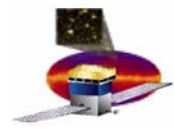


GLAST Large Area Telescope:

Science Analysis Software Overview WBS: 4.1.D

Richard Dubois
Stanford Linear Accelerator Center
SAS Subsystem Manager

richard@slac.stanford.edu



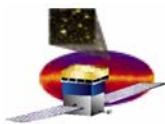
Outline

- **Overview**
- **Level III Requirements Summary**
- **WBS Interfaces**
- **Cost**

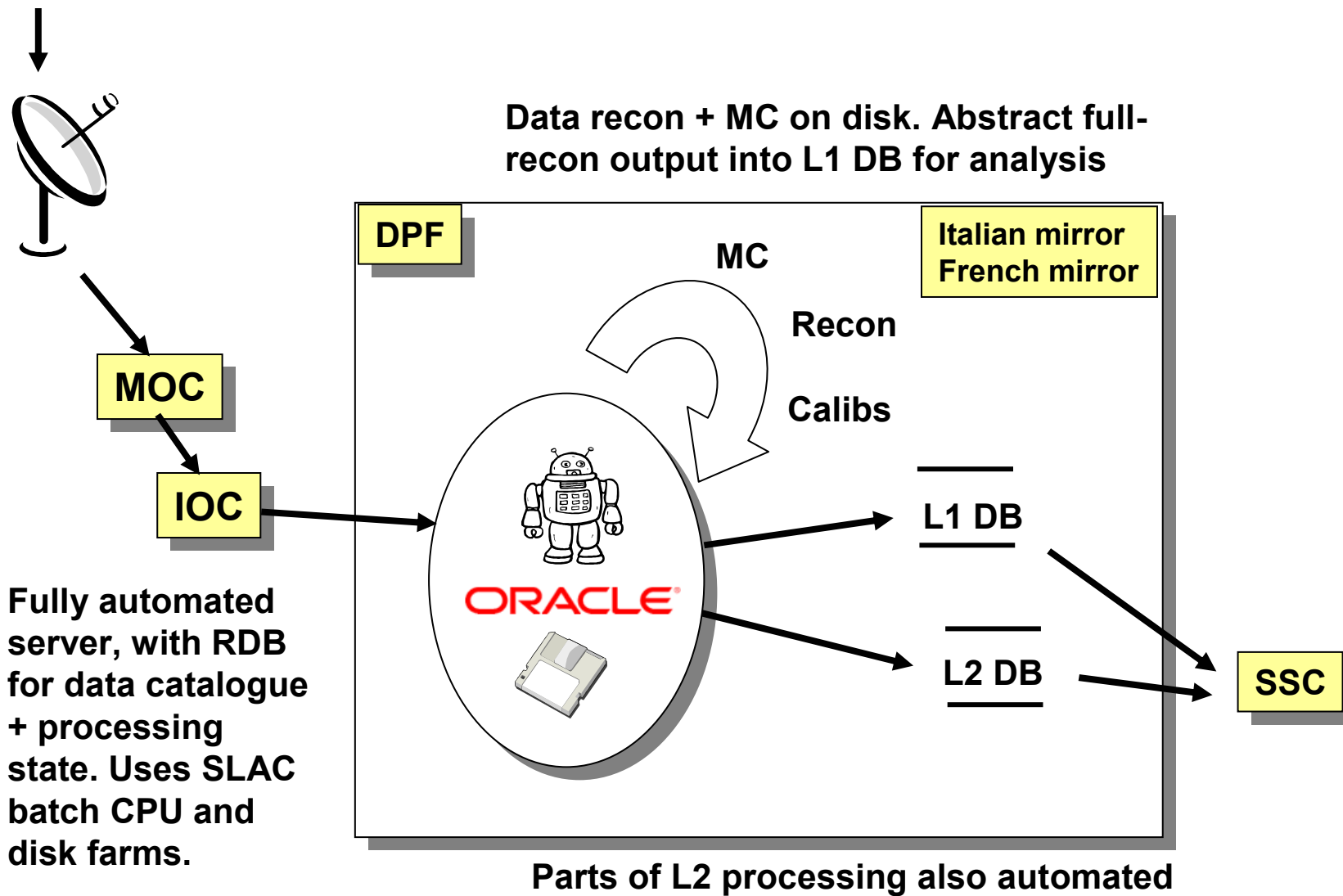


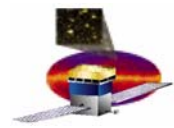
Science Analysis Software Overview

- Data Pipeline
 - Prompt processing of Level 0 data through to Level 1 event quantities
 - Providing near real time monitoring information to the IOC
 - Monitoring and updating instrument calibrations
 - Reprocessing of instrument data
- Performing bulk production of Monte Carlo simulations
- Higher Level Analysis
 - Creating high level science products from Level 1 for the PI team
 - Transient sources
 - Point source catalogue
 - Providing access to event and photon data for higher level data analysis
- Interfacing with other sites (sharing data and analysis tool development)
 - mirror PI team site(s)
 - SSC
- Supporting Engineering Model and Calibration tests
- Supporting the collaboration for the use of the tools

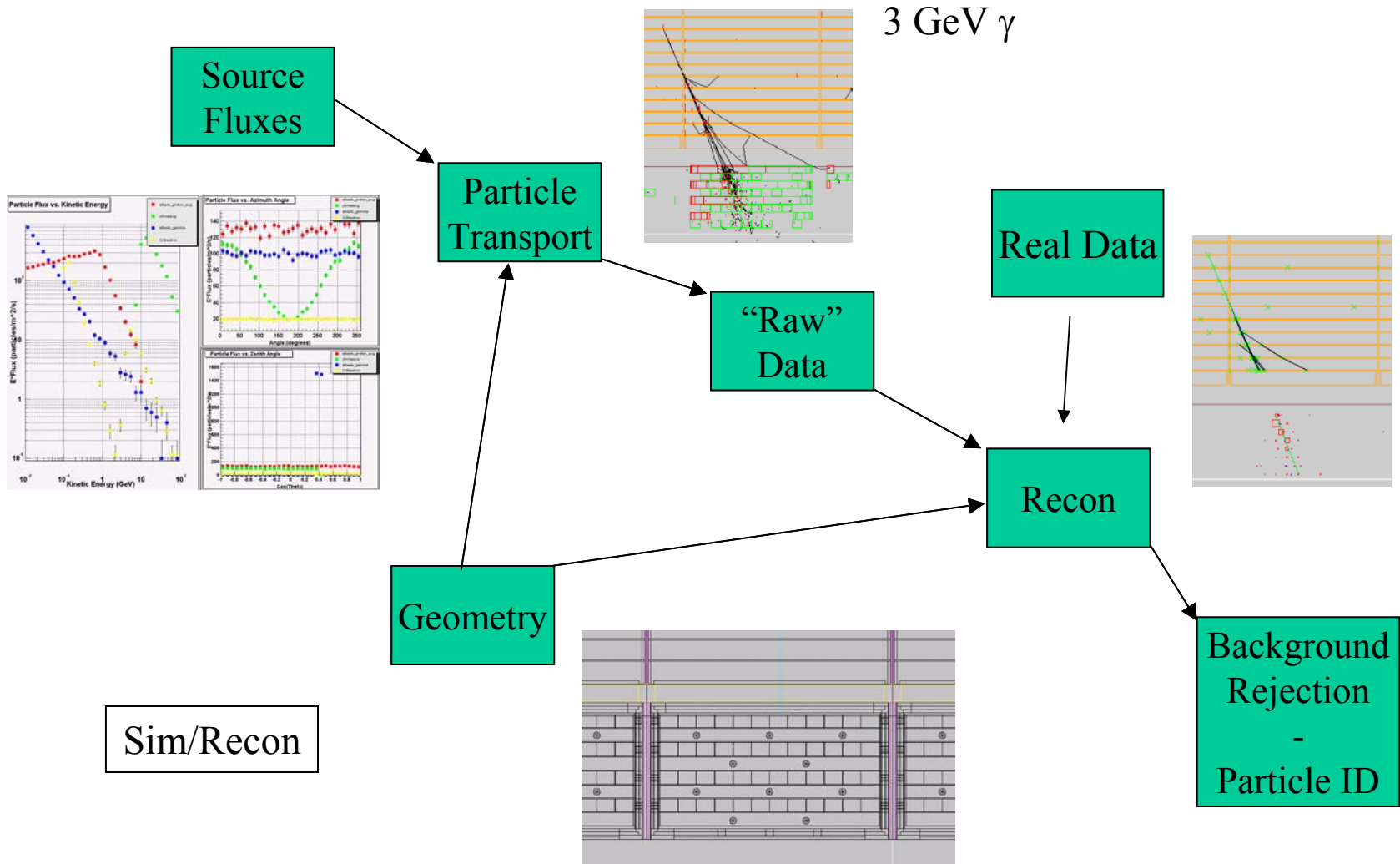


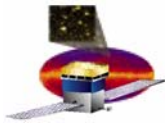
Data Flow



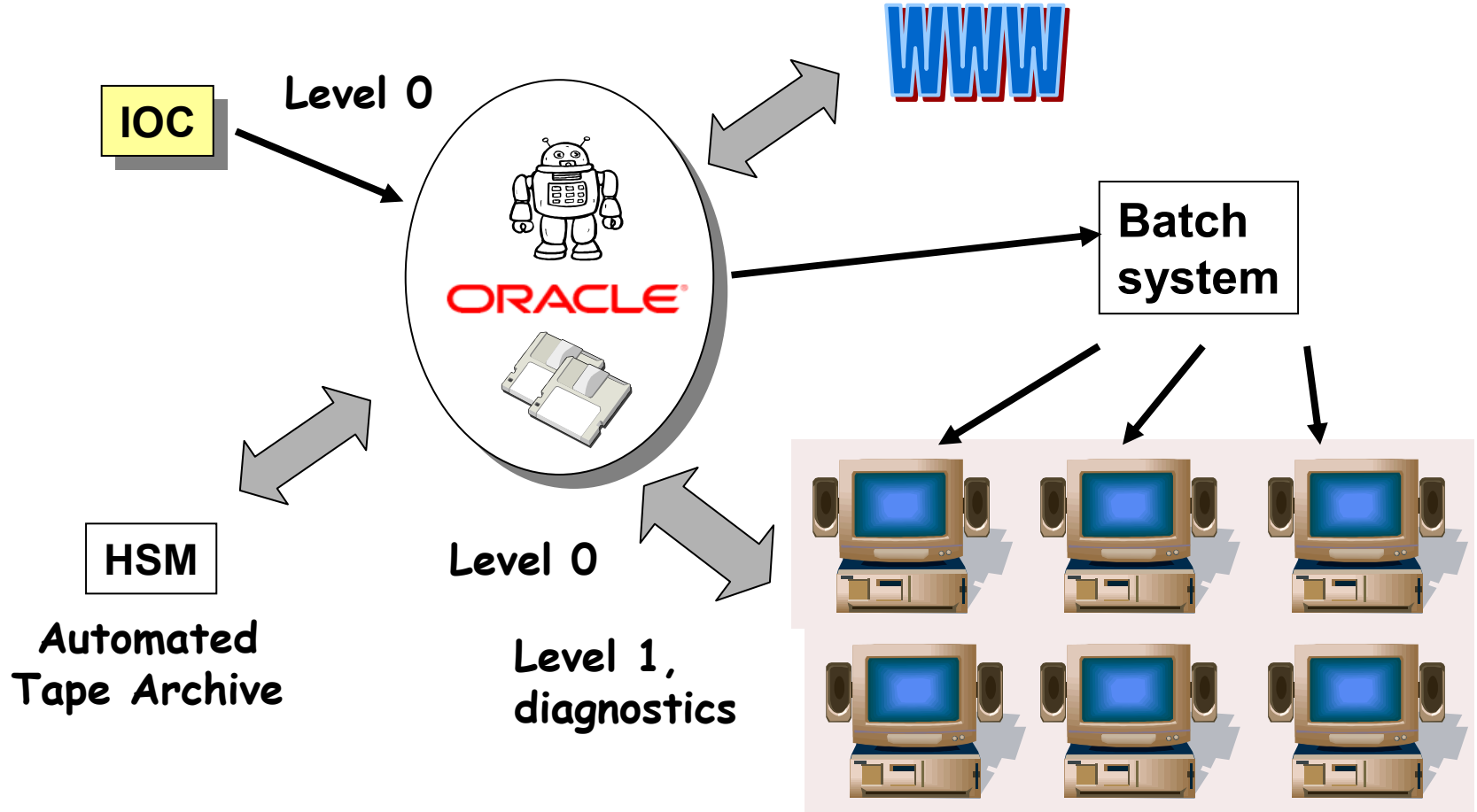


Level 1 Chain

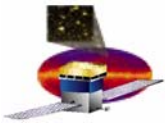




Processing Pipeline



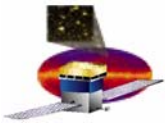
**50-100 CPUs; ~50 TB disk by 2010
Infrastructure supplied by SLAC Computing Center**



Level III Requirements Summary

Ref: LAT-SS-00020

Function	Requirement	Expected Performance (if applicable)	Verification
Flight Ground Processing	perform prompt processing from Level 0 through Level 1	keep pace with up to 10 GB Level 0 per day and deliver to SSC within 24 hrs	demonstration
	provide near-real time monitoring to IOC	within 6 hrs	demonstration
	maintain state and performance tracking		demonstration
	facilitate monitoring and updating of instrument calibrations		demonstration
	archive all data passing through	> 50 TB on disk and tape backup	demonstration
Instrument Design Support	Create simulation tool, based on instrument geometry, that reproduces the interactions of photons and background		system test - comparison to balloon flight and existing data
	Create physics model of expected photons and backgrounds incident upon the instrument		system test - comparison to balloon flight and existing data
	Create algorithms to interpret the data from the instrument to identify the interaction and estimate photon direction and energy		system test - comparison to engineering model tests
	Create algorithms to generate calibration constants for the subsystem components		system test - in conjunction with engineering model tests
High Level Tools	Interface with the SSC and PI mirror sites, sharing selected data and algorithms		demonstration
	Create High-Level Science products. Development of analysis tools		demonstration
Mission Support	Support the Software system for the life of the mission		demonstration



Science Analysis Software Status

- Ported existing simulation/reconstruction code to new environment: architecture, I/O, code management
 - Will need another (smaller) iteration to optimize use of the new tools
- Ported '99 Beam Test version of Recon to be mainstream – used for PDR Instrument Performance and BFEM
 - Gained experience leading to redesign (in progress)
- Supported BFEM data handling and analysis
- Supported PDR Instrument Performance
 - Bulk production of simulations on SLAC linux farm
 - Tuned up Sources and recon algorithms
- GEANT4 simulation package in test
- On target for Spring and Fall Major Sim/Recon code releases
- Working with SSC on Science Tools
 - Joint working group underway; 1 SSC FTE to be located at SLAC
 - defining Level 1 database requirements and technology; trying prototypes
 - Formed subgroups for Software Standards & Instrument Response Functions/CALDB
 - Joint planning workshop with SSC in early Summer '02



Responses to Pre-Baseline Recommendations

- **Develop resource-loaded cost and schedule**
 - **Done**
- **Develop clear, formal agreements with all off-project software providers**
 - **Agreements in place with Italy and Japan**
 - **Not 'formal', but is in budget/schedule/work-packages**
 - **Expected to expand as Science Tools effort develops**
- **Plan for calibration software development in conjunction with the detector subsystems.**
 - **Done, with I&T**
- **Plan for a sufficient level of infrastructure staffing to track changes and development in all the software tools planned for use.**
 - **Devoting new SLAC hire to librarian, code dist, etc tasks**
 - **Targeted new GSFC hire to user support**
 - **Delayed 1 yr by budget cut**
- **Define parts of software that are mission critical and determine a reasonable contingency for those parts.**
 - **done**



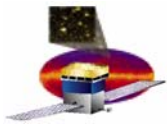
Responses to Baseline Recommendations

- **Recommend Baseline Approval: Technical, Cost, Schedule, Management**
 - **Agreed!**
- **With SSC, move forward with planning for implementation of Science Analysis Tools**
 - **In progress**
 - **joint LAT-SSC working group has been formed to plan and oversee the implementation of the Science Analysis Tools.**
- **Improve depth of organization at level of S/W architect and S/W engineers**
 - **We are looking**
- **Fill the user support position**
 - **Funds are budgeted for FY 2003**
- **Note: French software group has pulled out.**
 - **We're in the process of addressing this change of plan**
 - **Change of lead at NRL; scrounging for manpower**
 - **Not critical yet**

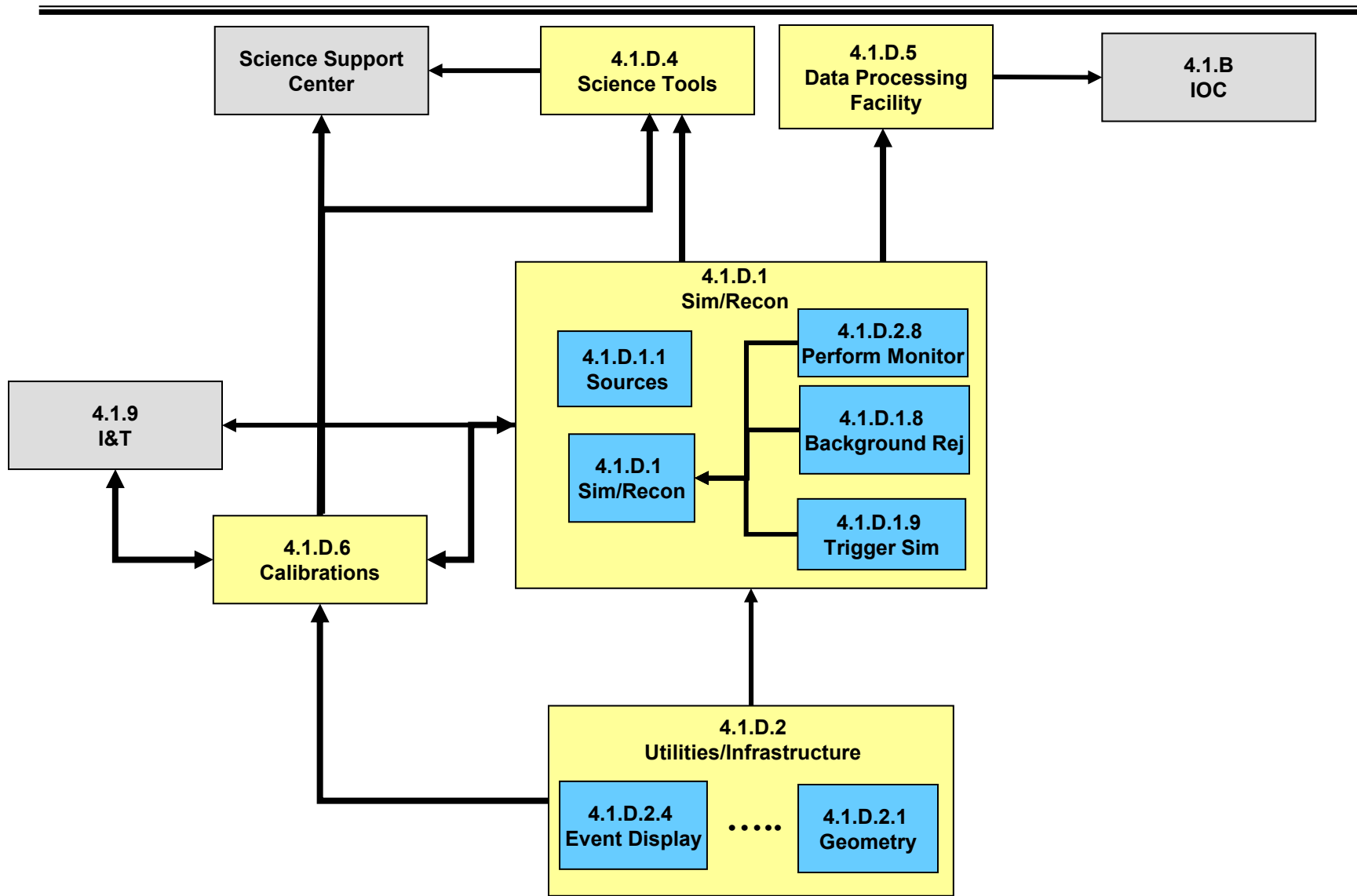
Quote from PDR Report on SAS:

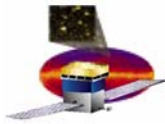
It is not a technically challenging project, yet it is vital to the successful operation of the instrument.

ie a low risk project.

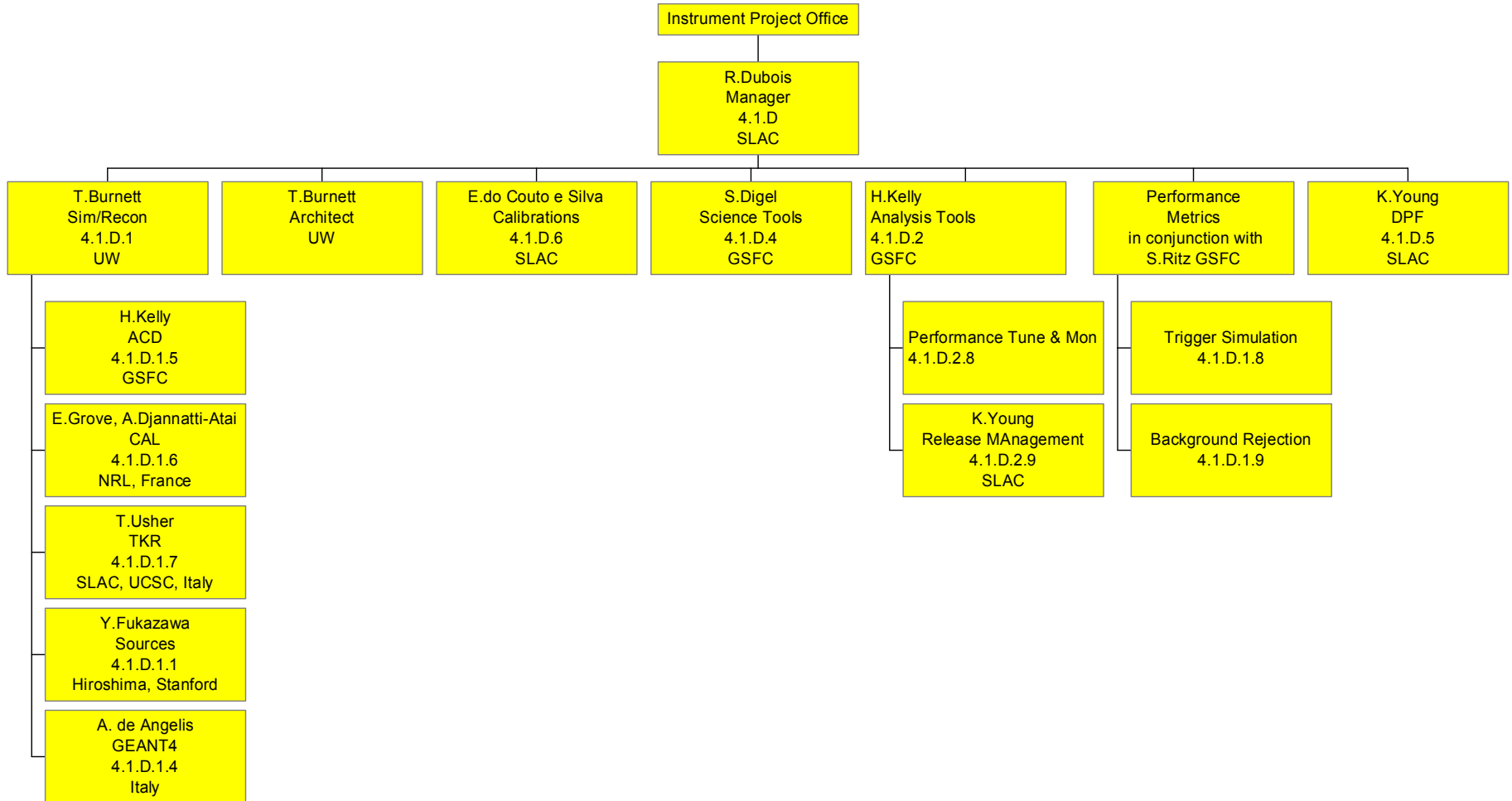


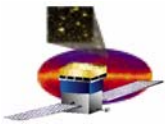
Subsystem WBS Interfaces



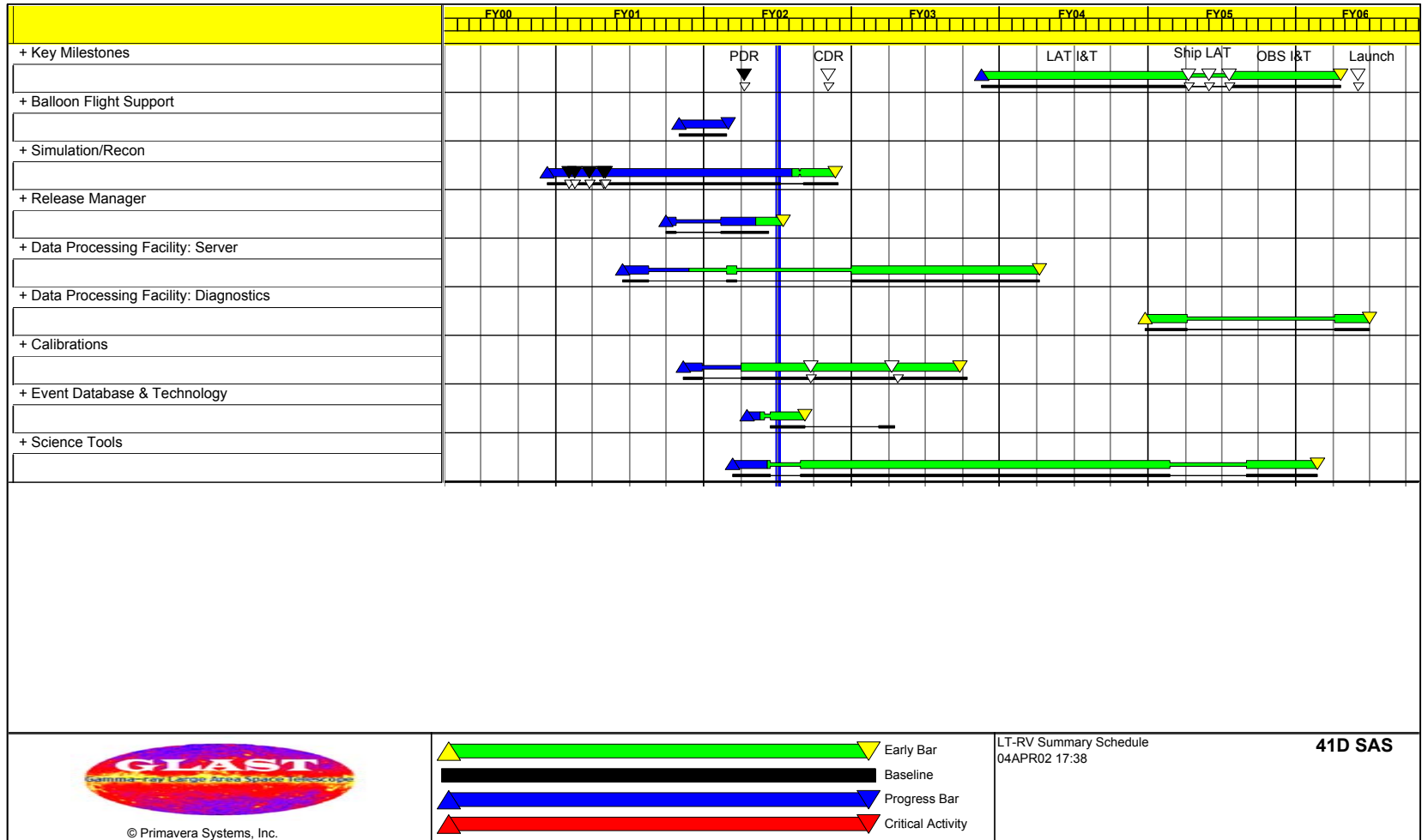


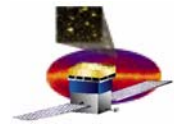
SAS Organization



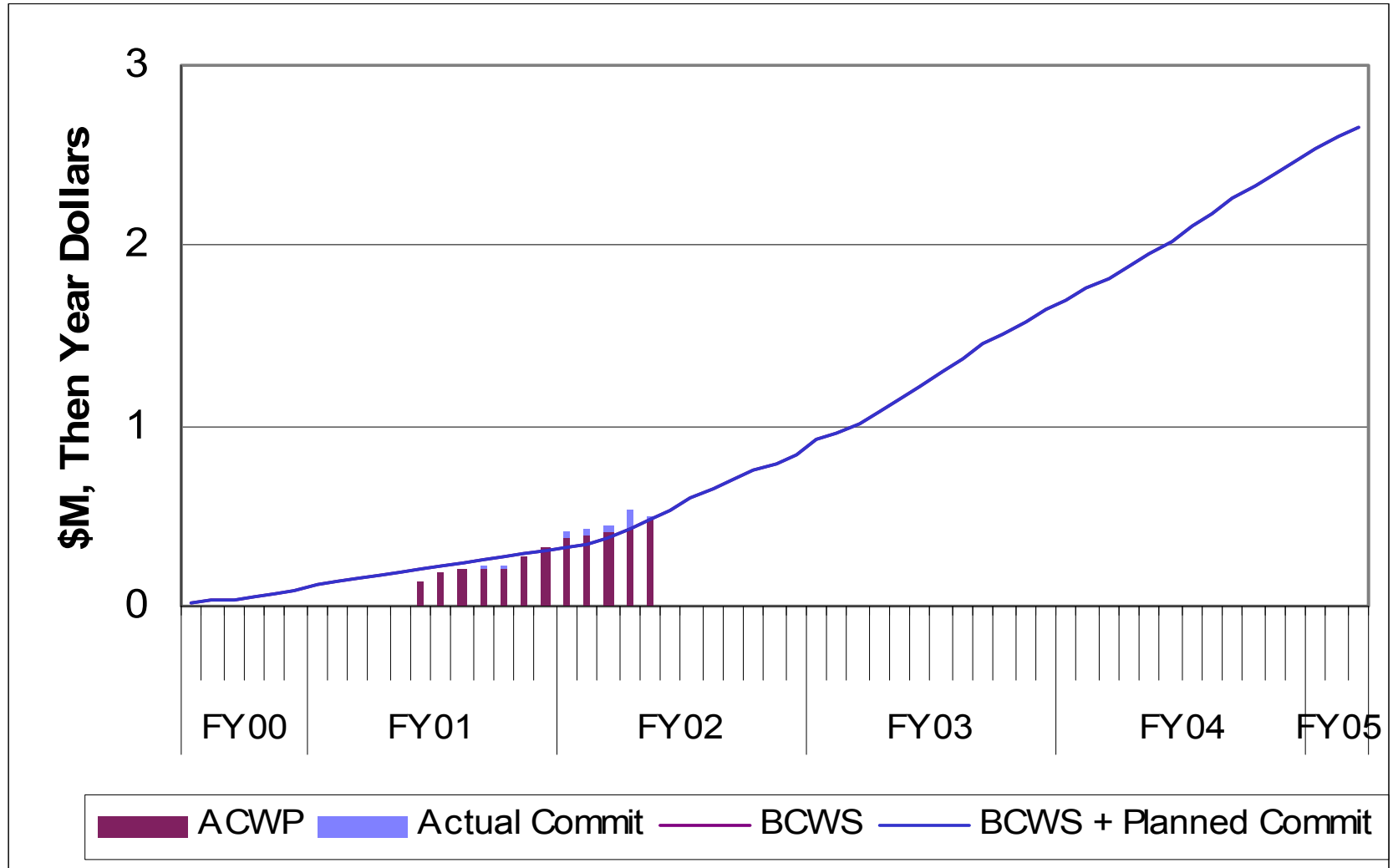


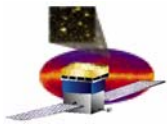
Summary Schedule



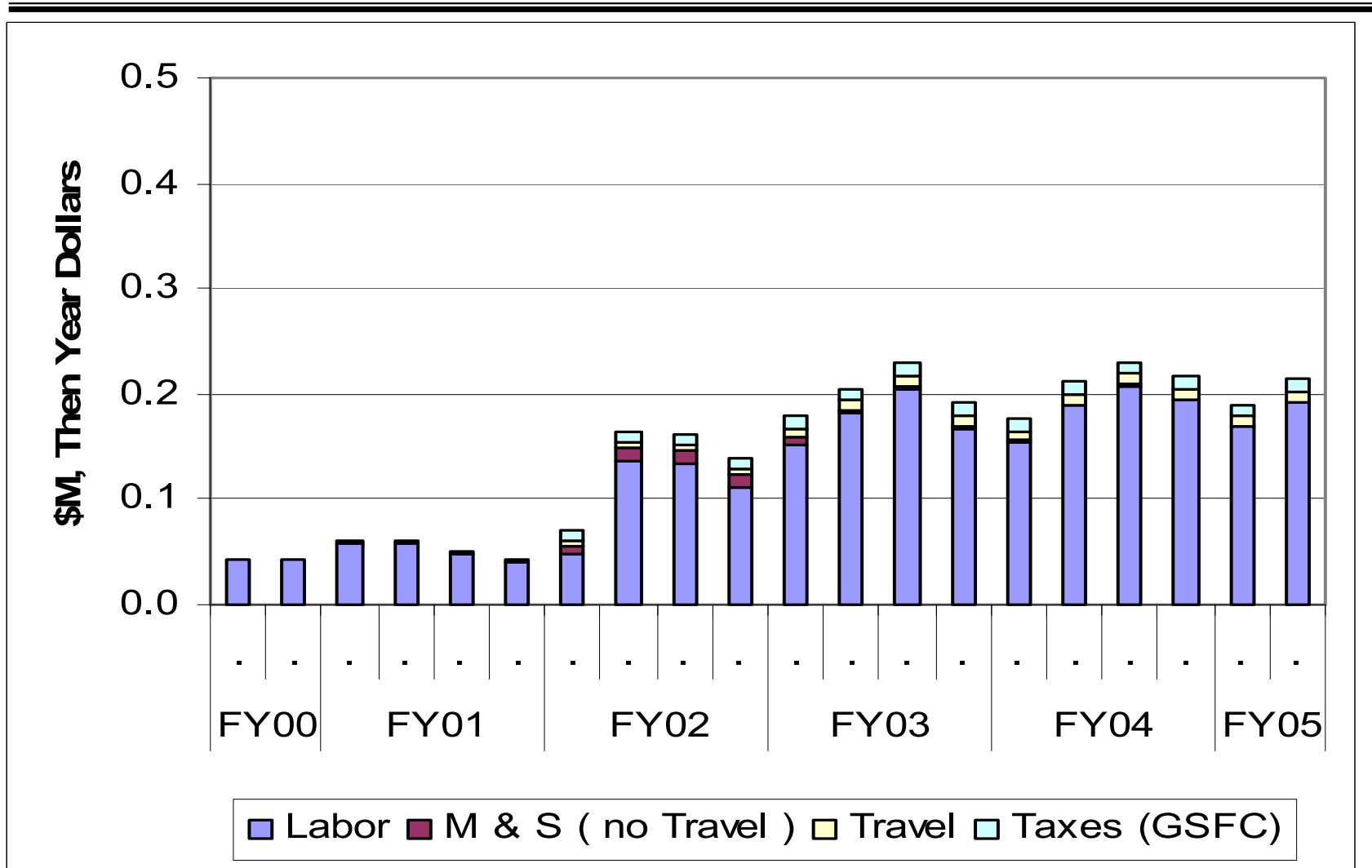


SAS Cost & Commitments





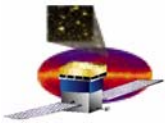
SAS Cost Type





SAS Interface Milestones (Level 3)

Science Analysis Software Requirements Review	04/20/01
Science Analysis Software PDR	08/17/01
AV: Calibration Prototype Coding for I & T	05/15/02
AV: ACD Pulse Height Histograms for I & T	06/21/02
AV: Tracker Dead/Noisy Strips for I & T	06/21/02
Science Analysis Software CDR	09/04/02
AV: Tracker Tower & Tray Alignment	01/22/03



Key SAS Milestones (Level 4)

Prototype Release Manager in Place	03/11/02
AV: 1st Major Release of Simulation & Reconstr'n	04/09/02
Second Major Code Release	10/25/02
Annual Evaluation & Tracking of LAT Performance	12/23/02
Photon Database Technology Implemented	01/14/03
Completed Instrument Response function	05/29/03
Annual Evaluation & Tracking of LAT Performance	08/29/03
Production Version of Data Processing Facility	01/08/04
Annual Evaluation & Tracking of LAT Performance	08/31/04
Annual Evaluation & Tracking of LAT Performance	08/31/05
Science Tools in Place	11/21/05
Final End-to-End test	01/04/06
Data Processing Facility Completed	01/04/06