



Increased Flexibility for Prioritizing Targets at LCOGT

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Executive Summary

We have created a system for more flexible prioritization of observing requests. You can now communicate to the scheduler if a certain observation is more critical than another observation in your program. This is done by setting a **priority factor** in your observation request, which boosts or demotes the priority of your request. Software is in place that limits the range of boosting and demoting to keep each program in overall balance according to its TAC ranking. There is no net gain or net loss by using the new feature, only the ability to locally shift priorities between your observations.

Priorities: How LCOGT Decides What to Observe

If you've been awarded time on the LCOGT Network, your program received a priority which is based on the TAC ranking. The priority is a number, which typically spans a factor of three from the lowest ranked to the highest ranked programs.

Every time the scheduler runs, it considers all the requested observing blocks. Each block is given a "merit score" which is the priority of its program times the duration of the block. The scheduler then picks the scheduling solution that maximizes the overall merit score (i.e. the sum of scores of all scheduled blocks).

The consideration of block duration (in addition to program priority) allows longer blocks (which are harder to fit in the schedule) to compete fairly with combinations of more flexible shorter blocks.

Why We Wish to Improve The Priority Scheme

The above priority scheme does not consider some of the nuances of scheduling a telescope for maximal science benefit. For example, some of your targets may be more important to you than others, or some targets may be more critical at certain times in their evolution. But currently, all of your requests have the same priority (that number given to your program as a whole). Also, every target in a high priority

program shouldn't necessarily trump every target in a lower priority program all the time.

Adding Priority Flexibility

We have added a new parameter – the **priority factor** – which you can now specify in each observation request. The priority factor multiplies your current program priority, *just for that single observation request*. For example, if your program has priority 15, and you use a priority factor of 2, that block will be considered to have a priority of 30. Boosting priority is limited and it cannot be used all the time.

This new feature is called **IPP – Intra/Inter Proposal Priority**. It allows you to set different priorities for requests within your own proposal (“intra”) and it also allows you to outrank requests from other proposals (“inter”), some of the time.

Keeping it Fair

In addition to having a pool of hours to use, we now also give you a pool of IPP hours, which starts out as 5% of your initial regular hours. Your regular hours are debited as usual, i.e. based on the time your request took to execute. Now, in addition to that, your new IPP hours can be both debited and credited depending on the priority factor (denoted “f”) you wish to use:

- **f>1** [boosting a request]: You'll be debited $(f-1) \times (\text{length of request})$ IPP time.
- **f=1** [standard request]: No IPP time is debited or credited.
- **f<1** [demoting a request]: You'll be credited $(1-f) \times (\text{length of request})$ IPP time.

Debiting occurs upon *submission* of a request, and crediting occurs upon successful *completion* of a request.

You decide how to use your IPP hours, with some limitations:

1. Priority factors are limited to values ≥ 0.5 and ≤ 2 .
2. The IPP hours you can accumulate are limited to 10% of your program's original time allocation.

An Example

Say you have a 100-hour program. You are given initially those 100 hours plus a separate pool of 5 IPP hours. These can be used in any of the following ways:

- 5 hours with priority factor 2, costing $(2-1) \times 5 = 5$ IPP hours and 5 regular hours. At this point you are out of IPP time, and continue using the remainder of your regular 95 hours with priority factor 1 (costing 0 IPP hours and 95 regular hours).
- 10 hours with priority factor 1.5 (costing $(2-1.5) \times 10 = 5$ IPP hours) and the remaining 90 hours with priority factor 1.
- All 100 hours with priority factor 1.05 (this is set as the default value).
- Any other equivalent combination that adheres to the limits mentioned above.

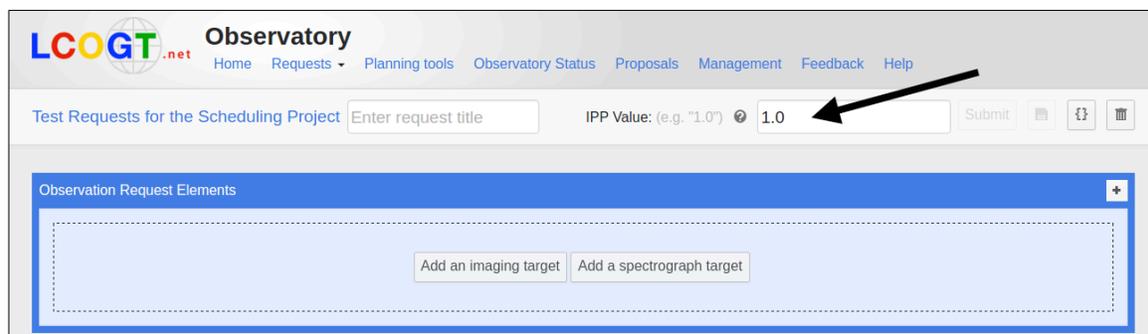
You can replenish your IPP hours by successfully requesting, for example:

- 2 hours with priority factor 0.5, gaining you $(1-0.5) \times 2 = 1$ IPP hour.
- 4 hours with priority factor 0.75, gaining you $(1-0.75) \times 4 = 1$ IPP hour.
- Any other combination.

Remember, you only gain IPP hours if your observation actually got scheduled and completed, and you cannot accumulate more than 10% of your original allotted time in IPP hours (so for the example above, you would not be allowed to have more than 10 unused IPP hours at any given time).

In Practice - Specifying a Priority Factor When Submitting a Request

On the web interface, you will see a new text box when submitting an observation (next to the observation title) where you can input your priority factor:



The screenshot shows the LCOGT Observatory web interface. At the top, there is a navigation bar with the LCOGT logo and the word "Observatory". Below the logo, there are several menu items: Home, Requests, Planning tools, Observatory Status, Proposals, Management, Feedback, and Help. The main content area shows a form for submitting a request. The form has a title "Test Requests for the Scheduling Project" and a text input field for "Enter request title". To the right of the text input field is a text input field for "IPP Value: (e.g. '1.0')", which currently contains the value "1.0". A black arrow points to this field. To the right of the IPP Value field are buttons for "Submit", a trash icon, a refresh icon, and a close icon. Below the form is a section titled "Observation Request Elements" with a plus sign in the top right corner. Inside this section, there are two buttons: "Add an imaging target" and "Add a spectrograph target".

If you try to use a priority factor larger than what's possible given your currently available IPP hours, the interface will notify you, and ask you to change your priority factor.

For submitting observing requests programmatically through the API, an optional **ipp_value** key can be added to the user_request dictionary before converting to json and submitting. To find out what your maximal allowed priority factor is, you can

use the new `get_max_allowed_ipp` API, which accepts the same input as the submission API, and returns your available IPP hours and the maximum priority factor allowed for that request.

Examples of using the API to set a priority factor, and for querying your available IPP time and maximum factor allowed, can be found at:

https://github.com/LCOGT/request_service_examples

General documentation about the API is at:

<http://developers.lcogt.net/>

FAQs

1. **This is too complicated. Do I lose anything by ignoring this new feature completely?**

No. Feel free to ignore the new feature. If all your observations are equally important to you, you don't have to do anything (just leave the priority factor at its default value of 1.05 for all of your requests). The system is set up so that it does not give anyone a net advantage or disadvantage. Users who adopt the new functionality will gain local advantages for certain targets at certain times, but this will be offset by disadvantages for other targets of theirs at other times.

2. **Why is the default value of the priority factor 1.05 and not 1.00?**

We are giving all users 5% of their allocated time as additional "free" IPP hours to start with. If all of your targets are equally important, you can still take advantage of this additional free IPP time, spread out across all your targets, by submitting all of your requests with a priority factor of 1.05. This also ensures the system is 100% fair to those who ignore the new feature compared to those who use it.

3. **Do I have to keep track of my priority usage?**

No. The system does it for you. You can see how much remaining IPP time you have through the web interface or API.

4. **Can I game the system by using my priority factors in a certain way?**

No. The system is designed so that you must end up with the same balance as if you hadn't used the priority factor feature at all.

5. **What happens if I use the API to submit a request with a priority factor larger than what I'm allowed?**

You will receive an error and your observation ***will not be submitted***. To avoid this, first find out what your limit is, then submit the request (as specified above).

If you have any additional questions, please email science-support@lcogt.net