TMT Thirty Meter Telescope

NAOJ National Astronomical Observatory of Japan

TMT Progress Report

Tomo Usuda (TMT-J Director)

Outline

1) International Status: Hawaii etc.

2) TMT-J activities

TMT Thirty Meter Telescope

Brief History of TMT

NAOJ National Astronomical Observatory of Japan

- 2007 Feb: GOPIRA's (Japan's O/IR Astronomy community) endorsement
- 2009 July: Maunakea (MK), Hawaii selected as site
- 2013 April: Conservation District Use Permit (CDUP) completed all court review successfully
- 2013 July: Scientific Authorities Sign the TMT Master Agreement
- 2014 May 6: TMT International Observatory (TIO) was formed as the legal entity (Caltech, UC, China, and Japan)
- 2014 May: Governing Board of TIO voted to start the Construction Phase
- 2014 July: Final Approval for sublease of the construction site at MK
- 2014 Oct 7: Ground Breaking Ceremony
- 2014 Dec 2: India becomes a full member at 10% level
- 2015 Apr: Major construction was started but suspended
- 2015 Apr 21: Canada becomes a full member with $243.5M (CAD)
- 2015 Dec 2: Hawaii Supreme Court invalidated the CDUP issued by BLNR to the UH to build TMT at MK

1) Status of the CDUP Reapproval for TMT

- Dec 2 2015: The Supreme Court of Hawaii decision on CDUP issued.
- Feb 2016: The Third Circuit Court further remands the permit application to the Board of Land and Natural Resources (BLNR) in Hawaii, and as a result, the contested case hearing process is reopened by BLNR.
- May 2016: Hearing Officer to preside over the BLNR hearing is selected and actual preparations for the hearing is initiated.
- Prehearing conferences (May 16, June 17, Aug 5, 12, & 29, & Oct. 3)
- Sep 26 2016: Site Visit

Hawaii Tribune Hei

Hearing Officer
(Ms. Riki M. Amano)

1) Status of the CDUP Reapproval for TMT

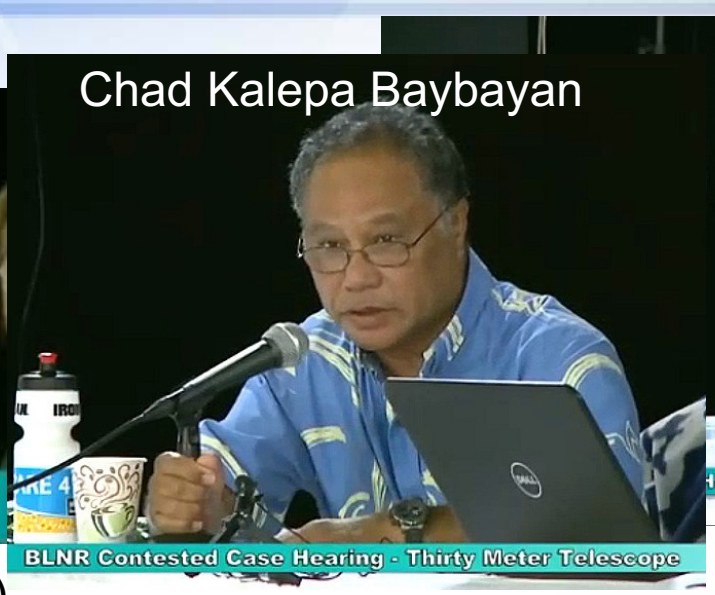
- Dec 2 2015: The Supreme Court of Hawaii decision on CDUP issued.
- Feb 2016: The Third Circuit Court further remands the permit application to the Board of Land and Natural Resources (BLNR) in Hawaii, and as a result, the contested case hearing process is reopened by BLNR.
- May 2016: Hearing Officer to preside over the BLNR hearing is selected and actual preparations for the hearing is initiated.
- Prehearing conferences (May 16, June 17, Aug 5, 12, & 29) & Oct. 3
- Sep 26 2016: Site Visit
- Evidentiary Hearing @Hilo (6 days in Oct, 3 days in Nov 2, 10 days in Dec, and 14 days reserved in Jan) → UH & TIO's testimonies were over

1) Status of the CDUP Contested Case Hearings

TMT Thirty Meter Telescope

NAOJ National Astronomical Observatory of Japan

Witnesses for UH (Oct & Nov)



Witnesses for TIO (Dec & Jan)

1) Status of the CDUP Reapproval for TMT

- Dec 2 2015: The Supreme Court of Hawaii decision on CDUP issued.
- Feb 2016: The Third Circuit Court further remands the permit application to the Board of Land and Natural Resources (BLNR) in Hawaii, and as a result, the contested case hearing process is reopened by BLNR.
- May 2016: Hearing Officer to preside over the BLNR hearing is selected and actual preparations for the hearing is initiated.
- Prehearing conferences (May 16, June 17, Aug 5, 12, & 29) & Oct. 3
- Sep 26 2016: Site Visit
- Evidentiary Hearing @Hilo (6 days in Oct, 3 days in Nov 2, 10 days in Dec, and 14 days reserved in Jan) → UH & TIO's testimonies were over
- Mar 2017: Decision by Hearing Officer (Ms. Riki M. Amano)
- June 2017: Decision by BLNR
- Onsite construction expected to resume in 6 months following CDUP approval. Expected resume date is April 2018 (cf. Another 6 month margin is available in case of delay)

1) Hawaii's Public Opinion: We Continue to Support TMT

TMT Thirty Meter Telescope

NAOJ National Astronomical Observatory of Japan

- 12/28/2015 – 1/9/2016 (post-HSC decision)

Honolulu Star-Advertiser public opinion poll (619)

"Do you support or oppose moving ahead with the construction of the TMT on Mauna Kea?"

Yes: 67% / No: 27%

(Yes: 39% / No: 59% limited to native Hawaiians)

- 5/15/2016 (prior to the pre-hearing)

Honolulu Star-Advertiser readers poll (1,341)

"What do you think about the restart of the TMT permitting process?"

Positive: 88% (1,182) / Negative: 8% (107)

- 7/26/2016 by Ward Research Inc.

Yes: 60% / No: 31%

(Yes: 46% / No: 45% limited to native Hawaiians)

"There should be a way for science & Hawaiian culture both to exist on Maunakea" **89% Support**

Hawaii News

Mayor Kim proposes Mauna Kea 'people's park'

New Hawai'i Island Mayor: Mr. Harry Kim stated to support TMT (Dec. 6)

HONOLULU Star-Advertiser

December 6, 2016 | 78° | Check Traffic

Working at Subaru Telescope - Staff Interviews

PUEO (Perpetuating Unique Educational Opportunities)

TMT Backup Plan Site Other than Hawaii

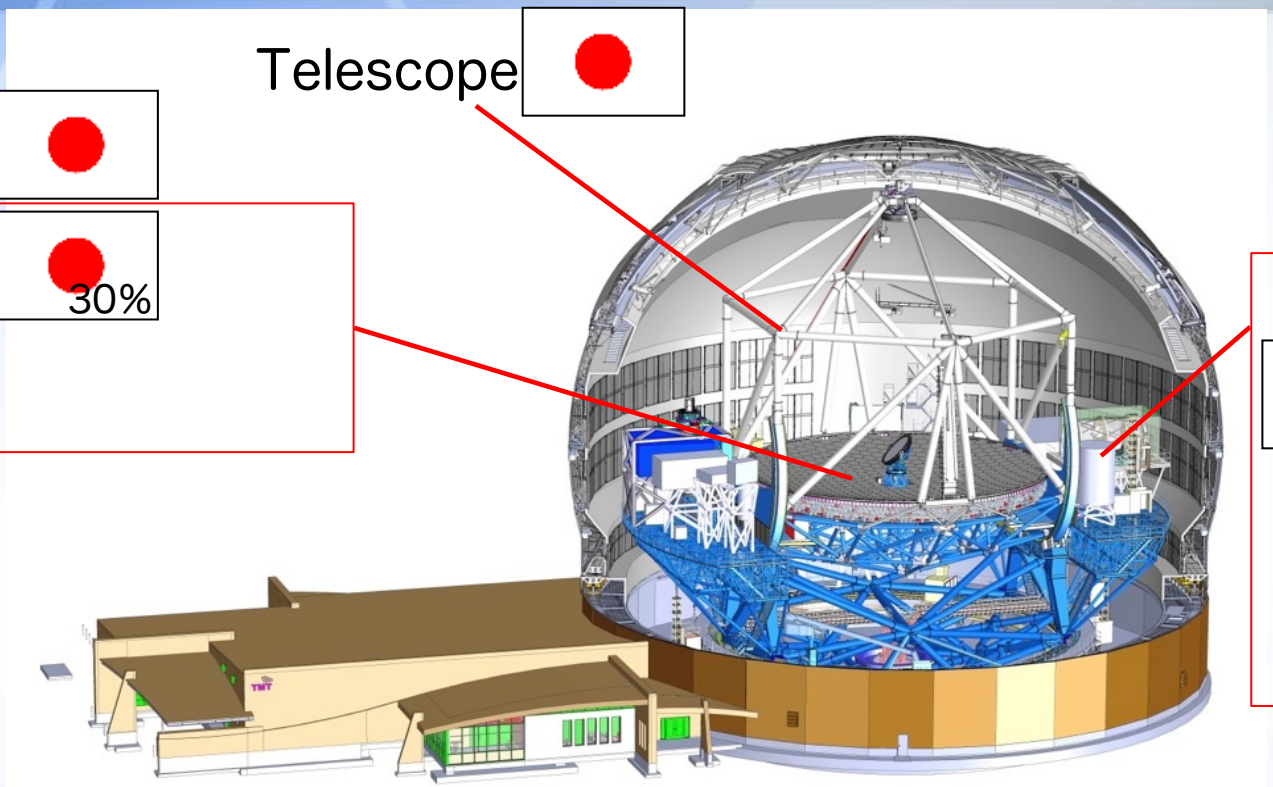
- Maunakea (Plan A) remains the first priority site.

  Strong recommendation for persistent effort to acquire CDUP.
- The conditions and timing for the decision on whether or not to construct in Hawaii (switch to BackupPlan) is under discussion
- Five "Town Meetings" were held by TMT-J SAC to discuss site issues in five cities (Aug 2 Kyoto, Sep 1 Sendai, Sep 6 Hilo, Sep 9 Tokyo, Sep 12 Hiroshima).
- TMT session in the Symposium of Group of Optical-Infrared Astronomers (GOPIRA) on September 26th
- Got 96 votes for Straw Poll on Backup Sites (Oct 3~11)
- Recommendations from TMT-J SAC meeting (Oct 14)

→ Japan supports ORM (La Palma @Spain) as the alternative site

- Oct 26~27, 2016 Board meeting: ORM as an alternate site

2) Japan's Contributions



1) Design fabrication / installation of the telescope structure,
2) Providing all the primary mirror segment blanks,
3) Polishing 30% of the primary mirror blanks,
4) Developing part of the First Generation Instruments, and
5) Cash contributions to cover common expenses etc.

2) TMT-J activities: M1 Blank & Polishing

Process of works	FY2013	FY2014	FY2015	FY2016	total
M1 Blank (plano-plano)	60(29)	35(0)	74(31)	40(21)	209(81)
Spherical Grinding	12(0)	19(0)	63(29)	60(52)	154(81)
Aspherical Grinding	12	16	33	8	69
Aspherical Polishing	Numbers () for partners		6	16	22
Hex Cutting			0	0	0

50th Blank backside Polished

107 Blanks produced (2015 Oct)

2) TMT-J activities: Telescope Structure (STR)

- STR Final Design Review (FDR) Series:
  - 17-20th Feb 15: FDRP1 (Mechanical) ✓
  - 27-29th Jul 15: FDRP2 (Control) ✓

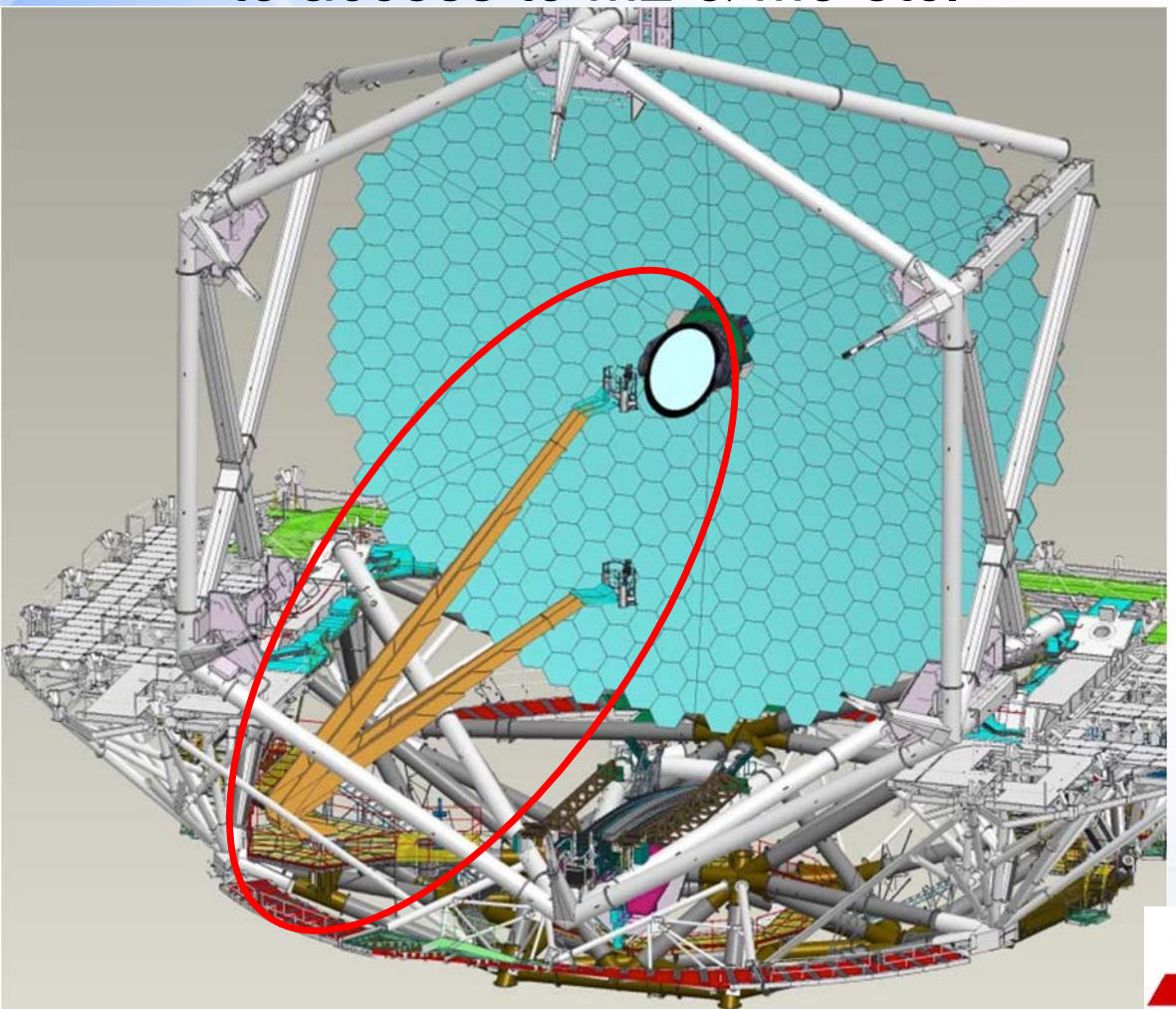
  "FDR design of telescope software and control system is progressing well in many areas, but has not yet reached FDR level"
  - 24-26th Feb 16: dFDRP2 (Control) ✓
    - "Excellent progress has been made on LOS issues. Short and long move performance is now meeting requirements"
  - 7-9th Dec 16: FDRP3 (SHS, ASP, Elevator) ✓
- Fabrication related reviews:
  - 8-9th Oct 15: Long-Lead Procurement Review PASS
  - Mar 16: Production Readiness Review (PRR1) & FDRC → Deferred to JFY2017~2018

2) TMT-J activities: STR ASP & Elevator

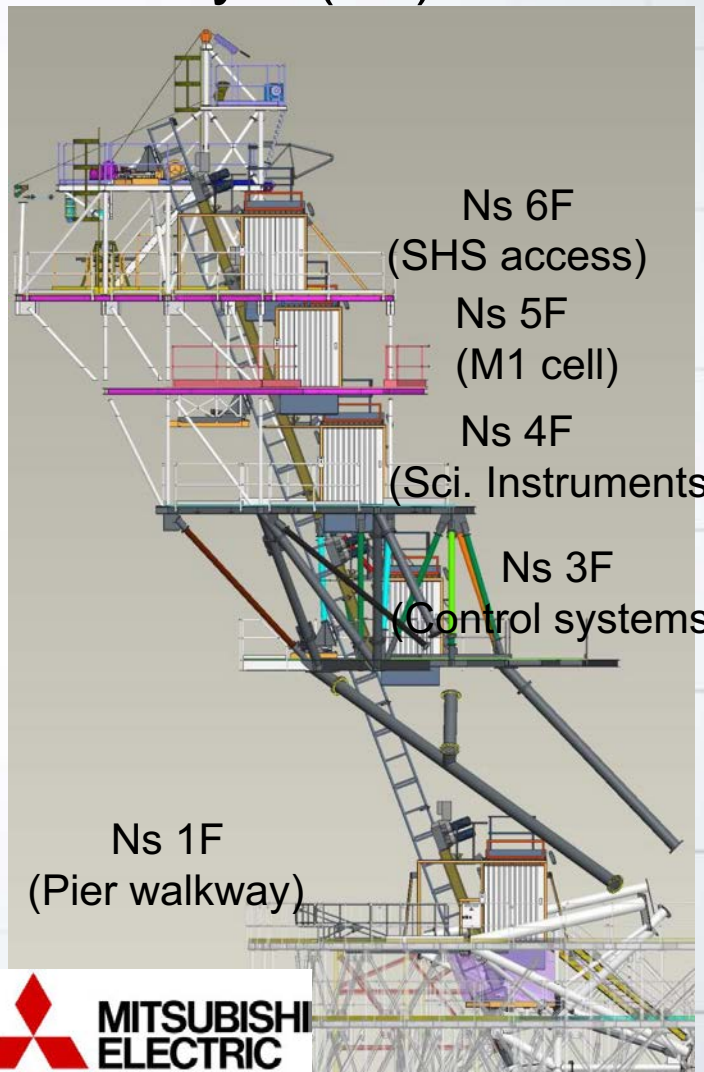
TMT Thirty Meter Telescope

NAOJ National Astronomical Observatory of Japan

ASP (Aerial Service Platform) to access to M2 & M3 etc.



Nasmyth (Ns) Elevator



MITSUBISHI ELECTRIC

2) TMT-J activities: STR FDRP3 on Dec 7~9

Panel committee's Out-briefing Report

- The committee recognizes the large amount of progress on the SHS, ASP and ELV designs since PDR.
- The documentation set was well done and made the review process more efficient.
- The committee appreciates the excellent work done by the MELCO team.

2) TMT-J activities: STR Segment Handling System

SLF received 2016 Good Design Award!

GOOD DESIGN AWARD

http://www.g-mark.org/about/

JP EN 中(簡/繁)

About GDA | Online Gallery | Participation | Promotions | Previous Activities

2016 | Year awarded | Special Award | Display detailed search

GOOD DESIGN BEST 100

‹ Previous page | Back to List

Will be displayed at the GOOD DESIGN EXHIBITION 2016 (10/28-11/3 @Tokyo Mid Town)

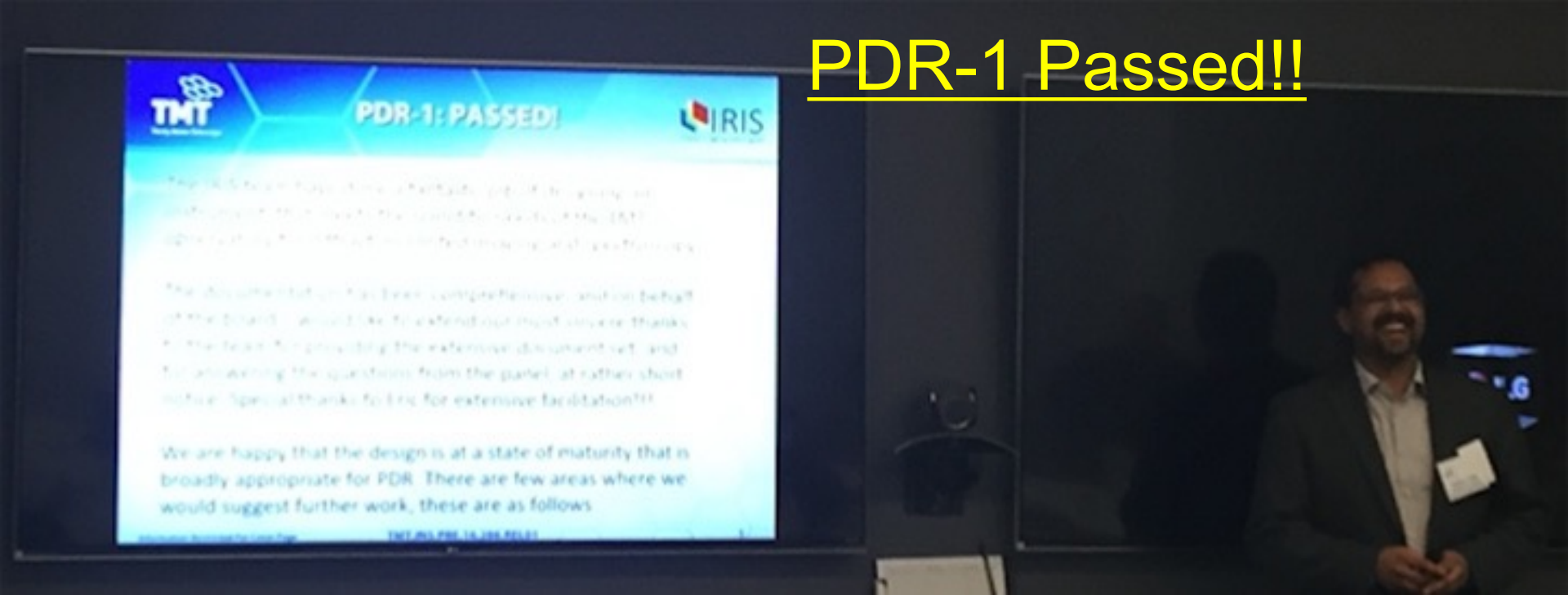
2) TMT-J activities: Early light Sci. instruments

- IRIS (near-IR Imager and Spectrometer):
  - λ=0.8~2.4 μm, FOV=34"x34", R=4000~8000
  - Preliminary Design Phase started since April 2013
  - PDR-1 was held in November 17~18 @TIO
  - PDR-2 is scheduled in mid-2017

- WFOS (Wide-field Optical spectrometer)
  - λ=0.31~1.1 μm, FOV=40.3' squared, R=1000~8000
  - Conceptual Design Handover Workshop held in Oct 13, 2013
  - A short "mini-study" design review was held in April 2015 @NAOC (China)

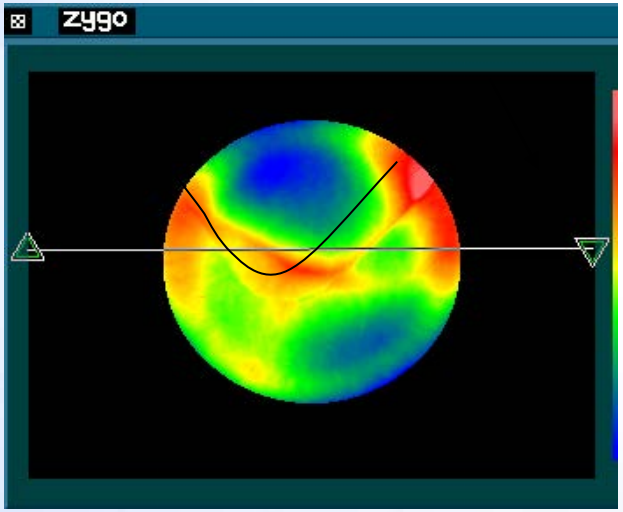
2) TMT-J activities: IRIS PDR-1 in Nov 17~18

PDR-1 Passed!!



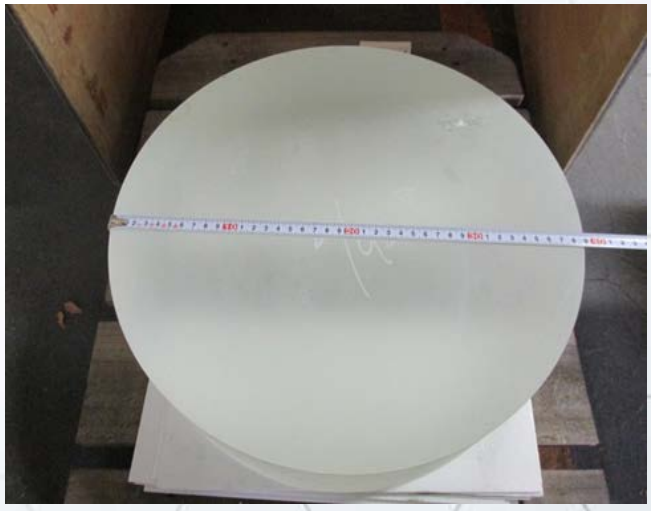
2) TMT-J activities: WFOS

- Conceptual design studies of Camera lens system
  - Large CaF2 glass polish tests
  - Procurement of large glass material (e.g., Φ440mm)
  - Optical design impact with un-uniformity of refraction
- New management team: PI (Kevin Bundy) & PM (Maureen Savage)



CaF2 polish test (Φ70mm)
Surface roughness: 139 nm PV, 26 nm RMS

Sample CaF2
ϕ200 x t59



Large Glass material (Ohara S-FPL51 ϕ390 x t128)

TMT-J activities: 2nd gen instruments

- Catch up many people at Universities to TMT project by instrumentation plan & science cases. Concept, feasibility, science, key technology, team structure, schedule, cost, & risks
- FY2016: 20M JPY for 6 projects:
  - TMT-AGE: TMT-Analyzer for Galaxies in the Early universe (Tohoku Univ.)
  - High-Contrast system for Second-Earth Imager for TMT (SEIT) (Kyoto & Hokkaido Univ.)
  - IR athermal optics with off-axis ashperical mirror (Univ. of Tokyo)
  - High efficiency & High resolution grating (Riken)
  - R&D works for MICHI (Mid-Infrared Camera, High-disperser, and IFU) (Kurume, Tokyo, Ibaraki Univ.)
  - IFU for WFOS (NAOJ)
- Called, Reviewed, Evaluated by TMT-J SAC committee
- Reports and information are open: http://tmt.mtk.nao.ac.jp/inst_budget-j.html

2) TMT-J activities: 4th Science Forum

- Kyoto, Japan, 24-26 May 2016
- First TMT Forum in Asia
- A great success! Total 136 participants (Japan 52)
- https://conference.ipac.caltech.edu/tmtsf2016/

2) TMT-J activities: WEPOC (Workforce Pipeline, Education, Public Outreach and Communications)

- Hilo, Hawaii, 3~7 December 2016
- First TMT International Workshop for Future Science and Technology Leaders from each partner
- A great success! Total ~40 participants (Japan 5)
- https://isee-telescope-workforce.org

2) TMT-J activities: Public Outreach

Mitaka Open House Day 2016

TMT Thirty Meter Telescope

NAOJ National Astronomical Observatory of Japan

About 1200 people joined the TMT quiz!

Exhibits on Natural and Cultural resources of Maunakea

2) TMT-J activities: Public Outreach

- 45 lectures in science museums, schools etc.
- 43 @14 Prefectures, 2 Radio lectures

Radio

Summary

- CDUP re-approval process is on going.
- The first light is delayed to 2027 from 2024
- TMT-J members are working to overcome the current severe situation with TIO
- Community supports are important for TMT and Maunakea observatories

- We appreciate Hawaii for astronomy at Maunakea