Report on the 20th International Scientific Workshop and Postgraduate Course on Electroporation-Based Technologies and Treatments (EBTT)

Date and Location:

The 20th edition of the International Scientific Workshop and Postgraduate Course on Electroporation-Based Technologies and Treatments (EBTT) took place from November 9–14, 2026, at the University of Ljubljana, Faculty of Electrical Engineering, in Ljubljana, Slovenia. The School offered both on-site and online participation.

Background:

The EBTT course has been part of the PhD programme in Biomedicine at the University of Ljubljana since 2003. Initially held biennially, the course has been conducted annually since 2011. It is intended for doctoral students, researchers, clinicians, engineers, and other users of electroporation technologies, from newcomers to experienced specialists. The 2026 School marked its 20th edition.

Participation:

On-site registration was closed mid-October due to reaching full capacity, while online registration remained available until the course began. The School brought together participants and lecturers from the international electroporation community. This year's EBTT School attracted 39 participants, including 31 attendees on-site and 8 online, from 21 different countries. The event also featured 23 lecturers from 9 different countries.

Topics Covered:

The EBTT 2026 programme combined fundamental principles of electroporation with biomedical and technological applications, including:

- Electrical properties of cells and tissues in electric fields
- Physical chemistry of membrane electroporation and molecular dynamics
- Electroporation protocols in vitro and in vivo
- Development of pulse generators, devices, and electrodes
- Electrochemotherapy and other tumor treatments
- Gene electrotransfer, gene therapy, and DNA vaccination
- Pulsed field ablation for cardiac arrhythmias and related safety considerations

Lectures were delivered by permanent faculty members and invited experts. Selected highlights included:

- Mina K. Chung (USA): Atrial fibrillation from genes to therapeutics
- Michal Cifra (Czechia): Electric field effects on proteins: direct and indirect pathways
- Mauro Giacca (United Kingdom): RNA therapies for cardiac repair and regeneration
- Brendan Koop (USA): Principles of designing safe and effective PFA systems for cardiac ablation
- Helmut Pürerfellner (Austria): How PFA will change cardiac arrhythmia treatment

- Mike Sano (USA): How clinical goals and constraints affect electroporation device development
- Graham Wright (Canada): MRI characterization of PFA lesions
- Samo Mahnič (Slovenia): On the origin of bubbles in PFA
- Matej Reberšek (Slovenia): Blood is not water

Key Highlights:

A central event was the roundtable “Cardiac Pulsed Field Ablation – Reality Check”, held on Thursday, November 12, 2026, from 15:15 to 18:00 CET, both on-site and online. Eleven invited panelists representing academia, clinical practice, and industry examined the opportunities and outstanding challenges of pulsed field ablation (PFA) in cardiac electrophysiology. Topics included procedural safety, lesion durability, coronary and vascular effects, interactions with cardiac devices, ventricular applications, integration with mapping systems, and gaps in clinical evidence. Damijan Miklavčič moderated the roundtable, with Bor Kos serving as digital moderator. More than 300 participants registered from companies (52%), academic or research institutions (26%), health-care providers (17%), governmental institutions (3%), and other (2%). The complete edited recording of the roundtable is available for viewing online (https://www.youtube.com/watch?v=OWHt4zdyZyM) and has already garnered substantial interest.

Practical Exercises and Laboratory Sessions:

As in previous years, the course combined theoretical lectures with supervised practical work. The 2026 practical workbook lists 21 distinct exercises: 15 laboratory exercises, 4 computer-modelling exercises, and 2 hardware-development and measurement exercises. Activities addressed gene electrotransfer, cell permeabilization, electric-field effects, pulsed-field bacterial inactivation, cardiac electroporation, molecular dynamics, treatment planning, and pulse measurement. Interactive online practical sessions were also offered to remote participants. Practical-work selection was preceded by a laboratory safety test.

Pulse Generators Exhibit and Demonstrations:

During the Friday coffee break and lunch, a display of commercially available and "home-made" pulse generators from the Laboratory of Biocybernetics, Faculty of Electrical Engineering, University of Ljubljana, was set up. Participants had the opportunity to explore and try out the devices.

EBTT 2026 Companion App:

A new feature of this year’s EBTT was a dedicated app that participants could install on their smartphones or laptops. The app provided easier access to information, a clearer overview of lectures and laboratory exercises, and better opportunities for networking and connecting with fellow participants.

Social Events:

The registration package included networking activities, including a Monday networking dinner, and “Icebreaker” for students on Tuesday evening, where students gathered for a fun-filled bowling night, sharing laughs, friendly competition, and plenty of high-fives.

Conclusion:

The 20th EBTT School continued the long-standing tradition of interdisciplinary education and exchange in electroporation-based technologies and treatments. The programme connected fundamental biophysics with clinical and industrial developments, with particular attention to the rapidly evolving field of cardiac pulsed field ablation. Its combination of expert lectures, hands-on training, and hybrid participation supported knowledge exchange across disciplines and institutions. Since its inception, the EBTT course has welcomed 1376 participants from 48 countries. Our commitment to delivering high-quality experiences remains a priority, and we continue to strive for further improvements to meet the needs of all participants, whether attending on-site or online.

The Bioelectrochemical Society has supported the EBTT School for 23 years, and we are sincerely grateful for its continued support.

Chair of the EBTT:
Saša Haberl Meglič, PhD

Course Director:
Professor Damijan Miklavčič, dr. h. c.

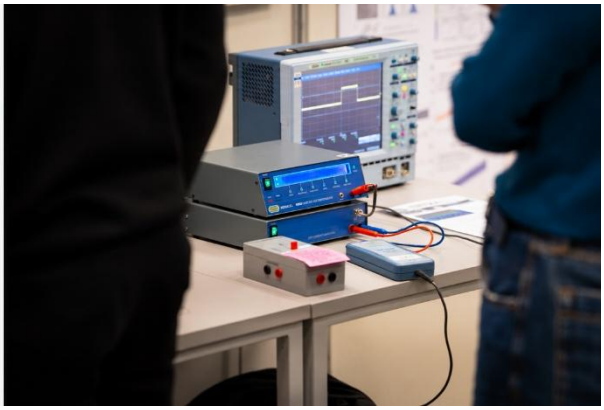
Photographs:



Lecture room, 2026



Round Table, 2026

Exhibition of a commercial and a “home-made” pulse generators during the coffee and lunch breaks on Friday.




Poster session, 2026




Social event – Icebreaker, 2026