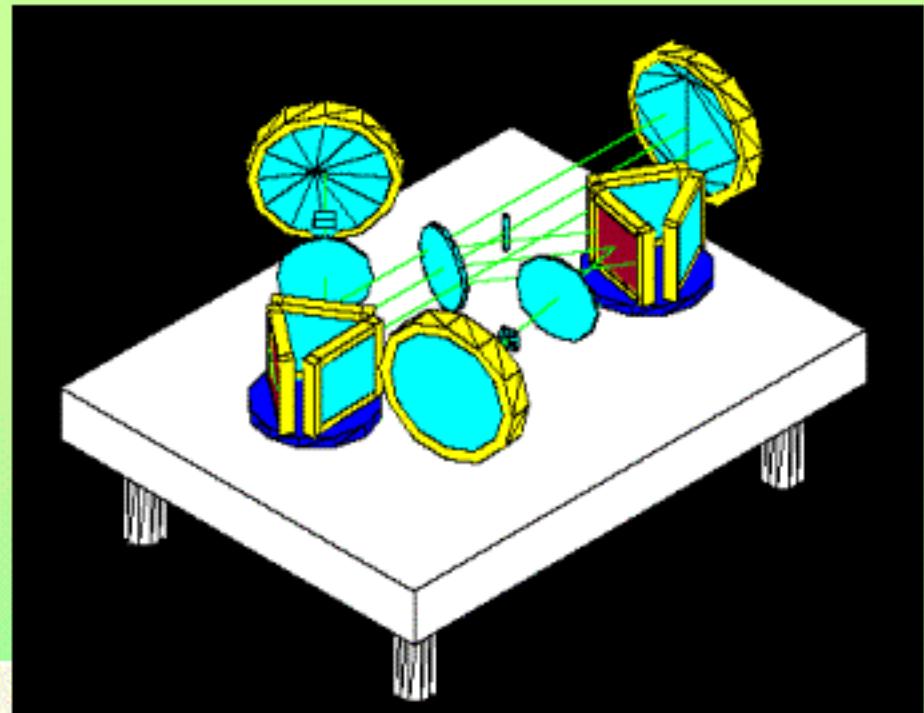
Focal Plane



Focal Plane- 4000 Fibers

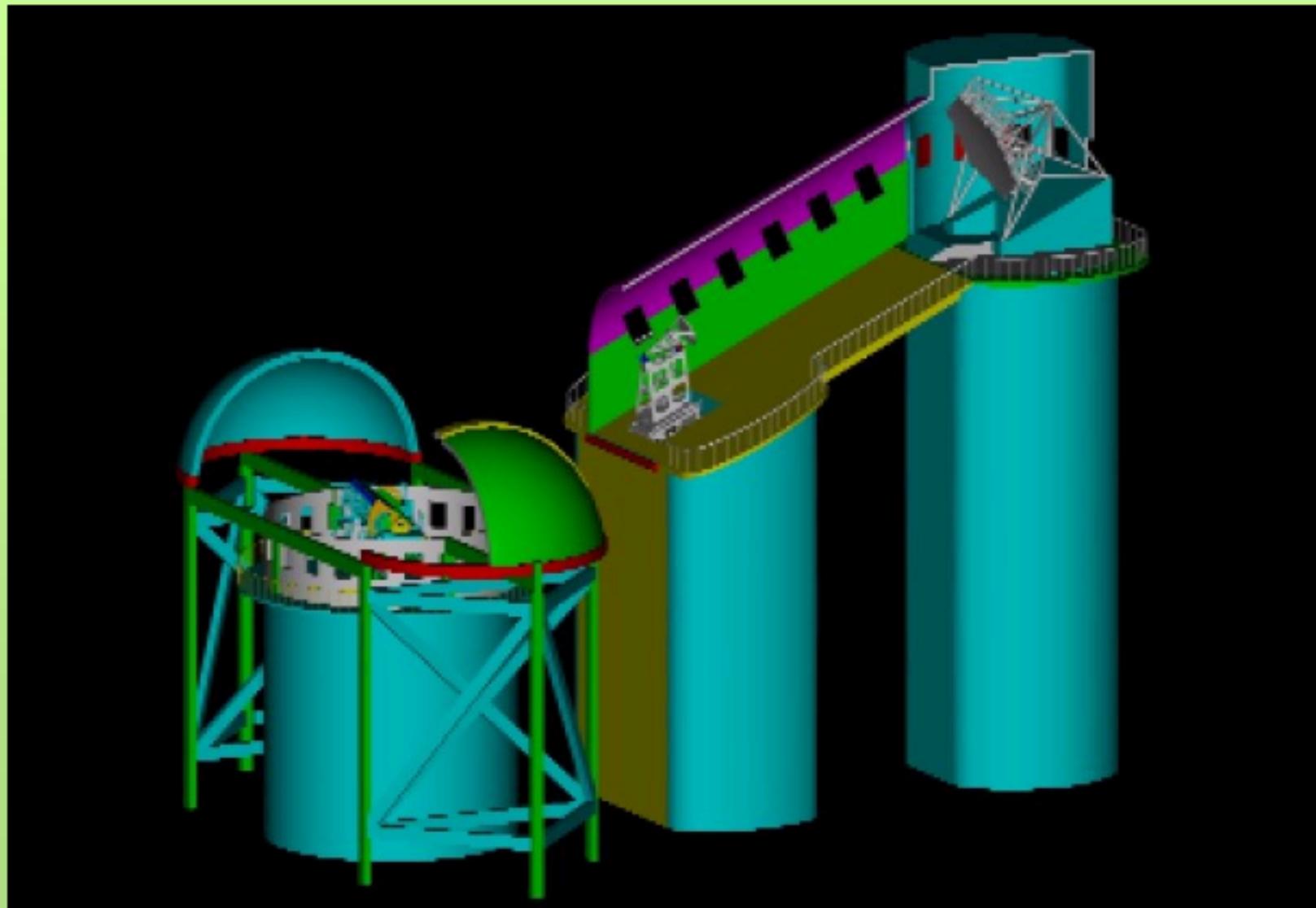
Spectrograph

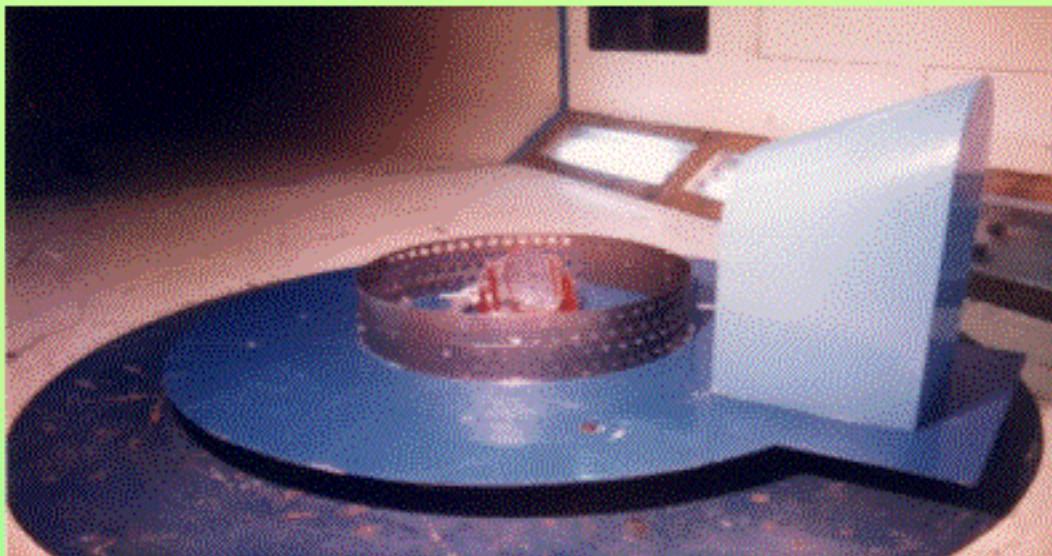
Design A
(Plane grating)



Design B
(Aspherical Grating)

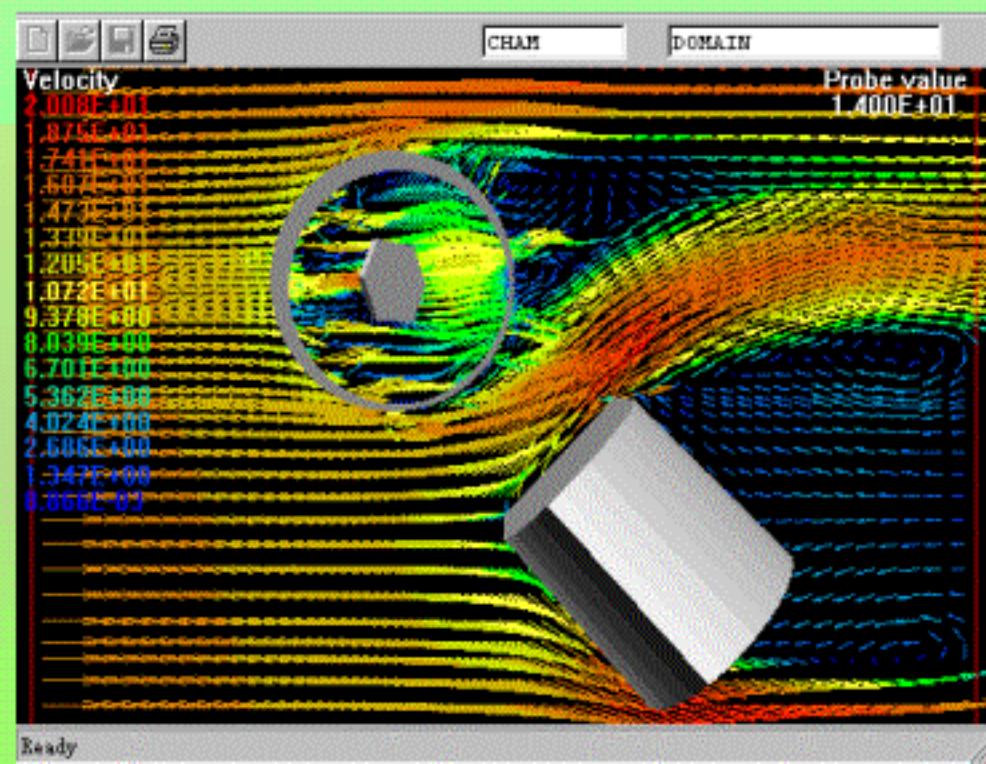
Enclosure



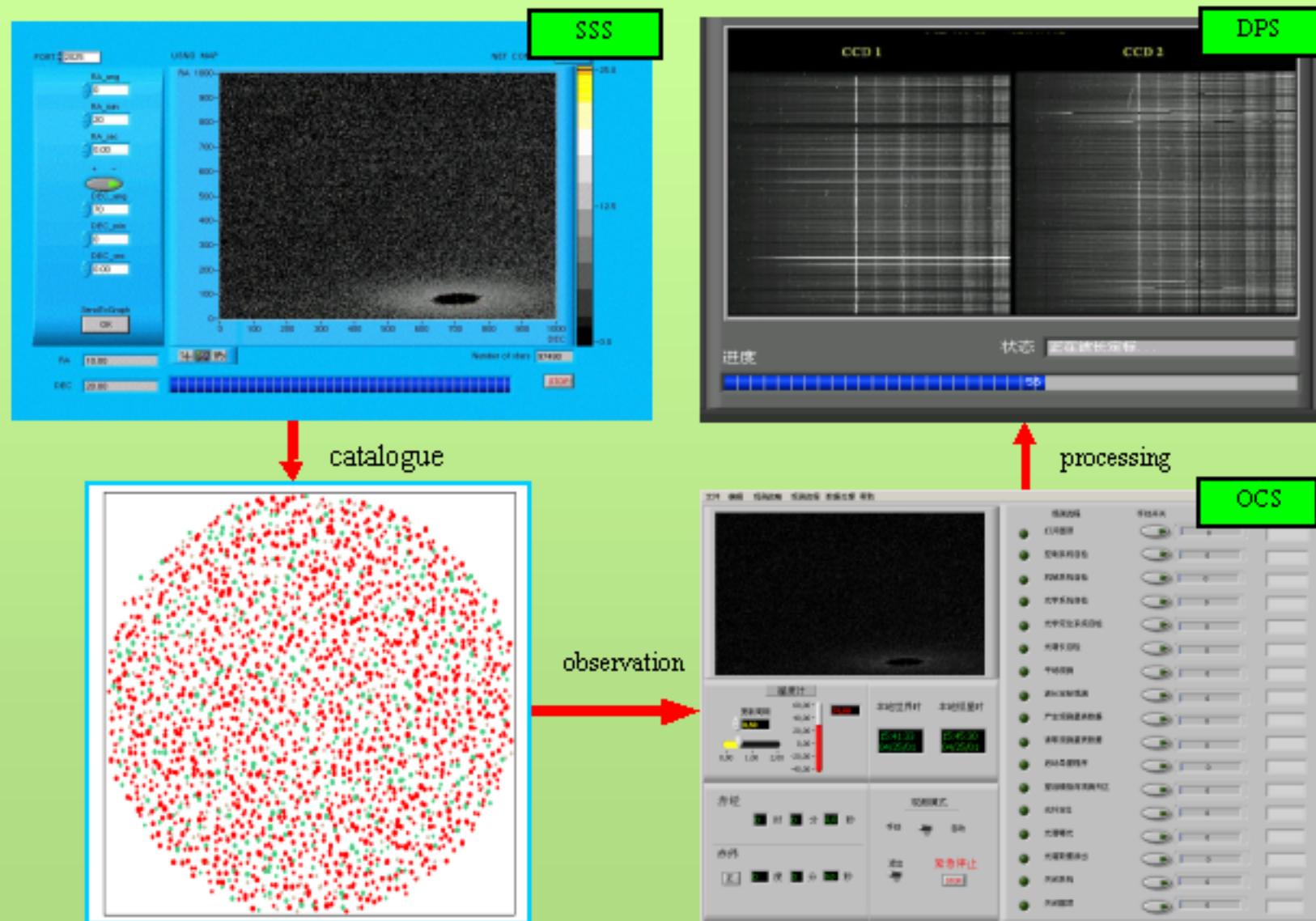


Wind tunnel test
for enclosure model

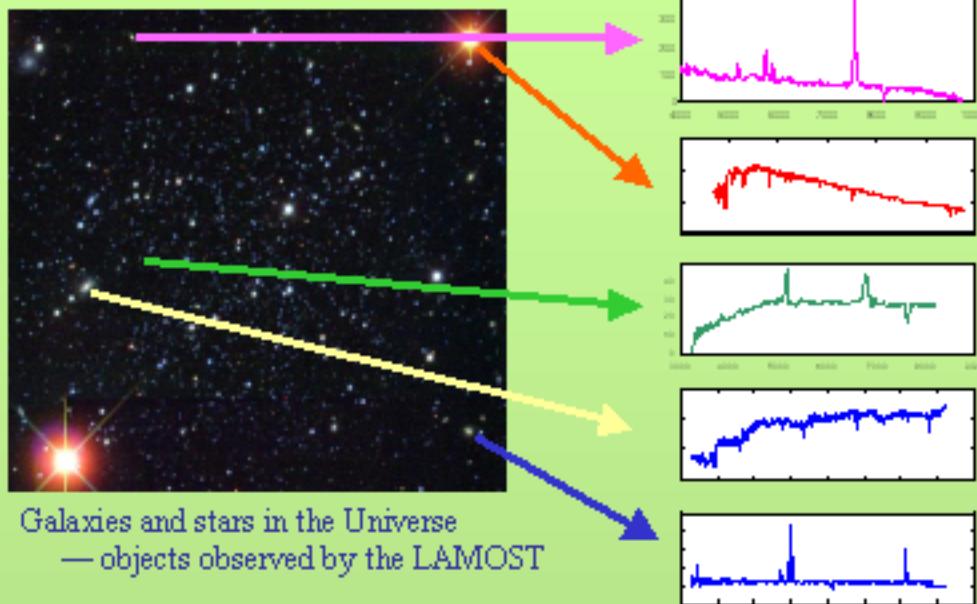
Simulation Analysis
for enclosure



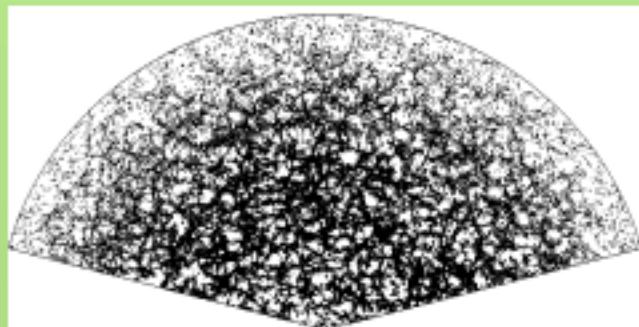
Observatory control & data processing



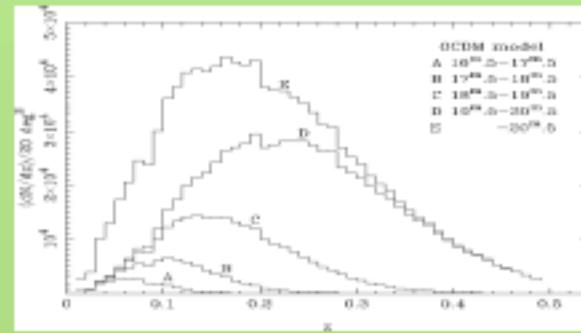
Input catalogs & survey strategy



Using its 4000 fibers, LAMOST permits a very high spectrum acquiring rate of several ten-thousands of spectra per night.



Space distribution of the LAMOST galaxy redshift survey (simulation)



Redshift distribution of the LAMOST galaxy redshift survey (simulation)

