EURO-LABS EU PROJECT - AN EASIER ACCESS TO THE EUROPEAN NUCLEAR PHYSICS FACILITIES

Adam Maj
IFJ PAN Kraków

https://web.infn.it/EURO-LABS/

SSNET'24
Orsay, Nov. 4-8, 2024

History of Nuclear Physics in EU projects

FINUPHY (2000-2005)
coord. Jean Vervier, coord. inst. GSI

EURONS (2005-2008)
coord. Alex Mueller, coord. inst. GSI

European nuclear structure integrated infrastructure initiative (EURONS)

ENSAR (2010-2014)
coord. Muhsin Harakeh, deputy Marek Lewitowicz, coord. inst. GANIL

European Nuclear Science and Applications Research

ENSAR2 (2016-2021)
coord. Muhsin Harakeh, deputy Marek Lewitowicz, coord. inst. GANIL

ERINS: European Research Infrastructures for Nuclear Science

ERINS –
coord. Angela Bracco, coord. inst. INFN

EURO-LABS (2022-2026)
coord. Navin Alahari, deputy Maria Colonna, coord. inst. INFN

3 communities grouped together:
- **Nuclear Physics**
- HE Accelerators
- HE Detectors

What is EURO-LABS?

PROJECT ACRONYM: EURO-LABS – EUROpean Laboratories for Accelerator Based Science

PROGRAMME: Horizon EU (Research infrastructure services to support health research, accelerate the green and digital transformation, and advance frontier knowledge)

DURATION: September 2022- August 2026 (4 years)

TOTAL BUDGET: 14.5 M€

TOTAL EC CONTRIBUTION:14.2 M€

CONSORTIUM: 33 participants from 18 countries

PROJECT COORDINATOR: Paolo Giacomelli (INFN)

The project brings together, for the first time, the three research communities of nuclear physics, accelerator and detector technologies for high energy physics, in a pioneering super-community of sub-atomic scientists.

It provides effective access to a network of 47 Research Infrastructures (including 3 RIs with Virtual Access) to conduct curiosity-based research, addressing fundamental questions and technological challenges and advancing projects with broad societal impact, fostering knowledge sharing between scientific fields and enhancing Europe's potential for successfully facing future challenges.

Courtesy Google Earth

Management Team

Scientific coordinator

A. NAVIN
GANIL

Deputy Scientific coordinator

M. COLONNA
INFN-LNS (Catania)

Deputy Scientific coordinator

I. EFTHYMIOPOULOS
CERN

Deputy Scientific coordinator

M. MIKUZ
Univ. Ljubljana

Project office Manager

PAOLO GIACOMELLI
INFN Bologna

Adam Maj, IFJ
WP2

Maria Borge, CSIC
WP5

The Project Office will be organised by INFN Bologna with the collaboration of CERN.

EURO-LABS
EUROPEAN LABORATORIES FOR ACCELERATOR BASED SCIENCES

Governing Board

Project Coordinator (GANIL) + 3 Deputies
Project Office INFN

WP1 Management

- Task 1: Project Management
- Task 2: Information Flow
- Task 3: Contacts

WP2 Access to RI for Physics

- Task 1: Stable Beam Facilities
- Task 2: Radioactive Ion Beams
- Task 3: Neutron Beam Facilities
- Task 4: Theoretical support for Experiments
- Task 5: Service Improvements

WP3 Access to RI for Accelerators

- Task 1: Material Testing Facilities
- Task 2: Technology Infrastructures
- Task 3: Electron and Plasma Beam Facilities
- Task 4: Applications

WP4 Access to RI for Detectors

- Task 1: Test Beams
- Task 2: Detector Characterization
- Task 3: Irradiation Facilities
- Task 4: Service Improvements

WP5 Open Diverse and Inclusive Science

- Task 1: Diversity Dissemination
- Task 2: Open Data
- Task 3: Machine Learning
- Task 4: Training

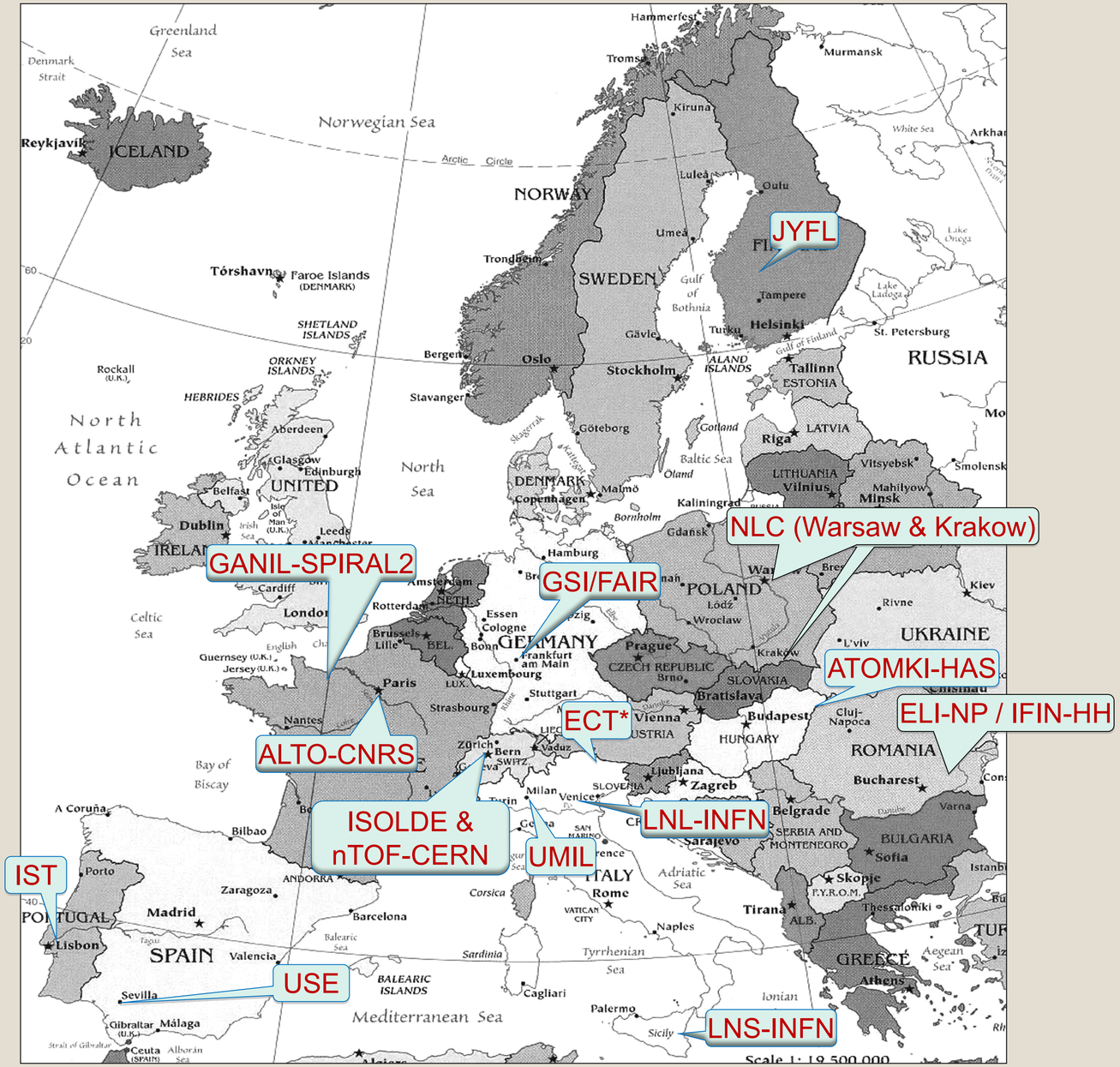
Management Team

Project Office

Governing Board

Total budget = 14.2 M€
WP2 buget = 6.1 M€

Map of Nuclear Physics facilities in WP2



17 TA/VA facilities
in 9 countries

16 beneficiaries
in 11 countries

Community: 2500-3000 scientists and highly qualified engineers

Goals of WP2

The scientific goal of the WP2 is to provide enhanced opportunities for exploring nuclei under extreme conditions:

- ❑ at high temperatures (T)
- ❑ at high angular moment (L)
- ❑ at large isospin (N/Z), i.e. nuclei close to the proton or neutron dripline
- ❑ with extreme masses (A)

This will be achieved by providing potential users a Transnational Access to various RIs providing
a wide portofolio of beams of

- ❑ stable ions: ranging from protons to uranium ions;
- ❑ radioactive ions: unstable nuclei far from the stability valley, developed either by Isotopic Separation On-Line, or by fragmentation induced by fast projectile and then by In-flight separation;
- ❑ neutrons

at various energies: ranging from few MeV up to 2 GeV.

This will be achieved also by providing potential users a Virtual Access to Theory4Exp facility, with user friendly codes for theoretical preparation and discussion of experimental project.

Moreover, the project will provide service improvements to all the facilities: streamlining the access to RIs, development of the biomedical applications, improving the ion source and target developments and helping in installations and running traveling detectors.

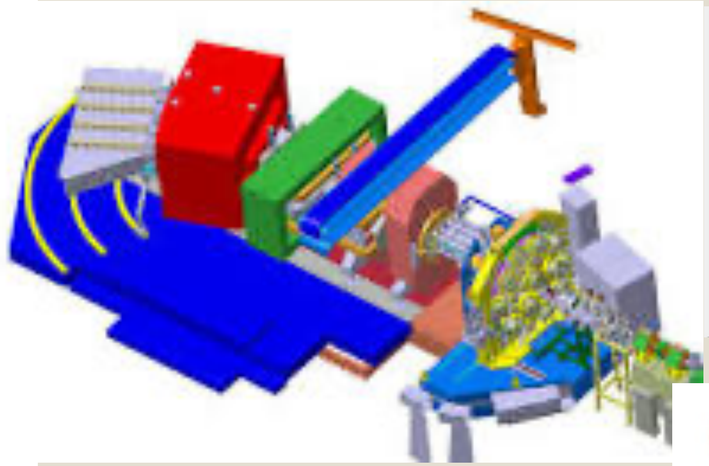
WP2: access to RI and instrumentation

Having TA to Research Infrastructures with a large portofolio of different types of beams is necessary for production of nuclei at extreme conditions, but not sufficient for their studies.

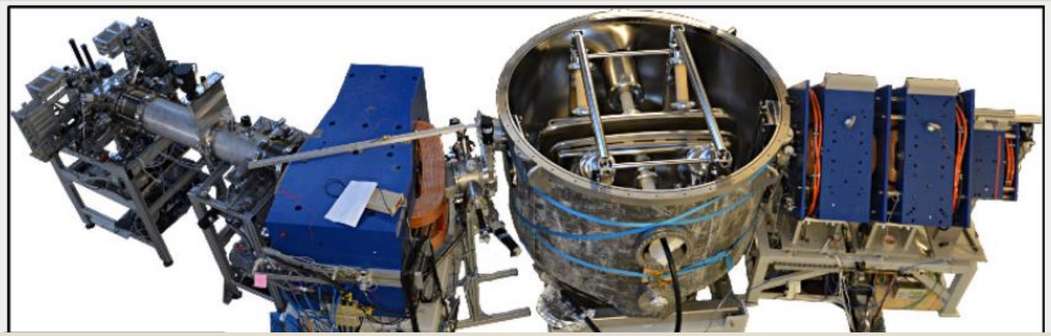
These facilities offer the state-of-the-art equipment:
Spectrometers and separators: (Super)-FRS, VAMOS, LISE, PRISMA, RITU, MARA, …

Examples of large acceptance spectrometers and separators

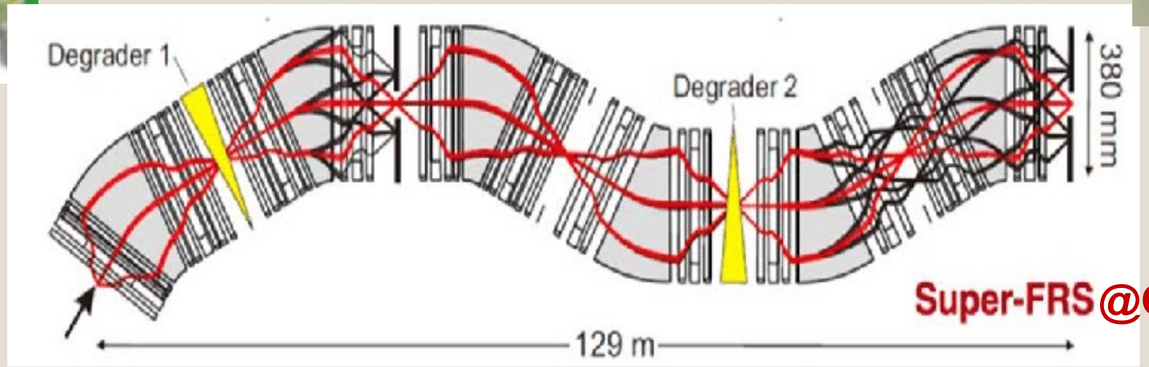
VAMOS@GANIL



MARA**@Jyvaskyla**



PRISMA@LNL



Super-FRS@GSI/FAIR

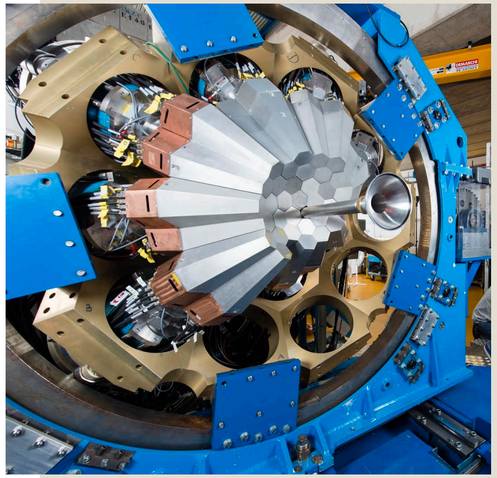
WP2: access to RI and instrumentation

In addition these facilities offer :

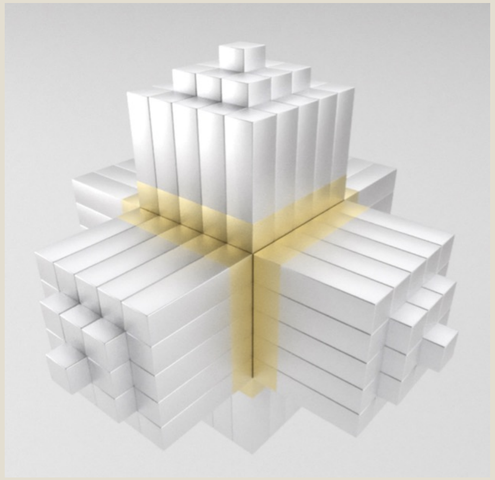
Novel detector setups: AGATA, PARIS, NEDA, FAZIA, MUGAST-GRIT, nu-Ball, R3B, CALIFA, FATIMA, ACTAR TPC, COLLAPSE, T-REX, ROSPHERE, GALILEO, EAGLE, KRATTA, BINA,…

*Examples of novel detector setups - some of them *) are travelling detectors*

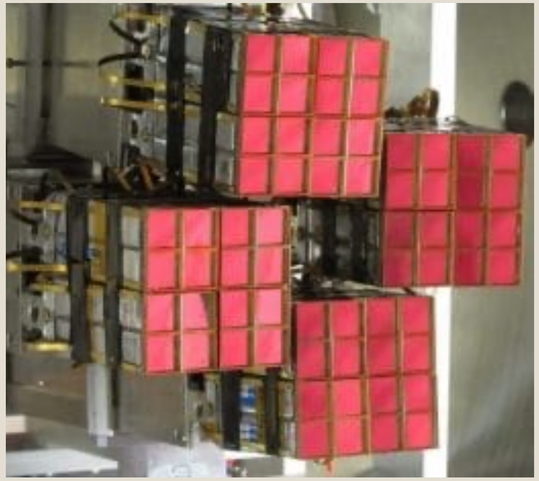
AGATA*



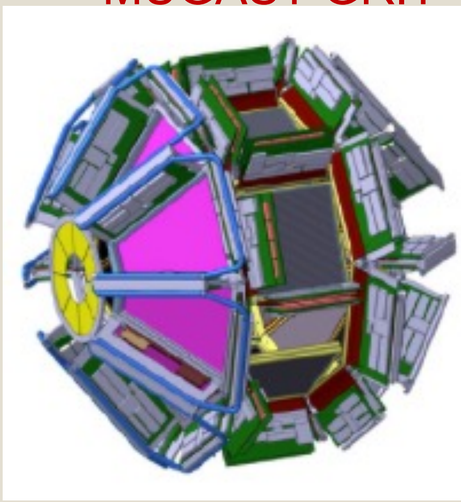
PARIS *



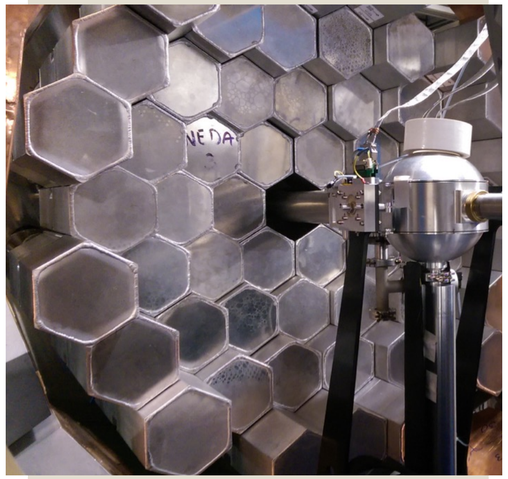
FAZIA *



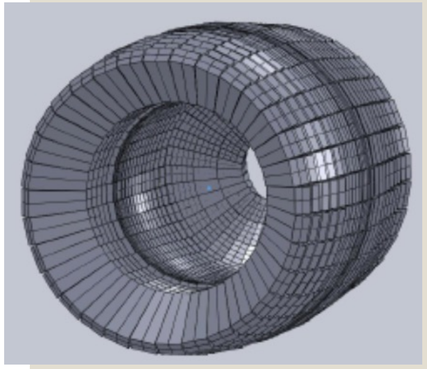
MUGAST-GRIT *



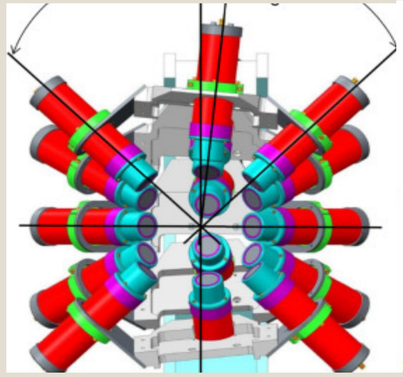
NEDA *



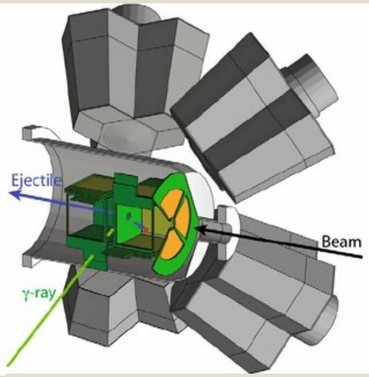
CALIFA@R3B



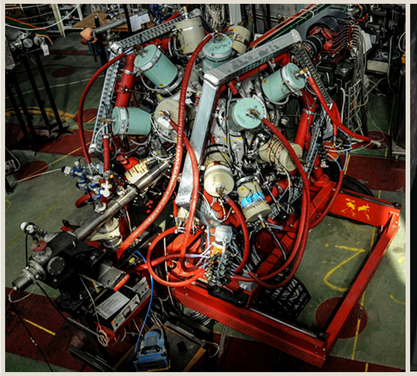
FATIMA *



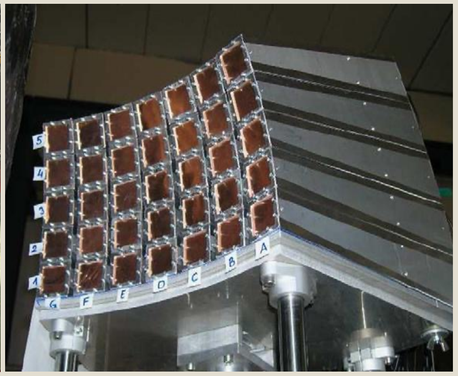
T-REX



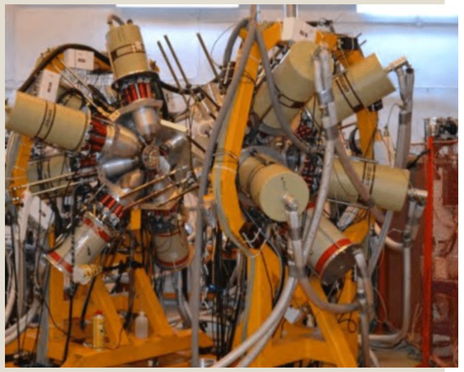
EAGLE



KRATTA *

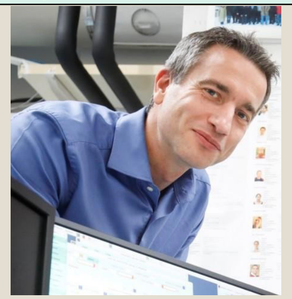
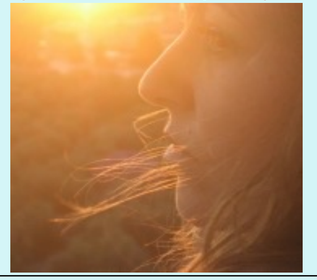


ROSPHERE



Organization of WP2

WP2 coordination: Adam Maj (IFJ PAN Krakow)

Task	WP2.1 Stable Ion Beam Facilities	WP2.2 Radioactive Ion Beams Facilities	WP2.3 Neutron Beam Facilities	WP2.4 Theoretical Support for Experiments	WP2.5 Service Improvements
Coordinator	**Paul Greenlees** JYFL Jyvaskyla	**Iulian Stefan** IJCLab Orsay	**Alberto Mengoni** CERN	**Bira van Kolck** IJCLab & ECT*	**Marco Durante** GSI
					
RI	• JYFL (Finland) • LNL-LNS (Italy) • GANIL-SPIRAL2 (France) ALTO (France) • GSI/FAIR (Germany) • NCL-SLCJ (Poland) • NLC-CCB (Poland) • IFIN Tandem (Romania) • USE-CLEAR (Spain) • ATOMKI-CLEAR (Hungary) • IST-CLEAR (Portugal)	• ALTO (France) • ISOLDE (CERN) • GSI/FAIR (Germany) • GANIL-SPIRAL2 (France) • LNL-LNS (Italy) • JYFL (Finland)	• n-TOF (CERN) • GANIL-SPIRAL2 (France) • ALTO (France) • LNL-LNS (Italy) • USE-CLEAR (Spain) • ATOMKI-CLEAR (Hungary)	• ECT* (Italy) • VA Theo4Exp: MeanField4Exp (Poland) Reaction4Exp (Spain) Structure4Exp (Italy) **Manuela Rodriguez-Gallardo** (U. Sevilla, Spain) 	• Streamlined procedures + Remote access • Bio medical • Ion source improvements • Target developments • Traveling detectors
	TA	TA	TA	TA/VA	

TA Facilities Coordinators

LNL/LNS	Tommaso Marchi, Allesia di Pietro
GANIL-SPIRAL2	Emanuel Clement
IJCLab ALTO	Jon Wilson
GSI/FAIR	Christoph Scheidenberger, Chrristine Hornung
ISOLDE@CERN	Sean Freeman
n-TOF@CERN	Alberto Mengoni
JYFL	Paul Greenlees
NLC-SLCJ	Katarzyna Hadynska-Klęk, Paweł Napiorkowski
NLC_CCB	Maria Kmiecik
IFIN-HH	Constantin Mihai
CLEAR USE Sevilla	Joaquin Gomez Camacho
CLEAR ATOMKI Debrecen	Sandor Biri
Clear IST Lisboa	Victoria Corregidor Berdasco
ECT*	Bira van Kolck

VA Facility coorrdinators

Theo4Exp:	Manuella Gallardo	(Reactions4Exp/Sevilla)
	Jerzy Dudek, Piotr Bednarczyk	(MeanField4Exp/Krakow)
	Gianluca Colo	(Structure4Exp/Milano))

WP2 Service improvements

- **Streamlined and remote access**
  - coord. Paweł Napiorkowski (Warsaw), Helena Albers (GSI)
- **Targets** **- coord. Manuela Cavallarro (LNS)**
- **FLASH (Bio-medical applications)**
  - coord. Marco Durante (GSI)
- **ERIBS (Ion source improvements)**
  - coord. Hannu Koivisto (JYFL)
- **INTRANS (Instrumentation and Training for accelerator based Nuclear Spectroscopy and Reaction)** **- coord. Araceli Lopes_Martens (IJCLab Orsay)**

Offer for the international users community

Each facility promised certain amount of beam time for the Project.

The costs of this amount of beam time is partially reimbursed (ca.20%) by the project.
In addition, the facility receives certain amount of money to cover the costs of travel and staying expences for the eligible groups.

Which user group is eligible?
The majority of the users must work in a country other than the country(ies) where the installation is located.

So if experimental group applied for a beam time for given facility, and if the local PAC approved the beamtime, the user group may apply for the TA suppport.

The suport is evaluated by the appropriate User Selection Panels

WP2 User Selection Panels (USPs)

LNL/LNS:
Alessia Di Pietro
Tommaso Marchii
Marialuisa Aliotta)
Kouichi HAGINO (PAC member)

GANIL:
Patricia Rousell-Chomaz
Emmanuel Clement
Stephan Oberstedt (SPIRAL2 - PAC Chair)
Silvia Leoni (SPIRAL2 - GUEC Chair)

IFIN-HH:
Constantin Mihai
Philippe Dessagne
Peter Thirolf

ISOLDE/CERN:
Sean Freeman
Gerda Neyens
Karsten Riisager
David Sharp

n-TOF/CERN:
Alberto Mengoni
Rosa Vlastou
Rene Reifarth
Nicola Colonna
Enrique Gonzales
Frank Gunsing
Enrico Chiaveri

NLC-SLCJ:
Władysław Trzaska (PAC Chair)
Katarzyna Wrzosek-Lipska

NLC-CCB:
Mushin Harakeh (IAC Chair)
Adam Maj

ECT*:
Bira van Kolck
Almudena Arcones
Constantia Alexandrou
David Kaplan
Marek Lewitowicz
Alessandre Obertelli
Barbara Pasquini
Vittorio Somà
Urs Wiedemann

IJCLab/ALTO:
Jonathan Wilson
Bogdan Fornal(PAC Chair)

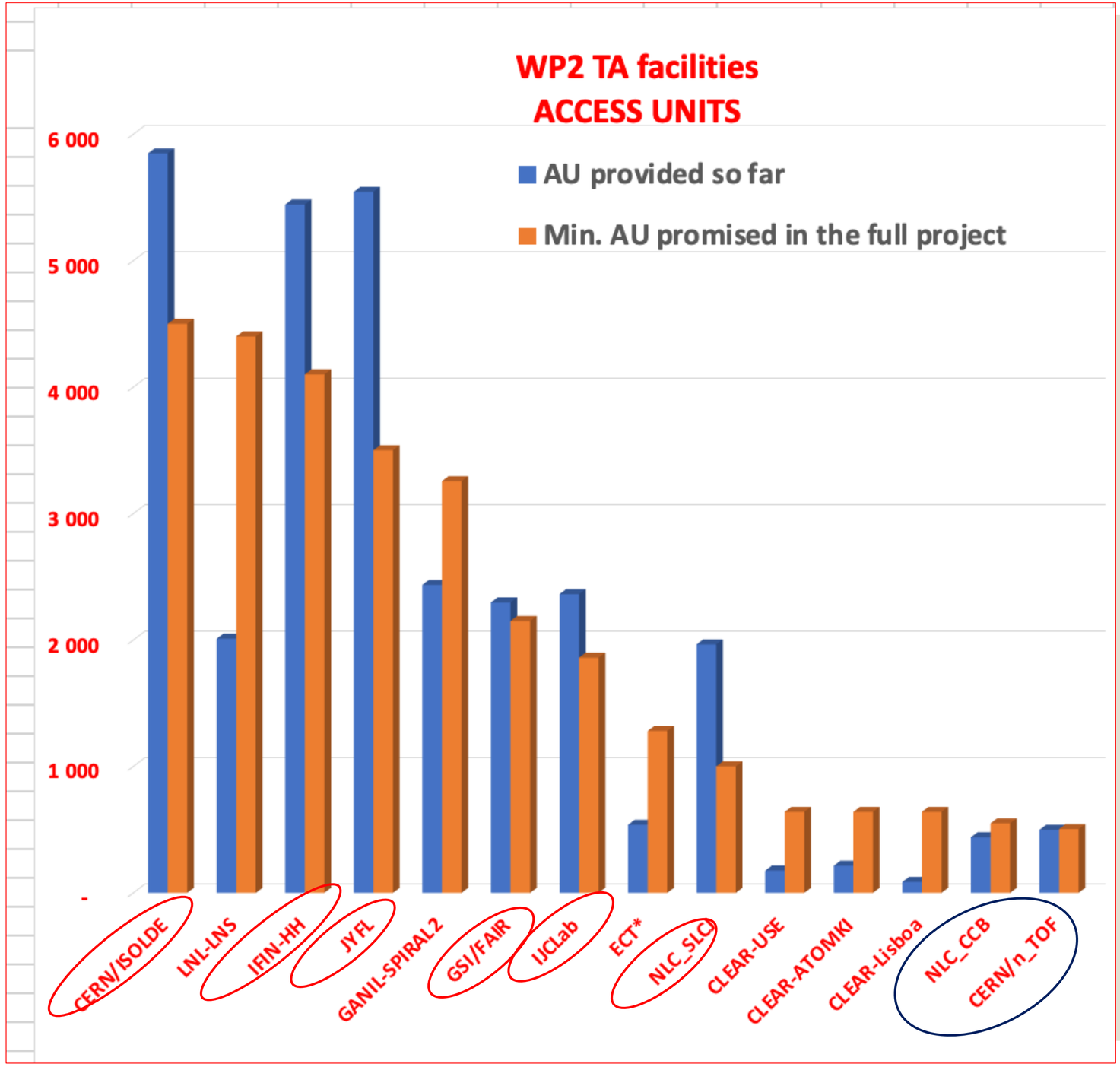
JYI/JYFL
Hans Otto Fynbo (PAC Chair)
Thomas Elias Cocolios
Dolores Cortina Gil
Kathrin Wimmer
Dirk Rudolph (JYU/JYFL)
Tomas Raúl Rodríguez Frutos

GSI-FAIR:
Christoph Scheidenberger
Christine Hornung
Marina Petri
Paul Greenlees

CLEAR (USE-IST-ATOMKI:
Adam Maj (CLEAR PAC Chair)
Javier García
Teresa Pinheiro
Ferenc Ditroi

- **The User Selection Panels meet (in-person or online) after submission of TA requests, evaluates them and makes decisions for the support.**
- **As a rule all approved experiments that fulfil the TNA eligibility criteria are supported.**
- **The level of funding is in general in proportion to the number of beam hours and preparation time recommended by the corresponding PAC, with a priority to new users and young researchers.**

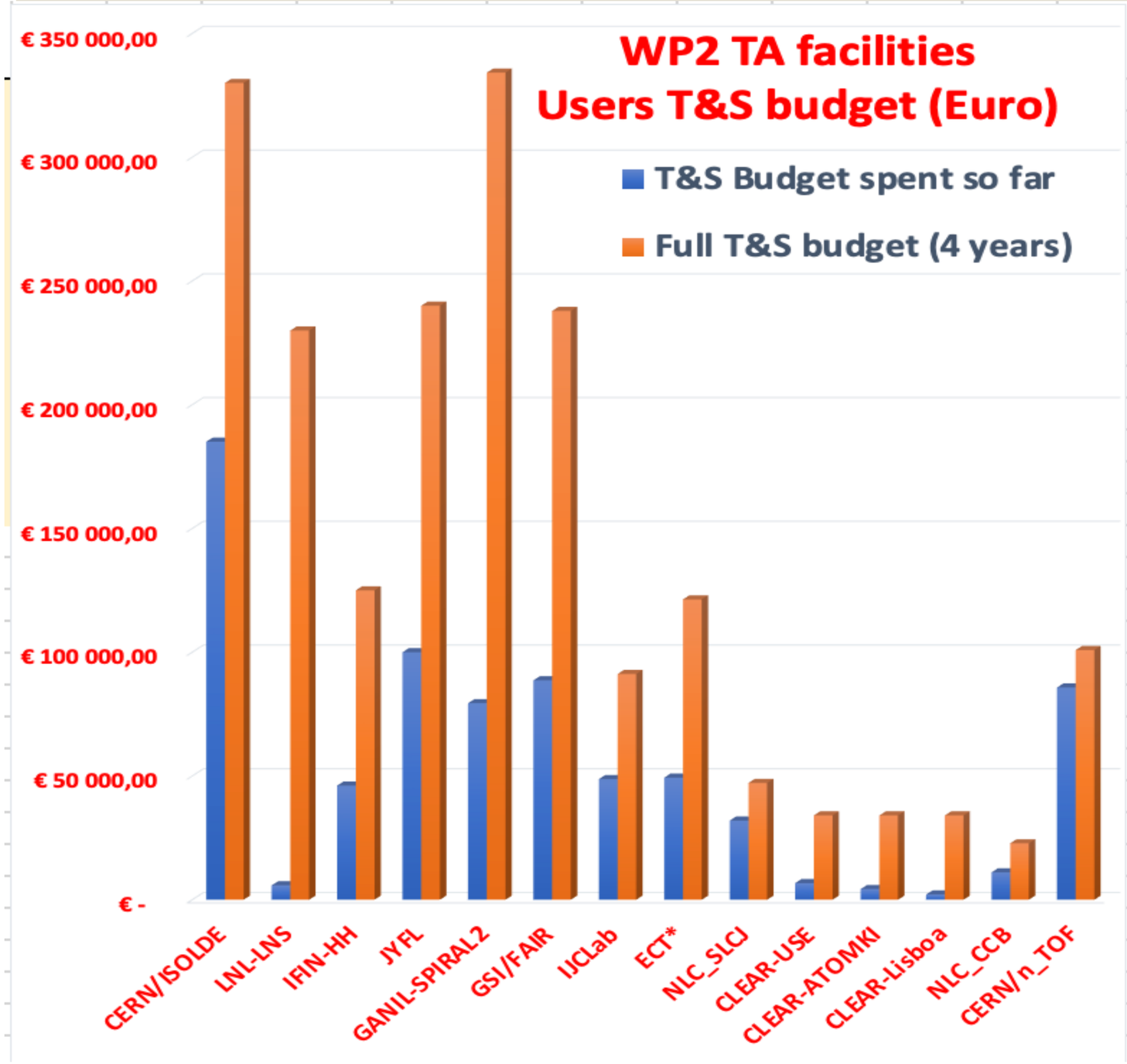
Some WP2 statistics from 2 years of EURO-LABS



6 facilities already exceeded the whole project AUs

2 facilities arr close to the 100% AUs

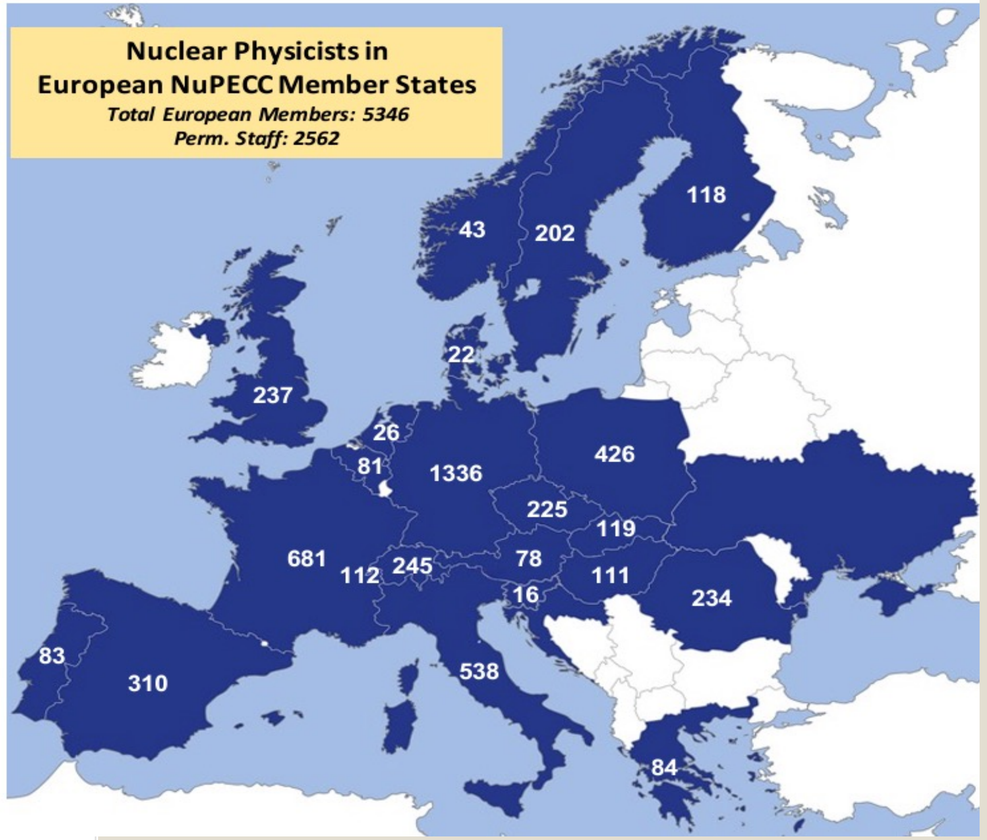
Nuclear Physics TA facilities are in high demand

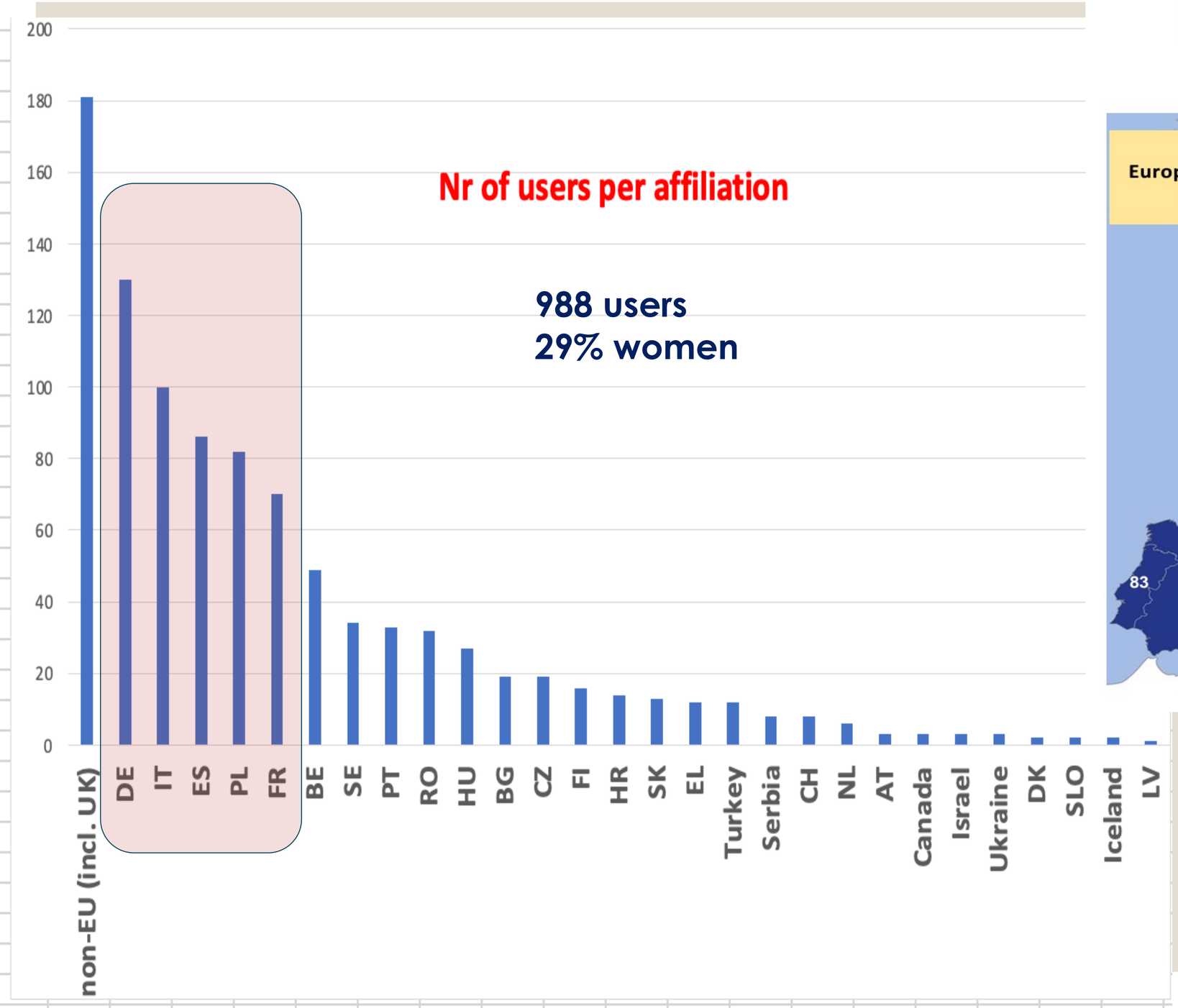


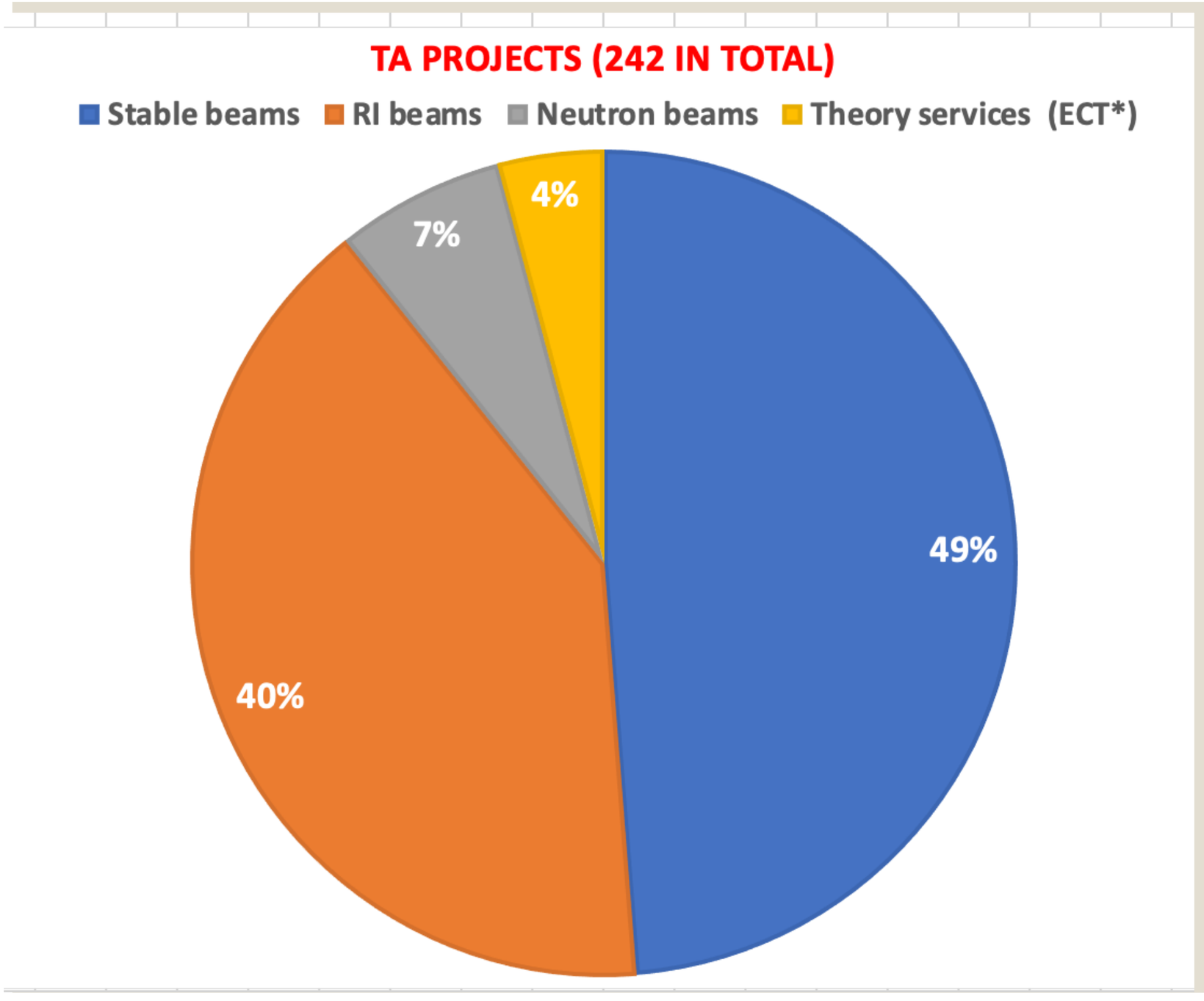
In general good spending of the T&S budget

2 facilities (SLCJ, n-TOF) close to 100%

Nuclear Physics Workforce in Europe






TA PROJECTS (242 IN TOTAL)
Stable beams
RI beams
Neutron beams
Theory services (ECT*)
49%
40%
7%
4%

Theo4EXP VA facility

https://institucional.us.es/theo4exp/

IFJ PAN Keakow, IPHC/CNRS and Strasbourg University - MeanField4Exp

EURO-LABS *Newsletter*
ISSUE No.2 | JULY 2024

Theo4Exp: a theory service provided by EURO-LABS

Manuela Rodríguez-Gallardo, Gianluca Colò and Jerzy Dudek, on behalf of the Theo4Exp team

In the last few years, the nuclear scientific community has been moving towards open science: open access publications, accessibility to experimental data and codes, etc. In this context, the creation of user-friendly platforms, in which non-expert users can perform calculations using well-

Theo4Exp VA Infrastructure

https://institucional.us.es/theo4exp

Services available

- **MeanField4Exp (Krakow/Strasbourg)**
  - Single Particle Energies
  - Nuclear Energy Diagrams
  - Macroscopic-Microscopic energy
  - Shape Evolution with Spin
  - 3D Cranking
  - 3D Nuclear Surfaces
- **Reaction4Exp (Sevilla)**
  - Coulomb breakup using EPM
  - Elastic scattering using OM and semiclassic.
  - Inelastic scattering using CC formalism
- **Structure4Exp (Milano)**
  - Self-consistent HF plus RPA
  - HF+BCS+RPA
  - Shell Model with KSHELL

Open to users from past 1st February 2024

VA facilities	AUs provided (9 months)	Estimated AUs (whole project)	%	Nr of users (9 months)	Estimated Nr of users (whole project)	%
MeanField4Exp	225	360	63%	24	40	60%
Reaction4Exp	117	400	29%	41	80	51%
Structure4Exp	65	160	41%	12	20	60%
Total	407	920	44%	77	140	55%

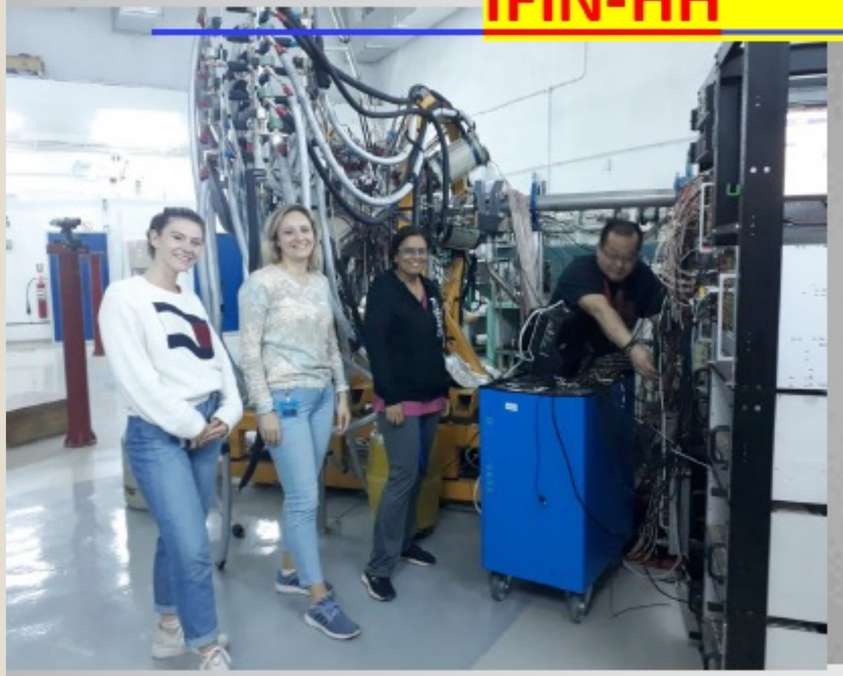
- **11 services (projects) available already**
- **More services in preparation – soon available**
- **Advertising the THEO4EXP VA – „Hands-on" workshop in ECT* July 7-9 , 2025**

For more info, ask
Jerzy Dudek, Irene Dedes, Gianluca Colo

Example from TA facilities
IFIN-HH (Bucharest) & CCB (Krakow)

Courtesy of Oliver Wieland

Search for E1 strength below the Giant Dipole Resonance from zero to finite temperature in Ni isotops at IFIN-HH and NLC-CCB facilities



In total 120 overall project partecipants

80 Persons @ IFIN HH+ ELI NP
11 Persons took Eurolabs support

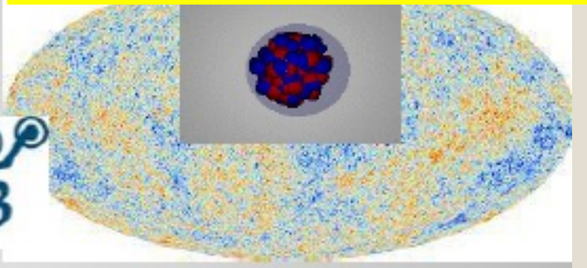
40 Persons @ CCB + IFJ
6 Persons took Eurolabs support.

Courtesy of Oliver Wieland

ADDITIONAL EXPERIMENT:

HOT PDR in ^{56,60,62,64,66}Ni CN
@ IFIN

GROUND STATE (zero T)
PDR in ^{58,62,64}Ni Target @ CCB



Z=28	^{56}Ni	^{57}Ni	^{58}Ni	^{59}Ni	^{60}Ni	^{61}Ni	^{62}Ni	^{63}Ni	^{64}Ni	^{65}Ni	^{66}Ni	^{67}Ni	^{68}Ni
	6.1 d	36.0 h	68.08	$8\cdot10^4$ y	26.22	1.14	3.63	100.8 y	0.93	2.52 h	54.6 h	21 s	29 s

N =28

1 — 1.07 — 1.14 — 1.21 — 1.29 — 1.36 — N/Z

	^{32}S + ^{24}Mg	^{34}S + ^{26}Mg	^{36}S + ^{26}Mg	^{16}O + ^{48}Ca	^{18}O + ^{48}Ca
	N=Z	N=Z+4n	N=Z+6n	N=Z+8n	N=Z+10n
	T1	T=0	T=0	T=0,T1,T2	T1,T2

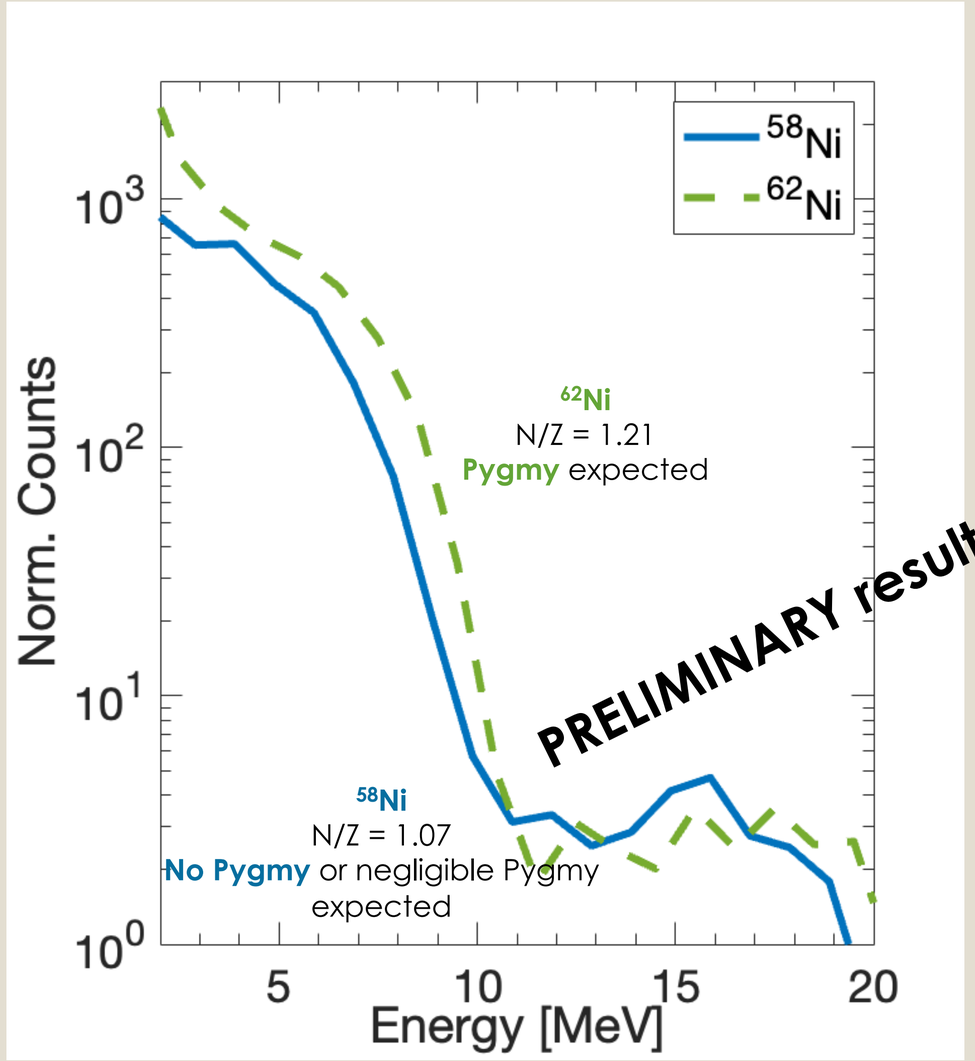
Neutron excess

Ebeam 60-90 MeV
E* 30-60 MeV
T≈1 - 2 MeV,
similar formation and angular momentums, no preequilibrium (LCP measurement)
@IFIN Magurele Bucharest

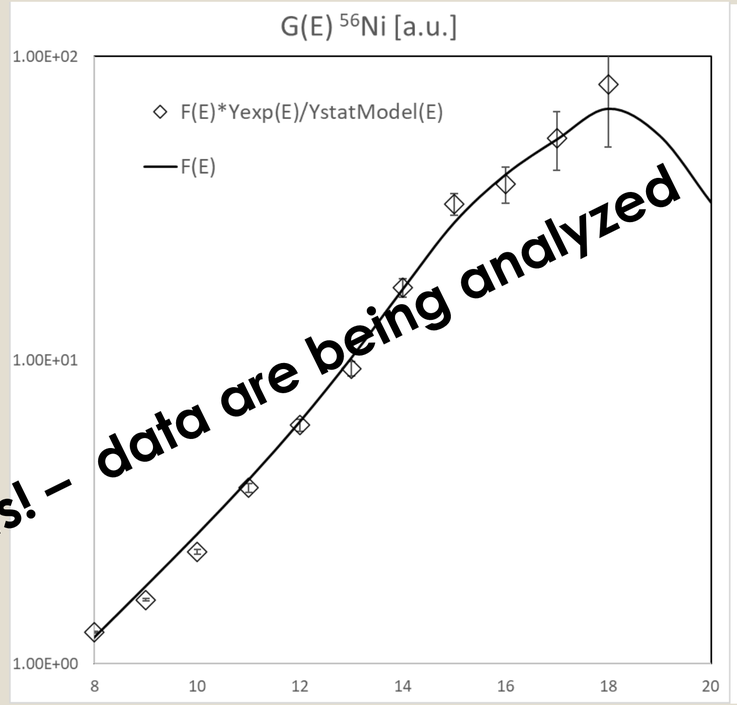
complementary measurements (p,p',γ) at T=0, polarisation and go also above threshold @CCB Krakow

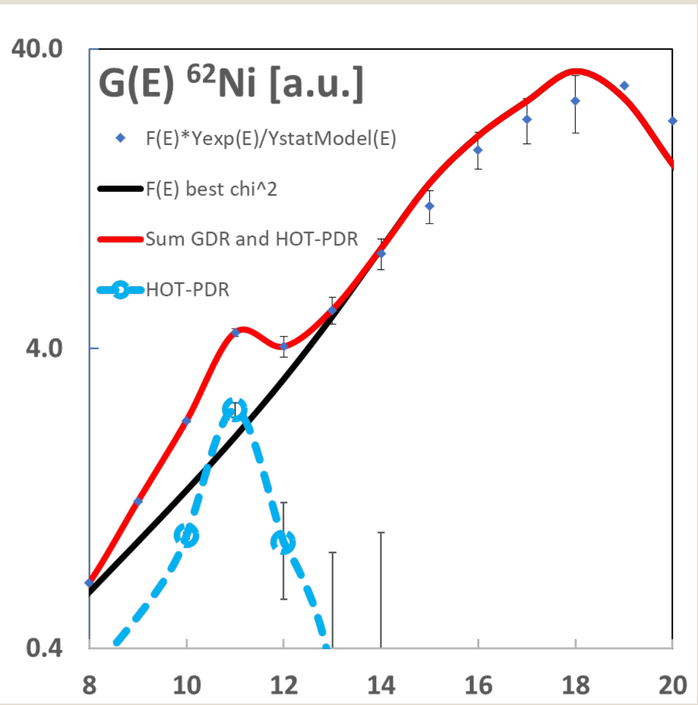
Courtesy of Oliver Wieland

Results of the ^{58,62}Ni Experiement **(CCB) for T=0**



Results of the ^{56,62}Ni Experiement **(IFIN-HH) for T>0**





PRELIMINARY results! – data are being analyzed

One scientific Question answered in 2 different laboratories with 2 different Methods !

Example from VA THEO4EXP facility

https://institucional.us.es/theo4exp/

THEO4EXP

HOME | EURO-LABS | MEANFIELD4EXP | REACTION4EXP | STRUCTURE4EXP | RESEARCH TEAM

theory tools

THEO4EXP

EUROLABS EUROPEAN LABORATORIES FOR ACCELERATOR BASED SCIENCES | UNIVERSIDAD D SEVILLA 1505 | IPHC Institut Pluridisciplinaire Hubert CURIEN STRASBOURG | UNIVERSITÀ DEGLI STUDI DI MILANO

INDIGO - DataCloud

Welcome to **indigo-dc**

Sign in with

ORCID

eduGAIN

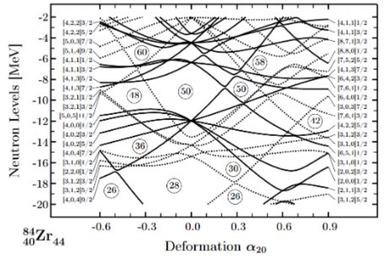
Local credentials

MeanField4Exp

IFJ PAN, KRAKOW, POLAND and IPHC and UNIVERSITY OF STRASBOURG, FRANCE

Single Particle Energies

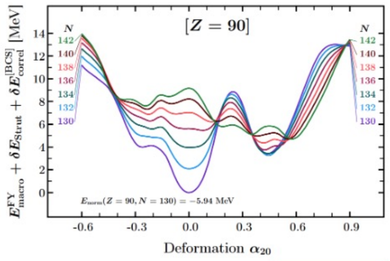
Generating diagrams of single nucleon energies.



Enter

Nuclear Energy Diagrams

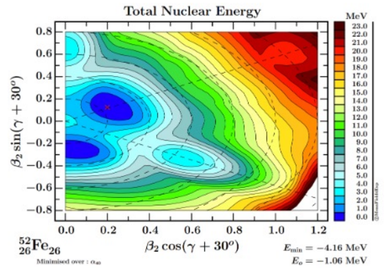
Generate Macroscopic-Microscopic Method nuclear energy diagrams.



Enter

Macroscopic-Microscopic Energy

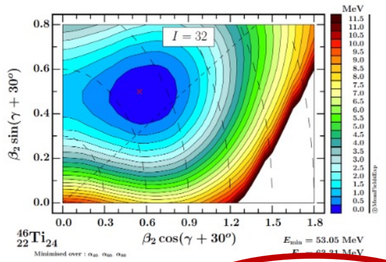
Generating total energy diagrams according to the Macroscopic-Microscopic approximation.



Enter

Shape Evolution with Spin

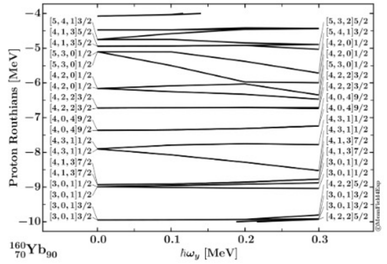
Generating diagrams of shape evolution with spin according to macroscopic energy models.



Enter

3D Cranking

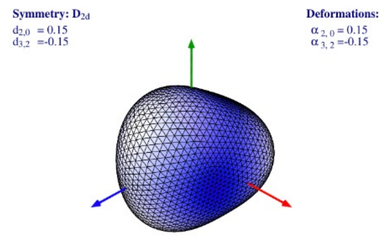
Create diagrams for single-particle Routhians through the Cranking method.



Enter

3D Nuclear Surface

Generate 3d diagrams of the nuclear shapes for customized deformations.



Enter

Courtesy of Jerzy Dudek, Irene Dedes, Rami Gaamouci

Proton Number:

22

Neutron Number:

24

Choose the Type of Energy:

Total energy = LSD + Rotational Energy

Step: 1 Smoothing: 0

Select Spin:

4 Spins

20

26

32

36

Deformation:

List of 5D Deformation Spaces:

bet, gam, a40, a60, a80

X axis: bet Y axis: gam

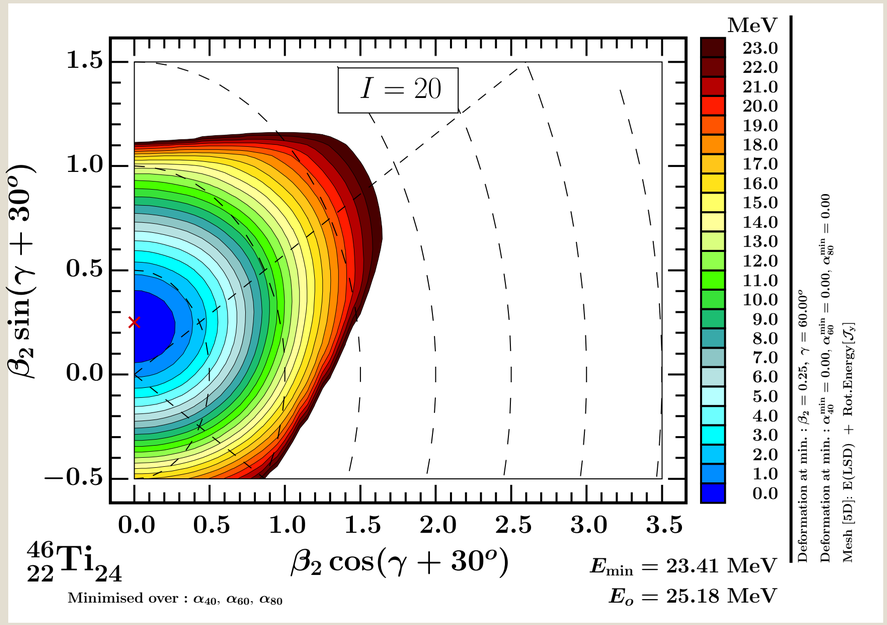
Min1: a40 Min2: a60 Min3: a80

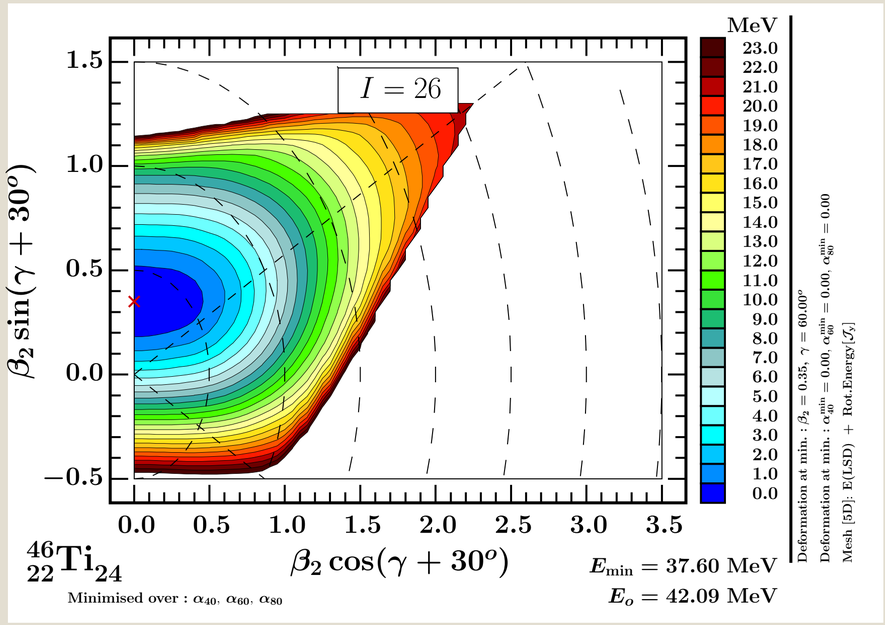
Choose a range of deformation

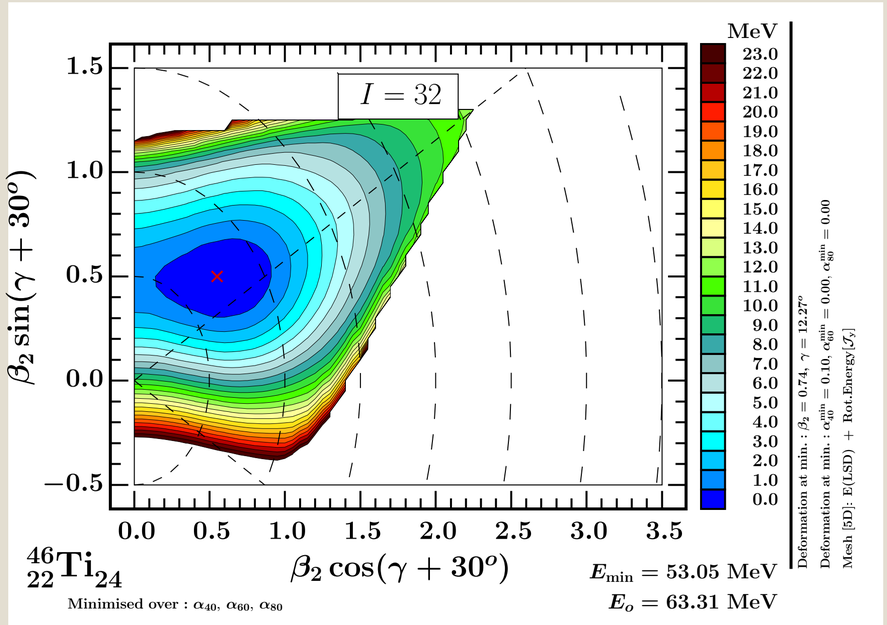
Extra information on the right hand side.

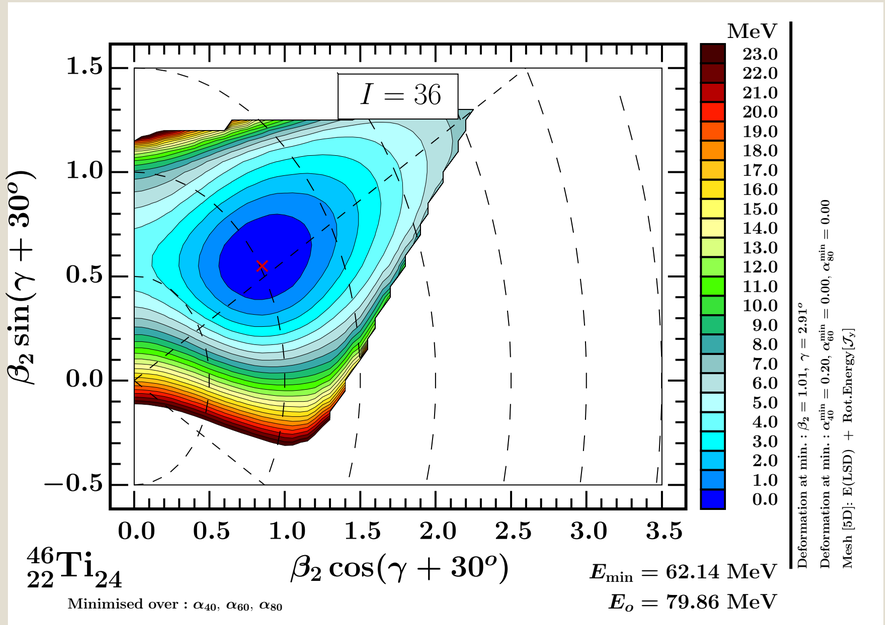
Data File.

Generate









Example from WP2 Service Improvements „InTraNs”

InTraNs

Instrumentation and Training for accelerator based Nuclear Spectroscopy and Reaction

https://web.infn.it/EURO-LABS/intrans/

2024 events:

86 participants. Great success !

→ the INTRANS SC has decided to host another workshop before the end of EURO-LABS contract

Courtesy of
Magda Górska and Aracelli Lopes-Martens

2025 events sponsored/organized by INTRANS:

-Training Workshop on Coulomb Excitation (27-30 January 2025, Florence, Italy)

-AGATA Data Analysis School (13-17 January 2025, Lyon, France)

-INTRANS Ge Detector School (7-11 April 2025, Liverpool, UK)

2026 events:

2nd INTRANS workshop (LNL)

Conclusions

- **The work in WP2 progresses very well.**
- **Many interesting scientific highlights in differrent TA facilities were obtained.**
- **Many facilities exceeded the AUs planned for whole duration of the project, other will exceed this limit soon. This demonstrated that access to nuclear physics facilities are in high demand**
- **Theo4Exp VA facility, opened to users only since 9 month, demonstrated large interest of the users. Further actions to adverise it are planned.**
- **Service improvements provided very interesting developments**

https://web.infn.it/EURO-LABS/


SERVICE IMPROVEMENTS
EURO LABS
EUROPEAN LABORATORY FOR ACCELERATOR BASED SCIENCE
ISOLDE
Thanks to all WP2 colleagues!
$\beta_2 \cos(\gamma + 30^\circ)$

WP2 budget

Tasks (all costs in €)	Person - months	Personnel costs	Subcontracting costs	Travel and subsistence	Equipment	Other goods, works and services	Total direct costs	Total indirect costs	Unit Access costs	Max. EU contribution to eligible costs (budget in Annex 2)	EC requested funding
Task 2.1-3	0,00	0,00	0,00	1 861 387,00	0,00	0,00	1 861 387,00	465 346,75	2 193 915,00	4 520 648,75	4 520 648,75
Task 2.4	165,60	601 205,00	0,00	121 344,00	0,00	0,00	722 549,00	180 637,25	120 320,00	1 023 506,25	497 000,00
Task 2.5	169,00	665 044,31	0,00	213 000,00	0,00	48 000,00	926 044,31	231 511,08	0,00	1 157 555,39	1 157 555,39
Total	**334,60**	**1 266 249,31**	**0,00**	**2 195 731,00**	**0,00**	**48 000,00**	**3 509 980,31**	**877 495,08**	**2 314 235,00**	**6 701 710,39**	**6 175 204,14**
Fixed target for EC funding (negotiation)											**6 180 000,00**
Checking the condition											**OK**

Beneficiary short name	Person - months	Personnel costs	Subcontracting costs	Travel and subsistence	Equipment	Other goods, works and services	Total direct costs	Total indirect costs	Unit Access costs	Max. EU contribution to eligible costs (budget in Annex 2)	EC requested funding
INFN	45,50	131 503,00	0,00	291 500,00	0,00	16 000,00	439 003,00	109 750,75	308 000,00	856 753,75	856 753,75
GANIL	0,00	0,00	0,00	342 567,00	0,00	0,00	342 567,00	85 641,75	351 403,00	779 611,75	779 611,75
CNRS	20,00	90 000,00	0,00	139 600,00	0,00	16 000,00	245 600,00	61 400,00	186 000,00	493 000,00	493 000,00
GSI	43,00	209 583,31	0,00	283 600,00	0,00	16 000,00	509 183,31	127 295,83	322 500,00	958 979,14	958 979,14
CERN	0,00	0,00	0,00	430 880,00	0,00	0,00	430 880,00	107 720,00	392 112,00	930 712,00	930 712,00
JYU	12,50	56 500,00	0,00	242 000,00	0,00	0,00	298 500,00	74 625,00	262 500,00	635 625,00	635 625,00
UNIWARSAW	24,00	72 000,00	0,00	56 700,00	0,00	0,00	128 700,00	32 175,00	103 500,00	264 375,00	264 375,00
IFJ PAN	72,00	216 000,00	0,00	22 800,00	0,00	0,00	238 800,00	59 700,00	57 200,00	355 700,00	175 700,00
IFIN-HH	4,00	10 634,00	0,00	140 500,00	0,00	0,00	151 134,00	37 783,50	143 500,00	332 417,50	332 417,50
USE	52,80	234 005,00	0,00	34 080,00	0,00	0,00	268 085,00	67 021,25	22 400,00	357 506,25	155 000,00
ATOMKI-HAS	8,00	19 500,00	0,00	37 080,00	0,00	0,00	56 580,00	14 145,00	22 400,00	93 125,00	93 125,00
IST	0,00	0,00	0,00	34 080,00	0,00	0,00	34 080,00	8 520,00	22 400,00	65 000,00	65 000,00
FBK	0,00	0,00	0,00	121 344,00	0,00	0,00	121 344,00	30 336,00	120 320,00	272 000,00	272 000,00
UMCG	12,00	75 324,00	0,00	15 000,00	0,00	0,00	90 324,00	22 581,00	0,00	112 905,00	112 905,00
CEA	0,00	0,00	0,00	4 000,00	0,00	0,00	4 000,00	1 000,00	0,00	5 000,00	5 000,00
UMIL	40,80	151 200,00	0,00	0,00	0,00	0,00	151 200,00	37 800,00	0,00	189 000,00	45 000,00
Total	**334,60**	**1 266 249,31**		**2 195 731,00**	**0,00**	**48 000,00**	**3 509 980,31**	**877 495,08**	**2 314 235,00**	**6 701 710,39**	**6 175 204,14**