



# Run IIb DZero PMG February '03 Status Period

- Overview, issues (Kotcher)
- Schedule status (O'Dell)
- AOB

Jon Kotcher  
Fermilab PMG  
April 1, 2003



# Run I Ib Project Organization

DO Run I Ib Project  
 J. Kotcher, Project Manager  
 R. Partridge, Deputy; V. O'Dell, Associate; W. Freeman, Assistant  
 M. Johnson, Technical Coordinator  
 A. Amorn-Vichet, Budget Officer; T. Erickson, Administration

**WBS 1.1**  
 Silicon  
 M. Demarteau  
 G. Ginther

1.1.1 Sensors  
 R. Demina, F. Lehner

1.1.2 Readout System  
 A. Nomerotski, E. von Toerne

1.1.3, 1.1.5 Mechanics & Assembly  
 W. Cooper, K. Krempetz

1.1.4 Production  
 J. Fast

1.1.4 QA, Testing, & Burn-in  
 C. Gerber

1.1.6 Monitoring  
 M. Corcoran, S. de Jong

1.1.7 Software & Simulation  
 F. Rizatdinova, L. Shabalina

1.1.8 Administration  
 (M. Demarteau)

**WBS 1.2**  
 Trigger  
 H. Evans  
 D. Wood

1.2.1 L1 Cal Upgrade  
 M. Abolins, (H. Evans),  
 P. LeDu

1.2.2 L1 Cal/Track Match  
 K. Johns

1.2.3 L1 Track Trigger  
 M. Narain

1.2.4 L2β Upgrade  
 R. Hirosky

1.2.5 Silicon Track Trigger  
 U. Heintz

1.2.6 Simulation  
 M. Hildreth, E. Perez

1.2.7 Administration  
 (D. Wood)

**WBS 1.3**  
 DAQ/Online  
 S. Fuess  
 P. Slattery

1.3.1 Level 3 Systems  
 D. Chapin, G. Watts

1.3.2 Network & Host  
 Systems  
 J. Fitzmaurice,  
 S. Krzywdzinski

1.3.3 Control Systems  
 F. Bartlett, G. Savage,  
 V. Sirotenko

1.3.4 DAQ/Online  
 Management  
 (P. Slattery)

**WBS 1.4**  
 Project  
 Administration

**WBS 1.5**  
 Installation  
 R. Smith

1.5.1 Silicon Installation  
 Mechanical:  
 H. Lubatti  
 Electronics:  
 L. Bagby, R. Sidwell

1.5.2 Trigger Installation  
 D. Edmunds

- George Ginther is new silicon co-leader
- Eckhard von Toerne is new silicon readout co-leader (replaces Bill Reay)
- Arisara Amorn-Vichet, new Budget Officer
- Kurt Krempetz, K. Hanagaki plenary speakers



# Two Upcoming Manpower Issues

- Replacement being sought for Hal Evans as WBS Level 2 Trigger Manager
  - ◆ Hal is driving Level 1 Calorimeter Trigger effort
  - ◆ Is only person with dual role (WBS L2 & 3) in upgrade
  - ◆ Other constraints on his time are growing, particularly over next years
  - ◆ Most critical that he remain in the WBS Level 3 (L1 Cal) position
  - ◆ Candidates identified
- Run IIb Commissioning Plan, Coordinator
  - ◆ "Physics-to-physics" downtime very tight
  - ◆ All downstream elements must be in place to ensure physics-readiness in under 10 months total
    - ▲ Databases, calibrations, filters, online monitoring/diagnostics, trigger efficiencies, etc.
    - ▲ Baseline shutdown begins 3 years (Mar '06)
      - Beam downtime ~ 7 months
  - ◆ Will require adiabatic investment from collaboration beginning <CY04
  - ◆ Am looking to appoint Run IIb Commissioning Coordinator
  - ◆ Outline of initial plan will be presented at Beaune Workshop in June (Partridge)



# First Change Controls

- Two change controls, of very different character, have come up in last few weeks:
  - ◆ Silicon Module Production Begun (baseline milestone: 5/17/04)
    - ▲ Partially an oversight in inter-task linking in original baseline schedule
    - ▲ Form in hand for signature
    - ▲ Vivian will describe in more detail
  - ◆ Design Change in Level 1 Calorimeter Trigger
    - ▲ Described later in talk
    - ▲ Dealt with formally in next status cycle (March)
- Both illustrative of process



# Silicon Sensors

- Layer 2-5 (Outer Layer) Sensor Production Readiness Review
  - ◆ Held March 6, 2003
  - ◆ Committee comments:
    - ▲ Sound design
    - ▲ One sensor type for outer layers greatly simplifies testing and production
    - ▲ Impressed by overall effort in sensor design and technical specs, and detailed QA program planned
    - ▲ Outer sensors will be robust against radiation damage for expected Run IIb luminosities
- Committee Report:
  - ◆ [http://d0server1.fnal.gov/projects/run2b/Management/PRRs/d0si\\_prr2003\\_report.pdf](http://d0server1.fnal.gov/projects/run2b/Management/PRRs/d0si_prr2003_report.pdf)
- Hangs off general DZero Run IIb Management Web Page:
  - ◆ [http://d0server1.fnal.gov/projects/run2b/Management/Posted\\_Info/Management\\_web.htm](http://d0server1.fnal.gov/projects/run2b/Management/Posted_Info/Management_web.htm)
- Are pushing, preparing for Layer 0 and 1 procurements mid-April (HPK)
  - ◆ Tacked on to existing outer layer order
  - ◆ Radiation testing, flux calculations more exacting here
  - ◆ Will be reviewed
- Remainder of status from Vivian...



# Recent Procurement Experience

- Two major procurements hit runway simultaneously in last two months:
  - ◆ SVX4 2<sup>nd</sup> prototype (Institute of Physics, Academia Sinica, Taiwan)
    - ▲ CDF+DZero: \$174k (present prototype) + \$515k production (Fall '03)
  - ◆ Outer layer sensors (Hamamatsu)
    - ▲ DZero only: \$1.45M
  - ◆ After some investigation, and despite somewhat different character, both are considered sole-sourced & foreign (and >\$100k)
  - ◆ Case must adequately outline how Buy America Act has been satisfied for each
    - ▲ No formal advertising done
  - ◆ Both procurements apply to both experiments
  - ◆ Both at or near critical path
- Much of what we need is known, but had to be pulled together
- In each case (sensors, SVX4), schedule-driven nature of projects stressed in Procurement Memorandum



# Procurement

- **SVX4**
  - ◆ 1<sup>st</sup> prototype handled through Mosis (California)
  - ◆ Current supplier is Institute of Physics, Academia Sinica (AS), Taiwan
    - ▲ CDF collaborator -> MoU-driven
  - ◆ Taiwan Semiconductor (TSMC) is manufacturer in either case
    - ▲ 0.25 $\mu$ m CMOS technology, rad-hardness
    - ▲ Design tools, approaches are foundry-specific
  - ◆ Primary issue is justification of foreign sole source:
    - ▲ as physicists on upgrade, and due to their proximity to TSMC, AS uniquely qualified to oversee this fabrication
- **Outer layer sensors**
  - ◆ Not MoU-driven, straight procurement through FNAL
    - ▲ Source(s) of money for each experiment varies - a detail
  - ◆ Flesh out following:
    - ▲ Less-than-favorable IIa experience with Micron (both)
    - ▲ Positive IIa Hamamatsu performance (CDF)
    - ▲ Clearly describe search for US vendors (DZero - IIa)
    - ▲ Request For Proposal (RFP) for IIb prototypes (CDF - HPK+ST)
  - ◆ It has (since) been decided to submit CDF & DZero orders together



# Procurement

- **Status:**
  - ◆ **SVX4 package complete & driven to CH Office Fri, Mar 28**
    - ▲ Signatures complete ~ Mar 12
    - ▲ SVX4 technically ready for submission Mon, Mar 24
    - ▲ Pre-discussions with CH lawyers have been positive, but not done yet...
  - ◆ **DZero sensor order complete week of Mar 24, CDF order being completed now**
  - ◆ **Both will be submitted to CH after final vetting today/tomorrow**
    - ▲ Note that Bob C. is doing all of these procurements! (in between NuMI, other commitments)
      - This should be addressed
- **Is taking collaboration, cooperation of many people to get this through:**
  - ◆ **Carlson, Chapman, Cibic, Collins, Huite, Kotcher, Leonard, Lukens, Miller, Monhart, Philp, CH Office personnel**
  - ◆ **Critical ingredient: such collaboration must continue throughout lifetime of project if we are going to make this work as it will need to**
- **Everyone has been learning, good performance after initial shock wave**



# Procurement

- Upcoming sole-sourced foreign orders:

Item	Company	Anticipated Procurement Date	Amount (FY02 k\$)	Comments
LO & L1 sensors	Hamamatsu (Japan)	Apr '03	310	Will be tacked on to outer layer sensor order
Analog cables	Dyconex (Swiss)	Sep '03	167	
Low Voltage Power Supplies	Wiener (Germany)	Fall '03	40	
Engineering & production for L1 Cal Trigger	Saclay (MoU/SoW)	Jul '03	554	MoU/SoW relevant here?
<b>TOTAL</b>			<b>1,071</b>	



# Run IIb MoUs/SoWs

- Project intending to sign MoUs/SoWs with every institution providing deliverables for Run IIb, regardless of source of support
  - ♦ Delineate begin/end of responsibilities, boundaries
- First priority goes to those needing transfer of project funds in FY03
- MoUs/SoWs required this year for EQU \$ transfer:

Institution	Sub-project	Sub-system	Date Needed	Amount (FY02 k\$)	Status
Louisiana Tech	Silicon	Cable testing	7/25/03	1	Signed, account set up
Arizona	Trigger	Level 1 Cal/Track Match	2/28/03	201	Signed, account set up
Kansas State	Silicon	Silicon electronics & sensor testing, procurement	6/13/03	733	Submitted, in final negotiation
Washington	Silicon	Layer 0, 1 support structures	4/10/03	216	Submitted, in final negotiation
Boston	Trigger	Level 1 Track Trigger	4/01/03	340	Submitted, in final negotiation
Columbia	Trigger	Level 1 Cal Trigger	4/01/03	198	In final preparation
Stony Brook	Trigger	Silicon Track Trigger	4/01/03	56	In preparation
Rice	Silicon	Temperature monitoring	3/24/03	29	In preparation



# WBS 1.2: Trigger Upgrades

## Level 1 projects underway

- Level 1 Calorimeter
- Level 1 Cal-track matching
- Level 1 Tracking
- Trigger simulations

## Level 2 projects (not discussed here)

- L2 Beta upgrade & STT upgrade
- Later start in schedule
- VTM's procured for STT (part of larger order)

Upcoming major milestone:  
July '03 summer integration test  
of prototype L1 Calorimeter  
components

WBS 1.2: Trigger Upgrade  
H. Evans (Columbia), D. Wood (Northeastern)

WBS 1.2.1: Level 1 Calorimeter  
M. Abolins (MSU), H. Evans (Columbia),  
P. LeDu (Saclay)

WBS 1.2.2: Level 1 Cal-track match  
K. Johns (Arizona)

WBS 1.2.3: Level 1 Tracking  
M. Narain (Boston)

WBS 1.2.4: Level 2 Beta upgrade  
R. Hirosky (Virginia)

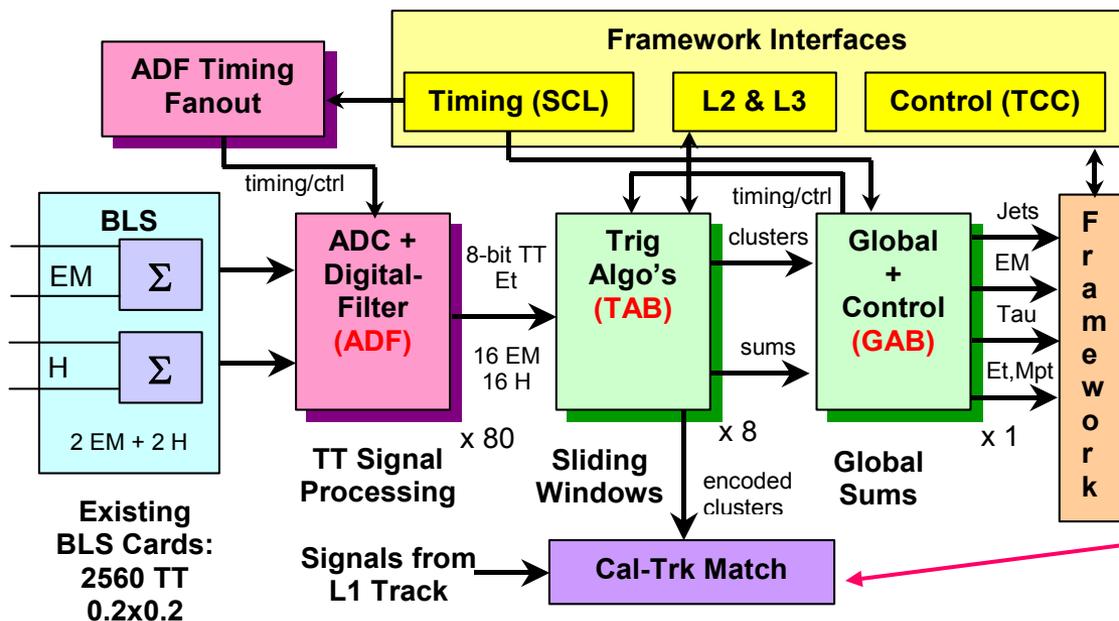
WBS 1.2.5: Level 2 STT upgrade  
U. Heintz (Boston)

WBS 1.2.6: Trigger Simulation  
M. Hildreth (ND), E. Perez (Saclay)



# WBS 1.2.1: Calorimeter Trigger Upgrade

- **Saclay**
  - ◆ ADC+Digital Filter (ADF)
  - ◆ ADF timing distribution board
  - ◆ Analog splitter (for in-situ tests)
  - ◆ ADF Crate/backplane
- **Nevis**
  - ◆ Trigger algorithm board (TAB)
  - ◆ Global Algorithm Board (GAB)
  - ◆ Crates for TAB/GAB
  - ◆ Test system for ADF-to-GAB cables
- **Michigan State**
  - ◆ Interfacing to existing system, framework
  - ◆ Infrastructure

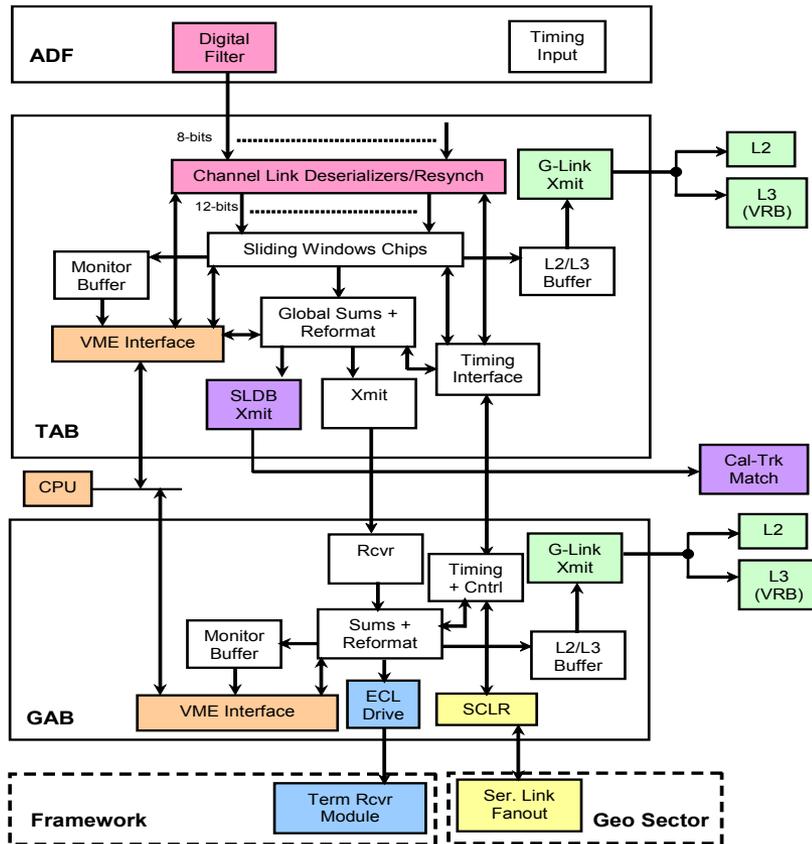


L1 Cal/Track Match:  
University of Arizona



# Current TAB/GAB Architecture

16-Jan-03



- TAB I/O is Fierce

Signal	I/O	Cables	Where
Power	I	Bus	Rear
ADF TTs	I	30	Rear
Cal-Track	O	3	Front
L2/L3	O	1	Front
Timing (SCL)	I	1	Front
VME	I/O	1	Front

- Lots of Traces on Board
  - 11 768-pin FPGAs +...
- No room for:
  - standard VME
  - SCL mezzanine
- GAB (currently) Deals w/ This
  - Trigger Functions
  - VME Interface
  - SCL Interface



# Testing the TAB Prototype

- Goal: have TAB ready for July Integration
- Problem: TAB Layout Difficult
  - ◆ Layout Tool (pads) barely up to the Task
- TAB Testing Stages at Nevis
  1. Electrical/FPGA tests Signal Tap
  2. Test Data Readback VME
  3. Test Data w/ Simple Timing Fake SCL
  4. Output to GAB GAB
- Full GAB Functionality not Required until 4)
  - ◆ integration w/ ADFs only uses 1) - 3)
- Solution: Split GAB into Two Boards
  1. VME/SCL Interface - very simple
  2. GAB - lives in TAB crate, similar interfaces



# The New System

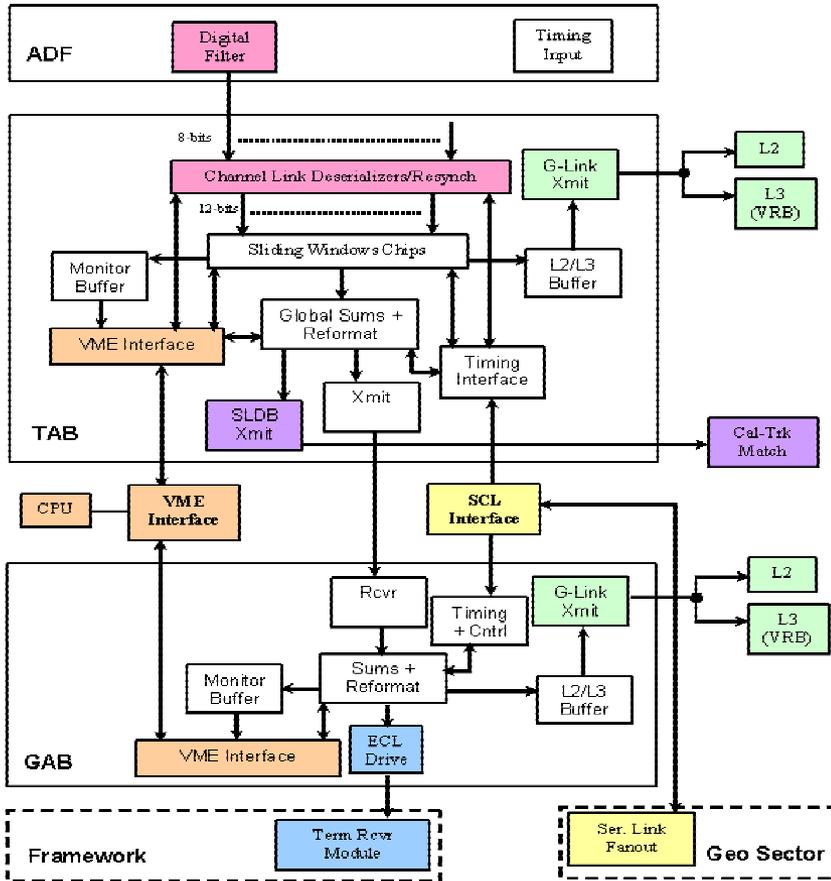
5-Mar-03

## Advantages

- TAB → July Integr. Test
  - ◆ comp's necessary for TAB tests avail. when needed
  - ◆ impossible w/out changes
- Simplifies Design
  - ◆ GAB Layout easier
  - ◆ GAB testing easier
  - ◆ Maintenance easier

## Disadvantages

- Cost ? No...
  - ◆ orig: proto=\$12K; prod=\$8K
  - ◆ additional proj cost ~\$4K
- Is an overall advantage:
  - ◆ Engineering ~same
  - ◆ Comp's ~same as orig. est.
  - ◆ Fabrication signif. easier





# Prototype Schedule

Item	Old Sched	New Sched
TAB Assembled	3/14/03	5/9/03
TAB Bench Tested	5/16/03	7/15/03
GAB Assembled	4/11/03	6/24/03
GAB Bench Tested	7/15/03	8/29/03
VME/SCL Interface Assembled	—	5/2/03
VME/SCL Interface Tested	—	7/15/03
Start Integration Test	7/16/03	7/16/03
End Integration Test	10/8/03	10/8/03

Production Schedule Unaffected

## Current Status

- VME/SCL
  - ◆ design ~ done; schematics ~ done; layout started
- TAB
  - ◆ layout nearly done; enhanced monitoring added → easier testing



# Subsequent discussions

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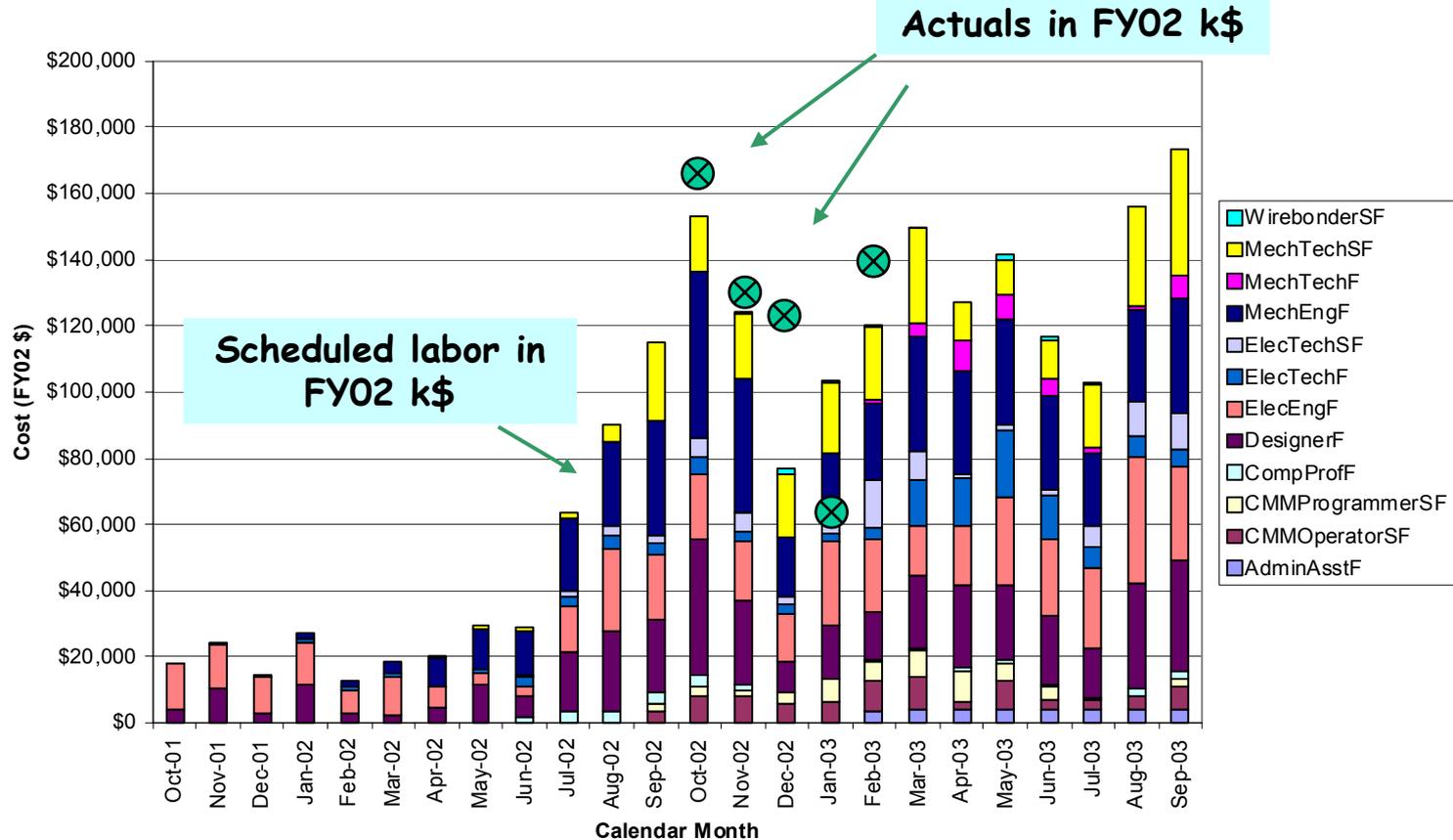
- Examined the possibility/desirability of having other groups design & build one of the new boards (e.g. SCL interface).
- Evaluated at engineering resources available at Nevis.
- Conclusion: pursue both "GAB" boards at Nevis
  - ◆ Best strategy for staying on schedule for Summer integration tests
  - ◆ Easier coordination
- First Results
  - ◆ Work on VME/SCL Interface proceeding at record pace



# Labor Cost Extracted from Schedule vs. Actuals (R&D)

Through Feb '03

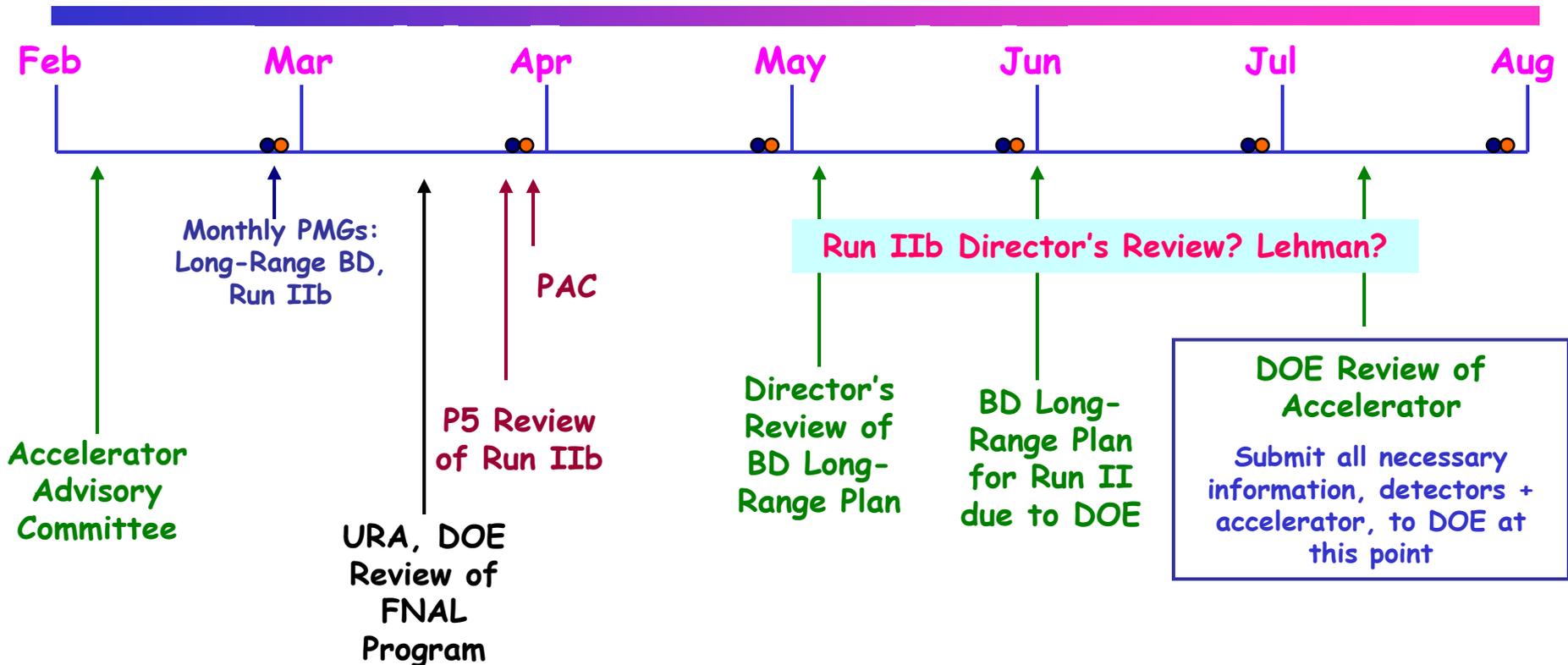
FNAL Technical Labor  
All Funding Sources  
FY02 & FY03



Actual labor costs track those in schedule



# Toward FY04



- Approval for continued Run IIb funding must be in place by Sep '03
- What's required for this, and when?
  - ◆ Director's Review (?)
  - ◆ Lehman Review (CD-3b) (?)
  - ◆ Signatures, processing on DOE end (yes)
  - ◆ P5 report (yes - should be in hand)
  - ◆ All completed in time to allow for unabated funding...



# Comments, Conclusions

- Project is dynamic entity, will evolve until completion
  - ◆ Major managerial assignments, other labor
  - ◆ Collaboration involvement
  - ◆ Adequate flexibility of technical designs
- Technical progress continues to be very good, although not as fast as is/will be required
  - ◆ Intrinsically difficult problem, are increasingly turning to this
- Still learning from Run IIa systems
  - ◆ Impacting Run IIb design decisions
- Understanding, developing project machinery still in process
  - ◆ COBRA does some very fascinating things, still learning here
  - ◆ Huge overhead
- SVX4, sensor procurement experience very valuable, will facilitate purchases that follow
  - ◆ Making available additional procurement manpower at peak times would help
- Beginning to implement change controls



# Level 1 Trigger Highlights

- Prototype design phase concluded for three major boards in Level 1 trigger upgrade:
  - ◆ Level 1 Calorimeter Trigger
    - ▲ ADC-Digital Filter Board (ADF) - Saclay
    - ▲ Trigger Algorithm Board (TAB) - Columbia University
    - ▲ 2/3 of the PCBs required for L1 Cal
      - Remaining Global Algorithm Boards (GAB) being completed
  - ◆ Level 1 Calorimeter/Track Match
    - ▲ Flavor Board (MTFB)
  - ◆ Layouts begun
- Analog splitter installed during January shutdown in Level 1 Cal rack at DZero Assembly Building, Movable Counting House
  - ◆ Picks off in-situ signals from four trigger towers
  - ◆ Data will be taken, analyzed during next few months
  - ◆ Preparation for tests of full L1 Cal prototype chain (ADF, TAB, GAB), beginning this summer



# Adhering to Schedule

- Creating, maintaining a schedule and using it to monitoring progress is only initial step
- Essential that next step be taken: extract lessons learned from slippages, implement corrective actions where possible. Anticipate project needs well in advance.
- Project has begun to turn this corner
- Schedule being taken with increasing seriousness, attentiveness by all principals
- This is a major step, will continue until we've finished