GLAST Large Area Telescope:
I & T Input to Monthly Technical/Cost/Schedule Review 06/30/05

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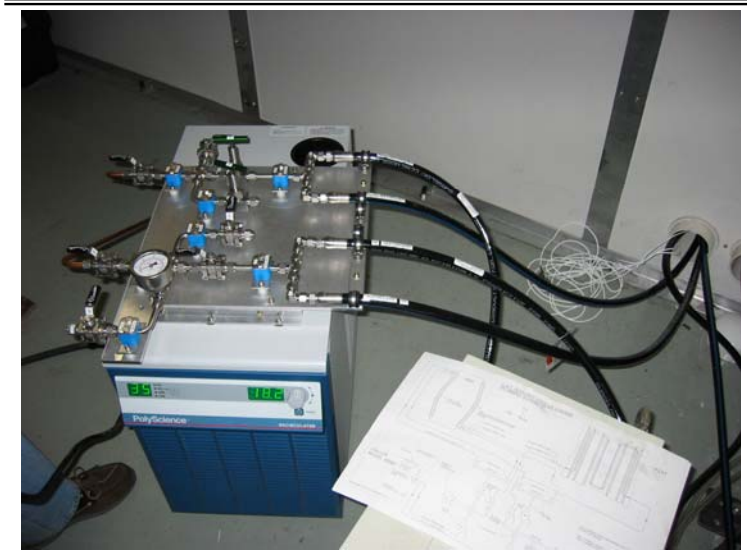
Last Month's Accomplishments (1 of 3)

- **Management**
  - **Tracking hardware shortages for LAT integration.**
    - **TKR Delivery**
    - **ELX Boxes**
  - **Procedure Status**
    - **69 of 70 submitted for sign-off or released**
- **IFCT**
  - **Completed 4 tower tests.**
  - **Completed I&T receiving tests on 3 TKR's, 11 CAL's and 3 TEM's.**
  - **Completed assembly, checkout and installation of the grid cooler (aka the Chilla from Manila).**
  - **Completed installation of 2 additional towers for a total of 6 towers installed in the grid.**
  - **Completed alignment survey of 6 towers.**
  - **Preparations complete for 6 tower tests.**
  - **Completed shear plate and cable tray installation at four towers.**

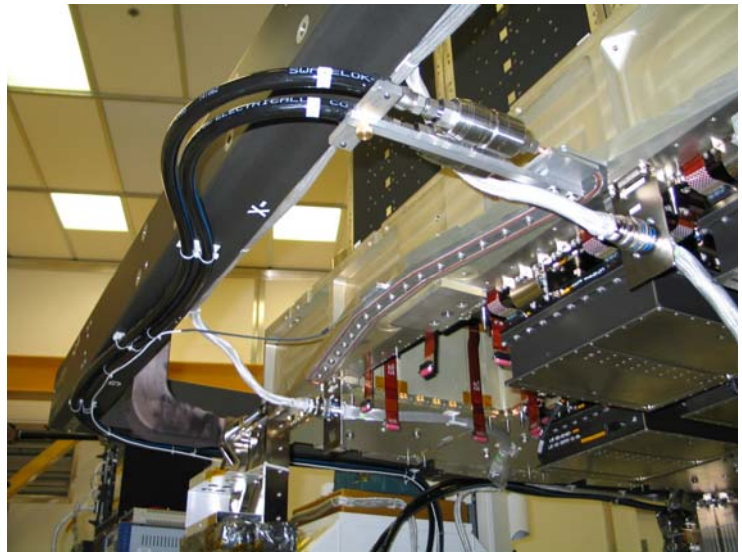
Last Month's Accomplishments (2 of 2)

- **Online**
  - **LATTE**
    - **Supported VSC software Python interface implementation**
    - **Exploratory work in progress to demonstrate interaction with the VSC and its software interface**
    - **4.9.0 released for ACD**
      - **Initiated by ACD-discovered bug**
      - **Bug fixes, Trigger GUI, GPIB support**
      - **Updated HippoDraw correcting memory leaks**
      - **Updated trigger GUI to address concerns raised in trigger meeting**
      - **Bug fix for incorrectly initialized TEM BUSY_LRS_MASK register (measures TEM deadtime)**
    - **Housekeeping multi-pen strip-chart GUI V2.0 deployed to clean room for real-time monitoring.**
    - **E-logbook Version 3.4.1 released (minor bug fixes with corresponding tutorial and documentation updates)**

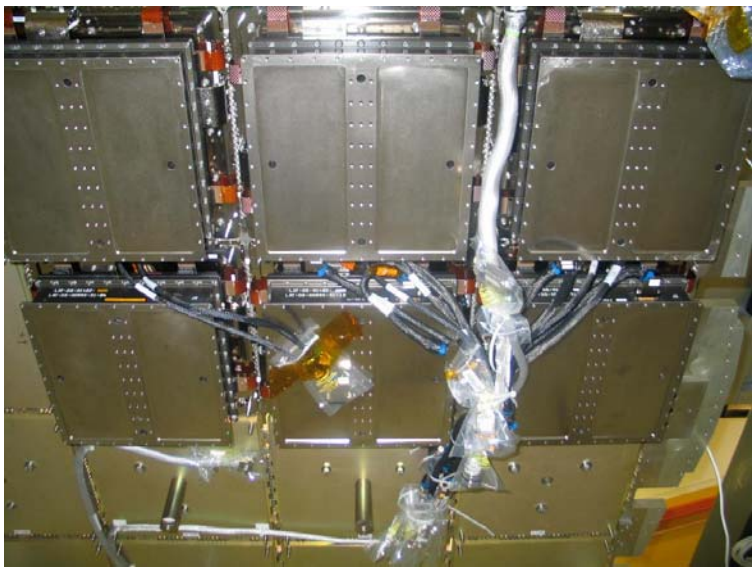
I&T Activities



Grid Chiller Unit Installation



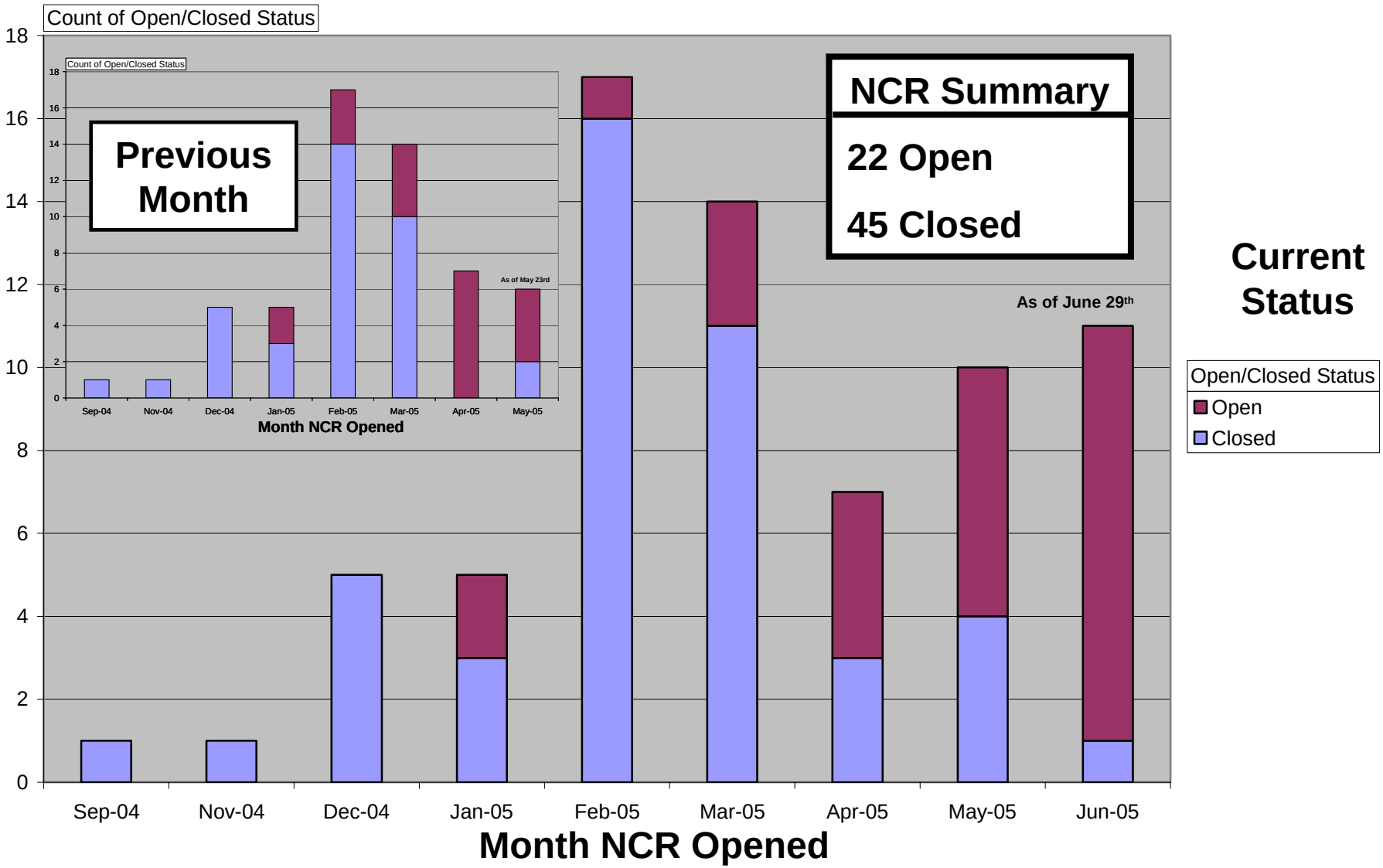
Grid Cooling



Six CAL/TEM's Installed

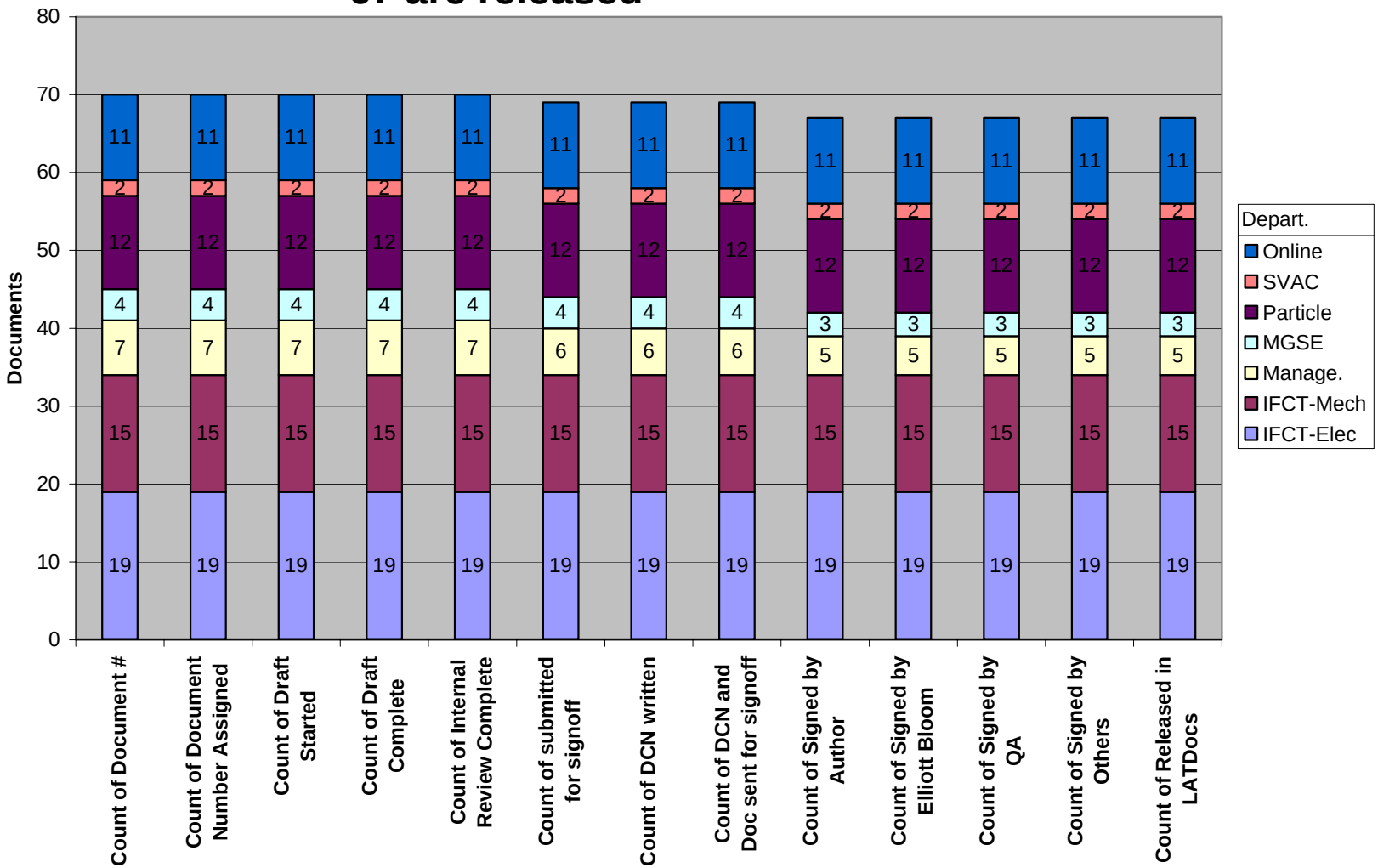
Six Towers in the Grid

I&T NCRs by Month Open/Closed Status



Procedure Status

- 70 documents total
- 69 latest versions submitted for sign-off
- 67 are released



Procedure Status (1 of 1) – Management

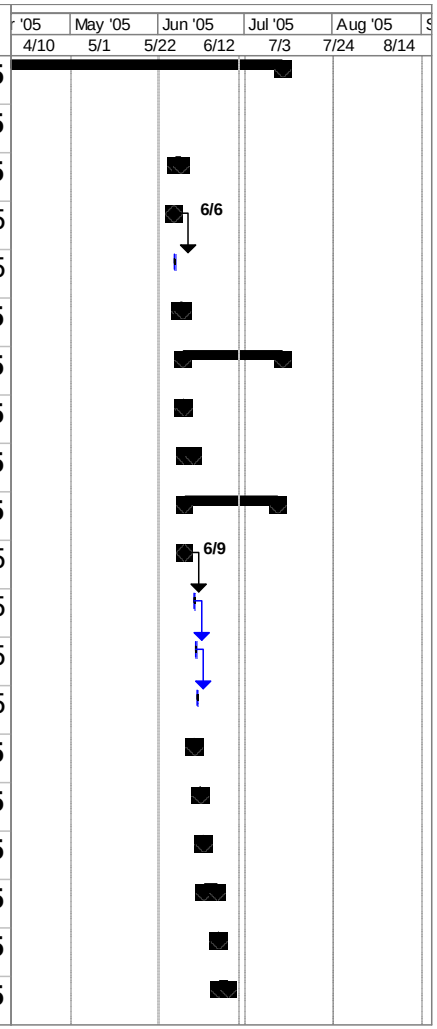
Depart.	Document #	Document Title	Author	Document Number Assigned	Draft Started	Draft Complete	Internal Review Complete	Latest Draft in LATDocs	Draft sent to NASA	Submitted to CM (Natalie) for signoff (or expected date)	DCN written	DCN and Doc sent for signoff	Signed by Author	Signed by Elliott Bloom	Signed by QA	Signed by Others	Released in LATDocs	Completion Date (or expected)	Comments
Manage.	LAT-MD-01376-02	LAT Integration & Test Plan	Bloom / Fouts / Grist	✓	✓	✓	✓	✓	✓	01-Apr-05	✓	✓	✓	✓	✓	✓	✓	06-May-05	
Manage.	LAT-TD-04542-01	ACD Subsystem to LAT I&T Deliverables MOU	Bloom / Bright	✓	✓	✓	✓		N/A	*30-Jun-05*								*14-Jul-05*	Draft from Bloom sent to Thompson on 6/24/05
Manage.	LAT-TD-04543-01	CAL Subsystem to LAT I&T Deliverables MOU	Bloom / Bright	✓	✓	✓	✓	✓	N/A	07-Oct-04	✓	✓	✓	✓	✓	✓	✓	17-Nov-04	
Manage.	LAT-TD-04544-01	Mechanical and TCS Subsystem to LAT I&T Deliverables MOU	Bloom / Bright	✓	✓	✓	✓	✓	N/A	18-Feb-05	✓	✓	✓	✓	✓	✓	✓	24-Feb-05	
Manage.	LAT-TD-04546-01	ELX/T&DF Subsystem to LAT I&T Deliverables MOU	Bloom / Bright	✓	✓	✓	✓	✓	N/A	27-Aug-04	✓	✓	✓	✓	✓	✓	✓	04-Oct-04	
Manage.	LAT-TD-04547-01	TKR Subsystem to LAT I&T Deliverables MOU	Bloom / Bright	✓	✓	✓	✓	✓	N/A	09-May-05	✓	✓						*12-Jul-05*	Comments from Hiro Tajima need to be addressed.
Manage.	LAT-TD-06637-01	LATTE Schema Naming Conventions	Fouts / Grist	✓	✓	✓	✓	✓	✓	03-Jun-05	✓	✓	✓	✓	✓	✓	✓	29-Jun-05	

Upcoming I&T Events

- CAL/TEM Installation in Bay 5 (Complete)
- CAL/TEM Installation in Bay 1 (Complete)
- 4 Tower Tests (Complete)
- Receive TEM/TPS 3 and 4 (Complete)
- Receive TKR 4 (Complete)
- STR #14, 15 ECD 7/5
- SVAC data taking for 6 towers ECD 7/15

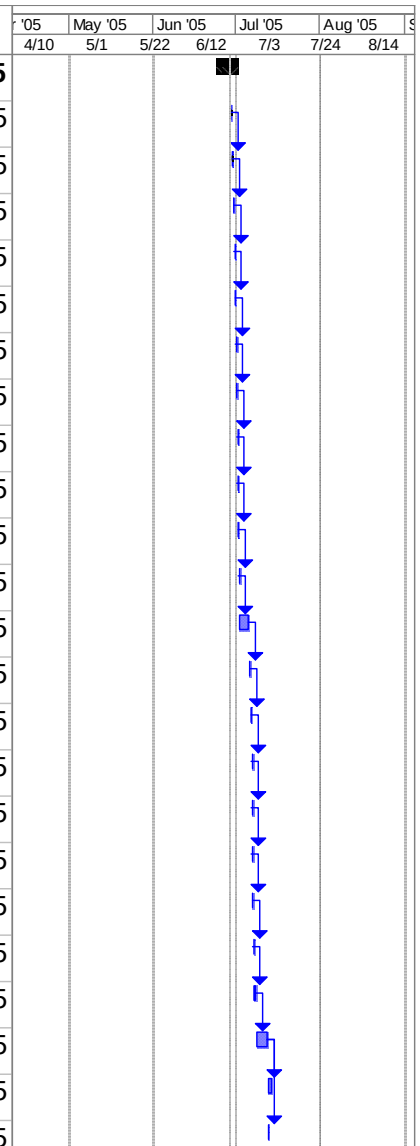
I&T Detail Schedule (1 of 3)

ID	Task Name	Start	% Complete	Finish
835	**Tower 4 - Bay 8**	**2/22/05**	**70%**	**7/14/05**
836	**FM107 Post ship test and receiving test**	**2/22/05**	**100%**	**2/28/05**
843	**Tracker 4 post ship test & receiving test**	**6/6/05**	**100%**	**6/8/05**
853	TEM/TPS 4 Flight Readiness	6/6/05	100%	6/6/05
854	TEM/TPS EICIT & SVT	6/6/05	100%	6/6/05
855	**TEM/TPS-4 I&T**	**6/8/05**	**100%**	**6/9/05**
861	**Tower-4 Grid Bay 8 I&T**	**6/9/05**	**61%**	**7/14/05**
862	**TKR-5 installation into grid bay 8**	**6/9/05**	**100%**	**6/9/05**
866	**FM107 installation into grid bay 8**	**6/10/05**	**100%**	**6/13/05**
869	**6 Tower Test**	**6/9/05**	**61%**	**7/12/05**
870	Install Chiller bars	6/9/05	100%	6/9/05
871	6 Tower Survey	6/13/05	100%	6/13/05
872	Install & Inject Shear plates (Bay 0,4,5,1)	6/13/05	100%	6/14/05
873	Install Cable Trays	6/14/05	100%	6/14/05
874	**Bay 8 and 9 ECITs**	**6/13/05**	**100%**	**6/13/05**
877	**Setup EM GASU EM PDU and connect cables**	**6/15/05**	**100%**	**6/15/05**
885	**TEM Register Tests 0,1,4,5,8,9**	**6/16/05**	**100%**	**6/16/05**
899	**Work on NCR 542**	**6/16/05**	**100%**	**6/21/05**
913	**Calorimeter LPTs 0,1,4,5,8,9**	**6/21/05**	**100%**	**6/21/05**
920	**Trigger Tests**	**6/22/05**	**100%**	**6/24/05**



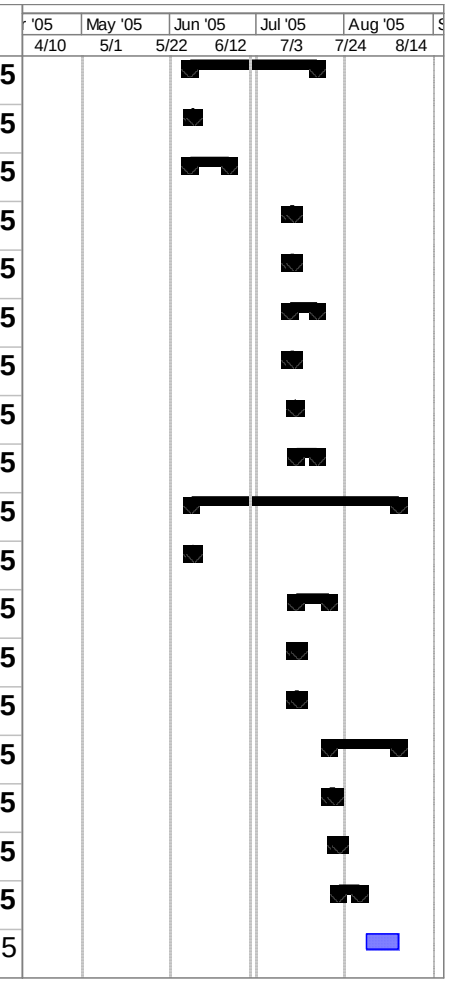
I&T Detail Schedule (2 of 3)

ID	Task Name	Start	% Complete	Finish
931	**Calibration**	**6/27/05**	**100%**	**6/28/05**
938	TEM register tests 0 (per NCR 529)	6/29/05	100%	6/29/05
939	TEM register tests 1 (per NCR 529)	6/29/05	100%	6/29/05
940	TEM register tests 4 (per NCR 529)	6/29/05	0%	6/30/05
941	TEM register tests 5 (per NCR 529)	6/30/05	0%	6/30/05
942	TEM register tests 8 (per NCR 529)	6/30/05	0%	6/30/05
943	TEM register tests bay 9 special (per NCR 529)	6/30/05	0%	7/1/05
944	TE704 Bay 8 per NCR 542	7/1/05	0%	7/1/05
945	TE704 Bay 9 per NCR 542	7/1/05	0%	7/1/05
946	Tracker LPT Bay 9 per NCR 539	7/1/05	0%	7/1/05
947	Special Register Test Bay 4 per NCR 532	7/1/05	0%	7/1/05
948	STR 15 - Calorimeter Calibration (pending approval)	7/1/05	0%	7/1/05
949	STR 14 - Trigger Timing Scans	7/1/05	0%	7/5/05
950	TE601/TE602/TE604 Bay 8 (pending input from Hiro)	7/6/05	0%	7/6/05
951	TE601/TE602/TE604 Bay 9 (pending input from Hiro)	7/6/05	0%	7/6/05
952	E2E B-13 (one minute - configuration verification)	7/6/05	0%	7/6/05
953	E2E B-2 (one minute - configuration verification)	7/6/05	0%	7/6/05
954	E2E B-10 (one minute - configuration verification)	7/6/05	0%	7/6/05
955	Confirmation from SVAC on configuration verification	7/6/05	0%	7/7/05
956	E2E B-13 (1 hour)	7/7/05	0%	7/7/05
957	E2E B-2 (4 hours)	7/7/05	0%	7/8/05
958	E2E B-10 (15 hrs)	7/8/05	0%	7/12/05
959	Thermistor bonding/cure on bays 0/4 (NCR351)	7/12/05	0%	7/14/05
960	Install Cable Trays	7/12/05	0%	7/13/05



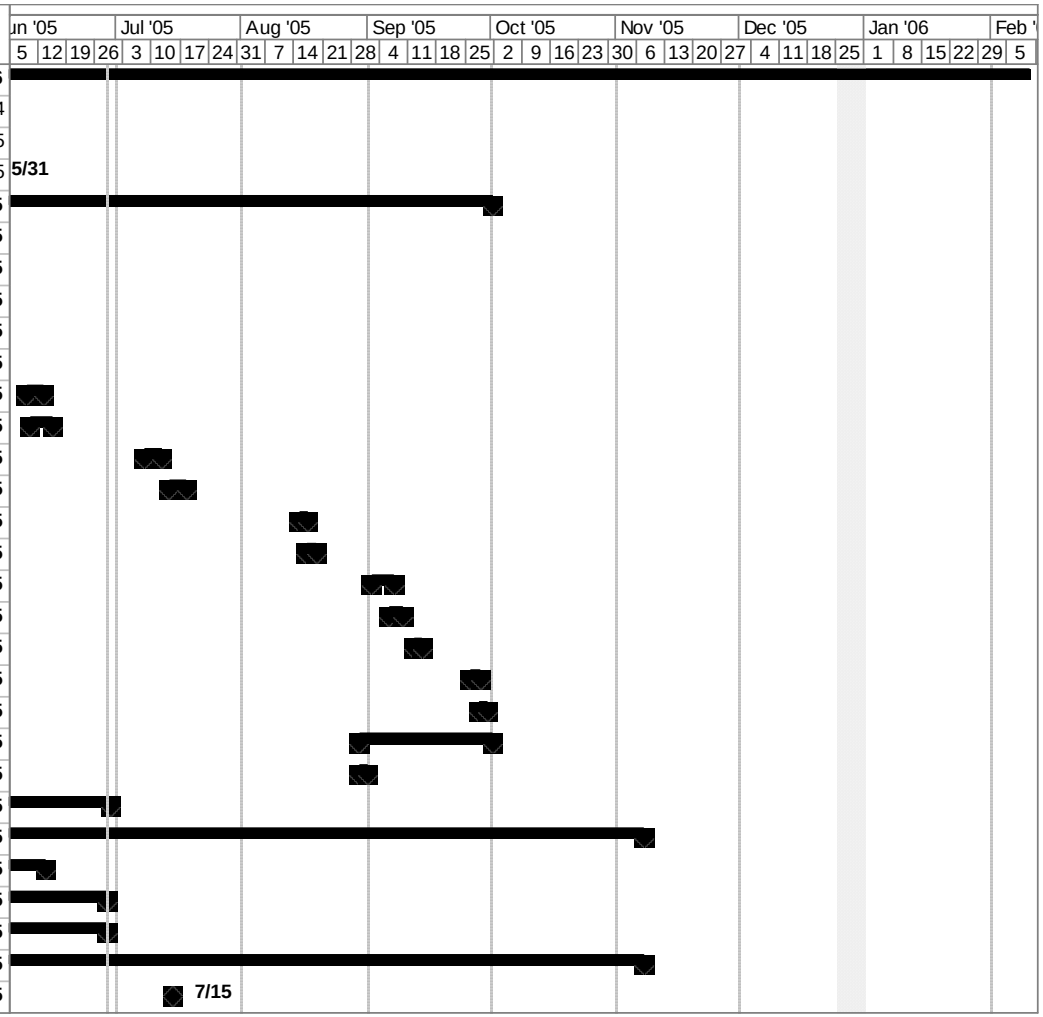
I&T Detail Schedule (3 of 3)

ID	Task Name	Start	% Complete	Finish
961	**Tower 5, Bay 13**	**6/7/05**	**24%**	**7/22/05**
962	**FM108 Post ship test and receiving test**	**6/7/05**	**100%**	**6/9/05**
969	**Tracker 5 post ship test & receiving test**	**6/7/05**	**100%**	**6/21/05**
978	**TEM/TPS 5 Flight Readiness**	**7/12/05**	**0%**	**7/13/05**
979	**TEM/TPS-5 I&T**	**7/12/05**	**0%**	**7/13/05**
985	**Tower-5 Grid Bay 13 I&T**	**7/12/05**	**0%**	**7/22/05**
986	**TKR-4 installation into grid bay**	**7/12/05**	**0%**	**7/13/05**
990	**FM108 installation into grid bay 13**	**7/13/05**	**0%**	**7/14/05**
993	**Tower-5 Grid Bay 13 Test**	**7/14/05**	**0%**	**7/22/05**
997	**Tower 6, Grid Bay 12**	**6/7/05**	**6%**	**8/19/05**
998	**FM110 Post ship test and receiving test**	**6/7/05**	**100%**	**6/9/05**
1005	**Tracker 6 post ship test & receiving test**	**7/15/05**	**0%**	**7/26/05**
1015	**TEM/TPS 6 Flight Readiness**	**7/14/05**	**0%**	**7/15/05**
1016	**TEM/TPS-6 I&T**	**7/14/05**	**0%**	**7/15/05**
1022	**Tower-6 Grid Bay 12 I&T**	**7/26/05**	**0%**	**8/19/05**
1023	**TKR-6 installation into grid bay**	**7/26/05**	**0%**	**7/28/05**
1028	**FM110 installation into grid bay 12**	**7/28/05**	**0%**	**7/29/05**
1032	**Tower-6 Grid Bay 12 Test**	**7/29/05**	**0%**	**8/5/05**
1036	8 Tower Test	8/8/05	0%	8/19/05



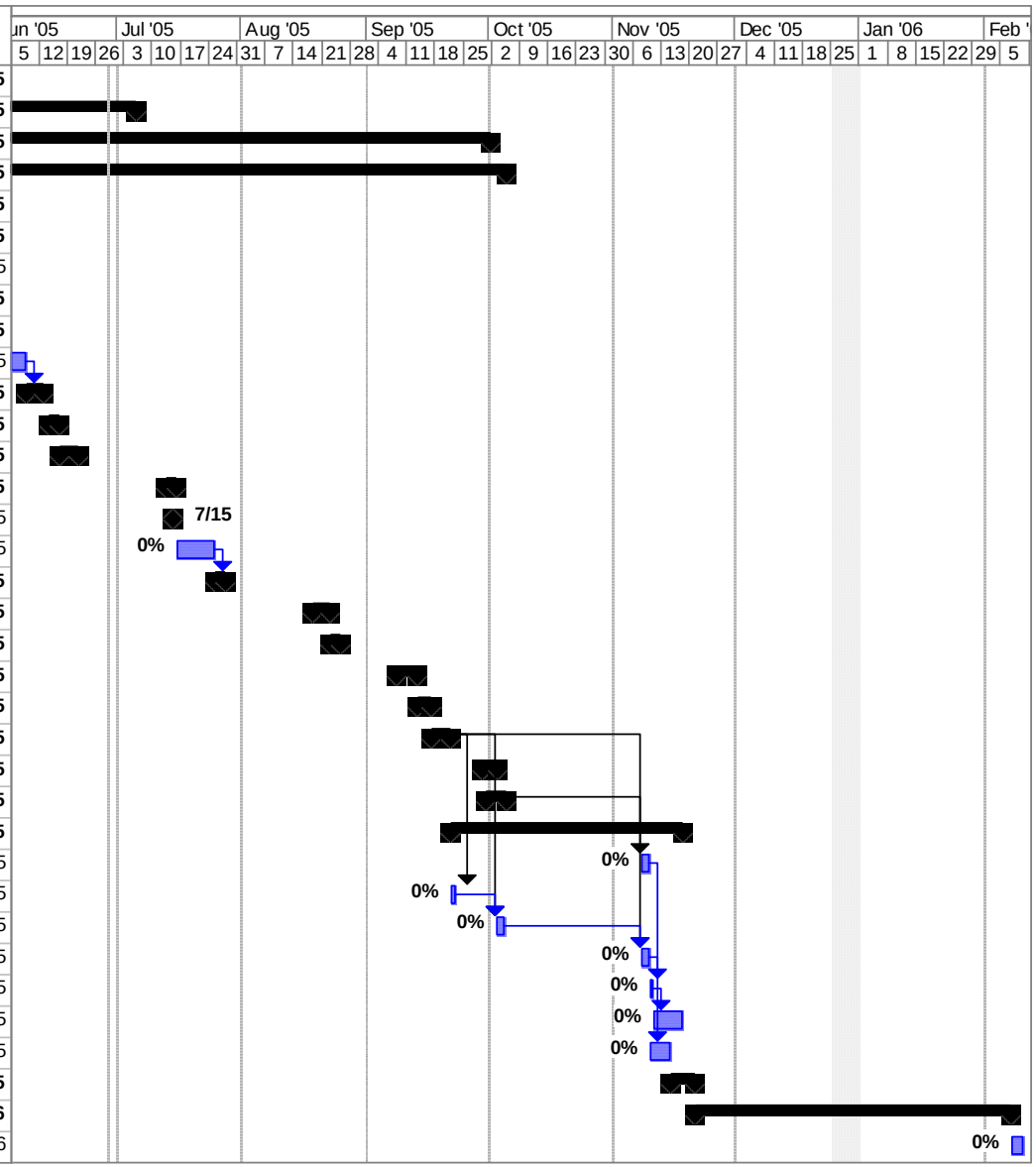
I&T 6 Month Look Ahead (1 of 2)

ID	Task Name	Duration	Start	Finish
1	**LAT Accelerated Integration Plan**	**449.94 days?**	**3/19/04**	**2/10/06**
2	Grid RFI	0 days	10/22/04	10/22/04
3	X-LAT Thermal Plate RFI	0 days	2/9/05	2/9/05
4	Radiators RFI	0 days	5/31/05	5/31/05
5	**Tracker Receiving**	**171 days**	**1/14/05**	**10/1/05**
6	**Tower A**	**7 days**	**1/14/05**	**1/26/05**
11	**Tower B**	**8 days**	**2/14/05**	**2/24/05**
17	**Tower 1**	**3 days**	**5/10/05**	**5/13/05**
21	**Tower 2**	**6 days**	**5/10/05**	**5/18/05**
25	**Tower 3**	**8 days**	**5/10/05**	**5/20/05**
29	**Tower 4**	**2 days**	**6/9/05**	**6/13/05**
33	**Tower 5**	**3.06 days**	**6/10/05**	**6/15/05**
37	**Tower 6**	**2 days**	**7/8/05**	**7/12/05**
41	**Tower 7**	**2 days**	**7/14/05**	**7/18/05**
45	**Tower 8**	**2 days**	**8/15/05**	**8/17/05**
49	**Tower 9**	**2.13 days**	**8/17/05**	**8/19/05**
53	**Tower 10**	**2 days**	**9/2/05**	**9/7/05**
57	**Tower 11**	**3.06 days**	**9/6/05**	**9/9/05**
61	**Tower 12**	**2 days**	**9/12/05**	**9/14/05**
65	**Tower 13**	**2 days**	**9/26/05**	**9/28/05**
69	**Tower 14**	**2.13 days**	**9/28/05**	**9/30/05**
73	**Tower 15**	**21.88 days**	**8/30/05**	**10/1/05**
79	**Tower 16**	**1.5 days**	**8/30/05**	**8/31/05**
85	**Calorimeter Receiving**	**138 days**	**12/1/04**	**6/29/05**
176	**Electronics Receiving**	**393.44 days**	**3/19/04**	**11/8/05**
177	**Cables**	**81.63 days**	**2/10/05**	**6/14/05**
196	**TEM Assemblies**	**86.75 days**	**2/18/05**	**6/29/05**
215	**TEM PS Assemblies**	**86.75 days**	**2/18/05**	**6/29/05**
234	**Electronic Boxes**	**393.44 days**	**3/19/04**	**11/8/05**
242	**ACD Receiving**	**0 days**	**7/15/05**	**7/15/05**



I&T 6 Month Look Ahead (2 of 2)

ID	Task Name	Duration	Start	Finish
244	**Grid Assemby in I&T**	**76.19 days**	**11/1/04**	**2/25/05**
275	**TEM to Calorimeter**	**98.25 days**	**2/7/05**	**7/5/05**
330	**Calorimeter/Tracker/TEM/TEM-PS T**	**147.94 days**	**2/21/05**	**10/1/05**
379	**Tower Installation**	**131.44 days**	**3/21/05**	**10/5/05**
380	**Install Bay 0 (Tower A)**	**10 days**	**3/21/05**	**4/5/05**
388	**Install Bay 4 (Tower B)**	**10 days**	**4/8/05**	**4/22/05**
396	2 Tower CPT	11 days	4/22/05	5/10/05
397	**Install Bay 5 (Tower 1)**	**2.5 days**	**5/20/05**	**5/25/05**
404	**Install Bay 1 (Tower 2)**	**2.5 days**	**5/23/05**	**5/26/05**
411	4 Tower CPT	8 days	5/26/05	6/8/05
412	**Install Bay 9 (Tower 3)**	**2.5 days**	**6/8/05**	**6/13/05**
419	**Install Bay 8 (Tower 4)**	**2.5 days**	**6/14/05**	**6/16/05**
426	**Install Bay 13 (Tower 5)**	**2.5 days**	**6/16/05**	**6/21/05**
433	**Install Bay 12 (Tower 6)**	**2.5 days**	**7/13/05**	**7/15/05**
440	FSW Delivery w/ EM SIU	0 days	7/15/05	7/15/05
441	8 Tower CPT	5 days	7/15/05	7/25/05
442	**Install Bay 10 (Tower 7)**	**2.5 days**	**7/25/05**	**7/27/05**
449	**Install Bay 11 (Tower 8)**	**2.5 days**	**8/18/05**	**8/22/05**
456	**Install Bay 14 (Tower 9)**	**2.5 days**	**8/22/05**	**8/25/05**
463	**Install Bay 15 (Tower 10)**	**3 days**	**9/8/05**	**9/13/05**
470	**Install Bay 6 (Tower 11)**	**3 days**	**9/13/05**	**9/16/05**
477	**Install Bay 7 (Tower 12)**	**2.5 days**	**9/16/05**	**9/21/05**
484	**Install Bay 2 (Tower 13)**	**2.5 days**	**9/29/05**	**10/3/05**
491	**Install Bay 3 (Tower 14)**	**3.5 days**	**9/30/05**	**10/5/05**
497	**Install Electronics and Cables**	**39.63 days?**	**9/21/05**	**11/18/05**
498	Install SIU	1.5 days	11/8/05	11/9/05
499	Install GASU	1.5 days	9/21/05	9/22/05
500	Install PDU	1.5 days	10/3/05	10/4/05
501	Install EPU	1.5 days	11/8/05	11/9/05
502	FSW Install and Checkout	1 day?	11/9/05	11/10/05
503	LATTE 5 Validation	5 days	11/10/05	11/18/05
504	16 Tower CPT	3 days	11/9/05	11/14/05
505	**ACD Install and Test**	**4 days**	**11/14/05**	**11/21/05**
508	**LAT Level System Test**	**45 days**	**11/21/05**	**2/7/06**
514	Pack & Ship to NRL	3 days	2/7/06	2/10/06



SAS Interfaces

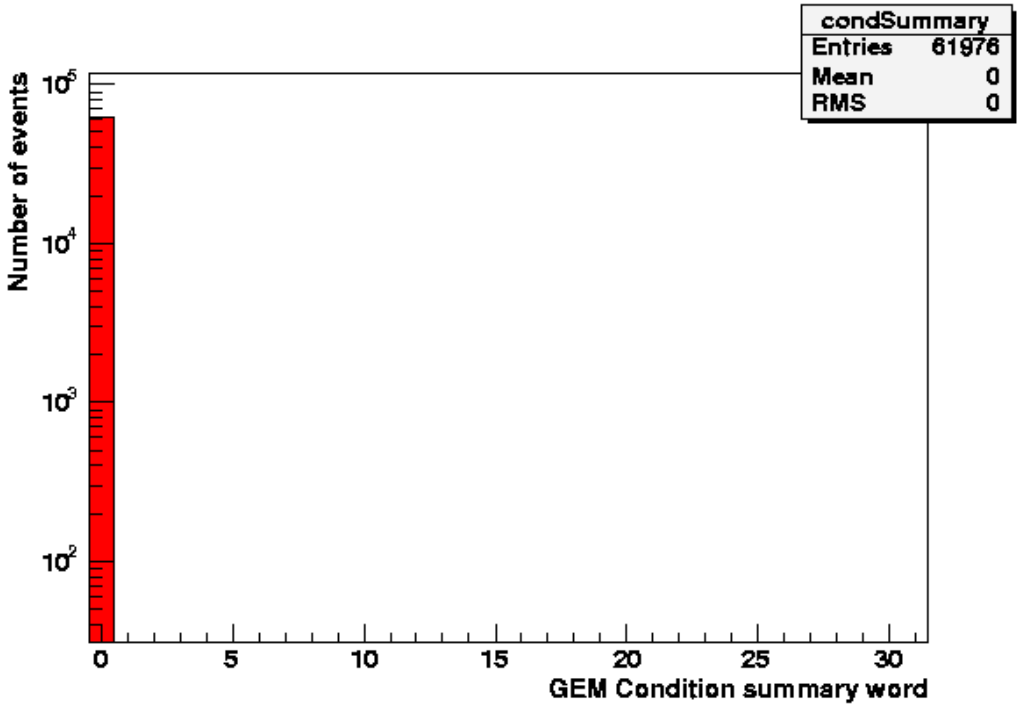
- SVAC is happy with CCB process
  - Thanks Richard
- Code release is getting more stable and reliable
  - Working with SAS to sharpen validation procedures
    - specially calibrations
- Pipeline issues are more infrequent
  - We expect to transition into a more robust architecture in a not so distant future
    - Ought to be tailored to the ISOC needs

Data Analysis Issues (up to 4 tower data)

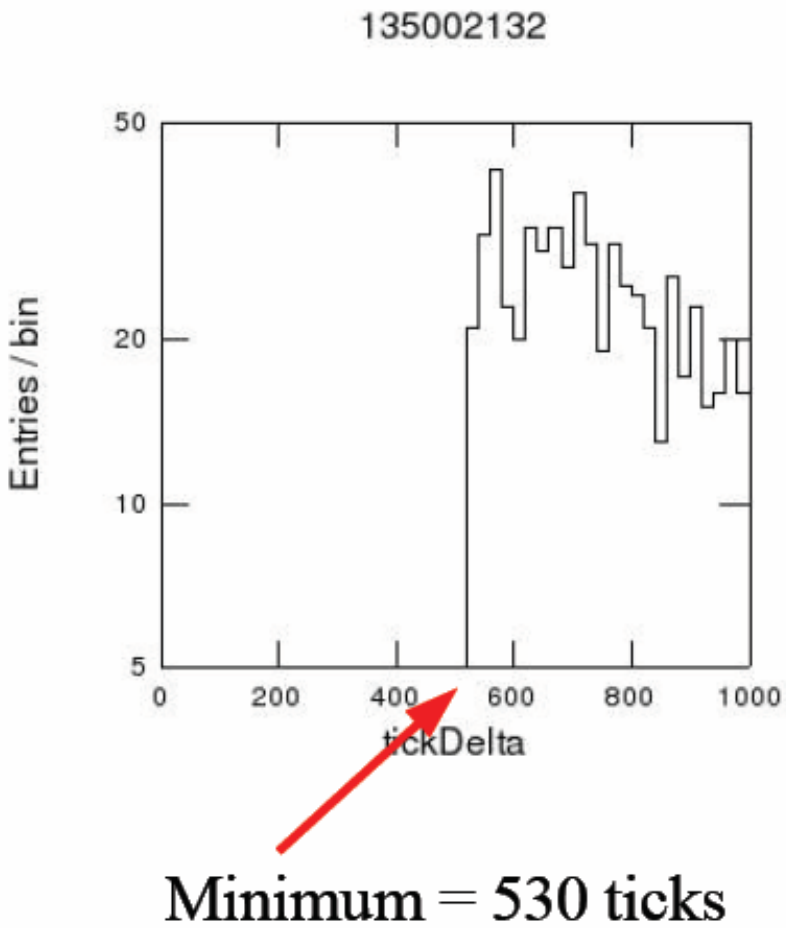
- Hardware failures or problems
  - None so far !!! Kudos to the “royal we”
- Anomalies in offline distributions
  - Becoming less frequent and mostly due to
    - Incorrect configurations (mostly operational procedures)
    - Mistakes in the offline data analysis codes
- Understanding how the instrument works
  - Requires a much broader knowledge of
    - Integrated detector system functions and performance
    - LAT configuration (needs to be configuration controlled)
    - Details of complex offline software
    - How the analysis parameter space changes as we add more towers

Feedback to Operations: Procedures

- SVAC automated reports identified that GEM was not reporting trigger information properly for some of the 4 tower tests
- Action
  - stopped data taking to investigate root cause (Eduardo)
- Root cause
  - incorrect power up of system
    - found by Horwitz and confirmed by Huffer
- Recommendation to I&T
  - Improve procedures
  - Introduce online control plots during data taking



Understanding Performance: Deadtime



- Warren Implemented an offline variable to measure time without being affected by roll over of counter
- Measured deadtime in several configurations
  - Working to understand numbers

Do we have enough data yet?

- One tower
- Two towers
  - End-to-end cosmic ray data
    - To exercise trigger and data flow capabilities
  - SVAC cosmic ray data
    - To perform calibrations
    - To do performance studies that require large statistical sample
- Four towers to Sixteen towers (prior to ACD integration)
  - Only planned to collect SVAC data
  - May request some tests (most likely between 6 and 8 towers) to
    - Configure the instrument to take data with 2 Trigger Engines (simulate on-orbit operation)
    - Study nominal/high rates with TEM diagnostics OFF
    - Understand TKR one-shot behavior
    - Study TKR cable FIFO errors (caused by induced showers)

Issues & Concerns

ISSUES

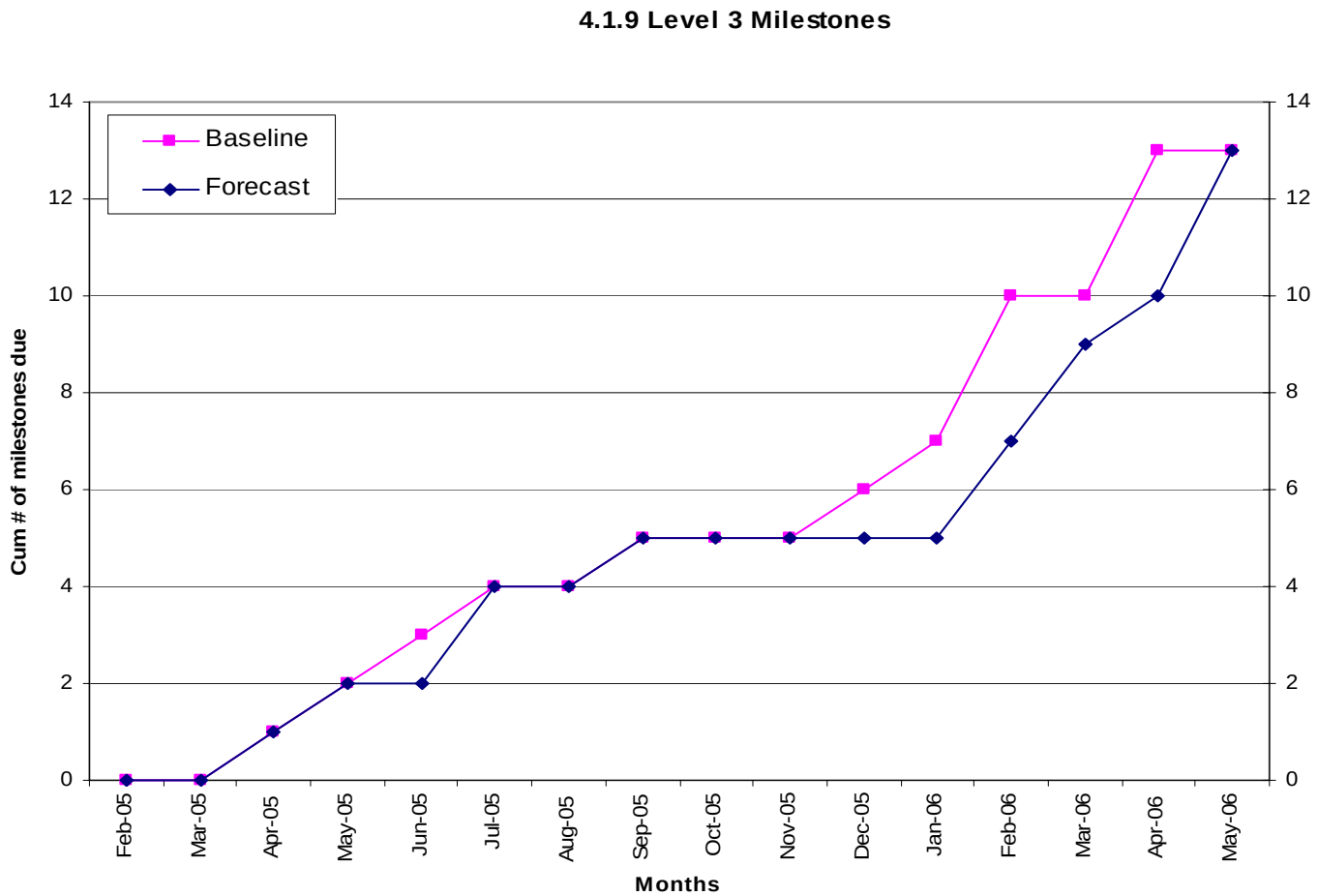
- **Availability of flight assembly hardware.**
  - **Shortages identified by I&T and being worked with Subsystems.**
    - **Flight Cables**
  - **TKR**
  - **SIU & EPU**

CONCERNS

- **Additional I&T manpower for Online, SVAC and IFCT.**
- **TPS rework and replacement, availability for future tower installations.**

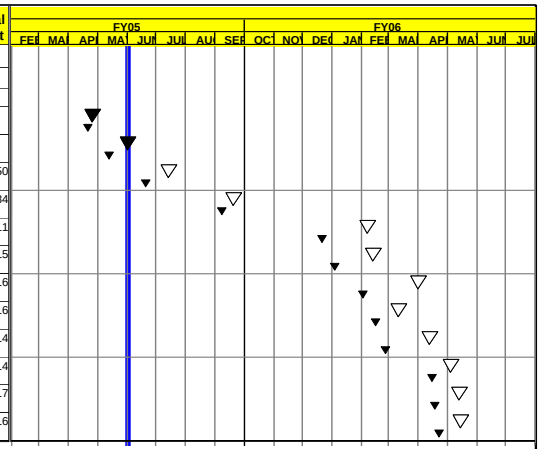
Cost/Schedule Reports for Presentation
May 2005 Month End
4.1.9 Integration & Test

Level 3 Milestone Count



Level 3 Milestone List

AV	Activity ID	ND	Activity Description	Baseline Finish	-2m Var	-1m Var	Bsln Var	Early Finish	Total Float
Instrument Project Office (Level 3)									
4.1.9 I&T									
9	1M99010	9	Start 2 Tower Comprehensive Performance Tesl	04/20/05	4	4	-3	04/25/05A	
9	1M99020	9	Start 4 Tower Comprehensive Performance Test	05/12/05	1	1	-12	05/31/05A	
9	1M99030	9	Start 8 Tower Comprehensive Performance Test	06/20/05	-4	-4	-16	07/13/05	50
9	1M99040	9	Start 16 Tower Comprehensive Performance Test	09/07/05	-4	-4	-8	09/19/05	84
9	1M1000130	9	LAT Ready to Ship to NRL for Env Tesl	12/20/05	-9	-9	-27	02/06/06	11
9	1M19010	9	Ship LAT to NRL for Env Test	01/03/06	-13	-13	-40	02/12/06	15
9	1M19020	9	LAT EMI/EMC Test	02/01/06	-14	-14	-58	03/31/06	16
9	1M19030	9	LAT Sine Vibe	02/14/06	-14	-14	-24	03/10/06	16
9	1M19040	9	LAT Acoustic Test	02/24/06	-16	-16	-46	04/11/06	14
9	1M19050	9	LAT TVAC	04/14/06	-15	-15	-20	05/04/06	14
9	1M19060	9	LAT Weight & CG	04/17/06	-14	-14	-25	05/12/06	17
9	1M19070	9	Ship LAT to Spectrum Astro	04/21/06	-16	-16	-23	05/14/06	16



Run Date 06/16/05 15:50
Data Date 06/01/05

GLAST LAT PROJECT
Level 3 Milestones
Baseline Variance (Organized by Subsystem)

LT-DA: Baseline Variance
FL-D4: AV: Level 3 Milestones
Report #10
Sheet 1

Milestone Variance Explanation

- **Schedule Impact**
  - **30 days due to late delivery of hardware**
- **Cost Impact**
  - **No cost impact**
- **Corrective Action**
  - **Evaluate system level test definition and durations.**
  - **Use 7/24 schedule as required for system level test to minimize test duration.**

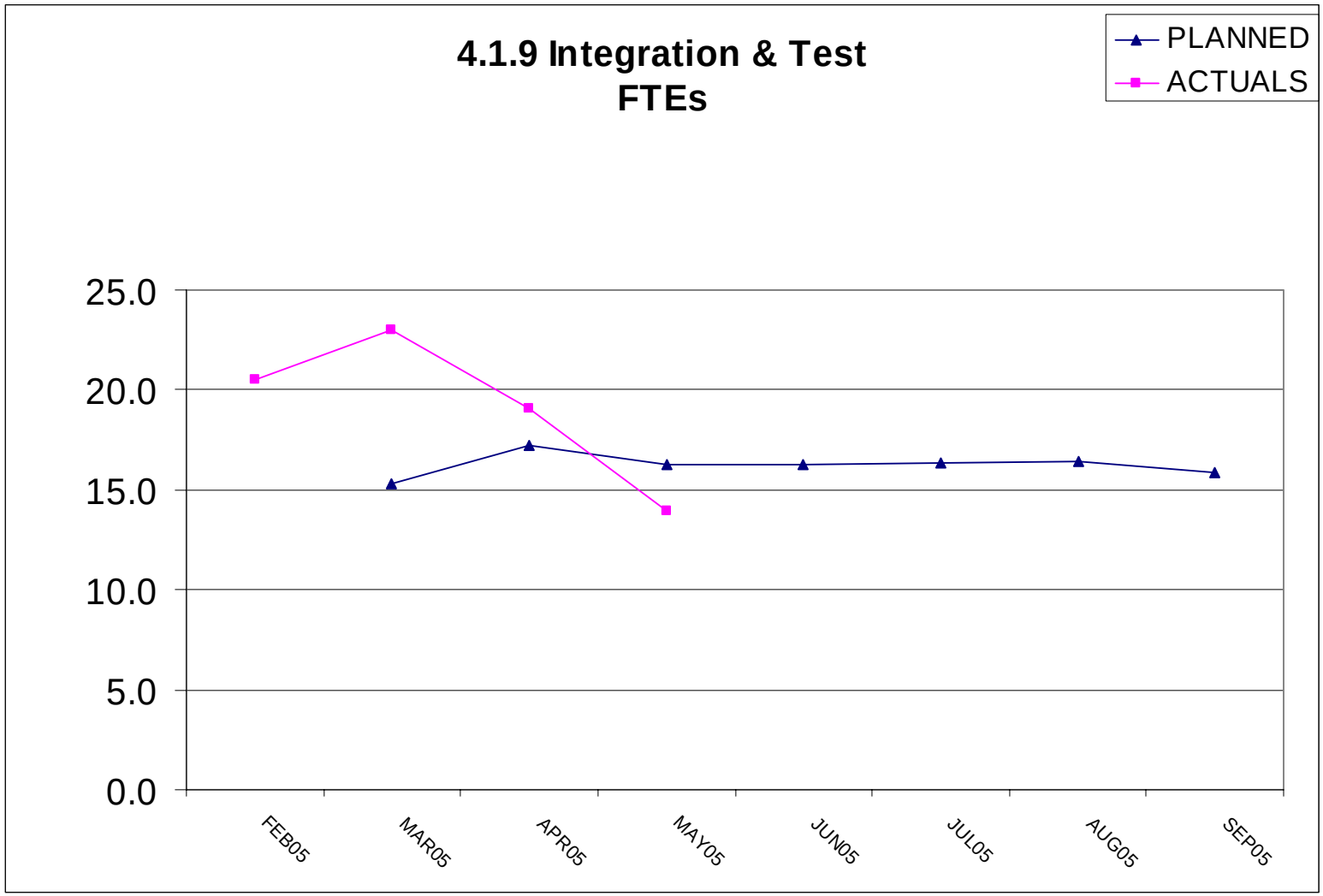
Cost Report

Reporting Category	Cost Incurred				Estimated Cost			Estimated Final Cost		Unfilled Orders Outstanding
	During Month		Cum. to Date		Detail		Balance of Contract	Contractor Estimate	Contract Value	
	Actual	Planned	Actual	Planned	JUN05	JUL05				
4.1.9 INTEGRATION & TEST										
4.1.9.1 I&T MANAGEMENT	62	47	1,125	1,163	49	44	135	1,354	1,354	0
4.1.9.3 INSTR OPS COORDINATOR	0	0	31	31	0	0	0	31	31	0
4.1.9.4 MECH GROUND SUPT EQUIP	19	9	2,074	1,892	0	39	-15	2,098	2,098	0
4.1.9.5 ONLINE SOFTWARE	0	0	654	654	0	0	0	654	654	0
4.1.9.6 INTEG, FACILITIES, CONFIG & TEST	147	77	2,909	3,193	221	343	747	4,219	4,219	18
4.1.9.7 PARTICLE TEST	0	0	43	48	0	0	5	48	48	4
4.1.9.8 ENVIRONMENTAL TEST	65	-52	372	332	146	128	101	747	747	0
4.1.9.9 SCIENCE VERIFICATION, ANALYSIS & CALIBRATI	0	0	300	300	0	0	0	300	300	0
CAPW[3]Totals:	293	82	7,507	7,613	416	555	974	9,451	9,451	22

Cost Variance Explanation

- Why overrun/underrun?
  - Fly away instrumentation costs haven't been recorded
  - Vacations
- What will be done to correct?
  - No action required

FTE Report (DOE/NASA-funded only)



FTE Variance Explanation

- Why overrun/underrun?
  - Vacations
- What is the impact?
  - None
  - Potential future impact when hardware arrives.
- What will be done to correct?
  - Moving 1 FTE from ELX to I&T
  - Hire production control person.