# JOHANN EDUARDO BAADER

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Ph.D. in electrical engineering with expertise in magnetic measurement and tuning of undulators, with particular depth in in-situ radiation damage detection and pulsed-wire field reconstruction techniques. Seven years of experience across SLAC National Accelerator Laboratory and European XFEL, including developing and operating SLAC's pre-tuning systems, independently tuning HE-SXU undulators for the LCLS-II-HE upgrade, and design of magnetic characterization systems for superconducting undulators at European XFEL.

## EDUCATION

**University of Campinas, São Paulo, Brazil**

Ph.D., Electrical Engineering GPA: 4.0 Mar/2020

Thesis title: *A Novel Technique for Detecting Radiation Damage in Variable-Gap Permanent-Magnet Undulators Based on In-Situ Magnetic Measurements.*

M.S., Electrical Engineering GPA: 4.0 May/2015

Dissertation title: *Improvement of Rotating Coil System for Magnetic Measurement of the New Brazilian Synchrotron Light Source Sirius* (in Portuguese).

**University of Blumenau, Santa Catarina, Brazil**

B.S., Electrical Engineering B.S. average grade: 9.56 of 10.00 Feb/2013

Final paper title: *Modelling and Control of Corrector Magnets Power Supply for Particle Accelerator* (in Portuguese).

## RESEARCH & WORKING EXPERIENCE

**SLAC National Accelerator Laboratory** **California, United States**

*Staff Engineer* | SLAC's Magnetic Measurements Group Jan/2025 -

- Developed a pre-tuning setup that reduced the number of working days for final measurement and tuning of LCLS-II-HE Soft X-ray Undulators by 33%, and used it to pre-tune ten HE-SXU undulators.
- Commissioned two magnetic measurement systems: a 3.4m-long single stretched-wire system that measures first and second field integrals with repeatability better than ±5 μTm and ±10 μTm², respectively, and a Hall probe system achieving positional accuracy better than 0.1 mm with field precision better than 0.5 mT.
- Deployed a touch probe measurement system for locating individual magnetic poles and reference surfaces of undulators, achieving spatial resolution and precision better than 10 μm.
- Independently tuned four HE-SXU undulators end-to-end and assisted with tuning of two additional units.

**European XFEL GmbH** **Schenefeld, Germany**

*Undulator Scientist / Postdoctoral Researcher* | Undulator Systems Group Jun/2020 – Dec/2024

- Developed pulsed wire and Hall probe-based magnetic measurement systems for long superconducting undulators, including the design, data processing algorithms, and procurement.
- Designed vacuum chambers for superconducting undulator magnetic measurement systems.
- Performed magnetic field simulations for the design of superconducting phase shifters.

**SLAC National Accelerator Laboratory** **California, United States**

*Visiting Graduate Research* | SLAC's Magnetic Measurements Group Apr/2017 - May/2018

- Participated in a collaborative research project focused on radiation damage detection and magnetic measurements for LCLS-II undulators.
- Performed the initial tests and validation of a novel radiation damage detection system based on measuring magnetic flux changes in undulators during operation, proving that the developed system could measure and detect relative field changes better than 0.01%.
- Programmed a National Instruments module (PXIe-4464) for measuring magnetic flux change.
- Developed the software and hardware of a verification circuit to ensure the voltmeters used to measure flux change operates properly.
- Designed a flip coil system for measuring field integrals, purchased required components, developed the system software, built, tested, and commissioned the system.

**Brazilian Synchrotron Light Source (LNLS)** **São Paulo, Brazil**

*Ph.D. Research* | LNLS' Magnets Group Aug/2014 - Apr/2017

- Performed field simulations and revised the design of the LNLS' undulators with Radia.
- Reviewed and studied appropriate techniques for measuring undulators' magnetic field for small gaps.

*Master's Research* | LNLS' Magnets Group Mar/2013 - Feb/2015

- Investigated the influence of systematic and random errors in rotating coil magnetic measurement systems by performing numerical simulation via Matlab.
- Improved repeatability and accuracy of the long and "mini" rotating coil systems used by the Magnets Group.

## AWARDS & SCHOLARSHIPS

- Best Oral Presentation Award (Applied Electromagnetism) at the 16th Brazilian Symposium on Microwaves and Optoelectronics & 11th Brazilian Congress on Electromagnetism, Curitiba, Paraná, Brazil, 2014.
- Sandwich Doctorate Scholarship Abroad (PDSE) granted by the Coordination for the Improvement of Higher Education Personnel (CAPES) in 2017.
- Ph.D. research granted by the Coord. for the Improvement of Higher Education Personnel (CAPES) in 2015.
- M.S. research granted by the National Council for Scientific and Technological Development (CNPq, 2013).

## LEADERSHIP EXPERIENCE AS TEACHING ASSISTANTSHIP

**University of Campinas** | *Laboratory of Electromagnetism* Feb/2019 - Jul/2019
**University of Campinas** | *Waveguide Laboratory* Aug/2018 - Dec/2018
**University of Campinas** | *Electromagnetic Theory* Mar/2016 - Dec/2016
**University of Campinas** | *Waveguide Theory* Aug/2014 - Dec/2014
**University of Blumenau** | *Electromagnetic Theory* Mar/2010 - Dec/2011

- Reinforced lessons given by the teacher by reviewing material with undergraduate students.
- Led classes and administered exams under the direction of the professor.
- In addition to the *Waveguide Theory* and *Waveguide Laboratory* courses, designed, simulated, built, and measured microstrip antennas and power dividers with a group of about 20 undergraduate students.

## SKILLS & INTERESTS

- **Languages:** English and Spanish (professional working proficiency), Portuguese (native)
- **Software for Mechanical and PCB Design:** AutoCAD, Fusion360, ExpressPCB, LibreCAD
- **Software Development and Numerical Simulation:** NI LabWindows/CVI (C, C++), Matlab, Simulink
- **Software for Magnetic Simulation:** Radia, FEMM
- **Hardware:** National Instruments modules (PXIe-4464, PXI-6608), Copley Accelnet and Xenus controllers, Newport translation stages and controllers

## VOLUNTEER EXPERIENCE

**University of Campinas** **São Paulo, Brazil**

*Curso Exato* | http://www.preac.unicamp.br/cursoexato Feb/2016 - Feb/2017 and Aug/2018 - Dec/2018

- Conducted supplementary mathematics classes for public high school students to enhance their knowledge and improve their probability of acceptance into a major university.

*Hour of Code* | http://code.org/ Sep/2016

- Supervised, guided, and motivated students through tough puzzles about computer science during a 1-hour meeting, designed to demystify code and show that anybody can learn the basics of programming.

## SELECTED PUBLICATIONS

- Baader, J.E., Anderson, S.D., Wolf, Z.R. "A Novel In-Situ Radiation Damage Diagnostic System for Undulators." *IEEE Trans. Instrum. Meas.*, 2020.
- Baader, J.E., Casalbuoni, S. "Magnetic Field Reconstruction Using the Pulsed Wire Method: An Accuracy Analysis." *Measurement*, 2022.
- Baader, J.E., et al. "Magnetic Performance Assessment of the S-PRESSO Superconducting Undulator Mock-Up." *IEEE Trans. Applied Superconductivity*, 2024.
- Baader, J.E., et al. "Status Update on SUNDAE2 Magnetic Field Test Facility at European XFEL." *J. Phys.: Conf. Ser.*, 2024.
- Baader, J.E., Levashov, Y., Wolf, Z.R., Nuhn, H.-D. "HE-SXR Undulator Pre-Tuning Test Plan." LCLS-TN-26-4, SLAC National Accelerator Laboratory, 2026.

*Full publication record:* ORCID ● Google Scholar ● Research Gate