Curriculum Vitae

Name: Zhichen Feng
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ORCID: https://orcid.org/0000-0002-1200-1970

Education Background:

11/2008 — 06/2014,
Ph.D. in plasma physics, Institute for Fusion Theory and Simulation, Department of Physics, Zhejiang University, Hangzhou, China

09/2007 — 10/2008,
Junior specialist, Joint doctoral training program, studying plasma physics in University of California, Irvine, CA, US

09/2005 — 09/2007,
Master's degree student, Department of Physics, Zhejiang University, Hangzhou, China

09/2001 — 06/2005,
B.S. physics, Chu Kochen Honors College, Zhejiang University, Hangzhou, China

Working Experience:

07/2014 — 03/2018: Assistant researcher, Institute for Fusion Theory and Simulation, Department of physics, Zhejiang University, Hangzhou, China.
Participated in theoretical and numerical research on plasma physics in magnetic confined plasma area. Published two papers: "An Approach to Numerically Solving the Poisson Equation"[6], and "Numerical study on wave-induced beam ion prompt losses in DIII-D tokamak"[5]. Started to study stellarator physics form 12/2016 as a visiting scholar at Princeton Plasma Physics Laboratory, NJ.

04/2018 — 04/2022: Postdoc researcher, Institute for Fusion Theory and Simulation, Department of physics, Zhejiang University, Hangzhou, China.
Conducted theoretical research on stellarator plasma physics. Performed theoretical and physical design and optimization of stellarators. Published 4 papers[1–4] on stellarator design and optimization. Research on other fundamental magnetic confined plasma physics, such as magneto hydrodynamic stabilities and plasma confinement in magnetic confined plasma configurations.

12/2022 – now: Postdoc associate, Renewable And Sustainable Energy Institute, University of Colorado, Boulder

Visiting History:

09/2007 — 10/2008: junior specialist, studying plasma physics in University of California, Irvine, CA, US.

12/2016 — 06/2017: visiting scholar, studing stellarator physics Princeton Plasma Physics Lab., NJ, US.

08/2019 — 09/2019: visited Princeton Plasma Physics Lab. and attended the 22nd International Stellarator and Heliotron Workshop University of Wisconsin, US.

RESEARCH AREA:

Stellarator design and optimization; wave-particle resonance, particle motion, transport and gyrokinetic simulation in magnetic confined plasma devices; Alfven eigenmodes in tokamak.

I have been engaged in plasma physics and controlled fusion over 10 years. Understand the fundamental plasma physics very well. Now I am familiar with fusion plasma physics. Know what is necessary and what is sufficient for magnetic controlled fusion theoretically. I am familiar with computational plasma physics codes, such as VEMC, STELLOPT, TERPSCHORE, SFINCS, M3D-K, and so on. Also I know how to write code to realize the numerical computation in plasma physics.

1). Design a linked mirror stellarator (LMS) configuration using simple circular coils recently. It is of good magnetic flux surfaces and controllable shearless rotational transform in vacuum field. Most particles are well confined. The widths of trapped particles' bounce orbits are comparable or even smaller than their Larmor radiuses, so that the neoclassical phenomena will be very small. This makes the neoclassical transport in LMS comparable with it in equivalent tokamak. Also the bootstrap current is believed to be small. This configuration can potentially be a candidate for fusion reactor or neutron source. The paper was published on Nuclear Fusion.

2). Work with other PHD students on optimizing stellarators form simple coils. Found low neoclassical transport stellarators using 4 planer coils. Found low neoclassical transport stellarators with magnetic well using 4 simple coils.

2). From Dec. 2016 to Jun. 2017, started to study the stellarator physics in Princeton Plasma Physics Laboratory. Focus on stellarator design and optimization then. A paper on quasi-axisymmetric stellarator optimization using STELLOPT was published. Work with two graduated students to design stellarators with simple coils. Two paper on this project were published.

3). Study the anomalous particle transport induced by electrostatic perturbations. By developing a new code based on guiding center Hamiltonian equations in tokamak (derived by R. B. White), found the phase space islands when particles cross $\theta = 0$ plane (2007-2008), and found that the mechanism of anomalous transport for circulating particles is stochastic motion because of islands overlapping, which leads to diffusive transport, while the trapped particles are not. I derived an analytical diffusion coefficient for circulating particles according to quasi linear theory.

4). Use the D-IIID equilibrium and neutral beam deposition data to study the fast ions prompt loss in real geometry. Obtain the numerical fast ion loss signal which is comparable to the DIII-D experimental result. Calculate the AE growth rate from AE-induced beam ion prompt loss, and find the result is smaller than the rough estimate by W. W. Heidbrink.

PUBLICATIONS:

1. **Zhichen Feng**, Guodong Yu, Peiyou Jiang, and GuoYong Fu, “Proposal of a linked mirror configuration for magnetic confinement experiment”, Nuclear Fusion 61, 096021 (2021), https://doi.org/10.1088/1741-4326/ac0b4f.
2. Guodong Yu, **Zhichen Feng**, Peiyou Jiang, and GuoYong Fu, “Existence of an optimized stellarator with simple coils”, Journal of Plasma Physics, 88(3), 905880306 (2022), https://doi.org/10.1017/s0022377822000459.
3. Guodong Yu, **Zhichen Feng**, Peiyou Jiang, Neil Pomphrey, Matt Landreman, and GuoYong Fu, “A neoclassically optimized compact stellarator with four planar coils”, Physics of Plasmas 28, 092501 (2021), https://doi.org/10.1063/5.0057834.
4. **Zhichen Feng**, David A. Gates, Samuel A. Lazerson, Matt Landreman, Neil Pomphrey, and GuoYong Fu, “Optimization of quasi-axisymmetric stellarators with varied elongation”, Physics of Plasmas, 27, 022502 (2020), https://doi.org/10.1063/1.5127948.
5. **Zhichen Feng**, Jia Zhu, GuoYong Fu, W. W. Heidbrink, and M. A. Van Zeeland, “Numerical study on wave-induced beam ion prompt losses in DIII-D tokamak”, Physics of Plasmas 24, 082517 (2017), https://doi.org/10.1063/1.5000073.
6. **Zhichen Feng**, Zheng-Mao Sheng, “An Approach to Numerically Solving the Poisson Equation”, Physica Scripta 90, 065603 (2015), https://doi.org/10.1088/0031-8949/90/6/065603.
7. **Zhichen Feng**, Zhiyong Qiu, and Zheng-Mao Sheng, “The mechanism of particles transport induced by electrostatic perturbation in tokamak”, Physics of Plasmas, 20, 122309 (2013), https://doi.org/10.1063/1.4849455.
8. P. Y. Jiang, **Z. C. Feng**, G. D. Yu, G. Y. Fu, “FP3D: A code for calculating 3D magnetic field and particle motion”, arXiv, (10. 2023), https://doi.org/10.48550/arXiv.2310.08188.