



INSTITUT NATIONAL DE **PHYSIQUE NUCLÉAIRE** ET DE **PHYSIQUE DES PARTICULES**



IN2P3

50 ANS DE PHYSIQUE DES DEUX INFINIS

INTRODUCTION

CSI 'Accélérateurs' – 09 & 10 Février 2021

Jean-Luc BIARROTTE, CNRS/IN2P3

jean-luc.biarrotte@in2p3.fr

Particle accelerators @IN2P3

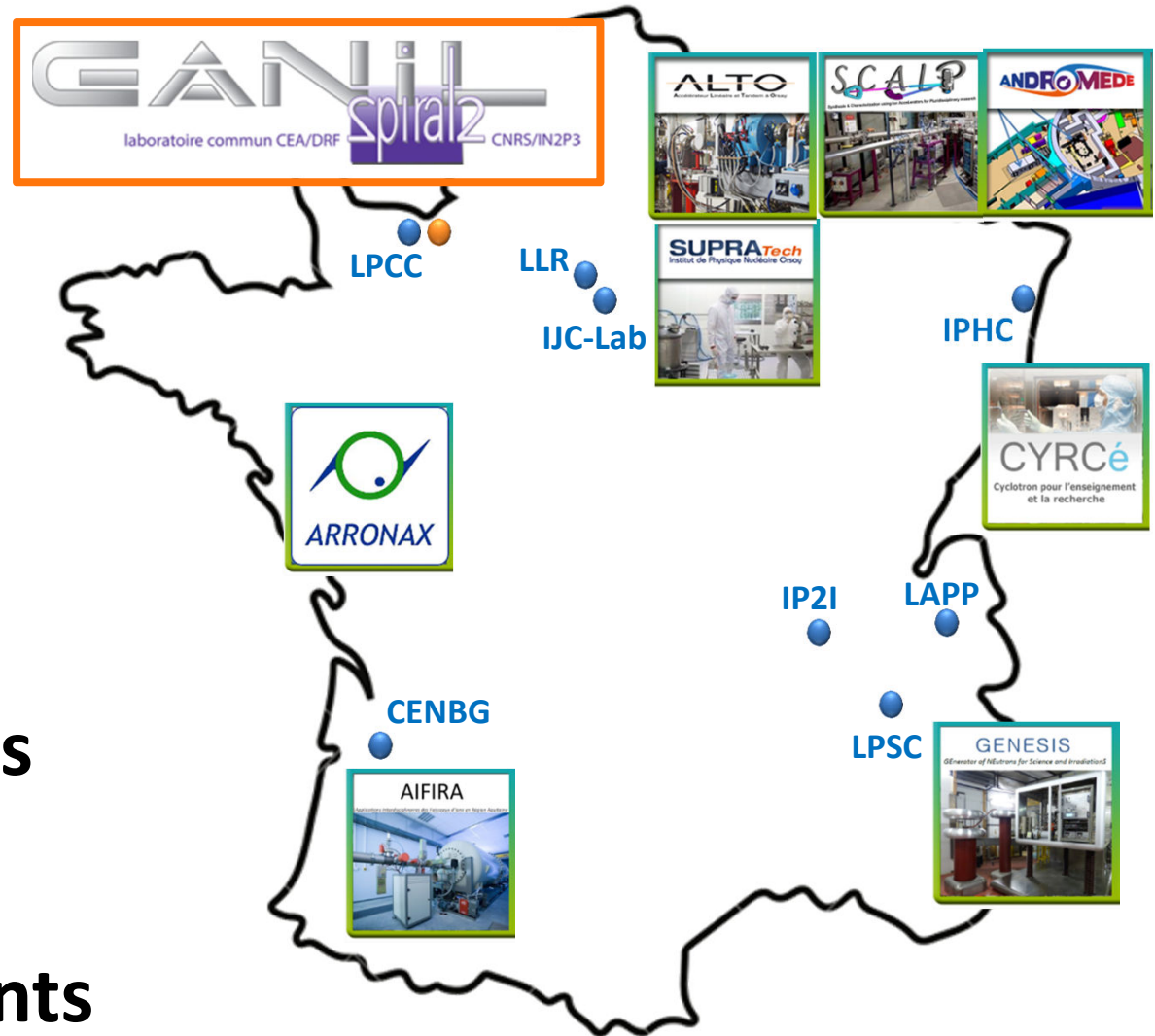
9 labs
involved

9 platforms
(1 national)

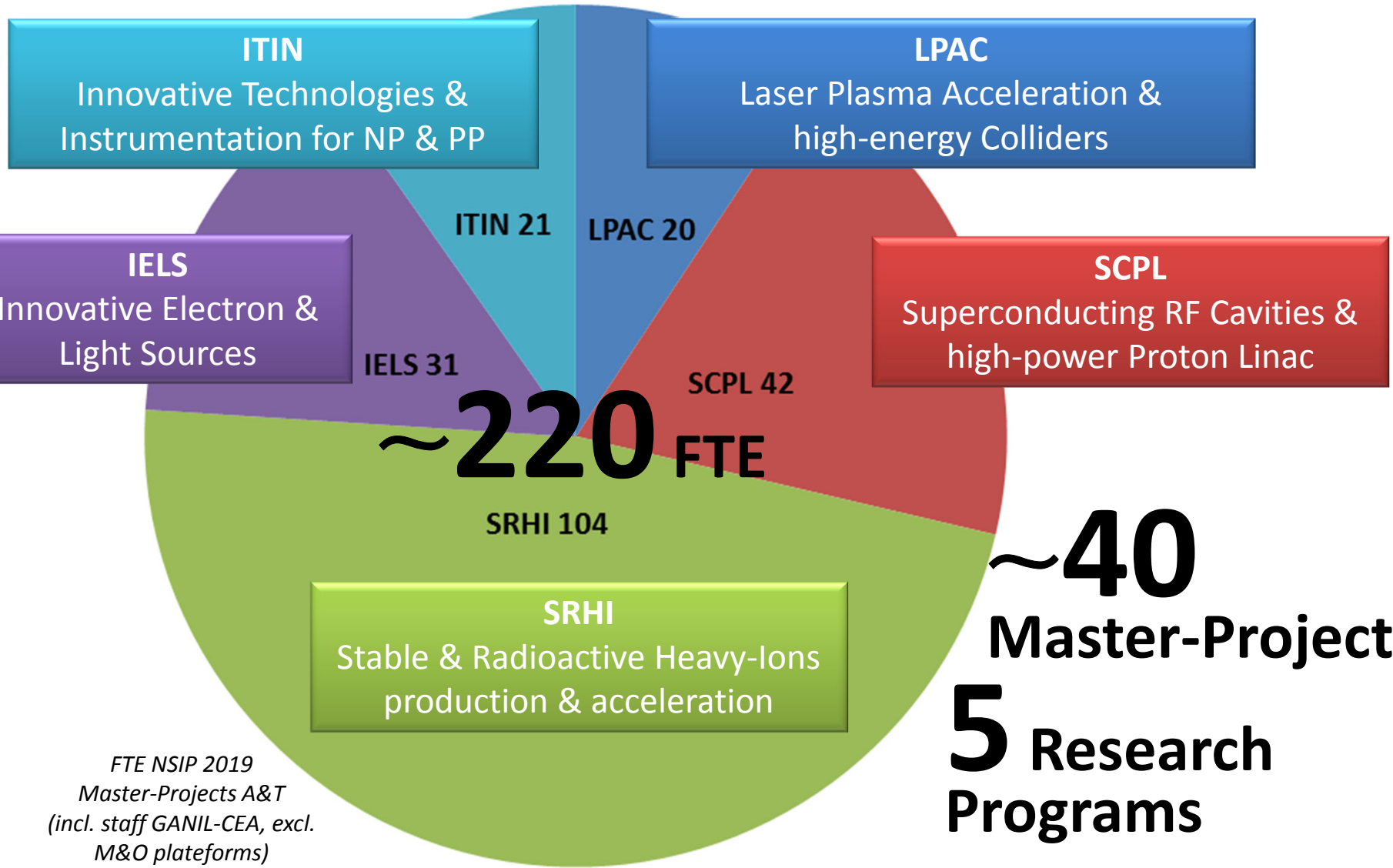
1 GDR

~65 researchers
(~15 HDR)

~25 PhD students



Accelerators & Technologies: portfolio



FTE NSIP 2019
Master-Projects A&T
(incl. staff GANIL-CEA, excl.
M&O platforms)

Missions of accelerators teams

- Actively participate to the **design & construction of particle accelerators** able to address the IN2P3 research programs
 - ✓ top priorities being the development of GANIL, CERN and other world-class accelerators facilities addressing IN2P3 science
- Strongly develop **innovative R&D programs** on accelerators physics & technologies, in order to enhance accelerators performance towards:
 - ✓ Higher beam intensities and luminosities
 - ✓ Higher beam energies
 - ✓ Higher efficiency and reliability
- Make accelerator technologies **available to other** scientific users and to specific industrial & societal needs
 - ✓ When appropriate

CSI 16-17 June 2016

→ Last CSI on Accelerators: **June 2016**

- ✓ General overview of the existing accelerator activities

Jeudi 16 juin 2016

Séance ouverte au public (Auditorium Marie Curie)

- | | |
|---------------|--|
| 09h00 - 9h30 | Accueil |
| 9h30 - 9h45 | 1 Introduction de la thématique « Développement accélérateurs à l'IN2P3 » par Maud Baylac (LPSC) |
| 9h45 - 10h15 | 2 R&D Accélérateurs à l'IN2P3: enjeux, stratégie et perspectives: Sébastien Bousson (IPNO) |
| 10h15 - 11h00 | 3 R&D photo-Injecteurs et sources Compton: Hugues Monard (LAL)
Rapporteur : Vittoria Petrillo (INFN Milan) |
| 11h00 - 11h30 | Pause café |
| 11h30 - 12h15 | 4 R&D accélération laser plasma: Arnd Specka (LLR)
Rapporteur : Patric Muggi (MPP) |
| 12h15 - 13h00 | 5 R&D source d'ions lourds : contexte, activités à l'IN2P3 et perspectives: Thomas Thuillier (LPSC)
Rapporteur: Jacques Lettry (CERN) |
| 13h00 - 14h00 | Pause déjeuner |
| 14h00 - 14h45 | 6 R&D supraconductivité en régime RF: David Longuevergne (IPNO)
Rapporteur: Sergio Calatroni (CERN) |
| 14h45 - 15h30 | 7 R&D accélérateur pour le projet MYRRHA: Frédéric Bouly (LPSC)
Rapporteur: Robin Ferdinand (GANIL) |
| 15h30 - 15h55 | 8 Le projet SPIRAL2 : Franck Varenne (GANIL) |
| 15h55 - 16h20 | 9 Travaux sur les futurs collisionneurs : Phillip Bambade (LAL) |
| 16h20 - 16h45 | Pause café |

A few structuration actions since then

- Creation of the IN2P3 **Master-Projects** portfolio (2016)
- Creation of an IN2P3 **label for accelerator-based research platforms** (2017)
- Creation of the **GdR APPEL** on laser-plasma accelerators (2019)
- Creation **of IJCLab in Orsay** and its Accelerator Research Center ARCO (2020)
- Launch of the **PACIFICS initiative** together with CEA (2021)
 - ✓ **P**article **A**ccelerators Initiative for **F**uture Innovative and **C**hallenging Systems
 - ✓ Basis for a national R&D program on accelerator R&D incl: high-field magnets, SRF cavities, laser-plasma technology, high-current ion sources
 - ✓ 9.7M€ (tbc) over 6 years

Main on-going roadmap exercises

→ Exercices de prospective nationale en physique nucléaire, physique des particules et astroparticules

- ✓ <https://prospectives2020.in2p3.fr/>
- ✓ GT7 report on Accelerators released on June 3, 2020
- ✓ Final report by 2022

→ European strategy for particle physics update

- ✓ Released on June 19, 2020
- ✓ Lab Directors Group has been mandated by CERN Council to develop an associated roadmap by end 2021
- ✓ 5 expert panels
 - ▶ Magnets: P. Veldre (IRFU) / L. Garcia-Tabares Rodriguez (CIEMAT)
 - ▶ Plasma: R. Assmann (DESY) / E. Gschwendtner (CERN)
 - ▶ Muons: D. Schulte (CERN) / M. Palmer (BNL)
 - ▶ ERL: M. Klein (Liverpool) / A. Hutton (JLAB)
 - ▶ RF: S. Bousson (IJCLab) / H. Weise (DESY)

→ Snowmass process in the US, 2020-22

- ✓ <https://snowmass21.org/>



Accelerators for the Future

2020-2030 French Strategic Plan for Nuclear Physics, Particle Physics, Astroparticle Physics and associated Technologies & Applications.

Report of the GT07 working group:

PARTICLE ACCELERATORS & ASSOCIATED INSTRUMENTATION



Photo: Christophe Barad (GANIL)

Authors

Jean-Luc Biarrotte (CNRS/IN2P3), Rodolphe Clédassou (CNRS/IN2P3),
Brigitte Cros (CNRS/LPGP), Angeles Faus-Golfe (CNRS/IJCLab),
Luc Perrot (CNRS/IJCLab)

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High-priority future initiatives

An electron-positron Higgs factory is the highest-priority next collider. For the longer term, the European particle physics community has the ambition to operate a proton-proton collider at the highest achievable energy. Accomplishing these compelling goals will require innovation and cutting-edge technology.

the particle physics community should ramp up its R&D effort focused on advanced accelerator technologies, in particular that for high-field superconducting magnets, including high-temperature superconductors;

Europe, together with its international partners, should investigate the technical and financial feasibility of a future hadron collider at CERN with a centre-of-mass energy of at least 100 TeV and with an electron-positron Higgs and electroweak factory as a possible first stage. Such a feasibility study of the colliders and related infrastructure should be established as a global endeavour and be completed on the timescale of the next Strategy update.

The timely realization of the electron-positron International Linear Collider (ILC) in Japan would be compatible with this strategy and, in that case, the European particle physics community would wish to collaborate.

Innovative accelerator technology underpins the physics reach of high-energy and high-intensity colliders. It is also a powerful driver for many accelerator-based fields of science and industry. The technologies under consideration include high-field magnets, high-temperature superconductors, plasma wakefield acceleration and other high-gradient accelerating structures, bright muon beams, energy recovery linacs. The European particle physics community must intensify accelerator R&D and sustain it with adequate resources. A roadmap should prioritize the technology, taking into account synergies with international partners and other communities such as photon and neutron sources, fusion energy and industry. Deliverables for this decade should be defined in a timely fashion and coordinated among CERN and national laboratories and institutes.

CSI 9-10 February 2021

→ Focus = IN2P3 accelerator

Master-Projects closely connected with the ESPP update

→ For evaluation:

- ✓ FCC-NPC
- ✓ PERLE
- ✓ PALLAS
- ✓ PIP-II

→ For background information:

- ✓ ALP-e, SRF, ESS, MYRRHA
- ✓ ARCO

Mardi 9 février 2021	
Séance ouverte au public	
Accueil	
9h45 - 10h05	1 Mise en route de la visioconférence et mot de bienvenue par Olivier Drapier
10h05 - 10h20 10' + 5'	2 Introduction : Jean-Luc BIARROTTE, IN2P3
10h20 - 11h00 30' + 10'	3 Accelerator physics and technology challenges for the XXIst century : Franck ZIMMERMANN, CERN
11h00 - 11h45 30' + 15'	4 The R&D on FCC and future colliders at IN2P3 : Angeles FAUS-GOLFE, IJCLab <i>Pour avis.</i> Rapporteurs : Antoine CHANCE (CEA) et Frank ZIMMERMANN (CERN)
11h45 - 12h30 30' + 15'	5 PERLE @Orsay TDR : Walid KAABI, IJCLab <i>Pour avis.</i> Rapporteurs : Erk JENSEN (CERN), Antoine CHANCE (CEA) et Frank ZIMMERMANN (CERN)
12h30 - 14h00 Pause déjeuner	
14h00 - 14h30 20' + 10'	6 Electron laser-plasma acceleration R&D at IN2P3 : Arnd SPECKA, LLR <i>Pour information</i>
14h30 - 15h15 30' + 15'	7 PALLAS : Kevin CASSOU, IJCLab <i>Pour avis.</i> Rapporteurs : Marie-Emmanuelle COUPRIE (SOLEIL) , Ralph ASSMANN (DESY) et Frank ZIMMERMANN (CERN)
15h15 - 15h45 20' + 10'	8 Superconducting RF cavities R&D at IN2P3 : Mohammed FOUAIDY, IJCLab <i>Pour information</i>
15h45 - 16h00 Pause	
16h00 - 16h30 20' + 10'	9 Status of IN2P3 contributions to ESS and MYRRHA : Guillaume OLRV, IJCLab <i>Pour information</i>
16h30 - 17h15 30' + 15'	10 IN2P3 contribution to PIP-II : David LONGUEVERGNE, IJCLab <i>Pour avis.</i> Rapporteurs : Erk JENSEN (CERN) et Paolo PIERINI (ESS/INFN)
17h15 - 17h45 20' + 10'	11 ARCO, Centre de Recherche en Accélérateurs d'Orsay : organisation et positionnement national : Sébastien BOUSSON, IJCLab <i>Pour information</i>
17h45	Fin de séance ouverte



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**THANK YOU TO ALL FOR
YOUR COMMITMENT!**

jean-luc.biarrotte@in2p3.fr

