



# Calorimetry Upgrade

Steve Kuhlmann, Level-2 Manager

Joey Huston, Level-3 Manager Preshower

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## Preshower/Crack

- University of Tsukuba
- INFN (Pisa, Rome)
- JINR (Dubna)
- Argonne National Laboratory
- Michigan State University
- Rockefeller University
- FNAL

## Electromagnetic Timing

- Texas A&M
- INFN (Frascati)
- University of Chicago
- University of Michigan
- Argonne National Lab
- FNAL

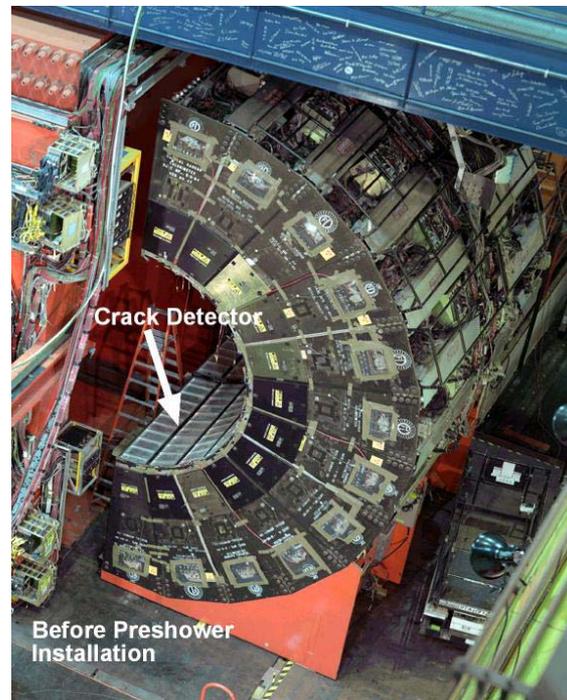
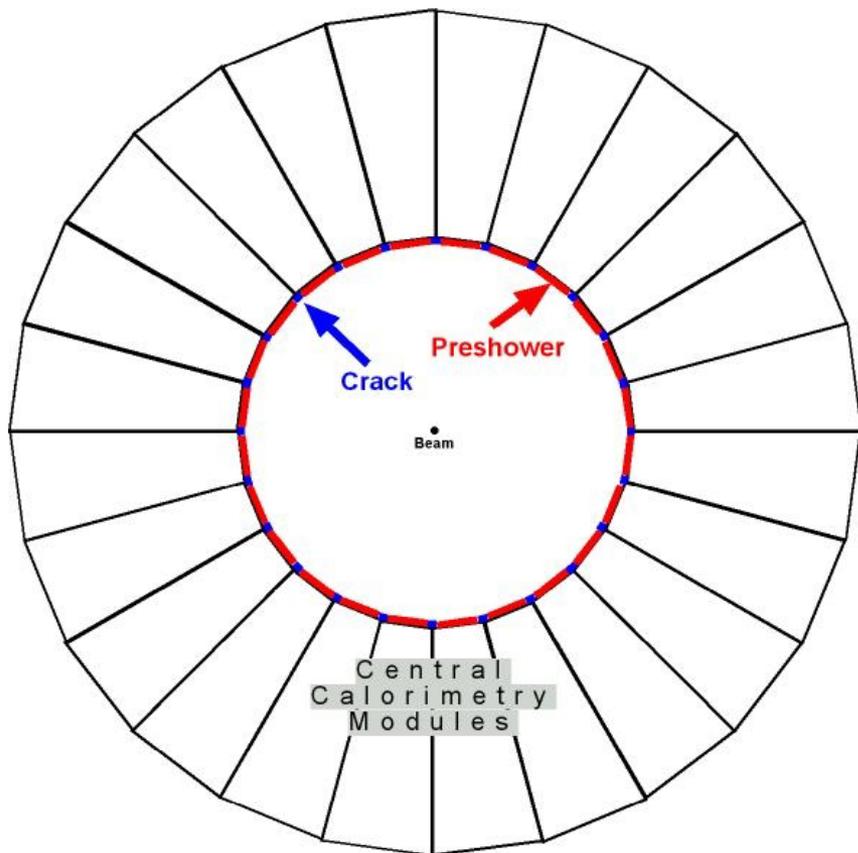


# Electromagnetic Timing

- Project Finished 4 months ahead of schedule!
- All Cables, Splitters, ASD's and TDC's in hand.
- End-Plug installation completed.
- 3 Central Wedges instrumented.
- Performance excellent, <2 ns resolution.
- Installation to be completed in the next long shutdown.



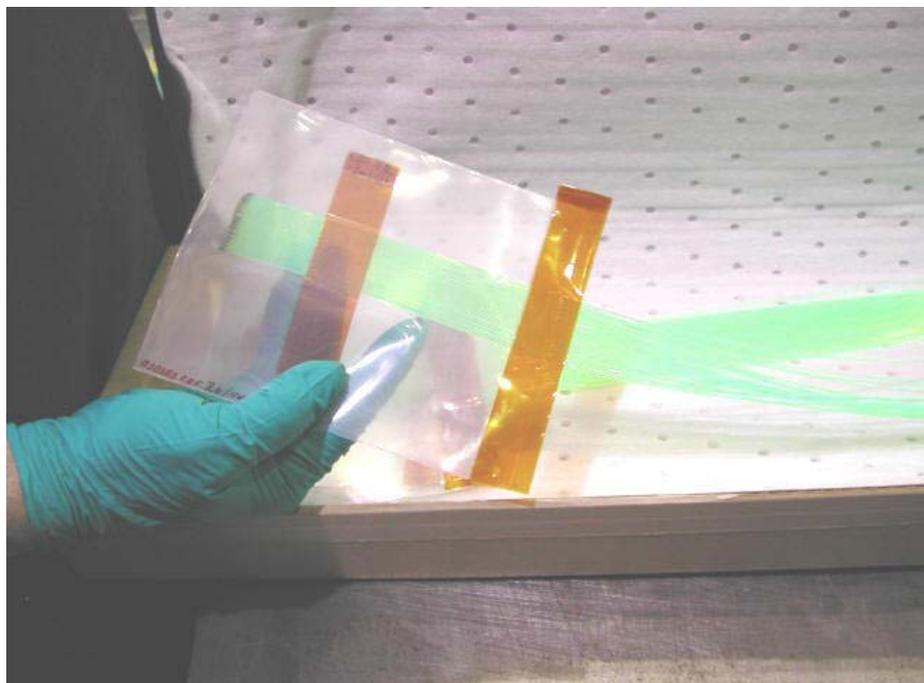
# Preshower/Crack Detectors



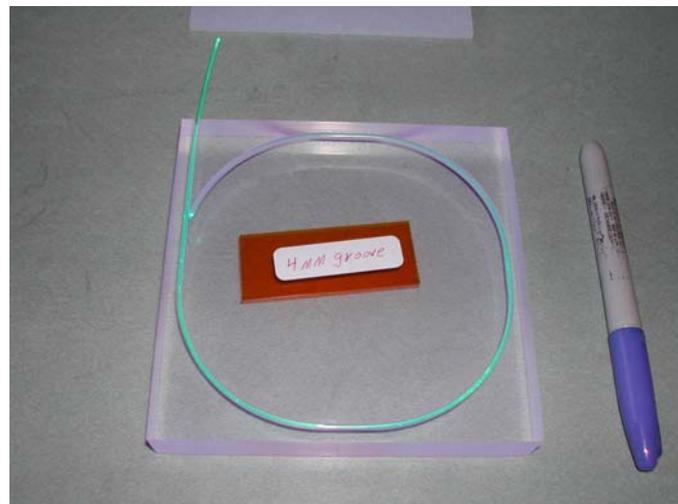


# Preshower / Crack Detectors

## Fiber and tile preparation at FNAL



- Fibers polished, mirrored, and spliced to clear fibers at Lab 7
- Scintillator tiles for full-scale prototype were prepared at Lab 8

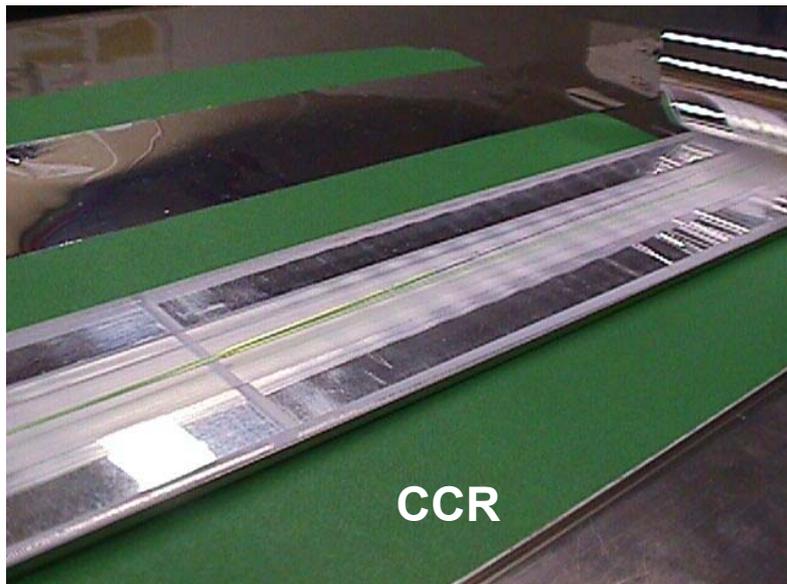
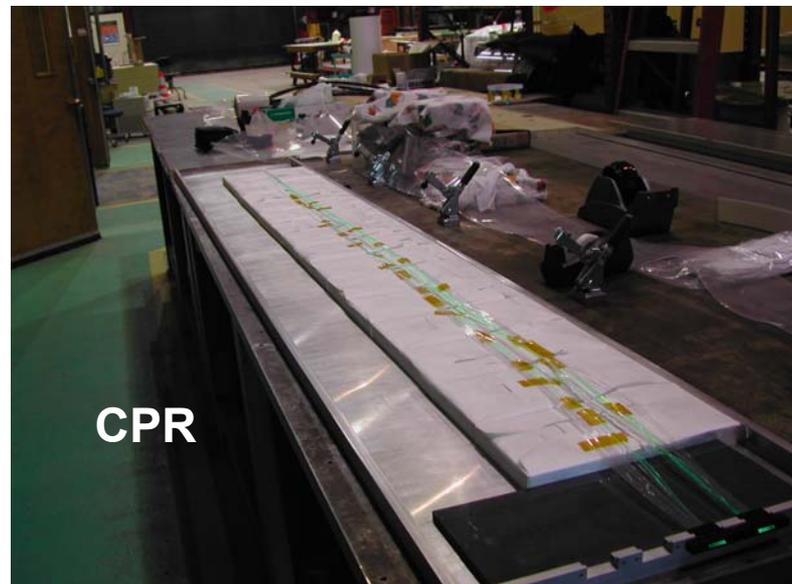
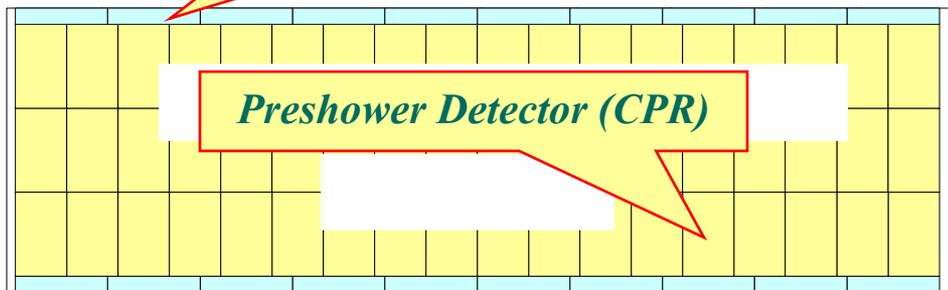




# Preshower/Crack Detectors

*Crack Detector (CCR)*

*Preshower Detector (CPR)*





# Preshower / Crack Progress

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- **Production Phototubes tested at Tsukuba and with full-scale prototype at ANL, no surprises.**
- **Phototube procurement/testing still critical path item, and still on “aggressive” schedule (without contingency) for Oct 2004.**



# Preshower / Crack Progress

- **Funding for final phototube purchase somewhat uncertain due to fallout of silicon cancellation.**
- **New schedule baseline will assign 100% contingency to this purchase.**
- **On the other hand, Tsukuba looking for ways to speed up the last (small) purchase so it is not the critical path.**



# Preshower / Crack Progress

- Full INFN approval of scintillator, fibers, HV, and travel funds to help with construction/installation, happened in late September.
- This is one year later than expected due to uncertainties in Run IIB. (One L2 milestone missed in original schedule)
- Enough “padding” in original assembly schedule to remain ahead of phototubes and still on “aggressive” path.



# Preshower / Crack Progress

- R+D focus on light yield, should have at least x2 safety margin over spec.

	Light Yield Factor
1 fiber loop → 4 loops	x1.57
Optical grease or glue	x1.47
Tyvek → 3M SuperReflector	x1.40
Mirror Fiber ends	x1.36
Polish Sides of Tiles	x1.20
Attenuation by clear fibers and Connector Junction	x0.35 (current MSU measure)
Green to Clear Splice	x0.85 (expect 0.93 from CMS)



# Preshower/Crack Progress

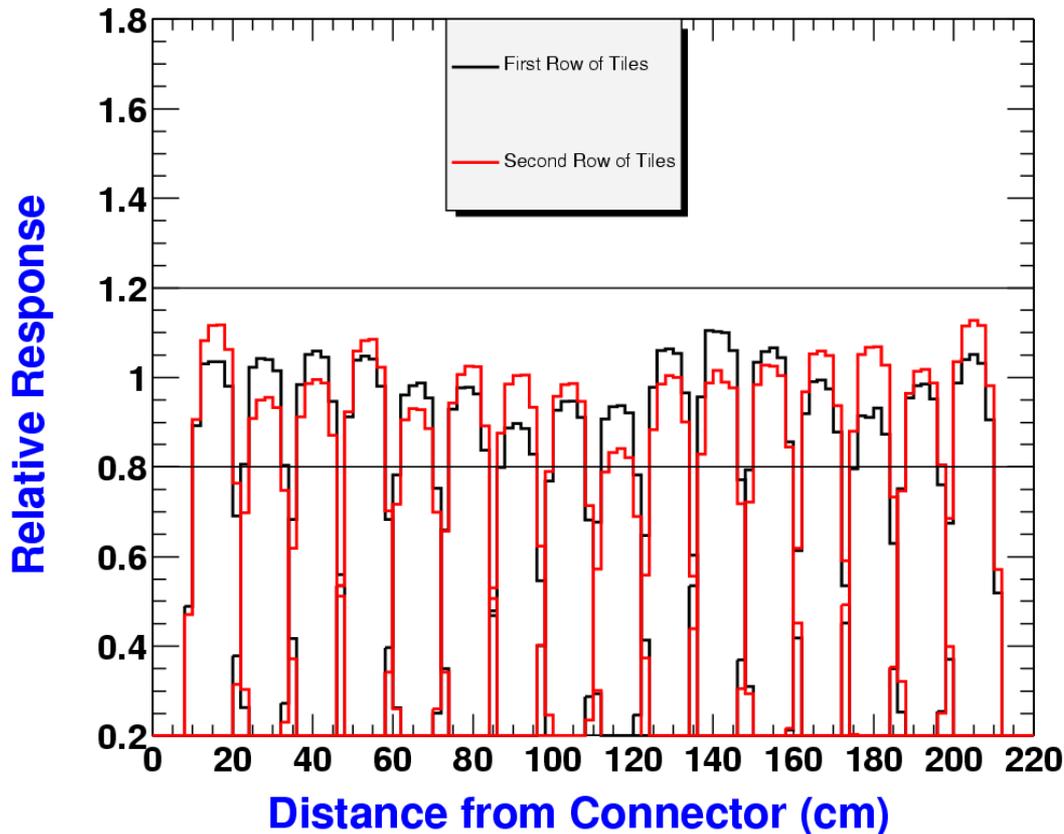
- 3M has stopped manufacture of VM2002, SuperReflector that gives us x1.4 more light. We bought the last two rolls, enough for project!





# Preshower / Crack Progress

- Another important R+D result, **uniformity of full-scale CPR module**



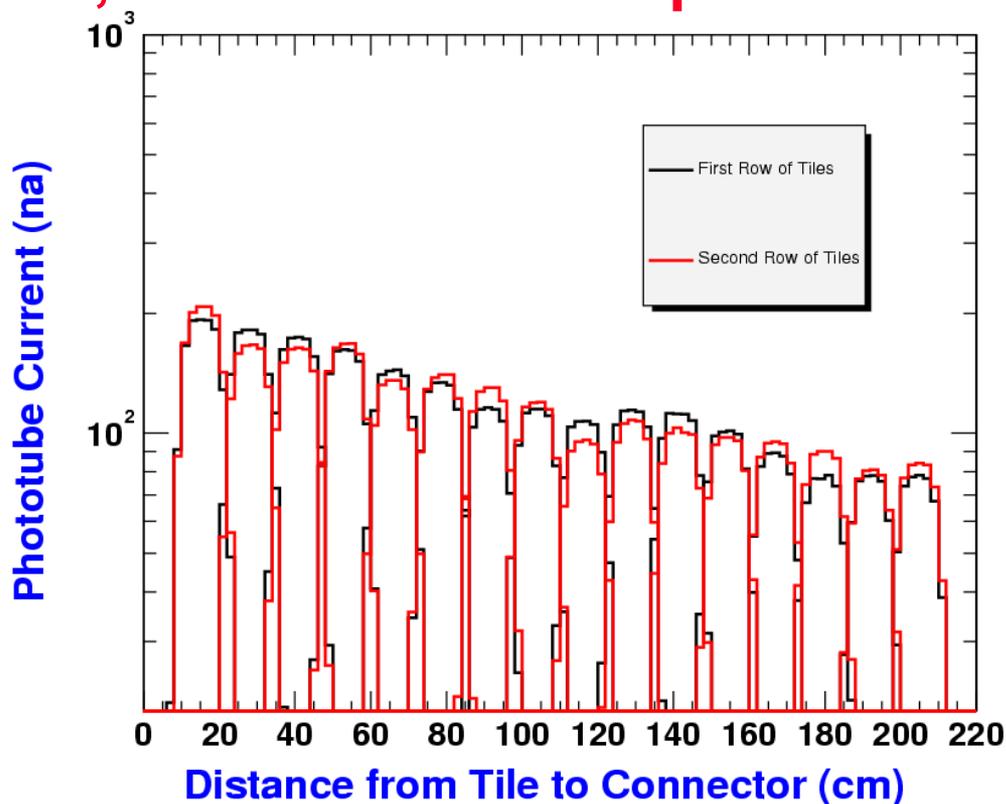
Corrected for  
Attenuation Length.

Excellent Uniformity!  
RMS=6%.



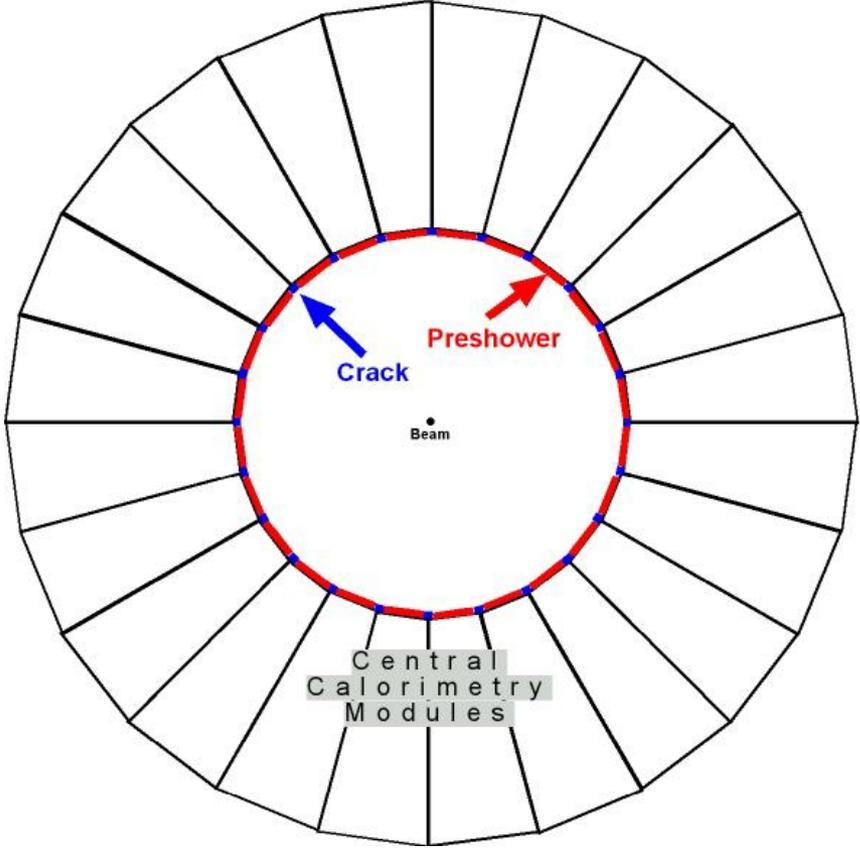
# Preshower/Crack Progress

- Attenuation of this batch of PolHiTech fibers in module too large. Tests of new batch underway this week, with detailed comparison with Kuraray.





# Installation in the Collision Hall





# Installation in the Collision Hall

With help from the CDF Operation Managers, we developed a draft plan to install the Preshower/Crack detectors without a rollout, in **10 weeks**. (First presented at FNAL Program Management Group meeting on August 26<sup>th</sup>)

CDF/DOC/CALORIMETRY/CDFR/6653

## Proposal to install the new CPR2 inside the B0 collision hall

J. Huston, S. Kuhlmann, S. Lami, M. Lindgren,  
P. Lukens, L. Nodulman, R. Roser

August 28, 2003

### Abstract

The CDF Collaboration has proposed to replace the present *Central Preshower* (CPR) and *Central Crack* (CCR) detectors with an integrated detector based on scintillator (CPR2). In this note we present a first plan to install the CPR2 upgrade inside the B0 collision hall during a short (10-12 weeks) shutdown.

Estimate based on 1 shift/day  
with an 8-man team.

Could be faster (6-8 weeks)  
with 2 shifts/day.

Contribution from Italian  
technical personnel

Table 1: Tentative time schedule for the CPR2 installation:

	Action	Hours
1	Access begins.	
2	North arches are pulled fully out.	10 days
3	2 2-man teams work on South arches while North are pulled. They: 1) remove old transition cards, undress old cables; 2) install new transition cards, dress new cables; 3) mount phototube boxes on arch;	10 days all overlap
4	Remove CPR and CCR/bar from 1 bottom wedge on 1 North arch. Mount new detectors on that wedge to find problems and prove installation design.	2 days
5	Remove bottom CPR and CCR/bar from other North arch.	0.5 days
6	Install scaffolding on bottom wedges of North arch.	1 day
7	8-man teams now start removing all CCR and CCR/bar from both North arches.	3 days
8	2-man teams completely install studs and brackets and other installation equipment on both North arches.	6 days
9	During n.8, physicists not in the other teams mount new CCR on old bars.	1.5 days all overlap
10	During n.8, bottom wedge CPR and CCR/bar are removed from both South arches by 8-man team.	0.5 days all overlap
11	During n.8, scaffolding is installed by 8-man team on South arches.	1 day all overlap
12	During n.8, 8-man teams remove all remaining CPR and CCR/bars from South arches.	3 days all overlap
13	2-man teams install studs etc. on South arches.	6 days
14	2 2-man teams then install electronics and phototube boxes on North arches.	5 days
15	During n.13 and n.14, 8-man teams mount new CPR and CCR/bar on North arches.	6 days all overlap
16	During n.15, physicists not in the other teams mount new CCR on old bars for South arches.	1.5 days
17	8-man teams mount new CPR and CCR/bar on South arches.	1 day
18	During n.17, a small team of physicists/techs not in 8-man teams start installing optical cables on North arches, all the way to the phototube box, plugging in tubes.	6 days all overlap
19	The team of physicists/techs not in 8-man teams install optical cables on South arches, all the way to the phototube box, plugging in tubes.	6 days
20	Cosmic ray checkout by physicists, starts during n.18.	5 days
21	North arches move back in.	10 days
	Total	60 days

Up to two weeks for  
North arches pull out  
(same to back in)

Should start installing PMT  
boxes and signal cables in  
available short shutdowns before  
CPR2 installation



# Installation in the Collision Hall

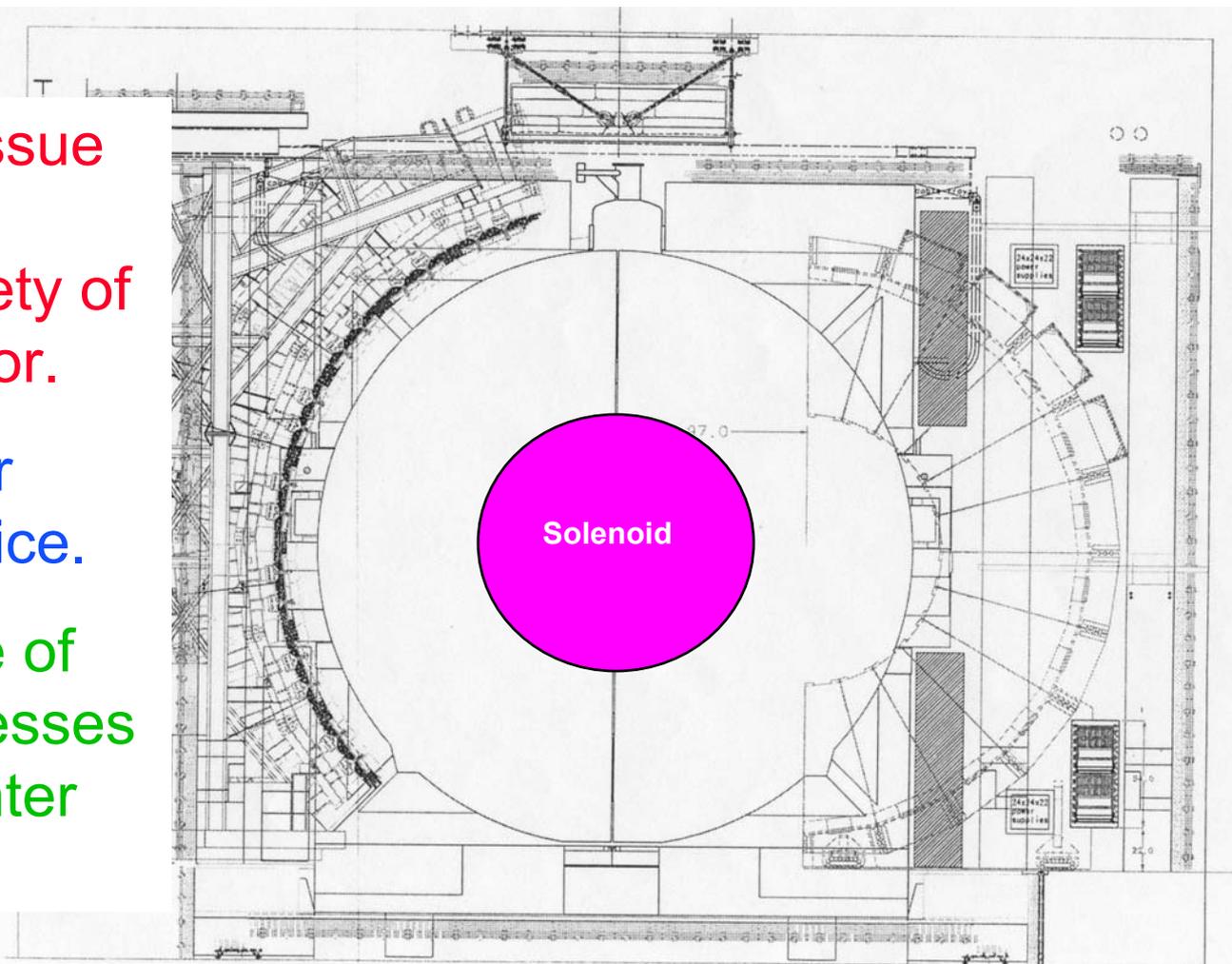
- Since this note was written, we had access to the inside of the arches.
- **Operations group is no longer convinced the four weeks of North arch movement is needed/desirable.**
- Without the full North arch pull, access for people and equipment is thru small hole.
- **I made it!**



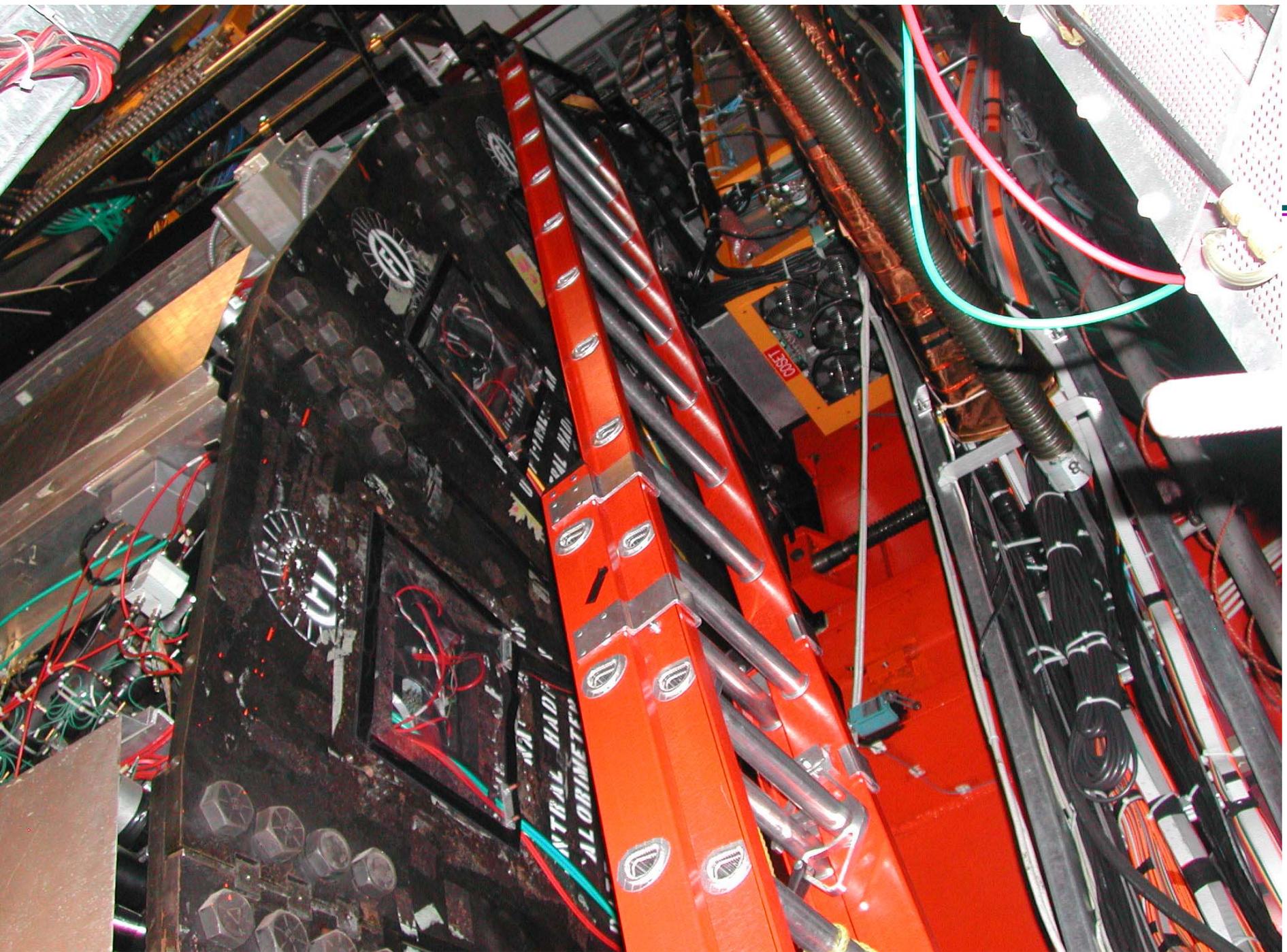


# Installation in the Collision Hall

- Most important issue is well-designed scaffolding for safety of people and detector.
- Will need time for learning and practice.
- Hope to do some of this in >2 day accesses throughout the winter and spring.



CENTRAL ARCHES MAX MOVEMENT  
IN COLLISION HALL





# Installation in the Collision Hall

- Another important issue is fiber routing.
- Some wedges need special routing.
- Will need time for learning and practice, also in short accesses?

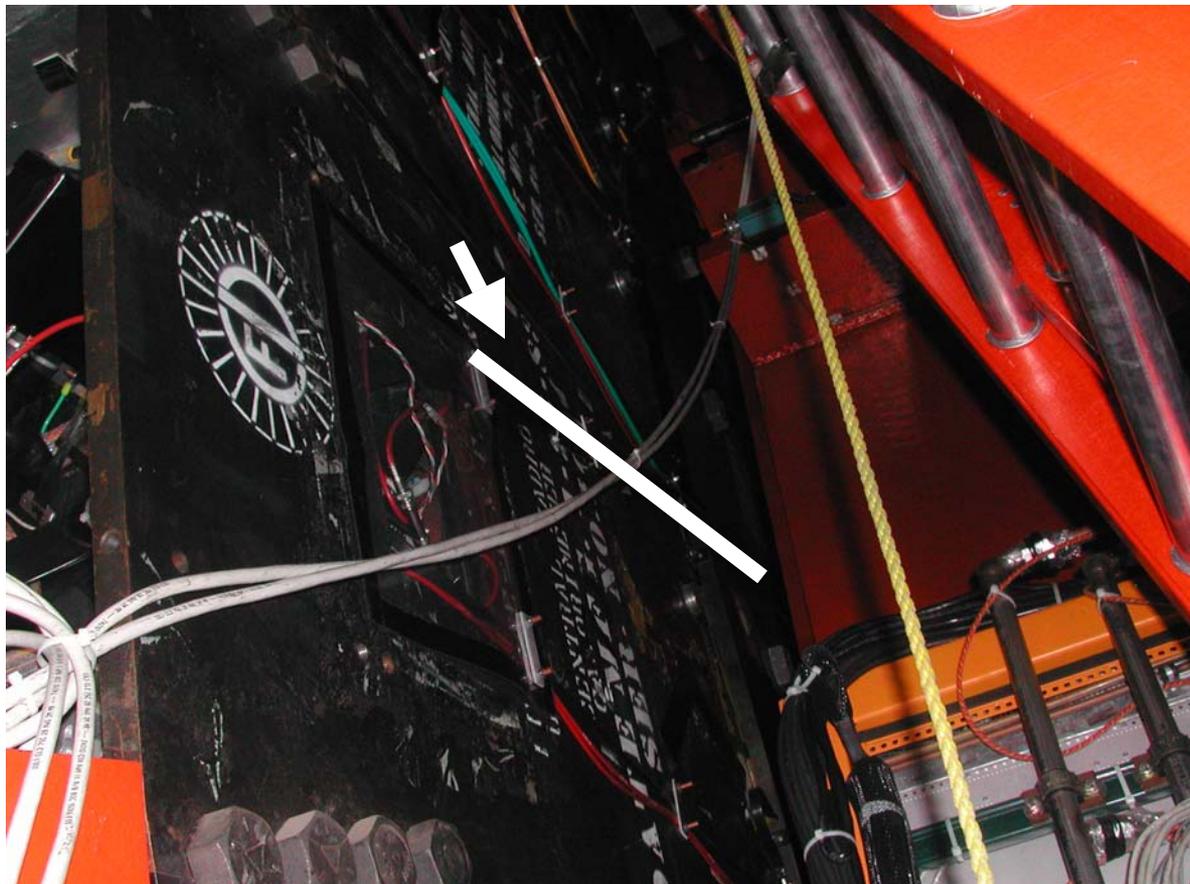
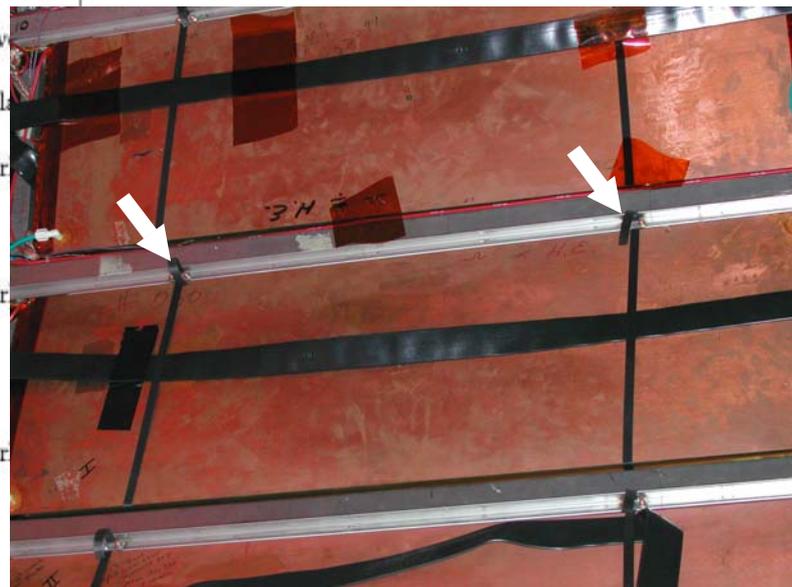




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Total	60 days

• During the last access we realized the best scheme is to reuse the current studs, removing 12 days from the schedule.





# Partial Installation in 2004

- Will want and need to install some wedges in 2004, at the very least to make sure we know how to do it for 2005.
- What fraction we can install depends on the exact date of the shutdown and our construction schedule, and how much practice we get before the shutdown.
- Partial installation is the most challenging for the software/analysis, but we are assuming this is by far the best thing for the hardware installation and are pushing hard to have the software ready by summer 2004.