Bull. Soc. R. Sci. Liège, 2024, **93**(2), 32–43 *Peer-reviewed conference paper*
doi:10.25518/0037-9565.11588

How to Get Observing Time on the DOT

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Paper presented at the 3rd BINA Workshop on "Scientific Potential of the Indo-Belgian Cooperation", held at the Graphic Era Hill University, Bhimtal (India), 22nd–24th March 2023.

Abstract

The article describes the approach followed by the Devasthal Time Allocation Committee to evaluate observing proposals to the Devasthal Optical Telescope (DOT) over the period 2020–2023, the results of the time allocation process, and some statistics of the proposals and final time allocation. It also provides some suggestions to the Aryabhatta Research Institute of Observational Sciences that aim to improve the DOT science output and the quality of observing proposals, as well as suggestions to DOT proposers to help improve their chances of obtaining DOT observing time in the future.

Keywords: Telescopes — Observing time — Time Allocation Committee – DOT

1. Introduction

This article (and the associated talk) aims to describe the processes followed in the evaluation of observing proposals to, and the allocation of observing time on, the 3.6-m Devesthal Optical Telescope (DOT) by the Devasthal Time Allocation Committee (DTAC) over the period 2020–2023, i.e. observing cycles DOT-2020-C2 to DOT-2023-C1. The article also summarizes some statistics of the observing proposals and time allocation, and provides suggestions for both the Aryabhatta Research Institute of Observational Sciences (ARIES; to improve the DOT, the observing community, and the proposal process), and the DOT proposers (to improve the quality of observing proposals and improve their chances of obtaining observing time). The discussion of the article is restricted to "Indian" proposals (i.e. proposals with PI's affiliated to an Indian institution), that were evaluated by the DTAC. Finally, while inputs and data were gratefully received from the other DTAC members, the opinions expressed in this article are mine, and this is me giving them (Medawar, 1979).

In passing, it appears appropriate to mention the qualifications of the author to write such an article, of both descriptive and (somewhat) prescriptive nature. The author has been a member of the DTAC since its inception (in 2017) and has read and evaluated almost every DOT proposal since then. He has (intentionally) submitted no DOT proposals (as either PI or co-I) and hence has no conflicts of interest with any DOT proposal. And, at the time of the third BINA workshop

(March 22–24, 2023), where this talk was given, he had every intention of not being a member of DTAC in the foreseeable future. Unfortunately, the best laid schemes o' mice an' men gang aft agley (Burns, 1785).

2. The DTAC: Constitution, Processes, and Issues

Over the period 2020–2023, the DTAC consisted of the following members: (1) Tushar Prabhu (chair, Indian Institute of Astrophysics (IIA), Bengaluru), (2) G. C. Anupama (IIA, Bengaluru), (3) Devendra Ojha (Tata Institute of Fundamental Research, Mumbai), (4) Yogesh Chandra Joshi (convenor, ARIES), (5) Brijesh Kumar (ARIES), and (6) Nissim Kanekar (National Centre for Radio Astrophysics, Pune).

The DOT has two 4-month observing cycles every year, separated by the monsoon, over February–May (C1) and October–January (C2). The proposal deadlines are the preceding December 1 (for cycles C1) and August 1 (for cycles C2). The DTAC meetings to evaluate the proposals and allocate observing time are in early January (C1) and early September (C2). While the DTAC meetings were in person at either IIA or ARIES prior to 2020, the COVID pandemic and related issues meant that all DTAC meetings over 2020–2023 were held online.

During the period 2020–2023, all DOT proposals were sent for review to 1–2 referees (and to more, in some cases). The proposals were also independently evaluated by the DTAC members, and both the referees and the DTAC members gave numerical grades to each proposal. Each proposal was then formally discussed in the DTAC meeting, in order of decreasing average grade. Following the discussion, each proposal was given a final DTAC grade, and placed in one of four quartiles, A $\equiv$ good proposal, B $\equiv$ moderate proposal with some flaws, C $\equiv$ weak proposal with significant flaws, D $\equiv$ very weak proposal, which should not be allocated time. In general, proposals in Category A were allocated most of the requested time and also given scheduling preference with regard to weather conditions (e.g. dark nights), proposals in Category B were allocated part of the requested time, proposals in Category C were given some observing time (often to carry out a pilot study), while proposals in Category D were not allocated any time. The schedulability of the sources of the individual proposals was then checked by the ARIES scheduling team, based on instrument availability, target sources, and moon conditions, and the final decision was made about the allocation of observing time.

The following general issues were noted during the DTAC review process:

- The short separation between the proposal deadlines and the starts of the observing cycles implies that the refereeing and DTAC processes, and the scheduling, have to be expeditious. As a result, referee reports could not be obtained for some proposals. This issue was mitigated in later cycles by sending, at the outset, invitations to more referees. However, there were still typically a few proposals (out of $\approx 65 - 75$) without referee reports in each cycle.

- The three primary DOT instruments, IMAGER, ADFOSC, and TANSPEC, are all mainport instruments, implying that only one of these can be mounted at any given time (with

TIRCAM2 mounted on a side port). Given the overheads in mounting the main-port instruments, each of these instruments is typically mounted only once, for a period of $\approx 1-2$ months, in each cycle. This affected proposals with sources over a wide RA range (albeit one that could be covered in the full cycle), as only some of the targets could often be scheduled, due to instrument availability issues.

- There was often lack of clarity on the instrument capabilities, e.g. the faintest targets for ADFOSC spectroscopy, how deep can one go with IMAGER, etc. This was exacerbated by issues related to the auto-guider, which was not working for most of this period.
- Many (most?) proposals had insufficient technical information (e.g. the required sensitivity, the target magnitudes, Target-of-Opportunity (ToO) criteria, required cadence, etc.). In the view of the author, the lack of attention paid to technical issues was the most serious single flaw affecting the DOT proposals. Given that many proposals were resubmissions of proposals from earlier cycles, it was especially disconcerting that not much effort had been put in to address the DTAC comments on the earlier proposals.
- Many proposals contained little information on earlier DOT observations and science results. This was especially the case for ToO proposals.
- There was no formal technical review of the proposals. Instead, DTAC had to internally carry out the technical assessment.
- There was no user feedback on issues that had come up during earlier observations.
- My view is that two pages is quite short for an observing proposal, and that this shortness was detrimental to proposal quality. It is harder to write a short story than a novel!

3. Lies, Damned Lies, and Statistics: Outcomes of the DTAC Process

This section summarises some of the statistics of the DTAC process, based on data that were available in March 2023. I emphasise that some areas of interest, at least to me, are missing from the discussion, mostly due to a lack of data. These include DOT publications, the fraction of allocated time lost due to instrument/telescope issues, the fraction of allocated time lost due to weather, instrument pressure, local sidereal time pressure, ToO usage, PI career stage, broad science categories, etc.

The first two panels of Fig. 1 provide a summary of [A] the requested time by, and [B] the allocated time to, PI's from ARIES and from other Indian institutions in each of the six observing cycles from DOT-2020-C2 to DOT-2023-C1. Fig. 1[A] also mentions the number of observing proposals in each cycle (next to the total requested nights).

It is clear that the number of proposals and the number of requested nights peaked sharply in the first cycle (97 proposals and ≈ 250 requested nights), and then stabilised to typical values of ≈ 70 proposals and ≈ 155 requested nights per cycle, over the next 5 cycles. The number of allocated nights was typically ≈ 55 over Cycles DOT-2021-C1 to DOT-2022-C2, and then

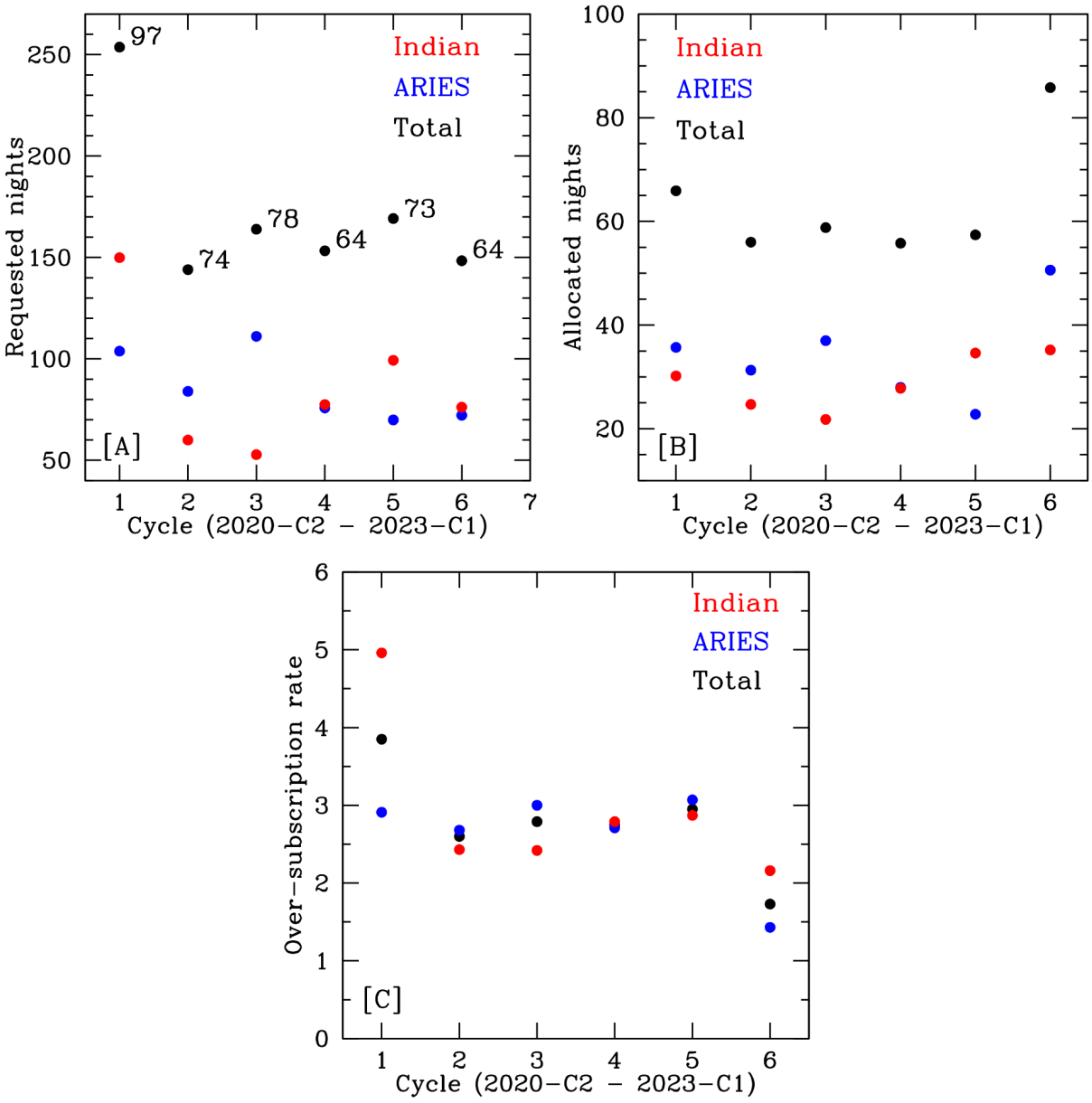

Figure 1: [A] The number of requested nights in each cycle for the six cycles from DOT-2020-C2 to DOT-2023-C1. The numbers next to the total requested nights indicate the number of observing proposals in each cycle. [B] The number of allocated nights. [C] The over-subscription rate for each cycle, defined as the ratio of time requested to time allocated in each cycle. In all panels, PI's from ARIES are indicated in blue, PI's from other Indian institutions in red, and the total number in black.

jumped to ≈ 85 in DOT-2023-C1 (mostly because it appeared that fewer instrument test nights were going to be needed in the last cycle). The median value for requested nights is ≈ 159 nights and for allocated nights is ≈ 59 nights, across the six cycles.

Figure 1[C] plots the "over-subscription rate" for the DOT in each cycle. Estimating this is not trivial, given that the demand for dark or grey nights is typically far larger than for bright nights; conversely, ToO proposals typically ask for any moon conditions. I chose to define the over-subscription rate as the ratio of the requested time to the allocated time, since this effectively includes the dark/grey issue and is probably a more reliable estimator of the true over-subscription. The figure shows that the typical over-subscription was $\approx 2.5-3$ over Cycles DOT-2021-C1 to DOT-2022-C2, but then dropped to ≈ 1.7 in Cycle DOT-2023-C1 (due to the significantly larger allocation of time in this cycle; see Fig. 1[B]).

The median value of the over-subscription rate is ≈ 2.8, over the six cycles. At first glance, this appears to be a fairly reasonable over-subscription rate, suggesting a telescope with good competition for observing time. However, it should be clearly stated that the above over-subscription rate is artificially inflated by both a number of very weak proposals in each cycle and typically over-large time requests on many accepted proposals. Unfortunately, it is not the case that time is not available for allocation to good proposals, as would normally be the situation for an over-subscription rate of ≈ 3. On the contrary, there has been a significant amount of unallocated time in every cycle, which has been returned to the observatory (for use in ToO proposals, make-up observations, tests, etc.) because there were no proposals to which the time could be fruitfully allocated. The "true" over-subscription rate is thus lower than unity, in the sense that any proposal of even moderate quality is very likely to obtain observing time.

ToO proposals form an important category of DOT proposals. At the initial DTAC discussions with the ARIES management, it had been agreed to restrict the time allocation of such proposals to about 10% of the total allocated time. This was due to the intrinsic uncertainty in the occurrence of ToO targets, making it hard to schedule the telescope. However, the interest in ToO projects at the DOT has been quite high and these proposals have typically been amongst the more fruitful ones. Fig. 2 plots [A] the number of requested and allocated nights in the ToO category, and [B] the over-subscription rate for ToO proposals. It is clear that the number of requested ToO nights has increased significantly over the last 5 cycles, making up $> 20\%$ of the total requested time. The time allocated to ToO projects has steadily increased from DOT-2020-C2, with the fraction of the total time allocated to ToO projects being $\approx 25\%$ in DOT-2023-C1. The over-subscription rate for ToO proposals was significantly higher than the total over-subscription rate in DOT-2020-C2 and DOT-2021-C1, but has been similar to the total over-subscription rate over the last 4 cycles, mostly due to the DTAC decision to allow a ToO fraction higher than $\approx 10\%$.

Finally, an important issue with telescope time allocation is whether the process contains implicit or explicit bias against sub-groups (e.g. based on gender, career stage, race, caste, etc.). A number of studies have been carried out of such systematic biases (especially related to gender and career stage) in the proposal review process at different telescopes (e.g., Reid, 2014; Patat, 2016; Carpenter, 2020; Hunt et al., 2021), with remedial strategies (usually, dual-anonymous

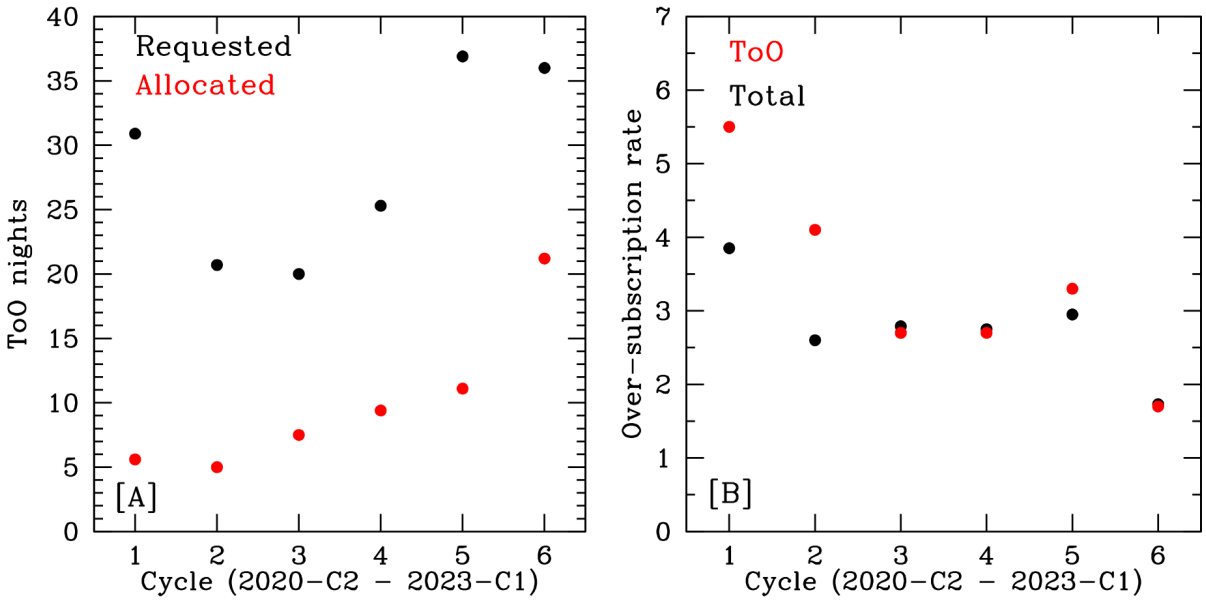

Figure 2: [A] The number of requested nights (black) and allocated nights (red) in the ToO category in each cycle for the six cycles from DOT-2020-C2 to DOT-2023-C1. [B] The over-subscription rate for ToO proposals, in red; the total over-subscription rate is shown in black, for comparison.

evaluation) often used to address these biases (e.g., Johnson and Kirk, 2020; Carpenter et al., 2022). At present, we have immediate access to the PI gender for DOT proposals and I hence carried out a gender-based analysis of DOT proposals over the last six cycles. The results are presented in Fig. 3, whose panels show [A] the number of requested nights by female (red) and male (blue) PI's in each cycle, [B] the fraction of the total nights requested (solid circles) and allocated (open circles), and [C] the gender-based over-subscription rate, defined as the total requested time divided by the total allocated time, separately for proposals with female (red) and male (blue) PI's.

Figure 3[A] shows that, in any cycle, the number of nights requested by male PI's is significantly higher than the number requested by female PI's. This is perhaps not too surprising, given the gender distribution among astronomy faculty members in India. However, much more worrying is that the absolute number of nights requested by female PI's has been decreasing over the last six cycles, from > 55 nights in DOT-2020-C2 to ≈ 31 nights in DOT-2023-C1. The reasons for this are not obvious, although a similar pattern has been noticed in a similar analysis of proposals for the Giant Metrewave Radio Telescope (GMRT; Kanekar, unpublished). For the GMRT, the trend since 2020 is the reverse of that over the previous decade, during which the number of proposals with female PI's steadily increased. This suggests that the situation since 2020, for both the GMRT and the DOT, may be related to the COVID pandemic and its after-effects. The situation should be monitored to discern any long-term trends.

Figure 3[B] plots in solid (open) circles the fraction of requested (allocated) nights with

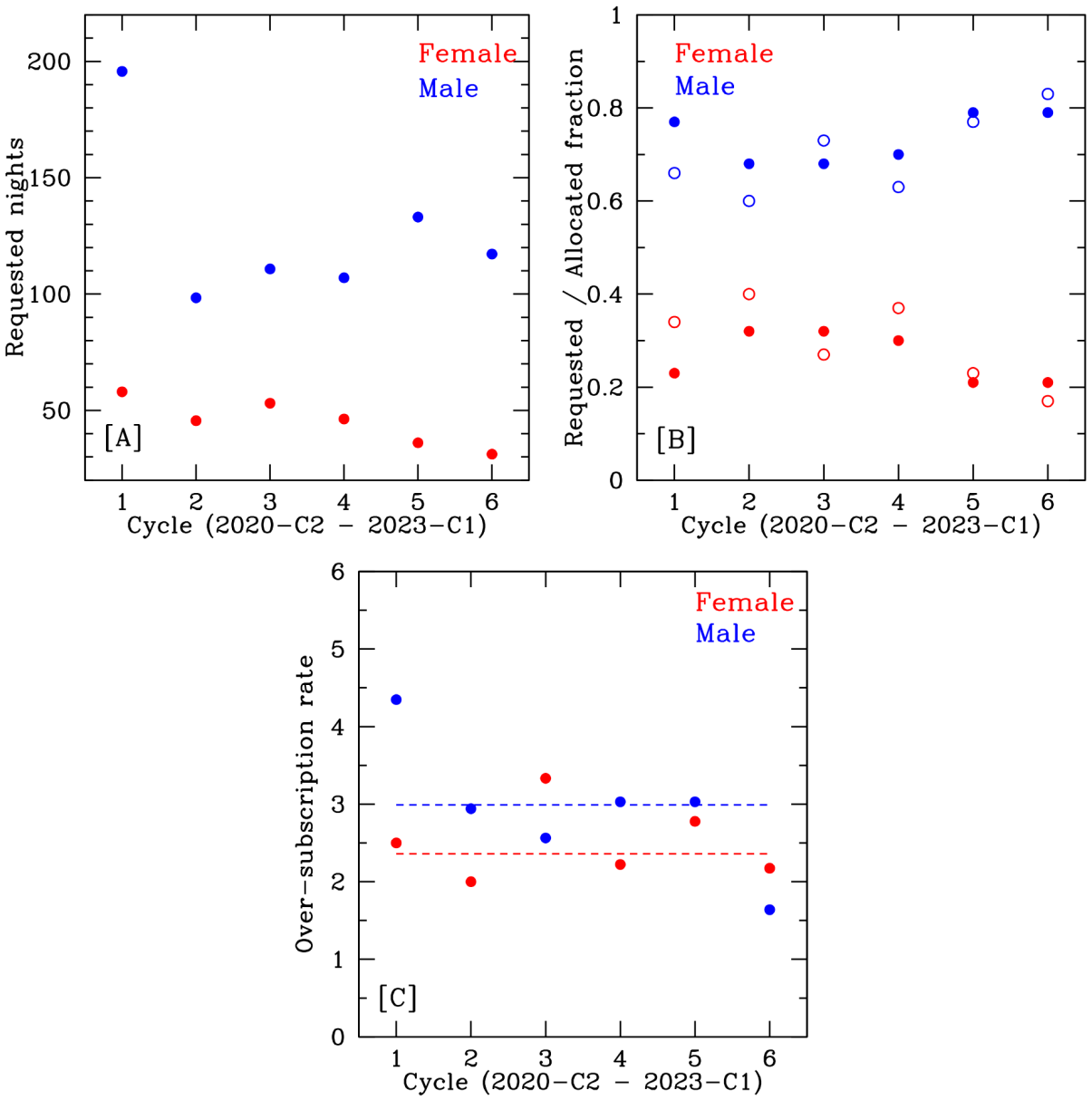

Figure 3: [A] The number of requested nights for female (red) and male (blue) PI's in each cycle for the six cycles from DOT-2020-C2 to DOT-2023-C1. The decline in requested nights for female PI's is clear from the figure. [B] The fraction of requested (solid circles) and allocated (open circles) for female (red) and male (blue) PI's, again for each cycle. [C] The over-subscription rate for female (red) and male (blue) PI's for each cycle; the dashed horizontal lines indicate the median over-subscription rates for female and male PI's across the six cycles.

female (red) and male (blue) PI's. For PI's of each gender, the two fractions are similar, indicating no systematic bias against female PI's. In fact, the median fraction of accepted nights is ≈ 0.31 for female PI's, slightly higher than the median fraction of requested nights (≈ 0.27). Similarly, Fig. 3[C] compares the over-subscription rate for female (red) and male (blue) PI's for the six cycles. The over-subscription is typically slightly higher for male PI's: the median over-subscription rates are ≈ 3 (male PI's) and ≈ 2.4 (female PI's). Figs. 3[B] and [C] indicate that there is no evidence of a gender-based bias in the time allocation process. However, as noted above, the decline in the absolute number of proposals with female PI's over the last six cycles is a matter of serious concern.

4. Suggestions for the ARIES Observatory

There are a number of areas where both the DOT usage and output, and the quality of DOT proposals, might be improved by action from ARIES. Some of these are listed below, in no particular order, as suggestions for the observatory:

- Exposure time calculators (ETCs) should be implemented for each instrument and the ETC output should be be attached to DOT proposals. This is a critical requirement for a telescope and would result in more sensible estimates of the required observing time.
- More information is needed on the capabilities of the current instruments, both with regard to the typical time needed to achieve a given target sensitivity and the best sensitivity that has been achieved with each instrument in deep runs. Science verification observing runs should be carried out to obtain this information, under instrument verification time.
- It would be extremely useful to implement service observing and dynamical scheduling at the DOT. This would ensure that the highest-ranked proposals get the best observing conditions, maximizing the DOT science output. Further, this would be beneficial for ToO and short proposals, where it may be difficult for observers to travel to Devasthal.
- Increasing the allowed length of proposals to three (or four) pages is likely to improve the overall quality. A separate technical case should also be a required part of each proposal, with the technical justification reviewed by an ARIES technical committee for feasibility.(I note that the technical committee has now been set up by ARIES.)
- The quality of DOT proposals is a serious concern. ARIES should conduct regular proposal-writing and data analysis workshops/schools to try to address this issue.
- It is critical to obtain user feedback on the actual performance of the DOT and the instruments during the observations. One possibility is to implement a feedback form that must be filled out by observers at the end of each observing run, describing any issues that were faced during the observations. Setting up a Users' Committee would also be useful, to address longer-term issues. Another possibility would be to obtain such input via workshops, either at ARIES or at the annual Astronomical Society of India meeting.

- The fact that the three primary DOT instruments (IMAGER, ADFOSC, and TANSPEC) are all main-port instruments severely restricts the capabilities of the DOT. I note that the only current side-port instrument, TIRCAM2, was actually not built for the DOT, but has been a useful workhorse because it is always available. While the development of multiple instruments with different observing capabilities is generally good for an observatory, it is critical to have a strategy in place for the mounting of the different instruments, and the optimal use of the main and the side ports. It would be extremely useful if ARIES were to develop an optical long-slit spectrograph and an optical imager (or a combined instrument) for the two side ports; these are basic instruments that should always be available for use at a 4m-class telescope. (I note that a DOT side-port imager has now been implemented and is being tested in the present cycle.) It would also be useful to have a community discussion (e.g. via a DOT workshop) for the next suite of instruments (e.g. an intermediate-resolution spectrograph covering optical and near-IR, a multi-object spectrograph, an integral field spectrograph, etc.) to be built for the DOT, which should include a strategy for their mounting on the telescope so as to maximize the science output.

- Improving the competitiveness of the DOT proposals (i.e. increasing the "true" over-subscription rate) is extremely important for the health of the telescope. It might be useful to consider inviting long-term "large" observing proposals, perhaps once every 2–3 years, with a few proposals to be selected in this category. Approved proposals would only then need to submit a report on the work done so far at each deadline, for approval for continuation of the project.

- The recommended fraction of time allocated to ToO proposals could be increased from the current nominal 10%. This would be more easily done with the implementation of service observing at the DOT.

- Finally, the current system of two 4-month proposal cycles separated by the monsoon makes the timeline for proposal evaluation and scheduling very tight. In addition, the overheads in switching main-port instruments mean that often each main-port instrument is scheduled only once (for 1–2 months) per cycle. This often means that only part of the sources of a given proposal can be observed in one cycle, and the rest have to be held for the next cycle. Further, the deadline for Cycle-2 proposals each year is on December 1, when less than half of Cycle-1 has been completed and results from even the completed observations are often not available. It may hence be better to have a single 8-month main observing cycle every year, with a deadline around July 1. A subsidiary call could be made at the December 1 deadline.

5. How to Get Observing Time on the DOT

Many DOT proposals have been found to have severe and very basic flaws, which immediately precludes their being accepted for observations. In this section, I list a few actions that the proposers might take to increase their chances of getting DOT observing time.

- Many DOT proposals in each cycle provide almost no information about the context of the proposal, open questions in the field, and how the proposed observations would yield progress. It is often found that the proposed science has already been carried out, and sometimes with 8m-class telescopes. A clear statement of how the proposed observations will complement or move forward literature studies is an important part of any proposal.

- Proposals should provide some details of the path that will be taken from the observations to the science results. What would a null result (e.g., a non-detection or absence of a correlation) yield?

- The criteria by which the targets were selected should be clearly stated. This is especially important for ToO proposals, where the category of the targets (e.g., long gamma ray bursts, gravitational wave events, Type II supernovae, etc.) should be explicitly spelt out.

- For ToO proposals, the trigger criteria must be clearly explained. Also, the number of triggers should stated clearly (statements such as "2–3 triggers" are not acceptable). It is also important for ToO proposals to explain in detail how many targets are likely to be available in the coming DOT cycle, based on earlier statistics.

- As noted earlier, the technical case of DOT proposals has been found to be especially weak. There is often no information about the target magnitudes, the expected signal strength, the required signal-to-noise ratio, the basis of the time request, justification for the cadence of monitoring observations, etc. All of these really must be stated clearly in the technical justification.

- In the case of ToO proposals, the technical case should state the instruments that will be used, the observing time per instrument for each target, and the required cadence (in the case of monitoring studies), with a clear justification.

- Proposals that target known objects should not be submitted as ToO proposals, unless there is time variability associated with the targets. A good example of this is the case of proposals following up the host galaxies of gamma-ray bursts (GRBs) or supernovae (SNe): while the GRBs or SNe are variable, the host galaxies are not, and there is no obvious justification for requesting ToO time to study the host galaxies. If such ToO time is felt to be warranted, it needs to be clearly justified.

- Finally, if observing time has been allocated to a proposal in the past, any resubmitted proposals should contain a detailed description of the science results and associated publications on a separate page (or pages).

6. Summary

This article has attempted to summarise the DTAC processes for DOT time allocation over the period 2020–2023, to list some of the results of the time allocation and their statistics, and to provide recommendations to the ARIES observatory to improve DOT usage and to DOT proposers to improve the quality of future proposals. A few take-home points are listed below:

- The median number of nights per observing cycle requested over the last six cycles is ≈ 159, while the median number of nights allocated per cycle is ≈ 59. Some unallocated time in each cycle was returned to the ARIES observatory, as there were not enough proposals deemed to be of acceptable quality.

- The median over-subscription rate per cycle was ≈ 2.8 over the six cycles. While this appears reasonable, the rate has been artificially inflated by both a number of very weak proposals in each cycle and over-large time requests in proposals. As noted above, unallocated time in each cycle was returned to the observatory, indicating that the "true" DOT over-subscription rate is less than unity.

- The number of requested ToO nights has increased significantly over the last five cycles, and now makes up $> 20\%$ of the requested time. The fraction of time allocated to ToO projects has increased since cycle DOT-2020-C2, with the fraction being $\approx 25\%$ in DOT-2023-C1. Service observing at the DOT would be very helpful for ToO proposals, which form an important part of DOT usage.

- No evidence was found for gender bias in the DOT time allocation: the median over-subscription rate for female PI's is ≈ 2.4, while that for male PI's is ≈ 3.0. However, there is a clear decrease in the number of proposals with female PI's over the last six cycles, which is a matter of serious concern. It would be useful to examine the dependence of the time allocation process on PI's in other sub-groups.

- A number of suggestions have been provided to ARIES for consideration, including (1) implementing exposure time calculators for each instrument, (2) providing more information on instrument capabilities, (3) implementing service observing, (4) increasing the allowed length of DOT proposals, (5) improving the quality of DOT proposals via schools/workshops, (6) obtaining user feedback on the actual DOT performance, (7) setting up a set of side-port instruments, especially "standard" instruments like an optical long-slit spectrograph and an optical imager, that would be available all the time, (8) implement long-term "large" proposal calls, once every $2-3$ years, and (9) consider a single 8-month proposal cycle with a deadline of July 1, along with a subsidiary call for proposals with a deadline of December 1.

- A number of suggestions have also been made to DOT proposers, including (1) providing context for the proposed science and a clear statement of how the proposal will move the field forward, (2) providing details of how the observations will yield science results, (3) stating the target selection criteria, and, for ToO proposals, the target selection criteria, the trigger criteria, and the number of triggers, (4) providing a clear technical justification, including target magnitudes, signal strength, required signal-to-noise ratio, exposure time calculations, etc., and (5) providing details of the science results of earlier proposals, especially for cases of a resubmission.

Acknowledgments

I thank Tushar Prabhu, G. C. Anupama, Devendra Ojha, Yogesh Chandra Joshi and Brijesh Kumar for many discussions on DOT and DTAC issues, as well as for inputs for the talk. I also thank Yogesh and Brijesh for providing the data from the last six DOT cycles, and Peter De Cat and Santosh Joshi for being very forgiving of my egregious delay in submitting this article. I acknowledge the Department of Atomic Energy for funding support, under project 12-R&D-TFR-5.02-0700.

Further Information

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Conflicts of interest

The author declares no conflicts of interest.

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