

ExoTAC Report on Starshade S5 Milestone #8A Review

February 20, 2020

A telecon review of the Milestone #8A Final Report for the Starshade Technology to TRL 5 Activity (S5) was held on February 20, 2019. All of the ExoTAC members were able to participate in the telecon.

Milestone #8A deals with the thermal stability of several key structural elements of the starshade as the angle of the surface of the starshade with respect to the Sun changes during observations at L2. Specifically, the Milestone requires that a combination of analysis and laboratory testing demonstrate that the total shape error of the truss bay longeron and node assemblies does not exceed plus or minus 200 microns over the range of Sun angles anticipated for observing with the nominal HabEx starshade (40 degrees to 83 degrees). Stability of these elements is critical for maintaining the proper petal positioning during observations.

Lab testing of a variety of flight-like-material full-scale sample longerons and nodes of medium fidelity was performed at the Interferometric Metrology Facility (IMF) in San Diego. The IMF has an accuracy of plus or minus 1 micron, making it suitable for this Milestone. The lab results for both the longerons and nodes were compared with the predictions of an analytical model for the thermal strain produced over the temperature range expected during observations and found to be in good agreement, validating the analytical model. The predicted errors in disk radius were found to be well within the requirements with substantial margins (e.g., 92% for the uniform radial bias). Future work will extend the testing to the interfaces between the truss and the petal interfaces. The ExoTAC raised the question of the temperature of the backside as seen by the telescope, and wondered if this would interfere with near-IR spectroscopy by HabEx.

The ExoTAC agrees that Milestone #8A has been fully met and congratulates the entire S5 team on their continuing successful efforts to advance the technology readiness levels of the elements in the S5 activity.

We thank David Webb, Stuart Shaklan, Phil Willems, and the other S5 team members for their presentation and comments during the review.

Exoplanet Exploration Program TAC Members

Alan P. Boss (Chair), Carnegie Institution

Rebecca Oppenheimer, American Museum of Natural History

Joe Pitman, Heliospace Corporation

Lisa Poyneer, Lawrence Livermore National Laboratory

Steve T. Ridgway, National Optical Astronomy Observatory