

# SSD TASKS AND COSTS

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# BOUNDARY CONDITIONS

- Tasks are 85% complete
- Schedule is about 30% done – lots of guesses
- Cost not done
- Work done by a novice physicist – Not by an engineer
  - Estimates of time has been optimistic in the past

# WBS STRUCTURE

- 1.4.1        Mechanics
- 1.4.2        Electronics
- 1.4.3        Assembly
- 1.4.4        Infrastructure

# 1.4.1 MECHANICS

Needed  
now

1.4.1	<input type="checkbox"/> Mechanics	300 days	Tue 11/2/10	Tue 1/10/12
1.4.1.18	Mechanical envelope for PCB for Ladder Board Interface Cable	5 days	Tue 11/2/10	Mon 11/8/10
1.4.1.1	Design brackets that bond to the OSC	5 days	Mon 9/26/11	Sat 10/1/11
1.4.1.16	Design brackets that bond to the SSD	5 days	Mon 10/3/11	Fri 10/7/11
1.4.1.2	Design Assembly Fixtures for alignment	5 days	Mon 10/10/11	Fri 10/14/11
1.4.1.17	Design Assembly fixtures for mounting to the OSC	5 days	Mon 10/17/11	Fri 10/21/11
1.4.1.3	Design Cable routing on OSC	5 days	Mon 10/24/11	Fri 10/28/11
1.4.1.12	Design Cable routing though Cone at OSC/ESC interface	5 days	Mon 10/31/11	Fri 11/4/11
1.4.1.13	Design Cable routing though Cone at OSC/WSC interface	5 days	Mon 11/7/11	Fri 11/11/11
1.4.1.15	Design cable routing on ESC	5 days	Mon 11/7/11	Fri 11/11/11
1.4.1.14	Design cable routing on WSC	5 days	Mon 11/14/11	Fri 11/18/11
1.4.1.4	Cost and Schedule Estimate	5 days	Mon 11/21/11	Tue 11/29/11
1.4.1.5	Design Review	14 days	Wed 11/30/11	Mon 12/19/11
1.4.1.6	Mechanical Design Complete	0 days	Mon 12/19/11	Mon 12/19/11
1.4.1.7	Machine fixtures	10 days	Tue 12/20/11	Mon 1/2/12
1.4.1.10	Assemble fixtures	2 days	Tue 1/3/12	Wed 1/4/12
1.4.1.11	Machine brackets	14 days	Tue 12/20/11	Fri 1/6/12
1.4.1.8	Bond Brackets to OSC	2 days	Mon 1/9/12	Tue 1/10/12
1.4.1.9	Mechanics Completed	0 days	Tue 1/10/12	Tue 1/10/12

Needs to be  
done during  
OSC design

# MECHANICS - COMMENTS

- Need envelope of ladder cable board soon
- Most of mechanical work can be done in 3 months
- Do we need to design brackets before OSC design is finished?
  - Must put in those constraints
- Engineering support for WBS
- When will this be done
- SSD Mounting brackets needed before alignment

# 1.4.2 - ELECTRONICS

- Ladder Board
  - Prototype
  - Preproduction
  - Production
- Ladder Board
  - Prototype
  - Preproduction
  - Production
- DAQ
  - Prototype
  - Production
- Integrated Test System

# ASSUMPTIONS

- Preproduction does not start until have tested RDO and Ladder Board
- Modification
- Preproduction
- Modification if necessary
- Production

# LADDER - 1

Done

<input type="checkbox"/> Ladder Board	1008 days	Thu 10/1/09	Wed 9/18/13
<input type="checkbox"/> Design and Prototype	433 days	Thu 10/1/09	Wed 6/8/11
Ladder Board Design	268 days	Thu 10/1/09	Tue 10/12/10
Define Ladder Board Parts	14 days	Wed 9/1/10	Mon 9/20/10
Order Ladder Board Parts	5 days	Wed 9/1/10	Fri 10/15/10
Order and Receive Ladder Board PCB	30 days	Wed 10/13/10	Tue 11/23/10
Receive Ladder Board Parts	45 days	Wed 9/1/10	Tue 11/2/10
Assemble Ladder Prototype	30 days	Wed 11/24/10	Mon 1/10/11
Design and Build Debug Board	30 days	Wed 10/13/10	Tue 11/23/10
Test Ladder Board Prototype	90 days	Tue 1/11/11	Wed 5/18/11
Define Ladder Board Changes	7 days	Thu 5/19/11	Fri 5/27/11
Full Cost Estimate for Production	7 days	Tue 5/31/11	Wed 6/8/11
Ladder Board Prototype Finished	0 days	Wed 6/8/11	Wed 6/8/11

The next big thing to do is test!!!



# LADDER-2

<b>1.4.2.1.2</b>	<b>☐ Preproduction</b>	<b>198 days</b>	<b>Fri 6/15/12</b>	<b>Tue 4/2/13</b>
1.4.2.1.2.11	Design Review	14 days	Fri 6/15/12	Thu 7/5/12
1.4.2.1.2.1	Modify PCB Board	21 days	Fri 7/6/12	Fri 8/3/12
1.4.2.1.2.2	Order Parts for N ladder boards	14 days	Mon 8/6/12	Thu 8/23/12
1.4.2.1.2.3	Receive Parts for Ladder Boards	90 days	Fri 8/24/12	Mon 1/7/13
1.4.2.1.2.4	Order and Receive PCB	45 days	Mon 8/6/12	Mon 10/8/12
1.4.2.1.2.5	Assemble ladder boards	15 days	Tue 1/8/13	Tue 1/29/13
1.4.2.1.2.6	Test ladder boards	30 days	Wed 1/30/13	Wed 3/13/13
1.4.2.1.2.7	Preproduction Design Review	14 days	Thu 3/14/13	Tue 4/2/13
1.4.2.1.2.8	Ladder Board Preproduction Complete	0 days	Tue 4/2/13	Tue 4/2/13

# LADDER-3

<b>1.4.2.1.3</b>	<b>Production</b>	<b>118 days</b>	<b>Wed 4/3/13</b>	<b>Wed 9/18/13</b>
1.4.2.1.3.9	Ladder Board Production Design Review	14 days	Wed 4/3/13	Mon 4/22/13
1.4.2.1.3.1	Modify Ladder Board if Necessary	14 days	Tue 4/23/13	Fri 5/10/13
1.4.2.1.3.2	Order Parts for Remaining Boards	14 days	Mon 5/13/13	Fri 5/31/13
1.4.2.1.3.3	Receive Ladder Board Parts	60 days	Mon 6/3/13	Mon 8/26/13
1.4.2.1.3.4	Order and Receive PCB	45 days	Mon 5/13/13	Tue 7/16/13
1.4.2.1.3.7	Test Boards	10 days	Wed 7/17/13	Tue 7/30/13
1.4.2.1.3.5	Assemble ladder boards on ladders	2 days	Tue 8/27/13	Wed 8/28/13
1.4.2.1.3.8	Test ladders on Bench	14 days	Thu 8/29/13	Wed 9/18/13
1.4.2.1.3.6	Ladder Board Production Complete	0 days	Wed 9/18/13	Wed 9/18/13

# RDO

<b>1.4.2.2</b>	<b>RDO Board</b>	<b>738 days</b>	<b>Fri 10/1/10</b>	<b>Thu 9/5/13</b>
<b>1.4.2.2.1</b>	<b>Prototype</b>	<b>236 days</b>	<b>Fri 10/1/10</b>	<b>Thu 9/8/11</b>
1.4.2.2.1.1	FPGA Pinout for VME and Trigger/DAQ	30 days	Fri 10/1/10	Sat 1/1/11
1.4.2.2.1.2	FPGA Design for VME	30 days	Mon 1/3/11	Mon 2/14/11
1.4.2.2.1.3	FPGA Design for Trigger/DAQ	80 days	Tue 10/12/10	Mon 2/7/11
1.4.2.2.1.4	Slave FPGA Design	55 days	Tue 10/12/10	Sat 1/1/11
1.4.2.2.1.5	Design RDO Board	60 days	Mon 1/3/11	Tue 3/29/11
1.4.2.2.1.6	Order and Receive RDO Parts	60 days	Mon 1/3/11	Tue 3/29/11
1.4.2.2.1.7	Order and Receive RDO Board PCB	30 days	Wed 3/30/11	Tue 5/10/11
1.4.2.2.1.8	Assemble RDO Board Prototype	21 days	Wed 5/11/11	Thu 6/9/11
1.4.2.2.1.9	Test RDO Board Prototype	60 days	Fri 6/10/11	Fri 9/2/11
1.4.2.2.1.10	Full Cost Estimate for Production	3 days	Tue 9/6/11	Thu 9/8/11
1.4.2.2.1.12	RDO Prototype Complete	0 days	Thu 9/8/11	Thu 9/8/11
<b>1.4.2.2.2</b>	<b>Preproduction</b>	<b>109 days</b>	<b>Fri 9/9/11</b>	<b>Mon 2/13/12</b>
1.4.2.2.2.1	Preproduction Design Review	14 days	Fri 9/9/11	Wed 9/28/11
1.4.2.2.2.1	Modify PCB Board	14 days	Thu 9/29/11	Tue 10/18/11
1.4.2.2.2.2	Order and Receive Parts	60 days	Wed 10/19/11	Thu 1/12/12
1.4.2.2.2.3	Order and Receive PCB	30 days	Wed 10/19/11	Thu 12/1/11
1.4.2.2.2.4	Assemble and Test Boards	21 days	Fri 1/13/12	Mon 2/13/12
1.4.2.2.2.6	RDO Preproduction Complete	0 days	Mon 2/13/12	Mon 2/13/12
<b>1.4.2.2.3</b>	<b>Production</b>	<b>109 days</b>	<b>Wed 4/3/13</b>	<b>Thu 9/5/13</b>
1.4.2.2.3.1	RDO Production Design Review	14 days	Wed 4/3/13	Mon 4/22/13
1.4.2.2.3.1	Modify RDO Board Design if necessary	14 days	Tue 4/23/13	Fri 5/10/13
1.4.2.2.3.2	Order and Receive Parts	60 days	Mon 5/13/13	Tue 8/6/13
1.4.2.2.3.3	Order and Receive PCB	45 days	Mon 5/13/13	Tue 7/16/13
1.4.2.2.3.4	Assemble and Test Boards	21 days	Wed 8/7/13	Thu 9/5/13
1.4.2.2.3.5	RDO Production Complete	0 days	Thu 9/5/13	Thu 9/5/13

Critical Items

# FPGA PROGRESS

- FPGAs critical to success of project
- FPGAs for VME and DAQ/Trigger
  - VME design mostly done
  - DAQ/Trigger big question
    - Needs SUBATECH resources
    - Have not received a date when this will be completed
  - Need pinouts for RDO Board development
- Slave FPGA well underway by Micheal
- RDO board needed to test Ladder Board

# DAQ

<b>1.4.2.3</b>	<b>☐ DAQ</b>	<b>411 days</b>	<b>Wed 9/1/10</b>	<b>Mon 4/16/12</b>
<b>1.4.2.3.1</b>	<b>☐ Prototype DAQ</b>	<b>320 days</b>	<b>Wed 9/1/10</b>	<b>Wed 12/7/11</b>
1.4.2.3.1.1	Obtain DAQ Computer for testing	30 days	Mon 8/1/11	Mon 9/12/11
1.4.2.3.1.2	Obtain DRORC Card	1 day	Wed 9/1/10	Wed 9/1/10
1.4.2.3.1.3	Order and receive a TCD	90 days	Fri 4/1/11	Mon 8/8/11
1.4.2.3.1.4	Develop prototype test software	60 days	Tue 9/13/11	Wed 12/7/11
1.4.2.3.1.6	Prototype DAQ Software Complete	0 days	Wed 12/7/11	Wed 12/7/11
<b>1.4.2.3.2</b>	<b>☐ Production DAQ</b>	<b>137 days</b>	<b>Mon 10/3/11</b>	<b>Mon 4/16/12</b>
1.4.2.3.2.8	Design Review	14 days	Thu 12/8/11	Tue 12/27/11
1.4.2.3.2.1	Obtain Second DAQ Computer	30 days	Mon 10/3/11	Fri 11/11/11
1.4.2.3.2.2	Order 2 more DRORC plus 1 spare	90 days	Mon 10/3/11	Wed 2/8/12
1.4.2.3.2.3	Develop Final testing software	60 days	Thu 12/8/11	Fri 3/2/12
1.4.2.3.2.4	Develop DAQ Software	30 days	Thu 12/8/11	Thu 1/19/12
1.4.2.3.2.5	Test Ladders on Bench	30 days	Mon 3/5/12	Fri 4/13/12
1.4.2.3.2.6	Assemble DAQ Computer in DAQ Room	1 day	Mon 4/16/12	Mon 4/16/12
1.4.2.3.2.7	DAQ Complete	0 days	Mon 4/16/12	Mon 4/16/12

At least one TCD high priority

# DAQ COMMENTS

- Using conventional DAQ for STAR
- Minimal technical risk
- Resources for this is minimal
- Tonko will do much of it
- Nevertheless, we need to develop diagnostic software

# TEST SYSTEM

<b>1.4.2.4</b>	<b>[-] Integrated Test System</b>	<b>243 days</b>	<b>Fri 7/1/11</b>	<b>Thu 6/14/12</b>
1.4.2.4.1	Assemble Trigger System(s)	15 days	Tue 8/9/11	Mon 8/29/11
1.4.2.4.2	Obtain Power Supply, VME Crate, Computer	15 days	Thu 11/17/11	Fri 12/9/11
1.4.2.4.3	Obtain Ladder Board and RDO Board	1 day	Fri 9/9/11	Fri 9/9/11
1.4.2.4.4	Define first generation test software	30 days	Fri 7/1/11	Fri 8/12/11
1.4.2.4.5	Provide first generation Slow Control Software	90 days	Mon 9/12/11	Wed 1/18/12
1.4.2.4.6	Test system up to and not including DAQ	90 days	Thu 1/19/12	Thu 5/24/12
1.4.2.4.7	Test including DAQ	14 days	Fri 5/25/12	Thu 6/14/12
1.4.2.4.8	Testing Complete	0 days	Thu 6/14/12	Thu 6/14/12
1.4.2.5	Electronics Complete	0 days	Wed 9/18/13	Wed 9/18/13

# TEST COMMENTS

- Need to purchase minimal elements of power supply soon
  - As soon as we confirm power requirements of Ladder Board
- Slow controls needed soon
- Decide how many systems we need
- Do we need TCD and how soon can we get it?



# 1.4.3 - ASSEMBLY

<b>1.4.3</b>	<input type="checkbox"/> <b>Assembly</b>	<b>765 days</b>	<b>Mon 1/3/11</b>	<b>Thu 1/16/14</b>
<b>1.4.3.1</b>	<input type="checkbox"/> <b>Alignment</b>	<b>716 days</b>	<b>Mon 1/3/11</b>	<b>Thu 10/31/13</b>
1.4.3.1.1	Define Method	15 days	Mon 1/3/11	Mon 1/24/11
1.4.3.1.2	Ship to Alignment Location	15 days	Thu 9/19/13	Wed 10/9/13
1.4.3.1.4	Add brackets to end of ladders	1 day	Thu 10/10/13	Thu 10/10/13
1.4.3.1.5	Measure	15 days	Fri 10/11/13	Thu 10/31/13
1.4.3.1.6	Alignment Complete	0 days	Thu 10/31/13	Thu 10/31/13
<b>1.4.3.2</b>	<input type="checkbox"/> <b>OSC Assembly</b>	<b>314 days</b>	<b>Thu 10/11/12</b>	<b>Thu 1/16/14</b>
1.4.3.2.1	Move or Ship to Assembly Hall	15 days	Fri 11/1/13	Thu 11/21/13
1.4.3.2.2	Install mounting fixtures on ladders	1 day	Mon 11/25/13	Mon 11/25/13
1.4.3.2.4	Install Ladders on OSC	1 day	Tue 11/26/13	Tue 11/26/13
1.4.3.2.5	Install Patch Panels	1 day	Thu 10/11/12	Thu 10/11/12
1.4.3.2.6	Attach Cables on Ladders and Patch Panel	1 day	Wed 11/27/13	Wed 11/27/13
1.4.3.2.7	Temporary Cooling?	1 day	Fri 11/29/13	Fri 11/29/13
1.4.3.2.8	Test System	30 days	Mon 12/2/13	Thu 1/16/14
1.4.3.2.9	Assembly on OSC Complete	0 days	Thu 1/16/14	Thu 1/16/14
1.4.3.3	Ready to Install in STAR	0 days	Thu 1/16/14	Thu 1/16/14

# ASSEMBLY COMMENTS

- Where to do testing?
  - LBNL – requires extra airplane flight
  - BNL – can alignment be done there
- Need to mount carbon elements to SSD ladders
  - LBNL shop can do that
  - Can BNL do it?
- Who will do the translation from measurements to STAR database?

# INFRASTRUCTURE – 1.4.4

- Cables 1.4.4.1
  - Relatively easy to produce
  - Some risk in aluminum cables
    - Should start now
  - Need to have concept of patch panels on OFC and ESC
  - Pick power supply soon so that can develop slow controls
    - Wiener is a good choice
  - Need to start cooling
    - Jim is coming back
  - Slow controls big manpower gap
    - Get hardware
    - Need person soon (within a year)

# SUMMARY

- Current end date is 5/1/14
- Assuming perfect funding and manpower
- Funding
  - We are using R&D funding
  - Need funds at LBNL
  - Project funds
- We are physicist limited
  - Need Slow Controls assistance
  - Also alignment
- Engineering support
  - Develop cost
- Some engineering needed today
- How to do commissioning?
- SUBATECH is not forever
  - No physicist on project
  - New director – not from our field
  - Need resources to complete their contribution
- Funding transfer to LBNL