

## ***France HADRON***

a national infrastructure for hadrontherapy  
research including ETOILE, ARCHADE and  
protontherapy centers

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# Context and challenges

- The cancer treatments based on **physical approaches** remain necessary because of tumor heterogeneity
- **Carbon ion therapy** is a reliable and relatively cheap treatment of unresectable and radioresistant tumors
- It is a **new domain of medical technology** where France could have input in R&D and economical development
- French research in hadrontherapy has gain **and international visibility** that worth to be supported
- A need **to federate this multidisciplinary domain** with multiple locations of the involved teams
- The next “plan cancer” (2014-2019) propose a “**national regulation for expensive facilities** as for example protontherapy facilities”

# A bit of history (1)

## The *France HADRON* infrastructure is based on a large heritage:

- The sites of Caen (GANIL), Nice (Médicyc) and Orsay (ICPO) are existing for more than 20 years...
- A Regional program for hadrontherapy research (PRRH) has been initiated in 2002 in Lyon just after the announcement of the carbon ion project in 1997, named ETOILE
- The CNRS launched the Mi2b GDR, end of 2004
- Caen presented its own project , Asclépios, in 2005
- A first attempt of national program in 2007 did not succeed (opposition of the INCa...)

## A bit of history (2)

- **Projects** for new centers or upgrade of existing centers are existing for both carbon ions and protons: at Lyon (**ETOILE**), Caen (**Archade**), Orsay (2010), Nice (2014) and more, Toulouse, Nantes, Lyon for protons.
- Since 2001 the French teams have **effective links** with the CERN, GSI, CNAO, MedAustron and the NIRS. Moreover, they have actively participated to every **European consortia** and research programs as: Enlight (2001-...), Enlight++, ULICE (2009-14), ENVISION, Partner (2010-13), Intervision.
- **Teams from other towns** than those having project of centers are joining and actively participating, mainly through CNRS teams: Clermont-Ferrand, Marseille, Strasbourg, Grenoble... totalizing more than twenty research teams all over France.
- **Hadrontherapy research is thus active in France for more than twenty years**



**ICTR-PHE**



**2014**





# Difficulties to overdraw

- The **spreading** of the material and teams
- The deep **lack of access to the beams**, which are either:
  - In medical centers with few research infrastructure (Nice, Orsay)
  - Or in research centers which agenda is not specifically devoted to hadrontherapy (GANIL)
- A **weak industrial and governmental support** in France although a very high know how in research institution (IN2P3, CEA) and some well known small corporations (Pantechnic, Sigmaphi)
- **The lack of referent carbon ion center in France**
- **And the lack of controlled randomized comparative clinical studies in the domain of hadrontherapy** although 27 years of neutrontherapy and 22 years of protontherapy in France (circa 10000 patients, 50% having ocular tumours)

# The opportunity of the « Grand Emprunt » in 2010

- The French government launched a huge call for projects in 2010 and 2011 for **boosting research and training** in any domain important for the economical welfare and development in the future.
- Different forms of complementary responses could be proposed: **Equipex, Labex, National Infrastructures**.
- The proposals were evaluated by **international boards**.
- **Hadrontherapy has been rather successful** in that game obtaining recognition from three independent international boards for **1 Equipex in Caen, 1 Labex in Lyon and 1 National Infrastructure: France HADRON**.

# *France HADRON* - objectives

- To federate research teams and organize research at a national level,
- To fund beam time and beam line access for research.
- To open new research beam lines for protons and carbon ions, to increase available beam time
- To optimize technical means and procedure for hadrontherapy,
- To network in the frame of the European programs
- To have a positive input on economy



*France HADRON* is a unique national institution made of 5 centers

- **A national infrastructure distributed on 5 *nodes* (places) :**
  - ETOILE Center in Lyon,
  - ARCHADE Center in Caen,
  - Centre Antoine Lacassagne / IMPACT in Nice,
  - Curie Institute / ICPO in Orsay,
  - Claudius Regaud Institute / PERICLES in Toulouse.
- **with the partnership of CNRS/IN2P3 (IPNL & LPC) and of IRSN,**
- **and the support of INSERM, INCa, CEA, ENLIGHT, ULICE and 16 industrials and public institutions including CNES, Thales, Mérieux, AREVA, ...**

# France HADRON – scientific project (1)

- **Multidisciplinary:** medicine, physics, biology, computer, etc.
- **25 teams are involved :**
  - Lyon - Clermont-Fd : teams of C. Rodriguez-Lafrasse, M. Beuve, D. Dauvergne, G Montarou, N. Foray, D. Sarrut, B. Shariat, B. Ribba, P. Pommier.
  - Nice : teams of JM. Hannoun-Levi, P. Mandrillon.
  - Orsay : teams of A. Fourquet / R. Dendale, A. Mazal, J. Hall / F. Pouzoulet.
  - Caen : teams of D Cussol / J. Colin, M. Bernaudin, K. Boumediène, JL. Lefaix, MH. Moscatello, JL. Habrand.
  - Toulouse : teams of E. Moyal, P. Celsis / A. Laprie / M. Delannes, R. Ferrand

# *France HADRON* – scientific project (2)

## - Organized into 4 working packages:

- **WP1** - How to identify and assess the medical value of hadron therapy (clinical research); Jean Louis HABRAND (Caen-Paris)
- **WP2** - How to improve treatment plans (measurements, modeling and computer simulation); Daniel CUSSOL (Caen)
- **WP3** - How to better understand the effect of treatment (radiation biology, radiotoxicology); Claire RODRIGUEZ-LAFRASSE (Lyon)
- **WP4** - How to improve the quality control of treatment (instrumentation); Denis DAUVERGNE (Lyon).

# France HADRON – scientific project (3)



# France HADRON – governance

National Agency for research (ANR)  
and CNRS for management (DR19 in Caen)

France HADRON

**Coordinators: Jacques Balosso  
& JL Habrand**

(3 years mandate)

+

Assistance (**2 persons**)

**Steering Committee (SC/CD)**

(President **G rard Montarou**, 3 years  
mandate)

- IN2P3 representative
- ITMO TS representative
- ITMO Cancer representative
- Partners and Node  
representatives
- Scientific representative of  
territorial Councils
- Regional representatives of  
Minister of science (DRRT)

**Executive Management Committee /  
Experience Committee (MC/CG)**

(monthly meeting)

(President **R gis F rrand**, 2 years  
mandate)

- Node representatives
- WP leaders

**Scientific  
Advisory  
Board (SAB)**

(annual meeting)

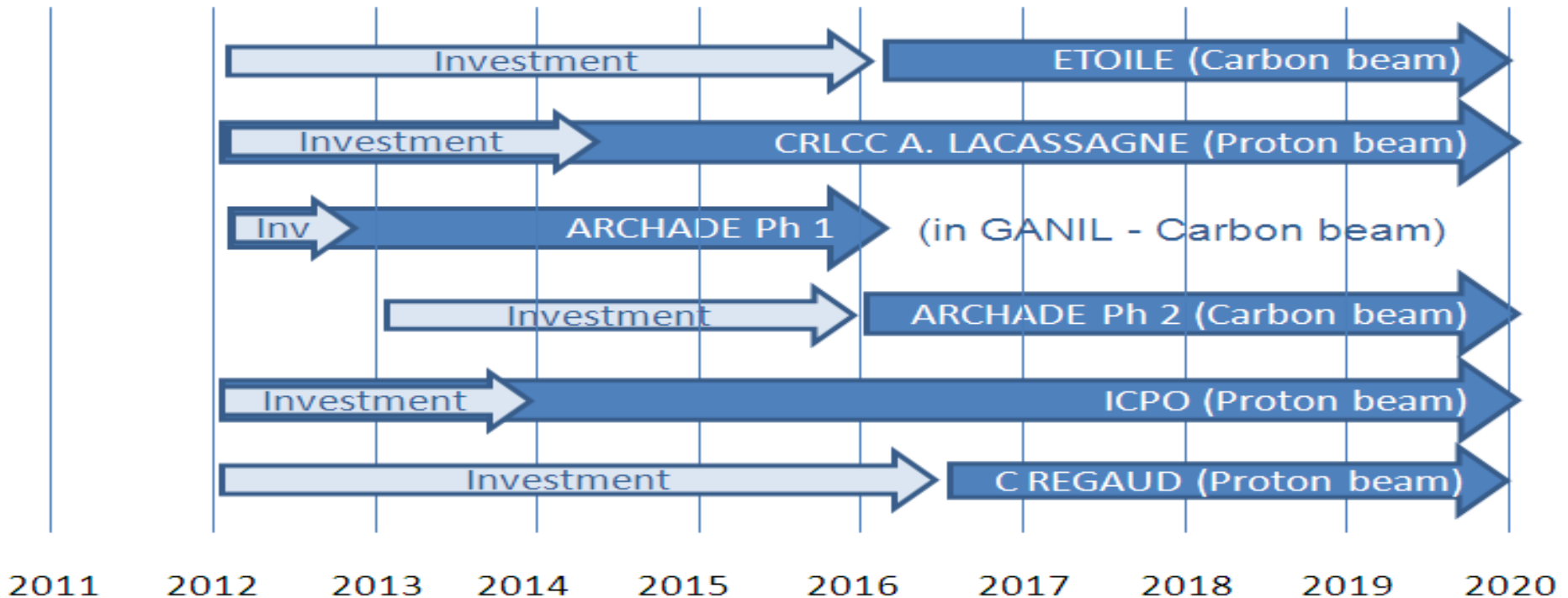
# *France HADRON* received 15 M€ for 2013-2019 principal support

The provisional distribution is the following:

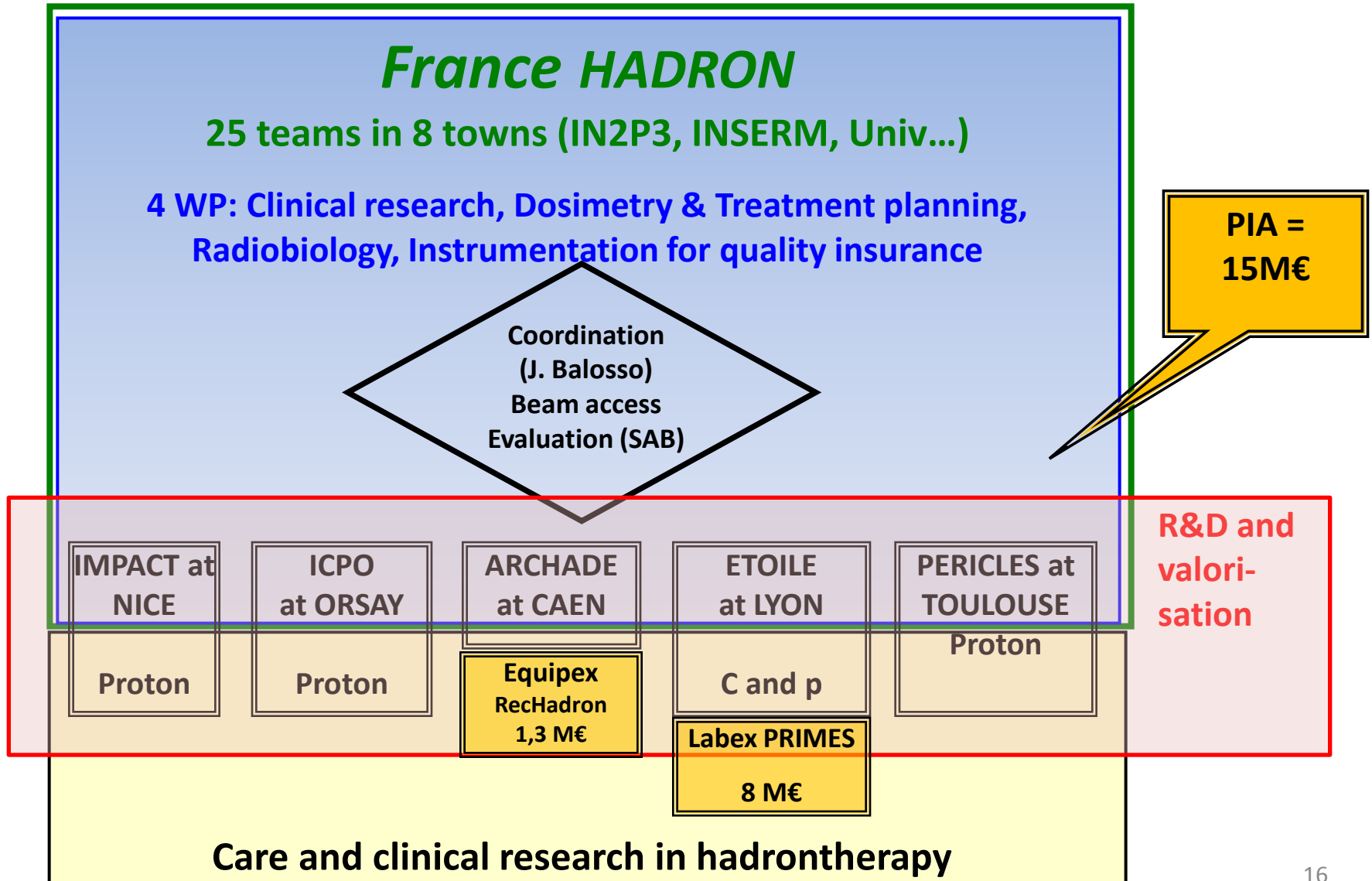
- 5495,60 k€ for the general activities, the beam access cost and the clinical research support
- 5900,00 k€ for equipments to make possible new and easier beam access: 5 M€ for proton in Nice and Orsay and 0,9 M€ for carbon at GANIL
- 3604,40 k€ are kept as a reserve for future developments possibly for carbon ions.

# France HADRON – prospect

The financial starting point is 1<sup>st</sup> of March 2013, the financial agreement has been signed mid September 2013, the launching meeting took place in Meudon (near Paris) the 14<sup>th</sup> of October 2013  
Recruitment of assistance staff is ongoing



# Global organization of hadrontherapy research in France around FrHA





# Conclusion and perspectives

- Thanks to FrHA the hadrontherapy research domain is now **unified and coordinated** and should have **continuity**
- The main **innovative axe in carbon ion** therapy is the cooperation between: Caen – Lyon
- In each location, and specifically in Lyon, the **connection between the different organizations** (Labex and Infrastructure) will have to be finely define and smoothly run together
- FrHA should also continue to participate actively to **European programs** in the frame of Horizon 2020
- The challenge **to continue to integrate new facilities** (protons?) and new teams coming into that research domain is open
- The new **“Plan cancer”** remains open to hadrontherapy, however no governmental decision toward ETOILE project has been done yet...



Rhône-Alpes Région



Thank-you

