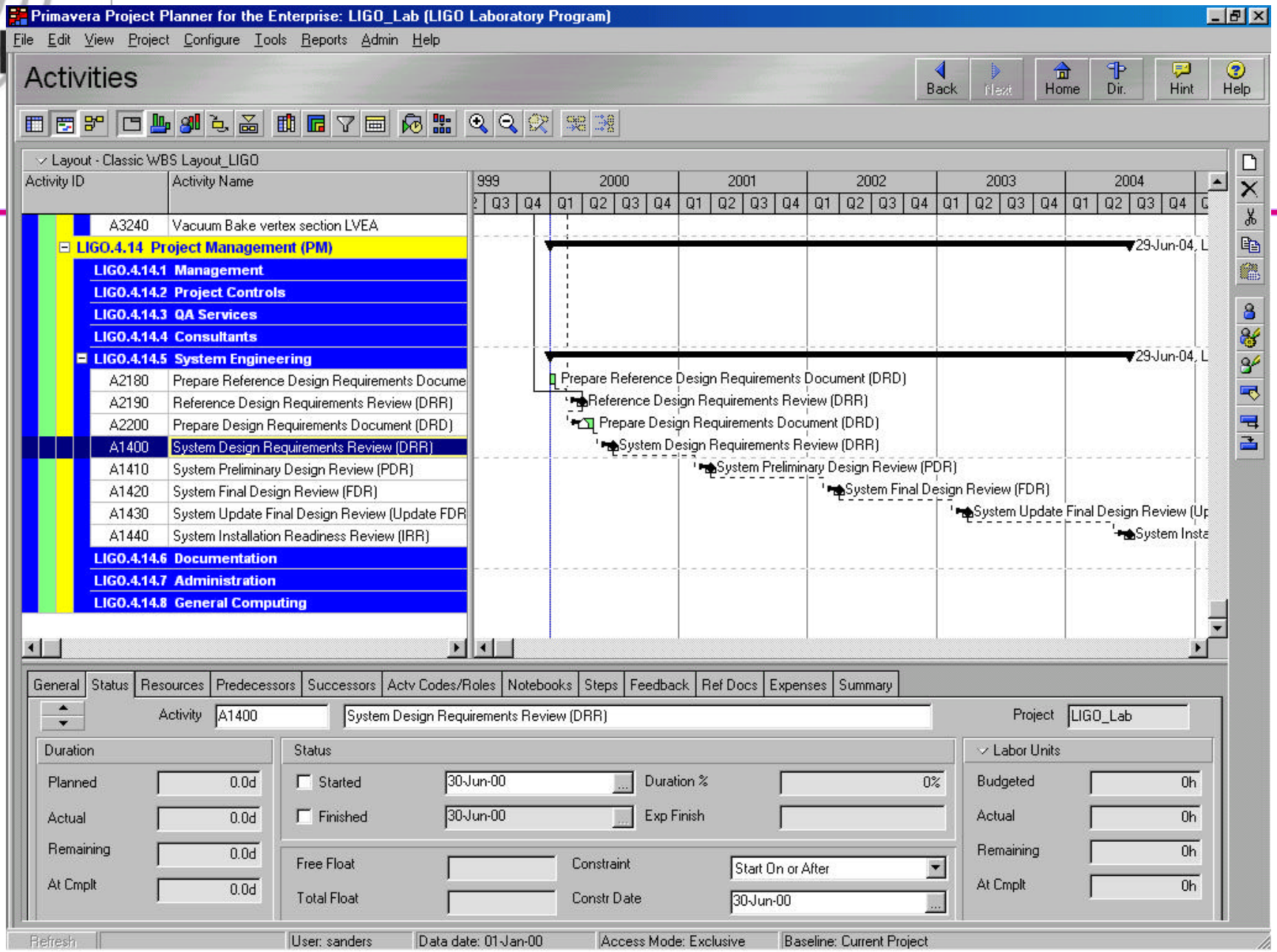
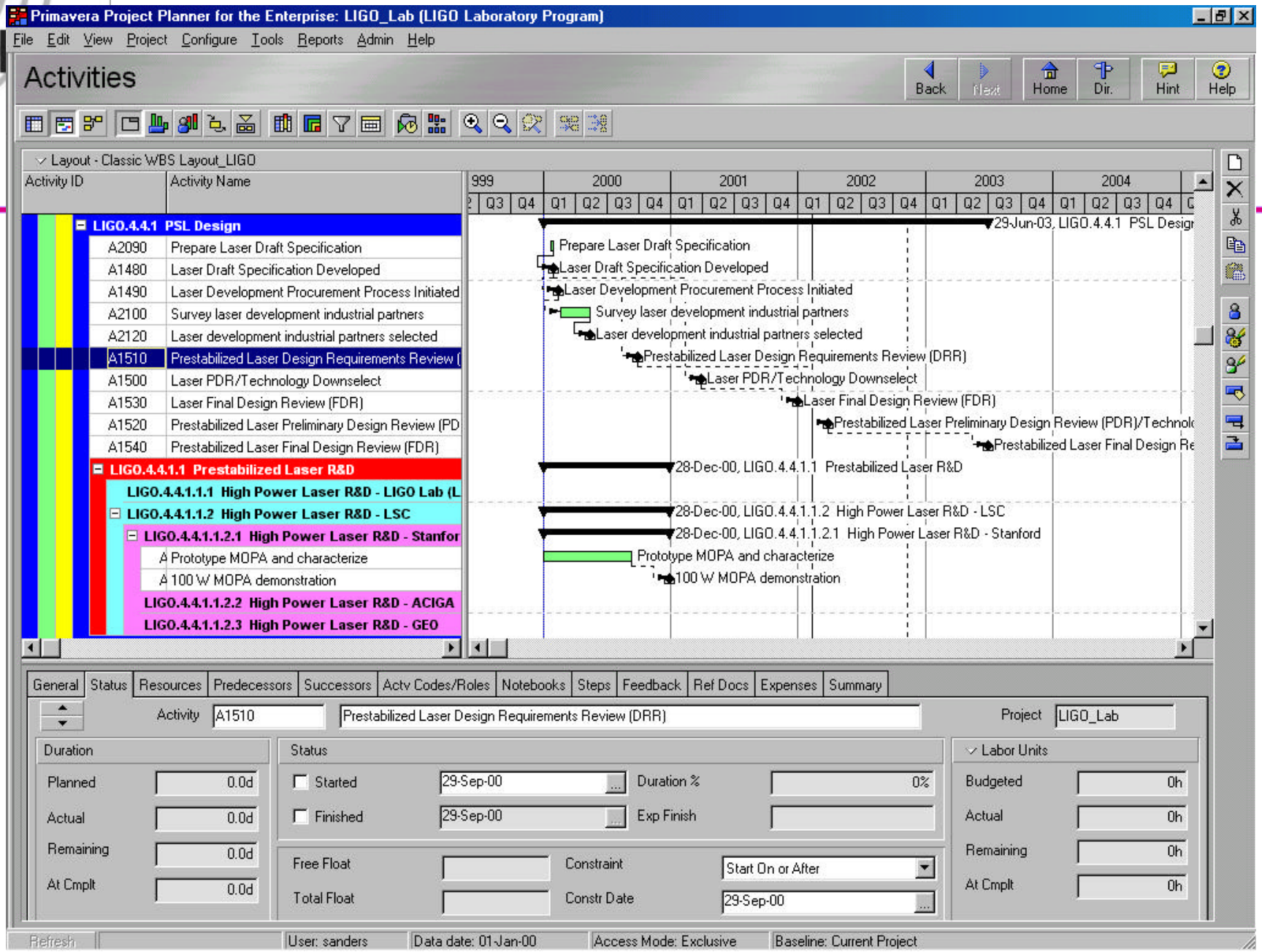
Milestones for Lasers and Optics

Gary Sanders

LSC Meeting - LLO

March 2000


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
File Edit View Project Configure Tools Reports Admin Help
Activities
Back Next Home Dir. Hint Help
Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
A3240 Vacuum Bake vertex section LVEA
LIGO.4.14 Project Management (PM)
LIGO.4.14.1 Management
LIGO.4.14.2 Project Controls
LIGO.4.14.3 QA Services
LIGO.4.14.4 Consultants
LIGO.4.14.5 System Engineering
A2180 Prepare Reference Design Requirements Docume
A2190 Reference Design Requirements Review (DRR)
A2200 Prepare Design Requirements Document (DRD)
A1400 System Design Requirements Review (DRR)
A1410 System Preliminary Design Review (PDR)
A1420 System Final Design Review (FDR)
A1430 System Update Final Design Review (Update FDR
A1440 System Installation Readiness Review (IRR)
LIGO.4.14.6 Documentation
LIGO.4.14.7 Administration
LIGO.4.14.8 General Computing
1999
2000
2001
2002
2003
2004
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
29-Jun-04, L
29-Jun-04, L
Prepare Reference Design Requirements Document (DRD)
Reference Design Requirements Review (DRR)
Prepare Design Requirements Document (DRD)
System Design Requirements Review (DRR)
System Preliminary Design Review (PDR)
System Final Design Review (FDR)
System Update Final Design Review (Up
System Insta
General Status Resources Predecessors Successors Actv Codes/Roles Notebooks Steps Feedback Ref Docs Expenses Summary
Activity A1400
System Design Requirements Review (DRR)
Project LIGO_Lab
Duration
Planned 0.0d
Actual 0.0d
Remaining 0.0d
At Cmplt 0.0d
Status
Started 30-Jun-00
Finished 30-Jun-00
Duration % 0%
Exp Finish
Free Float
Total Float
Constraint Start On or After
Constr Date 30-Jun-00
Labor Units
Budgeted 0h
Actual 0h
Remaining 0h
At Cmplt 0h
Refresh
User: sanders
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
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Activities
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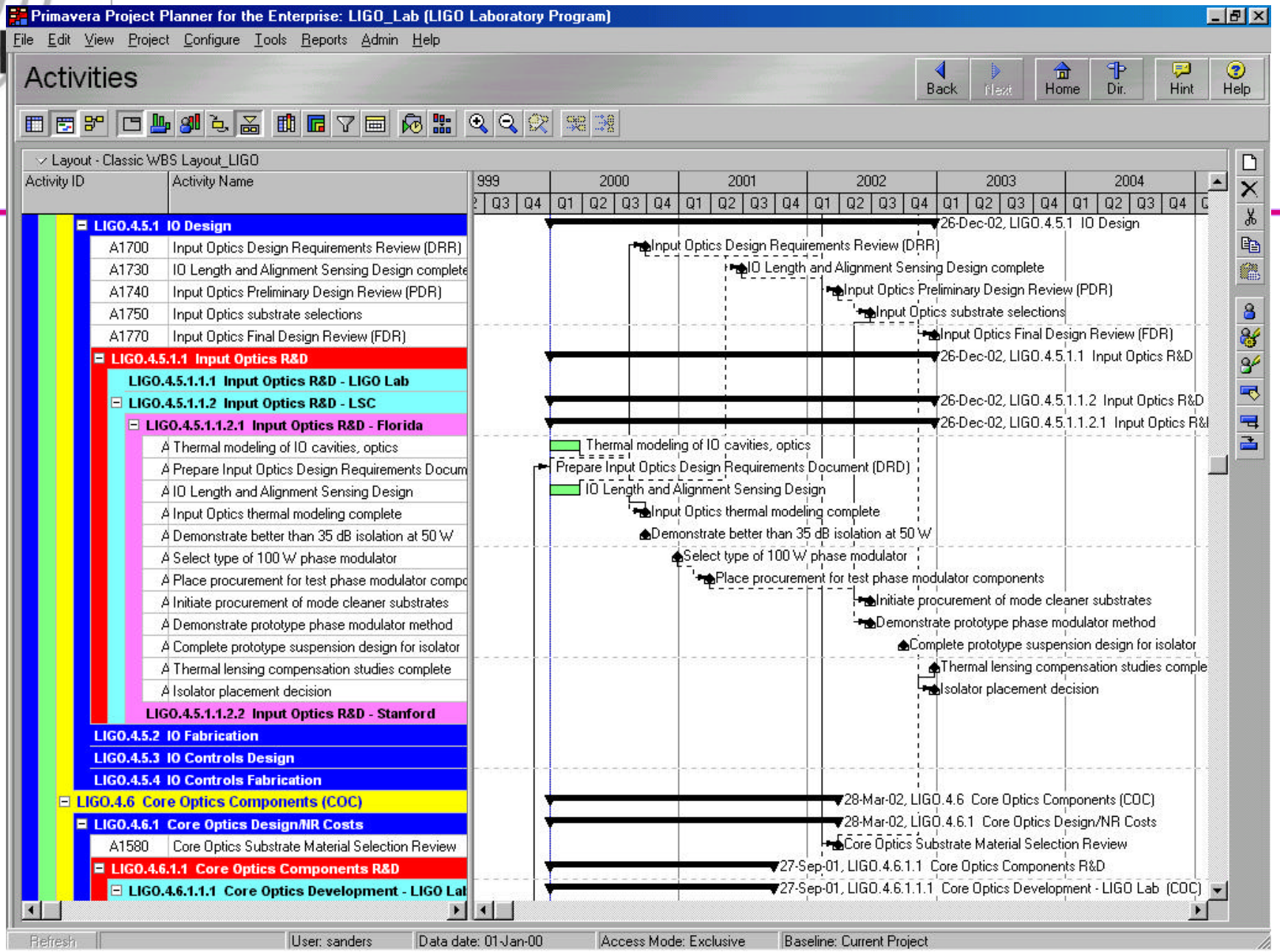
Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
LIGO.4.4.1 PSL Design
A2090 Prepare Laser Draft Specification
A1480 Laser Draft Specification Developed
A1490 Laser Development Procurement Process Initiated
A2100 Survey laser development industrial partners
A2120 Laser development industrial partners selected
A1510 Prestabilized Laser Design Requirements Review (
A1500 Laser PDR/Technology Downselect
A1530 Laser Final Design Review (FDR)
A1520 Prestabilized Laser Preliminary Design Review (PD
A1540 Prestabilized Laser Final Design Review (FDR)
LIGO.4.4.1.1 Prestabilized Laser R&D
LIGO.4.4.1.1.1 High Power Laser R&D - LIGO Lab (L
LIGO.4.4.1.1.2 High Power Laser R&D - LSC
LIGO.4.4.1.1.2.1 High Power Laser R&D - Stanfor
A Prototype MOPA and characterize
A 100 W MOPA demonstration
LIGO.4.4.1.1.2.2 High Power Laser R&D - ACIGA
LIGO.4.4.1.1.2.3 High Power Laser R&D - GEO
1999 2000 2001 2002 2003 2004
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
29-Jun-03, LIGO.4.4.1 PSL Design
Prepare Laser Draft Specification
Laser Draft Specification Developed
Laser Development Procurement Process Initiated
Survey laser development industrial partners
Laser development industrial partners selected
Prestabilized Laser Design Requirements Review (DRR)
Laser PDR/Technology Downselect
Laser Final Design Review (FDR)
Prestabilized Laser Preliminary Design Review (PDR)/Technol
Prestabilized Laser Final Design Re
28-Dec-00, LIGO.4.4.1.1 Prestabilized Laser R&D
28-Dec-00, LIGO.4.4.1.1.2 High Power Laser R&D - LSC
28-Dec-00, LIGO.4.4.1.1.2.1 High Power Laser R&D - Stanford
Prototype MOPA and characterize
100 W MOPA demonstration
General Status Resources Predecessors Successors Actv Codes/Roles Notebooks Steps Feedback Ref Docs Expenses Summary
Activity A1510
Prestabilized Laser Design Requirements Review (DRR)
Project LIGO_Lab
Duration
Planned 0.0d
Actual 0.0d
Remaining 0.0d
At Cmplt 0.0d
Status
Started 29-Sep-00
Finished 29-Sep-00
Duration % 0%
Exp Finish
Free Float
Total Float
Constraint Start On or After
Constr Date 29-Sep-00
Labor Units
Budgeted 0h
Actual 0h
Remaining 0h
At Cmplt 0h
Refresh
User: sanders
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
File Edit View Project Configure Tools Reports Admin Help
Activities
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Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
LIGO.4.5.1 IO Design
A1700 Input Optics Design Requirements Review (DRR)
A1730 IO Length and Alignment Sensing Design complete
A1740 Input Optics Preliminary Design Review (PDR)
A1750 Input Optics substrate selections
A1770 Input Optics Final Design Review (FDR)
LIGO.4.5.1.1 Input Optics R&D
LIGO.4.5.1.1.1 Input Optics R&D - LIGO Lab
LIGO.4.5.1.1.2 Input Optics R&D - LSC
LIGO.4.5.1.1.2.1 Input Optics R&D - Florida
A Thermal modeling of IO cavities, optics
A Prepare Input Optics Design Requirements Docum
A IO Length and Alignment Sensing Design
A Input Optics thermal modeling complete
A Demonstrate better than 35 dB isolation at 50 W
A Select type of 100 W phase modulator
A Place procurement for test phase modulator compo
A Initiate procurement of mode cleaner substrates
A Demonstrate prototype phase modulator method
A Complete prototype suspension design for isolator
A Thermal lensing compensation studies complete
A Isolator placement decision
LIGO.4.5.1.1.2.2 Input Optics R&D - Stanford
LIGO.4.5.2 IO Fabrication
LIGO.4.5.3 IO Controls Design
LIGO.4.5.4 IO Controls Fabrication
LIGO.4.6 Core Optics Components (COC)
LIGO.4.6.1 Core Optics Design/NR Costs
A1580 Core Optics Substrate Material Selection Review
LIGO.4.6.1.1 Core Optics Components R&D
LIGO.4.6.1.1.1 Core Optics Development - LIGO Lal
1999 2000 2001 2002 2003 2004
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
26-Dec-02, LIGO.4.5.1 IO Design
Input Optics Design Requirements Review (DRR)
IO Length and Alignment Sensing Design complete
Input Optics Preliminary Design Review (PDR)
Input Optics substrate selections
Input Optics Final Design Review (FDR)
26-Dec-02, LIGO.4.5.1.1 Input Optics R&D
26-Dec-02, LIGO.4.5.1.1.2 Input Optics R&D
26-Dec-02, LIGO.4.5.1.1.2.1 Input Optics R&
Thermal modeling of IO cavities, optics
Prepare Input Optics Design Requirements Document (DRD)
IO Length and Alignment Sensing Design
Input Optics thermal modeling complete
Demonstrate better than 35 dB isolation at 50 W
Select type of 100 W phase modulator
Place procurement for test phase modulator components
Initiate procurement of mode cleaner substrates
Demonstrate prototype phase modulator method
Complete prototype suspension design for isolator
Thermal lensing compensation studies comple
Isolator placement decision
28-Mar-02, LIGO.4.6 Core Optics Components (COC)
28-Mar-02, LIGO.4.6.1 Core Optics Design/NR Costs
Core Optics Substrate Material Selection Review
27-Sep-01, LIGO.4.6.1.1 Core Optics Components R&D
27-Sep-01, LIGO.4.6.1.1.1 Core Optics Development - LIGO Lab (COC)
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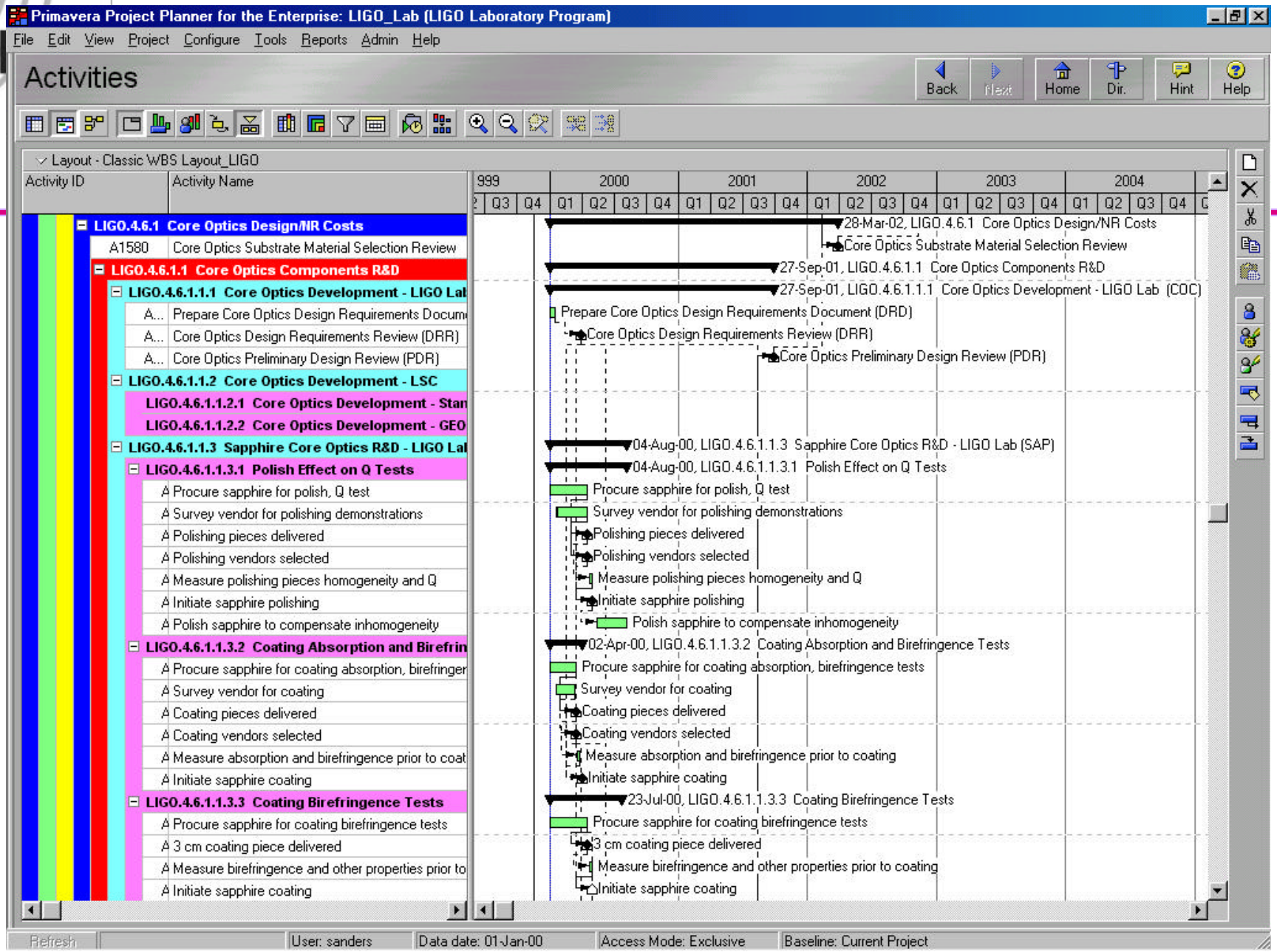
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
File Edit View Project Configure Tools Reports Admin Help
Activities
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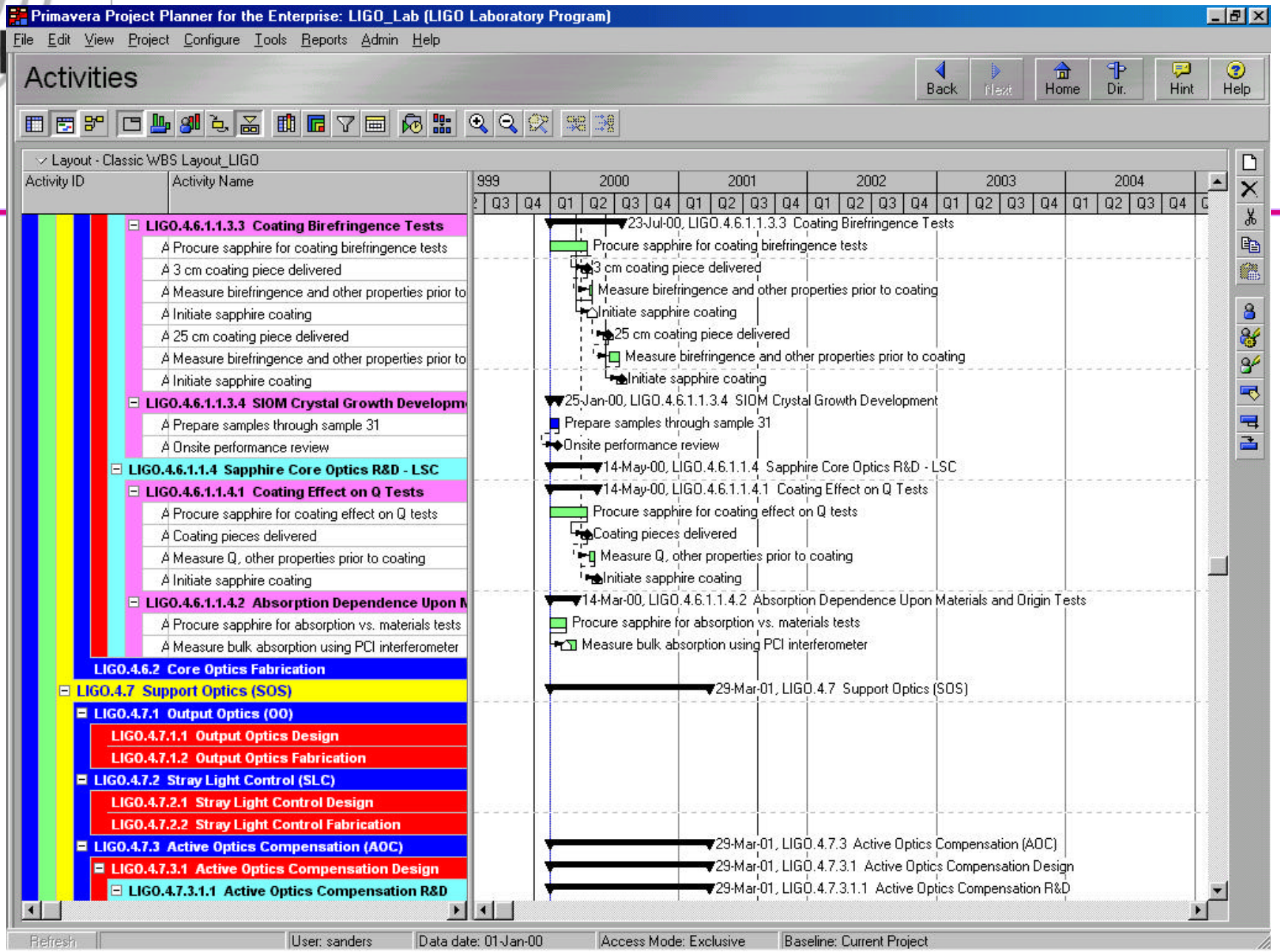
Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
LIGO.4.6.1 Core Optics Design/NR Costs
A1580 Core Optics Substrate Material Selection Review
LIGO.4.6.1.1 Core Optics Components R&D
LIGO.4.6.1.1.1 Core Optics Development - LIGO Lal
A... Prepare Core Optics Design Requirements Docum
A... Core Optics Design Requirements Review (DRR)
A... Core Optics Preliminary Design Review (PDR)
LIGO.4.6.1.1.2 Core Optics Development - LSC
LIGO.4.6.1.1.2.1 Core Optics Development - Stan
LIGO.4.6.1.1.2.2 Core Optics Development - GEO
LIGO.4.6.1.1.3 Sapphire Core Optics R&D - LIGO Lal
LIGO.4.6.1.1.3.1 Polish Effect on Q Tests
A Procure sapphire for polish, Q test
A Survey vendor for polishing demonstrations
A Polishing pieces delivered
A Polishing vendors selected
A Measure polishing pieces homogeneity and Q
A Initiate sapphire polishing
A Polish sapphire to compensate inhomogeneity
LIGO.4.6.1.1.3.2 Coating Absorption and Birefrin
A Procure sapphire for coating absorption, birefringer
A Survey vendor for coating
A Coating pieces delivered
A Coating vendors selected
A Measure absorption and birefringence prior to coat
A Initiate sapphire coating
LIGO.4.6.1.1.3.3 Coating Birefringence Tests
A Procure sapphire for coating birefringence tests
A 3 cm coating piece delivered
A Measure birefringence and other properties prior to
A Initiate sapphire coating
999 2000 2001 2002 2003 2004
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
28-Mar-02, LIGO.4.6.1 Core Optics Design/NR Costs
Core Optics Substrate Material Selection Review
27-Sep-01, LIGO.4.6.1.1 Core Optics Components R&D
27-Sep-01, LIGO.4.6.1.1.1 Core Optics Development - LIGO Lab (COC)
Prepare Core Optics Design Requirements Document (DRD)
Core Optics Design Requirements Review (DRR)
Core Optics Preliminary Design Review (PDR)
04-Aug-00, LIGO.4.6.1.1.3 Sapphire Core Optics R&D - LIGO Lab (SAP)
04-Aug-00, LIGO.4.6.1.1.3.1 Polish Effect on Q Tests
Procure sapphire for polish, Q test
Survey vendor for polishing demonstrations
Polishing pieces delivered
Polishing vendors selected
Measure polishing pieces homogeneity and Q
Initiate sapphire polishing
Polish sapphire to compensate inhomogeneity
02-Apr-00, LIGO.4.6.1.1.3.2 Coating Absorption and Birefringence Tests
Procure sapphire for coating absorption, birefringence tests
Survey vendor for coating
Coating pieces delivered
Coating vendors selected
Measure absorption and birefringence prior to coating
Initiate sapphire coating
23-Jul-00, LIGO.4.6.1.1.3.3 Coating Birefringence Tests
Procure sapphire for coating birefringence tests
3 cm coating piece delivered
Measure birefringence and other properties prior to coating
Initiate sapphire coating
Refresh
User: sanders
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
File Edit View Project Configure Tools Reports Admin Help
Activities
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Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
LIGO.4.6.1.1.3.3 Coating Birefringence Tests
Procure sapphire for coating birefringence tests
3 cm coating piece delivered
Measure birefringence and other properties prior to
Initiate sapphire coating
25 cm coating piece delivered
Measure birefringence and other properties prior to
Initiate sapphire coating
LIGO.4.6.1.1.3.4 SIOM Crystal Growth Developm
Prepare samples through sample 31
Onsite performance review
LIGO.4.6.1.1.4 Sapphire Core Optics R&D - LSC
LIGO.4.6.1.1.4.1 Coating Effect on Q Tests
Procure sapphire for coating effect on Q tests
Coating pieces delivered
Measure Q, other properties prior to coating
Initiate sapphire coating
LIGO.4.6.1.1.4.2 Absorption Dependence Upon M
Procure sapphire for absorption vs. materials tests
Measure bulk absorption using PCI interferometer
LIGO.4.6.2 Core Optics Fabrication
LIGO.4.7 Support Optics (SOS)
LIGO.4.7.1 Output Optics (OO)
LIGO.4.7.1.1 Output Optics Design
LIGO.4.7.1.2 Output Optics Fabrication
LIGO.4.7.2 Stray Light Control (SLC)
LIGO.4.7.2.1 Stray Light Control Design
LIGO.4.7.2.2 Stray Light Control Fabrication
LIGO.4.7.3 Active Optics Compensation (AOC)
LIGO.4.7.3.1 Active Optics Compensation Design
LIGO.4.7.3.1.1 Active Optics Compensation R&D
1999
2000
2001
2002
2003
2004
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
23-Jul-00, LIGO.4.6.1.1.3.3 Coating Birefringence Tests
Procure sapphire for coating birefringence tests
3 cm coating piece delivered
Measure birefringence and other properties prior to coating
Initiate sapphire coating
25 cm coating piece delivered
Measure birefringence and other properties prior to coating
Initiate sapphire coating
25-Jan-00, LIGO.4.6.1.1.3.4 SIOM Crystal Growth Development
Prepare samples through sample 31
Onsite performance review
14-May-00, LIGO.4.6.1.1.4 Sapphire Core Optics R&D - LSC
14-May-00, LIGO.4.6.1.1.4.1 Coating Effect on Q Tests
Procure sapphire for coating effect on Q tests
Coating pieces delivered
Measure Q, other properties prior to coating
Initiate sapphire coating
14-Mar-00, LIGO.4.6.1.1.4.2 Absorption Dependence Upon Materials and Origin Tests
Procure sapphire for absorption vs. materials tests
Measure bulk absorption using PCI interferometer
29-Mar-01, LIGO.4.7 Support Optics (SOS)
29-Mar-01, LIGO.4.7.3 Active Optics Compensation (AOC)
29-Mar-01, LIGO.4.7.3.1 Active Optics Compensation Design
29-Mar-01, LIGO.4.7.3.1.1 Active Optics Compensation R&D
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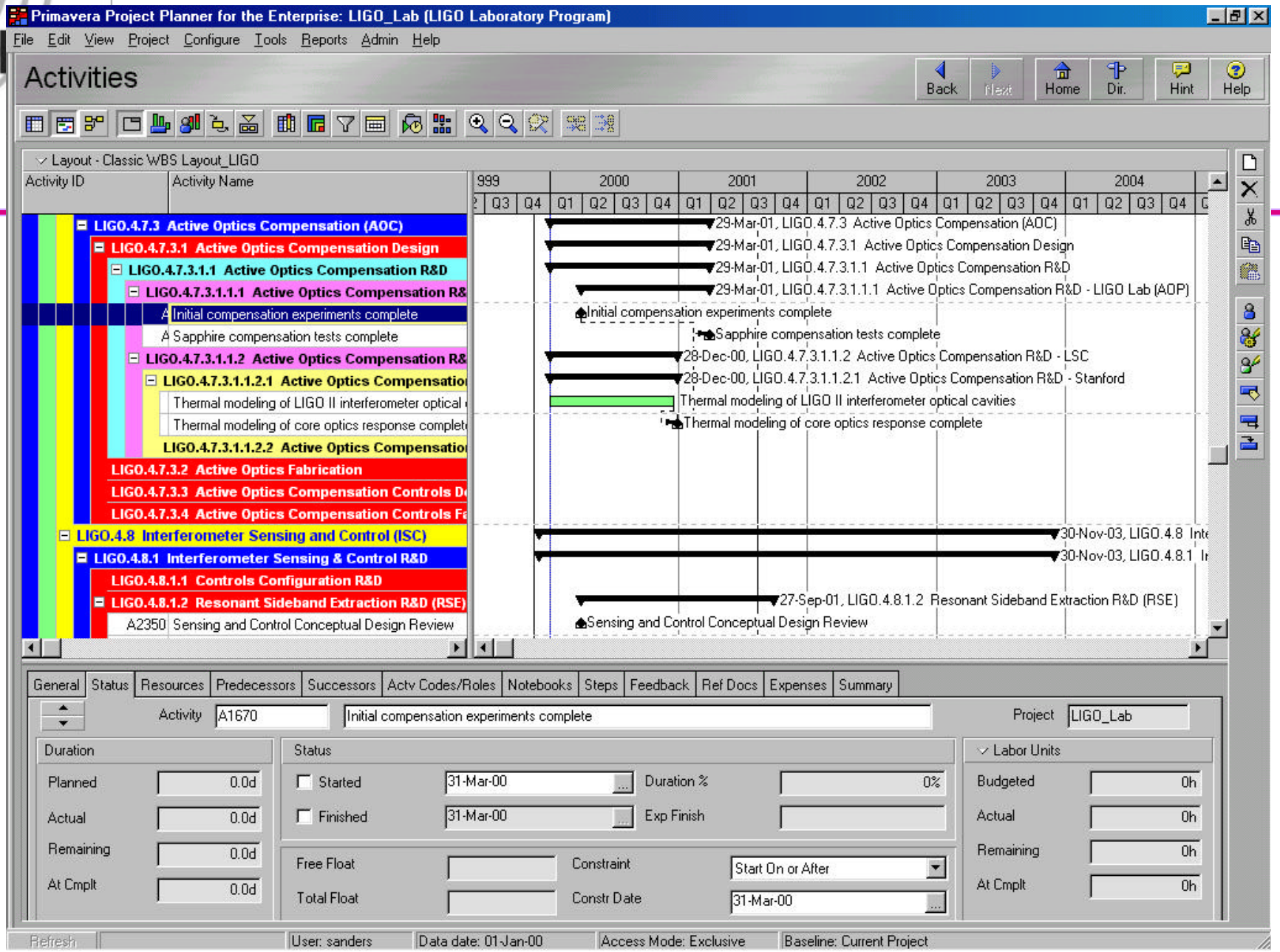
User: sanders
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
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Activities
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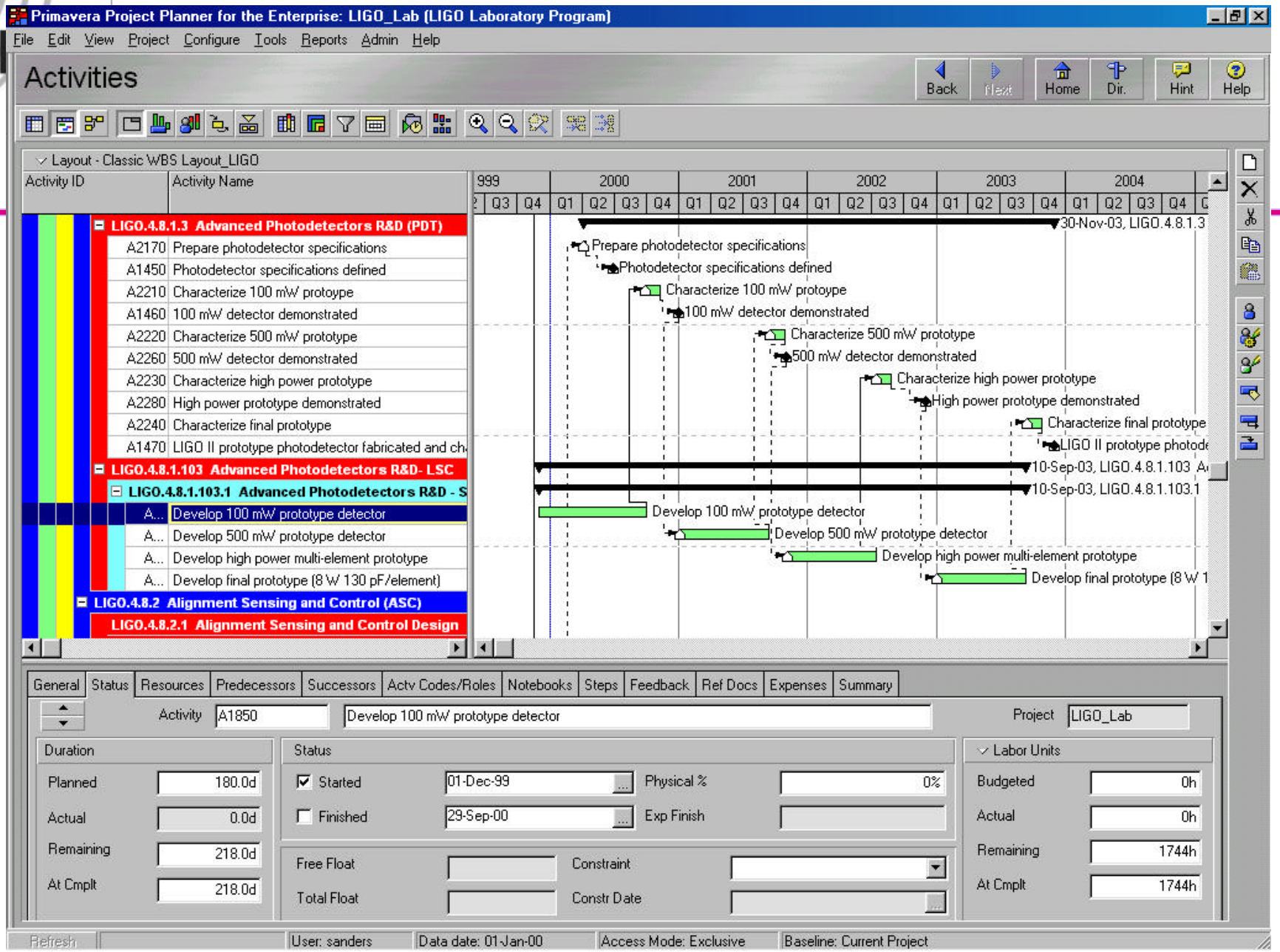
Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
LIGO.4.7.3 Active Optics Compensation (AOC)
LIGO.4.7.3.1 Active Optics Compensation Design
LIGO.4.7.3.1.1 Active Optics Compensation R&D
LIGO.4.7.3.1.1.1 Active Optics Compensation R&
Initial compensation experiments complete
Sapphire compensation tests complete
LIGO.4.7.3.1.1.2 Active Optics Compensation R&
LIGO.4.7.3.1.1.2.1 Active Optics Compensatio
Thermal modeling of LIGO II interferometer optical
Thermal modeling of core optics response complet
LIGO.4.7.3.1.1.2.2 Active Optics Compensatio
LIGO.4.7.3.2 Active Optics Fabrication
LIGO.4.7.3.3 Active Optics Compensation Controls D
LIGO.4.7.3.4 Active Optics Compensation Controls Fa
LIGO.4.8 Interferometer Sensing and Control (ISC)
LIGO.4.8.1 Interferometer Sensing & Control R&D
LIGO.4.8.1.1 Controls Configuration R&D
LIGO.4.8.1.2 Resonant Sideband Extraction R&D (RSE)
A2350 Sensing and Control Conceptual Design Review
999 2000 2001 2002 2003 2004
Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
29-Mar-01, LIGO.4.7.3 Active Optics Compensation (AOC)
29-Mar-01, LIGO.4.7.3.1 Active Optics Compensation Design
29-Mar-01, LIGO.4.7.3.1.1 Active Optics Compensation R&D
29-Mar-01, LIGO.4.7.3.1.1.1 Active Optics Compensation R&D - LIGO Lab (AOP)
Initial compensation experiments complete
Sapphire compensation tests complete
28-Dec-00, LIGO.4.7.3.1.1.2 Active Optics Compensation R&D - LSC
28-Dec-00, LIGO.4.7.3.1.1.2.1 Active Optics Compensation R&D - Stanford
Thermal modeling of LIGO II interferometer optical cavities
Thermal modeling of core optics response complete
30-Nov-03, LIGO.4.8 Inte
30-Nov-03, LIGO.4.8.1 I
27-Sep-01, LIGO.4.8.1.2 Resonant Sideband Extraction R&D (RSE)
Sensing and Control Conceptual Design Review
General Status Resources Predecessors Successors Actv Codes/Roles Notebooks Steps Feedback Ref Docs Expenses Summary
Activity A1670
Initial compensation experiments complete
Project LIGO_Lab
Duration
Planned 0.0d
Actual 0.0d
Remaining 0.0d
At Cmplt 0.0d
Status
Started 31-Mar-00
Finished 31-Mar-00
Duration % 0%
Exp Finish
Free Float
Total Float
Constraint Start On or After
Constr Date 31-Mar-00
Labor Units
Budgeted 0h
Actual 0h
Remaining 0h
At Cmplt 0h
Refresh
User: sanders
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project


Primavera Project Planner for the Enterprise: LIGO_Lab (LIGO Laboratory Program)
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Activities
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Layout - Classic WBS Layout_LIGO
Activity ID
Activity Name
LIGO.4.8.1.3 Advanced Photodetectors R&D (PDT)
A2170 Prepare photodetector specifications
A1450 Photodetector specifications defined
A2210 Characterize 100 mW protoype
A1460 100 mW detector demonstrated
A2220 Characterize 500 mW prototype
A2260 500 mW detector demonstrated
A2230 Characterize high power prototype
A2280 High power prototype demonstrated
A2240 Characterize final prototype
A1470 LIGO II prototype photodetector fabricated and ch
LIGO.4.8.1.103 Advanced Photodetectors R&D- LSC
LIGO.4.8.1.103.1 Advanced Photodetectors R&D - S
A... Develop 100 mW prototype detector
A... Develop 500 mW prototype detector
A... Develop high power multi-element prototype
A... Develop final prototype (8 W 130 pF/element)
LIGO.4.8.2 Alignment Sensing and Control (ASC)
LIGO.4.8.2.1 Alignment Sensing and Control Design
1999 2000 2001 2002 2003 2004
30-Nov-03, LIGO.4.8.1.3
Prepare photodetector specifications
Photodetector specifications defined
Characterize 100 mW protoype
100 mW detector demonstrated
Characterize 500 mW prototype
500 mW detector demonstrated
Characterize high power prototype
High power prototype demonstrated
Characterize final prototype
LIGO II prototype photode
10-Sep-03, LIGO.4.8.1.103 A
10-Sep-03, LIGO.4.8.1.103.1
Develop 100 mW prototype detector
Develop 500 mW prototype detector
Develop high power multi-element prototype
Develop final prototype (8 W 1
General Status Resources Predecessors Successors Actv Codes/Roles Notebooks Steps Feedback Ref Docs Expenses Summary
Activity A1850
Develop 100 mW prototype detector
Project LIGO_Lab
Duration
Planned 180.0d
Actual 0.0d
Remaining 218.0d
At Cmplt 218.0d
Status
Started 01-Dec-99
Finished 29-Sep-00
Physical % 0%
Exp Finish
Free Float
Total Float
Constraint
Constr Date
Labor Units
Budgeted 0h
Actual 0h
Remaining 1744h
At Cmplt 1744h
Refresh
User: sanders
Data date: 01-Jan-00
Access Mode: Exclusive
Baseline: Current Project