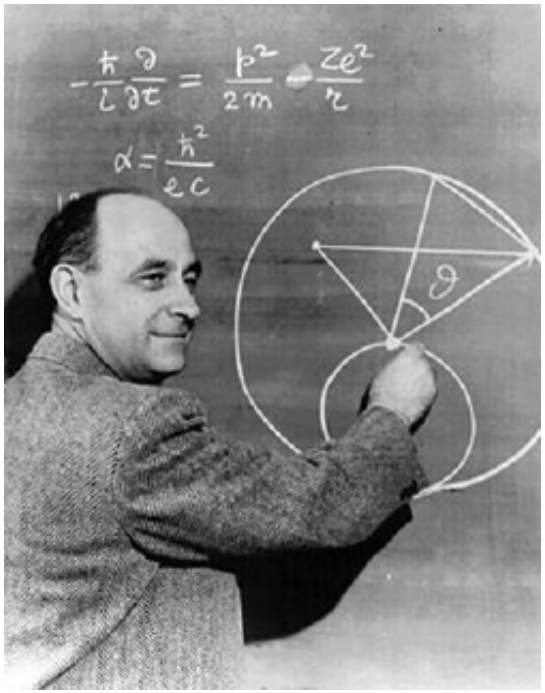
Presentation of the Russian edition of the booklet

A.Nisati and G.Tonelli “The Discovery of the Higgs Boson at LHC”

From the Fermi theory of weak interactions.

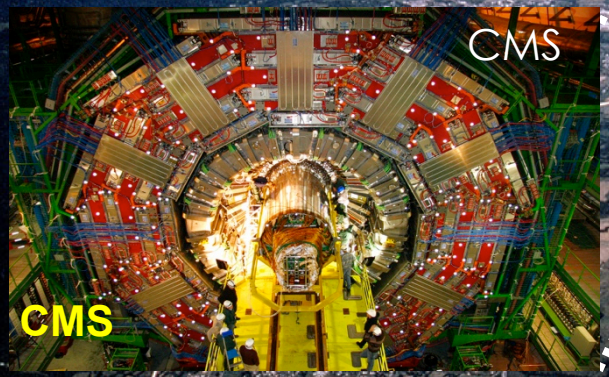
- Enrico Fermi was the first one to interpret the radioactive β decay as the manifestation of a new interaction.

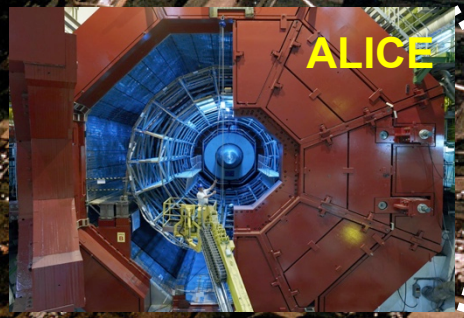


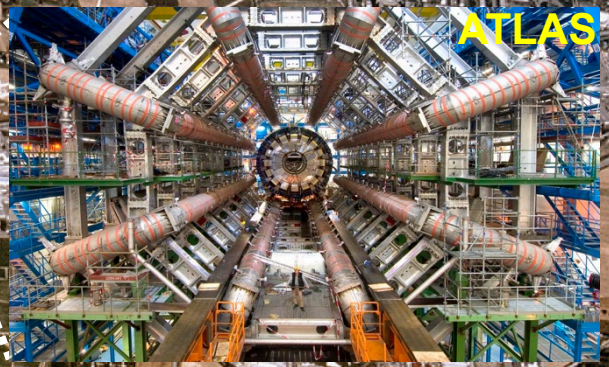
- After him, for many years, what we call today the weak interaction was called the Fermi interaction.

- Fermi founded the basement of the theory that opened the route to the Standard Model of fundamental interactions.

to the Large Hadron Collider and its beautiful experiments.

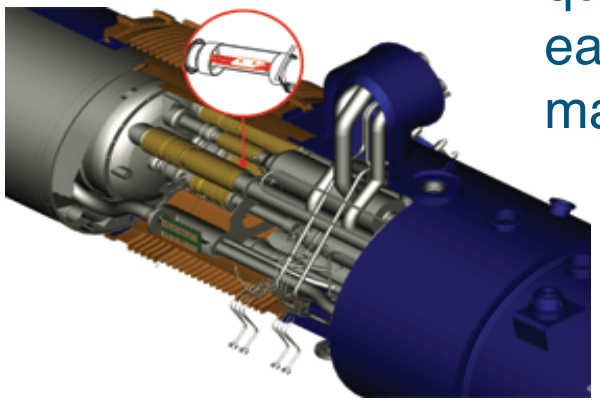






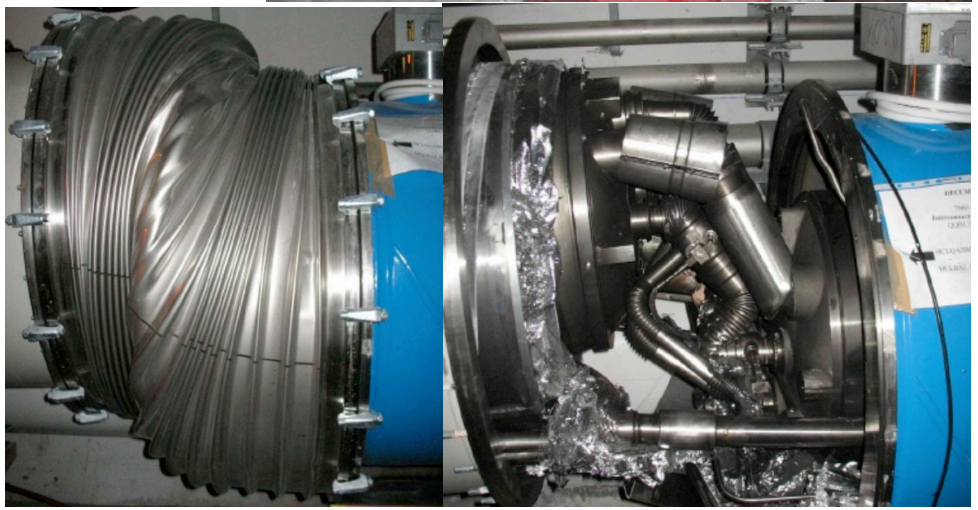
10/09/2008: the joy for the first beams in LHC

19/09/2008: our black friday



Superfluid helium in quick expansion can easily displace a string of many 20t magnets…

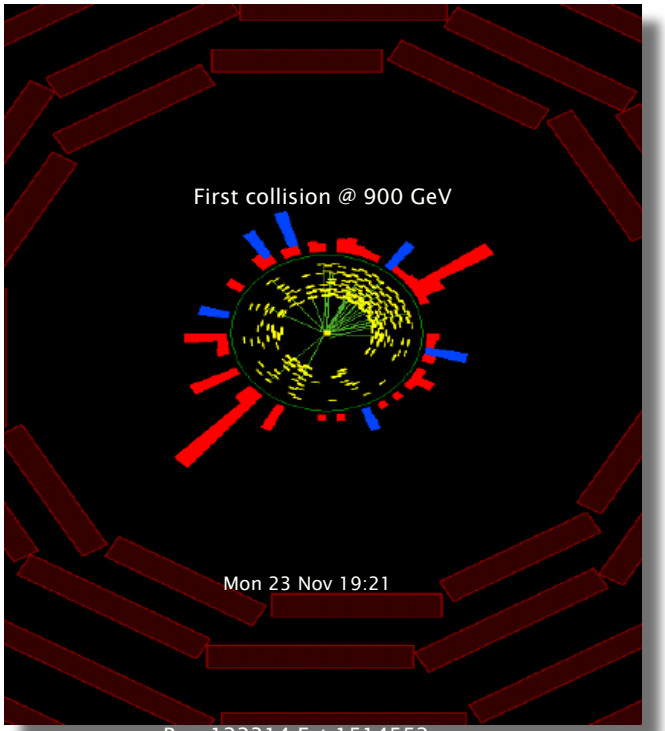
… and these are the consequences: ~1 year of work to replace/repair/re-check 53 magnets and to put in place any sort of test and all possible preventive actions to avoid the same incident could happen again.

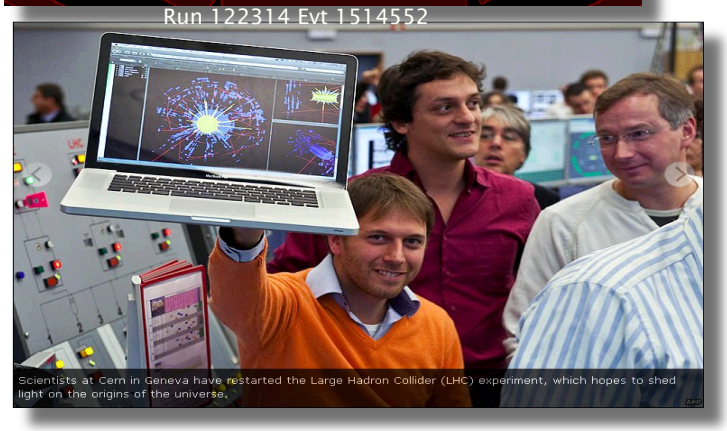


The LHC Start-Up Nov 20 2009

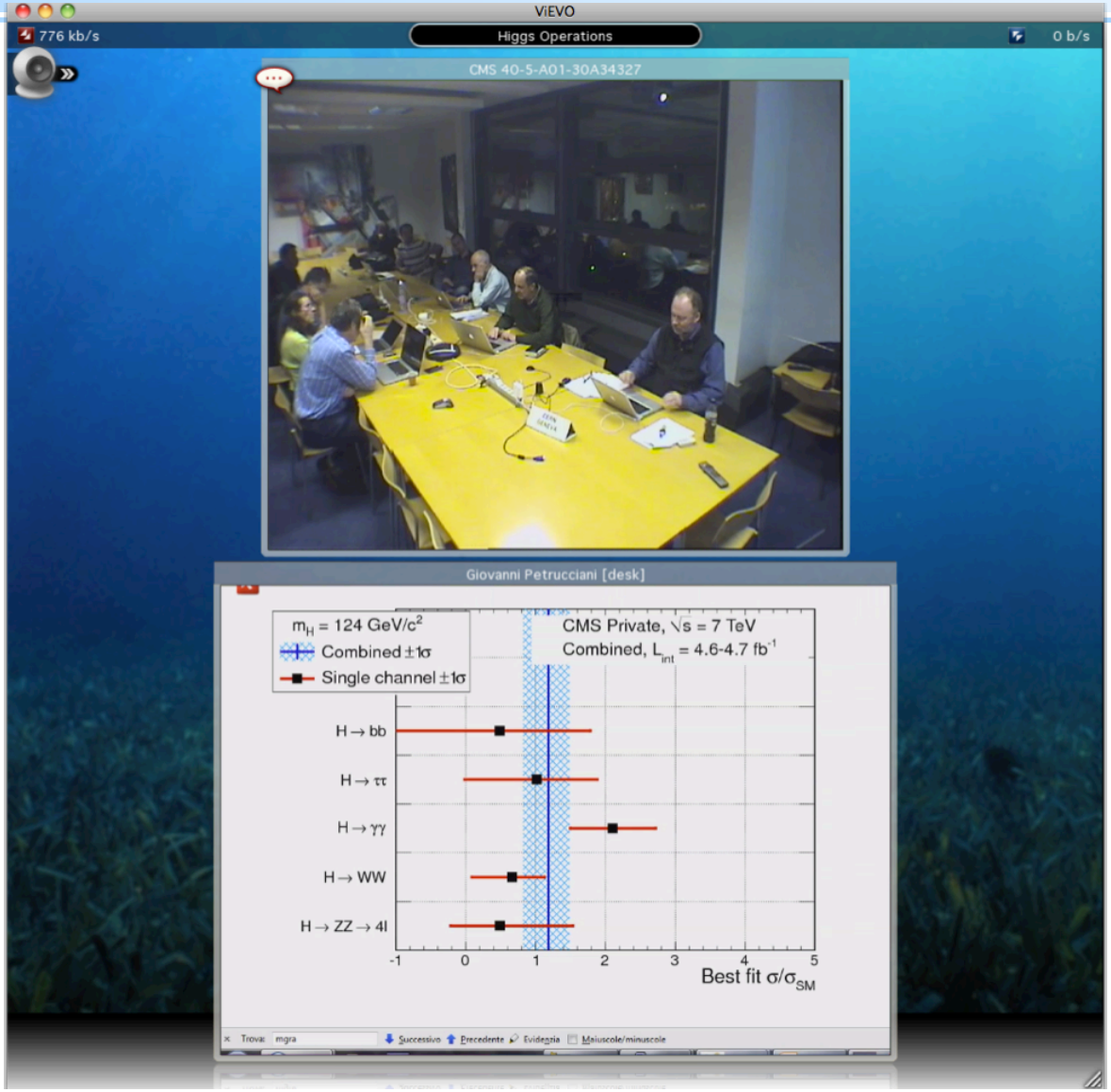
- **Nov.20: Start of 2009 beam circulation**
- **Nov. 23: First collisions at 900 GeV**
- **Nov. 26: First results shown publicly at CERN!**
- **Dec.6: First physics fills**
- **Dec.8: Acceleration**
  - —both beams ramped to 1.18 TeV each
- **Dec.11: Higher proton intensities (7E10)**
  - —Starting to accumulate luminosity at 900 GeV
- **Dec.14. Collisions at 2.36 TeV !**

First CMS Collision Event



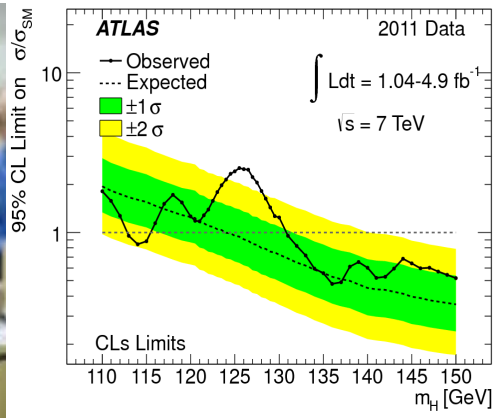


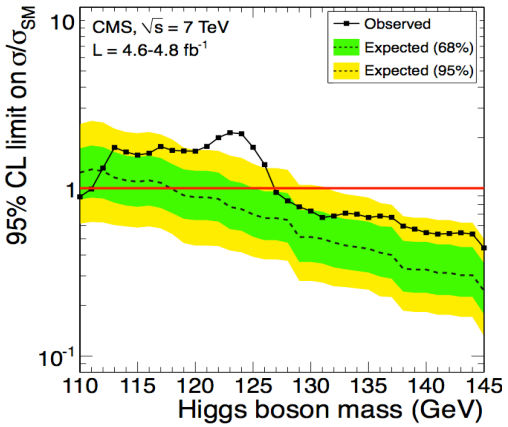
Hectic moments Dec.10 2011 19:08:56



December 13th 2011: the first moment of truth.

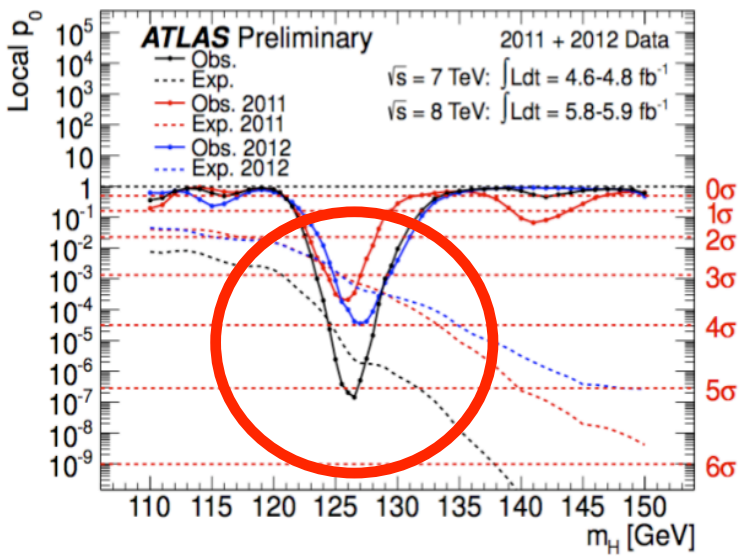
First evidence of an excess around 125 GeV



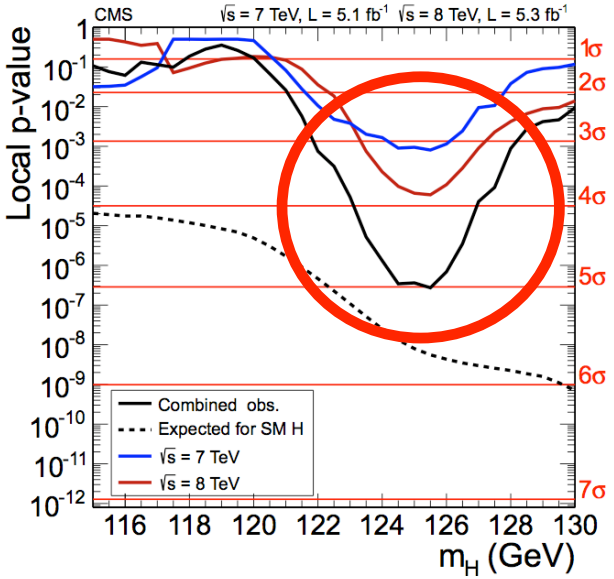


July 4th 2012: Higgsdependence day.

Discovery of a Higgs-like boson at LHC.



Combined significance 5.0σ at 125-126GeV for each experiment.



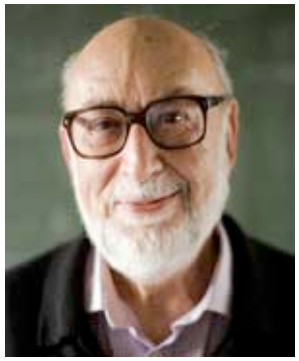
Observation of a New Particle in the Search for the Standard Model Higgs Boson with the ATLAS Detector at the LHC

arXiv: 1207.7214v1.

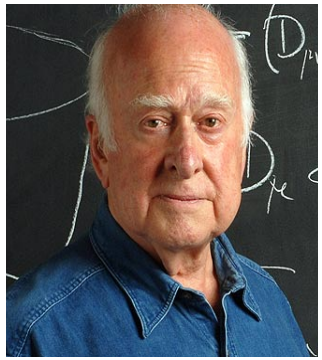
Observation of a New Boson at a Mass of 125 GeV with the CMS Experiment at LHC

arXiv 1207.7235v1

Nobel Prize for Physics 2013



Francois Englert



Peter Higgs

jointly assigned to François Englert and Peter W. Higgs ***"for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider "***

A new, fundamental particle has been discovered.

The Standard Model is now complete.

Many reasons to be happy

When Igor Golutvin told me that JINR was planning to publish a russian version of our paper on the discovery of the Higgs boson at LHC I was very happy for several reasons.

First of all JINR is definitely the most important high energy physics institution in Russia and one of the best in the world.

I consider therefore a great honour and a privilege to see our paper made available to young students.

Secondly I have a very special personal relationship with JINR.

Dubna was the home laboratory of the great Bruno Pontecorvo, born and educated in Pisa, and one of the greatest scientists of the XX century.

Still today our physics department in Pisa, which is is named after E. Fermi, is housed within the industrial complex that was formerly owned by the Pontecorvo family. Bruno, together with Enrico Fermi, is a key figure of reference for every student of our university.

Picture from XVII Annual RDMS CMS Conference

JINR International conference hall, Dubna 2014

Dubna is the host laboratory for RDMS (Russia and Dubna Member States) the collaboration, led by Igor Golutvin, that played a key role in designing the CMS experiment and contributed enormously to the construction and commissioning of key detector components for the muon systems and the calorimetry.

Last but not least Igor is an old friend of mine with whom I have shared this fantastic adventure that is lasting since more than 20 years. Thanks to his outstanding efforts our experiment succeeded in discovering the Higgs boson and is today extremely competitive in the quest for new physics. With the continuous support of Igor and RDMS I am sure that CMS will be also able to face any future challenge.

I do hope that this booklet will contribute to strengthen the long-lasting tradition of successful scientific cooperation between Dubna and Pisa and to educate a new generation of young scientists to address new challenges in exploring matter and the universe.