
Run II Upgrades Status May Report

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Outline

- Technical Highlights
- Status Report for May
 - Milestones
 - % Complete
 - M&S Costs
 - Personnel Costs and Effort Report
- v3 of the Plan (compare v2)
 - Schedule, scope and strategy changes
 - Cost and Schedule Comparison
- Updated Luminosity Profile
 - and what's changed

Status

Technical Highlights

- Protons on Target
 - First test of slip-stacking successful
 - Tested with $6.5E12$ protons with 1.4 ns bunch length on target.
- Recycler
 - met operating criteria: ready for e-cool commissioning
 - ready to participate in HEP in mixed-source operation
- E-cooling R&D at WBL completed
 - All major components, diagnostics and controls developed and tested
 - Beam properties achieved close to spec
 - Spec: 4.3 MeV, 500 mA, 0.2 mrad r.m.s
 - Actual: 3.5 MeV (long runs)/4.3 (short), 350 mA (long)/700 (short), "beam temperate" / angle-spread close to 0.2 mrad (analysis ongoing)
 - Currently disassembling and moving and starting to measure solenoids
- Tevatron separators
 - Effort refocused
 - One conditioned, and one almost conditioned
 - Minimum need is two!

Class A Milestones "+/- 3 month window"

WBS	Name	Baseline Date	Actual or Forecast
26.3.4.9.16	Recycler commissioned for electron cooling	6/1/04	6/1/04 complete
26.1.1.10	<i>Slip Stacking Operational</i>	12/23/04	12/23/04 on track

Planned & Actual % Complete

WBS	WBS Name	Planned % Complete (P%C)	Actual % (A%C)	(A%C)/(P%C)
1	Run II	33%	31%	93%
26	Luminosity Upgrades	34%	31%	92%
26.1	Protons on Target	39%	38%	97%
26.2	Pbar Acceptance	29%	26%	90%
26.3	Pbar Stacking and Cooling	41%	37%	91%
26.4	Tevatron High Luminosity	29%	27%	91%
26.6	Project Management	38%	39%	100%
27	Maintenance & Reliability	32%	33%	102%

M&S Costs and Labor for May '04

M&S Costs through May 2004 (\$K)							
ROLL UP	TASK DESCRIPTION	04 ObiBud	YTD OBL	YTD Act	PY OC	5/04 RIP	(YTD OBL + RIP) /ObiBud
26 & 27	Run II Upgrades	10,536	5,583	2,643	802	419	57%
26	Luminosity Upgrades	9,153	4,484	2,252	802	405	53%
26.1	Protons on Target	481	334	536	531	21	74%
26.2	Pbar Acceptance	801	250	151	12	35	36%
26.3	Pbar Stacking & Cooling	3,856	1,372	678	185	26	36%
26.4	Tevatron High Intensity	3,420	2,437	796	74	320	81%
26.6	Management Oversight	595	91	91	0	3	16%
27	Maintenance & Reliability	1,383	1,061	360	0	14	78%

Effort reporting from AD and CD (still need to integrate TD and PPD)

Effort Report for May (FTE)							
WBS	AD Effort	CD Effort	TD Effort (Est)	PPD Effort (Est)	Total	FTE Corrected	Proj Need
26.1 Protons on Target	11.2				11.2	13	10
26.2 Pbar Acceptance	5.7		4	1	10.7	13	15
26.3 Pbar Stacking and Cooling	24.2		1	3	28.2	33	30
26.4 Tevatron	20.2	8.3	8	2	38.5	45	42
26.6 Management	1.5	0.7			2.2	3	4
27 Maintenance Upgrades	5.3		2		7.3	9	4
Total	68.0	9.0	15	6	98.0	115	105

v2→v3: Schedule Changes

- Electron Cooling
 - R&D @WBL now complete - move and installation delayed [only] 2-3 months ← pretty good!
 - Now "estimate" first cooling of pbars Aug05 - right at the start of shutdown. (Review e-cool commissioning plan ~Aug 10)
 - **Start the learning curve for making and using e-cooled stacks after recovering from the shutdown**
 - The start of the 05 shutdown may be driven by completion of this milestone if progress is good
- Stacktail Cooling Upgrade
 - Also delayed about 2-3 months (technical review: available engineering, realistic schedule - phased plan)
 - Want to be conservative and comfortable with reliable operation of Recycler and e-cooling before committing to the full bandwidth upgrade
 - ➔ **Put the tank move upgrade into phase 3 (with e-cool)**
 - as soon as e-cooling is in use in HEP, late 05.
 - get full upgrade ready for early 06 (most likely install in summer 06)

V3
DRAFT

Scope/Schedule Changes for v3

- Pbar target
 - install beam sweeping only if necessary
 - new target stack will last 2-3 months with slip-stacking
 - quick to build and replace - keep ahead with spares
 - spot size extends life for 5% reduction in acceptance
- AP2 & DB acceptance
 - reduce scope of specific tasks: injection septum vacuum, extraction kicker tube...
- Stacking and Cooling
 - update electron-cooling schedule
 - stretch 10 weeks (move from WBL)
 - longer commissioning ramp-up
 - Stacktail upgrade (following review)
 - 2-step upgrade: tank move as soon as e-cooling is in operation, bandwidth increase ready at start of 06 (assume installation in summer 06)
- Tevatron
 - add two separators in summer 04, the rest in 05
 - upgraded TEL installed summer 05 (not 04) - R&D review moved to Oct 04
 - BPM commissioning plan included

v2→v3: Scope Changes

- Additions

- OTRs

- Change request already submitted for 3 OTRs in A1 line and one at IPM in Tev. Expected to be much superior to present wire chambers for optics matching.

- MI BLM

- Change request in prep. Needed to provide more dynamic range and improved data logging for operating collider and NuMI.

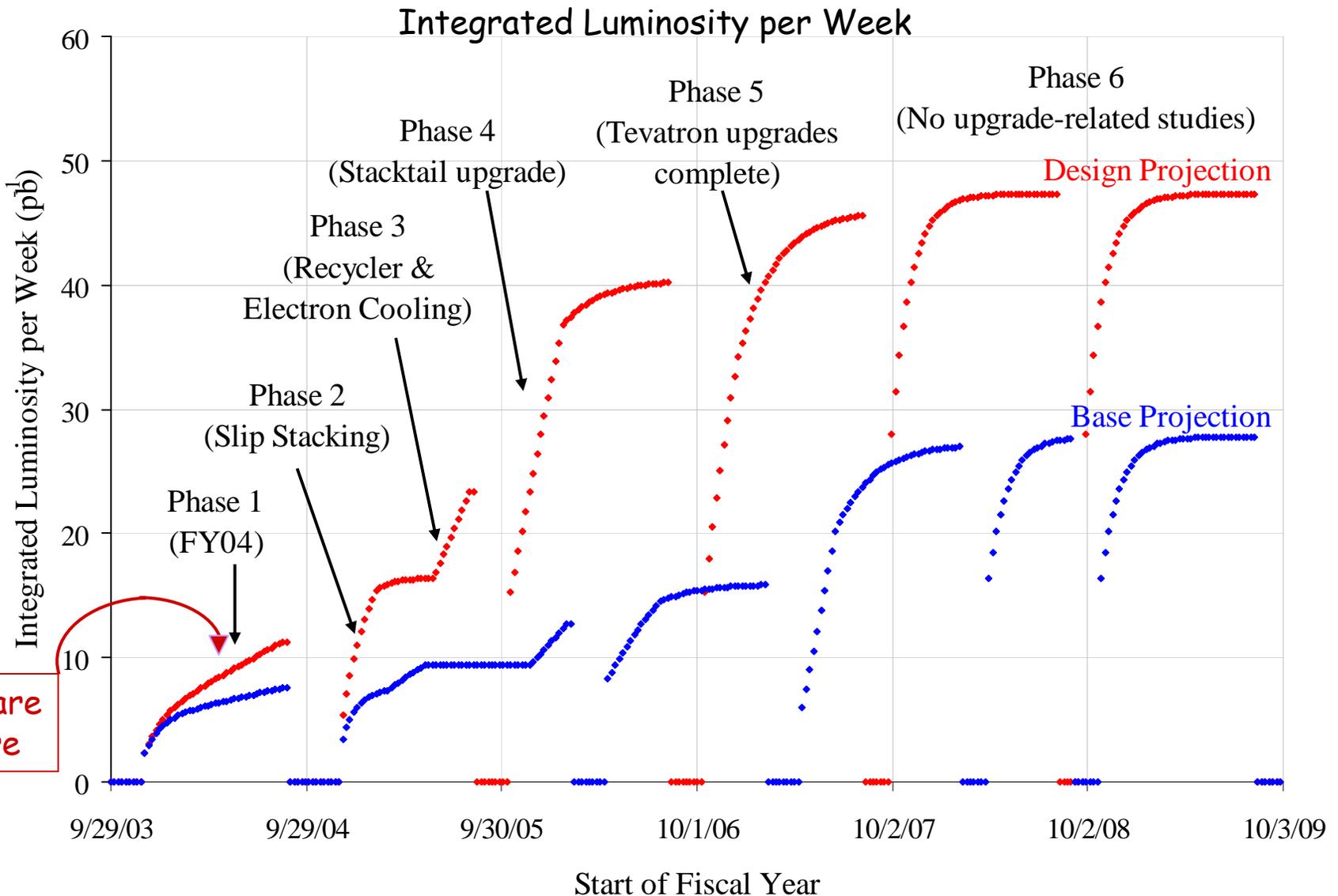
v2→v3: Milestones

WBS	Class A Milestone	V3	V2	V3-V2 (mth)	V3-V2 Comment
26.1.2.1.4.3	New Target in Operation (Milestone)	1/2/04	1/2/04	0	
26.6.2.2	Review Recycler Commissioning Plan	3/1/04	2/9/04	1	
26.3.4.9.16	Recycler commissioned for Electron cooling	6/1/04	6/1/04	0	
26.1.2.2.4.2	Beam Sweeping Ready (redefined)	9/21/04	8/25/04	1	
26.2.2.10	Initial AP2&DB Improvements Complete (Milestone)	11/19/04	11/22/04	0	
26.4.4.3.1.5	New standard separators operational	12/16/04	10/25/04	2	mistake in V2
26.1.1.10	Slip Stacking Operational	12/23/04	12/23/04	0	
26.6.2.4	Start Phase 2 (Milestone)	12/23/04	12/23/04	0	
26.3.6.8	Rapid Transfers Operational (Milestone)	8/16/05	6/14/05	2	
26.2.1.4	New Lens Operational (Milestone)	8/25/05	6/10/05	2	
26.3.5.12	Electron Cooling of pbars Demonstrated	8/25/05	6/1/05	3	
26.6.2.5	Start Phase 3 (Milestone)	8/25/05	6/1/05	3	V3: follows 05 SD ~12/1/05, and include stacktail tank move
26.2.2.11	Intermediate AP2&DB Improvements Complete (Milestone)	10/3/05	10/3/05	0	
26.2.2.12	Final AP2&DB Improvements Complete (Milestone)	10/2/06	10/2/06	0	
26.3.3.1.10	Stacktail Momentum Operational (Milestone)	12/5/06	12/6/05	12	
26.6.2.6	Start Phase 4 (Milestone)	12/5/06	12/6/05	12	Stacktail bandwidth upgrade
26.4.4.4.14	New helix operational	12/14/06	12/5/06	0	
26.4.3.1.11	TEL System Operational	2/12/07	2/12/07	0	
26.6.2.7	Start Phase 5 (Milestone)	2/12/07	2/12/07	0	

v2→v3: Cost

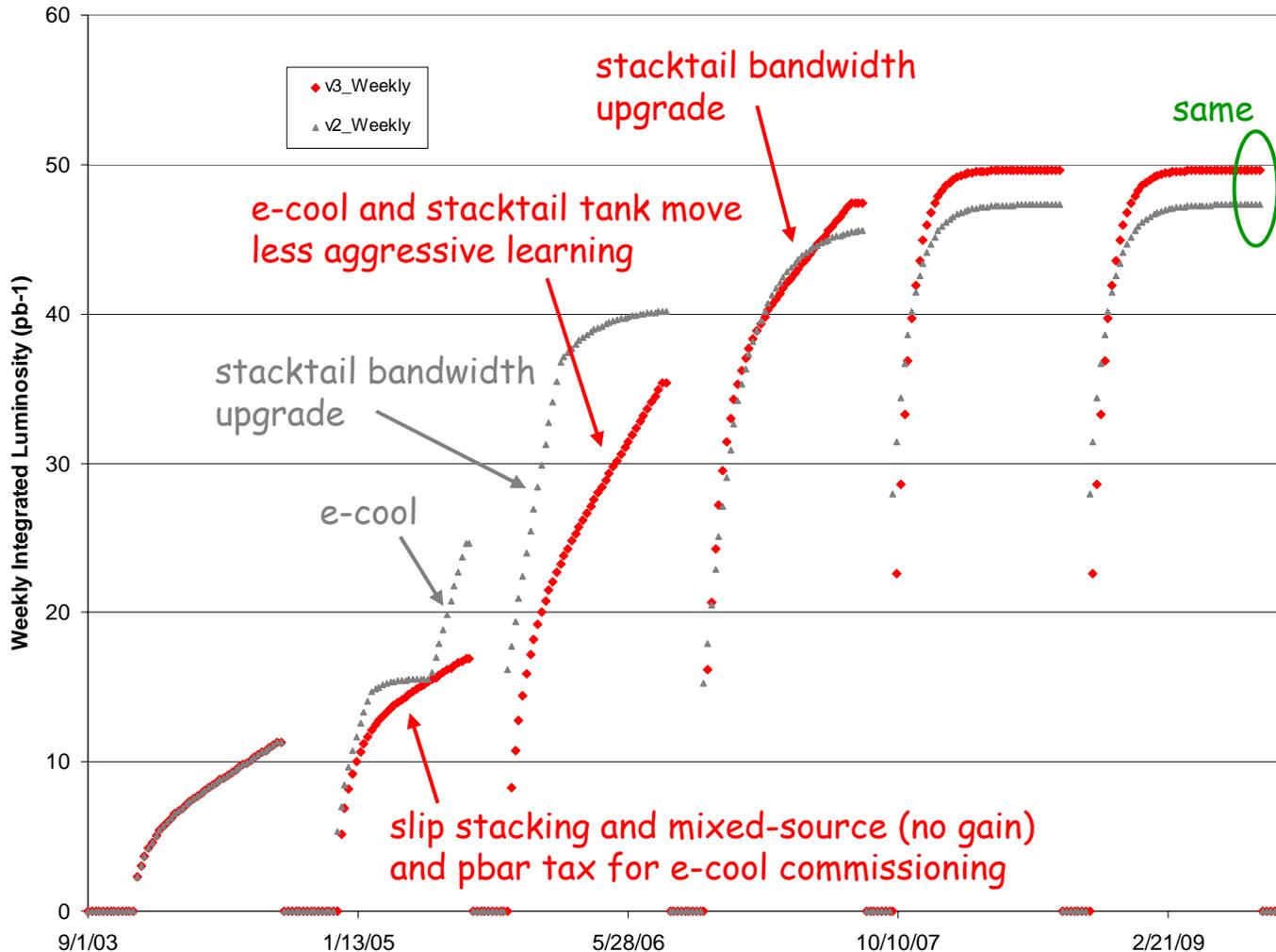
WBS	NAME	v2.5 Base		v3 Base		Difference		Comment
		M&S	Lab	M&S	Lab	M&S	Lab	
26&27		\$16,811,426	\$17,963,547	\$17,053,325	\$18,997,832	\$241,899	\$1,034,285	
26	Luminosity Upgrades	\$13,508,426	\$16,958,441	\$13,750,325	\$17,992,727	\$241,899	\$1,034,285	
26.1	Protons on Pbar Target	\$1,911,500	\$1,191,790	\$2,281,500	\$1,286,481	\$370,000	\$94,691	
26.1.1	Slip Stacking	\$895,000	\$436,394	\$895,000	\$437,018	\$0	\$623	
26.1.2	Pbar Target and Sweeping	\$91,500	\$102,346	\$91,500	\$97,644	\$0	(\$4,702)	
26.1.3	MI Upgrades	\$925,000	\$596,899	\$1,125,000	\$596,899	\$200,000	\$0	MI BLM + \$1-200K Labor!
26.1.4	Booster-MI Cogging	\$0	\$56,151	\$0	\$56,151	\$0	\$0	
26.1.5	Optical Transition Radiation Detectors			\$170,000	\$98,769	\$170,000	\$98,769	OTR
26.2	Pbar Acceptance	\$1,846,960	\$2,157,041	\$1,366,960	\$2,064,381	(\$480,000)	(\$92,660)	
26.2.1	Lithium Lens Upgrades	\$521,000	\$583,740	\$481,000	\$544,123	(\$40,000)	(\$39,617)	
26.2.2	AP2 and Debuncher Acceptance	\$1,325,960	\$1,573,301	\$885,960	\$1,520,258	(\$440,000)	(\$53,043)	DB Inj, Ext and Inst
26.3	Pbar Stacking and Cooling	\$3,871,998	\$4,016,616	\$3,739,998	\$4,295,611	(\$132,000)	\$278,996	
26.3.1	Stacking and Cooling Integration	\$0	\$443,001	\$0	\$443,001	\$0	\$0	
26.3.2	Debuncher Cooling	\$0	\$24,857	\$0	\$22,858	\$0	(\$1,999)	
26.3.3	Stacktail Cooling	\$1,004,000	\$368,918	\$1,384,000	\$405,939	\$380,000	\$37,022	New Est, New Tanks
26.3.4	Recycler Stacking and Cooling	\$774,998	\$1,190,458	\$249,998	\$1,157,639	(\$525,000)	(\$32,819)	Drop Kicker, Less RF upgrade
26.3.5	Electron Cooling	\$1,556,000	\$1,579,875	\$1,569,000	\$1,853,635	\$13,000	\$273,760	Added labor (AIP)
26.3.6	Rapid Transfers	\$537,000	\$409,507	\$537,000	\$412,540	\$0	\$3,032	
26.4	Tevatron High Luminosity	\$5,877,968	\$8,154,963	\$6,361,867	\$8,819,946	\$483,899	\$664,983	
26.4.1	Tevatron Task Force	\$0	\$1,856,038	\$0	\$1,856,038	\$0	\$0	
26.4.2	Beam-beam Limitations	\$5,000	\$452,692	\$5,000	\$452,692	\$0	\$0	
26.4.3	Active Beam-Beam Compensation	\$1,250,000	\$1,184,048	\$1,270,000	\$1,222,229	\$20,000	\$38,181	
26.4.4	Increased Helix Separation	\$1,788,500	\$1,037,523	\$2,092,498	\$1,313,371	\$303,998	\$275,848	Infrastructure and Techs
26.4.5	Luminosity Leveling	\$0	\$9,054	\$0	\$9,054	\$0	\$0	
26.4.6	Improved Control and Diagnostics	\$2,463,468	\$2,704,761	\$2,464,369	\$3,090,989	\$901	\$386,227	137K BPM, 222 BLM (was plac
26.4.7	Tevatron Vacuum Improvements	\$90,000	\$12,354	\$90,000	\$12,354	\$0	\$0	
26.4.8	Tevatron Alignment	\$281,000	\$898,492	\$440,000	\$863,219	\$159,000	(\$35,273)	...?
26.6	Management		\$1,438,032		\$1,526,307	\$0	\$88,275	
27	Maintenance and Reliability	\$3,303,000	\$1,005,106	\$3,303,000	\$1,005,106	\$0	\$0	

Design and Base Projections (Feb04 DOE Review)



Draft v3 weekly luminosity

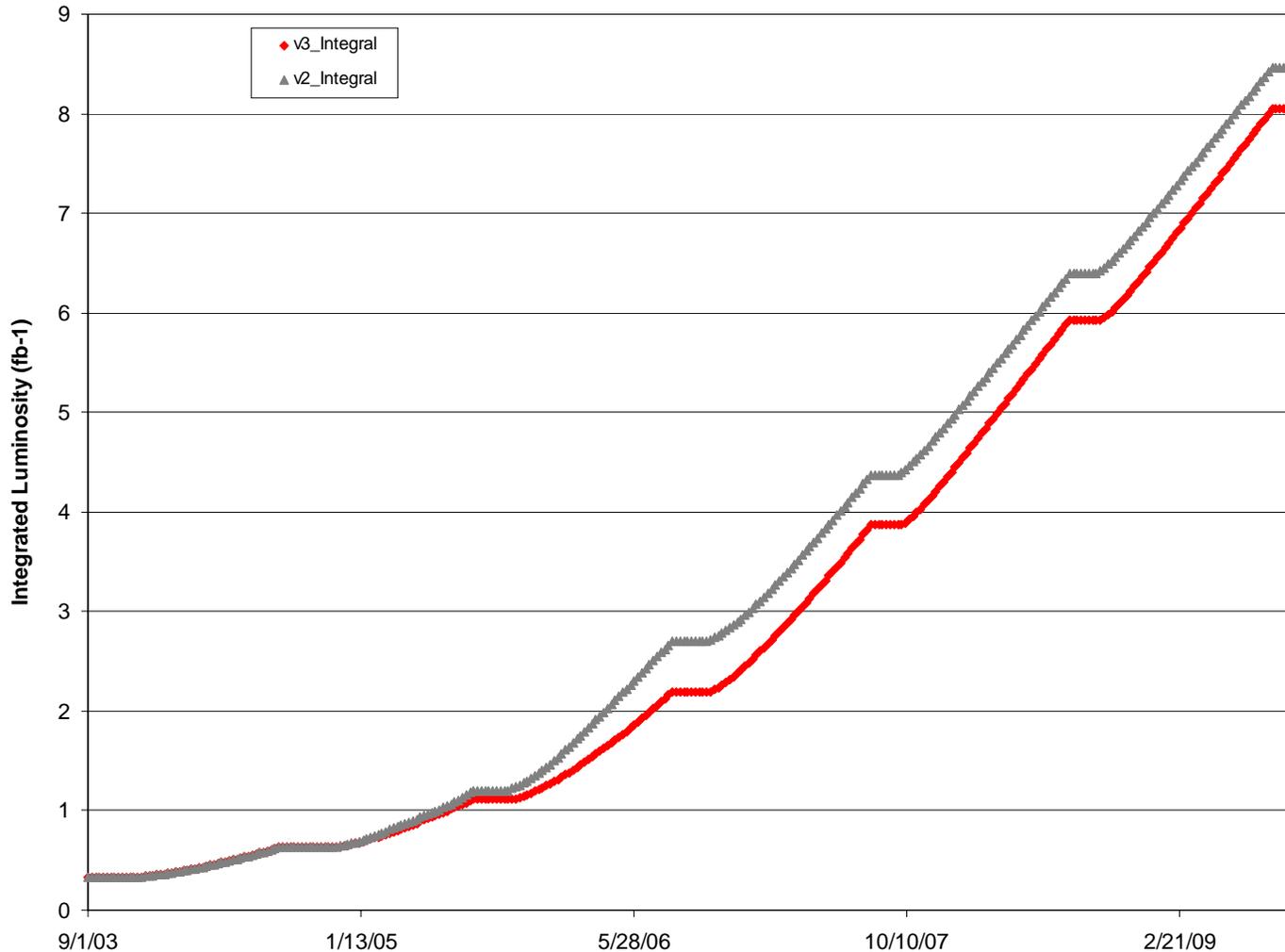
Compare Weekly Luminosity



- V3 schedule
- Pbar tax through FY05 (e-cool)
- More phased upgrade to stacktail
- Mixed-source operation in 05, assumed to be break-even (conservative)
- Store length in 05-06 20 hrs, 15 hrs thereafter
- More conservative learning slope for each phase
- Slightly more conservative recovery from shutdown

Draft v3 Integrated Luminosity

Comparison on Integrated Luminosity



• Design target still 8.5+/-1 fb⁻¹ (current number 8.0)

• Fall-back scenario (without e-cool) still > 4.5