

# **LSST Observation Simulator Requirements Document**

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## **1. Overview**

The aim of this project is the development and deployment of an Observation Simulator for the Large-aperture Synoptic Survey Telescope (LSST). The Simulator should be able to operate as a standalone application.

## **2. Requirements**

Requirements for the Simulator can be divided into two categories: operational requirements and technical requirements. The former group deals, roughly speaking, with "what the Simulator is supposed to do". The latter, with "how the Simulator is supposed to do it".

### **2.1. Operational Requirements**

1. The Simulator should be able to schedule up to TBD exposures per night.
2. The Simulator should make sure that the allocation of telescope time is such that, on average (over one year), each science program matches its science goals.
3. The Simulator should schedule observations in order to satisfy the cadence requirements of the science programs.
4. The Simulator should be able to schedule observations up to a time scale comparable to the shortest cadence allowed by the telescope.
5. The Simulator should not schedule observations closer than TBD degrees to the Sun or to the Moon.
6. The Simulator should not schedule observations in user-defined exclusion zones.
7. The Simulator should be able to take the current seeing conditions into account in determining the scheduling of observations of the different science programs.
8. The Simulator should take the current airmass into consideration in

- determining the scheduling of observations of the different science programs.
9. The Simulator should take the current weather conditions into consideration in determining the scheduling of observations of the different science programs.
  10. The Simulator should take the expected image depth into consideration in determining the scheduling of observations of the different science programs.
  11. The Simulator should take into consideration:
    - a. The pointing limits of the telescope.
    - b. Telescope slewing time.
    - c. Telescope settling time.
    - d. Dome rotation speed.
    - e. Shutter time.
    - f. Readout time of the camera.
    - g. Exposure time.
    - h. Configuration change time (filters etc.).
    - i. Engineering time.
    - j. Down time.

## **2.2. Technical Requirements**

1. Users should be able to ingest their own (Phase 2) science proposals.
2. Users should be able to use an arbitrary number of proposals.
3. Users should be able to run the simulation for as long as they want.
4. The Simulator should have efficient memory management.
5. The Simulator should be responsive to user interaction.
6. Users should be able to easily set and edit simulation parameters (e.g. FoV of the camera, latitude/longitude of the observatory, telescope slew time, dome rotation speed, filter switching times, weather data/model, exclusion zones etc.).
7. There should be no hard-coded minimum time step in the simulation.
8. The code of the Simulator should be easy to modify by a non-expert developer.
9. The Simulator should be adequately documented.