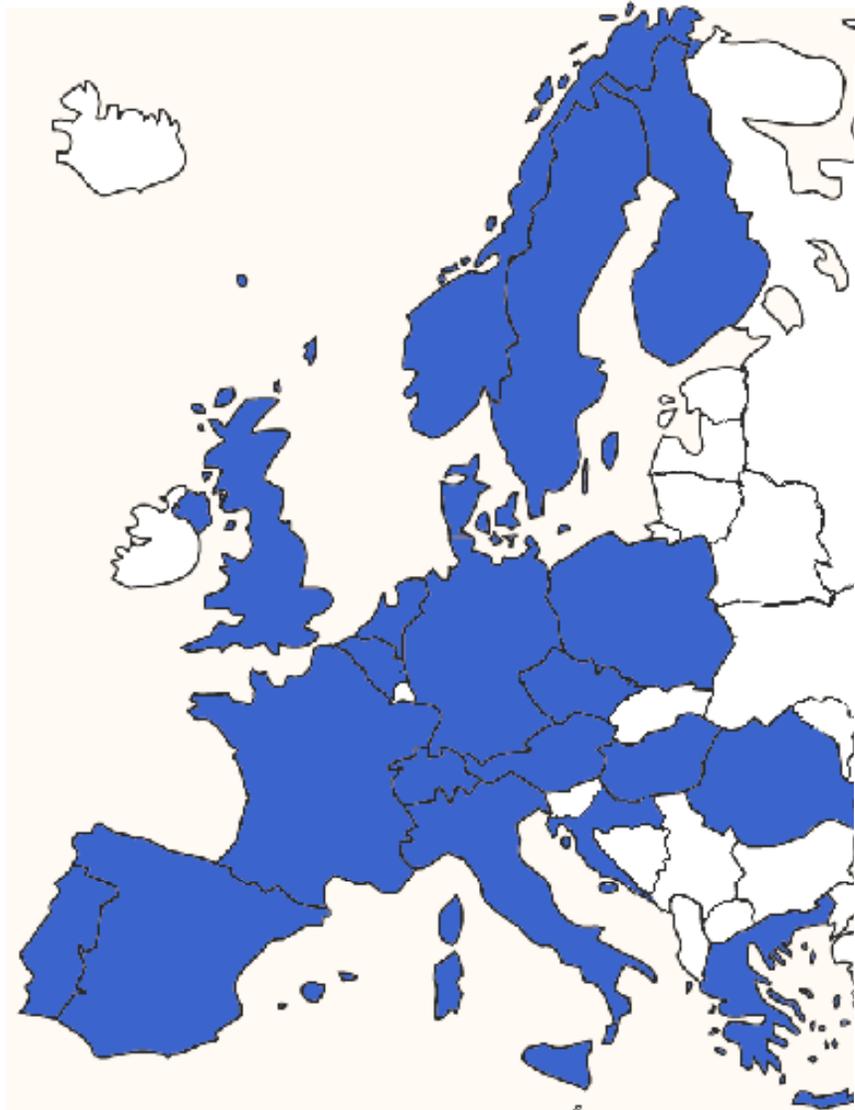




# What **NuPECC** is

- **Nuclear Physics European Collaboration Committee:**
  - Expert Committee of the **European Science Foundation**. It was founded 1988 by subscribing **national research councils**, who nominate nuclear scientists as their representatives to be appointed by ESF.
- **Objective of NuPECC:**
  - “To strengthen European collaboration in **nuclear science** through the promotion of **nuclear physics and its trans-disciplinary use and application** in collaborative ventures between research groups within Europe and particularly those from countries linked to the ESF”.



- has currently 28 members from **20** countries
  - Bulgaria intends to join in 2011
  - Ongoing talks with
    - Russia
    - Slovenia
    - Slovakia
    - Turkey
- meets 3 times a year in different member states



- Founded **1974**
- **79** member organisations
  - Science Ministries
  - Research Councils
  - Academiesfrom **30** countries
- **5** Standing C'ttees
- **6** Expert Boards & C'ttees
  - **NuPECC**

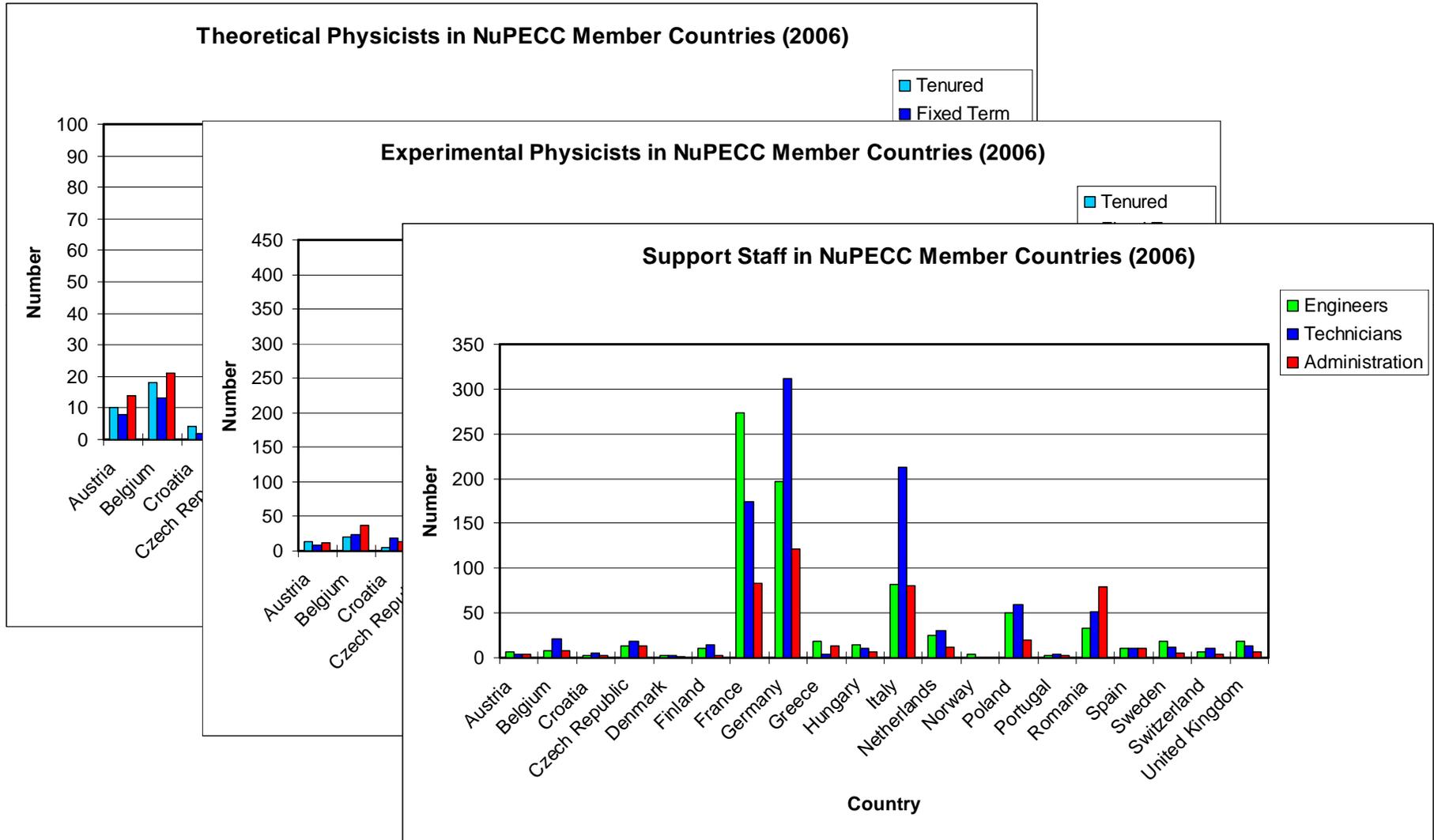
# What does

- Identifies key scientific issues
- Launches new Projects
- **Develops Long Range Plans**
- Interacts with stakeholders
- Performs surveys of human resources
- Issues publications & performs outreach activities

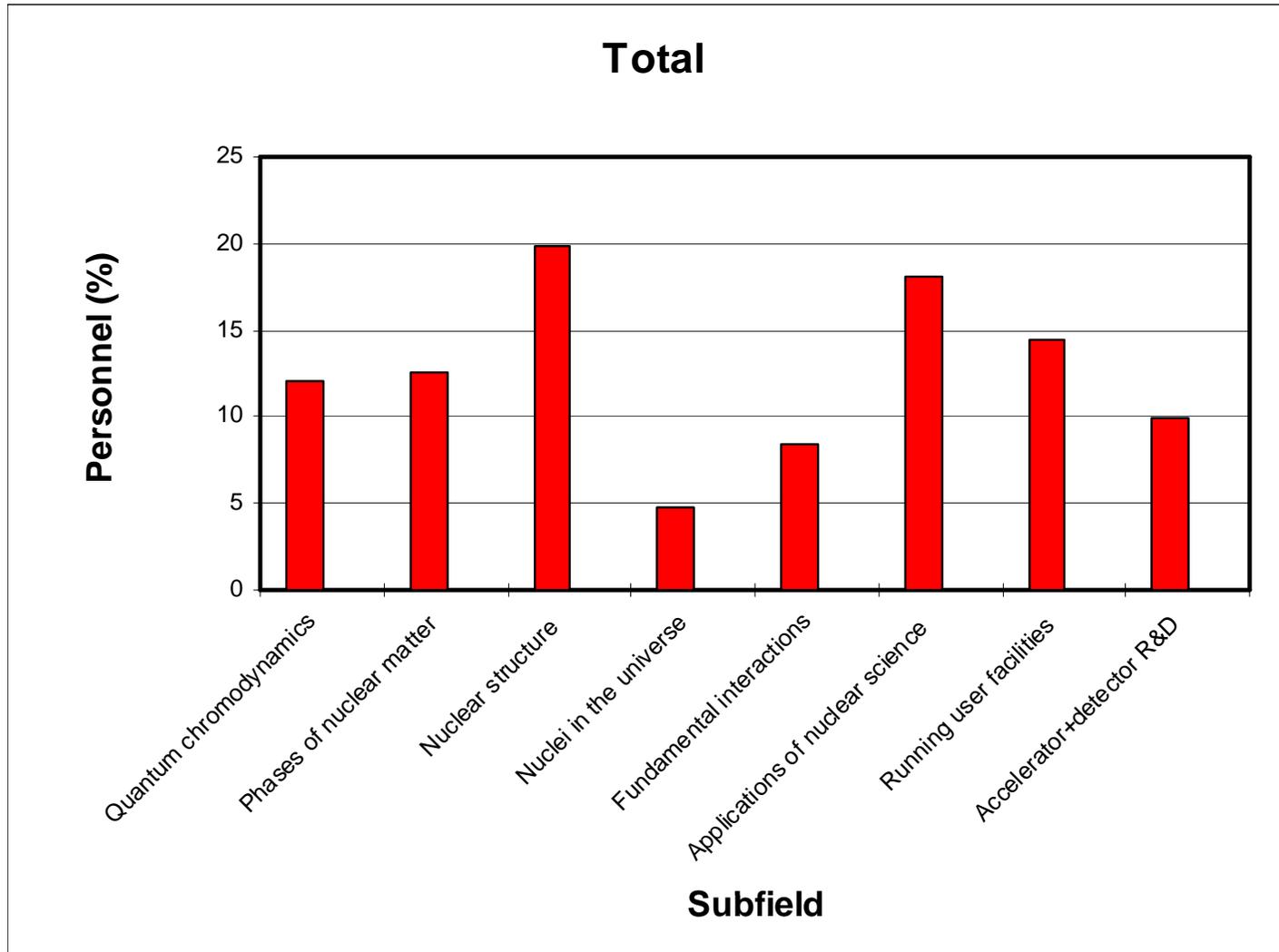
# Launch of New Projects

- **EU Framework 6 Programme**
  - Integrated Infrastructure Initiatives, I3s
    - **HadronPhysics** - Strongly Interacting Matter
      - CBMnet @ FAIR
    - **EURONS** - Nuclear Structure and Reaction Dynamics
      - SPIRAL2 & GSI
  - Design Studies
    - **FAIR** (Facility for Antiproton and Ion Research, Darmstadt, Germany)
    - **EURISOL**
- **EU Framework 7 Programme**
  - Integrating Activities, IAs
    - **HadronPhysics2** - Hadron Structure & Spectroscopy
      - PAX @ FAIR
    - **HadronPhysics3** proposal
      - ENC @ FAIR
    - **ENSAR** - Nuclear Science & Applications
      - EURISOL
    - **SPIRIT** - Applied Nuclear Physics
- **Burgeoning new projects**
  - ISOL @ MHYRRA
  - Nuclear Physics @ ELI
  - ENC and PAX @ FAIR
  - LHeC @ CERN

# Survey of Human Resources



# ...in Various Key Subfields



# Publications

- **Web:** [www.nupecc.org](http://www.nupecc.org)
- **Nuclear Physics News**
  - 4 issues p.a., 6000 subscribers in Europe, North America & Japan
- **Handbook of Facilities Access**
- **Survey of Resources**
- **Topical Reports**
- **Long Range Plans**
- **Outreach activities**
  - **Brochures**
    - **Radioactive Beams**
    - **Nature at the Femto-scale**
  - **Public Awareness of Nuclear Science, PANS**
    - [www.nupecc.org/pans](http://www.nupecc.org/pans)
  - **Nuclear Physics Experience, NUPEX**
    - [www.nupecc.org/NUPEX](http://www.nupecc.org/NUPEX)

# NuPECC Links

- **Europe**

- European Science Foundation, **ESF**
- **EU Framework Programmes 4-7:**
  - NuPECC initiated 7 Networks, **I3s & IAs** (ca. 2000 scientists & engineers each)
  - NuPECC initiated ERA-net "**NuPNET**" (18 science ministries & funding agencies)
- NuPECC roadmap → **ESFRI**
- Cross membership with **EPS** Nuclear Physics Board, **NPB**
- Particle Physics **ECFA** committee

- **Globally**

- Cross membership with US Nuclear Science Advisory Committee, **NSAC**
- Cross membership with Asian Nuclear Physics Association, **ANPhA**
- Interactions with recently founded Latin American **ALAFNA**
- International Union of Pure and Applied Physics, **IUPAP:**
  - European representative in Working Group on **Int'l Coordination of Nuclear Physics, WG.9**
- Organisation for Economic Co-operation and Development, **OECD:**
  - European member of Working Group on Nuclear Physics, **Global Science Forum**

# NuPECC Long Range Plan 2010

## Perspectives of Nuclear Physics in Europe

# Rationale

- Nuclear Physics projects involve setting up large-scale Research Infrastructures
  - needs
    - Strong science case
    - Strong support of the entire scientific community
    - Strong support of policy makers
    - Coherent action of funding agencies
  - because they are expensive!
- Nuclear Physics projects have long lead times
  - Needs
    - Considered planning ahead via Long Range Plans

# Objectives

- Review status of the field
- Issue recommendations to advance
  - The science
  - Its applications in Europe
- Develop action plan
  - Roadmap for
    - Upgrading existing Nuclear Physics facilities
    - Building new large-scale Research Infrastructures
- Collaborate closely with
  - EU FP7 projects
    - IAs: “HadronPhysics2”, “ENSAR”, SPIRIT and “HadronPhysics3”
    - ERA-net “NuPNET” (18 European science ministries & funding agencies from 14 European countries)
- Put European Nuclear Physics into worldwide context
  - NSAC (DoE & NSF) in USA, ANPhA in Asia, ALAFNA in Latin America
  - IUPAP
  - OECD Global Science Forum

# Procedure

- **Preparatory phase of LRP2010 in summer 2009**
  - 6 Scientific Themes identified by NuPECC
  - NuPECC Steering C'ttee established
  - 6 Working Groups established
    - Preparatory workshops
  - ESF funding secured
- **Scoping Workshop in Oct. 2009**
  - Community & Working Groups meet & discuss LRP2010
  - Subsequent drafting workshops
    - Working Groups
    - Steering C'ttee
    - NuPECC
  - LRP2010 draft versions on NuPECC web site
- **Consensus Conference in June 2010 (Spanish EU Presidency)**
  - Community discussed Scientific Themes and approved
    - Recommendations
    - Roadmap
- **Finalising & planning of outreach activities**
  - Long Range Plan 2010, Brochure, Slide Show
  - Dissemination Plan set up
  - Launch of **Presentation Conference** (Belgian EU Presidency) in Dec. 2010

# Working Groups

## 1) Hadron Physics

### – Convener: U. Wiedner (U Bochum)

- Experts: C. Alexandrou, M. Anselmino, R. Beck, M. Birse, T. Bressani, M. Guidal, T. Hennino, F. Maas, U. Meissner, K. Peters, A. Schaefer, M. Soyeur, A. Szczurek, M. Vanderhaeghen

## 2) Phases of Strongly Interacting Matter

### – Convener: P. Giubellino (INFN Torino)

- Experts: G. Cardella, F. Gulminelli, A. Kugler, J. Nystrand, J.-Y. Ollitrault, M. Petrovici, K. Redlich, P. Senger, R. Snellings, J. Wessels, U. Wiedemann

## 3) Nuclear Structure & Dynamics

### – Convener: R. Julin (JYFL Jyväskylä)

- Experts: N. Alahari, T. Aumann, Y. Blumenfeld, P. Butler, H. Fynbo, A. Gadea, W. Korten, A. Maj, G. Neyens, T. Nilsson, R. Roth, P. Roussel-Chomaz, C. Scheidenberger, A. Vitturi, D. Vretenar

## 4) Nuclear Astrophysics

### – Convener: B. Fulton (U York)

- Experts: N. Chamel, Z. Fülöp, F. Hammache, M. Heil, J. José, G. Martinez Pinedo, F. de Oliveira, P. Prati, T. Rauscher, S. Romano, K. Sonnabend, C. Vockenhuber, P. Woods

## 5) Fundamental Interactions

### – N. Severijns (KU Leuven)

- Experts: R. Calabrese, G. Drexlin, D. Horvath, K. Kirch, K. Pachuki, F. Piquemal, S. Schönert, R. Timmermans, C. Volpe, O. Zimmer

## 6) Nuclear Physics Tools & Applications

### – Convener: S. Leray (CEA/IRFU Saclay)

- Experts: J. Benlliure, A. Boston, M. Durante, S. Gammino, J. Gomez Camacho, M. Huyse, J. Kucera, L. Sihver, C. Trautmann

# Outline

- **Executive Summary**
  - Purpose, Scientific & Societal Scope, Objectives
  - Science Case
  - Research Infrastructures & Networking
  - Scientific Themes
- **Recommendations & Roadmap**
- **Research Infrastructures & Networking**
  - Existing Research Infrastructure & Upgrades
  - Future Research Infrastructures
  - Collaboration at European and Global Level
- **Scientific Themes**
  - Hadron Physics
  - Phases of Strongly Interacting Matter
  - Nuclear Structure & Dynamics
  - Nuclear Astrophysics
  - Fundamental Interactions
  - Nuclear Physics Tools & Applications

# Research Infrastructures & Networking

- Existing Research Infrastructures & Upgrades
  - Theory & Computing
  - Lepton Beam Facilities
  - Hadron Beam Facilities
  - Smaller Scale Facilities
- Future Research Infrastructures
  - ESFRI Roadmap Facilities
  - Major Upgrades of Existing Facilities
  - Travelling Detectors
  - Projects & Design Studies
- Networking
  - Europe
    - European Science Foundation
    - European Union
      - FP7 Integrating Activities “HadronPhysics2”, “ENSAR”, SPIRIT, “HadronPhysics3”
      - FP7 European Research Area ERA-net “NuPNET”
    - European Physical Society
    - European Committee for Future Accelerators
  - Outwith Europe
    - Sister Organisations NSAC, ANPhA, ALAFNA
  - Globally
    - International Union of Pure and Applied Physics, IUPAP WG.9
    - OECD Global Science Forum

## CURRENT NUCLEAR RESEARCH FACILITIES IN EUROPE



Accelerator laboratory JYFL,  
University of Jyväskylä, Finland



Electron accelerator ELSA, University  
of Bonn, Germany



European Centre for Theoretical  
Studies in Nuclear Physics and  
Related Areas, ECT\*, Trento, Italy



Forschungszentrum Jülich, FZJ  
(COSY and HPC), Jülich, Germany



Institut de Physique  
Nucléaire, IPNO, Orsay, France



Grand Accélérateur National d'Ions  
Lourds, GANIL (SPIRAL), Caen, France



Helmholtzzentrum für  
Schwerionenforschung  
GmbH, GSI, Darmstadt,  
Germany



European Organisation for  
Nuclear Research, CERN  
(ALICE, AD, COMPASS  
and ISOLDE),  
Genève, Switzerland



Kernfysisch Versneller  
Instituut, KVI, Groningen,  
The Netherlands

NuPECC member countries

FP7 facilities

Smaller-scale facilities

Laboratori Nazionali  
del Sud of INFN, LNS,  
Catania, Italy



Laboratori Nazionali  
di Frascati of INFN, LNF,  
Frascati, Italy



Laboratori Nazionali  
di Legnaro of INFN,  
LNL, Legnaro (Padova), Italy



Mainzer Mikrotron, MAMI,  
University of Mainz,  
Germany



Max-lab, University of  
Lund, Sweden

# Facilities

Large-scale:

• GSI

FAIR

• GANIL

SPIRAL2

# FAIR

Nuclear Structure & Astrophysics  
(Rare-isotope beams)

Hadron Physics  
(Stored and cooled anti-protons)

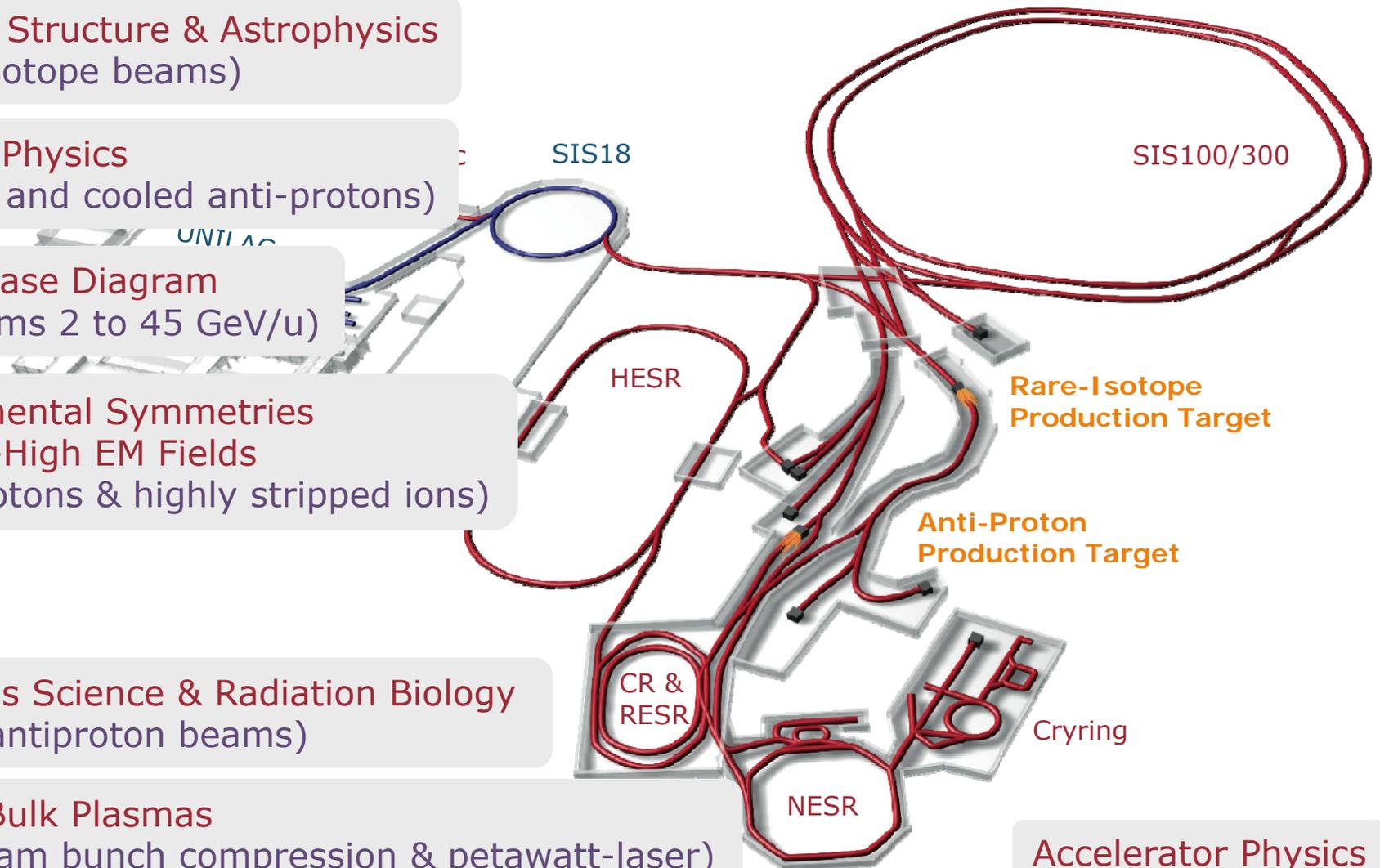
QCD-Phase Diagram  
(HI beams 2 to 45 GeV/u)

Fundamental Symmetries  
& Ultra-High EM Fields  
(Antiprotons & highly stripped ions)

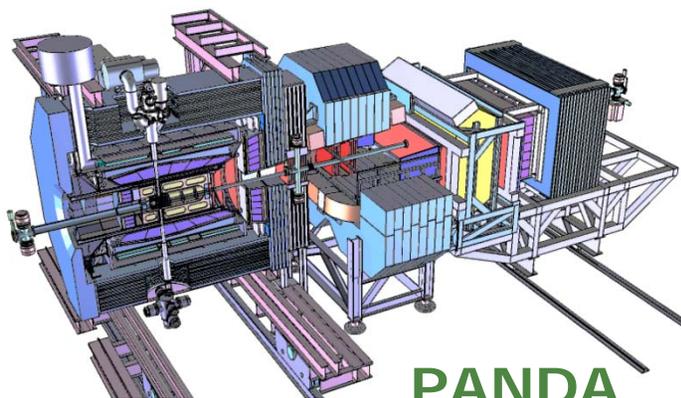
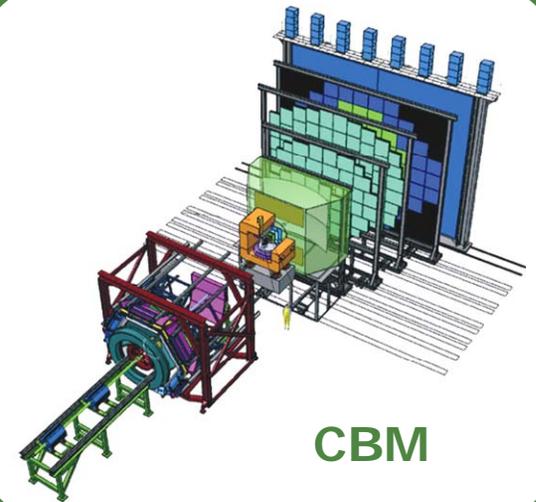
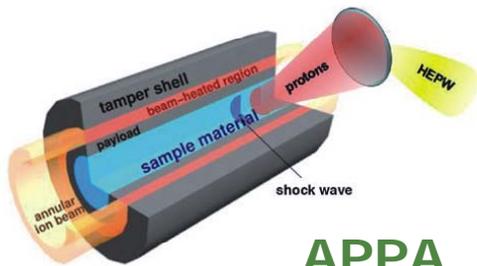
Materials Science & Radiation Biology  
(Ion & antiproton beams)

Dense Bulk Plasmas  
(Ion-beam bunch compression & petawatt-laser)

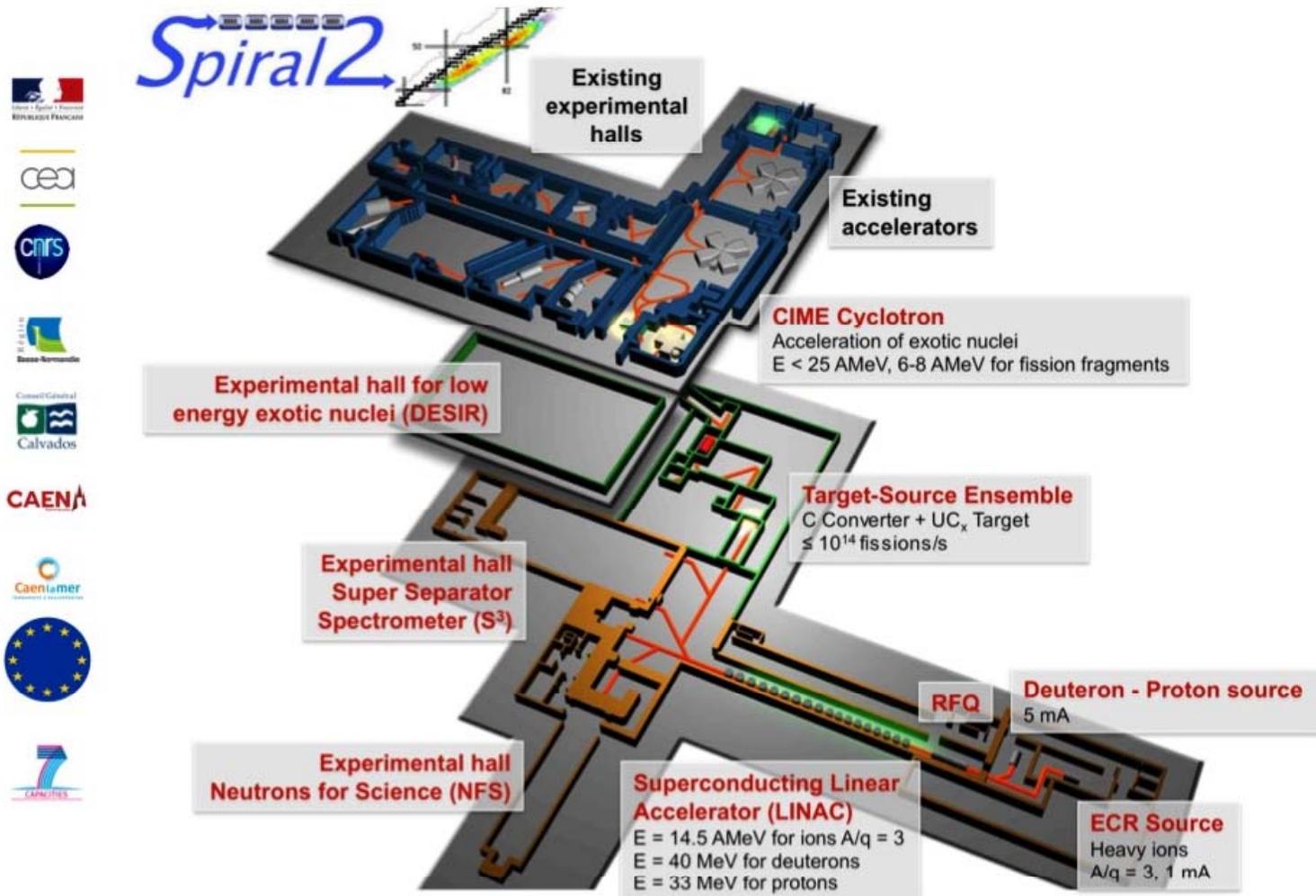
Accelerator Physics



# FAIR Experiments



# SPIRAL2 @ GANIL



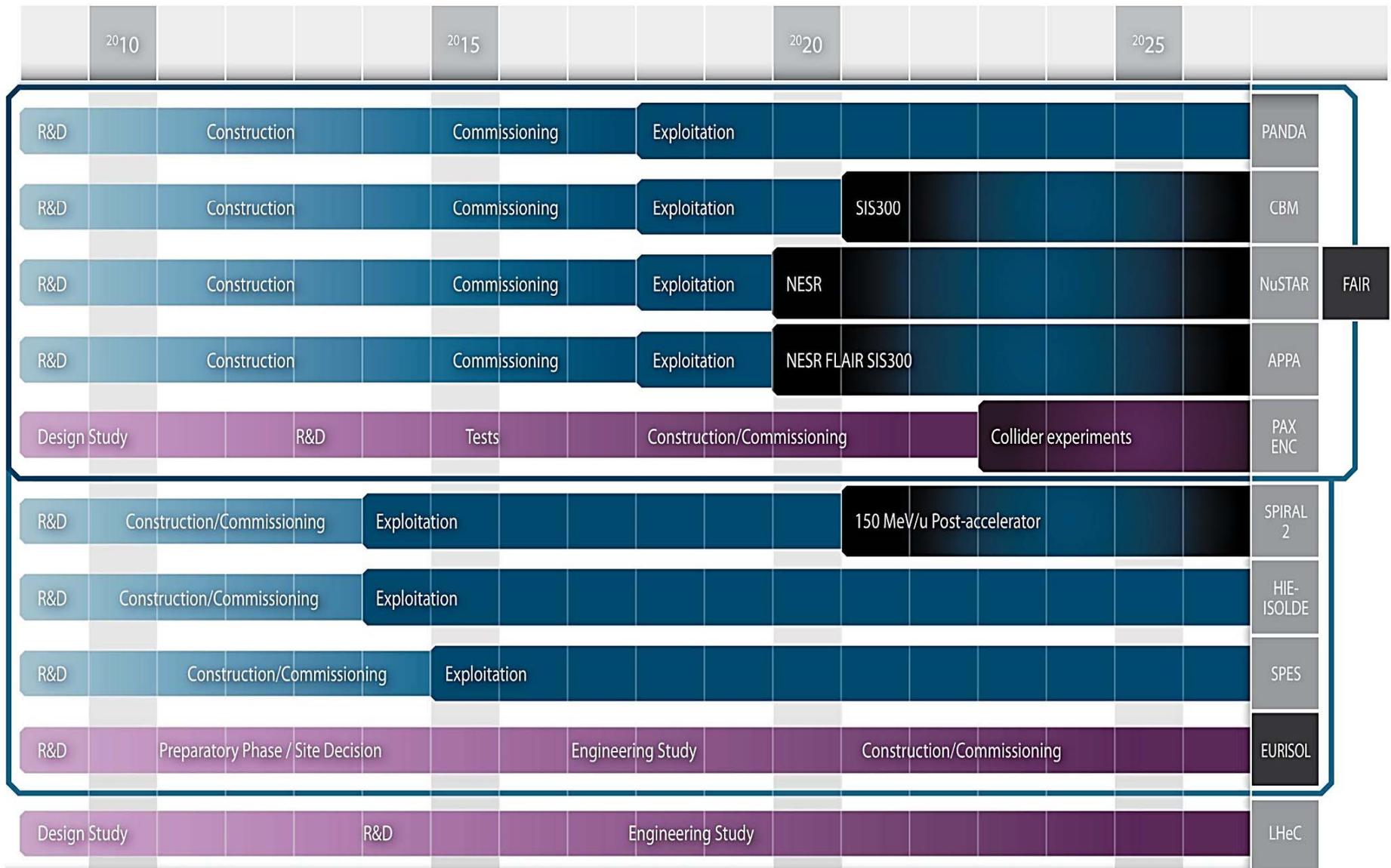
# LRP2010 Recommendations

- **Complete ESFRI Facilities**
  - **FAIR** with PANDA, CBM, NuSTAR and APPA
  - **SPIRAL2** at GANIL including S3 and DESIR
- **Perform Major Upgrades**
  - **HIE-ISOLDE** at CERN
  - **SPES** at INFN-LNL
  - **AGATA**
  - **SC Linac** at GSI
- **Support ALICE at CERN**
  - Upgrade the nuclear beams and the detector to expand physics reach
- **Support Theory**
  - **RI ECT\*** in Trento
  - Projects for advanced studies related to the experimental roadmap
  - Dedicated high-performance computing facilities
- **Fully exploit Existing Facilities**
  - **Lepton beam facilities** ELSA in Bonn, MAMI in Mainz, COMPASS at CERN, DAΦNE at INFN-LNF, and **hadron beam facilities** COSY at FZ Juelich and GSI in Darmstadt
  - **Heavy ion beam facilities** JYFL, KVI, GSI, GANIL, IPNO, ISOLDE, INFN-LNL and INFN-LNS
  - **Underground labs** in Europe such as LUNA at INFN Gran Sasso
  - **AD** at CERN & upgrade **ELENA**
  - **Smaller scale national and university labs** across Europe dedicated to nuclear structure & astrophysics experiments, fundamental interactions and nuclear applications

# LRP2010 Recommendations Cont'd

- **Support Nuclear Physics Applications & Education**
  - Secure and develop nuclear physics skills basis for current and future needs
  - Develop nuclear energy, medicine & security applications
  - Develop of novel sources, beams, targets & instrumentation
- **Promote Planning for Future Large-Scale Facilities**
  - **EURISOL** as RI in future updates of ESFRI list
  - Technical Design Study for intense radioactive beams at **ISOL@MYRRHA**
  - Technical Design Studies for **PAX** and **ENC** at FAIR
  - Technical Design Study for **LHeC** at CERN
  - Inclusion of nuclear physics programmes @ **ELI** and **ESS**

# ROADMAP FOR NEW LARGE SCALE FACILITIES



Thank you very much for  
your attention