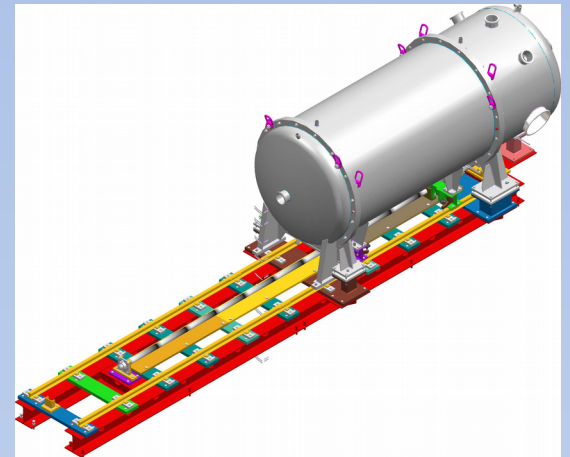


HARPS 3 Telescope Refurbishment Work-package



Current status



Review of activity

1. Drew up a provisional refurbishment proposal
2. Searched for potential vendors
3. ACE (Tucson) responded – involved in UK Schmidt & JKT
4. Commissioned a study from ACE to cost proposal
5. ACE visit to INT for survey & performance testing
6. MOU agreed with ING (outlined refurbishment)
7. Software architecture devised and TCS requirements set
8. Statement of Work for refurbishment substantially complete

Major Refurbishments

Replacements

- Telescope axes drive motors and encoders
- All telescope control system hardware
- Telescope control system software

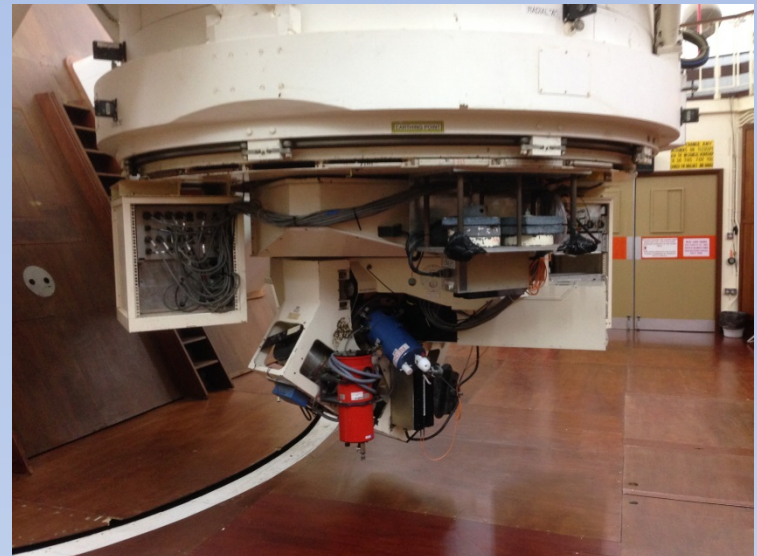
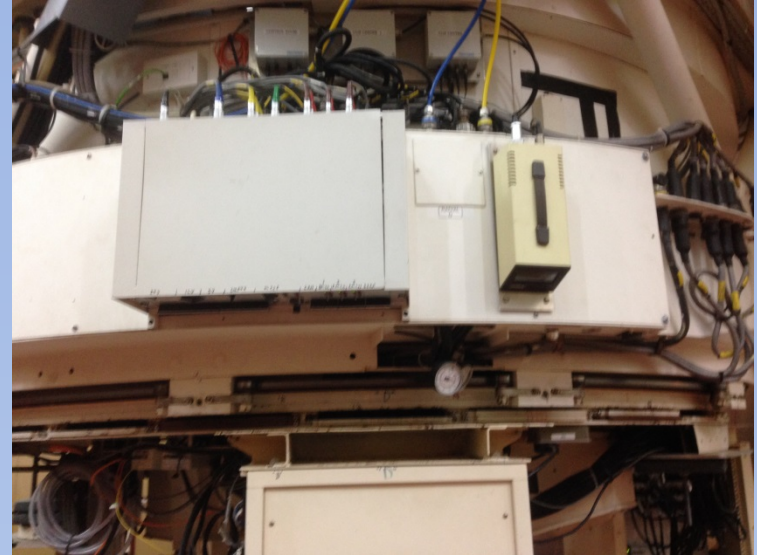
Optional replacements

- Mirror support
- Dome rotation drives
- Shutter drives and/or controls

Additions

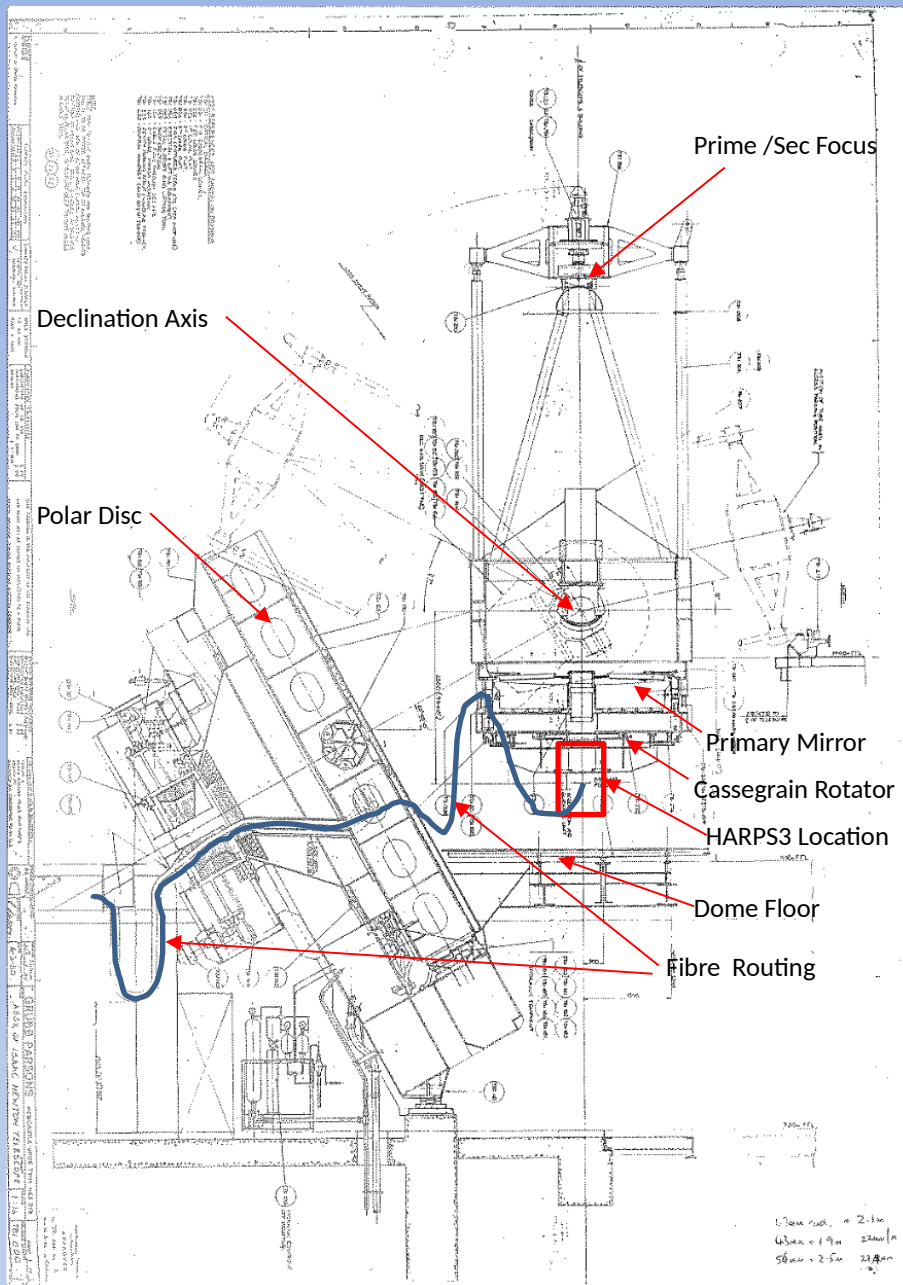
- Robotic operation
- Alarm and interlock handling
- Weather detection facilities

Isaac Newton Telescope



HARPS 3 Telescope refurbishment status

INT Development



- The INT underwent major changes for deployment at a lower latitude.
- The INT was also substantially modified after installation and so drawings of the revised INT are not necessarily as built.
- Main changes:
 - Primary Mirror (PM) support.
 - Right Ascension Drive & support structure.
 - RA and DEC encoding systems.
 - Include RA & Dec drive & encoding in refurbishment plus ?PM support.
- The INT Dome underwent considerable modifications to the bogie system and shutter drives.
 - The dome track was re-ground to a better level.
 - The number of dome bogies was increased.
 - Hydraulic suspension was added.
 - Dome still introduces vibrations in telescope.
 - Include a dome microdrive upgrade option and shutter control in the refurbishment.
- Fibre Run
 - By-pass cable wraps and choose direct polar axis route as shown.

Control room



Engineering rack
Manual telescope
& Dome control

Telescope power
Limits/interlock display
Oil support control
Dome lighting

Major Refurbishments

System	Replace/improve	Advise on refurbishment	Preferences
HA Axis	Replace QM Motor & tachos/encoder Replace on axis encoder Replace SM Motor & tacho/encoder Maintain/improve anti-backlash mode	Axis limits Clamp Motors Clamp limits Closure of position loop	On-axis position loop. Prefer all new components. Absolute encoding Retain useful cabling.
DEC Axis	Replace QM Motor & tachos/encoder Replace on axis encoder Replace SM Motor & encoder Maintain/improve torque bias mode	Axis limits Clamp Motors Clamp limits Investigate drive friction	Prefer all new components. Distance-coded reference marks. Retain useful cabling.
Cassegrain TT	Replace axis motor & encoder Implement additional limits & locking	Axis limits	Prefer all new components. Re-use of cable wrap cables.
Other limits and interlocks	Horizon, access park, polar disc limits and tie-bar interlocks	Inspect limit s and advise	Prefer all new components.
Focus	Axis motor	Encoder & Limits	Prefer all new components.
Mirror cover drive	Motor Encoder	Limits. Interface monitoring to TCS	Prefer all new components.
Mirror support	Improve performance of mirror support control system or replace with new controller	Incorporate system monitoring of pressures and load cells	Replace mirror support controller.
Temperature sensing	Replace sensor transmitters/interfaces	-	Maintain existing sensors.
Counterweight system	-	-	Maintain current system.
Oil support	Incorporate digital pressure and flow sensing for new TCS.		Maintain current system including lift-off sensing and any new components/sensors.
Dome drive	Dome rotation and shutter drives	Consider replacement of task units with VFD Microdrive control	Replace drive units, controller and switchgear
Telemetry	Replace TEML		Robust system that does not use slip rings and is EMC compliant.
Telescope control system	Replace with new computer and hardware controllers/interfaces.		Compliance with telescope control software requirements.
Engineering console and control desk	Replace with limited manual control features plus GUI.		

Outline and status of draft SOW part 1

- Introduction
 - Descriptions of INT and aim of the refurbishment project (robust, reliable robotic operation).
- Current status of the INT
 - Reference to detailed description & other documentation available
- Technical requirements
 - Pointing, tracking and slewing requirements
 - Cassegrain rotator limits
 - Focus mechanism
 - Mirror support (options to be considered)
 - Dome rotation (optional upgrade to micro-drive) & shutter control
- Safety
 - Personnel: telescope and enclosure access interlocks & permit to work
 - Equipment: unattended operation & safety interlocks; cable protection
 - Alarms and fire safety: electronics rack protection, fire detection & alarm interface

Outline and status of draft SOW part 2

- Telescope Control Software
 - Broad description of requirements
 - Reference to requirements document (emphasis on robotic operation)
- Contractual - definitions
 - Definition of systems and hardware/software components
 - Deliverable documentation and CIDL
 - Environmental and lifetime specifications
 - Verification and acceptance (design verification and acceptance matrices)
 - Training
 - Vendor guarantees and support
- Contractual - conduct
 - Design phases and reviews
 - Progress reporting, meetings and oversight
 - Interaction with, and support from, ING throughout phases
 - On-site safety, access, permissions & responsibilities
 - Necessary permits (and constraints) to operate robotically

Key: Good progress Not done

Contract issues

- Draft SOW
 - Technical issues to discuss with ING now on version 0.3
 - ING agreement with SOW and involvement with contract negotiations
 - ING support for refurbishment period (crucial to avoid delaying vendor)
- New procurement process:
 - Gate A process (just completed for camera and about to proceed for INT)
 - Invitations to express interest - advertise through CU and other contract portals with 3 week response time.
 - Identification and pre-qualification of vendors
 - Assembly of contractual documentation package (including agreed SOW)
- Potential vendors
 - ACE (Tucson) are still interested
 - ProjectSoft (The Czech Republic).
 - Other known potential vendors to be informed of opportunity

Outline of refurbishment schedule

- The schedule has slipped by months due to workload.
 - will depend on the time it takes to deploy the contract and the vendor’s capabilities.
- University procurement rules have very recently changed – now (not) easier!
 - An extra ? week stage (gate A) is required but subsequent contract should be easier to issue
- Call for telescope closure once chosen vendor negotiations are complete.
- Telescope acceptance still to be complete by 31st March 2021.

Proposed schedule

Stage	Description	Start	Finish
1	Complete draft statement of work & release to ING	30 Nov 18	28 Jun 19
2	Agree statement of work with ING & formal release	-	31 Jun 19
3	Gate application	3 May 19	7 Jun 19
4	Invite statement of interest from vendors	10 Jun 19	1 Jul 19
5	Tender process & select vendor	7 Jul 19	30 Sep 19
6	Vendor negotiations?	1 Oct 19	30 Oct 19
7	Announce telescope closure	-	30 Oct 19
8	Preliminary design	1 Nov 19	31 Jan 20
9	Final design	1 Feb 20	31 Jun 20
10	Refurbishment period	1 Sep 20*	30 Apr 21*
11	Telescope acceptance	1 May 21	31 May 21

* Projected date to be agreed with selected vendor.