**Astrophysics Strategic Technology Gap Input Form**

**Introduction**

Understanding and addressing the gaps between current technology capabilities and those needed for future missions is critical to achieve NASA’s astrophysics science goals. Use this form to submit to the three Program Offices (POs) within the Astrophysics Division (APD) information on technology capability gaps for future strategic astrophysics missions. The POs carry out the gap prioritization process biennially on even years, with the next one in 2024. Strategic astrophysics missions are those prioritized by the 2020 Astrophysics Decadal Survey (Astro2020), APD’s response to it, and/or other programmatic guidance from APD.

This form is intended to describe a technology capability gap that needs to be filled to enable or enhance capabilities of a future strategic astrophysics mission. The submission should not describe a specific candidate technology to fill such a gap, nor a gap not relevant to any mission mentioned in the above documents. Such non-strategic gaps will be discarded without prioritization.

Since all strategic gaps considered in the most recent prioritization will be reevaluated along with new submissions, resubmit any existing gaps only if you’re suggesting a modification. To see whether you need to submit a new gap or revision, as well as to see examples of what a full gap submission looks like, please review the most recent gap descriptions and prioritization [here](https://apd440.gsfc.nasa.gov/tech_gap-descriptions.html).

**Gap Assessment**

The POs will use the information provided in this form to assess how the technology gap affects future strategic missions, and to gauge the impact a successful technical solution would provide. That information will guide our technology prioritization process that feeds into the Astrophysics Biennial Technology Report (ABTR), informing current and future Strategic Astrophysics Technology (SAT) calls and selections, as well as other technology development planning.

**Instructions for Providing Gap Prioritization Information**

Please send your completed form to [opher.ganel@nasa.gov](mailto:opher.ganel@nasa.gov) and [brendan.p.crill@jpl.nasa.gov](mailto:brendan.p.crill@jpl.nasa.gov). Ithai.pham@nasa.govnputs received by June 3, 2024 will be incorporated into the current prioritization process. Inputs received after the cutoff date will be considered in the next cycle. Early submissions are appreciated. The following section describes the information requested.

The information provided will be used as input to the POs’ biennial technology gap prioritization process, and may be publicly released, in whole or in part, on the POs’ websites and in other publications**.**

**Identify Strategic Mission(s) Enhanced or Enabled by Closing this Technology Gap:** Check the appropriate box(es) to indicate which strategic mission(s) will be enabled or enhanced by closing this gap (Habitable Worlds Observatory, HWO; Far-IR Flagship; X-ray Flagship; Cosmic Microwave Background, CMB, Probe; Far-IR Probe; X-ray Probe; or Other, in which case write in the strategic mission name and reference where it is mentioned in the Astro2020).

**Brief Description of the Technology Capability Needed:** Describe the technology capability gap and associated key performance parameters in 100 – 150 words. Please describe a technology capability gap, (e.g., “*Single-photon-counting, high-QE, megapixel UV/Vis detector*”) not a specific implementation approach to fill such a gap (e.g., not “*Megapixel UV/Vis EMCCDs*,” not because there is anything intrinsically wrong with EMCCDs, but they are a specific solution, not a technology gap. Potential solutions and their state of the art (SOTA) are to be described in the next section).

**Technical Goals and Objectives to Fill the Capability Gap:** Describe the quantitative, measurable, technical goals and objectives (key performance parameters) for a candidate technology to fill the described capability gap. For example, “*The goal is to produce a detector with a sensitivity of X over a wavelength range of Y to Z nm as required for optimal science return for mission ABC.*” Capability gaps with clearly quantified objectives are more easily assessed during the prioritization process.

**Assessment of the TRL of Full Solution:** In 100 – 150 words, describe the current state of the art (SOTA) of relevant technologies, if any, that can potentially fill this capability gap completely, even if they cannot yet do so. Base your TRL on performance capabilities and functional shortcomings relative to fulfilling all key performance parameter requirements listed for the gap. Base your TRL estimates on the definitions given by NASA Procedural Requirement (NPR) [7123.1D](https://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7123&s=1B), Appendix E. Note that the SAT program funds technology maturation in the mid-TRL range (3 – 5). Thus, gaps where the relevant technologies expected to fulfil the needs completely are already at a TRL of 6 or higher will not be considered. Please include here publicly accessible references justifying the estimated Technology Readiness Level (TRL, see below) of these technologies.

**Scientific, Engineering, and/or Programmatic Benefits:** In 100 – 150 words, describe the scientific, engineering, and/or programmatic benefits of filling this technology gap, and state the expected impact, from mission-enabling to mission-enhancing. Benefits could be scientific (e.g., better science output), engineering (e.g., lower mass), and/or programmatic (e.g., reduced cost, schedule, and/or risk). For example, “*The desired material will be 50% stronger than the current state-of-the-art, reducing the mass of a 4 m telescope optical subsystem by X kg.*”

**Applications and Potential Relevant Missions for PCOS, COR, and ExEP:** Identify potential missions or applications that would benefit from technologies that can fill this capability gap, identified in the Astro2020 or APD’s response to it. If the gap is crosscutting, mention any other missions with Astrophysics science goals, whether or not these additional missions are strategic. Submissions enabling or enhancing multiple strategic missions receive higher prioritization scores.

**Urgency:** What are the anticipated or estimated launch years of missions expected to be enabled or enhanced by solutions closing the technology gap? If there is an earlier schedule driver (e.g., international partnership agreed-to delivery date), state the driver and its date. How challenging will it be to close the gap? This includes two aspects. First, can the gap be closed by a single technology (e.g., an advanced optical coating); a system of technologies (e.g., a cryogenic detector system comprising a detector, cold readout electronics, and warm readout electronics); or a system of technology systems (e.g., ultra-stable telescope, comprising a high-precision mirror, a system of sensors and actuators that control the mirror shape, a mechanical jitter suppression system, a high-fidelity thermal control system, etc.)? Second, would developing the needed technology/ies be fairly straightforward, a stretch, or a major stretch? In general, gaps with greater urgency receive somewhat higher priority scores.

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| **Astrophysics Strategic Technology Gap Input Form** | | |
| Technology Capability Gap Name: | | Date Submitted: |
| Submitter Name: | Organization: | |
| Telephone: | Email Address: | |
| **Prioritization Information (see accompanying instructions)** | | |
| Identify Strategic Missions Enhanced or Enabled by Closing this Technology Gap:  **HWO  Far-IR Flagship  X-ray Flagship  CMB Probe  Far-IR Probe  X-ray Probe  Other (write in below the mission name and reference where it is mentioned in Astro2020):** | | |
| Brief Description of the Technology Capability Needed (100 – 150 words): | | |
| Technical Goals and Objectives (Key Performance Parameters) to Fill the Capability Gap (150-300 words): | | |
| Assessment of the current TRL of full solution addressing all the above key performance parameters and requirements and references (integer between 1 and 9 per NPR 7123.1D, Appendix E): | | |
| References justifying the above TRL (if any): | | |
| Scientific, Engineering and/or Programmatic Benefits (100 – 150 words): | | |
| Applications and Potential Relevant Missions for Astrophysics Division (100-200 words): | | |
| Urgency:  Years to estimated launch or other schedule driver:  Level of complexity (single tech, system of techs, or system of tech systems):  Level of difficulty (straightforward, stretch, or major stretch): | | |