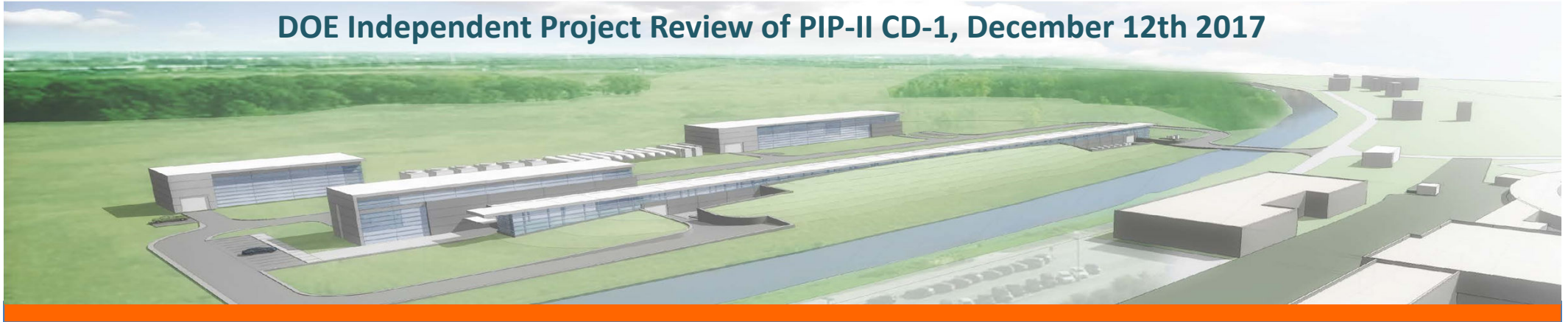


DOE Independent Project Review of PIP-II CD-1, December 12th 2017



International collaboration for PIP-II

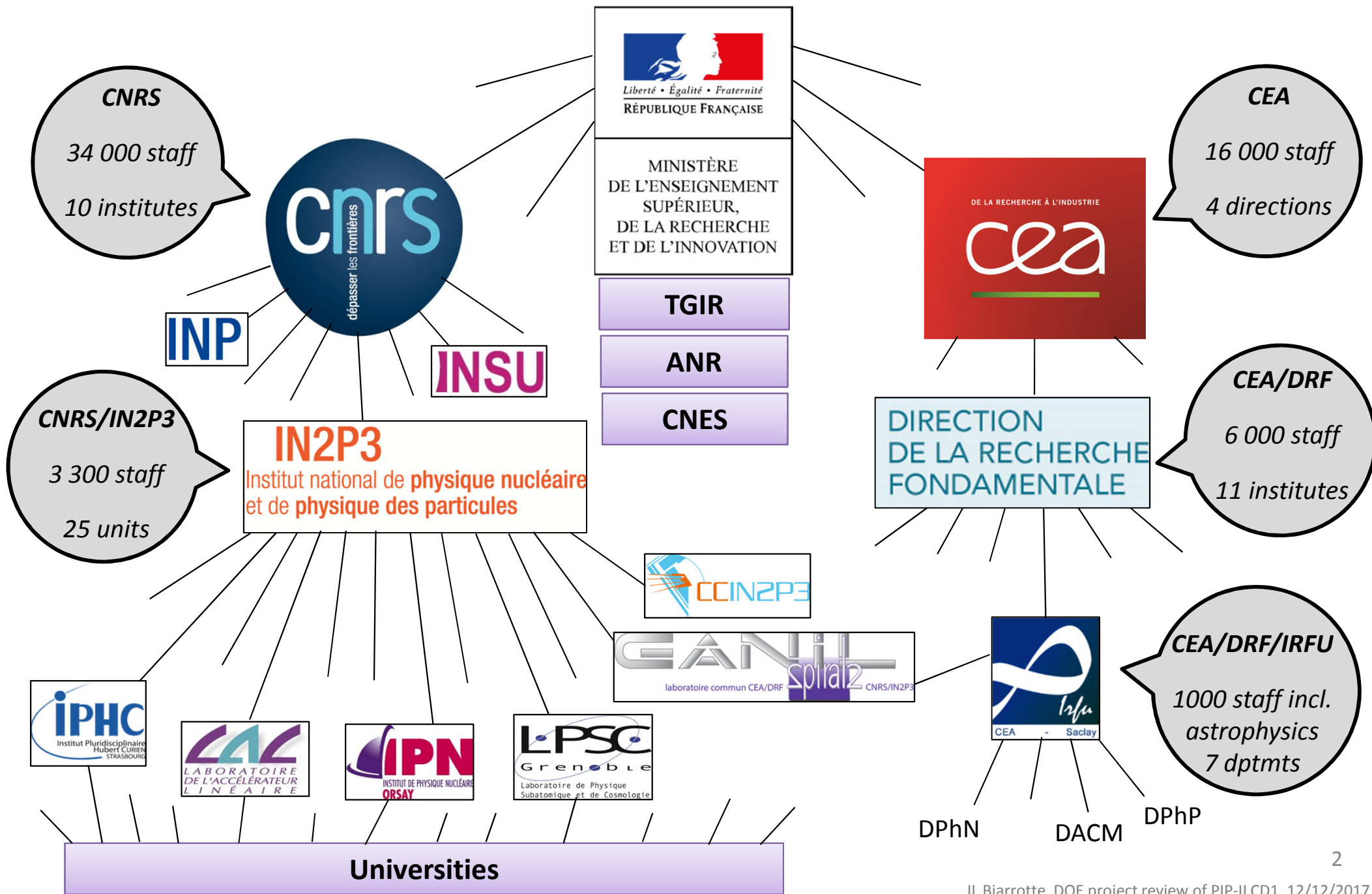
View from IN2P3



dépasser les frontières

Jean-Luc BIARROTTE, CNRS/IN2P3
Scientific Director for 'Accelerators & Technologies'
jlbiarrotte@admin.in2p3.fr

French research organisation (nuclear, particle & astroparticle physics)



IN2P3 research areas

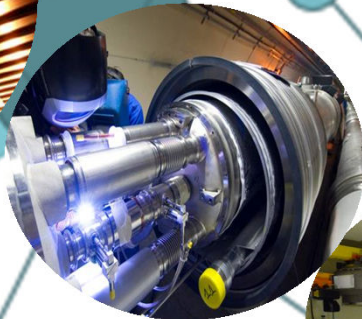
Particles & hadronic physics

Matter's most elementary constituents and fundamental interactions



Nuclear physics & Applications

Structure of nuclear matter, nuclear energy and medical applications



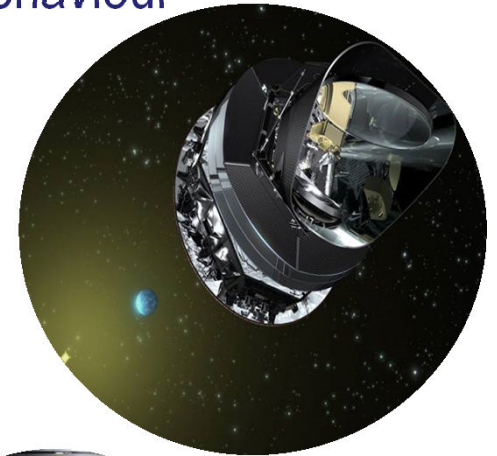
Accelerator & Technology

Major R&D domains



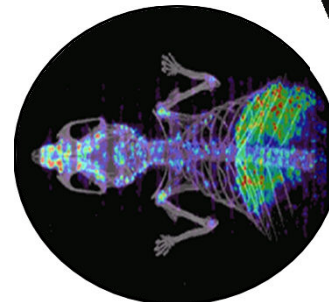
Astroparticle physics and Cosmology

Universe's composition and behaviour



Computing & Data

Data Science and Computing research

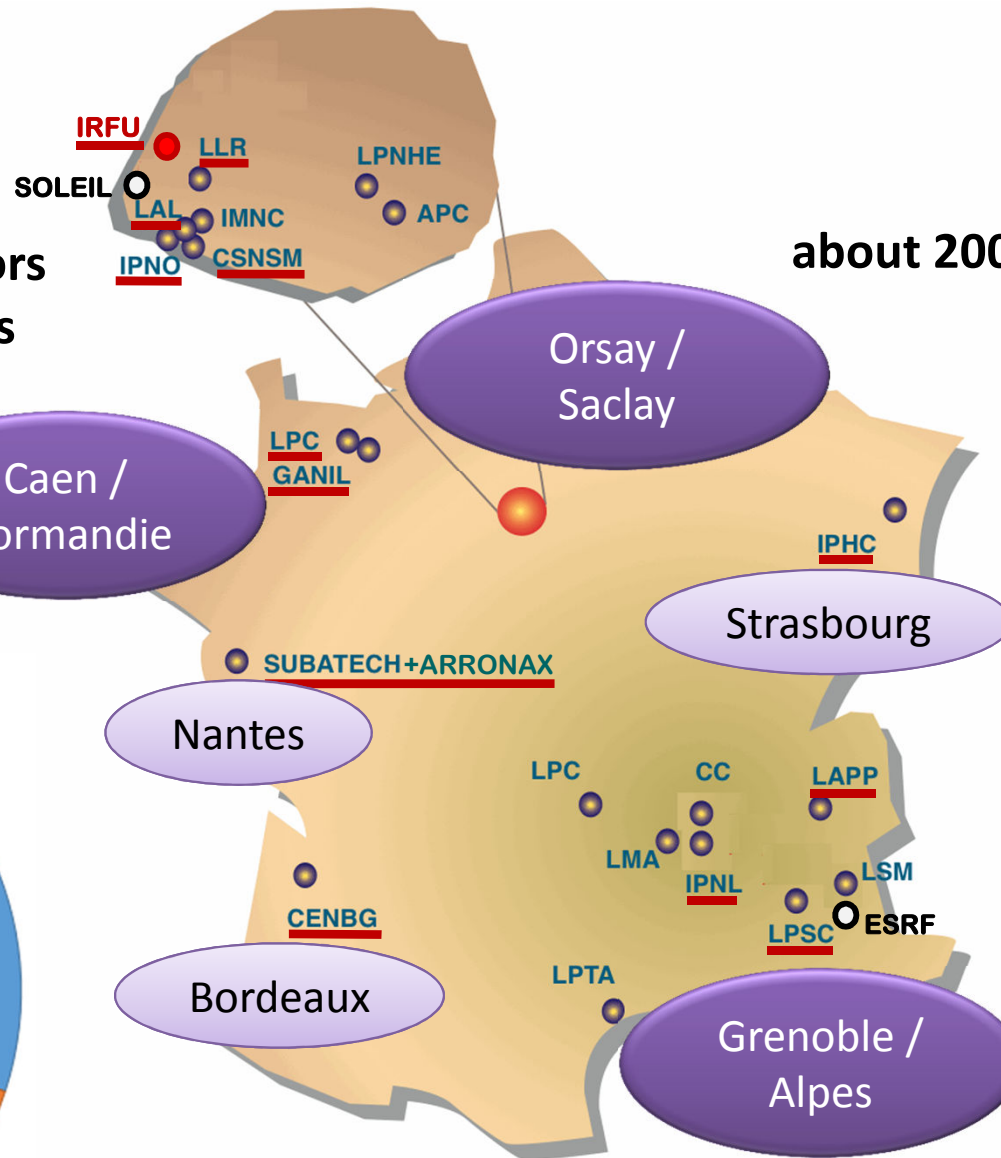


Accelerator R&D labs in France



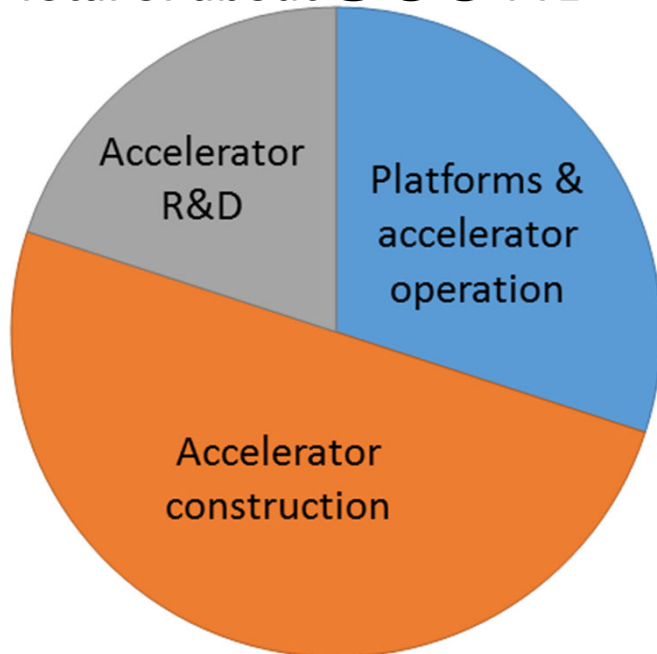
IN2P3 labs
Les deux infinis

about 300 FTE on accelerators
(incl. GANIL-CNRS) in 13 labs



about 200 FTE on accelerators
(incl. GANIL-CEA)

Total of about **500** FTE



+ 2 French
« sociétés civiles »



International
(21 partners, FR 7.5%)

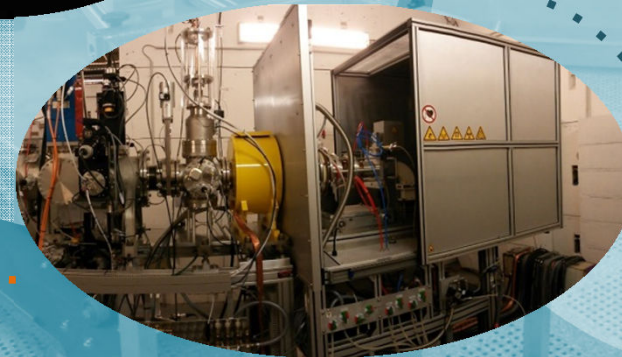
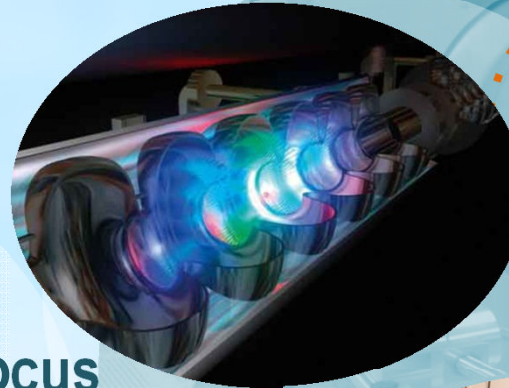


French
(CNRS 72%, CEA 28%)

Accelerator R&D @ IN2P3 – Main skills

ACCELERATOR RESEARCH & DEVELOPMENTS

- Superconducting accelerating cavities and cryotechnology
- Sources & injectors
- Radioactive beams
- Beam dynamics, colliders final focus
- Plasma acceleration, laser/beam interactions
- Beam instrumentation
- Related technologies (RF, vacuum...)



© CSNSM/Jean-François Dars; Desy Hamburg; Cern; CNRS/IN2P3
Conception graphique : Anna Thibaut (IPNL)

INTENSE BEAMS LASERS SUPERCONDUCTING
ION SOURCES PLATFORMS CRYOTECHNOLOGY

SPIRAL-2 SRF linac @GANIL

- ❑ 200kW ion SRF linac 14.5MeV/u
- ❑ Presently in commissioning phase
- ❑ Very close collaboration with CEA



IN2P3 In-Kind contribution to SPIRAL-2 linac

- ❑ Accelerator design & commissioning
- ❑ Heavy-ion injector
- ❑ High-beta SRF cryomodules
(88MHz QWR: 7 cryomodules, 14 cavities)
- ❑ Cryogenic plant & distribution
- ❑ Beam instrumentation & dump

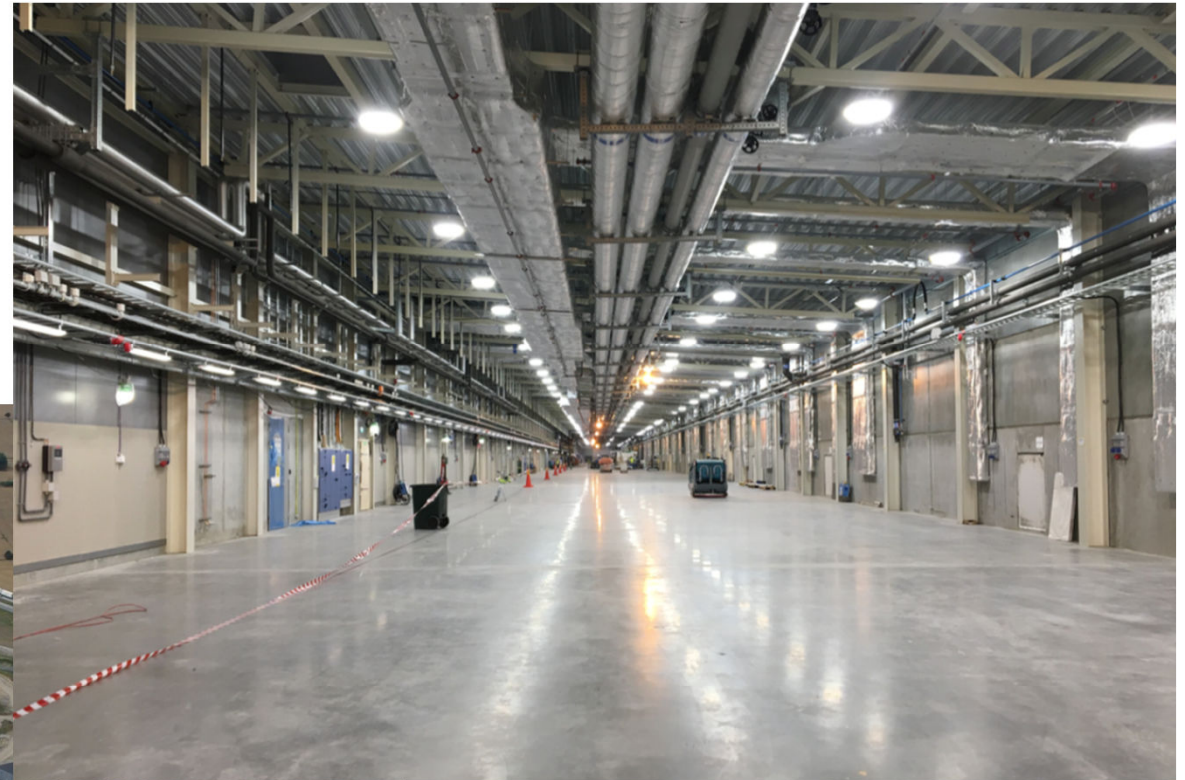
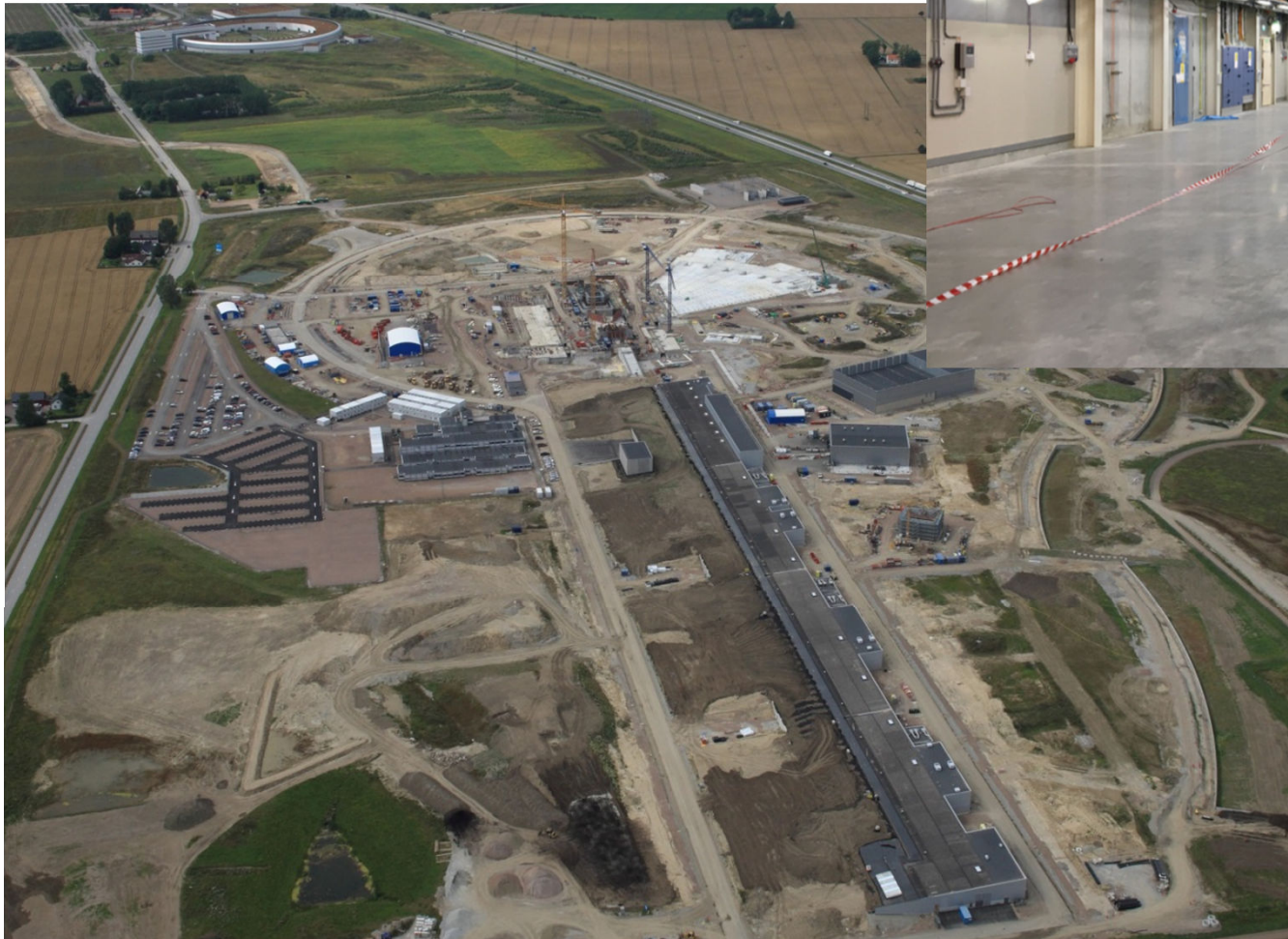
IN2P3 In-Kind contribution to XFEL

- ❑ Conditionning & delivery of 800+ RF couplers @1.3GHz
- ❑ Close collaboration with CEA
- ❑ First XFEL beam in 2017
- ❑ Present related activities: expertise for LCLS2 couplers, R&D for ILC...



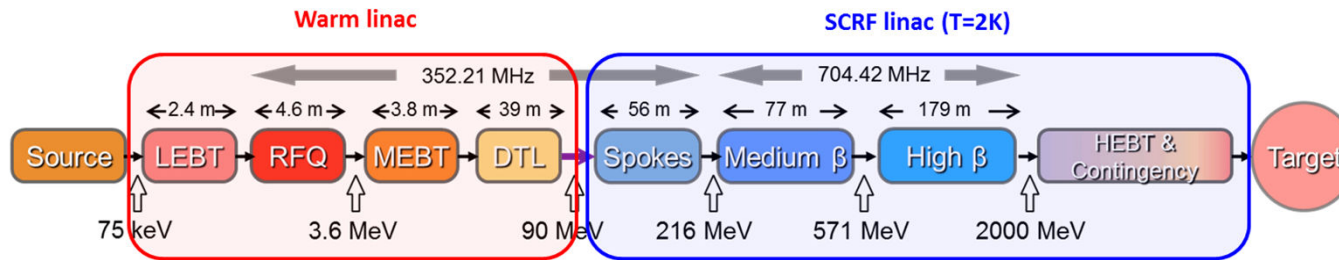
European Spallation Source

- ❑ 5MW 2 GeV proton SRF linac
- ❑ Construction has started
- ❑ First beam planned in 2020

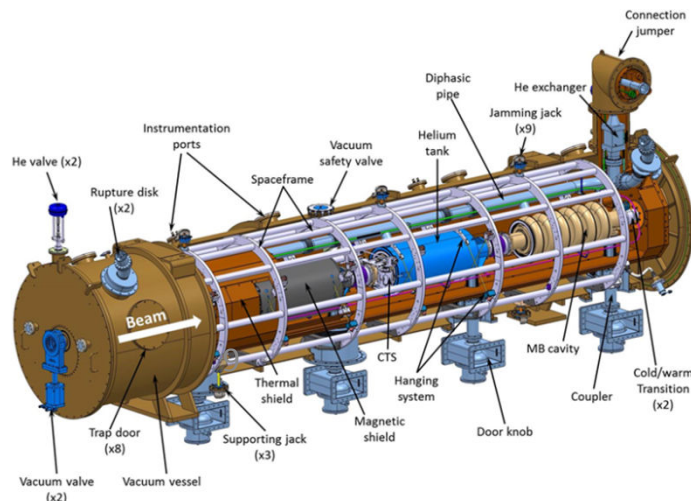


EUROPEAN
SPALLATION
SOURCE

IN2P3 In-Kind contribution to ESS

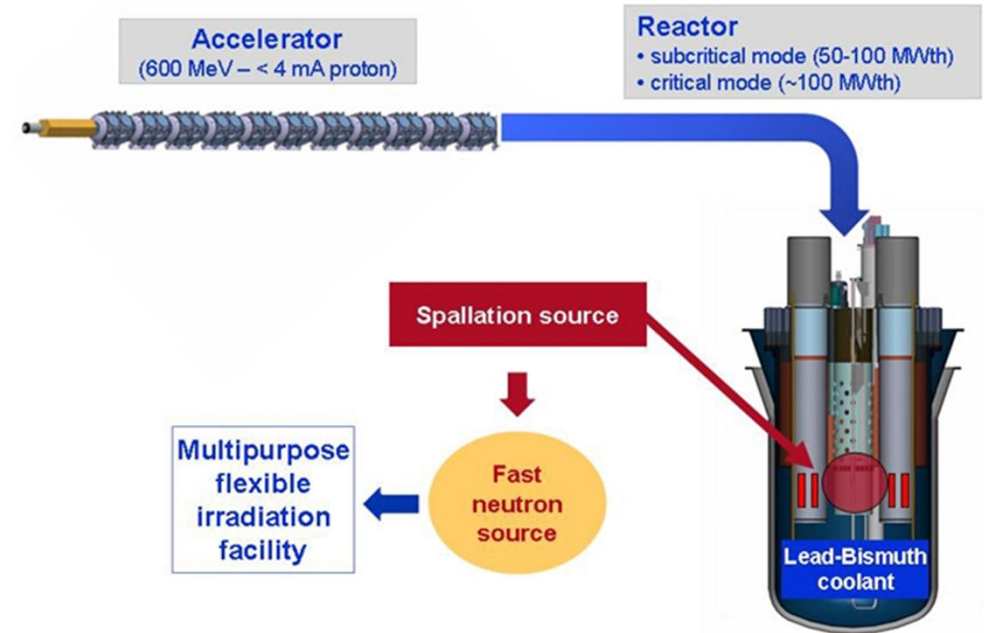
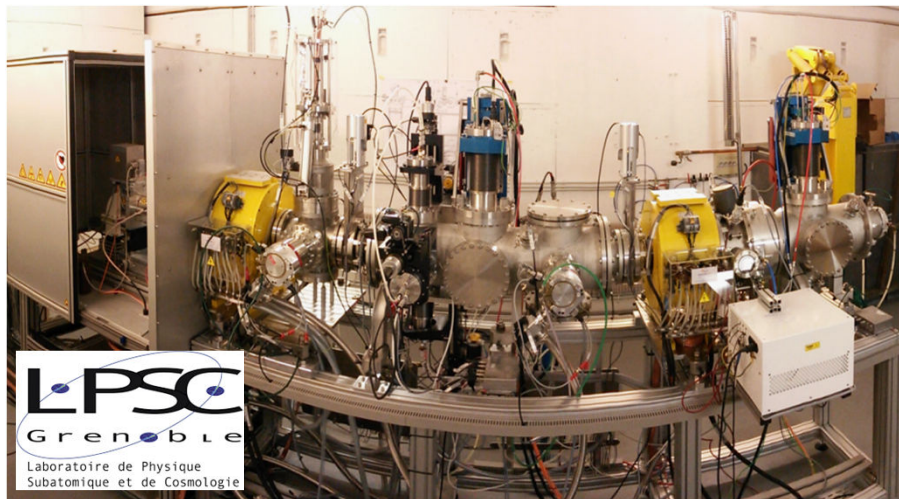


- ❑ 13 spoke cryomodules 352MHz (26 cavities) and associated valve boxes
- ❑ Cryogenic control & command for full SRF linac
- ❑ Design of the medium and high beta elliptical cryomodules together with CEA



Multipurpose hYbrid Research Reactor for High-tech Applications (SCK*CEN, Mol, Belgium)

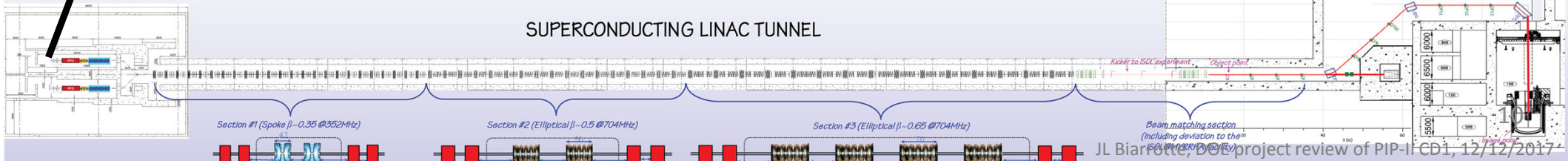
- ❑ Demonstration of the ADS concept at high power
- ❑ 2.4MW, 600MeV SRF CW linac
- ❑ Main issue = reliability



INJECTOR BUILDING

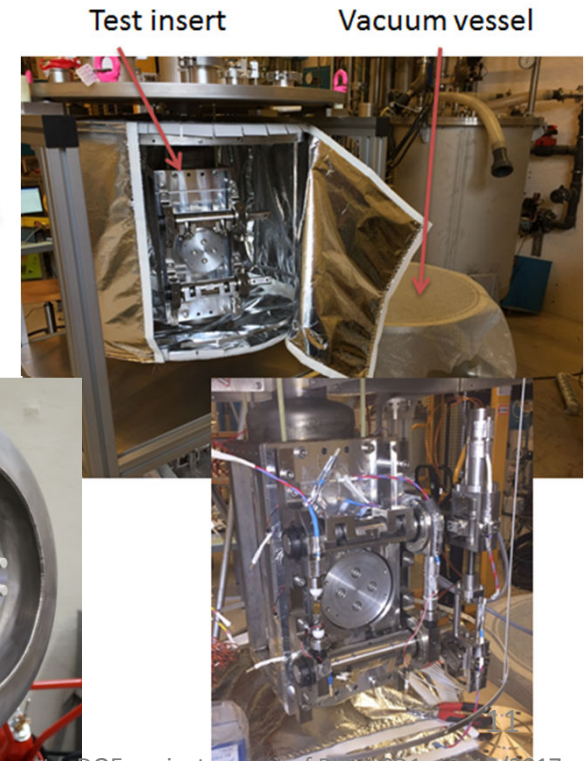
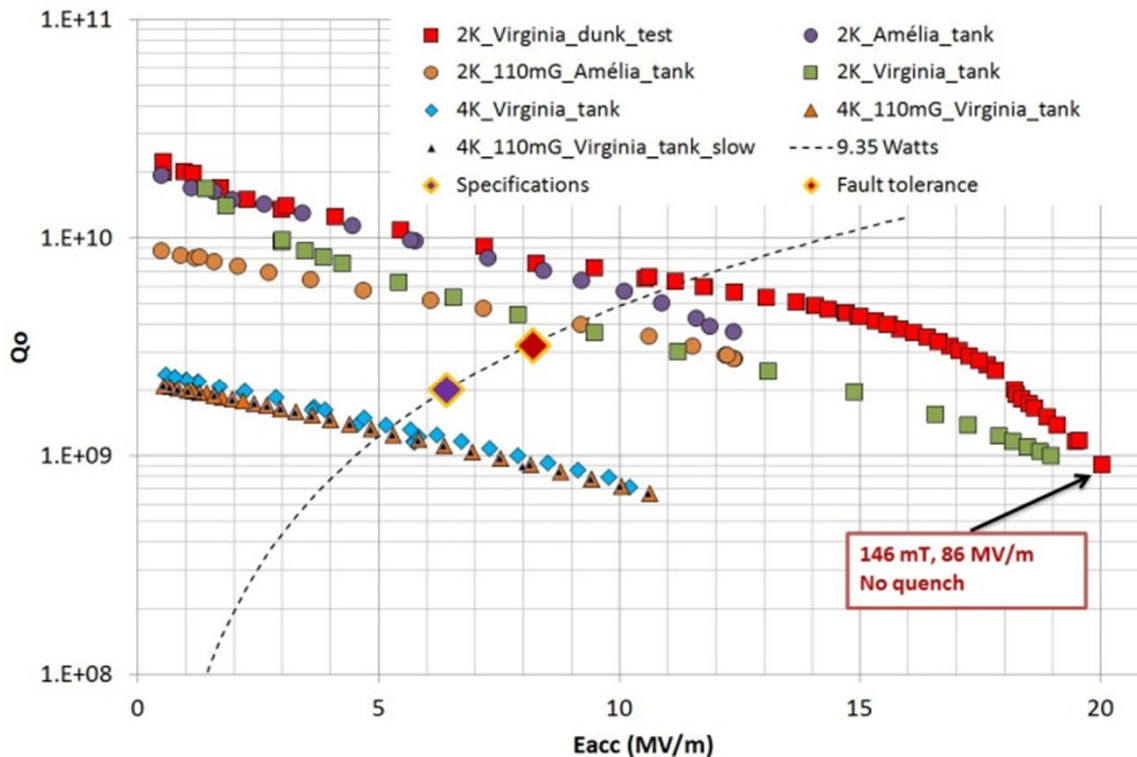
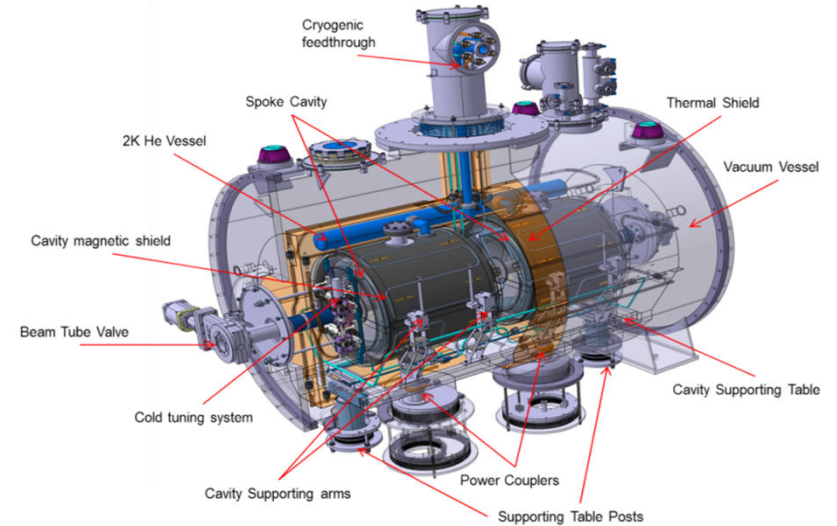
SUPERCONDUCTING LINAC TUNNEL

REACTOR BUILDING



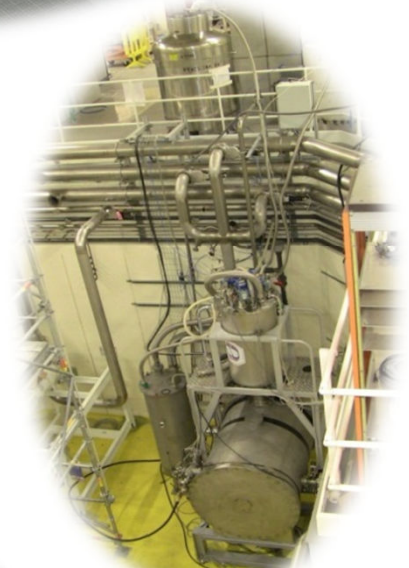
IN2P3 SRF R&D contribution to MYRRHA

- ❑ SRF linac design
- ❑ R&D on spoke cryomodule (beta 0.4, 352MHz) incl. Cavities & Couplers
- ❑ R&D on innovative fault-tolerant systems incl. Cold Tuning System & LLRF developments



SUPRATECH platform (Orsay)

- ❑ 85m² ISO4 clean room
- ❑ Surface treatment lab
- ❑ Helium liquifier (70l/h) & 2K pumping
- ❑ 1400°C heat treatment station
- ❑ Cryogenic test halls (several cryostats) & temperature sensor calibration station
- ❑ Material characterization platform
- ❑ Power couplers lab incl. 70m² ISO5 clean room
- ❑ RF power systems (e.g. 80kW 700 MHz IOT, 2.8MW 350MHz & 5MW 1.3 GHz klystrons)



❑ LBNF-DUNE is of major scientific interest for CNRS/IN2P3

- ✓ about 30 neutrino physicists & engineers presently involved in our labs, and growing
- ✓ new CRADA signed with Fermilab last October 26th



❑ This interest naturally extends to a possible participation to the construction of PIP-II, that aligns perfectly well with IN2P3 experience on SRF technologies (SPIRAL2, XFEL, ESS, MYRRHA...)

- ❑ **Technical discussions have been initiated since October 2017** between Fermilab and IN2P3 on potential contributions.
Two areas of interest identified:
 - ✓ **LB650** cryomodules (together with CEA & INFN)
 - ✓ **SSR2** cavities & ancillaries components

- ❑ Our available resources are presently limited for the next 2 years (ESS in production phase, MYRRHA in prototyping phase) but...

- ❑ **...IN2P3 is definitively interested to get involved in PIP-II development**
 - ✓ Initial involvement (next 2 years) could include participation in **targeted R&D areas** to be defined ('intellectual' resources and small equipment)
 - ✓ In parallel, work toward defining, jointly with CEA, a **possible FR In-Kind participation** to be discussed at the French ministry level



dépasser les frontières

Institut National de Physique Nucléaire et de Physique des Particules



THANK YOU FOR YOUR ATTENTION!

jlbiarrotte@admin.in2p3.fr