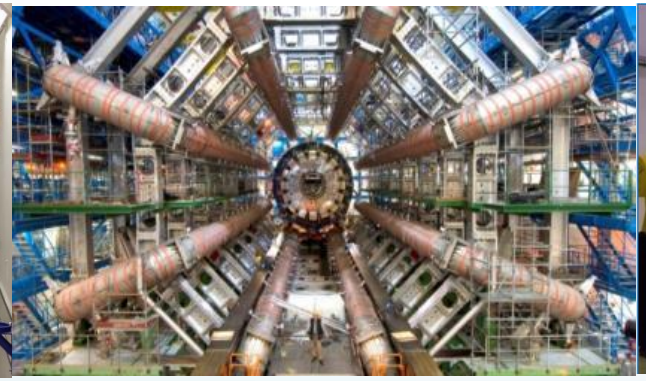
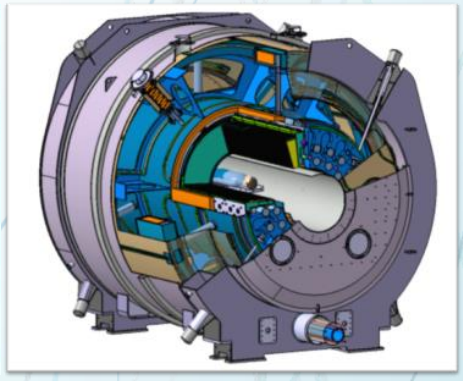
DE LA RECHERCHE À L'INDUSTRIE

cea

The CEA





www.cea.fr

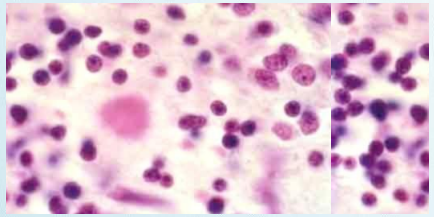
CEA expertise and know-how

French nuclear deterrent

French nuclear power plant fleet

Reprocessing of spent fuel *(world first)*

Vitrification of nuclear waste *(disposal management)*



First French CT scanner

Mad cow disease: European screening test

First rapid Ebola screening test

First gene therapy for Parkinson's disease and beta-thalassemia *(hereditary blood disease)*

Flat screen technology

Airbag deployment system

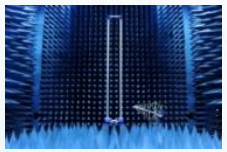
Ultrasound inspection of automotive, aerospace and nuclear parts

Superconducting magnets and Atlas and CMS experiments at CERN

Pollution cleanup technology using supercritical fluids *(green chemistry)*

The CEA - Location and figures

- 9 Research centers in France
- 5 Regional platforms for technology transfer

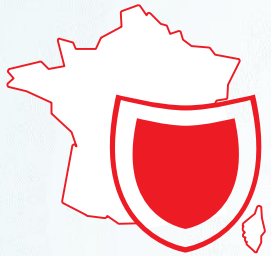
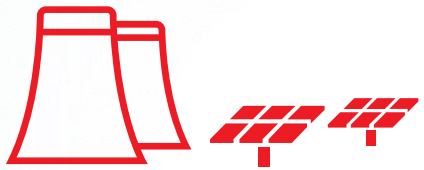


16,000 employees

1,400 doctoral students and post-docs

Participation in major university clusters

Leader of strategic missions for the future

DAM	DEN	DRT	DRF
			
Defence and security	**Nuclear and renewable energy**	**Technology research**	**Fundamental research**

Reuters has published a ranking of the most innovative research agencies:

1. Alternative Energies and Atomic Energy Commission (France)
2. Fraunhofer Society (Germany)
3. ……

IRFU

FUNDAMENTAL RESEARCH DIVISION (2016)

MAIN FIGURES

630 M€
budget

3500
scientific publications/year

42
joint labs

83
European Research Council grants since 2007
(over 1200 scientists)

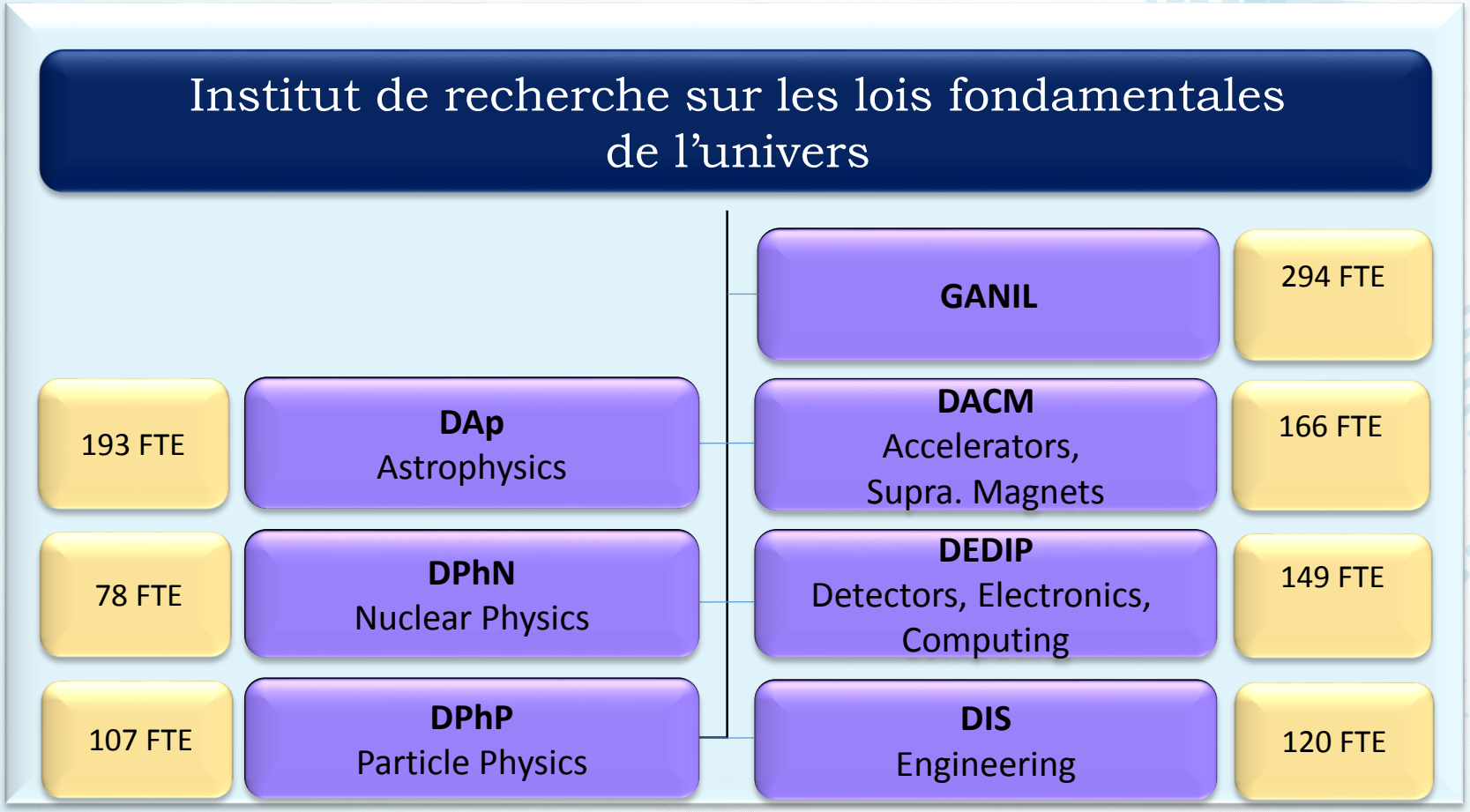
6300 staff
Among which:
- 3500 permanent CEA staff
- 1200 University, CNRS and INSERM staff
- 700 PhD (50% foreigners)
- 900 post-doc and non permanent

230
research contracts with industrials

566
active patents

33
startups since 2000

Irfu: an Institute of DRF



~1140 FTE

~713 Permanent CEA

- 17 ERC
- 970 publications
- 93 PhD 's
- 65 active patents

Research in Physics in link with large scale facilities

- Researches into the fundamental laws of the Universe
  - What are the ultimate constituents of matter?
  - What is the energy content of the Universe?
  - How is the Universe structured?
  - What are nuclear matter self-organisation processes?
- Important developments and platforms in key technologies
  - Accelerator, superconducting magnets, detectors, space devices
  - Key actor for the large international projects in physics
  - Know how used for other domains (health, energy,..)

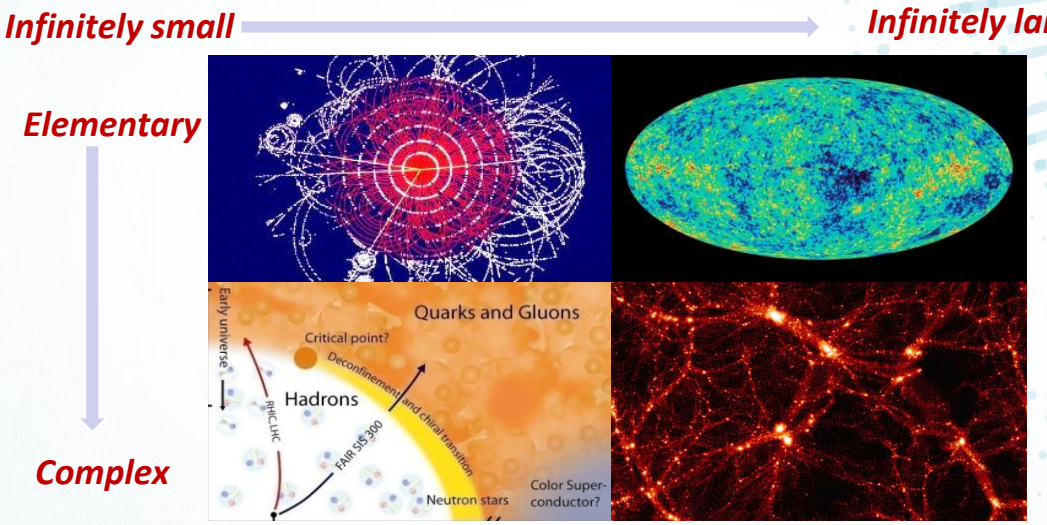
Research in Physics

What are the ultimate constituents of matter ?

- *LHC (ATLAS, CMS)*
- ***Neutrinos*** *(accelerator, reactor)*

What is the energy content of the Universe ?

- *Dark matter & energy (CTA, DESI, EUCLID)*
- *Antimatter (GBAR)*



What are the origins of particles and nuclei ?

- ***Exotic nuclei*** *(Riken, Ganil)*
- ***QGP*** *(Alice)*
- ***Structure*** *(Compass, Clas12, EIC,* ***Panda X3****)*

What are the origin and structure of the Universe ?

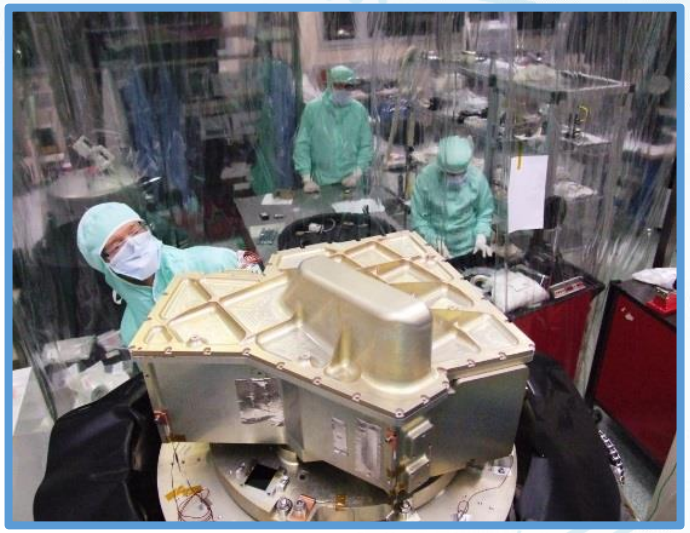
- *Star and galaxies (Artemis, JWST, ELT)*
- *Planets (Solar Orbiter, Plato)*
- *Violent phenomena (SVOM, ATHENA)* ***ARIEL (NEW !)***

Large platforms @ Saclay (50 000 m²)

DETECTORS

Large micromegas detectors integration and tests (LHC UPGRADES)

Clean room - 130m²



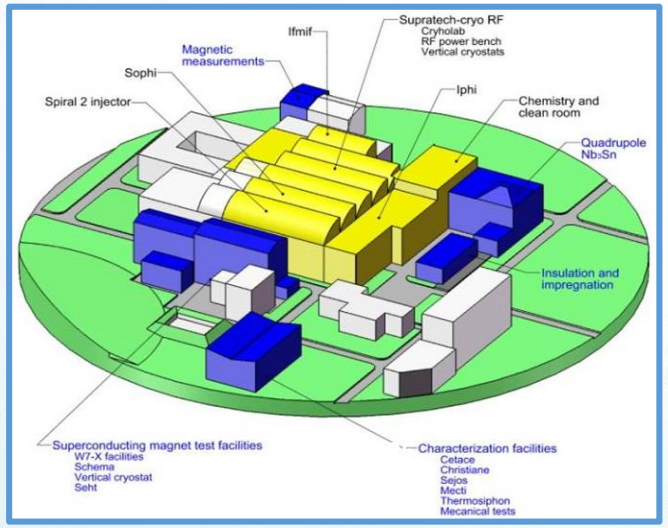
SPACE

Clean rooms for space instruments integration and tests

Magnets and accelerators

Synergium - 25 000m²

Integration halls, clean rooms cryostats



Computing

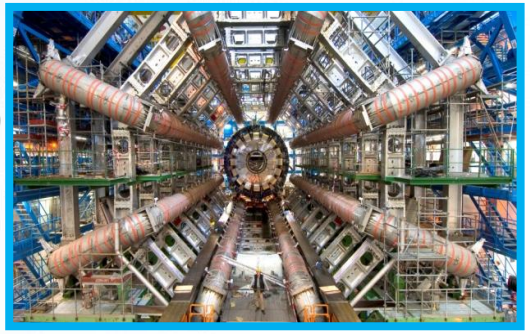
HPC cluster

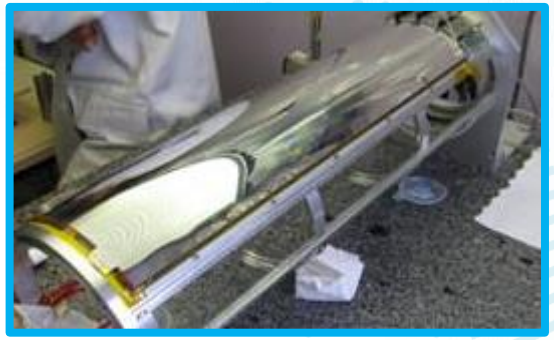
Node of Grid@LHC

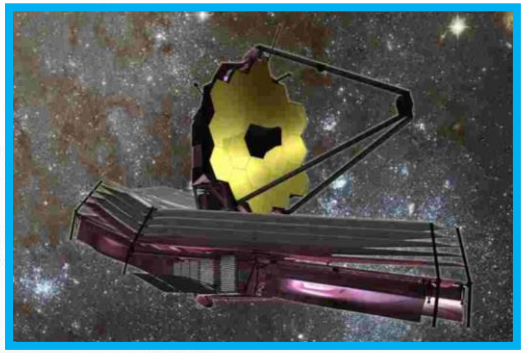
Inventing and constructing new devices

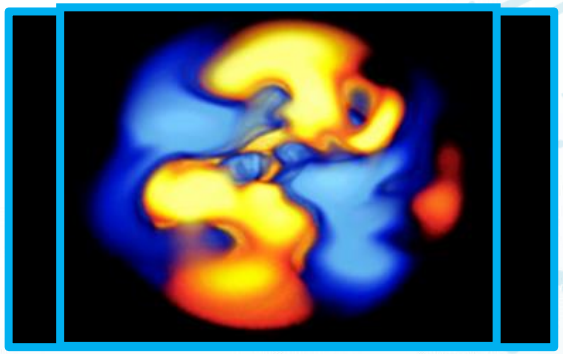
Accelerator and superconducting magnets

- *ESS (RFQ, cryomodules)*
- *FAIR (proton Linac, magnets)*
- *Saraf (Linac)*
- *Spiral2 (Source, RFQ, cryomodules)*
- *HL-LHC, FCC (magnets)*
- *Fusion projects*
- *MRI magnets (11.7 T)*









Observing : spatial devices

- *Camera, spectroimaging*
- *cryomechanisms*

Detecting

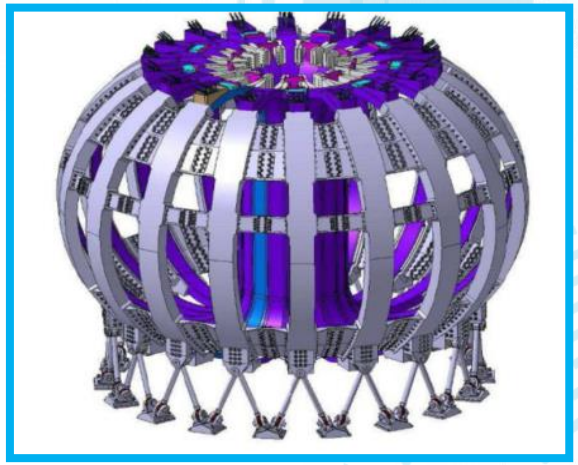
- *Gaseous detectors (Micromegas)*
- *Solid detectors (bolometers)*
- *Electronics (ASICS)*

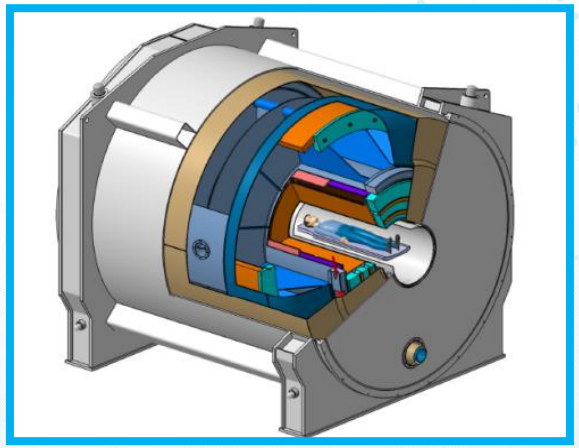
Simulating

- *HPC*
- *Grid*

Applying research and technologies

Fusion *(broader approach: IFMIF, JT60-SA; ITER)* - CEA was designated by the French Government to represent France into this approach





Light sources *(major contribution to XFEL, ESS)* ***Health:*** *MRI (11.7 T Magnet Iseult), detectors*

DRF and IRFU with China: a very fruitful collaboration

Publications with China: 165/year (China 4th partner outside Europe)

Collaborations:

- Particle Physics (LIA FC PPL), MOU GANIL/CAS and an LIA ?
- 0υββ Worldwide Efforts
- SVOM Space mission IRFU/CAS (NAOC, SECM,XIOPM) : gamma bursts (Space variable Objects Monitor)
- Climate Change: LIA Monocle (Monsoon Ocean Climate)
- Theory Physics CEA-IpHT/CSRC
- Vegetal biology (LIA with Tsinghua university)

Many H2020 /and national call projects

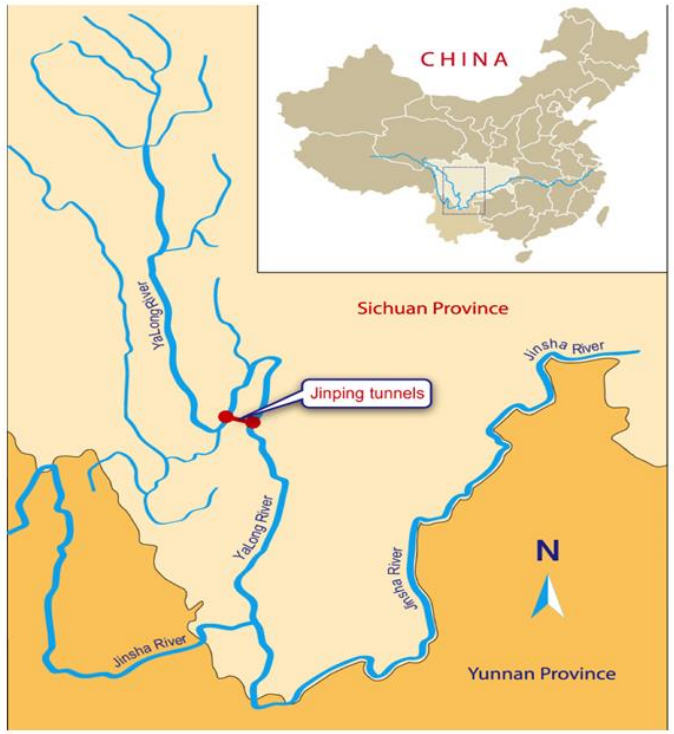
DRF in China: a very fruitful collaboration

Major Programs: Fusion : CEA and MOST have signed a MOU (SIFFER) concerning fusion activities (**WEST project**) see below……

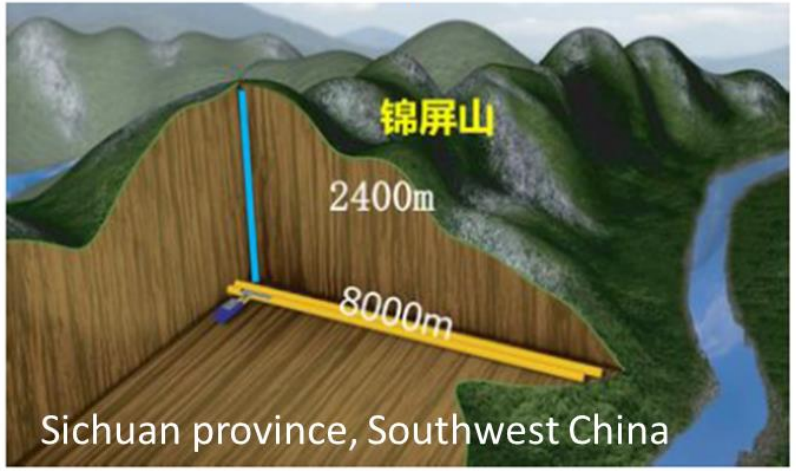
`强调今天双方值第四次中法高级别人文交流对话之际，在中国科技部副部长和法国欧洲与外交事务部长的见证下，签署了《关于创建中法聚变联合研究中心的合作框架协议（SIFFER）》，标志着双方加强合作的重要一步。双方今后将共同利用核聚变研发领域的资源、技能和能力，为更有效应对聚变科学技术重大挑战做出重要贡献。

On **March 14, 2018, Professor Xi Wang,** Director of the Zhangjiang Laboratory, Shanghai Chinese Research Institute, and Christophe Gégout, Deputy General Administrator of CEA, signed an agreement to initiate collaboration in communication technologies and information and in life sciences.

PandaX-III at the China JinPing Underground Lab



Panda X-III will be installed at the Jinping Underground Lab (deepest in the world - 1μ/week/m²)



The cosmic ray rate is under 0.2 muons/m²/day making it the best-shielded underground laboratory in the world

Next Tuesday we are arriving in Shanghai : SJTU and SINAP

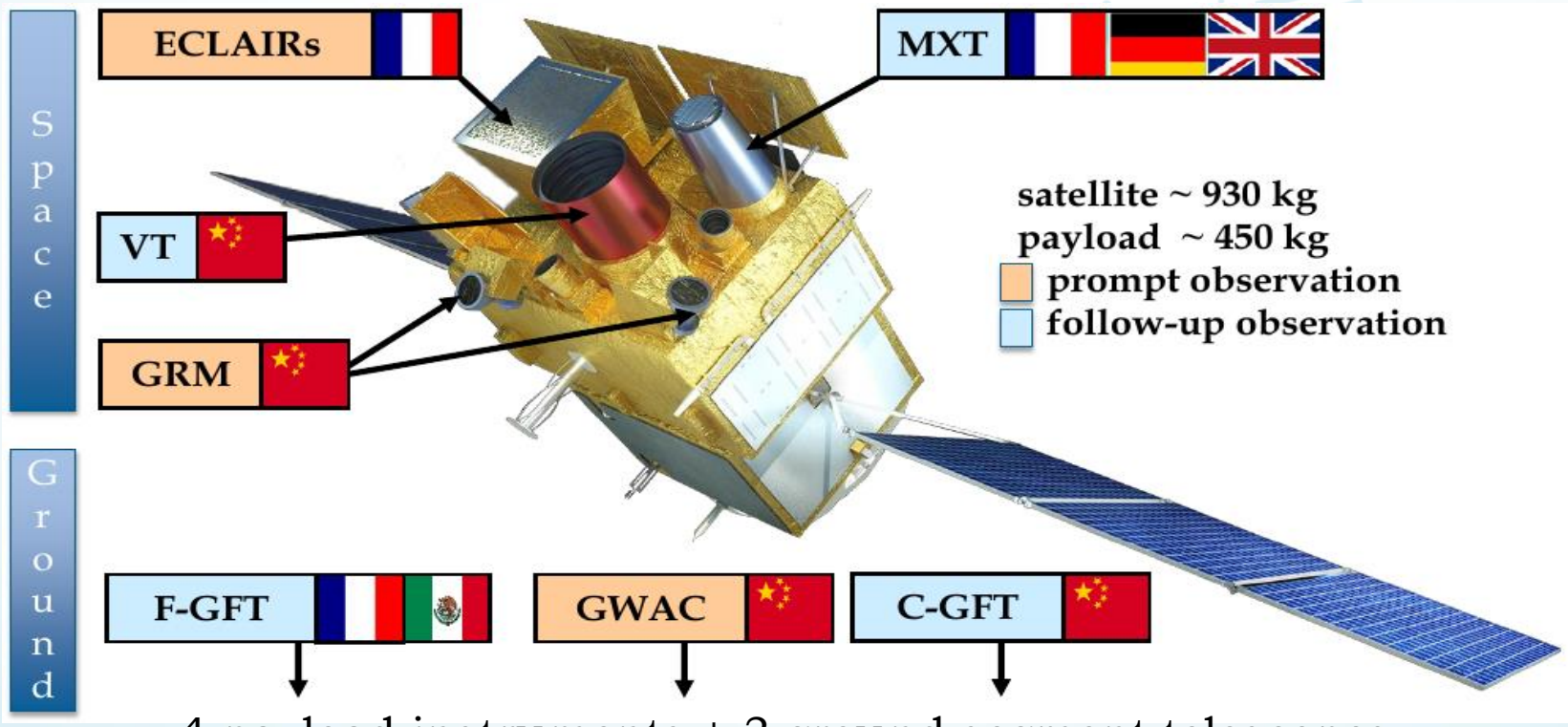
Exchanges with SINAP on the Shanghai X-ray FEL Facility

Next Tuesday we are arriving in Shanghai : SJTU and SINAP

The SVOM mission

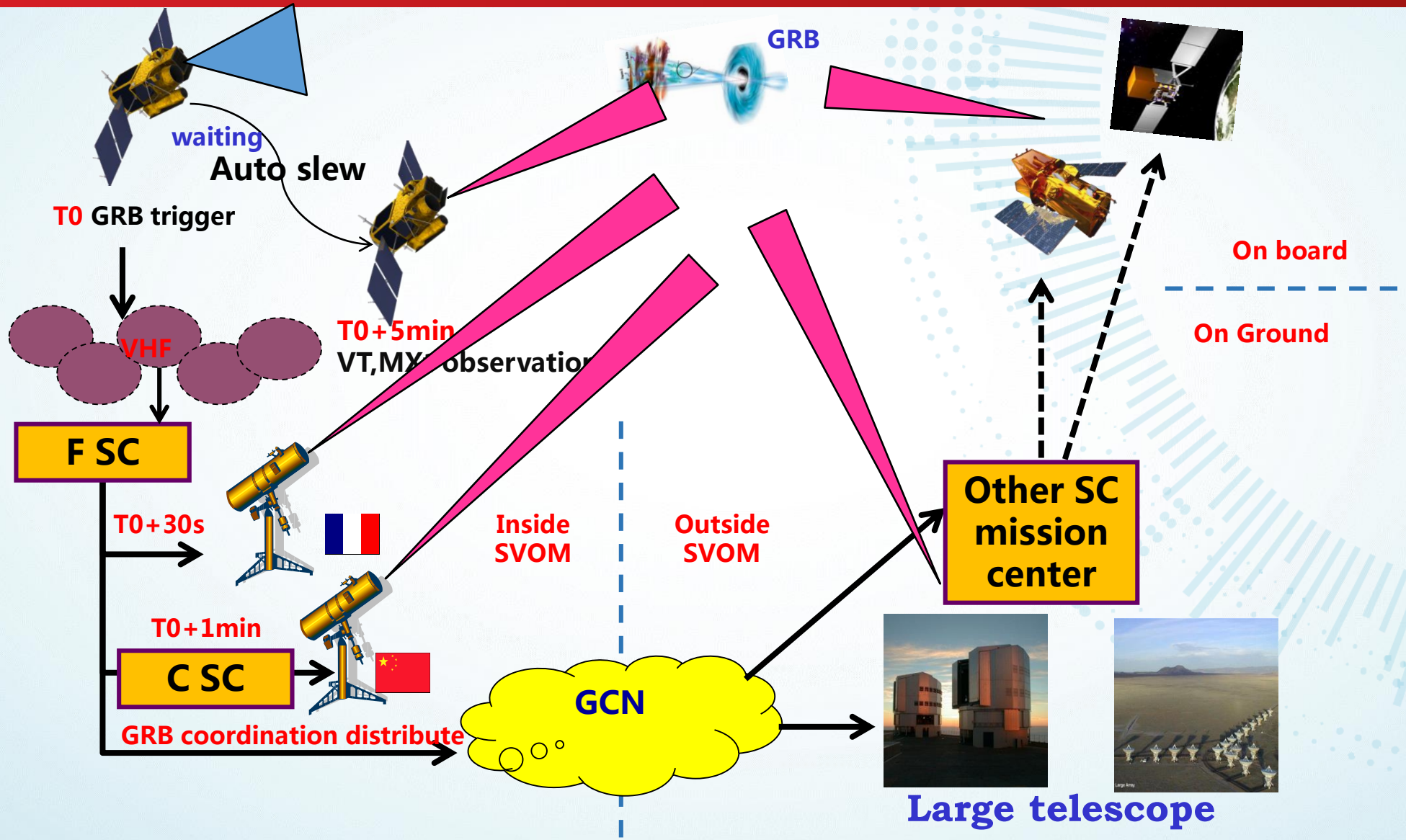
SVOM = **S**pace-based multiband astronomical **V**ariable **O**bjects **M**onitor
SVOM is a **Chinese-French** space mission dedicated to the detection and study of **Gamma-Ray Bursts** and their use for astrophysics and cosmology.

Launch in Dec. 2021, for 3+2 years



4 payload instruments + 3 ground segment telescopes

GRB Observation scenario



The SVOM consortium

- **China**
  SECM Shanghai
  NAOC Beijing
  IHEP Beijing
  Nanjing University

- **Mexico** UNAM

- **UK** University of Leicester

- **Germany** MPE Garching

- **France**
  CNES Toulouse
  APC Paris
  CPPM Marseille
  GEPI Meudon
  IAP Paris

- **France**
  IRAP Toulouse
  IRFU Saclay
  LAL Orsay
  LAM Marseille
  LUPM Montpellier
  OAS Strasbourg

IRFU Contributions

PI-ship of the SVOM mission for the French part

PI-ship of the X-ray telescope MXT

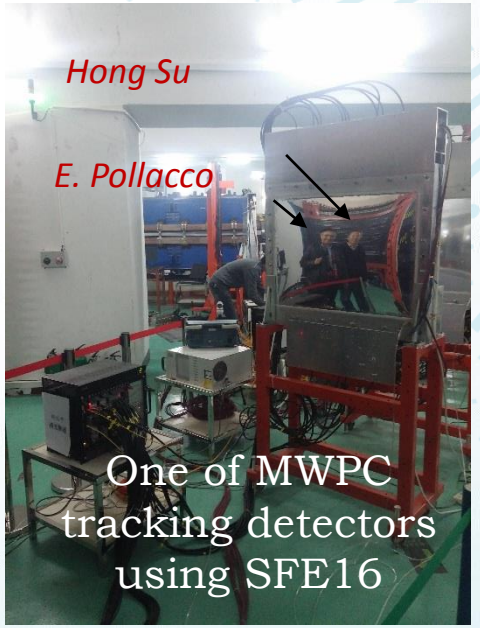
PI-ship of the French Scientific Ground Segment
including the alert network

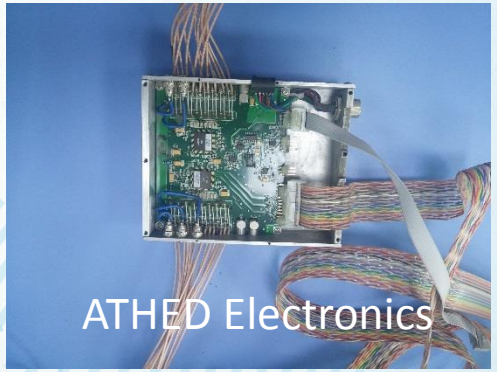
TOTAL : 79.5 FTE

Collaboration between IMP Lanzhou and IRFU/DEDIP

- Started in 2007 after the visit of **Wenlong Zhan**
- Current step: use of AGET chips for TPC / Also used by ACAS for PANDA-XIII experiment

Success story of the use of Saclay's Asics related on poster sticked in a the IMP building

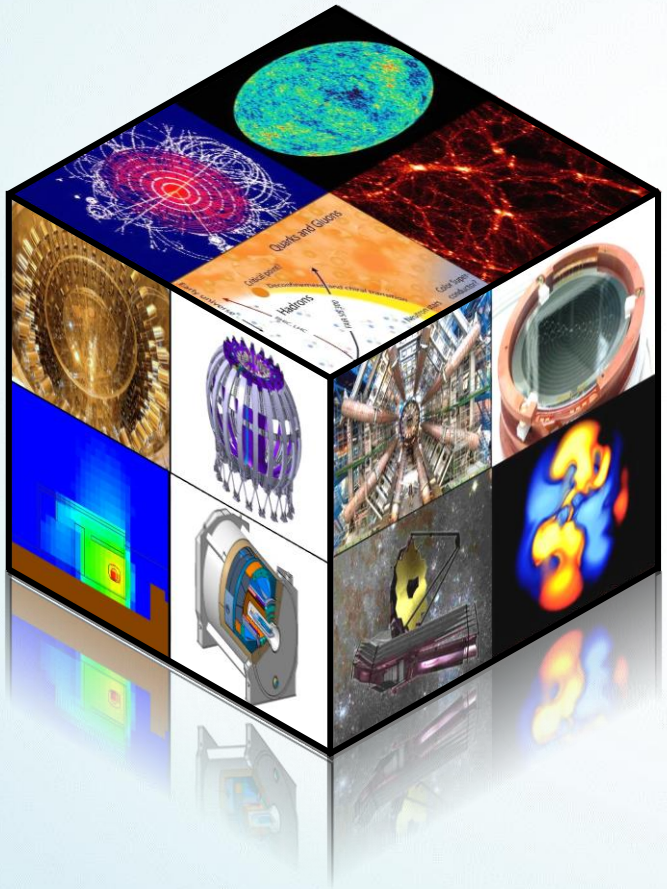




Fanny Farget

Wenlong Zhan

Hongwei Zhao



Thank you for your attention