



Third International SPES workshop

10-12 October 2016

INFN Laboratori Nazionali di Legnaro



The EURISOL – DF Project



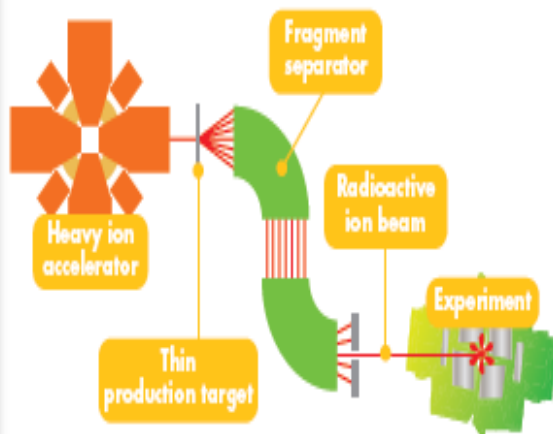
Sara Pirrone

INFN - Sezione di Catania

RIBs Production

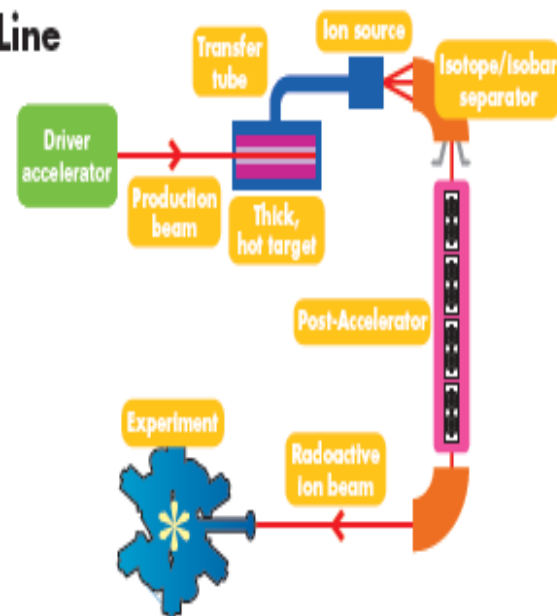
Fragmentation

The RIBs are produced by fragmentation of a stable nucleus on a thin target. The primary beam has high energy and high selectivity, but low intensity.



ISOL: Isotope Separation On-Line

Radioactive nuclides are produced by spallation, fission or fusion reactions of a primary beam on a thick target. The fragments are separated on-line, and reaccelerated. The secondary beams are very intense.

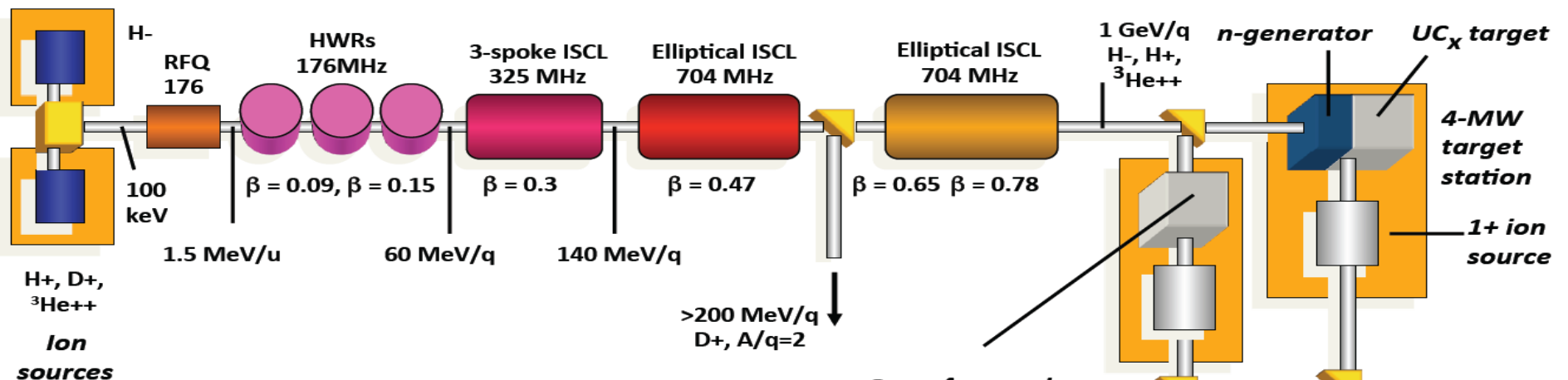


LONG RANGE PLAN 2010

NuPECC
RECOMMENDATIONS

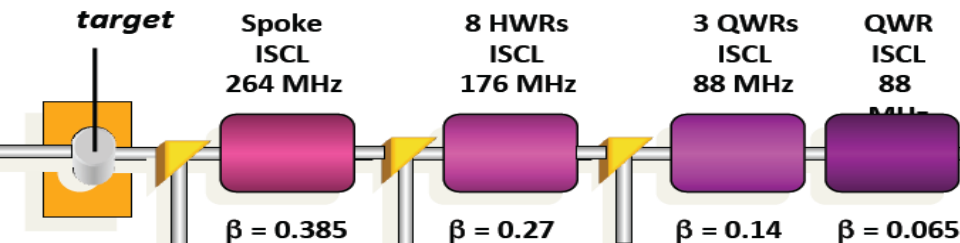


EURISOL



A possible schematic layout for a EURISOL facility

Secondary fragmentation target



To high-energy experimental areas

To medium-energy experimental areas

To low-energy areas

Low-resolution mass-selector

Charge selector

Charge breeder

High-resolution mass-selector

EURISOL

EURISOL MoU

The EURISOL MoU establishes a common understanding among the Parties of the collaborative effort required for the continued development of EURISOL, including more focused R&D and a more refined cost estimate.

Signatories: **CERN, COPIN(Poland), BEC (Belgium), GANIL, INFN, JYFL**

The Mou is implemented by a **Steering Committee**:

M.Lewitowicz (GANIL, Chair)

M.J.Borge (CERN)

A.Maj (COPIN)

S.P. (INFN)

L.Popescu (BEC)

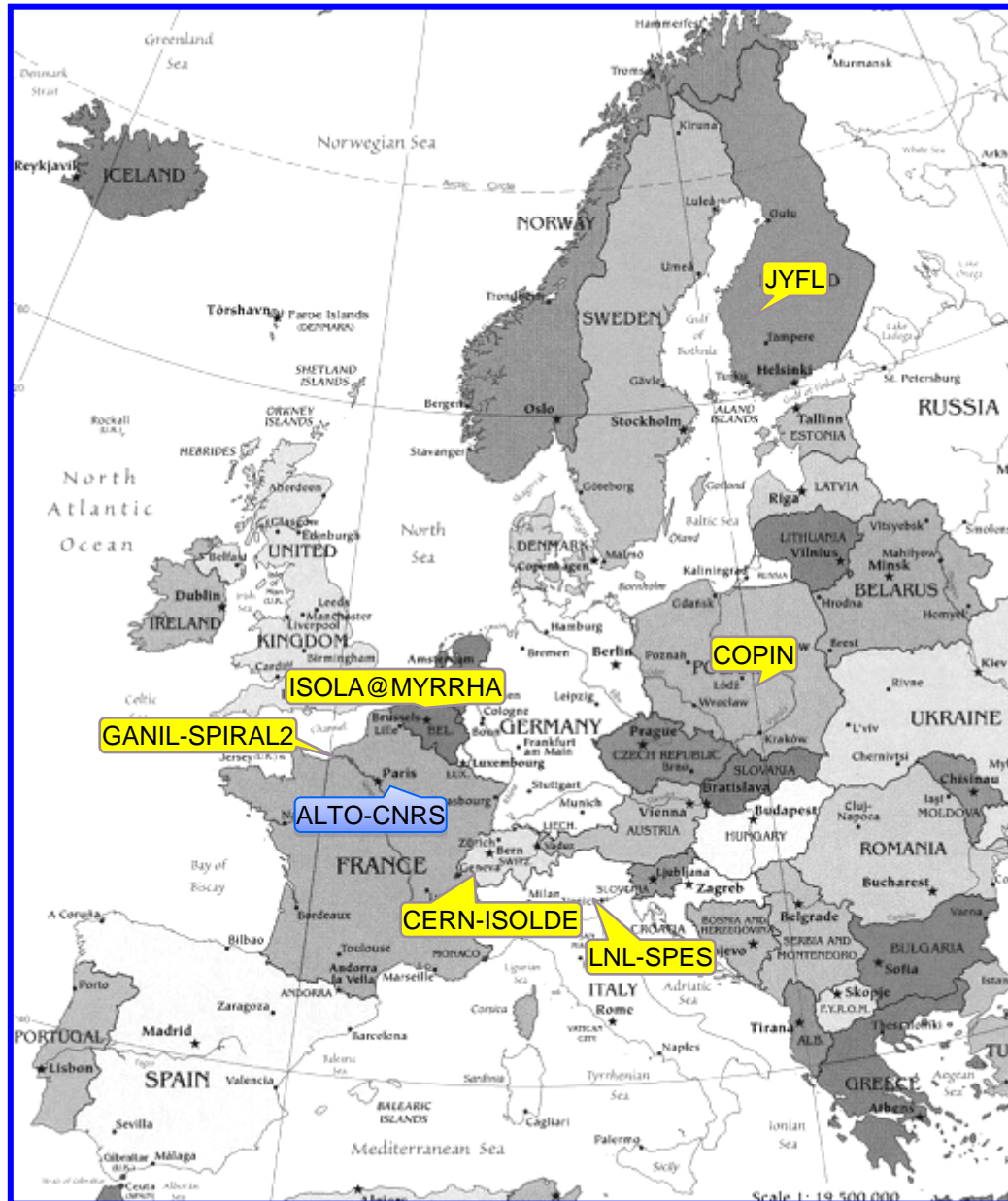
A.Jokinen (JYFL)

A.Bracco (NuPECC representative)

Y. Blumenfeld (EURISOL JRA ENSAR2, invited)

EURISOL-DF Initiative from 2014

EURISOL – Distributed Facility (DF)



Members :

ISOLDE/CERN

SPES-INFN

SPIRAL2-GANIL

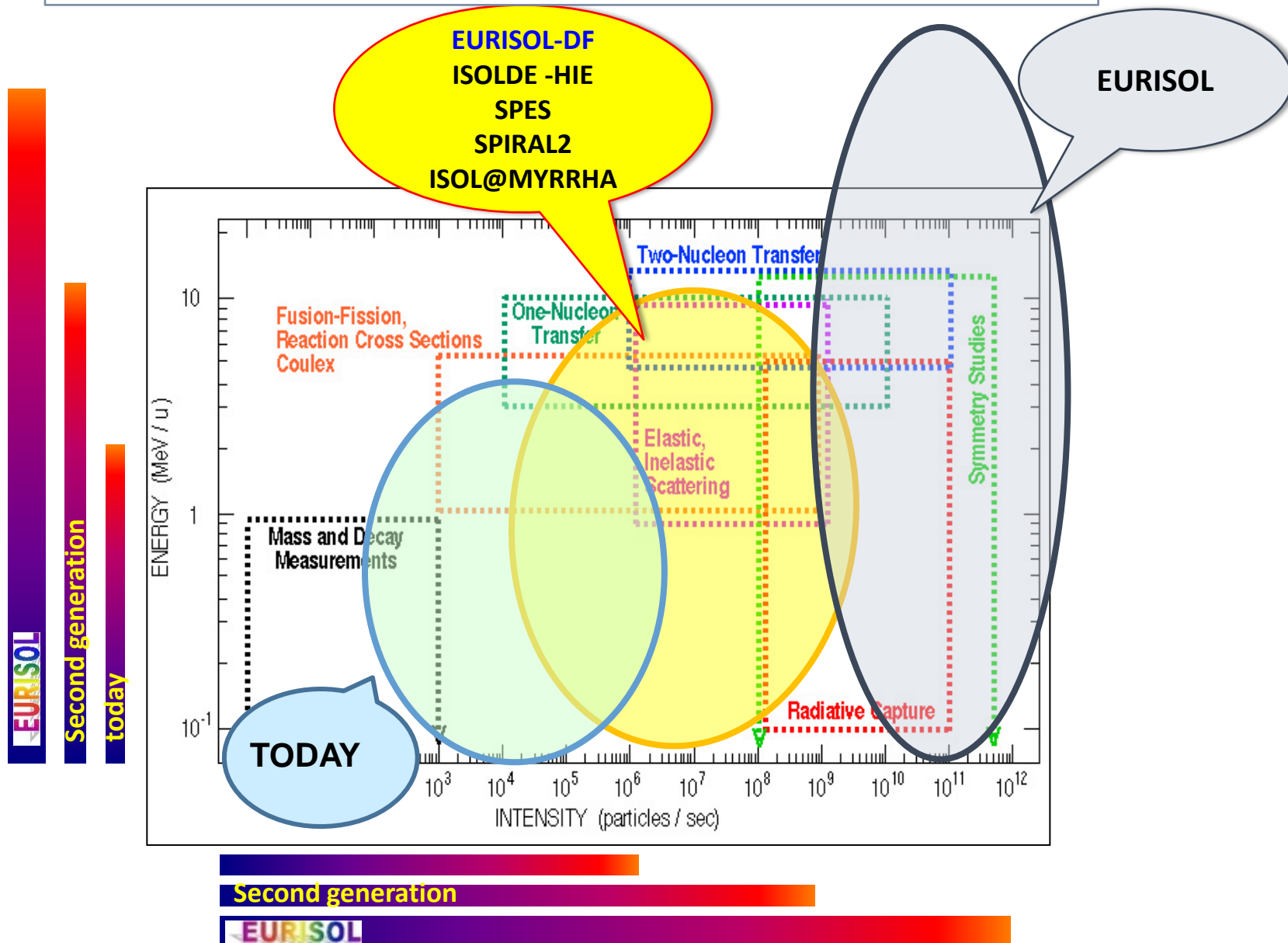
ISOL@MYRRHA -SCK•CEN

JYFL, Finland

COPIN Consortium, Poland

**...and hopefully soon
ALTO-Orsay**

Physics with ISOL RIB - Intensity & Energy domains



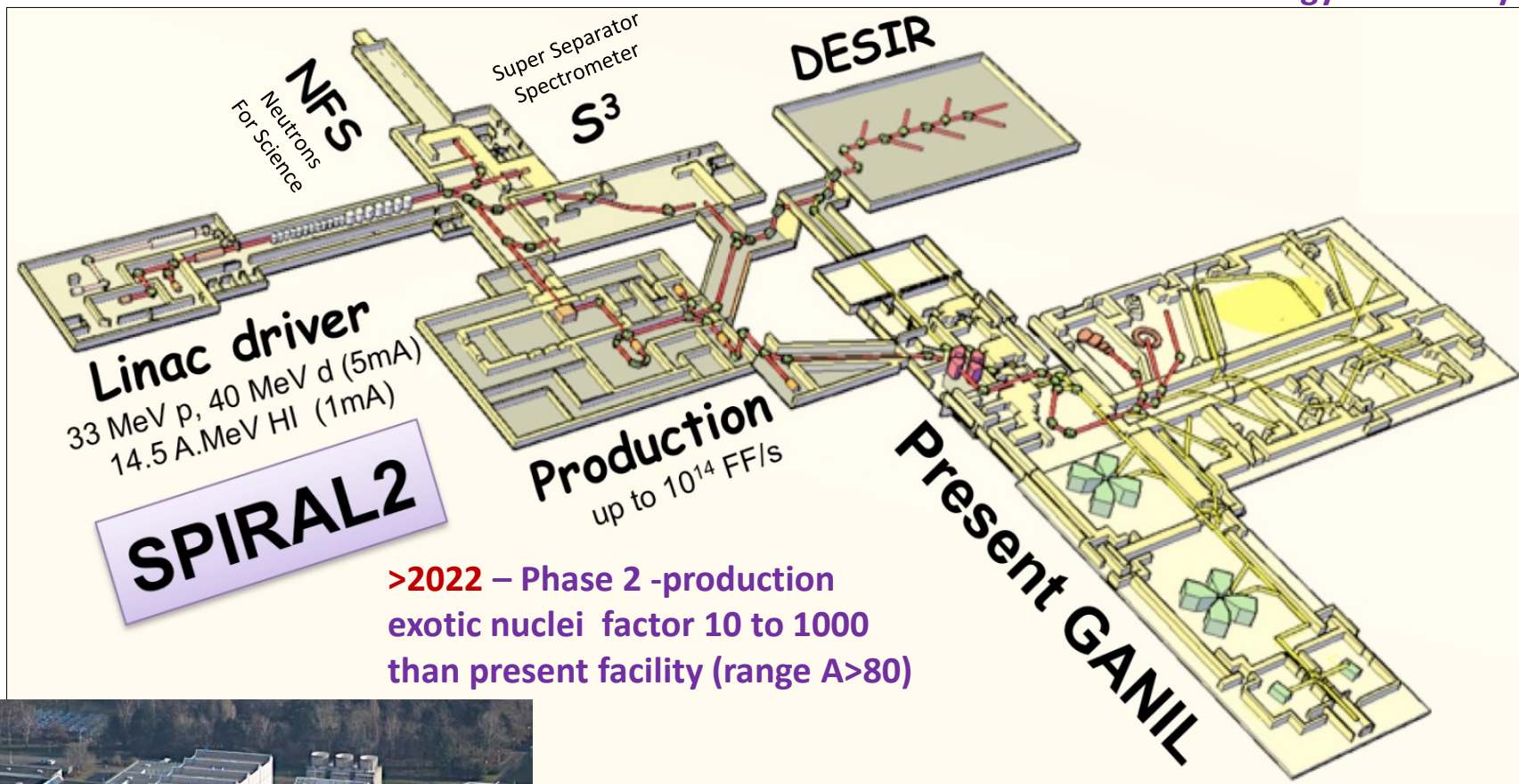
The Eurisol-DF 'Pillar' facilities

GANIL-SPIRAL2

2017 - Phase 1- Increase the intensity of stable beams(x10-100) & High intense neutron source

2017 - First LINAC beam (now installation and commissioning)

2022 - DESIR Low energy RIB facility



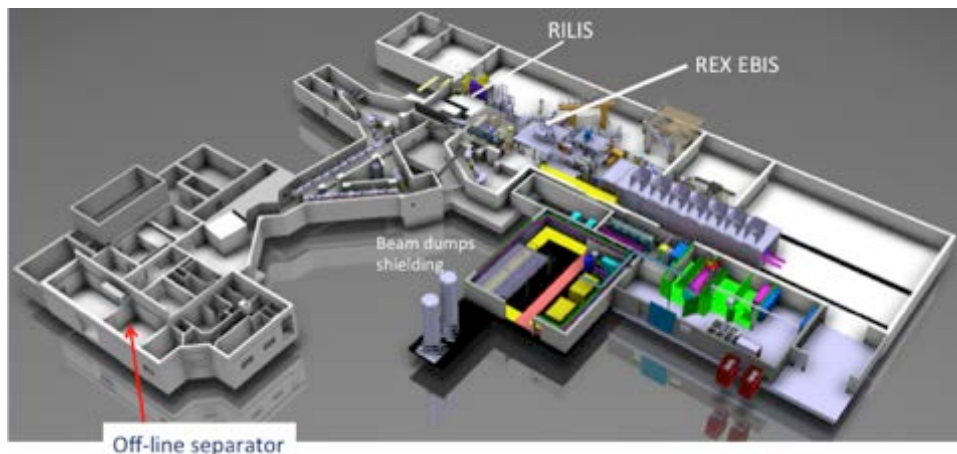
>2022 – Phase 2 -production
exotic nuclei factor 10 to 1000
than present facility (range $A > 80$)

2017 -SPIRAL1 Upgrade New light RIBs from beam/target
fragmentation

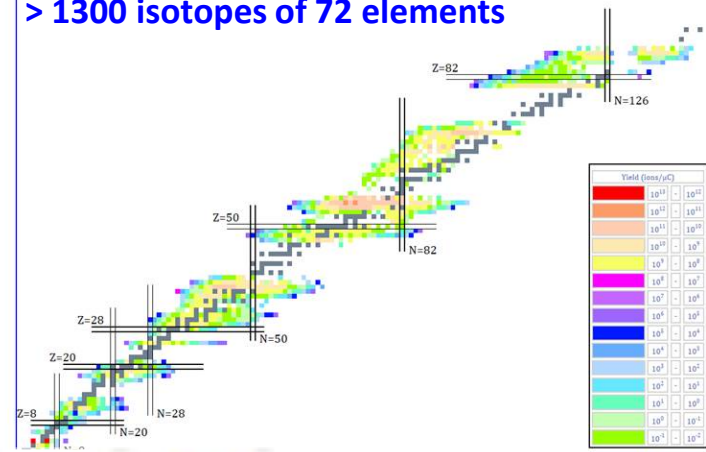


ISOLDE

- ISOLDE is the CERN radioactive beam facility (approved 50 y ago!) Rex-ISOLDE fully operational
- Run by an international collaboration since 1965. (B, CERN, Dk, E, F, Ge, Gr, I, India, N, R, S, UK)
- Provides low energy (60KeV) or post-accelerated beams ($E_p=1.4\text{GeV}$, $i=2\mu\text{A}$, 2kW primary beam)
- today offers the largest range of available isotopes of any ISOL facility worldwide.
- HIE UPGRADE to complete in 2018 ($E=10\text{ MeV/nucleon}$ + chopper line)**
- Today the physics campaign @ 5.5 MeV/u already started with ^{110}Sn beam at 10^7pps



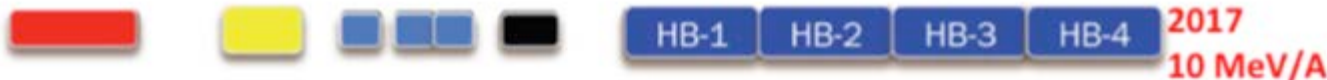
> 1300 isotopes of 72 elements



✓ HIE STAGE 1



✓ HIE STAGE 2



✓ HIE STAGE 3 WITH CHOPPER LINE 2018 (LS2)



Physics Autumn 2015

@ 4.3 MeV/u

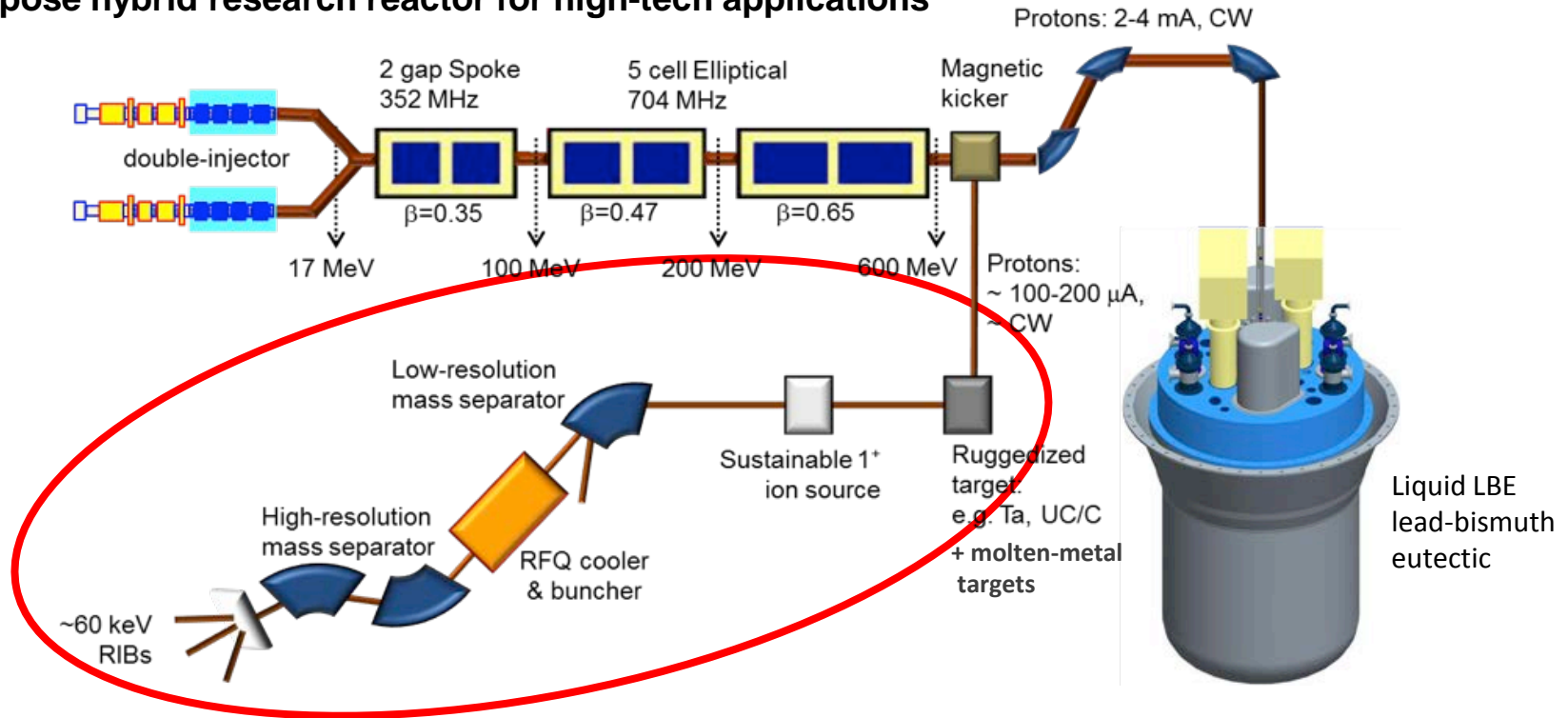
Spring 2016 5.5 MeV/A

2017
 10 MeV/A

Started Jan 2010
Budget 40 MCHF

MYRRHA* ADS Facility & ISOL@MYRRHA

*Multi-purpose hybrid research reactor for high-tech applications



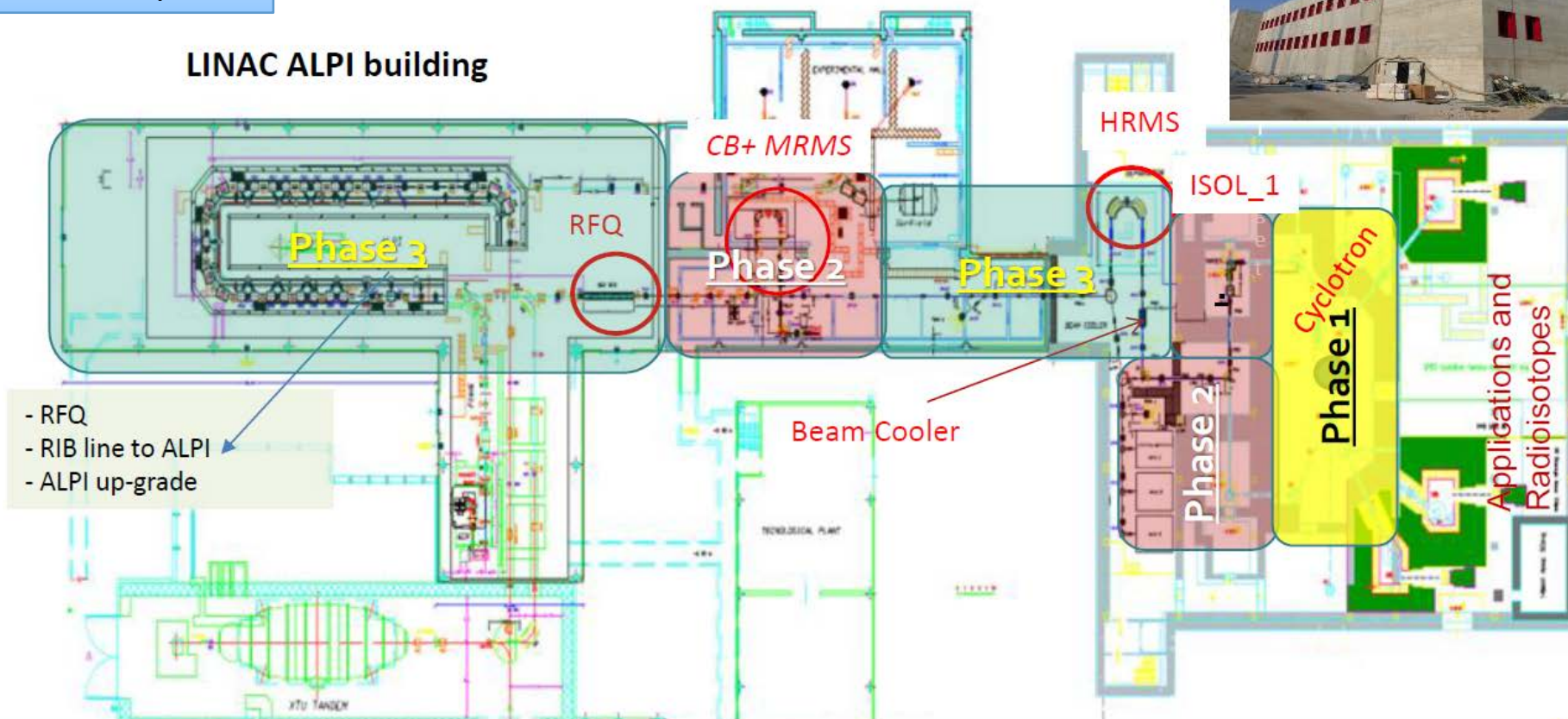
ISOL@MYRRHA

- By using a small fraction of the MYRRHA p-beam, high-purity RIB can be produced,
- Low-energy (60KeV) RIBs & most intense ISOL beams available in the world.
- fundamental research in various fields
- production of innovative radioisotopes.
- Experimental program complementary to other ISOL facilities – long-run experiments

INFN – SPES

Installation phases

≥ 50 M€,
first beams by 2019



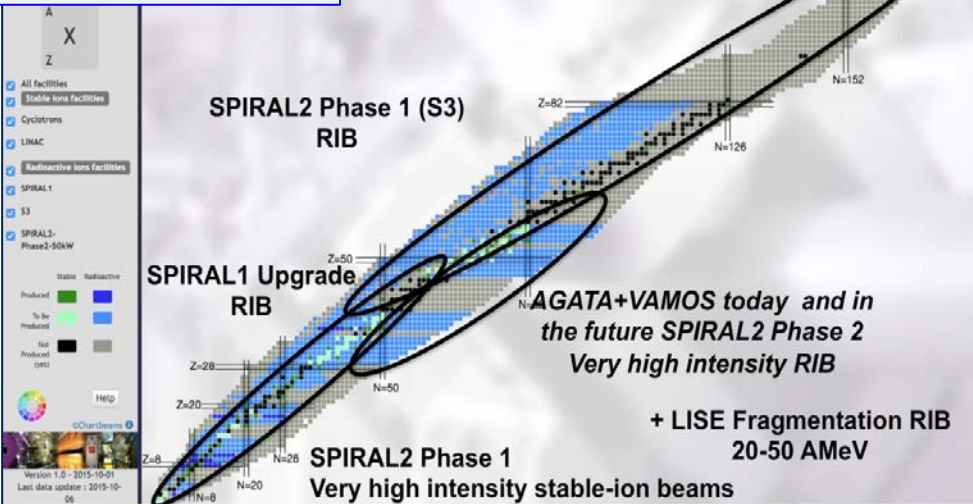
- **Phase 1. 2016** - Building + First operation with the cyclotron **NOW!**
- **Phase 2. 2017-18** - From C.B. to RFQ + SPES target, LRMS, 1+ Beam Lines
- **Phase 3. 2019** – HRMS-BeamCooler + RFQ to ALPI



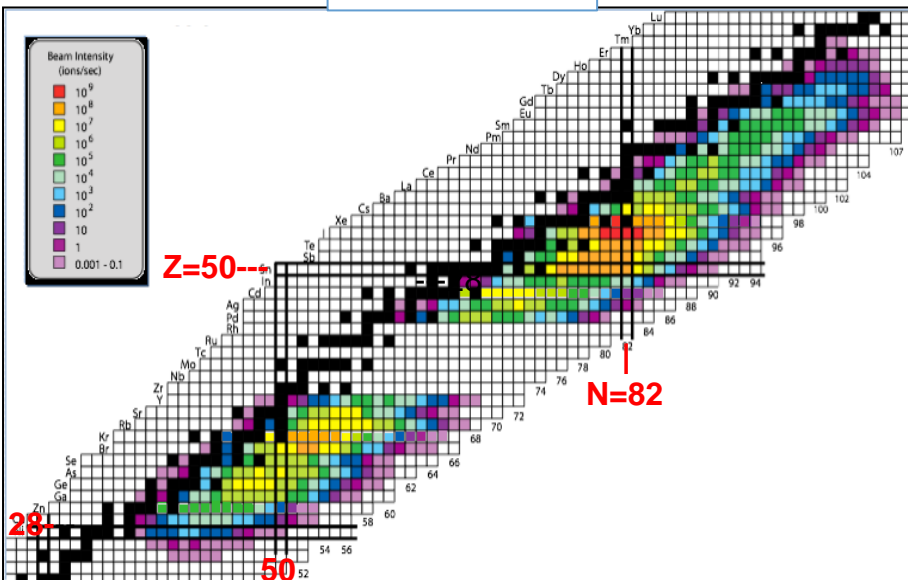
Radioactive Ion Beams production

GANIL-SPIRAL2

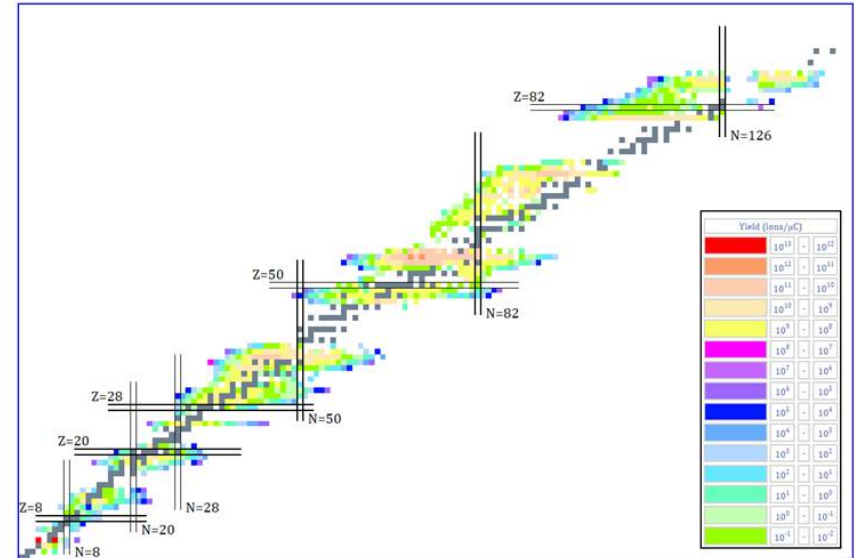
<http://u.ganil-spiral2.eu/chartbeams/>



INFN - SPES



ISOLDE-CERN



http://test-isolde-yields.web.cern.ch/test-isolde-yields/query_tgt.htm

EURISOL-DF

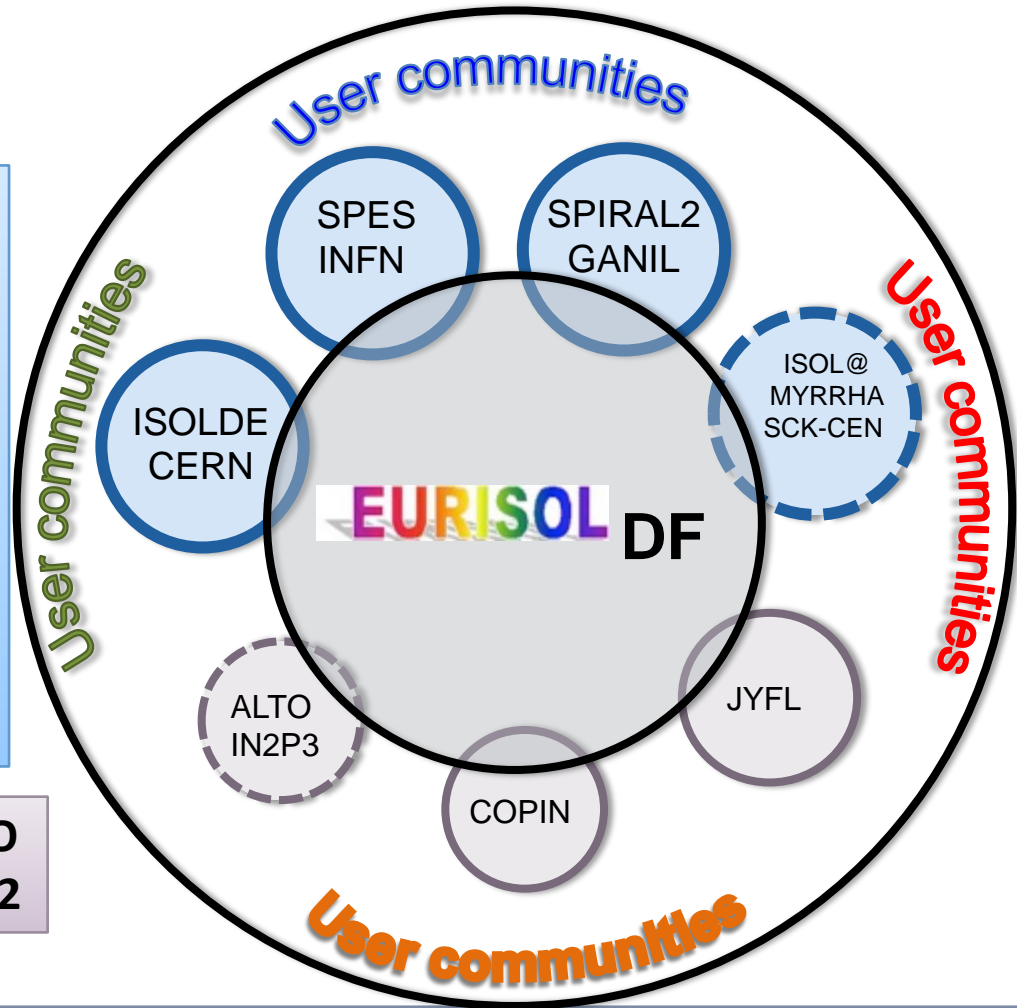
Support effort to enhance complementarities in beam / energy / intensity

<https://web.infn.it/spes/index.php/news/spes-beam-tables>

EURISOL – Distributed Facility (DF) Initiative

Goals of EURISOL-DF

- Prepare strong scientific case for RIB science and applications
 - Support, upgrade, optimize and coordinate the involved facilities
 - Foster R&D on RIB production and Instrumentation towards EURISOL
 - Support user driven policy (User Group)
 - **EURISOL single site facility as a long term goal**
-
- Collaboration with FAIR/NUSTAR & ALTO
 - Interaction with EURISOL JRA in ENSAR 2



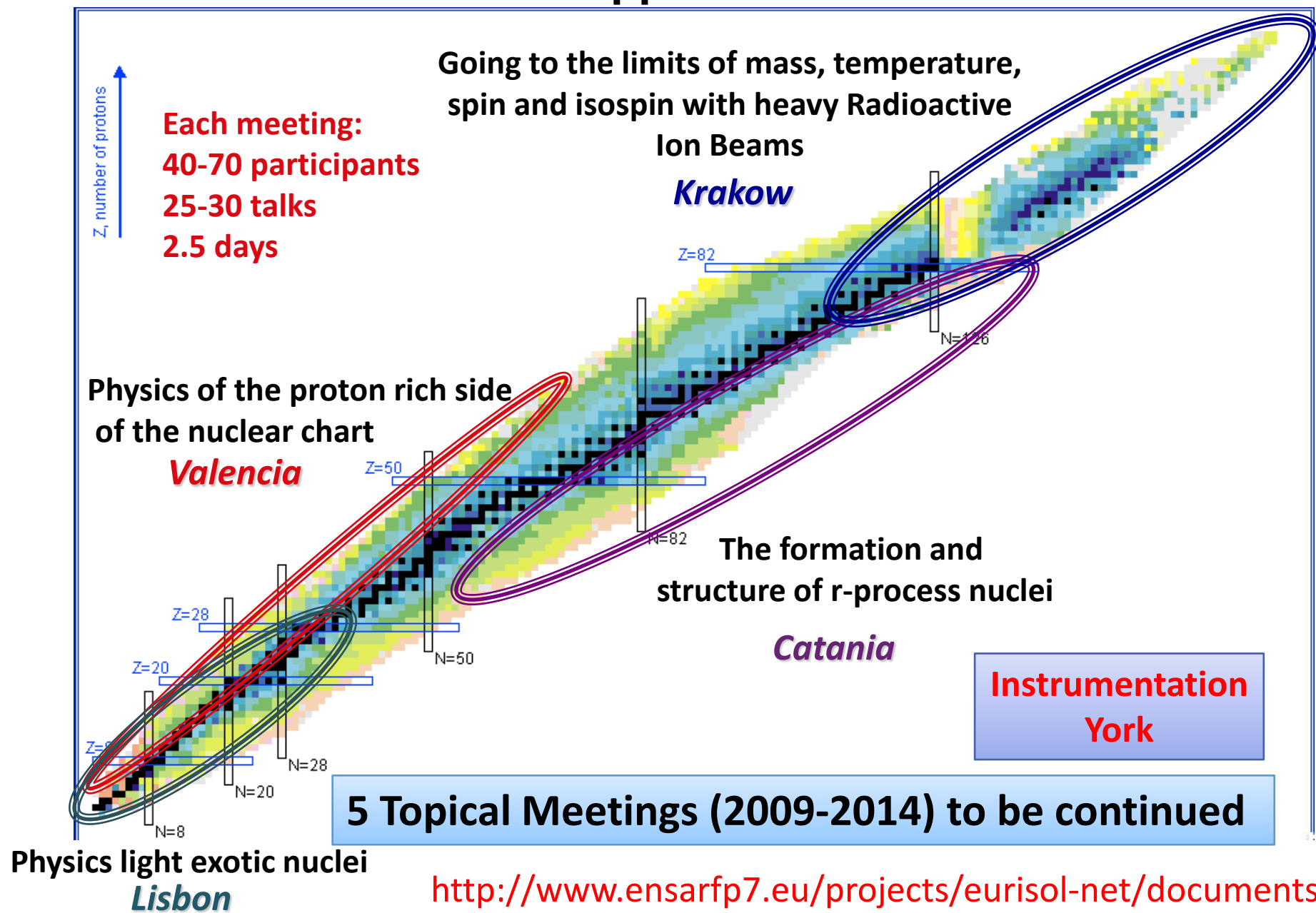
Forthcoming Goal:

Get EURISOL-DF on the ESFRI (European Strategy Forum on Research Infrastructure) list, as a candidate project by 2018

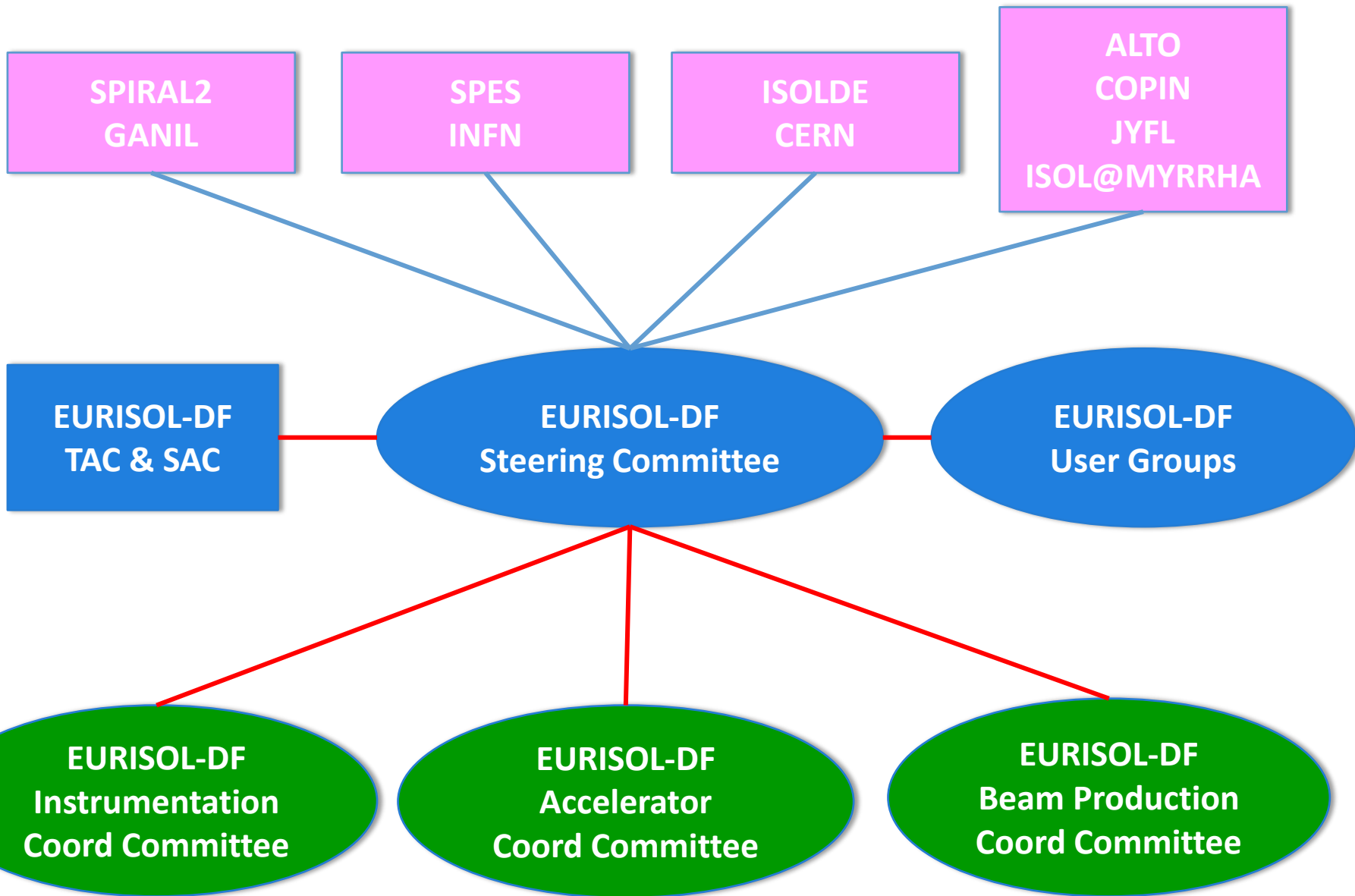
http://www.eurisol.org/eurisol_df/

website by LNL-Fondi Esterni

Prepare strong scientific case for RIB Science and Applications



EURISOL-DF Organization (Preliminary Scheme)



EURISOL-DF Instrumentation Coordination Committee (EICC)

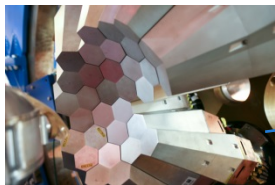
(Preliminary)

The role of the EICC:

- to reinforce the synergies and to coordinate efforts and R&D between the facilities and the major collaborations on existing and new detectors
- to coordinate experimental campaigns at the RIB facilities which are members of EURISOL-DF

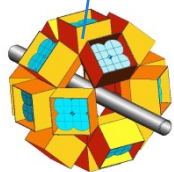
Traveling detectors (examples)

Gamma-ray detectors

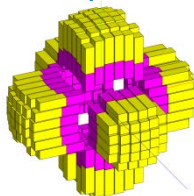


AGATA

EXOAM 2

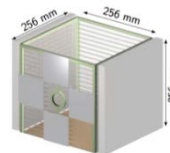


PARIS

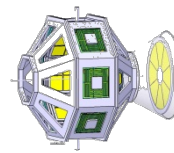


Charged particle detectors

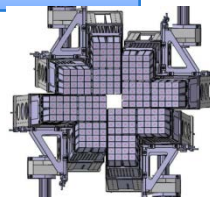
ACTAR-TPC



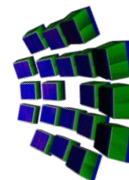
GASPARD



FAZIA

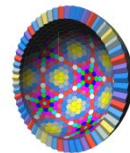


FARCOS



Neutron detectors

NEDA



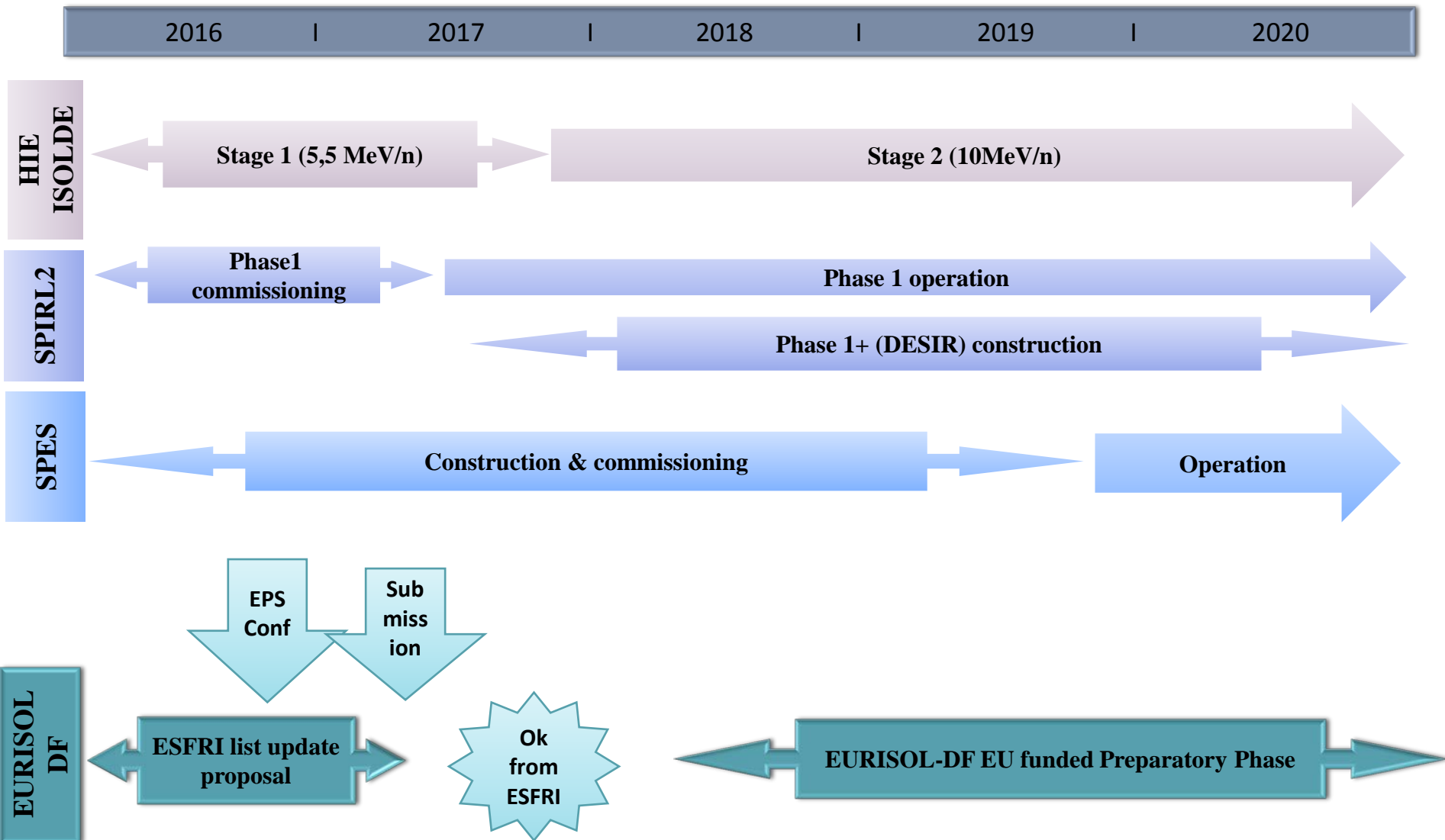
DEMON

EURISOL-DF Submission of the project to ESFRI by March 2017

EURISOL-DF working groups for the preparation of the ESFRI-list proposal:

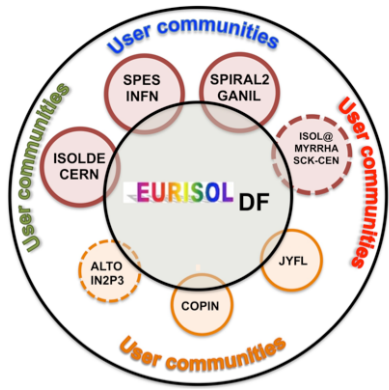
- **WG1:** Science & applications (together with EURISOL User Group): Coordinator R. Raabe
- **WG2:** Technical R&D – accelerators: Coordinator A. Facco
- **WG3:** Technical R&D – RIB beam handling, targets and ion sources: Coordinator M. Borge
- **WG4:** Technical R&D – spectrometers & detectors: Coordinator H. Savajols
- **WG5:** EURISOL-DF & relationships with ESFRI & EC and its future legal structure: Coordinator: A. Bracco

Timeline EURISOL-DF



EPS Divisional Conference
Towards EURISOL Distributed Facility

EURISOL DF 2016



Leuven, October 18-21, 2016

Acknowledgements

Warm thanks to the **EURISOL SC members**

M.Lewitowicz (GANIL)

MJG Borge (CERN)

A. Maj (COPIN)

L. Popescu (BEC)

A. Jokinen (JYFL)

A. Bracco (NuPECC representative)

Y. Blumenfeld (EURISOL JRA ENSAR2 representative)

and Angela Bonaccorso (past Chair Eurisol User Group)

for their contributions in the preparation of this talk