Project co-financed by the European Regional Development Fund
Sectoral Operational Programme
„Increase of Economic Competitiveness”
“Investments for Your Future”

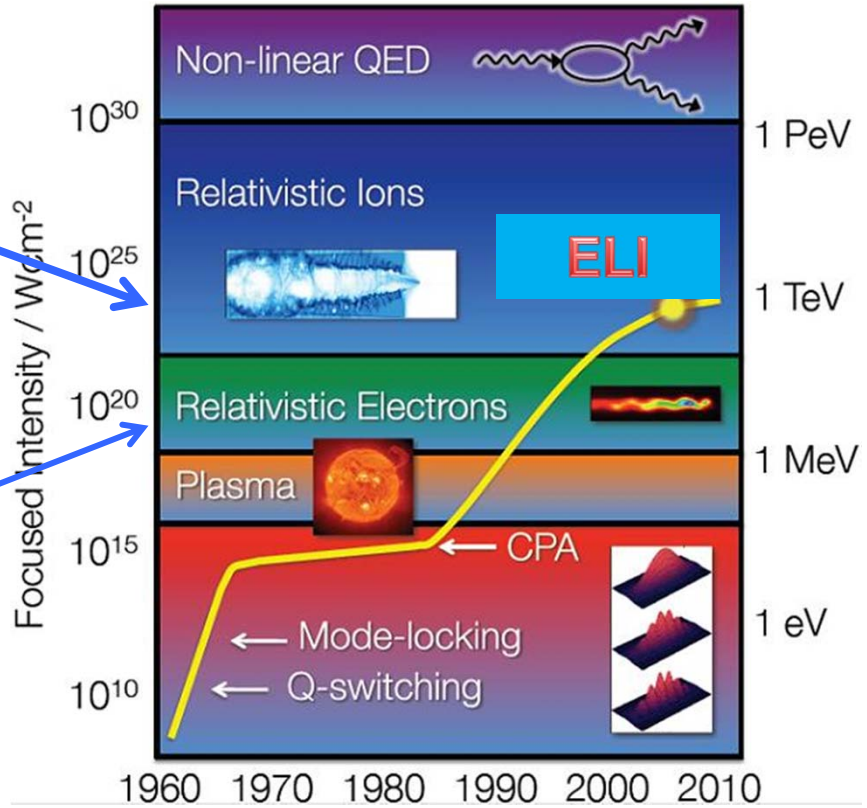
Extreme Light Infrastructure – Nuclear Physics (ELI-NP)
Stadiul Implementarii si Perspective

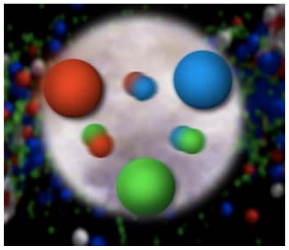
Nicolae-Victor Zamfir

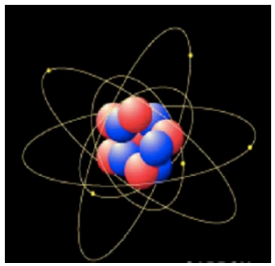
Extreme Light Infrastructure (ELI)

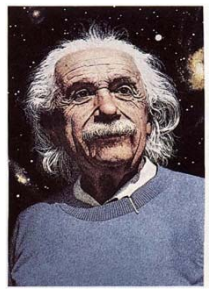
10^{24}W~ 1% of Sun's total power on 1 cm^2

1 PW ~ Highest Power today









Extreme Light Infrastructure

2006 – ELI on ESFRI Roadmap

ELI-PP 2007-2010 (FP7)

ELI-Beamlines (Czech Republic)

ELI-Attoseconds (Hungary)

ELI-Nuclear Physics (Romania)

EU Competitiveness Council December 2009

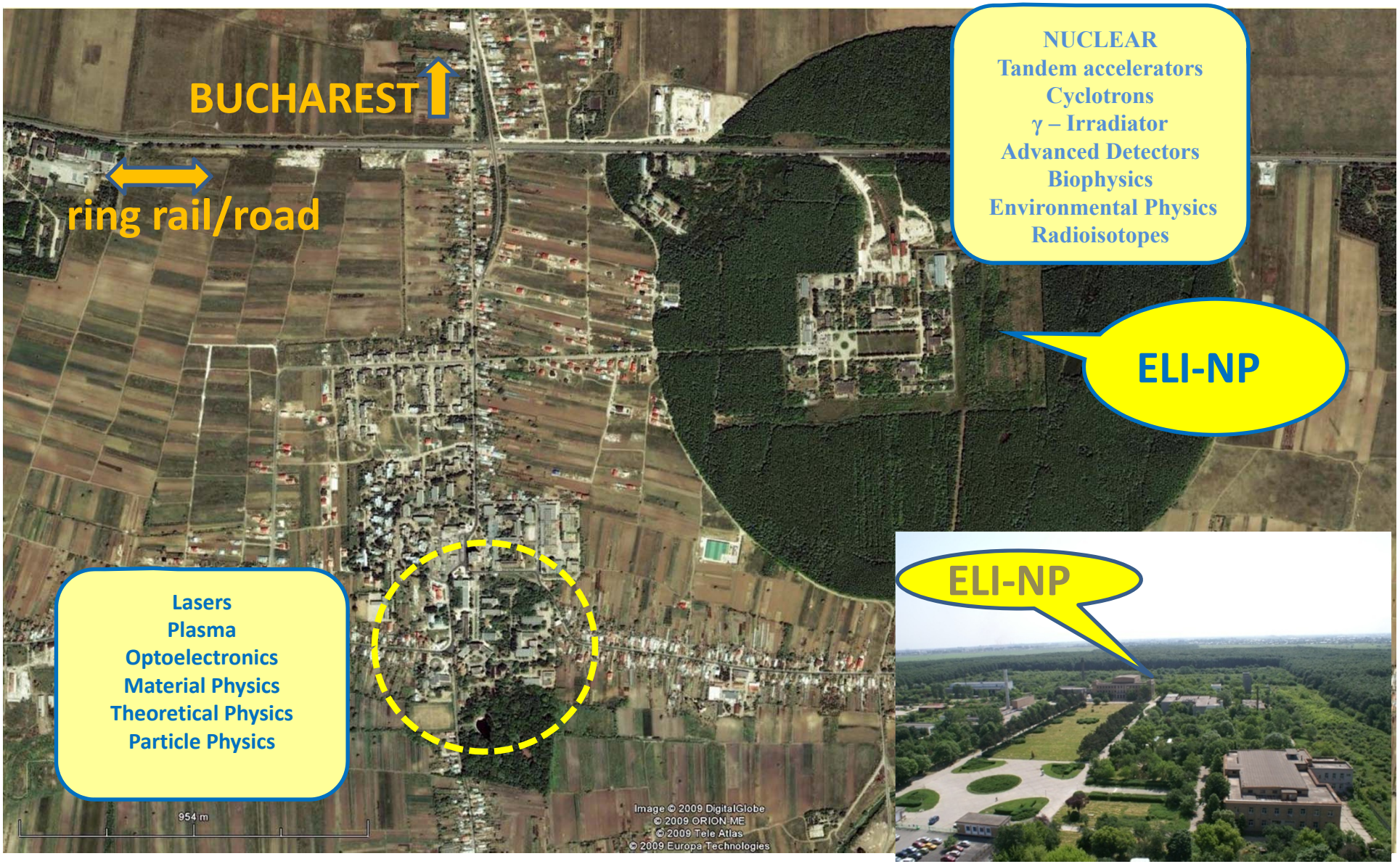
ELI-DC (Delivery Consortium): 2010

Legal entity: April 2013

Czech Republic, Hungary, Romania,

Italy, Germany, UK

Bucharest-Magurele
National Physics Institutes



ELI-NP Milestones

January 2012: *Project submitted to the EC*

July 2012: *Romanian Government Decision*

Construction of the New Research Infrastructure ELI-NP: 293 M€

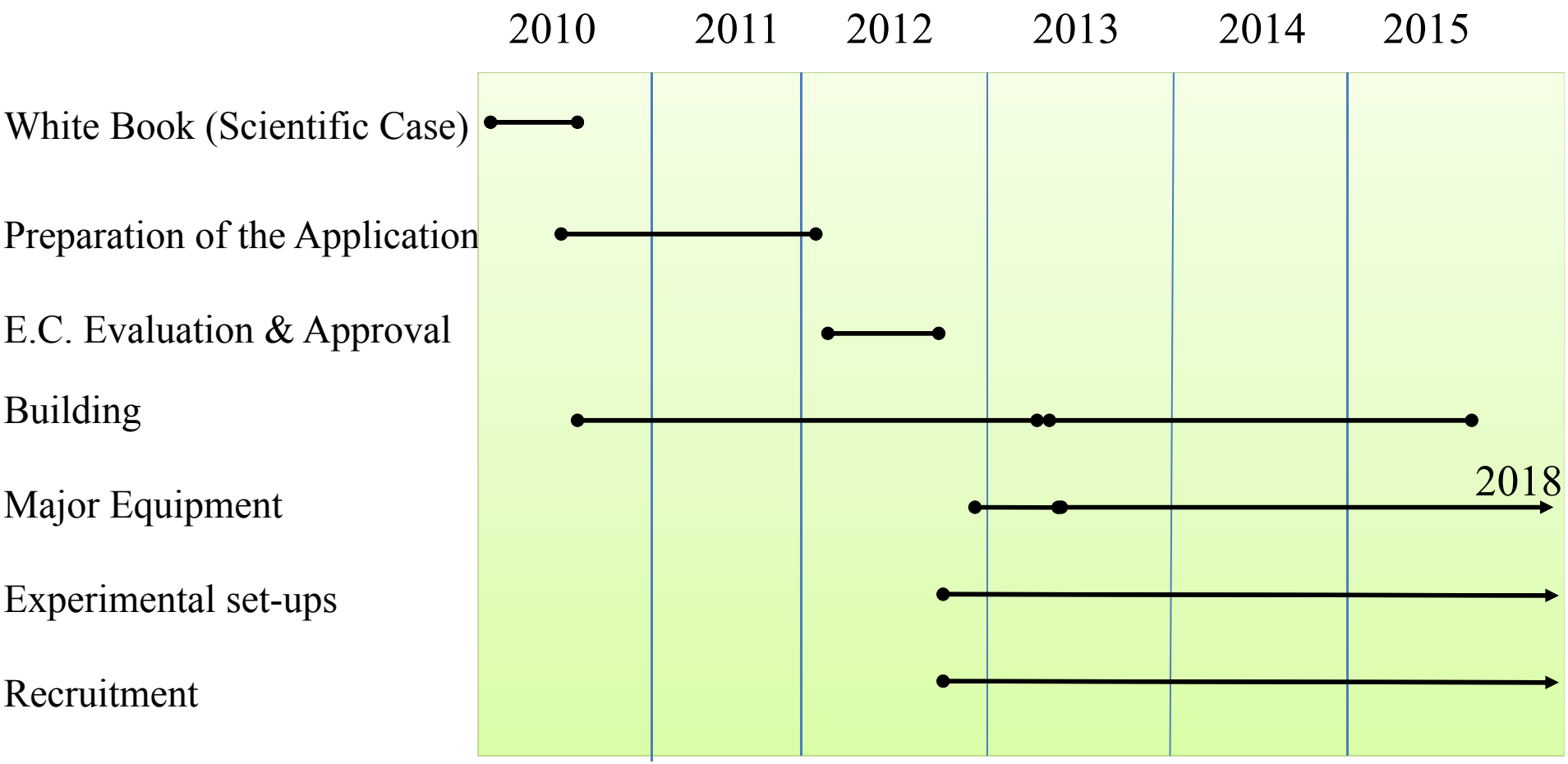
September 2012: *EC Project Approval*

European Regional Development Fund

Financial Support (83%) of the First phase (2012-2015) 180 M€

December 2012: *Contract with Romanian Managing Authority*

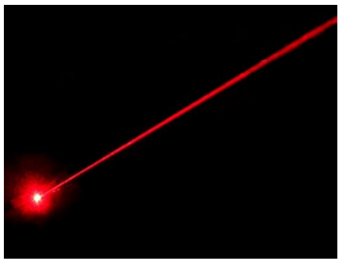
Project implementation



Study of matter with new powerful probes

Light

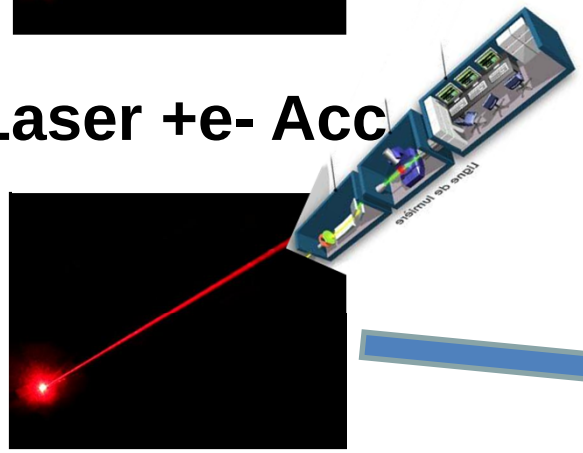
Two machines of extreme performances
Large discovery potential

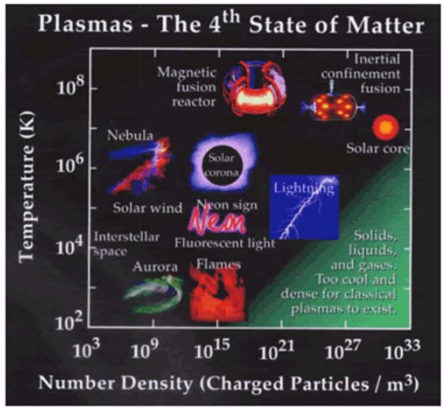


Two 10 PW lasers, 10^{23} W/cm^2

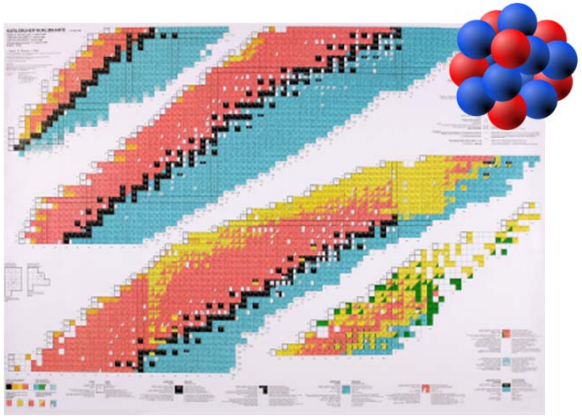
Extreme E-M fields

Laser +e- Acc





Femto scale

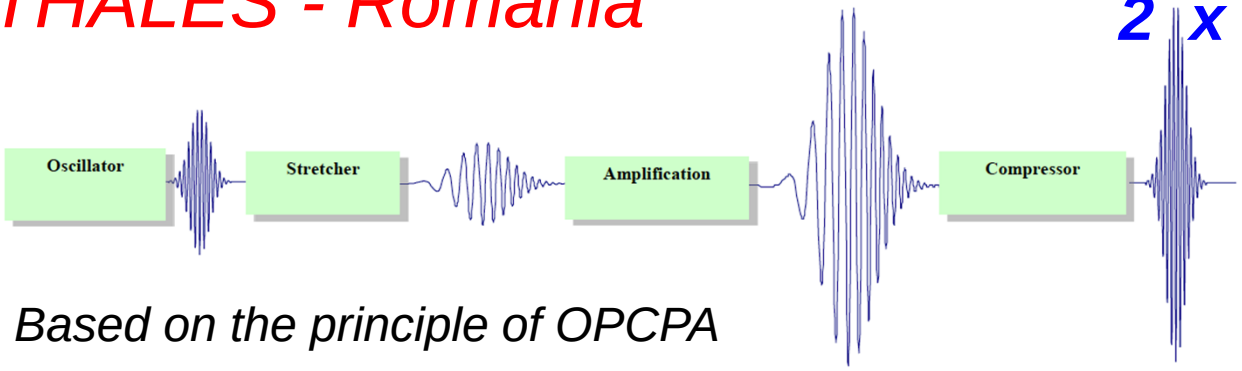


BCS Brillant Gamma Beams

ELI–NP High Power Laser System

THALES – France
THALES - Romania

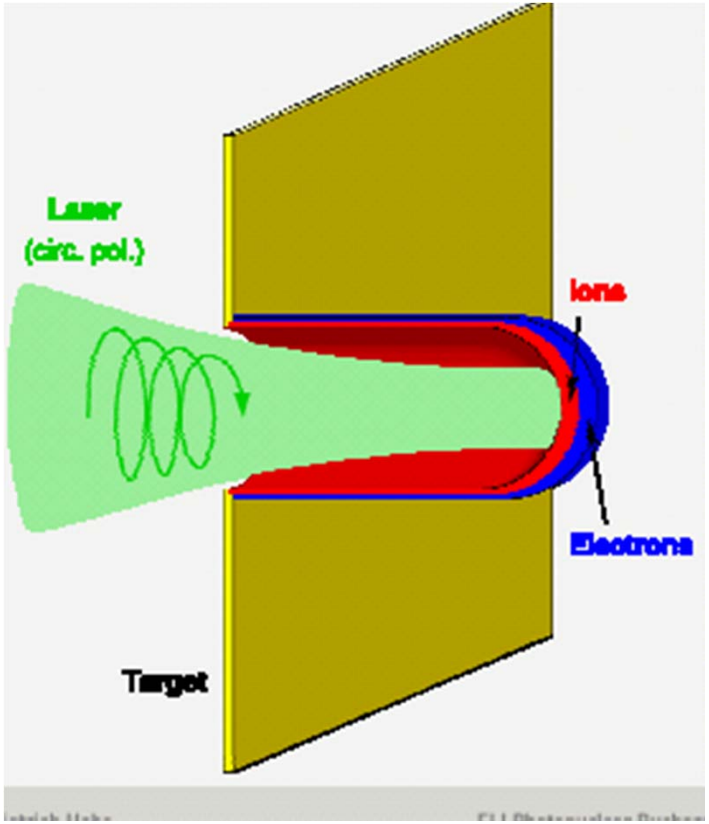
2	x	0.1 PW	10Hz
2	x	1 PW	1 Hz
2	x	10 PW	0.1 Hz



Based on the principle of OPCPA

Laser-Ion Acceleration
Radiation Pressure Acceleration RPA

- thin targets (~ nm thick diamond-like carbon foils)



Electrons and ions accelerated at solid state densities 10^{24}e cm^{-3}

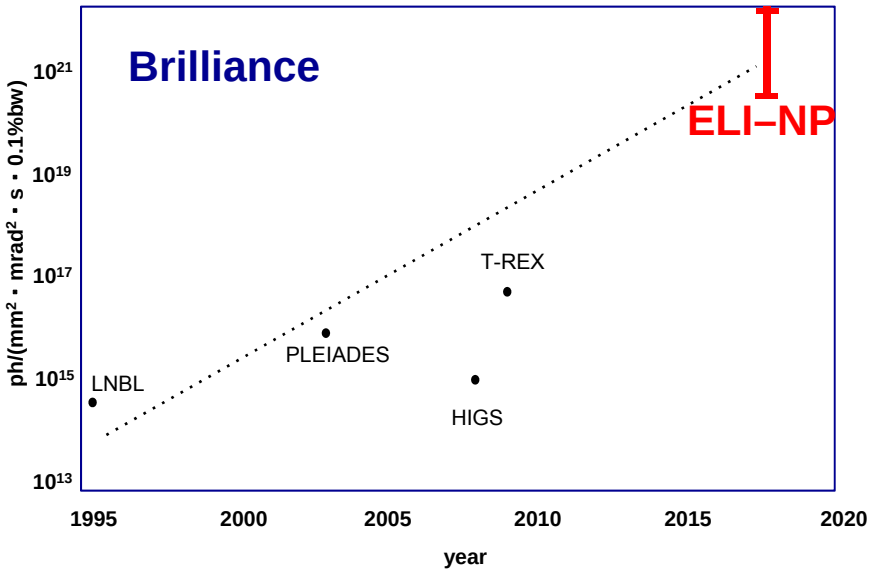
never reached before

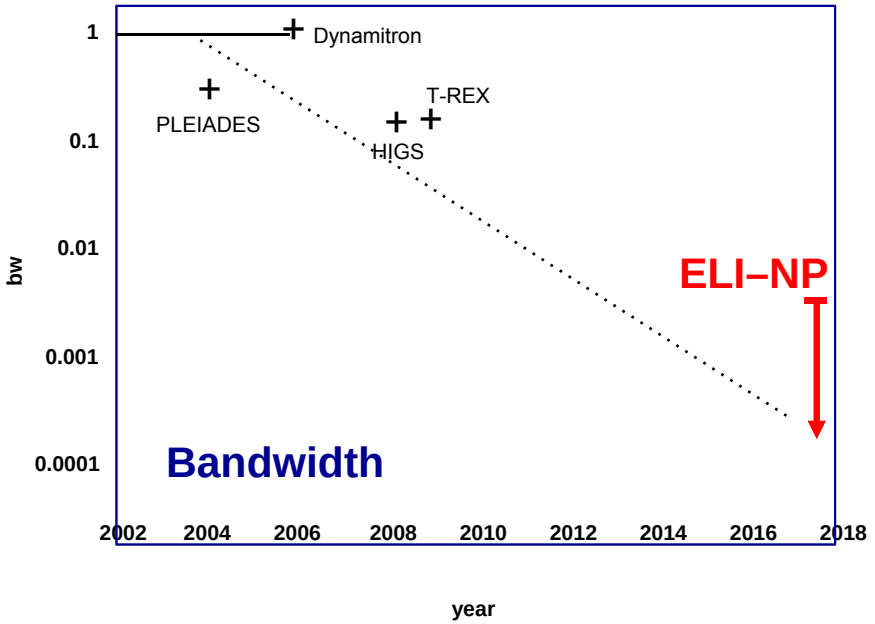
(Classical beam densities 10^{8}e cm^{-3}) on very short distance (μm-mm)

$E \sim I_{laser}$

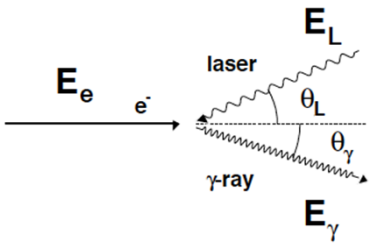
Energy reached equal to a 400m up-to-date accelerator (reduction of scale of 10^{9})

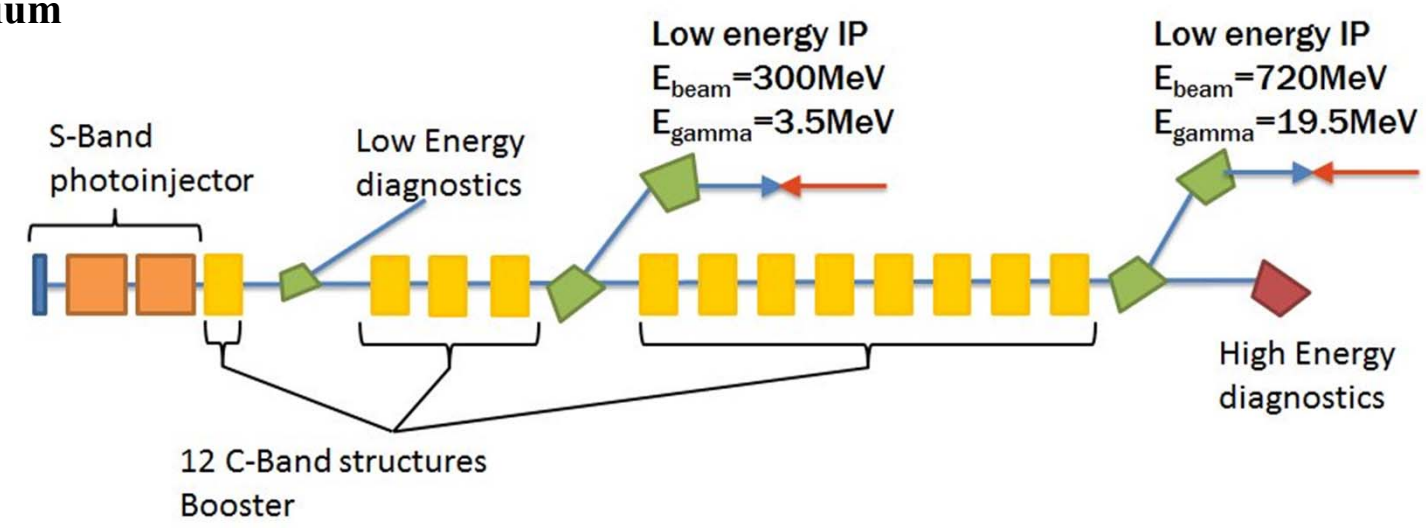
ELI–NP Gamma Beam System





EuroGammas Consortium
Research Institutes and
HighTech Companies
from 8 Countries

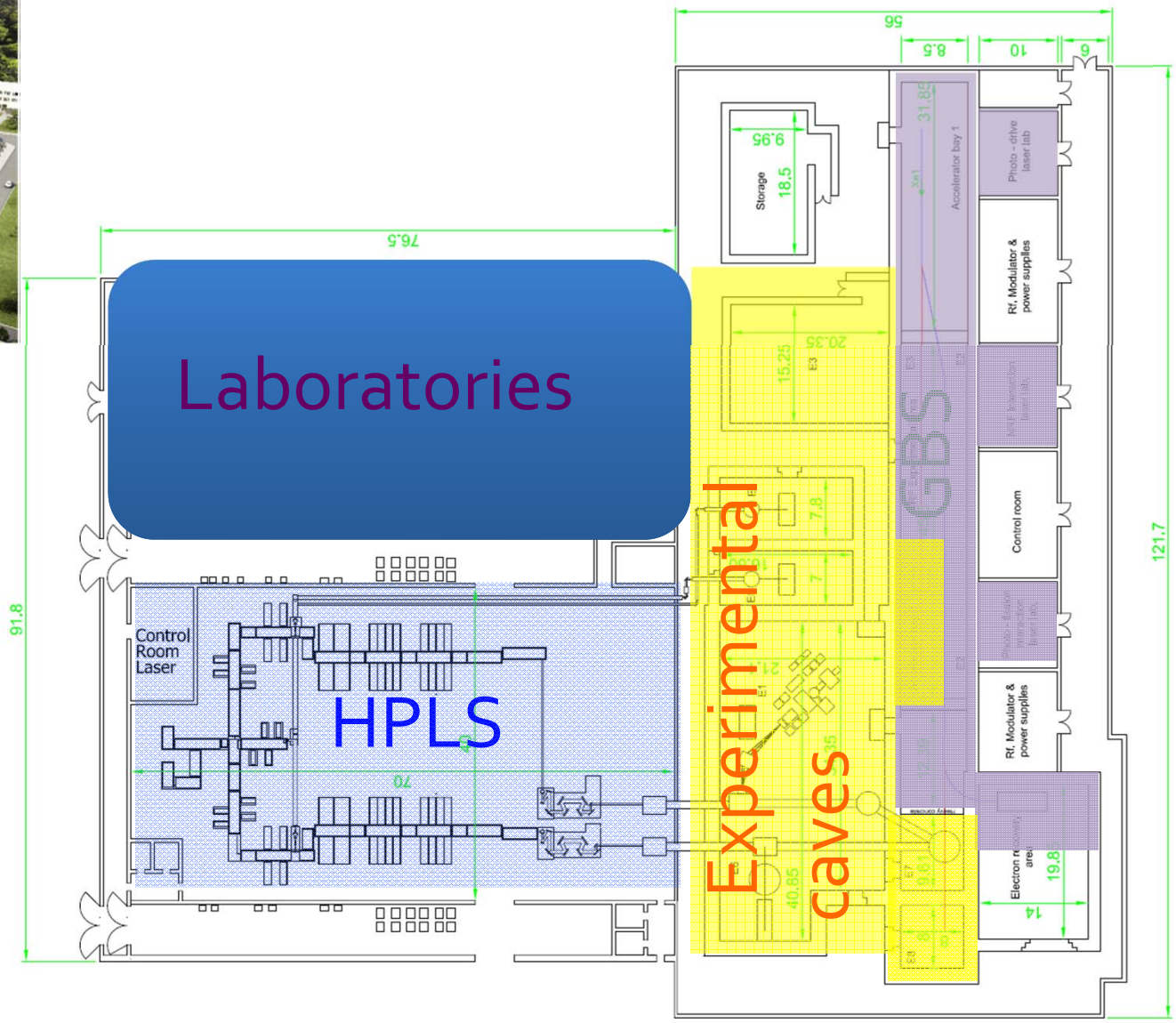




ELI–NP Experiment Building

anti-vibration slab

±1 μm @ < 10 Hzg



Buildings, 33000 m^2 total

- Experimental area building
- Guest house
- Canteen
- Office building

November 11, 2014

ELI – Nuclear Physics Research

- **Nuclear Physics experiments to characterize laser – target interaction**

- **Exotic Nuclear Physics and astrophysics**

  complementary to other ESFRI Large Scale Physics Facilities (FAIR- De, SPIRAL2- Fr)

- **Applications based on high intensity laser and very brilliant γ beams**

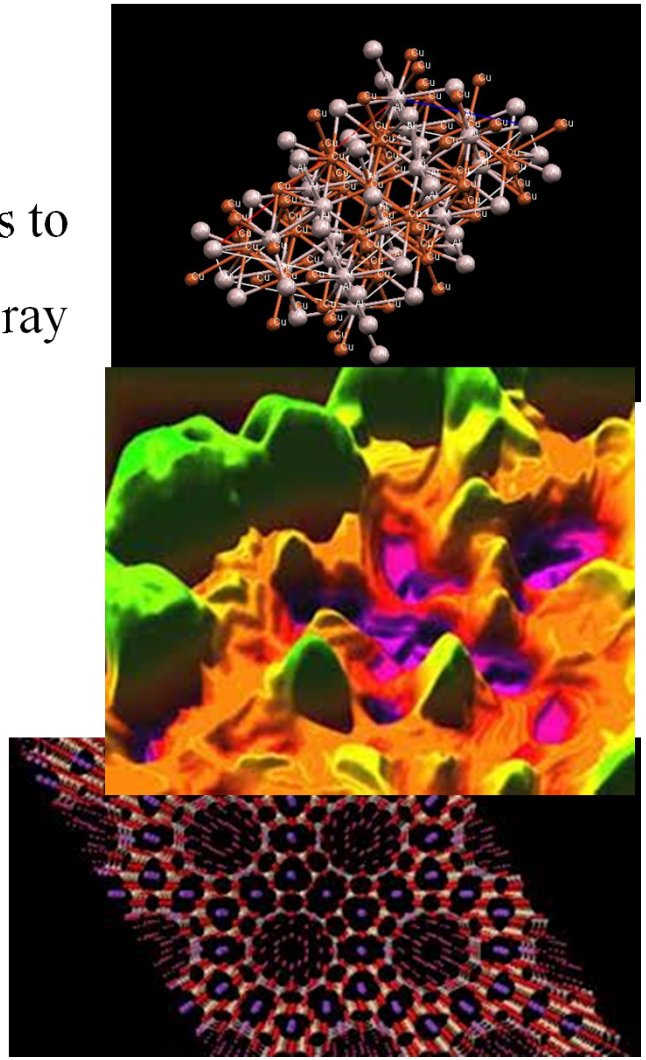
ELI-NP in '**Nuclear Physics Long Range Plan in Europe**' as a major facility

Potential Nuclear Photonics Applications

from C. Barty (Lawrence Livermore National Laboratory)

Materials Science and Engineering

- novel experimental studies of material behavior – thanks to extreme fields intensity provided by the laser and gamma-ray beams
- **polarized positron beam – new microscopy**



ELI-NP Academic Forum

- *to secure the fulfillment of ELI-NP needs in terms of PhD students, junior researchers, engineers, and technicians (training programs, specific MSc and PhD programs, etc.);*

- *to assure the education of engineers for the companies part of the high-tech cluster at Magurele;*

- *to support the ELI-NP Project in the achievement of its objectives in terms of scientific excellence;*

ELI-NP Industrial Forum

Body promoting relationships, for mutual benefits, with local and foreign companies

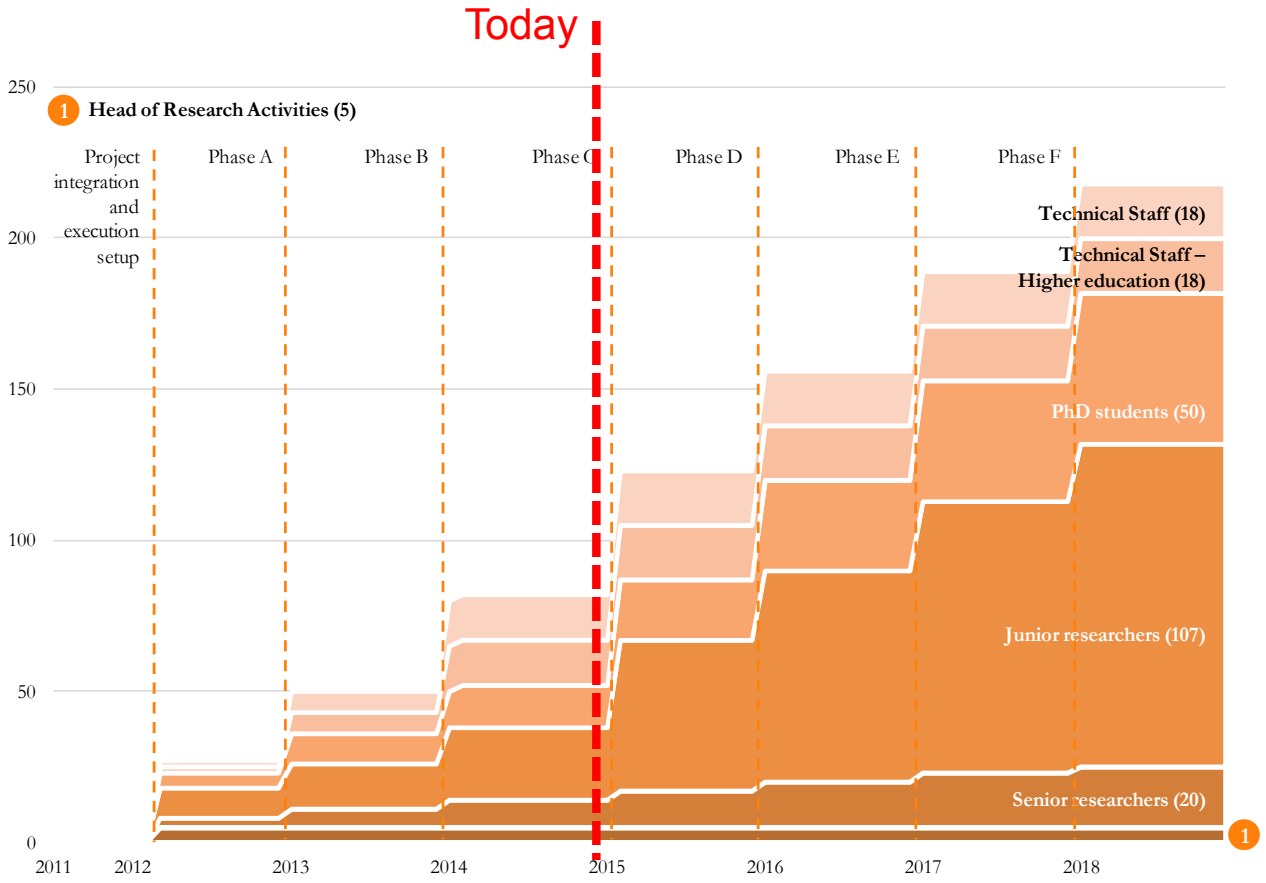
- *Consulting in elaborating the TDRs for experiments and auxiliary equipment*
- *Promotion of contractual research, technology transfer, etc.*
- *Consulting services provided by ELI-NP experts*
- ***Creation of a cluster of high-tech companies in Magurele***

- "ELI-NP CLUSTER INOVATIV" si "Măgurele High Tech Cluster"
- CLARA (Center for Lasers and Radiation) Project

Human Resources

Attracting the best competencies:

- public announcements
- international recruitment
- junior researchers specializing in a unique and top-level field of research
- PhD students will benefit of a very high specialization with enormous possibilities



EUROPEAN UNION

GOVERNMENT OF ROMANIA

Structural Instruments 2007-2013

Sectoral Operational Programme "Increase of Economic Competitiveness"

"Investments for Your Future!"

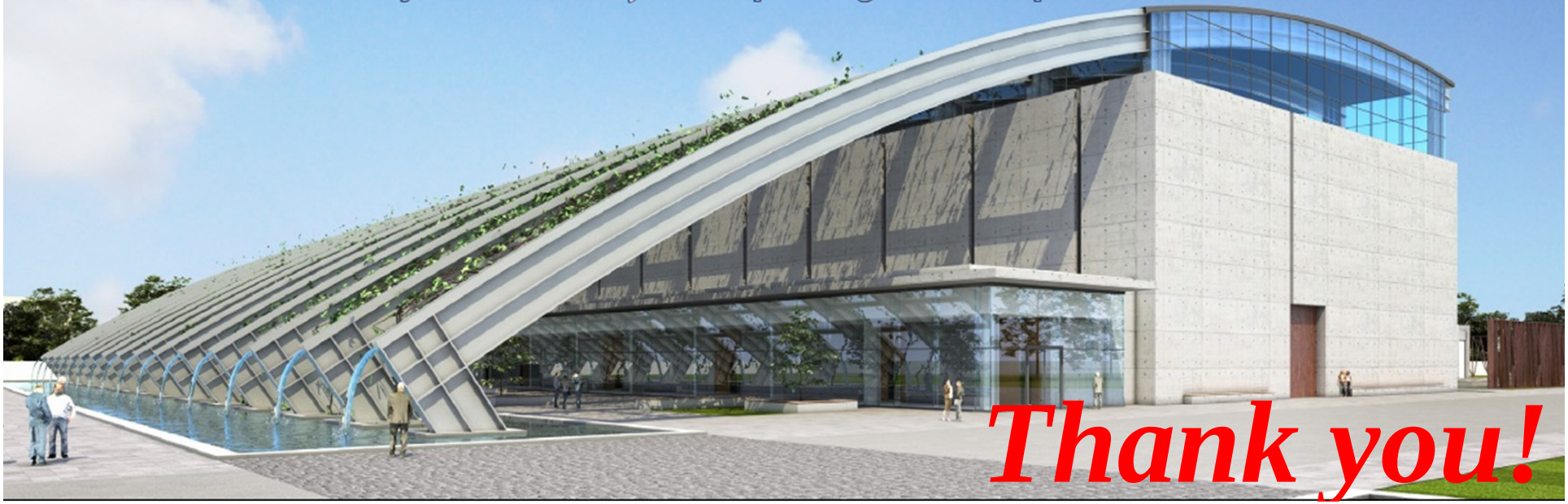
IFIN-HH

Extreme Light Infrastructure - Nuclear Physics (ELI-NP) - Phase I

eli Nuclear Physics

www.eli-np.ro

Project co-financed by the European Regional Development Fund



Thank you!