Presentation on Sino-American Bilateral Workshop

Briefing on NAOC

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National Astronomical Observatories · CAS

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Outline

- Structure of NAOC
- Progress of Key Projects

  - LAMOST - FAST - LUREX

- Some New Projects

  - 21CMA - WSO - Site Survey

- Contribution to International Community
- Collaboration with the U.S.

Structure of NAOC

Subordinate Units

- Headquarter (Beijing)
- Yunnan Observatory
- Nanjing Institute of Astronomical Optics and Technology
- Urumqi Observatory
- Changchun Observatory

Structure of NAOC

- **Observatories, Coordinated Academically by NAOC**
  - Purple Mountain Observatory
  - Shanghai Astronomical Observatory

- **Research centers jointly administered by the NAOC and Universities**
  - **Beijing Astrophysics Center** with Peking Univ.
  - **East China Astronomy and Astrophysics Center** with Nanjing Univ.
  - **Astro-geodynamics Research Center** with Tongji Univ.
  - **Center for Astrophysics** with Univ. of Science & Technology of China

Structure of NAOC

- **30 Research Groups**
  - 7 galactic astrophysics
  - 7 stellar astrophysics
  - 7 solar & solar system
  - 9 applied astronomy

Structure of NAOC

- **Six observing bases**

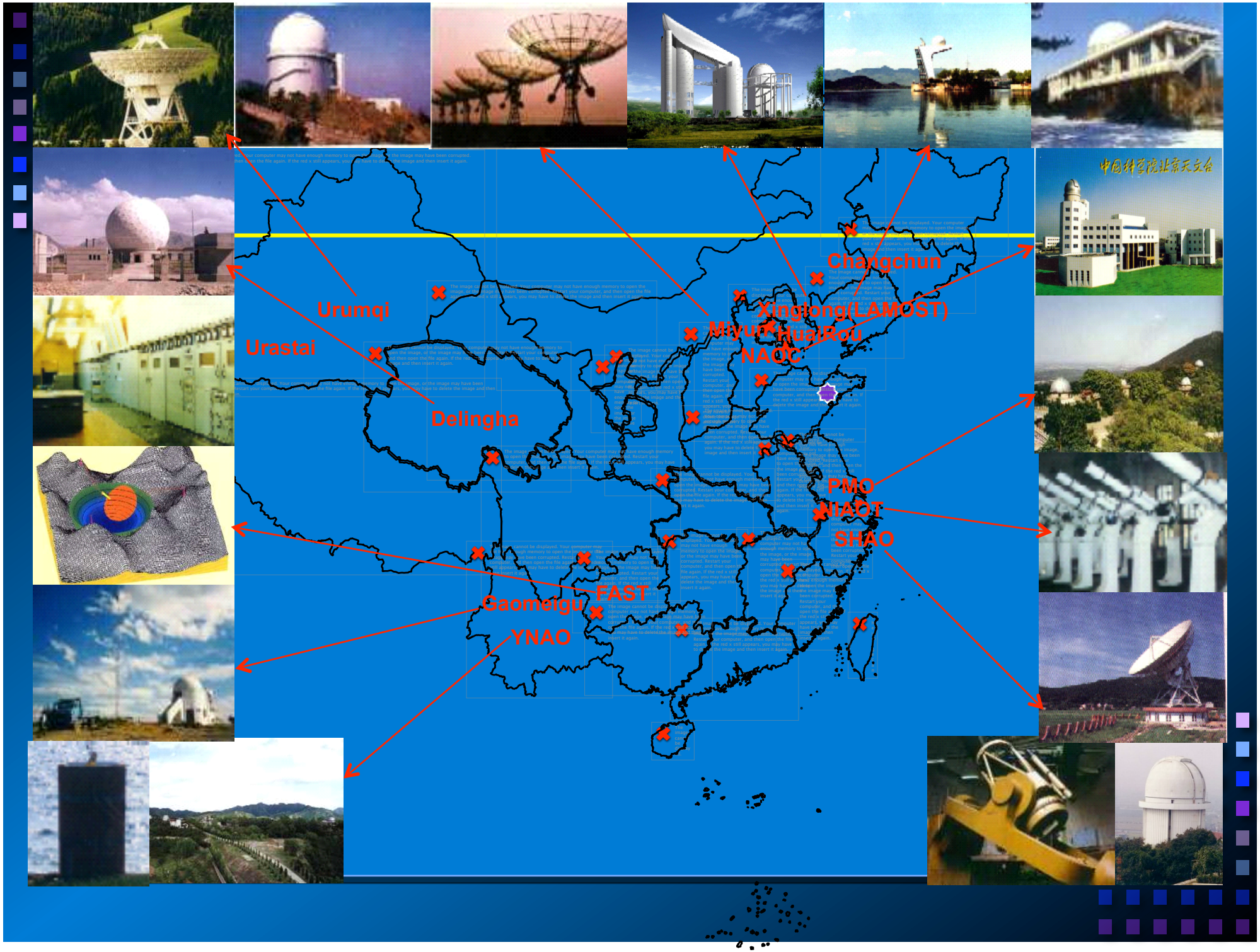
  Xinglong; Huairou; Nanshan; Sheshan;

  Delingha; Southern base

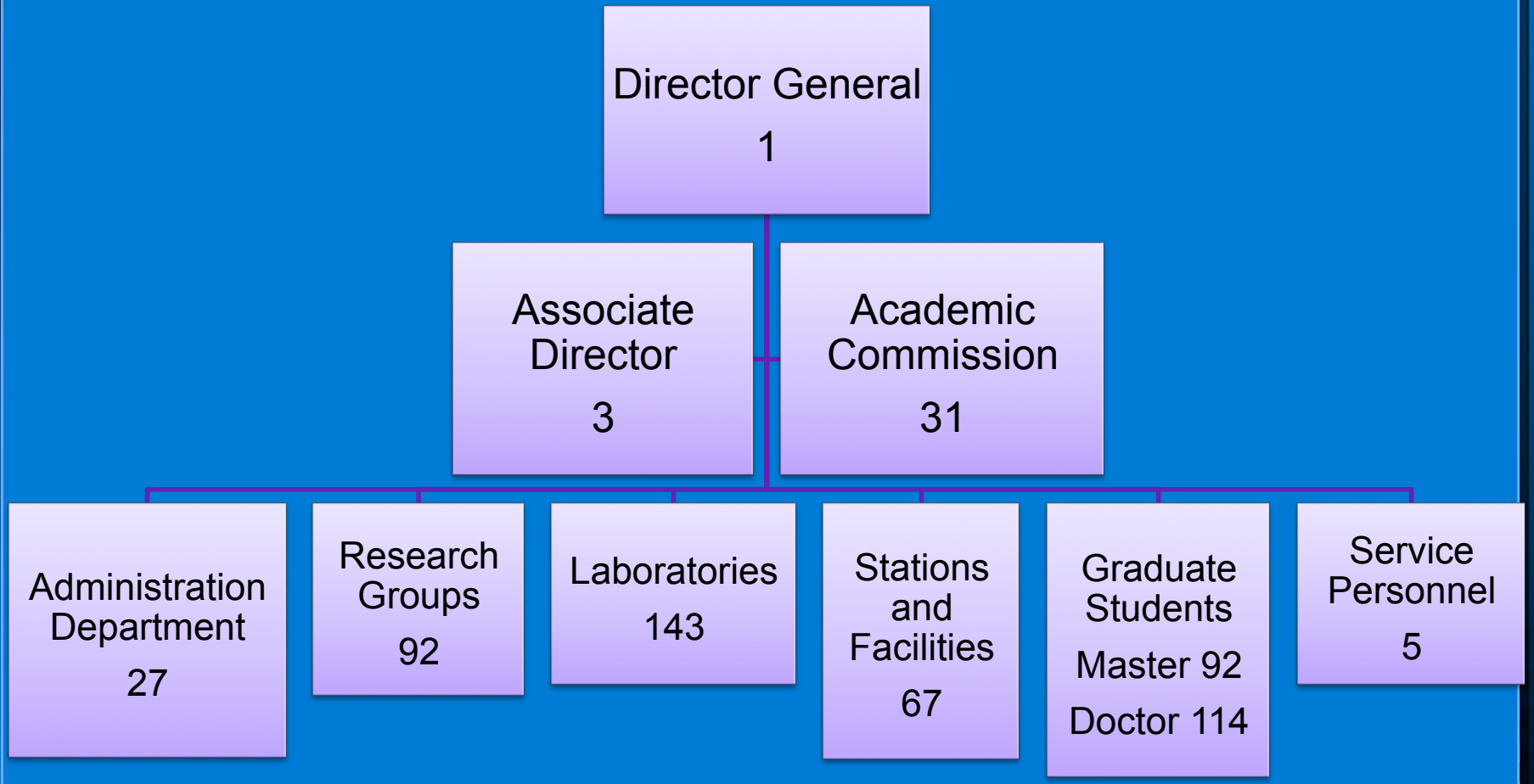
- **Seven laboratories**

  Optic; Space; mm & sub-mm radio;

  CCD; VLBI; FAST; LAMOST

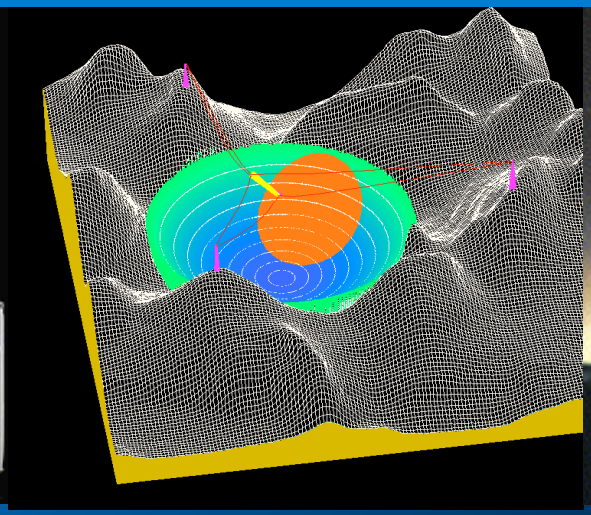

Urumqi
Urastai
Delingha
Changchun
Xinglong(LAMOST)
Miyun
HuiRou
NAOC
PMO
NIAOT
SHAO
FAST
Gaomeigu
YNAO

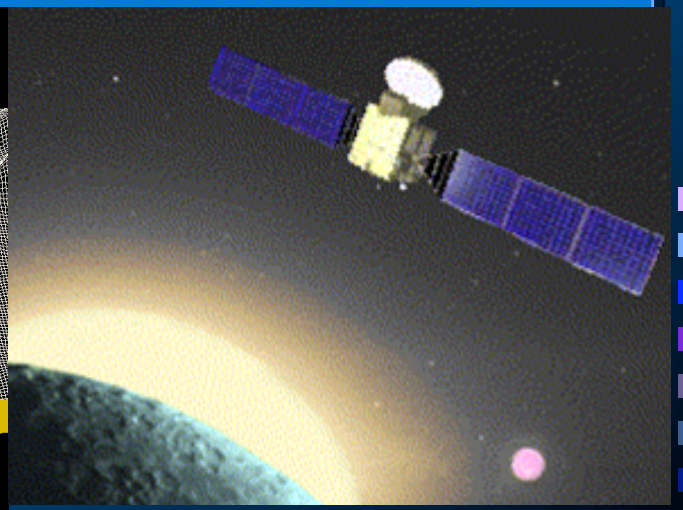
Structure of NAOC (HQ)



Progress of Key Projects

- **LAMOST** (Large sky Area Multi-Object fiber Spectroscopic Telescope)
- **FAST** (Five-hundred-meter Aperture Spherical Telescope)
- **LUREX** (Lunar Resource Explorer : Chang'E)





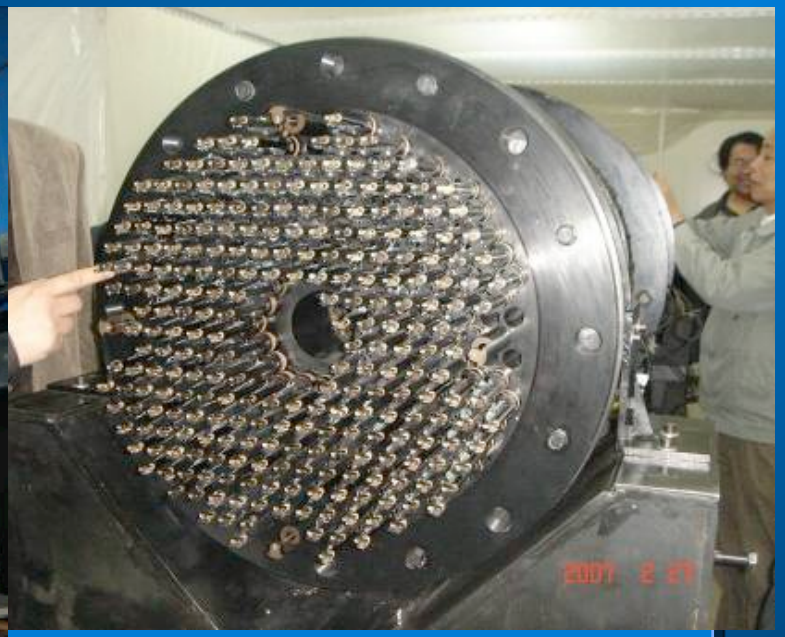
Status and Progress of LAMOST

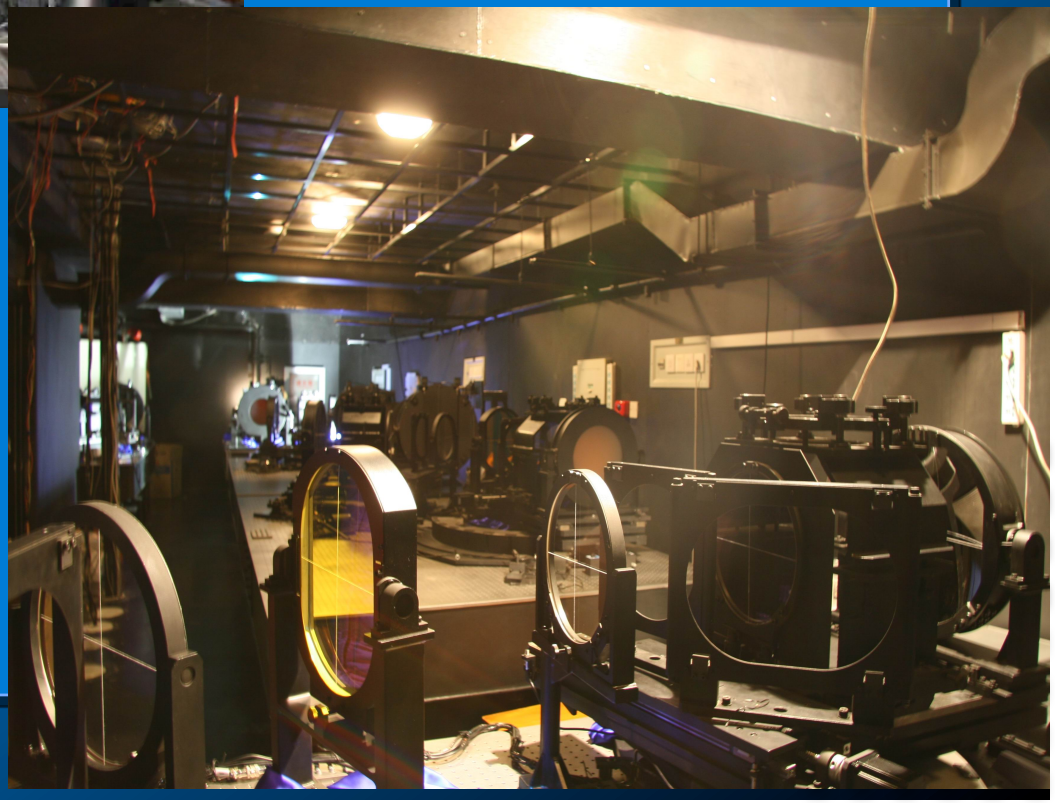
- adopts the **active optics technique** as well as the **parallel controllable fiber positioning** system.
- a unique astronomical instrument in combining a **large clear aperture** and **wide field of view**.
- 2007-2008:
  - » Optic (Ma 24 + Mb 37)
  - » Instruments (4000 fibers, 16 spectrographs, 32 CCDs)

Status and Progress of LAMOST

- Technical advantages:
  - large clear aperture (4m, segmented mirrors)
  - wide field of view (5 degree)
  - multi-object spectroscopic survey (4000 objects with one exposure)

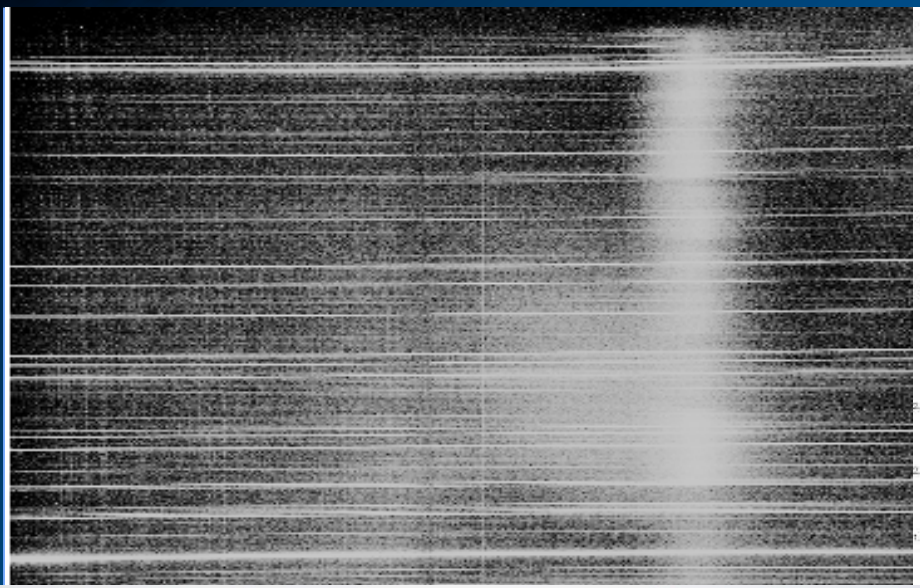
- Scientific goals:
  - large scale structure and extragalactic astronomy
  - structure of Milky Way and stellar physics
  - cross identification through multi-wave observation

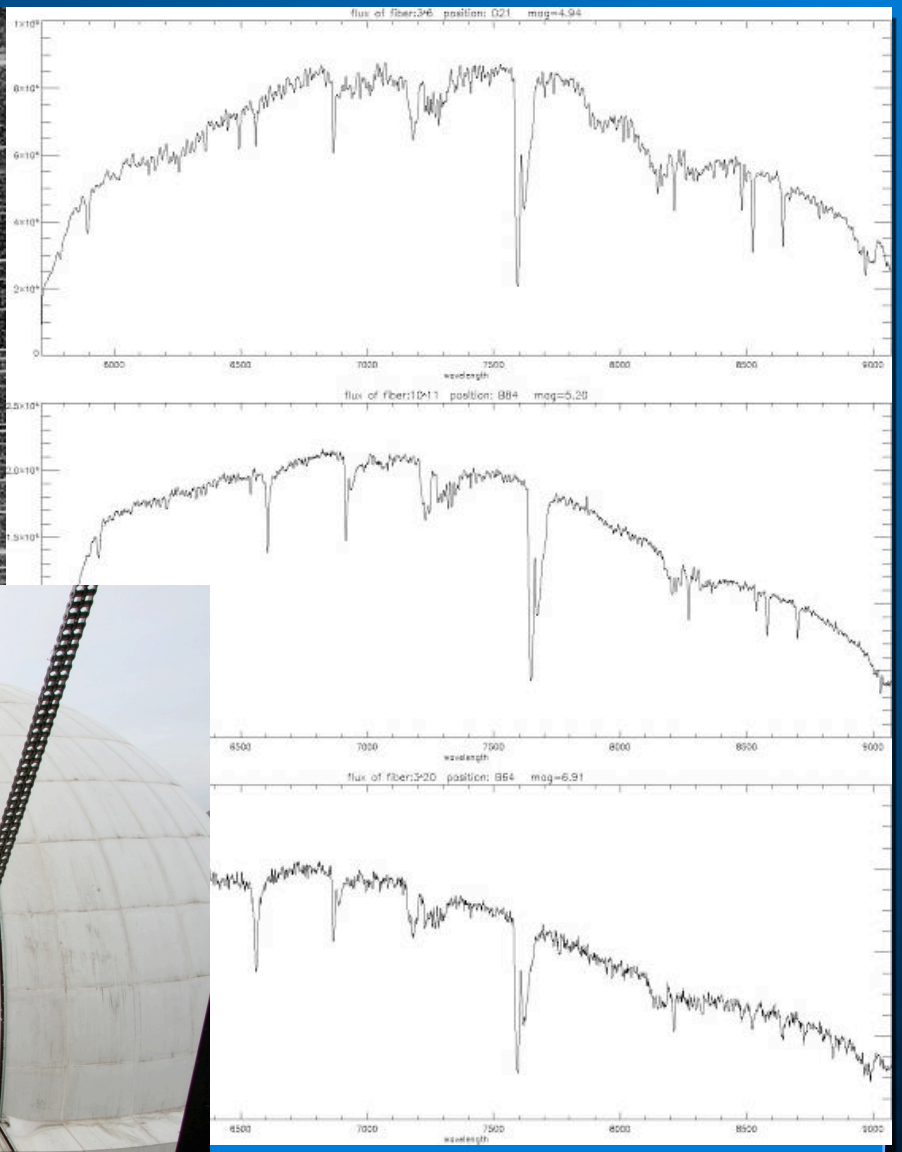




Key event:

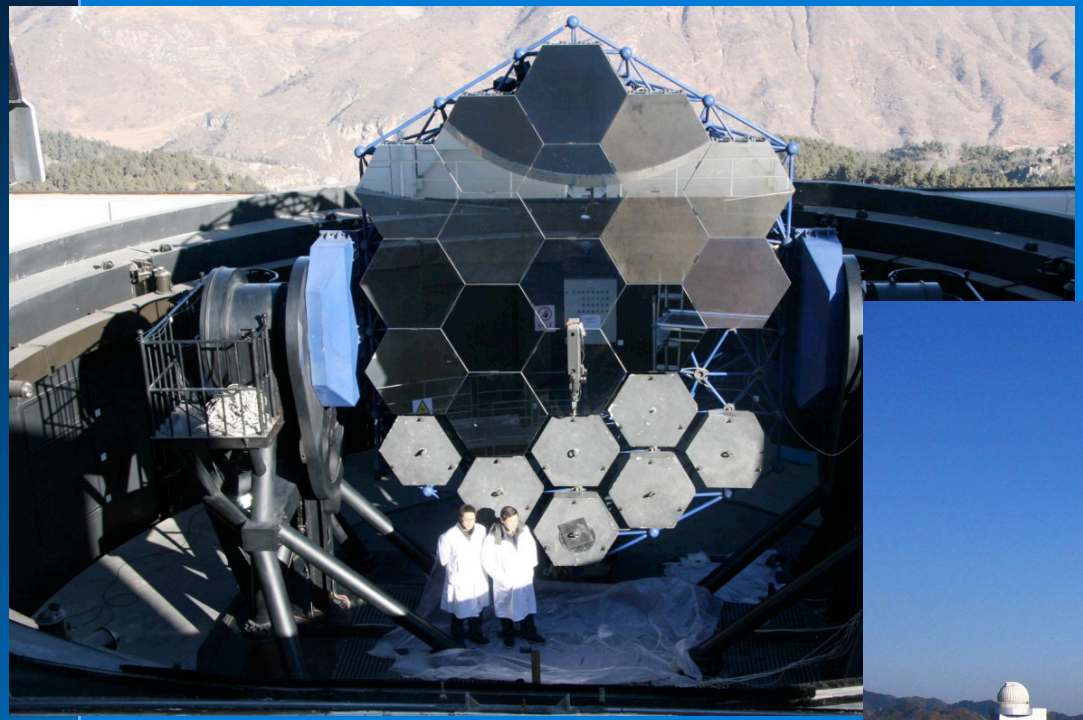
- Small system finished in June, 1/4 optic, 1/16 fibers
- Observing while constructing
- Finished in this August





Spectra taken by a small system

Status and Progress of LAMOST

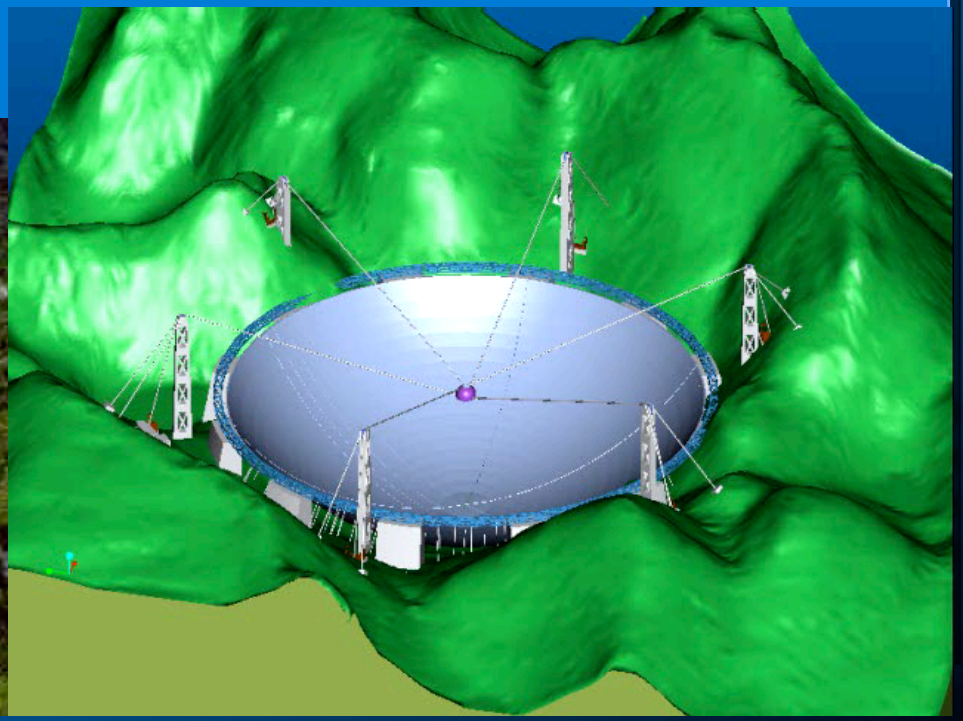


Feb. 2008

Oct. 2007

Status and Progress of FAST

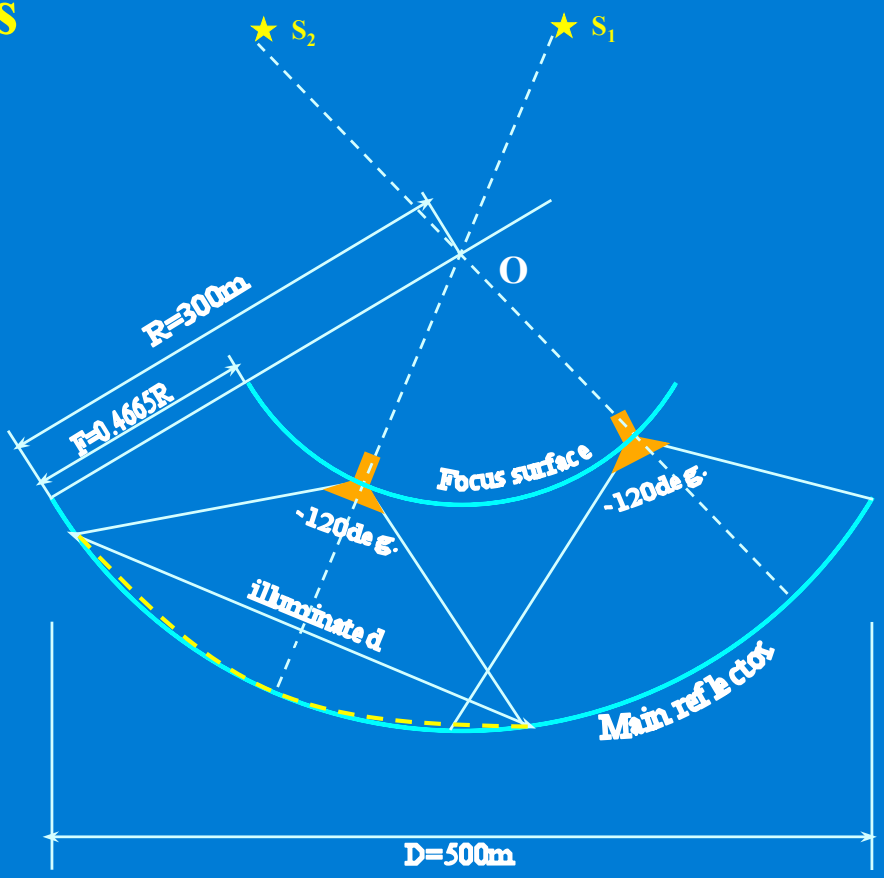
- Unique Karst depression as the site
- Active main reflector
- Cable - parallel robot feed support



Status and Progress of FAST

Optical geometry and Specs

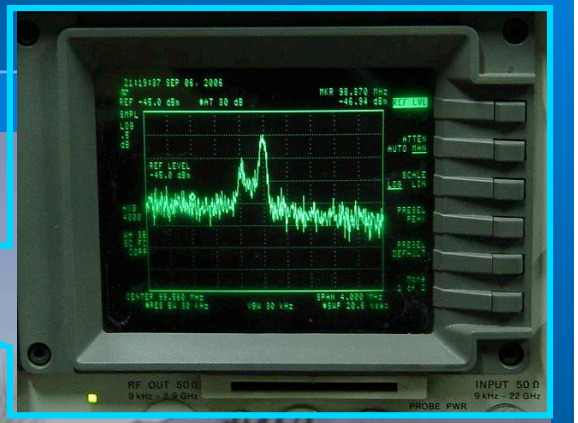
- Reflector： R～300m, D～500m, opening angle:θ～110-120°
- Illuminated aperture: D_{eff}=300m
- Sky coverage： maximum zenith angle: 40°
- Working frequencies：
- 70MHz-3GHz, up to C-, X-band
- Sensitivity 2000 ㎡/K
- Resolution 2.9’
- Multibeam 19
- Pointing Accuracy： 8″



Miyun Model

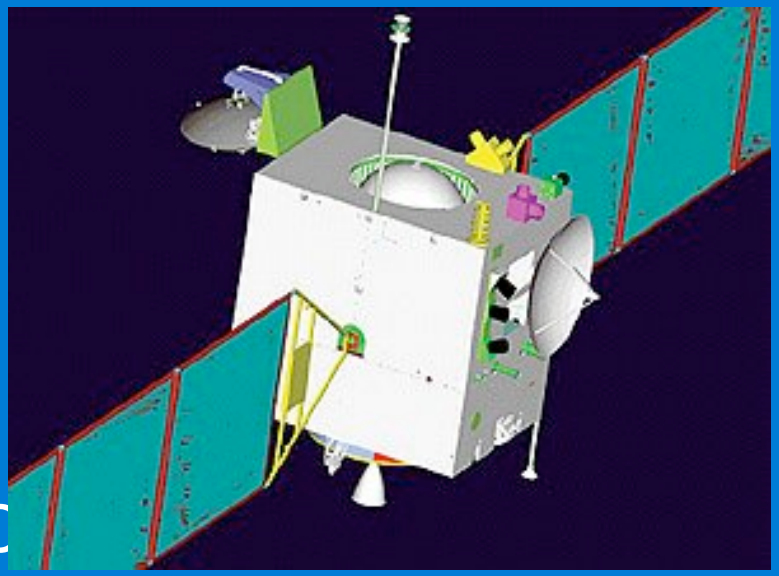
HI detection on Sep. 6 2006

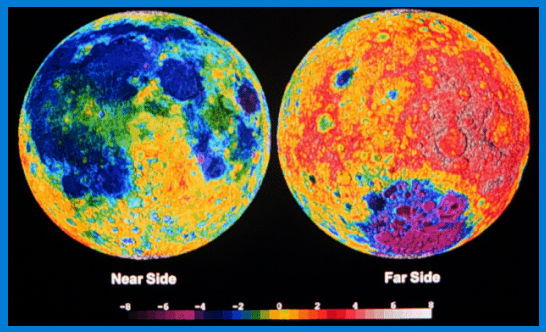
Official Approval on
FAST Funding Proposal on
Jul. 10 2007 by NDRC

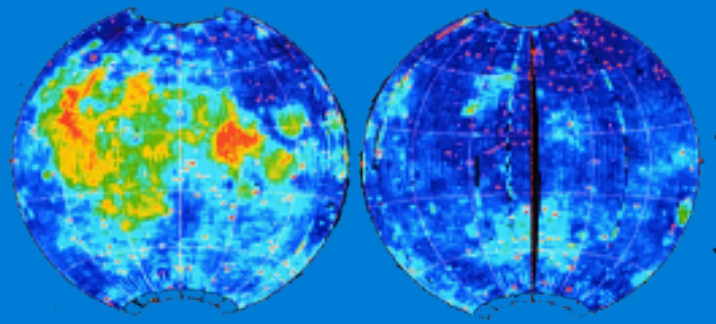


Status and Progress of LUREX

- Chang'E Project successfully launched to survey the moon in 2007.
- NAOC is the leading science programs of the project.
- The science ground segment is built and operating at NAOC





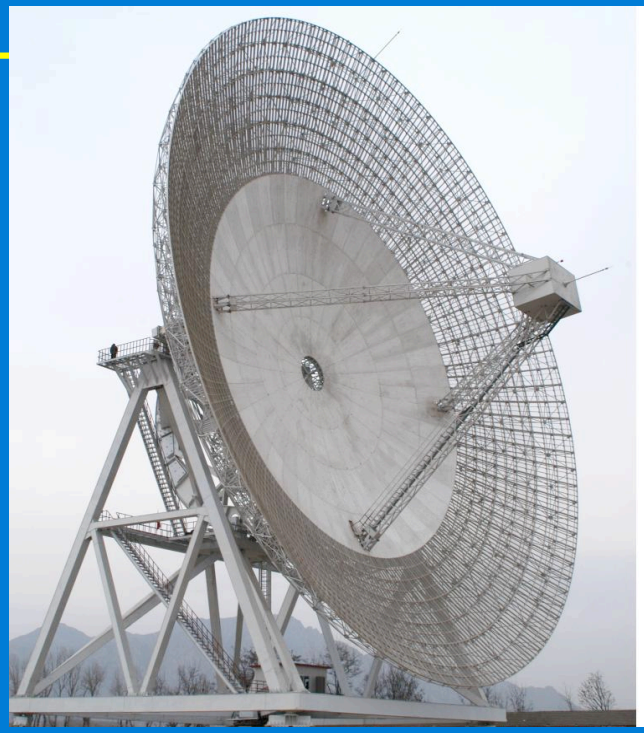


Status and Progress of LUREX

The scientific goals of LUREX

- To acquire three-dimensional atlas of the Moon's surface, and spectra
- To investigate abundance and distributions of usable elements
- To survey distribution and thickness of dusty, loose lunar regolith, in order to estimate potential gas resource, especially helium
- To learn more about space environment near the Moon

Data downlink stations and data center



- A 50-meter and a 40-meter antennas have been built by NAOC for data downlinks and VLBI orbit measurement.
- Data center is located at NAOC headquarter.

Some New Projects

- 21cm survey (Detection of first light after Big Bang)
- WSO/UV (World Space Observatory-Ultraviolet)
- Astronomical Site Survey in Western China

Status and Progress of 21CMA

June 2006: construction completed

10287 antennas @ 4x6 km arms

Physical area：50544m² Effective area: 25000 m²

Total cost：3M USD

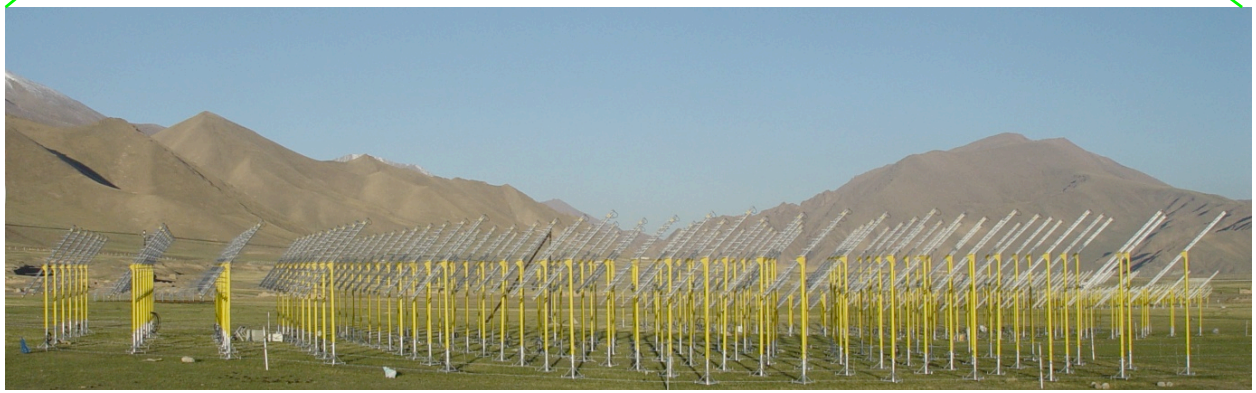
S

N

W

E

control room



21CMA Layout

81 pods along two perpendicular arms (6km+4km)

Baselines: 3240 Freq channels: 4096

Status and Program of 21CMA

Frequency coverage:

50 - 200 MHz

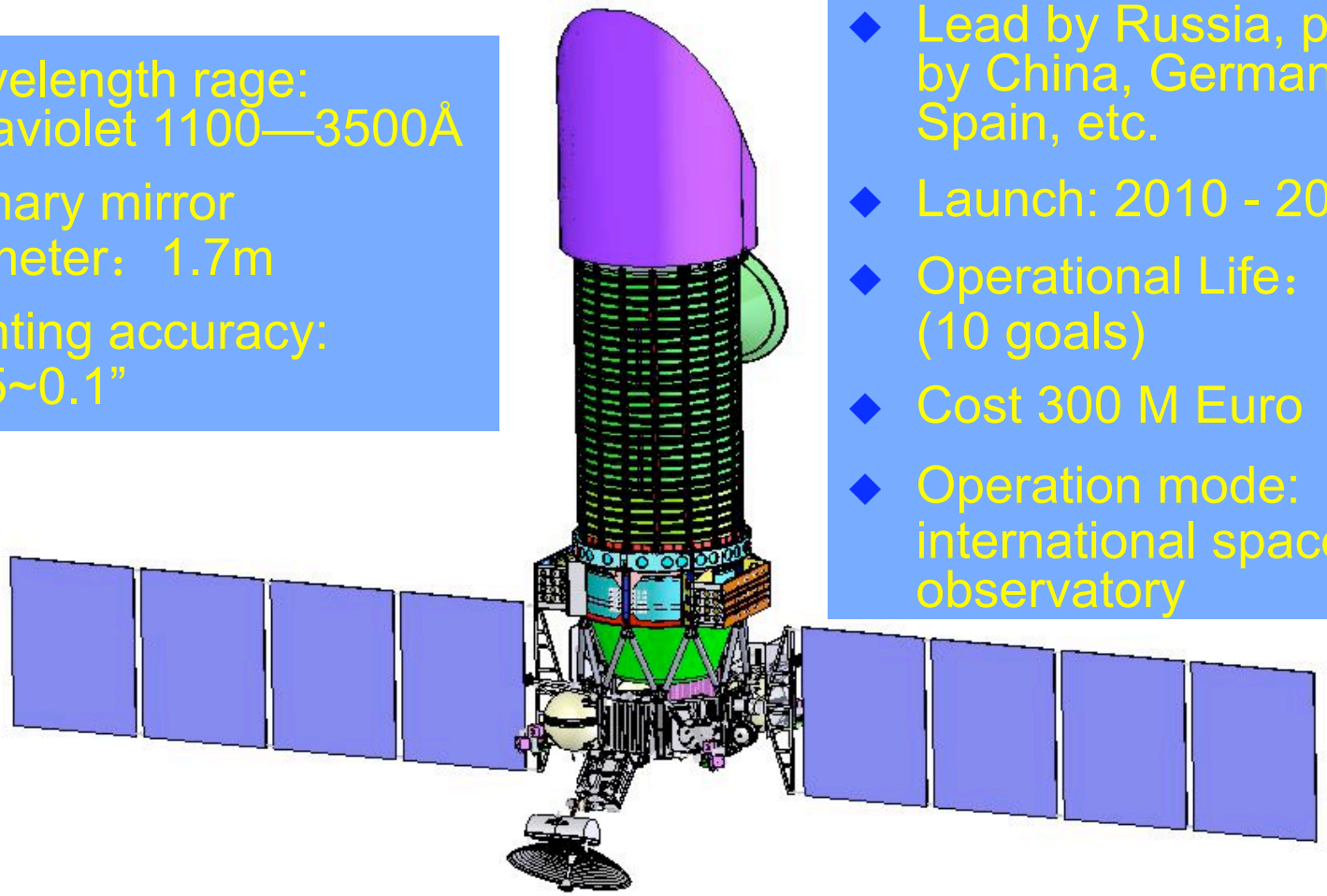
Redshifted 21cm Line:

$\lambda = 21\text{cm}\ (1 + z)$

z	λ(cm)	v(MHz)
6	147	200
10	246	130
20	441	68

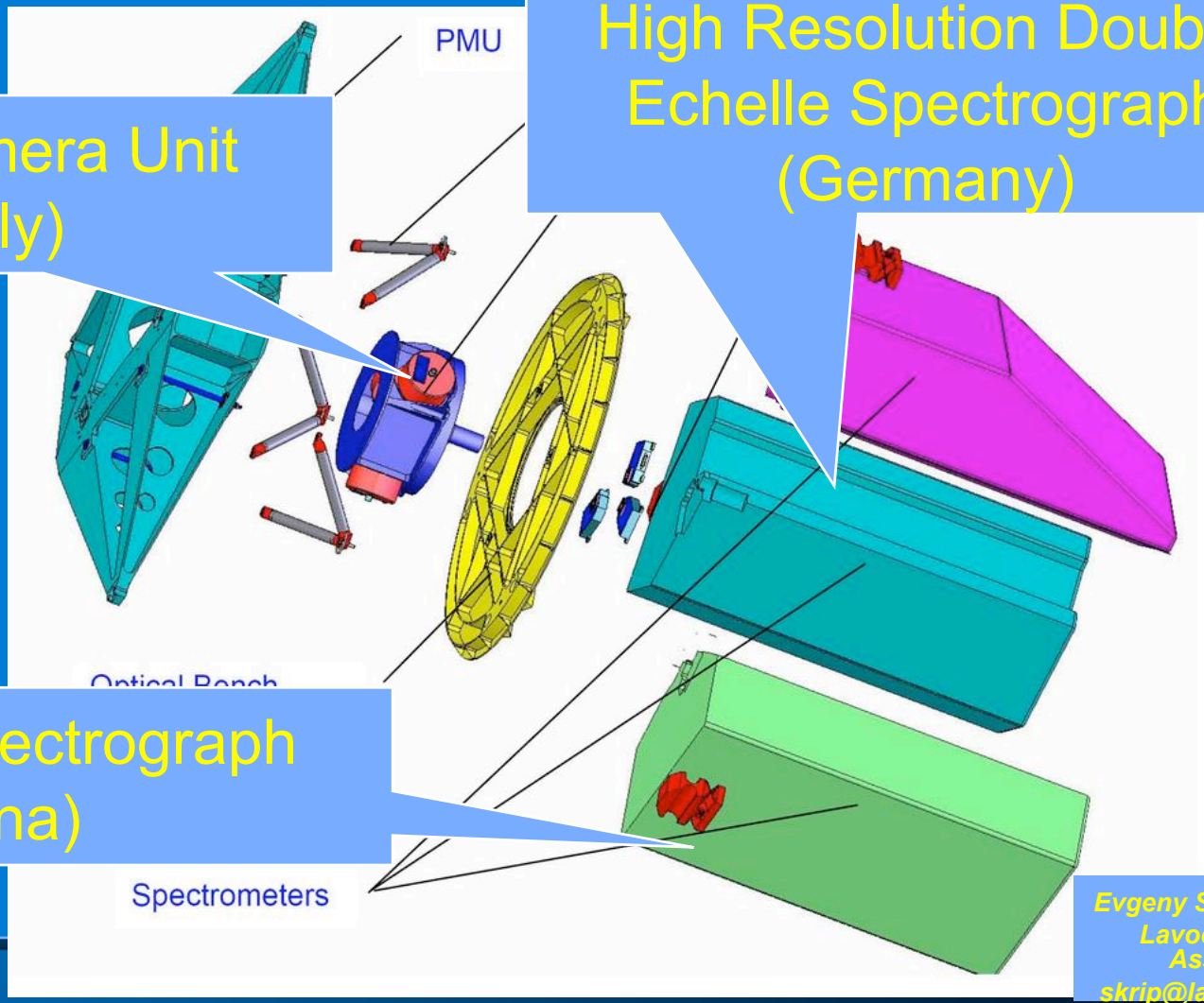
World Space Observatory - Ultraviolet

- Wavelength rage: Ultraviolet 1100—3500Å
- Primary mirror diameter： 1.7m
- Pointing accuracy: 0.05~0.1”



- Lead by Russia, participated by China, Germany, Italy, Spain, etc.
- Launch: 2010 - 2012
- Operational Life： 5years (10 goals)
- Cost 300 M Euro
- Operation mode: international space observatory

WSO-UV's Three Science Instruments



Field Camera Unit (Italy)

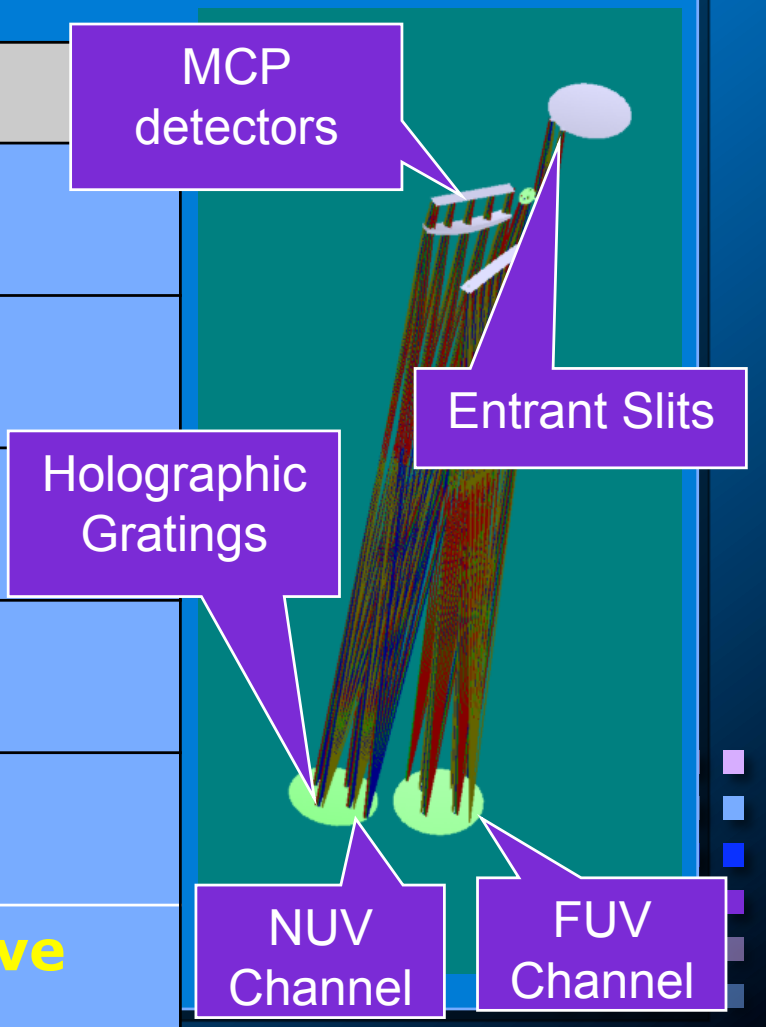
High Resolution Double Echelle Spectrograph (Germany)

Long Slit Spectrograph (China)

Evgeny Skripunov
Lavochkin Association
skrip@laspace.ru

Long Slit Spectrograph Contributed by China (lead by NAOC)

Parameter	specification
Wavelength coverage	102~320 nm two-channel design
Width of slit	1″ ≈ 82 μm
Length of slit	75″ ≈ 6.2 mm
Spectral resolution	1500~2500
Spatial resolution	0.5″~1″
sensitivity	Optimized to observe faint sources

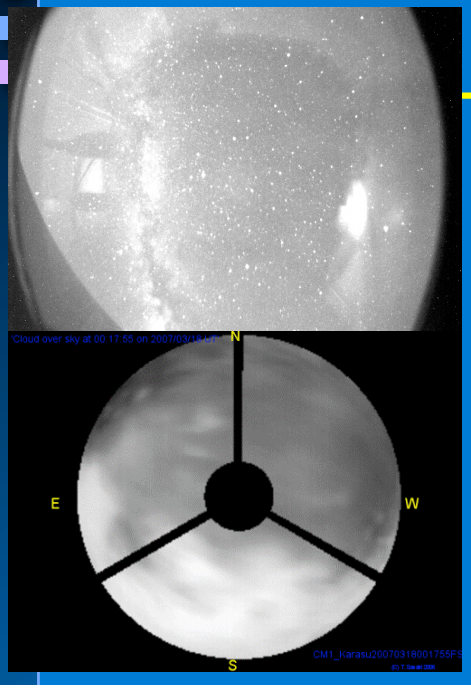


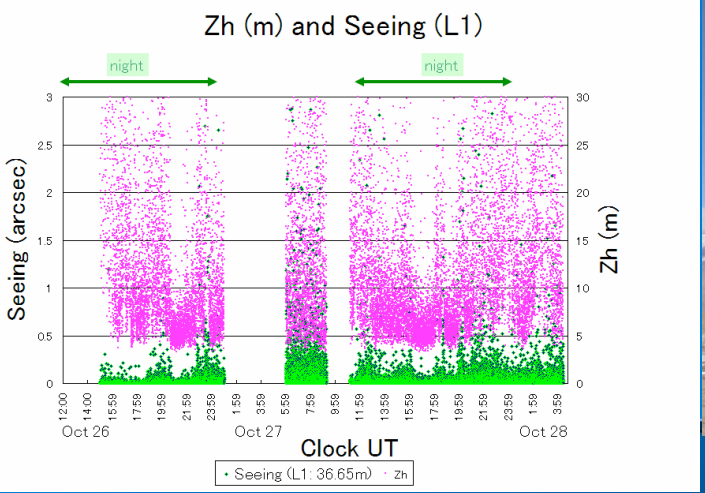
Astronomical Site Survey in Western China

2003-present, for the next generation ELT, and for mid-sized telescopes of the Eastern-Asian astronomical observatories.

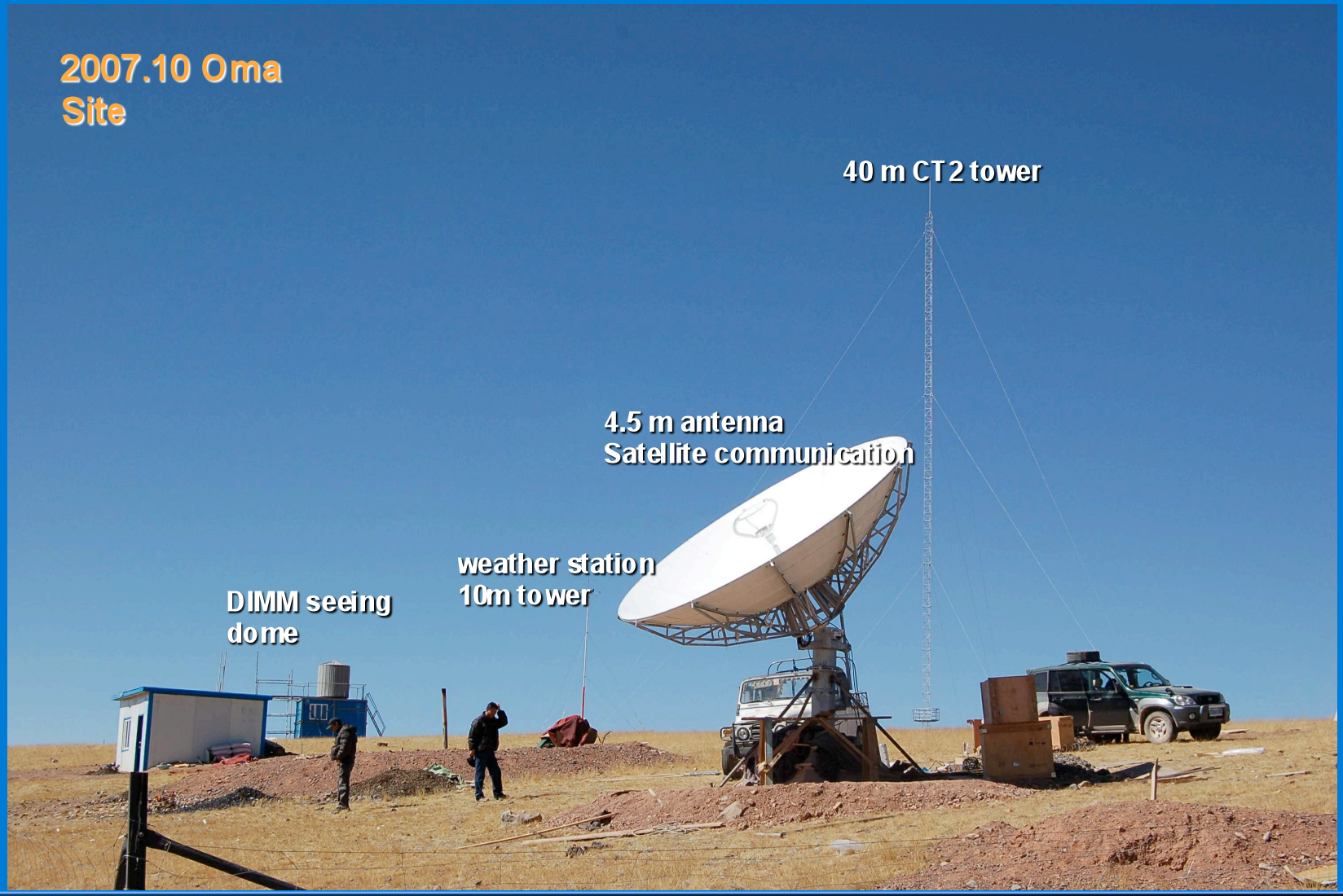
Survey Area: Tibet, Xinjiang, Qinghai, Yunnan

Site Survey: Infrastructure and Monitoring





Site Survey: Infrastructure and Monitoring



Contribution to International Community

- Astronomical journal *Chinese Journal of Astronomy and Astrophysics* (*Research in Astronomy and Astrophysics* in 2009) has become a SCI journal.

- The 28th General Assembly of the International Astronomical Union (IAU/GA) was awarded to China for the first time, and will be held in 2012. NAOC will be in charge of organizing. This historical milestone would undoubtedly promote the international status and influences of Chinese astronomy, and would also boost the development of astronomy and astrophysics.

Collaboration with the U.S.

- Frequent international exchanges between astronomical institutions and individuals in the past
- Collaborations in researches, including radio astronomy, data mining and processing, etc.
  - FAST, SDSS, ALMA and so on.
- Further our collaborations in the future

Thank You!

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