
GANIL

Latest developpements

General presentation

• 240 permanent staff CNRS et CEA
(engineers, technicians, 29 researchers)
1 lecturer Univ. Caen

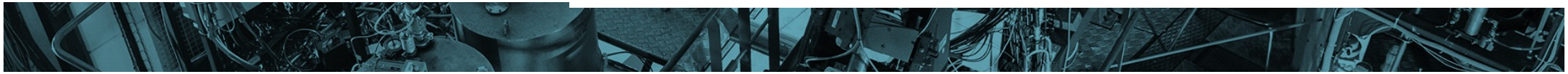
- 100 temporary staff

50 CDD engineers, technicians,
19 PhD
15 post-docs
16 apprenticies

- CIMAP = 24 permanent staff

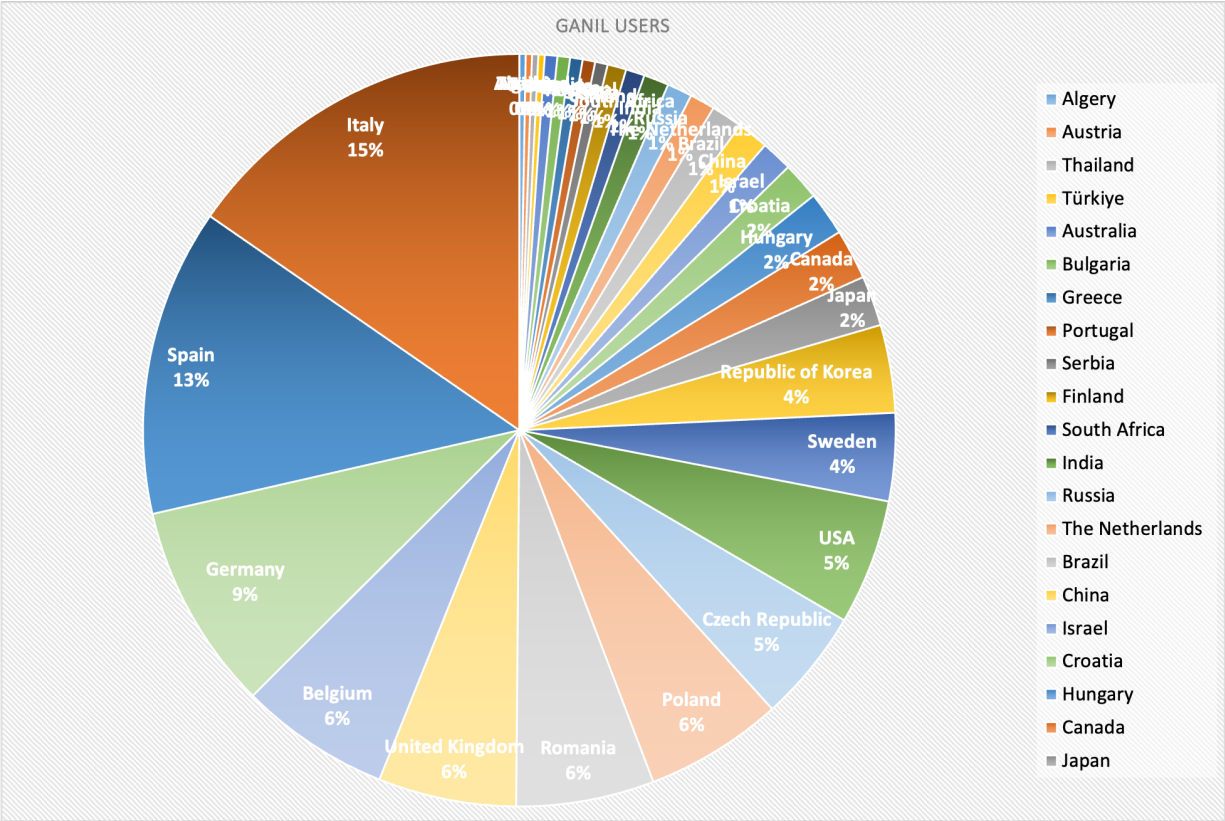
+ 15 PhD + 8 postdocs

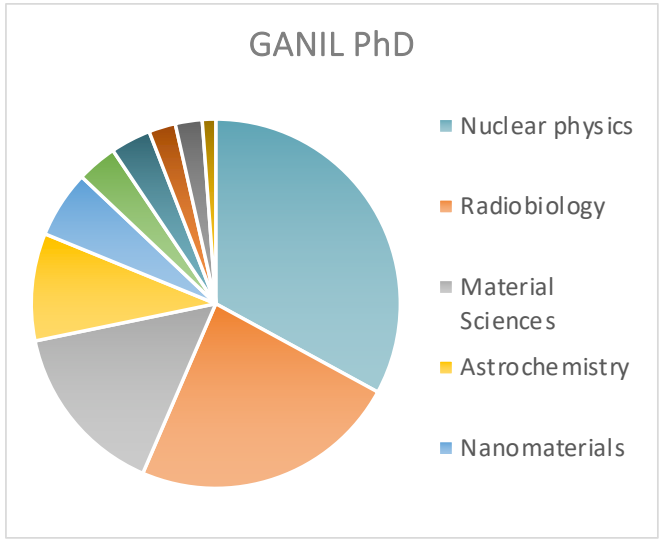
- More than 300 scientists yearly to perform experiments



GANIL users

- An international scientific community of almost 800 members (~half French)

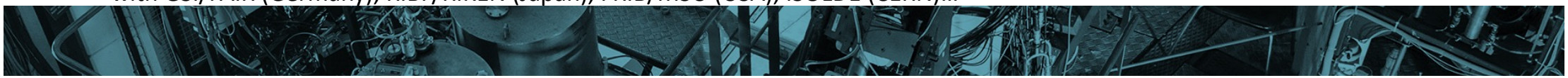




95 PhD students working on GANIL data

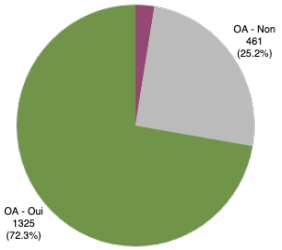
A major facility for heavy ions in the world

with GSI/FAIR (Germany), RIBF/RIKEN (Japan), FRIB/MSU (USA), ISOLDE (CERN)…

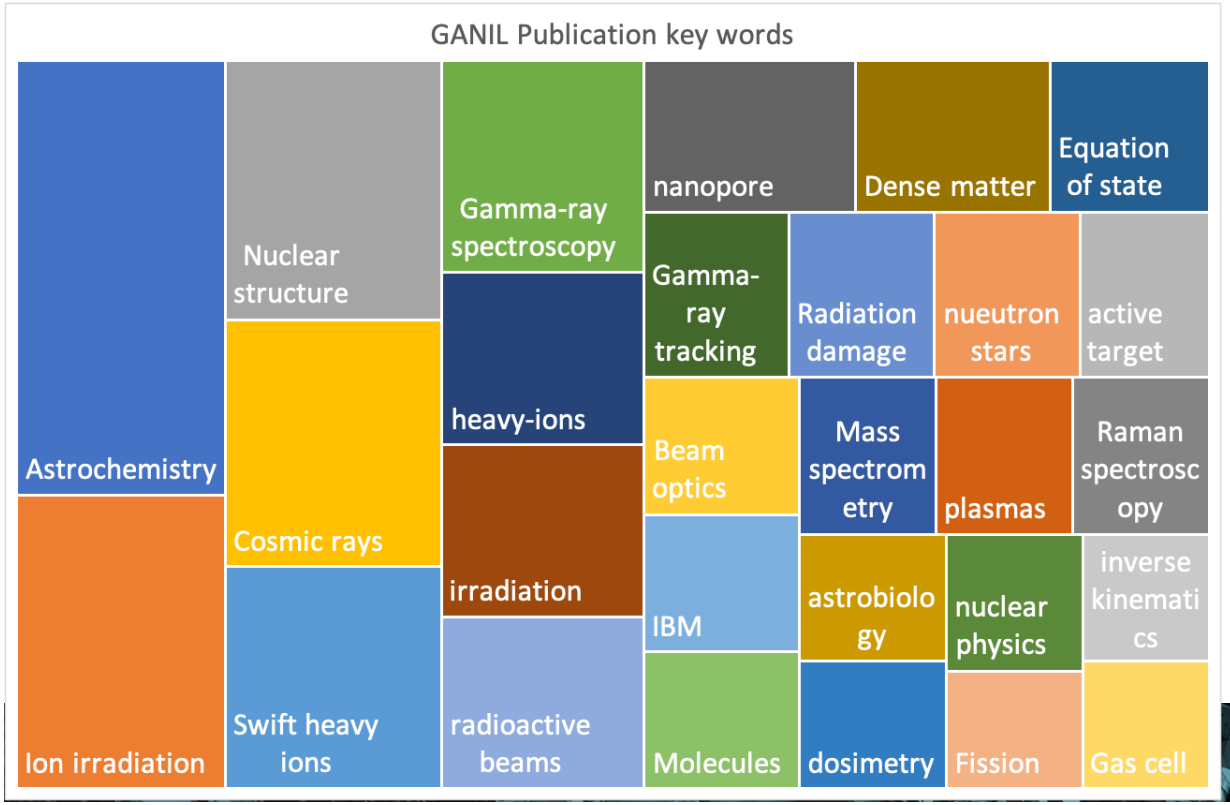


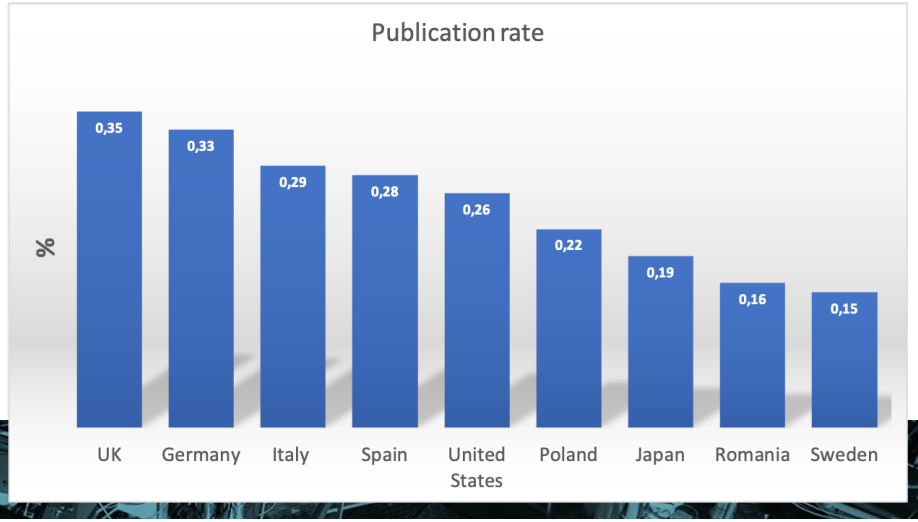
Scientific production

OPEN ACCESS 73%



Between 100 and 150 publications/year
85% in international collaboration






GANIL
Scientific programs at GANIL
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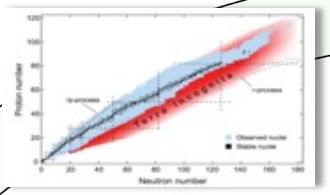
A multi-user pluridisciplinary laboratory

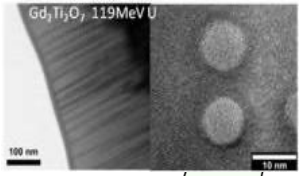
Nuclear Astrophysics

Nuclear Physics

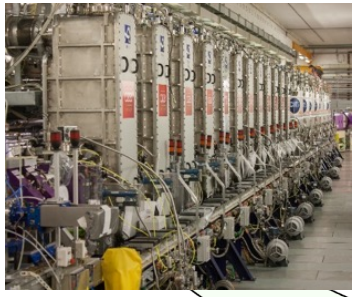


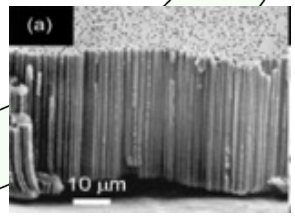
Astrochemistry

Materials under irradiation

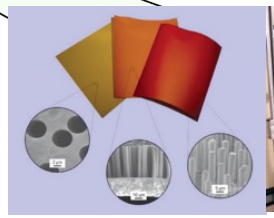


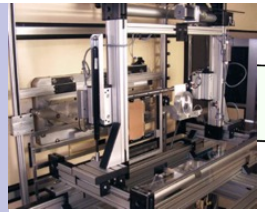
R&D on accelerators and detectors





Nanostructuration





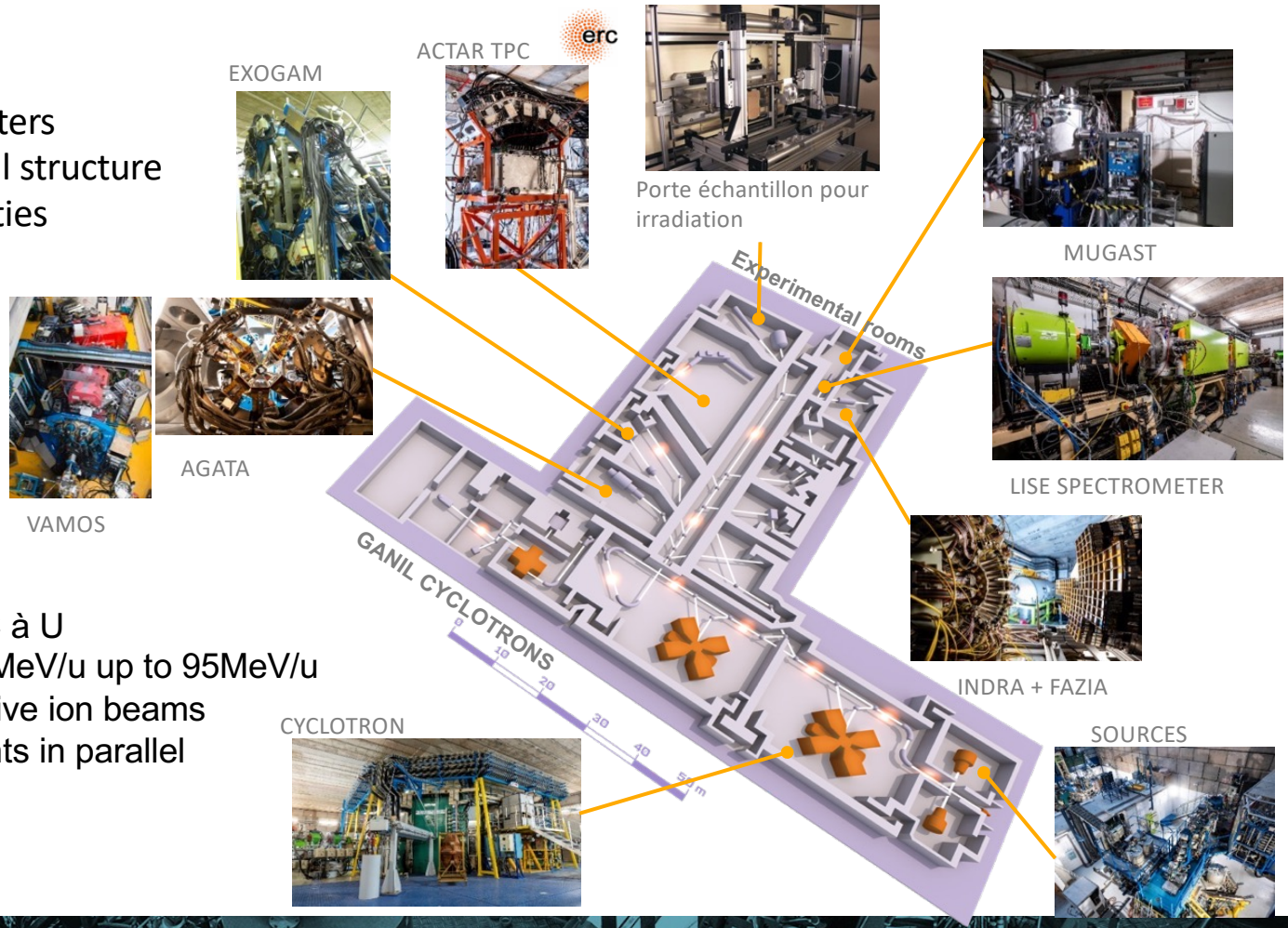
Industrial applications: microporous membranes, tests of electronic components

Radiobiology, new therapies


GANIL
GANIL installations and projects
© Ph. Stroppa/CEA

GANIL cyclotrons and experimental rooms

- Fission
- EOS
- Exotic Nuclei clusters
- Exotic Nuclei Shell structure
- Exotic radioactivities



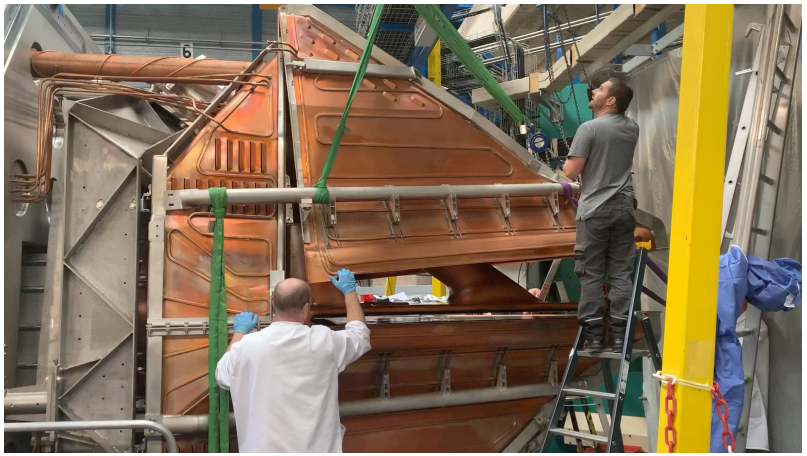
- 5 cyclotrons
- Stable beams: ^{12}C à U
- Energy : from <1 MeV/u up to 95MeV/u
- SPIRAL1 radioactive ion beams
- Up to 4 experiments in parallel

CYREN : a deep renovation ambition for GANIL to maintain scientific objectives at the best level

2024-2033 renovation programme

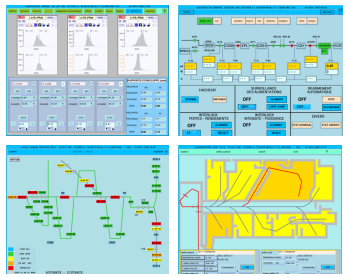
GANIL

- cyclotrons



- Infrastructure

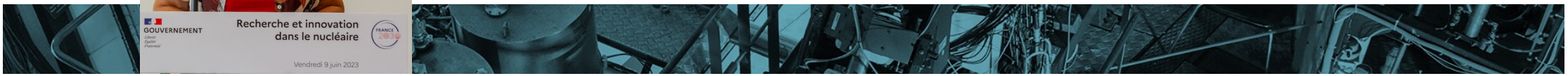
- Safety supervision



Minister for Research confirmed an endowment of ***40 M€ for GANIL projects: DESIR, NEWGAIN, CYREN (11,2 ; 7,4 ; 21,4)***

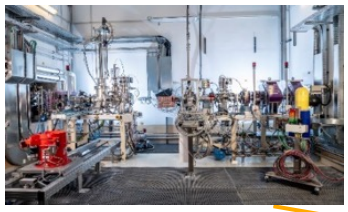
➢ Objective n°1:
Keep the installation in good operational conditions for the next 20 years

➢ Objective n°2:
Optimise human resources for maintenance and further renovation



SPIRAL2 LINAC and the new experimental rooms

EXPERIMENTAL ROOM NFS
(NEUTRONS FOR SCIENCE)

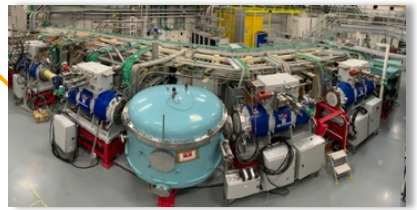


Convertor room

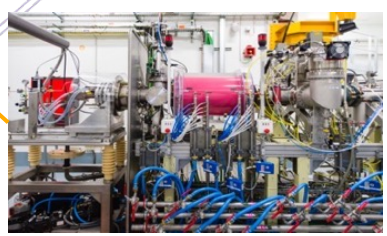
Time of Flight room

EXPERIMENTAL ROOM
DESIR
(Desintegration,
Excitation and Storage
of Radioactive Ions)

LINEAR accelerator (LINAC)



EXPERIMENTAL ROOM S3
(SUPER SEPARATOR
SPECTROMETER)



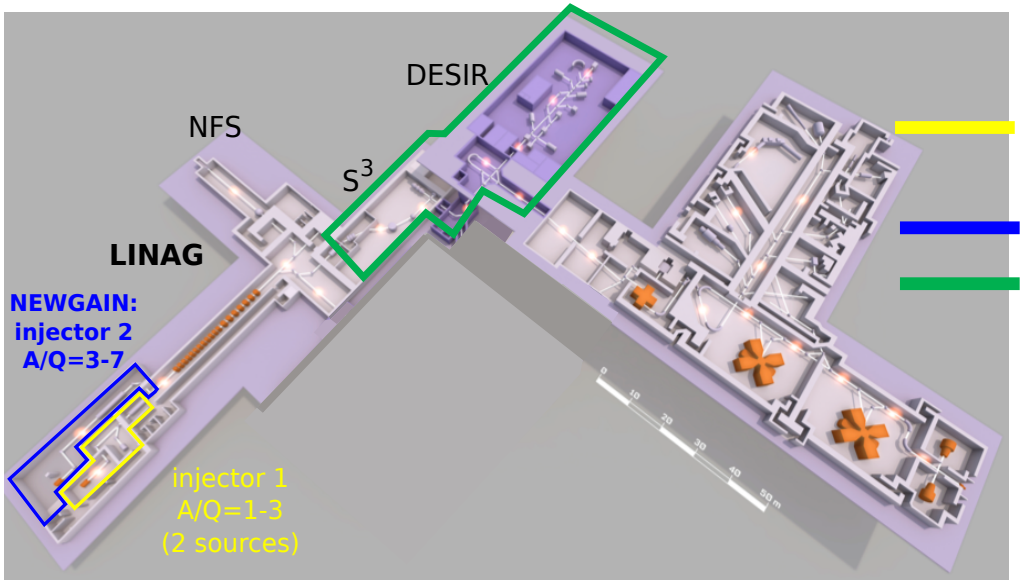
ION SOURCE

First heavy ion beam : $^{18}O^{6+}$ 50µA, 7 MeV/u
LINAC transmission 98%
$^{40}Ar^{14+}$ 80µA, 7 MeV/u

NEWGAIN
NEW GANIL INJECTOR

High intensity beams :
5 mA, 33 MeV protons
5 mA, 40 MeV deutons
1 mA, <14,5 MeV/u heavy ions

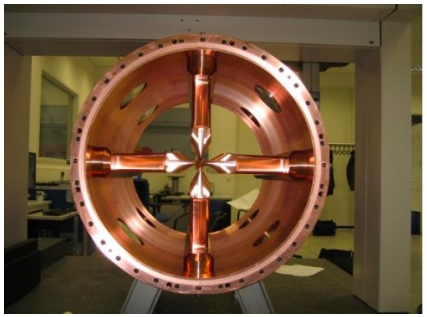
NEWGAIN : New GANIL Injector

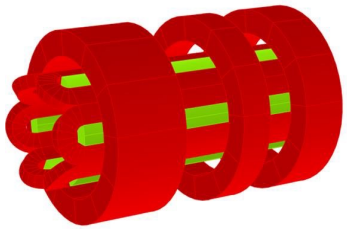


Existing

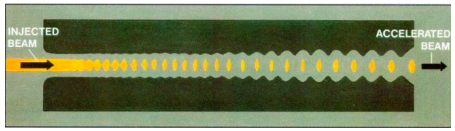
NEWGAIN

Main User





Source supraconducting ASTERICS



RFQ for heavy ions

	beam intensities	*injector1* *2023*	*2028*	*(injector2)* *≥ 2030*
Ions	**Intensity (pμA)** **Phoenix V3** **RFQ A/Q≤3**	**Intensity (pμA)** **Phoenix V3** **RFQ A/Q≤7**	**Intensity (pμA)** **SC Ion Source** **RFQ A/Q≤7**
^{18}O	80	*	375
^{19}F	>15	>40	>40
^{36}Ar	16	70	45
^{40}Ar	3.6	70	45
^{36}S	2.3	*	*
^{40}Ca	2.9	10	20
^{48}Ca	1.2	10	20
^{58}Ni	1.1	4	**8**
^{84}Kr	0.1	10	**20**
^{139}Xe	0.001	7	**>10**
^{238}U	<<0.001	0.1	**6**

Measured Estimated * -> no estimation

World-record intensities

The Neutrons For Science facility

NFS is the first operational experimental area of SPIRAL2 at GANIL

Physics case

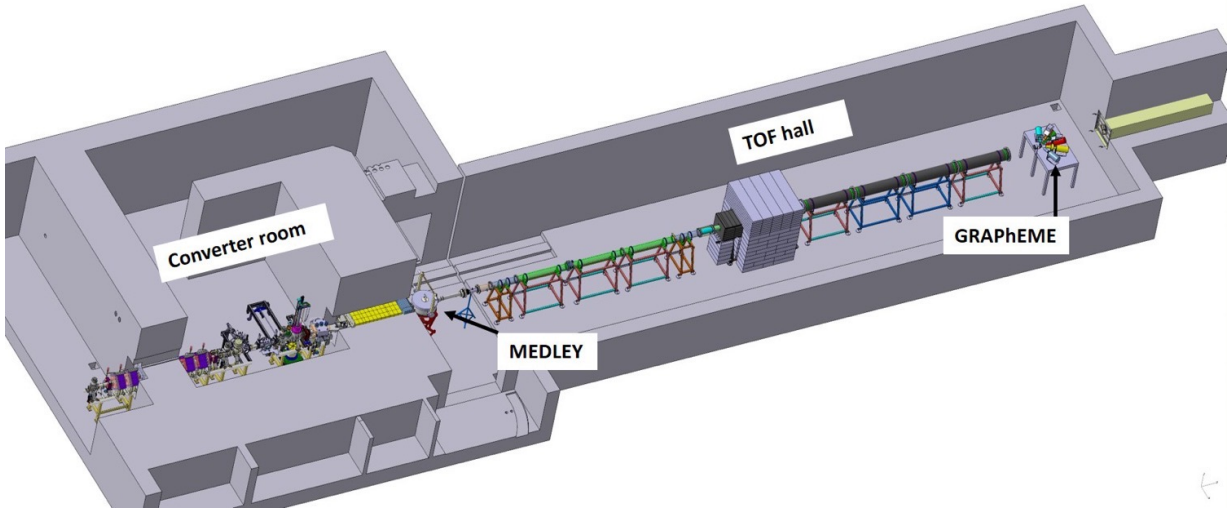
- ❑ Fundamental physics
- ❑ Astrophysics
- ❑ New generation of reactor
- ❑ Fusion technology
- ❑ Radioisotopes production for medical applications
- ❑ Biology (cells irradiation..)
- ❑ Development and characterization of new detectors
- ❑ Study of the single-event upsets

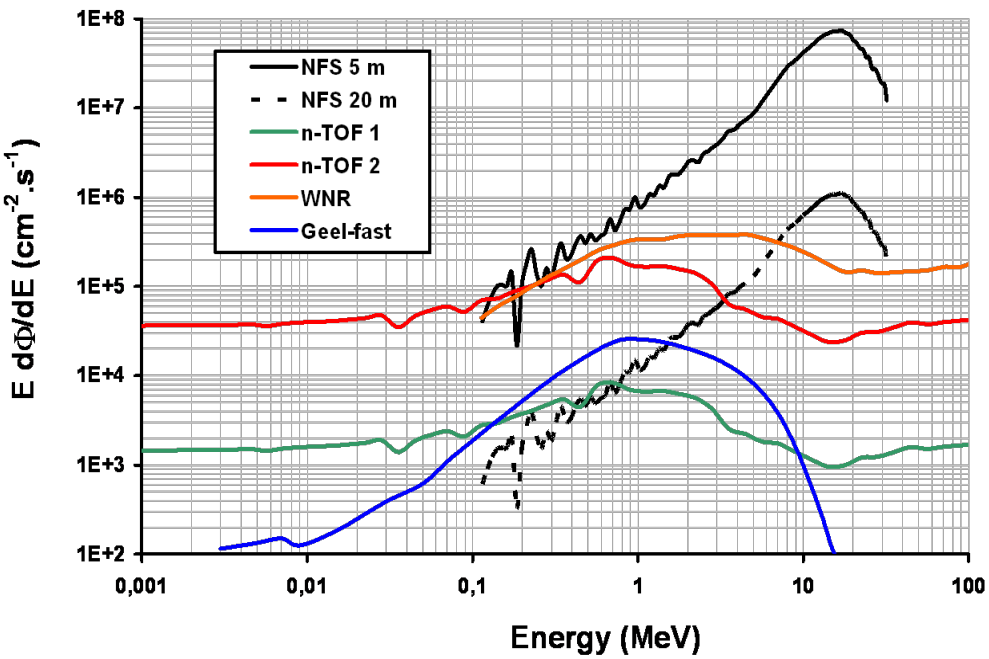
International collaboration

50 physicists

15 laboratories

6 partners

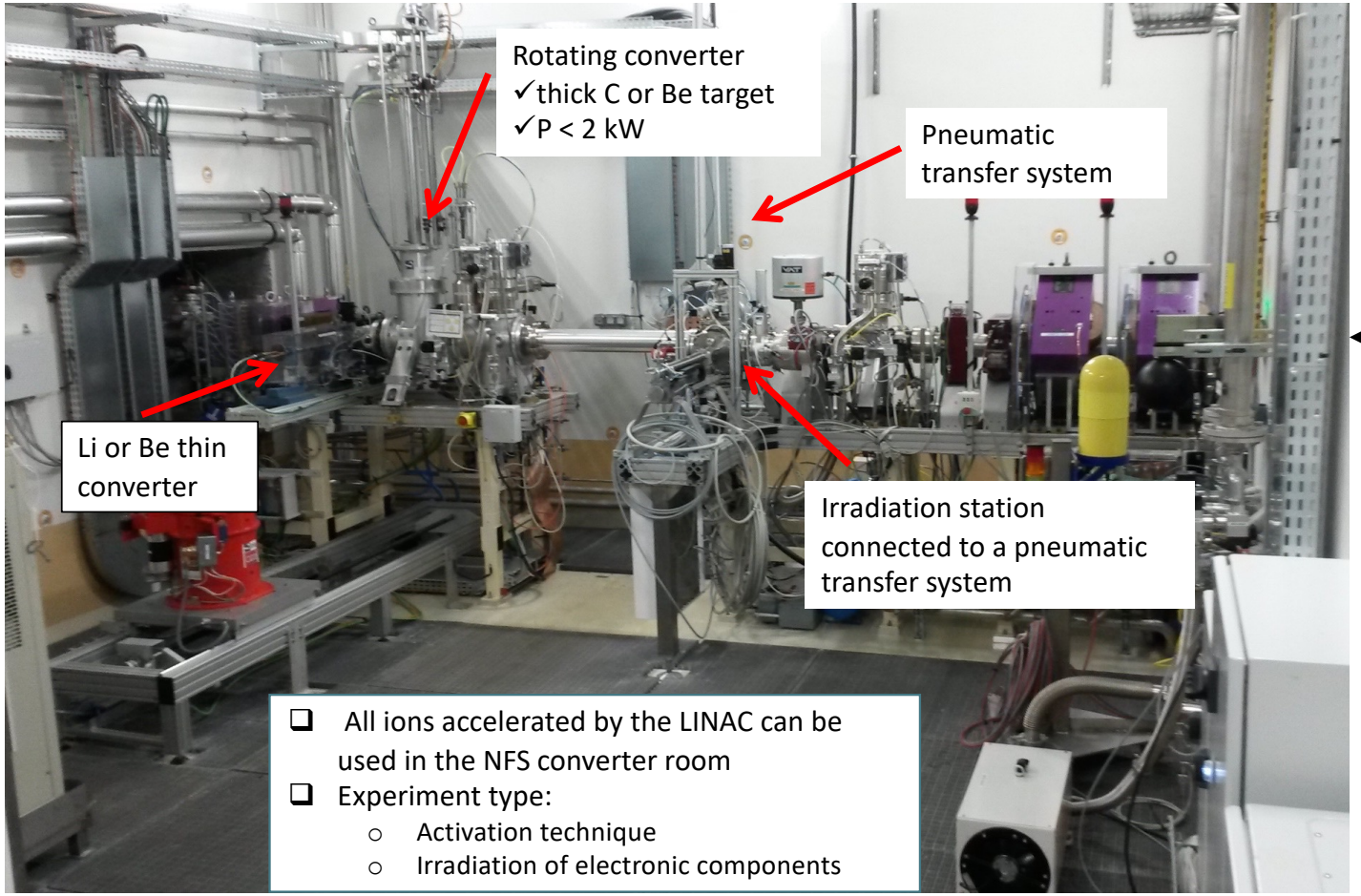




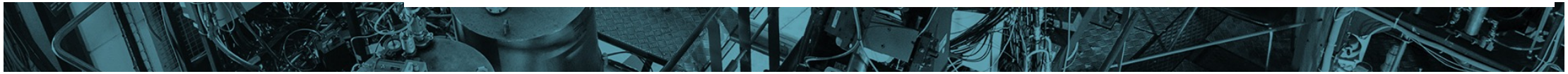
High neutron flux and good complementarity with other facilities

NFS : Converter room

- Neutron production
- Light-ion irradiations

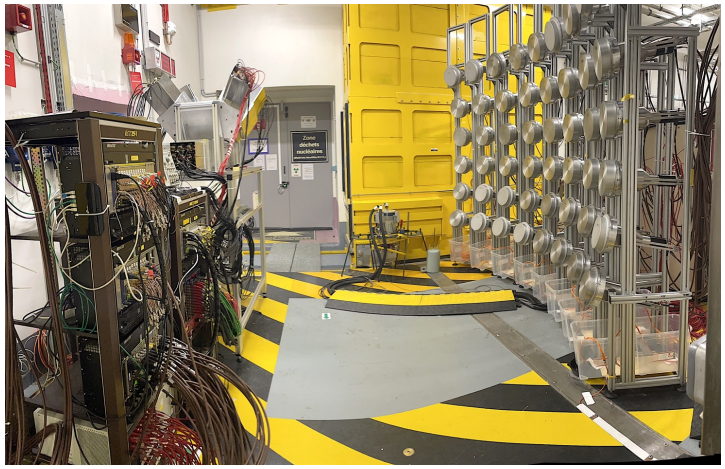


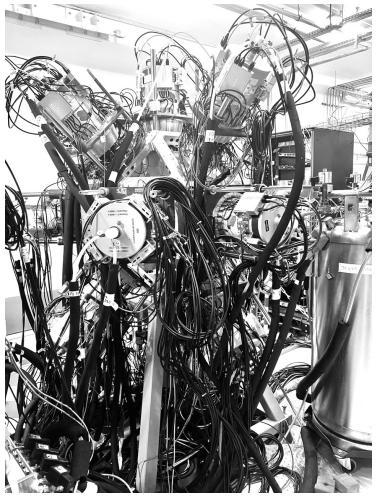
NFS : TOF Hall

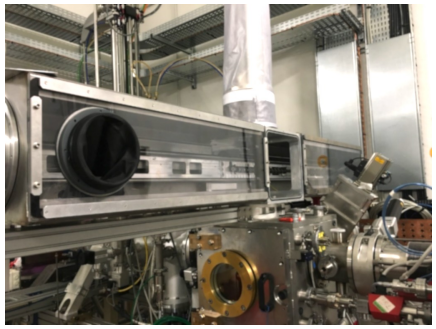


Some NFS Experiments

- Pygmy dipole resonance in ^{140}Ce using the (n,n'γ) reaction, Marine Vandebrouck et al
- Light ions production studies with MEDLEY at the NFS facility, Diego Tarrio et al
- (n,xn γ) reaction cross section measurements for nuclear energy, M. Kerveno et al
- REPARE project: production of ^{211}At for alphatherapy, Gilles de France et al





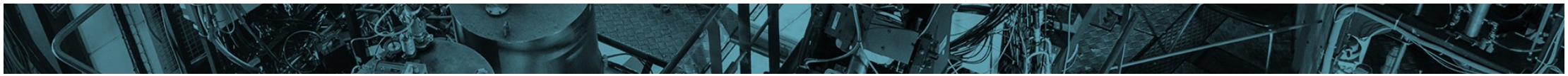


REPARE

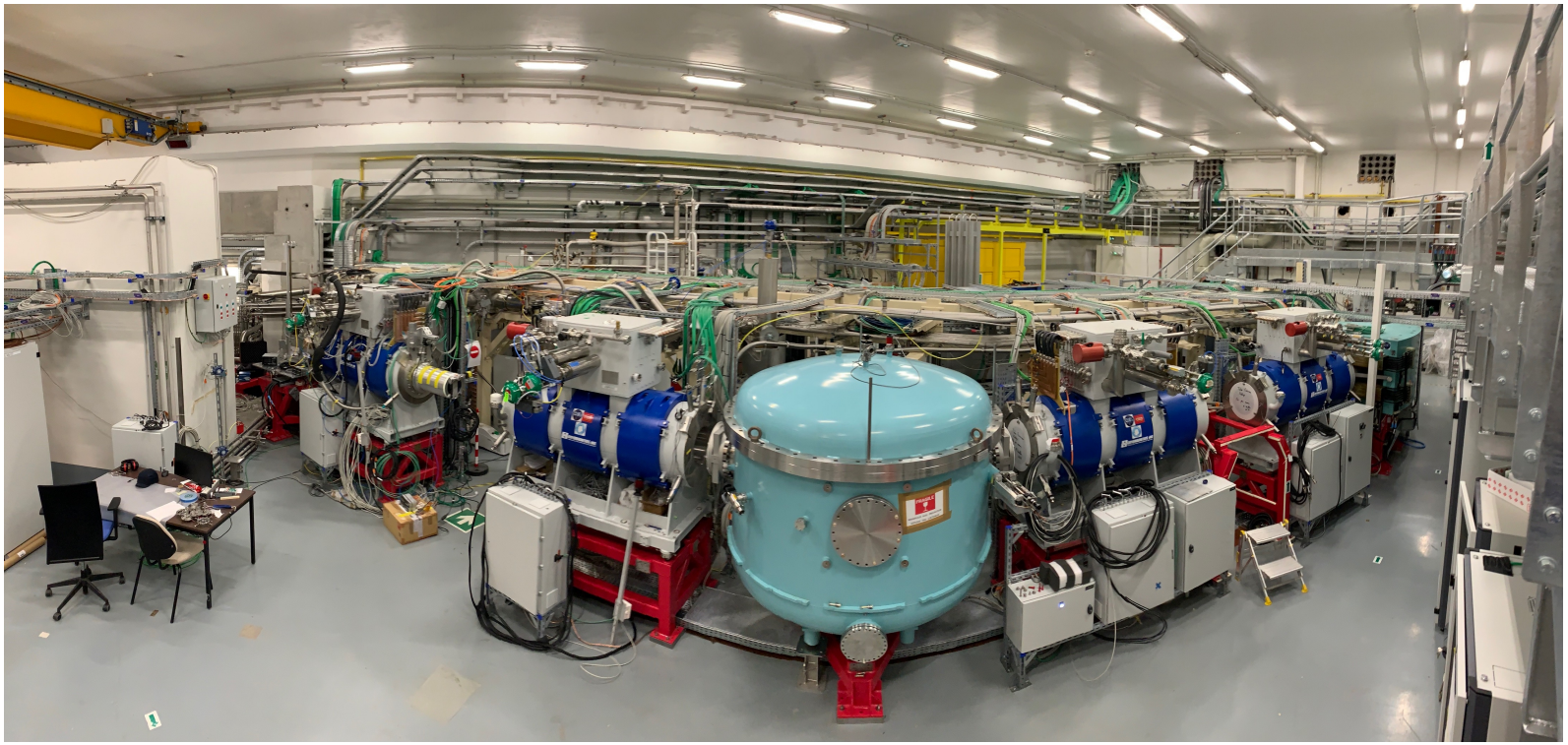
MEDLEY

- Shedding new light on the structure of ^{56}Ni using (n,3n) reaction at NFS, E. Clement et al

- ^{235}U fission fragment study with FALSTAFF at NFS, D. Doré et al.

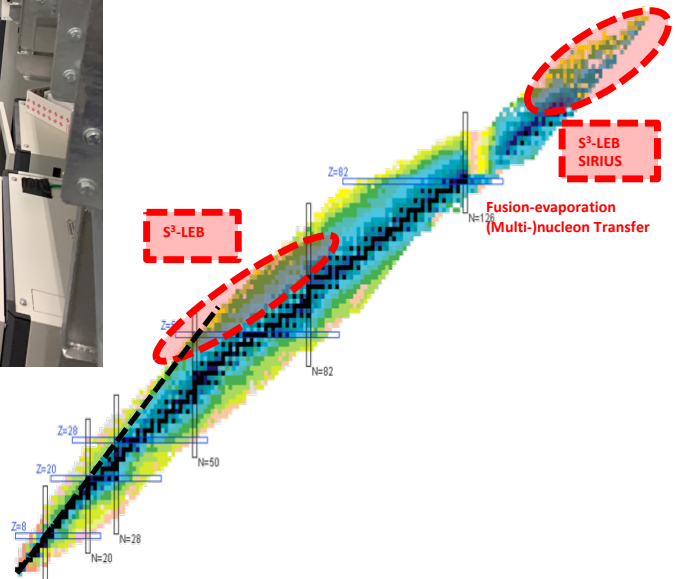


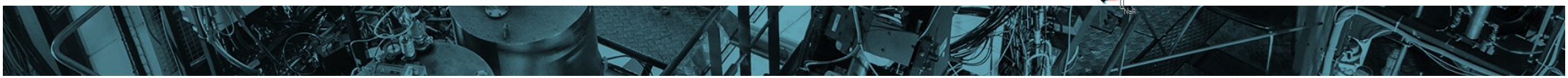
S^3 : Super Separator Spectrometer



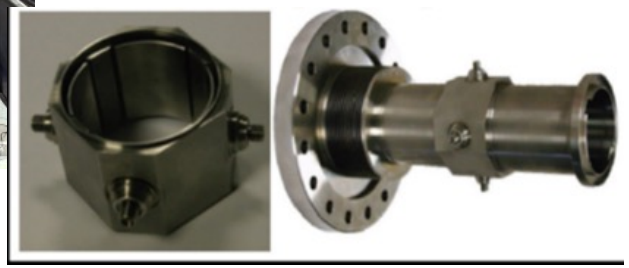
A spectrometer with state-of-the-art performances

First beam on target 2024
First experiments 2026





First beam on target, November 2024



BPM optimisés avec succès

On 21 November 2024, the first milestone in the commissioning of GANIL's new spectrometer, the Super Spectrometer Separator S3, was successfully achieved.
Well done to everyone!
Beam 40Ar14+ intensity 80uAe (close to the world record)

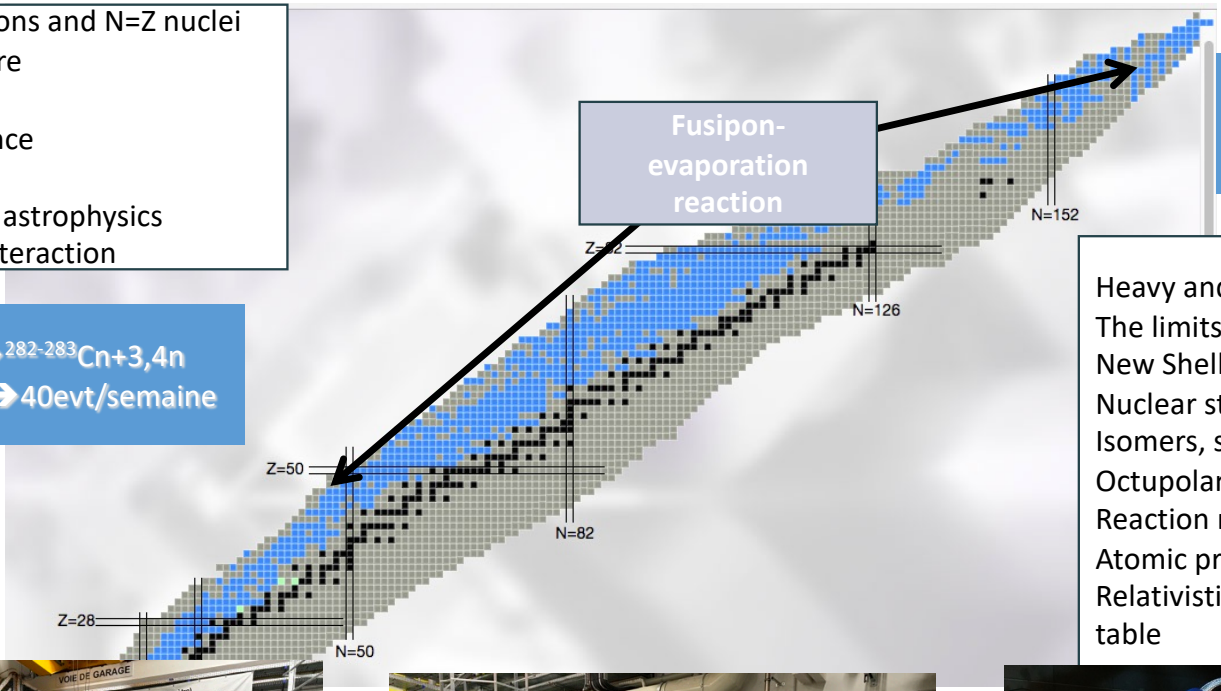
Preparations for the spectrometer's 'optical' commissioning in December 2025

Rare event studies in nuclear physics

GANIL

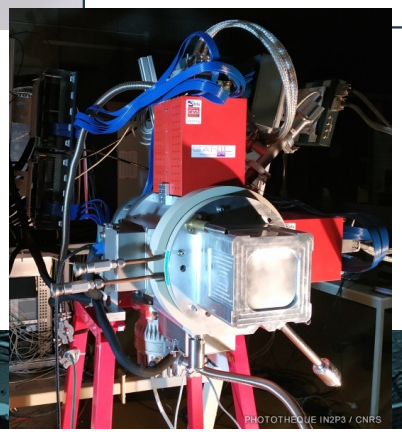
Dripline of protons and N=Z nuclei
Nuclear structure
π-ν interaction
Shape coexistence
Exotic decay
Rp processes in astrophysics
Fundamental interaction

$^{48}Ca+^{238}U \rightarrow ^{282\text{-}283}Cn+3,4n$
(I=10pμA) → 40evt/semaine



$^{48}Ca+^{238}U \rightarrow ^{282\text{-}283}Cn+3,4n$
(I=10pμA) → 40evt/week

Heavy and super-heavy elements
The limits of nuclear existence
New Shell closure
Nuclear structure
Isomers, shapes and moments
Octupolar deformation
Reaction mechanisms
Atomic properties
Relativistic effects and position in the periodic table



S3-LEB+ SIRIUS installation in progress

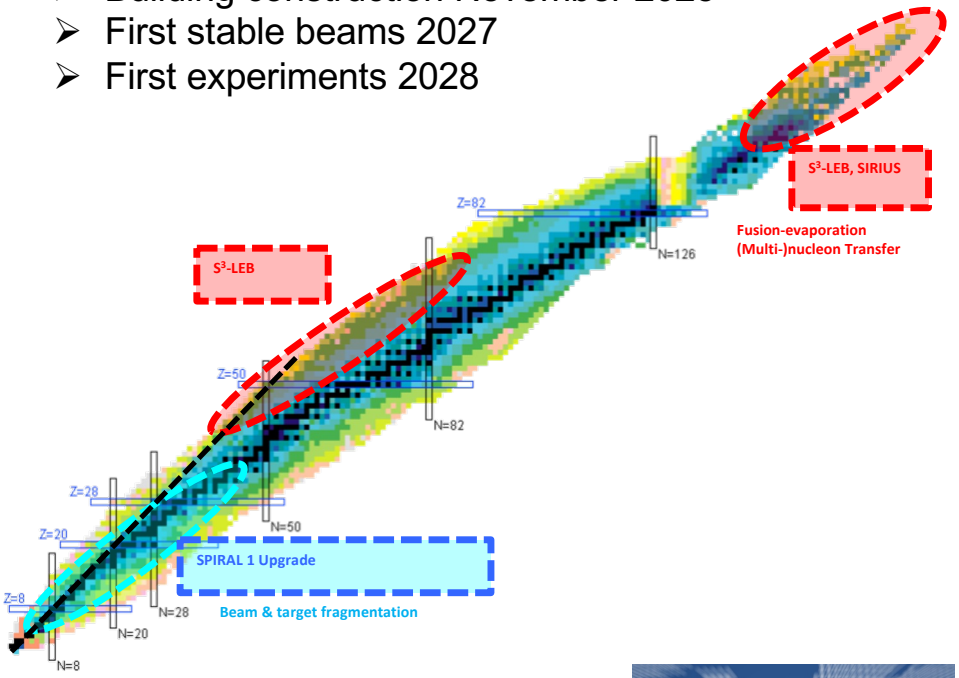
DESIR
Decay, Excitation, Storage of Radioactive Ions

- Beams from SPIRAL1 and S3
- Important beam preparation and purification capabilities
- High resolution and high precision experiments
- Studies of fundamental properties of nuclei:

masses, lifetimes, decay modes, spin, quadrupolar moments…

- Nucleosynthesis Fundamental interactions, study of weak interaction

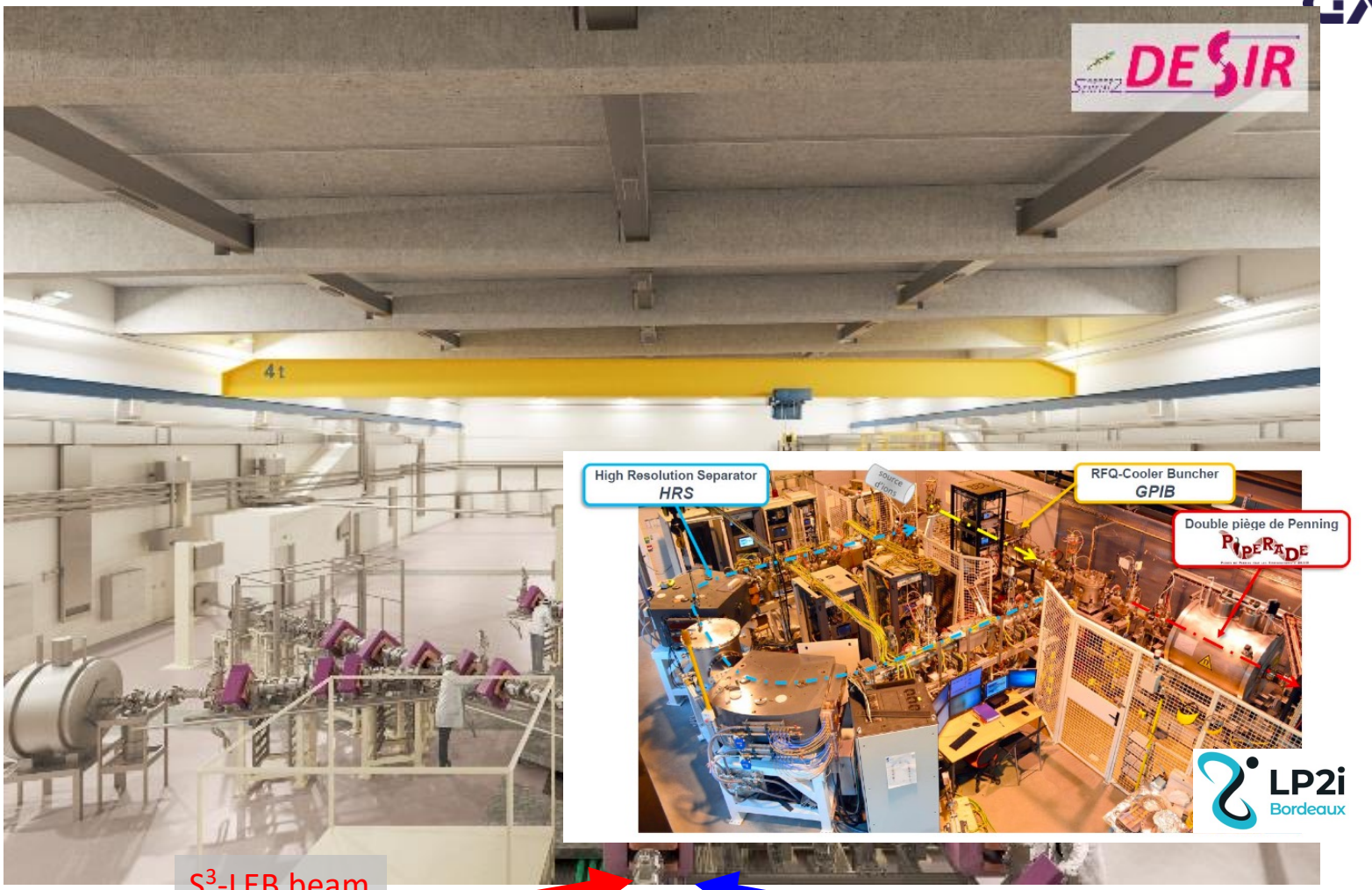
- Site inauguration Novembre 2023
- Building construction November 2025
- First stable beams 2027
- First experiments 2028



- Scientific aperture

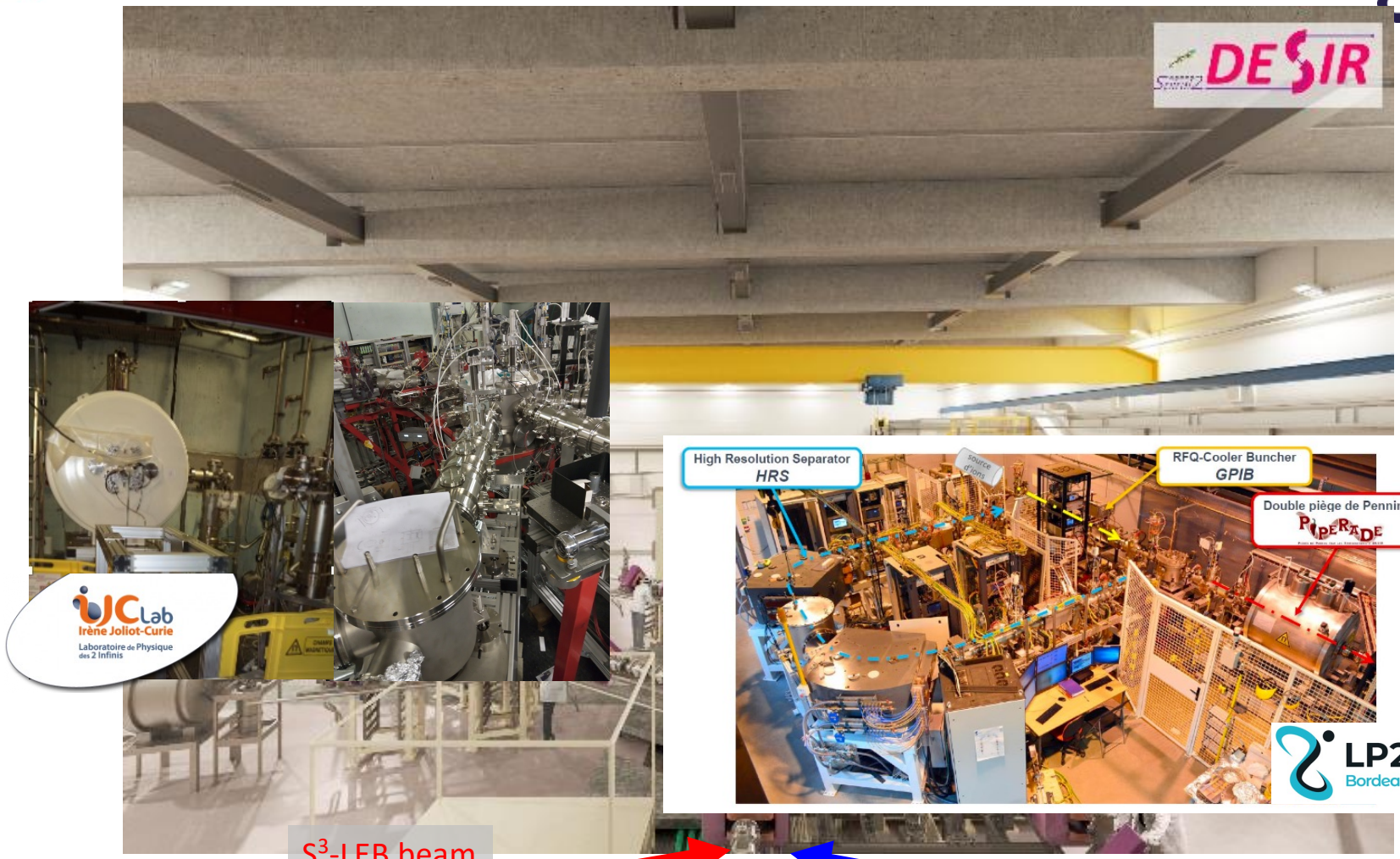
Contribution to ESPPU

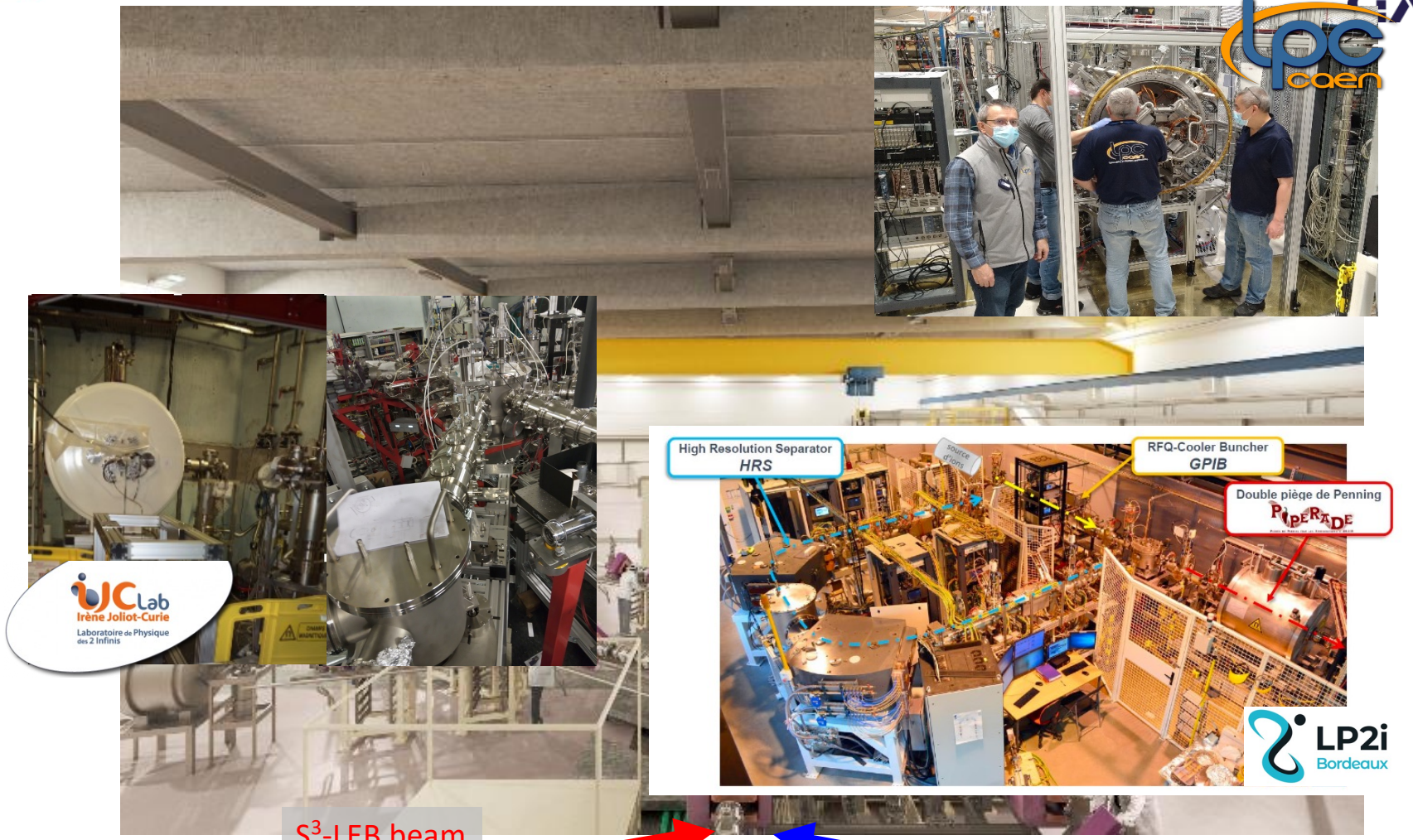

4t
S3-LEB beam
SPIRAL1 beam



S^3-LEB beam

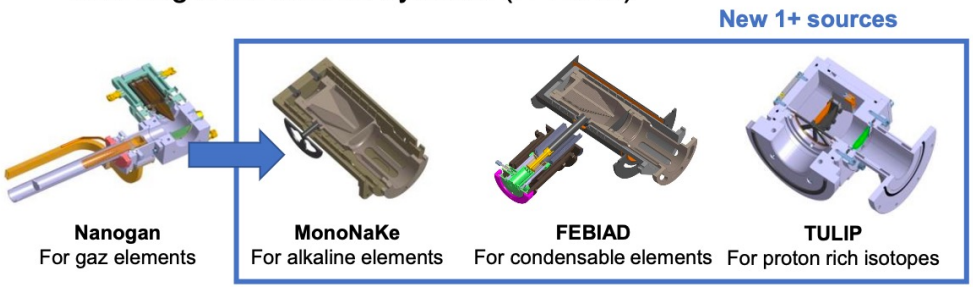
SPIRAL1 beam


DESIR
High Resolution Separator
HRS
RFQ-Cooler Buncher
GPIB
Double piège de Penning
PIPERADE
IJCLab
Irène Joliot-Curie
Laboratoire de Physique des 2 Infinis
LP2i
Bordeaux
S3-LEB beam
SPIRAL1 beam

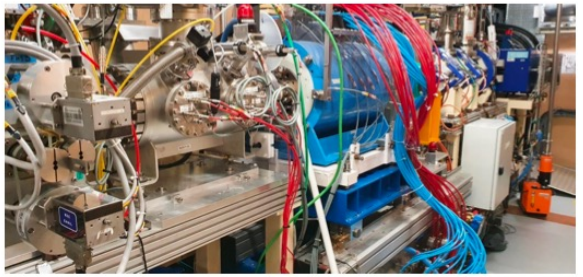

High Resolution Separator
HRS
RFQ-Cooler Buncher
GPIB
Double piège de Penning
PIPERADE
IJCLab
Irène Joliot-Curie
Laboratoire de Physique des 2 Infinis
LP2i
Bordeaux
S3-LEB beam
SPIRAL1 beam

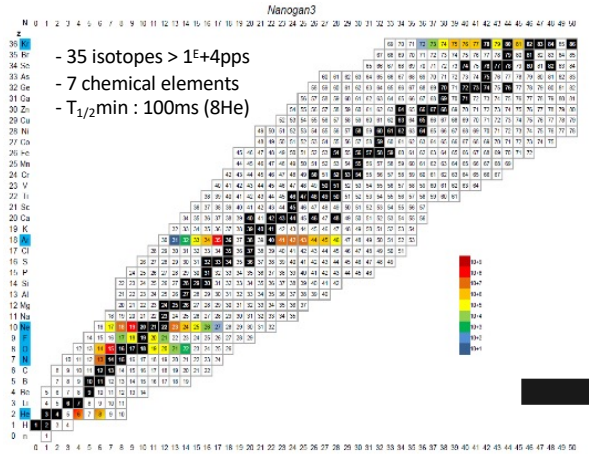
SPIRAL1 upgrade

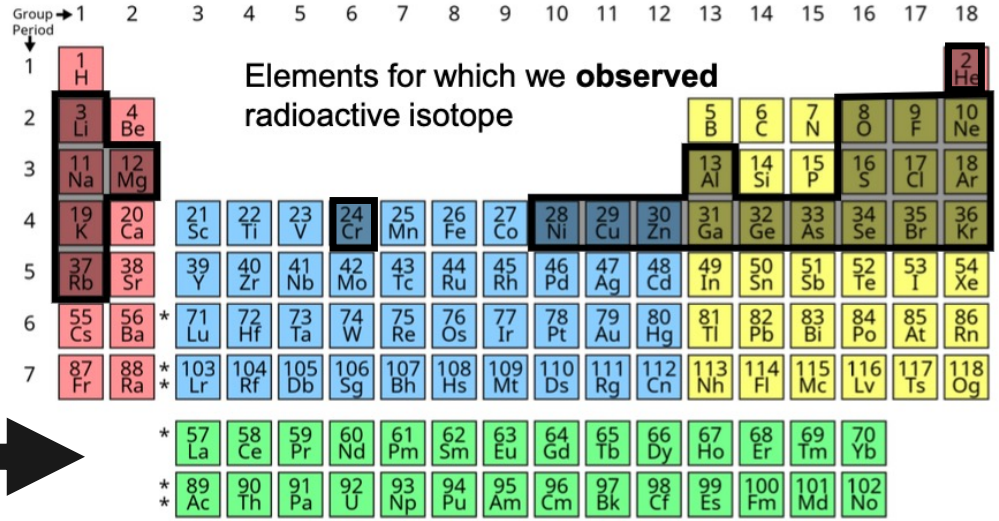
- New target Ion Source Systems (FEBIAD)



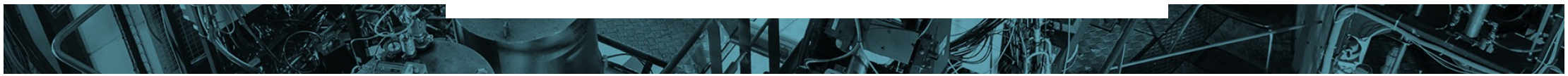
- The charge breeder

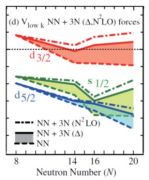


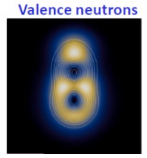


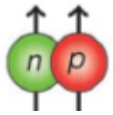


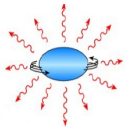
50 new isomers/isotopes
With intensities suitable for acceleration











Heavy Fragment survival in Multi Nucleon Transfer reaction I. Stefan et al

AGATA Workshop, GANIL, May 2024

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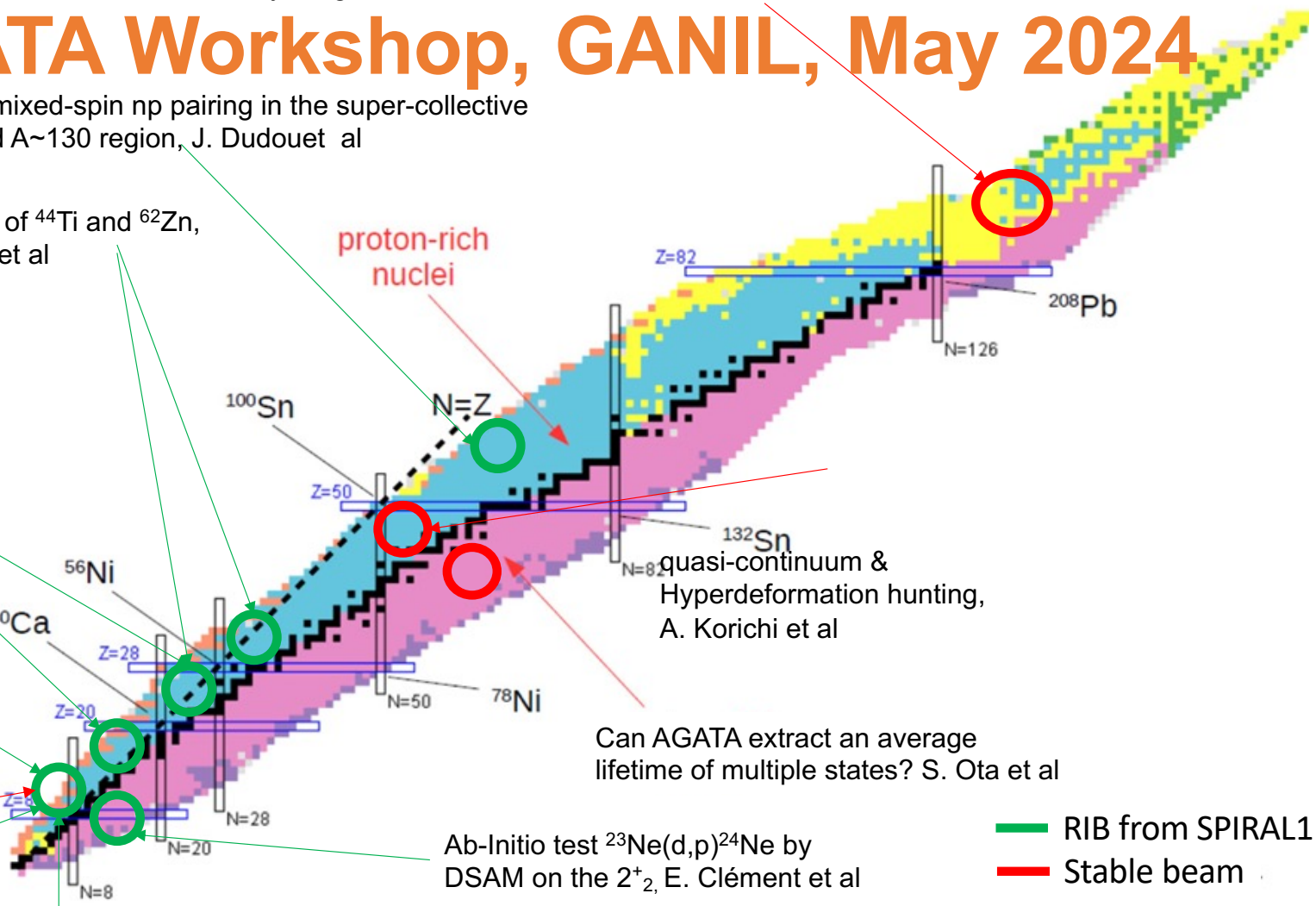


quasi-continuum & Hyperdeformation hunting, A. Korichi et al

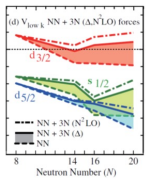
Can AGATA extract an average lifetime of multiple states? S. Ota et al

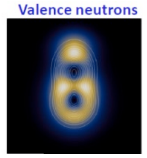
Ab-Initio test ^{23}Ne(d,p)^{24}Ne by DSAM on the $2^{+}_{2,}$ E. Clément et al

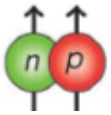
Studying X-ray Bursts with the AGATA-GRIT-VAMOS Setup G. Lotay et al

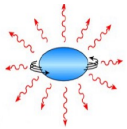
RIB from SPIRAL1

Stable beam









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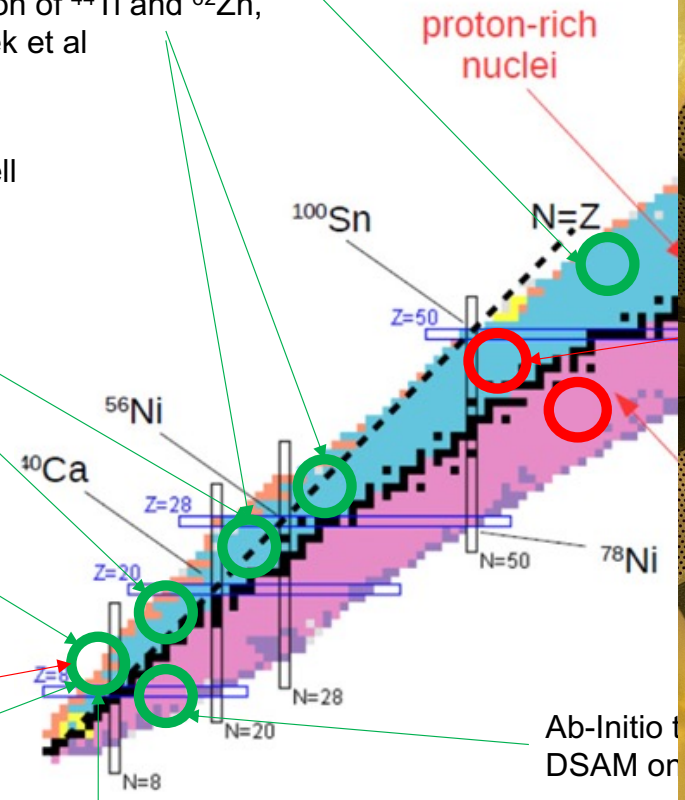


Ab-Initio t
DSAM or

Studying X-ray Bursts with the AGATA-GR

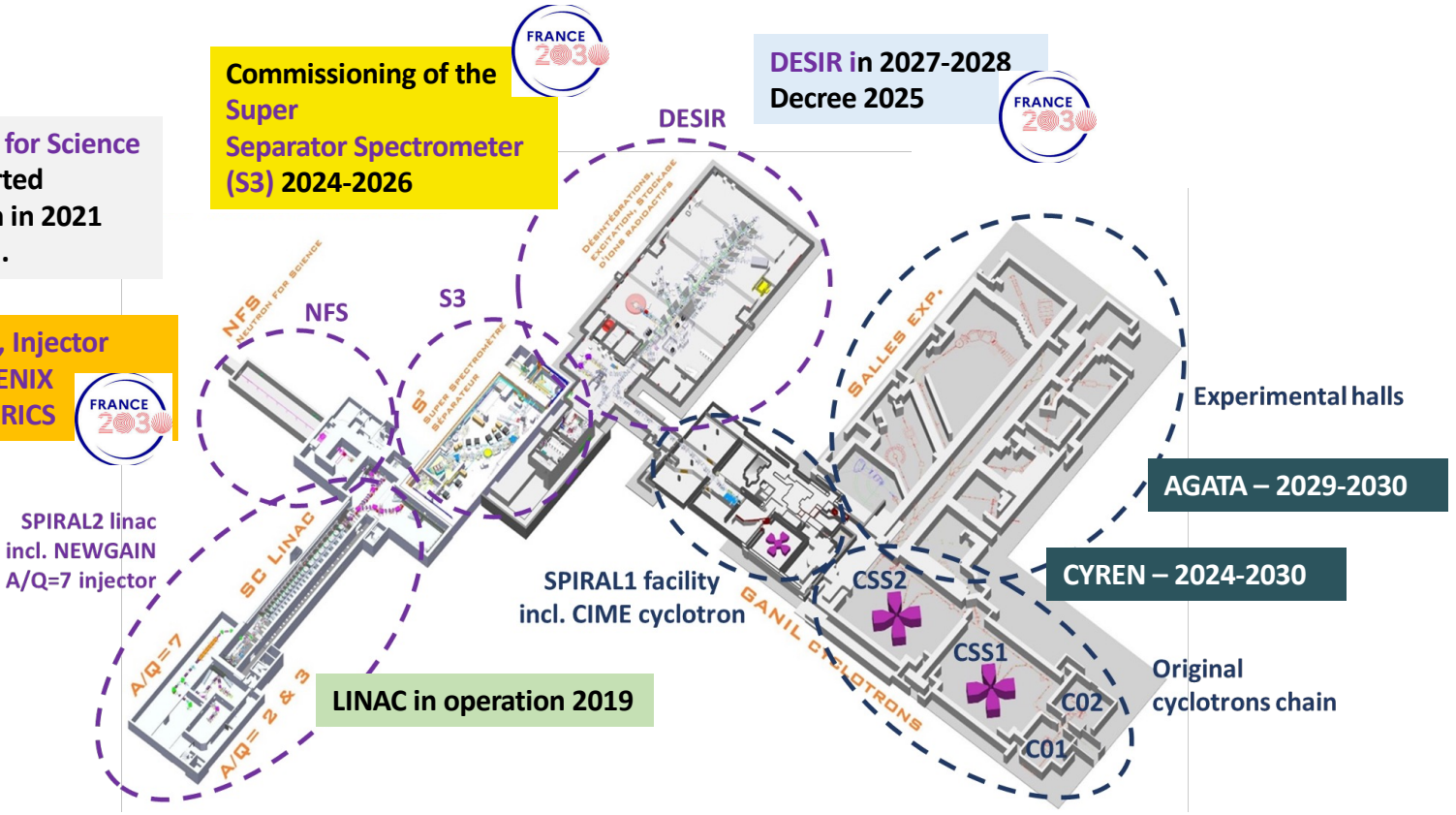
GANIL Horizon 2030

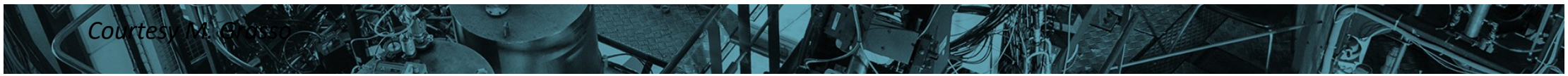
Neutrons for Science (NFS) started operation in 2021 (first exp).

NEWGAIN, Injector 2028 PHOENIX 2032 ASTERICS

Commissioning of the Super Separator Spectrometer (S3) 2024-2026

DESIR in 2027-2028 Decree 2025





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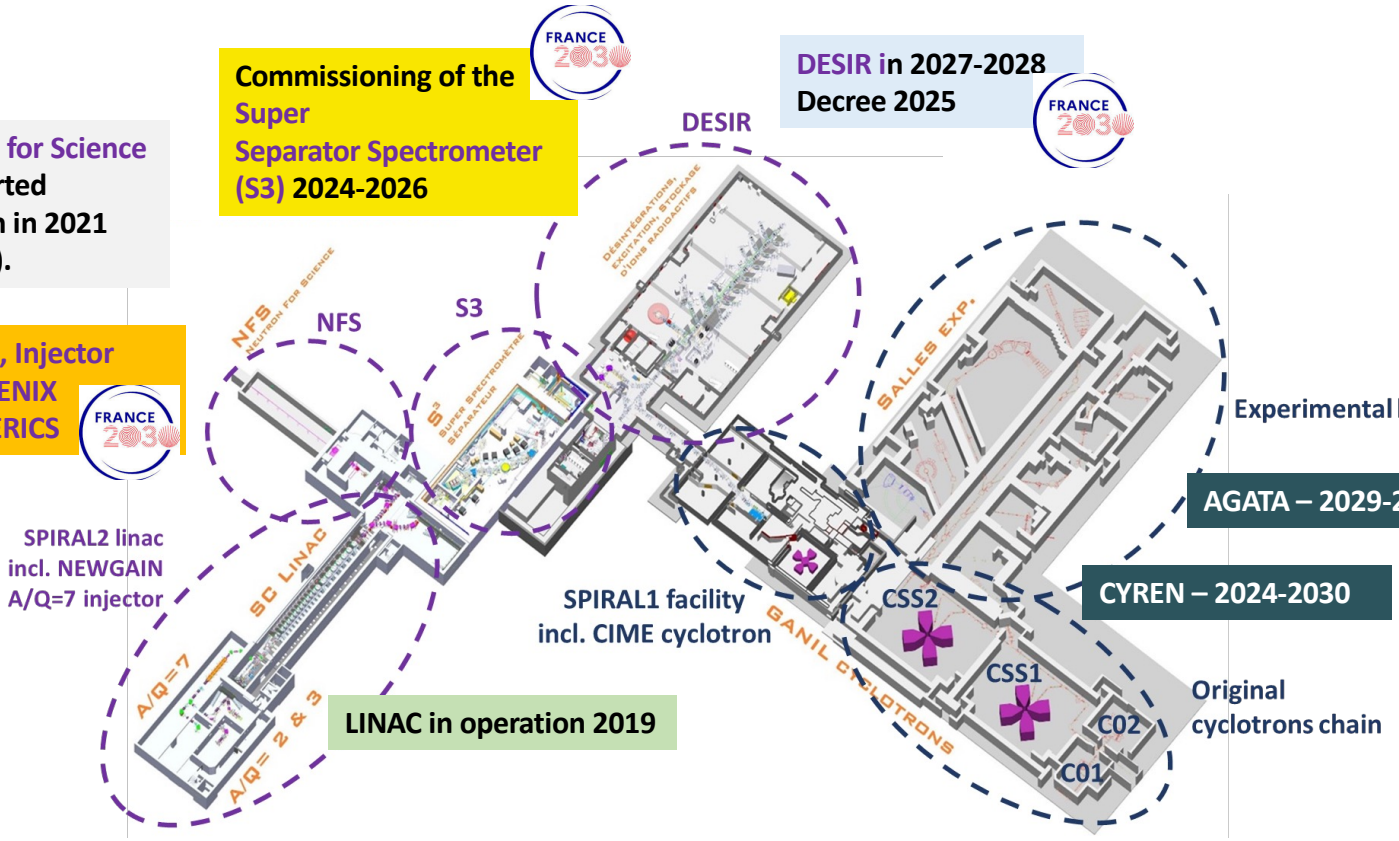


Courtesy M. Grosso

More than 12 presentations on GANIL results and projects !

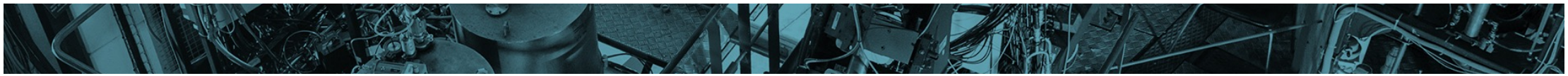
D. Treasa **FALSTAFF** 05.26. 2:55 PM
V. Manea **S3** 05.26 4:30 PM
A. Chibi **ACTAR** 05.26 PM
B. Rubio **NA2STARS** 05.27 11:45
C. Ciampi **FAZIA** 05.29 11:00
D. Bahini **S3** 05.29 11:40
P. Van Isacker **THEORY** 05.29 06:00 PM
C. Paxman **AGATA** 05.30 09:10
L.M. Motilla **MORA** 05.30 09:10
L. Hayen **ASGARD** 05:29 11:55
X. Fléchard **bStiled** 05.30 09:25

International conferences


European Nuclear Physics Conference 2025

Caen 25-30 septembre 2025 : 400 personnes
https://indico.in2p3.fr/event/30430/

Deauville 17-22 mai 2026 : 1300 personnes
https://www.ipac26.org/



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