



THIRTY METER TELESCOPE

TMT Operations: 2-page summary



Observing Modes

PI-Directed & Pre-Planned Service

- **PI-Directed Mode**
 - each PI is responsible for their own observing program. They operate the instruments and execute the observations themselves and have direct control of real-time decision making
- **Pre-Planned Queue Service Observing**
 - TMT staff members execute pre-defined observations on behalf of PIs in a queued sequence. Service observing provides the ability to efficiently carry out programs that do not require a full or half night of PI-directed observing, e.g. observations that require a regular but short cadence
- **Tools will be provided to allow conditions-adapted scheduling within a PI-directing observing block or partner observing block.**
 - these same tools will allow for a fully adaptive queue across the TMT partnership in the future if that is the direction the partnership elects to go



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TMT Ops: Construction Deliverables

- TMT will provide full suite of proposal preparation, pre-observing, observing and post-observing support tools
- All instruments delivered with standard data reduction software pipelines
 - TMT maintains after delivery with handoff review & documentation
 - TMT supports community-led (open source) development & enhancement
 - Data pipelines used during observing for quick-look
 - Also facilitate TMT staff quality control checks to monitor telescope & instruments
- TMT Data Archive
 - main system used by observers to retrieve their science data
 - searchable with associated metadata and calibration frames
 - science data accessible to partners after proprietary period
 - archive hosted under contract with partner in off-island location (operations budget line item \$300K/yr.). Or could be established in Hawaii & run by TMT
 - reduced data products (2D spectra, etc.) kept in TMT Archive & associated with data

Ops Costs

- ◆ TMT Ops Model developed and costed over 1.5 years
 - Initially based on “enhanced” “corrected” Keck model
 - \$27M/year running costs (119 employees: 10 FTE added primarily in software after operations model review)
 - \$12M/year in place for new instrumentation

- ◆ What about the 10% rule (operations ~ 10% capital cost of a project)?
 - NSF rule: 4% running costs, 2-3% renewal costs, 2-3% additions to appropriate NSF grants program to allow community use of the facility
 - 8-10m observatories running costs between 3 and 4% of capital
 - This rule breaks down for larger projects
 - Many cost items (concrete, iron, etc.) have large capital costs with no associated ops costs (e.g. TMT has 10 times the cost in concrete of a Keck telescope)
 - Many personnel costs are independent of facility capital costs (e.g. 1 Director, 1 telescope operator per night, etc.)
 - Can trade upfront costs for reduced ops costs and the TMT is actively pursuing this