Decadal Survey Large Mission Concept Study
Final Report Content
Arial 12 font
150-200 pages before Ref/Acronyms/Appendices

1. Executive Summary (no more than 6 pages)-**OST chairs**

2. Science Description to cover the following (60-70 pages): **STDT, SWG Leads**

- Describe the scientific objectives and the compelling nature of these objectives
- Describe the measurements required to fulfill the scientific objectives expected to be achieved by your activity.
- Describe the technical implementation you have selected, and how it performs the required measurements.
- Of the required measurements, which are the most demanding? Why?
- Present the performance requirements (e.g. spatial and spectral resolution, sensitivity, timing accuracy) and their relation to the science measurements.
- Present a brief flow down of science goals/requirements and explain why each payload instrument and the associated instrument performance are required.
- Opportunities for guest observer program
- Describe the relationship to other observatories
- Describe the state of the field including ground capabilities at the time of expected LRD
- Describe any enabling or enhancing precursor science and plan

3. Mission Implementation: 10 pages (David/Johannes) **Goddard Study Team**
    - discuss science to requirements (for instruments and
    - observatory) to performance requirements
    - example Science Tracebility Matrix (put rest in appendix?)
    - key mission design criteria
    - key decisions in the implementation (single aperture vs
    - interferometer decision – put the KT matrix in appendix)
    - Off/On-Axis telescope architecture

3. Design Reference Mission Description (10-15 pages total): **STDT/Goddard Study Team**
    - The notional mission with time allocations for the science against which an estimate of science yield is made.

4. Flight Systems (40-55 pages total):

A. Requirements **STDT Instruments, Goddard Study Team**

- Trace out the driving flight system requirements from the required science measurements and observations
- Compare expected flight system performances against requirements to demonstrate expected margins
- Discuss measurement error budgets
- Master Equipment Lists: mass of major elements quantified based on subsystem estimates
- Technical Margins: use institutional margins where applicable. Analyze best and worst case scenarios

B. Instrumentation: **STDT Instrument leads & science instrument leads**

- Describe the proposed science instrumentation, and briefly state the rationale for its selection. Discuss the specifics of each instrument (Inst #1, Inst #2 etc) and how the instruments are used together.
- Indicate the technical maturity level of the major elements and the specific instrument TRL of the proposed instrumentation (for each specific Inst #1, Inst#2 etc), along with the rationale for the assessment (i.e. examples of flight heritage, existence of breadboards, prototypes, mass and power comparisons to existing units, etc).
- Describe any enabling technology
- Trade space considered: Alternative set of mission architectures evaluated against science objectives, cost and risk.
- For the science instrumentation, describe any concept, feasibility, or definition studies already performed (to respond you may provide copies of concept study reports, technology implementation plans, etc).
- Describe the flight heritage of the instruments and its subsystems. Indicate items that are to be developed, as well as any existing hardware or design/flight heritage.
- Describe the development for each instrument
- Identify any major or unique V&V activities

C. Spacecraft **Goddard Study Team**

- Describe the spacecraft characteristics and requirements. Include a preliminary description of the spacecraft design and a summary of the estimated performance of the key spacecraft subsystems.
- Identify any required new technologies or developments or open implementation issues.
- Address to the extent possible the accommodation of the science instruments by the spacecraft.

5. Mission Design: (5-6 pages) **Goddard Study Team**

- Provide a brief descriptive overview of the mission design (launch, launch vehicle, orbit, pointing strategy) and how it achieves the science requirements (e.g. if you need to cover the entire sky, how is it achieved?).

- Demonstrate compatibility with launch vehicle performance and fairing size
- Provide diagrams or drawings showing the observatory (payload and s/c) with the instruments and other components labeled and a descriptive caption. Provide a diagram of the observatory in the launch vehicle fairing indicating clearance.

6. Concept of Operations (5-10 pages): **STDT, Instrument Leads, Goddard Study Team**
   - Provide a brief description of mission operations, aimed at communicating the overall complexity of the ground operations (frequency of contacts, reorientations, complexity of mission planning, etc). Analogies with currently operating or recent missions are helpful.
   - Mission operations drivers and sensitivities assessed
   - Major flight / ground trades identified
   - New ground system capabilities identified
   - For instrument operations, provide a functional description of operational modes, and ground and on- orbit calibration schemes. Describe the analysis of the data to achieve the scientific objectives of the investigation. Describe the types of data (e.g. bits, images) and provide an estimate of the total data volume returned.
   - Identify any unusual constraints or special communications, tracking, or near real-time ground support requirements.
   - Identify any unusual or especially challenging operational constraints (i.e. viewing or pointing requirements).
   - Describe the science and operations center for the activity: will an existing center be expected to operate this activity?; how many distinct investigations will use the facility?; will there be a guest observer program?; will investigators be funded directly by the activity?
   - Will the activity need and support a data archive?

7. Technical Risk Assessment & Management (5-10 pages) **Goddard Study Team**
   - Compare risks across the different architectures
   - Identify mitigation strategies for key risks

8. Technology (10-15) **STDT (e.g. Jonas Zmudinas) & Goddard Study Team**
   - Summarize technology gaps in flight and ground system
   - Describe technology path towards the Decadal Survey, and between DS and expected PDR

9. Cost and Schedule (2-4 pages): **Goddard Study Team**
   - Work breakdown structure: NASA standard WBS & Dictionary (down to Level 2 and Level 3 for spacecraft and payload)
   - (page count consistent with no cost or schedule required for interim report)

10. Science Policies (1-2 pages):

- Provide a brief description of data rights considerations and science team selection considerations

11. Plans for remainder of Study (2-3 pages):

12. Conclusion (1 page):
    - Provide any conclusion the study team thinks is important to highlight

13. References
14. Acronyms
15. Appendices as required (no more than 100 pages)