

# SAM/UV Laser Safety Procedures for the SOAR Telescope Normal Operations

## Scope

This document provides a description of safety procedures for the SOAR Adaptive Module (SAM) UV laser during normal operation. It should be providing to visiting observers who will make use of SAM. The information should be available to the telescope operators. Safety procedures for maintenance activities are covered in a separate document.

## Description

Attached to the telescope above the floor level area is a high-power ultraviolet (UV) laser that is used for correcting the effects of turbulence of the atmosphere. The laser beam is fully enclosed until it reaches the top of the telescope, then it is expanded to a 25-cm diameter and launched into the atmosphere (Figure 1). When the laser is turned on during operation, the beam is not visible to people and the amount of scattered UV light at the level of the dome and telescope platform is much less than at the sunny beach. There is no danger to personnel during normal routine operation of the laser.

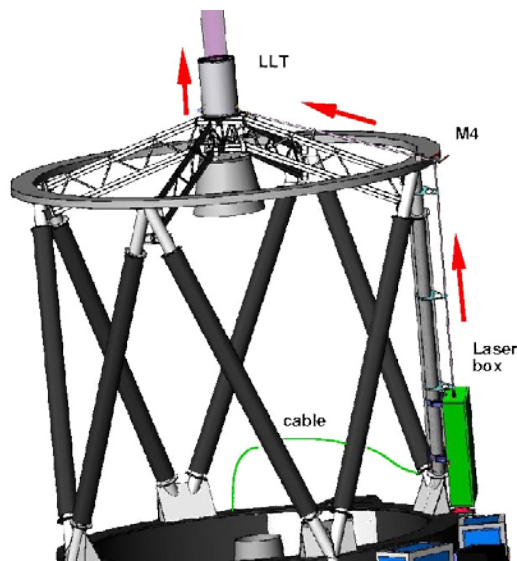


Figure 1. - Laser Beam Path

During normal operation and telescope maintenance (except the maintenance of the laser system itself) the technical personnel, telescope operators, and astronomers are allowed to enter the telescope floor. The UV laser is properly enclosed and is considered safe (Class 1), so there is no hazard to people or property.

If the laser itself requires maintenance and the UV laser beam will be exposed, the Authorized Laser Operators shall declare the telescope dome a **Laser Controlled Area**.

The Authorized Laser Operators are the only persons that can declare the telescope floor a Laser Controlled Area.

Authorized Laser Operators are SOAR maintenance personnel who have been trained in laser safety and have detailed knowledge and understanding of the design of the laser system.

Presently, the Authorized Laser Operators are:

- Roberto Tighe
- Andrei Tokovinin

### **Safety Control System**

In the unlikely event that there is tampering or a catastrophic failure with the laser system and or the telescope, such as an earthquake, then the following mechanical safety systems have been provided to switch off the laser:

- Laser Emergency Stop Buttons at the following locations: in the control room, on the laser controller and chiller box mounted on the telescope, on the laser electronics box mounted on the telescope, at the dome floor near the stairway. This immediately de-energizes the laser, and is not the same as a routine shut-down.
- An interlock on the laser box door that would turn off the laser if the box were opened; this acts like the emergency stop button
- The laser rack must be energized using a key switch on the telescope.

If any one of the above safety features is used, or following a catastrophic event which might have caused mechanical damage, a thorough inspection of the laser system shall be made before the laser is turned back on.

### **Informational Safety Features**

The following safety features are provided to inform people of the status of the laser:

- Bilingual LASER ON/DO NOT ENTER sign and indication light:
  - in the control room
  - at the door to the telescope floor.When the laser is in normal operation, it is safe to go to the observing floor even when it is on, and the “Do Not Enter” portions of the signs will be covered.
- Barrier chain with warning sign to be placed across the stairway entrance when maintenance activities are underway (not during normal operation)
- This document will be distributed to all visiting observers who will use SAM
- The SAM LGS computer Graphical User Interface (GUI) that informs operators of the status of the laser and the safety controls. The GUI is informational only and does not override the physical safety controls of the laser.

### **Laser Maintenance**

Laser maintenance safety practices are detailed in the “SAM/UV Laser Safety Procedures for the SOAR Telescope during Laser Maintenance” document. Under no circumstances

should anyone other than the Authorized Laser Operators touch the laser or any of the laser components. During Laser maintenance, authorization to enter the telescope floor area shall be given by the Authorized Laser Operators.

People will know if it is safe to enter the telescope floor area when there is no “barricade”, no warning signage, and the laser warning light system located near the SOAR dome access door is not in the DO NOT ENTER mode. During laser maintenance the warning lights may not be “on” at all times, so if warning signs or “barricades” are present unauthorized personnel should not enter the telescope floor area.