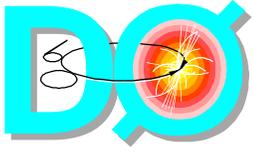
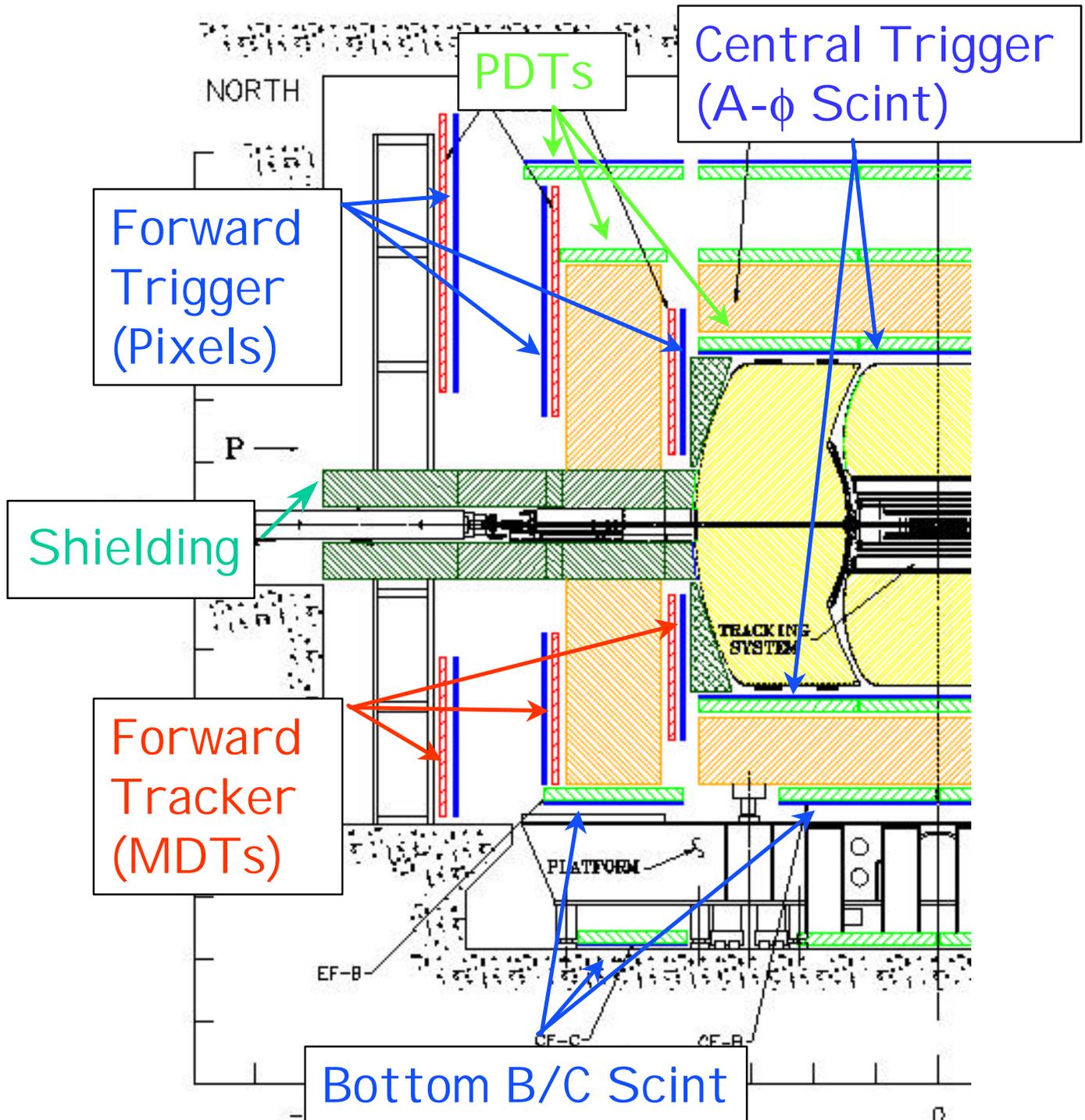


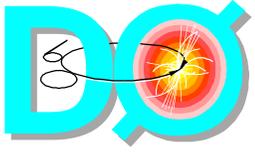
# **Muon Upgrade Redux**

**Ken Johns**  
**University of Arizona**  
**for the**  
**DÆ Muon Upgrade Group**



# Muon Detector Upgrade





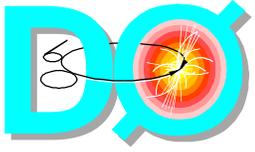
# Central Muon Trigger Detectors

- **A-f Counters**

- ◆ Completed construction and testing of 630 scintillation counters (**Dh** x **Df** = 0.2 x 4.5°)
- ◆ Installed 540 counters onto the detector
- ◆ Commenced cabling and commissioning

**Installed  
A-f  
Counters**

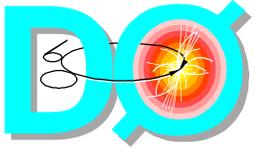




# Central Muon Trigger Detectors

- **Cosmic Cap Counters**
  - ◆ Commenced cabling and commissioning of 224/240 Cosmic Cap counters
- **New Bottom Counters**
  - ◆ 118/120 Bottom Counters installed
  - ◆ Commenced cabling and commissioning

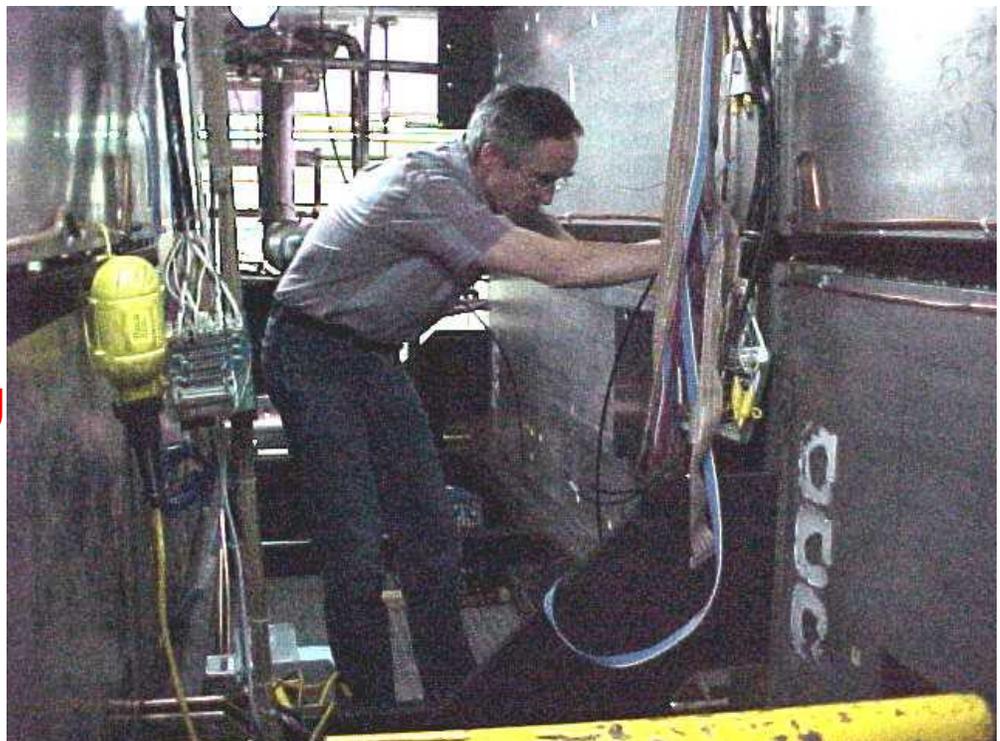


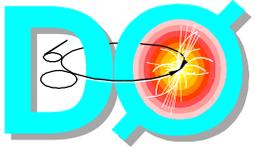


# Central Muon Chambers

- **WAMUS PDT's**
  - ◆ All 94 PDT's are installed.
  - ◆ Outfitted ~80% of PDT's with new HV boards, delay boards, and gas blocks
  - ◆ Successfully tested PDT readout chain (from front-end electronics through muon readout card to Level 3)

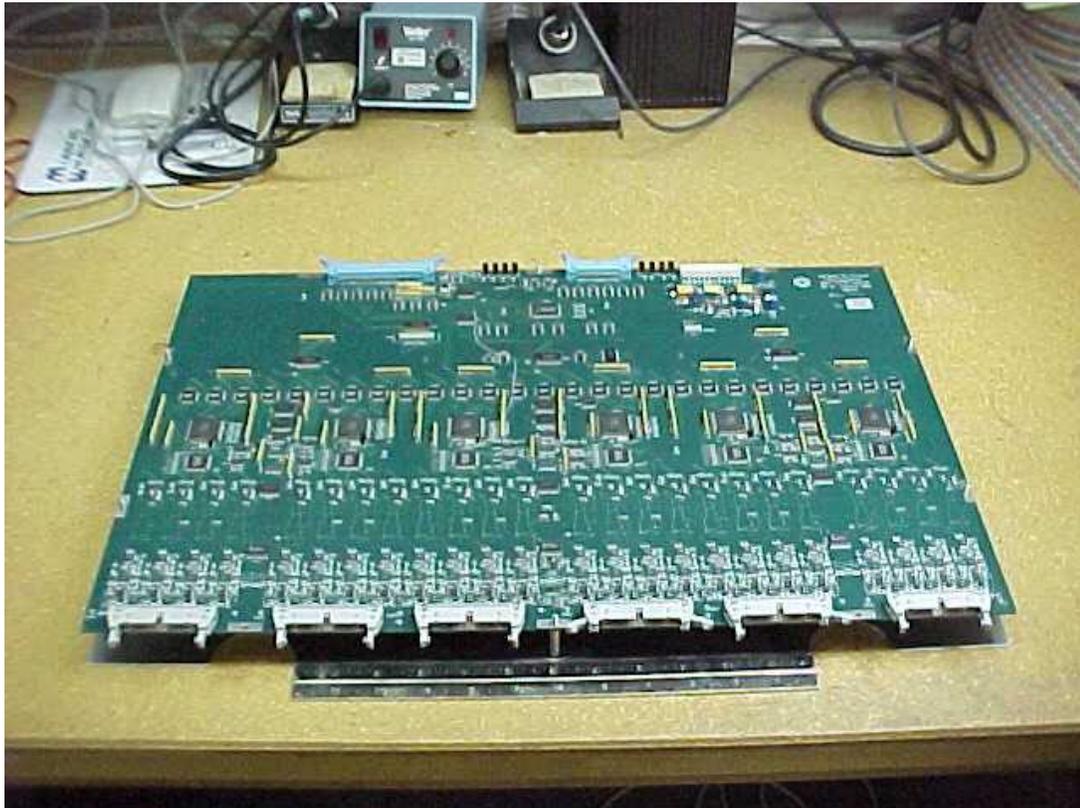
**Herman Haggerty preparing PDT's for commissioning**



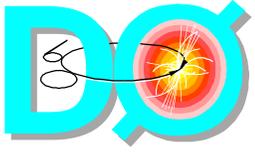


# Muon Electronics

- **PDT Front-end Electronics**
  - ◆ Moving from prototyping to production



**24 channel PDT Front-End Board**

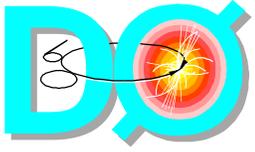


# Muon Electronics

- **Scintillator Front-end Electronics**
  - ◆ Prototype testing with detectors in progress
  - ◆ Could benefit from additional technical manpower

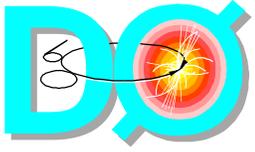


**48 channel Scintillator Front-End Card**



# Muon Electronics

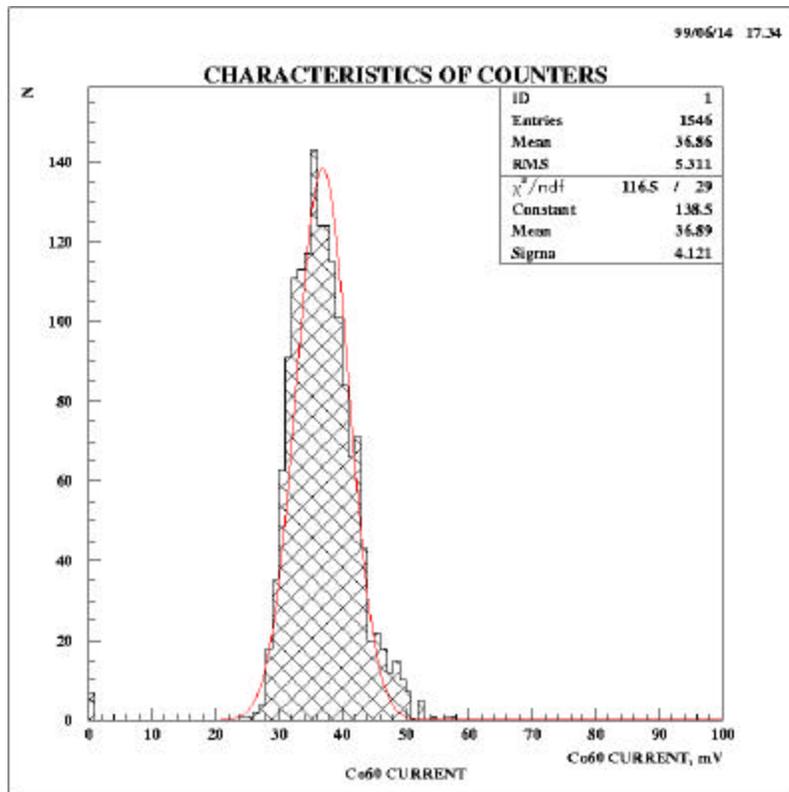
- **MDT Electronics**
  - ◆ 25% of ADB's produced by JINR
  - ◆ Prototype testing of digitizing boards with detectors in progress
- **Readout Electronics**
  - ◆ Successful data acquisition from a PDT using the full readout chain (detector front-end through muon readout card to Level 3)
  - ◆ Muon Readout Card moving from prototyping to production
  - ◆ Muon Fanout Card 1st prototype system testing in progress

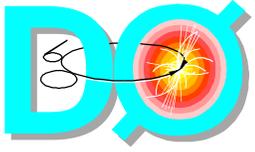


# Forward Muon Trigger Counters

- Pixel Counters

- ◆ IHEP completed construction of all 4600 Pixel counters
- ◆ A and C layer Pixel counters were delivered to Fermilab; B layer by 6/30/99
- ◆ All counters are tested with radioactive sources at IHEP and again at Fermilab



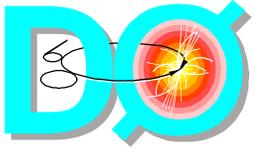


# Forward Muon Trigger Counters

- Pixel Octants

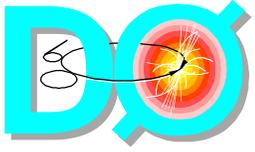
- ◆ Assembly

- ◆ Procure frames from outside, drill holes, install holders, mount counters, cable, test
- ◆ 4/48 Pixel octants are built and 3/48 are tested ( $^{90}\text{Sr}$  and LED)
- ◆ All A layer Pixel holders are on hand (from IHEP); B and C layer holders are in production
- ◆ 14/16 A layer octant frames exist; C layer octant frames are out for bid
- ◆ Production of cables and LED calibration hardware is keeping pace with octant assembly
- ◆ Engineering on octant supports is in progress



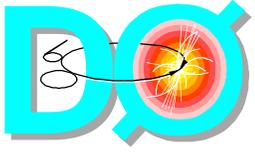
# Forward Muon Trigger Counters

- **Cost**
  - ◆ Within cost estimate
- **Schedule**
  - ◆ All pixel counters are built
  - ◆ Production rate of pixel octants is consistent with schedule (~1.1/week)
  - ◆ Need to complete octant support engineering
- **Manpower**
  - ◆ Schedule contains 3 Fermilab techs for octant assembly
  - ◆ IHEP visitors play an important role



# Forward Muon Tracking Chambers

- MDT's (Mini-Drift Tubes)
  - ◆ Tubes for 5/48 octants have been delivered to Fermilab
  - ◆ MDT production at JINR has resumed after a ~3 month delay due to problems with endcap procurement from Yerevan
  - ◆ Delay will likely be compensated for by running two shifts at JINR; we will monitor weekly production rate
  - ◆ ALL MDT's are extensively tested at JINR and again at Fermilab
  - ◆ Gas tightness of MDT's will continue to be monitored closely



# Forward Muon Tracking Chambers

- **MDT Octants**

- ◆ **Assembly**

- ◆ Procure honeycomb panels from outside, build frames at Lab F, drill holes, insert blades, insert MDT's, assemble into octant, cable, and test

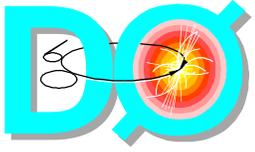
- ◆ Honeycomb panels from outside (Newcourt) did not meet specs (90/110 failed)

- ◆ Four frames assembled at Lab F from good panels with no problems

- ◆ Final blade (MDT holder) samples will arrive from vendor this week and production will follow shortly (and quickly)

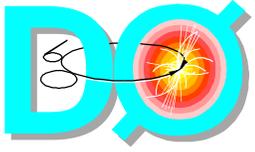
- ◆ Drilling jig exists

- ◆ Expect MDT octant assembly to begin in early July



# Forward Muon Tracking Chambers

- **Cost**
  - ◆ Within cost estimate
- **Schedule**
  - ◆ Production of MDT's is slightly behind schedule but will likely be completed according to schedule
  - ◆ No data on octant production rate (need 1.3/week) at this time but assembly should be straightforward if honeycomb panels are available
- **Manpower**
  - ◆ Schedule contains 7 Fermilab techs for octant assembly
  - ◆ JINR visitors play an important role



# Summary

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- **Central Muon System**



- ◆ Commencing commissioning

- **Muon Electronics**



- ◆ Finishing prototype testing and moving into production

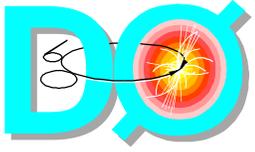
- **Forward Muon Trigger**



- ◆ All counters built
- ◆ Octant production in progress

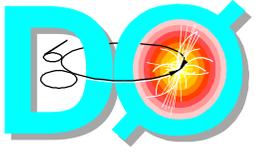
- **Forward Muon Tracker**

- ◆ MDT production in progress
- ◆ Octant production starting shortly



# Outstanding Issues

- **Central Muon System**
  - ◆ None
- **Muon Electronics**
  - ◆ None
- **Forward Muon Trigger**
  - ◆ Continued or increased support for Russian visitors
- **Forward Muon Tracker**
  - ◆ MDT production rate
  - ◆ Procurement of flat panels from outside vendors
  - ◆ MDT octant assembly rate
  - ◆ Continued or increased support for Russian visitors



# Lab F Tour

- MDT Tube Test Stand
  - ◆ Basar Sabirov
- MDT Octant Assembly
  - ◆ Linda Stutte
- MDT Octant Test Stand
  - ◆ Leonid Vertogradov
- Pixel Counter Test Stand
  - ◆ Valeri Evdokimov
- Pixel Octant Assembly
  - ◆ Linda Stutte
- Pixel Octant Test Stand
  - ◆ Dmitri Denisov