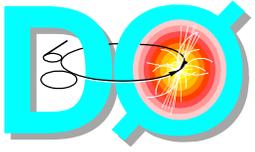


# **Installation and Commissioning of the DØ Detector**

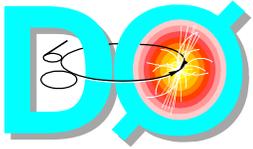
**Jonathan Kotcher  
DØ Collaboration  
Brookhaven National Laboratory**

**DoE Review  
Fermilab  
June 17-18, 1999**



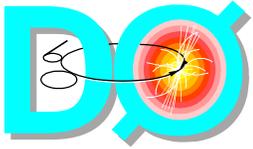
# Outline

- **Organization**
- **Installation**
  - \* **Approach**
  - \* **Current status**
  - \* **Run II installation sequence**
- **Commissioning**
  - \* **Overview**
  - \* **Current activities (Assembly Hall, other labs,...)**
  - \* **Commissioning plans, near- and long-term**
- **Closing remarks**



# Installation Approach

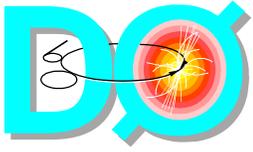
- **Installation is integrated part of each sub-project:**
  - \* **sub-detector design takes into account installation constraints, interferences, end game scenario**
  - \* **designs developed from extensive discussions between groups**
    - **A-f counter design based on detailed survey measurements**
    - **design of forward pixels/MDTs in part driven by proximity to end iron**
    - **FPS modular design motivated by installation/repair/access concerns**
    - **CFT connector design developed within very tight spatial constraints**
  - \* **Money and manpower for installation embedded in individual subprojects**
    - **accounted for in resource loading**



# Installation Approach

(cont'd)

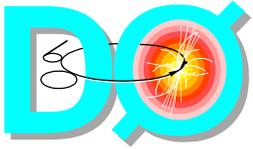
- **Installation of detector is spatially very tightly constrained**
  - \* **DOE is highly hermetic, sub-detectors very closely nested**
  - \* **basically one way it can be assembled**
- **Choreography very well understood**
  - \* **done before by many of the same people (L2 managers and other physicists, technical staff)**
  - \* **collaboration has experience bringing complex detector system online quickly, efficiently**
    - **immediately started taking physics data upon roll-in for Run I with no engineering run**



# Silicon Electronics Commissioning

- Commissioning of silicon readout system at SiDet:
  - \* final readout chain being exercised:
    - interface/adaptor boards, sequencers, VRBs, Multi-Port Memory, Level 3 (NT)
  - \* 24k channels have been read out at once, error rates  $<10^{-14}$
  - \* ultimately will provide test of 10% of readout channels:
    - downloading tests, random and coherent noise, current monitoring, readout errors, data unpacking, calibration databases & programs,...
  - \* install EXAMINE, final crate control & monitoring systems/software (Sep, 1999)

Much functionality, expertise will be directly transferred to final experiment

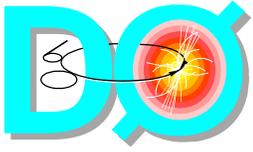


# Fiber Tracker Electronics Commissioning

- **Cosmic ray test at Lab 3:**
  - \* FT, preshowers currently with VLPCs, SVXII, stand-alone sequencer
  - \* Test of final prototypes of major components prior to production:
    - Front-end boards (AFE, DFE), sequencers, mixer board
    - Absolute photoelectron/mip calibration
      - ◆ preshower charge division caps, FT trigger
    - Training ground
      - ◆ EPICS, DART,...

Activity	Projected Dates (1999)
Prototype testing of SVX stereo board	May 17 – July 12
Prototype testing of 1/8 AFE	July 12 – Aug 16
Test of full AFE with final version sequencers	Aug 16 – Sep 13
High-rate test of L1 trigger (incl. DFE, prototype mixer board)	Aug 30 – Sep 24
Absolute Calibration	Jun 21 – Sep 15

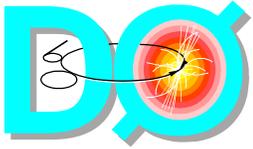
**Prepare to commission FT/preshower front-end & trigger electronics in Assembly Hall (Jan, 2000)**



# Installation Status

- **Solenoid**
  - \* installed, tested, mapped
- **Central preshower**
  - \* installed with solenoid
- **Central muon system**
  - \* 540/630 A-f counters installed (top and sides)
  - \* 224 cosmic cap scintillation counters, 118/120 new cosmic bottom
  - \* 94 PDTs - 18 A-layer, all B-and C-layers (38 each)
- **Level 1 trigger framework**
  - \* installed, commissioned for 1st users

**These are final systems - not prototypes.  
In place, being commissioned**



# Commissioning Overview

- **Assembly Hall:**

- \* **Online system operational**

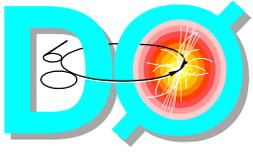
- primary commissioning tool
- EXAMINE, control/monitoring frameworks written, detector-ready
- calibration frameworks ready end Sep

- \* **Commissioning central muon crate begun (cosmic rays)**

- building block for remaining systems
- developing event monitoring, crate control, monitoring/alarms, HV, L3,...
- CAL crates interleaved as available

- \* **Prepare to commission front-end & trigger electronics for delivery and hookup of trackers:**

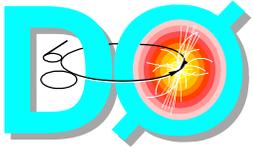
- readout installed before detectors: silicon starting in Sep, FT in Jan
- developing integrated plan for pre-commissioning tracker front-end



# Commissioning Overview

(cont'd)

- **Other labs:**
  - \* Commissioning of silicon readout at SiDet (10% test)
  - \* Cosmic ray test at Lab 3 - fiber tracker, preshowers
- **Other systems:**
  - \* **Forward Muon**
    - **b/gsources, front-end/optical pulsers**
  - \* **Calorimeter**
    - **calibration pulser system**
  - \* **Trigger**
    - **in-situ commissioning pulsers: data/trigger emulators**
  - \* **Plan for integration end tasks under development, initial commissioning schedule in hand**
- **Many commissioning tasks can continue unabated after roll-in to Collision Hall**

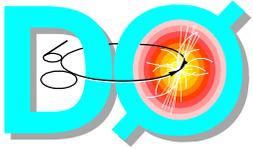


# Commissioning Overview

(cont'd)

- **Organizational efforts:**
  - \* **Commissioning Coordinator appointed**
    - Commissioning representatives chosen for every sub-system - discussions begun
  - \* **Very successful Online Workshop June 3-4, 1999 at Fermilab**
    - 35 registered, 70+ attendees - majority from detector groups
    - Tutorials for users, software contributors - people identified
  - \* **Seattle Collaboration Workshop, June 27-July 2, 1999**
    - "Commissioning Workshop"

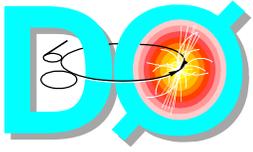
**Collaboration's focus is shifting toward interfaces, integration**



# Concluding remarks

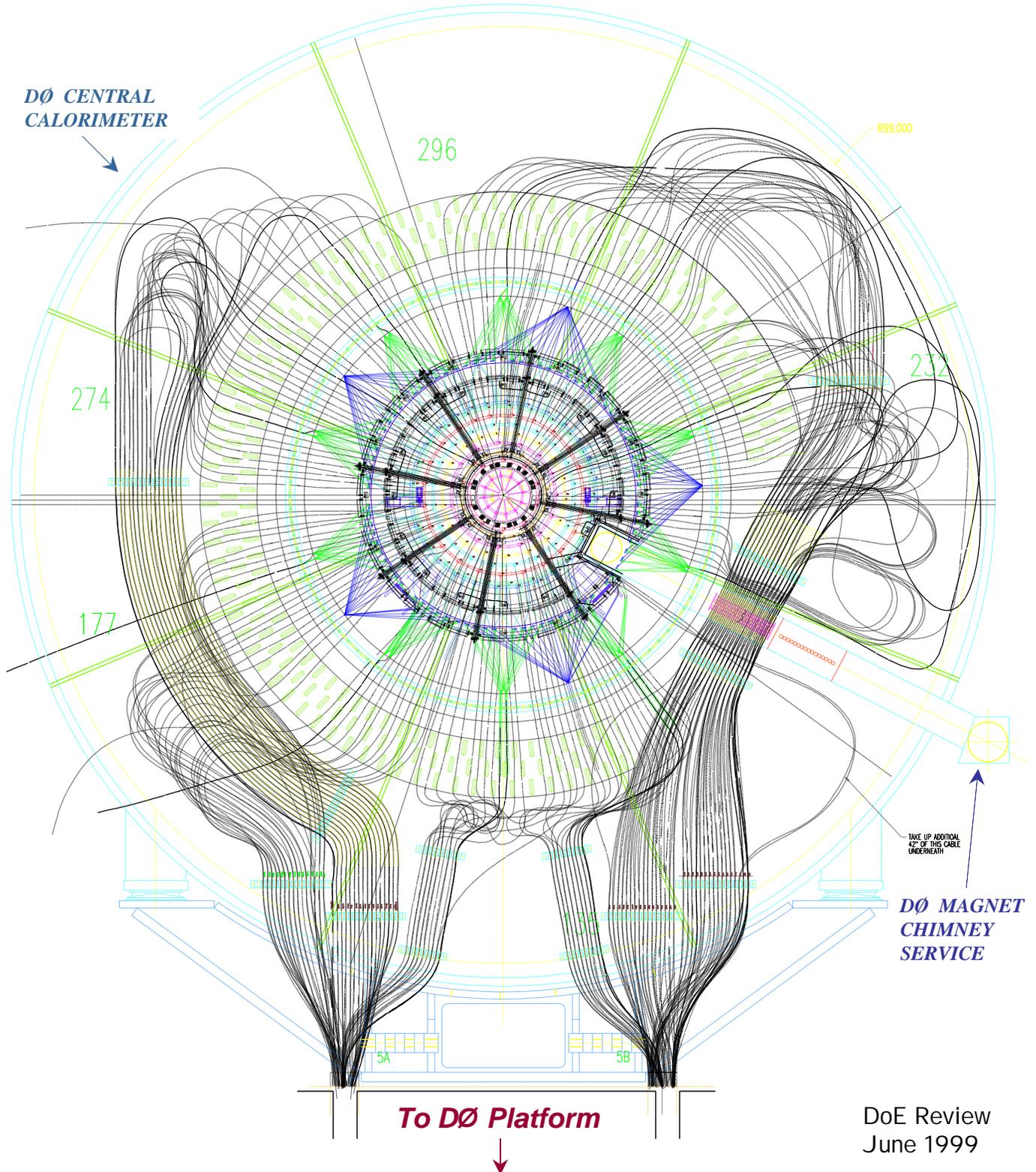
- **New organization:**
  - \* separate Installation and Commissioning Coordinators, developing integrated approach to bringing up experiment
- **Installation scheme well understood**
  - \* nothing new about how pieces get put in place
  - \* solenoid, CPS, L1 trigger, most of central muon installed
  - \* infrastructure being attended to
- **Essentials of commissioning plan in hand**
  - \* plan for full readout of WAMUS crate ® other systems bootstrapped from here
  - \* prepare readout/trigger in DAB for trackers
  - \* fundamentals of plan for individual detectors understood, full end game being developed
- **Schedule requires well-choreographed, pre-planned approach**
  - \* appropriate attention to interfaces

**Collaboration preparing for being  
physics-ready in July, 2000**

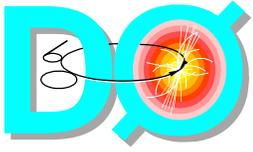


# Fiber Tracker and Central Preshower: Fiber Hook-up

*As Viewed from Face of DØ Central Calorimeter*



DoE Review  
June 1999

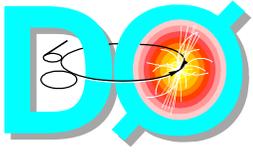


# Central Muon Commissioning

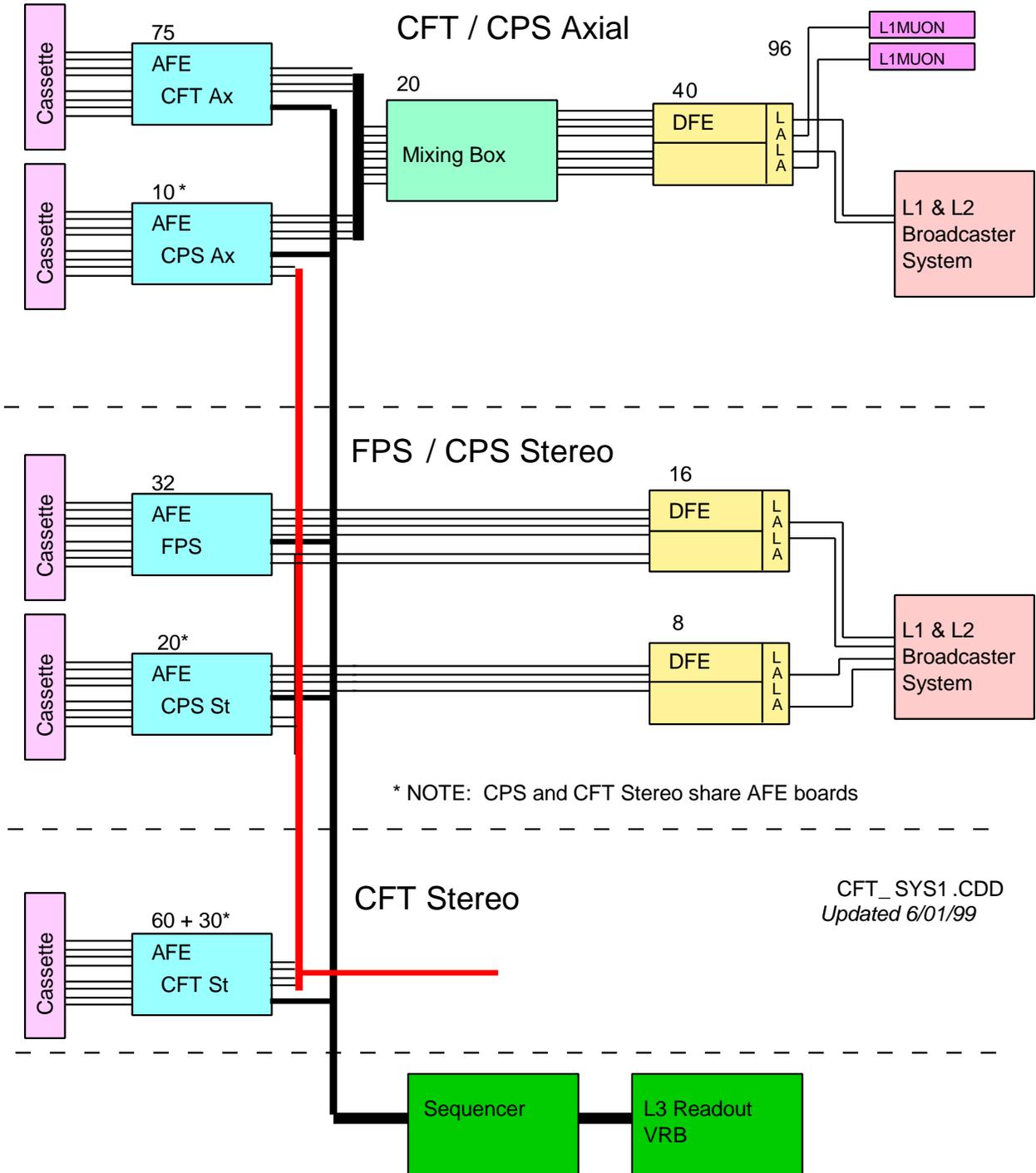
- First steps in readout of single muon crate have been completed:
  - \* PDT cosmic ray trigger: 3-deck coincidence, roads in DSPs
  - \* data out via VBD, data cable, through Level 3 to host
  - \* HV controlled with final control software
- Plan currently being implemented for crate readout utilizing full functionality of final system:

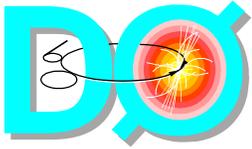
Activity	Dates (1999)
1553 crate installed in MCH3, cables run from platform	Jun 14 – Jun 28
HV control	Done
Prepare 1553 port on Muon Control Board	Jun 21 – Jul 23
Insert EPICS database entries	Jul 26 – Aug 9
Prepare EXAMINE software	Jun 14 – Jul 26
Prepare DSP code for proper data format	Jun 21 – Jul 21
<b>Crate fully operational, read out</b>	<b>Aug 9</b>
SCL delivered and commissioned	Aug 2 – Aug 16
Prepare additional crates for full readout	Jun 21 – Sep 5
<b>System ready for full multi-crate readout</b>	<b>Sep 5</b>

**Prototype for remaining systems**

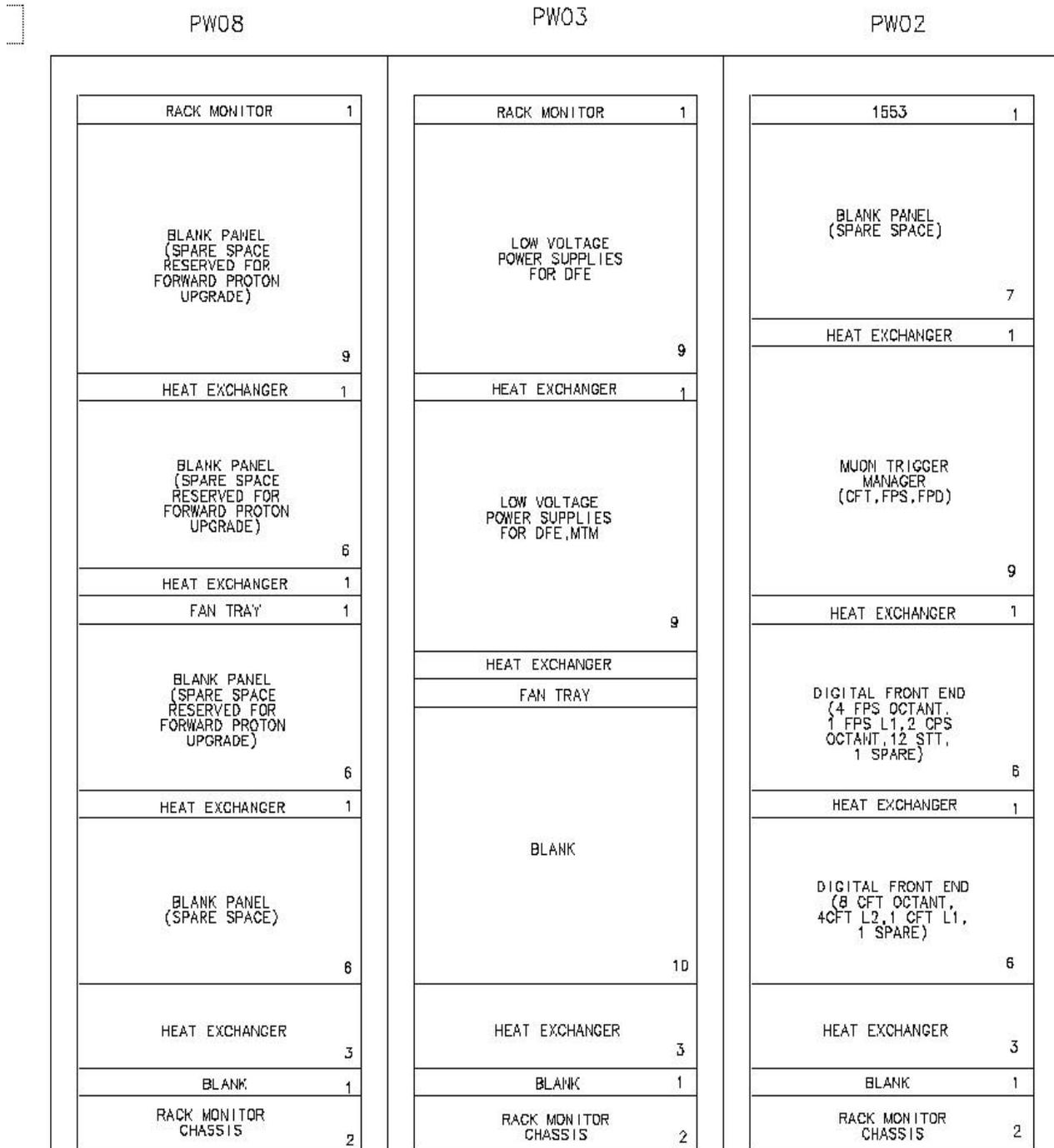


# Fiber Tracker/Preshower Trigger Electronics





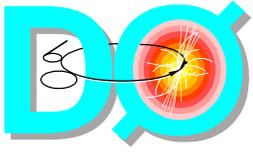
# Platform Rack Layout (West Side)



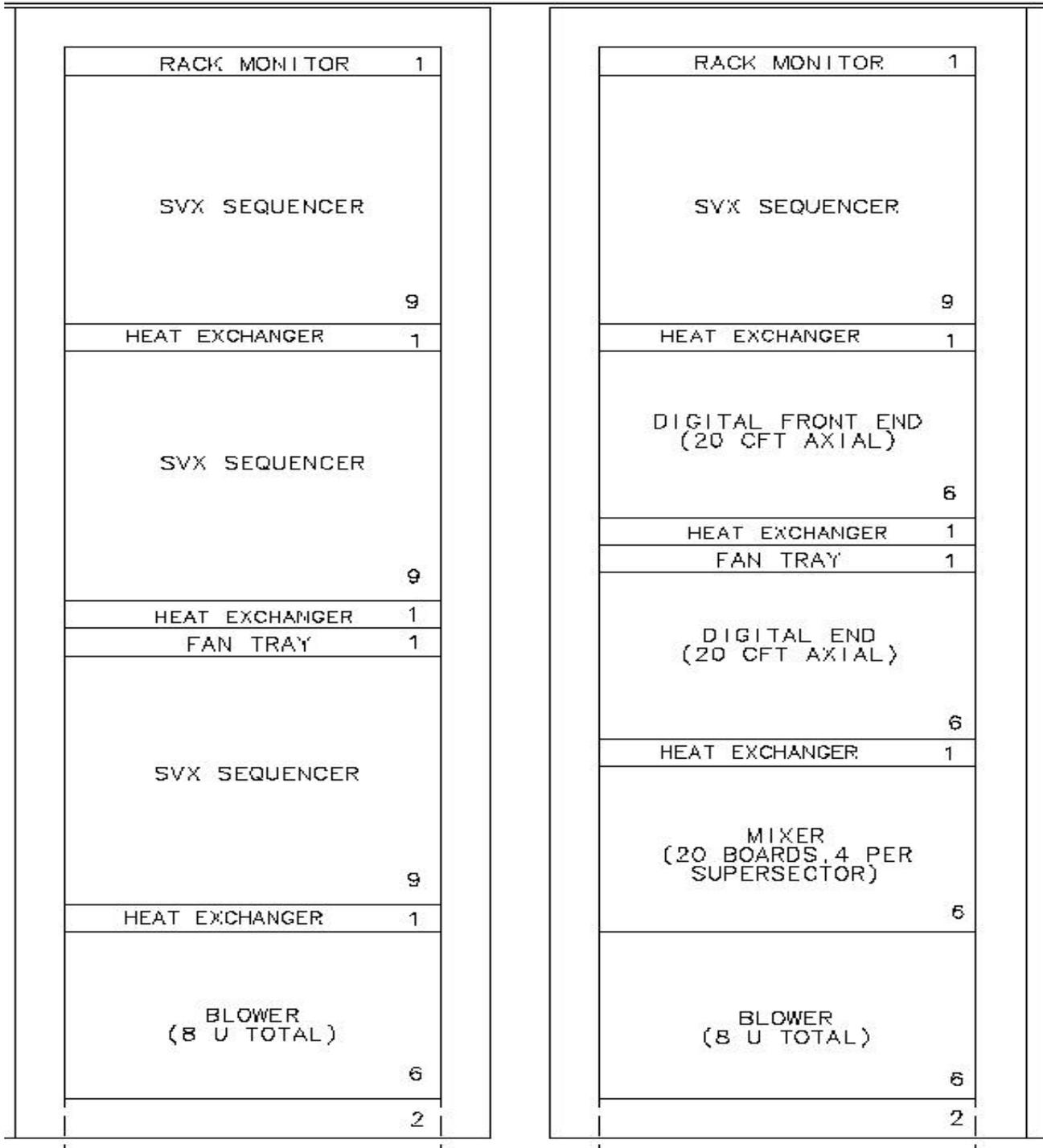
## Platform Rack Layout -- West

Shown: DFE Tracking System (PW02),  
Power Supplies (PW03),  
+ Spare Space Reserved for FPD (PW08)

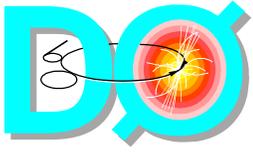
DoE Review  
June 1999



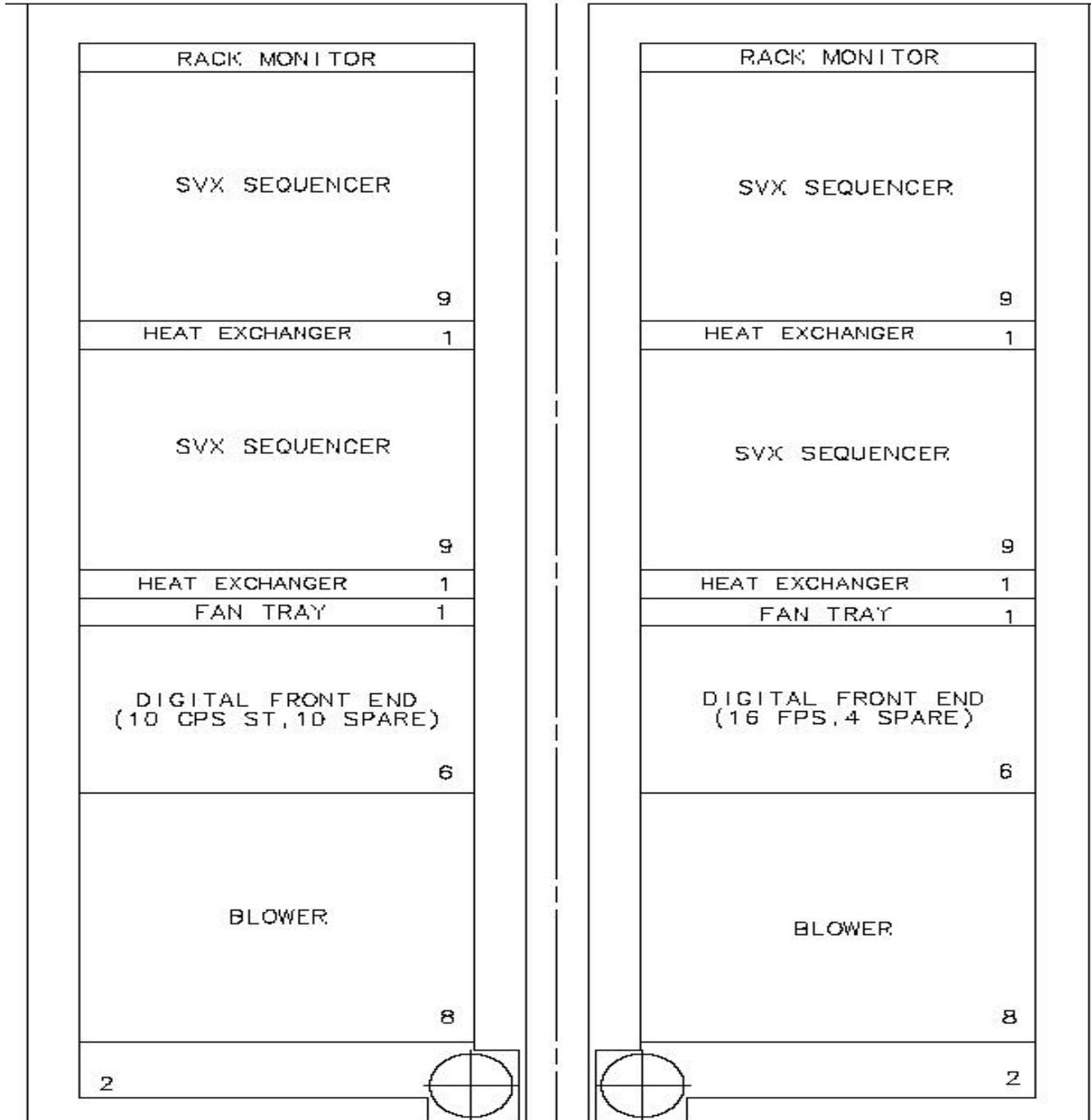
# Platform Rack Layout (Tracking System)



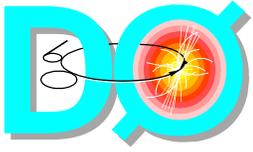
**Shown: Digital FE: CFT Axial, mixer boards,  
SVX Sequencers, Heat Exchangers**



# Platform Rack Layout (cont.)

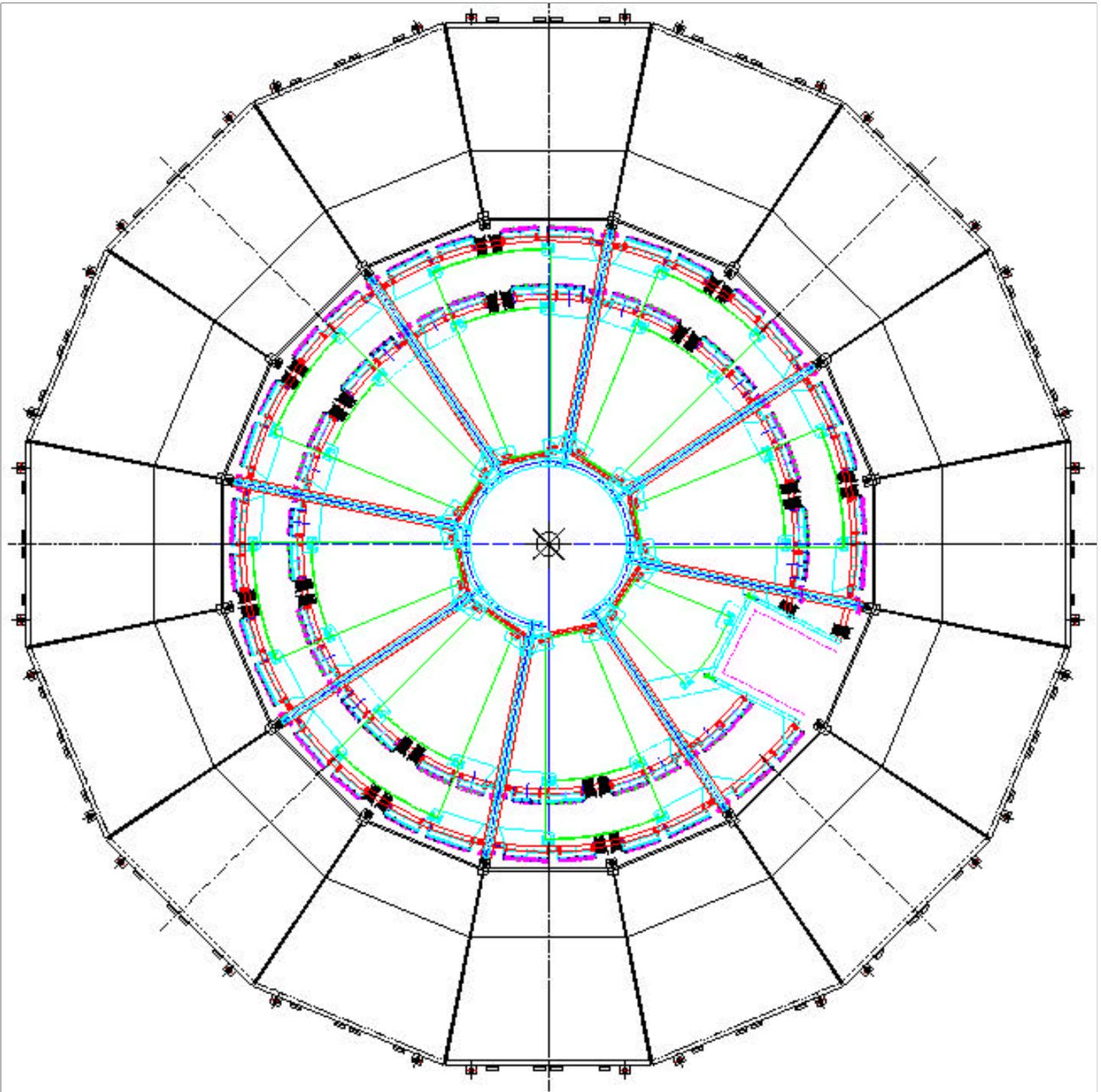


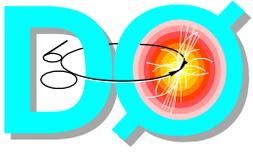
**Shown: Digital FE: CPS Stereo + Spares,  
SVX Sequencers, Heat Exchangers**



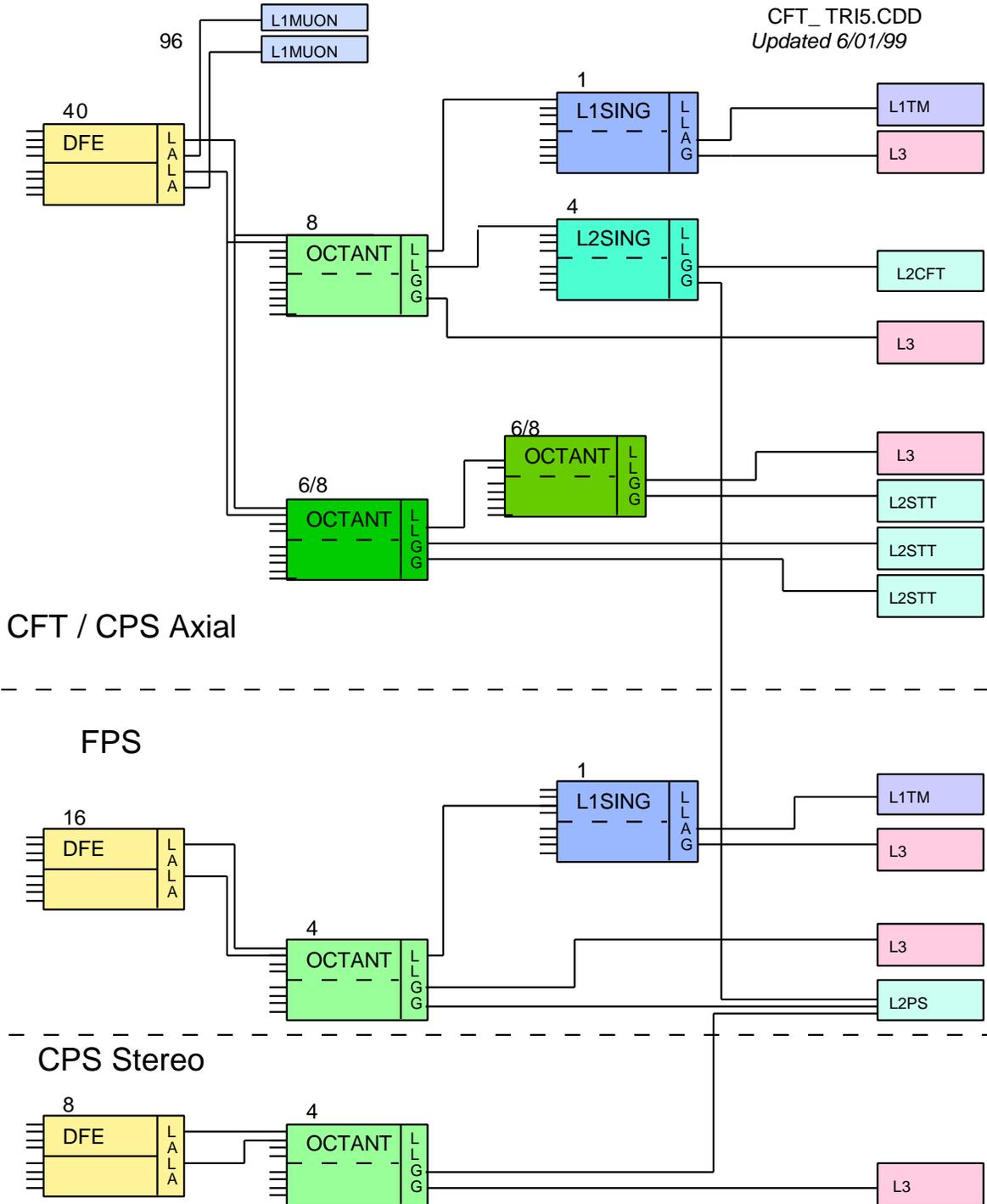
# Modularity of Forward Detectors

End Calorimeter View:  
FPS-North Assembly (Layers 1&3) and ICD Tile Array





# CTT Electronic System



Block Diagram of CTT System