Hua-sheng XIE (谢华生)

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Born: Nov. 14, 1987, Hengyang, Hunan, China
Mail: a). 河北廊坊开发区华祥路新源东道新奥科技园智能大厦，065001;
b). Huaxiang Road, Economic and Technological Development Zone, LangFang Hebei, China 065001
E-mail: xiehuasheng[at]enn.cn, huashengxie@{gmail.com, 126.com}
Tel: +86-177-3368-5518
Web: http://hsxie.me, https://hsxie.github.io/, https://github.com/hsxie

2018.02-
Chief Scientist of Fusion Theory and Simulation,
ENN Science and Technology Development Co.,Ltd. [新奥科技发展有限公司（新奥能源研究院）]

Education

- **Postdoc** 2015.10 - 2018.02, School of Physics, Peking University
- **Ph.D.** Plasma Physics, 2015, Zhejiang University
  Thesis: *Numerical Simulations of Micro-turbulence in Tokamak Edge* (Advisor: Yong XIAO)
- **B.S.** Physics, 2010, Zhejiang University
  Thesis: *Study of ES1D Beam-Plasma Interactions* (Advisor: Prof. Liu CHEN)

Research interests (up to now)

- Compact fusion, fusion roadmap.
- Fundamental plasma theories (especially, space plasma, astrophysics)
- Algorithms for numerical solutions or simulations of linear and nonlinear plasma problems

- Tokamak physics (Alfvén waves/eigenmodes, ballooning mode, edge, ...)
- Dipole field (space and laboratory, see gkd)

Publications

Google: https://scholar.google.com/citations?user=nOuRU_8AAAAJ&hl=en
WoS: https://www.webofscience.com/wos/author/record/KHU-1481-2024

1. **H. S. Xie**, Generalized Plasma Dispersion Function: One-solve-all Treatment, Visualizations, and Application to Landau Damping, Physics of Plasmas, 2013, **20**, 092125. [13a]
2. **H. S. Xie**, Constant Residual Electrostatic Electron Plasma Mode in Vlasov-Ampere System, Physics of Plasmas, 2013, **20**, 112108. [13b]
3. **H. S. Xie**, PDRF: A General Dispersion Relation Solver for Magnetized Multi-fluid Plasma, Computer Physics Communications, 2014, **185**, 670-675. [14a]
4. W. Chen, Z. Qiu, X. T. Ding, **H. S. Xie**, L. M. Yu, X. Q. Ji, J. X. Li, Y. G. Li, J. Q. Dong, Z. B. Shi, Y. P. Zhang, J. Y. Cao, X. M. Song, S. D. Song, M. Xu, Q. W. Yang, Yi. Liu, L. W. Yan, X. R. Duan and HL-2A team, Observation and Theory of Nonlinear Mode Couplings between Shear Alfvén Wave and Magnetic Island in Tokamak Plasmas, EPL, 2014, **107**, 25001. [14b]
5. **H. S. Xie**, J. Zhu and Z. W. Ma, Darwin Model in Plasma Physics Revisited, Physica Scripta, 2014, **89**, 105602. [14c]
6. W. Chen, LiMin Yu, Yi. Liu, X.T. Ding, **H. S. Xie**, J. Zhu, L.M. Yu, X.Q. Ji, J.X. Li, Y.G. Li, D.L. Yu, Z.B. Shi, X.M. Song, J.Y. Cao, S.D. Song, Y.B. Dong, W.L. Zhong, M. Jiang, Z.Y. Cui, Y. Huang, Y. Zhou, J.Q. Dong, M. Xu, F. Xia, L.W. Yan, Q.W. Yang, X.R. Duan and the HL-2A Team, Destabilization of Reversed Shear Alfven Eigenmodes Driven by Energetic Ions During NBI in HL-2A Plasmas with $q_{\min} \sim 1$, Nuclear Fusion, 2014, **54**, 104002. [14d]
7. **H. S. Xie** and Y. Xiao, Parallel Equilibrium Current Effect on Existence of Reversed Shear Alfvén Eigenmodes, Physics of Plasmas, 2015, **22**, 022518. [15a]
8. **H. S. Xie** and Y. Xiao, Unconventional Ballooning Structures for Toroidal Drift Waves, Physics of Plasmas, 2015, **22**, 090703. [15b]
9. **H. S. Xie** and Y. Xiao, PDRK: A General Kinetic Dispersion Relation Solver for Magnetized Plasma, Plasma Science and Technology, 2016, **18**, 97. [16a]

10. W. Chen, L. M. Yu, X. T. Ding, **H. S. Xie**, Z. B. Shi, X. Q. Ji, D. L. Yu, Y. P. Zhang, P. W. Shi, Y. G. Li, B. B. Feng, M. Jiang, W. L. Zhong, J. Y. Cao, X. M. Song, M. Xu, Y. H. Xu, L. W. Yan, Yi. Liu, Q. W. Yang, X. R. Duan and HL-2A Team, Core-localized Alfvénic Modes Driven by Energetic-ions in the HL-2A NBI Plasmas with Weak Magnetic Shears, Nuclear Fusion, 2016, **56**, 036018. [16b]

11. **H. S. Xie** and B. Li, Global Theory to Understand Toroidal Drift Waves in Steep Gradient, Physics of Plasmas, 2016, **23**, 082513. [16c]

12. **H. S. Xie**, Y. Xiao, I. Holod, Z. Lin and E. Belli, Sensitivity of kinetic ballooning mode instability to tokamak equilibrium implementations, Journal of Plasma Physics, 2016, **82**, 905820503. [16d]

13. J. Cheng, J. Q. Dong, L. W. Yan, Z. X. He, **H. S. Xie**, Y. Xiao, K. J. Zhao, Z. H. Huang, J. Q. Xu, L. Liu, Z. B. Shi, W. L. Zhong, D. L. Yu, X. Q. Ji, Y. Huang, X. M. Song, Q. W. Yang, X. T. Ding, X. L. Zou, X. R. Duan and HL-2A Team, Roles of turbulencešC and pressure-gradientšCinduced flows in triggering H-mode at marginal heating power on HL-2A tokamak, EPL, 2016, **116**, 15001. [16e]

14. **H. S. Xie**, Y. Xiao and Z. Lin, New Paradigm for Turbulent Transport Across a Steep Gradient in Toroidal Plasmas, Physical Review Letters, 2017, **118**, 095001. [17a]

15. **H. S. Xie**, Y. Y. Li, Z. X. Lu, W. K. Ou and B. Li, Comparisons and applications of four independent numerical approaches for linear gyrokinetic drift modes, Physics of Plasmas, 2017, **24**, 072106. [17b]

16. **H. S. Xie**, Y. Zhang, Z. C. Huang, W. K. Ou and B. Li, Local gyrokinetic study of electrostatic microinstabilities in dipole plasmas, Physics of Plasmas, 2017, **24**, 122115. [17c]

17. **H. S. Xie**, Z. X. Lu and B. Li, Kinetic ballooning mode under steep gradient: High order eigenstates and mode structure parity transition, Physics of Plasmas, 2018, **25**, 072106. [18a]

18. **H. S. Xie**, BO: A unified tool for plasma waves and instabilities analysis, Computer Physics Communications, 2019, **244**, 343–371. [19a]

19. H. Y. Sun, J. S. Zhao, **H. S. Xie** and D. J. Wu, On Kinetic Instabilities Driven by Ion Temperature Anisotropy and Differential Flow in the Solar Wind, ApJ, 2019, 884:44. [19b]

20. Y. F. Wu, X. Tao, X. Liu, L. J. Chen, **H. S. Xie**, K. J. Liu and R. B. Horne, Particle-in-cell simulation of electron cyclotron harmonic waves driven by a loss

cone distribution, Geophysical Research Letters, 2020, **47**, e2020GL087649. [20a]

21. Z. W. Yang, Y. D. Liu, S. Matsukiyo, Q. M. Lu, F. Guo, M. Z. Liu, **H. S. Xie**, X. L. Gao and J. Guo, PIC Simulations of Microinstabilities and Waves at Near-Sun Solar Wind Perpendicular Shocks: Predictions for Parker Solar Probe and Solar Orbiter, The Astrophysical Journal Letters, 2020, 900:L24. [20b]

22. H. Y. Sun, J. S. Zhao, W. Liu, **H. S. Xie** and D. J. Wu, Electron Temperature Anisotropy and Electron Beam Constraints from Electron Kinetic Instabilities in the Solar Wind, The Astrophysical Journal, 2020, 902:59. [20c]

23. C. Shi, J. S. Zhao, H. Y. Sun, C. Y. Huang and **H. S. Xie**, Electromagnetic Emission Driven by Electron Beam Instability in the Jovian Polar Regions, The Astrophysical Journal, 2020, 902:151. [20d]

24. S. Y. Sun, X. S. Wei, Z. Lin, P. F. Liu, W. H. Wang and **H. S. Xie**, Verification of local electrostatic gyrokinetic simulation of driftwave instability in field-reversed configuration, Physics of Plasmas, 2020, **27**, 112504. [20e]

25. H. J. Ma, **H. S. Xie***, Y. K. Bai, S. K. Cheng, B. H. Deng, M. Tuszewski, Y. Li, H. Y. Zhao, B. Chen and J. Y. Liu, Two-parameter modified rigid rotor radial equilibrium model for field- reversed configurations, Nuclear Fusion, 2021, **61**, 036046. [21a]

26. H. J. Ma, **H. S. Xie***, B. H. Deng, Y. K. Bai, S. K. Cheng, Y. Li, B. Chen, M. Tuszewski, H. Y. Zhao and J. Y. Liu, A new tool GSEQ-FRC for two-dimensional field-reversed configuration equilibrium, Nuclear Fusion, 2021, **61**, 086006. [21b]

27. H. Y. Sun, J. S. Zhao, W. Liu, Y. Voitenko, V. Pierrard, C. Shi, Y. H. Yao, **H. S. Xie**, and D. J. Wu, Electron Heat Flux Instabilities in the Inner Heliosphere: Radial Distribution and Implication on the Evolution of the Electron Velocity Distribution Function, ApJ Letters, 2021, 916:L4. [21c]

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29. D. Guo, **H. S. Xie**, W. Bai, W. J. Liu, Y. K. M. Peng, X. M. Song, R. Y. Tao, Bo Chen, B. Liu, Bin Chen, B. H. Deng, Y. J. Shi, B. S. Yuan, M. S. Liu, and EXL-50 Team, Optical Boundary Reconstruction With Visible Camera in the EXL-50 Spherical Tokamak, IEEE Transactions on Plasma Science, 49, 12, 3848, 2021. [21e]

30. J. C. Li, Z. Lin, J. Q. Dong, **H. S. Xie** and S. F. Liu, Microturbulence in edge of a tokamak plasma with medium density and steep temperature gradient, Plasma Phys. Control. Fusion 63 (2021) 125005. [21f]

31. J. Q. Cai, **H. S. Xie***, Y. Li, M. Tuszewski, H. B. Zhou and P. P. Chen, A Study of the Requirements of p-11B Fusion Reactor by Tokamak System Code, Fusion Science and Technology, 2022, 78:2, 149-163. [22a]

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33. **H. S. Xie**, D. Banerjee, Y. K. Bai, H. Y. Zhao, J. C. Li, BORAY: A ray tracing code for various magnetized plasma configurations, Computer Physics Communications 276 (2022) 108363. [22c]

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35. Z. Liang, H. Liu, H. F. Du, B. Chen, Y. M. Yang, **H. S. Xie**, S. Y. Dai and D.Z. Wang, Assessments of the performance of neutral beam injection on the spherical tokamak EXL-50, Fusion Engineering and Design 180 (2022) 113189. [22e]

36. D. F. Kong, S. R. Xu, Y. R. Shou, Y. Gao, Z. S. Mei, Z. Pan, Z. P. Liu, Z. X. Cao, Y. L. Liang, Z. Y. Peng, P. J. Wang, D. Luo, Y. Li, Z. Li, **H. S. Xie**, G. Q. Zhang, W. Luo, J. R. Zhao, S. Y. Chen, Y. X. Geng, Y. Y. Zhao, J. M. Xue, X. Q. Yan, and W. J. Ma, Alpha-Particle Generation from H-11B Fusion Initiated by Laser Accelerated Boron Ions, Laser and Particle Beams, 2022, 5733475. [22f]

37. D. Banerjee, S. D. Song, **H. S. Xie**, B. Liu, M. Y. Wang, W. J. Liu, B. Chen, L. Han, D. Luo, Y. Y. Song, X. M. Song, M. S. Liu, Y. J. Shi, Y. K. Martin Peng and the EXL-50 team, and Yu. V. Petrov and R. W. Harvey, Investigation of the effectiveness of 'multi-harmonic' electron cyclotron current drive in the non inductive EXL-50 ST, Journal of Physics: Conference Series, 2397, 1, 012011 (2022). [22g]

38. Y. H. Yao, J. S. Zhao, **H. S. Xie**, W. Liu and D. J. Wu, The Oblique Alfvén Ion Beam Instability in the Earth' s Ion Foreshock, Research in Astronomy and Astrophysics, 23:025014, 2023. [23a]

39. H. J. Ma, **H. S. Xie** and B. Li, Simulations of energy deposition of electron cyclotron waves in a dipole-confined plasma based on ray trajectory, Physics of Plasmas, 2023, **30**, 042502. [23b]

40. **H. S. Xie**, M. Z. Tan, D. Luo, Z. Li and B. Liu, Fusion reactivities with drift bi-Maxwellian ion velocity distributions, Plasma Phys. Control. Fusion 65 (2023) 055019. [23c]

41. W. Bai and **H. S. Xie***, Toward developing a comprehensive algorithm for solving kinetic plasma dispersion relations for parallel propagation with a kappa distribution, Physics of Plasmas, 2023, **30**, 043903. [23d]

42. J. Bao, W.L. Zhang, D. Li, Z. Lin, G. Dong, C. Liu, **H. S. Xie**, G. Meng, J.Y. Cheng, C. Dong and J.T. Cao, MAS: a versatile Landau-fluid eigenvalue code for plasma stability analysis in general geometry, Nucl. Fusion 63 (2023) 076021. [23e]

43. **H. S. Xie**, A simple and fast approach for computing the fusion reactivities with arbitrary ion velocity distributions, Computer Physics Communications 292 (2023) 108862. [23f]

44. H. Z. Kong, **H. S. Xie*** and J. Z. Sun, A linear parameters study of ion cyclotron emission using drift ring beam distribution, Nucl. Fusion 63 (2023) 126034. [23g]

45. 郝保龙，李颖颖，陈伟，郝广周，顾翔，孙恬恬，王🄴民，董家齐，袁保山，彭元凯，石跃江，**谢华生**，刘敏胜，ENN TEAM，EXL-50U 球形环中快离子磁场波纹损失的优化模拟研究，物理学报 Acta Phys. Sin. 72, 21 (2023) 215215. [23h]

46. H. Z. Kong, **H. S. Xie***, B. Liu, M.Z. Tan, D. Luo, Z. Li and J. Z. Sun, Enhancement of fusion reactivity under non-Maxwellian distributions: effects of drift-ring-beam, slowing-down, and kappa super-thermal distributions, Plasma Phys. Control. Fusion 66 (2024) 015009. [24a]

47. H.J. Ma, **H. S. Xie** and B. Li, Simulation of ion cyclotron wave heating in the EXL-50U spherical tokamak based on dispersion relations, Plasma Sci. Technol. 26 (2024) 025105. [24b]

48. **H. S. Xie** and X. Y. Wang, On the upper bound of non-thermal fusion reactivity with fixed total energy, Plasma Phys. Control. Fusion 66 (2024) 065009. [24c]

49. **H. S. Xie**, H. J. Ma and Y. K. Bai, Plasma wave propagation conditions analysis using the warm multi-fluid model, Fundamental Plasma Physics 10 (2024) 100050. [24d]

50. M. S. Liu, **H. S. Xie***, Y. M. Wang, J. Q. Dong, K. M. Feng, X. Gu, X. L. Huang, X. C. Jiang, Y. Y. Li, Z. Li, B. Liu, W. J. Liu, D. Luo, Y. K. M. Peng, Y. J. Shi, S. D. Song, X. M. Song, T. T. Sun, M. Z. Tan, X. Y. Wang, Y. M. Yang, G. Yin and H. Y. Zhao, ENN' s roadmap for proton-boron fusion based on spherical torus, Phys. Plasmas 31, 062507 (2024). [24e]

51. **H. S. Xie**, Rapid Computation of the Plasma Dispersion Function: Rational and Multi-pole Approximation, and Improved Accuracy, AIP Advances 14, 075007 (2024). [24f]

52. M. S. Liu, **H. S. Xie***, Y. M. Wang, J. Q. Dong, K. M. Feng, X. Gu, X. L. Huang, X. C. Jiang, Y. Y. Li, Z. Li, B. Liu, W. J. Liu, D. Luo, Y. K. M. Peng, Y. J. Shi, S. D. Song, X. M. Song, T. T. Sun, M. Z. Tan, X. Y. Wang, Y. M. Yang, G. Yin and H. Y. Zhao, Response to Comment on 'ENN' s roadmap for proton-boron fusion based on spherical torus' [Phys. Plasmas 31, 062507 (2024)], Phys. Plasmas 31, 084702 (2024). [24g]

Submitted or to submit

1. **H. S. Xie**, R. Denton, J. S. Zhao and W. Liu, BO 2.0: Plasma Wave and Instability Analysis with Enhanced Polarization Calculations, arXiv:2103.16014, 2021.

2. **H. S. Xie**, Bremsstrahlung Radiation Power in Fusion Plasmas Revisited: Towards Accurate Analytical Fitting, arXiv:2404.11540, 2024.

Books

1. **谢华生**，计算等离子体物理导论，科学出版社，北京，2018. **H. S. Xie**, Introduction to Computational Plasma Physics (in Chinese), Science Press, Beijing, 2018. http://hsxie.me/cppbook/.

2. **谢华生**，聚变点火原理概述（聚变能源研究的零级量），中国科学技术大学出版社，合肥，2023. **H. S. Xie**, Introduction to Fusion Ignition Principles: Zeroth Order Factors of Fusion Energy Research (in Chinese), USTC Press, Hefei, 2023. http://hsxie.me/fusionbook/.

Preprint or unrefereed

1. **H. S. Xie**, Pure Monte Carlo Method: a Third Way for Plasma Simulation, arXiv, 1210.2265.

2. **H. S. Xie** and L. Chen, Linear Gyrokinetic Coupling of Firehose and Mirror Modes, arXiv, 1210.4441.

(Selected manuscripts, which are not in final forms.)

Codes development

1. GPDF, General Plasma Dispersion Function, 2013. Ref: [13a].
2. PDRF, Plasma Dispersion Relation Solver – Fluid version, 2013. Ref: [14a].
3. PDRK/BO/BORAY, Plasma Dispersion Relation Solver – Kinetic version, 2014. Ref: [16a], [19a], [22c].
4. AMC, Alfvén Mode Code, 2013. Ref: [15a].
5. MGK, Multi-approach GyroKinetic code (with Yue-yan LI and Zhi-xin LU), 2016. Ref: [17b].

(Other educational oriented codes: pic1d, vlasov1d, orbitm, mhd2d, transport1d, ...)

See lists: https://github.com/hsxie, http://hsxie.me/codes/