

iSHELL Review Summary

This document is a response to the charge, including the review panel's primary concerns related to the instrument. It is not intended to be a comprehensive summary of all issues, concerns or suggestions identified by the panel or by individual reviewers; these will be provided separately.

We believe that the iSHELL team can deliver an instrument that provides a unique and powerful capability to the astronomical community.

Should the project proceed with procuring the optics? If not, what additional work is needed?

Additional work is required to provide detailed drawings for quotes. In addition the project should investigate alternative vendors, such as II-VI or SSG, and quantify the performance/cost trade, for the OAPs. Beyond this preparatory work, the optics are ready to procure. Priority should be given to optics, such as the OAPs, where vendor information may interact with the mechanical design. De-scope options may lead them to delay procurement on some filters or cross-dispersers.

Are all other aspects of the project ready to proceed to detailed design? If not, what additional work is needed

Translation of the optical design to warm dimensions is essential before any final dimensioning of the bench or mechanisms can be done. If there is any reason to believe this would modify the optical design, this task needs to be completed before completing optics procurement. Development of the design for light baffling within both channels, but especially the spectrograph channel, is required before the mechanisms can enter detailed design. Both the baffling and shield designs need further work before the cryostat and bench can proceed to detailed design. An optical assembly and alignment plan is needed before the optics mounts can proceed to detailed design. This should include the process for adjusting (if needed) for "as built" optics dimensions. Finally, an outline integration and test plan, including the optical assembly/alignment plan, and a plan for implementing possible de-scopes, would both be useful in sequencing the detailed design effort.

It is not clear who is filling the role of system engineer at present; this person needs to be identified. Someone is needed to address or supervise the critical tasks identified above as preparation for detailed design, as well as trades in optics procurement.

Are there significant high-risk areas not identified by the project? Are there significant risk-mitigation actions not already identified by the project?

1) The ambitious and broad ranging science goals currently identified for iSHELL have led to a complex instrument configuration involving many sophisticated mechanisms. We are concerned that the project's focus in planning has been on the need to spend the NSF funds before next August, whereas in fact the greater risk is that the funds will be spent without leaving the

instrument in a state where it can be completed with the remaining resources. The reviewers urge the iSHELL team to identify a core instrument configuration that would, with low risk, accomplish a more limited science program within the budget and schedule of the current NSF award. Wherever possible this should be done in a way that allows for subsequent implementation of additional capabilities as resources become available. It is important that this prioritization be completed before committing further resources to capabilities not required for this core mode of operation.

We believe that a de-scope strategy will still result in a scientifically valuable instrument. We note that virtually any configuration will still result in an instrument that is unique at longer wavelengths (LM) and potentially unequalled at shorter wavelengths (JHK). Initial demonstration of its capabilities would then provide a strong justification for additional funding to restore the de-scoped capabilities.

2) We are concerned that the risk from scattered or leaked light has been underestimated - that is, background light in addition to direct thermal radiation from the cold structure. Areas of particular concern are baffling along the light path within the spectrograph channel, as well as the transition across the order-sorting filters (from behind the slit to the spectrograph volume).

3) The absence of a person in the systems engineering role, noted above, presents risk. In addition there is a risk that engineering tasks will prevent the project manager from spending sufficient time in his management role.

Do the project budget and schedule appear realistic?

1) The budget does not appear to have an adequate allowance for contingency, particularly in the absence of quotes for most optical components and given the state of the mechanical design. The mechanical design is still at a stage appropriate to PDR, which precludes precise estimates of fabrication costs. Based on current information, we think that a target contingency of ~20% of budget is a reasonable goal.

2) Even without contingency, the mechanical fabrication schedule is quite compressed. An integration and test plan needs to be outlined, which will better define need dates for mechanical sub-systems and may allow a less-compressed fabrication schedule. This plan will also indicate whether the I&T phase now scheduled has an appropriate duration. We note that the I&T phase should be considered as starting with initial build-up of the instrument cold structure, not when the mechanical assembly is complete. In terms of overall duration (time to first light), the schedule may be reasonable, but more detailed planning is required to confirm this. It is certainly not too conservative.