



Insm

Laboratory of Nanostructures and Nanomaterials



Idea how to turn science-fiction into science





REPORT

nature nanotechnology

Antiferromagnetic spintronics

T. Jungwirth, X. Marti, P. Wadley & J. Wunderlich

WEB OF SCIENCE^{*} Hot Paper Y Highly Cited Paper

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nature physics

50 top institutions from 3 continents & companies: IBM, Hitachi, ...

Focus

The 2017 Magnetism Roadmap

Electrical switching of an antiferromagnet

Towards radiation and magnetic-field hard ultra fast, dense, and energy efficient memory-logic





EXTEREME LIGHT INFRASTRUCTURE

ELI Beamlines Introduction

NDVI November 2, 2017







What is ELI ?

ELI, the "Extreme Light Infrastructure", will be the first laser research infrastructure world-wide which is the result of a co-ordinated effort of a multi-national scientific laser community.

ELI White Book, 2011

A scientific community going global !



Pan-European Initiative





User base







Now we get ELI ERIC

- ERIC –European Research Infrastructure Consortium
- The integration of the three Pillars will provide Europe with a unique International RI, open to scientific users on the basis of excellence, and to Industry developers through transparent and competitive procedures
- The Members are Governments (or International Organizations) and «may» indicate Institutions as their Representing Entities, fixing the limits of the mandate
- As an international organization the ERIC has tax exemptions
- Procurement rules are independent from EU rules





Outlook



2021 - completion of enhancements projects

2019 - use of all laser sources, E1, E3, E4,

E5

2018 - Facility completion, first user calls and experiments - E1, start of biolab operation Installation and

commissioning, first

2017 -

first

experiments -

elipsometry

R&D projects

NSP – core support for the R&D activities ELIBIO – Biolab facility, new technology, R&D activities HIFI – High-field science and computing capabilities ADONIS - Multiple-enhancements for parallel operation CHAMPP - Laser driven XFEL and medical applications

nsi

ELI a world class laser research infrastructure with high impact for society











Lasers in Europe -Vision

A structured research landscape to meet global challenges and create economic growth

European Laser Community



The basis

Infrastructure Network: Laserlab-Europe



Flexible instrument to perform and initiate new science beyond the national scale

> 08-May-17

ESFRI Pan-European Research Infrastructures ELI



Mission-oriented single entities to meet global challenges



Motivation for hosting countries

Innovation clusters



2017 REGIONAL INNOVATION SCOREBOARD



ELI Mission

- Building the **world's first international laser facility** with a state of the art laser equipment (ultra-intense short pulse lasers and secondary sources of particles and x-rays)
- Enabling revolutionary science as a wide benefits to society ranging from medical and biomedical imaging, improvement of oncology treatment, fast electronics, creation of new materials
- Creating an **attractive platform for educating** a new generation of PhD. students, scientists and engineers



FII Pan-Furnnean Prniert

ELI-BL Dolny Brezany Czech Republic ultrashort x-ray generation, particle acceleration

ELI-ALPS Szeged Hungary ultrashort laser pulses at high repetition rate

ELI-NP Magurele

Romania ultra-intense optical and gamma ray pulses

UHFS

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Ultra-High-Field Science unprecedented laser field strength (location: to be decided later)



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Extreme Light for new science and variety of applications

- Investigation of vacuum structure
- Particle acceleration
- Ion sources
- Neutron sources
- Terahertz radiation sources
- Ultrafast-laser driven X-ray sources
- Attoscience: ultrafast dynamics
- Laser-based nuclear physics
- Physics of dense plasmas
- Laboratory astrophysics

- Material science
- Medicine
- Biology
- Environment
- Fusion research
- Space science
- Astro-Biology
- Fundamental Physics
- More will come

From "ELI White Book", 2011



Science is the driver

• The **science case** is why Europe has decided 11 years ago to build ELI

 The applications potential (the socio-economic added value) is why Europe has decided to build ELI in three CE countries, using Structural Funds





ELI – international dimension



- ELI will be the world's first international laser research infrastructure, pursuing unique science and research applications

 "CERN of laser research"
- ELI is the first ESFRI project to be fully implemented in the newer EU Member States
- ELI will be operated as a distributed research infrastructure based on 3 specialised and complementary facilities located in the Czech Republic, Hungary and Romania
- ELI is pioneering a funding model combining the use of structural funds with national and EC funding and contributions in an ERIC



International Cooperation

Oueen's Uni.

- 100% capacity operated by ELI ERIC
- Open excellence driven access
 - 5 laser systems
 - 6 beamlines
 - 9 user stations
- Fist call 1Q 2018
- User community estimate
 - 500 users per year at full operation
 - Originating from over 30 countries



ETMC

AEA, NIFS