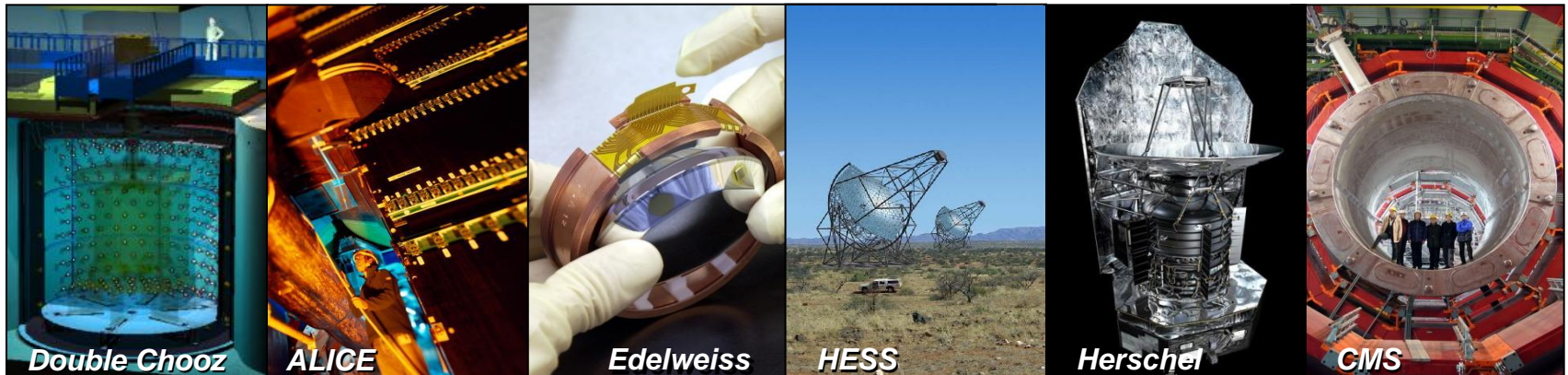
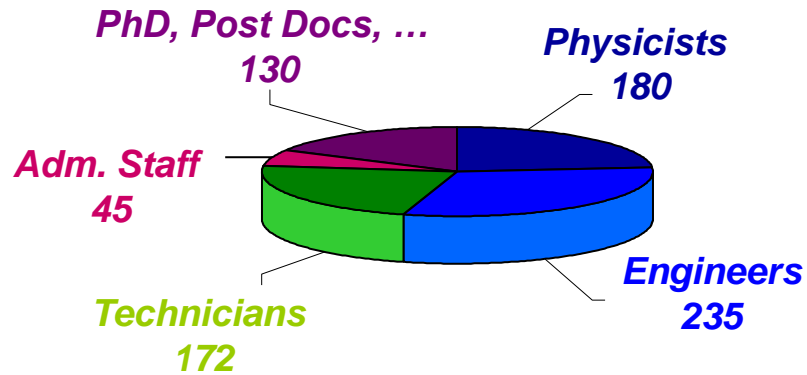


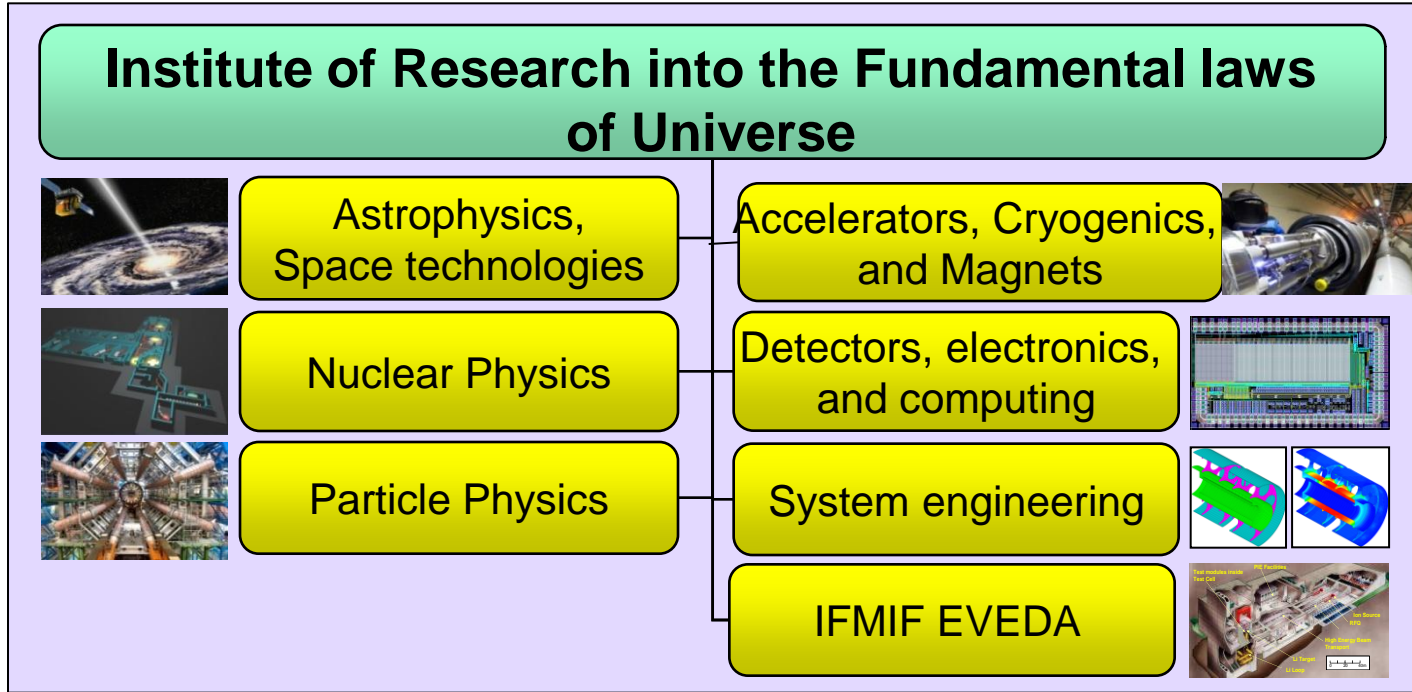
Computational Structural Mechanics and Superconducting Technologies

孫志宏 SUN Zhihong

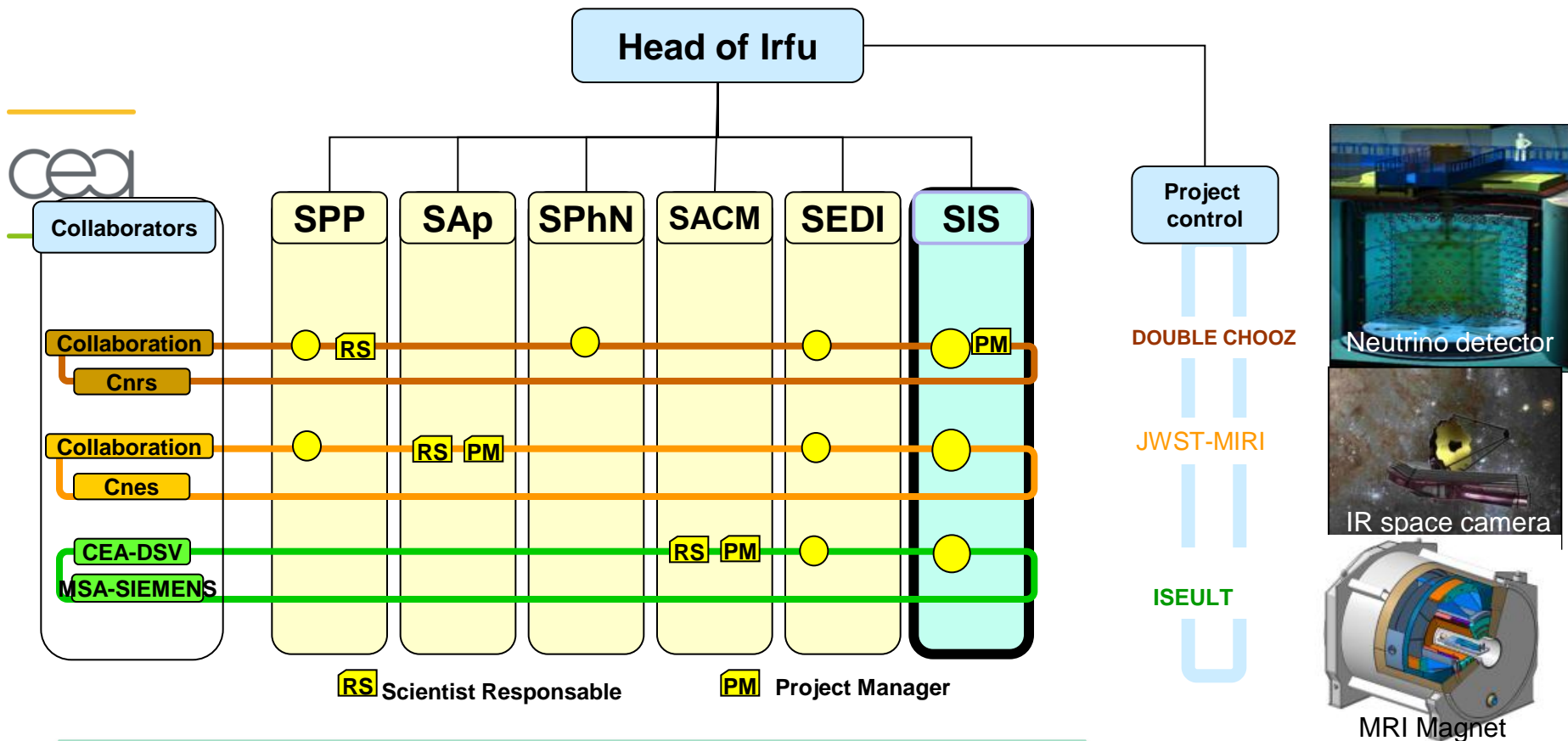




Research and technology

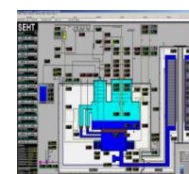


SIS through the project oriented organization in the institute



System Engineering Division (SIS) :

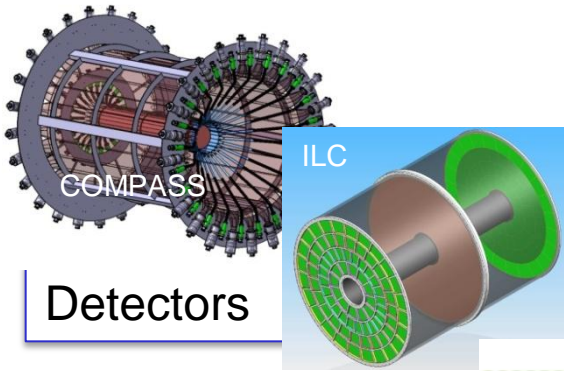
- Design office, Mechanical engineering
- Instrumentation
- Control command and remote supervision
- Project management



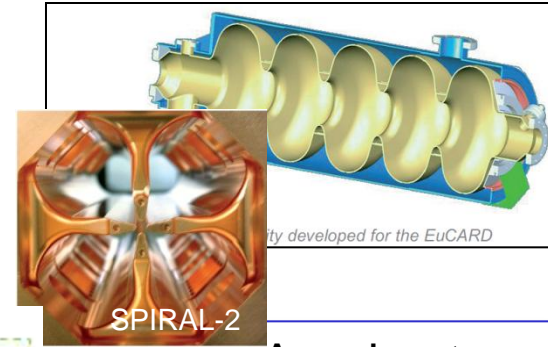
Design Office of System Engineering Division

Mechanical design of innovative systems

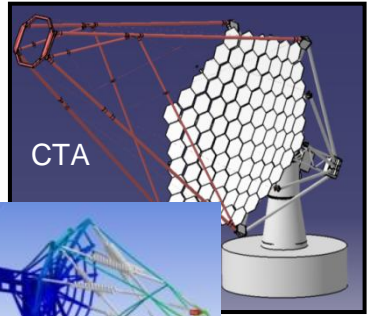
Involved in almost of the projects of the institute



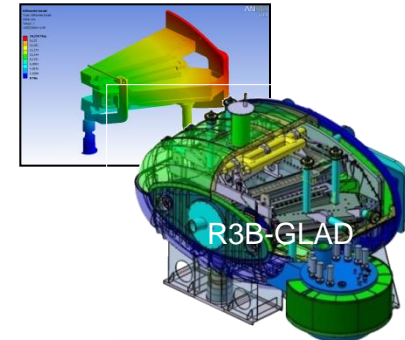
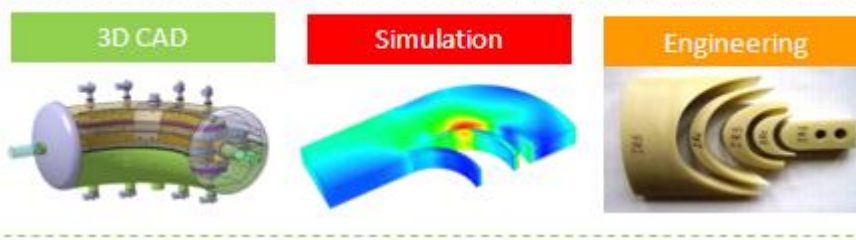
Detectors



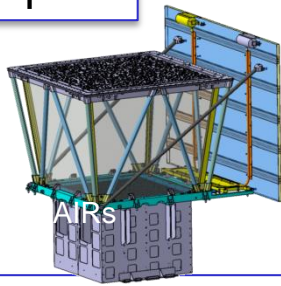
Accelerators



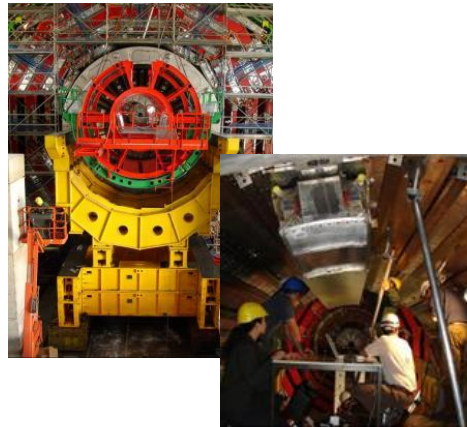
Telescopes



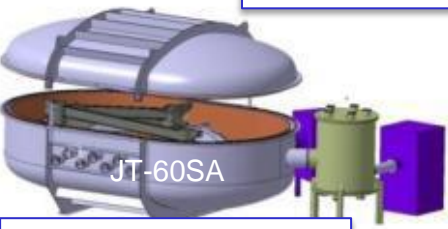
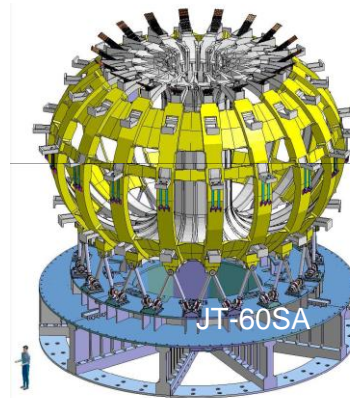
Magnets



Space instruments



Integration tooling

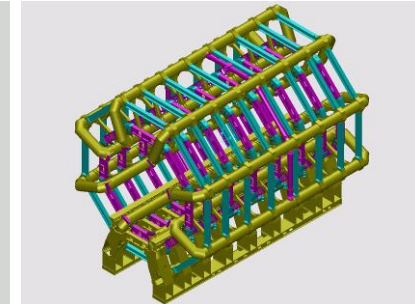
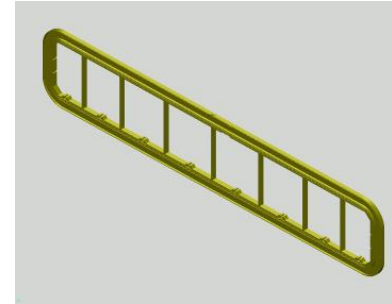


Tests facilities

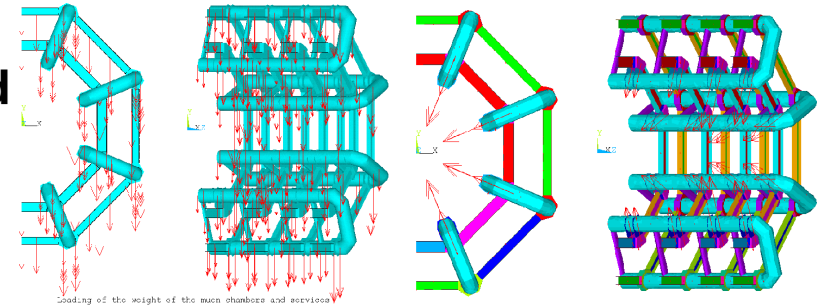
From design to realisation

- Architecture of mechanical systems

- Computer Aided Design (EUCLID, CATIA, SMARTEAM)

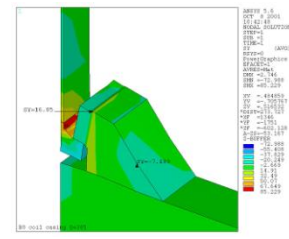
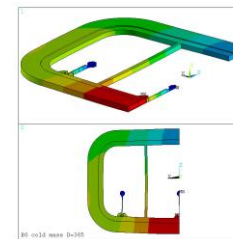


- Computational structural mechanics, simulations of mechanical, thermal and electro - magnetical behaviours (CASTEM, ANSYS) Design optimisation



- Definition of technical specification

- Industrial follow-up

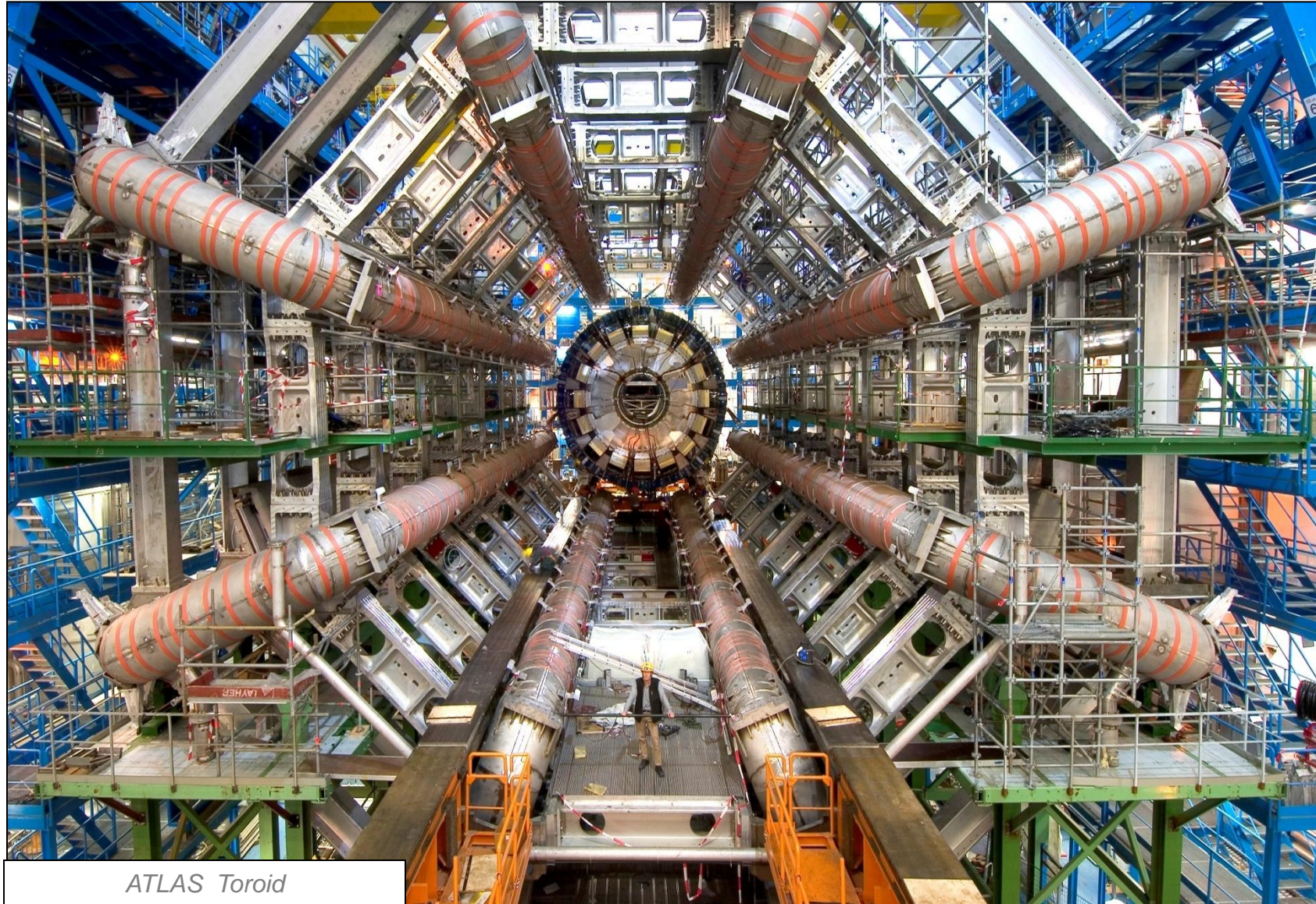


IEEE TRANSACTIONS ON APPLIED SUPERCONDUCTIVITY, VOL. 16, NO. 2, JUNE 2006

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ATLAS Barrel Toroid Warm Structure Design and Manufacturing

Z. Sun, I. Zaitsev, A. Dudarev, A. Foussat, V. Hennion, B. Levesy, M. Massinger, C. Mayri, Y. Pabot, H. ten Kate, and P. Védrine



ATLAS Toroid



Since the creation of the FCPPL, collaborations have been carried out between the two institutes CAS IHEP and CEA Irfu (CEA Saclay) in the two fields on the related technologies:

- Computational Structural Mechanics

(Coordinators: 屈化民 QU Huamin, 孫志宏 SUN Zhihong)

- Superconducting Technologies

(Coordinators: 朱自安 ZHU Zian, Antoine DAËL)

Two divisions of CEA Saclay involved in the collaborations: SIS (Systems Engineering) division and the SACM (Accelerators, Cryogenics and Magnetism) division.

Activities within the framework of FCPPL

Visits, exchanges between senior physicists and engineers:



-Visit of ZHU Zian of IHEP at Saclay, 2007.

- Visit of A. Daël, P. Ponsot, F. Nunio and Z. Sun of CEA Irfu at IHEP, 2009. Warmly received by 高杰 GAO Jie, ZHU Zian and QU Huamin.

王建力 WANG Jianli, mechanical engineer of the IHEP accelerator centre, made one year's visit in the design office of CEA Irfu, 2007 – 2008.

WANG Jianli mainly worked on the computational mechanics through finite element analysis of the two projects: R3B-Glad and CTA (Cherenkov Telescope Array).



The Final Design of the R3B-GLAD Cold Mass Assembly and Manufacturing Status

CEA Saclay, Irfu, France

Z. Sun, P. Graffin, G. Disset, S. Cazaux, A. Daël, P. Daniel-Thomas, B. Gastineau, J.P. Lottin, M. Massinger, C. Mayri, F. Nunio, C. Pès, L. Scola

CAS, IHEP, China

J. Wang

This work is in the framework of FAIR Project at GSI and within NUSTAR physics program.

Zhihong SUN, CEA Saclay, Irfu, France Paper 2AO-06 MT-21, Hefei, October 20, 2009

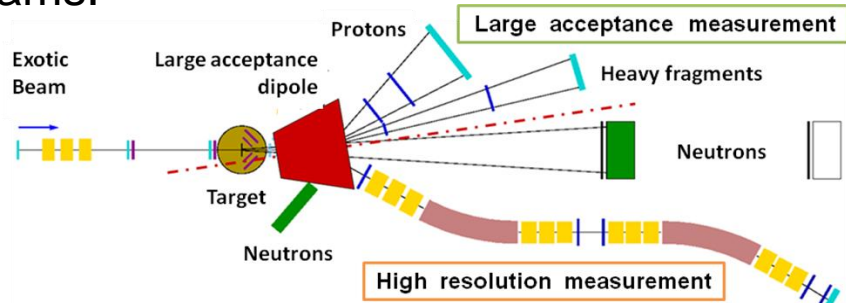


R3B-GLAD

The R3B-Glad is a superconducting Magnet that provides the field required for a large acceptance spectrometer, dedicated to the analysis of Reactions with Relativistic Radioactive ions Beams.

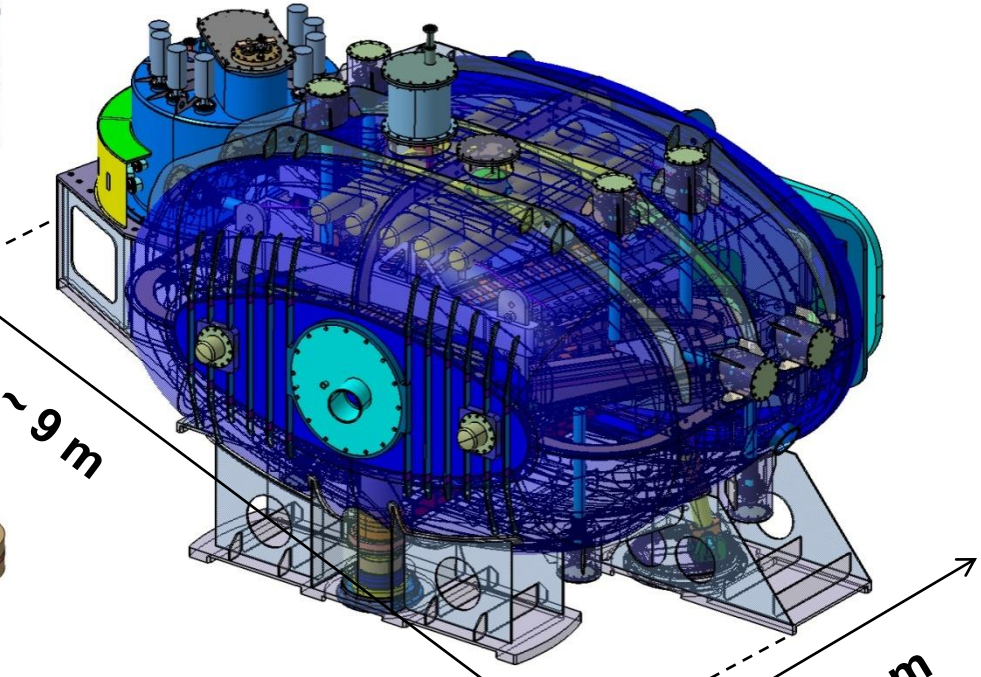
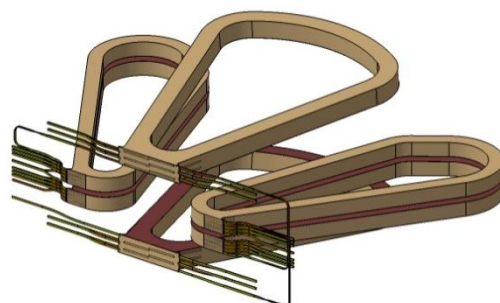
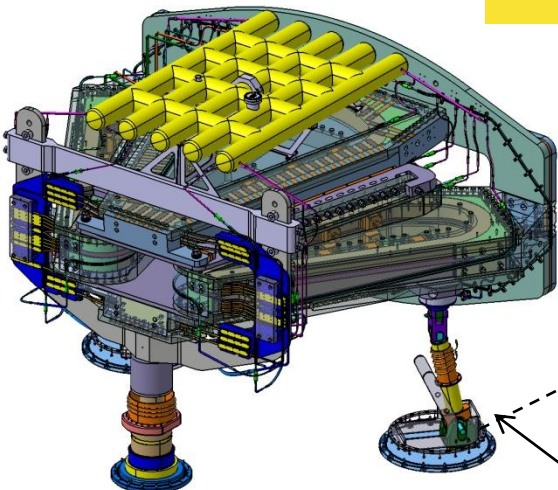


GSI
FAIR



- Cable**
Rutherford
Cu-NbTi

17 km, 5.2 tons
- Cold mass**
Al 5083
22 tons
- Thermosiphon**
Liq-Helium 4.6 K
- Magnet** ~ 60 t
- Active shielding**





THE CONSTRUCTION OF THE MAGNET

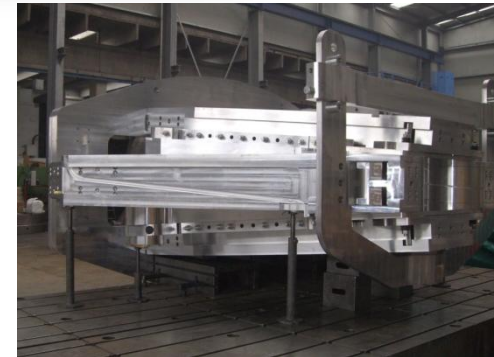
- **Reduced-scale coil test in Saclay:**

A reduced-scale $(1/2)^3$ model of a main coil with casing has been tested at Saclay. The aim is to validate the indirect cooling at 4,6 K and the mechanical blocking system of the coil in its casing by differential thermal shrinkage.



- **Cold mass manufacturing:**

The manufacturing of the coils, mechanical parts of the cold mass & windings of the coils have been performed in Genoa by *ASG superconductors S.p.A.*, the delivery at Saclay was in Dec. 2010.



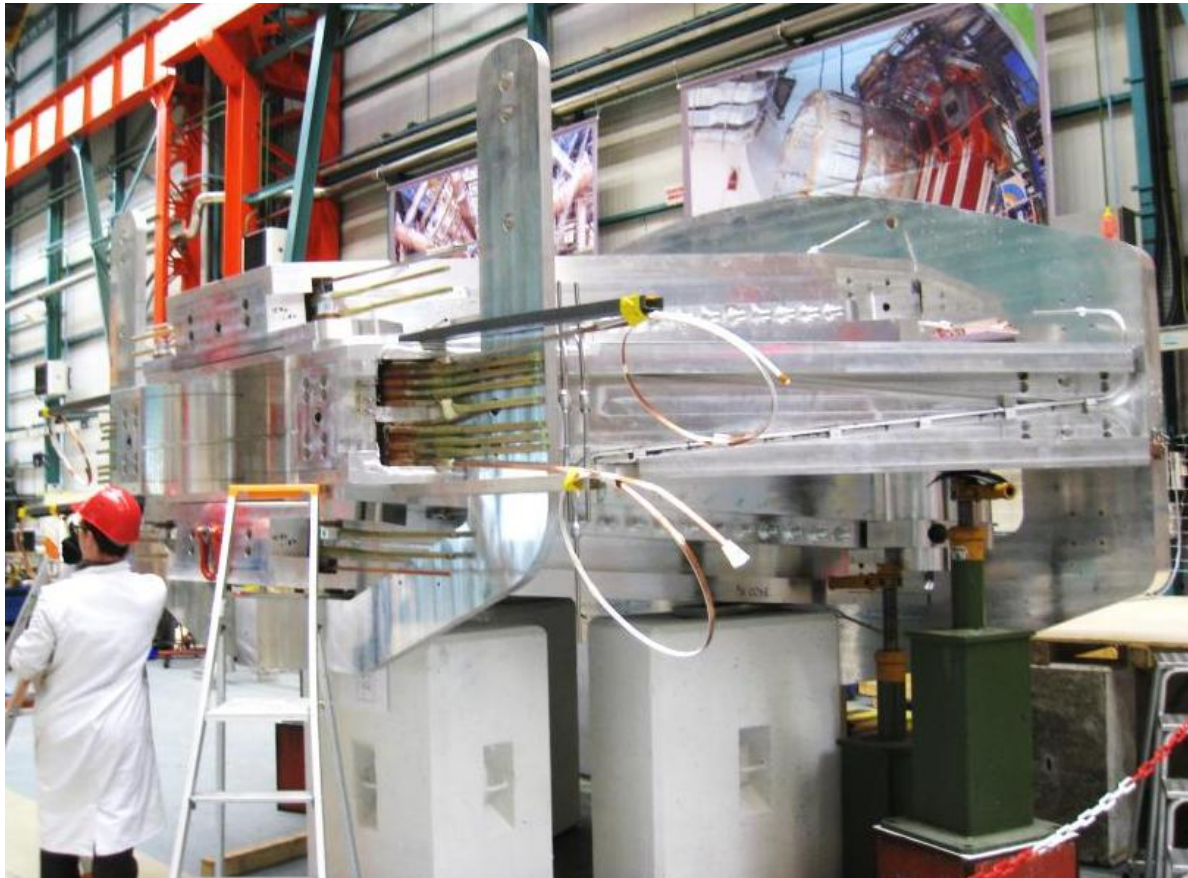
- **Cold mass assembly at Saclay:**

The cables have been stabilized at the exit of the coils & the connections between double pancakes are soldered and insulated. Liquid helium cooling pipes have been installed on the coil casings.





Cold mass assembly is undergoing at Saclay:

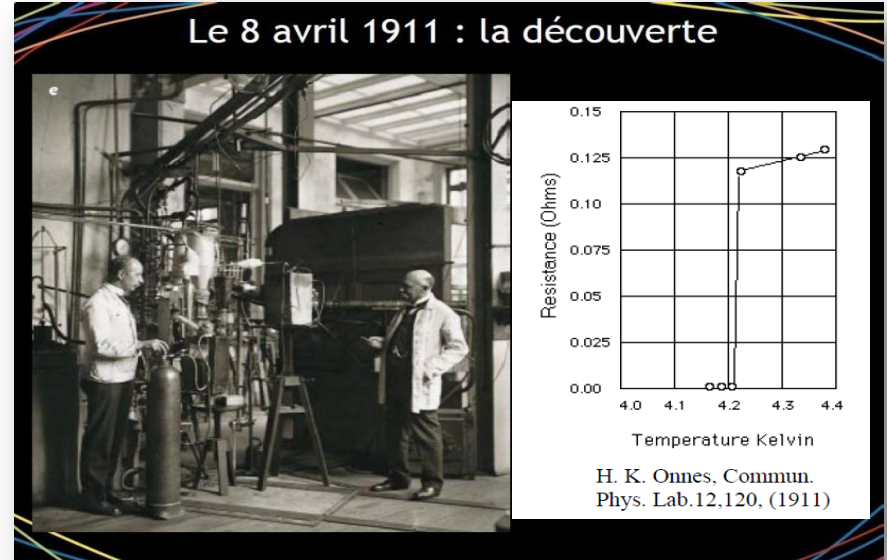


Conclusion



Let's celebrate today,
Chinese and French
colleagues, the 100 Years
of Superconductivity.

The date of the discovery was
8 April 1911.



Continue collaborations in the fields of computational structural mechanics and superconducting technologies.

Provide expertise in the mechanical design of the instruments at the service of physics.

Thanks for the warm welcome and hospitality.
All the best wishes for a great future of FCPPL.