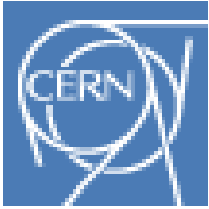


The Large Hadron Collider: scientific instrument, technological feat, global project

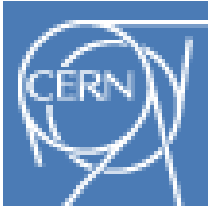
Philippe Lebrun
Accelerator Technology department, CERN

LHC Grid Fest
3 October 2008



A very large scientific instrument...





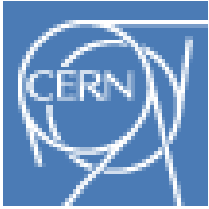
... based on advanced technology

23 km of superconducting magnets
cooled in superfluid helium at 1.9 K

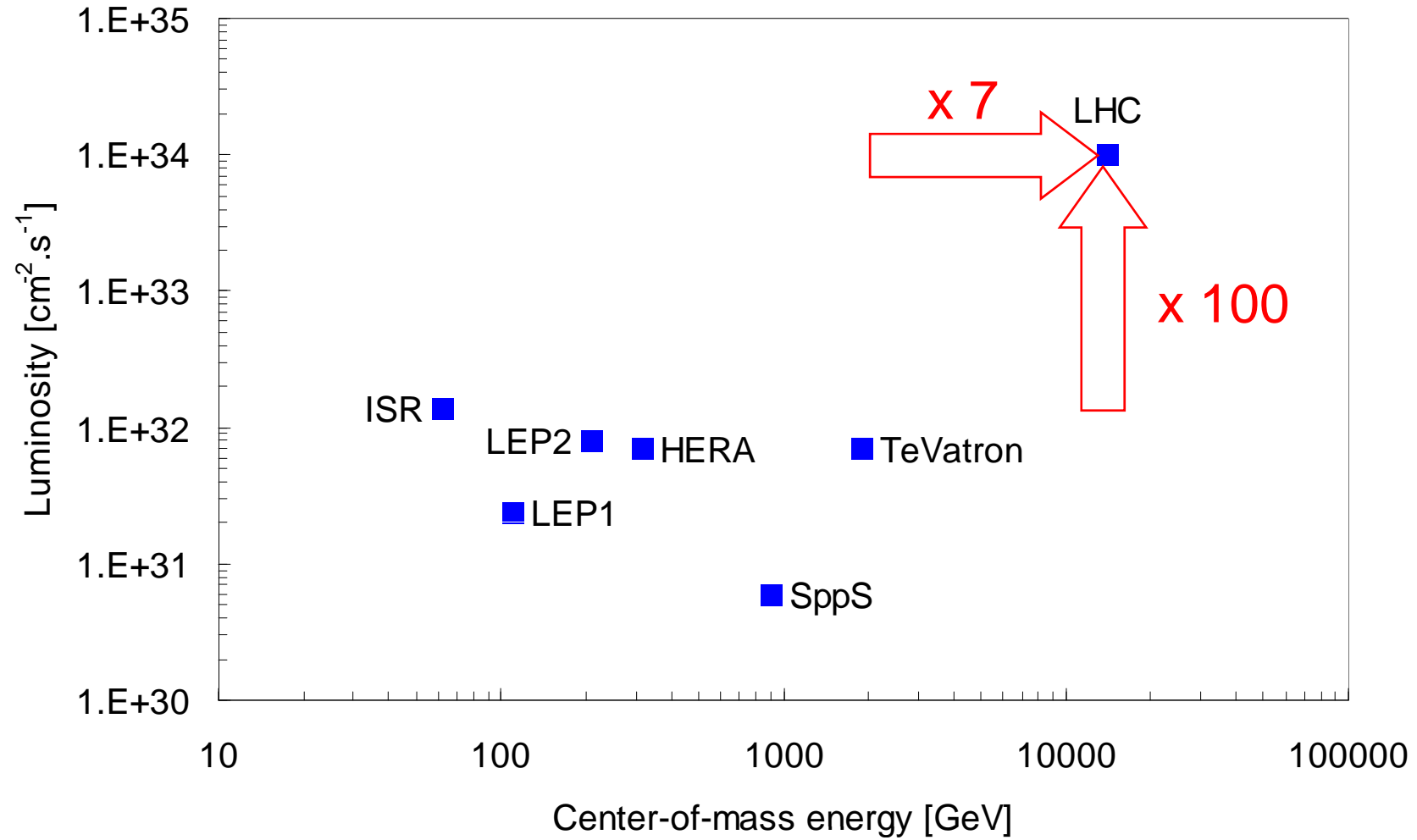


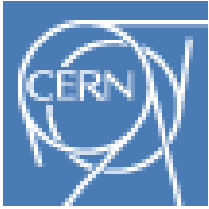
LHC 2008





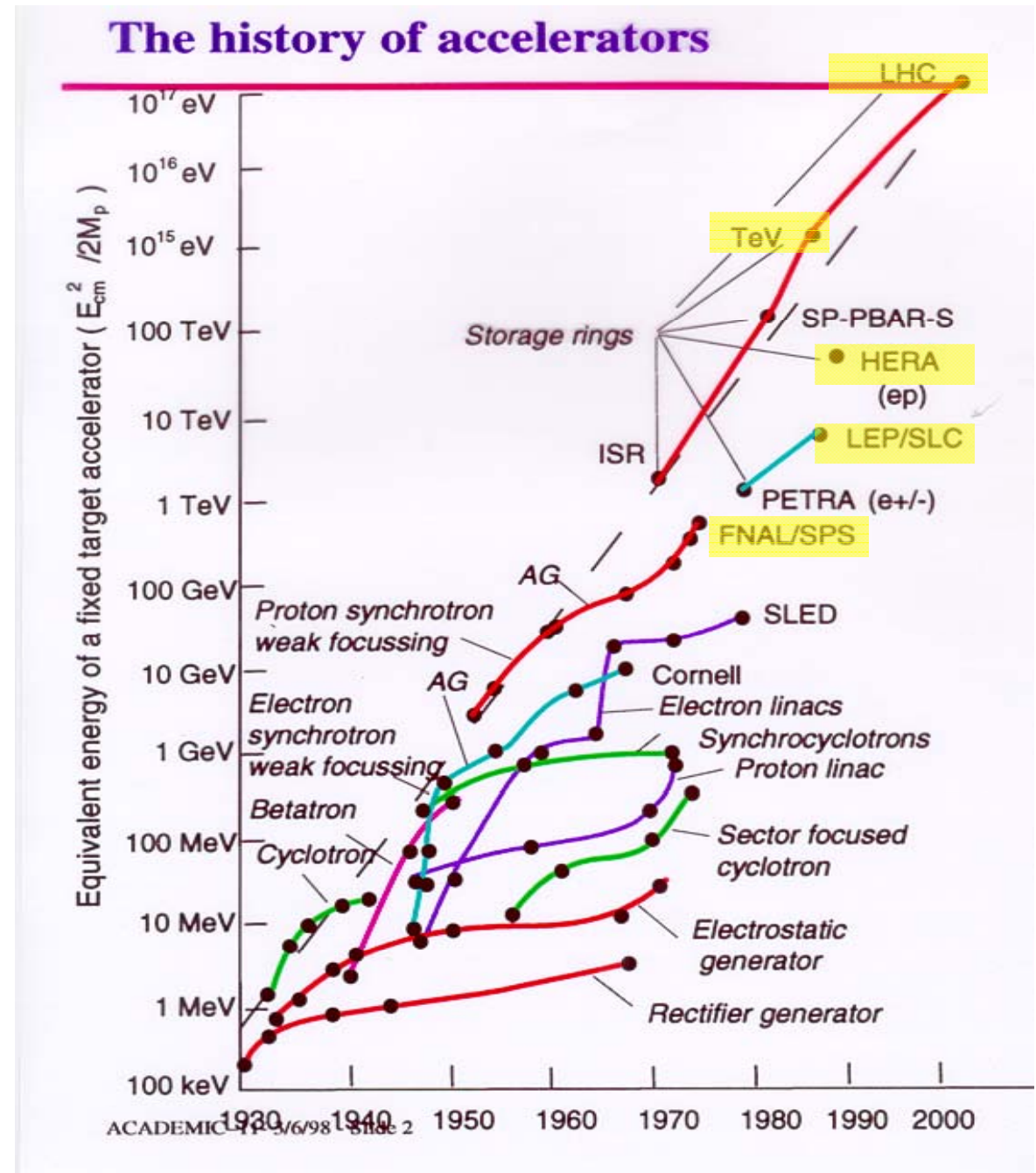
A particle collider well beyond the pre-existing state-of-the-art

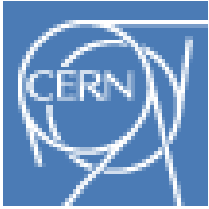




Superconductivity, a key technology

- to produce high electromagnetic fields,
- to limit electrical power consumption,
- to sustain the development of high-energy particle accelerators



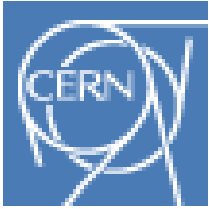


Industrial production of superconducting magnets



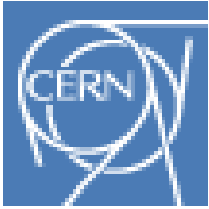
LHC 2008





Series cold testing of superconducting magnets



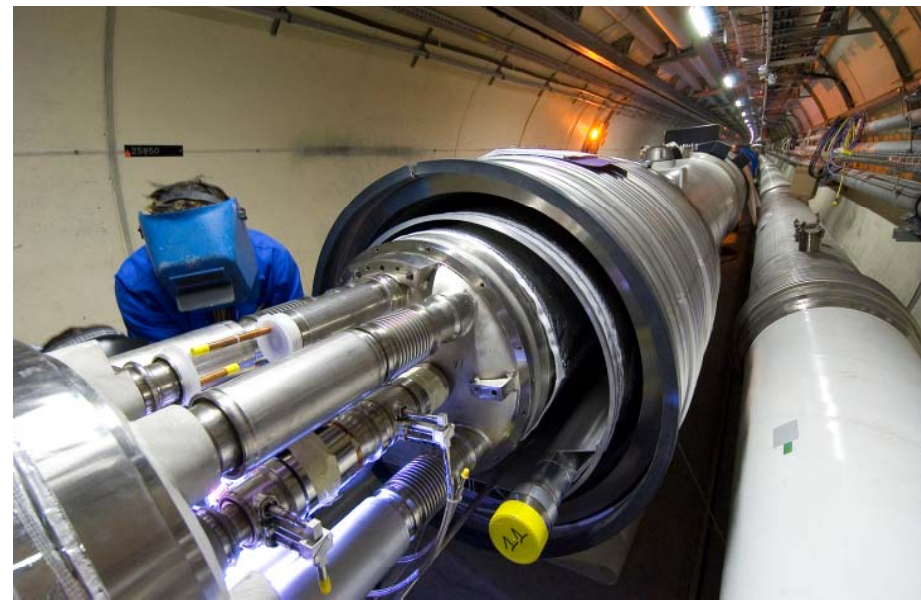


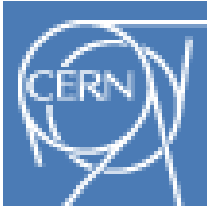
Installation and interconnection in the tunnel



65'000 electrical joints
Induction heated soldering
Ultrasonic welding
Very low residual resistance
HV electrical insulation

40'000 cryogenic junctions
Orbital TIG welding
Weld quality
Helium leaktightness



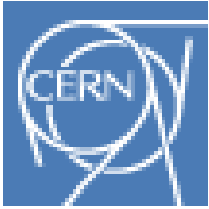


Powerful and efficient helium cryogenic plants for refrigeration down to 1.8 K



LHC 2008

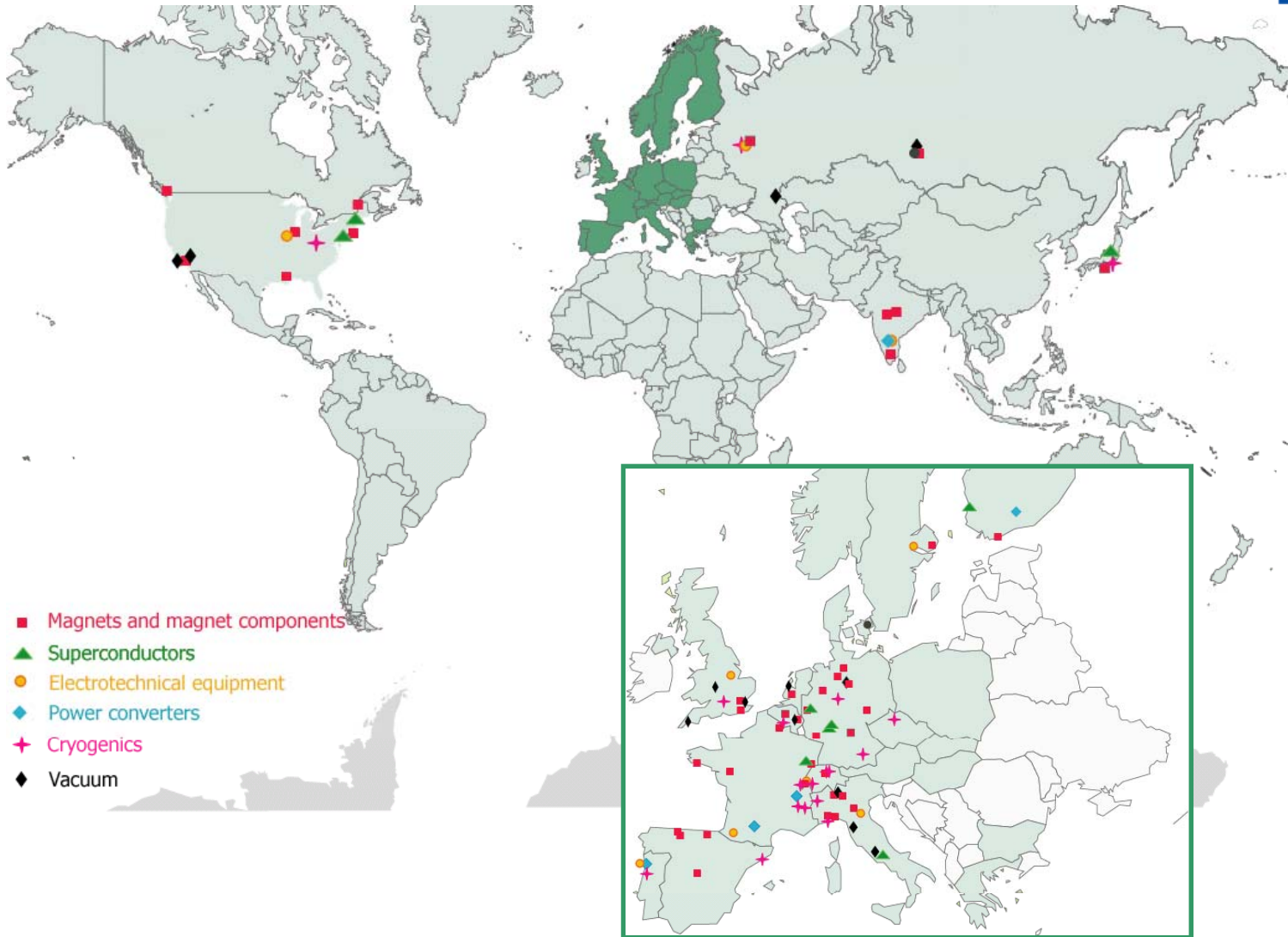


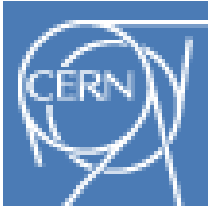


90 hi-tech industrial contracts in the world

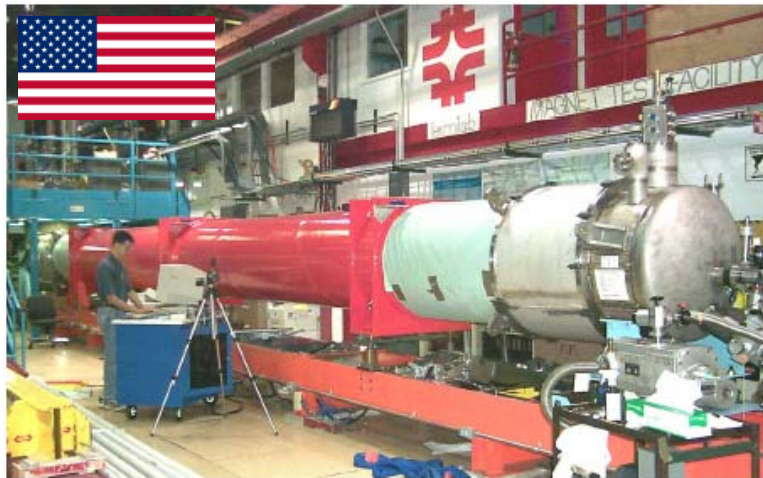
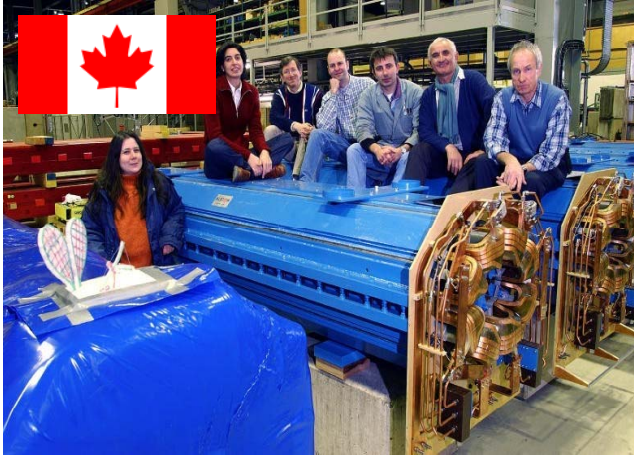


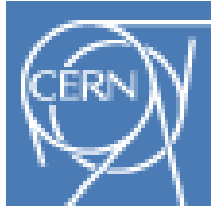
LHC 2008





A global project spanning space...

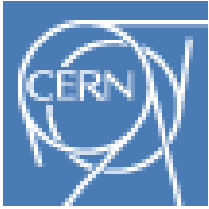




...and time



- Preliminary conceptual studies 1984
- First magnet models 1988
- Start structured R&D program 1990
- Approval by CERN Council 1994
- Industrialization of series production 1996-1999
- DUP & start civil works 1998
- Adjudication of main procurement contracts 1998-2001
- Start installation in tunnel 2003
- Cryomagnet installation in tunnel 2005-2007
- Functional test of first sector 2007
- Operation for physics 2008-2030



Engineering data management system

Single data repository, access to documentation via WWW



LHC Hardware Baseline

Collapse Expand

- LHC Hardware Baseline
 - Cryo Magnets in Common Arc Cryostats**
 - Cryo Dipoles in the Arcs and the Dispersion Suppressors
 - Cold Mass Assembly
 - Dipole Cryostat & Related Equipment
 - Standard Arc Short Straight Sections
 - Short Straight Sections in Dispersion Suppressors
 - Other Arc Cryostats and Components
 - Long Straight Sections
 - Cryogenics
 - Vacuum System
 - DC Powering and Quench Protection
 - Radiofrequency System
 - Transfer Lines, Injections and Beam Dumping
 - Other Machine Systems
 - Civil Engineering Works and Infrastructure
 - General Services
 - Installation
 - LHC Specific Facilities

Help Search for Documents Guidelines for Document Creation Approval List

Cryo Magnets in Common Arc Cryostats

Type: Project, Identifier: LHCAM228, Code: Approved
Project Engineer: Philippe LEBRUN

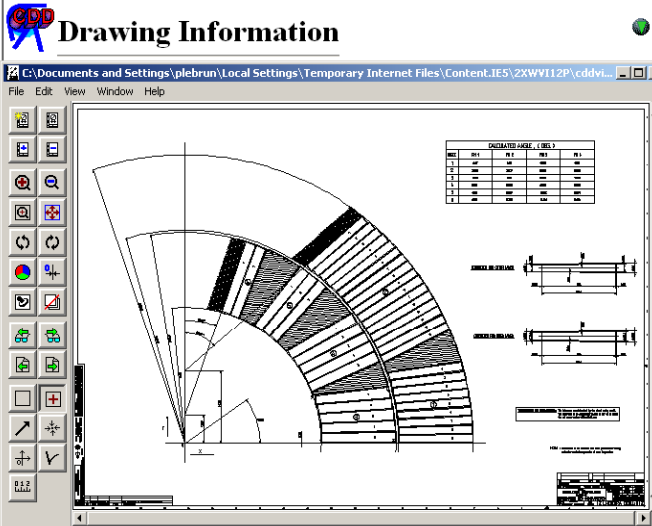
- LHC-DC-ES-0001 LHC Magnet Polarities
 - LHC-DC-ES-0001-30-10 Russenc.pdf (202 Kb)
- LHC-G-ES-0010 The Smoothing of the M Ring (Final Positioning)
 - lhc-g-es-0010-10-00 PDF (145 Kb)
- LHC-LB-EC-0002 Addition of a Flange o Covers of the Magnet Cold Masses
 - LHC-LB-EC-0002-10-10 A PC
 - lhc-lb-ec-0002-10-10 Engin

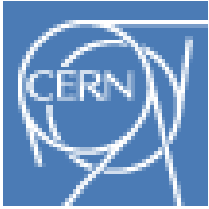
[Open Drawing Folder](#)

LHC Hardware Baseline

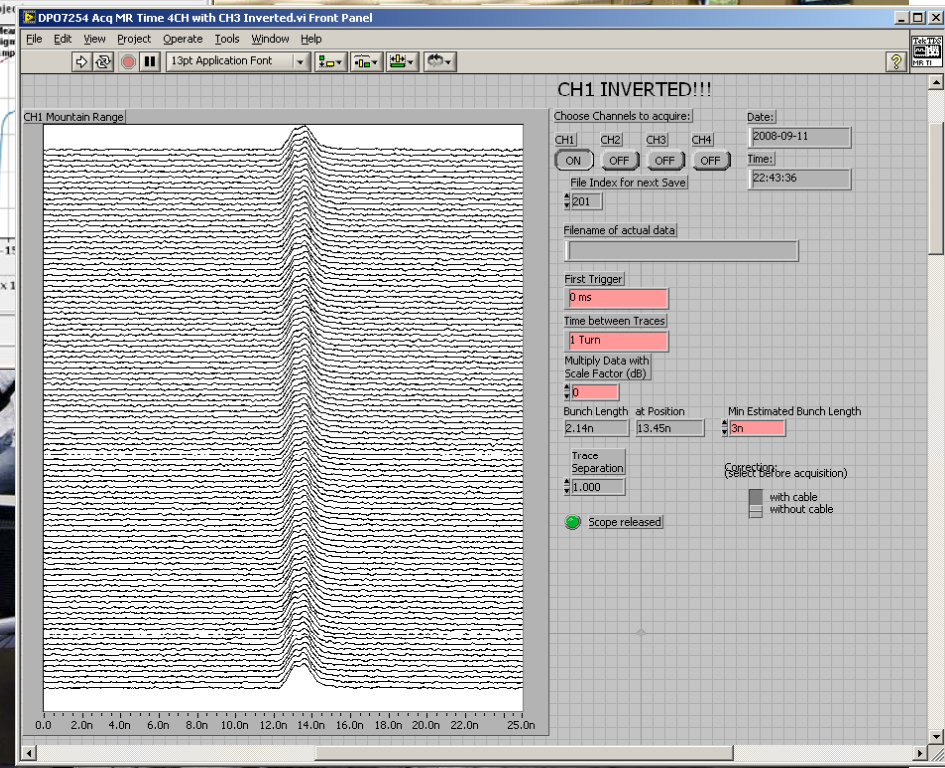
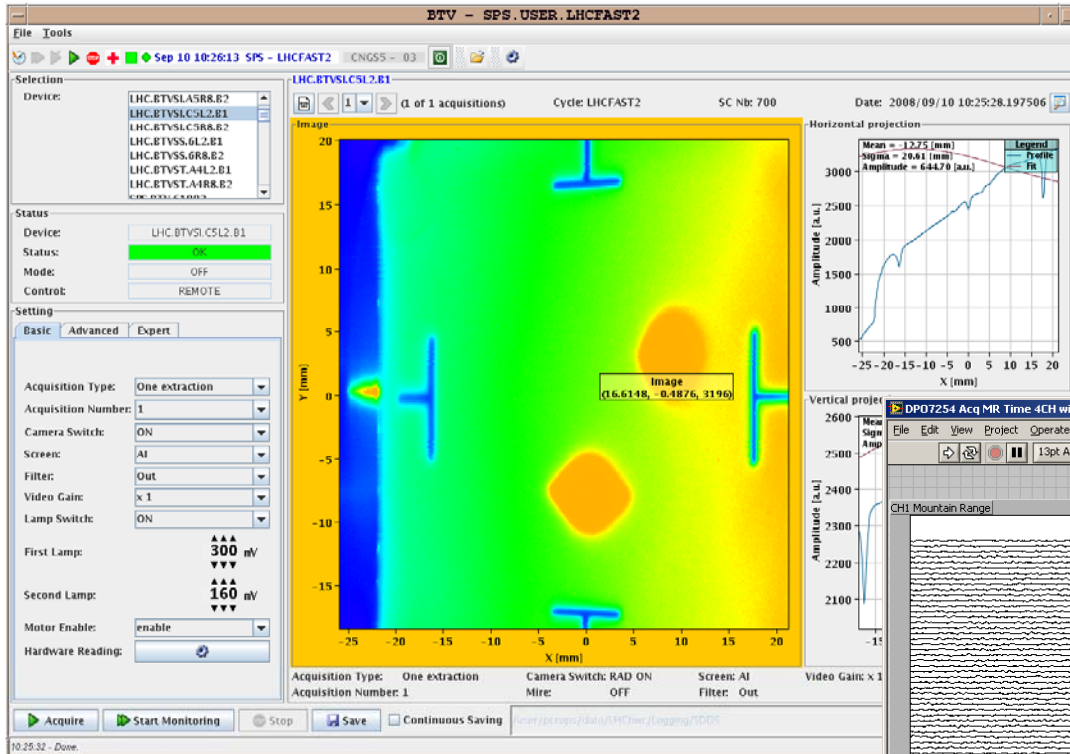
Collapse Expand

- LHC Hardware Baseline
 - Cryo Magnets in Common Arc
 - Cryo Dipoles in the Arcs ar
 - Cold Mass Assembly
 - Collared Coil
 - Coils**
 - Superconducting
 - Superconducting
 - Quench Heaters
 - Cable & Ground
 - Other Coil Comp
 - Collars
 - Spool Pieces
 - Bus Bars
 - Yoke & Related Comp
 - Shrinking Cylinder & F
 - Quench Diode Assem
 - Cold Bore Pipes & Ins
 - Dipole Beam Screen





LHC startup



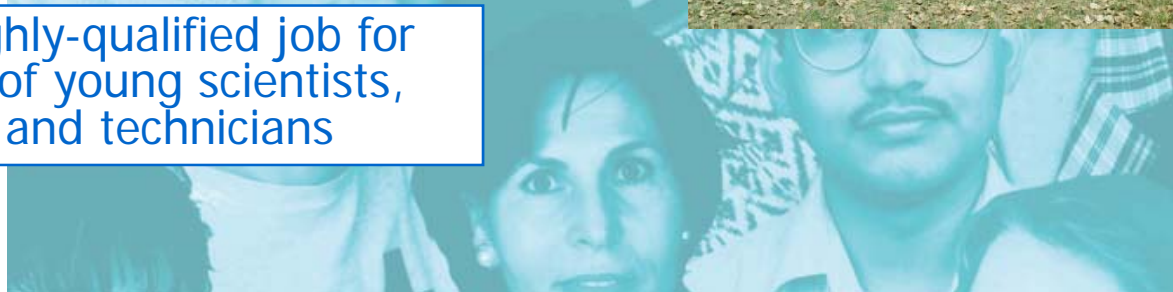


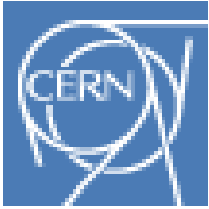
Training in science and engineering



> 50 doctoral theses
> 120 diploma theses
in magnetism, cryogenics and
superconductivity

A first, highly-qualified job for
hundreds of young scientists,
engineers and technicians





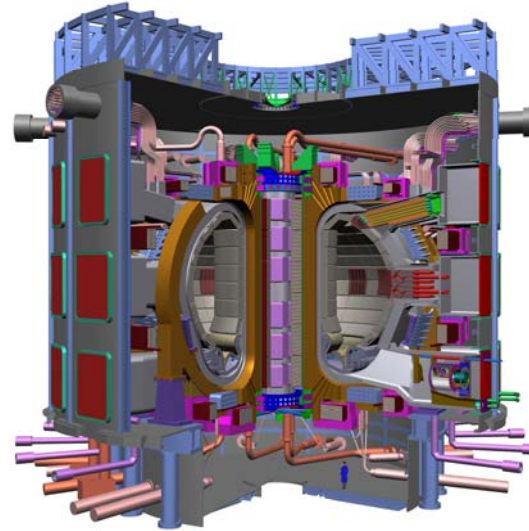
Technology shared with society



LHC 2008



Advanced materials



Energy



Health

