

Extreme Universe Space Observatory (EUSO)

A Proposal for U.S. Participation in the EUSO

8/2/01

Proposal Champion:
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Proposal Manager:
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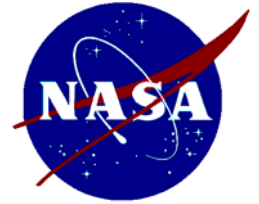
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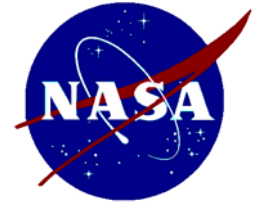
Opportunity and Objective



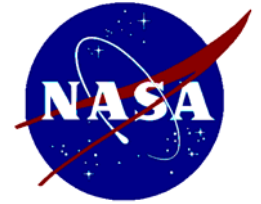
- The European led EUSO collaboration is seeking U.S. participation
- NASA is currently soliciting proposals in response to a recently released Medium-class Explorer (MIDEX) and Mission of Opportunity(MO) Announcement of Opportunity (AO)
- The MO AO allows for the funding of investigations that are of interest to NASA Office of Space Science (OSS) as part of a non-OSS mission
- The U.S. teams objective is to obtain funding from NASA through the MO AO that will enable them to participate in the scientific investigation and provide the optical subsystem for EUSO



EUSO Overview



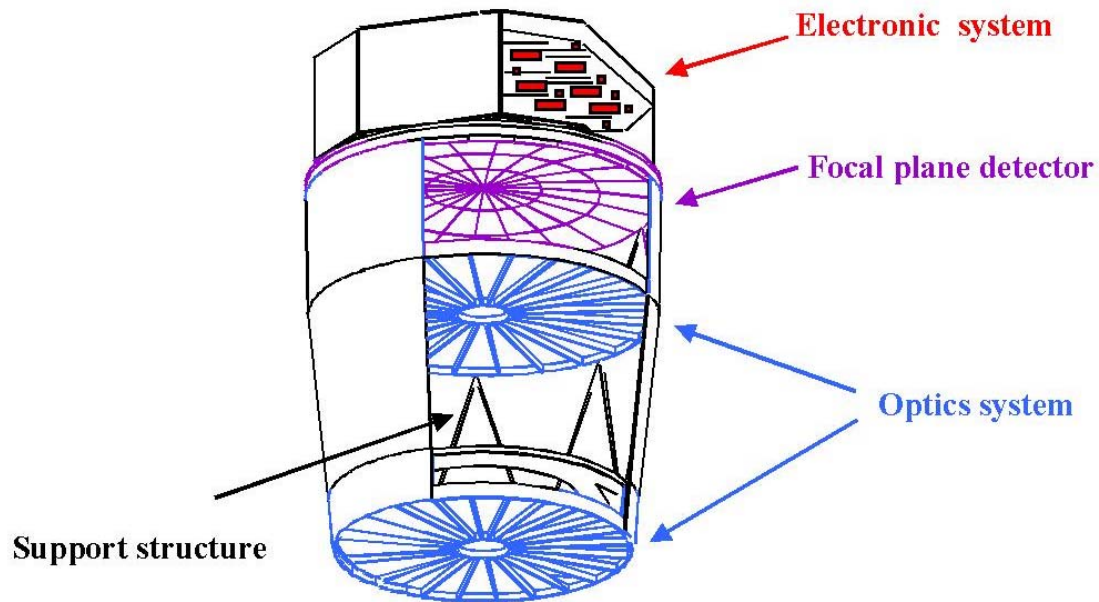
- EUSO is a European led International Space Station (ISS) attached payload devoted to the exploration of the highest energy processes present and accessible in the Universe.
- EUSO will detect the Extreme Energy Cosmic Rays (EECRs with $E > 3 \times 10^{19} \text{eV}$) and high energy Cosmic Neutrino (CN) flux.
- EUSO will observe the fluorescence of EECRs and CNs in the dark Earth's atmosphere by looking downward from space under a 60° full field-of-view. Fluorescence light will be imaged by a large Fresnel lens optics onto finely segmented focal plane detector. The segmentation and time resolution will be able to reconstruct the shower arrival direction and energy with high precision.
- EUSO will detect about 10^3 EECR events per year, and will open a window to the high energy neutrino universe.



EUSO Overview

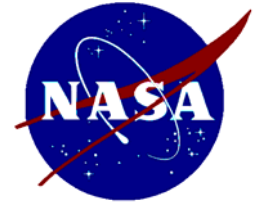


EUSO Payload





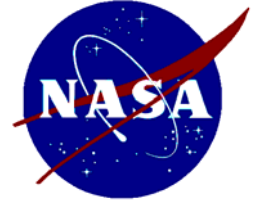
EUSO Overview



- EUSO link to NASA Strategic Plan
 - EUSO science can be found in the Space Science Enterprise Structure and Evolution of the Universe Roadmap
- EUSO link to MSFC roles and missions
 - MSFC is NASA's Lead Center for Large Space Optics Manufacturing Technology
 - EUSO will utilize two large Fresnel lens optics provided by MSFC to image EECRs Fluorescence
 - Fresnel lens optics of the size proposed EUSO have never been manufactured for a space based application



Proposal Themes/Strategies



- EUSO has the potential for making a significant discovery in fundamental physics
- The proposed optical system provided by NASA enables EUSO to happen
- NASA participation in EUSO benefits OWL



Approach to Implementation



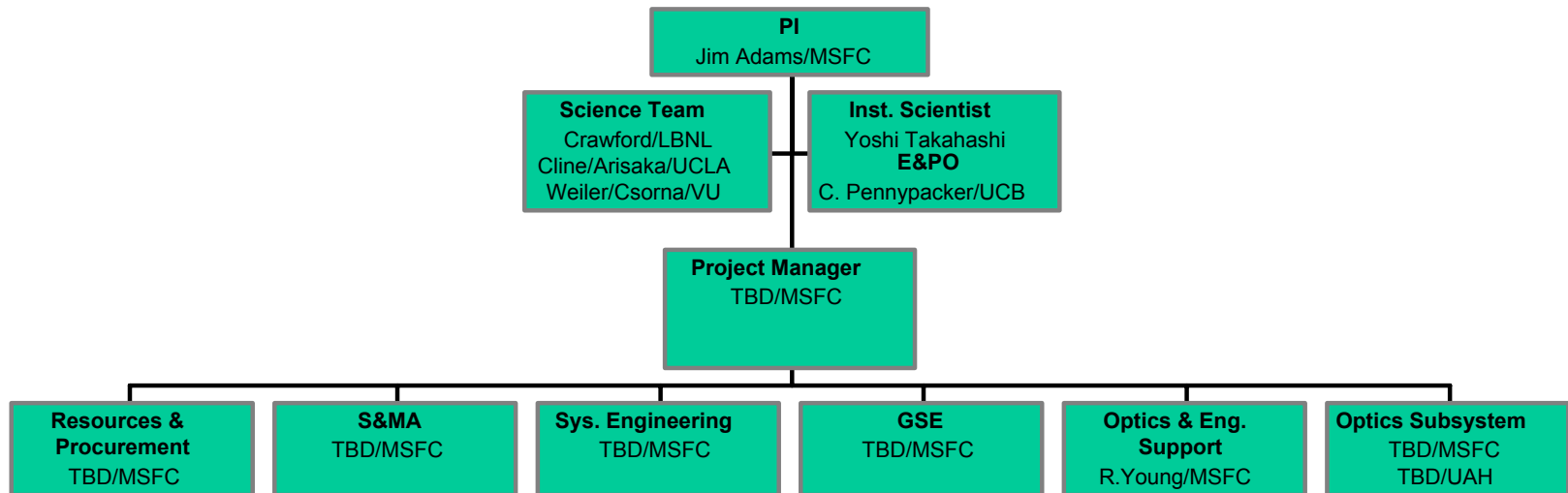
- U.S. Team Roles and Responsibilities
 - Dr. Jim Adams/MSFC -PI
 - Dr. Katsushi Arisaka/UCLA - Co-I, focal plane consultation
 - Dr. Mark Christl/MSFC - Co-I, analysis and track reconstruction
 - Dr. David Cline/UCLA - Co-I, theory, analysis and track reconstruction
 - Dr. Hank Crawford/LBNL - Co-I, front end electronics consultation
 - Dr. Steve Csorna/VU - Co-I, simulations
 - Dr. Carl Pennypacker/UCB - Co-I, Education and Public Outreach (E&PO), front end electronics consultation
 - Dr. Toshi Tajima/UT - Co-I, theory
 - Dr. Yoshi Takahashi/UAH - Co-I, Instrument Scientist, optics design
 - Dr. John Watts/MSFC - Co-I, simulations
 - Dr. Tom Weiler/VU - Co-I, theory
 - TBD/MSFC - Project Management/Systems Engineering for hardware



Approach to Implementation



U.S. Team Organization





Approach to Implementation

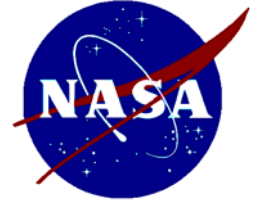


U.S. Contribution ROM Cost Estimate

1.1 Project Management	\$2.2 million
1.2 Science and Data Management	\$5.0 million
1.3 Systems Engineering	(included in item 1.1)
1.4 Optical Subsystem	\$10.3 million
1.5 Ground Support Equipment	\$1.0 million
1.6 Education and Public Outreach	\$1.0 million
1.7 Safety and Mission Assurance	(included in item 1.1)
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Subtotal =	\$19.5 million
Contingency (25%)	\$4.9 million
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Total =	\$24.4 million



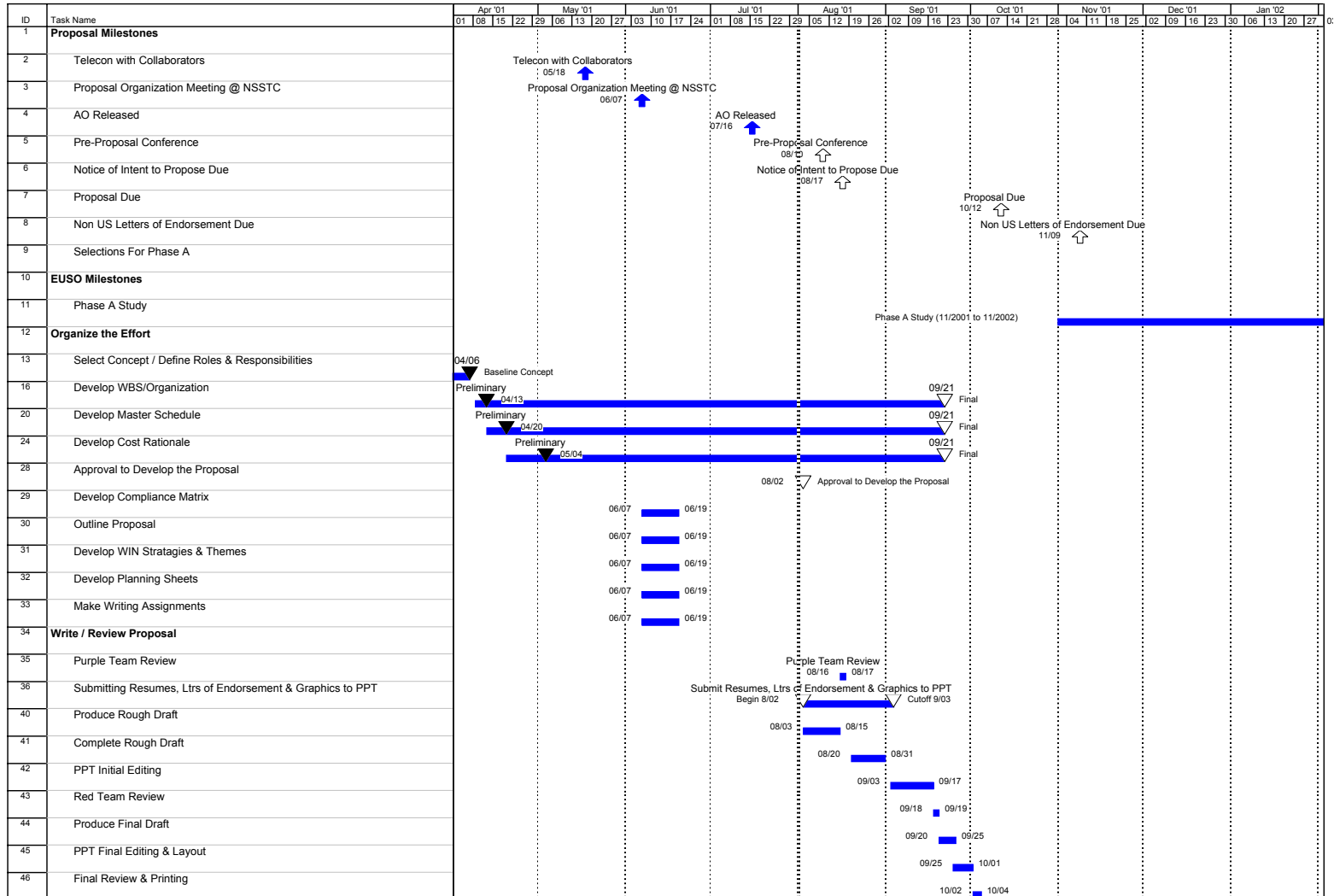
Risk/Technical Challenges



- Fresnel optics of the size planned for EUSO have never been manufactured for a space based application
 - Manufacturing tests that will conclude with the production of prototype hardware are planned as a risk mitigation strategy
- Other??

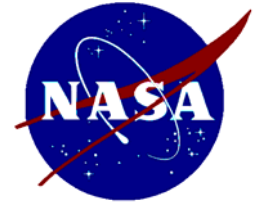


EUSO Proposal Development Schedule





Proposal Resources Requirements



- The estimated manpower (in FTEs) required from 8/3/01-10/12/01 to develop the proposal is as follows:
 - SD50: 0.5
 - SD21: 0.75
 - SD70: 0.25
 - Other MSFC: 0.5
 - PPT: 0.5
- No money is required



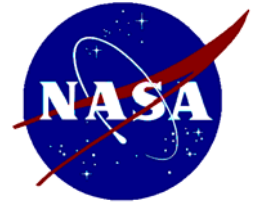
Competitive Analysis



- There is no other known group competing with this team on EUSO
 - Agreements are in place with the Europeans for our participation in EUSO
- The MO field is wide open and we have no idea who may submit proposals for other investigations
- We expect to get excellent marks from the peer review based on the following:
 - Our proposal has very strong science
 - The science we propose is in the NASA strategic plan
 - The perceived scientific value is high and the cost to NASA for participation in EUSO is low



Conclusion/Recommendation



- EUSO has the potential for exciting discoveries in the area of EECRs
- The U.S. has an unique opportunity to participate in EUSO science activities by providing the optical subsystem
- Recommendation
 - Provide Authority To Proceed (ATP) for the development of a U.S. EUSO proposal against the MIDEX/Mission of Opportunity AO
- The MSFC EUSO team will seek PMC permission to submit the proposal once it is developed