**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.

In response to the “Pathways to Discovery in Astronomy and Astrophysics for the 2020s” (Astro2020), the POs are working to update our Astrophysics strategic technology gap priorities. This will inform APD’s response to the Decadal Survey.

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, submit any of those 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 potential future 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(s) to opher.ganel@nasa.gov and brendan.p.crill@jpl.nasa.gov. Ithai.pham@nasa.govnputs received by Jan 3, 2022 will be incorporated into the current prioritization cycle. 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:** Indicate which strategic mission(s) will be enabled or enhanced by closing this gap 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).

**Assessment of the Current State of the Art (SOTA):** In 100 – 150 words, describe the current SOTA of relevant technologies, if any, that can potentially fill this capability gap completely, even if they cannot yet do so. Describe their performance capabilities and functional shortcomings relative to applicable Astrophysics science and application needs. Please include here publicly accessible references justifying the estimated Technology Readiness Level (TRL, see below) of these technologies.

**Estimated TRL of Full Solution:** Enter the estimated current TRL of these relevant SOTA technologies with respect to addressing the full solution, meaning fulfilling all key performance parameter requirements listed for the gap. Base your TRL estimates on the definitions given by NASA Procedural Requirement (NPR) [7123.1C](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.

**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.

**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:**Write in the mission name and reference where it is mentioned in Astro2020:**       |
| Brief Description of the Technology Capability Needed (100 – 150 words):      |
| Assessment of the current State-of-the-Art (SOTA) and references justifying full-solution TRL quoted at right (100 – 150 words):  | Estimated TRL of full solution addressing all key performance parameters of this gap: |       |
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| Technical Goals and Objectives (Key Performance Parameters) to Fill the Capability Gap:      |
| Scientific, Engineering and/or Programmatic Benefits (100 – 150 words):      |
| Applications and Potential Relevant Missions for Astrophysics Division:      |
| 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):       |