

# *Colaborari Internationale*

- IUCN
- CERN
- FAIR
- SPIRAL2
- ELI-NP

# *Institutul Unificat de Cercetari Nucleare (IUCN) Dubna*

1956 Institutul Unificat de Cercetari Nucleare (12 state membre)

Astazi: 18 state membre

6 State membru asociat (Egipt, Germania, Italia, Serbia, Sud-Africa, Ungaria)

Buget anual ~ 100 milioane dolari

Cotizatia Romaniei : ~1%

20% IUCN, 8% Granturi, 12% +15% proiecte, 15% salarii, 30% contracte

Directori Adjuncti IUCN: Serban Titeica, Alexandru Mihul, Aurel Sandulescu

Directori Adjuncti Laboratoare: Nicolae Popa, Gheorghe Adam, Sanda Adam

Colaborari ale cercetatorilor romani:

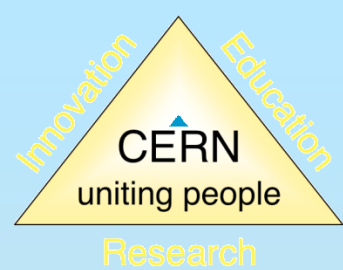
- 13 cercetatori romani pe termen lung
- Practica de vara a studentilor (16 studenti)
- Colaborari la 26 teme (din 44) de cercetare a 23 de institute si universitati (~50 vizite anuale)
  - Fizica teoretica
  - Particule elementare
  - Fizica Nucleara
  - Fizica Materiei Condensate, Cercetari Radiobiologice
  - Tehnologie Informationala si Fizica Computationala

# *CERN*

- Fondat in 1954 (12 state membre)
- Astazi:
  - 20 state membre
  - 2500 angajati
  - 1.1 miliarde CHF buget anual
  - 10000 utilizatori din 580 universitati si institute din 85state



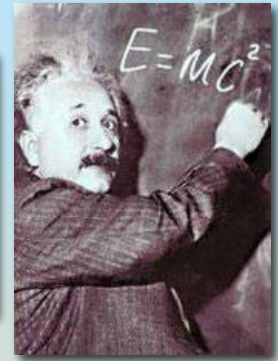
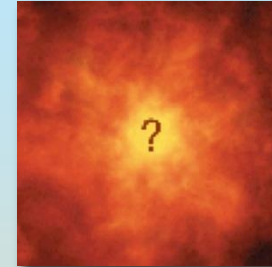
# The Mission of CERN



(from R. Heuer)

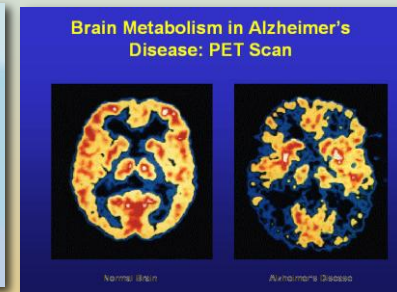
- **Push back** the frontiers of knowledge

E.g. the secrets of the Big Bang ...what was the matter like within the first moments of the Universe's existence?

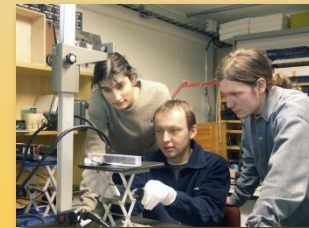


- **Develop** new technologies for accelerators and detectors

Information technology - the Web and the GRID  
Medicine - diagnosis and therapy



- **Train** scientists and engineers of tomorrow



- **Unite** people from different countries and cultures



# *Romania la CERN*

- **Inainte de 1989: Participare `neoficiala` la experimente (prin IUCN)**
- **1990 – 2010: Participare oficiala la experimente (MoU)**
- **Romania stat candidat (Legea 203/2010) 2010-2014**
  - **Experimente~ 100 cercetatori + 30 auxiliar din 7 institutii**
  - **Dezvoltare tehnologica**
  - **Participare la Scoala de vara CERN-IUCN**
  - **Cursurile de vara pentru profesori**
  - **Contracte economice????????**

# LHC

- **ALICE**
  - IFIN-HH
  - Institute of Space Science (separate MoU)
- **ATLAS**
  - IFIN-HH
  - 'Politehnica' University Bucharest
  - National Institute of Isotopic and Molecular Technologies Cluj-Napoca
- **LHCb**
  - IFIN-HH
- **LCG – TIER2**
  - IFIN-HH
  - Institute for Space Sciences
  - 'Politehnica' University Bucharest
  - National Institute of Isotopic and Molecular Technologies Cluj-Napoca
  - AIC University Iasi

## PS

**DIRAC** (IFIN-HH )

**n-TOF** (IFIN-HH)

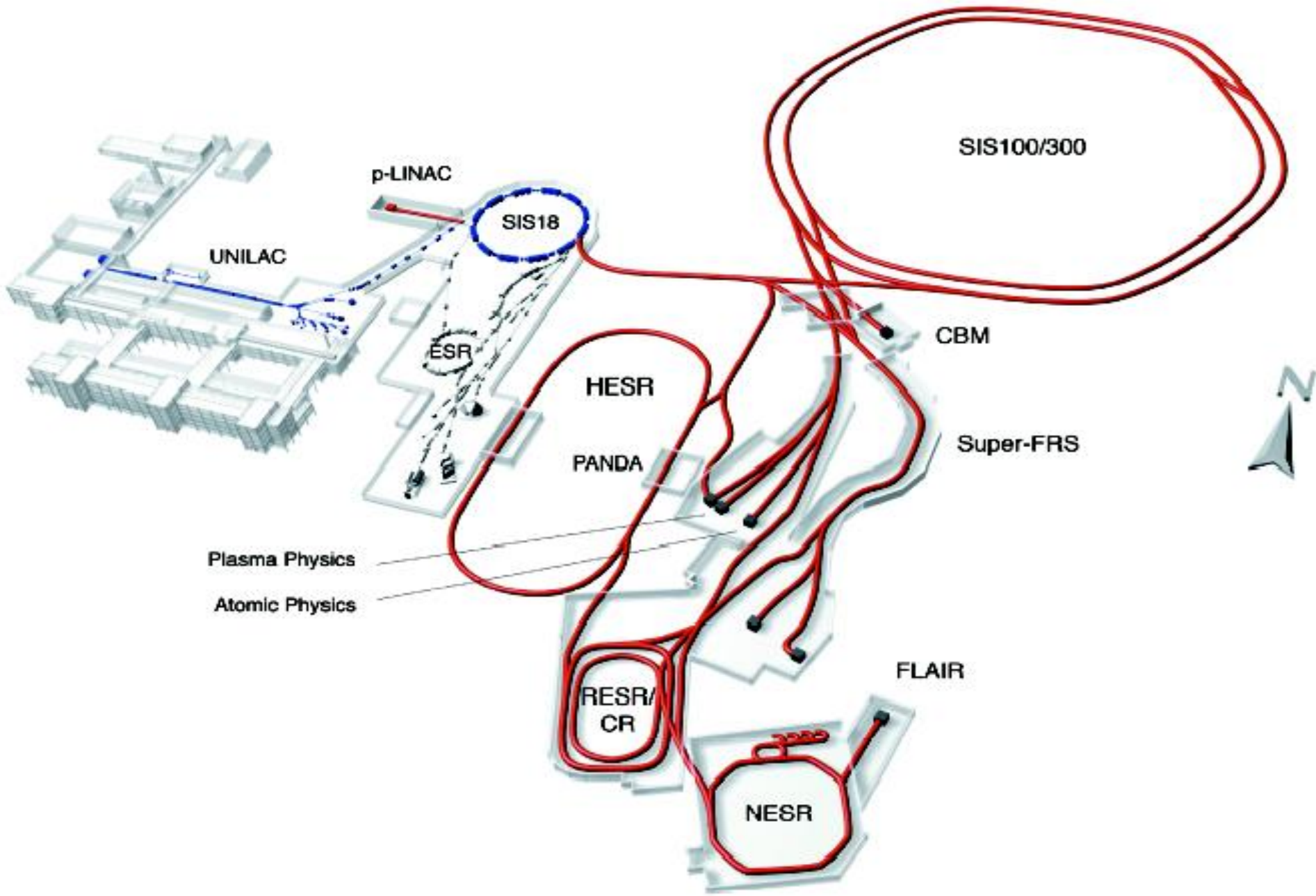
**ISOLDE** (IFIN-HH)

**RD-50** (INCDFM,UB)



# *Facility for Antiproton and Ion Research (FAIR)*

- GSI Darmstadt
- pe lista ESFRI
- 1493 Milioane euro (2010 – 2018)
- 3000 cercetatori din 40 tari
- 2010: Finlanda, Franta, Germania, India, Polonia,  
Romania (1%), Rusia, Slovenia, Suedia.





The different shapes of the nucleus: collectivity versus individuality

Testing the Standard Model

Isospin dependence of the nuclear force

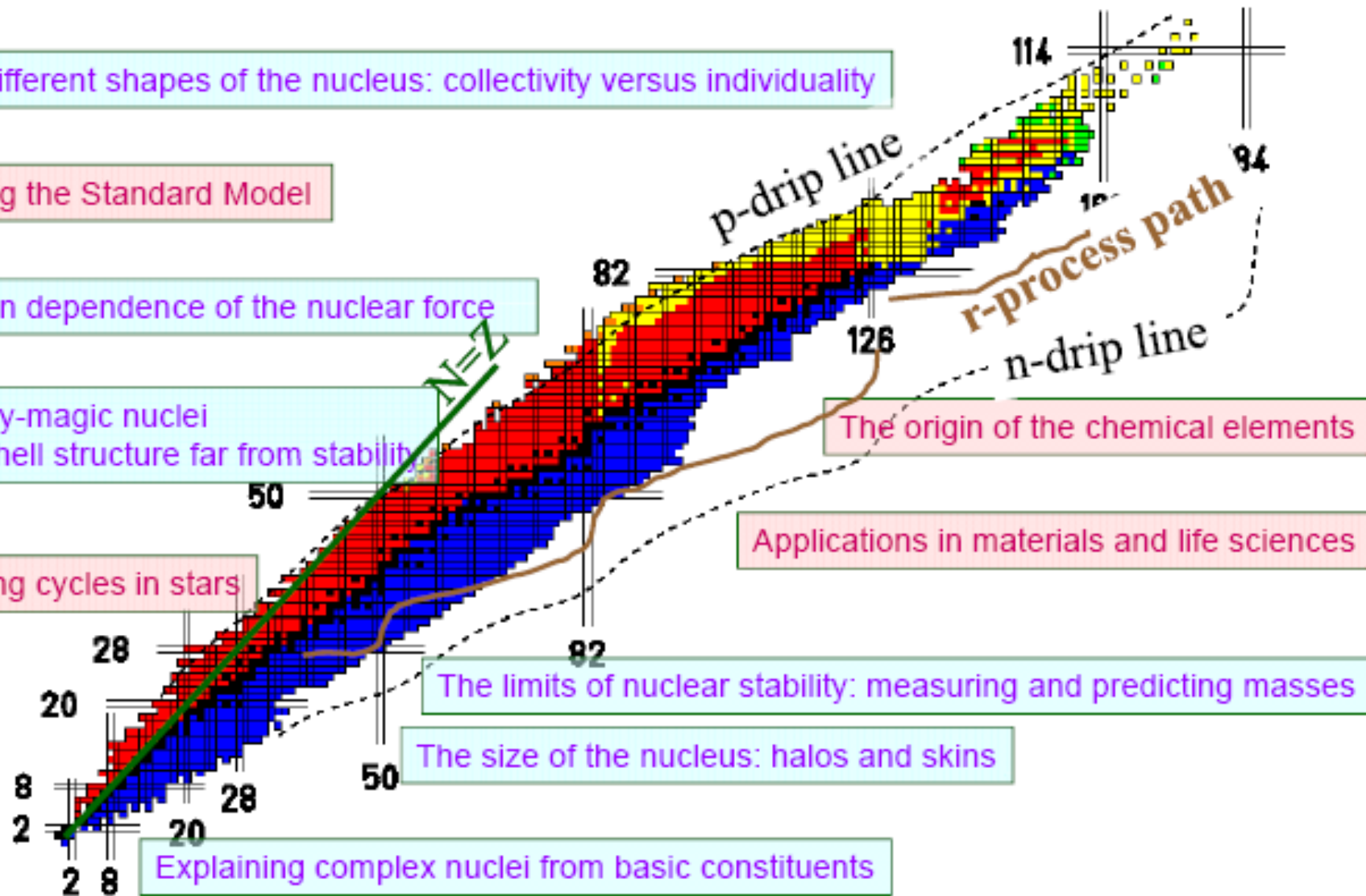
Doubly-magic nuclei and shell structure far from stability

Burning cycles in stars

The limits of nuclear stability: measuring and predicting masses

The size of the nucleus: halos and skins

Explaining complex nuclei from basic constituents



# *Romania la FAIR*

- Accelerator: ICPE-CA, ICSI
- Cercetare: IFIN-HH, ISS, INFLPR
  - Nuclear Structure, Astrophysics and Reactions (NUSTAR):
    - HISPEC/DESPEC
    - Reactions with Relativistic Radioactive Beams (R3B)
  - Compressed Baryon Matter (CBM)
  - Antiproton Annihilation at Darmstadt (PANDA)
  - Stored Particle Atomic Physics Collaboration (SPARC)

# *SPIRAL 2*

- GANIL (Caen – Franta)
- pe lista ESFRI
- 2010-2014: 130 milioane euro
- Studii de fizica nucleara cu fascicule radioactive (ISOL)
- Participarea Romaniei (IFIN-HH)
  - Sistem de masurare a pierderilor de fascicul pentru acceleratorul linear
  - Studiul dezintegrarilor si al starilor izomere ale nucleelor departate de linia de stabilitate
  - Studii de structura si mecanisme de reactii nucleare folosind fascicule stabile si radioactive accelerate de complexul GANIL-SPIRAL2



# *Extreme Light Infrastructure*

ELI on ESFRI list  
ELI-PP 2007-2010

December 2009 (EC)

3 Pillars

(Structural Funds 2011-2015):

CZECH Rep: Beamlines

HUNGARY: Short Pulses

ROMANIA: Nuclear Physics

April 2010: ELI-DC

**2016: ELI-ERIC**





“Extreme Light” :

- two 10 PW lasers,  
intensity  $10^{23} \text{ W/cm}^2$
- very brilliant  $\gamma$  beam,  
<19.5 MeV, BW: $10^{-3}$

produced by Compton scattering on a 720 MeV  $e$  beam  
(LINAC X-band or C-band technology)

2012-2016: 280 Mil. Euro



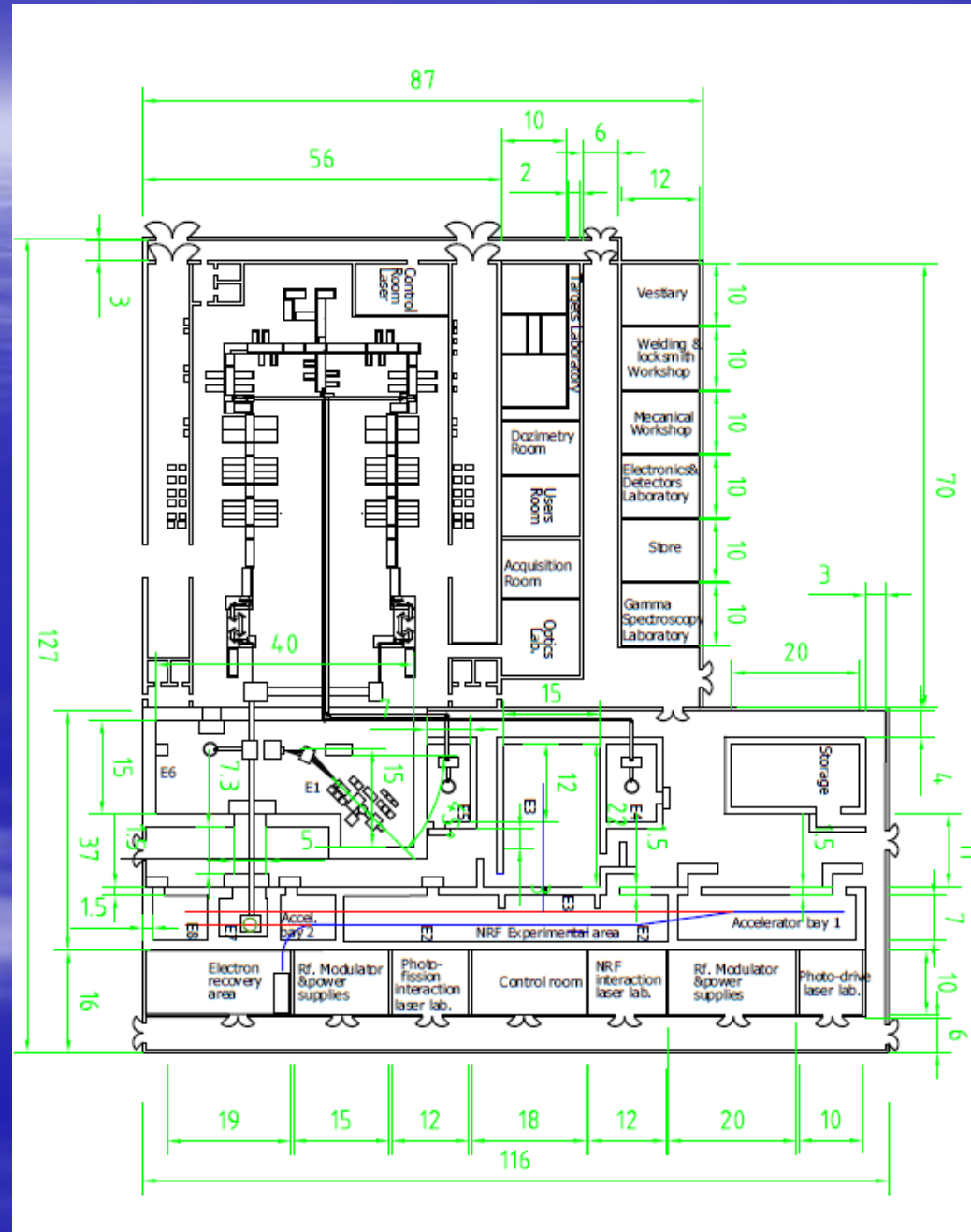
# *ELI – Nuclear Physics Research*

- *Nuclear Physics experiments to characterize laser – target int.*
- *High Power Laser Physics*
- *Material Physics*
- *Photonuclear reactions.*
- *Exotic Nuclear Physics and astrophysics*  
*complementary to other NP large facilities (FAIR, SPIRAL2).*
- *Nuclear methods and techniques based on high intensity laser and very brilliant  $\gamma$  beams.*

*August 2010  
Feasibility Study:*

*280 M€ :*

- 80 M€ Lasers  
and beam transport*
- 60 M€  $\gamma$  beam*
- 65 M€ Construction*
- 30 M€ Experiments*
- 30 M€ Technical Assistance*
- 15 M€ Contingencies*





# *Next Steps*

- *Civil Construction Technical Plans: Sept. 2011 – March 2012*
- *Answering DG-Regio requirement to diminish the risks (including the financial risk)*
  - 2 funding phases:*
    - *(March) 2012 – (Sept.) 2015*
    - *(Sept.) 2014 – 2016*
- *September 2012 : JASPERS Review*
- *October 2012: Application submitted to DG-Regio*
- *March 2012: Grand Agreement for funding*
  - Start the Tender Procedures*
- *Implementation (Partnership: IFIN-HH, INFLPR, INCDFM)*



- NuPECC
- IUPAP
- EPS-NPB

European Physical Society

Horia Hulubei National Institute  
of Physics and Nuclear Engineering

Romanian Physical Society

# European Nuclear Physics Conference



*Achievements and Future Perspectives*

*The nuclear physics community, from young physicists to established practitioners, meet in Bucharest to showcase*

**Organized by  
the Nuclear Physics Board  
of the EPS**

**Programme Committee:**

Heloise Goutte  
Nasser Kalantar-Nayestanaki  
Klaus Peters  
Olaf Scholten (*Chair*)  
Nicolae-Victor Zamfir

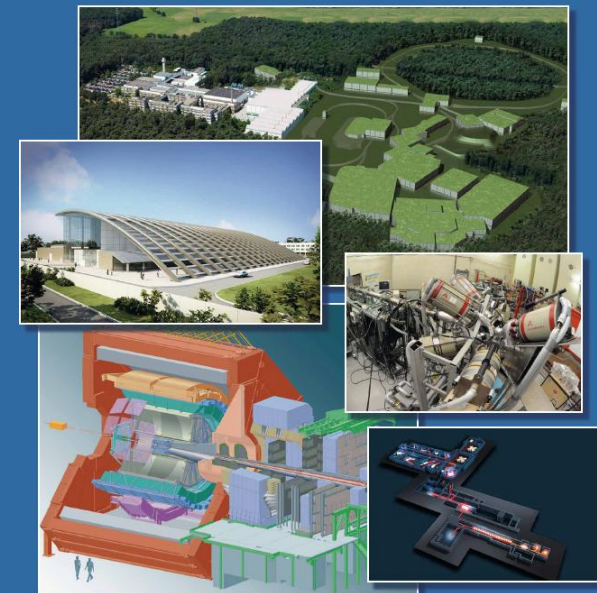
**Local Organizing Committee:**

Vlad Avrigeanu  
Virgil Baran  
Gheorghe Cata-Danil  
Andrei Dorobantu  
Mitica Dragusin  
Constantin Ivan  
Alexandru Jipa  
Alexandra Olteanu  
Alexandru Popescu  
Adrian Socolov  
Ioan Ursu  
Nicolae-Victor Zamfir (*Chair*)

*Young scientists will benefit  
from low participation fees  
and generous opportunities  
to present their results.*

<http://www.ifin.ro/eunpc2012/>

**Nuclear Physics for the Next Generation**



**September 17-21, 2012, Bucharest, ROMANIA**