Australian National University

Handover Document

Prepared For

Advanced Instrumentation and Technology Centre

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Acronyms

AO Adaptive Optics.

BTO Beam Transfer Optics.

EC Electronics Cabinet.

LGS Laser Guide Star.

1 Project Context

Two Guide Star Lasers (GLS), the ANU and the EOS, are being installed on the 1.8m telescope. The lasers are used to create a Laser Guide Star (LGS) in the sodium layer to approximate the atmospheric distortion for Adaptive Optics (AO).

2 Project Scope

The scope of the project is limited by the preliminary design of the interface between the ANU and EOS lasers and the 1.8m telescope. The telescope components, such as the Beam Transfer Optics (BTO) and the Laser Launch Telescope, are out of scope.

3 Approach

Initially, a number of work packages were identified for the project:

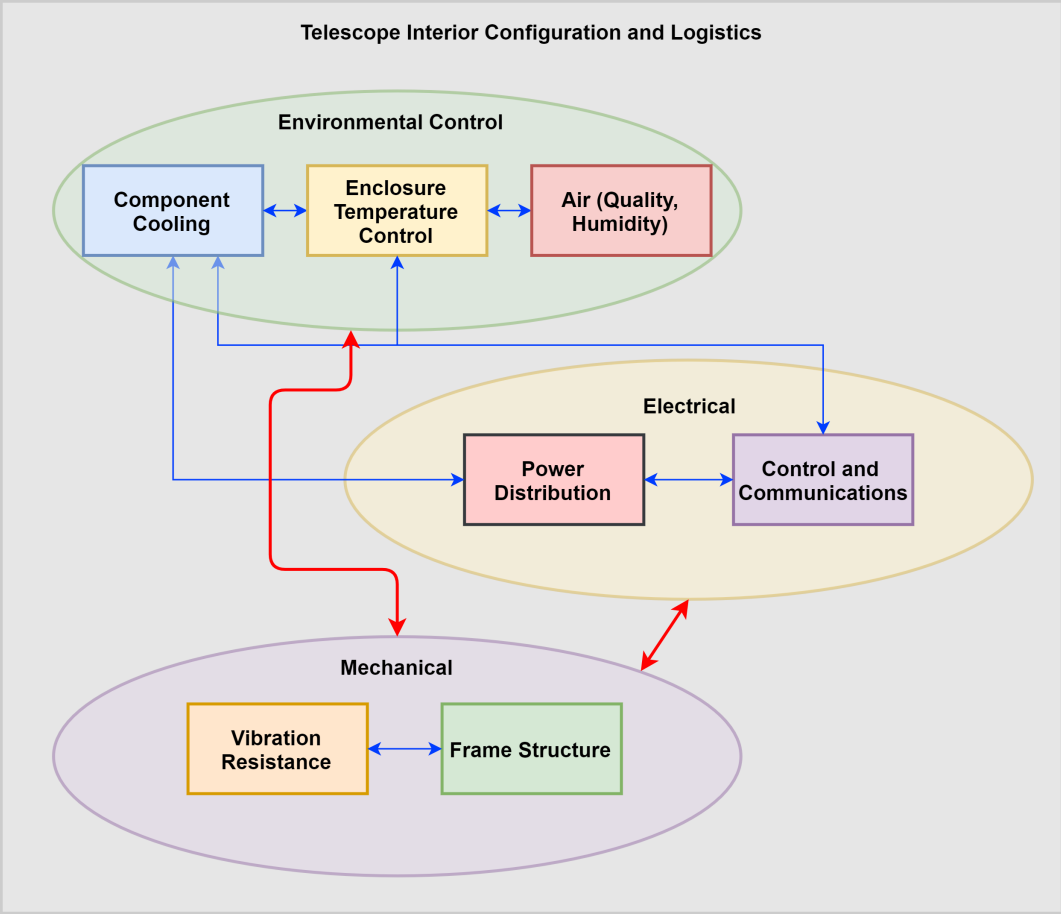

Figure 1: Project Work Packages

The work packages, along with a short description of their scope, are as follows:

1. Component Cooling, the liquid cooling inputs to the laser components that need to be maintained at highly specific temperatures, and the installation of chillers for this purpose.

2. Enclosure Temperature Control, maintaining the internal temperature of the air inside the enclosure at a range suitable for the components inside.

3. Power Distribution, determining the power requirements of all subsystems, and the cable and power socket layouts required.

4. Control and Communications, determining the control and communication systems, including protocols, cables, and switches.

5. Vibration Analysis, determining the vibration the system is subjected to, and designing for maximum tolerances.

6. Frame Design, the mechanical design of the structure itself.

4 Results

The final outcomes were split into the three main subsystems:

1. Mechanical, which included the laser mounting frame and vibration analysis

2. Electrical, including communications, power draw and cable routing

3. Environmental, containing cooling and air quality control.

Preliminary designs were produced for each subsystem, as detailed in the Subsystem Design Reports and the overall design in the Concept Design Report.
The key design decisions included:

1. Optical breadboards are mounted on a carbon fiber frame

2. Mounting frame is enclosed by removable insulation panels (laser enclosure)

3. The laser enclosure has heating, cooling , fan and a HEPA filter

4. The ANU laser is cooled by two Bay Voltex chillers located on the entry level

5. The EOS laser is cooled by one Bay Voltex chiller located on the entry level

6. The ANU Electronics Cabinet (EC) is located on the observation deck under the laser enclosure

7. The ANU Electronics Cabinet is controlled via CAN bus

8. The EOS EC is located on the entry level

9. The EOS oscillators are placed in the clean room

5 Future Work

The next team most likely be tasked with developing the detailed interface design. Further development of the project entails:

1. Detailed FEA analysis of the mounting frame
2. Mechanical testing of frame components
3. Incorporation of other subsystem components into the model
4. Finalisation of the enclosure insulation panel material and attachment method
5. Vibration testing to determine laser vibrational tolerance
6. Integration of radiator to cooler loop
7. Determine exact cooling specifications and pick on of the cooling options presented
8. According to the specified cooling model, the control connector type on it needs to be found out.
9. Sum of current draw from all components needs to be testified (less than 80A)

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References

Appendix