



Australian National University

Project Pro Forma

Prepared For

**Advanced Instrumentation and Technology Centre
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Acronyms

AITC Advanced Instrumentation and Technology Centre.

AO Adaptive Optics.

CAD Computer Aided Design.

EOS Electro-Optic Systems.

GSL Guide Star Laser.

IDD Interface Design Document.

LGS Laser Guide Star.

OOS out of scope.

RVM Requirements Verification Matrix.

SERC Space Environment Research Centre.

SGL Semiconductor Guidestar Laser.

SRR System Requirements Reviews.

SRRC System Requirements Reviews Closing.

SRRO System Requirements Reviews Opening.

SRRP System Requirements Reviews Preliminary.

SSS System Subsystem Specification.

1 Scope

This section outlines the scope of this document, the context of the project, and the scope of the project. It also defines aspects of the system that have been deemed to be out of scope.

1.1 Document Scope

The scope of this document is to provide an overview of the Guide Star Laser Interface project being undertaken for the Advanced Instrumentation and Technology Centre (AITC), the project objectives and the corresponding initial requirements.

1.2 Project Context

1.2.1 The Telescope

The Electro-Optic Systems (EOS) 1.8m telescope is currently used for satellite and space debris tracking at Mt Stromlo Observatory in Canberra. This telescope is also the site of the Space Environment Research Centre (SERC) project to build an Adaptive Optics Imaging (AOI) system for satellite imaging, and an AO system for space debris Tracking and Pushing (AOTP).

1.2.2 Guide Star Laser Optics

In Adaptive Optics (AO) a Guide Star Laser (GSL) is required to produce an artificial star in the atmosphere, which can be used to measure atmospheric turbulence above the telescope. This artificial star is known as a Laser Guide Star (LGS). Using a GSL is the current optimum method of creating a light source with acceptable return photon flux and manoeuvrability to track fast moving objects such as satellites.

1.2.3 Adaptive Optics Projects

The AITC is in the process of developing multiple AO systems for various projects, including the SERC AOI and AOTP systems. They also have an invested interest in the demonstration of ANU's Semiconductor Guidestar Laser (SGL) prototype, as it is predicted to be a cheaper and more effective product for AO systems around the world.

1.2.4 System Interface

AITC has expressed a preferential preliminary concept for the System Interface that would enable all three GSL solutions to be interfaced to the telescope simultaneously. However, it has also been recognised that this may not be possible within the constraints of the 1.8m telescope and the three GSL systems. Note that simultaneous interfacing does not imply simultaneous propagation of the lasers.

1.3 Project Scope

The project scope is to define and provide the requirements to interface the commercial Toptica GSL, the EOS GSL, and the ANU SGL on the EOS 1.8m telescope located at the Mt. Stromlo Laser Ranging

Facility, ACT. See Section 2 for further details.

1.4 Out of Project Scope

The capabilities/attributes defined to be out of scope (OOS) of the project objectives and deliverables for the Interface System are outlined as below:

- a. Beam transfer optics from the laser to the laser launch telescope
- b. Laser launch telescope

2 Project Objectives and Deliverables

This section outlines the minimum and extension objectives and deliverables of the project.

2.1 Objectives and Deliverables Outline

A minimum set of objectives and deliverables have been established for successful project delivery. To maximise value provided to the AITC, a framework and schedule for a tiered set of extension project objectives, with corresponding deliverables have been established. Should project progression enable verification and successful delivery of the minimum objectives and deliverables, the extension deliverables shall be reviewed and agreed to by both AITC and the project team before progressing. This will ensure that time is used in manner that adds the most value to the project.

2.2 Minimum Objectives and Deliverables

2.2.1 The Objective

The minimum objective is to capture the necessary requirements such that the end users can develop an interface system between the EOS 1.8m telescope, the Toptica GSL, the EOS GSL, and the ANU SGL.

2.2.2 The Deliverable

The minimum objective will be delivered as a System Subsystem Specification (SSS) document. The SSS will be the major project artifact, and will outline the System and Subsystem Requirements, the constraints and a Requirements Verification Matrix (RVM). The RVM will provide a framework for verification of the system interface against the requirements, and ensure that each requirement is quantitative. The SSS will undergo three phases; a System Requirements Reviews Preliminary (SRRP), System Requirements Reviews Opening (SRRO) and System Requirements Reviews Closing (SRRC).

2.2.3 The System Requirements Reviews Process

The System Requirements Reviews (SRR) process will allow verification and redirecting during the opening phase of the project. It will also ensure that the delivered requirements of the SSS have reached maturity, and that the minimum objectives and deliverables are successfully delivered during the closing phase of the project.

2.3 Extension Objectives and Deliverables 1

2.3.1 The Objective

If project progression allows, the closing SRR will be brought forward. In this case, Extension Objectives and Deliverables 1 will be undertaken. This objective is to to utilise the SRR approved SSS to develop the characteristics of and specify the interfaces. This will provide an overall framework for the interfaces and enable the AITC to develop the interface system.

2.3.2 The Deliverable

Extension Objective 1 will be delivered as an Interface Design Document (IDD) with supporting Computer Aided Design (CAD) documentation.

2.4 Extension Objectives and Deliverables 2

2.4.1 The Objective

If the IDD reaches an appropriate maturity, development of the Interface System will commence in parallel with the development of the IDD. In this case, the objectives and deliverables for the development of the Interface System will be further defined and agreed to with a AITC meeting.

2.4.2 The Deliverable

Extension Objective 2 will be delivered as CAD files and appropriate supporting documentation.

3 Document Tree

The Document Tree shown in Figure 1 outlines the complete document artifact structure for the minimum, extension 1 and extension 2 deliverables.

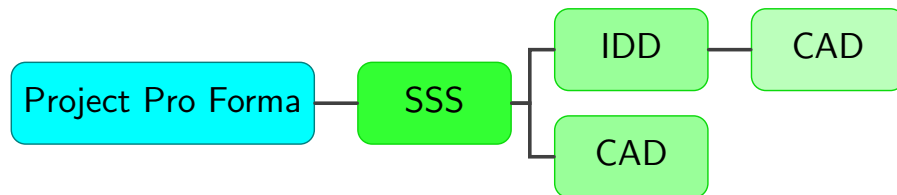


Figure 1: Document Tree - the complete document hierarchy.

4 Schedule

This section outlines the planned project schedule, along with how it will be adapted to different events. An outline of the schedule is shown in Figure 2 below.

4.1 Schedule Outline

The project schedule has been developed to ensure that the minimum objectives and deliverables are met. The project schedule will therefore be revised if key project check points are met ahead of schedule. As the project is still in its infancy, the specific objectives and deliverables for extension of the project will be reviewed as necessary. As such, scheduling beyond the minimum objectives and requirements could not be accurately gauged and is not represented in the project schedule.

4.2 Project Pro Forma Schedule

The first artifact delivered to the AITC will be this document: the Project Pro Forma, on Friday 17 March 2017. As outlined in Section 1, this document contains outlines of project scope, objectives, deliverables, constraints and scheduling. These aspects have been document in order to ensure alignment between the project team and AITC.

4.3 Minimum Objectives and Deliverables Schedule

The SSS will undergo three phases to ensure the project progresses within the time constraints imposed by the university. In order to ensure an optimal work flow, each SSS phase will be reviewed one week prior to university review. This will allow input from the AITC and university to form deliverables that provide the best possible value to the client. The first phase, a SRRP AITC meeting, will be held on Friday 17 May with the aim of verification or redirection of the SSS as necessary. The second phase, an AITC SRRO, is the first major review of the SSS, and will provide the AITC with the opportunity to express benefits of further development to interface groupings. The third phase, an AITC SRRC, is the handing over and acceptance review of the SSS.

4.4 Extension Objectives and Deliverables 1

If project progression allows for development of the Extension Objectives and Deliverables 1, the work hours between SRRO and SRRC will be reduced. This will ensure successful delivery of the minimum requirements earlier in the schedule. As the SRRC approaches, the project team and AITC will meet and finalise the requirements and schedule for Extension Objectives and Deliverables 1.

4.5 Extension Objectives and Deliverables 2

If project progression allows for development of the Extension Objectives and Deliverables 2, the SRRO and SRRC will be held as a single event: SRR. This will ensure a very early delivery of the minimum requirements. As is the case for the first extension deliverable, this scenario will prompt the project team and AITC to meet and finalise the requirements of Extension Objectives and Deliverables 1 and 2, and develop a new schedule.

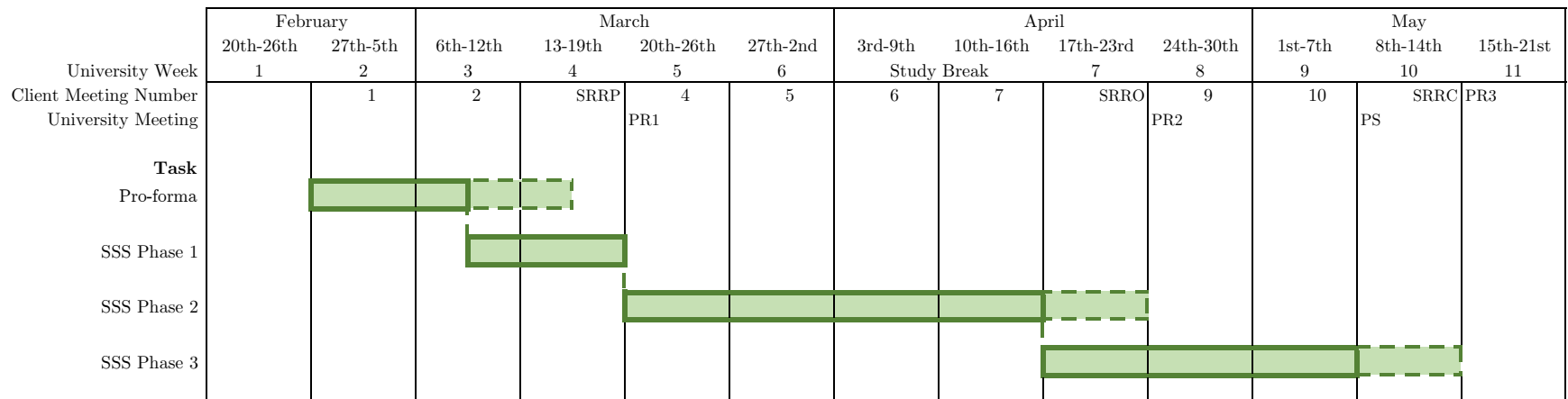


Figure 2: Project Schedule

5 Interfaces and Constraints

5.1 Interfaces and Constraints Outline

The interfaces and constraints of the system that fall within the definition of the Scope Statement (section 1.3) are outlined from a top level perspective Figure 3. There are four major groupings of interfaces within the top level System Interface; 1. 1.8m Telescope and Dome, 2. EOS LASER, 3. Toptica Laser, 4. ANU SGL. Each of these interfaces are further broken down to Physical, Electrical, Optical, Logical and Environmental. The number referencing system applied to the interfaces and constraints will be utilised as the frame work to ensure all requirements are addressed in the SSS project artifact.

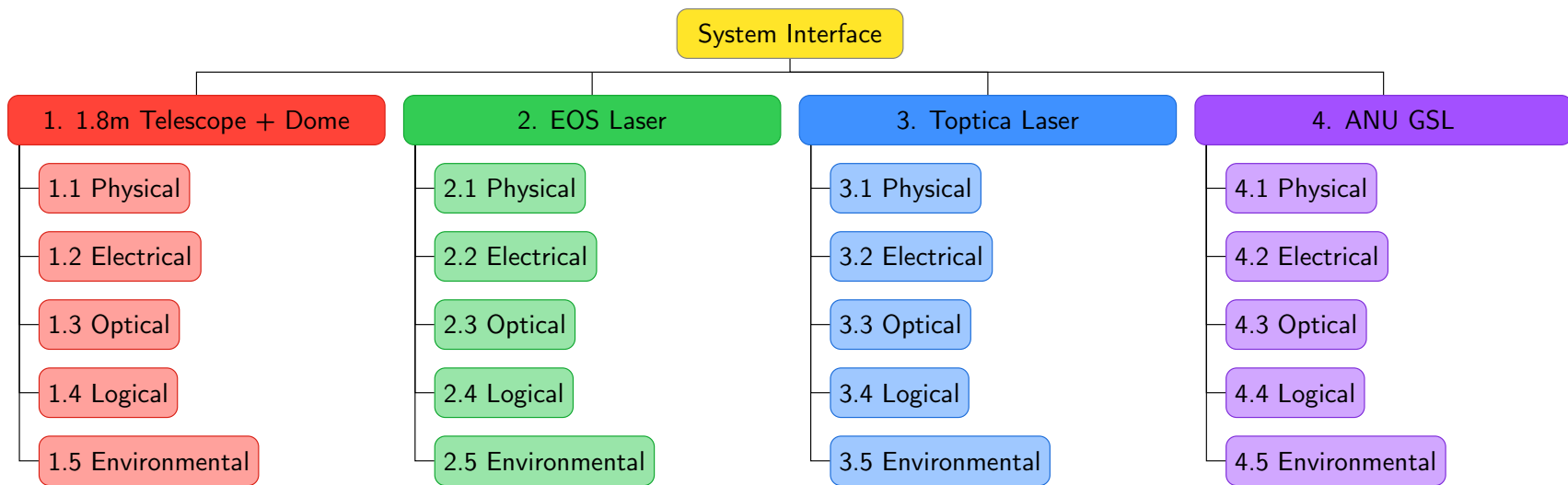


Figure 3: Interface Tree