Louis Costrell Awards Ceremony

Louis Costrell Awards

- NAPAC’19 Student poster prizes
- Community service awards
- APS Division Physics of Beams Outstanding Doctoral Thesis Research Award
- US Particle Accelerator School Prize for Achievement in Accelerator Science and Technology
- IEEE Particle Accelerator Science and Technology (PAST) Doctoral Student Award
- IEEE Particle Accelerator Science and Technology (PAST) Awards

Student Poster Prizes

- Student poster session Sunday afternoon
- 65 posters presented to early attendees

- Many excellent posters and fun conversations

- 4 prizes given based on:
  - Technical and scientific merit
  - Explanation
  - Presentation
  - Contribution

NAPAC2019
NORTH AMERICAN PARTICLE ACCELERATOR CONFERENCE

Enhanced Robustness of GaAs-based Photocathodes Activated by Cs, Sb, and O_2

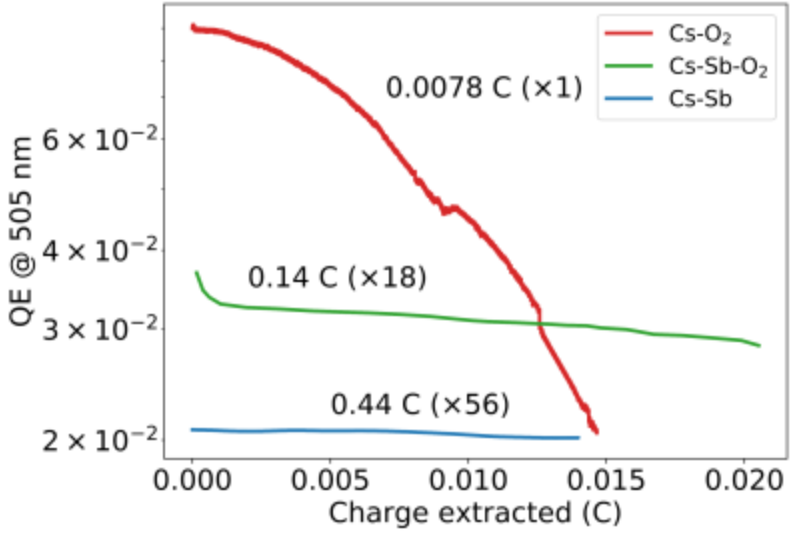
J. Bae, I. Bazarov, L. Cultrera, F. Ikponmwen, A. Galdi, J. Maxson
Cornell University, Ithaca, New York, USA

Background

GaAs-based photocathodes are widely used to produce highly spin polarized electron beams at high currents. Spin polarized photoemission requires activation to achieve Negative Electron Affinity (NEA). The NEA surface is extremely vacuum sensitive, and this results in rapid QE degradation.

In this work, we activated GaAs samples with unconventional methods using Cs and Sb. We confirmed NEA activation on GaAs surfaces and more than an order of magnitude enhancement in charge extraction lifetime compared to the standard Cs-O_2 activation without significant loss in spin polarization.

Lifetime



Measuring sub-femtosecond x-ray pulses with angular streaking

S. Li, T. Driver, E. Champenois, P. Rosenberger, T. Barnard, P. Bucksbaum, J. Duris, J. MacArthur, A. Natan, J. O'Neal, T. Wolf, A. Marinelli and J. P. Cryan along with the LU00 Collaboration*

Stanford PULSE Institute, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA

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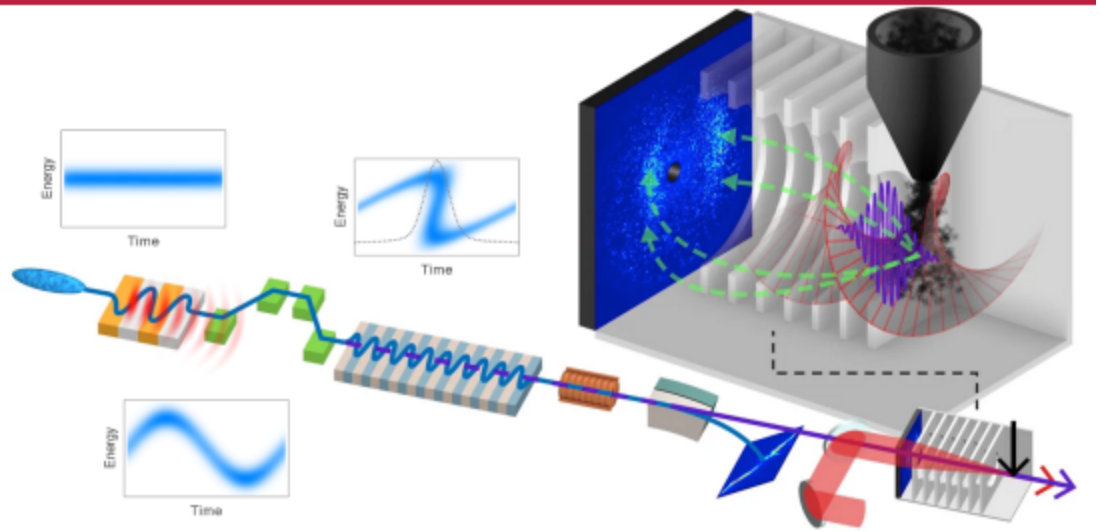
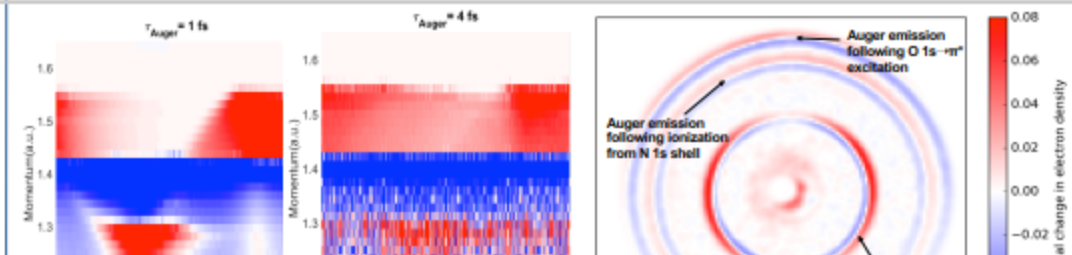
Recent sub-femtosecond x-ray pulse development at the LCLS calls for a high resolution measurement scheme to resolve the extremely short x-ray pulses. We employ angular streaking to fully characterize these sub-femtosecond x-ray pulses. We have developed a reconstruction algorithm to extract the pulse's temporal and spectral structure from the streaking measurement. We have also combined these attosecond x-ray pulses with the technique used to characterize them to measure attosecond-timescale dynamics in photoexcited small molecules.



Angular Streaking

The linearly polarized x-ray pulse ionizes gas phase atoms and releases photoelectrons. In the presence of a circularly polarized streaking laser field, photoelectrons released at different times experience an angularly varying momentum shift. The time-domain information is thus imbedded in the momentum distribution of the photoelectrons.

Streaking the Auger Electrons



STARRE Lab

Sub-THz Accelerator Research Laboratory

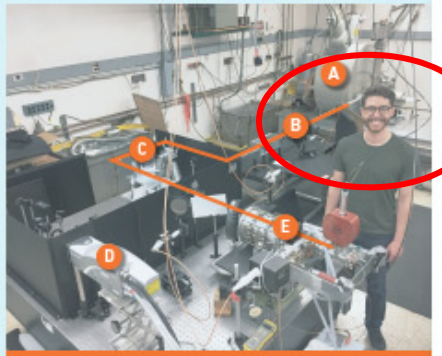
Enabling High-Power Testing of Sub-THz Accelerators

Massachusetts Institute of Technology

PSFC

Introduction

- With the potential for high efficiency in a small form factor, there has been growing interest in linear accelerator concepts driven at sub-THz and THz frequencies.
- Testing of these high-frequency structures requires sub-THz pulses on the nanosecond timescale to avoid excessive pulsed heating. However, few sources exist that can achieve such short pulse widths at the required power levels.
- This work presents the development of the STARRE Lab, a facility at the Massachusetts Institute of Technology for testing breakdown in high gradient accelerator structures at 110 GHz.



A. Gyrotron B. Waveguide C. Pulse Chopper
D. 532 nm Laser E. SLAC Accelerator Structure

1 GYROTRON

Dedicated high-power sub-THz source

1.5 MW Output Power

110 GHz Output Frequency

3 µs Pulses

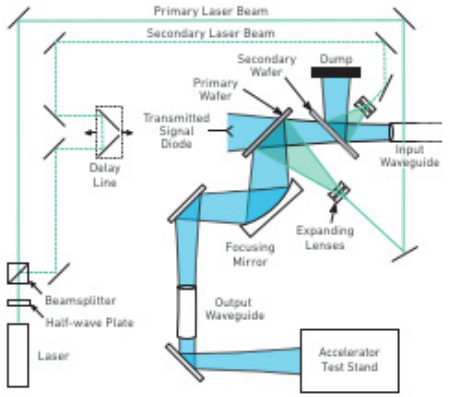
6 Hz Rep Rate

3 µs Input Pulse

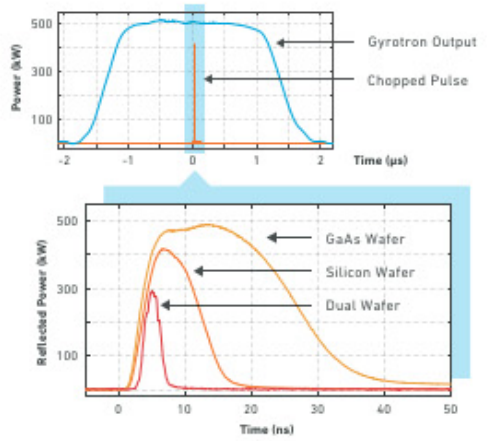
2 MICROWAVE PULSE CHOPPER

10 ns Output Pulse

Laser-driven semiconductor pulse chopper generating 10 ns megawatt-level pulses



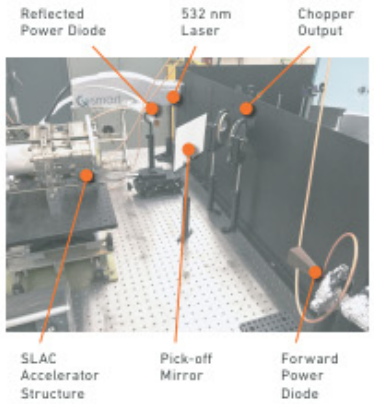
Operational diagram of laser-driven semiconductor pulse chopper



Top: Chopped pulse compared to gyrotron output pulse
Bottom: Chopped pulses produced by different wafers materials

3 ACCELERATOR TEST STAND

Free-space coupling to accelerator structure



Accelerator test stand at pulse chopper output

RECENT DEVELOPMENTS OF Nb_3Sn AT JLAB FOR SRF ACCELERATOR APPLICATION

U. Pudasaini[1], G. Eremeev[2], C. E. Reece[2], and M. J. Kelley[1,2]
[1]The College of William & Mary, Williamsburg, VA 23187, USA
[2]Thomas Jefferson National Accelerator Facility, Newport News, VA 23606, USA

NAPAC2019

WILLIAM & MARY CHARTERED 1693

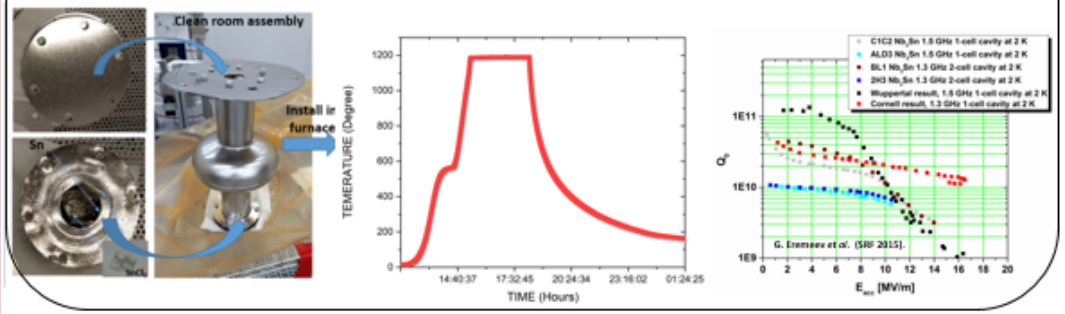
Jefferson Lab

ABSTRACT

The desire to **reduce the construction and operating costs** of future SRF accelerators motivates the search for alternative, higher-performing materials. **Nb_3Sn (T_c ~ 18.3 K and H_{sh} ~ 425 mT)** is the front runner. However, tests of early Nb_3Sn-coated cavities encountered **strong Q-slopes** limiting the performance. Learnings from studies of coated materials related to cavity performance prompted significant changes to the coating process. It is now possible to routinely produce slope-free cavities having **$Q_0 \geq 2\times10^{10}$ at 4 K and $> 4\times10^{10}$ at 2K** up to the accelerating gradient in excess of **15 MV/m** at its best. Obtaining similar results in five-cell cavities is a current goal to test them under an accelerator environment. We have produced Nb3Sn-coated **CEBAF 5-cell** cavities with accelerating gradients useful for **cryomodules**.

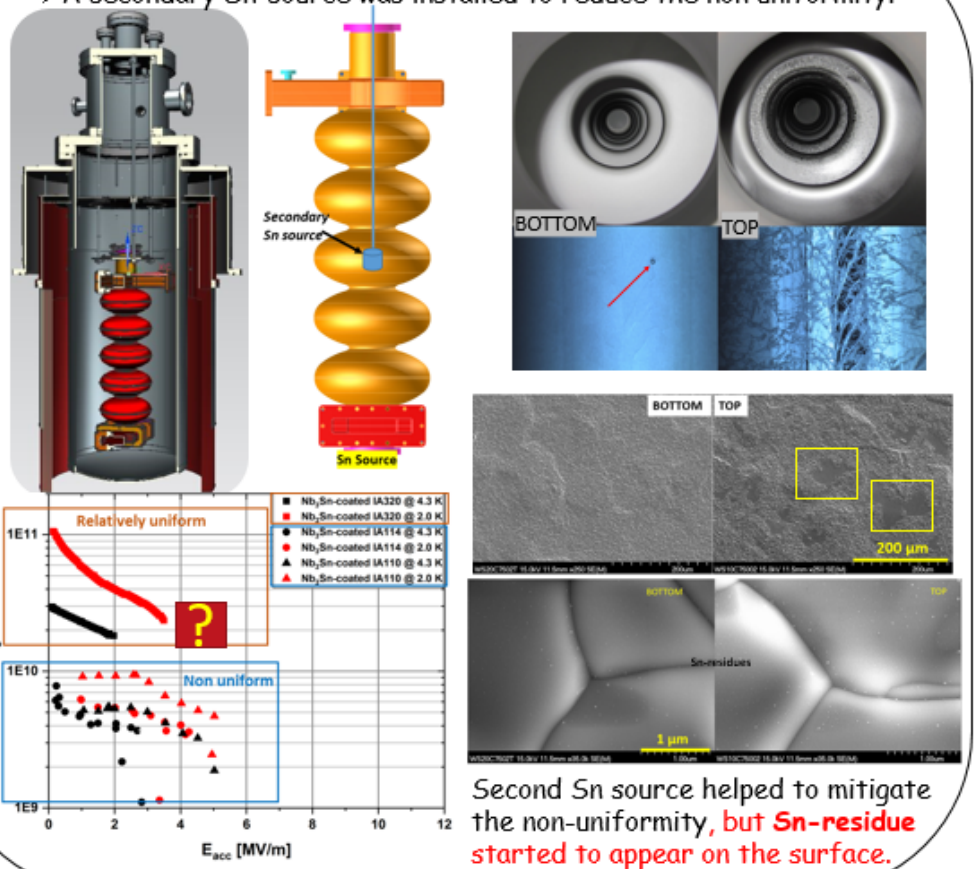
SINGLE-CELL CAVITY COATING

- Tin vapor diffusion is a promising technique.
- Two-step process: nucleation at 500 °C for 1 hour followed by 3 hours of coating deposition at 1200 °C.
- Initial cavities had low-field $Q_0 > 1\times10^{10}$ at 4 K, but the maximum gradient was consistently limited by a precipitous Q-slope.



FIVE-CELL CAVITY COATING

- The coatings had up-down asymmetry with the single source of Sn.
- A secondary Sn-source was installed to reduce the non uniformity.



Second Sn source helped to mitigate the non-uniformity, but **Sn-residue** started to appear on the surface.

Community Service Awards

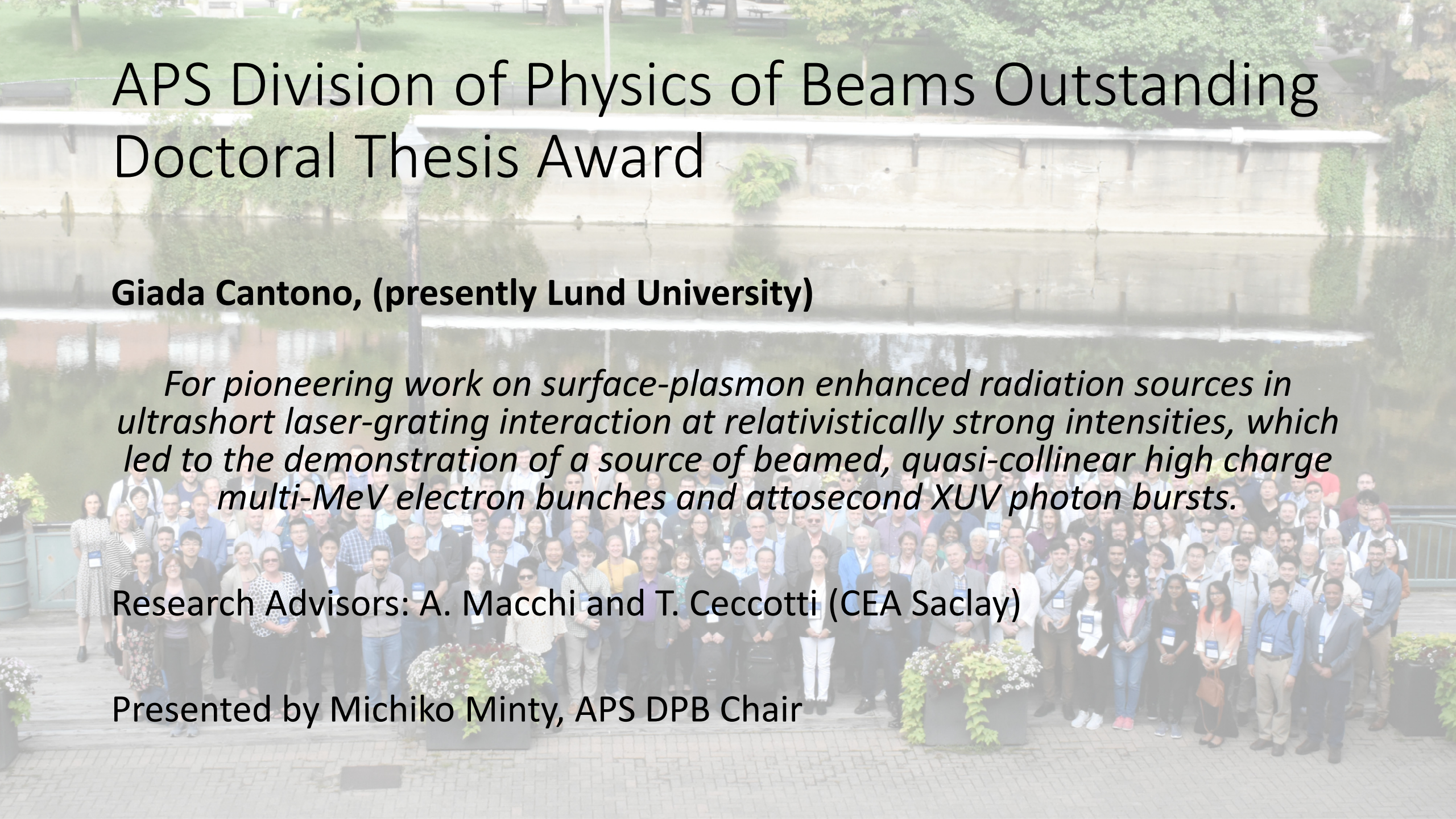
- Physical Review Accelerator and Beams Robert H. Siemann Award

  Stan Schriber (MSU, emeritus)

- APS Division of Physics of Beams Outstanding Service Award

  Stan Schriber (MSU, emeritus)

APS Division of Physics of Beams Outstanding Doctoral Thesis Award



Giada Cantono, (presently Lund University)

For pioneering work on surface-plasmon enhanced radiation sources in ultrashort laser-grating interaction at relativistically strong intensities, which led to the demonstration of a source of beamed, quasi-collinear high charge multi-MeV electron bunches and attosecond XUV photon bursts.

Research Advisors: A. Macchi and T. Ceccotti (CEA Saclay)

Presented by Michiko Minty, APS DPB Chair

US Particle Accelerator School Prize for Achievement in Accelerator Science and Technology

Cameron Geddes (LBNL)

For pioneering experiments on laser guiding, electron trapping, and high-quality beam production in laser-plasma accelerators.

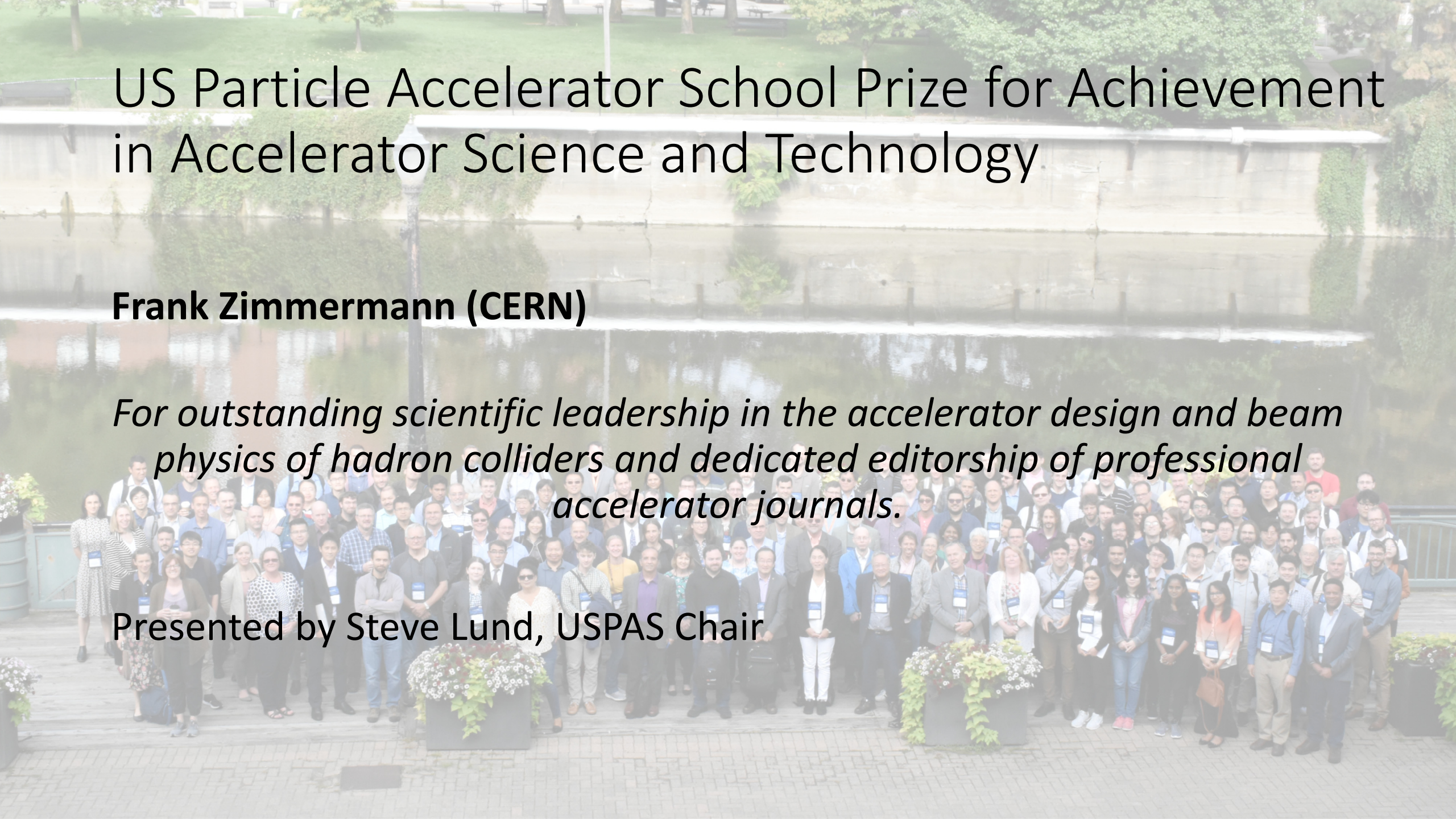
Presented by Steve Lund, USPAS Chair

US Particle Accelerator School Prize for Achievement in Accelerator Science and Technology

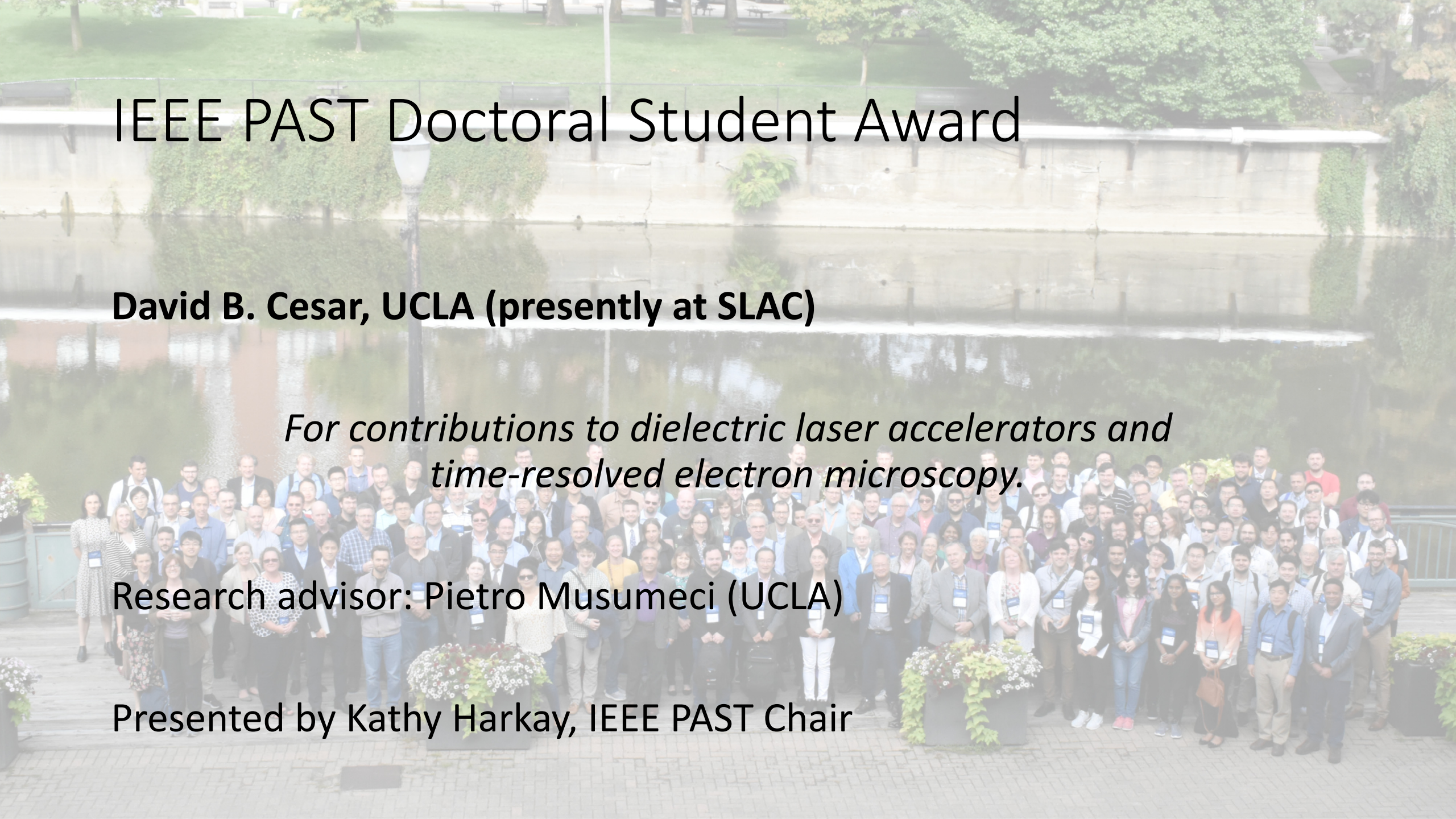
Frank Zimmermann (CERN)

For outstanding scientific leadership in the accelerator design and beam physics of hadron colliders and dedicated editorship of professional accelerator journals.

Presented by Steve Lund, USPAS Chair



IEEE PAST Doctoral Student Award



David B. Cesar, UCLA (presently at SLAC)

For contributions to dielectric laser accelerators and time-resolved electron microscopy.

Research advisor: Pietro Musumeci (UCLA)

Presented by Kathy Harkay, IEEE PAST Chair

IEEE PAST Award

Paolo Craievich (PSI)

During his entire career Paolo has provided important contributions to accelerator science and technology of electron linacs, in particular RF transverse deflection structures, beam manipulation with self-induced fields and high-brightness photoinjector and their application to advanced accelerators and light sources. Furthermore, he gave pioneering contributions to the applications of the passive streaking and linearization with self-induced fields.

Presented by Kathy Harkay, IEEE PAST Chair

IEEE PAST Award

John R. Cary (Tech-X and University of Colorado)

For exceptional contributions to accelerator and beam physics.

Presented by Kathy Harkay, IEEE PAST Chair