

First Shipment of BNL Equipment for g-2 to Fermilab

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Fermilab/Northwestern University
All Experimenters Meeting
September 12, 2011

Overview of the g-2 Experiment

- The gyromagnetic ratio: $\gamma = (\text{spin of a particle})/(\text{angular momentum})$
 - This is the Bohr magneton for elementary particles
- The “g-factor” is the difference between the Bohr magneton and γ
- $g=2$
 - Relativistic quantum mechanics
 - Due to extra degrees of freedom of the electron
- $g-2 \neq 0$
 - Radiative corrections in Quantum Field Theory
- We want to measure g-2 and we need to see how far it differs from what our theorist friends think it should be.
- We can improve the current measurement 4 fold by moving the BNL g-2 experiment to Fermilab.

The g-2 Experiment is Going Where?

- Fermilab!
 - This is obviously exciting!
- How does it get there?
 - Helicopters, Barges and Trucks Oh My!
- But not yet!
 - There are lots of “real” movers for the storage ring and the magnets being put into the budget

The g-2 Experiment is Going Where?

- We have limited R&D funds
 - Make use of existent equipment from the Brookhaven experiment to set up test stands at Fermilab
 - Spare vacuum chambers were brought back because we want to put our tracking apparatus within the vacuum and having the physical equipment is useful.
 - Collaborating institutions (Cornell, Regis) also got pieces they need for work they are doing:
 - Cornell: Working on upgrading the magnetic kickers, so they got a spare kicker to build and work with
 - Regis: Refurbishing the fiber harp monitors which measure the beam profiles



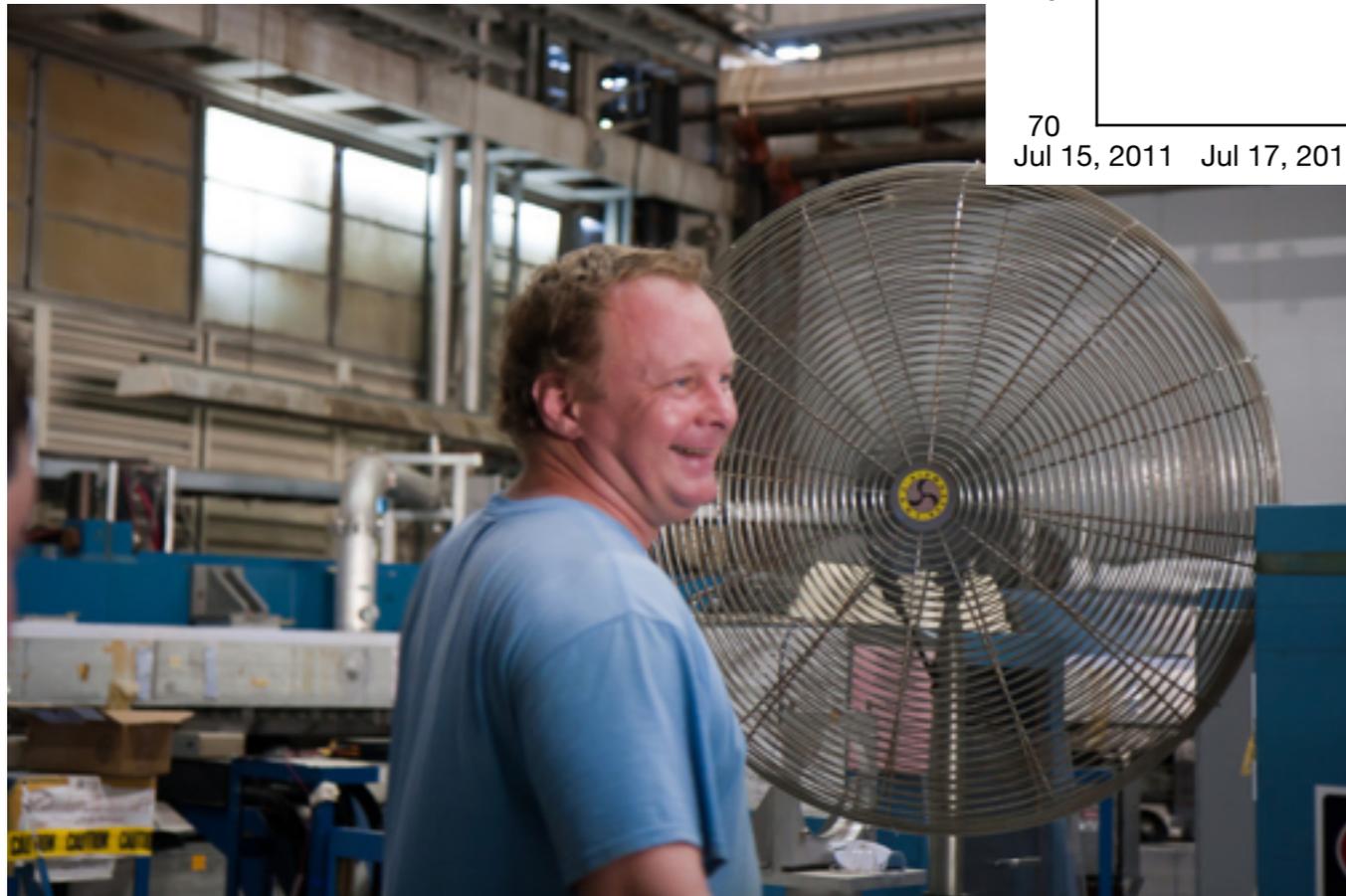
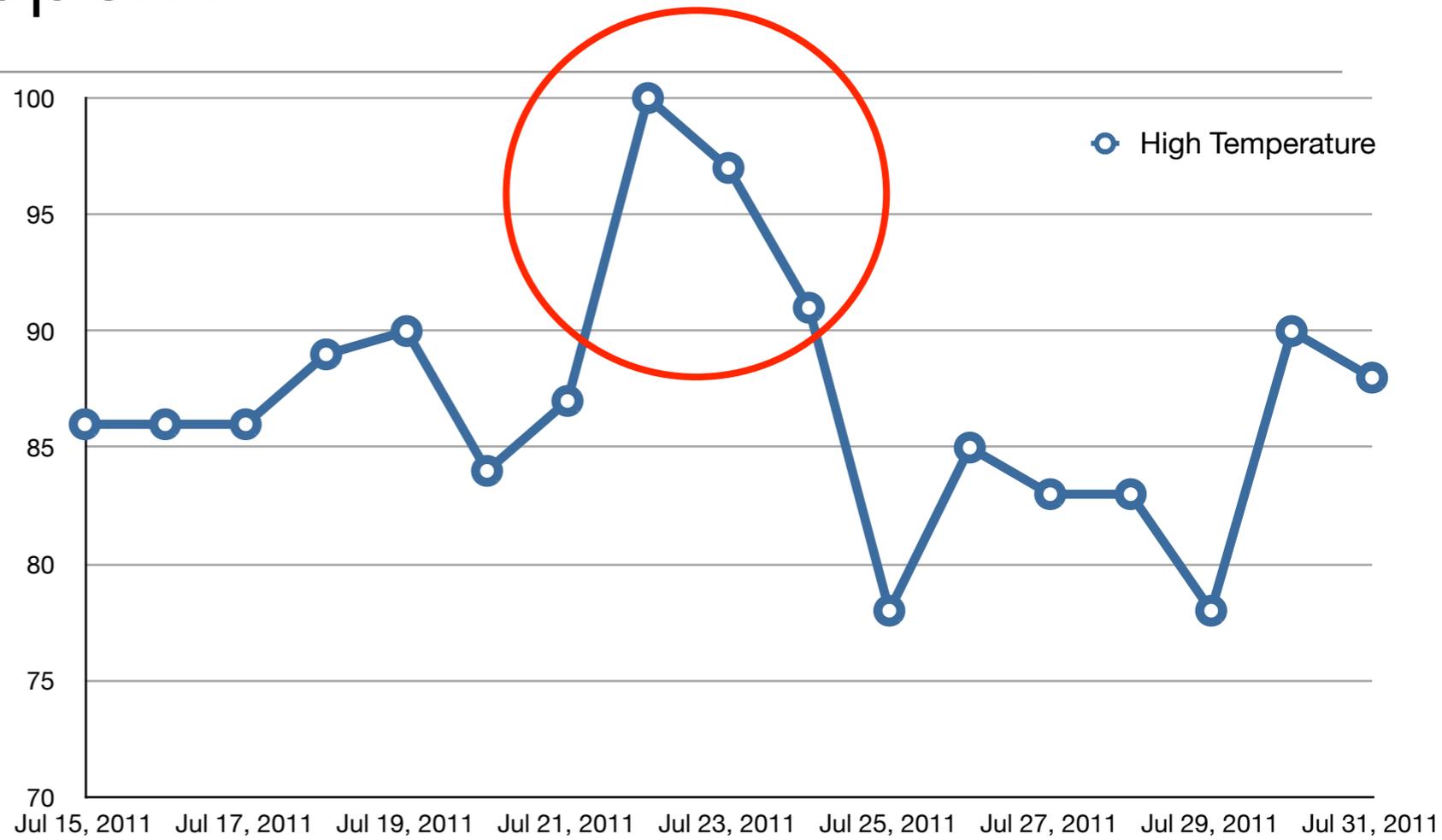
Summer Moving Crew of 2011

From left to right:

Leah Welty-Rieger
Mandy Rominsky
Chris Polly
Brendan Casey
Kelly Hardin

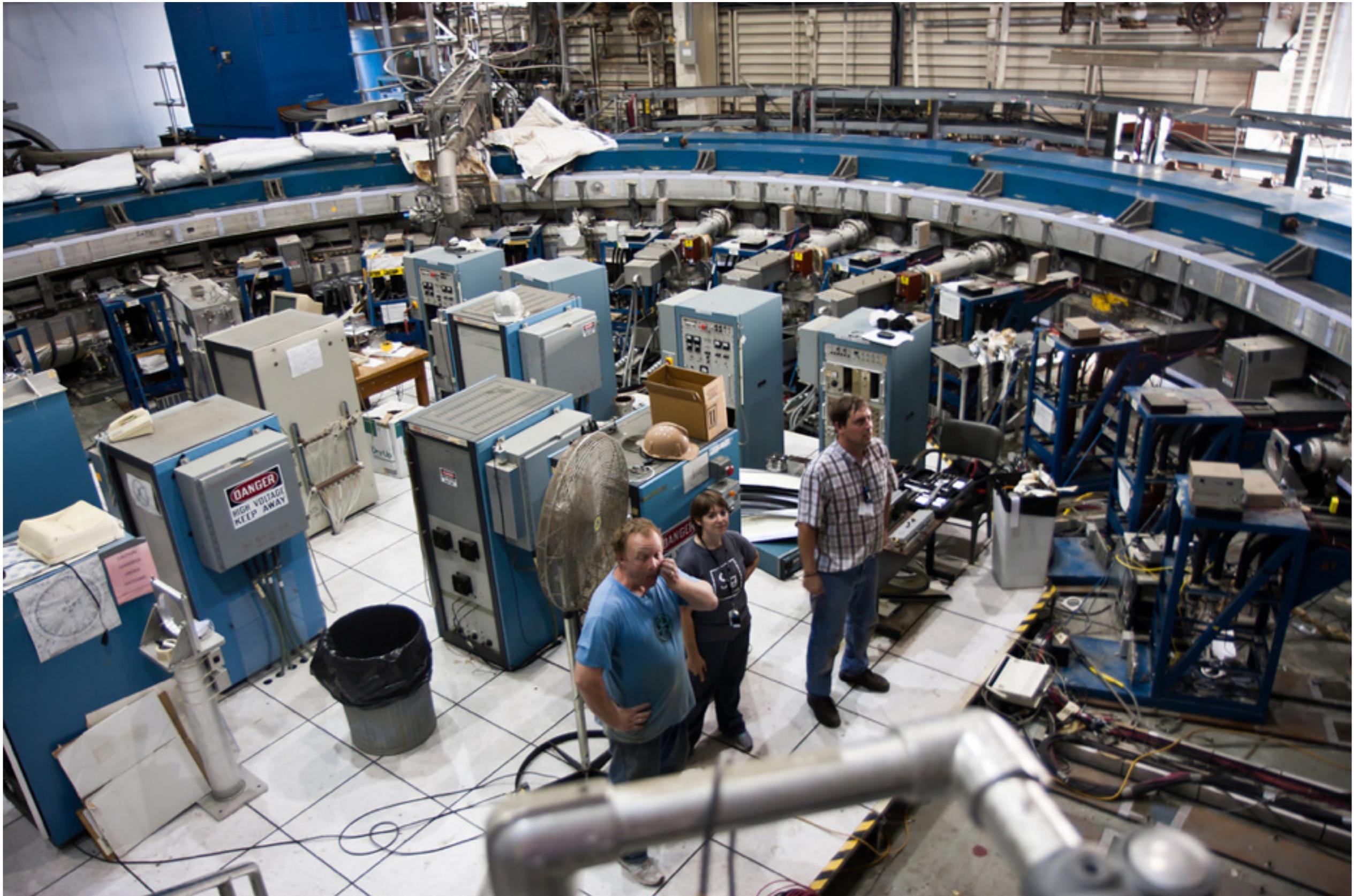
When Did This Happen?

On the hottest days of the year at Brookhaven!



The hall where the g-2 ring resides is not air conditioned

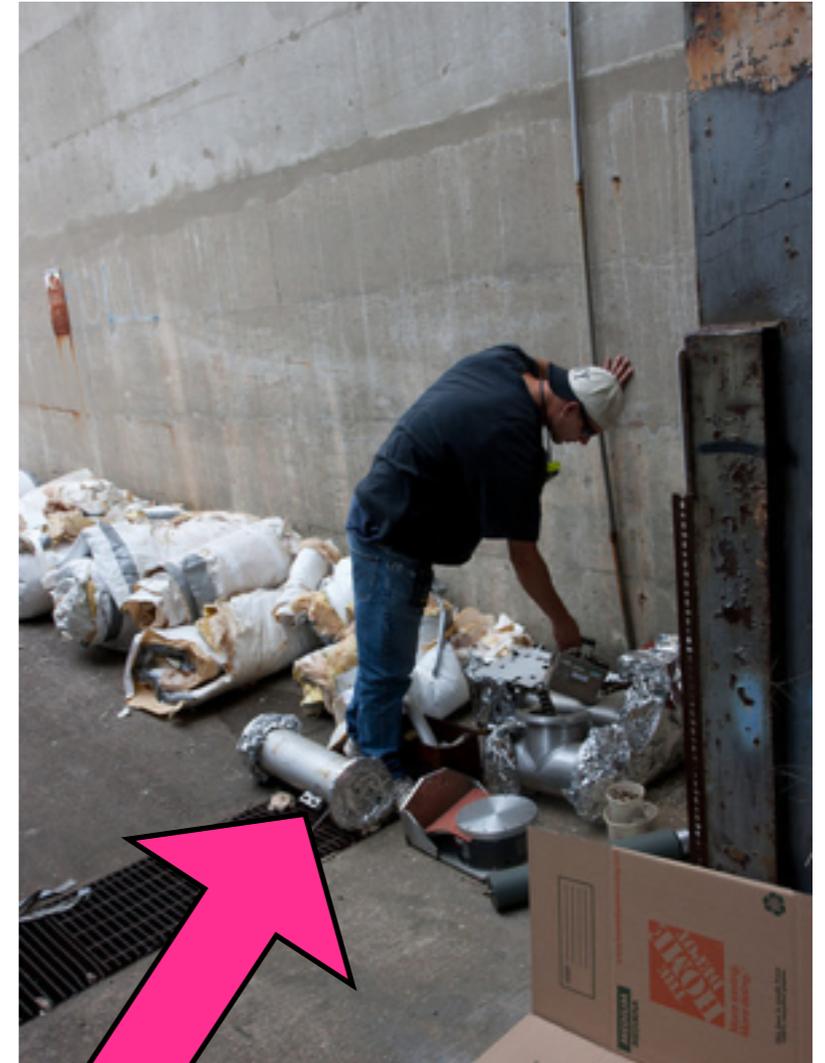
(apparently it **was** in the budget but then they miscalculated some equipment costs so the air was out!)



When I got there most of the insulation had already been removed....but there was a long way to go.



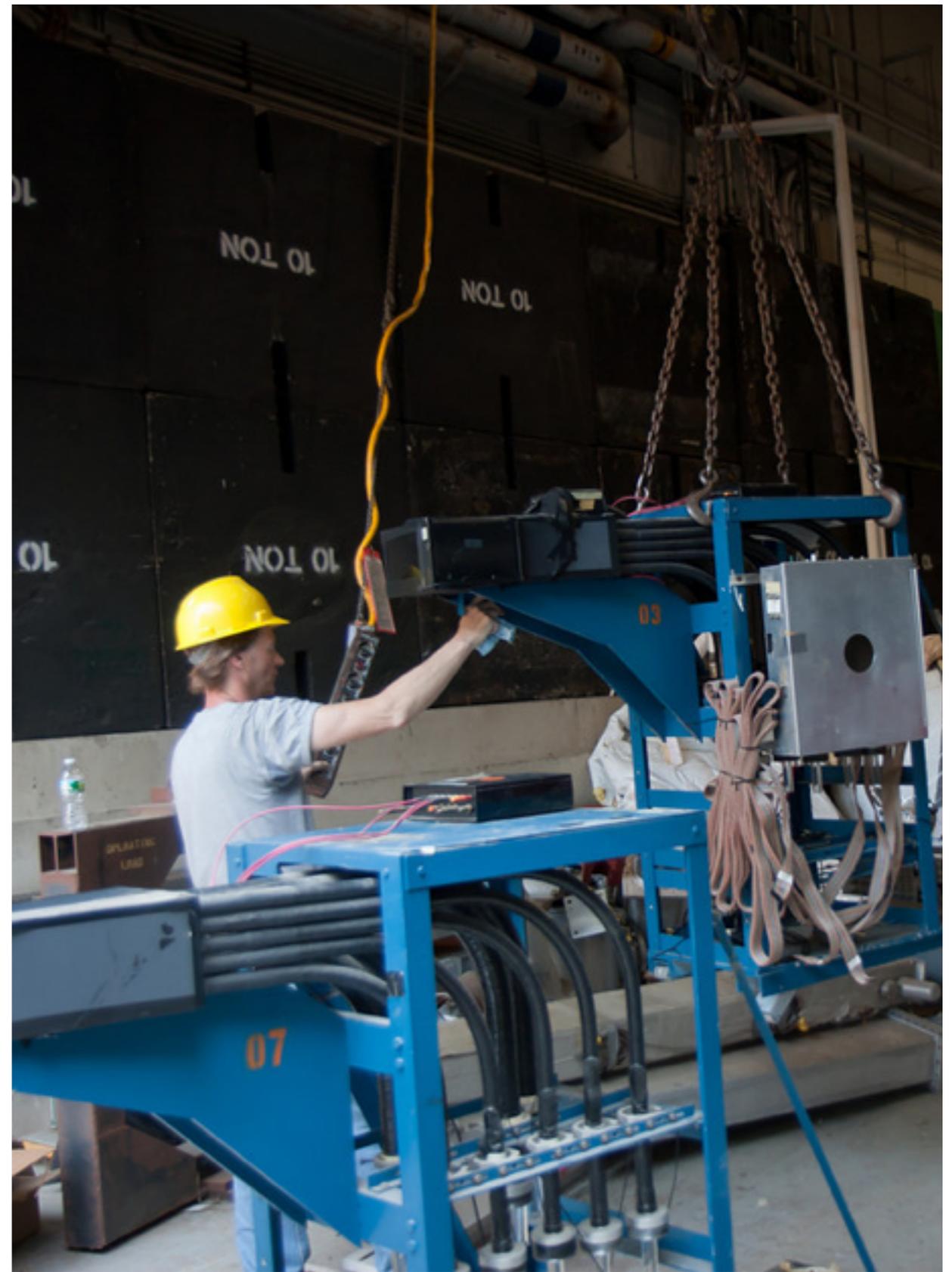
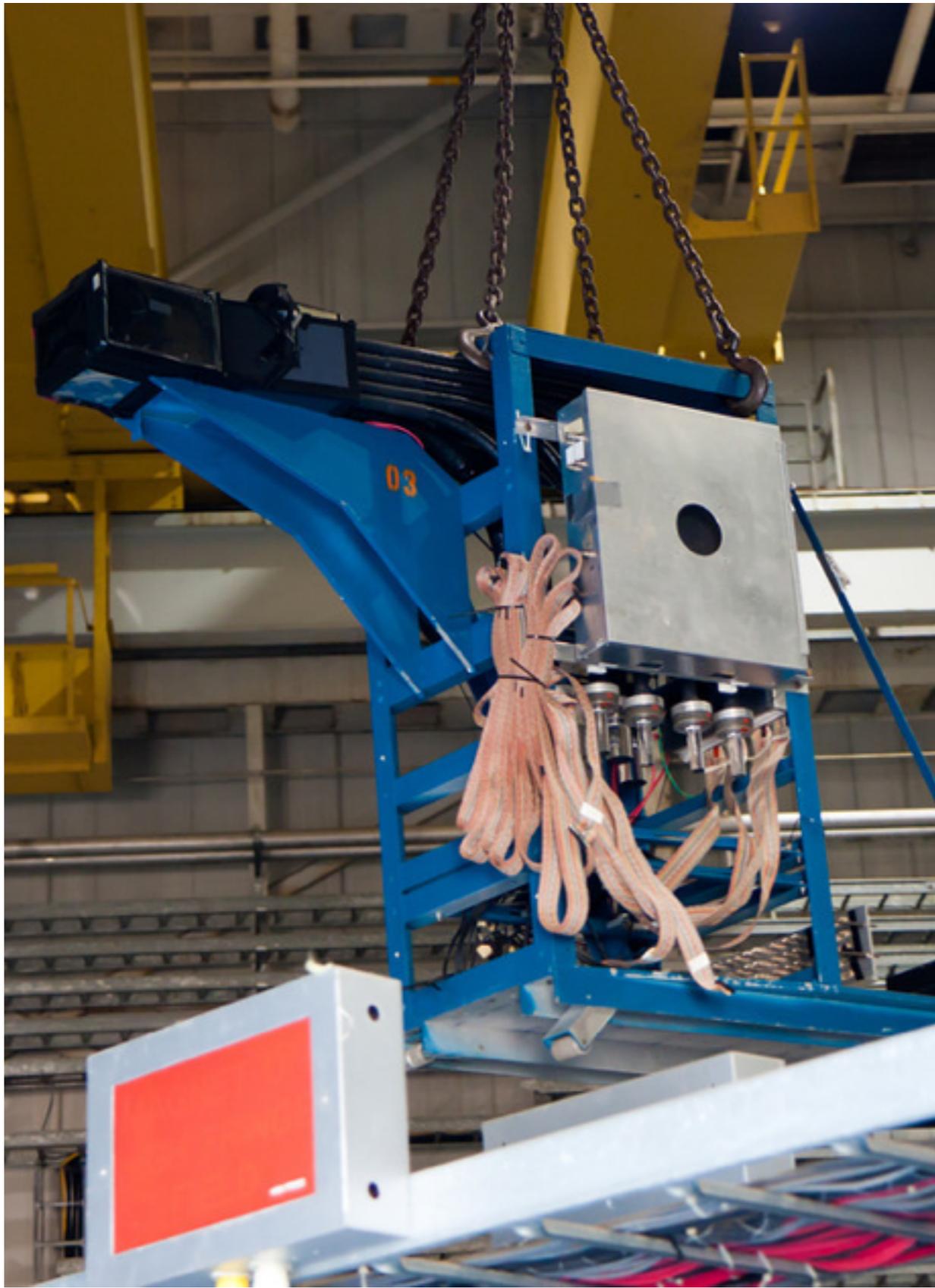
Who doesn't want to be pulling down fiber glass insulation in 100 degree heat?



Pounds of insulation was moved over a 4 day period.
Everything had to be surveyed before it could be thrown in the garbage
or put on the truck!



WIRES! Make them nice!
This was Mandy's favorite part of the work.



Calorimeters.



Someone had to get them on the truck. We couldn't use the crane in any way shape or form to get them on there so it was 1, 2, 3 PUSH!



Taking apart the calorimeter photo tubes and packing them up.



The Last Day or “How much stuff will fit on this truck” Day.



Lots! Everyone wanted something, and as we had room I think everyone was happy.



We got a sciencey UHaul!



Arrival at Fermilab!



Unloading at D-Zero



The vacuum chambers moving into the D-Zero High Bay area. These will be used for testing of the tracking chambers.

Summer BNL Trip - Engineering Meeting

- Sent four experts out to BNL
 - Kurt Krempez: Head of PPD mech eng
 - Bob DeMaat: Head of PPD elec eng
 - Rick Ford: Head of FNAL tech centers
 - Larry Bartoszek: Independent mechanical engineer
- Very productive two days
 - Experts got to tour the ring and have meetings with all of the relevant BNL engineers and physicists
 - Detailed look at all of the subsystems and discussions about what to reuse
 - Large transfer of institutional knowledge regarding engineering challenges

Summer BNL Trip - Engineering Meeting

- Major conclusions
 - g-2 storage ring is really a marvel of engineering
 - Work to establish new control systems will be significant
 - Biggest technical risk in moving the coils
 - Initial plan developed to test coils before and after move
 - General agreement that moving coils early is best way to mitigate risk

The New g-2 at Fermilab Status

- We received Stage 1 approval in January of 2011
- CD0 paperwork submitted ~ 1 month ago
 - Expect it to be granted early CY2012
- FY2012
 - Risk assessment
 - CDR Written and submitted
- FY2013: Disassembly
- Fall 2013: Ship storage ring and magnets
- FY2014: Reassembly
- FY2015: Shimming and Commissioning
- FY2016: Taking data!

Summary

- We had a busy few weeks at Brookhaven
 - Took off all the insulation and removed it from the experimental hall
 - Moved 2 vacuum chambers back to D-Zero to use for testing of tracking chambers
 - Moved 8 calorimeter stations
 - Some equipment stopped off at Cornell for their needed testing.
 - Concluded with a collaboration meeting
- Are in a good position to get work done for a CDR in the next 6-9 months.

Backups

Timeline items that have to be sequential:

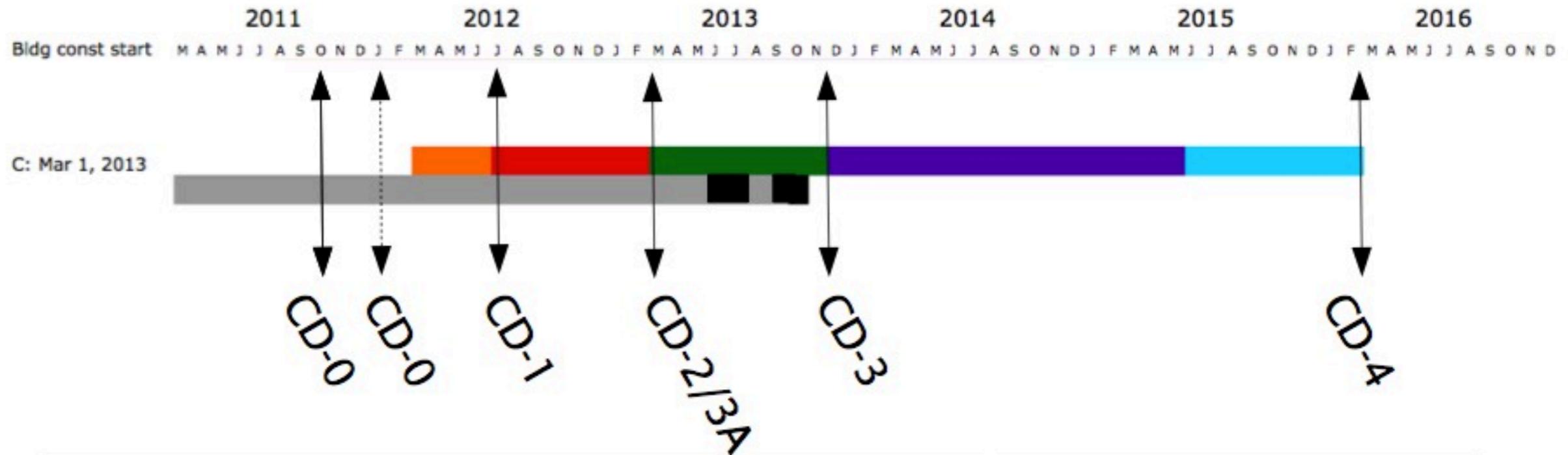
Building CDR	4 mos	Paid by FESS operating if GPP
Building engineering	8 mos	Paid on GPP
Building construction	9 mos	Paid on GPP
Ring assembly	18 mos	
Field shimming	9 mos	

Possible transport times:

Barge Voyage	
Disassembly	



*must ship in Jun-Jul, midSep-Oct



CD-0 Approve Mission Need	1st quarter FY 2012
CD-1 Approve Alternative Selection and Cost Range	3rd quarter FY 2012
CD-2 Approve Performance Baseline CD-3A Approve Limited Construction (ring transport)	2nd quarter FY 2013
CD-3 Approve Start of Construction	1st quarter FY 2014
CD-4 Approve Start of Operations	2nd quarter FY 2016

- Hearing CD-0 could come a little later than this schedule, 2nd quarter FY12
- CD 1/2 can slide a little/compress
- Do not want CD-3 to slide (3a questionable)
- Still have goal of producing CDR draft by March 2012 (7 months from now)