2004 CSC Beam Test Status

Darin Acosta
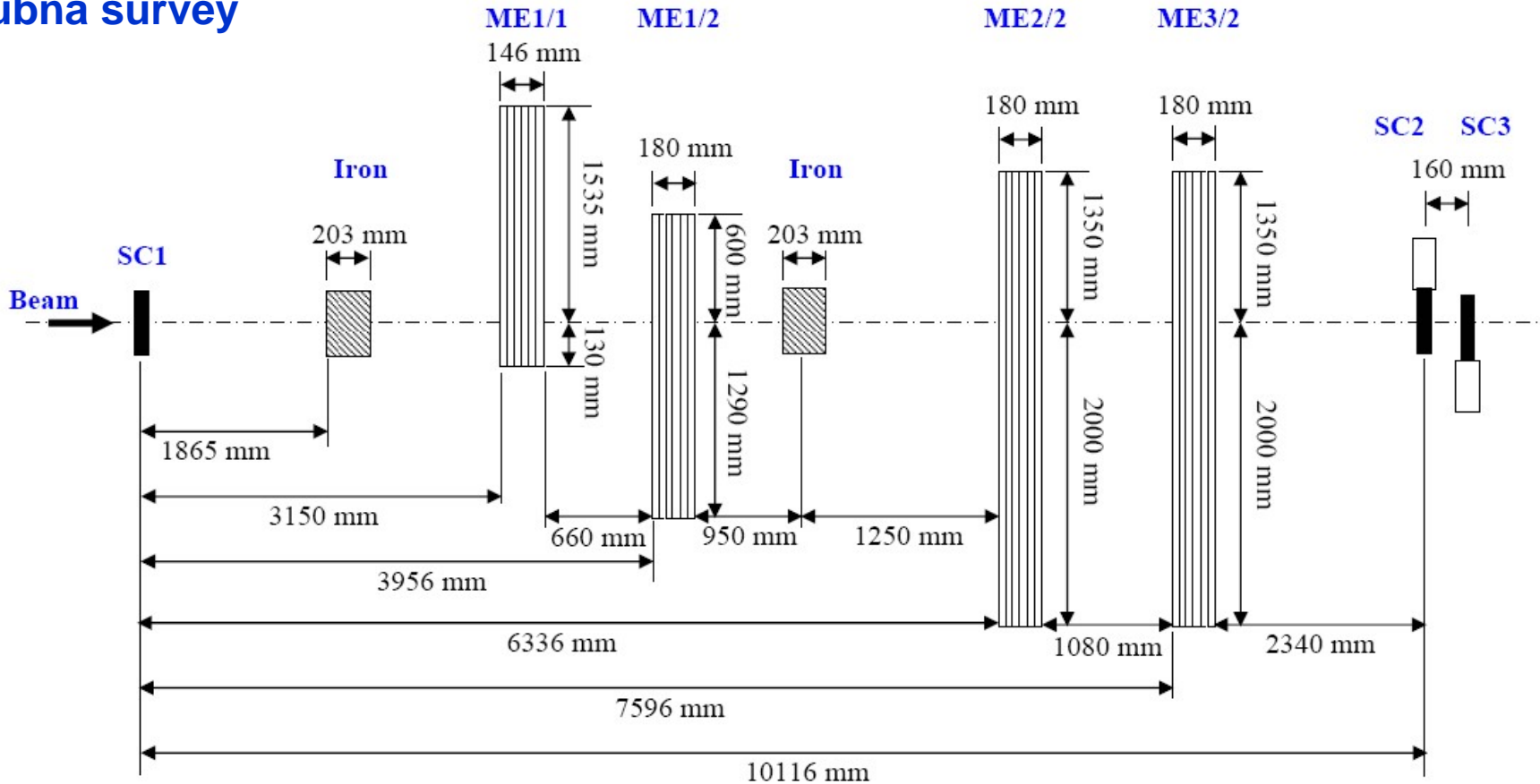
Initial CSC Arrangement

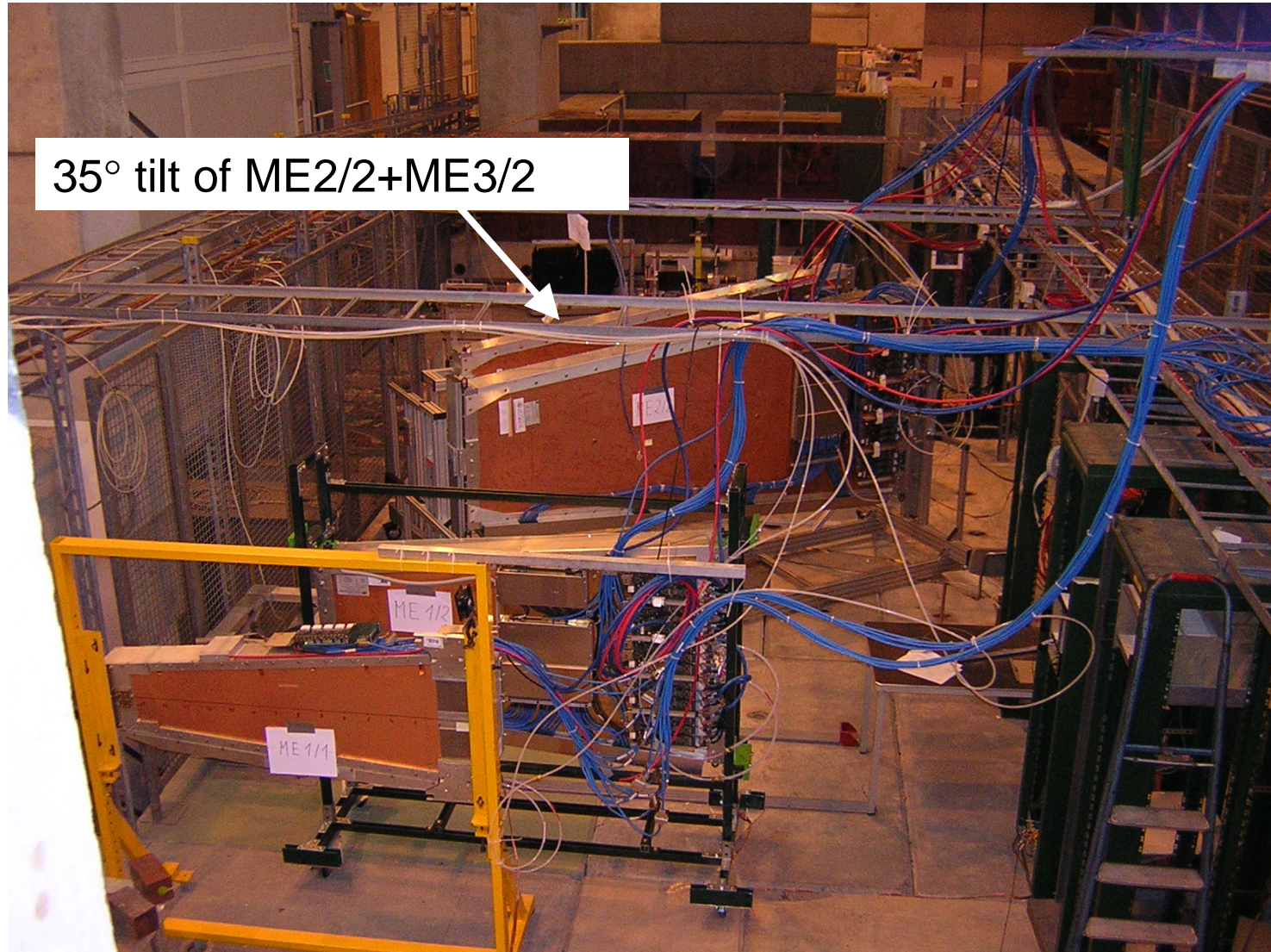**Dubna survey**

35° tilt of ME2/2+ME3/2
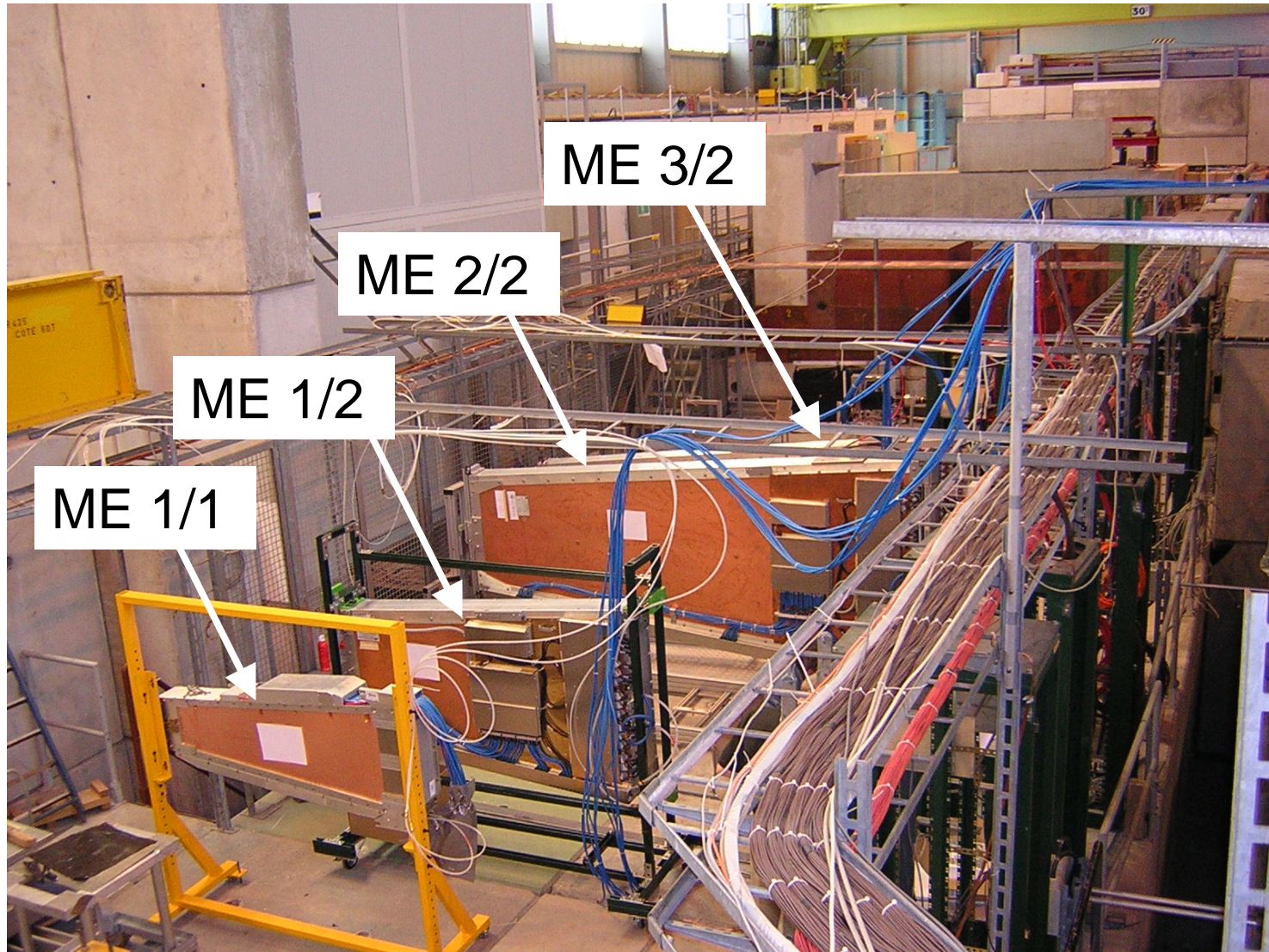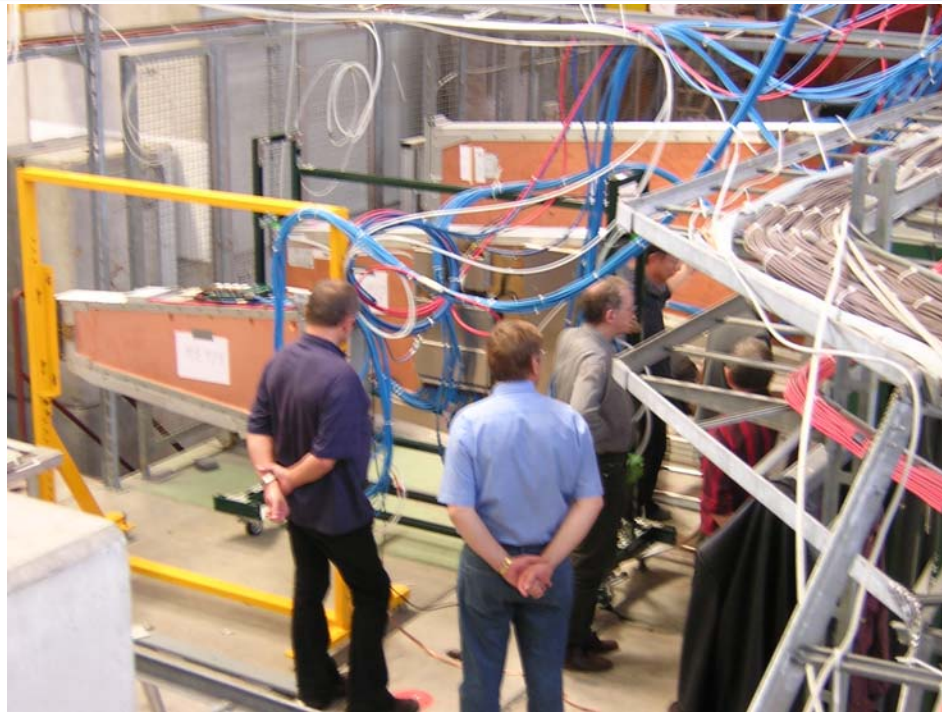
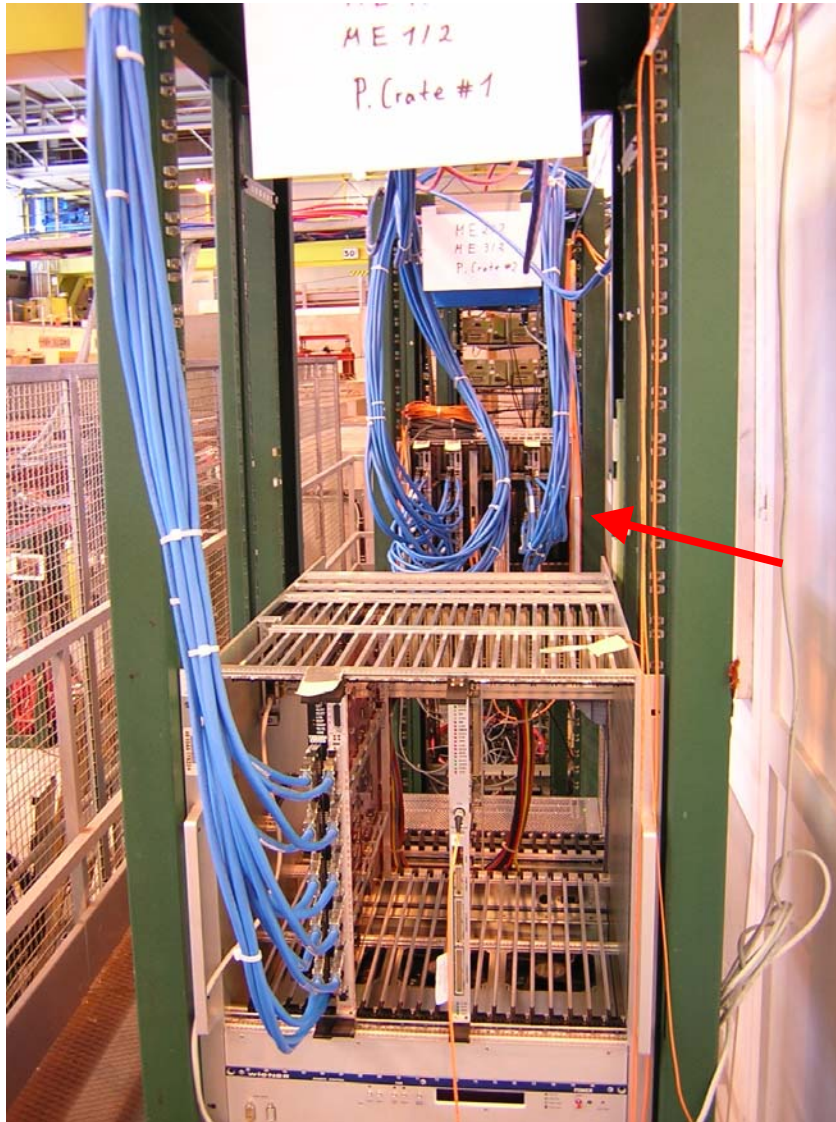# CSC Checkout with ISR Software

- **After installation, ISR + Dubna teams checkout CSC performance with FAST DAQ**

- **HV settings:**
  - **ME1/1: 3.0 kV**
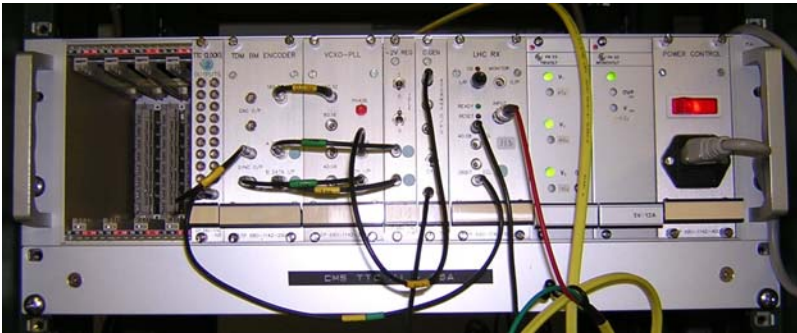 - **ME1/2, ME 2/2, ME3/2: 3.5 kV**

Peripheral Electronics

- **Two peripheral crates installed:**
  - ◆ **Possible multi-crate control**
  - ◆ **Multi-MPC to Track-Finder test**
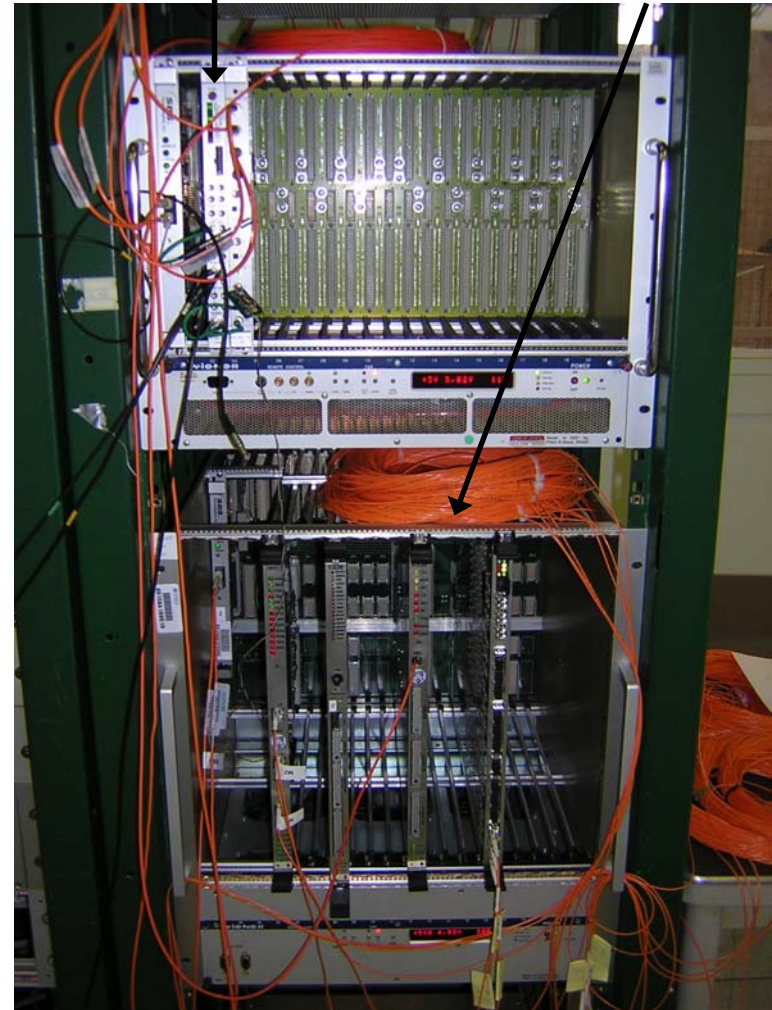- **Currently using just one crate, however**

TTCmi crate
(not used for asynch beam)

NIM logic for scintillator-
based L1A trigger

TTCvi crate

Track-Finder crate
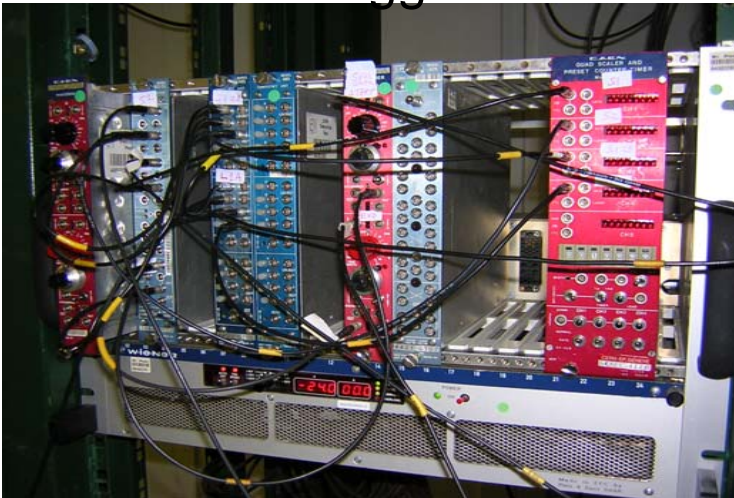
Beam Test Goals

- **Test new CCB2004 with discrete logic (esp. during 25 ns beam)**
- **Test TMB2004 with RAT (RPC and ALCT Transition card)**
- **Use XDAQ-based (and unified) run control and event builder**
  - **Retire cfeb_control**
  - **New DAQ computer (RH9, dual-processor Xeon)**
- **Use fully functional Track-Finder system (Sector Processor – SP)**
  - **Full data format, self-triggering (L1A generation)**
- **Add in ME1/2**
- **Add in ME1/1** — Muon slice tests!
- **Add an endcap RPC on ME1/2**
  - **Connect Link board to RAT, record RPC data in TMB**
- **Use new DDU+DCC (FED) developed by OSU**
- **Use new crate controller developed by OSU**
- **Test DCS prototype**
- **Test monitoring prototype**
- **Test new ALCT firmware with ghost-busting improvements**
- **Add a small block of iron absorber between to validate OSCAR/ORCA**
- **…**

May Test Beam Schedule

June Test Beam Schedule (25 ns)

Accomplishments

- **Using new Peripheral Crate software to control 4 chambers in one peripheral crate**
    - But logging data with DDU dump utility rather than XDAQ event builder
- **Started working with CCB2004 and TMB2004 right from the beginning**
    - Seem to be behaving OK, but can't sign off until data quality issues resolved and after 25 ns run
- **Track-Finder (SP) successfully logging data**
    - Separate control and DAQ system initially
- **DCS prototype working**
- **Monitoring prototype working offline**
- **Unified Run Control developed**

Problems Encountered

- **Some CFEBs and DMBs not getting programmed on power-up**
  - Solved recently with 2 hard resets issued by CCB (with 2 sec sleep between)
- **Driver reading DDU data in BigPhys memory hangs**
  - Serious problem holding up good data runs
  - Variable on when read gets stuck
- **Errors/bugs in DDU data unpacking**
- **"Interesting" mapping of CFEB channels in ME1/1…**
- **Cannot load new ALCT firmware in ME1/1**

Monitoring Plots (Korytov et al.)
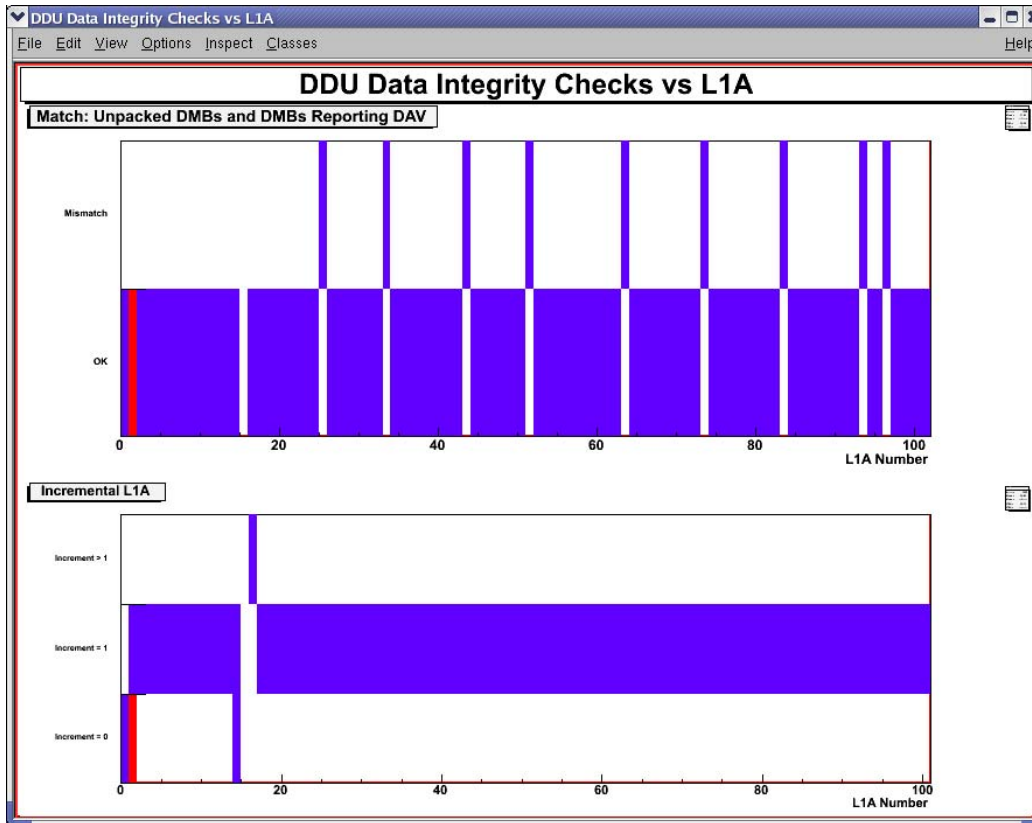
- **Data unpacking integrity**
  - **Match/mismatch between number of unpacked DMB and number of DMB with DAV**

  - **Incremental L1A from DDU Header**
    - **>1 implies readout cannot keep up with rate**

DDU Error stat word

Error Status in header and trailer

Error	Header	Trailer
DDU Output Constricted: 32		4
Local DAQ FIFO Full: 31		151
Local DAQ FIFO Near Full: 30		350
Local DAQ Fiber Error: 29		32
Wrong First Word: 28		8
L1A-FIFO Full: 27		85
Data Stuck in FIFO: 26		167
No Live Fibers: 25		62
One Single Bit-Vote Error: 24		12
Local DAQ FPGA Clock-DLL Error: 23		59
S-Link Full Bit Present: 22		89
S-Link Not Ready: 21	723	576
TMB Error: 20		67
ALCT Error: 19		58
TMB/ALCT Word Count Error: 18		69
TMB/ALCT-DDU L1A Mismatch: 17		67
DDU Critical Error: 16	154	158
DDU Single Event Error: 15		154
DDU Single Event Warning: 14		103
INPUT FIFO Near Full: 13		32
Hardware Bit-Vote Errors: 12		9
Control FPGA Clock-DLL Error: 11		82
CFEB Lost Samples: 10		159
Missing Control Words: 09		60
Extra Control Words: 08		6
Timeout Error: 07	154	229
Multiple Bit-Vote Error: 06		66
Two Single Bit-Vote Errors: 05		76
INPUT FIFO Full: 04		70
Lost/New Fibers: 03		56
DMB-DDU L1A Mismatch: 02		63
CFEB CRC Error: 01		64

Trailer unpacking still has bugs…

DCS

- **Valeri Sytnik has working DCS prototype using PVSS II for EMU peripheral crate electronics**

- **Upgraded to handle TMB2004 and CCB2004 at beam test, and demonstrated to work**

- **Will need to resolve issues with sharing access to peripheral crate**

SP Input Data (LCT ½-Strip Distribution)

LCTHalfStrip {LCTHalfStrip>0 && LCTCSCID==8}

htemp	
Entries	1332
Mean	66.52
RMS	8.09

ME3/2

ME2/2

ME1/2

SP / TMB Data Comparison

- **Runs 77, 78:**
  - ◆ **DDU and SP logged data simultaneously**

- **Compare SP input with that expected based on TMB output:**
  - ◆ **Take TMB data from DDU readout**
  - ◆ **Use ALCT BXN for BX assignment**
  - ◆ **Put LCT data though MPC simulation**
  - ◆ **Compare with SP input for 4 BX every L1A**

- **Result (run 77):**
  - ● **Number of L1A matches: 1000**
  - ● **Number of missed DDU events: 7**
  - ● **Number of missed SP events: 7**
  - ● **Number of mismatched MPC/SP events: 27**
  - ◆ **97% agreement**
  - ◆ **Differences seem to be mostly data missing in the TMB/DDU readout when the LCT is has shifted by about 2 BX from nominal**

LCT Efficiency vs. BX (Read out by SP)
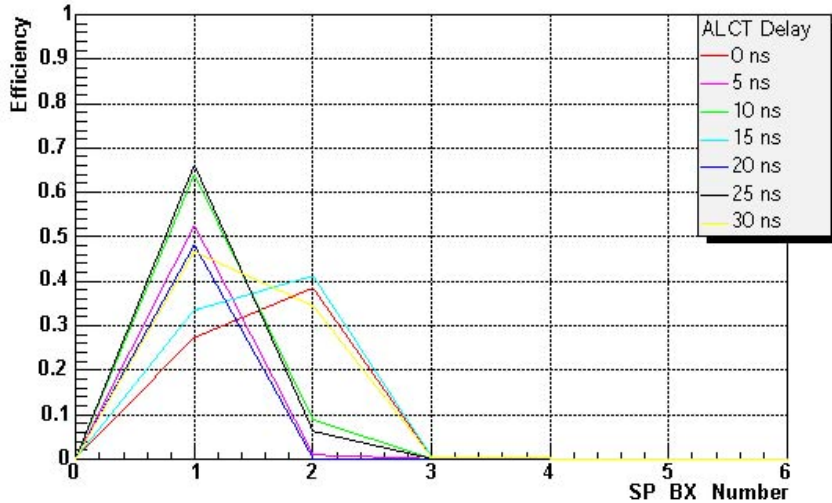
ME1/1   79.0% overall
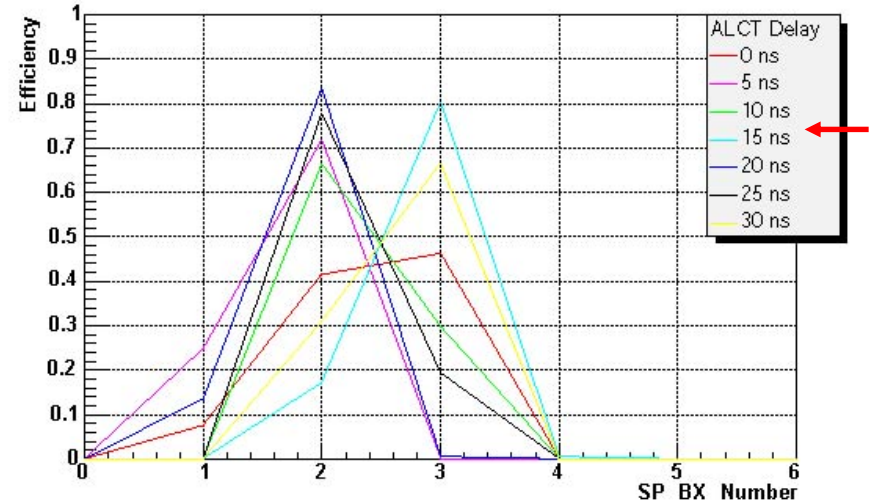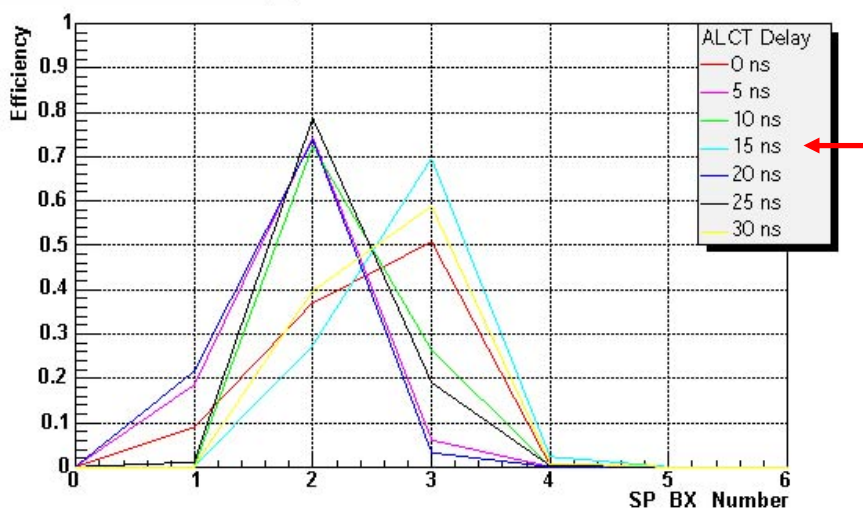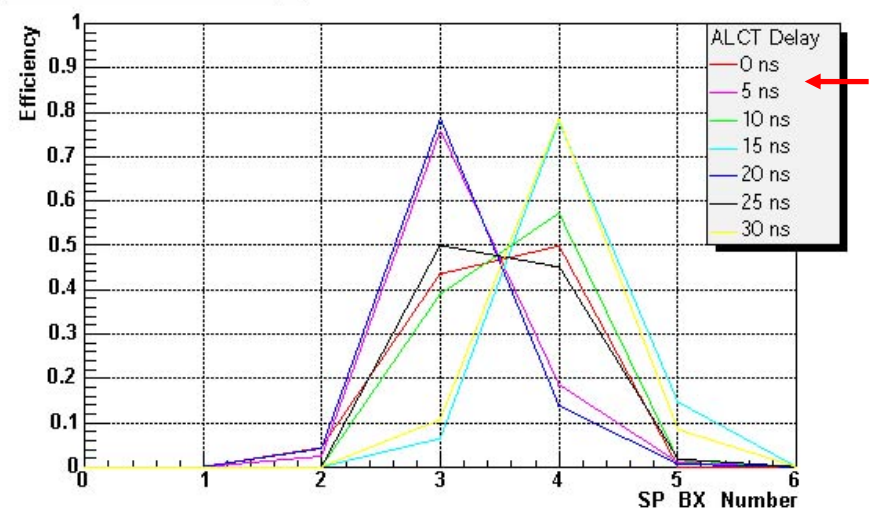
ME1/2   97.5% overall

ME2/2   99.0% overall

ME3/2   98.0% overall

→ To align CSC data in SP BX #3

ALCT Efficiency and Ghost Study

- **Several Track-Finder only data runs were logged by the SP DAQ program, for old and new ALCT firmware, various ALCT settings, and different incident angles**

- **Purpose is to understand accelerator and collision pattern efficiencies, as well as ghost rate**

- **Results:**

  - **For 28° incidence, the ghost probability is 40–50% for collision and accelerator patterns on, as observed last year**

  - **No difference with new ALCT firmware**

  - **Ghost rate ~5% for collision patterns only**

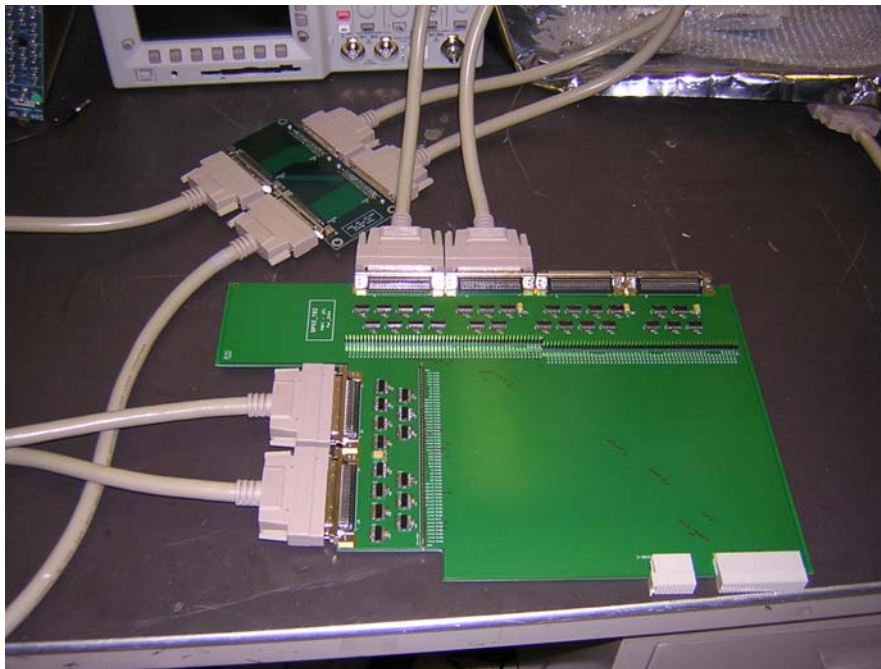 - **No discrimination yet between accelerator and collision patterns, since latter includes former!**

    - **Will change collision patterns and re-study**

```
Pattern A:
ly0          2  1  0
ly1          4  3
ly2          5
ly3       7  6
ly4   10  9  8
ly5   13 12 11
```

DT/CSC Transition Card Test

- **While we were waiting for beam, managed to test a new DT/CSC transition card for the Track-Finder**
    - **New design solves connector space problem**
    - **Tester board allows loopback test without DT Track-Finder**
- **Data test succeeded, except for 1 broken backplane pin**

http://www.phys.ufl.edu/~acosta/tb/tb.html

News

SPS status

Contact info

Location of data archived on Castor

Plans

- **DAQ:**
  - **Solve driver issues**
  - **Verify data integrity**

- **Track-Finder:**
  - **Demonstrate track-finding, self-trigger experiment**
  - **Collect more data correlated with DDU**
  - **Tune ALCT patterns, take data with various ALCT settings**
  - **Multiple peripheral crates (multiple MPC's)**

- **ME1/1:**
  - **HV scan**
  - **Spatial scan**
  - **Iron absorber runs**

- **Data analysis:**
  - **Collect data with iron between CSC's, compare with simulation**

People

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Chertok, Max	UCD
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- **Thanks to everyone contributing to the beam test effort, especially those experts putting in countless hours in the control room**