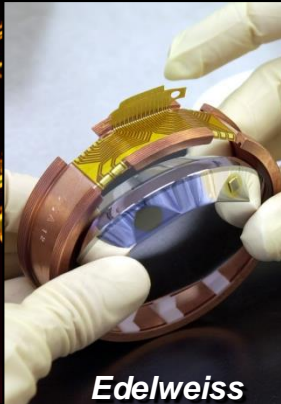


# FALL 2014 EPICS COLLABORATION MEETING

2014 - IRFU



**Director: Philippe Chomaz**  
**Assistant: Josiane Parnas**  
**Deputy: Nicolas Alamanos**  
**Marie-Cécile AUBERT**

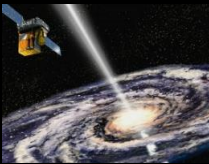
**Larsim**  
 Research on sciences matter lab  
**Etienne Klein**

**Assistants**

<b>Quality &amp; Environment</b>	<b>Emmanuelle Bougamont</b>
<b>Project</b>	<b>Philippe Bourgeois</b>
<b>Communication</b>	<b>Sophie Kerhoas-Cavata</b>
<b>Budget</b>	<b>Nathalie Judas</b>
<b>Europe Programs</b>	<b>Sylvie Leray</b>
<b>Industrial Partnerships</b>	<b>Christine Porcheray</b>
<b>Human Resources</b>	<b>Christine Tiquet</b>

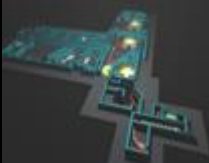
**Delegates**

<b>Continuing education</b>	<b>Emmanuelle Bougamont</b>
<b>Computing &amp; Simulation</b>	<b>Allan-Sacha Brun</b>
<b>Evaluation</b>	<b>Pascal Debu</b>
<b>Safety</b>	<b>Alain Le Saux</b>
<b>Computing ressources</b>	<b>Michel Mur</b>
<b>PhD Students</b>	<b>Jérôme Rodriguez</b>
<b>Scientific Information</b>	<b>Angèle Séné</b>
<b>In-kind follow-up</b>	<b>Antoine Dael</b>



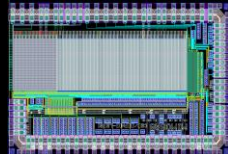
**Sap**  
 Astrophysics and  
 Space Technologies  
**Anne Decourchelle**  
*Dep. Head: Michel Talvard*

**SACM**  
 Accelerators, Cryogenics  
 and Magnetism  
**Pierre Védrine**  
*Dep. Head: Philippe Chesny*



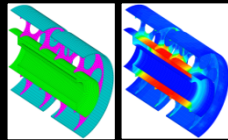
**SPhN**  
 Nuclear Physics  
**Héloïse Goutte**  
*Dep. Head: Jacques Ball*

**Sedi**  
 Detectors, Electronics  
 and Computing  
**Eric Delagnes**  
*Dep. Head: Philippe Bourgeois*

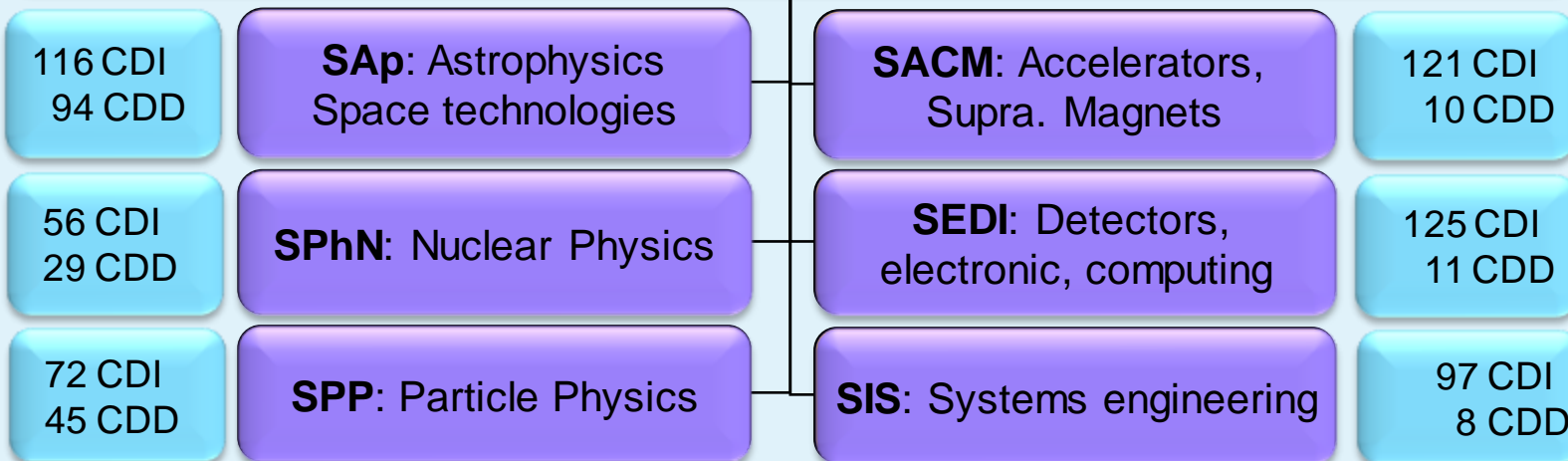


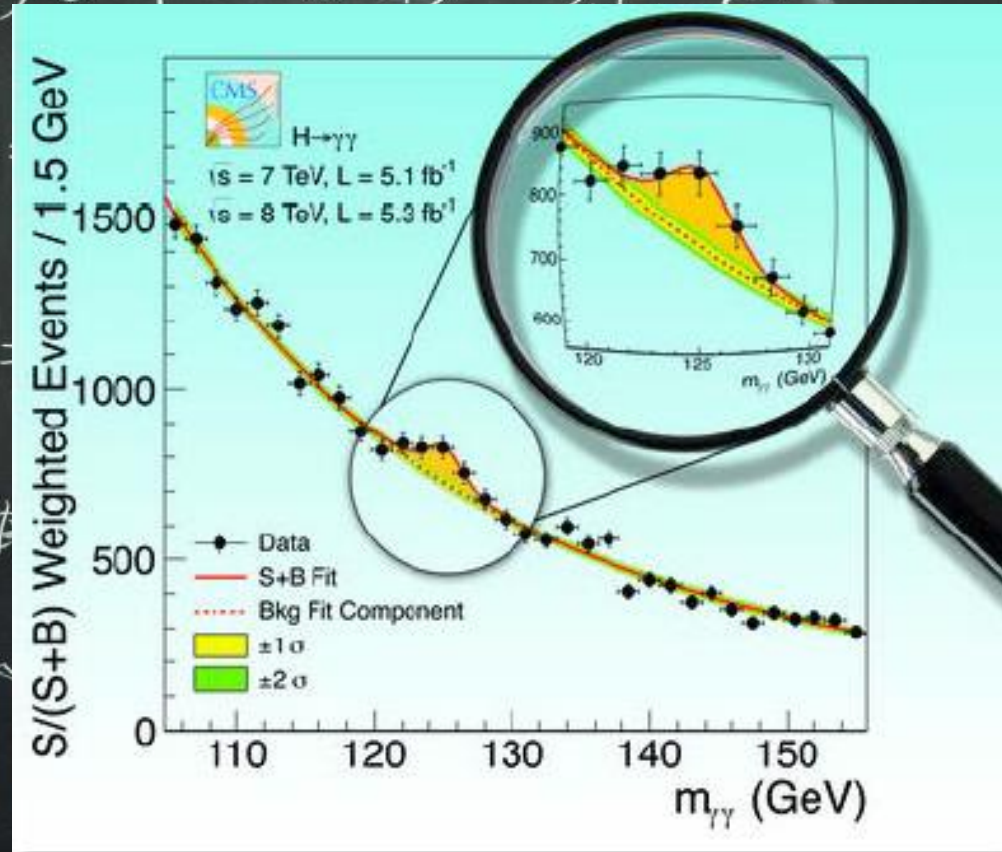
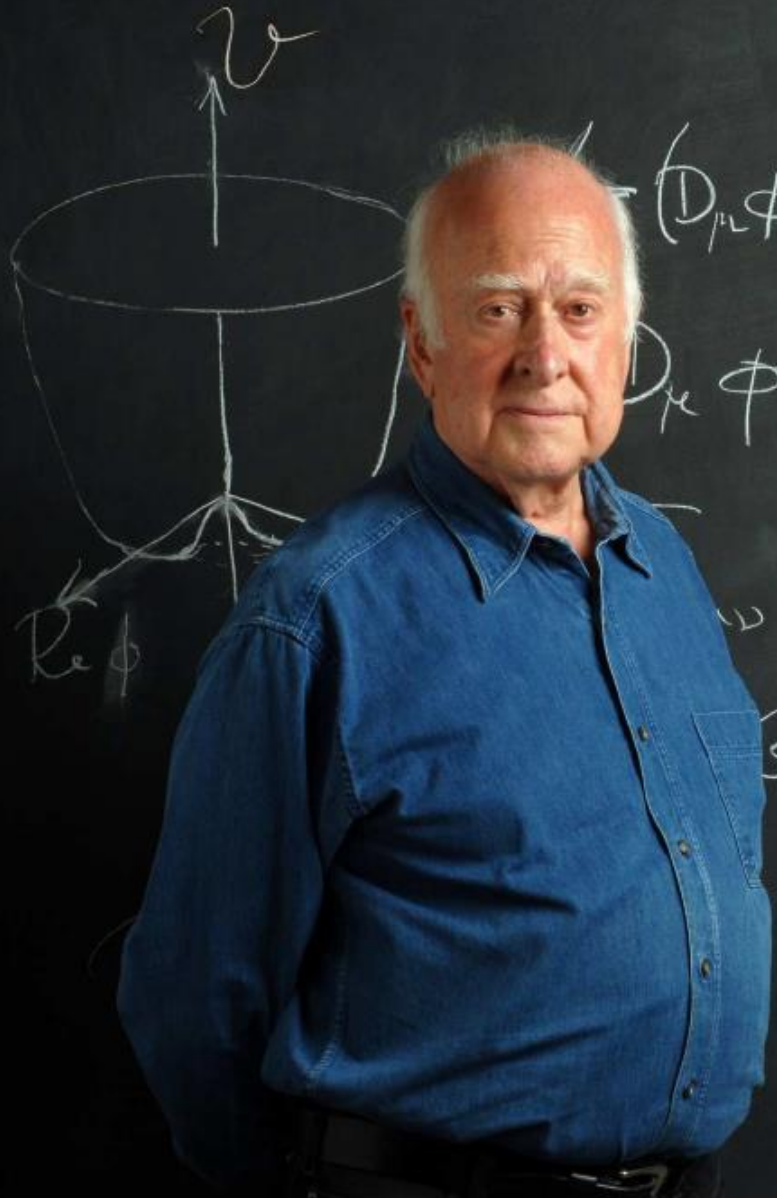
**SPP**  
 Particle Physics  
**Anne-Isabelle Etievre**  
*Dep. Head: Georges Vasseur*

**SIS**  
 Mechanical Design  
 and System Engineering  
**Florence Ardellier**  
*Dep. Head: Frédéric Molinié*



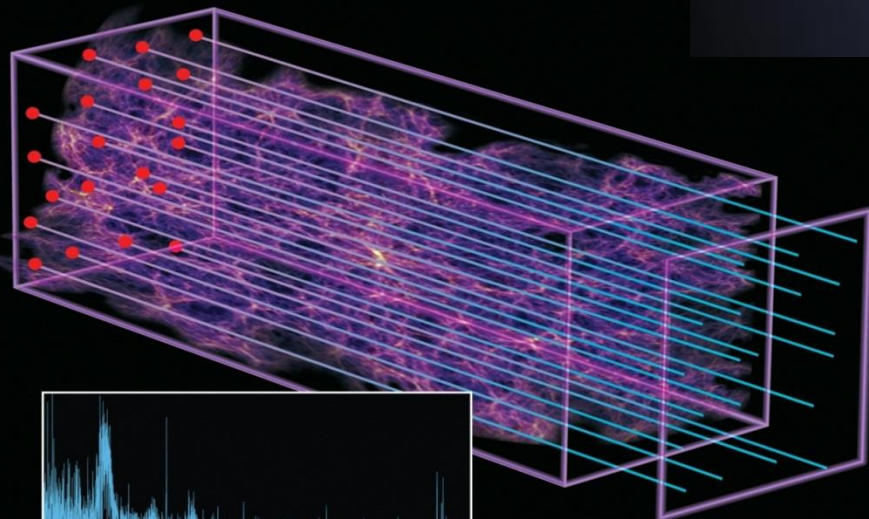
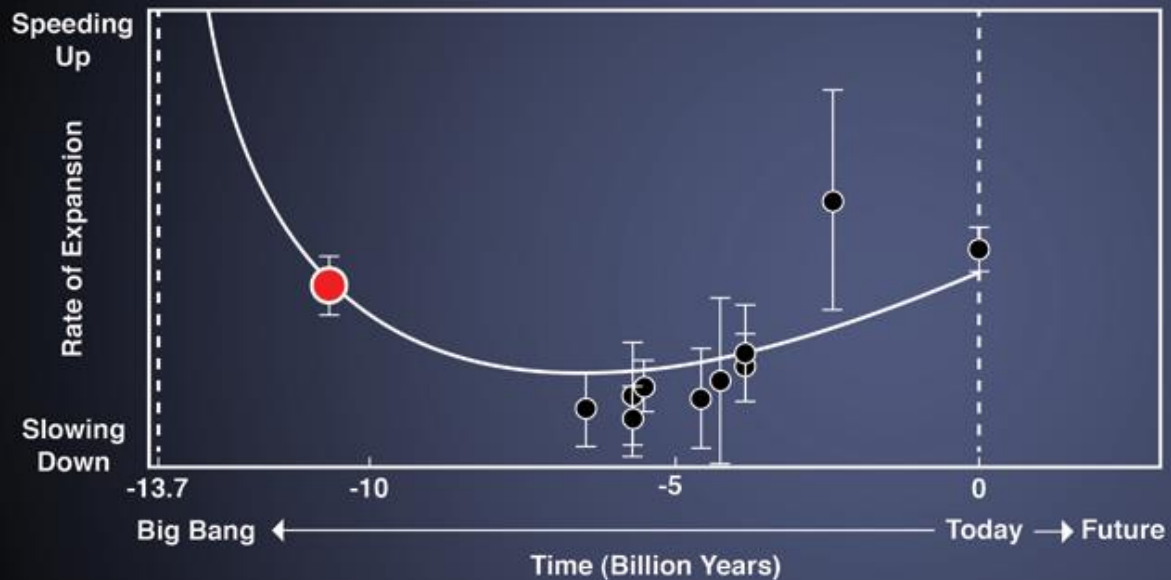
## Institute of Research into the Fundamental laws of Universe





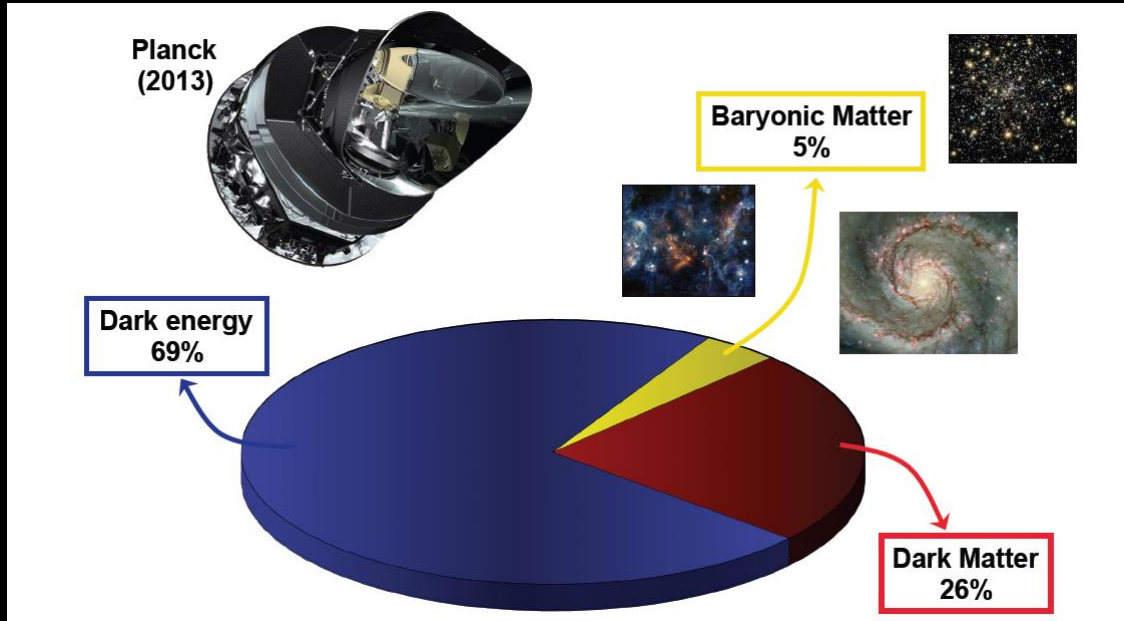


First observation of  
Baryon Acoustic  
Oscillations (BAO) in  
intergalactic hydrogen  
clouds.....



Observation of  
the deceleration  
of the expansion  
of the Universe  
11 billion years  
ago





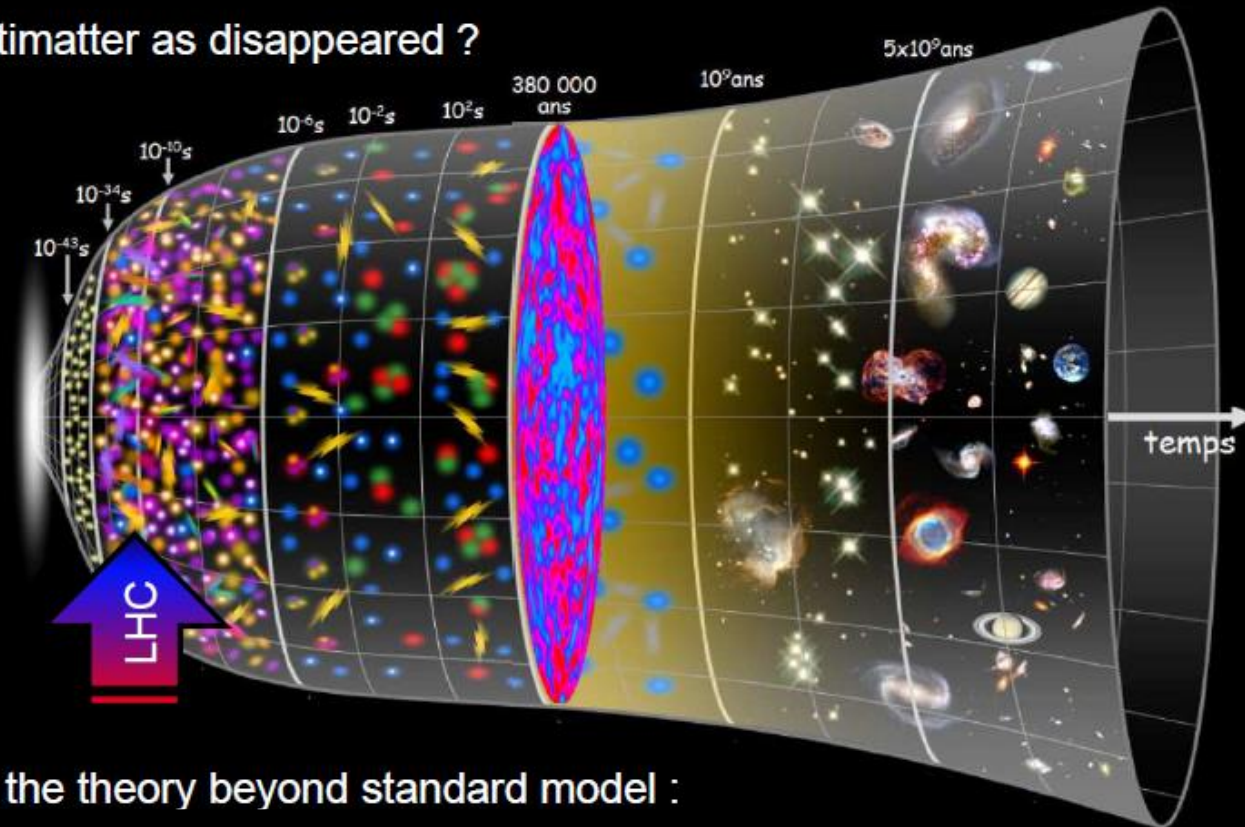
Explicit appearance of a neutrino flavor from neutrinos of another flavor through neutrino oscillations

# THE BIG PICTURE: STANDARD MODEL INCOMPLETE

Why the Universe is Accelerating ?

What the Dark Matter made of ?

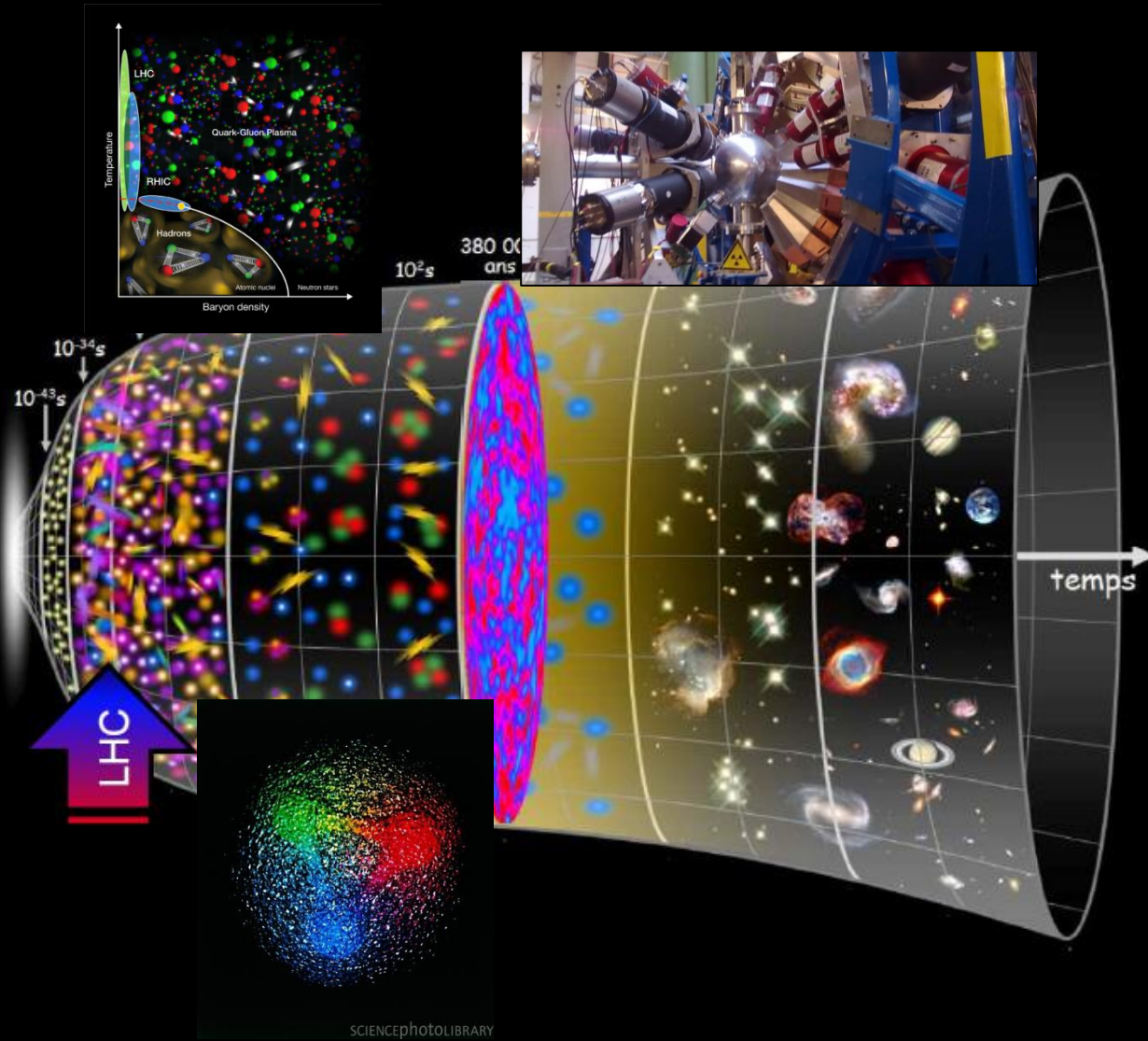
Why antimatter as disappeared ?



What is the origin of inflation ?

What is the theory beyond standard model :







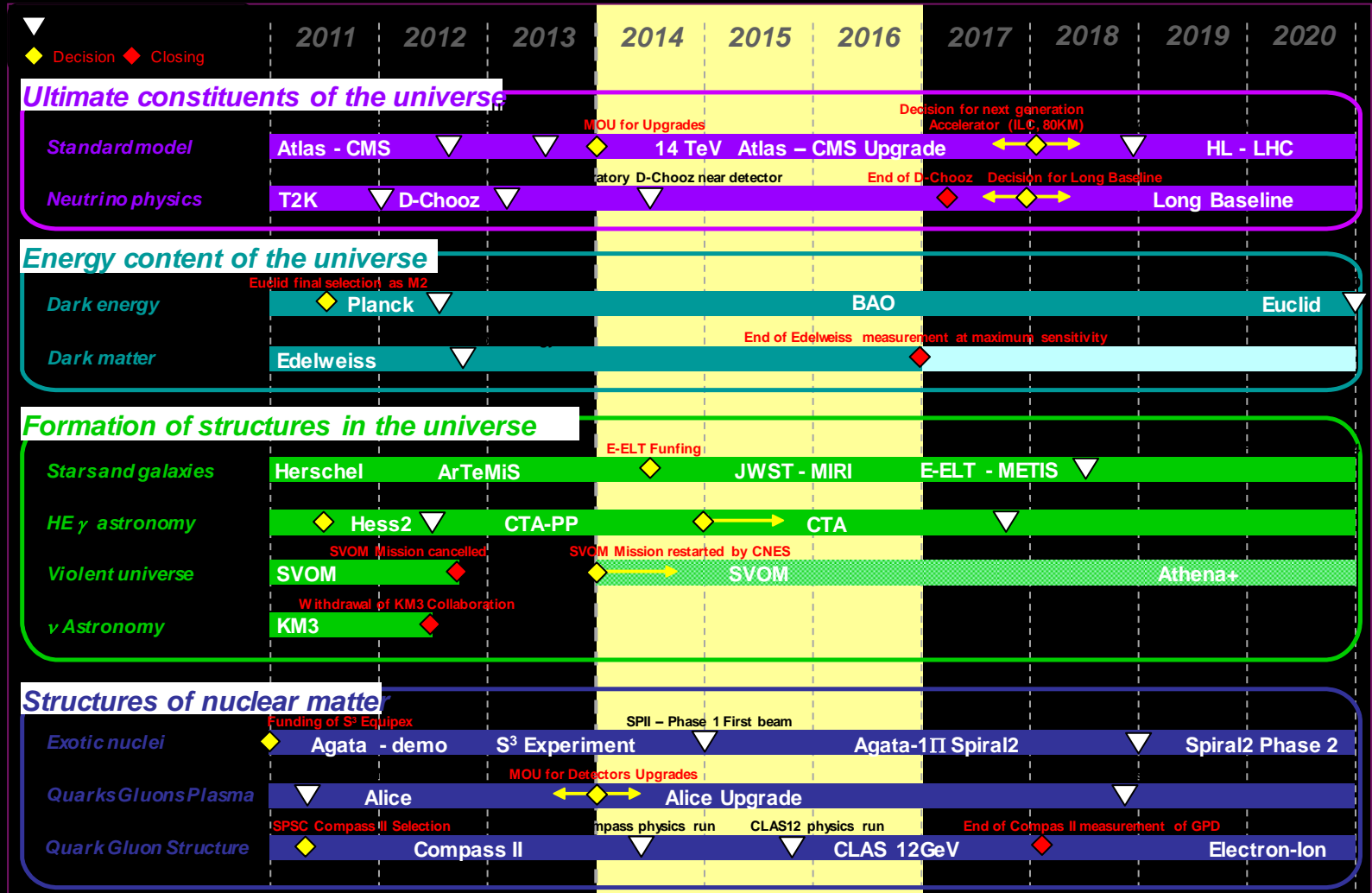
DE LA RECHERCHE À L'INDUSTRIE



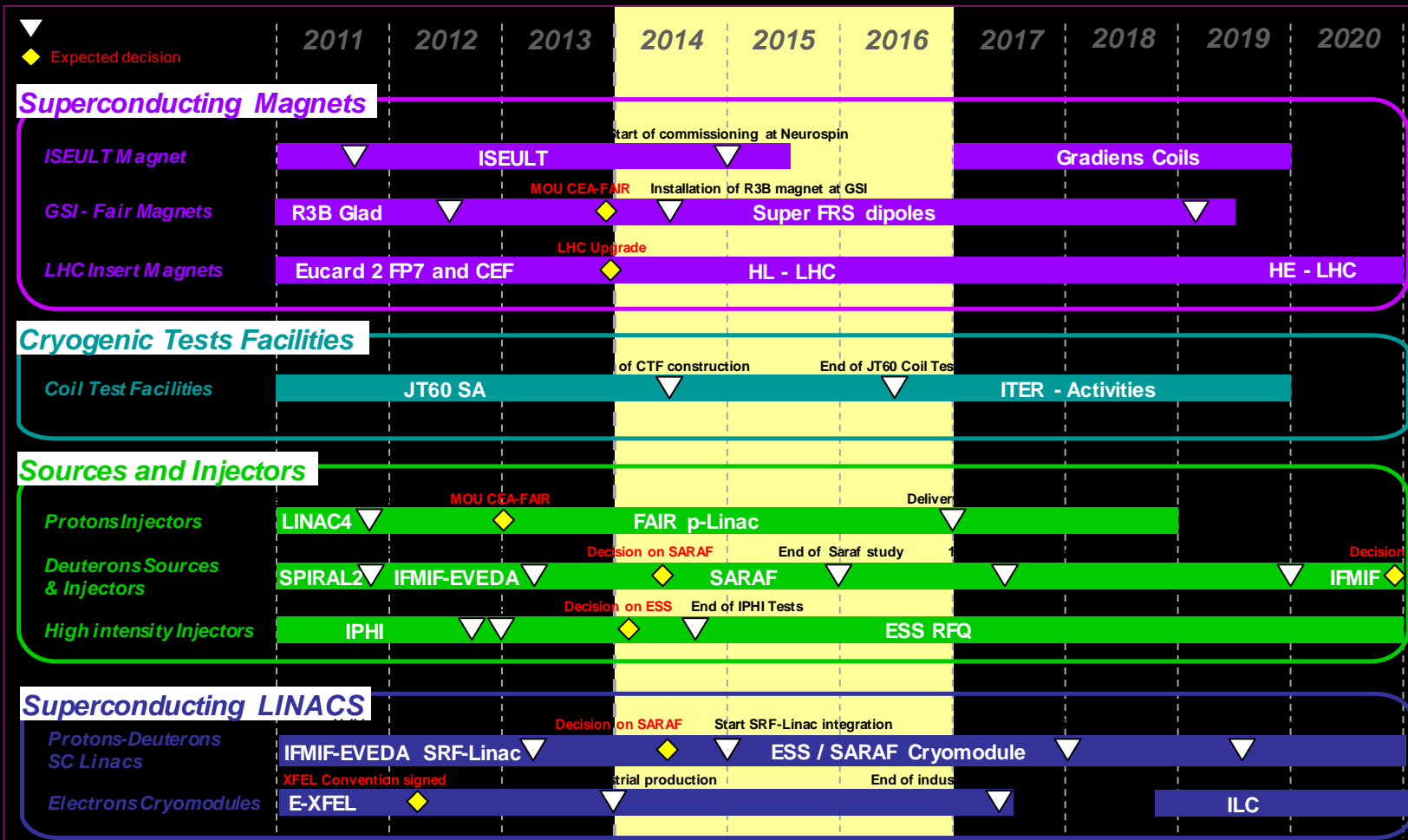
# IRFU road maps



## Irfu roadmap



## Irfu roadmap in Cryotechnologies



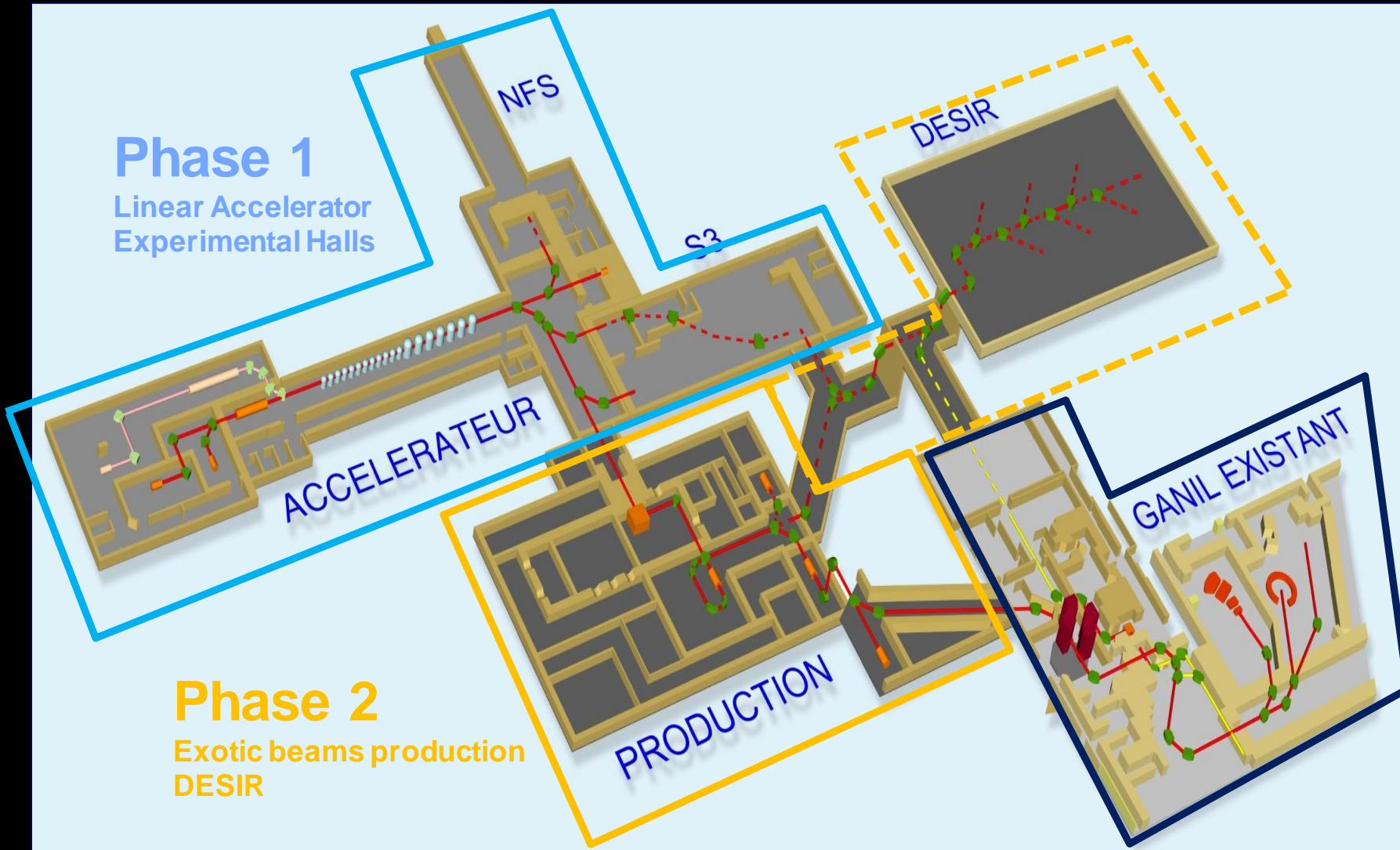




# Participating in the construction of SPIRAL2



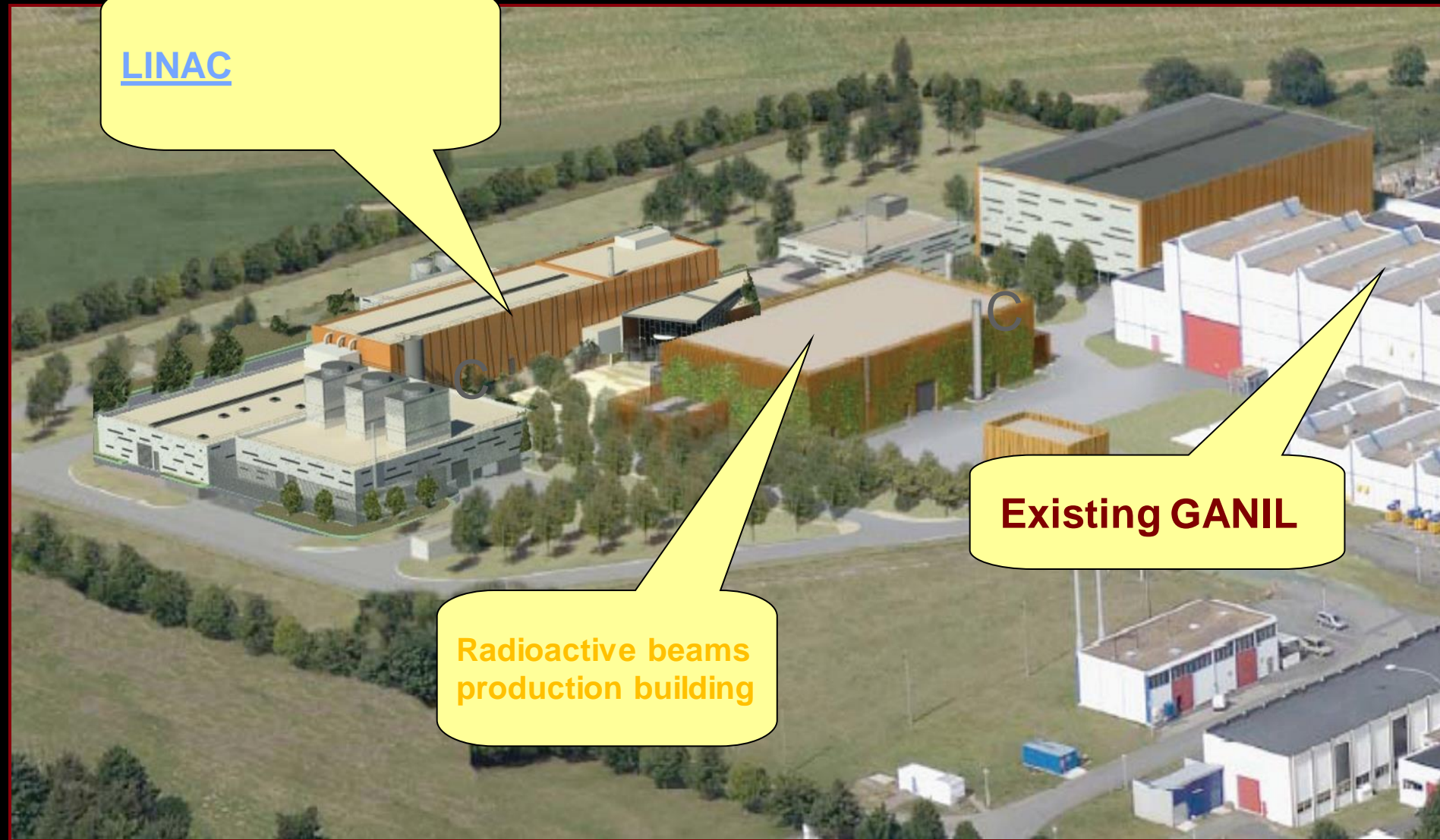
## Construction of the accelerator in two phases



LINAC

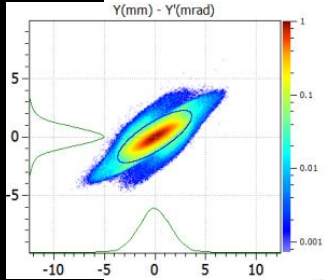
Radioactive beams  
production building

Existing GANIL





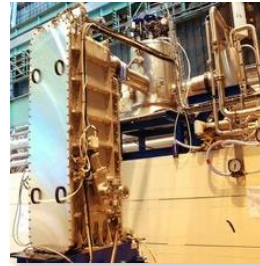
# The Irfu workpackages for the accelerator



Beam dynamics studies



MEBT slits

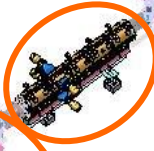


$\beta=0.07$  « A » cryomodules



RFQ

LEBT



deuterons/protons source, Mechanics integration, slits, CC, instrumentation / automatisms, integration and tests of LEBT2 - LEBTC

Mechanics integration, slits, CC, instrumentation / automatisms LEBT1

Low Level RF electronics

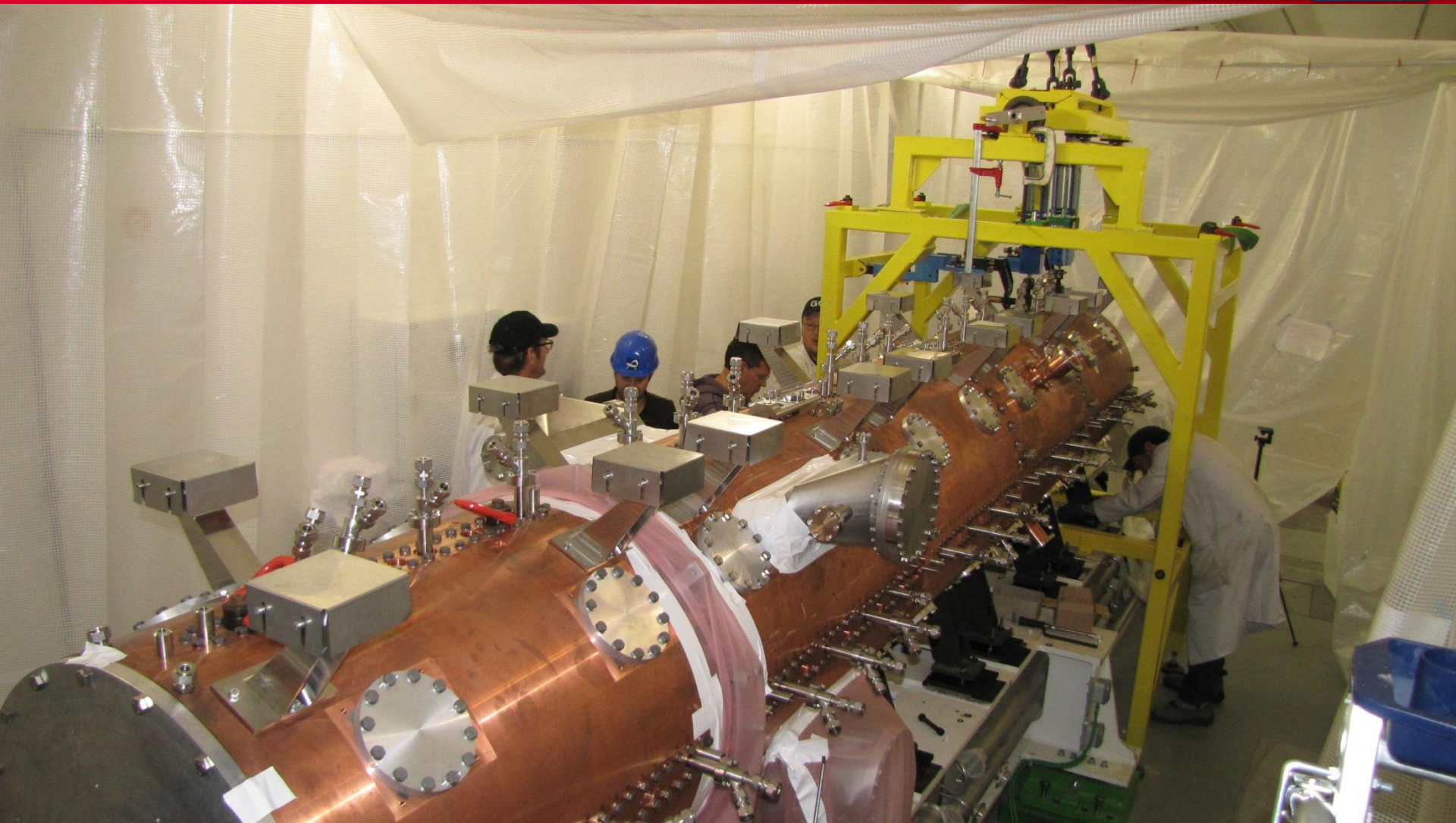












# Participation in the construction of accelerators in Europe





FAIR





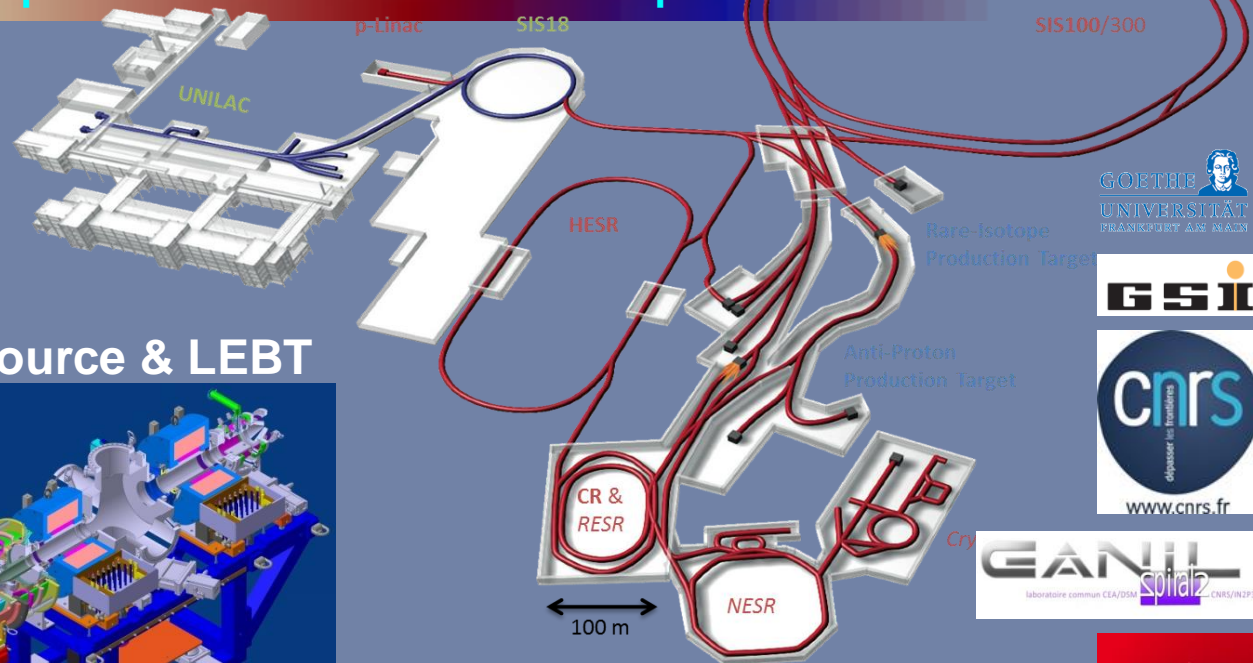


Beam Energy	70 MeV
Beam Current (op.)	35 mA
Beam current (des.)	70 mA
Beam pulse length	36 $\mu$ s
Repetition rate	4 Hz
RF-Frequency	325.224 MHz
Total hor. emittance (norm)	2.1/4.2 $\mu$ m
Tot. Mom. spread	$\leq \pm 10^{-3}$
Linac length	$\approx 35$ m

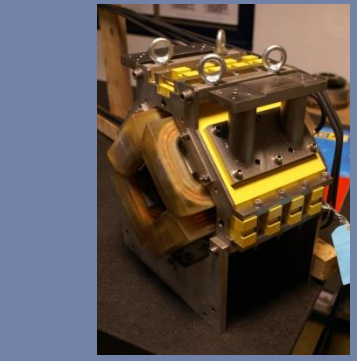
“Cooperation Agreement on the French contribution to the construction of the international Facility for Antiproton and Ion Research in Europe (FAIR) and on the German contribution to the construction of the SPIRAL2 Facility at GANIL”

GSI, Frankfurt University, CEA, CNRS, GANIL

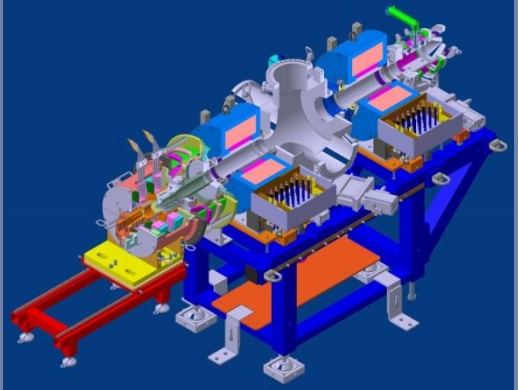
## Implication of Irfu in 3 WP for the p-Linac Period 2009-2017



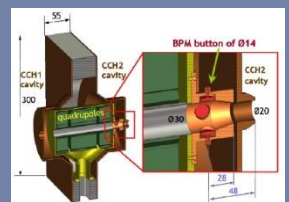
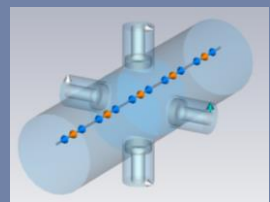
## WP5 External Magnets



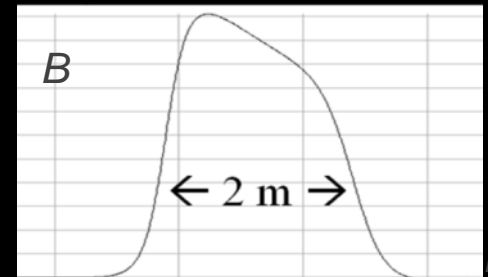
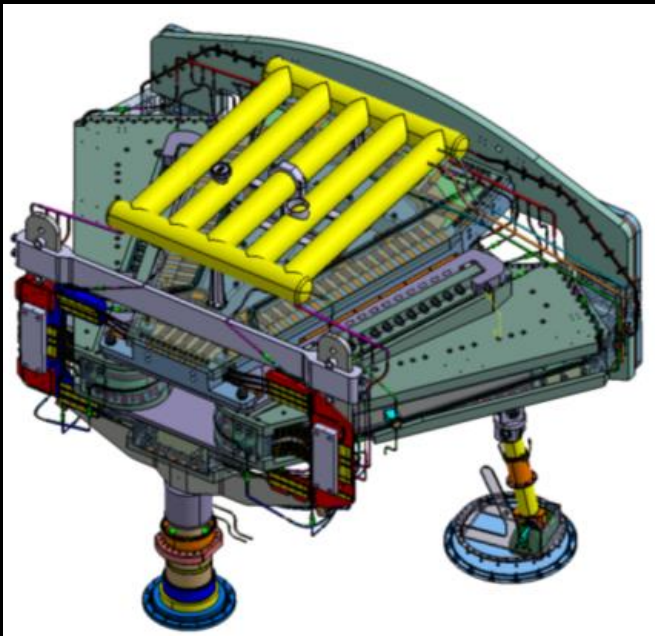
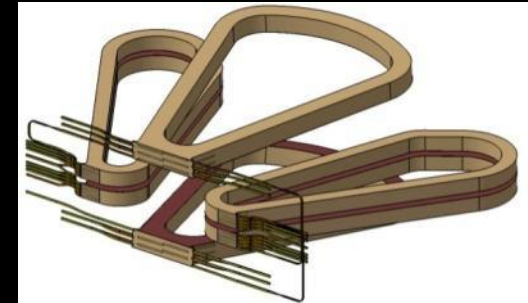
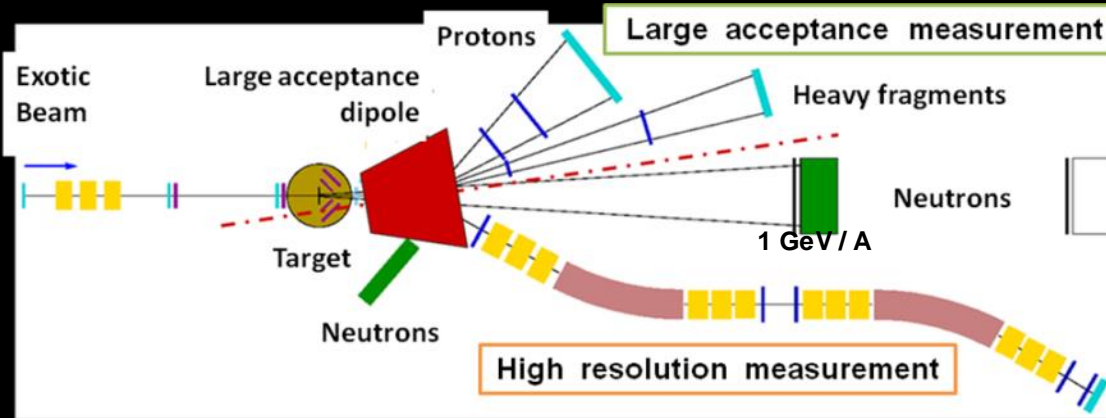
## WP1 Source & LEBT



## WP7 Diagnostics BPM



# R3B-GLAD

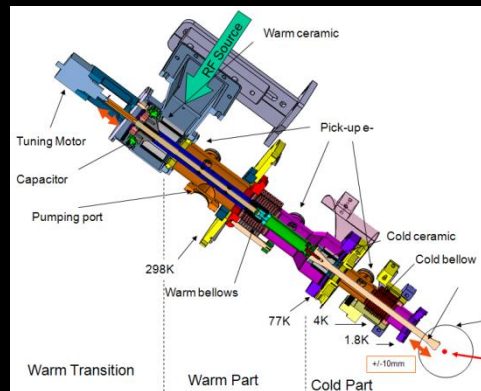
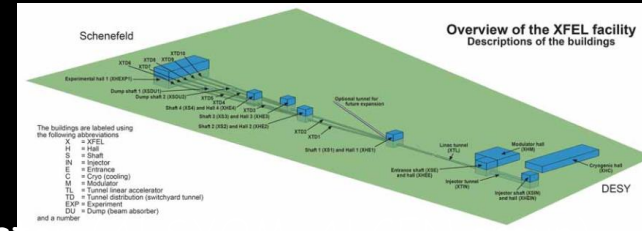








- **Irfu (Saclay) : Integration of 83 (100) cryomodules**
  - Cryomodules integrated in a new dedicated facility
  - Assembly in clean room of 83 cavity strings
  - Assembly of 83 cold masses in their vacuum vessel
  - Series operation sub-contracted to an industrial operator (AES/OM, AECLEN group)
- **IN2P3/LAL (Orsay) : Delivery of over 650 (800) Couplers**
  - LAL hosts all the conditioning process
  - Contract attributed to a Thales / RI consortium
  - Couplers received, prepared, conditioned & sent for integration in the cryomodules

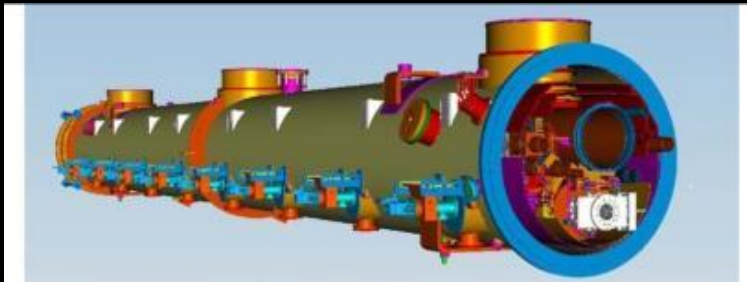


Couplers industrialization (Orsay)





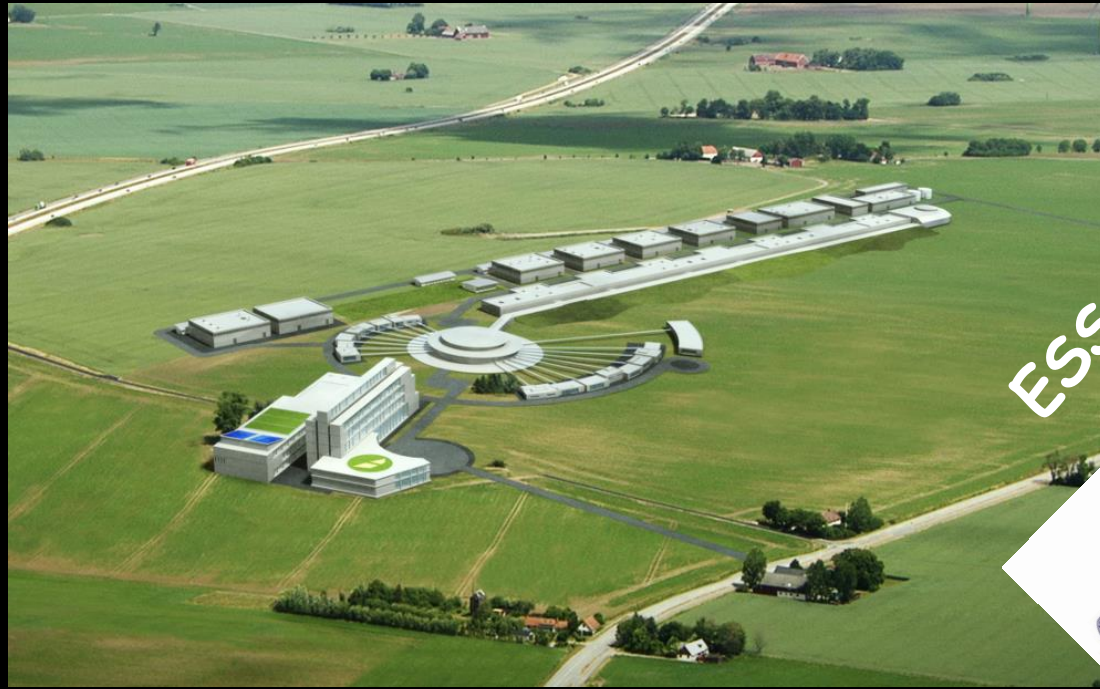
- Each cavity string contains 8 cavities, 8 RF couplers, one quadrupole, one BPM and two vacuum valves



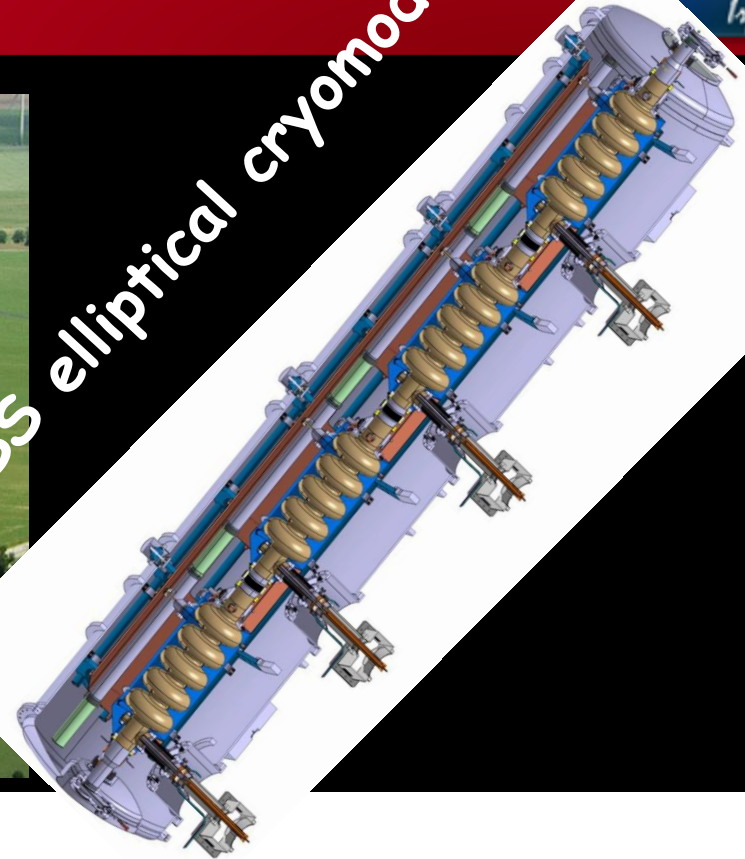
Transfer of cryomodule in clean room roll-out area



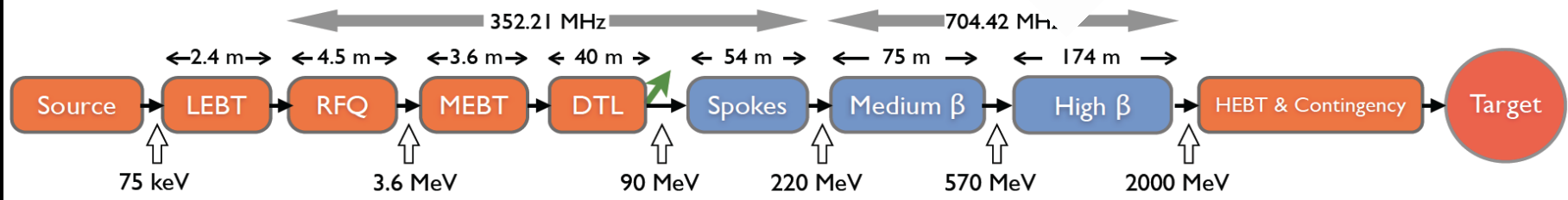
Transfer of cryomodule in RF coupler assembly area



ESS elliptical cryomodules



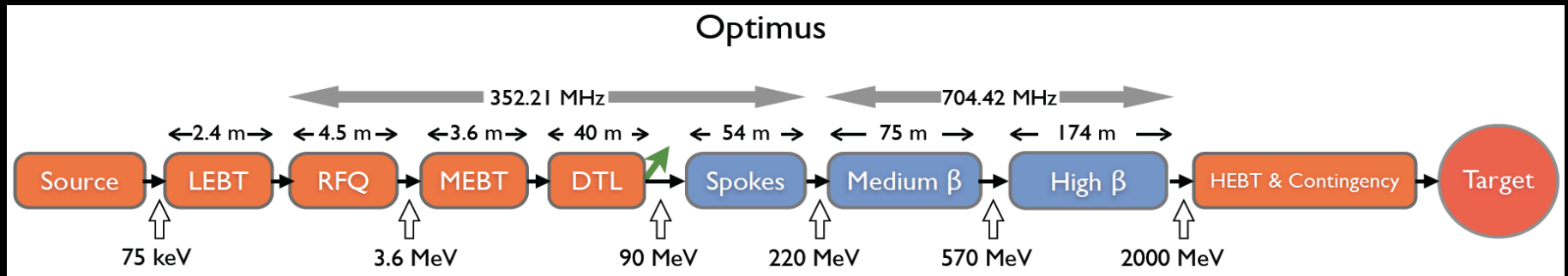
Optimus







France is « financing »  
~8% of the project  
CEA contribution of the  
Order of ~90M€





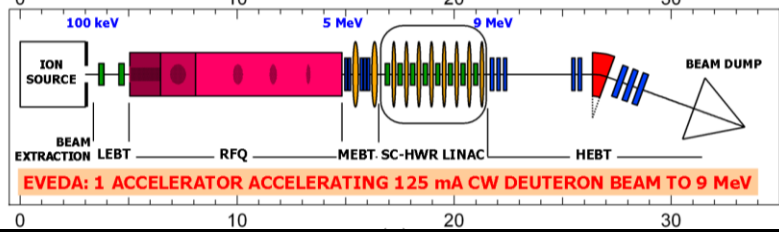
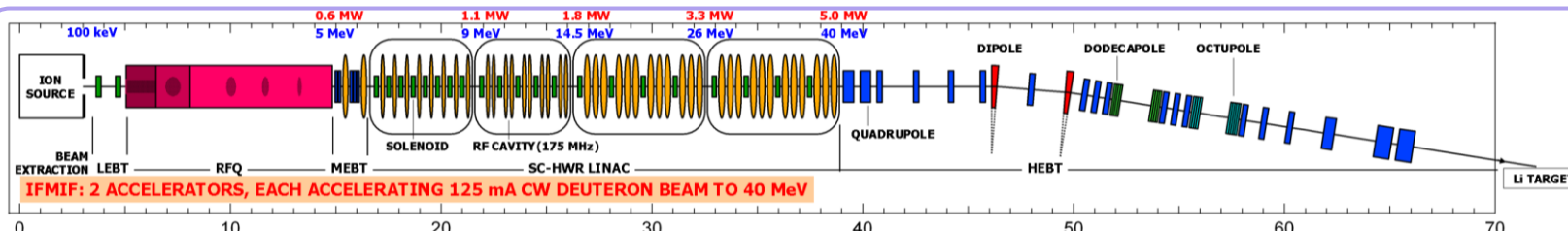
Bât 124 - P°31A



# Participation in the construction of accelerators in Japan



## IFMIF Accelerator

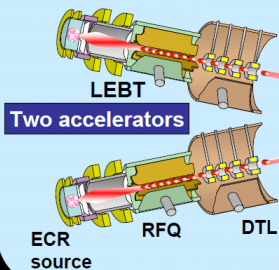


## IFMIF-EVEDA Prototype Accelerator



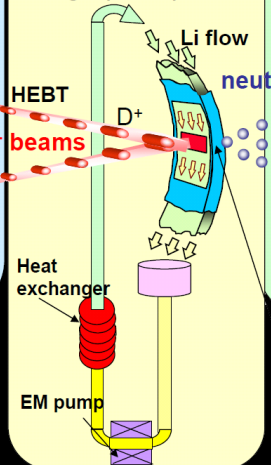
### Accelerator

Deuteron accelerators:  
40 MeV 250 mA (10 MW)



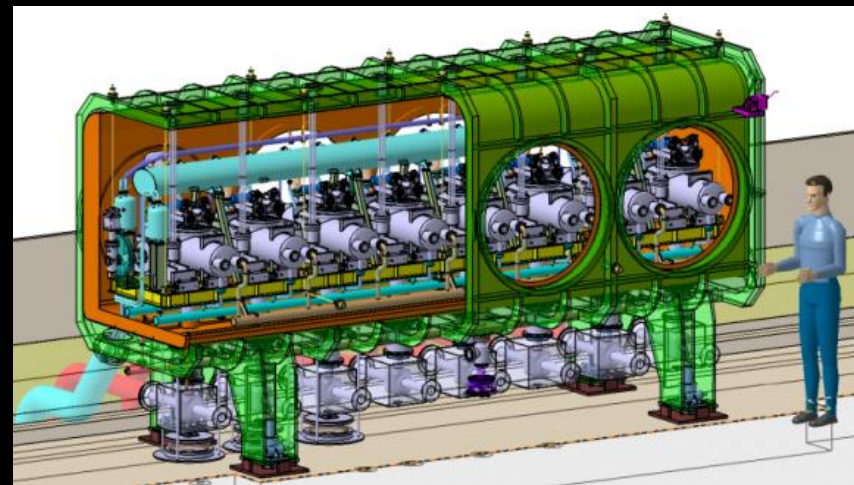
### Target

10 MW beam heat removal  
with high speed liquid Li flow

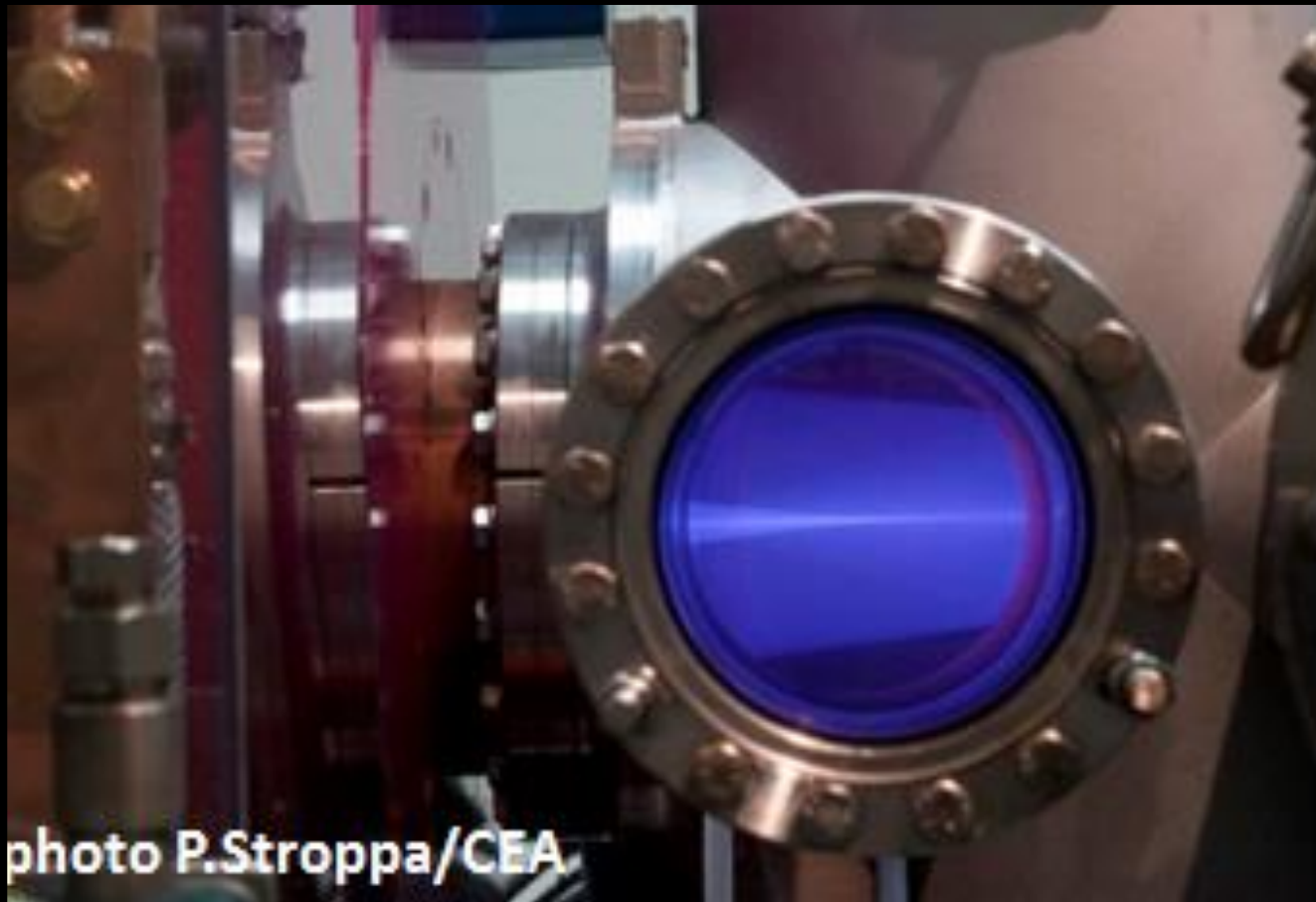


### Test Cell

- Irrad. Volume > 0.5L for  $10^{14}$  n/(s·cm<sup>2</sup>), (20 dpa/year)
  - Temp.:  $250 < T < 1000^\circ\text{C}$
- Test pieces
- n-irradiation ( $\sim 10^{17}$  n/s)
- PIE



World record for the deuterons injector  
140 mA at 100 keV (14 kW)



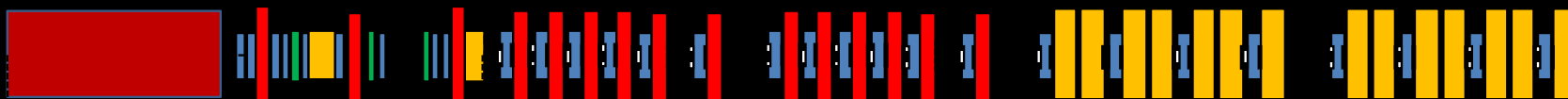


# Projet Saraf:

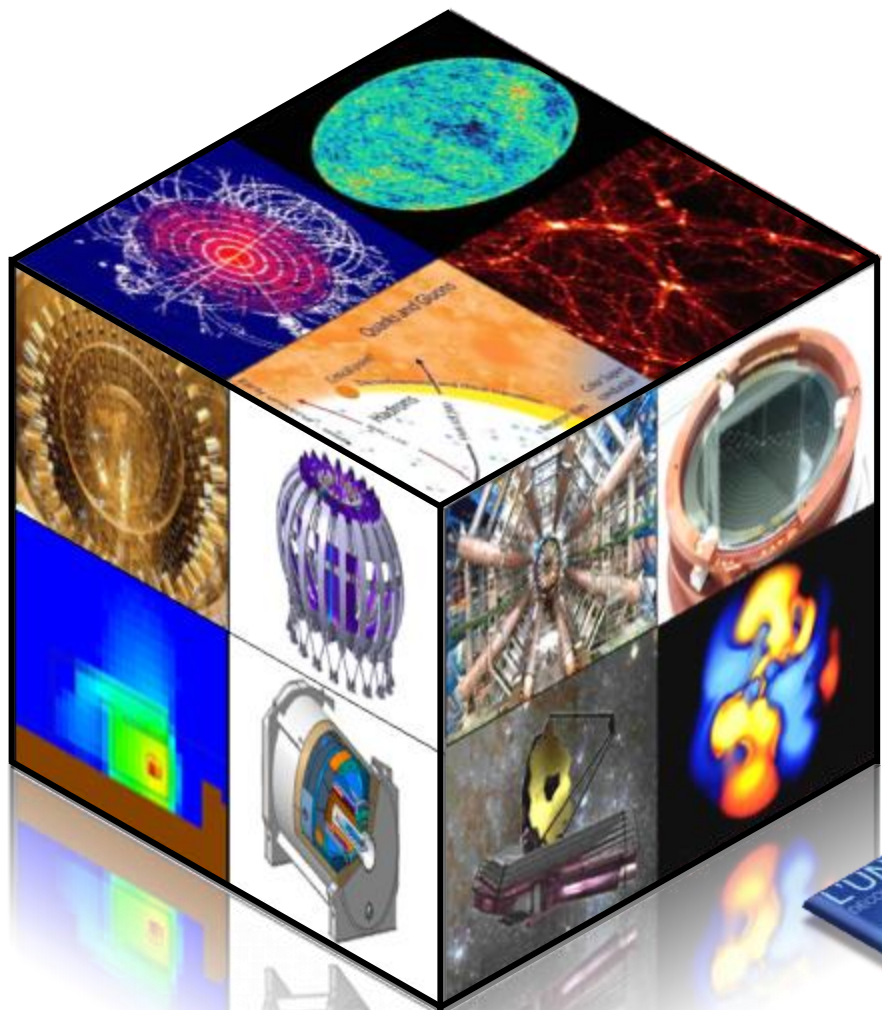


$\beta=0.09$

$\beta=0.18$

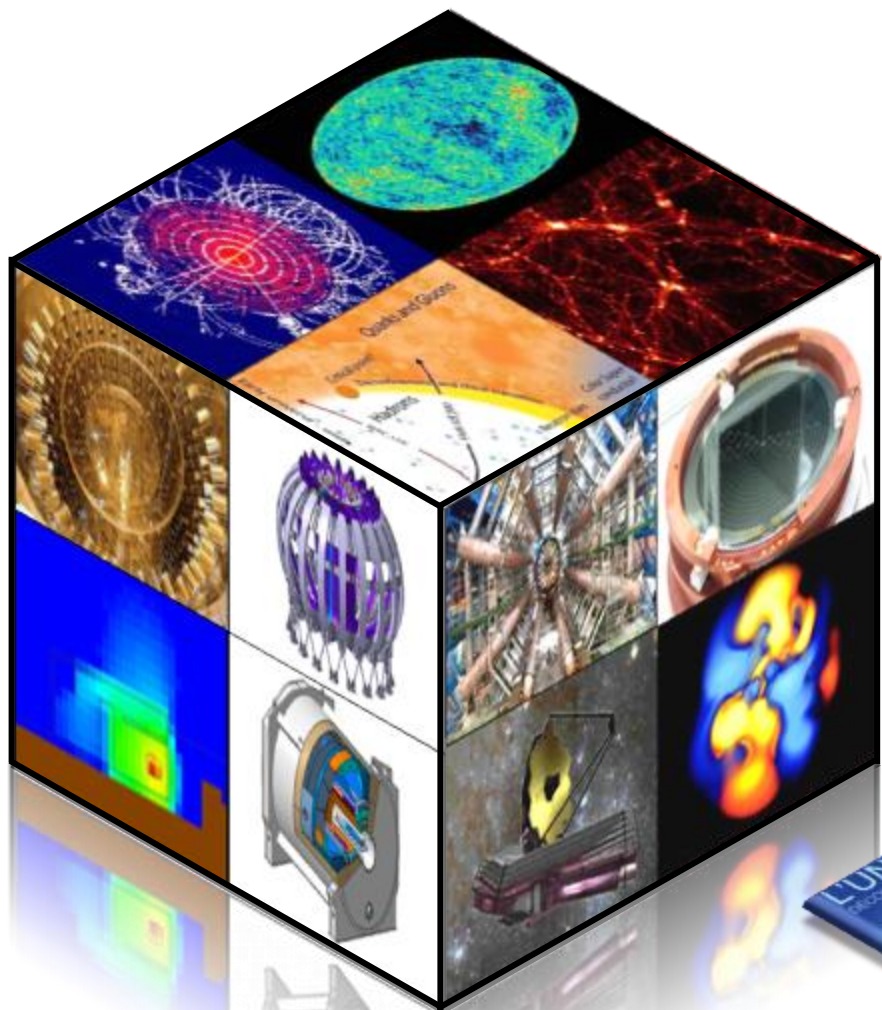


I would like to wish you an  
exciting and fruitful meeting



irfu





irfu