



Institut national de physique nucléaire et de physique des particules

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DUNE at IN2P3 and the TGIR
DUNE-IN2P3 - TGIR kick-off workshop

IN2P3

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Introduction & Outline

Introduction:

- important workshop for the organization of the project at IN2P3
- thank you for your participation
 - physicists, postdocs, grad students, engineers, technicians on the project at IN2P3
 - directorates of the labs involved
- thanks to our distinguished guests: DUNE management, FNAL, CERN

Outline of my talk:

- short overview about neutrino physics @ IN2P3
- the DUNE project at the institute
- roadmap for research infrastructures in France, TGIR projects
- the TGIR for DUNE



Neutrino Physics @ IN2P3

Neutrino nature, Masses & Mixing (NUMM scientific program)

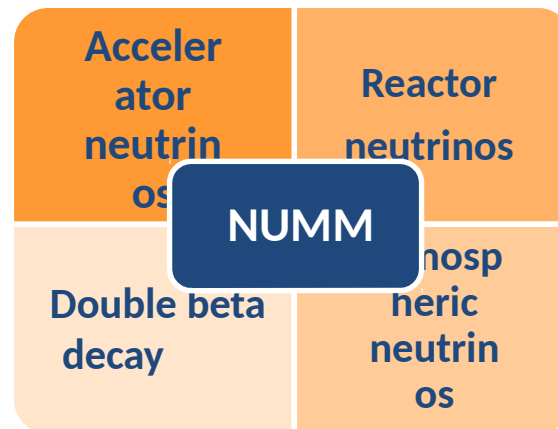
- a major topic for IN2P3, with a broad variety of projects
- activities in Theory as well
- scientific animation with GDR/IRN Neutrino (since 2005): ~150 participants <http://gdrneutrino.in2p3.fr>

- Accelerator-based:*
- DUNE
 - T2K
 - (ancillary: NA61/SHINE)

- Reactor-based:*
- Double Chooz
 - JUNO
 - Stereo, Solid
- [DAS: Fanny Farget]

- Astro:*
- KM3Net
 - SuperNEMO
 - SK
- [DAS: Vincent Poireau]

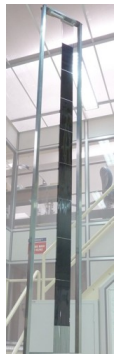
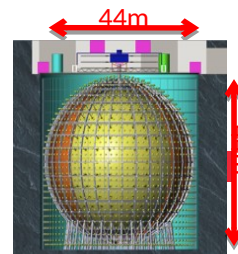
T2K
Taking data
INGRID ND
Wagasci modules
ND280 upgrades



DOUBLE-CHOOZ
Dismantling in 2018

SOLID & STEREO

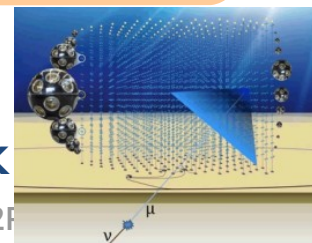
JUNO
SPMT electronics: 27k PM
New tracker electronics
OPERA target tracker
Installation in 2021-2022



SUPER-NEMO
⁸²Se source sheets produced
Installed & commissioned in 2018
First data in 2019

KM3NET/ORCA
6 strings taking data since Feb 2020
When complete: 115 strings
Instrumented mass: 5,7 Mton
>3 sigma MH in 3 years

Super-K



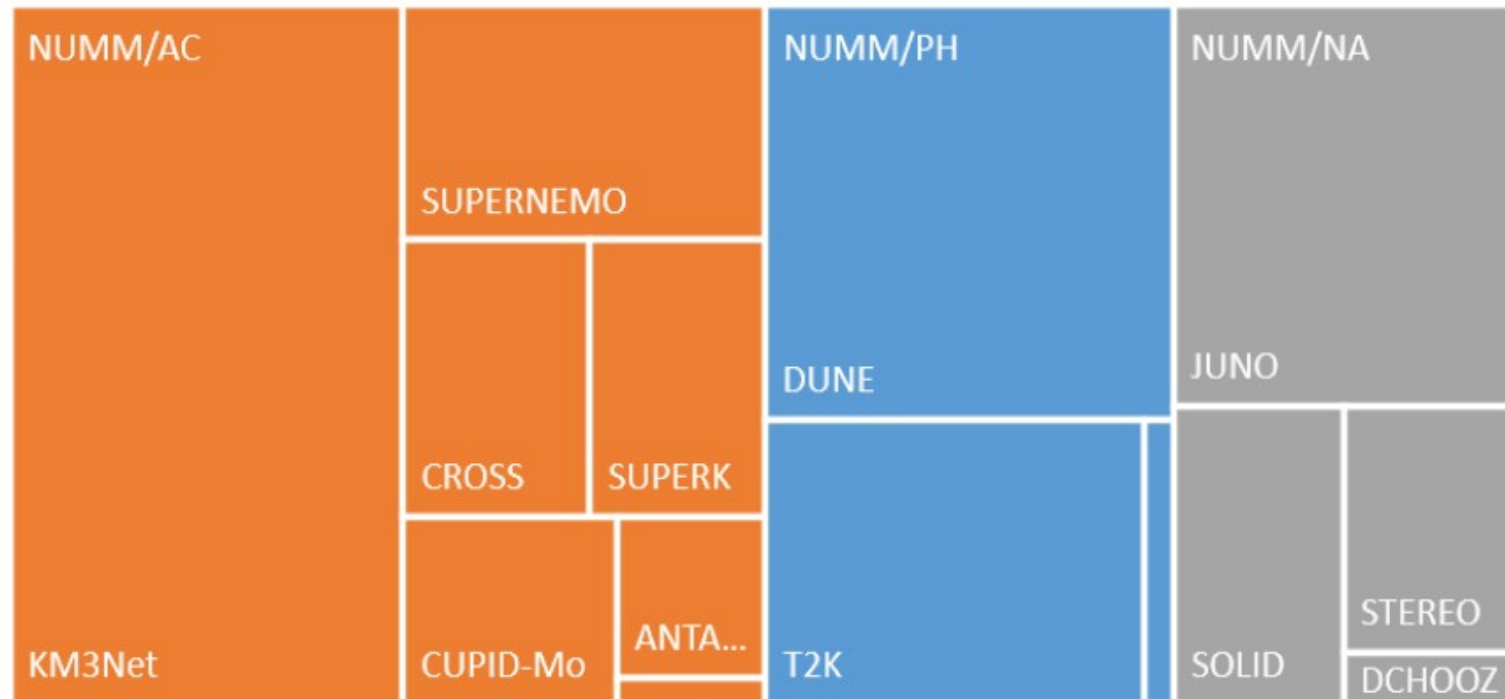


Neutrino Physics @ IN2P3

Global effort on neutrinos (2020 data):

FTE 2020

■ NUMM/PH ■ NUMM/AC ■ NUMM/NA



- staff involved (all categories): ~250
- total FTE 2020: ~150



Manpower for DUNE @ IN2P3

Current manpower (2020):

- 15 staff physicists (5 faculty, 10 CNRS)
- 5 PhD students
- 2 postdocs
- 19 engineers and technicians

Prospects & hiring:

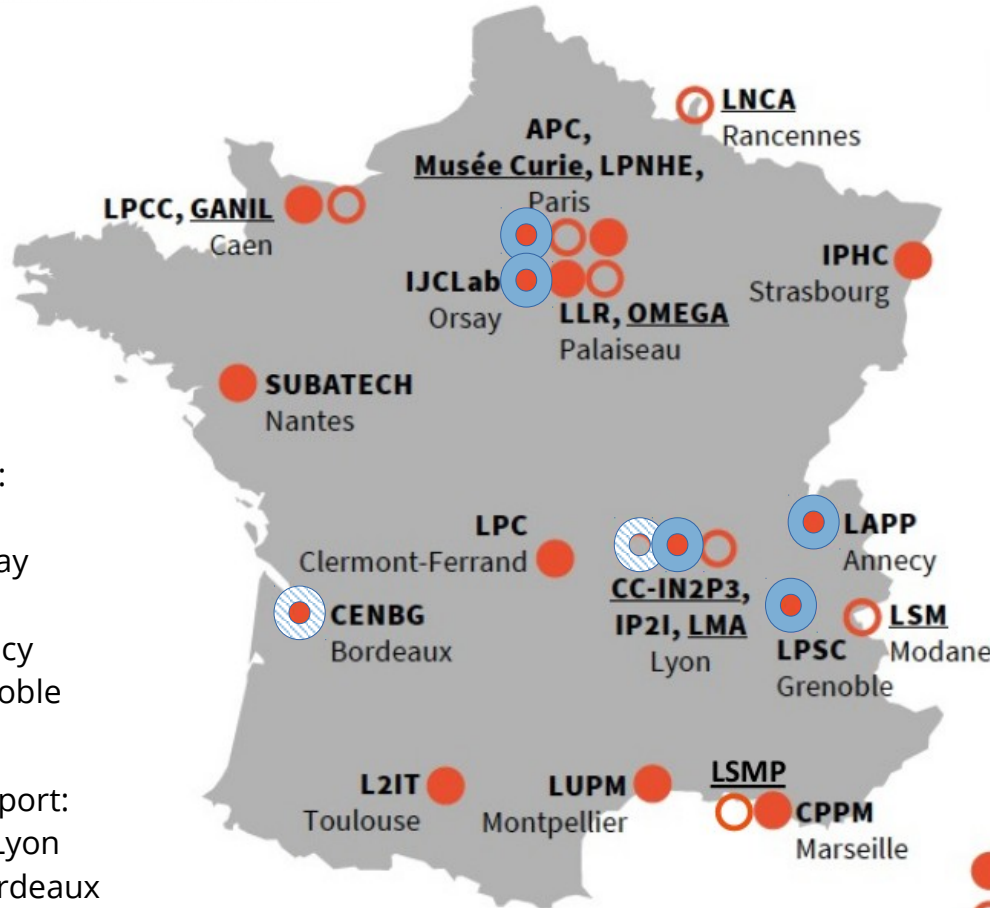
- will definitely grow with internal mobility of IN2P3 physicists, given the scientific interest, and as scientific exploitation phase is nearing
- goal is to roughly double our participation in the long run
- strong will of the institute to increase participation also with new hirings:
 - new junior scientist opening this year, more to come
 - support with postdoc positions as well
- additional fundings also (Labex, etc)

Important note about manpower:

- technical staff is a major strength of our institute (1500 highly skilled people)
- IN2P3 staff (physicists, engineers, technicians) are not paid by the projects
- → flexibility to enroll more people on top priority projects, in case of need/emergency, etc



IN2P3 labs in DUNE



- Labs in DUNE:**
 - APC Paris
 - IJCLab Orsay
 - IP2I Lyon
 - LAPP Annecy
 - LPSC Grenoble
- Technical support:**
 - CC-IN2P3 Lyon
 - CENBG Bordeaux
 - (possibly other labs)

- Unité mixte de recherche
- Plateforme nationale
- Laboratoire international

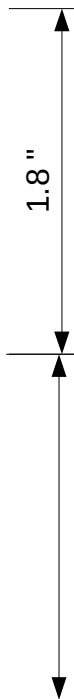
National Roadmap of Research Infra.

2018



**RESEARCH INFRASTRUCTURES
NUCLEAR AND HIGH-ENERGY PHYSICS**

5 TGIR/VLRI



6 IR/RI

CATEGORY	NAME	FULL NAME	ESFRI
IO	CERN	European Organization for Nuclear Research	
VLRI	CERN LHC	European Organization for Nuclear Research Large Hadron Collider	HL-LHC (2016)
VLRI	EGO-VIRGO ¹	European Gravitational Observatory - VIRGO	
VLRI	FAIR	Facility for Antiproton and Ion Research	FAIR (2006)
VLRI	GANIL-Spiral2	Grand National Heavy Accelerator (GANIL) – Radioactive Ion Production System in Line of 2nd generation ion (SPIRAL2)	Spiral2 (2006)
VLRI	CTA ²	Cherenkov Telescope Array	CTA (2008)
RI	HESS ³	High Energy Stereoscopic System	
RI	DUNE	Deep Underground Neutrino Experiment – Long-Baseline Neutrino Facility	
RI	JUNO	Jiangmen Underground Neutrino Observatory	
RI	KM3NeT	Kilometre Cube Neutrino Telescope	KM3NET (2006, 2016)
RI	LSST ⁴	Large Synoptic Survey Telescope	
RI	PAO	Pierre Auger Observatory	

- situation as of 2018 | full roadmap here: <https://www.enseignementsup-recherche.gouv.fr/cid70554/la-feuille-route-nationale-des-infrastructures-recherche.html#fr>
- roadmap currently being updated
- situation has changed already for DUNE: now VLRI



TGIR/VLRI versus IR/RI

▶ FOUR CATEGORIES OF RESEARCH INFRASTRUCTURES

This French roadmap is built around four categories of research infrastructures, according to their national or multinational nature, their method of governance and their budget support. The criteria presented hereinabove apply to the four categories, which are defined on the following principles:

- the **International Organisations** (IOs) are legally based on an intergovernmental convention which is sometimes doubled with an inter-agency agreement and statutes that describe in a detailed way the implementation of the convention or agreements. The intergovernmental convention, which is associated with a financial protocol, in particular specifies the objectives of the organisation, the conditions for membership, the operating bodies, and the particulars on contributions for member States;
- the **Very Large Research Infrastructures** (VLRIs) pertain to a government strategy resulting in several actions of the financial law and budget earmarking of the MESRI. They are national or are subject to international or European partnerships, in particular through their engagement in the roadmap of the European strategy forum (ESFRI). They are major instruments in the networks of industrial and innovation collaboration. VLRIs are under the scientific responsibility of the research operators;
- the **Research Infrastructures** (RIs), depend on the choices of the various research operators and are implemented by them, whether by research Alliances or their members, or public establishments due to their particular missions;
- the **projects**, whether in the process of construction or already producing but which have not yet reached full maturity according to the criteria listed hereinabove, already exist and have importance in the French research landscape which warrants listing on the roadmap. This status for an infrastructure is of a transient nature and will be analysed again at the next update of the roadmap.

These 4 types do not show a hierarchy of excellence or technological nature. Apart from the IOs, the legal or judicial structures, the budget dimension or thematic groupings can take on various forms and therefore are not restrictive criteria distinguishing the VLRIs from RIs or projects.

TGIR/VLRI:

- strategic infrastructures
- of international nature
- w/ long-term goals
- specific earmarking in the nation's budget

Note:

- change of vocabulary for next roadmap:
TGIR → IR*
VLRI → RI*



Genesis of the DUNE TGIR

Early R&D phase:

- started circa 2006 in France
- european studies in the framework of LAGUNA/LNBO: 2008-2014
- WA105 (demonstration of double-phase technology) approved in 2013
- ESPP 2013
- fusion of european and US efforts
- March 2015: creation of the DUNE collaboration
- continued R&D (3x1x1)
- FR investment for that period of time: 2M€ M&S + 90 h.year
- follow-up on DP (ProtoDUNE-DP)

Towards the TGIR:

- 2017: preparatory work to have DUNE as an IR/RI in the FR 2018 roadmap
- Jan 2018: 1st DUNE France meeting organized
- Sept 2019: proposal submitted to the High Committee for TGIR/VLRI
- Oct 10 2019: hearing by the High Committee for TGIR/VLRI
- Jan 2020: favorable opinion of HC-TGIR, preparatory work with MESRI+CNRS+CEA
- Jun 2020: ESPP with emphasis on future LBL projects and in particular DUNE
- Jul 2020: mandate given by the Ministry (DGRI) to CEA & CNRS to negotiate participation in PIP-II & DUNE
- March 2021: agreement by the Ministry on the negotiated participation
- now: public communication from Ministry is imminent... (this week?)



Main facts:

- joint proposal by CNRS/IN2P3 & CEA/IRFU
- for both DUNE & PIP-II projects
- fundings are devoted only to the construction and installation phases
 - M&S costs predominantly (CORE, non-CORE)
 - (salaries of staff are not paid by the project)
 - limited amount of short-term technician contracts
 - trips for installation
- for DUNE: covers about half of the M&S cost of FD2 (VDM)
- current finance schedule (revisable): 6 years from 2022 to 2026



Conclusion

Looking back: a very fruitful year

- a lot has happened over the last 12-18 months
- impressive progresses on many fronts, as detailed in the following talks
 - infrastructure work on sites
 - definition of the US baseline
 - R&D/tests with ProtoDUNEs at CERN
 - evolution/consolidation of the FD2 effort
 - global effort of everybody (collaboration, US, CERN, EU partners, FR)
 - choice of the Vertical Drift as the baseline technology
 - consolidation of partnerships and *tour de table* for FD2
 - including the cryostat and CERN
 - success with the FR TGIR funding request
 - all planets/stars are well aligned now

Ahead of us:

- still a huge amount of work of course
- this workshop is very important to get everybody on board and well informed
- in addition tomorrow we'll work on the project organization & deliverables at IN2P3 level