US observes ELI laser research programme of the European Union as good practice

A recent report by the National Academies of Sciences, Engineering and Medicine (NASEM) on ultrafast lasers recommends the European programme of Extreme Light Infrastructure (ELI), a pillar of which is based in Szeged, Hungary, to the attention of the US government as an example to learn from.

They say “the second laser revolution” is being done outside the US: the total peak power for operational, under construction, and proposed high power laser facilities in Europe is five times more than in the US or Asia.

The report commissioned by US government agencies was carried out by a committee of renowned experts chaired by Phil Bucksbaum, Professor at Stanford University. It says the US is losing ground in highly intense, ultrafast lasers that have broad applications in manufacturing, medicine, and national security. These powerful lasers originated in the US however, research-funding agencies in Europe and Asia began in the last decade to invest heavily in new collaborations and facilities that will employ these high-intensity lasers for broad areas of science and applied research.

The report focuses on highly intense pulsed petawatt-class lasers (one petawatt equals one million billion watts) revolutionised research opportunities. These deliver extreme energies concentrated into a pulse of an attosecond (one attosecond compares to one second as one second does to the age of the universe). Such laser sources create conditions that can accelerate and collide intense beams of elementary particles, drive nuclear reactions, heat matter to conditions found in stars, or even realise the „wonder” of matter created out of the empty vacuum. Scientific results exposing the interaction between matter and high-intensity lasers may lead to common applications in medicine (e.g. cancer therapies), nanotechnology and environment protection. In manufacturing, robot lasers can be programmed to more tasks than mechanic machines, high-intensity lasers may be well used for precision manufacturing processes in particular.

Among coordinated national and regional research and infrastructure collaborations dominating this sector now, the study names the unique initiative of the ELI programme being implemented in the Czech Republic, Hungary and Romania, three facilities soon to come under the umbrella of the joint ELI European Research Infrastructure Consortium (ELI ERIC). This coincides with the final recommendations of the committee: the US should conduct national programmes to develop high-intensity laser technology and deriving applications, while it is also deemed reasonable to get involved in research activities running in overseas institutions such as ELI. The report also points out that heavy investments in laser infrastructures have contributed to strengthening European enterprises engaged in developing laser technologies, such as One-five, Femtolasers or Lumera Laser.

This approach towards ELI is good news for Hungary as József Pálinkás, President of the NRDI Office summarised the results of recent consortium-building negotiations: if ELI qualifies as an ERIC (European Research Infrastructure Consortium), it would be easier to involve external users in financing the highly costly operation of the infrastructure in the long run. The attosecond laser facility in Szeged provides suitable laboratory environment to build extreme powerful laser systems for industrial partners, and even the development process itself may result in versatile applications and bring economic profit.

Further reading on the subject:

- Szeged-based super laser facility forms part of European Research Infrastructure Consortium to be established with active EU support
- Spain shows interest in new laser facility in Szeged
- József Pálinkás: Berlin stands for the international consortium to exploit the Szeged laser facility
- New laser research facility in Szeged awaits researchers from all over the world
- New agreement to involve French researchers in the utilisation of the laser centre in Szeged
- Envoy extraordinary for the international utilisation of the ELI laser research centre capacities in Szeged