LAMOST Spectroscopic Survey

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Present by
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Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST)

- A meridian active reflecting Schmidt telescope

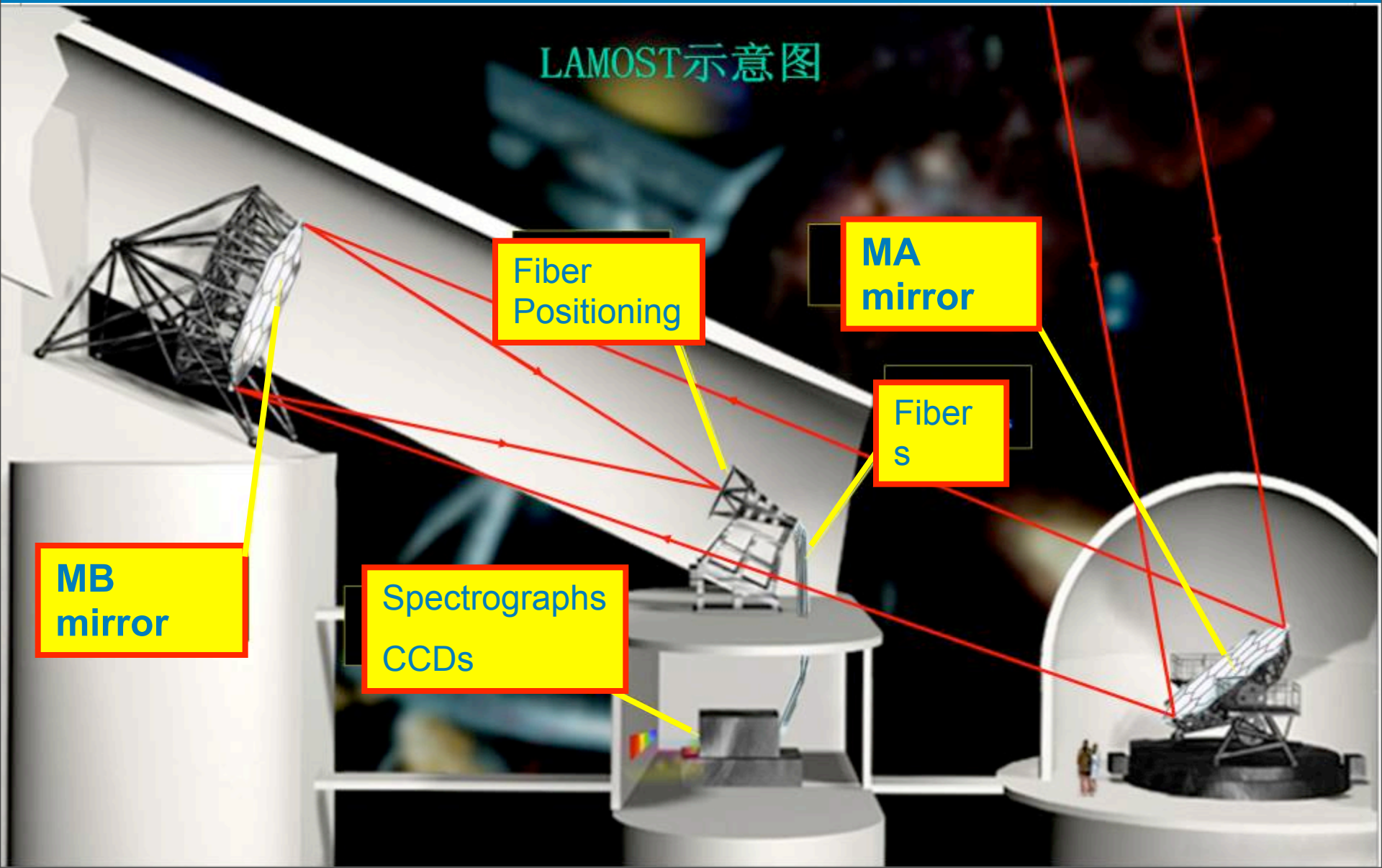
- Started in 1997
- First light in August 2008
- Inauguration in 16 October 2008

- now in commissioning stage

Characteristics of LAMOST

- Effective aperture — 4 meter
- FOV — 5°（1.75m linear）
- Number of optical fiber — 4000
- Observing sky area — $-10° \leq \delta \leq +90°$
- Spectral resolution — 1-0.25nm
- Size of fiber — 3.30 arcsec（320 macro linear）
  - Site seeing: ~2 arcsec
- Survey capability — taking spectral resolution 1nm, integration time 1.5 hours, magnitude limit: 20.5^m

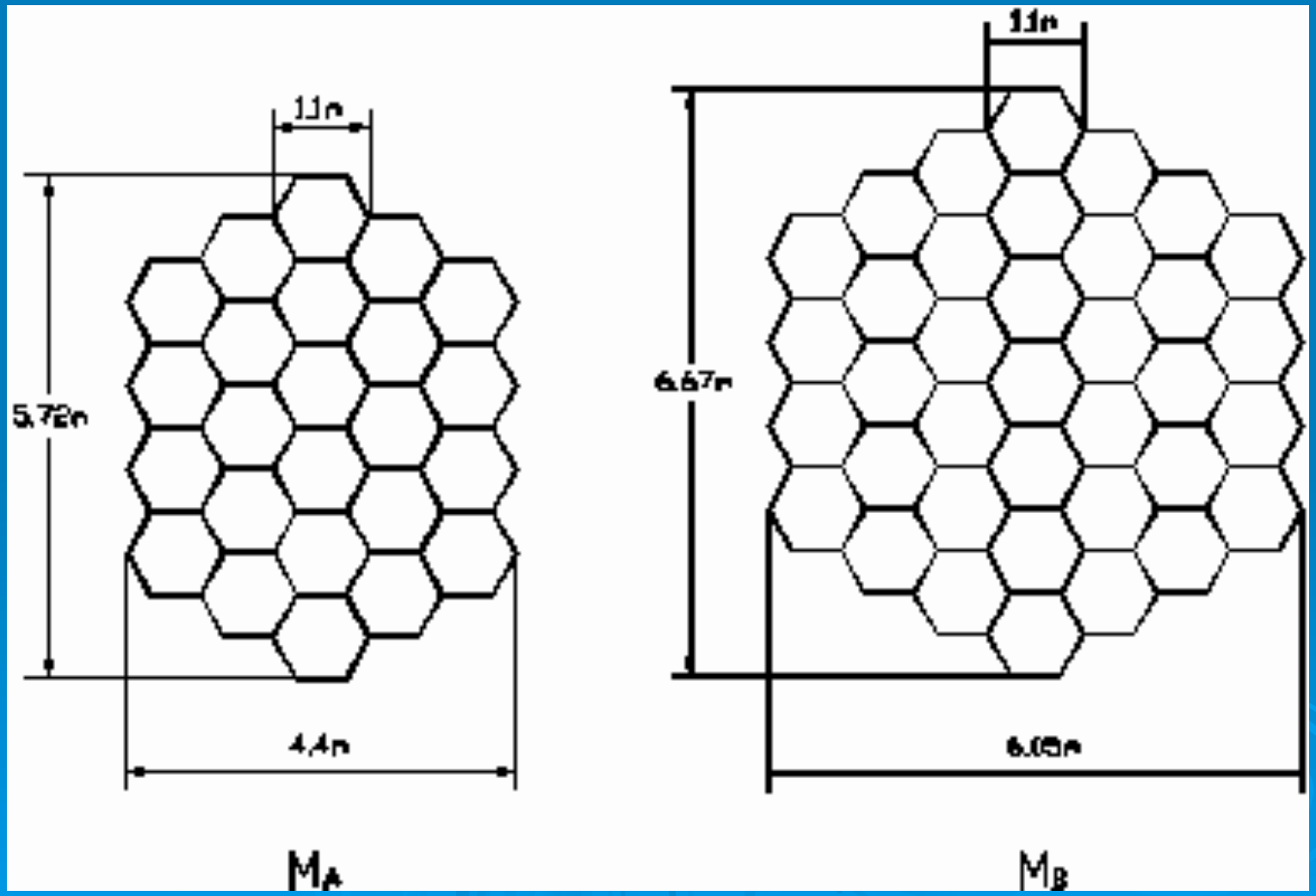
Structure of LAMOST



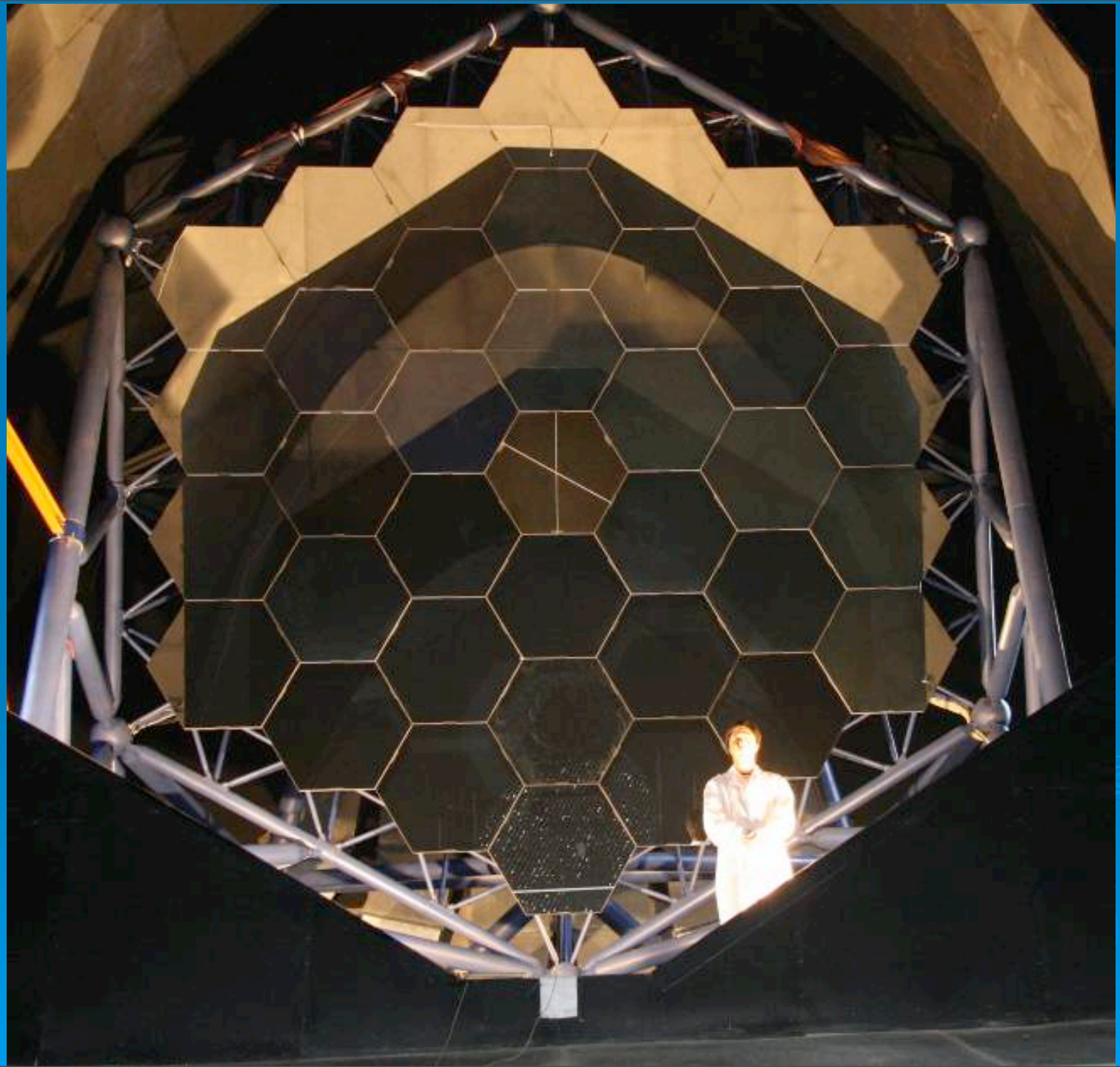
Enclosure

Oct 20, 2007

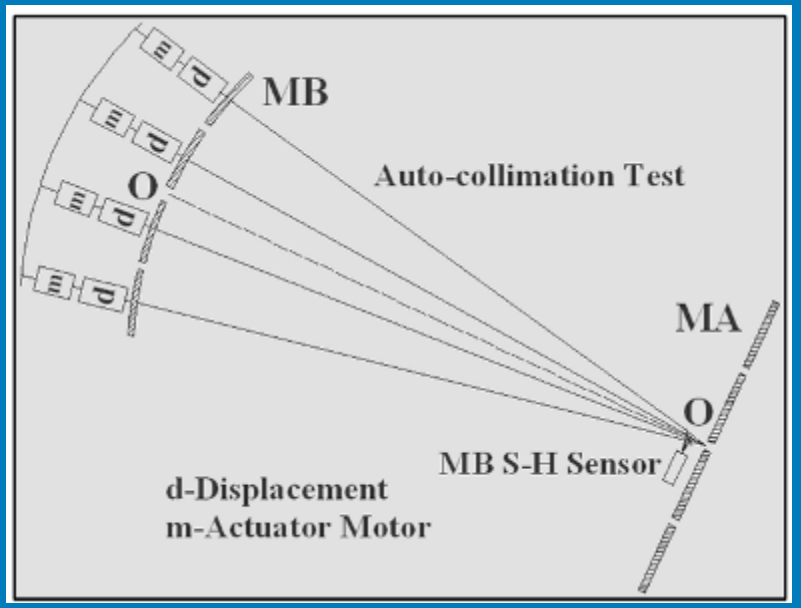
- MA: reflecting corrector (24 sub-mirrors) ~ 4.9m
- MB: spherical mirror (37 sub-mirrors) ~ 6.1m

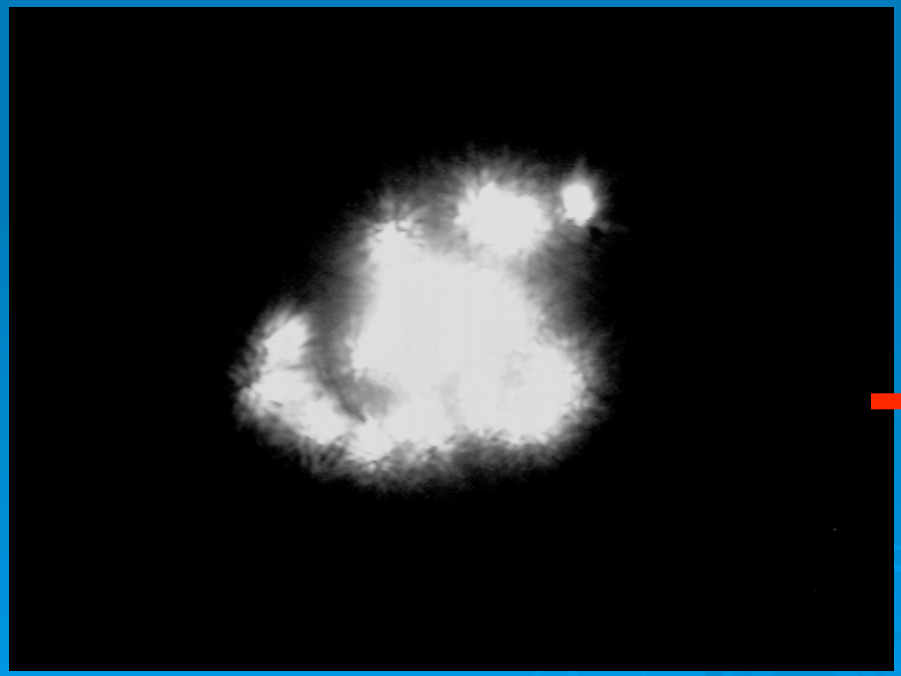


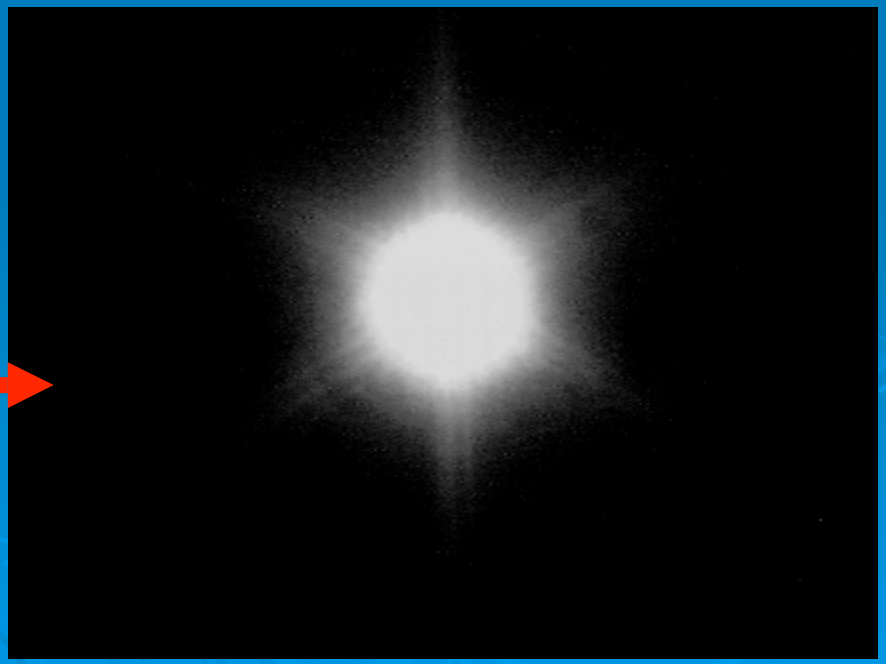
MB



- Segmented Active optics for 37 sub-mirrors of MB

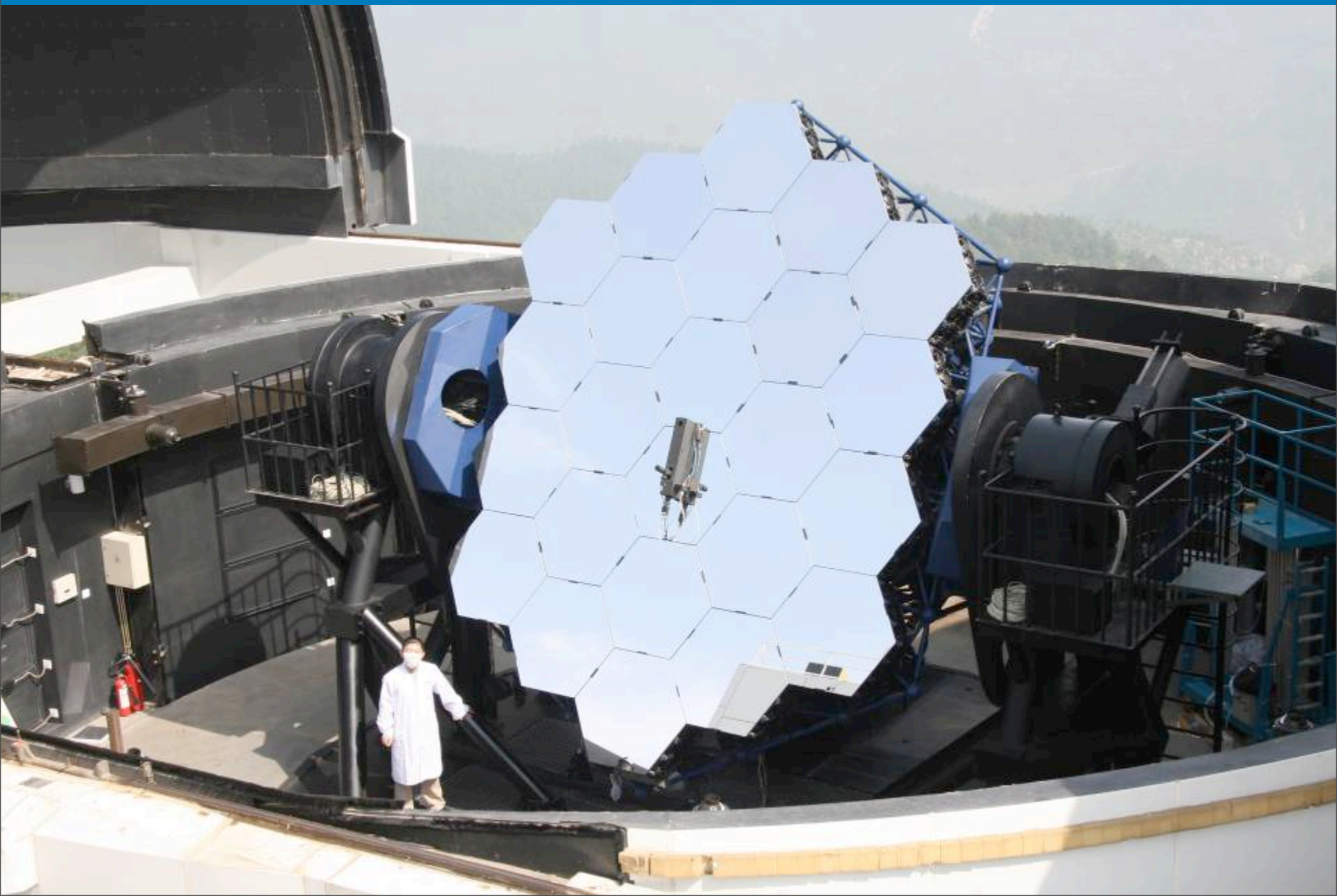




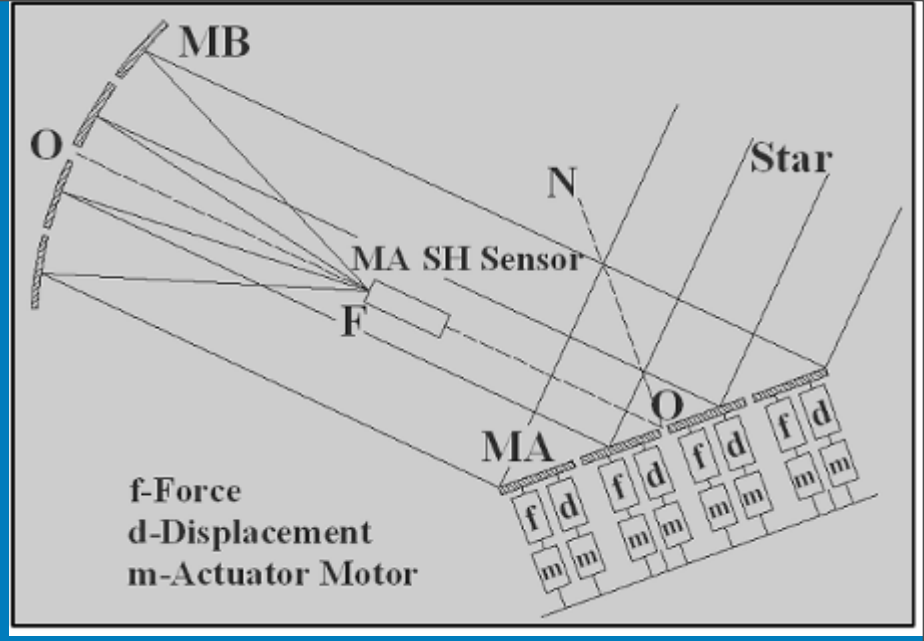


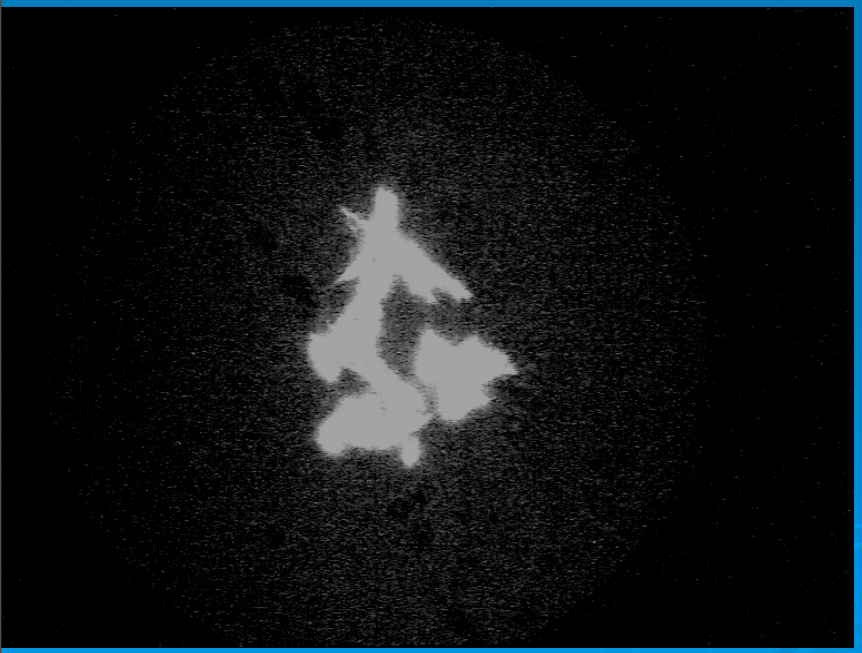
（July 13,2008）

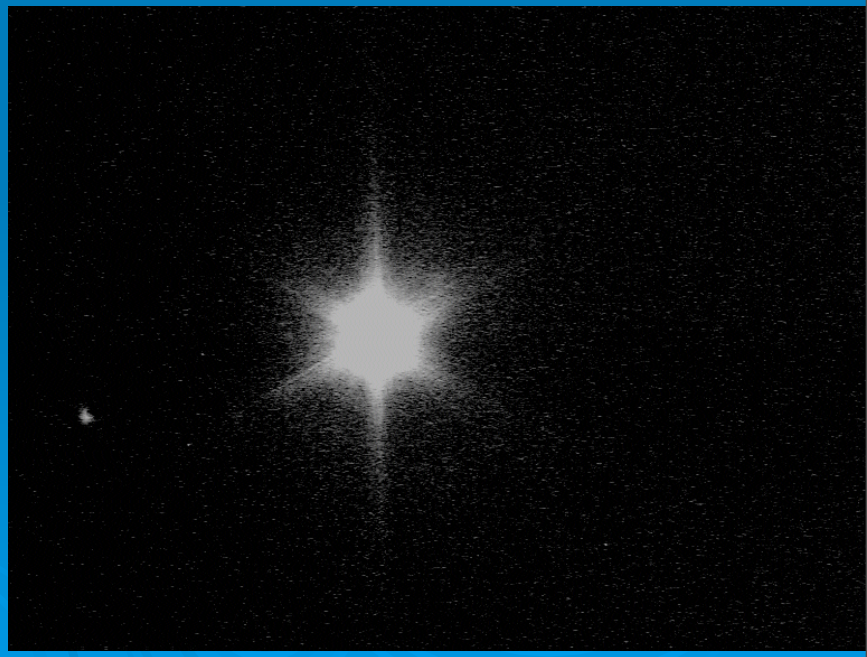
24 sub-mirrors of MA



- Segmented and thin mirror active optics for 24 sub-mirrors of MA

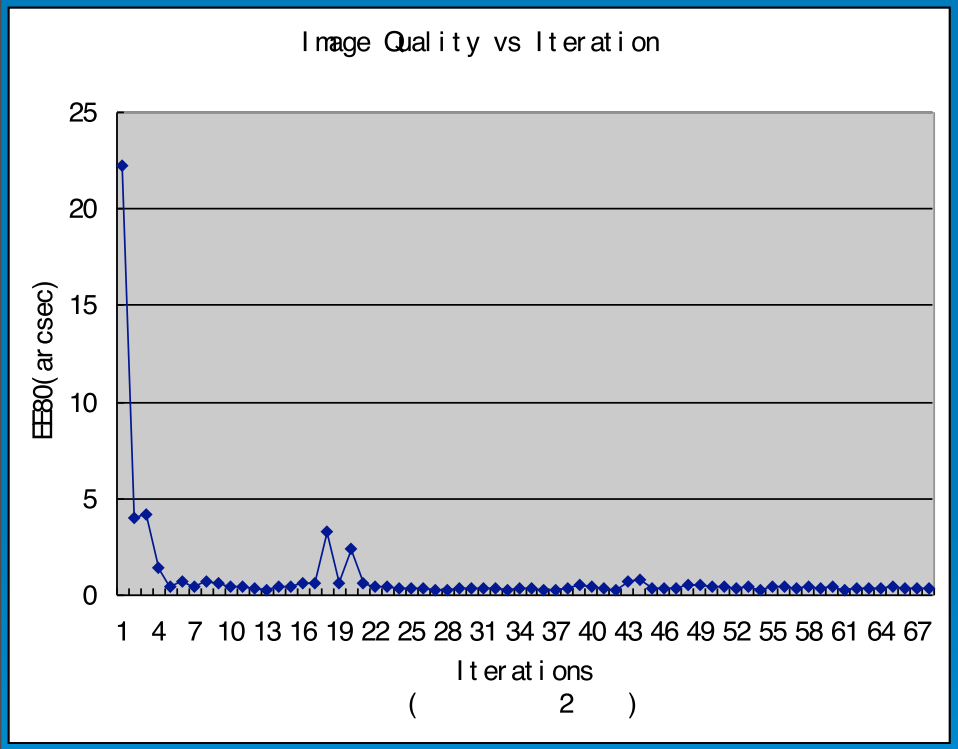


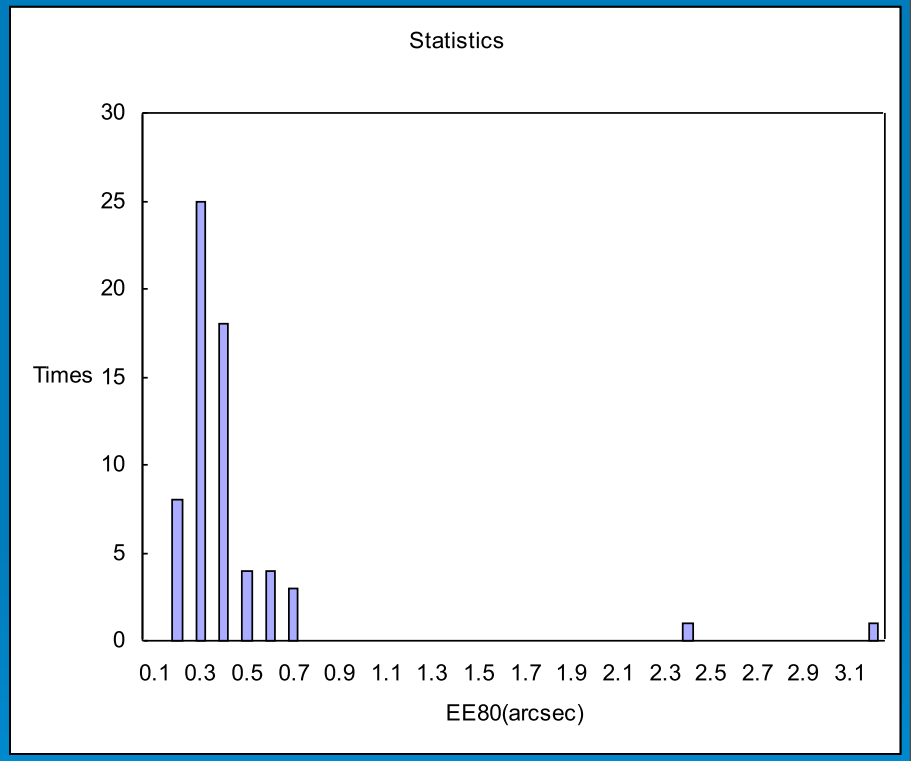




（Sept. 10, 2008）

Image quality of LAMOST





（Nov. 21, 2008)

Instruments

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- 4000 Fibers (130km)

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- 4000 Fiber positioning units
  - 8000 step motors
- 16 Spectrographs
  - 250 fibers per spectrograph

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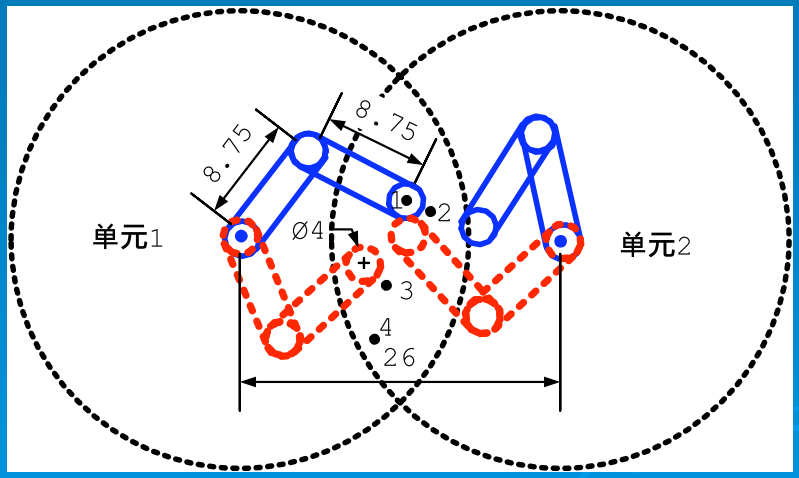
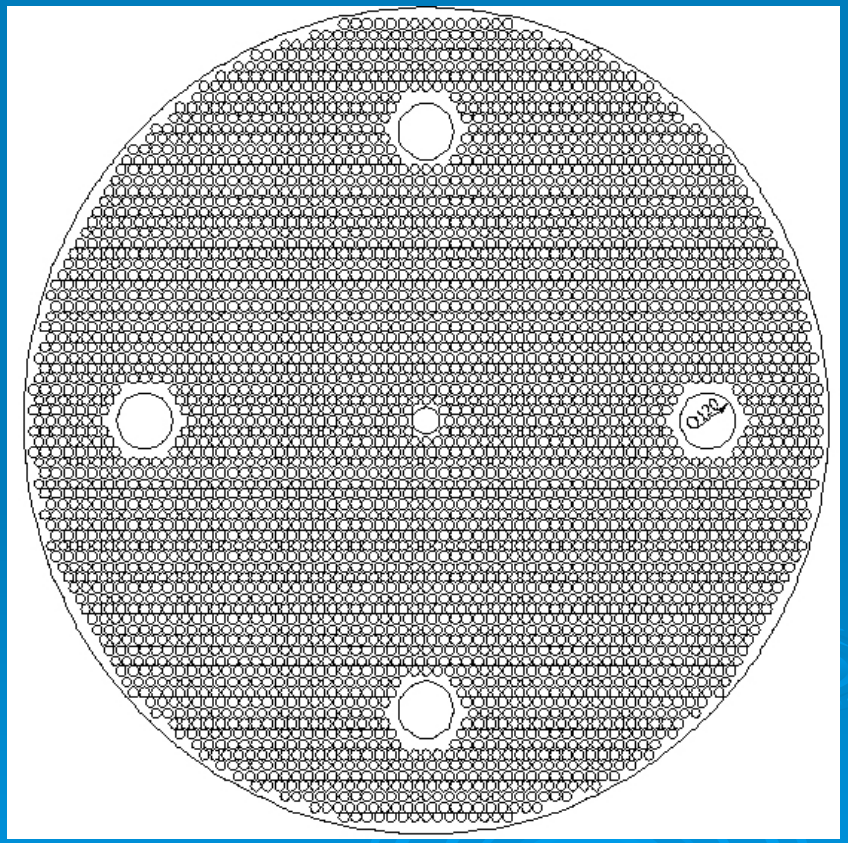
  - 250 fibers per spectrograph
- 32 4k x 4k CCD Cameras
  - E2V CCD chips

4000 fiber positioning units

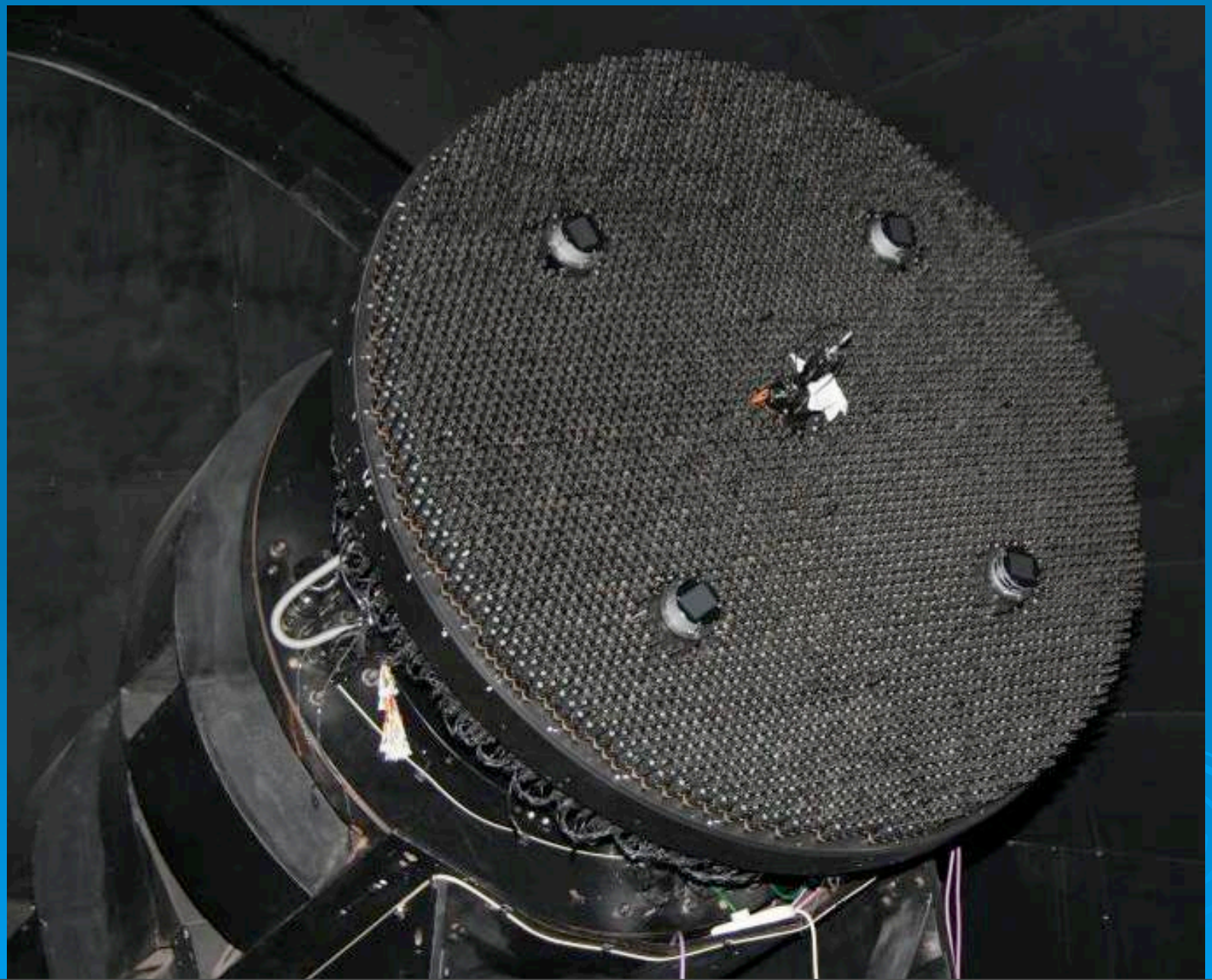
Positioning unit with 2 step motors

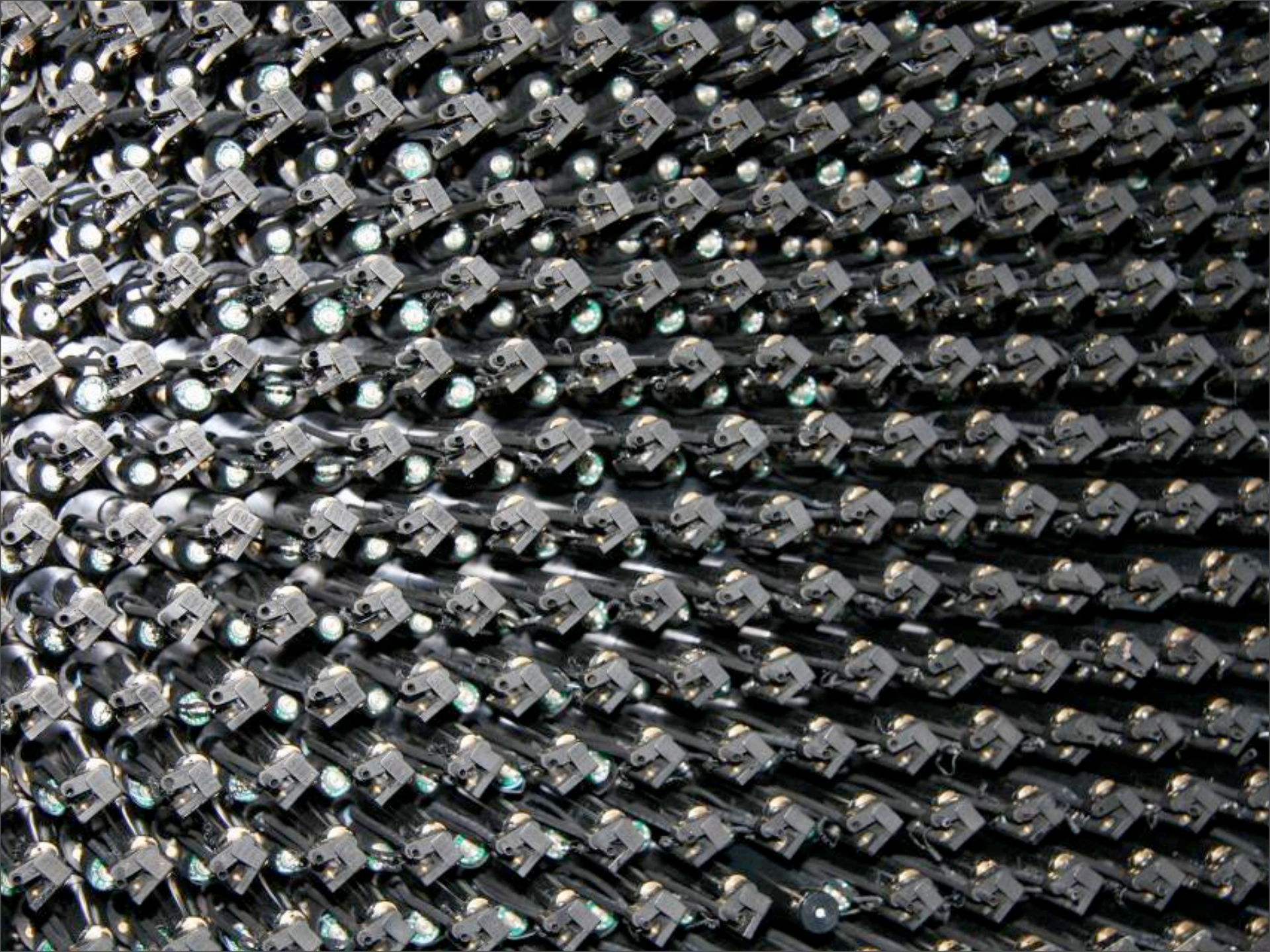


Double arm scheme



Focal Plate for holding 4000 fibers



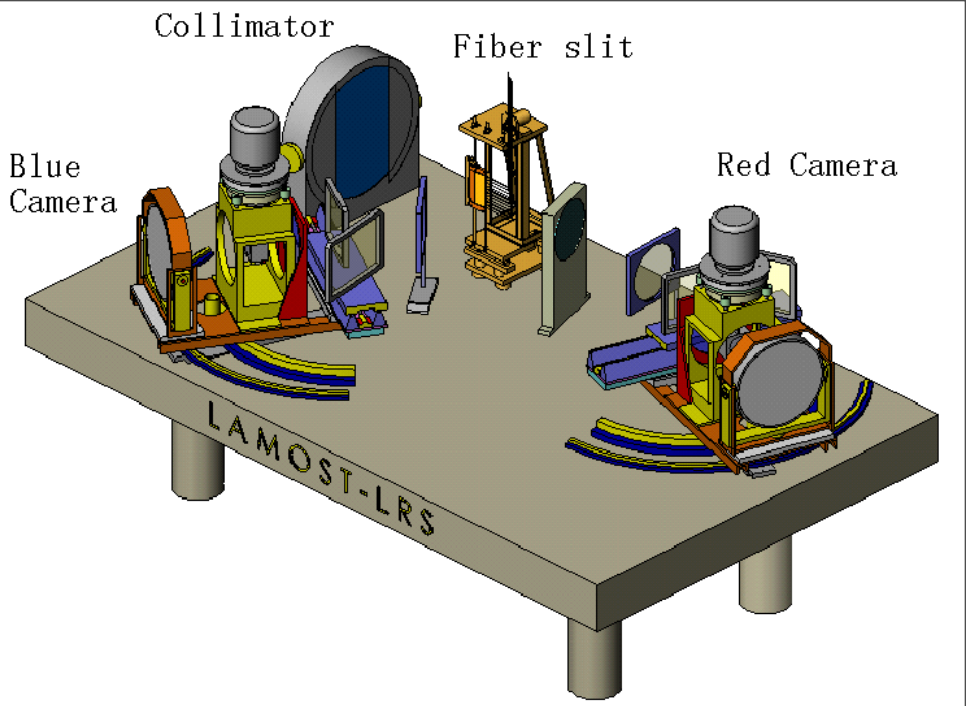


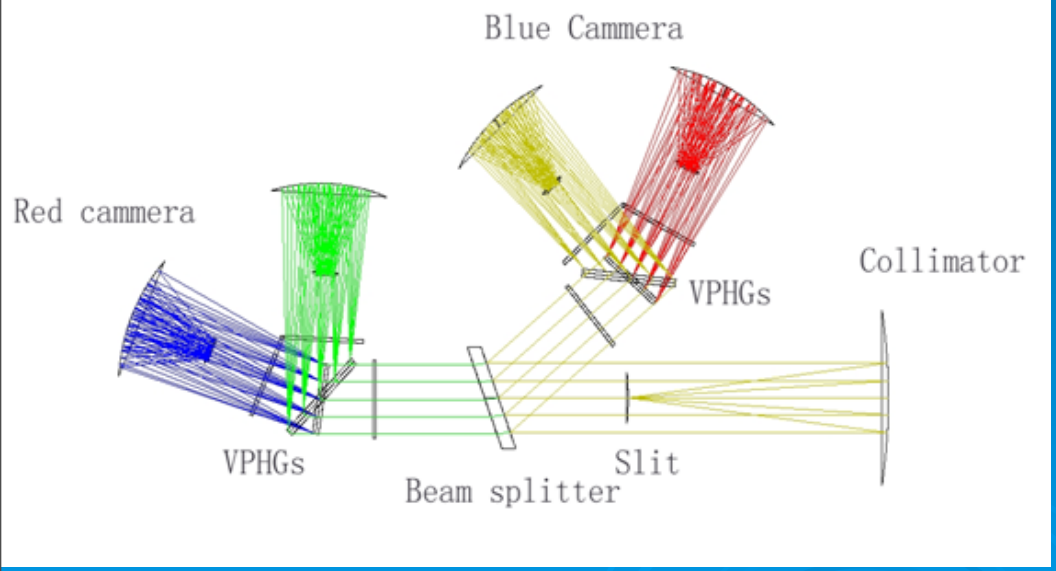
16 spectrographs

250 fibers per spectrograph

R_L = 1000/2000

R_M= 5000/10000





Spectral range:

Low blue: 370—590nm

red: 570—900nm

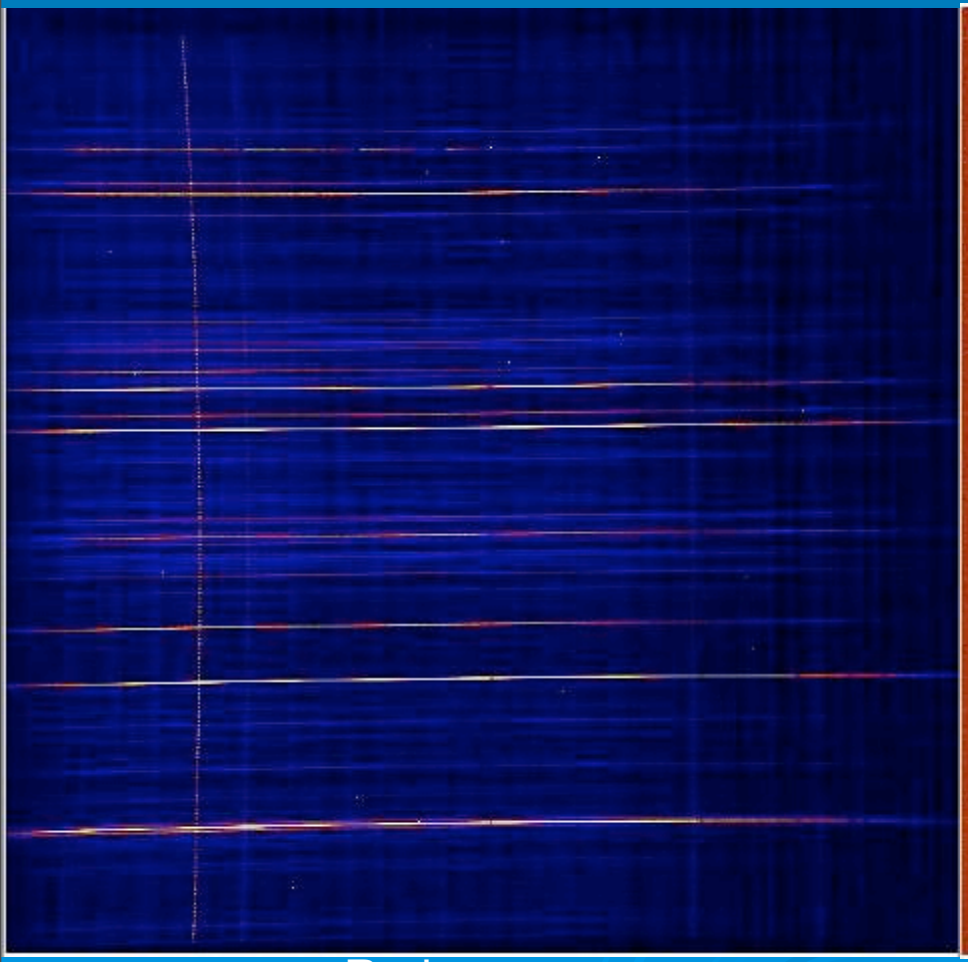
Medium blue: 510nm — 540nm

red: 830nm — 890nm

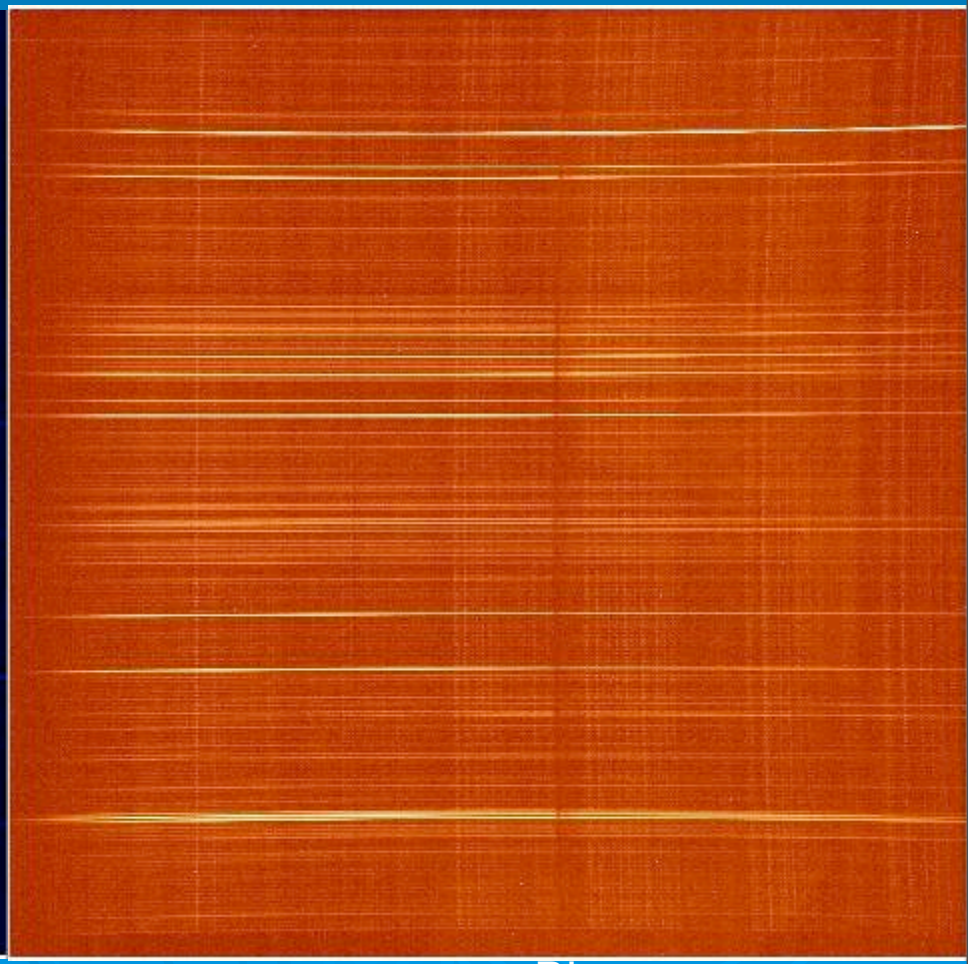
Test Observations

- Sept. 28, 2008
  - More than 2000 spectra of bright stars got in one test observation
- Dec. 27, 2008
  - M31

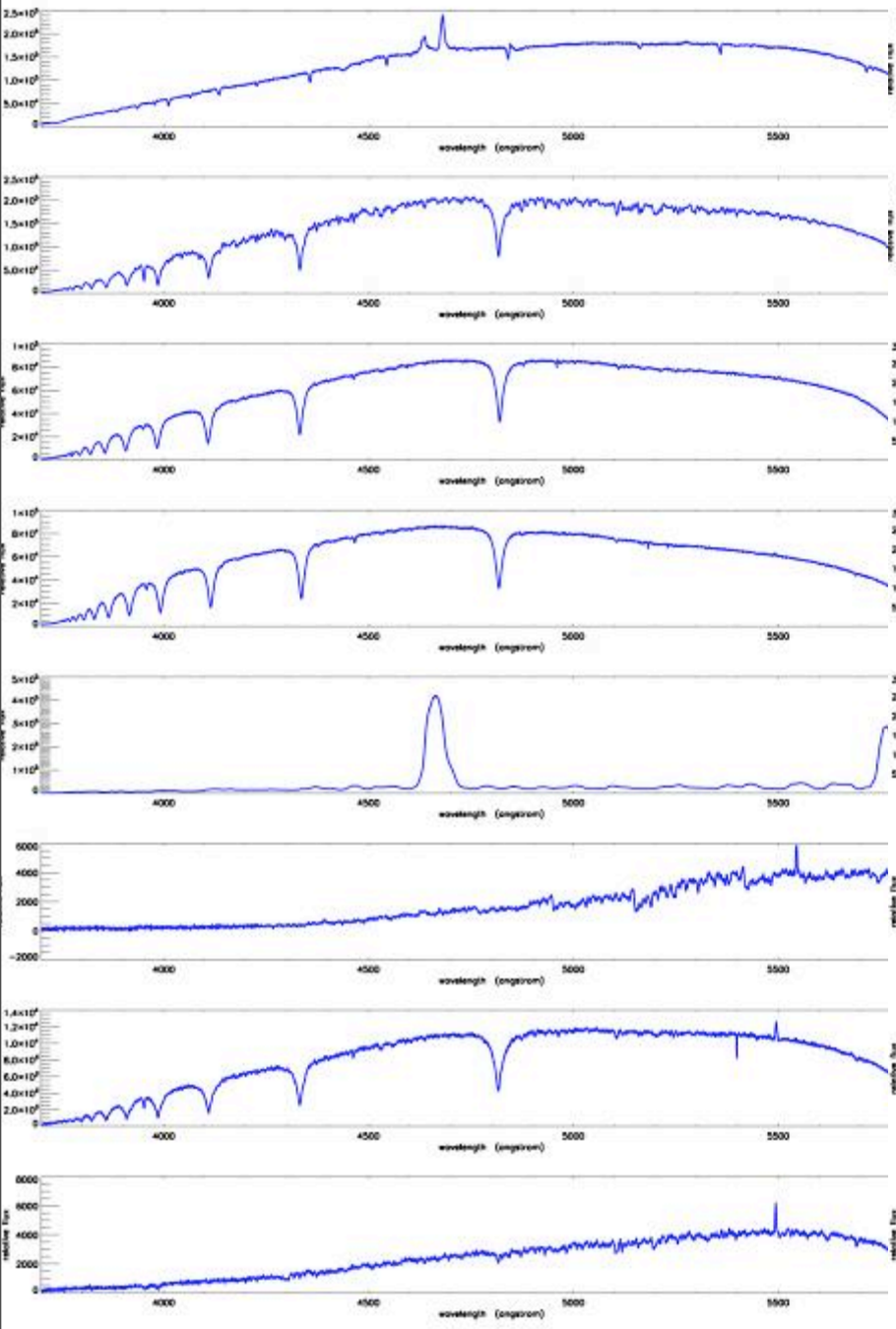
Spectra of stars（28/9/2008）

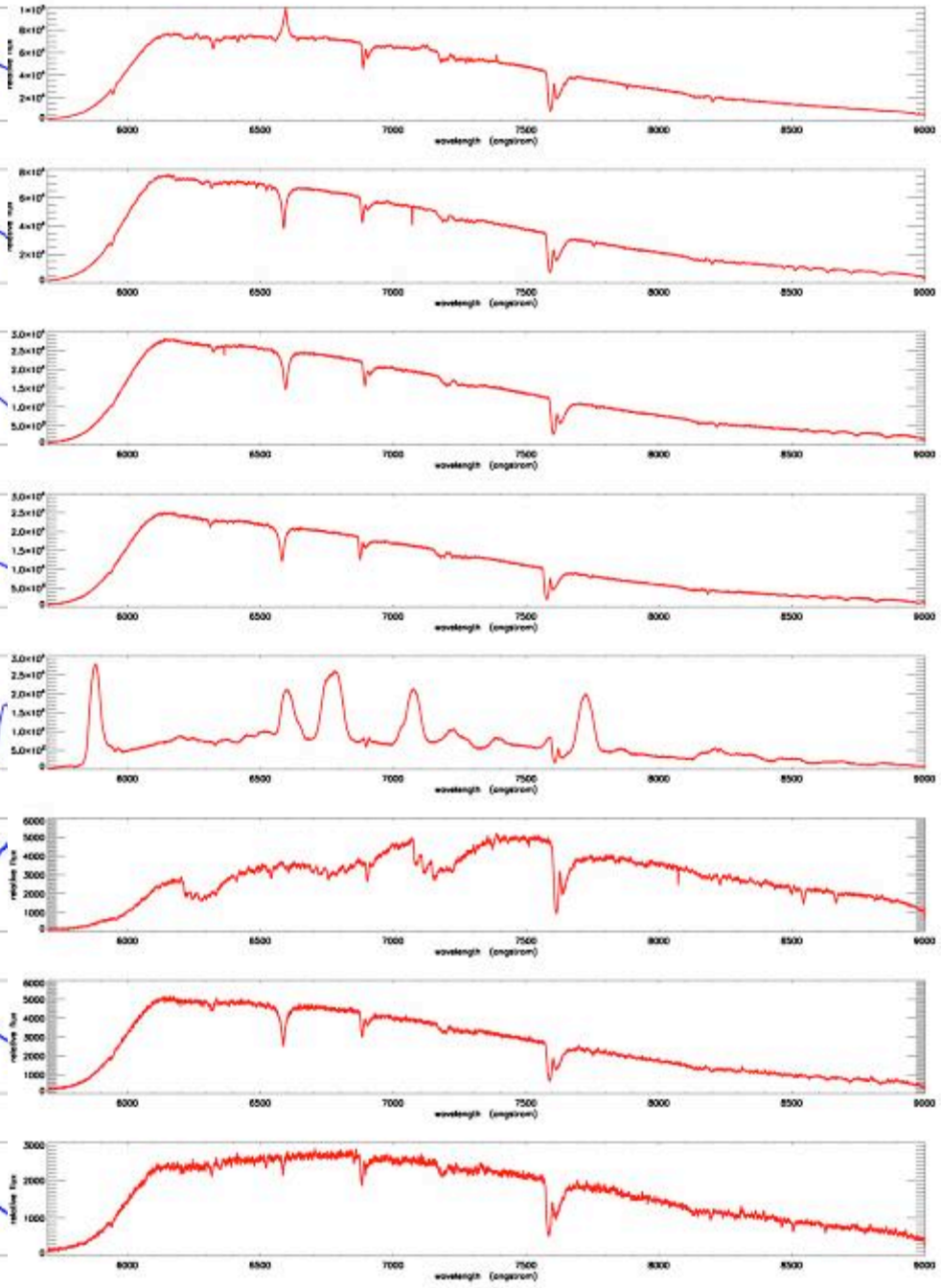


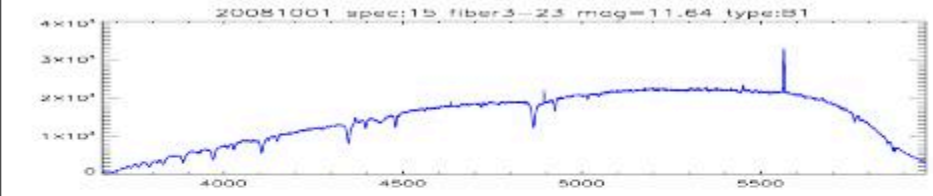
Red

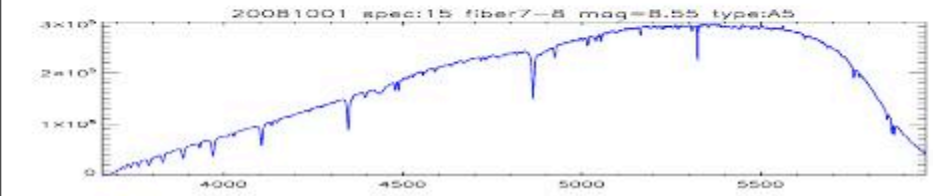


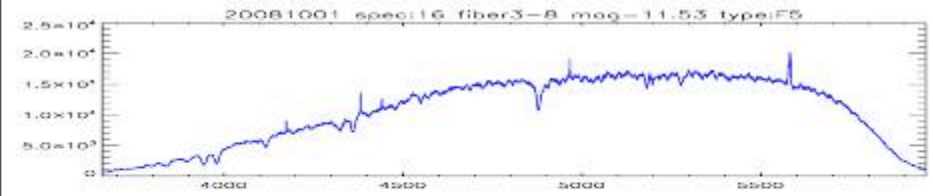
Blue


wavelength (angstrom)


wavelength (angstrom)


20081001 spec:15 fiber3-23 mag=11.64 type:B1


20081001 spec:15 fiber7-8 mag=8.55 type:A5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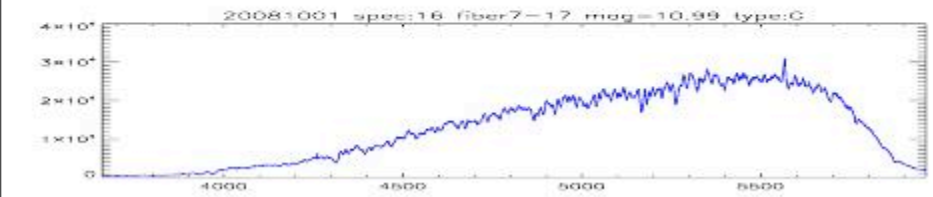
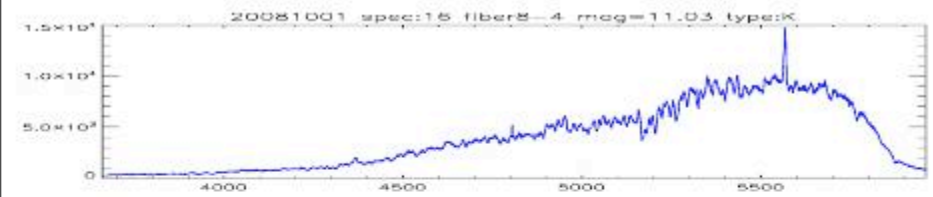
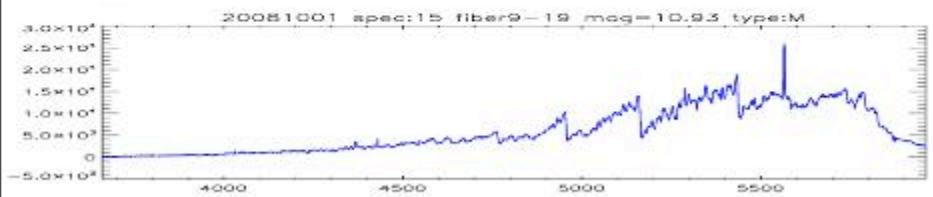
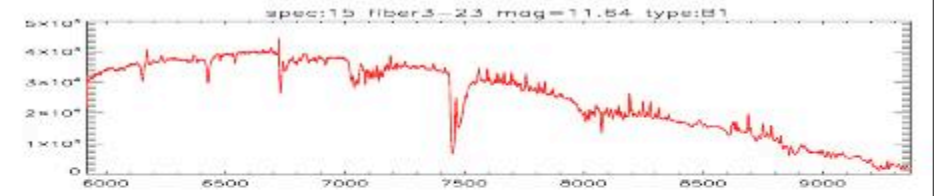
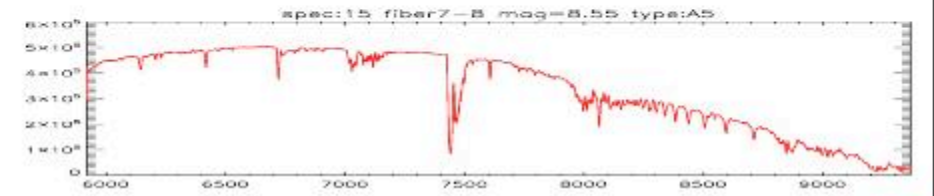
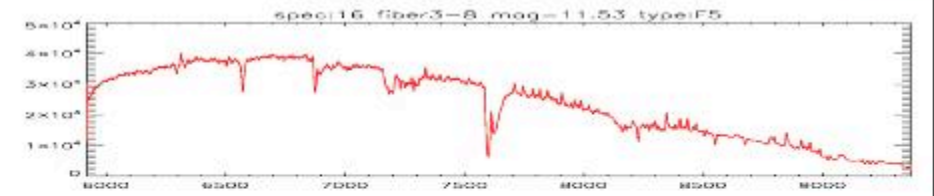

20081001 spec:16 fiber7-17 mag=10.99 type:G

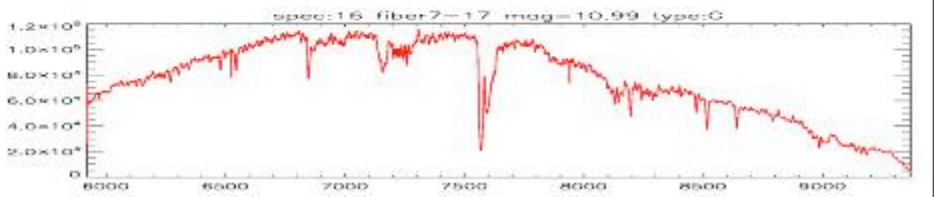

20081001 spec:15 fiber8-4 mag=11.03 type:K


20081001 spec:15 fiber9-19 mag=10.93 type:M


spec:15 fiber3-23 mag=11.64 type:B1


spec:15 fiber7-8 mag=8.55 type:A5


spec:16 fiber3-8 mag=11.53 type:F5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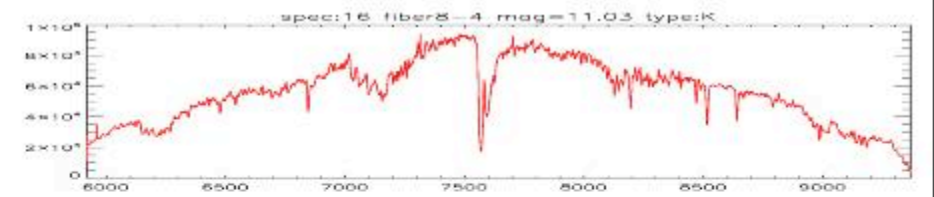
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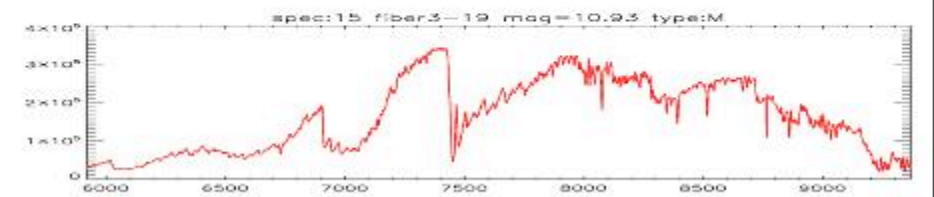
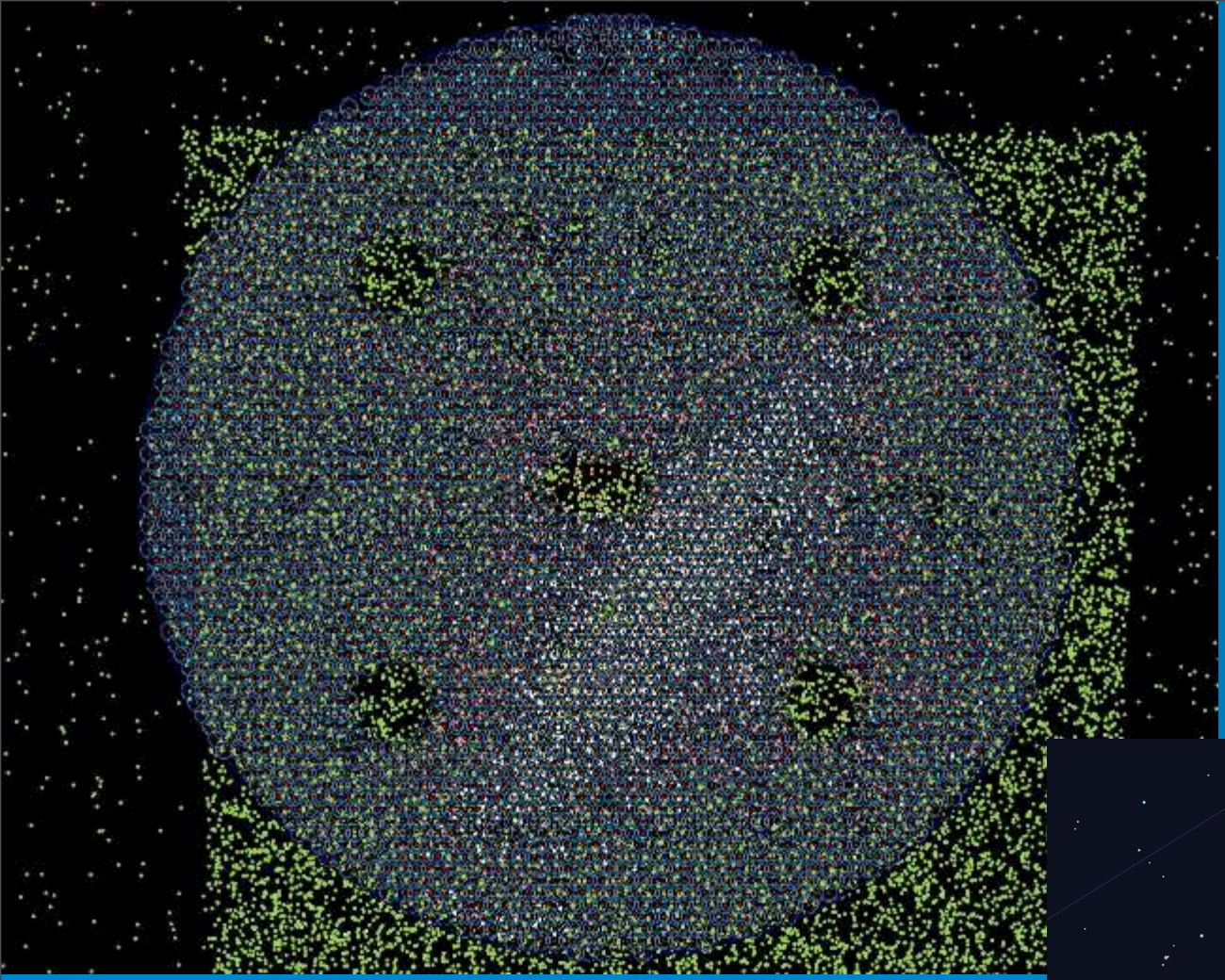
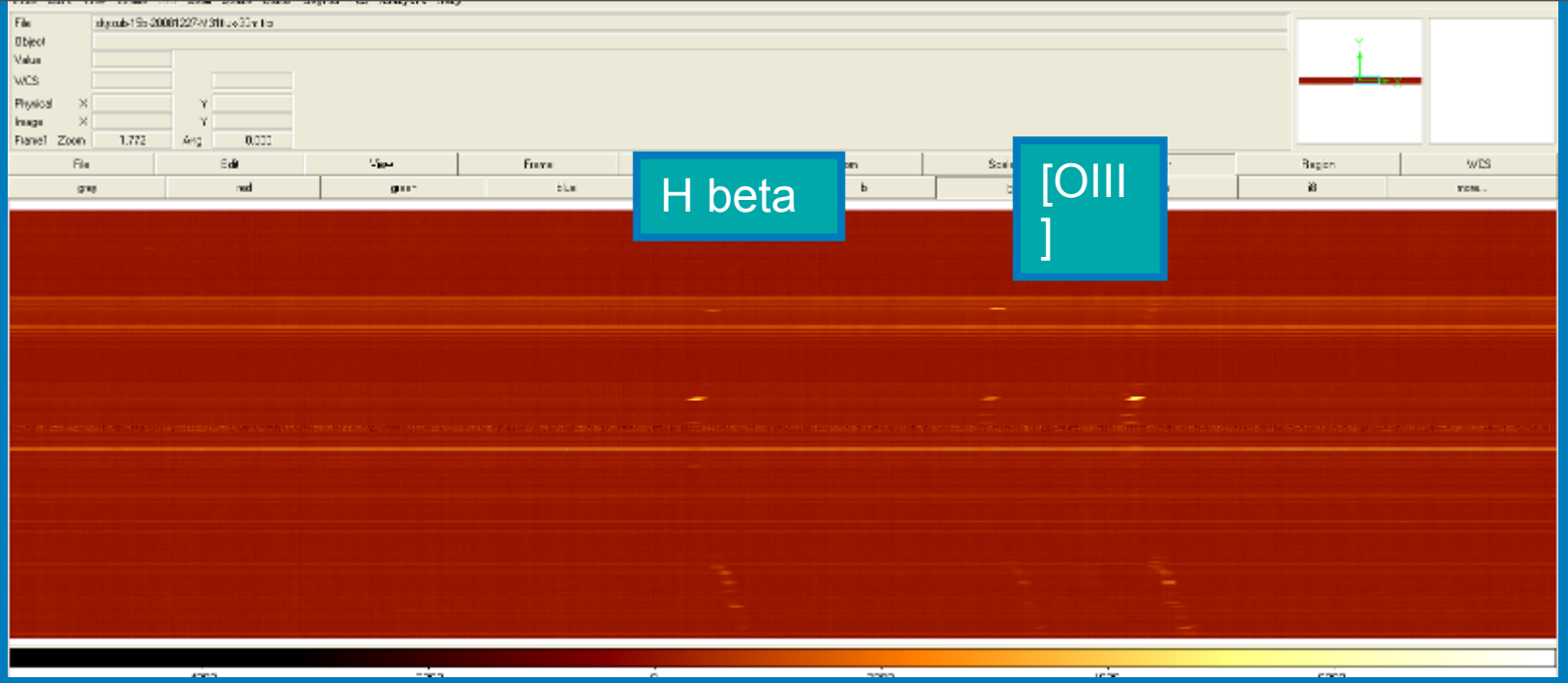
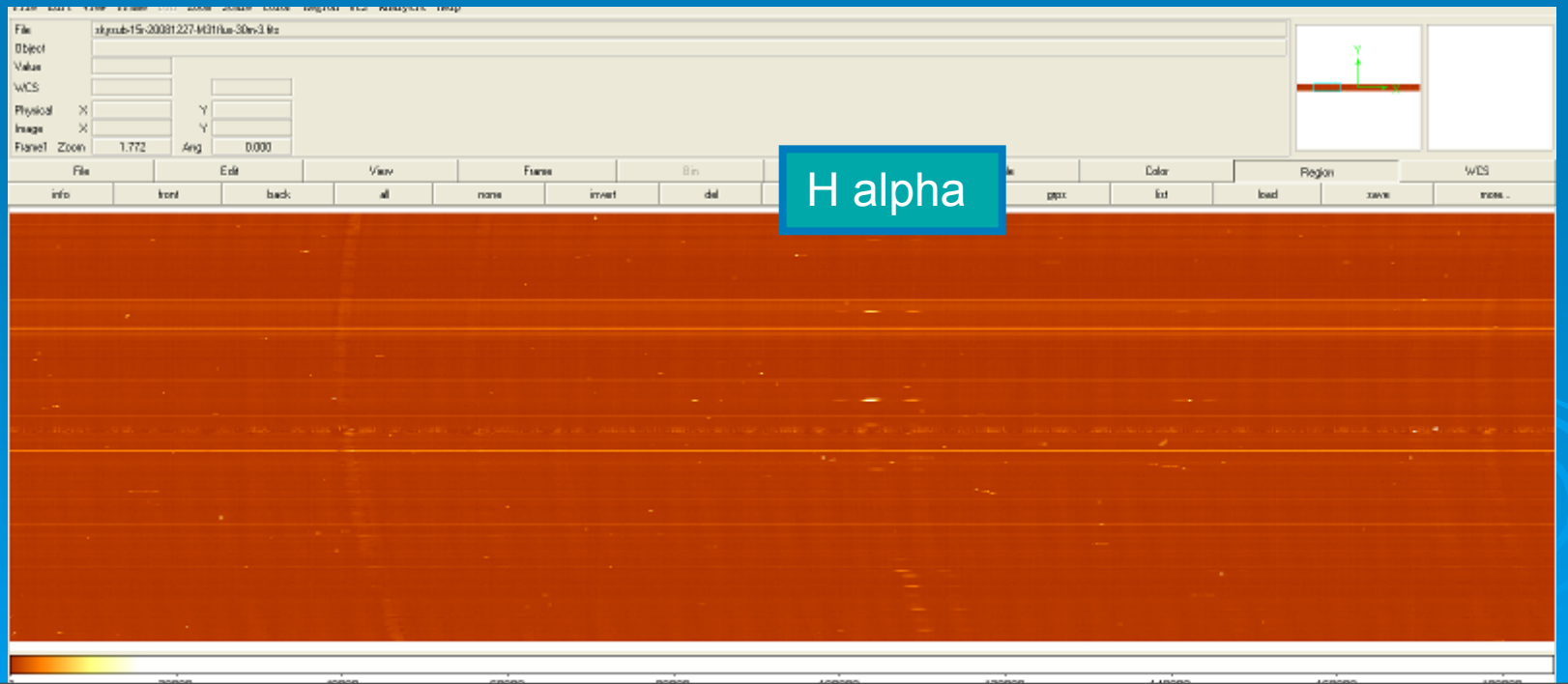

spec:15 fiber3-19 mag=10.93 type:M

Test Observations

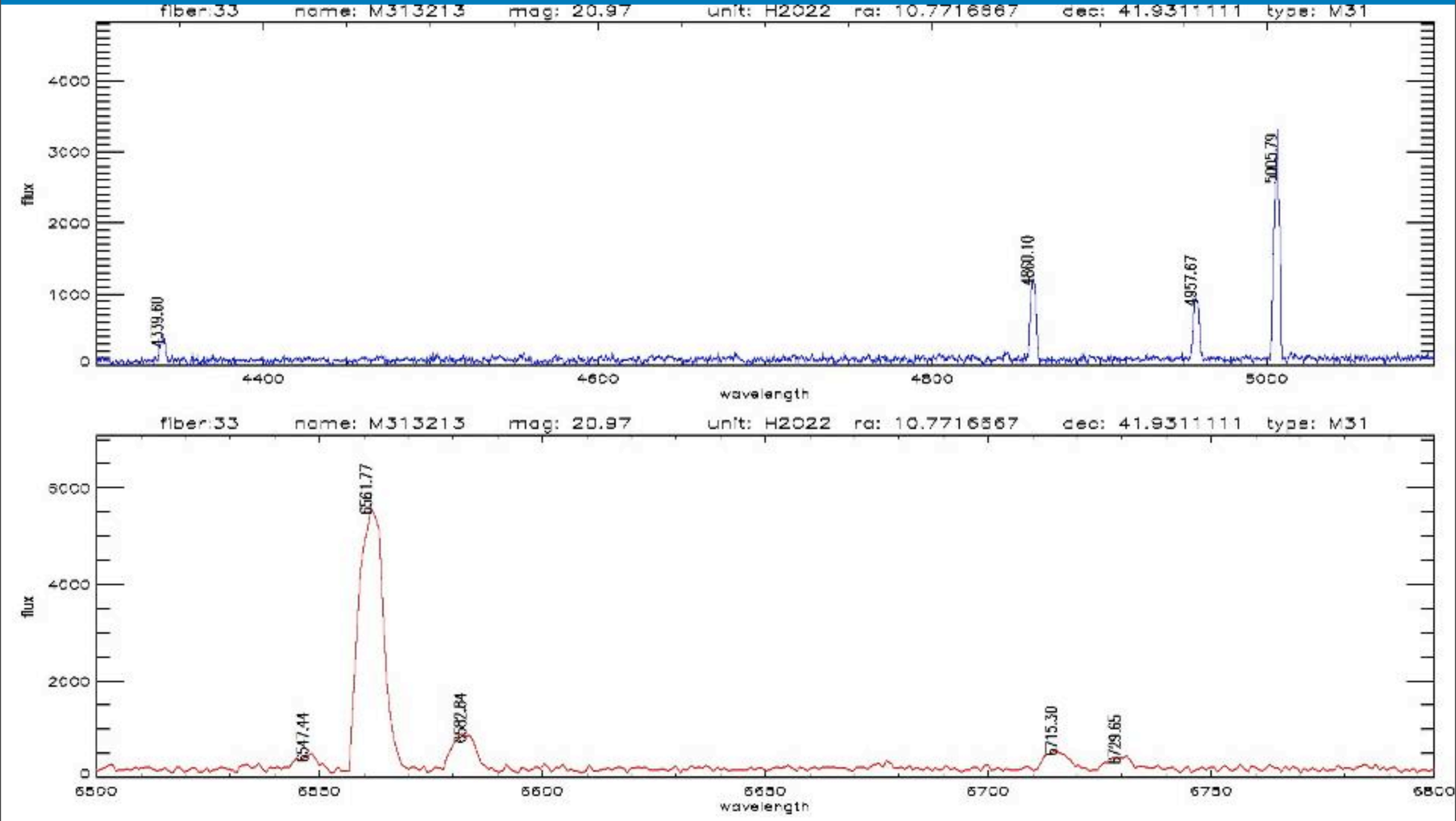
- Dec. 27, 2008
  - M31
    - Planetary nebula
    - Global clusters
  - Others
    - Galaxies
    - Stars
  - 1800s Exp.




H beta
[OIII]


H alpha

PN in M31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wavelength
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4860.10
4957.67
5005.79
fiber:33 name: M313213 mag: 20.97 unit: H2022 ra: 10.7716667 dec: 41.9311111 type: M31
flux
wavelength
6547.44
6561.77
6682.84
6715.30
6729.65

Plan

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- 2009: commission period
  - Early Science

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- 2009: commission period
  - Early Science
- 2010 / 2011: regular spectroscopic survey
  - 5 year survey

Spectroscopic Surveys

- Key projects include
  - extra-Galactic
  - Milky Way
  - cross-identification
- WG for the Milky Way study
- WG for extragalactic survey
  - Survey plan will be fixed in 2009

Galactic survey plan:

- Consider a 5 year survey plan
- spectra of 2.5m stars are expected
  - Using about ½ of the total dark observing time for halo (down to 20m)
  - Using about ½ of the grey and all bright nights for bright stars (18m) in the ‘green’ fields

Galactic Astronomy

- **Dwarf galaxies and stellar moving groups;**
- **Constraining the gravitational potential;**
- **Search for extremely metal poor stars;**
- **The structure of the thin/thick disks;**
- **Survey of Galactic globular and open clusters.**

Extragalactic Survey

Observe galaxies and QSOs
in the NGC of 7700 deg^2 (SDSS sky)
in the SGC of about 3500 deg^2

- Shallow Survey:
  2.3 million galaxies of r<18.8 in 7500 deg^2;
- Deep Galaxy Survey:
  3.2 million galaxies of r<19.5 in 3700 deg^2
- Early Massive Galaxy Survey (EMG):
  1 million galaxies of V<20.0;
- QSO survey
  0.6 million QSO of i<20.5;

A data base of 7 million extragalactic spectra

Thank You !