ANTOINE BAILLOD

Contact: +41 79 481 72 22 ⋄ antoine.baillod@epfl.ch
Chemin du Boisy 30, 1004 Lausanne, VD, Switzerland
Linkedin: antoinebaillod ⋄ ORCID: 0000-0003-0352-9180

RESEARCH INTERESTS

Stellarator optimization, quasi-symmetry and quasi-isodynamicity, trade-off between stellarator optimization targets, magnetic field topology and its impact on transport, chaos dynamics, coil and permanent magnets optimization, development of physics based proxy functions for optimization

EDUCATION

Swiss Plasma Center (SPC) **December 2018 - Present**
PhD in plasma physics
Lectures on: Parallel computing, Plasma Instabilities, Magnetic Confinement.

École Polytechnique Fédérale de Lausanne (EPFL) **2013-2018**
Master in applied physics
Lectures on (in particular): Plasma physics, Computational simulation of physical systems.
Bachelor in Physics.

Kungliga Tekniska Högskolan (KTH) **2015-2016**
Student exchange program

EXPERIENCE

Swiss Plasma Center (SPC) **December 2018 - Present**
PhD Student

- Implemented the capability to run the Stepped Pressure Equilibrium Code (SPEC) at fixed toroidal current profile. Published in: A. Baillod *et al.* (2021), *Computation of multi-region, relaxed magneto-hydrodynamic equilibria with prescribed toroidal current profile*, J. of Plasma Physics **87** (4).
- Participated in coupling SPEC with simsopt, and performed proof-of-principle optimizations of stellarator finite β equilibria for good magnetic surfaces. Published in: A. Baillod *et al.*, *Stellarator optimization for nested magnetic surfaces at finite β and toroidal current*, Physics of Plasmas **29** (4).
- Implemented a new unique angle representation of toroidal surfaces in SPEC, in an attempt at solving the code fragility in strongly shaped geometries. Publication in preparation.
- Studied the effect of bootstrap current on the equilibrium β-limit of a rotating ellipse. Results were modelled using the High Beta Stellarator expansion. Publication in preparation.

Culham Centre for Fusion Energy (CCFE) **February 2018 - September 2018**
Master thesis on "Statistical analysis of JET Lithium beam data"

- Took part in the development of a statistical analysis code for the lithium beam diagnostic used on the Joint European Torus (JET). A Bayesian statistical approach was used to improve the diagnostic precision and error bar estimation.

Centre Hospitalier Universitaire Vaudois (CHUV) **September 2017 - February 2018**
Intern in the radiophysics department

- Developed an experimental setup to measure the effective dose emitted by the imaging system of the Cyberknife radiotherapy apparatus.
- Used a Treatement Planning System (TPS) to evaluate the effective dose patients are exposed to.
- Results are part of a publication: R. Moeckli *et al.* (2020), *Dose indicator for CyberKnife image-guided radiation therapy*, Medical Physics **47** (5)

TEACHING EXPERIENCE

Teaching assistant

- General physics for first year bachelor students, fall semester 2016, 2018-2021
- Mathematical methods for physicists, spring semester 2019-2022

Project supervision

- Co-supervision of a master student internship during summer 2021, on constructing proxy functions for field line integrability in a stellarator equilibrium.
- Co-supervision of a master student lab project during two semesters in 2021-2022, on exploring the connection between quasi-symmetry and shear-less stellarators.

KEY SKILLS

Programming Languages	FORTRAN, MATLAB, Python, Bash, C++, LaTeX
Tools	MPI, OpenMP, SLURM
Research codes	SPEC, simsopt, FOCUS, DESCUR, booz_xform

LANGUAGES

French	Mother tongue
English	Fluent
German	Basic knowledge

PERSONAL INTERESTS

Association	Polyphys (association for PhD students in physics at EPFL) *Treasurer (2021) and Vice President (2022)*
Hobbies	Outdoor sports (hiking, downhill skiing and ski touring, trail running, climbing) Cooking, travelling

CONFERENCE CONTRIBUTIONS

Invited talks

- **Stellarator optimization for nested magnetic surfaces at finite beta and toroidal current**, June 2022, *International Stellarator and Heliotron Workshop (ISHW)*, Warsaw, Poland

Contributed talks

- **Pressure effects on the topology of magnetic fields in stellarators**, October 2021, *European Fusion Theory Conference (EFTC)*, online
- **Pressure effects on the topology of magnetic fields in stellarators**, ,August 2021, *Sherwood Fusion Theory Conference*, online

Posters

- **Optimization of the equilibrium β-limit in a classical stellarator with bootstrap current**, March 2022, *Simons Collaboration on Hidden Symmetries and Fusion Energy Annual Meeting 2022*, New York, NY, USA
- **Bootstrap current effect on classical stellarator β-limit**, October 2020, *Varenna Fusion Theory conference*, online
- **Toroidal current effects on 3D magnetic equilibria**, August 2019, *Joint Annual Meeting of SPS and ÖPG*, Zürich, ZH, Switzerland
- **Constraining the toroidal current profile in SPEC equilibria**, March 2019, *Simons Collaboration on Hidden Symmetries and Fusion Energy Annual Meeting 2019*, New York, NY, USA

PUBLICATIONS

First author

- A. Baillod *et al.*, (2021), *Computation of multi-region, relaxed magnetohydrodynamic equilibria with prescribed toroidal current profile*, J. of Plasma Physics **87** (4), 10.1017/S0022377821000520
- A. Baillod *et al.* (2022), *Stellarator optimization for nested magnetic surfaces at finite β and toroidal current*, Physics of Plasmas **29** (4), 10.1063/5.0080809

Co-author

- T. S. Pedersen *et al.* (2022), *Experimental confirmation of efficient island divertor operation and successful neoclassical transport optimization in Wendelstein 7-X*, Nuclear Fusion **64** (4), 10.1088/1741-4326/ac2cf5
- A. Kumar *et al.* (2022), *Nature of ideal MHD instabilities as described by multi-region relaxed MHD*, Plasma Physics and Controlled Fusion **64** (6), 10.1088/1361-6587/ac53ee
- A. Kumar *et al.* (2021), *Computation of linear MHD instabilities with the multi-region relaxed MHD energy principle*, Plasma Physics and Controlled Fusion **63** (4), 10.1088/1361-6587/abdbd0
- Z. Qu *et al.* (2020), *Coordinate parameterisation and spectral method optimisation for Beltrami field solver in stellarator geometry*, Plasma Physics and Controlled Fusion **62** (12), 10.1088/1361-6587/abc08e
- J. Loizu *et al.* (2020), *Direct prediction of nonlinear tearing mode saturation using a variational principle*, Physics of Plasmas **27** (7), 10.1063/5.0009110
- R. Moeckli *et al.* (2020), *Dose indicator for CyberKnife image-guided radiation therapy*, Medical Physics **47** (5), 10.1002/mp.14103
- O. Février *et al.* (2018), Analysis of wall-embedded Langmuir probe signals in different conditions on the Tokamak à Configuration Variable, Review of Scientific Instruments **18**, 10.1063/1.5022459