SGSLR Testing Facility at GGAO

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This document describes the equipment and facilities that will be used to test the SGSLR systems. This Test Facility and equipment will be located at the Goddard Geophysical and Astronomical Observatory (area 200 at the Goddard Space Flight Center).

DISCLAMER: The facilities and equipment described are currently under development and are subject to change.

Site Layout and Building Location

The Goddard Geophysical and Astronomical Observatory (GGAO) is an access controlled government facility, located approximately 3 miles from the main Goddard campus, in the middle of the Beltsville Agricultural Research center. The observatory consists of several buildings and scientific structures in a cleared forest setting. At any given time, the complex is hosting various projects and experiments.

The location of SGSLR is shown in Figure 1. The building is next to NASA's heritage SLR station, MOBLAS 7. SGSLR does not contain any test equipment (e.g. oscilloscopes, optical measurement devices), however manuals for all equipment present are available to users of the facility.

Figure 1- GGAO Site Layout

Building and Infrastructure

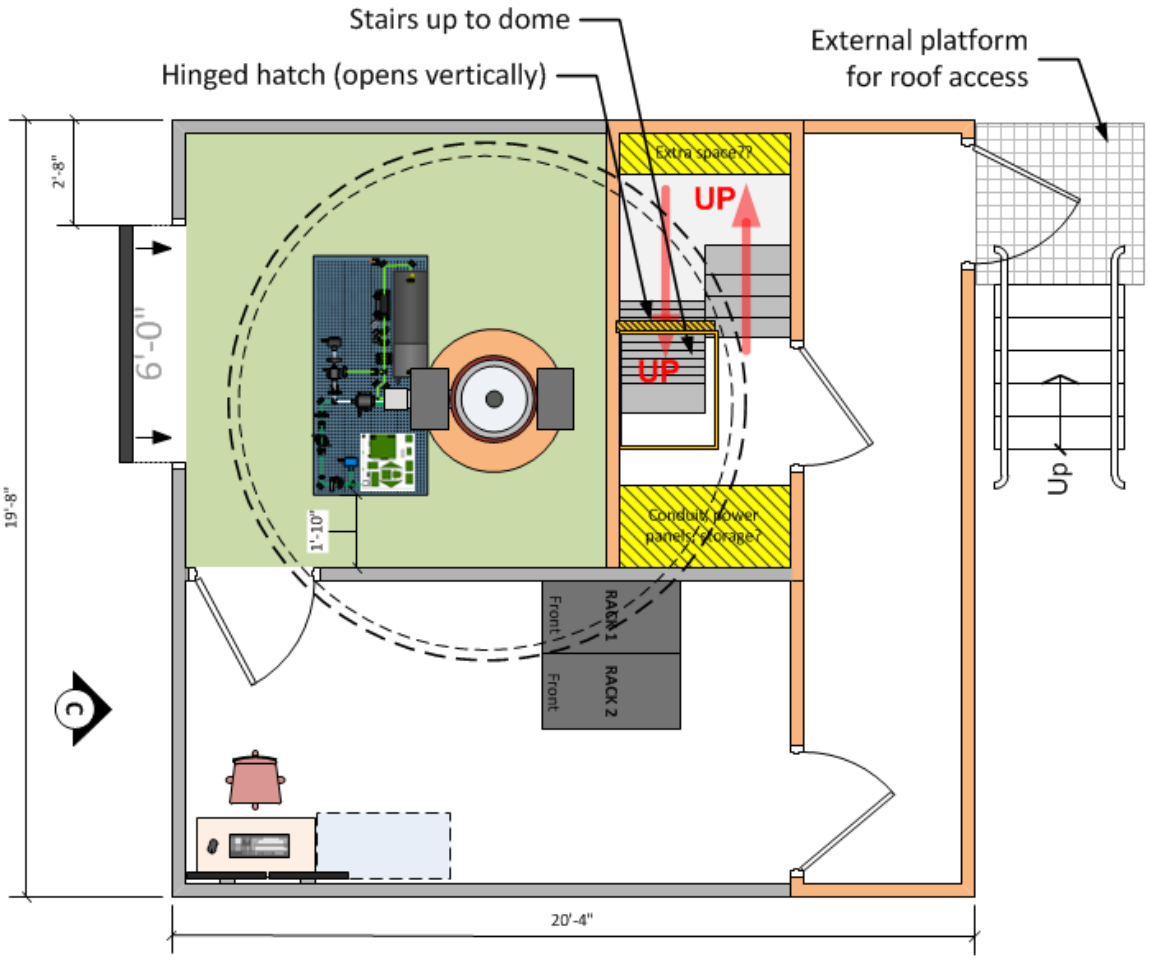

Figure 2 - SGSLR Currently Proposed Layout

The SGSLR building is an approximate 20’ by 25’ rectangular concrete structure with a height of 9’. The building sits on a concrete foundation with a 1’ apron around the perimeter. There is a 3’ diameter cylindrical pier that consists of steel reinforced concrete, single pour. It is physically decoupled from the SGSLR building and foundation to provide a vibrational isolation of at least 95% and fundamental frequency of greater than 80 Hz. The pier rises 2’4” above the floor inside the building.

Normal access to the inside of the building is though a single door on the west facing wall. The building consists of 4 separate rooms: an antechamber, control room, optics/laser room, and a stairwell to the inside of the dome. Each room is unfurnished unless otherwise specified. Climate control is provided for the control and optics/laser room. There is a 6’ removable panel on the outside of the structure leading to the optics/laser room to allow equipment to be placed. This panel is sealed after use to prevent contamination of the room. The entire building has an 8” raised floor to allow cable routing.

Dual, redundant, identical HVAC units are present. Their make and model will be determined. Each unit is controllable via an Ethernet interface. The optics/laser room is controllable to +/- 1C, while the control room is controllable to +/- 3C. The optics/laser room has a HEPA filtration component to provide a cleaner environment, however this is not guaranteed to hold to a clean room specification.

A 4 meter diameter, steel frame dome is present on the roof of the structure, centered on the pier. The dome has a slit with a vertical rolling shutter. The azimuthal position of the dome as well as the shutter position are electronically controllable via standard interfaces. The API for controlling the dome will be made available to users of the facility. The inside of the dome is accessible from a stairwell inside of the building, as well as stairs leading to a platform above the entryway of the building.

Standard 100 amp electric service is available, with outlets located in each room. In addition, network and internet capabilities are present.

Several methods of lightning protection are present at the facility. There are surge protection boxes located at the breaker panel as well as at the external equipment pads. All data connections entering and exiting the shelter are transmitted via optical fiber transceivers.

Weather Station

Weather and atmospheric data is available via equipment located external to the structure.

- Paroscientific MET4A Meteorological Measurement System
- Vaisala FS11P Present Weather Sensor
- Vaisala WMT703 Ultrasonic Wind Sensor

Each unit is controlled via a standard RS232 interface available within the shelter. They provide the following parameters:

- Barometric pressure
- Temperature
- Humidity
- Wind Speed and direction
- Horizontal Visibility
- Precipitation Status

Radar

A Laser Hazard Reduction System (LHRS) aircraft avoidance radar is located adjacent to the SGSLR structure. The radar provides a 9.4 GHz, 3 degree full angle beam that can be bore sighted with and slaved to a transmitted laser beam from SGSLR. The LHRS consists of a radar antenna and transceiver, remote control unit, and a local control unit (LCU). When an aircraft is detected, an active low pulse is generated at the LCU within the SGSLR shelter. This signal is present on the “Laser Enable” output located on the rear of the LCU and can be used in a fail-safe manner in the event of a fault or outage(inhibit by default). When combined with motorized blocks and NDs for the optical bench, this signal can be used to quickly block the laser beam and prevent exposure. Complete documentation on the function and interface of the aircraft avoidance radar will be available to users of the facility.

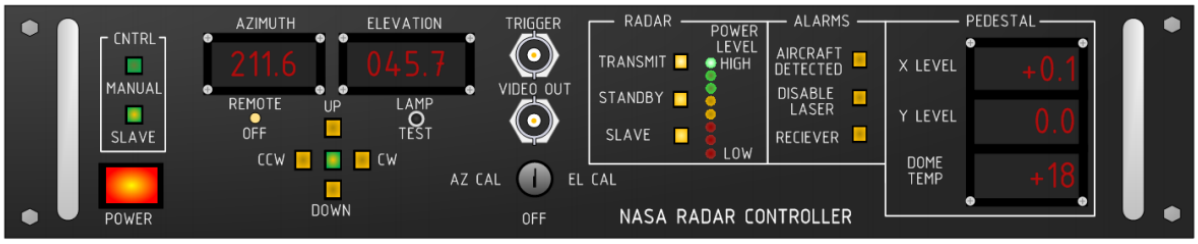

Figure 3- Front of Local Control Unit for Radar

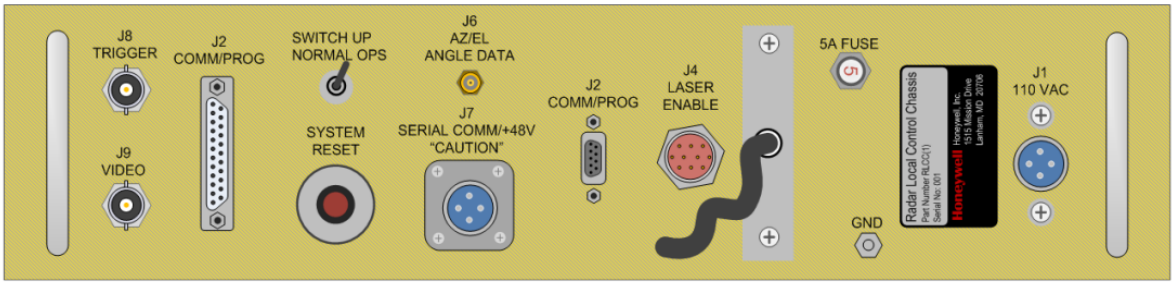

Figure 4- Rear of Local Control Unit for Radar

Outdoor Equipment Pads

There are three concrete pads external to the SGSLR building. Each pad has underground conduit running to it from the SGSLR building. The pads hold the following equipment:

1. Paroscientific MET4A, Vaisala WMT703, Hemisphere A52 Multi-frequency GNSS antenna
2. Vaisala FS11P
3. Cloud Cover Sensor (to be determined)

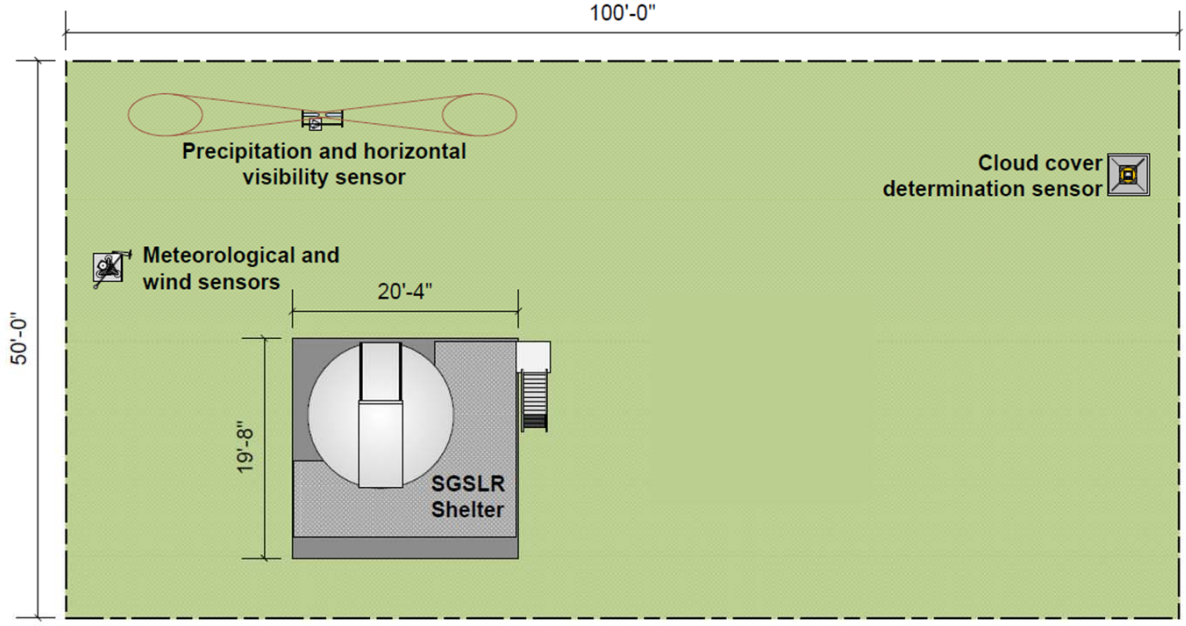

Figure 5 - Conceptual Layout of Outdoor Pads

Calibration targets

There are at least three calibration targets within the line of sight of the SGSLR structure. The targets each consist of a 1 inch diameter retroreflector cube mounted on a stable concrete pier. From the perspective of SGSLR, the targets are located at elevations near or slightly below 0 degrees.