

Status of the CSC Track-Finder:

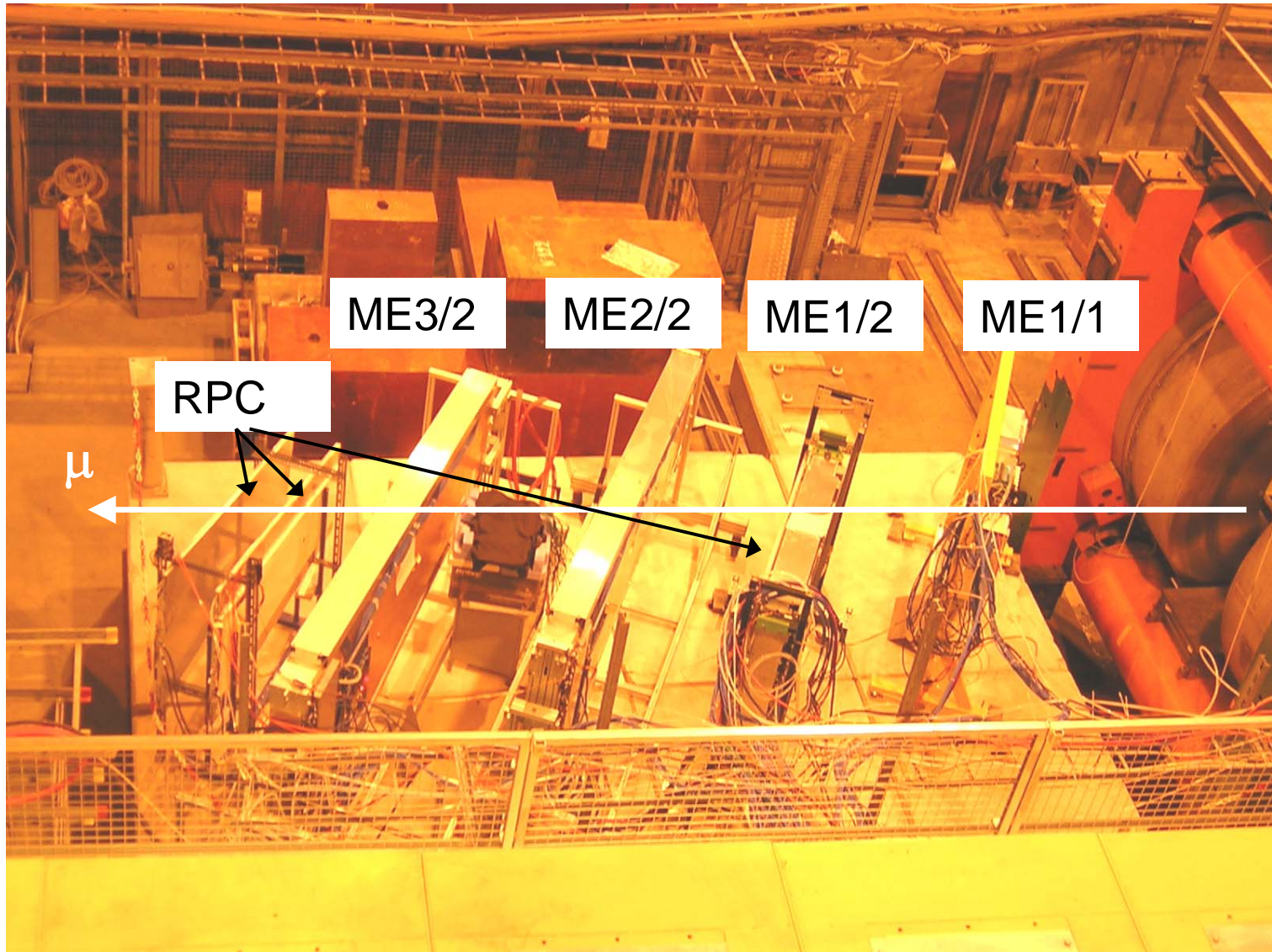
Oct. beam test results
DT/CSC integration test results
Production status
Test plans

Darin Acosta

University of Florida

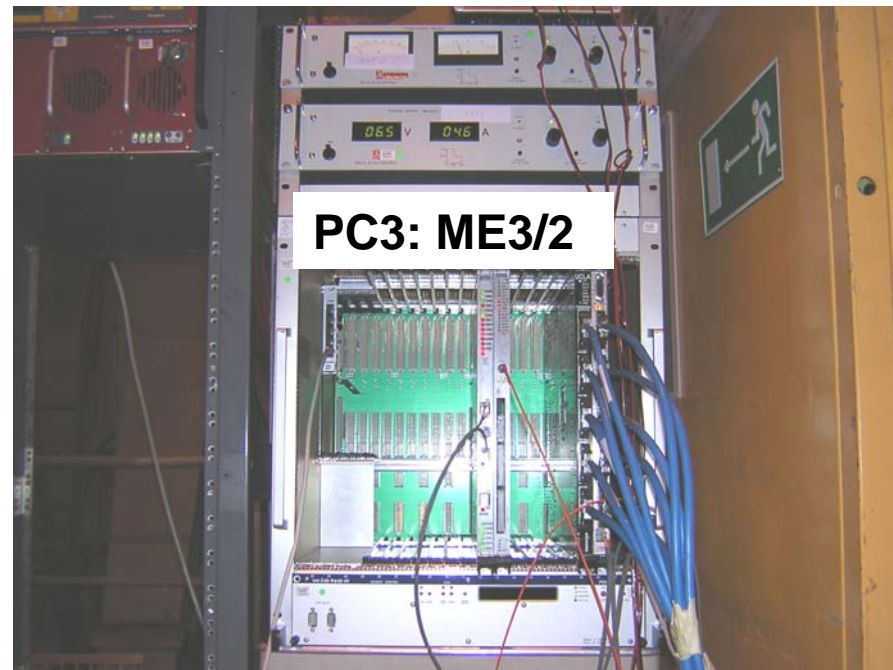
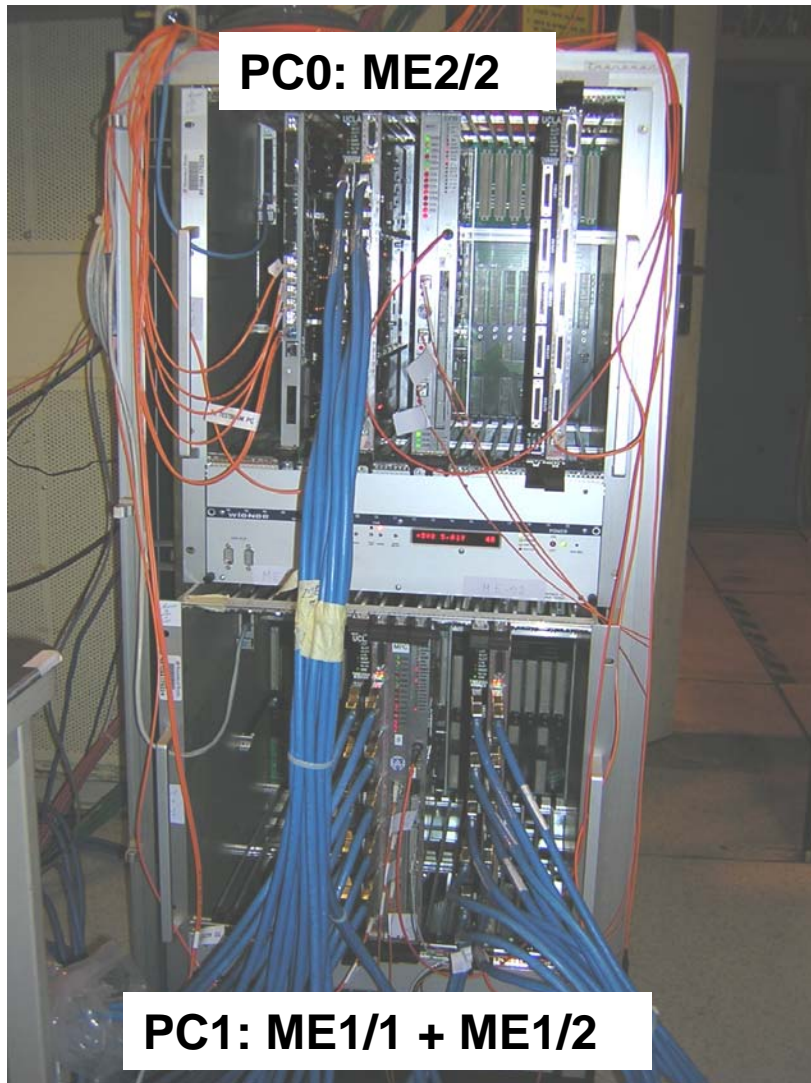


Oct.2004 Beam Test with HCAL+RPC @ H2





Peripheral Crate Arrangement

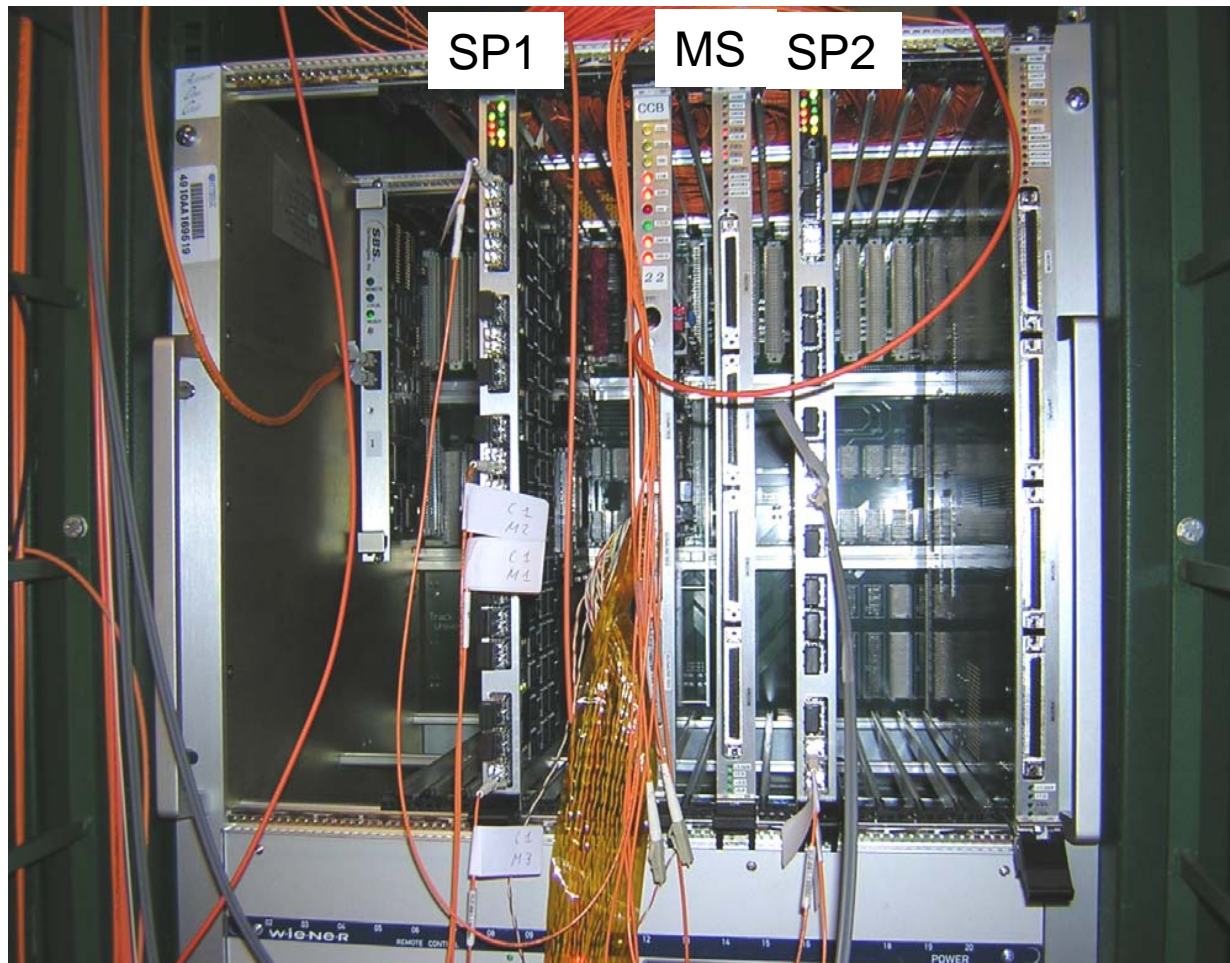


First time 3 MPC → SP test

First time production
peripheral backplane tested



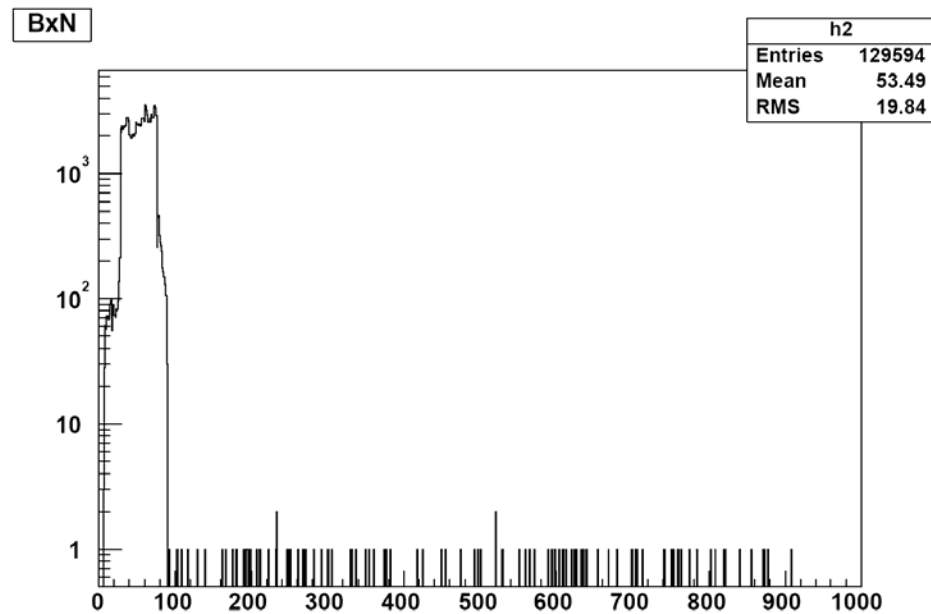
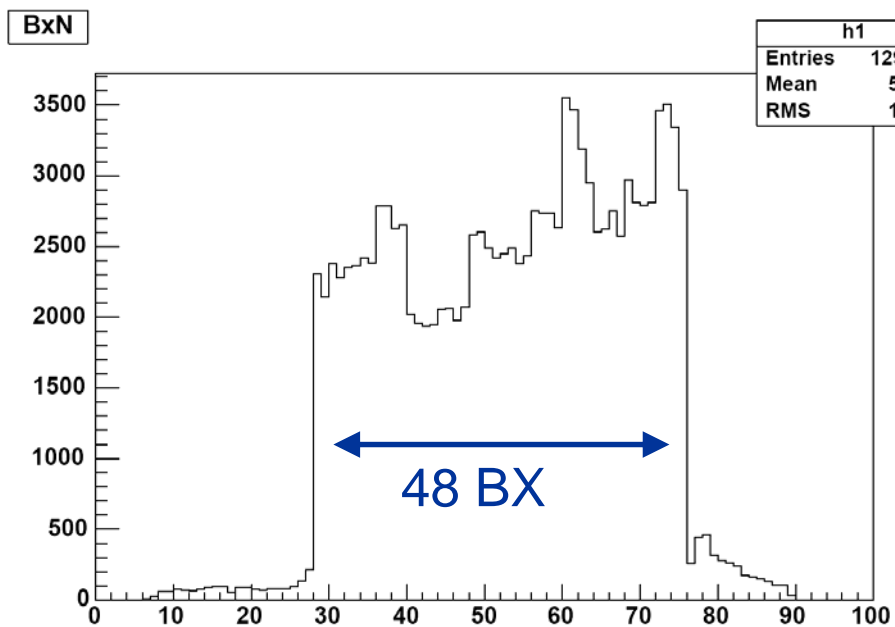
Track-Finder Crate



First time two SPs run simultaneously (including L1A trigger generation to TTC and data output to Muon Sorter)



SP BxN Distribution

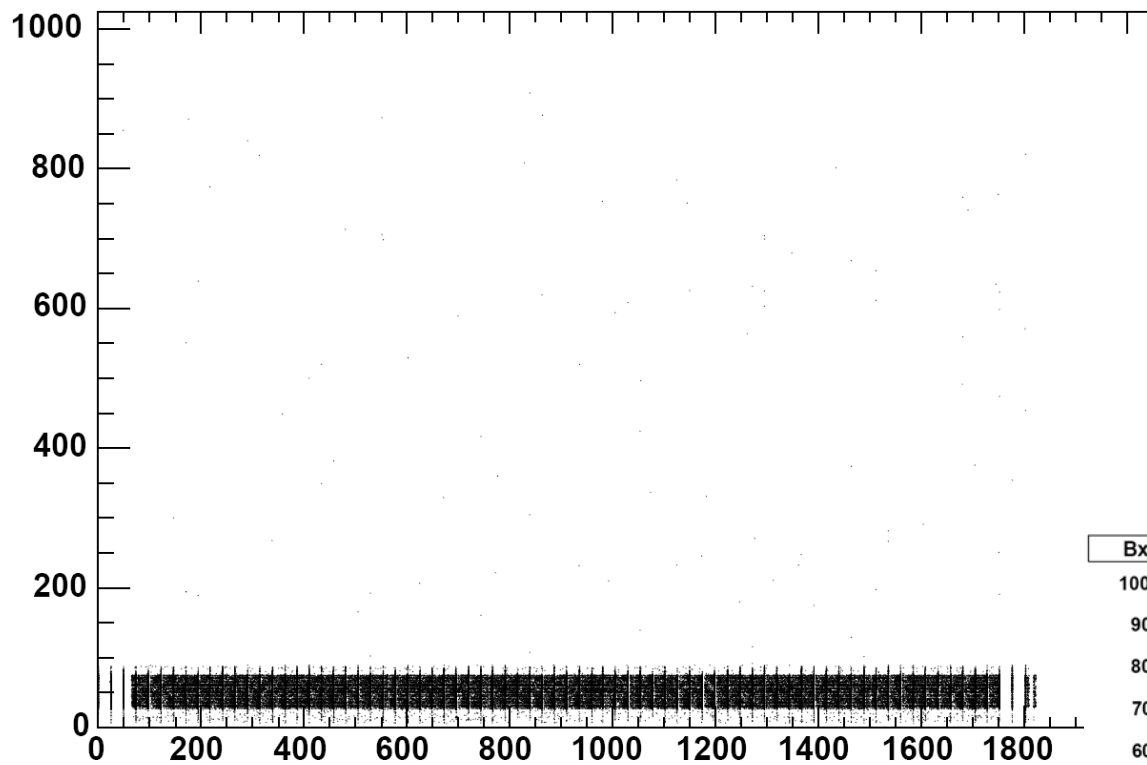


Run 515: correct time structure, random rate consistent with cosmics



BX vs. L1A

BxN:L1A

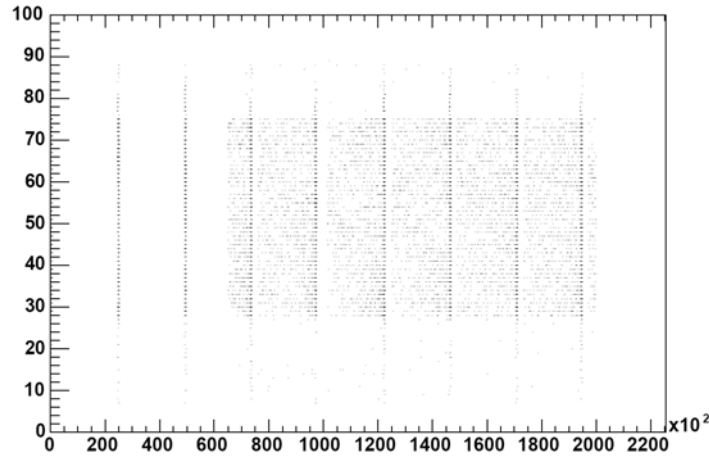


Run 515: 80 spills \Rightarrow Stable!

BX counter reset every BC0

BxN:L1A {BxN<100&&L1A<200000}

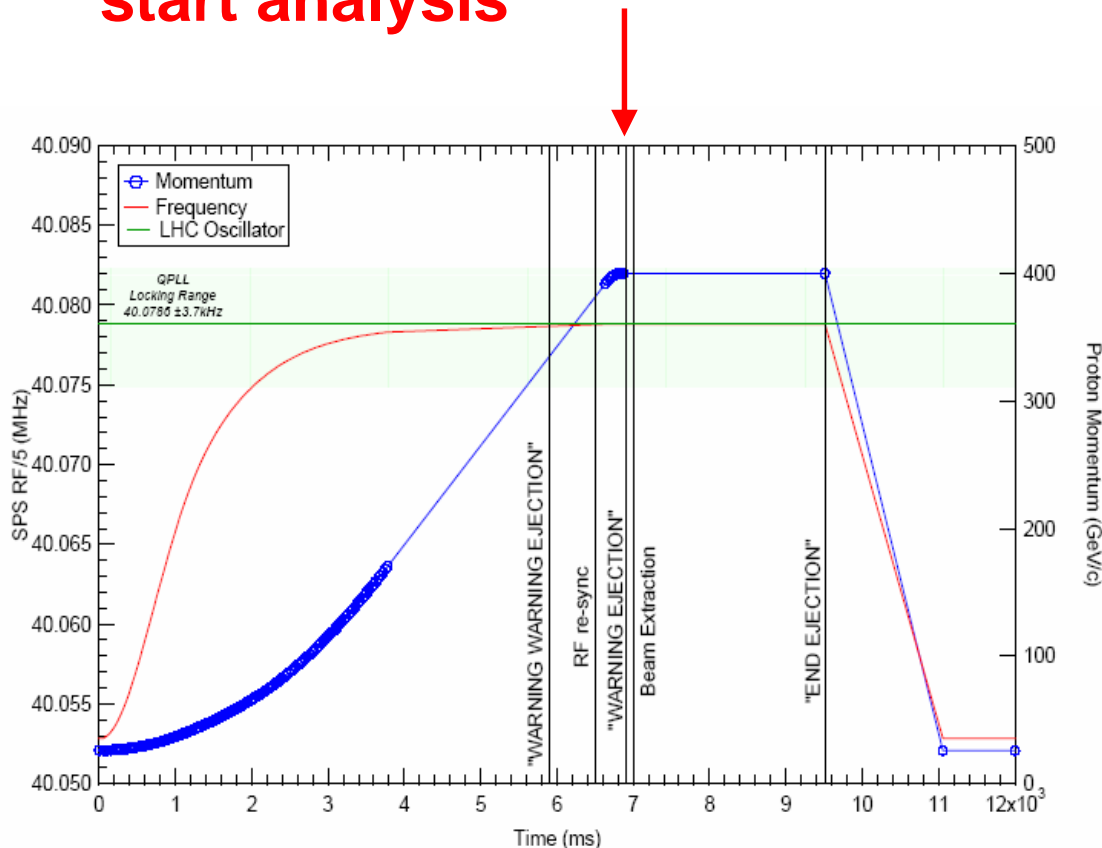
zoom





October's structured beam – report

- Orbit period analysis using CSC Track-Finder at H2
- Special firmware in SP to detect non-924bx periods
- “Warning Ejection” (400ms after “RF re-sync”) used to start analysis

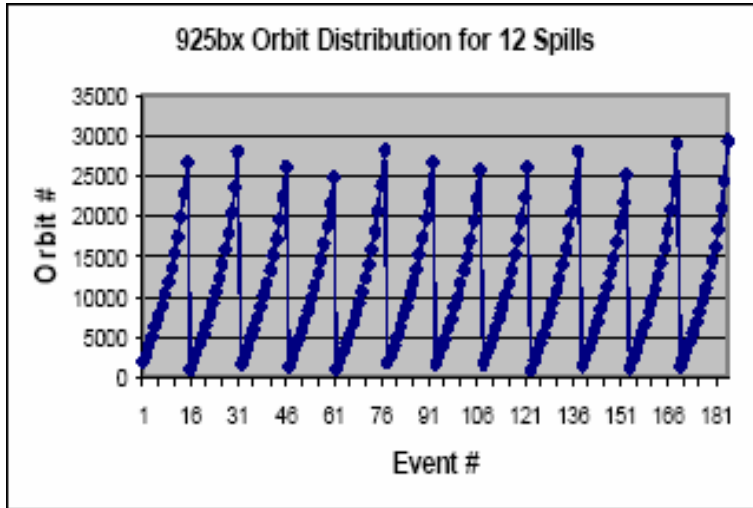


⇒ ALWAYS 924BX

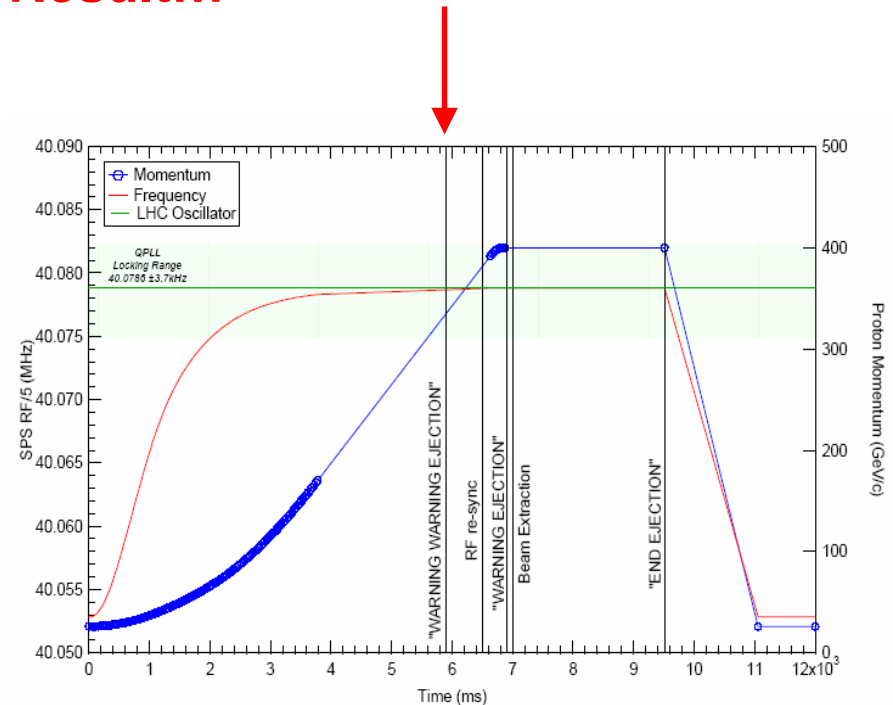
Communicated to
SPS team
(Sophie Baron,...)



Last June's problem explanation



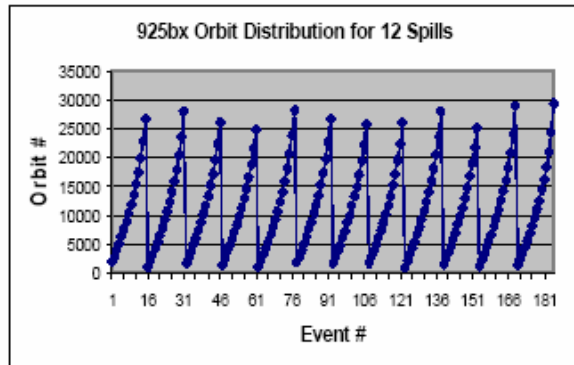
- Tried to reproduce the problem
- Suspicion: wrong Warning signal used as a start (“WWE”)
- Same tests as before with the WWE as a start (before RF re-sync)
- Result...





Last June 's problem explanation

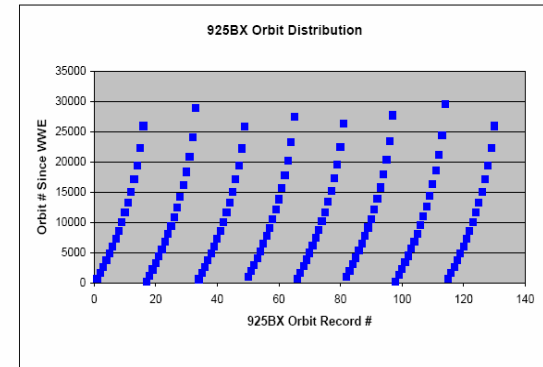
JUNE



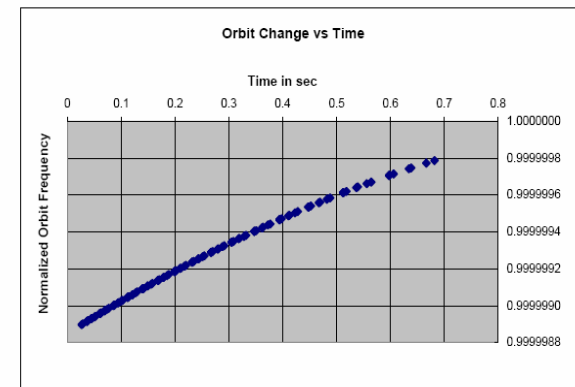
“Conclusion:
Orbit disturbances
 occur 15-16 times during
 first 0.7 sec (23 us * 30000) of
 spill.”

OCTOBER (with WWE)

Sector Processor (SP02) BC0 Analyzer Data
 Beam Gate is Triggered by the WWE signal



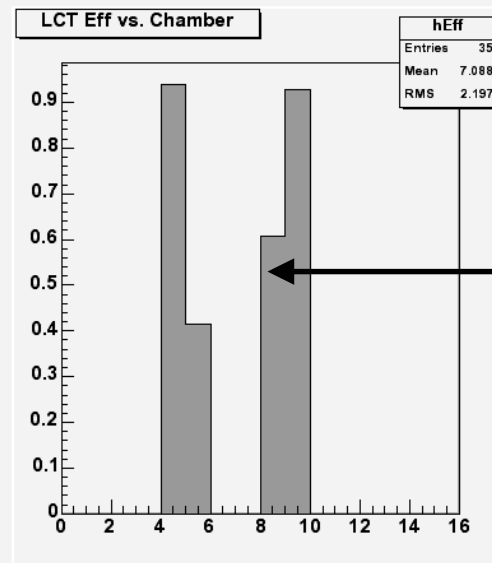
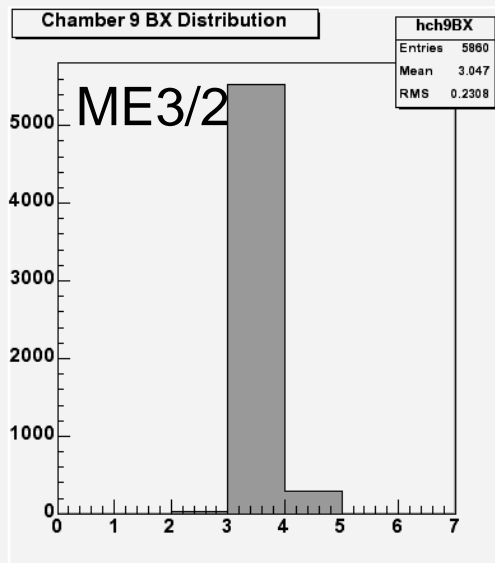
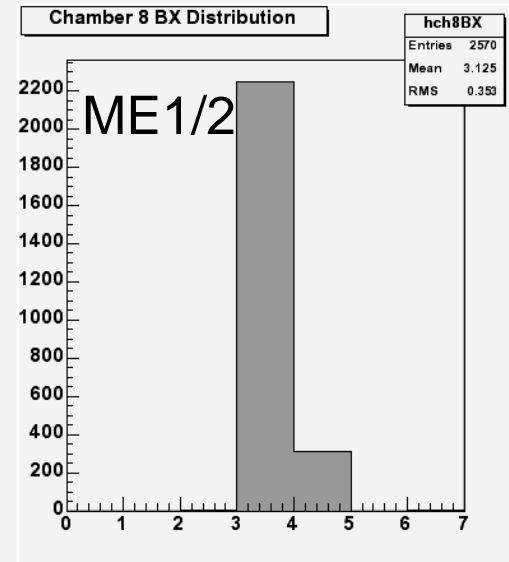
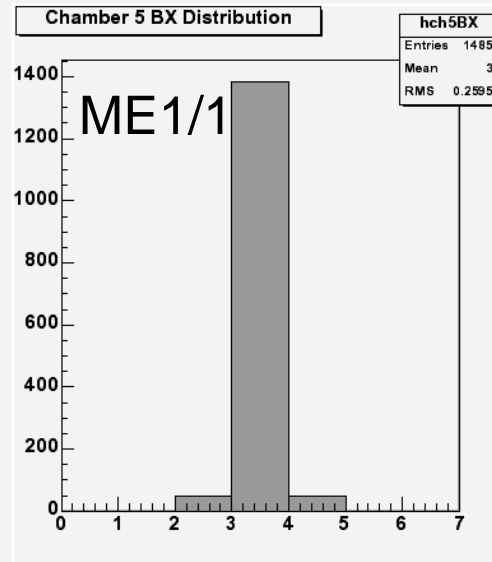
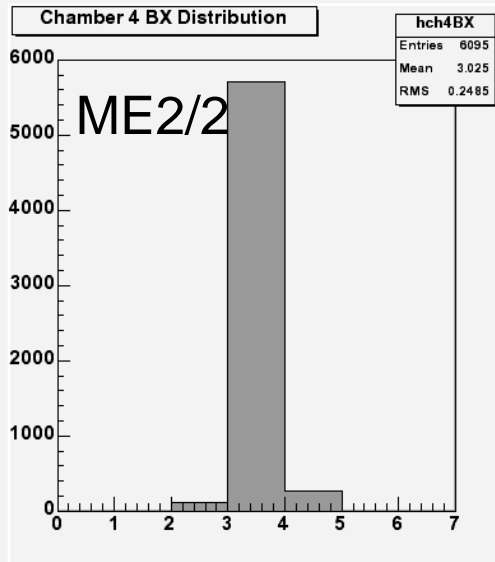
Same Data as Above but Recalculated into Orbit Frequency Change



- ⇒ Probably wrong signal used during June's 25ns run
- ⇒ Confirmed with visit to X5A (if cables left untouched)



CSC Timing Distribution



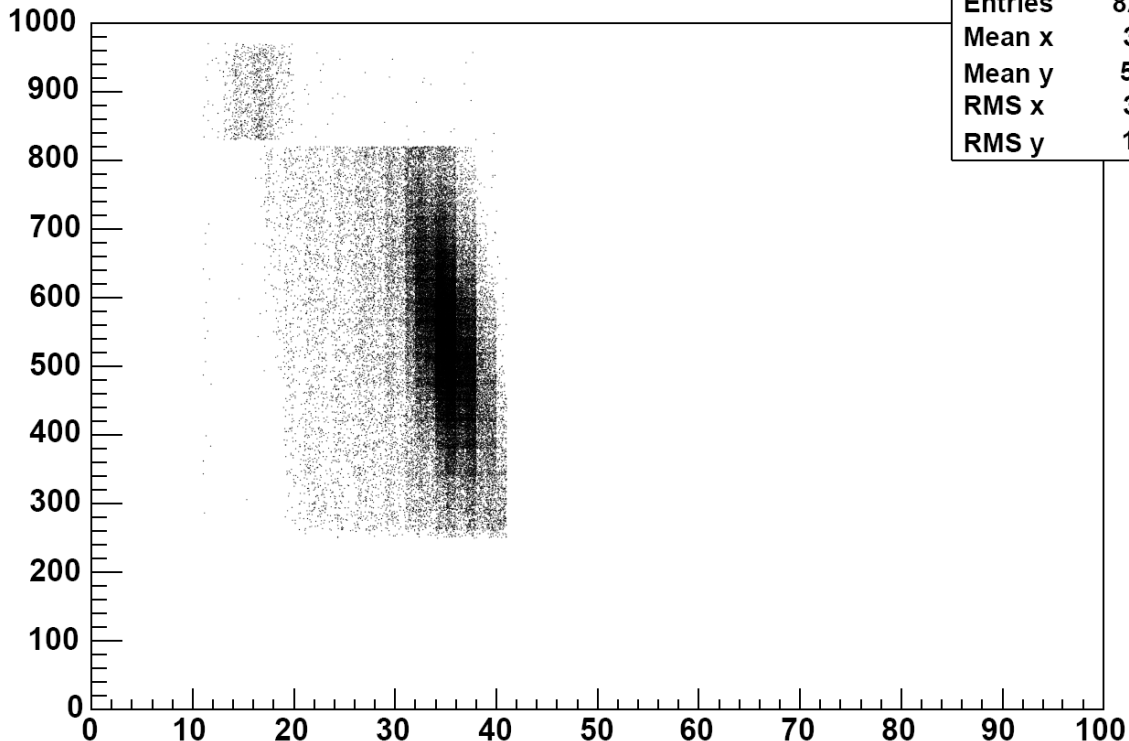
All LCT data nicely centered on same BX as seen by SP

Low apparent efficiency is a geometric effect



ME1/1 Profile

Phi vs. Eta

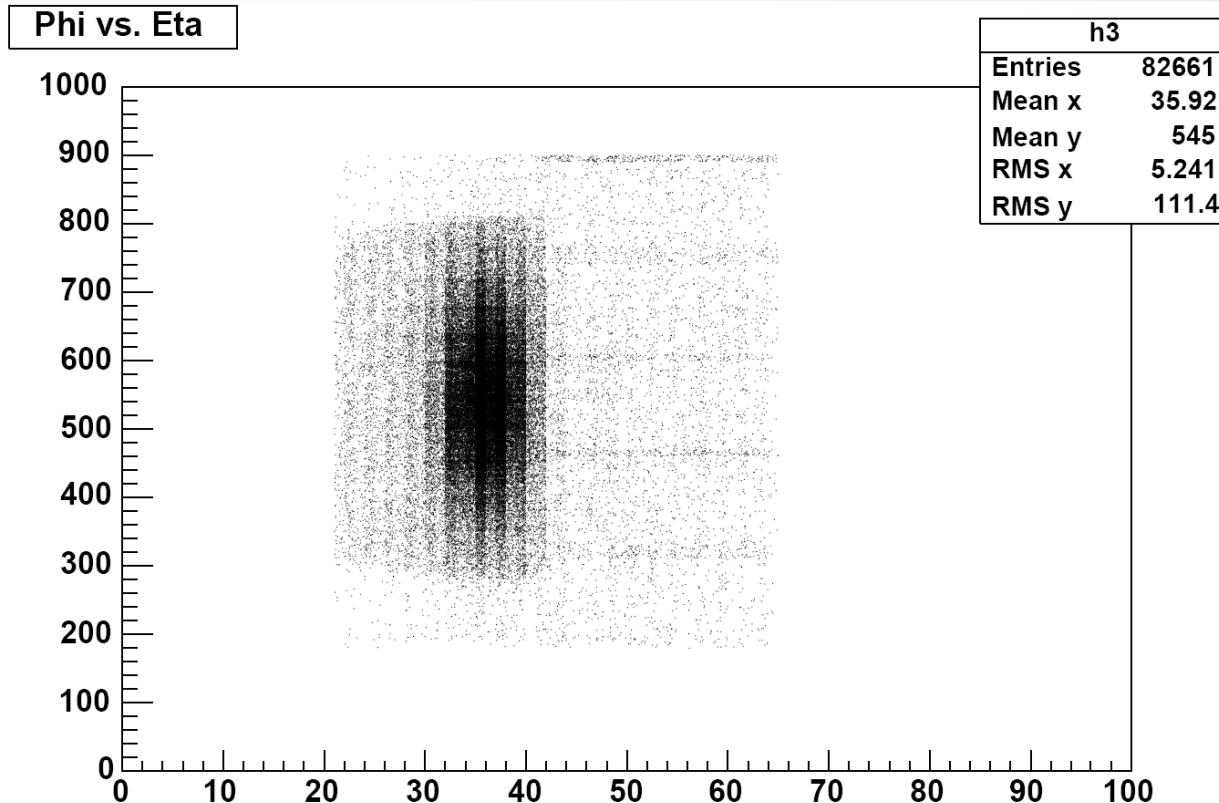


h3	
Entries	82123
Mean x	33.75
Mean y	545.2
RMS x	3.728
RMS y	117.2

- ◆ Wire tilt visible
- ◆ Fifth CFEB with 3:1 ganging visible
 - TMB should not send this data to trigger path?



ME1/2 Profile

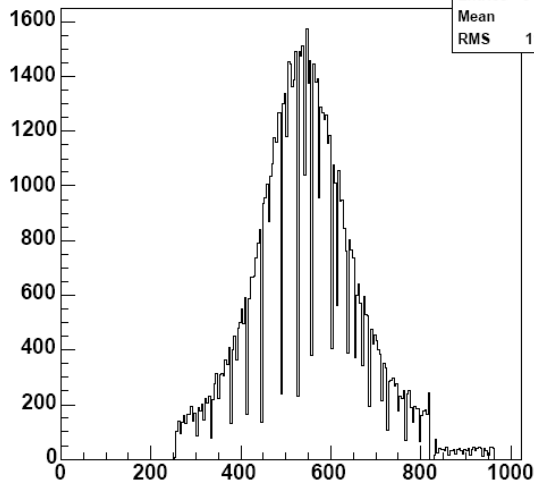


- ◆ Shadow of ME1/1 seen (ME1/1 + ME “n” triggers)
- ◆ ME2/2 + ME3/2 triggers are sometimes outside geometric acceptance of ME1/1 and ME1/2

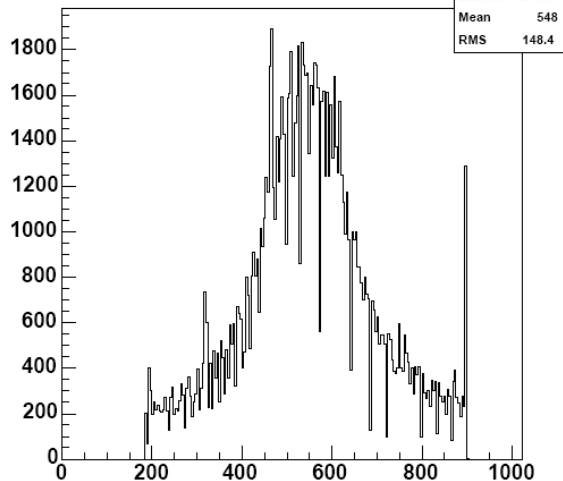


Global “Phi” (Strip) Distribution

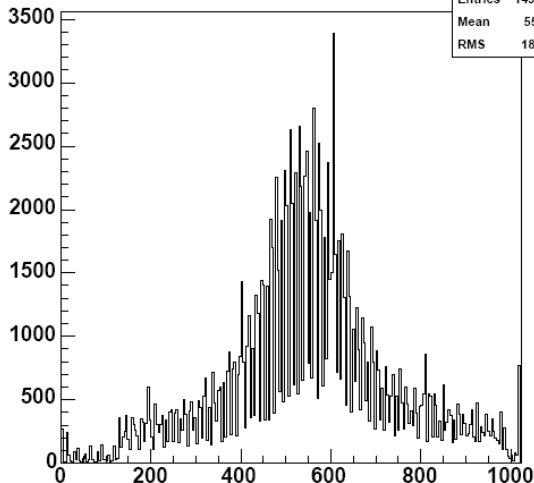
ME1/1 Phi Global



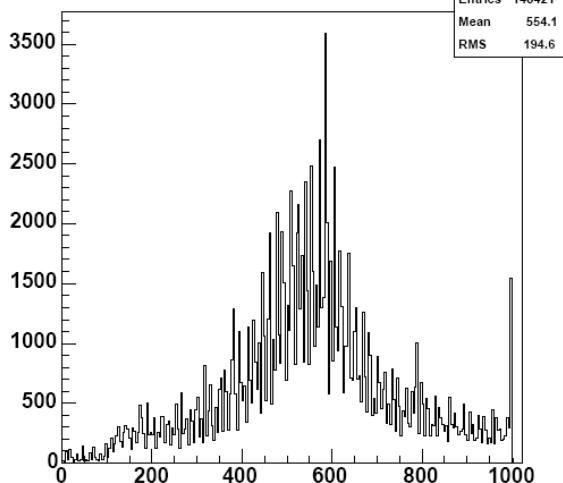
ME1/2 Phi Global



ME2/2 Phi Global



ME3/2 Phi Global



Full chamber coverage with SP trigger (may be useful for analyses)

Uses ORCA LUT for Local Phi (related to strip id)

Global Phi LUTs modified to take into account testbeam geometry

Thanks to UCLA for updates to TMB/SR simulation



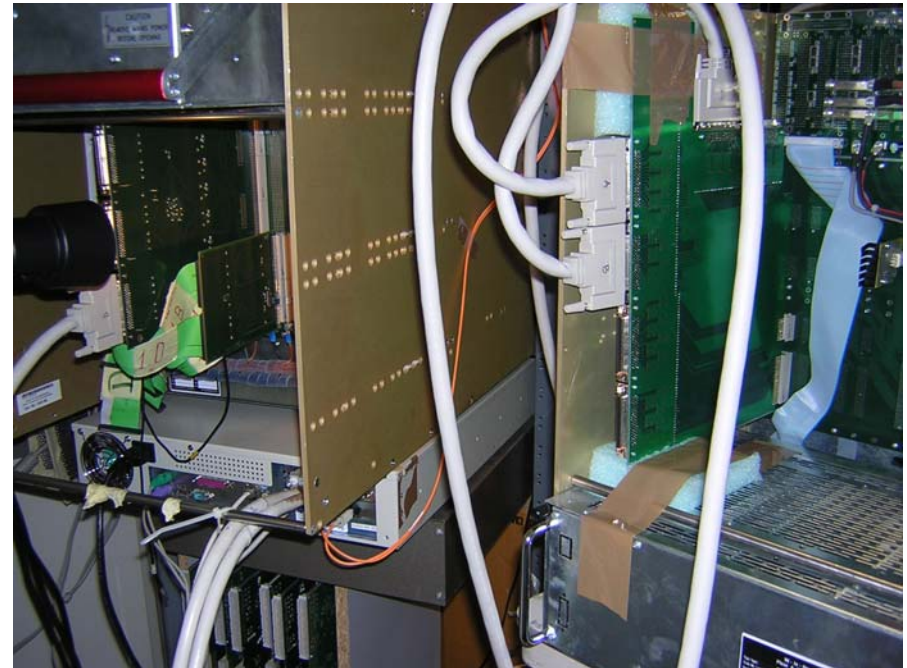
SP and MS Logic Validation

- **Muon Sorter reports back to SP “winner bits” for those SP tracks selected**
 - ◆ Analysis of 270K events shows perfect agreement between reported winner bits and expected winner bits based on SP output
 - ◆ Additional 43K events analyzed with SP re-programmed to create extra ghost tracks for same muon: same conclusion
 - ◆ Checked winner bits sent to two SPs running simultaneously, again agreement
- **SP Track-Finding logic was also tested. Logged outputs agree perfectly with emulation based on logged inputs (as in previous tests)**



Second DT/CSC Integration Test

- **Took place in early November**
- **Same CSC TF Sector Processor as last year**
- **New CSC TF transition card used**
 - ◆ **Successfully tested in loopback last May with walking 1's**
- **New DT TF Sector Processor**
 - ◆ **Successfully used during Oct.'04 beam test**
- **Same DT transition card as last year**





DT/CSC Test Results

- **No synchronized start signal used, just a common clock and continuous cycling of data**
- **DT TF software to load and readout DT TF**
- **CSC software to load and readout CSC TF**
- **From DT to CSC**
 - ◆ Walking 1's test worked, except for 4 bits in reverse order on DT transition card
 - ◆ 1024 random numbers also successfully received
- **From CSC to DT**
 - ◆ Walking 1's test OK except a few bits may be stuck in DT TF
 - **Under investigation**
 - ◆ Random numbers not tested: not enough software development time to predict what should be received
- **Loopback tests of CSC TF using random numbers underway in Florida**



CSC SP Production Status

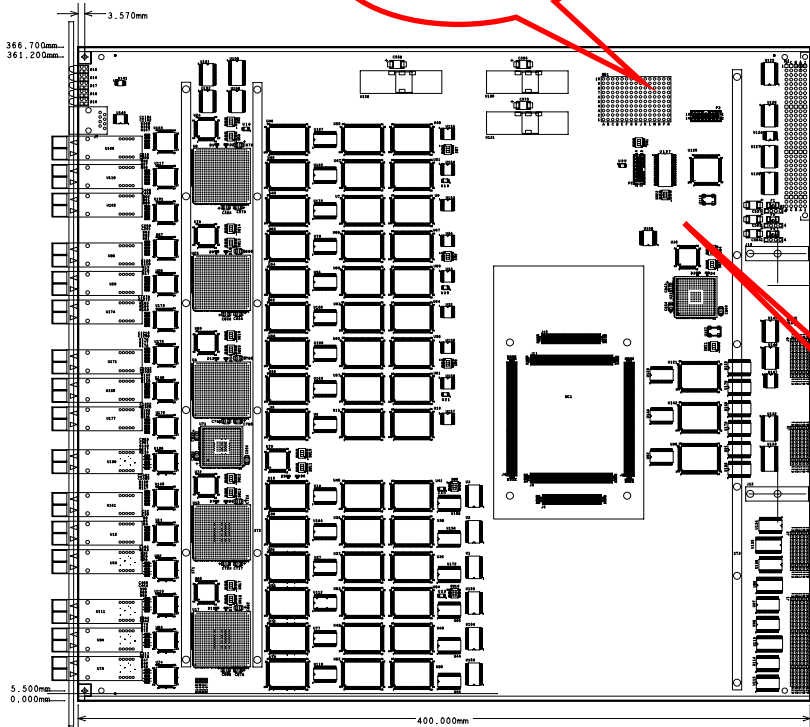
- **Most prototype tests completed**
 - ◆ Demonstrated successful operation and self-triggering during 2004 beam tests
 - ◆ DDU readout still be implemented
- **Design changes for production to schematics completed**
- **Routing completed**
 - ◆ >1 month delay from expectation because of difficulties with inexperienced engineer at vendor
- **Manufacture and assembly of 2 production samples submitted late last month, bare boards should arrive this month**
- **Mezzanine card will be submitted ~now as well**
 - ◆ No design changes since prototype



Compare SP02 and SP04 Layouts

SP02

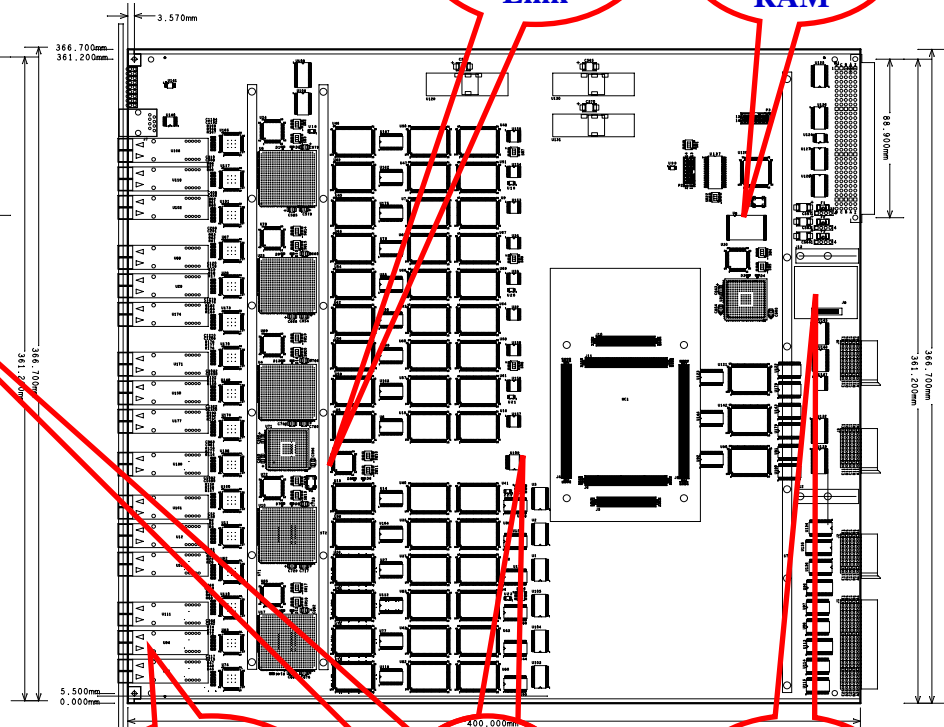
Breadboard goes away



SP04

40 MHz Oscillator for DDU Link

256 Mbit Flash RAM



Find Major Differences:

Link Connectors does not stick out

RF Clock Fanout moves from here to here

QPLL Daughter Board

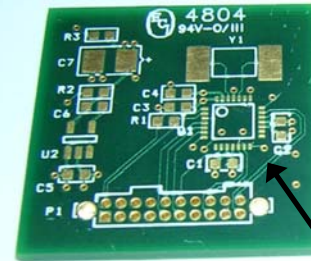


QPLL Daughterboard

Top



Bottom



QPLL

- **Designed and fabricated**
- **Small card to house QPLL used to set stable reference clock for optical links**
 - ◆ Idea is that you could swap in other solutions if needed



Schedule and Manpower

- **Production + single board tests complete by May '05**
 - ◆ 2 month delay since AR presentation
- **Additional 2 months for full Track-Finder crates with Muon Sorter**
 - ◆ Presently planned for tests in U.S.
- **Ready for tests at CERN in Bat. 904: Aug. '05**
- **But: have a prototype SP, crate, and computer @ CERN now waiting for integration tests with GMT, slice tests, and other tests for Bat. 904**
- **New graduate student on-board to assist with production tests in Florida with engineers**
- **Postdoc to be hired to be responsible for system tests at CERN**



Slice Tests and Magnet Tests

- **Detailed discussion within CSC community only began last night!**
- **CSC Track-Finder will be an integral part, and will provide a trigger**
 - ◆ Nominal trigger with muons pointing to i.p. should be straightforward: default ORCA cuts and LUTs
 - ◆ Opening trigger windows to increase cosmic acceptance also possible, some study and simulation required
 - ◆ Firmware needs updating for ALCT part of CSC trigger in order to efficiently trigger for different entrance angles
- **Whether trigger is available “24/7” during magnet test depends on CSC operations**