

II. Pillar of HE and EXCELLENT, MISSION ORIENTED, RESEARCH ON HIGH REPETITION/HIGH ENERGY LASERS;

Collaboration in topics related to societal challenges



Gonçalo Figueira
(IST)



Inmaculada Figueroa
(Spanish Ministry
of Science & Innovation)



Lorenzo Giuffrida
(ELI-BL)



Zsolt Fülöp
(HU, ELI-ALPS)



Giancarlo Gatti
(CLPU)

Rapporteur: Nad'a Witzanyová (ELI ERIC)



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Discussion Questions for Panel

-II. Pillar of HE and EXCELLENT, MISSION ORIENTED, RESEARCH ON HIGH REPETITION/HIGH ENERGY LASERS;

- How to target the different researchers (research communities)? i.e. how to “sell” us outside the usual community ?
- How Lasers at High Intensity, HRR could reflect to society and research applications?
- What the role of the CLPU and ELI could be in this path?
- Why ELIMAIA is complementary/competitive compared to standard accelerators? Which user communities would benefit from conducting experiments at ELIMAIA?



Pillar 2 of Horizon-Europe and excellent, mission-oriented research on high-repetition / high-energy lasers: collaboration in topics related to societal challenges

HORIZON EUROPE

PILLAR I

EXCELLENT SCIENCE

- European Research Council
- Marie Skłodowska-Curie
- Research Infrastructures

PILLAR II

GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS

- Clusters
 - Health
 - Culture, Creativity & Inclusive Society
 - Civil Security for Society
 - Digital, Industry & Space
 - Climate, Energy & Mobility
 - Food Bioeconomy, Natural Resources, Agriculture & Environment
- Joint Research Centre

PILLAR III

INNOVATIVE EUROPE

- European Innovation Council
- European Innovation ecosystems
- European Institute of Innovation & Technology
(The European Institute of Innovation & Technology -EIT- is not part of the Specific Programme)

WIDENING PARTICIPATION

Pillar I of HE

Traditional support of RIs

Pillar 2 of HE

Supports research into **societal challenges** and reinforces **technological** and **industrial** capacities

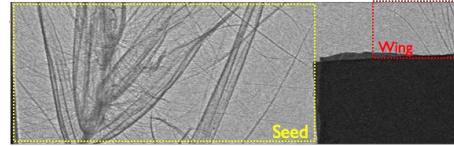
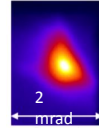
Calls are published under six **clusters** in several domains

Potential for interactions between research, healthcare, industry, energy sectors. RIs should get involved.

In addition to this, possible use of Widening activities can be a way forward.

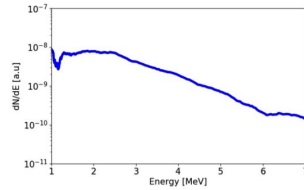
Applications to Society and Research: examples

Electron Driver

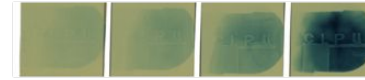


X-ray PCI
-Organic samples
-Time-resolved (ICF)

Proton Driver

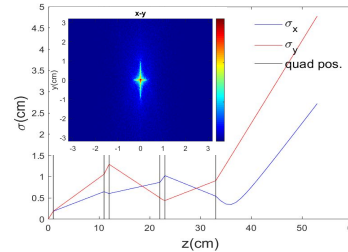
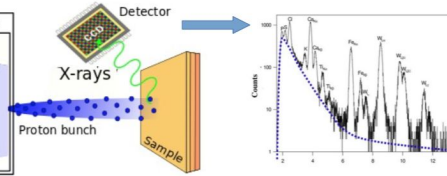
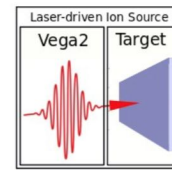
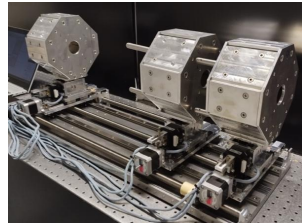


Proton Radiography

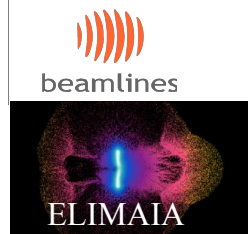


PIXE

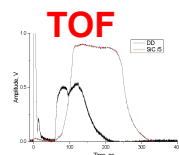
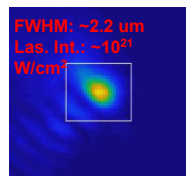
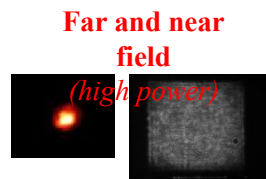
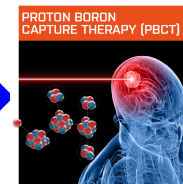
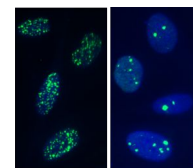
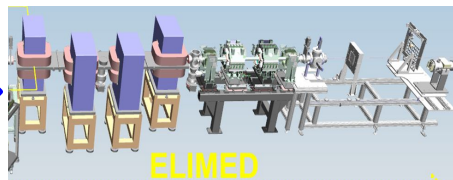
Transport Line



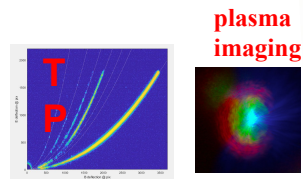
-Radiobiology
-Radionuclides
-Cultural Heritage
-Materials
-Plasma Physics
-Space Applications



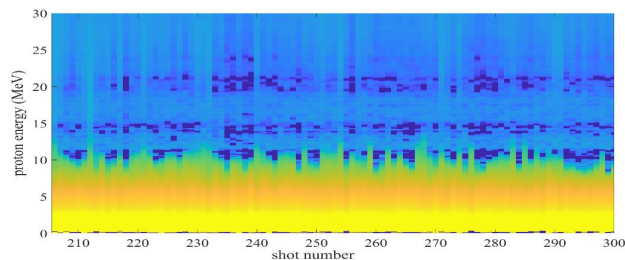
The **ELIMAIA** user beamline: *ELI Multidisciplinary Applications of laser-Ion Acceleration*



γ -ray detector



Rep.-rate capability: stable proton acceleration @ 0.5 Hz @ 10^{21} W/cm^2



Technical Specifications

- ✓ HAPLS laser ($>10\text{J}$, $<30\text{fs}$, $>10^{21}\text{W/cm}^2$, 1-10 Hz)
- ✓ on-shot, full-power, on-target laser, plasma, and ion diagnostics
- ✓ dedicated ion beam transport (ELIMED)
- ✓ on-shot, high rep. rate clinical ion dosimetry
- ✓ innovative regimes for ion acceleration (protons and ions)
- ✓ high beam quality for irradiation of biological samples

Societal Impact

- ✓ novel clinical dosimetry through dedicated on-line diagnostics
- ✓ in-vitro in-vivo irradiation with proton/carbon beams using ultrahigh dose-rate and flash radiotherapy approaches (10^9 Gy/s)

HCEMM EU Teaming Grant Project



Heart failure is one of the most common reasons for hospitalization of patients.

Prognosis is poor if manifest heart failure is left untreated (5-year survival rate of less than 50%)

The etiology of heart failure is diverse. A distinction is made between patients with preserved (HFpEF; EF > 50%) and reduced ejection fraction (HFrEF).

Hemodynamically, HFpEF is characterized by abnormal stiffness of cardiac muscle cells. The ventricles no longer fill optimally and the ejection fraction of the heart decreases. HFpEF is heterogeneous and most patients suffer from numerous comorbidities



Hypothesis: oxidative stress and inflammation influence the development and the pathophysiology of HFpEF via modulation of LV diastolic stiffness.

Plan with Prof. Dr. Nazha Hamdani:

Investigate how comorbidities, gender, age, oxidative stress, and inflammation on the pathophysiology of HFpEF and LV stiffness modulation and designing a treatment option for each HFpEF subgroup via studying:

Protein quality control in zebrafish in cooperation with ELI-ALPS

Protein modifications in zebrafish in cooperation with ELI-ALPS

Signaling pathways in zebrafish in cooperation with ELI-ALPS