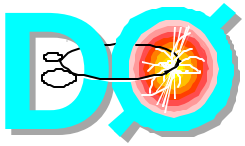


D0 Run 2b Project

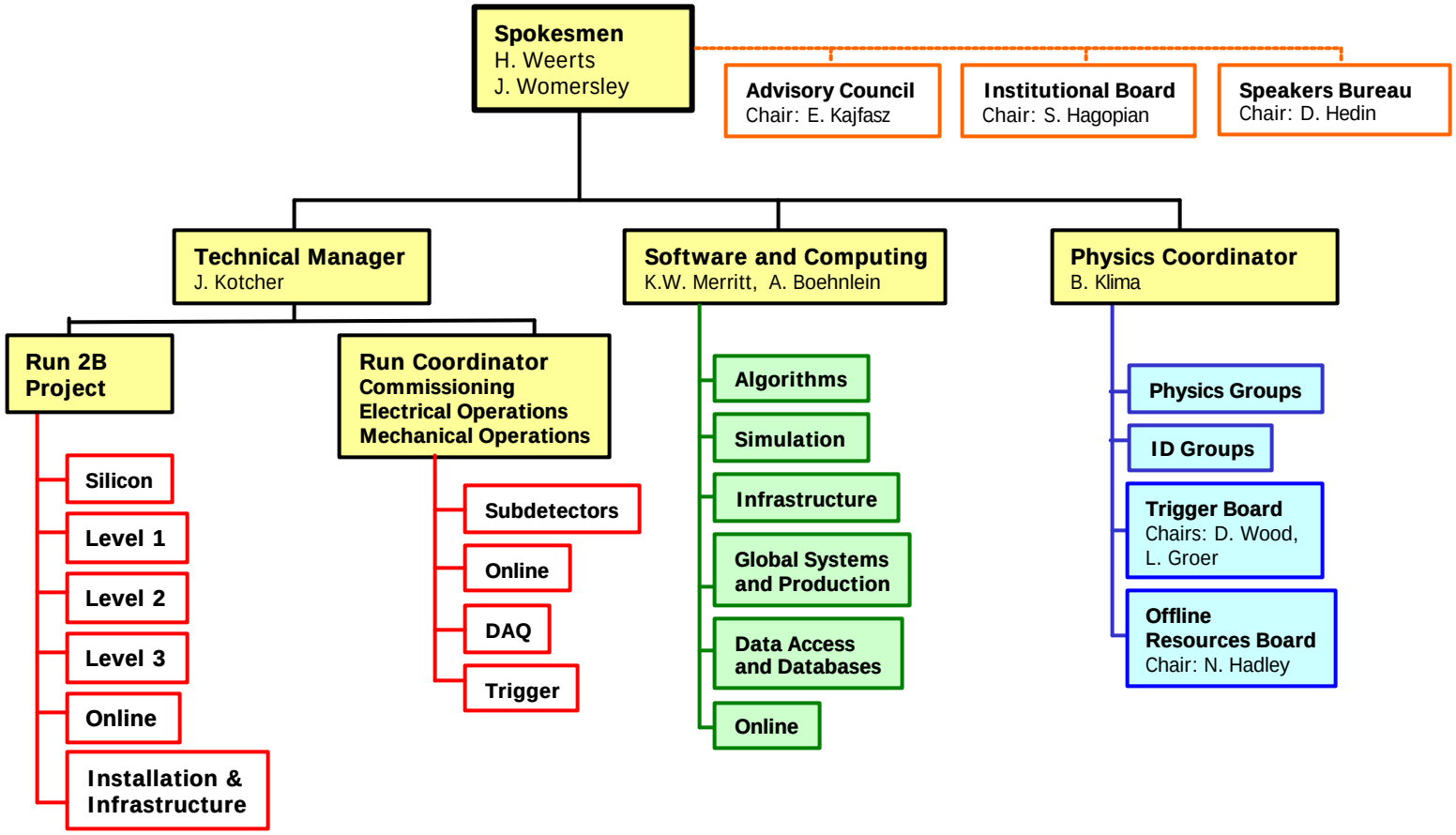
- Project organization
- Highlights since last review
- Outline of preliminary budget
- Observations
- Conclusions

Jon Kotcher

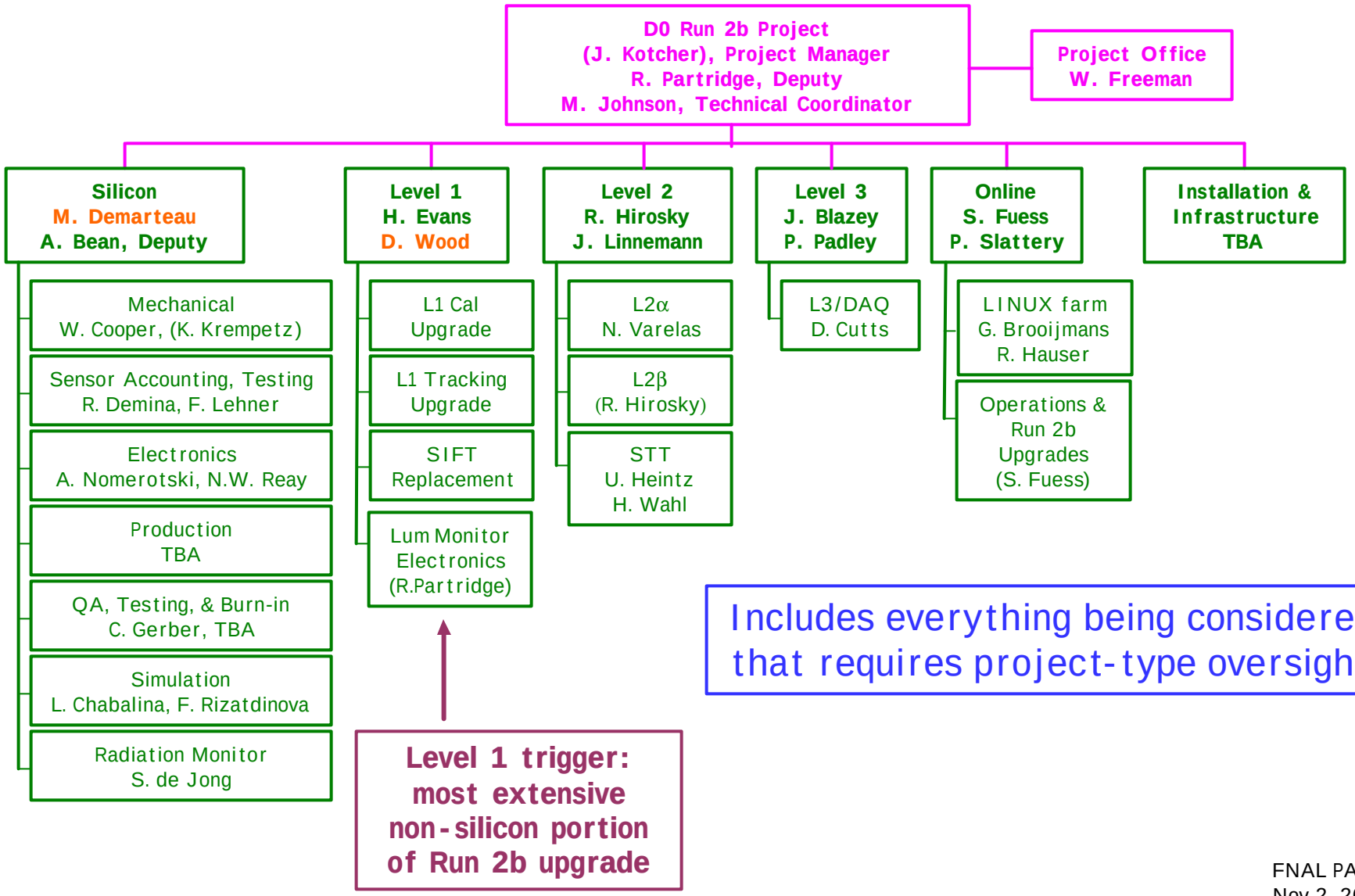
Fermilab PAC Meeting

November 2-4, 2001

D0 Experiment Organization



Run 2b Project Organization



Highlights Since Last Review

- All WBS Level 2 Sub-Project Managers in place
  - Mix of past D0 project experience, fresh blood
  - Most silicon sub-task managers identified
    - Strong group, actively collaborating on new design
  - Level 1 trigger sub-tasks remain to be assigned
    - Much interest within collaboration to participate
    - Designs approaching closure
- Thoughts on how to approach 5E32, 15 fb^{-1} have greatly matured
- Major features of silicon design fully fleshed out:
  - Improved impact parameter resolution
    - Layers 0&1, axial only
  - Maintain good pattern recognition, stand-alone tracking
    - Layers 2-5, axial + stereo
  - Simplicity, conservative approach:
    - Live within existing cable plant, reuse interface boards
    - Limit number of modules – 2 (axial+stereo) X 3 types (L2-5)
    - On-board electronics wherever possible (analog cables)
    - >15 fb^{-1} L0&1, >25 fb^{-1} outer layers
    - L0&1 mechanically distinct – staging if needed, future replacement?

Highlights Since Last Review

Silicon End Game

Dates obtained from Run 2b silicon schedule

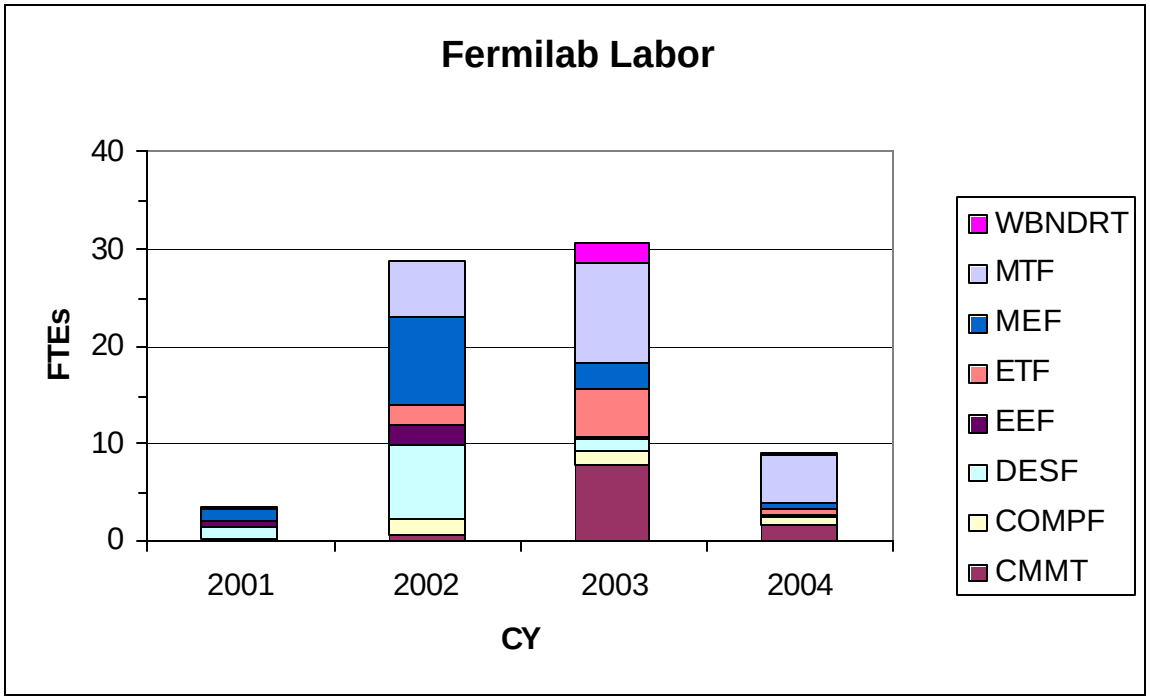
Activity	Date	Duration wrt previous task
Shutdown begins	May 11, 2004	-
Silicon ready to move to DAB	Aug 06	12 weeks
Silicon installed in Fiber Tracker	Aug 24	2 weeks
Silicon cabling, commissioning begins	Sep 08	2 weeks
Commissioning complete, ready to close	Nov 17	10 weeks
TOTAL SHUTDOWN DURATION		6.5 MONTHS

Timing, duration of shutdown driven by silicon
Ample time for installation of upgraded Level 1 trigger (2-3 months)

Highlights Since Last Review

Fermilab technical manpower needed, by type, for silicon project
(physicists not included)

FNAL Resources	Person-yrs
CMM Tech	10.1
Computing Prof.	3.9
Designer/Drafter	9.9
Electrical Engineer	3.2
Electrical Tech	7.6
Mechanical Engineer	13.3
Mechanical Tech	21.5
Wire Bonder	2.4
Total Person Yrs	72.0



Extracted from resource-loaded silicon schedule

Highlights Since Last Review

- **Run 2b triggering needs greatly clarified**
  - **Run 2b Trigger Task Force**
    - **29 members, first convened June 25, 2001**
    - **Charge: investigate triggering in higher-rate environment (5E32)**
    - **Provided basis for Run 2b Trigger Conceptual Design Report (CDR)**
  - **CDR covers all aspects of trigger needs, from present through Run 2b**
  - **Level 1, Silicon Track Trigger are primary focus for 5E32 running**
  - **Review of SIFT replacement project on Sep 25, '01**
- **Like silicon, trigger upgrades being approached as conservatively as possible:**
  - **Exploit existing designs, systems, experience**
  - **Effort to find alternatives to designs that require broad replacements of infrastructure**
  - **Carefully crafting sub-projects, assignments, & responsibilities**
  - **As machine comes up, use Run 2a data to provide quantitative guidance - modify course if necessary**
- **Maintain high p_T program through 2007+ in most economic manner, define path that maximizes likelihood of successful completion**

Run 2b Project Cost

Prior to 5E32 running

Sub-Project	M&S ($k)	Contingency (%)	Total ($k)	Fiscal Year Needed	Comments
*SIFT replacement	873	41	1,232	FY02-03	Needed for 132 nsec; includes two full ASIC submissions
Level 2b	411	37	562 (192 identified)	$370k in FY02	$370k is estimate of full project cost
Commercial DAQ system	449	50	675	FY02-03	If needed; decision by end CY01
TOTAL	$1,733k	31	$2,277k (incl DAQ option)		$192k identified funds in L2b removed

Manpower excluded unless otherwise noted
Assumes July '04 Run 2b shutdown, 132 nsec changeover at end CY03
***Changed since CDR**

Run 2b Project Cost

Preparation for 5E32 running

Sub-Project	M&S ($k)	Contingency (%)	Total ($k)	Fiscal Year Needed	Comments
Silicon	8,101	42	11,519	FY02-04 ($4,239k in FY02)	FY02: sensors, electronics, mechanical D0 NSF MRI: $(1.7+0.7)M
Level 1 Calorimeter Trigger	726	100	1,452	FY03-04	Excludes $100k R&D in FY02
* Level 1 Cal/Track Matching	100	50	150	FY02-03	Utilize existing Run 2a Muon Trigger Cards
Level 1 Track Trigger	360	50	540	FY03-04	Fiber singlets; use DFE layout
Level 2 Silicon Track Trigger	392	40	549	FY02	Manpower included; exploit FY02 Run 2a STT production
Level 2b Upgrade	62	34	83	FY03-04	New processors
Online	-		950	FY02-06	Assumed from operating; not included in TOTALS below
TOTAL	$9,741k	47	$14,293k		Preparation for 5E32 running
GRAND TOTAL	$11,474k	44	$16,570k		All upgrades
FY02 request (est – excludes most manpower)	$4,239k - silicon, includes R&D, $800k FY02 MRI funds not included $2,600k – trigger, includes R&D, operating requests **Lab guidance: $2,500k equipment**				

Observations

- Run 2b project unique with respect to past efforts
  - Fixed, externally-imposed end date
  - Schedule is primary (only?) variable of interest
  - Differs significantly from way we've done business in past
- D0 Run 2a silicon has been enormously successful
  - Strong group:
    - Significant expertise, silicon experience
    - Able sub-project leadership
    - Collaborating well, developing technically sound, practical device
  - Run 2a silicon a proven success through all phases to date:
    - Fabrication, installation, in-situ hookup & operations, beam data, reconstruction
  - Collaboration stepped up in Run 2a, will do so again
- Laboratory well-equipped for such an undertaking
  - Much silicon expertise
  - Deep technical staff, mechanical & electrical
  - Other resources quite ample
  - Past experience indicates that helpful, active Laboratory support will be there once commitment is made

Observations

- Silicon schedule is aggressive, has little contingency
  - Probably have more time than we've planned for, but should not count on it
- Financial, other commitments must be made available now in order remain on track
  - Long ramp up would be costly, resulting delay difficult to recover from
  - Waiting for full baselining (1st quarter CY02) before spending is not tenable
- Bottom Line for FY02:
  - $4,239k - $800k D0 MRI = $3,439k to keep SMT on track in FY02
    - Full D0 MRI contribution (FY02-04): $1.7M + $0.7M matching
    - FY02 silicon funding request contains some allowance for time contingency
  - $2,600k to maintain momentum of Run 2b trigger upgrades
  - **TOTAL FY02 REQUEST = $6,039k M&S (includes trigger contingency)**
  - **Lab guidance: $2,500k M&S**
- Cannot keep pace on all fronts in FY02 within these constraints
  - At moment, silicon alone cannot be properly supported
  - Choices among non-silicon projects will also have to be made
  - Profile beyond FY02, overall cost integral are also concerns
- D0 commitment is there to make this work, but must get what we need
  - Only relevant if made available on time scales consistent with Run 2b goals

Conclusions

- Run 2b upgrades will allow us to exploit full discovery potential of Tevatron while opportunity is available
- Time window is tight, finite - but probably longer than we anticipate at this point
- Will require some boldness to pull off successfully
  - Ramp up must be timely
  - Resources must be made available
  - Projects need to be established on short time scales
- Much headway made in defining, fleshing out D0 Run 2b projects during past 6 months
- In light of all of the above, request that Committee recommend approval for:
  - Run 2b silicon
  - Run 2b trigger upgrades needed both prior to, and in preparation for, 5E32 running