DRAFT Charter for the X-ray Surveyor Science Instrument Working Group

The goal of the X-ray Surveyor Science Instrument Working Group (IWG) is to support the Science and Technology Definition Team (STDT) in defining the science instruments required for a compelling and executable mission. In pursuit of this objective, the IWG will support the STDT in translating science goals and requirements into technical instrument requirements, provide the STDT with technical information and metrics required to make scientific tradeoff decisions, and support the STDT in assessing technology readiness and preparing technology development plans and roadmaps necessary to demonstrate that the instruments envisioned by the STDT are part of an executable mission concept. In order to accomplish these tasks, the IWG will make use of the resources of the X-ray Surveyor's scientific and technical communities, collaborate with the Study Office in instrument definition and engineering activities, and solicit the co-operation of other institutional and industrial entities as appropriate. This charter establishes the principles, the structure & management of the IWG, defines its relationship to the STDT, the STDT's working groups, and X-ray Surveyor Study Office.

Principles and Scope

1. In all of its deliberations, the IWG will place the highest priority on defining science instruments that make for the most compelling and executable X-ray Surveyor mission concept. Particular instrument architectures and technologies will be considered as means to this end, rather than as ends in themselves.

2. The activities of the IWG will be open to the entire X-ray Surveyor community, including interested parties in academic, research, industrial and NASA organizations. The IWG will endeavor to keep the X-ray Surveyor community fully informed of its activities, and to the maximum extent possible, solicit, accept, and synthesize community input.

3. The IWG will study the X-ray Surveyor (XRS) instrument complement defined by the STDT. Candidate XRS instruments include:

- An X-ray microcalorimeter;
- A High-definition X-ray imager; and
- An X-ray grating spectrometer.

The instrument complement may be modified as the STDT science case continues to develop. As appropriate, the IWG will inform the STDT of other instruments that, in the IWG's view, may best meet the STDT's science objectives. As required to fulfill its obligations defined in this charter and as directed by the STDT, the IWG will also consider instrument accommodation

within the XRS Observatory.

Responsibilities

4. The IWG will flow science requirements provided by the STDT down to instrument performance capabilities and technical requirements. The IWG will collaborate with the STDT and its working groups to optimize the science return and technical requirements of the XRS mission concept. For this purpose the IWG leadership shall monitor and, as appropriate, contribute to the deliberations of the STDT Science Working Groups. The IWG will also identify and/or develop instrument technical complexity metrics required to facilitate scientific trade studies requested by the STDT.

5. As directed by the STDT, the IWG will assess the technology readiness of XRS instruments and their subsystems and components. The IWG will track progress in relevant instrument technology development. The IWG will support the STDT in preparing instrument technology development roadmaps that articulate timelines, milestones and decision points for technology maturation through Key Decision Point B and Preliminary Design Review, per the NASA Astrophysics Decadal Survey Management Plan[1]. The IWG will take special note of the following guidance from the Management Plan:

> "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
>
> a. How TRL5 will be achieved by KDP-B
> b. How TRL6 will be achieved by PDR
> c. Description of technology funding and timeline required to achieve TRL5."

6. The IWG leadership will collaborate and communicate regularly with the X-ray Surveyor Optics Working group to ensure that characteristics and capabilities of XRS instruments are well-matched to those of the XRS optics.

7. With the approval of the STDT, the IWG will seek and make use of the expertise and resources of the Study Office and of the academic, research, industrial and government communities as required in discharging its responsibilities.

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[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

8. The IWG is not responsible for down-selecting amongst viable alternative instrument architectures and technologies. The IWG leadership will foster collaboration and open communication between members and will strive to achieve consensus wherever possible. As required by this charter, the IWG will report objectively on the relative scientific capability and performance, and technical complexity and maturity of the alternatives it considers. Its reporting will fairly reflect the range of opinions expressed by IWG members

9. The IWG will report at least quarterly to the STDT.

Structure

10. The IWG shall be chaired by an STDT member. The IWG shall have two Co-chairs for each notional instrument. The Co-chairs shall be selected from and represent the X-ray Surveyor instrumentation community. The Study Office shall designate an ex-officio representative to the IWG. The IWG welcomes the involvement of NASA headquarters and NASA's Physics of the Cosmos (PCOS) program office.

11. Participation in the IWG is open, with consent of the IWG leadership, to all individuals who subscribe to its goals. The IWG leadership shall issue a community call for members. At the discretion of the IWG leadership, individuals with special expertise may be invited to participate in the IWG.

Role of the Study Office

12. The Study Office is tasked by the STDT to perform systems engineering studies and analyses to help understand the capabilities and limits of the instruments once integrated on the payload.

13. The Study Office will provide support to the IWG as follows:

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 and implement evaluation tools that will aid the IWG in assessing technical readiness of on-going technology development efforts.
c) The Study Office will cooperate with the IWG to ensure the identification of a suite of instruments that meets the science requirements specified by the STDT. The Study Office will incorporate inputs from the IWG in X-ray Surveyor mission configuration studies. As directed by the STDT, the Study Office shall strive to define instrument accommodations that meet the technical requirements of instrument concepts recommended by the

IWG. The Study Office will incorporate suggestions and technical information provided by the members of the IWG.

14. The Study Office and the IWG will endeavor to communicate clearly and efficiently at all times. The studies performed by the Study Office, unless restricted by ITAR or similar regulations, will be shared with the IWG and the broader community.