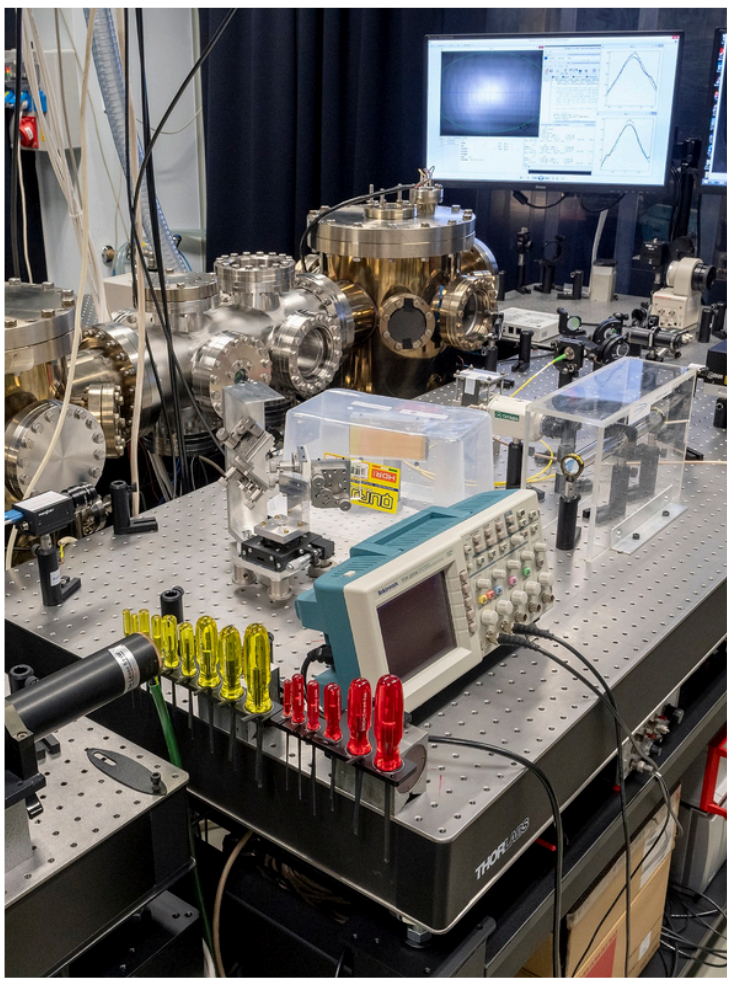
RESEARCH LABORATORY FOR NANOPLASMONIC LASER FUSION

NAPLIFE - CRADLE OF NANOFUSION / NANOFUSION - FUTURE OF ENERGY, ENERGY OF FUTURE

Fusion power generation can be much more concentrated, using way less raw material, than other current production methods. 20 tonnes of coal is equivalent to about 1 kilogram of fissile material, and the same amount of energy can be extracted from 1 gram of fusion fuel. The energy from nuclear fusion is several times greater than from other energy sources. Added to this is the effect of compression, which varies from technology to technology. The Nanoplasmonic Laser-Initiated Fusion Experiment (NAPLIFE) is based on Norbert Kroó's idea: using nanoplasmons, energy can be compressed without any separate compression, (using laser energy injected into the fusion material at the speed of light), up to a million times, according to some theoretical estimates. This is what this programme is investigating.



MAIN RESEARCH AREAS

- Nanoplazmonics
- Nuclear Physics
- Spectroscopy
- Quantum optics
- Non-equilibrium plasma fusion

IMPLEMENTER:
HUN-REN Wigner Research Centre for Physics

PROJECT NUMBER: 2022-2.1.1-NL-2022-00002

FUNDING PERIOD: 01.01.2022 - 28.02.2026

OVERALL BUDGET: 1.127.964.898 HUF

NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION OFFICE
HUNGARY
PROGRAM FINANCED FROM THE NRDI FUND

BENEFITS TO BE EXPECTED FROM LABORATORY RESEARCH

The successful implementation of nanofusion will open up new perspectives for technological innovation. Currently, impact is expected in four areas:

1. Making power generation in nuclear power plants more efficient and scalable;
2. Building a network of mini (basement-sized) power plants, which will greatly increase energy security by connecting them to the appropriate smart grid;
3. Developing even smaller energy sources, truck (or bus, combat vehicle) size, to increase mobility and reduce battery demand;
4. Developing and implementing fusion process chains with no radioactive waste production and power plants to achieve zero environmental impact.

THE PROFESSIONAL TEAM

The backbone of our team consists of the most eminent national and international experts and renowned representatives of the three professional fields (laser, nuclear fusion, energetics) covering the experiment.

By name and function:

Project and project group leaders, management:

- József Péter Lévai (Director General of Wigner FK, host institute)
- Sándor Biró Tamás (Wigner FK RMI, project leader)
- Norbert Kroó (Wigner FK SZFI, prof.em, scientific advisor)
- László Pál Csernai (Wigner FK RMI, Univ. Bergen, prof.em, scientific advisor)
- Szeledi Anett (Wigner FK, project manager, assistant to the professional leader)
- Csete Mária (SZTE Quantum Optics, associate professor, head of theoretical group)
- Attila Bonyár (BME Electrotechnika Tsz, associate professor, head of material preparation group)
- Kedves Miklós Ákos (Wigner FK SZFI, head of laser experiment group)
- Miklós Veres (Wigner FK SZFI, Deputy Head of Technical Department, Head of Spectroscopy Group)

Staff working on the project

Wigner FK full time:

- Sándor Biró Tamás Research Professor
- Professor emeritus Norbert Kroó
- Papp István postdoc (31.12.2024)
- Judit Kámán postdoc (30.11.2023)
- Konstantin Zhukovsky postdoc
- Kumari Archana postdoc (30.11.2022)
- Gray Carlsson Fulbright postdoc (01.09.2024 - 31.12.2024)
- Ágnes Nagyné Szokol PhD student PTE
- Anett Szeledi Project Manager
- Jean Pierre Svantner, Intern, ETH Zurich (2023.06.01. - 2023.08.31.)

FK Wigner part-time:

- Miklós Veres Scientific advisor, Deputy Head of Profession, Head of Group
- István Rigó postdoc (- 31.08.2023)
- Roman Holomb postdoc
- Péter Rácz senior research fellow (- 30.06.2022)
- Dear Ákos Miklós senior research fellow
- Márk Aladi postdoc
- Béla Ráczkevi senior research fellow (- 29.02.2024.)
- Ádám Inger PHD student, research engineer 40%
- Alexandra Borók PhD student BME 50%
- Abdulameer Nour Jalal PhD student DE 50%
- Bálint Ferenc Tóth Communications Officer 50% (01.11.2023 - 31.10.2024)
- Antónia Dömötör Accounting 23%

University of Szeged staff, contract staff:

- Mária Csete Associate Professor, Group Leader
- Professor Gábor Galbács
- Professor Balázs Bánhelyi
- Professor Attila Czirják
- Szenes András postdoc
- Dávid Vass PhD student SZTE
- Olivér Fekete PhD student SZTE
- Emese Tóth Assistant Researcher
- Ádám Bélteki postdoc
- Palásti Dávid PhD student SZTE
- Fernando Alexander Casian Plaza student SZTE
- Gyula Kajner Student SZTE
- Urbán Orsolya student SZTE

Budapest University of Technology and Economics, on assignment:

- Attila Bonyár Associate Professor BME VIK ETT, Group Leader
- Zangana Shereen PhD student BME, (- 31.03.2024.)
- Kovács Rebeka BME MSC student
- Nóra Tarpataki BME MSC student
- (Alexandra Borók and Judit Kámán also in this group)

University of Debrecen, on assignment:

- Melinda Szalóki Associate Professor, FOK

HUN-REN Energy Research Centre:

- Péter Petrik senior research fellow (-)
- Julianna Szabó Associate (2024.02. -)

Regular Advisers

Individual consultants:

- Csernai Consult, Bergen, Norway (contracted, regular visitor)
- Rafelski Johann, Univ. Arizona, Tucson, Arizona (yearly visitor)
- Project Implementation Task Force (PIT)
- Gábor Szabó President, ELI-ALPS Director, Szeged
- Dezső Varga Secretary, Senior Research Fellow, Wigner FK
- Aladár Czitrovszky Professor Emeritus, Wigner FK
- Attila Nagy Senior Research Fellow, Wigner FK

Current delegate of the NRDI

Expert Support Committee:

- Chairman Miklós Kellermayer
- Charaf Hassan
- György Kosztolányi
- Roland Jakab
- István Szász
- László Monostori
- Gabriella Pusztai

Supervisory Board

- László Bódis President
- István Ádám Kiss
- József Bokor László Borhy
- Péter Buchwald
- György Grüner

Ad hoc assistants

- Professor Károly Osvay University of Szeged
- Katalin Varjú ELI-ALPS Director
- Professor Zsolt Fülöp ATOMKI Debrecen
- Dániel Papp Researcher ELI-ALPS
- Bíró Barna researcher ATOMKI Debrecen
- László Stuhl Researcher ATOMKI Debrecen
- László Borhy
- Péter Buchwald
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- Bíró Barna researcher ATOMKI Debrecen
- László Stuhl Researcher ATOMKI Debrecen

POSSIBLE PARTNERSHIPS

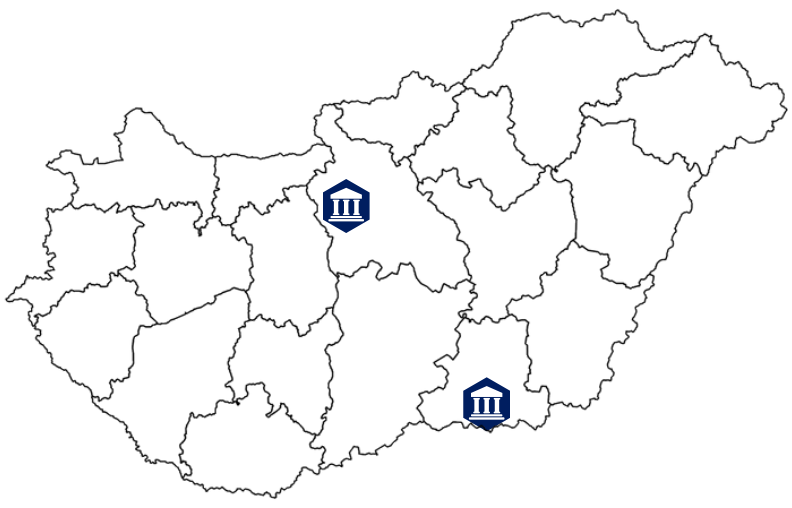
The inventors and initial patent applicants are from three different institutions: Norbert Kroó is a professor at Wigner University, László Csernai is from the University of Bergen in Norway, and István Papp is a young postdoc at the Babes-Bolyai University in Cluj. The nanoparticles are prepared by the Energy Research Institute and the Department of Electrical Engineering at the BME. Other interested, collaborating partners from the United States have also applied: Csaba Tóth from Lawrence Berkley Laboratory and Dénes Molnár from Purdue University. We have a shorter (2 months) collaboration with Professor Johann Rafelski, Professor Emeritus at Arizona State University, funded by the Fullbright Foundation. The latter promises to be fruitful: the professor sees further potential in the use of polarised laser light.

TARGET GROUP

- General public interested in power generation, nuclear fusion, laser optics, plasmonics and nano-technology
- Research groups or companies.
- Undergraduate students who are planning to participate in research.

PLACES OF IMPLEMENTATION:

- Budapest
- Szeged



PROFESSIONAL CONTACT

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CONTACT

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