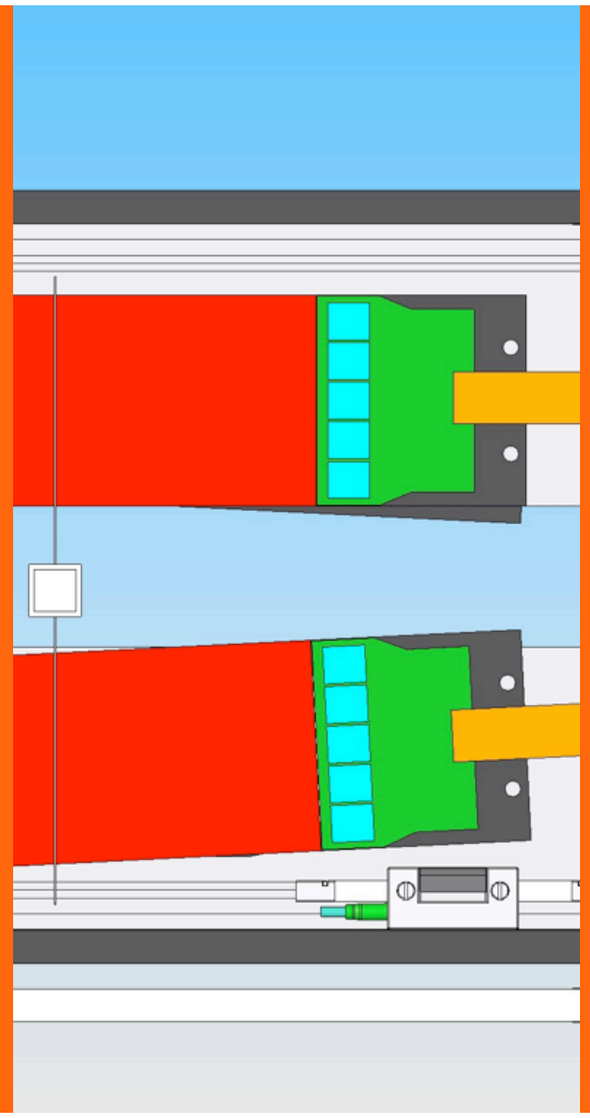
HPS Test Run Tracking and Vertexing: Status and Plans



Tim Nelson - SLAC

HPS Collaboration Meeting - JLab

5/26/2011

Task Assignments

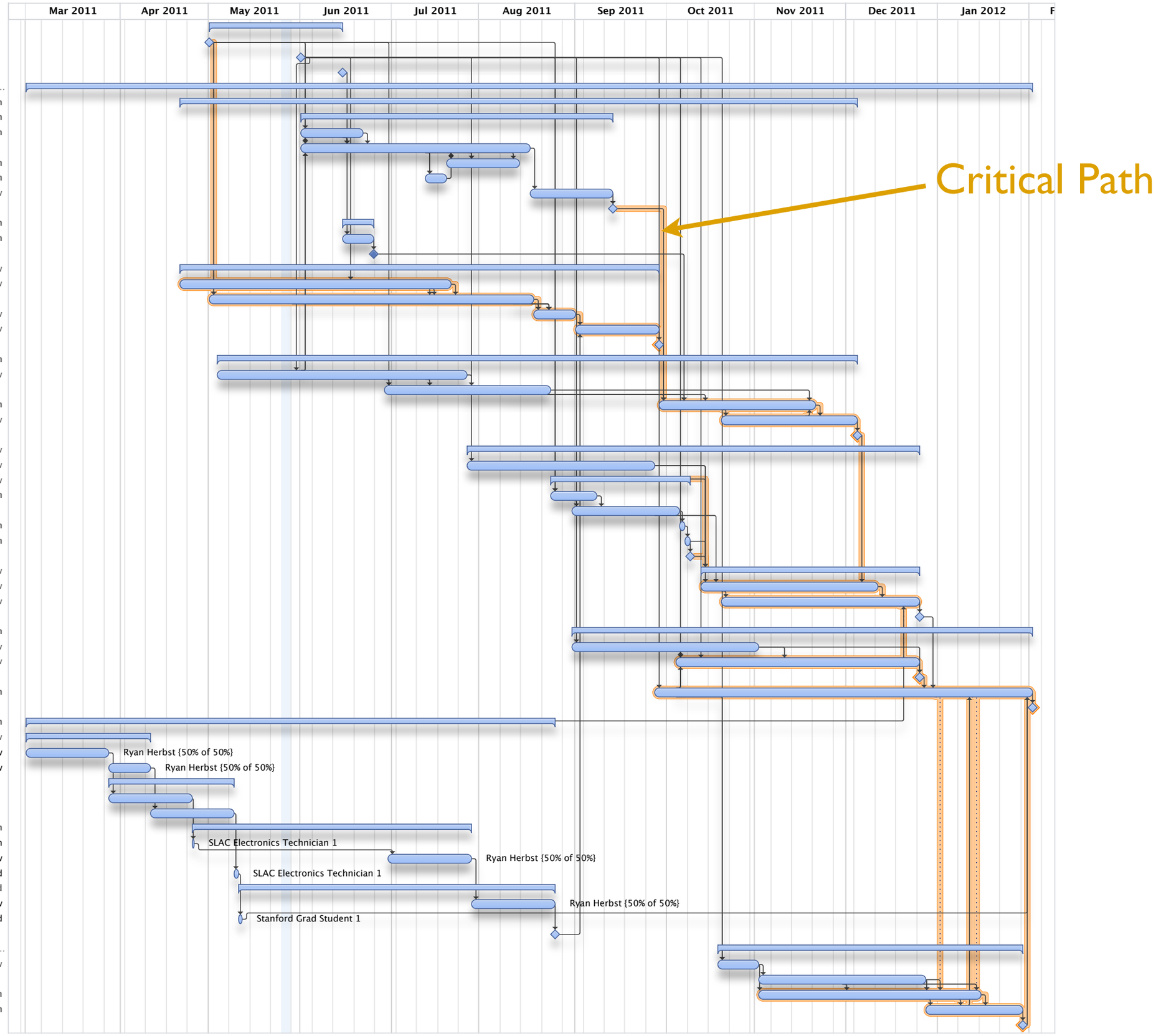
- Hybrid and DAQ Design - SLAC (w/ UCSC)
- DAQ Assembly - SLAC
- DAQ Testing - SLAC (w/ UCSC)
- Hybrid Assembly - UCSC
- Hybrid Testing - UCSC (w/ SLAC)
- Sensor Testing - UCSC
- Mechanical and Cooling Design - SLAC (w/ FNAL)
- Support Fabrication - SLAC (w/ FNAL)
- Module Assembly and Testing - SLAC (w/ UCSC)
- Tracker Assembly and Testing - SLAC (w/ UCSC)

Schedule

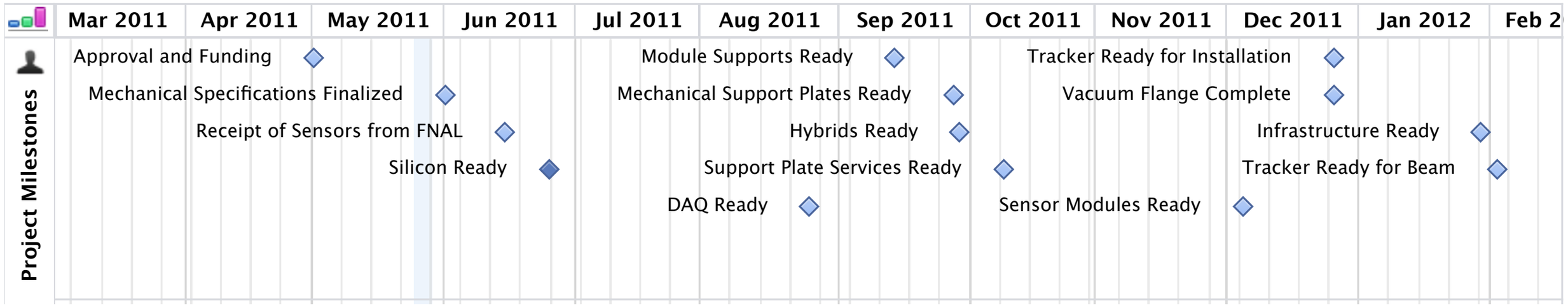
- Time and resources are constrained: important to understand schedule limitations
- Developed a detailed, resource-loaded schedule for delivery of the tracker
- Care has been taken not to “back in” to the schedule from any required completion date.
- In general, this schedule is consistent with other schedule exercises. (e.g. independently developed DAQ schedule from Ryan)
- Good news: there is some float between this schedule and our official schedule, which itself includes some contingency.

http://www.slac.stanford.edu/~tknelson/HPS/Tracker_TR.htmld/

Task	Duration	Effort
1) External Milestones	6w 2d	
1.1) Approval and Funding		
1.2) Mechanical Specifications Finalized		
1.3) Receipt of Sensors from FNAL		
2) Tracking System	48w 1...	76w 1...
2.1) Sensor Modules	32w 2d 4h	38w 3d 6h
2.1.1) Supports	15w	5w 3d 6h
2.1.1.1) Design	3w	1w 2d 4h
2.1.1.2) Procurement	11w	
2.1.1.3) Fabrication	3w 2d 4h	1w 3d 6h
2.1.1.4) Assembly	1w	2d 4h
2.1.1.5) Testing	4w	2w
2.1.1.6) Module Supports Ready		
2.1.2) Silicon	1w 2d 4h	1w 2d 4h
2.1.2.1) Testing	1w 2d 4h	1w 2d 4h
2.1.2.2) Silicon Ready		
2.1.3) Hybrids	23w	16w
2.1.3.1) Design	13w	10w
2.1.3.2) Procurement	15w 3d	
2.1.3.3) Assembly	2w	2w
2.1.3.4) Testing	4w	4w
2.1.3.5) Hybrids Ready		
2.1.4) Integration	30w 3d 4h	15w 2d 4h
2.1.4.1) Design	12w	6w
2.1.4.2) Procurement	8w	
2.1.4.3) Assembly	7w 2d 4h	3w 2d 4h
2.1.4.4) Testing	6w 2d 4h	6w
2.1.5) Sensor Modules Ready		
2.2) Support Plates	21w 3d 4h	10w
2.2.1) Mechanicals	9w	3w
2.2.2) Services	6w 3d 4h	2w
2.2.2.1) Design	2w 1d	1w 2d 4h
2.2.2.2) Procurement	5w 1d	
2.2.2.3) Assembly	1d 2h	1d 2h
2.2.2.4) Testing	1d 2h	1d 2h
2.2.2.5) Support Plate Services...		
2.2.3) Integration	10w 2d 4h	5w
2.2.3.1) Assembly	8w 2d 4h	2w
2.2.3.2) Testing	9w 2d 4h	3w
2.2.4) Tracker Ready for Installation		
2.3) Vacuum Chamber	22w 5.5h	8w 1d 2h
2.3.1) Mechanicals	9w	2w
2.3.2) Services	11w 3d 4h	4w
2.3.3) Vacuum Flange Complete		
2.3.4) Integration	18w 5.5h	2w 1d 2h
2.3.5) Tracker Ready for Beam		
2.4) DAQ	25w 2d	7w 2d 4h
2.4.1) Design	6w	3w
2.4.1.1) Readout Board Design	4w	2w
2.4.1.2) Combined Cable Design	2w	1w
2.4.2) Procurement	6w	
2.4.2.1) Readout Boards	4w	
2.4.2.2) Combined Cables	4w	
2.4.3) Assembly	13w 2d	2w 1d 4h
2.4.3.1) Readout Board Assembly	4h	4h
2.4.3.2) Readout Board...	4w	2w
2.4.3.3) Combined Cable Assembly	1d	1d
2.4.4) Testing	15w 1d	2w 1d
2.4.4.1) Readout Board Testing	4w	2w
2.4.4.2) Combined Cable Testing	1d	1d
2.4.5) DAQ Ready		
2.5) Infrastructure	14w 3...	11w 3...
2.5.1) Design	2w	1w
2.5.2) Procurement	8w	
2.5.3) Assembly	10w 3...	6w 1d 0.5h
2.5.4) Testing	4w 3d 1.5h	4w 2d 4h
2.5.5) Infrastructure Ready		



Key Milestones



- Produced a set of key milestones from completion of major tasks
- Quite a lot has to happen this Summer to meet flurry of milestones in the Fall

Critical Path Items

- Critical path: Hybrid and DAQ
  Limited by effort available from Ryan and others in Haller group.

- Close behind: Mechanical and Cooling systems (esp. module supports)
  Limited by effort available from Marco and FNAL.

Not much can be done elsewhere to speed things up, so it is important to keep the pipeline full on these tasks and find shortcuts on them that reduce schedule risk wherever possible.

Status and Plans

Work is underway in a number of areas

- Silicon testing and qualification
- DAQ design
- Mechanical and cooling design
- *Software*

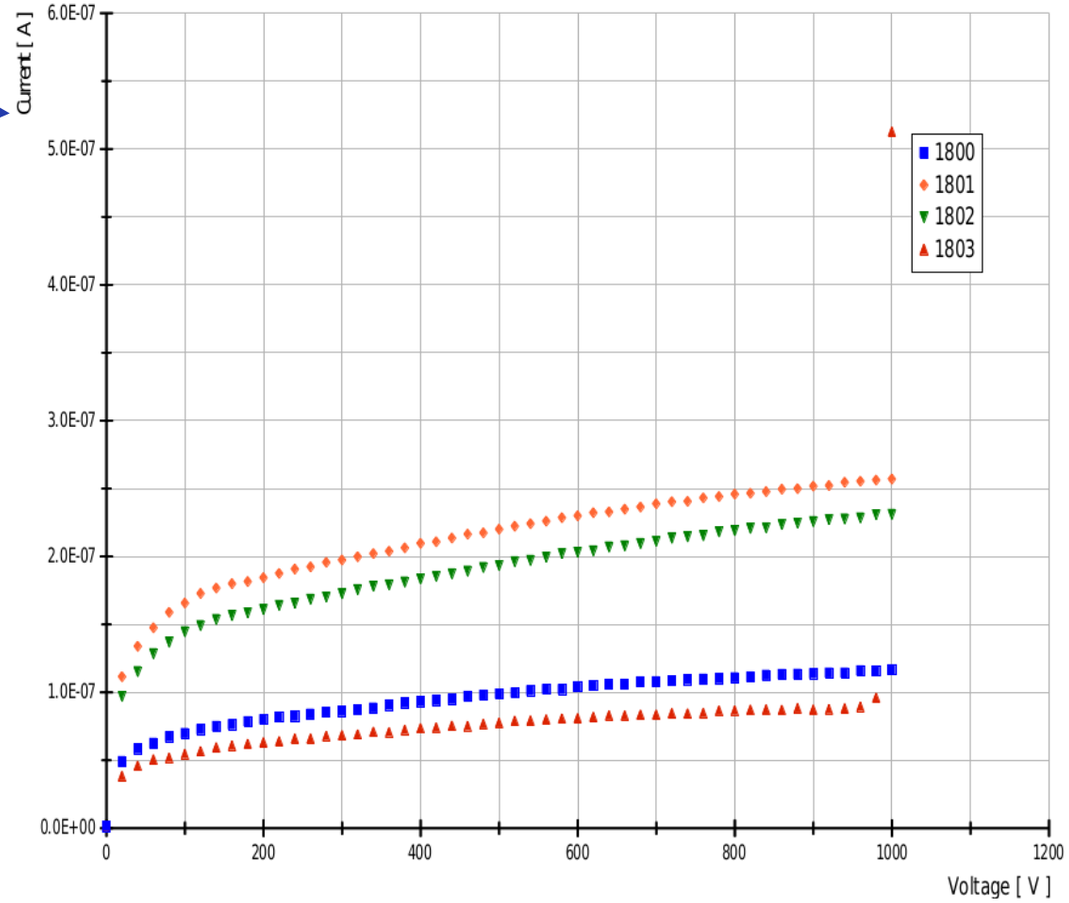
Silicon Status

UCSC

- CV Curves: bias voltages
  Will be able to operate most if not all of test run at 150V bias.

Sensor	Full Depletion Voltage [V]	Full Depletion Voltage + 10% [V]
1800	132.4	145.64
1801	135.5	149.05
1802	135.0	148.5
1803	132.6	145.86

- IV Curves:
  leakage currents and breakdown voltages
  Quality of sensors for radiation tolerance appears excellent



- Wirebonding Tests:
  Ensure that metallization on sensors in long-term storage at FNAL still in good condition:
  Sensors appear fine.

Silicon Plans

UCSC

- Reached same conclusion as D∅ Run IIb effort:
  testing presents greater hazards to channel yield than building and selecting best modules.
- Will only perform IV curves to identify sensors meeting highest breakdown voltage specification.
- Can have silicon tested and ready within a few weeks.

Hybrids and DAQ Status SLAC

- Draft hybrid schematic is under review
  - https://confluence.slac.stanford.edu/display/hpsg/Hybrid
- RTM schematic is under review and in layout queue
  - https://confluence.slac.stanford.edu/display/hpsg/RTM

Comments on both currently being collected on confluence to move designs forward as quickly as possible.

Hybrids and DAQ Plans SLAC

- Hybrids
  - After schematic approval, work on layout and mechanical design begins: requires close collaboration between Ryan and Marco.
  - Met with Geoff Hall Monday at CERN and have agreement to purchase APV25 chips as soon as payment can be arranged
- RTM
  - After schematic approval and layout complete, goes to fabrication. It's a big board and layout takes time...
  - A mini-RTM (single-hybrid readout) is planned so DAQ testing and development can continue while full RTM proceeds in parallel.

Mechanical Design Status SLAC

- Conceptual design is as complete: full design requires concrete specs
- Cooling and Mechanical Specifications: under review and taking comments
  - https://confluence.slac.stanford.edu/display/hpsg/Mechanical+and+Cooling+Specifications+-+*DRAFT*
- Fabrication of CF-composite for module supports: FNAL
  - Discussing with Bill Cooper regarding fiber specifications and layup requirements for module supports.
  - Must determine if necessary material is in hand or needs to be ordered.

Mechanical Design Plans SLAC

- With final specs, Marco will complete modeling and calculations necessary to engineer details and validate solutions.
- FNAL will acquire materials (if not in hand) and begin fabrication of required sheets of CF-composite.
- Want to have support prototype in hand by the time we have hybrids so we can proceed immediately to module assembly
- Design and fabrication of assembly fixtures is last major task: very important not to overlook this.

Summary

- Aggressive but realistic schedule for completion of tracker
- Critical path items are clearly identifiable and receiving special emphasis
- Greatest risk is major design flaw that would require fundamental changes: most likely somewhere in the hybrid or DAQ.

  Important to have working prototypes ASAP.
- Software is also an important piece. A few projects are focal points for the tracking system. These will be discussed further in software sessions.