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Overview of Target of Opportunity Programs

Target of Opportunity (ToO) observations provide scientifically valuable data on objects whose observability cannot be predicted. LDT's ability to switch quickly between instruments makes it an ideal facility for ToO programs that require rapid response, such as observations of newly discovered Solar System objects, gamma-ray bursts, supernovae, cataclysmic variables and other transient phenomena. Because the instrument cube allows instruments to be switched in about one minute, the LDT has the potential to become a leading facility for ToO observations.

In this spirit, the partners have agreed to implement the ToO policies and procedures outlined in this document, with the following goals:

- To maximize the scientific return of ToO programs while also minimizing the impact on regularly scheduled programs
- To limit the demands on observatory operations, staff and budget
- To respect and support each partner's right to control how it uses its share of telescope time
- To institute a streamlined protocol that will allow one partner's ToO programs to interrupt another partner's scheduled programs
- To ensure fair time accounting that reflects the 'clear ether' premium afforded to ToO programs and provides compensation to partners whose programs are interrupted
- To recognize other categories of observations that merit protection from ToO interruptions

- To establish expectations for publications resulting from ToO observations

The policies and procedures described in the full policy document shall be reviewed and revised if and as needed.

The current LDT Target of Opportunity (ToO) policy document is available here: [ToO-Policy-20210922.pdf](#). Users should be familiar with the current version of the policy.

Current Approved ToO Programs

See the bottom section of the most current [Science Schedule](#) for approved programs.

ToO Limitations:

Current policy is:

- ToO are limited to pre-approved programs – the list is on the bottom of the [Science Schedule](#).
- No more than one ToO trigger per night
- The maximum duration of a ToO is two hour. This includes calibration time.

Procedure for triggering a ToO

Contacts: At a minimum, to trigger a ToO, the team calls the LDT control room (try, in order: (928) 233-3291, (928) 268-2914, (928) 354-2674). If the ToO observer knows in advance, they are encouraged as a courtesy to contact the TO, the PI of the program that will be interrupted and the LDT scheduler by e-mail ahead of time.

TCO: Note that designated Time Critical Observations (TCO; highlighted in red on observing schedule) have the right to reject the ToO and are expected to reject the ToO unless the ToO will not interfere with their TCO science. During a TCO observation the final decision to accept/reject a ToO lies with the TCO observers.

Engineering Time: Note that ToO's may be submitted during engineering time, however the principal observer or engineer for that engineering time has the right to reject the ToO if the ToO would create undue interference with the engineering activities.

Telescope Operator Responsibility

Confirm that the ToO team has an approved ToO program with time remaining and that this is the first ToO of the night. (See the [bottom of the current science schedule](#) for currently approved programs.)

Record in the night logs:

1. The PI, program ID and observer for the ToO program.
2. Time when the ToO was triggered;
3. Time when the interrupted observer finished their last exposure before handing over control;
4. Time when the interrupted observer started their first exposure after the ToO;
5. Any additional time used for calibrations.

The TO will not be asked to change the LMI filter complement, or the DeVený grating. (Note that on nights that the DeVený is not scheduled for use it is the intention to leave the DeVený grating, filter, grating tilt, & slit width in a standard configuration.)

Coordinate with the ToO observer to ensure that the necessary calibrations are acquired, either during the initial ToO time, at the end of the night, or, in rare cases, at the start of the next night. The TO is not expected to work longer than their scheduled shift.

Interrupted Observer Responsibility

If the ToO is a "rapid" ToO, the observers must hand over control of the telescope within 10 minutes.

If the ToO is a "slow" ToO, the observers must hand over control of the telescope within 30 minutes.

The interrupted observers should be ready to take back control of the telescope when the ToO team finishes.

If the observer(s) are on-site, for safety they must make sure that at least one person stays with the Telescope Operator at the LDT.

ToO Team Responsibility

The ToO observers must perform their own observations, typically remotely.

If desired, the ToO observers may focus the DeVený collimator and adjust the grating tilt and/or slit width through the LOUI. If DeVený was in use by the interrupted observer, the ToO observer must return any settings to their previous values before handing back over.

The ToO observers must keep the TO and interrupted observers apprised of their plans regarding when they expect to hand back control of the telescope. A ToO may not take more than two hours (including any calibration time) without pre-approval from the Director or their designate.

When planning your ToO, keep in mind that the Telescope Operator cannot be expected to work longer than their scheduled shift.

The ToO team should coordinate with the TO and the interrupted observers to ensure they get any needed calibrations. Possible scenarios for acquiring calibrations include:

- if the filter selection overlaps, the scheduled observer may already be taking the needed calibration frames & share them
- ToO observer takes dome flats before handing back over
- ToO observer hands back over to the scheduled observer ASAP & re-connects during twilight to get necessary calibration frames & that time is accounted for as part of the ToO
- in unusual cases LMI dome flats might need to be taken the following afternoon at the start of the next observing night

The ToO observers must hand back control of the telescope/instrument after no more than 2 hours.

Within one day of the observations the ToO team should send an email to the LDT Scheduler (tac at lowell dot edu) with a brief report on the observations including start/end times.

Important note about CANCELLATIONS: If the ToO team calls a ToO and decides to cancel **before** the start of the ToO, they **MUST** inform the TO of this. Otherwise, they will be considered to be control of the telescope, and will be charged for the time accordingly. Do not assume that because the weather is bad and the dome is closed that the triggered ToO cancels automatically. It does not.

LDT Scheduler Responsibility

Update the remaining available time for the ToO program at the bottom of the Science Schedule web page.

Adjust the observing time account balances accordingly for all involved partners.