

5th EACOA - Regional Report

Astronomical Activities Update Core Observatories, China Mainland

Gang ZHAO (趙剛)

National Astronomical Observatories

Chinese Academy of Sciences

2011-11-07 @ Kyoto

Outline

- ◆ Brief introduction of the core observatory system
- ◆ Current and ongoing major projects
 - ground-based facilities
 - Space missions
- ◆ The strategy of development- Future projects
- ◆ EA regional collaborations
- ◆ 2012 IAU/GA at Beijing

CAS core observatory system

“large” NAOC

National Astronomical Observatories,
CAS (NAOC)

Purple Mountain Observatory (PMO)

Shanghai Astronomical Observatory
(SHAO)

Headquarters

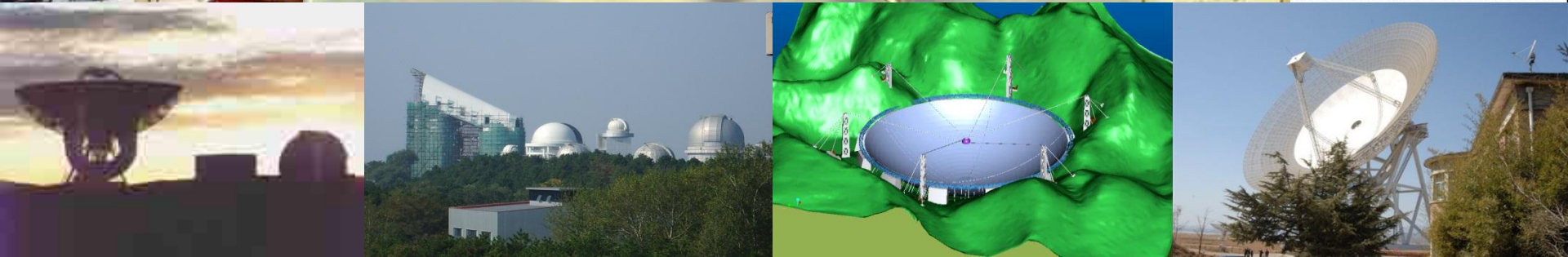
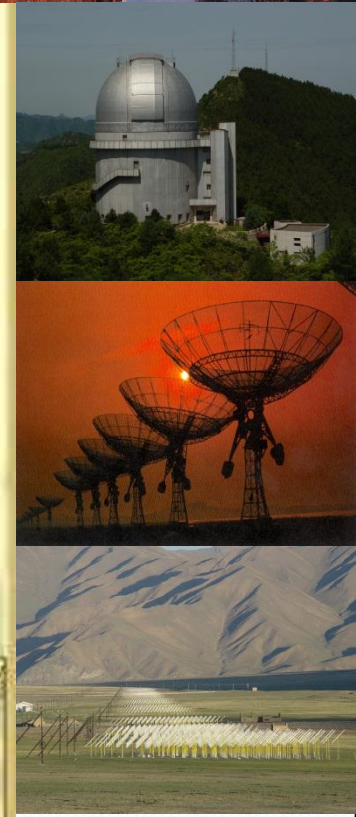
Yunnan Astronomical
Observatory (YNAO)

Nanjing Institute of
Astronomical Optics
and Technology
(NIAOT)

Xinjiang
Astronomical
Observatory (XAO)

Changchun
Observatory (CAO)

“small” NAOC



Current and Ongoing Major Projects at NAOC

Ground—Based Facilities

Status & Progress of LAMOST, FAST, 21CMA, CSRH

LAMOST = 郭守敬望遠鏡 (Guoshoujing Telescope)

- ◆ LAMOST granted the final acceptance of construction by the National Development & Reform Commission on June 4, 2009
- ◆ Pilot survey started in Oct. 2011 after 2 years' engineering & scientific commissioning
- ◆ Formal Surveys start ~ Sept. 2011
 - ▣ LEGUE – The LAMOST Experiment for Galactic Understanding and Evolution
 - ▣ LEGAS – The LAMOST Extragalactic Surveys



Examples of first light sciences by LAMOST

Research in Astron. Astrophys. 2010 Vol. 10 No. 8, 753–760
<http://www.raa-journal.org> <http://www.iop.org/journals/raa>

测试天区发现一批贫金属星

Test observations that search for metal-poor stars with the Guoshoujing Telescope (LAMOST)

Hai-Ning Li^{1,2}, Gang Zhao¹, Norbert Christlieb³, A-Li Luo¹, Jing-Kun Zhao¹, Yong-Heng Zhao¹, Jian-Jun Chen¹ and Zhong-Rui Bai¹

- ¹ Key Laboratory of Optical Astronomy, National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China; lh@nao.cas.cn; gzhao@nao.cas.cn
- ² Graduate University of Chinese Academy of Sciences, Beijing 100049, China
- ³ Zentrum für Astronomie der Universität Heidelberg, Landessternwarte, Königstuhl Heidelberg, Germany

仙女座大星云发现一批新的类星体

LAMOST Discovers Quasars Behind the Andromeda Galaxy

Zhi-Ying Huo¹, Xiao-Wei Liu^{1,2}, Hai-Bo Yuan¹, Hui-Hua Zhang¹, Yong-Heng Zhao³, Jian-Jun Chen³, Zhong-Rui Bai³, Hao-Tong Zhang³, Hua-Wei Zhang¹, Ruben García-Benito², Mao-Sheng Xiang⁴, Hong-Liang Yan³, Juan-Juan Ren³, Shi-Wei Sun³, Yong Zhang⁵, Ye-Ping Li⁵, Qi-Shuai Lu⁵, You Wang⁵, Ji-Jun Ni⁵ and Hai Wang⁵

- ¹ Department of Astronomy, Peking University, Beijing 100871, China; x.liu@pku.edu.cn
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- ³ National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China
- ⁴ Department of Astronomy, Beijing Normal University, Beijing 100875, China
- ⁵ Nanjing Institute of Astronomical Optics & Technology, Chinese Academy of Sciences, Nanjing 210042, China

Research in
Astronomy and
Astrophysics

Research in Astron. Astrophys. 2010 Vol. 9 No. XX, 000–000
<http://www.raa-journal.org> <http://www.iop.org/journals/raa>

Research in
Astronomy and
Astrophysics

仙女座大星云发现一批新的行星状星云

LAMOST Discovers New Planetary Nebulae in the Outskirts of the Andromeda Galaxy

Hai-Bo Yuan¹, Xiao-Wei Liu^{1,2}, Zhi-Ying Huo¹, Hui-Hua Zhang¹, Yong-Heng Zhao³, Jian-Jun Chen³, Zhong-Rui Bai³, Hao-Tong Zhang³, Hua-Wei Zhang¹, Ruben García-Benito², Mao-Sheng Xiang⁴, Hong-Liang Yan³, Juan-Juan Ren³, Shi-Wei Sun³, Yong Zhang⁵, Ye-Ping Li⁵, Qi-Shuai Lu⁵, You Wang⁵, Ji-Jun Ni⁵ and Hai Wang⁵

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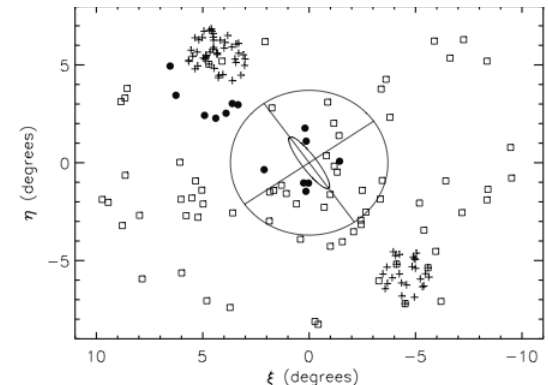


Fig. 3 Spatial distribution of background quasars in the vicinity of M31. Filled circles, crosses and open squares represent, respectively, quasars newly identified with the LAMOST, SDSS quasars, and previously known quasars archived in the NED. The inner ellipse represents the optical disk of M31 of radius $R_{25} = 95/3$, while the outer ellipse is a projected circle of 50 kpc radius.

Five-hundred-meter Aperture Spherical Telescope - FAST



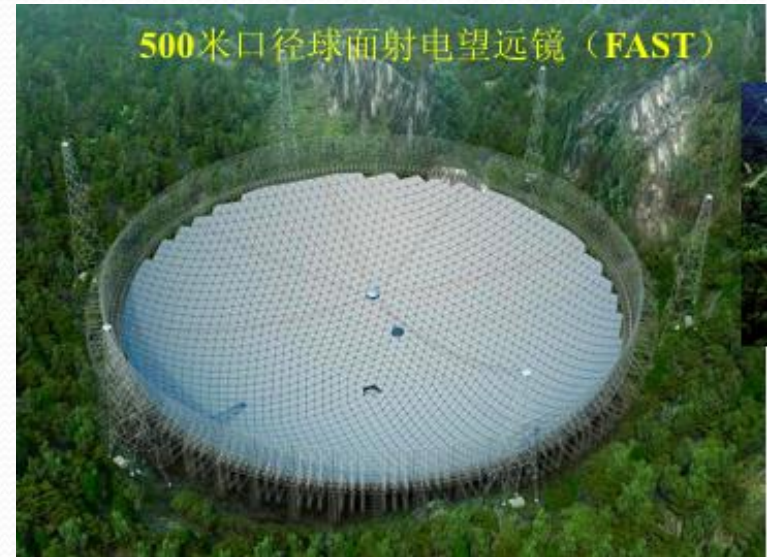
The second Large-scale Science Project funded by NDRC for Astronomy

Three outstanding aspects

- Unique Karst depression as the site
- Active main reflector
- Cable

FAST sciences

- Neutral Hydrogen line (HI) survey
- Pulsar research
- Molecular lines
- Joining VLBI network
- Search for Extraterrestrial Intelligence (SETI)



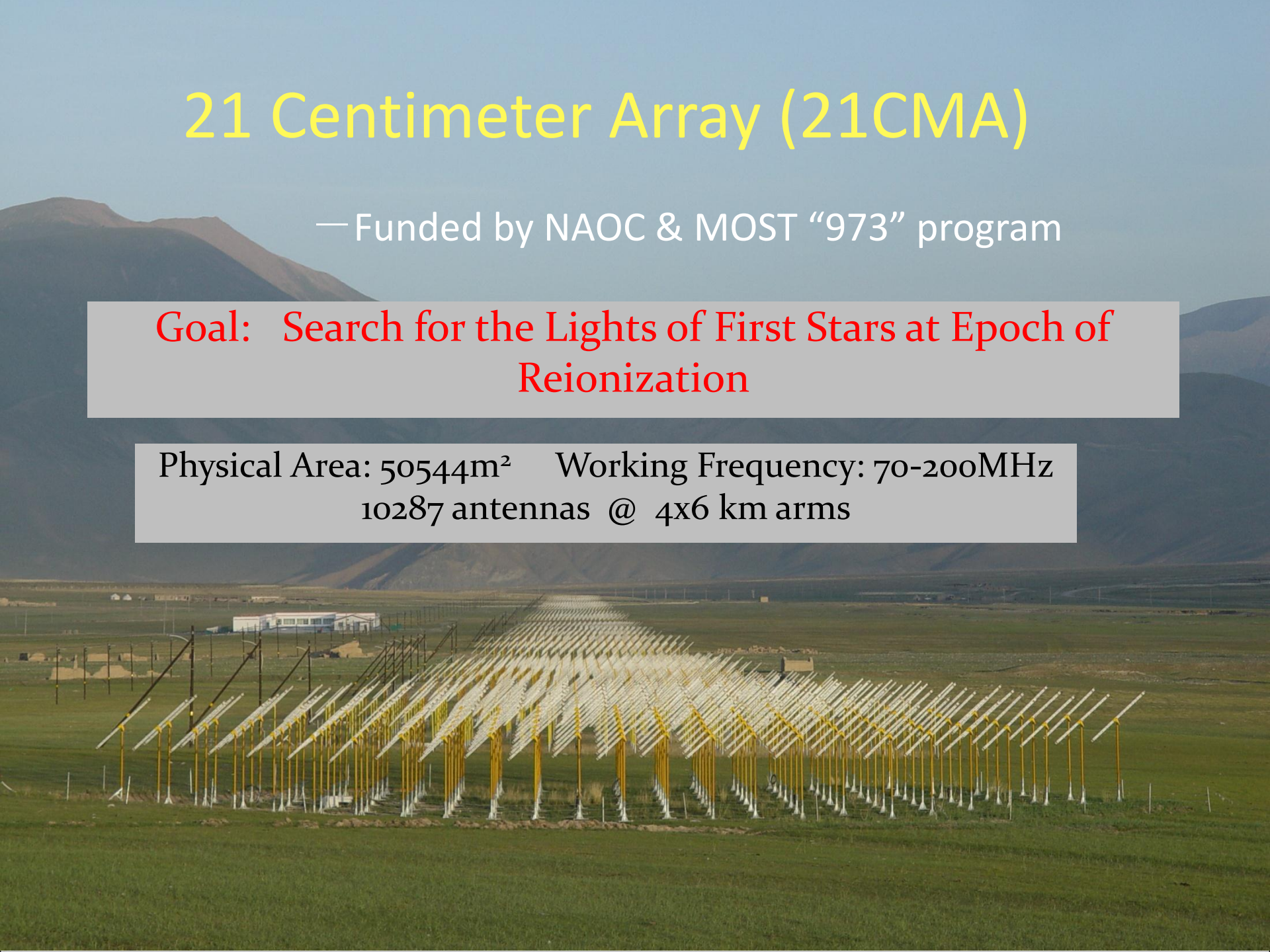
Construction 5.5 yr in 2010—2015

21 Centimeter Array (21CMA)

—Funded by NAOC & MOST “973” program

Goal: Search for the Lights of First Stars at Epoch of Reionization

Physical Area: 50544m² Working Frequency: 70-200MHz
10287 antennas @ 4x6 km arms



Chinese Spectral Radio Heliograph (CSRH)

a new instrument capable of true imaging spectroscopy,
with high temporal, spatial, and spectral resolution

— Funded by CAS via National Key Equipment R&D Program

Specifications

Freq Range 0.4–15 GHz

Spatial Res. 1.3"– 50"

Array $40 \times 4.5\text{m} + 60 \times 2\text{m}$
2008-2011, 2011-2013

Max baseline 3 km

Field of view $0.6^\circ - 7^\circ$

Site: Inner Mongolia



Current and Ongoing Major Projects at NAOOC

Space Missions

SVOM, CE3, HXMT, DSO

Space-based multi-band astronomical Variable Object Monitor (SVOM)

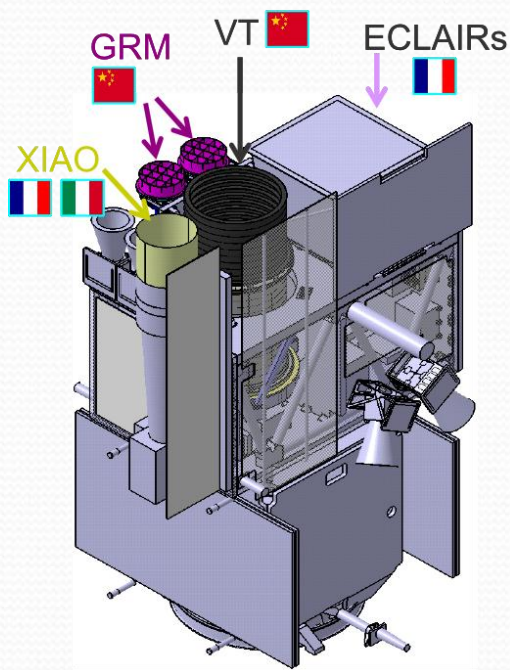
Multi- λ GRB project

Designed to detect about 80 GRBs of all known types per year, including those at very high redshifts

China's contribution to Scientific Payload

GRM: two soft gamma-ray (50keV-5MeV) spectrophotometers

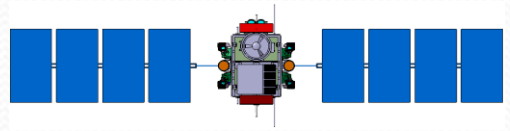
VT: one 45cm-diameter optical telescope



	Spectral band	Field of View	Localization Accuracy	GRBs/yr
GRM	50keV-5MeV	2 sr	N/A	~ 80
ECLAIRs	4-250 keV	2 sr	10 arcmin	~ 80
XIAO	0.3-2 keV	diameter 25 arcmin	10 arcsec	~ 70
VT	400-650 nm 650-950 nm	21 × 21 arcsec	1 arcsec	~ 60



a Sino-French space mission scheduled to be launched in 2014



CE3 Lunar Optical Telescope (LOT)

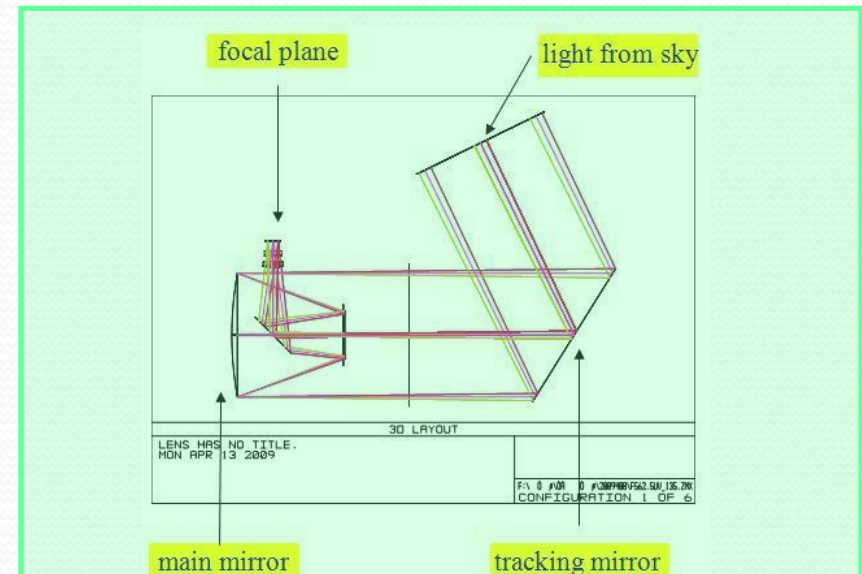
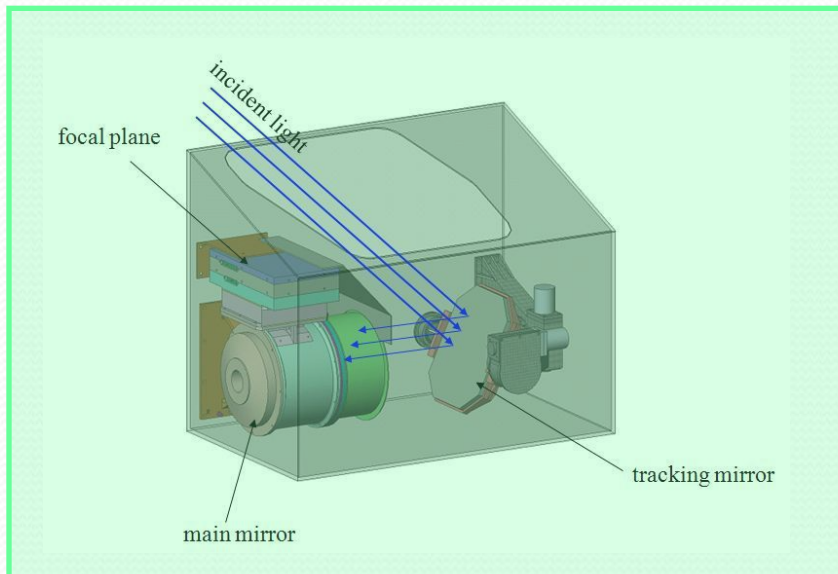
Second Phase of the Chinese Lunar Exploration Project

Optics Design

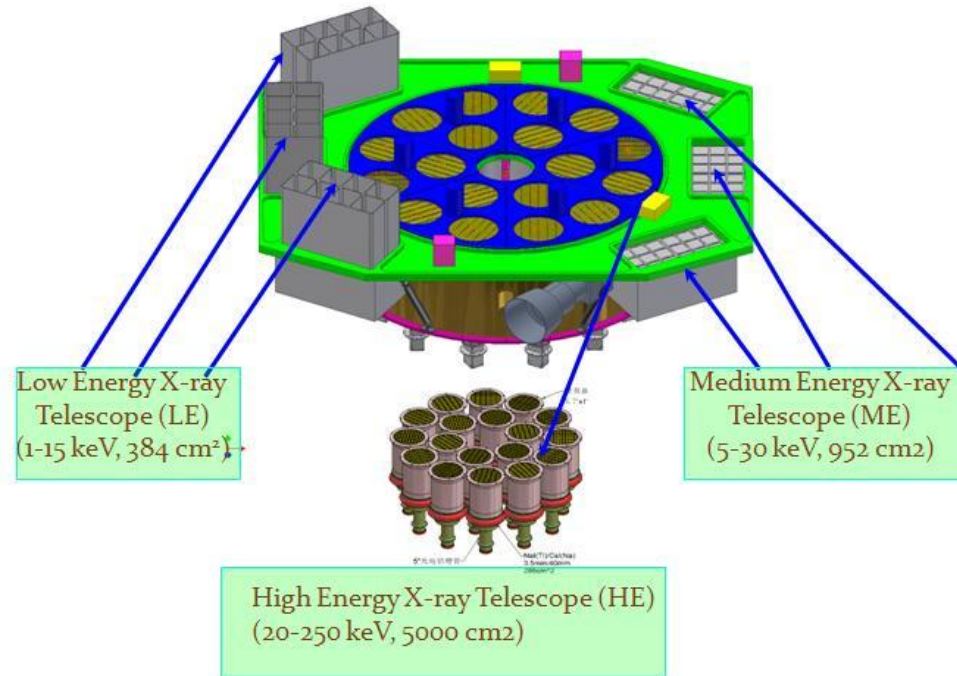
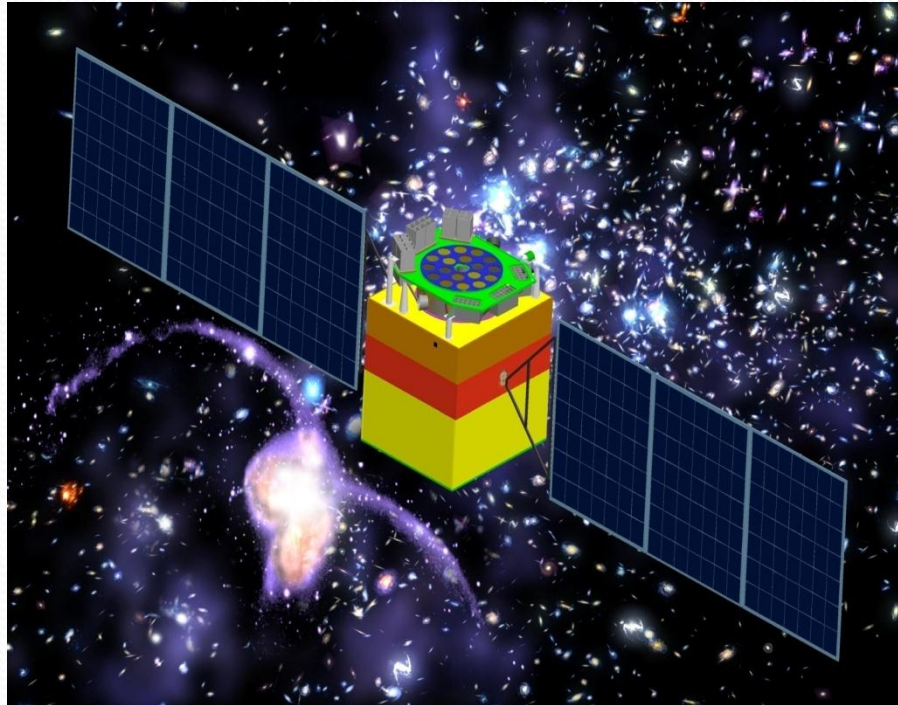
- ◆ LAMOST-like R-C System
- ✓ Spectral coverage: 200 – 360 nm
- ✓ Diameter of main mirror : 150mm
- ✓ F-ratio: F/3.75
- ✓ FOV: $1.36^\circ \times 1.36^\circ$
- ✓ E2V CCD 47-20 with TEC
- ✓ Limiting mag: AB 15^m (30s, 5 σ)

Scientific Motivation

- ◆ Long term monitoring in NUV:
 - Cataclysmic variables
 - X-ray binaries ...
 - AGNs & quasars
- ◆ Survey in Galactic plane: around lunar north polar
(Sky area not covered by GALEX)

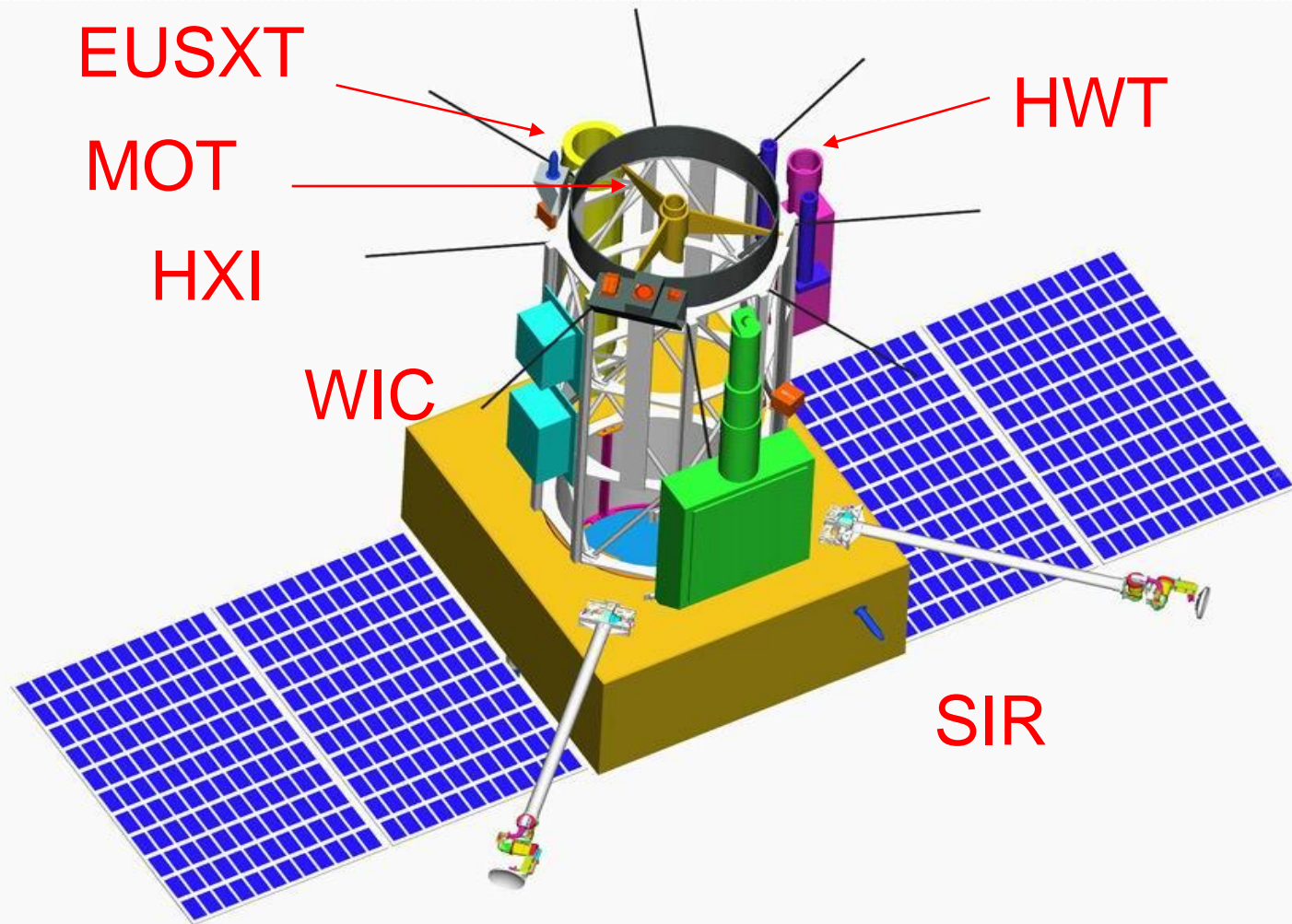


Hard X-ray Modulation Telescope (HXMT)



- HXMT will perform a broad band (1-250 keV) X-ray all-sky survey and make pointed observations of X-ray sources to study their spectroscopic and multi-band temporal properties
- Has been selected as the first astronomical mission in 2005, scheduled to launch 2013-2014

Deep Sky Solar Telescope (DSO)



Pending on decision of NDRC for 12th 5 yr Plan

Looking Into The Future

Bottleneck of the development of Chinese astronomy

- Lack of high-quality sites, esp. optical/infrared
- Limits on telescopes' capabilities and performances

Strategic and Planning Committee on Astronomy Development

NSFC/CAS/CAS, 2009

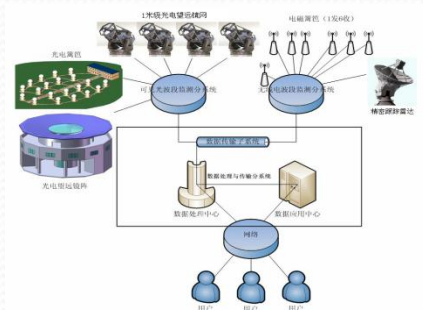


**Decadal survey,
Recommendations /
High-priority projects**



- Developing Antarctic astronomy at Dome A
- Participating in international TMT Project
- Building space-based telescopes

Roadmap 2020, Chinese ground-based and space-based astronomical facilities



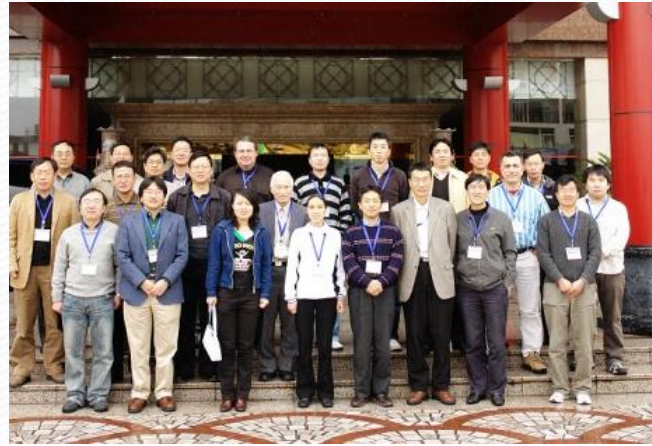
EA Regional Cooperation

EAPSNNet, Solar Physics

East-Asian Extra-solar Planets Search Network (EAPSNet)



2006, Hakone, Japan



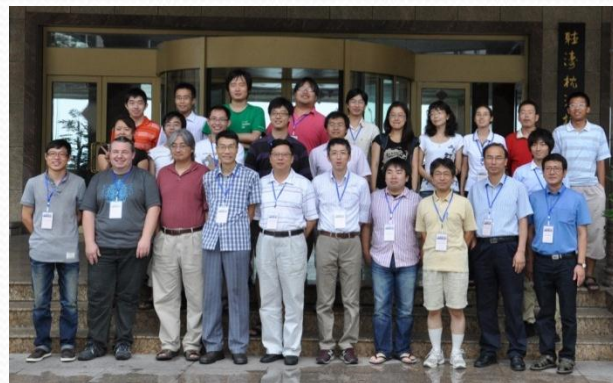
2007, Lijiang, China



2008, Jeju, Korea



2009, Hokkaido, Japan



2010, Weihai, China



2011, Seoul, Korea

Current Status & Discoveries



- ◆ Okayama 1.88m tel., Japan
 - ▣ 300 GK giants ($V < 6$), since 2001
 - ▣ 10 planets and 1 brown dwarf

- ◆ Xinglong 2.16m tel., China & Okayama
 - ▣ 100 GK giants ($V \sim 6$), since 2005
 - ▣ (1 planet and 2 brown dwarfs)



Current Status & Discoveries

◆ Bohyunsan 1.8m tel., Korea & Okayama

- ▣ 140 GK giants ($V < 6.5$), since 2005
- ▣ 1 brown dwarf



◆ Subaru 8.2m tel., Japan & EAPSNET

- ▣ >200 GK giants ($6.5 < V < 7$), since 2006
- ▣ Several candidates

◆ TUBITAK 1.5m tel., Turkey

- ▣ 50 GK giants ($V \sim 6.5$), since 2008

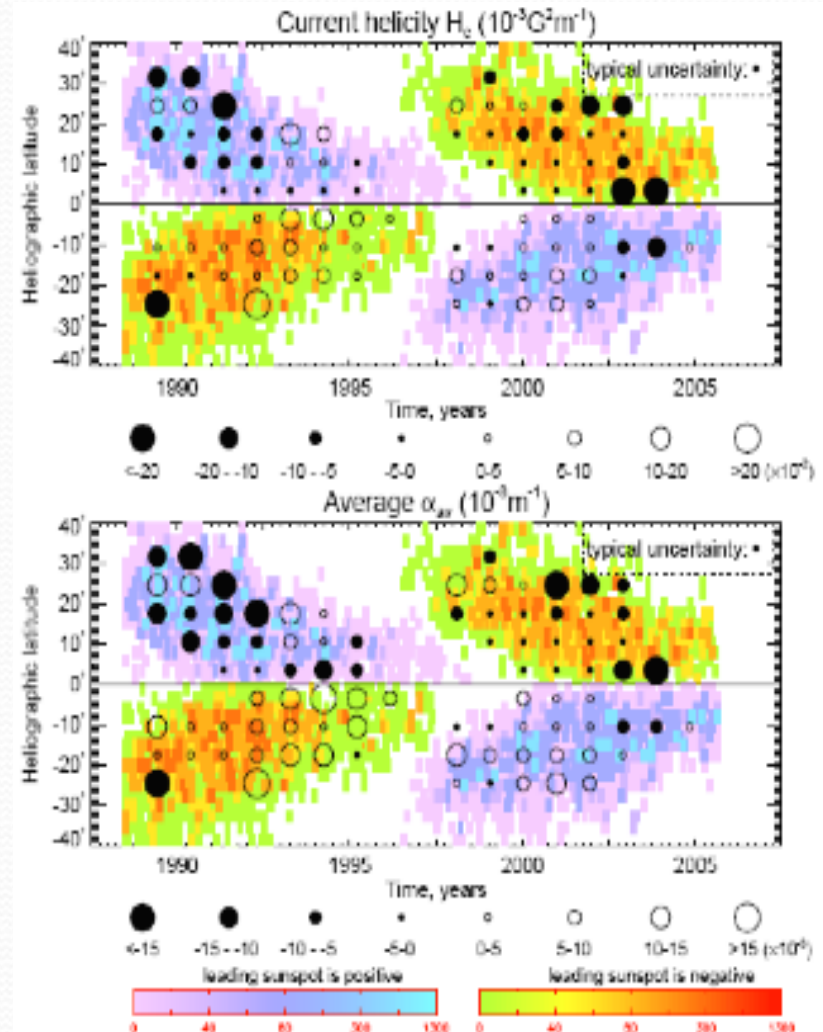


First China-Korea Solar Physics Workshop at Huairou in 2005

Cooperative study of magnetic helicity with Japanese and Korea Solar Astronomers



The signatures with Profs. Takeo Kusugi and T. Sakurai for cooperative program between Japanese and Chinese Solar Physicists in the period of 36th COSPAR in Beijing, 2006



EA Regional Cooperation

GOAL: **to build the EA observatory** (Kaifu, Liu 90's)

- ◆ Since the 1993 China-Japan Joint Site-Survey in Qinghai sets an excellent example, site surveys for better observatories has always been one main task of the East Asia Core Observatories Association (EACOA).
- ◆ Specific observation time should be reserved for EACOA to provide more opportunities to EA astronomers. This will support voluntary applications as well as joint projects like the EA Planet Search NETwork etc.

EA Regional Cooperation

- ◆ EACOA engages in promoting the regional communication in astronomical fields, containing exchanging visiting scholars, and organizing joint symposia, workshops, summer schools, can do better
- ◆ NAOC willing to take the responsibility on the EACOA secretariat and play an active role



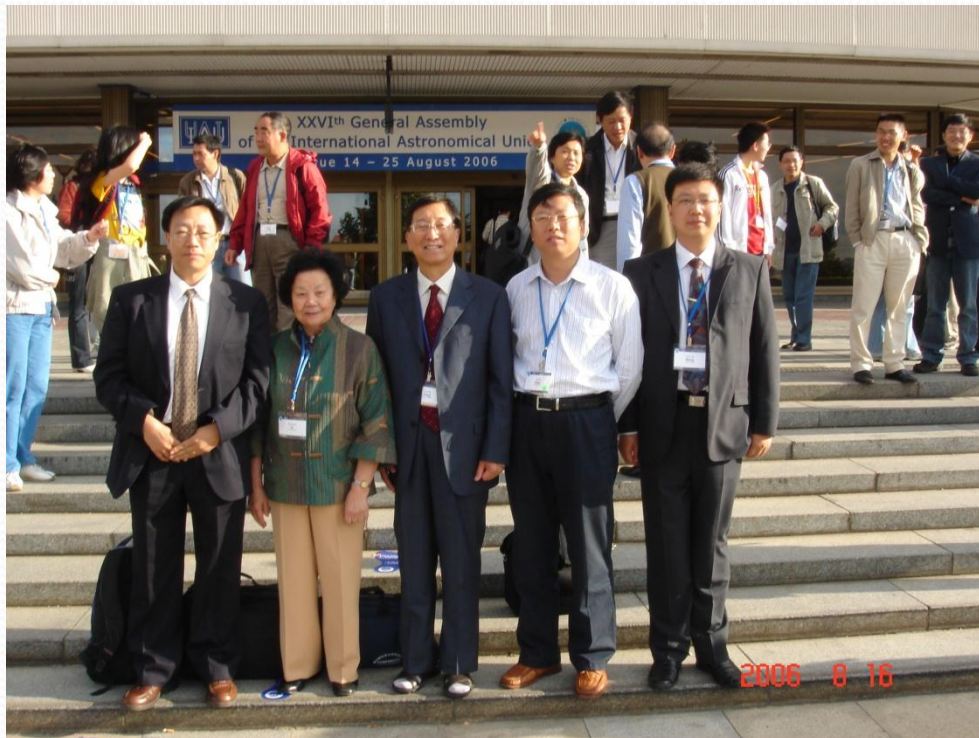
IAU

XXVIII General Assembly

20-31 August, 2012
Beijing, China



- ◆ In August of 2006, at the 26th International Astronomical Union (IAU) General Assembly, the Chinese Astronomical Society win the first bid for China to host the 28th IAU General Assembly.



Venue of 2012 IAU/GA: China National Convention Center (CNCC)



- ◆ 2012 IAU/GA will be a milestone in the history of IAU/GA, with 8 Symposia, 18 Special Sessions and 7 Joint Discussions;
- ◆ During the opening, Jocelyn Bell will be invited to give a special talk;
- ◆ Invited Discourses will invite top-leading scientists including the latest Nobel winner;
- ◆ Various activities including Young Astronomer, Women in Astronomy, UNAWE workshop, etc.

◆ Important dates

- ▣ Sept. 1, 2011 – Feb. 29, 2012: Early Registration and abstract submission
- ▣ Mar. 1, 2011 – Aug. 1, 2012: Regular Registration
- ▣ Aug. 19, 2012 – Aug. 26, 2012: On-site Registration

All East-Asian astronomers are warmly welcome to join this important and meaningful event!

THANKS!

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