Fermi Large Area Telescope
Instrument Science Operations Center

ISOC Operations Status

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Outline

- LAT Operations Highlights
- FSW Updates
- Science Operations Status
- Instrument Updates
- ISOC Facility Updates

LAT Uptime for Physics = 99.2%

- LAT operations are quite stable, but some interruptions to routine data-taking since last IFC meeting
  - 3 restarts of the LAT, each taking a couple of minutes
  - 3 hours devoted to calibrations
  - 3 hour test with 10 GeV filter bypass threshold
  - 6 minutes lost due to unexpected SAA transit

LAT Operations Highlights since March 2010

- 2010 Apr 5: Fermi TOO, for 200 kseconds. No change to LAT data-taking.
- 2010 Apr 13: Restarted LAT to use new LCFG/RIM FSW code
- 2010 Apr 29: Fermi rocking angle changed to 45 degrees
- 2010 May 2: Observed a single event without expected compression
- 2010 May 13: FSW build B2-2-1 started.
  - Provides improved GRB alg.
- 2010 May 27: Fermi returned to 50 degrees rocking angle
- 2010 June 17: 2 orbit test with GAMMA filter High Energy Pass set to 10 GeV.
  - Data delivered to FSSC, but flagged with DATA_QUAL=0
- 2010 July 1: Used 3 hours for routine charge injection Calibrations of CAL, TKR, ACD
- 2010 July 25: CAL Twr 4, Layer X1, Col 4, +Face, HE diode began misbehaving.
- 2010 July 28: FSW build B2-2-2 started.
  - Fixed known compression bug tickled by bad CAL HE channel output.
- 2010 Aug 6: LAT had an unpredicted excursion into the SAA (2 seconds long) which caused a run to stop prematurely. Lost ~6 minutes of data.
  - FIX to be applied to ground software in the MOC.

LAT data collection since Launch

Build	Events	Percentage	Activation Date	Days
Pre-activation				13
B1-0-8	4978114560	3.754	24-Jun-08	37
B1-1-0	9787216696	7.381	31-Jul-08	61
B1-1-3	20154913225	15.199	30-Sep-08	120
B2-0-0	15254567639	11.504	28-Jan-09	94
B2-0-1	4465013138	3.367	2-May-09	27
B2-0-2	18861007646	14.223	29-May-09	111
B2-1-0	2297478230	1.733	17-Sep-09	14
B2-0-2'	1323628181	0.998	1-Oct-09	7
B2-1-2	3607700760	2.721	8-Oct-09	21
B2-2-0	28496050581	21.489	29-Oct-09	166
LCFG start	5072986682	3.826	13-Apr-10	30
B2-2-1	12740146334	9.608	13-May-10	76
B2-2-2	5566087673	4.197	28-Jul-10	33
Total	**132,604,911,345**	**100.000**	**30-Aug-10**	**810**

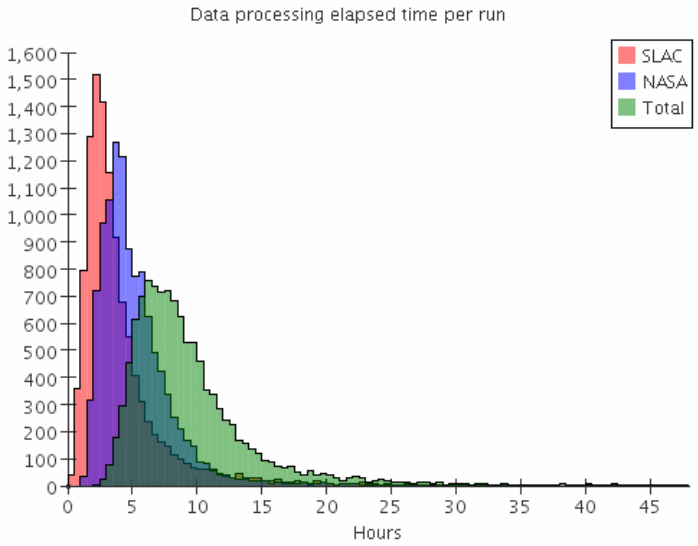
LAT Flight Software Plans

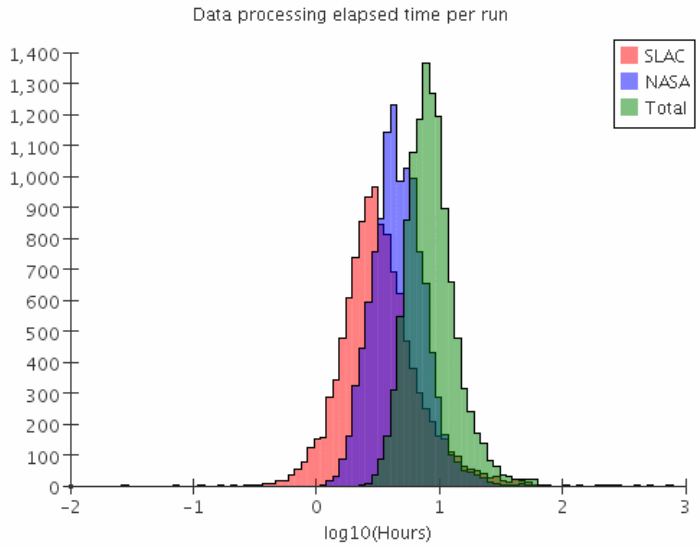
- Both planned and possible updates of LAT FSW, for long term maintenance
- B2-3-0: LCI upgrades
  - Testing in progress
  - Expecting to load soon, in 2010
  - Expecting ~4x faster charge injection calibrations for CAL, TKR, ACD
- BX-X-X: Add background rejection filter to the events that are fed into the onboard science processing (GRB afterburner)
  - Need time from key developer. But expect significant progress in 2010
- BY-Y-Y: Compiling FSW under various linux flavors for easier integration into offline software systems
  - Investigating feasibility of separating parts of the on-board filters needed by offline
  - Upgrading build tools to accommodate RHEL4/RHEL5 32/64 Oses.
  - Would need careful trace of compiler dependencies in code base

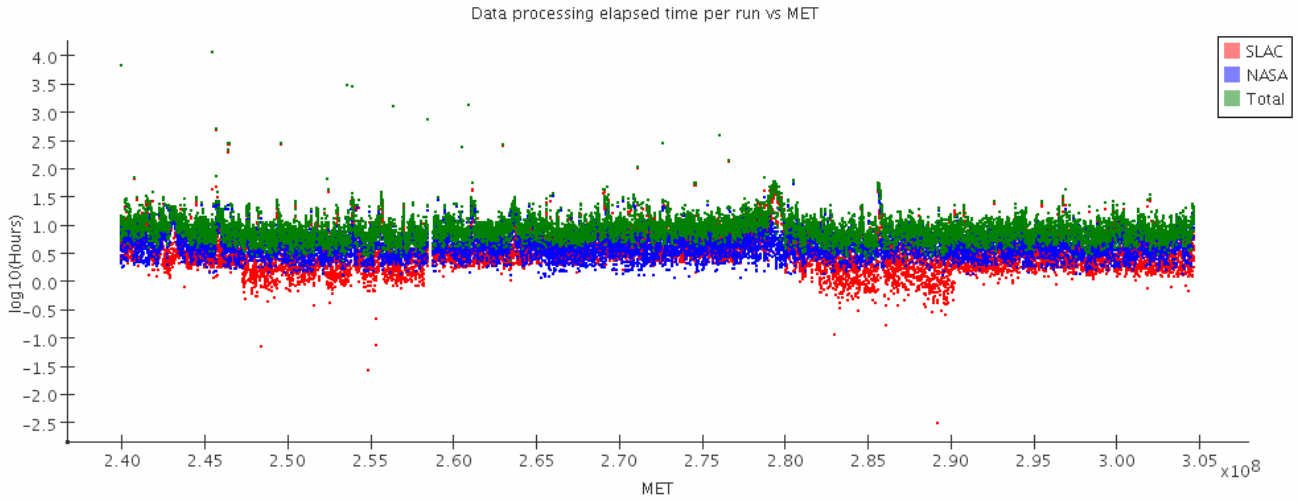
ISOC Science Operations

- Still making incremental improvements to processing performance and reliability
  - Working to debug RHEL5 which may be causing stuck jobs
- Level 1 Processing metrics
  - >12000 orbits of Fermi since launch
  - 26 billion events transmitted to the ground from the LAT
    - 400 million classified as photons in L1 processing and delivered to the public through the Fermi Science Support Ctr
  - 250 CPU-years of processing time at SLAC
  - 600 TB of output data files
- Science Data Monitoring
  - 120,000 quantities monitored
  - 4238 monitored quantities have automated alarms, sent via email
  - Automated DQM has caught all known instrument issues so far

Data Processing Elapsed Time Per Run







Automated Science Processing Status

- GRB Tasks
  - ASP Blind Search
    - 24 GRB candidates since 04 Aug 2008
    - 8 confirmed LAT GRBs (GRB080916C, 081024B, 090217, 090510, 090902B, 090926A, 100116A, 100724B)
    - 16 accidentals
      - 3 associated with Earth limb emission during the AXP-triggered ARRs; 1 associated with Vela entering LAT FoV
      - Remaining 12 are consistent with the expected 5-sigma threshold rate of 18 over two years.
  - The GRB refinement task
    - Produced position refinement and spectra for all 8 LAT GRBs
    - Processed >2252 GRB candidate notifications received via GCN since 04 Aug 2008.

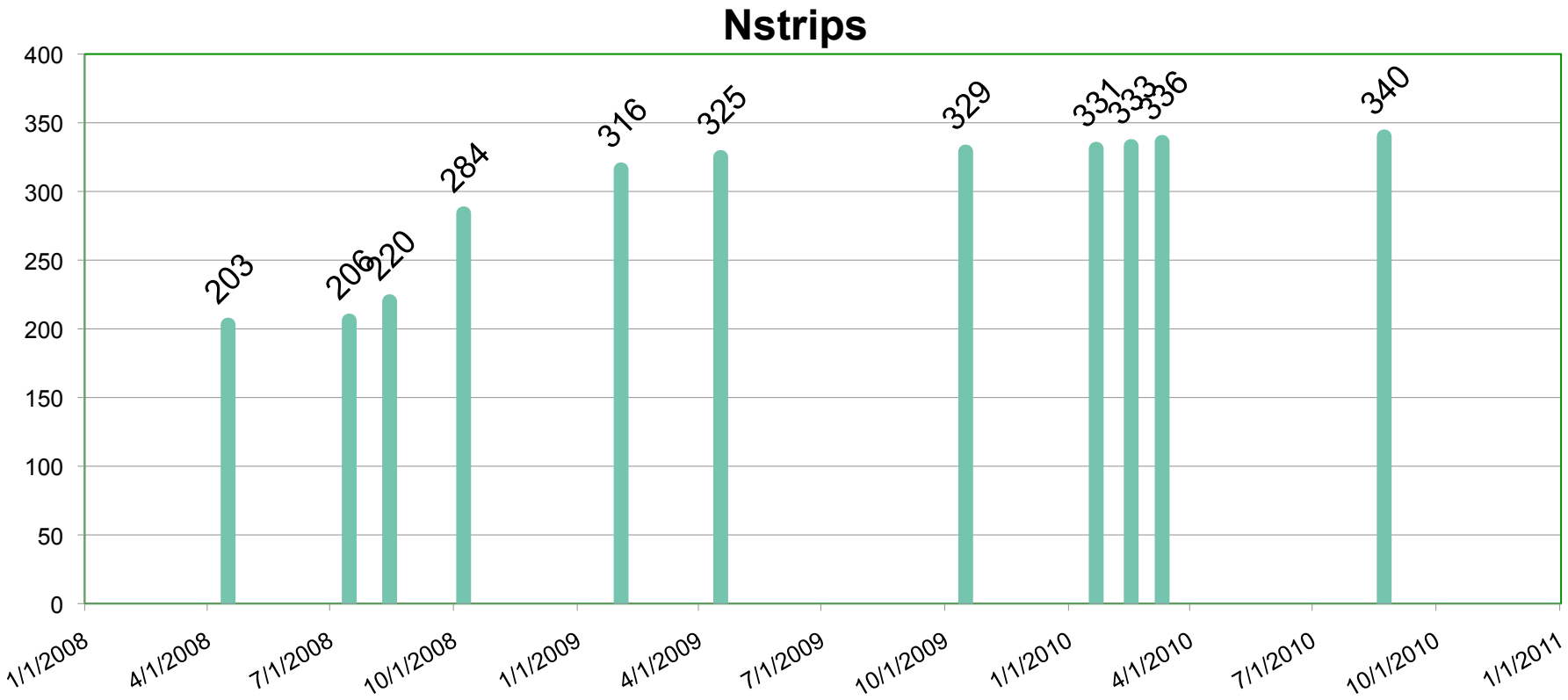
ASP Status Update (2)

- Flaring source detection and flux monitoring tasks
  - Key resources for the Galactic and Extragalactic Flare Advocates activities
  - More than 85 ATELs have been issued for flaring sources as a result of ASP processing.
  - Daily and weekly fluxes for the monitored source list are now sent to the FSSC on a daily basis.
    - Important resource for Fermi GI proposals
    - 40 sources have been added to the original 23
    - Used by multiwavelength community for planning and coordinating observing campaigns.

Instrument Performance Updates

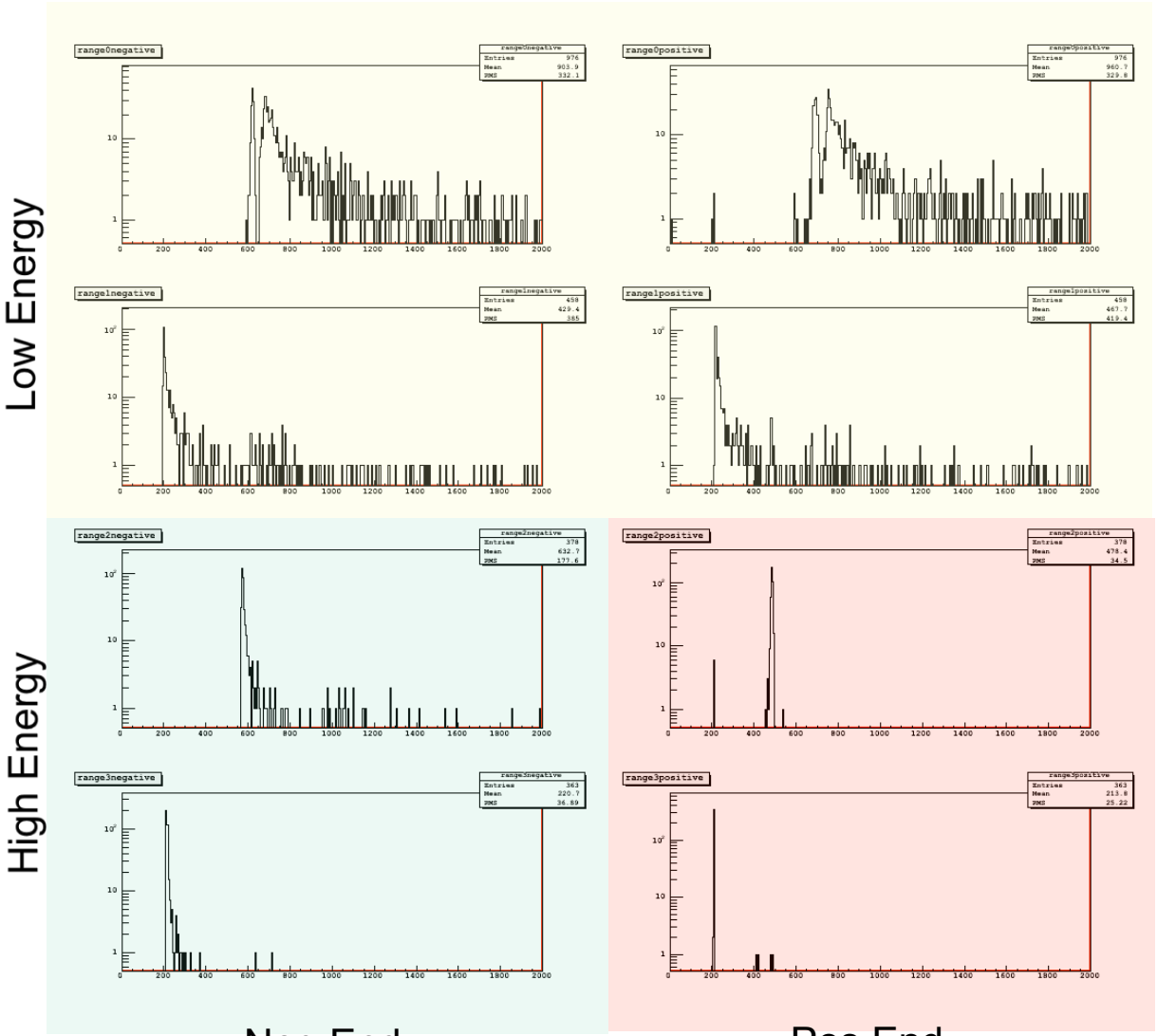
LAT TRACKER Si Strip Masking

- 137 strips masked since launch
  - 93 of these are on Tower A (the 1st tower); none after the first year
- Total number of masked strips = 340 of 884,736 = 0.038%



LAT CAL Channel Failure

- CAL team is using heavy ion events to better characterize the LE and HE responses of the bad channel
- HE channel masked out of Data Monitoring alarms
- May learn more in next CAL charge injection calibration

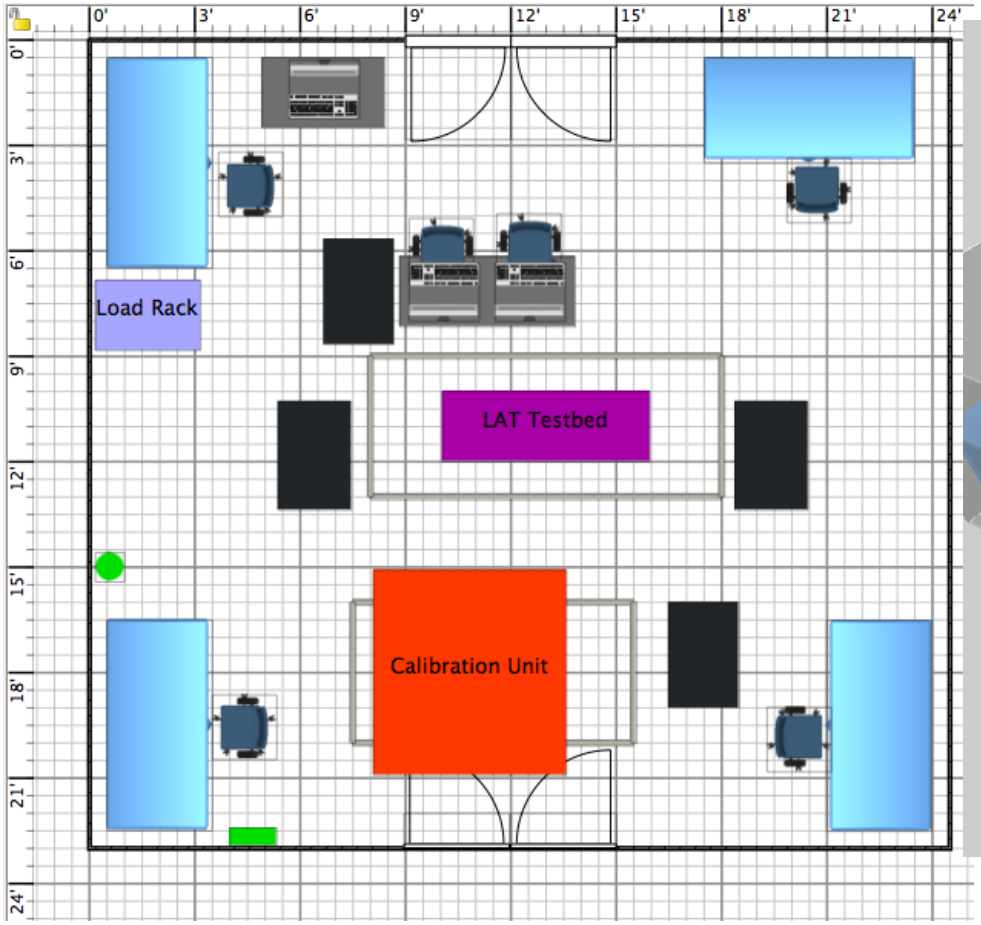


ISOC Operations Facility Updates

ISOC Operations Facility Changes

- ISOC Ops Facilities in Building 84 at SLAC are being reduced in size
  - Driven by a need to put more staff in building 84, as SLAC starts a period of constructing new buildings
- Mission Support Room and Dataflow Lab are each being halved in size
- Mission Support Room changes
  - Current space being halved, with the installation of a partition wall
  - 3 operator workstations will be available (formerly 6)
  - Change will happen in the next 2 months
- LAT Dataflow Lab changes
  - Changes completed in July
  - The dividing wall that was removed to expand the lab in 2006 has been restored.
    - LAT Calibration Unit and Testbed and racks were relocated
    - Heavy items and test stands on workbenches have been anchored for seismic protection
  - ISOC keeps half of room 138 for LAT FSW build-system computers

Revised Layout of LAT Dataflow Lab



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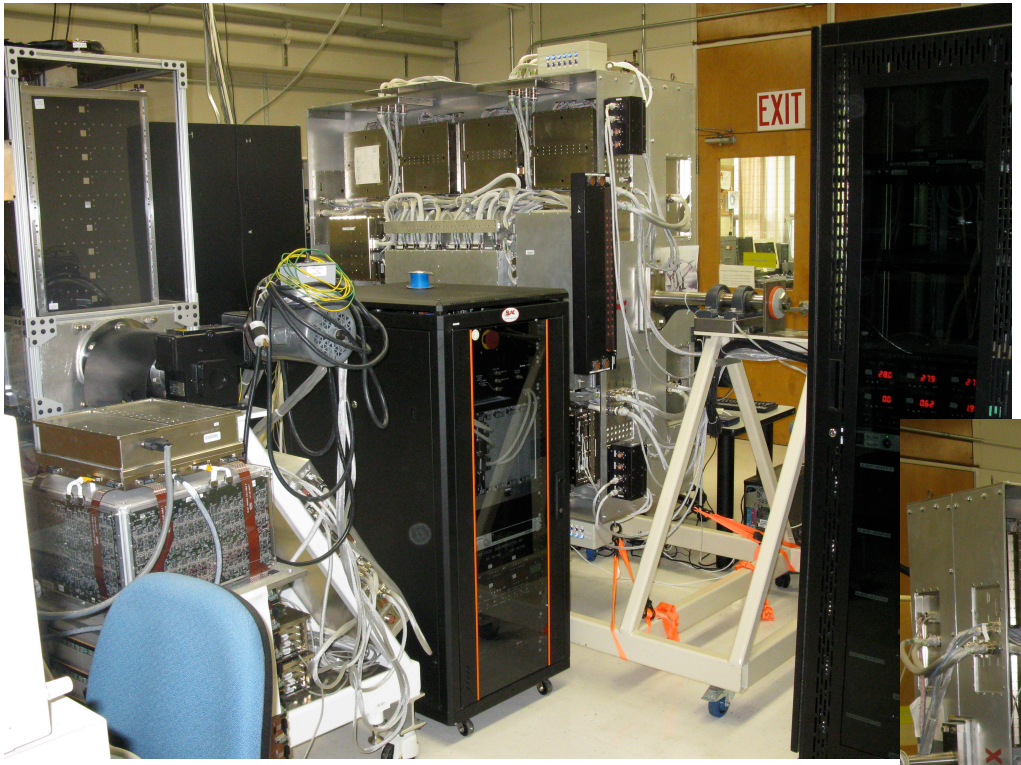
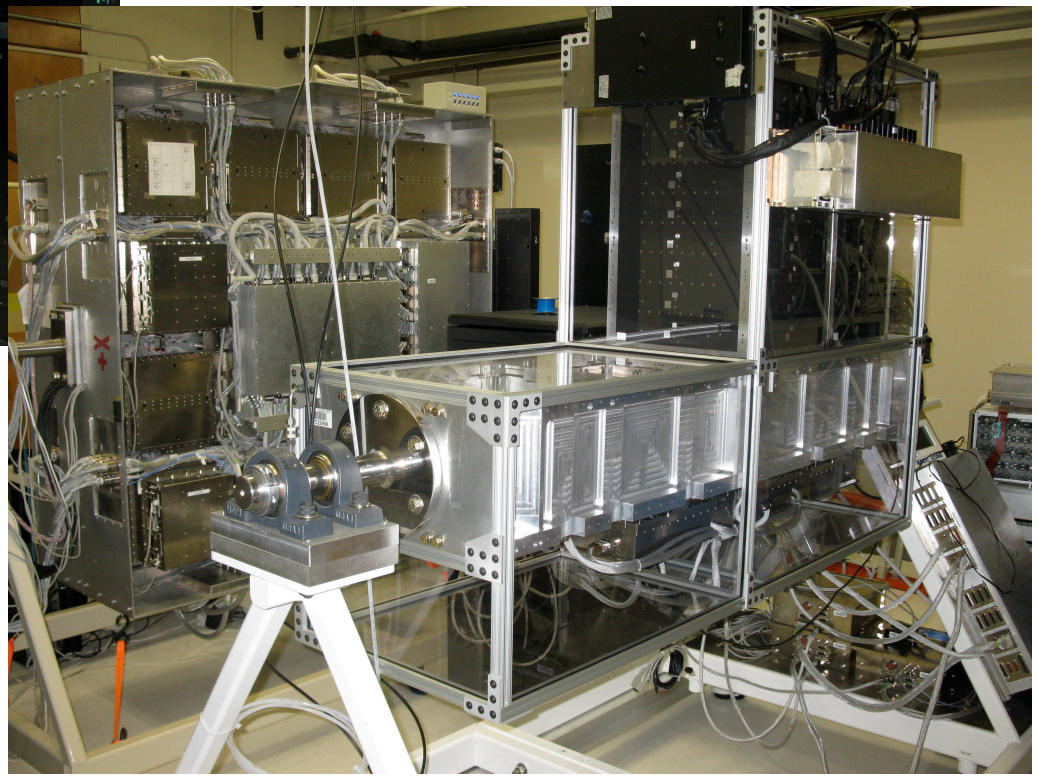
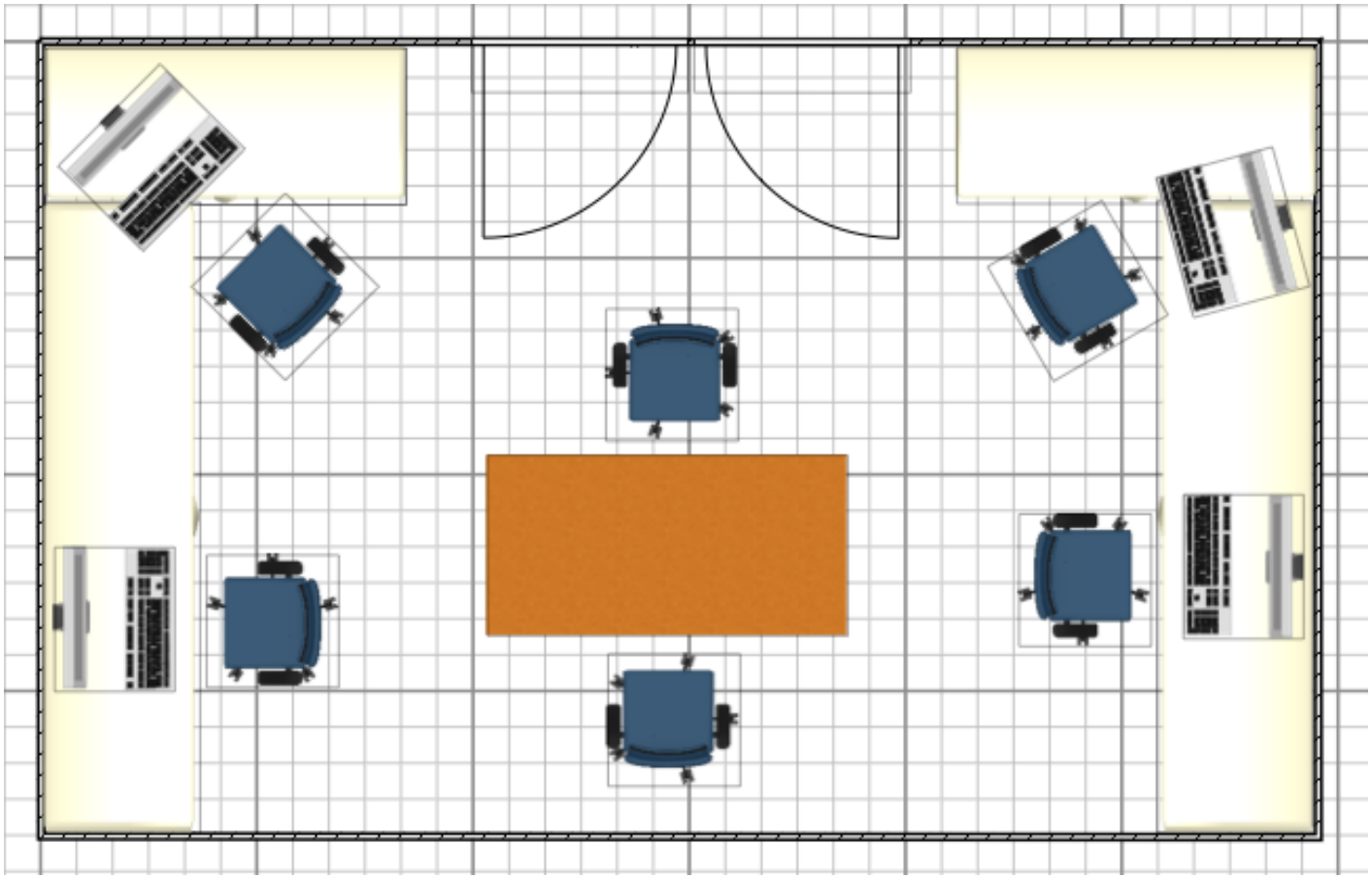




Planned Layout of Mission Support Room

- 3 Ops workstations with triple displays
- Plus 1 Windows PC and 1 Linux PC using shared display/seat



Backup Slides

Future LAT Performance Updates

Improving LAT On-board Science Output

- Meetings continue, to gather inputs on other on-board science configuration updates, and other update ideas
  - Splinter session at LAT Collab meetings on this topic
    - Science drivers for updates
    - Online/on-board changes
- Preparations for Solar flares and CMEs in Solar Cycle max.
- LAT calibrations using Earth limb observations