

KOSMOS System Design Note 4

Title: KOSMOS-to-Telescope Mechanical Interface Design
Author: Jay Elias
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Introduction

This document describes the criteria for the design of the mechanical interface between KOSMOS and the Mayall telescope rotator/guider.

Design Criteria

OSMOS is designed to attach to the MDM 2.4-m Hiltner telescope, which has a different mechanical interface than the Mayall telescope. Consequently, the design of the instrument enclosure must be adapted to the Mayall, or a suitable adaptor plate must be designed that attaches to the Mayall, to which KOSMOS then attaches.

There are a few additional considerations:

- The Blanco telescope has the same mechanical interface as the Mayall, except that the optimal back-focal distance is slightly less (about $\frac{3}{4}$ inches less than the 6-inch BFD of the Mayall). Although instruments can be operated at the nominal BFD on both telescopes, the image quality will be slight better at the optimal location on the Blanco.
- There exists an adaptor for the Mayall that allows instruments from the 2.1-m telescope to be attached directly. If KOSMOS attached to this adaptor, it could be attached to the 2.1-m as well. The back-focal distance with this adaptor is 2 inches.
- For reference, the BFD on the MDM 2.4-m is 3 inches.

Overall, it is more important to be able to build a copy of KOSMOS for the Blanco telescope without significant additional design effort, than it is to be able to use KOSMOS on the 2.1-m telescope.

Discussion

There are effectively 3 options available:

- The KOSMOS enclosure design is modified to attach directly to the Mayall rotator guider. Because more back-focal distance is needed, this involves extending the enclosure and does not present difficulties in fitting the slit wheel into the new design. The enclosure design would need to be modified again for the Blanco, or else the copy (COSMOS) would be run at nominal rather than optimal focus. Some FEA of the enclosure would need to be done to verify flexure performance. The additional space would allow for any additional stiffeners needed to match the enclosure to the rotator/guider while maintaining

flexure performance. The Mayall analysis should be sufficient for both KOSMOS and COSMOS. This approach does not allow operation on the 2.1-m.

- The KOSMOS enclosure design is left unchanged, but an adaptor is designed that attaches to the Mayall rotator/guider and presents a mounting interface like the MDM 2.4-m. The adaptor can be very rigid, and can be designed in such a way that adaptation of the design for COSMOS will be straightforward. Little or no analysis is required. This approach does not allow operation on the 2.1-m. This approach is clearly the most economical.
- The 2.1-m adaptor is used. Because it requires a smaller BFD than the OSMOS design, the KOSMOS enclosure would need to be re-designed to reduce the BFD, which may require modification of the slit wheel mechanism. In addition, mounting to this adaptor requires changes to the front of the enclosure to maintain rigidity – which may not be possible with the small BFD. This approach is clearly the least economical, and is the only one that presents performance risk (possibility of greater flexure than seen in OSMOS). It does, however, allow operation on the 2.1-m. A copy of the 2.1-m adaptor with appropriate thickness would allow use on the Blanco telescope.

From the point of view of performance on the 4-m telescopes, either of the first two options should be similar and presents very low risk. Since the second of those two options is less demanding in terms of design resources (and possibly fabrication resources as well), it is clearly preferable.

The only advantage of the third option is that it allows operation on the 2.1-m. This is offset by the greater design and analysis effort required, and the potential for performance degradation (flexure). If operation on the 2.1-m telescope was a requirement, the design and performance issues would have to be addressed, but since it is not, it is preferable to choose an option that reduces risk, cost, and schedule.

Conclusion

KOSMOS will be attached to the Mayall rotator/guider using an adaptor plate that attaches to the rotator guider and that has the same mounting interface as the MDM 2.4-m telescope. The design will allow fabrication of an equivalent adaptor for the Blanco telescope, for use at its optimum focus.

It is acknowledged that this decision precludes use of KOSMOS on the 2.1-m telescope without modification of that telescope's interfaces.

Versions

Version	Date	Changes
1	May 4, 2010	First draft