

Charter for the X-ray Surveyor Optics Working Group (OWG)

Version 1: 22-Aug-2016

The overall goal of the Optics Working Group (OWG) is to assist the STDT in demonstrating that a credible and feasible path exists to fabricate an X-ray telescope to support the X-ray Surveyor notional mission. In order for the mission to be capable of realizing the science envisioned by the STDT, the STDT seeks assistance from the X-ray optics community—including experts from academia, industry and research institutions, in identifying potential approaches for creating the X-ray mirrors and all related technologies (e.g., alignment and mounting techniques, thermal controls and metrology) required to assemble individual optical components into a large-area, satellite-borne X-ray telescope. This charter establishes the principles, the structure & management of the OWG, and the role of the Study Office.

Principles:

1. The OWG will be responsible for gathering and synthesizing community input on the various optics technologies that could potentially be used to realize the goals of the X-ray Surveyor mission concept.
2. Greater collaboration leads to faster progress. The OWG will seek to foster collaboration and open communication between all active participants. The dialog between various parties shall be performed in an open, collegial, and constructive spirit.
3. The OWG is not a panel for down-selecting optics technologies or recommending termination of any development efforts. The STDT does not intend to down-select technologies either, but reserves the right and freedom to express opinions in the final Decadal Study document.
4. The success of the OWG will depend on technology teams and community members sharing information on both successful and unsuccessful research and development efforts. It will also depend on the Study Office sharing results of modeling efforts, studies and other engineering work it performs.
5. Neither the OWG nor Study Office will attempt to impose direction on any party with respect to technology development efforts. The OWG will support dialogue & provide technical review, comments & other support of individual optical system investigators if requested to by the research teams.
6. The OWG will closely follow the Guiding Principles defined in the management plan for the Astrophysics Decadal Survey 2010¹. Or particular relevance to the activities of the OWG are the “Technology Development Principles.”

¹ “Astrophysics Decadal Survey 2020: Management Plan for Large Mission Concepts Studies – Rev B” [June 21, 2016] <http://science.nasa.gov/astrophysics/2020-decadal-survey-planning>

- “The Technology Readiness Levels (TRL) of enabling technologies at the time of Decadal submittal will be one factor important to the Decadal Survey Committee and independent cost/risk assessment
- Of equal or greater importance will be the credibility of the technology roadmap that shows
 - How TRL5 will be achieved by KDP-B (SMD Handbook1)
 - How TRL6 will be achieved by PDR (NASA policy2)
 - Description of technology funding and timeline required to achieve TRL5”

Scope:

7. The Study Office, with voluntary help from OWG members, will develop a suite of tools to assist the STDT in assessing technology readiness of different methods for producing X-ray mirrors capable of meeting the science requirements of X-ray Surveyor. Such tools could include, but would not be limited to: common error budgets; optic level and system-level simulations that account for opto-mechanical effects such as gravity, assembly, ground-to-orbit changes and thermal effects; and ray-tracing codes.

The output of these tools and inputs from technology teams and OWG participants will be used to develop a technology roadmap that articulates a timeline for technology maturation, milestones, and decision points through KDP-B and PDR (see the NASA Astrophysics Decadal Survey Management Plan). The OWG will assist the STDT in developing this roadmap. The STDT/OWG acknowledges that NASA may or may not use this roadmap or milestones in an actual mission design or selecting technologies for an eventual X-ray Surveyor mission.

8. The OWG will assist the STDT in understanding the overall technical complexity of the mirrors as a function of key performance parameters, for use by the STDT in developing the science case.
9. The OWG will develop of a unified set of standards for reporting progress.
10. The OWG will investigate and actively work on ways to involve and engage industry in all aspects of the X-ray optics and telescope development effort.

Structure:

11. The OWG will have a Chair who is an STDT member. The OWG shall have two co-chairs representing the Study Office and the Community.
12. Participation in the OWG is open to all interested individuals from US and international organizations—including academia, industry and research institutions. The OWG also welcome involvement from both NASA headquarters and the PCOS program office.

13. The OWG leadership will strive to build consensus among all OWG participants. The leadership will also ensure that when multiple opinions and options remain after discussions, that all perspectives will be presented when reporting designs, study results and recommendations to the STDT.
14. The OWG will be responsible for presenting quarterly progress reports to the STDT.

Role of the Study Office:

15. The Study Office is tasked by the STDT to perform systems engineering studies and (among other mission related tasks) develop tools and analyses to help understand the performance, capabilities, and limits of various X-ray optics technologies.
16. The OWG will provide a line of communication between the Study Office staff, the STDT and the community. The studies, calculations and assessments performed under the auspices of the OWG will greatly benefit from technical details and research results provided by teams actively conducting research and development on high-resolution X-ray mirrors. The OWG will work with the teams to adhere to official policies (e.g., Export Control Issue regulations) and respect other sensitivities (e.g., proprietary information) that may limit what data is shared among mirror technology development teams. Subject to these constraints, the OWG will share the results of its studies, calculations and assessments with the various development teams.
17. The Study Office will provide support to the OWG in several different ways.
 - a. The Study Office will conduct parametric design studies and perform calculations whose results will benefit as many on-going technology efforts as possible.
 - b. The Study Office will help develop evaluation tools that will aid the STDT in assessing technical readiness of on-going technology development efforts.
 - c. The Study Office will develop an error budget and associated tolerance framework to understand the influence of different factors on overall telescope performance.
 - d. The Study Office will ensure the development of at least one telescope point-design that meets the Science Requirements determined by the STDT. This point-design will be used in the X-ray Surveyor mission configuration studies. The Study Office shall strive to develop a design which is maximally general and able to accommodate any promising technologies for individual mirror elements (e.g., segmented substrate, integral-shell substrates or combinations of both). The Study Office will incorporate suggestions and technical information provided by the members of the OWG and technical teams.
18. The studies performed by the Study Office, unless restricted by ITAR or similar regulations, will be shared with the OWG and the broader community.