The Large Hadron Collider
A marvel of technology

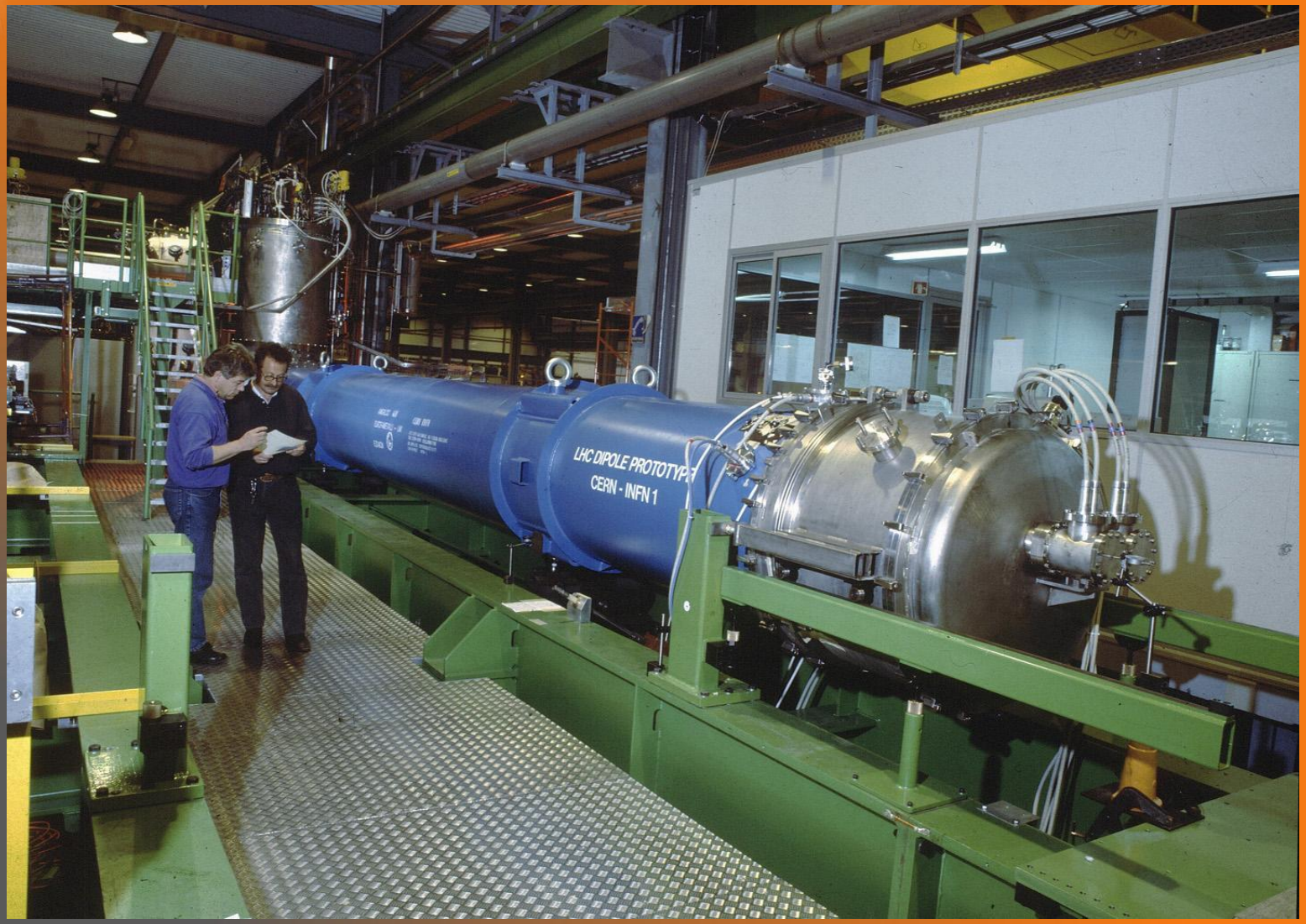
Lyn Evans

10th Anniversary of the discovery of the Higgs boson, 4th July 2022

In December 1993, a plan was presented to the CERN Council to build the machine over a ten-year period by reducing the other experimental program of CERN to the absolute minimum, with the exception of the full exploitation of the LEP collider. An external expert panel chaired by Robert Aymar endorsed the design.

Although the plan was generally well received, it became clear that two of the largest contributors, Germany and the United Kingdom, were very unlikely to agree to the budget increase required. They also managed to get Council voting procedures changed from a simple majority to a double majority, where much more weight was given to the large contributors so that they could keep control.

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



Finance Committee April 1994

Message de J.P. Gourber et R. Perin

à L. Evans

- on a atteint 8,73 tesla

  100 quench

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.

1996

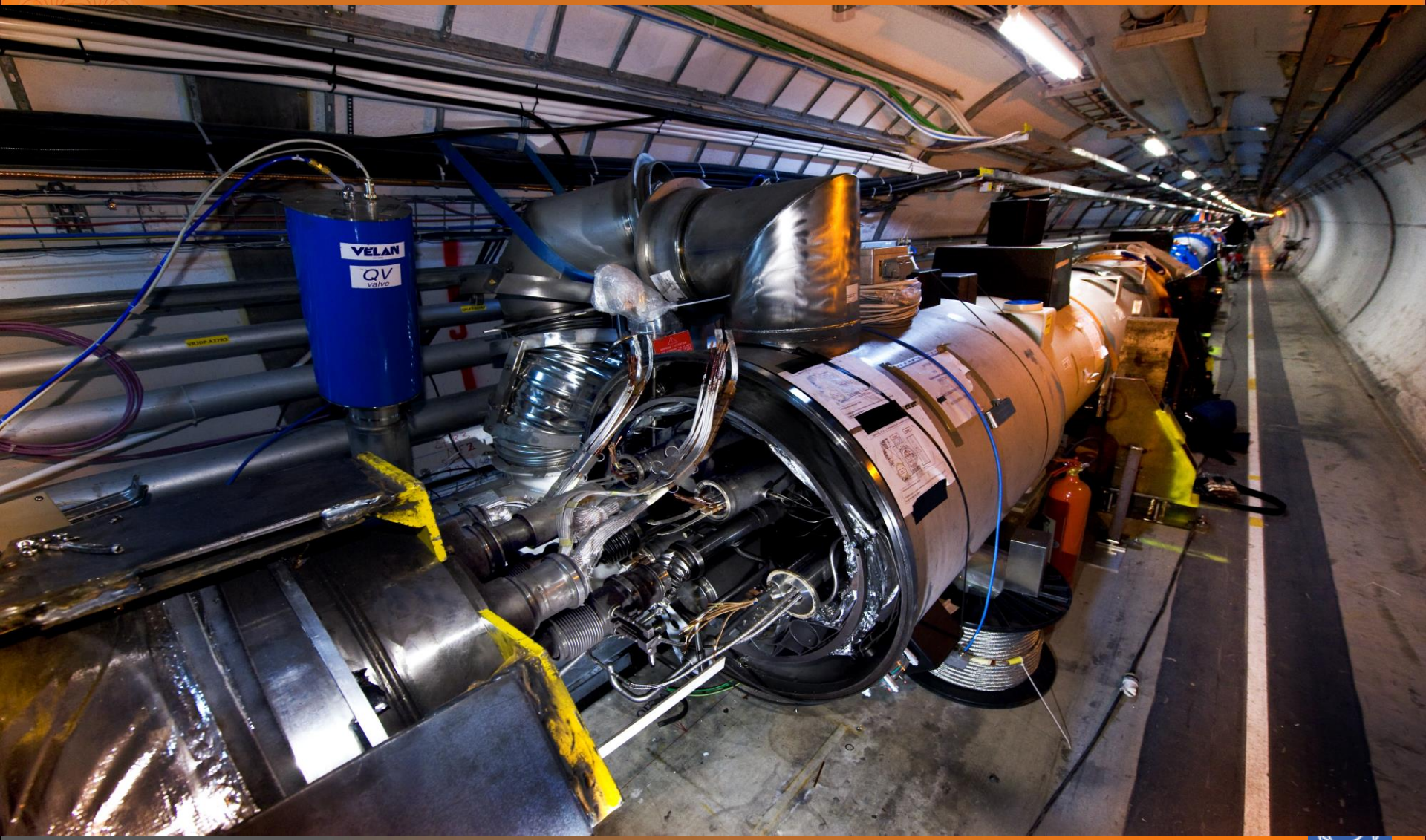
March

- India makes a financial contribution to the construction of the LHC.
- And in June, Russia announces a financial contribution to the project.

December

- Canada announces a financial contribution for the LHC, while a protocol of co-operation is defined for participation of the United States.
- In December 1997, the US declares a contribution.

19th September 2008



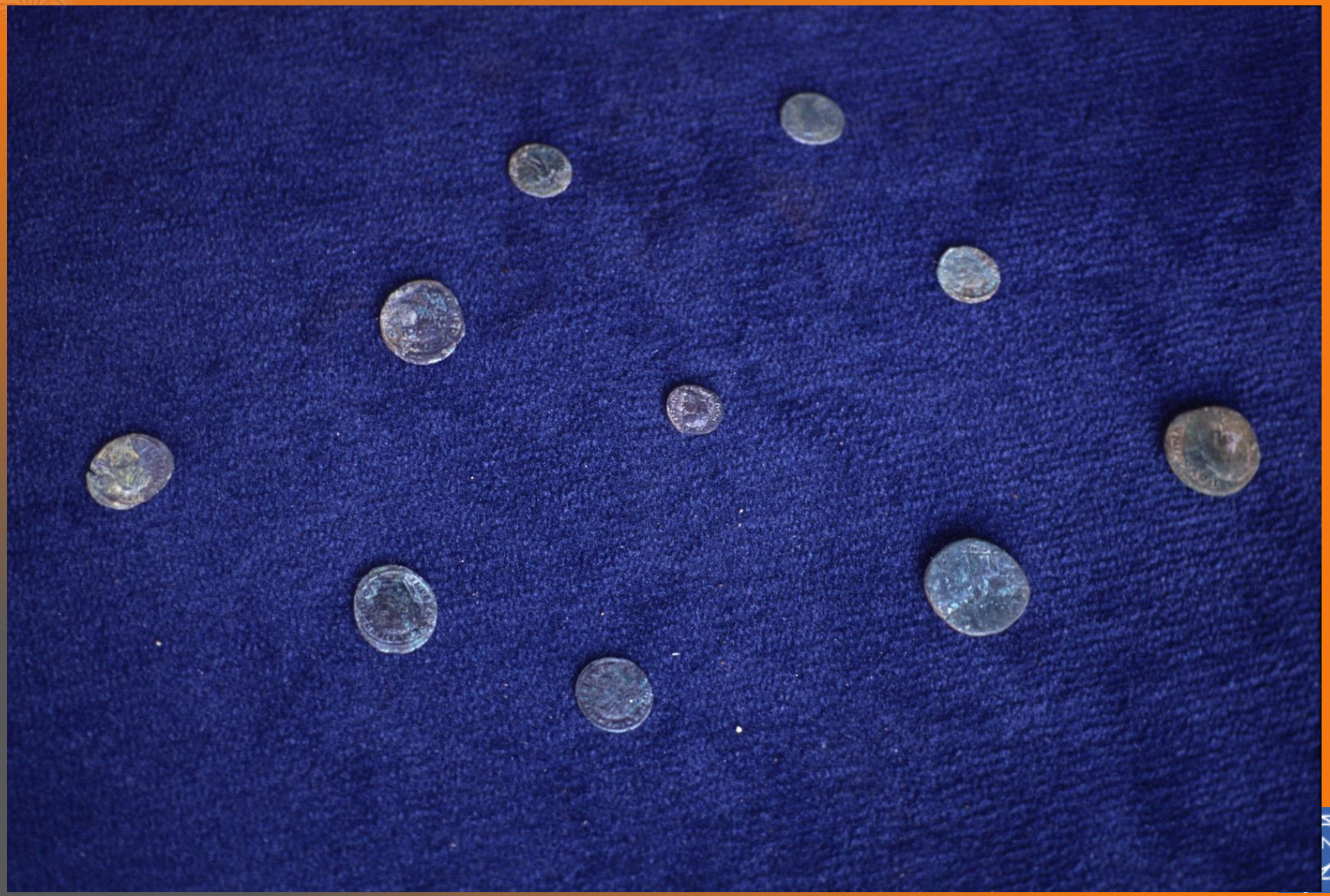
QRL crisis June 2004

Magnet rows

Magnet rows

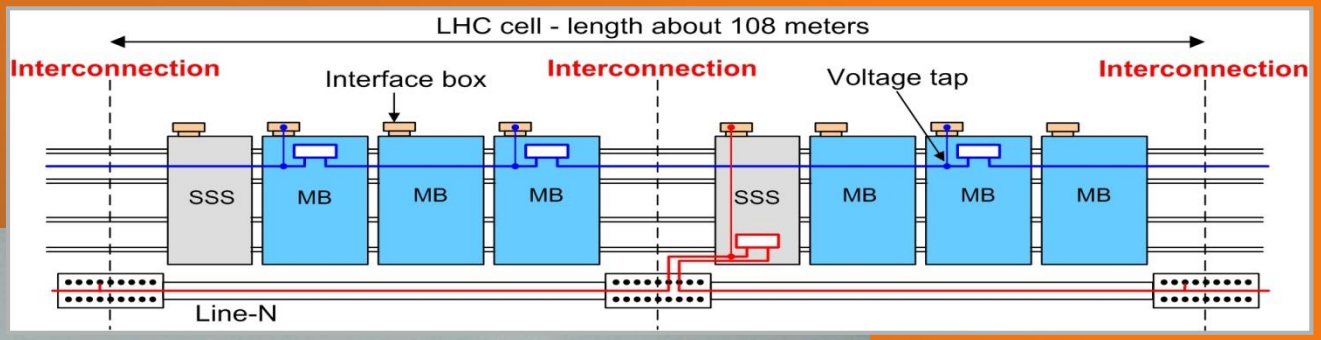
Aerial view of Point 5
Gallo-roman vestiges 1998

Roman coins found during archeological excavations at Point 5

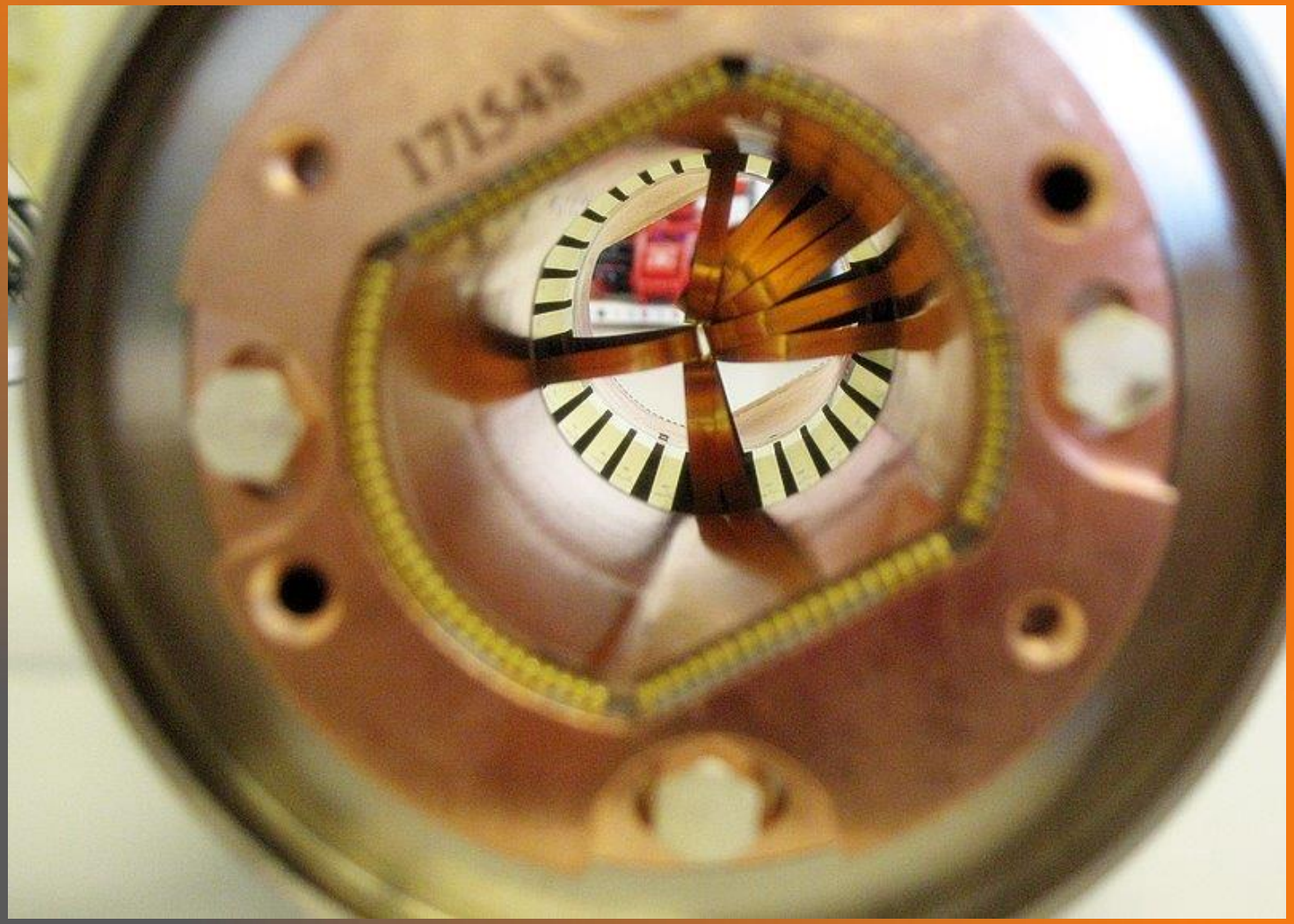


Inner triplet crisis Feb 2005

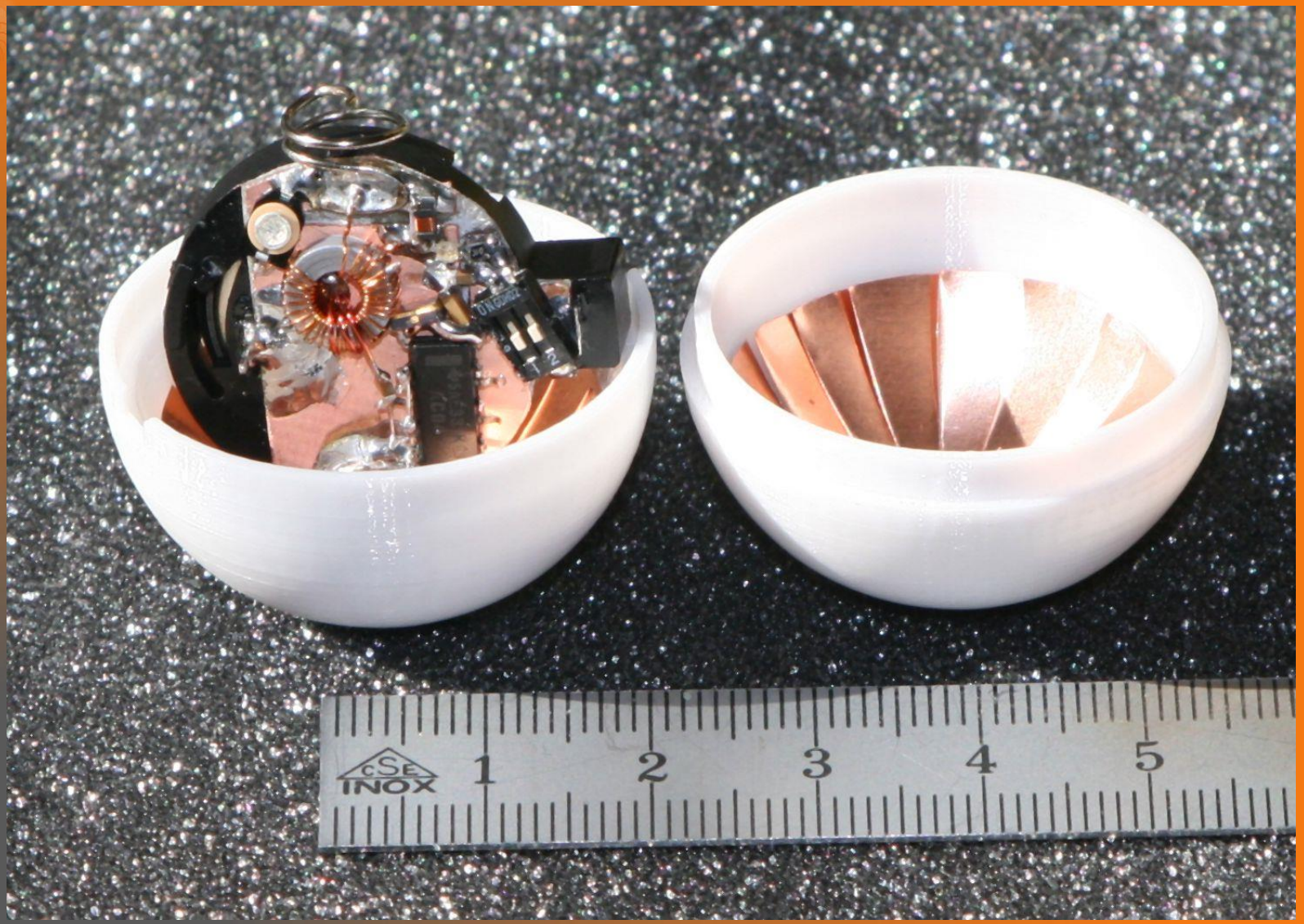
The crisis of the PIM's



Arc plug-in module with damaged fingers

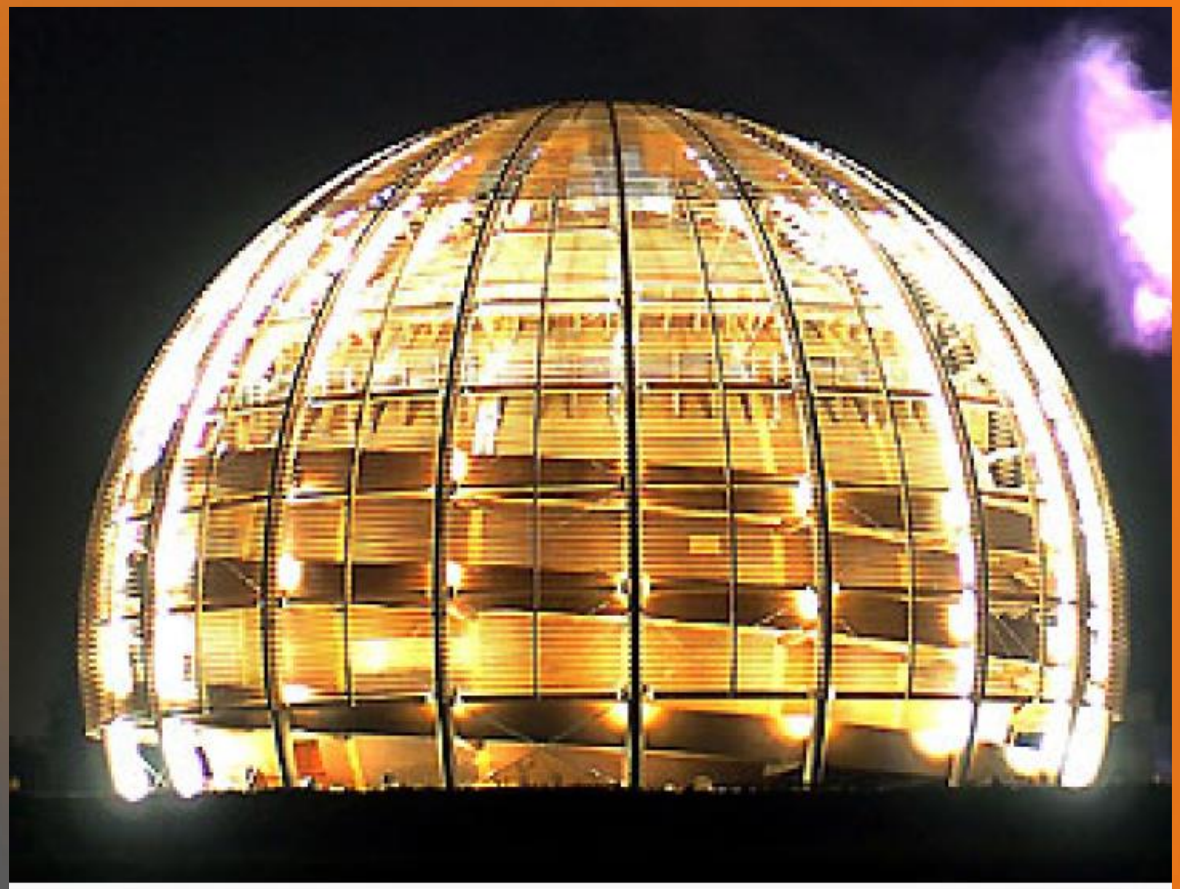


Transmitter ball



Quarks and Photons: The Strangest Little Things in Nature

FOX NEWS.COM, THURSDAY, NOVEMBER 09, 2006



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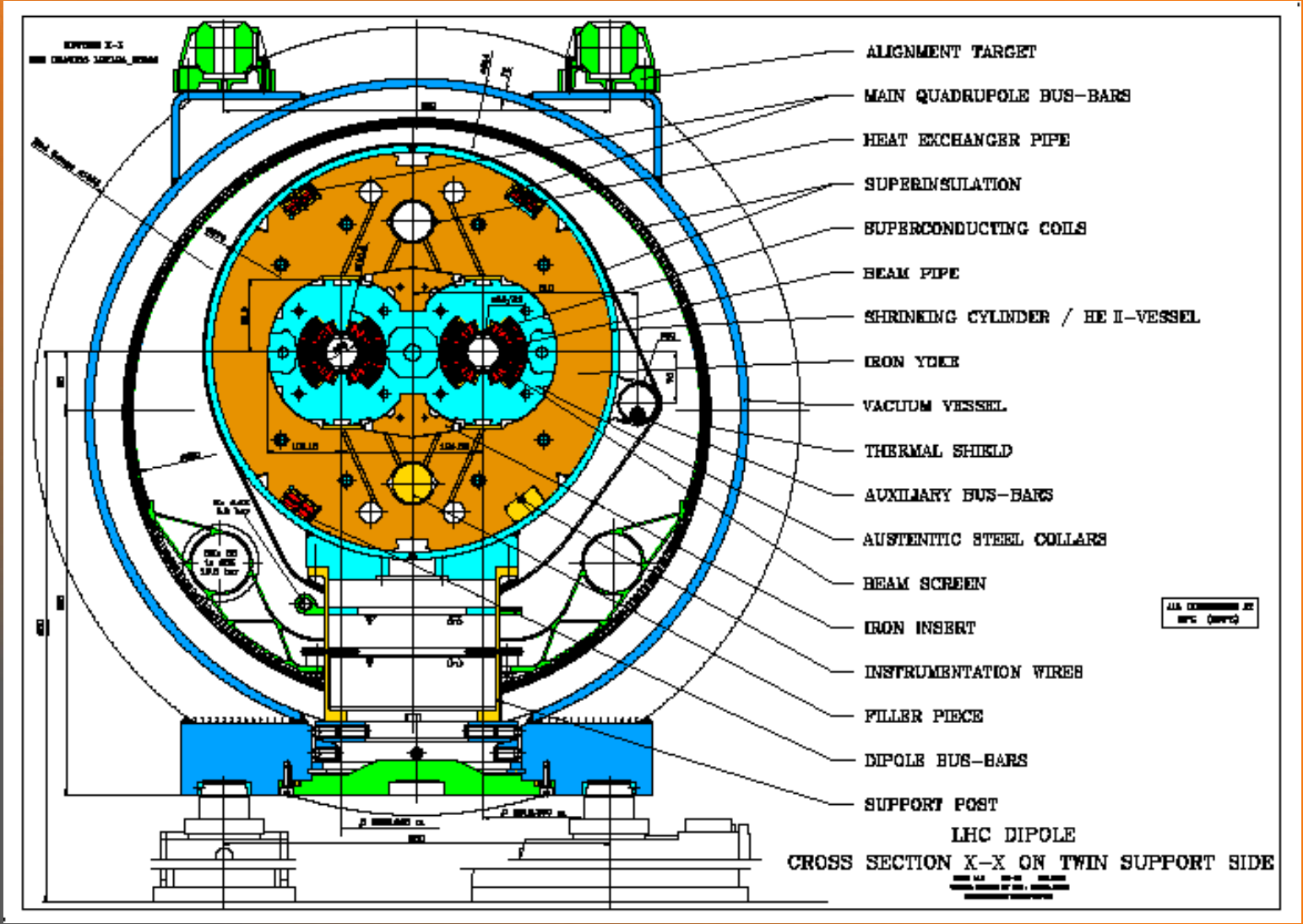
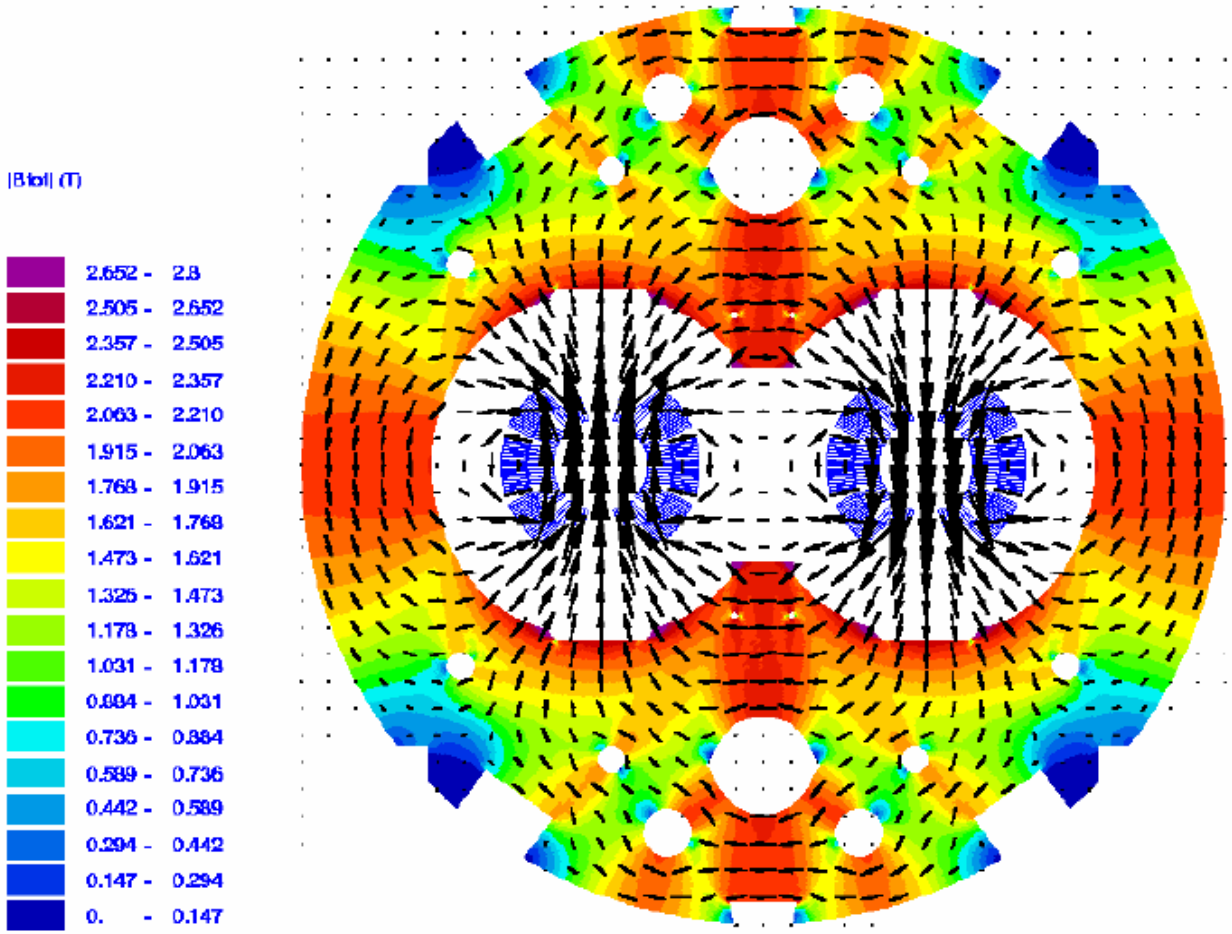
The CERN Large Hadron Collider in Geneva, Switzerland, which will be the world's largest particle accelerator when it enters full operation in 2008.

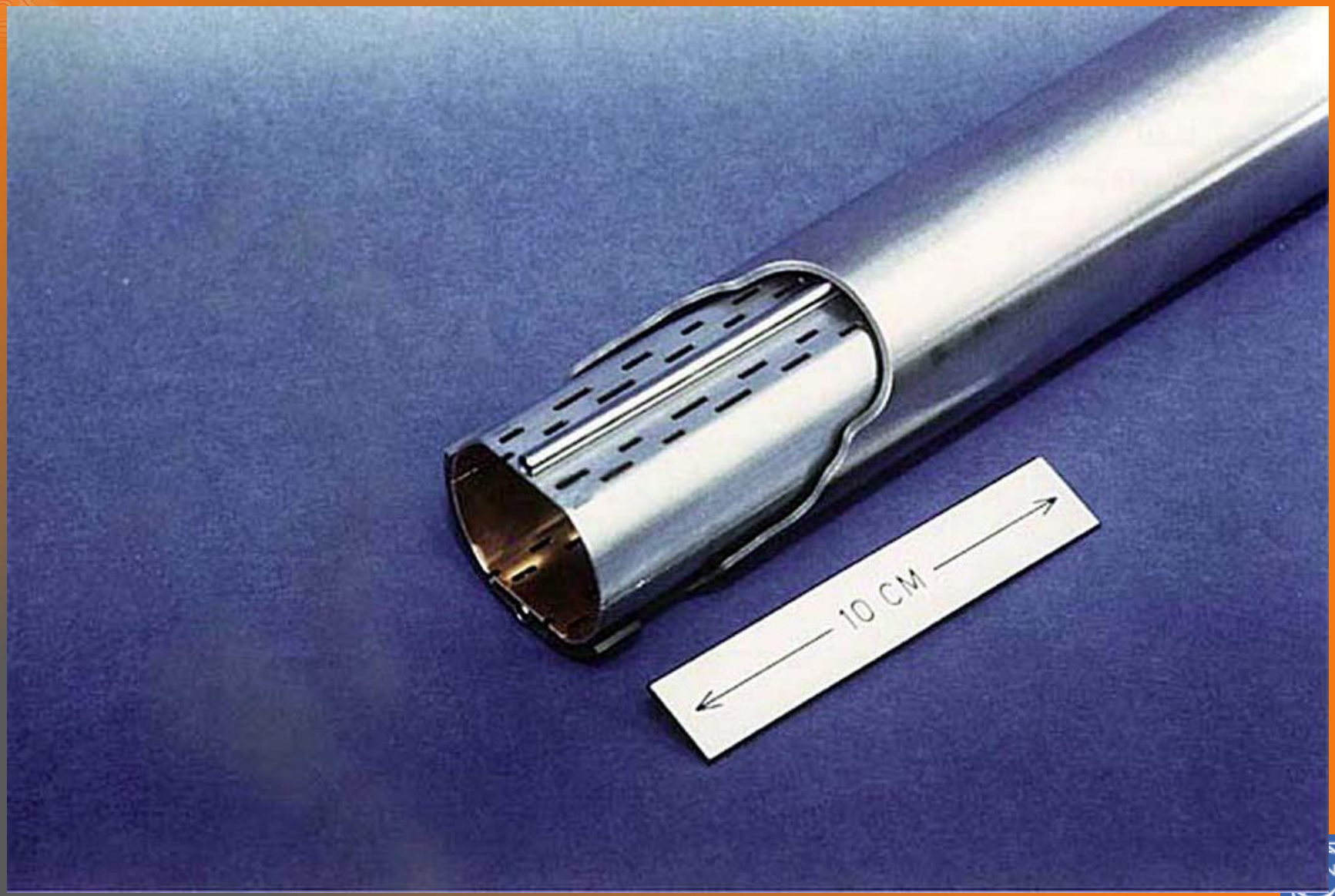
Cross-section of LHC cryodipole



Dipole magnetic flux plot



LHC beam screen



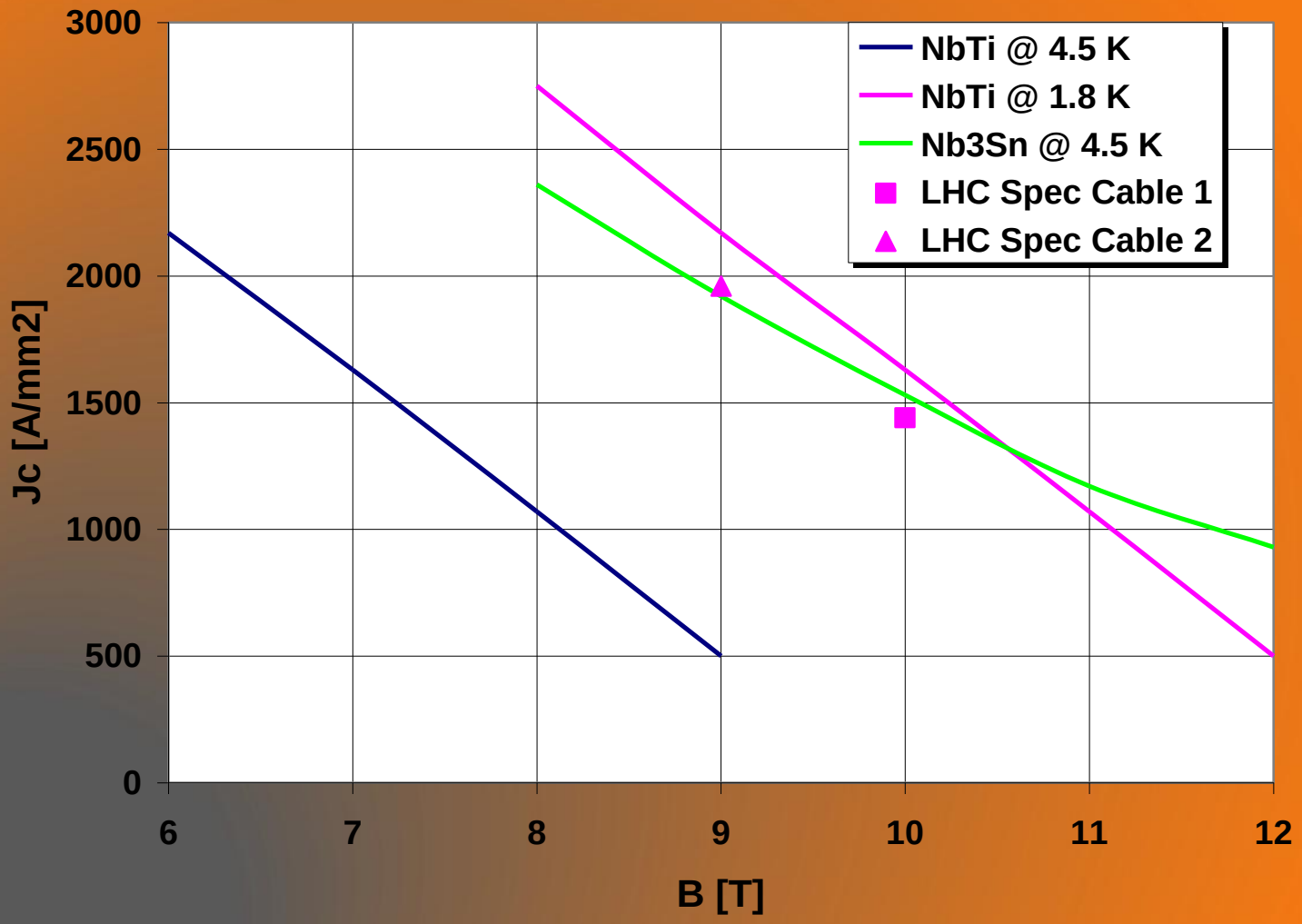
Warm Vacuum System

For roughly 3 km of the 27 km circumference, mainly in the long straight sections, the vacuum chambers are at room temperature, requiring a low residual pressure without the benefit of the distributed cryopumping. As a spin-off of the development of sputtering technology for superconducting cavities a new getter material (TiZrV) has been developed which can be sputtered on the internal surface of the copper vacuum chambers and can be activated at the very low temperature of 200 degrees (conventional getters require activation at 600 degrees).

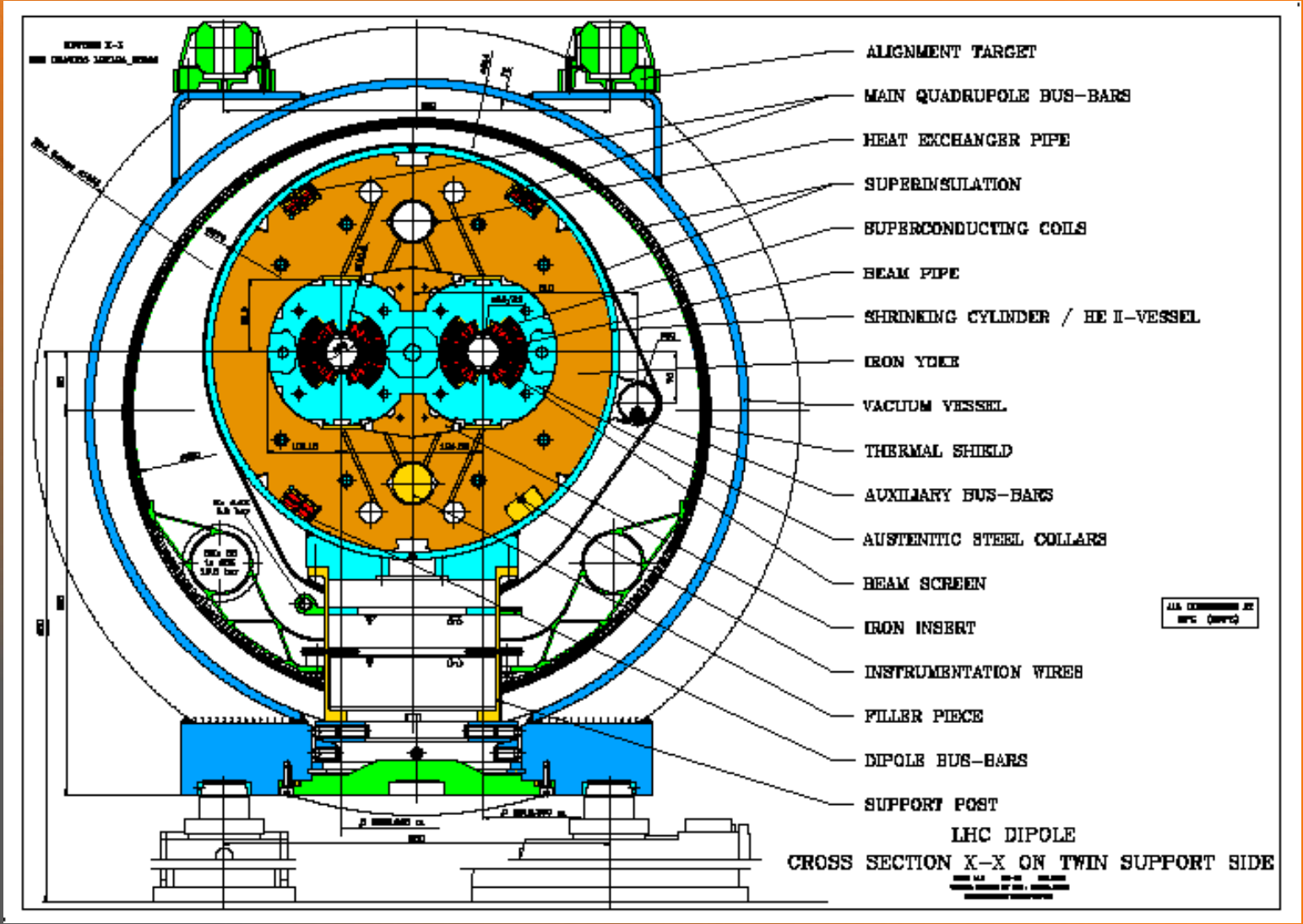
When activated, the chamber wall itself becomes a distributed pump, producing very low residual pressure and at the same time a very low secondary emission yield, preventing the buildup of an electron cloud.

All warm chambers, including those inside the detectors, are treated in this way.

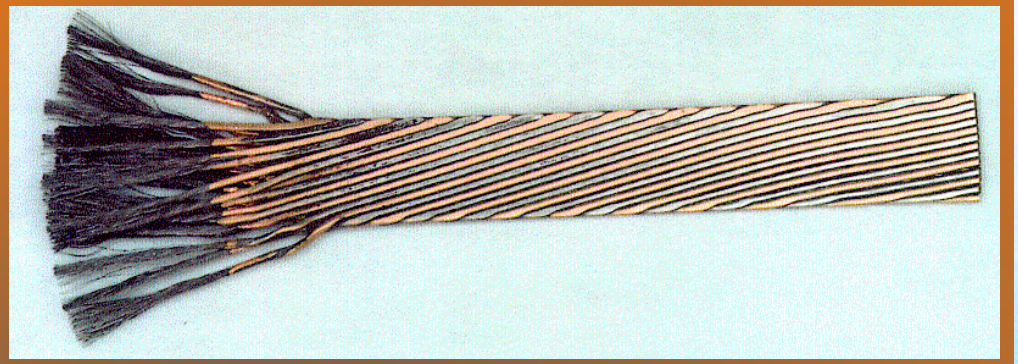
Critical current density of technical superconductors

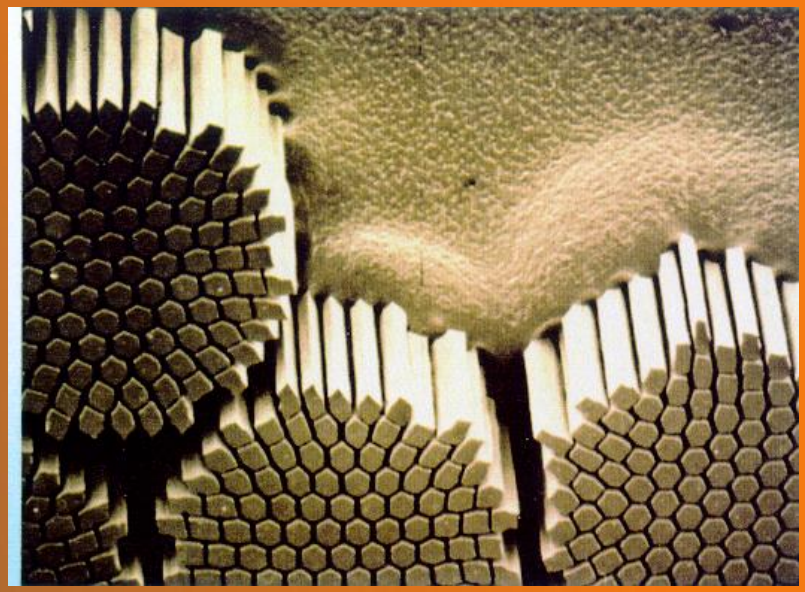


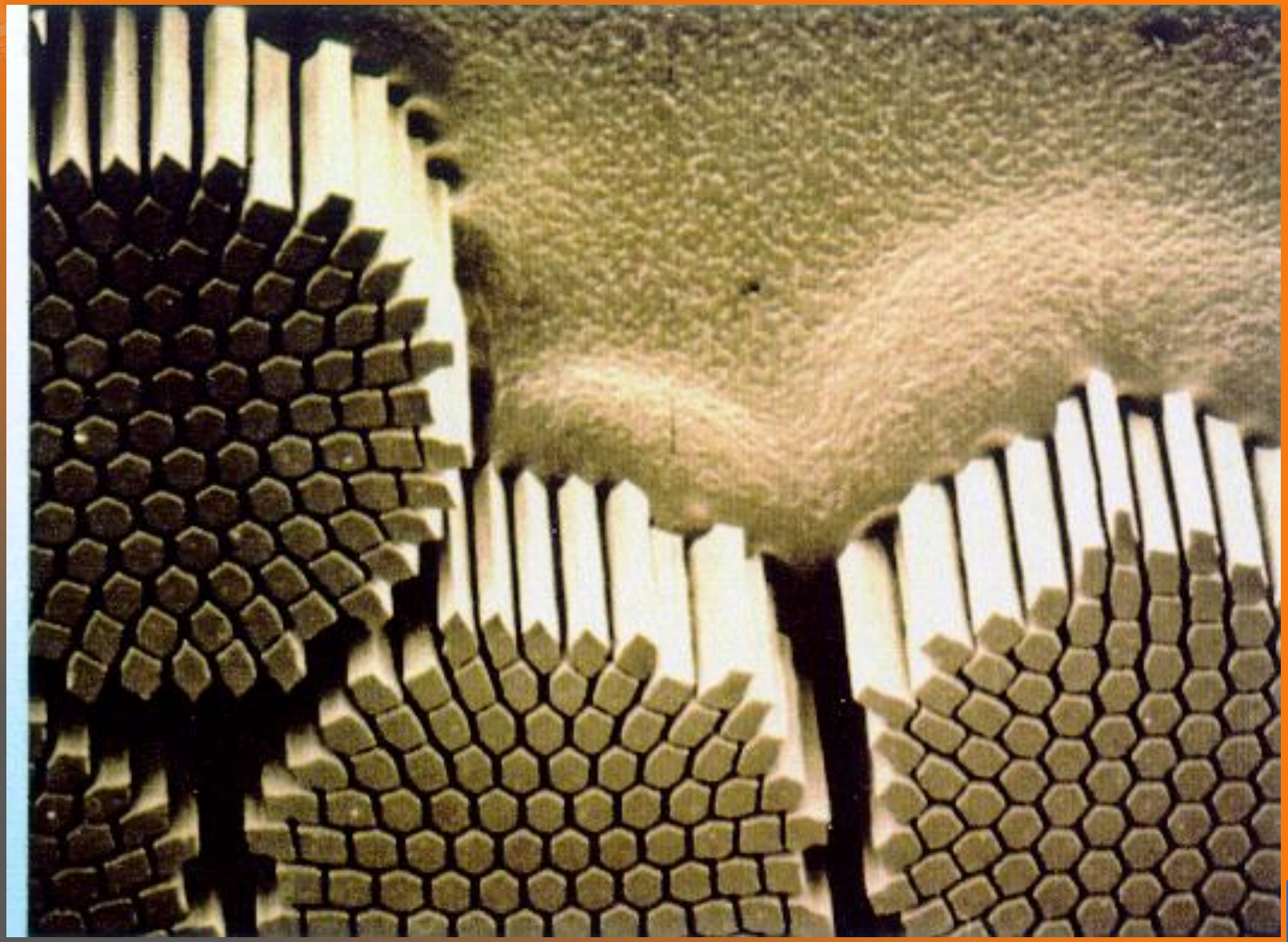
Cross-section of LHC cryodipole



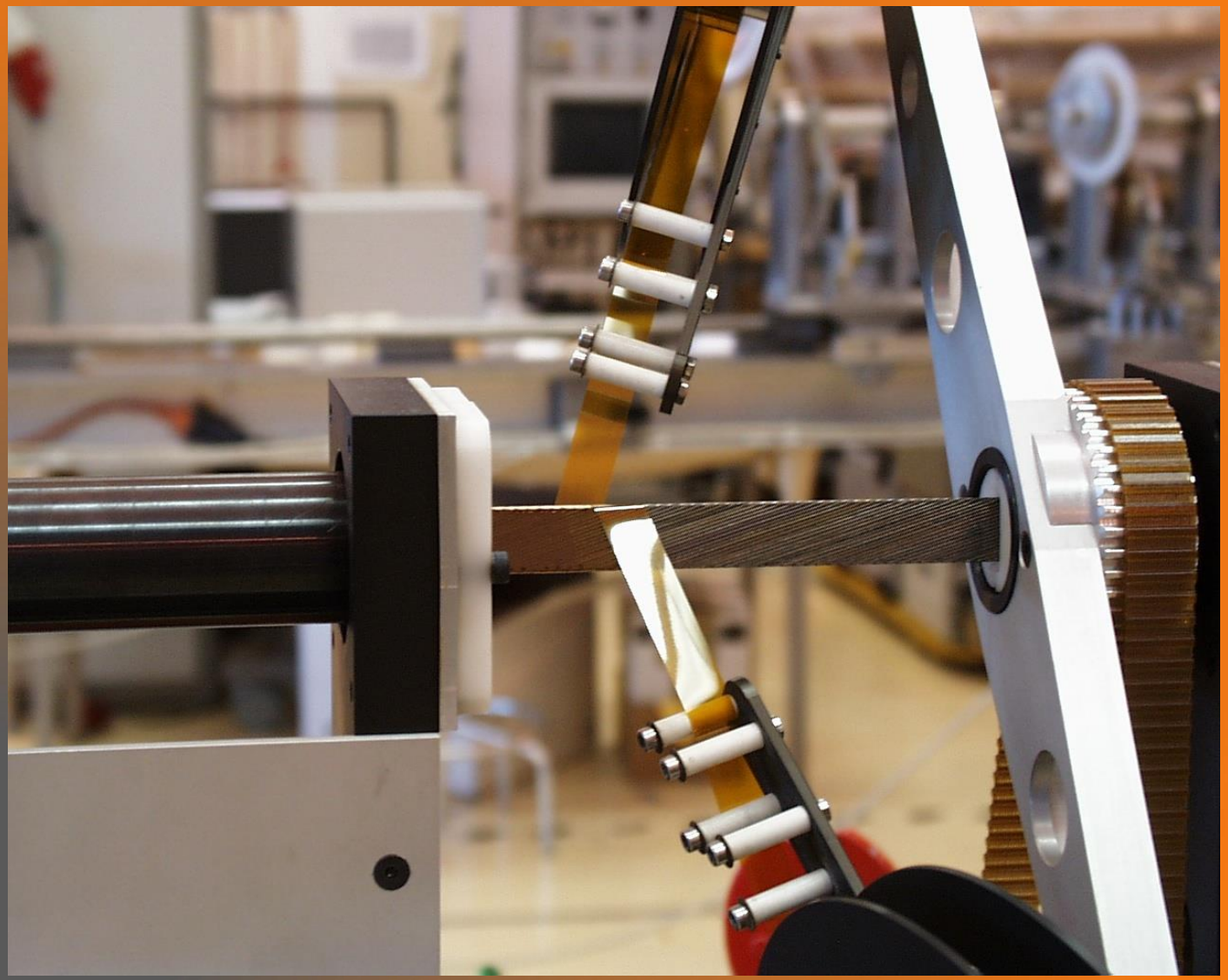
7000 km of superconducting cable Nb-Ti



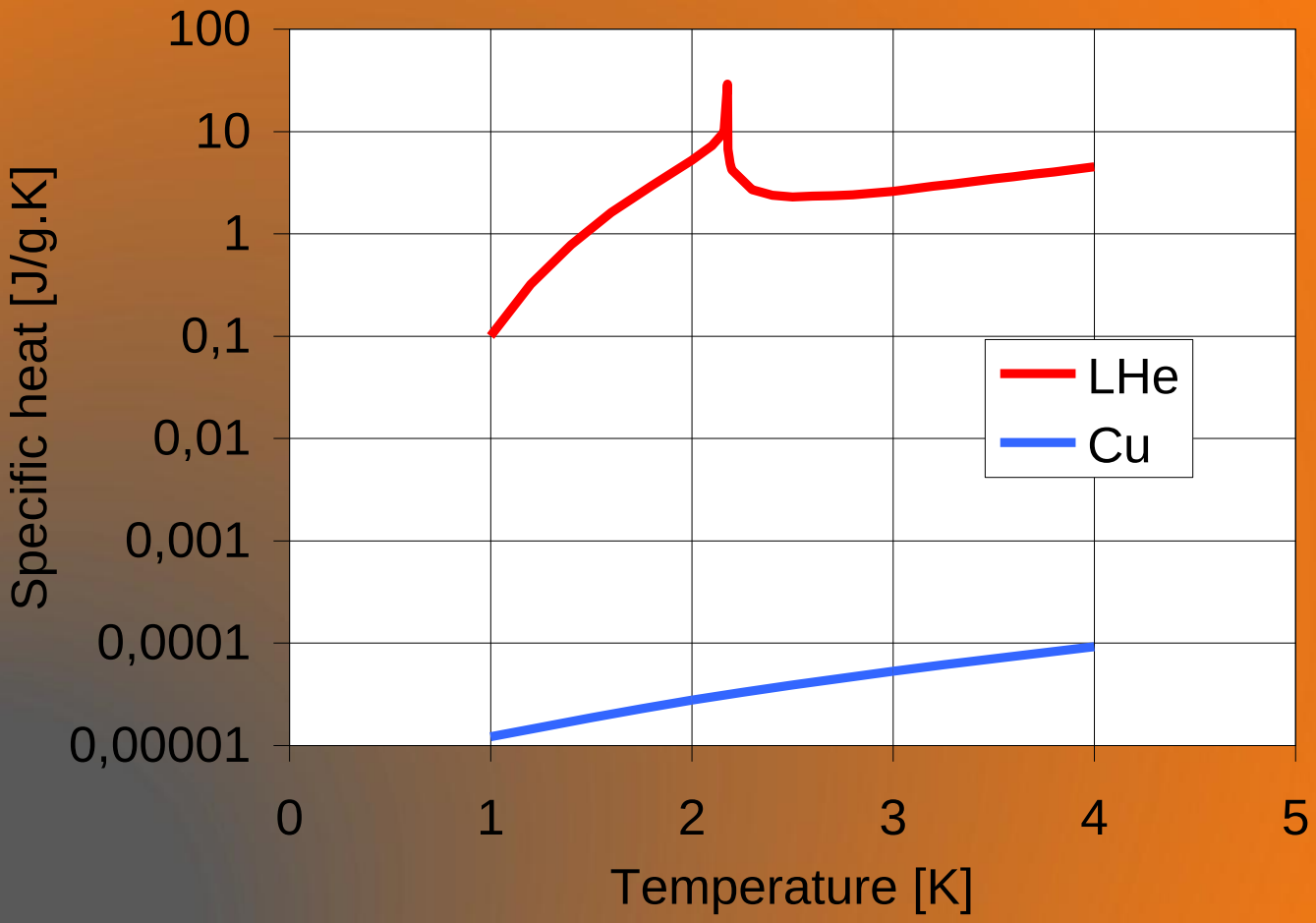




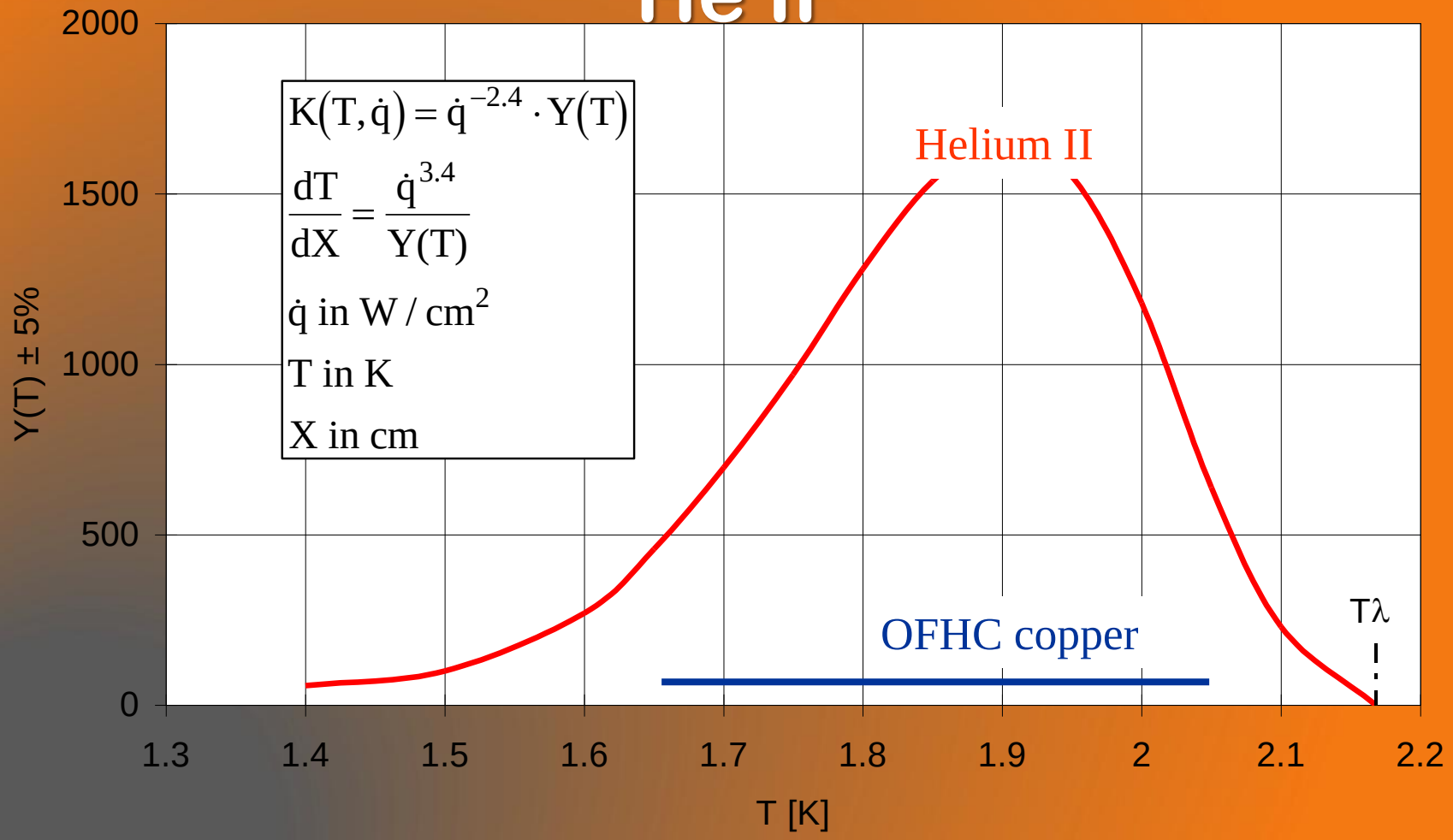
Cable insulation by double polyimide wrap



specific heat of LHe and Cu



equivalent thermal conductivity of He II



Cryogenic operation of LHC sector