TMT project in Japan and prospects for collaborations in ELT era

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TMT overview
Science goals
Japan's contribution plan and status
Operation and

collaborations



October 14, 2013 EAMA meeting

Thirty Meter Telescope

- •Construction site: Mauna Kea in Hawaii
- •Primary mirror: 30m diameter
- •Wavelength: 0.3-28µm
- •Diffraction limit: 8 mas (@1um)
- •FOV: 15 arcmin
- •First light instruments : Infrared Imaging Spectrometer (IRIS) Wide Field Optical Spectrometer (WFOS) Infrared Multi-object Spectrometer (IRMS)
- •Construction start: 2014
- •First light: 2022











TMT will be constructed at Mauna Kea (4050m) near Subaru and Keck







Segment mirrors for the primary mirror



The primary mirror consists of 492 segment mirrors





Segment mirrors on support system (SSA)



TMT collaboration



•TMT project partners: Japan (NAOJ), Canada(ACURA), China (NAOC), India (ITCC), US (UC, CIT). NSF (US) started 5-year support for partnership-planning activities.







Preparation for agreement for starting construction

- •Master Agreement defining the project goal, members' right and governance structure
- •Documents for details on contributions, telescope time, etc.

■July 2013 Science Authorities (e.g. NAOJ director) sign the master agreement

■Feb 2014 Whole agreement will be signed by Financial Authority (e.g. NINS director general)

■April 2014 Decision to proceed (starting construction)



Master agreement signed by science authorities





Scientific Authorities Sign the TMT Master Agreement

July 29, 2013 | Topics

All of the scientific authorities of the TMT partners have signed a Master Agreement.

July 25, 2013 Waikoloa, Hawaii

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The Thirty Meter Telescope (TMT) project announces that all of the scientific authorities of the TMT partners have signed a Master Agreement. The Master Agreement document establishes a formal agreement amongst the international parties defining the project goals, establishing a governance structure and defining member party rights, obligations and benefits. Masahiko Hayashi, the Director General of the National Astronomical Observatory of Japan, signed the document as the scientific authority representing Japan.







Hawaii local newspaper reporting the lease (April 13, 2013)



The decision clears the way for top \$1 billion. the group managing the Thirty Meter The telescope's segmented pri-Telescope project to negotiate a sub- mary mirror, which is nearly 100 lease for land with the University of feet (30 meters) long, will give it Hawaii nine times the collecting area of the

Some Native Hawaiian groups had petitioned against the project, arguing it would defile the mountain's sacred AUTODAT.



This file image shows an artist's rendition of what the See TMT Page A5 Thirty Meter Telescope would look like atop Mauna Kea.



TMT-J contribution: Telescope structure



Light and stiff structure is required.Accurate tracking is essential.

TMT M1 diameter is 3.7 (=30/8.2) times larger than Subaru M1.



TMT-J contribution: primary mirror blank and polishing



Developing mirror blank and surface grinding/polishing
Mass production of mirror blanks and grinding in 2013

Prototype segment mirror produced in 2012



First segment mirror blank actually used for TMT M1





Instruments: IRIS imager and WFOS camera system



Infrared Imaging Spectrometer (IRIS) Wide Field Optical Spectrometer (WFOS)







Science case: Search for earthlike planets in habitable zone







Atmosphere of planets: direct imaging/spectroscopy



Searches and studies for earth-like planets around low-mass red dwarfs (M type stars) by direct imaging/spectroscioy of planets (cf. radial velocity survey with Subaru/IRD)





Subaru/HiCIAO images Jupiter-size planet GJ504b.



Atmospheres of planets: transmission spectroscopy



Measurement of additional absorption by planetary atmosphere during transit





Sicence case: First stellar systems/galaxies









Most distant galaxy confirmed by spectroscopy with Subaru (2012)



Shibuya et al. (2012)



Survey with Subaru/HSC and TMT follow-up



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TMT

Subaru with HSC





Wide field of view of the prime focus camera HSC





Typical Apparent Diameter of the Moon (0.5 degrees)



Suprime-Cam First Light Release January 1999

Suprime-Cam Image Release September 2001 Hyper Suprime-Cam Image Release July 2013

M31 observed with Subaru/HSC

M31 observed with Subaru/HSC







- •The telescope is operated by the TMT International Observatory (TIO). TIO facility will be located in Hawaii (Hilo)
- •Observing time share (as well as operation budget) for a partner is in proportion to the contribution in construction phase.
- •Time allocation (program selection) is made by each partner separately.

•Classical and service observing modes (queue modes for future) are planned. Target of Opportunity (ToO) observation is possible.



TMT science meetings



- •1st TMT science forum (July 2013)
- •TMT science workshop "Astronomy in the TMT Era" (October 16-17, 2013, Tokyo)



