



Status of EMU Electronics

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(Reported by J. Gilmore)

EMU Meeting

Gainesville, Florida

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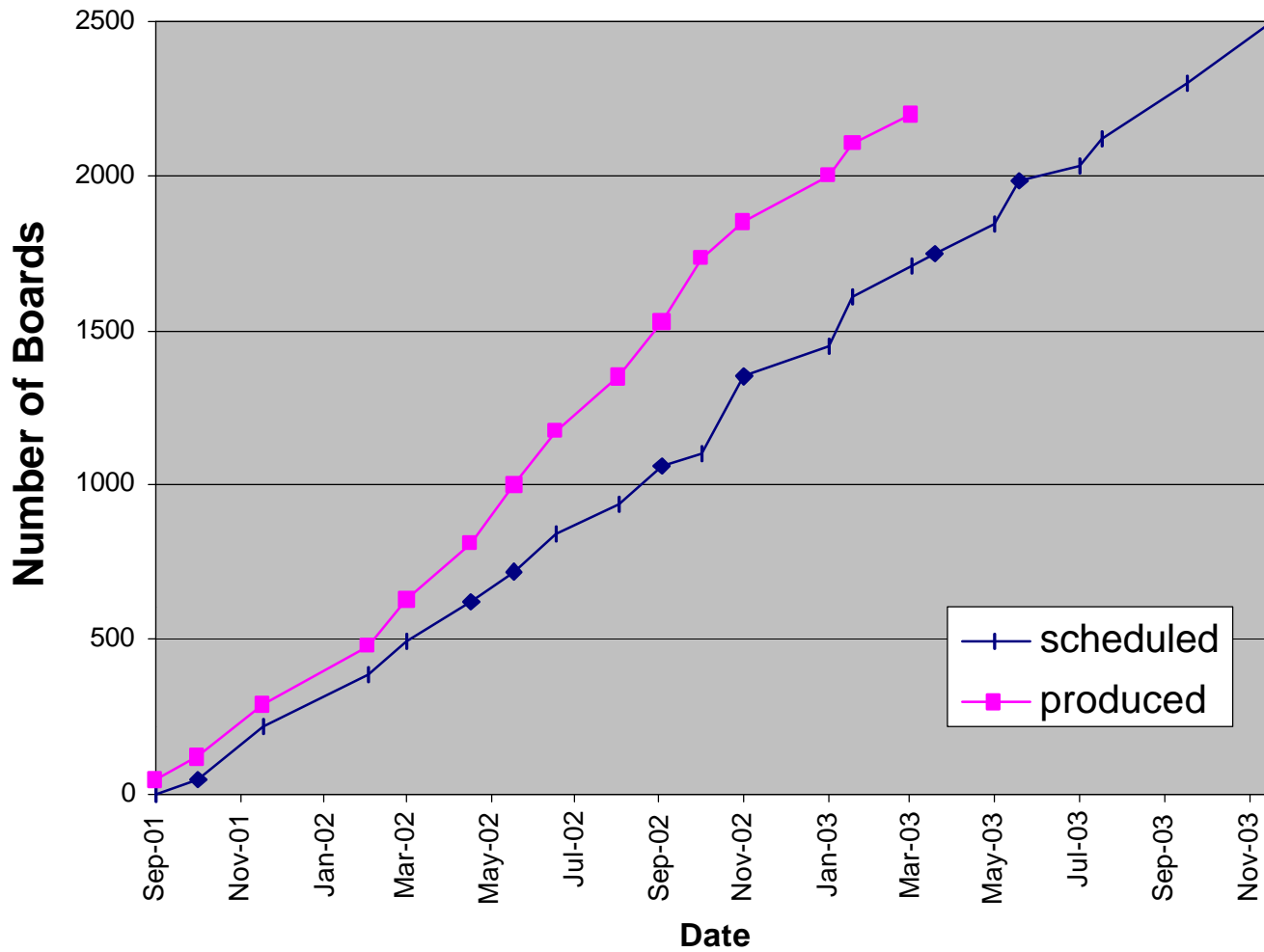


Production of On-Chamber Boards

- **CFEB**
 - Over 2200 (out of 2500) boards produced and tested.
 - All CSC-CFEB and CFEB-CFEB cables produced.
- **AFEB**
 - All 10,000 boards produced and tested.
 - All AFEB-ALCT cable produced.
- **ALCT**
 - ALCT-384: All 250 boards produced. 220 of these passed all tests.
 - ALCT-672: 53 of 85 boards produced and assembled. Testing in progress.
 - ALCT-288: 48 out of 108 prototype boards produced and assembled. Testing in progress.
- **LVDB** – 222 out of 500 boards delivered.

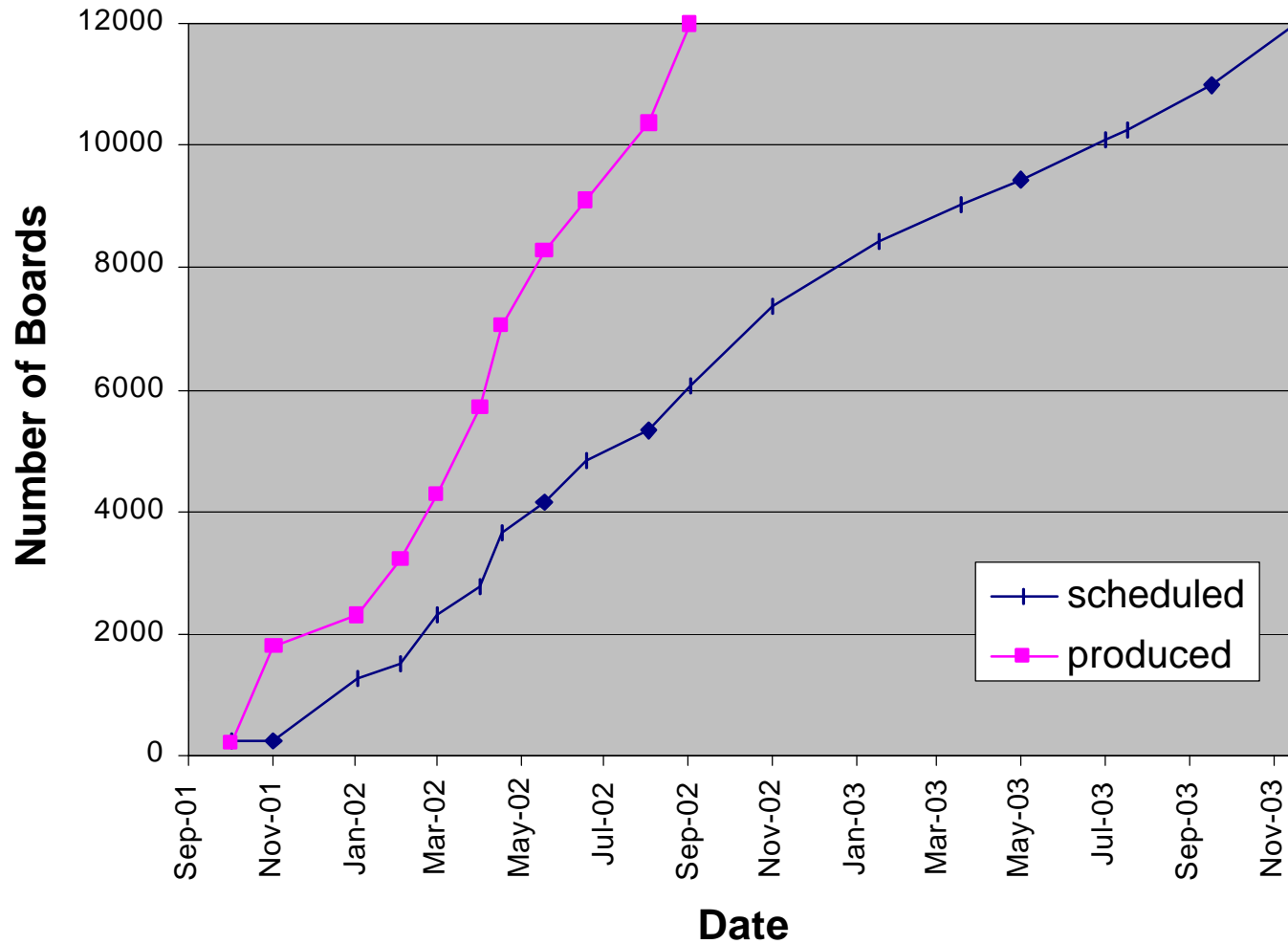


CFEB Production Rate



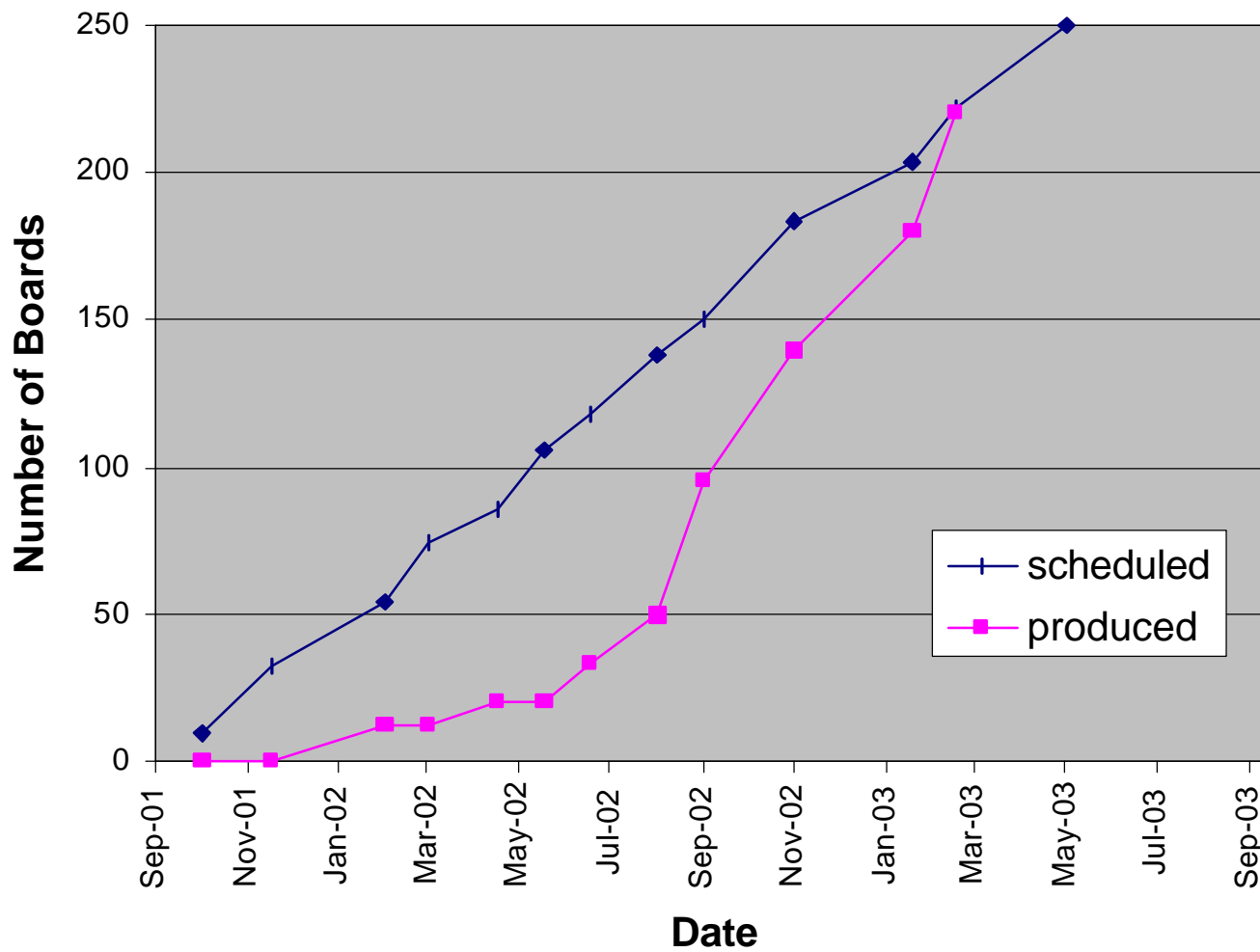


AFEB Production Rate





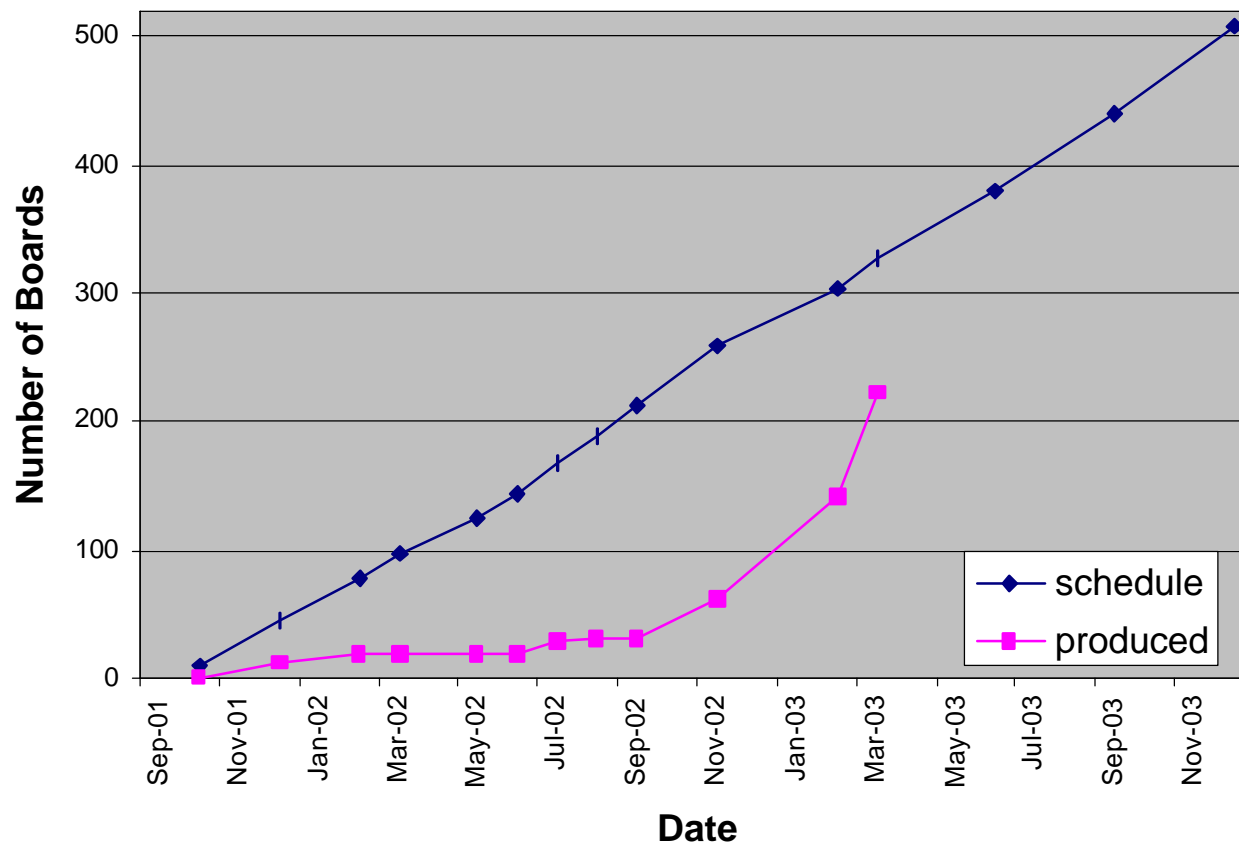
ALCT-384 Production





LVDB/LVMB Production

- All LVMB plus cables produced.
- LVDB Production catching up:





FAST Site Testing Statistics

- Summary of FAST site board rejection statistics – from <http://www.phys.ufl.edu/cms/emu/fast/failure-stat.shtml>

	30 CSC's (Jul 02-Oct 02)	45 CSC's (Nov 02-Feb 03)	Remarks
CFEB	(13 + 14)/150 18%	(3 + 5)/225 3.5%	<i>Rev-8 problem on first 125 boards. (see next slide) FAST site learning curve.</i>
AFEB	(6 + 27)/720 4.6%	(0 + 19)/1080 1.8%	<i>Most of the problems are cross-talks caused by threshold being set too low. (Capacitor value out of bounds).</i>
ALCT	6/30 20%	9/45 20%	<i>Low Statistics, but shows no improvement in rejection rate.</i>

**Red: hardware problems (bad ASIC's , flakey solder joints,
broken connectors/latches)**

Green: other problems (noise, threshold, firmware/software)



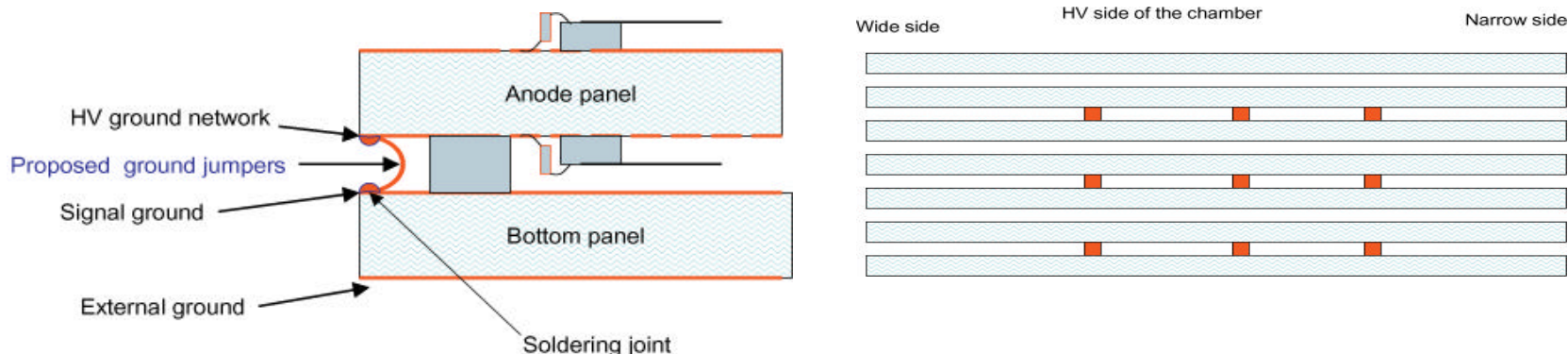
CFEB Repairs

- **Some rejected CFEB's had large pedestal shifts. Problem traced to bad soldering of LV regulator used on the early Rev-8 boards (125 boards).**
 - All Rev-8 CFEB's not yet mounted were sent to OSU and fixed.
 - B. Bylsma traveled to CERN and fixed all Rev-8 boards already mounted on CSC's
- **Some screws holding skew-clear cable connector to the CFEB have fallen off after shipping. Solution proposed and adopted by the collaboration:**
 - CFEB's already mounted on CSC's: check for screw tightness, dismount CFEB and tighten screw if necessary, then apply "lock-tite" fluid.
 - CFEB's not yet mounted on CSC's: check and tighten screws then use "lock-tite" fluid.
 - CFEB's at OSU (~1300 to be shipped) have all been fixed.



AFEB Noise Reduction

- FAST site tests reveal that the AFEB picks up noise from the HV supply line.
- Proposed solution (Bondar)
 - Install jumpers between HV ground plane and cathode ground plane at several locations along the HV side. Tests showed the jumpers greatly reduce this noise.



- Plan was made and adopted by the collaboration to retro-fit all CSC's
 - All CSC's at ISR-CERN have been retro-fitted.



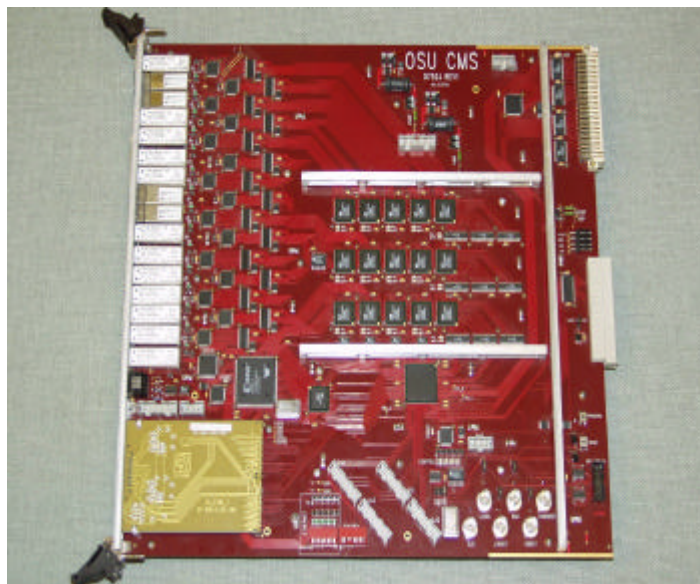
Peripheral Crate Electronics

- **Prototypes of DMB, TMB, CCB, Custom Backplane produced and tested.**
 - TMB firmware nearing completion. Firmware for all other boards have been completed and debugged.
 - Dynatem (Controller) software written and tested.
 - A new, simpler controller being prototyped.
 - TTC software installed (CCB) and working.
 - Rad-hard solution of CCB using discrete logic proposed to collaboration.
- **Skew-clear cable production on schedule**
 - YE2,3 cables mostly produced and delivered.
 - YE1 cables: Length approved. In production
- **Preliminary integration of CSC + (on-chamber boards) + (peripheral crate electronics) achieved in April 2002.**



Electronics in USC55

- **First 9U DDU board produced and tested. (2002)**



- ✓ Full error checking implemented
- ✓ Interface to VME
- ✓ PC readout via Gigabit Ethernet (90 MB/s data transfer)
- ✓ DMB calibration pulses, regular and random timing
- ✓ S-Link64 tested
- **Need to integrate w/ FMM and TTS**

- **EMU will have 36 DDU's in 4 crates located in USC55.**
Latest rack layout in USC55 at
http://cmsdoc.cern.ch/~wsmith/USC55_racks.html



Looking Ahead

- **Radiation tolerant tests of all peripheral crate boards (60 MeV protons at UCD) by Summer 03.**
 - Tolerance of all components to a level of 3×10^{11} n's/cm²
 - Finalize scheme to make CCB immune to SEU.
- **Tests of EMU Electronics system – for validation of peripheral crate electronics prior to ESR and production.**
 - Use multiple chambers and multiple peripheral crates.
 - Tests with Cosmic rays at UCLA by end of April '03
 - Test with 25 ns beam at CERN in May '03
- **Start LV, cooling designs for peripheral crates – Apr 03**
- **ESR of full EMU electronics system - October 03**
- **Start production for peripheral crate boards by end of 03.**
- **Commissioning of installed CSC's on iron disks at SX5 – 2003, 2004**