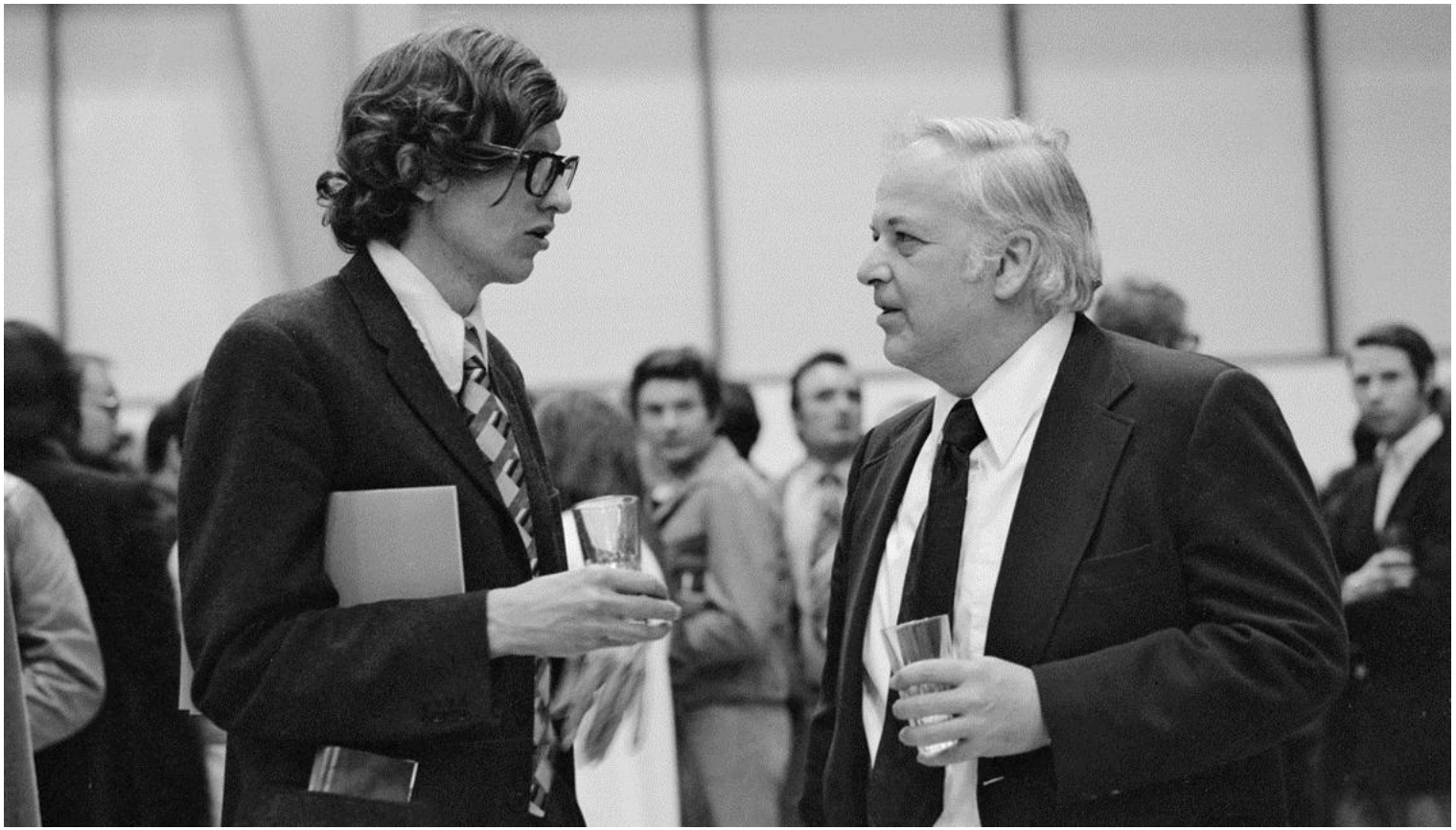
The LHC, the inside story

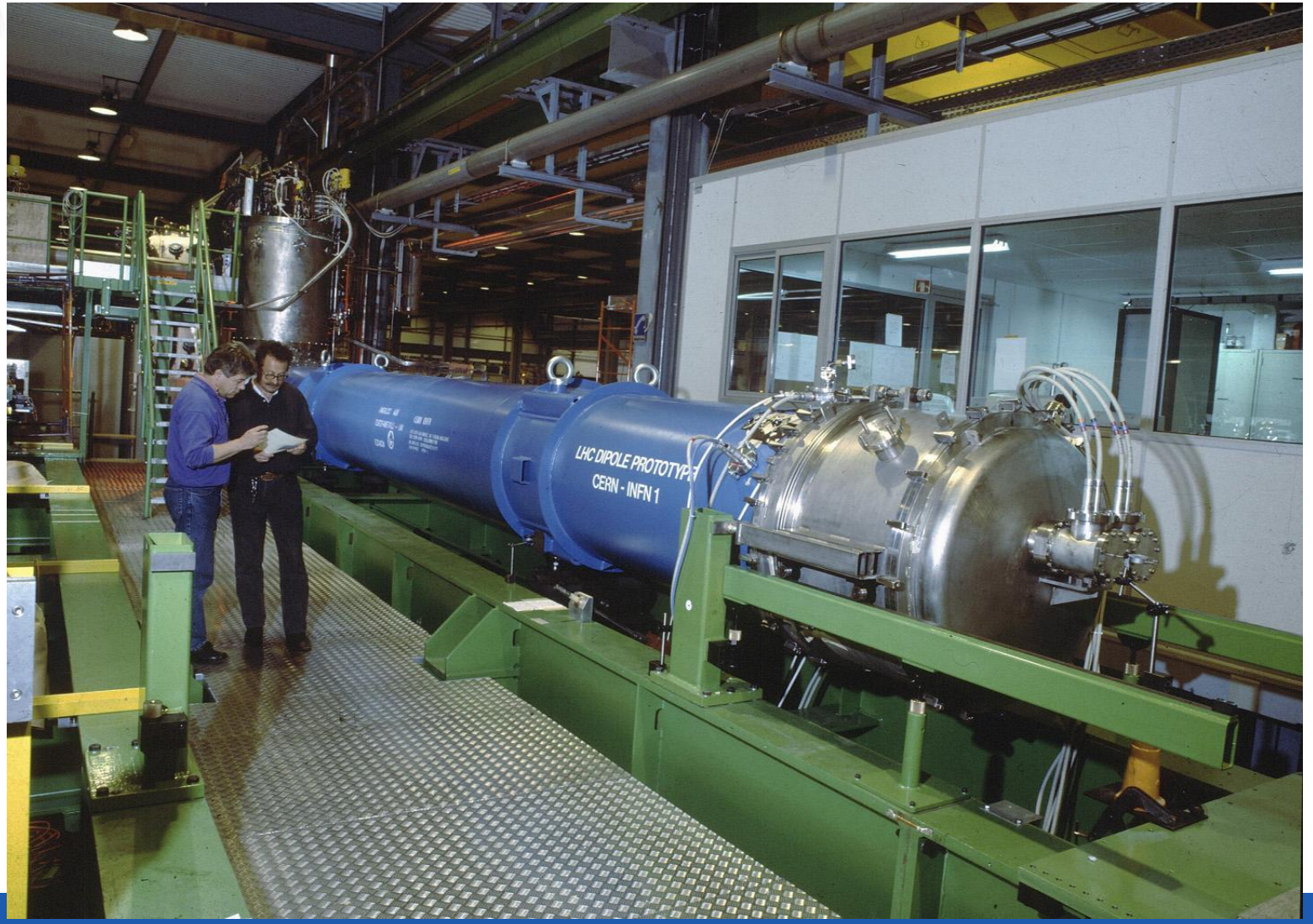


70th Birthday Celebration in Honour of Professor Sir Chris Llewellyn-Smith

The beginning

- 7th May 1993 Meeting with Carlo.
- 16th December 1993. First special CC where the double voting procedure was pushed through by the UK and Germany.
- 1st March 1994 first visit to Japan.
- 14th April 1994 first 10m prototype tested.

The 10 metre long prototype bending magnet for LHC, which has reached a field of 8,73 Tesla on 14 April 1994



SM18 control room - 1994

Finance Committee April 1994

Message de J.P. Gourber et R. Perin

à L. Evans

on a atteint 8,73 tesla

100 quench

The battle for approval

In June 1994, the proposal to build the LHC was made once more to Council. Seventeen member states voted to approve the project. However, because of the newly adopted double voting procedure, approval was blocked by Germany and the UK, who demanded substantial additional contributions from the two host states, France and Switzerland, claiming that they obtained disproportionate returns from the CERN budget. They also requested that financial planning should proceed under the assumption of 2% annual inflation, with a budget compensation of 1%, essentially resulting in a 1% annual reduction in real terms. Council meeting was kept open.

The battle for approval

In order to deal with this new constraint, we were forced to propose a “missing magnet” machine where only two thirds of the dipoles would be installed in a first stage. The deadlock concerning extra host-state contributions was broken when France and Switzerland agreed to make extra voluntary contributions in the form of a 2% annual inflation adjustment, compared with the 1% adjustment from the other member states. The project was approved for two-stage construction, to be reviewed in 1997 after the size of the contribution offered by non-member states interested in joining the LHC program would be known.

The diplomatic assault

- 2nd March 1995 Second Japan visit.
- Meeting in the Diet.
- Dinner with the Ministry of Foreign Affairs.

Japan becomes an Observer June 1995

Japan becomes an Observer of CERN and announces a financial contribution to the LHC.
The Japanese Minister for Education, Sciences and Culture offers a Daruma doll to CERN's Director-General. According to Japanese tradition, an eye is painted on the doll to mark the beginning of the LHC project and the second eye must be drawn at the time of its completion.
Japan makes two other major financial contributions to the LHC project in 1996 and 1998.

The diplomatic assault

- 8th January 1996 Visit to Washington (via Detroit)
- 10th January finally arrive in Washington!
- 13th March US contribution of $450 M declared.
- June 1996 India and Russia declare a contribution.
- December 1996 Canada declares contribution.

The sting in the tail

- October 1996 UK and Germany demand a budget cut of between 8 and 10%.
- 8th November 1996 difficult CC meeting on budget cut. “Not a good day!”
- 19th December 1996. Budget cut approved together with single-stage construction and approval to take out loans.

United States contribution - December 1997

The United States signs an agreement to take part in the LHC, in particular by providing superconducting magnets for the accelerator.

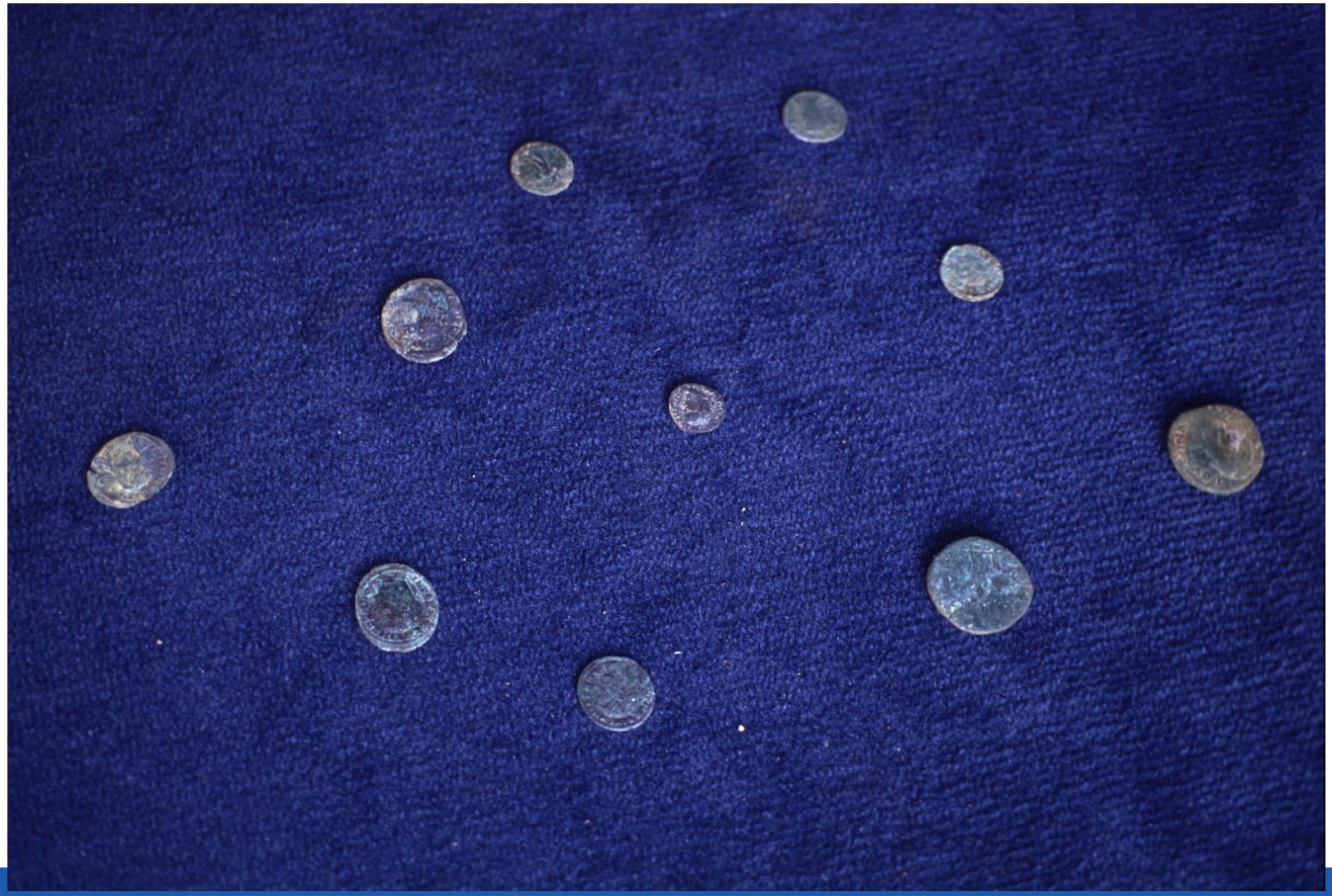
About 1300 American physicists are users of CERN today.

August 1998

- The French government publishes a decree of public utility for the LHC, thus giving its final green light for the start of civil engineering work. The go-ahead is the result of an environmental impact study and a public information campaign.
- The Swiss cantonal authorities had approved work on the Swiss territory at the beginning of the year.

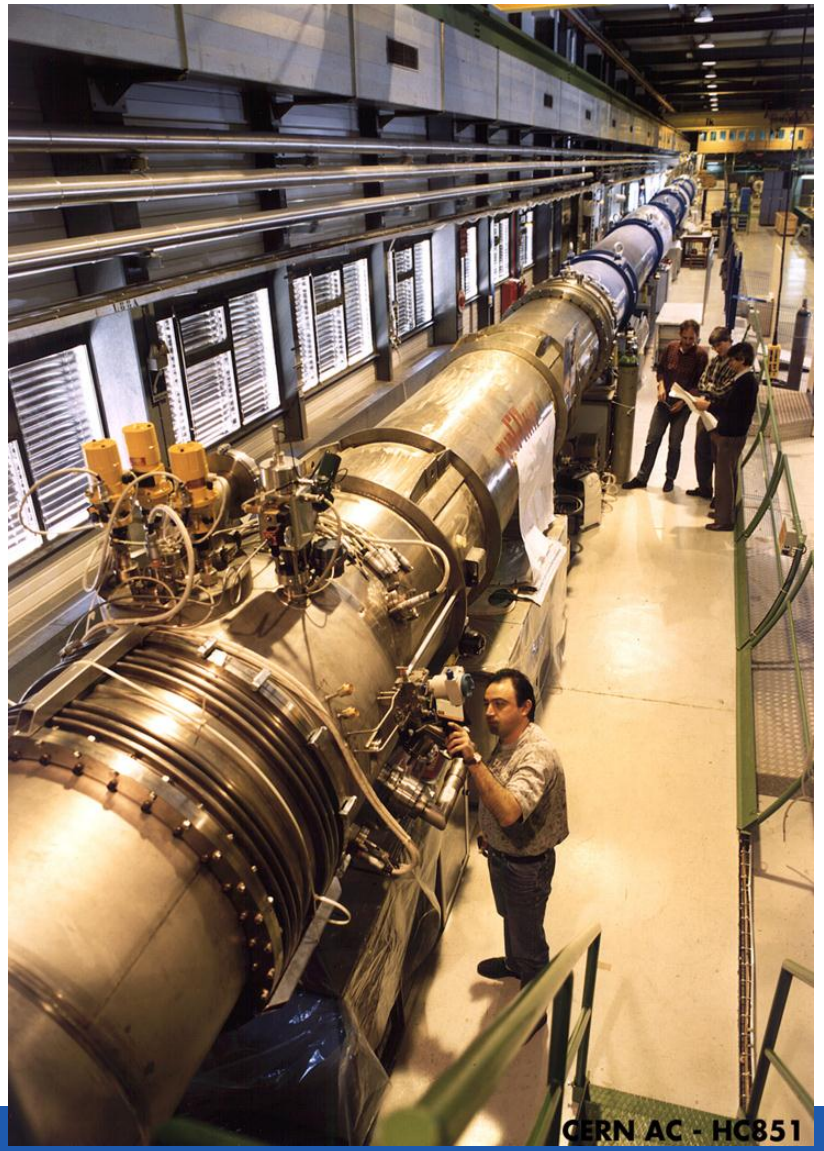
Aerial view of Point 5. Gallo-roman vestiges 1998

Roman coins found during archeological excavations at Point 5



December 1998

Four years after its start-up, the first test string of the LHC comes to the end of its operation. Composed of prototypes, it made it possible to test and validate the various components and systems of the LHC.



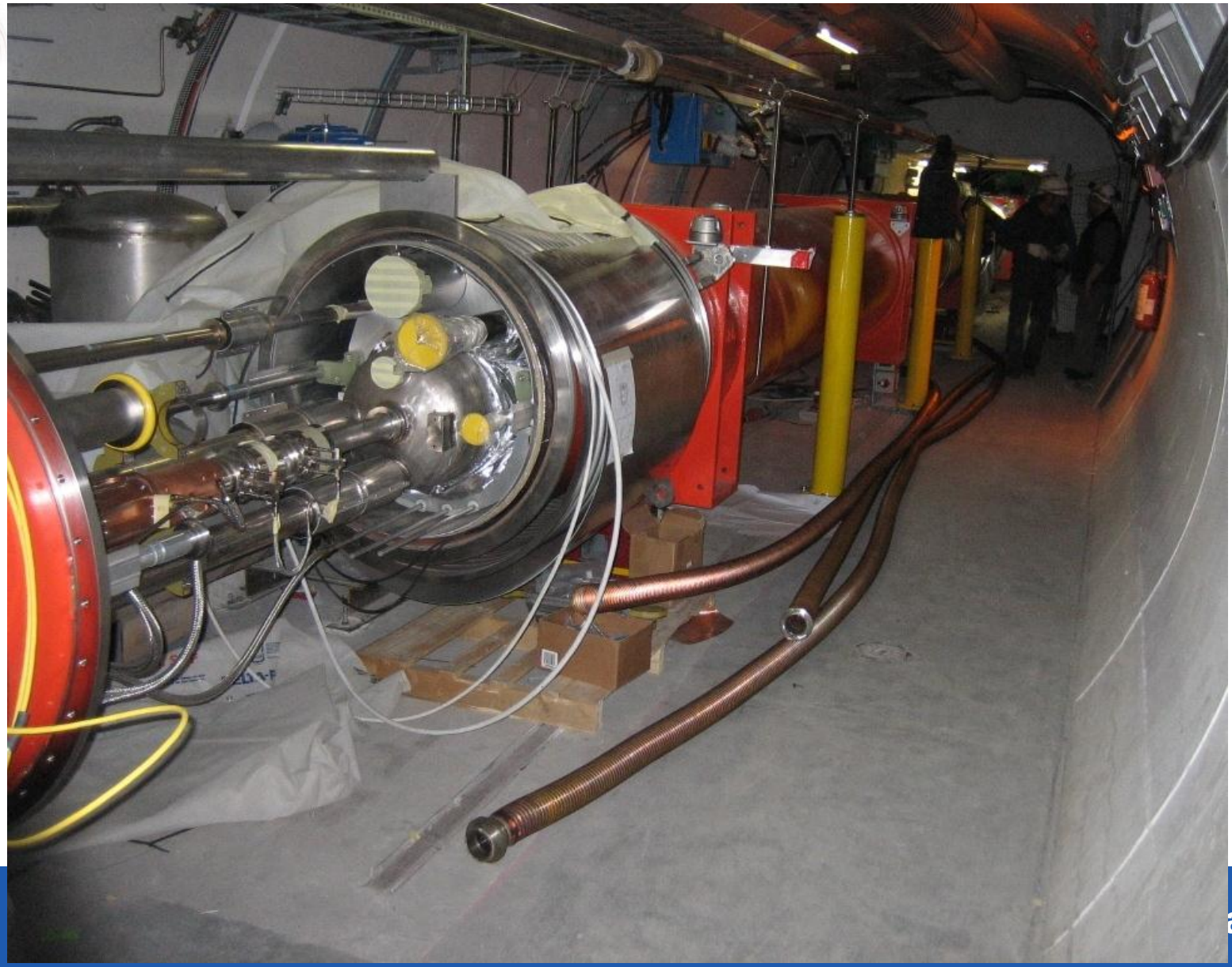
ROCLA crisis Easter 1999

QRL crisis June 2004

Magnet rows

Magnet rows

Inner triplet crisis Feb 2005



Quarks and Photons: The Strangest Little Things in Nature

FOX NEWS.COM, THURSDAY, NOVEMBER 09, 2006

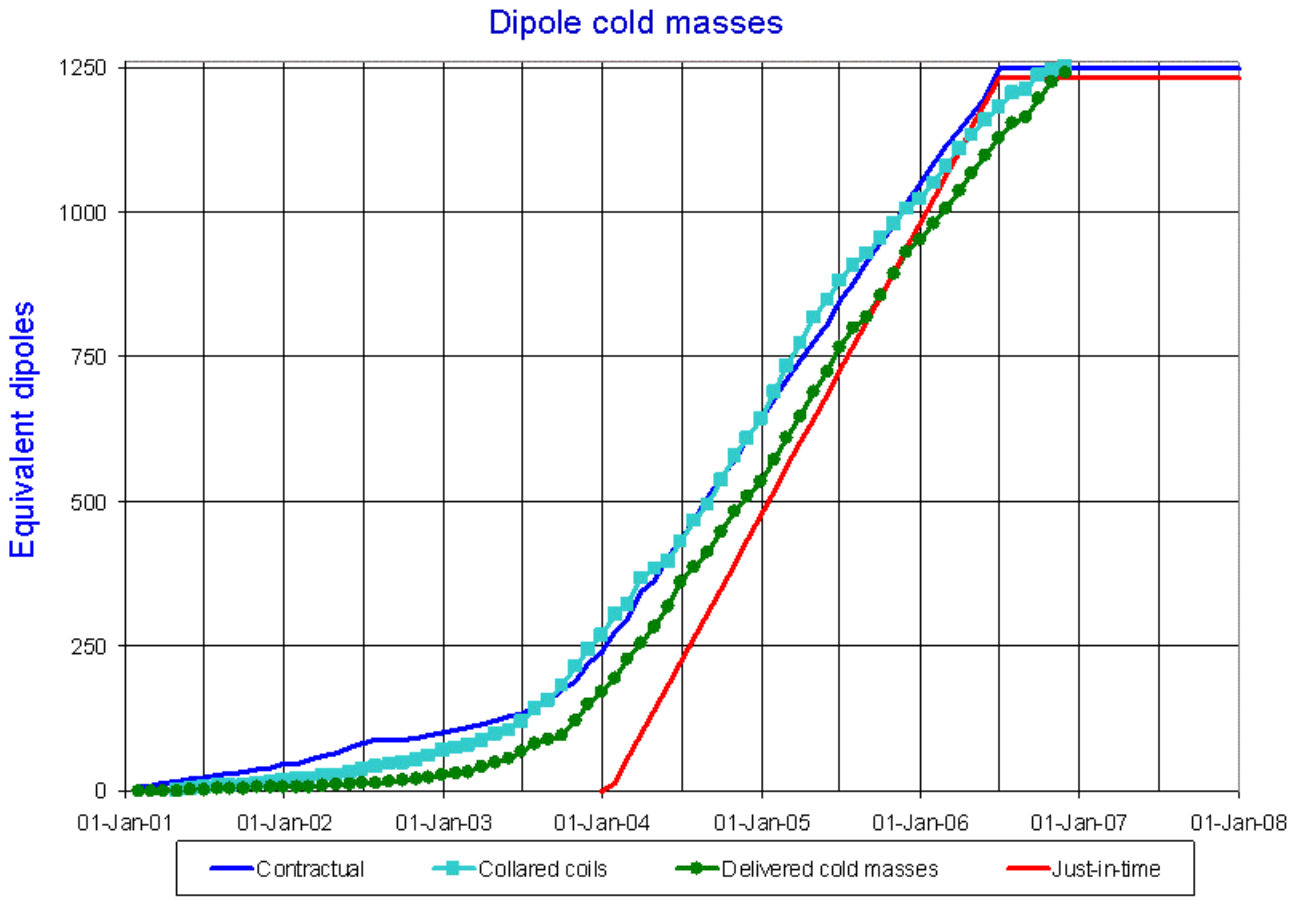
AP

The CERN Large Hadron Collider in Geneva, Switzerland, which will be the world's largest particle accelerator when it enters full operation in 2008.

Dipole cold masses

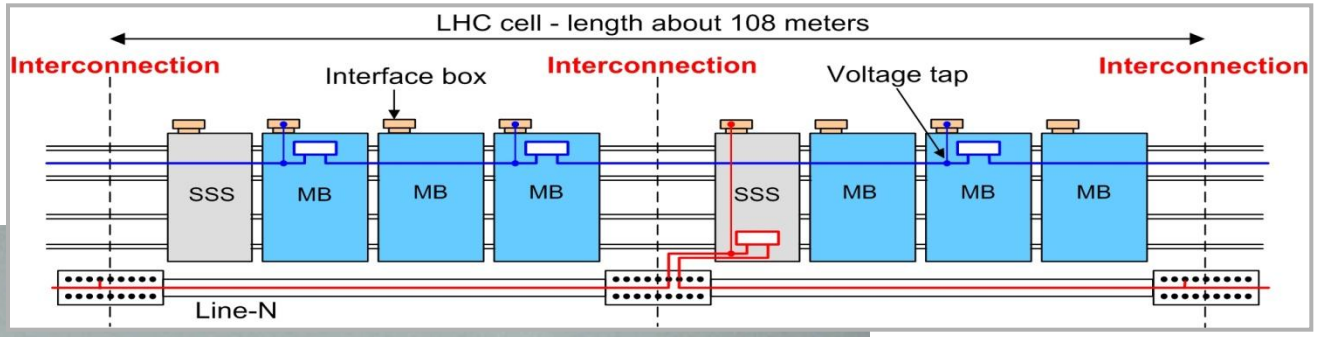
LHC Progress Dashboard

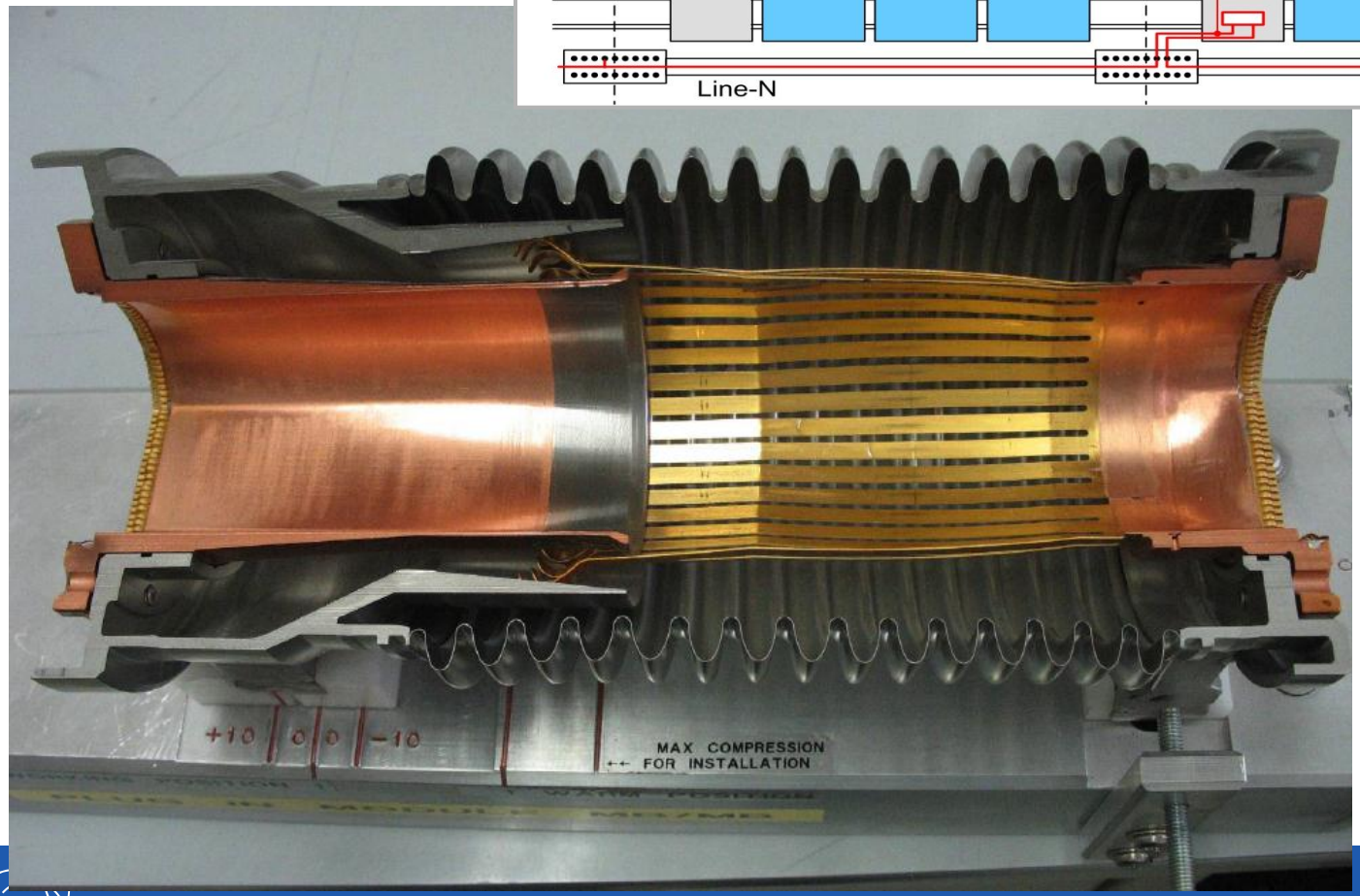
Accelerator Technology Department



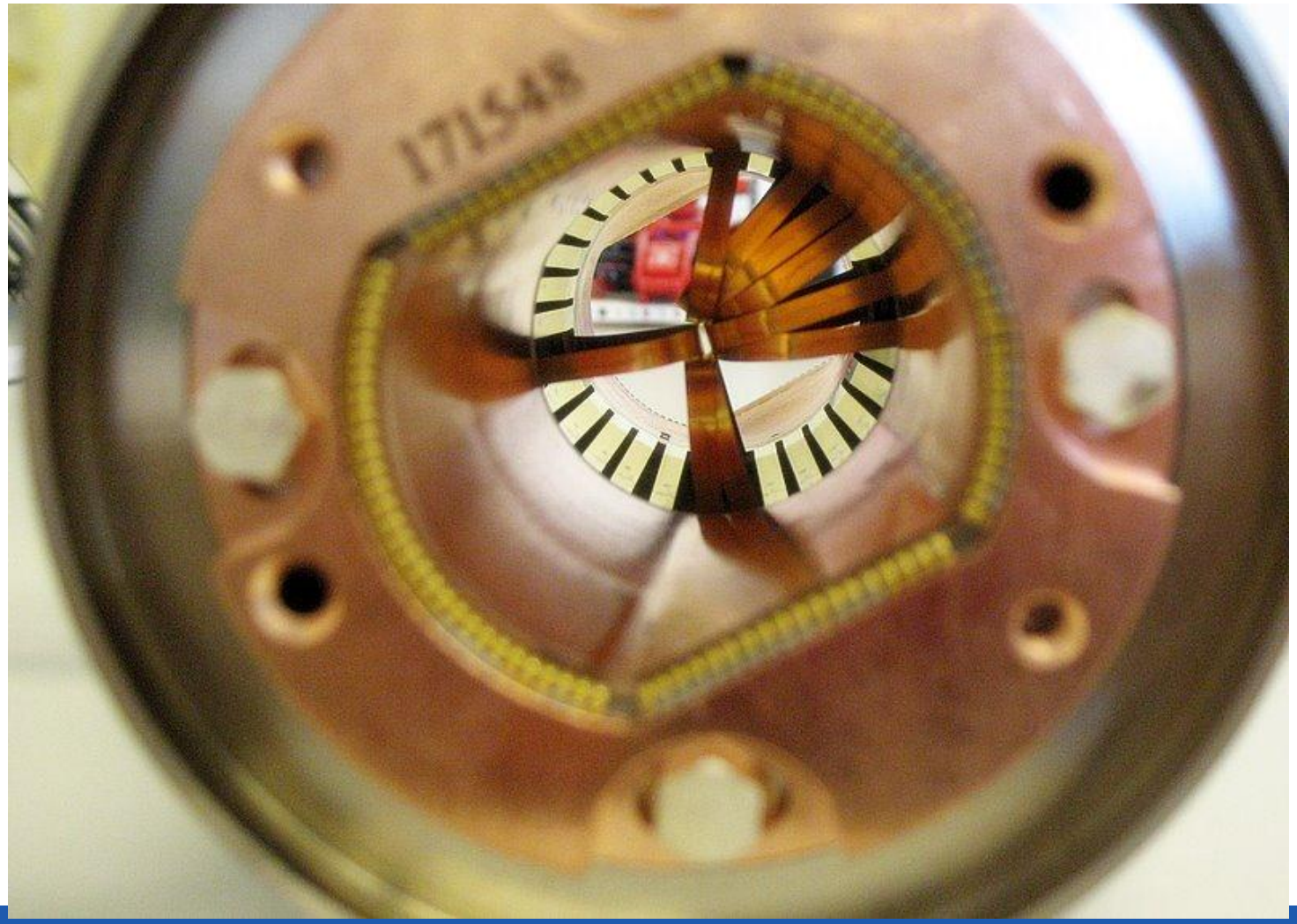
Updated 30 Nov 2006 Data provided by G. de Rijk AT-MCS

The crisis of the PIM's

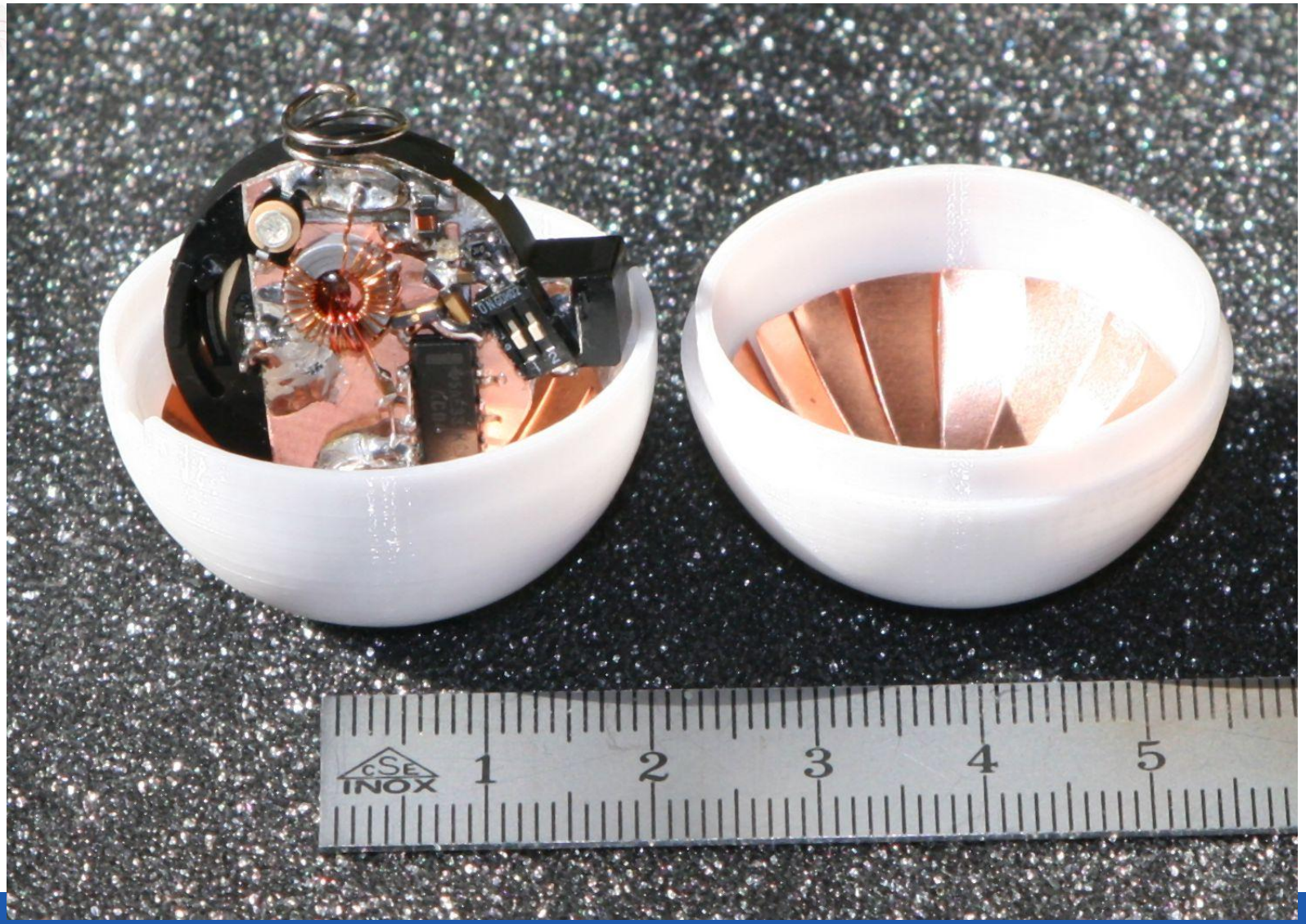




Arc plug-in module with damaged fingers



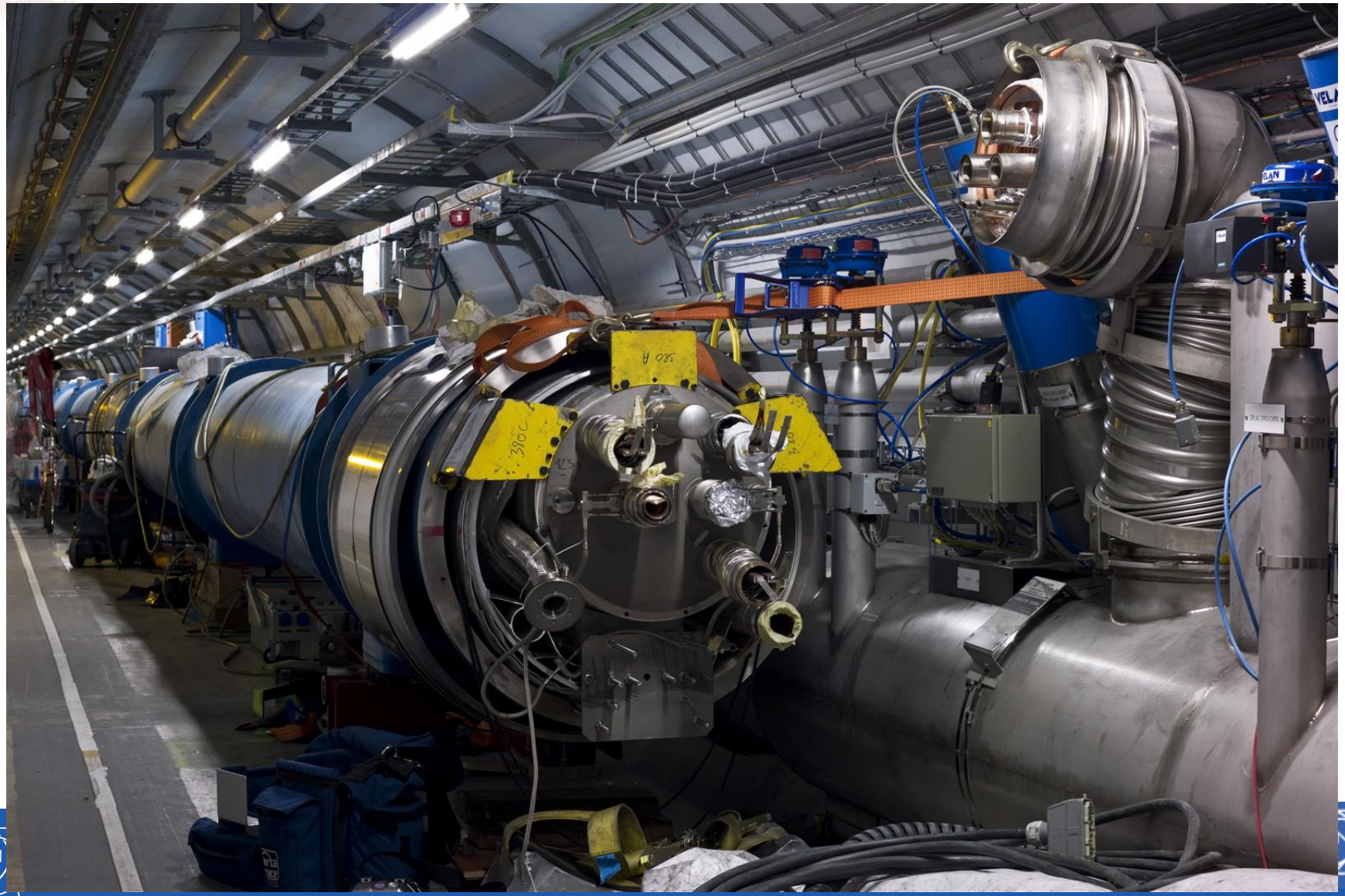
Transmitter ball



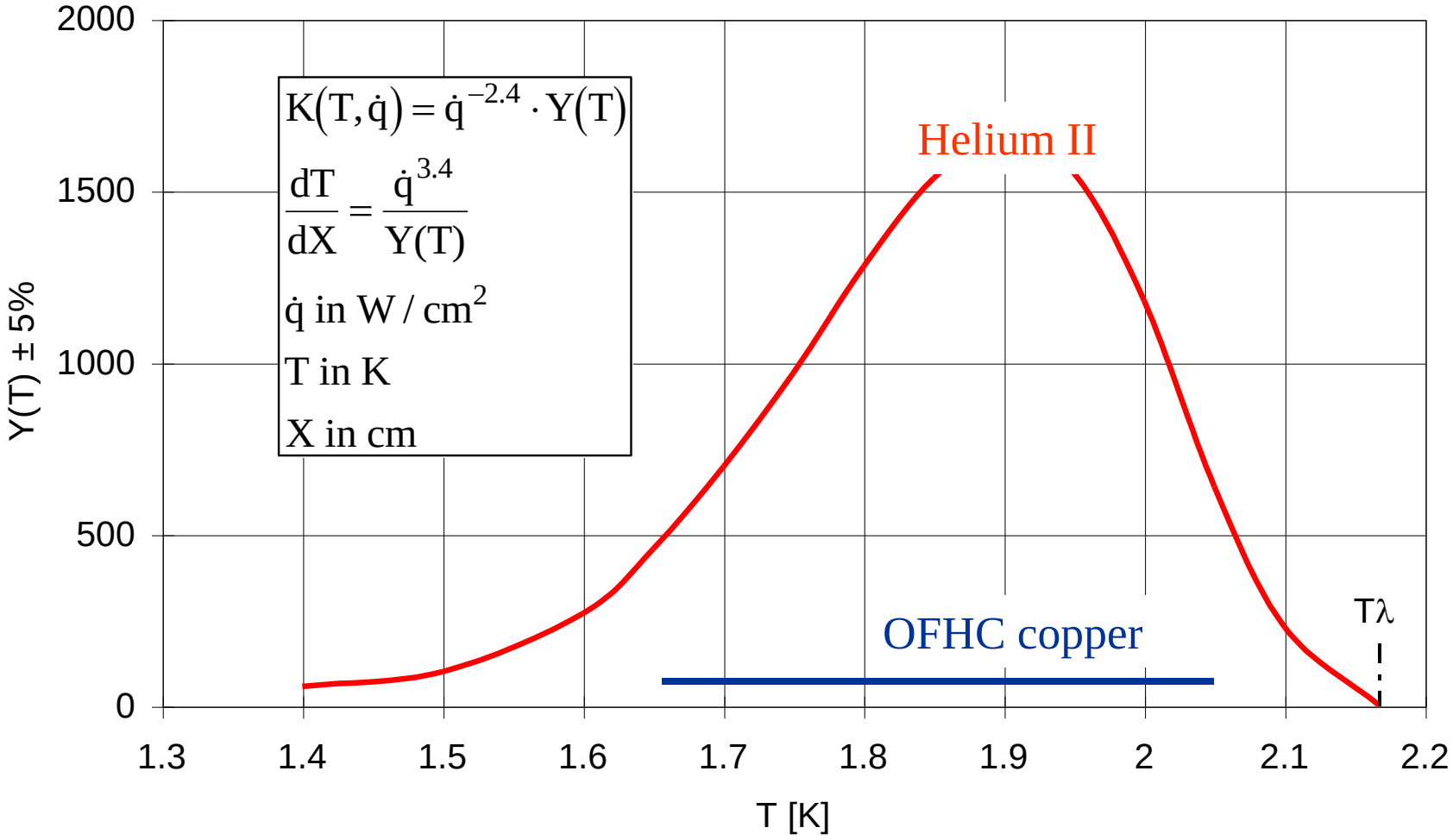
10 September 2008

5 DGS

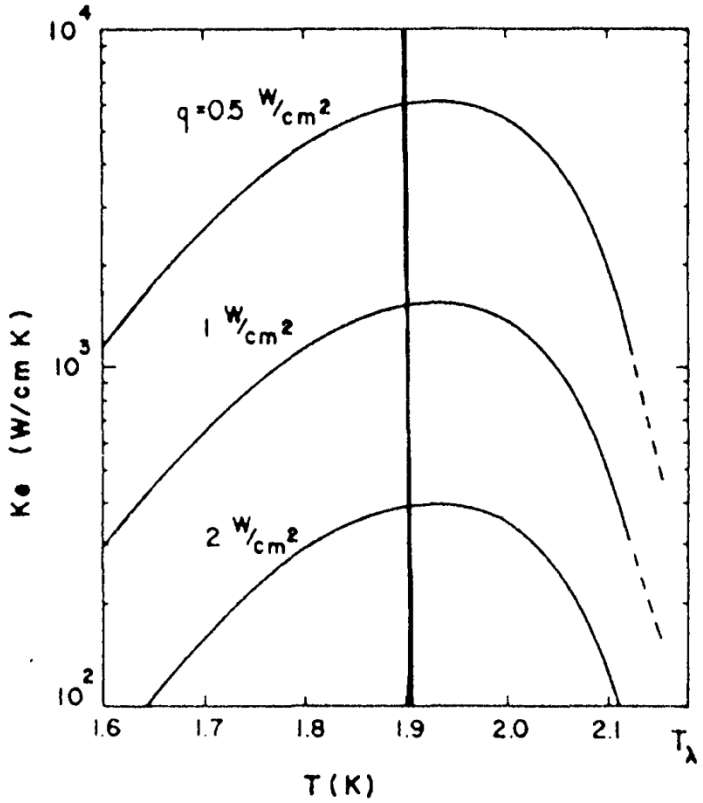
19 September 2008



Equivalent thermal conductivity of He II

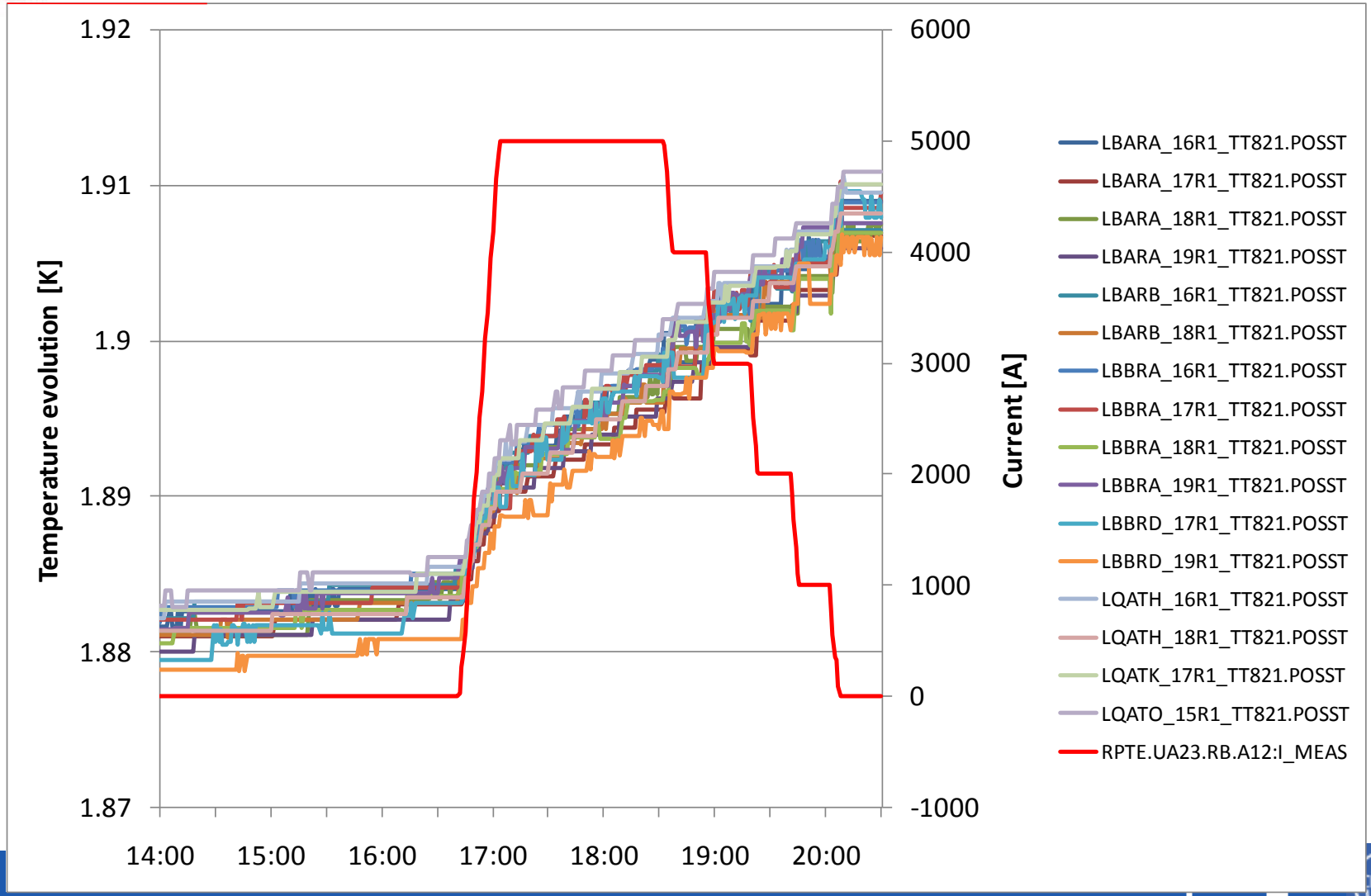


Equivalent thermal conductivity of He II

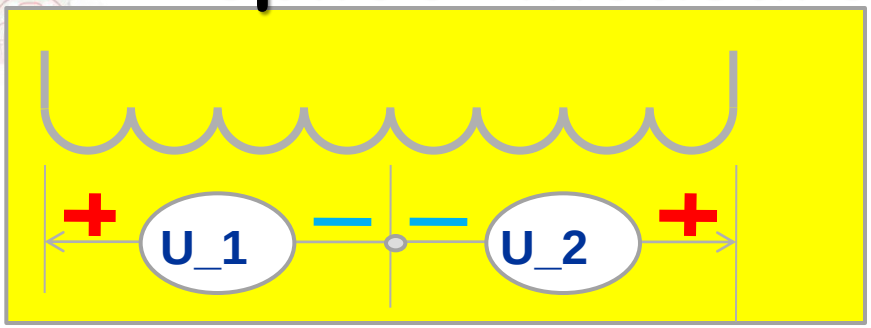


Effective thermal conductivity of He II.

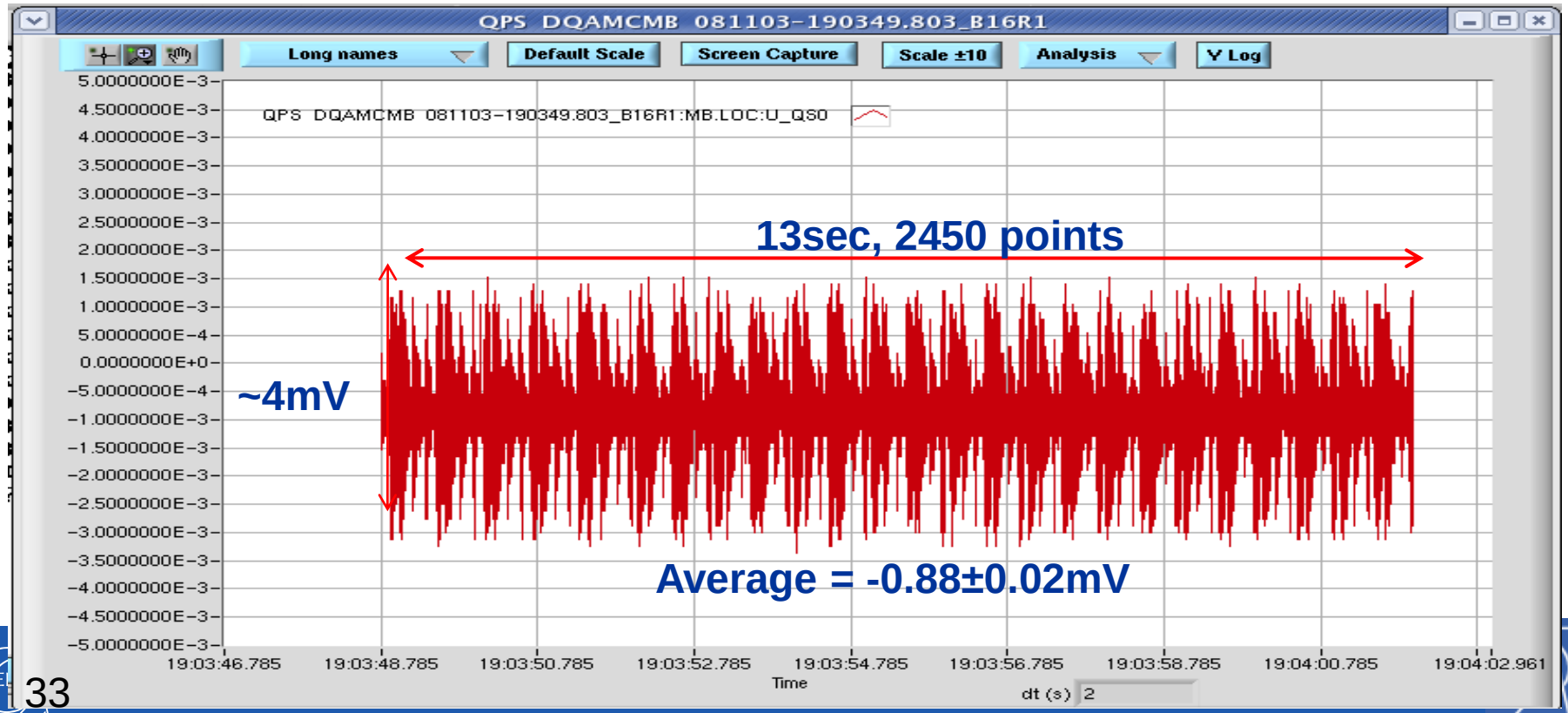
Powering example
15R1 powering @ 5000A



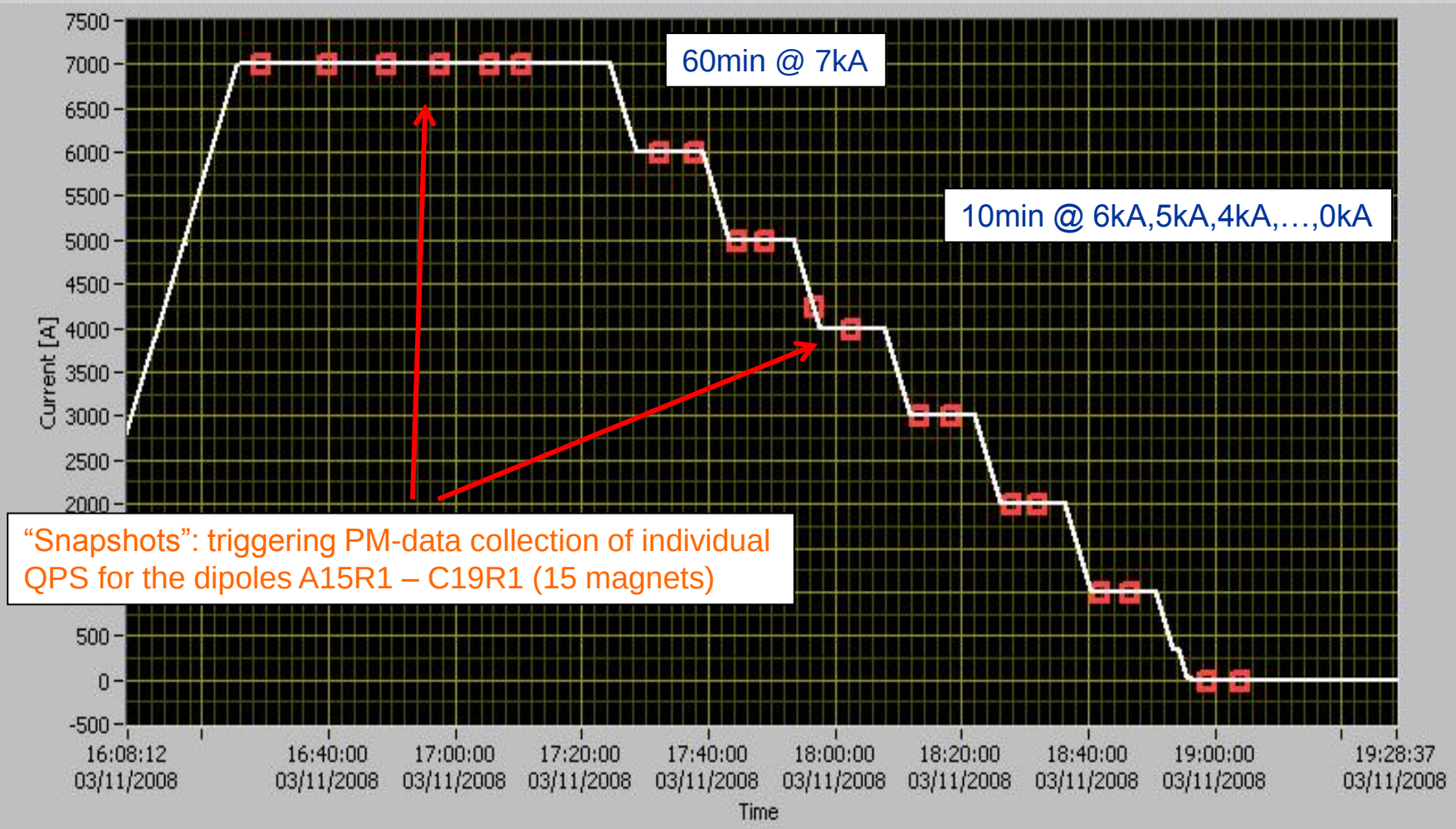
Sector A12: A15R1 – C19R1
"splice" measurements on 03.11.08



U_QS0 => -(U_1+U_2)
Sampling Rate = 5ms
Resolution = 0.125mV
Quench Threshold = 100mV@10ms



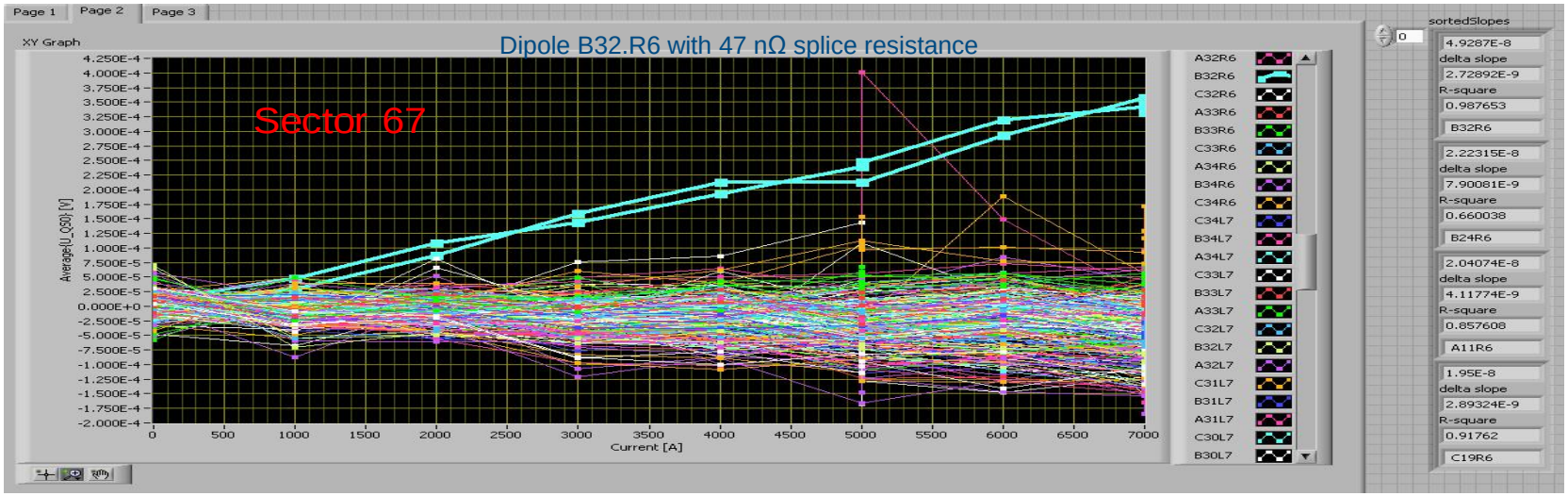
Sector A12: A15R1 – C19R1 measurements on 03.11.08

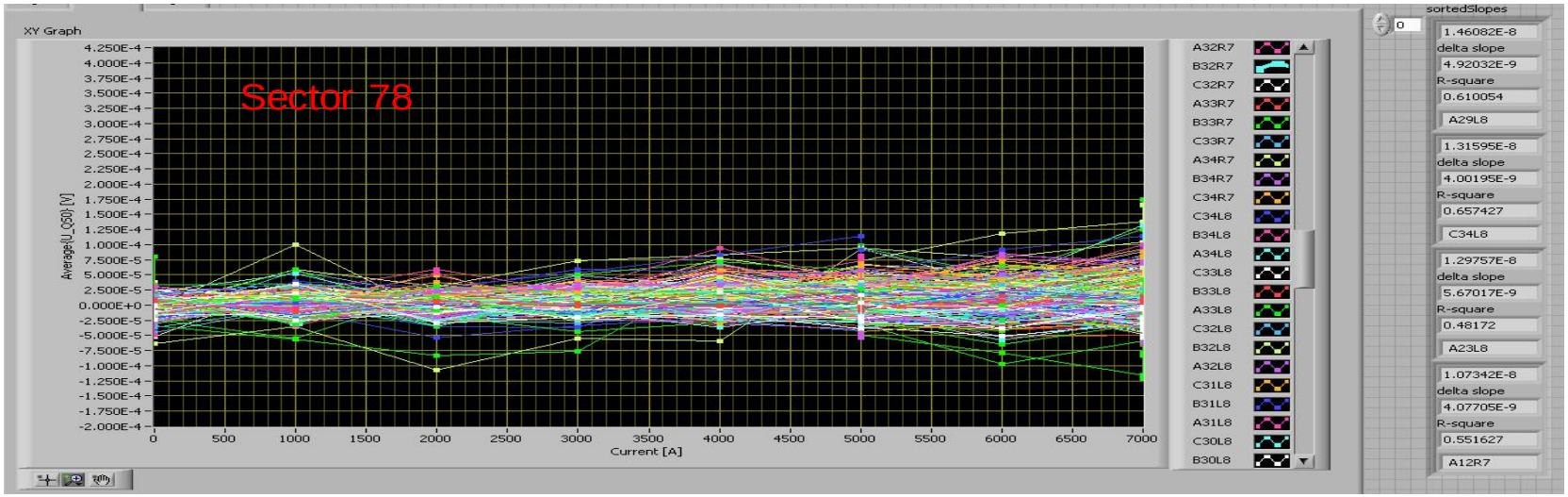


Courtesy Z. Charifoulline

Snapshots in S67 and S78 on all 154 dipoles - B32.R6 with a high (47 nΩ) joint resistance between the poles of one aperture

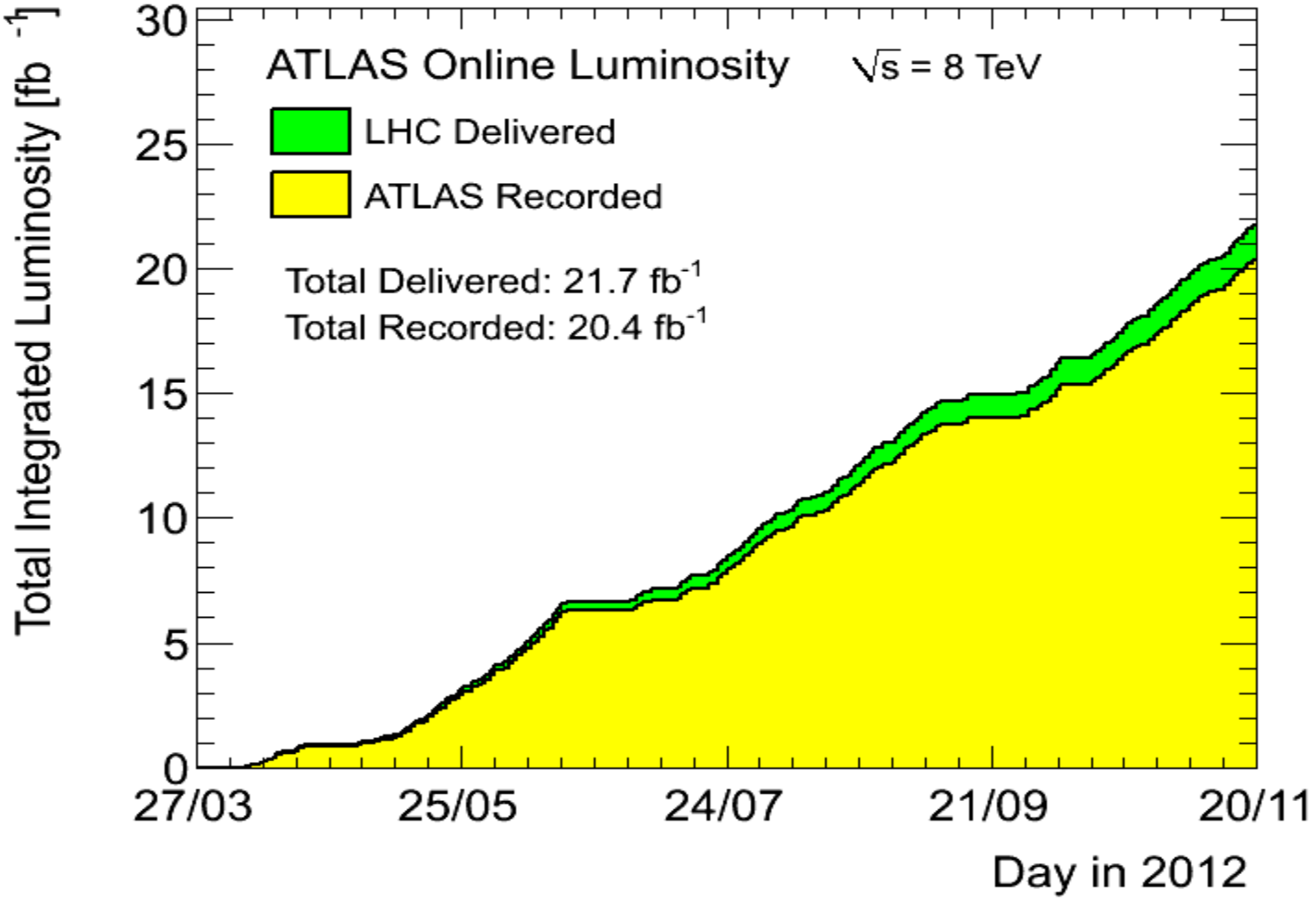
Results from provoked massive Post-Mortem of all dipoles in sectors 67 & 78





Lyn Evans

Integrated luminosity 2012




Thank you
Chris!
- PAYS de GALLE -
- WALES -