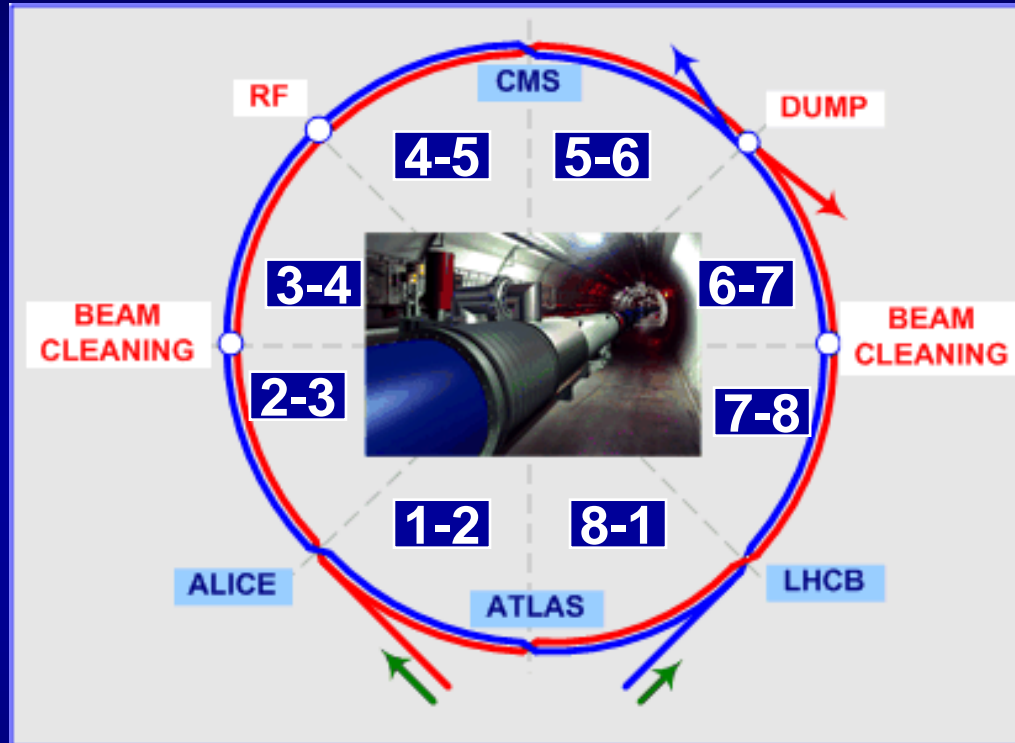


LHC machine (and some outreach)

Mike Lamont

LHC - sectors



Magnets

5 September, the 1000th cryo-magnet was installed in the LHC tunnel in the arc between point 3 and point 4.

1000 out of 1746
(1232 dipoles)



Last one due in
in March 2007

Interconnects

Joining everything up – 1700 times

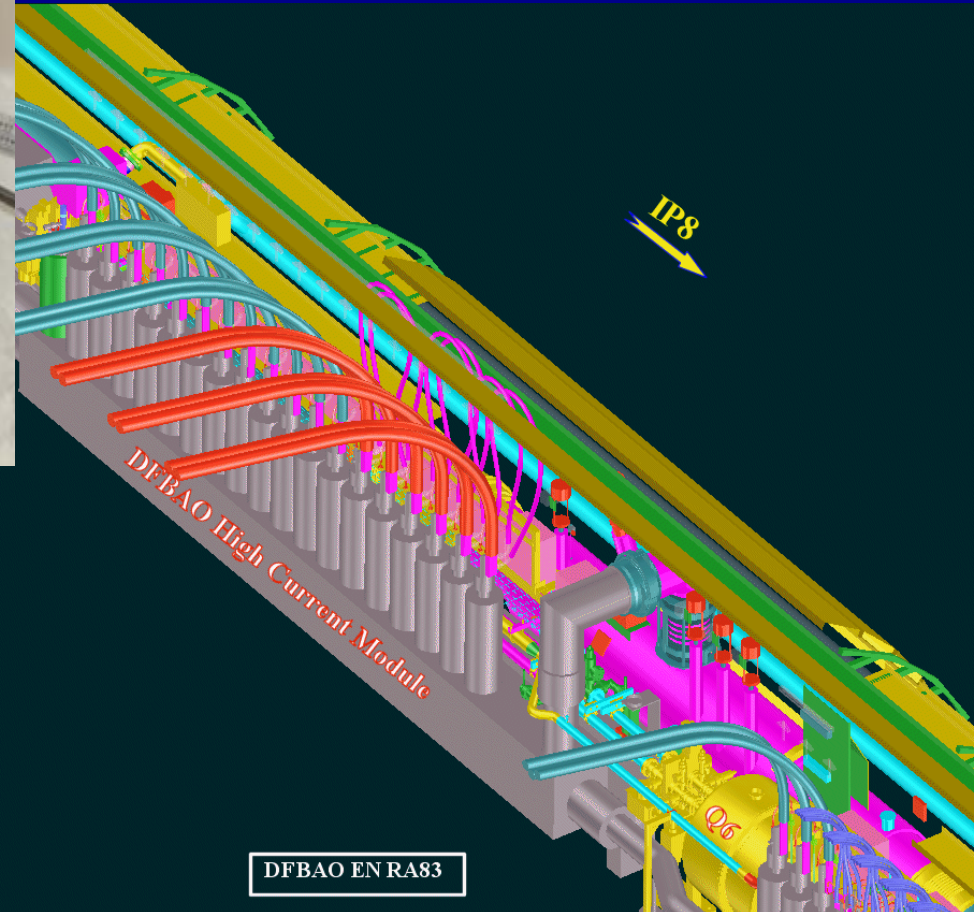
- Vacuum, bellows, RF contacts plus leak checks
- Cryogenics, thermal shield, heat exchanger
- Bus bars
 - superconducting splices x 10,000 (induction welding)
- Corrector circuit
 - splices x 50,000 (ultrasonic welding)



Huge, painstaking & industrialised
Clearly on the critical path

DFBs

Responsible for feeding the room temperature cables into the cold mass.

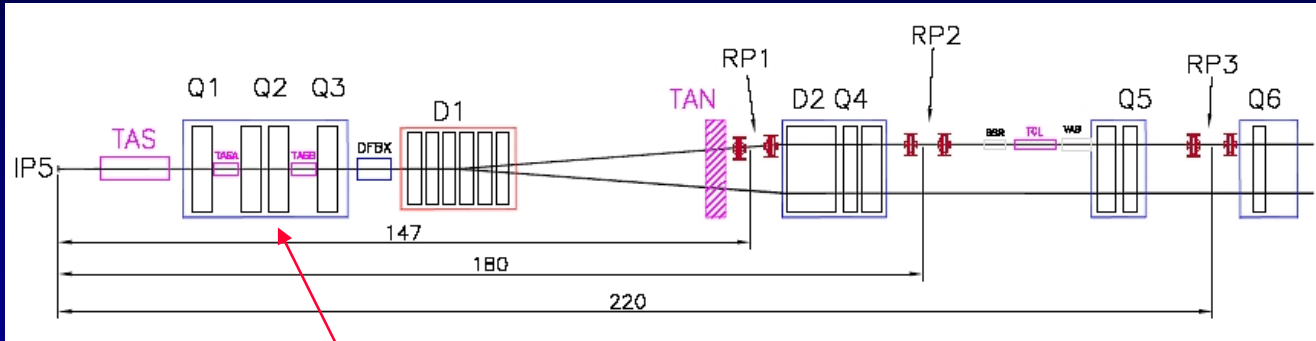


DFBA - arcs
DFBM - quads
DFBL - links
DFBX – triplets
52 total

C.BAULT le 13-03-2006

DFBAO EN RA83

Long Straight Sections



LSS.L8 (Injection septa)



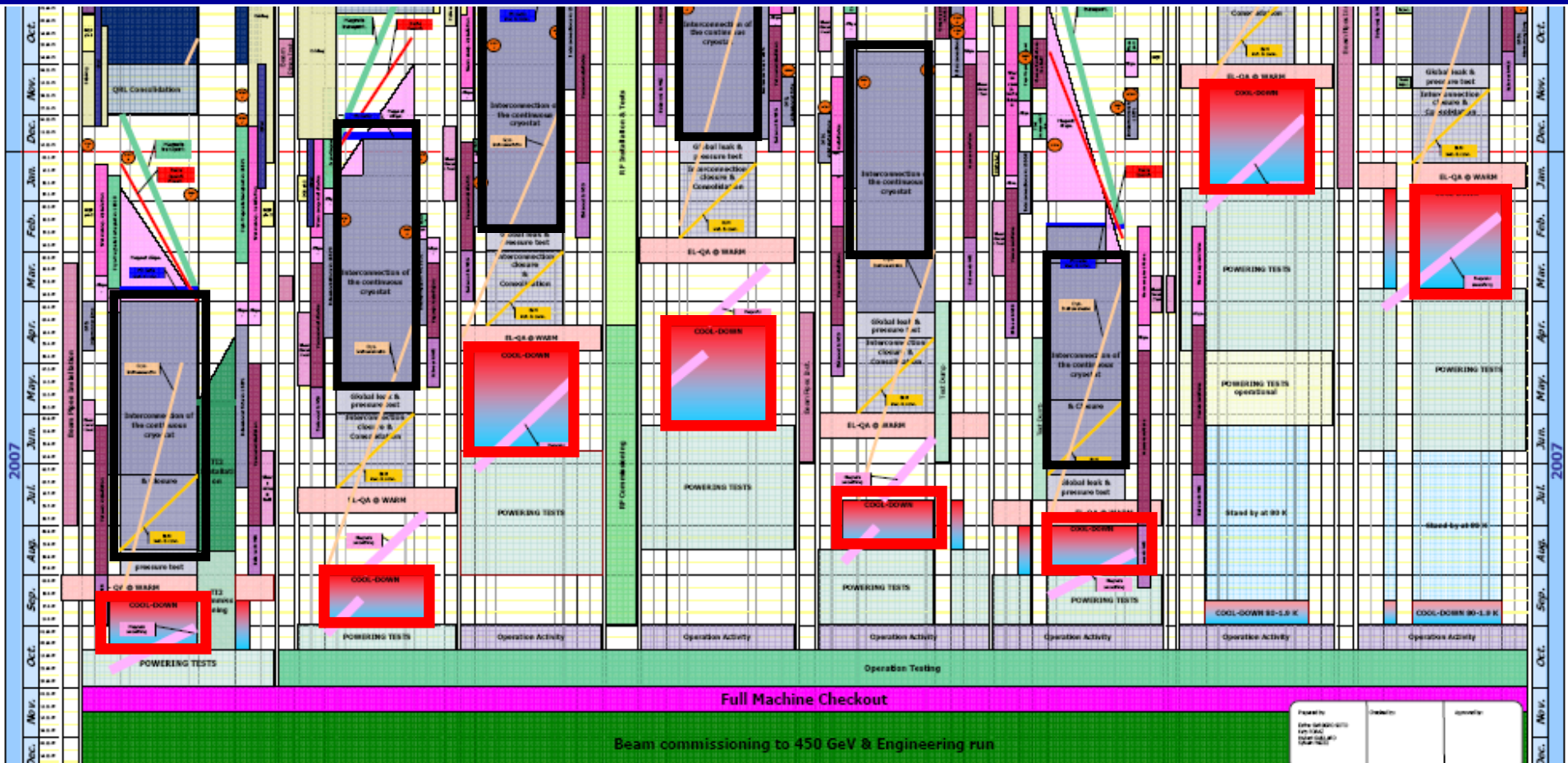
LHC Construction and Installation

General Co-ordination Schedule

Status line @ 2006-07-07



NOW

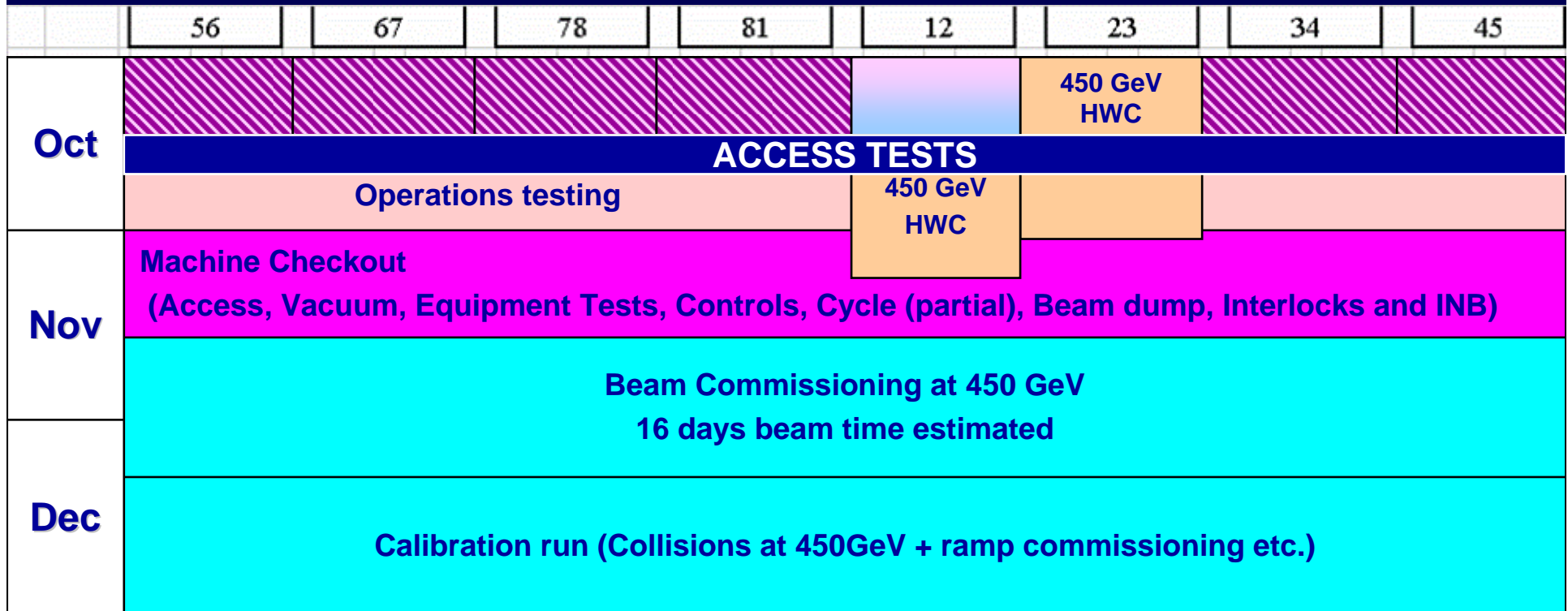


XMAS 2007

2007 is the year

- **Installation & HWC:**
 - Huge amount to do.
- **Potential milestones include:**
- **Cool down of first sector (7-8)**
- **Installation of the 1232th dipole.**
- **Installation of the last cryo-magnet (1746th)**
- **Powering of the first sector to nominal current (7-8)**
- **Completion of interconnect work - continuous vacuum.**

End 2007



Sectors 5-6, 6-7, 1-2 & 2-3:

- reduced commissioning of main circuits to 1.1 TeV

Calibration Run 2007

- **Closure of the ring for access tests**
- **The hand over the machine to operations for full machine check-out, LHC prepares for beam.**

- **First beam into the machine**
- **First circulating beam**
- **First collisions at 450 GeV.**

- **Machine development could see single beam taken up the ramp to around 1.1 TeV - new world record**

- **Contingency**
 - **If the challenging LHC installation schedule cannot be met in fully in 2007 then a sector test which will inject beam down T18 and into sector 7-8 is a possibility (probably Q3 2007).**

Who knows...

111 CERN AB 31-11-07 12:20:26
LHC Run 1234 data of 31-11-07 12:20:16

— ** STABLE BEAMS ** —

E = 0.450 TeV/c	Beam	In Coast		0.5 h
Beams	Beam 1	Beam 2		
#bun	43	43		
Nprot(t)	1.71e12	1.73e12		
tau(t) h	121	140		
Luminosities	ATLAS	ALICE	CMS	LHC-B
L(t) 1e28 cm-2s-1	5.23	6.23	7.13	5.21
/L(t) nb-1	0.78	0.68	0.78	0.52
BKG 1	1.20	0.52	0.90	0.43
BKG 2	0.85	0.82	0.50	0.80

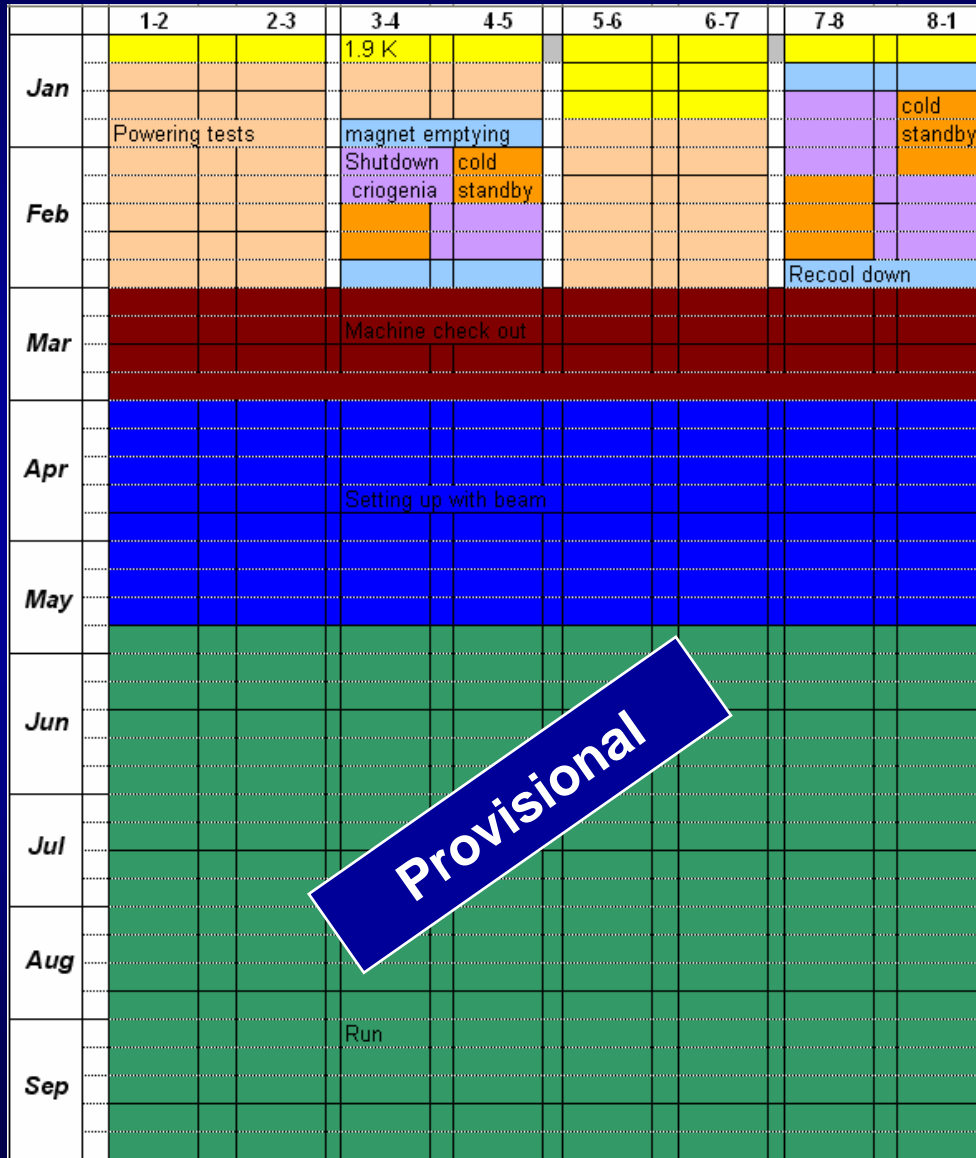
Comments 31-11-07 11:40:26

COLLIMATORS in coarse settings

Separation Scan in IR1/Atlas

2008

Should look something like...



Provisional

Hardware commissioning to 7 TeV

Machine Checkout ≈ 1 month

Commissioning with beam ≈ 2 months

Pilot Physics ≈ 1 month

MAJOR NEWS OF COURSE

Web

	<h2>LHC MACHINE OUTREACH</h2>	
	<p>LHC - the aim of the exercise: To smash protons moving at 99.999999% of the speed of light into each other and so recreate conditions a fraction of a second after the big bang. The LHC experiments try and work out what happened.</p>	

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[Vital Statistics](#)
[Who does what](#)
[Who makes what](#)
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[News](#)
[The LHC in 60 seconds](#)

[Guided Tour of the LHC](#)
[FAQ](#)

The Large Hadron Collider (LHC) is being built in a circular tunnel 27 km in circumference. The tunnel is buried around 50 to 175 m. underground. It straddles the Swiss and French borders on the outskirts of Geneva.

It is designed to collide two counter rotating beams of protons or heavy ions. [Proton-proton collisions](#) are foreseen at an energy of 7 [TeV](#) per [beam](#) with a planned start-up in 2007.

- High energy [beams](#) move around the LHC ring inside a continuous [vacuum](#) guided by [magnets](#).
- The magnets are superconducting and are cooled by a huge [cryogenics](#) system. The [cables](#) conduct current without resistance in their superconducting state.
- The beams will be stored at high energy for hours. During this time [collisions](#) take place inside the four main [LHC experiments](#).

"Particle physics is the unbelievable in pursuit of the unimaginable. To pinpoint the smallest fragments of the universe you have to build the biggest machine in the world. To recreate the first millionths of a second of creation you have to focus energy on an awesome scale."
The Guardian



Interactions.org

Large Hadron Collider Communication

WHAT IS THE LHC?

LHC EXPERIMENTS

LHC WORLDWIDE

LHC COMPUTING

NEWS ARCHIVE

IMAGE BANK

CALENDAR

LHC ORGANIZATION

DOCUMENTS & REPORTS

CONTACT US

INTERACTIONS.ORG

The LHC is the next step in a voyage of discovery which began a century ago. Back then, scientists had just discovered all kinds of mysterious rays, X-rays, cathode rays, alpha and beta rays. Where did they come from? Were they all made of the same thing, and if so what?

These questions have now been answered, giving us a much greater understanding of the Universe. Along the way, the answers have changed our daily lives, giving us televisions, transistors, medical imaging devices and computers.

On the threshold of the 21st century, we face new questions which the LHC is designed to address. Who can tell what new developments the answers may bring?



Building 904, where the short straight sections are being assembled, is often called "Lego Land" by the workers because of the wide variety of these sets of magnets and cryostats.



The mirrors of the RICH2 detector, one of the two Ring Imaging Cherenkov detectors of the LHCb experiment, are meticulously assembled in a clean room.

News

CERN Courier September 2006

- ATLAS superconducting solenoid succeeds in full commissioning
- D0 finds evidence for WZ pair production
- LHC dipole installation gets to half-way mark
- CMS gets ready for its descent underground
- PAMELA looks for dark matter and antimatter

27 September 2006 - Mainichi
Finding the Higgs - 27km long LHC nearly complete (in Japanese) [more...](#)

8 September 2006 - PhysOrg The story of a 27km long machine and the fundamental building blocks of the Universe [more...](#)

Large Hadron Collider News from www.interactions.org

Project Progress

[LHC Dashboard](#)

[General Coordination Schedule](#) (pdf)

[Status of LHC Magnet Test Facility](#)

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LHC@FNAL



Fermi National Accelerator Laboratory

LHC@FNAL Remote Operations Center



LHC@FNAL is being built to support commissioning and operations of the Large Hadron Collider ([LHC](#)) and the Compact Muon Solenoid ([CMS](#)) experiment at [CERN](#). The goal is to give CMS and accelerator scientists and engineers remote access to capabilities that are available in control rooms at CERN, and to serve as a communications conduit for members of the LHC community in the US.



1. 3D Rendering

Construction Status

Construction started September 13, 2006
Construction to be completed- Winter 2006
Commissioning and operations - Spring 2007
Construction questions can be directed to:

- ◆ Project Manager – [Elvin Harms](#)
- ◆ Project Manager for consoles – [Erik Gottschalk](#)
- ◆ Project Engineer – [Steve Dixon](#)

LHC@FNAL Planning

- ◆ [LHC@FNAL Integration Task Force](#)
- ◆ [Original LHC@FNAL Task Force](#)
- ◆ [Advisory Committee](#)

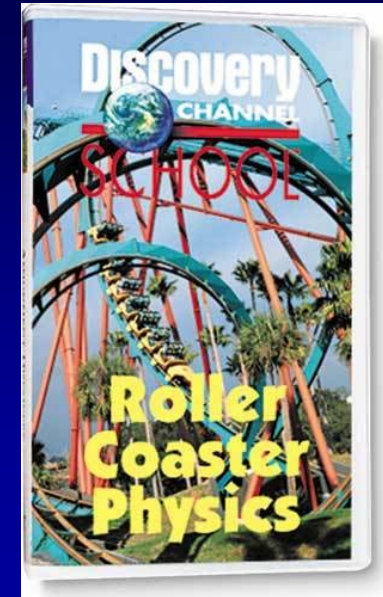


2. Photo - Sept. 22, 2006

Seen as an outreach conduit

Public Relations

- **Lots of showing people around**
 - TV, press, VIPs etc. etc.
- **Usual destinations**
 - SM18
 - CCC
 - IP8 – near, interesting, and advanced.



This usually, but not always, on request of the press office

“Do you have a young, female Albanian expert on the LHC?”

CCC

This is cool



**Unofficial viewing gallery upstairs
(out of working hours or book it)**

Two big posters!

Little museum has gone – no room

Masterclass participation



c/o Michael Kobel

FAQ

The vacuum in the LHC is comparable to outer space, if it were a car tyre with a leak, there are so few gas molecules that it would take 10 000 years to go flat.

Ask an expert

Question: as the CMS /LHC was switched on, did you realize the sudden difference it made on the earths slight differential in its rotational and tilting effect but very slight?

Conclusion

- **Major headlines expected over the next 2 – 3 years**
 - Coordination DSU-CO
- **Little proactive outreach**
 - We're busy
 - We rely on DSU-CO
- **Reactive outreach support**
 - Visits, experts, video link-ups, web, FAQ, interviews etc.
- **Going to be very little to see on the surface soon**
 - Tunnel (special visitors)
 - CCC is cool – some improvement possible
 - LHC@FNAL